Appendix: Flood Risk and Drainage

Annex 1: Flood Risk Assessment
Annex 2: Drainage Assessment Report

Appendix: Flood Risk and Drainage

Annex 1: Flood Risk Assessment

Annex 2: Drainage Assessment Report

4188 Vinegar Yard
Flood Risk Assessment
November 2021

Consulting Structural and Civil Engineers

AKT II Ltd

White Collar Factory
1 Old Street Yard
London EC1Y 8AF

T +44 (0)20 7250 7777
F +44 (0)20 7250 7555
info@akt-uk.com

Contents

Revision	Date	Status
06	02.11.21	Final Issue
05	15.10.21	Planning Issue
04	25.08.21	Preliminary Issue
03	17.12.20	Planning Issue
02	11.12.20	Preliminary Issue
01	04.12.20	Draft issue

Prepared by: Sara Mercuriali

Checked by: Dariusz Nowacki

Approved by: David Purcell

1 Introduction

AKT II have been commissioned to undertake a Flood Risk Assessment (FRA) in support of the proposed redevelopment of the land bounded by St Thomas Street, Fenning Street, Vinegar Yard and Snowfields including Nos. 1-7 Fenning Street and No. 9 Fenning Street, SE1 3QR. This report is intended to cover only flood risk and to provide the guidelines and parameters for the detailed design.

This report has been prepared in accordance with the guidance contained in the National Planning Policy Framework 2021 (NPPF) and the accompanying Planning Practice Guidance.

St Thomas Bermondsey Limited (the "Applicant") submitted an application for full planning permission for the redevelopment of Vinegar Yard (the "Site") to the London Borough of Southwark ("LBS" or the "Council") on 21 December 2018 under reference 18/AP/4171 (the "Application"). The Application was considered by the Council's Planning Committee on 29 June 2020. Officers recommended the Application for approval subject to conditions and S106, but LBS resolved to refuse.

On 24 August 2020 the Mayor notified LBS and the Applicant of his intention to recover the Application for his own determination (GLA ref. GLA/6208/S2). Since then, the Applicant has been working with officers at the GLA and Southwark to amend the development proposals, seeking amongst other changes to address LBS' heritage concerns that had led to the local refusal. This Flood Risk Assessment has therefore been prepared as part of a package of materials for submission to the GLA for the purposes of public consultation and consideration of the Revised Scheme by the Mayor.

The updated scheme seeks to provide flexible medical and research & development floorspace (Use Classes D1 and / or B1(b)) designed to allow for occupation by Guys and St Thomas' NHS Foundation Trust, but flexible to ensure long term resilience. Levels one to ten of the building will first be offered to Guys and St Thomas' for use as either D1 medical space or B1(b) research & development. The remainder of the upper floors, levels 11 to 18, comprise a B1(a) office use. This configuration reflects Guys and St Thomas's Adaptable Estates Strategy, where buildings are able to accommodate a range of possible functions both physically and by virtue of permitted uses in the long term. In the event that Guys and St Thomas' do not wish to occupy levels 1 to 10 of the proposed building, it will default to a B1(b) research and development use and will be made available to R&D occupiers whose work can support the SC1 Life Science & Innovation District. Minor changes to the plant configuration at levels 3 and 8 of the building and the retail floorspace at ground floor level would also change as a result of a research and development use. The remainder of the proposed floorspace within the scheme would not change in the event of a research and development occupier taking the building. The flexible medical and research & development use will be controlled by a suitably worded planning condition and obligation within the Section 106 agreement.

This report has been carried out considering D1 use (medical use) only from the first to the tenth floor of the main building. As this use is more onerous when compared to alternative B1B use (research and development use), the assessment has been undertaken considering the worst case scenario (D1 use). Therefore, it is believed that the proposed dual use of the building does not change the design fundamentals and the Flood Risk Assessment (FRA) still meets the guidance contained in the National Planning Policy Framework (NPPF) and the accompanying Planning Practice Guidance.

2 The Site

2.1 Site location

The site is bounded by St Thomas Street, Fenning Street, Vinegar Yard and Snowfields including Nos. 1-7 Fenning Street and No. 9 Fenning Street, SE1 3QR (Fig. 2.1).The National Grid reference for the site is TQ 330799, Latitude 51.502746 and Longitude -0.083846188. It is bounded to the north, south and west by St Thomas Street, Snowsfields and Fenning Street, respectively. The site is located in a commercial area and is surrounded by buildings of various ages. The site is located in close proximity to London Bridge, the Shard and Borough Market. London Bridge mainline railway station is located immediately to the north of the site on the opposite side of St Thomas Street (Fig 2.3).

The topographic survey of the site is included in Appendix F.

The wider contextual location (see Fig 2.2) shows the site located 400m south of the River Thames, in close proximity to the Shard and Guy's Hospital.

2.2 Site description

The site comprises of an irregular shaped plot of land located in the Borough of Southwark, in the London Bridge area, occupying an area of approximately 0.30 Ha.

The majority of the site is currently being used as a car park area with a small security cabin located on the eastern side.

The site comprises also of a low rise industrial building located at 1-7 and 9 Fenning Street. This is a two storey brick warehouse with a concrete ground floor which provides approximately 848 m² (GIA) of light industrial with ancillary office and storage floorspace (B1).

The majority of the site was previously used as a work space for Network Rail in connection with the development works at London Bridge.

An electrical substation is present on the western side of Fenning Street approximately 20m to the west of the site.

Refer to Figure 2.1 for the existing arrangement.

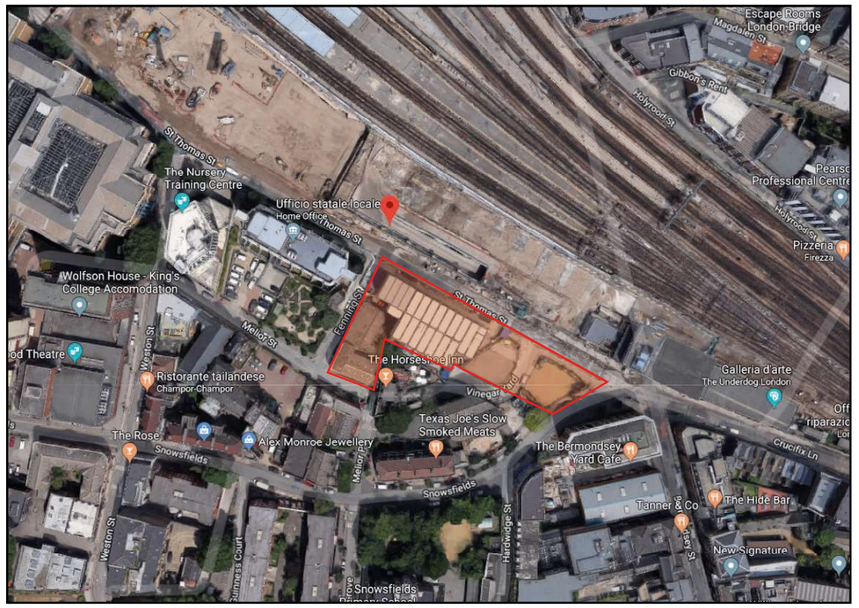


Figure 2.1 Site Location

Figure 2.2 Aerial image Site Location, London Bridge

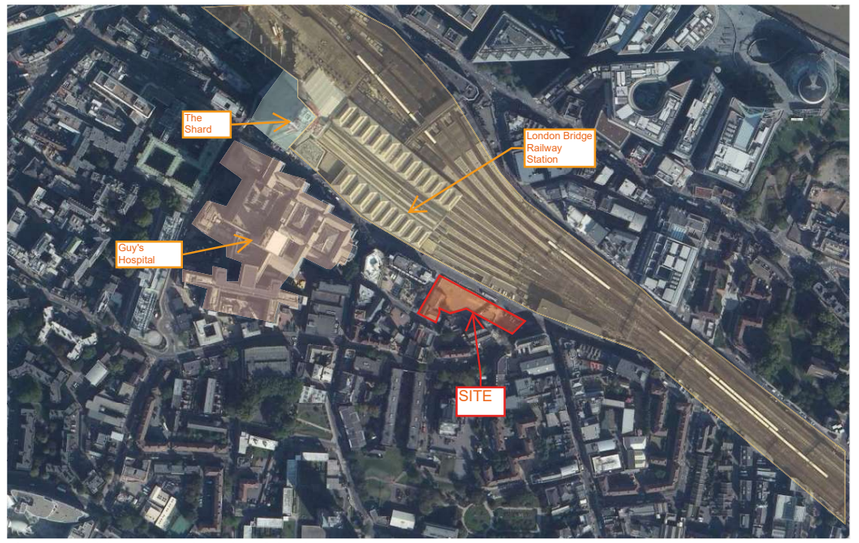


Figure 2.3 Wider contextual location of the site

3 Proposed Development

The proposed redevelopment of the site comprises the demolition of existing buildings, retention and the refurbishment of the warehouse and the erection of a ground, mezzanine and 18 storey building (with plant at roof) and 3 basement levels, comprising of café and community space within the warehouse and within the new building office, flexible medical and research and development, and flexible retail and affordable workspace, alongside cycle and disabled car parking, servicing, refuse and plant areas, public garden (including soft and hard landscaping), highway improvements and all other associated works.

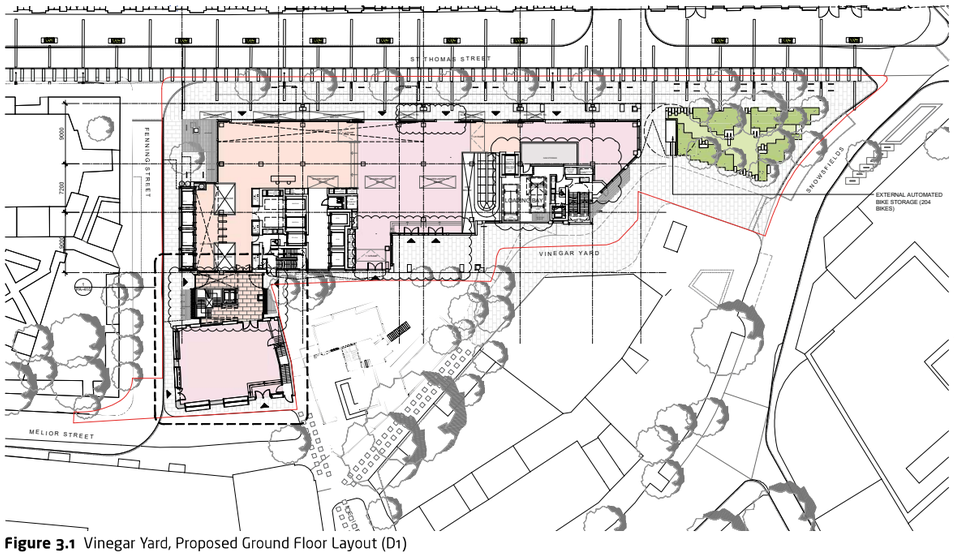


Figure 3.1 Vinegar Yard, Proposed Ground Floor Layout (D1)

Figure 3.2 Architectural rendering of the site

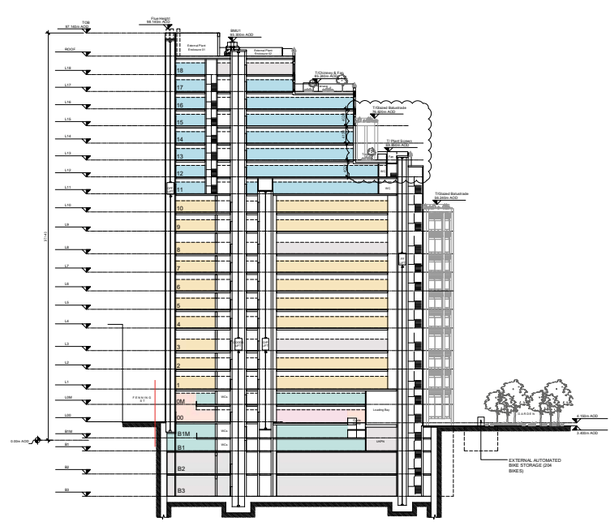


Figure 3.3 Vinegar Yard, Proposed Section

4 Requirements of National Planning Policy Framework (NPPF)

4.1 Summary

In July 2021 the National Planning Policy Framework (NPPF) was updated, although the requirements and goals remain essentially the same as the Planning Policy Statement 25 "Development and Flood Risk" (PPS 25) which are:

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

With regard to the NPPF, those proposing particular developments are responsible for:

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

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

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

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

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

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

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

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

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

5 Strategic Flood Risk Assessments

Strategic Flood Risk Assessments (SFRA) are produced by Local Authorities in order to form the basis for preparing appropriate policies for flood risk management. The Environment Agency advise that Developers "should consult the Strategic Flood Risk Assessment prepared by your local planning authority" when preparing their design.

The site has been the subject to the London Borough of Southwark (LBS) Strategic Flood Risk Assessment dated January 2017. The key findings and recommendations from this report relating to the development site are summarised in the following section and have been used to inform the preparation of this site-specific Flood Risk Assessment.

5.1 Summary

The London Borough of Southwark commissioned Conway | AECOM to undertake the January 2017 SFRA to update the previous February 2008 SFRA utilising the new datasets that have become available in the interim. The key recommendations/ conclusions that impact the proposed development area are as follows:

- The main source of flood risk in Southwark is as a result of tidal activity within the River Thames. However, the Borough is currently protected by the Thames Tidal Defences up to the 1 in 1000 year event.
- LBS should ensure the Sequential Test is undertaken for all strategic land allocations to reduce flood risk to the allocation and ensure that the vulnerability classification of the proposed land use is appropriate to the Flood Zone classification. The Sequential and Exception Tests requirements are given in greater detail in Section 6.1. of this report.
- If development is to be constructed with less vulnerable uses at ground level or below then covenants need to be put in place to prevent future alteration of these areas to 'more vulnerable' uses without further consideration of the associated flood risk.
- Basement dwellings are classified as highly vulnerable developments and should not be permitted in Flood Zone 3. Basement access threshold levels should be at or above the 1 in 100 year flood level with climate change, and all basements must include provision of internal staircases to upper floors. Flood resilient construction techniques should be employed and consideration given to all forms of flood risk.
- All developments in the Borough will be required to incorporate Sustainable Drainage Systems (SuDS) to reduce both the volume and speed of surface water run-off unless there are practical reasons for not doing so.
- The underlying geology within Southwark is likely to impose constraints on the implementation of infiltration SuDS in many areas across the Borough. This is likely to necessitate the installation of lined systems to provide attenuation and reduction of runoff rates, requiring reuse of runoff or discharge to local surface water bodies or drainage systems.
- Developments will be expected to achieve greenfield run-off rates and at least 50% attenuation of the undeveloped site's surface water run-off at peak times, and where possible to achieve 100% attenuation.

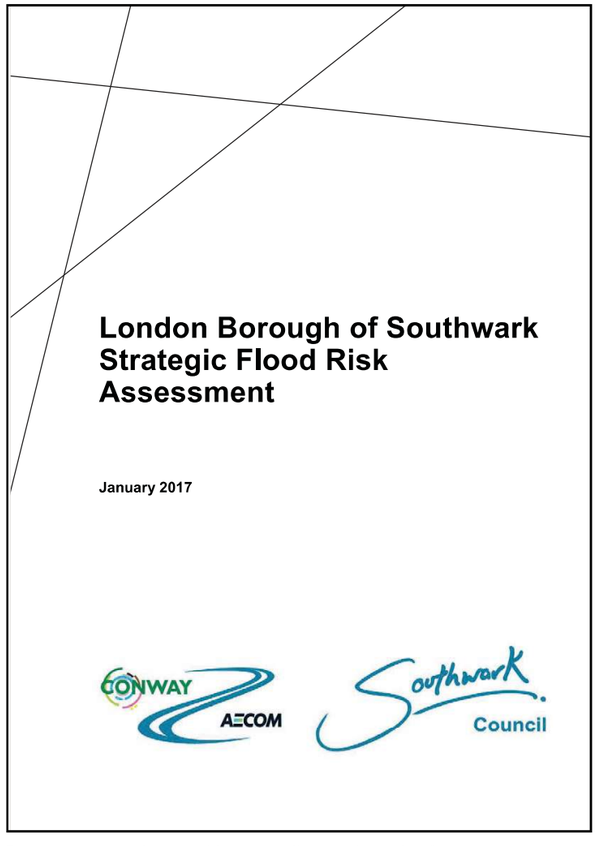


Figure 5.1 London Borough of Southwark Strategic Flood Risk Assessment

6 Sources of Flooding

In accordance with the NPPF, it is a requirement to assess the probability of flooding to the site from all potential sources. For the purposes of this assessment this has been broken down into five potential sources:

- Flooding from rivers and sea
- Flooding from sewers
- Flooding from groundwater
- Flooding from artificial sources (e.g. reservoirs and canals)
- Flooding from surface water

These sources are discussed and assessed in more detail in Sections 6.2 to 6.7 below.

Figure 6.1 Environment Agency Flood Map for Planning (Rivers and Sea)

6.1 Sequential Test

A risk-based Sequential test should be applied at all stages of the planning process. It's aim is to steer developments to areas at the lowest probability of flooding (i.e. to Flood Zone 1).

Based on the Environment Agency's "Flood Map for Planning (Rivers and Sea)" (refer to Figure 6.1), the site is located within Flood Zone 3a - an area assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%). However, the site benefits from the presence of flood defences along the River Thames. According to the Environment Agency Product 4 data (see Appendix), The Thames Barrier and associated defence system has a 1 in 1000 year standard which means it ensures that flood risk is managed up to an event that has 0.1% annual probability. This is also confirmed by the Thames Estuary 2100 (2012) report.

The proposed redevelopment of the site comprises the erection of a ground, mezzanine and 18 storey building (with plant at roof level and 3 basement levels) The lower floors will accommodate medical-related uses whilst the top floors will provide the office workspace. The basement level B1, B1 mezzanine and ground floor mezzanine will accommodate affordable workspace. The ground floor level will provide the retail areas and the lobby for the office and clinical floors will be located. The plant areas will be located at the basement levels B2 and B3 and on the top floors of the building. The existing warehouse to the south west of the site is being retained and refurbished to be used as retail and seminar spaces.

In accordance with NPPF Table 2 (reproduced below), the office, retail and affordable workspace uses are classified as **"less vulnerable"** uses. The medical use would be classed as **"more vulnerable"**.

Referring to NPPF Table 3 (reproduced below) "less vulnerable" land uses are suitable in Flood Zones 1, 2 and 3a and the "more vulnerable" uses, i.e. the medical floorspace requires the Exception Test to be applied and passed.

Flood Risk vulnerability classification (see Table 2)		**Essential Infrastructure**	**Water Compatible**	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**
Flood Zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✖	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✖	✖	✖

National Planning Policy Framework: Table 3 - Flood Risk Vulnerability and Flood Zone "Compatibility"

Essential infrastructure
- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable
- Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure").

More vulnerable
- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*

Less vulnerable
- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-compatible development
- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to a specific warning and evacuation plan.*

National Planning Policy Framework: Table 2 - Flood Risk Vulnerability Classification

6.2 Exception Test

6.2.1 Exception Test Requirements

The NPPF states that:

"The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.

If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance.

The application of the exception test should be informed by a strategic or site specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. 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.

Both elements of the exception test should be satisfied for development to be allocated or permitted.

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;
- 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."

6.2.1 Exception Test Assessment

There are a number of points that have been considered in respect of providing evidence for the Exception Test:

- The proposed development will meet relevant environmental and sustainability standards noted in national and planning policy.
- The development targets a "Very Good" score for the retail spaces and 'Excellent' score for the office spaces under the BREEAM resulting in high standards of sustainability through design and building quality, with attention given to reducing the environmental impact throughout the whole lifetime of the proposed development.
- The proposed development will provide sustainable benefits to the wider community by the reduction in volume of surface water flow in extreme rainfall events by the provision of SuDS devices.
- The EA inspect the local flood defences twice a year and confirmed that the current grade of defences in the area is 2 (good) in the Borough. These defences are maintained in good condition and are therefore unlikely to fail.
- The site is located within a Flood Warning / Flood Alert area which would alert occupiers to potential flooding allowing them to move to upper floors if necessary. Detailed consideration of emergency procedures in the event of breach of flood defences is given in Section 7 of this report.
- The more vulnerable use (medical floorspace) is located at first floor level which is above the breach event levels published by the Environment Agency (refer to Appendix D). For the less vulnerable uses at basement levels, the development will include safe access and escape routes to the ground level via internal staircases and appropriate emergency plan will be implemented (see Section 6.7.1). Because the more vulnerable use is at first floor level, well above breach levels, it is considered safe in the event of breach flooding. For the less vulnerable uses at basement level, in the event of breach flooding, finished floor levels at or above breach levels will be provided as an additional precaution, to protect the building entrances and ensure that all finished floor levels and access points to lower levels are set at or above breach level (see Appendix E). The breach levels are taken from the Environment Agency Product 4 information dated 17th of October 2018 and based upon modelled events up to 2100 to give maximum likely water levels in the event of breach with an allowance for climate change. For more detailed explanation of breach flood protection, refer to Section 7.0 of this report.

It is therefore believed that the more vulnerable uses on the site pass the requirements on the Exception Test, and should be taken into account by the Local Planning Authority.

6.3 Flooding from Rivers and Sea

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

Based on the Environment Agency's "Flood Risk from Rivers or the Sea" map (refer to Figure 6.2), the site is at very low risk - an area assessed as having less than 0.1% annual probability (1 in 1000 annual probability) of river or sea flooding.

The EA data contained in Appendix D confirms that the flood defences in the area are regularly inspected and maintained.

The Southwark SFRA also confirms that the flood defences in the area are maintained in good condition and are therefore unlikely to fail.

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

There is a probability of flooding to the development associated with a potential breach in the River Thames flood defences. This scenario is discussed in Section 7 of this report.

6.4 Flooding from Sewers

Sewer and highway drainage flooding occurs when the capacity of systems are exceeded, or the function of the system is impeded (e.g. tide locking or blockage), which results in surcharging of the system and water being forced to the surface via gullies, manholes, foul water appliances such as toilets or other dedicated overflows.

The available Thames Water record plan (Figure 6.3 below) indicates that there are a number of combined public sewers in the vicinity of the site and there is a 150mm dia. combined water sewer crossing the site in Vinegar Yard. It is intended, with the permission of Thames Water Utilities to divert the section of sewer. As all the drainage infrastructure in the area is combined, the consequences of sewer flooding may be high due to the limited inflow capacity of road drains in the event of an extreme storm. This may be worsened by blocked drains or gullies. However, the SFRA indicates that the Borough's drainage infrastructure is regularly cleaned and maintained.

Map A2 in Appendix B - 'Flooding History' in the Southwark SFRA indicates that the site falls close to but outside an area with flooding history. As a detailed check, a Sewer Flooding History Enquiry has been lodged with Thames Water who have confirmed that there is no recorded history of sewer flooding at the site (refer to Appendix B).

Using all the available evidence it is therefore considered that the site has **a low probability of flooding from sewers and the local drainage network**, as long as they continue to be adequately maintained in the future.

6.5 Flooding from Groundwater

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

MAp A5 in Appendix A - 'Areas at Risk of Flooding from Groundwater' in the Southwark SFRA confirms that the site is not located within an area with potential for groundwater flooding at surface or below ground level.

Desktop studies carried out by AKT II confirm that perched groundwater is likely to be encountered during the basement construction. The groundwater in the site is expected to be relatively shallow. It is therefore recommended that in the construction of the proposed basement, suitable protection should be offered via an appropriate waterproofing strategy as a precaution. Refer to Appendix C for an extract from the desktop study.

A suitable waterproofing strategy is to be developed by the Architect at the next design stage.

Based on this evidence, we believe that the site has **a low probability of flooding from groundwater sources** if an appropriate waterproofing strategy is implemented.

6.6 Flooding from Artificial Sources

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

The Thames Water Water Asset Map (Fig. 6.4) indicates that there are 800mm dia. trunk and 250mm dia. distribution mains running parallel to the development area in St. Thomas Street. Additionally there are a 90mm dia. distribution main located in Fenning Street, a 125mm dia. distribution main in Melior Street and a 200mm dia. distribution main running in Snowsfileds. There is also a 90 mm dia. distribution main crossing the site in Vinegar Yard. Although unlikely, a water main can burst at anytime which can result in the flooding of nearby properties.

Thames Water are currently replacing the Victorian water mains across London which will reduce the probability of water mains bursting and therefore reduce the risk of flooding to the development.

The topography of the surrounding roads suggests that flooding due to any burst would continue to flow eastward along St Thomas Street and southward along Snowsfields rather than entering the site. The surface water flooding assessment in Section 6.6 below further reinforces this conclusion.

To further reduce the flood risk from water mains, any initial sign of a burst water main should be reported to Thames Water as soon as possible and the local highway drainage system should be adequately maintained.

There are no artificial sources of flooding in the immediate vicinity of the site. Figure 6.5 shows the Environment Agency's Flood Map for Reservoirs which indicates that the site is not at risk from flooding associated with reservoirs or artificial sources.

Based on this information it is therefore considered that the site has **a low probability of flooding from artificial sources**.

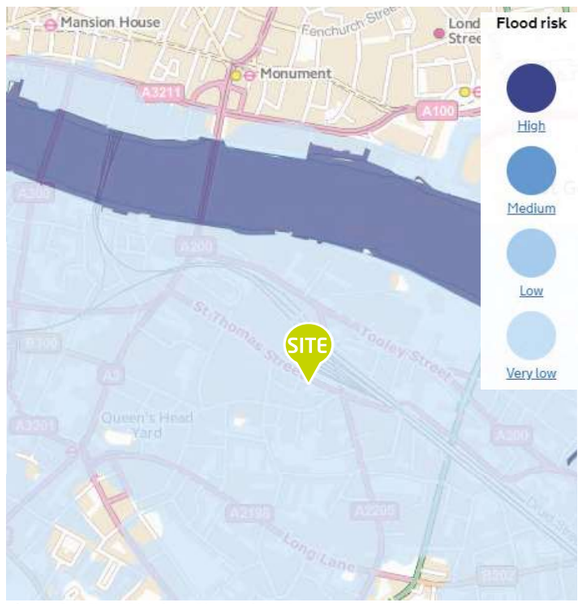


Figure 6.2 Flood Risk from Rivers of the Sea

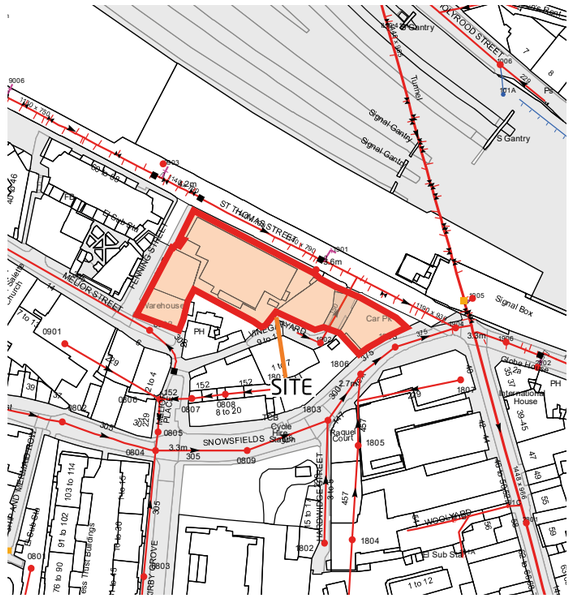


Figure 6.3 Thames Water Asset Record - Sewers

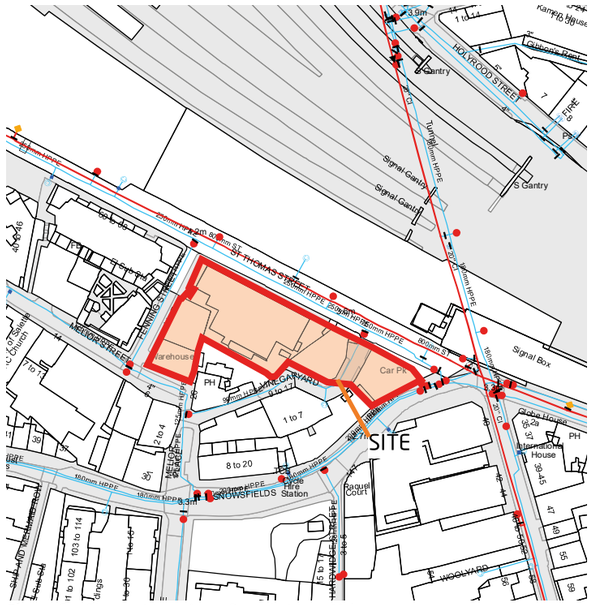


Figure 6.4 Thames Water Asset Record - Water Mains

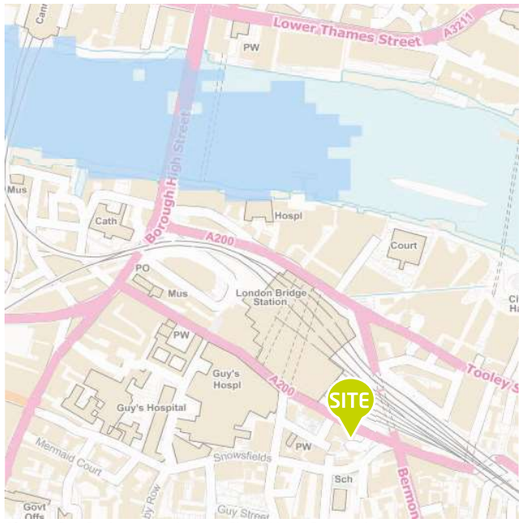


Figure 6.5 Environment Agency Flood Map - Reservoirs

6.7 Flooding from Surface Water

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

As the surrounding area is highly developed it almost entirely comprises of impermeable hardstanding area which, during high intensity storms, will generate large surface water runoff flows. Map A4 'Flood Map for Surface Water' of the SFRA (Appendix A) shows that the site is located within an area identified as a Critical Drainage Area.

The Environment Agency's Risk of Flooding from Surface Water map indicates that the eastern part of the site where Vinegar Yard crosses the site has low probability of surface water flooding but the surrounding roads have a low to high probability of flooding.

The Environment Agency provide further maps which break down this flooding into probabilities ranging from "High" to "Very Low" probability of occurring where "High" is a greater than 1 in 30 (3.3%) chance of occurring, "Medium" is a between 1 in 30 (3.3%) and 1 in 100 (1%) chance of occurring, "Low" is a between 1 in 100 (1%) and 1 in 1000 (0.1%) chance of occurring and "Very Low" is a less than 1 in 1000 (0.1%) chance of occurring. Refer to Figure 6.13 for the Flood Risk from Surface Water map.

- The "High" probability maps in Figs. 6.6 & 6.7 indicate that there is no surface water flooding on the site. A small area of shallow, slow moving flood water is noted south east of the site on Snowsfields towards Hardwidge Street (generally less than 900mm deep and less than 0.25 m/s).
- The "Medium" probability maps in Figs. 6.8 & 6.9 show that the site is still clear of flooding. The extent of the flooding to the south east of the site on Snowsfields has increased but remains generally shallow (less than 300mm deep) with generally velocity less than 0.25 m/s. There is also a potential for small shallow patch of slow moving water south of the site in Vinegar Yard (less than 300mm deep and less than 0.25 m/s).

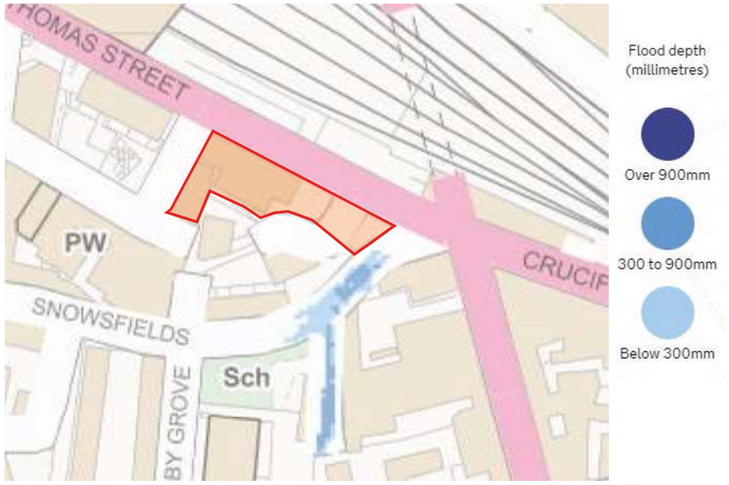


Figure 6.6 Environment Agency's Flooding from Surface Water Map (High Probability - Depth)

Figure 6.7 Environment Agency's Flooding from Surface Water Map (High Probability - Velocity)

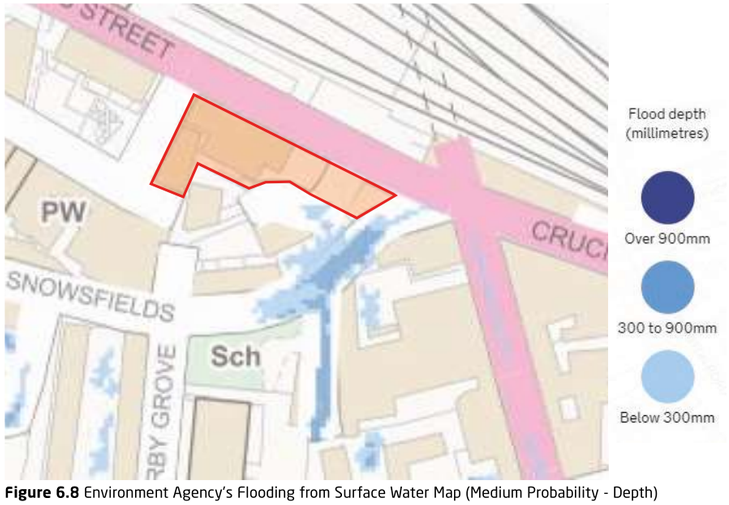


Figure 6.8 Environment Agency's Flooding from Surface Water Map (Medium Probability - Depth)

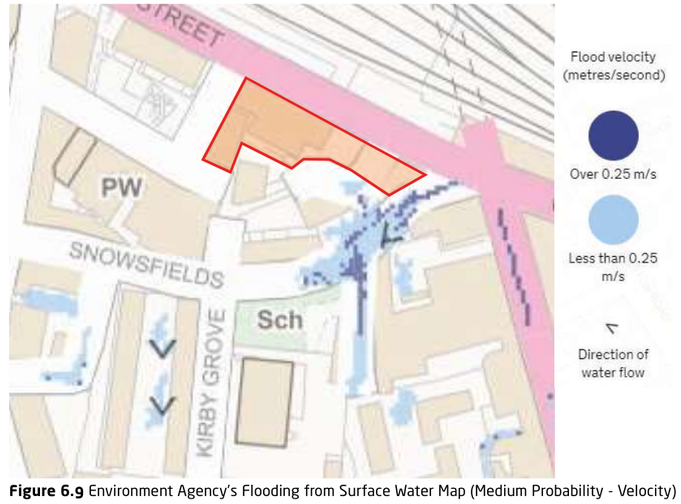


Figure 6.9 Environment Agency's Flooding from Surface Water Map (Medium Probability - Velocity)

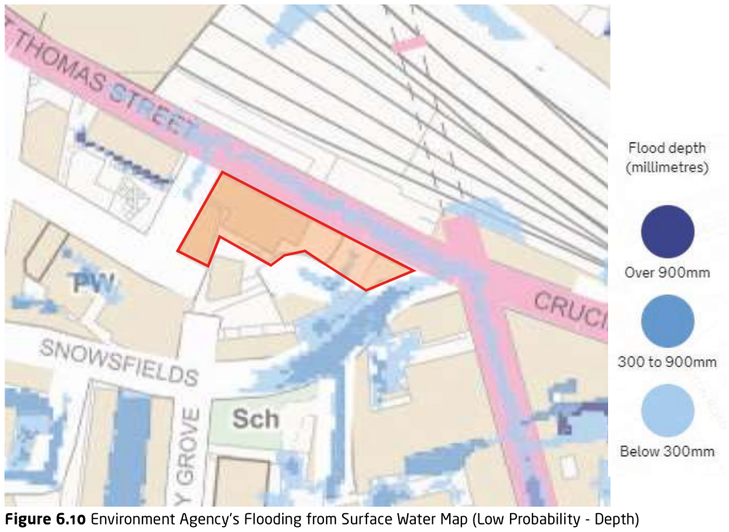


Figure 6.10 Environment Agency's Flooding from Surface Water Map (Low Probability - Depth)

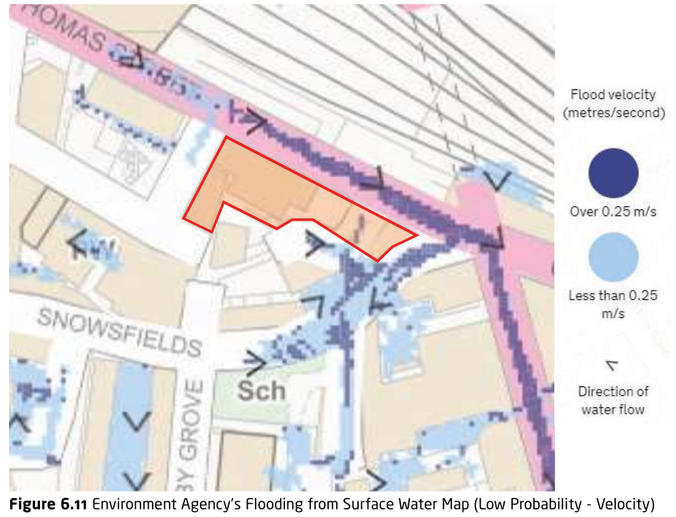


Figure 6.11 Environment Agency's Flooding from Surface Water Map (Low Probability - Velocity)

- The "Low" probability maps in Figs. 6.10 and 6.11 show localised flooding on eastern part of the site where Vinegar Yard crosses the site. However, this is shallow (less than 300mm deep) with a velocity generally less than 0.25 m/s. This road will be removed in the new scheme as it is proposed to have an external landscaped area that will be drained by a new drainage system. The flooding indicated extends to the along whole of St Thomas Street (less than 300mm deep and more than 0.25 m/s) and to a part of Fenning Street (less than 300mm deep and less than 0.25 m/s). The flooding to the south in Vinegar Yard and to the south east of the site on Snowsfields has increased remaining less than 900mm deep with a velocity over 0.25 m/s.

