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Alexander House, Reading

Flood Risk Assessment

On behalf of **PJ Alexander Estates Ltd**

Project Ref: 45074/2001 | Rev: 01 | Date: January 2019

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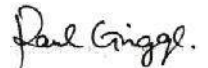
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1 Introduction

- 1.1.1 Peter Brett Associates LLP (PBA) has been commissioned by PJ Alexander Estates Ltd to prepare a Flood Risk Assessment (FRA) to support the detailed planning application for the site known as Alexander House, 205-207 King's Road, Reading.
- 1.1.2 This Strategy has been prepared in accordance with relevant national, regional and local planning policy guidance as follows:
- National policy regarding flood risk as contained within National Planning Policy Framework (NPPF), dated July 2018, and the accompanying National Planning Practice Guidance (NPPG), dated October 2018.
 - The Ministerial Statement HCWS161, dated 18th December 2014.
 - Non-statutory Technical Standards for Sustainable Drainage Systems, March 2015, Defra.
 - Flood Risk Assessments: Climate Change Allowances, 19th February 2016 and updated 3rd February 2017, Environment Agency (EA).
 - Reading Borough Council (RBC) Strategic Flood Risk Assessment (SFRA), June 2017.
 - RBC Revised Sustainable Design and Construction Supplementary Planning Document, 11th July 2011.
- 1.1.3 This report summarises the risk from surface water flooding that may affect the development and outlines proposals to discharge the foul water.

2 Site Information

2.1 Site Location and Plan

- 2.1.1 The Alexander House, Reading site is approximately 0.16ha in size and lies to the east of Reading town centre (postcode RG1 4LS, site centre grid reference SU 72937 73255). The site currently consists of a 2-storey office building and associated parking.
- 2.1.2 The site is bounded by the A329 King's Road to the south, Rupert street to the west and residential properties to the north and east. Refer to Figure 2.1 below.

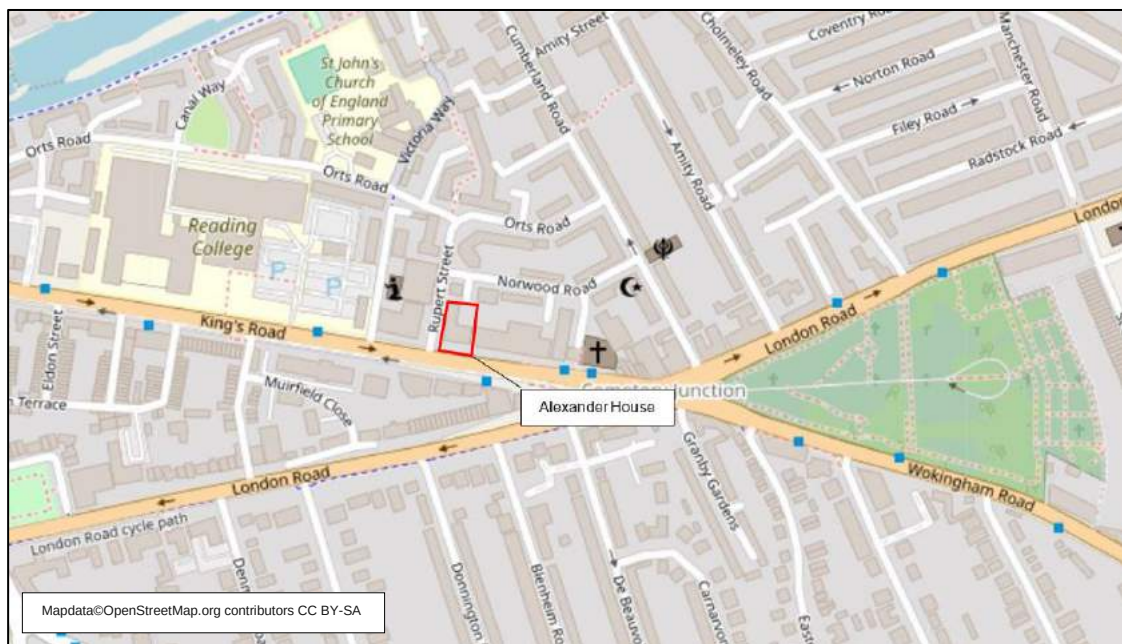


Figure 2.1: Site Location Plan

- 2.1.3 A copy of the topographical survey of the site undertaken by Laser Surveys (Drawing Number G9179/2, dated 14th December 2018), is contained within **Appendix A**.
- 2.1.4 The site is approximately 0.35km from the River Kennet and 0.7km from the River Thames, both watercourses are to the north of the site.

