Appendix 2: Replacement Appendices to the October 2021 ES

Cumulative Scheme List and Map

Revised Archaeological Desk Based Assessment and Geoarchaeological Assessment

Flood Risk Assessment and Drainage Strategy

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New Aberfeldy Masterplan
Flood Risk Assessment

Job No: 2272

Date: 07th April 2022

Revision: 1.4

Project name	New Aberfeldy Masterplan	Job Number
Report Name	Flood Risk Assessment	2272

Document Revision History

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1.4	07/04/2022	Updated to include Jolly's Green within the application boundary

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1 Introduction

1.1 Purpose of Report

Parmarbrook has been instructed by Aberfeldy New Village LLP (joint venture between EcoWorld London and Poplar HARCA) to prepare a Flood Risk Assessment (FRA) in support of a hybrid planning application for the New Aberfeldy Masterplan.

The scope of this report is limited to an assessment of flood risk at the site and the measures required to appropriately mitigate flood risk for the lifetime of the development, taking into consideration the vulnerability of the proposed use to flood risk. A preliminary surface water drainage scheme is reported separately.

The FRA has been updated for the inclusion of Jolly's Green within the application boundary.

1.2 Information Source

The assessment has been undertaken in accordance with the below documents and guidance detailed within the National Planning Policy Framework (NPPF) and the accompanying Planning Practice Guidance (PPG).

- Ordnance Survey (OS);
- British Geological Survey (BGS);
- Environment Agency (EA);
- Department for Environment, Food and Rural Affairs (DEFRA);
- Thames Water Sewer Records;
- National Planning Policy Framework, July 2021
- National Planning Practice Guidance (NPPG) August 2021
- Policy SI 12 Flood Risk Management, The London Plan 2021
- Policy SI 13 Sustainable Drainage, The London Plan 2021
- London Borough of Tower Hamlets Local Plan 2020
- London Borough of Tower Hamlets Strategic Flood Risk Assessments
- London Borough of Tower Hamlets Preliminary Flood Risk Assessment
- London Borough of Tower Hamlets Local Flood Risk Management Strategy
- London Borough of Tower Hamlets Surface Water Management Plan

It is to be noted that this FRA has been undertaken as a desktop study and no intrusive site investigations have been undertaken to inform this report.

2 Planning Policy and Guidance

2.1 National Planning Policy Framework

The thrust of national planning policy, as articulated in the NPPF is that inappropriate development in areas at risk of flooding should be avoided where possible, as summarised below:

- Inappropriate development in areas at risk of flooding should be avoided and that development should be directed away from areas at highest risk (whether existing or future), but where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere (NPPF para. 159).
- The policy of seeking to steer development to areas with the lowest risk of flooding, from any source, is implemented through the application of the flood risk sequential test. Development should not be allocated or permitted if there are reasonably available sites, appropriate for the proposed development in areas with a lower risk of flooding. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding (NPPF para. 162).
- If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives) the exception test may have to be applied. The need for the test will depend on the potential vulnerability of the site and of the vulnerability of the development proposed (as set out in Annex 3 of NPPF; also PPG Table 2 and Table 3) (NPPF para. 163). For example, the exception test need not be applied for less vulnerable development in any flood zone, or for more vulnerable development in flood zones 1 or 2.
- Where the exception test must be applied, application of the test for development proposals at the application stage should be informed by a site-specific flood risk assessment. For the test to be passed it should be demonstrated that: (a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; (b) and the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall (NPPF para. 164). Both elements of the test should be satisfied for the development to be permitted (NPPF para. 165).
- A site-specific flood risk assessment should be provided for all development in flood zones 2 and 3 [whilst] in flood zone 1, an assessment should accompany all proposals involving: sites of 1 ha or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use (NPPF para. 167).
- Development should not increase flood risk elsewhere (NPPF para. 167).
- Development should only be allowed in areas at risk of flooding where the flood risk assessment (and the sequential and exception tests, as required), demonstrate that: a) within the site, the most vulnerable development is located in areas of lowest flood risk (unless there are overriding reasons to prefer a different location); b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment; c) the development incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate; d) any residual (flood) risk can be safely managed; and e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan (NPPF para.167).

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- Applications for some minor development and changes of use should not be subject to the sequential or exception tests (NPPF para. 168). The exceptions are stated in Footnote 56.
- Major development should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems should: a) take account of advice from the lead local flood authority; b) have appropriate proposed minimum operational standards; c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and d) where possible, provide multifunctional benefits (NPPF para. 169).

2.2 The London Plan 2021: Policies SI 12 & SI 13

The London Plan 2021 provides an overall strategic plan for the Mayor of London, 32 London boroughs and the City of London Corporation. The plan sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20 – 25 years.

Policies SI 12 and SI 13 are related to improving water quality, flood mitigation and reducing flood risk through sustainable urban drainage systems.

Policy SI 12 (Flood Risk Management) states that:

A. Current and expected flood risk from all sources (as defined in paragraph 9.2.12) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.
B. Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should cooperate and jointly address cross-boundary flood risk issues including with authorities outside London.
C. Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.
D. Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.
E. Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.

Policy SI 13 (Sustainable Drainage) states that:

A. Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.
B. Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:

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B. Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:

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   1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
   2) rainwater infiltration to ground at or close to source
   3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens).
   4) rainwater discharge direct to a watercourse (unless not appropriate)
   5) controlled rainwater discharge to a surface water sewer or drain
   6) controlled rainwater discharge to a combined sewer.

C. Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.
D. Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

2.3 London Borough of Tower Hamlets Local Plan 2031

The Local Plan was adopted in January 2020, it sets out how the borough of Tower Hamlets will grow and develop until 2031 and identifies how many new homes, jobs and services are needed to support our growing population, and where and how they should be provided. It will also shape how our places will look and feel and influence the way that our communities interact with each other and the spaces around them. It also provides a series of policies to ensure development is well-designed, accessible, safe and respects and enhances the environment, and can be delivered alongside new infrastructure and local services.

Policy D.ES4 (Flood Risk) states that:

1. Development is required to be located in areas suitable for the vulnerability level of the proposed uses with:
   a. highly vulnerable uses not allowed within flood zone 3a
   b. essential infrastructure and more vulnerable uses within flood zone 3a required to pass the exception test, and
   c. highly vulnerable uses within flood zone 2 required to pass the exception test.
2. Development is required to provide a flood risk assessment if it meets any of the following criteria:
   a. The development site is over 1 hectare in size within flood zone 1
   b. The site is within flood zones 2 or 3a
   c. The development may be subject to other sources of flooding, as defined in the Tower Hamlets Strategic Flood Risk Assessment.
3. The flood risk assessment should include:
   a. A sequential test if the development is in flood zone 2 or 3
   b. The risks of both on and off-site flooding to and from the development for all sources of flooding including fluvial, tidal, surface run-off, groundwater, ordinary watercourse, sewer and reservoir
   c. An assessment of tidal risk in the event of a breach in the River Thames defences
   d. The impact of climate change using the latest government guidance
   e. Demonstration of safe access and egress, and
   f. Mitigation measures, taking account of the advice and recommendations set out in the Tower Hamlets Strategic Flood Risk Assessment.
4. Site design of development which meets criteria outlined in Part 2 above is required to:

a. undertake a sequential approach to development layout to direct highest vulnerability uses to areas of the site with lowest flood risk, and
b. incorporate flood resilience and/or resistance measures.

5. Development is required to protect and where possible increase the capacity of existing water spaces and flood storage areas to retain water.
6. Development is required to enable effective flood risk management through:
   a. requiring development along the River Thames and the River Lea and its tributaries to be set back by the following distances unless significant constraints are evidenced:
      i. A minimum of a 16-metre buffer strip along a tidal river, and
      ii. A minimum of a 8-metre buffer strip along a fluvial river.
   b. optimising opportunities to realign or set back defences and improve the riverside frontage to provide amenity space and environmental enhancement.

Policy D.ES5 (Sustainable Drainage) states that:

1. Development is required to reduce the risk of surface water flooding, through demonstrating how it reduces the amount of water run-off and discharge from the site through the use of appropriate water reuse and sustainable drainage systems techniques.
2. Major development is required to submit a drainage strategy which should demonstrate that surface water will be controlled as near to its source as possible in line with the sustainable drainage systems hierarchy.
3. Development is required to achieve the following run-off rates:
   a. New development in critical drainage areas is required to achieve a greenfield run-off rate and volume leaving the site
   b. All other development should seek to achieve greenfield runoff rate and volume leaving the site. Where this is not possible, the minimum expectation is to achieve at least 50% attenuation of the site's surface water run-off at peak times prior to redevelopment.

2.4 London Borough of Tower Hamlets Strategic Flood Risk Assessments

The LBTH Strategic Flood Risk Assessment was published in August 2017 to determine flood risk across the borough.

The Level 1 SFRA aims to collate and review all information available regarding flood risk for the borough, to enable the Sequential Test to be undertaken. In addition, it identifies areas at risk of flooding from all sources and provides information to allow the LBTH to set suitable policies to address flood risk management.

The Level 2 SFRA allows the Exception Test to be undertaken for Sites which cannot be located within a lower flood risk area. This report also provides enough information to assist each borough with strategic planning for their administrative area.

Information from both SFRAs regarding tidal, fluvial, surface water, sewer and groundwater flooding is included within Section 2 of this FRA.

2.5 London Borough of Tower Hamlets Preliminary Flood Risk Assessment

The LBTH's Preliminary Flood Risk Assessment (PFRA) was published in May 2011, to provide a high-level summary of flood risk to the borough.

The report describes the probability and subsequent consequences of past and future flooding, and considers flooding from overland surface water runoff, groundwater, sewers and ordinary watercourses. Information from the PFRA regarding flooding is included within Section 2 of this FRA.

2.6 London Borough of Tower Hamlets Local Flood Risk Management Strategy

The LBTH Local Flood Risk Management Strategy (LFRMS)xii was published in June 2015, to provide guidance and information for residents, businesses and developers regarding Tower Hamlets strategy for dealing with flooding within the borough.

It was completed to fulfil LBTH's requirement and duties as Lead Local Flood Authority (LLFA) and sets out how LBTH plan to manage flood risk across the Borough. In general, the LFRMS describes LBTH's commitment to work to address local flood risk and provides a framework of how local flood risk will be managed.

2.7 Environmental Permitting and Land Drainage Consent

Under the Environmental Permitting (England and Wales) Regulations 2016 an Environmental Permit for Flood Risk Activities is required from the Environment Agency for any permanent or temporary works, including works:

- In, over or under a designated main river
- Within 8 m of the top of bank of a designated main river or of the landward toe of a flood defence (16 m if it is a tidal main river or a sea defence).

In addition, any permanent or temporary works within the floodplain of a designated main river may also require an Environmental Permit for Flood Risk Activities. A permit is separate to and in addition to any planning permission granted.

Land drainage consent may be required from the lead local flood authority or drainage board for work to an ordinary watercourse.

Undertaking activities controlled by local byelaws also requires the relevant consent.

3 Site Description & Context

3.1 Site Location

The Aberfeldy estate is located in Lansbury ward in the south-east of Tower Hamlets. Aberfeldy is one of the most physically and geographically segregated parts of the borough, with the A12 and A13 road networks splitting the estate from the rest of Poplar and Blackwall.

The site is located to the south of the River Lea and the Leven Yard Gasworks site. It is bounded to its west by the A12 and borders the Aberfeldy Village Development and Culloden Primary School to the south.

The site is centred on the approximate National Grid Reference TQ 38483 81132, as shown in Figure 1.

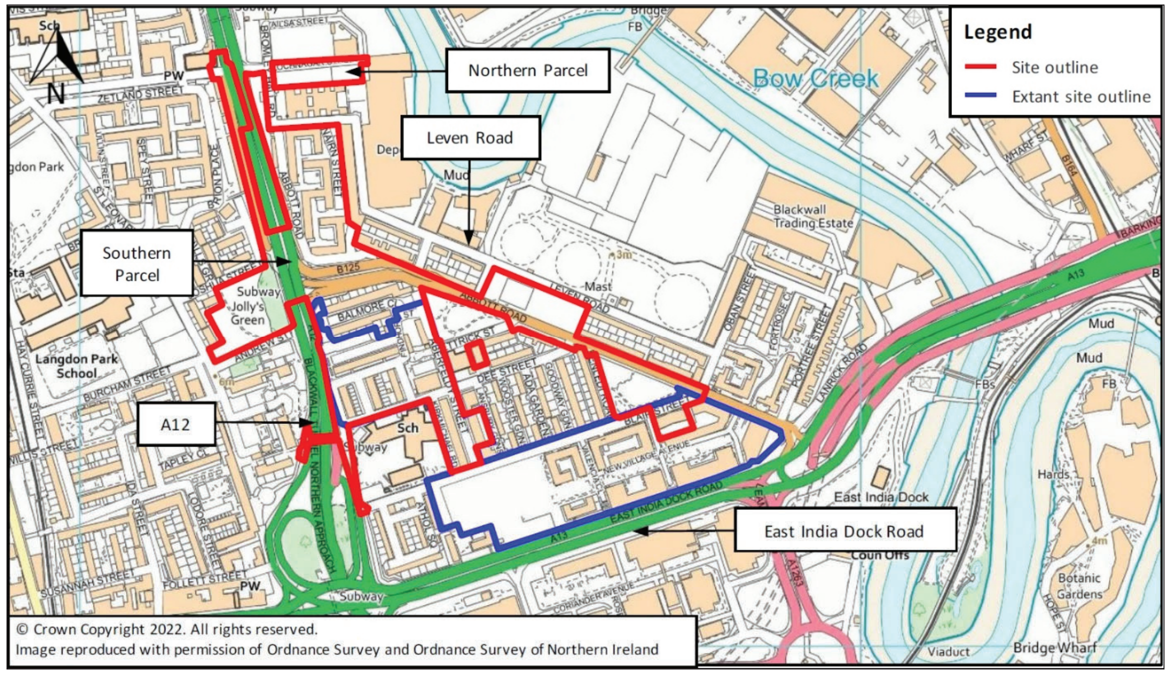

Figure 1 - Site Location

3.2 Existing and Proposed Development

The existing site includes:

- Existing homes on the Aberfeldy estate, including the properties and land around Balmore Close
- The Nairn Street Estate to the north and the new Poplar Works development adjacent to the A12.
- Land at Lochnagar Street to the north of Bromley Hall School
- Abbott Road and the existing green spaces or Braithwaite Park and Leven Road Open Space
- Land along Blair Street, adjacent to Braithwaite Park, which will complete the courtyard building within the built phase of Aberfeldy Village; and
- The existing vehicular underpass, Jollys Green, land parallel to the A12 and the pedestrian underpass at Dee Street.

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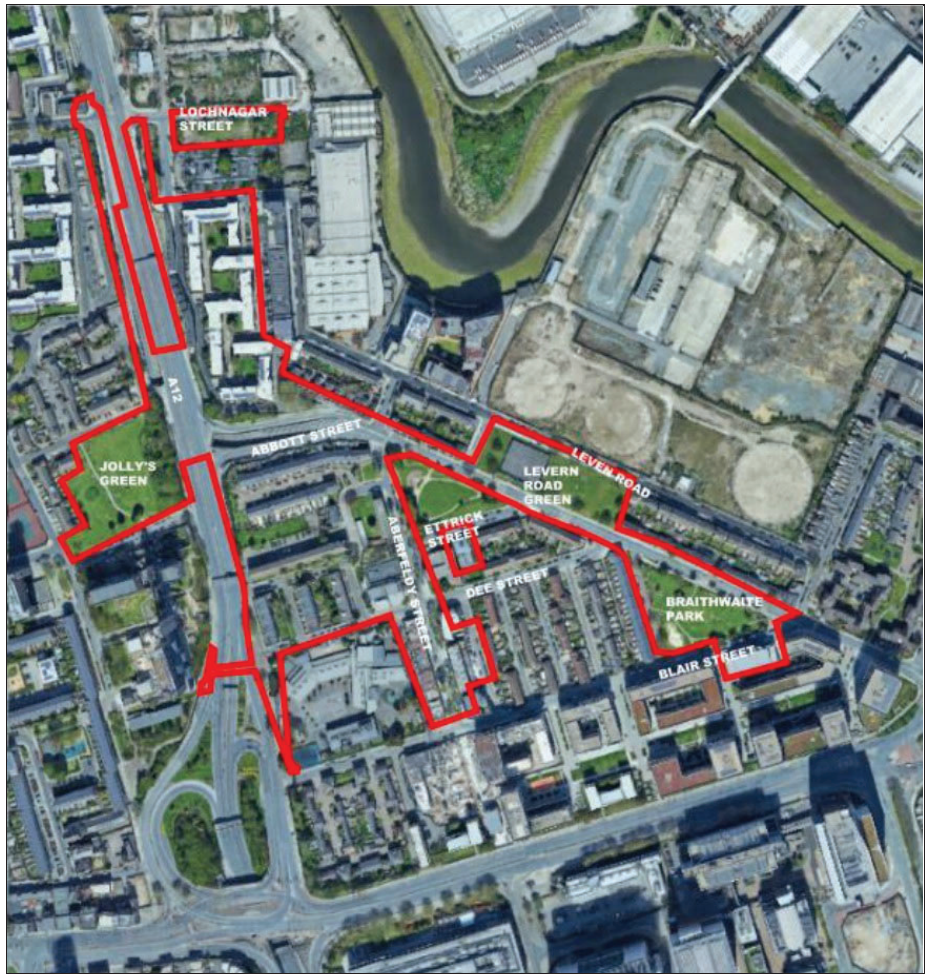

Figure 2 - Site Aerial View

A portion of the site benefits from an extant outline planning permission (ref: PA/11/02716/PO) for the construction of 1,176 residential units, of which 901 will have been constructed following completion of phase 3.

The proposed new masterplan is a once in a generation opportunity to reshape the heart of Poplar by maximising the LLP, Poplar HARCA and Tower Hamlets' landholdings which will deliver:

- A neighbourhood that fosters growth through high quality mixed use redevelopment
- A revitalised local centre with new retail, commercial workspace, civic and faith facilities
- Considerable public realm focused on walkability, healthy streets and creating a child friendly place
- Opportunity for improved connectivity to, from and through the site
- A significant number of new high quality homes providing a significant contribution to LBTH housing targets.

The proposals comprise a hybrid planning application seeking detailed permission for Phase A and outline planning permission for future phases.

The outline scheme comprises the demolition of all existing structures and redevelopment to include buildings up to 100 metres in height (illustratively 28 storeys) and up to 141,014sq.m. of floorspace comprising a maximum of 133,971sq.m. of residential uses; retail use, workspaces; car and cycle parking; a new pedestrian route through the repurposing of the Abbott Road vehicular underpass for pedestrians/cyclists; landscaping, open spaces, public realm, access, infrastructure and highways works.

The detailed scheme comprises the construction of buildings 5-11 storeys in height to provide 277 residential units, retail uses and a temporary marketing suite, access, car and cycle parking, landscaping, public realm, and improvements to Braithwaite Park and Leven Road Open Space.

The NPPG classifies residential development as More vulnerable to flood risk, and commercial and retail development as Less Vulnerable to flood risk.

Refer to Appendix A for the illustrative Aberfeldy New Masterplan Layout.

3.3 Waterbodies in the Vicinity of the Site

Waterbodies in the vicinity of the site are identified in Figure 3.

The River Lee is located a minimum of approximately 160 m east of the site and flows in a generally southerly direction to its confluence with the River Thames. The River Thames is located approximately a 550 m south of the site and flows in an easterly direction towards the Thames Estuary.

According to the main river map both the River Lee and the River Thames are classified as a 'main river'. The Environment Agency carries out maintenance, improvement and construction work on main rivers to manage flood risk.

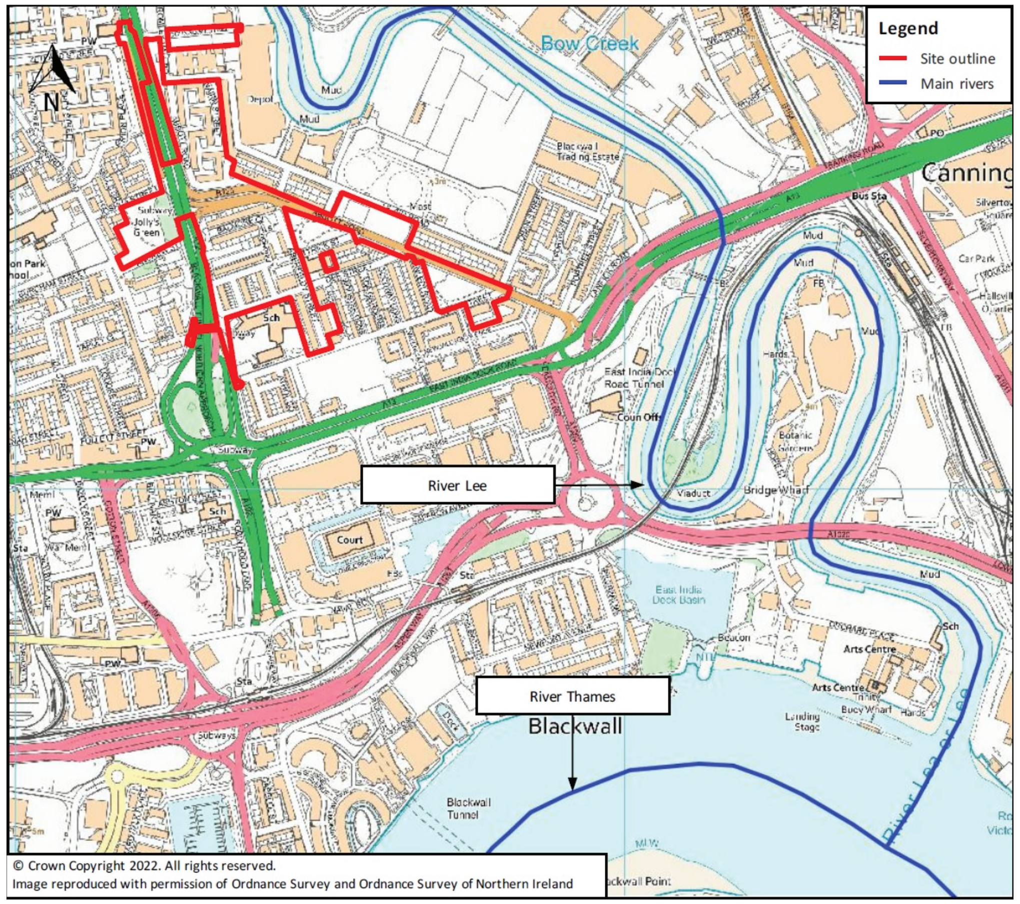

Figure 3 – Location and Designation of Waterbodies

3.4 Site Levels and Topography

The existing site levels have been extracted from the Lidar Digital Terrain Model (DTM) provided by the Department for Environment, Food & Rural Affairs (DEFRA) Survey Data portal. The maps identify the existing levels to Ordnance datum as illustrated in Figure 4.

The DTM indicates that the site levels range between approximately 1.4 and 5.3 metres Above Ordnance Datum (m AOD), with the northern site parcel situated approximately 2.0 m higher than the southern parcel.

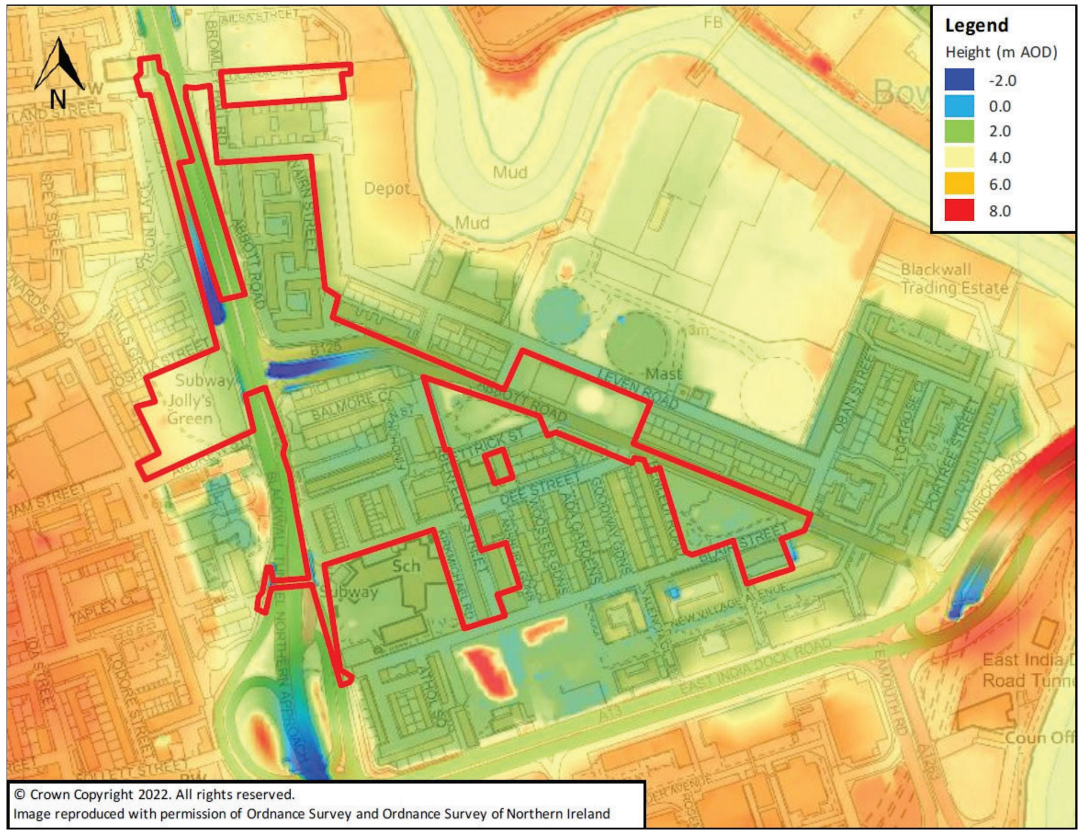

Figure 4 – Lidar level data

3.5 Site Geology and Hydrogeology

British Geological Survey (BGS) mapping indicates that the superficial deposits at the majority of the site comprise alluvium - clay, silt, sand and peat formed up to 2 million years ago in the Quaternary Period. In the western area Sands and Gravels of the Kempton Gravel Member appear at shallow depths. (Figure 5).

The bedrock geology at the site comprises clay, silt and sand of the London Clay formation - sedimentary bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period (Figure 6).

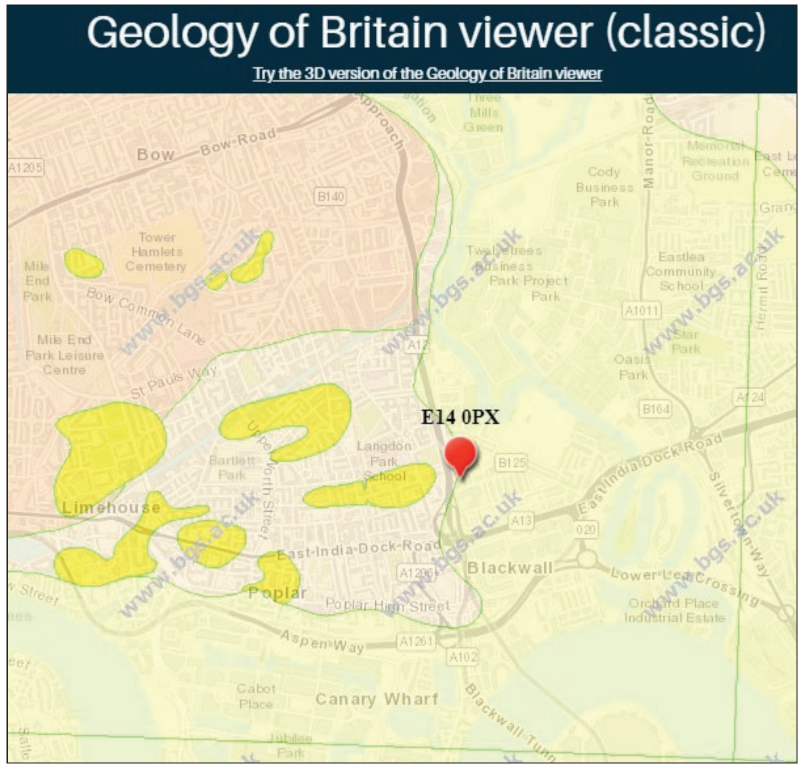

Figure 5 - Site Superficial deposits

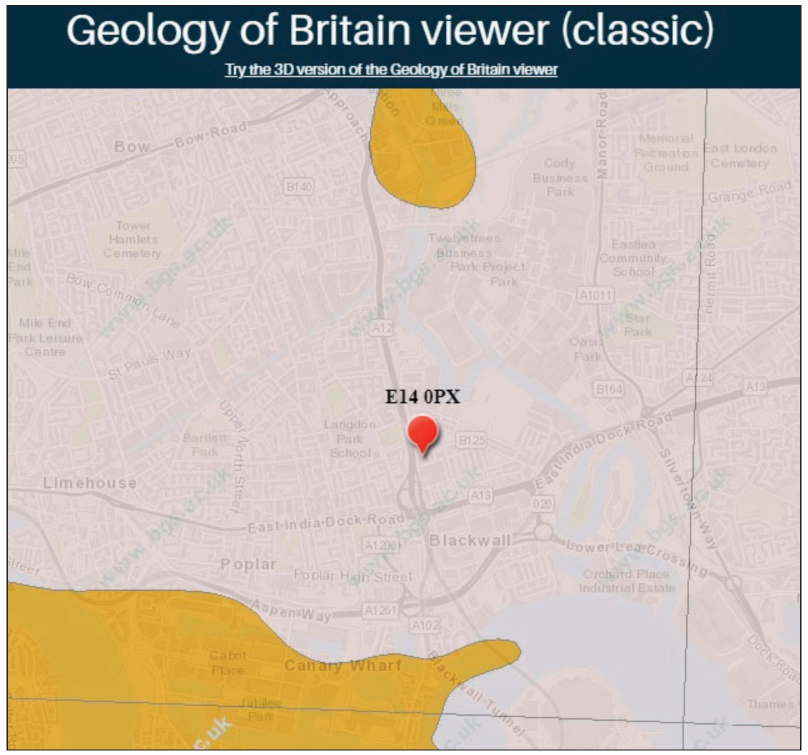

Figure 6 - Site Bedrock Geology

The National Geoscience Data Centre's Single Onshore Borehole Index holds five records of boreholes within the site boundary. These indicate that made ground is present to a maximum depth of 2.5 m below ground level (bgl) underlain by silty sandy clay interlaid with gravel to a depth of 25.0 m bgl.

Refer to Appendix B for the BGS Historic borehole logs.

The EA provides publicly available mapping which indicates the aquifer classifications and groundwater vulnerability of geological deposits of England and Wales.

Aquifer designations reflect the importance of aquifers in terms of groundwater as a resource and in their role in supporting surface water flows and wetland ecosystems. Aquifer maps are split into two different types of aquifer designations; superficial, which are permeable unconsolidated deposits and bedrock which are solid, permeable formations.

Environment Agency (EA) records indicate that the Sands and Gravels of the Kempton Gravel Member are considered a Secondary A Aquifer. Alluvium deposits are considered a Secondary Aquifer (undifferentiated) (Figure 7).

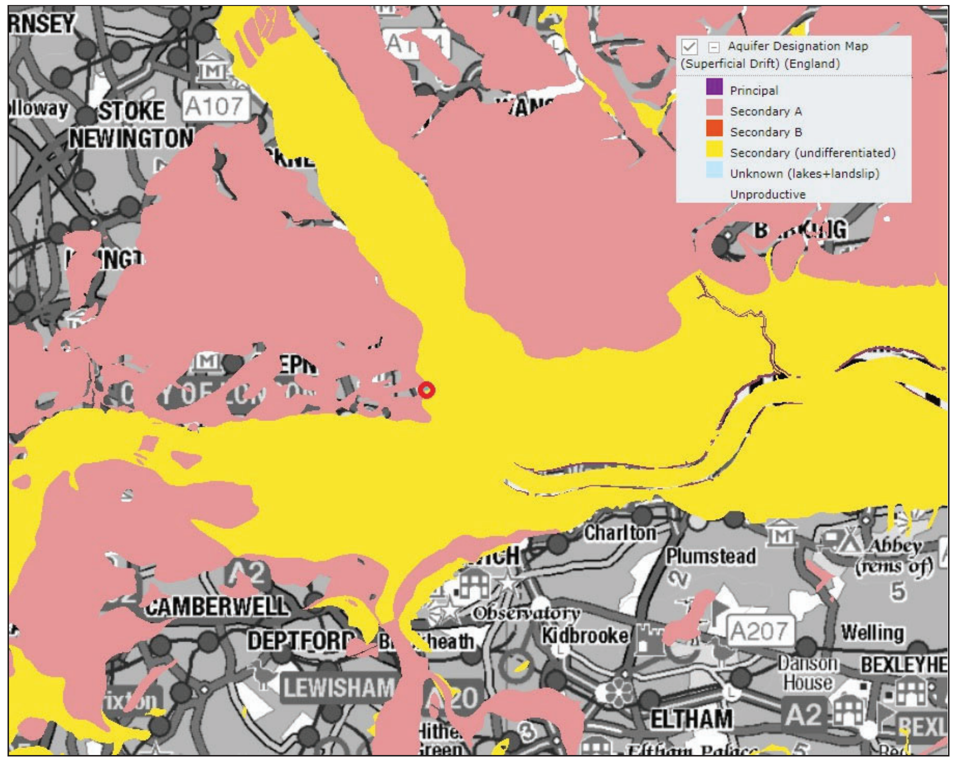

Figure 7 – Environment Agency Aquifer Designation Map (Superficial)

The London Clay in the bedrock is considered an Unproductive strata (Figure 8).

Figure 8 – Environment Agency Aquifer Designation Map (Bedrock)

Therefore, the Groundwater Vulnerability Zone is considered to be Medium-Low. (Figure 9).

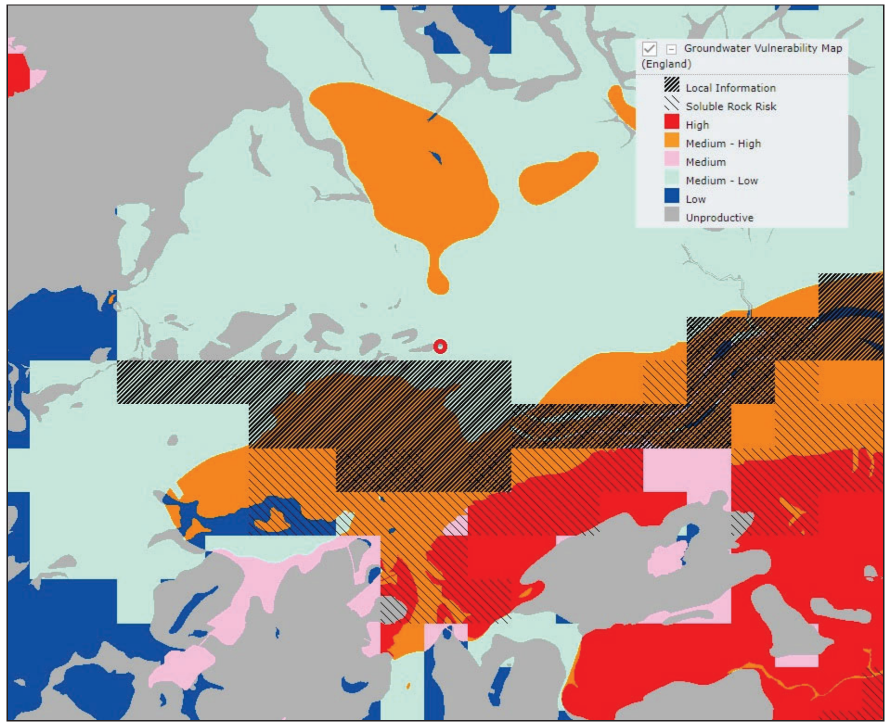

Figure 9 – Environment Agency Groundwater Vulnerability Map

According to the Soilscapes maps produced by the National Soils Research Institute, soil conditions at the western area of the site are described as 'Loamy soils with naturally high groundwater'. In the central and eastern areas they are indicated as 'Loamy and clayey soils of coastal flats with naturally high groundwater' (Figure 10).

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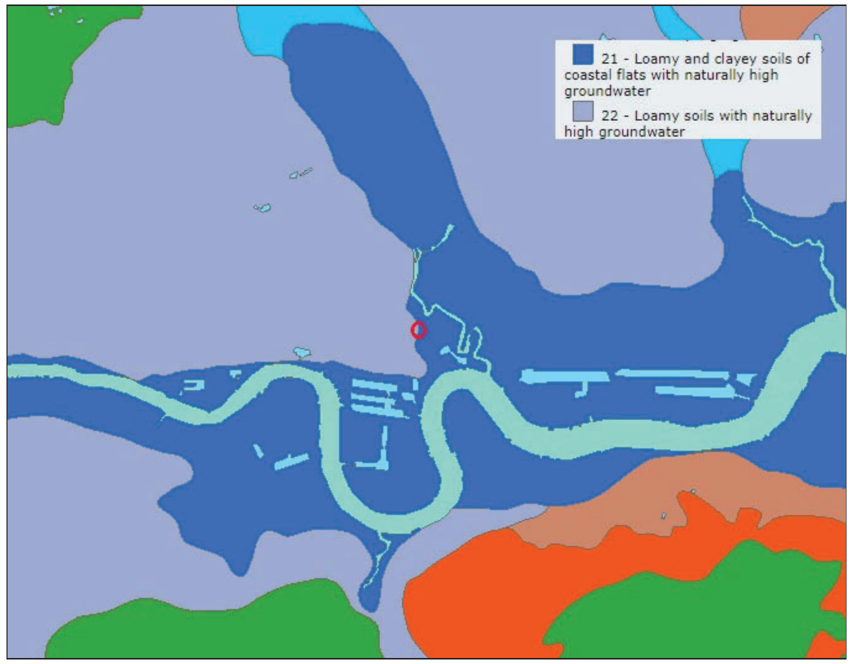


Figure 10 – Soilscape (England) Map

EA define Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk.

The SPZ map in the area shows that the site is not located within a catchment, outer or inner designated source protection zones (Figure 11).

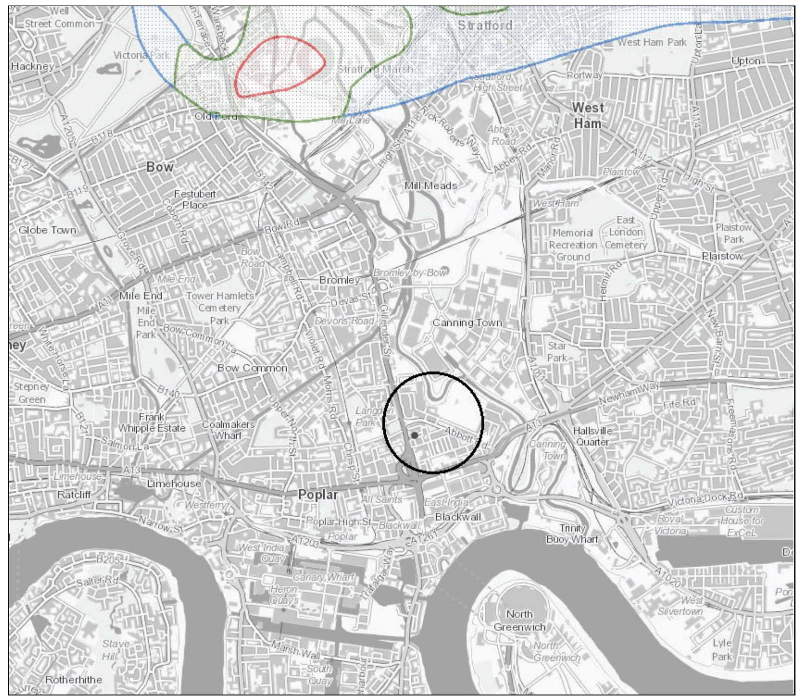


Figure 11 – Environment Agency Source Protection Zones Map

4 Assessment of Flood Risk

4.1 Flood Zone Designation

Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. The NPPF and PPG defines Flood Zones as follows:

a. Flood Zone 1 (Low Probability): Land having a less than 1 in 1,000 annual probability of river or sea flooding.
b. Flood Zone 2 (Medium Probability): Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
c. Flood Zone 3a (High Probability) Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
d. Flood Zone 3b (The Functional Floodplain): This zone comprises land where water has to flow or be stored in times of flood.

The flood zones are shown on the Environment Agency Flood Map for Planning (Rivers and Sea). The flood zones shown on the flood map are defined by the predicted extent of flooding during the present day 1 in 100 (non-tidal rivers), 1 in 200 (tidal rivers and sea) and 1 in 1,000 (rivers and sea) annual exceedance probability (AEP) events. The zones do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

Flood zone 3b (functional floodplain) is not separately distinguished on the Flood Map for Planning but is usually identified by local planning authorities in their SFRAs. The boundary of flood zone 3b is normally defined as land that would flood during the present day 1 in 20 AEP event, although definitions may vary particularly in some districts and in urban areas.

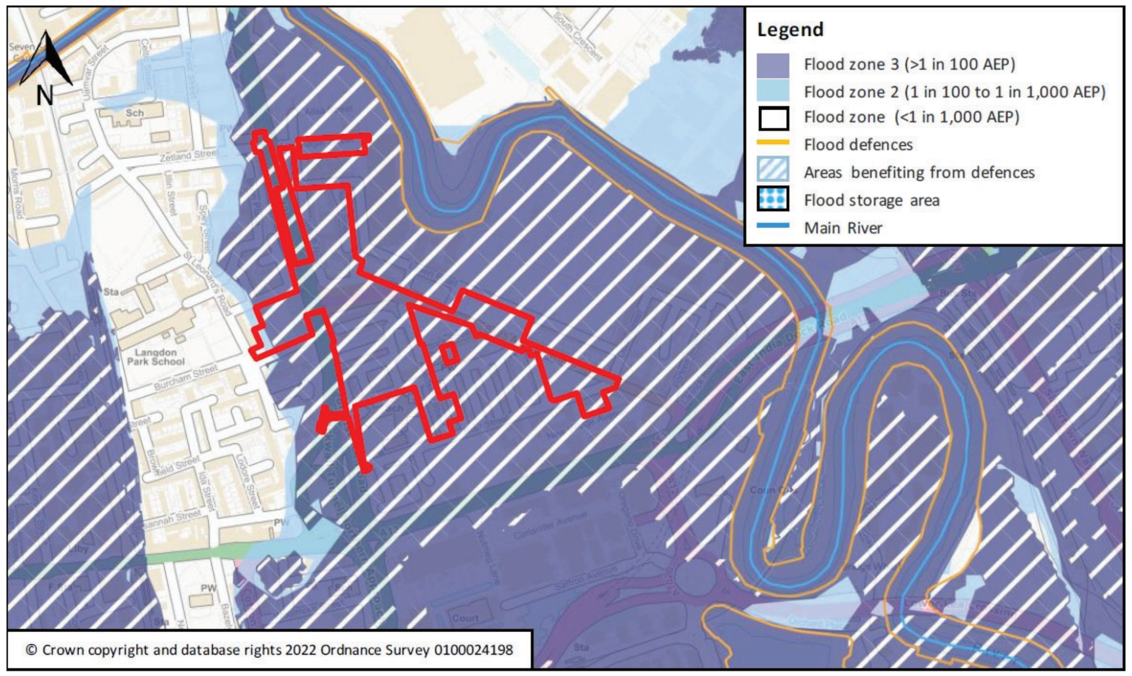


Figure 12 – EA Flood Map from Rivers & Sea

Where an area benefits from formal flood defences providing a minimum standard of protection, the defended area may be indicated as an area benefiting from flood defences. However, not all areas are shown as such, and unless specifically indicated, the Flood Map for Planning conservatively shows land at risk of flooding in the absence of flood defences. The Flood Map for Planning (Figure 12) indicates the site to be located in flood zone 3 and is in an area benefiting from the presence of flood defences.

4.2 Historical Records of Flooding

The Environment Agency historic flood map indicates that extensive flooding of the site occurred in 1928 and that land beyond the south-east corner of the site was also flooded in 1947 (Figure 13).

It should be noted that raised defences were not present along the River Lee when flooding occurred at the site. The London Borough of Tower Hamlets SFRA indicates that flood defences were constructed following the 1947 flood event.

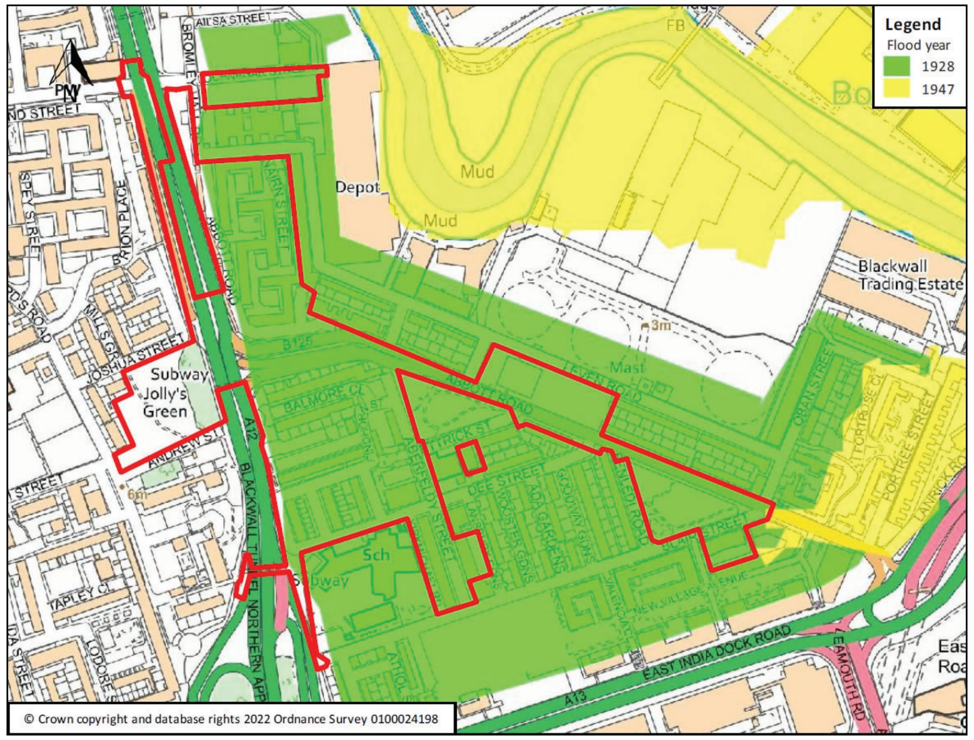


Figure 13 – Recorded Flood Outlines.

4.3 Flood Risk – River Lee

As detailed in Section 3.3, the River Lee is located a minimum of approximately 160 m east of the site and flows in a generally southerly direction to its confluence with the River Thames.

The Environment Agency (EA) has confirmed that the flood defences along the River Lee prevent flooding in up to the 1 in 1,000 AEP event and that the planning application should be informed by an assessment of flood risk from the River Thames. Refer to Appendix C for the Product 4 Detailed Flood Risk Maps provided by the EA.

4.4 Flood Risk – River Thames

As detailed in Section 3.3, the River Thames is located approximately a 550 m south of the site and flows in an easterly direction towards the Thames Estuary.

The extent of flooding presented by the Flood Map for Planning does not take into account the presence of flood defences. However, the site is located in an area benefitting from formal defences, including the Thames Barrier.

The Thames Barrier and the raised defences along the banks of the River Thames and are designed to provide a 1 in 1,000 annual probability Standard of Protection (SoP) and therefore mitigate the risk of flooding from the River Thames in up to the present day 1 in 1,000 annual probability event.

The crest level of the defences situated adjacent to the site is currently 5.23 m AOD. It is expected that the crest level of the defences will be raised to 6.20 m AOD in accordance with the TE2100 Plan in order to maintain the current SoP up to 2100.

Based upon the above, the site is assessed to be at a low risk of flooding form the River Thames. However, a residual risk of flooding exists due to potential overtopping of the defences for events exceeding the SoP, due to a structural failure of the flood defence walls, or due to a failure of Thames Barrier to operate as intended.

The Environment Agency has provided outputs from its 2017 Thames Tidal Upriver Breach Inundation Modelling Study. The extents of flooding resulting from a breach of the River Thames flood defences for the present day and 2100 climate change scenarios are presented by Figure 14 and indicate that the site is at risk of flooding.

Maximum flood levels for the present day and 2100 climate change scenarios are presented by Figure 15 and Figure 16 respectively. The model results indicate that peak flood levels across the southern site parcel for the present day and 2100 climate change scenarios are 2.80 m AOD and 3.68 m AOD respectively. Peak flood levels within the northern site parcel are shown to range from 3.18 – 3.55 m AOD in the present day scenario and 3.65 – 5.10 m AOD in the 2100 climate change scenario.

Flood hazard mapping for the present day and 2100 climate change scenarios are presented by Figure 17 and Figure 18 respectively. The flood hazard at the site is generally shown to be significant (i.e. dangerous for most people), with areas of extreme hazard (i.e. dangerous for all) identified along the site access roads in the 2100 climate change scenario. Refer to Appendix D for the Environment Agency EIA response letter.

