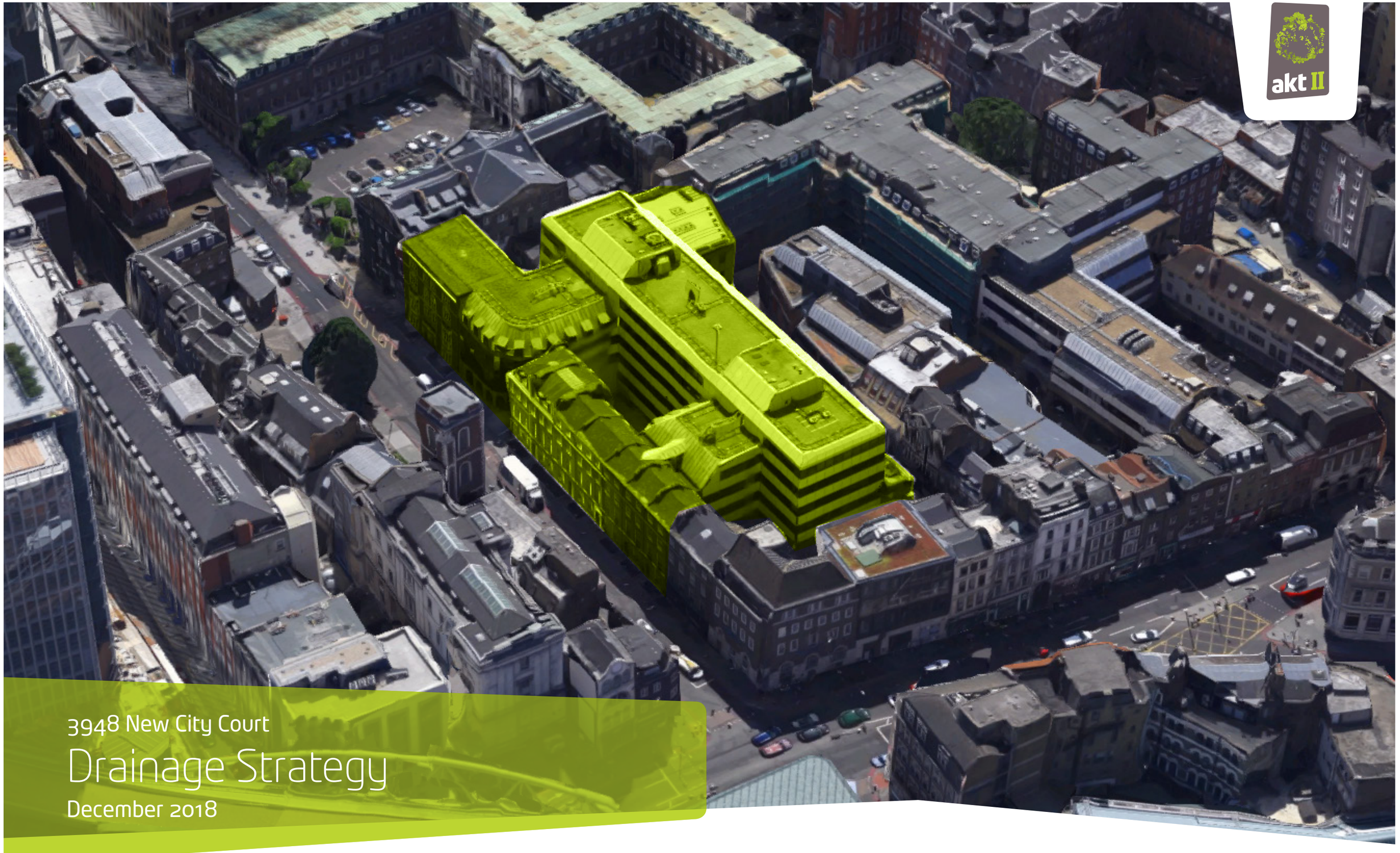
NEW CITY COURT

Drainage Strategy
AKT II



3948 New City Court
Drainage Strategy
December 2018

Consulting Structural and Civil Engineers

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Contents

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P4	06/12/2018	For Information
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P2	09/10/2018	2nd Draft
P1	25/09/2018	DRAFT

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1 Surface water drainage

1.1 Existing scheme

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

- A 1143 × 762 mm combined sewer running under St Thomas Street to the north of the site.
- A 300 mm combined water sewer running under Keats House to the east of the site.
- A 375mm dia. combined water sewer in King's Head Yard to the south of the site.

An extract from the record plans is shown in Figure 1.2 for reference.

It is believed that all surface water from the building currently discharges directly to one or more of these public sewers without any form of attenuation, but it is not clear which one, and it is therefore recommended that a CCTV survey of the existing site drainage network is undertaken to confirm the location, size and condition of all existing outfalls from the site and to rule out any third-part connections from adjoining properties.

The total site area excluding the existing lightwells in St Thomas Street is approximately 3,300 m². 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 × 0.330 × 32.6 = **29.1 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 × 0.330 × 103.8 = **92.7 litres / sec**

Manhole reference	Manhole cover level	Manhole invert level
7111	5.11 m	0.34 m
7101	4.8 m	n/a
8101	3.82 m	-0.19 m

Figure 1.1 Thames Water Sewer Record

1.2 Proposed scheme

The proposed impermeable area will remain as existing. Again using the Modified Rational Method, the proposed (unattenuated) peak run-off from the new extension for the 1-in-1-year return period storm would be:

$\mathbf{Q_1}$ = 3.61 × 0.75 × 0.3300 × 32.6 = **29.1 litres / sec**

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

$\mathbf{Q_{100}}$ = 3.61 × 0.75 × 0.330 × 103.8 = **92.7 litres / sec**

The Environment Agency (EA) 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. Figure 1.3 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:

$\mathbf{Q_{1\,(+40\%)}}$ **= 40.8 litres / sec** and $\mathbf{Q_{100\,(+40\%)}}$ **= 129.8 litres / sec**

In accordance with the EA'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 NPPF 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.