2.2 Proposals

- 2.2.1 It is proposed that the site is redeveloped to incorporate a 7-storey student accommodation block with associated access and 5 car parking spaces. The building will accommodate 182 rooms contained within shared and studio apartments.
- 2.2.2 The Architect's Proposed Landscape Plan (Drawing Number L-90-100) can be found in **Appendix B**.

3 Flood Risk Assessment

3.1 National Policy

- 3.1.1 The NPPF requires a site-specific FRA to be carried out to support the planning application. The degree of detail that an FRA should include depends upon the scale and potential impact of the proposed development. The FRA should consider the risk to the development from all sources of flooding and the off-site impacts on the downstream flood risk to others. An assessment of climate change should also be included.

3.2 Strategic Flood Risk Assessment

- 3.2.1 Local Planning Authorities (LPAs) should prepare Strategic Flood Risk Assessments (SFRA) in consultation with the Environment Agency (EA). This is then used by the LPAs to inform sustainability appraisals and Local Development Documents (LDDs). The SFRA is initially used to refine information on areas that may flood, taking into account all sources of flooding and the impacts of climate change, in addition to the information depicted on the EA Flood Zone Mapping.
- 3.2.2 The LPA, Reading Borough Council (RBC), has prepared an SFRA which was released in June 2017. The SFRA provides flood risk information on a Borough-wide scale.
- 3.2.3 This FRA has been compiled taking account of the information provided within the RBC SFRA.

3.3 Reading Core Strategy

- 3.3.1 Local planning policy relevant to the site is currently contained within the RBC Core Strategy adopted January 2008 and altered January 2015, which forms part of the Local Plan and sets out the Council's overall planning strategy to achieve the 2020 vision for the borough of Reading.
- 3.3.2 Policy 11 (Built and Natural Environment) - Flooding addresses flood risk and states the following:

'Planning permission will not be permitted for development in an area identified as being at high risk of flooding, where development would reduce the capacity of the flood plain to store floodwater, impede the flow of floodwater or in any way increase the risks to life and property arising from flooding.'

3.4 Fluvial Flood Zone

- 3.4.1 The initial phase of identifying whether a site is potentially at risk of flooding is to consult the EA's Flood Maps, available on the EA's website.



Figure 3.1: Extract of Flood Map from EA website

- 3.4.2 This mapping shows the site to lie in Flood Zone 1; land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

3.5 Vulnerability

- 3.5.1 The NPPF follows a sequential risk based approach in determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas.
- 3.5.2 NPPF Table 2, below, taken from the Planning Practice Guidance to the NPPF confirms the 'flood risk vulnerability classification' of a site depending on the proposed usage. This classification is subsequently applied to NPPF Table 3, below, to determine whether:
- the proposed development is suitable for the flood zone in which it is located, and
 - whether an Exception Test is required for the proposed development.
- 3.5.3 In this case the proposed development is a student halls of residence.

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.
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Table 3.1: NPPF Planning Practice Guidance Table 2: Flood Risk Vulnerability Classification

Flood Risk Vulnerability Classification	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓

Table 3.2: NPPF Planning Practice Guidance Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility'

- 3.5.4 Review of the NPPF tables, above, shows that development classed as '*more vulnerable*' is appropriate for Flood Zone 1.

3.6 Groundwater

- 3.6.1 The Groundwater Source Protection Zone Maps, available on the DEFRA Magic Map Application, indicate the risk of contamination to groundwater sources such as wells, boreholes and springs used for public drinking water supply. The shape and size of a zone depends on the ground conditions, how the groundwater is abstracted, and other environmental factors.
- 3.6.2 The EA mapping shows that the site lies within the Total Catchment (Zone 3) and is over a major aquifer with high groundwater vulnerability. This suggests that the groundwater (aquifer) directly below the site is extracted and that the ground conditions above the aquifer have the potential to be permeable. This mapping therefore indicates that there is a potential for the movement of contaminants through the strata and subsequently pollution of the aquifer.
- 3.6.3 The RBC SFRA states that the risk of groundwater flooding throughout Reading is typically considered to be low. The historic flood records for the site indicate that there has not been an occurrence of groundwater flooding in close proximity to the site. The historic flood records are contained within **Appendix C**.

