LANMOR Consulting

Civil Engineers & Transport Planners

3 Duke Street

Flood Risk Assessment & Drainage Strategy

December 2023

231746/FRA/OR/RS/01

LANMOR Consulting

Civil Engineers & Transport Planners

LANMOR Consulting Ltd,
Thorogood House, 34 Tolworth Close
Surbiton, Surrey, KT6 7EW

Tel: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
Internet: www.lanmor.co.uk

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APPENDICES

1 INTRODUCTION

1.1 General

1.1.1 Lanmor Consulting Ltd has been commissioned to provide a Flood Risk Assessment and Drainage Strategy report for the proposed development at 3 Duke Street, Richmond, TW9 1HP.

1.1.2 Figure 1.1 below shows the location of the site.

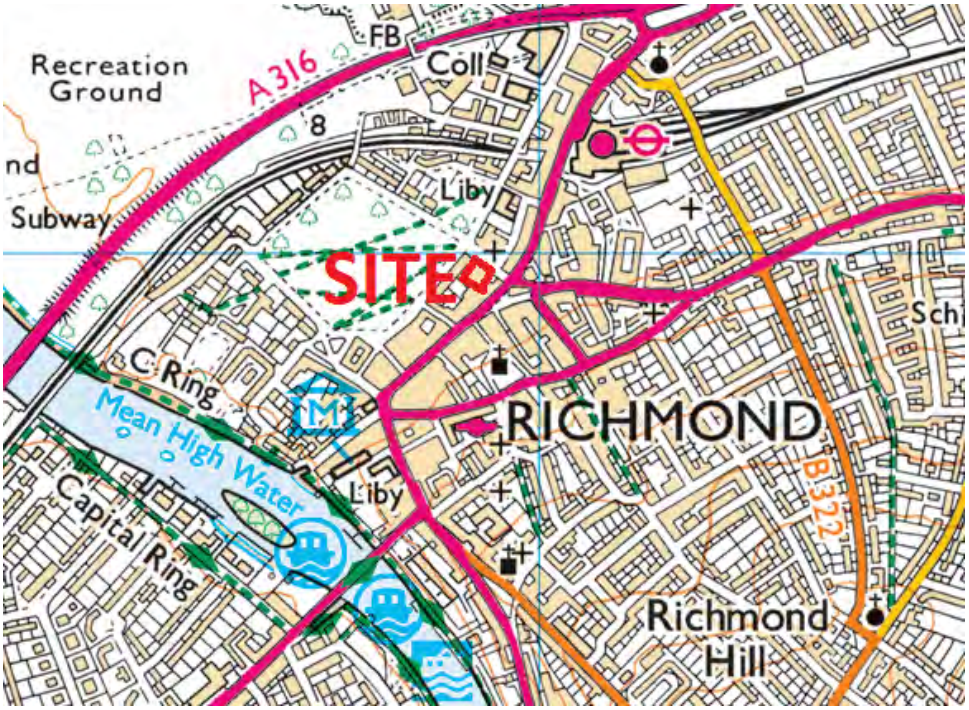


Figure 1.1 – Site Location

1.2 Scope

1.2.1 This report describes the sites existing conditions, development proposals and implications of flooding on the site as described in the governments guidance document; National Planning Policy Framework (NPPF) and its technical guidance. This report will consider the following:

- Development proposals
- Sources of flooding and flood defences
- Flooding extents, depth and climate change predictions

- Impact of flooding on the development
- Dangers presented by flooding

1.2.2 This report has been prepared in accordance with the requirements of the governments National Planning Policy Framework (NPPF) and its planning practice guidance and will demonstrate that the proposed development will be safe and will not increase the risk of flooding in the surrounding area.

1.2.3 This report will also consider the proposed drainage regime for the site. It will assess the site's current Greenfield runoff rate, suitable methods of discharging the runoff from the development and set the drainage strategy for the proposed development, including discharge rates and any requirements for attenuation.

2 BASELINE CONDITIONS AND PROPOSED DEVELOPMENT

2.1 Existing Site

2.1.1 The site is located in the centre of Richmond town, the surrounding area consisting of a large number of commercial units with occasional residential units scattered within. The closest river is the River Thames, being an estimated 500m away from the site. Being in a town centre, there is a high density of buildings and the ground largely consists of impermeable surfaces.

2.2 Geology

2.2.1 The British Geological Survey (BGS) indicates that the site is underlain by a bedrock of London Clay Formation – Clay and silt. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period. Superficial deposits of Kempton Park Gravel Member – Sand and gravel were also recorded. The sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period.

2.3 Proposed Development

2.3.1 The proposal consists of the erection of a 3-storey extension above a retail area to be used as a private flat complex containing a total of three bedrooms and three ensuite bathrooms. The flat complex also contains a cycle storage unit on the ground floor. The floor plans for the proposed development have been included in Appendix A.

3 SOURCES OF FLOODING

3.1 Fluvial / Tidal Flooding

3.1.1 The NPPF and PPG define the Flood Zones as follows:

- Zone 1: 'Low Probability' This zone comprises land assessed as having a less than a 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.

- Zone 2: 'Medium Probability' – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-0.1%) in any year.

- Zone 3a: 'High Probability' – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

- Zone 3b: 'The Functional Floodplain' – This zone comprises land where water must flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

3.1.2 Detailed flooding mapping was requested from the EA, however as the site is located in Flood Zone 1, they were not able to provide any flood levels and refer to the flood mapping for planning on the government website. Figure 3.1 shows the site's location in relation to the Flood Zones.

Figure 3.1 – Fluvial Flood Map

3.1.3 The dark blue shaded area on the above map shows area in Flood Zone 3 that might be subject to flooding with a probability of 1.0% or greater, the light blue areas show the probability of flooding between 1.0% and 0.1%. The orange lines indicate the presence of flood defences along the river. The unshaded areas indicate a flood probability of less than 0.1%.

3.1.4 The application site is shown to be within Flood Zone 1. This means that there is a fluvial risk of flooding of less than 0.1% or (1 in 1000) in any given year. The application site is indicated to be a considerable distance from the extent of Flood Zones 2 and 3.

3.2 Surface Water Flooding

3.2.1 The surface water flood mapping provided by the EA is considered to be the best available source of national information of surface water flooding it is a starting point for understanding patterns and probability of surface water flooding.

3.2.2 The EA accept that the mapping has limitations and state that *"these maps cannot definitely show that an area of land or property is, or is not, at risk of flooding, and the maps are not suitable for use at an individual property level."*

3.2.3 The surface water flood maps on the government website show the indicate extents of flooding for different return periods. Figure 3.2 below shows the extents and depth of flooding from an event with a probability of 1.0%.

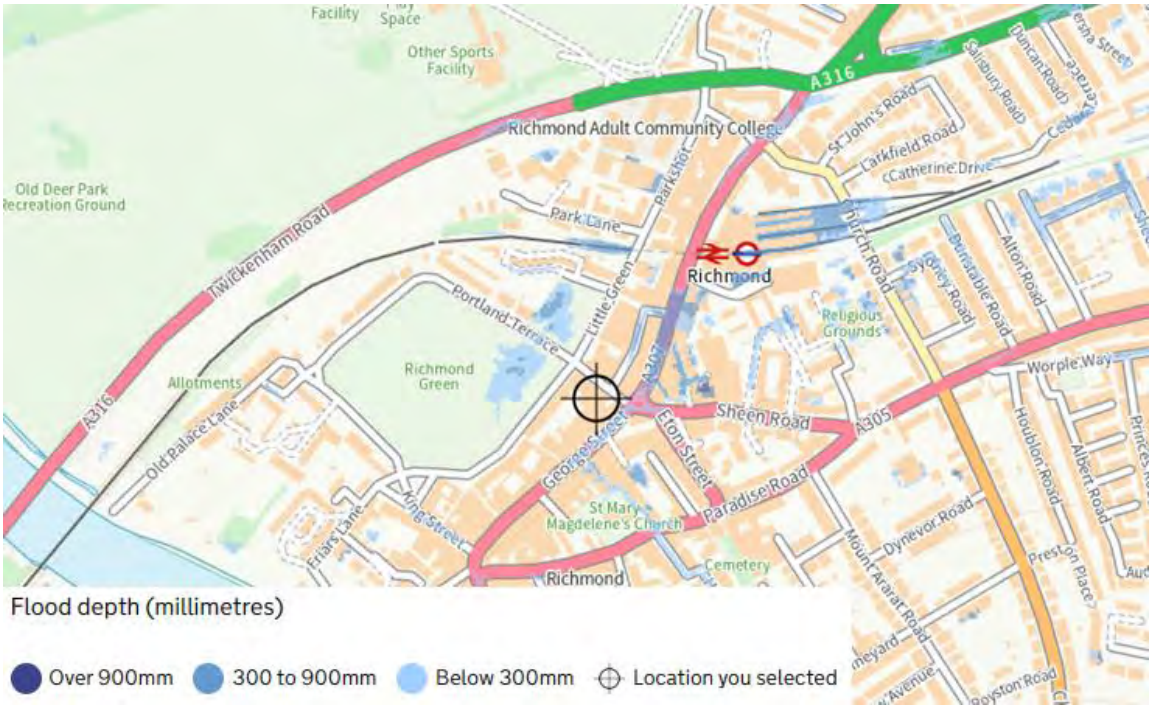


Figure 3.2 – Surface Water Flood Mapping

3.2.4 The flood map above shows the site will not be subject to flooding with a probability of 1.0%. The site is therefore identified as being in a low surface water flood risk area.