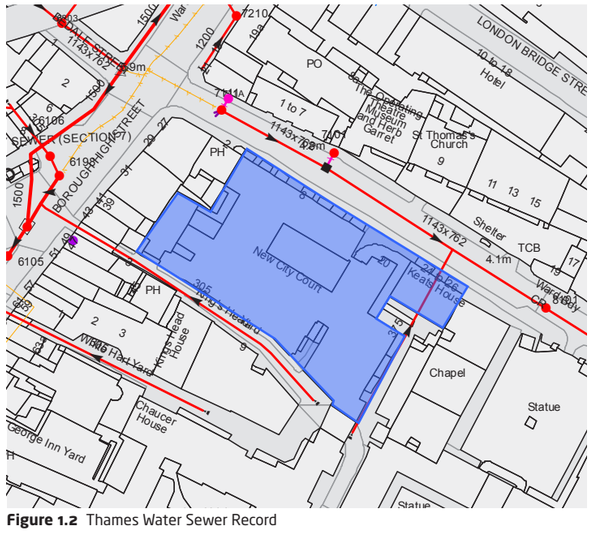


Figure 1.2 Thames Water Sewer Record

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. it should mitigate the impact of climate change and any increase in the area of hardstanding). In this case, this would mean that, rather than discharging 129.8 litres / sec, the maximum permissible discharge from the site would be 92.7 litres / sec.

Further to the above, the London Plan's Policy 5.13 states that "Development proposals should aim to achieve greenfield run-off rates". The 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:

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

where AREA is the site area in km² (pro rata of 50 ha if the site is less than 50 ha), 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:

$\mathbf{Q_{BAR}} = 0.00108 \times 0.50^{0.89} \times 600^{1.17} \times 0.45^{2.17}$ = **183.4 litres / sec (for 50 ha)**

Scaling this for the actual site area gives:

$\mathbf{Q_{BAR}}$ = (183.4 × 0.330) ÷ 50 = **1.21 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 $\mathbf{Q_{100}}$ = **3.81 litres / sec.** However, Clause 17 of the DEFRA / EA publication 'Rainfall runoff management for developments' states that "A practicable minimum limit on the discharge rate from a flow attenuation device is often a compromise between attenuating to a satisfactorily low flow rate while keeping the risk of blockage to an acceptable level. This limit is set at 5 litres per second, using an appropriate vortex or other flow control device. Where sedimentation could be an issue, the minimum size of orifice for controlling flow from an attenuation device should normally be 150 mm laid at a gradient not flatter than 1 in 150, which meets the requirements of Sewers for Adoption 7th Edition".

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 greenfield run-off rate.

Potential approaches that can be taken are discussed in the next section.

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%

Figure 1.3 Peak rainfall intensity allowance

1.3 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.

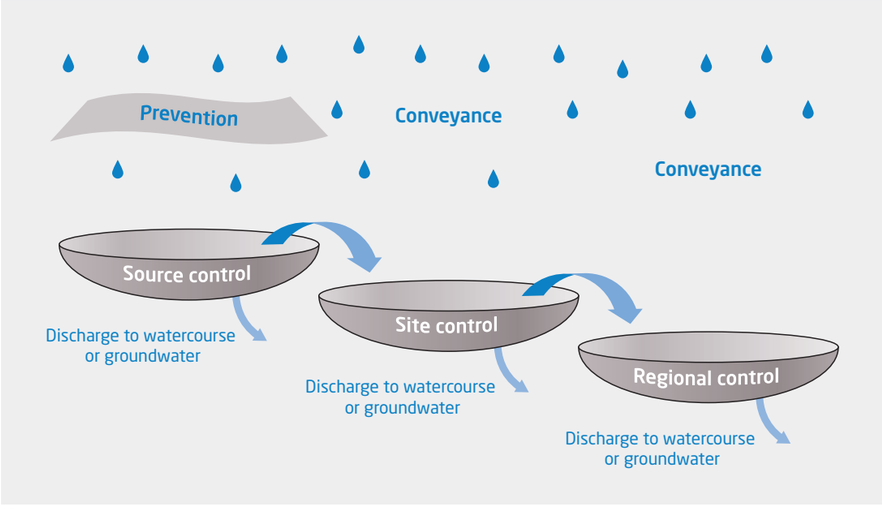


Figure 1.4 SuDS management train

Drainage hierarchy

Based on the above and in line with the London Plan and the Sustainable Drainage Manual published by CIRIA (Construction Industry Research and Information Association), the following drainage hierarchy has been considered when preparing the surface water disposal strategy:

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

Assessment of SuDS techniques

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.

It is proposed to utilise a rainwater harvesting system. Water for sub-surface irrigation will be supplied by the building's greywater recycling system, with additional treatment to ensure public health and safety. System will be designed by MEP Engineers.

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 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 full 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-off. 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 full 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.

It is proposed to incorporate tanked permeable surfacing for water retention above the podium deck.

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 full 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 full 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.

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 (limited to 5 litres/sec in line with the DEFRA guidance) under the 1-in-100-year (plus 40% climate change) storm event from the building is **190 m³**.

It is recommended that at this stage a cost and space allowance is made for a storage volume of **190 m³** (greenfield reduction) as our recent experience with Thames Water suggests that they insist on limiting the discharge rates to the greenfield run-off rate in line with Policy 5.13 of the London Plan. An additional 10% freeboard within the blue roofs is to be provided to meet the LBS requirements.

