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ODYSSEY

DEVELOPING JOURNEYS

TROUT ROAD

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

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ON BEHALF OF TROUTBOURNE LLP

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1.0 INTRODUCTION

1.1 General

1.1.1 Odyssey has been commissioned by Troutbourne LLP to undertake a flood risk assessment (FRA), incorporating a surface water and foul drainage strategy, to be submitted in association with a planning application for a development at Rainbow and Kirby Industrial Estates, Trout Road, Yiewsley, UB7 7XT.

1.1.2 The proposals comprise the demolition of existing structures and phased redevelopment of the Site to provide nine plots ranging between 3 storeys and 11 storeys in height (including ground level) to include residential units (Use Class C3), flexible retail/café/restaurant floorspace (Class E(a,b,c)), light industrial floorspace (Class E (g)(iii)), associated hard and soft landscaping, car parking, cycle parking, servicing, refuse and plant areas, public realm improvements, highways works and other works associated with the development.

1.1.3 This report sets out the main flood risks to the Site and those that may arise as a result of the development. It also demonstrates the principles of surface water management at the Site.

1.1.4 The report comprises the following elements:

- **Section 2.0** reviews the existing Site conditions including the geology, hydrology and existing drainage regime of the Site.
- **Section 3.0** provides a description of the development proposals.
- **Section 4.0** provides a summary of relevant planning policy.
- **Section 5.0** provides and assessment of the existing flood risk to the Site.
- **Section 6.0** considers Sequential and Exception tests.
- **Section 7.0** sets out the proposed surface water drainage strategy.
- **Section 8.0** sets out the proposed foul water drainage strategy.
- **Section 9.0** summarises and concludes the report.

2.0 EXISTING SITE CONDITIONS

2.1 Location

2.1.1 The Site comprises the Rainbow and Kirby Industrial Estates, which accommodate an approximately 2.3 hectare plot within the London Borough of Hillingdon ('LBH'). Parts of the Site front the south side of Trout Road, the western side of Yiewsley High Street, and the northwest side of St Stephen's Road, with the entire southwest boundary bordered by the Grand Union Canal. The Site largely accommodates a range of single-storey and two-storey industrial buildings, many of which were in a poor state of repair, particularly those fronting Trout Road.

2.1.2 The surrounding area comprises a mix of industrial uses, commercial uses and residential properties, with building heights ranging from two storeys up to five storeys. Both the former church immediately opposite the Site's High Street frontage and the George & Dragon Public House to the north are locally listed buildings. The Site is not located within a conservation area and does not contain any statutory listed or locally listed buildings.

2.1.3 The Site is allocated in the LBH Local Plan, adopted in 2020, for a mixed-use development which is to be brought forward 'in accordance with the broad parameters of the approved scheme, subject to site-specific constraints (Ref: 38058/APP/2013/1756)'.

2.1.4 The Site is located approximately 400 metres (m) to the north-west of West Drayton railway station. The Ordnance Survey grid reference for the site is 505877E, 180497N and the nearest postcode is UB7 7XT. The site location plan is presented in **Appendix A** alongside the proposed site layout.

2.2 Topography

2.2.1 A topographical survey of the site was undertaken by Atum Survey Services LTD. in May 2021. The data shows the site predominantly falls from the north to the low point at the existing buildings in the northern half of the site, the site levels range from 30.63 metres Above Ordnance Datum (m AOD) in the north-east and 28.20m AOD in the location of the existing buildings. South of the existing buildings, the site broadly falls from the west to the buildings in the northern part of the site and the south, with levels ranging from 30.32m AOD in the west to 28.69m AOD in the south. The topographical data is presented in **Appendix B**.

2.3 Geology and Hydrogeology

2.3.1 British Geological Survey (BGS) online mapping (accessed September 2025) indicates the bedrock geology of the site comprises London Clay Formation (clay, silt and sand). The mapping also shows there are superficial deposits of Langley Silt Member (clay and silt) on the site. There are also superficial deposits of Lynch Gravel Member – Sand and Gravel found along the south-west boundary of the site in association with the canal. There is BGS mapping is presented in **Appendix C**.

2.3.2 BGS mapping shows borehole records available in close vicinity to the site. The following conditions were encountered within the borehole record with BGS reference TQ08SE8, which is the closest borehole to the site and shares the same bedrock and superficial deposits:

- Ground level to 0.41m below ground level (bgl) – Drift - Gravel and blue clay
- 0.41m to 2.41m bgl – London Clay – Blue [London] clay
- 2.41m to 3.40m bgl – Reading Beds (soft) – Mottled clay
- 3.40m to 3.56m bgl – Reading Beds (soft) – Brown dead sand
- 3.56m to 3.63m bgl – Reading Beds (soft) – Mottled clay
- 3.63m to 4.01m bgl – Reading Beds (soft) – Live sand
- 4.01m to 4.04m bgl – Reading Beds (soft) – Blowing sand
- 4.04m to 4.09m bgl – Reading Beds (soft) – Blue clay and stone
- 4.09m to 4.19m bgl – Reading Beds (soft) – White blowing sand
- 4.19m to 4.29m bgl – Reading Beds (soft) – Blue clay
- 4.29m to 4.45m bgl – Reading Beds (soft) – Flints
- 4.45m to 4.83m bgl – Reading Beds (soft) –Chalk
- The borehole record indicates that ground water was overflowing in the borehole although the level at which this occurred is not clear.

2.3.3 Environment Agency (EA) online mapping indicates the nearest 'Main River' is the Fray's River located approximately 180m west of the site. The Grand Union Canal can be found within the immediate vicinity of the south-west site boundary. A second major river, the River Pinn, crosses under the Grand Union Canal approximately 450m north of the site.

2.3.4 BGS hydrogeology mapping shows the site lies within the Thames Group, described as a "*Rocks with essentially no groundwater*", and summarised as a "*Predominantly clayey sequence up to 140m thick confining underlying aquifers. Occasional springs at base have very hard water*".

2.3.5 Groundwater mapping published by the EA shows the site is not located within a Source Protection Zone.

2.4 Existing Drainage Regime

2.4.1 The Thames Water sewer records show the presence of a public surface water sewer within the site boundary, in the south-east corner that crosses under the Grand Union Canal. There are also surface water sewer networks in the roads serving the residential and commercial buildings around the site. The Thames Water sewer records are presented in **Appendix D**.

2.4.2 According to Thames Water sewer records, there is a public foul sewer within the south-west part of the site, which crosses the site roughly parallel to the canal. There are also other public foul sewers in the roads serving the residential and commercial buildings around the site.

2.4.3 As the developable area for this site is less than 50ha, the Institute of Hydrology (IoH) Report 124 Flood Estimation for Smaller Catchments (1994) method is suitable to estimate greenfield peak flow rates (50ha is used in the formula and the flow rate is linearly interpolated based on the ratio of the development area). This methodology is approved in the Construction Industry Research and Information Association (CIRIA) C753 The SuDS Manual; the parameters used are presented in **Table 2.2**.

Table 2.2: SuDS Parameters

Parameter	Value	Unit
SAAR	677	mm
Soil Index	0.3	-
Region	6	-
Urban	0.000	-

2.4.4 **Table 2.3** summarises the greenfield discharge rates for the total proposed impermeable area (1.67ha). Supporting calculations are provided in **Appendix E.**

Table 2.3: Greenfield Surface Water Discharge Rates

Return Period	Greenfield Discharge Rates from Site (litres per second (l/s))	Greenfield Discharge Rates per Hectare (l/s/ha)
QBAR	2.9	1.7
Q1	2.5	1.5
Q30	6.6	3.9
Q100	9.3	5.6

2.4.5 As the site is currently developed, brownfield rates have been calculated using Flood Estimation Handbook (FEH) data. The runoff rates for the existing impermeable area (2.23ha) are shown in **Table 2.4** and supporting calculations are provided in **Appendix E**.

Table 2.4: Estimated Total Brownfield Surface Water Discharge Rates

Return Period	Estimated Brownfield Discharge Rates from site (l/s)
Q1	136.1
Q2	158.8
Q30	358.0
Q100	462.9

3.0 PROPOSED DEVELOPMENT

3.1.1 The proposals comprise the demolition of existing structures and phased redevelopment of the site to provide nine plots ranging between 3 storeys and 11 storeys in height (including ground level) to include residential units (Use Class C3), flexible retail/café/restaurant floorspace (Class E (a,b,c)), light industrial floorspace (Class E (g)(iii)), associated hard and soft landscaping, car parking, cycle parking, servicing, refuse and plant areas, public realm improvements, highways works and other works associated with the development.

3.1.2 There are 433 proposed residential units.

3.1.3 The proposed site layout is presented in **Appendix A**.

4.0 PLANNING POLICY

4.1 Flood and Water Management Act (2010)

4.1.1 The Flood and Water Management Act (FWMA) received royal assent on 8th April 2010. It was intended to implement Sir Michael Pitt's recommendations following the widespread summer floods of 2007. Guidance and information notes are published online by the Department for Environment, Food and Rural Affairs (Defra) to address a range of aspects concerning the Act.

4.1.2 The FWMA encourages the use of Sustainable Drainage Systems (SuDS) on development sites by removing the automatic right to connect to sewers.

4.1.3 The development proposals for the site considered by this report should adhere to the FWMA through the provision of SuDS as a fundamental component of the surface water drainage strategy.

4.2 National Planning Policy Framework (2024)

4.2.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies, and how these policies should be applied. Planning Practice Guidance (PPG) is available online and provides additional guidance to the NPPF, as well as providing links to relevant detailed documents. **Section 4.3** provides further detail on the PPG.

4.2.2 Paragraph 170 of the NPPF states *"inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere."*

4.2.3 Paragraph 172 of the NPPF states *"All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property."*

4.2.4 Paragraph 181 of the NPPF states *"when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*

- *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;*
- *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;*
- *it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- *any residual risk can be safely managed; and*
- *safe access and escape routes are included where appropriate, as part of an agreed emergency plan."*

4.2.5 In accordance with the NPPF, a site-specific FRA is required for sites within the following categories:

- In Flood Zone 1, all proposals involving:
  - Sites of one hectare or more.
  - Land which has been identified by the EA as having critical drainage problems.
  - Land identified in the SFRA as being at increased flood risk in the future.
  - Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.
- All proposals for development in Flood Zones 2 and 3.

4.3 Planning Practice Guidance (2022)

4.3.1 The PPG provides additional direction to the NPPF, with details provided in each section of the document on how to conform to the NPPF.

4.3.2 All land in England is classified as falling into one of three main flood zones, with the zones referring to the probability of river or sea flooding, ignoring the existence of defences. The PPG identifies and describes the EA flood zones as:

- Flood Zone 1: Low probability – land assessed as having less than a 1 in 1,000 annual probability of river or sea flooding (<0.1% Annual Exceedance Probability (AEP)).
- Flood Zone 2: Medium probability – land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river or sea flooding (1% - 0.1% AEP).
- Flood Zone 3: High probability – land assessed as having a 1 in 100 or greater annual probability of river flooding (≥1% AEP), or a 1 in 200 or greater annual probability of sea flooding (≥0.5% AEP).
- Flood Zone 3b: The Functional Floodplain – land where water has to flow or be stored in times of flood (as identified by the LPAs in the SFRA).

4.3.3 The current PPG sets out the following drainage hierarchy that the discharge of surface water runoff should adhere to:

- Into the ground (infiltration).
- To a surface water body.
- To a surface water sewer, highway drain, or another drainage system.
- To a combined sewer.

4.4 The London Plan (2021)

4.4.1 Policy SI 12 of the London Plan states:

A. "Current and expected flood risk from all sources … 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 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. Development 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.
F. Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.
G. Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat."

4.4.2 Policy SI 13 of the London Plan states:

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:
    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 increase water use efficiency, improved water quality, and enhance biodiversity, urban greening, amenity and recreation."

4.5 London Borough of Hillingdon Local Plan Part 1 (Adopted November 2012)

4.5.1 Relevant points of Policy EM1 of the London Borough of Hillingdon Local Plan (LBH LP) Part 1 state:

4.5.2 "*The Council will ensure that climate change mitigation is addressed at every stage of the development process by:*

10. Locating and designing development to minimise the probability and impacts of flooding.

11. *Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption.*

12. *Giving preference to development of previously developed land to avoid the loss of further green areas.*

13. *Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks."*

4.5.3 Policy EM6 of the LBH LP Part 1 states:

"The Council will require new development to be directed away from Flood Zones 2 and 3 in accordance with the principles of the NPPF.

The subsequent Hillingdon Local Plan: Part 2 -Site Specific Allocations LDD will be subjected to the Sequential Test in accordance with the NPPF. Sites will only be allocated within Flood Zones 2 or 3 where there are overriding issues that outweigh flood risk. In these instances, policy criteria will be set requiring future applicants of these sites to demonstrate that flood risk can be suitably mitigated.

The Council will require all development across the borough to use sustainable urban drainage systems (SUDS) unless demonstrated that it is not viable. The Council will encourage SUDS to be linked to water efficiency methods. The Council may require developer contributions to guarantee the long term maintenance and performance of SUDS is to an appropriate standard."

4.5.4 Relevant points of Policy EM8 of the LBH LP Part 1 state:

"<u>Water Quality</u>

The Council will seek to safeguard and improve all water quality, both ground and surface. Principal Aquifers, and Source Protection Zones will be given priority along with the:

- River Colne
- Grand Union Canal
- River Pinn
- Yeading Brook
- Porter Land Brook
- River Crane
- Ruislip Lido"

4.6 London Borough of Hillingdon Local Plan Part 2 (Adopted January 2020)

4.6.1 Policy DMEI 9 of the LBH LP Part 2 states:

A. *"Development proposals in Flood Zones 2 and 3a will be required to demonstrate that there are no suitable sites available in areas of lower flood risk. Where no appropriate sites are available, development should be located on the areas of lowest flood risk within the site. Flood defences should provide protection for the lifetime of the development. Finished floor levels should reflect the Environment Agency's latest guidance on climate change.*

B. *Development proposals in these areas will be required to submit an appropriate level Flood Risk Assessment (FRA) to demonstrate that the development is resilient to all sources of flooding.*

C. *Development in Flood Zone 3b will be refused in principle unless identified as an appropriate development in Flood Risk Planning Policy Guidance. Development for appropriate uses in Flood Zone 3b will only be approved if accompanied by an appropriate FRA that demonstrates the development will be resistant and resilient to flooding and suitable warning and evacuation methods are in place.*

D. *Developments may be required to make contributions (through legal agreements) to previously identified flood improvement works that will benefit the development site.*

E. *Proposals that fail to make appropriate provision for flood risk mitigation, or which would increase the risk or consequences of flooding, will be refused."*

4.6.2 Policy DMEI 10 of the LBH LP Part 2 states:

A. *"Applications for all new build developments (not conversions, change of use, or refurbishment) are required to include a drainage assessment demonstrating that appropriate sustainable drainage systems (SuDS) have been incorporated in accordance with the London Plan Hierarchy (Policy 5.13: Sustainable drainage).*

B. *All major new build developments, as well as minor developments in Critical Drainage Areas or an area identified at risk from surface water flooding must be designed to reduce surface water run-off rates to no higher than the pre-development greenfield run-off rate in a 1:100 year storm scenario, plus an appropriate allowance for climate change for the worst storm duration. The assessment is required regardless of the*

changes in impermeable areas and the fact that a site has an existing high run-off rate will not constitute justification.

C. *Rain Gardens and non householder development should be designed to reduce surface water run-off rates to Greenfield run-off rates.*

D. *Schemes for the use of SuDS must be accompanied by adequate arrangements for the management and maintenance of the measures used, with appropriate contributions made to the Council where necessary.*

E. *Proposals that would fail to make adequate provision for the control and reduction of surface water run-off rates will be refused.*

F. *Developments should be drained by a SuDs system and must include appropriate methods to avoid pollution of the water environment. Preference should be given to utilising the drainage options in the SuDS hierarchy which remove the key pollutants that hinder improving water quality in Hillingdon. Major development should adopt a 'treatment train' approach where water flows through different SuDS to ensure resilience in the system.*

Water Efficiency

G. *All new development proposals (including refurbishments and conversions) will be required to include water efficiency measures, including the collection and reuse of rain water and grey water.*

H. *All new residential development should demonstrate water usage rates of no more than 105 litres/person/day.*

I. *It is expected that major development proposals will provide an integrated approach to surface water run-off attenuation, water collection, recycling and reuse.*

Water and Wastewater Infrastructure

J. *All new development proposals will be required to demonstrate that there is sufficient capacity in the water and wastewater infrastructure network to support the proposed development. Where there is a capacity constraint the local planning authority will require the developer to provide a detailed water and/or drainage strategy to inform what infrastructure is required, where, when and how it will be delivered."*

4.6.3 Policy DMEI 11 of the LBH LP Part 2 states:

"All development proposals within a Source Protection Zone, Safeguard Zone or Water Protection Zone must assess any risk to groundwater resources and demonstrate that these would be protected throughout the construction and operational phases of development."

5.0 SOURCES OF FLOOD RISK

5.1 Fluvial Flooding

5.1.1 Fluvial flooding is caused by flows in rivers or streams exceeding the capacity of the river channel and spilling into the floodplain. Fluvial flooding can also occur on designated floodplain land after a period of heavy rainfall.

5.1.2 The EA Flood Map for Planning (accessed September 2025) shows the site is entirely located within Flood Zone 1; land assessed as having less than a 1 in 1,000 annual probability of river or sea flooding (<0.1% AEP). The flood risk vulnerability classification of residential units is 'more vulnerable' and the flood risk vulnerability classification of commercial development is 'less vulnerable' and therefore all of the Proposed Development is deemed to be appropriate for this site in accordance with the PPG. The EA Flood Map for Planning mapping is presented in **Appendix F**.