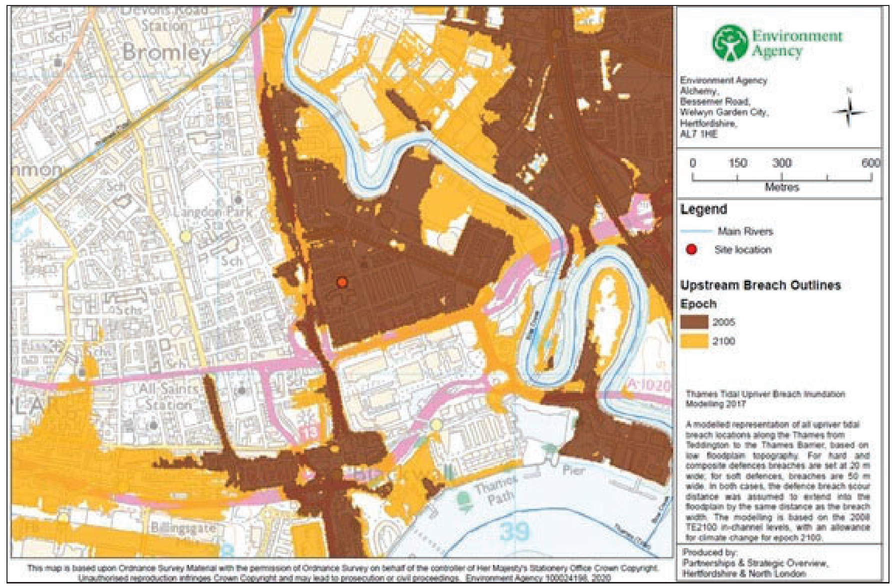
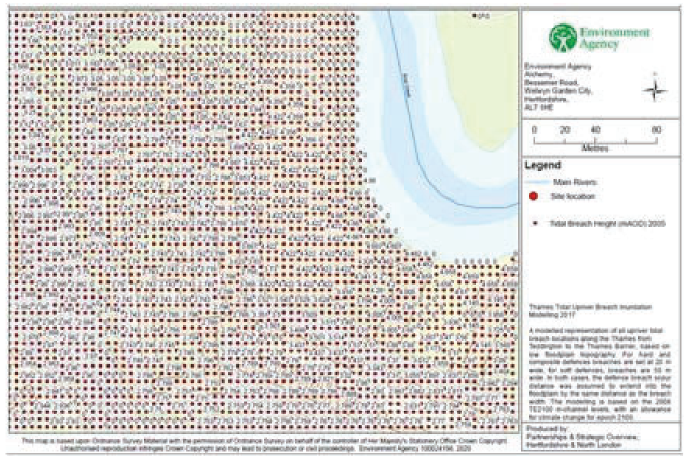
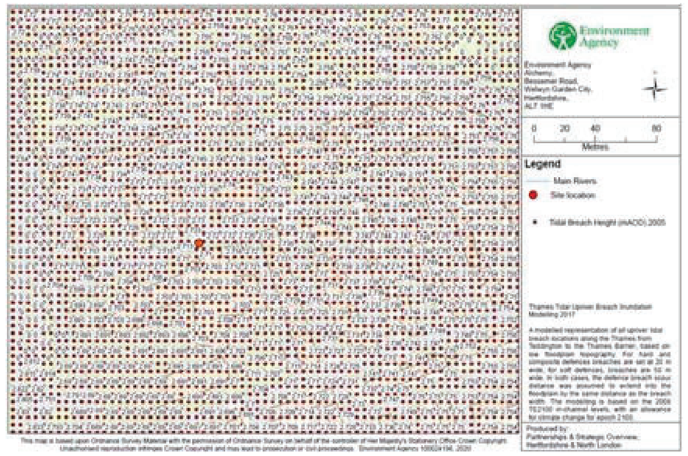


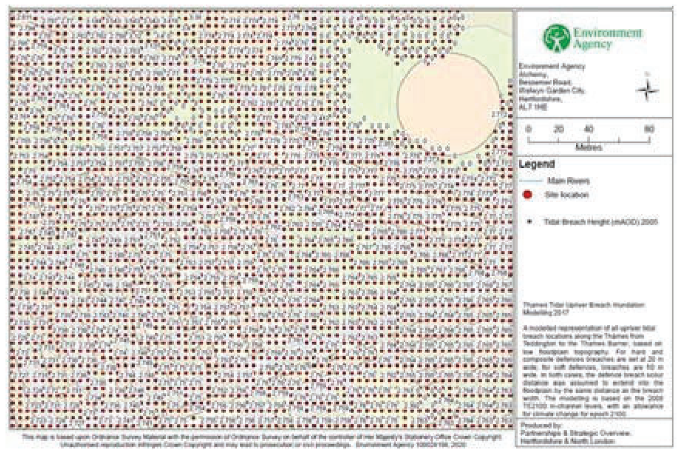
Figure 14 – Modelled Flood Extent – Breach. Tidal Upriver Breach Inundation Modelling Study 2017



North Aberfeldy Village

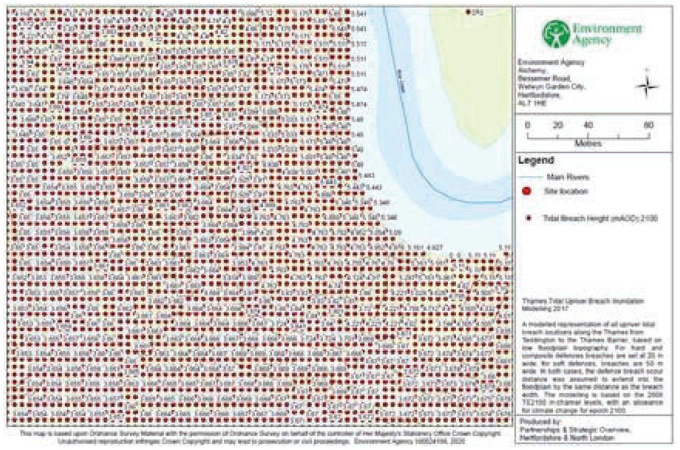


South-west Aberfeldy Village

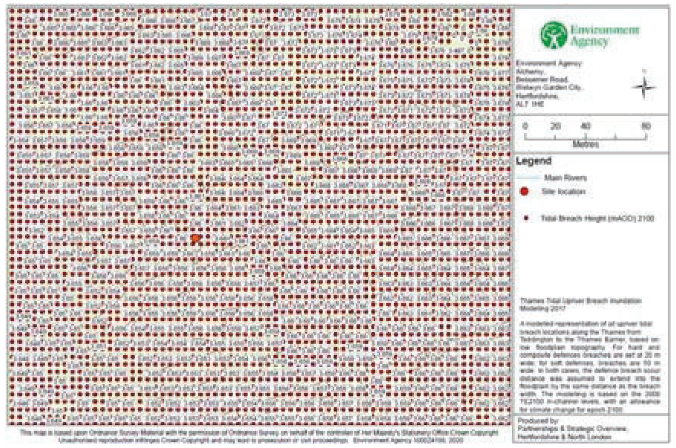


South-east Aberfeldy Village

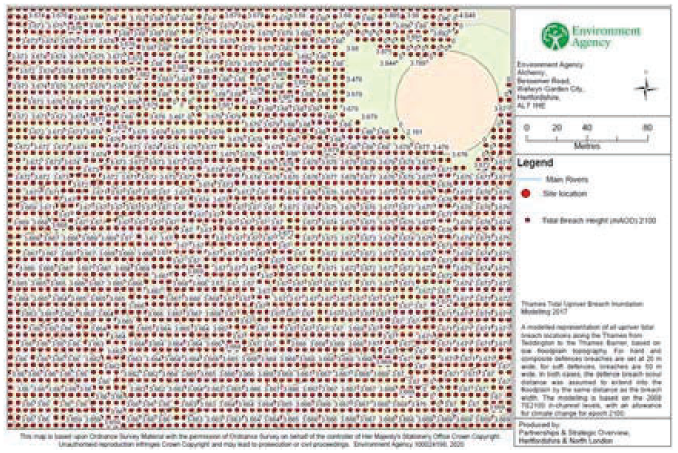
Figure 15 – Maximum Water Level – Breach (2005). Tidal Upriver Breach Inundation Modelling Study 2017



North Aberfeldy Village



South-west Aberfeldy Village



South-east Aberfeldy Village

Figure 16 – Maximum Water Level – Breach (2100). Tidal Upriver Breach Inundation Modelling Study 2017

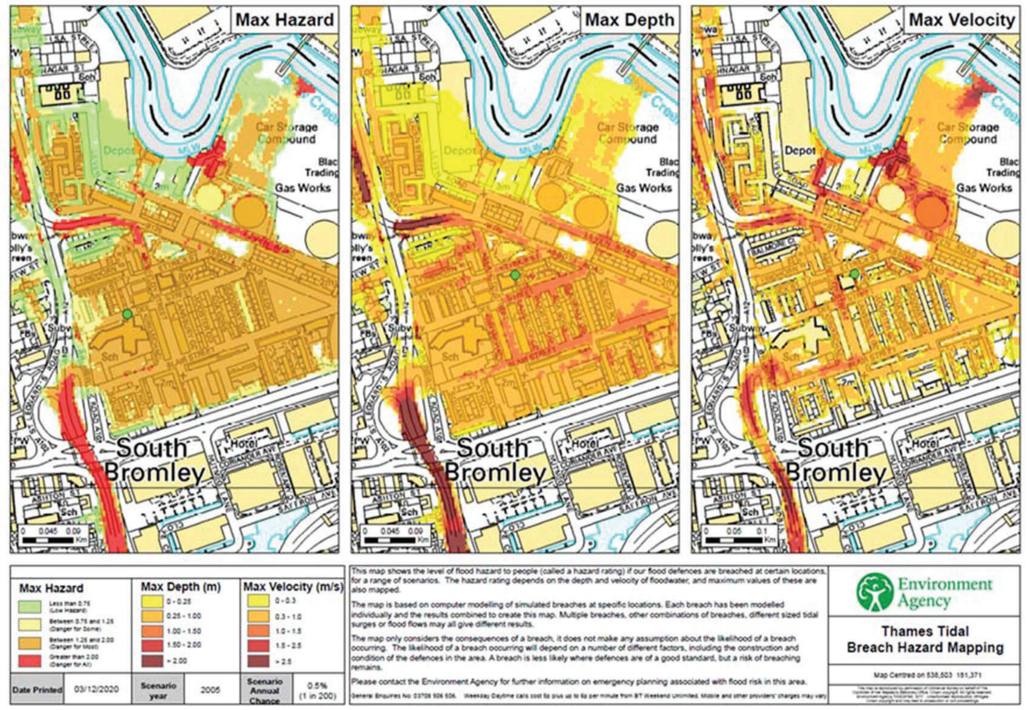


Figure 17 – River Thames Hazard Mapping Breach (2005). Tidal Upriver Breach Inundation Modelling Study 2017

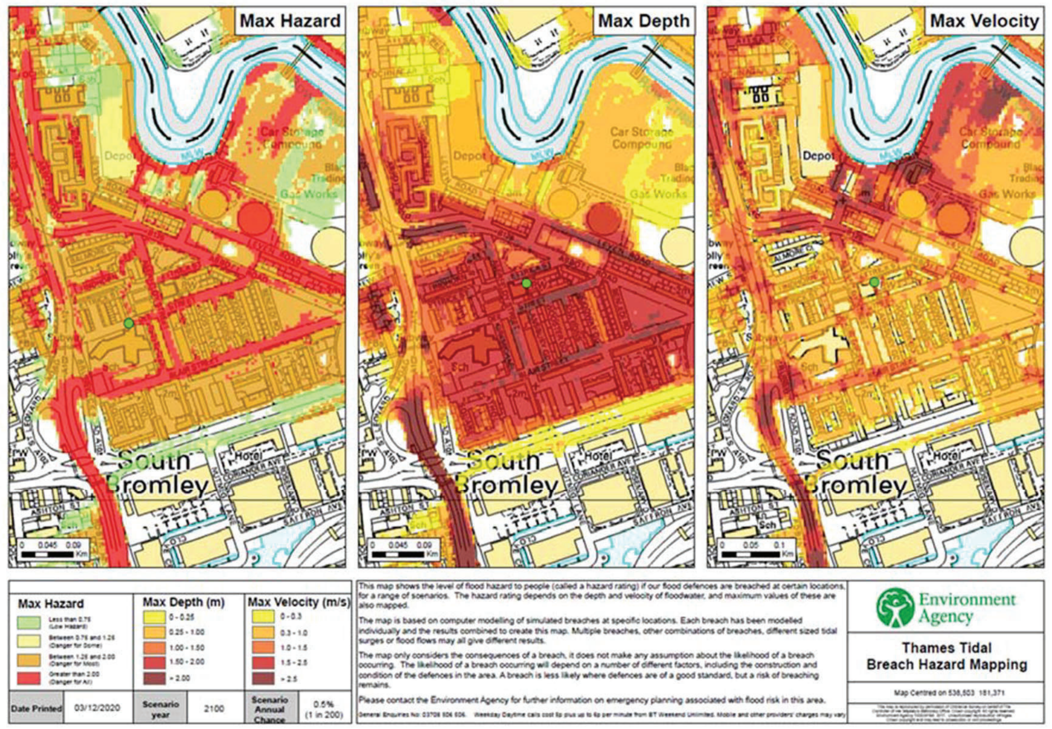


Figure 18 – River Thames Hazard Mapping Breach (2100). Tidal Upriver Breach Inundation Modelling Study 2017

4.5 Surface Water Flooding

Pluvial flooding occurs when natural and engineered systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, low duration summer rainfall event which overwhelms the local surface water drainage systems. This flood water would then be conveyed via overland flow routes dictated by the local topography.

Appendix A, Map 006, of the SFRA indicates that the site is located within a Critical Drainage Area.

The Flood Risk from Surface Water map (Figure 19) shows the majority of the site to be at very low risk of flooding from surface water, with the site access roads identified as being at increased risk.

Potential flood depths along the site access roads for the low, medium and high risk events are presented by Figure 19. Flood depths are shown to be approximately 300 mm, with the exception of the A12 underpass where flood depths are expected to exceed 900 mm.

It should be noted that the modelling approach used to generate the Flood Risk from Surface Water map generally underestimates the capacity of urban drainage networks. It is typically assumed that drainage networks provide a surface water removal rate of 12 mm per hour, equivalent to 33 litres per second per hectare of impermeable area. As such, it is likely that the Flood Risk from Surface Water map overstates the risk of flooding at the site from this source.

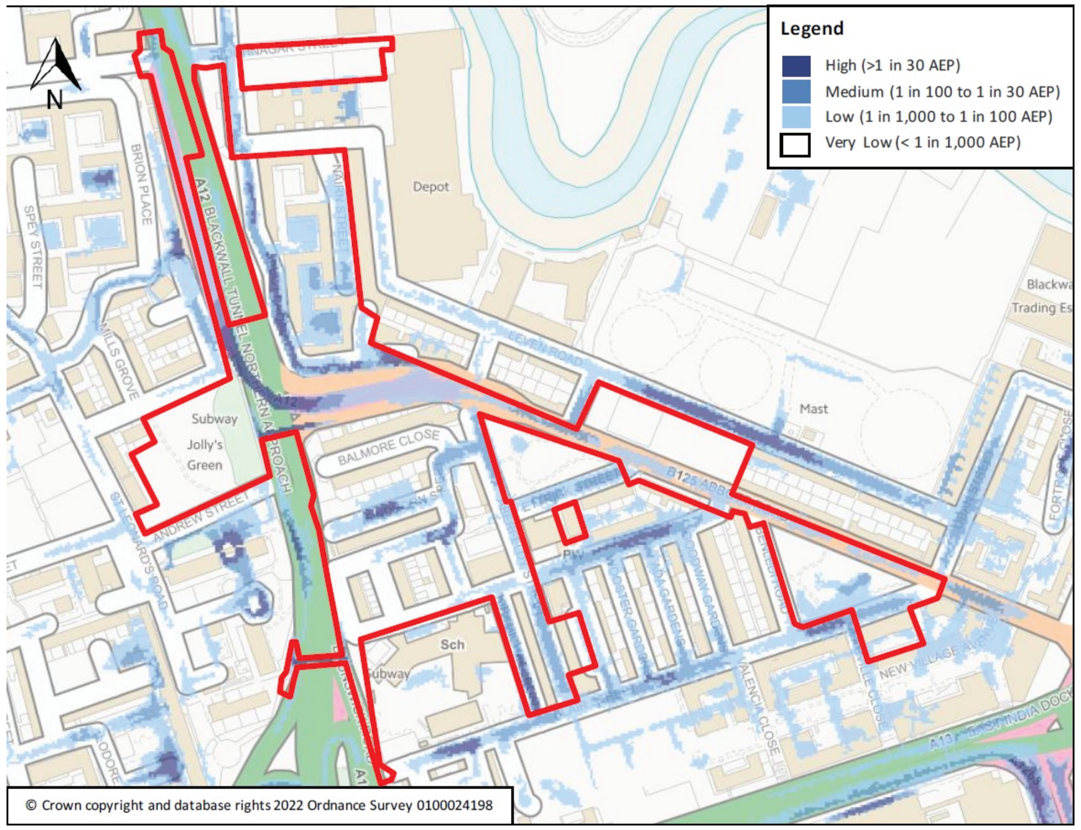


Figure 19 – EA Flood Risk from Surface Water

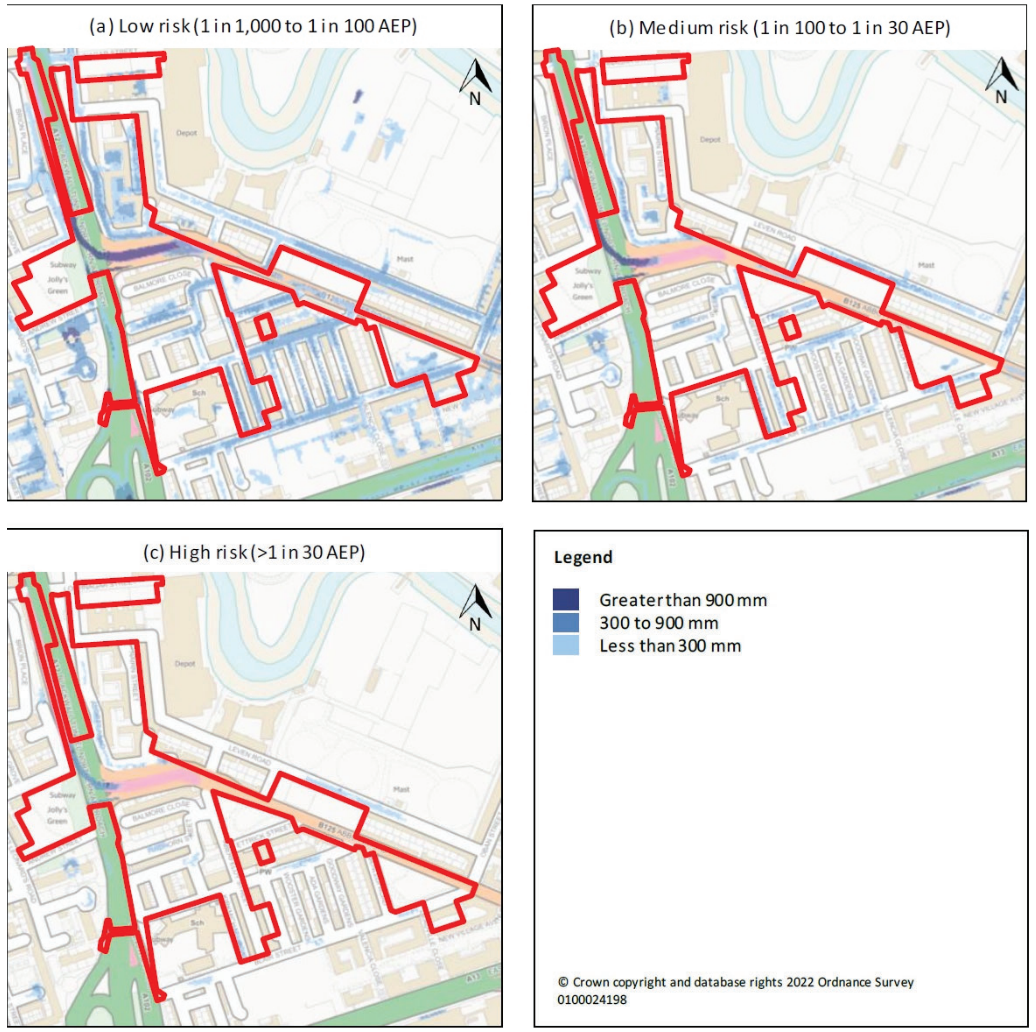


Figure 20 – EA Flood Risk from Surface Water - Depth

4.6 Sewer Flooding

The existing sewer system in London was constructed in the 19th century. The sewer system consists of combined sewers which were initially designed to collect foul waters only. However, the spare capacity of the sewers at the time and surface water flood risk incidents, resulted in a decision to use the sewers, also for the collection of surface water. Six main interceptor sewers were built and fed by 450 miles of main sewers and 13,000 miles of local sewers which historically discharged into the River Thames.

In the LB of Tower Hamlets the sewer network is a largely combined foul and surface water system managed by Thames Water. The combined sewers have brickwork culverts which outfall into the River Thames. Based on present day forecasting for heavy rainfall events, it is predicted that the culverts only have capacity for the 1 in 10 annual probability flood event. Additionally, any new surface water sewers have been designed to hold the 1 in 30 annual probability flood event. Subsequently, London experiences flooding as a result of a lack of sewer capacity, although they are generally of small consequence (mainly flooding of roads). However, climate change will result in summer storms increasing in frequency, and winter storms becoming more prolonged. This means that the current standard of protection for the existing sewer system will be reduced and more frequent localised flood events, as a result of sewer flooding, can be expected.

The data provided by Thames Water shows postcodes where properties are known to have experienced sewer flooding. The majority of the incidents of sewer flooding are clustered in the north of the borough around Bow and Victoria Park - post codes E3 2, E3 5, E9 5 and E9 7. The relatively high number of incidents reported in post code areas E3 2 and E3 5 may be the result of a shallow gradient drainage network. There are recorded 3no internal sewer flood records at the site post code E14 0.

The sewer system was not modelled for the SWMP explicitly hence interaction between the sewer system and surface water modelling was not investigated.

Sewer flooding generally results in localised short-term flooding caused by intense rainfall events overloading the capacity of the sewers. Flooding can also occur as a result of a blockage, poor maintenance or structural failure.

There are existing Thames Water adopted combined sewers in the vicinity of the proposed development. It is anticipated that the adopted sewers will be regularly maintained by Thames Water and therefore risk of failure should be considered to be minimal. Should the existing sewers flood, they will follow the proposed flood exceedance routes and existing topography.

The proposed development is a Brownfield site which discharges unrestricted surface water flows into the existing public sewers; post-development the surface water discharge rates will be heavily restricted to the Greenfield Qbar rate. Therefore, the proposed development is considered to be at low risk of sewer flooding.

4.7 Flood Risk from Reservoirs, Canals and Other Artificial Sources

The Flood Risk from Reservoirs map (Figure 21) indicates that the site may be at risk of flooding from reservoirs when there is also flooding from rivers. However, all large reservoirs are regularly inspected by reservoir panel engineers with essential safety work carried out as required. As detailed on the gov.uk website, reservoir flooding is therefore extremely unlikely to occur. There are no canals or other artificial sources located within the vicinity of the site that are expected to present a risk of flooding.

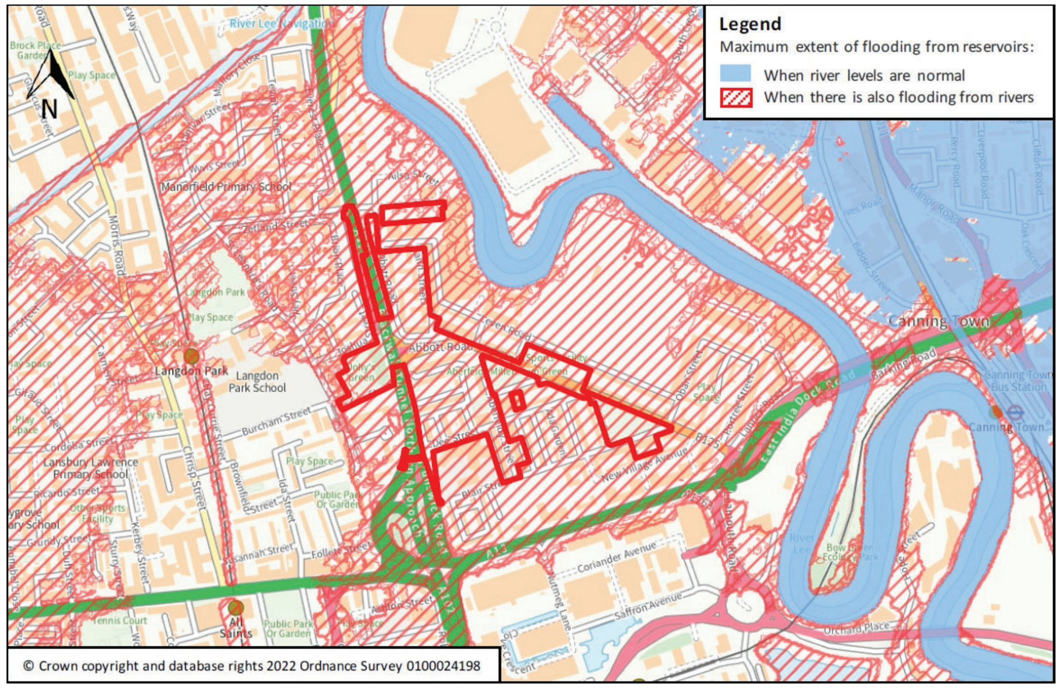


Figure 21 – Flood Risk from Reservoirs Map

4.8 Water Main Burst

A burst water main can occur at any time and can have a serious impact on both property and infrastructure.

Any pipe burst can result in flooding of roads and property however the locations at most risk are considered to be low points in the topography along roads and tunnels and locations where large water mains run along streets and open spaces. This is because flood water would accumulate at low points and burst flows are much larger for larger pipes.

Thames Water has recently undertaken a review of bursts on their trunk main network following a series of incidents in 2016. This review came to the following findings regarding the causes of bursts; 'there is no single common cause of the bursts. Whilst age and condition of the pipes is an underlying factor in the eight high-profile failures, there were no systematic failings that could be said to have consistently caused or enabled the bursts.'

At present no assessment of the risk of water main burst flooding has been undertaken as it has not been possible to obtain water main asset information, such as pipe sizes and locations. Therefore as a pre-cautionary approach and in the absence of 2d modelling or data from Thames Water, any infrastructure or property in the vicinity of the areas at high risk (low points and large water mains) can be assumed to be at high risk from this source. Good management of the infrastructure itself is the key to minimising the threat of flooding from these sources.

Thames Water outlines their plans to improve their distribution network in order to reduce leakage and the risk of burst mains; this is set out in their 'Long-Term Strategy 2015-2040' document. The programme to replace the oldest and leakiest pipes and replacement of trunk mains has already started. Thames Water will make use of latest technology to monitor and manage the performance of their system and to reduce losses of water. Information from 'smart' meters will help target key locations to improve performance. Improved knowledge of deterioration rate of trunk mains and improved monitoring will help, to better predict and prevent these bursts.

Therefore, the site is considered to be at low risk of flooding from water main burst.

4.9 Ground Water Flooding

Groundwater flooding generally occurs during intense, long-duration rainfall events, when infiltration of rainwater into the ground raises the level of the water table until it exceeds ground levels. It is most common in low-lying areas overlain by permeable soils and permeable geology, or in areas with a naturally high water table.

Flood risk due to groundwater has been assessed by reviewing the Strategic Flood Risk Assessment and borehole data available on the British Geological Survey's (BGS) website. The SFRA notes that flood risk due to groundwater is generally low; however, some areas have a significant risk for elevated groundwater levels.

In these areas, basements are most likely to obstruct groundwater flows which will increase the risk of flooding to these buildings

The British Geological Survey Groundwater Flooding Hazard map (Figure 22) indicates that the majority of the site is at low risk of flooding from this source, with the western most side of the site (Sands and Gravels superficial deposits of the Kempton Gravel Member) at a significant risk of groundwater flooding.

Typically the areas, where the secondary aquifer is thinnest in depth and are primarily covered by impermeable areas such as buildings and roads. In these areas, rainwater cannot infiltrate into the ground and subsequently raise groundwater levels. The main cause for rising groundwater levels is therefore caused by sewers leaking and the lateral transmission of high water levels from the River Thames and River Lee. Due to the impermeable surfaces in these areas, groundwater flooding is most likely to affect basements and utilities that are not waterproofed properly.

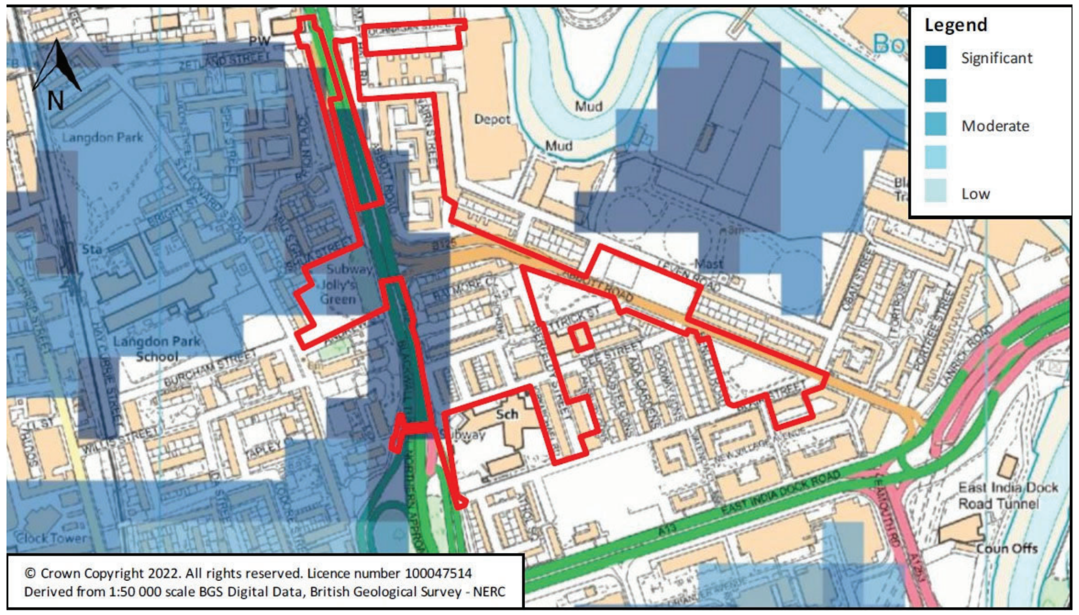


Figure 22 – Groundwater Flooding Hazard Map

In addition to the natural geology beneath the LB of Tower Hamlets, there can be a substantial depth of made ground that comprises material that has been deposited as a result of human occupation and development since settlement by the Romans in the 1st century AD. This material which sits above the other geologies is highly variable but can hold perched groundwater and therefore pose a risk of groundwater flooding to basements and other buried structures.

Groundwater flood risk is not expected to increase in the short to medium term. However, climate change is likely to increase the existing groundwater flood risk due to higher rainfall, and increased leakage from drains and sewers infiltrating into ground. Sea level rise will increase the water level within the River Thames which will also increase groundwater levels, although this will dissipate with distance from the river. Additionally, the defence improvements by the TE2100 and Thames Barrier may help to mitigate this.

Considering the BGS historic boreholes, the groundwater is likely to be present towards the base of the Kempton Gravel Member layer which extends to a depth of approximately 3 to 5m below ground level and above the impermeable London Clay (Refer to RSK Phase 1 report and RSK Intrusive Pile Assessment SI Report). Therefore, groundwater may be encountered within the proposed basement excavation.

The possibility for seasonal fluctuations in the ground water level should also be considered with the contractor being required to have suitable remediation and de-watering measures in place during works to construct the basement.

Therefore, the majority of the site is considered to be at Low risk of groundwater flooding at ground level and the western areas at Medium risk of groundwater flooding below ground.

5 Flood Risk Mitigation Measures

The risk of flooding to the proposed development will be mitigated through the implementation of the measures proposed within the following section of this report.

5.1 Finished Flood Levels

For the Residential Development the Finished floor levels of the proposed units will be set a minimum of 0.15 m above adjacent ground levels and above peak flood levels in the 2100 climate change breach scenario. Where it is not practicable to raise finished floor levels to this degree, sleeping accommodation (i.e. bedrooms) will be provided at first floor level to ensure that safe refuge is available. For the Retail Development the Finished floor levels of the proposed units will be set a minimum of 0.15 m above adjacent ground levels.

5.2 New Basement

The construction for the proposed new basement should consider a cavity drain system behind the blockwork lining wall. A drainage channel behind the lining wall and at the base of the slab would then collect any groundwater which would be pumped to ground floor level and ultimately convey it into the public sewers via the existing below ground drainage network.

5.3 Safe Refuge

Evacuation of the site is unlikely to be feasible given that the risk of flooding is principally associated with defence failure, the occurrence of which cannot be predicted. As such, areas of safe refuge should be provided at first floor level for the proposed retail units.

5.4 Flood Resistant and Resilient Construction

Flood resistant and resilient construction techniques should be incorporated into the design of the buildings where appropriate, in line with the CIRIA Code of Practice for Property Flood Resilience (C790). These include design features and finish materials to minimise the entry of water and/or reduce the damage in the unlikely event of the development being inundated. The use of non-return valves should be considered given the presence of surrounding public combined sewers.

5.5 Flood Warning and Evacuation Plan

It is recommended that a Flood Warning and Evacuation Plan is prepared in consultation with London Borough of Tower Hamlets emergency planning team. The objectives of the plan would be to reduce the risk to property and life by ensuring that all residents are aware of the potential risk of flooding and the procedures that should be implemented in the event that flooding is expected or has occurred. This would be achieved by: 1) Setting out the measures that would need to be taken if flooding is forecast, during flooding and following an 'all-clear' notification; 2) Summarising the roles and responsibilities for flood response and management; and 3) Describing how flood warnings are issued, flood warning codes and what they mean, and other sources of flood information

The site is included in an Environment Agency flood alert and warning area. This provides the opportunity for the relevant response procedures set out in the Flood Plan to be invoked in response to receipt of a flood warning from the Environment Agency.

6 Sequential Test and Exception Test

6.1 Sequential Test

The NPPF requires the Local Authority to apply the Sequential Test in consideration of new development. The aim of the Test is to steer new development to areas at the lowest probability of flooding.

Given that the subject site has not been allocated as one of the London Borough of Tower Hamlets proposed future development sites, it has not been specifically assessed within the SFRA. The Sequential Test is based on the EA Flood Zones and information contained within the SFRA.

The site is located within Flood Zone 3 benefiting from flood defences and is therefore classified as being at a very low fluvial and tidal flood risk. No significant risks have been identified from any of the other sources assessed. Therefore, the site is considered to be sequentially preferable for development and passes the Sequential Test.

6.2 Exception Test

In accordance with the Flood Risk Vulnerability Classification in Table 2 of the Planning and Practice Guidance Flood Risk and Coastal Change, the proposed development is classified as 'More Vulnerable' development.

Table 3 of the Planning Practice Guidance indicates that 'more vulnerable' developments are considered appropriate within Flood Zone 3 benefitting from flood defences without the requirement to apply the Exception Test. Therefore, application of the Exception Test is not required for the proposed development.

7 Summary and Recommendations

Parmarbrook has been instructed by Aberfeldy New Village LLP (joint venture between EcoWorld London and Poplar HARCA) to prepare a Flood Risk Assessment (FRA) in relation to the proposed redevelopment of Aberfeldy Village, East India Dock E14 within the London Borough of Tower Hamlets.

The Flood Map for Planning shows the proposed development site is located within the 1 in 100 / 1 in 200 annual probability flood outline and is therefore defined by the NPPF as being situated within flood zone 3.

The River Lee is located a minimum of approximately 160 m east of the site. The Environment Agency has confirmed that the flood defences along the River Lee prevent flooding in up to the 1 in 1,000 AEP event.

The Thames Barrier and the raised defences along the banks of the River Thames provide a present day 1 in 1,000 standard of protection. The TE2100 Plan states that the crest levels of the defences will be raised to maintain this standard of protection to the year 2100.

The site is shown to be at a residual risk of flooding in the event of a failure of the River Thames flood defences. The maximum flood levels at the site are shown to range between 3.65 and 5.10 m AOD in the 2100 climate change scenario.

The Flood Risk from Surface Water map indicates the majority of the site is at a very low risk of flooding from surface water. However, the site access roads identified as being at increased risk.

The Flood Risk from Reservoirs map indicates that the site may be at risk of flooding from reservoirs. However, all large reservoirs are regularly inspected by reservoir panel engineers with essential safety work carried out as required and reservoir flooding is therefore extremely unlikely to occur.

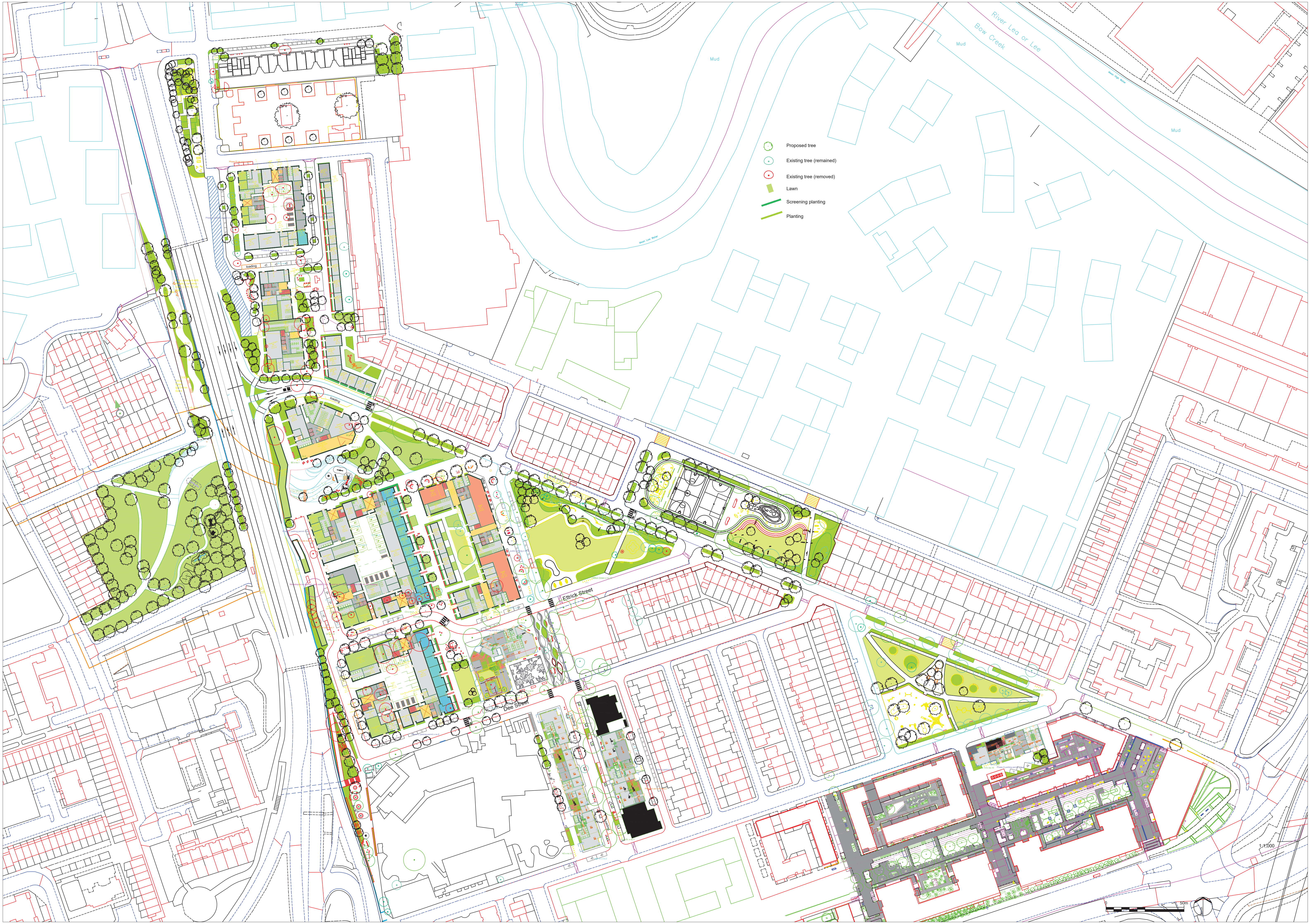
There may be some susceptibility to groundwater flooding at the site.

This report has demonstrated that the proposed development may be completed in accordance with the requirements of planning policy subject to the following:

- Finished floor levels of the residential units will be set a minimum of 0.15 m above adjacent ground levels;
- Finished floor levels of the residential units will be raised above the peak flood levels in the 2100 climate change breach scenario, or sleeping accommodation to be provided at first floor level;
- Finished floor levels of the proposed retail units will be set a minimum of 0.15 m above adjacent ground levels and safe refuge to be provided at first floor level;
- The construction for the proposed new basement should consider a cavity drain system behind the blockwork lining wall.
- The latest best practice flood resistant and resilient construction techniques to be incorporated into the design of the building where appropriate; The use of non-return valves should be considered given the presence of surrounding public combined sewers; and
- Flood Warning and Evacuation Plan to be developed in consultation with London Borough of Tower Hamlets.

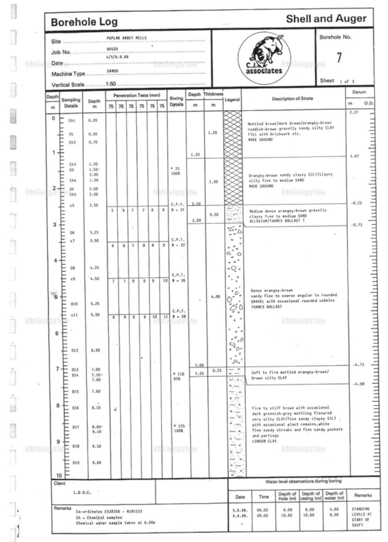
APPENDIX A

ILLUSTRATIVE NEW ABERFELDY MASTERPLAN LAYOUT


River Lea or Lee
Bow Creek
Mud
Proposed tree
Existing tree (remained)
Existing tree (removed)
Lawn
Screening planting
Planting
loading
Ettrick Street
Dee Street
1:1000
50m

APPENDIX B

BGS HISTORIC BOREHOLE LOGS



Borehole Log — **Shell and Auger**

Site: POPLAR ABBEY MILLS
Job No.: 80520
Date: 4/5/9.8.88
Machine Type: DANDO
Vertical Scale: 1:50

C.J. associates

Borehole No.: 7
Sheet 1 of 3

Sampling Details	Depth m	Penetration Tests (mm) 75	75	75	75	75	75	Boring Details
Ch1	0.20							
D1	0.50							
Ch2	0.70							
Ch3	1.20							
U3	1.50-2.00							* 25 100%
Ch4	1.50							
D4	2.00							
Ch5	2.00							
c5	2.50	5	6	7	7	8	9	C.P.T. N = 31
D6	3.25							
c7	3.50	6	6	7	8	8	9	C.P.T. N = 32
D8	4.25							
c9	4.50	7	7	8	9	9	10	C.P.T. N = 36
D10	5.25							
c11	5.50	6	8	8	9	10	11	C.P.T. N = 38
D12	6.50							
D13	7.00							
U14	7.10-7.60							* 110 95%
D15	7.60							
D16	8.10							
U17	8.60-9.10							* 125 100%
D18	9.10							
D19	9.60							

Depth m	Thickness m	Description of Strata	Datum m O.D.
			2.27
1.20	1.20	Mottled brown/dark brown/orangey-brown reddish-brown gravelly sandy silty CLAY FILL with brickwork etc. MADE GROUND	1.07
2.50	1.30	Orangey-brown sandy clayey SILT/clayey silty fine to medium SAND MADE GROUND	-0.23
3.00	0.50	Medium dense orangey-brown gravelly clayey fine to medium SAND ALLUVIUM/THAMES BALLAST ?	-0.73
7.00	4.00	Dense orangey-brown sandy fine to coarse angular to rounded GRAVEL with occasional rounded cobbles THAMES BALLAST	-4.73
7.25	0.25	Soft to firm mottled orangey-brown/ brown silty CLAY	-4.98
		Firm to stiff brown with occasional dark greenish-grey mottling fissured very silty CLAY/fine sandy clayey SILT with occasional plant remains, white fine sandy streaks and fine sandy pockets and partings LONDON CLAY	

Client: L.D.D.C.

Remarks: Co-ordinates E538356 - N181533
Ch = Chemical samples
Chemical water sample taken at 6.00m

Water level observations during boring

Date	Time	Depth of Hole (m)	Depth of casing (m)	Depth of water (m)	Remarks
5.8.88.	08.00	6.00	6.00	4.60	STANDING LEVELS AT START OF SHIFT
6.8.88.	08.00	10.60	10.60	6.00	

Sampling / Properties

Depth	Type	Cu kPa	w%	SPT N
0.50-0.70	B			
0.70-1.00	B			
1.40-1.70	B			
2.00-2.45	CB			34
3.00-3.45	CB			43
4.00-4.45	CB			46
5.00-5.45	CB			51
6.00-6.45	CB			31
6.20	D			
6.50-6.95	U(47)	87	28	
7.25	D			
8.00-8.45	U(38)	107	28	
8.75	D			
9.50-9.95	U(36)	96	25	

Strata

Description	Depth	Level
	G.L.	1.78
MADE GROUND: Brown fine to coarse sand with a little fine to medium angular to sub-rounded gravel and many brick and concrete fragments. A2	1.40	0.38
MADE GROUND: Firm brown silty clay with a little fine to medium angular to sub-rounded gravel and many brick fragments. A1	1.70	0.08
Dense brown silty fine to coarse SAND with some fine to coarse angular to sub-rounded gravel and occasional pockets of firm brown-grey silty clay. B6	2.45	-.670
Dense yellow-brown slightly sandy fine to coarse angular to sub-rounded GRAVEL. C4	6.20	-4.42
Stiff mottled brown and orange-brown silty CLAY. A6b	6.50	-4.72
Stiff dark grey faintly laminated very closely fissured very silty occasionally slightly sandy CLAY with some light brown silty fine sand partings and occasional plant remains. D6b		

Drilling

Type	From	To	Size	Fluid
Cable Tool	0.00	25.00	0.15	

Groundwater

Co-ordinates: TQ 538414 181438 Ground Level: 1.78m AOD

Struck	Behaviour	Sealed	Date	Hole	Cased	Water
19.00	Rose to 14.45m in 20 minutes		19.09.89	6.00	6.00	4.35
			20.09.89	19.00	6.50	14.45

Remarks

Borehole Record

Exploration Associates

Project Northern Drainage - Phase 2A - Job No. 1079
London Docklands Development Corporation

Contract M9049

Borehole 5A (1 of 3)

Sampling / Properties

Depth	Type	Cu kPa	w%	SPT N
1.20-1.50	B			
1.50-1.95	U(49)			
2.50-2.95	CB			46
3.50-3.95	CB			34
4.50-4.95	CB			44
5.50-5.95	CB			47
6.20-6.50	B			
6.50-6.95	U(49)	98	24	
7.30	D			
8.00-8.45	U(55)	71	26	
8.75	D			
9.50-9.95	U(51)	104	27	

Strata

Description	Depth	Level
	G.L.	1.92
MADE GROUND**: Black ash fill and domestic refuse. A2	1.20	0.72
Stiff mottled brown and orange-brown silty sandy CLAY with occasional fine to medium angular to sub-angular gravel and rootlets. B1	2.00	-.080
Dense yellow-brown sandy fine to coarse angular to rounded GRAVEL. C4	6.20	-4.28
Stiff grey-brown very silty slightly sandy CLAY. D6b	6.50	-4.58
Stiff dark grey-brown faintly laminated very closely fissured very silty occasionally slightly sandy CLAY with some light brown silty fine sand partings and plant remains. D6b		

Drilling

Type	From	To	Size	Fluid
Cable Tool	0.00	25.00	0.15	

Groundwater

Co-ordinates: TQ 538453 181323 Ground Level: 1.92m AOD

Struck	Behaviour	Sealed	Date	Hole	Cased	Water
19.60	Rose to 13.00m in 20 minutes		27.09.89	6.00	6.00	4.28
			28.09.89	15.00	8.00	DRY
			29.09.89	25.00	18.00	13.00

Remarks Permeability tests carried out at 4.60m, 6.00m and 7.30m.

Borehole Record

Exploration Associates

Project Northern Drainage - Phase 2A - Job No. 1079
London Docklands Development Corporation

Contract M9049

Borehole 6A (1 of 3)

APPENDIX C

ENVIRONMENT AGENCY PRODUCT 4 DETAILED FLOOD RISK MAPS

Product 4 (Detailed Flood Risk) for: Aberfeldy Village, London, E14 0PT
Reference: HNL 195148 AS
Date: 03/12/2020

Contents

- Flood Map for Planning (Rivers and Sea)
- Flood Map Extract
- Thames Estuary 2100 (TE2100)
- Thames Tidal Upriver Breach Inundation Modelling 2017
- Thames Tidal Upriver Breach Inundation Modelling Map
- Site Node Locations Map
- Defence Details
- Recorded Flood Events Data
- Recorded Flood Events Outlines Map
- Additional Information

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.

Please refer to the Open Government Licence which explains the permitted use of this information.

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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 https://www.gov.uk/check-flood-risk

At this Site:

The Flood Map shows that this site lies within Flood Zone 3 - with a 1% chance of flooding from rivers (fluvial flooding) and a 0.5% chance of flooding from the sea (tidal flooding) in any given year.

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 tidal River Thames through the Thames Tidal Defences Study completed in 2006 by Halcrow Ltd.

Thames Estuary 2100 (TE2100)

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 Thames node closest to your site is **2.46**; the locations of nearby nodes on the River Thames are also shown on the enclosed map.

Details about the TE2100 plan

The Plan sets out how the Environment Agency and our partners can work together to manage tidal flood risk, from now until the end of the century. It is an adaptive plan for managing the Thames Estuary, including the tidal defence system, until 2100 so that current standards of flood protection are maintained or improved taking into account climate change effects e.g. sea level rise. The Plan has 3 phases of activity:

- Until 2035 – maintain and improve current defences, safeguard areas required for future improvements, and monitor climate change indicators.
- 2035-2050 – raise existing walls, defences & smaller barriers whilst reshaping the riverside environment.
- 2050-2100 – determine and implement an option for the future of the Thames Barrier, and adapt other defences as required to work alongside this to protect the estuary.

The Thames Estuary 2100 Plan can be found at: https://www.gov.uk/government/publications/thames-estuary-2100-te2100

Details about the TE2100 in-channel levels

The TE2100 in-channel levels take 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 the Barrier would normally shut for the 2008 epoch – will have to be allowed through to ensure that the barrier is not shut too often. For this reason, levels upriver of the barrier will increase and the tidal walls will need to be heightened to match.

Why is there no return period for levels upriver of the barrier?

The levels upriver 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 upriver 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.

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TE2100 2008 levels:

Levels downriver of the Thames Barrier are 0.1% AEP (1 in 1000) and levels upriver are the highest levels permitted by the Thames Barrier, described as the Maximum Likely Water Levels (MLWLs). The defence levels (left defence, right defence) are the minimum levels to which the defences should be built.

Node	Easting	Northing	Extreme water level (m)	Present Day Statuatory Defence Level (Thames Left Bank) (m)	Allow for future 2100 defence raising to a level of... (Thames Left Bank)
2.46	538943	180471	4.67	5.23	6.20
2.46au	539436	180390	4.66	5.18	6.20

TE2100 climate change levels:

			2065 to 2100		**2100**	
Node	Easting	Northing	Design water level	Defence level (both banks)	Design water level	Defence level (both banks)
2.46	538943	180471	5.16	5.70	5.65	6.20
2.46au	539436	180390	5.15	5.70	5.64	6.20

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Thames Tidal Upriver Breach Inundation Modelling

The map attached displays site-specific modelled flood levels at your site. These have been taken from the Thames Tidal Upriver Breach Inundation Modelling Study 2017 completed by Atkins Ltd. in May 2017.

We have developed a modelling approach where all upriver breach locations along the Thames are equitably modelled, to ensure a consistent approach across London. This modelling simulates 5679 continuous tidal breaches along the entire extent of the Thames from Teddington to the Thames Barrier. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.

For breaches upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. The levels used are referred to as Maximum Likely Water Levels (MLWLs). Therefore 2005 and 2100 epochs were modelled on that basis.

This modelling has two epochs to consider; the 2005 epoch is a representation of today’s flood levels without climate change considerations taken into account, and the 2100 epoch which takes into account changes likely to be seen due to climate change.

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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 **tidal** flood event. The defences are all raised, man-made and privately owned. It is the riparian owners' responsibility to ensure that they are maintained to a crest level of **5.23m** mAODN (the Statutory 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 **3 (fair),** 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://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities

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:

https://www.gov.uk/government/publications/thames-estuary-2100-te2100

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 are provided in the enclosed map.

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 and drainage systems that have been overwhelmed.

Other Sources of Flood Risk

The Lead Local Flood Authority for your area are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse) and may hold further information .

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.

