Ham Close Regeneration

Planning Application:

Flood Risk Assessment & Drainage Strategy

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Contents

1 Project Information

1.1 Project Information

Client	Hill Residential

1.2 Project Details

Project Name	Ham Close, Richmond
Location	Ham Close, Ham, Richmond Upon Thames, TW10 7PG
Jubb Project Number	21246

1.3 Report Details

Version	V2
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1.4 Project Authorisation

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AUTHORISATION:

Version	Date	Detail	Prepared By	Approved By
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V1	07/02/22	First Issue	KG	RL
V2	23/03/22	Updated to suit comments	KG	RL

2 Introduction

2.1 Instruction

2.1.1 Jubb has been commissioned by Hill Residential to provide flood risk and drainage advice in relation to proposals for the residential development in Ham Close, Ham, Richmond Upon Thames, TW10 7PG.

2.1.2 This report may not be reproduced by any third party for any use without the written agreement of Jubb Consulting Engineers Ltd.

2.2 Brief

2.2.1 This Drainage Statement is prepared in accordance with the requirements of the National Planning Policy Framework (NPPF) published by the Department of Communities and Local Government. The NPPF sets out the government's national policies to protect people and property from flooding in both existing and future situations as a result of development.

2.2.2 Section 14 of the NPPF and the associated Planning Practice Guidance for Flood Risk and Coastal Change sets out the framework for planning decisions made by the local, regional and national government and the Environment Agency (EA). In order for planning authorities to make informed decisions on the Development of sites in areas at risk of flooding, NPPF requires the developer to carry out an assessment of flood risk.

2.2.3 This report addresses the requirements given in Section 14 of the NPPF and other issues which are deemed relevant to flood risk. These requirements include the following:

- Assessment of the magnitude and severity of flood risk to the Site, including consideration of current and future impacts of climate change;
- Assess suitability of the site and future development through the application of the Sequential Test and Exception Test (where required);
- Assess the impacts of current and future development of the site on flood risk to adjacent developments;
- Determine ability of existing and proposed drainage to accommodate development flows with respect to surface water runoff and flood risk;
- Demonstrate that appropriate mitigation measures have been taken to prevent flooding;
- Demonstrate that appropriate emergency situations have been considered e.g. overland flow path and evacuation routes.

2.2.4 This report also considers the disposal of wastewater generated by the proposed Development. Existing infrastructure will be reviewed to identify potential options for the disposal of foul and surface water runoff for future development.

3 Site Location & Description

3.1 Existing Site Context

3.1.1 The Application Site area is 4.69 Hectares. The site is located on Ham Close, between St Richard's CE Primary School and Ham Street/Wiggins Lane, in a predominantly residential setting. The site is centred at National Grid Reference TQ 0030585, OS co-ordinates 550309 158566.

3.1.2 The application site currently houses 192 homes, a community centre and a Maker Labs use as part of the existing Ham Close Estate, existing site layout can be seen in Figure 1.

3.1.3 Access is provided from Ham Close which forms two parallel minor roads that generally run north-west to south-east, connecting to Ashburnham Road in the south and Woodville Road in the north.