3.3 Groundwater Flooding

3.3.1 The London Borough of Richmond published a Preliminary Flood Report Assessment (PFRA), detailing the risk of groundwater flooding to areas within the borough. Within the SFRA was included a map which demonstrates the risk of groundwater flooding in the area.

3.3.2 The site is in an area of increased potential for elevated groundwater levels from permeable superficial deposits. This means that there is an increased risk of groundwater flooding in the area of the site. However, as the proposals are for a vertical extension and residential accommodation will be located above ground level, the risk of groundwater flooding to the development is considered low.

3.4 Sewer Flooding

3.4.1 Also detailed in the London Borough of Richmond's preliminary flood risk report assessment is risk of sewer flooding based on the level of sewer flooding in the past. The area of the site is situated within a 6- 10 number of sewer flooding, which means that it is higher on average than the rest of Richmond. However, despite this, it remains low on the scale. Therefore, sewer flooding is not a high risk of flooding for the site.

3.5 Flooding from Reservoirs

3.5.1 The EA flood map indicates that there is no risk of flooding from reservoirs. This is because there are no reservoirs in the area, or which affect the site.

4 IMPACT OF FLOODING

4.1 Flood Probability and Climate Change

4.1.1 The nearest source of flooding to the site is from the Thames, which is located approximately 500m away from the site. Given the distance of the proposed development from the nearest source of flooding, the EA were not able to provide flood level data for this site. However, they were able to confirm the site is in Flood Zone 1, so has a probability of 0.1% or less risk of fluvial flooding.

4.1.2 The Environment Agency have published updated climate change allowances. The allowance to be implemented is based on the management catchment area, flood zone and site vulnerability. The Flood Risk Assessment: Climate Change Allowances recommends that sites in Flood Zones 2 and 3, or Zone 1 where there is a risk it might be in Flood Zone 2 or 3 in the future, should use the central or higher central allowance for increased river flows. The site is located in Flood Zone 1 and is some distance from Zones 2 or 3, therefore even when climate change allowances are considered, the site is still some distance from the flood.

4.2 Impact on Flood Waters

4.2.1 The site is located in Flood Zone 1, some distance from the 1.0% flood extent. Therefore, the proposed erection of a 3-storey extension above a retail area will not restrict the free flow of flood waters or displace any flood storage volumes for an event with a 1.0% probability or greater, including climate change.

4.3 Flood Impact on Development

4.3.1 As the development is located well above the flood level for an event with a probability of 1.0% +CC or greater, it will not be at risk of flooding from a flood event with a probability of 1.0% +CC AEP and will not put residents at risk. Therefore, residents of the flats will be safe from flooding for a 1% AEP +CC event.

4.4 Safe Access

4.4.1 Since the proposed development will not be at risk from flooding for an event with a probability of 1.0% AEP +CC, a safe access route can always be provided to and from the development site along Duke Street.

4.5 Sequential Test

4.5.1 The principal of the sequential test is to assess locations and to prioritise development in areas at less risk of flooding. The NPPF suggests that Regional Planning Bodies and Local Planning Authorities should ensure their spatial strategies include a broad consideration of flood risk. Strategic Flood Risk Assessments (SFRA) refine information on the probability of flooding, taking other sources of flooding and the impacts of climate change into account. They provide the basis for applying the sequential test.

4.5.2 The proposed development is location in Flood Zone 1, the lowest risk of flooding. Therefore the sequential test is considered to have been passed as development has been directed to the lowest flood risk areas.

5 DRAINAGE STRATEGY

5.1 Existing Drainage Networks

5.1.1 As part of the investigation into the existing drainage regime for the site, sewer records were obtained from Thames Water. Sewer records show that there is an existing foul water sewer which runs down Duke Street. It has been observed that the foul sewer has a diameter of 450mm along Duke Street connecting into a combined trunk sewer at the junction with The Green/Little Green.

5.1.2 The surface water sewer along Duke Street is indicated to have a diameter of 450mm, increasing to 600mm along The Green. A copy of the Thames Water sewer records has been included in Appendix B.

5.2 Proposed Foul Water Drainage

5.2.1 The proposed foul water drainage will collect all foul water sources and transport it to the nearby foul sewer using pipes. Due to there being an existing retail area on the ground floor, it is assumed that there is already an existing foul water drainage network in place though the precise layout of this will need to be confirmed by CCTV survey. Foul water from the flat complex will be connected to the existing network and discharged at the same location.

5.3 Proposed Surface Water Drainage

5.3.1 With regards to discharge of surface water runoff from the development, the SuDS hierarchy has been considered when designing the drainage strategy for the site. Since the proposed development will incorporate a flat roof, blue roof attenuation was considered to be a viable option for the capture and attenuation of rainwater. This method of SuDS is ideal for densely developed urban areas, where the potential for ground level attenuation is restricted.

5.3.2 Rainwater harvesting was also considered, as a means of reusing surface water runoff within the building. However, these systems require a separate network of pipes within the property, as well as tanks and pumps to store the rainwater and distribute it throughout. It was considered impractical to implement rainwater harvesting systems on the site due to site constraints and excessive

cost for the development. In addition, for these systems to be successfully implemented there must be sufficient demand for water reuse otherwise this may lead to water quality issues.

5.3.3 Furthermore, rainwater harvesting tanks should not be included in the assessment of attenuation required to store runoff from a development as there is no guarantee that the tank will be sufficiently empty to receive another storm. Should the rainwater harvesting tank be full at the start of the storm, it will not be able to receive any more runoff, therefore additional storage of a similar size would be required to cater for all storm events and the rainwater harvesting tank will provide no benefit in terms of attenuation. For those reasons, and the excessive cost of providing the system, this method has been discounted.

5.3.4 Next on the Sustainable Drainage Hierarchy is the use of ground infiltration techniques such as soakaways and infiltration basins. The British Geological Survey (BGS) records indicate the ground conditions to consist of London Clay Formation which is not suitable for infiltration techniques. The site is also located in a densely developed urban area, and the footprint of the building occupies the entire site with no available land surrounding the property. Were infiltration techniques to be used, the surface water discharge from any soakaway or infiltration systems would risk damaging the foundations of the building as the requisite 5m offset would be unachievable, so this method has been discounted.

5.3.5 Discharge to a watercourse is the next option on the Sustainable Drainage Hierarchy, however as the proposed development is not situated near any suitable watercourse, discharging via this method would therefore not be a viable option.

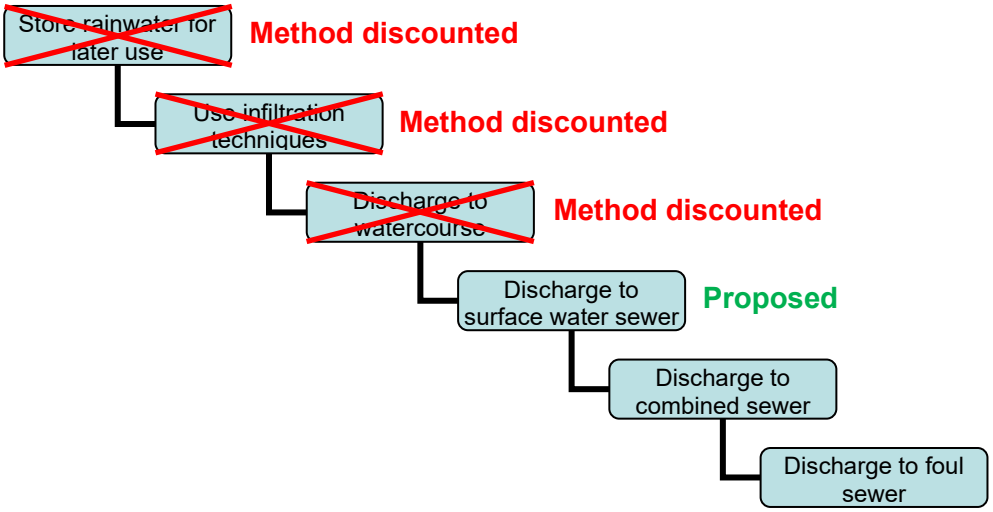


Figure 5.1 – SuDS Hierarchy

5.3.6 Next on the hierarchy is the discharge to a sewer and attenuating the flows. There is a surface water sewer in Duke Street and so it is proposed to connect into this sewer to discharge runoff from the site.

5.3.7 Calculations have been undertaken to determine the existing Brownfield runoff rates from the site to set the proposed discharge rates. The results are tabled below.

Return Period	Brownfield Rate (l/s)	Proposed Discharge (l/s)			
		Blue Roof	Other Areas	**Total Site**	% reduction
1 in 1	1.1	0.1	0.4	**0.5**	52%
1 in 30	2.6	0.1	1.0	**1.1**	58%
1 in 100	3.5	0.1	1.3	**1.4**	59%
1 in 100 +40% CC	4.8	0.1	1.8	**1.9**	59%

Table 5.1 – Existing and Proposed Flow Rates

5.3.8 A blue roof drainage system will capture rainwater on the main roof of the building and attenuate the flow to the surface water sewer. This will restrict the peak discharge rate from the main roof to a maximum of 0.1 l/s for the 1 in 100-year event plus climate change allowances. In addition, there is a small area of roof at the third-floor level that will discharge to the surface water sewer unrestricted. Due to site constraints, it is not possible to provide any form of

attenuation for these small areas, and calculations have been completed to determine the peak flow rate from them. The total peak discharge rate from the site for the 1 in 100-year event plus climate change has been calculated at 1.9 l/s, a 59% reduction from the existing Brownfield rate.

