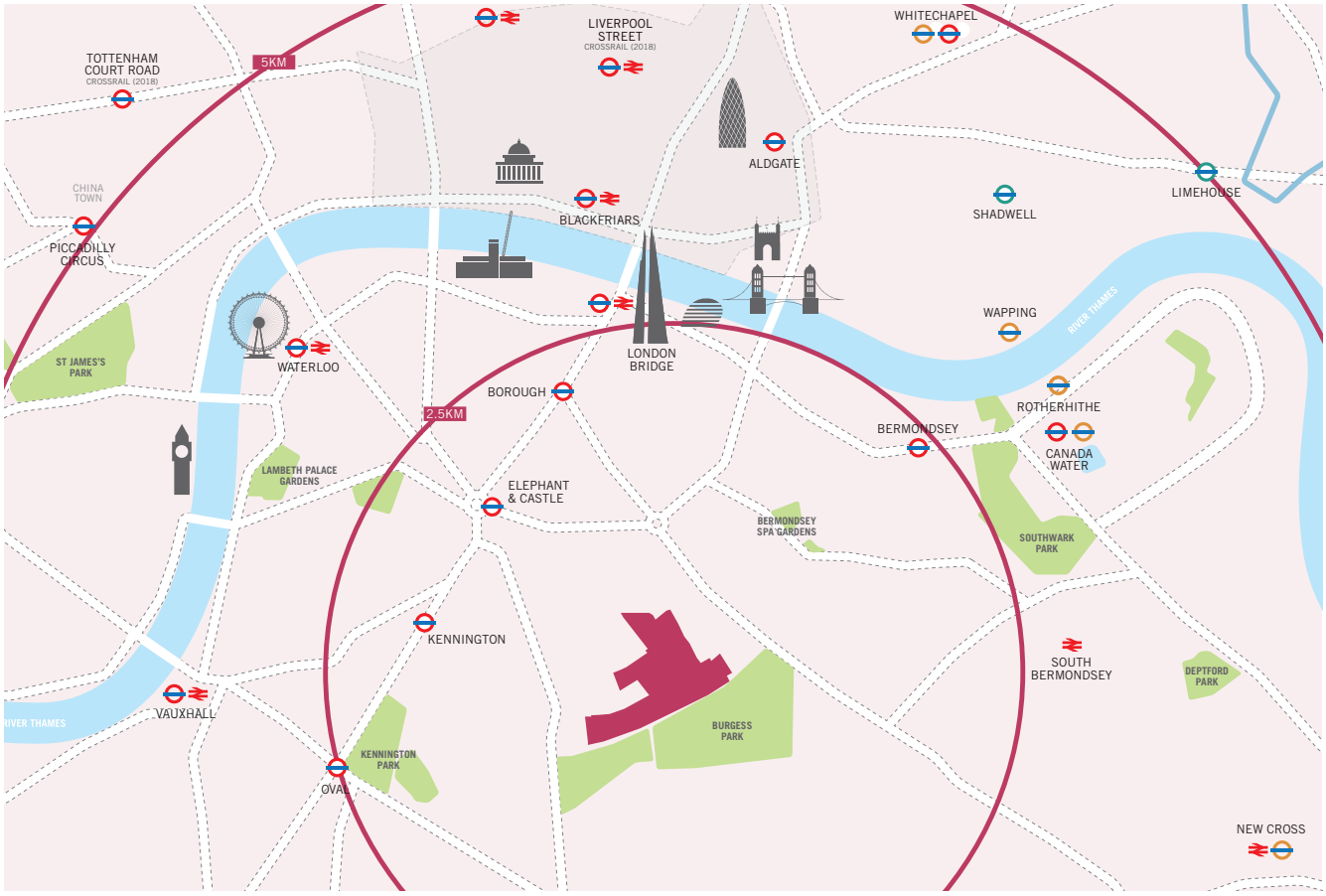

Planning Application for the Aylesbury Estate Regeneration

Masterplan & First Development Site Application

Flood Risk Assessment

WSP

v1

AYLESBURYNOW

Quality Management

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
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FLOOD RISK ASSESSMENT

Aylesbury Estate, Southwark, London

23/09/2014

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Executive Summary

	Item	Comment	Reference
1	Development Description Detailed Application	Up to 815 mixed tenure residential dwellings, and a community centre/retail unit.	Section 2
	Development Description Outline Application	Up to 2,745 mixed tenure residential dwellings, up to 2,500m^2 of employment, 1,050m^2 of pre-school facilities, 1,800m^2 retail floor space, 3,000m^2 healthcare facilities, and community space	Section 2
2	Location	Easting – 532980 Northing – 178053	Section 2
3	Scale of Development	Approx. 26 Ha	Section 2
4	Current Land Use	Predominantly Residential with pockets of open space - Brownfield	Section 2
5	Type of Application	First Development Site – Detailed Application Masterplan – Outline Application	Section 3
6	Planning Status	Identified within the London Borough of Southwark Local Plan, and Aylesbury Estate Area Action Plan.	Section 1
7	EA Flood Zone Classification	Defended Flood Zone 3a	Section 2 & 4
8	EA Modelled Flood Level	N/A	Section 4
9	Site Level	3.75mAOD in the north to 3.0mAODin the south	Section 2
10	Flood Volume Displaced	N/A	Section 9
11	Allowance for Climate Change	Within surface water drainage assessment	Section 6 & 8
12	Impact on Floodplain	N/A	Section 9
13	Safe Access and Egress	Multiple Locations throughout the Comprehensive Development	Section 9
14	Drainage	Proposed traditional gravity fed drainage arrangement supplemented by Sustainable Drainage Systems and offline storage to limit peak discharge to a minimum of 50% less brownfield rates	Section 8 & 9

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1 Introduction

1.1 Appointment and Brief

1.1.1 WSP have been commissioned by the Notting Hill Housing Trust (referred to as the Applicant here in) to provide a Flood Risk Assessment (FRA) for the redevelopment of a brownfield site located to the north of Albany Road in Southwark, London. A site location plan is provided in Appendix A.

1.1.2 The development proposals are to demolish the existing 2,400 residential dwellings at the Aylesbury Estate (the Comprehensive Development) and construct approx. 3,560 new residential dwellings and accompanying employment, healthcare, educational, retail and community facilities. Refer to Appendix B for the proposed site masterplan.

1.1.3 The Comprehensive Development forms the majority of the redevelopment associated with the Aylesbury Area Action Plan (AAAP). Excluded from the Comprehensive Development are Sites 1a and 7; Site 1a has been constructed whilst Site 7 is currently under construction at the time of writing this report. For further details of the AAAP extents refer to Appendix C.

1.1.4 The Applicant has agreed with London Borough of Southwark (LBS) to submit two Planning Applications for the Comprehensive Development. The Applications will remain linked at both submission and at determination, the Applications will be split in line with the AAAP programme as follows:

- First Development Site: Detailed Planning Application for Phase 1, Sites 1b and 1c as defined by the AAAP only; and
- Masteplan: Outline Planning Application for Phases 2, 3 &4 and Site 10 from Phase 1 (as defined by the AAAP).

1.1.5 This FRA has been prepared to accompany both above Planning Applications on behalf of the Applicant. Where the FRA requires it the sections shall be split into 'First Development Site' (FDS) and 'Masterplan Site' subheadings.

1.1.6 The National Planning Policy Framework (NPPF) (2012) within Section 10 "Meeting the challenge of climate change, flooding and costal change" requires a Planning Application to be accompanied by a site specific FRA. This report has been prepared in accordance with NPPF and the supporting document, 'Technical Guidance to the National Planning Policy Framework'.

1.2 Planning Status

1.2.1 In 2010, LBS adopted the AAAP which provides the planning policy context for the regeneration of the Estate. The early phases of the Estate have already been redeveloped or are subject to recent planning permissions (sites 1a & 7 in Appendix C). The Comprehensive Development covers the remaining AAAP area.

1.3 Objective of the Study

1.3.1 This report has been commissioned to identify the likely flooding issues associated with the Comprehensive Development and the surrounding catchment area and the possible constraints that could be imposed on the development.

1.3.2 The emphasis of this report has been geared towards the proposed strategy for controlling surface and foul water discharge from the Comprehensive Development in order to minimise the impact of the development upon flood risk associated with properties and watercourses situated downstream, in accordance with the NPPF.

2 Existing Site

2.1 Site Location

2.1.1 The Comprehensive Development is located in the London Borough of Southwark on the existing Aylesbury Estate site to the north of Burgess Park.

FDS Application

2.1.2 The FDS Application is bounded by Albany Road to the south, Westmoreland Road to the north, Portland Street to the east, and Bradenham Close and the AAAP Site 1a to the west.

Masterplan Site

2.1.3 The Masterplan Site is bounded by Albany Road to the south, Portland Street, Dawes Street and the FDS Application to the west, Alvey Street, Thurlow Street and Bagshot Street to the east and East Street to the north.

2.1.4 A site location plan can be found in Appendix A.

2.1.5 A full topographical survey of the FDS Application can be found in Appendix D alongside the available topographical information for the Masterplan Site.

2.2 Site Description

2.2.1 Table 2.1 describes the general Estate characteristics.

Table 2.1 Characteristics of the site

Area	*Approximately 26 Hectares. The Comprehensive Development is currently a residential development.*	
General Topography	*The Site slopes gently from a maximum of 3.75mAOD in the north to approximately 3m AOD at the southern extreme, over a distance of c.600m. Natural deposits have been recorded at various sites in the wider surrounding area and at varying depths. Natural clays at 0.09m AOD to the east at Albany Road; between 1.86m and 1.90m at the north end and south end of Dunton Road; and -0.30m at 360 Old Kent Road. Sandy-clay gravels were exposed at 0.70m AOD at the Old Kent Road junction with Bowles Road too.*	
Existing Surfacing	*The existing Estate predominantly comprises impermeable surfaces consisting of car parking and built development, there are small pockets of public open space throughout the development.*	
Current Use	*Residential development*	
Boundaries	*North*	*Westmore Road and East Street*
	South	*Albany Road*
	East	*Thurlow Street, Alvey Street and Bagshot Street*
	West	*Bradenham Close and Dawes Street*
Access	*There are multiple pedestrian and vehicular access locations around the Comprehensive Development.*	

2.3 Existing Watercourses

2.3.1 There are no watercourses currently classified, or proposed to be classified, as a main river in the vicinity of the Comprehensive Development. The closest watercourse is the River Thames, an EA Main River, located approximately 1.8km to the north of the site. The watercourse is tidal in nature in this area and outfalls into the Thames estuary.

2.4 Existing Drainage

2.4.1 The Comprehensive Development's surface water currently drains via short lengths of private drainage to external Thames Water Utilities Limited (TWUL) combined systems located within the public highway network.

2.4.2 The internal surface water drainage systems consist of rain water pipes, gullies and gratings discharging into short lengths of private drainage arrangements. These sewer arrangements are either surface water sewers or combined sewers or a combination of both. These private sewers discharge to the TWUL public combined sewers via gravity. There is no known surface water attenuation associated with the Comprehensive Development.

2.4.3 The foul water associated with each application site drains from on-plot foul or combined sewers to the TWUL public combined sewers via gravity.

2.4.4 The FDS Application ultimately discharges the 2134mm internal diameter TWUL sewer that runs west to east on Albany Road. The majority of the Masterplan Site ultimately discharges into the same Albany road sewer, with the exception of areas to the north that discharge to the 1372mm by 914mm culvert running from west to east on East Street.

FDS Application

2.4.5 Within the FDS Application topography survey a 600mm diameter connection to the TWUL sewer in Albany road was identified, the TWUL asset location register (Appendix E) identified this sewer as 'abandoned'. Further on-site inspection by Draincare Ltd in June 2014 identified, through sound testing, that this sewer although abandoned retained existing connectivity with the 2134mm internal diameter TWUL sewer in Albany Road.

2.5 Existing Watermains

2.5.1 The Comprehensive Development is predominantly served by four water mains; a 355mm diameter and 250mm diameter to the south in Albany Road, and a 90mm diameter and 125mm diameter to the north in East Street.

2.5.2 For details of the existing potable water infrastructure refer to Appendix E.

2.6 Existing Land Drainage

2.6.1 The Comprehensive Development is classed as brownfield and is served by existing traditional drainage sewerage systems.

2.6.2 There is no known formal land drainage arrangement associated with the Comprehensive Development. Runoff from the small pockets of open green space throughout the Comprehensive Development is likely to infiltrate into the underlying subsoil and/or convey to formal hardstanding areas that are drained via the existing on site sewerage system.

2.7 Geology

2.7.1 WSP reviewed the British Geological Society mapping of the area and identified the Comprehensive Development to be located on the Kempton Park Gravel, overlying the soil of Lambeth Group which in turn is underlain by Thanet Sand Formation all of which overlays the White Chalk Group. To the south of the Comprehensive Development the Langley Silt Member is identified as overlaying the Kempton Park Gravel Formation.

FDS Application

2.7.2 WSP Environmental completed a Geo-Environmental and Geotechnical Preliminary Risk Assessment (PRA) (Appendix 15.1 of the Aylesbury Estate Environmental Statement) in August 2014. Five boreholes ranging from 15 to 25m below ground level, window sampling, and monitoring wells were undertaken.

2.7.3 The ground conditions encountered:

- Made Ground, maximum depth encountered at 3.7mbgl;
- Langley Silt Member slightly gravelly slightly sandy clay with ferruginous dark pockets. The depths ranged between 1.9m to 4.5m bgl;
- Kempton Park Gravel Formation gravelly sand and sandy clayey gravel with occasional sandy silty clay layers, with depths ranging from 6.0m and 7.0m bgl;
- Lambeth Ground encountered slightly sandy clay and slightly gravelly clayey sand. Depths were from 8.0m to 11.0m bgl;
- Thanet Sand formation encountered dense silty sand from 22.0m to 22.80m bgl; and
- White Chalk group comprised structurless chalk of sandy gravelly clayey silt with flint gravel – weak and low to medium density.

2.7.4 During the investigations groundwater strikes ranged from 4.5m below ground level in the south-east to 7.8m below ground level in the central southern portion of the site.

2.7.5 Seven trial pit locations were attempted within the FDS to ascertain the capacity of infiltration drainage techniques within the site. Of the seven tests only one drained successfully to BRE Digest 365 requirements, this test was located within the proposed West Moreland Park and allowed an infiltration rate of $1*10^{-5}$m/s between 2.1m and 2.8m below ground level.

2.8 Hydrogeology – review PRA

2.8.1 The EA Groundwater Vulnerability map indicates one geological classification across the Comprehensive Development. The Comprehensive Development is shown as being underlain by a minor aquifer (variable permeable). The minor aquifer comprises the Kempton Park Gravels and Thanet Sand formations. These aquifers are described as being important for local supplies and in supplying baseflow to rivers but do not produce large quantities of water.

2.8.2 The EA Groundwater Vulnerability Map classifies the soils underlying the site as soils of high leaching potential.

2.8.3 The EA indicates that the site does not lie within a Groundwater Protection Zone.

2.8.4 There are no recorded groundwater abstraction sites within the Comprehensive Development boundary. There are 8 recorded abstraction sites within 2 km of the sites, the nearest being approx. 210m north of the site where groundwater is extracted for non-evaporative cooling process amongst other uses.

2.8.5 There are no pollution incident register entries within the Comprehensive Development boundary. There is one entry recorded within 500m, it was a 'significant' incident to the south in Burgess Park which was recorded as having a significant impact to water in August 2007.

2.9 EA Flood Zone Mapping

2.9.1 From review of the London Borough of Southwark Strategic Flood Risk Assessment (SFRA) 2008 and SFRA Appendix 2, and EA Flood Zone Mapping both application sites lie wholly within defended Flood Zone 3a. This zone comprises land assessed as having a less than 1 in 200 annual probability of tidal flooding (<0.5%). The indicative Flood Maps provided by the EA and SFRA ignore the presence of the significant flood defences along the River Thames and the operation of the Thames Barrier, see Appendix F for SFRA mapping and Appendix G for EA mapping.

2.10 Historical Flood Records

2.10.1 The EA, SFRA nor the London Borough of Southwark Surface Water Management Plan (SWMP) 2011 hold any historical flood records for either application site. The SFRA does identify a number of local historical events within Southwark:

- Fluvial flooding of the southern bank of the River Thames to the north of the site in January 1928;
- Surface water flooding in April 2004 to the south of the site in Dulwich due to a rainfall event of reported probability less than 0.3% in any year; and
- TWUL have noted that prior to the completion of the Coldharbour Lane project in 2008 a number of properties were at risk of combined sewer overload flooding. The SFRA identifies localised incidents to the north of the site and that the area to the east of the site experienced at least 10 sewer flooding incidents between 1998 and 2008.

2.10.2 Refer to Appendix H for SWMP appendices that identify ground water and surface water historical flood incidents out with the Comprehensive Development.

2.11 Flood Defences

2.11.1 Correspondence from the EA indicate that the defences along the River Thames to the north of the Comprehensive Development are designed to defend up to a 1 in 1000 year flood event, the defences are all raised, man-made and privately owned but regularly inspected by the EA. The defences are at a level of 5.41mAODN on both banks and are rated by the EA as 'Grade 2 - Good'.

2.11.2 The Comprehensive Development is situated west of the Thames Barrier, which offers protection from tidal surge events.

2.11.3 There are no other known flood defences within the vicinity of the Comprehensive Development.

3 Proposed Development

3.1 Description – What type of development is proposed and where will it be located within the overall site?

3.1.1 The FDS Application and Masterplan Site illustrative scheme layout can be viewed in Appendix B.

FDS Application

3.1.2 The FDS Application for AAAP Site 1b and 1c is located on the western edge of the proposed Estate and will provide:

- Up to 815 mixed tenure new homes;
- An extra care facility/learning disability facility; and
- A community facility / early years facility / gym

Masterplan Site

3.1.3 The Masterplan Site forms the remainder of the Comprehensive Development and will broadly comprise:

- Approximately 2,745 mixed tenure new homes;
- Up to 2,500m^2 of Employment;
- Up to 3,000m^2 of retail or workspace; and
- Up to 500m^2 of retail floor space;
- Up to 4,750m^2 of health / community / early years facilities; and
- Provision of an energy centre.

3.2 Is the proposed development new, extension or change of use?

3.2.1 The proposed residential development will replace, in part, the existing residential estate and is therefore not considered as a change of land use.

3.3 What is its vulnerability classification?

3.3.1 According to the NPPF, development located in tidal Flood Zone 3a is deemed appropriate for 'Less Vulnerable' land uses such as commercial and retail uses, with 'More Vulnerable' land uses such as residential developments required to pass the exception test (see Section 3.5 of this report).

Table 3.1 - Table 3 of the NPPF Technical Guidance.

Flood Risk Vulnerability classification (see Table 2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (See Table 1)	**Zone 1**	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	X	Exception Test required	✔
	Zone 3b 'Functional Floodplain'	Exception Test required	✔	X	X	X

✔ Development is appropriate

X Development should not be permitted

3.4 Is the proposed development consistent with the local development documents?

The London Plan (2011) and Supplementary Planning Guidance (2014)

3.4.1 In July 2011 the Mayor of London published the replacement of the spatial development strategy for London, known as the London Plan. The London Plan is the overall strategic plan for London and sets out a fully integrated economic, transport, social and environmental framework for the development of the capital to 2031. Chapter 5 of the London Plan identifies London's response to climate change, the following policies are relevant:

- Policy 5.3 Sustainable design principles: 'efficient use of natural resources (including water)' and 'avoiding impacts from natural hazards (including flooding)';
- Policy 5.11 'Major development proposals should be designed to include roof, wall and site planting, especially green roofs and walls where feasible' to help in delivering 'adaption to climate change' and 'sustainable urban drainage';
- Policy 5.12 'Development proposals must comply with the flood risk assessment and management requirements set out in PPS25'; and
- Policy 5.13 'Developments should utilise sustainable urban drainage systems…and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible'.

3.4.2 Titled '*Sustainable Design and Construction'*, the London Plan Supplementary Planning Guidance was published in April 2014. This document was published to support developers, local planning authorities and neighbourhoods in achieving sustainable development. It provides guidance on how to achieve the London Plan policies. Relevant extracts for this chapter are:

- 3.4.2 – It is important to incorporate sustainable drainage in all developments to prevent the increasing volume of surface water runoff;
- 3.4.8 – Attenuation should be provided to a minimum of 50% of the brownfield surface water runoff at peak times; and
- 3.4.10 – Aspirational runoff rates for greenfield sites are greenfield runoff rates and for previously developed sites is three times greenfield rates.

London Borough of Southwark Strategic Flood Risk Assessment 2008

3.4.3 The London Borough of Southwark (LBS) level 1 Strategic Flood Risk Assessment (SFRA) provides an assessment of all types of flood risk to inform and use in planning decisions. The SFRA enables the Local Planning Authority (LPA) to: apply the Sequential Test; allocate appropriate sites for development; identify opportunities for reducing flood risk; and carefully consider the implications of climate change.

3.4.4 The SRFA identifies and supports the LBS development framework policies including the core strategy and the wider London Plan and Supplementary Planning Guidance.

Southwark Plan 2007

3.4.5 The Southwark Plan was adopted in July 2007. It provides a framework for all land use and development in LBS. The remaining relevant policy from the Southwark Plan with regard to hydrology and flood risk is:

- Policy 3.9 Water 'new developments must use preventative measures to ensure that they do not lead to a reduction in water quality' and 'new developments should not result in an increase in surface water run-off'.

Southwark Core Strategy 2011

3.4.6 Southwark Borough Council adopted the Core strategy in April 2011. The strategy sets the outline for the overall direction of development within the borough. The Aylesbury Area Action Plan is referenced within the Core Strategy and takes lead from the direction set out within this document. The Core Strategy identifies that planning decisions will be made with reference to the London plan and the below applicable strategic policies:

- Strategic Policy 1 – Sustainable Development - Development will improve the places we live and work in and enable a better quality of life for Southwark's diverse population. It will help meet the needs of a growing population in a way that respects the limits of the planet's resources and protects the environment.
- Strategic Policy 13 – High environmental standards - Development will help us live and work in a way that respects the limits of the planet's natural resources, reduces pollution and damage to the environment and helps us adapt to climate change

Southwark Surface Water Management Plan

3.4.7 A Surface Water Management Plan (SWMP) is a study to understand the flood risks that arises from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from surface runoff, groundwater, and ordinary watercourses.

3.4.8 The purpose of a SWMP is to identify what the local flood risk issues are, their effects and what options there may be to manage them. These options are presented in an Action Plan which lists the partners who are responsible for taking the options forward. Although the SWMP provides a full flood history for the study area, which may include coastal and fluvial flood sources, the action plan only proposes measures to manage local flooding. The Action Plan is agreed by partners and reviewed periodically.

Aylesbury Area Action Plan 2010

3.4.9 The Aylesbury Area Action Plan was provided for examination in public in September 2009 and later adopted by the council in January 2010. The plan provides a blueprint for the ambitious redevelopment of the area over the following 20 years.

3.4.10 The plan provides the below direction in terms of hydrology, drainage and flood risk:

- Individual homes to achieve Code for Sustainable Homes level four;
- Provision of green open spaces to aid in water management;
- Sixteen development objectives are identified for the scheme which include: 'encourage sustainable use of water resources', 'maintain and enhance the quality of water', and 'to reduce vulnerability to flooding'; and
- Promotion of the use of SuDS.

The Comprehensive Development's consistency with Local Policy

3.4.11 The Comprehensive Development aspires to provide SuDS where feasible and attenuation of surface waters to a minimum of 50% brownfield surface water runoff at peak times. Discharge rates across the Comprehensive Development will be restricted to the agreed rates with TWUL. For further information on proposed surface water discharge rates and SuDS refer to Section 8 of this report.

3.4.12 It is considered that the development proposals broadly meet the above development control policies and guidance for the requirements of flood risk and drainage.

3.5 Please provide evidence that the sequential test and where necessary the exception test has been applied in the selection of this site for this type of development.

Sequential Test

3.5.1 As the Comprehensive Development is identified within the adopted AAAP it is deemed to have passed the Sequential Test.

Exception Test

3.5.2 The Comprehensive Development is identified within the SFRA and referenced as an area of deprivation when measured against a range of indicators including quality of environment, pollution and health. For this reason the Comprehensive Development is recognised by LBS as a '*key'* regeneration area to provide '*more and better quality homes, improved access to employment and public services and improved quality of the environment*'.

3.5.3 As such the Aylesbury AAAP was prepared and subsequently adopted to provide a framework by which the area will be developed over the coming years.

3.5.4 LBS via their Core Strategy, SFRA and production of the AAAP have provided the required evidence that the Comprehensive Development will install overall betterment to the area. As such Part A of the exception test ('*demonstrate that the development provides wider sustainable benefits'*) is deemed to be achieved. This FRA will provide the evidence to conclude Part B of the exception test ('*site specific flood risk assessment must demonstrate the development will be safe for its lifetime….without increasing flood risk elsewhere'*).

4 Sources of Flood Risk

4.1.1 What sources of flooding could affect the site?

Table 4.1 - Likely Flooding Sources

SOURCE	LIKELIHOOD – Very Likely, Possible, Insignificant
Fluvial	insignificant
Coastal - Sea	N/A
Coastal - Estuarine	N/A
Pluvial / sheet run off	Insignificant
Sewer - SWS, FWS, CS, CSO	Insignificant
Groundwater	Insignificant
Dam breach	N/A
Canal	N/A
Other sources	N/A

4.2 For each identified source describe how flooding would occur, with reference to any historic records where these are available.

Fluvial and Tidal Flooding

4.2.1 The Comprehensive Development is located within defended tidal Flood Zone 3a as identified by the EA and SFRA. The River Thames flood defences provide adequate defence against flooding up to a level of 5.41m AOD, according to EA data this protects against events up to and including the 1 in 1000 year flood event. As such the direct impact of fluvial flooding can be considered negligible, however the main risk to the Comprehensive Development is a residual risk resulting from a breach/overtopping of flood defences.

4.2.2 The LBS SFRA shows the site being subject to breached flood waters and identified that the site lies within the 6 to 12 hour inundation zone. During consultation with LBS it was recommended that due to the strategic nature of the mapping further investigation into the impact of breached flood waters should be undertaken.

4.2.3 The EA assessed nine strategic breach/overtopping locations along the reach of the Thames applicable to the Comprehensive Development. The EA has confirmed that none of the nine modelled breach/overtopping locations would individually inundate the Comprehensive Development, see Appendix Gfor EA correspondence.

4.2.4 The 2008 SFRA model data is strategic in nature and is considered to be superseded for the purposes of assessment in light of the 2011-2012 Halcrow Studies upon which the EA site specific breach analysis assessment is based. It is therefore concluded that the residual risk of flooding, for the Comprehensive Development, from a breach/overtopping of flood defences is negligible.

Pluvial/Sheet Flooding

4.2.5 From review of LBS SWMP mapping there has previously been no recorded incidents of surface water flooding within the Comprehensive Development (see Appendix H). The SFRA identifies a number of overland flow routes that generally travel through the Comprehensive Development from the north west to the lake that is located to the south of the Comprehensive Development in Burgess Park.

4.2.6 Since the SFRA was published the EA surface water flood risk mapping has been made available. This mapping is considered to be the most accurate and up to date source of data for assessment purposes. The EA data identifies that surface water flow routes through the Comprehensive Development are along the existing highway network

4.2.7 There is a small localised area identified as at risk of surface water flooding on the southern boundary of the FDS Application. The area is currently occupied by a slightly sunken concrete basketball court.

4.2.8 In addition the FDS Application could be subject to overland flow routes from the north west (Westmoreland Road and beyond) of the FDS Application boundary. During pluvial flooding from this source the flood waters are identified as routed along Westmoreland Road to the north of the FDS Application, and Bradenham Close to the west of the FDS Application.

4.2.9 The primary highway network within the Comprehensive Development will remain post development and in conjunction with strategic setting of finished floor and ground levels post development the flood risk from pluvial/sheet flooding is considered insignificant, refer to Section 8 and 9 for details.

Sewers

4.2.10 The majority of onsite sewers within the Comprehensive Development are to be replaced during the redevelopment. The strategic outfall locations and sewers within Albany Road, Portland Street, East Street and Thurlow Street will be retained. Due to the urbanised location of the Comprehensive Development and the local topography the Comprehensive Development could be susceptible to localised flooding from the retained sewers. If flooding of these sewers were to occur within the Comprehensive Development the flood event would be conveyed along the existing public highway network. Furthermore in conjunction with strategic setting of finished floor and ground levels post development the flood risk from sewer flooding is considered insignificant.

Groundwater

4.2.11 Based upon the results from the FDS Application WSP Environmental PRA Investigation works groundwater flooding is not considered an issue. Further works will need to be carried out to confirm the ground water levels remain consistent across the Masterplan Site.

Water Mains

4.2.12 The location of the water mains throughout the site could provide localised flood risk if the water mains are not maintained properly.

4.2.13 There are no historical records of flooding from water mains for the site.

4.2.14 If existing mains within the highway do burst, flood waters will flow down the existing highway network away from the site as per above pluvial/sheet/sewer flooding risk. Furthermore in conjunction with strategic setting of finished floor and ground levels post development the flood risk from water main flooding is considered insignificant.

5 Probability

5.1 Which flood zone is the site in?

5.1.1 The Site is located within tidal Flood Zones 3a as indicated within the EA flood risk mapping. This mapping does not take into consideration flood defences.

5.2 If there is a Strategic Flood Risk Assessment covering this site, what does it show?

5.2.1 A Level 1 Strategic Flood Risk Assessment was prepared in February 2008 by Jacobs on behalf of LBS.

5.2.2 The SFRA identifies that the Comprehensive Development lies within Flood Zone 3a and is in an area susceptible to breached floodwaters. It is considered superseded by the EA Comprehensive Development specific assessment (correspondence attached in Appendix G).

5.2.3 The SFRA does not identify any historic flooding from any source within the Comprehensive Development.

5.2.4 The SFRA refers to the AAAP in respect to how the area will be developed.

5.3 What is the probability of this site flooding taken into account the contents of the SFRA and any further site specific assessment?

5.3.1 The primary identified source of flooding within the SFRA and EA mapping is tidal flood risk. As stated above the Comprehensive Development is considered defended up to and including a 1 in 1000 year flood event by river bank defences and the downstream Thames Barrier. The EA have assessed the Comprehensive Development in relation to nine individual breach locations, this assessment has been based on the 2011/12 Halcrow assessment. The modelling data identifies that the site is not subject tidal flood water from any of the nine modelled breach locations as such the risk of flooding from tidal flood sources is considered insignificant ; refer to Sections 2 and 4 for further details.

5.3.2 From the information available at the time of writing this report and in conjunction with strategic setting of finished floor and ground levels post development the flood risk to people or property within the Comprehensive Development is considered insignificant.

5.4 What are the existing rates and volumes of run-off generated by the site?

5.4.1 The Comprehensive Development is currently a residential development with associated pockets of open space.

5.4.2 TWUL are currently preparing a Capacity Impact Assessment (CIA) for the Comprehensive Development in order to provide allowable discharge rates per plot associated with each Application (for plot references refer to proposed drainage strategies in Appendix C). The CIA is not due to be completed until December 2014 and TWUL have agreed to condition each application in respect to discharge rates for the purposes of planning. In light of this an interim methodology for calculating discharge rates has been proposed.

5.4.3 From discussions with the emerging LBS SuDS Approval Body (SAB) and EA it was agreed that is was not considered practicable to calculate discharge rates for the Comprehensive Development using Greenfield methodology, therefore it was agreed that the interim assessment should be based upon the Wallingford Modified Rational Method procedure for a 15 minute 2 year rainfall event. Once the results of the CIA are received and rates are less than those quoted within this report these results will take president. Refer to Appendix I & J for details.

5.4.4 The proposed development surface water discharge rates also take into account London Plan requirements and where applicable additional adjustments for increases in foul flow. For further details refer to Section 8.

FDS Application

5.4.5 An existing drainage connectivity survey was undertaken for the FDS Application. In summary the site has six discharge locations to the TWUL combined sewers;

- 450mm ø to Bradenham Close (NW);
- 225mm ø to Portland Street (NE);
- 450mm ø to Portland Street (SE);and
- 300mm ø to Bradenham Close (SW);
- 225mm ø to Portland Street (E);
- 600mm ø to Albany Road (S).

5.4.6 Appendix K identifies the existing discharge locations and existing impermeable area assessment.

5.4.7 All 6 discharge location ultimately discharge into the 2134mm diameter strategic TWUL combined sewer in Albany Road. As such the site has been assessed as one catchment of approximately 2.55 Ha of impermeable area (Appendix K). The Wallingford Procedure's Modified Rational Method was utilised to calculate the existing discharge rate for the brownfield site, calculations are available in Appendix I.

Table 5.1 FDS Application existing brownfield surface water runoff rates as per Wallingford Procedure's Modified Rational Method of calculation.

Return Period (years)	Peak Brownfield Discharge Rate (l/s)
	15 min Storm Duration
2	328 l/s

5.4.8 The existing run-off volume for the catchment has been calculated as 1607m^3. Refer to Appendix L for details.

Masterplan Site

5.4.9 At the time of writing this report only basic topographic information is available for the Masterplan Site i.e. the surrounding strategic highway network. Therefore the existing impermeable area and subsequent volumes cannot be quantified at this stage, therefore for the purposes of this assessment the proposed impermeable areas have been applied. Once further topographical details of the Masterplan Site become available during the later stages of design further assessment based upon the FDS Application approach will be undertaken where necessary.

5.4.10 A review of the drainage viability of proposed plot (and block) phasing plan was carried out. The below catchments and impermeable areas were assessed as per the FDS Application philosophy for the 2 year 15 minute Wallingford Procedure Modified Rational Method.

Table 5.2 Masterplan Site existing brownfield surface water runoff rates as per the 2 year 15 minutes Wallingford Procedure's Modified Rational Method of calculation.

Peak Brownfield Discharge Rate		
Blocks included in Catchment (as per Appendix J)	Impermeable Area Assessed (Ha)	2 year 15 minute Discharge Rate (l/s)
4	1.132	145
5	1.113	143
6	1.102	142
7	0.782	100
8a to 9b	1.323	170
9c to 10	1.043	134
11a	0.509	65
12	1.040	134
11b & 13 & 15b	2.280	293
14	1.276	404
15a	0.452	58
16a	0.510	66
16b	0.491	63
17a & 17b	0.688	88
17c	0.654	84

6 Climate Change

6.1 Development lifespan

6.1.1 Based on a typical lifespan for this type of development of 100 years for residential the highlighted allowances for climate change as set out in Table 5 of NPPF Technical Guidance below have been adopted for the Surface Water Drainage Design.

Table 6.1 - Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights as per NPPF.

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%		+20%	
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

6.2 How is flood risk at the site likely to be affected by climate change?

6.2.1 The quantification of the effects of climate change is included in sections 8 and 9 below.

7 Detailed Development Proposals

7.1 Development layout proposals and drawings

7.1.1 The proposed site masterplan can be found in Appendix B.

7.1.2 The land use and vulnerability for the Proposed Development land uses is established in Section 3 of this report.

8 Surface Water and SuDS Drainage Strategy

8.1 General Principles and Design Considerations

8.1.1 The proposed Estate drainage strategy is designed not to exacerbate any existing flood risk associated with properties situated upstream, or downstream, of the site in accordance with principles set out within the NPPF.

8.1.2 SuDS will be implemented throughout the Comprehensive Development. The level of SuDS provision within the Masterplan Site will be confirmed during the detailed design stages however each plot will follow the SuDS/drainage principles set out within the FDS Application to ensure commitment to SuDS provision and to demonstrate consistency across the whole of the Comprehensive Development.

8.1.3 The proposed development drainage arrangement for the Comprehensive Development will comprise of a traditional drainage network that will be supplemented, where appropriate, with SuDS devices to provide source control, water quality treatment and bio diversity enhancement. The piped drainage networks (foul and surface water) will be designed to Sewers for Adoption standards and is intended to be offered for adoption to TWUL under Section 104 of the Water Industry Act.

8.1.4 In light of the information available at the time of writing this report only one of XX trial pits within the FDS conformed to BRE Digest 365 requirements. The conforming test was located within the proposed West Moreland Park area, due to the landscaped nature and proposed planting this area is not suitable for infiltration SuDS. None of the remaining tested locations within the FDS provide infiltration opportunities as results are not compliant with BRE Digest 365.

8.1.5 As and when the Masterplan Site advances intrusive infiltration testing in accordance with BRE Digest 365 will be carried out to determine the viability of infiltration drainage techniques.

8.1.6 In light of the information available at the time of writing this report infiltration techniques have not been considered further as part of the Comprehensive Development SuDS and surface water drainage strategy.

8.1.7 It is intended that all the SuDS located within the communal areas will form an adoption agreement between the Applicant and a third party management and maintenance company. Any SuDS within the public highway namely the geo-cellular soil vault assembly is proposed to be adopted by LBS Highways. The proposed maintenance regimes for the devices will be based upon CIRIA C697 'The SuDS Manual' guidelines and where applicable manufacturers recommendations. Proposed adoption agreements between the Applicant and the third party company will be based upon the CIRIA ICoP MA2 SuDS Maintenance Framework Agreement. Refer to contract template in Appendix M for details.

8.1.8 The drainage arrangements across the Comprehensive Development, where appropriate will incorporate suitable pollution control measures such as trapped gullies, catchpit manholes and a Class 1 petrol interceptors.

8.1.9 Where practicable it is the intention to utilise existing connections into the TWUL combined sewer network. The proposed foul and surface water drainage networks will remain separate and will only combined prior to connection into the existing TWUL combined sewer.

8.2 Proposed Site Sustainable Drainage Systems

FDS Application

8.2.1 A SuDS hierarchy (seen below in Table 8.1) has been followed in applying the use of sustainable drainage techniques within the FDS Application in line with the London Plan.

Table 8.1 SuDS feasibility study for development site

SUDS Technique	Can they be feasibly incorporated into the site?	Reason
Green Roofs	✓	On podium decks within Plots 1 and 2 there will be provision of intensive green roofing. Extensive green roof provision will be provided as per the drainage strategy in Appendix N. The green roofs will provide an element of source control and inception storage as well as biodiversity enhancement
Basins and Ponds	X	Due to limited open space open features cannot be included.
Filter Strips, Swales and Bio-Retention	✓	Small localised bio-retention areas will be provided to provide source control, water quality and biodiversity enhancement. Space limitations exclude the use of swales.
Infiltration techniques	X	The singular compliant BRE Digest 365 test is not situated in an area where infiltration SuDS can feasibly be employed. None of the further test complied with BRE Digest 365 standards and therefore Infiltration SuDS will not be considered further.
Permeable surfaces and tree pits	X/✓	Permeable paving has not been proposed due to highway adoption issues, however substantial tree pit and geo-cellular soil vault assembly provision has been allocated within Plots 1, 2 and 3 adding an element of source control and water quality enhancement for runoff associated with highways and hard standing areas
Rainwater Harvesting	X/✓	Rainwater butts will be Provided for the areas of terrace housing. Full rainwater harvesting will not be incorporated
Tanked Systems	✓	Currently proposed to incorporate 850m^3 of tanked storage onsite for proposed surface water attenuation.

Masterplan Site

8.2.2 The level of additional SuDS provision within the Masterplan Site (Plots 4 to 18) will be confirmed during the detailed design stages however each plot will follow the SuDS/drainage principles set out within the FDS Application to ensure commitment to SuDS provision and to demonstrate consistency across the whole Estate.

8.2.3 In addition during the detailed design of the Masterplan Site there will be further consideration given to the viability of both rainwater harvesting and permeable paving SuDS devices.

8.2.4 As and when the Masterplan Site advances intrusive infiltration testing in accordance with BRE Digest 365 will be carried out to determine the viability of infiltration drainage techniques.

8.3 Proposed Surface Water Drainage Arrangements, Rates, Volumes and Outfall Details

8.3.1 The proposed discharge rates for the Comprehensive Development are to be confirmed by TWUL following completion of the CIA. The below interim surface water discharge rate methodology is based upon the Wallingford Procedure and has been agreed in principle with LBS and EA.

8.3.2 The drainage strategy for the Masterplan Site will be follow the principles identified within the below FDS Application strategy.

FDS Application

Volumetric Mitigation

8.3.3 Two catchments are proposed to cover the FDS Application, refer to Appendix O for catchment details:

- Plots 1,2 and a section of terraced housing to the north of Plot 3 will form the primary catchment; and
- The remaining area of Plot 3 forms the secondary catchment.

8.3.4 The existing and proposed impermeable areas discharging to TWUL sewers has been calculated as:

- 2.55 Ha Existing; and
- 3.21Ha (not including green roofs) Proposed.

8.3.5 The above demonstrates that, unmitigated there will an increase of 0.66 Ha, which equates to an increase in volume of 416m^3 for the 100 year 6 hour event. The proposed green roofs within the FDS Application will provide inception and long term storage benefits. Based upon the likely extensive green roof build-up in conjunction with data set out within CIRIA C644 Table 10.1 the incorporation of green roofs provide an equivalent impermeability reduction of 0.19 Ha or 120m^3, bringing the additional volumetric run-off down to 296m^3 as per calculations attached in Appendix P.

8.3.6 Further volumetric mitigation is provided by restricting off site surface water flows to less than the existing two year event, details of which are provided below. The approach set out within this report follows the principles of volumetric excess mitigation as outlined within the Code for Sustainable Homes, BS 8582-13 and Defra Document W5-074; Preliminary Rainfall Runoff Management for Developments.

Proposed Surface Water Discharge Rates

8.3.7 The proposed discharge rate for the FDS Application has been limited to provide a 65% betterment on existing peak 1 in 2 year brownfield discharge rates (identified in Section 5 of this report) once peak foul flow adjustments have been considered and equates to a rate of 111 l/s. This provides 15% betterment over minimum London Plan requirements. This approach is in accordance with LBS SAB and EA aspiration. For calculation methodology refer to Appendix I.

Proposed Surface Water Attenuation Volumes

8.3.8 The calculated surface water discharge rate was subsequently broken down on a pro-rata basis for catchment purposes as per Table 8.2 below.

8.3.9 A hydraulic model was undertaken within WinDES in order to size the drainage network to adoptable standards and assess the required surface water storage requirements for critical 1 in 100 year plus 30% allowance for climate change rainfall event. The required storage volumes will be provided by below slab off-line storage tanks as identified within the drainage strategy in Appendix N. The storage volumes and discharge rates per catchment are identified below:

Table 8.2 – Proposed catchment attenuation facility requirements

Catchment	Required Tank Storage (to be confirmed following agreed discharge rates with TWUL)	Outflow (to be confirmed following TWUL capacity impact assessment)
Plots 1, 2 and north of 3	500 m^3	80.0 l/s
Remainder of Plot 3	350 m^3	30.8 l/s

8.3.10 For details on the calculation methodology refer to Appendix Q.

Proposed Surface Water Exceedance

8.3.11 The hydraulic model includes the provision of extensive green roofs. The provision of the green roofs provides inception storage and source control, in particular for the short storm durations which tend to cause sewer related flooding. As a result of the green roofs, exceedance flooding associated with the drainage network for the critical 1 in 100 year plus 30% allowance for climate change rainfall event has, in the main, been eliminated. The two areas subject to minimal exceedance flooding (approximately 3m^3 each during the 1 in 100 year plus climate change rainfall event) are:

- The proposed manhole on the east end of East West Street; and
- The proposed sewer run in the rear garden of the north east terraced houses.

8.3.12 In both cases excess water will be diverted to proposed permeable areas, the exceedance to the west of East West Street will be directed to local geo-cellular soil vault assembly and planted areas. The exceedance within the terraced housing back gardens will be retained within the gardens via landscaping. Refer to external level/exceedance plan within Appendix R for details.

Proposed Surface Water Drainage Description

8.3.13 As identified within the drainage strategy the FDS Application will utilise a traditional drainage network supplemented by various SuDS devices (identified in Section 8.2 above) to provide source control, water quality treatment and bio diversity enhancement.

8.3.14 Surface water run-off from:

- Roofs and green roofs will be conveyed via traditional methods (rain water down pipes) to surface water sewers;
- Highways and pavements where applicable will be directed to geo-cellular soil vault assembly provisions across the site prior to entry into the traditional surface water sewer network. Where geo-cellular soil vault assembly is not accessible highways and pavements will be drained via gullies to the surface water network; and
- Hard standing and paved areas will be conveyed to a combination of traditional drainage locations and bio-retention areas.

Proposed Surface Water Outfalls

8.3.15 The proposed discharge locations for both catchments are:

- The primary catchment (Plots 1, 2 and northern part of 3) will utilise the existing 600mm diameter connection to the south of the site that connects directly into the strategic 2134mm internal diameter TWUL sewer in Albany Road. The 600mm sewer is identified within the TWUL asset location plan (Appendix E) as abandoned, further onsite inspections have identified that although abandoned the sewer is still intact and has existing connectivity to the strategic sewer in Albany Road; and

- The secondary catchment (remainder of Plot 3) will utilise the existing 450mm diameter TWUL sewer to the south east of the site which connects into the 900mm diameter TWUL sewer in Portland Street.

Masterplan Site

Volumetric Mitigation

8.3.16 Volumetric mitigation requirements cannot be quantified at this stage however any mitigation will be provided by the introduction of green roofs and other SuDS devices in conjunction with restricting off site surface water flows to less than the existing two year event. This approach is in line with the FDS Application.

Proposed Surface Water Discharge Rates

8.3.17 The proposed discharge rates for the Masterplan Site has been limited to provide a 50% betterment on existing peak brownfield discharge rates (identified in Section 5 of this report) once peak foul flow adjustments has been considered. Once further details of the development parcels, existing drainage details and associated capacity are known and storage spatial constraints confirmed, the Applicant will strive, as far as reasonably practicable, to provide a betterment over and above minimum London Plan requirements. This level of commitment has been demonstrated as part of the FDS Application.

The calculated surface water discharge rates are subsequently broken down on a catchment basis as per

Proposed Surface Water Exceedance

8.3.18 At this stage the level of surface water exceedance cannot be quantified however the provision of the green roofs and other possible SuDS measures will provide an element of inception storage and source control for the short storm durations which tend to cause sewer related flooding. It is the intention that any exceedance drainage will be managed and stored at ground level locally until capacity within the proposed surface water drainage network becomes available again. This level of detail will be confirmed during the detailed design stages during which ground and finished floor levels will be taken into careful consideration, as demonstrated at part of the FDS Application.

Proposed Surface Drainage Description

8.3.19 As identified within the drainage strategy the Detailed Application Site will utilise a traditional drainage network supplemented by various SuDS devices (identified in Section 8.2 above) to provide source control, water quality treatment and bio diversity enhancement.

8.3.20 The general principle behind surface water conveyance remains as per the FDS strategy, roof drainage will enter the surface water sewer system directly, highways drainage will be directed through geo-cellular soil vault assembly where feasible prior to entry into the surface water sewer network, and hardstanding will be drained to a combination of SuDS features and the proposed surface water network.

8.3.22 In addition if non-habitable basements are considered further within the proposed developments fronting Albany Road it is considered likely that pumped discharge will have to be provided. Accompanying this will be mitigation measures associated with safe access/egress of the basement during times of flooding, appropriate signage, and suitable finished ground levels out with thresholds of the basement (for further information see Section 9 of this report).

Proposed Surface Water Outfalls

8.3.23 Likely outfall locations into the TWUL combined sewer network have been identified within the outline drainage strategy within Appendix S however these outfalls will be confirmed during the detailed design stages.

8.3.24 Table 8.3 below.

Proposed Surface Water Attenuation Volumes

8.3.25 The initial storage sizing is based upon the upper limits of WinDES Quick Storage Estimates for the critical 1 in 100 year plus 30% allowance for climate change rainfall event taking into account proposed surface water discharge rates. Refer to Appendix T for details.

8.3.26 The required storage volumes will be provided by off-line storage tanks as identified within the drainage strategy in Appendix S. The storage volumes and discharge rates per catchment are identified below.

Proposed Surface Water Exceedance

8.3.27 At this stage the level of surface water exceedance cannot be quantified however the provision of the green roofs and other possible SuDS measures will provide an element of inception storage and source control for the short storm durations which tend to cause sewer related flooding. It is the intention that any exceedance drainage will be managed and stored at ground level locally until capacity within the proposed surface water drainage network becomes available again. This level of detail will be confirmed during the detailed design stages during which ground and finished floor levels will be taken into careful consideration, as demonstrated at part of the FDS Application.

Proposed Surface Drainage Description

8.3.28 As identified within the drainage strategy the Detailed Application Site will utilise a traditional drainage network supplemented by various SuDS devices (identified in Section 8.2 above) to provide source control, water quality treatment and bio diversity enhancement.

8.3.29 The general principle behind surface water conveyance remains as per the FDS strategy, roof drainage will enter the surface water sewer system directly, highways drainage will be directed through geo-cellular soil vault assembly where feasible prior to entry into the surface water sewer network, and hardstanding will be drained to a combination of SuDS features and the proposed surface water network.

8.3.31 In addition if non-habitable basements are considered further within the proposed developments fronting Albany Road it is considered likely that pumped discharge will have to be provided. Accompanying this will be mitigation measures associated with safe access/egress of the basement during times of flooding, appropriate signage, and suitable finished ground levels out with thresholds of the basement (for further information see Section 9 of this report).