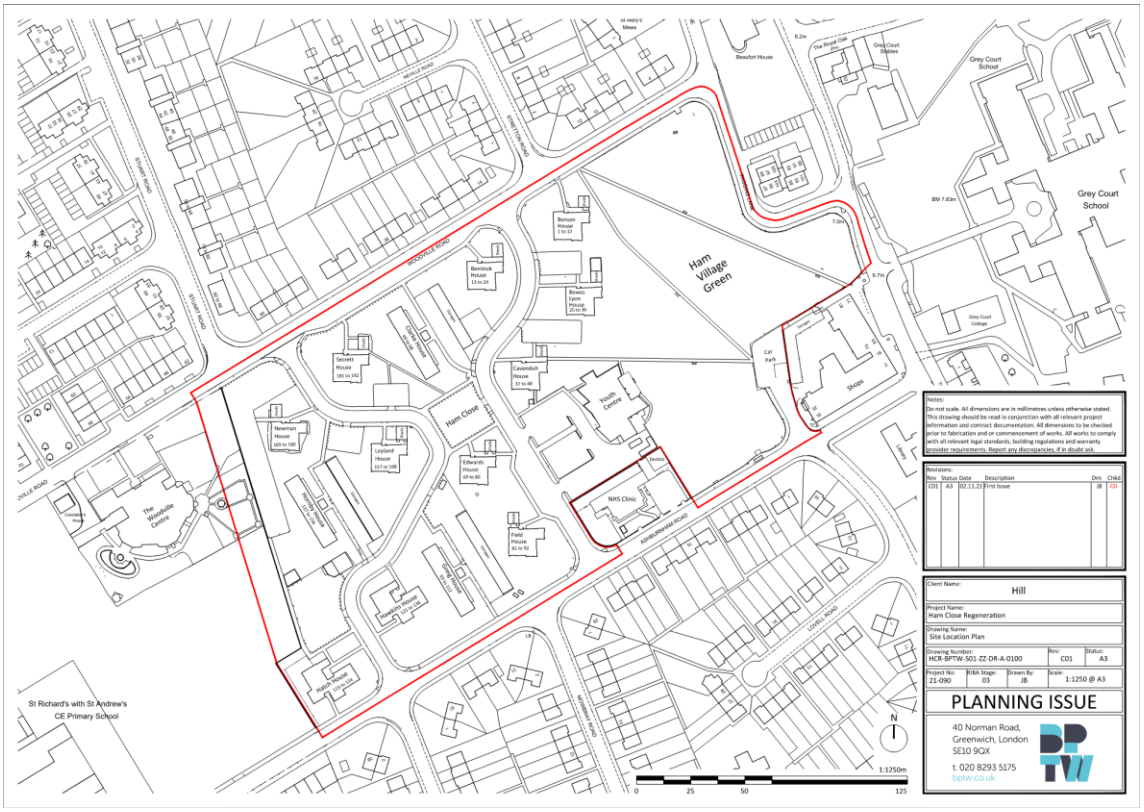

Figure 1: Indicative Site Masterplan

3.2 Development Proposals

3.2.1 The development proposals comprise the "demolition of the existing buildings on-site and phased mixed-use development comprising 452 residential homes (Class C3) up to six storeys; a Community/Leisure Facility (Class F2) of up to three storeys in height, a "Maker Labs" (sui generis) of up to two storeys together with basement car parking and site wide landscaping ('the Development')."

3.2.2 This application is being submitted to the London Borough of Richmond upon Thames (LBRuT). Architectural layouts can be found in Appendix A.

3.3 Site Topography

3.3.1 The site levels vary between 7.5mAOD at the north boundary (Woodville Road) and 6.7mAOD at the south-eastern boundary (Ashburnham Road).

3.3.2 Refer to Appendix B for topographical survey.

3.4 Site Geology

3.4.1 A Geo-Environmental Report prepared by Enzygo Geoenvironmental Ltd (Aug 2021) summarises the ground conditions to comprise Made Ground over firm clay and loose becoming dense with depth sand and gravel. This is underlain by London Clay comprising stiff clay. The report extracts can be found in Appendix C.

3.4.2 Groundwater was encountered at depth between 2.2m and 4.3m below ground level.

3.4.3 The site is not located within a designated Source Protection Zone.

3.5 Existing Sewers

3.5.1 There are number of existing Thames Water sewers within the site boundary, all avaliable sewer information can be found in Appendix D, extract of the asset map can be seen in Figure 2.