In summary, the flooding associated with the existing internal road crossing the site in Vinegar Yard will be mitigated by its removal in the proposed scheme.

There is a probability of surface water flooding from St Thomas Street, Fenning Street and Snowsfields. It is recommended that a detailed review of the level relationship between the access points to the building are carried out at the next design stage.

Possible mitigation measures may include:

- Elevated access to the basement
- Drop down/raise up automatic flood barrier
- Temporary flood barriers

It is considered that implementation of any of the recommended measures will reduce the probability of the surface water flooding to low.

Also refer to the recommendations given in Section 7.0 of this report regarding breach protection.

6.7.1 Safe Access

The occupiers could safely remain in the buildings during any flood in the surrounding area without endangering themselves.

In the event that occupiers do wish to leave the site during flood events, the EA and Defra published FD2321/TR2 "Flood Risks to People" in March 2006. Guidance Note 2, Figure 6.12 provides details on combinations of flood depth and velocities that cause danger to people. This table shows that people can become endangered in shallow but fast moving water through to still but deep water (refer to Fig. 6.12).

From the Environment Agency Surface Water Flooding Maps discussed above, the maximum depth of water could potentially exceed 300mm to south east of the site on Snowsfields towards Hardwidge Street. However, the area on St Thomas Street and Fenning Street is subject to shallow flood water which is less than 300mm deep and over 0.25 m/sec. According to Figure 6.12 this situation presents a very low hazard to people so the occupiers could exit the building on this elevation and walk westward in order to reach dry ground on Fenning Street towards Melior Street. These routes are indicated in Figure 6.13 for reference.

In addition to the escape route, Map A9 of the Southwark SFRA contained in Appendix B confirms that the site is located within a **Flood Warning / Flood Alert area** meaning that occupiers would be given advance warning by the building management team of potential flood events and therefore choose their escape route prior to the event.

We would recommend that the building owner signs into/registers to receive Environment Agency warning alerts.

	Depth (m)																
Velocity (m/s)	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.6	0.75	0.80	1.00	1.25	1.50	1.75	2.00	2.25	2.50
0.00	0.53	0.55	0.60	0.63	1.15	1.20	1.25	1.30	1.38	1.40	1.45	1.50	1.63	1.75	1.88	2.00	2.13
0.10	0.53	0.56	0.62	0.65	1.18	1.24	1.30	1.36	1.45	1.48	1.54	1.60	1.75	1.90	2.05	2.20	2.35
0.30	0.54	0.58	0.66	0.70	1.24	1.32	1.40	1.48	1.60	1.64	1.72	1.80	2.00	2.20	2.40	2.60	2.80
0.50	0.55	0.60	0.70	0.75	1.30	1.40	1.50	1.60	1.75	1.80	1.90	2.00	2.25	2.50	2.75	3.00	3.25
0.75	0.56	0.63	0.75	0.81	1.38	1.50	1.63	1.75	1.94	2.00	2.13	2.25	2.56	2.88	3.19	3.50	3.81
1.00	0.58	0.65	0.80	0.88	1.45	1.60	1.75	1.90	2.13	2.20	2.35	2.50	2.88	3.25	3.63	4.00	4.38
1.50	0.60	0.70	0.90	1.00	1.60	1.80	2.00	2.20	2.50	2.60	2.80	3.00	3.50	4.00	4.50	5.00	5.50
2.00	0.63	0.75	1.00	1.13	1.75	2.00	2.25	2.50	2.88	3.00	3.25	3.50	4.13	4.75	5.38	6.00	6.63
2.50	0.65	0.80	1.10	1.25	1.90	2.20	2.50	2.80	3.25	3.40	3.70	4.00	4.75	5.50	6.25	7.00	7.75
3.00	0.68	0.85	1.20	1.38	2.05	2.40	2.75	3.10	3.63	3.80	4.15	4.50	5.38	6.25	7.13	8.00	8.88
3.50	0.70	0.90	1.30	1.50	2.20	2.60	3.00	3.40	4.00	4.20	4.60	5.00	6.00	7.00	8.00	9.00	10.00
4.00	0.73	0.95	1.40	1.63	2.35	2.80	3.25	3.70	4.38	4.60	5.05	5.50	6.63	7.75	8.88	10.00	11.13
4.50	0.75	1.00	1.50	1.75	2.50	3.00	3.50	4.00	4.75	5.00	5.50	6.00	7.25	8.50	9.75	11.00	12.25
5.00	0.78	1.05	1.60	1.88	2.65	3.20	3.75	4.30	5.13	5.40	5.95	6.50	7.88	9.25	10.63	12.00	13.38

Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification
< 0.75		Very low hazard - Caution
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm
1.25 to 2.00		Danger for most – includes the general public
> 2.00		Danger for all – includes the emergency services

Figure 6.12 FD2321/TR2 "Flood Risk to People" Extract

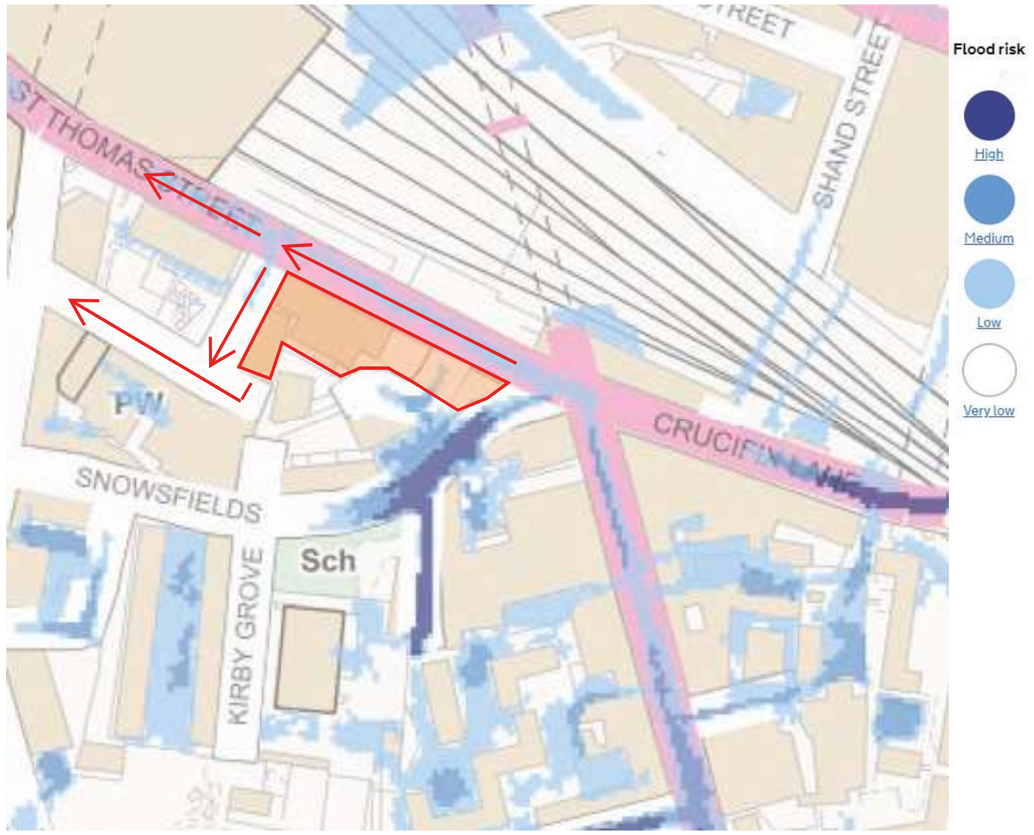


Figure 6.13 Safe access route

7 EA Breach Modelling

7.1 Thames Tidal Breach Modelling

The Environment Agency have provided the modelled flood extents from their 'Thames Tidal Upriver Breach Inundation Modelling Study 2017' completed by Atkins Ltd in May 2017. These levels are based upon the unlikely event of Thames defences being breached.

The modelled breach extent in Figure 7.1 and Table 1 confirm that the site would be impacted by the breach of the flood defences and the resulting maximum flood level given is 4.39m on north west corner (St Thomas Street) and 3.69m on south east corner (Vinegar Yard).

Comparison of the site topographic survey and the modelled inundation flood level mentioned above indicates that the site would be impacted by a maximum depth in excess of 0.658m on the southern side of the site where Vinegar Yard enters the site at node 9.

From the road levels taken from Figure 7.2 below it is possible to note that St Thomas Street on north west corner (4.2m AOD) would be impacted by a maximum depth of 0.19m at node 2 and Vinegar Yard on south east corner (3.6m AOD) would be impacted by a maximum depth of 0.09m at node 6.

The Environment Agency have confirmed that the site is within an area benefiting from flood defences. The flood defences are inspected twice a year to ensure that they remain fit for purpose. The current condition grade for defences in this area is 2 (good), on scale of 1 (very good) to 5 (very poor). Therefore, the probability of a breach occurring is minimal.

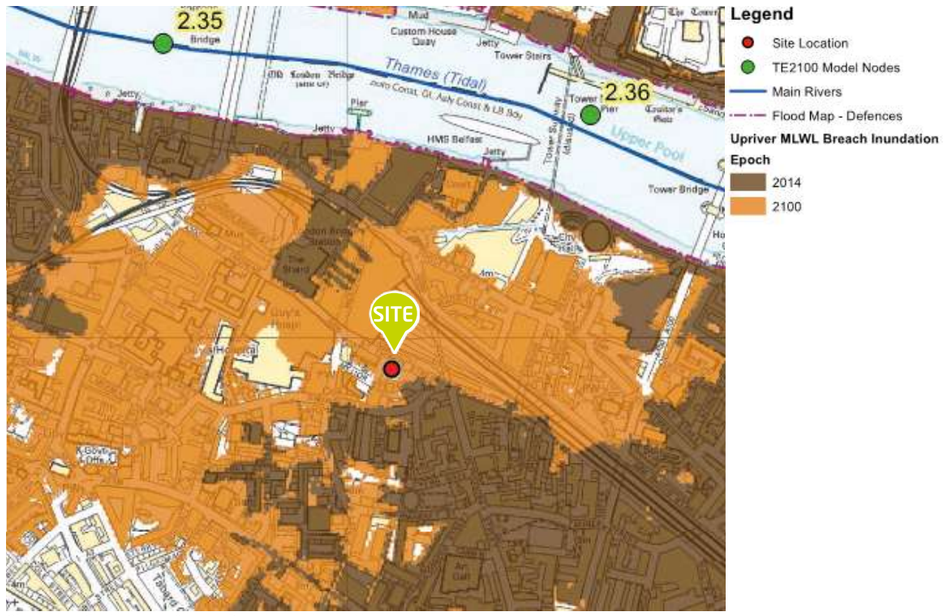


Figure 7.1 Environment Agency Breach Inundation Map

7.2 Mitigation Measures

- The more vulnerable use (medical floorspace) is located at first floor level which is above the breach event levels published by the Environment Agency (refer to Appendix D). For the less vulnerable uses at basement levels, the development will include safe access and escape routes to the ground level via internal staircases and appropriate emergency plan will be implemented (see Section 6.7.1). Because the more vulnerable use is at first floor level, well above breach levels, it is considered safe in the event of breach flooding. For the less vulnerable uses at basement level, in the event of breach flooding, finished floor levels at or above breach levels will be provided as an additional precaution, to protect the building entrances and ensure that all finished floor levels and access points to lower levels are set at or above breach level (see Appendix E). The breach levels are taken from the Environment Agency Product 4 information dated 17th of October 2018 and based upon modelled events up to 2100 to give maximum likely water levels in the event of breach with an allowance for climate change. Refer to Table 1 below for reference.
- The building managers will be registered with the EA Flood Warning System and the Flood Warning and Evacuation Plan will be developed.
- The proposed development does not contain any habitable areas at ground floor and basement levels. The occupants/ building users could safely evacuate to mezzanine level via internal staircases and safely remain inside the building.
- It is recommended that permanent flood resilience is included within the design of the building entrances in order to prevent flood water entering the property and causing damage. This would mitigate the potential cost and time of a post-flood recovery of the building.
- Due to the probability of the surface water flooding in St Thomas Street and Vinegar Yard, it is recommended that the protection of the basement is a permanent fixture capable of protecting to a minimum level of 4.39m AOD at the junction between St Thomas Street and Fenning Street and to a minimum of 3.69m AOD in Vinegar Yard. This protection would be achieved by setting the finished floor levels at or above breach levels.
- Flood Resilient Measures. As per LBS Sustainable Design and Construction Supplementary Planning Document (2009), AKT II recommends that during construction the opportunity be taken to adopt flood resilient design techniques on the ground floor and basement, and to allow for the removal of water from the basement in the event of inundation. Resilient construction measures would reduce/remove the impact of a flood event on the structure of the building. The following has been identified as possible option for inclusion at this site:
  - Locate a sub-surface sump in the basement for pumped removal of floodwater from any source;
  - Use of flood resistant building materials;
  - Use of solid concrete floors instead of timber flooring;
  - Use of water resistant wall coatings;
  - Use of water resistant plasters, including water resistant render, lime-based plaster finishes, ceramic tiles and hydraulic lime coatings;
  - Use of horizontally laid plasterboard;
  - Use of galvanized and stainless steel fixings;
  - Use of treated wood instead of MDF or softwoods;
  - Install non-return valves on the drainage outlets of the building, especially those from the basement; and
  - Raising electrical wiring above ground levels, where practicable.

Additionally, the buildings should be designed to accept the flow of water through passageways and to drain water after flooding, particularly the basement. Furthermore, access should be available to all spaces to permit drying and cleaning after a flood event.

- Flood Resistant Construction. Sub-stations and plant are proposed at basement levels. The sub-stations and plant are contained in areas that are resistant to breach floodwater by protection by raised ground floor levels.
- Access points to the basement threshold are at or above the 2100 year maximum water level in accordance with section 2.2.2 of Southwark Council 'Basement and flooding guide for developers'.

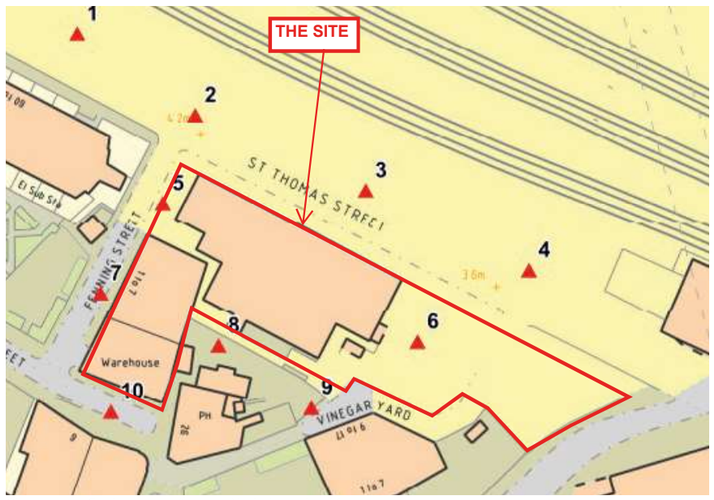


Figure 7.2 Environment Agency Node Location Map

Node	National Grid Reference		Modelled levels in mAODN for Max Likely Water Level	
	Easting	Northing	2014	2100
1	533050	179986	Nil return	4.43
2	533073	179970	Nil return	4.38
3	533107	179955	Nil return	4.12
4	533139	179940	Nil return	3.83
5	533067	179953	Nil return	4.39
6	533117	179926	Nil return	3.69
7	533055	179935	Nil return	4.38
8	533078	179925	Nil return	3.76
9	533096	179913	3.34	3.69
10	533057	179912	Nil return	4.13

Table 1 Site-specific modelled breach flood levels

8 Run-off Assessment

8.1 Existing Buildings / Uses

The available Thames Water record plans indicate that the closest surface water or combined public sewers to the site are:

- A 305mm diameter combined sewer in Melior Street to south-west of the site.
- A 375mm diameter combined sewer in Snowsfields to the east of the site.
- A 1140 x 790mm combined sewer under St Thomas Street to the north of the site becoming 1190 x 930mm at the junction with Snowsfields.
- A 150mm diameter combined sewer to the south crossing the site in Vinegar Yard and connecting into the 1140 x 790mm combined sewer in St Thomas Street.

An extract from the record plans is shown in Figure 8.1 for reference.

The site comprises of an irregular shaped plot of land located in the Borough of Southwark City Council, in the London Bridge Area.

The majority of the site is currently being used as car park area with a small security cabin located on the eastern side.

The site comprises also of a low rise industrial building located at 1-7 Fenning Street and 9 Fenning Street. This is a two storey brick warehouse with a concrete ground floor which provides approximately 848 m² (GIA) of light industrial with ancillary office and storage floorspace (B1). The majority of the site was previously used as a work space for Network Rail in connection with the development works at London Bridge.

Details of existing private drainage including outfalls from the applicant site are not known and need to be confirmed by carrying out a CCTV drainage survey. Therefore, it is recommended that a CCTV survey of the existing drainage network is undertaken in order to confirm the location, size, levels and condition of all existing surface water connections from the site and to identify if there are any third party connections from the adjacent properties which will need to be considered in the proposed scheme.

The total site area is approximately 2,300m² which is 100% hardstanding.

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

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

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

For the peak 1-in-1-year return period storm event this gives an existing discharge rate from the site of:

$\mathbf{Q_1}$ = 3.61 × 0.75 × 0.23 × 32.4 = **20.2 litres/sec**

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

$\mathbf{Q_{100}}$ = 3.61 × 0.75 × 0.23× 103.2 = **64.2 litres/sec**

8.2 Proposed scheme

The proposed redevelopment of the site comprises the demolition of existing buildings, retention and the refurbishment of the warehouse and the erection of a ground, mezzanine and 18 storey building (with plant at roof) and 3 basement levels, comprising of café and community space within the warehouse and within the new building office, flexible medical and research and development, and flexible retail and affordable workspace, alongside cycle and disabled car parking, servicing, refuse and plant areas, public garden (including soft and hard landscaping), highway improvements and all other associated works.

The plans indicate that the site area within red boundary is approximately 2,300 m² and comprises of 93% hardstanding. It is proposed to have a soft landscaped area to the east of the site which will improve the sustainability of the development and help to reduce the peak surface water runoff from the site during smaller storm events. However, in large storm event the impact will be negligible and so it is assumed that site area is 100% impermeable.

The yellow shaded areas in Figure 8.1 are public realm areas and it is not intended to attenuate these areas within the development.

Using the Modified Rational Method, the proposed (unattenuated) peak run-off from the site for the 1-in-1-year return period storm would be:

$\mathbf{Q_1}$ = 3.61 × 0.75 × 0.23 × 32.4 = **20.2 litres/sec**

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

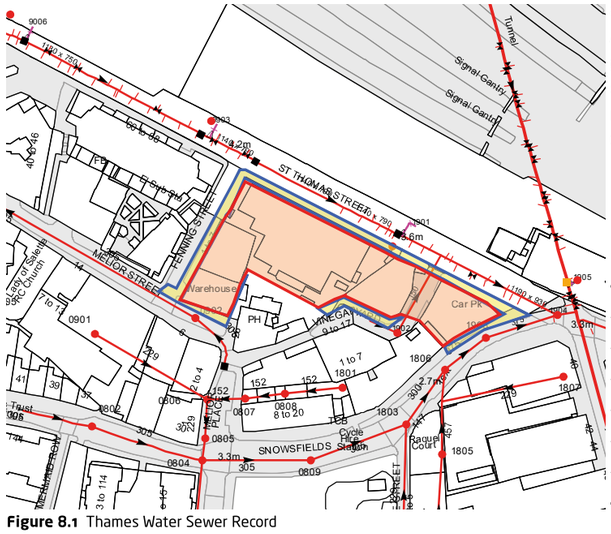


Figure 8.1 Thames Water Sewer Record

$\mathbf{Q_{100}}$ = 3.61 × 0.75 × 0.23 × 103.2 = **64.2 litres/sec**

The Environment Agency updated their guidance on climate change allowance in February 2016 to include an upper and lower allowance to be considered depending on the specific site characteristics. Table 8.1 on page 16 shows the revised figures based on various building life spans. Therefore, making an allowance for climate change of 40% this would give an unattenuated design discharge of:

$\mathbf{Q_{1\,(+40\%)}}$ = **28.3 litres/sec** and $\mathbf{Q_{100\,(+40\%)}}$ = **89.9 litres/sec**

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

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

Therefore, as an absolute minimum, the proposed site discharge under the 1-in-100-year storm plus climate change should be no greater than the existing 1-in-100-year storm discharge (i.e. mitigate the impact of climate change and any increase in the area of hardstanding). In this case, this would mean that the maximum permissible discharge from the site would be **64.2 litres/sec**.

Further to the above, the recently publicshed new London Plan's Policy SI 13 on Sustainable drainage states that "Development proposals should aim to get as close to greenfield run-off rates as possible depending on site conditions". The Environment Agency (EA) also suggests that Developers should aim to achieve greenfield run off from their site. In accordance with the method outlined in the Institute of Hydrology Report 124, the Greenfield runoff for the site is calculated from the formula:

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

Manhole reference	Manhole cover level	Manhole invert level
0902	0.72 m	n/a
1902	n/a	n/a
1806	2.631 m	-1.581 m
1903	2.91 m	-0.92 m
1904	3.178 m	-1.581 m
1901	4.142 m	-1.028 m
1903	4.132 m	-1.038 m

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

Q_{BAR} = 0.00108 × 0.500$^{0.89}$ × 600$^{1.17}$ × 0.45$^{2.17}$ = **183.4 litres/sec (for 50ha)**

Scaling this for the actual site area gives:

Q_{BAR} = (183.4 × 0.23) ÷ 50 = **0.84 litres/sec**

Using the Hydrological Growth Curve for south east England, the growth factor from Q_{BAR} to Q_{100} is 3.146 which gives a value for **Q_{100} =2.65 litres/sec.**

As the project is new build we would expect that based on our recent experience in the borough, the Local Authority, Thames Water, and the EA would require the storm water discharge to be limited to the greenfield run-off rate of **2.65 litres/sec**. A Pre-Planning Enquiry was sent to Thames Water Utilities on this basis on 11.10.20 and their response was received on 16.11.20 confirming the restricted surface water discharge of 2.65 litres/sec is acceptable (see Appendix 2 of the Drainage Assessment report).

As previously mentioned, details of existing private drainage including outfalls from the site to the public network are not known and need to be investigated. At this stage an allowance for three new sewer connections into the surrounding public sewers (one in St Thomas Street, one in Melior Street and one in Snowfields) should be made in case the existing connections are not in re-usable condition as indicated in the Strategic Drainage Layouts which can be found in Appendix 1 of the Drainage Assessment report. Sewer outfalls are to be positioned above the surcharge levels of the public sewers. At the next stage of the design AKTII will need to consult Thames Water with regard to any potential new sewer connections to the sewer in St Thomas Street, should the CCTV survey prove that existing connections are not viable for re-use. There is a risk that new connections would be subject to a Section 98 application which can take up to 12 months and is very expensive and also requires that Thames Water contractors carry out the sewer connection works on behalf of the Client.

Section 8.3 discusses the potential approaches that can be taken to meet these requirements.

Range	Total potential change anticipated for 2010-2039	Total potential change anticipated for 2040-2059	Total potential change anticipated for 2060-2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Table 8.1 Peak rainfall intensity allowance

8.3 Disposal methods

SUDS management train

A useful concept used in the development of sustainable drainage systems is the SUDS management train (sometimes referred to as the treatment train). Just as in a natural catchment, drainage techniques can be used in series to change flow and quality characteristics of the runoff in stages. There are a variety of measures that can be implemented to achieve these goals:

Site management / Prevention

Site management procedures are used to limit or prevent runoff and pollution and include:

- Minimising the hardened areas within the site
- Frequent maintenance of impermeable surfaces
- Minimising the use of de-icing products

Source control

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

Site control

Where source control techniques do not provide adequate protection to the receiving watercourses in terms of flood protection and pollution control, site control may be required.

Regional control

Where large areas of public space are available regional control can be incorporated to provide additional 'communal' storage and treatment to runoff from a number of sites. However, in this case, all storage and treatment will be implemented on site.

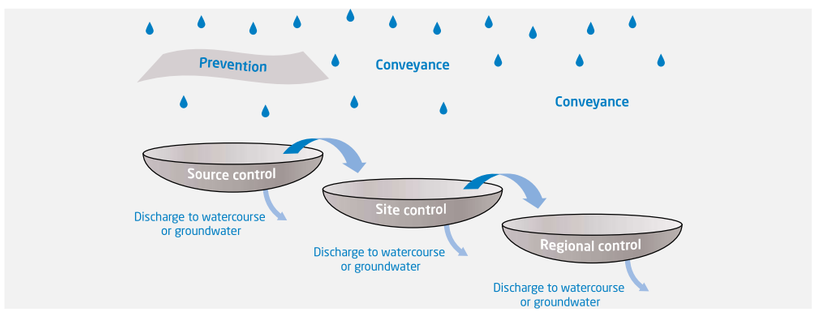


Figure 8.2 SUDS management train

Drainage hierarchy

Based on the above, the following drainage hierarchy, in accordance with The London Plan 2021 Policy SI 13 on sustainable drainage, will therefore need to be considered when preparing the surface water disposal strategy:

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

The London Plan 2021 also states that "rainwater should be managed as close to the top of the hierarchy as possible" and that "there should be a preference for green over grey features, and drainage by gravity over pumped systems.'

Rainwater harvesting

This involves the capture of rainwater into a tank for re-use (usually non-potable) such as irrigation, toilet flushing or vehicle cleaning. Systems are now available which combine rain water harvesting with tanked attenuation. This means that water is stored during dry periods for re-use but released ahead of predicted storms in order to ensure that the full attenuation capacity remains available when it is needed.

As the project is a new build, it should be possible to install a rainwater harvesting system where roof water could be collected for re-use to flush toilets or irrigate planted areas. Its use should therefore be investigated further at the next design stages to determine its suitability in terms of the plant space requirements, the need for a secondary water distribution network, the available yield and demand.

Green / brown / blue roofs

These are used on flat or shallow pitched roofs to provide a durable roof covering which also provides thermal insulation, amenity space and biodiversity habitat as well as attenuation of rainwater. Depending on the design, these roofs can attenuate differing volumes of rainwater. The term 'blue roof' is reserved for those roofs designed to maximise water retention. This is a relatively recent area of increased focus and can involve an attenuation tank at roof level which reduces (or avoids) the need for pumping of basement tanks.

It is not proposed to include green roofs at terrace level, but it is intended to incorporate some trees and plants to improve biodiversity of the development and to limit the run-off volume of rainwater through short-term attenuation and evaporation.

It is proposed that blue roofs are incorporated into the scheme. The volume of attenuation required is provided in the 'storage tanks' section of this report.

Raingardens

Raingardens are planted areas (usually close to buildings but not immediately adjacent) that allow the diversion of a portion of rainwater from either downpipes or the surrounding paved surfaces. These techniques can be incorporated into the landscaping plans for a site and are most effective where the landscaping regime is designed with the aim of capturing as much rainfall as possible. They can either allow infiltration into the ground or have tanked systems for water retention, depending on the site and soil conditions. There are also a number of vertical raingardens attached to building walls with rainwater downpipes diverted through a stacked series of planters.

As the proposed structure takes up the majority of the site area it is not possible to incorporate raingardens into the scheme.

Bio-retention

This refers to a chain of landscaped features, potentially including reed beds, filter drains, etc. designed to hold and treat surface water. They are often used where there is a high risk of low-level pollution, for example from road run-of. However, it does require areas of open space. The design of a bio-retention system can vary widely depending on site conditions and available space. At a small scale this could include flow through planters or tree pits.

As the proposed structure takes up the majority of the site area it is not possible to incorporate bio-retention into the scheme.

Permeable surfacing

Permeable hard surfaces which work in much the same way as traditional impermeable surfaces apart from the ability to allow rainwater to pass through. Permeable blocks are traditionally used but there are now a range of permeable asphalt and resin bound gravel pavings being used increasingly commonly.

Permeable surfaces can either allow infiltration into the ground or have tanked systems for water retention, depending on the site and soil conditions. They are suitable in even the most densely built-up development. However, they're not well suited to roads carrying heavy or fast motor traffic.

The Landscape Architects proposals do not include permeable paving systems in the scheme.

Swales

These are dry ditches used as landscape features to allow the storage, carriage and infiltration of rainwater and are often used as linear features alongside roads, footpaths or rail lines. They can also be integrated into the design of many open spaces.

As the proposed structure takes up the majority of the site area it is not possible to incorporate swales into the scheme.

Detention basin / ponds

These are landscape features designed to store and in some cases infiltrate rainwater. Detentions basins are usually dry, whereas a pond should retain water. These features need areas of open space but can often be combined with other sustainable drainage techniques.

As the proposed structure takes up the majority of the site area it is not possible to incorporate ponds into the scheme.

Discharge to tidal river / dock / canals

Discharging clean rainwater directly to tidal rivers, canals or docks isn't normally a sustainable drainage technique. Other more productive techniques should be used first. However, it is generally more sustainable than discharging to the combined or surface drainage systems. Residual surface water can be discharged to tidal / large waterbodies, in some cases with no limitation on volumes. Some storage may be required to allow for outfalls becoming tide locked. Care is needed to prevent scour (sediment removal) in the receiving waterbody and potentially to prevent pollution. Consent from the EA, the asset owner and (where applicable) the Canal and River Trust is required.

There are no adjacent rivers or ponds and so discharge to a watercourse will not be a viable disposal method.

Storage tanks

Storage tanks are single GRP (glass reinforced plastic) units usually but not necessarily located below ground level which attenuate rainwater for later slow release back into the drainage system but do not provide the wider benefits of green infrastructure sustainable drainage. They can also have the disadvantage that pumping may be required to empty the tank into the drainage system – especially if the tank is located at or below basement level. Where tanks are designed for large storm events, care is needed to ensure that they still perform a useful sustainable drainage function for low order storms.

Geocellular storage tanks are similar to storage tanks except that the volume is made up from multiple units rather than a single tank meaning they can be more flexible in terms of shape to suit constrained sites.

It is proposed that geo-cellular tanks are introduced as a form of attenuation below the ground level to the east of the site and below the Warehouse ground floor finished floor level to the south of the site.

It is believed that the most feasible disposal option for the site is to discharge to the existing public sewers utilising the existing or new outfalls. The approximate storage volume required for greenfield rate of **2.65 litres/sec** under the 1-in-100-year (plus 40 % climate change) storm event from the building is **150 m³**.

It is recommended that at this stage a cost and space allowance is made for the storage volume of **150 m³** in order to limit the discharge rates to the Greenfield run-of rate of **2.65 l/sec** in line with Policy SI 13 of The London Plan 2021. An additional 10% freeboard within the blue roofs is to be provided to meet the LBS requirements.

The proposed attenuation features for the main building will comprise blue roof systems covering part of the roof terraces and a geo-cellular tank located below the landscaped area to the east of the site. The proposed attenuation strategy for the existing Warehouse building to the south-west of the site will consist of a small geo-cellular tank with a storage volume of 15m³ located below the ground finished floor level. The intention is to accommodate the majority of the required attenuation volume at roof utilising blue roof systems. Any volume that cannot be accommodated at roof will be provided in a geo-cellular storage tank located below the ground level in order to allow gravity discharge into the public sewer. The proposed discharge rates and volumes will be determined at the next design stage. Provision of non-return valves at outfall points is to be confirmed during the next design stage.

Oversized piping

Using larger than necessary pipework creates more room to store rainwater. This would be potentially more sustainable than storage tanks / geocellular storage (modular attenuation tank) if the pipes drain by gravity and do not require pumping. However, this option lacks the wider benefIts of the green infrastructure based techniques.

Due to the restricted nature of the site the pipework would become impractically large to provide the volume of storage required to achieve the required run-of rate.

Design for exceedance

This involves designing areas within a site such that they will flood and hold water during rare storm events (typically a frequency of once in ten years or longer).

As the attenuation volume has been sized to accommodate the 1-in-100-year plus climate change event there is no need to design for exceedance.

Summary of the proposed SuDS strategy

The intention is to accommodate the majority of the required attenuation volume for the main building at roof utilising blue roof systems. Any volume that cannot be accommodated at roof will be provided in a geo-cellular storage tank located below the ground level in the landscaped area to the east of the site in order to allow a gravity discharge into the public sewer. The proposed discharge rates and associated storage volumes will be determined at the next design stage. The intention is also to accommodate a small geo-cellular tank with a volume of 15m³ below the ground finished floor level of the existing Warehouse building to allow gravity discharge into the public sewer running in Melior Street. The discharge rate will be agreed with Thames Water by a way of submitting a pre-planning enquiry. A pre-planning enquiry was sent on 11.11.20, Thames Water responded on 16.11.20 confirming that a restricted discharge rate of 2.65 litres/sec into the public sewer from the development is acceptable (see Appendix 2 of the Drainage Assessment report).

Three options have been considered in terms of surface water attenuation strategy and they will need to be further investigated at the next stage of the design (see Appendix 1 of the Drainage Assessment report). Options A and B are based on a combination of blue roof systems covering a portion of roof terraces and geo-cellular tanks below ground level in order to limit the discharge rate to the Greenfield run-of rate of **2.65 l/sec** in line with Policy SI 13 of The London Plan 2021. Option C is considered as a secondary option and it is based on blue roof systems covering all the roof terraces (except for new level 13th terrace) in order to attenuate the majority of the main building catchment area. The remaining landscaped area and the existing Warehouse building will be attenuated via two small tanks located below the ground level. It is worth mentioning the fact that this option will be in line with LBS requirements to maximise the use of blue roof systems, but on the other hand the greenfield runoff will be exceeded (from 2.65 litres/sec to 4 litres/sec).

