Appendix H – Water Resources, Drainage and Flood Risk Assessment

Replacement Environmental Statement

Volume III

3461 Blossom Street

Flood Risk Assessment

December 2014

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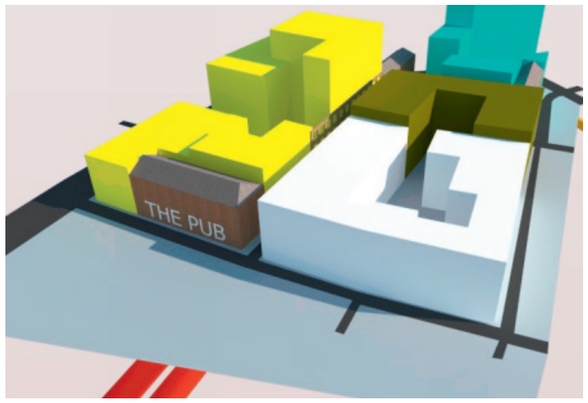

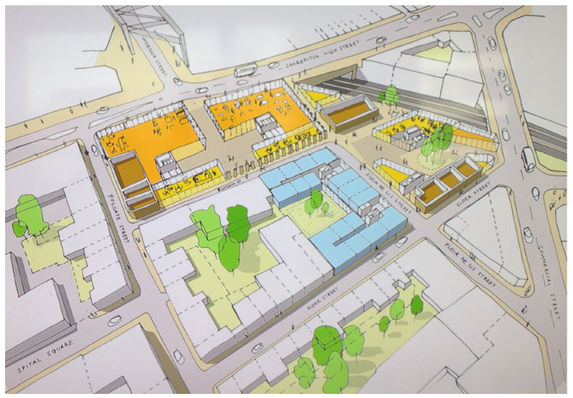

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1 Introduction

The following report is a Flood Risk Assessment (FRA), prepared by AKT II for the development of a site known as Blossom Street, located off Shoreditch High Street in the London Borough of Tower Hamlets. The study is prepared in accordance with the requirements of the National Planning Policy Framework (NPPF), and supports the project's BREEAM and Code for Sustainable Homes assessments.

This report is prepared for the exclusive use of AKT II and our client. All comments and conclusions in this report are based upon the assumption that the sourced data is reliable. AKT II accept no liability for any inaccurate conclusions or assumptions resulting from inaccurate information.

2 Flood Risk Assessment Requirements

The National Planning Policy Framework, published in March 2012 (formerly Planning Policy Statement 25: Development and Flood Risk, PPS 25) states that:

- The susceptibility of land to flooding is a material planning consideration;
- The Environment Agency has the leading role in providing advice on flood issues, at a strategic level and in relation to planning applications;
- Planning decisions should apply the precautionary principle to the issue of flood risk, using a risk-based search to avoid inappropriate development on undeveloped and undefended flood plains etc;
- Developers should fund flood defences and warning measures required because of the development; and
- Planning policies and decisions should recognise that the consideration of flood risk and its management needs to be applied on a whole-catchment basis and not only be restricted to flood plains

Also, those proposing particular developments are responsible for:

- Providing an assessment of whether any proposed development is likely to be affected by flooding and whether it will increase flood risk elsewhere and the measures proposed to deal with these effects and risks; and
- Satisfying the local Planning Authority that any flood risk to the development or additional risk arising from the proposal will be successfully managed with the minimum environmental effect thus ensuring the safe development and secure future occupancy of the site.

After this has been addressed, it is then the Local Planning Authority's responsibility (advised as necessary by the Environment Agency) to determine an application for planning permission after taking into account all material considerations, including the issue of flood risk and how it might be managed or mitigated. Local Planning Authorities are required to adopt a risk-based approach to proposals for development in flood risk areas. The assessment of risk should take into account:

- The area liable to flooding;
- The probability of it occurring, both now and over time;
- The extent and standard of existing flood defences and their effectiveness over time;
- The likely depth of flooding;
- The rates of flow likely to be involved; and
- The nature of the development proposed and the extent to which it is designed to deal with flood risk.

Local Planning Authorities in conjunction with the Environment Agency are responsible for determining that the threat of flooding should be managed. This is to ensure that the development is and remains safe throughout its lifetime (i.e. it has an appropriate degree of protection) and does not increase flood risk elsewhere.

Following flooding in December 2000 the Environment Agency (EA) provided indicative flood plain maps to all authorities and published them on the EA website. In addition to these indicative maps (following a national programme adopted by the Agency in 1996), detailed data and maps for priority areas at risk are available, to provide precise information for building developments.

The Government looks to local Planning Authorities under NPPF to apply the risk-based approach to their decisions on development control through a sequential test. Under the test, sites are to be categorised under the following zones.

1. Areas with little or no potential risk of flooding (annual probability less than 0.1% for rivers, tidal & coastal) - These areas would have no constraints on development other than the need to ensure that the development does not increase run-off from the site to greater than that from the site in its undeveloped or presently developed state. For development proposals on sites within Flood Zone 1 comprising one hectare or above the vulnerability to flooding from other sources as well as from river and the sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA.
2. Areas with medium risk of flooding (annual probability between 1.0% - 0.1% for rivers and between 0.5% - 0.1% for tidal & coastal) -These areas would be suitable for most developments.

3a. Areas with high potential risk of flooding (annual probability greater than 1.0% for rivers and greater than 0.5% for tidal & coastal). - These areas will generally be suitable for residential, commercial and industrial uses, provided there are adequate flood defences in place, that ensure buildings are designed to resist flooding, there are suitable warning and evacuation procedures in place and the new development does not add to flood risk downstream.

3b. Areas at highest risk from flooding (including those areas behind defences that offer a standard of defence less than 1% for rivers and less than 0.5% for tidal & coastal or where there is a significant risk that failure could lead to rapid inundation by fast flowing water) - These areas may be suitable for recreation, sport and conservation use.

3
The Site

3.1
Site location

The site assessed in this FRA is located within the Shoreditch area of London to the North East of Liverpool Street Station in the London Borough of Tower Hamlets.

The site is roughly triangular in shape and is bounded by Newton Folgate/Shoreditch High Street to the West, Blossom Street/Elder Street to the East, Overground railway lines to the North and Folgate Street to the South. Shoreditch High Street Overground Station is located approximately 100m north of the site. The majority of the surrounding land use around the site is commercial, light industrial and residential developments.

The National Grid Reference for the site is 533480, 182050.

The site location is illustrated in Figures 3.1 to 3.3.

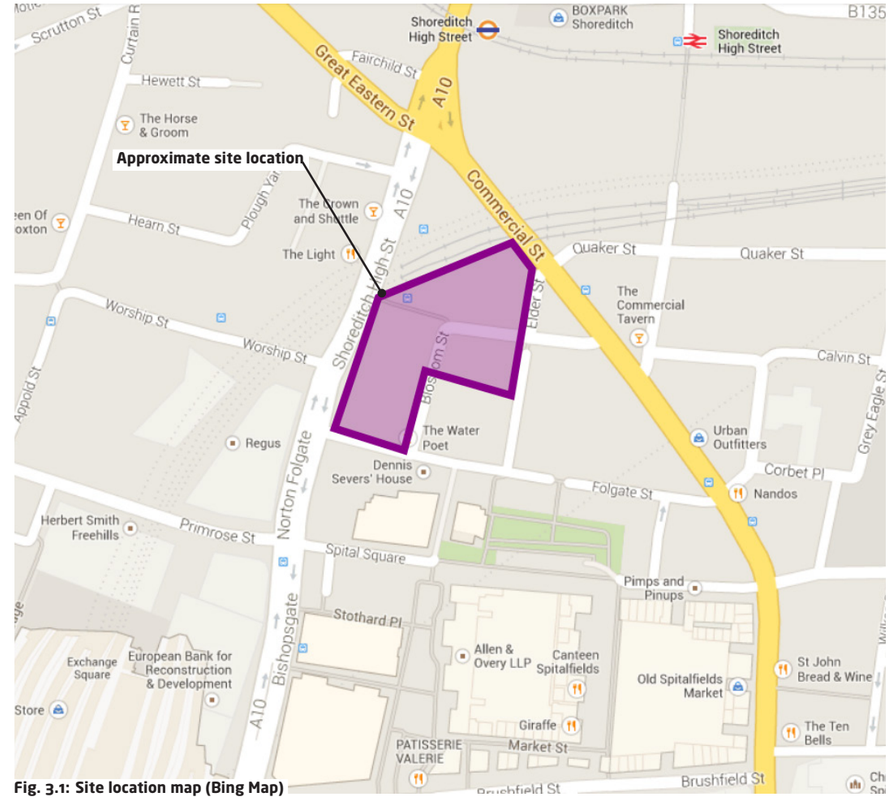


Fig. 3.1: Site location map (Bing Map)

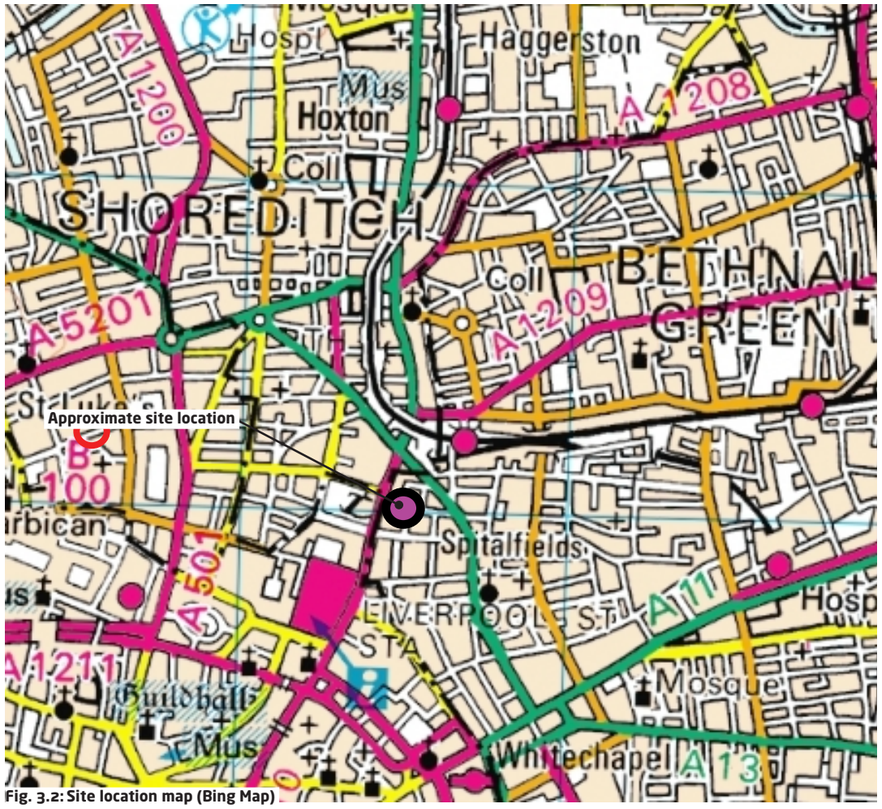


Fig. 3.2: Site location map (Bing Map)

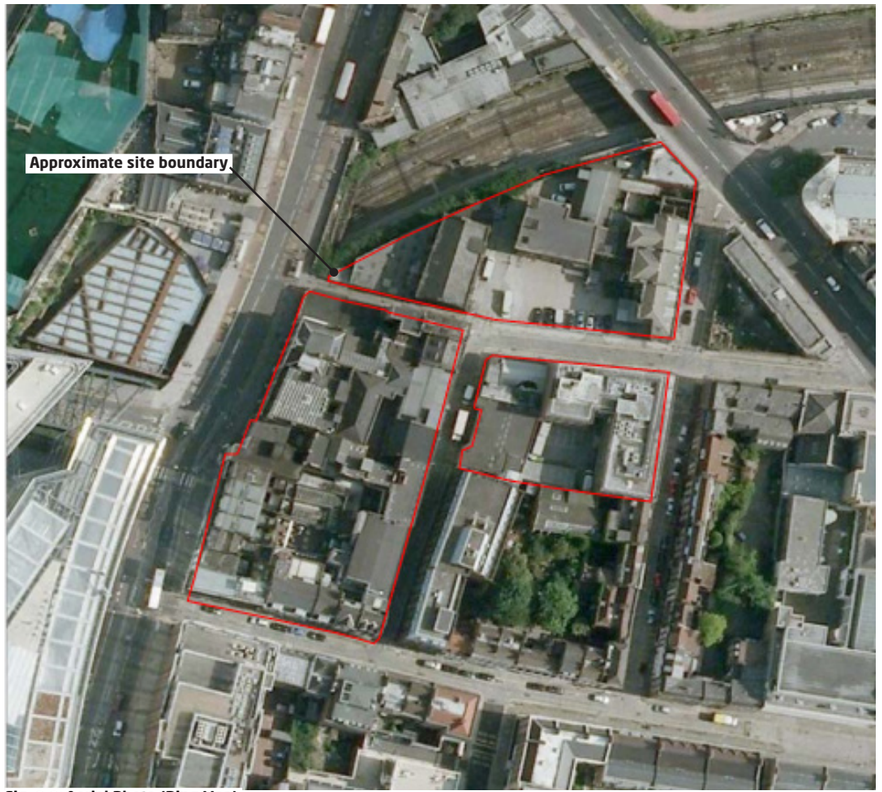


Fig. 3.3: Aerial Photo (Bing Map)

3.2
Site description

The site occupies an area of approximately 0.82 ha and comprises various low rise buildings of different heights, ages and styles which will be demolished to give space for new buildings. A number of warehouses along Elder Street are listed and will need to be retained.

The site is made up of 2 - 9 Shoreditch High Street, 13 - 20 Norton Folgate Street, 5 - 11 Folgate Street, 12 - 17 Blossom Street, 2 - 8 Elder Street, 161 Commercial Street, and Warehouses (Nicholls and Clarke Buildings),10 Blossom Street, 11 Fleur de Lis Street and 14 - 22 Elder Street. The Northern and Eastern sub-sites are also occupied by a hard-surfaced car park.

Images of the current buildings on site are displayed in Figures 3.4-3.8.

Fig. 3.4: Site photo of Existing development from Fleur De Lis Street

Fig. 3.5: Site photo from Elder Street

Fig. 3.6: Site photo of existing development from Shoreditch High Street

Fig. 3.7: Site photo from Blossom Street

Fig. 3.8: Site photo from Folgate Street

4
The Proposed Development

The proposed development divides the site into three distinct areas. Existing listed buildings and facades will be retained whilst all other buildings located within the site area would be demolished to create space for the proposed new development.

The proposed development is comprised of three distinct plots (S1, S2 and S3). As the concept for the masterplan has developed, these plots were further subdivided into individual buildings, resulting in the following plots: S1, S1a, S1b, S1c, S2 and S3 which are highlighted below.

- Plot S1: Area fronting Norton Folgate/Shoreditch High Street (note: for the purposes of this assessment, reference to 'Site S1' captures the plots comprising S1, S1a, S1b and S1c);
- Plot S2: Area to the North between Fleur De Lis Street and the railway (note: for the purposes of this assessment, reference to 'Site S2' captures the plots comprising S2); and
- Area to the east (note: for the purposes of this assessment, reference to 'Site S3' captures the plot comprising S3).

The Proposed development for S1 comprises commercial, and retail storey buildings with plant room and bicycle storage at basement level. It is proposed that the development for S2 and S3 would also comprise of new-build office, commercial and residential structures with basements which would serve as plant rooms, bicycle storage and shower areas. The ground floor will consist of retail units, restaurant and bars whilst first floor and above will be made up of both office and residential units. The Warehouse on Elder Street will be refurbished as part of the S2 proposals. Proposed finished floor levels across the site are set to be between 13.8 and 14.2m Above Ordnance Datum (AOD).

There are currently entrances to site S1 on Folgate Street to the South, Blossom Street to the East, Fleur de Lis Street to the North and Norton Folgate/Shoreditch High Street to the West. It is proposed to maintain several of these entrances. The entrance to S2 on Elder Street will also be retained. It is not known at this stage if the entrance to S3 will be on Fleur de Lis Street or Blossom Street.

The current proposals for the development are illustrated in Figures 4.1 & 4.2.

Fig. 4.1 Architect's illustration of proposed buildings - Principal View

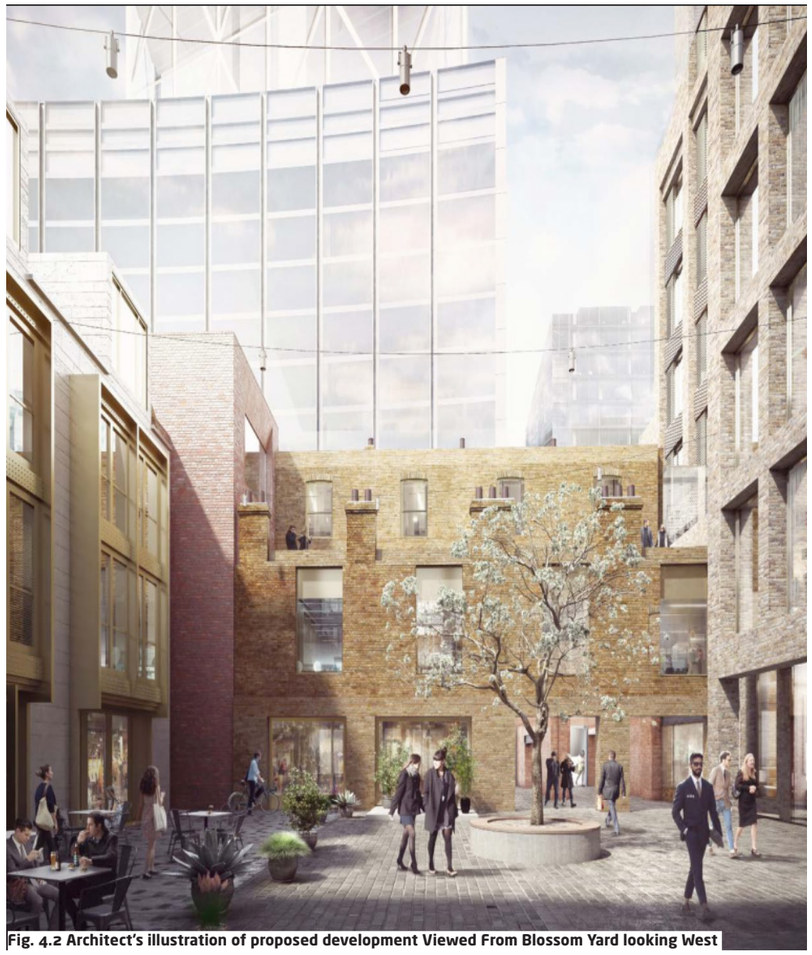


Fig. 4.2 Architect's illustration of proposed development Viewed From Blossom Yard looking West

5 Flood Risk Assessment

The following Flood Risk Assessment (FRA) has been prepared using all relevant available information including the London borough of Tower Hamlets Level 2 Strategic Flood Risk Assessment (SFRA) published in January 2012.

The FRA considers flood risk from the following five sources:

- Fluvial and tidal
- Groundwater
- Sewers
- Surface water flow
- Artificial sources

5.1 Fluvial and tidal

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

The site is located approximately 1.5km North of the River Thames. Environment Agency flood maps show that there are no major surface water courses in close proximity to the site and the site does not appear under the three main areas at risk of tidal flooding in Tower Hamlets as indicated by the SFRA report.

The Environment Agency Flood Map for the area, shown in Figure 5.1 indicates that the site is located in Flood Zone 1. Flood Zone 1 comprises of land assessed as having less than 0.1% (1 in 1000) annual probability of flooding from fluvial or tidal sources.

According to the London Borough of Tower Hamlets SFRA the highest water level in the River Thames during the 1 in 200 year tidal cycle with storm surcharge under the present day operation of the Thames Barrier is in the order of 5.0m AOD, which is much lower than the proposed levels of the site. Proposed finished floor levels of the building generally range between 13.8m AOD and 14.2m AOD at ground floor level with basement level between the range of 9.2m and 8.5m AOD.

Using all the available evidence it is considered that the site has a low probability of flooding from fluvial or tidal sources.

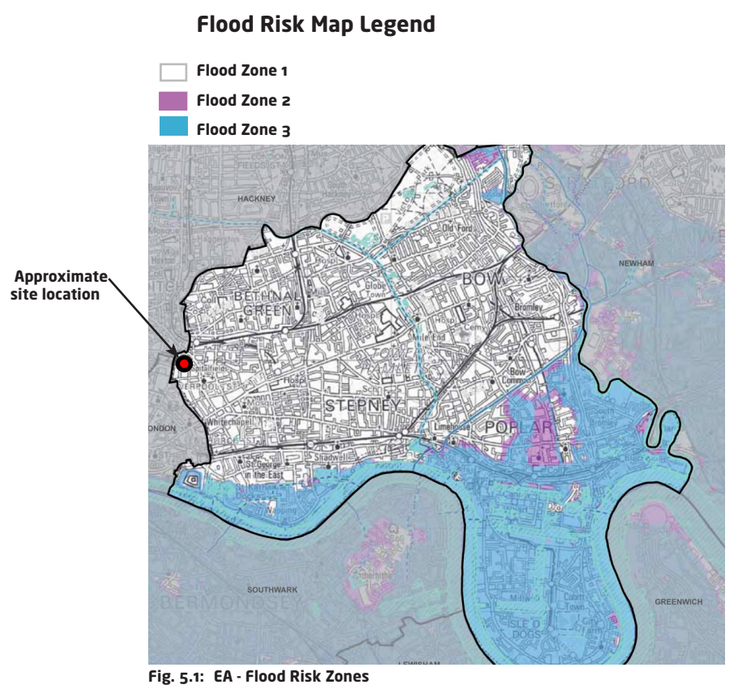


Fig. 5.1: EA - Flood Risk Zones

5.2 Groundwater

Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata and is often highly localised in low lying areas which are underlain by permeable aquifers. After a prolonged period of rainfall, a considerable rise in the water table can result in inundation for extended periods of time.

Borehole records located in close vicinity to the site where obtained from the British Geological Survey (BGS) archives and show underlying soils considered to be Made Ground overlying Soft Brown Sandy Clay and Gravel. The Envirocheck Superficial Geology Map (Fig. 5.2 below) shows the site to be underlain by a secondary aquifer which is likely to be associated with the underlying Terrace Gravel. The BGS Boreholes recorded groundwater at approximately 8.8m below ground level. It is anticipated that perched groundwater will be present within the Terrace Gravel Stratum and confined groundwater will be present in the Thanet Sand Stratum, which will have hydraulic connectivity with the underlying Chalk. An extract of the Envirocheck Report is contained in Appendix A of this report.

During the excavation works associated with the new basement level there is the possibilty of ground water inflow from the adjacent soils. As such the proposed basement on site will be protected from perched ground water via a waterproofing strategy which will include an external tanking membrane, reinforced concrete liner walls and a cavity drainage system.