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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:-

https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

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:

https://www.gov.uk/flood-risk-standing-advice-frsa-for-local-planning-authorities

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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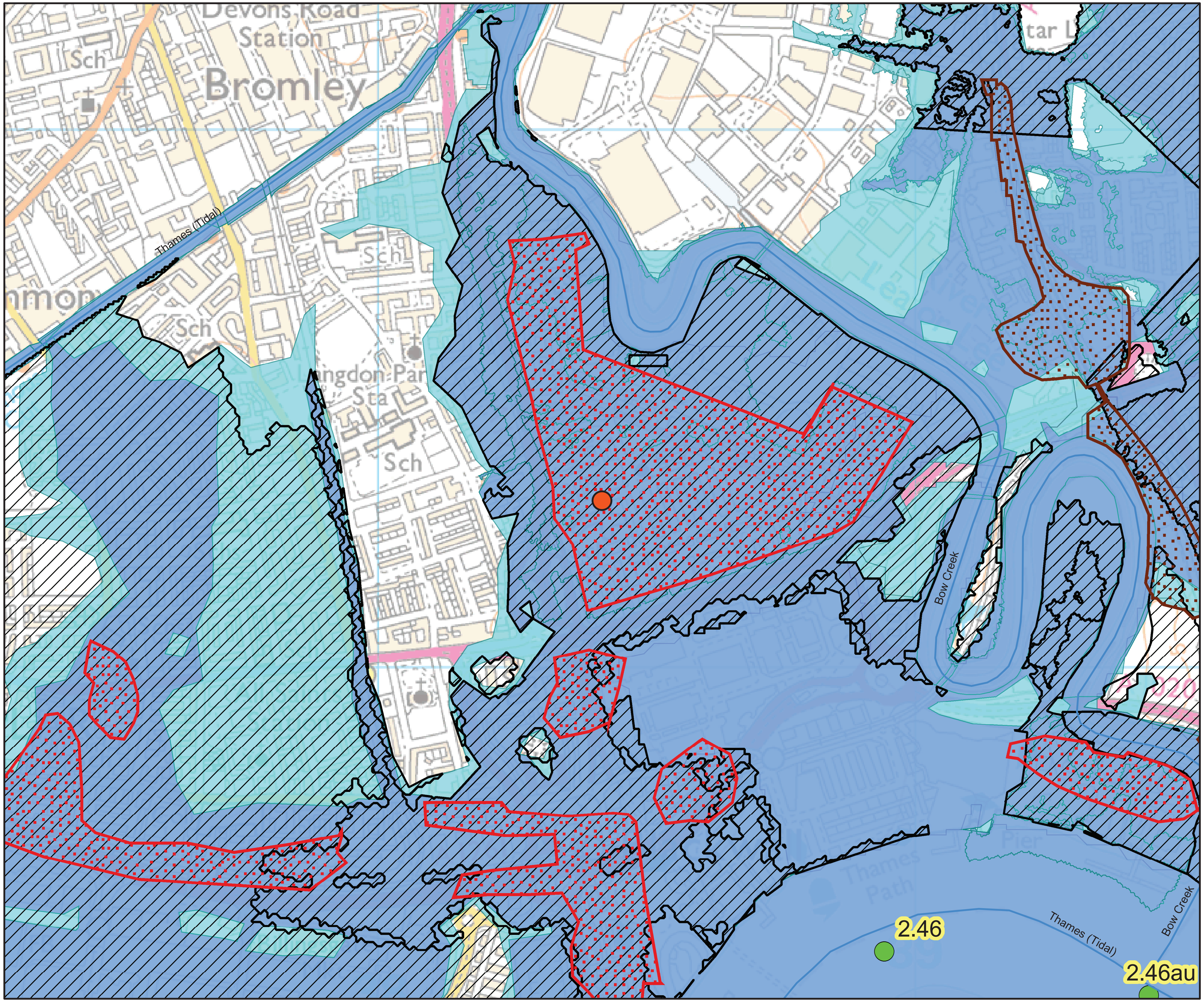
Detailed FRA/FCA for: Aberfeldy Village, London, E14 0PT - 03/12/2020 - HNL 195148 AS



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N

0 150 300 600
Metres

Legend

- Main Rivers
- Site location
- TE2100Nodes
- 1707 Flood Outline
- 1928 Flood Outline
- 1953 Flood Outline
- Areas Benefiting from Flood Defences
- Flood Zone 3
- Flood Zone 2

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Produced by:
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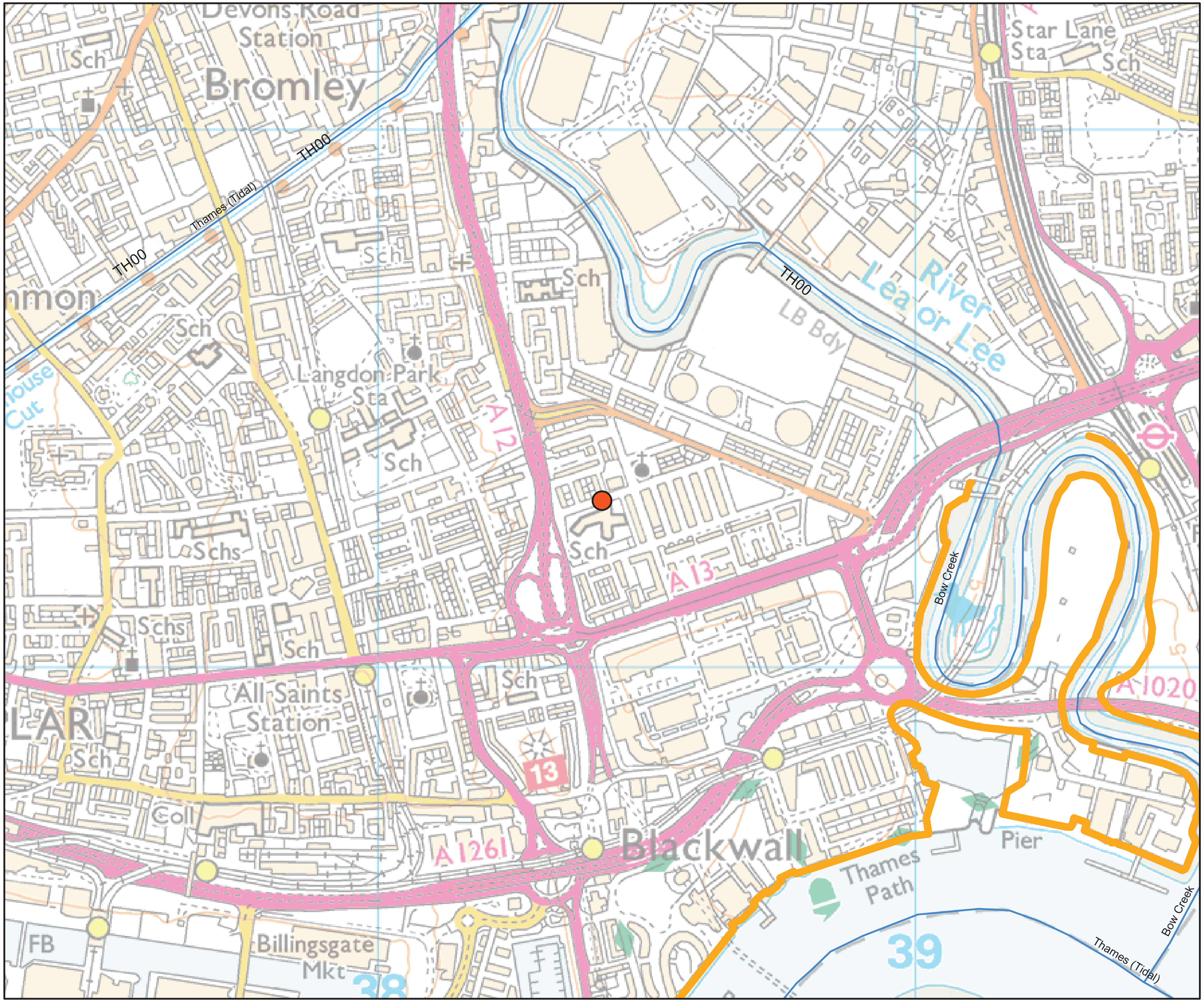
Detailed FRA/FCA for: Aberfeldy Village, London, E14 0PT - 03/12/2020 - HNL 195148 AS



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N

0 150 300 600
Metres

Legend

Main Rivers

Site location

TTD Defences SDL (mAODN)

SDL

5.23

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

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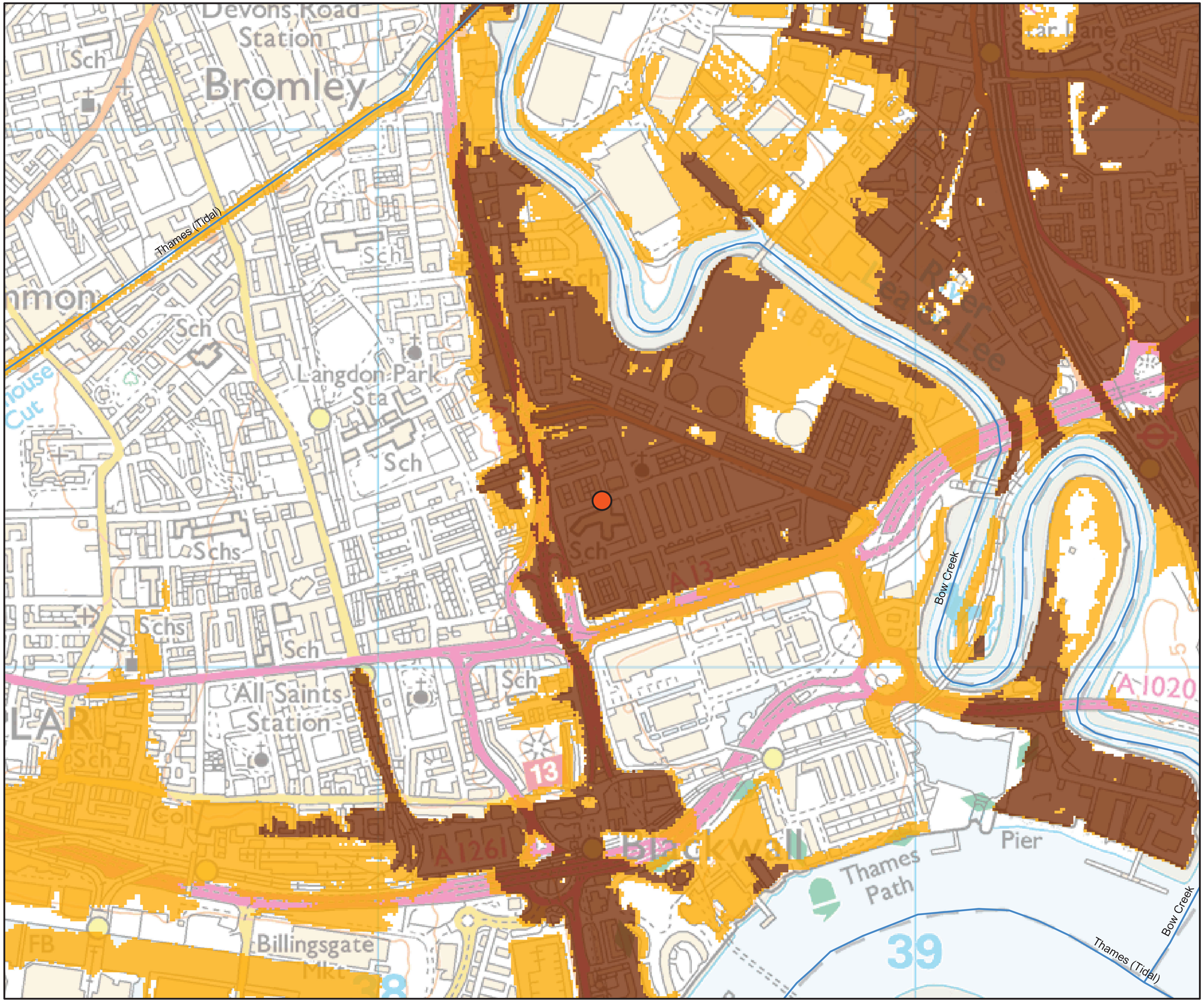
Breach Modelling Map for: Aberfeldy Village, London, E14 0PT - 03/12/2020 - HNL 195148 AS



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N

0 150 300 600
Metres

Legend

Main Rivers

Site location

Upstream Breach Outlines

Epoch

2005

2100

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

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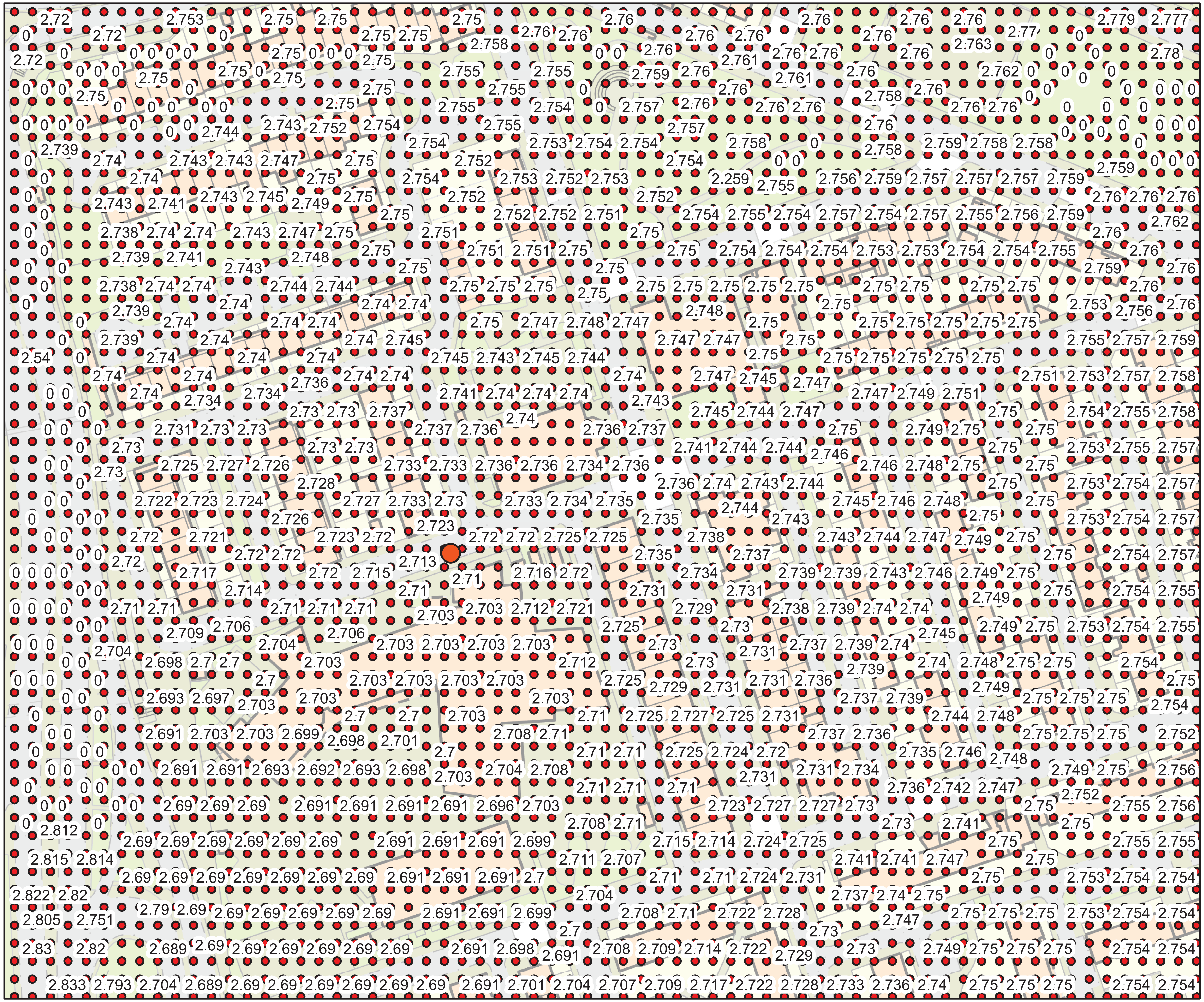
Modelled Flood Levels For: South West Aberfeldy Village, London, E14 0PT - 03/12/2020 - HNL 195148 AS



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N

0 20 40 80
Metres

Legend

Main Rivers

Site location

Tidal Breach Height (mAOD) 2005

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

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N

0 20 40 80
Metres

Legend

Main Rivers

Site location

Tidal Breach Height (mAOD) 2100

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

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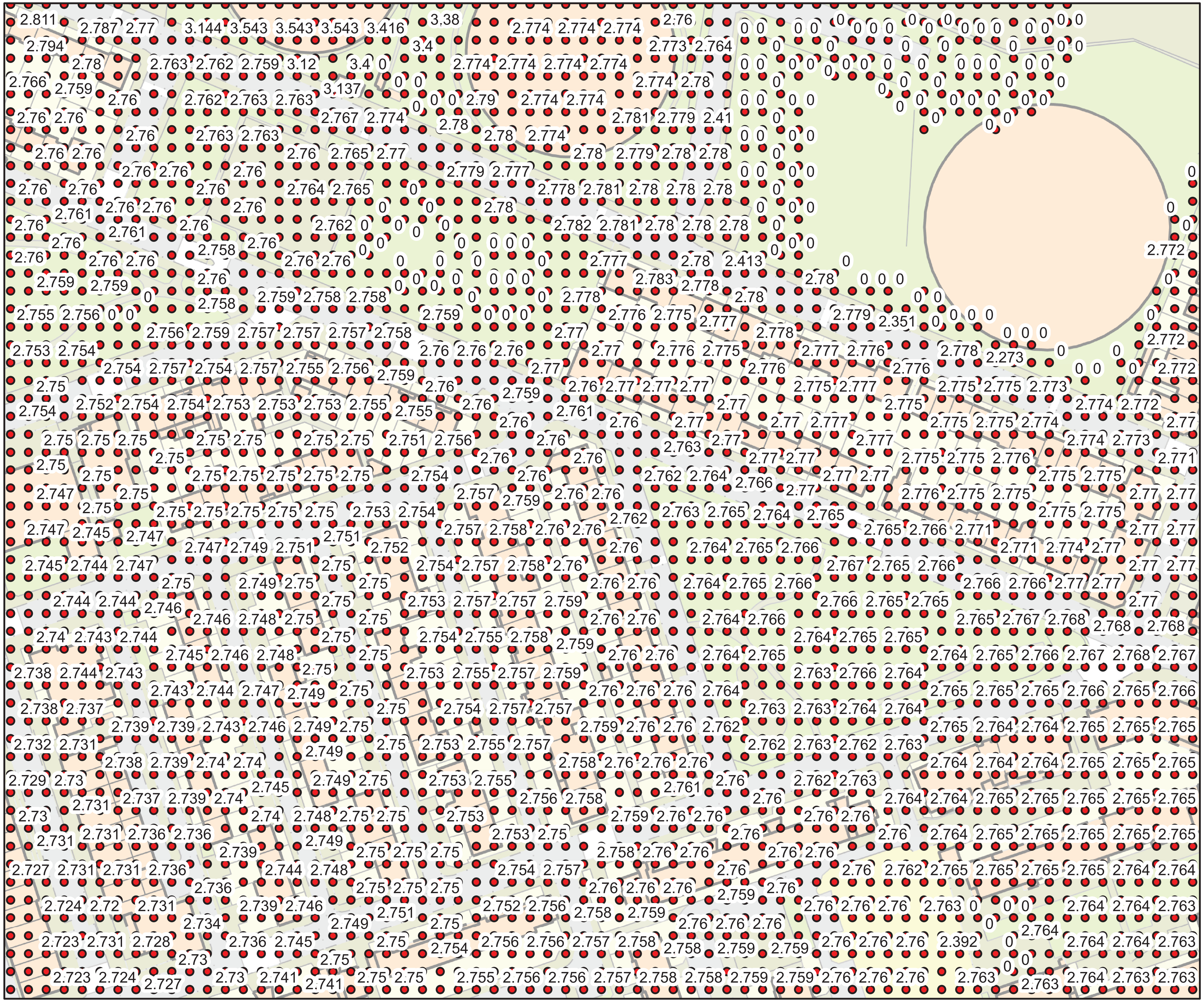
Modelled Flood Levels For: South East Aberfeldy Village, London, E14 0PT - 03/12/2020 - HNL 195148 AS



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Main Rivers

Site location

Tidal Breach Height (mAOD) 2005

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A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

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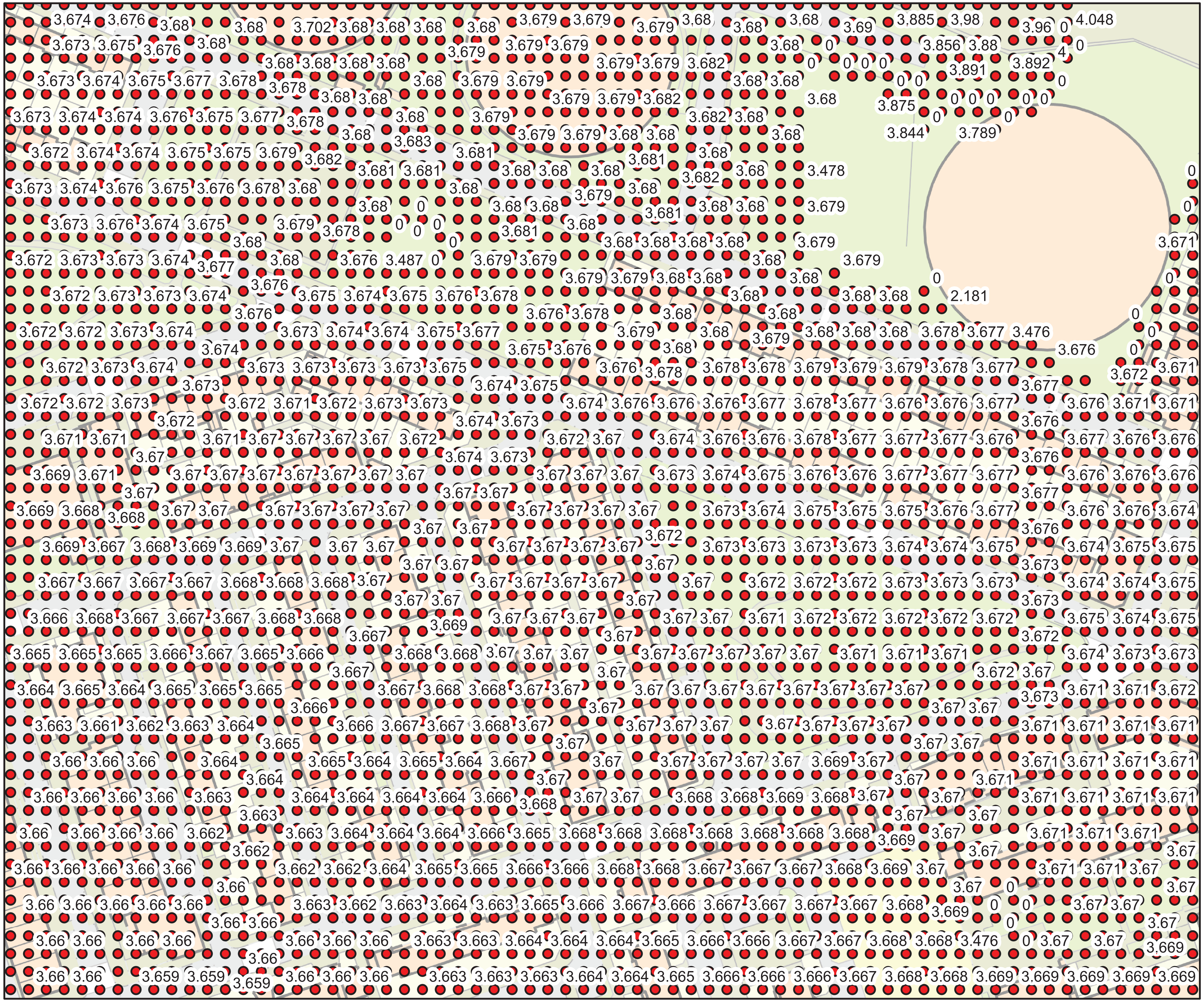
Modelled Flood Levels For: South East Aberfeldy Village, London, E14 0PT - 03/12/2020 - HNL 195148 AS



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N

0 20 40 80
Metres

Legend

Main Rivers

Site location

Tidal Breach Height (mAOD) 2100

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

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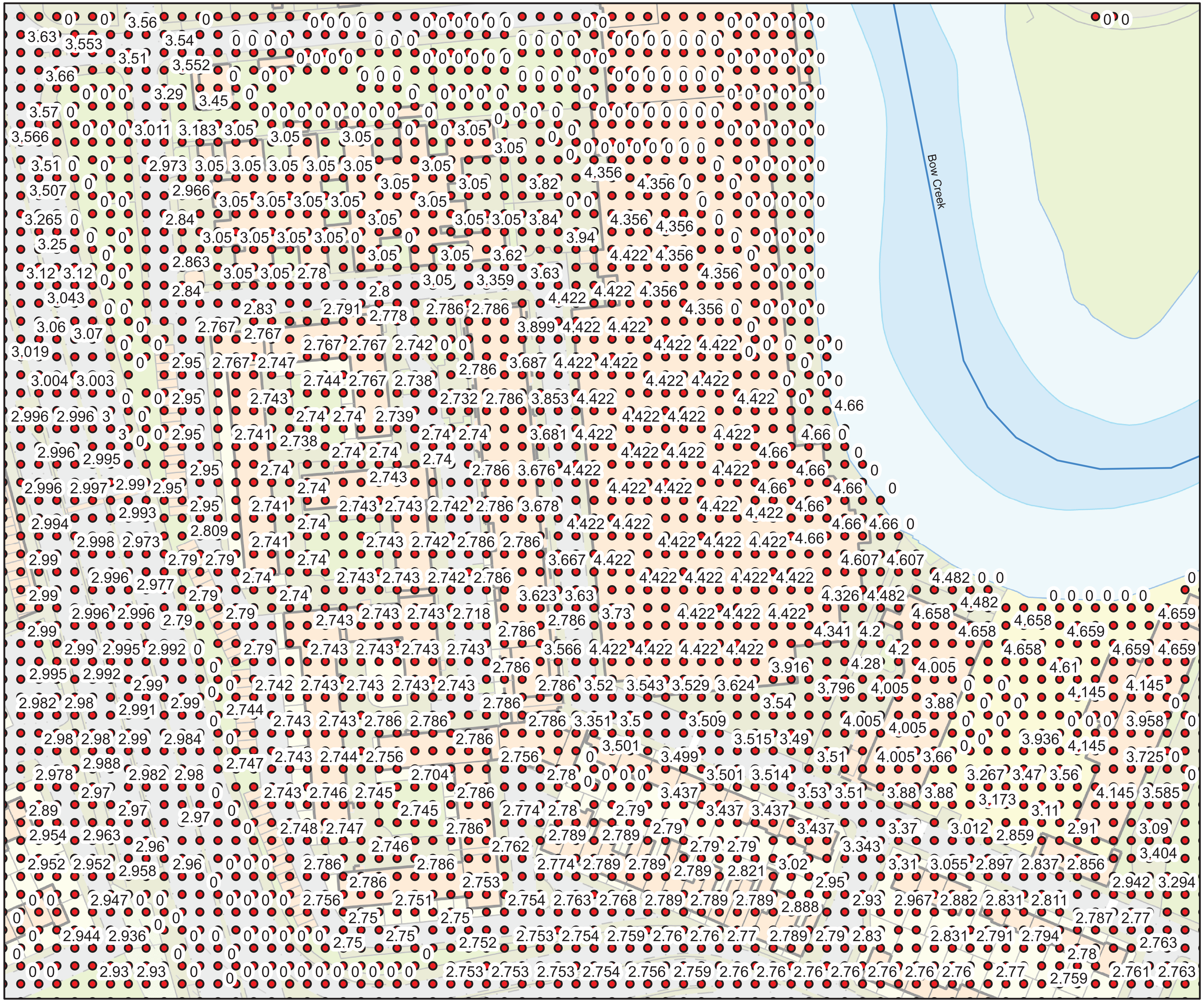
Modelled Flood Levels For: North Aberfeldy Village, London, E14 0PT - 03/12/2020 - HNL 195148 AS



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N

0 20 40 80
Metres

Legend

Main Rivers

Site location

Tidal Breach Height (mAOD) 2005

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

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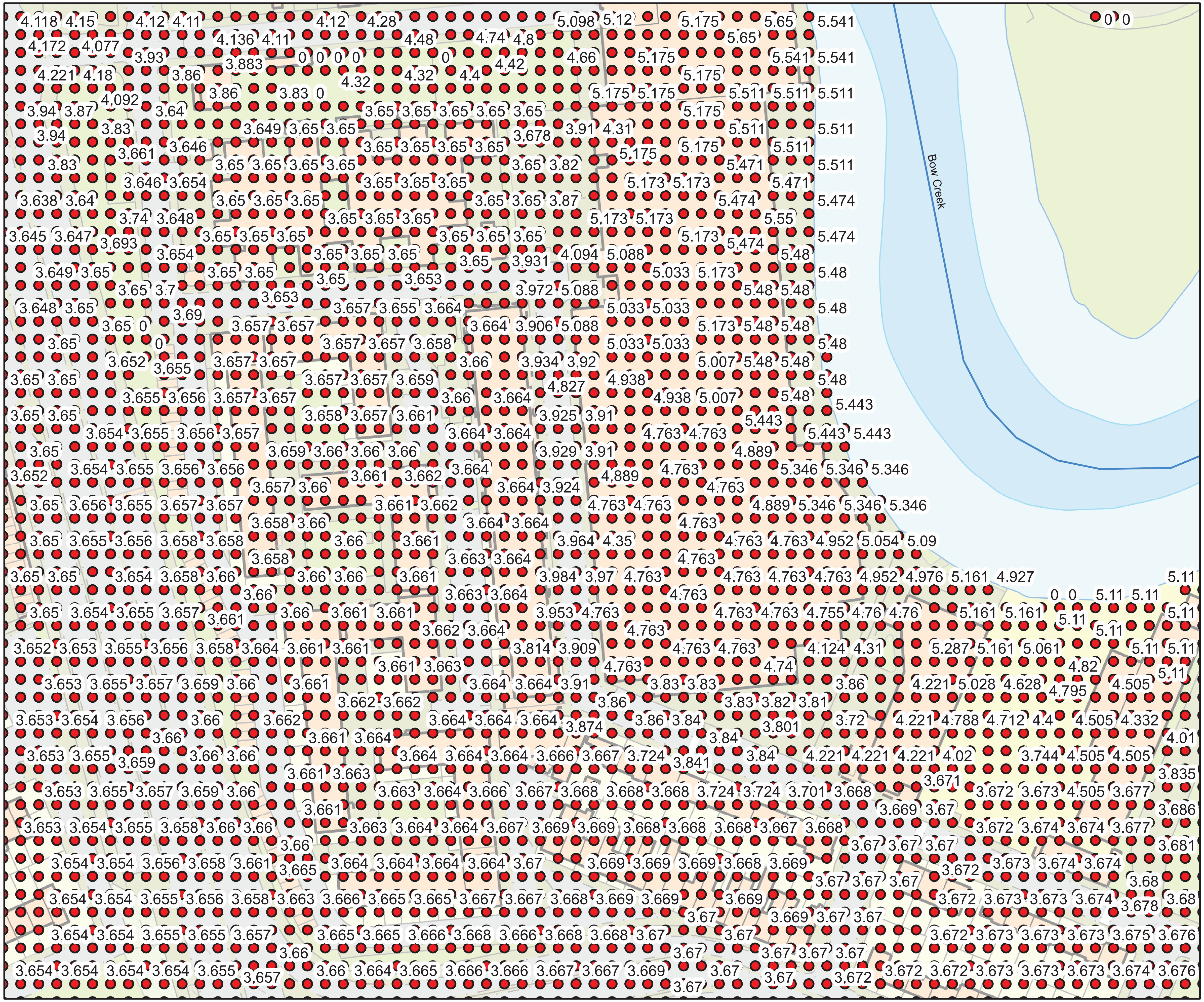

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N

0 20 40 80
Metres

Legend

Main Rivers

Site location

Tidal Breach Height (mAOD) 2100

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

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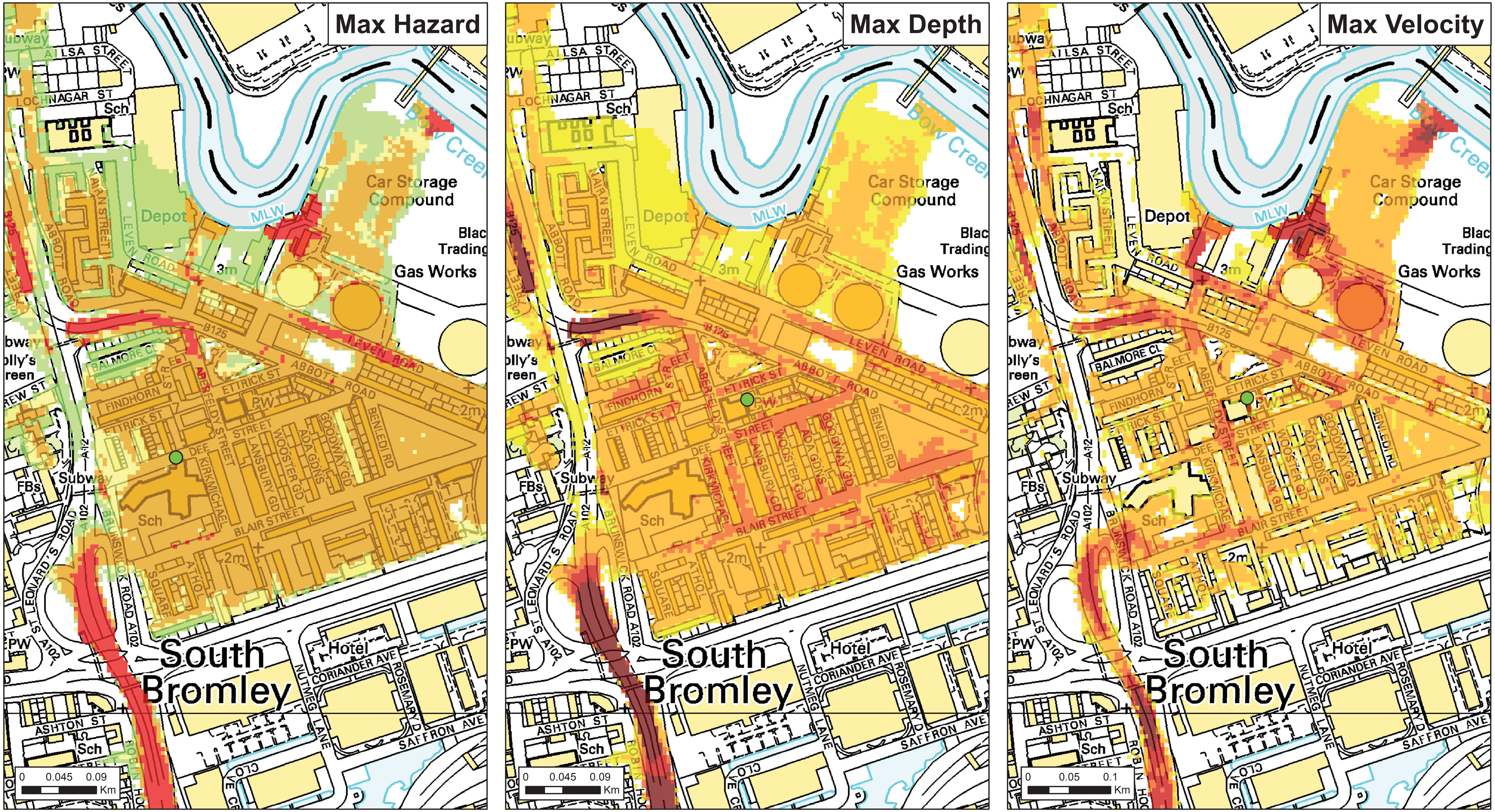


Max Hazard	Max Depth (m)	Max Velocity (m/s)
Less than 0.75 (Low Hazard)	0 - 0.25	0 - 0.3
Between 0.75 and 1.25 (Danger for Some)	0.25 - 1.00	0.3 - 1.0
Between 1.25 and 2.00 (Danger for Most)	1.00 - 1.50	1.0 - 1.5
Greater than 2.00 (Danger for All)	1.50 - 2.00	1.5 - 2.5
	> 2.00	> 2.5

Date Printed	03/12/2020	Scenario year	2005	Scenario Annual Chance	0.5% (1 in 200)

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

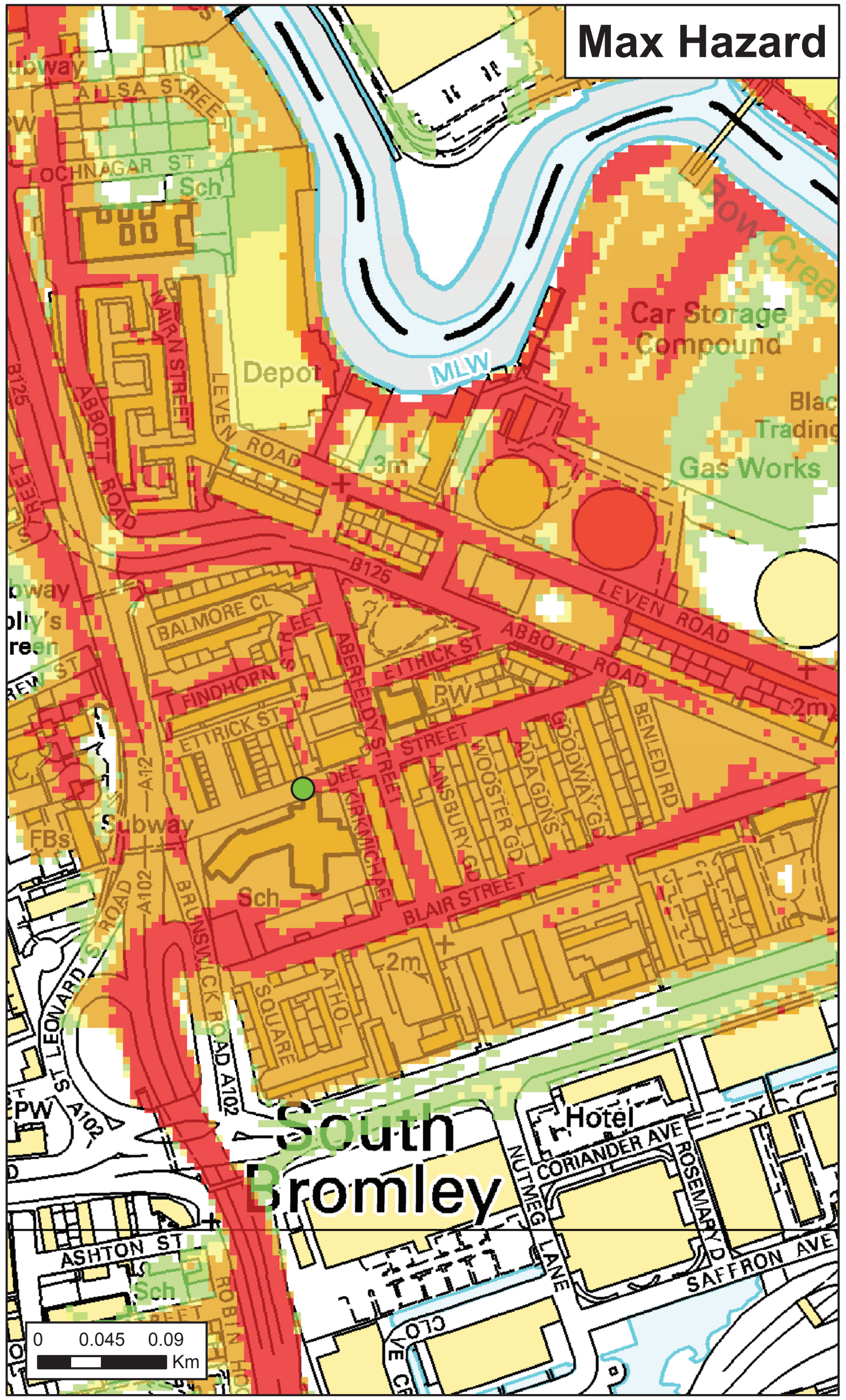
Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.

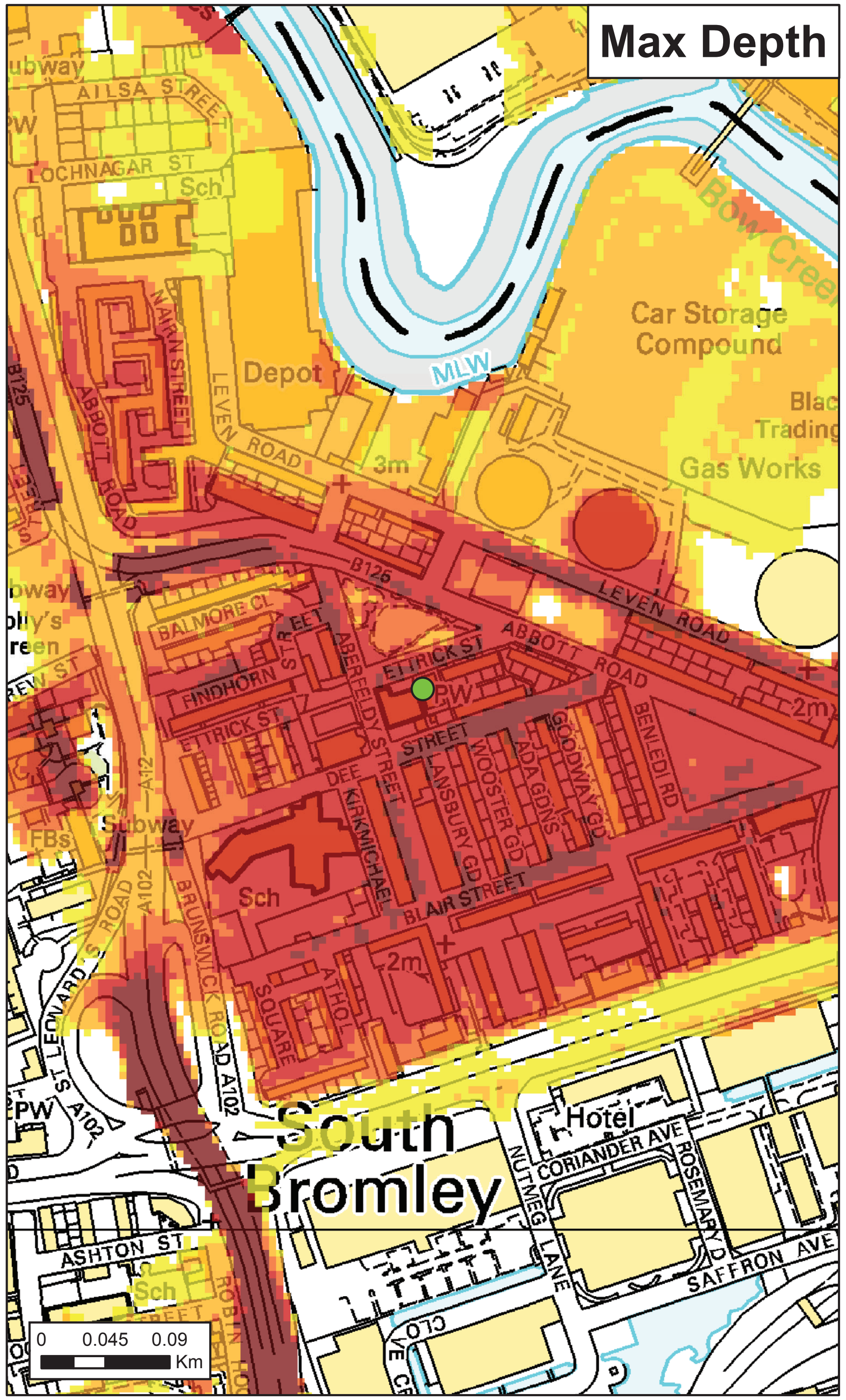
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

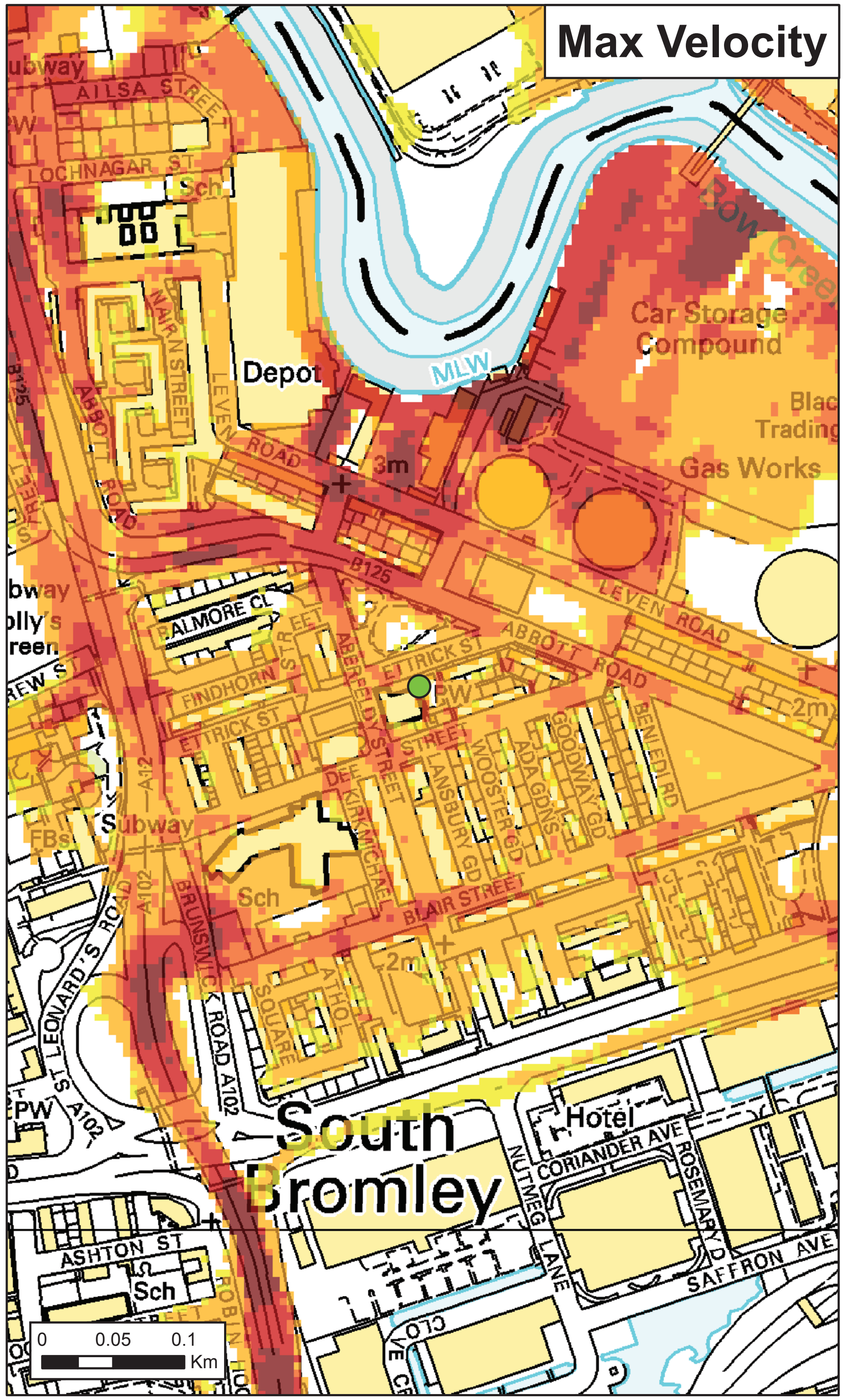
Environment Agency

Thames Tidal Breach Hazard Mapping

Map Centred on 538,503 181,371







Max Hazard

Less than 0.75	(Low Hazard)
Between 0.75 and 1.25	(Danger for Some)
Between 1.25 and 2.00	(Danger for Most)
Greater than 2.00	(Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- > 2.5

Date Printed	03/12/2020	Scenario year	2100	Scenario Annual Chance	0.5% (1 in 200)

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.

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Environment Agency

Thames Tidal Breach Hazard Mapping

Map Centred on 538,503 181,371

APPENDIX D

ENVIRONMENT AGENCY RESPONSE LETTERS

creating a better place

Environment Agency

Clare Richmond
Development Management
Planning & Building Control
Town Hall, Mulberry Place
5 Clove Crescent
London
E14 2BG

Our ref: NE/2021/133603/01-L01
Your ref: PA/21/01820/NC

Date: 14 September 2021

Dear Clare,

Aberfeldy Estate, Abbott Road, Land to the north of East India Dock Road (A13), London E14

Request for an Environmental Impact Assessment (EIA) scoping opinion under Regulation 15 of the Town and Country Planning (Environmental Impact Assessment) regulations 2017 (as amended), in respect of a hybrid planning application for the demolition of existing buildings and the redevelopment of the site to comprise approximately 1,600 residential units, 7,500sqm of non-residential uses, new and improved access arrangements, associated servicing and landscaping, and public open space. Full planning permission will be sought for approximately 270 residential units and 2,500sqm of non-residential uses.

Thank you for consulting us on the above Environmental Impact Assessment (EIA) on 16 August 2021.

The site is located within **Flood Zone 3** and is protected to a very high standard by the Thames tidal flood defences up to a 1 in 1000 (0.1%) chance in any year flood event. Our latest flood modelling shows the site would be at risk if there was to be a breach in the defences or they were to be overtopped.

We would require an assessment of the most up to date breach data to be included within the Flood Risk Assessment (FRA) to ensure there is appropriate consideration of the residual flood risk. The submitted FRA will need to demonstrate that there will be no sleeping accommodation below the modelled tidal breach flood level OR that there will be a permanent fixed barrier in place at or above the modelled tidal breach flood level to prevent floodwater entering any sleeping accommodation below the modelled breach flood level.

The FRA will need to demonstrate how the proposed development and the site users will be kept safe for the lifetime of the development. The proposal will need to consider a safe means of access and/or egress in the event of flooding from all new buildings to an area wholly outside the floodplain. Lastly, to improve flood resilience, we recommend that, where feasible, finished floor levels are set above the 2100 breach flood level.

Advice to LPA

Sequential Test
In accordance with the NPPF (paragraph 158), development should not be permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. It is for the local planning authority to determine if the sequential test has to be applied and whether or not there are other sites available at lower flood risk. Our flood risk standing advice reminds you of this and provides advice on how to apply the test.

Insurance eligibility
New homes built in flood risk areas after 1 January 2009 are not covered by the Flood Re-insurance scheme and may not be eligible for home insurance. We advise contacting an insurance provider to discuss whether your development would qualify for insurance.

Flood Risk Management Scheme Funding eligibility
New properties and buildings converted to housings within areas of flood risk after 1 January 2012 will not be counted towards the outcome measures of any proposed future flood alleviation scheme. This is to avoid inappropriate development in flood risk areas. Further information can be found at https://www.gov.uk/government/publications/calculate-grant-in-aid-funding-flood-risk-management-authorities

Flood resistance and resilience
We strongly recommend the use of flood resistance and resilience measures. Physical barriers, raised electrical fittings and special construction materials are just some of the ways you can help reduce flood damage.

To find out which measures will be effective for this development, please contact your building control department. If you'd like to find out more about reducing flood damage, visit the Flood Risk and Coastal Change pages of the planning practice guidance. Further guidance on flood resistance and resilience measures can also be found in:

Government guidance on flood resilient construction
https://www.gov.uk/government/publications/flood-resilient-construction-of-new-buildings

CIRIA Code of Practice for property flood resilience
https://www.ciria.org/Research/Projects_underway2/Code_of_Practice_and_guidance_for_property_flood_resilience_.aspx

British Standard 85500 – Flood resistant and resilient construction
https://shop.bsigroup.com/ProductDetail/?pid=000000000030299686

Advice to applicant

Water Resources
Increased water efficiency for all new developments potentially enables more growth with the same water resources. Developers can highlight positive corporate social responsibility messages and the use of technology to help sell their homes. For the homeowner lower water usage also reduces water and energy bills.

We endorse the use of water efficiency measures especially in new developments. Use of technology that ensures efficient use of natural resources could support the environmental benefits of future proposals and could help attract investment to the area. Therefore, water efficient technology, fixtures and fittings should be considered as part of new developments.

Residential developments
All new residential development are required to achieve a water consumption limit of a maximum of 125 litres per person per day as set out within the Building Regulations &c. (Amendment) Regulations 2015.

However, we recommend that in areas of serious water stress (as identified in our report Water stressed areas - final classification) a higher standard of a maximum of 110 litres per person per day is applied. This standard or higher may already be a requirement of the local planning authority.

Commercial/Industrial developments
We recommend that all new non-residential development of 1000sqm gross floor area or more should meet the BREEAM 'excellent' standards for water consumption.
We also recommend you contact your local planning authority for more information.

Signing up for flood warnings
The applicant/occupants should phone Floodline on 0345 988 1188 to register for a flood warning, or visit https://www.gov.uk/sign-up-for-flood-warnings. It's a free service that provides warnings of flooding from rivers, the sea and groundwater, direct by telephone, email or text message. Anyone can sign up.

Flood warnings can give people valuable time to prepare for flooding – time that allows them to move themselves, their families and precious items to safety. Flood warnings can also save lives and enable the emergency services to prepare and help communities.

For practical advice on preparing for a flood, visit https://www.gov.uk/prepare-for-flooding.

To get help during a flood, visit https://www.gov.uk/help-during-flood.

For advice on what do after a flood, visit https://www.gov.uk/after-flood.

Final comments
Thank you for contacting us regarding the above application. Our comments are based on our available records and the information submitted to us. Please quote our reference number in any future correspondence. Please provide us with a copy of the decision notice for our records. This would be greatly appreciated.

Should you have any queries regarding this response, please contact me.

Yours sincerely,

Hannah Malyon
Sustainable Places Planning Advisor

Direct dial: 0208 474 9666
E-mail: HNLSustainablePlaces@environment-agency.gov.uk

creating a better place

Environment Agency

Nelupa Malik
London Borough of Tower Hamlets
Development Control
PO Box 55739
London
E14 1BY

Our ref: NE/2021/133954/01
Your ref: PA/21/02377

Date: 21 December 2021

Dear Nelupa

Hybrid application seeking detailed planning permission for Phase A and outline planning permission for future phases, comprising: Outline planning permission (all matters reserved) for the demolition of all existing structures and redevelopment to include a number of buildings ranging between maximum heights of 13.5m AOD and 100m AOD and up to 141,014sqm (GEA) of floorspace comprising the following mix of uses: ? Up to a maximum of 133,971sqm (GEA) of Residential floorspace (Class C3); ? Up to 4,444sqm (GEA) of retail, workspace, food and drink uses (Class E); ?Car and cycle parking; ?Formation of new pedestrian route through the conversion and repurposing of the Abbott Road vehicular underpass for pedestrians and cyclists; ?Landscaping including new open spaces and public realm and ?New means of access, associated infrastructure and highways works. In Full, for 30,133sqm (GEA) residential (Class C3) floorspace to include a number of buildings ranging between maximum heights of 25.17m (AOD) and 42.73m (AOD), 1341 sqm of retail, food and drink uses associated with a replacement Neighbourhood Centre and a temporary marketing suite (Class E and Sui Generis), together with access, car and cycle parking, associated landscaping and new public realm, and improvements to Braithwaite Park and Leven Road Open Space. This application is accompanied by an Environmental Statement.

Aberfeldy Estate, Phase A, Land to the north of East India Dock Road (A13), east of the Blackwall Tunnel Northern Approach Road (A12) and to the south west of Abbot Road.

Thank you for consulting us on this planning application. We have **no objections** to the proposed development.

The site is located within Flood Zone 3 and is protected to a very high standard by the Thames tidal flood defences up to a 1 in 1000 (0.1%) chance in any year flood event. Our latest flood modelling shows the site would be at risk if there was to be a breach in the defences or they were to be overtopped.

We are satisfied that:

- *The developer has assessed the risk from a breach in the Thames tidal flood defences using the latest modelled tidal breach data.*
- The developer has not proposed any sleeping accommodation below the modelled tidal breach flood level.