3.7 Surface Water / Pluvial Flooding

- 3.7.1 The EA's Flood Map for Surface Water is generated by using a 'rolling ball' methodology of direct rainfall on an area and calculating where it flows. It is important to note that while this mapping takes into account rural and urban catchments it does not take into account infiltration or existing drainage networks.

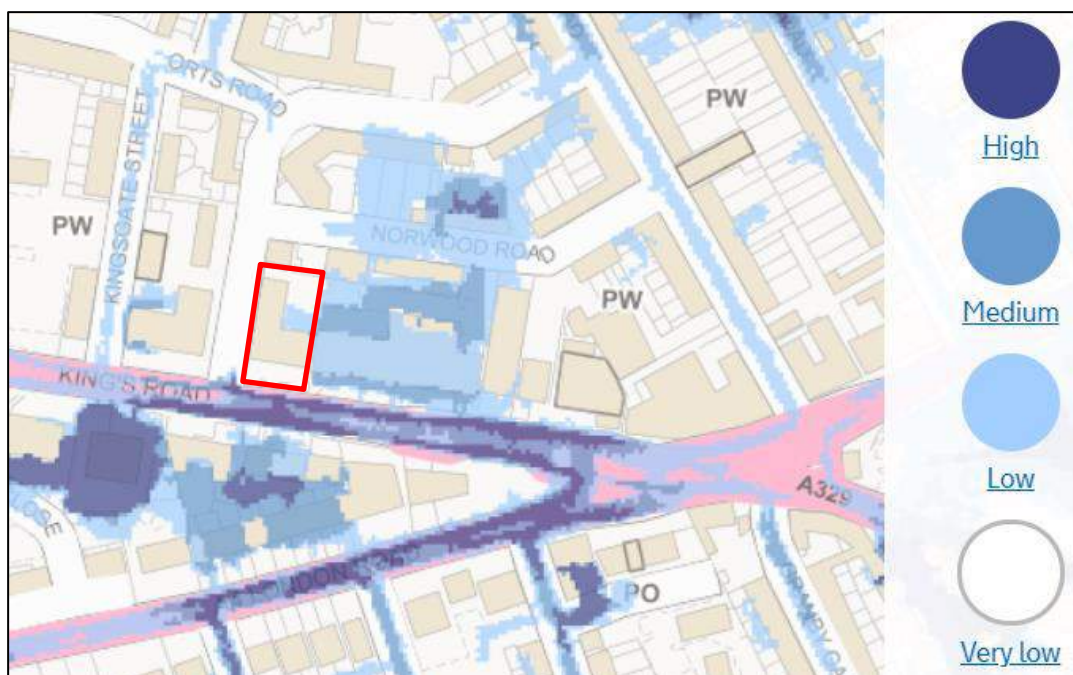


Figure 3.2: Extract from EA Flood Map for Surface Water

- 3.7.2 Review of this mapping shows that the site itself is at a very low to low risk of flooding from surface water runoff. However, areas with a high risk of surface water flooding are located adjacent to the site boundaries.

3.8 Climate Change

- 3.8.1 In considering flood risk to the site, it is necessary to fully consider the potential impacts of climate change for the lifetime of the development within the mitigation measures.
- 3.8.2 The EA's Flood Risk Assessments: Climate Change Allowances guidance which supports the NPPF provides contingency allowances for potential increases in sea level rise, peak river flow and rainfall intensity.
- 3.8.3 In accordance with this guidance, the potential for increased flood probability as the result of possible climate change has been taken into account in the consideration of mitigation measures over the lifetime of the development through a +20% allowance for increases in peak rainfall intensity (i.e. surface water drainage).

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115	Comment
Upper End	10%	20%	40%	20% allowance applied for 'more vulnerable' development in Flood Zone 1, not within a known flood risk area with a 100 year life expectancy
Central	5%	10%	20%	

Table 3.3: Flood Risk Assessments: Climate Change Allowances Table 2 Peak Rainfall Intensity Allowance in Small and Urban Catchments (use 1961 to 1991 baseline)

- 3.8.4 An exceedance event of 100 year +40% climate change has also been carried for the proposed surface water network.

- 3.8.5 As the site lies in Flood Zone 1, refer to Section 3.4, according to the guidance there is no requirement to add an allowance for climate change to peak river flows.

3.9 Impact of the Development on Site Permeability

- 3.9.1 As the proposed building footprint is very similar to that of the existing building, the permeability of the site will remain the same. The existing site is approximately 90% impermeable.