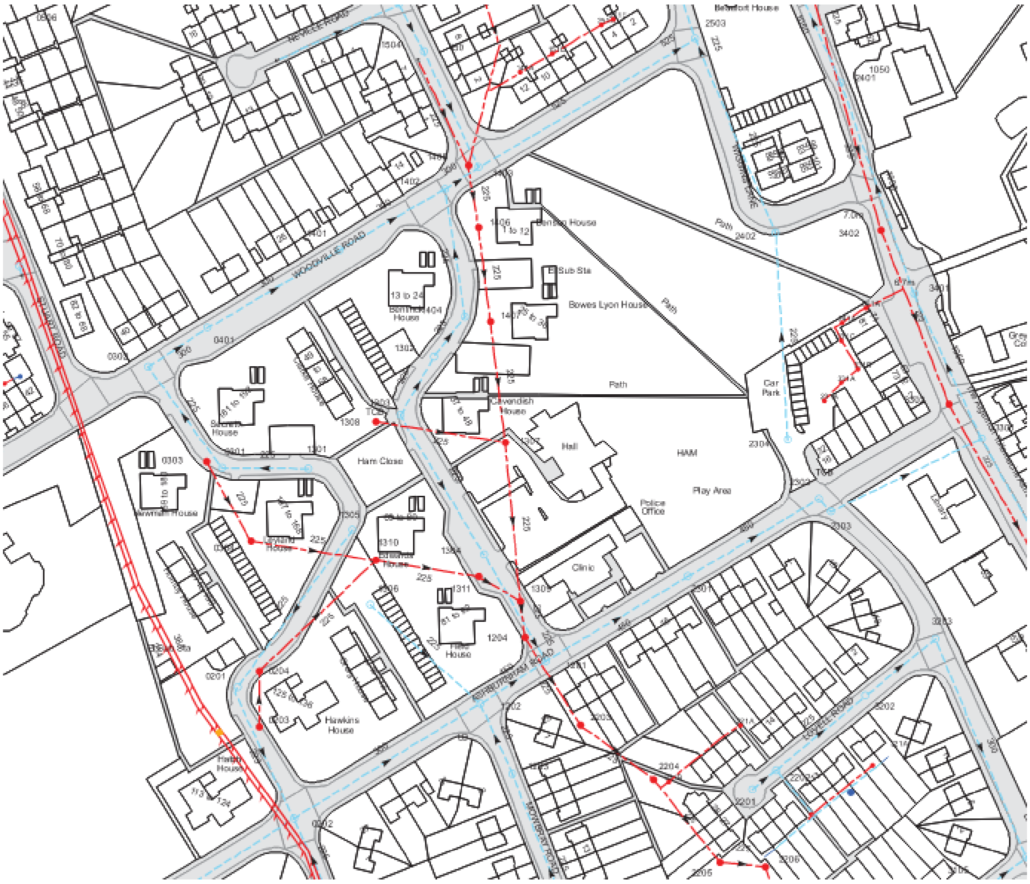

Figure 2, Existing Drainage Layout

3.5.2 The surface water sewers onsite follow the layout of the existing road infrastructure, with 5 total discharge locations: 2 outfalls towards the 300-525mmØ sewer in Woodville Road to the north, and 3 outfalls towards the 300-450mmØ sewer in Ashburnham Road to the south. All surface water outfalls are 225mmØ and have invert levels roughly at 2m below ground levels.

3.5.3 There is also an existing 225mmØ surface water sewer running in the northern direction through the eastern part of the Ham Village Green, originating within the existing car park, at a location of the proposed Community Centre. This sewer runs towards Wiggins Lane and joints the 525mmØ sewer in Woodville Road north of the site.

3.5.4 The foul water network onsite is connected towards a 225mmØ sewer running directly across the site. This sewer appears to drain the residential properties along Stretton Road north of the site (outside of the site boundary) and is routed in a straight line through the site running under landscaping and car parking areas. Once outside of the site boundary, the sewer crosses Ashburnham Road and is routed through private gardens in the southern direction. The levels of this sewer appear to be relatively flat, with some areas showing no falls between manholes, with an invert level approximately 3m below ground level.

3.5.5 Two Thames Water rising mains are also present onsite, running south to north, parallel to each other along the western boundary.

3.5.6 To the east of the site, there are two sewers located within Ham Street, a 225mmØ foul water sewer running in the southern direction and a 1050mmØ surface water sewer running in the northern direction.

3.5.7 There are private drainage networks onsite, an Underground Survey drawing can be found in Appendix D. The drains appear to serve the development only, with no drains from outside of the site boundary, other than the public sewers described above.

3.6 Existing runoff rates

3.6.1 For the purposes of drainage calculations, the Ham Village Green has been excluded from the catchment as the existing and proposed use of this area will remain unchanged and will not drain towards the neighbouring sewers.

3.6.2 The Site area discharging to the sewers measures approximately 2.96Ha, of which approximately 1.24Ha is landscaped (30% impermeable). The existing runoff rates have been estimated using Modified Rationale Method, results can be seen in Table 1 below.

Storm	*Rainfall Intensity (mm/hr)*	*Existing Rainfall (l/s)*
1 in 1	*28.2*	*231.8*
1 in 30	*86.0*	*708.4*
1 in 100	*113.8*	*936.9*

Table 1, Existing Runoff Rates

3.6.3 The Site is currently split into 5 catchments, each with their own 225mmØ outfall. As the areas are similar in size, it can be assumed the current discharge rate per outfall is ~187 l/s for a 1 in 100 year storm.