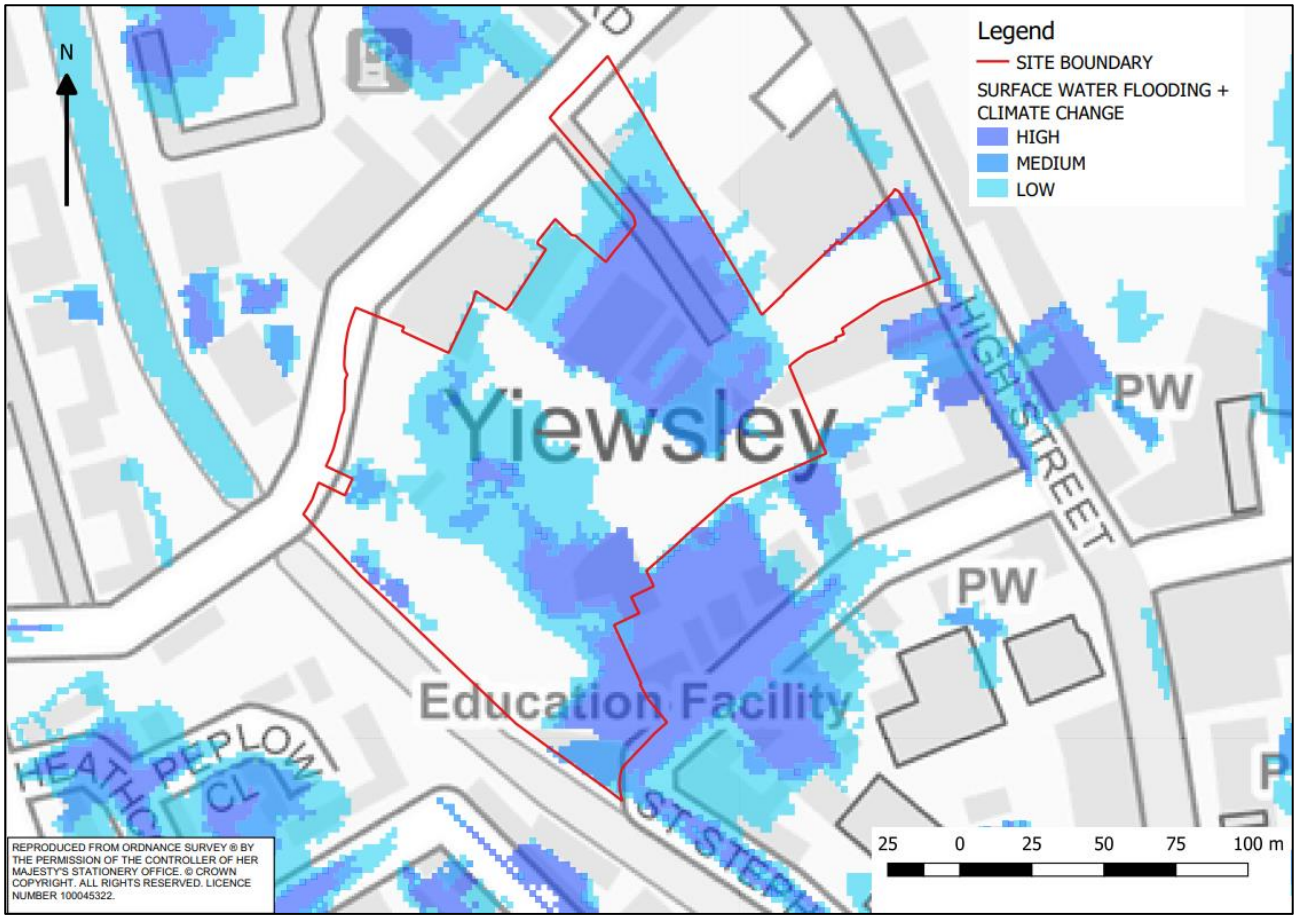
5.1.3 The online JBA Trust Flood Mapping shows there have been no recorded fluvial flooding incidents on the site. The closest recorded historic flood incident is approximately 400m north of the site in association with the River Pinn.

5.2 Surface Water Flooding

5.2.1 Surface water (pluvial) flooding is caused by rainfall levels exceeding the natural infiltration properties of the surrounding soils. Flooding can occur where there is a lack of a formalised drainage system, or as a result of a poorly designed or maintained sewer system. Flooding can also occur owing to the absence of a natural method of drainage such as watercourses or ditches, or where soil infiltration rates are low. Flooding often results in ponding of water at low points or when surface water flow routes are blocked by an obstruction.

5.2.2 The EA Risk of Flooding from Surface Water (RoFSW) including climate change mapping shows very low, low, medium and high risk of surface water flooding on the site. The extents of the RoFSW are shown in **Figure 5.1**.

Figure 5.1: Risk of Flooding from Surface Water Including Climate Change



5.2.3 EA mapping shows that though the extents cover a lot of the site, most of it corresponds to a low depth of surface water, most of the medium and high flood risk is only 0.2-0.3m in depth, with no medium or high risk at a depth of 0.6m. The RoFSW depth mapping is shown in **Figures 5.2 to 5.4**. The existing site is known to be largely impermeable which contributes to the surface water flood risk.

Figure 5.2: Risk of Flooding from Surface Water Including Climate Change – 0.2m depth

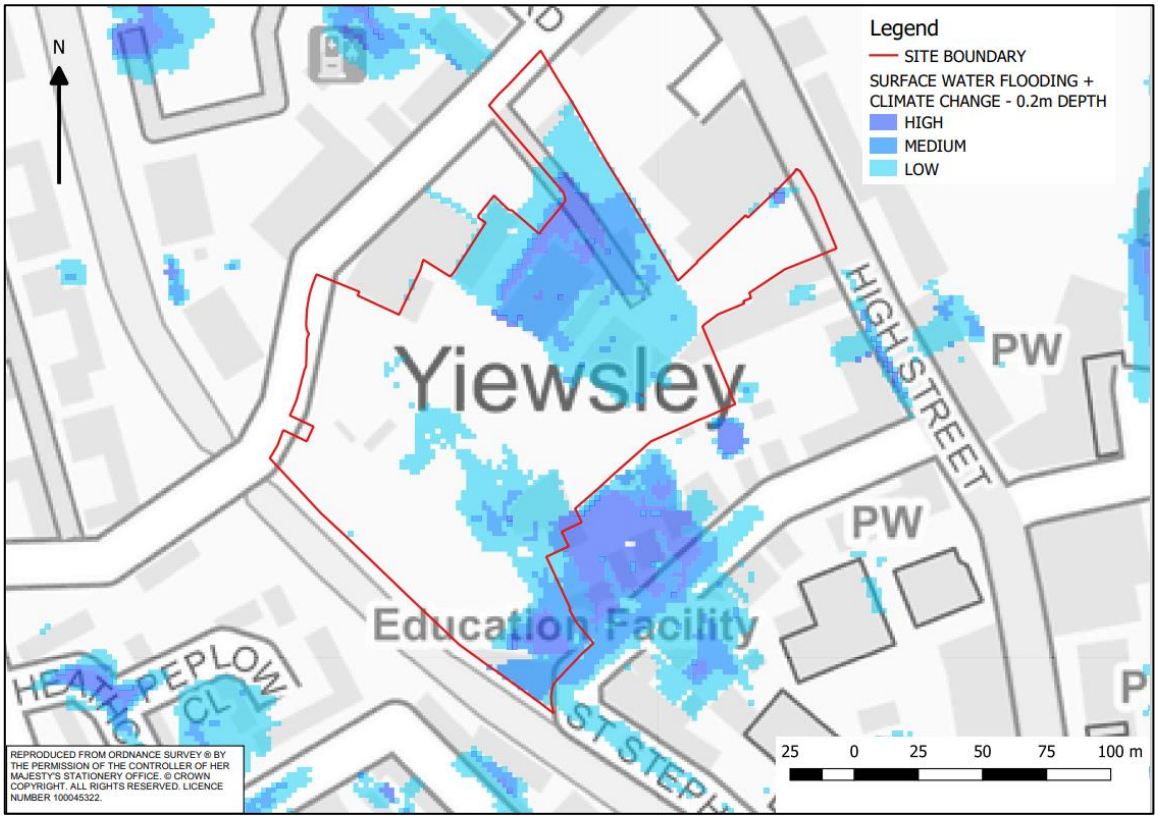


Figure 5.3: Risk of Flooding from Surface Water Including Climate Change – 0.3m depth

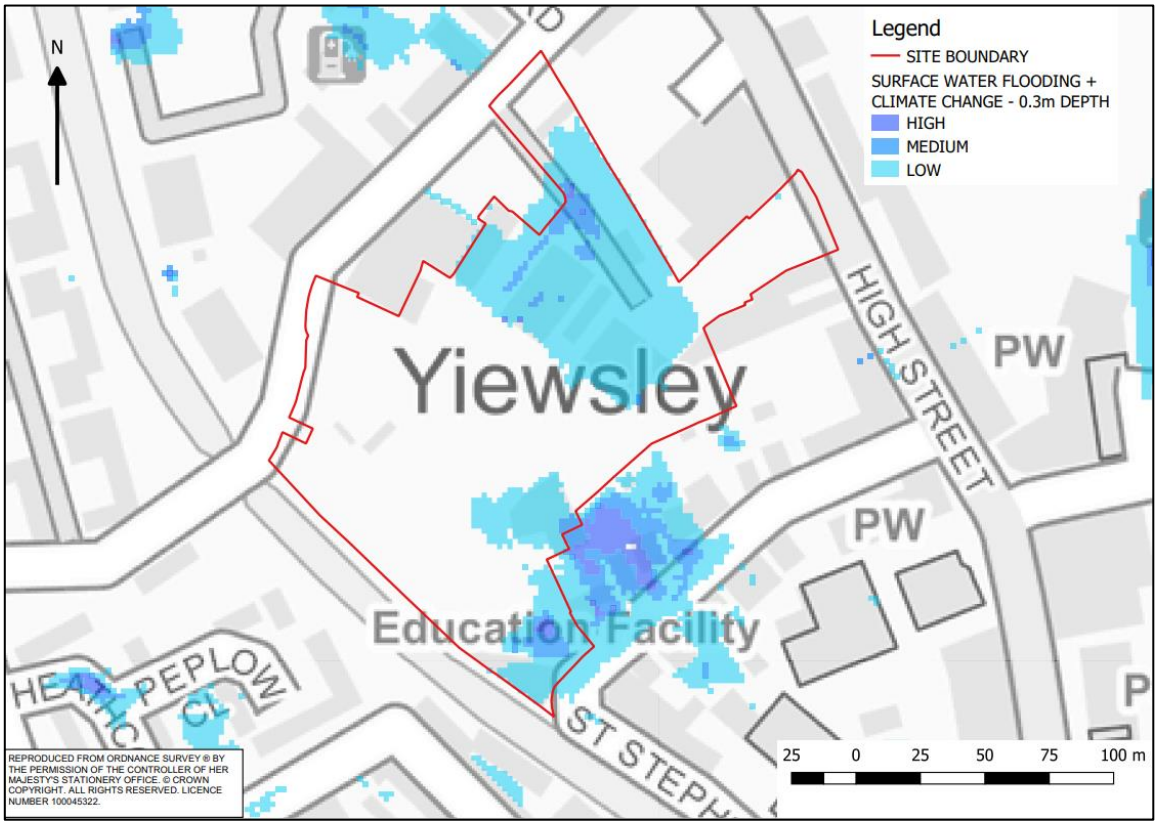
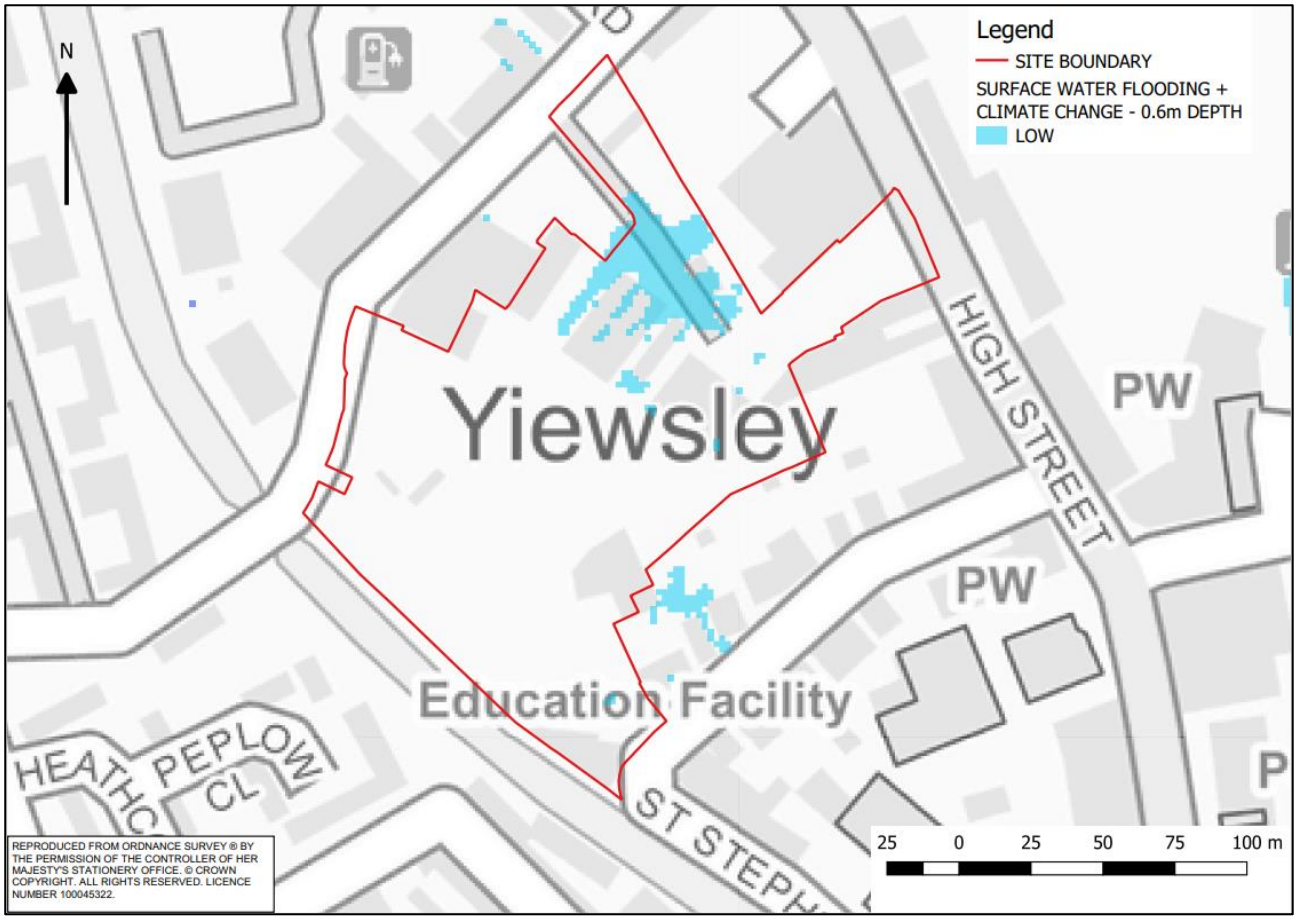
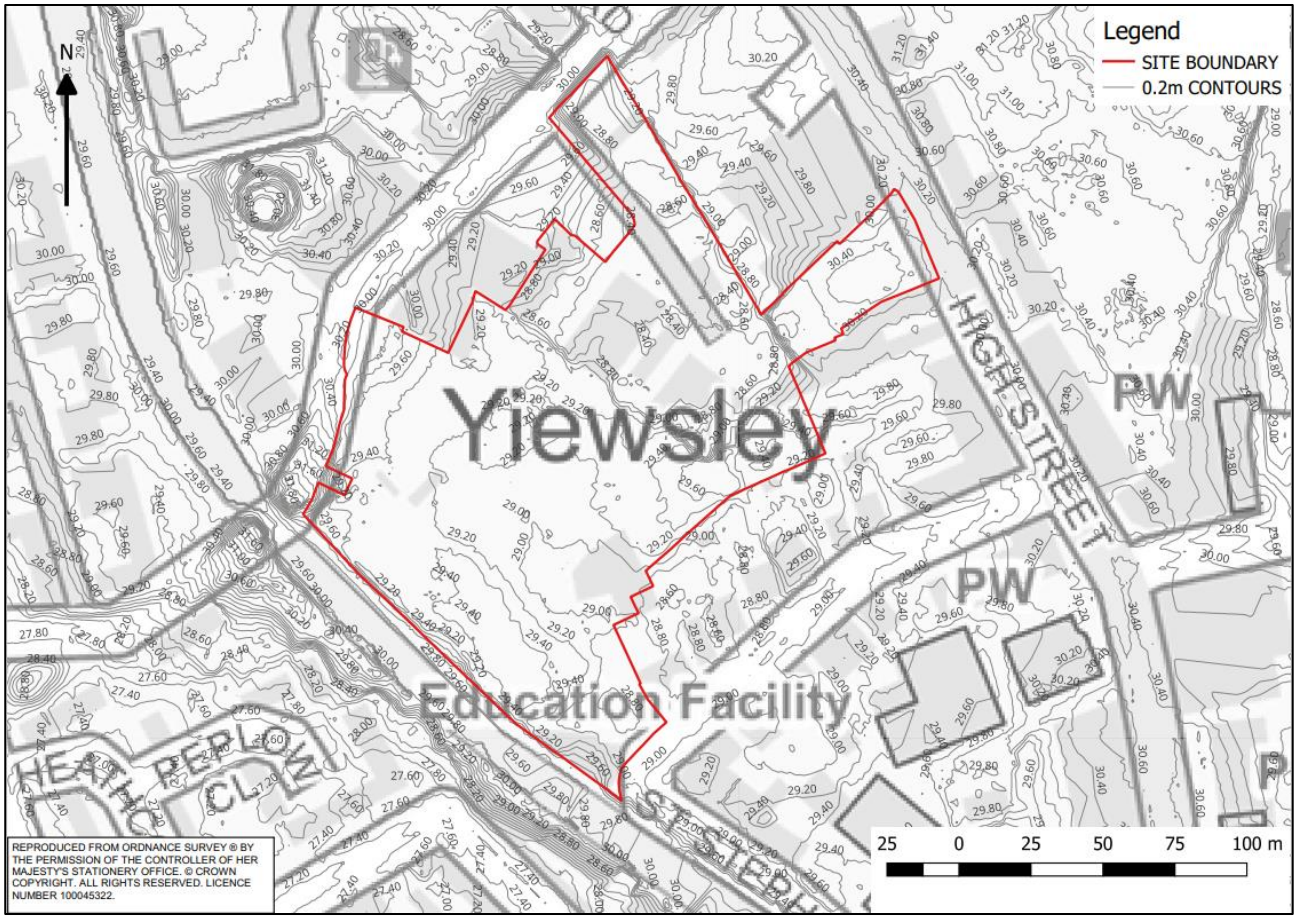


Figure 5.4: Risk of Flooding from Surface Water Including Climate Change – 0.6m depth



5.2.4 In addition to the generally low depth of surface water, the levels on and around the site are presented in **Figure 5.5**.

Figure 5.5: Site Boundary on LiDAR Data for the Site and Surrounding Areas



5.2.5 The levels show that the surface water flows mostly originate on the site, and flow to areas off the site, for example, the neighbouring buildings to the south east. Implementation of an effective drainage strategy the development would remove the risk of flooding from surface water on the site and therefore reduce surface water flood risk in the neighbouring areas.

5.2.6 There is a small area to the north of the site where the levels are shown to fall towards the site from Trout Road and the surface water extents extend outside the site boundary indicating a possible flow path onto the site. However, in 2019 a new building was constructed in that space which blocks that route, and the google maps image shown in **Figure 5.6** shows that levels around the building rise from Trout Road towards the site, rather than falling as the LiDAR shows.