3.10 The Sequential Test and Exception Test

- 3.10.1 The NPPF follows a sequential risk based approach in determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas. The SFRA provides the basis for applying the Sequential Test.
- 3.10.2 The NPPF states that *'the aim of the Sequential Test is to steer new development to areas with the lowest probability 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 probability of flooding.'*
- 3.10.3 As the site lies within Flood Zone 1, and is therefore at the lowest risk of flooding, it is considered to have passed the Sequential Test.
- 3.10.4 Table 3 of the NPPF Planning Practice Guidance (a copy of which is contained in Section 3.5 Vulnerability) confirms that an Exception Test does not need to be carried out for sites located within Flood Zone 1.

4 Surface Water Drainage

4.1 Existing Surface Water Drainage

- 4.1.1 The site currently consists of an office building and associated parking, and is served by a piped network which discharges surface water directly to a Thames Water surface water sewer. The site is currently 90% impermeable and there does not appear to be any existing attenuation storage on the site.
- 4.1.2 A copy of the topographical survey of the site undertaken by Laser Surveys (Drawing Number G9179/2, dated 14th December 2018), is contained within **Appendix A**.
- 4.1.3 A copy of Thames Water asset records (ALS/ALS Standard/2018_3915221, dated November 2018) are contained within **Appendix D**.
- 4.1.4 An assessment of the brownfield and greenfield discharge rates from the site has been undertaken using the HR Wallingford Modified Rational Method.
- 4.1.5 A copy of the calculations is contained within **Appendix E**. Table 4.1 provides a summary of the rates.

Return Period	Brownfield Discharge Rate	Greenfield Discharge Rate
1 in 1 Year	20.4 l/s	0.22 l/s
1 in 30 Year	49.6 l/s	0.61 l/s
1 in 100 year	63.4 l/s	0.84 l/s

Table 4.1: Brownfield and Greenfield Discharge Rates

4.2 Proposed Surface Water Strategy

Discharge Destination

- 4.2.1 The Building Regulations H3 and the NPPF Planning Practice Guidance include the following hierarchy for the discharge of surface water from a development.

See the Planning Practice Guidance

This states:

"Generally the aim should be discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable:

- 1. Into the ground (infiltration)*
- 2. To a surface water body;*
- 3. To a surface water sewer, highway drain or another drainage system;*
- 4. To a combined sewer."*

- 4.2.2 The suitability of each of the items listed in the above hierarchies have been assessed in turn for the proposed Alexander House Development. It has been determined that discharge by

infiltration is not suitable for this site. This is primarily due to the small site area and close proximity to other buildings.

- 4.2.3 There are no surface water bodies within the vicinity of the site, therefore it is proposed to continue to discharge surface water arising from the development to Thames Water surface water sewer on Norwood Road.
- 4.2.4 A copy of the Proposed Drainage Layout (45074/2001/001) is contained within **Appendix F**.

Peak Flow Control – Defra Technical Standard S3

S3. For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

- 4.2.5 As previously discussed in Section 4.1 the site is served by a Thames Water sewer to the north of the site, in Norwood Road.
- 4.2.6 In accordance with best practice the proposed drainage strategy seeks to reduce the peak discharge rate from the site to '*as close as reasonably practicable to the greenfield runoff rate*'. The proposed site levels and small size of accessible areas within the site prevents sufficient underground attenuation being provided to reduce the peak discharge rate to that of greenfield, however a peak discharge rate of 8 l/s for the 1 in 100 year + 20% climate change rainfall event, which represents a significant reduction (87%) on the brownfield discharge rate 1 in 100 year event is proposed.
- 4.2.7 In accordance with the EAs Flood Risk Assessments: Climate Change Allowances guidance which supports the NPPF, the potential for increased flood probability as the result of possible climate change over the lifetime of the development has been taken into account through the inclusion of a +20% allowance for increases in peak rainfall intensity within the surface water drainage design.
- 4.2.8 The comparison between existing and proposed discharge rates can be found in Table 4.2.

Return Period	Brownfield Discharge Rate	Greenfield Discharge Rate	Proposed Discharge Rate	% Reduction to Brownfield
	l/s	l/s	l/s	
1 in 1 Year	20.4	0.22	4.5	77.9 % reduction
1 in 30 year	49.6	0.61	7.8	84.3 % reduction
1 in 100 Year	63.4	0.84	8.0	87.4 % reduction
1 in 100 +20% CC	-	-	8.0	-

Table 4.2: Proposed Surface Water Discharge Rates

- 4.2.9 A copy of the Proposed Drainage Layout (45074/2001/001) and accompanying MicroDrainage calculations are contained within **Appendices F and G** respectively.

