330 Grays Inn Road Ltd

330 GRAYS INN ROAD

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY ADDENDUM

70057187-RP-FRA-002
FEBRUARY 2021

CONFIDENTIAL

330 Grays Inn Road Ltd

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PROJECT NO. 70057187

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DATE: FEBRUARY 2021

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FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY ADDENDUM

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QUALITY CONTROL

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1 INTRODUCTION

1.1 APPOINTMENT AND BRIEF

1.1.1 WSP has prepared this Flood Risk Assessment (FRA) and Drainage Strategy (DS) Addendum on behalf of 330 Grays Inn Road Ltd, for the Site referred to as 330 Grays Inn Road, to provide a response back to the London Borough of Camden (LBC) who are the Lead Local Flood Authority (LLFA) comments, as well as comments received from the Greater London Authority (GLA).

1.1.2 The aim of this report is to provide additional information and explanation of the design to date.

1.2 LBC COMMENTS

1.2.1 The following comments were received by LBC.

<u>The proposal are currently unacceptable for the following reasons:</u>

1. *The proposals have not fully addressed the London Plan's drainage hierarchy and does not meet the requirements of the New London Play Policy SI 13. Specifically, it is not clear whether or not all aspects of the drainage hierarchy have been fully considered. It is not clear whether green roofs and rainwater harvesting will be incorporated into the drainage strategy as contradicting information is presented within the information provided. If these are not proposed, please provide justification as to why not. The current proposal for a pumped attenuation tank is not considered to be a sustainable option and so all efforts should be made to incorporate green infrastructure including green roofs and rainwater harvesting. The existing building to be refurbished will discharge unrestricted to the Thames Water system in Gray's Inn Road.*

2. *The proposed runoff rates do not adhere to the requirements of Policy SI 13 within the London Plan. More information is required including the entire site in calculations. The proposed runoff rate does not include runoff from the whole site as it does not include the unrestricted flow from the refurbished part of the development. Discharge from this part of the site should be restricted to greenfield rates or as close as reasonably practical.*

3. *Sufficient information has not been provided to demonstrate that the proposals adhere to sections 3.4.7 / 3.4.8 of the London Plan SPG. Specifically, the entire site area has not been used in calculations.*

4. *Does not comply with Defra Non-Statutory Technical Standards S5,9. In addition, please provide clarification as to the attenuation volume provided: 612 m3 provided according to strategy but 627 m3 has been modelled using microdrainage. No drawings to indicate how exceedance flows will be managed.*

5. *No site-specific drainage asset investigations have been carried out.*

6. *No confirmation of capacity in the sewer network for the proposed connection.*

7. *Information regarding the management of health and safety risks related to the SuDS design should be provided by the applicant.*

1.3 GLA STAGE 1 COMMENTS

1.3.1 The following comments were received by GLA.

6. *Attenuation is proposed to be provided within an attenuation tank in the basement, which is pumped off site. Pumping is not a sustainable solution to surface water discharge and should be avoided. Site constraints created by development design is not considered sufficient justification. The drainage strategy should be re-visited to incorporate attenuation volume above ground where possible.*

7. *In terms of SuDS, the drainage strategy mentions inclusion of green roofs, however these are not clearly identified on the proposed scheme plans. No other SuDS are proposed. The Sustainability Statement mentions rainwater harvesting and permeable paving, which should be included within the drainage strategy. Further consideration should be given to sustainable, above ground, green SuDS to meet the water quantity, water quality, biodiversity, and amenity requirements as per the CIRIA SuDS Manual.*

9. *The surface water drainage strategy for the proposed development does not comply with London Plan policy 5.13 (and the New London Plan policy SI.13), as it does not give appropriate regard to providing a sustainable drainage solution. The Applicant should revisit the drainage strategy to avoid surface water pumping as far as possible, include a range of Sustainable Drainage Systems (SuDS), and assess exceedance flood flow routes (above the 1 in 100 year + 40% design storm event).*

13. *The proposed development generally meets the requirements of London Plan policy 5.15 (and the New London Plan policy SI.5). However, the Applicant should provide details of the type of rainwater harvesting system proposed, which can be integrated with the surface water drainage system to provide a dual benefit.*

2 DESIGN TEAM RESPONSE

2.1 SURFACE WATER STRATEGY OVERVIEW

2.1.1 The drainage design for the scheme has developed from inception to take into account site constraints as well as policy requirements set out by the London Plan as well Camdens Core Strategy. The aim has been to ensure we reduce surface water discharge rates as much as possible in line with best practice whilst considering the proposal itself in terms of unit numbers as well as limitations on what can be achieved within the plot itself in terms of attenuation.

2.1.2 In order to provide a clear response to each of the points raised, I've provided a response back on each of the points raised by the LBC and the GLA.

2.2 DESIGN TEAM RESPONSE TO LBC COMMENTS

2.2.1 The scheme includes Green Roofs (942.9m^2) which equates to 44% of available flat roof area, this is the maximum that can be achieved whilst considering required plant/lift overruns/ stair pop up and need for useable and accessible amenity space. A separate Rainwater Harvesting tank (18m^3) is also provided in the basement. This addendum report includes the latest plans in relation to proposed green roofs and the basement plan showing the rainwater harvesting tank location for clarity, please refer to **Appendix A**. The SuDS Proforma has also been updated and included in **Appendix B**.

2.2.2 Following internal design discussions, the use of an active rainwater system integrated as part of the main attenuation tank will be explored as part of detailed design to potentially increase the amount of water being used for re-use by using the main attenuation tank. The exact use of this water will be determined as part of the detailed design stage, however as 612m^3 of storage is provided, the inclusion of an active rainwater harvesting system would help reduce water demand significantly. We suggest that this can be conditioned as a pre-commencement but post-demolition condition.

2.2.3 With respect to the element that is being refurbished internally only and its associated surface water discharge rate, as the proposed F&B element of the hotel is an internal refurbishment, it's very difficult and a huge undertaking to change the existing internal drainage within that demise, any works would require significant modifications to the roof outlets, all the downpipes, internally routing of rainwater and changes to the existing outfall arrangements for that part of the site, as well as effecting the structure of the building itself having to introduce some form of attenuation within this demise. Any works would destroy the integrity of the existing building, and through consultation discussions with LBC it was key that this existing building be retained. The new build parts of the site will restrict surface water to a rate of 2.0 l/s for the 1:100 year + 40% climate change event, which is significant betterment on the existing rates of discharge. Green roofing is provided to aid in a reduction of peak flow over the F&B element. As such it's not viable to attenuate the entire site, as the refurbishment aspect needs to discharge as it currently does.