The proposed attenuation features will comprise blue roof systems on the podium deck and on the Tower. This will allow a gravity discharge into the public sewers.

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-off 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

It is proposed to provide the blue roof systems covering the entire podium deck and a part of the Tower to achieve a total volume of **190 m³** in order to limit the discharge rate to **5 litres/sec** from the development. The discharge rate has been agreed with Thames Water by a way of submitting a pre-planning enquiry (see Appendix 3).

A schematic drainage strategy is included in Appendix 1 for reference.

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 piping	Site control	✓	×	×	×
Design for exceedance	Site control	✓	×	×	×

Figure 1.5 Summary of proposed SuDS devices

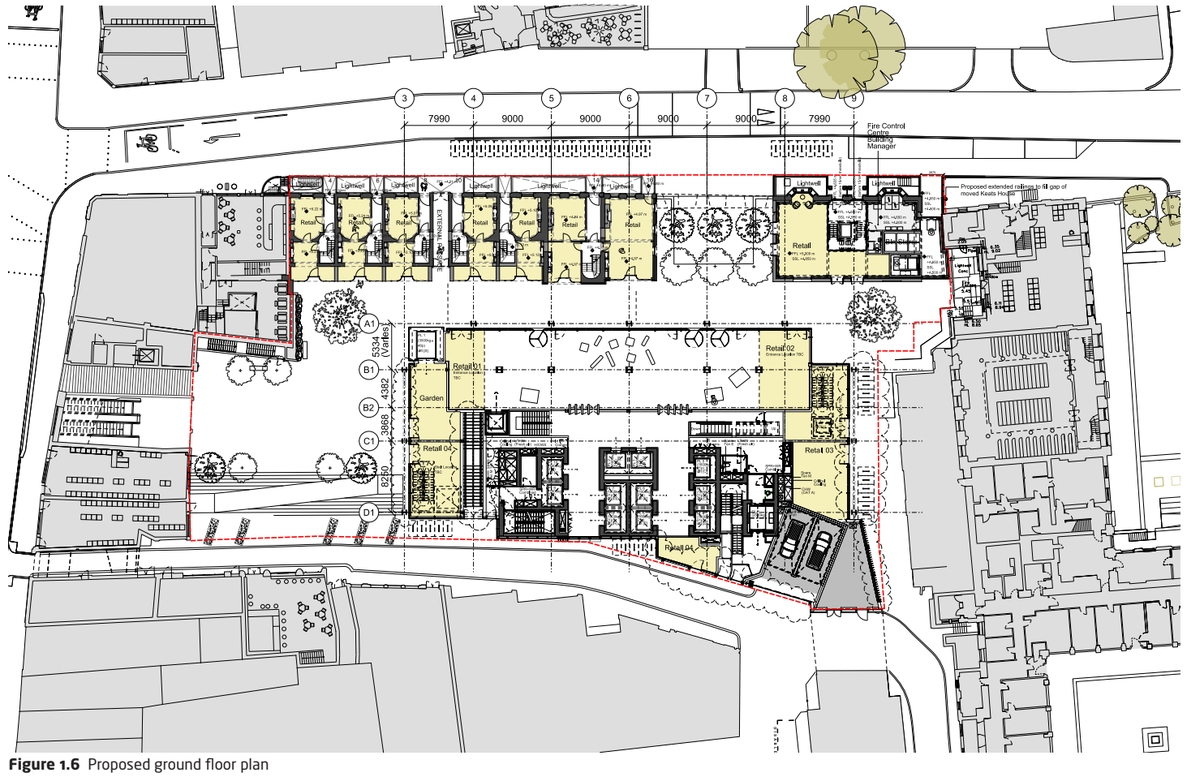


Figure 1.6 Proposed ground floor plan

2 Flood risk assessment requirements

The EA's Indicative Floodplain Map (see Figure 2.1) shows that the site lies in Flood Zone 3a. – an area with a high probability of flooding from rivers and sea without the local flood defences.

A Flood Risk Assessment (FRA) has been undertaken by AKT II which concluded that the site will not increase the flood risk to other properties and the proposed development has an acceptable flood risk within the terms and requirements of the NPPF. Refer to AKT II FRA report.

The main findings of this report can be summarised as:

- In accordance with the NPPF, 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 flood defences along the River Thames. According to the EA Product 4 data (see Appendix E of the AKT II FRA), 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 retail and office uses are acceptable within Flood Zone 3a.
- The development does not require the Exception Test to be applied and therefore, the development is considered appropriate to the location.
- 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 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 King's Head Yard. It is recommended that mitigation measures specified in the AKT II FRA are implemented during the next design stage.
- The proposed redevelopment has an acceptable flood risk within the terms and requirements of the NPPF, subject to implementation of the mitigation measures outlined in the AKT II FRA.