Element	Management stage	Water quantity	Water quality	Amenity & biodiversity	Possible in scheme
Rainwater harvesting	Prevention	✓	×	×	✓
Green/brown/ blue roof	Source control	✓	✓	✓	✓
Raingardens	Source control	✓	✓	✓	×
Bio-retention	Source control	✓	✓	✓	×
Permeable surfacing	Source control	✓	✓	×	×
Swales	Source control	✓	✓	✓	×
Detention basin/ponds	Source control	✓	✓	✓	×
Discharge to tidal river / dock / canals	Site control	✓	×	×	×
Storage tanks/ Geocellular storage	Site control	✓	×	×	✓
Oversized pumping	Site control	✓	×	×	×
Design for exceedance	Site control	✓	×	×	×

Figure 8.3 Summary of potential SuDS devices

Option A

This will comprise of blue roof systems covering a portion of level 17th, 15th, 10th and 8th roof terrace, resulting in a total volume of 43m³ and in a gravity discharge into the public sewers. The remaining volume will be provided via a storage tank located below ground level in the landscaped area to the east of the site with a total volume of 100m³ and a small geo-cellular tank located below the ground finished floor level of the existing Warehouse building with a volume of 15m³ to allow a gravity discharge into the public sewers.

Option B

This will comprise of blue roof systems covering a portion of level 15th, 10th and 8th roof terrace, resulting in a total volume of 17m³ and in a gravity discharge into the public sewers. The remaining volume will be provided via a storage tank located below ground level with a total volume of 118m³ in the landscaped area to the east of the site and a small geo-cellular tank located below the ground finished floor level of the existing Warehouse building with a total volume of 15m³ to allow gravity discharge into the public sewers.

Option C

This will comprise of blue roof systems covering a portion of all the roof terraces (level 19th, 17th, 15th, 10th and 8th) except for new level 13th where it is intended not to have blue roof resulting in a total volume of 94m³ and in a gravity discharge into the public sewers. The remaining catchment area will be attenuated via a storage tank located below ground level in the landscaped area to the east of the site with a total volume of 42m³ and a small geo-cellular tank located below the ground finished floor level of the existing Warehouse building with a total volume of 15m³ to allow gravity discharge into the public sewers. This option is based on the majority of the main building being attenuated via blue roof systems covering all roof terraces (except for new level 13th terrace) and on the assumption that the maximum allowable discharge in the sewer of 4 litres/sec can exceed the greenfield run-off rate of 2.65 litres/sec.

The surface water attenuation strategy is based upon three new outfall gravity connections into the public sewer: one in Melior Street for the existing Warehouse building, one in St Thomas Street for the blue-roof outfall discharge and one in Snowfields for the geo-cellular tank outfall discharge. If the CCTV drainage survey at the next stage of the design will prove that the existing 150mm dia. public sewer running through the site can be divested and the outfall into the public sewer running in St Thomas Street is suitable for re-use then an alternative option could be to connect the discharge from the below ground geo-cellular tank to the east of the site into the existing outfall in the public sewer running in St Thomas Street (see Appendix 1 of the Drainage Assessment report). This will need to be confirmed via a CCTV drainage survey of the existing drainage to be undertaken at the next stage of the design.

9 Conclusions

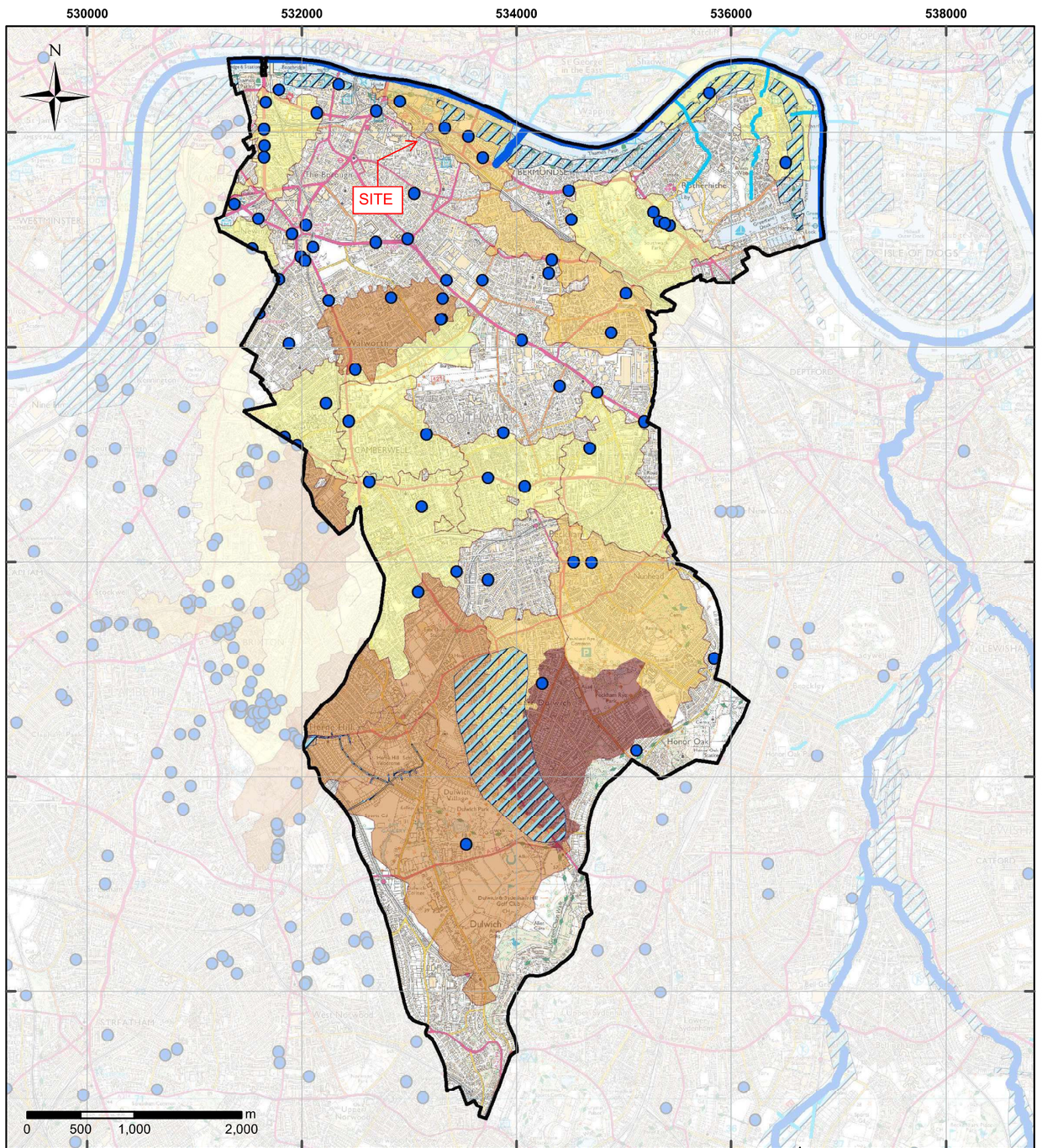
- In accordance with the National Planning Policy Framework, the site would be categorised as lying within Flood Zone 3a - an area assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%). However, the site benefits from the presence of well maintained flood defences along the River Thames. According to the Environment Agency Product 4 data (see Appendix D), The Thames Barrier and associated defence system has a 1 in 1000 year standard which means it ensures that flood risk is managed up to an event that has 0.1% annual probability. This is also confirmed by the Thames Estuary 2100 (2012) report.
- In accordance with the NPPF, the proposed office, retail, cafe are acceptable within Flood Zone 3a.
- The "more vulnerable" uses of the development (medical uses) are at first floor level and above and are therefore at minimal risk of flooding. However, additional measures including the presence and condition of flood defences, the intention to raise the finished floor levels to protect the building entrances up to breach level, the available warning systems and the safe evacuation route further satisfy the requirements of the Exception Test.
- The site has been assessed as having very low probability of flooding from rivers or tidal sources.
- In the event of breach the occupants can evacuate to higher levels and safely remain inside or can leave the site early having been alerted by the Flood Warning Service.
- The Developer should register for the Environment Agency's Flood Warning Service as a precaution.
- The site has been assessed as having low probability of flooding from surcharging sewers.
- The site has been assessed as having low probability of flooding from groundwater sources.
- The site has been assessed as having low probability of flooding from artificial sources.
- The site has been assessed as being at flood risk from surface water flooding from St Thomas Street and Vinegar Yard. It is recommended that the mitigation measures specified in Sections 6.6 & 7.2 are implemented during the next design stage. It is considered that the implementation of any of the recommended measures would reduce the probability of flooding from the surface water to low.
- Temporary or permanent barriers should be provided to the building entrances from flooding in a breach event. It is concluded that given the large number of access points to the building that a temporary level of protection would be difficult to achieve, and therefore it is recommended that the floor levels are set at or above the breach event level, as a permanent protection.
- The proposed redevelopment has an acceptable probability of flooding within the terms and requirements of the National Planning Policy Framework, subject to implementation of the mitigation measures outlined in this report.
- In order to comply with legislative requirements the existing surface water discharge should be reduced to greenfield rate of **2.65 litres/sec.**

The comments stated above are based on information received from other consultees. The flood risk classification of this site has been based on the above observations, and the recommendations stated.

4188
Vinegar Yard

Appendix A

London Borough of Southwark SFRA Maps



Legend

- Southwark Borough Boundary
- Main River
- Ordinary Watercourse
- Culvert
- Localised Flood Incident
- Historic Flood Outline

Total Properties Flooded by Overloaded Sewers by Postcode Area

- 1 - 2
- 3 - 6
- 7 - 11
- 12 - 37

Flooding History

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

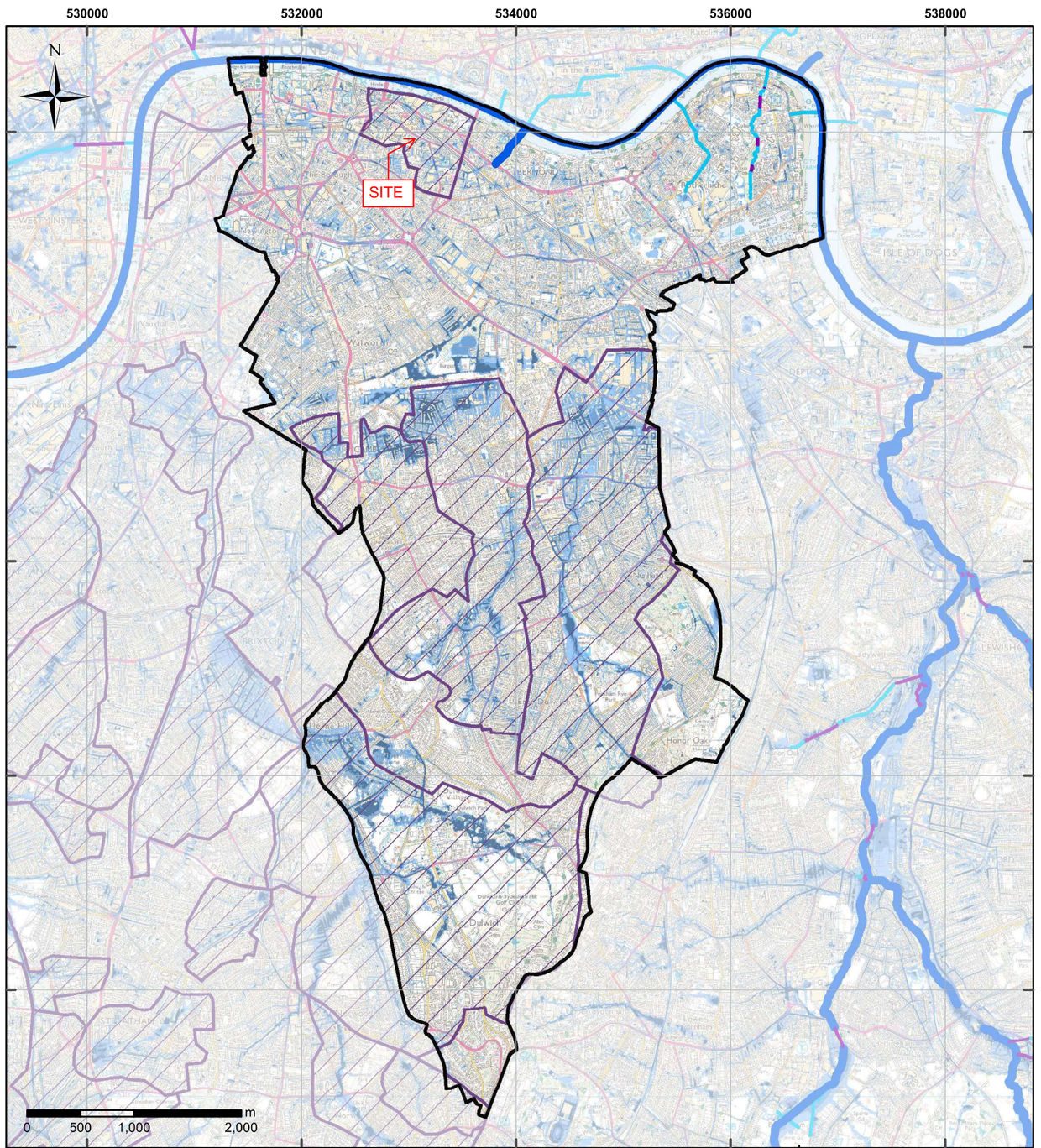
Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
KLD	AD	GP

Scale at A4: 1:48,000
Scale at A3: 1:35,000
Scale at A1: 1:17,000

Date: 07/12/2016

MAP A2



Legend

- Southwark Borough Boundary
- Main River
- Ordinary Watercourse
- Culvert
- Critical Drainage Area
- High Risk of Flooding (1 in 30 years)
- Medium Risk of Flooding (1 in 100 years)
- Low Risk of Flooding (1 in 1000 years)

Flood Map for Surface Water

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

GIS:	Checked:	Approved:
AD	SB	GP

Scale at A4:	1:48,000
Scale at A3:	1:35,000
Scale at A1:	1:17,000
Date:	07/09/2016

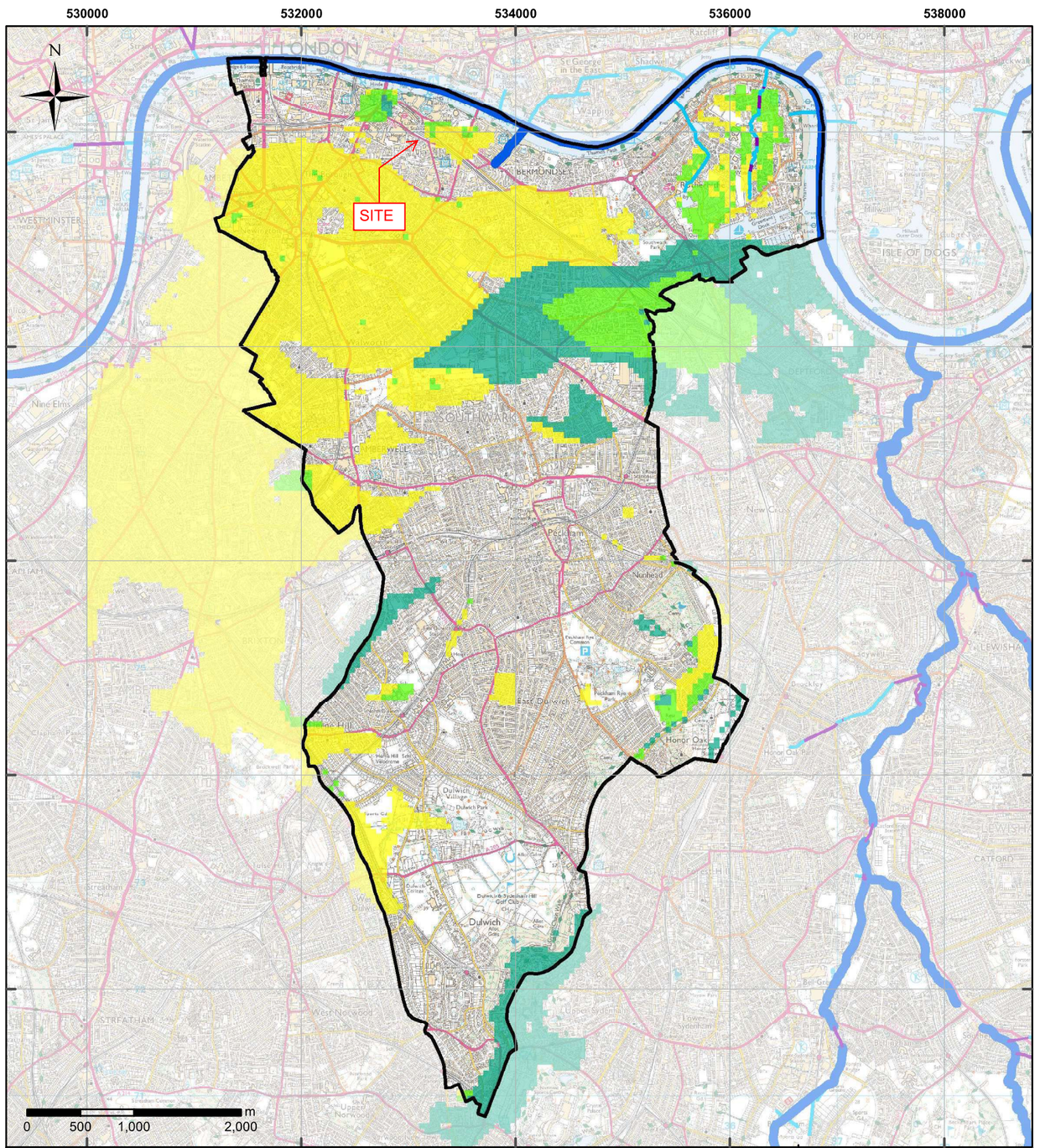
MAP A4

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

Licensing Information:



Legend

- Southwark Borough Boundary
- Main River
- Ordinary Watercourse
- Culvert
- Limited potential for groundwater flooding to occur
- Potential for groundwater flooding of property situated below ground level
- Potential for groundwater flooding to occur at surface

Areas at Risk of Flooding from Groundwater

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

GIS:	Checked:	Approved:
AD	SB	GP

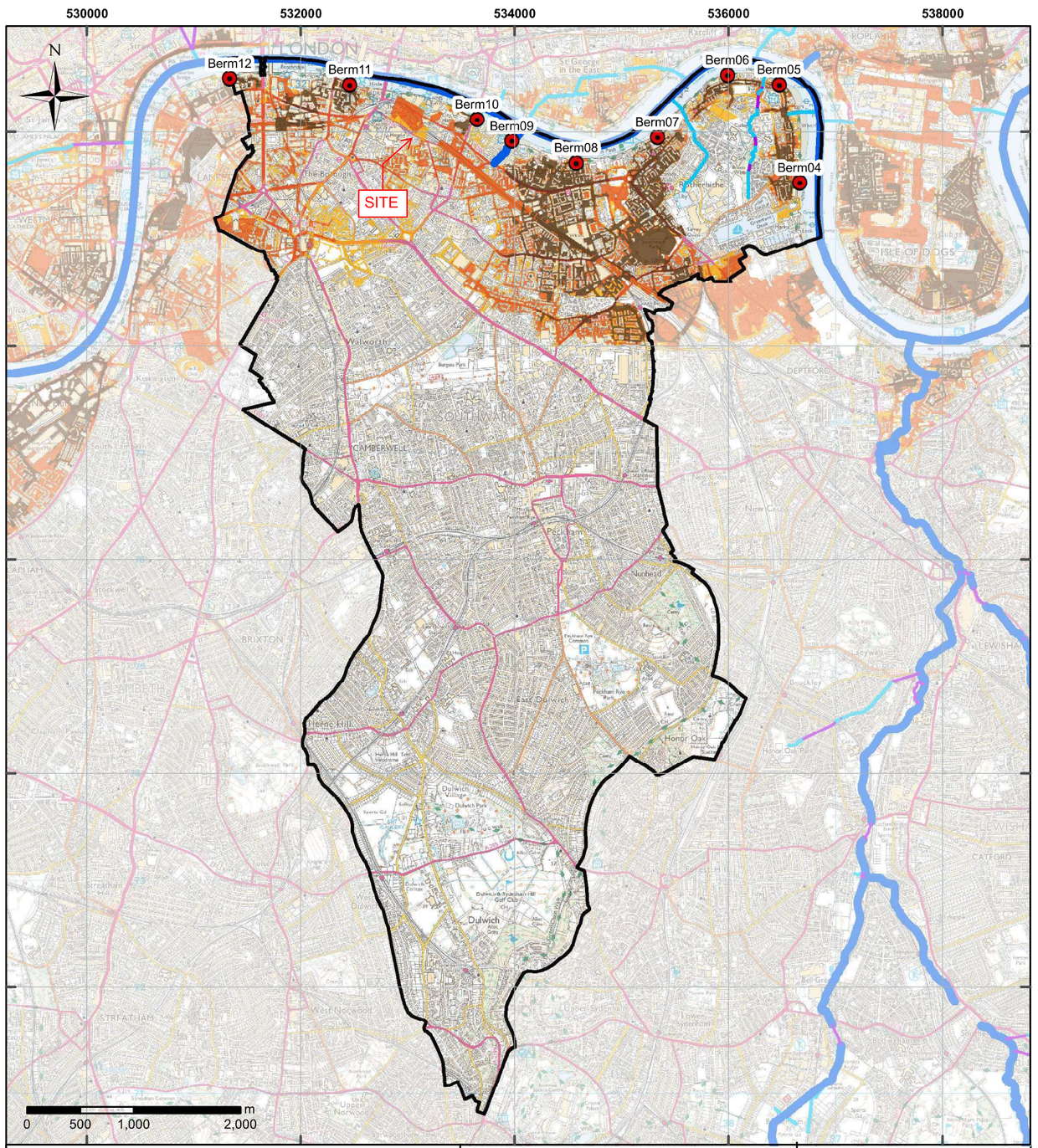
Scale at A4: 1:48,000	Date: 15/09/2016
Scale at A3: 1:35,000	
Scale at A1: 1:17,000	**MAP A5**

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

Licensing Information:



Legend

- Southwark Borough Boundary
- Main River
- Ordinary Watercourse
- Culvert
- Breach Location

Maximum Predicted Flood Extent - Year

- 2014
- 2065
- 2100

Breach Assessment Maximum Predicted Flood Extents

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
AD	SB	GP

Scale at A4: 1:48,000 Scale at A3: 1:35,000 Scale at A1: 1:17,000	Date: 15/09/2016 **MAP A8.1**

530000

532000

534000

180000

N

Berm11

Year 2014

SITE

Year 2065

Year 2100

0 350 700 1,400 m

Legend

- Borough Boundary
- Breach Location
- Flood Defence

Flood Depth (m)

High : 14

Medium : 7

Low : 0

1:225,000

Berm11 Breach Assessment Flood Depth

CONWAY AECOM

Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
AD	SB	GP

Scale at A4: 1:33,500
Scale at A3: 1:23,500
Scale at A1: 1:11,500

Date: 15/09/2016

MAP A8.2.8

530000 532000 534000

180000

N

Berm12

SITE

Year 2014

Year 2065

Year 2100

0 350 700 1,400 m

Legend

- Borough Boundary
- Breach Location
- Flood Defence

Flood Depth (m)

High : 14

Medium : 7

Low : 0

1:225,000

Berm12 Breach Assessment Flood Depth

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
AD	SB	GP

Scale at A4: 1:33,500
Scale at A3: 1:23,500
Scale at A1: 1:11,500

Date: 15/09/2016

MAP A8.2.9

530000

532000

534000

180000

N

Berm11

SITE

Year 2014

Year 2065

Year 2100

0 350 700 1,400 m

Legend

- Borough Boundary
- Breach Location
- Flood Defence

Velocity (m/s)

- High : 9.15
- Medium : 4.5
- Low : 0

1:225,000

Berm11
Breach Assessment
Flood Velocity

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
AD	SB	GP

Scale at A4: 1:33,500
Scale at A3: 1:23,500
Scale at A1: 1:11,500

Date: 15/09/2016

MAP A8.2.8

530000 532000 534000

180000

N

Berm12

SITE

Year 2014

Year 2065

Year 2100

0 350 700 1,400 m

Legend

- Borough Boundary
- Breach Location
- Flood Defence

Velocity (m/s)

High : 9.15

Medium : 4.5

Low : 0

1:225,000

Berm12 Breach Assessment Flood Velocity

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
AD	SB	GP

Scale at A4: 1:33,500
Scale at A3: 1:23,500
Scale at A1: 1:11,500

Date: 15/09/2016

MAP A8.2.9

530000

532000

534000

180000

N

Berm11

Year 2014

SITE

Year 2065

Year 2100

0 350 700 1,400 m

Legend

- Borough Boundary
- Breach Location
- Flood Defence

Maximum Hazard

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

1:225,000

Berm11 Breach Assessment Flood Hazard

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
KLD	AD	GP

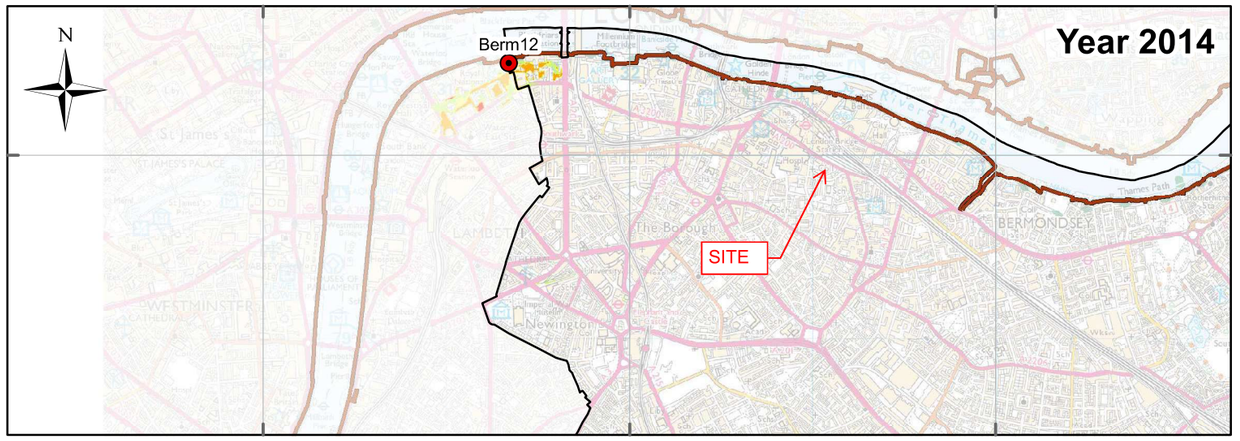
Scale at A4: 1:33,500
Scale at A3: 1:23,500
Scale at A1: 1:11,500

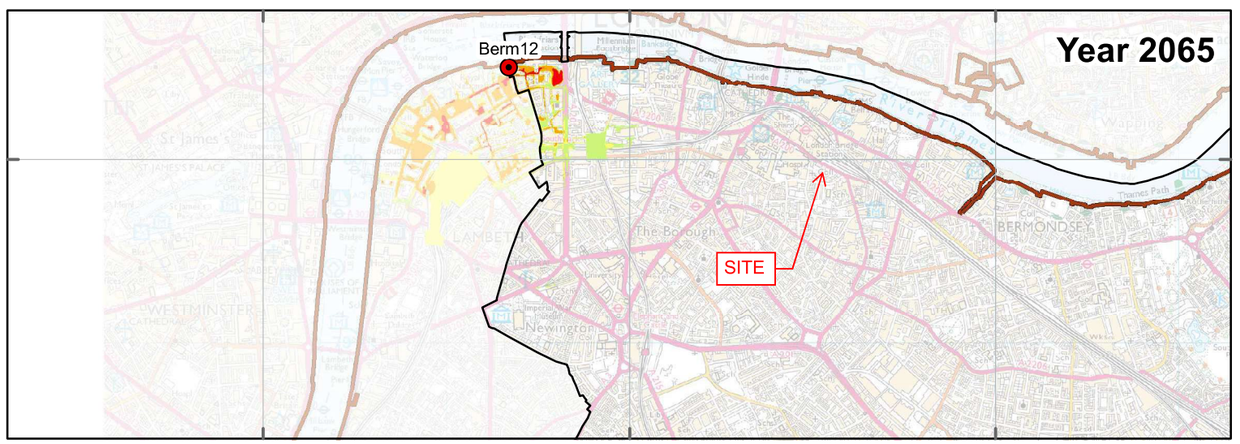
Date: 20/12/2016

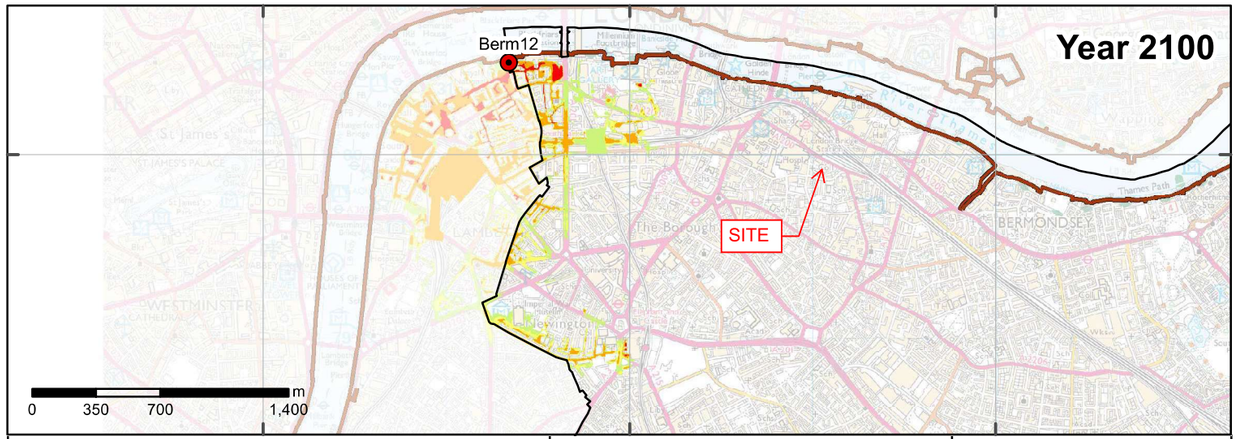
MAP A8.4.8

530000 532000 534000

180000





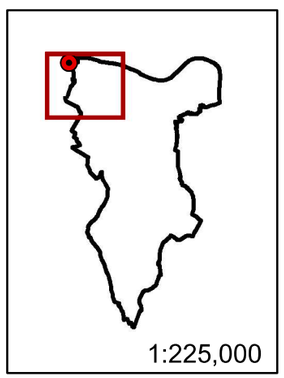


Legend

- Borough Boundary
- Breach Location
- Flood Defence

Maximum Hazard

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



Berm12 Breach Assessment Flood Hazard

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

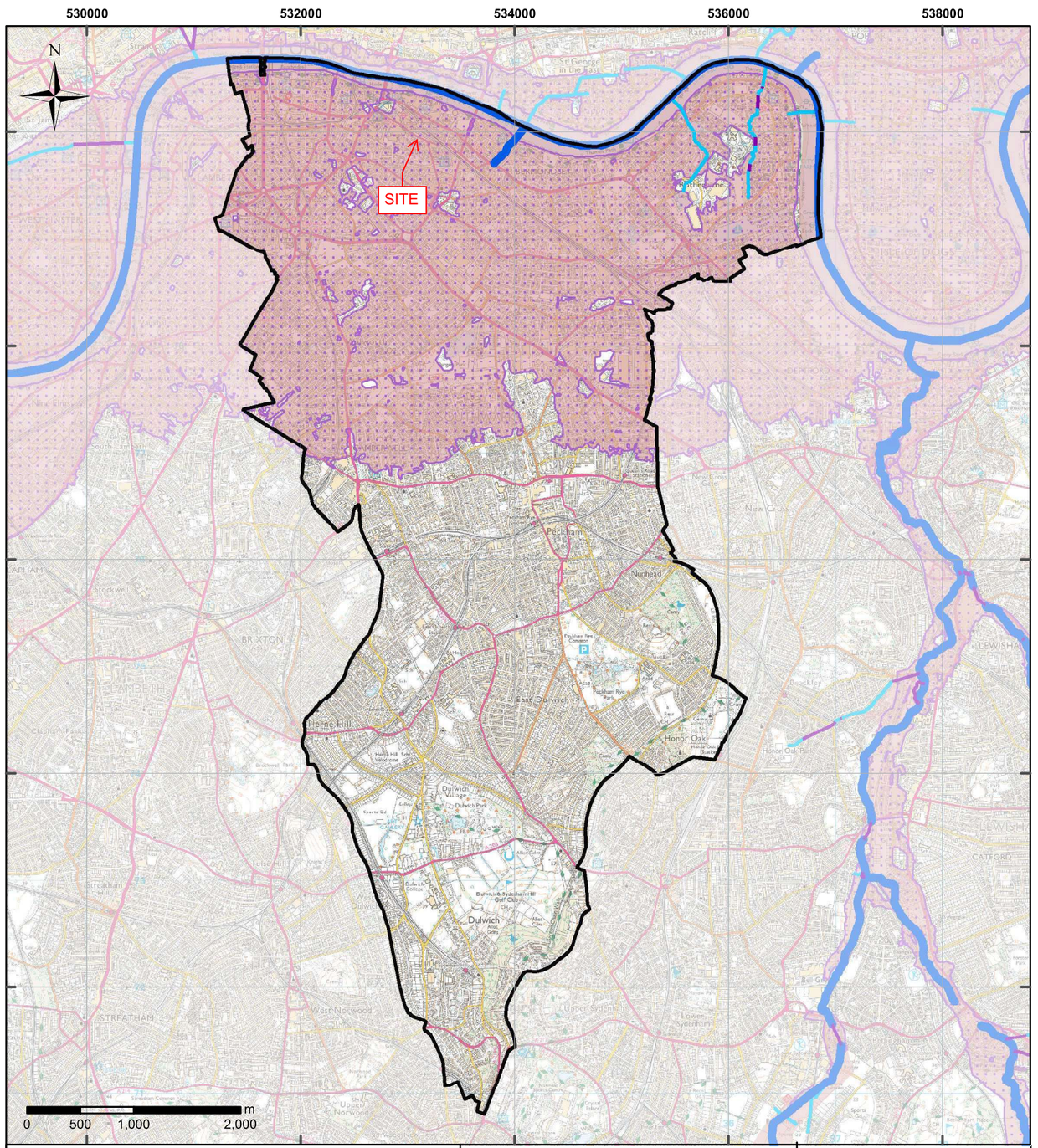
Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
KLD	AD	GP

Scale at A4: 1:33,500
Scale at A3: 1:23,500
Scale at A1: 1:11,500

Date: 20/12/2016

MAP A8.4.9



Legend

- Southwark Borough Boundary
- Main River
- Ordinary Watercourse
- Culvert
- Flood Warning Area
- Flood Alert Area

Emergency Flood Planning

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

London Borough of Southwark

Southwark Council

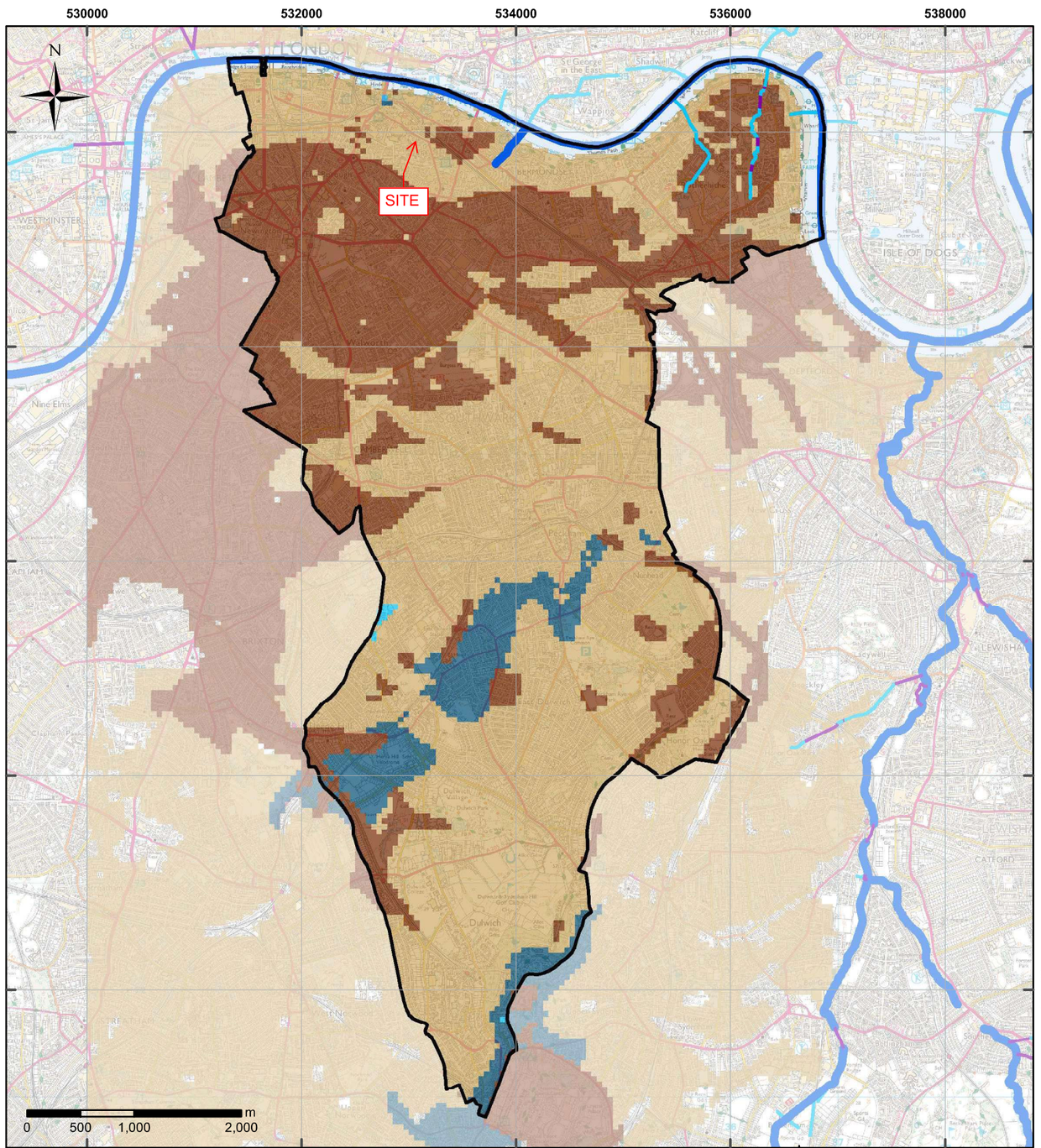
Strategic Flood Risk Assessment

GIS:	Checked:	Approved:
AD	SB	GP

Scale at A4: 1:48,000
Scale at A3: 1:35,000
Scale at A1: 1:17,000

Date: 15/09/2016

MAP A9



Legend

- Southwark Borough Boundary
- Main River
- Ordinary Watercourse
- Culvert

Subsurface Suitability for Infiltration SuDS

- Highly Suitable
- Probably Suitable
- Potentially Suitable for Bespoke Designs
- Unlikely to be Suitable

SuDS Infiltration Suitability

CONWAY AECOM
Shaping London's Highways

Sunley House, 4 Bedford Park
Croydon, Surrey, CR0 2AP

Tel: +44 (0) 208 639 3500
www.aecom.com

GIS:	Checked:	Approved:
KLD	AD	GP

Scale at A4: 1:48,000	Date: 05/12/2016
Scale at A3: 1:35,000	
Scale at A1: 1:17,000	**MAP A11**

London Borough of Southwark

Southwark Council

Strategic Flood Risk Assessment

4188
Vinegar Yard

Appendix B

Thames Water Correspondence

Sewer Flooding
History Enquiry

Property Searches

AKT II Ltd

Search address supplied	vinegard yard 49 St. Thomas Street London SE1 3QX
Your reference	4188
Our reference	SFH/SFH Standard/2018_3901562
Received date	**1 November 2018**
Search date	**1 November 2018**

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

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

0845 070 9148

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: vinegard yard,49,St. Thomas Street,London,SE1 3QX

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

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

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

0845 070 9148

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- “Internal flooding” from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- “At Risk” properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company’s reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

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

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

0845 070 9148

4188
Vinegar Yard

Appendix C

AKT II Deskstudy Extract

6 Ground Model

The purpose of this section of the report is to highlight any risks associated with geotechnical studies and underground structures.