2.2.4 The total attenuation provides is 612m^3 to limit the new build site to 2.0 l/s. The calculations for the 1:100 year + 40% CC event which were included in the FRA and DS. I'm unsure where 627m^3 was stated. We have included the calculations again within **Appendix C**.

2.2.5 In terms of Exceedance flow paths, the development site occupies the full extent of the boundary line for the site, therefore any exceedance flow paths are limited to the raised first floor level. I've provided within **Appendix D** projected routes of surface water runoff in this area, and also projected routes based on the topographical survey within the retained footpaths around the site to the highway.

2.2.6 In terms of survey works, some survey works have been carried out and we have included this within **Appendix E**. Further survey works may need to be undertaken as part of detailed design. The surveys undertaken to date have confirmed an existing connection to the combined sewer which we are utilising to discharge surface water at 2.0 l/s. The discharge rates have been approved by Thames Water, this approval is included in **Appendix F.**

2.2.7 In terms of SuDS Maintenance, the maintenance owner is 330 Grays Inn Road Ltd. We have added a green roof element to the maintenance strategy. Please refer to Table 2-1 below.

Table 2-1 - Drainage Maintenance Requirements

Drainage Feature	Regular Maintenance	Occasional Maintenance	Monitoring
Drainage Channels	Inspections will be frequent and regular, depending on local conditions, but at least annually by Site management. Inspections will include gratings; covers including their locking bolts; sumps and sump buckets; exposed concrete surround and adjacent paving. Channels will be flushed with water or high-pressure jetting (no boiling water or cleaning agent will be used). All silt buckets and sumps will be cleaned out replaced back into the units ensuring they are correctly fitted.	All channel surfaces and joints will be checked and repaired as necessary.	Inspected every 6 months or after large storm.
Manholes / Inspection Chambers	Inspection chambers will be checked every 6 months for the accumulation of debris and silt and cleaned as necessary.		Inspect every 6 months or after large storms.
Concrete Attenuation Tank/Rainwater Harvesting Tank	Tank will be checked every 6 months for the accumulation of debris and silt and cleaned as necessary.		Inspect every 6 months or after large storms.
Green Roofs	Inspect all components including soil substrate, vegetation, drains, irrigation	Replace dead plants as required	Inspected every 6 months

	systems (if applicable), membranes, integrity of waterproofing and structural stability. Inspect drain inlets to ensure unrestricted runoff from the drainage layer. Remove debris and litter to prevent clogging of inlet drains and inference with plant growth.	Remove invasive and nuisance vegetation including weeds.	or after large storm.

2.2.8 With respect to Health and Safety related to SuDS Design. The key risks in terms of H&S is the maintenance required for the attenuation tank/rainwater harvesting tank and pumps themselves, given the depth and location. Any maintenance will need to be carried out by a suitably qualified professional with confined space training. The maintenance of the green roofs also poses a potential risk, due to working at height, and therefore will also need to be undertaken by a suitably qualified professional in line with manufacturer requirements. This is captured under CDM Risk Register and will continue to update as required as the scheme develops towards detail design.

2.1 DESIGN TEAM RESPONSE TO GLA STAGE 1 COMMENTS

2.1.1 With respect to the GLA Stage 1 comments, as above we can confirm the inclusion of green roofs that occupy 44% of roof areas and rainwater harvesting is proposed for the development. As indicated above the use of an active rainwater harvesting system as part of the main attenuation tank will be explored at detailed design stage, to offer additional rainwater harvesting within the scheme.

2.1.2 We have included within **Appendix D** the exceedance flow path plan.

2.1.3 With regards to the pumping of surface water, we do agree that the pumping of surface water is not the preferred option, as a gravity solution would be more sustainable. However, there are a number of constraints, preventing this storage being above ground. The first is that through discussions with Thames Water, it is their preference is to re-utilise the sewer connection to the east of the site, rather than discharging via a new connection and heading, to one of the major trunk sewers located to the north or south of the site, this existing 229mm diameter outfall which connects to the 1168x813 sewer to the east has a fixed invert level just below ground level (IL 14.08m AOD), and following surveys was deemed to actually be a 150mm diameter pipe. For context the lower ground floor level is 14.650m AOD so leaves little room for storage at higher level, especially considering pipe bends and routing of pipe work especially from the west to east direction where this outfall is.

2.1.4 We did explore the option of providing all storage at podium level however this would result in a significant drop in the basement level to allow for sufficient build up at podium level (approximately 1.0m needed), which would result in significant additional excavation and use of concrete and its associated carbon emissions. This option would have also required a connection to the main sewer within Swinton Street, which TW would no prefer given its trunk sewer status.

2.1.5 The option of blue roofs was discussed as part of design development, however the geometry of the roofs across the development site is varied with some areas of pitched roof, plant well and others with green roofs to maximise biodiversity at multiple levels across the buildings. Therefore, based on this the introduction of blue roofs would be restricted, resulting in limited contributing areas.

2.1.6 The second point is given the volume of storage required (612m^3) and the flow rate that is required to be achieved of 2.0 l/s for the new build part of the site, the spatial plan area needed would simply not be possible, without compromising the viability of the scheme in terms of unit numbers.