5.3.9 A drainage layout for the proposed development has been prepared and is included in Appendix C as drawing 231746/DS/01. Drainage calculations using MicroDrainage have been undertaken to estimate the depth of water within the blue roof, and to calculate the peak discharge rates from the unrestricted areas. The calculations have been completed for the 1 in 100-year event plus 40% climate change and show there will be a greater than 50% reduction in the peak flow rate without resulting in flooding on site or in the surrounding area. Full calculations for the site have been included in Appendix C.

6 SURFACE WATER/SUDS MAINTENANCE

6.1.1 Regularly inspecting the surface water drainage network for blockages and clearing unwanted debris / silt from the system should improve the performance of the surface water network and decrease the need for future repairs. In the event that road gullies become blocked, high pressure water jets can be used to clear the gully and ensure they are functioning correctly, this should be undertaken by certified trained professionals.

6.1.2 The level and frequency of maintenance required on site is dependent on the type of facility. The type of maintenance will fall into one of three categories "regular maintenance", "occasional maintenance" and "remedial maintenance".

6.1.3 Regular maintenance of the drainage and SuDS features will include, inspections, removal of litter / debris and sweeping of the surfaces. Occasional maintenance will include removal of sediment etc. and remedial maintenance may include structural repairs and infiltration reconditioning if required.

6.1.4 The drainage and SuDS elements after an initial inspection following construction should be inspected on a monthly basis for the first 12 months and after large storms, thereafter the following maintenance regime should be applied and adjusted if the 12-month monitoring process has identified any issues.

6.1.5 Following completion of the development a Management Company will be set up to maintain all the communal areas, including the drainage. It will be their responsibility to maintain the drainage network, including the SuDS elements.

6.1.6 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained.

6.1.7 Pipes are intended to be the main conveyance across the development. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

6.1.8 For manholes and pipes, the following maintenance will be required.

Manhole / Pipe Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
	Remove sediment from structures.	Annually or as required
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required
	If continued poor performance jet and CCTV survey poorly performing runs.	As required
Monitoring	Inspect/check all inlets, outlets, to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of pipe manholes for sediment build-up and remove if necessary	Every 5 years or as required

Table 7.1 – Manhole, Catchpit and Pipe Maintenance Schedule

6.1.9 For blue roofs, the following maintenance schedule is recommended:

Blue Roof Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular inspections	Inspect all components including drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms

	Inspect for evidence of erosion at channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Occasional maintenance	Remove debris and litter to prevent clogging of inlet drains and interference	Six monthly and annually or as required
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Table 7.2 – Blue Roof Maintenance Schedule

6.1.10 For specialist pieces of equipment, maintenance brochures will be provided by the manufacturers. These will set out the frequency of inspections and correct methods of cleaning etc. that should be followed. It is recommended that once installed the facility should be inspected monthly for the first three months and thereafter at six monthly intervals or as advised in the maintenance brochure.

6.1.11 The above information is only intended as guidance in standard maintenance practise for surface water drainage and SUDs features. The above measures should be reviewed regularly and modified to suit the site conditions.

7 SUMMARY AND CONCLUSION

7.1.1 The site is located in the centre of Richmond, the surrounding area consisting of a large number of commercial units with occasional residential units scattered within. The proposal consists of the erection of a 3-storey extension above a retail area to be used as a private flat complex containing a total of three bedrooms and three ensuite bathrooms. The flat complex also contains a cycle storage unit on the ground floor.

7.1.2 The application site is shown to be within Flood Zone 1. This means that there is a fluvial risk of flooding of less than 0.1% or (1 in 1000) year event. The application site is indicated to be a considerable distance from the extent of Flood Zones 2 and 3, even when including allowances for future climate change.

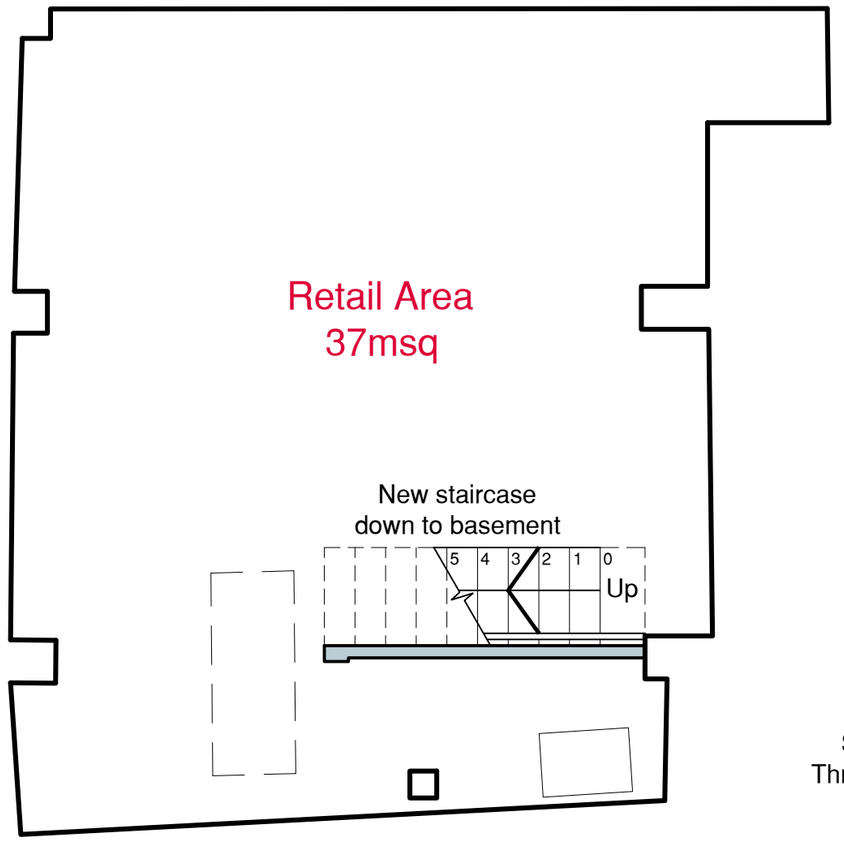
7.1.3 Sewer records show that there are existing foul and surface water sewers which run down Duke Street. It is assumed that foul water from the existing retail property is drained to this foul sewer and so it is proposed to exploit this existing connection for the proposed flats.

7.1.4 In terms of the proposed surface water drainage for the proposed development, a blue roof drainage system will capture rainwater on the main flat roof of the building and attenuate the flow to the surface water sewer in Duke Street. Runoff from the terrace areas at the third-floor level will discharge to the sewer at an unrestricted rate. The peak discharge rate for the entire site will therefore be restricted to a maximum of 1.9 l/s for the 1 in 100-year event plus 40% climate change allowances, which is a 59% reduction on the existing Brownfield rate.

7.1.5 For the reasons outlined in this report we see no reason to refuse planning permission on the grounds of flood risk, or there being insufficient capacity to discharge runoff from the development.

APPENDIX A

Proposed Floor Plans



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Section Through B-B

Section Through A-A

Section Through A-A

Section Through B-B

Scale - Metres

0 1 2 3 4 5

REV	COMMENTS	BY	DATE
-	-	-	-

SUITE 7A HOLLY HOUSE BUSINESS CENTRE
220-224 NEW LONDON ROAD
CHELMSFORD
ESSEX
CM2 9AE

design two

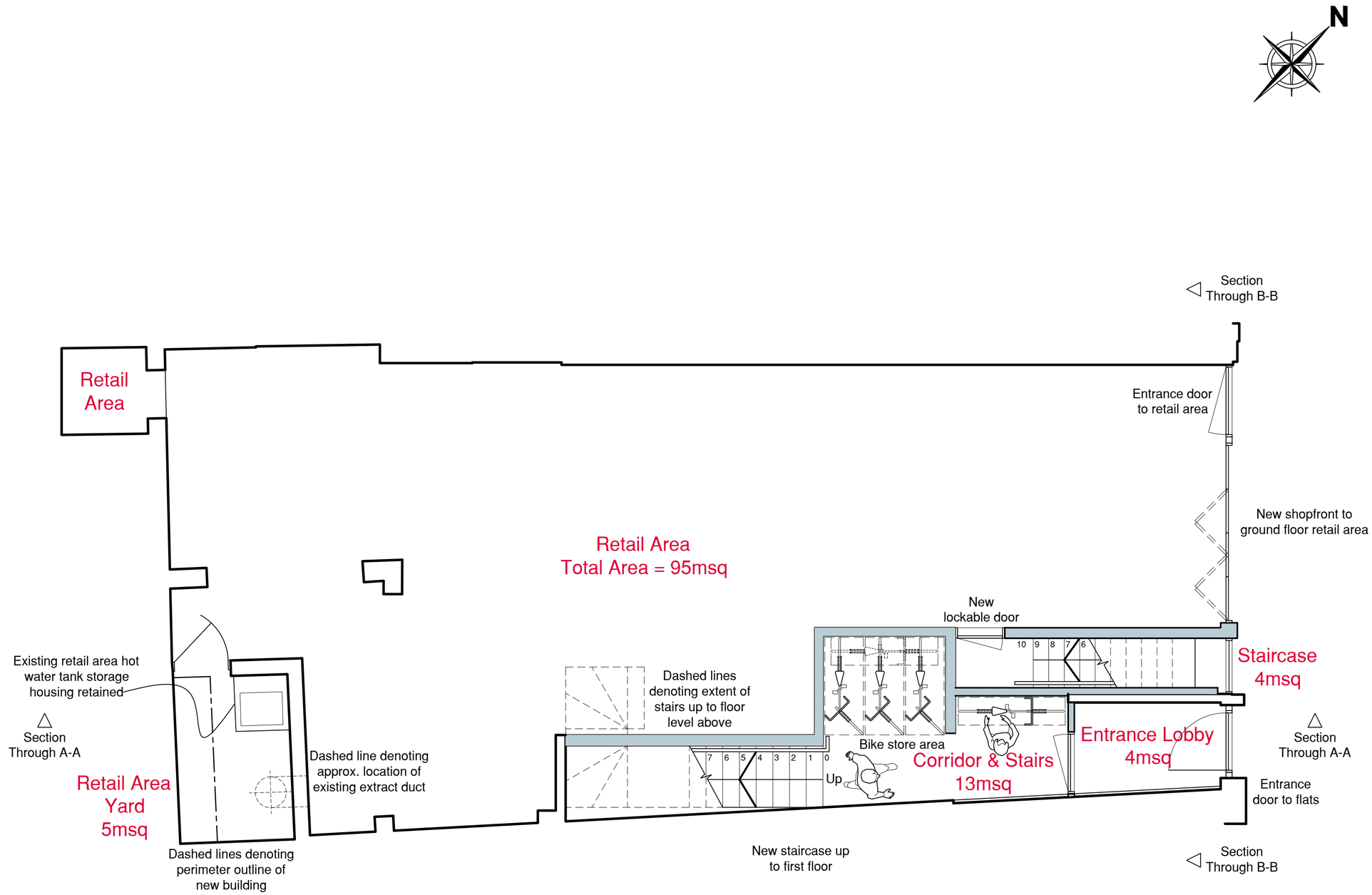
DESIGNBYTWO@OUTLOOK.COM WWW.DESIGNBYTWO.CO.UK

