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Lincoln House
294-302 High Holborn

Flood Risk Assessment & Drainage Strategy Report

EPR
architects

Contents

Appendices

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HEYNE TILLETT STEEL

1 Introduction

Heyne Tillett Steel have been commissioned to undertake a Flood Risk Assessment (FRA) and Drainage Strategy Report in support of the planning application at 296-302 Lincoln House, Holborn, in the London Borough of Camden.

This study has been prepared in accordance with the National Planning Policy Framework (NPPF) and with reference to relevant local planning policy such as Camden Local Policy CC3: Water and Flooding and Policy CC2: Adopting to Climate Change. The London Plan (2016) and the London Borough of Camden (LBC)'s Strategic Flood Risk Assessment (SFRA) and Planning Guidance 3 & 4 (CPG 3 & 4) have also been referenced where relevant.

The site is approximately 1000m^2 in area and falls within Flood Zone 1, as defined by the Environment Agency (EA). As such, the development does not meet the requirements set out by NPPF to necessitate a FRA to support the planning application. However, in accordance with Camden's SFRA, a Flood Risk Assessment is required for this development regardless of the site area or flood zone as it is classified as a major development and included within the LBC Critical Drainage Area "Group3_005".

2 The Site

2.1 Existing

The site address is Lincoln House, 296-302 High Holborn, London WC1V 7JH ('the Site').

The Site is an eight storey mixed use building (plus basement and ground) providing a total floor area of 5,660sqm GEA. Office accommodation is located at the upper floors and there are two shop-type units at ground floor, currently occupied by a bank and a café.

The Site is bounded by High Holborn to the north, Northumberland House (303-306 High Holborn) – an office building to the east, the private gardens of Lincoln's Inn to the south and 294-295 High Holborn to the west - which is currently a vacant site with no buildings or structures. The surrounding area is predominantly commercial in nature.

The Site was originally constructed in the early 1950s and has been subject to various adaptions and extensions since its original construction. It now takes on a 'T' shape form sitting on a broadly rectangular site on the south side of High Holborn, with the building presenting a full width frontage to the street. The upper floors step in at various levels on the different elevations reflecting its incremental extension over time.

The OS Grid Reference for the site is TQ 308 815.

A copy of the site location plan can be found in Appendix A of this report.

2.2 Proposed

The development proposals consist of refurbishment, remodelling and extensions at rear, flank and roof level to provide 2,200sqm (GIA) additional floor-space and rooftop plant. There is a proposed change of use of ground floor Use Classes from A1, A2 and B1a uses to provide 2 x A1 units (204sqm GIA) and remainder in B1a Use, and associated external alterations to the elevations. The works also include the provision of appropriate cycle parking, waste/recycling storage, additional services and associated ancillary works.

The architect's proposed layouts are included in Appendix B.

3 Flood Risk

3.1 Flooding from Fluvial and Tidal Sources

Fluvial flooding is flooding caused by rivers, watercourses or ditches overflowing. Tidal flooding is flooding caused by elevated sea levels or overtopping by wave action. In estuarine areas, flooding might arise from either fluvial or tidal flooding, or a combination of the two.

The EA 'Flood Map for Planning' shows that the site is located in Flood Zone 1 (Figure 1). The technical guidance document to the National Planning Policy Framework (NPPF) states that this zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). The risk of flooding from fluvial and tidal sources is considered low.

3.2 Flooding from Surface Water

Surface water flooding can occur as a result of either overland flow or ponding. Overland flow occurs following heavy or prolonged rainfall, or snow melt, where water can no longer be absorbed on the surface and results in surface run-off. Unless it is channelled elsewhere, the run-off travels overland, following the natural gradient of the land. Ponding occurs as the overland flow reaches natural depressions or blockages in the local topography.

The EA flood risk from surface water map (Figure 2), shows that the majority of the site is not at risk of surface water flooding with only the courtyard being at low risk which equates to a chance of flooding

LBC SFRA also presents surface water flood risk maps which suggest the same level of flood risk for the site. A copy of the surface water flood risk maps from the SFRA are contained in Appendix C.