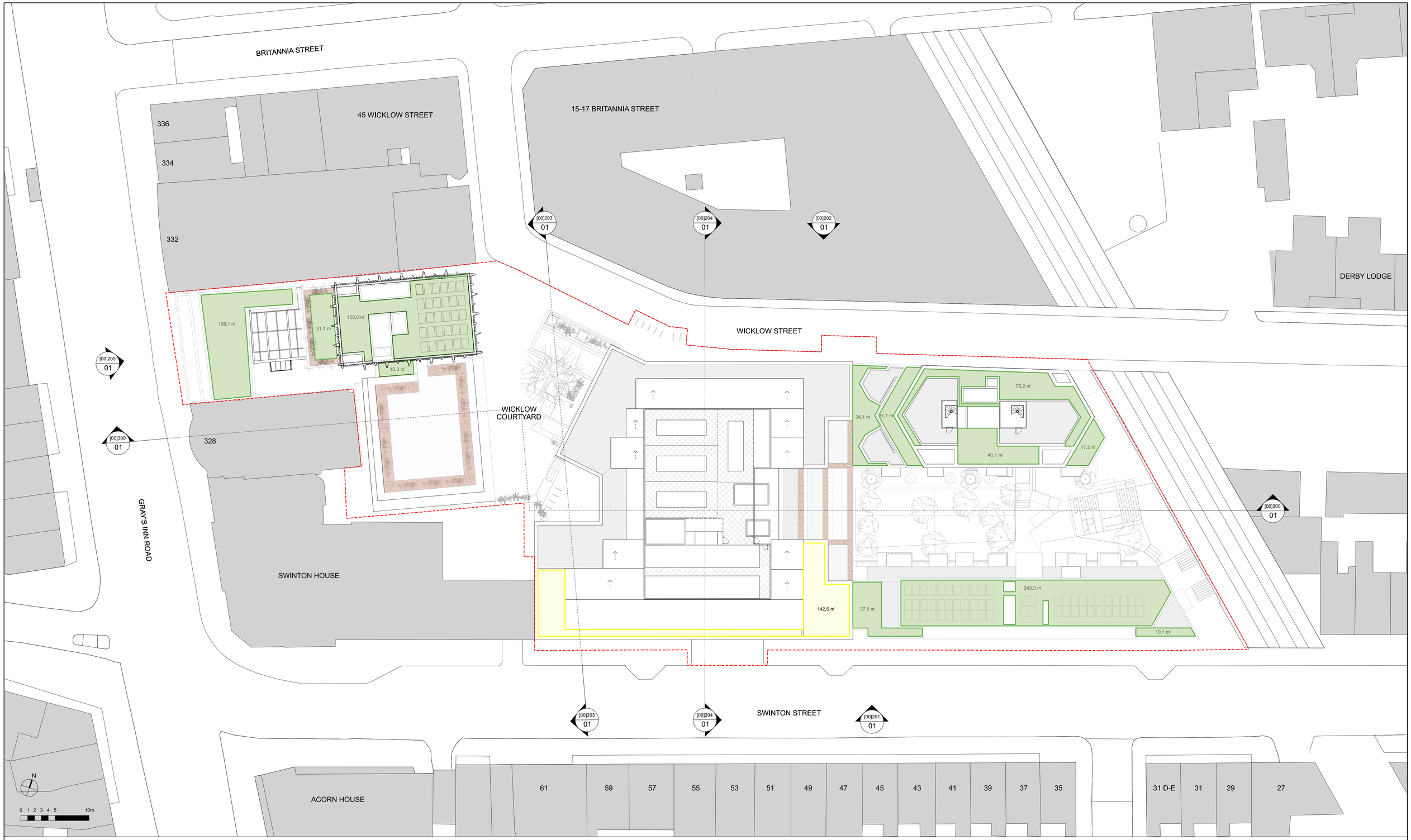
2.1.7 We therefore concluded as part of design development a pumped solution would best way forward to efficiently achieve the required attenuation and flow rate, within the context of the build.

3 CONCLUSIONS

3.1.1 We trust that the information provided in this FRA and DS addendum address the comments from the LBC and the GLA as the scheme is restricting surface water discharge rate as low as possible and green roofs and rainwater harvesting is being proposed in line with policy.

Appendix A

ROOF PLAN AND BASEMENT PLAN



01 GENERAL ARRANGEMENT: FOURTEENTH FLOOR PLAN

KEY

- SITE BOUNDARY
- INTENSIVE GREEN ROOF OR VEGETATION OVER STRUCTURE. VEGETATED SECTIONS ONLY. SUBSTRATE MINIMUM SETTLED DEPTH OF 150mm
- EXTENSIVE GREEN ROOF WITH SUBSTRATE OF MINIMUM SETTLED DEPTH OF 80mm (OR 60mm BENEATH VEGETATION BLANKET)
- PERENNIAL PLANTING (SPECIES TBC)
- DECKING TO ACCESIBLE TERRACES (MATERIAL TBC)

REV	DATE	
P01	01/02/21	ISSUED FOR PLANNING

CONSULTANTS	NAME
CLIENT:	GROVEWORLD
STRUCTURAL ENGINEER:	WSP
MECHANICAL ENGINEER:	XC02
COST CONSULTANT:	TURNER TOWNSEND
ACOUSTIC CONSULTANT:	HANN TUCKER
TRANSPORT CONSULTANT:	STEER
DAYLIGHT / SUNLIGHT :	POINT2

NOTE

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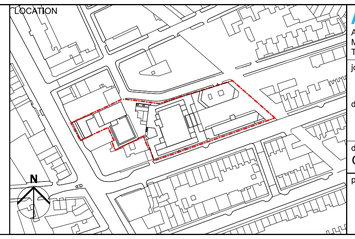
LOCATION