CLIENT
Johanna Cumming

PROJECT
No. 3 Duke Street, Richmond, Greater London TW9 1HP

TITLE
Proposed Basement Layout Plan

SCALE @ A3	DRAWN BY	DATE
1:50	NM	Aug 23
PROJECT DWG NO.		REVISION
DB67/PL/05		-



Scale - Metres

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IMPORTANT INFORMATION

REV	COMMENTS	BY	DATE
-	-	-	-

SUITE 7A HOLLY HOUSE BUSINESS CENTRE
220-224 NEW LONDON ROAD
CHELMSFORD
ESSEX
CM2 9AE

design two

DESIGNBYTWO@OUTLOOK.COM WWW.DESIGNBYTWO.CO.UK

CLIENT

Johanna Cumming

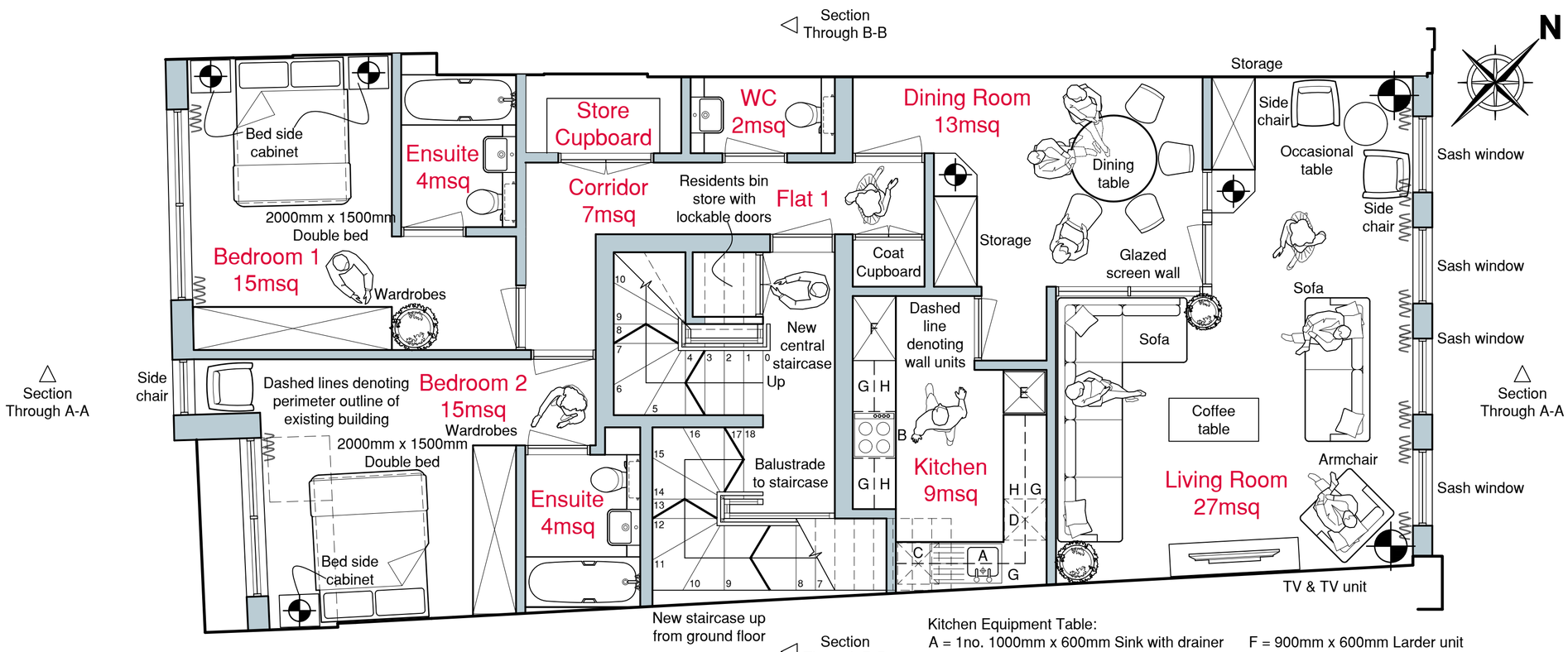
PROJECT

No. 3 Duke Street, Richmond, Greater London TW9 1HP

TITLE

Proposed Ground Floor Layout Plan

SCALE @ A2	DRAWN BY	DATE
1:50	NM	Aug 23
PROJECT DWG NO.		REVISION
DB67/PL/06		-



Kitchen Equipment Table:

A = 1no. 1000mm x 600mm Sink with drainer
B = 1no. 600mm x 600mm Cooker/Oven & hob
C = 1no. 600mm x 630mm Washing machine
D = 600mm x 630mm Dishwasher
E = 600mm x 600mm Fridge freezer
F = 900mm x 600mm Larder unit
G = 300mm Deep wall units = 5200mm Linear length available
H = 600mm Deep base units = 2500mm Linear length available

Housing Design Standards - London Planning Guide 2022

Type of space	Furniture required in each room	Furniture size (mm)	Number of items required (by bedspace) 1p	2p	3p	4p	5p	6p	7p	+
Living space	Armchair (or 'sofa seat' in addition to sofa where required below)	850 x 850	2	2	3	1	2	3	4	+1
	Settee - 2 seat (optional as above)	850 x 1300	(Item optional)							
	Settee - 3 seat (optional as above)	850 x 1850				1	1	1	1	1
	TV	220 x 650	1	1	1	1	1	1	1	1
	Coffee table	500 x 1050 (or 750 diameter)	1	1	1	1	1	1	1	1
	Occasional table	450 x 450					1	1	1	1
	Storage units	500 x length shown	1000	1000	1000	1500	2000	2000	2000	+1
Dining space	Dining chair	450 x 450	2	2	3	4	5	6	7	+
	Dining table	800 x length shown	800	800	1000	1200	1350	1500	1650	+
Double bedroom	Double bed in principle bedroom	2000 x 1500		1	1	1	1	1	1	1
	Double bed in other double bedroom	1900 x 1350		1	1	1	1	1	1	1
	Bedside table	400 x 400		2	2	2	2	2	2	2
	Desk and chair	500 x 1050 (+ chair)		1	1	1	1	1	1	1
	Chest of drawers	450 x 750		1	1	1	1	1	1	1
	Double wardrobe	600 x 1200		1	1	1	1	1	1	1
Twin bedroom	Single bed	1900 x 900				2	2	2	2	2
	Bedside table	400 x 400				2	2	2	2	2
	Chest of drawers	450 x 750				1	1	1	1	1
	Desk and chair	500 x 1050 (+ chair)				1	1	1	1	1
	Double wardrobe	600 x 1200				1	1	1	1	1

Type of space	Furniture required in each room	Furniture size (mm)	Number of items required (by bedspace) 1p	2p	3p	4p	5p	6p	7p	+
Single bedroom	Single bed	1900 x 900	1		1	1	1	1	1	1
	Bedside table	400 x 400	1		1	1	1	1	1	1
	Chest of drawers	450 x 750	1		1	1	1	1	1	1
	Desk and chair	500 x 1050 (+ chair)	1		1	1	1	1	1	1
	Single wardrobe	600 x 600	1		1	1	1	1	1	1
Kitchen			Length in mm							
	(1) Sink top with drainer	600 x 1000	1000	1000	1000	1000	1000	1000	1000	1000
	(2) Cooker (or oven + hob) space	600 x 600	600	600	600	600	600	600	600	600
	(3) Washing machine position / worktop	600 x 630	630	630	630	630	630	630	630	630
	(4) Other base units	600 x length shown	600	1200	1600	1600	1600	2700	2700	+
	(4a) Dishwasher / worktop (included in 4)	600 x length shown	(Item optional)							
	(5) Ancillary equipment space	600 x length shown					600	600	1200	1200
	(6) Fridge / freezer space	600 x 600	600	600	600	600	600	600	600	600
	(7) Recycling bins space	600 x length shown	300	300	300	300	600	600	600	600
	(8) Total length of fitments (Items 1 to 7)		3730	4330	4730	4730	5630	6730	7330	+
	(9) Wall cupboards		300 x maximum available length							
	Note: Item 3,5,7 may be in other rooms or spaces but should be close to kitchen									
Bathroom	W/C + cistern	500 x 700	1	1	1	1	1	1	1	1
	Bath	700 x 1700	1	1	1	1	1	1	1	1
	Hand wash basin	450 x 600	1	1	1	1	1	1	1	1
	Shower tray	750 x 750	(Item optional)							
WC/ Cloakroom	W/C + cistern	500 x 700	(Where required)							
	Hand rinse basin	250 x 350	(Where required)							