Proposed Surface Water Outfalls

8.3.32 Likely outfall locations into the TWUL combined sewer network have been identified within the outline drainage strategy within Appendix S however these outfalls will be confirmed during the detailed design stages.

Table 8.3 – Proposed catchment surface water discharge rates and attenuation facility requirements

Catchment (Plot numbers)	Required Tank Storage (to be confirmed following agreed discharge rates with TWUL)	Outflow (to be confirmed following TWUL capacity impact assessment)
4	259 m^3 230 m^3	70.4 l/s
5	455 m^3 154 m^3	71.5 l/s
6	211 m^3 249 m^3 146 m^3	69.02 l/s
7	255 m^3 173 m^3	50.0 l/s
8a to 9b	724 m^3	85.0 l/s
9c to 10	569 m^3	67.0l/s
11a	367 m^3	32.5 l/s
12	367 m^3 204 m^3	66.1 l/s
11b & 13 & 15b	1253 m^3	144.2 l/s
14	283 m^3 427 m^3	76.8 l/s
15a	252 m^3	27.5 l/s
16a	283 m^3	30.7 l/s
16b	271 m^3	30.2 l/s
17a & 17b	377 m^3	43.7 l/s
17c	361 m^3	40.3 l/s

8.4 Foul Water Drainage

8.4.1 The proposed peak foul flow rates for the Comprehensive Development are to be confirmed by TWUL following completion of the CIA. As an interim solution peak foul flow estimates have been based upon Sewers for Adoption 7th Edition methodology. Where the proposed peak flow is greater than the estimated existing, the additional flow has been taken out of the surface water discharge rate allowance in order to avoid foul water attenuation. For calculation methodology refer to Appendix I & J.

8.4.2 The foul drainage strategy for the Masterplan Site will follow the principles identified within the below FDS Application strategy.

FDS Application

8.4.3 The existing and proposed peak foul flow rates are summarised below:

Table 8.4 – FDS Application foul drainage assessment

Catchment	Existing peak discharge rate	Proposed peak discharge rate
FDS Application	26.9 l/s	38.2 l/s

8.4.4 The overall increase in peak foul water discharge for the FDS Application is 11.3 l/s. This amount has been taken out of the surface water discharge allowance for the FDS Application.

8.4.5 There are two proposed foul water drainage networks within the FDS Application, the two networks are split as per the surface water catchments identified above and in Appendix O.

8.4.6 Both networks proposed discharge via gravity to TWUL combined sewers:

- The larger network encompassing Phase 1, 2 and the northern section of 3 discharges via the 600mm diameter TWUL existing combined sewer to the south of the FDS Application into the 2134mm internal diameter Albany Road sewer; and
- The remainder of Plot 3 discharges via the 450mm diameter TWUL existing combined sewer to the south east of the FDS Application into the 900mm diameter sewer in Portland Street which consequently enters the strategic sewer in Albany Road.

Masterplan Site

8.4.7 At this stage an indicative assessment of the proposed foul flows has been made (calculations in Appendix J). Details are summarised in Table 8.5 below:

Table 8.5 – Masterplan Site foul drainage assessment

Catchment	Existing peak discharge rate (l/s)	Proposed peak discharge rate (l/s)
4	9.35	13.56
5	9.35	8.70
6	8.47	12.43
7	9.49	7.73
8a to 9b	7.18	7.09
9c to 10	7.13	7.22
11a	3.38	1.48
12	5.93	7.82
11b & 13 & 15b	7.5	12.08
14	5.88	16.25
15a	2.92	6.02
16a	2.69	7.36
16b	2.69	5.37
17a & 17b	2.78	2.33
17c	2.78	6.11

8.4.8 The indicative total increase in peak foul discharge rates for the Masterplan Site is 34.03 l/s. This amount has been taken out of the surface water discharge allowances for the Masterplan Site.

8.4.9 The indicative foul water sewer routes and likely outfall locations are as identified within Appendix S.

9 Flood Risk Management Measures

9.1 Changes in levels

FDS Application

9.1.1 Largely levels onsite will remain at or close to existing ground levels. The depression that is the existing basketball court to the south of the site will be brought into level with the landscaped area and removed from risk of further surface water flooding.

9.1.2 There is an existing potential risk that overland surface water/pluvial flooding from offsite areas to the north west that will collect within Westmoreland Road and potentially overtop and convey through the development and enter Albany Road. The proposed levels along the boundary of Westmoreland Road to the north of the site will be such that all overland flow routes from this possible source will be directed away from the proposed development and onto Albany Road via Bradenham Close

9.1.3 All ground, road and threshold/finished floor levels have been locally set taking into account development drainage exceedance events to prevent water ingress and protect people and property during potential flooding events.

9.1.4 For details on finished floor and external ground levels and exceedance routing refer to Appendix R.

Masterplan Site

9.1.5 Level assessments similar to that carried out for the FDS will be undertaken for the Masterplan Site in line with development phasing ensuring that the proposed levels are safe, protecting people and property.

9.1.6 The developments fronting Albany Road (Plots 4, 14, 16, & 17) within the Masterplan Site may incorporate basement level car parking within their design. Should basements be confirmed during the detailed design stages associated with these plots all external levels will be designed such that surface water is directed away from basement thresholds levels.

9.2 Flood Compensation

9.2.1 No flood compensation is required on the Comprehensive Development as the EA have confirmed following further modelling that none of the nine individual breach assessments of the River Thames to the north of the Comprehensive Development individually encroach on the site (see EA correspondence in Appendix G).

9.3 Flood warning/ evacuation plan/ flood proofing

9.3.1 As the Comprehensive Development is located within the EA Flood Warning Area the development will sign up for the advance warning service from the EA.

9.3.2 Further flood warning measures and evacuation plans are not proposed for the Comprehensive Development, as the Site has been identified as having an insignificant risk of flooding.

9.3.3 No basements are provided within the FDS Application, although it is deemed good practice where within the Masterplan Site basements potential basement level car parking that flood resilient/resistant materials and techniques will be utilised during their construction. See section 11 for residual flood risks associated with basement provision.

9.4 Safe access

9.4.1 No mitigation is required as dry safe pedestrian and vehicular emergency access is readily achievable via multiple locations across the Comprehensive Development for all flood events up to and including the 1 in 1000 year flood.

10 Offsite Impacts

10.1 How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?

10.1.1 Section 8 and 9 above identify the Flood Risk Management Measures to be deployed on the Comprehensive Development.

10.1.2 To ensure a robust Flood Risk Assessment and drainage strategy all designs, where appropriate, will be in accordance with current standards and best practice procedures.

10.2 How will you prevent run-off from the completed development causing impact elsewhere?

10.2.1 A pre and post storm water run-off assessment was undertaken for the Detailed and Masterplan Sites. The surface water strategy provides significant betterment in terms of off-site discharge, therefore the scheme will not cause a detrimental impact to off-site third parties.

10.2.2 Existing overland flow paths will be maintained and no detrimental impact to off-site third parties is expected.

11 Residual Risks

11.1 What flood related risks remain after you have implemented the measures to protect the site from flooding?

11.1.1 The Comprehensive Development will be at a low/negligible risk of flooding from all sources following implementation of the above detailed SuDS provisions/mitigation measures.

11.1.2 The risk of a blockage to the proposed storage arrangements outfalls or consecutive extreme storm events occurring, which are outside of normal design parameters, could mean that the volumes available within the storage devices are exceeded.

11.1.3 Another possible residual risk to the development is as a result of storm events greater than the sewer design criteria, which could cause overland flooding to the Site.

11.1.4 Where basements are under consideration for the Masterplan Site pumps would likely be required within the drainage arrangement. There then remains a risk of pump failure.

11.2 How, and by whom, will these risks be managed over the lifetime of the development?

11.2.1 The likelihood of a blockage to the outfall devices or an extreme consecutive storm event occurring is minimal. To mitigate for this a robust maintenance and pre-treatment strategy shall be implemented on the Comprehensive Development to reduce the likelihood of blockages.

11.2.2 Overland flood routes shall be designed into the development to take account of overland flood flow routes from exceedance events, and to divert any excess floodwater around and away from proposed buildings. In an exceedance event such as the 1 in 100 year plus 30% allowance for climate change rainfall event, flows from the built development will be directed away from properties via overland flow routes towards the proposed storage areas and/or areas of open space. This approach has been adopted for FDS Application, and the Masterplan Site will follow the same principles during the later stages of design.

11.2.3 It is proposed to combat the pump failure risk that where basements are considered and there is a need for pumped discharge there will be an incorporated standby, duty and assist pump arrangement to provide back up. A robust twenty four hour maintenance and emergency call out programme will be incorporated to ensure future performance. Further detail of the pumps and pump maintenance/call out programme will be provided during detailed planning application and detailed design of the Masterplan Site.

12 Conclusions

12.1 Summary

General

12.1.1 The existing Site is identified as located within the defended tidal Flood Zone 3a.

12.1.2 The EA have confirmed that the River Thames defences to the north of the site provide the site with fluvial flood protection up to and including the 1 in 1000 year fluvial flood event.

12.1.3 Further EA analysis of nine breach/overtopping locations along the River Thames in line with the 2011-2012 Halcrow studies has identified that none of the nine breach locations would result in flood water inundation of the Application Site. As such the Application Site is considered at insignificant risk of fluvial and tidal flooding.

12.1.4 TWUL are currently preparing a Capacity Impact Assessment for the Comprehensive Development in order to provide allowable discharge rates per plot associated with each Application. The CIA is not due to be completed until December 2014 and TWUL have agreed to condition each application in respect to discharge rates for the purposes of planning. In light of this an interim methodology for calculating discharge rates has been proposed.

12.1.5 From discussions with the emerging LBS SuDS Approval Body (SAB) and EA it was agreed that is was not considered practicable to calculate discharge rates for the Comprehensive Development using Greenfield methodology, therefore it was agreed that the interim assessment should be based upon the Wallingford Modified Rational Method procedure for a 15 minute 2 year rainfall event. Once the results of the CIA are received and rates are less than those quoted within this report these results will take president.

12.1.6 Safe emergency access can be provided and maintained for the lifetime of the development for events up to and including the 1 in 1000 year flood event.

12.1.7 The development will sign up for the EA flood warning alerts.

12.1.8 All ground, road, and threshold/finished floor levels will be locally set taking into account exceedance events associated with potential on and off site sources to prevent water ingress and protect people and property.

12.1.9 It is intended that all the SuDS located within the communal areas will form an adoption agreement between the Applicant and a third party management and maintenance company. Any SuDS within the public highway namely the geo-cellular soil vault assembly is proposed to be adopted by LBS Highways.

12.1.10 The proposed maintenance regimes for the devices will be based upon CIRIA C697 ‘The SuDS Manual’ guidelines and where applicable manufacturers recommendations.

FDS Application

12.1.12 Based on the information provided within this report it is concluded that:

- Surface water discharge rates have been proposed exceeding London Plan minimum requirements at 65% less existing brownfield discharge rates. Existing discharge rates are based on the 2 year 15 minute Wallingford Procedure Modified Rational Method (as provisionally agreed with the EA and LBS). The maximum surface water discharge rate of 111 l/s is proposed for all events up to and including the 1 in 100 year plus 30% allowance for climate change rainfall event;
- The proposed foul water discharge rate is based on Sewers for Adoption 7th Edition methodology and is estimated to be 38.2 l/s, the foul network is proposed as entirely gravity fed and will connect downstream of the proposed surface water connection points;
- The proposed development includes the reduction from six existing combined sewer outfall locations to two re-utilised combined sewer outfall locations. Proposed networks will be separate surface and foul systems up until the discharge locations identified;
- The 2 outfalls from site will utilise existing connections, namely the 600mm diameter combined sewer to the south of the site retaining the existing connection to the strategic 2134mm internal diameter sewer in Albany Road, and the 450mm combined sewer located to the south east of the site connected into the 900mm diameter sewer in Portland Street which in turn feeds the strategic sewer in Albany Road;
- Sub podium surface water storage tanks will be provided within the identified catchments to the sum of 500m3 and 350m3 respectively;
- SuDS in the form of bio-retention, green roofs, geo-cellular soil vault assembly and tree pits throughout the site provide an element of source control coupled with surface water quality treatment and biodiversity qualities;

Masterplan Site

12.1.13 It is proposed that the general principles behind the wider Masterplan Site will follow that identified for the FDS as set out within this report and above. Additional points concluded on the Masterplan Site within this report are:

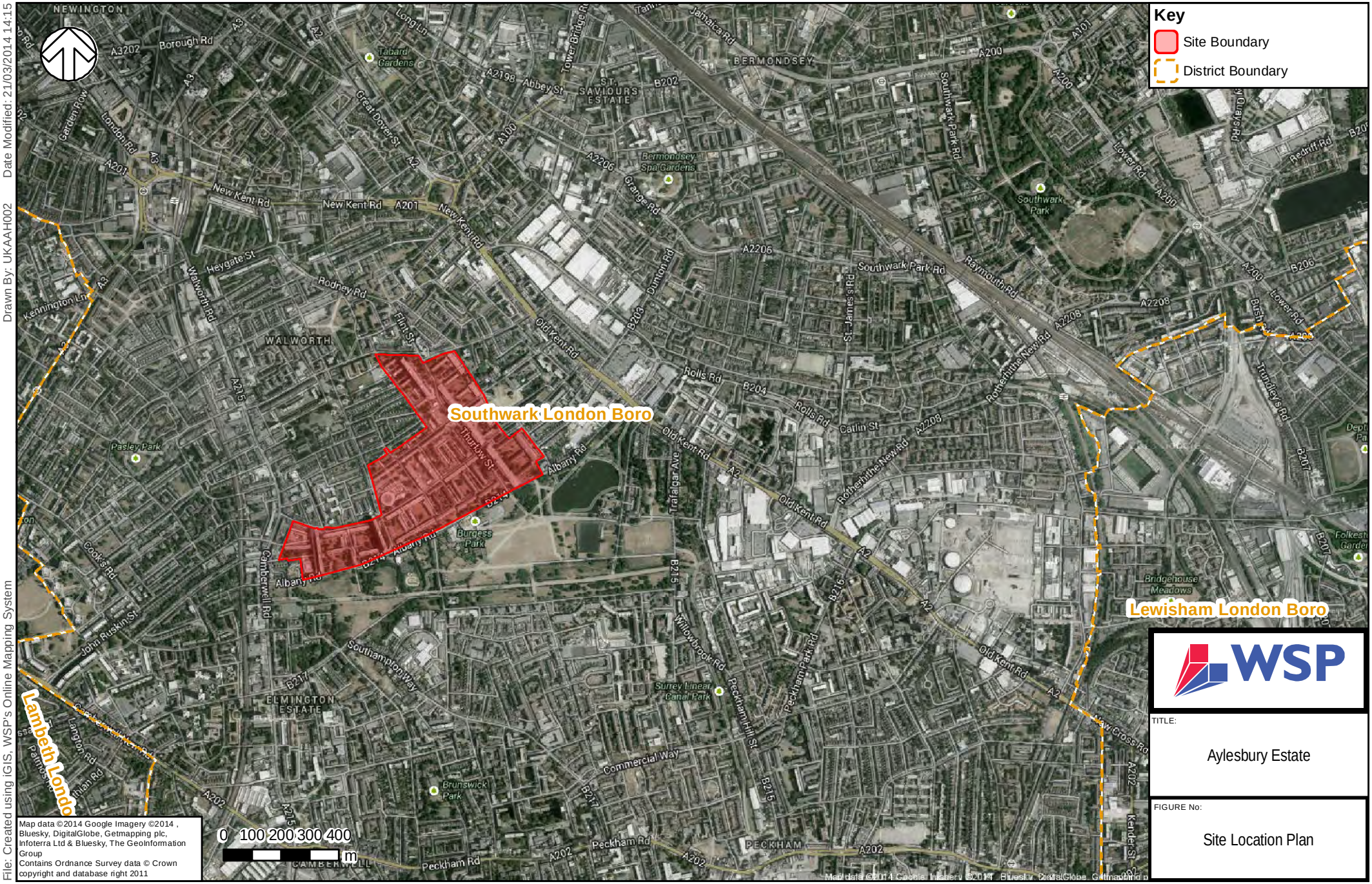
- At this stage outline combined discharge rates have been identified within this report at minimum London Plan requirements of 50% existing brownfield rates, with existing rates based on the Wallingford Procedure Modified Rational Method 2 year 15 minute rainfall event.
- The proposed foul water network discharge is estimated at 121.55 l/s, the network will look to emulate the FDS drainage strategy where feasible and discharge via a gravity connection downstream of the surface water connection points.
- Outline attenuation provisions have been sized and level checked to afford storage at the proposed discharge rates for all events up to and including the 1 in 100 year plus climate change rainfall event;
- The outline proposed discharge locations as identified within this report ultimately outfall to the 2134mm internal diameter strategic TWUL combined sewer in Albany Road, and the 1372mm by 914mm TWUL combined culvert in East Street;
- Any basements proposed throughout the site will be designed and built utilising flood resilient measures including appropriate signage; and
- External levels at thresholds of basements will be set to ensure surface water flow routes are directed away from entering the basement;
- Pumped discharge locations will incorporate a standby, duty and assist pump arrangement providing back up, supported by a 24 hour maintenance and emergency call out programme.

12.1.14 The Comprehensive Development is therefore presented as sustainable in terms of flood risk and compliant with the criteria set out in the NPPF and the London Borough of Southwark.

13 Appendices

- Appendix A – Site Location Plan
- Appendix B - Development Masterplan
- Appendix C – Aylesbury Area Action Plan Phases and Plots
- Appendix D – Topographic Survey
- Appendix E – Thames Water Correspondence
- Appendix F – SFRA Appendices and Figures
- Appendix G – EA Correspondence
- Appendix H – SWMP Appendices
- Appendix I – FDS Drainage Calculations
- Appendix J – Masterplan Drainage Calculations
- Appendix K – Existing FDS Catchments & Discharge Locations
- Appendix L – FDS Existing Brownfield Discharge Volume
- Appendix M – CIRIA ICoP SuDS Framework
- Appendix N – FDS Proposed Drainage Strategy
- Appendix O – FDS Proposed Catchment Plan
- Appendix P – FDS Proposed Brownfield Discharge Volumes
- Appendix Q – FDS WinDES Model Results
- Appendix R – FDS Proposed Levels Plan
- Appendix S – Masterplan Proposed Drainage Strategy
- Appendix T – Masterplan WinDES Quick Storage Calculations

Appendix A – Site Location Plan



File: Created using iGIS, WSP's Online Mapping System Drawn By: UKAAH002 Date Modified: 21/03/2014 14:15

WSP

TITLE:

Aylesbury Estate

FIGURE No:

Site Location Plan

Appendix B – Development Masterplan

ANNOTATED AREA MASTERPLAN
1:1250

Key

Public Squares

① **East Street Square**
Located adjacent to offices and the East St Market, the East Street Square functions as a spill-out space for workers eating lunch, market shoppers having a break, and potentially for further market stalls.

② **Aylesbury Square**
Aylesbury Square is the largest public square in the development and will be the focal point of movement and activity for the local area. It will be an extension of the activity space for the surrounding community and retail buildings and will be suitable for outdoor events.

③ **School Square**
The School Square creates a space for children, parents, vehicles, cyclists and pedestrians to interact within a safe and attractive environment. Hard paved with shade and seating for waiting children, the square will facilitate high numbers of people at any one time and allow for freedom of movement in many directions.

④ **Westmoreland Square**
Westmoreland Square is a local urban square creating the foreground for nearby community facilities and retail. The space will be mostly hard landscaped to enable a range of uses from market stalls to community events, or a day-to-day meeting spot. Specimen trees will be of an appropriate scale for the space, echoing the large existing tree adjacent to the community centre.

Neighbourhood Parks (proposed names)

⑤ **Missenden Park**
Missenden Park creates a green link for students walking or cycling between Aylesbury Square and Faraday School. Located a distance from Burgess Park, a MUGA and other facilities provide active recreation for children and adults within the surrounding proposed and existing housing. Scale and orthogonal layout is that of a typical London square.

⑥ **Gaitskell Park**
Gaitskell Park is a key green space along the Community Spine as it forms a hinge that allows for a change of alignment. This directional movement will be clearly legible to enable easy movement within a greater soft landscape than nearby Missenden Park.

⑦ **Thurlow Park**
Thurlow Park is smaller garden space adjacent to Thurlow Road. With its several large existing trees, the park provides an opportunity for varied planting and seasonal interest.

⑧ **Bagshot Park**
Bagshott Park functions as a neighbourhood park, with a balance of hard and soft spaces (including lawn) to enable passive recreation and small neighbourhood gatherings.

⑨ **Portland Park**
Portland Park will be an urban park with high level of activity: skateboarding, parkour and gym equipment. Located between Faraday School and Burgess Park, it provides a useful facility for parents, and may feature a cafe with outdoor seating for parents to sit whilst children play on the nearby equipment.

⑩ **Alvey Park**
Local park featuring a local playable space and community gardens. Alvery Park will have a small-scale feel to enable a high level of community ownership and involvement.

In addition to the squares and neighbourhood parks, a series of local playable spaces, pocket parks and community gardens are provided across the masterplan.

⑪ **Landmark Tower**
Landmark Tower marking the strategic junction of Albany Road and Thurlow Street.

⑫ **Community Spine**
A new east-west route connecting Walworth Road, schools, new parks, shops and Old Kent Road

⑬ **Residential Streets**
New residential streets of houses integrate with the surrounding area and new development.

⑭ **Higher Density Blocks**
Higher density blocks create a new frontage for Burgess Park.

⑮ **New Public Realm**
Public realm improvements to Albany Road and Thurlow Streets, new pedestrian crossings, cycle routes, street trees and bus routes.

N

Appendix C – Aylesbury Area Action Plan Phases and Plots

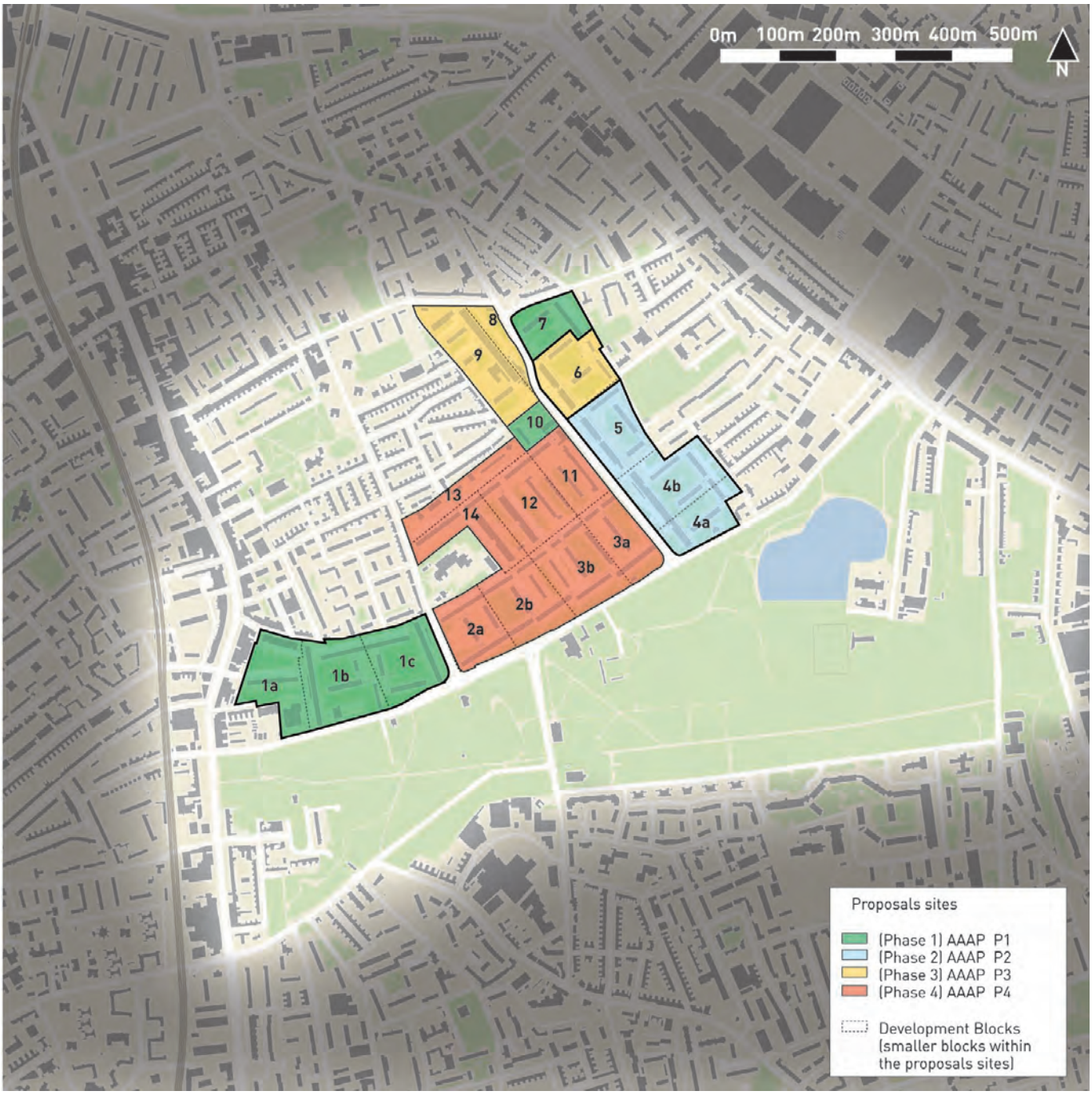
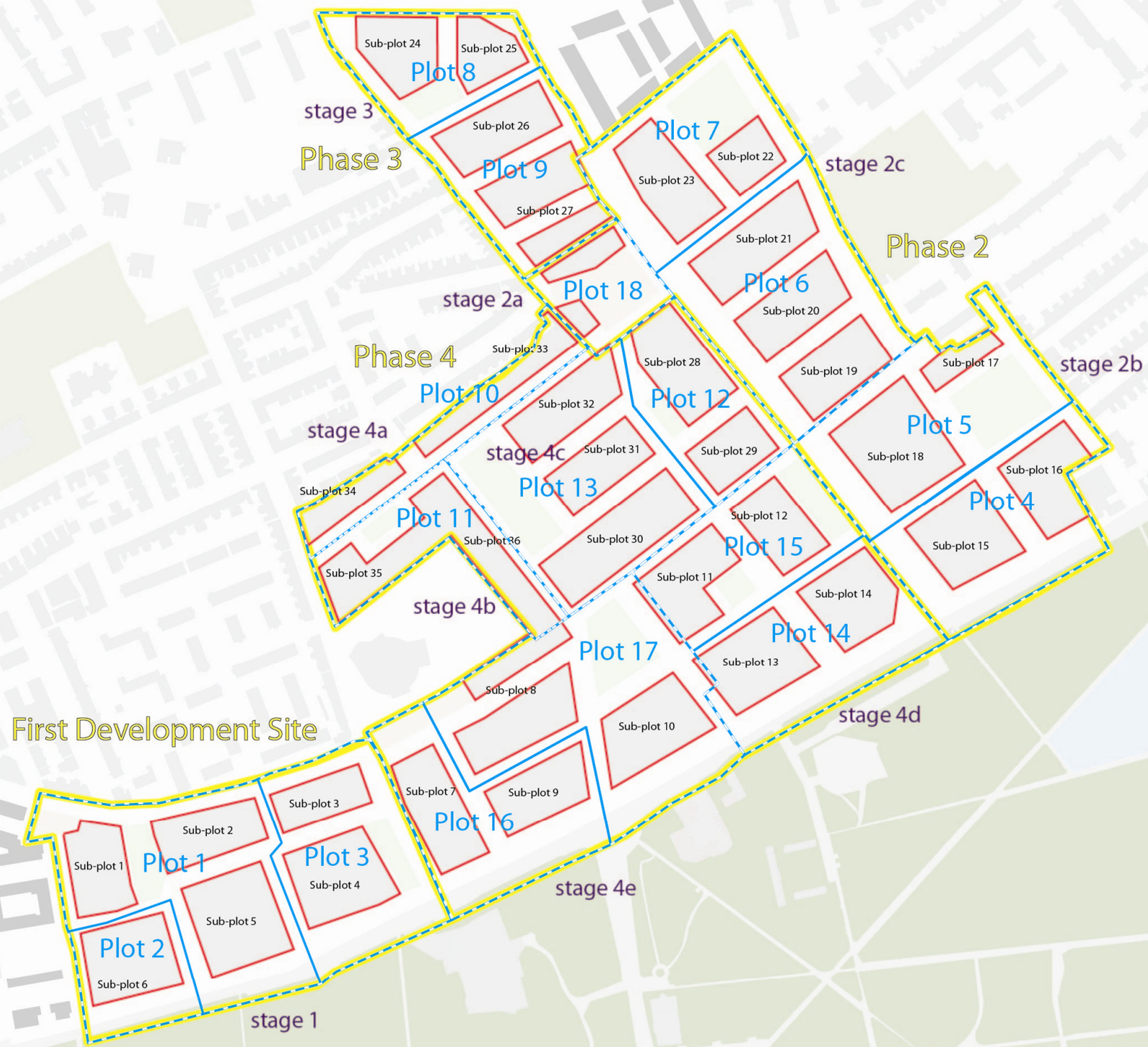


Figure 6: Proposals sites

Annexure 11.6: Development Area Plot Plan / Phasing Diagram

Phase boundary
stage boundary
Plot boundary
Plot leases



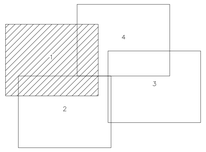
Appendix D – Topographic Survey

NORTH

Co-ordinate Table			

Survey Note:

Survey information has been added to the original survey carried out by Adam Limited (7836-0113-01A). A scale factor of 0.99981058 was applied for the original survey drawings.
The additional survey information added by Terrain is related to the same grid and with the same scale factor applied.



SHEET LAYOUT

Revision	Description	Date

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey bkwl Value 15.37m

Abbreviations

Ballard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
BT Inspection Cover	BT	Service Marker	MK
Concrete Paving Slabs	CPS	Sign Post	SP
Cable Television Cover	CTV	Sluice Valve	SV
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Fire Hydrant	FH	Telephone Call Box	TCB
Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
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Kerb Outlet	KO	Ridge Level	RL
Lamp Post	LP	Roof Level	RTL
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Marker Post	MK	Threshold Level	THL
Parking Meter	PM	Parapet Wall Level	PWL
Post	P	Finished Floor Level	FFL
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Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
Post and Rail Fence	PRF	Shrub Bed	S\B
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Wooden Panel Fence	WPF		

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Project
AREA 1
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TOPOGRAPHICAL SURVEY

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SM	CDW
Scale 1:200@A0	Date APR 2014
Drawing Number TS14-142S\1	Revision —
Sheet 1 of 4	

All levels related to Ordnance Survey GPS Network.

Value N/A

2 0 10 metres
SCALE BAR

SHEET 2

Co-ordinate Table			

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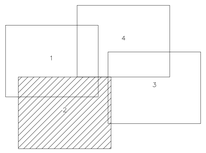

SHEET LAYOUT

NORTH

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

Abbreviations

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BT Inspection Cover	BT	Service Marker	MK
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Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
Post and Rail Fence	PRF	Shrub Bed	S\B
Post and Wire Fence	PWF		
Wooden Panel Fence	WPF		

Revision	Description	Date

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Drawing Number TS14-142S\2	Revision –
Sheet 2 of 4	

All levels related to Ordnance Survey GPS Network.

Value N/A

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SCALE BAR

NORTH

BUILDING

ALBANY ROAD

GAYHURST brick bollard

Co-ordinate Table

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SHEET LAYOUT

Revision	Description	Date

LEGEND

Survey control station
Banking
Gate (single)
Gate (double)
Tree Spread and Girth shown to scale
Building
Fence
Contour 22.50
Wall
Ordnance Survey Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
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Drawing Number TS14-142S\3	Revision –
Sheet 3 of 4	

All levels related to Ordnance Survey GPS Network.

Value N/A

SCALE BAR 2 0 10 metres

5327000E 5328000E 5329000E

17770ON

2 0 10 metres
SCALE BAR

NORTH

Co-ordinate Table			

Survey Note:

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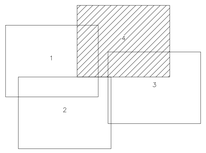

SHEET LAYOUT

Revision	Description	Date

LEGEND

Survey control station △5
Banking
Building
Gate (single)
Gate (double)
Fence
Contour 22.50
Wall
b.w.w.l
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
BT Inspection Cover	BTI	Service Marker	MK
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Sheet 4 of 4	

All levels related to Ordnance Survey GPS Network.

Value N/A

Co-ordinate Table			
Station	Easting	Northing	Level
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2	532811.220	177902.441	2.814
3	532784.167	177945.134	2.622
4	532754.440	178033.506	2.499
5	532837.616	178095.826	2.582
6	532970.427	178197.402	2.613
7	532882.621	178323.210	2.756
8	532771.398	178450.616	3.353
9	532866.853	178468.286	2.843
10	532923.841	178452.308	2.808
11	533051.001	178477.917	2.818
12	533123.002	178372.275	2.620
13	533186.886	178231.644	2.746
14	533250.790	178254.821	2.454
15	533344.096	178157.346	2.055
16	533398.223	178079.019	2.380
17	533259.556	178004.127	1.909
18	533132.032	177916.633	2.157
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT

GPS Note:
This survey is related to Ordnance Survey National Grid by GPS 'rapid static' methods. No scale factor has been applied to the survey information. All horizontal distances taken from this drawing are ground distances.

Notes:
All road markings are indicative only
Their maybe trees and other detail not shown in private gardens and areas where we could not gain access at the time of the survey.

Revision	Description	Date

LEGEND

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Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall bkwl
Tree Spread and Girth shown to scale
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Title
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Sheet 1 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
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2	532811.220	177902.441	2.814
3	532784.167	177945.134	2.622
4	532754.440	178033.506	2.499
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10	532923.841	178452.308	2.808
11	533051.001	178477.917	2.818
12	533123.002	178372.275	2.620
13	533186.886	178231.644	2.746
14	533250.790	178254.821	2.454
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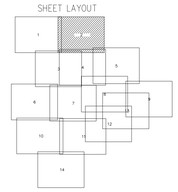
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT



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Revision	Description	Date

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

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SITES 2-14 (EXCLUDING 7)
AYLESBURY ESTATE
LONDON, SE17

Title
TOPOGRAPHICAL SURVEY

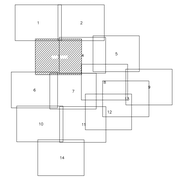
Drawn by	Checked by
SM/MW/LC	CDW
Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\9	Revision –
Sheet 2 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
2	532811.220	177902.441	2.814
3	532784.167	177945.134	2.622
4	532754.440	178033.506	2.499
5	532837.616	178095.826	2.582
6	532970.427	178197.402	2.613
7	532882.621	178323.210	2.756
8	532771.398	178450.616	3.353
9	532866.853	178468.286	2.843
10	532923.841	178452.308	2.808
11	533051.001	178477.917	2.818
12	533123.002	178372.275	2.620
13	533186.886	178231.644	2.746
14	533250.790	178254.821	2.454
15	533344.096	178157.346	2.055
16	533398.223	178079.019	2.380
17	533259.556	178004.127	1.909
18	533132.032	177916.633	2.157
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT



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Notes:
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Revision	Description	Date

LEGEND

Survey control station △ 5
Banking
Gate (single)
Gate (double)
Tree Spread and Girth shown to scale
Building
Fence
Contour 22.50
Wall
Ordnance Survey value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
BT Inspection Cover	BT	Service Marker	MK
Concrete Paving Slabs	CPS	Sign Post	SP
Cable Television Cover	CTV	Sluice Valve	SV
Electricity Cable Pit	EC	Stop Tap	ST
Electricity Pole	EP	Stop Cock	SC
Earth Rod	ER	Telegraph Pole	TP
Fire Hydrant	FH	Telephone Call Box	TCB
Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
Inspection Cover	IC	Eaves Level	EL
Kerb Outlet	KO	Ridge Level	RL
Lamp Post	LP	Roof Level	RFL
Manhole	MH	Soffit Level	SFL
Marker Post	MK	Threshold Level	THL
Parking Meter	PM	Parapet Wall Level	PWL
Post	P	Finished Floor Level	FFL
Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
Post and Rail Fence	PRF	Shrub Bed	S\B
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Wooden Panel Fence	WPF		

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Client
NOTTING HILL HOUSING

Project
SITES 2-14 (EXCLUDING 7)
AYLESBURY ESTATE
LONDON, SE17

Title
TOPOGRAPHICAL SURVEY

Drawn by	Checked by
SM/MW/LC	CDW
Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\10	Revision –
Sheet 3 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
2	532811.220	177902.441	2.814
3	532784.167	177945.134	2.622
4	532754.440	178033.506	2.499
5	532837.616	178095.826	2.582
6	532970.427	178197.402	2.613
7	532882.621	178323.210	2.756
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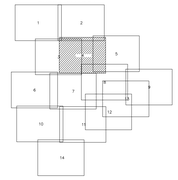
17	533259.556	178004.127	1.909
18	533132.032	177916.633	2.157
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT



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Revision	Description	Date

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Tree Spread and Girth shown to scale
Wall b.w.
Ordnance Survey Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
BT Inspection Cover	BT	Service Marker	MK
Concrete Paving Slabs	CPS	Sign Post	SP
Cable Television Cover	CTV	Sluice Valve	SV
Electricity Cable Pit	EC	Stop Tap	ST
Electricity Pole	EP	Stop Cock	SC
Earth Rod	ER	Telegraph Pole	TP
Fire Hydrant	FH	Telephone Call Box	TCB
Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
Inspection Cover	IC	Eaves Level	EL
Kerb Outlet	KO	Ridge Level	RL
Lamp Post	LP	Roof Level	RFL
Manhole	MH	Soffit Level	SFL
Marker Post	MK	Threshold Level	THL
Parking Meter	PM	Parapet Wall Level	PWL
Post	P	Finished Floor Level	FFL
Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
Post and Rail Fence	PRF	Shrub Bed	S\B
Post and Wire Fence	PWF		
Wooden Panel Fence	WPF		

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Client
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Project
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Title
TOPOGRAPHICAL SURVEY

Drawn by SM/MW/LC	Checked by CDW
Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\11	Revision –
Sheet 4 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
2	532811.220	177902.441	2.814
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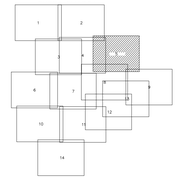
NORTH

SHEET LAYOUT



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Revision	Description	Date

LEGEND

Survey control station △5
Building
Banking
Gate (single)
Gate (double)
Fence
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
BT Inspection Cover	BT	Service Marker	MK
Concrete Paving Slabs	CPS	Sign Post	SP
Cable Television Cover	CTV	Sluice Valve	SV
Electricity Cable Pit	EC	Stop Tap	ST
Electricity Pole	EP	Stop Cock	SC
Earth Rod	ER	Telegraph Pole	TP
Fire Hydrant	FH	Telephone Call Box	TCB
Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
Inspection Cover	IC	Eaves Level	EL
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Manhole	MH	Soffit Level	SFL
Marker Post	MK	Threshold Level	THL
Parking Meter	PM	Parapet Wall Level	PWL
Post	P	Finished Floor Level	FFL
Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
Post and Rail Fence	PRF	Shrub Bed	S\B
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Land Surveyors Association

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Title
TOPOGRAPHICAL SURVEY

Drawn by	Checked by
SM/MW/LC	CDW
Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\12	Revision –
Sheet 5 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
2	532811.220	177902.441	2.814
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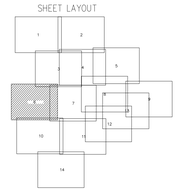
NORTH

SHEET LAYOUT



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Revision	Description	Date

LEGEND

Survey control station △ 5
Banking
Building
Gate (single)
Gate (double)
Fence
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

Abbreviations

Ballard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
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Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
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Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\13	Revision –
Sheet 6 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
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NORTH

SHEET LAYOUT

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Revision	Description	Date

LEGEND

Survey control station
Banking
Gate (single)
Gate (double)
Tree Spread and Girth shown to scale
Building
Fence
Contour 22.50
Wall
Ordnance Survey Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
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Drawing Number TS14-142S\14	Revision –
Sheet 7 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
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1	532850.182	177794.712	2.558
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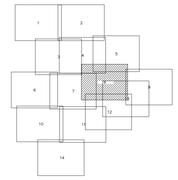

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Revision	Description	Date

LEGEND

Survey control station	△ 5	Building	
Banking		Fence	
Gate (single)		Contour	22.50
Gate (double)		Wall	
Tree Spread and Girth shown to scale		Ordnance Survey	Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
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Drawing Number TS14-142S\15	Revision –
Sheet 8 of 14	

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Co-ordinate Table			
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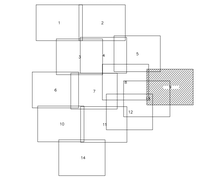
16	533398.223	178079.019	2.380
17	533259.556	178004.127	1.909
18	533132.032	177916.633	2.157
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT



GPS Note:
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Revision	Description	Date

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

Abbreviations

Ballard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
BT Inspection Cover	BT	Service Marker	MK
Concrete Paving Slabs	CPS	Sign Post	SP
Cable Television Cover	CTV	Sluice Valve	SV
Electricity Cable Pit	EC	Stop Tap	ST
Electricity Pole	EP	Stop Cock	SC
Earth Rod	ER	Telegraph Pole	TP
Fire Hydrant	FH	Telephone Call Box	TCB
Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
Inspection Cover	IC	Eaves Level	EL
Kerb Outlet	KO	Ridge Level	RL
Lamp Post	LP	Roof Level	RFL
Manhole	MH	Soffit Level	SFL
Marker Post	MK	Threshold Level	THL
Parking Meter	PM	Parapet Wall Level	PWL
Post	P	Finished Floor Level	FFL
Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
Post and Rail Fence	PRF	Shrub Bed	S\B
Post and Wire Fence	PWF		
Wooden Panel Fence	WPF		

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Client
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Project
SITES 2-14 (EXCLUDING 7)
AYLESBURY ESTATE
LONDON, SE17

Title
TOPOGRAPHICAL SURVEY

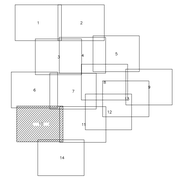
Drawn by	Checked by
SM/MW/LC	CDW
Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\16	Revision –
Sheet 9 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
2	532811.220	177902.441	2.814
3	532784.167	177945.134	2.622
4	532754.440	178033.506	2.499
5	532837.616	178095.826	2.582
6	532970.427	178197.402	2.613
7	532882.621	178323.210	2.756
8	532771.398	178450.616	3.353
9	532866.853	178468.286	2.843
10	532923.841	178452.308	2.808
11	533051.001	178477.917	2.818
12	533123.002	178372.275	2.620
13	533186.886	178231.644	2.746
14	533250.790	178254.821	2.454
15	533344.096	178157.346	2.055
16	533398.223	178079.019	2.380
17	533259.556	178004.127	1.909
18	533132.032	177916.633	2.157
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT



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Revision	Description	Date

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
BT Inspection Cover	BT	Service Marker	MK
Concrete Paving Slabs	CPS	Sign Post	SP
Cable Television Cover	CTV	Sluice Valve	SV
Electricity Cable Pit	EC	Stop Tap	ST
Electricity Pole	EP	Stop Cock	SC
Earth Rod	ER	Telegraph Pole	TP
Fire Hydrant	FH	Telephone Call Box	TCB
Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
Inspection Cover	IC	Eaves Level	EL
Kerb Outlet	KO	Ridge Level	RL
Lamp Post	LP	Roof Level	RFL
Manhole	MH	Soffit Level	SFL
Marker Post	MK	Threshold Level	THL
Parking Meter	PM	Parapet Wall Level	PWL
Post	P	Finished Floor Level	FFL
Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
Post and Rail Fence	PRF	Shrub Bed	S\B
Post and Wire Fence	PWF		
Wooden Panel Fence	WPF		

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NOTTING HILL HOUSING

Project
SITES 2-14 (EXCLUDING 7)
AYLESBURY ESTATE
LONDON, SE17

Title
TOPOGRAPHICAL SURVEY

Drawn by	Checked by
SM/MW/LC	CDW
Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\17	Revision –
Sheet 10 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
2	532811.220	177902.441	2.814
3	532784.167	177945.134	2.622
4	532754.440	178033.506	2.499
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8	532771.398	178450.616	3.353
9	532866.853	178468.286	2.843
10	532923.841	178452.308	2.808
11	533051.001	178477.917	2.818
12	533123.002	178372.275	2.620
13	533186.886	178231.644	2.746
14	533250.790	178254.821	2.454
15	533344.096	178157.346	2.055
16	533398.223	178079.019	2.380
17	533259.556	178004.127	1.909
18	533132.032	177916.633	2.157
19	532930.019	177800.581	2.278

SHEET LAYOUT

GPS Note:
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Revision	Description	Date

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall bkwl
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

Abbreviations

Ballard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
BT Inspection Cover	BT	Service Marker	MK
Concrete Paving Slabs	CPS	Sign Post	SP
Cable Television Cover	CTV	Sluice Valve	SV
Electricity Cable Pit	EC	Stop Tap	ST
Electricity Pole	EP	Stop Cock	SC
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Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
Inspection Cover	IC	Eaves Level	EL
Kerb Outlet	KO	Ridge Level	RL
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Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
Post and Rail Fence	PRF	Shrub Bed	S\B
Post and Wire Fence	PWF		
Wooden Panel Fence	WPF		

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Trade Association

177900N

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LONDON, SE17

Title
TOPOGRAPHICAL SURVEY

Drawn by	Checked by
SM/MW/LC	CDW
Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-1425\18	Revision –
Sheet 11 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
2	532811.220	177902.441	2.814
3	532784.167	177945.134	2.622
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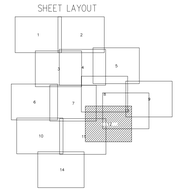
18	533132.032	177916.633	2.157
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT



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Notes:
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Revision	Description	Date

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
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Concrete Paving Slabs	CPS	Sign Post	SP
Cable Television Cover	CTV	Sluice Valve	SV
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Earth Rod	ER	Telegraph Pole	TP
Fire Hydrant	FH	Telephone Call Box	TCB
Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
Inspection Cover	IC	Eaves Level	EL
Kerb Outlet	KO	Ridge Level	RL
Lamp Post	LP	Roof Level	RFL
Manhole	MH	Soffit Level	SFL
Marker Post	MK	Threshold Level	THL
Parking Meter	PM	Parapet Wall Level	PWL
Post	P	Finished Floor Level	FFL
Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Chestnut Paling Fence	CPF		
Post and Chain Fence	PCF	Flower Bed	F\B
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Drawn by	Checked by
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Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\19	Revision –
Sheet 12 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
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14	533250.790	178254.821	2.454
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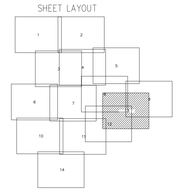
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT



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Revision	Description	Date

LEGEND

Survey control station △ 5
Banking
Gate (single)
Gate (double)
Tree Spread and Girth shown to scale
Building
Fence
Contour 22.50
Wall
Ordnance Survey Value 15.37m

Abbreviations

Bollard	BD	Pipe	PE
Borehole	BH	Road Sign	RS
British Telecom Box	BTB	Rodding Eye	RE
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Flag Staff	FS	Traffic Light	TL
Gas Valve	GV	Unsurfaced	U\S
Gate Post	GP	Vent Pipe	VP
Gully	GY	Water Meter	WM
Inspection Cover	IC	Eaves Level	EL
Kerb Outlet	KO	Ridge Level	RL
Lamp Post	LP	Roof Level	RFL
Manhole	MH	Soffit Level	SFL
Marker Post	MK	Threshold Level	THL
Parking Meter	PM	Parapet Wall Level	PWL
Post	P	Finished Floor Level	FFL
Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
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Drawn by	Checked by
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Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\20	Revision –
Sheet 13 of 14	

All levels related to the Ordnance Survey GPS network.