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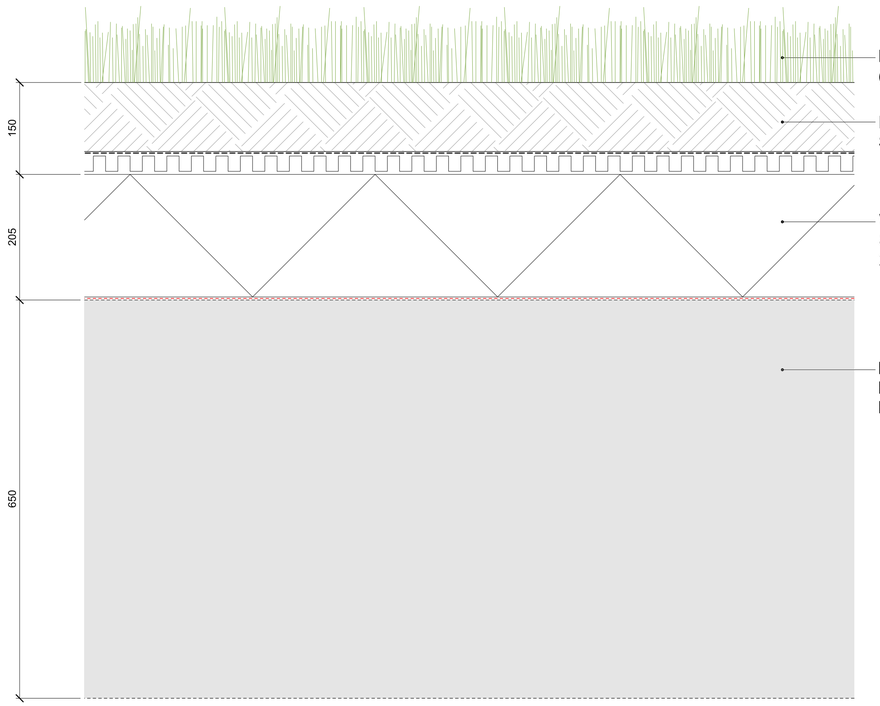
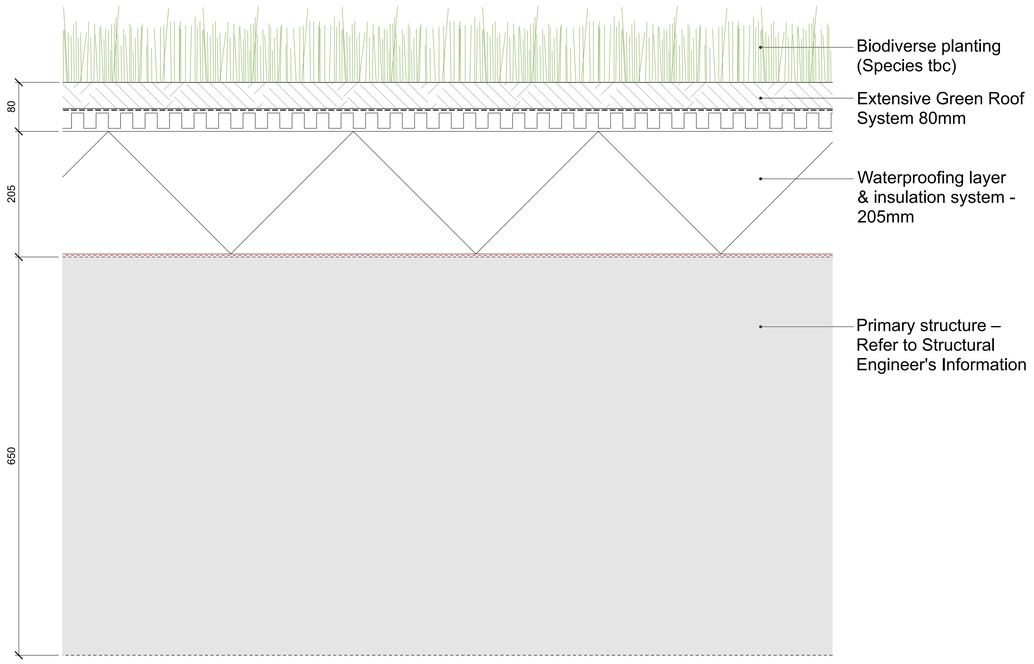
job title				
330 GRAYS INN ROAD				
drawing title / location				
PROPOSED MASTERPLAN EXTENT OF GREEN ROOFS				
drawn by	checked	scale	status	
GS	MH	1:250@A1; 1:500@A3	PLANNING	
project	zone	source	classification	drawing no.	revision
18116		A	(00)_P150	P01



01 DETAIL: INTENSIVE GREEN ROOF (150mm SUBSTRATE)



02 DETAIL: EXTENSIVE GREEN ROOF (80mm SUBSTRATE)

KEY

REV	DATE	
A	02/02/21	ISSUED FOR INFORMATION

CONSULTANTS	NAME
CLIENT:	GROVEWORLD
STRUCTURAL ENGINEER:	WSP
MECHANICAL ENGINEER:	XC02
COST CONSULTANT:	TURNER TOWNSEND
ACOUSTIC CONSULTANT:	HANN TUCKER
TRANSPORT CONSULTANT:	STEER
DAYLIGHT / SUNLIGHT :	POINT2

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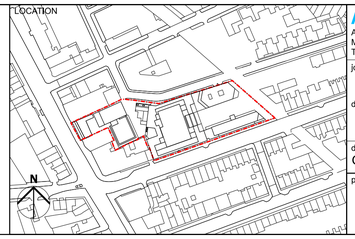

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job title
330 GRAYS INN ROAD