Volume Control – Defra Technical Standard S5

S5. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

- 4.2.10 The proposed development has a similar building footprint to that of the existing building, therefore the impermeable area remains the same. The volume of run-off in the 100 year 6 hour storm event will remain increased above greenfield but will be greatly reduced in comparison with the brownfield discharge rate. The management of the additional volume through infiltration or re-use is not considered reasonably practicable for the development and therefore the rate of run-off has been restricted to the reduced rate, for all storm events, in order to prevent an adverse effect on flood risk.
- 4.2.11 Typically, the rate of run-off would be limited to the Q_{bar} rate for all storm events up to and including the 1 in 100 year event plus climate change allowance, however, as discussed in the previous section, the site constraints prevent sufficient attenuation being provided to reduce the peak discharge rate to that level.
- 4.2.12 However, a peak discharge rate of 8 l/s for the 1 in 100 year + 20% climate change rainfall event which represents a significant reduction (87%) on the brownfield discharge rate 1 in 100 year event is proposed.

Flood Risk within the Development – Defra Technical Standards S7 to S9

S7. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

S8. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement) or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

- 4.2.13 The proposed surface water drainage network has been designed not to flood in a 1 in 30 year or 1 in 100 year + 20% climate change rainfall event.
- 4.2.14 A copy of the Proposed Drainage Layout (45074/2001/001) and accompanying MicroDrainage calculations are contained within **Appendices F and G** respectively.

S9. The design of the site must ensure that so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

- 4.2.15 In the event of a rainfall event in excess of a 100 year + 20% climate change event surface water will be contained on site and flow towards the lower end of the car park. Exterior

surfaces at the building edge will convey water away from the building, allowing it to remain within the car park.

- 4.2.16 To further understand the implications of a rainfall event in excess of a 100 year + 20% climate change event, the 100 year + 40% climate change event has been modelled. The results show minimal flooding that will be contained within the site boundary.
- 4.2.17 A copy of the Exceedance Event Drawing (45074/2001/002) and accompanying MicroDrainage calculations are contained within **Appendices F and G** respectively.

Sustainable Drainage Systems (SuDS) Selection

- 4.2.18 The Ministerial Statement HCWS161, dated 18th December 2014 states that:

*'.....the Government's expectation is that sustainable drainage systems will be provided in new developments **wherever this is appropriate.***

- 4.2.19 The NPPG paragraph 051 describes SuDS as follows:

*'Sustainable drainage systems are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible. **They provide opportunities to:***

- *reduce the causes and impacts of flooding;*
- *remove pollutants from urban run-off at source;*
- *combine water management with green space with benefits for amenity, recreation and wildlife.'*

- 4.2.20 The current planning policy and guidance advises that SuDS in the form of open or near surface systems employing natural processes should be used where possible, **not that they must be used**. They can also provide opportunities to combine water management with amenity and wildlife, but only where appropriate.
- 4.2.21 Due to the small area and highly constrained nature of the site the proposed surface water drainage strategy utilises SuDS in the form of underground cellular storage to attenuate surface water flows.
- 4.2.22 A copy of the Proposed Drainage Layout (45074/2001/001) is contained within **Appendix F**.

Structural Integrity – Defra Technical Standards S10 & S11

S10. Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

S11. The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.

- 4.2.23 The components that make up any drainage network have different life expectancies which can be greatly affected by the effectiveness of their maintenance regime and upstream sediment capture/management.

- 4.2.24 The proposed network comprises of a piped network, a pump, inspection chambers, slot drains, gullies and a Hydro-Brake flow control. As with any drainage system, this network requires regular inspection and maintenance to ensure that the individual components continue to operate as designed, both in terms of hydraulic capacity and potential pollutant removal. Further details regarding the maintenance of the proposed system are contained in Section 6.
- 4.2.25 At the detailed design stage, individual components will be specified that ensure that the structural integrity of all the components is suitable for their intended use, location and anticipated loading conditions.