Cont/d..

The proposal does not have a safe means of access and/or egress in the event of flooding from all new buildings to an area wholly outside the floodplain however, safe refuge within the higher floors of the development has been suggested.

To improve flood resilience, we recommend that, where feasible, finished floor levels are set above the 2100 breach flood level, **which is 3.68mAOD in the Southern parcel and 5.10mAOD in the northern parcel of the development**.

Informative – advice to LPA

We do not normally comment on or approve the adequacy of flood emergency response procedures accompanying development proposals, as we do not carry out these roles during a flood. Our involvement with this development during an emergency will be limited to delivering flood warnings to occupants / users covered by our flood warning network.

In line with the Planning Practice Guidance (PPG) to the National Planning Policy Framework, any assessment of the safety of a development from flooding should consider the ability of site residents / users to safely access and exit the building during a design flood event, as well as their ability to evacuate ahead of an extreme flood. One of the key considerations to ensure that any new development is safe is whether or not adequate flood warnings would be available to people using the development.

In all circumstances where warning and emergency response is fundamental to managing flood risk, we advise local planning authorities to formally consider the emergency planning and rescue implications of new development in making their decisions. As such, we recommend you consult with your emergency planners and the emergency services to determine whether the proposals are safe and in accordance with the guiding principles of the PPG.

We have considered the findings of the flood risk assessment in relation to the likely duration, depths, velocities and flood hazard rating against the design flood for the proposal. This does not mean we consider that the access is safe nor the proposals acceptable in this regard. We remind you to consult with your emergency planners and the emergency services to confirm the adequacy of the evacuation proposals. Any assessment should be based on the breach data included within the submitted FRA.

Final comments:

Once again thank you for consulting us on this planning application. Please contact me should you have any questions.

Yours sincerely,

Mr Demitry Lyons
Sustainable Places Planning Advisor

End

Aberfeldy Village, London

Masterplan, Below Ground Drainage Strategy

Stage 2+ Planning Issue

Issue P08 – 6th April 2022

Prepared For:

ECOWORLD AND POPLAR HARCA

MEINHARDT

MEINHARDT

ABERFELDY VILLAGE, LONDON

BELOW GROUND DRAINAGE STRATEGY

ISSUED FOR PLANNING

Quality Assurance Page

Issue	Date	Prepared By	Checked By	Approved By	Remarks
DRAFT	18/12/2020	Mrs. M. Burca	Mr. C. Ryan	Mr. C. Ryan	Draft Issue
P01	17/09/2021	Mr. L. Hornblow	Mr. L. Boustead	Mr. C. Marchant	Draft Stage 2+ Planning Issue
P02	06/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Draft Stage 2+ Planning Issue
P03	12/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Stage 2+ Planning Issue
P04	22/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Stage 2+ Planning Issue
P05	26/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Updated to address ES comments.
P06	08/03/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Draft revised planning issue
P07	01/04/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Revised planning issue
P08	06/04/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Revised planning issue

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Appendix B – Thames Water Asset Records and Pre Development Enquiry Response
Appendix C – Drainage Strategy Drawings and Calculations
Appendix D – Tower Hamlets SUDS Proforma
Appendix E – Architects Plans

Executive Summary

Meinhardt UK Ltd has been appointed by Ecoworld International to undertake the foul and surface water below ground drainage design for the proposed construction of Aberfeldy Village. The scheme consists of approximately 1500 units proposed across multiple Phases. The proposals comprise of a number of blocks including podiums and some towers up to 29 stories in height. The Site is located within the London Borough of Tower Hamlets in an area known as Poplar Riverside, Aberfeldy Village, E14, London.

The proposed surface water drainage strategy for each phase has been developed to utilise sustainable drainage techniques (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding of the Thames Water sewer network in the local area. A scheme has been developed that utilises blue, green and podium deck attenuation roof structures along with below ground cellular attenuation tanks designed for the 1:100 year plus 40% climate change storm event.

The developments QBAR greenfield runoff rate has been calculated to be 22.4/s. It is proposed that the entire site will discharge at this rate as agreed with the London Borough of Tower Hamlets. Each building and associated hardstanding being proposed to discharge at a proportion of this flow rate, this has been split between 13 separate connections across the site receiving the total 22.4/s. Each buildings associated storm water drainage is conveyed by a traditional gravity run system to the nearest Thames Water Asset, with all connection discharging into the Thames Water combined water Sewer network.

As the development must ensure that private and public drainage areas remain separate, due to ownership and future maintenance as well as adoption requirements the total site area considered for the drainage strategy is based on the private areas, and not the entire site area of 9.1ha. The site area is circa 5.92ha, which excludes council adopted roads and green areas, as such the total hardstanding (impermeable area) is circa 3.2ha.

The option of infiltrating has been dismissed due to the requirement to ensure an exclusion zone of 5m is provided from each soakaway structure to either buildings or public highway, as such no space is available to allow for an full infiltration strategy, additionally although it is feasible to drain into the River Terrace Deposits (gravels) it would not be recommended as it can cause flooding of existing basements given the impermeable London Clay cap below.

The proposed foul water drainage strategy for the site involves the MEP engineer's coordination of the superstructure drainage up until it exits the buildings and enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings and convey to a demarcation chamber, before discharging via gravity to the existing Thames Water combined water sewers within the site or surrounding the site. This will be coordinated during detailed design.

A pre planning enquiry has been submitted to Thames Water stating the proposed foul and surface water discharge rates from the new development. Thames Water had responded giving approval for both however, new plans have been submitted since and flow rate applied from the scheme has reduced from that agreed in the pre planning, it is therefore assumed this is still accepted.

The Thames Water asset records for the site highlighted potential foul and surface water connection points however further CCTV survey works will need to be undergone before any detailed design.

Refer to drainage drawings 2812-MHT-CV-BG-DR-100 and 2812-MHT-CV-RF-DR-101 within the appendix for proposed drainage layout.

1 Introduction

This Drainage Strategy Report has been prepared by a Meinhardt and is submitted in support of a hybrid planning application for the Aberfeldy Village Masterplan. The hybrid planning application is made in relation to the north of East India Dock Road (A13), east of the Blackwall Tunnel Northern Approach Road (A12) and to the southwest of Abbot Road (the "Site") on behalf of The Aberfeldy New Village LLP' ("The Applicant"). The hybrid planning application is formed of detailed development proposals in respect of Phase A for which no matters are reserved ("Detailed Proposals"), and outline development proposals for the remainder of the Site, with all matters reserved ("Outline Proposals"). The Detailed Proposals and Outline Proposals together are referred to as the "Proposed Development".

This report is an update to the version dated 22/04/2021 (P04) that was submitted to the Council in support of the hybrid planning application. This updated version has been prepared in response to the changes to the planning application boundary as explained in the covering letter to accompany the amendments to the Proposed Development as well as comments received from the GLA and Water Resources ES Chapter on the ES chapter and technical reports for which the Drainage Strategy formed part off. The sections of this report that are different from those contained in the original version submitted in 2021 are contained [on pages 3, 10, 11, 13, 14, 15 and 23 and relate to Jolly's Green/please describe the relevant amendment. We have highlighted these changes in red within the document for ease.

The Proposed Development comprises the comprehensive redevelopment of the Site. The Proposed Development will provide new retail and workspace floorspace along with residential dwellings and the pedestrianisation of the A12 Abbott Road vehicular underpass to create a new east to west route. The Development will also provide significant, high quality public realm, including a new Town Square, a new High Street and a public park.

The purpose of the Drainage Strategy Report is to assist our client and the Local Planning Authority to make an informed decision regarding the drainage strategy for the proposed development in addition to assist the BREEAM assessor with the rewarding of credits under Pol 03.

2 Existing Drainage

1.1 Existing Site

The existing site is located in an area known as Poplar Riverside, Aberfeldy Village, E14, London, within the London Borough of Tower Hamlets.

The existing site is a mixed-use development consisting of residential housing and non-residential floor space, including shops, professional services, food and drink, residential institution, storage, community and cultural uses.

The Site is located in Poplar, within the administrative boundary of the London Borough of Tower Hamlets. The Site is 9.1 hectares (approx. 22 acres) in total and comprises:

- Abbott Road;
- Aberfeldy Street;
- Balmore Close;
- Blairgowrie Court;
- Heather House;
- Jura House;
- Tartan House;
- Thistle House;
- Kilbrennan House;
- Nos. 33-35 Findhorn Street;
- 2a Ettrick Street;
- 384 Abbott Road;
- Lochnagar Street;
- Aberfeldy Neighbourhood Centre;
- Nairn Street Estate; and
- Leven Road Open Space and Braithwaite Park are included for their enhancement.
- Jolly's Green

The total site area is 9.1Ha, and the total drained site area totals circa 5.92ha which excludes council adopted roads and green areas. The total hardstanding (impermeable area) is circa 3.2ha. 3.2ha has been used in the drainage calculations.

The River Lee is located to the east of the site and flows in a generally southerly direction to its confluence with the River Thames. The entire site is noted on the Gov.uk website's Flood map for planning to be wholly within flood zone 3 however benefits from the presence of flood defences.

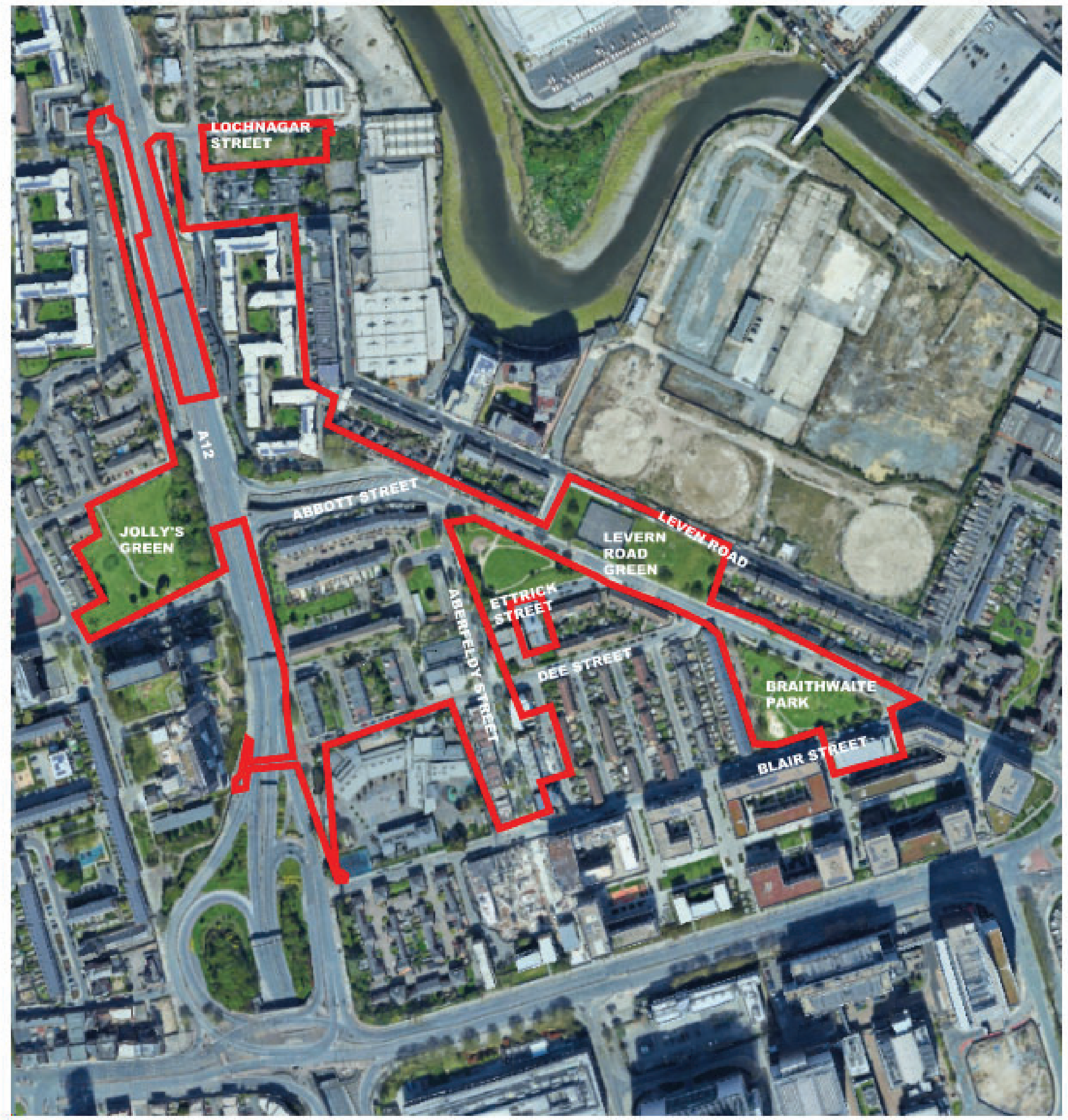

Figure 1: Site Location

1.2 Existing Drainage

1.2.1 Private Onsite Drainage

A topographical survey of the site has been completed by Aworth Survey in December 2009 and a utility survey was carried out for the site by Sumo Services Survey in August 2020.

Based on these surveys the existing private drainage network consists of surface water, foul water and combined water pipes and manholes. All of the existing private drainage has been shown to be draining to the closest Thames Water public sewer via multiple existing connections to the Thames Water surface and combined water sewers crossing through the site.

Figure 2: Topographical Survey

A CCTV survey will be undertaken to confirm the exact line, level, and condition of the connections to the surrounding public sewer network.

A copy of the topographical and utility surveys can be found in the appendices.

1.2.2 Public Sewers

Asset records obtained in November 2020 from Thames Water have revealed public surface and combined water sewers crossing through the proposed Aberfeldy Village site. The arrangement of the network is summarised below:

Thames Water Surface Water Sewers

The surface water sewers crossing the proposed site are located within:

- Abbott Road (B125) within the proposed site boundary (From MH Ref: 3406 – 3403 to 3402). The diameter of the surface water sewer is 225mm;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 2420 – 3403 to 3402). The diameter of the surface water sewer is 225mm. It is assumed to be a Thames Water pumping station for the road fly under. A CCTV survey will be required to establish what it serves.

These two sewers are assumed to be picking up Abbott Roads highway drainage and will therefore be abandoned along with the road itself as dictated by the scheme.

Thames Water Combined Water Sewers

The combined water sewers crossing the proposed site are located within:

- Lochnagar Street to the north of the site (the public combined water sewer is running west within Lochnagar Street to MH Ref: 2704). The diameter of the combined water sewer is 305mm and changes to 381mm just before connecting into Thames Water manhole 2704;
- Bromley Hall Road to the north west of the site (From MH Ref: 2630 to 2705). The diameter of the combined water sewer is 225mm and changes to 305mm just before connects to Thames Water manhole 2705;
- Leven Road to the east of the site (the public combined water sewer is running south within Leven Road: from MH Ref: 3605 to 5403). The diameter of the combined water sewer starts at 225mm and increases in size to 300mm sewer. The combined water sewer then changes into a 600mm before entering the proposed site and connecting into Thames Water combined manhole 5403;
- Leven Road to the east of the site (the public combined water sewer is running north within Leven Road: from MH Ref: 7403 to 5405). The diameter of the combined water sewer starts at 305mm, changes in size to 300mm sewer and then to 225 before connecting into Thames Water combined manhole 5405;
- Darnaway Place to the east of the site (the public combined water sewer is running south within Darnaway Place: from MH Ref: 4511 to 4407). The diameter of the combined water sewer is 229mm;
- Blair Street to the south of the site and running north through the proposed site boundary (From MH Ref: 7303 to 6302). The diameter of the combined water sewer is 305mm and changes to 457mm after the junction with Thames Water combined sewer which is running north to the combined Thames Water manhole 6302;
- Blair Street to the south of the site (the public combined water sewer is running east within Blair Street from: MH Ref: unknown-4203 to 5205). The diameter of the combined water sewer is 305mm and changes to 457 before connecting into Thames Water combined manhole 5205;
- Aberfeldy Street within the proposed site boundary (the public combined water sewer entering through the south of the site and is running north within Aberfeldy Street: from MH Ref: 5205 to 4407). The diameter of the combined water sewer starts at 457mm and changes to 533mm before connecting into Thames Water combined water manhole 4301A. The combined water sewer exiting Thames Water manhole 4301A is 610mm and changes to 686mm after Thames Water combined manhole 4420, before connecting into Thames Water combined manhole 4407;

Aberfeldy Village, London
Masterplan, Below Ground Drainage Strategy

- Dee Street within the proposed site boundary (the public combined water sewer is running east within Dee Street from MH Ref: 3222 to 4312). The diameter of the combined water sewer is 305mm;
- Ettrick Street within the proposed site boundary (the public combined water sewer is running east from MH Ref: 3316 to 4301A). The diameter of the combined water sewer is 300mm and changes to 305 before connecting into Thames Water combined manhole 4301A;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 8301 to the combined trunk running north within Joshua Street). The diameter of the combined water sewer is 914mm and changes to 991mm just before connects to the combined trunk in Joshua Street;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 4407 to the combined trunk running north within Joshua Street). The diameter of the combined water sewer is 991mm.
- Jolly's Green; there is a 1524 x 1227mm combined sewer running underneath Jolly's Green. This large trunk sewer has connecting sewers that run under the roads adjacent to the green space prior to discharging to the trunk, these roads being Andrew Street and Joshua Street.

There is a combined water trunk sewer located to the west of the site within the proposed site boundary running north. The diameter of the combined water sewer is 2250mm.

Refer to the Appendix B for the complete Thames Water Asset Records.

Meinhardt has overlaid the existing sewer information from the Thames Water Asset Records and the proposed architectural masterplan on a sketch to determine whether there are any areas where proposed structure will sit over the existing Thames Water assets. The sketch has highlighted a number of the proposed buildings are located directly above the existing Thames Water sewers and manholes. Where this occurs either a build over agreement or a sewer diversion will be required with Thames Water to proceed with the current site layout.

Based on the Thames Water Assets Records all of the existing private drainage has been shown to be draining to the north of the site where there are multiple existing connections to the Thames Water surface and combined water sewers crossing through the site.

Refer to the sketch 2812-MHT-CV-BG-DR-050 in the appendices for details of the existing Thames Water sewers crossing the site.

2 Drainage Strategy

2.1 Surface Water Drainage

2.1.1 Drainage Design Parameters

The industry standards along with the Environment Agency and Sewers for Adoption 7th Edition dictate for below ground surface water drainage that:

- There will be no surcharging of the drainage system for a 1 in 2-year storm;
- The drainage can be surcharged with no flooding for a 1 in 30-year storm; and
- The drainage can flood on-site for a 1 in 100-year storm with a 40% climate change allowance provided the flood water remains on site and does not flood habitable areas or affect safe ingress and egress to the site for occupiers.

All surface water drainage options outlined in this report adhere to these principles.

Hydraulic calculations have been carried out using the Micro Drainage hydraulic modelling software unless otherwise specified. Refer to Appendix C for calculations.

2.1.2 Initial Consultations

2.1.2.1 Local Authority/Planning Authority – Tower Hamlets Council

Tower Hamlets Council were contacted on 01/09/21 to discuss the proposed drainage strategy prior to planning submissions, however, no response has been received at the time of writing.

2.1.2.2 Thames Water

A predevelopment enquiry has been submitted to Thames Water to confirm if there is sufficient capacity within the Thames Water public sewer network to accommodate the proposed development. Thames Water have confirmed there is sufficient capacity in the surrounding public sewers to accept the flows from the proposed development.

2.1.3 Proposed Surface Water Drainage Strategy

The proposed site will discharge at the equivalent QBAR greenfield rate of 22.4/s. Hydraulic calculations indicate that the attenuation volume required for the development to discharge at the proposed discharge rate of 22.4/s for a 1 in 100 year + 40% climate change storm event is approximately 3662m^3, to be confirmed during detail design. This strategy should also include measures to improve run-off quality whilst maximising bio-diversity, amenity and other multifunctional benefits to provide a sustainable drainage system as noted in PPG.

Table 2-1: Discharge Opportunities

London Sustainable Drainage Hierarchy	Site Specific Application
Store rainwater for later use	There are limited opportunities for rainwater harvesting on this project due to the proposed usage of the building and limited external space that requires irrigation. It has therefore been discounted.
Use infiltration techniques, such as porous surfaces in non-clay areas	Due to the underlying geology of the site being London Clay and poor infiltration rates, infiltration devices are not used on this site. Furthermore, there are limited locations that comply with the requirement of Building Regulations to be more than 5m from a highway or structure. The use of infiltration techniques has therefore been discounted including infiltration basins/ponds.
Attenuate rainwater in ponds or open water features for gradual release	Due to the constrained nature of the site, there is little opportunity for above ground storage structures like ponds. Although green spaces are provided in the proposals, the areas are not suitable to be used for controlled flooding due to the proposed nature of the areas i.e. ponds. Furthermore, the existing levels across the site do not offer any suitable locations where controlled flooding may occur.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Excess surface water flows during high intensity rainfall events are proposed to be stored using a combination of podium/blue roofs, green roofs bio-retention/SuDS planters and below ground geo-cellular storage crates.
Discharge rainwater direct to a water course	Not possible because there are no watercourses in area surrounding site
Discharge rainwater to a surface water sewer/drain	Not possible because there are no surface water drains in area surrounding site, nearby public sewers are combined.
Discharge rainwater to a combined sewer	Discharge to a combined system at the restricted rate equivalent to QBAR greenfield rates.

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The proposed surface water strategy for the site will be developed to utilise sustainable drainage techniques (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding. Due to the limited areas of landscaping available on the site there are constraints to which SuDS can be incorporated into the development. SuDS with large land take such as detention basins or ponds are not suitable for an urban development therefore not applicable for development. It is also found that the use of infiltration SuDS will not be feasible for the site due to the existing ground conditions. The proposed drainage strategy for the development has therefore been made sustainable through the use of blue roofs, high level podiums attenuation and below ground attenuation tanks.

Due to the segregation of parcels, due to ensuring private drainage is separate to public highway drainage its not possible to integrate or provide a holistic surface water design whereby one parcel is potentially using an area in another parcel for attenuation, including any open green space that is proposed aspart of the wider strategy, as this would require a new public TW sewer network to be placed within an existing built environment which is unviable given the context of the scheme.

It is proposed that each phase will have a separate drainage network.

Phase A Strategy – Detailed Planning Application

Based on the above, the only feasible surface water discharge location is the public sewers surrounding the site. Phase A is divided into 3 different locations therefore it is proposed that Blocks I1, J1, F1, H1&H2 and H3 to drain separately into the closest Thames Water sewer. Therefore the strategy is outlined below.

Block I1:
The proposed surface water drainage strategy for Building I1 has been made sustainable through the use of a blue roof and a below ground attenuation tank. The approximate volume of attenuation for this building is 69m^3. Of which 34.2m^3 attenuation is provided by cellular attenuation crates and 35m^3 is provided by the blue/green roof.

The surface water drainage network will drain via gravity to the northwest of Building I1 into a demarcation chamber restricting the discharge rate to 1l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water sewer network. It is proposed that controls will be used on the blue roof to ensure that all attenuation is fully utilised. It is proposed that a new connection will be made to the northwest corner of the building into the Thames Water combined water network in Blair Street (TWMH7303). The Thames Water sewer asset records have no cover level or Invert level information for the manhole THMH7303 therefore a survey is required for the existing combined water sewer running along Blair Street.

Block J1:
The proposed surface water drainage strategy for Building J1 has been made sustainable through the use of a below ground attenuation tank. It is proposed to discharge surface water from Building J1 via gravity into Thames Water combined water sewer in Leven Road (TWMH3602) via a new connection. Surface water discharge from the building is to be restricted to 1.25l/s which is to be controlled via a hydrobrake on a demarcation manhole prior to discharging into Thames Water combined water sewer. The approximate required storage for building J1 is 346m^3 this is to be provided through the proposed cellular attenuation crates.

Block F1:
To attenuate surface water at source and reduce the risk of downstream flooding it is proposed that Building F1 will use of blue roofs, high level podium attenuation and a below ground attenuation tank. The approximate volume of attenuation is 185m^3. It is proposed that controls will be used on the blue roofs and high level podium to ensure that all attenuation is fully utilised. The surface water drainage network will drain via gravity to the northeast of the building into a demarcation chamber restricting the discharge rate to 1.25l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. It is proposed that a new connection will be made to the southeast corner of the building, branching into the Thames Water combined water sewer in Aberfeldy Street between manholes TWMH4313 & TWMH4312.

Block H1/H2 & H3:
The proposed surface water drainage strategy for the buildings H1&H2 and H3 has been made sustainable through the use of two below ground attenuation tanks (one attenuation tank serving buildings H1&H2 and one attenuation tank serving building H3) and blue/green roof areas to attenuate surface water at source and reduce the risk of downstream flooding.

The proposed surface water drainage network for buildings H1&H2 will drain via gravity to the east of the buildings into a demarcation chamber restricting the discharge rate to 1.5l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. The approximate volume of attenuation for buildings H1&H2 is 161m^3, of which 49m^3 is provided through the blue roof and 112m^3 is provided through the below ground cellular attenuation crates.

The same strategy is applied to Building H3 which will discharge surface water via gravity to the west of the building into a demarcation chamber restricting the discharge rate to 1.25l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. The approximate volume of attenuation for building H3 is 135m^3, of which 24m^3 is provided through the blue roof and 111.2m^3 is provided through the below ground cellular attenuation crates.

Buildings H1&H2 and H3 will discharge surface water via two new separate connections into Thames Water combined sewer in Aberfeldy Street (TWMH4215).

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

To achieve the proposed discharge rates 6.25l/s it is required to attenuate an approximate volume of 896m^3.

Phase B Strategy – Outline Planning Application

The proposed surface water strategy for the phase B has been developed to utilise sustainable drainage systems (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding of the Thames Water sewer network. The scheme that has been developed to utilise a combination of blue roofs, high level podium attenuation and attenuation tanks.

The proposed strategy includes a total of three new connections to the existing Thames Water combined sewer network. These are outlined below:

- One connection to the Thames Water combined sewer network in Leven Road (TWMH3605), through a new connection serving the adjacent Block A1/A2 receiving a restricted discharge rate of 1.5l/s.
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3517 to TWMH2536), through a new connection serving Block A3, B1/B2 & B4 receiving a total restricted discharge rate of 3.5l/s.
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3516), through a new connection serving Blocks B3 and B5 receiving a total restricted discharge rate of 2.3l/s.

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

To achieve the proposed discharge rates 7.3l/s it is required to attenuate an approximate volume of 862m^3

The Jolly's Green area will be delivered as part of Phase B. The area is proposed to be public realm and is proposed to discharge surface water at a restricted rate equivalent to the QBAR greenfield for all storms up to and including the 1 in 100 year +40% climate change storm. This rate has been calculated to be 3.9l/s and approximately 100m³ of surface water attenuation will be required to facilitate this. This will be provided through the use of permeable paving.

Phase C Strategy – Outline Planning Application

The proposed drainage strategy for Phase C is similar to that of Phase B. It is proposed that surface water will be attenuated through the use of SuDS to minimise the likelihood of downstream flooding. It is proposed that the primary source of attenuation for Phase C will be below ground attenuation tanks with further attenuation to be provided via blue roofs and high levels podium attenuation.

It is proposed that surface water from the Phase C will flow via gravity to the east of this phase where a new connection to the Thames Water network in Ettrick Street (TWMH4303), will be made. This is subject to a CCTV survey which will survey the line, level and condition of the existing sewer. If this survey identifies any available existing connections in this location there may be an opportunity to reuse. This will be explored during detailed design.

Each block shall attenuate and restrict flows separately before connecting into TWMH4303, the below summaries the proposed discharge rates and required attenuation for each block within phase C;

- Block C1/C2/C3/C4 shall restrict discharge rate to 1.5l/s requiring a total 651m³ attenuation of which 425m³ is to be provided through below ground cellular attenuation crates and 238m³ provided via blue roofs and high levels podium attenuation.
- Block C5 & C6 have been designed to have a shared flow control structure limiting discharge to 1l/s with attenuation however split both buildings to receive 10m³ attenuation provided through below ground cellular attenuation crates. Flows from Blocks C5 and C6 are to be conveyed into a combined running along Ettrick Street to the east before discharging into TWMH4303.
- Block E1/E2/E3 is to restrict discharge rate to 1.5l/s requiring a total 563m³ attenuation of which 400.4m³ is to be provided via below ground cellular attenuation crates and 162m³ provided via blue roofs and high levels podium attenuation.

The Phase C development shall therefore discharge at a maximum 4.0l/s for the 1:100 year plus 40% climate change event, this flow is all conveyed into the Thames Water Manhole TWMH4303 in Ettrick Street. The total amount of attenuation to be provided for this phase is 1233m³.

Phase D Strategy – Outline Planning Application

The proposed surface water drainage strategy for the building Phase D has been made sustainable through the use of a below ground attenuation tank and blue roofs and high levels podium attenuation

The proposed surface water strategy for the building Phase D is to discharge surface water via gravity to the southeast of Phase D into Thames Water combined water sewer in Ettrick Street (TWMH4302) via a new connection. This is subject to a CCTV survey which will survey the line, level and condition of the existing sewer. If this survey identifies any available existing connections in this location there may be an opportunity to reuse. This will be explored during detailed design.

Surface water discharge from the site is to be restricted to 1.5l/s which is to be controlled via a hydrobrake on a demarcation manhole prior to discharging into Thames Water combined water sewer. The approximate volume of attenuation for Phase D is 576m³, of which 490m³ is to be provided via below ground attenuation crates and 87m³ provided via and blue roof attenuation.

For full drainage strategy drawings refer to the Appendix C, including exceedance flow routes. Summary of the drainage strategy can be found in the Tower Hamlets SUDS proforma in Appendix D.

2.1.4 Proposed Discharge Rates Summary

The table below shows the volume of surface water attenuation required to suit a 1 in 100-year storm event + 40% climate change. A breakdown of the proposed discharge rates and required attenuation volumes is shown in Table 1.

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	Storm Event	Proposed Discharge Rate	Required Surface Water Attenuation
Phase A Blocks I1, J1, F1, H1&H2 and H3	1 in 100 year + 40% CC	6.0 l/s	896m³
Phase B	1 in 100 year + 40% CC	10.9 l/s	965m³
Phase C	1 in 100 year + 40% CC	4.0 l/s	1231m³
Phase D	1 in 100 year + 40% CC	1.5 l/s	576m³
Total		22.4 l/s	3668m³

Table2-2: Proposed Surface Water Discharge Rates

2.1.5 Water Quality

The proposed drainage strategy manages pollution risk for the site based on a simple qualitative method as defined in the CIRIA SuDS Manual C753, consisting of an assessment of likely pollution hazard levels for the site and SuDS performance capacities:

Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 2-3: Extract from CIRIA C753: Pollution Hazard Indicines

The site is predominantly roof areas and pedestrian walkways and as such, the site has a Low Pollution hazard level. Surface water run-off will be managed using a range of SuDS detailed previously that will offer water quality benefits.

The car parking a ground level is covered and therefore will be discharged to the foul network.

SuDS bio-retention planters and green roofs will provide pollution control as they assit with removing heavy metals and hydrocarbons from surface water run-off.

2.1.6 Amenity, Bio-diversity and Multi-functional benefits

The proposed drainage strategy offers a number of multifaceted benefits across amenity, biodiversity and other areas. Blue/green roofs provide a positive impact on amenity for the site and green roofs and SuDS bio-retention areas help to improve and increase bio-diversity. As discussed in the section above, the SuDS bio-retention planters and green roofs in particular in addition to other SuDS features help to improve water quality from the site.

2.2 Foul Water Drainage

2.2.1 Drainage Design Parameters

The below-ground foul drainage system will be designed to Sewers for Adoption 8th Edition, BS EN 752 Parts 3 and 4, and the Building Regulations Document H where appropriate.

2.2.2 Proposed Foul Water Drainage Strategy

Due to size and phasing of the development, it is proposed that foul drainage from the site will be split into 10 individual outfalls into the Thames Water combined network. Splitting the foul discharge from the site is important due to the potential increase in flow, reducing the impact on the existing Thames Water combined drainage network.

The proposed foul water drainage strategy for the site involves the MEP engineer's coordination of the superstructure drainage up until it exits the building and enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings and convey to a demarcation chamber, before discharging via gravity to the existing Thames Water combined water sewers within the site or surrounding the site. This will be coordinated during detailed design.

The proposed strategy includes various connections to the existing Thames Water combined sewer network. These are outlined below.

As phase A is divided into 3 different locations it is proposed that Blocks I1, J1, F1, H1&H2 and H3 to drain separately into the closest Thames Water combined water sewer network. Therefore five connections to the Thames Water combined water sewer network are proposed for phase A:

- For the building I1 it is proposed that a new connection will be made to the northwest corner of the building into the Thames Water combined water network in Blair Street (TWMH7303);
- It is proposed that building J1 to discharge foul water into Thames Water combined water sewer in Leven Road (TWMH3602) via a new connection;
- It is proposed that a new connection will be made to the southeast corner of the building F1 into the Thames Water combined water sewer in Aberfeldy Street (TWMH4313-TWMH4312); and
- Buildings H1&H2 and H3 will discharge foul water via two new separate connections into Thames Water combined sewer in Aberfeldy Street (TWMH4215).

The proposed strategy for phase B includes a total of three connections to the existing Thames Water combined sewer network. These are outlined below:

- One connection to the Thames Water combined sewer network in Leven Road (TWMH3605), through a new connection serving building A1/A2;
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3517 to TWMH2536), through a new connection serving buildings A3, B1/B2 and B4;
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3516), through a new connection serving building B3/B5.

It is proposed that foul water from the Phase C will flow via gravity to the east of this phase where a new connection to the Thames Water network in Ettrick Street (TWMH4303) will be made. This will be serving the buildings C1/C2/C3/C4, C5, C6 & E1/E2/E3.

The proposed foul water strategy for the building Phase D is to discharge foul water via gravity to the southeast of the phase D into Thames Water combined water sewer in Ettrick Street (TWMH4302) via a new connection.

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

The discharge locations and foul water strategy will be confirmed during detailed design and a Section 106 drainage connection application for each connection will be submitted at the construction stage to Thames Water for formal approval of the proposed connections arrangement.

2.2.3 Proposed Foul Water Discharge Rates

Based on the most recent accommodation schedule (as at 17.09.21), the peak foul water discharge rate from the site will be in the region of 75l/s. This proposed discharge rate has been calculated in accordance with BS EN 12056-2, however, this will be confirmed by Meinhardt's MEP engineer during detailed design.

Thames Water have been contacted and have confirmed they have sufficient capacity in their network to accept the proposed flows from the development (surface water and foul water).

2.3 Proposed Combined Water Flow Rates

The proposed combined water discharge rates for the site are outlined in Table 1.

Contributing Area (ha) – Hardstanding areas	Proposed Surface Water Discharge Rate [1 in 100 year storm + 40% CC] (l/s)	Proposed Peak Foul Water Discharge Rate (l/s)	Proposed Combined Peak Discharge Rate (l/s)	Reduction compared to Existing Combined Discharge Rate
3.2	22.4	75.58	97.98	67%

Table 1: Proposed Combined Water Discharge Rates

The proposed discharge rates will be confirmed during detailed design.

2.4 Site Wide Foul Water Drainage Coordination

The proposed foul water drainage strategy for the site involve coordination with Meinhardts MEP engineer's to coordination the superstructure drainage up until it enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings before discharging via gravity into the Thames Water combined sewer located in the surrounding roads.

Any ground floor or basement level foul water drainage that can't be drained by gravity will be routed to private basement foul water pump chambers which will lift foul water from the basements into the internal drainage network before draining via gravity into the external below ground drainage network.

2.5 Operations and Maintenance

2.5.1 Pipes (Including Oversized)

2.5.1.1 Location and Description

Pipes are proprietary products and the materials can vary across the site and as such where used the manufacturer's recommendations should be followed. Regardless of the product used, the pipes will be fully compliant with the Meinhardt drainage specification.

2.5.1.2 Operation

They are intended to be dry except for during rainfall events. These have been designed to be self-cleansing for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers, manholes, rodding plates and rodding eyes.

2.5.1.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the development to a greater level of flood risk. Maintenance responsibility for the pipes should be placed with Ecoworld.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

2.5.2 Green/Blue Roofs, Location and Description

A green/blue roof specialist will be required at later design stages.

2.5.2.1 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the development to a greater level of flood risk. Maintenance responsibility for the pipes should be placed with Ecoworld.

Maintenance Schedule	Required Action	Typical Frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify and sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie. Year one), replace dead plans as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly and annually or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly and annually or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required - clippings should be removed and not allowed to accumulate	Six monthly and annually or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

2.5.3 Bioretention Systems

2.5.3.1 Location and Description

Bio-retention systems (including rain gardens) are shallow landscaped depressions can reduce runoff rates and volumes, and treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering interception and can also provide:

- Attractive landscape features that are self-irrigating and fertilizing
- Habitat and biodiversity
- Cooling of the local microclimate due to evapotranspiration.

Bio-retention systems have been specified to be used in various privately managed public spaces throughout the site.

2.5.3.2 Operation

It has been concluded in literature (Dalrymple, 2013) that bio-retention systems will typically require approximately 2.5 times more maintenance than typical landscaped designs.

Maintenance schedule	Required Action	Typical Frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary)	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace if necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace and plants to maintain planning density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly or biannually
Occasional maintenance	Infill nay holes or scour in filter medium, improve erosion protection of required	As required
	Repair minor accumulations of silt by raking away surface mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

2.5.4 Geocellular units

2.5.4.1 Location and Description

Geocellular units are proprietary products and therefore manufacturer's specific recommendations should also be taken into consideration above what has been prepared in this document. Additionally, different manufacturers may have different connection types and arrangements which will need to be taken in to consideration.

2.5.4.2 Operation

The geocellular units, along with permeable paving, are intended to attenuate the discharge from the site up to and including the 1 in 100 year plus 40% climate change event.

Access for maintenance has been provided through inspection chambers.

2.5.4.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of geocellular units as designed. As the feature is buried a regularly inspection regime is very important to ensure the correct functionality of the surface water drainage network. Maintenance responsibility for the geocellular units and their surrounding areas should be placed with Ecoworld.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
	Check penstocks and other mechanical devices (if present).	Half yearly.
	Inspect ventilation cowl (if present)	Monthly and after large storms.
Regular maintenance\inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually (or as required after heavy rainfall events)
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents.	As required.

2.5.5 Permeable Pavements

2.5.5.1 Location and Description

The permeable pavement is located at the Jolly's Green area of the development.

The permeable pavement has been designed in accordance with CIRIA C753.

Permeable pavements contain proprietary products and as such, the manufacturer's recommendations should be followed where used.

2.5.5.2 Operation

Permeable pavements are an efficient mean of managing surface water runoff close to its source – intercepting runoff, reducing the volume and frequency of runoff, and providing a treatment medium.

The surface has been designed to be porous or to contain gaps where rain can flow through the upper construction layers into the voided stone which makes up the sub-base.

2.5.5.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the pervious pavement. Maintenance responsibility for the pavement and its surrounding area should be placed with Ecoworld.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	3-monthly, 48 hours after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.
Regular maintenance/inspection	Brushing and vacuuming.	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of clogging or manufacturers' recommendations.
Occasional maintenance	Removal of weed or management using glyphospate applied directly into the weeds by an applicator rather than spraying.	As required – one per year on less frequently used pavements.
	Stabilise and mow contributing and adjacent areas.	As required.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing materials.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).

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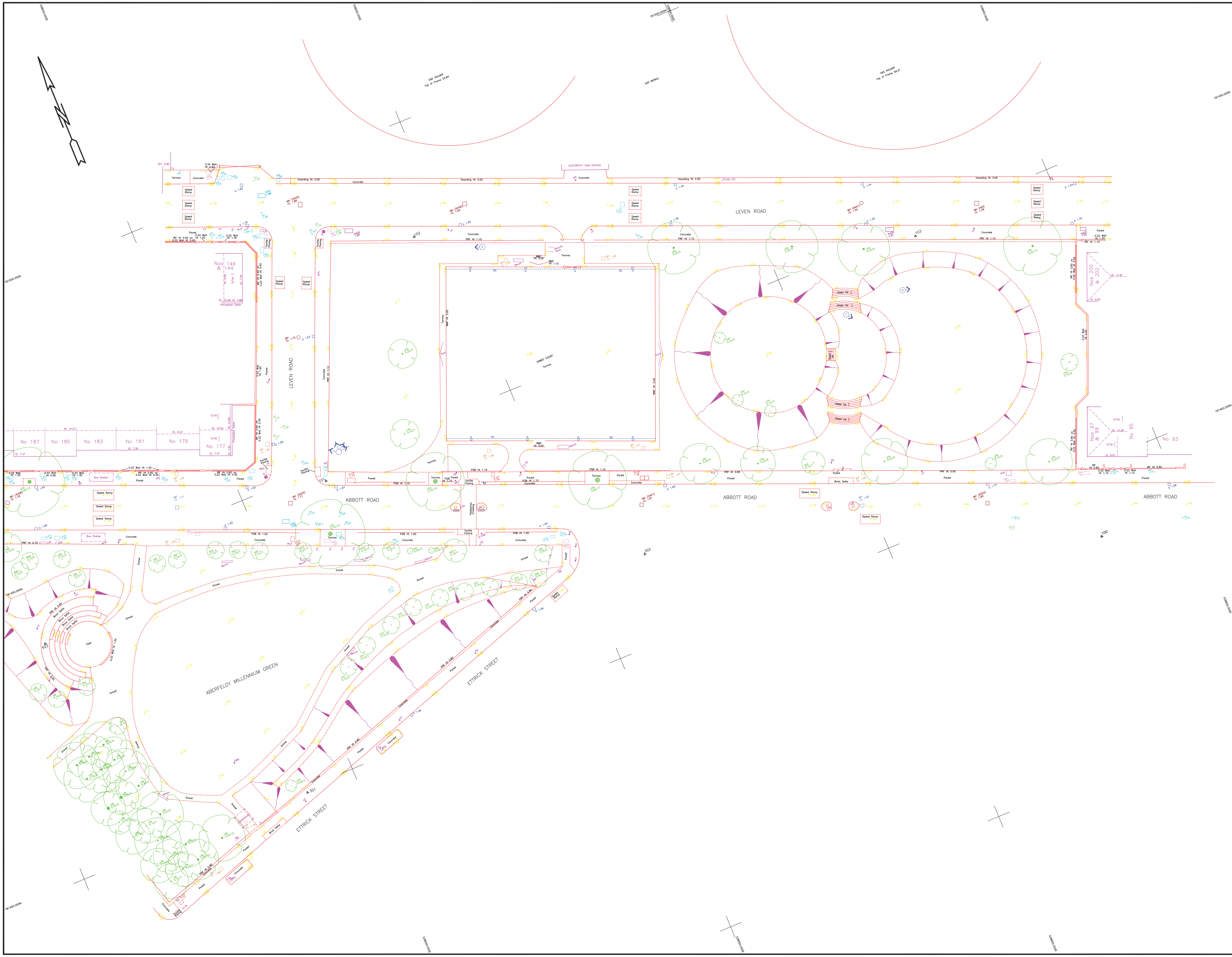
Appendix A – Topographical & Utility Surveys



Coordinate Table

Aworth SURVEY CONSULTANTS

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
100	PN	538634.795	181387.889	1.889
101	PKN	538514.670	181447.628	1.737
102	PKN	538544.730	181480.753	1.873
103	PKN	538624.766	181447.996	1.674
300	??	538463.462	181378.864	1.771
301	PN	538491.308	181399.170	1.700
302	PKN	538560.752	181415.049	1.811
622	PN	538459.194	181440.085	3.221
C1	PN	538663.947	181376.651	1.940
C2	PN	538687.952	181279.286	1.783
C3	PKN	538506.884	181219.790	1.829
C4	PN	538429.831	181475.704	1.957

HN – Hilti® Nail PKN – Parker Kalon® Nail PGM – Permanent Ground Marker
PM – Punch Mark PN – Pipe Nail W – Washer (used with PKN and PN)

SHEET LAYOUT

2 1

NOTE:
PHOTO POSITIONS SHOWN THUS:
FOR PHOTO'S REFER TO DRAWING 3553-7 SHEET 3.

NOTES

LEVELLING THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

GRID THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID BY GPS USING OSTN02. THE LOCAL GRID ORIGIN IS STN C1, CO-ORDINATES 538663.947E, 181376.651N.

LLOYD'S REGISTER QUALITY ASSURANCE CERTIFICATED COMPANY

THE SURVEY ASSOCIATION

Aworth
SURVEY CONSULTANTS
LRQA Certificated Office
Norfolk House, Norfolk Way, Uckfield, TN22 1EP
Tel:– 01825 768319 Fax:– 01825 768310
www.aworth.co.uk als@aworth.co.uk
The Lansdowne Building, 2 Lansdowne Road
Croydon, CR9 2ER
Tel:– 020 8263 6046 Fax:– 020 8263 6146

Drawing No	Sheet	Revision
3553-7	1	
	Scale 1:200	@ A0

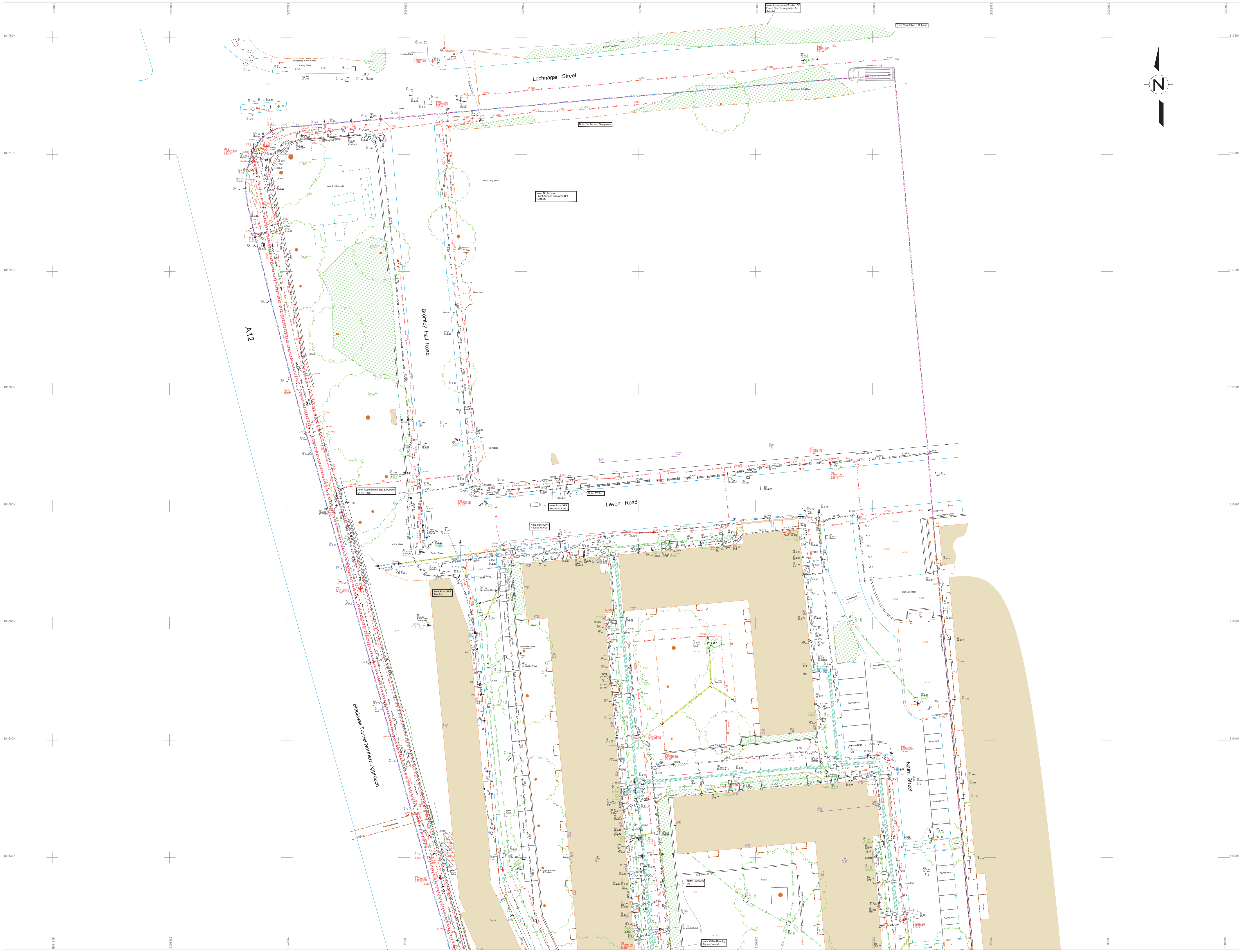
Surveyed	NW/CS
Drawn	TP
Checked	PE
Date	18/12/09

Project

ABERFELDY VILLAGE
POPLAR
PHASE 7

Client

POPLAR HARCA
UNIT 3, QUEBEC WHARF
14 THOMAS ROAD
LONDON E14 7AF



GENERAL NOTES

IrresP/Ective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services

Only sub-surface utility information is provided. Above ground utility information may be shown where it assists with positional referencing.

Utilities may continue outside of the survey area. Any paint marks outside of the area are for investigative purposes only and may not represent the full extent of the sub-surface utilities.

Where logic indicates a utility exists but which cannot be positively confirmed with the technology, an assumed route (ASR) is recorded. All assumed service routes (ASR) have been highlighted with a background yellow colour for visual enhancement.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed

Vertical & Horizontal Position - Vertical position (depth) is indicative to the top of the utility/feature and is recorded as (x.xxd) i.e. (1.25d) - (depth to top of service) and should not be taken as exact, as this could be the surround to the service rather than the service itself. Where depth information from the technology is unclear, depth is not shown. Drains and piP/Es/ducts may have been detected using threading and the depth indicated could be between the top (soffit) and the bottom (invert). Horizontal position is indicative to the centre of the utility/feature and should not be taken as exact.

Warranty - Biodegradable paints are used to mark-out the position of the utilities. Markings may become illegible quickly deP/Ending on ground, weather and traffic conditions. No warranty is given in resP/Ect of the durability of the paint markings and that they are a complete representation of the sub-surface utilities, therefore, this drawing should be used as the primary reference for the survey results.

This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non-invasive technologies only and the P/Erformance can be adversely affected by ground, weather and site conditions outside of SUMO's control, therefore, some utilities may be undetectable. While SUMO uses reasonable endeavours to detect all utilities, it does not warrant that 100% detection will be achieved and that approximate depth P/Enetration of the technologies SUMO uses will not be greater than two metres.

SHEET LAYOUT

Sheet 01
Sheet 02
Sheet 03

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

Previous Sumo Survey "SOR016539.dwg" has been inserted into this model for reference.