3.7 Existing Watercourses

3.7.1 The site is located approximately 750m east from the river Thames. The nearest watercourse appears to be a ditch in Ham Lands, approximately 300m west of the site, Ham Pond is also located approximately 400m southeast of the site. All of these are too distant to be significantly impacted by the site.

4 Proposed Development

4.1 Development Description

4.1.1 The development proposals comprise the "demolition of the existing buildings on-site and phased mixed-use development comprising 452 residential homes (Class C3) up to six storeys; a Community/Leisure Facility (Class F2) of up to three storeys in height, a "Maker Labs" (sui generis) of up to two storeys together with basement car parking and site wide landscaping ('the Development')."

4.2 Development Suitability

4.2.1 The NPPF sets out the Sequential Test to steer developments towards areas of lowest probability of flooding, taking account of their vulnerability to flooding.

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1 **(<1 in 1000)**	✓	✓	✓	✓	✓
Flood Zone 2 **(up to 1 in 1000)**	✓	✓	Exception Test	✓	✓
Flood Zone 3a **(1 in 100 fluvial) (1 in 200 tidal)**	Exception Test	✓	X	Exception Test	✓
Flood Zone 3b **(functional floodplain)**	Exception Test	✓	X	X	X

Table 2, Development Suitability

4.2.2 The development use is classified as a 'More Vulnerable' development. Under Table 2 of the NPPF Planning Practice Guidance as the site is in Flood Zone 1, all vulnerability classes are suitable and thus the proposed scheme is deemed acceptable.

5 Flood Risk

5.1 Fluvial Flooding

5.1.1 The Environment Agency (EA) produces floodplain maps for the UK, which show the area at risk of fluvial and tidal flooding. The EA flood zone maps identify undefended floodplain, giving the horizontal extent of low (Zone 1), medium (Zone 2) and high-risk flood zones (Zones 3a and 3b) depending on the severity of the flood event.

5.1.2 The EA's Flood Map for Planning (Figure 3) indicates the site to be wholly located within Flood Zone 1 (Low Probability) and therefore defined as having less than a 1 in 1,000 annual probability of river flooding.

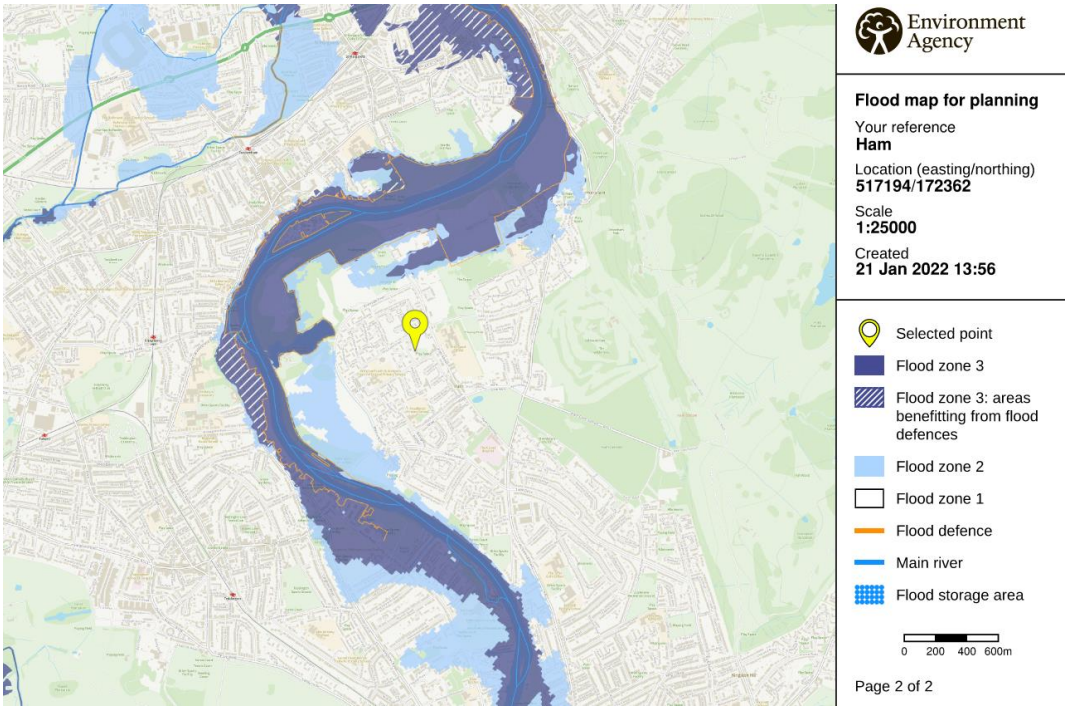

Figure 3, Extract from Environment Agency Tidal and Fluvial Flood Risk Map

5.1.3 Table 2 of the NPPF Planning Practice Guidance for Flood Risk and Coastal Change states in terms of flood risk vulnerability, that all types of development are suitable within this flood zone. Sequential and exception tests are not required.