Scale - Metres
0 1 2 3 4 5

IMPORTANT INFORMATION

REV	COMMENTS	BY	DATE
A	Balconies omitted Bedrooms & En-suites reconfigured Bedroom area totals amended	NM	04.12.23
B	Bedroom 1 & 2 layouts amended Additional window added to Bedroom 2 Bedroom area totals amended	NM	08.12.23

SUITE 7A HOLLY HOUSE BUSINESS CENTRE
220-224 NEW LONDON ROAD
CHELMSFORD
ESSEX
CM2 9AE

design two

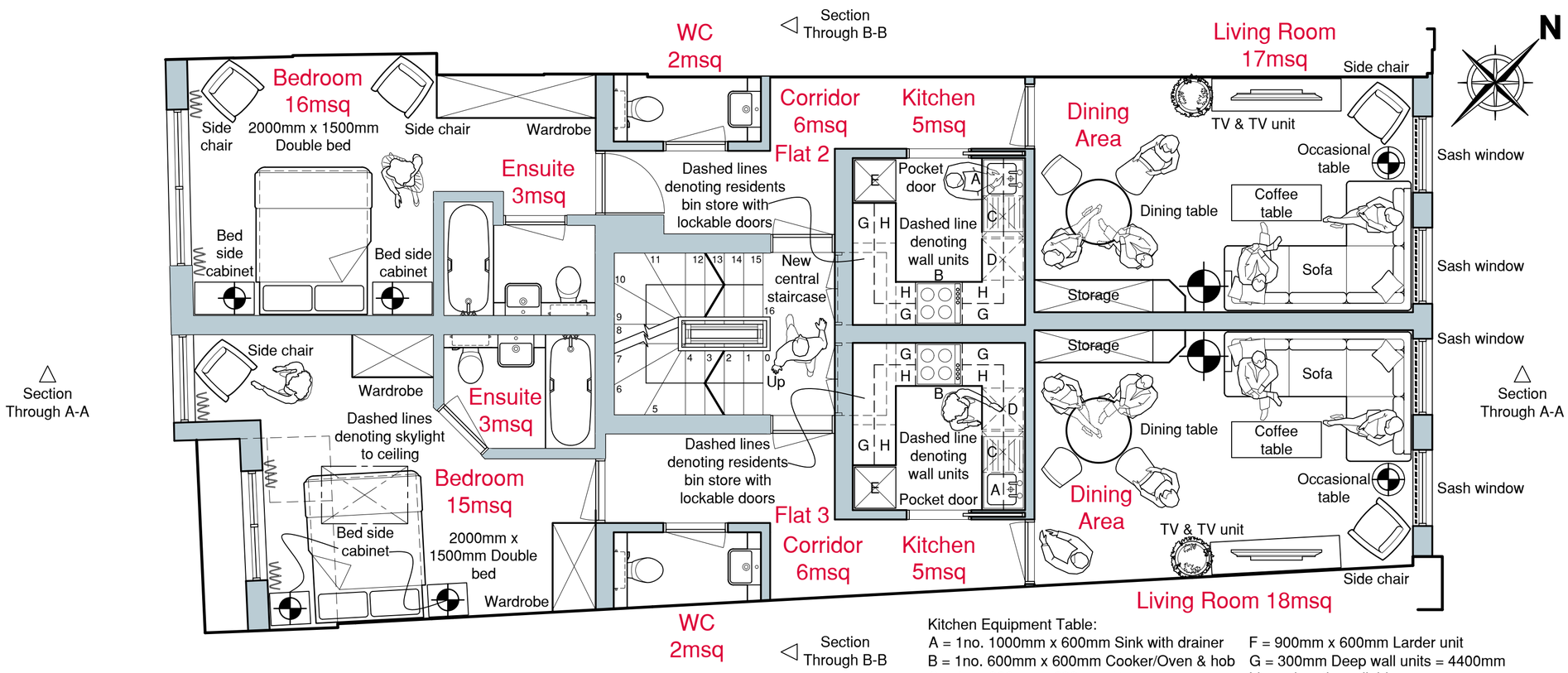
DESIGNBYTWO@OUTLOOK.COM WWW.DESIGNBYTWO.CO.UK

CLIENT
Johanna Cumming

PROJECT
No. 3 Duke Street, Richmond, Greater London TW9 1HP

TITLE
Proposed First Floor Layout Plan

SCALE @ A2	DRAWN BY	DATE
1:50	NM	Aug 23
PROJECT DWG NO. DB67/PL/07		REVISION B



Kitchen Equipment Table:

A = 1no. 1000mm x 600mm Sink with drainer
B = 1no. 600mm x 600mm Cooker/Oven & hob
C = 1no. 600mm x 630mm Washing machine
D = 600mm x 630mm Dishwasher
E = 600mm x 600mm Fridge freezer
F = 900mm x 600mm Larder unit
G = 300mm Deep wall units = 4400mm Linear length available
H = 600mm Deep base units = 1500mm Linear length available

Housing Design Standards - London Planning Guide 2022

Type of space	Furniture required in each room	Furniture size (mm)	Number of items required (by bedspace) 1p	2p	3p	4p	5p	6p	7p	+
Living space	Armchair (or 'sofa seat' in addition to sofa where required below)	850 x 850	2	2	3	1	2	3	4	+1
	Settee - 2 seat (optional as above)	850 x 1300	(Item optional)							
	Settee - 3 seat (optional as above)	850 x 1850				1	1	1	1	1
	TV	220 x 650	1	1	1	1	1	1	1	1
	Coffee table	500 x 1050 (or 750 diameter)	1	1	1	1	1	1	1	1
	Occasional table	450 x 450					1	1	1	1
	Storage units	500 x length shown	1000	1000	1000	1500	2000	2000	2000	+1
Dining space	Dining chair	450 x 450	2	2	3	4	5	6	7	+
	Dining table	800 x length shown	800	800	1000	1200	1350	1500	1650	+
Double bedroom	Double bed in principle bedroom	2000 x 1500		1	1	1	1	1	1	1
	Double bed in other double bedroom	1900 x 1350		1	1	1	1	1	1	1
	Bedside table	400 x 400		2	2	2	2	2	2	2
	Desk and chair	500 x 1050 (+ chair)		1	1	1	1	1	1	1
	Chest of drawers	450 x 750		1	1	1	1	1	1	1
	Double wardrobe	600 x 1200		1	1	1	1	1	1	1
Twin bedroom	Single bed	1900 x 900				2	2	2	2	2
	Bedside table	400 x 400				2	2	2	2	2
	Chest of drawers	450 x 750				1	1	1	1	1
	Desk and chair	500 x 1050 (+ chair)				1	1	1	1	1
	Double wardrobe	600 x 1200				1	1	1	1	1

Type of space	Furniture required in each room	Furniture size (mm)	Number of items required (by bedspace) 1p	2p	3p	4p	5p	6p	7p	+
Single bedroom	Single bed	1900 x 900	1		1	1	1	1	1	1
	Bedside table	400 x 400	1		1	1	1	1	1	1
	Chest of drawers	450 x 750	1		1	1	1	1	1	1
	Desk and chair	500 x 1050 (+ chair)	1		1	1	1	1	1	1
	Single wardrobe	600 x 600	1		1	1	1	1	1	1
Kitchen			Length in mm							
	(1) Sink top with drainer	600 x 1000	1000	1000	1000	1000	1000	1000	1000	1000
	(2) Cooker (or oven + hob) space	600 x 600	600	600	600	600	600	600	600	600
	(3) Washing machine position / worktop	600 x 630	630	630	630	630	630	630	630	630
	(4) Other base units	600 x length shown	600	1200	1600	1600	1600	2700	2700	+
	(4a) Dishwasher / worktop (included in 4)	600 x length shown	(Item optional)							
	(5) Ancillary equipment space	600 x length shown					600	600	1200	1200
	(6) Fridge / freezer space	600 x 600	600	600	600	600	600	600	600	600
	(7) Recycling bins space	600 x length shown	300	300	300	300	600	600	600	600
	(8) Total length of fitments (Items 1 to 7)		3730	4330	4730	4730	5630	6730	7330	+
	(9) Wall cupboards		300 x maximum available length							
	Note: Item 3,5,7 may be in other rooms or spaces but should be close to kitchen									
Bathroom	W/C + cistern	500 x 700	1	1	1	1	1	1	1	1
	Bath	700 x 1700	1	1	1	1	1	1	1	1
	Hand wash basin	450 x 600	1	1	1	1	1	1	1	1
	Shower tray	750 x 750	(Item optional)							
WC/ Cloakroom	W/C + cistern	500 x 700	(Where required)							
	Hand rinse basin	250 x 350	(Where required)							