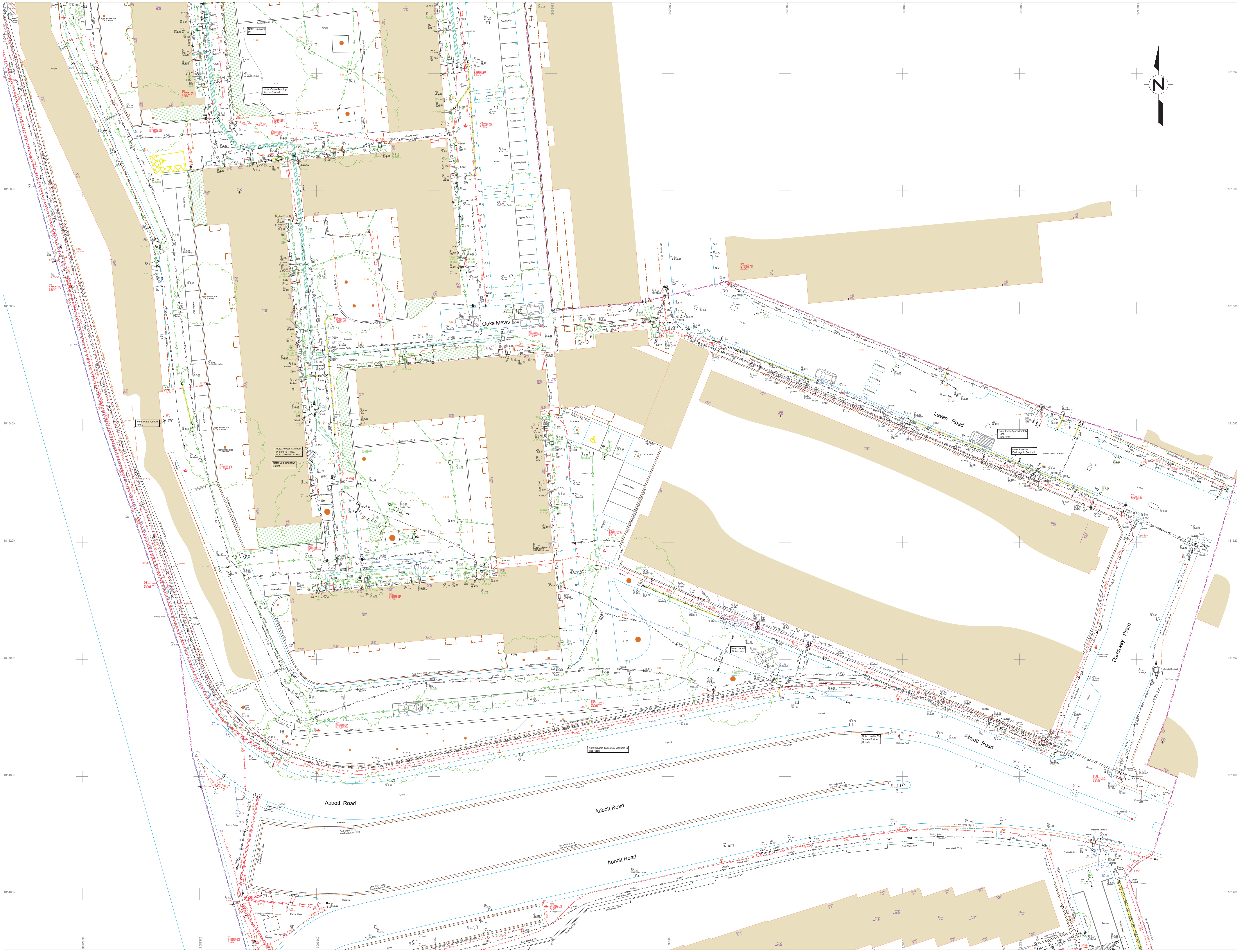
SUMO SERVICES Ltd
8 HAYWARD BUSINESS CENTRE
NEW LANE
HAVANT
HAMPSHIRE
PO9 2NL
TEL: 0845 456 1104
www.sumoservices.com

Title: Utility Mapping

Client: Aberfeldy New Village LLP

Project: Aberfeldy Village, Tower Hamlets, London

Date Completed:	15/08/2020	Post Code:	E14 0ND
Surveyed:	DW, JHG, CE	Scale:	1/200 (A0 Sheet)
Drawn:	DM		
Checked:	DW, JHG, CE		
Job No:	SOR017679	Dwg No: 01	Rev:



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SHEET LAYOUT

Sheet 01

Sheet 02

Sheet 03

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

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8 HAYWARD BUSINESS CENTRE
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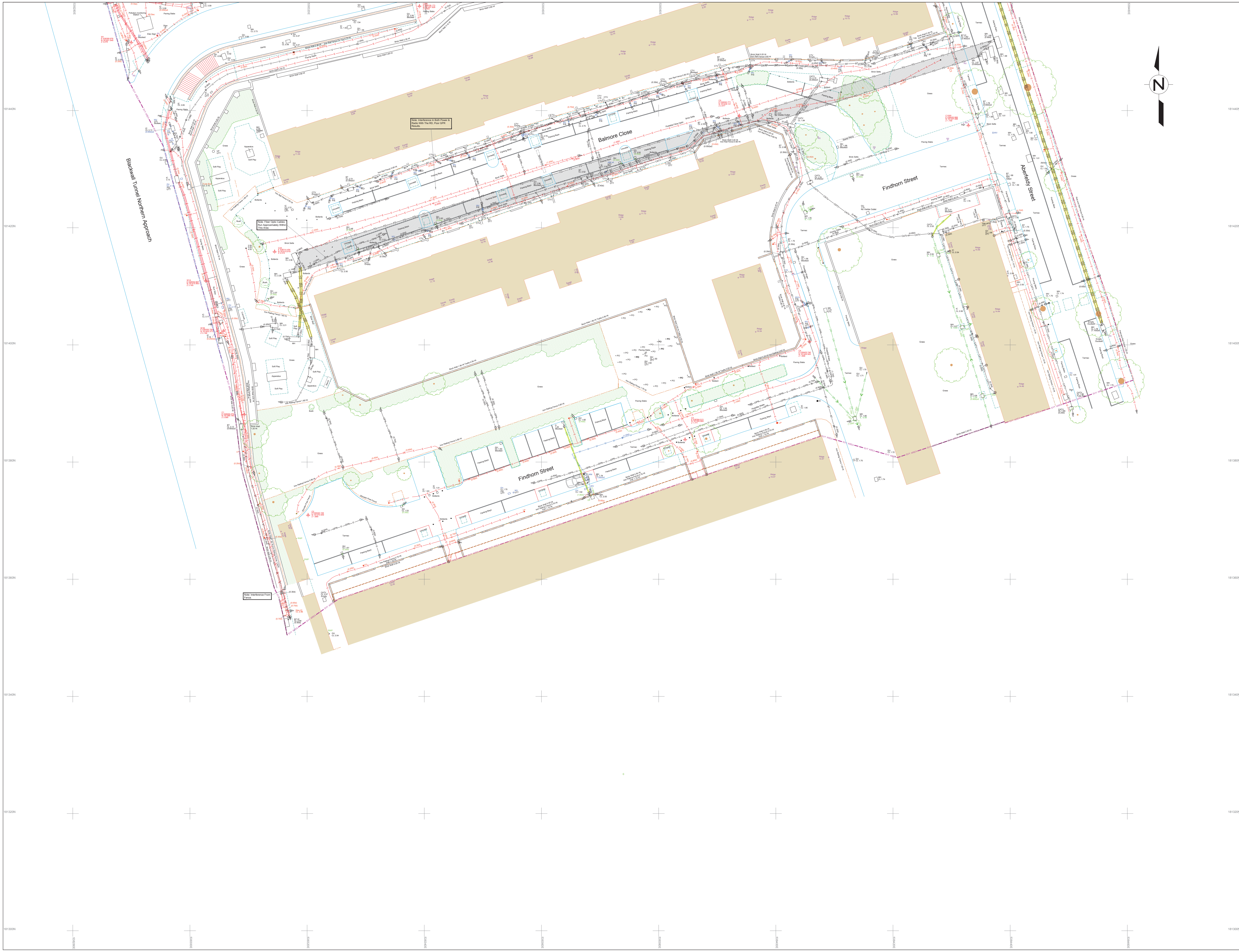
HAMPSHIRE
PO9 2NL
TEL: 0845 456 1104
www.sumoservices.com

Title: Utility Mapping

Client: Aberfeldy New Village LLP

Project: Aberfeldy Village, Tower Hamlets, London

Date Completed:	15/08/2020	Post Code:	E14 0ND
Surveyed:	DW, JHG, MW, CE	Scale: 1/200 (A0 Sheet)	
Drawn:	DM		
Checked:	DW, JHG, MW, CE		
Job No: SOR017679		Dwg No: 02	Rev:



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SHEET LAYOUT

Sheet 02

Sheet 03

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

Previous Sumo Survey "SOR016539.dwg" has been inserted into this model for reference.

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8 HAYWARD BUSINESS CENTRE
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Client: Aberfeldy New Village LLP

Project: Aberfeldy Village, Tower Hamlets, London

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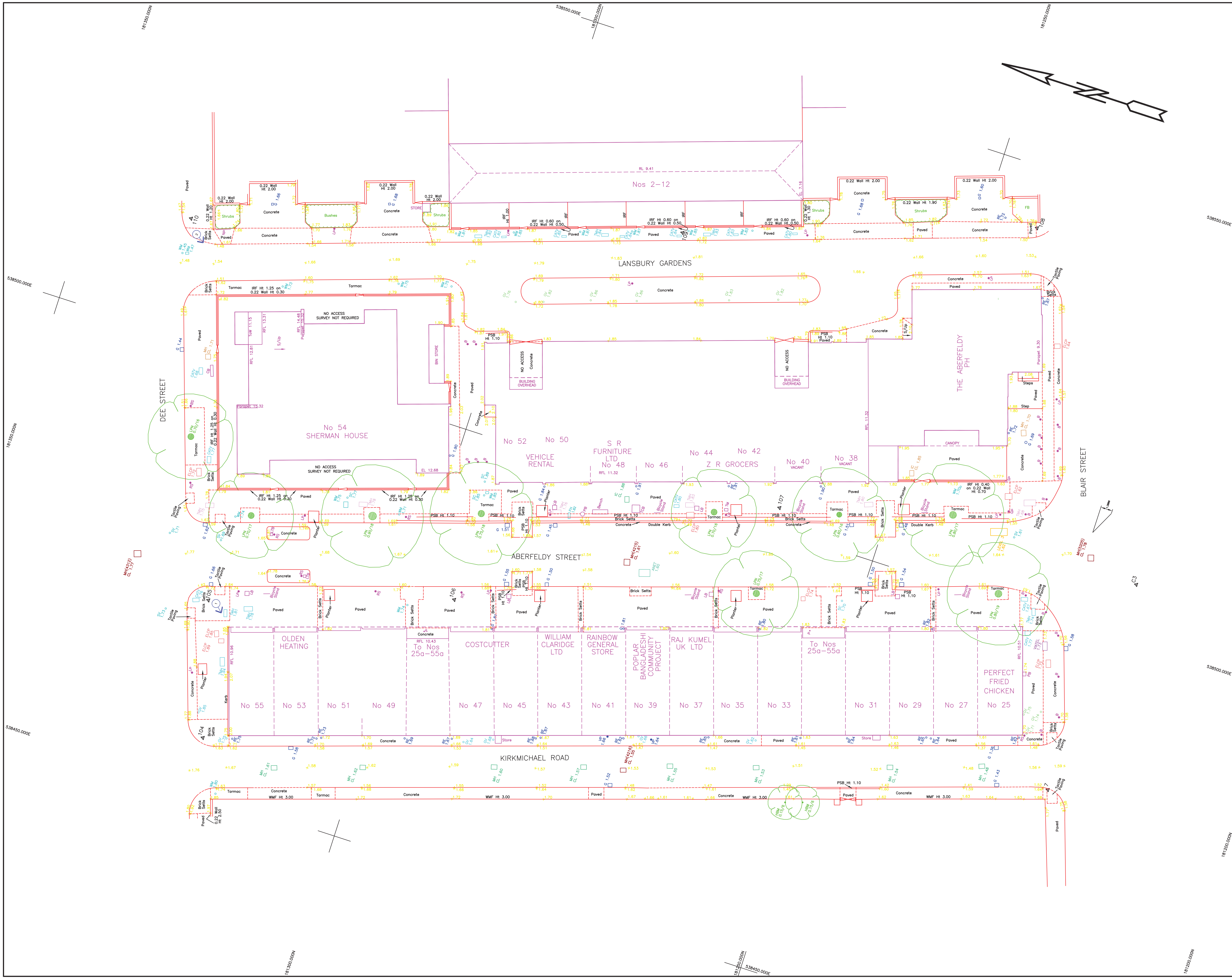
Surveyed:	DW, JHG, MW, CE	Scale: 1/200 (A0 Sheet)	
Drawn:	DM		
Checked:	DW, JHG, MW, CE		
Job No: SOR017679		Dwg No: 03	Rev:



LEGEND

AIR CONDITIONING UNIT	ACU	
ADVERTISING BOARD	AB	
AIR VALVE	AV	
BOLLARD	B	
BELISHA BEACON	BB	
BOREHOLE	BH	
BASEMENT LIGHT	BLT	
BOUNDARY POST/PEG	BP	
BUS STOP	BS	
CABLE TELEVISION PIT	CATV	
COAL HOLE	CH	
CONTROL BOX	CB	
DOG WASTE BIN	DWB	
DOWN PIPE	DP	
EARTHING ROD	ER	
ELECTRICITY CABLE PIT	ELCP	
ELECTRICITY CONTROL BOX	CBE	
ELECTRICITY INSPECTION COVER	ELIC	
ELECTRICITY POLE	EP	
ELECTRICITY PYLON	EL PYLON	
FIRE HYDRANT	FH	
FLAG STAFF	FS	
FLOODLIGHT	FLT	
FLOWER BED	FB	
FOOTPATH	FP	
GAS VALVE	GV	
GUIDE POST	GP	
GULLY	G	
INSPECTION COVER	IC	
INSPECTION COVER (UNKNOWN)	ICU	
KERB OUTLET	KO	
LAMP HOLE	LH	
LAMP POST	LP	
LIGHTED BOLLARD	LTB	
LITTER BIN	LB	
MANHOLE	MH	
MILESTONE	MS	
NAME PLATE	NP	
NOTICE BOARD	NB	
PARKING METER	PM	
POST	P	
POST BOX	PB	
RAIN WATER PIPE	RWP	
REFLECTOR POST	RP	
ROAD SIGN	RS	
RODDING EYE	RE	
SERVICE MARKER POST	SMP	
SIGN POST	SP	
SLUICE VALVE	SV	
SOIL & VENT PIPE	SVP	
SPOTLIGHT (GROUND)	SPLG	
SPOTLIGHT (TOWER)	SPLT	
STOP COCK	SC	
TELECOM CONTROL BOX	CBT	
TELECOM INSPECTION CHAMBER	TIC	
TELECOM MANHOLE	TMH	
TELECOM PILLAR	TLP	
TELEGRAPH POLE	TP	
TELEPHONE CALL BOX	TCB	
TICKET MACHINE	TM	
TL CABLE INSPECTION COVER	TLIC	
TRAFFIC LIGHT	TL	
TRAFFIC LIGHT CONTROL BOX	CBTL	
TRAFFIC LIGHT CONTROL POST	CPTL	
VENT PIPE	VP	
WATER METER	WM	
WASH OUT	WO	
WATER CONTROL PILLAR	WCP	
WATER TAP	Tap	
WATER TROUGH	WT	

LEVELS

SPOT LEVEL(+Indicates pos.)	+ 127.13
BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
EAVES LEVEL	EL
FLOOR LEVEL	FL
INVERT LEVEL	IL
ROOF LEVEL	RFL
RIDGE LEVEL	RL
SOFFIT LEVEL	SFL
SPRING LEVEL	SPL
THRESHOLD LEVEL	THL
TOP OF WALL LEVEL	ToW
WATER LEVEL	WL

FENCE DESCRIPTIONS

BARBED WIRE FENCE	BWF
CHAIN LINK FENCE	CLF
CHESTNUT PALING FENCE	CPF
CLOSE BOARD FENCE	CBF
CONCRETE SLAB FENCE	CSF
CORRUGATED IRON FENCE	CIF
CRASH BARRIER	CBR
IRON RAILINGS	IRF
INTERWOVEN FENCE	IWF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	Misc F
OPEN BOARD FENCE	OBF
PALING FENCE	PLF
PALISADE FENCE	PAL
PEDESTRIAN SAFETY BARRIER	PSB
POST AND CHAIN FENCE	PCF
POST AND MESH FENCE	PMF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
TRELLIS	TLS
WIRE MESH FENCE	WMF
AVERAGE	Ave
HEIGHT	Ht

DRAINAGE

SURFACE WATER PIPE	0.15 SW
FOUL WATER PIPE	0.15 FW
NO VISIBLE CONNECTION	NVC
UNABLE TO LIFT	UTL
UNABLE TO SURVEY	UTS
TAKEN FROM RECORDS	TFR
DRAINAGE CHANNEL (OPEN)	DC
DRAINAGE CHANNEL (COVERED)	DC
OVERHEAD WIRE	O/H W
BANKING	
EXTENT OF VEGETATION	
HEDGES	
MARSH	
GATE	SINGLE DOUBLE
RETAINING WALL	RTW
SLOPING MASONRY	
STILE	
WALL (Width drawn to scale)	
BUILDING	
OPEN SIDED/ BUILDING OVERHEAD	
CANOPY	
GLASS ROOFED	
ARCHWAY	
CONTOURS	25.50
ORDNANCE SURVEY BENCH MARK	OSBM Value 12.47
TEMPORARY BENCH MARK	TBM Value 50.00
SURVEY STATION	

TREE LEGEND

ALDER	ALD	MAPLE	MPL
ASH	ASH	OAK	OAK
ASPEN	ASP	PINE	PNE
BEECH	BCH	POPLAR	POP
CEDAR	CED	PRUNUS	PRU
CHERRY	CHY	RHODODENDRONS	RDN
CONIFEROUS	CON	ROWAN	RWN
CYPRESS	CYP	SALLOW	SLW
DECIDUOUS	DEC	SAPLING	SAP
DEAD	DED	SWEET CHESTNUT	SCH
ELDERBERRY	ELD	SILVER BIRCH	SIB
ELM	ELM	SPRUCE	SPR
EUCALYPTUS	EUC	SPECIES UNKNOWN	SPU
FIR	FIR	SYCAMORE	SYC
FRUIT	FRT	TREE OF HEAVEN	TOH
HAWTHORN	HAW	WELLINGTONIA	WEL
HAZEL	HZL	WHITEBEAM	WBM
HORNBEAM	HBM	WILLOW	WLW
HORSE CHESTNUT	HCH	WALNUT	WNT
HOLLY	HLY	YEW	YEW
INDIAN BEAN TREE	IBT		
LARCH	LAR	MULTI–TRUNK	MT
LABURNUM	LBM		
LOCUST	LCS	0.2 / 6 / 3T	
LIME	LIM		
LONDON PLANE	LPN	Dia of Bole / Tree Height / No of Trunks	
MAGNOLIA	MAG		

SIZES AND SPECIES ARE INDICATIVE ONLY, WITH THE MEAN SPREAD DRAWN TO SCALE.

Coordinate Table

Aworth SURVEY CONSULTANTS

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
7	PN	538480.864	181222.252	1.571
100	–	538634.795	181387.889	1.889
104	PNW	538456.201	181318.168	1.791
105	PNW	538471.710	181322.503	1.767
106	PKN	538480.626	181295.154	1.724
107	PNW	538502.572	181262.266	1.788
108	PN	538542.985	181243.685	1.646
109	PKN	538529.685	181282.973	1.849
110	PKN	538513.558	181338.185	1.587
C2	PN	538687.952	181279.286	1.783
C3	PKN	538506.884	181219.790	1.829

HN – Hilti® Nail PKN – Parker Kalon® Nail PGM – Permanent Ground Marker
PM – Punch Mark PN – Pipe Nail W – Washer (used with PKN and PN)

NOTE:
PHOTO POSITIONS SHOWN THUS: 1

FOR PHOTO'S REFER TO DRAWING 3553–2 SHEET 2.

NOTES

GRID THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID BY GPS USING OSTN02. THE LOCAL GRID ORIGIN IS STN C1, CO–ORDINATES 538663.947E, 181376.651N.

LEVELLING THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

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Drawing No	Sheet	Revision
3553–2	1	
	Scale 1:200	@A1

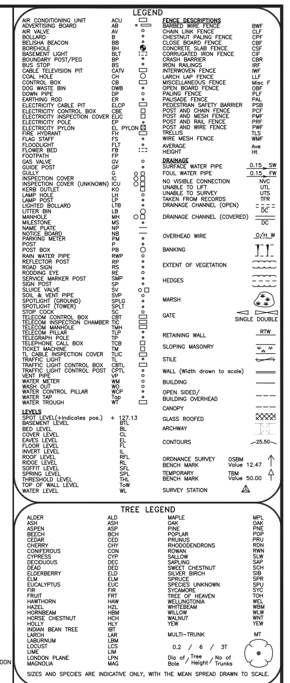
Surveyed	NW
Drawn	DRF/TP
Checked	PDE
Date	18/12/09

Project

ABERFELDY VILLAGE
POPLAR
PHASE 2

Client

POPLAR HARCA
UNIT 3, QUEBEC WHARF
14 THOMAS ROAD
LONDON E14 7AF



Coordinate Table

Aworth SURVEY CONSULTANTS

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
50	PN	538723.408	181302.555	1.783
51	PN	538743.187	181255.906	1.653
52	PNW	538752.765	181230.150	1.729
53	PN	538777.386	181218.539	1.788
54	PN	538768.285	181195.695	4.223
55	PN	538823.444	181216.378	4.266
56	PN	538862.514	181229.780	4.289
57	PN	538889.518	181250.146	4.314
58	PN	538898.100	181276.217	3.382
59	PKN	538883.382	181285.090	2.634
60		538801.399	181318.471	1.922
61	PKN	538771.406	181319.327	1.852
62	PN	538777.714	181288.671	1.808
63	PKN	538848.013	181273.050	1.636
65	PNW	538783.642	181236.459	1.944
66	PEG	538811.387	181291.715	1.744
C1	PN	538663.947	181376.651	1.940
C2	PN	538687.952	181279.286	1.783

HN – Hilti® Nail
PM – Punch Mark
PKN – Parker Kalon® Nail
PN – Pipe Nail
PGM – Permanent Ground Marker
W – Washer (used with PKN and PN)

NOTE:

PHOTO POSITIONS SHOWN THUS: ←①

FOR PHOTO'S REFER TO DRAWING 3553-5 SHEET 2.

NOTES

GRID THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID BY GPS USING OSTN02. THE LOCAL GRID ORIGIN IS STN C1 E538663.947, N81376.651

LEVELLING THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

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THE SURVEY ASSOCIATION

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Drawing No	Sheet	Revision
3553-5	1	
	Scale 1:200	@ A0

Surveyed	CS
Drawn	JBW
Checked	PDE
Date	18/12/09

Project

ABERFELDY VILLAGE
POPLAR
PHASE 5

Client

POPLAR HARCA
UNIT 3, QUEBEC WHARF
14 THOMAS ROAD
LONDON E14 7AF

LEGEND

AIR CONDITIONING UNIT	ACU	
ADVERTISING BOARD	AB	
AIR VALVE	AV	
BOLLARD	B	
BELISHA BEACON	BB	
BOREHOLE	BH	
BASEMENT LIGHT	BLT	
BOUNDARY POST/PEG	BP	
BUS STOP	BS	
CABLE TELEVISION PIT	CATV	
COAL HOLE	CH	
CONTROL BOX	CB	
DOG WASTE BIN	DWB	
DOWN PIPE	DP	
EARTHING ROD	ER	
ELECTRICITY CABLE PIT	ELCP	
ELECTRICITY CONTROL BOX	CBE	
ELECTRICITY INSPECTION COVER	ELIC	
ELECTRICITY POLE	EP	
ELECTRICITY PYLON	EL PYLON	
FIRE HYDRANT	FH	
FLAG STAFF	FS	
FLOODLIGHT	FLT	
FLOWER BED	FB	
FOOTPATH	FP	
GAS VALVE	GV	
GUIDE POST	GP	
GULLY	G	
INSPECTION COVER	IC	
INSPECTION COVER (UNKNOWN)	ICU	
KERB OUTLET	KO	
LAMP HOLE	LH	
LAMP POST	LP	
LIGHTED BOLLARD	LTB	
LITTER BIN	LB	
MANHOLE	MH	
MILESTONE	MS	
NAME PLATE	NP	
NOTICE BOARD	NB	
PARKING METER	PM	
POST	P	
POST BOX	PB	
RAIN WATER PIPE	RWP	
REFLECTOR POST	RP	
ROAD SIGN	RS	
RODDING EYE	RE	
SERVICE MARKER POST	SMP	
SIGN POST	SP	
SLUICE VALVE	SV	
SOIL & VENT PIPE	SVP	
SPOTLIGHT (GROUND)	SPLG	
SPOTLIGHT (TOWER)	SPLT	
STOP COCK	SC	
TELECOM CONTROL BOX	CBT	
TELECOM INSPECTION CHAMBER	TIC	
TELECOM MANHOLE	TMH	
TELECOM PILLAR	TLP	
TELEGRAPH POLE	TP	
TELEPHONE CALL BOX	TCB	
TICKET MACHINE	TM	
TL CABLE INSPECTION COVER	TLIC	
TRAFFIC LIGHT	TL	
TRAFFIC LIGHT CONTROL BOX	CBTL	
TRAFFIC LIGHT CONTROL POST	CPTL	
VENT PIPE	VP	
WATER METER	WM	
WASH OUT	WO	
WATER CONTROL PILLAR	WCP	
WATER TAP	Tap	
WATER TROUGH	WT	

LEVELS

SPOT LEVEL(+Indicates pos.)	+ 127.13
BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
EAVES LEVEL	EL
FLOOR LEVEL	FL
INVERT LEVEL	IL
ROOF LEVEL	RFL
RIDGE LEVEL	RL
SOFFIT LEVEL	SFL
SPRING LEVEL	SPL
THRESHOLD LEVEL	THL
TOP OF WALL LEVEL	ToW
WATER LEVEL	WL

FENCE DESCRIPTIONS

BARBED WIRE FENCE	BWF
CHAIN LINK FENCE	CLF
CHESTNUT PALING FENCE	CPF
CLOSE BOARD FENCE	CBF
CONCRETE SLAB FENCE	CSF
CORRUGATED IRON FENCE	CIF
CRASH BARRIER	CBR
IRON RAILINGS	IRF
INTERWOVEN FENCE	IWF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	Misc F
OPEN BOARD FENCE	OBF
PALING FENCE	PLF
PALISADE FENCE	PAL
PEDESTRIAN SAFETY BARRIER	PSB
POST AND CHAIN FENCE	PCF
POST AND MESH FENCE	PMF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
TRELLIS	TLS
WIRE MESH FENCE	WMF
AVERAGE	Ave
HEIGHT	Ht

DRAINAGE

SURFACE WATER PIPE	0.15 SW
FOUL WATER PIPE	0.15 FW
NO VISIBLE CONNECTION	NVC
UNABLE TO LIFT	UTL
UNABLE TO SURVEY	UTS
TAKEN FROM RECORDS	TFR
DRAINAGE CHANNEL (OPEN)	DC
DRAINAGE CHANNEL (COVERED)	DC

OVERHEAD WIRE O/H W
BANKING
EXTENT OF VEGETATION
HEDGES
MARSH
GATE SINGLE DOUBLE
RETAINING WALL RTW
SLOPING MASONRY
STILE
WALL (Width drawn to scale)
BUILDING
OPEN SIDED/ BUILDING OVERHEAD
CANOPY
GLASS ROOFED
ARCHWAY
CONTOURS 25.50
ORDNANCE SURVEY BENCH MARK OSBM Value 12.47
TEMPORARY BENCH MARK TBM Value 50.00
SURVEY STATION

TREE LEGEND

ALDER	ALD	MAPLE	MPL
ASH	ASH	OAK	OAK
ASPEN	ASP	PINE	PNE
BEECH	BCH	POPLAR	POP
CEDAR	CED	PRUNUS	PRU
CHERRY	CHY	RHODODENDRONS	RDN
CONIFEROUS	CON	ROWAN	RWN
CYPRESS	CYP	SALLOW	SLW
DECIDUOUS	DEC	SAPLING	SAP
DEAD	DED	SWEET CHESTNUT	SCH
ELDERBERRY	ELD	SILVER BIRCH	SIB
ELM	ELM	SPRUCE	SPR
EUCALYPTUS	EUC	SPECIES UNKNOWN	SPU
FIR	FIR	SYCAMORE	SYC
FRUIT	FRT	TREE OF HEAVEN	TOH
HAWTHORN	HAW	WELLINGTONIA	WEL
HAZEL	HZL	WHITEBEAM	WBM
HORNBEAM	HBM	WILLOW	WLW
HORSE CHESTNUT	HCH	WALNUT	WNT
HOLLY	HLY	YEW	YEW
INDIAN BEAN TREE	IBT		
LARCH	LAR	MULTI–TRUNK	MT
LABURNUM	LBM		
LOCUST	LCS		
LIME	LIM		
LONDON PLANE	LPN		
MAGNOLIA	MAG		

0.2 / 6 / 3T
Dia of Bole / Tree Height / No of Trunks

SIZES AND SPECIES ARE INDICATIVE ONLY, WITH THE MEAN SPREAD DRAWN TO SCALE.

Coordinate Table

Aworth SURVEY CONSULTANTS

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
100	PN	538634.795	181387.889	1.889
101	PKN	538514.670	181447.628	1.737
105	PNW	538471.710	181322.503	1.767
110	PKN	538513.558	181338.185	1.587
300	PKN	538463.462	181378.864	1.771
301	PN	538491.308	181399.170	1.700
302	PKN	538560.752	181415.049	1.811
303	PKN	538584.861	181360.978	1.582
600	PKN	538427.513	181308.490	1.990
601	PN	538391.334	181297.567	2.139
602	PN	538373.212	181302.329	2.239
603	PKN	538353.673	181294.721	2.329
604	HN	538339.098	181280.636	2.476
605	PN	538334.163	181259.767	2.593
606	HN	538321.900	181325.555	2.415
607	PN	538315.708	181356.368	2.973
608	PKN	538307.935	181397.113	3.182
609	PN	538297.372	181442.215	3.063
610	PN	538340.316	181458.161	2.433
611	PN	538387.155	181468.694	1.590
612	PN	538429.773	181450.741	1.801
613	PN	538402.553	181424.181	1.756
614	PN	538405.993	181397.949	1.873
615	PN	538355.834	181378.805	1.592
616	PN	538419.161	181368.113	1.830
617	PN	538385.738	181353.977	1.855
618	PKN	538378.350	181338.972	2.196
619	PKN	538346.946	181350.869	1.948
620	PN	538440.400	181424.358	1.632
C4	PNW	538429.831	181475.704	1.957

HN – Hilti® Nail
PM – Punch Mark
PKN – Parker Kalon® Nail
PN – Pipe Nail
PGM – Permanent Ground Marker
W – Washer (used with PKN and PN)

SHEET LAYOUT

1 2 3

NOTE:

PHOTO POSITIONS SHOWN THUS: 1

FOR PHOTO'S REFER TO DRAWING 3553–6 SHEET 4.

NOTES

GRID THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID BY GPS USING OSTN02. THE LOCAL GRID ORIGIN IS STN C1, CO–ORDINATES 538663.947E, 181376.651N.

LEVELLING THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

LLOYD'S REGISTER QUALITY ASSURANCE CERTIFICATED COMPANY

THE SURVEY ASSOCIATION

Aworth
SURVEY CONSULTANTS
LRQA Certificated Office
Norfolk House, Norfolk Way, Uckfield, TN22 1EP
Tel:– 01825 768319 Fax:– 01825 768310
www.aworth.co.uk als@aworth.co.uk
The Lansdowne Building, 2 Lansdowne Road
Croydon, CR9 2ER
Tel:– 020 8263 6046 Fax:– 020 8263 6146

Drawing No	Sheet	Revision
3553–6	2	
	Scale 1:200	@A0

Surveyed	DR/CS
Drawn	TP
Checked	PDE
Date	18/12/09

Project

ABERFELDY VILLAGE
POPLAR
PHASE 6

Client

POPLAR HARCA
UNIT 3, QUEBEC WHARF
14 THOMAS ROAD
LONDON E14 7AF

Appendix B – Thames Water Asset Records and Pre Development Enquiry Response

Mrs Maria Magdalena Burca
Ecoworld and Poplar Harca C/O Meinhardt (UK) Ltd
10 Aldersgate Street
London
EC1A 4HJ

Wastewater pre-planning
Our ref DS6080631

24 March 2021

Pre-planning enquiry: Confirmation of sufficient capacity

Dear Mrs Burca,

Thank you for providing information on your development:

Aberfeldy Village, Area known as Poplar Riverside, London, E14 0HT.

Existing: 297 dwellings, primary school and commercial space (2,217sqm).

Proposed: Demolition of existing site. Phase A – 250 residential units. Foul water discharging by gravity. 50 units to MH7303, 23 units to MH3605, 75 units to MH4301A, 102 units to MH4215. Surface water discharging by gravity attenuated to 8.59l/s to manholes 7303, 3605, 4301A and 4215.

Phase B – 573 residential units, 920.3sqm of workspace, 1,894.9sqm of residential hub, 344,8sqm of estate management space and 443.3sqm of retail space. Foul water discharging by gravity. 79 units to MH3605, 222 units to MH3517 and MH2536, 160 units to MH3516. Surface water discharging by gravity attenuated to 8l/s to manholes 3605, 3517, 2536 and 3516.

Phase C – 622 residential units and 4,816.7sqm workspace. Foul water discharging by gravity to manhole 4303. Surface water discharging by gravity attenuated to 6l/s to manhole 4303.

Phase D – Primary school. Foul water discharging by gravity to manhole 4302. Surface water discharging by gravity attenuated to 3l/s to manhole 4302.

Phase E – 427 residential units and 2,808.3sqm of workspace. Foul water discharging by gravity. 220 units to the manhole upstream of MH4203 in Blair Street, 151 units to MH4202 and 78 units to MH4216.

Overall surface water discharge rates for the development will be restricted to 33.59l/s.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent combined sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to not be viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers.

Only when it can be proven that soakage into the ground or a connection into an adjacent watercourse is not possible would we consider a restricted discharge into the public combined sewer network.

If the peak surface water run-off discharge is then restricted to Greenfield run-off rates/a maximum of 33.59l/s as your drainage strategy indicates, then we would have no objections to the proposals.

Thames Water Planning team would ask to see why it is not practicable on the site to restrict to Greenfield run-off rates if they are consulted as part of any planning application.

In considering your surface water needs, we support the use of sustainable drainage on development sites. You'll need to show the local authority and/or lead local flood authority how you've taken into account the surface water hierarchy that we've included.

Please see the attached 'Planning your wastewater' leaflet for additional information.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 0203 577 9811.

Yours sincerely

Siva Rajaratnam - Adoptions Engineer

Thames Water

Asset location search

Property Searches

Meinhardt (UK) Ltd
10

LONDON
EC1A 4HJ

Search address supplied	Aberfeldy Village Aberfeldy Street London London UK
Your reference	Aberfeldy Street Aberfeldy Village E14 0NU
Our reference	ALS/ALS Standard/2020_4292429
Search date	5 November 2020

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

Search address supplied: Aberfeldy Village, Aberfeldy Street, London, London, UK,

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

TQ3881NE
TQ3881SW
TQ3881NW
TQ3881SE

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

The following quartiles have been printed as they fall within Thames' water area:

TQ3881NE
TQ3881SW

TQ3881NW
TQ3881SE

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

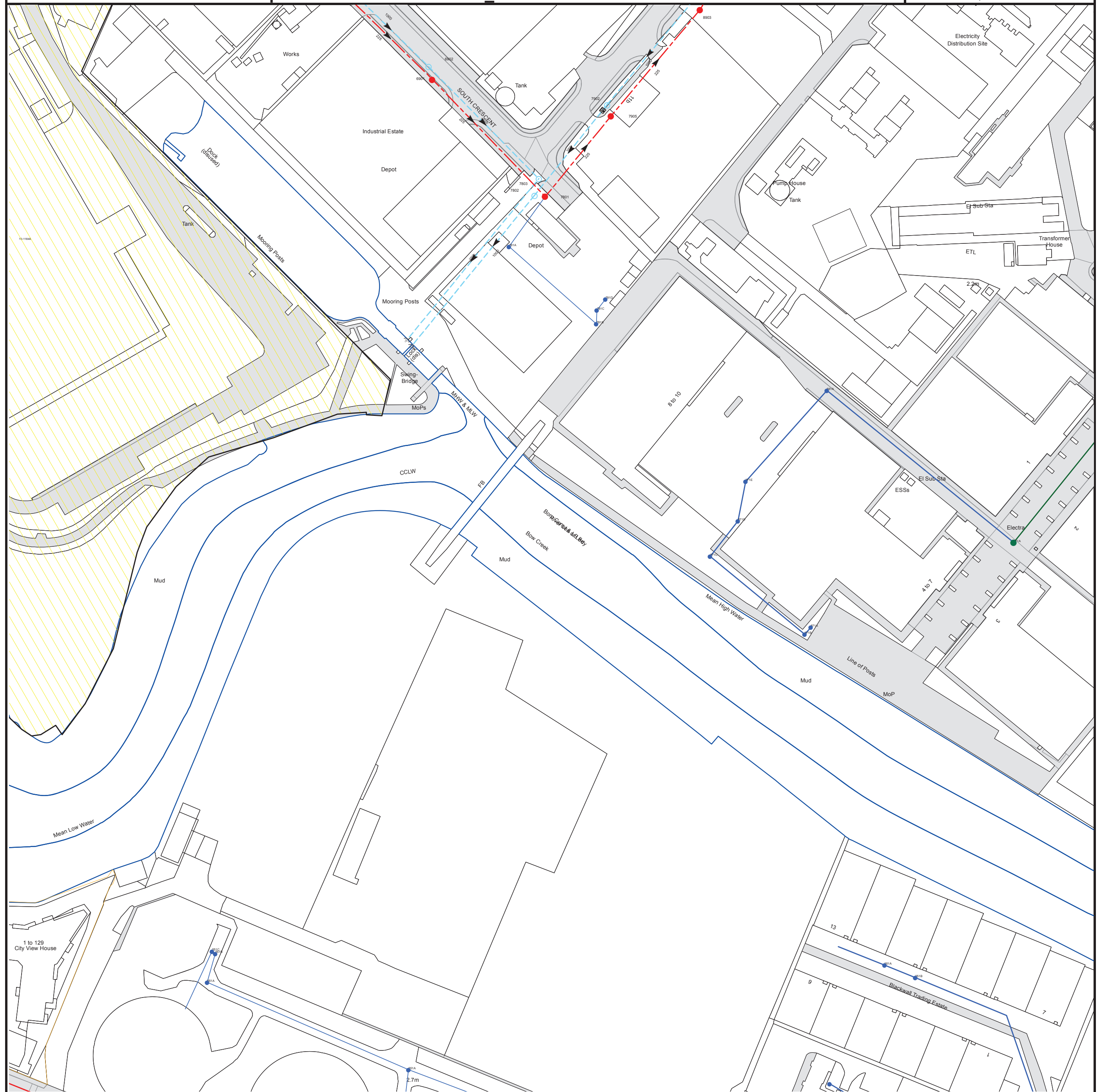
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4292429	TQ3881NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538750,181750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
85AB	n/a	n/a
85AC	n/a	n/a
951A	n/a	n/a
951B	n/a	n/a
8904	n/a	n/a
8903	n/a	n/a
781A	n/a	n/a
7802	n/a	n/a
7803	n/a	n/a
7801	n/a	n/a
781B	n/a	n/a
781C	n/a	n/a
781D	n/a	n/a
871C	n/a	n/a
871D	n/a	n/a
871E	n/a	n/a
871B	n/a	n/a
871A	n/a	n/a
881A	n/a	n/a
971A	n/a	n/a
651A	n/a	n/a
6902	n/a	n/a
6901	n/a	n/a
7902	n/a	n/a
7905	n/a	n/a
551A	n/a	n/a
551C	n/a	n/a
551B	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4292429	TQ3881SW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538250,181250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3407	2.25	.86
3402	1.92	-3.79
3403	1.94	-.54
2417	3	1.5
141A	n/a	n/a
2424	2.32	n/a
141G	n/a	n/a
411H	n/a	n/a
4203	1.7	-.48
4204	1.79	-.7
4202	1.71	-.9
4201	1.7	-.94
42DH	n/a	n/a
42DI	n/a	n/a
42DJ	n/a	n/a
42EA	n/a	n/a
4216	1.57	-1.33
42EE	n/a	n/a
4215	1.61	-2.24
42EG	n/a	n/a
42ED	n/a	n/a
43DB	n/a	n/a
33CH	n/a	n/a
4301A	1.77	-2.82
43DE	n/a	n/a
431E	n/a	n/a
43DD	n/a	n/a
43DF	n/a	n/a
4319	1.76	-1.28
43DG	n/a	n/a
44DB	n/a	n/a
44DA	n/a	n/a
44CI	n/a	n/a
44DC	n/a	n/a
44DD	n/a	n/a
44CH	n/a	n/a
44CJ	n/a	n/a
3432	1.68	-1.72
4420	1.59	-3.16
4419	1.7	-3.27
4408	1.75	-3.45
3405	1.72	.13
4407	1.97	-3.55
4401	1.76	-.05
3404	1.67	-.33
3222	2.36	.55
32CG	n/a	n/a
42EC	n/a	n/a
33EE	n/a	n/a
4313	2.04	-1.04
43DI	n/a	n/a
33ED	n/a	n/a
33EC	n/a	n/a
33EB	n/a	n/a
4312	1.73	-2.54
33EA	n/a	n/a
33DJ	n/a	n/a
431D	n/a	n/a
431C	n/a	n/a
33CE	n/a	n/a
4303	n/a	n/a
4302	n/a	n/a
431B	n/a	n/a
33DB	n/a	n/a
33DC	n/a	n/a
431A	n/a	n/a
33DD	n/a	n/a
3016	4.41	-1.42
3015	4.08	-1.55
3014	3.45	-1.74
3010	n/a	n/a
3023	4.25	1.24
3005	n/a	n/a
3009	3.98	1.27
3008	4.06	2.68
3007	4.16	-1.23
3006	6.19	2.89
2422	2.26	-4.27
2406	2.7	1.83
2409	2.99	2.3
2408	n/a	n/a
2304	2.49	1.07
2420	3.36	1.54
2303	2.35	.8
2305	2.66	1.02
2301	2.38	.73
3306	2.49	1.72
3310	2.57	.74
3406	2.76	1.11
3401	3.04	-8.94

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3302	2.7	.54
3301B	2.29	-1.11
33CI	n/a	n/a
3205	2.35	-4.07
33CD	n/a	n/a
3202	n/a	n/a
33CJ	n/a	n/a
33DE	n/a	n/a
33DF	n/a	n/a
33DG	n/a	n/a
33DH	n/a	n/a
33DA	n/a	n/a
33DI	n/a	n/a
3316	n/a	n/a
2102	4.37	1.67
2012	4.38	1.37
2112	4.66	-8.47
3112	n/a	n/a
3101	n/a	n/a
3102	n/a	n/a
3103	n/a	n/a
3106	n/a	n/a
311C	n/a	n/a
311B	n/a	n/a
311A	n/a	n/a
4104	1.72	-.02
411E	n/a	n/a
411A	n/a	n/a
411J	n/a	n/a
411F	n/a	n/a
411B	n/a	n/a
411I	n/a	n/a
411G	n/a	n/a
411C	n/a	n/a
4103	1.85	-.11
411D	n/a	n/a
4011	4.17	1.55
4102	1.93	-.22
4101	1.93	-.49
12BD	n/a	n/a
12BE	n/a	n/a
2208	5.19	2.74
22CE	n/a	n/a
22CD	n/a	n/a
12BF	n/a	n/a
22BH	n/a	n/a
22BI	n/a	n/a
22BJ	n/a	n/a
22CA	n/a	n/a
22CB	n/a	n/a
22CC	n/a	n/a
2207	5.18	2.47
21CE	n/a	n/a
21CD	n/a	n/a
2203	5.2	2.35
21CC	n/a	n/a
2202	3.7	1.85
2204	3.93	2.12
2201	2.97	.77
2212	2.64	1.93
3218	2.85	1.21
3217	2.94	.53
3219	2.74	1.64
3201	2.44	-8.63
3204	2.34	-.83
3203	2.47	-1.25
12EB	n/a	n/a
12EA	n/a	n/a
121I	n/a	n/a
121F	5.7	4.88
121K	5.65	4.88
121T	5.98	3.89
121J	n/a	n/a
121G	5.7	4.55
12DJ	n/a	n/a
121E	n/a	n/a
121H	n/a	n/a
121D	5.7	3.04
121O	6.31	4.9
12DI	n/a	n/a
121C	5.99	3.08
121R	6.17	4.07
12DH	n/a	n/a
12FH	n/a	n/a
12FI	n/a	n/a
12BJ	n/a	n/a
12CA	n/a	n/a
12CB	n/a	n/a
12AI	n/a	n/a
12AJ	n/a	n/a
12BA	n/a	n/a
12BB	n/a	n/a
12BC	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
11ED	n/a	n/a
11EC	n/a	n/a
11EB	n/a	n/a
21BE	n/a	n/a
11CG	n/a	n/a
11EA	n/a	n/a
21CH	n/a	n/a
21BF	n/a	n/a
11CH	n/a	n/a
11DJ	n/a	n/a
11CI	n/a	n/a
11CJ	n/a	n/a
21BG	n/a	n/a
11DA	n/a	n/a
11DB	n/a	n/a
11DI	n/a	n/a
21BH	n/a	n/a
11DC	n/a	n/a
11DH	n/a	n/a
21BI	n/a	n/a
11DF	n/a	n/a
11DG	n/a	n/a
21BJ	n/a	n/a
2110	5.27	3.03
21CA	n/a	n/a
21CB	n/a	n/a
2109	4.66	2.72
10DF	n/a	n/a
20DC	n/a	n/a
101A	n/a	n/a
20CD	n/a	n/a
10CC	n/a	n/a
10CI	n/a	n/a
20CI	n/a	n/a
1017	5.67	2.64
10CD	n/a	n/a
1016	5.23	2.03
10FD	n/a	n/a
20CJ	n/a	n/a
2019	4.77	1.79
10FE	n/a	n/a
11EI	n/a	n/a
11EJ	n/a	n/a
11FA	n/a	n/a
11FB	n/a	n/a
11FC	n/a	n/a
11FE	n/a	n/a
11FH	n/a	n/a
1102B	5.81	2.58
11EG	n/a	n/a
11EF	n/a	n/a
1101A	5.8	2.17
11EE	n/a	n/a
2103	4.5	2.19
02CH	n/a	n/a
12GD	n/a	n/a
12DG	n/a	n/a
12BI	n/a	n/a
12DF	n/a	n/a
12DD	n/a	n/a
12DC	n/a	n/a
12BH	n/a	n/a
12DB	n/a	n/a
12DA	n/a	n/a
12CJ	n/a	n/a
12GF	n/a	n/a
1205	n/a	n/a
12CI	n/a	n/a
12BG	n/a	n/a
12CH	n/a	n/a
12CC	n/a	n/a
13DH	n/a	n/a
13DE	n/a	n/a
13DG	n/a	n/a
13DF	n/a	n/a
13DD	n/a	n/a
13DI	n/a	n/a
13DC	n/a	n/a
13DB	n/a	n/a
1303	n/a	n/a
1301	5.33	3.16
1004	n/a	n/a
1009	n/a	n/a
1003	n/a	n/a
1001A	n/a	n/a
1010	5.03	1.14
2004	5.3	2.58
1013	5.52	1.82
2005	4.86	3.56
2006	4.74	3.75
1011	5.33	1.55
001D	n/a	n/a
10DH	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2011	4.53	1.22
10FA	n/a	n/a
10EJ	n/a	n/a
10DG	n/a	n/a
10DE	n/a	n/a
10DB	n/a	n/a
101B	n/a	n/a
10DD	n/a	n/a
20DB	n/a	n/a
01FD	n/a	n/a
0102A	6.44	3.38
01FG	n/a	n/a
01FH	n/a	n/a
01FI	n/a	n/a
01FJ	n/a	n/a
01FF	n/a	n/a
01GA	n/a	n/a
01GB	n/a	n/a
01GC	n/a	n/a
01BE	n/a	n/a
01BF	n/a	n/a
0003	6.02	2.89
11CB	n/a	n/a
11GI	n/a	n/a
11GA	n/a	n/a
11CC	n/a	n/a
11GB	n/a	n/a
11GC	n/a	n/a
11GD	n/a	n/a
11GE	n/a	n/a
11GF	n/a	n/a
11GG	n/a	n/a
10FC	n/a	n/a
11HC	n/a	n/a
11HA	n/a	n/a
11HD	n/a	n/a
0302	5.99	3.98
0312	n/a	2.95
0402	5.17	2.45
0301	5.75	3.69
0311	5.81	2.78
1410	5.02	1.25
141E	n/a	n/a
1411	5.23	1.47
141D	n/a	n/a
1404	5.25	1.53
141C	n/a	n/a
1312	5.55	3.33
1405	5.47	2.46
1415	n/a	n/a
1311	5.43	2.97
1403	4.55	1.3
1414	n/a	n/a
1310	5.38	3.07
1302	n/a	n/a
141H	n/a	n/a
131A	n/a	n/a
1402	4.17	1.17
141B	n/a	n/a
1401	3.58	1.08
2315	4.46	1.69
2314	3.26	1.25
2403	2.27	-5.19
2407	2.81	2.25
0212	n/a	n/a
0201B	6.49	3.67
02CI	n/a	n/a
0202	6.24	3.38
12FD	n/a	n/a
1103B	5.94	3.13
12FC	n/a	n/a
11CD	n/a	n/a
121S	6.11	5.25
12FB	n/a	n/a
12FA	n/a	n/a
12EJ	n/a	n/a
12EI	n/a	n/a
12EH	n/a	n/a
12EG	n/a	n/a
121L	5.71	4.55
12EF	n/a	n/a
121M	5.73	4.28
121A	5.6	3.17
12EE	n/a	n/a

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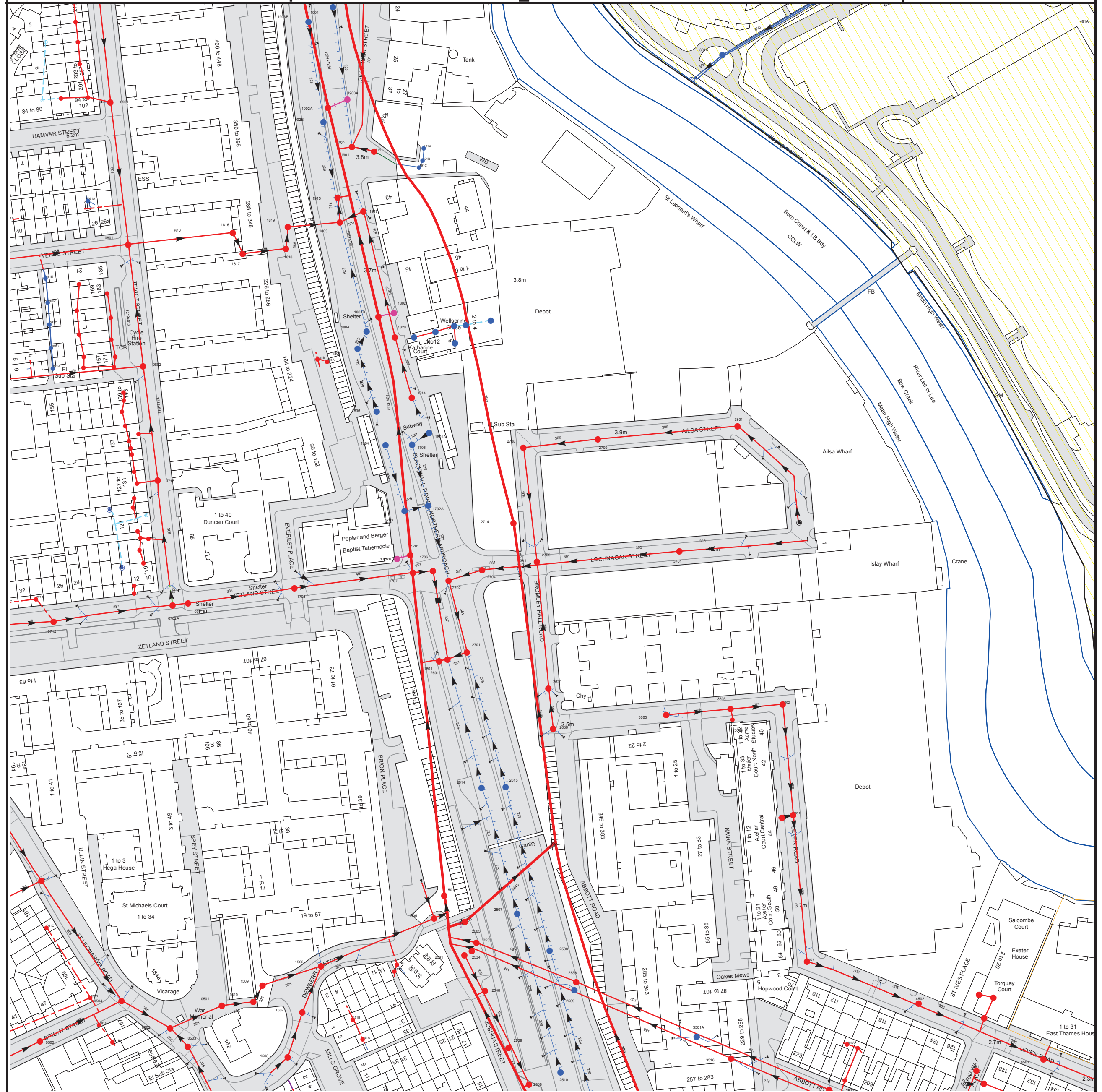
Asset Location Search Sewer Map - ALS/ALS Standard/2020_4292429	TQ3881NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538250,181750