5.1.4 The risk of fluvial and tidal flooding to the development is low.

5.2 Overland (Surface Water) Flooding

5.2.1 The EA also produces maps which highlight the risk of flooding from surface water flows. The Long-Term Flood Risk Information maps can illustrate when the capacity of existing surface water drainage networks or channels are exceeded in extreme rainfall events. These maps are produced, as with fluvial modelling, based on generalised information, and need to be verified in terms of topographical ground levels and indicated flow routes.

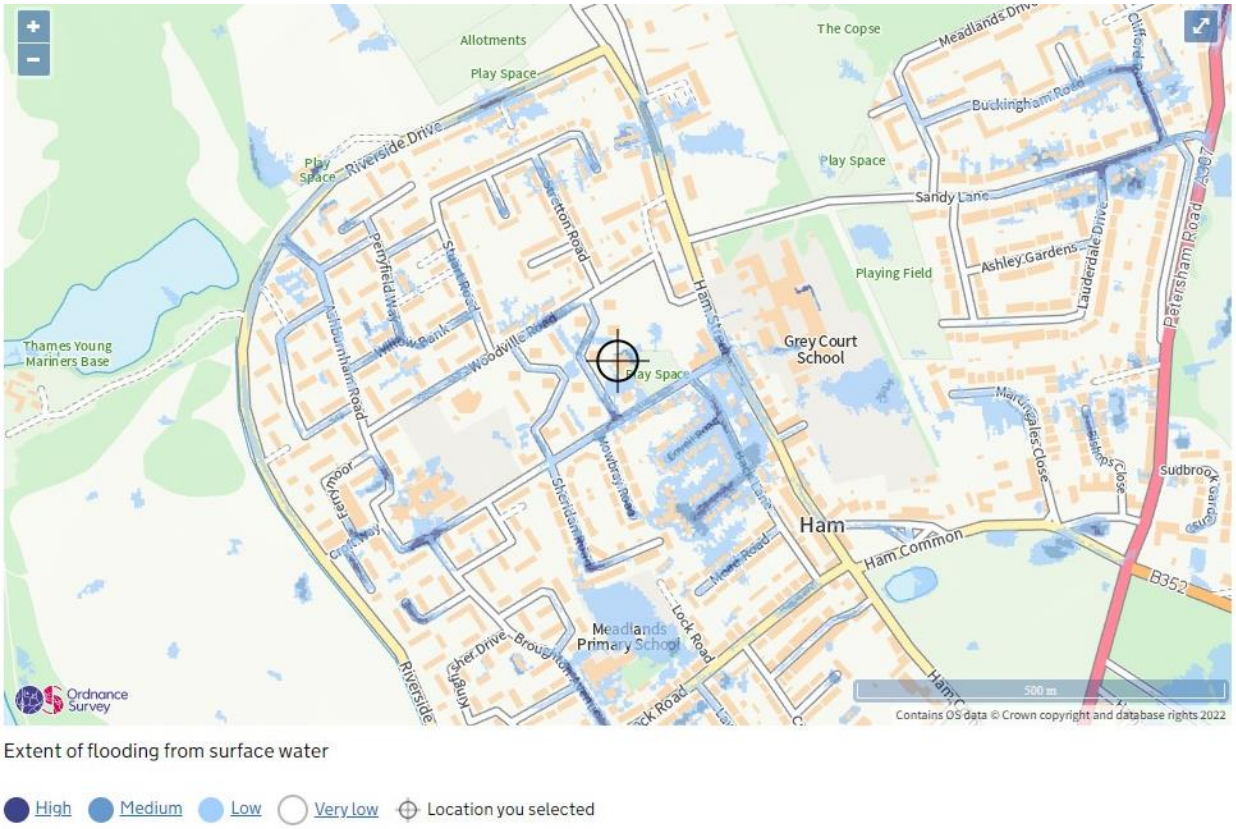

Figure 4, Extract from Environment Agency's Long-Term Flood Risk mapping indicating Surface Water Flood Risk

5.2.2 Figure 4 indicates there are number of flood risk areas within the site. The locations shown on the map correspond to topographical low points, which as shown on the topographical survey, have gullies to ensure that area is drained during rainfalls.