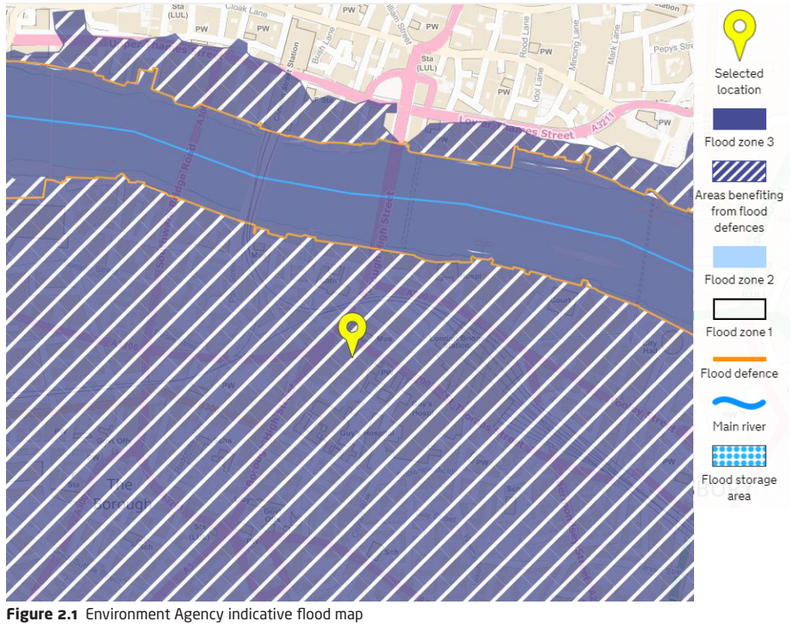


Figure 2.1 Environment Agency indicative flood map

3 Foul water drainage

3.1 Existing scheme

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

- A 1143 × 762mm combined sewer running under St Thomas Street to the north of the site.
- A 300 mm combined water sewer running under Keats House to the east of the site.
- A 375mm dia. combined water sewer in King's Head Yard to the south of the site.

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

It is believed that all surface water from the building currently discharges directly to one of these public sewers without any form of attenuation, but it is not clear which one, and it is therefore recommended that a CCTV survey of the existing site drainage network is undertaken to confirm the location and size of all existing connections from the site and to rule out a third-party connections from adjoining properties.

Existing foul water discharge has been calculated using existing plans of the Main building, Keats House and 4-16 St Thomas Street.

The existing foul flows from the development are as follows:

Appliance	No.	Discharge Units per Appliance	Total Units
Washbasins	52	0.5	26
Urinal	13	0.5	6.5
Kitchen Sink	5	0.8	4
WCs	42	2	84
Floor Drains	20	2	40
Total			**160.5**

Therefore, the total foul flow from the development is **8.5 l/s**.

3.2 Proposed scheme

The proposed foul water discharge has been based on the peak daily discharge of 4,950 and 2,640 litres per day per 100m² of floor area of office and retail space, respectively.

The proposed foul flow from the Main Building and the refurbished Keats House are as follows:

Use	Area (sqm)	Daily Discharge (litres/day)	Peak Flow Rate (litres/sec)
Office	30,934	1,531,233	17.7
Retail	1,881	49,6588	0.6
Hub	685	6,781.5	0.1
Total			**18.4**

The proposed foul flow from the refurbished Georgian Terrace (4-16 St Thomas Street) are as follows:

Use	Area (sqm)	Daily Discharge (litres/day)	Peak Flow Rate (litres/sec)
Office	732	36,234	0.4
Retail	400	10,560	0.1
Total			**0.5**

There will be an increase in flow rate of approximately **12 l/s** into the public sewer which would need to be agreed with Thames Water by a way of submitting a pre-development enquiry and secured under Section 106 of the Water Industry Act 1991.

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. It is recommended that an allowance is made at this stage for pumping foul water from below the basement level slab up to high level in the basement to allow it to discharge by gravity to the public sewer.

As with the surface water drainage, due to the depth of the public sewers it is recommended that, if possible, the existing drainage connection(s) should be reused, subject to the findings of the CCTV survey.

4 BREEAM

Pol 03: Flood and surface water management

BREEAM is the world's leading sustainability assessment method for masterplanning project, infrastructure and building.

BREEAM does this through third party certification of the assessment of an asset's environmental, social and economic sustainability performance, using standards developed by BRE. This means BREEAM rated developments are more sustainable environments that enhance the well-being of the people who live and work in them, help protect natural resources and make for more attractive property investments.

Category Pol 03 aims to recognise projects that have identified flood risks and put in place measures to avoid, reduce and delay the discharge of rainfall to public sewers and watercourses, and minimise the risk and impact of localised flooding on and off-site, watercourse pollution and other environmental damage.

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 (Assessing and managing flood risk in development - Code of practice).

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 the natural or man-made environment of and surrounding the site. The priority levels detailed in the BREEAM 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, the 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. For 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 – the site is located in Flood Zone 3a.	N/A
3.	The site-specific 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 flood 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 food 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. (OR)

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 E) 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 has been 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 has been reduced to greenfield rate.	✓
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 carried out by AKT II 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 building covers the entire site area it is not possible to make infiltration a viable option. Therefore, it is not possible to prevent the additional run-off from leaving the site.	✗
12.	As the building covers the entire site area it is not possible to make infiltration a viable option.	✓
13.	Pre-development 1-year peak flow rate = 29.3 litres/sec Mean annual flow rate Q_{bar} = 1.21 litres/sec 2 litres/sec/ha = 0.6 litres/sec It is proposed to reduce the proposed peak discharge rate to greenfield rate (5.0 litres/sec).	✓
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 two credits out of a possible two can be awarded under these criteria.

Minimising watercourse pollution

Pollution criteria	AKT II assessment	
16.	As confirmed above, no infiltration is possible and there is insufficient green roof coverage therefore this criterion cannot be achieved.	✗
17.	SuDS devices will be specified where possible within the limitations of the development.	✓
18.	Petrol separators will be provided for car parking & loading areas.	✓
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 it is not possible to award the one credit available under these criteria.

Overall, we believe that potentially four credits out of a possible five can be awarded under the Polo3 criteria outlined above.

5 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 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.

5.1 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 will 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 5.1) 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 will be 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

5.2 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 BMS 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/off/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.

5.3 Petrol separators

Petrol separator will be provided for the service yard area. The separator shall be provided with a robust device to provide visual and audible warning to an appropriate location when the level of oil reaches 90% of the oil storage volume under static liquid level conditions. Appropriate maintenance shall then be carried out.