drawing title / location
GREEN ROOF BUILD-UPS
DETAILS

drawn by	checked	scale	status
GS	MH	1:5@A1; 1:10@A3	INFORMATION

project	zone	source	classification	drawing no.	revision
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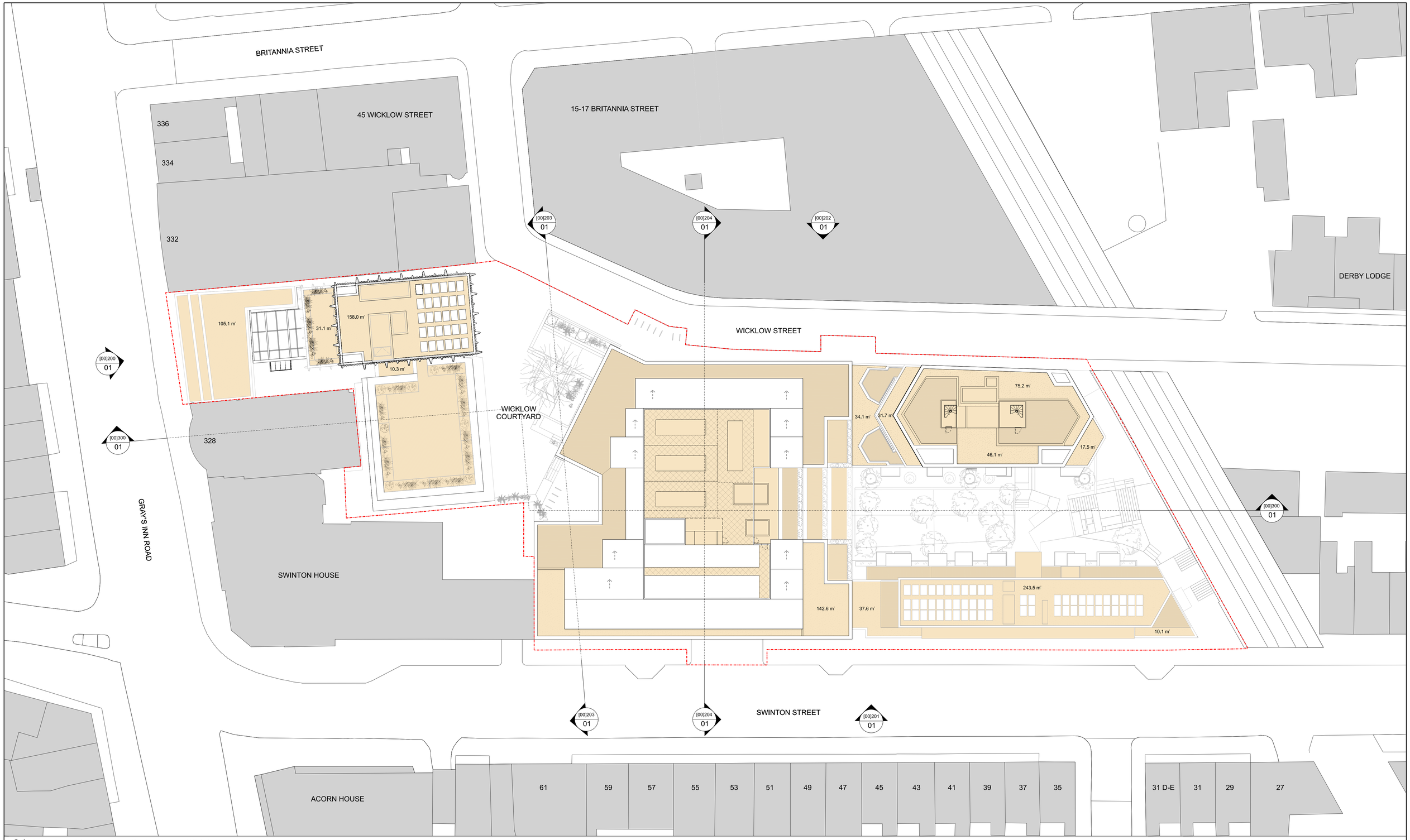

01 GENERAL ARRANGEMENT: FOURTEENTH FLOOR PLAN

KEY

SITE BOUNDARY

AREAS OF FLAT ROOF WITH POTENTIAL FOR GREEN ROOF

REV	DATE	
A	17/02/21	ISSUED FOR INFORMATION

CONSULTANTS	NAME
CLIENT:	GROVEWORLD
STRUCTURAL ENGINEER:	WSP
MECHANICAL ENGINEER:	XC02
COST CONSULTANT:	TURNER TOWNSEND
ACOUSTIC CONSULTANT:	HANN TUCKER
TRANSPORT CONSULTANT:	STEER
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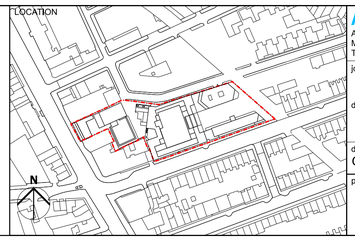

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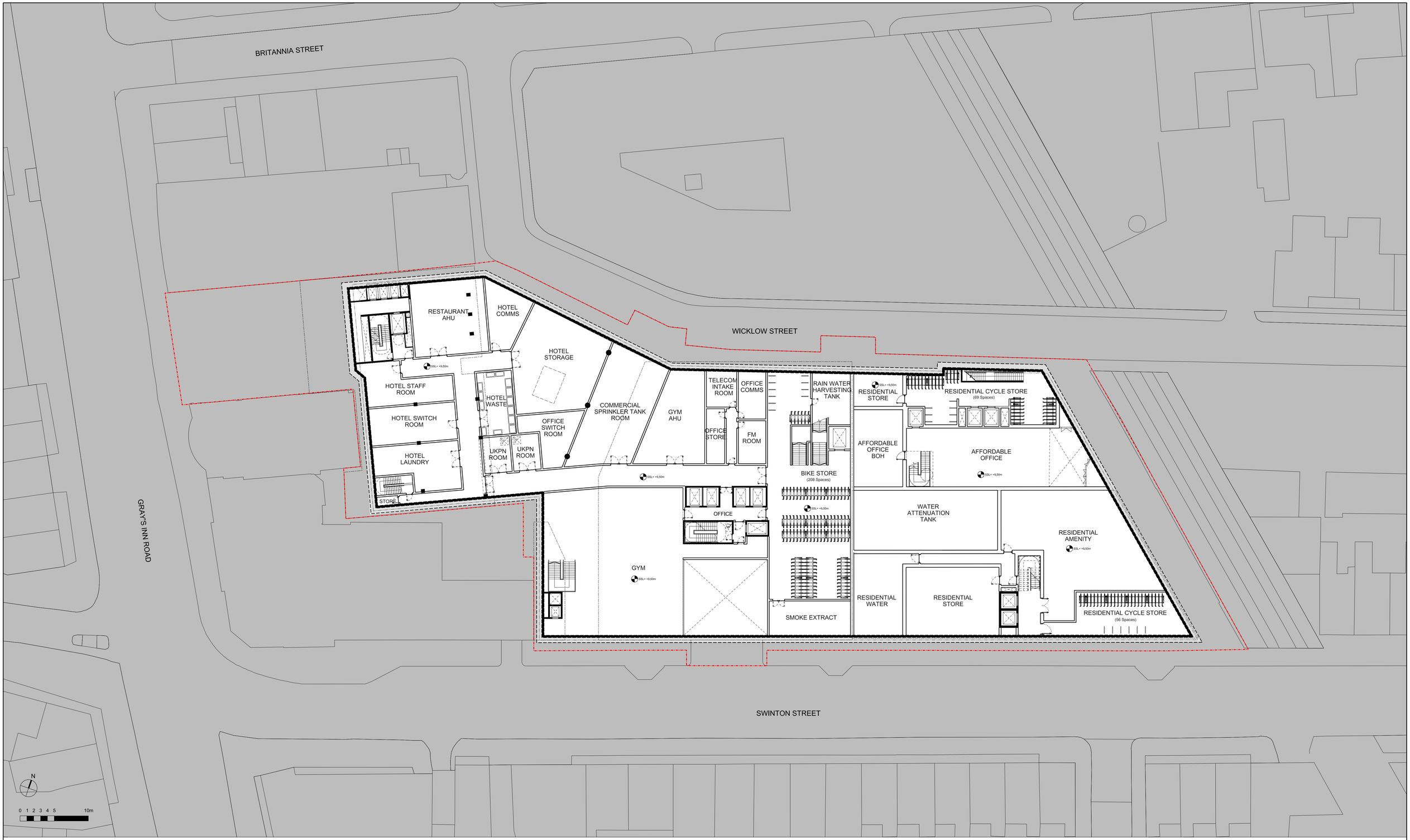
job title
330 GRAYS INN ROAD