The development works will include a thorough review of the surface water drainage on site with all areas being positively drained. This is expected to remove the flood risk to this location. Furthermore, the courtyard area is included in the proposed building extension, where run-off will be managed at roof level, eliminating the possibility of surface water accumulation on the ground. It is worth noting that the flow path arrows shown in Figure 2, demonstrate that surface water would not pond within the site boundary with overland flows travelling in the south easterly direction away from the site.

Taking all of the above into account, the site is considered to be at low risk from surface water flooding.

3.3 Flooding from Groundwater

Groundwater flooding can occur on sites which are located on permeable ground. After a prolonged period of rainfall, a considerable rise in the water table can result in inundation for extended periods of time.

Mapped information included in the LBC's SFRA shows that the site is not located in an area where there is increased susceptibility for elevated groundwater. A copy of this map is located in Appendix C.

Therefore the flood risk from groundwater is considered low.

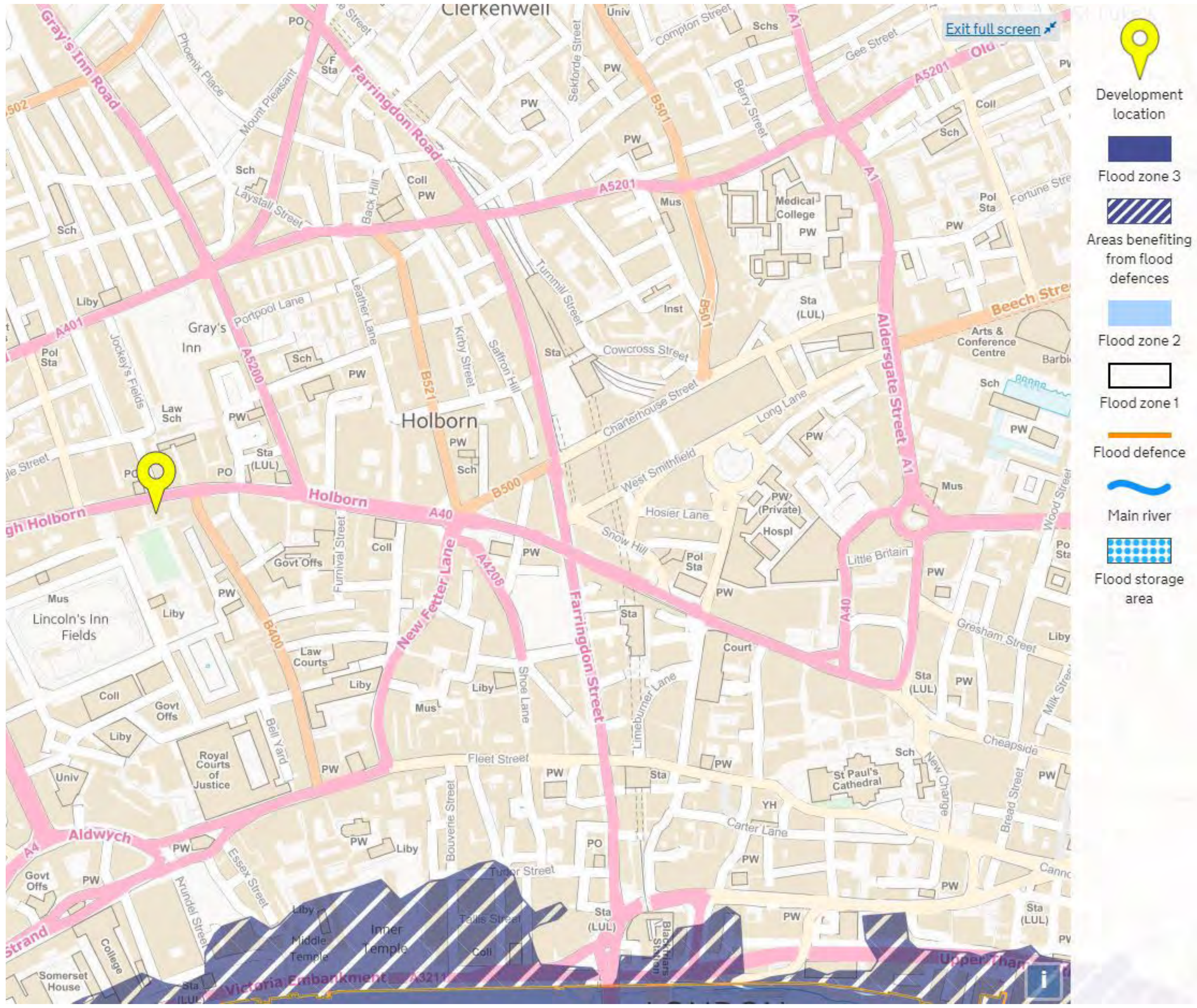

Figure 1 - Flood Map for Planning

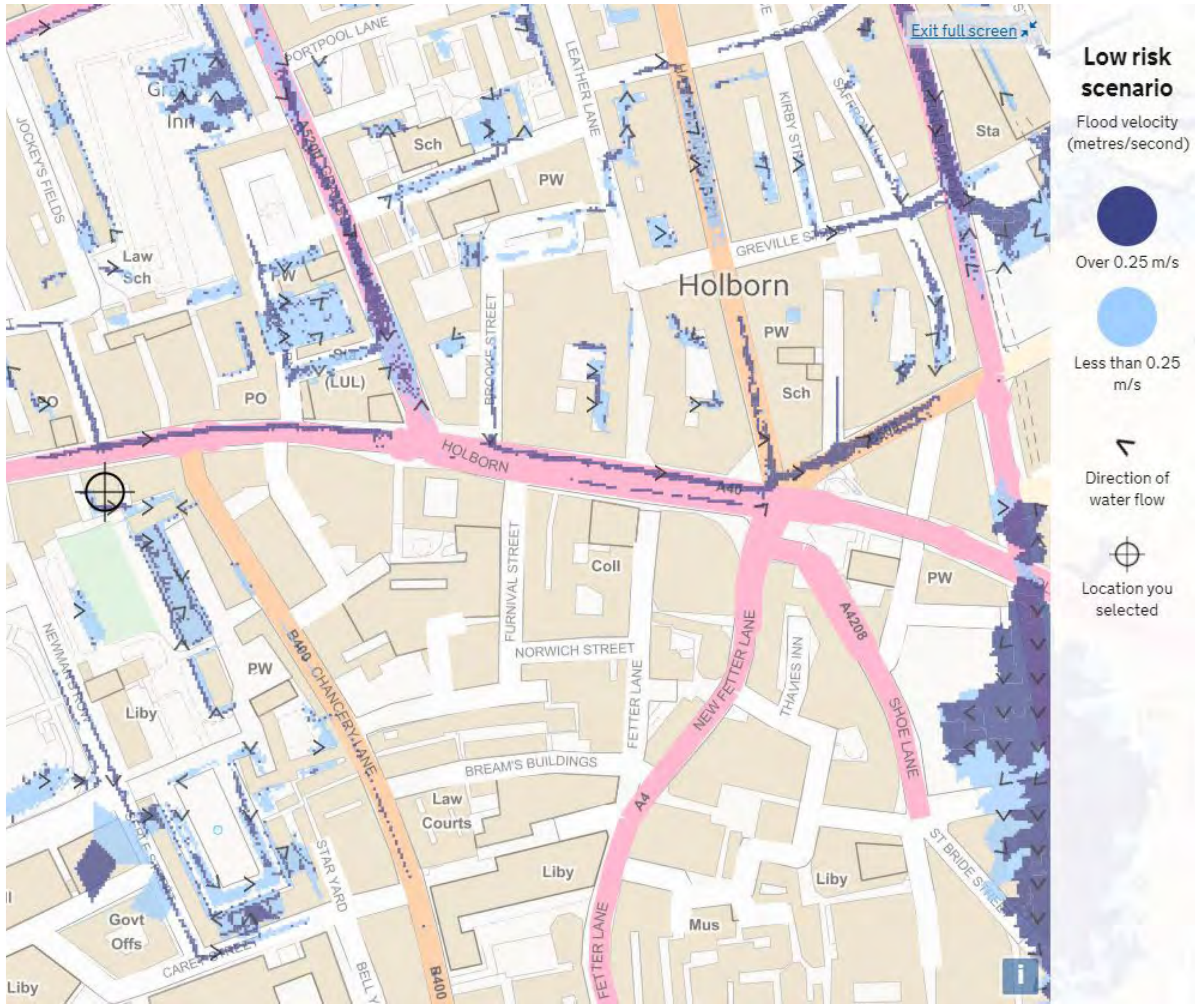

Figure 2 - Flood Risk from Surface Water

3.4 Flooding from Sewers