Figure 5.6: Site Boundary on LiDAR Data for the Site and Surrounding Areas

5.2.7 Further along Trout Road there is a possible thin conduit (behind the tall wooden fence shown in **Figure 5.6**) where the levels cannot currently be confirmed, however due to a kerb and the neighbouring building which is topographically lower than the road and conduit, the water would flow towards the building rather than the site. As a result, it is considered that there isn't a risk of overland flows from Trout Road entering the site.

5.2.8 Owing to this, implementation of an effective drainage strategy should remove risk of flooding from surface water from the site, and reduce the surface water flood risk in neighbouring areas and provide overall betterment.

5.3 Groundwater Flooding

5.3.1 Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata. A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land. Periods of prolonged rainfall may also be a cause of groundwater flooding, with aquifers and soils becoming saturated.

5.3.2 The West London Council (WLC) Strategic Flood Risk Assessment (SFRA) Susceptibility to Groundwater Flooding mapping shows the site is in an area with a susceptibility of between 50% and 75% to groundwater flooding. **The mapping is presented in Appendix F**.

5.3.3 A nearby BGS borehole record also indicated groundwater within five metres of the ground surface.

5.4 Sewer Flooding

5.4.1 Flooding can occur owing to the failure of existing foul or surface water drainage infrastructure. If flows within the drainage system exceed the designed capacity or foreign matter causes blockages, overflow to the surface can occur, leading to flooding.

5.4.2 The WLC SFRA Historical Sewer Flooding Incidents mapping shows the site is located in an area where no historical sewer flooding incidents have been recorded. The Historical Sewer Flooding Incidents mapping is presented in **Appendix F**.

5.5 Flooding from Artificial Sources

5.5.1 Failure and overtopping of reservoirs and navigable water bodies, and failure of water mains, constitute the primary means of flooding from artificial sources.

5.5.2 The EA Flood Risk from Reservoirs mapping indicates the site is not located within the maximum extent of flooding from reservoirs. The EA Flood Risk from Reservoirs mapping is presented in **Appendix F.**

5.5.3 The site is bounded by the Grand Union Canal on the south-west side. The water levels in the canal are around the same level as the site. The site would only be impacted by the canal if there was a breach in the wall of the canal towards the site. There is a minimum of 4m land mass between the canal and the boundary of the site, therefore the risk to the site from the canal is considered very low.

6.0 THE SEQUENTIAL AND EXCEPTION TEST

6.1 The Sequential Test

6.1.1 The EA's flood zones are the starting point for the Sequential approach promoted by the NPPF, and are shown on the EA flood mapping. The PPG identifies that the overall aim of the Sequential Test is to steer new developments to with low flood risk.

6.1.2 As stated by the NPPF, development should not be allocated or permitted if there are reasonably available sites appropriate for the Proposed Development in areas with lower probability of flooding. The SFRA provides the basis for applying this test.

6.1.3 Following application of the Sequential Test, if it is not possible for the development to be located in areas with lower probability of flooding, proposed sites should take into account the flood risk vulnerability of land uses (Table 2, PPG) and apply the Exception Test if required (Table 3, PPG).

6.1.4 The whole site is located in Flood Zone 1, surface water and groundwater risk would be mitigated through an effective drainage strategy, risk of flooding from sewers and artificial sources is considered to be low. The site is allocated in the Local Plan, and therefore the Sequential Test is considered passed.

6.2 The Exception Test

6.2.1 For the Exception Test to be passed, it should be demonstrated that:

- the development would provide wider sustainability benefits to the community that outweigh the flood risk; 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.

6.2.2 The whole site is located in Flood Zone 1, surface water and groundwater risk would be mitigated through an effective drainage strategy, risk of flooding from sewers and artificial sources is considered to be low and therefore the exception test is not required.

7.0 SURFACE WATER DRAINAGE STRATEGY

7.1 Surface Water Drainage Strategy Requirements

7.1.1 The Department for Environment, Food & Rural Affairs (DEFRA) National Standards for Sustainable Drainage Systems (SuDS) was published on 19th June 2025. The standards updated the drainage hierarchy and state, *"Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:*

- *Priority 1: collected for non-potable use*
- *Priority 2: infiltrated to the ground*
- *Priority 3: discharge to an above ground surface water body*
- *Priority 4: discharged to a surface water sewer, or another piped surface water drainage system*
- *Priority 5: discharge to a combined sewer"*

7.1.2 The standards also provide detailed standards to which SuDS should be designed for all types and scales of developments.

7.2 Proposed Surface Water Drainage Strategy

7.2.1 The indicative surface water drainage strategy described below is outlined in **Drawing 24-101-001C.**

7.2.2 As set out in **Section 4.3**, the drainage hierarchy states the first priority is collection of rainwater for non-potable use. It is proposed that green roofs would be installed on many of the buildings, and planted swales and a planted wet play area would reuse surface water that falls on the site. However, water reuse would not manage all of the surface water generated on site, therefore a hybrid solution would be required.

7.2.3 The second priority for surface water discharge is "*infiltration into the ground*". The site is underlain by London Clay which is known for its poor infiltration capabilities. The site is also impacted by high groundwater. Owing to this it is deemed that infiltration would not be viable on this site.

7.2.4 The third priority for surface water discharge is "*to a water body*", however there are no waterbodies on the site or within the vicinity of the site that would permit a gravity connection, this includes the Grand Union Canal. A pumping station would be required to discharge to the canal due to the levels of the site and proposed attenuation and the shallow nature of the canal. Pumping stations are understood to be highly unfavourable.

7.2.5 The fourth priority for surface water discharge is "*to a surface water sewer*". It is proposed that surface water would be attenuated using green roofs, swales, wet play areas, permeable paving and attenuation tanks, before being discharged to the Thames Water public surface water sewer at manhole 8405.

7.2.6 The surface water discharge rate would be restricted to Qbar using a vortex control device. As the site is brownfield, the restricted rate provides significant betterment over the existing arrangement.

7.2.7 The proposed discharge rates, existing discharge rates and percentage betterment are provided in **Table 7.1**.

Table 7.1: Percentage Betterment

Return Period	Proposed Discharge Rate (l/s)	Estimated Existing Discharge Rates from Site (l/s)	Percentage Betterment Provided (%)
Q1	2.9	136.1	97.9
Q2	2.9	158.8	98.2
Q30	2.9	358.0	99.2
Q100	2.9	462.9	99.4

7.2.8 The attenuation would accommodate a 1 in 100 year storm plus 40% to account for climate change in line with the latest guidance. The attenuation would be lined to prevent groundwater ingress into the system and buoyancy calculations would be undertaken to inform design of the tanks. As the proposals are for apartments which are unlikely to expand in impermeable area, urban creep has not been included. Supporting Causeway Flow calculations are included in **Appendix E**.

7.2.9 Exceedance flows have been considered. It is expected that flows would be managed within the roads, and the proposed site levels would ensure that any exceedance flows would be diverted around the new buildings.

7.3 Water Quality

7.3.1 The "*pollution hazard indices for different land use classifications*" table has been extracted from CIRIA C753 The SuDS Manual, and applied to the development proposals, as shown in **Table 6.2**.

Table 7.2: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. less than 300 traffic movements per day	Low	0.5	0.4	0.4

7.3.2 Permeable pavement would provide treatment for the surface water runoff from the site that it attenuates. A proprietary treatment system would treat the remainder of the surface water that doesn't attenuate in the permeable paving. The SuDS mitigation indices for the permeable paving and proprietary treatment system have been calculated in **Table 6.3**, in accordance with the guidance contained in The SuDS Manual.

Table 6.3: SuDS Mitigation Indices

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7
Proprietary Treatment System – Up-Flo™ Filter	0.8	0.69	0.4

7.3.3 **Table 6.3** demonstrates both the permeable paving and proprietary treatment system would provide a sufficient level of surface water runoff treatment prior to discharging to the surface water sewer.

7.4 SuDS Maintenance Requirements

7.4.1 Maintenance of the drainage system and SuDS features would be carried out in accordance with the manufacturer guidance and through an approved maintenance management plan to minimise the residual flood risk of drainage system blockage.

7.4.2 Maintenance would be the responsibility of the developer to assign, however the "*operation and maintenance requirements for pervious paving*", "*operation and maintenance requirements for attenuation storage tank*", "*operation and maintenance requirements for green roof*", "*operation and maintenance requirements for swales*" and "*operation and maintenance requirements for proprietary*

treatment systems" tables have been extracted from The SuDS Manual and are presented in **Appendix G**.

8.0 FOUL DRAINAGE STRATEGY

8.1 General

8.1.1 Peak design discharges for residential dwellings would be calculated based on the Sewerage Sector Guidance:

Residential domestic flow = 4,000 litres/dwelling/day (peak)

8.1.2 It is proposed the new foul flows would be conveyed by gravity and connect into the Thames Water public foul sewer network that crosses the site. The foul drainage strategy is presented in **Drawing 24-101-001C**. The connection is subject to application with Thames Water.

8.1.3 The development is also subject to a foul sewer diversion through the site. The diversion is also subject to application with Thames Water.

8.1.4 A Pre-Application Enquiry has been undertaken with Thames Water for the foul flows; the correspondence shows that there is currently sufficient capacity within the foul sewer to take the foul flows from the site. The correspondence is presented in **Appendix H**.

9.0 SUMMARY AND CONCLUSIONS

9.1 General

9.1.1 Odyssey has been commissioned by Troutbourne LLP to undertake a flood risk assessment (FRA), incorporating a surface water and foul drainage strategy, to be submitted in association with a planning application for a development at Rainbow and Kirby Industrial Estates, Trout Road, Yiewsley, UB7 7XT.

9.1.2 The EA Flood Map for Planning shows the Site is entirely located within Flood Zone 1; land assessed as having less than a 1 in 1,000 annual probability of river or sea flooding (<0.1% AEP). The flood risk vulnerability classification of residential units is 'more vulnerable' and the flood risk vulnerability classification of commercial development is 'less vulnerable' and therefore all of the Proposed Development is deemed to be appropriate for this Site in accordance with the PPG.

9.1.3 The EA Risk of Flooding from Surface Water (RoFSW) including climate change mapping shows very low, low, medium and high risk of surface water flooding on the site. EA mapping shows that though the extents cover a lot of the site, most of it corresponds to a low depth of surface water, most of the medium and high flood risk is only 0.2-0.3m in depth, with no medium or high risk at a depth of 0.6m. The existing site is known to be largely impermeable which contributes to the surface water flood risk.

9.1.4 The levels on the site and the surrounding areas show that the surface water flows originate on the site, and flow to areas off the site, for example, the neighbouring buildings to the south east. There is a small area to the north of the site where the levels are shown to fall towards the site from Trout Road and the surface water extents extend outside the site boundary indicating a possible flow path onto the site. However, in 2019 a new building was constructed in that space which blocks that route, and the levels around the building rise from Trout Road towards the site, rather than falling as the LiDAR shows. Further along Trout Road there is a possible thin conduit however due to a kerb and the neighbouring building which is topographically lower than the road and conduit, the water would flow to towards the building rather than the site. As a result, it is considered that there isn't a risk of overland flows from Trout Road entering the site.

9.1.5 Owing to this, implementation of an effective drainage strategy should remove risk of flooding from surface water from the site, and reduce the surface water flood risk in neighbouring areas.

9.1.6 Susceptibility to Groundwater Flooding mapping shows the Site is in an area with a susceptibility of between 50% and 75% to groundwater flooding and a nearby BGS borehole record also indicated groundwater within five metres of the ground surface. Historical Sewer Flooding Incidents mapping shows the Site is located in an area where no historical sewer flooding incidents have been recorded. EA Flood Risk from Reservoirs mapping indicates the Site is not located within the maximum extent of flooding from reservoirs.

9.1.7 It is proposed that surface water would be attenuated using green roofs, swales, wet play areas, permeable paving and attenuation tanks, before being discharged to the Thames Water public surface water sewer at manhole 8405. The surface water discharge rate would be restricted to Qbar using a vortex control device. As the Site is brownfield, the restricted rate provides significant betterment over the existing arrangement. The attenuation would accommodate a 1 in 100 year storm plus 40% to account for climate change in line with the latest guidance. The attenuation would be lined to prevent groundwater ingress into the system and buoyancy calculations would be undertaken to inform design of the tanks. As the proposals are for apartments which are unlikely to expand in impermeable area, urban creep has not been included.

9.1.8 It is proposed the new foul flows would be conveyed by gravity and connect into the Thames Water public foul sewer network that crosses the Site. The connection is subject to application with Thames Water. The development is also subject to a foul sewer diversion through the Site. The diversion is also subject to application with Thames Water.

9.1.9 This FRA demonstrates the Proposed Development could be drained in a sustainable manner, commensurate with local and national policy.

DRAWINGS

N

TROUT ROAD

Aldi

HIGH STREET

Grand Union Canal

PP1
PLAN AREA 1600m²
0.9m EFFECTIVE DEPTH
POROSITY 0.3
C.L. 29.32
I.L. 28.12

SWALE 1
PLAN AREA = 165m²
EFFECTIVE DEPTH 300mm

PP2
PLAN AREA 695m²
0.8m EFFECTIVE DEPTH
POROSITY 0.3
C.L. 28.62
I.L. 27.52

DISCHARGE RATE
RESTRICTED TO 1.0l/s USING
VORTEX CONTROL DEVICE

SWALE 2
PLAN AREA = 267m²
EFFECTIVE DEPTH 300mm

PROPOSED DIVERSION OF
PUBLIC FOUL SEWER ENDING
AT EXISTING MANHOLE 9404.
C.L 30.23
I.L. 26.37

DISCHARGE RATE
RESTRICTED TO 7l/s USING
VORTEX CONTROL DEVICE

TANK 1
PLAN AREA 836m²
1m EFFECTIVE DEPTH
C.L. 29.29
I.L. 27.31

TANK 2
PLAN AREA 56m²
1.2m EFFECTIVE DEPTH
C.L. 29.22
I.L. 27.20

PP3
PLAN AREA 769m²
0.9m EFFECTIVE DEPTH
POROSITY 0.3
C.L. 28.93
I.L. 27.73

CL 29.06
IL 27.37

CL 29.03
IL 26.27

WATER STORAGE AREA
PLAN AREA = 184m²
EFFECTIVE DEPTH 300mm

DISCHARGE RATE
RESTRICTED TO 1l/s USING
VORTEX CONTROL DEVICE

TANK 3
PLAN AREA 308m²
1.2m EFFECTIVE DEPTH
C.L. 29.46
I.L. 27.06

CL 28.83
IL 26.39

CL 28.83
IL 26.43

DISCHARGE RATE
RESTRICTED TO 2.9l/s USING
VORTEX CONTROL DEVICE

PROPOSED CONNECTION
TO PUBLIC SURFACE WATER
SEWER MH 8405
APPROX. C.L 29.32
CALCULATED I.L. 26.98

EXISTING SURFACE WATER
SEWER MH 8405, DOWNSTREAM
OF SEWER UNDER CANAL
C.L 30.06
I.L. 26.92

PROPOSED DIVERSION OF
PUBLIC SURFACE WATER SEWER
STARTING AT EXISTING MANHOLE 9402.
C.L 30.80
I.L. 29.54

CL 28.87
IL 26.05

CL 28.93
IL 26.85

PROPOSED DIVERSION OF
PUBLIC FOUL SEWER STARTING
NEAR EXISTING MANHOLE 9404.
APPROX. C.L 28.93
INTERPOLATED I.L. 26.83

PRIORY CLOSE

P:\24-101 - Rainbow & Kirby Industrial Estate\Tech\Acad\Drawings\24-101-001 Drainage Strategy.dwg

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS ISSUED BY THE ARCHITECT.
3. TOPOGRAPHICAL SURVEY WAS COMPLETED BY ATUM SURVEY SERVICES LTD. DRAWING REF. DAT / 9.0 REV B. DATED FEBRUARY 2019.
4. SITE LAYOUT HAS BEEN PROVIDED BY PATEL TAYLOR. DRAWING REF. 458-PTA-ZZ-11-DR-A-1100-P16 DATED 04/07/2025 AND 458-PTA-ZZ-11-DR-A-1111-P08 DATED 04/07/2025.
5. PROPOSED SuDS FEATURES ARE INDICATIVE ONLY AND SUBJECT TO EVOLVE IN LINE WITH THE DESIGN DEVELOPMENT.
6. DRAINAGE STRATEGY AND PROPOSED DIVERSIONS SUBJECT TO CONFIRMATION OF SURFACE WATER AND FOUL OUTFALLS AND THEREFORE INDICATIVE ONLY AND SUBJECT TO CHANGE.