drawing title / location
PROPOSED MASTERPLAN
EXTENT OF GREEN ROOFS

drawn by	checked	scale	status
GS	MH	1:250@A1; 1:500@A3	INFORMATION

project	zone	source	classification	drawing no.	revision
18116		A	(SK)_036		A



01 GENERAL ARRANGEMENT: BASEMENT LEVEL

KEY

SITE BOUNDARY

REV	DATE
P01	

CONSULTANTS	NAME
CLIENT:	GROVEWORLD
STRUCTURAL ENGINEER:	WSP
MECHANICAL ENGINEER:	XC02
COST CONSULTANT:	TURNER TOWNSEND
ACOUSTIC CONSULTANT:	HANN TUCKER
TRANSPORT CONSULTANT:	STEER
DAYLIGHT / SUNLIGHT :	POINT2

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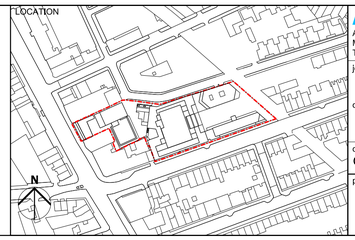

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BASEMENT LEVEL

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GS	MH	1:250@A1; 1:500@A3	PLANNING

project	zone	source	classification	drawing no.	revision
18116		A	(00)_P099		P01

Appendix B

UPDATED SUDS PROFORMA

Camden

GREATERLONDONAUTHORITY

LoDEG

1. Project & Site Details		
	Project / Site Name (including sub-catchment / stage / phase where appropriate)	330 Grays Inn Road
	Address & post code	330 Grays Inn RdKings Cross, London WC1X 8DA
	OS Grid ref. (Easting, Northing)	E 530607
		N 182817
	LPA reference (if applicable)	
	Brief description of proposed work	Redevelopment of the former Royal National Throat, Nose and Ear hospital, comprising: Retention of 330 Gray's Inn Road and a two storey extension for use as hotel, demolition of all other buildings
	Total site Area	5320 m^2
	Total existing impervious area	5320 m^2
	Total proposed impervious area	5320 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	Public Combined Sewer, various locations. To be confirmed as part of
	Designer Name	Gurdeep Bansal
	Designer Position	Associate Director
	Designer Company	WSP UK LTD

2. Proposed Discharge Arrangements			
	2a. Infiltration Feasibility		
	Superficial geology classification	None Recorded	
	Bedrock geology classification	London Clay	
	Site infiltration rate	m/s	
	Depth to groundwater level	m below ground level	
	Is infiltration feasible?	No	
	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	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	N
	6 discharge rainwater to a surface water sewer/drain	N	N
	7 discharge rainwater to the combined sewer.	Y	Y
	2c. Proposed Discharge Details		
	Proposed discharge location	Local Combined Sewer Network	
	Has the owner/regulator of the discharge location been consulted?	Yes, and approved by Thames Water	

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	0.64			
1 in 1	0.54	55.17		2
1 in 30	1.47	141.34		2
1 in 100	2.03	186.35		2
1 in 100 + CC			612	2
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Pump Flow Control		

3c. Proposed SuDS Measures

	Catchment area (m^2)	Plan area (m^2)	Storage vol. (m^3)
Rainwater harvesting			18
Infiltration systems	0		0
Green roofs	943	943	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	5320		612
Total	**6263**	**943**	**630**

4. Supporting Information

4a. Discharge & Drainage Strategy	Page/section of drainage report
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Chapter 8
Drainage hierarchy (2b)	Chapter 8
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Refer to Drainage Strategy
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Refer to Drainage Strategy
Proposed SuDS measures & specifications (3b)	Refer to Drainage Strategy
4b. Other Supporting Details	Page/section of drainage report
Detailed Development Layout	Refer to Drainage Strategy
Detailed drainage design drawings, including exceedance flow routes	Refer to Drainage Strategy
Detailed landscaping plans	Refer to Drainage Strategy
Maintenance strategy	Refer to Drainage Strategy
Demonstration of how the proposed SuDS measures improve:	Refer to Drainage Strategy
a) water quality of the runoff?	
b) biodiversity?	
c) amenity?	

Appendix C

ATTENUATION CALCULATIONS

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	7.671	1.171	2.0	222.5	O K
30 min Summer	8.002	1.502	2.0	285.3	O K
60 min Summer	8.319	1.819	2.0	345.6	O K
120 min Summer	8.805	2.305	2.0	437.9	O K
180 min Summer	9.095	2.595	2.0	493.0	O K
240 min Summer	9.287	2.787	2.0	529.5	O K
360 min Summer	9.511	3.011	2.0	572.1	O K
480 min Summer	9.624	3.124	2.0	593.5	O K
600 min Summer	9.681	3.181	2.0	604.5	O K
720 min Summer	9.708	3.208	2.0	609.4	Flood Risk
960 min Summer	9.705	3.205	2.0	608.9	Flood Risk
1440 min Summer	9.606	3.106	2.0	590.0	O K
2160 min Summer	9.365	2.865	2.0	544.3	O K
2880 min Summer	9.148	2.648	2.0	503.2	O K
4320 min Summer	8.839	2.339	2.0	444.4	O K
5760 min Summer	8.611	2.111	2.0	401.0	O K
7200 min Summer	8.429	1.929	2.0	366.5	O K
8640 min Summer	8.275	1.775	2.0	337.2	O K
10080 min Summer	8.141	1.641	2.0	311.8	O K
15 min Winter	7.671	1.171	2.0	222.5	O K
30 min Winter	8.002	1.502	2.0	285.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	177.456	0.0	172.3	19
30 min Summer	114.185	0.0	172.0	34
60 min Summer	69.652	0.0	335.0	64
120 min Summer	44.603	0.0	343.8	124
180 min Summer	33.805	0.0	343.2	184
240 min Summer	27.485	0.0	342.6	244
360 min Summer	20.164	0.0	341.4	364
480 min Summer	15.978	0.0	340.2	482
600 min Summer	13.260	0.0	339.0	602
720 min Summer	11.348	0.0	337.7	722
960 min Summer	8.827	0.0	335.1	962
1440 min Summer	6.156	0.0	329.2	1442
2160 min Summer	4.266	0.0	664.0	2100
2880 min Summer	3.289	0.0	649.6	2364
4320 min Summer	2.290	0.0	609.9	3068
5760 min Summer	1.781	0.0	864.0	3864
7200 min Summer	1.474	0.0	894.1	4680
8640 min Summer	1.269	0.0	923.7	5456
10080 min Summer	1.123	0.0	953.0	6256
15 min Winter	177.456	0.0	172.3	19
30 min Winter	114.185	0.0	172.0	34