5 Foul Water Drainage

5.1 Existing Foul Water Drainage

- 5.1.1 Much like the existing surface water drainage, the foul water drainage exits the site at the north and discharges to a Thames Water foul sewer.
- 5.1.2 A copy of the topographical survey of the site undertaken by Laser Surveys (Drawing Number G9179/2, dated 14th December 2018), is contained within **Appendix A**.
- 5.1.3 A copy of Thames Water asset records (ALS/ALS Standard/2018_3915221, dated November 2018) are contained within **Appendix D**.

5.2 Proposed Foul Water Drainage

- 5.2.1 As the proposed development is considerably larger than the existing office building the foul discharge rates will increase significantly. A calculation has been carried out in order to investigate the increase in foul discharge rates and a pre-planning application has been submitted.
- 5.2.2 It is proposed that the foul water drainage utilises the existing discharge point on the site. Due to the changes to internal and external levels the drainage will require pumping in order to tie in with this point.

6 Maintenance Strategy

6.1.1 This section sets out the inspection and maintenance requirements for the long term management of the development surface water drainage system. As the proposed network will remain under private ownership this work would be undertaken by a private maintenance company.

6.2 Health, Safety and Welfare

6.2.1 All those responsible for maintenance should take appropriate health, safety and welfare precautions for all activities including lone working, if relevant, and risk assessments should always be undertaken. The site's infrastructure Health and Safety File should be consulted before carrying out any works either inside or outside of the development's boundary and information regarding the location of existing utilities passed on to operatives.

6.2.2 The requirements of the Health and Safety at Work Act 1974 and The Construction (Design and Management) Regulations 2015 should be adhered to and any residual risks identified in the Health and Safety File should be managed and information passed on to maintenance operatives through task specific risk assessments.

6.3 Operation and Maintenance

6.3.1 There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:

- Regular Maintenance – *'basic tasks undertaken on a frequent and predictable schedule, including inspections/monitoring, silt or oil removal if required more frequently than once a year, vegetation management, sweeping of surfaces and litter and debris removal.'*
- Occasional Maintenance – *'tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks (eg sediment removal or filter replacement).'*
- Remedial Maintenance – *'intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design, construction and regular maintenance activities. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and so timings are difficult to predict.'*

6.3.2 Specific maintenance needs should be monitored and maintenance schedules adjusted to suit the location and condition of the drainage feature in question.

Operation and Maintenance Activity	SuDS Components	
	Piped Network / Inspection Chambers / Catchpits / Gullies	Geocellular Storage
Regular Maintenance		
Inspection	■	■
Litter and debris removal	■	□
Grass cutting		□

Operation and Maintenance Activity	SuDS Components	
	Piped Network / Inspection Chambers / Catchpits / Gullies	Geocellular Storage
Occasional Maintenance		
Sediment management¹	■	■
Remedial Maintenance		
Structure rehabilitation / repair	□	□

Table 6.1: Extract Table 32.1 Typical Key SuDS Components operation and Maintenance Activities, The SuDS Manual C753, CIRIA 2015

6.4 Piped Network / Inspection Chambers / Catchpits

- 6.4.1 Piped network components require regular inspection and maintenance to ensure that the individual components continue to operate as designed, both in terms of hydraulic capacity and potential pollutant removal. All drainage inspection chambers and catchpits will therefore be inspected and cleaned regularly.

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then six monthly
	Debris removal from catchment surface / gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair / rehabilitation of gratings, inlets and outlets	As required
Monitoring	Inspect / check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed	Annually and after large storm events
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of features or pipework is required.	As required

Table 6.2: Operation and Maintenance for Piped Network / Inspection Chambers / Catchpits

6.5 Geocellular Storage

- 6.5.1 Geocellular storage systems are high porosity modular plastic units that can be used to efficiently create a below ground structure for the temporary storage of surface water. Their inherent flexibility in size and shape means that they can be tailored to suit the specific characteristics and requirements of most sites. This is added by their ability to be located below public open space and trafficked areas.

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required take remedial action.	Monthly for three months, then annually
	Remove debris from the catchment surface (where may cause risks to performance).	Monthly

Maintenance Schedule	Required Action	Frequency
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by silt, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and / or internal forebays.	Annually, or as required
Remedial Maintenance	Repair / rehabilitation of inlets, outlets, overflows and vents.	As required
Monitoring	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside the tank for sediment build-up and remove if necessary.	Every 5 year as required