LEGEND:

- SITE BOUNDARY
- EXISTING SURFACE WATER SEWER
- EXISTING FOUL WATER SEWER
- EXISTING SURFACE WATER RISING MAIN
- DECOMMISSIONED SEWER
- EXISTING PUBLIC FOUL SEWER TO BE DIVERTED
- PROPOSED PERMEABLE PAVING
- PROPOSED SURFACE WATER SEWER
- VORTEX CONTROL DEVICE
- PROPOSED FOUL SEWER
- ROOT PROTECTION ZONES
- PROPRIETARY TREATMENT DEVICE
- PROPOSED CELLULAR STORAGE TANK
- FW FW FW INDICATIVE FOUL SEWER DIVERSION
- SW INDICATIVE SURFACE WATER SEWER DIVERSION
- SUNKEN NATURAL PLAY WATER STORAGE AREA
- SWALE
- GREEN ROOF AREAS
- ORIFICE PLATE WITHIN MANHOLE WITH SCREEN

Rev	Amendments	Drn	Chk	App	Date
C	UPDATED FOR COMMENTS	JW	GG	GG	05.09.25
B	UPDATED FOR SITE LAYOUT	JW	-	-	01.08.25
A	UPDATED SITE LAYOUT AND DRAINAGE STRATEGY	HM	JW	GG	13.06.25

ODYSSEY
Tuscany House
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E: info@odysseyconsult.co.uk
W: www.odysseyconsult.co.uk

Job Title
RAINBOW & KIRBY INDUSTRIAL ESTATE

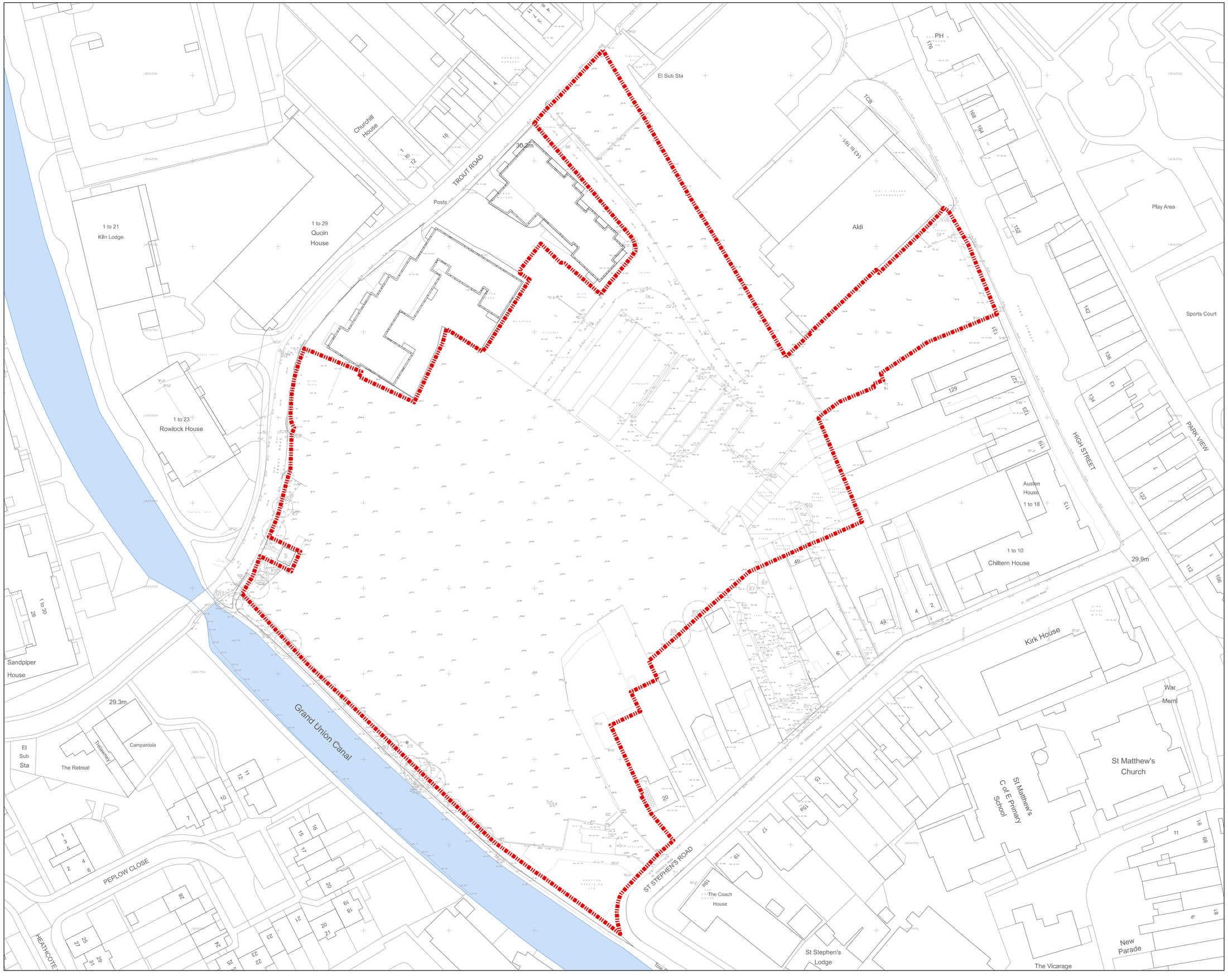
Drawing Title
DRAINAGE STRATEGY

Client
DP9 LTD

Scale	Date	Designed
1:500 @A1	MAR 25	CN
Drawn	Checked	Approved
CN	JW	GG
Job No	Drawing No	Rev
24-101	24-101-001	C

APPENDIX A

Site Location Plan and Proposed Site Layout



General Notes

DO NOT SCALE. All dimensions must be checked on site, errors are to be reported.

Contractors must ensure that cross referenced drawings and specifications noted on these drawings are checked on a regular basis to ensure that the latest revisions are used.

Key

Site Boundary

N

Scale 1:500 @ A1

0 5m 10m 20m 30m 40m

Issue Record		By	Chk	Date
P03	For Information	SR	SR	22.01.2025
P02	For Information	SR	SR	20.01.2025
P01	For Information	SR	SR	01.07.2024

Title
Existing site plan

Project
Trout Road

Scale
1:500 @ A1 1:1000 @ A3

Status
S2 - Suitable for Information

Drawing Number **Revision**
458-PTA-MP-00-DR-A-101 **P03**

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Patel Taylor

General Notes

DO NOT SCALE. All dimensions must be checked on site, errors are to be reported.

Contractors must ensure that cross referenced drawings and specifications noted on these drawings are checked on a regular basis to ensure that the latest revisions are used.

Key

Site Boundary

Private	Shared Ownership	Affordable Rent
Studio	Studio	Studio
1B2P	1B2P	1B2P
2B3P	2B3P	2B3P
2B4P	2B4P	2B4P
3B4P	3B4P	3B4P
3B5P	3B5P	3B5P
3B6P	4B5P	3B6P

- Lobby/circulation
- Commercial
- Workspace/makerspace
- Cycle storage
- Refuse
- Plant
- Security room

Scale 1:500 @ A1

0 5m 10m 20m 30m 40m

Issue Record	By	Chk	Date
P16 For Information	AS	SR	04.07.2025
P15 For Information	KN	SR	27.06.2025
P14 For Information	KN	SR	13.06.2025
P13 For Information	KN	SR	11.06.2025
P12 For Information	KN	SR	09.06.2025
P11 For Information	KN	SR	06.06.2025
P10 For Information	AS	SR	20.05.2025
P09 For Information	AS	SR	28.04.2025
P08 For Information	AS	SR	14.04.2025
P07 For Information	AS	SR	25.03.2025
P06 For Information	AS	SR	24.03.2025
P05 For Information	KN	SR	19.03.2025

Title
General arrangement plan
Level 00

Project
Trout Road

Scale
1:500 @ A1 1:1000 @ A3

Status
S2-Suitable for information

Drawing Number **Revision**
458-PTA-ZZ-00-DR-A-1100 **P16**

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General Notes

DO NOT SCALE. All dimensions must be checked on site, errors are to be reported.

Contractors must ensure that cross referenced drawings and specifications noted on these drawings are checked on a regular basis to ensure that the latest revisions are used.

Key

Site Boundary

Biodiverse roof
Area: 2496.4 m2

Biosolar roof
Area: 1949.3 m2

Scale 1:500 @ A1

0 5m 10m 20m 30m 40m

Issue Record		By	Chk	Date
P08	For information	AS	SR	04.07.2025
P07	For information	AS	SR	27.06.2025
P06	For information	AS	TS	16.06.2025
P05	For information	AS	SR	13.06.2025
P04	For information	AS	SR	25.03.2025
P03	For information	AS	SR	24.03.2025
P02	For information	AS	SR	19.03.2025
P01	For information	AS	SR	18.03.2025

Title
General arrangement plan
Roof plan

Project
Trout Road

Scale
1:500 @ A1 1:1000 @ A3

Status
S2-Suitable for information

Drawing Number
458-PTA-ZZ-11-DR-A-1111

Revision
P08

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APPENDIX B

Topographical Survey

ABBREVIATIONS

ABH	Arched Beam Height	KO	Kerb Outlet
B	Brick	L	Light
BAL	Balcony	LP	Lamp Post
BB	Belisha Beacon	MH	Manhole
BD	Bollard	MKR	Marker
BH	Beam Height	MSF	Metal Security Fence
BL	Bed Level	N/A	No Access
BP	Brick Pier	OHC	Overhead Cables
BRW	Brick Retaining Wall	P	Post
BS	Bus Stop	PALF	Palisade Fence
BT	British Telecom	PF	Picket Fence
BW	Brick Wall	PIT	Trial Pit
BWF	Barbed Wire Fence	PL	Pavement Light
C	Concrete	PM	Parking Meter
CAB	Cabinet	PRF	Post & Rail Fence
CBF	Close Boarded Fence	PWF	Post & Wire Fence
CBW	Concrete Block Wall	R	Render
CIF	Corrugated Iron Fence	RAD	Radiator
CL	Cover Level	RE	Rodding Eye
CLF	Chain Link Fence	RH	Ridge Height
COL	Column	RS	Road Sign
CPF	Concrete Panel Fence	RWP	Rain Water Pipe
CPS	Concrete Paving Slabs	S	Stone
CRW	Concrete Retaining Wall	SV	Stop Valve
CSU	Ceiling Slopes Up	SL	Skylight
CTV	Cable Television	SP	Soil Pipe
CW	Concrete Wall	SPS	Stone Paving Slabs
CZY	Crazy Paving	SRW	Stone Retaining Wall
D	Door	SW	Stone Wall
DH	Door Height	SWS	Surface Water Sewer
EC	Electricity Cover	TJ	Top of Joist
ESG	Electrical Switch Gear	T	TILE
EH	Eave Height	TB	Telephone Box
EP	Electricity Pole	TRW	Timber Retaining Wall
FB	Flower Bed	UJ	Underside of Joist
FC	False Ceiling	UR	Underside of Ridge Board
F/E	Fire Escape	UWP	Underside of Wall Plate
FH	Fire Hydrant	V	Vent
FL	Floor Level	VP	Vent Pipe
GY	Gully	W	Window
GV	Gas Valve	WL	Water Level
HA	Hatch	WM	Water Meter
IC	Inspection Cover	WMF	Wire Mesh Fence
IL	Invert Level	WPF	Wooden Panel Fence
IRF	Iron Railing Fence	WCL	Window Cill Height
IWF	Interwoven Fence	WHL	Window Head Height
		WRW	Wooden Retaining Wall

Top
Banks
Bottom
Fences
Change in Surface
Edge of Vegetation
OS Data

3.28 Floor to Ceiling Height
Gate
Survey Station
+10.60 Floor Level
Tree

NOTES

1. ALL LEVELS SHOWN ARE RELATED TO ORDNANCE SURVEY GPS DATUM.
2. ALL INFORMATION SHOWN IN GREYSCALE HAS BEEN PRODUCED BY OTHERS.
3. ALTHOUGH CARE HAS BEEN TAKEN, DUE TO ACCESS LIMITATIONS ALL HIGH LEVEL DETAIL HAS BEEN SURVEYED REMOTELY AND NOT CHECKED BY PHYSICAL MEASUREMENTS.
4. ALL CRITICAL MEASUREMENTS MUST BE CHECKED / VERIFIED.

REVISIONS		DATE
B.	LEVELS ALTERED TO RELATE TO ORDNANCE SURVEY GPS DATUM.	26 / 05 / 21
A.	LEVEL SURVEY EXTENDED TO INCLUDE THE LAND ADJACENT TO HIGH STREET.	29 / 03 / 19

INDICATIVE ONLY

SCALE: 1:500@A1
DATE: FEBRUARY 2019
DRAWN: SDC / GHT
JOB No:

TITLE: LEVEL SURVEY

JOB: TROUT ROAD, WEST DRAYTON.

CLIENT: C&G PROPERTIES PLC

DWG. No: DAT / 9.0

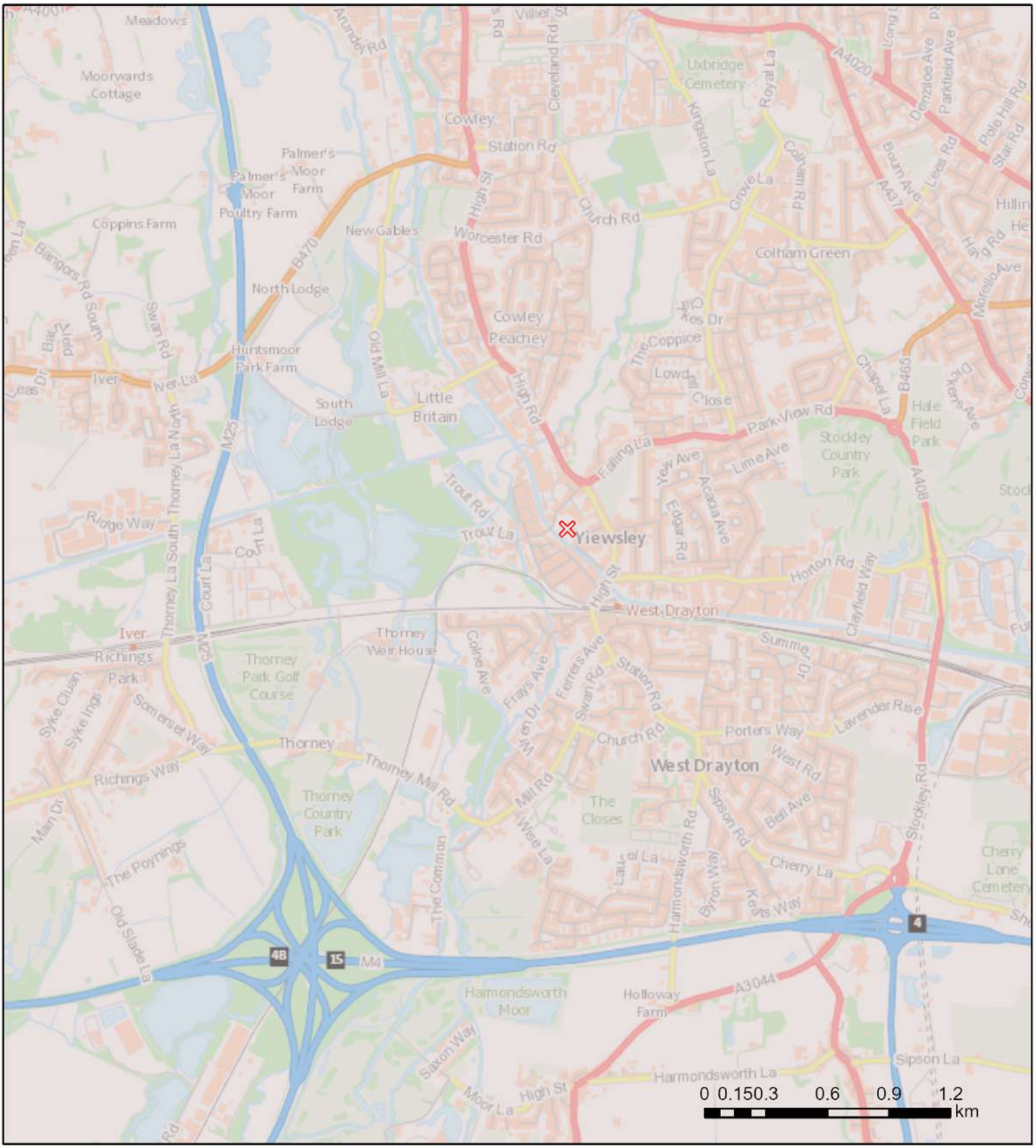
DATUM SURVEY SERVICES LTD.
BRICKFIELD HOUSE
HIGH ROAD
THORNWOOD
EPPING
ESSEX
CM16 6TH
T: 01992 566698
M: 07977 112286
M: 07977 111935
THE SURVEY ASSOCIATION FULL MEMBER
smas worksafe contractor www.smasltd.com
as recognised by SSIP SAFETY SCHEMES IN PROCUREMENT

APPENDIX C

British Geological Survey Mapping

Bedrock Geology

British Geological Survey

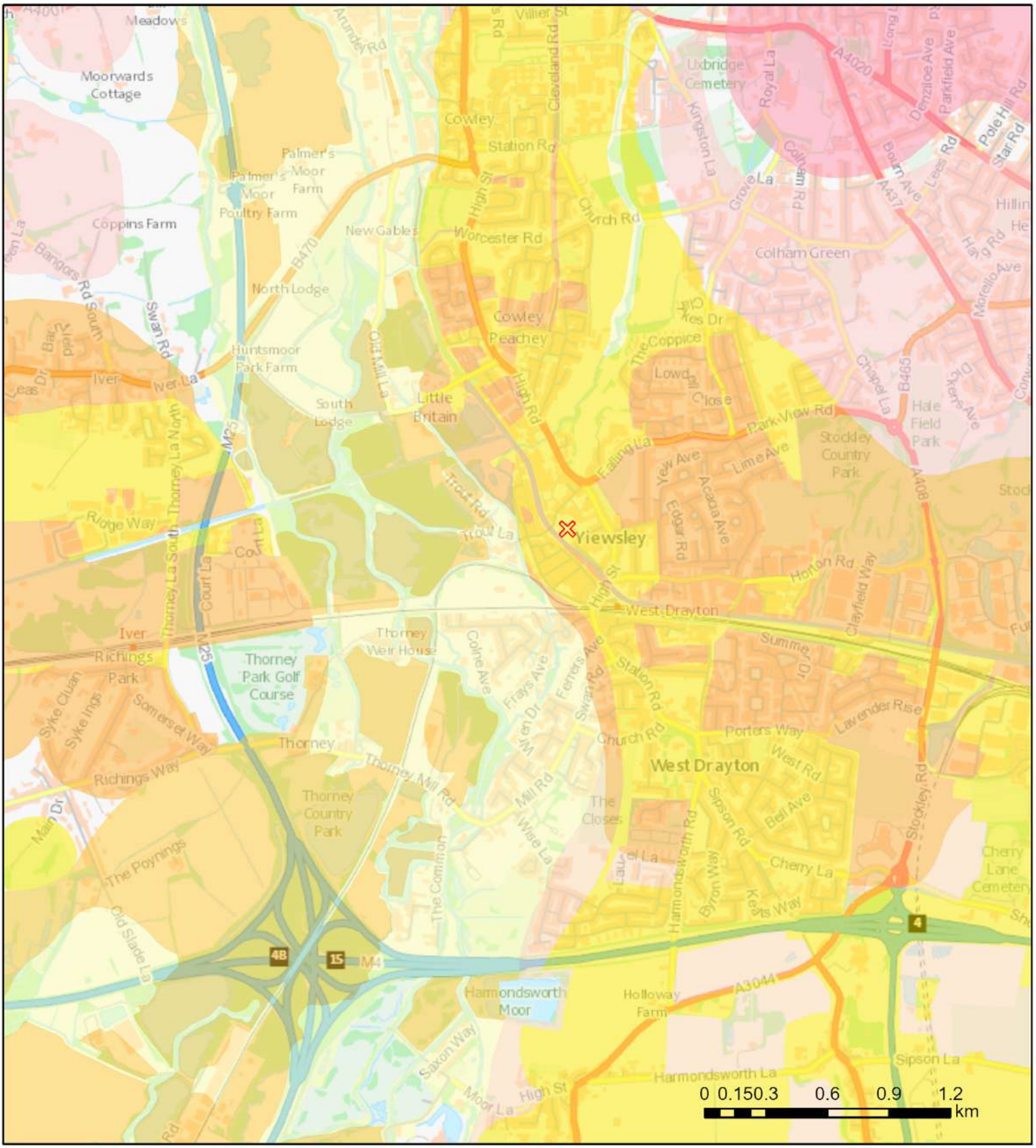


Map Key

Bedrock geology 1:50,000 scale

- LONDON CLAY FORMATION - CLAY AND SILT
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- LAMBETH GROUP - CLAY, SILT AND SAND