6.1 Published Geology

London belongs to the Thames basin which is a broad syncline of chalk occupied in its centre by sands and clays. Fluvial deposits associated with the former deposits of the River Thames lie on top of the bedrock. These different terraces are the remains of the river's floodplains.

The Envirocheck Superficial Geology map (Figure 6.1) indicates that the site is underlain by Alluvium. The Envirocheck Bedrock Geology map in (Figure 6.2) indicates that the site is underlain by London Clay Formation.

6.2 Previous Site Investigations

AKT has reviewed a previous ground investigation and combined geotechnical and contamination assessment of the site carried out in March 2012 by Ashdown Site Investigation Limited. The purpose of the works was to:

1. Assess the expected geology and hydrogeology underlying the site;
2. Establish the development history and most recent site use;
3. Identify potential sources of on-site and off-site contamination;
4. Establish the potential for on-site migration of contamination from off-site sources;
5. Identify sensitive receptors that may be at risk from any contamination migrating from the site and develop a preliminary conceptual model;
6. Assess ground and groundwater conditions prevailing at the site;
7. Provide information to assist others in undertaking design of foundations, ground floors and road pavements;
8. Test for the presence of potentially hazardous contamination and gas in the ground;
9. Provide a quantitative contamination risk assessment; and
10. Provide a quantitative site specific conceptual model.

6.3 Anticipated Ground Conditions

Boreholes located in close vicinity to the site were obtained from the BGS archives and have been included in Appendix C of this report. The locations of the boreholes and their relative ground models are illustrations in Figures 6.3 and 6.5 .

Although BGS boreholes provide a good indication of the likely conditions on the site, it is recommended that a full site investigation is carried out in order to investigate the ground conditions specific to the site and inform the foundations and substructure design.

Published British Geological Survey maps, borehole records and previous site investigation report indicate that the geology underlying the site comprises Made Ground, Alluvium, Kempton Park Gravel formation, London Clay and Woolwich & Reading Beds (Lambeth Group).

Made Ground

Made ground, generally comprising silty sandy fine to coarse gravel but locally comprising silty sandy clay with a variable gravel content and cobbles was recorded at each exploratory hole position. The gravel and cobble component of the soils variously comprised brick, flint, concrete, coal, ash, clinker, crystalline rock, quartz and glass. Wood, shells and metal were also locally recorded within the made ground soils.

Made Ground, has been recorded to a depth varying from 1.2m to 2m below ground level. The previous phase of works also recorded several obstructions including concrete slabs and buried foundations to be present within the made ground.

Alluvium

Underlying the made ground , firm silty clay containing a variable proportion of carbonaceous matter, flint, shell fragments and calcareous nodules was recorded 2.0m below ground level. These soils are considered to represent the Alluvium deposits indicated on the published geological map.

Alluvium is predominantly made up of soft, compressible clays, with localised organic pockets, silt and sand partings and peat bands. They, along with the River Terrace Gravels, represent ancient flood plain deposits that have become isolated as the river cut down to lower levels. Alluvium is associated with the production of methane ground gas due to a high level of organic material.

The Alluvium deposits were recorded to depths of between 4.3m and 6.4m during the previous phase of works undertaken at the site.

Kempton Park Gravel formation

Underlying the Alluvium, historic Boreholes generally found

medium dense to dense sands and flint gravels to depths of between 8.90m and 10.05m below ground level.

Although not indicated to be present on the site, these soils are considered to be representative of the Kempton Park Gravel Formation soils shown in the vicinity of the site on the published geology map.

London Clay Formation

Beneath the Kempton Park gravel formation, the London Clay formation comprises a stiff to very stiff grey fissured clay. With depth, the clay becomes very stiff/hard, is frequently fissured and can contain some inclusions and beds of weak mudstone and siltstone.

Generally, the London Clay layer varied between 24m and 29m in thickness, where the depth of the borehole was sufficient to reach the change in layer.

Woolwich & Reading Beds (Upper Mottled Clay)

Woolwich & Reading Beds were recorded on the deepest boreholes -29m to -36m OD. This was the deepest rock formation encountered on the site.

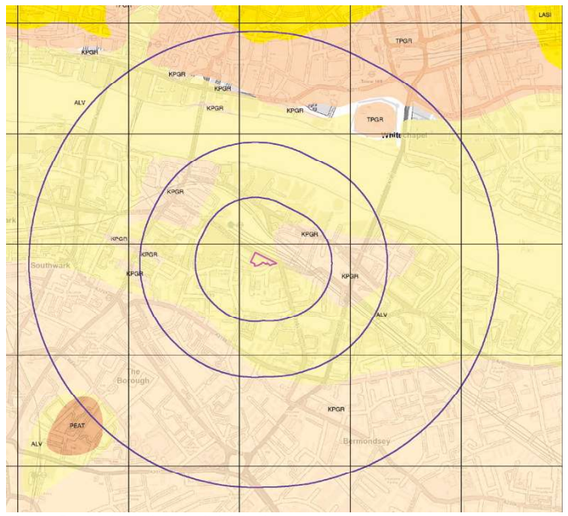


Figure 6.1 Envirochek Superficial Geology map

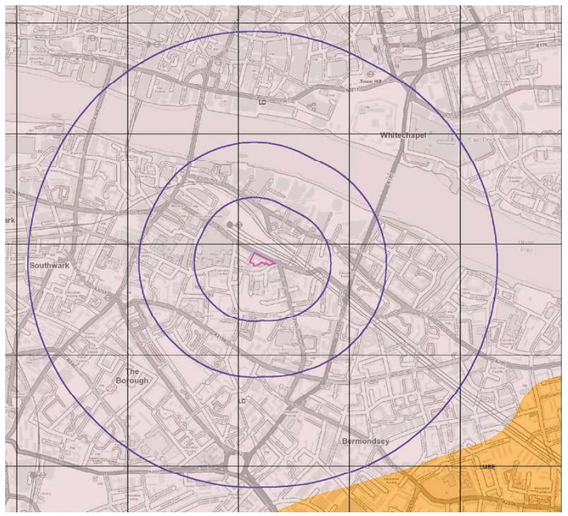
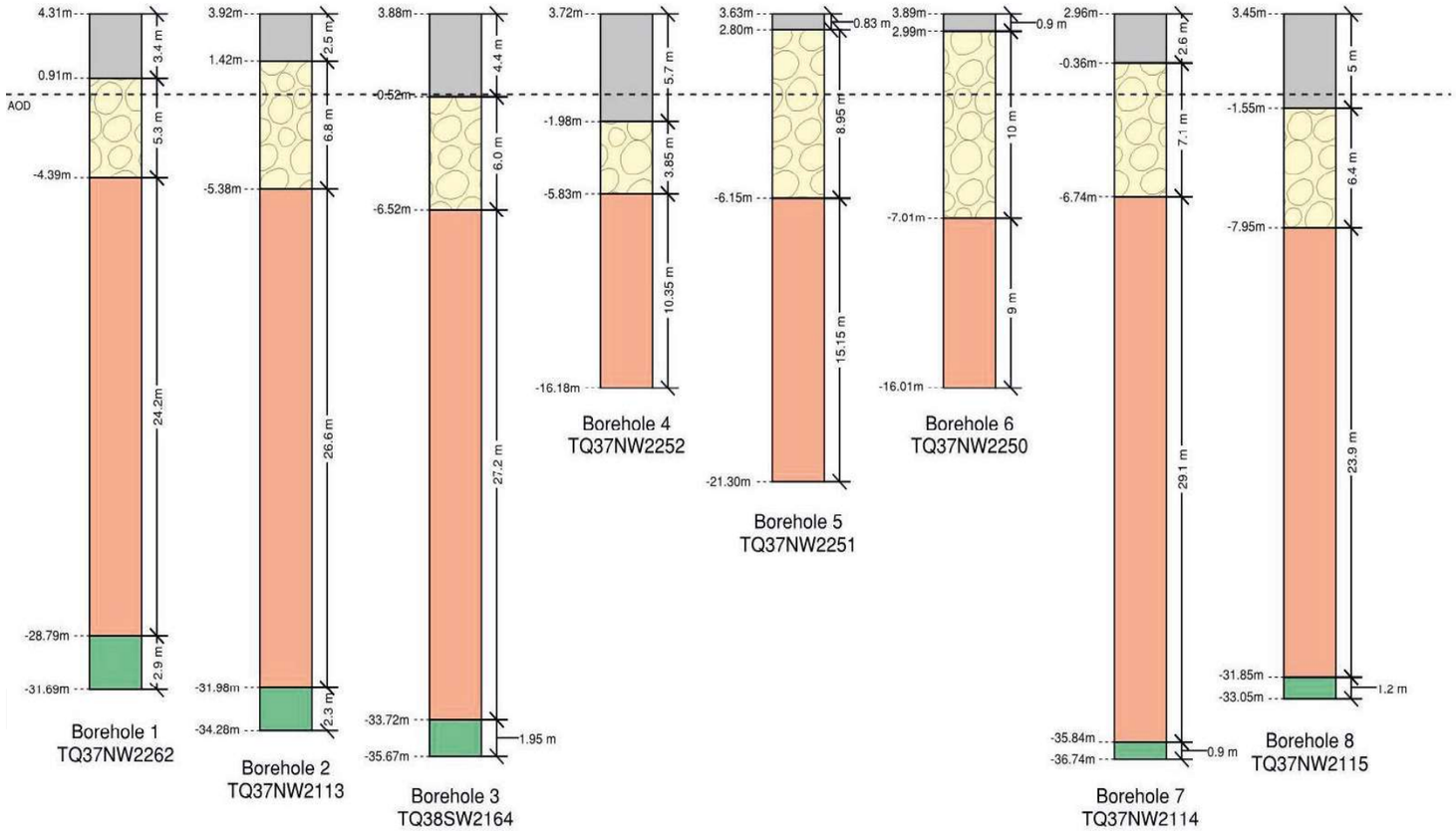


Figure 6.2 Envirocheck Bedrock map

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay and Silt	Flandrian - Pleistocene
	KPGR	Kempton Park Gravel Formation	Sand and Gravel	Devensian - Ipswichian
	LASI	Langley Silt Member	Silt	Devensian - Ipswichian
	TPGR	Taplow Gravel Formation	Sand and Gravel	Wolstonian - Chokierian
	PEAT	Peat	Peat [Unlithified Deposits Coding Scheme]	Quaternary - Ryazanian

Historic Boreholes



Legend

- Made Ground
- River Terrace Deposits (Alluvium + Gravels)
- London Clay
- Lambeth Group/Woolwich & Reading Beds

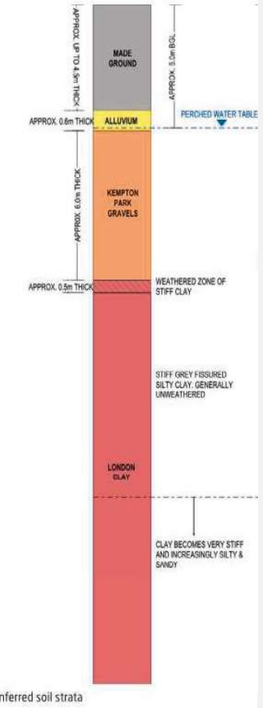


Figure 3.17 Inferred soil strata

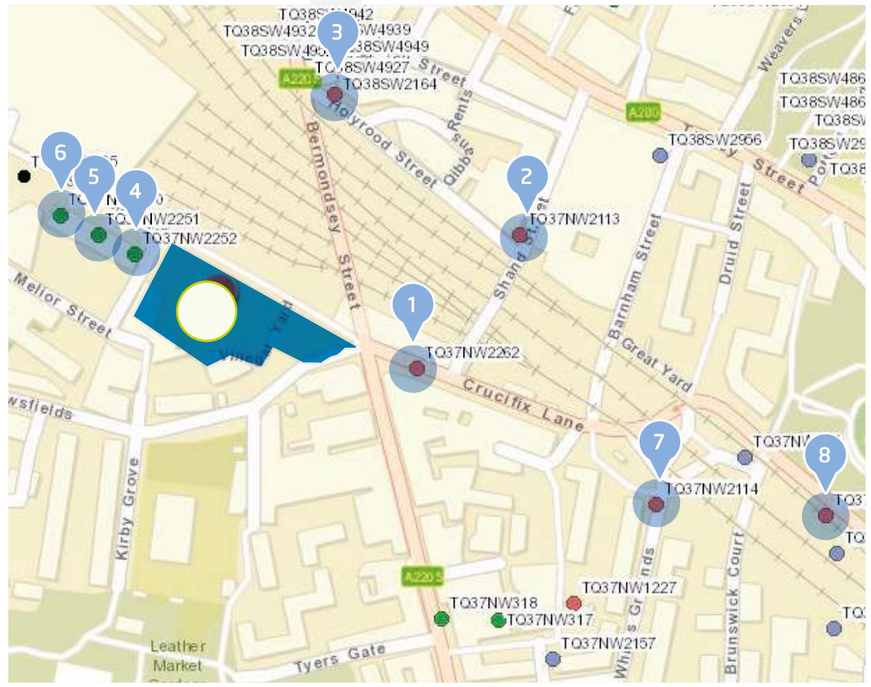


Figure 6.3 BGS Borehole Locations.

6.4 Hydrogeology and Hydrology

6.4.1 Environment Agency Classification

A Principal Aquifer is defined by the Environment Agency (EA) as layers of rock or drift deposits that have high inter granular and/ or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

A Secondary A Aquifer is defined by the Environment Agency as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

A Secondary B Aquifer is defined by the Environment Agency as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

A Secondary Undifferentiated (U) Aquifer is assigned by the Environment Agency in cases where it has not been possible to attribute either category A or B to a rock type.

Unproductive Strata have negligible permeability and are generally regarded as not containing groundwater in exploitable quantities.

6.4.2 Hydrogeology

The superficial Alluvium expected beneath the site is classified as a Secondary Undifferentiated Aquifer. The Secondary Undifferentiated Aquifer designation is usually given in cases where it has not been possible to attribute either Secondary A or B status to a rock type. In most cases, this means that the layer in question may have not previously been designated as both 'minor' and 'non-aquifer' in different locations due to the variable characteristics of the rock type.

The London Clay Formation expected at depth beneath the site is classified as Unproductive Strata, as per the Envirocheck Groundwater Vulnerability map (Figure 6.7). Unproductive Strata are deposits with low permeability that have negligible significance for water supply or river base flow.

6.4.3 Source Protection Zone

The EA have defined Source Protection Zones (SPZ's) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. The zones are defined by the EA as outlined below:

- The Inner Protection Zone is the distance travelled by groundwater from any point below the water table to the abstraction in 50 days for a particular area. It has a minimum radius of 50m.
- The Outer Protection Zone is the distance travelled by groundwater from any point below the water table to the abstraction in 400 days for a particular area. It has a minimum radius of 250m.
- The Total Catchment Zone is the area around the abstraction within which all groundwater recharge is presumed to be discharged to the source.

The SPZ Map from Envirocheck indicates that the site is not located within a Protection Zone (Figure 6.7). It is likely that the ground water abstractions are from the Chalk Aquifer. This means that there is no risk of pollutants or contaminants from the site making their way into a source of drinking water.

6.4.4 Ground Water Level

The cessation of abstraction from the chalk after the mid-1960's for industrial purposes caused groundwater levels to rise throughout the London basin. General Aquifer Research, Development and Investigation Team (GARDIT) was developed in order to minimise and ultimately halt the groundwater rise, but the EA's view is that rising groundwater no longer poses a problem and underground infrastructure is no longer threatened by inundation.

BGS borehole logs record groundwater first being struck at 3.4m below ground level to 4.6m below ground level, which indicates the water table to generally be found within the Alluvium layer. It should also be noted that groundwater levels are subject to variations caused by changes in the local drainage conditions and also by seasonal effects and as a result will be confirmed by standpipes in the ongoing SI.

6.4.5 Hydrology

The subterranean or underground rivers of London are the tributaries of the River Thames and River Lea that were built over during the growth of the metropolis of London. The rivers now flow through underground culverts. Figure xx depicts the location of the rivers/culverts which can be cross checked through the Envirocheck Superficial Geology map (Figure 6.1).

The nearest significant surface water feature is River Thames located some 474m to the north of the site.

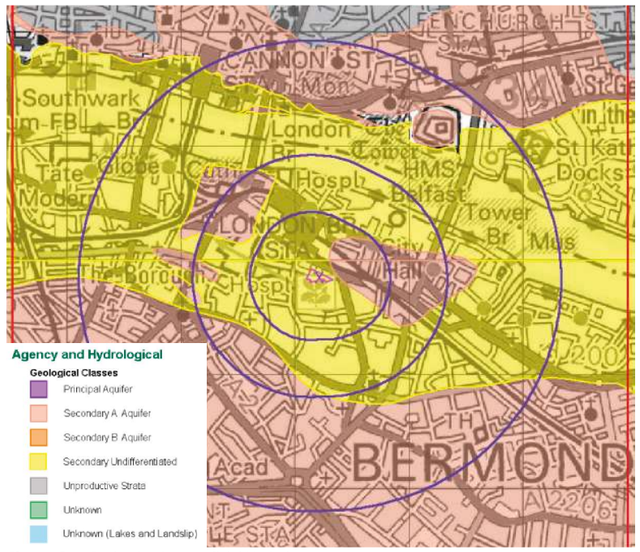


Figure 6.4 Envirocheck superficial Hydrology map.

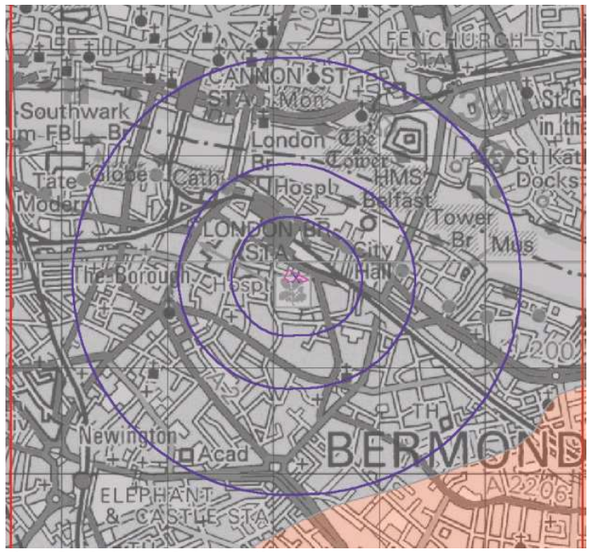


Figure 6.5 Envirocheck Bedrock Aquifer map.

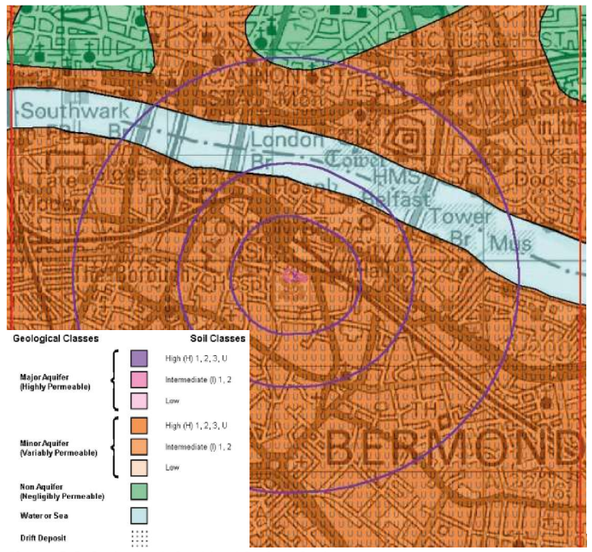


Figure 6.6 Envirocheck Combined Surface Geology map .

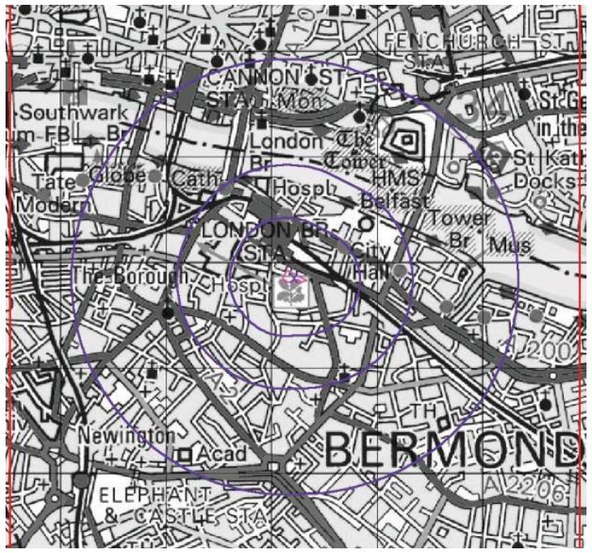


Figure 6.7 Envirocheck Source Protection zone map.

4188
Vinegar Yard

Appendix D

Environment Agency Flood Data

Product 4 (Detailed Flood Risk) for: St Vinegar Yard, St Thomas Street, SE1 9AB
Requested by: Thomas Mealey, AKT II
Reference: KSL 102387 LB
Date: 17 October 2018

Contents

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

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

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

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Flood Map for Planning (Rivers and Sea)

The Flood Map:

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

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

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

At this Site:

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

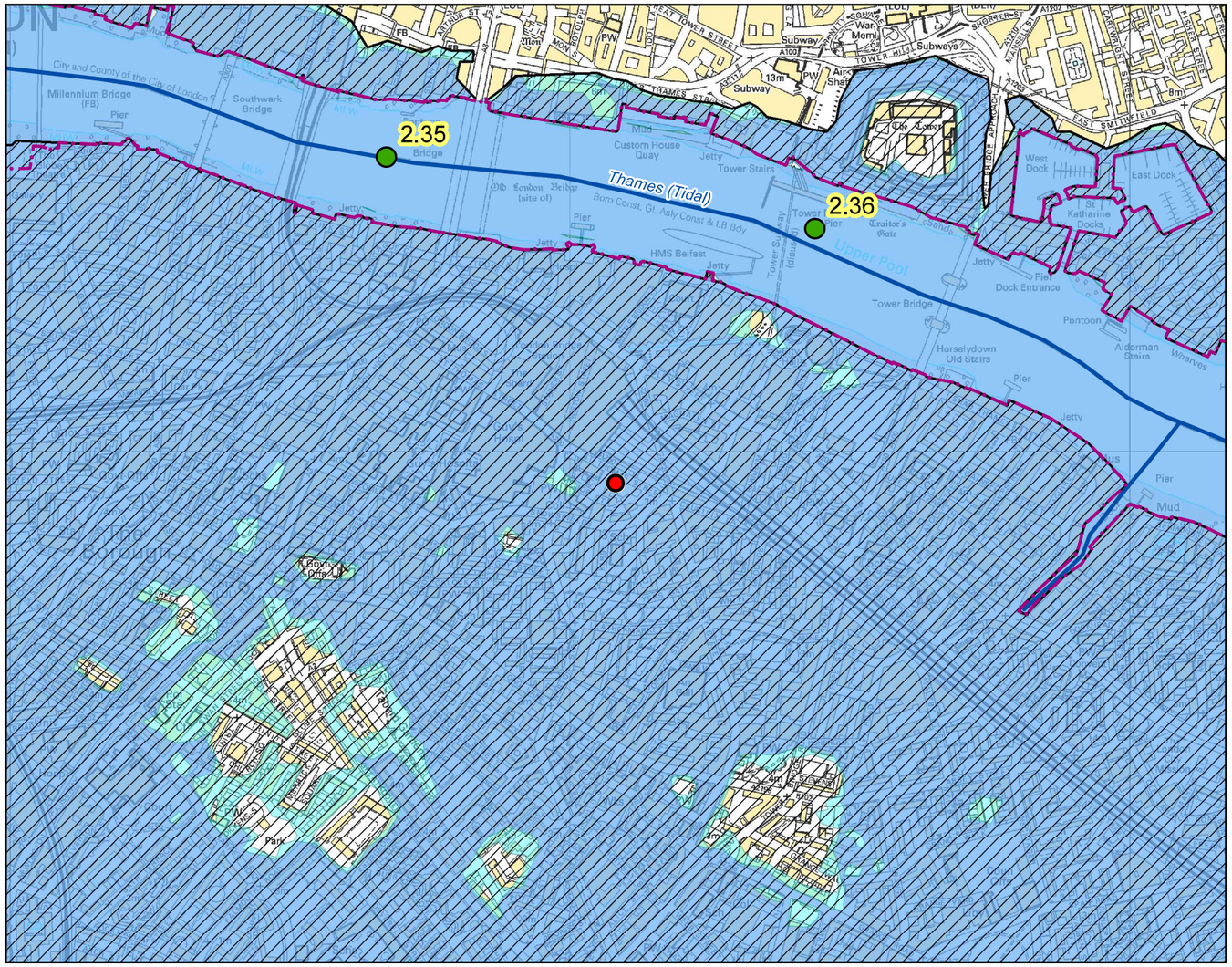
Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

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

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Detailed FRA/FCA Map centred on SE1 9AB created 17 October 2018 [Ref: KSL 102387 LB]



Environment Agency

Scale 1: 10,000

Legend

- Site Location
- TE2100 Model Nodes
- Main Rivers
- Flood Map - Defences
- Flood Map - Flood Storage Areas
- Areas Benefiting from Flood Defences
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2

Flood Map for Planning (assuming no defences)

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

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

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

Thames Estuary 2100 (TE2100)

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

Details about the TE2100 plan

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

Details about the TE2100 in-channel levels

The TE2100 in-channel levels take into account operation of the Thames Barrier when considering future levels. The Thames Barrier requires regular maintenance and with additional closures the opportunity for maintenance will be reduced. When this happens, river levels – for which the Barrier would normally shut for the 2008 epoch – will have to be allowed through to ensure that the barrier is not shut too often. For this reason, levels upriver of the barrier will increase and the tidal walls will need to be heightened to match.

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

The levels upriver of the barrier are the highest levels permitted by the operation of the Thames Barrier. If levels and flows are forecast to be any higher, the Thames Barrier would shut, ensuring that the tide is blocked and the river maintained to a low level. For this reason the probability of any given water level upriver of the Barrier is controlled and therefore any associated return period becomes irrelevant. The Thames Barrier and associated defence system has a 1 in 1000 year standard which means it ensures that flood risk is managed up to an event that has a 0.1% annual probability. The probability of water levels upriver is ultimately controlled by the staff at the Thames Barrier.

For further information about the Thames Barrier please visit our website at:

https://www.gov.uk/the-thames-barrier

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

TE2100 2008 levels:

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

Location	Node	Easting	Northing	Extreme water level (m)	Left defence (m)	Right defence (m)	Allow for future defence raising to a level of...	
							Left Bank (m)	Right Bank (m)
	2.34	531841	180694	4.82	5.41	5.41	6.35	6.35
	2.35	532671	180524	4.81	5.41	5.41	6.35	6.35
				4.81	5.41	5.41	6.35	6.35
				4.81	5.28	5.28	6.35	6.35
Tower	2.36	533437	180397	4.80	5.28	5.28	6.35	6.35
	2.37	534519	179917	4.78	5.28	5.28	6.35	6.35
	2.38	535264	180141	4.76	5.28	5.28	6.35	6.35
				4.75	5.28	5.28	6.35	6.35
				4.75	5.28	5.28	6.35	6.35
				4.75	5.23	5.23	6.20	6.20

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

TE2100 climate change levels:

				2065 to 2100		2100	
Location	Node	Easting	Northing	Design water level	Defence level (both banks)	Design water level	Defence level (both banks)
	2.34	531841	180694	5.31	5.85	5.85	6.35
	2.35	532671	180524	5.31	5.85	5.78	6.35
Tower	2.36	533437	180396	5.30	5.85	5.77	6.35
	2.37	534519	179917	5.27	5.85	5.76	6.35
	2.38	535264	180141	5.27	5.85	5.75	6.35
				5.26	5.85	5.74	6.35
				5.26	5.70	5.74	6.20

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Thames Tidal Upriver Breach Inundation Modelling - 2017

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

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

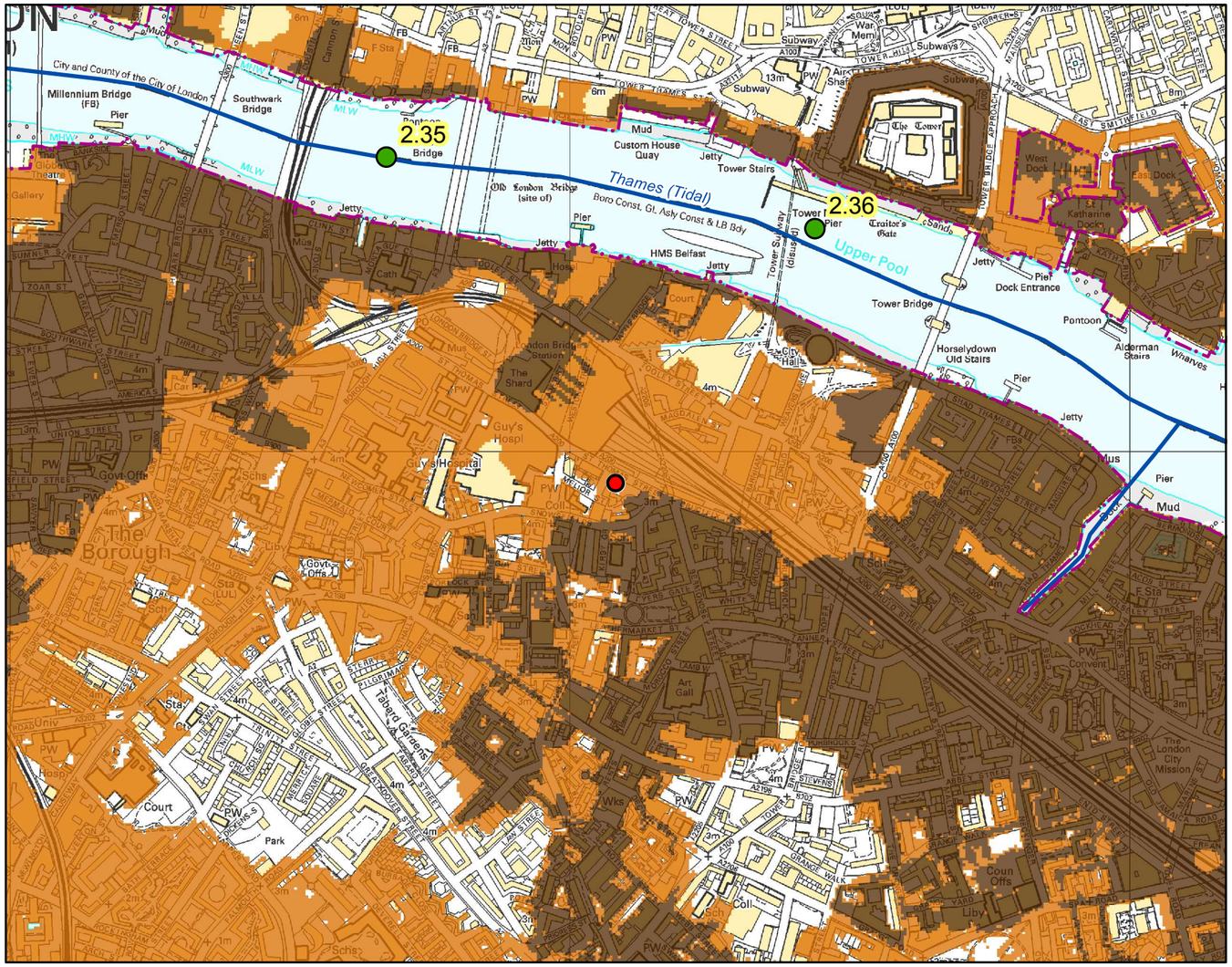
For breaches upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. The levels used are referred to as Maximum Likely Water Levels (MLWLs). Therefore 2014 and 2100 epochs were modelled on that basis.