Maintenance schedule	Required action	Recorded frequency
Regular maintenance	Follow the manufacturer's recommended guidelines.	As manufacturer's recommendations
	Remove sediment / oil from separator.	Six-monthly or as manufacturer's recommendations
	Service all electrical equipment.	As manufacturer's recommendations
	Inspect integrity of separator and all mechanical parts.	Six-monthly or as manufacturer's recommendations

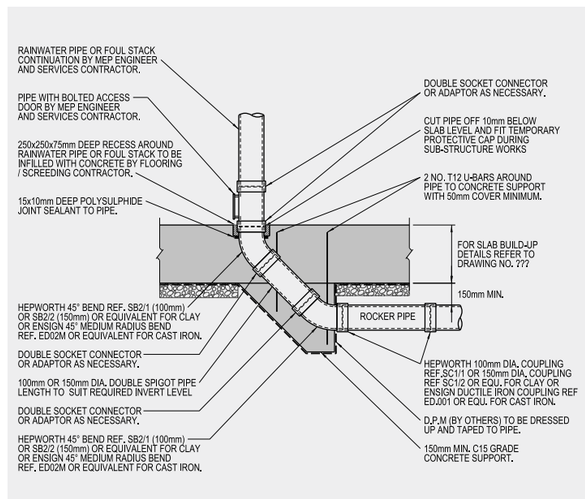


Figure 5.1 Rodding/Jetting access details

6 Drainage design standards

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

- BS EN 752:2017 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
- Planning Practice Guidance

7 Materials

	Item	Material	British standard
a)	Drainage pipe work	Vitrified clayware	BS EN 295-1
		Cast iron	BS EN 877
		Concrete	BS 5911-1 and BS EN 1916
		uPVC	BS EN 1401-1
		Stainless steel (if requested by Thames Water for sewer diversion)	BS EN 10296-2 (Thames Water to confirm)
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		

8 Summary

1. **Existing drainage network**
   A CCTV survey of the existing drainage network is required in order to determine the suitability of existing outfalls for re-use and to allow the detailed drainage design to proceed.
2. **Water authority discharge agreement**
   Thames Water have confirmed that the existing drainage infrastructure has sufficient capacity to accept flows from the proposed development. See Appendix 3 for their response to the pre-planning enquiry.
3. **MEP layout and flows**
   The proposed MEP drainage layout and flows will be required to allow the below ground drainage design to be progressed.