Futhermore, the Tower Hamlets SFRA indicate that only one incidence of groundwater flooding has been recorded occurring on Eric Street, Mile End on the 21st December 2004 where standing water was observed to have occurred. Eric Street is located approximately 3km from the site. It also concludes that ground water flooding is not considered to be a major problem in Tower Hamlets.

Using all the available evidence it is considered that the site has a low probability of flooding from groundwater.

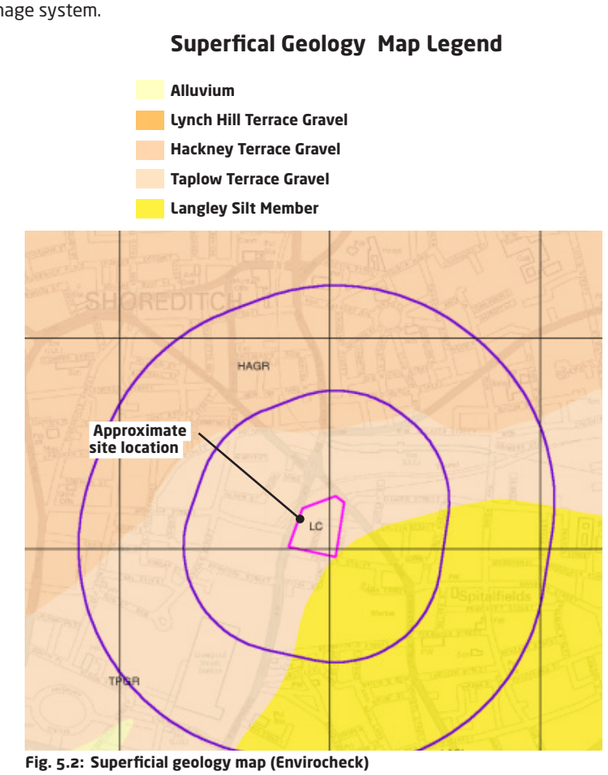


Fig. 5.2: Superficial geology map (Envirocheck)

5.3 Sewers and local drainage network

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 of the system and water being forced to the surface via gullies, manholes, foul water appliances such as toilets or other dedicated overflows.

The SFRA historical sewer flooding map (Fig. 5.3 below) indicates that between 1-5 properties were flooded from sewers around the site post code area (shown to be E1 6 on the sewer flooding map) prior to June 2010, however it is unknown where these properties were located in relation to the site. The SFRA also states that areas where surface water sewers can have a significant influence on flood risk are generally adjacent to watercourses or rivers where downstream water levels can directly influence sewer capacity.

The available Thames Water record plans indicate that there are 2210x838mm and 1676x1118mm combined sewers running parallel to one another under Norton Folgate to the west of the site, a 1524x813mm combined sewer in Folgate Street to the south of the site and a 305mm dia. combined sewer in Blossom Street to the east of the site. There is also the head of a 225mm dia. combined sewer at the north east corner of the site running eastward in Fleur de Lis Street and the head of a 225mm dia. combined sewer at the north east corner of the site running northwards in Elder Street connecting with a public combined sewer in Commercial Street. Level information for these is limited but the 1523x813mm and 2210x838mm sewers are noted as approximately 3-3.5m deep and the 1676x1118mm sewer is noted at approximately 8.5m deep. An extract from the record plans is shown in Figure 5.4 for reference.

There is a risk of flooding to the site as a result of overloaded sewers. The majority of the drainage infrastructure in the area is combined sewers, and as a result the consequences of sewer flooding are potentially high. However, evidence from the historical sewer flooding map (Fig. 5.3) indicate that the likelihood of flooding from sewers is low. A Sewer Flooding History Enquiry has been lodged with Thames Water who have confirmed that there is no recorded history of sewer flooding in the area. Their response is enclosed in Appendix C for reference.

In the proposed scheme, the building's thresholds would be designed to be located at a higher level than the pavement so that they are protected to some degree from the ponding of water in this area resulting from any future blockage of drains that may occur.

Using all the available evidence it is considered that the site has a low probability of flooding from sewers and the local drainage network, as long as they are adequately maintained as required.

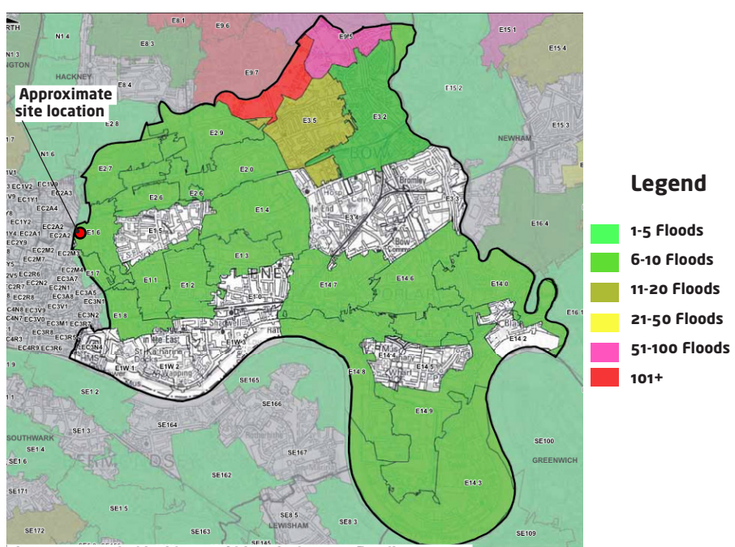


Fig. 5.3: Recorded incidents of historical sewer flooding (SFRA)

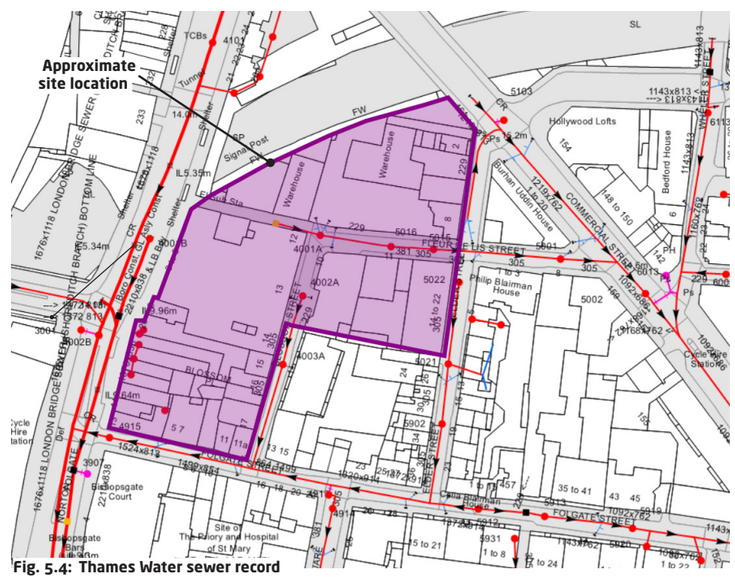


Fig. 5.4: Thames Water sewer record

5.4 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 intense rainfall is unable to soak into the ground or enter drainage systems due to blockages or capacity issues. Unless it is channelled elsewhere, the run-off travels overland, following the gradient of the land. Ponding occurs as the overland flow reaches low lying areas in the local topography. These flood events tend to have a short duration and depend on a number of factors such as geology, topography, rainfall, saturation, extent of urbanisation and vegetation.

As the surrounding area is highly developed it almost entirely comprises of impermeable hardstanding area which, during high intensity rainfall storms, will generate large surface water runoff flows. No record of surface water flooding around the proposed site was recorded in the SFRA report and the Environment Agency maps also indicate that the risk due to surface water at the site is low.

The survey drawings by Ploughman Craven (Appendix B), suggests that the site slopes up from west to east with levels ranging from 13.61m AOD on Shoreditch High Street to 15.0m AOD on Commercial Street and slopes down from north to south with levels ranging from 14.50m AOD to 13.75m AOD.

As part of the Drain London Project to inform the Borough's Preliminary Flood Risk Assessment (PFRA) and Surface Water Management Plan (SWMP), surface water modelling of Tower Hamlets was undertaken in March 2011. This was based on a 2-D TUFLOW hydraulic model with key assumptions to include the use of continuous loss (6.5mm/hr) and that the capacity of the drainage network was equivalent to the 1 hour duration 1 in 10 year storm to represent the presence of the underground drainage network (Fig 5.4). Part of the site area is located in a critica amongst any of the 31 Critical drainage areas that were identified in the study.

5.4.1 Surface Water Flow Assessment

A general surface water flow assessment was undertaken as part of this flood risk assessment for the surrounding area to assess how the topography would affect the site risk of flooding from surface water flow during extreme rainfall events, with the findings illustrated in Figure 5.5 below.

If an extreme event occurred and there was significant surface water flow on Shoreditch High Street, Folgate Street and Fleur De Lis Street, it is considered from an assessment of the site topography that there is a potential for some of the surface water on Shoreditch High Street to pond at the junction between Shoreditch High Street and Worship Street. The proposed building level for S1 is 13.9m AOD and the lowest level for Shoreditch High Street is 13.61. This would give a maximum freeboard of approximately 290mm.

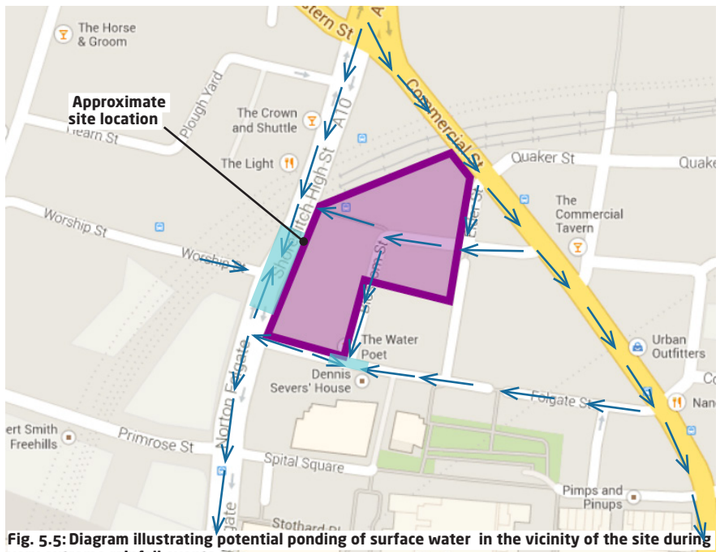


Fig. 5.5: Diagram illustrating potential ponding of surface water in the vicinity of the site during very extreme rainfall events

Additionally the Southern part of the site has a slightly lower level than the surrounding roads but has some protection from surface water flow in this area from a raised access at the building entrance through Folgate Street. The proposed site levels along Blossom Street appear to be relatively flat and at approximately the same level as the existing pavement. It is recommended that during the design development, the building threshold levels on Blossom Street are raised above 13.91m AOD, to ensure sufficient level difference between the pavement and the building. This will provide sufficient storage capacity to temporarily accommodate ponding in this area due to surface water generated on Blossom Street and potential flow from Folgate Street as indicated on Figure 5.5 below.

5.4.2 Surface Water Summary

If a very unlikely and very extreme rainfall event did occur with all the scenarios above, safe access to and egress from the site would be provided using the raised entrances on the Blossom Street, Fleur de Lis Street, Norton Folgate, Commercial Street and Shoreditch High Street.

Using all the available evidence, it is therefore considered that the site has a low probability of flooding from surface water.

5.5 Reservoirs, canals and other artificial sources

Where infrastructure exists that retains, transmits or controls the flow of water; flooding may result if there is a structural, hydraulic, geotechnical or mechanical failure of the infrastructure.

The SFRA report indicates that there are four canals located within the LB of Tower Hamlets and a number of docks and basins, each controlled by lock gates and/or weirs to maintain water levels. Due to regular inspection and maintenance carried out by British Waterways, the risk of flooding from docks and basins within the LB of Tower Hamlet is considered low. The Environment Agency Map (Fig 5.6) which shows the extent of flooding from reservoirs does not show any flooding in the vicinity of the site.

The Thames Water Asset map in Figure 5.7 indicates that a 200 mm diameter trunk water main is located to the West of the site under Norton Folgate Street and a 250mm diameter trunk water main to the East of the site under Commercial Street. It also indicates other smaller supply mains are located on all the roads surrounding the site and through the site. These mains are indicated as being either 4 or 6 inches (approx 100 or 150 mm) in diameter. A water main can burst at anytime which can result in the flooding of nearby properties. The SFRA holds no record of burst mains around the site. It is considered that the risk of the building flooding from an external burst water main should be low if the local drainage system is adequately maintained, as it should be adequately protected by the relative levels of the surrounding infrastructure as outlined in the surface water assessment in Section 5.4. Any initial sign of a burst water main should be reported to Thames Water as soon as possible.

Using all the available evidence, it is therefore considered that the site has a low probability of flooding from any artificial sources.

Flood Risk Map Legend

Maximum extent of flooding

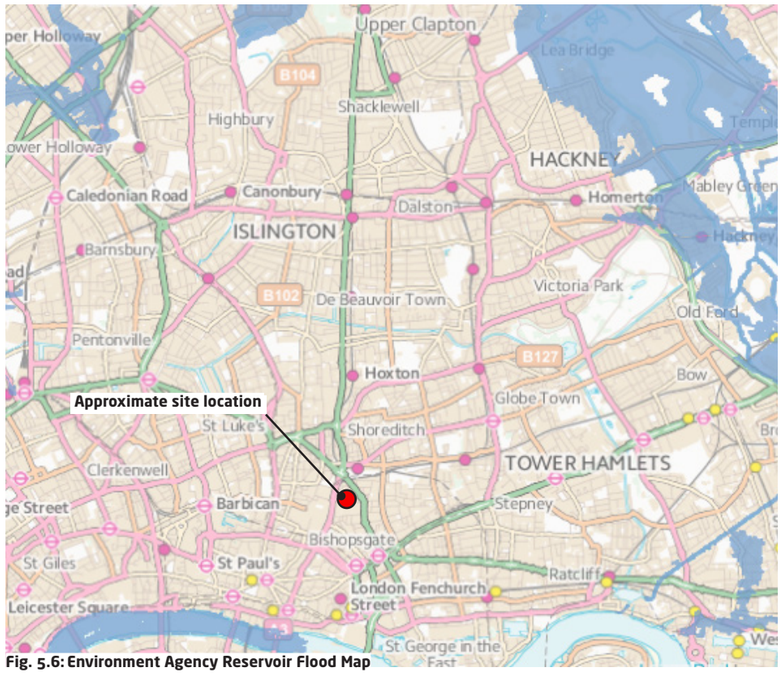


Fig. 5.6: Environment Agency Reservoir Flood Map

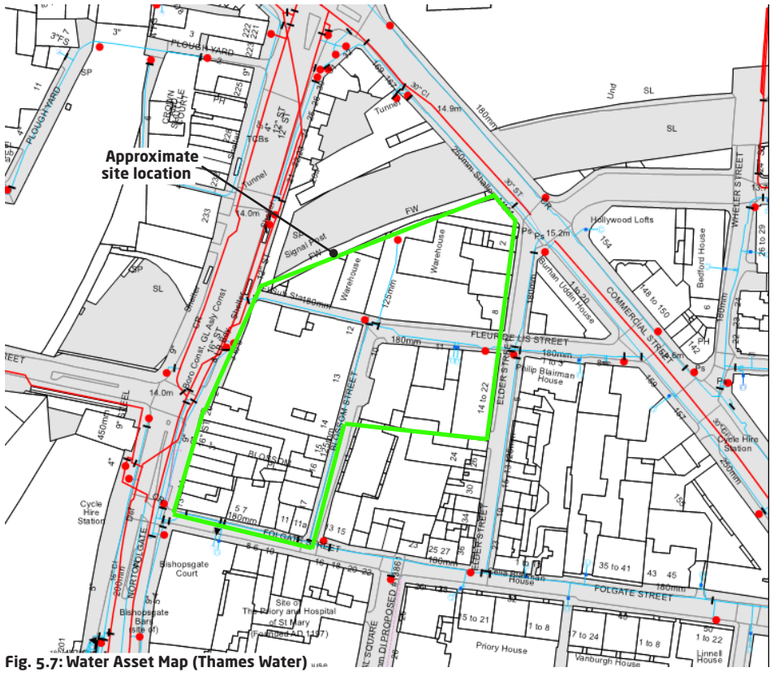


Fig. 5.7: Water Asset Map (Thames Water)

6 Drainage Strategy

6.1 Surface Water Drainage

6.1.1 Existing Scheme

There is an extensive existing combined drainage infrastructure network around the site. The Thames Water asset map shows a number of networks and branches of public combined sewers running through the site.

The known public sewer networks on the roads surrounding the site consist of six distinct main lines:

- 2210x838mm and 1676x1118mm combined sewers running parallel to one another under Norton Folgate to the west of the site.
- A 1524x813/1320x914mm combined sewer on Folgate Street to the south of the site.
- A 300/275mm dia. combined sewer on Blossom Street to the east of the site.
- The head of a 225/300mm dia. combined sewer at the north east corner of the site running eastward on Fleur de Lis Street.
- The head of a 225/300mm dia. combined sewer at the north east corner of the site running northwards in Elder Street connecting with a public combined sewer on Commercial Street.

Level information for the combined public sewers that surround the site are indicated on the CCTV drainage drawing (Appendix H). The 2210x838mm and 1676x1118mm combined public sewers on Shoreditch High Street/Norton Folgate are noted at approximately 3-3.5m and 8.5m depth respectively. The 300/275mm dia combined public sewer in Blossom Street is approximately 1.8m deep, the 225/300mm combined public sewer on Fleur De Lis Street is approximately 3.0m deep, the 1524x813/1320x914mm combined public sewer on Folgate Street is approximately 3.20m deep, and the 225/300mm combined public sewer on Elder Street is 2.5mm deep. An extract from the record plans is shown in Figure 5.4 for reference.

In addition to these main lines there appear to be a number of manholes located within the buildings along Norton Folgate. Diversion/divestment of these existing public manholes will need to be considered as part of the new scheme. Refer to section 6.3 for further details of drainage diversion and divestment.

The CCTV drainage investigation indicates that all surface water from the site currently discharges into one of the above mentioned public sewers without any form of attenuation. It is believed that some of the down pipes from the roofs discharge directly onto the hardstanding footways and surface water then runs off into the gullies in the road and carriageway. It is believed that the remaining roof and hard paved areas discharge via below ground piped connections directly into the public sewers. The extent, location and size of all existing connections from the site are shown on the CCTV drainage layout (Appendix H).

The total site area is approximately 8,230m² and is currently 100% hardstanding. The entire site is broken down into three sites: site 1 comprising an area of approximately 4,880m², site 2 of an approximate area 1,870m² and site 3 is approximately 1,480m². Surface and foul water discharge will be calculated for each of these sites individually.

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

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

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 this gives an existing discharge rate from each site of:

Site 1: $Q_1 = 3.61 \times 0.75 \times 0.488 \times 32.5 = 42.96$ litres/sec

Site 2: $Q_1 = 3.61 \times 0.75 \times 0.187 \times 32.5 = 16.46$ litres/sec

Site 3: $Q_1 = 3.61 \times 0.75 \times 0.148 \times 32.5 = 13.03$ litres/sec

and for the peak 1 in 100 year return period storm event this gives an existing discharge rate from each site of:

Site 1: $Q_{100} = 3.61 \times 0.75 \times 0.488 \times 93.9 = 124.04$ litres/sec

Site 2: $Q_{100} = 3.61 \times 0.75 \times 0.187 \times 93.9 = 47.53$ litres/sec

Site 3: $Q_{100} = 3.61 \times 0.75 \times 0.148 \times 93.9 = 37.62$ litres/sec

6.1.2 Proposed Scheme

It is considered that in the new scheme the overall footprint of the proposed buildings plus hardstandings will occupy the same overall area as the existing site. Like the existing site, the proposed scheme will comprise of 100% impermeable surfaces and therefore the estimated peak surface water discharge rate from the site will not change. Using the Modified Rational Method, the proposed (unattenuated) peak run-off from site 1 for the 1 in 1 year return period storm would be:

Site 1: $Q_1 = 3.61 \times 0.75 \times 0.488 \times 32.5 = 42.96$ litres/sec

Site 2: $Q_1 = 3.61 \times 0.75 \times 0.187 \times 32.5 = 16.46$ litres/sec

Site 3: $Q_1 = 3.61 \times 0.75 \times 0.148 \times 32.5 = 13.03$ litres/sec

and for the peak 1 in 100 year return period storm event:

Site 1: $Q_{100} = 3.61 \times 0.75 \times 0.488 \times 93.9 = 124.04$ litres/sec

Site 2: $Q_{100} = 3.61 \times 0.75 \times 0.187 \times 93.9 = 47.53$ litres/sec

Site 3: $Q_{100} = 3.61 \times 0.75 \times 0.148 \times 93.9 = 37.62$ litres/sec

Making an allowance for climate change of 30% this would give an unattenuated design discharge of:

Site 1: $Q_{1\,(+30\%)} = 55.85$ litres/sec and $Q_{100\,(+30\%)} = 161.25$ litres/sec

Site 2: $Q_{1\,(+30\%)} = 21.40$ litres/sec and $Q_{100\,(+30\%)} = 61.79$ litres/sec

Site 3: $Q_{1\,(+30\%)} = 16.94$ litres/sec and $Q_{100\,(+30\%)} = 48.91$ litres/sec

In accordance with the Environment Agency's guidelines, the Building Regulations and the Water Authority's advice, the preferred means of surface water drainage for any new development is into a suitable soakaway or infiltration drainage system. Sustainable Urban Drainage Systems (SUDS) can reduce the impact of urbanisation on watercourse flows, ensure the protection and enhancement of water quality and encourage recharging of groundwater in a manner which mimics nature.

In addition to this, the National Planning Policy Framework requires that surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic surface water flows arising from the site prior to the proposed development, whilst reducing flood risk to the site itself and elsewhere, taking climate change into account.

Therefore, as an absolute minimum, the proposed site discharge under the 1 in 100 year storm plus climate change should be no greater than the existing 1 in 100 year storm discharge (i.e. mitigate the impact of climate change). In this case, this would mean that, for site 1 rather than discharging 161.25 litres/sec, the maximum permissible discharge from site 1 would be 124.04 litres/sec. For site 2, instead of discharging 61.79 litres/sec, the maximum permissible discharge would be limited to 47.53 litres/sec. For site 3, rather than discharging 48.91 litres/sec, the maximum permissible discharge would be limited to 37.62 litres/sec.

Further to the above, the London Plan Essential Standard states that Developers should aim to achieve a 50% reduction on the existing discharge and the Environment Agency (EA) suggests that Developers should aim to achieve greenfield run off from their site. In accordance with the method outlined in the Institute of Hydrology Report 124, the Greenfield Runoff for the site is calculated from the formula:

$Q_{BAR} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

where AREA is the site area in km² (pro rata of 50ha if the site is less than 50ha), SAAR is the Standard Average Annual Rainfall in mm and SOIL is the Soil Index both read from The Wallingford Procedure maps. This gives a greenfield runoff for the site of:

$Q_{BAR} = 0.00108 \times 0.5^{0.89} \times 600^{1.17} \times 0.3^{2.17} = 76.1$ litres/sec (for 50ha)

Scaling this for each of the actual site areas gives:

Site 1: $Q_{BAR} = (76.1 \times 0.488) / 50 = 0.74$ litres/sec

Site 2: $Q_{BAR} = (76.1 \times 0.187) / 50 = 0.28$ litres/sec

Site 3: $Q_{BAR} = (76.1 \times 0.148) / 50 = 0.23$ litres/sec

Using the Hydrological Growth Curve for south east England, the growth factor from Q_{BAR} to Q_{100} is 3.146 which gives the values:

Site 1: $Q_{100} = 2.34$ litres/sec.