This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within London.

	National Grid Reference		Modelled levels in mAODN for Max Likely Water Level	
Node	Easting	Northing	2014	2100
1	533050	179986	Nil return	4.43
2	533073	179970	Nil return	4.38
3	533107	179955	Nil return	4.12
4	533139	179940	Nil return	3.83
5	533067	179953	Nil return	4.39
6	533117	179926	Nil return	3.69
7	533055	179935	Nil return	4.38
8	533078	179925	Nil return	3.76
9	533096	179913	3.34	3.69
10	533057	179912	Nil return	4.13

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Upriver Breach Inundation Modelling Map centred on SE1 9AB created 17 October 2018 [Ref: KSL 102387 LB]



Environment Agency

Scale 1: 10,000

Legend

- Site Location
- TE2100 Model Nodes
- Main Rivers
- Flood Map - Defences

Upriver MLWL Breach Inundation Epoch

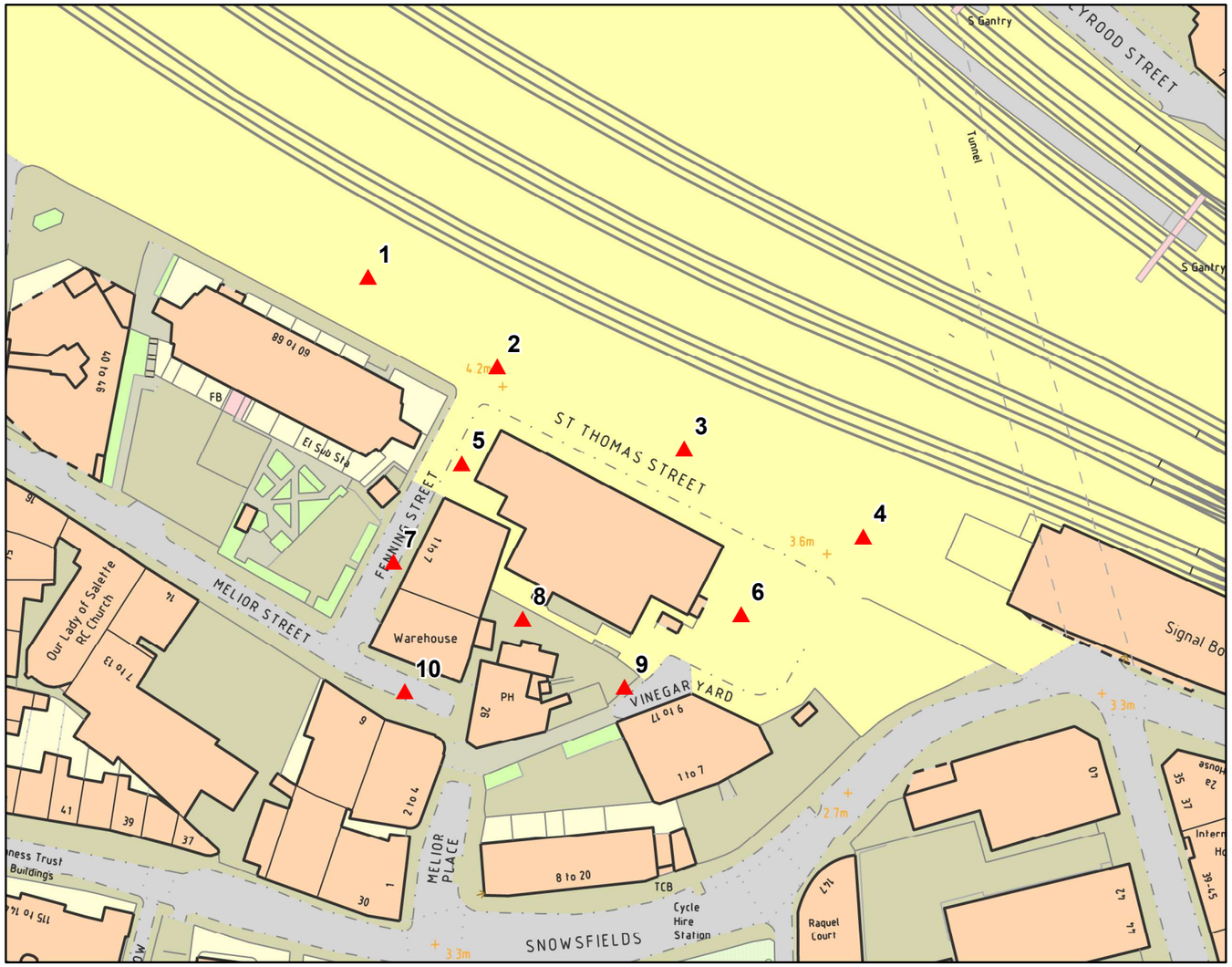
- 2014
- 2100

Thames Tidal Upriver Breach Inundation Modelling 2017

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

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

Node Location Map centred on SE1 9AB created 17 October 2018 [Ref: KSL 102387 LB]



Environment Agency

Scale 1: 1,000

Legend

- Node Point Locations

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

Defence Details

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

https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities

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

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

Areas Benefiting from Flood Defences

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

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

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Recorded Flood Events Data

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

Flood Event Data

1928 – The site was within approximately 200 m of the tidal flooding on the night of the 6th and morning of the 7th January. There was overtopping in the area during a storm surge (which coincided with high fresh water flows). An approximate level in the Thames at the time was 5.18 m AODN.

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

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

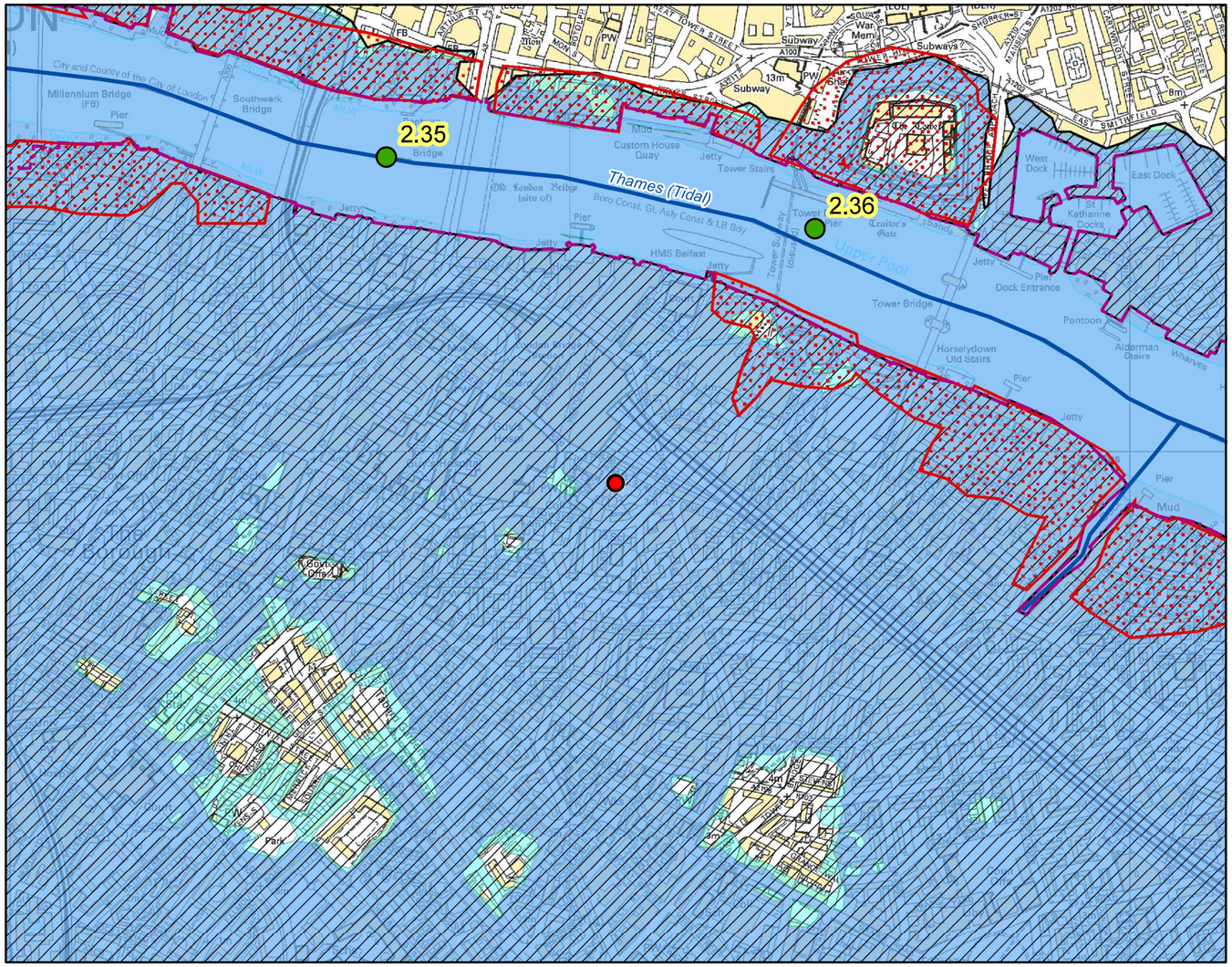
Please be aware that flooding can come from different sources. Examples of these are:

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

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

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Historic Flood Map centred on SE1 9AB created 17 October 2018 [Ref: KSL 102387 LB]



Environment Agency

Scale 1: 10,000

Legend

- Site Location
- TE2100 Model Nodes
- Main Rivers
- Flood Map - Defences
- Flood Map - Flood Storage Areas
- Areas Benefiting from Flood Defences
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2
- Jan 1928 Flood Outline

Flood Map for Planning (assuming no defences)

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

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

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

Additional Information

Information Warning - OS background mapping

The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.

Planning advice and guidance

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Complete the form in the link and email back to kslplanning@environment-agency.gov.uk

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.
We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Flood Risk Assessments guidance

Flood risk standing advice for applicants

In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

https://www.gov.uk/flood-risk-assessment-standing-advice

http://planningguidance.planningportal.gov.uk/

https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

https://www.gov.uk/guidance/flood-risk-and-coastal-change

You should also consult the Strategic Flood Risk Assessment and flood risk local plan policies produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. You should discuss surface water management with your Lead Local Flood Authority.
3. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection due to insufficient information

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Surface Water

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

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

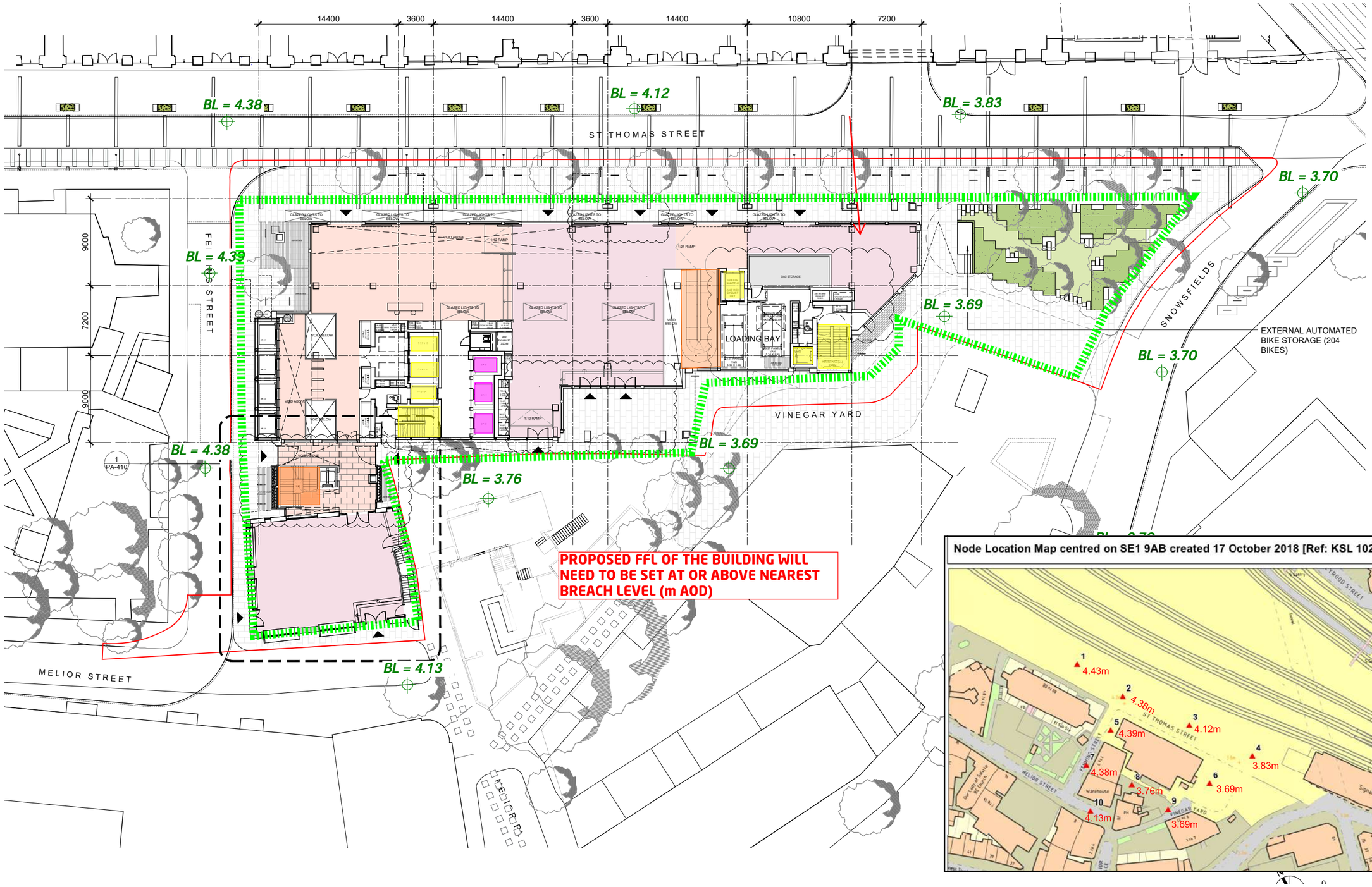
You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources. We are working with these organisations to improve knowledge and understanding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

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

4188
Vinegar Yard

Appendix E

Mitigation Measures Assessment



akt II

PROJECT	VINEGAR YARD	TITLE	MITIGATION MEASURES PLAN (RAISED FFL AT OR ABOVE BREACH LEVEL)		
DATE	15/10/21	SCALE	NTS	CAD FILENAME	-
STATUS	ISSUED FOR PLANNING				
DRAWN	SM	CHECKED	DN	PROJECT No.	4188
DRAWING No.	4188-CV-HS-003	REV	P3		

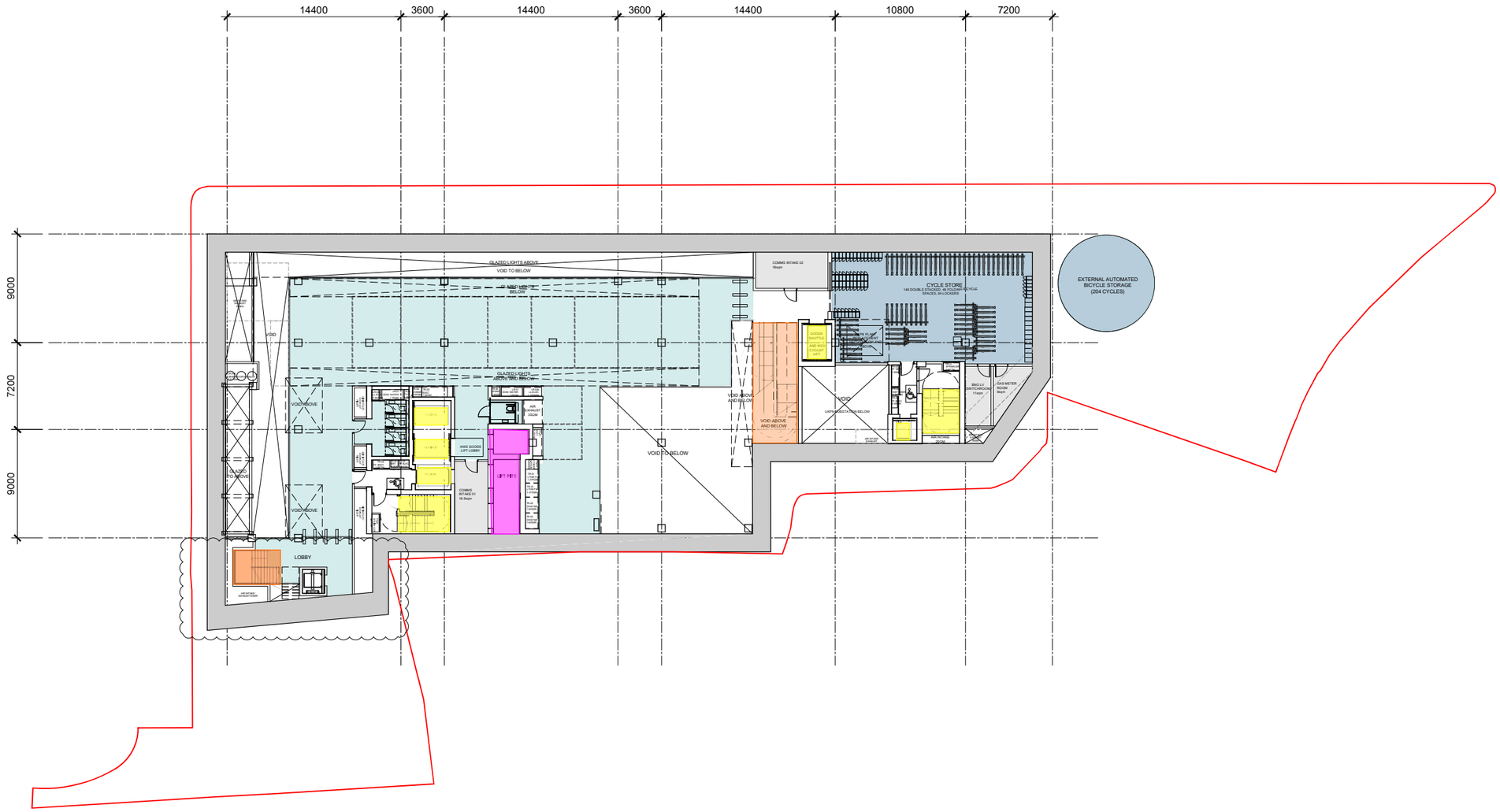
AREAS THAT ACCESS DOWN TO B1 / B2 / B3 LEVELS

AREAS THAT ACCESS DOWN TO B1 MEZZANINE LEVELS

AREAS THAT ACCESS DOWN TO B1 LEVELS

BL (m AOD) BREACH LEVEL

SITE BOUNDARY



AREAS THAT ACCESS DOWN TO B1 MEZZANINE/ B1 / B2 / B3 LEVELS

AREAS THAT ACCESS DOWN TO B1 MEZZANINE LEVEL ONLY.

AREAS THAT ACCESS DOWN TO B1 LEVEL ONLY.

DRAWINGS TO BE PRINTED IN COLOUR

KEY:

- APPLICATION BOUNDARY
- AFFORDABLE WORKSPACE
- BICYCLE FACILITIES
- PLANT

N

0 5M 10M 20M

SCALE: 1:200

KPF

Vinegar Yard
St. Thomas St
SE1 3QR

Client
St. Thomas Bermondsey Ltd.
3rd Floor, 50 Jermyn Street,
London, SW1Y 6LX
Tel: 020 7667 7766

Building Services Consultant
Sweco
1 Bath Road
Maidenhead, SL6 4AQ
Tel: 016 2862 3423

Planning Consultant
Montagu Evans
5 Bolton St
London, W1J 8BA
Tel: 020 7493 4002

Structural Consultant
AKT II
White Collar Factory
1 Old Street Yard
London, EC1Y 8AF
Tel: 020 7250 7777

Environmental Consultant
Trium Environmental Consulting
68 - 85 Tabernacle Street
London, EC2A 4BD
Tel: 020 3887 7118

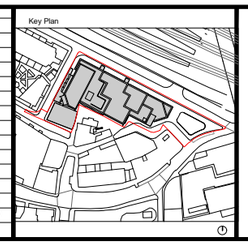
Townscape Consultant
Montagu Evans
5 Bolton St
London, W1J 8BA
Tel: 020 7493 4002

Transport Consultant
Caneparo Associates
21 Little Portland Street
London, W1W 8BT
Tel: 020 3617 8200

Cost Consultant
Arcadis
Arcadis House, 34 York Way
London, N1 9AB
Tel: 0 20 7812 2099

No.	Issue	Check	Date
P01	Planning Issue	SE	Sep 2021
P00	Planning Issue	AF	Dec 2020

Key Plan



Kohn Pedersen Fox Associates (International) PA
Architects and Planning Consultants

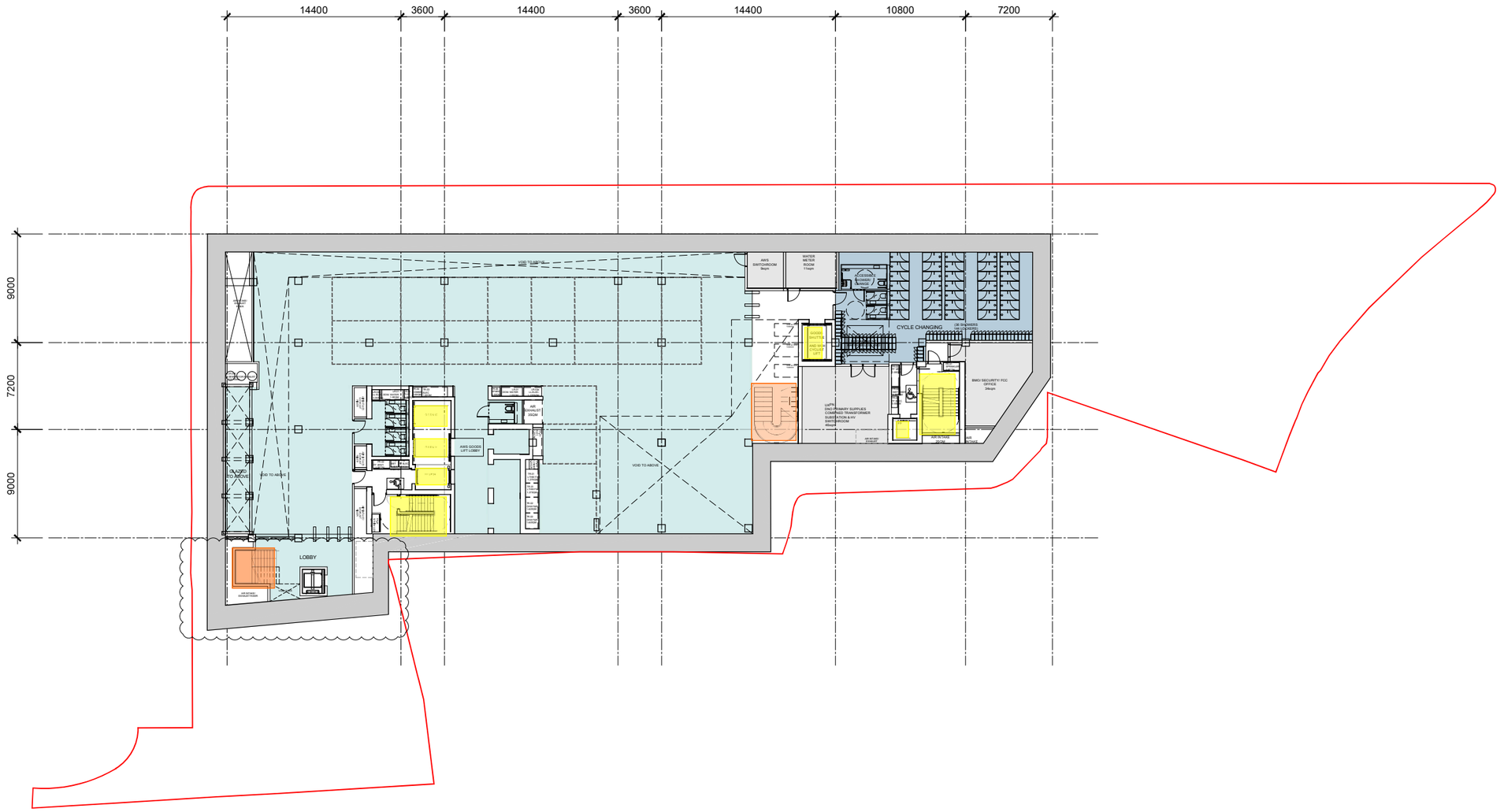
7a Langley Street
London WC2H 9JA
England
T: +44 (0) 20 3119 5300
F: +44 (0) 20 7497 1175
http://www.kpf.com

Proj. No. 2472
Project Vinegar Yard

Scale	Drawn by	Checked by
1:200 @ A1	SD	AF

Drawing Title and No.
PROPOSED GENERAL ARRANGEMENT PLAN
LEVEL BASEMENT 01 MEZZANINE

No. PA-99M
Rev. P01



AREAS THAT ACCESS DOWN TO B1 MEZZANINE/ B1 / B2 / B3 LEVELS

AREAS THAT ACCESS DOWN TO B1 LEVEL ONLY.

DRAWINGS TO BE PRINTED IN COLOUR

KEY:

- APPLICATION BOUNDARY
- AFFORDABLE WORKSPACE
- BICYCLE FACILITIES
- PLANT

N

0 5M 10M 20M

SCALE: 1:200

KPF

Vinegar Yard
St. Thomas St
SE1 3QR

Client
St. Thomas Bermondsey Ltd.
3rd Floor, 50 Jermyn Street,
London, SW1Y 6LX
Tel: 020 7667 7766

Building Services Consultant
Sweco
1 Bath Road
Maidenhead, SL6 4AQ
Tel: 016 2862 3423

Planning Consultant
Montagu Evans
5 Bolton St
London, W1J 8BA
Tel: 020 7493 4002

Structural Consultant
AKT II
White Collar Factory
1 Old Street Yard
London, EC1Y 8AF
Tel: 020 7250 7777

Environmental Consultant
Trium Environmental Consulting
68 - 85 Tabernacle Street
London, EC2A 4BD
Tel: 020 3887 7118

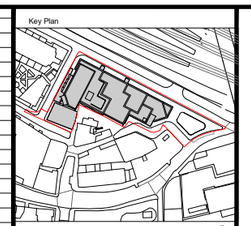
Townscape Consultant
Montagu Evans
5 Bolton St
London, W1J 8BA
Tel: 020 7493 4002

Transport Consultant
Caneparo Associates
21 Little Portland Street
London, W1W 8BT
Tel: 020 3617 8200

Cost Consultant
Arcadis
Arcadis House, 34 York Way
London, N1 9AB
Tel: 0 20 7812 2099

No.	Issue	Check	Date
P01	Planning Issue	SE	Sep 2021
P00	Planning Issue	AF	Dec 2020

Key Plan



Kohn Pedersen Fox Associates (International) PA
Architects and Planning Consultants

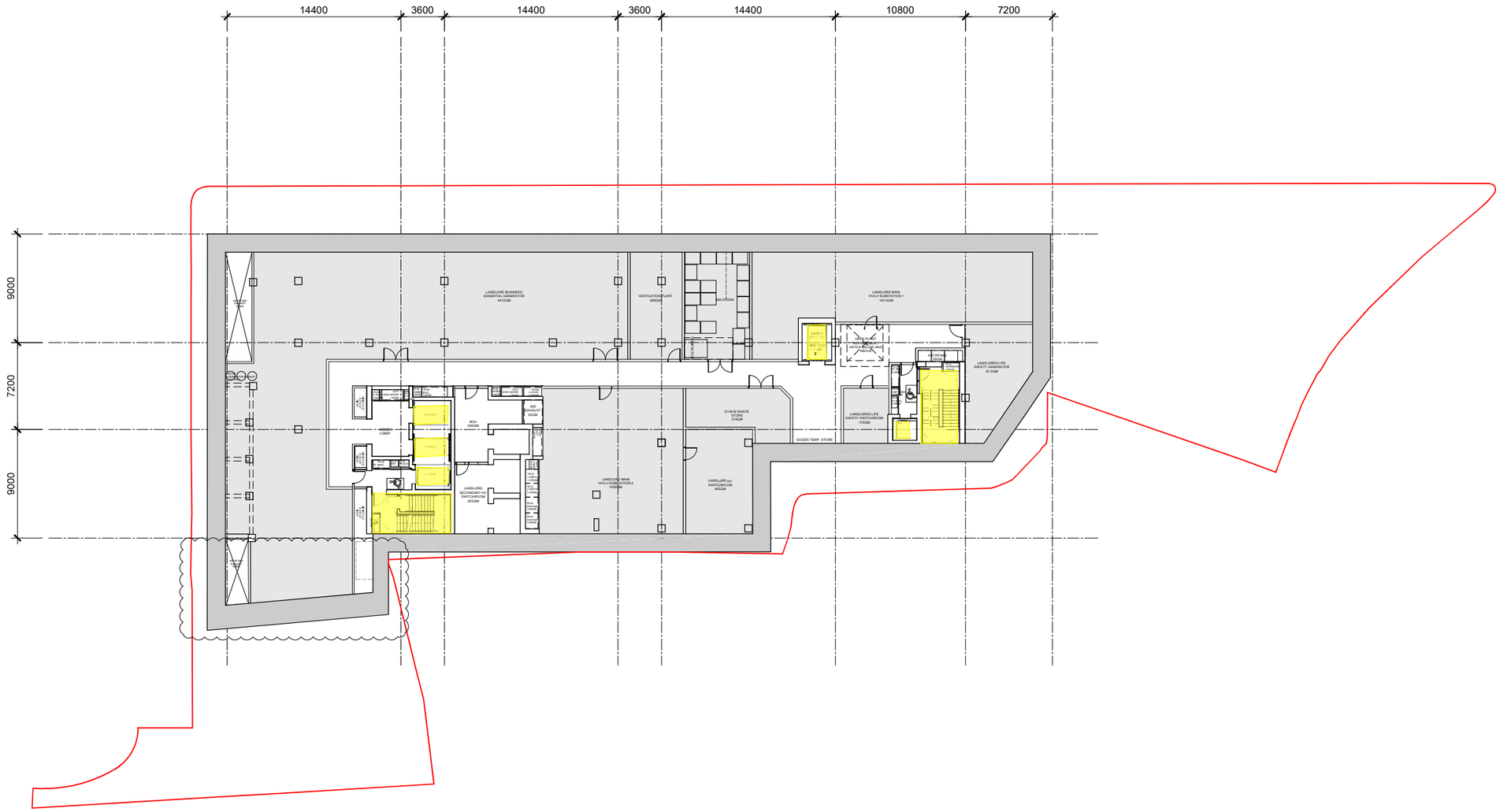
7a Langley Street
London WC2H 9JA
England
T: +44 (0) 20 3119 5300
F: +44 (0) 20 7497 1175
http://www.kpf.com

Proj. No. 2472
Project Vinegar Yard

Scale	Drawn by	Checked by
1:200 @ A1	SD	AF

Drawing Title and No.
PROPOSED GENERAL ARRANGEMENT PLAN
LEVEL BASEMENT 01

No. PA-099
Rev. P01



AREAS THAT ACCESS DOWN TO B1 MEZZANINE/ B1 / B2 / B3 LEVELS

DRAWINGS TO BE PRINTED IN COLOUR

KEY:

APPLICATION BOUNDARY

PLANT

N

0 5M 10M 20M

SCALE: 1:200

KPF

Vinegar Yard
St. Thomas St
SE1 3QR

Client
St. Thomas Bermondsey Ltd.
3rd Floor, 50 Jermyn Street,
London, SW1Y 6LX
Tel: 020 7667 7766

Building Services Consultant
Sweco
1 Bath Road
Maidenhead, SL6 4AQ
Tel: 016 2862 3423

Planning Consultant
Montagu Evans
5 Bolton St
London, W1J 8BA
Tel: 020 7493 4002

Structural Consultant
AKT II
White Collar Factory
1 Old Street Yard
London, EC1Y 8AF
Tel: 020 7250 7777

Environmental Consultant
Trium Environmental Consulting
68 - 85 Tabernacle Street
London, EC2A 4BD
Tel: 020 3887 7118

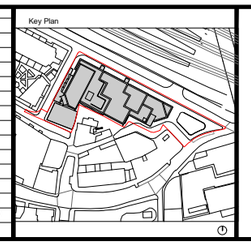
Townscape Consultant
Montagu Evans
5 Bolton St
London, W1J 8BA
Tel: 020 7493 4002

Transport Consultant
Caneparo Associates
21 Little Portland Street
London, W1W 8BT
Tel: 020 3617 8200

Cost Consultant
Arcadis
Arcadis House, 34 York Way
London, N1 9AB
Tel: 0 20 7812 2099

No.	Issue	Check	Date
P01	Planning Issue	SE	Sep 2021
P00	Planning Issue	AF	Dec 2020

Key Plan



Kohn Pedersen Fox Associates (International) PA
Architects and Planning Consultants