Table 6.3: Operation and Maintenance Requirements for Geocellular Storage

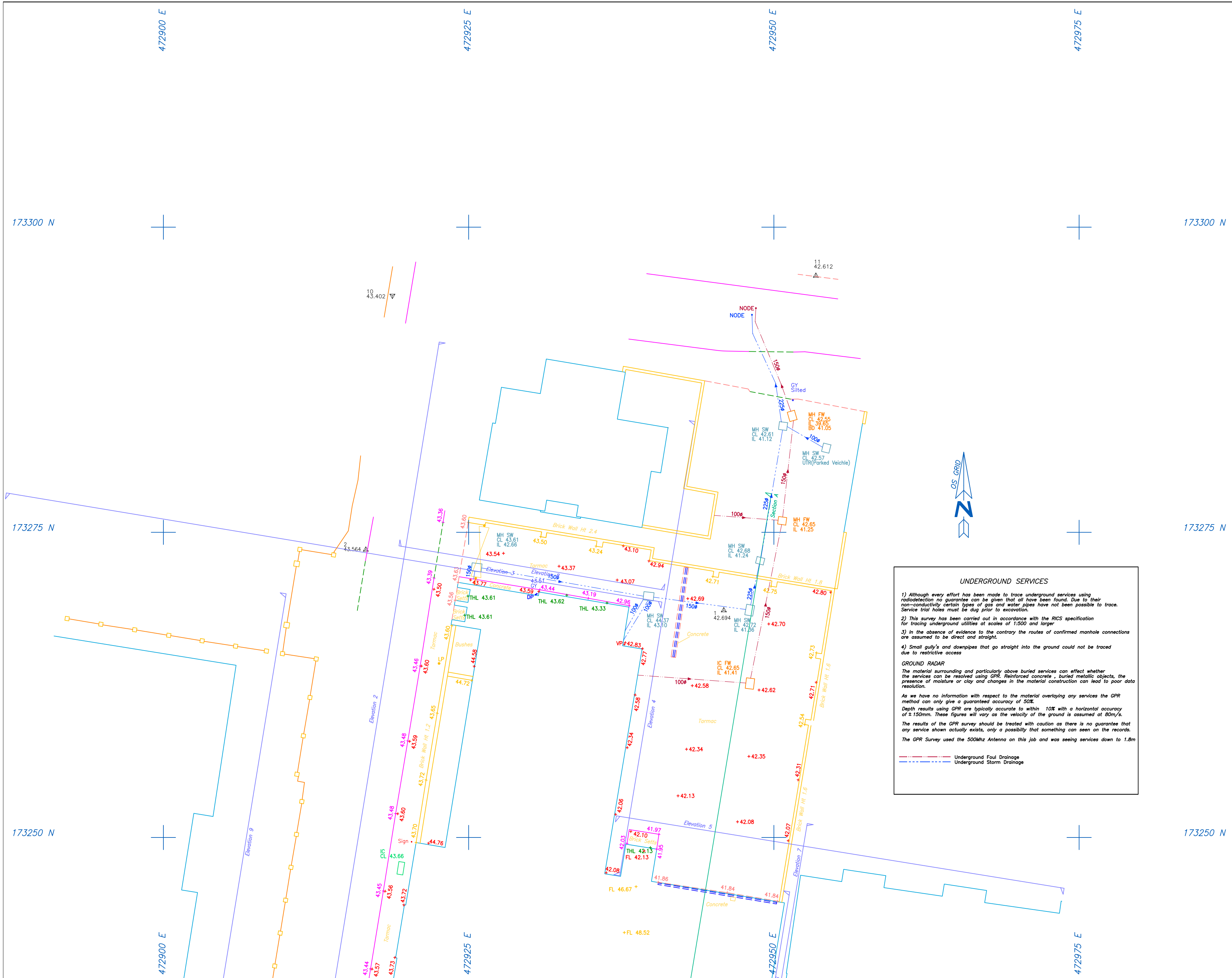
6.6 Pumps and Rising Mains

- 6.6.1 Both foul and surface water drainage will require pumping to allow discharge to the foul water and surface water sewers in Norwood Road. The pumps will require regular maintenance in line with the pump providers guidance, as the pump equipment has not yet been specified, accurate maintenance information is not available. The client will take on a contract of maintenance with the relevant pump supplier once the drainage network has been constructed.