Site 2: $Q_{100} = 0.90$ litres/sec.

Site 3: $Q_{100} = 0.71$ litres/sec.

As the project is a redevelopment of an existing 100% hardstanding site we would expect that the Local Authority, Thames Water and the EA would require attenuation to be provided to adhere to the London Plan requirement, a 50% reduction in surface water run-off. However, this will need to be agreed during the next design stages.

6.1.3 Disposal Methods

In accordance with the Environment Agency's guidelines, the Building Regulations and the Water Authority's advice, the preferred means of surface water drainage for any new development is into a suitable soakaway or infiltration drainage system. Sustainable Urban Drainage Systems (SUDS) can reduce the impact of urbanisation on watercourse flows, ensure the protection and enhancement of water quality and encourage recharging of groundwater in a manner which mimics nature.

In addition to this, the National Planning Policy Framework requires that surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic surface water flows arising from the site prior to the proposed development, whilst reducing flood risk to the site itself and elsewhere, taking climate change into account.

Therefore, the full range of SUDS options that have been considered during the development of the surface water drainage strategy include:

Source Control

Source control techniques will be used where possible as they control runoff at source in smaller catchments. They can also provide effective pollution control and treatment, thereby improving the quality of the effluent discharged to the receiving waters.

Site Control

Where source control techniques do not provide adequate protection to the receiving watercourses in terms of flood protection and pollution control, site control may be required. However, it is possible to provide sufficient protection to the site with only source control in this instance.

Drainage Hierarchy

Based on the above, the following drainage hierarchy will therefore need to be considered when preparing the surface water disposal strategy:

- Store water for later use
- Use infiltration techniques such as porous surfaces in non-clay area
- Attenuate rainwater in ponds or open water features fogradual release to a watercourse
- Attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse
- Discharge rainwater direct to a watercourse
- Discharge rainwater to a surface water drain
- Discharge rainwater to a combined sewer

The type and range of SUDS devices must be developed as part of the drainage design but an initial appraisal of the site and the proposed master plan suggests that there are various constraints present at the site, which include archaeological restrictions, conservation area requirements and unknown Thames Water sewer levels. The Envirocheck report indicates that London Clay is located below the Terrace Gravel deposits which is considered to be secondary Aquifers. Based on the ground conditions present at the site, it is unlikely that an efficient infiltration system could be installed at the site. There are no adjacent rivers or ponds and so discharge to a watercourse will not be a viable disposal method either. Due to the above mentioned constraints, we are unable to specify a particular SUDS solution at this stage. However, SUDS options for the proposed site have been considered and are shown on the preliminary surface water SUDS strategy drawings in Appendix G.

It is proposed to discharge surface water from the proposed development to the same sewers that the existing development discharges to, although at a reduced rate. It is likely that the most feasible disposal option for limiting surface water flows at the site will be through the use of geocellular below ground attenuation tanks with a limited outflow to the adjacent sewers.

The tables below presents the approximate tank volumes for each site required for a range of discharge rates under the 1 in 100 year (plus 30% climate change) storm event:

Site 1:

Discharge Condition	Discharge Rate	Storage Volume Required
Mitigate climate change only (Absolute minimum)	124 litres/sec	65 m^3
50% (London Plan requirement)	62 litres/sec	110 m^3
Pre-development 1-year peak flow rate	43 litres/sec	140 m^3
Greenfield (Environment Agency's preferred rate)	2.3 litres/sec	360 m^3

Site 2:

Discharge Condition	Discharge Rate	Storage Volume Required
Mitigate climate change only (Absolute minimum)	48 litres/sec	25 m^3
50% (London Plan requirement)	24 litres/sec	45 m^3
Pre-development 1-year peak flow rate	17 litres/sec	55 m^3
Greenfield (Environment Agency's preferred rate)	0.9 litres/sec	140 m^3

Site 3:

Discharge Condition	Discharge Rate	Storage Volume Required
Mitigate climate change only (Absolute minimum)	38 litres/sec	20 m^3
50% (London Plan requirement)	19 litres/sec	40 m^3
Pre-development 1-year peak flow rate	13 litres/sec	45 m^3
Greenfield (Environment Agency's preferred rate)	0.7 litres/sec	55 m^3

As mentioned in Section 6.1.2, we would expect that the Local Authority, Thames Water and the EA would require some form of attenuation to be provided on the proposed surface water peak flow rates but the exact rate will need to be agreed with them during the next design stages. However, it is recommended that at this early stage a space and cost allowance is made for a storage volume of at least 110m^3 at site 145m^3 for site 2 and 40m^3 for site 3, which satisfies the London Plan Essential Standard.

The attenuation tank should be located at a high enough level so as to allow a connection to be made to the public sewer by gravity – in this case, it would be at relatively high level within the basement aved areas. Locating the tank below this level would result in a pumped surface water system which is both unsustainable and uneconomic. Appendix G shows the proposed connection from the attenuation tanks at S1 and S2 to the combined public sewer on Shoreditch High Street/Norton Folgate and Fleur De Lis Street, and the proposed connection from S3 to the combined public sewer on Fleur De Lis Street.

In addition to this, the use of green roofs should be considered to improve the sustainability of the development and to help reduce the peak surface water runoff from the site. This would provide attenuation and water treatment during smaller storm events although in large storm events the impact will be negligible and so would not reduce the attenuation volumes quoted above.

The CCTV and level survey of the existing network indicates that the existing connections are at a higher level than the proposed basement therefore cannot be re-used in the proposed new buildings in S1, S2 and S3. For the refurbished buildings on site it may be possible to re-use existing drainage connection to prevent the need for constructing a new sewer connection. This would minimise both the cost of the work and the disruption to the surrounding roads which are busy thoroughfares and consequently require significant traffic management to be provided during the work.

Furthermore, in accordance with the requirements of Pollution Prevention Guideline 3 (PPG 3) a petrol interceptor is required for areas that are being used as loading bays and for regular vehicle deliveries. Provision of new petrol interceptors serving the delivery bays/refuse store of the new buildings on site should be included on Site S1 and S2.

6.2 Foul Water Drainage

6.2.1 Existing Foul Scheme

As described in section 6.1.1 above, there are a number of networks and branches of public combined sewers running under the roads surrounding the site. The CCTV drainage investigation drawing (Appendix H) shows that a foul water connection from the S1 buildings discharge into the 225mm combined and 275mm foul water public sewers on Blossom Street and a 150mm connection from S1c discharge into the 225/300mm combined public sewer on Fleur De Lis Street. It is not clear which of the public sewers receive foul water from S1a and S2 buildings. It is therefore recommended that existing site drainage network in these areas are re-surveyed to confirm the location and size of all existing connections from the site. The S3 buildings currently discharge via a 150mm diameter pipe directly to the 225/300mm combined public sewer on Fleur De Lis Street. It is believed that all foul drainage from the existing basements flows by gravity to the public sewers, however this is to be confirmed following the CCTV re-survey.

Existing plans are available for the existing buildings and they indicate the location of some foul appliances such as toilets and wash hand basins. The number of other foul appliances have been estimated based on the existing room layout. Using the guidelines for commercial developments given in BS EN 12056-2:2000 – "Gravity Drainage Systems Inside Buildings – Part 2: Sanitary Pipework, layout and calculation", the existing foul flow has been calculated for each site as follows:

Site 1:

Appliance	No.	Discharge Units Per Appliance	Total Number of Discharge Units
Wash hand basin	45	0.6	27
Shower	1	0.6	0.6
Sinks	28	1.3	36.4
WCs	51	2.5	127.5
Urinal	7	0.8	5.6
Total discharge units for site		**=**	**197.1 litres/sec**
Total flow from site		**=**	**7.02 Litres/sec**

Site 2

Appliance	No.	Discharge Units Per Appliance	Total Number of Discharge Units
Wash hand basin	14	0.6	8.4
Shower	3	0.6	1.8
Sinks	14	1.3	18.2
WCs	16	2.5	40
Total discharge units for site		**=**	**68.4 litres/sec**
Total flow from site		**=**	**4.14 Litres/sec**

Site 3

Appliance	No.	Discharge Units Per Appliance	Total Number of Discharge Units
Wash hand basin	25	0.6	15
Shower	4	0.6	2.4
Sinks	3	1.3	3.9
WCs	20	2.5	50
Urinal	9	0.8	7.2
Total discharge units for site		**=**	**78.5 litres/sec**
Total flow from site		**=**	**4.43 Litres/sec**

6.2.2 Proposed Scheme

The draft architectural layouts have been used to estimate the number of foul appliances in the proposed office space. Using the guidelines for commercial developments given in BS EN 12056-2:2000 – "Gravity Drainage Systems Inside Buildings – Part 2: Sanitary Pipework, layout and calculation", the proposed foul flow is calculated from the formula:

$Q = K \times \sqrt{DU}$

For "intermittent use" (representing dwellings, offices, etc.) K has a value of 0.5 giving:

Site 1

Appliance	No.	Discharge Units per Appliance	Total Number of Discharge Units
Wash hand basin	153	0.6	91.8
Shower	58	0.6	34.8
Sinks	0	1.3	0
WC	153	2.5	382.5
Dishwasher	0	0.8	0
Floor Drains	0	2.0	0
		Total Discharge Units for Site =	**509.1**
		Therefore, total flow from Site =	**11.28 litres/sec**

Site 2

Appliance	No.	Discharge Units Per Appliance	Total Number of Discharge Units
Wash hand basin	69	0.6	41.4
Shower	8	0.6	4.8
Urinal	16	0.8	12.8
WCs	65	2.5	162.5
Total discharge units for site		**=**	**221.5 litres/sec**
Total flow from site		**=**	**7.44 Litres/sec**

Site 3

Appliance	No.	Discharge Units Per Appliance	Total Number of Discharge Units
Wash hand basin	62	0.6	37.2
Shower	48	0.6	28.8
Sinks	26	1.3	33.8
WCs	62	2.5	155
Urinal	0	0.8	0
Total discharge units for site		**=**	**299 litres/sec**
Total flow from site		**=**	**8.65 Litres/sec**

At this early design stage it is suggested that the foul flow rates shown above are used until more accurate figures are available from the MEP engineer.

However as there is an increase to the existing flow rates, the increase will need to be agreed with Thames Water and their written approval of this will be required.

It is assumed that any foul water drainage from ground floor level and above will be drained by gravity in order to minimise the amount of pumping required. Until the levels of the existing connections into the public sewers are confirmed it is unclear whether the basement level will need to be pumped although this appears to be likely. It is therefore recommended that an allowance is made at this stage for pumping foul water from below the basement level slab up to high level in the basement to allow it to discharge by gravity to the public sewer.

As with the surface water drainage, due to the depth of the public sewers it is recommended that, if possible, the existing drainage connection(s) should be re-used for retained and refurbished buildings. It may also be possible to re-use some of the internal drainage at basement level and any existing pumping stations in order to minimise the need to break out the existing slab.

It should also be noted that all new drainage connections to the public sewer will require separate Thames Water approval.

6.3 Diversion and Divestment of Existing Sewers

As discussed in the previous sections there appear to be a number of manholes located within the buildings along Norton Folgate. According to the Thames Water sewer record, these are adopted manholes and part of the public sewer network. At present it is intended to construct the new buildings over the existing manholes which sit over the proposed footprint of site S1. A divestment of the existing manholes will be required to accommodate the new scheme. This will require Thames Water consent and the developer will be required to enter into a section 116 agreement with Thames Water.

The details of sewer diversion, divestment and any other required diversions will be further explored in the next stage of design.

6.4 BREEAM

Pol03: Surface Water run off

Flood Risk

Two credits may be awarded where:

1. The assessed development is situated in a flood zone that is defined by the relevant planning, policy and technical guidance documents as having a low annual probability of flooding. ***AND***
2. A site specific Flood Risk Assessment (FRA) confirms that there is a low risk of flooding from all sources.

OR One credit may be awarded where:

3. The assessed development is situated in a flood zone that is defined by the relevant planning, policy and technical guidance documents as having a medium or high annual probability of flooding and is not within the Functional Floodplain ***AND***
4. A site specific Flood Risk Assessment (FRA) confirms to the satisfaction of the Local Authority and Statutory Body that the development is appropriately flood resilient and resistant from all sources of flooding ***AND***
5. The ground level of the building and access to both the building and the site are designed (or zoned) so they are at least 600mm above the design flood level of the flood zone in which the assessed development is located.

Surface Water run off

6. An appropriate consultant is appointed to carry out, demonstrate and/or confirm the following criteria:

One credit may be awarded where:

Drainage measures are specified to ensure that the peak rate of run-off from the site to the watercourse (natural or municipal) is no greater for the developed site than it was for the pre-development site. This should comply at the 1 year and 100 year return period events. ***AND***

7. Calculations include an allowance for climate change; this should be made in accordance with current best practice planning guidance.

One further credit may be awarded where:

8. Flooding of property will not occur in the event of local drainage system failure ***AND***

EITHER

9. The post development run-off volume, over the lifetime of the building, is no greater than it would have been prior to the assessed site's development. ***AND***
10. Any additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques.

OR (where this cannot be achieved)

11. Justification from the Appropriate Consultant indicating why the above criteria cannot be achieved. ***AND***
12. The post development peak rate of run-off is reduced to a limiting discharge. The limiting discharge is defined as the following and the option with the highest flow rate must be achieved:
    - The pre-development 1-year peak flow rate ***OR***
    - The mean annual flow rate Q_{bar} ***OR***
    - 2 litres/sec/ha
13. For either option above, calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance.

Minimising water course pollution

One credit may be awarded where:

14. The Appropriate Consultant confirms that there is no discharge from the developed site for rainfall up to 5mm. ***AND***
15. Specification of Sustainable Drainage Systems (SuDS) or source control systems such as permeable surfaces or infiltration trenches where run-off drains are in areas with a relatively low risk of watercourse pollution. ***AND***
16. Specification of oil/petrol separators (or equivalent system) in surface water drainage systems, where there is a high risk of contamination or spillage of substances such as petrol and oil. ***AND***
17. All water pollution prevention systems have been designed and detailed in accordance with the recommendations of Pollution Prevention Guideline 3 (PPG3) and, where applicable, the SuDS Manual.

Assessment of Available Credit

Flood Risk Criteria	AKT II Assessment	
1.	The site is situated in Zone 1 – an area with a low probability of flooding according to the Environment Agency's Indicative Floodplain Map.	✓
2.	A detailed FRA has been carried out which confirms that the flood risk from other sources is low.	✓
3.	Not applicable - the site is located in Flood Zone 1.	N/A
4.	Not applicable - the site is located in Flood Zone 1.	N/A
5.	Not applicable - the site is located in Flood Zone 1.	N/A

Based on this we believe that potentially two credits can be awarded under these criteria as the detailed site specific Flood Risk Assessment confirms that the flood risk from all sources is low.

Run off Criteria	AKT II Assessment	
6.	AKT II are appropriate consultants with the relevant qualifications and experience to design SUDS and flood prevention measures and completing peak rate of run-off calculations	✓
7.	As the pre and post development hard standing areas are the same then there cannot be any more run-off volume over the lifetime of the building and the credit can be awarded by default in accordance with Compliance Note 17.	✓
8.	As confirmed in Section 6.1.3 above an allowance of 30% has been made for climate change.	✓
9.	A detailed FRA has been carried out which confirms that the property would not be at risk of flooding in the event of a local drainage system failure.	✓
10.	As the pre and post development hard standing areas are the same then there cannot be any more run-off volume over the lifetime of the building and the credit can be awarded by default in accordance with Compliance Note 17.	✓
11.	As the pre and post development hard standing areas are the same then there cannot be any more run-off volume over the lifetime of the building and the credit can be awarded by default in accordance with Compliance Note 17.	✓
12.	Not applicable as criteria 10 and 11 can be achieved.	×
13.	Pre-development 1-year peak flow rate = 72.42 litres/sec Mean annual flow rate Q_{bar} = 1.25 litres/sec 2 litres/sec/ha = 0.625 litres/sec However, this is not applicable as criteria 10 and 11 can be acheived.	×
14.	An allowance of 30% has been made for climate change.	✓

Based on this we believe that potentially two credits can be awarded under these criteria as the detailed site specific FRA confirms that the risk of flooding in the event of a local drainage system failure is low.

Pollution Criteria	AKT II Assessment	
15.	As confirmed in Section 6.1.3 above, no infiltration is possible and therefore this criterion cannot be achieved.	×
16.	SuDS will be incorporated where possible but their use is severely limited due to the site constraints.	✓
17.	All proposed drainage to accommodate the proposed development is to be designed and detailed in accordance with Pollution Guideline 3 (PPG3).	✓
18.	As built / record drainage plans for the site are to be made available to the occupiers of the site.	✓
19.	No chemical or liquid storage facilities are proposed on site, so this criterion is satisfied by default.	✓
20.	All proposed drainage to accommodate the proposed development is to be designed and detailed in accordance with the EA's Pollution Prevention Guidance.	✓

Based on this we believe that it is not possible to obtain the one credit available under these criteria.

6.5 Code for Sustainable Homes

Sur1: Management of Surface Water Run-off from Developments

Hydraulic Control Criteria (mandatory)

1. **Peak Rate of Run-off**

   If there is no increase in the man-made impermeable area as a result of the new development, then the peak rate of run-off criterion does not apply.

   Where there is an increase in impermeable area, ensure that the peak rate of runoff over the development lifetime, allowing for climate change, will be no greater for the developed site than it was for the pre-development site. This should comply at the 1 year and 100 year return period events.

   Where the pre-development peak rate of run-off for the site would result in a requirement for the post-development flow rate (referred to as the limiting discharge) to be less than 5 litres/sec at a discharge point, a flow rate of up to 5 litres/sec may be used where required to reduce the risk of blockage.

2. **Volume of Run-off**

   If there is no increase in the man-made impermeable area as a result of the new development, then the volume of run-off criteria does not apply.

   If the developed site would otherwise discharge, over the development lifetime allowing for climate change, a greater volume of rainwater run-off than the pre-development site for the 100 year 6 hour event, (see Calculation Procedures) then criterion A applies. If A cannot be satisfied then B applies.

   A: Ensure that the post development volume of run-off, allowing for climate change over the development lifetime, is no greater than it would have been before the development. The additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SUDS techniques.

   OR

   B: If A cannot be satisfied (full justification must be provided) then reduce the post development peak rate of run-off to the limiting discharge.

   The limiting discharge is the pre-development flow rate equivalent to the 1-year peak flow rate, mean annual flood flow rate (Q_{bar}) or 2 l/s/ha, whichever is the highest flow rate.

   For the 1-year peak flow rate the 1 year return period event criterion in section 1 above, applies. For all other events up to the 100 year return period event, the peak rate of run-off for the developed site must not exceed the limiting discharge.

   Where the limiting discharge flow rate would require a flow rate of less than 5 litres/sec at a discharge point, a flow rate of up to 5 litres/sec may be used where required to reduce the risk of blockage.

3. **Designing for Local Drainage System Failure**

   Demonstrate that the flooding of property would not occur in the event of local drainage system failure caused either by extreme rainfall or a lack of maintenance.

Water Quality Criteria

1. One credit can be awarded by ensuring there is no discharge from the developed site for rainfall depths up to 5mm.
2. One credit can be awarded by ensuring that the run-off from all hard surfaces shall receive an appropriate level of treatment in accordance with the SUDS Manual to minimise the risk of pollution.

AKT II assessment of available credits - Hydraulic Control Criteria

1. **Peak Rate of Run-off**

	Pre-development	Post Development
Site Area	8,230m²	8,230m²
Impermeable area	8,230m²	8,230m²
Permeable area	0m²	0m²
1 year peak run-off	72.42 litres/sec	72.42 litres/sec
100 year peak run-off	209.24 litres/sec	209.24 litres/sec

As there is no increase in the man-made impermeable area this mandatory criterion has been satisfied by default.

2. **Volume of Run-off**

For the 1 in 100 year event with a 6 hour duration:

Condition	Rate
Pre-development volume of run-off	194 m³
Volume of run-off caused by the new development **prior to mitigation + 30% CC**	251 m³
Additional volume caused by the new development prior to mitigation	57 m³

However, as there is no increase in the man-made impermeable area this mandatory criterion has been satisfied by default.

Limiting Discharge Condition	Rate
Pre-development 1 year peak flow rate	5.0 litres/sec
Mean annual flow rate Q_{bar}	0.21 litres/sec
2 litres/sec/ha	0.11 litres/sec

However, as there is no increase in the man-made impermeable area this mandatory criterion has been satisfied by default.

3. **Designing for Local Drainage System Failure**

A detailed FRA has undertaken by AKT II that demonstrated that the proposed development has a low risk of flooding from all sources including failure of the local drainage system, refer to Section 5.3 & 5.4. Therefore this mandatory criterion is satisfied.

AKT II assessment of available credits - Water Quality Criteria

1. As outlined in Section 6.1.3, it is unlikely that an efficient infiltration system could be installed at the site, sustainable drainage components such as green roofs, swales and rain gardens could be installed at the site to ensure that there is no discharge from the site for storms with a rainfall depth of up to 5 mm. To satisfy this credit all the surface water generated on site will be need to be conveyed through one of these systems, which is currently not proposed.
2. Any areas with a moderate or high risk of pollution to the drainage network are to receive an appropriate level of treatment prior to being discharged from the site. In accordance with the requirements of Pollution Prevention Guideline 3 (PPG 3), a petrol interceptor is required for areas that are being used as loading bays and for regular vehicle deliveries. Provision of new petrol interceptors should be included in the drainage design.

Flood Risk

The site is situated in Zone 1, an area with a moderate probability of flooding according to the Environment Agency's Flood Map. A FRA was undertaken by AKT II which demonstrates that there is a low risk of flooding to the proposed building and it is recommended that safe access and escape routes are incorporated into the proposed buildings in order to ensure safe egress from the buildings during extreme flood events.

It is recommended that building thresholds along Shoreditch High Street are set at a minimum level of 13.9m AOD to allow for a maximum freeboard of approximately 290mm. It is also recommended that the building threshold levels along Blossom Street are raised above 13.91m AOD.