Sewer and highway drainage flooding occurs when the capacity of systems is exceeded, or the function of the system is impeded (e.g. tide locking), which results in the surcharging and/or failure of the system and water being forced to the surface via gullies, manholes, dedicated overflows or connected infrastructure (e.g. toilets).

Figure 3 below shows an extract from the Thames Water asset map. As shown, there are two combined trunk sewers located in close proximity to the development site to the north of Lincoln House. Both are ovoid sewers, 1372mm x 914mm and 1219mm x 813mm, located at 6.4m b.g.l and 4.5m b.g.l respectively. A copy of the Thames Water asset map is included as Appendix D.

No sewer flooding is recorded nearby the proposed development, as shown in the maps provided in LBC's SFRA. The site is located within the Critical Drainage Area "Group3_005", but there are no designated Local Flood Risk Zones located nearby. The relevant maps are contained in Appendix C.
From the information described above, the site is considered to be at low risk from sewer flooding.

3.5 Flooding from Reservoirs and Artificial Sources

There are no artificial water sources in the vicinity of the site which pose a risk of flooding. Figure 4 below shows that the site is not at residual risk of flooding from reservoirs. Therefore the risk of flooding from reservoirs and artificial sources is considered to be low.

4 Existing Drainage

As outlined in Section 3.4, there are public sewers located to the north of the development site.

A CCTV survey was carried out to determine the existing drainage arrangements. The findings show that both foul and surface water discharge to the public sewer by gravity in the vicinity of Lincoln House.

There is no evidence to suggest that the surface water is restricted and therefore it is assumed that surface water discharges freely to the public sewer at present. The entire site area is impermeable in the existing situation and therefore the existing surface water flow rates to the public sewer were calculated based on the red line planning boundary area of 1000m^2.

In accordance with the Modified Rational Method, the peak existing run-off from the site is calculated from the formula:

$Q = 3.61 \times C_v \times i \times A$

where C_v is the volumetric runoff coefficient, A is the catchment area in hectares and i is the peak rainfall intensity in mm/hr.

For the peak 1 in 1 year return period storm event, the existing discharge rate from the site is:

$Q_1 = 3.61 \times 0.75 \times 31.2 \times 0.100 = 8.44$ l/sec

and for the peak 1 in 30 year return period storm event, the existing discharge rate from the site is:

$Q_{30} = 3.61 \times 0.75 \times 76.5 \times 0.100 = 20.70$ l/sec

and for the peak 1 in 100 year return period storm event, the existing discharge rate from the site is:

$Q_{100} = 3.61 \times 0.75 \times 98.9 \times 0.100 = 26.77$ l/sec

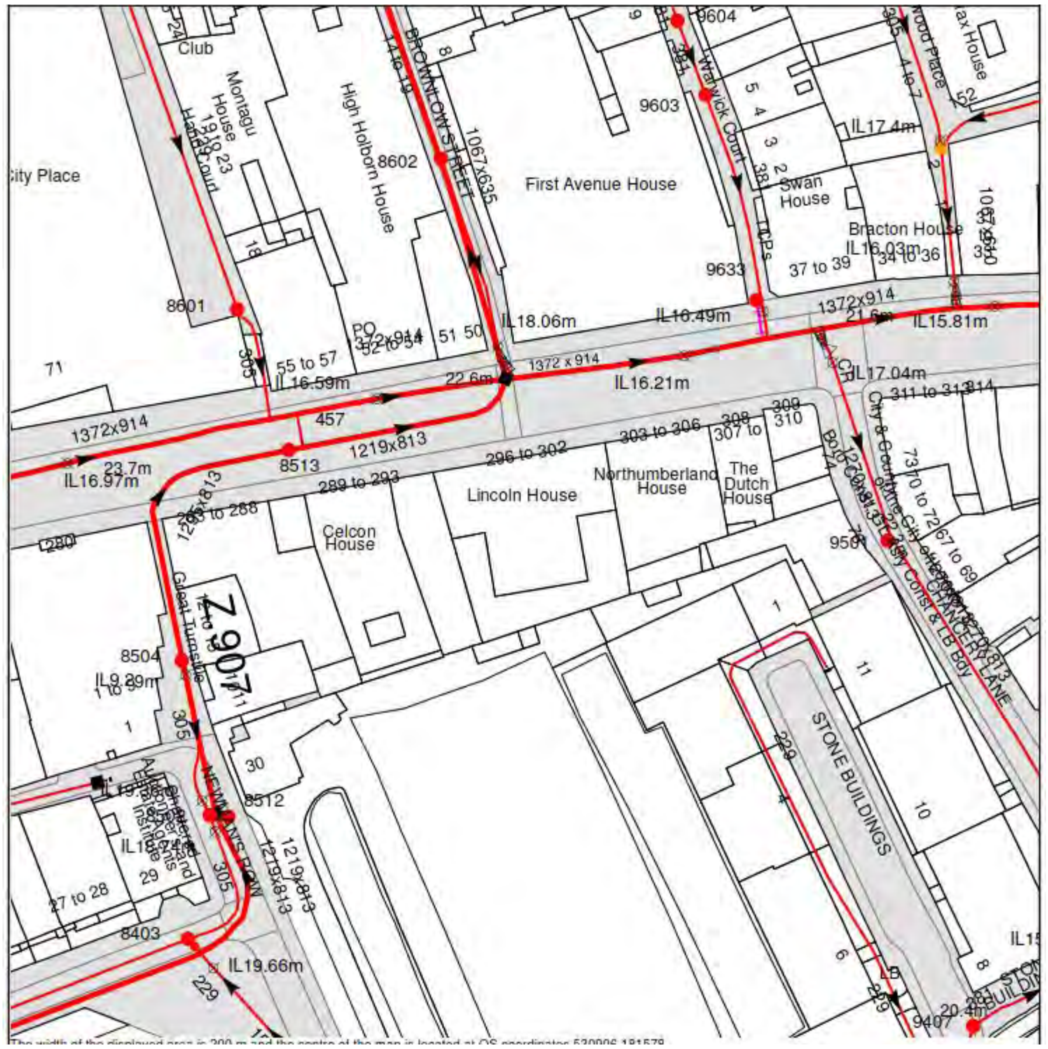

Figure 3 - Extract from Thames Water Asset Map

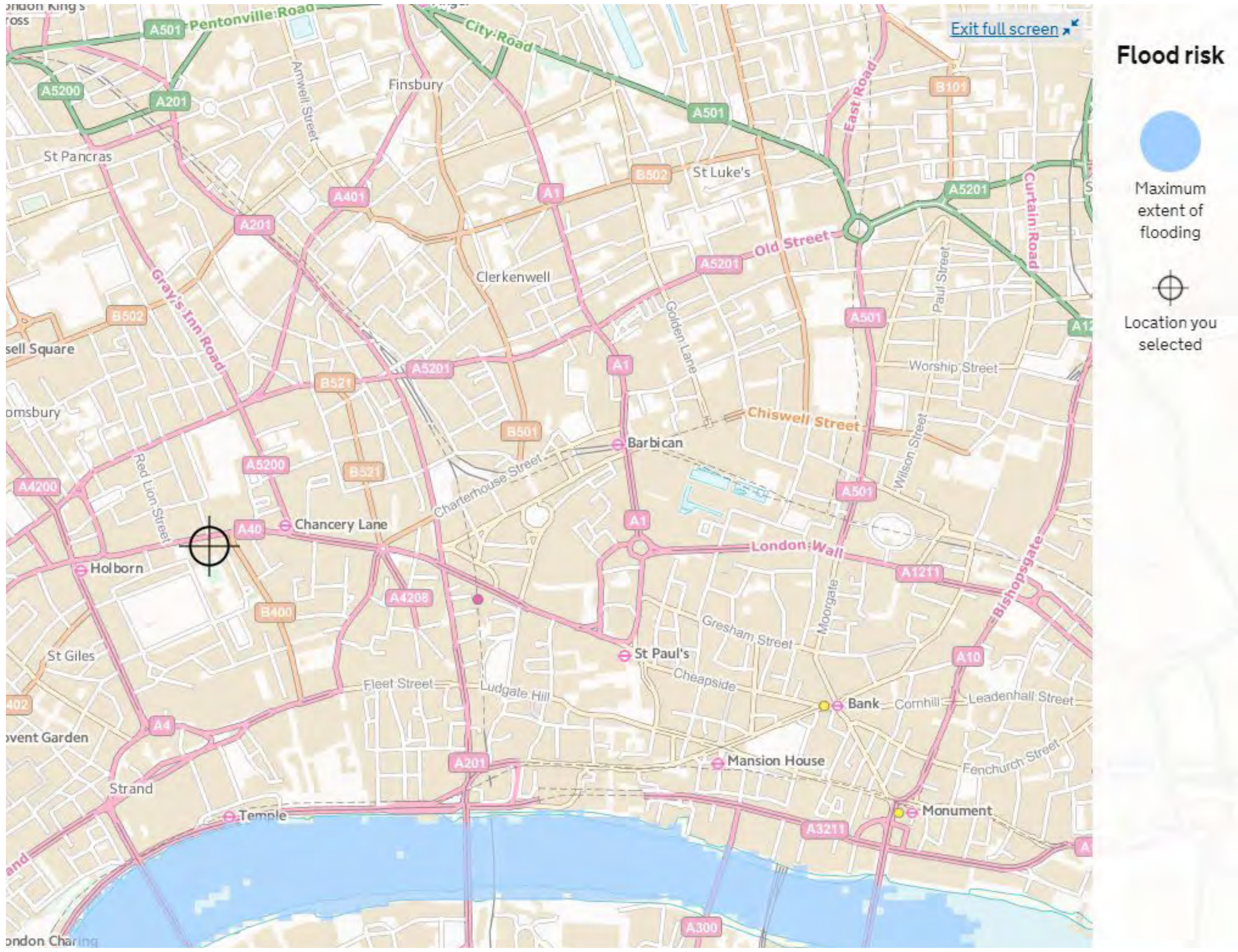

Figure 4 - Flood Risk from Reservoirs

5 Proposed Drainage

It is proposed to reuse the existing connection to the public sewer, where feasible. The development proposals include the extension of the building over the courtyard area, and raising of new foundations, making most of the existing below ground drainage redundant. However, the outfall location and condition seem suitable to be retained to accommodate a new outfall chamber which will take foul and surface water into the public sewer.

The proposed drainage layout can be found in Appendix E.

5.1 Surface Water Drainage Proposals

While it is proposed to extend the footprint of the building, there will be no increase to the impermeable areas as a result of the redevelopment. In turn, the surface water discharge to the public sewer will not increase due to the proposed works on site.

The unmitigated post-development runoff rates have been calculated taking into account a climate change allowance of 40%, in accordance with Table 2 of the EA's Climate Change Allowance guidance for a service life of 60 years for commercial developments, as stated in the LBC CPG3.

The proposed development will have the same impermeable area as the existing situation, therefore using the Modified Rational Method the proposed peak run-off for the 1 in 1 year return period storm event is:

Q_1 = 3.61 x 0.75 x 31.2 x 0.100 = 8.44 l/sec

and for the peak 1 in 30 year return period storm event, the proposed discharge rate from the site is:

Q_{30} = 3.61 x 0.75 x 76.5 x 0.100 = 20.70 l/sec

and for the peak 1 in 100 year return period storm event plus 40% climate change, the proposed discharge rate from the site is:

$Q_{100+40\%}$ = 3.61 x 0.75 x 138.43 x 0.100 = 37.48 l/sec

LBC's SFRA refers to Policy DM 18.2 of the City of London's Local Plan which states:

"1. The design of the surface water drainage system should be integrated into the design of proposed buildings or landscaping, where feasible and practical, and should follow the SuDS management train and London Plan drainage hierarchy.
2. SuDS designs must take account of the City's archaeological heritage, complex underground utilities, transport infrastructure and other underground structures, incorporating suitable SuDS elements for the City's high density urban situation.
3. SuDS should be designed, where possible, to maximise contributions to water resource efficiency, biodiversity enhancement and the provision of multifunctional open spaces."