Superficial Deposits



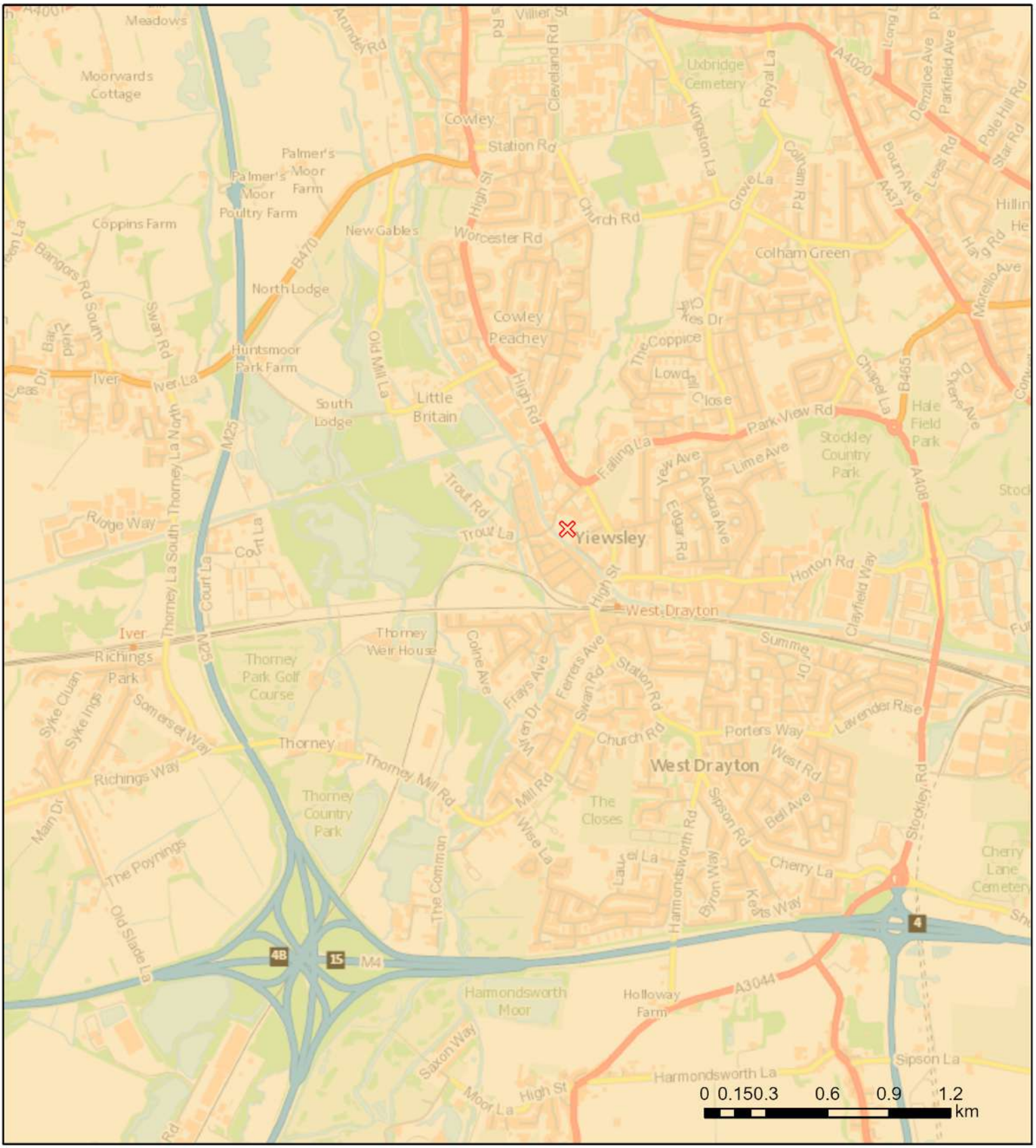
Map Key

Superficial deposits 1:50,000 scale

- BOYN HILL GRAVEL MEMBER - SAND AND GRAVEL
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- TAPLOW GRAVEL MEMBER - SAND AND GRAVEL
- BLACK PARK GRAVEL MEMBER - SAND AND GRAVEL
- HEAD - CLAY AND SILT
- HEAD - CLAY, SILT, SAND AND GRAVEL
- SHEPPERTON GRAVEL MEMBER - SAND AND GRAVEL
- LYNCH HILL GRAVEL MEMBER - SAND AND GRAVEL
- LANGLEY SILT MEMBER - CLAY AND SILT
- SUPERFICIAL THEME NOT MAPPED [FOR DIGITAL MAP USE ONLY] - WATER, TYPE UNSPECIFIED

Hydrogeology

British Geological Survey



Map Key

Hydrogeology 1:625,000 scale

Aquifers with significant intergranular flow

Highly productive aquifer

Moderately productive aquifer

Low productivity aquifer

Aquifers in which flow is virtually all through fractures and other discontinuities

Highly productive aquifer

Moderately productive aquifer

Low productivity aquifer

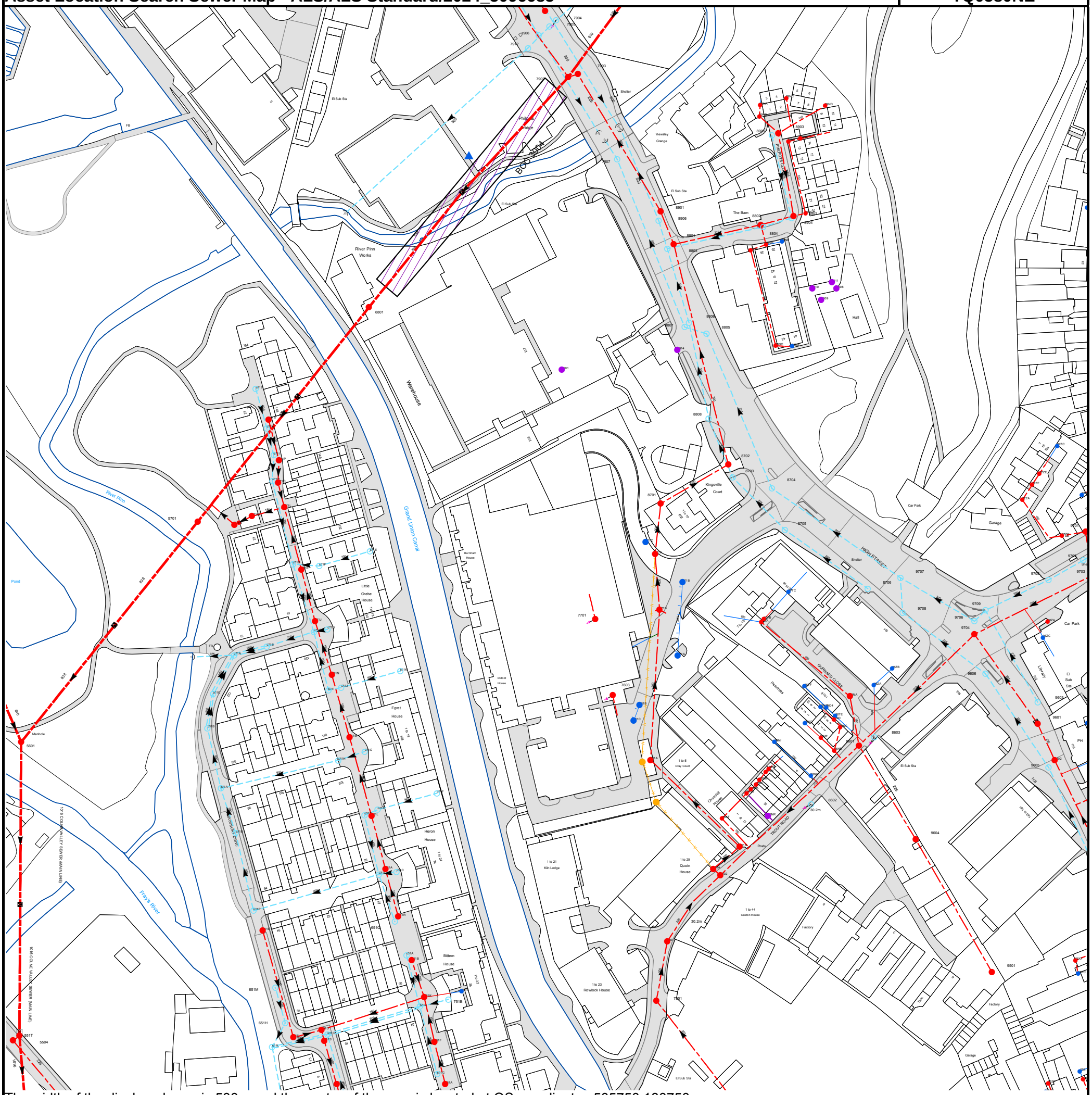
Rocks with essentially no groundwater

APPENDIX D

Thames Water Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2024_5096685

TQ0580NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 505750,180750

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Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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
94ZC	n/a	n/a
95ZF	n/a	n/a
95ZI	n/a	n/a
95ZI	n/a	n/a
95ZC	n/a	n/a
9501	n/a	n/a
95XF	n/a	n/a
05ZE	n/a	n/a
96ZC	n/a	n/a
9704	31	29.02
96ZA	n/a	n/a
9706	31.12	28.84
9708	30.85	28.69
9709	31	28.83
8706	30.95	28.89
9705	31.07	29.02
9707	30.75	28.55
9703	31.12	29.29
9702	31.44	28.99
97ZD	n/a	n/a
9701	31.4	29.31
97ZA	n/a	n/a
97BD	n/a	n/a
97ZF	n/a	n/a
97ZE	n/a	n/a
6801	27.98	23.35
7912	n/a	n/a
7906	28.26	27.29
7901	28.47	n/a
7905	27.93	26.3
7904	28.5	27.07
6901	n/a	n/a
7902	28.03	23.6
7903	n/a	n/a
7907	n/a	n/a
8906	29.28	27.93
8901	29.6	25.4
8803	0	n/a
8801	n/a	n/a
7914	n/a	n/a
8807	29.99	27.56
8806	29.88	28.41
8805	29.76	27.62
8808	30.65	28.45
88NA	n/a	n/a
89NB	n/a	n/a
89NA	n/a	n/a
8802	30.01	28.1
8804	29.94	28.55
88ND	n/a	n/a
8905	29.99	29
88NC	n/a	n/a
8903	29.98	28.55
88NE	n/a	n/a
89NC	n/a	n/a
89NF	n/a	n/a
8904	29.9	28.73
88NB	n/a	n/a
8902	29.91	28.23
89NE	n/a	n/a
89NG	n/a	n/a
7910	n/a	n/a
7909	n/a	n/a
89ND	n/a	n/a
7911	n/a	n/a
7908	n/a	n/a
97ZC	n/a	n/a
991A	n/a	n/a
7701	29.01	27.75
7603	29	27.43
761C	29.25	27
761B	29.325	27
771C	29.4	27
761A	29.19	26.053
771A	29	25.87
771B	29.55	25.922
8701	28.78	25.82
871A	29.4	27
871B	29.42	27
8702	30.81	25.78
8703	30.87	28.61
86NK	n/a	n/a
86NL	n/a	n/a
86NM	n/a	n/a
87TA	n/a	n/a
87TB	n/a	n/a
86NN	n/a	n/a
86NP	n/a	n/a
8704	n/a	n/a
86NI	n/a	n/a
8705	30.9	28.64

Manhole Reference	Manhole Cover Level	Manhole Invert Level
87TC	n/a	n/a
86TF	n/a	n/a
86NG	n/a	n/a
86NH	n/a	n/a
96BF	n/a	n/a
9605	30.31	29.61
96BE	n/a	n/a
9602	30.73	n/a
86NB	n/a	n/a
8601	30.25	26.75
86MF	n/a	n/a
8603	30.15	29.08
86NC	n/a	n/a
9601	30.73	28.79
96BA	n/a	n/a
86ND	n/a	n/a
86TE	n/a	n/a
8604	n/a	n/a
86NE	n/a	n/a
9603	n/a	n/a
86NA	n/a	n/a
86ZA	n/a	n/a
9606	30.61	29.31
86ZB	n/a	n/a
661F	30.04	28.31
561A	28.84	26.61
661H	29.86	27.2
661G	29.99	28.39
5601	27.46	22.88
661M	29.96	27.54
561B	28.51	26.55
561C	28.64	26.5
661I	29.71	27.92
661J	29.81	27.98
661N	29.77	27.32
661K	29.8	28.09
671A	28.77	26.46
671B	29.29	26.72
671C	29.59	26.85
671D	29.74	28.1
671J	29.61	27.11
671K	29.76	26.75
671F	29.7	27.9
671G	29.66	27.32
671E	30.03	28.25
671N	28.22	25.12
5701	27.64	23.17
671M	29.34	26.36
671L	29.74	26.49
651N	27.98	26.1
651L	28.4	26.32
651S	28.26	26.25
5504	n/a	n/a
651I	28.37	26.88
551T	27.15	22.71
651C	28.37	26.42
651D	28.41	26.3
651H	28.41	27.05
651J	29.41	26.78
651K	29.55	27.26
651M	28.59	27.26
651B	29.71	28.11
651A	29.65	27.93
651E	28.98	27.39
651Q	29.78	28.14
651R	29.82	28.62
651P	29.06	26.96
651O	29.97	27.43
661C	30	28.37
661A	29.97	27.99
661B	28.69	26.68
661L	29.88	27.81
661D	29.9	28.14
661E	29.85	28.19
651F	29.36	27.45
651G	28.99	26.85
751A	29.03	27.6
751B	29.72	27.88
751C	n/a	n/a
7501	30.23	26.37
8501	30.13	26.27
861A	30.01	26.195
8502	30.1	26.21
86NT	n/a	n/a
861B	30.05	26.163
86NS	n/a	n/a
86NR	n/a	n/a
8602	30.29	29.59
9604	28.53	26.93
681B	30.13	27.83
681A	30.13	27.6
681C	30.18	27.64
671H	29.95	27.43

Manhole Reference	Manhole Cover Level	Manhole Invert Level
671I	29.98	27.5
671O	30.02	26.93
671P	30.01	27.19

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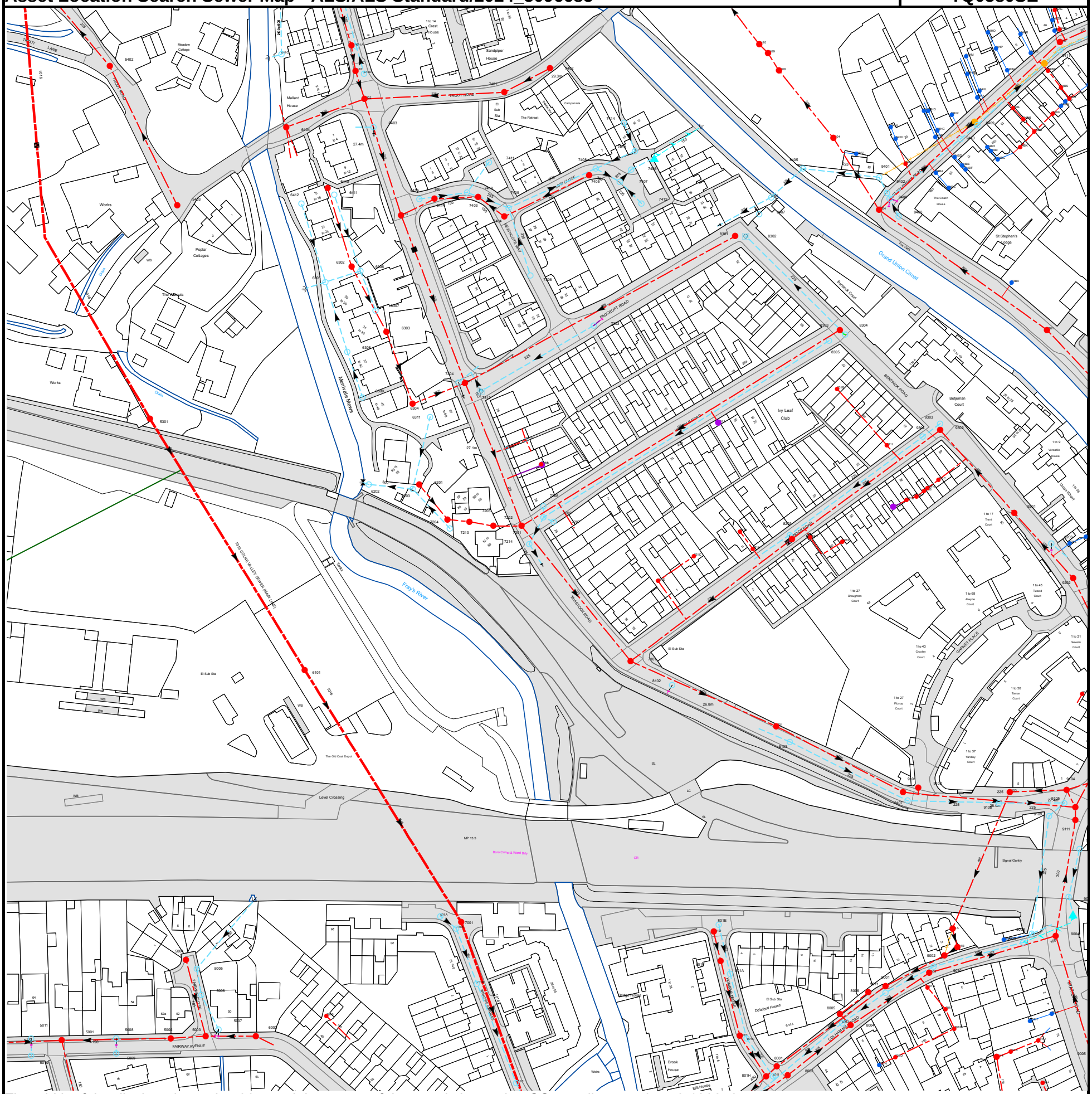
TQ0580SE