6.6 Drainage Design Standards

The following guides and current British Standards will be used for the design of the drainage elements on this project:

- BS EN 752:2008 Drain and Sewer Systems Outside Buildings
- BS EN 12056 Gravity Drainage Systems Inside Buildings: Part 2
- Building Regulations 2000 Part H1 – Sanitary Pipework and Drainage
- Building Regulations 2000 Part H2 – Cesspools and Tanks
- Building Regulations 2000 Part H3 – Rainwater Drainage
- Environment Agency "Control of Runoff from New Developments Interim Regional Guidance"
- National Planning Policy Framework

6.7 Materials

	Item	Material	British Standard
a)	Drainage pipe work	Vitrified Clayware	BS EN 295-1
		Cast Iron	BS EN 877
		Concrete	BS 5911-1 and BS EN 1916
		uPVC	BS EN 1401-1
b)	Precast Inspection Chambers	Precast Concrete	BS 5911 Part 200
c)	Drainage Gullies and Gratings	Vitrified Clayware	BS EN 295-1
		Ductile Iron	BS EN 124 D 400
d)	Drainage Channels & Gratings	Polymer Concrete	
		Ductile Iron	BS EN 124 D 400
e)	Access Covers	Grey Iron	BS EN 124
		Galvanised Steel	Facta Class A, B & D
f)	Cellular Units	Polypropylene	
g)	Geotextiles		

6.8 Risks and Unknowns

The main risk items relating to the civil and drainage designs which have been identified during the scheme design stage are as follows. These areas will be addressed during the ongoing stages of the design with the goal of minimising or removing them.

1. **Public Sewers**

The level and condition of the public sewers on Shoreditch High Street/Norton Folgate and discharge point(s) for the existing drainage network at S1a and S2 are currently unknown. A CCTV re-survey of the existing network at S1a and S2 is therefore required in order to determine this and allow the drainage design to proceed.

2. **Underground services/features**

Possible unknown services and features may exist on the site which has not been identified in the investigations completed to date. This may influence the chosen route for the drainage to avoid congested areas.

3. **Existing drainage network**

Permission will be required from the Water Authority to discharge surface and foul water to the existing public sewer and an agreement reached as to an acceptable discharge rate from the site to allow the drainage design to proceed. Agreements will also be required to divert and/or divest existing manholes.

4. **MEP Layout and flows**

The proposed MEP drainage layout and flows will be required to allow the below ground drainage design to progress. At present, a preliminary assessment of the likely foul flows has been made. Detailed layouts and flows will be necessary in order to progress with the proposed foul wdrainage layout and pipe sizes.

5. **Demolition of Existing Buildings and Diversion of Existing Services**

Careful consideration will need to be given to ensure that all services are suitably diverted prior to demolition of the existing buildings and prior to making final connections to existing drainage infrastructure.

Whilst this list is not exhaustive it covers the main areas that affect the cost of the drainage design.

7 Conclusions on Flood Risk Assessment

- The Environment Agency Flood Map indicates that the site is located within Flood Zone 1, an area of land assessed as having less than 0.1% (1 in 1000) annual probability of flooding from fluvial or tidal sources. Using all the available evidence, it is considered that the site has a low probability of flooding from fluvial or tidal sources.
- Using all the available evidence, it is considered that the site has a low probability of flooding from groundwater.
- Using all the available evidence, it is considered that the site has a low probability of flooding from sewers and other drainage networks as long as they are adequately maintained as required.
- Using all the available evidence, it is therefore considered that the site has a low probability of flooding from surface water and overland flow.
- Using all the available evidence, it is considered that the site has a low probability of flooding from artificial sources.
- This report has therefore demonstrated that the site has a low probability of flooding from all sources.

8 References

Site Specific Documents

Thames Water Sewer records

Shoreditch Estates, Envirocheck Report

CCTV Drainage Survey by SDS

Technical Guidance and Planning Policy Documents

BS 8533 : 2011, Assessing and managing flood risk in development : Code of Practice, October 2011.

CIRIA Report C624, Development and flood risk: guidance for the construction industry, 2004.

London Borough of Tower Hamlets, Strategic Flood Risk Assessment, May 2010.

Department for Communities and Local Government, National Planning Policy Framework, March 2012.

Department for Communities and Local Government, Technical Guidance to the National Planning Policy Framework, March 2012.

3461
Blossom Street

Appendix A

Extract of Envirocheck Report

Geology 1:10,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Present Day - Present Day
	WGR	Worked Ground (Undivided)	Artificial Deposit	Present Day - Present Day

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay and Silt	Flandrian - Flandrian
	LASI	Langley Silt Member	Silt	Devensian - Devensian
	KPGR	Kempton Park Gravel Formation	Sand and Gravel	Devensian - Devensian
	TPGR	Taplow Gravel Formation	Sand and Gravel	Wolstonian - Wolstonian
	HAGR	Hackney Gravel Member	Sand and Gravel	Wolstonian - Wolstonian

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	LC	London Clay Formation	Clay	Eocene - Eocene

Geology 1:10,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:10,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around a site. This mapping may be more up to date than previously published paper maps.

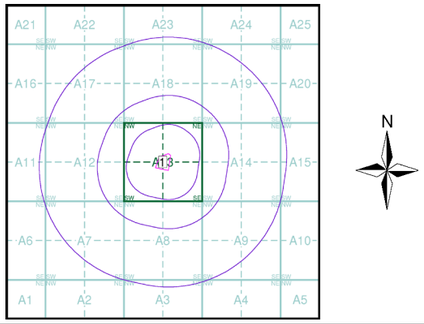
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page.

Please Note: Not all of the layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:10,000 Maps Coverage

Map ID: 1
Map Name: TQ38SW
Map Date: 1999
Bedrock Geology: Available
Superficial Geology: Available
Artificial Geology: Available
Faults: Not Available
Landslip: Not Available
Rock Segments: Not Available

Geology 1:10,000 Maps - Slice A



Order Details

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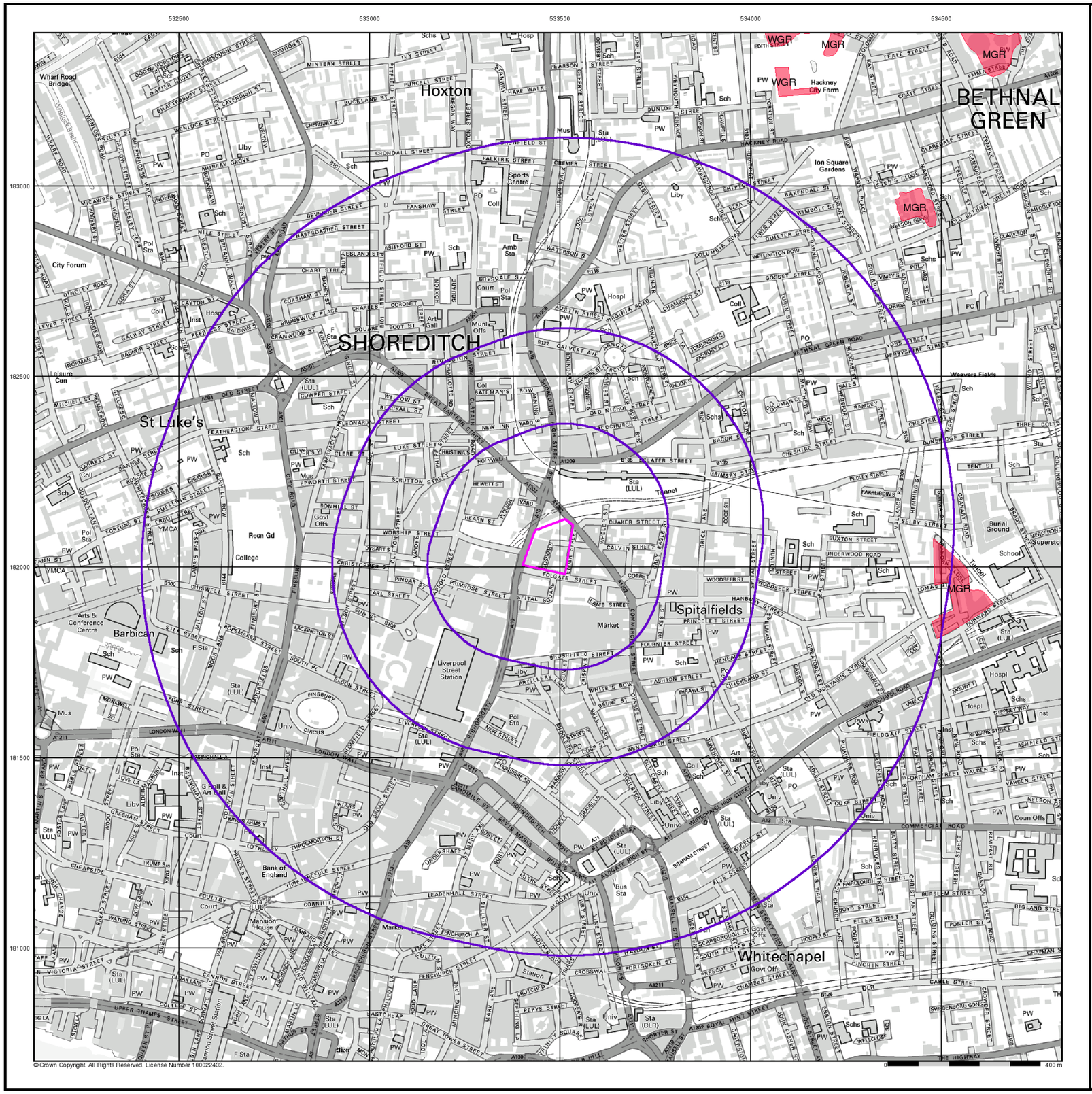
Customer Ref: 3461_Shoreditch Estate
National Grid Reference: 533480, 182050
Slice: A
Site Area (Ha): 1.27
Search Buffer (m): 1000

Site Details

Site at, Shoreditch, Hackney

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Artificial Ground and Landslip

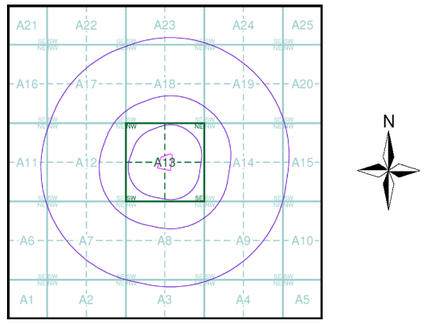
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



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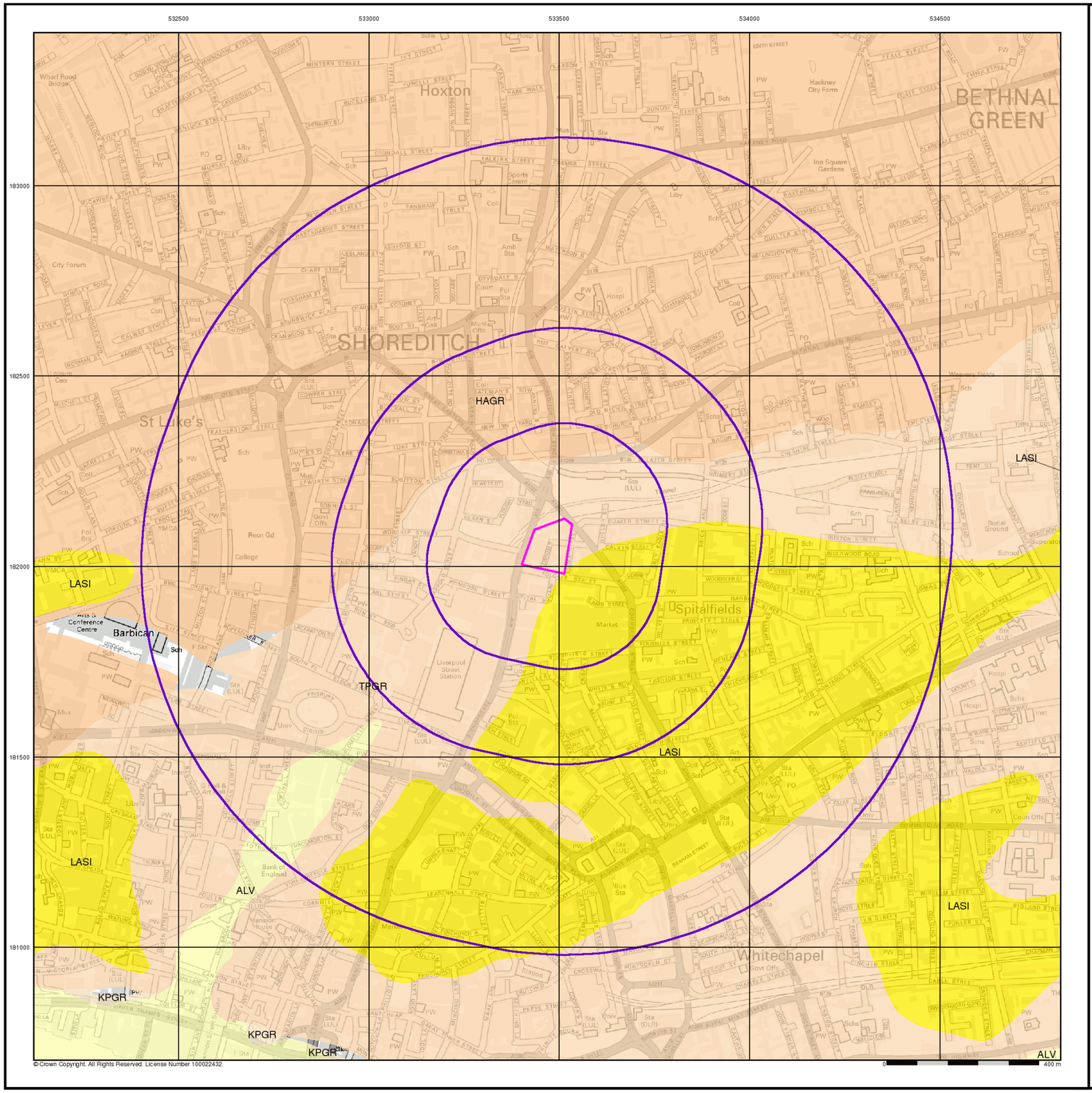
National Grid Reference:	533480, 182050
Slice:	A
Site Area (Ha):	1.27
Search Buffer (m):	1000

Site Details

Site at, Shoreditch, Hackney

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



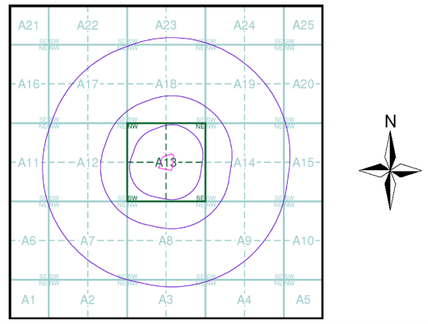
Superficial Geology

BGS 1:10,000 Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details

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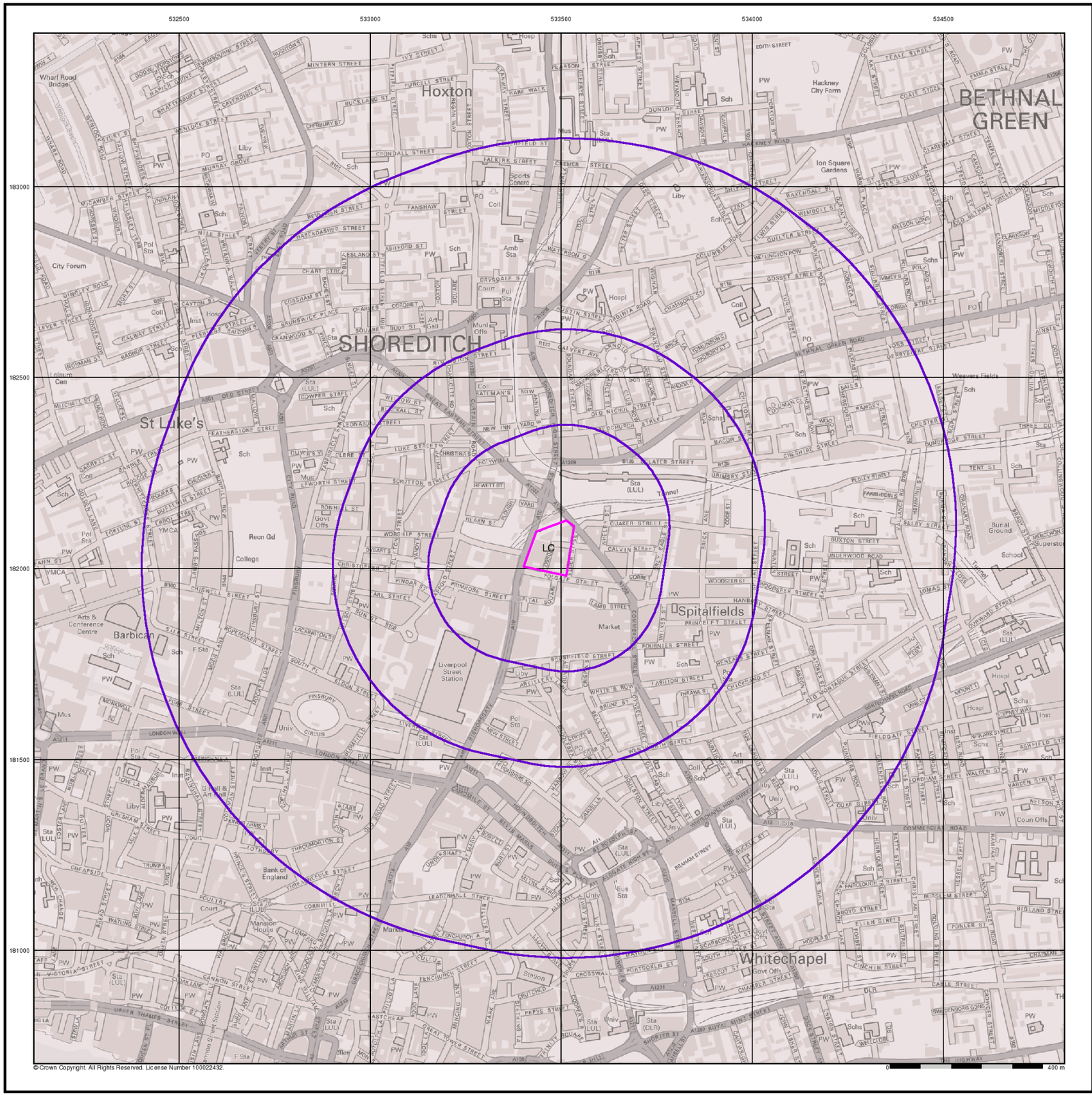
National Grid Reference:	533480, 182050
Slice:	A
Site Area (Ha):	1.27
Search Buffer (m):	1000

Site Details

Site at, Shoreditch, Hackney

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Bedrock and Faults

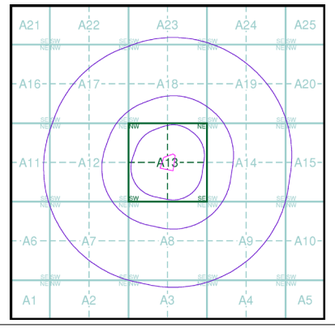
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults and thin beds mapped as lines such as coal seams and mineral veins. These are not restricted by age and could relate to features of any of the 1:10,000 geology datasets.

Bedrock and Faults Map - Slice A



Order Details

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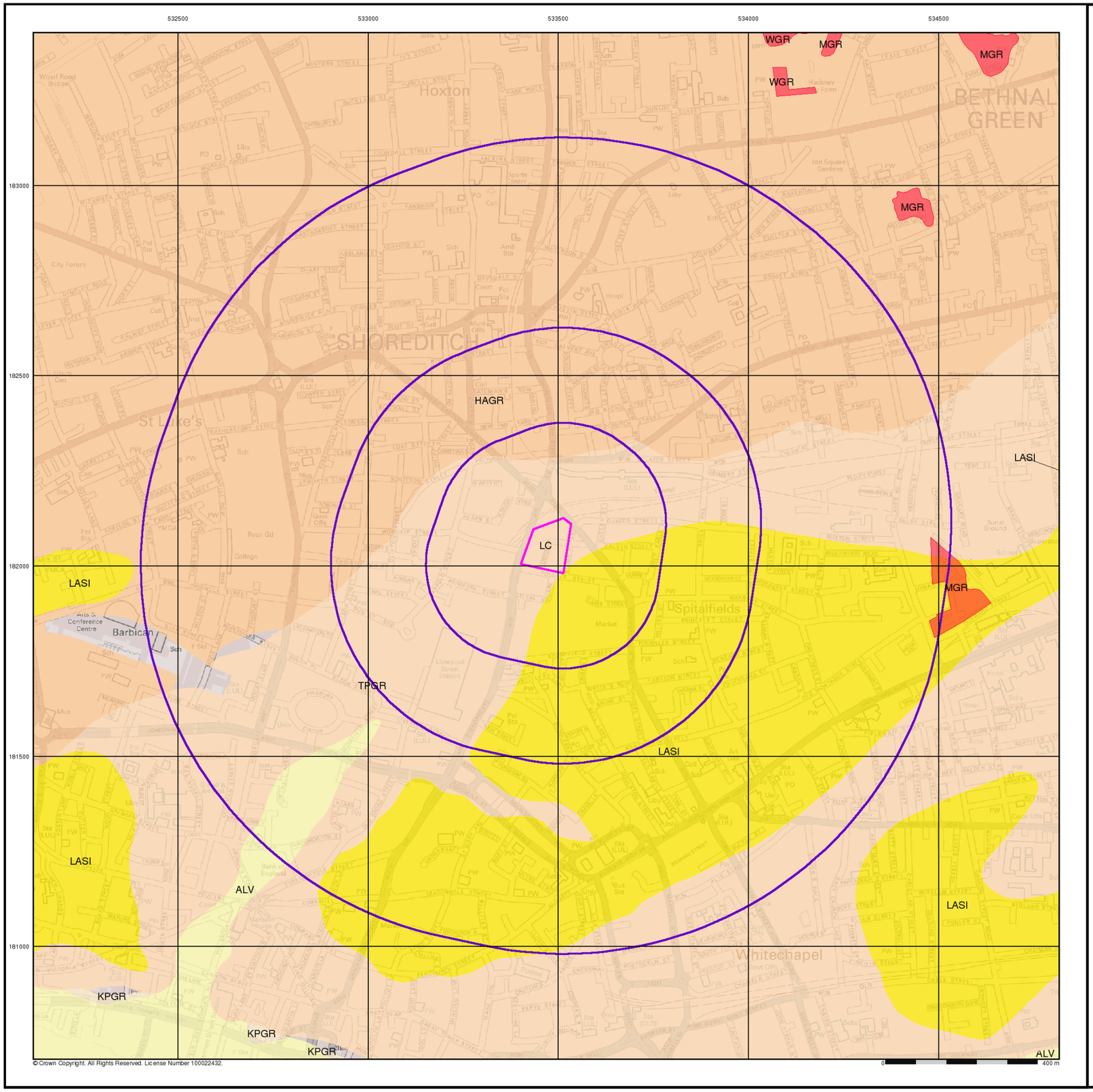
National Grid Reference:	533480, 182050
Slice:	A
Site Area (Ha):	1.27
Search Buffer (m):	1000