Co-ordinate Table			
Station	Easting	Northing	Level
1	532850.182	177794.712	2.558
2	532811.220	177902.441	2.814
3	532784.167	177945.134	2.622
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18	533132.032	177916.633	2.157
19	532930.019	177800.581	2.278

NORTH

SHEET LAYOUT

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Revision	Description	Date

LEGEND

Survey control station △ 5
Building
Banking
Gate (single)
Fence
Gate (double)
Contour 22.50
Wall
Tree Spread and Girth shown to scale
Ordnance Survey value 15.37m

Abbreviations

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BT Inspection Cover	BT	Service Marker	MK
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Drawn by	Checked by
SM/MW/LC	CDW
Scale 1:200@A0	Date JUL 2014
Drawing Number TS14-142S\21	Revision -
Sheet 14 of 14	

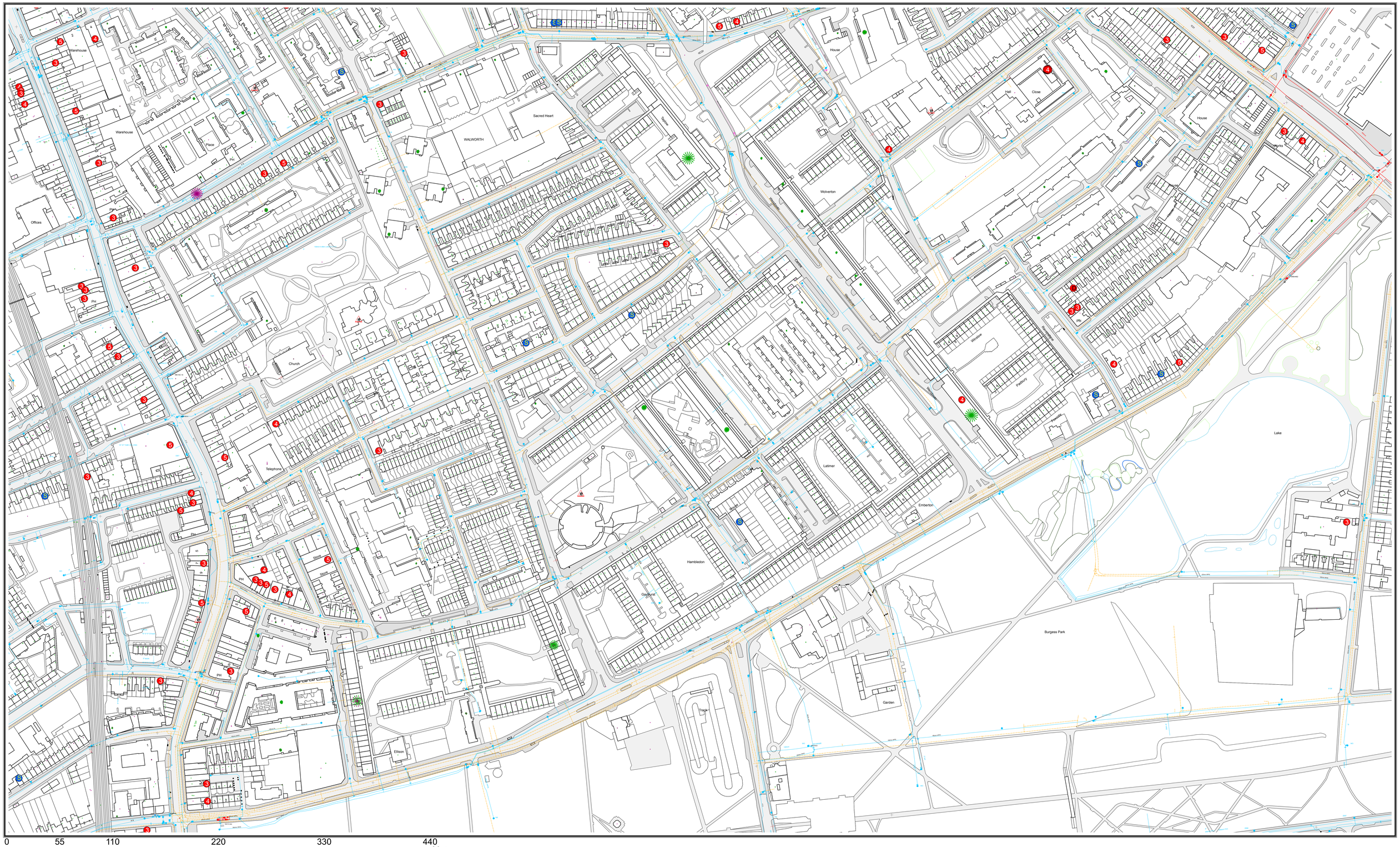
All levels related to the Ordnance Survey GPS network.

Appendix E – Thames Water Correspondence

Based on the Ordnance Survey Map with the Sanction of the
Controller of H.M Stationery Office License Number 100019345

Thames Water

N



0 55 110 220 330 440 Metres

The position of any boundary or apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. No liability of any kind whatsoever is accepted by Thames Water for any error or omission.

Printed At (A0) :1:1250
Printed By :KTUCHSCH
Print Date :16/05/2014
Map Centered On :532952,178064
Grid Reference :TQ3278

Based on the Ordnance Survey Map with the Sanction of the
Controller of H.M Stationery Office License Number 100019345

Thames Water

N

0 55 110 220 330 440
Metres

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Printed At (A0)	:1: 1250
Printed By	:KTUCHSCH
Print Date	:16/05/2014
Map Centered On	:532952,178064
Grid Reference	:TQ3278

Asset Information Sheet

Issued By : KTUCHSCH

Issued Date / Time : 16/05/2014 14:51:16

Centred on Easting : 533063

Northing : 177912

Centre Mapsheet : TQ3377NW

Short Ref No	Cover Level(M)	Invert Level(M)	Maintainer	Purpose	Type	Alt No	Comments
8102	2.63	-1.13	Thames Water Utilities	Combined	Manhole	SW/F4/58	
8903	2.54	-1.97	Thames Water Utilities	Combined	Manhole	SW/G4/10	
0002	2.9	0.15	Thames Water Utilities	Combined	Manhole	64	
00ZR			Private	Combined	Manhole		
09ZS			Private	Combined	Manhole		
7905	2.67	-2.31	Thames Water Utilities	Combined	Manhole	SW/G4/21	
8001	2.62	-1.15	Thames Water Utilities	Combined	Manhole	SW/F4/69	
88YZ			Private	Combined	Manhole		
7802	3.03	-1.54	Thames Water Utilities	Combined	Manhole	SW/G4/05	
8003	2.5	-1.75	Thames Water Utilities	Combined	Manhole	SW/F4/57	
9905	2.69		Thames Water Utilities	Combined	Manhole	SW/G4/65	

Asset Information Sheet

1002	2.35	-2.03	Thames Water Utilities	Combined	Manhole	60	
7004	2.41	-2.09	Thames Water Utilities	Combined	Manhole	SW/F4/63	
7903	2.58	-0.68	Thames Water Utilities	Combined	Manhole	SW/G4/56	
8804	2.59	-2.91	Thames Water Utilities	Combined	Manhole	SW/G4/19	
1701	1.85		Thames Water Utilities	Access	Manhole	SW/G5/11	SE Null
1106	2.66	-1.8	Thames Water Utilities	Combined	Manhole	58	
9001	2.53	0.23	Thames Water Utilities	Combined	Manhole	SW/F4/68	
9701	1.93	-1.78	Thames Water Utilities	Combined	Manhole	SW/G4/55	SE Null
9904	2.44	-2.48	Thames Water Utilities	Combined	Manhole	SW/G4/49	
6003	2.76	-1.09	Thames Water Utilities	Combined	Manhole	SW/F4/81	
10ZW			Private	Combined	Manhole		
78YX			Private	Combined	Manhole		
99YQ			Private	Combined	Manhole		
8902	2.5	-1.32	Thames Water Utilities	Combined	Manhole	SW/G4/09	
7706	2.26	0.36	Highways Authority	Surface	Manhole	SW/G4/58	
0602	3.3	-0.2	Thames Water Utilities	Combined	Manhole	SW/G5/9	
0903	2.53	-3.01	Thames Water Utilities	Combined	Manhole	SW/G5/7	
8701	2.22	0.03	Thames Water Utilities	Surface	Manhole	SW/G4/34	
78ZR			Private	Combined	Manhole		
89ZV			Private	Combined	Manhole		
8806	2.2	1.08	Highways Authority	Surface	Manhole	SW/G4/33	
99YX			Private	Combined	Manhole		

Asset Information Sheet

0802	1.71	-1.78	Thames Water Utilities	Combined	Manhole	SW/G5/51	
10ZQ			Private	Combined	Manhole		
1104	2.52	-1.55	Thames Water Utilities	Combined	Manhole	56	
78YY			Private	Combined	Manhole		
8702	2.24	-3.12	Thames Water Utilities	Combined	Manhole	SW/G4/32	
7002	2.28	-0.67	Thames Water Utilities	Combined	Manhole	SW/F4/52	
1001	2.61	-1.86	Thames Water Utilities	Combined	Manhole	59	
1105	2.59	-1.67	Thames Water Utilities	Combined	Manhole	57	
88YW			Private	Combined	Manhole		
8703	2.43		Thames Water Utilities	Combined	Manhole		SE Null
9804	2.15	0.66	Highways Authority	Surface	Manhole	SW/G4/63	
0902	2.55	-2.93	Thames Water Utilities	Combined	Manhole	SW/G5/8	
0702	1.81	-1.64	Thames Water Utilities	Combined	Manhole	SW/G5/24	
6601	2.46	-3.89	Thames Water Utilities	Combined	Manhole		SE Null
6004	2.48	-0.52	Thames Water Utilities	Combined	Manhole	SW/F4/47	
7804	2.86	0.45	Thames Water Utilities	Combined	Manhole	SW/G4/39	
8802	2.6	-2.7	Thames Water Utilities	Combined	Manhole	SW/G4/17	
8803	2.54	-2.81	Thames Water Utilities	Combined	Manhole	SW/G4/18	
1801	2.22	-0.32	Thames Water Utilities	Combined	Manhole	SW/G5/5	
2701	1.7	-1.87	Thames Water Utilities	Combined	Manhole	SW/G5/22	
9903	2.66	-2.44	Thames Water Utilities	Combined	Manhole	SW/G4/13	
7801	3.08	0.28	Thames Water Utilities	Combined	Manhole	SW/G4/43	

Asset Information Sheet

7001	2.77	1.37	Thames Water Utilities	Combined	Manhole	SW/F4/80	
7101	2.58		Thames Water Utilities	Combined	Manhole	SW/F4/40	
7901	3.08	-1.27	Thames Water Utilities	Combined	Manhole	SW/G4/42	
8901	2.66	-2.48	Thames Water Utilities	Combined	Manhole	SW/G4/15	
2001	2.25	-2.73	Thames Water Utilities	Combined	Manhole	61	
1108	2.39	-1.37	Thames Water Utilities	Combined	Manhole	50	
81ZT			Thames Water Utilities	Combined	Manhole		
00ZW			Private	Combined	Manhole		
10ZU			Private	Combined	Manhole		
1107	2.38	0.3	Thames Water Utilities	Combined	Manhole	51	
0001	2.64	0.28	Thames Water Utilities	Combined	Manhole	49	
1101	2.61	-0.38	Thames Water Utilities	Combined	Manhole	63	
1102	2.32	-1.2	Thames Water Utilities	Combined	Manhole	54	
8101	2.56	-0.87	Thames Water Utilities	Combined	Manhole	SW/F4/65	
9803			Thames Water Utilities	Combined	Manhole		
9802	2.14	0.38	Highways Authority	Surface	Manhole	SW/G4/62	
8801	2.59	-2.58	Thames Water Utilities	Combined	Manhole	SW/G4/16	
81ZR			Thames Water Utilities	Surface	Manhole		
68ZV			Private	Combined	Manhole		
2002	2.1	-3.16	Thames Water Utilities	Combined	Manhole	62	
7102	2.51	-0.99	Thames Water Utilities	Combined	Manhole	SW/F4/49	
9902	2.52	0.25	Thames Water Utilities	Combined	Manhole	SW/G4/48	

Asset Information Sheet

0801	2.27	-3.1	Thames Water Utilities	Combined	Manhole	SW/G5/6	
7705			Thames Water Utilities	Combined	Manhole		
2901	1.95	-0.63	Thames Water Utilities	Combined	Manhole	SW/G5/1	
2004			Thames Water Utilities	Unknown	Manhole		5.74M APPROX Null
2005			Thames Water Utilities	Unknown	Manhole		SE Null
91ZX			Private	Combined	Manhole		
9901	2.54	-2.21	Thames Water Utilities	Combined	Manhole	SW/G4/11	
0701	2.07		Thames Water Utilities	Access	Manhole	SW/G5/10	SE Null
0804			Thames Water Utilities	Access	Manhole		SE Null
09ZR			Private	Combined	Manhole		
7803	3.11	-1.86	Thames Water Utilities	Combined	Manhole	SW/G4/40	
7902	2.72	-0.98	Thames Water Utilities	Combined	Manhole	SW/G4/57	
7601	2.8	-0.92	Thames Water Utilities	Combined	Manhole	SW/G4/54	
1103	2.48	-1.23	Thames Water Utilities	Combined	Manhole	55	
1901			Thames Water Utilities	Combined	Manhole		INFO SUPPLIED BY DISTRICT Null
7703	2.36	0.95	Highways Authority	Surface	Manhole	SW/G4/60	
9801	2.22	1.04	Highways Authority	Surface	Manhole	SW/G4/61	
7704	2.33	0.67	Highways Authority	Surface	Manhole	SW/G4/59	
7805	2.95	-2.03	Thames Water Utilities	Combined	Manhole	SW/G4/38	
7104	2.61	-1.09	Thames Water Utilities	Combined	Manhole	SW/F4/50	
6002	2.69	-0.61	Thames Water Utilities	Combined	Manhole	SW/F4/46	
4802	1.64	-1.1	Thames Water Utilities	Combined	Manhole	SW/G5/21	

4903	1.81	-0.02	Thames Water Utilities	Combined	Manhole	SW/G5/13	
4701	1.94	-1.76	Thames Water Utilities	Combined	Manhole	SW/G5/20	
3191			Thames Water Utilities	Combined	Manhole		
3192			Thames Water Utilities	Combined	Manhole		
3903	2.4	-2.06	Thames Water Utilities	Combined	Manhole	SW/G5/4	
4904	1.8	-2.15	Thames Water Utilities	Surface	Manhole	SW/G5/49	DISUSED? Null
3702	1.77	-2.29	Thames Water Utilities	Combined	Manhole	SW/G5/19	
4902	1.87	-1.59	Thames Water Utilities	Combined	Manhole	SW/G5/15	
3101	2.08	-2.67	Thames Water Utilities	Combined	Manhole	65	SE Null
3901	2.5	-2.56	Thames Water Utilities	Combined	Manhole	SW/G5/2	
4801	1.75	-1.08	Thames Water Utilities	Combined	Manhole	SW/G5/17	
3001	2.19		Thames Water Utilities	Combined	Manhole		INVERT DEPTH 6.3M APPROX. Null
3902	2.49	-2.28	Thames Water Utilities	Combined	Manhole	SW/G5/3	
4101			Thames Water Utilities	Combined	Manhole		
3102			Thames Water Utilities	Combined	Manhole		
4901	1.81	-1.66	Thames Water Utilities	Combined	Manhole	SW/G5/16	
6901	2.89	-1.21	Thames Water Utilities	Combined	Manhole	SW/G4/23	
2003			Thames Water Utilities	Unknown	Manhole		
3701	1.81		Thames Water Utilities	Access	Manhole	SW/G5/12	SE Null
4702	1.96		Thames Water Utilities	Access	Manhole	SW/G5/50	SE Null
7103	2.64	-0.61	Thames Water Utilities	Combined	Manhole	SW/F4/41	
0803			Thames Water Utilities	Combined	Manhole		

6101	2.58	-0.57	Thames Water Utilities	Combined	Manhole	SW/F4/39	
87ZR			Private	Combined	Manhole		
7904	2.56	-2.11	Thames Water Utilities	Combined	Manhole	SW/G4/22	
90ZX			Private	Combined	Manhole		
98YV			Thames Water Utilities	Combined	Manhole		
99XZ			Thames Water Utilities	Combined	Manhole		
09ZT			Thames Water Utilities	Combined	Manhole		
98YX			Thames Water Utilities	Combined	Manhole		
09YX			Thames Water Utilities	Combined	Manhole		
11YU			Thames Water Utilities	Combined	Manhole		
77YT			Thames Water Utilities	Combined	Manhole		
88ZR			Thames Water Utilities	Combined	Manhole		
11YX			Thames Water Utilities	Combined	Manhole		
88YX			Thames Water Utilities	Combined	Manhole		
10ZT			Thames Water Utilities	Combined	Manhole		
11YS			Thames Water Utilities	Combined	Manhole		
78ZT			Thames Water Utilities	Combined	Manhole		
88YY			Thames Water Utilities	Combined	Manhole		
10YZ			Thames Water Utilities	Combined	Manhole		
78ZS			Thames Water Utilities	Combined	Manhole		
09ZU			Thames Water Utilities	Combined	Manhole		
00ZU			Thames Water Utilities	Combined	Manhole		

10ZR			Thames Water Utilities	Combined	Manhole		
80ZU			Thames Water Utilities	Combined	Manhole		
90ZT			Thames Water Utilities	Combined	Manhole		
90ZU			Thames Water Utilities	Combined	Manhole		
98YS			Thames Water Utilities	Combined	Manhole		
99YY			Thames Water Utilities	Combined	Manhole		
00YZ			Thames Water Utilities	Combined	Manhole		
98XZ			Thames Water Utilities	Combined	Manhole		
99YZ			Thames Water Utilities	Combined	Manhole		
67ZU			Thames Water Utilities	Combined	Manhole		
77YS			Thames Water Utilities	Combined	Manhole		
77YW			Thames Water Utilities	Combined	Manhole		
77YZ			Thames Water Utilities	Combined	Manhole		
11YW			Thames Water Utilities	Combined	Manhole		
89ZU			Thames Water Utilities	Combined	Manhole		
99YW			Thames Water Utilities	Combined	Manhole		
90ZW			Thames Water Utilities	Combined	Manhole		
98YR			Thames Water Utilities	Combined	Manhole		
10ZS			Thames Water Utilities	Combined	Manhole		
00ZQ			Thames Water Utilities	Combined	Manhole		
80ZT			Thames Water Utilities	Combined	Manhole		
90ZS			Thames Water Utilities	Combined	Manhole		

98YW			Thames Water Utilities	Combined	Manhole		
98YQ			Thames Water Utilities	Combined	Manhole		
91ZW			Thames Water Utilities	Combined	Manhole		
90ZV			Thames Water Utilities	Combined	Manhole		
98YU			Thames Water Utilities	Combined	Manhole		
98YT			Thames Water Utilities	Combined	Manhole		
77YU			Thames Water Utilities	Combined	Manhole		
99YS			Thames Water Utilities	Combined	Manhole		
99YR			Thames Water Utilities	Combined	Manhole		
67YX			Thames Water Utilities	Combined	Manhole		
09YW			Thames Water Utilities	Combined	Manhole		
89ZT			Thames Water Utilities	Combined	Manhole		
00ZV			Thames Water Utilities	Combined	Manhole		
09YY			Thames Water Utilities	Combined	Manhole		
09ZQ			Thames Water Utilities	Combined	Manhole		
99YU			Thames Water Utilities	Combined	Manhole		
10ZV			Thames Water Utilities	Combined	Manhole		
00ZS			Thames Water Utilities	Combined	Manhole		
77YR			Thames Water Utilities	Combined	Manhole		
78ZQ			Thames Water Utilities	Combined	Manhole		
70ZT			Thames Water Utilities	Combined	Manhole		
99YT			Thames Water Utilities	Combined	Manhole		

67YY			Thames Water Utilities	Combined	Manhole		
09YZ			Thames Water Utilities	Combined	Manhole		
77YV			Thames Water Utilities	Combined	Manhole		
10YY			Thames Water Utilities	Combined	Manhole		
311A			Thames Water Utilities	Foul	Inspection Chamber		
67YW			Private	Combined	Inspection Chamber		
7003	2.44	-0.51	Thames Water Utilities	Combined	Manhole	SW/F4/62	
8002	2.5	-1.8	Thames Water Utilities	Combined	Manhole	SW/F4/64	
111A			Private	Foul	Inspection Chamber		REDLINEID003344QHTCH2OCBEEC0605 14103410 Null
011A			Private	Foul	Inspection Chamber		REDLINEID003344QHTCH2OCBEEC0605 14103410 Null
011B			Private	Foul	Inspection Chamber		REDLINEID003344QHTCH2OCBEEC0605 14103410 Null
011C			Private	Foul	Inspection Chamber		REDLINEID003344QHTCH2OCBEEC0605 14103410 Null
111B			Private	Foul	Inspectio		REDLINEID003344QHTCH2OCBEEC0605

					n Chamber		14103410 Null

FINAL MEETING NOTES

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Job Title	Aylesbury Estate
Project Number	50600304
Date	16/05/2014
Time	10:30am
Venue	TWUL Offices Reading
Subject	Waste Water
Client	Notting Hill Housing (NHH)
Present	Tim Dale (TD) – TWUL Developer Services Geoff Brown (GB) – TWUL Asset Planner James Dyason (JD) - WSP
Apologies	

MATTERS ARISING **ACTION**

1.0 Project Introduction

1.1 JD gave project introduction. In summary:

- Regeneration scheme will involve demolition of circa 2,650 existing residential units and replaced with circa 3,500 residential dwellings;
- The Site has its own Aylesbury Area Action Plan (AAP) which has been prepared by London Borough of Southwark. The AAP is one of a number of Local Development Framework documents Southwark is preparing. The AAP is being prepared before the Core Strategy because Southwark urgently need a planning framework to enable redevelopment of the estate. The AAP accords with the vision and objectives of the emerging Core Strategy and in policy terms is consistent with the other AAP areas in the Borough;
- A hybrid planning application will be submitted in September 2014; an outline covering the whole Site and a detailed application associated with the first phase of development (Phase 1b/1c); and
- The anticipated start date on site for the above phase is April 2015

2.0 Existing Drainage Arrangement

2.1 NHH commissioned a full topographical survey for Phase 1b/1c including drainage connectivity works. The survey commission has been extended to cover the whole Site. Timescales for completion of the extended survey is circa July 2014.

2.2 WSP have prepared a composite existing drainage plan for the Phase 1b/1c Site by using details of the connectivity survey, TWUL records and FWMA obligations. In summary the 1b/1c site is served by TWUL combined sewers that outfall into the strategic TWUL combined network via six outfalls; three into the 825mm diameter combined sewer in Portland Street, one into the 2134mm diameter combined sewer in Albany Road and two into the 525mm diameter sewer in Bradenham Close.

2.3 It should be noted that the connection into the Albany Road sewer is likely to be via an existing 600mm diameter combined sewer. This sewer is highlighted as abandoned on the TWUL sewer records, however from onsite drainage connectivity work undertaken to date the sewer is still considered to take flow from the existing development

3.0 Surface Water Discharge from the Proposed Development

3.1 JD talked through the initial discharge calculations for the Phase 1b/1c Site. In summary:

- The assessment takes into consideration Thames Water sewer records and on site survey works;
- The discharge calculations are based upon pipe full hydraulic tables, pipe size, gradient (if known) and roughness co-efficient;
- From the total combined estimation the proposed foul flow has been discounted to leave a surface water allowance;
- This allowance has subsequently been reduced by 50% (in line with London Plan and Core Strategy requirements) to leave an allowable discharge rate of 413l/s; and
- It is the intention to keep the current flow regime in place in order prevent additional loading into the offsite sewers

3.2 JD stated the above methodology, if acceptable to TWUL, would be rolled out for the entire re-development. GB stated that the whole Site discharges either directly or indirectly into the Level 1 strategic trunk sewer located within Albany Road. This sewer has existing capacity issues and by applying the above methodology would likely exceed the capacity of the strategic network, therefore a capacity impact assessment will be required and should encompass the entire site. TD stated that the following procedure/timescales will apply: WSP/TWUL

- A capacity scoping report will need to be undertaken to confirm modelling scope and impact assessment cost. The scoping report will cost £400+VAT and will take 7-10 working days to compete; and
- Once the above is complete a covering letter will be required with plan showing likely sewer connection points. The impact assessment payment should also accompany the letter. Upon receipt of payment timescales to complete the assessment will be circa 12 working weeks.

3.3 JD stated that the receipt of the results will likely be after the application deadline. TD stated that for the purposes of planning, TWUL would be willing to condition the application. JD stated that an interim methodology will need to be agreed to assist in sizing of surface water storage requirements and informing the development cost plan. Once a methodology has been internally discussed it will be presented to TWUL for comment/approval in principle

4.0 Drainage Strategy

4.1 JD outlined the proposed drainage strategy for Phase 1b/1c. The principles of the outline application will also follow what is proposed in the detailed application. In summary:

Surface Water

- The surface water arrangement will consist of a traditional drainage network supplemented, where practicable, with SuDS devices which could include green roofs (above podiums), rainwater harvesting and bio-retention areas; and
- Surface water storage will be required and will likely be located within communal courtyards/open space and underneath the under-croft parking arrangements.

Foul Water

- It is likely that the foul water sewer arrangement will discharge into the TWUL network via gravity

General

Onsite foul and surface water drainage arrangements will remain separate up to the point of outfall, only then will they combine in accordance with TWUL requirements

4.2 JD stated whether TWUL would be willing to adopt the surface water drainage network. TD stated that this could be a possibility subject to review of the strategy proposed. TWUL however would only adopt downstream of any inline storage/SuDS arrangement. Offline storage would be acceptable in principle but will require a right in perpetuity to the area (to ensure storage cannot be removed in the future) and will require evidence of a robust maintenance plan of the storage device.

5.0 Proposed Trees over Sewers

5.1 JD stated that it is the intention of extending tree provision across the Site. With this principle in place there are a number of additional trees shown within the Phase 1b/1c Site that are proposed to be positioned over TWUL combined strategic sewers; namely the 525mm diameter sewer in Bradenham Close and the 1.125m x 0.85m sewer in Westmoreland Road. JD stated that the principle of tree provision over sewers has been accepted in the past with TWUL if the tree provision above the sewer is limited.

5.2 TD stated that the sewers in question are strategic and that the additional trees in Westmoreland Road are in effect infilling between existing trees and would therefore not be considered acceptable. TWUL do not want to set a precedent on Phase 1b/1c that could detrimentally affect their assets across the whole scheme when further details become known. TD stated that a definitive answer would be provided by TWUL upon receipt of a formal submission of the proposals. HTA

6.0 Sewer Easements

6.1 JD stated that the existing/proposed highway boundaries associated with Phase 1b/1c have yet to be confirmed however the 525mm diameter combined sewer within Bradenham Close passes close to the proposed buildings in two instances. If the sewer in these two areas are within private land TWUL sewer easements will apply. If the buildings partially encroach within the easement will a TWUL buildover/close to agreement apply? The buildings in question will be piled

6.2 TD stated that in any assessment TWUL will take into consideration working room on both sides of the sewer. The easement should be taken from the edge of pipe and width should be taken from SFA 6th Edition in the first instance. Taking into consideration the arrangement and foundation proposals there is unlikely to be an issue. JD stated that WSP will produce an easement plan and issue to TWUL to confirm acceptability. WSP

7.0 Decommissioning of Sewers

7.1 JD showed the WSP Proposed Sewer Decommissioning Plan for Phase 1b/1c. JD stated that it is the intention to stop up/remove all sewers within the site with the exception of retaining stubs to the offsite strategic sewers. JD queries procedure and timescales to undertake the works.

7.2 TD stated the following:

- There is no TWUL standard application form;
- Proposal to decommission will need to be undertaken by formal letter accompanied by drainage survey evidence to demonstrate that the sewers in question do not take third party catchment;
- TWUL will undertake all legals and serve standard notices;
- A fee of £500 inc VAT will be required;
- Timescales; application will take circa 2 working weeks assuming no diversions and 5 working weeks with diversions.
- Such works are not required for planning purposes

8.0 Sewer Diversions

8.1 JD stated that sewer diversions in the main are unlikely as all strategic sewers within the existing highways will be retained, however there is a possibility of diversions required during Plot 6 and Plot 11 works to accommodate the proposed development however these diversions and any other potential diversions will be reviewed further and confirmed during the later stages of design.

8.2 TD stated the diversions are not perceived to be a problem but will be subject to a S185 Application that can be undertaken post planning.

9.0 Streetscape

9.1 JD set out the streetscape methodology with the intention of narrowing the arrangement to accommodate adequate housing provision. These proposals are subject to confirmation with London Borough of Southwark highways, however it will mean positioning foul and surface water sewers within the private development frontages to avoid tree pits and services within the public highway. The arrangement proposed by WSP is in accordance with SFA 7th Edition.

9.2 TD stated that the initial sewer arrangement submitted looked acceptable in principle as it accords with the requirements of SFA. JD stated that once the streetscape is finalised an updated plan will be issued to TWUL for comment/approval in principle — WSP

10 AOD

10.1 TWUL to send over a digital copy of the sewer records that cover the entire re-development area — TWUL

Distribution:

All present
Caroline Toogood – NHH
Martin Stillion – WSP
Simon Purcell - WSP
Oliver Chapman – HTA
Mark Mawby – Price and Myers

Our ref: JD/50600304/140606 Dale

6 June 2014

Mr T Dale
Thames Water Utilities Limited
Developer Services
Clearwater Court
Vastern Road
Reading
RG1 8DB

Unit 9, The Chase
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Dear Tim

Aylesbury Estate – Sewer Impact Assessment Scoping Report

As discussed at our meeting dated 16 May 2014 please find below and enclosed the following in order for TWUL to prepare the sewer impact study scoping report:

- A cheque addressed to Thames Water Utilities Limited for the sum of £400+VAT;
- An outline plan showing development massing/units per plot;
- An outline plan showing likely connection points per plot into the strategic TWUL combined sewer network; and
- It is the intention to keep the current flow regime in place, where practicable, in order to prevent additional loadings into the localised public sewers

To assist in the scoping, what we want to achieve is an allowable combined discharge rate per plot. The rates proposed will then be used for the purposes of the foul and surface water drainage design post planning consent.

Should

Yours sincerely

James Dyason
Associate

Encs TWUL connection plan
Massing plan
Cheque for £400+VAT

cc Caroline Toogood – NHH
Martin Stillion - WSP

MEETING NOTES
FINAL

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Job Title	Aylesbury Estate
Project Number	50600304
Date	09/07/2014
Time	14:00
Venue	LBS – Tooley Street
Subject	Flood Risk and Drainage
Client	LBS/NHH
Present	John Kissi (JK)– LBS Joe Miller (JM)– LBS Kayleigh Wyatt (KW) – EA James Dyason (JD) - WSP
Apologies	

MATTERS ARISING **ACTION**

1.0 Planning Update

1.1 JD provided planning update:

- Scheme design freeze due mid-July
- Final draft of ES chapters and technical documentation to be completed by mid-August ready for final Client and legal review
- Both outline and detailed applications will be submitted on 11 September 2014.

2.0 TWUL Update

2.1 JD provided update:

- Met with TWUL dated 16 May 2014;
- FW and SW flows for the proposed development subject to a capacity impact assessment (CIA) due to capacity of Level 1 strategic combined sewer in Albany Road;
- TWUL currently undertaking a scoping study to confirm approach of modelling and costs of CIA. This is due imminently;
- CIA will take at least 12 working weeks to complete which takes completion past submission of the outline and detailed planning applications;
- TWUL have stated that they are willing to condition the application accordingly;
- An interim approach to surface water discharge has been proposed for the purposes of the applications whereby rates are set at brownfield rates (using Wallingford Modified Rational Method 2 yr 15 min estimates) less 50% in accordance with minimum requirements of the London Plan with an additional allowance for foul water offset. Suitable caveats will be added to the strategy stating that final rates will be agreed following completion of the CIA;
- TWUL willing in principle to adopt both foul and surface waters sewers if designed to SFA requirements. All suds and storage devices will need to be offline to the surface water sewers; and
- The drainage strategy will look to utilise existing connections to the strategic TWUL combined sewer network where practicable

JM stated that for the interim solution the modified rational method is the preferred method for determining runoff rates for the purpose of planning submissions and LBS would expect the drainage strategy to include this as a minimum. However should Thames Water's CIA indicate a lower runoff rate then this must be enforced to ensure sufficient capacity and would therefore take precedent.

2.1 In respect to the interim surface water discharge rate methodology proposed, JM and KW stated that although restricting to greenfield rates is preferable, it is not deemed particularly practicable in this instance. Therefore the EA and LBS wish to see a greater commitment to reduce surface water outfall rates over and above the minimum requirements of the London Plan. JD stated this will be reviewed as the drainage strategy progresses with the goal of providing approximately 10-15% betterment above minimum London Plan requirements.

JM stated that LBS interpret this as being a 60-65% reduction from existing brownfield rates and we would expect that the developer is working towards the upper limit of this band (i.e. 65% reduction).

JD stated for clarification purposes that WSP will aim to provide 10-15% betterment where achievable. If this cannot be accommodated we shall strive to still provide an element of betterment over and above minimum standards.

3.0 Surface Water Strategy Update

3.1 JD set out the surface and foul water drainage strategy for the First Development Site (FDS) that is subject to the detailed application. In summary:

- The surface water strategy at ground level will consist of a traditional drainage network supplemented by various SuDS techniques. These include bio-retention areas and silva cells to locally collect runoff and provide an element of sources control and water quality treatment;
- There will also be extensive and intensive green roof provision associated with Buildings 1, 4, 5 and 6. The quantum of which is currently being confirmed by the architects (HTA) and will also provide an element of source control and biodiversity enhancement;
- The surface water storage is positioned underneath Buildings 4 and 5 and will form part of the structural foundation arrangement and are sized to cater for the critical 100yr + 30% allowance for climate change rainfall event;
- Additional SuDS methods are still under further consideration;
- The foul will largely mimic the routing of the surface water sewers; and
- Both foul and surface water will drain via gravity to the TWUL public combined sewers

3.2 It was agreed that the current strategy proposed is acceptable in principle however if further SuDs provision could be included that would be beneficial. JD stated that this is currently being looked into.

3.3 JD stated that the SuDS proposed (silva cells) within the confines of the public highway will be offered for adoption to LBS highways. All other SuDs/storage elements will be managed by NHH

3.4 JM and JK stated that LBS will want to see the same level of SuDS/drainage commitment associated detailed application to be applied for all plots that make up the outline application. JD stated that for the outline application the surface water strategy will show areas of strategic attenuation only, indicative pipe runs and likely points of connections into the TWUL sewers. Further details, including quantum's of additional SuDS (following the principles of the FDS) will be set out as each plot comes forward at a later date, however the commitment to the same

level of SUDS provision for the outline application plots will be enshrined within the FRA and ES to enable LBS to condition appropriately. This was agreed in principle.

4.0 FRA Approach

4.1 JD stated that the FRA will cover both applications. Within each sub heading it will state clearly whether the text applies to both applications or solely for the detailed/outline application. This approach was deemed acceptable in principle to all.

4.2 JD stated that the approach to the FRA will follow the proposals set out within the WSP letter to the EA dated 2 August 2014 ie

- No further breach analysis is required as the site falls outside the breached fluvial flood waters associated with the Thames;
- There are no plans, for the purposes of the planning application, to undertake safe escape assessments, a flood response plan or set FFL above breached fluvial flood water levels in light of the above information

4.3 JM stated that the above seemed reasonable however setting of FFL/external ground levels will need to ensure that people or property are not put at risk from flooding from other sources. JD stated that FFL/ground levels will take into consideration potential overland flow paths, from possible other sources, using the best available data and such an exercise will be undertaken as part of the detailed application. This was set out within the letter to the EA. This approach was deemed acceptable to all.

4.4 KW stated that if more vulnerable uses are set at ground floor level this is against local policy and will be highlighted by the EA in any planning response, however it will also be acknowledged by the EA that measures have been put in place (see 4.3) to demonstrate that such uses are not at risk of flooding. This approach will be acceptable to the EA. JD stated that although residential property is proposed at ground floor level it is unclear whether habitable accommodation is actually located at ground floor level. This will be confirmed.

5.0 EIA Approach

5.1 JD stated that WSP have prepared an EIA scoping opinion response back to LBS and this also included the aforementioned letter to the EA (covered in Section 4 of minutes). JD set out response regarding flooding and drainage, in particular the following:

- Clarification on minimum surface water discharge rates; and
- Ensuring that during construction flood risk is not exacerbated

5.2 JM stated that the EIA approach to construction flood risk is deemed acceptable.

Following the meeting JM has since reviewed the wording of this comment in the pre-app response to discharge rates and what was written was correct in its own context. The response states *"at least 50% of the greenfield runoff rate storage"* which should be interpreted as storage of 50% of that required if the development was discharging at greenfield rates. However, it is accepted that reduction in runoff rates should be the governing requirement, **hence LBS minimum standard is 50% reduction from existing brownfield runoff rates, as WSP pointed out.** This has been discussed and agreed with Dan Davies for matters going forward.

JD agreed that to avoid any confusion and miss interpretation we would recommend that the sentence is updated to state '**50% reduction from existing brownfield runoff rates'**

5.3 JD stated that the ES chapter will cover both applications in similar vein to the FRA. This was deemed acceptable to all

6.0 AOD

6.1 None

Distribution:
All present
Martin Stillion – WSP
Caroline Toogood – NHH
Julia F - HTA

Appendix F – SFRA Appendices and Figures

535000

178000

173000

BERMONDSEY

CAMBERWELL

BRIXTON

DEPTFORD

Rotherhithe

Burgess Park

Peckham Rye Park

East Dulwich

Dulwich Village

Dulwich College

Cycle Track

Leisure Centre

Peckham Leisure Centre

A 206

30m

40m

20m

50m

60m

70m

80m

± 0 245 490 980 Metres

JACOBS

CLIENT: London Borough of Southwark

PROJECT: Southwark SFRA

TITLE: Topography

DRG No: FIGURE A

SCALE: 1:20,000 at A2

DATE: 25/02/08

DRN	CHK'D	APRV'D
ES	AS	KD

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Planning Legend

- Southwark Boundary
- Main River

Elevation (mAOD)

- 0
- 0.1 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9
- 9 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 10m Contours

535000

178000

173000

BERMONDSEY

CAMBERWELL

SOUTHWARK

BRIXTON

DEPTFORD

NEATHAM

Millennium EB
Tate Modern
The Borough
Newington
Walworth
Burgess Park
Leisure Centre
Peckham
Peckham Rye Park
East Dulwich
Herne Hill
Dulwich Village
Dulwich College
College
Rotherhithe
Dock
Marina
Nunhead
Honor Oak Cemy
Cycle Track
A 205
B 304
51

± 0 250 500 1,000 Metres

JACOBS

CLIENT	London Borough of Southwark
PROJECT	Southwark SFRA
TITLE	Geology
DRG No	FIGURE B
SCALE	1:25,000 at A2
DATE	03/12/07
DRN	EKA
CHK'D	AS
APRV'D	KD

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Legend

Southwark Boundary

Bedrock Geology

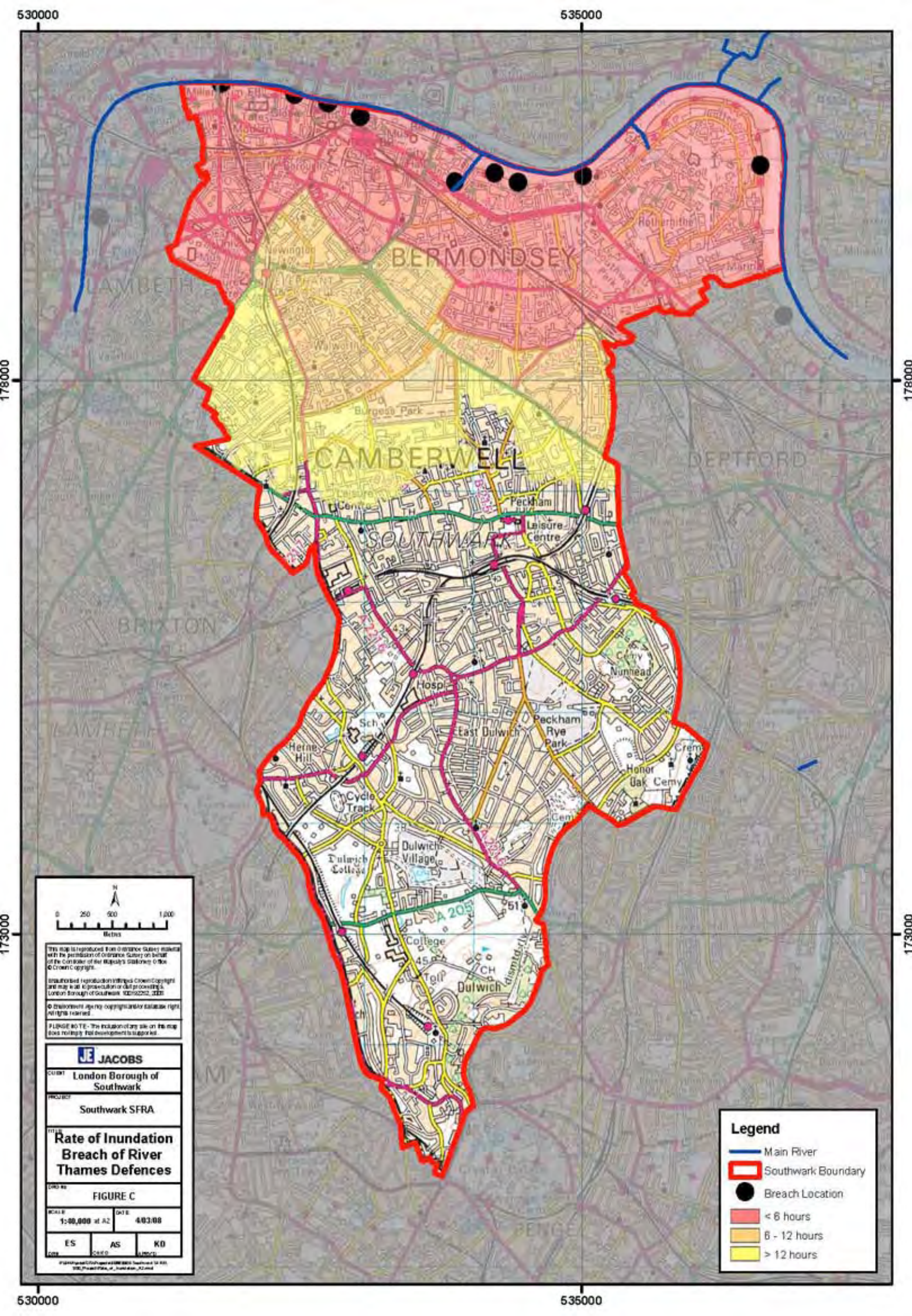
- Chalk including Red Chalk
- London Clay
- Reading and Thanet Beds

