SUSTAINABLE DRAINAGE STRATEGY

20-24 Tolworth Broadway

for

Jessona Investment Ltd

MAB CONSULTANCY

20-24 Tolworth Broadway

Sustainable Drainage Strategy

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EXECUTIVE SUMMARY

- The proposed development is for the part demolition of an existing building and part redevelopment to provide a part-four, part-three, part-one storey building, with nine new residential units and landscaping works at 20-24 Tolworth Broadway, Surbiton, KT6 7HL.
- The site is located within the centre of Tolworth, Surbiton.
- The site is located in Flood Zone 1 and is considered suitable for development under the sequential test
- An assessment of the surface water flood risk in the site area found the risk to be very low within the site boundary.
- A SuDS scheme has been considered utilising green roofs, permeable paving and water storage in line with the London Plan and Royal Borough of Kingston Upon Thames guidance.
- The proposed development lowers the flood risk in the area by reducing the run-off rate from the site through the introduction of SuDS.
- The surface water and foul drainage will connect into the Thames Water surface and foul sewers respectively via gravity connections within Burwood Close as per the existing site.

1 INTRODUCTION

1.1 Background

MAB Consultancy Ltd have been commissioned by Jessona Investment Ltd to produce a Drainage Strategy in support of the application for the part demolition of an existing building and part redevelopment to provide a part-four, part-three, part-one storey building, with nine new residential units and landscaping works at 20-24 Tolworth Broadway., Surbiton, KT6 7HL.

The purpose of this report is to provide information on surface and foul water drainage associated with the proposed development and to provide a strategy for the disposal of the surface and foul water drainage that will arise as a function of the development.

1.2 Site Description

The site is situated on the south side of Tolworth Broadway to the northwest of the A3 Tolworth roundabout and opposite the Tolworth Broad-way/Ewell Road junction. The current site use is commercial with a single flat at the second-floor level. To the north, west and east are commercial properties, whilst to the south is Burwood Close, beyond which are residential properties.

Figure 1 indicates the site location which is centred on Grid Reference TQ1950766122.

Figure 1: Site Location

A building survey is included in Appendix A, which indicates that the site has an area of approximately 680.2m^2. A building with a roof area of circa 650.8m^2 occupies the majority of the site, with a small delivery yard measuring circa 29.4m^2 located to the rear (south-west) of the property. The current property has a ground floor level of 23.88m AOD.

The site is presently used for retail at ground floor level with ancillary office and storage areas on the first floorand a flat on the second floor. A breakdown of the existing site area is provided within Table 1 below. The site is drained via rainwater pipes and a foul system into the Thames Water sewer network within Burwood Close.

Description	Area
Roof Area	650.8m^2
Service yard/External Paving	29.4m^2
Total Area	**680.2m^2**

Table 1: Existing Site Areas

1.3 Proposed Development

The proposed development is shown in Appendix B and consists of a part-four, part-three, part-one storey building, with nine new residential units and landscaping works.

The ground floor contains two retail units, along with refuse and bike stores and the entrances into the residential aspect. Above this is the residential aspect with a mix of one, two and three bed flats. The roof looks to incorporate a green roof along with an open space for residents at first floor level.

The proposed site areas are included within Table 2 below, with Appendix B containing a detailed breakdown:

Description	Area
Green Roof Area	247.1m^2
Impermeable Roof Area	387.4m^2
Hard landscaping	45.7m^2
Total Area	680.2m^2

Table 2: Proposed Site Areas

2 EXISTING SURFACE WATER DRAINAGE

2.1 Existing Public Sewers

There are surface water public sewers both within Burwood Close on the south-western boundary and within Tolworth Broadway to the north-east, as shown within the Thames Water (TW) Asset maps within Appendix C. There are no manholes shown at the site boundary and so either the existing connection will need to be used or a new lateral connection

In Burwood Close, the sewer is 150mm diameter, with an invert at the site boundary of approximately 22.85m AOD. Within Tolworth Broadway, there is a manhole on the opposite side of the road (ref: 5184) to the site with an invert level of 22.51m AOD.

2.2 Existing Private Drains

The current site has a formal surface water drainage arrangement with roof water discharging into the public sewers and a series of gullies for the hardstanding area.

2.3 Surface Water Flooding

Within urban areas where there are large areas of impermeable surfacing e.g. roof areas, car parking and roads, it is possible for high intensity rainfall storms to be unable to soak into the ground or enter the man-made drainage system at a quick enough rate to cope with the volume of water. Where this occurs, the excess water can flow across land and potentially cause flooding.