5.2.3 A review of the capacity of existing pipes shows the maximum capacity of the 225mmØ outlet pipes to be ~63 l/s. The maximum rainfall flows amount to ~187 l/s (as discussed in section 3.6.2). This would result in surface water flooding during times of extreme rainfall which would contribute to the surface water flooding shown above.

5.2.4 The proposed development will provide suitable drainage arrangements for all areas within the site boundary, with the onsite drainage designed to accommodate all storms up to and including 1 in 100 year + 40% climate change. The runoff rates from site will also be reduced, as a result helping with any existing sewer capacity concerns.

5.2.5 The risk of surface water flooding to the development is low.

5.3 Flooding from Groundwater

5.3.1 Groundwater flooding can occur after a prolonged period of rainfall, a considerable rise in the water table can result in inundation for extended periods of time.

5.3.2 The LBRuT web page contains an interactive map, which compiles information on the geology and the risks of groundwater flooding from numerous sources, such as the Environmental Agency (EA), GLA Drain London and the British Geological Survey (BGS). Summary of the results can be seen in the Table 3:

Source (Map)	Result
EA, Area Susceptible to Groundwater Flooding	75% or more
GLA Drain London, Increased Potential for Elevated Groundwater	Consolidated & Permeable Superficial
BGS, Susceptibility to Groundwater Flooding	Potential for groundwater flooding to occur at surface

Table 3, Groundwater vulnerability mapping summary

5.3.3 Based on the mapping information, the site is susceptible to groundwater flooding and mitigation measures will be required to ensure that the proposals are sufficiently protected from groundwater ingress.

5.3.4 The Geo-Environmental Report prepared by Enzygo Geoenvironmental Ltd (Aug 2021) states that the groundwater onsite was encountered at depths of between 2.2m and 4.3m below ground level. Further groundwater monitoring is being undertaken and will be used to inform any further design.

5.3.5 Groundwater will be considered during construction, especially during excavations and will have an impact on the below ground design, such as the drainage strategy. Additionally, all basements onsite will be designed to be safe from groundwater, a specialist waterproofing design will be implemented, to ensure that the required level of protection is achieved.

5.3.6 In terms of risk, the basements onsite are proposed to be used for 'less vulnerable' uses, such as car parking and plant. Therefore, in the unlikely event of the waterproofing measures failing, the consequences will be minimised. A separate Basement Impact Assessment is being submitted as part of the planning application.

5.3.7 Given the mitigation measures above, groundwater flooding is considered low risk.

5.4 Flooding from Sewers

5.4.1 The LBRuT web page contains an interactive map, which provides information on historic flooding incidents from sewers. The site lies within an area classified as "0 to 10 incidents recorded", which indicates a low risk of flooding from sewers.

5.4.2 The drainage strategy for the development aims to reduce the surface water runoff from site to greenfield. This will increase the capacity within the neighbouring sewer network – reducing any potential risk of surface water sewers flooding.

5.4.3 Thames Water have been consulted via a pre-development application and confirmed that the neighbouring sewer network has sufficient capacity.

5.4.4 The risk of flooding from sewers is low.

5.5 Flooding from Artificial Sources

5.5.1 The EA's Long-Term Flood Risk Information mapping indicates the potential extent of flooding from reservoir breach/failure. The site is safe from reservoir flooding while the river levels are normal.

5.5.2 Risk of flooding from reservoirs is very low, as in line with the Reservoirs Act 1975, reservoirs need to be regularly inspected and maintained, therefore reservoir flooding is unlikely.

5.5.3 Flood risk from artificial sources is considered to be low risk.

6 Proposed Drainage Strategy

6.1 Works to existing sewers

6.1.1 As highlighted in the earlier section of this report, there are numerous existing sewers onsite. There are three sewers which are identified to convey water from outside of the site, which will need to be retained or diverted. A description of the proposed works to the existing sewers can be found in Table 4 below.