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3701	n/a	n/a
3501A	n/a	n/a
3603	3.19	1.1
3516	n/a	n/a
3604	3.24	n/a
361A	3.5	.4
3602	3.75	.78
3601	3.55	.29
3507	3.39	n/a
3517	n/a	n/a
35CH	n/a	n/a
351A	n/a	n/a
35CG	n/a	n/a
4502	n/a	n/a
4511	n/a	n/a
45BF	n/a	n/a
45CB	n/a	n/a
45BH	n/a	n/a
45BG	n/a	n/a
4501	n/a	n/a
1705	n/a	n/a
2709	n/a	n/a
1801A	n/a	n/a
3801	n/a	n/a
1806	n/a	n/a
1814	n/a	n/a
181A	n/a	n/a
181B	n/a	n/a
1805	n/a	n/a
28AB	n/a	n/a
18CI	n/a	n/a
1820	n/a	n/a
18CH	n/a	n/a
1804	n/a	n/a
28AC	n/a	n/a
28AE	n/a	n/a
28AD	n/a	n/a
1801B	n/a	n/a
1802	n/a	n/a
1817	n/a	n/a
1818	n/a	n/a
1816	n/a	n/a
1819	n/a	n/a
1803	n/a	n/a
1917	n/a	n/a
1915	n/a	n/a
191C	n/a	n/a
191B	n/a	n/a
1914	n/a	n/a
191A	n/a	n/a
1901	n/a	n/a
1902B	n/a	n/a
1902A	n/a	n/a
1903A	n/a	n/a
391A	n/a	n/a
1903B	n/a	n/a
491A	n/a	n/a
1904	n/a	n/a
391B	n/a	n/a
2538	n/a	n/a
2510	n/a	n/a
1508	n/a	n/a
2539	n/a	n/a
0503	n/a	n/a
151A	n/a	n/a
0502	n/a	n/a
151B	n/a	n/a
1507	n/a	n/a
0501	n/a	n/a
1510	n/a	n/a
2540	n/a	n/a
2509	n/a	n/a
1509	n/a	n/a
2536	n/a	n/a
151D	n/a	n/a
1506	n/a	n/a
151C	n/a	n/a
2541	n/a	n/a
2534	n/a	n/a
2508	n/a	n/a
2535	n/a	n/a
2505	2.25	-8.8
1505	n/a	n/a
2507	n/a	n/a
1501	2.32	-5.24
2614	n/a	n/a
2615	n/a	n/a
2630	n/a	n/a
3605	n/a	n/a
2629	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1601	n/a	n/a
2601	n/a	n/a
2701	n/a	n/a
0702A	n/a	n/a
0701B	n/a	n/a
1708	n/a	n/a
2702	n/a	n/a
1707	n/a	n/a
1706	n/a	n/a
2704	n/a	n/a
2705	n/a	n/a
1702B	n/a	n/a
1701	n/a	n/a
2714	3.24	-9.46
1703	n/a	n/a
1702A	n/a	n/a
0713	n/a	n/a
2708	n/a	n/a
1704	n/a	n/a
07CH	n/a	n/a
07DB	n/a	n/a
07DD	n/a	n/a
07DE	n/a	n/a
07DJ	n/a	n/a
07EA	n/a	n/a
07EB	n/a	n/a
07DI	n/a	n/a
07DH	n/a	n/a
08BJ	n/a	n/a
08CA	n/a	n/a
08CB	n/a	n/a
08CC	n/a	n/a
08AH	n/a	n/a
081A	n/a	n/a
08EE	n/a	n/a
08DI	n/a	n/a
0802	n/a	n/a
08DH	n/a	n/a
08ED	n/a	n/a
081B	n/a	n/a
08DG	n/a	n/a
08EC	n/a	n/a
081C	n/a	n/a
08DF	n/a	n/a
08EB	n/a	n/a
081D	n/a	n/a
08DE	n/a	n/a
08EA	n/a	n/a
081E	n/a	n/a
0801	n/a	n/a
091A	n/a	n/a
0901	n/a	n/a
09BD	n/a	n/a
09BE	n/a	n/a
09BF	n/a	n/a
09CA	n/a	n/a
09BJ	n/a	n/a
09BC	n/a	n/a
09BI	n/a	n/a
09BH	n/a	n/a
071A	n/a	n/a
0506	n/a	n/a
051C	n/a	n/a
0712	n/a	n/a
051D	n/a	n/a
07CI	n/a	n/a
0504	n/a	n/a
07AH	n/a	n/a
07BJ	n/a	n/a
07CE	n/a	n/a
07CF	n/a	n/a
07CD	n/a	n/a
07CG	n/a	n/a
07CC	n/a	n/a
051B	n/a	n/a
0505	n/a	n/a
051A	n/a	n/a

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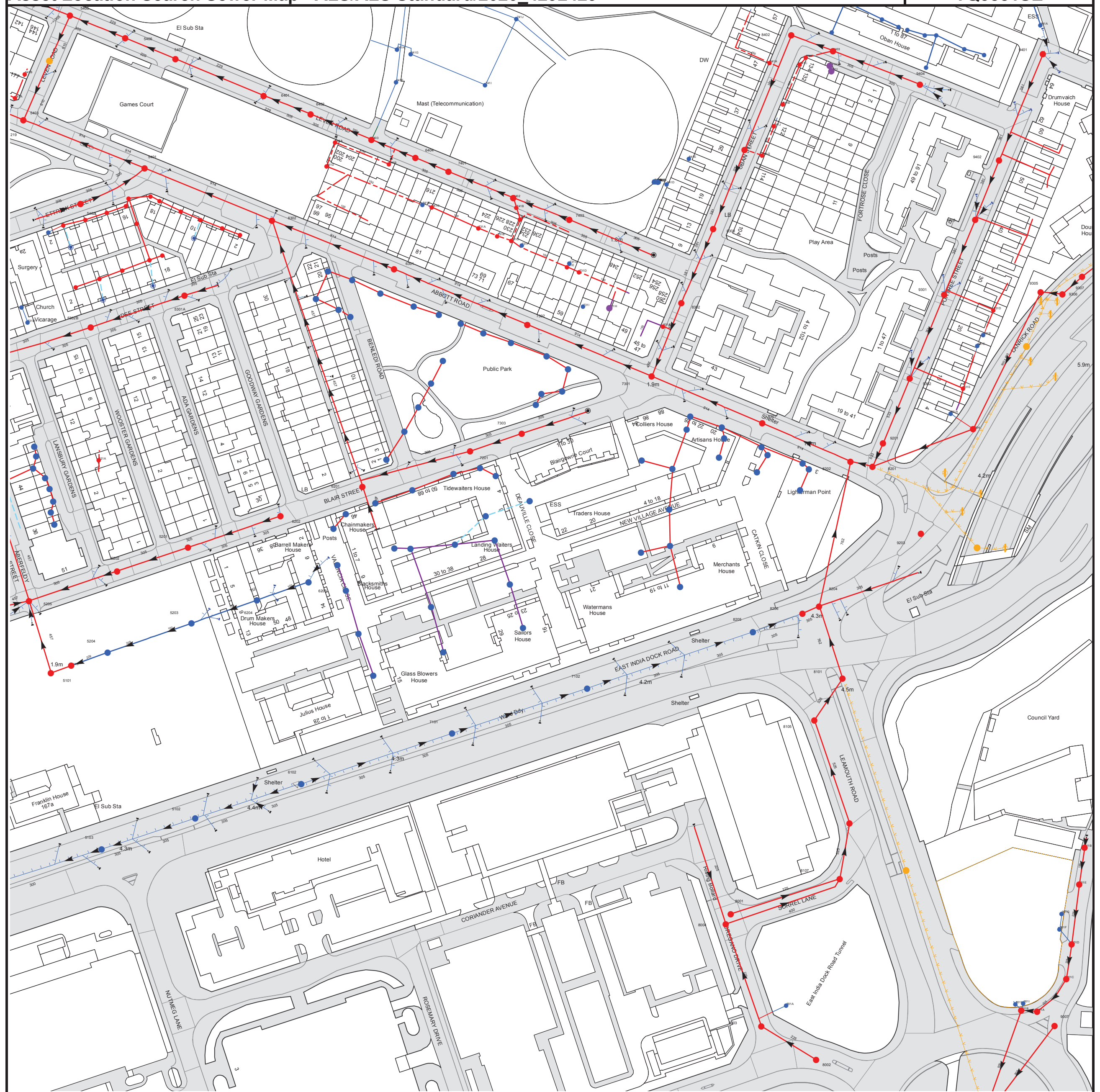
Asset Location Search Sewer Map - ALS/ALS Standard/2020_4292429	TQ3881SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538750,181250

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8401	n/a	n/a
841G	n/a	n/a
841A	n/a	n/a
841J	n/a	n/a
841B	n/a	n/a
8402	n/a	n/a
841C	n/a	n/a
841F	n/a	n/a
841H	n/a	n/a
841I	n/a	n/a
84DH	n/a	n/a
8403	n/a	n/a
94CI	n/a	n/a
94CH	n/a	n/a
94CJ	n/a	n/a
9404	n/a	n/a
94DA	n/a	n/a
94DC	n/a	n/a
94DB	n/a	n/a
9402	n/a	n/a
9401	n/a	n/a
7403	n/a	n/a
741A	n/a	n/a
741B	n/a	n/a
641C	n/a	n/a
641E	n/a	n/a
7402	n/a	n/a
841D	n/a	n/a
741E	n/a	n/a
741D	n/a	n/a
741H	n/a	n/a
741C	n/a	n/a
741G	n/a	n/a
741F	n/a	n/a
7401	n/a	n/a
641D	n/a	n/a
641B	n/a	n/a
841E	n/a	n/a
6404	n/a	n/a
641A	n/a	n/a
6403	n/a	n/a
6402	n/a	n/a
741I	n/a	n/a
641F	n/a	n/a
641G	n/a	n/a
641H	n/a	n/a
741J	n/a	n/a
5405	n/a	n/a
9203	n/a	n/a
82CD	n/a	n/a
82CH	n/a	n/a
82CE	n/a	n/a
8201	n/a	n/a
82CF	n/a	n/a
8202	n/a	n/a
82CJ	n/a	n/a
82CI	n/a	n/a
82CG	n/a	n/a
9201	n/a	n/a
83CF	n/a	n/a
9304	n/a	n/a
83CE	n/a	n/a
8301	n/a	n/a
931A	n/a	n/a
931E	n/a	n/a
9302	n/a	n/a
931C	n/a	n/a
931B	n/a	n/a
931D	n/a	n/a
9301	n/a	n/a
9306	n/a	n/a
9305	n/a	n/a
9307	n/a	n/a
9403	n/a	n/a
72AI	n/a	n/a
731B	n/a	n/a
73CI	n/a	n/a
731C	n/a	n/a
731F	n/a	n/a
7303	n/a	n/a
7302	n/a	n/a
72CD	n/a	n/a
73DD	n/a	n/a
73DB	n/a	n/a
73CG	n/a	n/a
73DA	n/a	n/a
731E	n/a	n/a
73CJ	n/a	n/a
731G	n/a	n/a
731D	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
731I	n/a	n/a
731H	n/a	n/a
72AH	n/a	n/a
7301	n/a	n/a
831A	n/a	n/a
82CB	n/a	n/a
82CC	n/a	n/a
8302	n/a	n/a
83CB	n/a	n/a
83CC	n/a	n/a
8303	n/a	n/a
8004	n/a	n/a
8003	n/a	n/a
801A	6.29	5.79
8002	n/a	n/a
9007	n/a	n/a
8001	n/a	n/a
8107	n/a	n/a
8106	n/a	n/a
6102	n/a	n/a
7101	n/a	n/a
8105	n/a	n/a
7102	n/a	n/a
8101	n/a	n/a
61BC	n/a	n/a
62DF	n/a	n/a
62CJ	n/a	n/a
8205	n/a	n/a
72CB	n/a	n/a
8206	n/a	n/a
62DE	n/a	n/a
8204	n/a	n/a
62DA	n/a	n/a
82BJ	n/a	n/a
72CA	n/a	n/a
6203	n/a	n/a
62DB	n/a	n/a
72AG	n/a	n/a
62DD	n/a	n/a
62DC	n/a	n/a
82CA	n/a	n/a
72BJ	n/a	n/a
72BI	n/a	n/a
6202	n/a	n/a
63DI	n/a	n/a
63DJ	n/a	n/a
62CA	n/a	n/a
63EI	n/a	n/a
62CB	n/a	n/a
63FA	n/a	n/a
63EA	n/a	n/a
6201	n/a	n/a
62CE	n/a	n/a
63ED	n/a	n/a
62EF	n/a	n/a
6301	n/a	n/a
63EG	n/a	n/a
62CD	n/a	n/a
63EC	n/a	n/a
63EF	n/a	n/a
63EH	n/a	n/a
63EB	n/a	n/a
63EE	n/a	n/a
72BA	n/a	n/a
73CF	n/a	n/a
7201	n/a	n/a
731A	n/a	n/a
72AJ	n/a	n/a
73CH	n/a	n/a
72CC	n/a	n/a
53AE	n/a	n/a
53BG	n/a	n/a
53BH	n/a	n/a
5402	n/a	n/a
54DI	n/a	n/a
5302B	n/a	n/a
521A	n/a	n/a
53BI	n/a	n/a
54BH	n/a	n/a
53BJ	n/a	n/a
5406	n/a	n/a
54DH	n/a	n/a
54DJ	n/a	n/a
53CC	n/a	n/a
5401	n/a	n/a
53CA	n/a	n/a
54EA	n/a	n/a
54EB	n/a	n/a
53CB	n/a	n/a
5407	n/a	n/a
54EC	n/a	n/a
5301A	n/a	n/a
54ED	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
53CD	n/a	n/a
63CF	n/a	n/a
6401	n/a	n/a
6302	n/a	n/a
5101	n/a	n/a
511B	n/a	n/a
5204	n/a	n/a
5203	n/a	n/a
5205	n/a	n/a
6204	n/a	n/a
5202	n/a	n/a
5201	n/a	n/a
52CH	n/a	n/a
52CI	n/a	n/a
52CJ	n/a	n/a
52DA	n/a	n/a
52DB	n/a	n/a
5403	n/a	n/a
541A	n/a	n/a
541B	n/a	n/a
52DC	n/a	n/a
52DE	n/a	n/a
52DD	n/a	n/a
531B	n/a	n/a
531A	n/a	n/a
5103	n/a	n/a
5102	n/a	n/a
901H	5.1	4.21
901B	5.1	2.1
901I	5.1	4.39
901A	4.91	2.2
901F	5.59	4.52
901G	5.59	2.97
901C	4.96	2.37
901D	4.82	2.43
901E	4.68	2.58
911B	4.6	3.15
94DF	n/a	n/a
94DE	n/a	n/a
941A	n/a	n/a

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ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

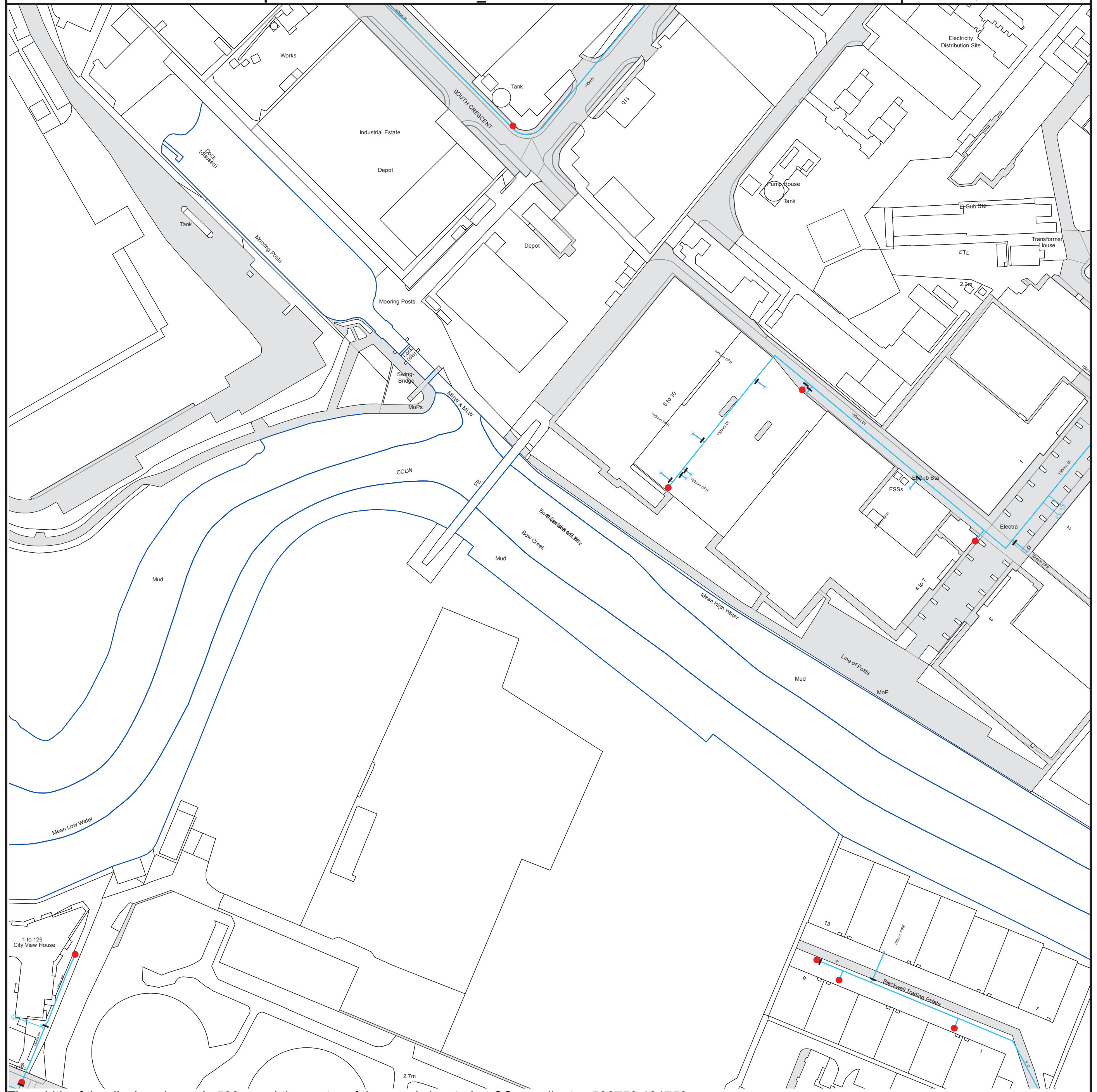
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2020_4292429	TQ3881NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538750,181750

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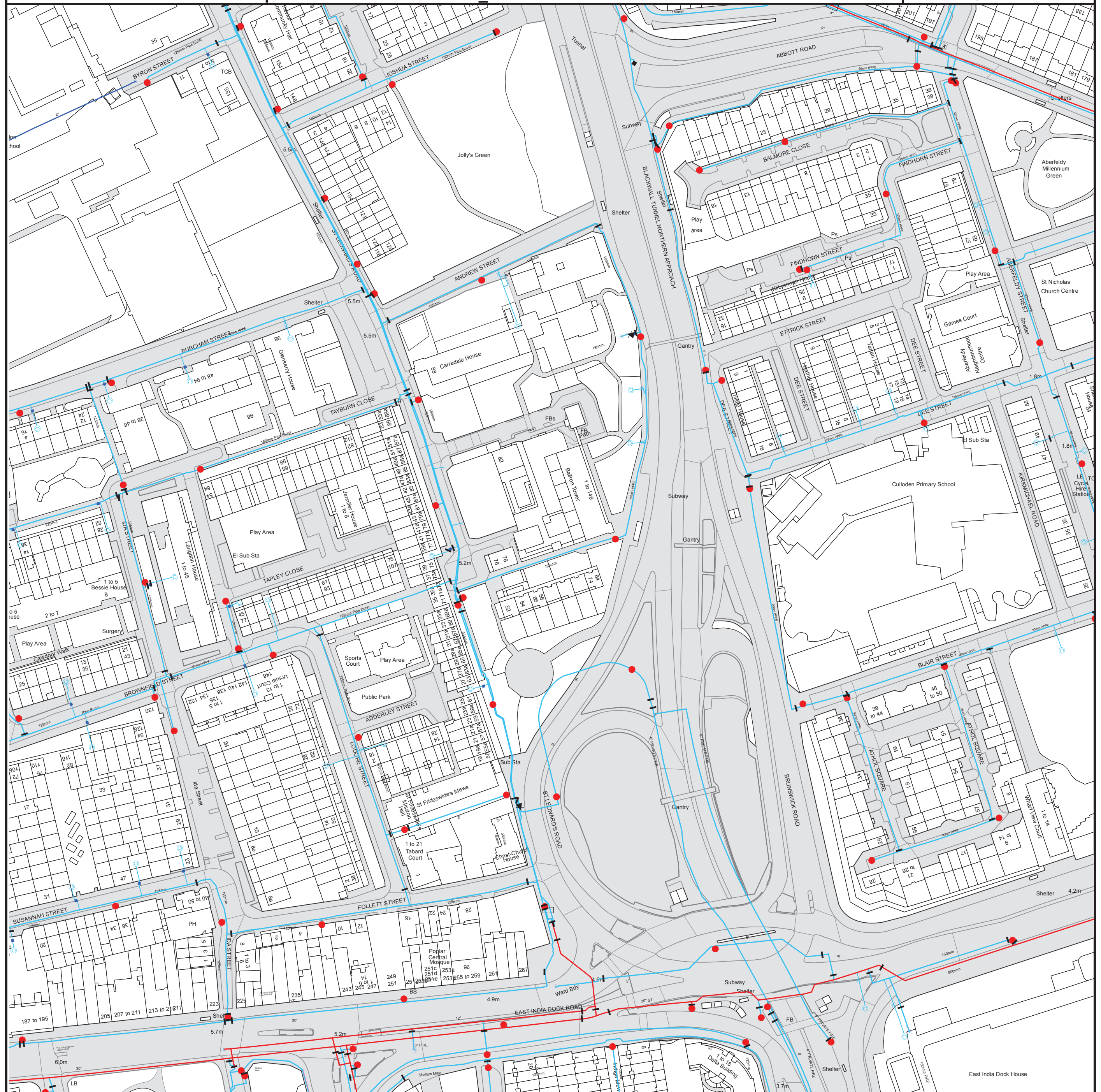
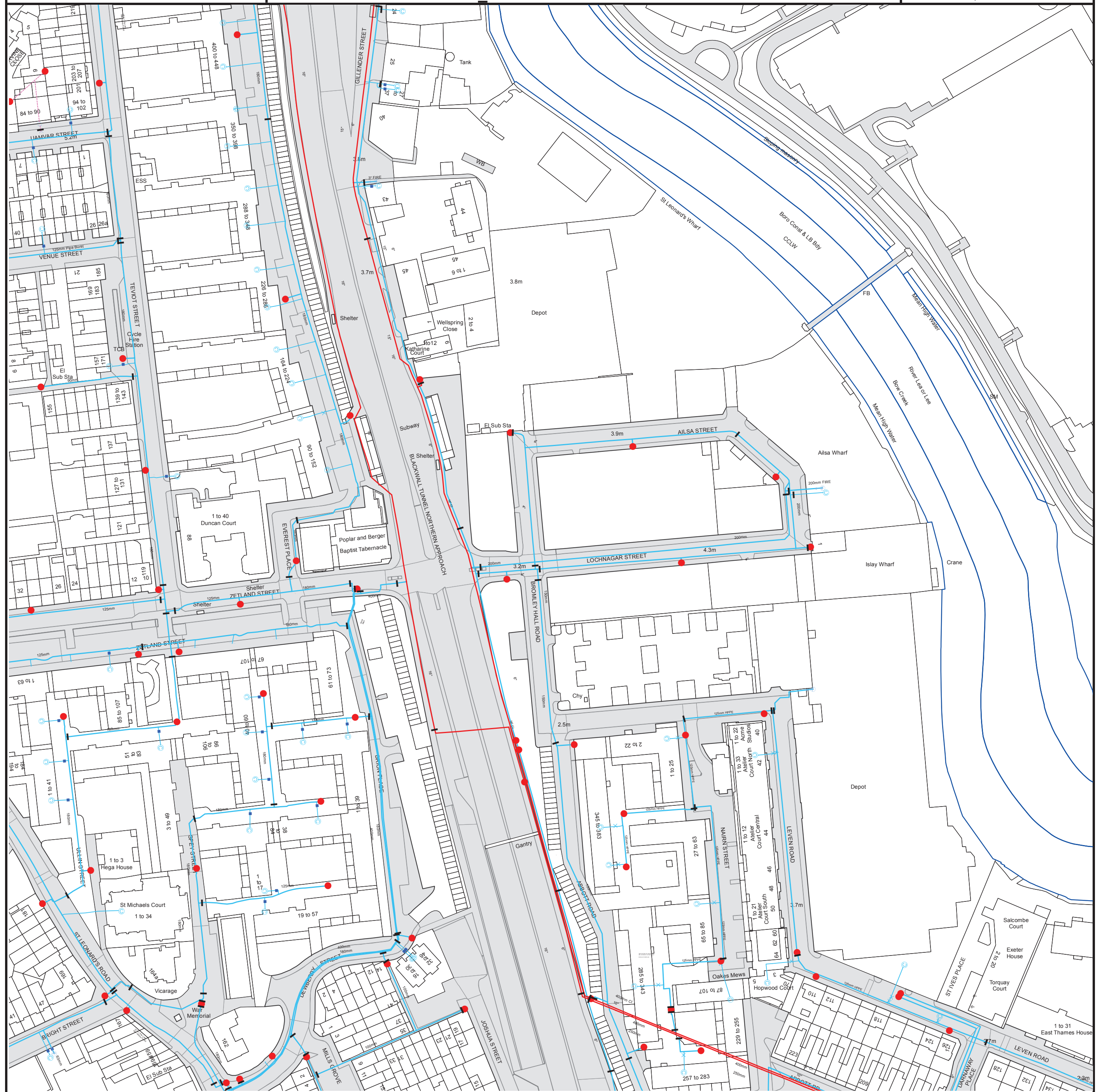
Asset Location Search Water Map - ALS/ALS Standard/2020_4292429	TQ3881SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538250,181250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

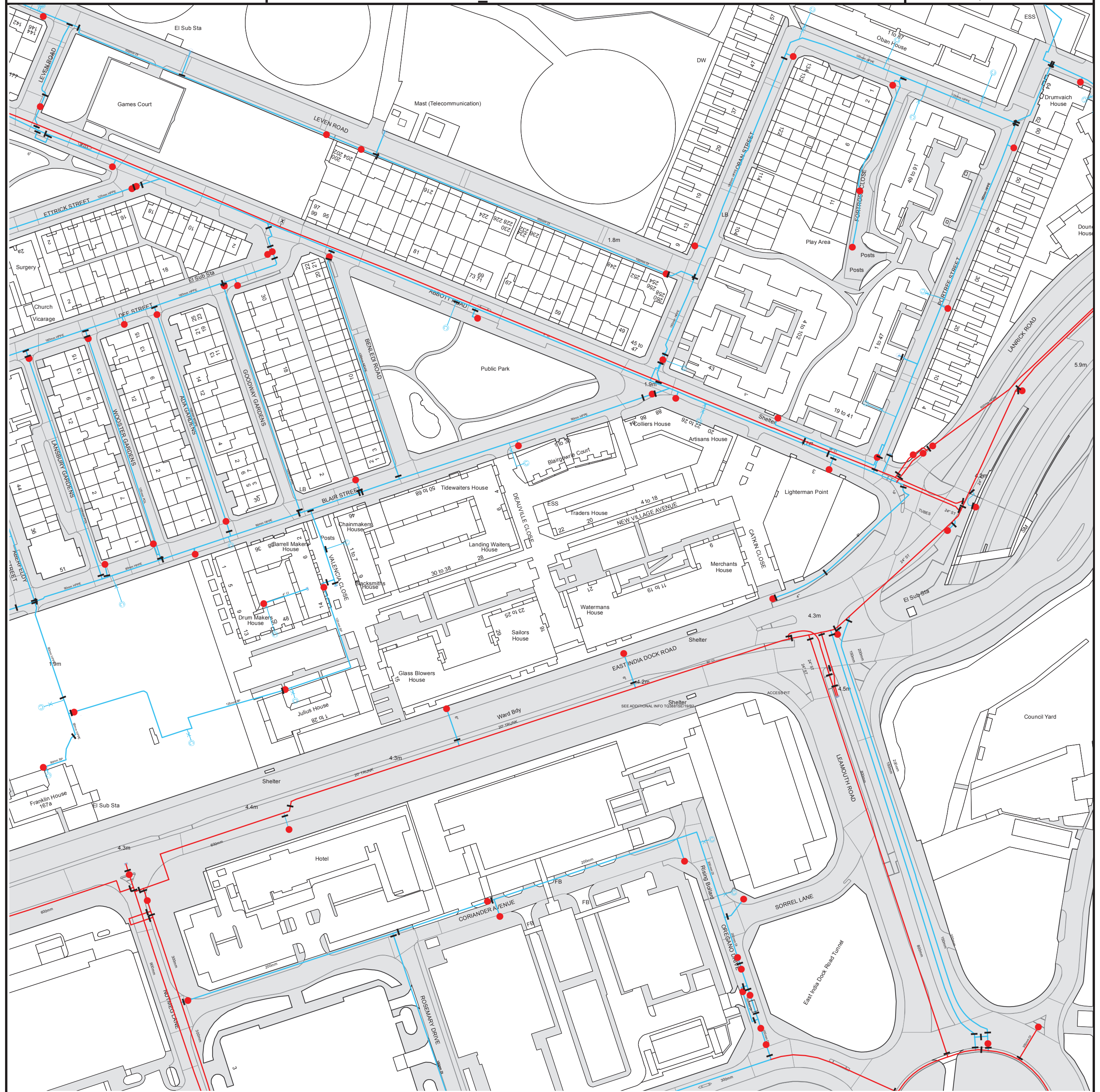
Asset Location Search Water Map - ALS/ALS Standard/2020_4292429	TQ3881NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538250,181750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Asset Location Search Water Map - ALS/ALS Standard/2020_4292429	TQ3881SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538750,181250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

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

16"

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

3" SUPPLY

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

3" FIRE

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

3" METERED

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

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

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

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

Valves

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

Hydrants

- Single Hydrant

Meters

- Meter

End Items

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

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

Operational Sites

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

Other Symbols

- Data Logger

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

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

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

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Appendix C – Drainage Strategy Drawings and Calculations

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.286	0.286	1.4	91.5	O K
30 min Summer	9.374	0.374	1.4	119.5	O K
60 min Summer	9.463	0.463	1.4	148.2	O K
120 min Summer	9.551	0.551	1.4	176.3	O K
180 min Summer	9.598	0.598	1.4	191.3	O K
240 min Summer	9.627	0.627	1.4	200.6	O K
360 min Summer	9.664	0.664	1.4	212.3	O K
480 min Summer	9.685	0.685	1.4	219.3	O K
600 min Summer	9.698	0.698	1.4	223.5	O K
720 min Summer	9.705	0.705	1.4	225.7	Flood Risk
960 min Summer	9.708	0.708	1.4	226.7	Flood Risk
1440 min Summer	9.692	0.692	1.4	221.4	O K
2160 min Summer	9.660	0.660	1.4	211.2	O K
2880 min Summer	9.629	0.629	1.4	201.1	O K
4320 min Summer	9.568	0.568	1.4	181.6	O K
5760 min Summer	9.504	0.504	1.4	161.2	O K
7200 min Summer	9.440	0.440	1.4	140.8	O K
8640 min Summer	9.385	0.385	1.4	123.3	O K
10080 min Summer	9.337	0.337	1.4	107.9	O K
15 min Winter	9.320	0.320	1.4	102.5	O K
30 min Winter	9.419	0.419	1.4	134.1	O K
60 min Winter	9.520	0.520	1.4	166.4	O K
120 min Winter	9.619	0.619	1.4	198.2	O K
180 min Winter	9.673	0.673	1.4	215.2	O K
240 min Winter	9.706	0.706	1.4	226.0	Flood Risk
360 min Winter	9.749	0.749	1.4	239.8	Flood Risk
480 min Winter	9.776	0.776	1.4	248.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	85.6	19
30 min Summer	90.705	0.0	107.0	34
60 min Summer	56.713	0.0	148.6	64
120 min Summer	34.246	0.0	178.2	124
180 min Summer	25.149	0.0	194.4	184
240 min Summer	20.078	0.0	204.0	242
360 min Summer	14.585	0.0	211.9	362
480 min Summer	11.622	0.0	211.8	482
600 min Summer	9.738	0.0	210.3	602
720 min Summer	8.424	0.0	208.3	722
960 min Summer	6.697	0.0	203.9	960
1440 min Summer	4.839	0.0	195.0	1342
2160 min Summer	3.490	0.0	333.1	1704
2880 min Summer	2.766	0.0	350.3	2076
4320 min Summer	1.989	0.0	357.5	2900
5760 min Summer	1.573	0.0	403.6	3744
7200 min Summer	1.311	0.0	420.2	4464
8640 min Summer	1.129	0.0	433.9	5192
10080 min Summer	0.994	0.0	445.1	5952
15 min Winter	138.153	0.0	94.8	19
30 min Winter	90.705	0.0	112.5	34
60 min Winter	56.713	0.0	165.9	64
120 min Winter	34.246	0.0	197.3	122
180 min Winter	25.149	0.0	210.9	180
240 min Winter	20.078	0.0	214.7	240
360 min Winter	14.585	0.0	214.5	358
480 min Winter	11.622	0.0	212.9	474

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.793	0.793	1.4	253.7	Flood Risk
720 min Winter	9.803	0.803	1.4	256.9	Flood Risk
960 min Winter	9.811	0.811	1.4	259.6	Flood Risk
1440 min Winter	9.801	0.801	1.4	256.3	Flood Risk
2160 min Winter	9.760	0.760	1.4	243.1	Flood Risk
2880 min Winter	9.721	0.721	1.4	230.8	Flood Risk
4320 min Winter	9.638	0.638	1.4	204.3	O K
5760 min Winter	9.553	0.553	1.4	176.8	O K
7200 min Winter	9.452	0.452	1.4	144.7	O K
8640 min Winter	9.368	0.368	1.4	117.8	O K
10080 min Winter	9.298	0.298	1.4	95.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	211.1	590
720 min Winter	8.424	0.0	209.3	706
960 min Winter	6.697	0.0	205.9	932
1440 min Winter	4.839	0.0	200.0	1370
2160 min Winter	3.490	0.0	371.8	1776
2880 min Winter	2.766	0.0	387.9	2216
4320 min Winter	1.989	0.0	370.5	3152
5760 min Winter	1.573	0.0	452.0	4088
7200 min Winter	1.311	0.0	470.7	4832
8640 min Winter	1.129	0.0	486.1	5536
10080 min Winter	0.994	0.0	498.9	6256

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.357

Time (mins) From:	To:	Area (ha)
0	4	0.357

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	320.0	1.000	320.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.329	0.329	0.8	32.3	O K
30 min Summer	9.429	0.429	0.8	42.1	O K
60 min Summer	9.528	0.528	0.8	51.7	O K
120 min Summer	9.618	0.618	0.8	60.5	O K
180 min Summer	9.660	0.660	0.8	64.7	O K
240 min Summer	9.682	0.682	0.8	66.8	O K
360 min Summer	9.701	0.701	0.9	68.7	Flood Risk
480 min Summer	9.703	0.703	0.9	68.9	Flood Risk
600 min Summer	9.696	0.696	0.8	68.2	O K
720 min Summer	9.687	0.687	0.8	67.3	O K
960 min Summer	9.667	0.667	0.8	65.4	O K
1440 min Summer	9.628	0.628	0.8	61.5	O K
2160 min Summer	9.571	0.571	0.8	56.0	O K
2880 min Summer	9.519	0.519	0.8	50.9	O K
4320 min Summer	9.414	0.414	0.8	40.5	O K
5760 min Summer	9.308	0.308	0.8	30.2	O K
7200 min Summer	9.233	0.233	0.8	22.9	O K
8640 min Summer	9.178	0.178	0.8	17.4	O K
10080 min Summer	9.139	0.139	0.8	13.6	O K
15 min Winter	9.369	0.369	0.8	36.2	O K
30 min Winter	9.482	0.482	0.8	47.2	O K
60 min Winter	9.593	0.593	0.8	58.2	O K
120 min Winter	9.696	0.696	0.8	68.2	O K
180 min Winter	9.746	0.746	0.9	73.1	Flood Risk
240 min Winter	9.773	0.773	0.9	75.8	Flood Risk
360 min Winter	9.800	0.800	0.9	78.4	Flood Risk
480 min Winter	9.808	0.808	0.9	79.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	32.4	19
30 min Summer	90.705	0.0	42.5	34
60 min Summer	56.713	0.0	53.8	64
120 min Summer	34.246	0.0	65.0	122
180 min Summer	25.149	0.0	71.6	182
240 min Summer	20.078	0.0	76.2	242
360 min Summer	14.585	0.0	83.0	362
480 min Summer	11.622	0.0	88.2	480
600 min Summer	9.738	0.0	92.3	594
720 min Summer	8.424	0.0	95.8	640
960 min Summer	6.697	0.0	101.4	760
1440 min Summer	4.839	0.0	109.5	1022
2160 min Summer	3.490	0.0	119.5	1432
2880 min Summer	2.766	0.0	126.3	1848
4320 min Summer	1.989	0.0	136.2	2680
5760 min Summer	1.573	0.0	143.8	3352
7200 min Summer	1.311	0.0	149.7	4040
8640 min Summer	1.129	0.0	154.7	4752
10080 min Summer	0.994	0.0	158.8	5352
15 min Winter	138.153	0.0	36.3	19
30 min Winter	90.705	0.0	47.5	33
60 min Winter	56.713	0.0	60.3	62
120 min Winter	34.246	0.0	72.8	122
180 min Winter	25.149	0.0	80.2	180
240 min Winter	20.078	0.0	85.3	238
360 min Winter	14.585	0.0	92.9	352
480 min Winter	11.622	0.0	98.7	466

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.805	0.805	0.9	78.9	Flood Risk
720 min Winter	9.797	0.797	0.9	78.1	Flood Risk
960 min Winter	9.770	0.770	0.9	75.4	Flood Risk
1440 min Winter	9.721	0.721	0.9	70.6	Flood Risk
2160 min Winter	9.642	0.642	0.8	62.9	O K
2880 min Winter	9.565	0.565	0.8	55.4	O K
4320 min Winter	9.403	0.403	0.8	39.5	O K
5760 min Winter	9.253	0.253	0.8	24.8	O K
7200 min Winter	9.162	0.162	0.8	15.8	O K
8640 min Winter	9.109	0.109	0.8	10.7	O K
10080 min Winter	9.080	0.080	0.7	7.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	103.3	576
720 min Winter	8.424	0.0	107.2	684
960 min Winter	6.697	0.0	113.4	802
1440 min Winter	4.839	0.0	121.5	1094
2160 min Winter	3.490	0.0	133.9	1556
2880 min Winter	2.766	0.0	141.4	2016
4320 min Winter	1.989	0.0	152.5	2892
5760 min Winter	1.573	0.0	161.1	3512
7200 min Winter	1.311	0.0	167.7	4112
8640 min Winter	1.129	0.0	173.2	4752
10080 min Winter	0.994	0.0	178.0	5344

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.127

Time (mins) From:	To:	Area (ha)
0	4	0.127

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	98.0	1.000	98.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0047-1000-1000-1000
Design Head (m)	1.000
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	47
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.315	0.315	1.4	56.7	O K
30 min Summer	9.411	0.411	1.4	73.9	O K
60 min Summer	9.507	0.507	1.4	91.2	O K
120 min Summer	9.596	0.596	1.4	107.4	O K
180 min Summer	9.640	0.640	1.4	115.3	O K
240 min Summer	9.665	0.665	1.4	119.6	O K
360 min Summer	9.689	0.689	1.4	124.1	O K
480 min Summer	9.698	0.698	1.4	125.6	O K
600 min Summer	9.697	0.697	1.4	125.4	O K
720 min Summer	9.690	0.690	1.4	124.2	O K
960 min Summer	9.673	0.673	1.4	121.1	O K
1440 min Summer	9.637	0.637	1.4	114.7	O K
2160 min Summer	9.584	0.584	1.4	105.2	O K
2880 min Summer	9.531	0.531	1.4	95.6	O K
4320 min Summer	9.421	0.421	1.4	75.7	O K
5760 min Summer	9.333	0.333	1.4	59.9	O K
7200 min Summer	9.263	0.263	1.4	47.4	O K
8640 min Summer	9.210	0.210	1.4	37.8	O K
10080 min Summer	9.170	0.170	1.3	30.6	O K
15 min Winter	9.354	0.354	1.4	63.6	O K
30 min Winter	9.461	0.461	1.4	83.0	O K
60 min Winter	9.570	0.570	1.4	102.6	O K
120 min Winter	9.672	0.672	1.4	120.9	O K
180 min Winter	9.723	0.723	1.4	130.1	Flood Risk
240 min Winter	9.752	0.752	1.4	135.3	Flood Risk
360 min Winter	9.783	0.783	1.4	141.0	Flood Risk
480 min Winter	9.797	0.797	1.4	143.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	56.3	19
30 min Summer	90.705	0.0	73.8	34
60 min Summer	56.713	0.0	94.2	64
120 min Summer	34.246	0.0	113.7	124
180 min Summer	25.149	0.0	125.2	182
240 min Summer	20.078	0.0	133.3	242
360 min Summer	14.585	0.0	145.1	362
480 min Summer	11.622	0.0	154.1	482
600 min Summer	9.738	0.0	161.3	600
720 min Summer	8.424	0.0	167.2	716
960 min Summer	6.697	0.0	176.7	818
1440 min Summer	4.839	0.0	188.6	1070
2160 min Summer	3.490	0.0	209.7	1476
2880 min Summer	2.766	0.0	221.5	1904
4320 min Summer	1.989	0.0	238.8	2640
5760 min Summer	1.573	0.0	252.4	3400
7200 min Summer	1.311	0.0	262.8	4104
8640 min Summer	1.129	0.0	271.4	4760
10080 min Summer	0.994	0.0	278.6	5448
15 min Winter	138.153	0.0	63.1	19
30 min Winter	90.705	0.0	82.5	33
60 min Winter	56.713	0.0	105.5	62
120 min Winter	34.246	0.0	127.3	122
180 min Winter	25.149	0.0	140.2	180
240 min Winter	20.078	0.0	149.2	238
360 min Winter	14.585	0.0	162.4	354
480 min Winter	11.622	0.0	172.3	468

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.800	0.800	1.4	144.0	Flood Risk
720 min Winter	9.797	0.797	1.4	143.4	Flood Risk
960 min Winter	9.779	0.779	1.4	140.2	Flood Risk
1440 min Winter	9.732	0.732	1.4	131.8	Flood Risk
2160 min Winter	9.662	0.662	1.4	119.2	O K
2880 min Winter	9.589	0.589	1.4	106.0	O K
4320 min Winter	9.422	0.422	1.4	75.9	O K
5760 min Winter	9.292	0.292	1.4	52.6	O K
7200 min Winter	9.202	0.202	1.4	36.3	O K
8640 min Winter	9.144	0.144	1.3	25.9	O K
10080 min Winter	9.107	0.107	1.2	19.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	180.2	582
720 min Winter	8.424	0.0	186.6	692
960 min Winter	6.697	0.0	196.4	904
1440 min Winter	4.839	0.0	201.0	1126
2160 min Winter	3.490	0.0	234.9	1600
2880 min Winter	2.766	0.0	248.0	2052
4320 min Winter	1.989	0.0	267.5	2852
5760 min Winter	1.573	0.0	282.7	3568
7200 min Winter	1.311	0.0	294.3	4184
8640 min Winter	1.129	0.0	304.0	4840
10080 min Winter	0.994	0.0	312.2	5448

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.223

Time (mins) From:	To:	Area (ha)
0	4	0.223

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	180.0	1.000	180.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
15 min Summer	9.298	0.298	1.1	38.8	O K
30 min Summer	9.388	0.388	1.1	50.4	O K
60 min Summer	9.477	0.477	1.1	62.1	O K
120 min Summer	9.558	0.558	1.1	72.6	O K
180 min Summer	9.596	0.596	1.1	77.5	O K
240 min Summer	9.615	0.615	1.1	79.9	O K
360 min Summer	9.630	0.630	1.1	81.9	O K
480 min Summer	9.630	0.630	1.1	81.9	O K
600 min Summer	9.622	0.622	1.1	80.9	O K
720 min Summer	9.612	0.612	1.1	79.6	O K
960 min Summer	9.593	0.593	1.1	77.0	O K
1440 min Summer	9.552	0.552	1.1	71.8	O K
2160 min Summer	9.492	0.492	1.1	63.9	O K
2880 min Summer	9.426	0.426	1.1	55.3	O K
4320 min Summer	9.319	0.319	1.1	41.4	O K
5760 min Summer	9.237	0.237	1.1	30.9	O K
7200 min Summer	9.180	0.180	1.1	23.4	O K
8640 min Summer	9.139	0.139	1.1	18.1	O K
10080 min Summer	9.111	0.111	1.0	14.5	O K
15 min Winter	9.335	0.335	1.1	43.5	O K
30 min Winter	9.436	0.436	1.1	56.7	O K
60 min Winter	9.537	0.537	1.1	69.9	O K
120 min Winter	9.630	0.630	1.1	81.8	O K
180 min Winter	9.674	0.674	1.1	87.6	O K
240 min Winter	9.697	0.697	1.1	90.6	O K
360 min Winter	9.718	0.718	1.1	93.4	Flood Risk
480 min Winter	9.723	0.723	1.1	94.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Discharge Volume (m^3)	Time-Peak (mins)
15 min Summer	138.153	0.0	38.9	19
30 min Summer	90.705	0.0	51.1	34
60 min Summer	56.713	0.0	64.7	64
120 min Summer	34.246	0.0	78.2	122
180 min Summer	25.149	0.0	86.1	182
240 min Summer	20.078	0.0	91.7	242
360 min Summer	14.585	0.0	99.9	362
480 min Summer	11.622	0.0	106.1	480
600 min Summer	9.738	0.0	111.1	582
720 min Summer	8.424	0.0	115.3	628
960 min Summer	6.697	0.0	122.2	752
1440 min Summer	4.839	0.0	132.1	1012
2160 min Summer	3.490	0.0	144.0	1432
2880 min Summer	2.766	0.0	152.1	1816
4320 min Summer	1.989	0.0	163.9	2552
5760 min Summer	1.573	0.0	173.2	3280
7200 min Summer	1.311	0.0	180.3	3960
8640 min Summer	1.129	0.0	186.3	4592
10080 min Summer	0.994	0.0	191.3	5336
15 min Winter	138.153	0.0	43.6	19
30 min Winter	90.705	0.0	57.3	33
60 min Winter	56.713	0.0	72.5	62
120 min Winter	34.246	0.0	87.6	122
180 min Winter	25.149	0.0	96.5	180
240 min Winter	20.078	0.0	102.7	238
360 min Winter	14.585	0.0	111.9	352
480 min Winter	11.622	0.0	118.8	466

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
600 min Winter	9.719	0.719	1.1	93.5	Flood Risk
720 min Winter	9.709	0.709	1.1	92.2	Flood Risk
960 min Winter	9.682	0.682	1.1	88.6	O K
1440 min Winter	9.631	0.631	1.1	82.0	O K
2160 min Winter	9.548	0.548	1.1	71.2	O K
2880 min Winter	9.452	0.452	1.1	58.8	O K
4320 min Winter	9.288	0.288	1.1	37.4	O K
5760 min Winter	9.182	0.182	1.1	23.6	O K
7200 min Winter	9.120	0.120	1.1	15.6	O K
8640 min Winter	9.086	0.086	1.0	11.2	O K
10080 min Winter	9.071	0.071	0.9	9.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Discharge Volume (m^3)	Time-Peak (mins)
600 min Winter	9.738	0.0	124.4	576
720 min Winter	8.424	0.0	129.1	680
960 min Winter	6.697	0.0	136.7	788
1440 min Winter	4.839	0.0	147.5	1084
2160 min Winter	3.490	0.0	161.3	1556
2880 min Winter	2.766	0.0	170.4	1988
4320 min Winter	1.989	0.0	183.7	2684
5760 min Winter	1.573	0.0	194.0	3352
7200 min Winter	1.311	0.0	202.0	3968
8640 min Winter	1.129	0.0	208.7	4584
10080 min Winter	0.994	0.0	214.3	5240

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.153

Time (mins) From:	To:	Area (ha)
0	4	0.153

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	130.0	1.000	130.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.3	Kick-Flo®	0.477	0.9
Flush-Flo™	0.236	1.1	Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.9	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	1.0	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.6
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.1	9.500	3.6

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.320	0.320	0.8	32.0	O K
30 min Summer	9.417	0.417	0.8	41.7	O K
60 min Summer	9.513	0.513	0.8	51.3	O K
120 min Summer	9.601	0.601	0.8	60.1	O K
180 min Summer	9.642	0.642	0.8	64.2	O K
240 min Summer	9.663	0.663	0.8	66.3	O K
360 min Summer	9.682	0.682	0.8	68.2	O K
480 min Summer	9.684	0.684	0.8	68.4	O K
600 min Summer	9.677	0.677	0.8	67.7	O K
720 min Summer	9.668	0.668	0.8	66.8	O K
960 min Summer	9.649	0.649	0.8	64.9	O K
1440 min Summer	9.611	0.611	0.8	61.1	O K
2160 min Summer	9.556	0.556	0.8	55.6	O K
2880 min Summer	9.504	0.504	0.8	50.4	O K
4320 min Summer	9.396	0.396	0.8	39.6	O K
5760 min Summer	9.298	0.298	0.8	29.8	O K
7200 min Summer	9.225	0.225	0.8	22.5	O K
8640 min Summer	9.172	0.172	0.8	17.2	O K
10080 min Summer	9.135	0.135	0.8	13.5	O K
15 min Winter	9.359	0.359	0.8	35.9	O K
30 min Winter	9.469	0.469	0.8	46.9	O K
60 min Winter	9.577	0.577	0.8	57.7	O K
120 min Winter	9.677	0.677	0.8	67.7	O K
180 min Winter	9.726	0.726	0.9	72.6	Flood Risk
240 min Winter	9.752	0.752	0.9	75.2	Flood Risk
360 min Winter	9.778	0.778	0.9	77.8	Flood Risk
480 min Winter	9.786	0.786	0.9	78.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	32.1	19
30 min Summer	90.705	0.0	42.2	34
60 min Summer	56.713	0.0	53.4	64
120 min Summer	34.246	0.0	64.4	122
180 min Summer	25.149	0.0	71.0	182
240 min Summer	20.078	0.0	75.6	242
360 min Summer	14.585	0.0	82.3	362
480 min Summer	11.622	0.0	87.4	480
600 min Summer	9.738	0.0	91.6	594
720 min Summer	8.424	0.0	95.0	642
960 min Summer	6.697	0.0	100.6	760
1440 min Summer	4.839	0.0	108.6	1024
2160 min Summer	3.490	0.0	118.6	1444
2880 min Summer	2.766	0.0	125.3	1848
4320 min Summer	1.989	0.0	135.1	2640
5760 min Summer	1.573	0.0	142.7	3344
7200 min Summer	1.311	0.0	148.5	4040
8640 min Summer	1.129	0.0	153.4	4680
10080 min Summer	0.994	0.0	157.6	5352
15 min Winter	138.153	0.0	36.0	19
30 min Winter	90.705	0.0	47.1	33
60 min Winter	56.713	0.0	59.8	62
120 min Winter	34.246	0.0	72.2	122
180 min Winter	25.149	0.0	79.5	180
240 min Winter	20.078	0.0	84.6	238
360 min Winter	14.585	0.0	92.2	352
480 min Winter	11.622	0.0	97.9	466

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.783	0.783	0.9	78.3	Flood Risk
720 min Winter	9.775	0.775	0.9	77.5	Flood Risk
960 min Winter	9.749	0.749	0.9	74.9	Flood Risk
1440 min Winter	9.701	0.701	0.9	70.1	Flood Risk
2160 min Winter	9.624	0.624	0.8	62.4	O K
2880 min Winter	9.548	0.548	0.8	54.8	O K
4320 min Winter	9.384	0.384	0.8	38.4	O K
5760 min Winter	9.244	0.244	0.8	24.4	O K
7200 min Winter	9.156	0.156	0.8	15.6	O K
8640 min Winter	9.106	0.106	0.8	10.6	O K
10080 min Winter	9.078	0.078	0.7	7.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	102.5	576
720 min Winter	8.424	0.0	106.3	684
960 min Winter	6.697	0.0	112.5	810
1440 min Winter	4.839	0.0	120.6	1094
2160 min Winter	3.490	0.0	132.8	1556
2880 min Winter	2.766	0.0	140.3	2016
4320 min Winter	1.989	0.0	151.3	2852
5760 min Winter	1.573	0.0	159.8	3512
7200 min Winter	1.311	0.0	166.4	4112
8640 min Winter	1.129	0.0	171.9	4752
10080 min Winter	0.994	0.0	176.5	5344