The online map of for surface water flooding (see Figure 2 below) indicates that within the site boundary there is a very low risk from surface water flooding.

The surrounding area to the west, north and south is also shown as having a very low risk. To the east, within Tolworth Broadway a low risk of flooding is shown. This is shown at a depth below 150mm and with a flow velocity below 0.25m/s.

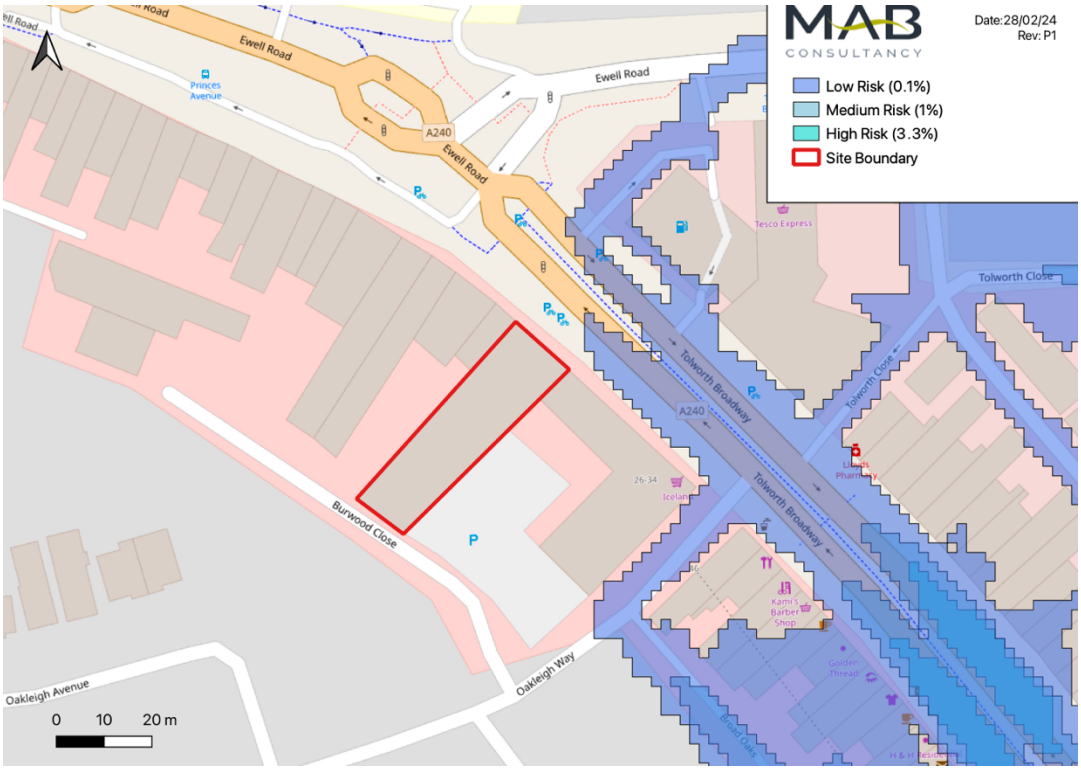

Figure 2: Long Term Risk of Surface Water Flooding

Thames Water have confirmed that there have been no recorded sewer flooding events in the area, as shown within Appendix C.

The site is therefore considered at a **very low** risk of surface water flooding and suitable from a sequential test perspective for development.

2.4 Site Run Off

With regards to the existing the existing run-off from the site, the site currently discharges unattenuated into the public sewer and the existing run off rates have been calculated as shown within Table 3 (see Appendix D for calculations).

Event	Run-Off Rate
Q_1	8.2l/s
Q_{30}	18.5l/s
Q_{100}	23.6l/s

Table 3: Existing Runoff Rates

However, the London Plan aspires for all new developments to discharge at the greenfield flow rate from the site where possible. Table 4 below displays the greenfield runoff rates at the site, derived using IH124 method (Appendix D contains the calculations).

Event	Run-Off Rate
Q_{bar}	0.11l/s
Q_{1}	0.09l/s
Q_{30}	0.25l/s
Q_{100}	0.34l/s

Table 4: Greenfield Runoff Rates

3 EXISTING FOUL WATER DRAINAGE

3.1 Existing Public Sewers

There is a 150mm diameter foul sewer which runs in an east to west direction within Burwood Close as shown on the TW asset maps within Appendix C. This currently serves the development via a lateral connection. There is no level information available for the lateral, however, the nearest upstream manhole (ref 4040), has an invert level of 22.30m AOD which can be considered as the invert level at the site boundary.

3.2 Existing Drainage

The existing site is assumed to discharge into the TW sewers around the site.