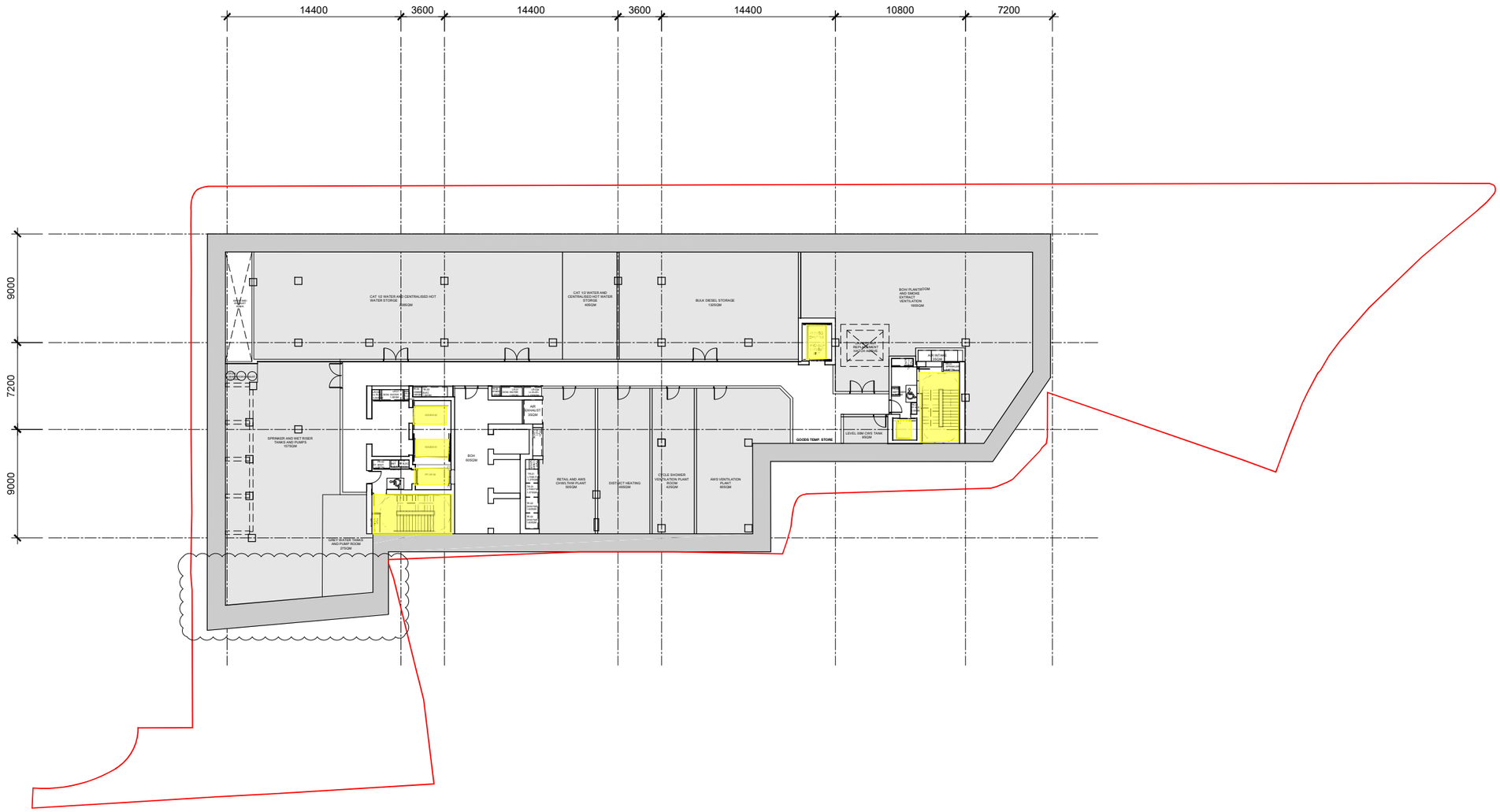
7a Langley Street
London WC2H 9JA
England
T: +44 (0) 20 3119 5300
F: +44 (0) 20 7497 1175
http://www.kpf.com

Proj. No. 2472
Project Vinegar Yard

Scale 1:200 @ A1
Drawn by SD
Checked by AF

Drawing Title and No.
PROPOSED GENERAL ARRANGEMENT PLAN
LEVEL BASEMENT 02

No. PA-098
Rev. P01



AREAS THAT ACCESS DOWN TO B1 MEZZANINE/ B1 / B2 / B3 LEVELS

DRAWINGS TO BE PRINTED IN COLOUR

KEY:

APPLICATION BOUNDARY

PLANT

N

0 5M 10M 20M

SCALE: 1:200

KPF

Vinegar Yard
St. Thomas St
SE1 3QR

Client
St. Thomas Bermondsey Ltd.
3rd Floor, 50 Jermyn Street,
London, SW1Y 6LX
Tel: 020 7667 7766

Building Services Consultant
Sweco
1 Bath Road
Maidenhead, SL6 4AQ
Tel: 016 2862 3423

Planning Consultant
Montagu Evans
5 Bolton St
London, W1J 8BA
Tel: 020 7493 4002

Structural Consultant
AKT II
White Collar Factory
1 Old Street Yard
London, EC1Y 8AF
Tel: 020 7250 7777

Environmental Consultant
Trium Environmental Consulting
68 - 85 Tabernacle Street
London, EC2A 4BD
Tel: 020 3887 7118

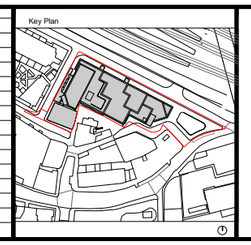
Townscape Consultant
Montagu Evans
5 Bolton St
London, W1J 8BA
Tel: 020 7493 4002

Transport Consultant
Caneparo Associates
21 Little Portland Street
London, W1W 8BT
Tel: 020 3617 8200

Cost Consultant
Arcadis
Arcadis House, 34 York Way
London, N1 9AB
Tel: 0 20 7812 2099

No.	Issue	Check	Date
P01	Planning Issue	SE	Sep 2021
P00	Planning Issue	AF	Dec 2020

Key Plan



Kohn Pedersen Fox Associates (International) PA
Architects and Planning Consultants

7a Langley Street
London WC2H 9JA
England
T: +44 (0) 20 3119 5300
F: +44 (0) 20 7497 1175
http://www.kpf.com

Proj. No. 2472
Project Vinegar Yard

Scale 1:200 @ A1
Drawn by SD
Checked by AF

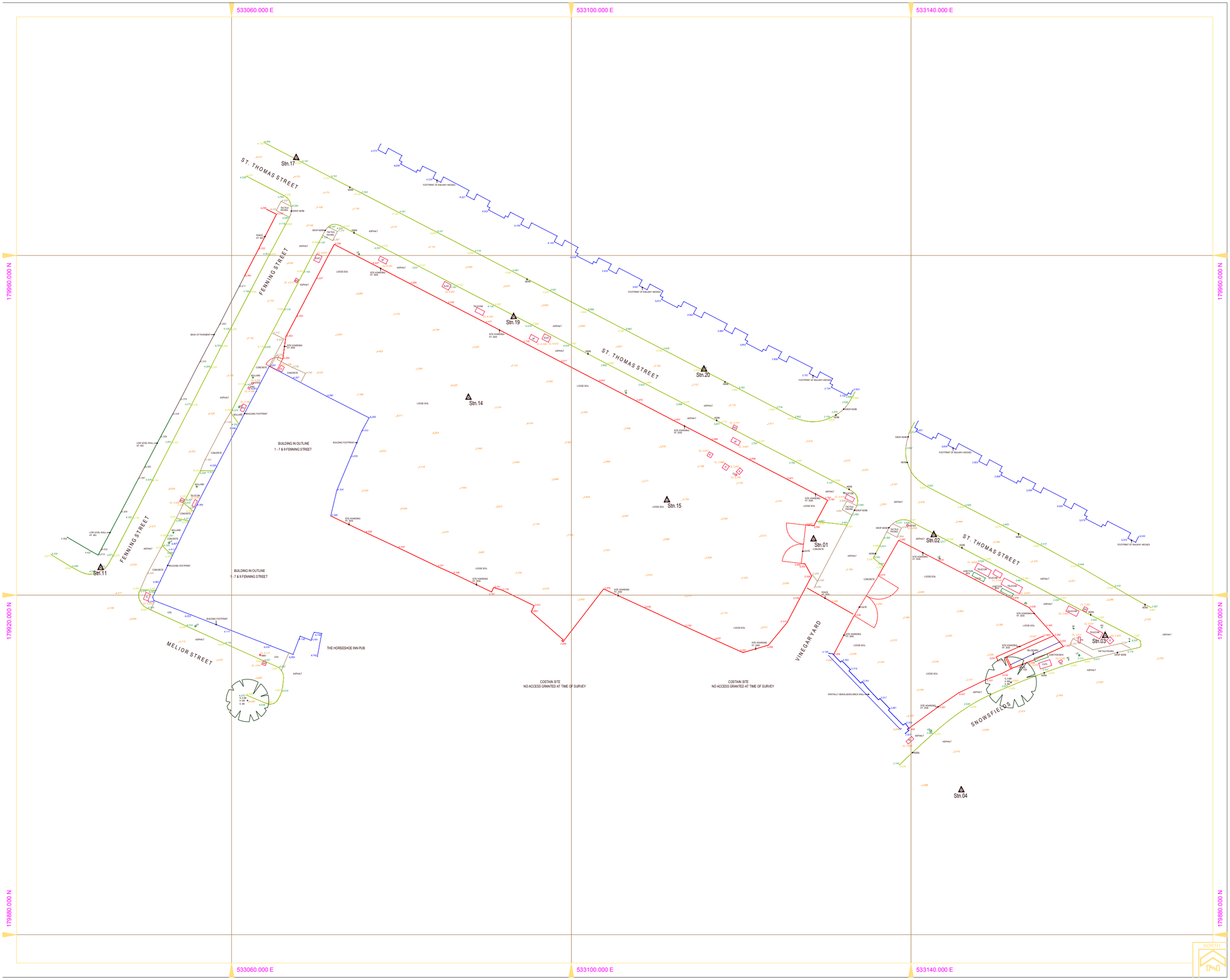
Drawing Title and No.
PROPOSED GENERAL ARRANGEMENT PLAN
LEVEL BASEMENT 03

No. PA-097
Rev. P01

4188
Vinegar Yard

Appendix F

Topographic Survey



DATE	REVISIONS

CONTROL SURVEY STATIONS

SURVEY ORIENTATED TO ORDNANCE SURVEY GRID USING SIMULTANEOUS STATIC GPS BASELINE OBSERVATIONS BETWEEN SURVEY CONTROL STATIONS 14 AND 15 USING A MINIMUM 2 HOUR OBSERVATION PERIOD. SURVEY LEVELS RELATED TO ORDNANCE SURVEY DATUM USING SIMULTANEOUS STATIC GPS BASELINE OBSERVATIONS BETWEEN SURVEY STATIONS 14 AND 15 USING A MINIMUM 2 HOUR OBSERVATION PERIOD.

STATION	EASTING (M)	NORTHING (M)	LEVEL (M)
01	533128.518	179926.581	3.490
02	533142.674	179927.088	3.590
03	533162.851	179915.220	3.316
04	533145.920	179897.020	2.729
11	533044.587	179923.219	4.274
14	533087.888	179943.259	4.168
15	533111.253	179931.166	3.696
17	533067.601	179971.492	4.205
19	533093.214	179952.771	4.109
20	533115.616	179946.591	3.805

ABBREVIATIONS (WHERE APPLICABLE)

A/C	AIR CONDITIONING	N/A	NO ACCESS
B	BOLLARD	O/H	OVERHEAD
BOE	BRICK ON EDGE COPING	RAD	RADIATOR
BT	BRITISH TELECOM COVER	R/L	ROOF LIGHT
CATV	CABLE TV COVER	R/S	ROLLER SHUTTER
CF	CEILING FALL	RSJ	ROLLED STEEL JOIST
CL	COVER LEVEL	RSS	ROLLED STEEL STANCION
CONC	CONCRETE FINISH	RWP	RAIN WATER PIPE
CPD	CUPBOARD	SAR	SLOPING ASPHALT ROOF
CPF	CARPET FLOOR FINISH	S/C	STRUCTURAL CEILING
CPS	CONCRETE PAVING SLABS	SGR	SLOPING GLASS ROOF
DK	DROP KERB	SP	SIGN POST
DP	DOWN PIPE	SSR	SLOPING SLATE ROOF
ER	EARTH ROD	STR	SLOPING TILED ROOF
FAR	FLAT ASPHALT ROOF	SVP	SOIL & VENT PIPE
FB	FLOWER BED	TCB	TRAFFIC CONTROL BOX
F/C	FALSE CEILING	T/L	TRAFFIC LIGHT
FH	FIRE HYDRANT	U	URINAL
FHR	FIRE HOSE REEL	VP	VENT PIPE
G	GULLY	VTF	VINYL TILED FLOOR
GPO	TELECOM COVER	WC	TOILET
GV	GAS VALVE	WHB	WASH HAND BASIN
HD	HAND DRIER	WMV	WATER METER VALVE
H/L	HIGH LEVEL	WSC	WATER STOP COCK
HT	HEIGHT	WT	WATER TANK
IC	INSPECTION COVER		
L/L	LOW LEVEL		
LP	LAMP POST		

LEGEND (WHERE APPLICABLE)

	LINE INDICATES OVERHEAD OR HIDDEN DETAIL
	INDICATES CENTRE OF STEEL, RAILING OR FENCES
C. 0.000	CILL HEIGHT TO OPENING FROM FINISHED FLOOR LEVEL
SP. 0.000	SPRING HEIGHT TO ARCH FROM CILL LEVEL
H. 0.000	HEAD HEIGHT TO OPENING FROM CILL LEVEL
+ 10.00	CROSS INDICATES POSITION OF LEVEL
DL 10.00	INDICATES POSITION OF DEDUCED LEVEL
(9.000)	INDICATES RELEVANT CEILING, BEAM OR SOFFIT HEIGHT
	EXISTING TREE (SPREAD & HEIGHTS - NEAREST METRE) G. GIRTH H. HEIGHT S. SPREAD

PLEASE NOTE (WHERE APPLICABLE)

1. THE ACCURACY OF THIS SURVEY DRAWING IS DEPENDENT UPON THE SCALE AT WHICH IT IS PRODUCED. USERS SHOULD NOT RE-SCALE THIS DRAWING WITHOUT WRITTEN CONSENT.
2. WHILST ALL REASONABLE CARE HAS BEEN TAKEN IN LOCATING THE UNDERGROUND SERVICES SHOWN ON THIS DRAWING, THE COMPLETENESS OR THE ACCURACY OF THE INFORMATION CANNOT BE GUARANTEED. USERS SHOULD SATISFY THEMSELVES WITH REGARD TO THE TYPE, SIZE AND ROUTE OF SERVICES BEFORE CONNECTIONS ARE AUTHORISED.
3. THE ABILITY TO SCALE FROM THIS SURVEY DRAWING IS DEPENDENT ON THE STABILITY OF THE DRAWING MATERIAL. USERS SHOULD VERIFY, BY THE SCALE OF THE SURVEY GRID, THE ACCURACY OF THE DRAWING MATERIAL PRIOR TO SCALING DIMENSIONAL INFORMATION.

ORDNANCE SURVEY RELATED MARK

TRAVERS CONTROL STATION STN 14

VALUE = 4.168m

TITLE
SITE PLAN

PROJECT
70 - 82 ST. THOMAS STREET

CLIENT
KPF ASSOCIATES

SCALE	DRAWN	DATE	DRAWING	REVISION
1:200@A1	P.C.	DEC 2018	9460/01	

Michael Gallie & Partners
RECORDING THE BUILT ENVIRONMENT™
166B Tower Bridge Road, London SE1 3LZ
T:0333-240-1211 F:0333-240-1169 E:survey@michaelgallie.co.uk

Appendix: Flood Risk and Drainage

Annex 1: Flood Risk Assessment

Annex 2: Drainage Assessment Report

4188 - Vinegar Yard

Drainage Assessment Report

October 2021

Consulting Structural and Civil Engineers

AKT II Ltd

White Collar Factory
1 Old Street Yard
London EC1Y 8AF

T +44 (0)20 7250 7777
F +44 (0)20 7250 7555
info@akt-uk.com

Contents

Revision	Date	Status
06	15.10.21	Planning Issue
05	25.08.21	Preliminary Issue
04	09.07.21	Addendum Issue
03	17.12.20	Planning Issue
02	11.12.20	Preliminary Issue
01	04.12.20	Draft issue

Prepared by:	Sara Mercuriali
Checked by:	Dariusz Nowacki
Approved by:	David Purcell

1 Introduction

AKT II have been commissioned to undertake a Drainage Assessment Report in support of the proposed redevelopment of the land bounded by St Thomas Street, Fenning Street, Vinegar Yard and Snowfields including Nos. 1-7 Fenning Street and No. 9 Fenning Street, SE1 3QR. This report is intended to outline the surface and foul water drainage strategy for the development.

St Thomas Bermondsey Limited (the "Applicant") submitted an application for full planning permission for the redevelopment of Vinegar Yard (the "Site") to the London Borough of Southwark ("LBS" or the "Council") on 21 December 2018 under reference 18/AP/4171 (the "Application"). The Application was considered by the Council's Planning Committee on 29 June 2020. Officers recommended the Application for approval subject to conditions and S106, but LBS resolved to refuse.

On 24 August 2020 the Mayor notified LBS and the Applicant of his intention to recover the Application for his own determination (GLA ref. GLA/6208/S2). Since then, the Applicant has been working with officers at the GLA and Southwark to amend the development proposals, seeking amongst other changes to address LBS' heritage concerns that had led to the local refusal. This Drainage Assessment Report has therefore been prepared as part of a package of materials for submission to the GLA for the purposes of public consultation and consideration of the Revised Scheme by the Mayor.

The updated scheme seeks to provide flexible medical and research & development floorspace (Use Classes D1 and / or B1(b)) designed to allow for occupation by Guys and St Thomas' NHS Foundation Trust, but flexible to ensure long term resilience. Levels one to ten of the building will first be offered to Guys and St Thomas' for use as either D1 medical space or B1(b) research & development. The remainder of the upper floors, levels 11 to 18, comprise a B1(a) office use. This configuration reflects Guys and St Thomas's Adaptable Estates Strategy, where buildings are able to accommodate a range of possible functions both physically and by virtue of permitted uses in the long term. In the event that Guys and St Thomas' do not wish to occupy levels 1 to 10 of the proposed building, it will default to a B1(b) research and development use and will be made available to R&D occupiers whose work can support the SC1 Life Science & Innovation District. Minor changes to the plant configuration at levels 3 and 8 of the building and the retail floorspace at ground floor level would also change as a result of a research and development use. The remainder of the proposed floorspace within the scheme would not change in the event of a research and development occupier taking the building. The flexible medical and research & development use will be controlled by a suitably worded planning condition and obligation within the Section 106 agreement.

2 Surface water drainage

2.1 Existing site

The available Thames Water record plans indicate that the closest surface water or combined public sewers to the site are:

- A 305mm diameter combined sewer in Melior Street to south-west of the site.
- A 375mm diameter combined sewer in Snowsfields to the east of the site.
- A 1140 x 790mm combined sewer under St Thomas Street to the north of the site becoming 1190 x 930mm at the junction with Snowsfields.
- A 150mm diameter combined sewer to the south crossing the site in Vinegar Yard and connecting into the 1140 x 790mm combined sewer in St Thomas Street.

An extract from the record plans is shown in Figure 1.1 for reference.

The site comprises of an irregular shaped plot of land located in the Borough of Southwark City Council, in the London Bridge Area.

The majority of the site is currently being used as car park area with a small security cabin located on the eastern side.

The site comprises also of a low rise industrial building located at 1-7 Fenning Street and 9 Fenning Street. This is a two storey brick warehouse with a concrete ground floor which provides approximately 848 m² (GIA) of light industrial with ancillary office and storage floorspace (B1). The majority of the site was previously used as a work space for Network Rail in connection with the development works at London Bridge.

Details of existing private drainage including outfalls from the applicant site are not known and need to be confirmed by carrying out a CCTV drainage survey. Therefore, it is recommended that a CCTV survey of the existing drainage network is undertaken in order to confirm the location, size, levels and condition of all existing surface water connections from the site and to identify if there are any third party connections from the adjacent properties which will need to be considered in the proposed scheme.

The total site area is approximately 2,300m² which is 100% hardstanding.

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

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

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

For the peak 1-in-1-year return period storm event this gives an existing discharge rate from the site of:

$\mathbf{Q_1}$ = 3.61 × 0.75 × 0.23 × 32.4 = **20.2 litres/sec**

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

$\mathbf{Q_{100}}$ = 3.61 × 0.75 × 0.23× 103.2 = **64.2 litres/sec**

2.2 Proposed scheme

The proposed redevelopment of the site comprises the demolition of existing buildings, retention and the refurbishment of the warehouse and the erection of a ground, mezzanine and 18 storey building (with plant at roof) and 3 basement levels, comprising of café and community space within the warehouse and within the new building office, flexible medical and research and development, and flexible retail and affordable workspace, alongside cycle and disabled car parking, servicing, refuse and plant areas, public garden (including soft and hard landscaping), highway improvements and all other associated works.

The plans indicate that the site area within red boundary is approximately 2,300 m² and comprises of 93% hardstanding. It is proposed to have a soft landscaped area to the east of the site which will improve the sustainability of the development and help to reduce the peak surface water runoff from the site during smaller storm events. However, in large storm event the impact will be negligible and so it is assumed that site area is 100% impermeable.

The yellow shaded areas in Figure 1.1 are public realm areas and it is not intended to attenuate these areas within the development.

Using the Modified Rational Method, the proposed (unattenuated) peak run-off from the site for the 1-in-1-year return period storm would be:

$\mathbf{Q_1}$ = 3.61 × 0.75 × 0.23 × 32.4 = **20.2 litres/sec**

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

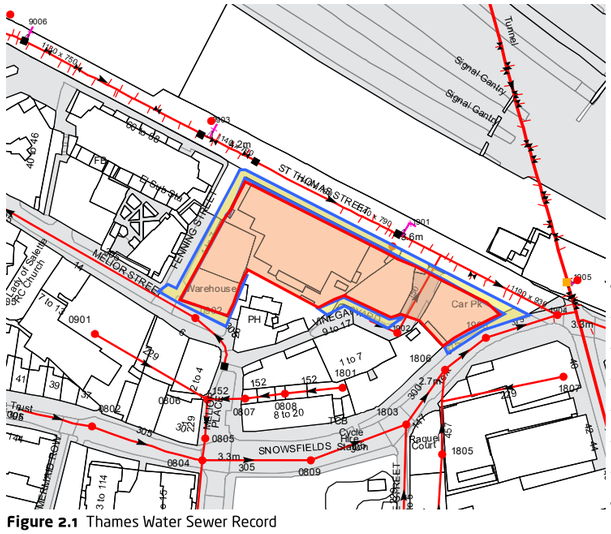


Figure 2.1 Thames Water Sewer Record

$\mathbf{Q_{100}}$ = 3.61 × 0.75 × 0.23 × 103.2 = **64.2 litres/sec**

The Environment Agency updated their guidance on climate change allowance in February 2016 to include an upper and lower allowance to be considered depending on the specific site characteristics. Table 1.1 on page 5 shows the revised figures based on various building life spans. Therefore, making an allowance for climate change of 40% this would give an unattenuated design discharge of:

$\mathbf{Q_{1\,(+40\%)}}$ = **28.3 litres/sec** and $\mathbf{Q_{100\,(+40\%)}}$ = **89.9 litres/sec**

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

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

Therefore, as an absolute minimum, the proposed site discharge under the 1-in-100-year storm plus climate change should be no greater than the existing 1-in-100-year storm discharge (i.e. mitigate the impact of climate change and any increase in the area of hardstanding). In this case, this would mean that the maximum permissible discharge from the site would be **64.2 litres/sec**.

Further to the above, the recently publicshed new London Plan's Policy SI 13 on Sustainable drainage states that "Development proposals should aim to get as close to greenfield run-off rates as possible depending on site conditions". The Environment Agency (EA) also suggests that Developers should aim to achieve greenfield run off from their site. In accordance with the method outlined in the Institute of Hydrology Report 124, the Greenfield runoff for the site is calculated from the formula:

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

Manhole reference	Manhole cover level	Manhole invert level
0902	0.72 m	n/a
1902	n/a	n/a
1806	2.631 m	-1.581 m
1903	2.91 m	-0.92 m
1904	3.178 m	-1.581 m
1901	4.142 m	-1.028 m
1903	4.132 m	-1.038 m

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

Q_{BAR} = 0.00108 × 0.500$^{0.89}$ × 600$^{1.17}$ × 0.45$^{2.17}$ = **183.4 litres/sec (for 50ha)**

Scaling this for the actual site area gives:

Q_{BAR} = (183.4 × 0.23) ÷ 50 = **0.84 litres/sec**

Using the Hydrological Growth Curve for south east England, the growth factor from Q_{BAR} to Q_{100} is 3.146 which gives a value for **Q_{100} =2.65 litres/sec.**

As the project is new build we would expect that based on our recent experience in the borough, the Local Authority, Thames Water, and the EA would require the storm water discharge to be limited to the greenfield run-off rate of **2.65 litres/sec**. A Pre-Planning Enquiry was sent to Thames Water Utilities on this basis on 11.10.20 and their response was received on 16.11.20 confirming the restricted surface water discharge of 2.65 litres/sec is acceptable (see Appendix 2).

As previously mentioned, details of existing private drainage including outfalls from the site to the public network are not known and need to be investigated. At this stage an allowance for three new sewer connections into the surrounding public sewers (one in St Thomas Street, one in Melior Street and one in Snowfields) should be made in case the existing connections are not in re-usable condition as indicated in the Strategic Drainage Layouts which can be found in Appendix 1. Sewer outfalls are to be positioned above the surcharge levels of the public sewers. At the next stage of the design AKTII will need to consult Thames Water with regard to any potential new sewer connections to the sewer in St Thomas Street, should the CCTV survey prove that existing connections are not in viable for re-use. There is a risk that new connections would be subject to a Section 98 application which can take up to 12 months and is very expensive and also requires that Thames Water contractors carry out the sewer connection works on behalf of the Client.

Section 2.3 discusses the potential approaches that can be taken to meet these requirements.

Range	Total potential change anticipated for 2010-2039	Total potential change anticipated for 2040-2059	Total potential change anticipated for 2060-2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Table 1.1 Peak rainfall intensity allowance

2.3 Disposal methods

SUDS management train

A useful concept used in the development of sustainable drainage systems is the SUDS management train (sometimes referred to as the treatment train). Just as in a natural catchment, drainage techniques can be used in series to change flow and quality characteristics of the runoff in stages. There are a variety of measures that can be implemented to achieve these goals:

Site management / Prevention

Site management procedures are used to limit or prevent runoff and pollution and include:

- Minimising the hardened areas within the site
- Frequent maintenance of impermeable surfaces
- Minimising the use of de-icing products

Source control

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

Site control

Where source control techniques do not provide adequate protection to the receiving watercourses in terms of flood protection and pollution control, site control may be required.

Regional control

Where large areas of public space are available regional control can be incorporated to provide additional 'communal' storage and treatment to runoff from a number of sites. However, in this case, all storage and treatment will be implemented on site.

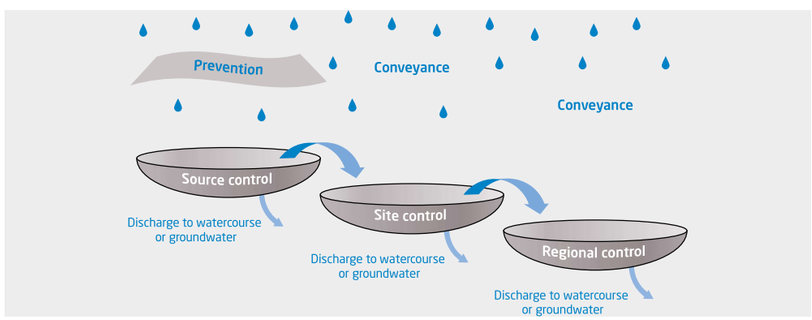


Figure 2.2 SUDS management train

Drainage hierarchy

Based on the above, the following drainage hierarchy, in accordance with the new London Plan 2021 Policy SI 13 on Sustainable drainage, will therefore need to be considered when preparing the surface water disposal strategy:

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

The new London Plan also states that "rainwater should be managed as close to the top of the hierarchy as possible" and that "there should be a preference for green over grey features, and drainage by gravity over pumped systems.'

Rainwater harvesting

This involves the capture of rainwater into a tank for re-use (usually non-potable) such as irrigation, toilet flushing or vehicle cleaning. Systems are now available which combine rain water harvesting with tanked attenuation. This means that water is stored during dry periods for re-use but released ahead of predicted storms in order to ensure that the full attenuation capacity remains available when it is needed.

As the project is a new build, it should be possible to install a rainwater harvesting system where roof water could be collected for re-use to flush toilets or irrigate planted areas. Its use should therefore be investigated further at the next design stages to determine its suitability in terms of the plant space requirements, the need for a secondary water distribution network, the available yield and demand.

Green / brown / blue roofs

These are used on flat or shallow pitched roofs to provide a durable roof covering which also provides thermal insulation, amenity space and biodiversity habitat as well as attenuation of rainwater. Depending on the design, these roofs can attenuate differing volumes of rainwater. The term 'blue roof' is reserved for those roofs designed to maximise water retention. This is a relatively recent area of increased focus and can involve an attenuation tank at roof level which reduces (or avoids) the need for pumping of basement tanks.

It is not proposed to include green roofs at terrace level, but it is intended to incorporate some trees and plants to improve biodiversity of the development and to limit the run-off volume of rainwater through short-term attenuation and evaporation.

It is proposed that blue roofs are incorporated into the scheme. The volume of attenuation required is provided in the 'storage tanks' section of this report.

Raingardens

Raingardens are planted areas (usually close to buildings but not immediately adjacent) that allow the diversion of a portion of rainwater from either downpipes or the surrounding paved surfaces. These techniques can be incorporated into the landscaping plans for a site and are most effective where the landscaping regime is designed with the aim of capturing as much rainfall as possible. They can either allow infiltration into the ground or have tanked systems for water retention, depending on the site and soil conditions. There are also a number of vertical raingardens attached to building walls with rainwater downpipes diverted through a stacked series of planters.

As the proposed structure takes up the majority of the site area it is not possible to incorporate raingardens into the scheme.

Bio-retention

This refers to a chain of landscaped features, potentially including reed beds, filter drains, etc. designed to hold and treat surface water. They are often used where there is a high risk of low-level pollution, for example from road run-of. However, it does require areas of open space. The design of a bio-retention system can vary widely depending on site conditions and available space. At a small scale this could include flow through planters or tree pits.

As the proposed structure takes up the majority of the site area it is not possible to incorporate bio-retention into the scheme.

Permeable surfacing

Permeable hard surfaces which work in much the same way as traditional impermeable surfaces apart from the ability to allow rainwater to pass through. Permeable blocks are traditionally used but there are now a range of permeable asphalt and resin bound gravel pavings being used increasingly commonly.

Permeable surfaces can either allow infiltration into the ground or have tanked systems for water retention, depending on the site and soil conditions. They are suitable in even the most densely built-up development. However, they're not well suited to roads carrying heavy or fast motor traffic.

The Landscape Architects proposals do not include permeable paving systems in the scheme.

Swales

These are dry ditches used as landscape features to allow the storage, carriage and infiltration of rainwater and are often used as linear features alongside roads, footpaths or rail lines. They can also be integrated into the design of many open spaces.

As the proposed structure takes up the majority of the site area it is not possible to incorporate swales into the scheme.

Detention basin / ponds

These are landscape features designed to store and in some cases infiltrate rainwater. Detentions basins are usually dry, whereas a pond should retain water. These features need areas of open space but can often be combined with other sustainable drainage techniques.

As the proposed structure takes up the majority of the site area it is not possible to incorporate ponds into the scheme.

Discharge to tidal river / dock / canals

Discharging clean rainwater directly to tidal rivers, canals or docks isn't normally a sustainable drainage technique. Other more productive techniques should be used first. However, it is generally more sustainable than discharging to the combined or surface drainage systems. Residual surface water can be discharged to tidal / large waterbodies, in some cases with no limitation on volumes. Some storage may be required to allow for outfalls becoming tide locked. Care is needed to prevent scour (sediment removal) in the receiving waterbody and potentially to prevent pollution. Consent from the EA, the asset owner and (where applicable) the Canal and River Trust is required.

There are no adjacent rivers or ponds and so discharge to a watercourse will not be a viable disposal method.

Storage tanks

Storage tanks are single GRP (glass reinforced plastic) units usually but not necessarily located below ground level which attenuate rainwater for later slow release back into the drainage system but do not provide the wider benefits of green infrastructure sustainable drainage. They can also have the disadvantage that pumping may be required to empty the tank into the drainage system – especially if the tank is located at or below basement level. Where tanks are designed for large storm events, care is needed to ensure that they still perform a useful sustainable drainage function for low order storms.

Geocellular storage tanks are similar to storage tanks except that the volume is made up from multiple units rather than a single tank meaning they can be more flexible in terms of shape to suit constrained sites.

It is proposed that geo-cellular tanks are introduced as a form of attenuation below the ground level to the east of the site and below the Warehouse ground floor finished floor level to the south of the site.

It is believed that the most feasible disposal option for the site is to discharge to the existing public sewers utilising the existing or new outfalls. The approximate storage volume required for greenfield rate of **2.65 litres/sec** under the 1-in-100-year (plus 40 % climate change) storm event from the building is **150 m³**.

It is recommended that at this stage a cost and space allowance is made for the storage volume of **150 m³** in order to limit the discharge rates to the Greenfield run-of rate of **2.65 l/sec** with Policy SI 13 of the new London Plan. An additional 10% freeboard within the blue roofs is to be provided to meet the LBS requirements.

The proposed attenuation features for the main building will comprise blue roof systems covering part of the roof terraces and a geo-cellular tank located below the landscaped area to the east of the site. The proposed attenuation strategy for the existing Warehouse to the south-west of the site will consist of a small geo-cellular tank with a storage volume of 15m³ located below the ground finished floor level. The intention is to accommodate the majority of the required attenuation volume at roof utilising blue roof systems. Any volume that cannot be accommodated at roof will be provided in a geo-cellular storage tank located below the ground level in order to allow gravity discharge into the public sewer. The proposed discharge rates and volumes will be determined at the next design stage. Provision of non-return valves at outfall points is to be confirmed during the next design stage.

Oversized piping

Using larger than necessary pipework creates more room to store rainwater. This would be potentially more sustainable than storage tanks / geocellular storage (modular attenuation tank) if the pipes drain by gravity and do not require pumping. However, this option lacks the wider benefIts of the green infrastructure based techniques.

Due to the restricted nature of the site the pipework would become impractically large to provide the volume of storage required to achieve the required run-of rate.

Design for exceedance

This involves designing areas within a site such that they will flood and hold water during rare storm events (typically a frequency of once in ten years or longer).

As the attenuation volume has been sized to accommodate the 1-in-100-year plus climate change event there is no need to design for exceedance.

Summary of the proposed SuDS strategy

The intention is to accommodate the majority of the required attenuation volume for the main building at roof utilising blue roof systems. Any volume that cannot be accommodated at roof will be provided in a geo-cellular storage tank located below the ground level in the landscaped area to the east of the site in order to allow a gravity discharge into the public sewer. The proposed discharge rates and associated storage volumes will be determined at the next design stage. The intention is also to accommodate a small geo-cellular tank with a volume of 15m³ below the ground finished floor level of the existing Warehouse building to allow gravity discharge into the public sewer running in Melior Street. The discharge rate will be agreed with Thames Water by a way of submitting a pre-planning enquiry. A pre-planning enquiry was sent on 11.11.20, Thames Water responded on 16.11.20 confirming that a restricted discharge rate of 2.65 litres/sec into the public sewer from the development is acceptable (see Appendix 2).

Three options have been considered in terms of surface water attenuation strategy and they will need to be further investigated at the next stage of the design (see Appendix 1). Options A and B are based on a combination of blue roof systems covering a portion of roof terraces and geo-cellular tanks below ground level in order to limit the discharge rate to the Greenfield run-of rate of **2.65 l/sec** in line with Policy SI 13 of the new London Plan. Option C is considered as a secondary option and it is based on blue roof systems covering all the roof terraces (except for new level 13th terrace) in order to attenuate the majority of the main building catchment area. The remaining landscaped area and the existing Warehouse building will be attenuated via two small tanks located below the ground level. It is worth mentioning the fact that this option will be in line with LBS requirements to maximise the use of blue roof systems, but on the other hand the greenfield runoff will be exceeded (from 2.65 litres/sec to 4 litres/sec).

Element	Management stage	Water quantity	Water quality	Amenity & biodiversity	Possible in scheme
Rainwater harvesting	Prevention	✓	✗	✗	✓
Green/brown/ blue roof	Source control	✓	✓	✓	✓
Raingardens	Source control	✓	✓	✓	✗
Bio-retention	Source control	✓	✓	✓	✗
Permeable surfacing	Source control	✓	✓	✗	✗
Swales	Source control	✓	✓	✓	✗
Detention basin/ponds	Source control	✓	✓	✓	✗
Discharge to tidal river / dock / canals	Site control	✓	✗	✗	✗
Storage tanks/ Geocellular storage	Site control	✓	✗	✗	✓
Oversized pumping	Site control	✓	✗	✗	✗
Design for exceedance	Site control	✓	✗	✗	✗

Figure 2.3 Summary of potential SuDS devices

Option A

This will comprise of blue roof systems covering a portion of level 17th, 15th, 10th and 8th roof terrace, resulting in a total volume of 43m³ and in a gravity discharge into the public sewers. The remaining volume will be provided via a storage tank located below ground level in the landscaped area to the east of the site with a total volume of 100m³ and a small geo-cellular tank located below the ground finished floor level of the existing Warehouse building with a volume of 15m³ to allow a gravity discharge into the public sewers.