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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
94HK	n/a	n/a
9410	28.83	26.43
94HM	n/a	n/a
94HB	n/a	n/a
94HA	n/a	n/a
9409	28.78	26.39
94HL	n/a	n/a
94HO	n/a	n/a
94HP	n/a	n/a
94HN	n/a	n/a
94BL	n/a	n/a
94HR	n/a	n/a
94BN	n/a	n/a
94HQ	n/a	n/a
94BO	n/a	n/a
94BP	n/a	n/a
94ZD	n/a	n/a
94BU	n/a	n/a
94ZA	n/a	n/a
9411	29.03	26.27
94ZE	n/a	n/a
9407	29.06	27.37
94BS	n/a	n/a
94BW	n/a	n/a
94BV	n/a	n/a
94BT	n/a	n/a
94BR	n/a	n/a
921B	n/a	n/a
921F	n/a	n/a
9304	27.83	26.74
921G	n/a	n/a
921H	n/a	n/a
94BA	n/a	n/a
921C	n/a	n/a
9302	28.04	25.84
9303	28	26.07
94BC	n/a	n/a
94BD	n/a	n/a
94BE	n/a	n/a
94BF	n/a	n/a
94BH	n/a	n/a
94BI	n/a	n/a
94BG	n/a	n/a
93BX	0	n/a
9201	n/a	n/a
94BK	n/a	n/a
9301	29.08	27.02
9203	28.5	27.6
921E	n/a	n/a
9202	30.65	28.11
921D	n/a	n/a
94ZG	n/a	n/a
94ZK	n/a	n/a
641A	27.96	26.95
641B	27.96	25.94
7401	28.01	26.38
7402	29.19	26.66
7414	n/a	n/a
8410	28.27	26.54
8409	n/a	n/a
8408	n/a	n/a
8404	28.19	26.71
94HI	n/a	n/a
94HF	n/a	n/a
94HD	n/a	n/a
94HE	n/a	n/a
94HC	n/a	n/a
6203	27.15	26.05
6201	n/a	n/a
6202	27.05	25.87
5301	26.93	22.5
6311	27.33	26.33
6304	n/a	n/a
6309	n/a	n/a
6308	n/a	n/a
6303	n/a	n/a
6307	n/a	n/a
6305	n/a	n/a
6306	n/a	n/a
6302	n/a	n/a
6413	n/a	n/a
5403	26.82	24.87
6412	n/a	n/a
6414	n/a	n/a
6415	n/a	n/a
6411	n/a	n/a
6410	n/a	n/a
6404	27.48	26.08
6403	27.6	26.43
6402	27.75	25.71

Manhole Reference	Manhole Cover Level	Manhole Invert Level
641D	27.67	27.03
641E	27.61	25.81
5402	26.67	24.41
641C	27.61	26.25
7214	27.15	26.38
7210	n/a	n/a
7202	n/a	n/a
7201	27.12	24.4
7207	27.15	26.55
7203	n/a	n/a
7204	n/a	n/a
7205	27.1	26.57
7208	27.14	26.6
721B	n/a	n/a
721A	n/a	n/a
721D	n/a	n/a
721C	n/a	n/a
7312	27.27	26.5
7301	27.38	24.84
7304	27.33	26.37
7303	27.12	25.82
7306	27.24	25.65
7404	n/a	n/a
7409	27.05	25.05
7403	n/a	n/a
7410	n/a	n/a
7407	27.46	24.42
7405	n/a	n/a
7406	27.64	n/a
7408	27.46	24.52
7411	n/a	n/a
821C	n/a	n/a
821A	n/a	n/a
821E	n/a	n/a
8201	27.08	25.24
821D	n/a	n/a
8203	27.06	25.94
821B	n/a	n/a
921A	n/a	n/a
921I	n/a	n/a
831A	n/a	n/a
831B	n/a	n/a
8305	27.46	26.42
8304	27.44	26.2
8303	27.5	25.34
8302	27.51	24.74
8301	27.52	26.28
9403	n/a	n/a
8407	27.73	26.8
9404	28.93	26.85
7412	n/a	n/a
9408	28.87	26.5
8406	30.06	26.92
9402	30.8	29.54
9401	n/a	n/a
8405	n/a	n/a
94HG	n/a	n/a
94HJ	n/a	n/a
7413	n/a	n/a
94HH	n/a	n/a
9001	26.71	22.6
9003	26.66	24.47
9010	26.6	24.99
9002	n/a	n/a
901B	n/a	n/a
9009	n/a	n/a
901L	n/a	n/a
9004	24.41	23.68
9008	26.59	25.47
901A	n/a	n/a
9006	n/a	n/a
9112	n/a	n/a
9111	25.75	23.44
9109	26.54	25.68
9110	26.17	23.12
9108	27.9	25.77
9105	26.5	25.69
9107	27.48	26.02
9103	27.84	22.89
9101	27.43	23.56
9104	27.15	23.03
9102	n/a	n/a
8103	26.92	25.83
911A	n/a	n/a
701C	26.48	24.76
801H	26.68	22.68
801I	26.67	24.76
8001	26.85	22.42
801C	26.74	24.82
801B	26.73	24.15
601B	n/a	n/a
701B	26.19	24.9
801A	26.55	24.9

Manhole Reference	Manhole Cover Level	Manhole Invert Level
801F	26.55	24.41
801D	26.59	24.94
701A	26.18	24.99
801E	26.64	24.98
7001	25.7	22.23
601A	26.12	25.07
8101	26.91	23.22
8102	n/a	n/a
7101	27.19	24.13
721E	n/a	n/a
901J	n/a	n/a
8002	26.8	25.05
901N	n/a	n/a
9005	27.95	24.13
901D	n/a	n/a
9014	n/a	n/a
901K	n/a	n/a
901O	n/a	n/a
901E	n/a	n/a
8004	26.77	24.86
8003	26.8	24.86
901H	n/a	n/a
8005	26.6	25.08
901P	n/a	n/a
901F	n/a	n/a
9011	26.71	24.94
8006	26.64	25.42
901G	n/a	n/a
5011	25.38	24.3
5010	25.39	24.32
5001	25.33	23.83
5009	25.38	24.16
5008	25.42	24.02
5002	25.35	24.07
5004	25.42	24.58
5005	25.49	24.75
5006	25.52	24.76
5003	25.39	24.15
5007	n/a	n/a
6002	25.6	24.32
6101	30.68	22.28

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

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
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- 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.

- Inlet
- Outfall
- Undefined End

Other Symbols

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

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

Ducts may contain high voltage cables. Please check with Thames Water.

- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the 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 indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. 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, please contact Property Searches on 0800 009 4540.

APPENDIX E

Causeway Flow Calculations and Greenfield Runoff Rates

Rainbow and Kirby Industrial Estate **24-101**

Existing SW Runoff

Modified Rational Method

Existing hardpaved area (ha) = 2.2329

Return period (1 : T years)	1	2	30	100
Rainfall intensity (mm/hr)	21.92	25.58	57.67	74.57
Existing surface water runoff (l/s)	136.1	158.8	358.0	462.9

Calculation: 2.78 x paved area x rainfall intensity

Duration 6 hour

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	1.671	Urban	0.000
SAAR (mm)	677	Region Number	Region 6

Results l/s

QBAR Rural	2.9
QBAR Urban	2.9
Q100 years	9.3
Q1 year	2.5
Q30 years	6.6
Q100 years	9.3

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Green Roof 1 to PP1	0.091	5.00	34.000		-71.473	61.792	1.000
PP1	0.448	5.00	29.320		-60.251	61.044	1.200
PP1 Hydrobrake			29.320	1200	-75.568	43.732	1.230
6			29.320		-76.304	34.294	1.272
7			29.100		-58.023	13.982	1.124
Swale 1	0.018	5.00	29.090		61.522	88.470	0.770
Greenroof to PP2	0.014	5.00	34.000		49.994	87.150	1.000
PP2	0.156	5.00	28.620		56.818	73.288	1.100
PP2 Hydrobrake			28.620	1200	43.284	72.739	1.150
Greenroof to PP3	0.041	5.00	34.000		22.419	19.448	1.000
PP3	0.171	5.00	28.930		30.427	16.975	1.200
PP3 Hydrobrake			28.930	1200	5.284	-1.337	1.330
Swale 2	0.056	5.00	29.090		18.692	47.911	0.300
Green roof to Tank 1	0.048	5.00	34.000		12.336	31.177	1.000
Tank 1	0.163	5.00	29.290		5.159	46.714	1.978
Wet play area	0.021	5.00	29.350		-58.013	-1.125	0.300
Tank 2	0.216	5.00	29.220		-44.608	3.917	2.024
Greenroof to Tank 3	0.036	5.00	34.000		-6.026	-52.782	1.000
Tank 3	0.192	5.00	29.460		-14.905	-21.427	2.397
Tank 3 Hydrobrake			28.900	1200	-23.024	-36.658	1.874
Outfall to sewer			28.870	1800	-33.529	-54.368	1.890

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Green Roof 1 to PP1	PP1	5.000	0.600	33.000	28.120	4.880	1.0	150	5.01	50.0
1.001	PP1	PP1 Hydrobrake	5.000	0.600	28.120	28.090	0.030	167.0	225	5.09	50.0
1.002	PP1 Hydrobrake	6	7.000	0.600	28.090	28.048	0.042	167.0	225	5.21	50.0
1.003	6	7	12.000	0.600	28.048	27.976	0.072	167.0	225	5.40	50.0
1.004	7	Tank 2	22.460	0.600	27.976	27.196	0.780	28.8	225	5.56	50.0
2.000	Greenroof to PP2	PP2	5.000	0.600	33.000	27.520	5.480	0.9	150	5.01	50.0

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	Swale 1	PP2	5.000	0.600	28.320	27.520	0.800	6.3	225	5.02	50.0
2.001	PP2	PP2 Hydrobrake	5.000	0.600	27.520	27.470	0.050	100.0	225	5.08	50.0
2.002	PP2 Hydrobrake	Tank 1	5.000	0.600	27.470	27.312	0.158	31.6	225	5.12	50.0
4.000	Green roof to Tank 1	Tank 1	5.000	0.600	33.000	27.312	5.688	0.9	150	5.01	50.0
5.000	Swale 2	Tank 1	5.000	0.600	28.790	27.387	1.403	3.6	150	5.02	50.0
2.003	Tank 1	Tank 2	7.258	0.600	27.312	27.268	0.044	165.0	225	5.23	50.0
6.000	Wet play area	Tank 2	5.000	0.600	29.050	27.271	1.779	2.8	225	5.01	50.0
1.005	Tank 2	Tank 3	26.477	0.600	27.196	27.063	0.133	199.1	300	5.96	50.0
7.000	Greenroof to PP3	PP3	5.000	0.600	33.000	27.730	5.270	0.9	150	5.01	50.0
7.001	PP3	PP3 Hydrobrake	5.000	0.600	27.730	27.600	0.130	38.5	225	5.05	50.0
7.002	PP3 Hydrobrake	Tank 3	5.000	0.600	27.600	27.063	0.537	9.3	225	5.07	50.0
8.000	Greenroof to Tank 3	Tank 3	5.000	0.600	33.000	27.063	5.937	0.8	150	5.01	50.0
1.006	Tank 3	Tank 3 Hydrobrake	6.241	0.600	27.063	27.026	0.037	167.0	225	6.06	50.0
1.007	Tank 3 Hydrobrake	Outfall to sewer	5.000	0.600	27.026	26.980	0.046	108.7	225	6.12	50.0

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	0.840	Drain Down Time (mins)	2440	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	0.750	Skip Steady State	x	Starting Level (m)			

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Node Green Roof 1 to PP1 Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	913	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.017	16-20	0.007	32-36	0.003	48-52	0.002	64-68	0.001	80-84	0.000	96-100	0.000	112-116	0.000
4-8	0.014	20-24	0.006	36-40	0.003	52-56	0.001	68-72	0.001	84-88	0.000	100-104	0.000	116-120	0.000
8-12	0.011	24-28	0.005	40-44	0.002	56-60	0.001	72-76	0.000	88-92	0.000	104-108	0.000		
12-16	0.009	28-32	0.004	44-48	0.002	60-64	0.001	76-80	0.000	92-96	0.000	108-112	0.000		

Node Greenroof to PP2 Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	135	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.002	16-20	0.001	32-36	0.000	48-52	0.000	64-68	0.000	80-84	0.000	96-100	0.000	112-116	0.000
4-8	0.002	20-24	0.001	36-40	0.000	52-56	0.000	68-72	0.000	84-88	0.000	100-104	0.000	116-120	0.000
8-12	0.002	24-28	0.001	40-44	0.000	56-60	0.000	72-76	0.000	88-92	0.000	104-108	0.000		
12-16	0.001	28-32	0.001	44-48	0.000	60-64	0.000	76-80	0.000	92-96	0.000	108-112	0.000		

Node Greenroof to PP3 Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	414	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.008	16-20	0.003	32-36	0.002	48-52	0.001	64-68	0.000	80-84	0.000	96-100	0.000	112-116	0.000
4-8	0.006	20-24	0.003	36-40	0.001	52-56	0.001	68-72	0.000	84-88	0.000	100-104	0.000	116-120	0.000
8-12	0.005	24-28	0.002	40-44	0.001	56-60	0.000	72-76	0.000	88-92	0.000	104-108	0.000		
12-16	0.004	28-32	0.002	44-48	0.001	60-64	0.000	76-80	0.000	92-96	0.000	108-112	0.000		

Node Green roof to Tank 1 Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	478	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.009	16-20	0.004	32-36	0.002	48-52	0.001	64-68	0.000	80-84	0.000	96-100	0.000	112-116	0.000
4-8	0.007	20-24	0.003	36-40	0.001	52-56	0.001	68-72	0.000	84-88	0.000	100-104	0.000	116-120	0.000
8-12	0.006	24-28	0.003	40-44	0.001	56-60	0.001	72-76	0.000	88-92	0.000	104-108	0.000		
12-16	0.005	28-32	0.002	44-48	0.001	60-64	0.000	76-80	0.000	92-96	0.000	108-112	0.000		

Node Greenroof to Tank 3 Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	361	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.007	16-20	0.003	32-36	0.001	48-52	0.001	64-68	0.000	80-84	0.000	96-100	0.000	112-116	0.000
4-8	0.005	20-24	0.002	36-40	0.001	52-56	0.000	68-72	0.000	84-88	0.000	100-104	0.000	116-120	0.000
8-12	0.004	24-28	0.002	40-44	0.001	56-60	0.000	72-76	0.000	88-92	0.000	104-108	0.000		
12-16	0.004	28-32	0.002	44-48	0.001	60-64	0.000	76-80	0.000	92-96	0.000	108-112	0.000		

Node PP1 Hydrobrake Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.930	Product Number	CTL-CCL-0106-7000-0930-7000
Downstream Link	1.002	Design Flow (l/s)	7.0	Min Outlet Diameter (m)	0.150
Replaces Downstream Link	✓	Objective	(CL) Minimise blockage risk	Min Node Diameter (mm)	0
Invert Level (m)	28.090	Sump Available	x		

Node PP2 Hydrobrake Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	2.002	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0048-1000-0850-1000
Invert Level (m)	27.470	Min Outlet Diameter (m)	0.075
Design Depth (m)	0.850	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.0		

Node PP3 Hydrobrake Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	7.002	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0046-1000-1030-1000
Invert Level (m)	27.600	Min Outlet Diameter (m)	0.075
Design Depth (m)	1.030	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.0		

Node Wet play area Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	6.000	Sump Available	✓
Replaces Downstream Link	x	Product Number	CTL-SHE-0077-2000-0300-2000
Invert Level (m)	29.050	Min Outlet Diameter (m)	0.100
Design Depth (m)	0.300	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.0		

Node Swale 2 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	x	Design Depth (m)	0.300	Diameter (m)	0.025
Downstream Link	5.000	Invert Level (m)	28.790	Design Flow (l/s)	0.7	Discharge Coefficient	0.600

Node Tank 3 Hydrobrake Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.007	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0078-2900-1237-2900
Invert Level (m)	27.026	Min Outlet Diameter (m)	0.100
Design Depth (m)	1.237	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.9		

Node Swale 1 Online Orifice Control

Flap Valve	x	Invert Level (m)	28.320	Design Flow (l/s)	1.0	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Depth (m)	0.300	Diameter (m)	0.013		

Node Swale 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	28.320
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1500

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	165.7	165.7	0.300	165.7	179.4

Node Swale 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	28.790
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	872

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	268.9	268.9	0.300	268.9	286.3

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.888	Depth (m)	0.900
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	28.120	Length (m)	180.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	476	Slope (1:X)	500.0		

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.137	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	27.520	Length (m)	76.049	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	500.0		

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	7.099	Depth (m)	0.900
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	27.730	Length (m)	112.167	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	1860	Slope (1:X)	500.0		

Node Tank 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	27.312
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	836.0	0.0	1.000	836.0	0.0	1.001	0.0	0.0

Node Wet play area Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.050
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	200

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	184.0	184.0	0.300	184.0	198.4

Node Tank 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	27.196
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	56.0	0.0	1.200	56.0	0.0	1.201	0.0	0.0

Node Tank 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	27.063
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	308.0	0.0	1.200	308.0	0.0	1.201	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	559.411	158.294	100 year +40% CC 720 minute winter	24.503	9.771
100 year +40% CC 15 minute winter	392.569	158.294	100 year +40% CC 960 minute summer	28.943	7.621
100 year +40% CC 30 minute summer	366.286	103.646	100 year +40% CC 960 minute winter	19.172	7.621
100 year +40% CC 30 minute winter	257.043	103.646	100 year +40% CC 1440 minute summer	19.902	5.334
100 year +40% CC 60 minute summer	243.777	64.423	100 year +40% CC 1440 minute winter	13.375	5.334
100 year +40% CC 60 minute winter	161.960	64.423	100 year +40% CC 2160 minute summer	13.437	3.713
100 year +40% CC 120 minute summer	151.422	40.016	100 year +40% CC 2160 minute winter	9.258	3.713
100 year +40% CC 120 minute winter	100.601	40.016	100 year +40% CC 2880 minute summer	10.729	2.875
100 year +40% CC 180 minute summer	115.841	29.810	100 year +40% CC 2880 minute winter	7.210	2.875
100 year +40% CC 180 minute winter	75.299	29.810	100 year +40% CC 4320 minute summer	7.723	2.019
100 year +40% CC 240 minute summer	90.744	23.981	100 year +40% CC 4320 minute winter	5.086	2.019
100 year +40% CC 240 minute winter	60.288	23.981	100 year +40% CC 5760 minute summer	6.184	1.583
100 year +40% CC 360 minute summer	67.614	17.399	100 year +40% CC 5760 minute winter	4.003	1.583
100 year +40% CC 360 minute winter	43.951	17.399	100 year +40% CC 7200 minute summer	5.187	1.323
100 year +40% CC 480 minute summer	52.027	13.749	100 year +40% CC 7200 minute winter	3.347	1.323
100 year +40% CC 480 minute winter	34.566	13.749	100 year +40% CC 8640 minute summer	4.507	1.150
100 year +40% CC 600 minute summer	41.708	11.408	100 year +40% CC 8640 minute winter	2.909	1.150
100 year +40% CC 600 minute winter	28.497	11.408	100 year +40% CC 10080 minute summer	4.023	1.026
100 year +40% CC 720 minute summer	36.459	9.771	100 year +40% CC 10080 minute winter	2.596	1.026