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.126

Time (mins) From:	To:	Area (ha)
0	4	0.126

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	100.0	1.000	100.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0047-1000-1000-1000
Design Head (m)	1.000
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	47
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.384	0.384	0.8	7.7	O K
30 min Summer	9.488	0.488	0.8	9.8	O K
60 min Summer	9.566	0.566	0.8	11.3	O K
120 min Summer	9.592	0.592	0.8	11.8	O K
180 min Summer	9.579	0.579	0.8	11.6	O K
240 min Summer	9.559	0.559	0.8	11.2	O K
360 min Summer	9.517	0.517	0.8	10.3	O K
480 min Summer	9.476	0.476	0.8	9.5	O K
600 min Summer	9.434	0.434	0.8	8.7	O K
720 min Summer	9.387	0.387	0.8	7.7	O K
960 min Summer	9.306	0.306	0.8	6.1	O K
1440 min Summer	9.192	0.192	0.8	3.8	O K
2160 min Summer	9.105	0.105	0.8	2.1	O K
2880 min Summer	9.071	0.071	0.7	1.4	O K
4320 min Summer	9.050	0.050	0.5	1.0	O K
5760 min Summer	9.040	0.040	0.4	0.8	O K
7200 min Summer	9.035	0.035	0.3	0.7	O K
8640 min Summer	9.032	0.032	0.3	0.6	O K
10080 min Summer	9.030	0.030	0.3	0.6	O K
15 min Winter	9.434	0.434	0.8	8.7	O K
30 min Winter	9.552	0.552	0.8	11.0	O K
60 min Winter	9.644	0.644	0.8	12.9	O K
120 min Winter	9.684	0.684	0.8	13.7	O K
180 min Winter	9.667	0.667	0.8	13.3	O K
240 min Winter	9.642	0.642	0.8	12.8	O K
360 min Winter	9.584	0.584	0.8	11.7	O K
480 min Winter	9.525	0.525	0.8	10.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	8.3	18
30 min Summer	90.705	0.0	10.9	33
60 min Summer	56.713	0.0	13.6	62
120 min Summer	34.246	0.0	16.4	116
180 min Summer	25.149	0.0	18.1	144
240 min Summer	20.078	0.0	19.3	176
360 min Summer	14.585	0.0	21.0	246
480 min Summer	11.622	0.0	22.3	316
600 min Summer	9.738	0.0	23.4	386
720 min Summer	8.424	0.0	24.3	448
960 min Summer	6.697	0.0	25.7	568
1440 min Summer	4.839	0.0	27.9	796
2160 min Summer	3.490	0.0	30.1	1128
2880 min Summer	2.766	0.0	31.9	1472
4320 min Summer	1.989	0.0	34.4	2200
5760 min Summer	1.573	0.0	36.2	2936
7200 min Summer	1.311	0.0	37.7	3584
8640 min Summer	1.129	0.0	39.0	4368
10080 min Summer	0.994	0.0	40.1	5048
15 min Winter	138.153	0.0	9.3	18
30 min Winter	90.705	0.0	12.2	32
60 min Winter	56.713	0.0	15.2	60
120 min Winter	34.246	0.0	18.4	116
180 min Winter	25.149	0.0	20.3	162
240 min Winter	20.078	0.0	21.6	188
360 min Winter	14.585	0.0	23.5	266
480 min Winter	11.622	0.0	25.0	342

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.463	0.463	0.8	9.3	O K
720 min Winter	9.391	0.391	0.8	7.8	O K
960 min Winter	9.268	0.268	0.8	5.4	O K
1440 min Winter	9.129	0.129	0.8	2.6	O K
2160 min Winter	9.066	0.066	0.7	1.3	O K
2880 min Winter	9.050	0.050	0.5	1.0	O K
4320 min Winter	9.038	0.038	0.4	0.8	O K
5760 min Winter	9.032	0.032	0.3	0.6	O K
7200 min Winter	9.029	0.029	0.3	0.6	O K
8640 min Winter	9.026	0.026	0.2	0.5	O K
10080 min Winter	9.024	0.024	0.2	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	26.2	416
720 min Winter	8.424	0.0	27.2	484
960 min Winter	6.697	0.0	28.8	598
1440 min Winter	4.839	0.0	31.2	808
2160 min Winter	3.490	0.0	33.8	1120
2880 min Winter	2.766	0.0	35.7	1472
4320 min Winter	1.989	0.0	38.5	2164
5760 min Winter	1.573	0.0	40.6	2936
7200 min Winter	1.311	0.0	42.3	3640
8640 min Winter	1.129	0.0	43.7	4392
10080 min Winter	0.994	0.0	44.9	5016

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.032

Time (mins) From:	To:	Area (ha)
0	4	0.032

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	20.0	1.000	20.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0047-1000-1000-1000
Design Head (m)	1.000
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	47
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.221	0.221	1.4	154.5	O K
30 min Summer	9.289	0.289	1.4	202.3	O K
60 min Summer	9.359	0.359	1.4	251.6	O K
120 min Summer	9.430	0.430	1.4	301.0	O K
180 min Summer	9.470	0.470	1.4	328.8	O K
240 min Summer	9.496	0.496	1.4	347.2	O K
360 min Summer	9.533	0.533	1.4	372.8	O K
480 min Summer	9.558	0.558	1.4	390.5	O K
600 min Summer	9.576	0.576	1.4	403.2	O K
720 min Summer	9.590	0.590	1.4	412.7	O K
960 min Summer	9.608	0.608	1.4	425.4	O K
1440 min Summer	9.624	0.624	1.4	436.5	O K
2160 min Summer	9.623	0.623	1.4	436.0	O K
2880 min Summer	9.609	0.609	1.4	426.0	O K
4320 min Summer	9.578	0.578	1.4	404.3	O K
5760 min Summer	9.546	0.546	1.4	382.5	O K
7200 min Summer	9.515	0.515	1.4	360.2	O K
8640 min Summer	9.481	0.481	1.4	336.5	O K
10080 min Summer	9.450	0.450	1.4	314.8	O K
15 min Winter	9.247	0.247	1.4	173.1	O K
30 min Winter	9.324	0.324	1.4	226.7	O K
60 min Winter	9.403	0.403	1.4	282.1	O K
120 min Winter	9.483	0.483	1.4	338.0	O K
180 min Winter	9.528	0.528	1.4	369.7	O K
240 min Winter	9.558	0.558	1.4	390.7	O K
360 min Winter	9.600	0.600	1.4	419.8	O K
480 min Winter	9.629	0.629	1.4	440.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	108.0	19
30 min Summer	90.705	0.0	114.9	34
60 min Summer	56.713	0.0	218.1	64
120 min Summer	34.246	0.0	227.4	124
180 min Summer	25.149	0.0	225.6	184
240 min Summer	20.078	0.0	222.1	244
360 min Summer	14.585	0.0	213.9	364
480 min Summer	11.622	0.0	207.7	484
600 min Summer	9.738	0.0	203.0	602
720 min Summer	8.424	0.0	199.3	722
960 min Summer	6.697	0.0	193.6	962
1440 min Summer	4.839	0.0	186.3	1442
2160 min Summer	3.490	0.0	400.6	2160
2880 min Summer	2.766	0.0	385.5	2736
4320 min Summer	1.989	0.0	355.3	3416
5760 min Summer	1.573	0.0	669.5	4160
7200 min Summer	1.311	0.0	692.6	4976
8640 min Summer	1.129	0.0	706.6	5712
10080 min Summer	0.994	0.0	700.1	6464
15 min Winter	138.153	0.0	112.0	19
30 min Winter	90.705	0.0	116.1	34
60 min Winter	56.713	0.0	226.7	64
120 min Winter	34.246	0.0	226.1	122
180 min Winter	25.149	0.0	219.0	182
240 min Winter	20.078	0.0	213.5	242
360 min Winter	14.585	0.0	206.5	360
480 min Winter	11.622	0.0	202.2	478

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.650	0.650	1.4	454.7	O K
720 min Winter	9.666	0.666	1.4	465.9	O K
960 min Winter	9.688	0.688	1.4	481.3	O K
1440 min Winter	9.709	0.709	1.4	496.5	Flood Risk
2160 min Winter	9.714	0.714	1.4	500.0	Flood Risk
2880 min Winter	9.704	0.704	1.4	492.7	Flood Risk
4320 min Winter	9.664	0.664	1.4	464.8	O K
5760 min Winter	9.627	0.627	1.4	438.8	O K
7200 min Winter	9.587	0.587	1.4	411.0	O K
8640 min Winter	9.546	0.546	1.4	381.9	O K
10080 min Winter	9.498	0.498	1.4	348.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	199.3	596
720 min Winter	8.424	0.0	197.4	714
960 min Winter	6.697	0.0	195.6	946
1440 min Winter	4.839	0.0	195.1	1412
2160 min Winter	3.490	0.0	401.6	2096
2880 min Winter	2.766	0.0	389.5	2740
4320 min Winter	1.989	0.0	368.8	3592
5760 min Winter	1.573	0.0	743.8	4440
7200 min Winter	1.311	0.0	753.6	5400
8640 min Winter	1.129	0.0	733.8	6312
10080 min Winter	0.994	0.0	719.2	7168

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.600

Time (mins) From:	To:	Area (ha)
0	4	0.600

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	700.0	1.000	700.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
15 min Summer	9.471	0.471	0.6	4.7	O K
30 min Summer	9.586	0.586	0.6	5.9	O K
60 min Summer	9.659	0.659	0.7	6.6	O K
120 min Summer	9.664	0.664	0.7	6.6	O K
180 min Summer	9.640	0.640	0.7	6.4	O K
240 min Summer	9.609	0.609	0.6	6.1	O K
360 min Summer	9.549	0.549	0.6	5.5	O K
480 min Summer	9.492	0.492	0.6	4.9	O K
600 min Summer	9.438	0.438	0.6	4.4	O K
720 min Summer	9.383	0.383	0.6	3.8	O K
960 min Summer	9.267	0.267	0.6	2.7	O K
1440 min Summer	9.141	0.141	0.6	1.4	O K
2160 min Summer	9.071	0.071	0.5	0.7	O K
2880 min Summer	9.053	0.053	0.4	0.5	O K
4320 min Summer	9.038	0.038	0.3	0.4	O K
5760 min Summer	9.032	0.032	0.3	0.3	O K
7200 min Summer	9.028	0.028	0.2	0.3	O K
8640 min Summer	9.026	0.026	0.2	0.3	O K
10080 min Summer	9.024	0.024	0.2	0.2	O K
15 min Winter	9.531	0.531	0.6	5.3	O K
30 min Winter	9.666	0.666	0.7	6.7	O K
60 min Winter	9.758	0.758	0.7	7.6	Flood Risk
120 min Winter	9.767	0.767	0.7	7.7	Flood Risk
180 min Winter	9.737	0.737	0.7	7.4	Flood Risk
240 min Winter	9.693	0.693	0.7	6.9	O K
360 min Winter	9.604	0.604	0.6	6.0	O K
480 min Winter	9.520	0.520	0.6	5.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Discharge Volume (m^3)	Time-Peak (mins)
15 min Summer	138.153	0.0	5.2	18
30 min Summer	90.705	0.0	6.8	32
60 min Summer	56.713	0.0	8.5	60
120 min Summer	34.246	0.0	10.3	98
180 min Summer	25.149	0.0	11.3	130
240 min Summer	20.078	0.0	12.0	164
360 min Summer	14.585	0.0	13.1	234
480 min Summer	11.622	0.0	13.9	302
600 min Summer	9.738	0.0	14.6	370
720 min Summer	8.424	0.0	15.2	440
960 min Summer	6.697	0.0	16.1	550
1440 min Summer	4.839	0.0	17.4	768
2160 min Summer	3.490	0.0	18.8	1104
2880 min Summer	2.766	0.0	19.9	1468
4320 min Summer	1.989	0.0	21.5	2192
5760 min Summer	1.573	0.0	22.6	2904
7200 min Summer	1.311	0.0	23.6	3664
8640 min Summer	1.129	0.0	24.4	4392
10080 min Summer	0.994	0.0	25.0	5144
15 min Winter	138.153	0.0	5.8	18
30 min Winter	90.705	0.0	7.6	32
60 min Winter	56.713	0.0	9.5	60
120 min Winter	34.246	0.0	11.5	108
180 min Winter	25.149	0.0	12.7	138
240 min Winter	20.078	0.0	13.5	178
360 min Winter	14.585	0.0	14.7	254
480 min Winter	11.622	0.0	15.6	326

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
600 min Winter	9.437	0.437	0.6	4.4	O K
720 min Winter	9.337	0.337	0.6	3.4	O K
960 min Winter	9.190	0.190	0.6	1.9	O K
1440 min Winter	9.076	0.076	0.5	0.8	O K
2160 min Winter	9.048	0.048	0.4	0.5	O K
2880 min Winter	9.038	0.038	0.3	0.4	O K
4320 min Winter	9.030	0.030	0.2	0.3	O K
5760 min Winter	9.026	0.026	0.2	0.3	O K
7200 min Winter	9.023	0.023	0.2	0.2	O K
8640 min Winter	9.021	0.021	0.1	0.2	O K
10080 min Winter	9.020	0.020	0.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Discharge Volume (m^3)	Time-Peak (mins)
600 min Winter	9.738	0.0	16.4	400
720 min Winter	8.424	0.0	17.0	464
960 min Winter	6.697	0.0	18.0	562
1440 min Winter	4.839	0.0	19.5	764
2160 min Winter	3.490	0.0	21.1	1104
2880 min Winter	2.766	0.0	22.3	1460
4320 min Winter	1.989	0.0	24.1	2140
5760 min Winter	1.573	0.0	25.4	2856
7200 min Winter	1.311	0.0	26.4	3592
8640 min Winter	1.129	0.0	27.3	4392
10080 min Winter	0.994	0.0	28.1	4960

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.020

Time (mins) From:	To:	Area (ha)
0	4	0.020

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	1.000	10.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0041-8000-1000-8000
Design Head (m)	1.000
Design Flow (l/s)	0.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	41
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	0.8	Kick-Flo®	0.369	0.5
Flush-Flo™	0.184	0.6	Mean Flow over Head Range	-	0.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.6	0.800	0.7	2.000	1.1	4.000	1.5	7.000	1.9
0.200	0.6	1.000	0.8	2.200	1.1	4.500	1.6	7.500	2.0
0.300	0.6	1.200	0.9	2.400	1.2	5.000	1.6	8.000	2.0
0.400	0.5	1.400	0.9	2.600	1.2	5.500	1.7	8.500	2.1
0.500	0.6	1.600	1.0	3.000	1.3	6.000	1.8	9.000	2.2
0.600	0.6	1.800	1.0	3.500	1.4	6.500	1.9	9.500	2.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.378	0.378	0.1	3.8	O K
30 min Summer	9.489	0.489	0.1	4.9	O K
60 min Summer	9.594	0.594	0.2	5.9	O K
120 min Summer	9.679	0.679	0.2	6.8	O K
180 min Summer	9.710	0.710	0.2	7.1	Flood Risk
240 min Summer	9.718	0.718	0.2	7.2	Flood Risk
360 min Summer	9.709	0.709	0.2	7.1	Flood Risk
480 min Summer	9.696	0.696	0.2	7.0	O K
600 min Summer	9.681	0.681	0.2	6.8	O K
720 min Summer	9.665	0.665	0.2	6.7	O K
960 min Summer	9.634	0.634	0.2	6.3	O K
1440 min Summer	9.576	0.576	0.2	5.8	O K
2160 min Summer	9.500	0.500	0.1	5.0	O K
2880 min Summer	9.434	0.434	0.1	4.3	O K
4320 min Summer	9.328	0.328	0.1	3.3	O K
5760 min Summer	9.245	0.245	0.1	2.5	O K
7200 min Summer	9.166	0.166	0.1	1.7	O K
8640 min Summer	9.101	0.101	0.1	1.0	O K
10080 min Summer	9.066	0.066	0.1	0.7	O K
15 min Winter	9.424	0.424	0.1	4.2	O K
30 min Winter	9.550	0.550	0.2	5.5	O K
60 min Winter	9.670	0.670	0.2	6.7	O K
120 min Winter	9.771	0.771	0.2	7.7	Flood Risk
180 min Winter	9.810	0.810	0.2	8.1	Flood Risk
240 min Winter	9.824	0.824	0.2	8.2	Flood Risk
360 min Winter	9.822	0.822	0.2	8.2	Flood Risk
480 min Winter	9.803	0.803	0.2	8.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	3.9	19
30 min Summer	90.705	0.0	5.1	33
60 min Summer	56.713	0.0	6.4	62
120 min Summer	34.246	0.0	7.7	122
180 min Summer	25.149	0.0	8.5	182
240 min Summer	20.078	0.0	9.0	240
360 min Summer	14.585	0.0	9.8	322
480 min Summer	11.622	0.0	10.5	382
600 min Summer	9.738	0.0	11.0	444
720 min Summer	8.424	0.0	11.4	510
960 min Summer	6.697	0.0	12.0	648
1440 min Summer	4.839	0.0	13.1	924
2160 min Summer	3.490	0.0	14.1	1324
2880 min Summer	2.766	0.0	14.9	1728
4320 min Summer	1.989	0.0	16.1	2504
5760 min Summer	1.573	0.0	17.0	3280
7200 min Summer	1.311	0.0	17.7	4032
8640 min Summer	1.129	0.0	18.3	4584
10080 min Summer	0.994	0.0	18.8	5240
15 min Winter	138.153	0.0	4.3	19
30 min Winter	90.705	0.0	5.7	33
60 min Winter	56.713	0.0	7.1	62
120 min Winter	34.246	0.0	8.6	120
180 min Winter	25.149	0.0	9.5	178
240 min Winter	20.078	0.0	10.1	234
360 min Winter	14.585	0.0	11.0	342
480 min Winter	11.622	0.0	11.7	406

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.787	0.787	0.2	7.9	Flood Risk
720 min Winter	9.767	0.767	0.2	7.7	Flood Risk
960 min Winter	9.724	0.724	0.2	7.2	Flood Risk
1440 min Winter	9.640	0.640	0.2	6.4	O K
2160 min Winter	9.530	0.530	0.2	5.3	O K
2880 min Winter	9.437	0.437	0.1	4.4	O K
4320 min Winter	9.293	0.293	0.1	2.9	O K
5760 min Winter	9.162	0.162	0.1	1.6	O K
7200 min Winter	9.066	0.066	0.1	0.7	O K
8640 min Winter	9.042	0.042	0.1	0.4	O K
10080 min Winter	9.035	0.035	0.1	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	12.3	470
720 min Winter	8.424	0.0	12.7	546
960 min Winter	6.697	0.0	13.5	702
1440 min Winter	4.839	0.0	14.6	996
2160 min Winter	3.490	0.0	15.8	1428
2880 min Winter	2.766	0.0	16.7	1844
4320 min Winter	1.989	0.0	18.0	2636
5760 min Winter	1.573	0.0	19.0	3408
7200 min Winter	1.311	0.0	19.8	3888
8640 min Winter	1.129	0.0	20.5	4408
10080 min Winter	0.994	0.0	21.0	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.015

Time (mins) From:	To:	Area (ha)
0	4	0.015

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	1.000	10.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0020-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	0.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	20
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	0.2	Kick-Flo®	0.175	0.1
Flush-Flo™	0.084	0.1	Mean Flow over Head Range	-	0.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.1	0.800	0.2	2.000	0.3	4.000	0.4	7.000	0.5
0.200	0.1	1.000	0.2	2.200	0.3	4.500	0.4	7.500	0.5
0.300	0.1	1.200	0.2	2.400	0.3	5.000	0.4	8.000	0.5
0.400	0.1	1.400	0.2	2.600	0.3	5.500	0.4	8.500	0.5
0.500	0.1	1.600	0.2	3.000	0.3	6.000	0.4	9.000	0.5
0.600	0.2	1.800	0.3	3.500	0.3	6.500	0.4	9.500	0.5

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.228	0.228	1.4	136.6	O K
30 min Summer	9.298	0.298	1.4	178.8	O K
60 min Summer	9.370	0.370	1.4	222.3	O K
120 min Summer	9.443	0.443	1.4	265.6	O K
180 min Summer	9.483	0.483	1.4	289.8	O K
240 min Summer	9.510	0.510	1.4	305.7	O K
360 min Summer	9.546	0.546	1.4	327.6	O K
480 min Summer	9.570	0.570	1.4	342.3	O K
600 min Summer	9.588	0.588	1.4	352.6	O K
720 min Summer	9.600	0.600	1.4	360.1	O K
960 min Summer	9.616	0.616	1.4	369.6	O K
1440 min Summer	9.627	0.627	1.4	376.2	O K
2160 min Summer	9.618	0.618	1.4	371.1	O K
2880 min Summer	9.600	0.600	1.4	360.2	O K
4320 min Summer	9.565	0.565	1.4	338.7	O K
5760 min Summer	9.529	0.529	1.4	317.3	O K
7200 min Summer	9.490	0.490	1.4	293.8	O K
8640 min Summer	9.453	0.453	1.4	271.9	O K
10080 min Summer	9.420	0.420	1.4	252.0	O K
15 min Winter	9.255	0.255	1.4	153.1	O K
30 min Winter	9.334	0.334	1.4	200.4	O K
60 min Winter	9.415	0.415	1.4	249.3	O K
120 min Winter	9.497	0.497	1.4	298.3	O K
180 min Winter	9.543	0.543	1.4	326.0	O K
240 min Winter	9.574	0.574	1.4	344.1	O K
360 min Winter	9.615	0.615	1.4	368.9	O K
480 min Winter	9.643	0.643	1.4	385.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	104.8	19
30 min Summer	90.705	0.0	114.2	34
60 min Summer	56.713	0.0	205.0	64
120 min Summer	34.246	0.0	224.4	124
180 min Summer	25.149	0.0	224.3	184
240 min Summer	20.078	0.0	221.2	244
360 min Summer	14.585	0.0	214.2	364
480 min Summer	11.622	0.0	208.7	482
600 min Summer	9.738	0.0	204.5	602
720 min Summer	8.424	0.0	201.0	722
960 min Summer	6.697	0.0	195.4	962
1440 min Summer	4.839	0.0	187.3	1442
2160 min Summer	3.490	0.0	403.6	2160
2880 min Summer	2.766	0.0	388.8	2504
4320 min Summer	1.989	0.0	356.0	3244
5760 min Summer	1.573	0.0	596.4	4040
7200 min Summer	1.311	0.0	620.0	4824
8640 min Summer	1.129	0.0	638.5	5544
10080 min Summer	0.994	0.0	651.2	6352
15 min Winter	138.153	0.0	110.4	19
30 min Winter	90.705	0.0	115.7	34
60 min Winter	56.713	0.0	220.1	64
120 min Winter	34.246	0.0	224.7	122
180 min Winter	25.149	0.0	218.8	182
240 min Winter	20.078	0.0	214.3	240
360 min Winter	14.585	0.0	208.2	358
480 min Winter	11.622	0.0	204.2	478

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.663	0.663	1.4	398.1	O K
720 min Winter	9.678	0.678	1.4	407.1	O K
960 min Winter	9.698	0.698	1.4	419.0	O K
1440 min Winter	9.715	0.715	1.4	429.0	Flood Risk
2160 min Winter	9.712	0.712	1.4	427.5	Flood Risk
2880 min Winter	9.695	0.695	1.4	416.9	O K
4320 min Winter	9.649	0.649	1.4	389.3	O K
5760 min Winter	9.604	0.604	1.4	362.4	O K
7200 min Winter	9.557	0.557	1.4	334.0	O K
8640 min Winter	9.503	0.503	1.4	301.9	O K
10080 min Winter	9.448	0.448	1.4	269.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	201.3	596
720 min Winter	8.424	0.0	199.2	712
960 min Winter	6.697	0.0	196.5	944
1440 min Winter	4.839	0.0	194.9	1400
2160 min Winter	3.490	0.0	405.7	2076
2880 min Winter	2.766	0.0	392.5	2712
4320 min Winter	1.989	0.0	366.5	3416
5760 min Winter	1.573	0.0	666.7	4328
7200 min Winter	1.311	0.0	690.8	5264
8640 min Winter	1.129	0.0	708.4	6144
10080 min Winter	0.994	0.0	715.2	6952

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.531

Time (mins) From:	To:	Area (ha)
0	4	0.531

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	1.000	600.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.222	0.222	1.4	133.5	O K
30 min Summer	9.291	0.291	1.4	174.7	O K
60 min Summer	9.362	0.362	1.4	217.2	O K
120 min Summer	9.432	0.432	1.4	259.4	O K
180 min Summer	9.472	0.472	1.4	283.0	O K
240 min Summer	9.497	0.497	1.4	298.5	O K
360 min Summer	9.533	0.533	1.4	319.7	O K
480 min Summer	9.557	0.557	1.4	334.0	O K
600 min Summer	9.573	0.573	1.4	344.1	O K
720 min Summer	9.586	0.586	1.4	351.3	O K
960 min Summer	9.601	0.601	1.4	360.4	O K
1440 min Summer	9.611	0.611	1.4	366.5	O K
2160 min Summer	9.602	0.602	1.4	360.9	O K
2880 min Summer	9.583	0.583	1.4	350.1	O K
4320 min Summer	9.547	0.547	1.4	328.5	O K
5760 min Summer	9.510	0.510	1.4	305.9	O K
7200 min Summer	9.471	0.471	1.4	282.6	O K
8640 min Summer	9.436	0.436	1.4	261.6	O K
10080 min Summer	9.403	0.403	1.4	242.1	O K
15 min Winter	9.249	0.249	1.4	149.6	O K
30 min Winter	9.326	0.326	1.4	195.8	O K
60 min Winter	9.406	0.406	1.4	243.6	O K
120 min Winter	9.486	0.486	1.4	291.4	O K
180 min Winter	9.531	0.531	1.4	318.4	O K
240 min Winter	9.560	0.560	1.4	336.1	O K
360 min Winter	9.600	0.600	1.4	360.2	O K
480 min Winter	9.628	0.628	1.4	376.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	103.4	19
30 min Summer	90.705	0.0	113.8	34
60 min Summer	56.713	0.0	201.4	64
120 min Summer	34.246	0.0	223.4	124
180 min Summer	25.149	0.0	224.5	184
240 min Summer	20.078	0.0	222.3	244
360 min Summer	14.585	0.0	215.7	364
480 min Summer	11.622	0.0	210.1	482
600 min Summer	9.738	0.0	205.7	602
720 min Summer	8.424	0.0	202.0	722
960 min Summer	6.697	0.0	195.9	962
1440 min Summer	4.839	0.0	186.9	1442
2160 min Summer	3.490	0.0	403.4	2160
2880 min Summer	2.766	0.0	388.8	2480
4320 min Summer	1.989	0.0	355.7	3240
5760 min Summer	1.573	0.0	583.2	4032
7200 min Summer	1.311	0.0	606.4	4760
8640 min Summer	1.129	0.0	624.7	5536
10080 min Summer	0.994	0.0	638.0	6352
15 min Winter	138.153	0.0	109.5	19
30 min Winter	90.705	0.0	115.5	34
60 min Winter	56.713	0.0	217.6	64
120 min Winter	34.246	0.0	225.3	122
180 min Winter	25.149	0.0	220.2	182
240 min Winter	20.078	0.0	215.6	240
360 min Winter	14.585	0.0	209.2	358
480 min Winter	11.622	0.0	204.9	476

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.647	0.647	1.4	388.5	O K
720 min Winter	9.662	0.662	1.4	397.2	O K
960 min Winter	9.681	0.681	1.4	408.6	O K
1440 min Winter	9.697	0.697	1.4	418.0	O K
2160 min Winter	9.693	0.693	1.4	416.0	O K
2880 min Winter	9.675	0.675	1.4	405.1	O K
4320 min Winter	9.629	0.629	1.4	377.5	O K
5760 min Winter	9.584	0.584	1.4	350.4	O K
7200 min Winter	9.535	0.535	1.4	321.3	O K
8640 min Winter	9.479	0.479	1.4	287.5	O K
10080 min Winter	9.427	0.427	1.4	256.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	201.7	596
720 min Winter	8.424	0.0	199.3	712
960 min Winter	6.697	0.0	195.8	944
1440 min Winter	4.839	0.0	192.9	1400
2160 min Winter	3.490	0.0	405.4	2076
2880 min Winter	2.766	0.0	391.8	2708
4320 min Winter	1.989	0.0	364.7	3412
5760 min Winter	1.573	0.0	652.0	4328
7200 min Winter	1.311	0.0	676.4	5264
8640 min Winter	1.129	0.0	695.7	6128
10080 min Winter	0.994	0.0	706.0	6864

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.519

Time (mins) From:	To:	Area (ha)
0	4	0.519

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	1.000	600.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.274	0.274	1.1	54.9	O K
30 min Summer	9.358	0.358	1.1	71.5	O K
60 min Summer	9.442	0.442	1.1	88.4	O K
120 min Summer	9.523	0.523	1.1	104.5	O K
180 min Summer	9.563	0.563	1.1	112.7	O K
240 min Summer	9.587	0.587	1.1	117.4	O K
360 min Summer	9.614	0.614	1.1	122.8	O K
480 min Summer	9.626	0.626	1.1	125.3	O K
600 min Summer	9.630	0.630	1.1	126.1	O K
720 min Summer	9.629	0.629	1.1	125.9	O K
960 min Summer	9.618	0.618	1.1	123.6	O K
1440 min Summer	9.591	0.591	1.1	118.2	O K
2160 min Summer	9.550	0.550	1.1	110.1	O K
2880 min Summer	9.510	0.510	1.1	102.0	O K
4320 min Summer	9.424	0.424	1.1	84.8	O K
5760 min Summer	9.350	0.350	1.1	70.0	O K
7200 min Summer	9.289	0.289	1.1	57.7	O K
8640 min Summer	9.238	0.238	1.1	47.5	O K
10080 min Summer	9.197	0.197	1.1	39.4	O K
15 min Winter	9.308	0.308	1.1	61.5	O K
30 min Winter	9.402	0.402	1.1	80.3	O K
60 min Winter	9.497	0.497	1.1	99.4	O K
120 min Winter	9.588	0.588	1.1	117.6	O K
180 min Winter	9.635	0.635	1.1	127.0	O K
240 min Winter	9.663	0.663	1.1	132.6	O K
360 min Winter	9.696	0.696	1.1	139.1	O K
480 min Winter	9.713	0.713	1.1	142.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	53.6	19
30 min Summer	90.705	0.0	70.1	34
60 min Summer	56.713	0.0	90.5	64
120 min Summer	34.246	0.0	109.2	124
180 min Summer	25.149	0.0	120.2	182
240 min Summer	20.078	0.0	127.9	242
360 min Summer	14.585	0.0	139.0	362
480 min Summer	11.622	0.0	147.4	482
600 min Summer	9.738	0.0	153.8	600
720 min Summer	8.424	0.0	159.0	720
960 min Summer	6.697	0.0	165.7	912
1440 min Summer	4.839	0.0	164.3	1138
2160 min Summer	3.490	0.0	201.9	1532
2880 min Summer	2.766	0.0	213.2	1956
4320 min Summer	1.989	0.0	229.7	2724
5760 min Summer	1.573	0.0	243.3	3464
7200 min Summer	1.311	0.0	253.3	4184
8640 min Summer	1.129	0.0	261.5	4920
10080 min Summer	0.994	0.0	268.4	5552
15 min Winter	138.153	0.0	60.0	19
30 min Winter	90.705	0.0	77.9	33
60 min Winter	56.713	0.0	101.3	64
120 min Winter	34.246	0.0	122.2	122
180 min Winter	25.149	0.0	134.4	180
240 min Winter	20.078	0.0	142.9	238
360 min Winter	14.585	0.0	155.1	356
480 min Winter	11.622	0.0	163.8	472

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.720	0.720	1.1	144.1	Flood Risk
720 min Winter	9.722	0.722	1.1	144.4	Flood Risk
960 min Winter	9.715	0.715	1.1	142.9	Flood Risk
1440 min Winter	9.680	0.680	1.1	136.0	O K
2160 min Winter	9.629	0.629	1.1	125.8	O K
2880 min Winter	9.574	0.574	1.1	114.9	O K
4320 min Winter	9.452	0.452	1.1	90.4	O K
5760 min Winter	9.336	0.336	1.1	67.2	O K
7200 min Winter	9.248	0.248	1.1	49.6	O K
8640 min Winter	9.183	0.183	1.1	36.7	O K
10080 min Winter	9.138	0.138	1.1	27.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	169.9	584
720 min Winter	8.424	0.0	173.5	698
960 min Winter	6.697	0.0	174.0	916
1440 min Winter	4.839	0.0	167.6	1198
2160 min Winter	3.490	0.0	226.1	1640
2880 min Winter	2.766	0.0	238.7	2104
4320 min Winter	1.989	0.0	257.0	2984
5760 min Winter	1.573	0.0	272.5	3696
7200 min Winter	1.311	0.0	283.7	4400
8640 min Winter	1.129	0.0	293.0	5024
10080 min Winter	0.994	0.0	300.8	5656

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.215

Time (mins) From:	To:	Area (ha)
0	4	0.215

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	1.000	200.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.3	Kick-Flo®	0.477	0.9
Flush-Flo™	0.236	1.1	Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.9	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	1.0	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.6
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.1	9.500	3.6

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.258	0.258	1.4	51.6	O K
30 min Summer	9.336	0.336	1.4	67.2	O K
60 min Summer	9.413	0.413	1.4	82.7	O K
120 min Summer	9.486	0.486	1.4	97.1	O K
180 min Summer	9.522	0.522	1.4	104.3	O K
240 min Summer	9.542	0.542	1.4	108.3	O K
360 min Summer	9.561	0.561	1.4	112.3	O K
480 min Summer	9.568	0.568	1.4	113.6	O K
600 min Summer	9.567	0.567	1.4	113.3	O K
720 min Summer	9.560	0.560	1.4	112.1	O K
960 min Summer	9.544	0.544	1.4	108.9	O K
1440 min Summer	9.509	0.509	1.4	101.8	O K
2160 min Summer	9.455	0.455	1.4	91.0	O K
2880 min Summer	9.406	0.406	1.4	81.2	O K
4320 min Summer	9.322	0.322	1.4	64.3	O K
5760 min Summer	9.253	0.253	1.4	50.6	O K
7200 min Summer	9.201	0.201	1.4	40.1	O K
8640 min Summer	9.161	0.161	1.3	32.3	O K
10080 min Summer	9.132	0.132	1.3	26.5	O K
15 min Winter	9.289	0.289	1.4	57.9	O K
30 min Winter	9.377	0.377	1.4	75.5	O K
60 min Winter	9.465	0.465	1.4	93.0	O K
120 min Winter	9.549	0.549	1.4	109.7	O K
180 min Winter	9.590	0.590	1.4	118.0	O K
240 min Winter	9.614	0.614	1.4	122.7	O K
360 min Winter	9.638	0.638	1.4	127.7	O K
480 min Winter	9.649	0.649	1.4	129.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	50.9	19
30 min Summer	90.705	0.0	66.9	34
60 min Summer	56.713	0.0	85.5	64
120 min Summer	34.246	0.0	103.4	122
180 min Summer	25.149	0.0	113.8	182
240 min Summer	20.078	0.0	121.2	242
360 min Summer	14.585	0.0	132.0	362
480 min Summer	11.622	0.0	140.1	482
600 min Summer	9.738	0.0	146.7	600
720 min Summer	8.424	0.0	152.1	716
960 min Summer	6.697	0.0	160.9	818
1440 min Summer	4.839	0.0	173.2	1066
2160 min Summer	3.490	0.0	190.8	1432
2880 min Summer	2.766	0.0	201.5	1820
4320 min Summer	1.989	0.0	217.1	2596
5760 min Summer	1.573	0.0	229.7	3336
7200 min Summer	1.311	0.0	239.1	4032
8640 min Summer	1.129	0.0	246.9	4680
10080 min Summer	0.994	0.0	253.4	5352
15 min Winter	138.153	0.0	57.1	19
30 min Winter	90.705	0.0	74.9	33
60 min Winter	56.713	0.0	95.8	62
120 min Winter	34.246	0.0	115.8	122
180 min Winter	25.149	0.0	127.5	180
240 min Winter	20.078	0.0	135.7	238
360 min Winter	14.585	0.0	147.7	354
480 min Winter	11.622	0.0	156.8	468

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.650	0.650	1.4	130.1	O K
720 min Winter	9.647	0.647	1.4	129.3	O K
960 min Winter	9.630	0.630	1.4	126.0	O K
1440 min Winter	9.588	0.588	1.4	117.5	O K
2160 min Winter	9.519	0.519	1.4	103.8	O K
2880 min Winter	9.439	0.439	1.4	87.9	O K
4320 min Winter	9.310	0.310	1.4	61.9	O K
5760 min Winter	9.214	0.214	1.4	42.8	O K
7200 min Winter	9.150	0.150	1.3	30.0	O K
8640 min Winter	9.110	0.110	1.2	22.0	O K
10080 min Winter	9.086	0.086	1.1	17.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	164.0	582
720 min Winter	8.424	0.0	170.0	692
960 min Winter	6.697	0.0	179.5	904
1440 min Winter	4.839	0.0	190.6	1126
2160 min Winter	3.490	0.0	213.7	1600
2880 min Winter	2.766	0.0	225.7	1992
4320 min Winter	1.989	0.0	243.3	2768
5760 min Winter	1.573	0.0	257.3	3464
7200 min Winter	1.311	0.0	267.9	4112
8640 min Winter	1.129	0.0	276.6	4752
10080 min Winter	0.994	0.0	284.0	5344

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.203

Time (mins) From:	To:	Area (ha)
0	4	0.203

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	1.000	200.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.216	0.216	1.1	43.2	O K
30 min Summer	9.282	0.282	1.1	56.3	O K
60 min Summer	9.346	0.346	1.1	69.3	O K
120 min Summer	9.407	0.407	1.1	81.3	O K
180 min Summer	9.436	0.436	1.1	87.3	O K
240 min Summer	9.453	0.453	1.1	90.6	O K
360 min Summer	9.470	0.470	1.1	94.0	O K
480 min Summer	9.476	0.476	1.1	95.3	O K
600 min Summer	9.476	0.476	1.1	95.2	O K
720 min Summer	9.471	0.471	1.1	94.1	O K
960 min Summer	9.456	0.456	1.1	91.2	O K
1440 min Summer	9.427	0.427	1.1	85.5	O K
2160 min Summer	9.385	0.385	1.1	77.1	O K
2880 min Summer	9.346	0.346	1.1	69.2	O K
4320 min Summer	9.277	0.277	1.1	55.4	O K
5760 min Summer	9.221	0.221	1.1	44.1	O K
7200 min Summer	9.177	0.177	1.1	35.4	O K
8640 min Summer	9.144	0.144	1.1	28.8	O K
10080 min Summer	9.119	0.119	1.1	23.9	O K
15 min Winter	9.242	0.242	1.1	48.5	O K
30 min Winter	9.316	0.316	1.1	63.2	O K
60 min Winter	9.390	0.390	1.1	77.9	O K
120 min Winter	9.459	0.459	1.1	91.9	O K
180 min Winter	9.495	0.495	1.1	99.0	O K
240 min Winter	9.515	0.515	1.1	103.0	O K
360 min Winter	9.537	0.537	1.1	107.4	O K
480 min Winter	9.547	0.547	1.1	109.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	42.3	19
30 min Summer	90.705	0.0	55.7	34
60 min Summer	56.713	0.0	71.5	64
120 min Summer	34.246	0.0	86.4	122
180 min Summer	25.149	0.0	95.1	182
240 min Summer	20.078	0.0	101.3	242
360 min Summer	14.585	0.0	110.3	362
480 min Summer	11.622	0.0	117.1	482
600 min Summer	9.738	0.0	122.5	600
720 min Summer	8.424	0.0	127.1	720
960 min Summer	6.697	0.0	134.4	808
1440 min Summer	4.839	0.0	144.7	1038
2160 min Summer	3.490	0.0	159.7	1428
2880 min Summer	2.766	0.0	168.6	1820
4320 min Summer	1.989	0.0	181.7	2596
5760 min Summer	1.573	0.0	192.3	3344
7200 min Summer	1.311	0.0	200.2	4032
8640 min Summer	1.129	0.0	206.7	4752
10080 min Summer	0.994	0.0	212.1	5440
15 min Winter	138.153	0.0	47.5	19
30 min Winter	90.705	0.0	62.3	33
60 min Winter	56.713	0.0	80.1	62
120 min Winter	34.246	0.0	96.7	122
180 min Winter	25.149	0.0	106.5	180
240 min Winter	20.078	0.0	113.4	238
360 min Winter	14.585	0.0	123.4	354
480 min Winter	11.622	0.0	130.9	470

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.549	0.549	1.1	109.8	O K
720 min Winter	9.546	0.546	1.1	109.3	O K
960 min Winter	9.534	0.534	1.1	106.7	O K
1440 min Winter	9.497	0.497	1.1	99.4	O K
2160 min Winter	9.435	0.435	1.1	86.9	O K
2880 min Winter	9.373	0.373	1.1	74.7	O K
4320 min Winter	9.268	0.268	1.1	53.7	O K
5760 min Winter	9.190	0.190	1.1	37.9	O K
7200 min Winter	9.136	0.136	1.1	27.2	O K
8640 min Winter	9.101	0.101	1.0	20.3	O K
10080 min Winter	9.080	0.080	1.0	16.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	137.0	582
720 min Winter	8.424	0.0	141.9	694
960 min Winter	6.697	0.0	149.7	906
1440 min Winter	4.839	0.0	158.6	1140
2160 min Winter	3.490	0.0	178.8	1576
2880 min Winter	2.766	0.0	188.9	1988
4320 min Winter	1.989	0.0	203.6	2768
5760 min Winter	1.573	0.0	215.4	3464
7200 min Winter	1.311	0.0	224.2	4112
8640 min Winter	1.129	0.0	231.6	4760
10080 min Winter	0.994	0.0	237.7	5352

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.170

Time (mins) From:	To:	Area (ha)
0	4	0.170

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	1.000	200.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.3	Kick-Flo®	0.477	0.9
Flush-Flo™	0.236	1.1	Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.9	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	1.0	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.6
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.1	9.500	3.6

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.230	0.230	0.8	23.0	O K
30 min Summer	9.298	0.298	0.8	29.8	O K
60 min Summer	9.365	0.365	0.8	36.5	O K
120 min Summer	9.425	0.425	0.8	42.5	O K
180 min Summer	9.452	0.452	0.8	45.2	O K
240 min Summer	9.463	0.463	0.8	46.3	O K
360 min Summer	9.470	0.470	0.8	47.0	O K
480 min Summer	9.465	0.465	0.8	46.5	O K
600 min Summer	9.456	0.456	0.8	45.6	O K
720 min Summer	9.447	0.447	0.8	44.7	O K
960 min Summer	9.428	0.428	0.8	42.8	O K
1440 min Summer	9.385	0.385	0.8	38.5	O K
2160 min Summer	9.327	0.327	0.8	32.7	O K
2880 min Summer	9.277	0.277	0.8	27.7	O K
4320 min Summer	9.196	0.196	0.8	19.6	O K
5760 min Summer	9.142	0.142	0.8	14.2	O K
7200 min Summer	9.106	0.106	0.8	10.6	O K
8640 min Summer	9.084	0.084	0.7	8.4	O K
10080 min Summer	9.070	0.070	0.7	7.0	O K
15 min Winter	9.258	0.258	0.8	25.8	O K
30 min Winter	9.335	0.335	0.8	33.5	O K
60 min Winter	9.412	0.412	0.8	41.2	O K
120 min Winter	9.481	0.481	0.8	48.1	O K
180 min Winter	9.512	0.512	0.8	51.2	O K
240 min Winter	9.527	0.527	0.8	52.7	O K
360 min Winter	9.538	0.538	0.8	53.8	O K
480 min Winter	9.536	0.536	0.8	53.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	23.2	19
30 min Summer	90.705	0.0	30.5	33
60 min Summer	56.713	0.0	38.5	64
120 min Summer	34.246	0.0	46.5	122
180 min Summer	25.149	0.0	51.3	182
240 min Summer	20.078	0.0	54.6	242
360 min Summer	14.585	0.0	59.5	360
480 min Summer	11.622	0.0	63.2	478
600 min Summer	9.738	0.0	66.2	526
720 min Summer	8.424	0.0	68.7	590
960 min Summer	6.697	0.0	72.8	714
1440 min Summer	4.839	0.0	78.8	968
2160 min Summer	3.490	0.0	85.6	1360
2880 min Summer	2.766	0.0	90.5	1732
4320 min Summer	1.989	0.0	97.5	2464
5760 min Summer	1.573	0.0	103.0	3168
7200 min Summer	1.311	0.0	107.2	3824
8640 min Summer	1.129	0.0	110.8	4496
10080 min Summer	0.994	0.0	113.8	5152
15 min Winter	138.153	0.0	26.0	19
30 min Winter	90.705	0.0	34.1	33
60 min Winter	56.713	0.0	43.1	62
120 min Winter	34.246	0.0	52.1	120
180 min Winter	25.149	0.0	57.4	180
240 min Winter	20.078	0.0	61.1	236
360 min Winter	14.585	0.0	66.6	350
480 min Winter	11.622	0.0	70.8	462

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.528	0.528	0.8	52.8	O K
720 min Winter	9.516	0.516	0.8	51.6	O K
960 min Winter	9.492	0.492	0.8	49.2	O K
1440 min Winter	9.440	0.440	0.8	44.0	O K
2160 min Winter	9.348	0.348	0.8	34.8	O K
2880 min Winter	9.270	0.270	0.8	27.0	O K
4320 min Winter	9.159	0.159	0.8	15.9	O K
5760 min Winter	9.098	0.098	0.8	9.8	O K
7200 min Winter	9.070	0.070	0.7	7.0	O K
8640 min Winter	9.059	0.059	0.6	5.9	O K
10080 min Winter	9.051	0.051	0.5	5.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	74.1	568
720 min Winter	8.424	0.0	76.9	666
960 min Winter	6.697	0.0	81.5	752
1440 min Winter	4.839	0.0	88.2	1068
2160 min Winter	3.490	0.0	95.9	1472
2880 min Winter	2.766	0.0	101.3	1872
4320 min Winter	1.989	0.0	109.2	2552
5760 min Winter	1.573	0.0	115.4	3176
7200 min Winter	1.311	0.0	120.1	3752
8640 min Winter	1.129	0.0	124.1	4496
10080 min Winter	0.994	0.0	127.4	5152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.091

Time (mins) From:	To:	Area (ha)
0	4	0.091

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	100.0	1.000	100.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0047-1000-1000-1000
Design Head (m)	1.000
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	47
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.246	0.246	1.1	88.5	O K
30 min Summer	9.322	0.322	1.1	115.8	O K
60 min Summer	9.399	0.399	1.1	143.7	O K
120 min Summer	9.476	0.476	1.1	171.3	O K
180 min Summer	9.518	0.518	1.1	186.4	O K
240 min Summer	9.544	0.544	1.1	196.0	O K
360 min Summer	9.579	0.579	1.1	208.5	O K
480 min Summer	9.601	0.601	1.1	216.4	O K
600 min Summer	9.615	0.615	1.1	221.4	O K
720 min Summer	9.624	0.624	1.1	224.7	O K
960 min Summer	9.633	0.633	1.1	227.8	O K
1440 min Summer	9.628	0.628	1.1	226.2	O K
2160 min Summer	9.604	0.604	1.1	217.6	O K
2880 min Summer	9.580	0.580	1.1	209.0	O K
4320 min Summer	9.534	0.534	1.1	192.2	O K
5760 min Summer	9.487	0.487	1.1	175.4	O K
7200 min Summer	9.436	0.436	1.1	157.1	O K
8640 min Summer	9.391	0.391	1.1	140.9	O K
10080 min Summer	9.351	0.351	1.1	126.5	O K
15 min Winter	9.276	0.276	1.1	99.2	O K
30 min Winter	9.361	0.361	1.1	129.8	O K
60 min Winter	9.448	0.448	1.1	161.3	O K
120 min Winter	9.535	0.535	1.1	192.5	O K
180 min Winter	9.582	0.582	1.1	209.6	O K
240 min Winter	9.613	0.613	1.1	220.6	O K
360 min Winter	9.653	0.653	1.1	235.1	O K
480 min Winter	9.679	0.679	1.1	244.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	78.8	19
30 min Summer	90.705	0.0	93.3	34
60 min Summer	56.713	0.0	141.5	64
120 min Summer	34.246	0.0	167.6	124
180 min Summer	25.149	0.0	177.6	184
240 min Summer	20.078	0.0	179.6	244
360 min Summer	14.585	0.0	178.2	362
480 min Summer	11.622	0.0	176.0	482
600 min Summer	9.738	0.0	173.7	602
720 min Summer	8.424	0.0	171.6	722
960 min Summer	6.697	0.0	167.7	962
1440 min Summer	4.839	0.0	160.9	1440
2160 min Summer	3.490	0.0	316.8	1820
2880 min Summer	2.766	0.0	324.2	2192
4320 min Summer	1.989	0.0	300.0	2984
5760 min Summer	1.573	0.0	389.6	3856
7200 min Summer	1.311	0.0	405.5	4608
8640 min Summer	1.129	0.0	418.7	5360
10080 min Summer	0.994	0.0	429.4	6056
15 min Winter	138.153	0.0	86.1	19
30 min Winter	90.705	0.0	95.3	34
60 min Winter	56.713	0.0	157.3	64
120 min Winter	34.246	0.0	179.1	122
180 min Winter	25.149	0.0	180.7	182
240 min Winter	20.078	0.0	179.7	240
360 min Winter	14.585	0.0	177.3	358
480 min Winter	11.622	0.0	175.2	476

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.696	0.696	1.1	250.7	O K
720 min Winter	9.708	0.708	1.1	255.0	Flood Risk
960 min Winter	9.721	0.721	1.1	259.6	Flood Risk
1440 min Winter	9.723	0.723	1.1	260.3	Flood Risk
2160 min Winter	9.699	0.699	1.1	251.6	O K
2880 min Winter	9.668	0.668	1.1	240.3	O K
4320 min Winter	9.607	0.607	1.1	218.7	O K
5760 min Winter	9.544	0.544	1.1	195.9	O K
7200 min Winter	9.475	0.475	1.1	171.2	O K
8640 min Winter	9.401	0.401	1.1	144.5	O K
10080 min Winter	9.340	0.340	1.1	122.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	173.5	592
720 min Winter	8.424	0.0	172.0	708
960 min Winter	6.697	0.0	169.5	936
1440 min Winter	4.839	0.0	166.4	1386
2160 min Winter	3.490	0.0	342.8	2016
2880 min Winter	2.766	0.0	335.7	2304
4320 min Winter	1.989	0.0	309.4	3240
5760 min Winter	1.573	0.0	436.3	4152
7200 min Winter	1.311	0.0	454.1	5048
8640 min Winter	1.129	0.0	469.0	5792
10080 min Winter	0.994	0.0	481.3	6464

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.345

Time (mins) From:	To:	Area (ha)
0	4	0.345

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	360.0	1.000	360.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.3	Kick-Flo®	0.477	0.9
Flush-Flo™	0.236	1.1	Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.9	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	1.0	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.6
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.1	9.500	3.6