Legend

Southwark Boundary

Drift Geology

- Alluvium
- River Terrace Deposits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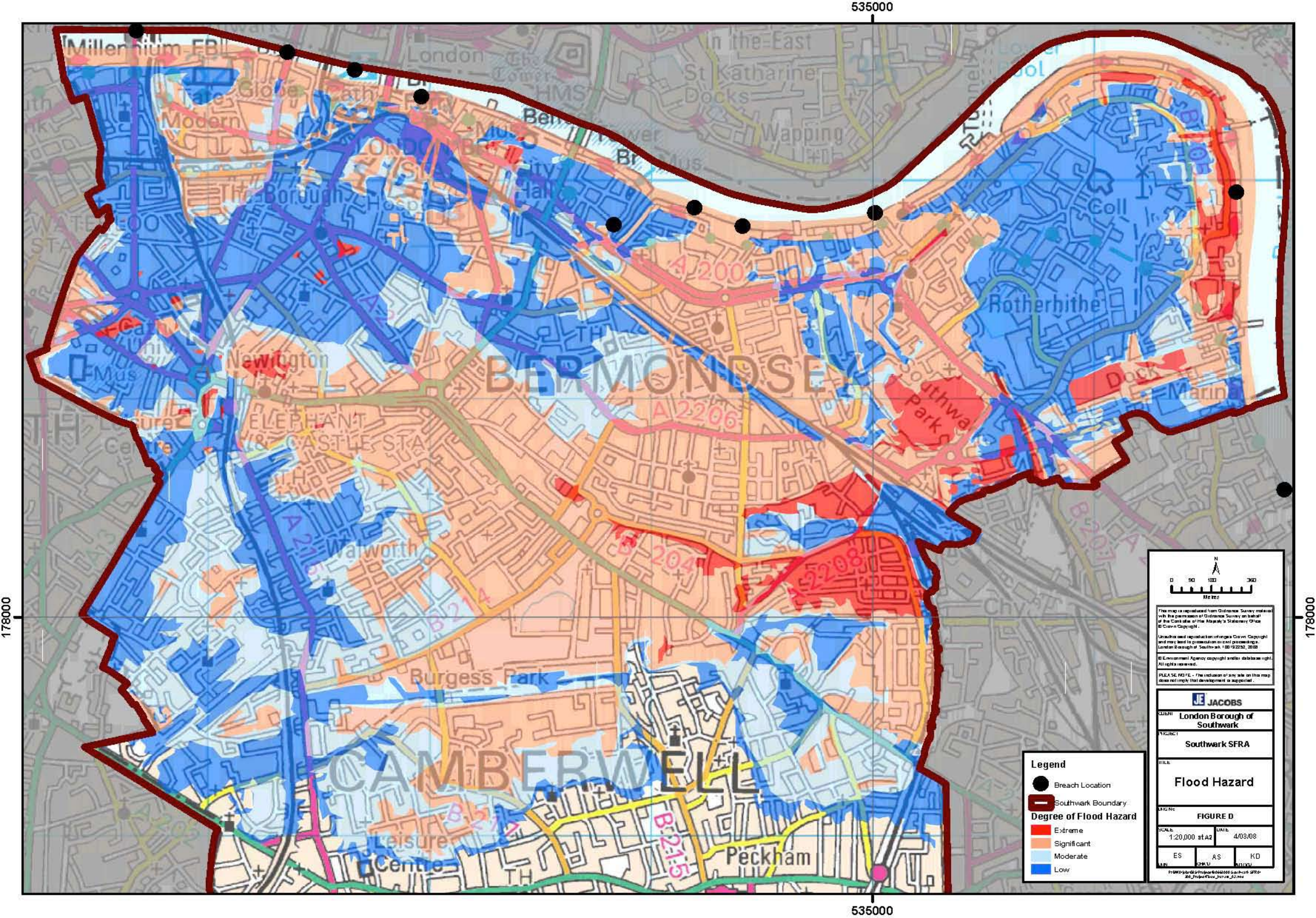
Peckham Rye Park
Herne Hill
Cycle Track
Honor Oak Cemy
Dulwich Village
Dulwich College
A 205
College
Toll
Dulwich
CH
0 250 500 1,000
Metres
JACOBS
CLIENT London Borough of Southwark
PROJECT Southwark SFRA
TITLE Rate of Inundation Breach of River Thames Defences
DRG No FIGURE C
SCALE 1:40,000 at A2
DATE 4/03/08
ES
AS
KD
Legend
Main River
Southwark Boundary
Breach Location
< 6 hours
6 - 12 hours
> 12 hours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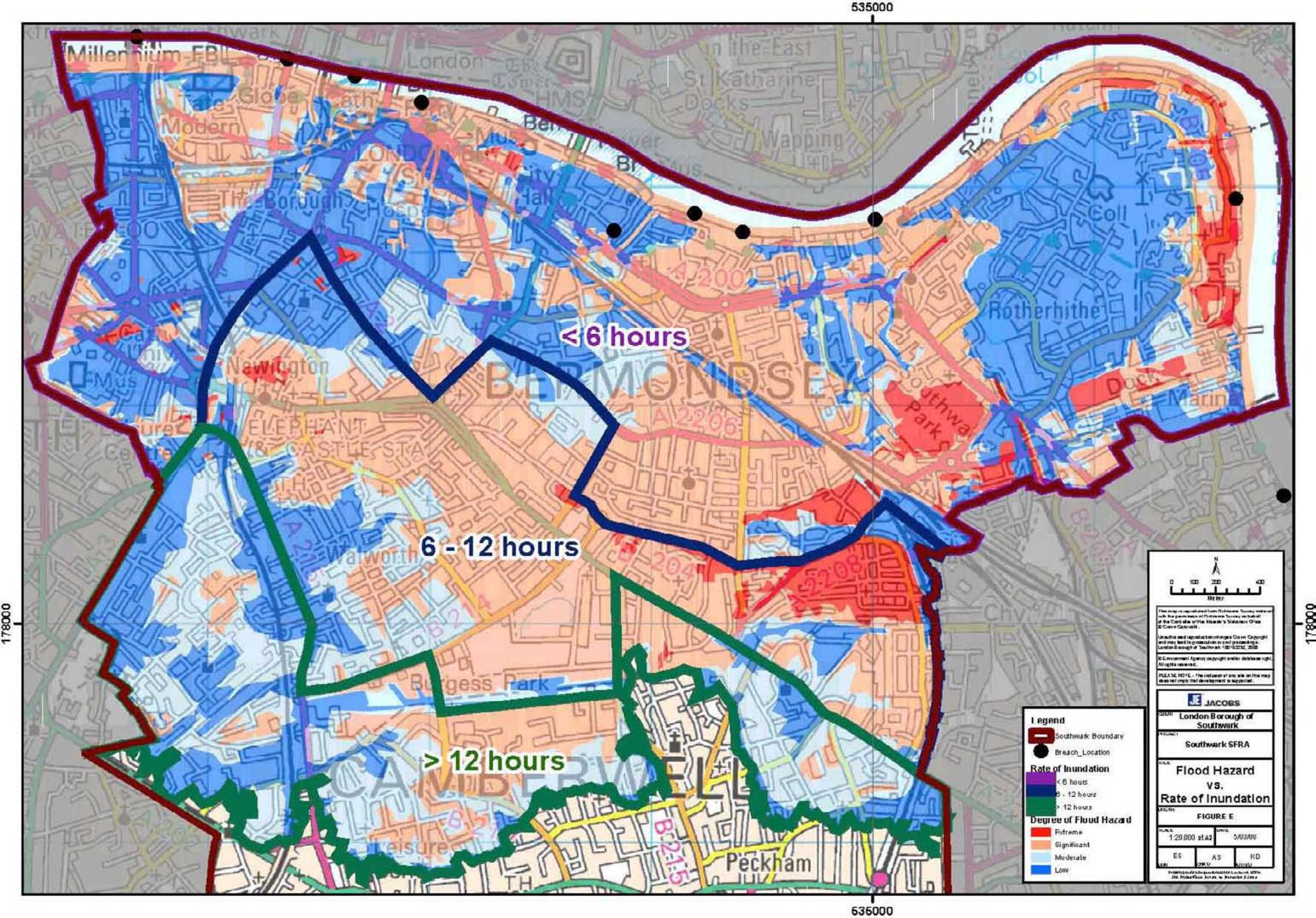
London
St Katharine Docks
Wapping
Rotherhithe
The Borough
Newington
BERMONDSEY
ELEPHANT & CASTLE STA
Walworth
Burgess Park
CAMBERWELL
Leisure Centre
Peckham
A200
A2206
A2
A215
B204
B214
B215
B205
Legend
Breach Location
Southwark Boundary
Degree of Flood Hazard
Extreme
Significant
Moderate
Low
Metres
JACOBS
CLIENT
London Borough of Southwark
PROJECT
Southwark SFRA
TITLE
Flood Hazard
FIGURE D
SCALE
1:20,000 at A2
DATE
4/03/08
ES
AS
KD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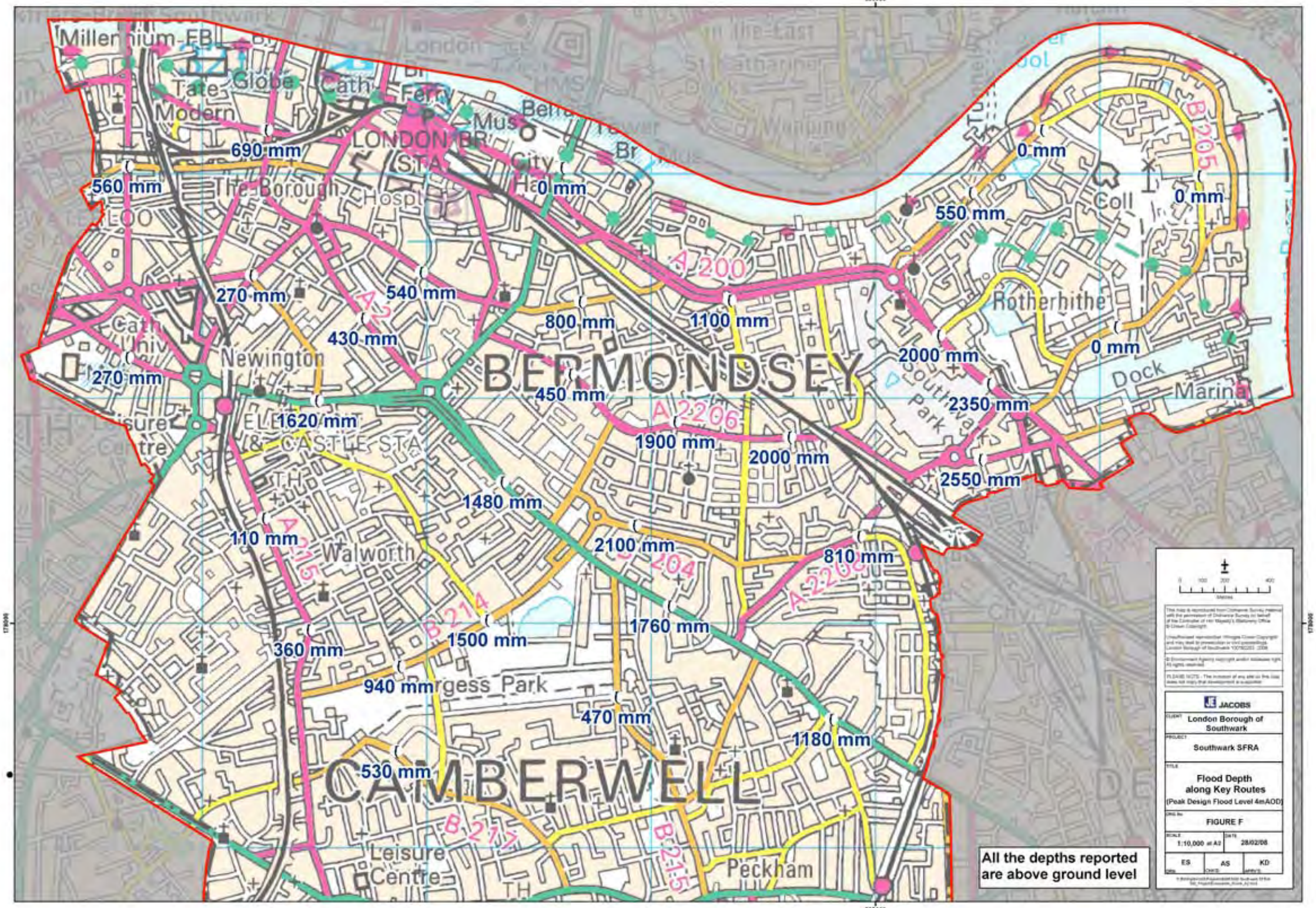
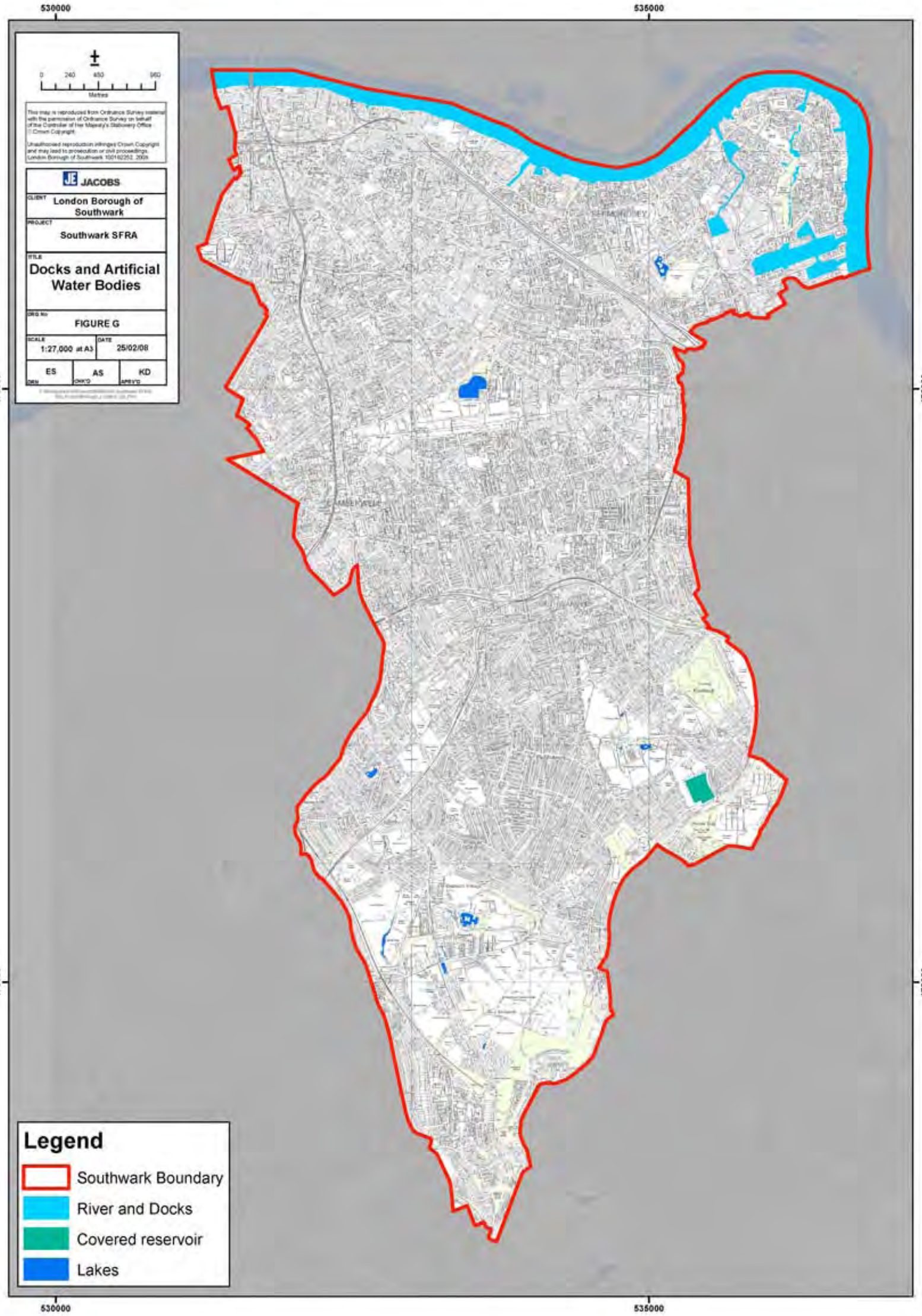
< 6 hours
6 - 12 hours
> 12 hours
BERMONDSEY
CAMBERWELL
Rotherhithe
Peckham
Legend
Southwark Boundary
Breach_Location
Rate of Inundation
< 6 hours
6 - 12 hours
> 12 hours
Degree of Flood Hazard
Extreme
Significant
Moderate
Low
JACOBS
London Borough of Southwark
Southwark SFRA
Flood Hazard vs. Rate of Inundation
FIGURE E
1:20,000 at A2
5/03/08
ES
AS
KD


BERMONDSEY
CAMBERWELL
690 mm
560 mm
0 mm
550 mm
0 mm
270 mm
540 mm
800 mm
1100 mm
430 mm
2000 mm
0 mm
270 mm
450 mm
2350 mm
1620 mm
1900 mm
2000 mm
2550 mm
1480 mm
110 mm
2100 mm
810 mm
1760 mm
360 mm
1500 mm
940 mm
470 mm
1180 mm
530 mm
All the depths reported are above ground level
JACOBS
London Borough of Southwark
Southwark SFRA
Flood Depth along Key Routes
(Peak Design Flood Level 4mAOD)
FIGURE F
1:10,000 at A3
28/02/08
ES
AS
KD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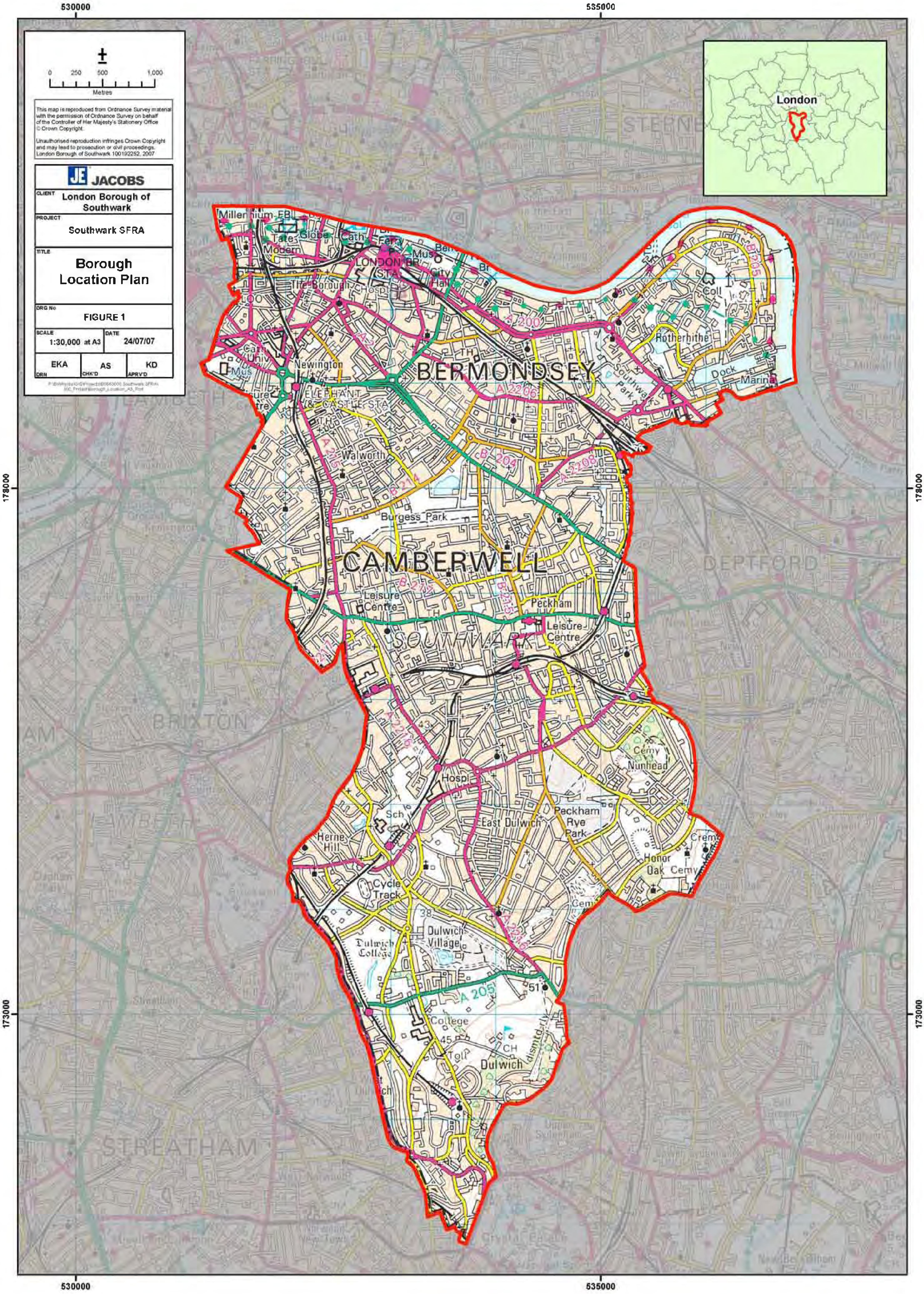
JACOBS
CLIENT London Borough of Southwark
PROJECT Southwark SFRA
TITLE Docks and Artificial Water Bodies
DRG No FIGURE G
SCALE 1:27,000 at A3
DATE 25/02/08
DRN ES
CHK'D AS
APR'D KD
Legend
Southwark Boundary
River and Docks
Covered reservoir
Lakes



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JACOBS
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London Borough of Southwark
PROJECT
Southwark SFRA
TITLE
Borough Location Plan
DRG No
FIGURE 1
SCALE
1:30,000 at A3
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BERMONDSEY
CAMBERWELL
SOUTHWARK
Rotherhithe
Newington
ELEPHANT & CASTLE STA
LONDON BR STA
Walworth
Burgess Park
Peckham
Leisure Centre
East Dulwich
Peckham Rye Park
Nunhead
Honor Oak Cemy
Herne Hill
Cycle Track
Dulwich Village
Dulwich College
Dulwich
Tate Modern
Globe
City Hall
The Borough
Southwark Park
Dock
Marina
A 200
A 2206
A 2208
B 204
B 214
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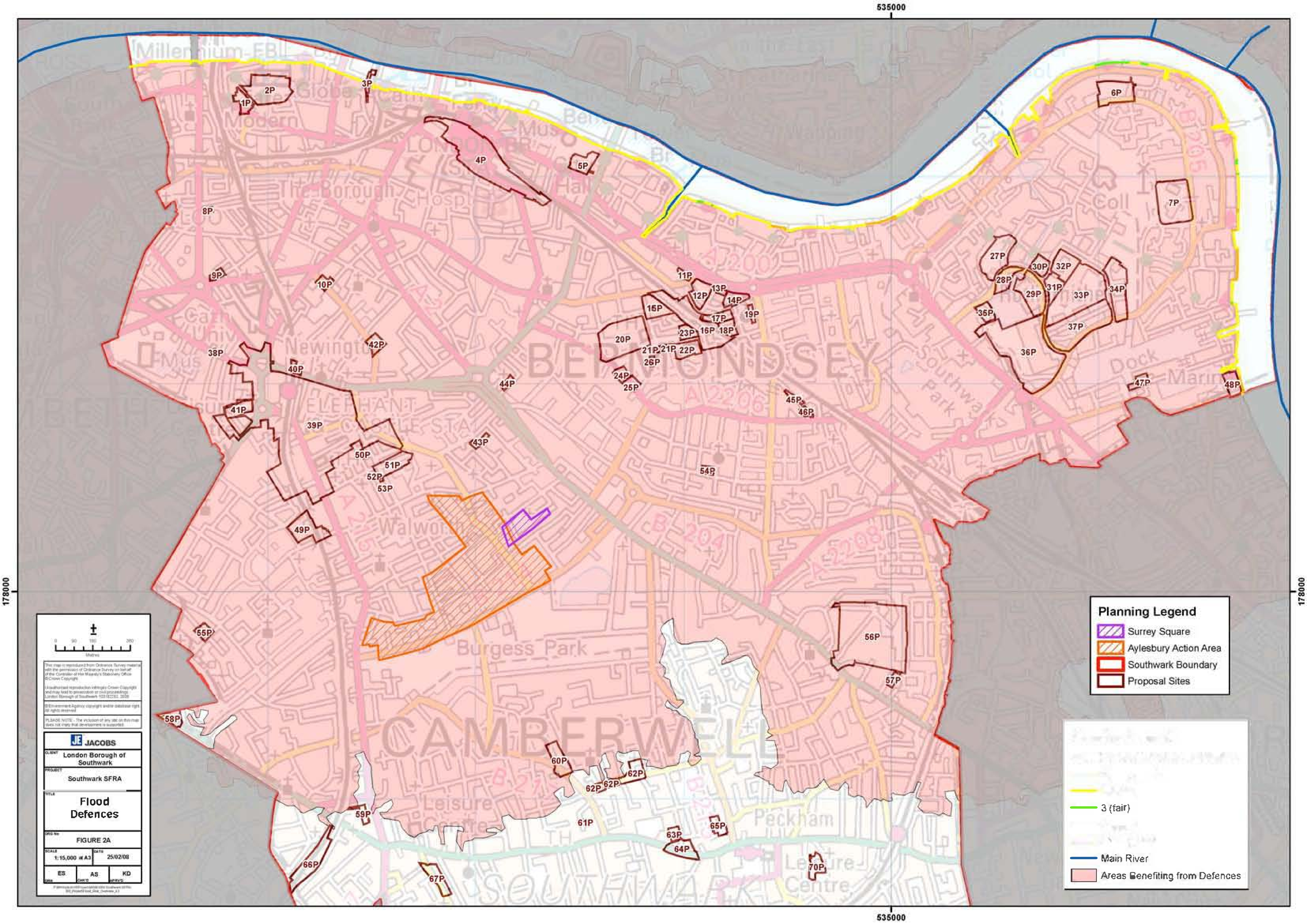
B 215
A 2216
A 205
DEPTFORD
BRIXTON
STREATHAM
LAMBETH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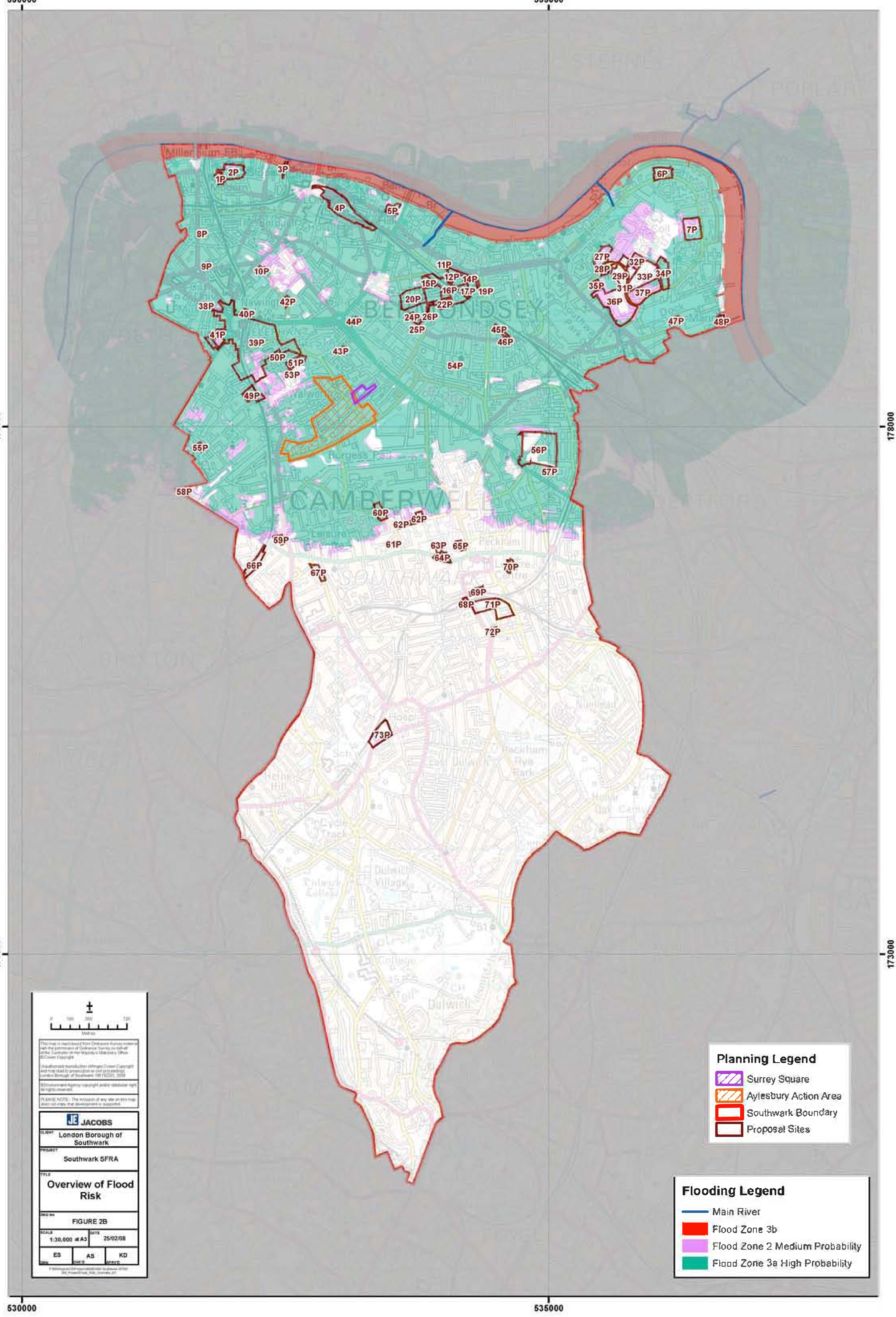
Planning Legend
Surrey Square
Aylesbury Action Area
Southwark Boundary
Proposal Sites
3 (fair)
Main River
Areas Benefiting from Defences
BERMONDSEY
CAMBERWELL
Burgess Park
Peckham
JACOBS
CLIENT London Borough of Southwark
PROJECT Southwark SFRA
TITLE Flood Defences
DRG No FIGURE 2A
SCALE 1:15,000 at A3
DATE 25/02/08
ES
AS
KD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CAMBERWELL
SOUTHWARK
Burgess Park
Peckham
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59P
60P
61P
62P
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67P
68P
69P
70P
71P
72P
73P
Planning Legend
Surrey Square
Aylesbury Action Area
Southwark Boundary
Proposal Sites
Flooding Legend
Main River
Flood Zone 3b
Flood Zone 2 Medium Probability
Flood Zone 3a High Probability
JACOBS
London Borough of Southwark
Southwark SFRA
Overview of Flood Risk
FIGURE 2B
1:30,000 at A3
25/02/08
ES
AS
KD

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1P 2P 3P 4P 5P 6P 7P 8P 9P 10P 11P 12P 13P 14P 15P 16P 17P 18P 19P 20P 21P 22P 23P 24P 25P 26P 27P 28P 29P 30P 31P 32P 33P 34P 35P 36P 37P 38P 39P 40P 41P 42P 43P 44P 45P 46P 47P 48P 49P 50P 51P 53P 54P 55P 56P 57P 58P 59P 60P 61P 62P 62P 62P 63P 64P 65P 66P 67P 68P 69P 70P 71P 72P

Legend

- Southwark Borough Boundary
- Proposal Sites
- Aylesbury Action Area
- Surrey Square
- Main River
- Flow Paths

Elevation (m AOD)

- 0
- 0.1 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9
- 9 - 10
- 10 - 20
- 20 - 30
- 30 - 40

0 100 200 400
Metres

JE JACOBS

CLIENT: London Borough of Southwark Council

PROJECT: Southwark SFRA

TITLE: **Overland Flow-Paths**

DRG No: FIGURE 3

SCALE: 1:12,500 at A2 | DATE: 04/03/08

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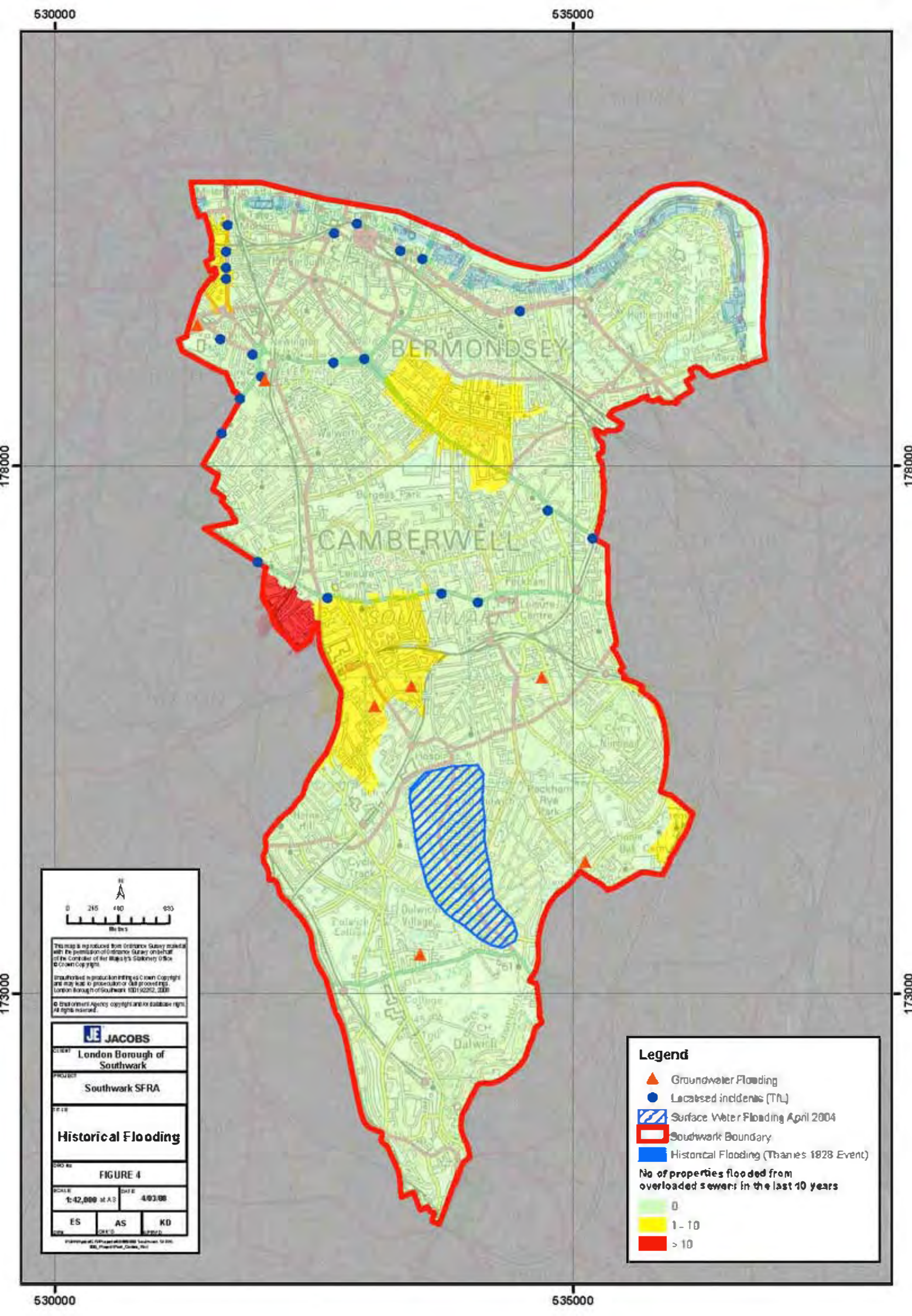
ES	AS	KD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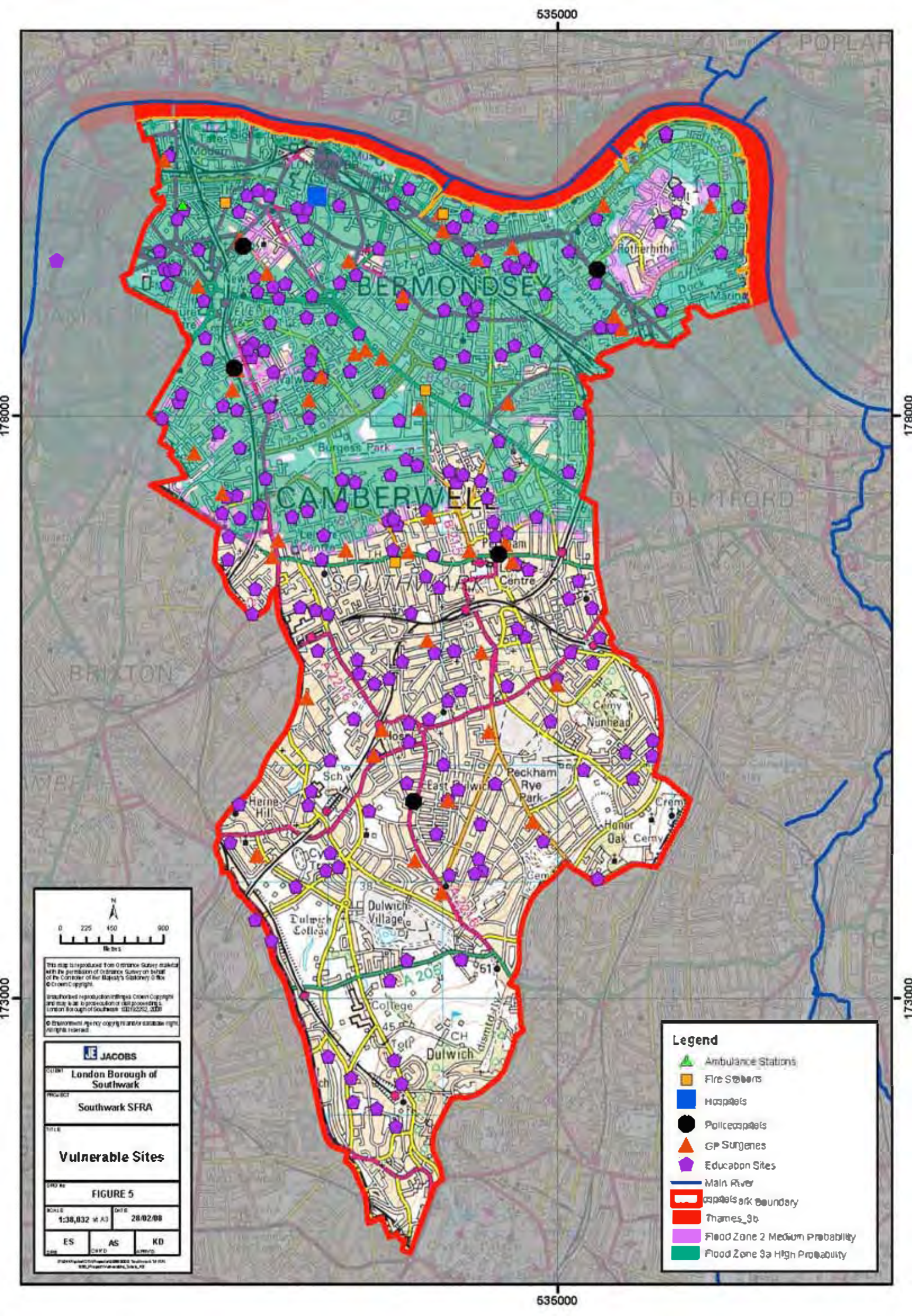
BERMONDSEY
CAMBERWELL
Legend
Groundwater Flooding
Localised incidents (TfL)
Surface Water Flooding April 2004
Southwark Boundary
Historical Flooding (Thames 1928 Event)
No of properties flooded from overloaded sewers in the last 10 years
0
1 - 10
> 10
JACOBS
London Borough of Southwark
Southwark SFRA
Historical Flooding
FIGURE 4
1:42,000 at A3
4/03/08
ES
AS
KD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BERMONDSEY
CAMBERWELL
SOUTHWARK
Rotherhithe
Burgess Park
Peckham Rye Park
Dulwich Village
Dulwich College
Dulwich
Nunhead
Honor Oak
Herne Hill
BRIXTON
DEPTFORD
0 225 450 900
Metres
JACOBS
London Borough of Southwark
Southwark SFRA
Vulnerable Sites
FIGURE 5
1:38,032 at A3
28/02/08
ES
AS
KD
Legend
Ambulance Stations
Fire Stations
Hospitals
Policestations
GP Surgeries
Education Sites
Main River
Southwark Boundary
Thames_3b
Flood Zone 2 Medium Probability
Flood Zone 3a High Probability

Appendix G – EA Correspondence

Product 4 (Detailed Flood Risk) for: Aylesbury Estate, Southwark, London, SE17 2BS
Requested by: Andrew Hutt, WSP UK
Reference: KSL140328JB258
Date: 4 April 2014

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements to the data for this location have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Flood map for planning (Rivers and Sea)

The Flood Map:

Our Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map indicates areas with a 1% (0.5% in tidal areas), Annual Exceedance Probability (AEP) - the probability of a flood of a particular magnitude, or greater, occurring in any given year, and a 0.1% AEP of flooding from rivers and/or the sea in any given year. In addition, the map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time and also take into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at www.environment-agency.gov.uk.

At this Site:

The Flood Map shows that this site lies within the outline of Flood Zone 3. This zone comprises land assessed as having a 0.5% (1 in 200) or greater annual probability of tidal flooding.

Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed modelling of the Thames Tidal Defences Study completed in March 2006 by Halcrow Ltd.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Model Output Data – Thames Estuary 2100

You have requested in-channel flood levels for the tidal river Thames. These have been taken from the Thames Estuary 2100 study completed by HR Wallingford in 2008. The modelled node closest to your site is **2.36**; the locations of nearby nodes are also shown on the enclosed map.

Why have the levels changed?
The TE2100 plan is now live and within it are a set of levels on which the flood risk management strategy is based. The plan is the overarching flood management strategy for the Thames Estuary and therefore any development planning should be based on the same underlying data.

What is the difference between the TE2100 levels and the 2008 Joint Probability levels that have previously been provided?
The values of the two sets of levels are very similar for the present day scenario. However, the TE2100 takes into account operation of the Thames Barrier when considering future levels. The Thames Barrier requires regular maintenance and with additional closures the opportunity for maintenance will be reduced. When this happens, river levels – for which we would normally shut the barrier – will have to be allowed through to ensure that the barrier is not shut too often. For this reason, levels upstream of the barrier will increase and the tidal walls will need to be heightened to match. The levels previously provided do not take this scenario into consideration.

Why is there no return period for levels upstream of the barrier?
The levels upstream of the barrier are the highest levels permitted by the operation of the Thames Barrier. If levels and flows are forecast to be any higher, the Thames Barrier would shut, ensuring that the tide is blocked and the river maintained to a low level. For this reason the probability of any given water level upstream of the Barrier is controlled and therefore any associated return period becomes irrelevant. The Thames Barrier and associated defence system has a 1 in 1000 year standard which means it ensures that flood risk is managed up to an event that has a 0.1% annual probability. The probability of water levels upriver is ultimately controlled by the staff at the Thames Barrier.

Why are the levels in west London higher than the defence crest levels?
In west London there is a heavy influence from upstream flows (fluvial flows). The flood defences are built to manage tidal flood risk only. With very high fluvial flows, the river levels in west London could be above the 0.1% annual probability tidal level.

Why are the climate change/future west London levels lower than the present day levels?
The climate change levels are assessed to determine the future tidal defence levels. For this reason they only account for extreme tidal events and not extreme fluvial flow events. The present day levels include extreme flows from upstream (fluvial events) as well as extreme tidal events.

For further information about the Thames Barrier please visit our website at:
http://www.environment-agency.gov.uk/homeandleisure/floods/38353.aspx

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

TE2100 present day levels:

Levels downstream of the Thames Barrier are 0.1% AEP (1 in1000) and levels upstream are the highest levels permitted by the Thames Barrier. The defence levels (left defence, right defence) are the minimum levels to which the defences should be built.

The defence levels near Teddington are lower than the extreme water levels because they take into account high fluvial events. The defences are tidal only.

Location	Node	Easting	Northing	Extreme water level (m)	Left defence (m)	Right defence (m)	Allow for future defence raising to a level of...	
							Left Bank (m)	Right Bank (m)
Battersea	2.25	526164	175611	4.90	5.41	5.41	6.35	6.35
	2.26	526642	176536	4.89	5.41	5.41	6.35	6.35
	2.27	526950	177323	4.88	5.41	5.41	6.35	6.35
	2.28	527631	177547	4.87	5.41	5.41	6.35	6.35
	2.29	528578	177781	4.87	5.41	5.41	6.35	6.35
	2.30	529598	177749	4.86	5.41	5.41	6.35	6.35
	2.31	530333	178388	4.85	5.41	5.41	6.35	6.35
	2.32	530481	179473	4.84	5.41	5.41	6.35	6.35
	2.33	530716	180429	4.83	5.41	5.41	6.35	6.35
	2.34	531841	180694	4.82	5.41	5.41	6.35	6.35
	2.35	532671	180524	4.81	5.41	5.41	6.35	6.35
				4.81	5.41	5.41	6.35	6.35
				4.81	5.28	5.28	6.35	6.35
Tower	2.36	533437	180397	4.80	5.28	5.28	6.35	6.35
	2.37	534519	179917	4.78	5.28	5.28	6.35	6.35
	2.38	535264	180141	4.76	5.28	5.28	6.35	6.35
				4.75	5.28	5.28	6.35	6.35
				4.75	5.18	5.18	6.20	6.20
Greenwich	2.39	536040	180673	4.74	5.18	5.18	6.20	6.20

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TE2100 climate change levels:
The water levels in west London are lower than the current day extreme levels because they do not take into account extreme fluvial events; they are tidal only levels.

				2065 to 2100		2100	
Location	Node	Easting	Northing	Design water level	Defence level (both banks)	Design water level	Defence level (both banks)
Battersea	2.25	526164	175611	5.41	5.85	5.84	6.35
	2.26	526642	176536	5.40	5.85	5.83	6.35
	2.27	526950	177323	5.39	5.85	5.83	6.35
	2.28	527631	177547	5.37	5.85	5.82	6.35
	2.29	528578	177781	5.36	5.85	5.82	6.35
	2.30	529598	177749	5.35	5.85	5.81	6.35
	2.31	530333	178388	5.34	5.85	5.80	6.35
	2.32	530481	179473	5.33	5.85	5.79	6.35
	2.33	530715	180428	5.32	5.85	5.79	6.35
	2.34	531841	180694	5.31	5.85	5.85	6.35
	2.35	532671	180524	5.31	5.85	5.78	6.35
Tower	2.36	533437	180396	5.30	5.85	5.77	6.35
	2.37	534519	179917	5.27	5.85	5.76	6.35
	2.38	535264	180141	5.27	5.85	5.75	6.35
				5.26	5.85	5.74	6.35
				5.26	5.70	5.74	6.20
	2.39	536040	180673	5.25	5.70	5.74	6.20
Greenwich	2.43	538582	178205	5.19	5.70	5.68	6.20

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Breach Modelling

The table below displays site-specific modelled flood levels at your site. These have been taken from Tidal Thames Breach modelling study completed by Halcrow in March 2012. The exact location of the given site specific levels and the extent of the breach is shown on the enclosed map.

This modelling simulates tidal breaches along the Thames from Teddington to the Mar Dyke and River Darent. A series of approximately 100 tidal models were developed for the Environment Agency at pre-determined breach locations. These were chosen using a risk-based approach by examining critical locations based on low floodplain topography. For hard defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, defences are assumed to breach down to the ground level behind the defence.

Based on the 2008 Extreme Water Level Modelling, the 0.5% probability of annual exceedance (1 in 200 year joint probability – Thames Barrier Operational) tidal event was modelled for all breach locations with a current year baseline of 2005. In addition, for breaches downstream of the Thames Barrier, the 1 in 200 year plus climate change event (2107 epoch) was also modelled.

This site is not located within the outlines of our breach models. However, nearby levels are available and have been provided below.

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Breach ID: Bermondsey 7 (Berm07)

	National Grid Reference		Modelled levels in m AODN for 0.5% AEP	
Point	**Easting**	**Northing**	**2005**	**2107**
1	532780	178451	No Flood	N/A
2	533032	178465	No Flood	N/A
3	533352	178064	No Flood	N/A
4	532931	177831	No Flood	N/A
5	532546	177686	No Flood	N/A
6	532509	177855	No Flood	N/A
7	532764	178071	No Flood	N/A
8	532962	178206	No Flood	N/A
9	532764	177810	No Flood	N/A
10	532917	178042	No Flood	N/A
11	533009	178310	No Flood	N/A
12	533154	178071	No Flood	N/A
13	533824	178386	1.60	N/A
14	533872	178336	1.60	N/A
15	533506	178057	No Flood	N/A
16	533459	177970	No Flood	N/A

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Breach ID: Bermondsey 8 (Berm08)

	National Grid Reference		Modelled levels in m AODN for 0.5% AEP	
Point	**Easting**	**Northing**	**2005**	**2107**
1	532780	178451	No Flood	N/A
2	533032	178465	No Flood	N/A
3	533352	178064	No Flood	N/A
4	532931	177831	No Flood	N/A
5	532546	177686	No Flood	N/A
6	532509	177855	No Flood	N/A
7	532764	178071	No Flood	N/A
8	532962	178206	No Flood	N/A
9	532764	177810	No Flood	N/A
10	532917	178042	No Flood	N/A
11	533009	178310	No Flood	N/A
12	533154	178071	No Flood	N/A
13	533824	178386	1.54	N/A
14	533872	178336	1.54	N/A
15	533506	178057	No Flood	N/A
16	533459	177970	No Flood	N/A

Please note that we have produced only a finite number of breach models for the Tidal Thames, based on a number of key locations. Although this site is outside of the extents of all of the breach models that we hold, we cannot state categorically that no breach model could be created that is shown to affect this site. As such, you may need to consider carrying out additional modelling to simulate the breaching of defences in a suitable alternative location.

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Upstream Inundation Modelling

The enclosed map shows the extent of the 0.5 % AEP (1 in 200) and 0.1% AEP (1 in 1000) results for the Tidal Thames Upstream Inundation modelling study completed by Halcrow Group Ltd. in 2011.

Based on the 2008 Extreme Water Level Modelling, the 0.5% and 0.1% probability of annual exceedance (1 in 200 and 1 in 1000 year joint probability respectively – Thames Barrier Operational) tidal event was modelled with a current year baseline of 2005.

Using the domains created as part of the Flood Zones Improvements modelling completed by Halcrow Group Ltd. in 2006, the project generated outputs for water depths, velocity, levels and hazard. However the scenario modelled is that the Thames Barrier is operational but all linear defences have been removed. It uses the joint probability levels calculated in 2008 and only provides data for embayments upstream of the Thames Barrier.

	National Grid Reference		Modelled levels in m AODN for 2005 Epoch	
Point	**Easting**	**Northing**	**0.5% (1 in 200) AEP**	**0.1% (1 in 1000) AEP**
1	532780	178451	No Flood	No Flood
2	533032	178465	No Flood	No Flood
3	533352	178064	No Flood	No Flood
4	532931	177831	No Flood	No Flood
5	532546	177686	No Flood	No Flood
6	532509	177855	No Flood	No Flood
7	532764	178071	No Flood	No Flood
8	532962	178206	No Flood	No Flood
9	532764	177810	No Flood	No Flood
10	532917	178042	No Flood	No Flood
11	533009	178310	No Flood	No Flood
12	533154	178071	No Flood	No Flood
13	533824	178386	2.34	2.40
14	533872	178336	2.34	2.40
15	533506	178057	No Flood	0.05
16	533459	177970	No Flood	0.05

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Defence Details

The design standard of protection of the flood defences in this area of the Thames is 0.1% AEP; they are designed to defend London up to a 1 in 1000 year flood event. The defences are all raised, man-made and privately owned. They are maintained to a crest level of 5.28 m AODN downriver of London Bridge and 5.41 m AODN downriver of London Bridge (the Flood Defence Level in this reach of the Thames). We inspect them twice a year to ensure that they remain fit for purpose. The current condition grade for defences in the area is 2 (good), on a scale of 1 (very good) to 5 (very poor). For more information on your rights and responsibilities as a riparian owner, please see our document 'Living on the edge' found on our website at:

https://publications.environment-agency.gov.uk/skeleton/publications/default.aspx

There are no planned improvements in this area. Please see the 'Thames Estuary 2100' document on our website for the short, medium and long term Flood Risk Management strategy for London:

http://www.environment-agency.gov.uk/homeandleisure/floods/125045.aspx

Areas Benefiting from Flood Defences

This site is within an area benefiting from flood defences, as shown on the enclosed extract of our Flood Map. Areas benefiting from flood defences are defined as those areas which benefit from formal flood defences specifically in the event of flooding from rivers with a 1% (1 in 100) chance in any given year, or flooding from the sea with a 0.5% (1 in 200) chance in any given year.

If the defences were not there, these areas would be flooded. An area of land may benefit from the presence of a flood defence even if the defence has overtopped, if the presence of the defence means that the flood water does not extend as far as it would if the defence were not there.

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Recorded Flood Events Data

We hold records of historic flood events from rivers and the sea. Information on the floods that may have affected the area local to your site is provided below and in the enclosed map (if relevant).

Flood Event Data

We do not hold records of historic flood events from rivers and/or the sea affecting this site. However, please be aware that this does not necessarily mean that flooding has not occurred here in the past, as our records are not comprehensive.

Due to the fact that our records are not comprehensive, we would advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding or drainage systems that have been overwhelmed.

We do not hold records of historic flood events from rivers and/or the sea affecting this site. However, please be aware that this does not

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Additional Information

Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

Important
If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:-

http://www.environment-agency.gov.uk/research/planning/33580.aspx

Depending on the enquiry, we may also provide advice on other issues related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice, the technical guidance to the National Planning Policy Framework and the existing PPS25 Practice Guide for information about what flood risk assessment is needed for new development in the different Flood Zones. These documents can be accessed via:

http://www.environment-agency.gov.uk/research/planning/82587.aspx
https://www.gov.uk/government/publications/national-planning-policy-framework-technical-guidance
https://www.gov.uk/government/publications/development-and-flood-risk-practice-guide-planning-policy-statement-25

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk / Consequence Assessment (FRA / FCA) where one is required, but does not constitute such an assessment on its own.

2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. The information produced by the local planning authority referred to above may assist here.

3. Where a planning application requires a FRA / FCA and this is not submitted or deficient, the Environment Agency may well raise an objection.

4. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your local planning authority.

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Email: kslenquiries@environment-agency.gov.uk

Development and Flood Risk

We have recently moved to issuing design water levels from the TE2100 project as part of data requests. Developers should use these levels as part of their flood risk assessments for elements impacted by in-river levels, for example defence crest heights etc. We are in the process of carrying out revised breach modelling for the floodplains based on these new in-river levels. Until this new breach modelling is available, developers may continue to use our existing (2008) breach modelling levels to inform their flood risk assessments and to set finished floor levels in developments at residual risk (where this data is available). Developers should be aware that these levels will be changing in the future and are likely to result in recommended finished floor levels being set at a higher level to that currently used. Developers may wish to undertake their own updated breach modelling using our TE2100 data, which we can supply on request where available.

Surface Water

We have provided two national Surface Water maps, under our Strategic Overview for flooding, to your Lead Local Flood Authority – London Borough of Southwark – who are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse), which alongside their existing local information will help them in determining what best represents surface water flood risk in your area.

London Borough of Southwark have reviewed these and determined what it believes best represents surface water flood risk. You should therefore contact this authority so they can provide you with the most up to date information about surface water flood risk in your area.

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources. We are working with these organisations to improve knowledge and understanding of surface water flooding.