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	Green Roof 1 to PP1	21	33.025	0.025	20.3	0.0000	0.0000	OK
240 minute winter	PP1	236	29.017	0.897	73.6	344.2216	0.0000	SURCHARGED
240 minute winter	PP1 Hydrobrake	236	29.015	0.925	7.0	1.0467	0.0000	SURCHARGED
2160 minute winter	6	2280	28.260	0.212	7.0	0.0000	0.0000	OK
2160 minute winter	7	2280	28.259	0.283	7.0	0.0000	0.0000	SURCHARGED
720 minute winter	Swale 1	690	28.412	0.092	1.0	15.2541	0.0000	OK
30 minute winter	Greenroof to PP2	22	33.013	0.013	2.9	0.0000	0.0000	OK
2880 minute winter	PP2	3000	28.265	0.745	3.3	139.3538	0.0000	SURCHARGED
2880 minute winter	PP2 Hydrobrake	3000	28.265	0.795	2.3	0.8988	0.0000	SURCHARGED
30 minute winter	Greenroof to PP3	21	33.023	0.023	9.1	0.0000	0.0000	OK
720 minute winter	PP3	720	28.556	0.826	12.0	170.4964	0.0000	SURCHARGED
720 minute winter	PP3 Hydrobrake	720	28.556	0.956	5.9	1.0816	0.0000	SURCHARGED
480 minute winter	Swale 2	464	28.951	0.161	4.5	43.3195	0.0000	FLOOD RISK
30 minute winter	Green roof to Tank 1	21	33.024	0.024	10.6	0.0000	0.0000	OK
2160 minute winter	Tank 1	2280	28.259	0.947	13.2	751.9337	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	Green Roof 1 to PP1	1.000	PP1	20.3	1.725	0.114	0.0489	
240 minute winter	PP1	1.001	PP1 Hydrobrake	7.0	0.322	0.176	0.1989	
240 minute winter	PP1 Hydrobrake	Hydro-Brake®	6	7.0				
2160 minute winter	6	1.003	7	7.0	0.961	0.173	0.4713	
2160 minute winter	7	1.004	Tank 2	6.9	0.569	0.071	0.8933	
720 minute winter	Swale 1	3.000	PP2	0.1	0.005	0.000	0.0998	
30 minute winter	Greenroof to PP2	2.000	PP2	2.9	0.266	0.015	0.0459	
2880 minute winter	PP2	2.001	PP2 Hydrobrake	2.3	0.201	0.045	0.1989	
2880 minute winter	PP2 Hydrobrake	Hydro-Brake®	Tank 1	0.9				
30 minute winter	Greenroof to PP3	7.000	PP3	9.1	0.785	0.049	0.0482	
720 minute winter	PP3	7.001	PP3 Hydrobrake	5.9	0.270	0.071	0.1989	
720 minute winter	PP3 Hydrobrake	Hydro-Brake®	Tank 3	0.8				
480 minute winter	Swale 2	5.000	Tank 1	0.5	1.127	0.005	0.0449	
30 minute winter	Green roof to Tank 1	4.000	Tank 1	10.6	2.879	0.055	0.0477	
2160 minute winter	Tank 1	2.003	Tank 2	-7.8	0.471	-0.193	0.2887	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Wet play area	136	29.112	0.062	3.6	11.3287	0.0000	OK
2160 minute winter	Tank 2	2280	28.259	1.063	11.1	56.5397	0.0000	SURCHARGED
30 minute winter	Greenroof to Tank 3	21	33.021	0.021	7.8	0.0000	0.0000	OK
2160 minute winter	Tank 3	2280	28.259	1.196	7.4	349.8536	0.0000	SURCHARGED
2160 minute winter	Tank 3 Hydrobrake	2280	28.258	1.232	6.0	1.3938	0.0000	SURCHARGED
15 minute summer	Outfall to sewer	1	26.980	0.000	2.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	Wet play area	6.000	Tank 2	1.0	0.171	0.003	0.1008	
2160 minute winter	Tank 2	1.005	Tank 3	4.8	0.636	0.062	1.8645	
30 minute winter	Greenroof to Tank 3	8.000	Tank 3	7.8	0.682	0.040	0.0476	
2160 minute winter	Tank 3	1.006	Tank 3 Hydrobrake	6.0	0.314	0.150	0.2482	
2160 minute winter	Tank 3 Hydrobrake	Hydro-Brake®	Outfall to sewer	2.9				727.7

APPENDIX F

Flood Mapping

Flood map for planning

Your reference	Location (easting/northing)	Created
24-101	**505900/180526**	**18 Dec 2024 17:17**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

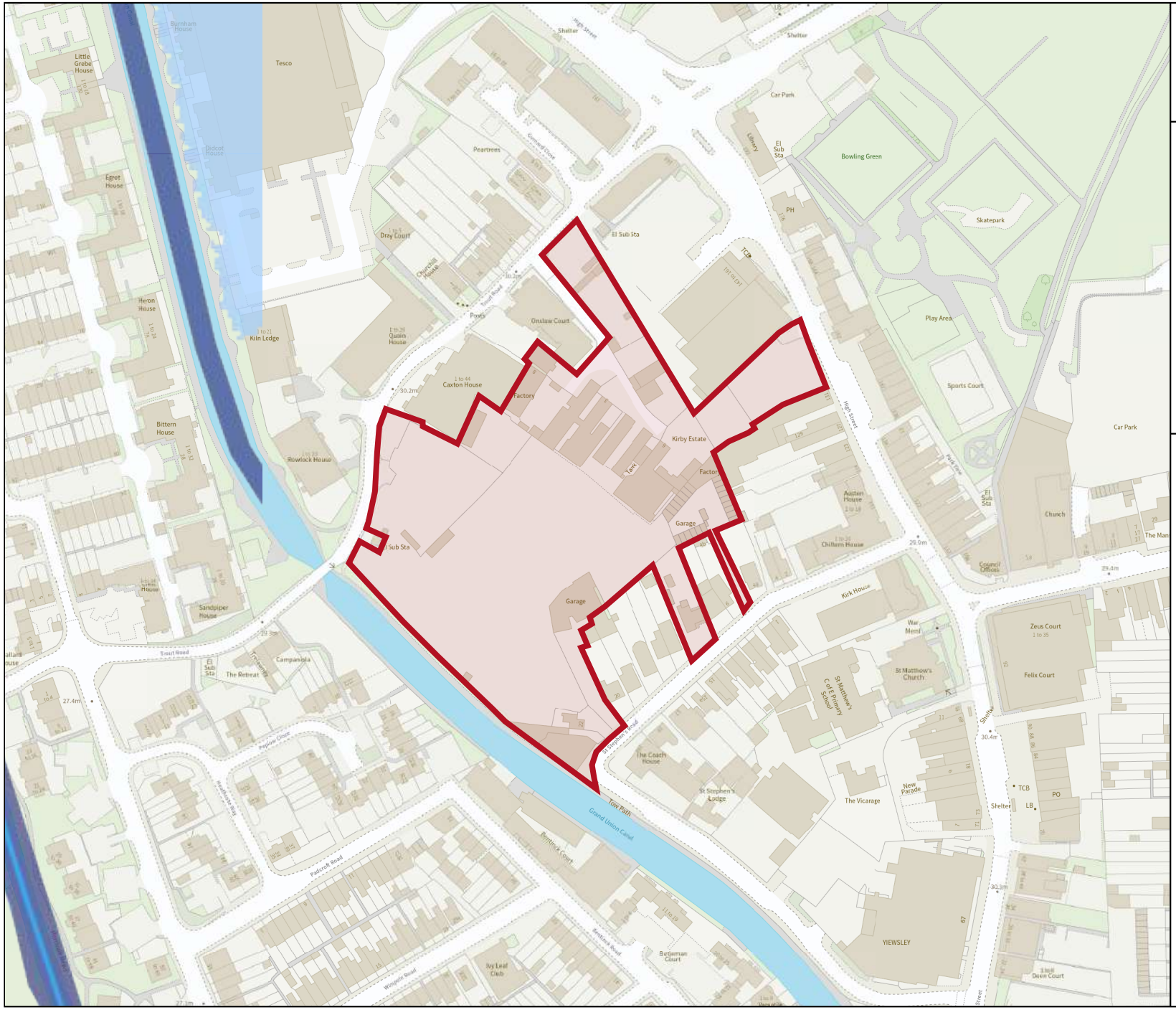
- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Our understanding of flood risk from rivers and the seas has changed since this information was published. Email enquiries@environment-agency.gov.uk for further information.

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
24-101

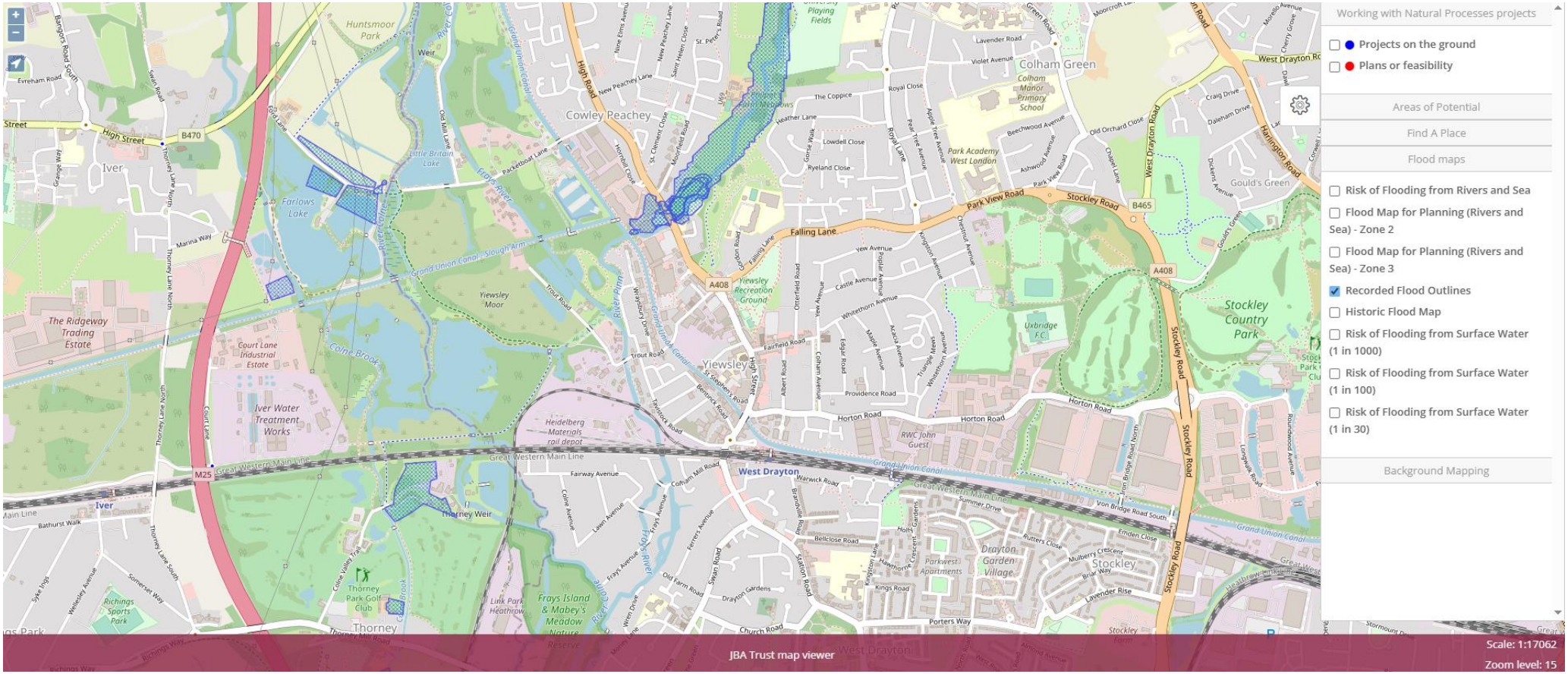
Location (easting/northing)
505900/180526

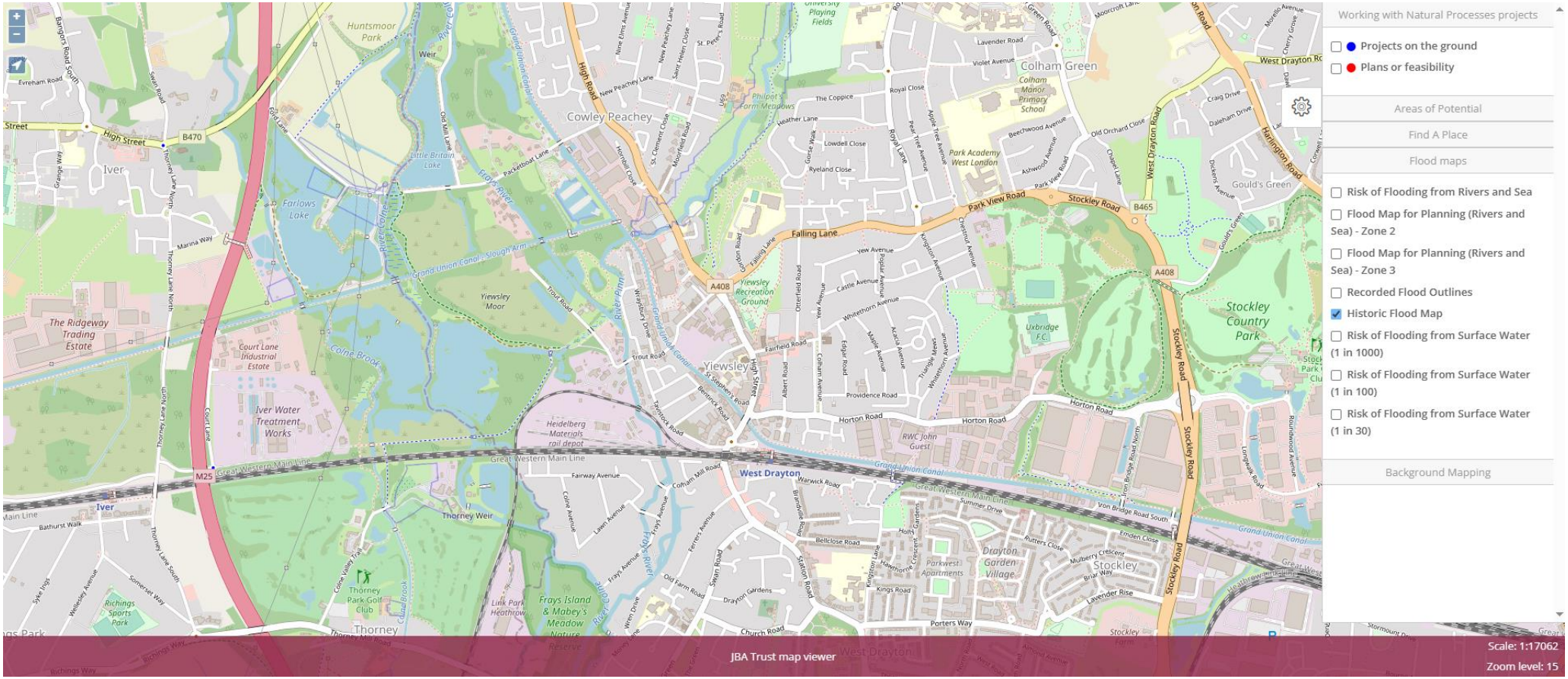
Scale
1:2500

Created
18 Dec 2024 17:17

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m


Working with Natural Processes projects
Projects on the ground
Plans or feasibility
Areas of Potential
Find A Place
Flood maps
Risk of Flooding from Rivers and Sea
Flood Map for Planning (Rivers and Sea) - Zone 2
Flood Map for Planning (Rivers and Sea) - Zone 3
Recorded Flood Outlines
Historic Flood Map
Risk of Flooding from Surface Water (1 in 1000)
Risk of Flooding from Surface Water (1 in 100)
Risk of Flooding from Surface Water (1 in 30)
Background Mapping
JBA Trust map viewer
Scale: 1:17062
Zoom level: 15