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 222 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.366	0.366	0.0	3.9	3.9	52.1	O K
30 min Summer	8.462	0.462	0.0	3.9	3.9	65.8	O K
60 min Summer	8.542	0.542	0.0	3.9	3.9	77.2	O K
120 min Summer	8.589	0.589	0.0	3.9	3.9	83.9	O K
180 min Summer	8.588	0.588	0.0	3.9	3.9	83.7	O K
240 min Summer	8.572	0.572	0.0	3.9	3.9	81.5	O K
360 min Summer	8.538	0.538	0.0	3.9	3.9	76.7	O K
480 min Summer	8.505	0.505	0.0	3.9	3.9	72.0	O K
600 min Summer	8.473	0.473	0.0	3.9	3.9	67.3	O K
720 min Summer	8.441	0.441	0.0	3.9	3.9	62.9	O K
960 min Summer	8.383	0.383	0.0	3.9	3.9	54.5	O K
1440 min Summer	8.286	0.286	0.0	3.9	3.9	40.8	O K
2160 min Summer	8.191	0.191	0.0	3.8	3.8	27.2	O K
2880 min Summer	8.137	0.137	0.0	3.5	3.5	19.6	O K
4320 min Summer	8.097	0.097	0.0	2.9	2.9	13.8	O K
5760 min Summer	8.080	0.080	0.0	2.4	2.4	11.4	O K
7200 min Summer	8.071	0.071	0.0	2.0	2.0	10.1	O K
8640 min Summer	8.064	0.064	0.0	1.7	1.7	9.1	O K
10080 min Summer	8.059	0.059	0.0	1.5	1.5	8.4	O K
15 min Winter	8.412	0.412	0.0	3.9	3.9	58.7	O K
30 min Winter	8.521	0.521	0.0	3.9	3.9	74.2	O K
60 min Winter	8.615	0.615	0.0	3.9	3.9	87.7	O K
120 min Winter	8.678	0.678	0.0	3.9	3.9	96.6	O K
180 min Winter	8.685	0.685	0.0	3.9	3.9	97.7	O K
240 min Winter	8.672	0.672	0.0	3.9	3.9	95.7	O K
360 min Winter	8.623	0.623	0.0	3.9	3.9	88.8	O K
480 min Winter	8.574	0.574	0.0	3.9	3.9	81.8	O K
600 min Winter	8.524	0.524	0.0	3.9	3.9	74.7	O K
720 min Winter	8.476	0.476	0.0	3.9	3.9	67.8	O K
960 min Winter	8.387	0.387	0.0	3.9	3.9	55.1	O K
1440 min Winter	8.249	0.249	0.0	3.9	3.9	35.4	O K
2160 min Winter	8.137	0.137	0.0	3.5	3.5	19.5	O K
2880 min Winter	8.101	0.101	0.0	3.0	3.0	14.4	O K
4320 min Winter	8.076	0.076	0.0	2.2	2.2	10.8	O K
5760 min Winter	8.065	0.065	0.0	1.7	1.7	9.2	O K
7200 min Winter	8.058	0.058	0.0	1.5	1.5	8.2	O K
8640 min Winter	8.053	0.053	0.0	1.3	1.3	7.5	O K
10080 min Winter	8.049	0.049	0.0	1.1	1.1	6.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	146.390	0.0	54.4	18
30 min Summer	94.615	0.0	70.4	33
60 min Summer	58.167	0.0	87.0	62
120 min Summer	34.550	0.0	103.4	122
180 min Summer	25.152	0.0	112.9	180
240 min Summer	19.972	0.0	119.6	202
360 min Summer	14.389	0.0	129.2	260
480 min Summer	11.404	0.0	136.6	326
600 min Summer	9.515	0.0	142.4	392
720 min Summer	8.203	0.0	147.4	458
960 min Summer	6.487	0.0	155.4	588
1440 min Summer	4.654	0.0	167.1	836
2160 min Summer	3.334	0.0	179.9	1188
2880 min Summer	2.629	0.0	189.1	1524
4320 min Summer	1.879	0.0	202.6	2208
5760 min Summer	1.480	0.0	213.0	2936
7200 min Summer	1.229	0.0	221.0	3672
8640 min Summer	1.055	0.0	227.7	4408
10080 min Summer	0.928	0.0	233.4	5136
15 min Winter	146.390	0.0	61.0	18
30 min Winter	94.615	0.0	78.9	32
60 min Winter	58.167	0.0	97.5	62
120 min Winter	34.550	0.0	115.8	118
180 min Winter	25.152	0.0	126.5	176
240 min Winter	19.972	0.0	133.9	230
360 min Winter	14.389	0.0	144.8	290
480 min Winter	11.404	0.0	153.0	360
600 min Winter	9.515	0.0	159.6	430
720 min Winter	8.203	0.0	165.1	500
960 min Winter	6.487	0.0	174.1	634
1440 min Winter	4.654	0.0	187.3	868
2160 min Winter	3.334	0.0	201.5	1192
2880 min Winter	2.629	0.0	211.8	1500
4320 min Winter	1.879	0.0	227.0	2208
5760 min Winter	1.480	0.0	238.5	2944
7200 min Winter	1.229	0.0	247.6	3672
8640 min Winter	1.055	0.0	255.1	4384
10080 min Winter	0.928	0.0	261.5	5112

Rainfall Details

Rainfall Model	FSR	Ratio R	0.437	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	20.500	Cv (Summer)	0.750	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.200

Time From:	(mins) To:	Area (ha)
0	4	0.200

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.000 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	150.0	0.0	1.000	150.0	0.0	1.001	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0094-3900-1000-3900	Sump Available	Yes
Design Head (m)	1.000	Diameter (mm)	94
Design Flow (l/s)	3.9	Invert Level (m)	8.000
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.9	Kick-Flo®	0.632	3.2
Flush-Flo™	0.297	3.9	Mean Flow over Head Range	-	3.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	0.600	3.4	1.600	4.8	2.600	6.1	5.000	8.3	7.500	10.0
0.200	3.8	0.800	3.5	1.800	5.1	3.000	6.5	5.500	8.7	8.000	10.4
0.300	3.9	1.000	3.9	2.000	5.4	3.500	7.0	6.000	9.0	8.500	10.7
0.400	3.8	1.200	4.2	2.200	5.6	4.000	7.4	6.500	9.4	9.000	10.9
0.500	3.7	1.400	4.6	2.400	5.9	4.500	7.9	7.000	9.7	9.500	11.2

Proposed Surface Water Discharge rates

Total Site Area = 9.1ha
Total actively drained area = 5.92 ha

Calculated Green field runoff rate = 22.4 l/s

Phase A
1. **Block F1:** Hard standing area (excluding green areas, roads): 2145m^2
2. **Block H1/H2:** Hard standing area (excluding green areas, roads): 2025m^2
3. **Block H3:** Hard standing area (excluding green areas, roads): 1700m^2
4. **Block I1:** Hard standing area (excluding green areas, roads): 905m^2
5. **Block J1:** Hard standing area (excluding green areas, roads): 2624m^2

Phase B
1. **Block A1/A2:** Hard standing area (excluding green areas, roads): 3570m^2
2. **Block A3:** Hard standing area (excluding green areas, roads): 1265m^2
3. **Block B1/B2:** Hard standing area (excluding green areas, roads): 2225m^2
4. **Block B3:** Hard standing area (excluding green areas, roads): 1525m^2
5. **Block B4:** Hard standing area (excluding green areas, roads): 1255m^2
6. **Block B5:** Hard standing area (excluding green areas, roads): 321m^2
7. **Jolly's Green:** Hard standing area (excluding green areas, roads): 200m^2

Phase C
1. **Block C1/C2/C3/C4:** Hard standing area (excluding green areas, roads): 6005m^2
2. **Block C5:** Hard standing area (excluding green areas, roads): 210m^2
3. **Block C6:** Hard standing area (excluding green areas, roads): 148m^2
4. **Block E1/E2/E3:** Hard standing area (excluding green areas, roads): 5185m^2

Phase D
1. **Block D1/D2/D3/D4:** Hard standing area (excluding green areas, roads): 5310m^2

Phase	Storm Event	Proposed Surface Water Discharge Rate	Proposed connections For connection location refer to Proposed Discharge Location Section	Required Surface Water Attenuation
Phase A Block F1	1 in 100 year + 40% CC	1.25 l/s	1 connection	185m³
Phase A Block H1/H2	1 in 100 year + 40% CC	1.5 l/s	1 connection	161m³
Phase A Block H3	1 in 100 year + 40% CC	1.25 l/s	1 connection	135m³
Phase A Block I1	1 in 100 year + 40% CC	1 l/s	1 connection	69m³
Phase A Block J1	1 in 100 year + 40% CC	1 l/s	1 connection	260m³
Phase B Block A1/A2	1 in 100 year + 40% CC	1.5 l/s	1 connections	343m³
Phase B Block A3	1 in 100 year + 40% CC	1 l/s	Shared Connection with Block B1/B2/B4 (0.33')	98m³
Phase B Block B1/B2	1 in 100 year + 40% CC	1.5 l/s	Shared Connection with Block A3/B4 (0.33')	183m³

Phase B Block B3	1 in 100 year + 40% CC	1.3 l/s	Shared connection with Block B5 (0.5)	129m³
Phase B Block B4	1 in 100 year + 40% CC	1 l/s	Shared Connection with Block A3/B1/B2 (0.33')	97m³
Phase B Block B5	1 in 100 year + 40% CC	1 l/s	Shared connection with Block B3 (0.5)	13m³
Phase B Jolly's Green	1 in 100 year + 40% CC	3.4 l/s	1 connection	100m³
Phase C Block C1/C2/C3/C4	1 in 100 year + 40% CC	1.5 l/s	Shared Connection with Block E1/E2/E3 & C5 (0.25)	651m³
Phase C Block C5	1 in 100 year + 40% CC	0.75 l/s	Shared Connection with Block E1/E2/E3 & C1/C2/C3/C4 (0.25)	10m³
Phase C Block C6	1 in 100 year + 40% CC	0.25 l/s	Shared Connection with Block E1/E2/E3 & C1/C2/C3/C4 (0.25)	10m³
Phase C Block E1/E2/E3	1 in 100 year + 40% CC	1.5 l/s	Shared Connection with Block C1/C2/C3/C4 & (0.25)	562m³
Phase D Block D1/D2/D3/D4	1 in 100 year + 40% CC	1.5 l/s	1 connection	576m³
Total		22.4 l/s	13 connections	3668m³

Proposed Discharge Locations

It is proposed to discharge surface water from all blocks via gravity to the surrounding Thames Water combined water sewers, the below are the locations of proposed connections and the proposed discharge rate, please also refer to the below ground drainage masterplan drawing (2812-MHT-CV-BG-DR-100);

- One new connection to the northwest corner of the building I1 into the Thames Water combined water network in Blair Street (TWMH7303); Proposed discharge rate is 1l/s;
- One new connection to the southeast corner of the building J1 into Thames Water combined water sewer in Leven Road (TWMH3602); Proposed discharge rate is 1.25l/s;
- One new connection to the northeast of building A1/A2 into the Thames Water combined water sewer in Leven Road (TWMH3605); Proposed discharge rate 1.5l/s:
- One new connection serving blocks A3, B1/B2 and B4 located to the south of the buildings discharging into Thames Water manhole (TWMH3501A); Proposed discharge rate 3.5l/s:
- One new connection north of block B3 downstream of Thames Water combined water manhole (TWMH3516); Proposed discharge rate is 2.3l/s:
- One new connection to the Thames Water combined sewer manhole in Ettrick Street (TWMH4303); Proposed discharge rate is 4l/s.
- One new connection to the Thames Water combined sewer manhole in Ettrick Street (TWMH4302); Proposed discharge rate is 1.5l/s.
- One new connection to the southeast corner of the building F1 into the Thames Water combined water sewer in Aberfeldy Street (TWMH4312); Proposed discharge rate is 1.25l/s; and
- Two new connections for Building H1&H2 and H3 which will discharge surface water via two new separate connections into Thames Water combined sewer in Aberfeldy Street (TWMH4215). Proposed discharge rate for Building H1&H2 connection is 1.5l/s and for Building H3 is 1.25l/s.
- One New connection to TW combined sewer under Joshua Street.

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Luke Boustead
Site name:	Aberfeldy Village
Site location:	Tower Hamlets

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.51314° N
Longitude:	0.00532° W
Reference:	4176337745
Date:	Mar 09 2022 17:48

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 5.9

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	580	580
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

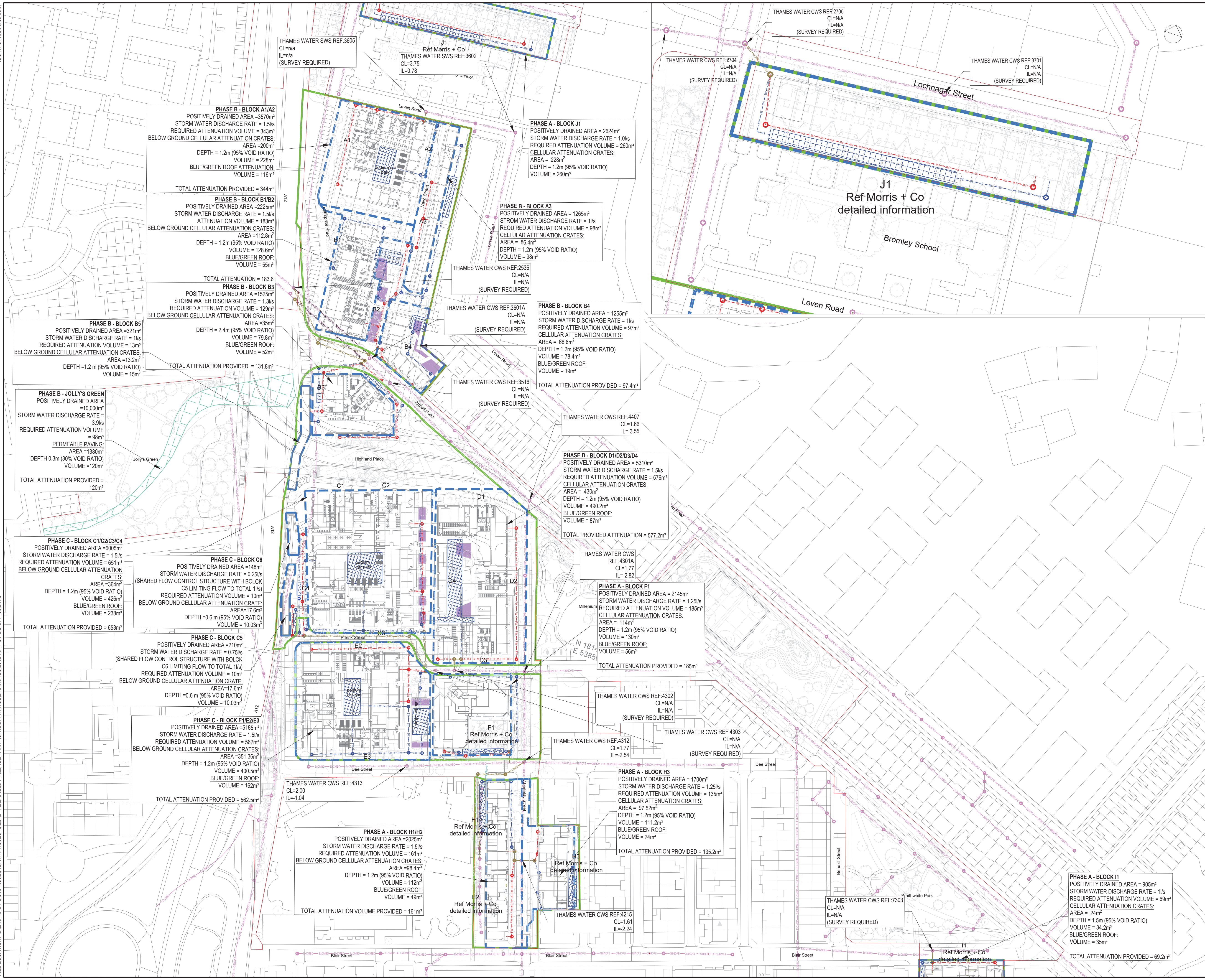
(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	22.86	22.86
1 in 1 year (l/s):	19.43	19.43
1 in 30 years (l/s):	52.58	52.58
1 in 100 year (l/s):	72.92	72.92
1 in 200 years (l/s):	85.49	85.49



ISSUED FOR INFORMATION

REV	DESCRIPTION	BY	DATE
P01	STAGE 2 ISSUE	LH	20/08/21
P02	SUSTAINABILITY PRESENTATION	LB	25/08/21
P03	DRAFT STAGE 2+ ISSUED FOR PLANNING	LH	17/09/21
P04	ISSUED FOR PLANNING	LB	14/10/21
P05	REVISED PLANNING ISSUE	LB	07/03/22

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5. PERMEABLE PAVING TO BE UTILIZED IN PRIVATELY MANAGED PUBLIC SPACE WHERE FEASIBLE.
6. THIS DRAWING IS BASED ON:
   - THAMES WATER ASSET RECORDS DATED NOVEMBER 2020
   - LEVITT BERNSTEIN ARCHITECTURAL MASTERPLAN 3663 - 100A - Proposed LGF Plan - Scenario A - P10, DATED: 10/08/21
   - TOPOGRAPHICAL & UTILITIES COMBINED SURVEY FULL SITE V2

TOTAL DISCHARGE RATE FROM SITE IS EQUAL TO THE GREENFEILD RUNOFF RATE OF 18.73 L/S.

KEY:

- ASSUMED PROPERTY BOUNDARY
- PROPOSED SURFACE WATER SEWER
- EXISTING SURFACE WATER SEWER
- PROPOSED FOUL WATER SEWER
- EXISTING COMBINED WATER SEWER
- PROPOSED COMBINED WATER SEWER
- ABANDONED SEWER
- PROPOSED SURFACE WATER MANHOLE
- EXISTING FOUL WATER MANHOLE
- PROPOSED FOUL WATER MANHOLE
- EXISTING COMBINED WATER SEWER
- PROPOSED COMBINED WATER MANHOLE
- PROPOSED BELOW GROUND SURFACE WATER ATTENUATION TANK
- SUDS PLANTER (BIO-RETENTION)
- ASSUMED POSITIVELY DRAINED BLOCK AREA
- PERMEABLE PAVING

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PROJECT
ABERFELDY VILLAGE MASTERPLAN

CLIENT
ECOWORLD

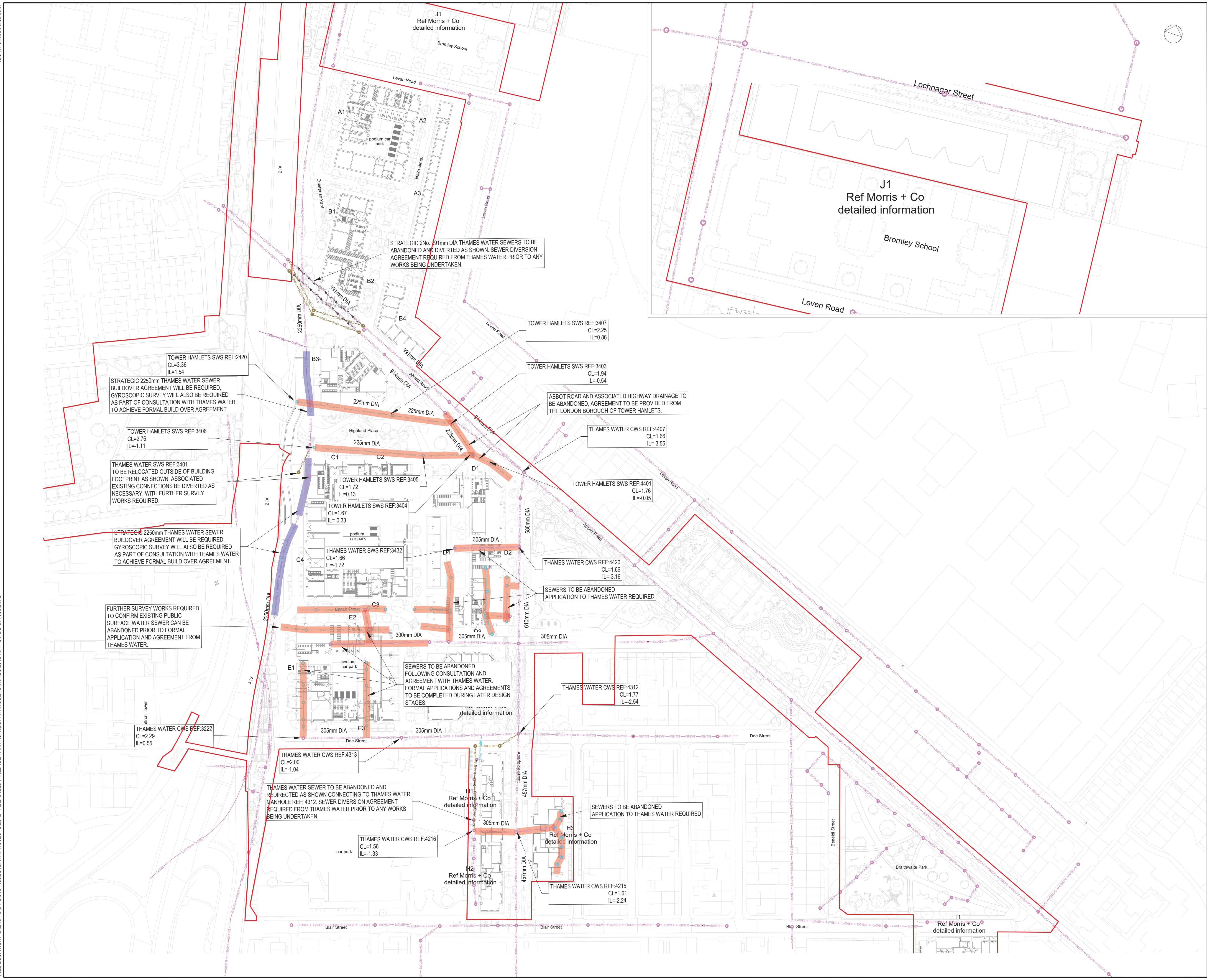
TITLE
BELOW GROUND DRAINAGE MASTERPLAN

DISCIPLINE			SCALE
CIVIL			1:1000
DRAWN	DESIGNED	CHECKED	APPROVED
LH	LH	LB	LB
DRAWING No			ISSUE
2812-MHT-CV-BG-DR-100			P05

ISO A1 841mm x 594mm

DATE: 07/03/2022
FILE LOCATION: \\MEINHARDT-DC1\PROJECTDATA\PROJECTS\2812 - ABERFELDY VILLAGE\1. MHT\CIVIL\DRAWINGS\2812-MHT-CV-BG-DR-100.DWG

ISO A1 841mm x 594mm



ISSUED FOR INFORMATION

REV	DESCRIPTION	BY	DATE
P01	STAGE 2 ISSUE	LH	20/08/21
P02	DRAFT STAGE 2+ ISSUED FOR PLANNING	LH	17/09/21
P03	ISSUED FOR PLANNING	LB	14/10/21
P04	REVISED PLANNING ISSUE	LB	08/03/22

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5. THIS DRAWING IS BASED ON:
   - THAMES WATER ASSET RECORDS DATED NOVEMBER 2020
   - LEVITT BERNSTEIN ARCHITECTURAL MASTERPLAN 3663 - 100A - Proposed LGF Plan - Scenario A - P10, DATED: 10/08/21
   - TOPOGRAPHICAL & UTILITIES COMBINED SURVEY FULL SITE V2

KEY:

- SITE BOUNDARY
- EXISTING SURFACE WATER SEWER
- EXISTING COMBINED WATER SEWER
- PROPOSED COMBINED WATER SEWER
- EXISTING SURFACE WATER MANHOLE
- EXISTING COMBINED WATER MANHOLE
- PROPOSED COMBINED WATER MANHOLE
- SEWER TO BE ABANDONED
- SEWER TO BE PASSED THROUGH STRATEGIC THAMES WATER SEWER BUILD OVER AGREEMENT
- SEWER TO BE DIVERTED & ABANDONED

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PROJECT
ABERFELDY VILLAGE MASTERPLAN

CLIENT
ECOWORLD

TITLE
THAMES WATER SEWER ABANDONMENT AND BUILDOVER MAP

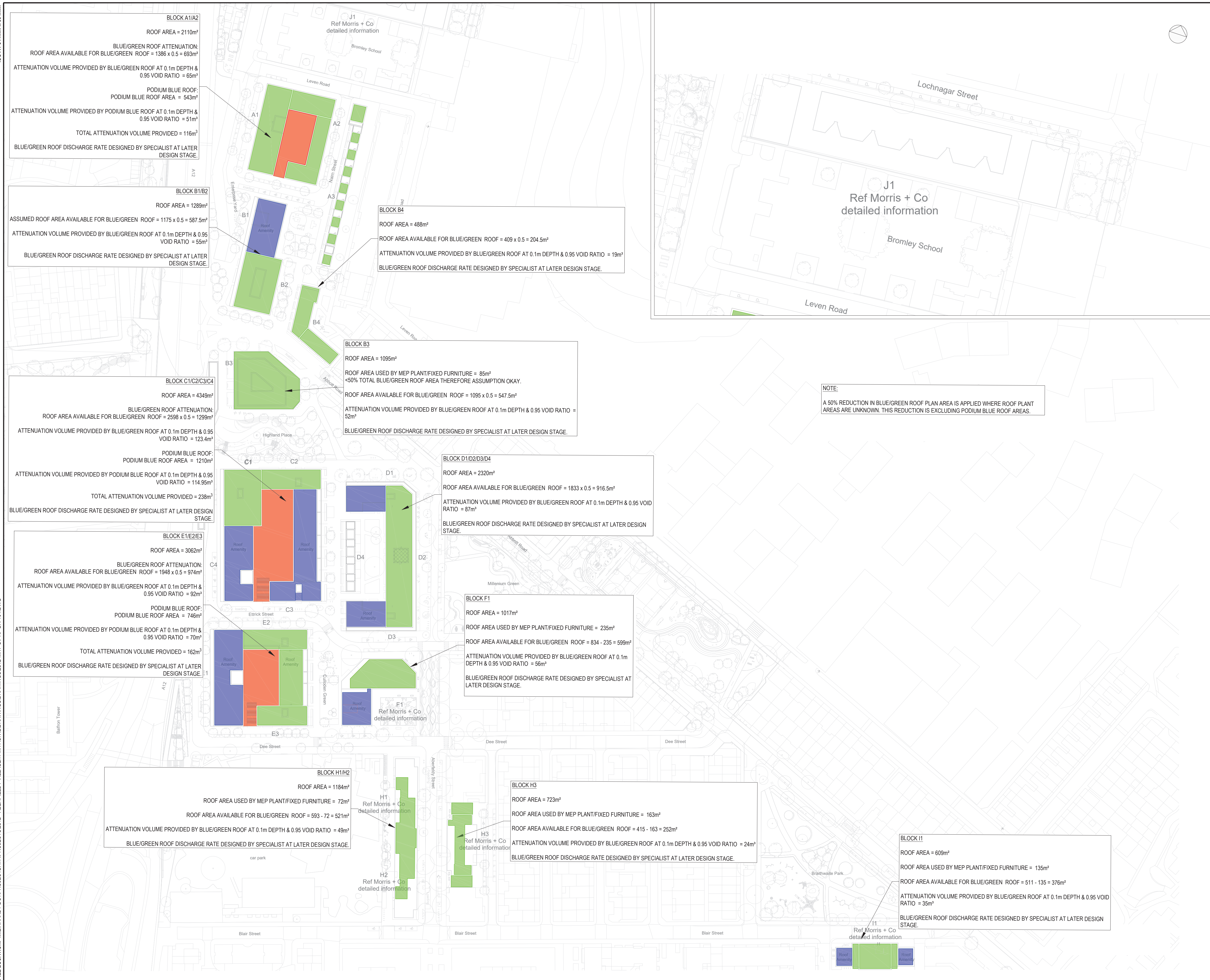
DISCIPLINE			SCALE
CIVIL			1:1000
DRAWN	DESIGNED	CHECKED	APPROVED
LH	LH	LB	CM
DRAWING No			ISSUE
2812-MHT-CV-BG-DR-050			P04

DATE: 08/03/2022
FILE LOCATION: \\MEINHARDT-DC1\PROJECTDATA\PROJECTS\2812 - ABERFELDY VILLAGE\1. MHT\CIVIL\DRAWINGS\2812-MHT-CV-BG-DR-050.DWG

ISO A1 841mm x 594mm

ISSUED FOR INFORMATION

REV	DESCRIPTION	BY	DATE
P01	STAGE 2 ISSUE	LH	20/08/21
P02	DRAFT STAGE 2+ FOR PLANNING	LH	17/09/21
P03	ISSUED FOR PLANNING	LB	14/10/21



BLOCK A1/A2

ROOF AREA = 2110m²

BLUE/GREEN ROOF ATTENUATION:
ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1386 x 0.5 = 693m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 65m³

PODIUM BLUE ROOF:
PODIUM BLUE ROOF AREA = 543m²

ATTENUATION VOLUME PROVIDED BY PODIUM BLUE ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 51m³

TOTAL ATTENUATION VOLUME PROVIDED = 116m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK B1/B2

ROOF AREA = 1289m²

ASSUMED ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1175 x 0.5 = 587.5m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 55m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK B4

ROOF AREA = 488m²

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 409 x 0.5 = 204.5m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 19m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK B3

ROOF AREA = 1095m²

ROOF AREA USED BY MEP PLANT/FIXED FURNITURE = 85m²
<50% TOTAL BLUE/GREEN ROOF AREA THEREFORE ASSUMPTION OKAY.

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1095 x 0.5 = 547.5m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 52m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK C1/C2/C3/C4

ROOF AREA = 4349m²

BLUE/GREEN ROOF ATTENUATION:
ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 2598 x 0.5 = 1299m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 123.4m³

PODIUM BLUE ROOF:
PODIUM BLUE ROOF AREA = 1210m²

ATTENUATION VOLUME PROVIDED BY PODIUM BLUE ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 114.95m³

TOTAL ATTENUATION VOLUME PROVIDED = 238m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

NOTE:

A 50% REDUCTION IN BLUE/GREEN ROOF PLAN AREA IS APPLIED WHERE ROOF PLANT AREAS ARE UNKNOWN. THIS REDUCTION IS EXCLUDING PODIUM BLUE ROOF AREAS.

BLOCK D1/D2/D3/D4

ROOF AREA = 2320m²

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1833 x 0.5 = 916.5m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 87m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK E1/E2/E3

ROOF AREA = 3062m²

BLUE/GREEN ROOF ATTENUATION:
ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1948 x 0.5 = 974m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 92m³

PODIUM BLUE ROOF:
PODIUM BLUE ROOF AREA = 746m²

ATTENUATION VOLUME PROVIDED BY PODIUM BLUE ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 70m³

TOTAL ATTENUATION VOLUME PROVIDED = 162m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK F1

ROOF AREA = 1017m²

ROOF AREA USED BY MEP PLANT/FIXED FURNITURE = 235m²

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 834 - 235 = 599m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 56m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK H1/H2

ROOF AREA = 1184m²

ROOF AREA USED BY MEP PLANT/FIXED FURNITURE = 72m²

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 593 - 72 = 521m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 49m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK H3

ROOF AREA = 723m²

ROOF AREA USED BY MEP PLANT/FIXED FURNITURE = 163m²

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 415 - 163 = 252m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 24m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK I1

ROOF AREA = 609m²

ROOF AREA USED BY MEP PLANT/FIXED FURNITURE = 135m²

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 511 - 135 = 376m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 35m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

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5. THIS DRAWING IS BASED ON:
   - LEVITT BERNSTEIN ARCHITECTURAL MASTERPLAN DWG REF; 3663 - 130 - Proposed Roof plan - Scenario A - P6.
   - MORRIS AND COMPANY ROOF PLANS A303-MCO-BF-R1-DR-A-01122, A303-MCO-BH-R1-DR-A-01138 & A303-MCO-BI-R1-DR-A-01158.

KEY:

- PROPOSED PODIUM DECK BLUE ROOF AREA
- PROPOSED BLUE OR GREEN ROOF AREA
- PROPOSED BLUE ROOF AREA

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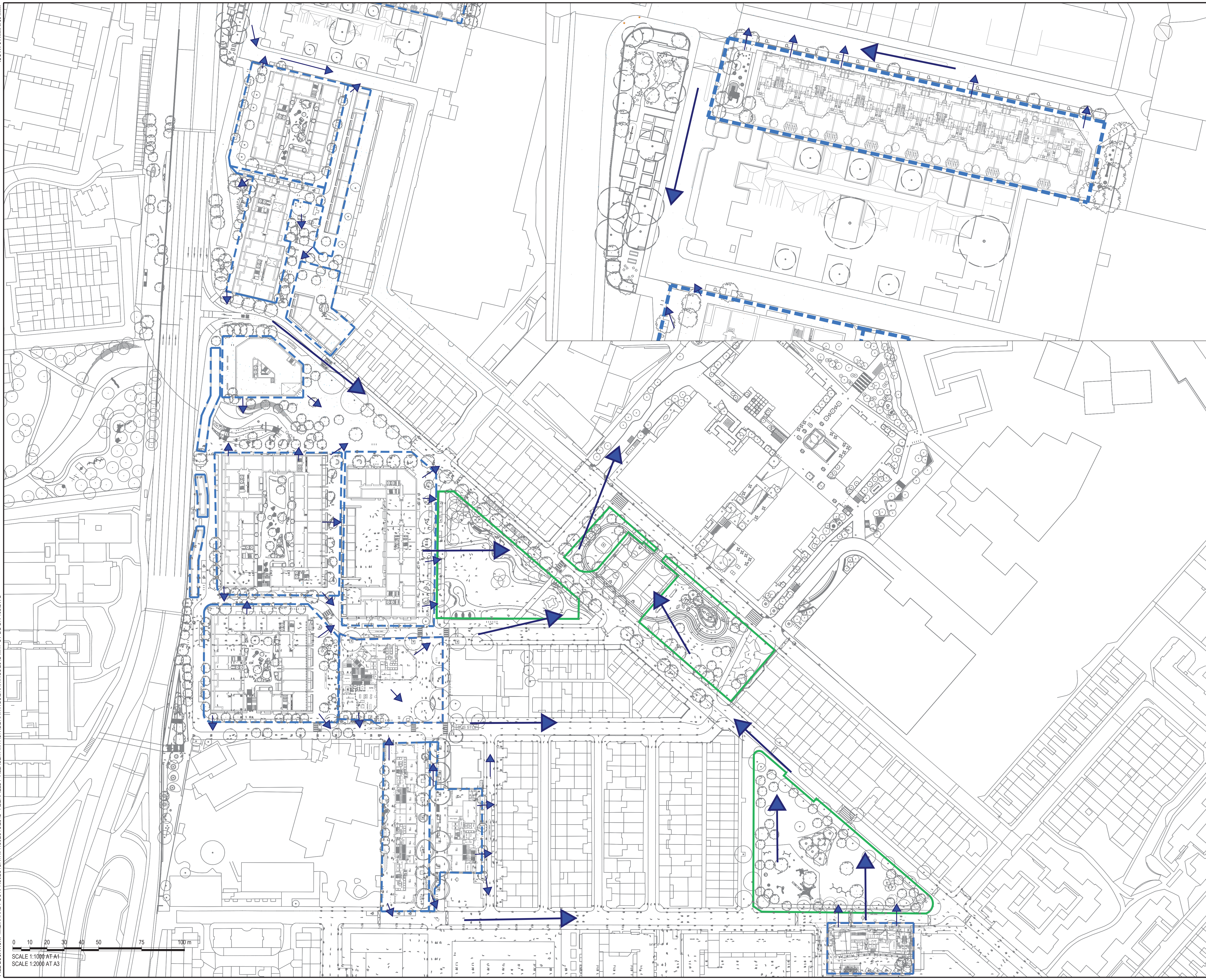
PROJECT
ABERFELDY VILLAGE MASTERPLAN

CLIENT
ECOWORLD

TITLE
ROOF MASTERPLAN

DISCIPLINE			SCALE
CIVIL			1:1000
DRAWN	DESIGNED	CHECKED	APPROVED
LH	LH	LB	CM
DRAWING No			ISSUE
2812-MHT-CV-BG-DR-101			P03

DATE: 14/10/2021
FILE LOCATION: \\MEINHARDT-DC1\PROJECTDATA\PROJECTS\2812 - ABERFELDY VILLAGE\1. MHT\CIVIL\DRAWINGS\DRAWINGS\2812-MHT-CV-RF-DR-101.DWG



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DATE: 10/02/2022
FILE LOCATION: \\MEINHARDT-DC1\PROJECTDATA\PROJECTS\2812 - ABERFIELDY VILLAGE\1. MHT\CIVIL\DRAWINGS\DRAWINGS\2812-MHT-CV-BG-DR-109.DWG

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	DATE
P01	FOR INFORMATION ONLY	SA	14.02.22
P02	REVISED ISSUE	LB	01.04.22

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6. THIS DRAWING IS BASED ON:
   - LEVITT BERNSTEIN ARCHITECTURAL MASTERPLAN 3663 - 100A - Proposed LGF Plan - Scenario A - P10, DATED: 10/08/21
   - TOPOGRAPHICAL & UTILITIES COMBINED SURVEY FULL SITE V2

KEY:

- PROPOSED BLOCK BOUNDARY
- PROPOSED GREEN SPACE BOUNDARY
- OVERLAND FLOW ROUTE

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PROJECT
ABERFELDY VILLAGE

CLIENT
ECOWORLD

TITLE
OVERLAND FLOW ROUTES

DISCIPLINE			SCALE
CIVIL			1:1000
DRAWN	DESIGNED	CHECKED	APPROVED
SA	LB	LB	GB
DRAWING No			ISSUE
2812-MHT-CV-BG-DR-109			P02

Appendix D – Tower Hamlets SUDS Proforma

TOWER HAMLETS

GREATER**LONDON**AUTHORITY

LoDEG

1. Project & Site Details		
	Project / Site Name (including sub-catchment / stage / phase where appropriate)	Aberfeldy Village
	Address & post code	Poplar Riverside, Aberfeldy Village, E14, London
	OS Grid ref. (Easting, Northing)	E 538365
		N 181398
	LPA reference (if applicable)	
	Brief description of proposed work	The Aberfeldy Village Masterplan aims to deliver, up to 1628 new homes, new workspace, a new high street, new and improved open space and the pedestrianisation of the A12 Abbott Road
	Total site Area	91000 m^2
	Total existing impervious area	37000 m^2
	Total proposed impervious area	32000 m^2
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	no
	Existing drainage connection type and location	Traditional piped system, multiple connection points
	Designer Name	Luke Boustead
	Designer Position	Senior Engineer
	Designer Company	Meinhardt

2. Proposed Discharge Arrangements			
2a. Infiltration Feasibility			
Superficial geology classification	Alluviam - Clay, Silt, S		
Bedrock geology classification	London Clay Formation		
Site infiltration rate	1.12x10 -4 and 2.55x10	m/s	
Depth to groundwater level		m below ground level	
Is infiltration feasible?	No		
2b. Drainage Hierarchy			
		Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use		N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas		N	N
3 attenuate rainwater in ponds or open water features for gradual release		N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release		Y	Y
5 discharge rainwater direct to a watercourse		N	N
6 discharge rainwater to a surface water sewer/drain		N	N
7 discharge rainwater to the combined sewer.		Y	Y
2c. Proposed Discharge Details			
Proposed discharge location	locations to Thames Water public combine		
Has the owner/regulator of the discharge location been consulted?	o Thames Water. Response received confir		

3. Drainage Strategy

3a. Discharge Rates & Required Storage	Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m^3)	Proposed discharge rate (l/s)
Qbar	22.4			
1 in 1				22.4
1 in 30				23.4
1 in 100				24.4
1 in 100 + CC				25.4
Climate change allowance used		40%		

3b. Principal Method of Flow Control	Vortex Flow control (Hydro-Brake or similar)

3c. Proposed SuDS Measures	Catchment area (m^2)	Plan area (m^2)	Storage vol. (m^3)
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	7000	3500	335
Blue roofs	11000	6500	620
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	3500	730	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds			0
Attenuation tanks	48334		2715
Total	69834	10730	3670

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 2.1.3
Drainage hierarchy (2b)	Section 2.1.3
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix B
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix C
Proposed SuDS measures & specifications (3b)	Throughout report

4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix B
Detailed drainage design drawings, including exceedance flow routes	Appendix B
Detailed landscaping plans	Appendix E
Maintenance strategy	Section 2.5
Demonstration of how the proposed SuDS measures improve:	Section 2
a) water quality of the runoff?	Section 2.1.5
b) biodiversity?	Section 2.1.6
c) amenity?	Section 2.1.6

Waltham Forest

GREATER**LONDON**AUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Uplands Business Park (outline site)
Address & post code	Blackhorse Ln, London E17 5QN
OS Grid ref. (Easting, Northing)	E 535695 N 189846
LPA reference (if applicable)	
Brief description of proposed work	Redevelopment of Uplands buisness park into light industry and residential flats
Total site Area	39000 m^2
Total existing impervious area	39000 m^2
Total proposed impervious area	39000 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Pumped/gravity connection to sewer under Goldsmith Street
Designer Name	Luke Boustead
Designer Position	Senior Engineer
Designer Company	Meinhardt

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Alluviam - Clay, Silt, S
Bedrock geology classification	London Clay
Site infiltration rate	1.12x10 m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	Y	Y
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.		

2c. Proposed Discharge Details

Proposed discharge location	blic surface water sewer under Goldmith Str
Has the owner/regulator of the discharge location been consulted?	Yes

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	6.5			
1 in 1				6.5
1 in 30				6.5
1 in 100				6.5
1 in 100 + CC				6.5
Climate change allowance used		40%		

3b. Principal Method of Flow Control

Vortex flow control

3c. Proposed SuDS Measures

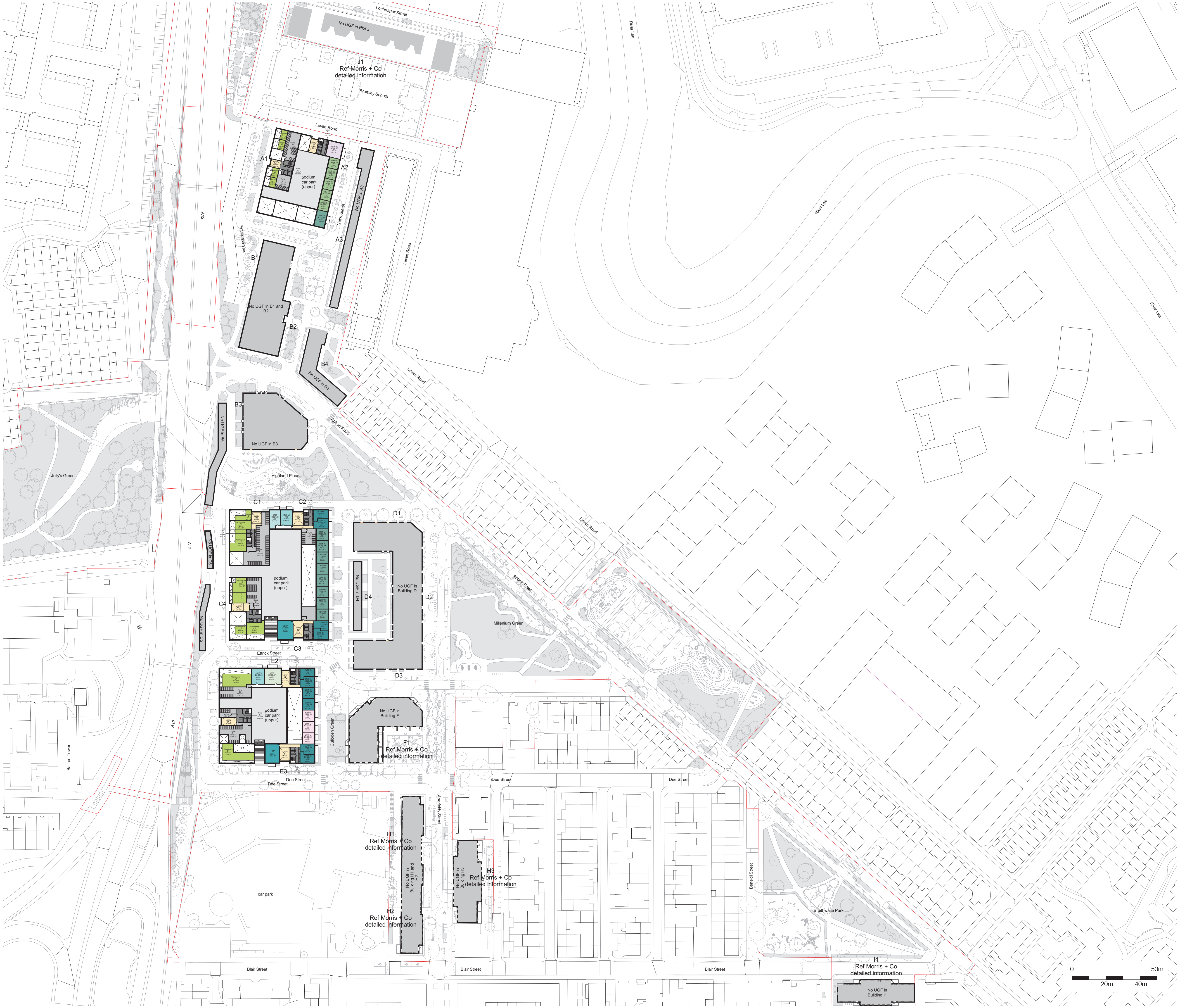
	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	1998
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		3162
Total	0	0	5160

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Detailed in section 8.2
Drainage hierarchy (2b)	Detailed in section 8.2
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Detailed in section 8.2
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Detailed in section 8.2 and Appendix
Proposed SuDS measures & specifications (3b)	Detailed in section 8.2

4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Detailed in Appendix
Detailed drainage design drawings, including exceedance flow routes	Detailed in Appendix
Detailed landscaping plans	Detailed in Appendix
Maintenance strategy	Detailed in Section 9
Demonstration of how the proposed SuDS measures improve:	Detailed in section 8.2
a) water quality of the runoff?	
b) biodiversity?	
c) amenity?	

Appendix E – Architects Plans



Notes

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Accommodation Key

1B2P	4B7P H	Post Room
1B2P W	4B7P M	Refuse
2B4P	4B8P M	Residents Amenity Hub
2B4P M	Core	Retail
3B5P	Cycle	Workspace
3B5P H	Estate Management Hub	
3B5P M	Lobby	
3B6P M	Plant	

Rev	Date	Description	Drawn / Checked
P2	06/08/21	Design Freeze Issue	LA
P1	05/07/21	For Information	LS

Project name

Aberfeldy New Masterplan

Drawing number: 3663 - LBA - Site - 01 - DR - A - 100B

Rev: **P2**

Drawing

Proposed UGF Plan - Scenario A

Purpose of issue

Information

Scale: 1 : 1000 @ A1

Date: 20/11/20

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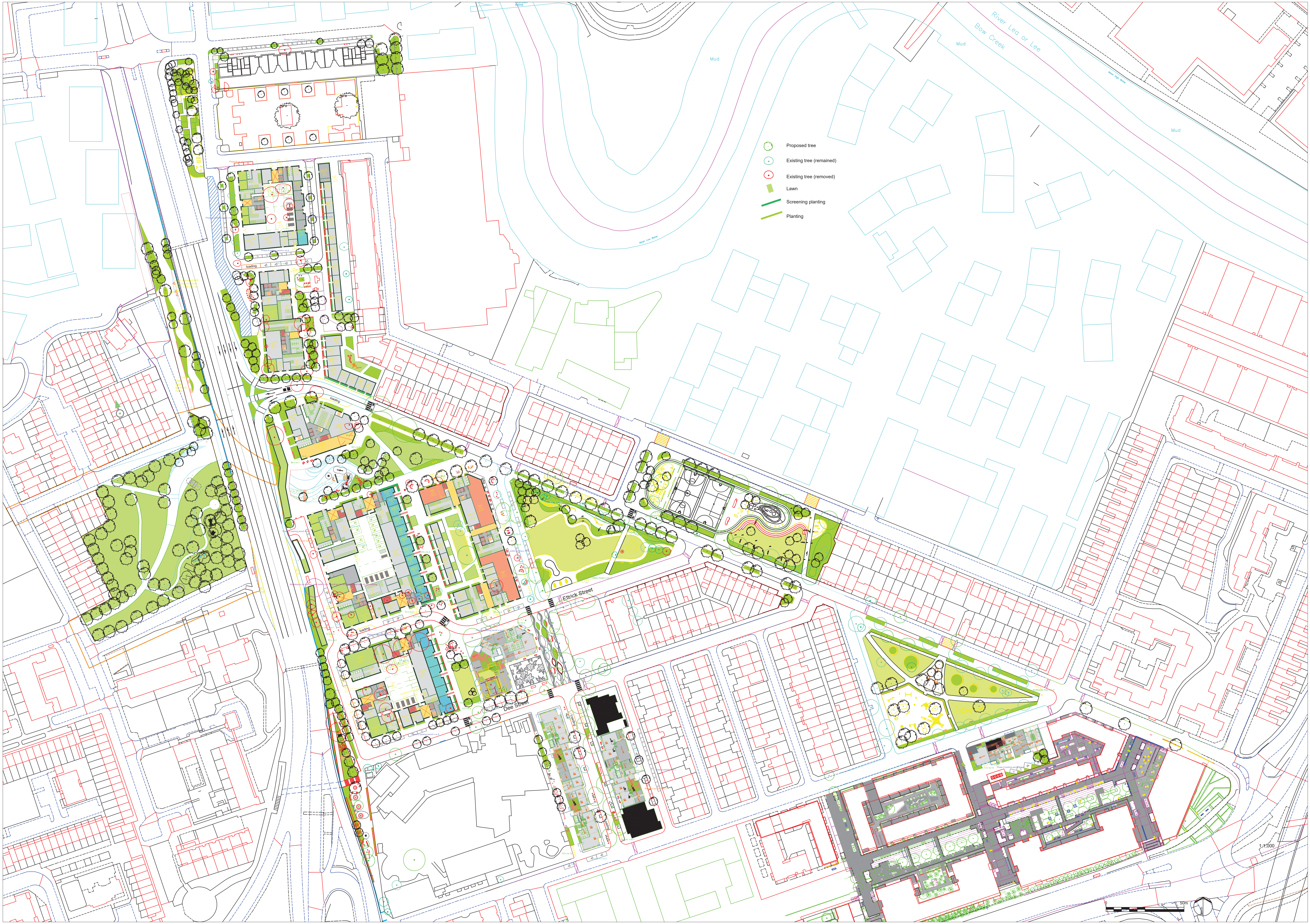
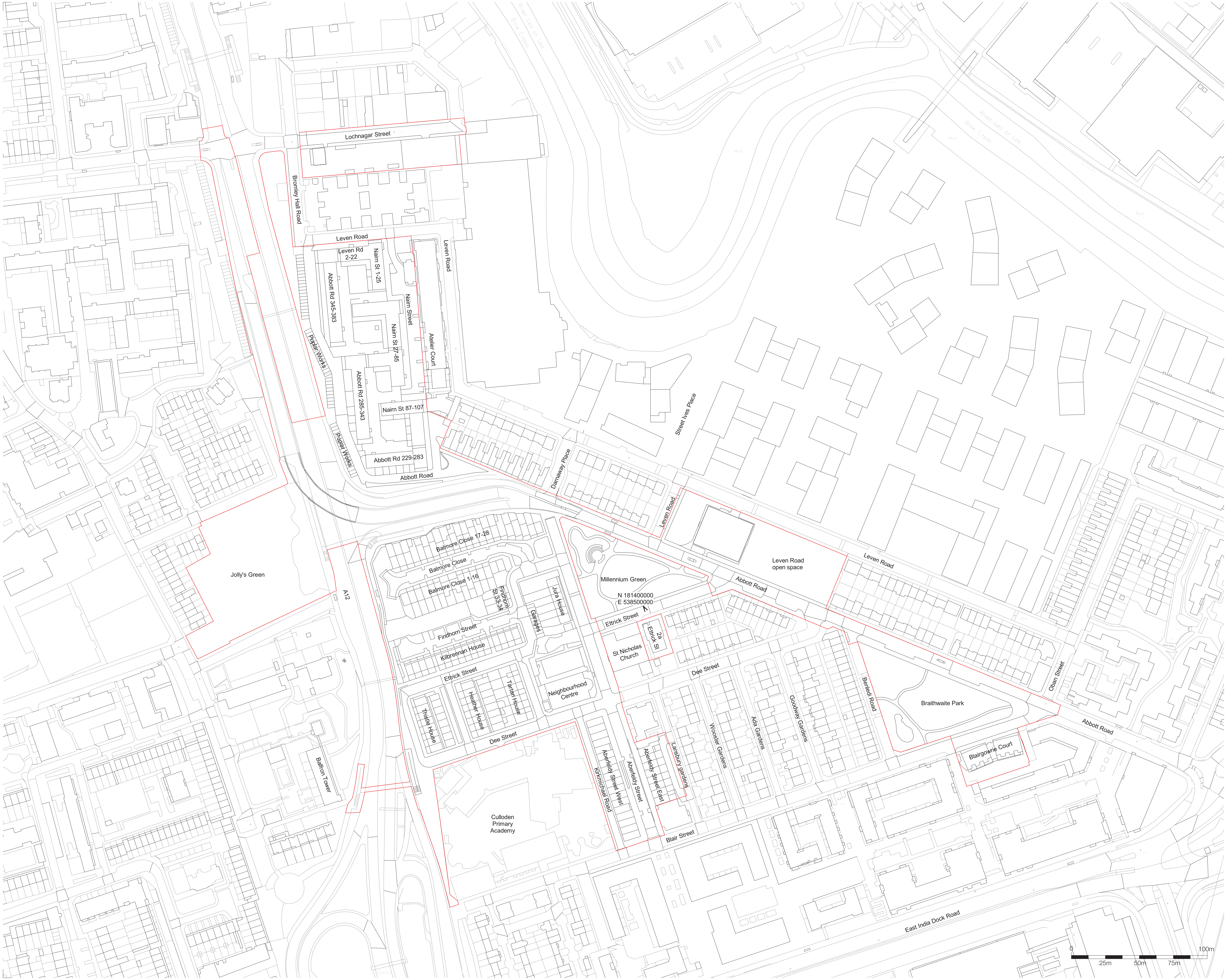

River Lea or Lee
Bow Creek
Mud
Proposed tree
Existing tree (remained)
Existing tree (removed)
Lawn
Screening planting
Planting
loading
Ettrick Street
Dee Street
1:1,000
50m



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Hybrid planning application boundary

Rev	Date	Description	Drawn / Checked
3	02/03/22	For Discussion	LS
2	01/03/22	For Discussion	LS
1	08/02/22	For Discussion	LS
0	19/10/21	Planning	LA

Project name

Aberfeldy New Masterplan

Drawing number: 3663 - LB - ZZ - 00 - DR - A - 000001

Rev: **3**

Drawing

Site Location Plan

Purpose of issue

For Information

Scale: 1 : 1250 @ A1

Date: 02/03/22

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