4 PROPOSED SURFACE WATER DRAINAGE

4.1 Surface Water Drainage (SuDS)

4.1.1 Drainage Hierarchy

In identifying SuDS options, it is important to take into consideration any constraints at the site which may influence the preferred surface water drainage criteria of the London Plan of:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
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.

The proposed development does offer the opportunity for some form of rainwater harvesting and use within the development and therefore this particular technique could be utilised subject to detailed design of the building. The site will still need an outfall in the occasion of a rainfall event occurring which exceeds the capacity of the storage facility.

Infiltration is not deemed as an option as whilst the soils in the area could potentially be suitable, the made ground in the area will restrict the depth. In addition, the nature of the scheme in reusing an existing structure means that there are no external areas on which to utilise infiltration devices.

Attenuation in open features is not considered feasible due to the condensed nature of the development, which means that any storage will need to be in the form of tanks released gradually located under the building footprint or within the green roof.

In terms of the outfall, as there are no watercourses in the area, this leaves the option of draining to public sewer. Given that the current site discharges into the public sewer, any reduction to the flow would be an improvement to the un-attenuated flow currently flowing into the sewer. Therefore, the proposed reduction to the run-off rate would be in line with the London Plan and local guidance.

4.1.2 Climate Change

Due to the location of the site, the factors for climate change, as defined by DEFRA, should be applied to the peak rainfall intensity. A 100-year lifespan for the development has been considered as the proposed use contains residential properties.

DEFRA provide climate change figures is shown in Table 5 below. It indicates that for small and urban catchments, a central level of 20% and upper end of 40% peak rainfall intensity allowance should be assessed in order to determine the future impacts of climate change.

Applies across all of England	Total Potential change anticipated 2022-2050	Total potential change anticipated 2051-2122
Upper End	40%	40%
Central	20%	25%

Table 5: DEFRA Climate change allowances

For the purposes of this report, it is proposed that a conservative approach is considered and that a climate change factor of +40% is utilised on all drainage calculations

4.1.3 SuDS Options

From those SuDS detailed within Table 7.1 of the SuDS Manual, the following shown in Table 6 are considered suitable.

Component Type	Collection Mechanism	Design Criteria						Suitable	Reason
		Water Quantity			Water Quality	Amenity	Biodiversity		
		Peak Run off Rate	Runoff Volume						
			Small Events	Large Events					
Rainwater Harvesting Systems	P		●	●		●		Y	
Green Roofs	S	○	●		●	●	●	Y	
Infiltration Systems	P	●	●	●	●	●	●	N	Lack of space and made ground
Proprietary Treatment Systems	P				●			Y	
Filter Strips	L		●		●	○	○	N	Lack of space
Filter Drains	L	●			●	○	○	N	Lack of space
Swales	L	●	●	●	●	●	●	N	Lack of space
Bio-retention Systems	P	●	●	●	●	●	●	N	Lack of space
Trees	P	●	●		●	●	●	N	Lack of space
Pervious Pavements	S	●	●	●	●	○	○	N	Lack of space
Attenuation Storage Tanks	P	●						Y	
Detention Basins	P	●	●		●	●	●	N	Lack of space
Ponds and Wetlands	P	●			●	●	●	N	Lack of space

Table 6: SuDS Component Assessment

Key: P = Point, L=Lateral, S=Surface, ●=Likely Valuable Contribution, ○=Some potential contribution

Whilst the site will discharge to a public sewer and as such water quality is not considered as critical, in order to promote best practice and in line with the Boroughs aim to reduce pollution, it is proposed to use a simple index approach to water quality as described in Table 26.1 of the SuDS Manual (C753). Table 26.2 indicates the pollution indices for types of

development which are considered as residential. Table 7 below summarises the pollution indices for the site.

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual driveways and low traffic roads (e.g. cul de sacs)	Low	0.5	0.4	0.4

Table 7: Pollution Hazard Indices

4.1.4 Proposed SuDS Scheme

From the above, it is proposed that a rainwater harvesting scheme will be considered, but the main aspect of the scheme will be via by green roofs, with external hard landscaping areas paved with potentially some form of permeable paving.

Green roofs, which are likely to be either intensive or extensive, will be utilised on 247.1m^2 of roofing. The exact classification is proposed to be designed post planning subject to Site Investigation and structural design. Permeable Paving will be provided on 45.7m^2.

All of the areas will be restricted to the rate from the site of 0.11l/s up to and including the 1 in 100-year storm including 40% climate change, with the volume retained up to the 360min storm.