Appendix 1

Schematic SuDS Strategy

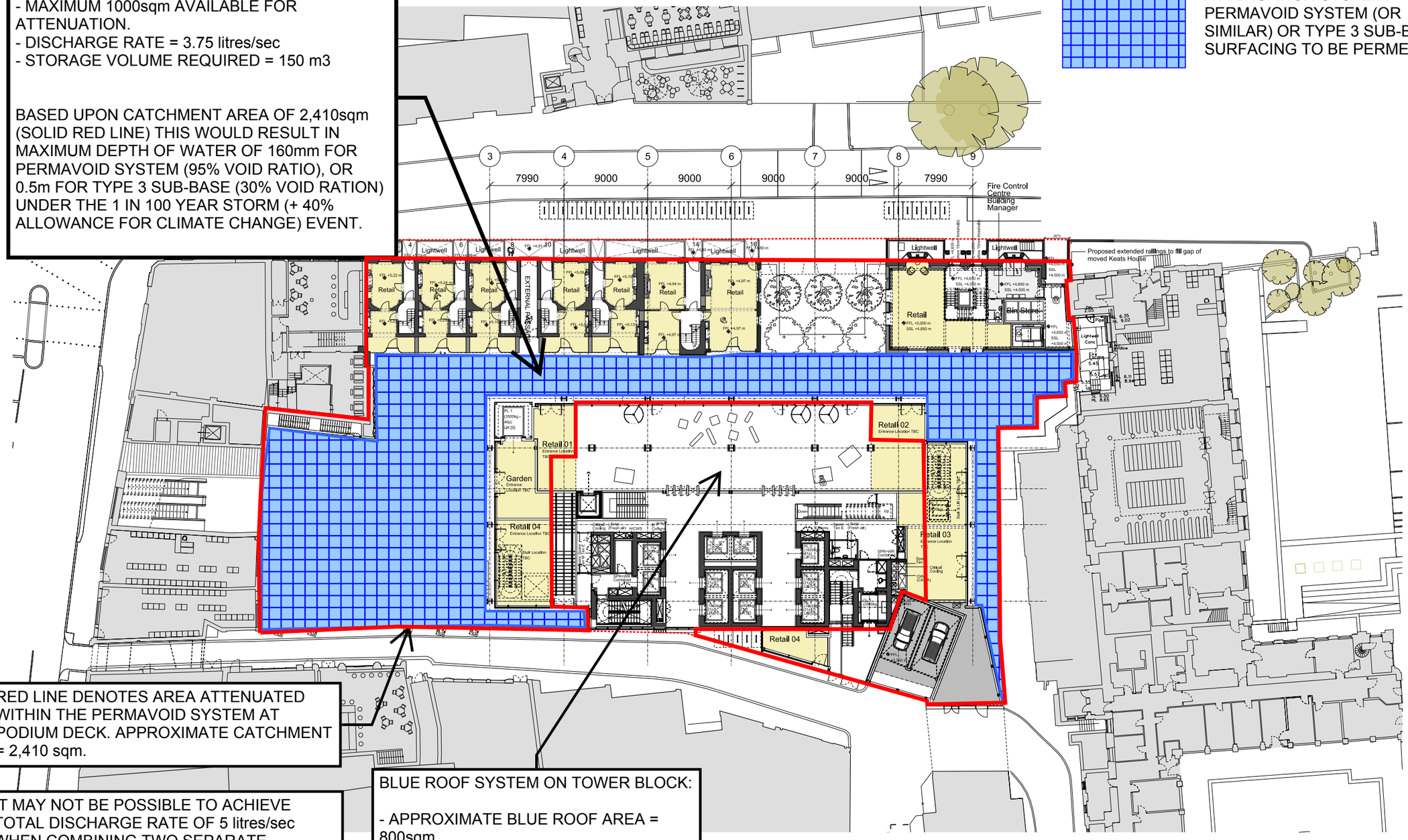
ATTENUATION ON PODIUM DECK: PERMAVOID (OR SIMILAR) OR TYPE 3 SUB-BASE

- MAXIMUM 1000sqm AVAILABLE FOR ATTENUATION.
- DISCHARGE RATE = 3.75 litres/sec
- STORAGE VOLUME REQUIRED = 150 m3

BASED UPON CATCHMENT AREA OF 2,410sqm (SOLID RED LINE) THIS WOULD RESULT IN MAXIMUM DEPTH OF WATER OF 160mm FOR PERMAVOID SYSTEM (95% VOID RATIO), OR 0.5m FOR TYPE 3 SUB-BASE (30% VOID RATION) UNDER THE 1 IN 100 YEAR STORM (+ 40% ALLOWANCE FOR CLIMATE CHANGE) EVENT.

LEGEND:

ATTENUATION SYSTEM: PERMAVOID SYSTEM (OR SIMILAR) OR TYPE 3 SUB-BASE. SURFACING TO BE PERMEABLE



RED LINE DENOTES AREA ATTENUATED WITHIN THE PERMAVOID SYSTEM AT PODIUM DECK. APPROXIMATE CATCHMENT = 2,410 sqm.

IT MAY NOT BE POSSIBLE TO ACHIEVE TOTAL DISCHARGE RATE OF 5 litres/sec WHEN COMBINING TWO SEPARATE SYSTEMS FOR TECHNICAL REASONS (FOR EXAMPLE, BLUE ROOF REQUIRES A MINIMUM NUMBER OF DISCHARGE POINTS WITH A MINIMUM DISCHARGE RATE FOR EACH ORIFICE. THIS MAY VARY FOR DIFFERENT BLUE ROOF MANUFACTURERS).

BLUE ROOF SYSTEM ON TOWER BLOCK:

- APPROXIMATE BLUE ROOF AREA = 800sqm
- APPROXIMATE CATCHMENT AREA = 800sqm

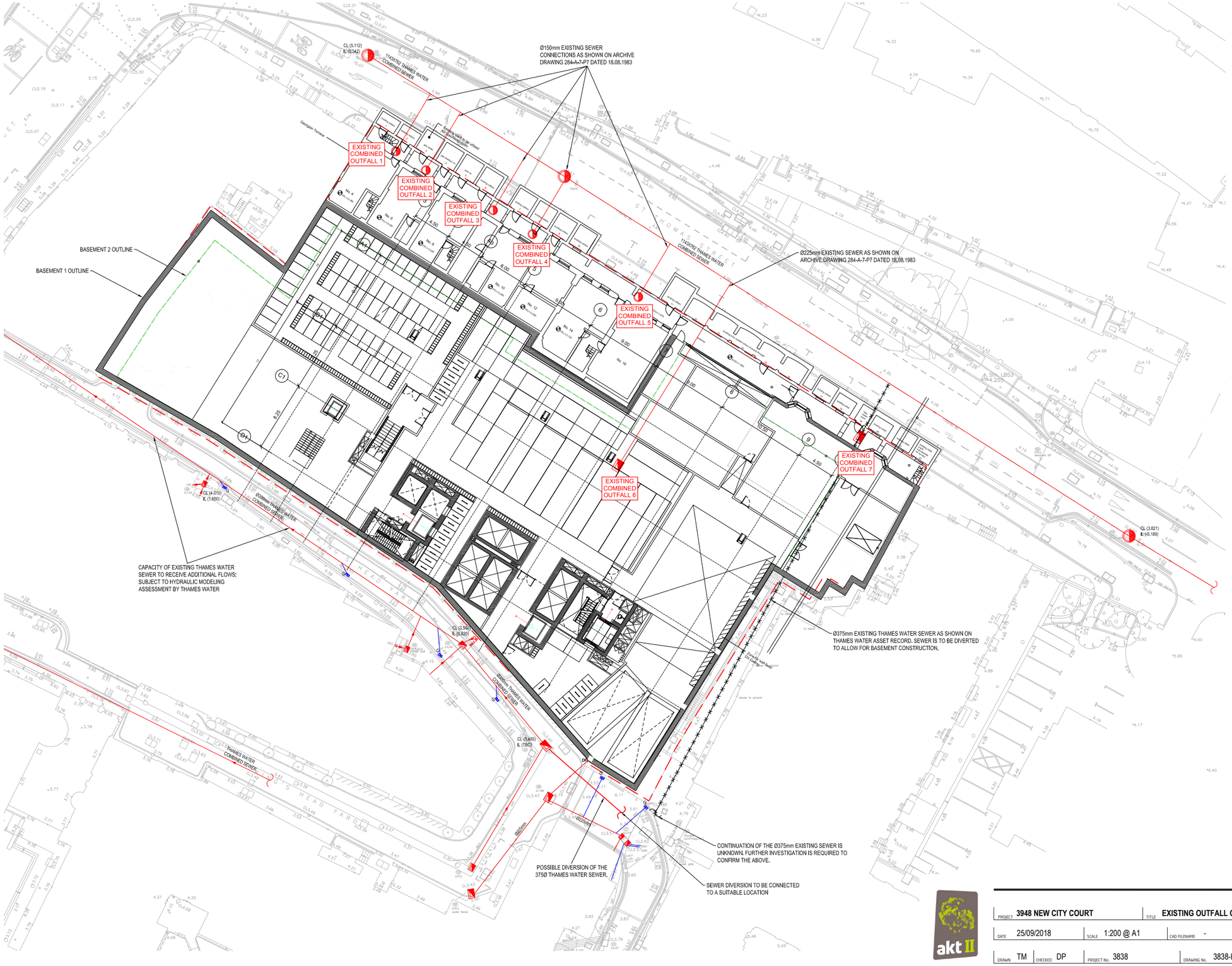
- DISCHARGE RATE = 1.25 litres/sec

akt II

PROJECT NEW CITY COURT		TITLE SURFACE WATER ATTENUATION	
DATE 08/10/2018	SCALE N.T.S.	CAD FILENAME -	STATUS PRELIMINARY
DRAWN DN	CHECKED DP	PROJECT No. 3948	DRAWING No. 3948-CSK001	REV P1

Appendix 2

Existing and Proposed Outfall Connections



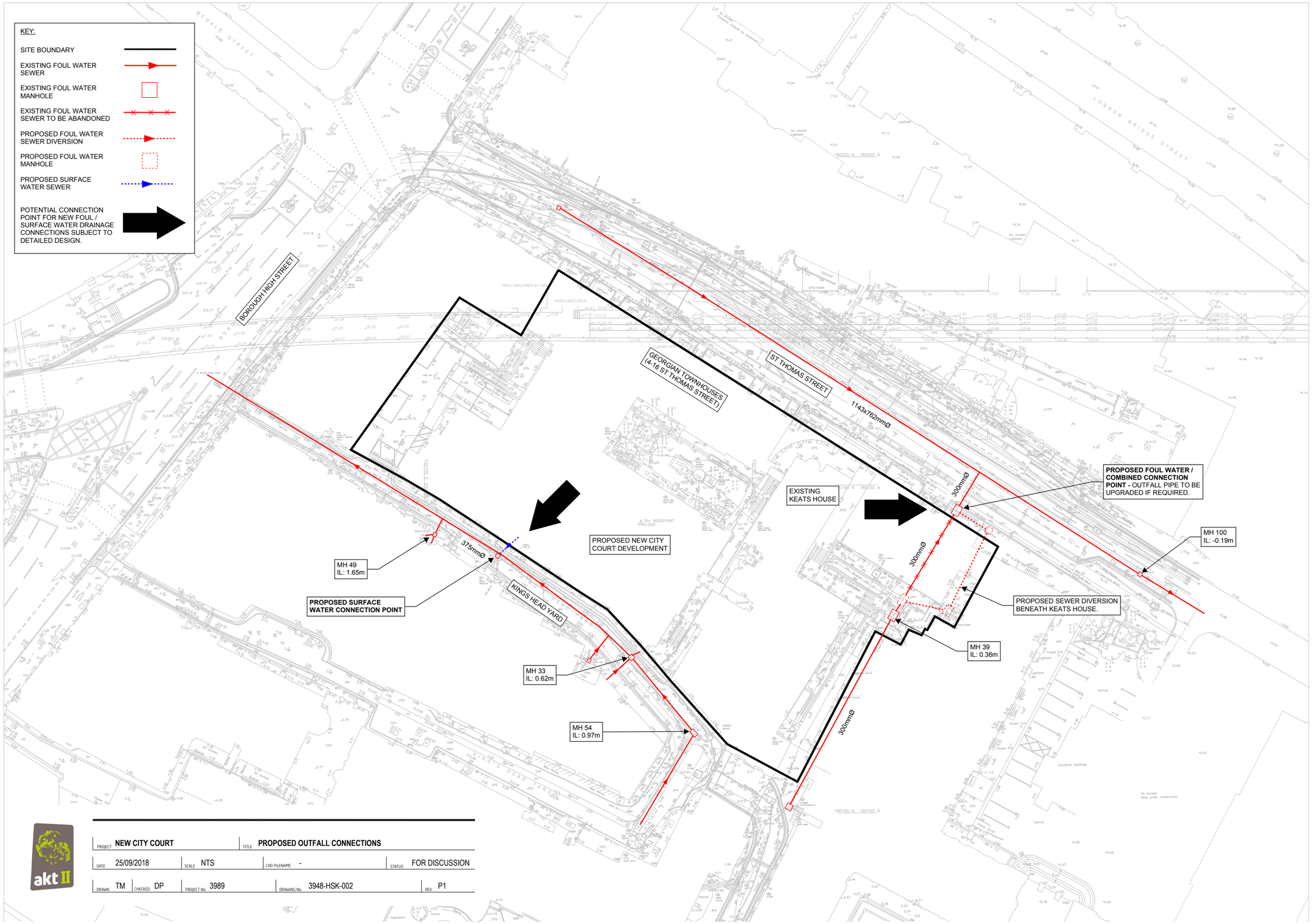
NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL AKT II DRAWINGS AND ALL OTHER RELEVANT ARCHITECT'S, ENGINEER'S AND LANDSCAPE ARCHITECT'S DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS SHOWN ARE IN METERS UNLESS INDICATED OTHERWISE.
3. DO NOT SCALE FROM THIS DRAWING.
4. BEFORE STARTING WORK, THE CONTRACTOR IS TO CHECK INVERT LEVELS AND POSITIONS OF ALL EXISTING DRAINS SEWERS, INSPECTION CHAMBERS AND MANHOLES AGAINST DRAWINGS AND REPORT ANY DISCREPANCIES TO THE ENGINEER.
5. THIS SCHEME HAS BEEN DESIGNED USING THE SURVEY INFORMATION AVAILABLE. IN PARTICULAR DRAWING NUMBERS 35722T-01-1, 35722T-01-2, 35722T-01-3, 35722T-01-4 AND 35722T-01-5, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL LEVELS, BOUNDARIES, FEATURES ETC, PRIOR TO COMMENCING WORKS ON SITE, AKT SHALL NOT ACCEPT ANY RESPONSIBILITY FOR ERRORS RESULTING FROM THE SURVEY.