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	8.319	1.819	2.0	345.7	O K
120 min Winter	8.806	2.306	2.0	438.2	O K
180 min Winter	9.097	2.597	2.0	493.4	O K
240 min Winter	9.290	2.790	2.0	530.0	O K
360 min Winter	9.515	3.015	2.0	572.9	O K
480 min Winter	9.629	3.129	2.0	594.6	O K
600 min Winter	9.689	3.189	2.0	605.8	O K
720 min Winter	9.716	3.216	2.0	611.1	Flood Risk
960 min Winter	9.717	3.217	2.0	611.2	Flood Risk
1440 min Winter	9.626	3.126	2.0	594.0	O K
2160 min Winter	9.400	2.900	2.0	551.0	O K
2880 min Winter	9.158	2.658	2.0	505.0	O K
4320 min Winter	8.797	2.297	2.0	436.5	O K
5760 min Winter	8.498	1.998	2.0	379.7	O K
7200 min Winter	8.244	1.744	2.0	331.3	O K
8640 min Winter	8.021	1.521	2.0	288.9	O K
10080 min Winter	7.824	1.324	2.0	251.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	69.652	0.0	334.9	64
120 min Winter	44.603	0.0	343.6	122
180 min Winter	33.805	0.0	343.0	182
240 min Winter	27.485	0.0	342.3	240
360 min Winter	20.164	0.0	341.0	358
480 min Winter	15.978	0.0	339.6	476
600 min Winter	13.260	0.0	338.3	594
720 min Winter	11.348	0.0	336.9	712
960 min Winter	8.827	0.0	334.0	944
1440 min Winter	6.156	0.0	327.8	1400
2160 min Winter	4.266	0.0	662.7	2056
2880 min Winter	3.289	0.0	649.2	2624
4320 min Winter	2.290	0.0	614.3	3244
5760 min Winter	1.781	0.0	864.0	4144
7200 min Winter	1.474	0.0	894.1	4976
8640 min Winter	1.269	0.0	923.7	5800
10080 min Winter	1.123	0.0	953.3	6656

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
FEH Rainfall Version	2013	Cv (Winter)	0.950
Site Location	GB 530591 182813	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.532

Time (mins) From:	To:	Area (ha)
0	4	0.532

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 6.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	190.0	3.300	190.0

Pump Outflow Control

Invert Level (m) 6.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	2.0000	1.800	2.0000	3.400	2.0000	5.000	2.0000
0.400	2.0000	2.000	2.0000	3.600	2.0000	5.200	2.0000
0.600	2.0000	2.200	2.0000	3.800	2.0000	5.400	2.0000
0.800	2.0000	2.400	2.0000	4.000	2.0000	5.600	2.0000
1.000	2.0000	2.600	2.0000	4.200	2.0000	5.800	2.0000
1.200	2.0000	2.800	2.0000	4.400	2.0000	6.000	2.0000
1.400	2.0000	3.000	2.0000	4.600	2.0000		
1.600	2.0000	3.200	2.0000	4.800	2.0000		

Appendix D

EXCEEDANCE FLOW PATHS

DO NOT SCALE

NOTES:

1. DRAWING IS BASED ON:
   - TOPOGRAPHICAL SURVEY BY WARNER SURVEYS DATED 12/02/2019.
2. FLOW PATHS BASED ON GROUND FLOOR PLANS AND FIRST FLOOR PLANS
3. EXCEEDANCE FLOWS INTERPOLATED BY EXISTING BOUNDARY LEVESL AND INTERNAL LEVELS FROM FIRST FLOOR TO GROUND FLOOR

WICKLOW STREET

SWINTON STREET

A-A

KEY:

SITE BOUNDARY

EXCEEDANCE FLOW PATHS

REV.	DATE	BY	DESCRIPTION	CHK	APD
P01	04/02/21	GB	FIRST ISSUE	GB	GB

DRAWING STATUS: FOR INFORMATION ONLY

WSP House, 70 Chancery Lane, London, WC2A 1AF, UK
T+ 44 (0) 207 314 5000, F+ 44 (0) 207 314 5111
wsp.com