Scale - Metres

0 1 2 3 4 5

REV	COMMENTS	BY	DATE
A	Balconies omitted Bedrooms & En-suites reconfigured Bedroom area totals amended	NM	04.12.23

SUITE 7A HOLLY HOUSE BUSINESS CENTRE
220-224 NEW LONDON ROAD
CHELMSFORD
ESSEX
CM2 9AE

design two

DESIGNBYTWO@OUTLOOK.COM WWW.DESIGNBYTWO.CO.UK

CLIENT

Johanna Cumming

PROJECT

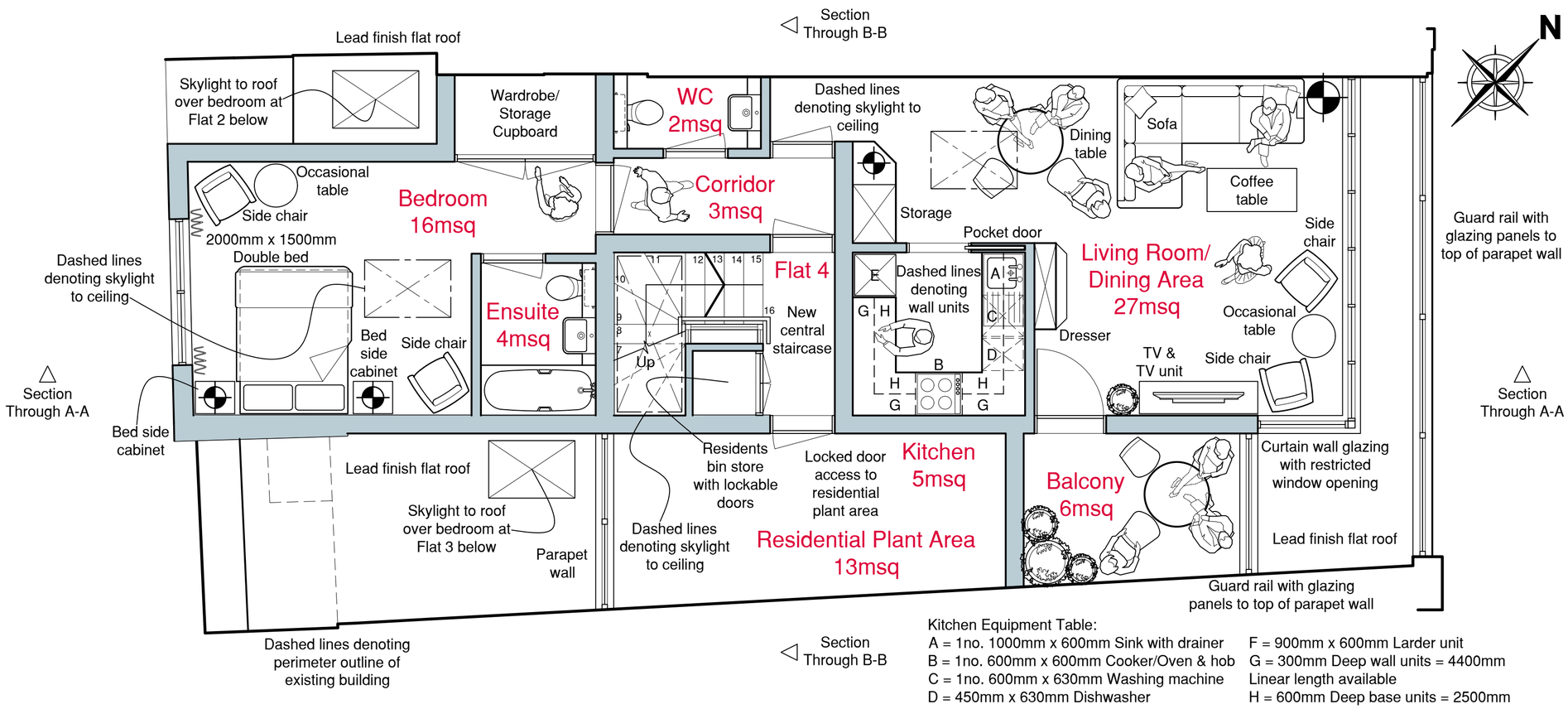
No. 3 Duke Street, Richmond, Greater London TW9 1HP

TITLE

Proposed Second Floor Layout Plan

SCALE @ A2	DRAWN BY	DATE
1:50	NM	Aug 23

PROJECT DWG NO.	REVISION
DB67/PL/08	A



Kitchen Equipment Table:

A = 1no. 1000mm x 600mm Sink with drainer
B = 1no. 600mm x 600mm Cooker/Oven & hob
C = 1no. 600mm x 630mm Washing machine
D = 450mm x 630mm Dishwasher
E = 600mm x 600mm Fridge freezer
F = 900mm x 600mm Larder unit
G = 300mm Deep wall units = 4400mm Linear length available
H = 600mm Deep base units = 2500mm Linear length available

Housing Design Standards - London Planning Guide 2022

Type of space	Furniture required in each room	Furniture size (mm)	Number of items required (by bedspace) 1p	2p	3p	4p	5p	6p	7p	+
Living space	Armchair (or 'sofa seat' in addition to sofa where required below)	850 x 850	2	2	3	1	2	3	4	+1
	Settee - 2 seat (optional as above)	850 x 1300	(Item optional)							
	Settee - 3 seat (optional as above)	850 x 1850				1	1	1	1	1
	TV	220 x 650	1	1	1	1	1	1	1	1
	Coffee table	500 x 1050 (or 750 diameter)	1	1	1	1	1	1	1	1
	Occasional table	450 x 450					1	1	1	1
	Storage units	500 x length shown	1000	1000	1000	1500	2000	2000	2000	+1
Dining space	Dining chair	450 x 450	2	2	3	4	5	6	7	+
	Dining table	800 x length shown	800	800	1000	1200	1350	1500	1650	+
Double bedroom	Double bed in principle bedroom	2000 x 1500		1	1	1	1	1	1	1
	Double bed in other double bedroom	1900 x 1350		1	1	1	1	1	1	1
	Bedside table	400 x 400		2	2	2	2	2	2	2
	Desk and chair	500 x 1050 (+ chair)		1	1	1	1	1	1	1
	Chest of drawers	450 x 750		1	1	1	1	1	1	1
	Double wardrobe	600 x 1200		1	1	1	1	1	1	1
Twin bedroom	Single bed	1900 x 900				2	2	2	2	2
	Bedside table	400 x 400				2	2	2	2	2
	Chest of drawers	450 x 750				1	1	1	1	1
	Desk and chair	500 x 1050 (+ chair)				1	1	1	1	1
	Double wardrobe	600 x 1200				1	1	1	1	1

Type of space	Furniture required in each room	Furniture size (mm)	Number of items required (by bedspace) 1p	2p	3p	4p	5p	6p	7p	+
Single bedroom	Single bed	1900 x 900	1		1	1	1	1	1	1
	Bedside table	400 x 400	1		1	1	1	1	1	1
	Chest of drawers	450 x 750	1		1	1	1	1	1	1
	Desk and chair	500 x 1050 (+ chair)	1		1	1	1	1	1	1
	Single wardrobe	600 x 600	1		1	1	1	1	1	1
Kitchen			Length in mm							
	(1) Sink top with drainer	600 x 1000	1000	1000	1000	1000	1000	1000	1000	1000
	(2) Cooker (or oven + hob) space	600 x 600	600	600	600	600	600	600	600	600
	(3) Washing machine position / worktop	600 x 630	630	630	630	630	630	630	630	630
	(4) Other base units	600 x length shown	600	1200	1600	1600	1600	2700	2700	+
	(4a) Dishwasher / worktop (included in 4)	600 x length shown	(Item optional)							
	(5) Ancillary equipment space	600 x length shown					600	600	1200	1200
	(6) Fridge / freezer space	600 x 600	600	600	600	600	600	600	600	600
	(7) Recycling bins space	600 x length shown	300	300	300	300	600	600	600	600
	(8) Total length of fitments (Items 1 to 7)		3730	4330	4730	4730	5630	6730	7330	+
	(9) Wall cupboards		300 x maximum available length							
	Note: Item 3,5,7 may be in other rooms or spaces but should be close to kitchen									
Bathroom	W/C + cistern	500 x 700	1	1	1	1	1	1	1	1
	Bath	700 x 1700	1	1	1	1	1	1	1	1
	Hand wash basin	450 x 600	1	1	1	1	1	1	1	1
	Shower tray	750 x 750	(Item optional)							
WC/ Cloakroom	W/C + cistern	500 x 700	(Where required)							
	Hand rinse basin	250 x 350	(Where required)							

Scale - Metres
0 1 2 3 4 5

IMPORTANT INFORMATION

REV	COMMENTS	BY	DATE
A	Balcony omitted Bedroom & En-suite reconfigured Bedroom area total amended	NM	04.12.23