KEY

- SITE BOUNDARY
- BASEMENT 2 OUTLINE
- PROPOSED COMBINED SEWER DIVERSION, EXACT LOCATION TO BE AGREED FOLLOWING CCTV SURVEY AND HYDRAULIC MODELING BY THAMES WATER.
- EXISTING COMBINED SEWER
- EXISTING SURFACE WATER SEWER
- EXISTING COMBINED SEWER TO BE DIVERTED AND OLD PIPE-WORK TO BE REMOVED
- EXISTING COMBINED SEWER MANHOLE
- EXISTING ROAD GULLY

PROJECT	3948 NEW CITY COURT	TITLE	EXISTING OUTFALL CONNECTIONS
DATE	25/09/2018	SCALE	1:200 @ A1
CAD FILENAME	-	STATUS	STATUS
DRAWN	TM	CHECKED	DP
PROJECT No.	3838	DRAWING No.	3838-HSK-001
REV	P1		


KEY:
SITE BOUNDARY
EXISTING FOUL WATER SEWER
EXISTING FOUL WATER MANHOLE
EXISTING FOUL WATER SEWER TO BE ABANDONED
PROPOSED FOUL WATER SEWER DIVERSION
PROPOSED FOUL WATER MANHOLE
PROPOSED SURFACE WATER SEWER
POTENTIAL CONNECTION POINT FOR NEW FOUL / SURFACE WATER DRAINAGE CONNECTIONS SUBJECT TO DETAILED DESIGN.
BOROUGH HIGH STREET
GEORGIAN TOWNHOUSES (4-16 ST THOMAS STREET)
ST THOMAS STREET
1143x762mmØ
PROPOSED NEW CITY COURT DEVELOPMENT
EXISTING KEATS HOUSE
300mmØ
PROPOSED FOUL WATER / COMBINED CONNECTION POINT - OUTFALL PIPE TO BE UPGRADED IF REQUIRED.
MH 100
IL: -0.19m
PROPOSED SEWER DIVERSION BENEATH KEATS HOUSE.
MH 39
IL: 0.36m
MH 49
IL: 1.65m
375mmØ
PROPOSED SURFACE WATER CONNECTION POINT
KINGS HEAD YARD
MH 33
IL: 0.62m
MH 54
IL: 0.97m
LONDON BRIDGE STREET
BEDALE STREET
PROJECT NEW CITY COURT
TITLE PROPOSED OUTFALL CONNECTIONS
DATE 25/09/2018
SCALE NTS
CAD FILENAME -
STATUS FOR DISCUSSION
DRAWN TM
CHECKED DP
PROJECT No. 3989
DRAWING No. 3948-HSK-002
REV P1

Appendix 3

Thames Water Response to Pre-planning Enquiry

Mr Thomas Mealey

AKT II
White Collar Factory,
1 Old Street Yard,
London,
Greater London,
EC1Y 8AF

Wastewater pre-planning
Our ref DS6054110

08 November 2018

Pre-planning enquiry: Capacity Confirmation

Dear Thomas,

Thank you for providing information on your development.

Site: New City Court, St. Thomas Street, London - SE1 9RY

Existing site: Offices (10,079m2).
Existing foul water discharge by gravity into 1143x762mm sewer in St Thomas Street.
Existing surface water discharge at 29.1 l/s for 1:1, 58.3 l/s for 1:10, 71.5 l/s for 1:30 & 92.7 l/s for 1:100 into 1143x762mm sewer.
Proposed site: Offices (31,666m2) + Retails (2,281m2)
Proposed foul water discharge by gravity into 1143x762mm sewer in St Thomas Street.
Proposed surface water discharge at 5.0 l/s into 375mm sewer in Kings Head Yard.

Foul Water

From the information you have provided, we can confirm that the existing **combined sewer** network does have sufficient capacity to accommodate the proposed foul water discharge from the proposed development.

Surface Water

When redeveloping an existing site, policy 5.13 of the London Plan and Policy 3.4 of the Supplementary Planning Guidance (Sustainable Design And Construction) states that every attempt should be made to use flow attenuation and SUDS/storage to reduce the surface water discharge from the site as much as possible.

If they are consulted as part of any planning application, Thames Water Planning team would ask to see why it is not practicable to attenuate the flows to Greenfield run-off rates i.e. 5l/s/hectare of the total site area or if the site is less than hectare in size then the flows should be reduced by 95% of existing flows. Should the policy above be followed, we would envisage no capacity concerns with regards to surface water for this site.

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

Please refer to the attached document titled ‘’Planning your wastewater’’ attached to this letter, specifically to notes relating to surface water. Also I would advise you to liaise with the Local Authority (LA) / Lead Local Flood Authority (LLFA) and discuss their criteria regarding surface water discharges in that area and adhere to their stipulation. If you agree & adhere to a LA/LLFA stipulation then Thames Water will be able to accommodate that agreed discharge.

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

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

What happens next?

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

If you’ve any further questions, please contact me on 020 3577 7608.

Yours sincerely

Zaid Kazi

Thames Water
Developer Services – Sewer Adoptions Team