CLIENT: 330 GRAY'S INN ROAD LIMITED

ARCHITECT: AHMM

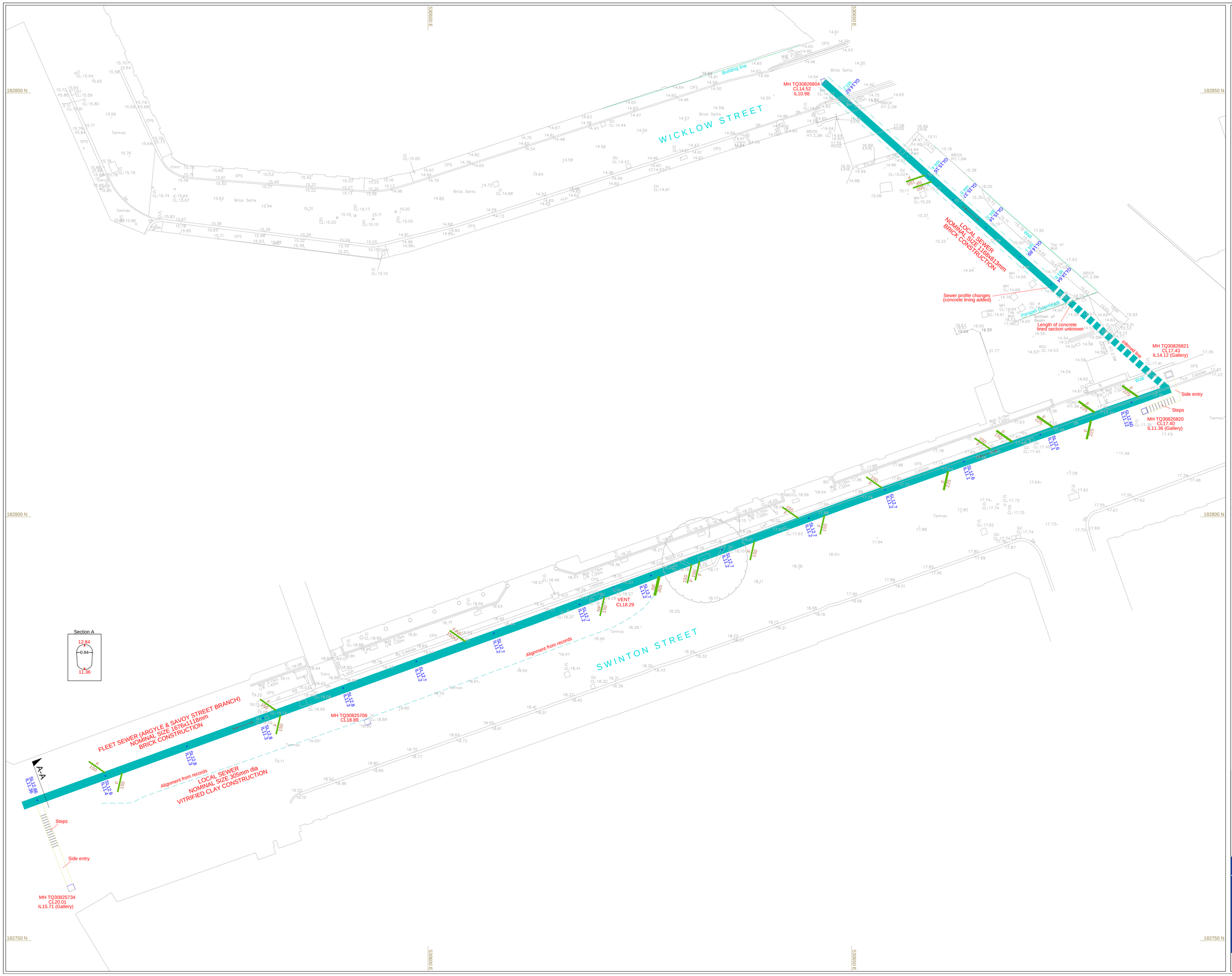
PROJECT: 330 GRAYS INN ROAD

TITLE: EXCEEDANCE FLOW PATHS

SCALE @ A1:	CHECKED:	APPROVED:
1:250	GB	GB
CAD FILE: 70057187-D-003.DWG	DESIGN-DRAWN: GB	DATE: February 21
PROJECT No: 70057187	DRAWING No: 70057187-D-003	REV: P01

Appendix E

SEWER SURVEYS



ABBREVIATIONS

GL	Ground Level	NF	Connection without flap
F	Connection with flap	SL	Soffit Level
Id	Invert Depth		

N

Greyscale linework is the existing topographic survey data supplied by the client as digital drawing file LT3190539P0001c.dwg. No responsibility for the accuracy of this topographic information can be accepted by Plowman Craven

Electro-detection techniques (sondes) have been used in the location of the local sewers. The results are not infallible and should be viewed in that light. It is normally expected that the optimum accuracy be +/-10% of the depth of the traced sonde

The location, as shown, of sewer connections has been derived from video footage and chainage recordings from the CCTV crawler unit used to undertake a condition survey. No direct measurement has been made.

Direct access to the line of the Fleet Sewer was not permitted. The survey techniques employed to establish the sewer alignment are a combination of direct survey at the access manholes, line of sight observations of a prism attached to the CCTV camera crawler unit, and the CCTV footage aquired. The expected accuracy of the drawn alignment is +/- 0.1m

LEGEND

- Assumed detail
- Tracing tolerance zone
- Direction of flow

Due to the inherent instability of paper materials, drawings plotted on paper may be stretched and distorted - dimensions scaled from paper plots should therefore be treated with caution

ISSUES & REVISIONS

Issue	Details	By	Date
Aprov1	Provisional Issue	JD	05/02/20

This survey is commensurate with band G accuracy, as outlined in the RICS survey detail accuracy banding table

All levels are in metres and are above Ordnance Survey Newlyn Datum derived by multiple network RTK GPS observations

The survey grid shown on this drawing is positioned on Ordnance Survey (OS) National Grid, obtained by multiple network RTK GPS observations

Unless otherwise stated, levels have been taken to finished ground surface

Drawing units are metres

CLIENT

WSP

WSP House
70 Chancery Lane
London
WC2A 1AF

PROJECT TITLE

330 Grays Inn Road

Kings Cross
London

2D Line & Level Survey

PRESENTATION SCALE 1:200 @ A1

DATE OF ORIGINAL SURVEY 30th January 2020

PC PROJECT No. 43872 CHECKED DL

DRAWING No. 43872-01 ISSUE Aprov1

Plowman Craven

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Appendix F

THAMES WATER CAPACITY CHECK RESPONSE

WSP UK LTD
WSP House
70 Chancery Lane
London
WC2A 1AF

Wastewater pre-planning
Our ref DS6080053

22 December 2020

Pre-planning enquiry: Confirmation of sufficient capacity

Dear Mr Bansal,

Thank you for providing information on your development.

Site: 330 Grays Inn Road, London, WC1X 8DA.

Proposed site: Redevelopment of site for 76 houses, 182 bed hotel, 13,288m2 offices and 1,445m2 gym.
Proposed foul water: To discharge via gravity equally between the 914mm x 610mm public combined water sewer in Wicklow Street, the 1168mm x 813mm public combined water sewer sewer on the eastern side of the site and the 1676x1118mm public combined water sewer in Swinton Street.
Proposed surface water: Surface water discharge via pump then gravity limited to 2l/s to connect via existing connection to 1168mm x 813mm public combined water sewer on the eastern side of the site.

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 combined 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.

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

WSP House
70 Chancery Lane
London
WC2A 1AF

wsp.com