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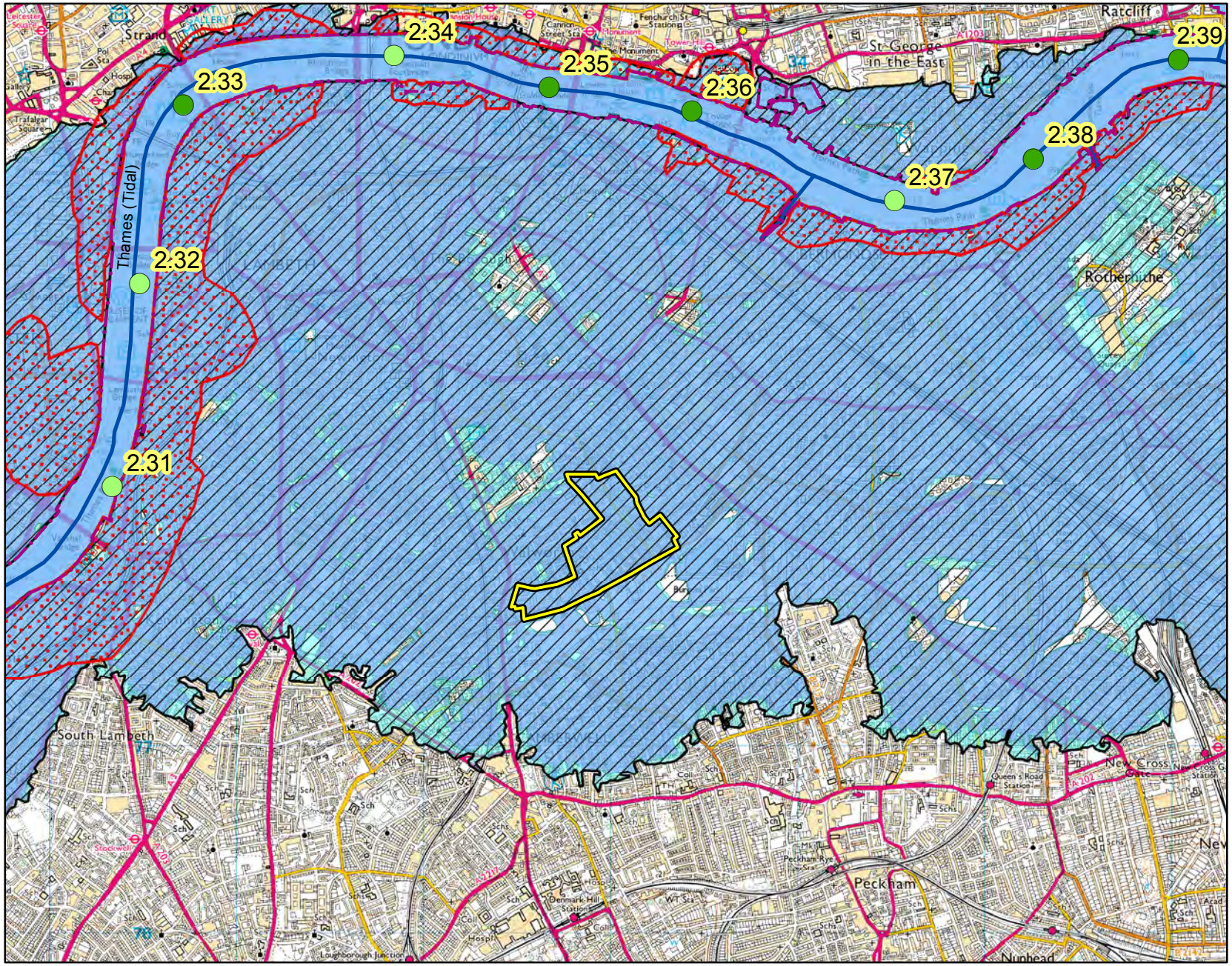
Email: kslenquiries@environment-agency.gov.uk

Detailed FRA/FCA Map centred on SE17 2BS created 4 April 2014 [Ref: KSL140328JB258]



Environment Agency

Scale 1: 30,000

N W E S

Legend

- Site Location
- Model Nodes - Modelled
- Model Nodes - Interpolated
- Flood Map - Defences
- Main Rivers
- Flood Map - Flood Storage Areas
- Areas Benefiting from Flood Defences
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2
- Jan 1928 Flood Outline

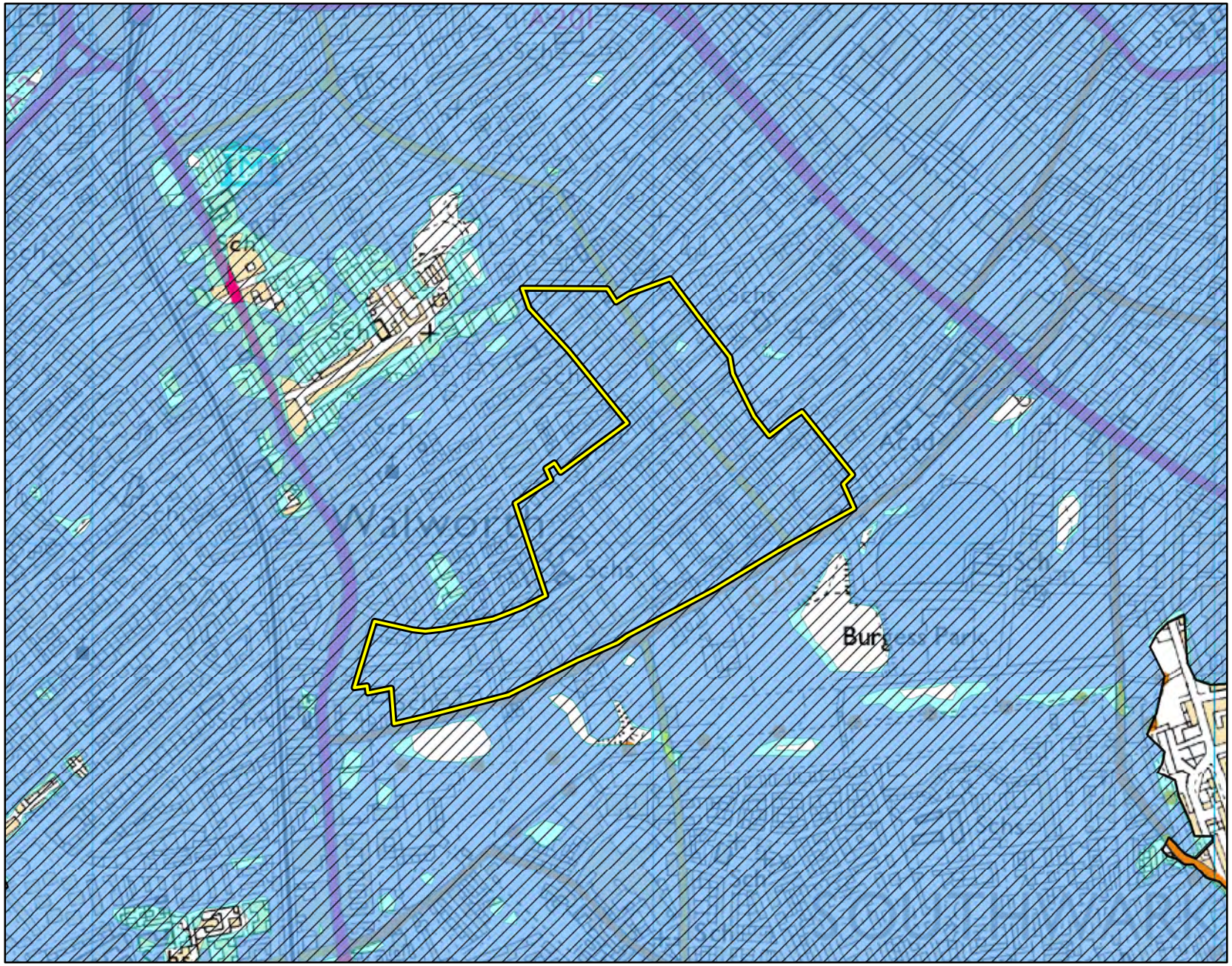
Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Detailed FRA/FCA Map centred on SE17 2BS created 4 April 2014 [Ref: KSL140328JB258]



Environment Agency

Scale 1: 10,000

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Legend

- Site Location
- Model Nodes - Modelled
- Model Nodes - Interpolated
- Flood Map - Defences
- Main Rivers
- Flood Map - Flood Storage Areas
- Areas Benefiting from Flood Defences
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2
- Jan 1928 Flood Outline

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
– from the sea with a 0.5% or greater chance of occurring each year
– or from a river with a 1% or greater chance of occurring each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

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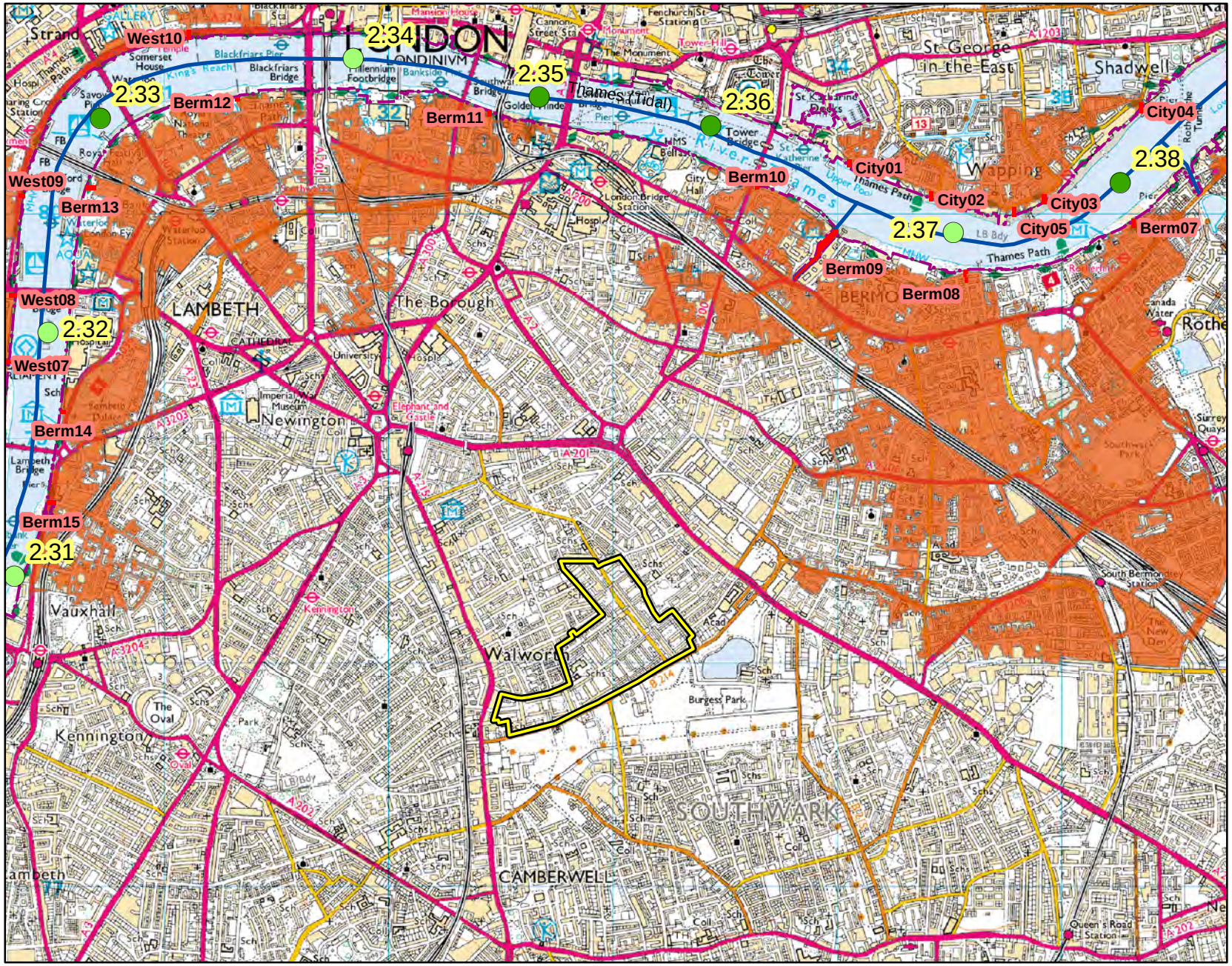
Breach Modelling Map centred on SE17 2BS created 4 April 2014 [Ref: KSL140328JB258]



Scale 1: 25,000

Legend

- Site Location
- Model Nodes - Modelled
- Model Nodes - Interpolated
- Main Rivers
- Flood Map - Defences
- Breach Locations
- 0.5% AEP (1 in 200 year) 2005 Max Flood Extent
- 0.5% AEP (1 in 200 year) 2107 Max Flood Extent

Thames Tidal Breach Modelling 2012

A modelled representation of tidal breaches along the Thames from Teddington to the Mar Dyke and River Darent, based on low floodplain topography. For hard defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, defences are assumed to breach down to the ground level behind the defence.
The modelling is based on the Extreme Water Levels 2008 (current year 2005), and includes 0.5% (1 in 200) chance in any year. In the case of breaches downstream of the Thames Barrier, the 1 in 200 year plus climate change event (2107 epoch) was also modelled.

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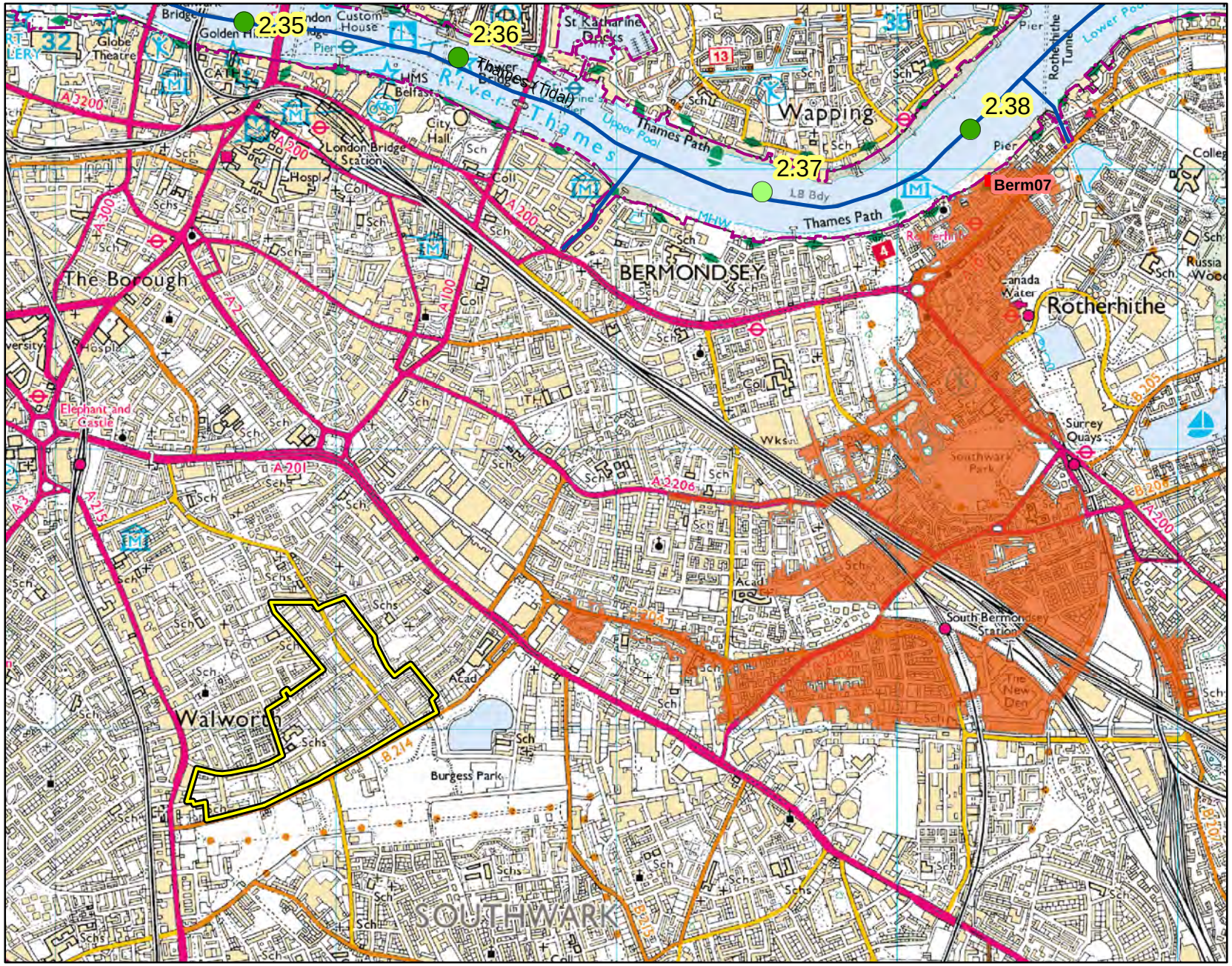
Breach Modelling Map (Berm07) centred on SE17 2BS created 4 April 2014 [Ref: KSL140328JB258]



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Scale 1: 20,000

Legend

- Site Location
- Model Nodes - Modelled
- Model Nodes - Interpolated
- Main Rivers
- Flood Map - Defences
- Breach Locations
- 0.5% AEP (1 in 200 year) 2005 Max Flood Extent
- 0.5% AEP (1 in 200 year) 2107 Max Flood Extent

Thames Tidal Breach Modelling 2012

A modelled representation of tidal breaches along the Thames from Teddington to the Mar Dyke and River Darent, based on low floodplain topography. For hard defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, defences are assumed to breach down to the ground level behind the defence.
The modelling is based on the Extreme Water Levels 2008 (current year 2005), and includes 0.5% (1 in 200) chance in any year. In the case of breaches downstream of the Thames Barrier, the 1 in 200 year plus climate change event (2107 epoch) was also modelled.

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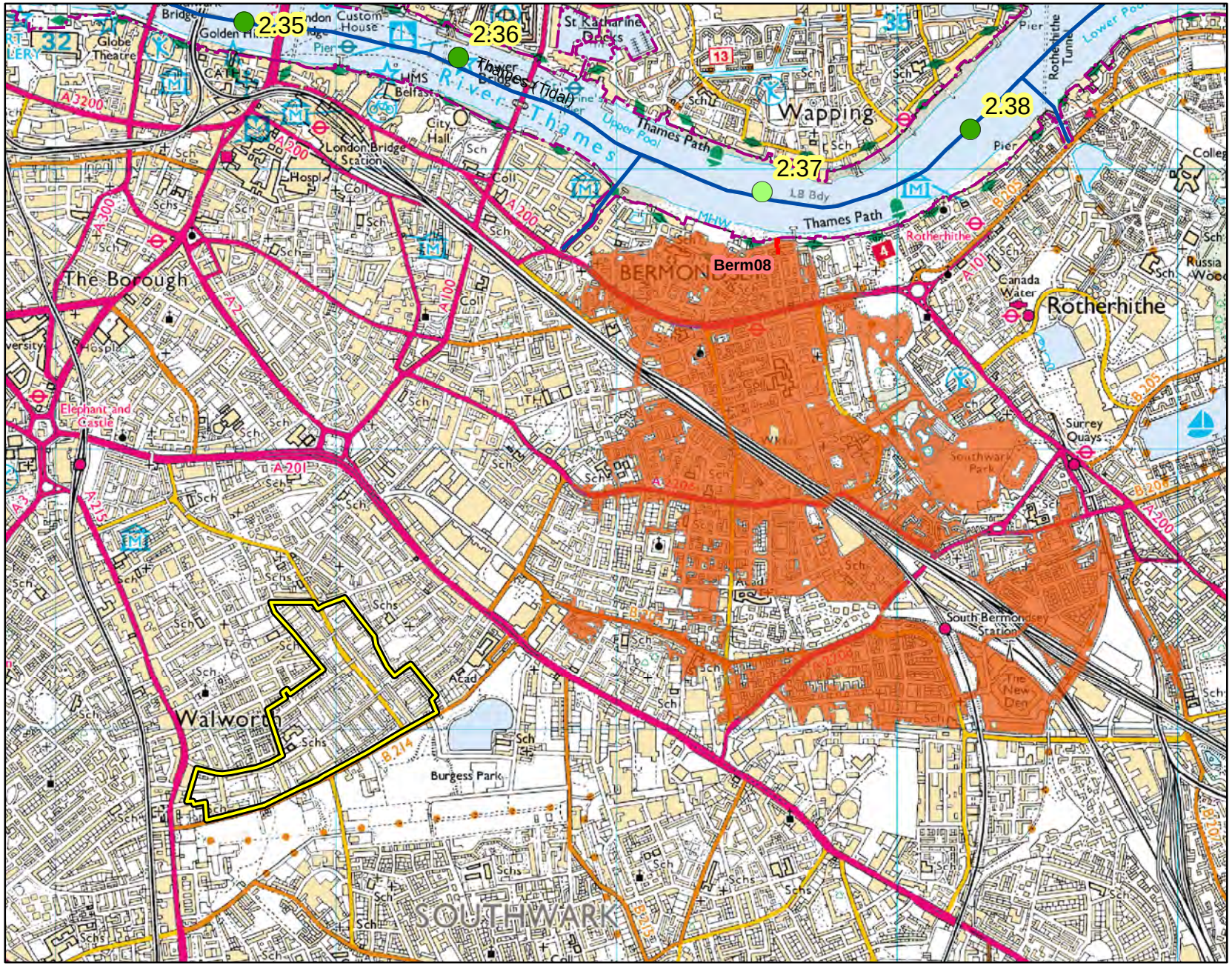
Breach Modelling Map (Berm08) centred on SE17 2BS created 4 April 2014 [Ref: KSL140328JB258]



Environment Agency

Scale 1: 20,000

Legend

- Site Location
- Model Nodes - Modelled
- Model Nodes - Interpolated
- Main Rivers
- Flood Map - Defences
- Breach Locations
- 0.5% AEP (1 in 200 year) 2005 Max Flood Extent
- 0.5% AEP (1 in 200 year) 2107 Max Flood Extent

Thames Tidal Breach Modelling 2012

A modelled representation of tidal breaches along the Thames from Teddington to the Mar Dyke and River Darent, based on low floodplain topography. For hard defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, defences are assumed to breach down to the ground level behind the defence.
The modelling is based on the Extreme Water Levels 2008 (current year 2005), and includes 0.5% (1 in 200) chance in any year. In the case of breaches downstream of the Thames Barrier, the 1 in 200 year plus climate change event (2107 epoch) was also modelled.

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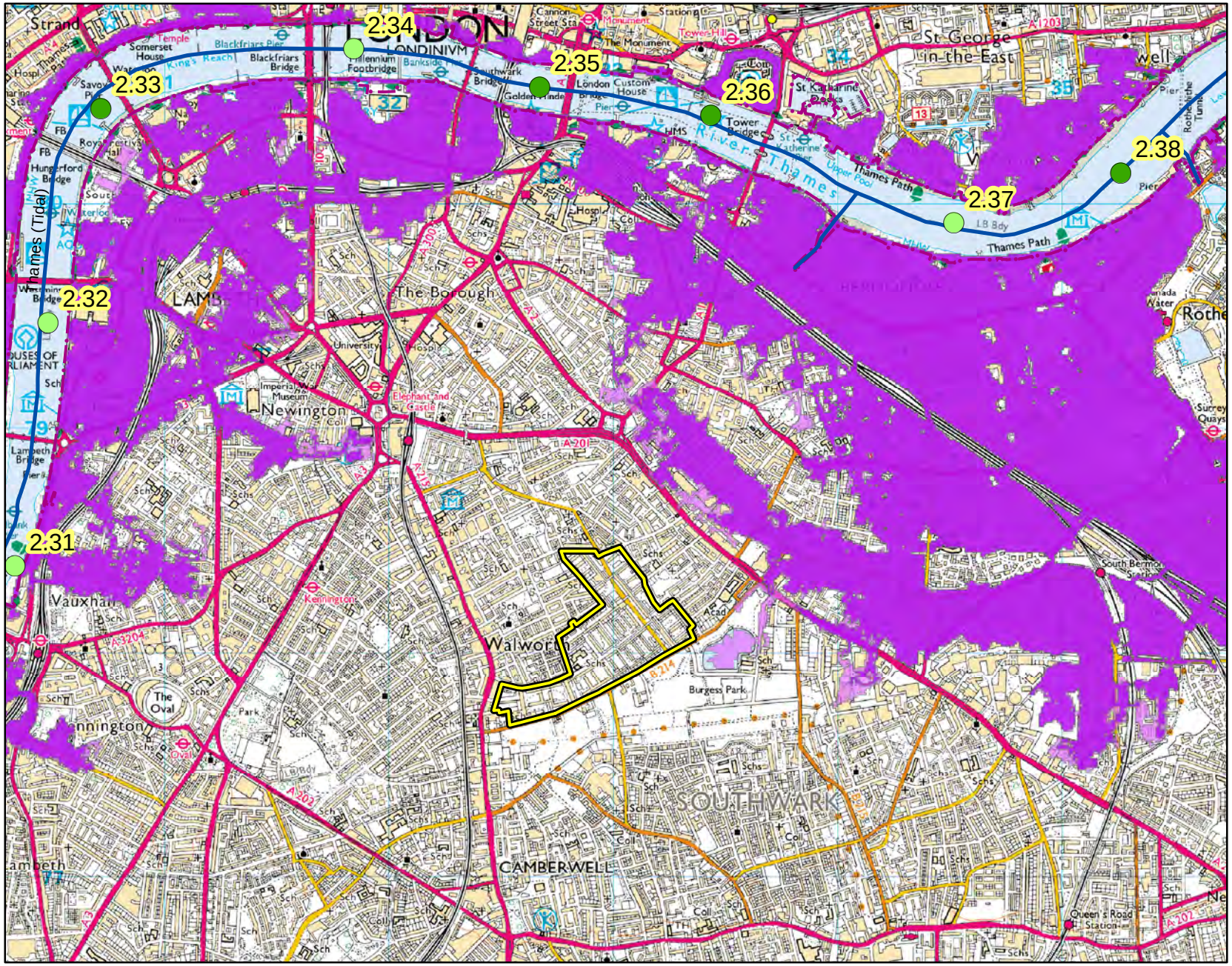
Upstream Inundation Modelling Map centred on SE17 2BS created 4 April 2014 [Ref: KSL140328JB258]



Environment Agency

Scale 1: 25,000

Legend

- Model Nodes - Modelled
- Model Nodes - Interpolated
- Main Rivers
- Flood Map - Defences
- 0.5% AEP (1 in 200 year) Maximum Flood Extent
- 0.1% AEP (1 in 1000 year) Maximum Flood Extent

Upstream Inundation Modelling 2011

A modelled representation of at-risk areas, assuming no defences, based on the upstream levels from the Thames Barrier operational scenarios. These are the levels that are providers to developers to include in flood risk assessments.
The modelling is based on the Extreme Water Levels 2008 (current year 2005), and includes 0.5% (1 in 200) and 0.1% (1 in 1000) chance in any year.

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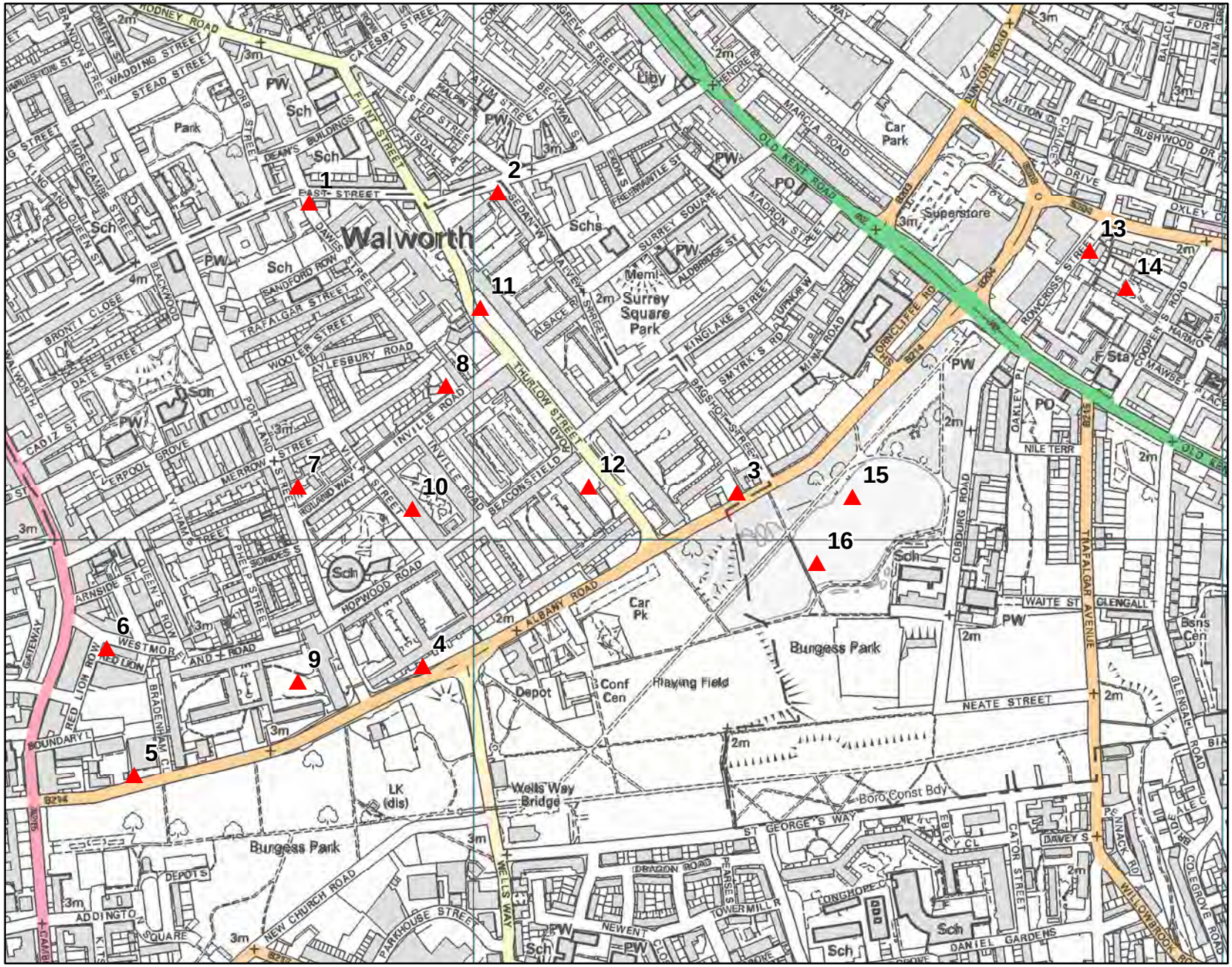
Node Location Map centred on SE17 2BS created 4 April 2014 [Ref: KSL140328JB258]



Environment Agency

Scale 1: 7,500

Legend

▲ Node Point Locations

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  - Internal Use for any purpose, or offering a product or service based on the Information for indirect commercial advantage, by an organisation that is primarily engaged in trade, commerce or a profession

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

MEETING NOTES
FINAL

Unit 9, The Chase

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Job Title	Aylesbury Estate
Project Number	50600304
Date	09/07/2014
Time	14:00
Venue	LBS – Tooley Street
Subject	Flood Risk and Drainage
Client	LBS/NHH
Present	John Kissi (JK)– LBS Joe Miller (JM)– LBS Kayleigh Wyatt (KW) – EA James Dyason (JD) - WSP
Apologies	

MATTERS ARISING **ACTION**

1.0 Planning Update

1.1 JD provided planning update:

- Scheme design freeze due mid-July
- Final draft of ES chapters and technical documentation to be completed by mid-August ready for final Client and legal review
- Both outline and detailed applications will be submitted on 11 September 2014.

2.0 TWUL Update

2.1 JD provided update:

- Met with TWUL dated 16 May 2014;
- FW and SW flows for the proposed development subject to a capacity impact assessment (CIA) due to capacity of Level 1 strategic combined sewer in Albany Road;
- TWUL currently undertaking a scoping study to confirm approach of modelling and costs of CIA. This is due imminently;
- CIA will take at least 12 working weeks to complete which takes completion past submission of the outline and detailed planning applications;
- TWUL have stated that they are willing to condition the application accordingly;
- An interim approach to surface water discharge has been proposed for the purposes of the applications whereby rates are set at brownfield rates (using Wallingford Modified Rational Method 2 yr 15 min estimates) less 50% in accordance with minimum requirements of the London Plan with an additional allowance for foul water offset. Suitable caveats will be added to the strategy stating that final rates will be agreed following completion of the CIA;
- TWUL willing in principle to adopt both foul and surface waters sewers if designed to SFA requirements. All suds and storage devices will need to be offline to the surface water sewers; and
- The drainage strategy will look to utilise existing connections to the strategic TWUL combined sewer network where practicable

JM stated that for the interim solution the modified rational method is the preferred method for determining runoff rates for the purpose of planning submissions and LBS would expect the drainage strategy to include this as a minimum. However should Thames Water's CIA indicate a lower runoff rate then this must be enforced to ensure sufficient capacity and would therefore take precedent.

2.1 In respect to the interim surface water discharge rate methodology proposed, JM and KW stated that although restricting to greenfield rates is preferable, it is not deemed particularly practicable in this instance. Therefore the EA and LBS wish to see a greater commitment to reduce surface water outfall rates over and above the minimum requirements of the London Plan. JD stated this will be reviewed as the drainage strategy progresses with the goal of providing approximately 10-15% betterment above minimum London Plan requirements.

JM stated that LBS interpret this as being a 60-65% reduction from existing brownfield rates and we would expect that the developer is working towards the upper limit of this band (i.e. 65% reduction).

JD stated for clarification purposes that WSP will aim to provide 10-15% betterment where achievable. If this cannot be accommodated we shall strive to still provide an element of betterment over and above minimum standards.

3.0 Surface Water Strategy Update

3.1 JD set out the surface and foul water drainage strategy for the First Development Site (FDS) that is subject to the detailed application. In summary:

- The surface water strategy at ground level will consist of a traditional drainage network supplemented by various SuDS techniques. These include bio-retention areas and silva cells to locally collect runoff and provide an element of sources control and water quality treatment;
- There will also be extensive and intensive green roof provision associated with Buildings 1, 4, 5 and 6. The quantum of which is currently being confirmed by the architects (HTA) and will also provide an element of source control and biodiversity enhancement;
- The surface water storage is positioned underneath Buildings 4 and 5 and will form part of the structural foundation arrangement and are sized to cater for the critical 100yr + 30% allowance for climate change rainfall event;
- Additional SuDS methods are still under further consideration;
- The foul will largely mimic the routing of the surface water sewers; and
- Both foul and surface water will drain via gravity to the TWUL public combined sewers

3.2 It was agreed that the current strategy proposed is acceptable in principle however if further SuDs provision could be included that would be beneficial. JD stated that this is currently being looked into.

3.3 JD stated that the SuDS proposed (silva cells) within the confines of the public highway will be offered for adoption to LBS highways. All other SuDs/storage elements will be managed by NHH

3.4 JM and JK stated that LBS will want to see the same level of SuDS/drainage commitment associated detailed application to be applied for all plots that make up the outline application. JD stated that for the outline application the surface water strategy will show areas of strategic attenuation only, indicative pipe runs and likely points of connections into the TWUL sewers. Further details, including quantum's of additional SuDS (following the principles of the FDS) will be set out as each plot comes forward at a later date, however the commitment to the same

level of SUDS provision for the outline application plots will be enshrined within the FRA and ES to enable LBS to condition appropriately. This was agreed in principle.

4.0 FRA Approach

4.1 JD stated that the FRA will cover both applications. Within each sub heading it will state clearly whether the text applies to both applications or solely for the detailed/outline application. This approach was deemed acceptable in principle to all.

4.2 JD stated that the approach to the FRA will follow the proposals set out within the WSP letter to the EA dated 2 August 2014 ie

- No further breach analysis is required as the site falls outside the breached fluvial flood waters associated with the Thames;
- There are no plans, for the purposes of the planning application, to undertake safe escape assessments, a flood response plan or set FFL above breached fluvial flood water levels in light of the above information

4.3 JM stated that the above seemed reasonable however setting of FFL/external ground levels will need to ensure that people or property are not put at risk from flooding from other sources. JD stated that FFL/ground levels will take into consideration potential overland flow paths, from possible other sources, using the best available data and such an exercise will be undertaken as part of the detailed application. This was set out within the letter to the EA. This approach was deemed acceptable to all.

4.4 KW stated that if more vulnerable uses are set at ground floor level this is against local policy and will be highlighted by the EA in any planning response, however it will also be acknowledged by the EA that measures have been put in place (see 4.3) to demonstrate that such uses are not at risk of flooding. This approach will be acceptable to the EA. JD stated that although residential property is proposed at ground floor level it is unclear whether habitable accommodation is actually located at ground floor level. This will be confirmed.

5.0 EIA Approach

5.1 JD stated that WSP have prepared an EIA scoping opinion response back to LBS and this also included the aforementioned letter to the EA (covered in Section 4 of minutes). JD set out response regarding flooding and drainage, in particular the following:

- Clarification on minimum surface water discharge rates; and
- Ensuring that during construction flood risk is not exacerbated

5.2 JM stated that the EIA approach to construction flood risk is deemed acceptable.

Following the meeting JM has since reviewed the wording of this comment in the pre-app response to discharge rates and what was written was correct in its own context. The response states *"at least 50% of the greenfield runoff rate storage"* which should be interpreted as storage of 50% of that required if the development was discharging at greenfield rates. However, it is accepted that reduction in runoff rates should be the governing requirement, **hence LBS minimum standard is 50% reduction from existing brownfield runoff rates, as WSP pointed out.** This has been discussed and agreed with Dan Davies for matters going forward.

JD agreed that to avoid any confusion and miss interpretation we would recommend that the sentence is updated to state '**50% reduction from existing brownfield runoff rates'**

5.3 JD stated that the ES chapter will cover both applications in similar vein to the FRA. This was deemed acceptable to all

6.0 AOD

6.1 None

Distribution:
All present
Martin Stillion – WSP
Caroline Toogood – NHH
Julia F - HTA

creating a better place

Environment Agency

Mr James Dyason
WSP in the UK
Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Our ref: SL/2014/112916/02-L01
Your ref: 50600304/EA-L001

Date: 29 July 2014

Dear Mr Dyason,

FURTHER INFORMATION (INCLUDING INFORMATION ON SURFACE WATER DRAINAGE) SUBMITTED. RE: PRE-APPLICATION ENQUIRY: CONFIRMATION OF SITE LOCATION RELATIVE TO MODELLED FLOOD EXTENTS AND CLARIFICATION OF NECESSITY FOR FURTHER BREACH MODELLING.

THE AYLESBURY ESTATE, LONDON BOROUGH OF SOUTHWARK, LONDON, SE17 2AA

Thank you for consulting the Environment Agency on further information for the above pre-application enquiry which we received by post on 09 July 2014, via a meeting on 09 July 2014 and by email on 11 July 2014 and 18 July 2014.

We have reviewed the submitted information and respond as follows:

Comments for applicant / Local Planning Authority
We would like to offer the following comments with respect to flood risk, Flood Risk Assessments and surface water management:

Flood risk (including breach modelling)
We have noted that the site is predominantly located in Flood Zone 3 which is defined as having a 'high probability' of river and sea flooding by the 'flood risk and coastal change' section of the national Planning Practice Guidance (PPG) (Table 1: flood zones of the flood zone and flood risk tables – Paragraph 065, Reference ID 7-065-20140306).

We have further noted that the site is within an area benefiting from the River Thames tidal flood defences, which defend the site up to a 1 in 1000 year annual probability of river flooding in any year (<0.1%). However, areas of residual flood risk can still occur, owing to failure of the flood defences or a design flood event greater than that mentioned above.

Environment Agency
Ergon House, Horseferry Road, London, SW1P 2AL
Telephone: 03708 506 506
Email: enquiries@environment-agency.gov.uk
Website: www.gov.uk/environment-agency

Nevertheless, upon reviewing our tidal River Thames breach modelling and upstream inundation modelling, we have noted that the site lies outside the currently modelled areas at risk of residual flooding, assuming a breach in, or overtopping of, the flood defences at given locations.

Accordingly, although we must declare that the aforementioned breach modelling is based upon a finite number of breach locations, therefore we cannot categorically state that no modelled breach flood event would reach a particular site, we have confirmed that we would not insist on further breach modelling being undertaken to support the proposed planning application on this occasion.

Notwithstanding the above information, we have noted that the London Borough of Southwark's Strategic Flood Risk Assessment (SFRA) indicates that, in the unlikely event of a breach in the defences, the rate of inundation to the site is defined as 'six to twelve hours' and the flood hazard rating for the site (based on depth and velocity of floodwaters) is designated as 'significant' (Figures C, D and E).

Please note that there may be other sources of flooding which affect this site – such as surface water, groundwater and sewer flooding – which are not within our direct remit, but nevertheless could be important considerations for managing flood risk for the proposed development. Indeed, consideration of other sources of flooding may be necessary to inform suitable mitigation measures to reduce the impact of any such flooding. Under the Flood & Water Management Act 2010, the Local Authority has the lead role in such flooding matters.

Flood Risk Assessments (including breach modelling and flood mitigation measures)

Owing to the location of the site outside the modelled flood extents of our tidal River Thames breach modelling and upstream inundation modelling, we have confirmed that we would not insist on further breach modelling being undertaken to support the proposed planning application on this occasion.

However, we would like to reiterate that, despite the location of the site outside said modelled flood extents, we expect the inclusion or exclusion of any flood mitigation measures – including the location of uses within the development, raised finished ground floor and/or threshold levels, flood resistant and resilient measures, safe escape or refuge procedures and flood response plans – to be informed by the assessment of all forms of flooding within the Flood Risk Assessment (FRA) itself.

We consider that any decisions regarding the exclusion of certain flood mitigation measures from any development proposals cannot be fully justified until an assessment of the risks posed by all forms of flooding has been undertaken.

Surface water management

We expect a suitable surface water drainage scheme to be designed and agreed with the Local Planning Authority, ourselves and Thames Water for, and implemented

within, the proposed development, as conveyed within our response to the London Borough of Southwark's request for scoping opinion (dated 15 May 2014 with reference SL/2014/112711/01-L01).

We expect any development to strive to achieve greenfield surface water run-off rates, manage surface water run-off as close to its source as possible, in line with a given drainage hierarchy, and to utilise Sustainable Drainage Systems (SuDS) wherever practical, as required by the Greater London Authority's London Plan (Policy 5.13) and the relevant 'priorities' within the Greater London Authority's Sustainable Design and Construction Supplementary Planning Guidance (SPG) (Section 2.4.4).

Accordingly, we are pleased to note that the developer will now aim to achieve a 10-15% improvement over the previously proposed 50% reduction in surface water discharge rates, resulting in a proposed 60-65% reduction in surface water discharge rates, wherever possible, as confirmed within the meeting notes (meeting dated 09 July 2014 with notes reference 50600304). In line with the comments from Joe Miller from the London Borough of Southwark, we can confirm that Environment Agency would also expect the developer to strive towards the upper limit of the proposed range: namely, a 65% reduction in surface water discharge rates.

We do acknowledge that it can be difficult for some development proposals to achieve reductions in surface water run-off rates to greenfield rates and to incorporate SuDS measures, owing to the type of development or constraints on site. Nevertheless, we expect that any possibilities to realise the aforementioned expectations are fully explored during the design of the development proposals and that any constraints are adequately justified.

We advise that the applicant visits the following resources for further information on SuDS:

- the 'flood risk and coastal change' section of the national PPG (the 'use of SuDS' section of the 'reducing the causes and impacts of flooding' section – Paragraph 051, Reference ID 7-051-20140306);
- CIRIA C697 document – 'The SuDS manual';
- the 'Interim Code of Practice for SuDS' which provides advice on design, adoption and maintenance issues, plus a full overview of other technical guidance on SuDS;
- CIRIA C522 document – 'Sustainable Drainage Systems – design manual for England and Wales';
- CIRIA C635 document – 'Designing for exceedance in urban drainage: good practice'.

We hope you find our response helpful. Please contact us if you have any questions.

Environment Agency
Ergon House, Horseferry Road, London, SW1P 2AL
Telephone: 03708 506 506
Email: enquiries@environment-agency.gov.uk
Website: www.gov.uk/environment-agency

Yours sincerely,

Miss Kayleigh Wyatt
Planning Advisor

Direct dial: 020 3263 8078
Direct fax: 020 3263 8021
Direct e-mail: kayleigh.wyatt@environment-agency.gov.uk

cc John Kissi – London Borough of Southwark
cc Joe Miller – London Borough of Southwark
cc Daniel Davies – London Borough of Southwark

Please note that the views expressed by the Environment Agency in this letter are in response to this pre-application enquiry only and do not represent our final views on any future planning applications made in relation to this site. We reserve the right to change our position in relation to any such planning applications. You should seek your own expert advice regarding technical matters relevant to any planning application prior to submission.

Your ref: SL/2014/112711/01-L01 and SL/2014/112916/01-L01
Our ref: 50600304/EA-L001

2 August 2014

BY Post and Email

Miss Kayleigh Wyatt
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Dear Kayleigh

Aylesbury Estate – Flood Risk and Drainage

Following the Environment Agency EIA scoping response to London Borough of Southwark dated 15 May 2014 and the Environment Agency letter to WSP dated 27 June 2014 we would like to take this opportunity to provide clarification on how WSP propose to address drainage and flood risk elements associated with the Proposed Development. The points including suitable clarification are set out below:

1.0 Fluvial Flood Risk

From review of the flood risk mapping the Environment Agency (EA) has provided to date, WSP agree that the Site lies wholly within defended Flood Zone 3. Upon request the EA have also provided breach analysis information in order to confirm the residual fluvial flood risk to the Site. The analysis reviewed nine different breach locations along the reach of the River Thames that could affect the Site. The breach locations are considered comprehensive for site assessment and the mapping is based upon Tidal Thames Upstream Inundation and Breach Modelling studies completed by Halcrow in 2011 and 2012 respectively.

The breach analysis assessment showed that the Site is not subject to breached flood waters, subsequently it was agreed with the EA, within their letter dated 27 June 2014, that no further breach analysis assessment would need to be undertaken for the purposes of the outline and detailed planning applications that are due to be submitted to London Borough of Southwark by mid-September 2014.

Within the aforementioned letter the EA draws reference to London Borough of Southwark's (LBS) February 2008 Strategic Flood Risk Assessment (SFRA) in terms of breached flood waters and the site being situated within a 'six to twelve hour' inundation zone. The SFRA model data is strategic in nature and is considered to be superseded for the purposes of producing a site specific Flood Risk Assessment in light of the 2011-2012 Halcrow Studies upon which the EA site specific breach analysis assessment is based upon.

As the Site lies wholly outside modelled areas at risk of residual flooding, is not proposed to assess, for the purposes of the planning applications, safe escape/refuge requirements, set finished floor/threshold levels above breached flood levels, implement less vulnerable uses at ground floor level and associated flood resilient/resistance construction or produce a Flood Response Plan

It should be noted that finished floor/threshold levels shall be set close to existing ground level and will take into consideration potential overland flow paths, from possible other sources, in accordance with national policy requirements.

2.0 Other Sources of Flood Risk

All other sources of flood risk will be assessed as part of the Flood Risk Assessment including review of the EA surface water flood risk mapping and information contained within the LBS SFRA and Surface Water Management Plan. Where site specific data is available prior to planning submission this will also be taken into consideration.

3.0 Surface Water Management

A surface water management strategy is currently being produced for the Proposed Development taking into consideration development phasing and, where practicable, will incorporate a variety of source control/SuDS techniques in accordance with Greater London Authority's London Plan and Sustainable Design and Construction Supplementary Planning Guidance.

In relation to offsite surface water discharge rates these are subject to confirmation with Thames Water following completion of a capacity impact assessment which is in the process of being procured. This assessment will be completed post planning application submission and Thames Water has stated that they are prepared to condition the application accordingly. For the purposes of preparing the drainage strategy and for planning submission it is proposed to limit surface water flows to existing estimated brownfield rates less 50% in accordance with mandatory London Plan requirements and the EIA scoping opinion. Suitable caveats will be incorporated into the strategy and FRA accordingly that will tie flows down to conclusions of the impact assessment.

Conclusion

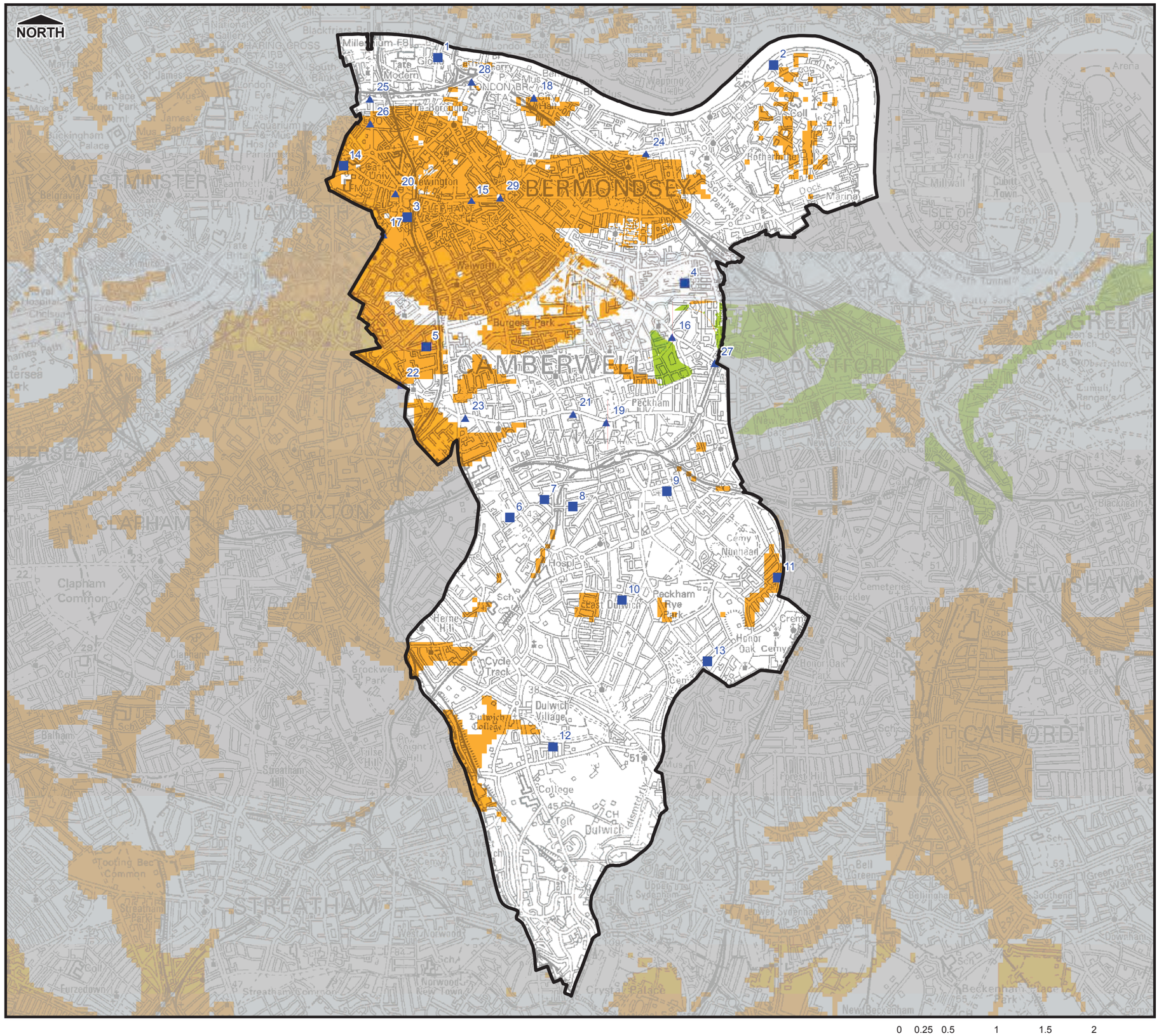
We trust the above provides sufficient clarity on how we are approaching drainage and flood risk in relation to the Proposed Development. Should you wish to discuss further please do not hesitated to contact the undersigned.