Option B

This will comprise of blue roof systems covering a portion of level 15th, 10th and 8th roof terrace, resulting in a total volume of 17m³ and in a gravity discharge into the public sewers. The remaining volume will be provided via a storage tank located below ground level with a total volume of 118m³ in the landscaped area to the east of the site and a small geo-cellular tank located below the ground finished floor level of the existing Warehouse building with a total volume of 15m³ to allow gravity discharge into the public sewers.

Option C

This will comprise of blue roof systems covering a portion of all the roof terraces (level 19th, 17th, 15th, 10th and 8th) except for new level 13th where it is intended not to have blue roof resulting in a total volume of 94m³ and in a gravity discharge into the public sewers. The remaining catchment area will be attenuated via a storage tank located below ground level in the landscaped area to the east of the site with a total volume of 42m³ and a small geo-cellular tank located below the ground finished floor level of the existing Warehouse building with a total volume of 15m³ to allow gravity discharge into the public sewers. This option is based on the majority of the main building being attenuated via blue roof systems covering all roof terraces (except for new level 13th terrace) and on the assumption that the maximum allowable discharge in the sewer of 4 litres/sec can exceed the greenfield run-off rate of 2.65 litres/sec.

The surface water attenuation strategy is based upon three new outfall gravity connections into the public sewer: one in Melior Street for the existing Warehouse building, one in St Thomas Street for the blue-roof outfall discharge and one in Snowfields for the geo-cellular tank outfall discharge. If the CCTV drainage survey at the next stage of the design will prove that the existing 150mm dia. public sewer running through the site can be divested and the outfall into the public sewer running in St Thomas Street is suitable for re-use then an alternative option could be to connect the discharge from the below ground geo-cellular tank to the east of the site into the existing outfall in the public sewer running in St Thomas Street (see Appendix 1). This will need to be confirmed via a CCTV drainage survey of the existing drainage to be undertaken at the next stage of the design.

3 Foul water drainage

3.1 Existing scheme

The available Thames Water record plans indicate that the closest foul water or combined public sewers to the site are:

- A 305mm diameter combined sewer in Melior Street to south-west of the site.
- A 375mm diameter combined sewer in Snowsfields to the east of the site.
- A 1140 x 790mm combined sewer under St Thomas Street to the north of the site becoming 1190 x 930mm at the junction with Snowsfields.
- A 150mm diameter combined sewer to the south crossing the site in Vinegar Yard and connecting into the 1140 x 790mm combined sewer in St Thomas Street.

An extract from the record plans is shown in Figure 1.1 for reference.

Details of existing private drainage including outfalls from the applicant site are not known and need to be confirmed by carrying out a CCTV drainage survey. Therefore it is recommended that a CCTV survey of the existing drainage network is undertaken in order to confirm the location, size, levels and condition of all existing foul water connections from the site and to identify if there are any third party connections from the adjacent properties which will need to be considered in the proposed scheme.

The peak foul water discharge from the pre-development site has been estimated based on the existing warehouse floor area (1000m²).

Based on a daily discharge of 990 litres per day per 100 m² of floor area of warehouse and assuming a 12 hour day for this facility, the approximate existing foul water discharge from the site is as follows:

Use	Area (sqm)	Daily Discharge (litres/day)	Peak Flow Rate (litres/sec)
Warehouse	**1,000**	**9,900**	**0.23**
Total			**0.23**

3.2 Proposed scheme

The foul water assessment of the proposed scheme has been carried out considering D1 use (medical use) only from the first to the tenth floor of the main building as this use is more onerous when compared to the alternative B1B use (research and development use).

The peak foul water flow has been estimated based on the loading units provided by the MEP engineer for the low usage (offices, retail units, seminar floorspace) and high usage (medical use/D1 use) based upon the hot and cold water peak demand.

Details of loading units per m² (related to the hot and cold water peak flow) are shown as follows:

	Low	Medium
Cold Water Peak Flow (LU/m²)	0.076	0.11
Hot Water Peak Flow (LU/m²)	0.036	0.08

The calculations of the proposed peak foul water flows from the development are summarized in the table below. According to the MEP consultant, an allowance of 20% design uplift future proofing has been made in accordance with the recommendation given by the MEP consultant.

Building Use	Type	Area (sqm)	Cold Water Peak Flow (LU)	Hot Water Peak Flow (LU)	Total LU
Offices	Low	11,470	881.72	412.92	1,294
Retail		588	44.69	21.17	65.86
Seminar		234	17.78	8.42	26.2
Medical (D1 use)	High	12,314	1,354.54	985.12	2,339
Total (LU)			**2,288**	**1,427**	**3,716**
20% Design Uplift					**4,460**

The conversion chart taken from Annex D in BS 6700 has been used in order to convert the loading units in litres/sec. The value of 4,460 (loading units) corresponds to a value of approximately **20 litres/sec** which represents the peak foul water flow from the proposed scheme.

There will be therefore an increase in the foul water flow rate of approximately 19.7 litres/sec which has been agreed with Thames Water by a pre-development enquiry that was submitted on 11.11.20. Thames Water's response dated 16.11.20 confirms that the public combined sewers surrounding the site have sufficient sewerage capacity to serve the development (see Appendix 2).

It is assumed that any foul water drainage from ground floor level and above will be drained by gravity in order to minimise the amount of pumping required. Until the levels of the existing connections and public sewers are confirmed it is unclear whether all the basement levels will need to be pumped although this appears to be likely. It is therefore recommended that an allowance is made at this stage for pumping foul water from below the B3 basement level slab up to high level in the basement to allow it to discharge by gravity to the public sewer.

It is assumed that, if necessary, to provide future flexibility that any A3 uses will be fitted out with suitable above ground grease management/dosing systems and this is not part of the below ground drainage network.

As previously mentioned, details of existing private drainage including outfalls from the site to the public network are not known and need to be investigated. At this stage an allowance for two new sewer connections into the public sewer (one running in St Thomas Street for the main building and one in Melior Street for the Warehouse building) should be made as indicated in the Strategic Drainage Layouts which can be found in Appendix 1. At the next stage of the design AKTII will need to consult Thames Water with regard to any potential new sewer connections to the sewer in St Thomas Street, should the CCTV survey prove that existing connections are not viable for re-use. There is a risk that new connections would be subject to a Section 98 application which can take up to 12 months and is very expensive and also requires that Thames Water contractors carry out the sewer connection works on behalf of the Client.

The proposed strategic drainage layout below ground level is contained in Appendix 1 for information.

4 Cavity Drainage

The perimeter retaining walls are to be designed to limit any flow of groundwater inside the basement box. In the event that water does penetrate through the walls, a cavity drainage utilising gullies will be provided throughout the new basement and will be connected to the below ground cavity drainage pumps.

It is intended that all cavity drainage discharges into the public sewers via the proposed/existing outfalls.

A strategy for the cavity drainage is to be confirmed by the Architect. Local thickenings of the raft are likely to be required to suit falls within the drainage system. Internal manholes will need to be incorporated into the design, however, wherever possible rodding eyes will be used within the raft in place of manholes to reduce the impact on the existing and proposed structures. It is therefore recommended that a suitable cost contingency is allowed for this.

5 Diversion of Existing Sewer

As discussed in Section 1.1 there is an existing 150mm public combined sewer that currently runs through the development area in Vinegar Yard. At present no CCTV drainage survey of this sewer has been carried out, therefore it is not possible to identify which property this sewer serves and the level of the sewer. It is therefore recommended that a CCTV drainage survey of the existing combined sewer is undertaken to investigate all incoming lateral connections (to rule out the risk of affecting 3rd party drainage), to identify the invert levels of the run and to determine if the outfall into the public sewer running in St Thomas Street is suitable for re-use.

At this stage, three diversion options have been explored which will be further investigated at the next design stage:

- Section 185 Diversion Agreement with Thames Water. This will be required if the existing sewer can be diverted to one of the sewers around the site.
- Build Over Agreement with Thames Water. This will be required if the new buildings can be constructed over the existing sewer that will need to be kept running in the proposed scheme.
- Section 116 Divestment Agreement with Thames Water. This will be required if the CCTV drainage survey results confirm that the existing sewer can be divested.

5.1 Stopping up of existing public carriageway

There are areas of existing public footpath and existing public carriageway which fall within the planning boundary and require alteration in the proposed scheme.

These areas are highlighted in yellow on the drawing 4188-CV-HS-002 in Appendix 1.

It is assumed that these areas will continue to drain unrestricted to the highway drainage system and into the Thames Water sewers.

The area highlighted in orange on 4188-CV-HS-002 in Appendix 1 has been assumed to be existing public highway which would be stopped up.

It is intended to divert the existing foul sewer from this area subject to CCTV survey and consultation with Thames Water.

All other service diversions are covered by the MEP Consultant proposals.

6 Flood risk assessment requirements

A Flood Risk Assessment has been undertaken by AKT II. Please refer to AKT II FRA report submitted for planning.

The main findings of this report can be summarised as:

- In accordance with the National Planning Policy Framework, the site would be categorised as lying within Flood Zone 3a - an area assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%). However, the site benefits from the presence of well maintained flood defences along the River Thames. According to the Environment Agency Product 4 data (see Appendix D), The Thames Barrier and associated defence system has a 1 in 1000 year standard which means it ensures that flood risk is managed up to an event that has 0.1% annual probability. This is also confirmed by the Thames Estuary 2100 (2012) report.
- In accordance with the NPPF, the proposed office, retail, cafe are acceptable within Flood Zone 3a.
- The "more vulnerable" uses (medical uses) of the development are located above ground level and are therefore at minimal risk of flooding. However, additional measures including the presence and condition of flood defences, the intention to raise the finished floor levels to protect the building entrances up to breach level, the available warning systems and the safe evacuation route further satisfy the requirements of the Exception Test.
- The site has been assessed as being at very low risk of flooding from rivers or tidal sources.
- In the event of breach the occupants can evacuate to higher levels and safely remain inside or can leave the site early having been alerted by the Flood Warning Service.
- The Developer should register for the Environment Agency's Flood Warning Service as a precaution.
- The site has been assessed as being at low risk from surcharging sewers.
- The site has been assessed as being at low risk from groundwater sources.
- The site has been assessed as being at low risk from artificial sources.
- The site has been assessed as being at flood risk from surface water flooding from St Thomas Street and Vinegar Yard. It is recommended that the mitigation measures specified in Sections 6.6 & 7.2 are implemented during the next design stage. It is considered that the implementation of any of the recommended measures would reduce the risk from the surface water flooding to low.
- Temporary or permanent barriers should be provided to the building entrances from flooding in a breach event. It is concluded that given the large number of access points to the building that a temporary level of protection would be difficult to achieve, and therefore it is recommended that the floor levels are set at or above the breach event level, as a permanent protection.
- The proposed redevelopment has an acceptable flood risk within the terms and requirements of the National Planning Policy Framework, subject to implementation of the mitigation measures outlined in this report.
- In order to comply with legislative requirements the existing surface water discharge should be reduced to the Greenfield rate of 2.65 litres/sec.

The comments stated above are based on information received from other consultees. The flood risk classification of this site has been based on the above observations, and the recommendations stated.

Figure 6.1 Environment Agency indicative flood map

7 BREEAM

Pol 03: Flood and surface water management

Prerequisite

1. An appropriate consultant is appointed to carry out and demonstrate the development's compliance with all criteria.

Up to two credits – Flood resilience

Two credits - Low flood risk

2. A site specific flood risk assessment (FRA) confirms the development is in a flood zone that is defined as having a low annual probability of flooding. The FRA takes all current and future sources of flooding into consideration.

One credit - Medium or high flood risk

3. A site specific FRA confirms the development is in a flood zone that is defined as having a medium or high annual probability of flooding and is not in a functional floodplain. The FRA must take all current and future sources of flooding into consideration.
4. To increase the resilience and resistance of the development to flooding, one of the following must be achieved:
   - **a.** The ground level of the building and access to both the building and the site, are designed (or zoned) so they are at least 600 mm above the design flood level of the site's flood zone; **OR**
   - **b.** The final design of the building and the wider site reflects the recommendations made by an appropriate consultant in accordance with the hierarchy approach outlined in Section 5 of BS 8533:2017.

Two credits – Surface water run-off

Prerequisite for surface water run-off credits

5. Surface water run-off design solutions must be bespoke, i.e. they must take account of the specific site requirements and natural or man-made environment of and surrounding the site. The priority levels detailed in the Methodology must be followed, with justification given by the appropriate consultant where water is allowed to leave the site.

One credit - Surface Water Run-Off - Rate

6. Drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) shows a 30% improvement for the developed site compared with the pre-developed site. This should comply at the 1-year and 100-year return period events.
7. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified Sustainable Drainage Systems (SuDS) are in place.
8. Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance.

One Credit - Surface Water Run-Off - Volume

9. Flooding of property will not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance); **AND EITHER**
10. Drainage design measures are specified so that the post-development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development. This must be for the 100-year 6-hour event, including an allowance for climate change.
11. Any additional predicted volume of run-off for this event is prevented from leaving the site by using infiltration or other SuDS techniques.

OR (only where Criteria 10 & 11 cannot be achieved)

12. Justification from the appropriate consultant indicating why the above criteria cannot be achieved, i.e. where infiltration or other SuDS techniques are not technically viable options.
13. Drainage design measures are specified so that the post-development peak rate of run-off is reduced to the limiting discharge. The limiting discharge is defined as the highest flow rate from the following options:
    - **a.** The pre-development one-year peak flow rate **OR**
    - **b.** The mean annual flow rate Q_{BAR} **OR**
    - **c.** 2 litres/sec/ha

    For the one-year peak flow rate, the one year return period event criterion applies.
14. Relevant maintenance agreements for the ownership, long-term operation and maintenance of all specified SuDS are in place.
15. For either option, above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance.

One credit – Minimising watercourse pollution

One credit

16. There is no discharge from the developed site for rainfall up to 5 mm (confirmed by the appropriate consultant).
17. Areas with a low risk source of watercourse pollution, an appropriate level of pollution prevention treatment is provided, using appropriate SuDS techniques.
18. Areas with a high risk of contamination or spillage of substances, such as petrol and oil, have separators (or an equivalent system) installed in surface water drainage systems.
19. Chemical or liquid gas storage areas have a means of containment fitted to the site drainage system (i.e. shutoff valves). This is to prevent the escape of chemicals to natural watercourses in the event of a spillage or bunding failure.
20. All water pollution prevention systems have been designed and installed in accordance with the recommendations of documents such as the SuDS Manual and other relevant industry best practice. They must be bespoke solutions taking account of the specific site requirements and natural or man-made environment of and surrounding the site.
21. A comprehensive and up-to-date drainage plan of the site will be made available for the building or site occupiers.
22. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place.
23. All external storage and delivery areas designed and detailed in accordance with the current best practice planning guidance.

Assessment of available credits

Prerequisite

Criterion	AKT II assessment	
1.	AKT II are appropriate consultants with the relevant qualifications and experience to design SuDS and flood prevention measures and completing peak rate of run-off calculations.	✓

Flood resilience

Criterion	AKT II assessment	
2.	Not applicable as the development is in Flood Zone 3a.	N/A
3.	The site-specifc FRA carried out by AKT II confirms that the site is situated in Flood Zone 3a.	✓
4a.	It is not possible to locate the building access 600mm above the food levels as entrances need to tie in with the existing ground levels.	✗
4b.	The design of the building and the wider site is in accordance with the flood risk assessment and the hierarchical approach outlined in the relevant standards.	✓

Based on this we believe that potentially one credit out of a possible two can be awarded under these criteria.

However, based upon the BREEAM Knowledge Base which states that 'In an area protected by existing flood defences, (designed to withstand a certain magnitude of flooding), the appropriate number of flood risk credits can be awarded where the defences reduce the risk to 'low' or 'medium' and the following conditions are met:

1. The development is not located in an area where new flood defences have to be, or have been, constructed to minimise the risk of flooding to the site and its locality purely for the purpose of the development or its wider master plan.

2. The development is located on previously occupied land (as defined by the criteria in BREEAM issue LE 01 Site selection).

3. The relevant agency confirm that, as a result of such defences, the risk of a flood event occurring is reduced to low or medium risk. If firm confirmation is not provided then the credit cannot be awarded.'

It is considered that the proposed development complies with the three conditions stated above. Condition 3 is confirmed by the EA Product 4 data (contained in Appendix D of the FRA) which states that 'The Thames Barrier and associated defence system has a 1 in 1000 year standard which means it ensures that flood risk is managed up to an event that has a 0.1% annual probability' and 'The design standard of protection of the flood defences in this area of the Thames is 0.1% AEP; they are designed to defend London up to a 1 in 1000 year tidal flood event', which is a low risk.

Based on the above evidence we believe that two credits out of a possible two may be awarded under these criteria.

Surface water run-off

Run-off criteria	AKT II assessment	
5.	The drainage strategy will be prepared in line with the London Plan drainage hierarchy and the priority levels detailed in the BREEAM Methodology.	✓
6.	The proposed peak run-off rate will be reduced to greenfield run-off rate from the proposed development.	✓
7.	The ownership, operation and maintenance requirements for each SuDS device will be written into the O&M Manual for the site.	✓
8.	An allowance of 40% has been made for climate change in all calculations in line with the Environment Agency's guidance.	✓
9.	The site-specific FRA has been carried out by AKT II which confirms that the site is at low risk of flooding from local drainage system failure.	✓
10.	As the pre and post development hard standing areas are the same then there will be more run-off volume over the lifetime of the building once climate change is considered.	✗
11.	As the existing building covers the entire site area it is not possible to utilise infiltration. Therefore, it is not possible to prevent the additional run-off from leaving the site.	✗
12.	As the existing building covers the entire site area it is not possible to utilise infiltration.	✓
13.	Pre-development 1-year peak flow rate = 20.2 litres/sec Mean annual flow rate Q_{bar} = **0.84** litres/sec 2 litres/sec/ha = 0.46 litres/sec It is proposed to reduce the proposed discharge rate to the Greenfield rate (2.65 litres/sec) from the proposed development.	✓
14.	The ownership, operation and maintenance requirements for each SuDS device will be written into the O&M Manual for the site.	✓
15.	An allowance of 40% has been made for climate change.	✓

Based on this we believe that potentially two credits out of a possible two can be awarded under these criteria.

Minimising watercourse pollution

Pollution criteria	AKT II assessment	
16.	As confirmed in Section 2.3, no infiltration is possible and there is no provision for green roof coverage therefore this criterion cannot be achieved.	✗
17.	SuDS devices will be specified where possible within the limitations of the development.	✓
18.	As there is a loading bay being provided as part of the scheme and petrol/oil separators will be provided as necessary.	✓
19.	There are no chemical/liquid gas storage areas proposed as part of the scheme.	N/A
20.	All water pollution prevention and SuDS devices will be designed in accordance with the SuDS Manual.	✓
21.	An up-to-date drainage plan will be made available to the site occupiers upon completion.	✓
22.	The ownership, operation and maintenance requirements for each SuDS device will be written into the O&M Manual for the site.	✓
23.	There are no external storage or delivery areas proposed as part of the scheme.	N/A

Based on this we believe that this credit cannot be awarded under these criteria.

Overall, we believe that potentially four credits out of a possible five can be awarded under the Pol03 criteria outlined above.

8 Maintenance and operation

Before cleaning, final testing and immediately before handover the Contractor will:

- Lift covers to manholes, inspection chambers and access points. Remove mortar droppings, debris and loose wrappings.
- Thoroughly flush pipelines with water to remove silt and check for blockages. Rod or jet pipelines between access points if there is any indication that they may be obstructed.
- Carry out a CCTV of the pipework to ensure that it is free of silt and blockages.

The End User shall then follow the "Waste Management, The Duty of Care - A Code of Practice (Revised 1996)" and shall ensure that their waste does not escape from their control and is transferred only to a registered waste carrier to be sent for recycling or disposal at a suitably licensed facility.

All waste arising from the maintenance of the drains and sewers shall be handled, stored and disposed of correctly to avoid pollution. Waste may be designated as hazardous / special waste and, as such, the End User shall ensure that they comply with the Hazardous Waste (England and Wales) Regulations 2005.

Reference shall be made to CIRIA publication C753 - The SuDS Manual by the Contractor and the End User. A suitable maintenance schedule must be developed, maintained, followed and updated as required to reflect observed performance. The following items are highlighted for guidance.

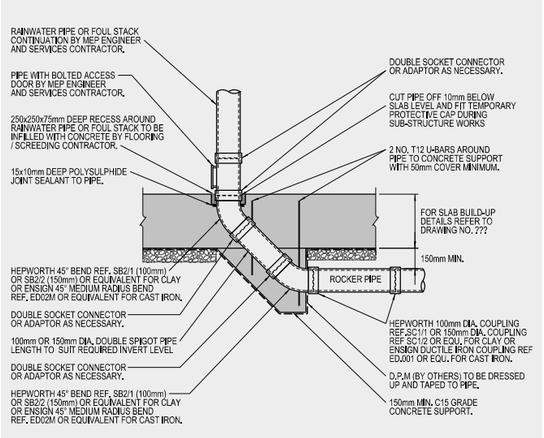


Figure 8.1 Rodding / jetting access detail

8.1 General drainage

The below ground drainage network will be designed in accordance with the requirements of the Building Regulations whilst acknowledging the need to limit the number of inspection chambers within "front of house" areas. To this end, all main runs have rodding eyes, manholes or inspection chambers at the head of the run and at all changes of direction to provide access to rod or jet the main pipework.

Where possible, connections from stacks or gullies will be made directly to these manholes or inspection chambers to allow the connection to be rodded or jetted from the downstream end. Where this is not possible, each stack will be detailed to have an access hatch provided just above floor level (see Figure 8.1) to allow the connection to be rodded or jetted from the upstream end. Similarly, the gullies will have a rodding access provided within their body allowing the pipework to be rodded or jetted from the gully downstream.

Gullies and channels will be specified with silt buckets and silt trap manholes have been provided upstream of all tanks and infiltration structures to prevent the ingress of silts into the drainage network and impairing the performance of the system.

Maintenance schedule	Required action	Recorded frequency
Regular maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action.	Monthly for the first three months then six-monthly
	Remove sediment from pre-treatment structures (e.g. gullies, channels, silt traps).	Six-monthly or as required
Occasional maintenance	Debris removal from catchment surface where this may cause risks to performance.	Monthly
Remedial actions	Repair / rehabilitation of inlets, outlets, overflows and vents.	As required
Monitoring	Inspect all manholes, inspection chambers, inlets, outlets, overflows and vents to ensure they are in good condition and operating as designed.	Annually and after large storms

8.2 Pumped systems

Pumps will be designed as duplex units operating on a duty/ standby run based on hours, pump failure and high/high water level. A suitable BMS interface shall be provided monitoring each pump system for the following status points:

- Pump 1 running / Pump 2 running - These statuses shall be provided to the BMS in the form of a volt free contact that is closed when the pump is running.
- Pump 1 failed / Pump 2 failed - These statuses shall be provided to the BMS in the form of a volt free contact that is closed when the pump has deemed to have failed, i.e. failed to run when requested. This shall cause a latched general alarm on the BMS.
- High water level - This status shall be provided to the BM in the form of a volt free contact that is closed when a high water level is breached. The level shall be set at a level that is higher than the normal pump control level switch. This shall cause a latched general alarm on the BMS.
- High/High water level - This status shall be provided to the BMS in the form of a volt free contact that is closed when a high/high water level is breached. The level shall set at a level that is higher than the high water level switch. This shall cause a critical latched alarm on the BMS.
- System not in automatic/not available - This status shall be provided to the BMS in the form of a volt free contact that is open (failsafe) when the system is not available to operate.

This shall operate should any event occur that could prevent the system from operating, such as power loss to the control panel, hand/of/auto switches not in Auto, or isolators opened. This shall cause a critical latched alarm on the BMS.

The BMS shall be capable of raising the following alarms:

- Excessive Pump Running Alarm - The BMS shall monitor the running status of each pump. Should any pump run for longer than 20 minutes, a general alarm shall be raised on the BMS.
- Excessive Pump Starts Alarm - The BMS shall calculate from the running status the number of starts per hour. Should the number of starts per hour exceed 4, a general alarm shall be raised on the BMS.

A control panel local to each pump station shall be provided to monitor the same status points and alarms as defined for the BMS Interface above

9 Drainage design standards

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

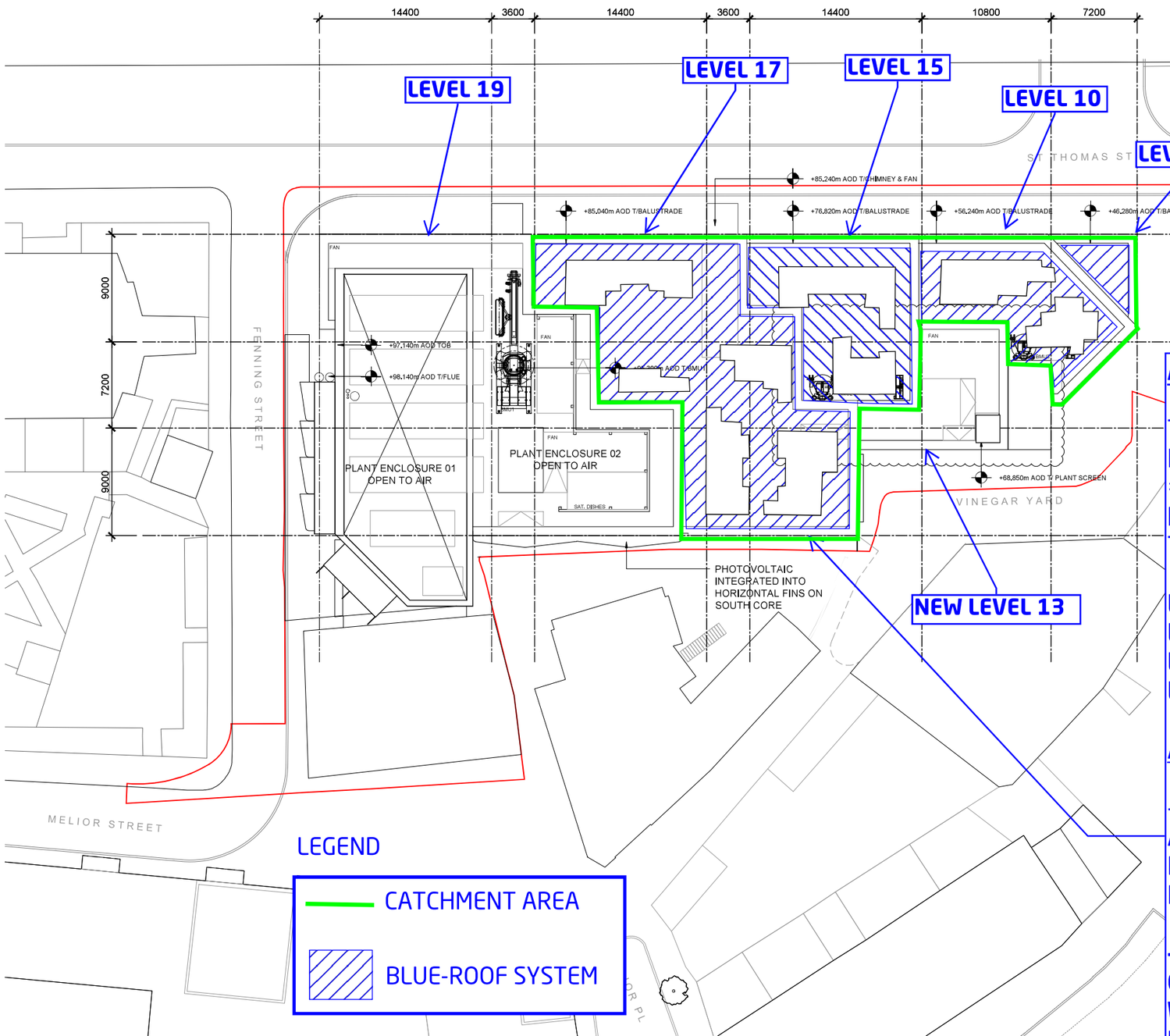
- BS EN 752:2017 Drain and Sewer Systems Outside Buildings. Sewer System Management
- BS EN 12056 Gravity Drainage Systems Inside Buildings: Part 2
- Building Regulations 2010 Part H1 – Foul Water Drainage (2015 Edition)
- Building Regulations 2010 Part H2 – Wastewater Treatment Systems and Cesspools (2015 Edition)
- Building Regulations 2010 Part H3 – Rainwater Drainage (2015 Edition)
- Building Regulations 2010 Part H4 – Building Over Sewers (2015 Edition)
- Building Regulations 2010 Part H5 – Separate Systems of Drainage (2015 Edition)
- Building Regulations 2010 Part H6 – Solid Waste Storage (2015 Edition)
- Environment Agency "Control of Runoff from New Developments Interim Regional Guidance"
- National Planning Policy Framework with reference to: 'Planning and Flood Risk and sustainable drainage requirements'
- Planning Practice Guidance with reference to: ' Non statutory technical standards for sustainable drainage systems'
- New London Plan (2021 version) - Policy SI 13 Sustainable Drainage

10 Materials

	Item	Material	British standard
a)	Drainage pipe work	Vitrified clayware	BS EN 295-1
		Cast iron	BS EN 877
		Concrete	BS 5911-1 and BS EN 1916
		uPVC	BS EN 1401-1
b)	Precast inspection chambers	Precast concrete	BS 5911 Part 200
c)	Drainage gullies and gratings	Vitrified clayware	BS EN 295-1
		Ductile iron	BS EN 124 D 400
d)	Drainage channels and gratings	Polymer concrete	
		Ductile iron	BS EN 124 D 400
e)	Access covers	Grey iron	BS EN 124
		Galvanised steel	Facta Class A, B & D
f)	Cellular units	Polypropylene	
g)	Geotextiles		

Appendix 1

Strategic Drainage Layouts - Options



STORAGE ASSESSMENT BASED UPON BLUE ROOF AT ROOF AND GEO-CELLULAR TANK AT GROUND LEVEL

TOTAL VOLUME TO BE PROVIDED ON SITE TO ATTENUATE CATCHMENT AREA OF **2,300m²** UNDER 1 IN 100 YS STORM EVENT + 40% CLIMATE CHANGE = **150m³**

MAXIMUM $Q_{RESTRICTED}$ = **2.65 litres/sec** (CONFIRMED BY PRE-DEVELOPMENT ENQUIRY)

ATTENUATION STRATEGY @ ROOF LEVEL OPT.A

TOTAL CATCHMENT AREA = **639m²**
ROOF AREA TO BE USED AS BLUE ROOF SYSTEM (STORAGE AREA) = **406m²**
MAXIMUM $Q_{RESTRICTED}$ = 1.9 litres/sec
TOTAL VOLUME **= 43m³**

LEVEL 17--> 130mm BLUE ROOF SYSTEM --> 0.6 litres/sec
LEVEL 15--> 130mm BLUE ROOF SYSTEM --> 0.5 litres/sec
LEVEL 10--> 130mm BLUE ROOF SYSTEM --> 0.5 litres/sec
LEVEL 8 --> 58mm BLUE ROOF SYSTEM --> 0.3 litres/sec

ASSUMPTIONS:

- 10% OF BLUE-ROOF STORAGE AREA AT TERRACE LEVEL Nos. 10 AND 15 TO BE EXCLUDED FROM CALCULATIONS TO ALLOW FOR BMU TRACKS (STRATEGY FOR BMU TO BE DEVELOPED AT THE NEXT STAGE OF THE DESIGN).

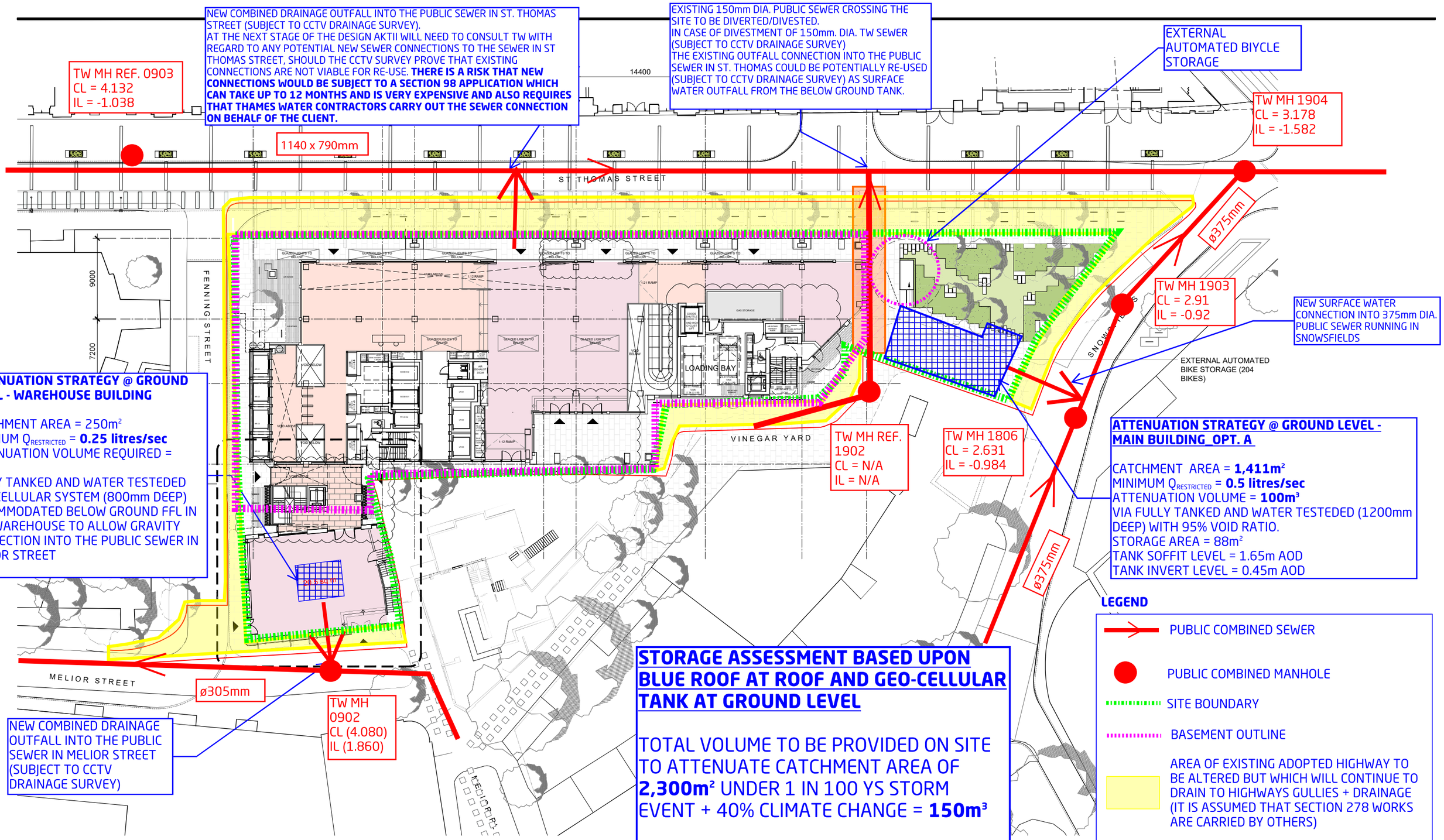
- ROOF AT LEVEL 19 (WITH NO ATTENUATION TO THE WEST OF THE SITE) AND AT LEVEL 13 (TO THE EAST OF THE SITE) WILL DRAIN TO BELOW GROUND ATTENUATION TANK IN THE LANDSCAPED AREA (TO THE EAST OF THE SITE) VIA PIPEWORK RUNNING HIGH LEVEL IN THE BASEMENT (TBC BY MEP ENGINEER).