Working with Natural Processes projects
Projects on the ground
Plans or feasibility
Areas of Potential
Find A Place
Flood maps
Risk of Flooding from Rivers and Sea
Flood Map for Planning (Rivers and Sea) - Zone 2
Flood Map for Planning (Rivers and Sea) - Zone 3
Recorded Flood Outlines
Historic Flood Map
Risk of Flooding from Surface Water (1 in 1000)
Risk of Flooding from Surface Water (1 in 100)
Risk of Flooding from Surface Water (1 in 30)
Background Mapping
JBA Trust map viewer
Scale: 1:17062
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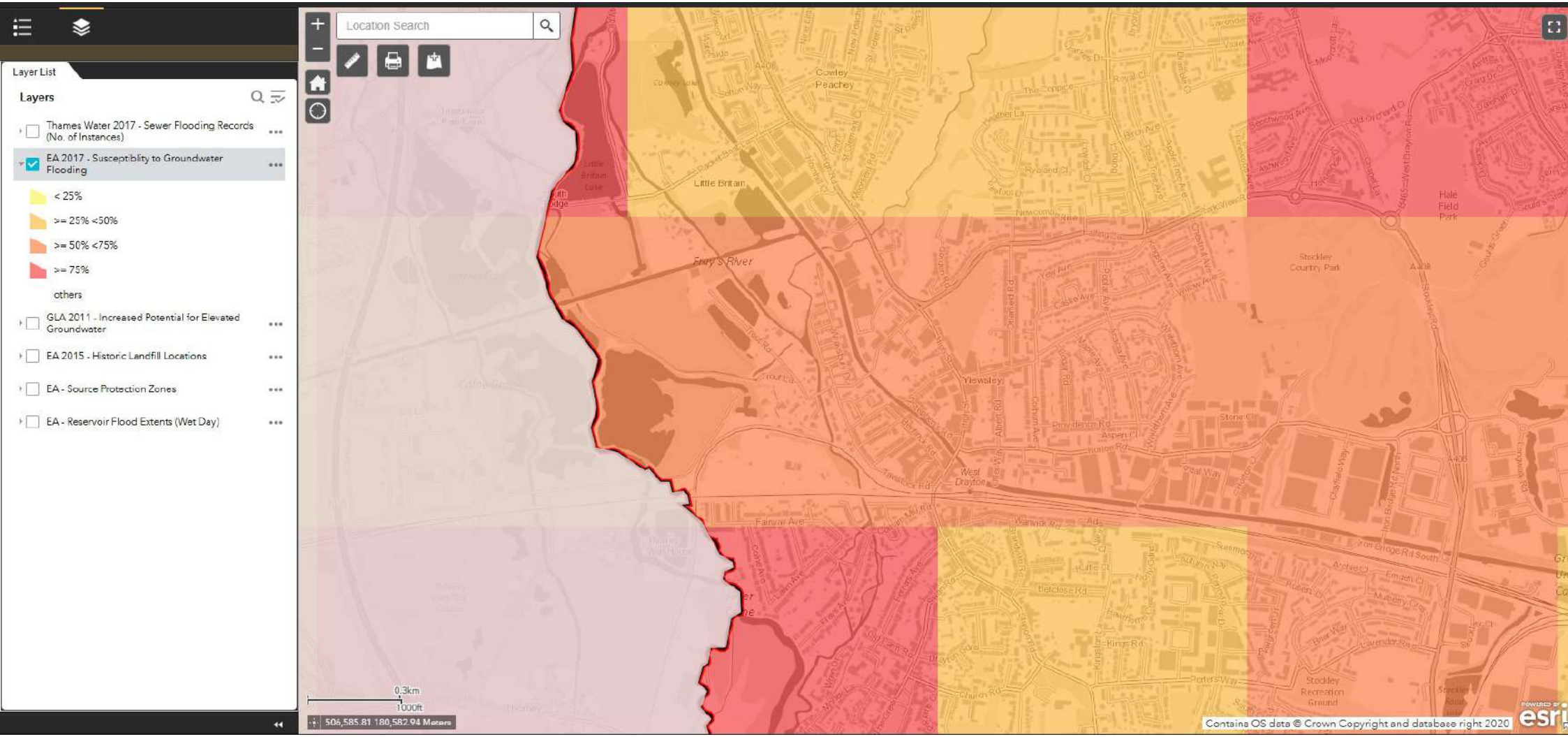
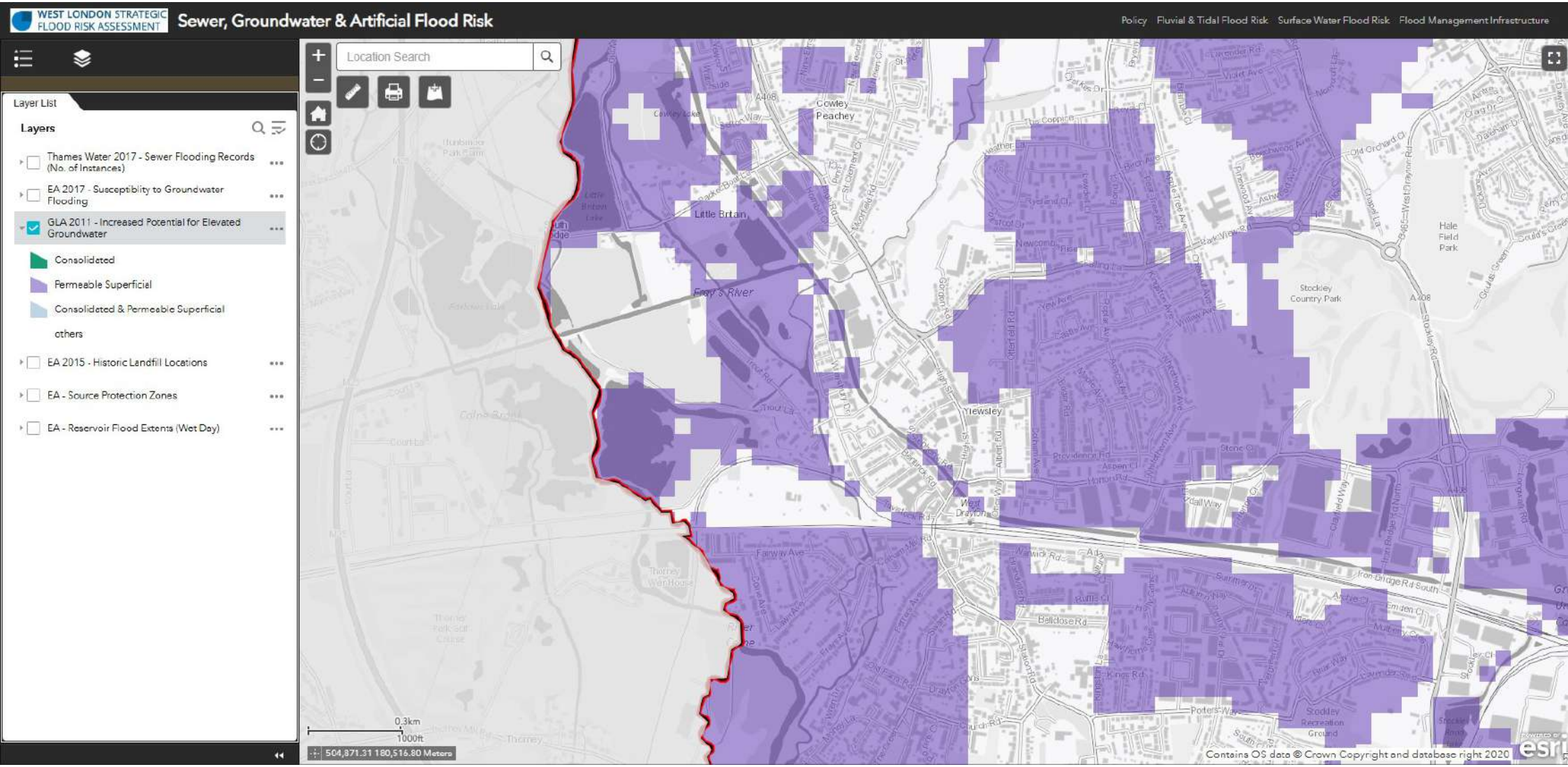
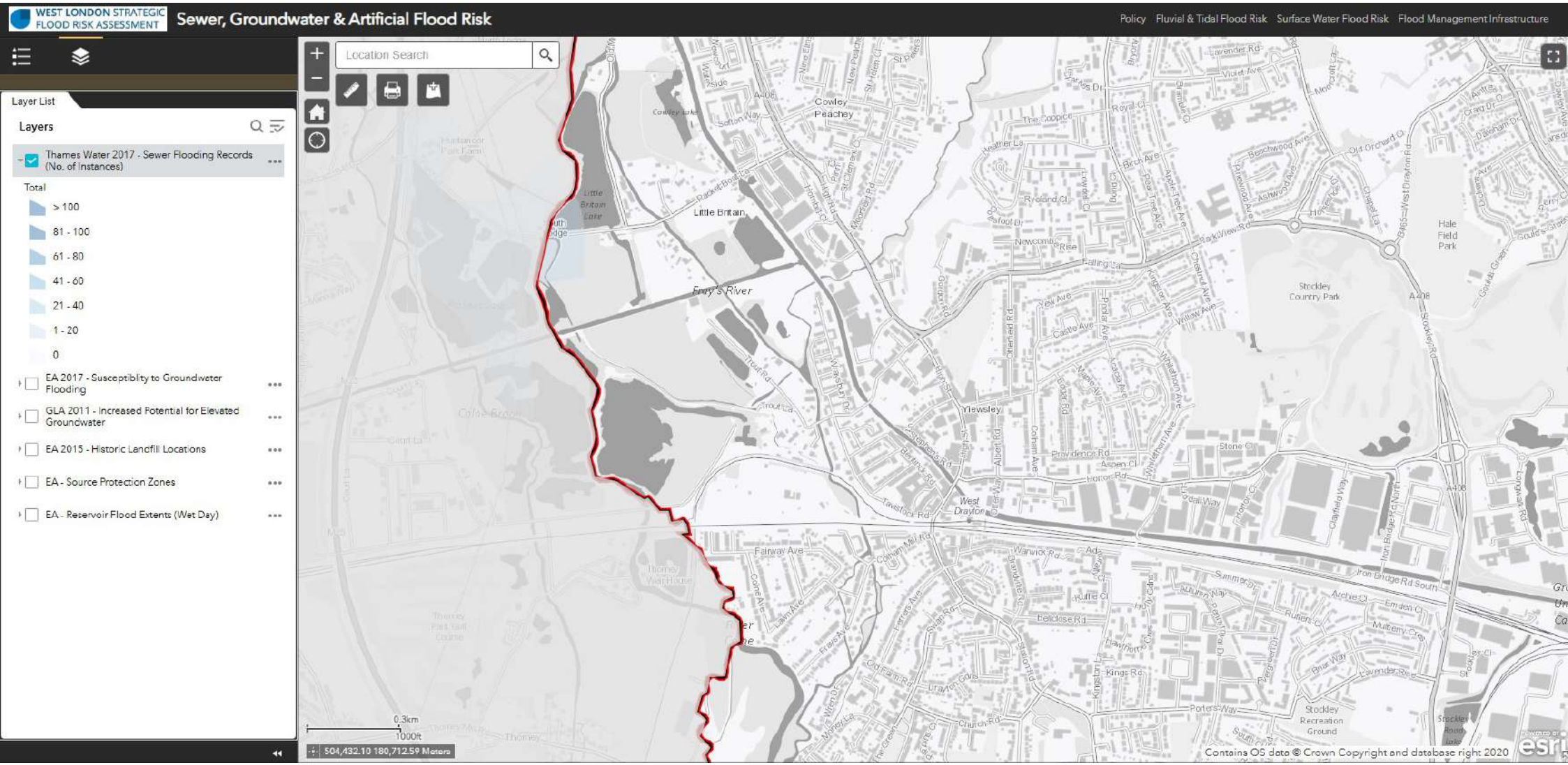
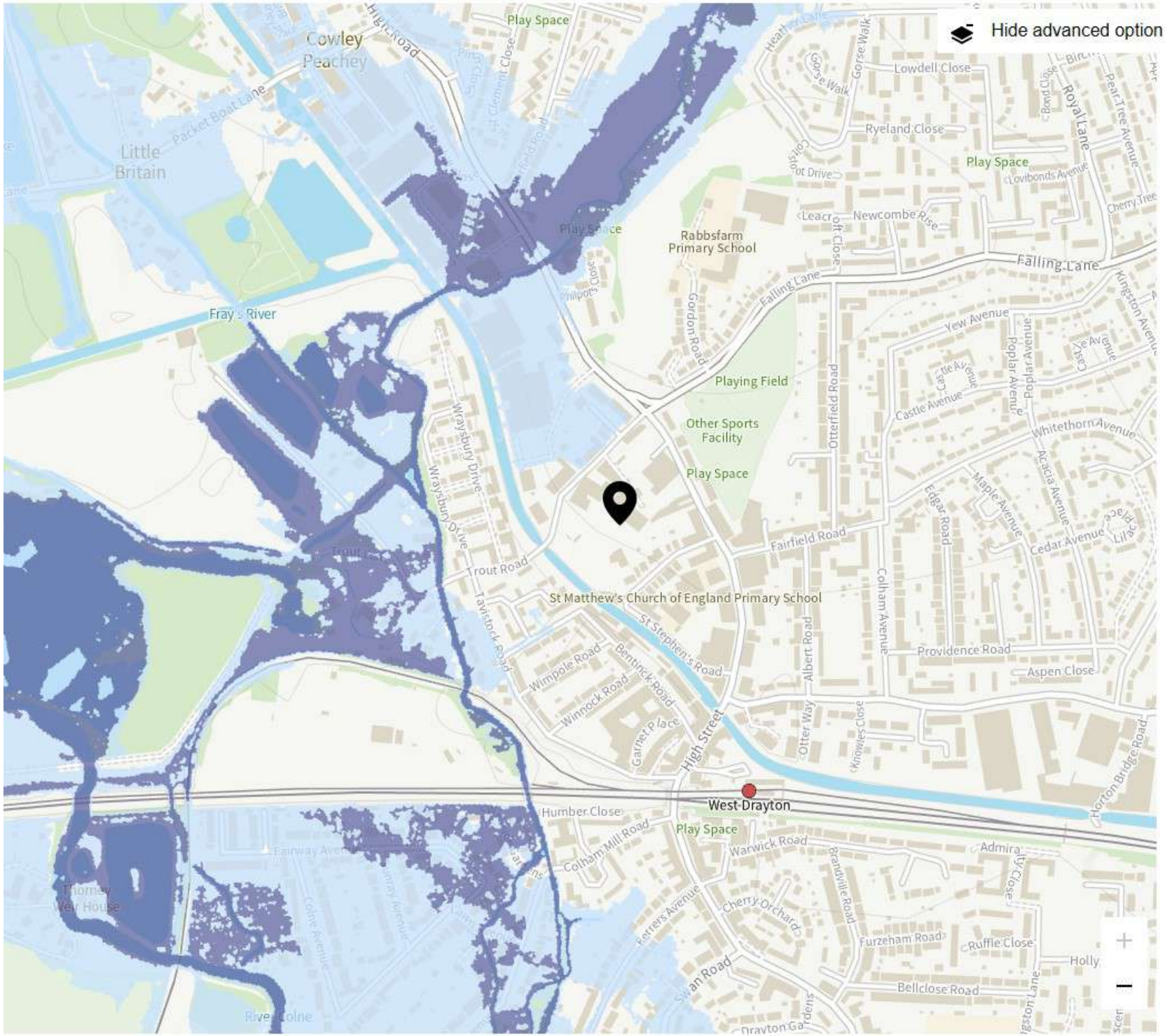

Layer List
Layers
Thames Water 2017 - Sewer Flooding Records (No. of Instances)
EA 2017 - Susceptiblity to Groundwater Flooding
< 25%
>= 25% <50%
>= 50% <75%
>= 75%
others
GLA 2011 - Increased Potential for Elevated Groundwater
EA 2015 - Historic Landfill Locations
EA - Source Protection Zones
EA - Reservoir Flood Extents (Wet Day)
Location Search
Little Britain
Ivery's River
Newsley
West Drayton
Stockley Country Park
Hale Field Park
Stockley Recreation Ground
0.3km
1000ft
506,585.81 180,582.94 Meters
Contains OS data © Crown Copyright and database right 2020
esri


WEST LONDON STRATEGIC FLOOD RISK ASSESSMENT
Sewer, Groundwater & Artificial Flood Risk
Policy
Fluvial & Tidal Flood Risk
Surface Water Flood Risk
Flood Management Infrastructure
Layer List
Layers
Thames Water 2017 - Sewer Flooding Records (No. of Instances)
EA 2017 - Susceptibility to Groundwater Flooding
GLA 2011 - Increased Potential for Elevated Groundwater
Consolidated
Permeable Superficial
Consolidated & Permeable Superficial
others
EA 2015 - Historic Landfill Locations
EA - Source Protection Zones
EA - Reservoir Flood Extents (Wet Day)
Location Search
Cowley Peachey
Little Britain
Yiewsley
West Drayton
Stockley Country Park
Hale Field Park
Stoddey Recreation Ground
0.3km
1000ft
504,871.31 180,516.80 Meters
Contains OS data © Crown Copyright and database right 2020


WEST LONDON STRATEGIC FLOOD RISK ASSESSMENT
Sewer, Groundwater & Artificial Flood Risk
Policy
Fluvial & Tidal Flood Risk
Surface Water Flood Risk
Flood Management Infrastructure
Layer List
Layers
Thames Water 2017 - Sewer Flooding Records (No. of Instances)
Total
> 100
81 - 100
61 - 80
41 - 60
21 - 40
1 - 20
0
EA 2017 - Susceptibility to Groundwater Flooding
GLA 2011 - Increased Potential for Elevated Groundwater
EA 2015 - Historic Landfill Locations
EA - Source Protection Zones
EA - Reservoir Flood Extents (Wet Day)
Location Search
Little Britain
Fray's River
Cowley Peachey
Yiewsley
West Drayton
Stockley Country Park
Hale Field Park
Stockley Recreation Ground
0.3km
1000ft
504,432.10 180,712.59 Metres
Contains OS data © Crown Copyright and database right 2020



Key

Surface water

- ○ Extent
- ○ Depth
- ○ Velocity

Rivers and the sea

- ○ Extent

Reservoirs

- ◉ Extent
- When river levels are normal
- When there is also flooding from rivers

Map details

- ☑ Show flooding
- ☑ Selected address

Pause to updates of flood risk data

We have paused updates to information about flood risk from rivers and the sea and surface water while we get ready for new data.

APPENDIX G

SuDS Operation and Maintenance Requirements

TABLE 12.5 Operation and maintenance requirements for green roofs

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 any 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
	Inspect underside of roof for evidence of leakage	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 plants 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 or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly 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 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

▶ Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified and eliminated, reduced or controlled where appropriate. This information will be required as part of the health and safety file.

▶ Generic health and safety guidance is presented in **Chapter 36**.

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
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 material	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)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Many of the specific maintenance activities for pervious pavements can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. There is also less risk of ice formation after snow melt, as the melt water drains directly into the underlying sub-base and does not have chance to refreeze. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours. It does not happen in all installations and, if necessary, this can be dealt with by application of salt. It is not likely to pose a hazard to vehicle movements.

▶ Generic health and safety guidance is presented in **Chapter 36**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

TABLE 17.1 Operation and maintenance requirements for swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

21.14 REFERENCES

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TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

should be undertaken whenever access for maintenance is required. Removal of oil, silt and other pollutants must be in accordance with the appropriate waste management legislation.

Maintenance responsibility for all systems should be placed with an appropriate organisation, and Maintenance Plans and schedules should be developed during the design phase.

▶ Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32**.

Table 14.2 provides guidance on the type of operation and maintenance schedule that may be appropriate for a proprietary treatment system. The list of actions is not exhaustive and some actions may not always be required.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

▶ Generic health and safety guidance is presented in **Chapter 36**.

14.12.2 Oil water separators

Specific requirements for oil/water separators are provided in PPG3 (EA/SEPA/EHSNI, 2006). The following items should be undertaken every six months as a minimum:

- check volume of sludge
- check thickness of light liquid
- check function of automatic closure device
- empty the separator, if required
- check the coalescing material and clean or change if necessary (class 1 only)
- check the function of the warning device (if fitted)

General inspection of the integrity of oil/water separators should occur at a maximum frequency of five years, and should cover the following:

- watertightness of system

APPENDIX H

Thames Water Capacity Check

Callum Needham

Odyssey Consult
Tuscany House
Basingstoke
RG21 4AF

Wastewater pre-planning
Our ref DS6147090

17 September 2025

Pre-planning enquiry: Confirmation of sufficient capacity

Site address: Rainbow and Kirby Industrial Estate, Trout Road UB7 7RL

Dear Callum,

Thank you for providing information on your development.

Proposed site: 450 flats and mixed commercial and retail units. Proposed foul water gravity connection via FWMH TQ05807501 in Trout Road.

We have completed the assessment of the foul water flows 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 foul wate 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.

Capacity at STW?

The receiving network is served by Mogden STW and there isn't a known performance issue which may cause the EA to object to the development.

Asset Protection

As the development is located on a Brownfield site there may be existing sewers or rising mains crossing the site. Where these sewers or rising mains are to become redundant or have to be diverted the full cost of administering and undertaking the works shall be financed by the developer.

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 the number below.

Yours sincerely

Natalya Bacon
Adoptions & Pre-Planning Engineer
Service Delivery
M: +44 7747 641932
T: +44 800 009 3921
E: developer.services@thameswater.co.uk
W: https://www.thameswater.co.uk/developers

Get advice – make your sewer connection correctly - Plumbing and drainage misconnections | Water UK

Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at Developer services | Thames Water