Yours sincerely

James Dyason
Associate

cc Caroline Toogood – Notting Hill Housing
Martin Stillion – WSP
Simon Purcell - WSP
Joe Miller – London Borough of Southwark – Flood and Drainage Team
Daniel Davies – London Borough of Southwark – Planning

Appendix H – SWMP Appendices



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED

Legend

- Southwark Borough Council
- Groundwater Flood Incident (EA Records)
- Groundwater Flood Incident (Other Records)

Increased Potential for Elevated Groundwater in

- Permeable Superficial Deposits
- Consolidated Aquifers

Notes

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 2m of the groundsurface. Such groundwater rise could lead to the following:

-Flooding of basements of buildings below ground level;
-Flooding of buried services or other assets below ground level;
-Inundation of farmland, roads, commercial, residental and amenity areas;
-Flooding of ground floors of buildings above ground level; and Overflowing of sewers and drains

2.Incident records shown are generally unconfirmed and may include issues such as water main bursts or non-groundwater related problems.
3.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.
4.Includes groundwater flood mapping provided by JBA consulting, Copyright. Jeremy Benn Associates Limited 2008-2011, partially derived from data supplied by the Environment Agency.

London Borough of Southwark

Southwark Council

Preliminary Flood Risk Assessment

Scale at A3	Date	Drawn by	Approved by
1:40,000	22/03/2011	C.Woolhouse	S.Cox

Increased Potential for Elevated Groundwater

Consultants
CAPITA SYMONDS Flood Risk Management
Scott Wilson
URS / Scott Wilson
6 - 8 Greencoat Place
London
SW1P 1PL

Drain London Programme Board Members

Environment Agency · Thames Water · LONDON COUNCILS · GREATER LONDON AUTHORITY

FIGURE 2

Filepath: D:\34786 Drain London_Tier 2_Group 7\700 Technical\711 GIS\01 Layout\KingstonIncreased Potential for elevated GW.mxd

THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED

Legend

- Borough Administrative Boundary
- Fluvial Flood Incidents
- Surface Water Flooding Incidents
- Surface Water Flood Outline

London Borough of Southwark

Southwark Council

Preliminary Flood Risk Assessment

Scale at A3	Date	Drawn by	Approved by
1:35,000	11/04/2011	D.SKILTON	J.ROBINSON

Surface Water Flooding Incidents and Fluvial Flooding Incidents

Consultants
CAPITA SYMONDS Flood Risk Management
Scott Wilson
URS / Scott Wilson
6 - 8 Greencoat Place
London
SW1P 1PL

Drain London Programme Board Members

Environment Agency · Thames Water · LONDON COUNCILS · GREATERLONDONAUTHORITY

FIGURE 1

Filepath: L:\Water\Projects & Jobs\D134000\Drain London Tier 2\D134785 Group 7\GIS\Workspaces

Appendix I – FDS Drainage Calculations

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - 1B/1C ONLY
Job No.	50600304
Made By	AAH
Checked By	AAH
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		2.55	ha
	Qp=	328	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - 1B/1C ONLY
Job No.	50600304
Made By	AAH
Checked By	AAH
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	328
10	507
30	626
100	808
30 minute storm duration	
Return Period	l/s
2	203
10	315
30	388
100	507
60 minute storm duration	
Return Period	l/s
2	128
10	197
30	244
100	322

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - 1B/1C ONLY
Job No.	50600304
Made By	AAH
Checked By	AAH
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	580	825
Retail/Trade/Community (Ha)	0	0.026
Residential Foul Flow Rate(l/s)	26.9	38.19
Trade Foul Flow Rate (l/s)	0	0.02
Total Foul Flow (l/s)	26.9	38.2

Additional Foul Flow (l/s) =	11.3

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		328
Minus additional (extra over) FW discharge	-11.3	316.7
London Plan aspirational 50% reduction	x 0.35	110.8
Total Proposed Surface Water Discharge to TWUL Sewer		110.8

Appendix J – Masterplan Drainage Calculations

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 4
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		1.132	ha
	Qp=	145	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 4
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	145
10	225
30	278
100	359
30 minute storm duration	
Return Period	l/s
2	90
10	140
30	172
100	225
60 minute storm duration	
Return Period	l/s
2	57
10	87
30	108
100	143

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 4
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	202	293
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	9.35	13.56
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	9.35	13.56

Additional Foul Flow (l/s) =	4.21

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		145
Minus additional (extra over) FW discharge	4.21	141
London Plan aspirational 50% reduction	x 0.5	70.395
Total Proposed Surface Water Discharge to TWUL Sewer		70.395

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 5
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		1.1126	ha
	Qp=	143	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 5
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	143
10	221
30	273
100	352
30 minute storm duration	
Return Period	l/s
2	89
10	137
30	169
100	221
60 minute storm duration	
Return Period	l/s
2	56
10	86
30	107
100	140

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 5
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	202	188
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	9.35	8.70
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	9.35	8.70

Additional Foul Flow (l/s) = -0.65

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		143
Minus additional (extra over) FW discharge	0	143
London Plan aspirational 50% reduction	x 0.5	71.5
Total Proposed Surface Water Discharge to TWUL Sewer		71.5

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 6
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		1.1018	ha
	Qp=	142	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 6
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	142
10	219
30	271
100	349
30 minute storm duration	
Return Period	l/s
2	88
10	136
30	168
100	219
60 minute storm duration	
Return Period	l/s
2	55
10	85
30	105
100	139

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 6
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	183	268
Retail/Trade/Community (Ha)	0	0.05
Residential Foul Flow Rate(l/s)	8.47	12.41
Trade Foul Flow Rate (l/s)	0	0.025
Total Foul Flow (l/s)	8.47	12.43

Additional Foul Flow (l/s) =	3.96

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		142
Minus additional (extra over) FW discharge	3.96	138
London Plan aspirational 50% reduction	x 0.5	69.02
Total Proposed Surface Water Discharge to TWUL Sewer		69.02

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOT 7
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$Qp = 3.61 \times Cv \times i \times A$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		0.7815	ha
	Qp=	100	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOT 7
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	100
10	155
30	192
100	248
30 minute storm duration	
Return Period	l/s
2	62
10	96
30	119
100	155
60 minute storm duration	
Return Period	l/s
2	39
10	60
30	75
100	99

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOT 7
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	205	167
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	9.49	7.73
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	9.49	7.73

Additional Foul Flow (l/s) = -1.76 (Reduction)

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		100
Minus additional (extra over) FW discharge	0	100
London Plan aspirational 50% reduction	x 0.5	50
Total Proposed Surface Water Discharge to TWUL Sewer		50

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 8 & 9 (EXC 9C) ONLY
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

Qp = 3.61 x Cv x i x A

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		1.323	ha
	Qp=	170	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 8 & 9 (EXC 9C) ONLY
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used

Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00

Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00

Z2 Values for 15, 30, and 60 minute rainfall events

15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results

Peak Brownfield Discharge Rates

15 minute storm duration	
Return Period	l/s
2	170
10	263
30	325
100	419

30 minute storm duration	
Return Period	l/s
2	105
10	163
30	201
100	263

60 minute storm duration	
Return Period	l/s
2	67
10	102
30	127
100	167

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 8 & 9
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	155	150
Retail/Trade/Community (Ha)	0	0.3
Residential Foul Flow Rate(l/s)	7.18	6.94
Trade Foul Flow Rate (l/s)	0	0.15
Total Foul Flow (l/s)	7.18	7.09

Additional Foul Flow (l/s) = -0.08 (Reduction)

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		170
Minus additional (extra over) FW discharge	0	170
London Plan aspirational 50% reduction	x 0.5	85
Total Proposed Surface Water Discharge to TWUL Sewer		85

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 10a & 9C
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

Qp = 3.61 x Cv x i x A

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		1.0432	ha
	Qp=	134	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 10a & 9C
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	134
10	207
30	256
100	330
30 minute storm duration	
Return Period	l/s
2	83
10	129
30	159
100	208
60 minute storm duration	
Return Period	l/s
2	53
10	80
30	100
100	132

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 10a & 9C
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	154	156
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	7.13	7.22
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	7.13	7.22

Additional Foul Flow (l/s) =	0.09

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		134
Minus additional (extra over) FW discharge	0.09	134
London Plan aspirational 50% reduction	x 0.5	66.955
Total Proposed Surface Water Discharge to TWUL Sewer		66.955

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 11a & 10b
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

Qp = 3.61 x Cv x i x A

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		0.5091	ha
	Qp=	65	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 11a & 10b
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	65
10	101
30	125
100	161
30 minute storm duration	
Return Period	l/s
2	41
10	63
30	77
100	101
60 minute storm duration	
Return Period	l/s
2	26
10	39
30	49
100	64

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 11a & 10b
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	73	32
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	3.38	1.48
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	3.38	1.48

Additional Foul Flow (l/s) = -1.90 reduction

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		65
Minus additional (extra over) FW discharge	0	65
London Plan aspirational 50% reduction	x 0.5	32.5
Total Proposed Surface Water Discharge to TWUL Sewer		32.5

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 12
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		1.0402	ha
	Qp=	134	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 12
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	134
10	207
30	256
100	330
30 minute storm duration	
Return Period	l/s
2	83
10	128
30	158
100	207
60 minute storm duration	
Return Period	l/s
2	52
10	80
30	100
100	131

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 12
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	128	169
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	5.93	7.82
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	5.93	7.82

Additional Foul Flow (l/s) =	1.90

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		134
Minus additional (extra over) FW discharge	1.9	132
London Plan aspirational 50% reduction	x 0.5	66.05
Total Proposed Surface Water Discharge to TWUL Sewer		66.05

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 13, 15B & 11b
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

Qp = 3.61 x Cv x i x A

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		2.2795	ha
	Qp=	293	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 13 & 11b
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	293
10	453
30	560
100	722
30 minute storm duration	
Return Period	l/s
2	181
10	281
30	347
100	453
60 minute storm duration	
Return Period	l/s
2	115
10	176
30	218
100	288

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 13 & 11b
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	162	261
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	7.50	12.08
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	7.50	12.08

Additional Foul Flow (l/s) =	4.58

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		293
Minus additional (extra over) FW discharge	4.58	288
London Plan aspirational 50% reduction	x 0.5	144.21
Total Proposed Surface Water Discharge to TWUL Sewer		144.21

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 14
Job No.	50600304
Made By	SEK
Checked By	AHH
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		1.276	ha
	Qp=	164	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 14
Job No.	50600304
Made By	AAH
Checked By	AAH
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	164
10	254
30	313
100	404
30 minute storm duration	
Return Period	l/s
2	102
10	157
30	194
100	254
60 minute storm duration	
Return Period	l/s
2	64
10	98
30	122
100	161

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 14
Job No.	50600304
Made By	AAH
Checked By	AAH
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	127	351
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	5.88	16.25
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	5.88	16.25

Additional Foul Flow (l/s) = 10.37

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		164
Minus additional (extra over) FW discharge	10.37	154
London Plan aspirational 50% reduction	x 0.5	76.815
Total Proposed Surface Water Discharge to TWUL Sewer		76.815

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 15
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		0.4519	ha
	Qp=	58	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 15A
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	58
10	90
30	111
100	143
30 minute storm duration	
Return Period	l/s
2	36
10	56
30	69
100	90
60 minute storm duration	
Return Period	l/s
2	23
10	35
30	43
100	57

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 15
Job No.	50600304
Made By	SEK
Checked By	JD
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	63	130
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	2.92	6.02
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	2.92	6.02

Additional Foul Flow (l/s) =	3.10

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		58
Minus additional (extra over) FW discharge	3.1	55
London Plan aspirational 50% reduction	x 0.5	27.45
Total Proposed Surface Water Discharge to TWUL Sewer		27.45

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - 16a
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		0.51	ha
	Qp=	66	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - 16a
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	66
10	101
30	125
100	162
30 minute storm duration	
Return Period	l/s
2	41
10	63
30	78
100	101
60 minute storm duration	
Return Period	l/s
2	26
10	39
30	49
100	64

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - 16a
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	58	159
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	2.69	7.36
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	2.69	7.36

Additional Foul Flow (l/s) =	4.68

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		66
Minus additional (extra over) FW discharge	4.68	61
London Plan aspirational 50% reduction	x 0.5	30.66
Total Proposed Surface Water Discharge to TWUL Sewer		30.66

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 16b
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

Qp = 3.61 x Cv x i x A

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		0.4906	ha
	Qp=	63	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 16b
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	63
10	98
30	121
100	155
30 minute storm duration	
Return Period	l/s
2	39
10	61
30	75
100	98
60 minute storm duration	
Return Period	l/s
2	25
10	38
30	47
100	62

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 16b
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	58	116
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	2.69	5.37
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	2.69	5.37

Additional Foul Flow (l/s) = 2.69

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		63
Minus additional (extra over) FW discharge	2.69	60
London Plan aspirational 50% reduction	x 0.5	30.155
Total Proposed Surface Water Discharge to TWUL Sewer		30.155

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 17a, 17b
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

Qp = 3.61 x Cv x i x A

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		0.6881	ha
	Qp=	88	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 16 & 17
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used	
Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00
Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00
Z2 Values for 15, 30, and 60 minute rainfall events	
15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results Peak Brownfield Discharge Rates	
15 minute storm duration	
Return Period	l/s
2	88
10	137
30	169
100	218
30 minute storm duration	
Return Period	l/s
2	55
10	85
30	105
100	137
60 minute storm duration	
Return Period	l/s
2	35
10	53
30	66
100	87

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 16 & 17
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	60	72
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	2.78	3.33
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	2.78	3.33

Additional Foul Flow (l/s) =	0.56

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		88
Minus additional (extra over) FW discharge	0.56	87
London Plan aspirational 50% reduction	x 0.5	43.72
Total Proposed Surface Water Discharge to TWUL Sewer		43.72

Wallingford Procedure - Modified Rational Method

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 17c
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Modified Rational Method

$$Qp = 3.61 \times Cv \times i \times A$$

Storm Duration		15	mins
Return Period		2	year
M5-60 min		20.5	mm
(From Windes FSR)			
r		0.438	
(From Windes FSR)			
D		15	minutes
(Storm duration)		0.25	hours
Z1		0.65	
(From Figure A.3a or A.3b read to an accuracy of 0.01)			
M5-D		13.3	mm
Z2	15min	0.80	
(From Table A1)	30min	0.00	
	60min	0.00	
MT-D		10.6	mm
i		42.4	mm/hr
(Average point intensity)			
Areal Reduction Factor		1	
(From Figure A.4)			
Average Areal Intensity		42.4	mm/hr
Cv (From Windes FSR)		0.84	(winter)
Impermeable Area		0.654	ha
	Qp=	84	l/s

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 17c
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Parameters Used

Storm Duration (mins)	Areal Reduction Factor
15	1.00
30	1.00
60	1.00

Storm Duration (mins)	Z1 Value
15	0.65
30	0.80
60	1.00

Z2 Values for 15, 30, and 60 minute rainfall events

15	13.3
Return Period	Z2 Value
2	0.80
10	1.23
30	1.52
100	1.96
30	16.4
Return Period	Z2 Value
2	0.80
10	1.24
30	1.53
100	2.00
60	20.5
Return Period	Z2 Value
2	0.81
10	1.24
30	1.54
100	2.03

Results

Peak Brownfield Discharge Rates

15 minute storm duration	
Return Period	l/s
2	84
10	130
30	161
100	207

30 minute storm duration	
Return Period	l/s
2	52
10	81
30	100
100	130

60 minute storm duration	
Return Period	l/s
2	33
10	50
30	63
100	83

Peak Discharge Rate

Client	NHH
Job Title	AYLESBURY ESTATE - PLOTS 17c
Job No.	50600304
Made By	SEK
Checked By	SEK
Approved By	JD

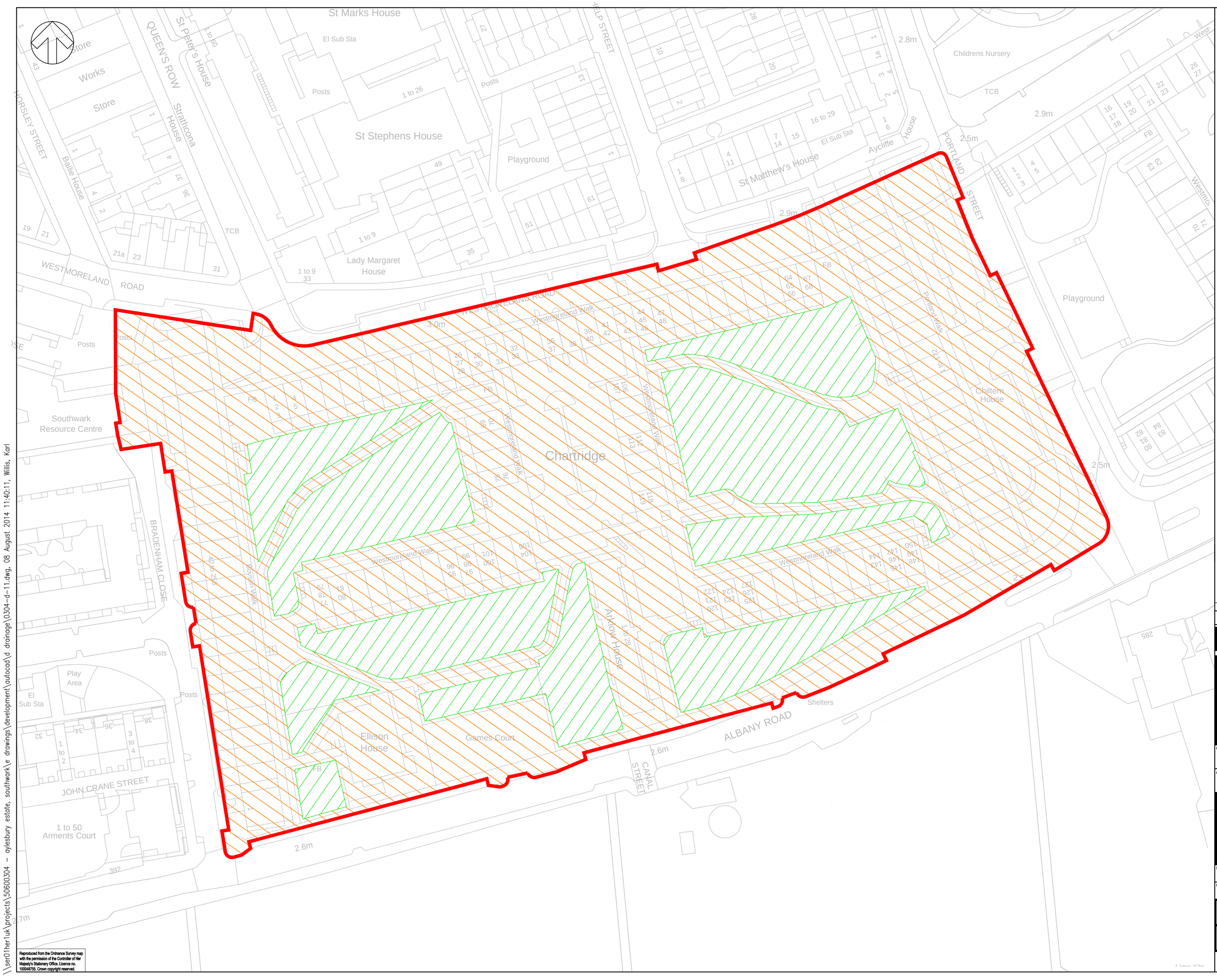
Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Existing and Proposed Peak Foul Flow Rates, based on Sewers for Adoption 7th Edition		
	Existing	Proposed
Residential Dwellings	60	132
Retail/Trade/Community (Ha)	0	0
Residential Foul Flow Rate(l/s)	2.78	6.11
Trade Foul Flow Rate (l/s)	0	0
Total Foul Flow (l/s)	2.78	6.11

Additional Foul Flow (l/s) =	3.33

Proposed Peak Discharge rate to TWUL Sewer (l/s)		
		Total
2 year 15 minute SW discharge rate (Wallingford)		84
Minus additional (extra over) FW discharge	3.33	81
London Plan aspirational 50% reduction	x 0.5	40.335
Total Proposed Surface Water Discharge to TWUL Sewer		40.335

Appendix K – Existing FDS Catchments & Discharge Locations



\\ser01her1uk\projects\50600304 - aylesbury estate, southwark\e drawings\development\autocad\d drainage\0304-d-11.dwg, 08 August 2014 11:40:11, Willis, Karl

DO NOT SCALE

NOTES:

1. THE 'DRAINAGE BOUNDARY' IS INDICATIVE AND REPRESENTS ALL AREAS DRAINING TO PROPOSED ONSITE DRAINAGE SYSTEMS.

KEY:

- DRAINAGE BOUNDARY
- EXISTING IMPERMEABLE AREA (2.55 Ha)
- EXISTING PERMEABLE AREA (0.95 Ha)

REV	DATE	BY	DESCRIPTION	CHK	APD
A	07/08/2014	KW	FIRST ISSUE	AH	JD

DRAWING STATUS: FOR INFORMATION ONLY

WSP
Unit 9, The Chase, John Tate Road
Foxholes Business Park, Hertford SG13 7NN
Tel: +44 (0)1992 526000 Fax: +44 (0)1992 526001
http://www.wspgroup.com

CLIENT: NHH

ARCHITECT: HTA

PROJECT: AYLESBURY ESTATE

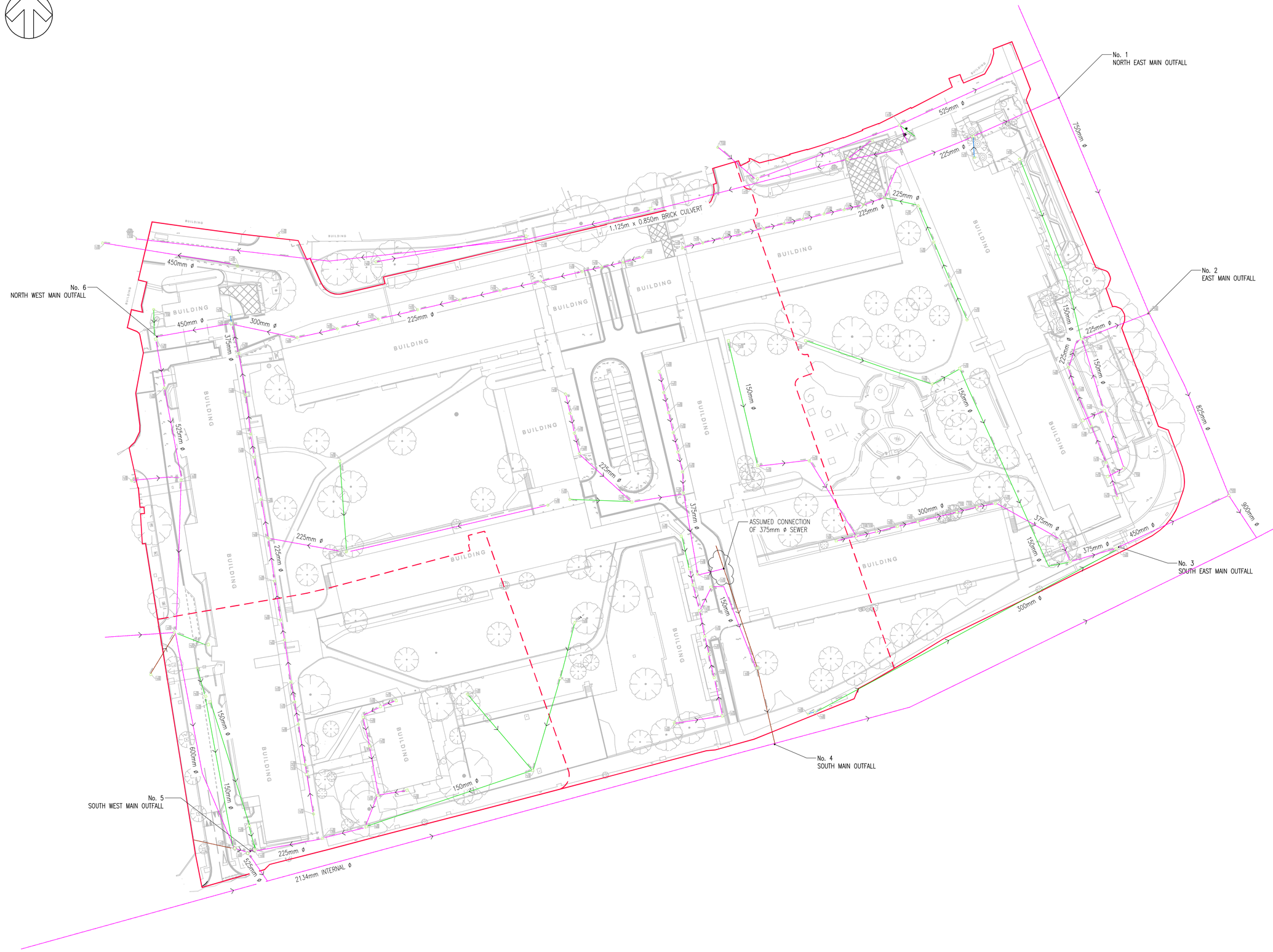
TITLE: FIRST DEVELOPMENT SITE EXISTING IMPERMEABLE AREA

SCALE @ A1:	CHECKED:	APPROVED:
1:500	AAH	JD
CAD FILE: 0304-D-11.DWG	DESIGN-DRAWN: KW	DATE: July 14

PROJECT No:	DRAWING No:	REV:
50600304	0304-D-11	A

PROJECT DOCUMENT REF: NHH-AES-WSP-C-D01-X-00-M2_D-11

DO NOT SCALE



NOTES:

1. SITE AND SUB PLOT BOUNDARY LINES ARE APPROXIMATE AT THIS STAGE AND SUBJECT TO REFINEMENT.
2. THE IDENTIFIED SEWER NETWORK IS BASED ON TWUL ASSET LOCATION RECORDS, TOPOGRAPHY SURVEY FROM NHHT (31.01.28 1b1c topo & utility survey 7836-0113-01A) AND FWMA OBLIGATIONS.
3. LINE AND LEVEL INFORMATION FROM THE TWUL RECORDS IS APPROXIMATE ONLY.

KEY:

- INDICATIVE SITE BOUNDARY
- COMBINED SEWER OPERATED BY TWUL
- SURFACE WATER SEWER NOT OPERATED BY TWUL
- TWUL ABANDONED SEWER
- FLOW DIRECTION

REV	DATE	BY	DESCRIPTION	CHK	APD
B	08/08/2014	KW	TITLE BLOCK & TERMINOLOGY UPDATED	AH	JD
A	29/04/2014	AH	FIRST ISSUE	AH	JD

DRAWING STATUS: FOR INFORMATION ONLY

WSP
Unit 9, The Chase, John Tate Road
Foxholes Business Park, Hertford SG13 7NN
Tel: +44 (0)1992 526000 Fax: +44 (0)1992 526001
http://www.wspgroup.com

CLIENT: NHH

ARCHITECT: HTA

PROJECT: AYLESBURY ESTATE

TITLE: FIRST DEVELOPMENT SITE
EXISTING SEWER ARRANGEMENT

SCALE @ A1:	CHECKED:	APPROVED:
1:500	AAH	JD
CAD FILE: 0304-D-02.DWG	DESIGN-DRAWN: AAH	DATE: April 14
PROJECT No: 50600304	DRAWING No: 0304-D-02	REV: B

PROJECT DOCUMENT REF: NHH-AES-WSP-C-D01-X-00-M2_D-02

n:\50600304 - aylesbury estate, southwark\e drawings\development\autocad\d drainage\0304-d-02.dwg, 19 August 2014 11:20:44, Hutt, Andrew

Appendix L – FDS Existing Brownfield Discharge Volume

Long Term Storage Calculations - Brownfield

Client	NHH
Job Title	Aylesbury Estate
Job No.	50600304
Made By	AAH
Checked By	AAH
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Pre-Development (Brownfield) Runoff Volume

Runoff Volume (Vol $_{bf}$) m^3 = AIMP x RD x 10

Impermeable Area (AIMP) in hectares = 2.55

Total Existing Impermeable Area of the Brownfield site

100 Year 6 Hour Rainfall Depth (RD) in millimetres = 63

RD is taken from Figure 3.1 of Ref 1

Vol $_{bf}$ = 1607 m^3

Development Runoff Volume

Runoff Volume (Vol $_{dev}$) m^3 = AIMP x RD x 10

Impermeable Area (AIMP) in hectares = 3.21

Total Impermeable Area of the Development site

100 Year 6 Hour Rainfall Depth (RD) in metres = 63

RD is taken from Figure 3.1 of Ref 1

Vol $_{dev}$ = 2022 m^3

Long Term Storage

Vol $_{dev}$ - Vol $_{bf}$ = 416 m^3

Note: Development impermeable area exludes green roofs

Ref 1 = Preliminary Rainfall Runoff Management for Developments (W5-074/A/TR/1)

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http:/www.wspgroup.com

Appendix M – CIRIA ICoP SuDS Framework

Reference: ICoP SUDS MA2

SUDS Maintenance Framework Agreement

This AGREEMENT is made the day of 200			*Date of the agreement.*
BETWEEN			
(1)	Developer	[as necessary]	*Details of relevant parties to be inserted.*
(2)	Owner		
(3)	Council		
(4)	Highway Authority	[as necessary]	
(5)	Sewerage Undertaker		
(6)	Surety	[as necessary]	

IT IS AGREED as follows:

1. Definitions and Interpretation

1.1	"the 1972 Act" means the Local Government Act 1972 (as amended).	
1.2	"the 1990 Act" means the Town and Country Planning Act 1990 (as amended).	
1.3	"the 1991 Act" means the Water Industry Act 1991 (as amended).	
1.4	"the 1980 Act" means the Highways Act 1980 (as amended).	*Include this clause if the Highways Authority is party to the Deed.*
1.5	"Above Ground Drainage" means that part of the SUDS on or above ground level such as grass swales, retention ponds and ancillary structures shown coloured or edged blue on the Plan.	
1.6	"Below Ground Drainage" means that part of the SUDS situated below ground level such as piped systems (including perforated pipes and surrounding material), soakaways, catchpits, filter drains and ancillary structures shown coloured or edged green on the Plan.	
1.7	"Completion" means the date of issue of the final certificate.	
1.8	"the Defects Correction Period" means the period of [ ] months after the date of issue of the Provisional Certificate issued under Clause [ ].	*Duration of defects correction period to be inserted.*
1.9	"the Drawings" means all plans, drawings, sections and the design or working documents listed in schedule [ ] [and attached to this Agreement].	*All relevant drawings should be listed or attached to the Agreement.*
1.10	"Engineer" means such officer as may be designated by the Council.	

1.11	"the Final Certificate" means the certificate defined in clause [ ].	*Details of clause number to be inserted.*
1.12	"Highways Agreement" means any agreement made pursuant to section 38 or 278 of the 1980 Act.	
1.13	"the Land" means land at [ ] shown [ ] on the Plan.	*Details of the land to be inserted.*
1.14	"the Plan" means the attached plan [(reference number)].	
1.15	"Planning Agreement" means any agreement made pursuant to section 106 of the 1990 Act in respect of the Land.	
1.16	"Planning Authority means the relevant local authority or statutory body responsible for planning in respect of the area in which the Land is situated.	
1.17	"Planning Permission" means the relevant planning permission in respect of development of the Land granted by the Planning Authority with any variation thereof or supplementary permission issued in respect thereof and or any Planning Agreement.	
1.18	"the Sewerage Undertakers Works" means those part of the SUDS that will be vested in the Sewerage Undertaker under the Undertakers Agreement.	
1.19	"the Specification" means any guidance notes on design and construction of SUDS from time to time published by CIRIA or others including: Book 14 Design of flood storage reservoirs Report I56 Infiltration drainage C522 Sustainable urban drainage systems – design manual for England and Wales C523 Sustainable urban drainage systems – best practice manual C582 Source control using constructed pervious surfaces C609 Sustainable drainage systems – hydraulic, structural and water quality advice or revisions or updates to the above.	*The Specification may be updated given new design guidance.*
1.20	"the SUDS" means the sustainable drainage system comprising all treatment and drainage systems including any pipework, swales, reed beds, ponds, filter trenches, attenuation tanks and detention basins.	
1.21	"the Works" means the construction of those parts of the Above Ground Drainage or the Below Ground Drainage shown on the Drawings that will vest in the Council.	*Note that the Works may be vested in the Council or the Highways Authority or the Sewerage Undertaker and subsequent clauses should be amended as required.*
1.22	"Undertakers Agreement" means any agreement made pursuant to section 104 of the 1991 Act.	

1.23	Words imparting one gender shall be construed as imparting any other gender.	
1.24	Words imparting the singular shall be construed as imparting the plural and vice versa.	
1.25	Words imparting persons shall be construed as imparting a corporate body and/or a partnership and vice versa.	
1.26	Where any party comprises more than one person the obligations and liabilities of that party under this Agreement shall be joint and several obligations and liabilities of those persons.	
	The clause headings shall not form part of this Agreement and shall not be taken into account in its construction or interpretation.	
2.	**Ownership and Responsibility for SUDS**	
2.1A	The Developer is [details of title]	*If the "Developer" is the "Owner" of the land at the time of entering into this Agreement alternative clause 2.1B should be used and subsequent clauses amended as necessary.*
2.1B	The Owner is [details of title]	
2.2	The Developer/the Owner proposes to construct the SUDS in connection with the development of the Land and has agreed to carry out such construction on the terms set out in this Agreement.	
2.3	The Developer/the Owner desires that on completion [or at the end of the Maintenance Period] the Council the Highway Authority or the Undertaker (as the case may be) shall be responsible for agreed parts of the Below Ground Drainage and that in the case of the Undertaker they become public works vested in either the Highway Authority or Undertaker pursuant to a Highway Agreement or Undertakers Agreement which agreements the Owner (if different from the Developer) and/or the Developer hereby covenants to enter into as soon as reasonably practicable following the completion of this Agreement.	*Vesting of below-ground SUDS.* *Amend as necessary given the parties entering into the Deed.*
2.4	The Developer/the Owner desires that on completion (or at the end of the Maintenance Period) the Council or the Highway Authority (as the case may be) shall be responsible for agreed parts of the Above Ground Drainage and that in the case of the Highway Authority they become public works vested in the Highway Authority pursuant to a Highway Agreement (or in the case of the Council by the provisions contained in this Agreement) which agreement the Owner (if different from the Developer) and/or the Developer hereby covenants to enter into as soon as reasonably practicable following the completion of this Agreement.	*Vesting of above-ground SUDS.* *Amend as necessary given the parties entering into the Deed.*
2.5	If any part of the Sewerage Undertakers Works discharges into or receives drainage from any other part of the SUDS which is not to be vested in the Sewerage Undertaker then the Owner (if different from the Developer) and/or the Developer hereby covenants with the Sewerage Undertaker to enter into a Deed	*Easement and rights of discharge may be necessary where drainage is received or discharged into land with different ownership.*

	of Grant of Easement and Rights to Discharge in Perpetuity as soon as reasonably practicable following the completion of this Agreement.	
2.6	[The Surety has agreed at the request of the Developer/the Owner to be a party to this Agreement].	*Surety if applicable.*
3.	**Construction of the Works**	
	The Developer/the Owner shall construct the Works at its own expense and complete the Works in accordance with the Drawings and Specification and any Planning Permission (as may be varied in accordance with clause [4]) to the reasonable satisfaction of the Engineer in the position and to the extent shown in the Drawings.	*Construction in accordance with drawings and specification.*
4.	**Minor Variations**	
	Without prejudice to clause [3] the Engineer may on the written request of the Developer/the Owner give consent (such consent not to be unreasonably withheld) to the Developer to construct the Works or any part of them otherwise than in strict conformity with the Drawings and the Specification subject to:	*Provision for minor variations.*
4.1	The written request by the Developer/the Owner being accompanied with such information and Drawings that the Engineer will require and the consent of the Engineer shall be in writing.	
4.2	The Developer/the Owner shall not allow any variation without such written consent being first obtained.	
4.3	Nothing within this clause shall permit or authorise the breach of the Specification.	
4.4	The grant of consent by the Engineer under this Clause shall not in any way prejudice any rights of the Council, the Highway Authority and the Sewerage Undertaker against the Developer/ the Owner [or the Surety] in respect of any breach or non-observance of any part of this Agreement [and the duties and obligations of the Surety shall apply in respect of the Works as varied as they apply to the Works shown on the Drawings.]	
4.5	The Developer/the Owner shall pay on demand the Engineers reasonable costs incurred in connection with the operation of this clause.	

5. Notification of intended Commencement of the Works

Notification of the start of construction.

The Developer/the Owner shall:

5.1 Give to the Engineer 4 weeks written notice of the date on which it proposes to commence the Works or any part of them and;

5.2 At the same time submit to the Engineer for inspection such additional plans, drawings and other design or working documents not previously submitted to him which relate to the carrying out of the Works as the Engineer may require and;

5.3 Notwithstanding the notice previously given give the Engineer 48 hours notice in writing of its intention to start the Works or any part of them.

6. Period of Construction

The Developer/the Owner shall:

6.1 Construct and complete the Works within a period of [ ] from this Agreement (unless the Engineer shall in writing agree to an extension of that period) and in any event;

Period to be agreed bearing in mind the provision that planning permission is granted for the development.

6.2 Ensure that before any building or property forming part of the development on the land which has the benefit of Planning Permission is brought into occupation such part of the Works as are necessary to drain those buildings or property shall be completed and in working order.

SUDS to be ready before occupation of the dwellings on the site.

7. Easements

The Developer shall at its own expense prior to commencement of the works obtain or ensure that they have been fully executed and enforce the following deeds and agreements:

Easements between parties as necessary to be provided before commencement of work.

7.1 Easements from third parties having interests in land through and on which the Above Ground Drainage and Below Ground Drainage are to be located for the Developer, [the Owner], the Council, the Highway Authority and the Sewerage Undertaker their servants and agents to enter upon such land after the vesting in the Council, the Highway Authority and the Sewerage Undertaker for the purpose of inspection, repair, maintenance, reconstruction, replacement or cleansing the form of and easements to be approved by the Council, the Highway Authority and the Sewerage Undertaker.

7.2 Easements and consents in favour of the Developer, [the Owner], the Council, the Highway Authority and the Sewerage Undertaker their servants and agents for the Works and the free flow and passage of water with or without other matter through them.

7.3 Easements and consents in favour of the Developer, [the Owner], the Council, the Highway Authority and the Sewerage Undertaker for the discharge of water with or without such other matter to any part of the SUDS, canal, pond or watercourse (as defined by section 219 (1) of the 1991 Act), to increase or decrease such discharge, to retain such discharge

	within any part of the SUDS and to take samples of such discharge.	
7.4	Easements and consents in favour of the Developer, [the Owner], the Council, the Highway Authority and the Sewerage Undertaker for the right to have in the water entering the SUDS soil and litter detritus or other matter or thing such that the same shall (as conditions from time to time may require) pass through and discharge from the SUDS or to be held in suspension in the water deposited in the SUDS and settle out upon the surface sides or walks of or elsewhere within the SUDS.	
7.5	Easements and consents in favour of the Developer, [the Owner], the Council, the Highway Authority and the Sewerage Undertaker for the right of support for the SUDS from the subjacent and adjacent land and soil including minerals.	
7.6	A Highways Agreement.	
7.7	An Undertakers Agreement.	
7.8	Such Statutory consents as may be required for the discharge of flood drainage works.	*Definition (clause 1.12).* *Definition (clause 1.22).* *Parties are advised to contact the Environment Agency at an early stage of any project to obtain the necessary consents which will be required in addition to any planning permission granted.*
8.	**Restriction of Other Works and Structures**	
	A. The Developer shall ensure that: B. The Owner shall ensure that:	*Amend as necessary.*
8.1	No building or structure is erected or acts or operation carried out so as to impair the proper operation of the Works.	
8.2	No access to the Works is in any way obstructed.	
8.3	Support for the SUDS is not withdrawn	
8.4	Ground levels within the Land are not altered such that the SUDS may function less well or less adequately for the storage or dispersal of water (as the case may be) than at the date hereof and in this regard the opinion of the Council, the Highway Authority and the Sewerage Undertaker shall be final and binding.	
8.5	In any transfer, conveyance or other disposition of the Land or any part thereof appropriate covenant as approved by the Council, the Highway Authority and the Sewerage Undertaker are contained therein in that respect binding upon the Land.	
9.	**Compensation**	
	The Council, the Highway Authority and the Sewerage Undertaker shall not be liable to make any payment in respect of:	*Restriction of liability.*

9.1 Any diminution in value of the interest of the Owner, tenant or occupier of the Land by reason of the exercise of any rights in relation to the SUDS.

9.2 Any claim, demands, losses, costs, charges and expenses in respect of or arising out of the exercise of any rights in relation to the SUDS, otherwise than arising in part or in whole from any act or default of the Council, the Highway Authority and/or the Sewerage Undertaker.

10. Certificates

Approval of the SUDS through Provisional and Final Certificates.

10.1 When the Developer/the Owner is of the Opinion that the Works have been completed it shall serve written notice on the Engineer to that effect.

10.2 After receiving such a notice the Engineer shall satisfy himself as to whether or not the Works have been completed and if he is so satisfied shall issue a certificate on behalf of the Council, Highways Authority or the Sewerage Undertaker to that effect ("the Provisional Certificate") in respect of the whole or substantial part of the Works as considered appropriate.

10.3 For the purposes of this clause the Works shall be deemed to have been completed when they have been substantially constructed in accordance with the preceding clauses of this Agreement.

10.4 If during the Defects Correction Period or until the Works vest in the Council, Highways Authority or the Sewerage Undertaker as appropriate (whichever is the longer) any defect, damage or blockage shall appear, arise or occur in the Works the Developer shall at its own expense and within [ ] months after such defect, damage or blockage has appeared, arisen or occurred (or immediately if required in writing by the Engineer) make good to the reasonable satisfaction of the Engineer and;

Period for remediation of defects to be inserted.

10.5 Without prejudice to clause [ ] the Developer shall during the period prior to the works being vested in the Council as appropriate in accordance with clause [ ] maintain the Works to the satisfaction of the Engineer.

Relevant periods to be inserted.

11. Access

11.1 The Developer shall allow and arrange for the Engineer to have access to the works and the Land at all reasonable times for the purpose of ensuring compliance with this Agreement.

Access to be provided to the Engineer.

12. Inspections

12.1 At any time before vesting of the Works in accordance with clause 14 the Developer/the Owner shall on being so requested in writing by the Engineer open up for inspection any part of the Works which may have been covered up.

Inspection of the works before covering up.

12.2 Should the Developer/the Owner fail to comply with any such request under 12.1 (and without prejudice to any other rights accruing on a breach of any part of this Agreement by the Developer/the Owner) the Engineer may arrange to open up the Works or any part of them.

12.3 In the event that any part of the Works is found to be defective, obstructed or otherwise failing to conform with the requirements of this Agreement the cost of such opening up rectification and reinstatement shall (subject to clause 12.4 below) be borne by the Developer/the Owner.

12.4 In any case other than mentioned in clause 12.3 above such costs shall be borne by the Council except that in any case where the Engineer has not been given reasonable notice and facilities by the Developer/the Owner in accordance with this Agreement to inspect any part of the Works and did not inspect them the cost of the opening reinstatement and rectification (if any) in relation to any part of the Works which shall have been opened up shall be borne by the Developer/the Owner whether or not such opening up reveals any defect, obstruction or other failure to comply with the requirements of this Agreement.

13. Right to Repair

Powers of the Council to complete or maintain the SUDS before vesting.

If at any time before the Works shall become vested in the Council in accordance with clause 14 the Developer/the Owner shall fail to construct, complete, make good and maintain the Works or any part of them in accordance with this Agreement:

13.1 The Council shall be entitled at its discretion to construct, complete, make good and maintain such parts of the Works as may be necessary in the opinion of the Engineer for the proper operation of the Works and may do so either by their own employees or by contract or in such other matter as they think fit after first giving reasonable notice in writing to the Developer/the Owner and the Surety of such intention and;

13.2 The Developer/the Owner shall upon demand pay to the Council the cost as certified by the Engineer of undertaking such part of the Works referred to in clause 13.1 including the cost of preparation and service of notices of administration.

14. Vesting

Requirements for vesting of the works in the Council.

14.1 The Council shall (subject to the Developer/the Owner complying with the terms of this Agreement and in particular the terms of clause 7) by declaration vest the Above Ground Drainage Works in the Council in accordance with the provisions contained in the 1972 Act.

14.2 The Council shall not be required to vest or to take over responsibility for the Works or any part of them until the following have occurred:

14.2.1 The Engineer shall have issued a certificate in writing certifying that:

Maintenance of SUDS and correction of defects during the Defects Correction Period.

14.2.1.1 The Works have been constructed and completed in accordance with the Drawing and the Specification to the reasonable satisfaction of the Engineer and have been maintained by the Developer/the Owner during the Defects Correction Period and any defects arising or work required in connection with the Works during that period and prior to the date of the Final

	Certificate have been made good or carried out by the Developer/the Owner to the reasonable satisfaction of the Engineer.	
14.2.1.2	No building structure or act has been erected or carried out so as to impair the proper operation of the Works.	
14.2.1.3	All requisite consents have been obtained and provided to the Engineer.	
14.2.2	All payments required by clause (19) have been paid.	
14.2.3	All requirements of clause [7] have been complied with.	*Provision of easements.*
14.2.4	The Engineer shall not be obliged to issue the Final Certificate whilst any dispute exists between the Developer/the Owner and a third party concerning the right of the Developer/the Owner to construct the works or any part of them in the position and the manner in which they have been constructed.	*Disputes.*
14.2.5	To ensure that the Works shall so soon as practicable after the Defects Correction Period receive the Final Certificate:	
14.2.5.1	The Developer/the Owner shall give [ ] months notice before the end of the Defects Correction Period.	*Notice before end of Defects Correction Period.*
14.2.5.2	Whether or not the Engineer shall have received notice as required under clause 14.2.5.1 above any inspection which the Engineer may require to make shall be made prior to the expiry of the Defects Correction Period and shall within [ ] days after such inspection advise the Developer/the Owner in writing of any defects arising or work required in connection with the Works and which require to be rectified or done before the issue of the Final Certificate.	*Notification of defects arising from inspections.* *Insert relevant periods.*

15. Duty to Developer

15.1 Nothing in this Agreement shall imply any obligation on the part of the Engineer or the Council, the Highway Authority or the Sewerage Undertaker to the Developer/the Owner or to any other person to ensure that the Works or any part them are properly constructed.

Developer responsible for proper construction of the SUDS.

16. Indemnity

16.1 The Developer/the Owner shall indemnify the Council and the Undertaker against all claims, costs, losses or expenses which may be made against them in connection with the construction and completion of the Works and any defect in title.

17. Termination

17.1 A. If the Developer shall:
B. If the Owner shall:

Amend as necessary.

17.1.1 Fail to perform any of its obligations under this Agreement.

Termination provision on breach of Agreement or bankruptcy.

17.1.2 (be adjudicated bankrupt or) shall go into liquidation voluntarily or otherwise or shall execute a deed of assignment for the benefit of or otherwise compound with its creditors (except for the purpose of reconstruction or amalgamation)

17.2 The Council and/or the Highway Authority and/or the Sewerage Undertaker may without prejudice to their other rights, remedies and powers against the Developer/the Owner for such breach of notice in writing to the Developer/the Owner (and the Surety) determine this Agreement and upon such notice being served this Agreement shall immediately determine but without prejudice to the obligations of [the Surety to the Council, the Highway Authority and the Sewerage Undertaker under clause 17 and of] the Developer/the Owner to the Council, the Highway Authority and the Sewerage Undertaker under this Agreement.