Site Details

Site at, Shoreditch, Hackney

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

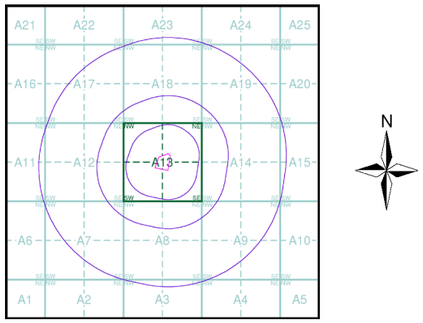
Additional Information

More information on 1:10,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details

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Customer Ref:	3461_Shoreditch Estate
National Grid Reference:	533480, 182050
Slice:	A
Site Area (Ha):	1.27
Search Buffer (m):	1000

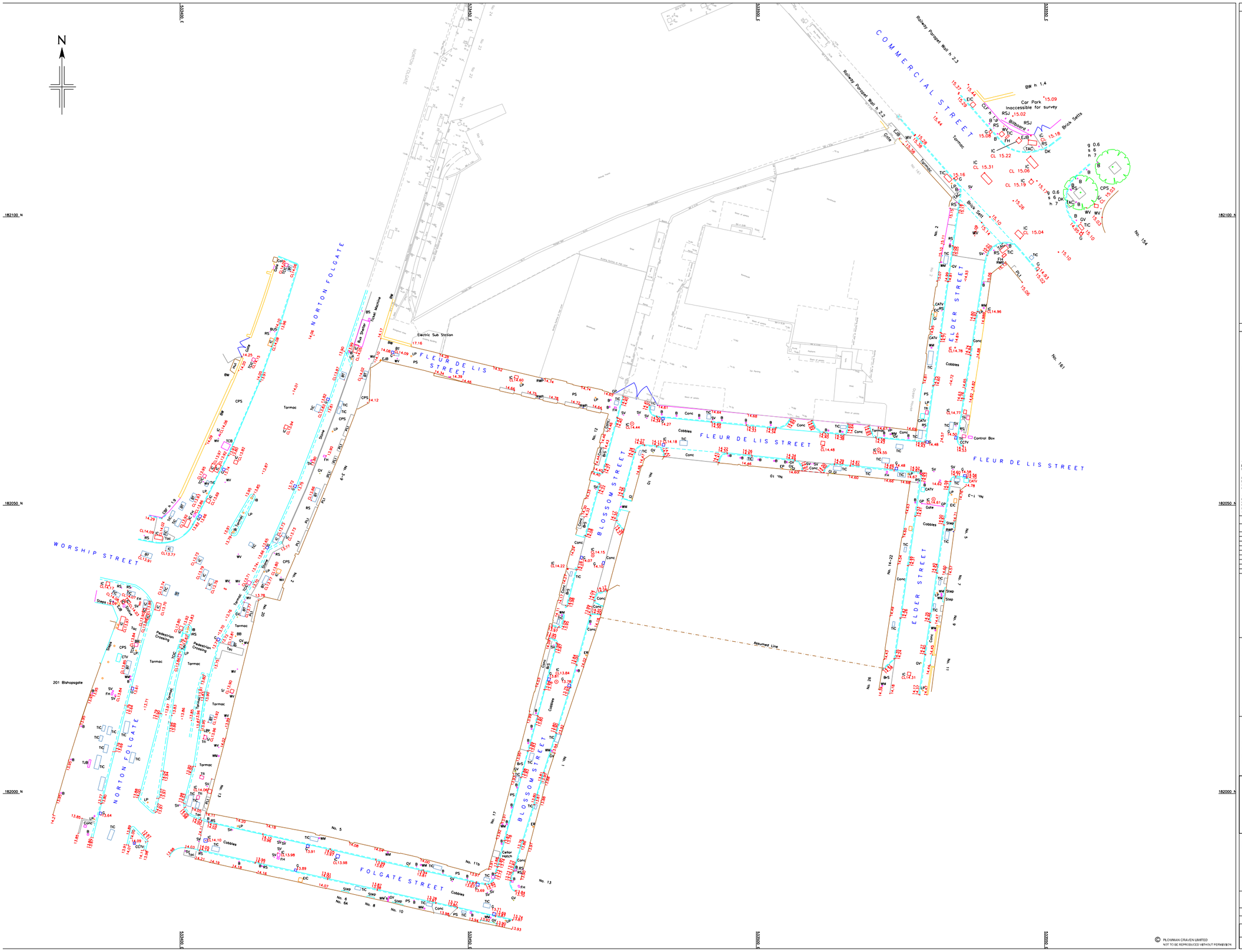
Site Details

Site at, Shoreditch, Hackney

3461
Blossom Street

Appendix B

Survey Drawings



STANDARD ABBREVIATIONS

AC	Air Conditioner	LB	Letter Box
ACM	Automatic Call Monitor	LP	Lamp Post
B	Bollard	Mas	Mast Arm
BF	Bin Full Sensor	MH	Manhole
BI	Bin Empty	Mon	Monitor
BI	Bollard	MB	Mill Bears
BrS	Bell Stand	Mon	Monitor
BWM	Bike Weighing Mat	NP	Notice Board
BT	Bin Tilted	OB	Oil Barrel
BT	Billboard Mount	OAK	Open Aspect Hatch
BM	Bike Hoop	OH	Overhead
CAM	Camera Mast	OSBM	Ordnance Survey Bench Mark
CAM	Camera Head Mount	P	Post
CCTV	Closed Circuit Television	PB	Pillar Box
CB	Corrugated Bollard	PGM	Permanent Ground Marker
CL	Circuit Level	PU	Pavement Light
CLF	Cycle Lock Frame	PL	Pedestrian Light
CLE	Cellular	PAV	Pavement Wall Mount
Cons	Conduits	PS	Parking Sensor
Cond	Conduits Hole	PMT	Power Distribution Box
CPS	Concrete Parking Stops	RP	Reading Pole
CT	Cable Television	RS	Road Sign
D	Drain	RG	Road Gully
DC	Door Closer	RSJ	Rolled Steel Joist
DH	Door Height	RWP	Rain Water Pipe
DT	Drain Tap	S	Stopper
DTL	Distance Travelled	SB	Stop Button
DLG	Double Glazed Cover	SBM	Silt Buster Mark
ELB	Electrical Junction Box	SC	Stop Cock
EM	Electric Hub	SP	Security Pence
EB	Electric Box	SBB	Street Bell
EC	Electric Meter	SL	Street Light
FB	Flower Bed	SD	Service Duct
FH	Fire Hydrant	RG	Sign Post
FL	Flag Pole	SV	Stop Valve
G	Gate	T	Telephone
G	Grill	Tap	Tap Handle
GC	Gas Cover	TBM	Temporary Bench Mark
GF	Gas Flare	TCB	Telephone Cabinet
GP	Gate Post	TB	Telephone Junction Box
GV	Gas Valve	TJB	Telephone Junction Box
H	Hydrant	TL	Traffic Light
HR	Hand Rail	TLCB	Traffic Light Control Box
I	Inspection Cover	TP	Telephone Pole
I	Inspection Chamber	TR	Telephone Riser
J	Junction Box	Turn	Turnout
JB	Junction Box	V	Vent
MG	Mechanical Road Gully	VP	Vent Pipe
PO	Post Office Box	WB	Water Board
SV	Stop Valve	WM	Water Meter
V	Valve	WV	Water Valve

OTHER ABBREVIATIONS

BP	Building Point	FL	Flatter
CL	Circuit Level	GPS	Global Positioning Satellite System
CC	Cycle Counter	MMS	Mobile Mapping Suite
CPV	Chemical Pulling Vehicle	SU	Survey Unknown
FB	Bicycle	TFB	Traffic Signal Equipment Box Cover
LB	Bollard		

LEGEND

2.70	FLOOR TO CEILING HEIGHT
F2.70	FLOOR TO FALSE CEILING HEIGHT
22.70	CEILING LEVEL
F22.70	FALSE CEILING LEVEL
	STAIR/STEP ARROWS POINT UP
	SLOPING CEILING ARROWS POINT UP
	ROOF ARROWS POINT DOWN
	ASSUMED DETAIL

THE IDENTIFICATION OF SERVICE COVERS HAS BEEN MADE BY A SURFACE INSPECTION ONLY. CRITICAL IDENTIFICATIONS SHOULD BE VERIFIED BY THE LIFTING OF COVERS OR A FULL UTILITIES SURVEY.

DUE TO THE INHERENT INSTABILITY OF PAPER MATERIALS, DRAWINGS PRINTED ON PAPER MAY BE STRETCHED AND DISTORTED. DIMENSIONS SCALED FROM PAPER PLOTS SHOULD THEREFORE BE TREATED WITH CAUTION.

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ISSUES & REVISIONS

Issue	Details	By	Date
A	Original Issue	PCL	30/08/13
B	Additional survey data inserted	PCL	04/09/13

SHEET LAYOUT

THIS SURVEY HAS BEEN CARRIED OUT TO AN ACCURACY CONSISTENT WITH A PRESENTATION SCALE OF 1:200. INTERROGATED DIMENSIONS WILL BE WITHIN THE TOLERANCE ASSOCIATED WITH THIS AND SMALLER SCALES ONLY.

ALL LEVELS ARE IN METRES AND ARE ABOVE ORDINANCE SURVEY NEWLYN DATUM DERIVED BY ACTIVE GPS OBSERVATIONS TAKEN OVER AN EXTENDED PERIOD OF TIME.

THE SURVEY GRID SHOWN ON THIS DRAWING IS POSITIONED ON ORDNANCE SURVEY (OS) NATIONAL GRID, OBTAINED BY MULTIPLE NETWORK RTK GPS OBSERVATIONS.
DATA HAS BEEN INSERTED FROM DRAWING NO 8127-1, ORIGINALLY SURVEYED IN NOVEMBER 2003 AND SHOWN IN GREY TONE IN THE LAYER 2003SURVEY-NOT REVISED.

ALL QUOTED DIMENSIONS ARE IN METRES
DRAWING UNITS ARE METRES

CLIENT

M3 CONSULTING

DASHWOOD HOUSE
69 OLD BROAD STREET
LONDON
EC2M 1QS

PROJECT TITLE

SHOREDITCH ESTATE

TOPOGRAPHICAL SURVEY

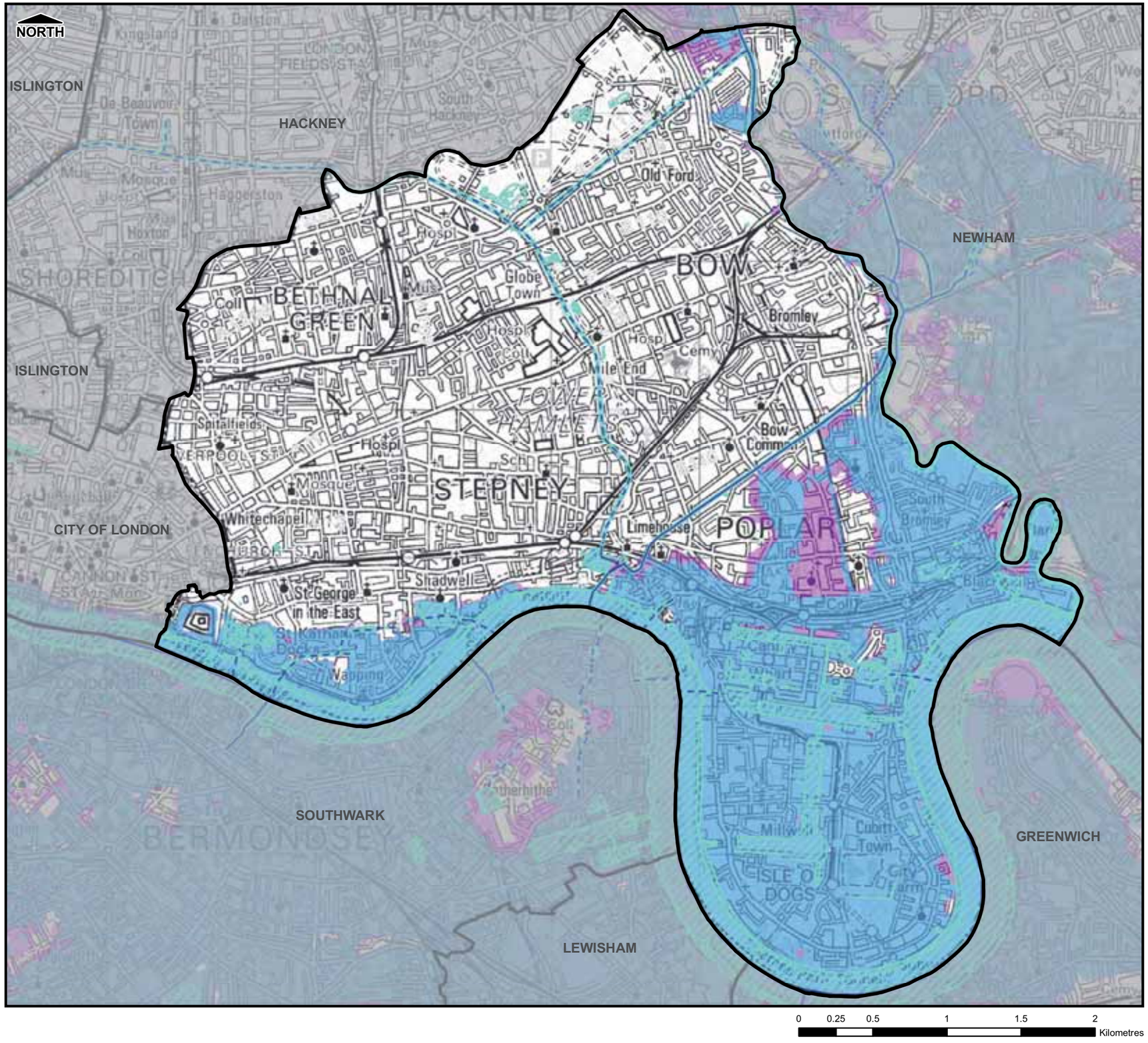
SURVEYED AND DRAWN BY
Plowman Craven
141 Lower Luton Road
Harpenden
Hertfordshire
AL5 5EQ
+44(0)1582 765566 info@plowmancraven.co.uk
+44(0)1582 765370 www.plowmancraven.co.uk

PRESENTATION SCALE	1:200 @ A0
DATE OF ORIGINAL SURVEY	August 2013
PC PROJECT No. 29791	CHECKED DGR
DRAWING No.	29791T-01
ISSUE	B

3461
Blossom Street

Appendix D

Strategic Flood Risk Assessment Maps



Legend

- Borough Administrative Boundary
- Main River
- Ordinary Watercourse
- Culverted Watercourse
- Permanent Water Bodies

Flood Zones

- Flood Zone 3
- Flood Zone 2

DRAWN BY	DATE	CHECKED BY	PASSED BY
E.Rewcastle	20/09/2011	S.Ip	S.Ip

SCALE @ A3	ISSUING OFFICE
1:26,000	Grosvenor Gardens

TOWER HAMLETS
LEVEL 2 STRATEGIC FLOOD RISK ASSESSMENT

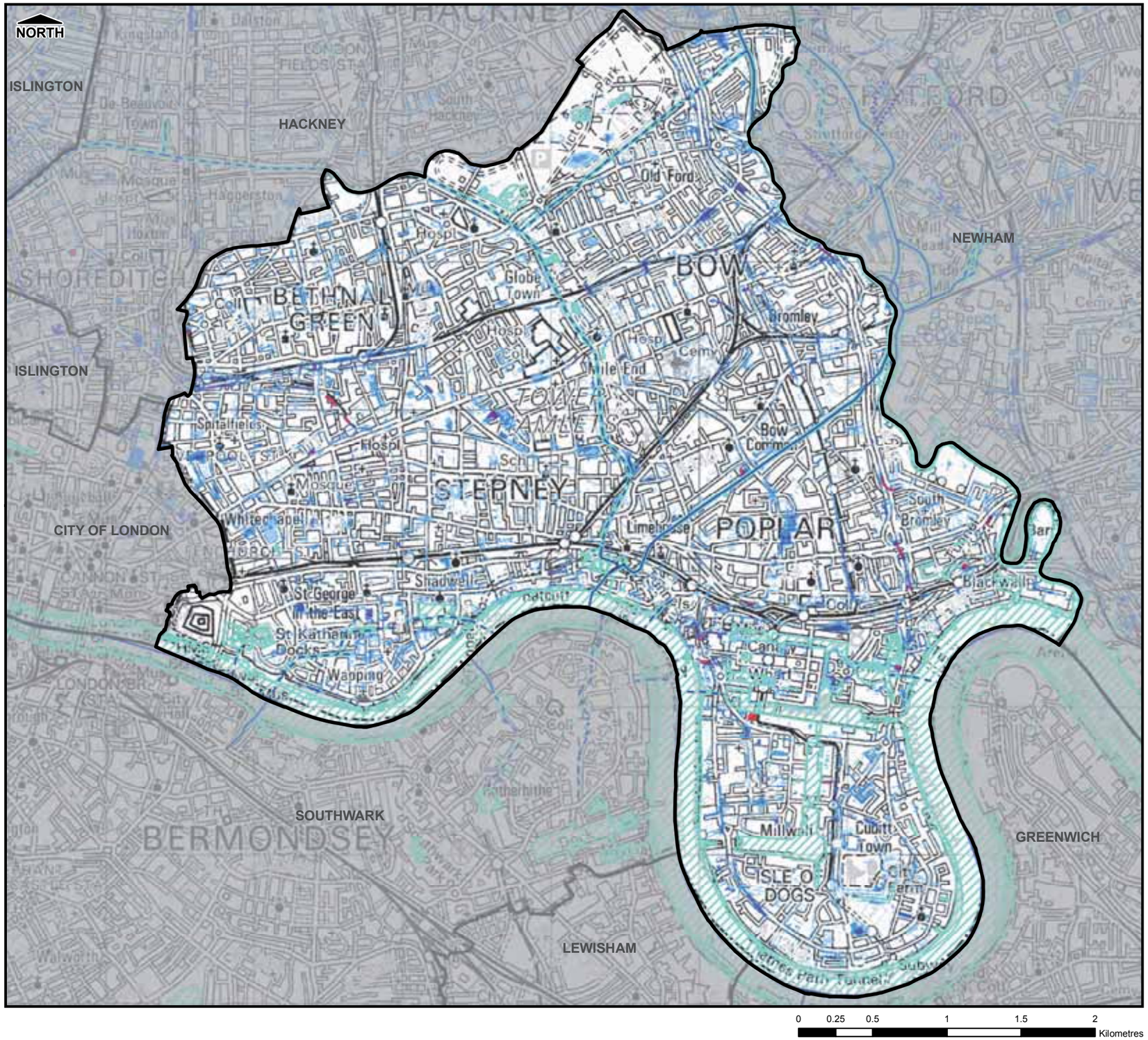
Figure B.1

Flood Zone Maps

TOWER HAMLETS

CAPITA SYMONDS

DRAWING NUMBER	REV
CS051300/FIG B.1	-



Legend

- Borough Administrative Boundary
- Main River
- Ordinary Watercourse
- Culverted Watercourse
- Permanent Water Bodies

Flood Depth

< 0.1m	0.5m to 1.0m
0.1m to 0.25m	1.0m to 1.5m
0.25m to 0.5m	> 1.5m

1. This map only shows the predicted likelihood of surface water flooding (this includes flooding from sewers, drains, small watercourses and ditches that occurs in heavy rainfall) for defined areas, and due to the coarse nature of the source data used, are not detailed enough to account for precise addresses.

DRAWN BY	DATE	CHECKED BY	PASSED BY
E.Rewcastle	20/09/2011	S.Ip	S.Ip

SCALE @ A3	ISSUING OFFICE
1:26,000	Grosvenor Gardens

TOWER HAMLETS
LEVEL 2 STRATEGIC FLOOD RISK ASSESSMENT

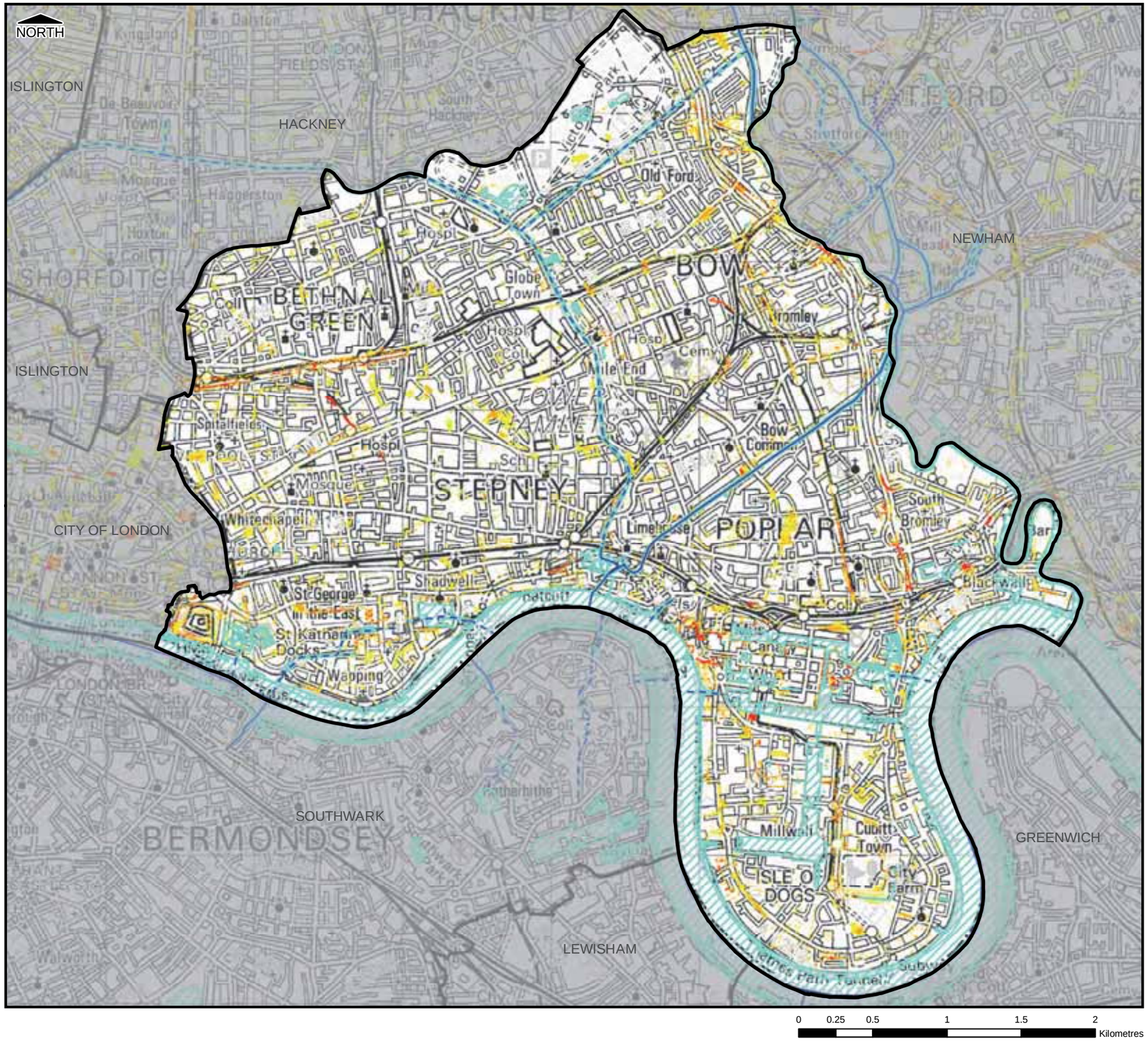
Figure B.2

Surface Water Depth:
1% AEP Rainfall Event

TOWER HAMLETS

CAPITA SYMONDS

DRAWING NUMBER	REV
CS051300/FIG B.2	-



Legend

- Borough Administrative Boundary
- Main River
- Ordinary Watercourse
- Culverted Watercourse
- Permanent Water Bodies