The opportunity for incorporating SUDS into the development proposals in order to reduce surface water run-off to the public sewers was investigated. The SUDS Hierarchy was considered in the development of the surface water strategy however the options for this development are limited due to the "*high density urban situation*".

Table 1 sets out the feasibility of utilising various SUDS, in accordance with the SUDS Hierarchy.

SUDS Option	Feasibility
Store rainwater for later use	The development is mainly a refurbishment with landscaping constraints, lacking available space to provide rainwater harvesting systems.
Use infiltration techniques, such as porous surfaces in non-clay areas	Soakaways and other infiltration techniques are deemed to be inappropriate for this site. This is due to the unsuitable space available to locate the device in accordance with BS 8301 which suggests a 5 metre easement from any building and/or its foundation. In addition it is likely that the water table will be high across the site.
Attenuate rainwater in ponds or open water features for gradual release	There is inadequate space for ponds or open water features to be used on this site.
Attenuate rainwater by storing in tanks or sealed water features for gradual release.	The space between the basement structure can be utilized to accomodate a below ground stormwater attenuation tank.
Discharge rainwater direct to a watercourse	No watercourses exist within the vicinity of the site.
Discharge rainwater to a surface water sewer/drain	No surface water sewers are accessible from the site, according to Thames Water sewer records.
Discharge rainwater to the combined sewer.	A trunk combined water sewer is accessible from the site, according to Thames Water sewer records.

Table 1 SUDS Hierarchy Feasibility Assessment

As set out in Table 1, it is feasible to accommodate a surface water attenuation tank below basement level. Space limitations within the foundations only allow to achieve a discharge rate of 5 l/s, which represents as close to greenfield rates as possible and provides an 86% reduction of the expected runoff rate for a 1 in 100 year event plus 40% climate change. The "Rainfall runoff management for developments" report prepared by EA in October 2013 states that for small sites where the greenfield runoff would be less than 5 litres/sec a minimum flow of 5 litres/sec should be used, as it would be impractical to install small control devices to achieve the required/lower flow rates.

This reduction will require a volume of 35m^3, which will be distributed across the basement as near to the outfall as it may be practicable. Hydraulic calculations are included in Appendix F.

5.2 Foul Water Drainage Proposals

Foul water will discharge to the public sewer, mimicking existing conditions. It is expected that all foul water can be routed to the outfall by gravity.

The peak foul water discharge rate is expected to increase as a result of the development proposals. The existing peak foul flow rate has been estimated using the discharge unit method, based on the existing floor plans. This was calculated to be 5.43 l/s. The proposed peak foul flow rate was calculated using the same methodology obtaining a 6.54 l/s flow rate, which represents a 20.5% increase in relation to the existing.

A pre-development enquiry was submitted to Thames Water who confirmed that the existing foul sewer network does have sufficient capacity to accommodate the proposed foul water discharge. A copy of the Thames Water letter is included in Appendix H.

5.3 Drainage Inspection and Maintenance Strategy

An inspection and maintenance strategy is proposed and included in Appendix G with the aim to ensure the correct performance of the drainage network during the service life of the installations.

6 Conclusion

This flood risk assessment has been prepared in accordance with NPPF, Guidance for Flood Risk and Coastal Change and regional and local planning policy guidance. The best available information has been used to assess each risk.

All sources of flooding have been assessed as follows:

- Fluvial/Tidal Flooding (Low Risk)
- Surface Water Flooding (Low Risk)
- Groundwater Flooding (Low Risk)
- Sewer Flooding (Low Risk)
- Reservoir Flooding and Artificial Sources (Low Risk)

A thorough assessment has been undertaken to determine the suitability of SUDS, in line with the requirements of the London Plan and LBC local policy. Surface water attenuation will be provided to reduce the surface water discharge rate to 5 L/s, which represents an 86% reduction in comparison with the peak unattenuated discharge. Surface and foul water will discharge to the public sewer by gravity reusing the existing combined outfall.