18. Surety's Obligation

18.1 If the Developer/the Owner fails to perform any of its obligations under this Agreement the Surety shall (subject to this clause) pay to the Council and/or the Highway Authority Sewerage Undertaker any expenditure which the Council and/or the Highway Authority and/or the Sewerage Undertaker may incur in accordance with this Agreement by reason of the failure of the Developer/the Owner to perform whether or not this Agreement has been determined.

Surety's obligation.

18.2 The Surety shall in no circumstance be liable to pay a sum greater than [ ] for which such the Surety binds itself and its successors and assigns to the Council, the Highway Authority and the Sewerage Undertaker.

Sum to be inserted.

18.3 The amount of any expenditure referred to in clause 18.1 shall be that certified by the Engineer, the Highways Authority or the Sewerage Undertaker whose certificate shall be final.

18.4	The Surety shall be discharged or released from the covenant in clause 18.1 when the Works become vested in the Council, the Highways Authority and the Sewerage Undertaker (as the case may be), but it shall not be discharged or released from this covenant by any arrangement between the Developer and the Council, the Highways Authority and the Sewerage Undertaker (as the case may be) or by the execution of any amended extra or substituted works authorised by clause [ ] or by any other whether as to payments, performance, time or otherwise whether made with or without the assent of the Surety.	
19.	**Bond in relation to Works that remain in the ownership of the Owner or the Developer**	*Bond provision*
19.1	If any part of the SUDS are to remain in the ownership of the Owner or the Developer then a bond in the sum of [£] shall be made in favour of the Council.	*Value of bond to be agreed and inserted.*
20.	**Disputes**	
20.1	All questions, disputes or differences which may arise at any time between the parties hereto in relation to the construction of the SUDS shall be referred in the first instance to a senior manager of each party who will attempt in good faith to resolve any issue arising out of this Agreement but failing resolution within 14 days may be referred with the agreement of all affected parties to mediation in accordance with the Centre for Dispute Resolution (CEDR) Model Mediation Procedure. If such parties do not agree upon mediation within 7 days thereafter or have not settled a dispute by mediation within 42 days from the initiation of the mediation the dispute shall be referred to the decision of a single arbitrator mutually agreed upon or failing such agreement within 14 days to be appointed by the President for the time being of the Chartered Institute of Arbitrators on the application of any of the affected parties and such arbitration shall be carried out in accordance with and subject to the application provisions of the Arbitration Act 1996.	*Provision for arbitration in the case of a dispute.*
21.	**Notices**	
21.1	Any notice to be served or document to be supplied or submitted under this Agreement shall be delivered or posted in respect of the Council to [details to be inserted], to the Highway Authority [details to be inserted] to the Sewerage Undertaker [details to be inserted] and any notices to be served on the Developer/the Owner may be delivered or posted to its/his last known address or its registered office.	*It is important that any change of address is notified to the other parties.* *Insert details of parties.*
22.	**Fees and Charges**	
	A. The Developer shall: B. The Owner shall:	*Amend as required.*
22.1	On the execution of this Agreement pay the costs incurred in preparation and completion of the same.	
22.2	(Engineer's costs). (Commuted Sum).	*Insert details of the Engineer's costs and the Commuted Sum as required. All costs should be shown exclusive of VAT.*

23. Transfer of Rights

23.1 The Developer/the Owner shall prior to the Works becoming vested in the Council in accordance with clause 14: *Transfer of rights.*

23.1.1 At the request of the Council execute or secure the execution of a conveyance or transfer to the Council and/or the Undertaker (and at no cost to them) vesting in them the freehold estate free from encumbrances of any land comprising the SUDS and upon which structures are erected for the proper operation of the Works and or amenity areas and to pay the costs of the preparation, completion and any stamp duty in respect of the same.

23.1.2 At the request of the Council secure at no cost to them the transfer or grant to them of the rights referred to in clause [ ] as they may require so such rights will vest in them. *Insert details of clause.*

24. Assignment

24.1 The Developer/the Owner shall not assign any interest or responsibility under this Agreement without the express written consent of the Council, the Highway Authority and the Sewerage Undertaker and upon such conditions and terms as they may impose. *Assignment of interest.*

25. Statutory Rights

25.1 Nothing in this Agreement shall in anyway prejudice the exercise by the Council, the Highway Authority or the Sewerage Undertaker of any of their statutory rights and powers arising otherwise than by virtue of this Agreement.

26. Third Party Rights

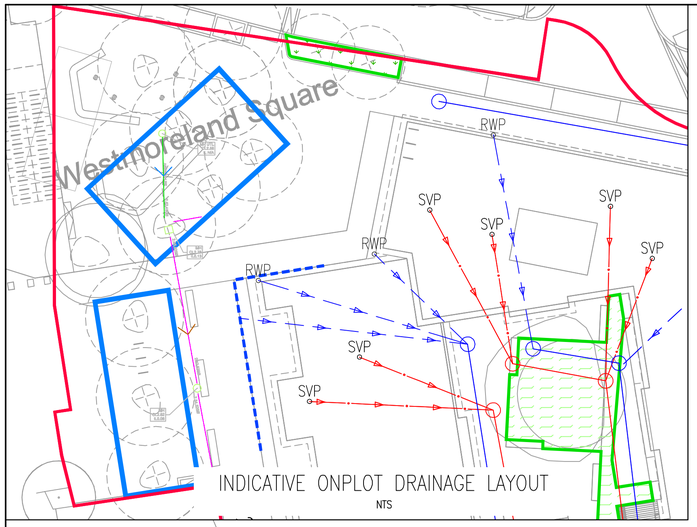
26.1 A person who is not a party to this Deed has no rights under the Contract (Rights of Third Parties) Act 1999 to enforce or have the benefit of any term of this Deed save where this Deed expressly provides otherwise but none of the foregoing provisions of this clause affect any right or remedy of a third party which exists or is available apart from the Act.

27. Application

27.1 This Agreement shall be governed by the laws of England and Wales.

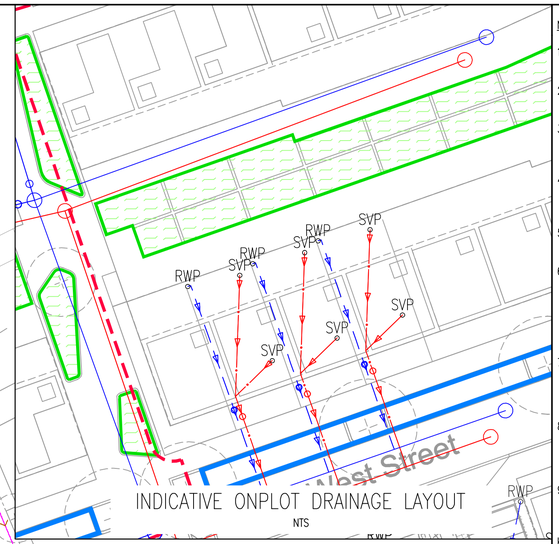
IN WITNESS WHEROF

Appendix N – FDS Proposed Drainage Strategy



PROPOSED HARD ENGINEERED BIO RETENTION AREA, PROVIDING UPSTREAM SURFACE WATER RETENTION AND WATER QUALITY TREATMENT PRIOR TO DISCHARGE INTO PROPOSED SURFACE WATER SEWER

PROPOSED GEO-CELLULAR SOIL VAULT ASSEMBLY SuDS FEATURE TO PROVIDE SOURCE CONTROL OF LOCALISED SURFACE WATER RUNOFF AND TREATMENT PRIOR TO DISCHARGE TO PROPOSED SURFACE WATER SEWER OR WHERE APPLICABLE TWUL COMBINED SEWER NETWORK



Westmoreland Square
Westmoreland Road
Westmoreland Park
Bradenham Close
Green Walk
Phillip Gardens
East-West Street
1.125m x 0.850m BRICK CULVERT
450mm ø
525mm ø
600mm ø
525mm ø
UNK ø
525mm ø
750mm ø
825mm ø
900mm ø
450mm ø
PLOT 1
PLOT 2
PLOT 3
RWP
SVP

SUB-PODIUM STORAGE:
VOLUME 525m³
AREA 350m²
SL 2.0mAOD
IL 0.5mAOD
(INCLUDES ALLOWANCE FOR CAST INSITU FOUNDATIONS)

PEAK SURFACE WATER DISCHARGE LIMITED TO 30.8 l/s FOR ALL EVENTS UP TO AND INCLUDING THE 1 IN 100 YEAR+CC (30%) RAINFALL EVENT

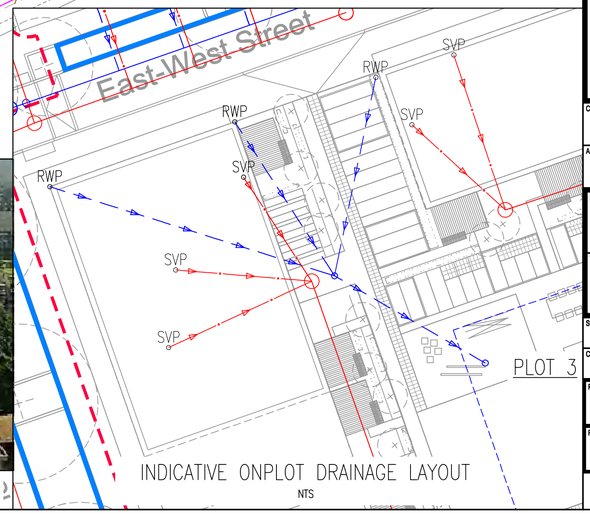
EXISTING TWUL MH:
CL 2.37mAOD
IL 0.02mAOD
PIPE ø 450mm

EXISTING TWUL MH:
CL 3.06mAOD
IL -2.32mAOD
PIPE ø 600mm

PEAK SURFACE WATER DISCHARGE LIMITED TO 80.0 l/s FOR ALL EVENTS UP TO AND INCLUDING THE 1 IN 100 YEAR+CC (30%) RAINFALL EVENT

SUB-PODIUM STORAGE:
VOLUME 1250m³
AREA 500m²
SL 1.75mAOD
IL -0.75mAOD
(INCLUDES ALLOWANCE FOR CAST INSITU FOUNDATIONS)

EXTENSIVE AND INTENSIVE GREEN ROOF PROVISION PROPOSED THROUGHOUT FDS



DO NOT SCALE

NOTES:

1. THE 'DRAINAGE BOUNDARY' IS INDICATIVE AND REPRESENTS ALL AREAS DRAINING TO PROPOSED ONSITE DRAINAGE SYSTEMS.
2. SUB PLOT BOUNDARY LINES ARE APPROXIMATE AT THIS STAGE AND SUBJECT TO REFINEMENT.
3. THE PROPOSED SEWER NETWORK IS INDICATIVE ONLY AT THIS STAGE AND SUBJECT TO CHANGE FOLLOWING THE PROGRESSION OF THE SCHEME.
4. THE IDENTIFIED SEWER OUTFALL LOCATIONS ARE BASED ON TWUL ASSET LOCATION RECORDS AND TOPOGRAPHY SURVEY FROM NHHT (31.01.28 1b1c topo & utility survey 7836-0113-01A).
5. LINE AND LEVEL INFORMATION FROM THE TWUL RECORDS IS APPROXIMATE ONLY.
6. ALLOWABLE DISCHARGE RATES SUBJECT TO FURTHER DISCUSSION AND CONFIRMATION WITH THAMES WATER FOLLOWING CONCLUSSION OF TWUL IMPACT ASSESSMENT. SURFACE WATER DISCHARGE RATES HAVE BEEN PROPOSED IN LINE WITH WALLINGFORD MODIFIED RATIONAL METHOD 1 IN 2 YEAR 15 MINUTE EVENT MINUS 65%. EQUATING TO A TOTAL FOR STAGE 1B/1C OF 110.8 l/s.
7. ASSUMES SURFACE WATER STORAGE IS LOCATED BELOW PODIUMS AT THIS STAGE. A 25% ALLOWANCE IN CAPACITY HAS BEEN INCLUDED FOR FORMING CAST INSITU FOUNDATIONS WITHIN STORAGE.
8. GEO-CELLULAR SOIL VAULT ASSEMBLY ARRANGEMENT TO INCORPORATE OUTFALLS THAT DISCHARGE EITHER TO EXISTING PUBLIC COMBINED SEWER NETWORK OR WHERE APPROPRIATE PROPOSED SURFACE WATER SEWER NETWORK.
9. BIORETENTION AREAS TO INCORPORATE LOW LYING GEO-CELLULAR SOIL VAULT ASSEMBLY UNITS. BIORETENTION TO INCORPORATE OUTFALLS INTO PROPOSED SURFACE WATER SEWER ARRANGEMENT.

KEY:

- DRAINAGE BOUNDARY
- INDICATIVE SUB PLOT BOUNDARY
- PROPOSED BIO-RETENTION AREAS
- PROPOSED PERMEABLE AREAS AT GROUND LEVEL
- PROPOSED GREEN ROOF EXTENTS
- PROPOSED GEO-CELLULAR SOIL VAULT ASSEMBLY. REFER TO NOTE 8 FOR DETAILS.
- INDICATIVE ONPLOT SW SEWER NETWORK
- INDICATIVE ONPLOT FW SEWER NETWORK
- COMBINED SEWER OPERATED BY TWUL
- TWUL ABANDONED SEWER TO BE RETAINED AND REUSED
- FLOW DIRECTION
- INDICATIVE STORAGE SIZING. SEE NOTE 6.
- PROPOSED LINEAR SURFACE WATER DRAIN OR EQUIVALENT TO DRAIN PRIVATE CURTILAGE ASSOCIATED WITH PROPOSED BUILDING FRONTAGES

REV	DATE	BY	DESCRIPTION	CHK	APD
D	07/08/2014	KW	SCHEME LAYOUT FREEZE AMENDMENTS	AH	JD
C	03/06/2014	AH	INCLUDES MODELLED NETWORK	AH	JD
B	03/06/2014	AH	REVISED MASTERPLAN 27-05-14	AH	JD
A	02/05/2014	AH	FIRST ISSUE	AH	JD

DRAWING STATUS: FOR INFORMATION ONLY

WSP
Unit 9, The Chase, John Tate Road
Foxholes Business Park, Hertford SG13 7NN
Tel: +44 (0)1992 526000 Fax: +44 (0)1992 526001
http://www.wspgroup.com

CLIENT: NHH

ARCHITECT: HTA

PROJECT: AYLESBURY ESTATE

TITLE: FIRST DEVELOPMENT SITE CONCEPT SURFACE WATER STRATEGY

SCALE @ A1:	CHECKED:	APPROVED:
1:500	AAH	JD
CAD FILE:	DESIGN-DRAWN:	DATE:
0304-D-04.DWG	AAH	June 14

PROJECT No:	DRAWING No:	REV:
50600304	0304-D-04	D

PROJECT DOCUMENT REF: NHH-AES-WSP-C-D01-X-00-M2_D-04

Appendix O – FDS Proposed Catchment Plan

\\ser01her1uk\projects\50600304 - aylesbury estate, southwark\e drowings\development\autocad\d drainage\0304-d-10.dwg, 08 August 2014 11:41:22, Willis, Karl

DO NOT SCALE

NOTES:

1. THE 'DRAINAGE BOUNDARY' IS INDICATIVE AND REPRESENTS ALL AREAS DRAINING TO PROPOSED ONSITE DRAINAGE SYSTEMS.
2. SUB PLOT BOUNDARY LINES ARE APPROXIMATE AT THIS STAGE AND SUBJECT TO REFINEMENT.
3. THE PROPOSED SEWER NETWORK IS INDICATIVE ONLY AT THIS STAGE AND SUBJECT TO CHANGE FOLLOWING THE PROGRESSION OF THE SCHEME.
4. THE IDENTIFIED SEWER OUTFALL LOCATIONS ARE BASED ON TWUL ASSET LOCATION RECORDS AND TOPOGRAPHY SURVEY FROM NHHT (31.01.28 1b1c topo & utility survey 7836-0113-01A).
5. LINE AND LEVEL INFORMATION FROM THE TWUL RECORDS IS APPROXIMATE ONLY.
6. ASSUMES SURFACE WATER STORAGE IS LOCATED BELOW PODIUMS AT THIS STAGE

KEY:

- DRAINAGE BOUNDARY
- INDICATIVE SUB PLOT BOUNDARY
- INDICATIVE SURFACE WATER CATCHMENT BOUNDARY
- INDICATIVE ONPLOT SW SEWER NETWORK
- COMBINED SEWER OPERATED BY TWUL
- TWUL ABANDONED SEWER TO BE RETAINED AND REUSED
- FLOW DIRECTION
- INDICATIVE STORAGE SIZING
- PROPOSED IMPERMEABLE AREA (3.16 Ha)
- PROPOSED PERMEABLE AREA (0.34 Ha)
- PROPOSED GREEN ROOF AREA (0.97 Ha)

REV	DATE	BY	DESCRIPTION	CHK	APD
A	07/08/2014	KW	FIRST ISSUE	AH	JD

DRAWING STATUS: FOR INFORMATION ONLY

WSP
Unit 9, The Chase, John Tate Road
Foxholes Business Park, Hertford SG13 7NN
Tel: +44 (0)1992 526000 Fax: +44 (0)1992 526001
http://www.wspgroup.com

CLIENT: NHH

ARCHITECT: HTA

PROJECT: AYLESBURY ESTATE

TITLE: FIRST DEVELOPMENT SITE INDICATIVE SURFACE WATER CATCHMENT PLAN

SCALE @ A1:	CHECKED:	APPROVED:
1:500	AAH	JD
CAD FILE:	DESIGN-DRAWN:	DATE:
0304-D-10.DWG	KW	July 14
PROJECT No:	DRAWING No:	REV:
50600304	0304-D-10	A

PROJECT DOCUMENT REF: NHH-AES-WSP-C-D01-X-00-M2_D-10

Appendix P – FDS Proposed Brownfield Discharge Volumes

Long Term Storage Calculations - Brownfield

Client	NHH
Job Title	Aylesbury Estate
Job No.	50600304
Made By	AAH
Checked By	AAH
Approved By	JD

Unit 9, The Chase
John Tate Road
Foxholes Business Park
Hertford
SG13 7NN

Pre-Development (Brownfield) Runoff Volume

Runoff Volume (Vol $_{bf}$) m^3 = AIMP x RD x 10

Impermeable Area (AIMP) in hectares = 2.55

Total Impermeable Area of the Brownfield site

100 Year 6 Hour Rainfall Depth (RD) in millimetres = 63

RD is taken from Figure 3.1 of Ref 1

Vol $_{bf}$ = 1607 m^3

Development Runoff Volume

Runoff Volume (Vol $_{dev}$) m^3 = AIMP x RD x 10

Impermeable Area (AIMP) in hectares = 3.02

Total Impermeable Area of the Development site including green roofs

100 Year 6 Hour Rainfall Depth (RD) in metres = 63

RD is taken from Figure 3.1 of Ref 1

Vol $_{dev}$ = 1903 m^3

Long Term Storage

Vol $_{dev}$ - Vol $_{bf}$ = 296 m^3

Note: Development impermeable area includes green roofs
Green roof area is approx.0.966 hectares
CIRIA C644 states approx. 80% volume reduction for 230mm Green Roof
Equivalent impermeable area: 3.02 hectares
Landscape areas are assumed to drain naturally

Ref 1 = Preliminary Rainfall Runoff Management for Developments (W5-074/A/TR/1)

Tel +44 (0)1992 526 000
Fax +44 (0)1992 526 001
http:/www.wspgroup.com

Appendix Q – FDS WinDES Model Results

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes BS Manhole Sizes SFA7

FEH Rainfall Model

Return Period (years)	2
Site Location	GB 532600 177950 TQ 32600 77950
C (1km)	-0.027
D1 (1km)	0.316
D2 (1km)	0.306
D3 (1km)	0.249
E (1km)	0.328
F (1km)	2.500
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	21.864	0.219	100.0	0.021	5.00	0.0	0.600	o	225
2.000	4.458	0.044	101.3	0.000	5.00	0.0	0.600	o	225
1.001	21.394	0.214	100.0	0.012	0.00	0.0	0.600	o	300
3.000	9.104	0.090	101.2	0.000	5.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.28	1.450	0.021	0.0	0.0	0.0	1.31	52.0	2.8
2.000	50.00	5.06	1.276	0.000	0.0	0.0	0.0	1.30	51.6	0.0
1.001	50.00	5.51	1.156	0.033	0.0	0.0	0.0	1.57	111.1	4.4
3.000	50.00	5.10	1.032	0.000	0.0	0.0	0.0	1.56	110.5	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.002	13.868	0.139	99.8	0.016	0.00	0.0	0.600	o	300
4.000	8.705	0.086	101.2	0.000	5.00	0.0	0.600	o	300
4.001	29.901	0.686	43.6	0.059	0.00	0.0	0.600	o	300
1.003	31.892	0.177	180.2	0.055	0.00	0.0	0.600	o	300
1.004	34.554	0.230	150.2	0.054	0.00	0.0	0.600	o	450
1.005	24.384	0.163	150.0	0.054	0.00	0.0	0.600	o	450
5.000	31.015	0.620	50.0	0.038	5.00	0.0	0.600	o	300
5.001	22.127	0.443	50.0	0.032	0.00	0.0	0.600	o	300
6.000	7.379	0.073	101.1	0.000	5.00	0.0	0.600	o	300
6.001	23.528	0.200	117.6	0.195	0.00	0.0	0.600	o	300
1.006	2.017	0.011	183.4	0.017	0.00	0.0	0.600	o	450
7.000	35.736	0.354	100.9	0.098	5.00	0.0	0.600	o	300
8.000	14.712	0.368	40.0	0.022	5.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.002	50.00	5.65	0.942	0.048	0.0	0.0	0.0	1.57	111.3	6.5
4.000	50.00	5.09	1.706	0.000	0.0	0.0	0.0	1.56	110.5	0.0
4.001	50.00	5.30	1.620	0.059	0.0	0.0	0.0	2.39	168.8	8.0
1.003	50.00	6.11	0.803	0.162	0.0	0.0	0.0	1.17	82.6	21.9
1.004	50.00	6.46	0.476	0.216	0.0	0.0	0.0	1.66	263.4	29.3
1.005	50.00	6.70	0.246	0.270	0.0	0.0	0.0	1.66	263.6	36.5
5.000	50.00	5.23	1.500	0.038	0.0	0.0	0.0	2.23	157.5	5.1
5.001	50.00	5.40	0.880	0.070	0.0	0.0	0.0	2.23	157.5	9.5
6.000	50.00	5.08	0.573	0.000	0.0	0.0	0.0	1.56	110.5	0.0
6.001	50.00	5.35	0.500	0.195	0.0	0.0	0.0	1.45	102.4	26.3
1.006	50.00	5.02	0.083	0.000	30.8	0.0	0.0	1.50	238.3	30.8
7.000	50.00	5.38	1.250	0.098	0.0	0.0	0.0	1.56	110.6	13.2
8.000	50.00	5.12	1.566	0.022	0.0	0.0	0.0	2.07	82.5	3.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
7.001	45.723	0.327	139.8	0.022	0.00	0.0	0.600	o	450
7.002	21.215	0.121	175.2	0.030	0.00	0.0	0.600	o	450
9.000	16.266	0.422	38.5	0.021	5.00	0.0	0.600	o	225
10.000	6.506	0.064	101.7	0.000	5.00	0.0	0.600	o	300
10.001	29.164	0.287	101.6	0.018	0.00	0.0	0.600	o	300
11.000	5.700	0.056	101.8	0.000	5.00	0.0	0.600	o	300
10.002	31.225	0.340	91.9	0.026	0.00	0.0	0.600	o	300
9.001	19.079	0.106	180.0	0.020	0.00	0.0	0.600	o	450
12.000	5.926	0.059	100.4	0.000	5.00	0.0	0.600	o	300
12.001	7.486	0.185	40.5	0.017	0.00	0.0	0.600	o	300
12.002	27.378	0.275	99.7	0.014	0.00	0.0	0.600	o	300
13.000	5.964	0.059	101.1	0.000	5.00	0.0	0.600	o	300
12.003	28.798	0.336	85.6	0.032	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
7.001	50.00	5.82	0.746	0.142	0.0	0.0	0.0	1.72	273.1	19.3
7.002	50.00	6.06	0.419	0.172	0.0	0.0	0.0	1.53	243.8	23.3
9.000	50.00	5.13	1.250	0.021	0.0	0.0	0.0	2.11	84.1	2.9
10.000	50.00	5.07	1.598	0.000	0.0	0.0	0.0	1.56	110.2	0.0
10.001	50.00	5.38	1.534	0.018	0.0	0.0	0.0	1.56	110.2	2.4
11.000	50.00	5.06	1.303	0.000	0.0	0.0	0.0	1.56	110.2	0.0
10.002	50.00	5.70	1.247	0.043	0.0	0.0	0.0	1.64	116.0	5.9
9.001	50.00	5.91	0.603	0.085	0.0	0.0	0.0	1.51	240.5	11.5
12.000	50.00	5.06	1.909	0.000	0.0	0.0	0.0	1.57	110.9	0.0
12.001	50.00	5.11	1.850	0.017	0.0	0.0	0.0	2.48	175.2	2.3
12.002	50.00	5.40	1.665	0.031	0.0	0.0	0.0	1.57	111.3	4.2
13.000	50.00	5.06	1.449	0.000	0.0	0.0	0.0	1.56	110.5	0.0
12.003	50.00	5.69	1.390	0.063	0.0	0.0	0.0	1.70	120.2	8.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
9.002	17.271	0.217	79.6	0.038	0.00	0.0	0.600	o	450
14.000	7.937	0.079	100.5	0.000	5.00	0.0	0.600	o	300
7.003	17.578	0.059	300.0	0.031	0.00	0.0	0.600	o	600
15.000	4.189	0.042	99.7	0.000	5.00	0.0	0.600	o	300
15.001	37.423	0.374	100.1	0.083	0.00	0.0	0.600	o	300
16.000	5.484	0.054	101.6	0.000	5.00	0.0	0.600	o	300
15.002	35.925	0.359	100.0	0.045	0.00	0.0	0.600	o	300
17.000	7.835	0.078	100.4	0.000	5.00	0.0	0.600	o	300
17.001	21.775	0.272	80.1	0.045	0.00	0.0	0.600	o	300
18.000	11.430	0.113	101.2	0.000	5.00	0.0	0.600	o	300
15.003	22.405	0.120	186.7	0.039	0.00	0.0	0.600	o	450
19.000	15.560	0.769	20.2	0.007	5.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.002	50.00	6.03	0.497	0.186	0.0	0.0	0.0	2.28	362.7	25.2
14.000	50.00	5.08	0.509	0.000	0.0	0.0	0.0	1.57	110.9	0.0
7.003	50.00	6.26	0.130	0.390	0.0	0.0	0.0	1.40	396.0	52.8
15.000	50.00	5.04	1.592	0.000	0.0	0.0	0.0	1.57	111.3	0.0
15.001	50.00	5.44	1.550	0.083	0.0	0.0	0.0	1.57	111.1	11.3
16.000	50.00	5.06	1.230	0.000	0.0	0.0	0.0	1.56	110.3	0.0
15.002	50.00	5.82	1.176	0.128	0.0	0.0	0.0	1.57	111.1	17.3
17.000	50.00	5.08	1.478	0.000	0.0	0.0	0.0	1.57	110.9	0.0
17.001	50.00	5.29	1.400	0.045	0.0	0.0	0.0	1.76	124.3	6.2
18.000	50.00	5.12	0.930	0.000	0.0	0.0	0.0	1.56	110.5	0.0
15.003	50.00	6.07	0.667	0.213	0.0	0.0	0.0	1.48	236.1	28.8
19.000	50.00	5.07	1.800	0.007	0.0	0.0	0.0	3.51	248.2	1.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
15.004	11.274	0.258	43.7	0.013	0.00	0.0	0.600	o	450
7.004	63.636	0.212	300.0	0.045	0.00	0.0	0.600	o	600
20.000	55.315	0.553	100.0	0.029	5.00	0.0	0.600	o	300
21.000	15.028	0.250	60.0	0.047	5.00	0.0	0.600	o	300
22.000	6.623	0.066	100.3	0.000	5.00	0.0	0.600	o	300
21.001	26.585	0.443	60.0	0.031	0.00	0.0	0.600	o	300
23.000	6.348	0.063	100.8	0.000	5.00	0.0	0.600	o	300
23.001	27.049	0.338	80.0	0.045	0.00	0.0	0.600	o	300
24.000	7.582	0.075	101.1	0.000	5.00	0.0	0.600	o	300
23.002	30.512	0.181	168.2	0.052	0.00	0.0	0.600	o	300
25.000	7.620	0.076	100.3	0.000	5.00	0.0	0.600	o	300
21.002	17.128	0.171	100.0	0.054	0.00	0.0	0.600	o	450

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
15.004	50.00	6.13	0.547	0.233	0.0	0.0	0.0	3.08	490.2	31.5
7.004	50.00	7.02	0.071	0.668	0.0	0.0	0.0	1.40	396.0	90.4
20.000	50.00	5.59	1.300	0.029	0.0	0.0	0.0	1.57	111.1	3.9
21.000	50.00	5.12	1.350	0.047	0.0	0.0	0.0	2.03	143.7	6.3
22.000	50.00	5.07	1.166	0.000	0.0	0.0	0.0	1.57	110.9	0.0
21.001	50.00	5.34	1.100	0.078	0.0	0.0	0.0	2.03	143.7	10.5
23.000	50.00	5.07	1.263	0.000	0.0	0.0	0.0	1.57	110.7	0.0
23.001	50.00	5.32	1.200	0.045	0.0	0.0	0.0	1.76	124.3	6.1
24.000	50.00	5.08	0.937	0.000	0.0	0.0	0.0	1.56	110.5	0.0
23.002	50.00	5.74	0.862	0.097	0.0	0.0	0.0	1.21	85.5	13.1
25.000	50.00	5.08	0.732	0.000	0.0	0.0	0.0	1.57	111.0	0.0
21.002	50.00	5.88	0.506	0.229	0.0	0.0	0.0	2.03	323.4	31.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
20.001	28.022	0.369	75.9	0.024	0.00	0.0	0.600	o	450
7.005	29.645	0.099	300.0	0.082	0.00	0.0	0.600	o	600
7.006	28.287	0.094	300.0	0.030	0.00	0.0	0.600	o	600
26.000	12.768	0.323	39.5	0.010	5.00	0.0	0.600	o	300
27.000	4.352	0.043	101.2	0.000	5.00	0.0	0.600	o	225
27.001	27.406	0.556	49.3	0.052	0.00	0.0	0.600	o	225
28.000	4.156	0.041	101.4	0.000	5.00	0.0	0.600	o	225
28.001	39.192	0.390	100.5	0.081	0.00	0.0	0.600	o	225
26.001	28.843	0.288	100.0	0.008	0.00	0.0	0.600	o	300
29.000	8.160	0.081	100.7	0.000	5.00	0.0	0.600	o	225
29.001	30.309	0.505	60.0	0.076	0.00	0.0	0.600	o	225
26.002	11.865	0.119	100.0	0.015	0.00	0.0	0.600	o	300
30.000	7.819	0.077	101.5	0.000	5.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
20.001	50.00	6.08	0.335	0.282	0.0	0.0	0.0	2.34	371.6	38.1
7.005	50.00	7.37	-0.185	1.032	0.0	0.0	0.0	1.40	396.0	139.7
7.006	50.00	7.71	-0.283	1.062	0.0	0.0	0.0	1.40	396.0	143.8
26.000	50.00	5.08	1.500	0.010	0.0	0.0	0.0	2.51	177.3	1.3
27.000	50.00	5.06	1.858	0.000	0.0	0.0	0.0	1.30	51.7	0.0
27.001	50.00	5.30	1.815	0.052	0.0	0.0	0.0	1.87	74.3	7.0
28.000	50.00	5.05	1.668	0.000	0.0	0.0	0.0	1.30	51.6	0.0
28.001	50.00	5.55	1.627	0.081	0.0	0.0	0.0	1.30	51.9	10.9
26.001	50.00	5.86	1.162	0.150	0.0	0.0	0.0	1.57	111.1	20.3
29.000	50.00	5.10	1.581	0.000	0.0	0.0	0.0	1.30	51.8	0.0
29.001	50.00	5.40	1.500	0.076	0.0	0.0	0.0	1.69	67.3	10.3
26.002	50.00	5.99	0.874	0.241	0.0	0.0	0.0	1.57	111.1	32.6
30.000	50.00	5.08	1.427	0.000	0.0	0.0	0.0	1.56	110.3	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
30.001	28.504	0.573	49.7	0.032	0.00	0.0	0.600	o	300
31.000	8.467	0.084	100.8	0.000	5.00	0.0	0.600	o	300
26.003	41.364	0.207	200.0	0.056	0.00	0.0	0.600	o	450
26.004	37.470	0.187	200.0	0.130	0.00	0.0	0.600	o	450
26.005	25.686	0.128	200.0	0.027	0.00	0.0	0.600	o	450
32.000	8.689	0.086	101.0	0.000	5.00	0.0	0.600	o	600
32.001	27.668	0.092	300.7	0.197	0.00	0.0	0.600	o	600
7.007	5.338	0.005	1067.6	0.008	0.00	0.0	0.600	o	600

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
30.001	50.00	5.30	1.350	0.032	0.0	0.0	0.0	2.23	158.0	4.3
31.000	50.00	5.09	0.839	0.000	0.0	0.0	0.0	1.57	110.7	0.0
26.003	50.00	6.47	0.605	0.329	0.0	0.0	0.0	1.43	228.1	44.5
26.004	50.00	6.90	0.398	0.459	0.0	0.0	0.0	1.43	228.1	62.1
26.005	50.00	7.20	0.211	0.486	0.0	0.0	0.0	1.43	228.1	65.8
32.000	50.00	5.06	0.664	0.000	0.0	0.0	0.0	2.42	685.0	0.0
32.001	50.00	5.39	-0.750	0.197	0.0	0.0	0.0	1.40	395.6	26.7
7.007	50.00	5.12	-2.000	0.000	80.0	0.0	0.0	0.74	208.3	80.0

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	5	2.739	1.450	1.064	Open Manhole	1200
2.000	o	225	2	2.618	1.276	1.117	Open Manhole	1200
1.001	o	300	6	2.900	1.156	1.443	Open Manhole	1200
3.000	o	300	4	2.628	1.032	1.296	Open Manhole	1200
1.002	o	300	7	2.700	0.942	1.458	Open Manhole	1200
4.000	o	300	6	3.300	1.706	1.294	Open Manhole	1200
4.001	o	300	8	3.277	1.620	1.357	Open Manhole	1200
1.003	o	300	8	2.900	0.803	1.797	Open Manhole	1200
1.004	o	450	9	2.500	0.476	1.574	Open Manhole	1350
1.005	o	450	8	2.351	0.246	1.655	Open Manhole	1350
5.000	o	300	9	2.999	1.500	1.199	Open Manhole	1200
5.001	o	300	10	2.900	0.880	1.720	Open Manhole	1200
6.000	o	300	13	2.553	0.573	1.680	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	21.864	100.0	6	2.900	1.231	1.443	Open Manhole	1200
2.000	4.458	101.3	6	2.900	1.232	1.443	Open Manhole	1200
1.001	21.394	100.0	7	2.700	0.942	1.458	Open Manhole	1200
3.000	9.104	101.2	7	2.700	0.942	1.458	Open Manhole	1200
1.002	13.868	99.8	8	2.900	0.803	1.797	Open Manhole	1200
4.000	8.705	101.2	8	3.277	1.620	1.357	Open Manhole	1200
4.001	29.901	43.6	8	2.900	0.934	1.666	Open Manhole	1200
1.003	31.892	180.2	9	2.500	0.626	1.574	Open Manhole	1350
1.004	34.554	150.2	8	2.351	0.246	1.655	Open Manhole	1350
1.005	24.384	150.0	11	2.407	0.083	1.873	Open Manhole	1350
5.000	31.015	50.0	10	2.900	0.880	1.720	Open Manhole	1200
5.001	22.127	50.0	11	2.407	0.437	1.670	Open Manhole	1350
6.000	7.379	101.1	10	2.629	0.500	1.829	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.001	o	300	10	2.629	0.500	1.829	Open Manhole	1200
1.006	o	450	11	2.407	0.083	1.873	Open Manhole	1350
7.000	o	300	12	2.600	1.250	1.050	Open Manhole	1200
8.000	o	225	13	2.916	1.566	1.125	Open Manhole	1200
7.001	o	450	13	2.947	0.746	1.751	Open Manhole	1350
7.002	o	450	14	3.758	0.419	2.889	Open Manhole	1350
9.000	o	225	15	2.600	1.250	1.125	Open Manhole	1200
10.000	o	300	21	2.625	1.598	0.727	Open Manhole	1200
10.001	o	300	16	2.844	1.534	1.010	Open Manhole	1200
11.000	o	300	23	2.627	1.303	1.024	Open Manhole	1200
10.002	o	300	17	2.642	1.247	1.095	Open Manhole	1200
9.001	o	450	16	2.661	0.603	1.608	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.001	23.528	117.6	11	2.407	0.300	1.807	Open Manhole	1350
1.006	2.017	183.4		2.400	0.072	1.878	Open Manhole	0
7.000	35.736	100.9	13	2.947	0.896	1.751	Open Manhole	1350
8.000	14.712	40.0	13	2.947	1.198	1.524	Open Manhole	1350
7.001	45.723	139.8	14	3.758	0.419	2.889	Open Manhole	1350
7.002	21.215	175.2	15	2.865	0.298	2.117	Open Manhole	1500
9.000	16.266	38.5	16	2.661	0.828	1.608	Open Manhole	1350
10.000	6.506	101.7	16	2.844	1.534	1.010	Open Manhole	1200
10.001	29.164	101.6	17	2.642	1.247	1.095	Open Manhole	1200
11.000	5.700	101.8	17	2.642	1.247	1.095	Open Manhole	1200
10.002	31.225	91.9	16	2.661	0.907	1.453	Open Manhole	1350
9.001	19.079	180.0	17	2.971	0.497	2.024	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
12.000	o	300	25	2.900	1.909	0.691	Open Manhole	1200
12.001	o	300	19	3.176	1.850	1.026	Open Manhole	1200
12.002	o	300	20	3.019	1.665	1.054	Open Manhole	1200
13.000	o	300	28	2.900	1.449	1.151	Open Manhole	1200
12.003	o	300	21	2.900	1.390	1.210	Open Manhole	1200
9.002	o	450	17	2.971	0.497	2.024	Open Manhole	1350
14.000	o	300	31	2.959	0.509	2.150	Open Manhole	1200
7.003	o	600	15	2.865	0.130	2.135	Open Manhole	1500
15.000	o	300	29	3.023	1.592	1.131	Open Manhole	1200
15.001	o	300	25	3.002	1.550	1.152	Open Manhole	1200
16.000	o	300	31	3.295	1.230	1.765	Open Manhole	1200
15.002	o	300	26	3.353	1.176	1.877	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
12.000	5.926	100.4	19	3.176	1.850	1.026	Open Manhole	1200
12.001	7.486	40.5	20	3.019	1.665	1.054	Open Manhole	1200
12.002	27.378	99.7	21	2.900	1.390	1.210	Open Manhole	1200
13.000	5.964	101.1	21	2.900	1.390	1.210	Open Manhole	1200
12.003	28.798	85.6	17	2.971	1.054	1.617	Open Manhole	1350
9.002	17.271	79.6	15	2.865	0.280	2.135	Open Manhole	1500
14.000	7.937	100.5	15	2.865	0.430	2.135	Open Manhole	1500
7.003	17.578	300.0	16	2.857	0.071	2.186	Open Manhole	1500
15.000	4.189	99.7	25	3.002	1.550	1.152	Open Manhole	1200
15.001	37.423	100.1	26	3.353	1.176	1.877	Open Manhole	1200
16.000	5.484	101.6	26	3.353	1.176	1.877	Open Manhole	1200
15.002	35.925	100.0	27	2.900	0.817	1.783	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
17.000	o	300	32	2.863	1.478	1.085	Open Manhole	1200
17.001	o	300	27	2.814	1.400	1.114	Open Manhole	1200
18.000	o	300	35	2.919	0.930	1.689	Open Manhole	1200
15.003	o	450	27	2.900	0.667	1.783	Open Manhole	1350
19.000	o	300	28	3.516	1.800	1.416	Open Manhole	1200
15.004	o	450	28	3.275	0.547	2.278	Open Manhole	1350
7.004	o	600	16	2.857	0.071	2.186	Open Manhole	1500
20.000	o	300	31	2.606	1.300	1.006	Open Manhole	1200
21.000	o	300	32	2.700	1.350	1.050	Open Manhole	1200
22.000	o	300	47	3.098	1.166	1.632	Open Manhole	1200
21.001	o	300	33	3.400	1.100	2.000	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
17.000	7.835	100.4	27	2.814	1.400	1.114	Open Manhole	1200
17.001	21.775	80.1	27	2.900	1.128	1.472	Open Manhole	1350
18.000	11.430	101.2	27	2.900	0.817	1.783	Open Manhole	1350
15.003	22.405	186.7	28	3.275	0.547	2.278	Open Manhole	1350
19.000	15.560	20.2	28	3.275	1.031	1.944	Open Manhole	1350
15.004	11.274	43.7	16	2.857	0.289	2.118	Open Manhole	1500
7.004	63.636	300.0	17	2.445	-0.141	1.986	Open Manhole	1500
20.000	55.315	100.0	32	2.494	0.747	1.447	Open Manhole	1350
21.000	15.028	60.0	33	3.400	1.100	2.000	Open Manhole	1200
22.000	6.623	100.3	33	3.400	1.100	2.000	Open Manhole	1200
21.001	26.585	60.0	34	2.600	0.656	1.644	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
23.000	o	300	48	2.500	1.263	0.937	Open Manhole	1200
23.001	o	300	34	2.500	1.200	1.000	Open Manhole	1200
24.000	o	300	50	2.578	0.937	1.341	Open Manhole	1200
23.002	o	300	35	2.500	0.862	1.338	Open Manhole	1200
25.000	o	300	53	2.105	0.732	1.073	Open Manhole	1200
21.002	o	450	34	2.600	0.506	1.644	Open Manhole	1350
20.001	o	450	32	2.494	0.335	1.709	Open Manhole	1350
7.005	o	600	17	2.445	-0.185	2.030	Open Manhole	1500
7.006	o	600	40	2.721	-0.283	2.405	Open Manhole	1500
26.000	o	300	39	3.001	1.500	1.201	Open Manhole	1200
27.000	o	225	46	3.141	1.858	1.058	Open Manhole	1200
27.001	o	225	40	3.165	1.815	1.125	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
23.000	6.348	100.8	34	2.500	1.200	1.000	Open Manhole	1200
23.001	27.049	80.0	35	2.500	0.862	1.338	Open Manhole	1200
24.000	7.582	101.1	35	2.500	0.862	1.338	Open Manhole	1200
23.002	30.512	168.2	34	2.600	0.681	1.619	Open Manhole	1350
25.000	7.620	100.3	34	2.600	0.656	1.644	Open Manhole	1350
21.002	17.128	100.0	32	2.494	0.335	1.709	Open Manhole	1350
20.001	28.022	75.9	17	2.445	-0.035	2.030	Open Manhole	1500
7.005	29.645	300.0	40	2.721	-0.283	2.405	Open Manhole	1500
7.006	28.287	300.0	18	2.957	-0.378	2.735	Open Manhole	1500
26.000	12.768	39.5	40	3.100	1.177	1.623	Open Manhole	1200
27.000	4.352	101.2	40	3.165	1.815	1.125	Open Manhole	1200
27.001	27.406	49.3	40	3.100	1.259	1.616	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
28.000	o	225	47	2.972	1.668	1.079	Open Manhole	1200
28.001	o	225	41	2.977	1.627	1.125	Open Manhole	1200
26.001	o	300	40	3.100	1.162	1.638	Open Manhole	1200
29.000	o	225	50	3.400	1.581	1.594	Open Manhole	1200
29.001	o	225	45	3.278	1.500	1.553	Open Manhole	1200
26.002	o	300	40	3.179	0.874	2.005	Open Manhole	1200
30.000	o	300	55	2.721	1.427	0.994	Open Manhole	1200
30.001	o	300	41	2.762	1.350	1.112	Open Manhole	1200
31.000	o	300	56	3.094	0.839	1.955	Open Manhole	1200
26.003	o	450	41	3.184	0.605	2.129	Open Manhole	1350
26.004	o	450	49	3.004	0.398	2.156	Open Manhole	1350
26.005	o	450	42	2.750	0.211	2.089	Open Manhole	1350
32.000	o	600	73	3.000	0.664	1.736	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
28.000	4.156	101.4	41	2.977	1.627	1.125	Open Manhole	1200
28.001	39.192	100.5	40	3.100	1.237	1.638	Open Manhole	1200
26.001	28.843	100.0	40	3.179	0.874	2.005	Open Manhole	1200
29.000	8.160	100.7	45	3.278	1.500	1.553	Open Manhole	1200
29.001	30.309	60.0	40	3.179	0.995	1.959	Open Manhole	1200
26.002	11.865	100.0	41	3.184	0.755	2.129	Open Manhole	1350
30.000	7.819	101.5	41	2.762	1.350	1.112	Open Manhole	1200
30.001	28.504	49.7	41	3.184	0.777	2.107	Open Manhole	1350
31.000	8.467	100.8	41	3.184	0.755	2.129	Open Manhole	1350
26.003	41.364	200.0	49	3.004	0.398	2.156	Open Manhole	1350
26.004	37.470	200.0	42	2.750	0.211	2.089	Open Manhole	1350
26.005	25.686	200.0	18	2.957	0.082	2.425	Open Manhole	1500
32.000	8.689	101.0	50	2.834	0.578	1.656	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
32.001	o	600	50	2.834	-0.750	2.984	Open Manhole	1500
7.007	o	600	18	2.957	-2.000	4.357	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
32.001	27.668	300.7	18	2.957	-0.842	3.199	Open Manhole	1500
7.007	5.338	1067.6	PLOT 1&2 SOUTH	2.709	-2.005	4.114	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		2.400	0.072	0.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
7.007	PLOT 1&2 SOUTH	2.709	-2.005	-2.320	0	0

Online Controls for Storm

Non Return Valve Manhole: 8, DS/PN: 1.005, Volume (m³): 8.3

Depth/Flow Relationship Manhole: 11, DS/PN: 1.006, Volume (m³): 10.0

Invert Level (m) 0.083

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	30.8000	0.900	30.8000	1.700	30.8000	2.500	30.8000
0.200	30.8000	1.000	30.8000	1.800	30.8000	2.600	30.8000
0.300	30.8000	1.100	30.8000	1.900	30.8000	2.700	30.8000
0.400	30.8000	1.200	30.8000	2.000	30.8000	2.800	30.8000
0.500	30.8000	1.300	30.8000	2.100	30.8000	2.900	30.8000
0.600	30.8000	1.400	30.8000	2.200	30.8000	3.000	30.8000
0.700	30.8000	1.500	30.8000	2.300	30.8000		
0.800	30.8000	1.600	30.8000	2.400	30.8000		

Non Return Valve Manhole: 17, DS/PN: 7.005, Volume (m³): 26.4

Non Return Valve Manhole: 42, DS/PN: 26.005, Volume (m³): 9.4

Depth/Flow Relationship Manhole: 18, DS/PN: 7.007, Volume (m³): 27.6

Invert Level (m) -2.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	80.0000	0.900	80.0000	1.700	80.0000	2.500	80.0000
0.200	80.0000	1.000	80.0000	1.800	80.0000	2.600	80.0000
0.300	80.0000	1.100	80.0000	1.900	80.0000	2.700	80.0000
0.400	80.0000	1.200	80.0000	2.000	80.0000	2.800	80.0000
0.500	80.0000	1.300	80.0000	2.100	80.0000	2.900	80.0000
0.600	80.0000	1.400	80.0000	2.200	80.0000	3.000	80.0000
0.700	80.0000	1.500	80.0000	2.300	80.0000		
0.800	80.0000	1.600	80.0000	2.400	80.0000		

Storage Structures for Storm

Tank or Pond Manhole: 10, DS/PN: 6.001

Invert Level (m) 0.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	350.0	1.500	350.0	1.501	0.0

Tank or Pond Manhole: 50, DS/PN: 32.001

Invert Level (m) -0.750

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	500.0	2.500	500.0	2.501	0.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	5	Number of Time/Area Diagrams	23
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Site Location GB 532600 177950 TQ 32600 77950	
C (1km)	-0.027
D1 (1km)	0.316
D2 (1km)	0.306
D3 (1km)	0.249
E (1km)	0.328
F (1km)	2.500
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%	100/15 Summer				
2.000	60 Winter	1	0%	100/15 Summer	100/15 Winter			1
1.001	15 Winter	1	0%	100/15 Summer				
3.000	60 Winter	1	0%	30/15 Summer	100/15 Winter			1
1.002	15 Winter	1	0%	30/15 Summer				
4.000	60 Winter	1	0%	100/15 Summer				
4.001	15 Winter	1	0%	100/15 Summer				
1.003	15 Winter	1	0%	30/15 Summer				
1.004	15 Winter	1	0%	30/15 Summer				
1.005	15 Winter	1	0%	30/15 Summer				
5.000	15 Winter	1	0%	100/15 Summer				
5.001	15 Winter	1	0%	100/15 Summer				
6.000	60 Winter	1	0%	100/15 Summer				
6.001	240 Winter	1	0%	30/60 Winter				