Existing route of sewer	Proposed Works	Comment
Pumped Foul Water rising mains to the west of the site.	To be retained.	The proposed layout has allowed for the existing sewer easement. This easement is a big constraint onsite and has a significant impact on the landscaping and the drainage strategy.
Gravity Foul Water 225mmØ sewer between manholes TW1405 – TW1204.	To be diverted.	The existing route of the sewer cannot be accommodated within the proposals and must be diverted towards the 225mmØ sewer in Ham Street, through the Green. Thames Water have been consulted and confirmed capacity for the diversion.
Gravity Surface Water 225mmØ sewer from existing car park (from manhole TW2304).	To be abandoned	Sewer underneath the proposed structure. Any existing connections will be diverted towards the new connection into sewer in Ashburnham Road.
All other drains onsite.	To be abandoned	All other drains onsite appear to only serve the existing development. As the proposals are to demolish the existing buildings, the drains will become redundant and will be abandoned.

Table 4, Works to Existing Sewers

6.1.2 To complete the diversions and sewer abandonments, Section 185 applications will be made to Thames Water during the next design stage.

6.2 Foul Water Drainage

6.2.1 A new foul water drainage network will be required to service the proposed development. The new network will collect and convey foul water discharge from the development to a point of connection on the existing sewer network.

6.2.2 As shown on the proposed drainage plan (Appendix E) two gravity foul water outfalls can be made to existing manholes TW1403 and TW1204.

6.2.3 Thames Water have been contacted via the pre-planning application and confirmed sufficient capacity for the neighbouring development. Confirmation can be found in Appendix G.

6.3 Surface Water Drainage

6.3.1 New surface water drainage will be required to drain surface water runoff from the proposed buildings. In line with the LBRuT Local Plan and the London Plan, the runoff from the proposed development will aim to restrict runoff rates to greenfield rates and the SuDS measures and discharge methods have been evaluated in accordance with the hierarchy, as shown in Table 5.

Hierarchy	Method	Feasibility	Comment
1	Rainwater use as a resource (rainwater harvesting / blue roofs).	✓	The proposals utilise green and blue roofs wherever possible.
2	Rainwater infiltration	X	Infiltration is not suitable for this site, due to minimum space requirements for soakaways to be positioned away from structures and the underlaying clay ground conditions.
3	Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)	✓	Green roofs, raingardens and permeable paving will be utilised across the scheme.
4	Rainwater discharge direct to a watercourse (unless not appropriate)	X	There is no suitable watercourse near the site.
5	Controlled rainwater discharge to a surface water sewer or drain	✓	It is proposed to discharge towards the neighbouring surface water sewers at greenfield runoff rates.
6	Controlled rainwater discharge to a combined sewer	X	There are no combined sewers in the area.

Table 5, Surface Water Discharge Hierarchy

6.3.2 As highlighted above, the site will discharge towards the neighbouring surface water sewer. The site can accommodate green and blue roofs, raingardens, permeable paving and below ground attenuation tanks to treat and attenuate runoff. A drainage strategy included in Appendix E shows the possible sizes and locations of these SuDS features, extract can be seen in Figure 5.

Figure 5 Proposed Drainage Layout

6.3.3 Greenfield Runoff Tool (from UKSuDS website) was used to calculate the greenfield runoff rate for the site, extract can be found in Appendix F. The site aims to discharge at greenfield runoff rates of 11.7 l/s/ha for all storms up to and including a 1 in 100 year + 40% climate change.

6.3.4 The site has been split into catchments taking the phasing and the outfall locations into account. The storage requirement for each outfall has been calculated and summarised on the drainage strategy drawings in Appendix E, all calculations can be found in Appendix F.

6.3.5 Constraints within the ground, such as the Thames Water easement, tree root protections and the required space for the services limit how much attenuation can be provided within some of the catchments. As a result, Catchment 1 will only be able to provide 315m³ of the 355m³ required to restrict the runoff to the greenfield target of 8.4 l/s. Based on the avaliable storage, the achievable runoff rate for this catchment is 10.7 l/s (equivalent to ~15 l/s/ha), which still offers a significant improvement compared to the existing unmitigated scenario.

6.3.6 It's important to highlight, that although the greenfield rates are shown to be achievable for all other catchments, further constraints may emerge during the detailed design stages and runoff rates may need to be increased (as highlighted above with regards to Catchment 1). The drainage strategy for the Site is a 'best endeavours' aproach, to meet the greenfield rates, without the need for pumping.