Critical Flood Hazard

- Caution (very low hazard)
- Significant (danger for most)
- Moderate (danger for some)
- Extreme (danger for all)

1. This map only shows the predicted likelihood of surface water flooding (this includes flooding from sewers, drains, small watercourses and ditches that occurs in heavy rainfall) for defined areas, and due to the coarse nature of the source data used, are not detailed enough to account for precise addresses
2. Flood Hazard has been defined based upon the joint EA and Defra R&D Technical Report FD2320 (January 2006).
3. Degree of flood hazard can be interpreted as follows:
   - Caution: Flood zone with shallow flowing water or deep standing water
   - Moderate: Flood zone with deep or fast flowing water. Dangerous for children, the elderly and the infirm
   - Significant: Flood zone with deep fast flowing water. Dangerous for most people.
   - Extreme: Flood zone with deep fast flowing water. Dangerous for all (including emergency services)

DRAWN BY	DATE	CHECKED BY	PASSED BY
E.Rewcastle	20/09/2011	S.Ip	S.Ip

SCALE @ A3	ISSUING OFFICE
1:26,000	Grosvenor Gardens

TOWER HAMLETS
LEVEL 2 STRATEGIC FLOOD RISK ASSESSMENT

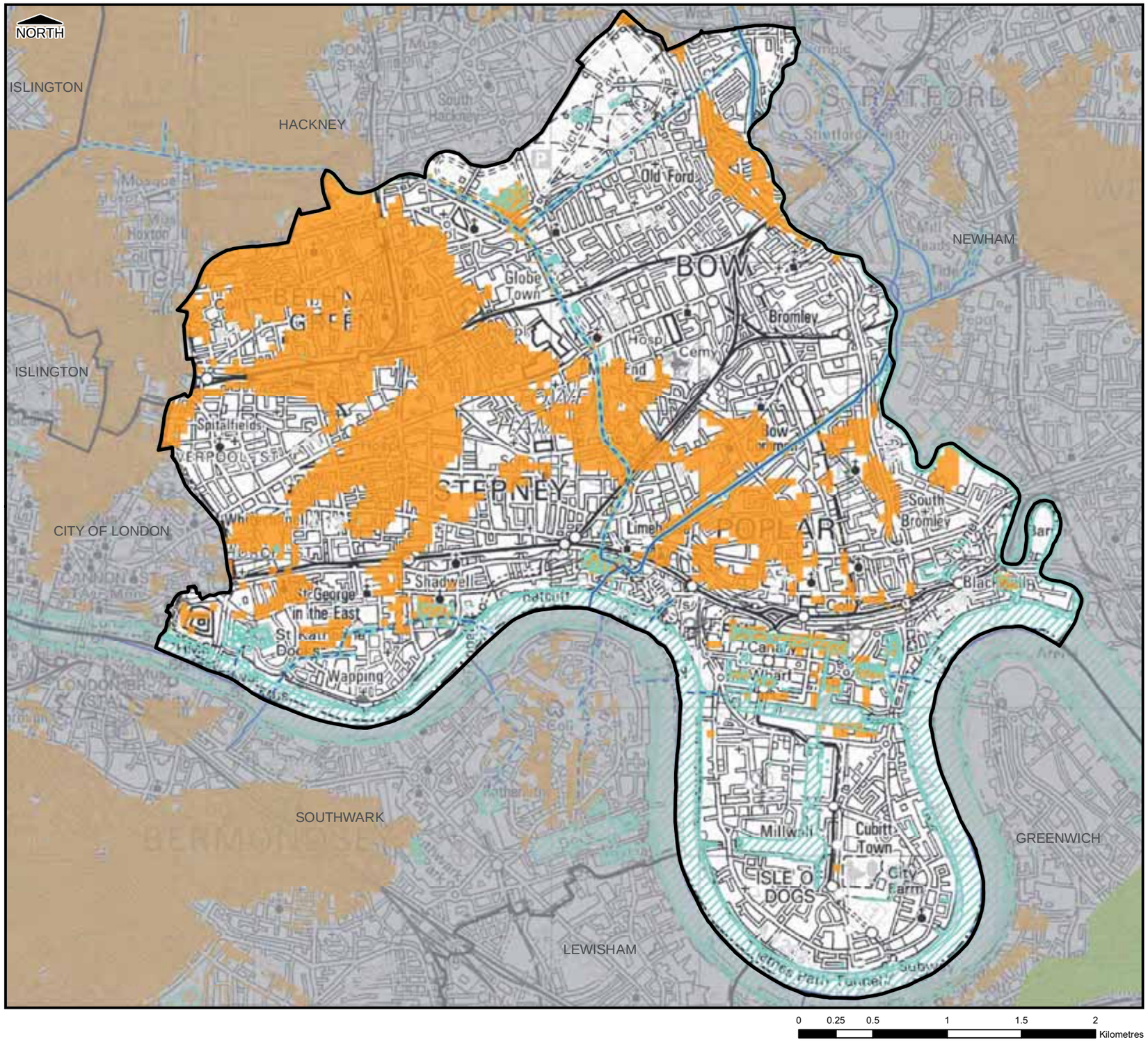
Figure B.3

Surface Water Flood Hazard:
1% AEP Rainfall Event

TOWER HAMLETS

CAPITA SYMONDS

DRAWING NUMBER	REV
CS051300/FIG B.3	-



Legend

- Borough Administrative Boundary
- Main River
- Ordinary Watercourse
- Culverted Watercourse
- Permanent Water Bodies

Increased Potential for Elevated Groundwater in

- Permeable Superficial Deposits
- Consolidated Aquifers

1. The increased Potential for Elevated Groundwater map shows those areas within the London Boroughs where there is an increased potential for groundwater to rise sufficiently to interact with the ground surface or be within 2 m of the ground surface. Such groundwater rise could lead to the following consequences:
   - flooding of basements of buildings below ground level;
   - flooding of buried services or other assets below ground level;
   - inundation of farmland, roads, commercial, residential and amenity areas;
   - flooding of ground floors of buildings above ground level; and
   - overflowing of sewers and drains.
2. Areas not shown to have increased potential for elevated groundwater should be considered to have a low potential for elevated groundwater – Lack of information does not imply 'no potential' of elevated groundwater in that area.
3. Includes groundwater flood mapping provided by JBA Consulting, Copyright © Jeremy Benn Associates Limited 2008 - 2011, partially derived from data supplied by the Environment Agency

DRAWN BY	DATE	CHECKED BY	PASSED BY
E.Rewcastle	20/09/2011	S.Ip	S.Ip

SCALE @ A3	ISSUING OFFICE
1:26,000	Grosvenor Gardens

TOWER HAMLETS
LEVEL 2 STRATEGIC FLOOD RISK ASSESSMENT

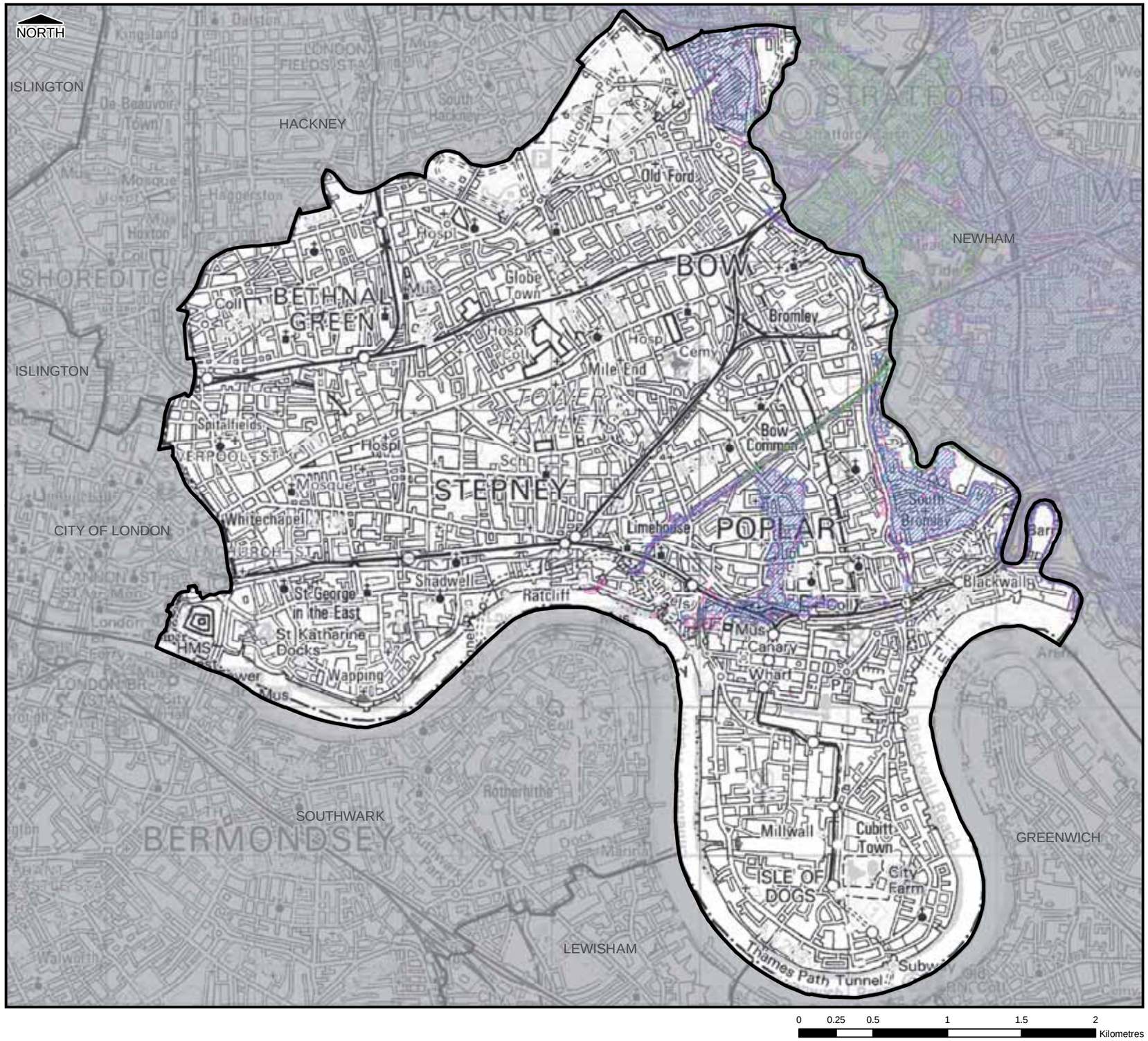
Figure B.4

Increased Potential for Elevated Groundwater Map

TOWER HAMLETS

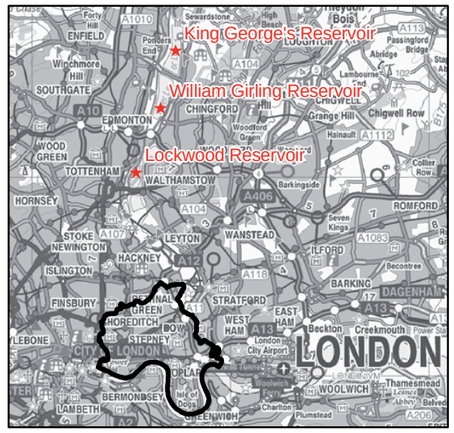
CAPITA SYMONDS

DRAWING NUMBER	REV
CS051300/FIG B.4	-



Legend

- Borough Administrative Boundary
- Breach Flood Extent of King George's Reservoir
- Breach Flood Extent of William Girling Reservoir
- Breach Flood Extent of Lockwood Reservoir



DRAWN BY	DATE	CHECKED BY	PASSED BY
E.Rewcastle	20/09/2011	S.Ip	S.Ip

SCALE @ A3	ISSUING OFFICE
1:26,000	Grosvenor Gardens

TOWER HAMLETS
LEVEL 2 STRATEGIC FLOOD RISK ASSESSMENT

Figure B.5

Reservoir Inundation Mapping

TOWER HAMLETS

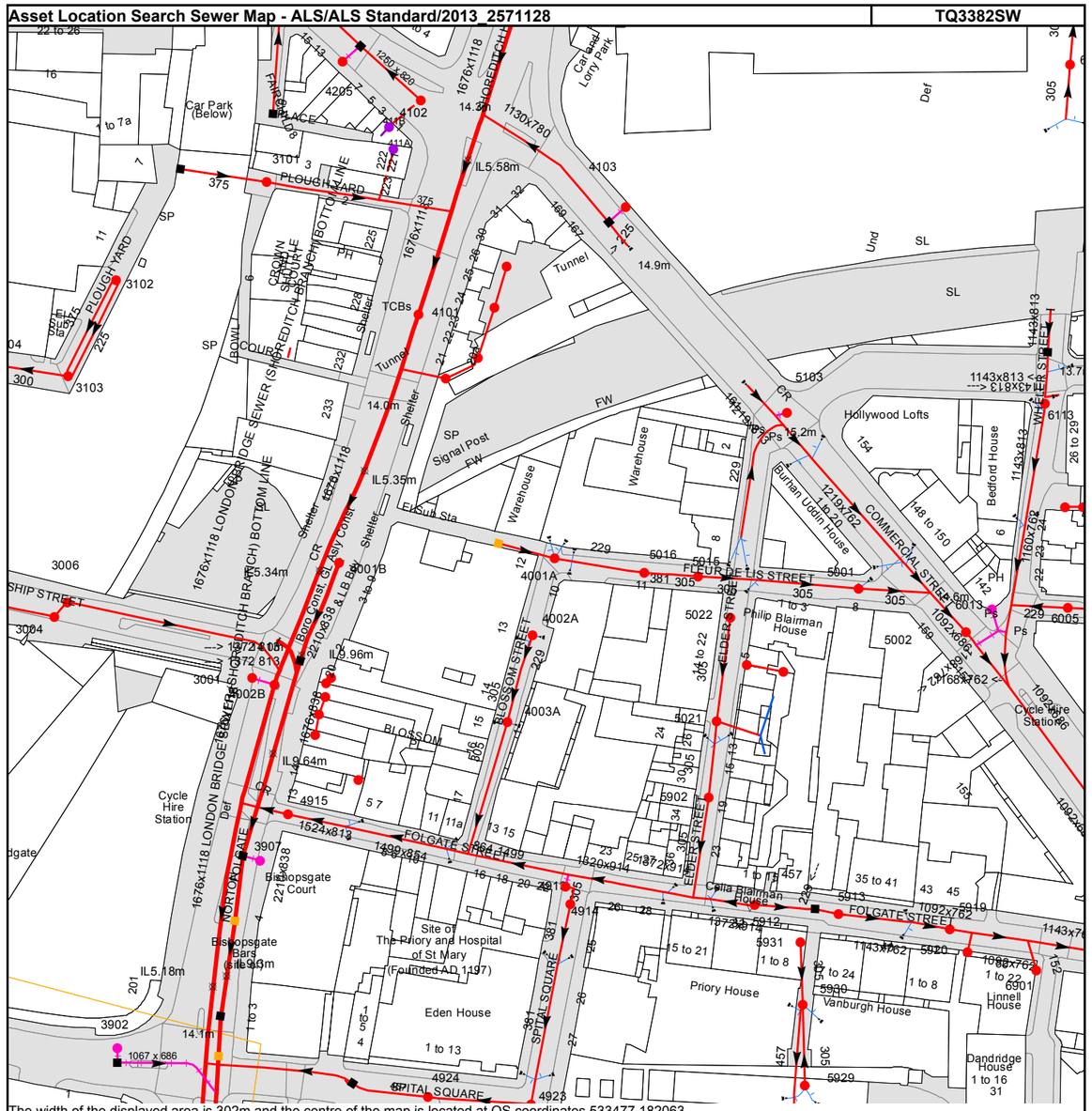
CAPITA SYMONDS

DRAWING NUMBER	REV
CS051300/FIG B.5	-

3461
Blossom Street

Appendix E

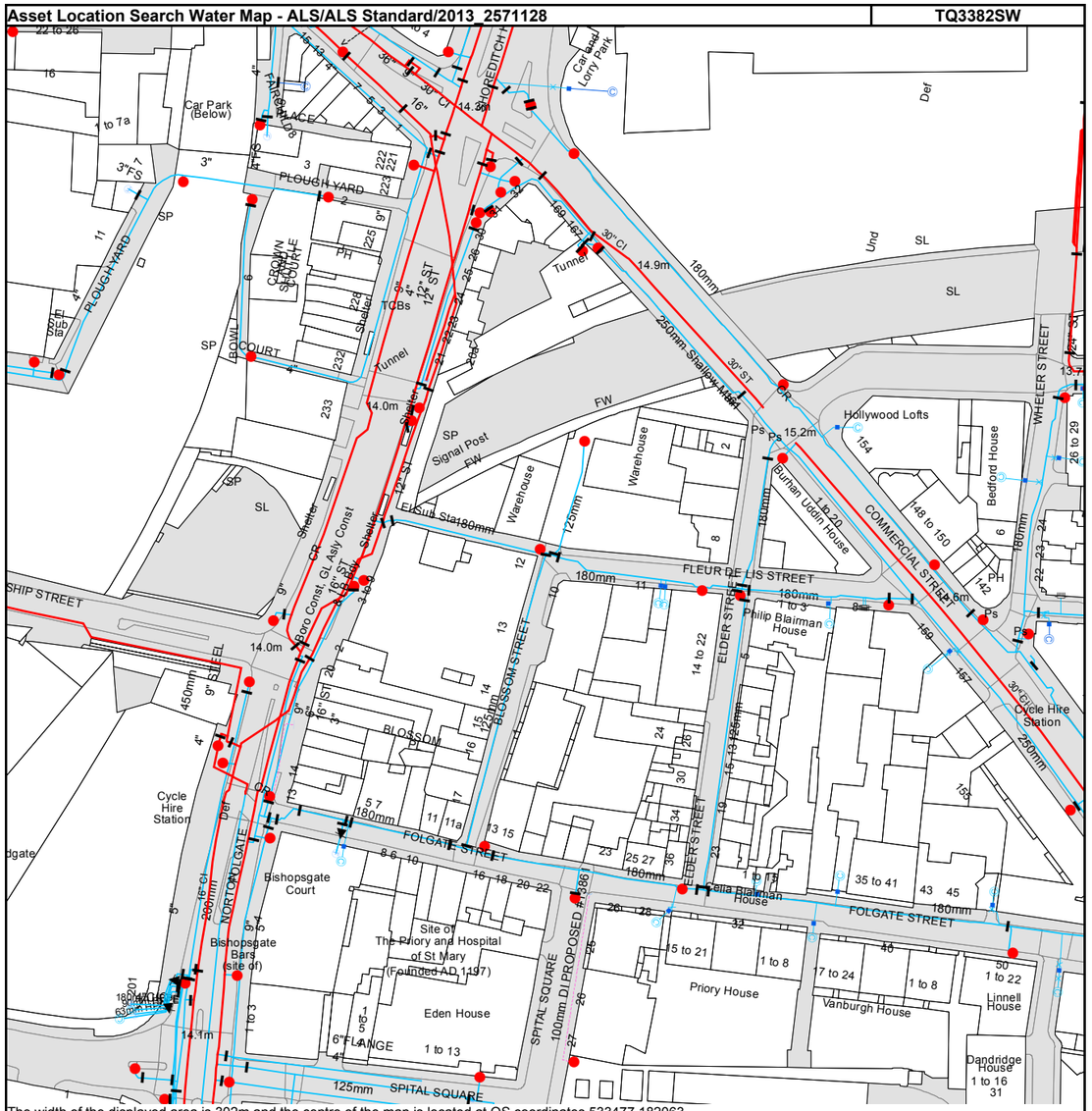
Thames Water Sewer Asset Maps



Manhole Reference	Manhole Cover Level	Manhole Invert Level
6210	n/a	n/a
4913	14.04	11.5
4914	14.18	9.98
5902	14.24	11.54
5021	n/a	n/a
5912	14.12	11.53
50DF	n/a	n/a
5931	14.36	11.85
5930	n/a	n/a
5929	n/a	n/a
5913	n/a	n/a
5919	14.04	10.63
5920	n/a	n/a
6901	n/a	n/a
4002A	n/a	n/a
4001A	n/a	n/a
4103	15.02	n/a
5016	n/a	n/a
5015	n/a	n/a
5022	n/a	n/a
50EA	n/a	n/a
5103	n/a	n/a
5001	n/a	n/a
5002	n/a	n/a
6013	n/a	n/a
6113	n/a	n/a
60DE	n/a	n/a
6005	n/a	n/a
60DD	n/a	n/a
4915	14.05	10.83
40CJ	n/a	n/a
40BE	n/a	n/a
4003A	n/a	n/a
40CB	n/a	n/a
40BI	n/a	n/a
4002B	13.82	5.24
40CA	n/a	n/a
40BJ	n/a	n/a
3001	13.9	n/a
3004	14.39	9.12
3006	14.38	n/a
4001B	14	10.57
41YR	n/a	n/a
3103	14.39	12.19
41YT	n/a	n/a
4101	14.13	5.44
41YU	n/a	n/a
3102	15.04	13.09
41YV	n/a	n/a
3101	14.71	10.43
411A	n/a	n/a
411B	n/a	n/a
4102	14.41	10.15
4205	14.43	n/a
4924	13.93	6.98
3902	14.78	n/a
3907	n/a	n/a

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 Water Map - ALS/ALS Standard/2013_2571128 | **TQ3382SW**



The width of the displayed area is 302m and the centre of the map is located at OS coordinates 533477,182063

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.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

Other Water Pipes (Not Operated or Maintained by Thames Water)