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.006	15 Winter	1	0%	30/15 Summer				
7.000	15 Winter	1	0%	100/15 Summer				
8.000	15 Winter	1	0%	100/15 Summer				
7.001	15 Winter	1	0%	100/15 Summer				
7.002	15 Winter	1	0%	100/15 Summer				
9.000	15 Winter	1	0%	100/15 Summer				
10.000	60 Winter	1	0%	100/15 Summer				
10.001	15 Winter	1	0%	100/15 Summer				
11.000	60 Winter	1	0%	100/15 Summer				
10.002	15 Winter	1	0%	100/15 Summer				
9.001	15 Winter	1	0%	100/15 Summer				
12.000	60 Winter	1	0%	100/15 Winter				
12.001	15 Winter	1	0%	100/15 Winter				
12.002	15 Winter	1	0%	100/15 Winter				
13.000	60 Winter	1	0%	100/15 Summer				
12.003	15 Winter	1	0%	100/15 Summer				
9.002	15 Winter	1	0%	100/15 Summer				
14.000	60 Winter	1	0%	100/15 Summer				
7.003	15 Winter	1	0%	100/15 Summer				
15.000	60 Winter	1	0%	100/15 Summer				
15.001	15 Winter	1	0%	100/15 Summer				
16.000	60 Winter	1	0%	100/15 Summer				
15.002	15 Winter	1	0%	100/15 Summer				
17.000	60 Winter	1	0%	100/15 Summer				
17.001	15 Winter	1	0%	100/15 Summer				
18.000	60 Winter	1	0%	100/15 Summer				
15.003	15 Winter	1	0%	100/15 Summer				
19.000	15 Winter	1	0%					
15.004	15 Winter	1	0%	100/15 Summer				
7.004	15 Winter	1	0%	100/15 Summer				
20.000	15 Winter	1	0%	100/15 Winter				
21.000	15 Winter	1	0%	100/15 Summer				
22.000	60 Winter	1	0%	100/15 Summer				
21.001	15 Winter	1	0%	100/15 Summer				
23.000	60 Winter	1	0%	100/15 Summer				
23.001	15 Winter	1	0%	100/15 Summer				
24.000	60 Winter	1	0%	100/15 Summer				
23.002	15 Winter	1	0%	100/15 Summer				
25.000	60 Winter	1	0%	100/15 Summer				
21.002	15 Winter	1	0%	100/15 Summer				
20.001	15 Winter	1	0%	100/15 Summer				
7.005	15 Winter	1	0%	30/15 Summer				
7.006	15 Winter	1	0%	30/15 Summer				
26.000	15 Winter	1	0%	100/15 Summer				
27.000	60 Winter	1	0%	100/15 Summer				
27.001	15 Winter	1	0%	100/15 Summer				
28.000	60 Winter	1	0%	100/15 Summer	100/15 Summer			2
28.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			2
26.001	15 Winter	1	0%	100/15 Summer				
29.000	60 Winter	1	0%	100/15 Summer				

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
29.001	15 Winter	1	0%	100/15 Summer				
26.002	15 Winter	1	0%	30/15 Summer				
30.000	60 Winter	1	0%	100/15 Summer				
30.001	15 Winter	1	0%	100/15 Summer				
31.000	60 Winter	1	0%	100/15 Summer				
26.003	15 Winter	1	0%	100/15 Summer				
26.004	15 Winter	1	0%	100/15 Summer				
26.005	15 Winter	1	0%	30/15 Winter				
32.000	60 Winter	1	0%					
32.001	15 Winter	1	0%	30/15 Winter				
7.007	15 Winter	1	0%	1/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	5	1.487	-0.188	0.000	0.06	0.0	2.9	OK
2.000	2	1.291	-0.210	0.000	0.01	0.0	0.4	OK
1.001	6	1.197	-0.259	0.000	0.04	0.0	4.3	OK
3.000	4	1.039	-0.293	0.000	0.01	0.0	0.4	OK
1.002	7	0.993	-0.249	0.000	0.07	0.0	6.2	OK
4.000	6	1.716	-0.290	0.000	0.01	0.0	0.5	OK
4.001	8	1.661	-0.259	0.000	0.05	0.0	7.0	OK
1.003	8	0.907	-0.196	0.000	0.26	0.0	19.8	OK
1.004	9	0.576	-0.350	0.000	0.11	0.0	25.9	OK
1.005	8	0.440	-0.256	0.000	0.13	0.0	28.8	OK
5.000	9	1.537	-0.263	0.000	0.04	0.0	5.4	OK
5.001	10	0.930	-0.249	0.000	0.07	0.0	9.1	OK
6.000	13	0.637	-0.236	0.000	0.10	0.0	6.7	OK
6.001	10	0.554	-0.246	0.000	0.08	0.0	6.8	OK
1.006	11	0.424	-0.110	0.000	0.24	0.0	30.8	OK
7.000	12	1.323	-0.227	0.000	0.13	0.0	13.6	OK
8.000	13	1.596	-0.195	0.000	0.04	0.0	3.1	OK
7.001	13	0.831	-0.365	0.000	0.08	0.0	19.4	OK
7.002	14	0.521	-0.348	0.000	0.12	0.0	22.7	OK
9.000	15	1.279	-0.196	0.000	0.04	0.0	3.0	OK
10.000	21	1.629	-0.269	0.000	0.02	0.0	1.5	OK
10.001	16	1.564	-0.270	0.000	0.02	0.0	2.1	OK
11.000	23	1.329	-0.274	0.000	0.02	0.0	1.1	OK
10.002	17	1.289	-0.258	0.000	0.05	0.0	5.2	OK
9.001	16	0.672	-0.380	0.000	0.06	0.0	10.5	OK
12.000	25	1.940	-0.269	0.000	0.02	0.0	1.4	OK
12.001	19	1.878	-0.272	0.000	0.02	0.0	2.1	OK
12.002	20	1.702	-0.263	0.000	0.04	0.0	3.7	OK
13.000	28	1.476	-0.273	0.000	0.02	0.0	1.2	OK
12.003	21	1.441	-0.249	0.000	0.07	0.0	7.5	OK
9.002	17	0.585	-0.362	0.000	0.09	0.0	22.5	OK
14.000	31	0.526	-0.283	0.000	0.01	0.0	0.8	OK
7.003	15	0.309	-0.421	0.000	0.17	0.0	48.6	OK
15.000	29	1.607	-0.285	0.000	0.01	0.0	0.6	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
15.001	25	1.613	-0.237	0.000	0.10	0.0	9.9	OK
16.000	31	1.250	-0.280	0.000	0.01	0.0	0.9	OK
15.002	26	1.253	-0.223	0.000	0.15	0.0	15.2	OK
17.000	32	1.487	-0.291	0.000	0.01	0.0	0.4	OK
17.001	27	1.443	-0.257	0.000	0.05	0.0	5.4	OK
18.000	35	0.933	-0.297	0.000	0.00	0.0	0.2	OK
15.003	27	0.774	-0.343	0.000	0.13	0.0	25.2	OK
19.000	28	1.807	-0.293	0.000	0.00	0.0	1.0	OK
15.004	28	0.640	-0.357	0.000	0.10	0.0	27.6	OK
7.004	16	0.265	-0.406	0.000	0.22	0.0	79.0	OK
20.000	31	1.338	-0.262	0.000	0.04	0.0	4.1	OK
21.000	32	1.395	-0.255	0.000	0.05	0.0	6.6	OK
22.000	47	1.192	-0.274	0.000	0.02	0.0	1.1	OK
21.001	33	1.156	-0.243	0.000	0.08	0.0	10.2	OK
23.000	48	1.285	-0.278	0.000	0.02	0.0	0.9	OK
23.001	34	1.242	-0.258	0.000	0.05	0.0	5.4	OK
24.000	50	0.972	-0.265	0.000	0.03	0.0	2.0	OK
23.002	35	0.939	-0.223	0.000	0.15	0.0	11.6	OK
25.000	53	0.758	-0.274	0.000	0.02	0.0	1.3	OK
21.002	34	0.610	-0.346	0.000	0.12	0.0	28.4	OK
20.001	32	0.435	-0.350	0.000	0.11	0.0	35.4	OK
7.005	17	0.069	-0.347	0.000	0.37	0.0	118.5	OK
7.006	40	-0.029	-0.345	0.000	0.38	0.0	120.4	OK
26.000	39	1.514	-0.286	0.000	0.01	0.0	1.3	OK
27.000	46	1.879	-0.204	0.000	0.02	0.0	0.6	OK
27.001	40	1.861	-0.179	0.000	0.09	0.0	6.2	OK
28.000	47	1.695	-0.198	0.000	0.03	0.0	1.0	OK
28.001	41	1.695	-0.157	0.000	0.20	0.0	9.6	OK
26.001	40	1.248	-0.214	0.000	0.18	0.0	18.1	OK
29.000	50	1.597	-0.209	0.000	0.01	0.0	0.6	OK
29.001	45	1.557	-0.168	0.000	0.14	0.0	9.0	OK
26.002	40	0.993	-0.181	0.000	0.33	0.0	28.9	OK
30.000	55	1.435	-0.292	0.000	0.01	0.0	0.4	OK
30.001	41	1.383	-0.267	0.000	0.03	0.0	3.8	OK
31.000	56	0.849	-0.290	0.000	0.01	0.0	0.5	OK
26.003	41	0.738	-0.317	0.000	0.19	0.0	38.5	OK
26.004	49	0.556	-0.292	0.000	0.26	0.0	53.1	OK
26.005	42	0.376	-0.285	0.000	0.29	0.0	55.4	OK
32.000	73	0.726	-0.538	0.000	0.02	0.0	8.1	OK
32.001	50	-0.663	-0.513	0.000	0.05	0.0	15.6	OK
7.007	18	-0.220	1.180	0.000	0.37	0.0	80.0	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	5	Number of Time/Area Diagrams	23
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Site Location GB 532600 177950 TQ 32600 77950	
C (1km)	-0.027
D1 (1km)	0.316
D2 (1km)	0.306
D3 (1km)	0.249
E (1km)	0.328
F (1km)	2.500
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%	100/15 Summer				
2.000	15 Winter	30	0%	100/15 Summer	100/15 Winter			1
1.001	15 Winter	30	0%	100/15 Summer				
3.000	15 Winter	30	0%	30/15 Summer	100/15 Winter			1
1.002	15 Winter	30	0%	30/15 Summer				
4.000	15 Winter	30	0%	100/15 Summer				
4.001	15 Winter	30	0%	100/15 Summer				
1.003	15 Winter	30	0%	30/15 Summer				
1.004	15 Winter	30	0%	30/15 Summer				
1.005	15 Winter	30	0%	30/15 Summer				
5.000	15 Winter	30	0%	100/15 Summer				
5.001	15 Winter	30	0%	100/15 Summer				
6.000	60 Winter	30	0%	100/15 Summer				
6.001	60 Winter	30	0%	30/60 Winter				

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.006	15 Winter	30	0%	30/15 Summer				
7.000	15 Winter	30	0%	100/15 Summer				
8.000	15 Winter	30	0%	100/15 Summer				
7.001	15 Winter	30	0%	100/15 Summer				
7.002	15 Winter	30	0%	100/15 Summer				
9.000	15 Winter	30	0%	100/15 Summer				
10.000	15 Winter	30	0%	100/15 Summer				
10.001	30 Winter	30	0%	100/15 Summer				
11.000	15 Winter	30	0%	100/15 Summer				
10.002	15 Winter	30	0%	100/15 Summer				
9.001	15 Winter	30	0%	100/15 Summer				
12.000	15 Winter	30	0%	100/15 Winter				
12.001	30 Winter	30	0%	100/15 Winter				
12.002	15 Summer	30	0%	100/15 Winter				
13.000	30 Winter	30	0%	100/15 Summer				
12.003	15 Winter	30	0%	100/15 Summer				
9.002	15 Winter	30	0%	100/15 Summer				
14.000	15 Winter	30	0%	100/15 Summer				
7.003	15 Winter	30	0%	100/15 Summer				
15.000	15 Summer	30	0%	100/15 Summer				
15.001	15 Winter	30	0%	100/15 Summer				
16.000	15 Winter	30	0%	100/15 Summer				
15.002	15 Winter	30	0%	100/15 Summer				
17.000	15 Winter	30	0%	100/15 Summer				
17.001	15 Winter	30	0%	100/15 Summer				
18.000	15 Winter	30	0%	100/15 Summer				
15.003	15 Winter	30	0%	100/15 Summer				
19.000	15 Winter	30	0%					
15.004	15 Winter	30	0%	100/15 Summer				
7.004	15 Winter	30	0%	100/15 Summer				
20.000	15 Winter	30	0%	100/15 Winter				
21.000	15 Winter	30	0%	100/15 Summer				
22.000	15 Winter	30	0%	100/15 Summer				
21.001	15 Winter	30	0%	100/15 Summer				
23.000	15 Winter	30	0%	100/15 Summer				
23.001	15 Winter	30	0%	100/15 Summer				
24.000	15 Winter	30	0%	100/15 Summer				
23.002	15 Winter	30	0%	100/15 Summer				
25.000	15 Winter	30	0%	100/15 Summer				
21.002	15 Winter	30	0%	100/15 Summer				
20.001	15 Winter	30	0%	100/15 Summer				
7.005	15 Winter	30	0%	30/15 Summer				
7.006	15 Summer	30	0%	30/15 Summer				
26.000	15 Winter	30	0%	100/15 Summer				
27.000	15 Winter	30	0%	100/15 Summer				
27.001	15 Winter	30	0%	100/15 Summer				
28.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			2
28.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			2
26.001	15 Winter	30	0%	100/15 Summer				
29.000	30 Winter	30	0%	100/15 Summer				

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
29.001	15 Winter	30	0%	100/15 Summer				
26.002	15 Winter	30	0%	30/15 Summer				
30.000	15 Winter	30	0%	100/15 Summer				
30.001	15 Winter	30	0%	100/15 Summer				
31.000	15 Winter	30	0%	100/15 Summer				
26.003	15 Winter	30	0%	100/15 Summer				
26.004	15 Winter	30	0%	100/15 Summer				
26.005	15 Winter	30	0%	30/15 Winter				
32.000	15 Winter	30	0%					
32.001	60 Winter	30	0%	30/15 Winter				
7.007	15 Winter	30	0%	1/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	5	1.521	-0.154	0.000	0.21	0.0	10.1	OK
2.000	2	1.437	-0.064	0.000	0.10	0.0	2.9	OK
1.001	6	1.442	-0.014	0.000	0.16	0.0	15.5	OK
3.000	4	1.423	0.091	0.000	0.04	0.0	2.9	SURCHARGED
1.002	7	1.424	0.182	0.000	0.26	0.0	23.6	SURCHARGED
4.000	6	1.740	-0.266	0.000	0.03	0.0	2.0	OK
4.001	8	1.711	-0.209	0.000	0.20	0.0	30.7	OK
1.003	8	1.411	0.308	0.000	0.80	0.0	60.2	SURCHARGED
1.004	9	1.286	0.360	0.000	0.34	0.0	79.2	SURCHARGED
1.005	8	1.150	0.454	0.000	0.44	0.0	97.7	SURCHARGED
5.000	9	1.572	-0.228	0.000	0.13	0.0	18.5	OK
5.001	10	1.044	-0.136	0.000	0.24	0.0	33.6	OK
6.000	13	0.816	-0.057	0.000	0.34	0.0	22.7	OK
6.001	10	0.805	0.005	0.000	0.32	0.0	29.0	SURCHARGED
1.006	11	1.016	0.483	0.000	0.24	0.0	30.8	SURCHARGED
7.000	12	1.395	-0.155	0.000	0.46	0.0	46.7	OK
8.000	13	1.624	-0.167	0.000	0.15	0.0	10.8	OK
7.001	13	0.910	-0.286	0.000	0.28	0.0	68.5	OK
7.002	14	0.750	-0.119	0.000	0.40	0.0	77.6	OK
9.000	15	1.306	-0.169	0.000	0.14	0.0	10.3	OK
10.000	21	1.662	-0.236	0.000	0.10	0.0	6.1	OK
10.001	16	1.599	-0.235	0.000	0.10	0.0	10.2	OK
11.000	23	1.360	-0.243	0.000	0.08	0.0	4.7	OK
10.002	17	1.340	-0.207	0.000	0.21	0.0	22.3	OK
9.001	16	0.762	-0.291	0.000	0.23	0.0	42.9	OK
12.000	25	1.973	-0.236	0.000	0.09	0.0	5.8	OK
12.001	19	1.912	-0.238	0.000	0.09	0.0	9.7	OK
12.002	20	1.745	-0.220	0.000	0.16	0.0	16.2	OK
13.000	28	1.506	-0.243	0.000	0.08	0.0	4.7	OK
12.003	21	1.502	-0.188	0.000	0.29	0.0	32.1	OK
9.002	17	0.740	-0.207	0.000	0.36	0.0	94.1	OK
14.000	31	0.706	-0.103	0.000	0.08	0.0	5.4	OK
7.003	15	0.707	-0.023	0.000	0.57	0.0	165.9	OK
15.000	29	1.686	-0.206	0.000	0.04	0.0	2.2	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
15.001	25	1.686	-0.164	0.000	0.42	0.0	43.0	OK
16.000	31	1.352	-0.178	0.000	0.06	0.0	3.8	OK
15.002	26	1.352	-0.124	0.000	0.62	0.0	63.9	OK
17.000	32	1.510	-0.268	0.000	0.02	0.0	1.7	OK
17.001	27	1.494	-0.206	0.000	0.22	0.0	23.7	OK
18.000	35	0.941	-0.289	0.000	0.01	0.0	0.6	OK
15.003	27	0.909	-0.208	0.000	0.54	0.0	105.9	OK
19.000	28	1.824	-0.276	0.000	0.02	0.0	3.5	OK
15.004	28	0.748	-0.249	0.000	0.41	0.0	116.8	OK
7.004	16	0.635	-0.036	0.000	0.75	0.0	265.2	OK
20.000	31	1.373	-0.227	0.000	0.13	0.0	14.0	OK
21.000	32	1.438	-0.212	0.000	0.19	0.0	22.7	OK
22.000	47	1.221	-0.245	0.000	0.07	0.0	4.7	OK
21.001	33	1.212	-0.188	0.000	0.30	0.0	38.4	OK
23.000	48	1.313	-0.250	0.000	0.06	0.0	3.9	OK
23.001	34	1.293	-0.207	0.000	0.21	0.0	23.3	OK
24.000	50	1.037	-0.200	0.000	0.12	0.0	8.2	OK
23.002	35	1.037	-0.125	0.000	0.62	0.0	48.4	OK
25.000	53	0.789	-0.243	0.000	0.08	0.0	5.2	OK
21.002	34	0.731	-0.225	0.000	0.49	0.0	114.0	OK
20.001	32	0.585	-0.199	0.000	0.44	0.0	138.3	OK
7.005	17	0.523	0.107	0.000	1.24	0.0	400.4	SURCHARGED
7.006	40	0.370	0.053	0.000	1.23	0.0	391.7	SURCHARGED
26.000	39	1.535	-0.265	0.000	0.03	0.0	4.7	OK
27.000	46	1.906	-0.177	0.000	0.08	0.0	2.4	OK
27.001	40	1.912	-0.128	0.000	0.39	0.0	26.6	OK
28.000	47	1.788	-0.105	0.000	0.15	0.0	4.5	OK
28.001	41	1.788	-0.064	0.000	0.84	0.0	41.1	OK
26.001	40	1.420	-0.042	0.000	0.73	0.0	73.6	OK
29.000	50	1.620	-0.186	0.000	0.06	0.0	2.4	OK
29.001	45	1.629	-0.096	0.000	0.62	0.0	39.2	OK
26.002	40	1.263	0.089	0.000	1.36	0.0	117.5	SURCHARGED
30.000	55	1.456	-0.271	0.000	0.02	0.0	1.4	OK
30.001	41	1.418	-0.232	0.000	0.12	0.0	16.6	OK
31.000	56	0.926	-0.213	0.000	0.03	0.0	2.5	OK
26.003	41	0.945	-0.110	0.000	0.75	0.0	153.3	OK
26.004	49	0.839	-0.009	0.000	0.98	0.0	197.3	OK
26.005	42	0.665	0.004	0.000	1.05	0.0	201.8	SURCHARGED
32.000	73	0.792	-0.472	0.000	0.10	0.0	33.2	OK
32.001	50	0.032	0.182	0.000	0.31	0.0	97.0	SURCHARGED
7.007	18	0.100	1.500	0.000	0.37	0.0	80.0	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	5	Number of Time/Area Diagrams	23
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Site Location GB 532600 177950 TQ 32600 77950	
C (1km)	-0.027
D1 (1km)	0.316
D2 (1km)	0.306
D3 (1km)	0.249
E (1km)	0.328
F (1km)	2.500
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+30%	100/15 Summer				
2.000	15 Winter	100	+30%	100/15 Summer	100/15 Winter			1
1.001	15 Winter	100	+30%	100/15 Summer				
3.000	15 Winter	100	+30%	30/15 Summer	100/15 Winter			1
1.002	15 Winter	100	+30%	30/15 Summer				
4.000	15 Winter	100	+30%	100/15 Summer				
4.001	15 Winter	100	+30%	100/15 Summer				
1.003	15 Winter	100	+30%	30/15 Summer				
1.004	15 Winter	100	+30%	30/15 Summer				
1.005	15 Winter	100	+30%	30/15 Summer				
5.000	15 Winter	100	+30%	100/15 Summer				
5.001	15 Winter	100	+30%	100/15 Summer				
6.000	60 Winter	100	+30%	100/15 Summer				
6.001	120 Winter	100	+30%	30/60 Winter				

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.006	15 Winter	100	+30%	30/15 Summer				
7.000	15 Winter	100	+30%	100/15 Summer				
8.000	15 Winter	100	+30%	100/15 Summer				
7.001	15 Winter	100	+30%	100/15 Summer				
7.002	60 Winter	100	+30%	100/15 Summer				
9.000	15 Winter	100	+30%	100/15 Summer				
10.000	15 Winter	100	+30%	100/15 Summer				
10.001	15 Winter	100	+30%	100/15 Summer				
11.000	15 Winter	100	+30%	100/15 Summer				
10.002	15 Winter	100	+30%	100/15 Summer				
9.001	15 Winter	100	+30%	100/15 Summer				
12.000	15 Winter	100	+30%	100/15 Winter				
12.001	15 Winter	100	+30%	100/15 Winter				
12.002	15 Winter	100	+30%	100/15 Winter				
13.000	15 Winter	100	+30%	100/15 Summer				
12.003	15 Winter	100	+30%	100/15 Summer				
9.002	15 Winter	100	+30%	100/15 Summer				
14.000	60 Winter	100	+30%	100/15 Summer				
7.003	60 Winter	100	+30%	100/15 Summer				
15.000	15 Winter	100	+30%	100/15 Summer				
15.001	15 Winter	100	+30%	100/15 Summer				
16.000	15 Winter	100	+30%	100/15 Summer				
15.002	15 Winter	100	+30%	100/15 Summer				
17.000	15 Winter	100	+30%	100/15 Summer				
17.001	15 Winter	100	+30%	100/15 Summer				
18.000	15 Winter	100	+30%	100/15 Summer				
15.003	15 Winter	100	+30%	100/15 Summer				
19.000	15 Winter	100	+30%					
15.004	60 Winter	100	+30%	100/15 Summer				
7.004	60 Winter	100	+30%	100/15 Summer				
20.000	60 Winter	100	+30%	100/15 Winter				
21.000	15 Winter	100	+30%	100/15 Summer				
22.000	15 Winter	100	+30%	100/15 Summer				
21.001	15 Winter	100	+30%	100/15 Summer				
23.000	15 Winter	100	+30%	100/15 Summer				
23.001	15 Winter	100	+30%	100/15 Summer				
24.000	15 Winter	100	+30%	100/15 Summer				
23.002	15 Winter	100	+30%	100/15 Summer				
25.000	60 Winter	100	+30%	100/15 Summer				
21.002	60 Winter	100	+30%	100/15 Summer				
20.001	60 Winter	100	+30%	100/15 Summer				
7.005	60 Winter	100	+30%	30/15 Summer				
7.006	60 Winter	100	+30%	30/15 Summer				
26.000	15 Winter	100	+30%	100/15 Summer				
27.000	15 Winter	100	+30%	100/15 Summer				
27.001	15 Winter	100	+30%	100/15 Summer				
28.000	15 Winter	100	+30%	100/15 Summer	100/15 Summer			2
28.001	15 Winter	100	+30%	100/15 Summer	100/15 Summer			2
26.001	15 Winter	100	+30%	100/15 Summer				
29.000	15 Winter	100	+30%	100/15 Summer				

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
29.001	15 Winter	100	+30%	100/15 Summer				
26.002	15 Winter	100	+30%	30/15 Summer				
30.000	15 Winter	100	+30%	100/15 Summer				
30.001	15 Winter	100	+30%	100/15 Summer				
31.000	15 Winter	100	+30%	100/15 Summer				
26.003	15 Winter	100	+30%	100/15 Summer				
26.004	15 Winter	100	+30%	100/15 Summer				
26.005	60 Winter	100	+30%	30/15 Winter				
32.000	120 Winter	100	+30%					
32.001	120 Winter	100	+30%	30/15 Winter				
7.007	60 Winter	100	+30%	1/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	5	2.726	1.051	0.000	0.37	0.0	17.3	FLOOD RISK
2.000	2	2.620	1.119	1.862	0.96	0.0	28.8	FLOOD
1.001	6	2.674	1.217	0.000	0.43	0.0	42.3	FLOOD RISK
3.000	4	2.629	1.297	0.653	0.16	0.0	11.7	FLOOD
1.002	7	2.669	1.427	0.000	0.59	0.0	54.2	FLOOD RISK
4.000	6	2.799	0.793	0.000	0.12	0.0	9.2	SURCHARGED
4.001	8	2.800	0.880	0.000	0.32	0.0	49.6	SURCHARGED
1.003	8	2.667	1.564	0.000	1.38	0.0	103.8	FLOOD RISK
1.004	9	2.303	1.377	0.000	0.62	0.0	142.6	FLOOD RISK
1.005	8	2.165	1.469	0.000	0.82	0.0	181.3	FLOOD RISK
5.000	9	2.267	0.467	0.000	0.22	0.0	32.0	SURCHARGED
5.001	10	2.201	1.021	0.000	0.41	0.0	57.3	SURCHARGED
6.000	13	1.406	0.533	0.000	0.63	0.0	42.9	SURCHARGED
6.001	10	1.335	0.535	0.000	0.32	0.0	29.1	SURCHARGED
1.006	11	2.033	1.500	0.000	0.24	0.0	30.8	SURCHARGED
7.000	12	2.316	0.766	0.000	0.82	0.0	84.1	FLOOD RISK
8.000	13	2.169	0.378	0.000	0.28	0.0	20.1	SURCHARGED
7.001	13	2.120	0.924	0.000	0.42	0.0	104.0	SURCHARGED
7.002	14	2.018	1.149	0.000	0.30	0.0	58.7	SURCHARGED
9.000	15	2.194	0.719	0.000	0.26	0.0	19.2	SURCHARGED
10.000	21	2.303	0.405	0.000	0.28	0.0	17.5	SURCHARGED
10.001	16	2.297	0.463	0.000	0.24	0.0	24.3	SURCHARGED
11.000	23	2.278	0.675	0.000	0.22	0.0	13.4	SURCHARGED
10.002	17	2.274	0.727	0.000	0.44	0.0	46.0	SURCHARGED
9.001	16	2.157	1.104	0.000	0.34	0.0	61.6	SURCHARGED
12.000	25	2.240	0.031	0.000	0.25	0.0	15.5	SURCHARGED
12.001	19	2.234	0.084	0.000	0.25	0.0	26.9	SURCHARGED
12.002	20	2.222	0.257	0.000	0.34	0.0	34.1	SURCHARGED
13.000	28	2.195	0.446	0.000	0.23	0.0	14.3	SURCHARGED
12.003	21	2.190	0.500	0.000	0.57	0.0	62.4	SURCHARGED
9.002	17	2.033	1.087	0.000	0.49	0.0	127.5	SURCHARGED
14.000	31	1.982	1.173	0.000	0.08	0.0	6.0	SURCHARGED
7.003	15	1.974	1.244	0.000	0.56	0.0	163.4	SURCHARGED
15.000	29	2.505	0.613	0.000	0.15	0.0	9.1	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
15.001	25	2.503	0.653	0.000	0.78	0.0	80.2	SURCHARGED
16.000	31	2.363	0.833	0.000	0.16	0.0	10.0	SURCHARGED
15.002	26	2.359	0.883	0.000	1.00	0.0	102.0	SURCHARGED
17.000	32	2.171	0.393	0.000	0.09	0.0	6.5	SURCHARGED
17.001	27	2.168	0.468	0.000	0.42	0.0	45.8	SURCHARGED
18.000	35	2.098	0.868	0.000	0.05	0.0	4.1	SURCHARGED
15.003	27	2.099	0.982	0.000	0.79	0.0	154.5	SURCHARGED
19.000	28	1.988	-0.112	0.000	0.03	0.0	7.1	OK
15.004	28	2.024	1.027	0.000	0.37	0.0	105.0	SURCHARGED
7.004	16	1.975	1.304	0.000	0.77	0.0	273.6	SURCHARGED
20.000	31	1.913	0.313	0.000	0.11	0.0	11.8	SURCHARGED
21.000	32	2.141	0.491	0.000	0.37	0.0	44.5	SURCHARGED
22.000	47	2.058	0.592	0.000	0.20	0.0	12.9	SURCHARGED
21.001	33	2.053	0.654	0.000	0.55	0.0	71.2	SURCHARGED
23.000	48	2.120	0.557	0.000	0.19	0.0	11.7	SURCHARGED
23.001	34	2.117	0.617	0.000	0.40	0.0	45.2	SURCHARGED
24.000	50	2.053	0.816	0.000	0.29	0.0	19.8	SURCHARGED
23.002	35	2.039	0.877	0.000	1.01	0.0	78.2	SURCHARGED
25.000	53	1.947	0.915	0.000	0.12	0.0	8.4	FLOOD RISK
21.002	34	1.965	1.009	0.000	0.54	0.0	125.0	SURCHARGED
20.001	32	1.965	1.180	0.000	0.44	0.0	140.4	SURCHARGED
7.005	17	1.886	1.471	0.000	1.31	0.0	420.8	SURCHARGED
7.006	40	1.882	1.566	0.000	1.34	0.0	428.5	SURCHARGED
26.000	39	2.635	0.835	0.000	0.06	0.0	8.8	SURCHARGED
27.000	46	2.827	0.744	0.000	0.37	0.0	11.0	SURCHARGED
27.001	40	2.827	0.787	0.000	0.65	0.0	45.1	SURCHARGED
28.000	47	2.974	1.081	2.179	1.26	0.0	37.8	FLOOD
28.001	41	2.978	1.126	1.419	1.20	0.0	58.9	FLOOD
26.001	40	2.631	1.169	0.000	1.04	0.0	104.9	SURCHARGED
29.000	50	2.849	1.043	0.000	0.29	0.0	11.7	SURCHARGED
29.001	45	2.849	1.124	0.000	0.98	0.0	61.6	SURCHARGED
26.002	40	2.352	1.179	0.000	1.99	0.0	171.7	SURCHARGED
30.000	55	1.901	0.174	0.000	0.09	0.0	6.1	SURCHARGED
30.001	41	1.903	0.253	0.000	0.21	0.0	29.9	SURCHARGED
31.000	56	1.879	0.740	0.000	0.10	0.0	7.1	SURCHARGED
26.003	41	1.881	0.826	0.000	1.17	0.0	238.0	SURCHARGED
26.004	49	1.592	0.744	0.000	1.67	0.0	335.4	SURCHARGED
26.005	42	1.363	0.702	0.000	1.07	0.0	205.9	SURCHARGED
32.000	73	1.092	-0.172	0.000	0.12	0.0	42.1	OK
32.001	50	1.091	1.241	0.000	0.23	0.0	73.7	SURCHARGED
7.007	18	1.645	3.045	0.000	0.37	0.0	80.0	SURCHARGED

Appendix R – FDS Proposed Levels Plan

POTENTIAL SURFACE WATER FLOODING FROM HORSLEY STREET AND WESTMORELAND ROAD (WEST) TO CONVEY AROUND THE FDS VIA BRADENHAM CLOSE

POTENTIAL EXCEEDANCE SURFACE WATER FLOODING FROM QUEENS ROW AND PHELP STREET WILL FLOW ALONG WESTMORELAND ROAD AND CONVEY AROUND THE FDS VIA PORTLAND ROAD.

2.5m³ EXCEEDANCE DURING WORST CASE 1 IN 100 YEAR PLUS 30% CLIMATE CHANGE RAINFALL EVENT. EXCEEDANCE WATERS RETAINED BY LANDSCAPING WITHIN TERRACED HOUSING BACK GARDENS

3.5m³ EXCEEDANCE DURING WORST CASE 1 IN 100 YEAR PLUS 30% CLIMATE CHANGE RAINFALL EVENT. EXCEEDANCE WATERS WILL BE STORED WITHIN THE HIGHWAY AND DRAINED TO GEOCELLULAR SOIL VAULT ASSEMBLY UNITS WHEN CAPACITY BECOMES AVAILABLE

HORSLEY STREET
QUEENS ROW
PHELP STREET
WESTMORELAND ROAD
HOPEWOOD ROAD
PORTLAND STREET
BOYSON ROAD
BOUNDARY LANE
EAST–WEST STREET
BRADENHAM CLOSE
GREEN LINK
ALBANY ROAD
PLOT 2
PLOT 3

NOTES:

DO NOT SCALE

1. THE PROPOSED SEWER NETWORK AND EXTERNAL LEVELS ARE INDICATIVE ONLY AT THIS STAGE AND SUBJECT TO REFINEMENT FOLLOWING THE PROGRESSION OF THE SCHEME.
2. THE MAXIMUM RAINFALL EVENT MODELLED DURING NETWORK DESIGN WAS THE 1 IN 100 YEAR PLUS 30% ALLOWANCE FOR CLIMATE CHANGE. NO EXCEEDANCE IS EXPERIENCED IN THE 1 IN 30 YEAR RAINFALL EVENT IN LINE WITH SEWERS FOR ADOPTION.
3. ALL LEVELS AND DIMENSIONS ARE IN 'mAOD' AND 'm' RESPECTIVELY UNLESS OTHERWISE STATED.

KEY:

- INDICATIVE ONPLOT SW SEWER NETWORK
- INDICATIVE ONPLOT FW SEWER NETWORK
- INDICATIVE STORAGE SIZING. SEE NOTE 6.
- PROPOSED LINEAR SURFACE WATER DRAIN OR EQUIVALENT TO DRAIN PRIVATE CURTILAGE ASSOCIATED WITH PROPOSED BUILDING FRONTAGES
- SURFACE WATER FLOW ROUTE
- IDENTIFIED MANHOLE THAT FLOODS DURING THE 1 IN 100 YEAR PLUS 30% CLIMATE CHANGE RAINFALL EVENT WinDES DRAINAGE MODEL (MAX FLOODING EXPERIENCED DURING THIS EVENT IS 3.5m³)

REV	DATE	BY	DESCRIPTION	CHK	APD
A	20/08/2014	AH	FIRST ISSUE	AH	JD

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ARCHITECT: HTA

PROJECT: AYLESBURY ESTATE

TITLE: FIRST DEVELOPMENT SITE
OVERLAND FLOW AND EXCEEDANCE ROUTING

SCALE @ A1:	CHECKED:	APPROVED:
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0304-D-12.DWG	AAH	August 14
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50600304	0304-D-12	A

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n:\50600304 – aylesbury estate, southwark\e drawings\development\autocad\d drainage\0304–d–12.dwg, 21 August 2014 13:33:28, Hutt, Andrew

Appendix S – Masterplan Proposed Drainage Strategy

DO NOT SCALE

EXISTING TW SEWER INVERT AT -2.9M AOD

TIE INTO EXISTING TW SEWER. INVERT LEVELS UNKNOWN. ASSUME INVERT LEVEL BELOW -2.50M AOD

STORAGE 8a
REQUIRE 724M³ AT 1.2M DEPTH
ACCEPTS DRAINAGE FROM PLOTS 8a, 8b, PART OF 9b & HIGHWAY DRAINAGE

STORAGE 7a(2)
REQUIRE 173M³
ACCEPTS DRAINAGE FROM PLOT 7a(2) & HIGHWAY DRAINAGE

STORAGE 7a(1)
REQUIRE 255M³
ACCEPTS DRAINAGE FROM PLOT 7a(1) & HIGHWAY DRAINAGE

TW SEWER IL UNKNOWN ASSUME BELOW -1.0M AOD

STORAGE 6a(2)
REQUIRE 211M³
ACCEPTS DRAINAGE FROM PLOT 6a(2) & HIGHWAY DRAINAGE

EXISTING TW SEWER IL -1.09M AOD

TW SEWER IL UNKNOWN ASSUME BELOW -1.0M AOD

STORAGE s10B
REQUIRE 569M³
ACCEPTS DRAINAGE FROM PLOTS 10b, s10a, S10b, 9c PART OF 9b & HIGHWAY DRAINAGE

STORAGE 6a(1)
REQUIRE 246M³
ACCEPTS DRAINAGE FROM PLOT 6a(1) & HIGHWAY DRAINAGE

STORAGE 6b
REQUIRE 146M³ AT 1.2M DEPTH
ACCEPTS DRAINAGE FROM PLOT 6b

TW SEWER IL UNKNOWN ASSUME BELOW -1.0M AOD

STORAGE 5b(2)
REQUIRE 154M³ AT 1.2M DEPTH
ACCEPTS DRAINAGE FROM PLOT 5b(2)

EXISTING TW SEWER IL GREATER THAN -1.09M AOD

STORAGE 12a
REQUIRE 367M³
ACCEPTS DRAINAGE FROM PLOT 12a & HIGHWAY DRAINAGE

EXISTING TW SEWER IL GREATER THAN -1.67M AOD

STORAGE 15a
REQUIRE 455M³
ACCEPTS DRAINAGE FROM PLOT 15a, 15b(1) & HIGHWAY DRAINAGE.

EXISTING TW SEWER IL -1.67M AOD

STORAGE 4b
REQUIRE 230M³ ACCEPTS DRAINAGE FROM PLOT 4b & HIGHWAY DRAINAGE HIGHWAY DRAINAGE

OUTFALL INTO EXISTING TW SEWER IN ROLAND WAY. INVERT LEVEL UNKNOWN

STORAGE 12b
REQUIRE 204M³
ACCEPTS DRAINAGE FROM PLOT 12b & HIGHWAY DRAINAGE

STORAGE 11a
REQUIRE 279M³
ACCEPTS DRAINAGE FROM PLOT 11a & 10b

STORAGE 15a
REQUIRE 252M³
ACCEPTS DRAINAGE FROM PLOT 15a

STORAGE 14a
REQUIRE 283M³
ACCEPTS DRAINAGE FROM PLOT 14A & HIGHWAY DRAINAGE

STORAGE 15b
REQUIRE 125.3M³
ACCEPTS DRAINAGE FROM PLOT 11b, 13a, 13b, 13c, 15b & HIGHWAY DRAINAGE. SUBJECT TO CONFIRMATION ON OUTFALL LEVEL. DRAINAGE FROM PLOTS 13a & 13c COULD BE LOCATED ADJACENT TO 13b/13a.

STORAGE 4A
REQUIRE 359M³
ACCEPTS DRAINAGE FROM PLOT 4a & HIGHWAY DRAINAGE

STORAGE 14b
REQUIRE 427M³
ACCEPTS DRAINAGE FROM PLOT 14b & HIGHWAY DRAINAGE

STORAGE 17c
REQUIRE 361M³
ACCEPTS DRAINAGE FROM PLOT 17C & HIGHWAY DRAINAGE

ALBANY ROAD SEWER INVERT LEVELS UNKNOWN ALONG FRONTAGE OF AYLESBURY ESTATE. BASED ON SURVEY FROM PROPOSED PLOTS 18/1C ASSUME INVERT LEVEL OF BELOW -3.1M AOD

STORAGE 16b
REQUIRE 271M³
ACCEPTS DRAINAGE FROM PLOT 16B & HIGHWAY DRAINAGE

OUTFALL INTO EXISTING TW SEWER IN PORTLAND STREET. INVERT LEVEL UNKNOWN

STORAGE 17a
REQUIRE 377M³
ACCEPTS DRAINAGE FROM PLOT 17A & 17B & HIGHWAY DRAINAGE

STORAGE 16a
REQUIRE 283M³
ACCEPTS DRAINAGE FROM PLOT 16A & HIGHWAY DRAINAGE

NOTES:

1. SUB PLOT BOUNDARY LINES ARE APPROXIMATE AT THIS STAGE AND SUBJECT TO REFINEMENT.
2. THE PROPOSED SEWER NETWORK IS INDICATIVE ONLY AT THIS STAGE AND SUBJECT TO CHANGE FOLLOWING THE PROGRESSION OF THE SCHEME.
3. THE IDENTIFIED SEWER OUTFALL LOCATIONS ARE BASED ON TWUL ASSET LOCATION RECORDS AND TOPOGRAPHY SURVEY FROM NHHT (31.01.28 1b1c topo & utility survey 7636-0113-01A).
4. LINE AND LEVEL INFORMATION FROM THE TWUL RECORDS IS APPROXIMATE ONLY.
5. ALLOWABLE DISCHARGE RATES PER PLOT TO BE CONFIRMED WITH LBS AND TWUL FOLLOWING COMPLETION OF THE TWUL CAPACITY IMPACT ASSESSMENT. INTERIM SURFACE WATER DISCHARGE RATE METHODOLOGY BASED UPON THE WALLINGFORD PROCEDURE AND HAS BEEN AGREED IN PRINCIPLE WITH LBS. REFER TO FLOOD RISK ASSESSMENT FOR FURTHER DETAILS.
6. THE INITIAL STORAGE SIZING IS BASED UPON MINIMUM LONDON PLAN REQUIREMENTS WITH A 50% REDUCTION IN BROWNFIELD RATES. ONCE FURTHER DETAILS OF THE DEVELOPMENT PARCELS, EXISTING DRAINAGE DETAILS AND ASSOCIATED CAPACITY ARE KNOWN AND STORAGE SPATIAL CONSTRAINTS CONFIRMED, NHH WILL STRIVE, AS FAR AS REASONABLY PRACTICABLE, TO PROVIDE A BETTERMENT OVER AND ABOVE MINIMUM LONDON PLAN REQUIREMENTS. THIS LEVEL OF COMMITMENT HAS BEEN DEMONSTRATED AS PART OF THE FIRST DEVELOPMENT SITE.
7. EXISTING DISCHARGE RATES HAVE BEEN DETERMINED FROM MASTERPLAN DEMOLITION DWG (REFER TO WSP W# 28-01-201 REV 00)
8. ASSUMES SURFACE WATER STORAGE IS LOCATED BELOW COURTYARDS AT THIS STAGE WITH NO STORAGE LOCATED WITHIN HIGHWAYS.
9. EXISTING HIGHWAYS HAVE NOT BEEN INCLUDED WITHIN THE PROPOSED DRAINAGE CATCHMENTS AND ARE ASSUMED TO DISCHARGE AT EXISTING UNRESTRICTED RATES.
10. DEPTH OF STORAGE HAS BEEN SIZED USING GEO-CELLULAR STORAGE OF 0.8M DEPTH UNLESS SPECIFIED. INVERT LEVELS OF UNDERGROUND STORAGE WILL BE DICTATED BY INCOMING PIPE LEVELS. COVER TO STORAGE AREAS MAY EXCEED 2.0M AND SUBJECT TO THE PROPOSED MANUFACTURER SPECIFICATIONS MAY REQUIRE PROTECTIVE SLAB .
11. OFFSET FROM BUILDING FOUNDATIONS HAVE BEEN ASSUMED AS A MINIMUM OF 2.0M. THIS MAY INCREASE WHERE STORAGE IS DEEP AND IS SUBJECT TO CONFIRMATION DURING FURTHER STAGES OF THE DRAINAGE DESIGN.
12. GROUND WATER LEVELS HAVE BEEN ASSUMED AS BELOW THE PROPOSED STORAGE AT THIS STAGE.
13. DRAINAGE IS SUBJECT TO REFINEMENT/ALTERATION FOLLOWING FURTHER DISCUSSION WITH DESIGN TEAM, TWUL, AND LBS.
14. ATTENUATION HAS BEEN SIZED USING MICRODRAINAGE QUICK STORAGE ESTIMATES FOR 1 IN 100 YEAR PLUS CLIMATE CHANGE EVENT.
15. SUDS WILL BE IMPLEMENTED THROUGHOUT THE OUTLINE APPLICATION SITE INCLUDING GREEN ROOFS AND BIO-RETENTION AREAS. THE LEVEL OF ADDITIONAL SUDS PROVISION WITHIN EACH PLOT WILL BE CONFIRMED DURING THE DETAILED DESIGN STAGES HOWEVER EACH PLOT WILL FOLLOW THE SUDS/DRAINAGE PRINCIPLES SET OUT WITHIN THE FIRST DEVELOPMENT SITE TO ENSURE COMMITMENT TO SUDS PROVISION AND TO DEMONSTRATE CONSISTENCY ACROSS THE WHOLE PROPOSED DEVELOPMENT.
16. DRAINAGE ARRANGEMENT HAS BEEN CO-ORDINATED WITH EXISTING TREES THAT ARE TO BE RETAINED. FOR FURTHER INFORMATION REFER TO HTA LANDSCAPE STRATEGY.

KEY

- SUB PLOT BOUNDARY
- INDICATIVE STORAGE AREAS
- INDICATIVE OUTFALL DIRECTION TO EXISTING TWUL SEWER
- PROPOSED SURFACE WATER SEWER (INDICATIVE)
- PROPOSED FOUL WATER SEWER (INDICATIVE)
- PROPOSED COMBINED SEWER (INDICATIVE)
- RETAINED TWUL SEWER
- PROPOSED DIVERTED SEWER
- PROPOSED TWUL RE-ALIGNED SEWER

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PROJECT: AYLESBURY ESTATE

TITLE: MASTERPLAN APPLICATION
INDICATIVE DRAINAGE STRATEGY

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Appendix T – Masterplan WinDES Quick Storage Calculations

Quick Storage Estimates – Aylesbury

Rates are based on proposed impermeable areas to give estimates for the storage and are also considered worst case for overall site due to a reduction in impermeable area. This will need to be reviewed in later design stages and plot storage size may need to increase or reduce and are subject to agreement from Thames Water. Highest storage estimate requirement has been used on outline strategy drawing.

Plot Storage Ref	Storage Estimate
■ 4a	= 0.65ha @ 40.5 l/s (rates pro rata to impermeable area)
	=258 to 359m^3
■ 4b	= 0.43ha @ 29.9 l/s (rates pro rata to impermeable area)
	= 165 to 230m^3
■ 5a	= 0.83ha @ 53.4 l/s (rates pro rata to impermeable area)
	= 328 to 455 m^3
■ 5b	= 0.28ha @ 18.1l/s 9rates pro rata to impermeable area)
	= 111ha to 154m^3
■ 6a (1)	= 0.45ha @ 28 l/s (rates pro rata to impermeable area)
	= 180 to 249m^3
■ 6a (2)	= 0.38ha @ 23.7 l/s (rates pro rata to impermeable area)
	= 153 to 211m^3
■ 6b	= 0.27ha @ 17.3 l/s (rates pro rata to impermeable area)
	= 105 to 146m^3
■ 7a (1)	= 0.47ha @ 29.8 l/s (rates pro rata to impermeable area)
	= 184 to 255m^3
■ 7b	= 0.32ha @ 20.2 l/s
	= 125 to 173m^3
■ 8a	= 1.323ha @ 85 l/s
	= 522 to 724m^3
■ s10b	= 1.04ha @ 66.5 l/s
	= 410 to 569m^3
■ 11a	= 0.509ha @ 32.5 l/s
	= 201 to 279m^3
■ 12a	= 0.668ha @ 42.4 l/s
	= 265 to 367m^3
■ 12b	= 0.371ha @ 23.6 l/s
	= 147 to 204m^3
■ 14a	= 0.507ha @ 30.7 l/s
	= 205 to 283m^3

- 14b = 0.768ha @ 46.1 l/s
  = 308 to 427m^3
- 15a = 0.452ha @ 27.4 l/s
  = 181 to 251m^3
- 15b = 2.28ha @ 144.2 l/s
  = 903 to 1253m^3
- 16a = 0.51ha @ 30.66 l/s
  = 205 to 283m_3
- 16b = 0.491ha @ 30.16 l/s
  = 196 to 271m^3
- 17a = 0.688ha @ 43.7 l/s
  = 272 to 377m^3
- 17c = 0.65ha @ 40.36 l/s
  = 261 to 361m^3

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AYLESBURYNOW

Planning Application for
the Aylesbury Estate Regeneration