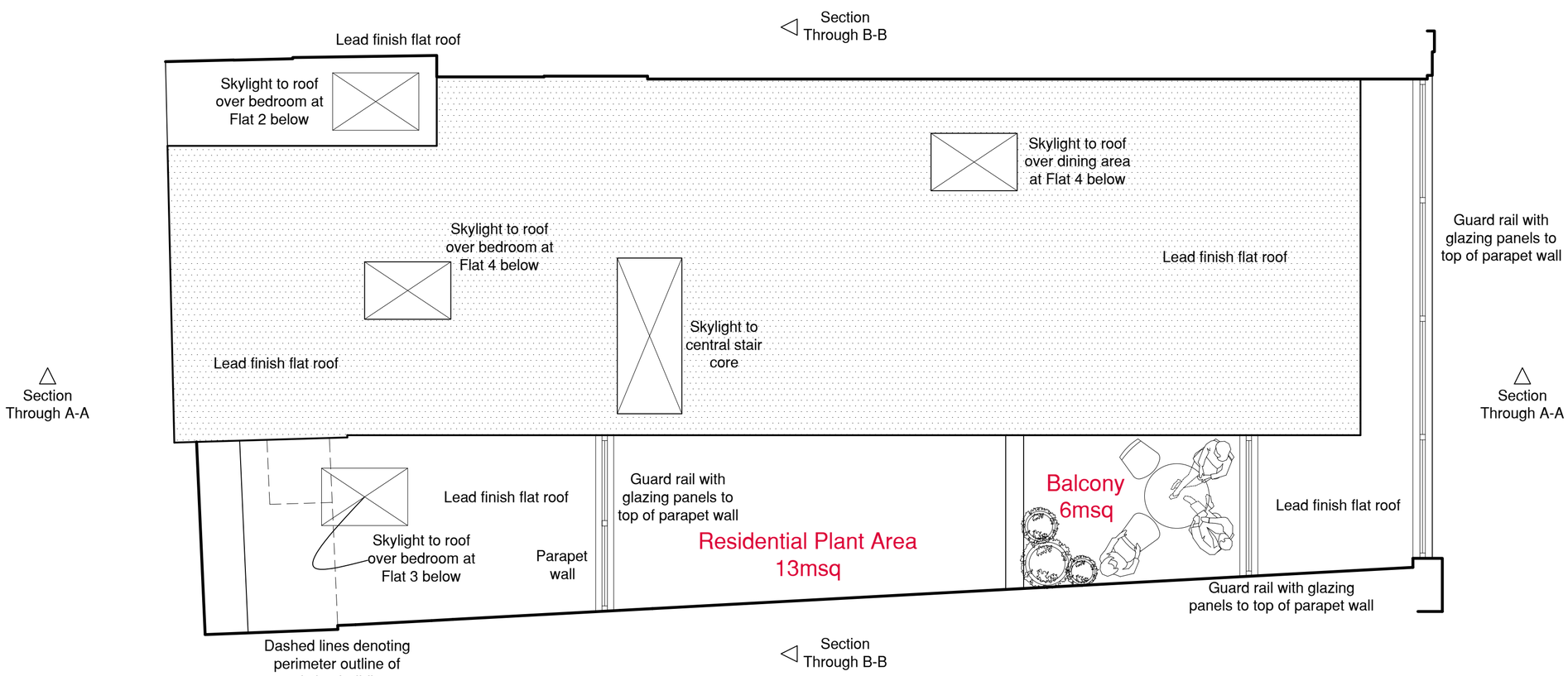
SUITE 7A HOLLY HOUSE BUSINESS CENTRE
220-224 NEW LONDON ROAD
CHELMSFORD
ESSEX
CM2 9AE
design two
DESIGNBYTWO@OUTLOOK.COM WWW.DESIGNBYTWO.CO.UK

CLIENT
Johanna Cumming

PROJECT
No. 3 Duke Street, Richmond, Greater London TW9 1HP

TITLE
Proposed Roof Flat Floor Layout Plan

SCALE @ A2	DRAWN BY	DATE
1:50	NM	Aug 23
PROJECT DWG NO. DB67/PL/09		REVISION A



Scale - Metres

0 1 2 3 4 5

N

IMPORTANT INFORMATION

This drawing uses survey information supplied by others and Design by Two cannot accept any liability, or guarantee the accuracy of that information. This drawing must be read in conjunction with all other drawings issued for this project, produced by Design by Two, Engineers, Specialist Suppliers etc. Therefore, all details and dimensions must be checked on site and all associated drawings checked prior to starting any works, and as work proceeds. Design by Two are to be consulted regarding any discrepancies

REV	COMMENTS	BY	DATE
A	Roof layout amended Skylight positions reconfigured to suit new flat layouts	NM	04.12.23

SUITE 7A HOLLY HOUSE BUSINESS CENTRE
220-224 NEW LONDON ROAD
CHELMSFORD
ESSEX
CM2 9AE

design two

DESIGNBYTWO@OUTLOOK.COM WWW.DESIGNBYTWO.CO.UK

CLIENT

Jo Cummins

PROJECT

No. 3 Duke Street, Richmond, Greater London TW9 1HP

TITLE

Proposed Roof Layout Plan

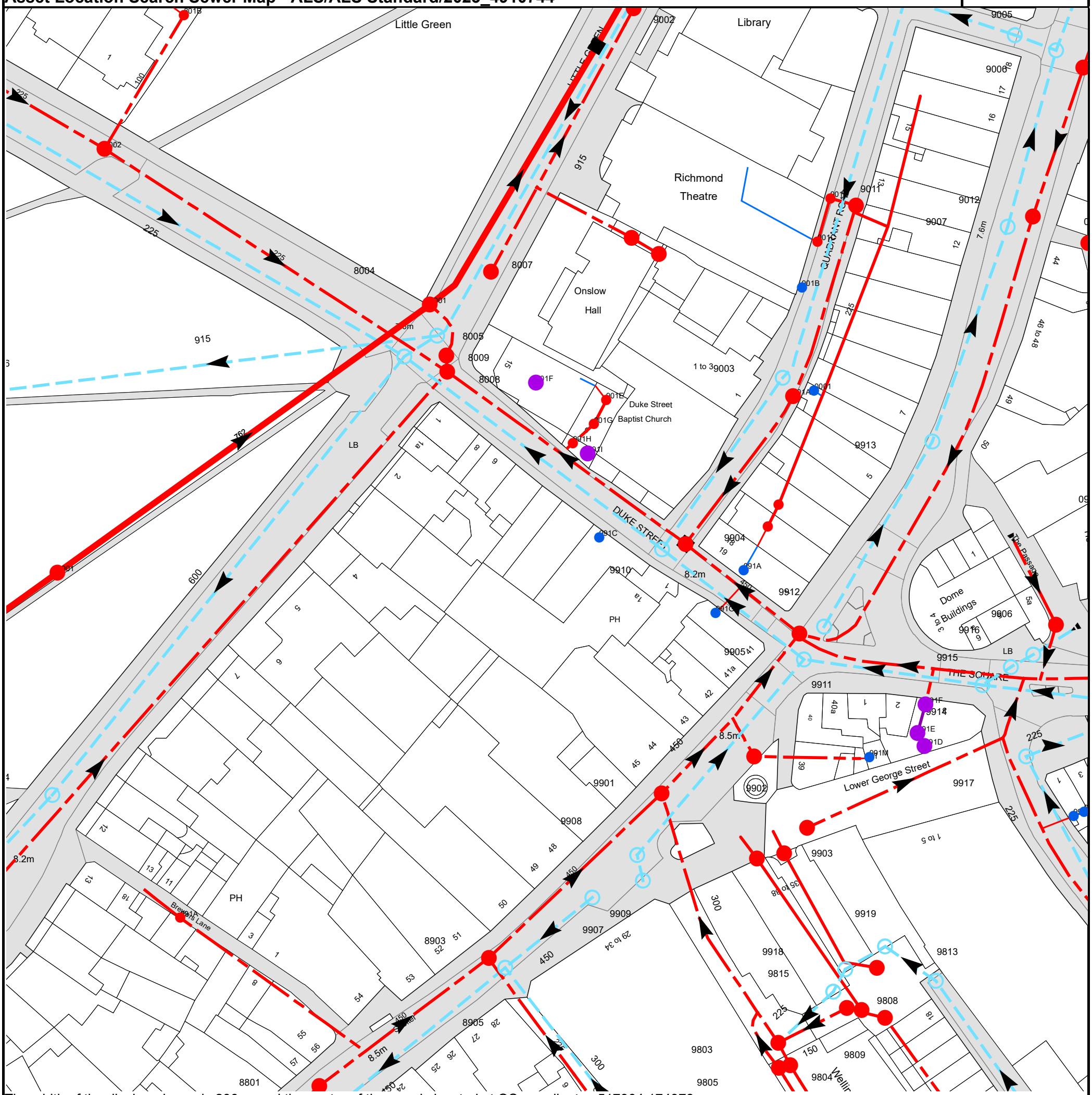
SCALE @ A2	DRAWN BY	DATE
1:50	NM	Aug 23

PROJECT DWG NO.	REVISION
DB67/PL/10	A

APPENDIX B

Thames Water Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4910744



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 517904,174978

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
0003	7.44	6.65
9914	8.07	6.17
9007	n/a	n/a
9915	n/a	n/a
9917	8.46	6.64
9012	n/a	n/a
9916	8.11	6.33
9906	7.94	5.23
0004	7.54	6.65
991B	n/a	n/a
091A	n/a	n/a
9006	n/a	n/a
9005	n/a	n/a
8801	8.68	4.24
9805	n/a	n/a
9804	9.29	6.79
9803	9.23	8.31
9808	n/a	n/a
98XQ	n/a	n/a
9809	n/a	n/a
9815	n/a	n/a
9813	9.56	8.62
9918	n/a	n/a
8905	8.5	6.03
99ZW	n/a	n/a
8903	8.44	4.06
9919	n/a	n/a
891A	n/a	n/a
9907	8.46	6.11
9909	8.44	7.94
99YY	n/a	n/a
9908	8.46	6.95
99ZV	n/a	n/a
9903	8.63	7.12
8009	8.28	n/a
8005	n/a	n/a
8001	n/a	-2.79
901B	n/a	n/a
8007	n/a	n/a
90YY	n/a	n/a
901C	n/a	n/a
90YX	n/a	n/a
9011	n/a	n/a
901D	n/a	n/a
8002	n/a	n/a
801B	n/a	n/a
9002	n/a	n/a
8901	n/a	-2.7
8004	n/a	n/a
8008	8.29	n/a
901F	n/a	n/a
991H	n/a	n/a
991I	n/a	n/a
901G	n/a	n/a
991C	n/a	n/a
901E	n/a	n/a
9901	8.35	3.81
9910	8.29	5.8
9904	8.27	3.34
991G	n/a	n/a
991A	n/a	n/a
9902	8.46	4.78
99YX	n/a	n/a
99YW	n/a	n/a
9003	n/a	n/a
901A	n/a	n/a
9905	8.09	3.58
9911	8.12	5.95
0001	n/a	n/a
9912	8.09	3.58
991M	n/a	n/a
991E	n/a	n/a
991D	n/a	n/a
991F	n/a	n/a
9913	7.86	5.59
8904	8.05	5.35

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.