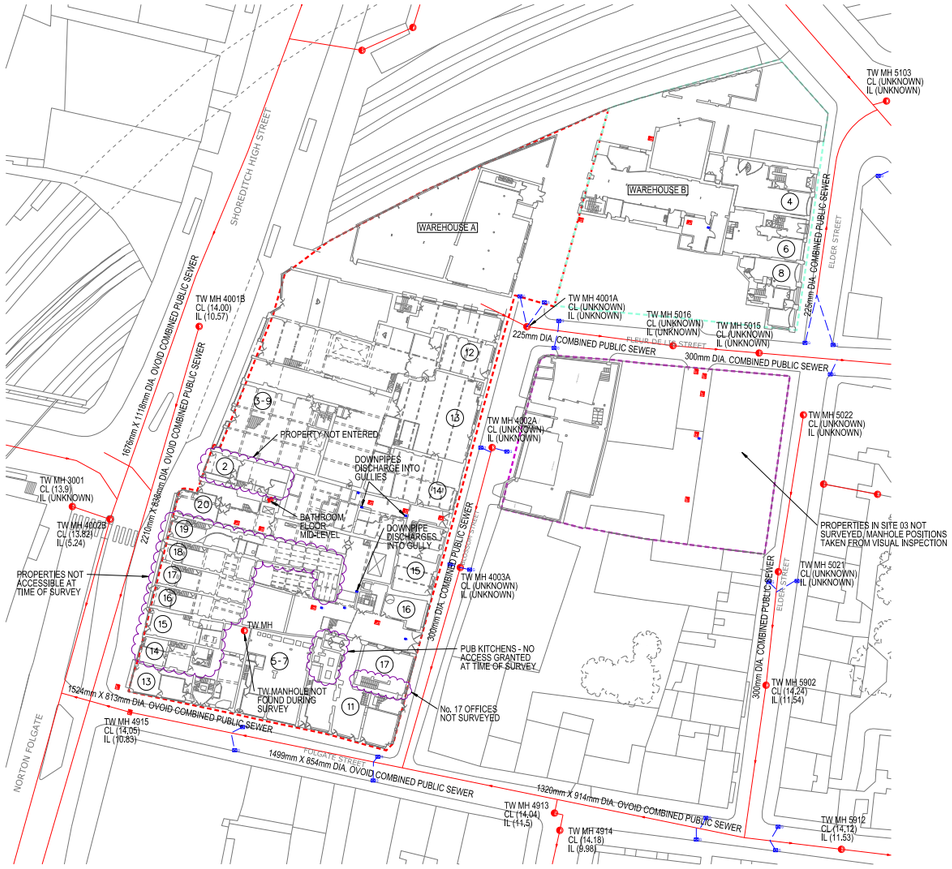
Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

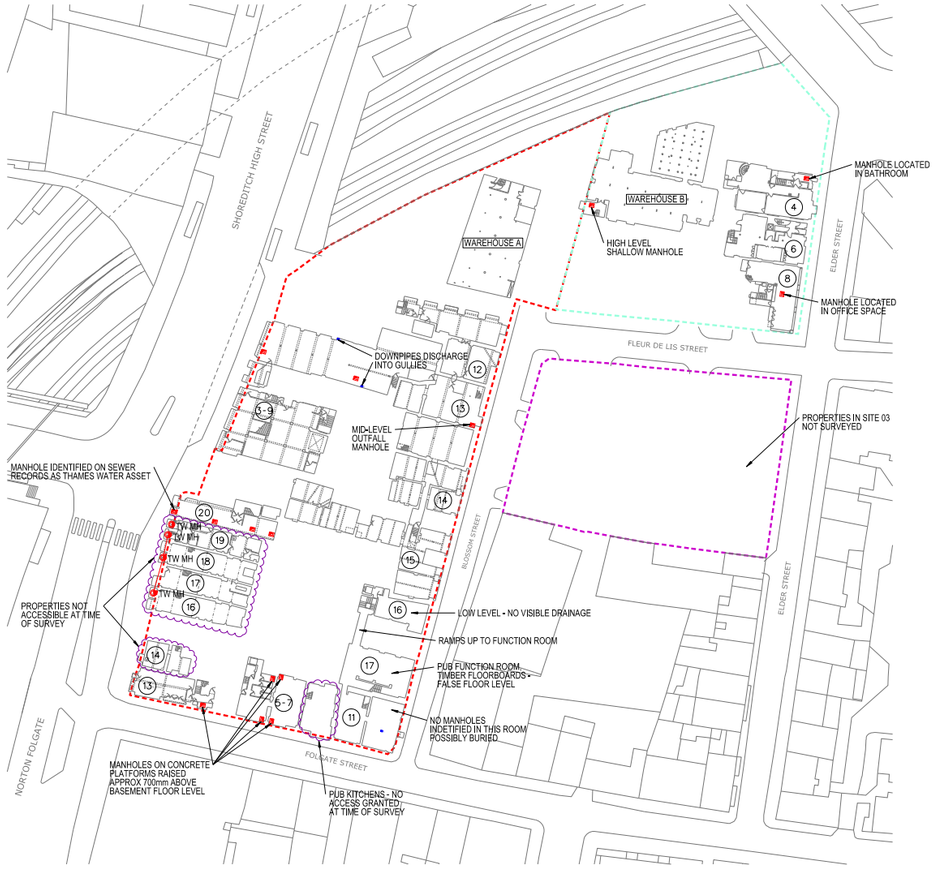
3461
Blossom Street

Appendix F

Existing Drainage Plan



SITE PLAN GROUND LEVEL



SITE PLAN BASEMENT LEVEL

NOTES

1. INFORMATION SHOWN ON THIS DRAWING IS BASED ON A SITE WALKOVER CARRIED OUT BY AKTII 04.04.2014 ,AND RECORD INFORMATION TAKEN FROM THAMES WATER SEWER RECORD AND EXISTING SURVEY PLANS.
2. MANHOLE AND GULLY SIZES AND POSITIONS SHOWN ARE INDICATIVE/APPROXIMATE AND SHOULD BE VERIFIED BY FURTHER DETAILED SURVEY.

LEGEND

- EXISTING COMBINED MANHOLE
- EXISTING COMBINED MANHOLE
- EXISTING FLOOR GULLY
- EXISTING ROAD GULLY
- EXISTING THAMES WATER SURFACE WATER CONNECTION
- EXISTING THAMES WATER COMBINE WATER SEWER
- SITE 01 BOUNDARY
- SITE 02 BOUNDARY
- SITE 03 BOUNDARY

5-7 FOLGATE STREET
SURFACE WATER: INTERNAL RWP'S FLOW TO BASEMENT. POTENTIALLY EXTERNAL RWP'S AT REAR DISCHARGE INTO PUB YARD AND/OR TO BASEMENT LEVEL.
FOUL WATER: FLOWS TO BASEMENT.

11 FOLGATE STREET & 15, 16 & 17 BLOSSOM STREET (THE WATER POET PUBLIC HOUSE)
SURFACE WATER: FLOWS TO YARD GULLIES AND COMBINED MANHOLES IN YARD WHICH FLOW TO PUBLIC SEWER IN BLOSSOM STREET. SURFACE WATER MAY ALSO FLOW TO BASEMENT LEVEL.
FOUL WATER: MAY FLOW TO MANHOLES IN YARD AND THEN TO PUBLIC SEWER IN BLOSSOM STREET. ALTERNATIVELY FLOWS TO BASEMENT.

GROUND FLOOR OF 17 BLOSSOM STREET (ACCESS TO OFFICES) NOT SURVEYED.

12, 13, 14 & 15 BLOSSOM STREET & 3-9 SHOREDITCH HIGH STREET
SURFACE WATER: EXTERNAL RWP'S DISCHARGE ON TO FLEUR DE LIS & BLOSSOM STREET PAVEMENTS. SOME INTERNAL RWP'S DISCHARGE TO INTERNAL GULLIES AND TO COMBINED WATER MANHOLES LEADING TO PUBLIC SEWER IN BLOSSOM STREET. OTHER INTERNAL RWP'S FLOW TO BASEMENT LEVEL.
FOUL WATER: MAY FLOW TO MANHOLES AT GROUND LEVEL AND INTO BLOSSOM STREET PUBLIC SEWER AND/OR FLOWS DIRECTLY TO BASEMENT.

2 SHOREDITCH HIGH STREET
SURFACE WATER: NOT SURVEYED
FOUL WATER: NOT SURVEYED

13 NORTON FOLGATE
SURFACE WATER: INTERNAL RWP'S DISCHARGE TO BASEMENT LEVEL. POTENTIALLY EXTERNAL RWP'S AT REAR WHICH MAY DISCHARGE TO PUB YARD.
FOUL WATER: DISCHARGES TO BASEMENT LEVEL.

14, 15, 16, 17, 18 & 19 NORTON FOLGATE
SURFACE WATER: NOT SURVEYED
FOUL WATER: NOT SURVEYED

20 NORTON FOLGATE
SURFACE WATER: INTERNAL RWP DISCHARGES TO FLOOR GULLY WHICH FLOWS TO DRAINAGE RUN IN PUB YARD WHICH FLOWS TO PUBLIC SEWER IN BLOSSOM STREET. OTHER INTERNAL RWP'S MAY FLOW TO COMBINED MANHOLES IN PROPERTY WHICH ARE ASSUMED TO FLOW TO BASMENT.
FOUL WATER: FLOWS TO INTERNAL COMBINED MANHOLES OR TO FLOW DIRECTLY TO BASEMENT.

SITE 03
SURFACE WATER: NOT SURVEYED
FOUL WATER: NOT SURVEYED

4 ELDER STREET
SURFACE WATER: EXTERNAL RWP'S AT REAR FLOW TO UNKNOWN, INTERNAL RWP'S FLOW TO BASEMENT.
FOUL WATER: FLOWS TO BASEMENT LEVEL.

6 ELDER STREET
SURFACE WATER: EXTERNAL RWP'S AT REAR FLOW TO UNKNOWN, INTERNAL RWP'S FLOW TO BASEMENT.
FOUL WATER: FLOWS TO BASEMENT LEVEL.

8 ELDER STREET
SURFACE WATER: EXTERNAL RWP'S AT REAR FLOW TO UNKNOWN, INTERNAL RWP'S FLOW TO BASEMENT.
FOUL WATER: FLOWS TO BASEMENT LEVEL.

WAREHOUSE A
SURFACE WATER: EXTERNAL RWP'S DISCHARGE ONTO YARD, SOME INTERNAL RWP'S FLOW TO FLEUR DE LIS STREET, OTHER INTERNAL RWP'S FLOW TO BASEMENT.
FOUL WATER: NONE.

WAREHOUSE B
SURFACE WATER: EXTERNAL RWP'S DISCHARGE ONTO YARD. MANHOLE LOCATED AT REAR OF WAREHOUSE MAY CONVEY SURFACE WATER TOWARD OTHER MANHOLES AND FURTHER ALONG TO PUBLIC SEWER IN FLEUR DE LIS STREET.
FOUL WATER: DISCHARGES TO BASEMENT HIGH LEVEL MANHOLE.

5-7 FOLGATE STREET
SURFACE WATER: PICKED UP BY A SERIES OF CONCRETE ENCASED MANHOLES AND FLOWS TO THE PUBLIC SEWER IN FOLGATE STREET.
FOUL WATER: PICKED UP BY A SERIES OF CONCRETE ENCASED MANHOLES AND FLOWS TO THE PUBLIC SEWER IN FOLGATE STREET.

11 FOLGATE STREET & 15, 16 & 17 BLOSSOM STREET (THE WATER POET PUBLIC HOUSE)
SURFACE WATER: MAY FLOW TO POSSIBLE MANHOLES IN KEG ROOM AND CONNECT TO PUBLIC SEWER IN BLOSSOM STREET.
FOUL WATER: MAY BE PICKED UP BY POSSIBLE MANHOLES IN KEG ROOM AND FLOW TO BLOSSOM STREET. RAISED SECTION OF THE ROOM MAY INDICATE DRAINAGE CONNECTIONS. FLOOR GULLY FLOWS TO BLOSSOM STREET SEWER.

12, 13, 14 & 15 BLOSSOM STREET & 3-9 SHOREDITCH HIGH STREET
SURFACE WATER: INTERNAL RWP'S DISCHARGE INTO FLOOR GULLIES AND CONNECT TO INTERNAL MANHOLES WHICH DISCHARGE TO THE PUBLIC SEWER IN SHOREDITCH HIGH STREET, SURFACE WATER MAY ALSO DISCHARGE DIRECTLY TO INTERNAL MANHOLES.
FOUL WATER: FLOWS DIRECTLY TO INTERNAL MANHOLES, POSSIBLY A MID-LEVEL OUTFALL MANHOLE DISCHARGING TO BLOSSOM STREET PUBLIC SEWER.

13 NORTON FOLGATE
SURFACE WATER: INTERNAL DOWNPIPES MAY DISCHARGE TO COMBINED INTERNAL MANHOLE RAISED ABOVE BASEMENT LEVEL AND OUTFALLS TO PUBLIC SEWER IN FOLGATE STREET.
FOUL WATER: DISCHARGES TO COMBINED INTERNAL MANHOLE RAISED ABOVE BASEMENT LEVEL AND OUTFALLS TO PUBLIC SEWER IN FOLGATE STREET.

14, 16, 17, 18 & 19 NORTON FOLGATE
SURFACE WATER: NOT SURVEYED
FOUL WATER: NOT SURVEYED

20 NORTON FOLGATE
SURFACE WATER: INTERNAL RWP'S MAY FLOW TO COMBINED MANHOLES IN PROPERTY WHICH ARE ASSUMED TO FLOW TO A SERIES OF BASEMENT INTERNAL MANHOLES, FLOWING TO THE PUBLIC SEWER IN NORTON FOLGATE.
FOUL WATER: FLOWS TO INTERNAL COMBINED MANHOLES FLOWING TO PUBLIC SEWER IN NORTON FOLGATE.

SITE 03
SURFACE WATER: NOT SURVEYED
FOUL WATER: NOT SURVEYED

4 ELDER STREET
SURFACE WATER: INTERNAL RWP'S ASSUMED TO FLOW TO BASEMENT INTERNAL MANHOLE CONNECTING TO PUBLIC SEWER IN ELDER STREET.
FOUL WATER: ASSUMED TO FLOW TO BASEMENT INTERNAL MANHOLE CONNECTING TO ELDER STREET PUBLIC SEWER.

6 ELDER STREET
SURFACE WATER: NONE FOUND.
FOUL WATER: NONE FOUND.

8 ELDER STREET
SURFACE WATER: INTERNAL RWP'S ASSUMED TO FLOW TO BASEMENT INTERNAL MANHOLE DISCHARGING TO PUBLIC SEWER IN ELDER STREET.
FOUL WATER: ASSUMED TO FLOW TO BASEMENT INTERNAL MANHOLE DISCHARGING TO PUBLIC SEWER IN ELDER STREET.

WAREHOUSE A
SURFACE WATER: BASEMENT INTERNAL RWP'S ASSUMED TO FLOW TO PUBLIC SEWER IN FLEUR DE LIS STREET.
FOUL WATER: NONE.

WAREHOUSE B
SURFACE WATER: NONE FOUND.
FOUL WATER: DISCHARGES TO BASEMENT HIGH LEVEL MANHOLE AND FLOWS TO MANHOLE IN YARD AND ASSUMED TO CONNECT TO PUBLIC SEWER IN FLEUR DE LIS STREET. NO FOUL DRAINAGE FOUND AT LOWER LEVEL.

REV	DATE	DESCRIPTION	BY	CHECKED
P1	10.07.14	PRELIMINARY ISSUE	RF	AGH

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CLIENT: BRITISH LAND

PROJECT: BLOSSOM STREET, E1

TITLE: EXISTING DRAINAGE LAYOUT - GROUND & BASEMENT LEVELS

DRAWN: RF	SCALE: 1:500 @ A1	CAD FILENAME: 3461-C-SK010.dgn	
DATE: JULY 2014	CHECKED: AGH	STATUS: PRELIMINARY	
PROJECT No.: 3461	DRAWING No.: C-SK010	REVISION: P1	

PRELIMINARY

PLOT DATE 10/07/2014 BY $USERNAME$

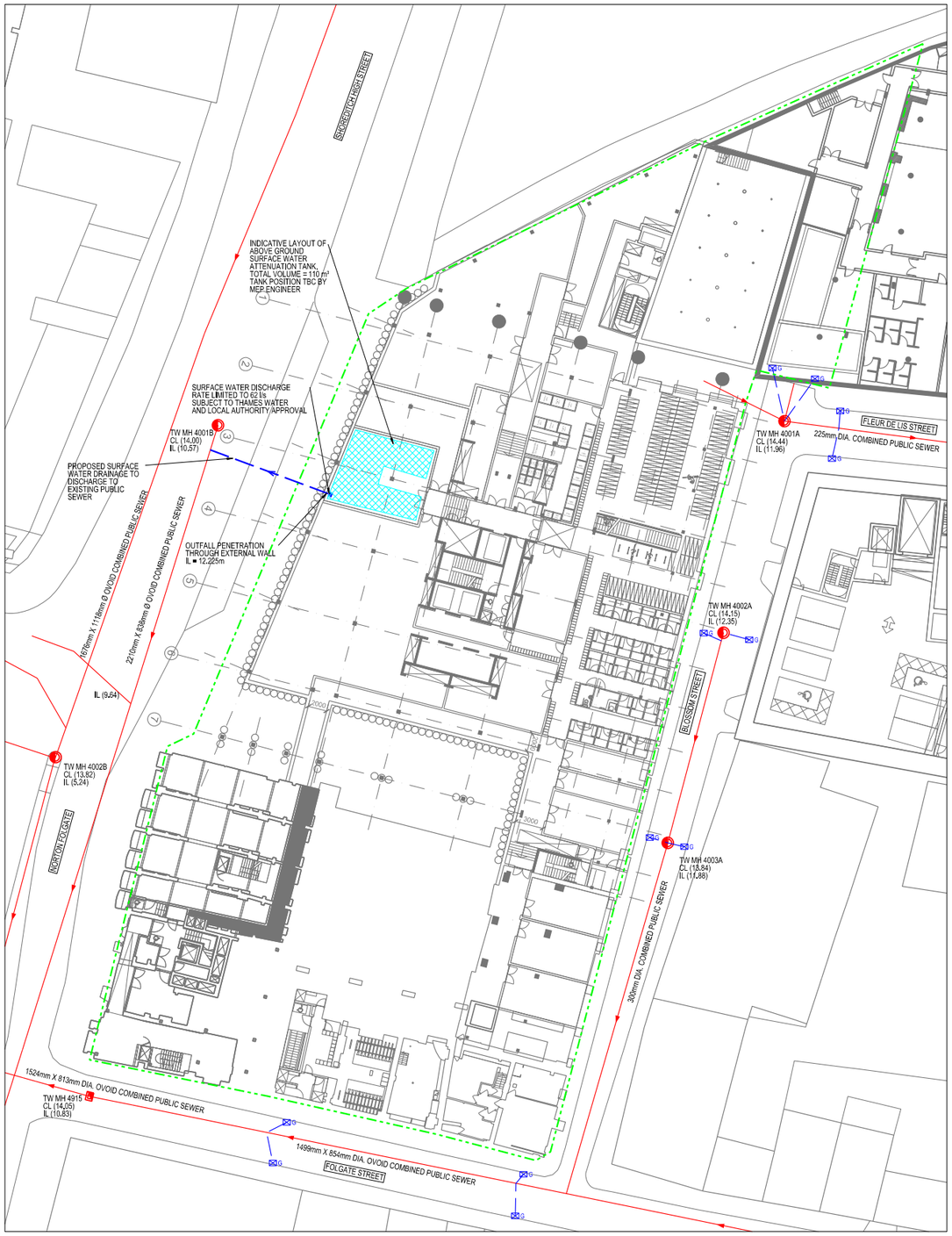
3461
Blossom Street

Appendix G

Proposed Drainage Plan

NOTE:

LOADING BAY/DELIVERY AREAS WILL REQUIRE A PETROL INTERCEPTOR IN ACCORDANCE WITH PPG3 GUIDELINES. LOCATION TO BE CONFIRMED DURING THE NEXT DESIGN STAGE. ALLOW COST CONTINGENCY AT THIS STAGE.



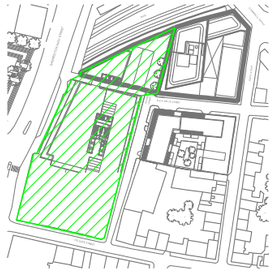
NOTES

1. THE SUDS PORPOSALS SHOWN BELOW ARE INDICATIVE OPTIONS TO BE EVALUATED IN THE NEXT STAGES OF DESIGN DEVELOPMENT.
2. REFER TO LANSCAPE ARCHITECTS DRAWING FOR HARD AND SOFT LANSCAPING PROPOSALS.

LEGEND

- DENOTES SITE BOUNDARY
- EXISTING ROAD GULLY
- EXISTING ROAD GULLY CONNECTION
- EXISTING THAMES WATER COMBINED WATER SEWER
- EXISTING THAMES WATER COMBINED WATER MANHOLE
- INDICATIVE PROPOSED SURFACE WATER DRAINAGE
- PROPOSED SURFACE WATER ATTENUATION TANK BY MEP ENGINEER
- PROPOSED FLOW CONTROL VALVE BY MEP ENGINEER

LOCATION PLAN



REV	DATE	DESCRIPTION	BY	CHECKED
P3	28/11/14	PRELIMINARY ISSUE	LK	AGH
P2	18/07/14	PRELIMINARY ISSUE	LK	AGH
P1	10/07/14	PRELIMINARY ISSUE	LK	AGH

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CLIENT: BRITISH LAND

PROJECT: BLOSSOM STREET, E1

TITLE: PRELIMINARY SURFACE WATER SUDS STRATEGY - SITE 1

DRAWN	SCALE	CAD FILENAME
RF	1:250 @ A1	3461-C-SK100.dgn

DATE	CHECKED	STATUS
JULY 2014	MD	PRELIMINARY

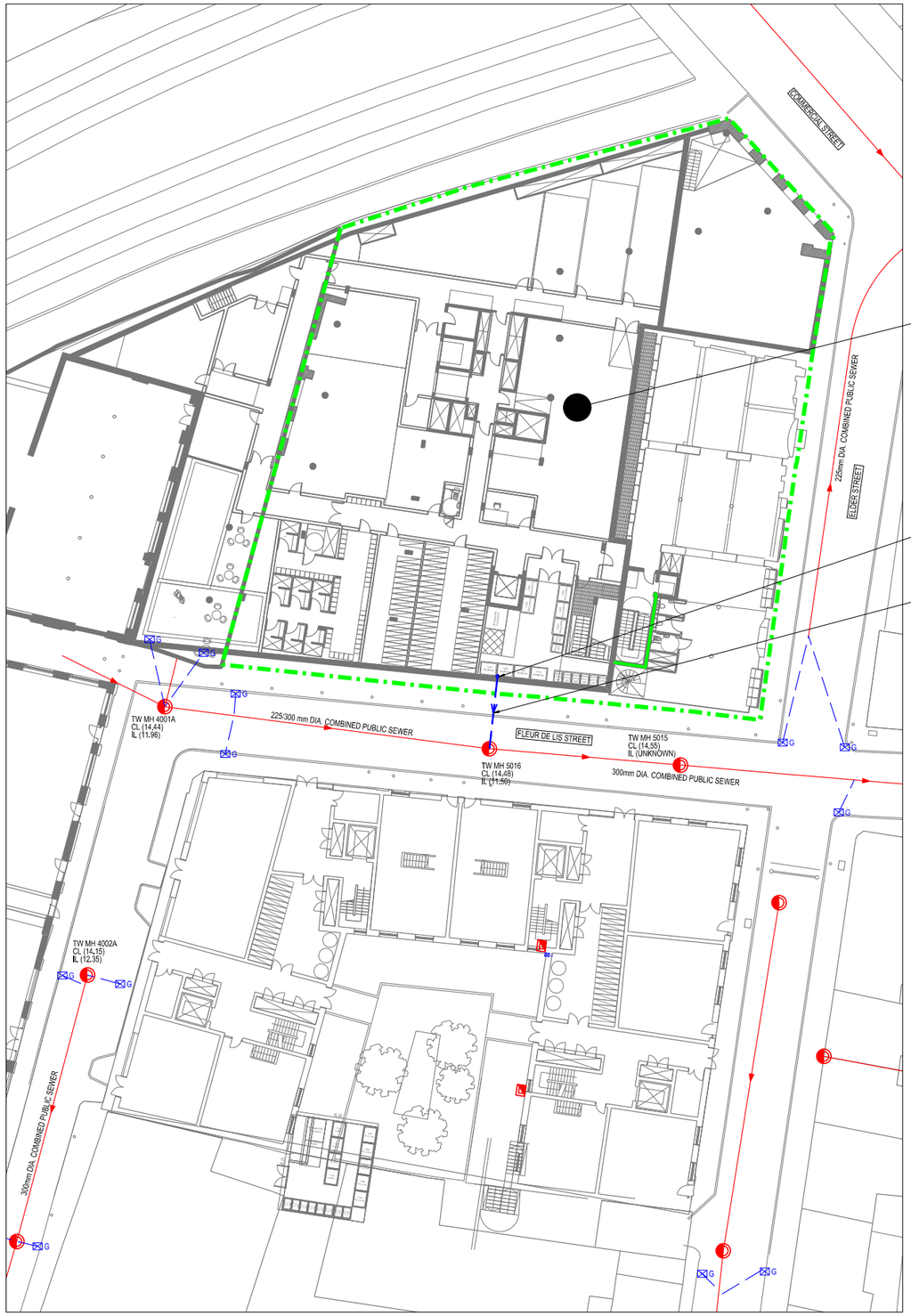
PROJECT No.	DRAWING No.	REVISION
3461	C-SK100	P3

PLOT DATE 28/11/2014 BY $USERNAME$

PRELIMINARY

NOTE:

LOADING BAY/DELIVERY AREAS WILL REQUIRE A PETROL INTERCEPTOR IN ACCORDANCE WITH PPG3 GUIDELINES. LOCATION TO BE CONFIRMED DURING THE NEXT DESIGN STAGE. ALLOW COST CONTINGENCY AT THIS STAGE.