6.3.7 In total, approximately 7,000m² of the site area will be attenuated via blue roofs, these will be restricted to approximately 11.1 l/s in total (see blue roof manufacturer calculations in Appendix F). The remaining site area will require approximately 1,570m³ of attenuation below ground. This is estimated to be split as ~340m³ of permeable paving, ~740m³ of podium storage (200mm of geo-cellular storage layer above the basement) and approximately 540m³ of attenuation tank storage.

6.3.8 This will provide a betterment of up to 97% over the existing unrestricted scenario, as shown in Table 6.

Storm	*Rainfall Intensity (mm/hr)*	*Existing Rainfall (l/s)*	Proposed Runoff (l/s)	*Betterment (%)*
1 in 1	*28.2*	*231.8*	37	*84%*
1 in 30	*86.0*	*708.4*	37	*95%*
1 in 100	*113.8*	*936.9*	37	*96%*
1 in 100 + 40%	*159.3*	*1311.7*	37	*97%*

Table 6, Existing vs Proposed Runoff Rates

6.4 Water Quality

6.4.1 Surface water management should incorporate sustainable drainage techniques to restrict surface water discharge from the Site, in addition to improving water quality of runoff. Runoff from the proposed development may contain hydrocarbons, pollutants and nutrients which may be harmful if discharged directly to the ground.

6.4.2 It is proposed to utilise green and blue roofs, raingardens, permeable paving, and extensive green landscaping throughout the site to provide biodiversity, amenity, treatment and control the rate of runoff.

6.4.3 A SuDS pro-forma for LBRuT has been completed and can be found in Appendix G.

7 SuDS Management & Maintenance

7.1.1 SuDs features will be managed in accordance with the guidelines outlined within The SuDS Manual (CIRIA C753, Chapter 32).

7.1.2 The drainage infrastructure to be constructed as part of proposed development will be a mixture of adopted and privately owned. All diversions and public sewers will be maintained by Thames Water. All other drainage infrastructure will be maintained privately, by a management company.

7.1.3 As the scheme is progressed management and maintenance practices for taking care of the SuDS/drainage infrastructure will be constantly reviewed and updated with a final confirmed plan to be detailed at the completion of the construction.

7.1.4 SuDS features will be managed in accordance with the guidelines in Ciria C753, Chapter 32. As this is early in the application process the final details of the SuDS system and exact maintenance requirements are not yet fully known. However, a few fundamental actions can be specified now, these are noted in the maintenance schedule in Appendix H.

8 Conclusions and Recommendations

8.1.1 It is considered that this assessment represents a comprehensive and robust analysis of the flood impact of the current proposals on the Site itself and on adjacent properties. In addition, this report demonstrates that the proposed development can be delivered sustainably in terms of flood risk, which can be summarised as follows:

Subject	Conclusion
TIDAL & FLUVIAL FLOOD RISK	The Development is located in Flood Zone 1 – classified as low probability for tidal and fluvial flooding on the Environment Agency flood maps.
FLOOD RISK FROM OTHER SOURCES	Groundwater risk is considered to be mitigated through waterproofing of the basement and using it for less vulnerable uses such as parking and plant space. All other sources of flood risk are considered low risk.
DEVELOPMENT SUITABILITY	The proposed land-use is considered suitable for the Site which lies within Flood Zone 1 – all vulnerability classifications appropriate in accordance with Table 3 of the NPPG Technical Guidance.
EXISTING DRAINAGE	The existing Site is drained via sewers onsite and within the neighbouring roads. The existing TW rising main will be retained and the foul water sewer will be diverted. Thames Water have been consulted regarding the proposals.
PROPOSED DRAINAGE	The London Plan drainage hierarchy has been followed to provide a reduction in runoff rates to as close as possible to greenfield rates, for all storms of up to and including 1 in 100 years + 40% climate change. The proposals will discharge both surface and foul water towards the neighbouring sewers; Thames Water have been consulted and confirmed capacity for the development.
SURFACE WATER MANAGEMENT	Proposals will utilise green and blue roofs, raingardens, permeable paving, and extensive green landscaping throughout the site to provide biodiversity, amenity, treatment and control the rate of runoff. Overland flow routes have been considered in the design, a SuDS Proforma has been completed and a Maintenance Schedule has been provided as part of this report.

Table 7, Summary Table