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

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
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- 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.

- Inlet
- Outfall
- Undefined End

Other Symbols

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

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement — Ducts may contain high voltage cables. Please check with Thames Water.
- Conduit Bridge
- Subway
- Tunnel

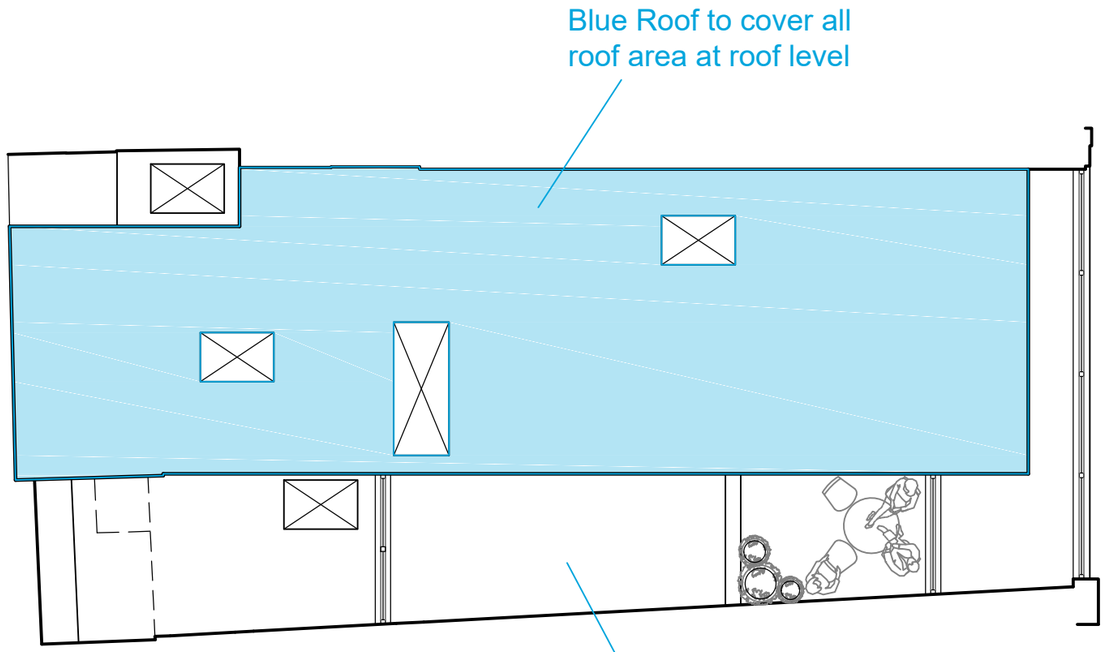
Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the 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 indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. 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, please contact Property Searches on 0800 009 4540.

APPENDIX C

Drawing 231746/DS/01 – Proposed Drainage Strategy



Bricks & Fuel (Duke Street) Ltd

3 Duke Street
Richmond, TW9 1HP

Drainage Strategy

SCALE	DRAWN BY	PRJ No.	DWG No.
1:100	OR	231746	231746-DS-01

LANMOR Consulting
Civil Engineers & Transport Planning

Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
www.lanmor.co.uk

MicroDrainage 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	0.027	0.027	0.1	2.1	Flood Risk
30 min Summer	0.035	0.035	0.1	2.7	Flood Risk
60 min Summer	0.043	0.043	0.1	3.2	Flood Risk
120 min Summer	0.050	0.050	0.1	3.7	Flood Risk
180 min Summer	0.052	0.052	0.1	3.9	Flood Risk
240 min Summer	0.053	0.053	0.1	4.0	Flood Risk
360 min Summer	0.054	0.054	0.1	4.0	Flood Risk
480 min Summer	0.054	0.054	0.1	4.0	Flood Risk
600 min Summer	0.053	0.053	0.1	4.0	Flood Risk
720 min Summer	0.053	0.053	0.1	4.0	Flood Risk
960 min Summer	0.052	0.052	0.1	3.9	Flood Risk
1440 min Summer	0.049	0.049	0.1	3.7	Flood Risk
2160 min Summer	0.044	0.044	0.1	3.3	Flood Risk
2880 min Summer	0.040	0.040	0.1	3.0	Flood Risk
4320 min Summer	0.033	0.033	0.1	2.5	Flood Risk
5760 min Summer	0.028	0.028	0.1	2.1	Flood Risk
7200 min Summer	0.025	0.025	0.1	1.9	Flood Risk
8640 min Summer	0.022	0.022	0.1	1.6	Flood Risk
10080 min Summer	0.020	0.020	0.1	1.5	Flood Risk
15 min Winter	0.031	0.031	0.1	2.3	Flood Risk
30 min Winter	0.040	0.040	0.1	3.0	Flood Risk
60 min Winter	0.048	0.048	0.1	3.6	Flood Risk
120 min Winter	0.056	0.056	0.1	4.2	Flood Risk
180 min Winter	0.059	0.059	0.1	4.4	Flood Risk
240 min Winter	0.060	0.060	0.1	4.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.706	0.0	1.9	19
30 min Summer	91.224	0.0	2.5	33
60 min Summer	56.713	0.0	3.3	62
120 min Summer	34.065	0.0	3.9	122
180 min Summer	24.952	0.0	4.3	182
240 min Summer	19.892	0.0	4.6	240
360 min Summer	14.403	0.0	5.0	316
480 min Summer	11.456	0.0	5.3	378
600 min Summer	9.585	0.0	5.6	440
720 min Summer	8.282	0.0	5.8	506
960 min Summer	6.572	0.0	6.1	644
1440 min Summer	4.737	0.0	6.6	912
2160 min Summer	3.409	0.0	7.3	1320
2880 min Summer	2.697	0.0	7.7	1704
4320 min Summer	1.936	0.0	8.2	2464
5760 min Summer	1.528	0.0	8.8	3224
7200 min Summer	1.272	0.0	9.1	3896
8640 min Summer	1.094	0.0	9.4	4664
10080 min Summer	0.963	0.0	9.6	5344
15 min Winter	139.706	0.0	2.1	19
30 min Winter	91.224	0.0	2.8	33
60 min Winter	56.713	0.0	3.7	62
120 min Winter	34.065	0.0	4.4	120
180 min Winter	24.952	0.0	4.9	178
240 min Winter	19.892	0.0	5.2	234

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
360 min Winter	0.061	0.061	0.1	4.6	Flood Risk
480 min Winter	0.060	0.060	0.1	4.5	Flood Risk
600 min Winter	0.060	0.060	0.1	4.5	Flood Risk
720 min Winter	0.059	0.059	0.1	4.5	Flood Risk
960 min Winter	0.057	0.057	0.1	4.3	Flood Risk
1440 min Winter	0.053	0.053	0.1	4.0	Flood Risk
2160 min Winter	0.046	0.046	0.1	3.5	Flood Risk
2880 min Winter	0.040	0.040	0.1	3.0	Flood Risk
4320 min Winter	0.031	0.031	0.1	2.3	Flood Risk
5760 min Winter	0.025	0.025	0.1	1.9	Flood Risk
7200 min Winter	0.021	0.021	0.1	1.6	Flood Risk
8640 min Winter	0.018	0.018	0.0	1.3	Flood Risk
10080 min Winter	0.016	0.016	0.0	1.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
360 min Winter	14.403	0.0	5.6	342
480 min Winter	11.456	0.0	6.0	394
600 min Winter	9.585	0.0	6.3	464
720 min Winter	8.282	0.0	6.5	542
960 min Winter	6.572	0.0	6.8	694
1440 min Winter	4.737	0.0	7.4	984
2160 min Winter	3.409	0.0	8.2	1408
2880 min Winter	2.697	0.0	8.6	1816
4320 min Winter	1.936	0.0	9.2	2592
5760 min Winter	1.528	0.0	9.8	3296
7200 min Winter	1.272	0.0	10.2	4032
8640 min Winter	1.094	0.0	10.5	4752
10080 min Winter	0.963	0.0	10.7	5352

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.413	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.008

Time (mins) From:	To:	Area (ha)
0	4	0.008

Model Details

Storage is Online Cover Level (m) 0.150

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)
0.000	75.2

Complex Outflow Control

Orifice

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 0.000

Orifice

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 0.000

Event: 360 min Winter