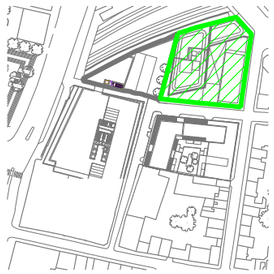
NOTES

1. THE SUDS PORPOSALS SHOWN BELOW ARE INDICATIVE OPTIONS TO BE EVALUATED IN THE NEXT STAGES OF DESIGN DEVELOPMENT.
2. REFER TO LANSCAPE ARCHITECTS DRAWING FOR HARD AND SOFT LANSCAPING PROPOSALS.

LEGEND

- DENOTES SITE BOUNDARY
- G EXISTING ROAD GULLY
- EXISTING THAMES WATER ROAD GULLY CONNECTION
- EXISTING THAMES WATER COMBINED WATER SEWER
- EXISTING THAMES WATER COMBINED WATER MANHOLE
- INDICATIVE PROPOSED SURFACE WATER DRAINAGE

LOCATION PLAN



REV	DATE	DESCRIPTION	BY	CHECKED
P3	28/11/14	PRELIMINARY ISSUE	LK	AGH
P2	18/07/14	PRELIMINARY ISSUE	LK	AGH
P1	10/07/14	PRELIMINARY ISSUE	LK	AGH

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CLIENT: BRITISH LAND

PROJECT: BLOSSOM STREET, E1

TITLE: PRELIMINARY SURFACE WATER SUDS STRATEGY - SITE 2

DRAWN	SCALE	CAD FILENAME
RF	1:200 @ A1	3461-C-SK101.dgn

DATE	CHECKED	STATUS
JULY 2014	MD	PRELIMINARY

PROJECT No.	DRAWING No.	REVISION
3461	C-SK101	P3

PRELIMINARY

PLOT DATE 28/11/2014 BY $USERNAME$

NOTE:

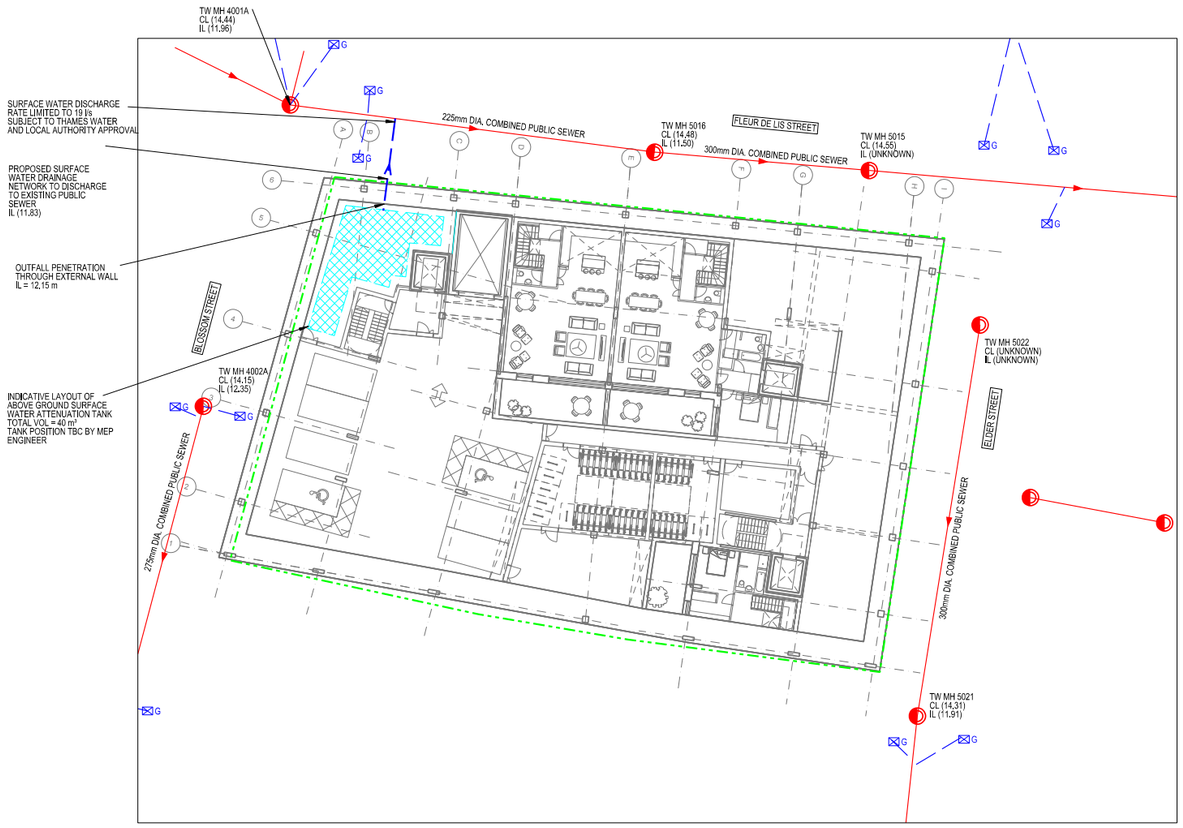
LOADING BAY/DELIVERY AREAS WILL REQUIRE A PETROL INTERCEPTOR IN ACCORDANCE WITH PPG3 GUIDELINES. LOCATION TO BE CONFIRMED DURING THE NEXT DESIGN STAGE. ALLOW COST CONTINGENCY AT THIS STAGE.

NOTES

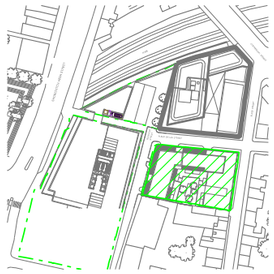
1. THE SUDS PORPOSALS SHOWN BELOW ARE INDICATIVE OPTIONS TO BE EVALUATED IN THE NEXT STAGES OF DESIGN DEVELOPMENT.
2. REFER TO LANSCAPE ARCHITECTS DRAWING FOR HARD AND SOFT LANSCAPING PROPOSALS.

LEGEND

- DENOTES SITE BOUNDARY
- EXISTING ROAD GULLY
- EXISTING ROAD GULLY CONNECTION
- EXISTING THAMES WATER COMBINED WATER SEWER
- EXISTING THAMES WATER COMBINED WATER MANHOLE
- INDICATIVE PROPOSED SURFACE WATER DRAINAGE
- PROPOSED SURFACE WATER ATTENUATION TANK BY MEP ENGINEER
- PROPOSED FLOW CONTROL VALVE BY MEP ENGINEER



LOCATION PLAN



REV	DATE	DESCRIPTION	BY	CHECKED
P3	28/11/14	PRELIMINARY ISSUE	LK	AGH
P2	18/07/14	PRELIMINARY ISSUE	LK	AGH
P1	10/07/14	PRELIMINARY ISSUE	LK	AGH

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CLIENT

BLOSSOM STREET, E1

PROJECT

PRELIMINARY SURFACE WATER SUDS STRATEGY - SITE 3

TITLE

DRAWN	RF	SCALE	1:200 @ A1	CAD FILENAME	3461-C-SK102.dgn
DATE	JULY 2014	CHECKED	MD	STATUS	PRELIMINARY

PROJECT No.	DRAWING No.	REVISION
3461	C-SK102	P3

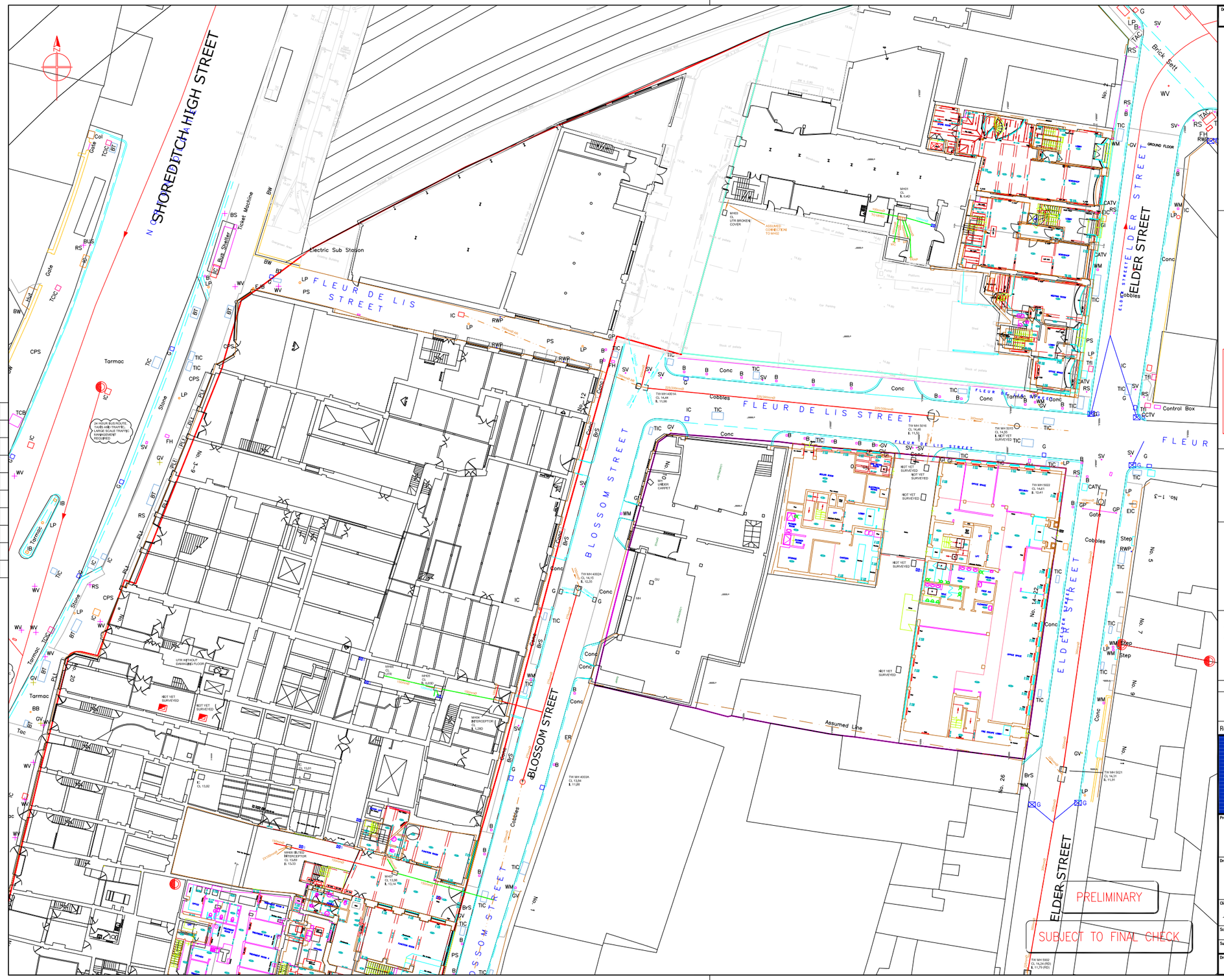
PLOT DATE 28/11/2014 BY $USERNAME$

PRELIMINARY

3461
Blossom Street

Appendix H

CCTV Drainage Investigation



Drawing No. SDS 204067.01 | Revision

SERVICE ABBREVIATIONS

AC	ASSUMED CONNECTION
AR	ASSUMED ROUTE
BD	BACK DROP
CC	CONFIRMED CONNECTION
CD	CHAMBER DEPTH
COW	CABLE ON WALL
CL	COVER LEVEL
CP	CATCH PIT
CB	CABLE RISER
d	DEPTH
(dis)	DISUSED
EOT	END OF TRACE
GU	GULLY
GPR (0.00)	GROUND PENERTRATING RADAR (DEPTH)
IL	INVERT LEVEL
KIG	KERB INLET GULLY
MH	MANHOLE
OHL	OVER HEAD LINE
PI	PETROL INTERCEPTOR
RD	FROM RECORD DRAWINGS
RE	RODDING EYE
SA	SOAKAWAY
UKN	UNKNOWN SERVICE
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RAISE
UTT	UNABLE TO TRACE
UTS	UNABLE TO SURVEY

SERVICE LEGEND

- FOUL WATER DRAINAGE
- SURFACE WATER DRAINAGE
- JETTING REQUIRED
- CCTV COMPLETE
- ELECTRICITY (ELEC)
- TELEPHONE (TEL)
- UNKNOWN SERVICE (UKN)
- OIL (OIL)
- CATV (CATV)
- GPR (GPR)
- UNDERGROUND CHAMBER

CAUTIONARY NOTES

ELECTRO–DETECTION TECHNIQUES HAVE BEEN USED IN THE LOCATION OF UNDERGROUND SERVICES. THE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATIONS MUST BE CARRIED OUT TO CONFIRM SERVICE IDENTIFICATION, POSITIONS AND PARTICULARLY DEPTHS. ALTHOUGH ALL REASONABLE EFFORT HAS BEEN MADE IN SEARCHING AVAILABLE RECORD DRAWINGS, THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED.
INFORMATION OBTAINED BY GPR IS INDICATIVE OF BURIED INFASTRUCTURE THAT MAY NOT BE DETECTABLE BY OTHER MEANS.

Note: Pipe sizes in mm

CCTV NOTES

PIPES ON CCTV REPORT ARE REFERENCED CLOCKWISE FROM THE OUTGOING X PIPE. ENDPONTS WITHIN BUILDINGS ARE INDICATIVE ONLY.

B C D A E X

SHEET LAYOUT

.01 .02

LEVELLING NOTES

ALL LEVELS ARE BASED ON EXISTING SURVEY

A SCALE FACTOR OF 1.000000 HAS BEEN APPLIED TO THIS DRAWING

Rev.	Date	Description	By

SURVEY DESIGN SERVICES and ASSOC. LTD.
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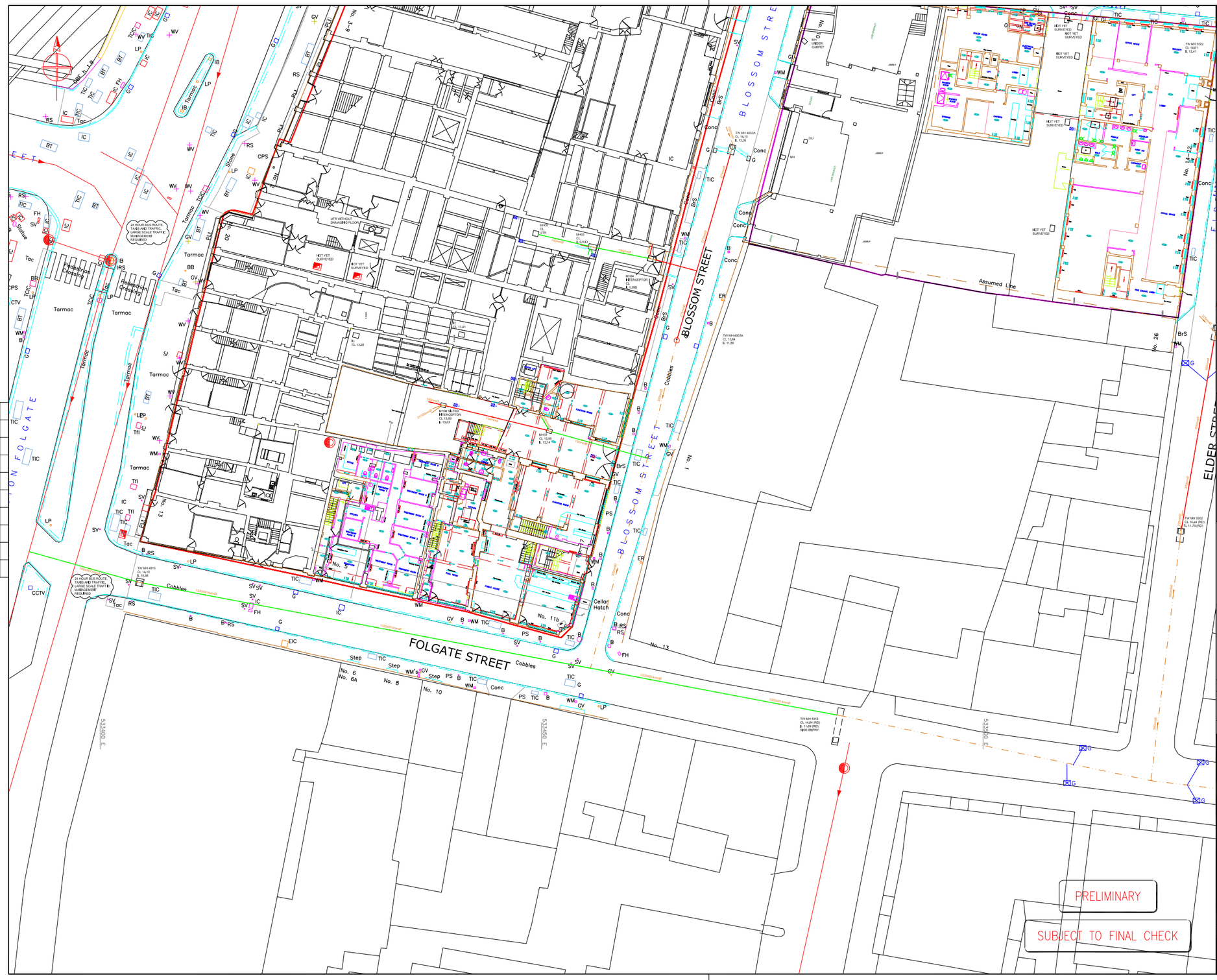
Project title: BLOSSOM ST LONDON

Drawing title: DRAINAGE INVESTIGATION

Client: AKT II

Scales 1:200		Drawn by R.J.W.	Sheet size A1
Surveyed by B.C.	Checked by S.C.F.	Approved by	Date SEP 2014
Drawing No. SDS 204067.01			Revision



Drawing No. SDS 204067.02

Revision

SERVICE ABBREVIATIONS

AC	ASSUMED CONNECTION
AR	ASSUMED ROUTE
BD	BACK DROP
CC	CONFIRMED CONNECTION
CD	CHAMBER DEPTH
COW	CABLE ON WALL
CL	COVER LEVEL
CP	CATCH PIT
CB	CABLE RISER
d	DEPTH
(dis)	DISUSED
EOT	END OF TRACE
GU	GULLY
GPR (0.00)	GROUND PENERTRATING RADAR (DEPTH)
IL	INVERT LEVEL
KIG	KERB INLET GULLY
MH	MANHOLE
OHL	OVER HEAD LINE
PI	PETROL INTERCEPTOR
RD	FROM RECORD DRAWINGS
RE	RODDING EYE
SA	SOAKAWAY
UKN	UNKNOWN SERVICE
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RAISE
UTT	UNABLE TO TRACE
UTS	UNABLE TO SURVEY

SERVICE LEGEND

FOUL WATER DRAINAGE	
SURFACE WATER DRAINAGE	
JETTING REQUIRED	
CCTV COMPLETE	
ELECTRICITY	ELEC
TELEPHONE	TEL
UNKNOWN SERVICE	UKN
OIL	OIL
CATV	CATV
GPR	GPR
UNDERGROUND CHAMBER	

CAUTIONARY NOTES

ELECTRO-DETECTION TECHNIQUES HAVE BEEN USED IN THE LOCATION OF UNDERGROUND SERVICES. THE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATIONS MUST BE CARRIED OUT TO CONFIRM SERVICE IDENTIFICATION, POSITIONS AND PARTICULARLY DEPTHS. ALTHOUGH ALL REASONABLE EFFORT HAS BEEN MADE IN SEARCHING AVAILABLE RECORD DRAWINGS, THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED.
INFORMATION OBTAINED BY GPR IS INDICATIVE OF BURIED INFASTRUCTURE THAT MAY NOT BE DETECTABLE BY OTHER MEANS.

Note: Pipe sizes in mm

CCTV NOTES

PIPES ON CCTV REPORT ARE REFERENCED CLOCKWISE FROM THE OUTGOING X PIPE. ENDPOINTS WITHIN BUILDINGS ARE INDICATIVE ONLY.

B C D A E X

SHEET LAYOUT

.01 .02

LEVELLING NOTES

ALL LEVELS ARE BASED ON EXISTING SURVEY

A SCALE FACTOR OF 1.000000 HAS BEEN APPLIED TO THIS DRAWING

Rev.	Date	Description	By

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Project title
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LONDON

Drawing title
DRAINAGE INVESTIGATION
GROUND LEVEL

Client
AKT II

Scales 1:200		Drawn by R.J.W.	Sheet size A1
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