- ROOF WITH NO ATTENUATION TO THE SOUTH OF THE SITE (WAREHOUSE) TO BE CONNECTED TO A GEO-CELLULAR TANK LOCATED BELOW WAREHOUSE GROUND FLOOR FFL TO ALLOW GRAVITY CONNECTION INTO PUBLIC SEWER IN MELIOR STREET.

- BLUE ROOF DESIGN BY MEP/ARCHITECT

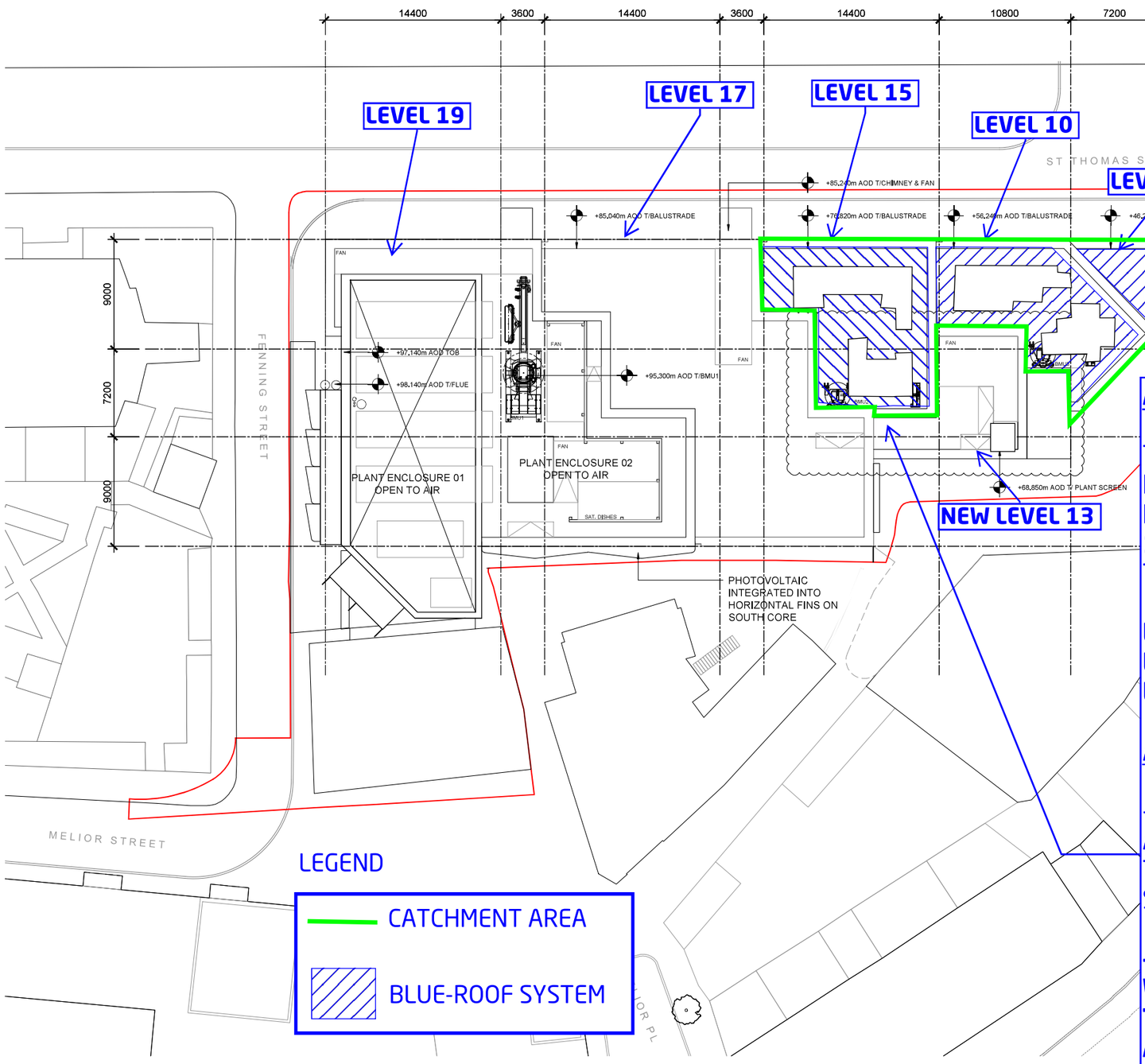
akt II

PROJECT	VINEGAR YARD			TITLE	PROPOSED ATTENUATION STRATEGY AT ROOF LEVEL OPT. A		
DATE	15/10/21	SCALE	NTS	CAD FILENAME	-	STATUS	ISSUED FOR PLANNING
DRAWN	SM	CHECKED	DN	PROJECT No.	4188	DRAWING No.	4188-CV-HS-001A	REV	P6



akt II

PROJECT VINEGAR YARD		TITLE PROPOSED ATTENUATION STRATEGY AT GROUND LEVEL_OPT. A	
DATE 15/10/21	SCALE NTS	CAD FILENAME -	STATUS ISSUED FOR PLANNING
DRAWN SM / CHECKED DN	PROJECT No. 4188	DRAWING No. 4188-CV-HS-002A	REV P7



STORAGE ASSESSMENT BASED UPON BLUE ROOF AT ROOF AND GEO-CELLULAR TANK AT GROUND LEVEL

MINIMUM TOTAL VOLUME TO BE PROVIDED ON SITE TO ATTENUATE CATCHMENT AREA OF **2,300m²** UNDER 1 IN 100 YEARS STORM EVENT + 40% CLIMATE CHANGE = **150m³**

MAXIMUM $Q_{RESTRICTED}$ = **2.65 litres/sec** (CONFIRMED BY PRE-DEVELOPMENT ENQUIRY)

ATTENUATION STRATEGY @ ROOF LEVEL OPT.B

TOTAL CATCHMENT AREA = **269m²**
MAXIMUM $Q_{RESTRICTED}$ = **1.3 litres/sec**
ROOF AREA TO BE USED AS BLUE ROOF SYSTEM (STORAGE AREA) = **160m²**
TOTAL VOLUME = **17m³**

LEVEL 15--> 130mm BLUE ROOF SYSTEM --> 0.5 litres/sec
LEVEL 10--> 130mm BLUE ROOF SYSTEM --> 0.5 litres/sec
LEVEL 8 --> 58mm BLUE ROOF SYSTEM --> 0.3 litres/sec

ASSUMPTIONS:

- 10% OF BLUE-ROOF STORAGE AREA AT TERRACE LEVEL Nos. 10 AND 15 TO BE EXCLUDED FROM CALCULATIONS TO ALLOW FOR BMU TRACKS (STRATEGY FOR BMU TO BE DEVELOPED AT THE NEXT STAGE OF THE DESIGN).

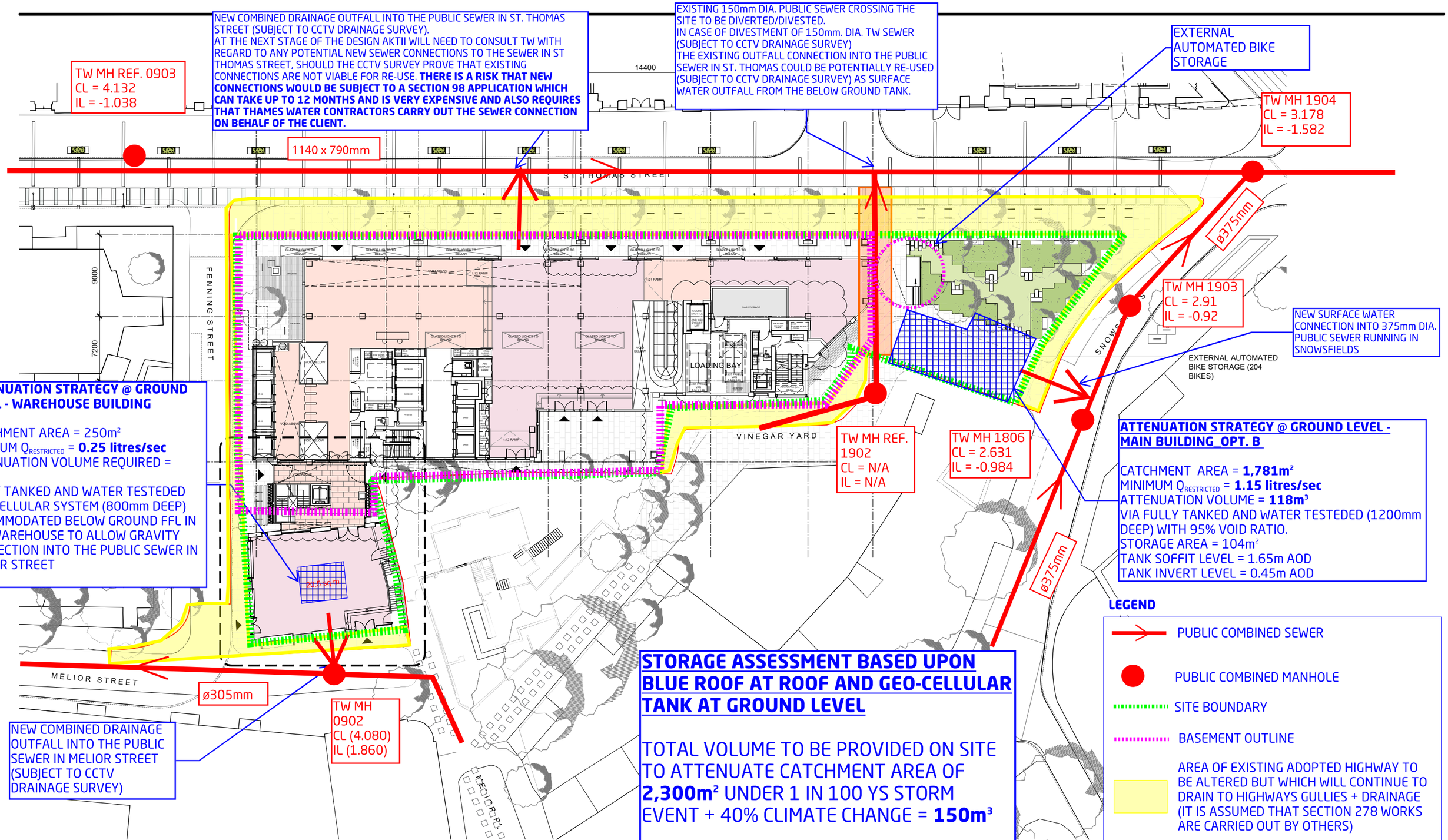
- ROOFS AT LEVEL 17 & 19 (WITH NO ATTENUATION TO THE WEST OF THE SITE) AND NEW LEVEL 13 (WITH NO ATTENUATION TO THE EAST OF THE SITE) WILL DRAIN TO BELOW GROUND ATTENUATION TANK IN THE LANDSCAPED AREA (TO THE EAST OF THE SITE) VIA PIPEWORK RUNNING HIGH LEVEL IN THE BASEMENT (TBC BY MEP ENGINEER).

- ROOF WITH NO ATTENUATION TO THE SOUTH OF THE SITE (WAREHOUSE) TO BE CONNECTED TO A GEO-CELLULAR TANK LOCATED BELOW WAREHOUSE GROUND FLOOR FFL TO ALLOW GRAVITY CONNECTION INTO PUBLIC SEWER IN MELIOR STREET.

- BLUE ROOF DESIGN BY MEP/ARCHITECT

akt II

PROJECT: VINEGAR YARD		TITLE: PROPOSED ATTENUATION STRATEGY AT ROOF LEVEL OPT. B	
DATE: 15/10/21	SCALE: NTS	CAD FILENAME: -	STATUS: ISSUED FOR PLANNING
DRAWN: SM	CHECKED: DN	PROJECT No.: 4188	DRAWING No.: 4188-CV-HS-001B	REV: P6



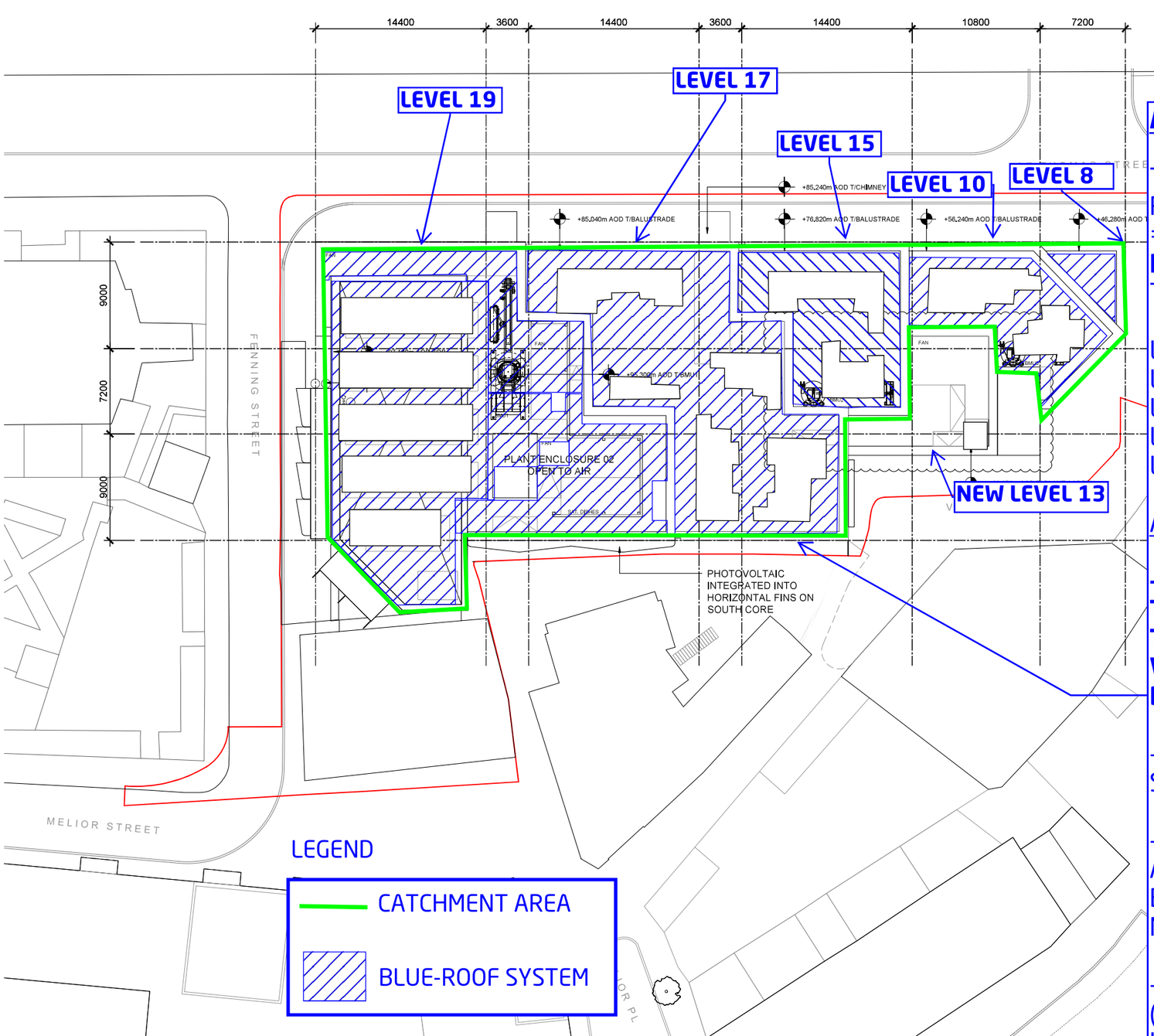
akt II

PROJECT VINEGAR YARD

TITLE PROPOSED ATTENUATION STRATEGY AT GROUND LEVEL_OPT. B

DATE	SCALE	CAD FILENAME	STATUS
15/10/21	NTS	-	ISSUED FOR PLANNING

DRAWN	CHECKED	PROJECT No.	DRAWING No.	REV
SM	DN	4188	4188-CV-HS-002B	P7



ATTENUATION STRATEGY @ ROOF LEVEL OPT. C

TOTAL CATCHMENT AREA = 1,239m²
ROOF AREA TO BE USED AS BLUE ROOF SYSTEM (STORAGE AREA) = **840m²**
MAXIMUM $Q_{RESTRICTED}$ = 2.5 litres/sec
TOTAL VOLUME = **94m³**

LEVEL 19 --> 158mm BLUE ROOF SYSTEM --> 0.6 litres/sec
LEVEL 17--> 130mm BLUE ROOF SYSTEM --> 0.6 litres/sec
LEVEL 15--> 130mm BLUE ROOF SYSTEM --> 0.5 litres/sec
LEVEL 10--> 130mm BLUE ROOF SYSTEM --> 0.5 litres/sec
LEVEL 8 --> 58mm BLUE ROOF SYSTEM --> 0.3 litres/sec

ASSUMPTIONS:

- NO BLUE ROOF PROVISION FOR LEVEL 13 TERRACE. L13 TERRACE TO BE DRAINED TO BELOW GROUND ATTENUATION TANK IN THE LANDSCAPED AREA (TO THE EAST OF THE SITE) VIA PIPEWORK RUNNING HIGH LEVEL IN THE BASEMENT (TBC BY MEP ENGINEER).

- MAIN BUILDING ROOF TO BE ATTENUATED VIA BLUE-ROOF SYSTEM AT ROOF LEVEL, EXCEPT FOR NEW LEVEL 13 TERRACE

- 10% OF BLUE-ROOF STORAGE AREA AT TERRACE LEVEL Nos. 10 AND 15 TO BE EXCLUDED FROM CALCULATIONS TO ALLOW FOR BMU TRACKS (STRATEGY FOR BMU TO BE DEVELOPED AT THE NEXT STAGE OF THE DESIGN).

- ROOF WITH NO ATTENUATION TO THE SOUTH OF THE SITE (WAREHOUSE) TO BE CONNECTED TO A GEO-CELLULAR TANK LOCATED BELOW WAREHOUSE GROUND FLOOR FFL TO ALLOW GRAVITY CONNECTION INTO PUBLIC SEWER IN MELIOR STREET.

- BLUE ROOF DESIGN BY MEP/ARCHITECT

- IT IS ACCEPTABLE TO EXCEED THE MAXIMUM ALLOWABLE DISCHARGE IN THE PUBLIC SEWER SYSTEM (2.65 L/S) AS LONG AS THERE IS THE INTENTION TO MAXIMIZE THE USE OF BLUE ROOF AT ROOF LEVEL (PLANNER'S PREFERRED OPTION)

akt II

PROJECT VINEGAR YARD		TITLE PROPOSED ATTENUATION STRATEGY AT ROOF LEVEL OPT. C	
DATE 15/10/21	SCALE NTS	CAD FILENAME -	STATUS ISSUED FOR PLANNING
DRAWN SM	CHECKED DN	PROJECT No. 4188	DRAWING No. 4188-CV-HS-001C	REV P6

NEW COMBINED DRAINAGE OUTFALL INTO THE PUBLIC SEWER IN ST. THOMAS STREET (SUBJECT TO CCTV DRAINAGE SURVEY).
AT THE NEXT STAGE OF THE DESIGN AKTII WILL NEED TO CONSULT TW WITH REGARD TO ANY POTENTIAL NEW SEWER CONNECTIONS TO THE SEWER IN ST THOMAS STREET, SHOULD THE CCTV SURVEY PROVE THAT EXISTING CONNECTIONS ARE NOT VIABLE FOR RE-USE. **THERE IS A RISK THAT NEW CONNECTIONS WOULD BE SUBJECT TO A SECTION 98 APPLICATION WHICH CAN TAKE UP TO 12 MONTHS AND IS VERY EXPENSIVE AND ALSO REQUIRES THAT THAMES WATER CONTRACTORS CARRY OUT THE SEWER CONNECTION ON BEHALF OF THE CLIENT.**

EXISTING 150mm DIA. PUBLIC SEWER CROSSING THE SITE TO BE DIVERTED/DIVESTED.
IN CASE OF DIVESTMENT OF 150mm. DIA. TW SEWER (SUBJECT TO CCTV DRAINAGE SURVEY)
THE EXISTING OUTFALL CONNECTION INTO THE PUBLIC SEWER IN ST. THOMAS COULD BE POTENTIALLY RE-USED (SUBJECT TO CCTV DRAINAGE SURVEY) AS SURFACE WATER OUTFALL FROM THE BELOW GROUND TANK.

EXTERNAL AUTOMATED BIKE STORAGE

TW MH REF. 0903
CL = 4.132
IL = -1.038

TW MH 1904
CL = 3.178
IL = -1.582

1140 x 790mm

14400

ST THOMAS STREET

ø375mm

TW MH 1903
CL = 2.91
IL = -0.92

NEW SURFACE WATER CONNECTION INTO 375mm DIA. PUBLIC SEWER RUNNING IN SNOW FIELDS

EXTERNAL AUTOMATED BIKE STORAGE (204 BIKES)

FENNING STREET

9000

7200

LOADING BAY

VINEGAR YARD

TW MH REF. 1902
CL = N/A
IL = N/A

TW MH 1806
CL = 2.631
IL = -0.984

ATTENUATION STRATEGY @ GROUND LEVEL - WAREHOUSE BUILDING

CATCHMENT AREA = 250m²
MINIMUM $Q_{RESTRICTED}$ = **0.25 litres/sec**
ATTENUATION VOLUME REQUIRED = **15m³**
FULLY TANKED AND WATER TESTEDED GEO-CELLULAR SYSTEM (800mm DEEP) ACCOMMODATED BELOW GROUND FFL IN THE WAREHOUSE TO ALLOW GRAVITY CONNECTION INTO THE PUBLIC SEWER IN MELIOR STREET

ATTENUATION STRATEGY @ GROUND LEVEL - MAIN BUILDING_OPT. C

CATCHMENT AREA = **811m²**
MINIMUM $Q_{RESTRICTED}$ = **1.25 litres/sec**
ATTENUATION VOLUME = **42m³**
VIA FULLY TANKED AND WATER TESTEDED (800mm DEEP) WITH 95% VOID RATIO.
STORAGE AREA = **55m²**
TANK SOFFIT LEVEL = 1.65m AOD
TANK INVERT LEVEL = 0.85m AOD

MELIOR STREET

ø305mm

TW MH 0902
CL (4.080)
IL (1.860)

NEW COMBINED DRAINAGE OUTFALL INTO THE PUBLIC SEWER IN MELIOR STREET (SUBJECT TO CCTV DRAINAGE SURVEY)

ø375mm

LEGEND

- PUBLIC COMBINED SEWER
- PUBLIC COMBINED MANHOLE
- SITE BOUNDARY
- BASEMENT OUTLINE
- AREA OF EXISTING ADOPTED HIGHWAY TO BE ALTERED BUT WHICH WILL CONTINUE TO DRAIN TO HIGHWAYS GULLIES + DRAINAGE (IT IS ASSUMED THAT SECTION 278 WORKS ARE CARRIED BY OTHERS)
- ADOPTED HIGHWAY TO BE STOPPED UP AND NEW HARD LANDSCAPING DRAINS TO NEW PRIVATE DRAINAGE SYSTEM.
- GEO-CELLULAR TANK

akt II

PROJECT VINEGAR YARD		TITLE PROPOSED ATTENUATION STRATEGY AT GROUND LEVEL_OPT. C	
DATE 15/10/21	SCALE NTS	CAD FILENAME -	STATUS ISSUED FOR PLANNING
DRAWN SM	CHECKED DN	PROJECT No. 4188	DRAWING No. 4188-CV-HS-002C	REV P7

Appendix 2

Pre-planning enquiry application form + Thames Water's response

Pre-planning enquiry

Application form

Please complete this form and return it to us at
developer.services@thameswater.co.uk or
Thames Water, Developer Services, Clearwater Court,
Vastern Road, Reading, RG1 8DB.

Application for a pre-planning enquiry

Please complete all sections of this form in BLOCK CAPITALS

If you're using this form to request a budget estimate, please note that you should be able to calculate the likely charges involved in your scheme by consulting our guide, 'Charging arrangements for new connection services', on our website.

Are you a: Developer ☐ Consultant ■ Land promoter ☐ (Please tick one.)

Is your application for: Water ☐ Wastewater ■ Both ☐ (Please tick one.)

Would you like a water budget estimate? Yes ☐ No ■

(We can only offer a wastewater budget estimate after modelling, if required).

A - About the person applying

Company name AKT II

Title Mr ☐ Mrs ☐ Ms ☐ Miss ■ Dr ☐ Other

First name(s) SARA

Last name MERCURIALI

Preferred contact number 02072507840

Alternative number 07483 040 308

Email address sara.mercuriali@akt-uk.com

Full postal address

Address line 1 White Collar Factory

Address line 2 1 Old Street Yard

Town

County LONDON Postcode EC1Y 8AF

B - Nominated contact

Who should we contact to process your application? Applicant ■ Someone else ☐

(Please tick one.)

If someone else:

Company name

Title Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr ☐ Other

First name(s)

Last name

Preferred contact number

Alternative number

Email address

Full postal address

Address line 1

Address line 2

Town

County

Postcode

C - Where the work is taking place

What is the address of the property being connected?

Same as applicant ☐ Same as nominated contact ☐

Somewhere else ■ (Please tick one.)

If somewhere else:

Site name VINEGARD YARD

Full postal address

Address line 1 VINEGARD YARD

Address line 2 ST THOMAS STREET,

Town LONDON

County

Postcode SE1 3QX

D - About the site

What is the local authority? LONDON BOROUGH OF SOUTHWARK

Ordnance Survey grid ref 533110, 179930

Type of site Greenfield ☐ Brownfield ■ Mixed ☐

How big is the site? 0.23 hectares

When do you intend to have first occupancy? MM YYYY TBC (Approximate date if necessary)

E - Planning status (if you've already started the planning process)

Is the development identified in the local plan? Yes ☐ No ■ Don't know ☐ If Yes, reference number

Does it have outline planning permission? Yes ☐ No ■ Don't know ☐ If Yes, reference number

Does it have full planning permission? Yes ☐ No ■ Don't know ☐ If Yes, reference number

Does the development have building regulations permission? Yes ☐ No ■ Don't know ☐

When do you intend to start on site? MM YYYY TBC

F - About the water supply

If you're proposing a water storage tank, what is its capacity? ☐ m^3

When will you want your first domestic connection laid on? MM ☐ YYYY ☐

For water supplies, what is the estimated flow rate required for your site? ☐ litres/sec (Not required if applying only for wastewater.)

G - Existing sewerage connections (Not required if applying only for water.)

	Foul water	Surface water
Does the site have the following sewerage connections?	☐	☐
What is the type of discharge method?	X Gravity ☐ Pumped	X Gravity ☐ Pumped
If sewage is pumped, what is the pump rate?	☐ litres/sec	☐ litres/sec
Amount of existing impermeable area per connection	N/A	TOTAL SITE IMPERMEBALE AEREA = 0.23 ha
What are the existing connection points? (For example, 'X' number of domestic and commercial properties drain into manhole 'Y' / sewer with diameter of 'Z'.)	EXISTING FW Q PEAK) Existing building --> two storey brick building warehouse Q_{peak} = 0.11 l/s	EXISTING SW Q PEAK--> in 100 year storm) Q_{peak} = 3.61 x 0.75 x 0.23 x 103.8 = 64.6 l/s

H - Proposed sewerage connections (Not required if applying only for water.)

	Foul water	Surface water
Does the site have the following sewerage connections?	X	X
What is the type of discharge method?	X Gravity ☐ Pumped	X Gravity ☐ Pumped
If sewage is pumped, what is the pump rate?	☐ litres/sec	☐ litres/sec
What is your proposed approach to surface water drainage?	N/A	☐ Traditional piped system X Sustainable drainage system (SuDS)
Do you propose using separate highway and surface water drainage systems?	N/A	n/a
If the surface water rate is attenuated, to what rate is it attenuated?	N/A	5 litres/sec
Amount of proposed impermeable area per connection	N/A	2 catchment areas) catchment area no. 1) Tower + hardstanding podium area Impermeable area = 0.201 ha Peak Surface Water Q = 4 l/s catchment area no. 2) Pavilion/Music Venue impermeable area = 0.029 ha Peak Surface Water Q = 1 l/s TOTAL SW Q peak FROM THE SITE --> 5 L/S
What are the proposed connection points? (For example, 'X' number of domestic and commercial properties drain into manhole 'Y' / sewer with diameter of 'Z'.)	OUTFALL no. 1 IN COMBINED SEWER IN ST. THOMAS STREET) SW Qpeak = 4 L/S FW Qpeak = 15 L/S COMBINED Qpeak = 4 + 15 = 19 l/s	OUTFALL no. 2 IN COMBINED SEWER IN ST. THOMASE STREET) SW Qpeak = 1 L/S FW Qpeak = 5 L/S COMBINED Qpeak = 1 + 5 = 6 l/s

Please note: The developer is expected to follow the local authority's drainage strategy and be able to demonstrate how the proposed (attenuated) discharge rate of any surface water flows has been calculated. For developments in Greater London, please refer to the London Plan Drainage Hierarchy (Policy 5.13). We will challenge the rates provided if they are not in line with those based on the local drainage strategies.

I - Additional information (where available)

When we're assessing your development needs, it's important that we know what buildings (if any) currently exist on the site. It may be, for example, that the infrastructure serving those properties is already sufficient to cater for your proposed development.

We realise it may be too early in your process to complete this table, but any information you can provide at this stage will help improve the accuracy of our assessment and could prevent us from requesting data in the future.

Property type	Existing site	Proposed site
General housing (units 3 person+)		
Flat (units up to 2 person)		
Primary school (max. pupil capacity)		
Senior school (max. pupil capacity)		
Boarding school (max. pupil capacity)		
Assembly hall (max. capacity)		200
Cinema (max. capacity)		
Theatre (max. capacity)		
Sports hall (max. capacity)		
Hotel (total bedrooms)		
Guest house (total bedrooms)		
Motel (total bedrooms)		
Holiday apartment (capacity)		
Leisure park (capacity)		
Caravan park standard (per space)		
Caravan site standard (per space)		
Camping site standard (per space)		
Camping site serviced (per space)		
Public house (max. capacity)		200
Restaurant / Day care centre (max. capacity)		60
Drive in restaurant (max. capacity)		
Hospital (per bed)		
Nursing / Care home (per bed)		
Offices (gross internal area in m^2)		23083
Shopping centre (gross internal area in m^2)		
Warehouse (gross internal area in m^2)	1000	
Commercial premises (gross internal area in m^2)		3705
Manufacturing unit (gross internal area in m^2)		
Other (please state units and description)		

J - Enclose your documents

Please make sure any attachments are in PDF format and don't exceed a total of 20MB in size per email.

All drawings must be of suitable detail and have a drawing reference number on them.

What we need from you to process your application:

Site location plan	This should show the site with nearby buildings, roads and any sewers.
Scaled site layout	This should show existing and proposed layouts.
Site drainage strategy plan (if available at this stage)	This should show all proposed sewers, pipe sizes and gradients. (Not required if applying only for water.)

Please also let us know if you have a **schedule of planned works** showing how you might phase your development.

Please note, without this information we may need to make assumptions about your requirements when calculating your budget estimate (if requested).

K - How we'll use this information

We'll use the information you give on this application form, and potentially share it with our delivery partners, to provide the service you've requested.

This could include contacting you to discuss your application and/or provide more details, visiting the site where work needs to be carried out, and invoicing you when appropriate. Your feedback is important to us, so we may also use the information to ask for your feedback on how we can improve our performance.

We won't use this information for marketing purposes without contacting you to seek your consent.

You can find Thames Water's privacy policy at **thameswater.co.uk/Legal/Privacy**.

L - Declaration

I confirm to the best of my knowledge that the information in this application is complete and correct.

Print name	sara mercuriali
Position within company	engineer
Company	AKT II
Date	29.10.18
Signature	Sara Mercuriali Digitally signed by Sara Mercuriali DN: C=US, E=sara.mercuriali@akt-uk.com, OU=AKT II, CN=Sara Mercuriali Date: 2018.10.29 10:24:39Z00'00'

Submitting your application

Please email your completed form to **developer.services@thameswater.co.uk** or send it to Thames Water Developer Services, Clearwater Court, Vastern Road, Reading RG1 8DB.

Once we've assessed your application, we'll write to tell you the result within 21 calendar days.

Where we know there's sufficient capacity we'll tell you, but if we're concerned there may not be, we'll advise you of the next steps. We'll also let you know if we need further information from you.

Getting in touch

For enquiries regarding this application or any other questions relating to your building or development work please contact us on:

thameswater.co.uk/developerservices

developer.services@thameswater.co.uk

0800 009 3921
Monday – Friday, 8am – 5pm

**Thames Water, Developer Services, Clearwater Court,
Vastern Road, Reading, Berkshire RG1 8DB**

This leaflet can be supplied in braille or audio-tape upon request.

03/18

Sara Mercuriali
AKT II
White Collar Factory
1 Old Street Yard
London
EC1Y 8AF

Our ref: DS6054801

0800 009 3921
Monday to Friday, 8am to 5pm

16th November 2018

Pre-planning enquiry: Confirmation of sufficient capacity

Site Address: Vinegard Yard, St Thomas Street, London, SE1 3QX

Dear Miss Mercuriali,

Thank you for providing information on your development for 23,083m^2 of office space, 3705m^2 of commercial space, a 200 capacity music venue, a 200 seat public house and a 60 seat restaurant replacing the existing car park and 1000m^2 industrial use building.

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

Foul Water

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

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

Please note that you must 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 sewerage capacity.

Surface Water

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

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

If the peak surface water run-off discharge is then restricted to a maximum of 5l/s (split between the two proposed combined connections i.e. 4l/s and 1l/s) as your drainage strategy indicates, then we would have no objections to the proposals.

We would encourage techniques such as green roofs, permeable paving and rainwater harvesting that restricts surface water discharges from your site.

Please note that the Local Planning authority may comment on surface water discharge under the planning process.

Please Note

There are existing public sewers crossing the site. New buildings will need to be kept between 3 and 6.5m away from existing sewer depending on the size and depth of the sewer. Alternatively, it may be possible for sewers to be diverted around the new development. If you wish us to review a diversion proposal please submit this via a Section 185 Diversion application. On some occasions it may be possible to abandon existing public sewers. Please contact us for further information on this process.

All connection requests are subject to a full Section 106 (Water Industry Act 1991) application before the Company can confirm approval to the connection itself. Please also note that capacity in the public sewerage system cannot be reserved. 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.

Note on trunk sewers: Connecting directly to Trunk sewers can be complex and dangerous, which means we often refuse permission. In this case, you will need to find an alternative sewer or method of discharge. Please contact the Sewer Connections team through our Helpdesk on 0800 009 39 21 for further information.

If Thames Water permits a connection to the trunk sewer, we will insist on carrying out the connection ourselves under Section 107 of the Water Industry Act. We would advise for you to apply as soon as possible.

The discharge of non-domestic effluent is not permitted until a valid trade effluent consent has been issued by Thames Water. If anything other than domestic sewage is discharged into the public sewers without the above agreement an offence is committed and the applicant will be liable to the penalties contained in Section 109(1) (WIA 1991).

Applicants should contact Trade Effluent prior to seeking a connection approval, to discuss trade effluent consent and conditions of discharge. A Trade Effluent reference number should be obtained and included in the relevant box of the attached application form. The address for

Trade Effluent is - Thames Water Utilities Limited, Waste Water Quality, Crossness Sewage Treatment Works, Belvedere Road, Abbeywood, London. SE2 9AQ. Alternatively you can telephone them on 020 8507 4321.

The views expressed by Thames Water in this letter are in response to this pre development enquiry at this time and do not represent our final views on any future planning applications made in relation to this site.

Yours sincerely,

Jonathan Shildrick BSc
Development Engineer
Developer Services