From Table 26.3 of the SuDS Manual (C753), the combination of permeable paving and green roofs is deemed to reduce the pollution indices to an acceptable level. Table 8 below includes the assessment.

Land Use	Total Suspended Solids	Metals	Hydro-carbons
Residential roofs	0.2	0.2	0.05
Green Roof	0.8	0.7	0.9
Suitable	Yes	Yes	Yes
Hard Landscaped Area	0.5	0.4	0.4
Permeable Paving	0.7	0.6	0.7
Suitable	Yes	Yes	Yes

Table 8: Pollution Hazard Indices Post Development

Appendix E contains an indicative scheme of the drainage layout along with hydraulic calculations and Table 9 below provide a summary of the run-off utilised and storage provided.

Greenfield Runoff Rate (Qbar)(l/s)	0.11l/s		
Existing Discharge Rate (l/s)	Up to 23.6l/s		
Proposed Attenuation Volume (m3)	71.4m^3		
Site Runoff and Storage Volume	**Runoff/Discharge Rate and betterment %**		**Required Storage Volume (m3)**
	Existing Runoff Rate	**Proposed Discharge Rate (% Betterment)**	
1 in 1 year	8.2l/s	0.11l/s(99%)	NA
1 in 30 year	18.5l/s	0.11l/s(99%)	NA
1 in 100 year	23.6l/s	0.11l/s(99%)	NA
1 in 100 year + CC	NA	NA	71.4m^3

Table 9: Run-off Rates and Volumes

It is proposed that the storage required is located in the green roof and within underground crates located under the hard landscaping. Assuming a system with a 0.95 void ratio for the underground storage, the remaining storage required for the site is 72.2m^3 as shown within the calculations within Appendix E.

Appendix E also contains an indicative drainage scheme indicating how the storage could be accommodated within the site boundary.

It is proposed that the surface water system will connect to the surface water sewer located within Burwood Close via a gravity connection.

In the occurrence of an exceedance event, the flow paths are predicted to follow those shown within Appendix F.

4.2 Maintenance

The maintenance for the surface water system will be critical in ensuring that the components function as they are designed to do over their design life time. A maintenance plan is included within Appendix G based upon the above strategy.

5 PROPOSED FOUL DRAINAGE

5.1 Thames Water Connection

Foul water discharge will be via the existing TW sewers within Burwood Close. The proposed peak flow generated by the site is shown within Table 10 below.

Type	Area (m^2)	No Units	Uses	Time Period (hr)	Peak Factor	Design Flow (l/s)	Total (l/s)
Residential	-	9	TW 50 houses rule[1]	24	6	0.08	**0.12**
Retail	461	-	90l/staff/day[2]	10	3	0.04	

Table 10: Design Foul Loading

[1] TW '50 House rule' First houses discharge at 3600 l/d +10% infiltration, subsequent properties at 600l/d + 10% infiltration.

[2] Assumes 8 members of staff per retail unit with loads taken from British Water Flows and Loads - 4

The proposed development will generate a total of 0.12l/s (to be confirmed at the detailed design stage).

5.2 Thames Water Connection

The proposed connection points are via the existing gravity connections within Burwood Close. The development will need to apply to connect via a Section 106 application which will be undertaken at the detailed design phase and all internal drainage will be undertaken in line with the Building Regulations Part H.

An indicative drainage scheme showing the proposed connection is included within Appendix E.

6 SUMMARY

The proposed development is for the part demolition of an existing building and part redevelopment to provide a part-four, part-three, part-one storey building, with nine new residential units and landscaping works at 20-24 Tolworth Broadway, Surbiton, KT6 7HL.

Surface Water drainage calculations have been undertaken which provide a suitable strategy for discharging surface water and demonstrates the feasibility of the development proposals utilising SuDS in line with the London Plan and local policies.

The SuDS included are green roofs and permeable paving, with any additional flow of water off-site being restricted to the rate of 0.11l/s before being discharged into the surface water public sewer within Burwood Closet via a gravity connection. Any additional volume of water in the 1 in 100-year rainfall event plus 40% climate change 360-minute storm will be stored on site in underground tanks.

The foul drainage will look to connect via a gravity connection into foul public sewer within Burwood Close.

Whilst the final details concerning the foul and surface water disposal will be confirmed during the detailed design phase, this report demonstrates that the scheme is feasible from a surface and foul water drainage perspective and that the proposals can be designed in line with the London Plan and local policies concerning the site and Borough.

Therefore, it is proposed that a suitably worded drainage condition is applied to any planning approval in line with the strategy outlined within this report.

The Royal Borough of Kingston Upon Thames SuDS Proforma is included within Appendix H.