7 Summary

- 7.1.1 The EA Flood Zone mapping shows the site to lie in Flood Zone 1; land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). As such the Alexander House site has little or no risk of fluvial flooding, being in the lowest flood risk zone, and is therefore considered to have passed the Sequential Test.
- 7.1.2 The NPPF Tables 2 and 3, show that all development classes are appropriate for Flood Zone 1 and that an Exception Test is not required.
- 7.1.3 EA groundwater mapping confirms that the site lies on a Total Catchment (Zone 3) and is over a major aquifer with a high groundwater vulnerability. The RBC SFRA confirms that there are no historical records of any groundwater flood events on or in close proximity to the site.
- 7.1.4 In line with the drainage hierarchy all discharge destinations were considered, it was found that discharge to ground was not suitable due to the small site area and high groundwater vulnerability. There are no surface water bodies within the vicinity of the site, therefore it is proposed to continue to discharge to the Thames Water surface water sewer in Norwood Road.
- 7.1.5 The proposed surface water strategy utilises SuDS to store runoff generated by the development up to and including a 1 in 100 year + 20% allowance for climate change event restricted to a reduced rate, for all storm events, in order to prevent an adverse effect on flood risk.
- 7.1.6 In accordance with best practice the proposed drainage strategy seeks to reduce the peak discharge rate from the site to '*as close as reasonably practicable to the greenfield runoff rate*'. The nature and density of the development required to make the scheme viable prevents sufficient attenuation being provided to reduce the peak discharge rate to that of greenfield, however a peak discharge rate of 8 l/s is proposed, which represents a significant reduction (87.4%) on the existing discharge in to Thames Water network.
- 7.1.7 As a result, the precautionary principle advocated by the NPPF to the uncertainties of flooding has been satisfactorily addressed and there are no flooding or drainage related constraints to development on the site.

Appendix A Topographical Survey, Ref: G9179, dated 14/12/18, Laser Surveys



LAND AND BUILDING SURVEYS, UNDERGROUND SERVICES LOCATION, CCTV DRAINAGE SURVEYS.
Established 1975, Member of The Survey Association.
LASER SURVEYS LTD, OPEN SPACE UPPER WATERFLODS, WALVERLEY, WY14 1UT
TEL 01886 833173 FAX 01886 833485
email: www.laser@laser-surveys.com
OLD DASHY, STUBBERS GATE, WHITTINGTON ROAD, BLACKMORE, CMA 10W
TEL 01708 438408 FAX 01708 438405
email: info@laser-surveys.com

DATUM NOTES

CO-ORDINATES USED ARE BASED ON O/S NATIONAL GRID, OBTAINED USING THE ACTIVE GPS NETWORK AND ADJUSTED TO A LOCAL GRID WITH A SCALE FACTOR OF 1.0000

LEVELS ARE RELATED TO :- O/S ACTIVE GPS NETWORK.

SURVEY CONTROL STATIONS SHOWN

ABBREVIATIONS (where applicable)

AV	Air Valve	MK	Marker
BK	Brick	MS	Milestone
BL	Bollard	MT	Meter
BS	Bus Stop	MY	Mercury
BT	British Telecom	OH	Overhead
C/B	Close Boarded	PW	Paving
CL	Cover Level	PB	Post Box
CLK	Chadlink	PE	Pipe
CO	Column	PM	Parking Meter
Conc	Concrete	P/R	Post and Rail
CP	Catch Pit	PT	Post
CPS	Concrete Paving Slabs	P/W	Post and Wire
CTV	Cable Television	RE	Rodding Eye
CW	Combined Water	RET	Retaining
DC	Drainage Channel	RS	Road Sign
DP	Drain Pipe	RSJ	Roller Steel Joint
EP	Electricity Pole	SC	Stop Cock
ER	Earthing Rod	SK	Sewerage
FB	Flower Bed	SPT	Septic Tank
FE	Fence	ST	Stop Trap
PH	Fire Hydrant	SV	Stop Valve
FL	Floor Level	SVC	Security Video Camera
FP	Flag Pole	SW	Storm Water
FW	Foul Water	TGB	Telephone Call Box
GP	Gate Post	THL	Threshold Level
GV	Gas Valve	TL	Traffic Light
GY	Gully	TK	Tank
HT	Height	TP	Telegraph Pole
IC	Inspection Cover	UG	Underground
IL	Invert Level	UT	Unable to trace Further
IN	Interceptor	UTR	Unable To Raise
I/R	Iron Railings	VP	Vent Pipe
JB	Junction Box	WL	Water Level
KO	Kerb Outlet	WM	Water Meter
LB	Litter Bin	WO	Wash Out
LP	Lamp Post	BD	Back Drop
MH	Manhole Cover		

NOTES

- Drainage pipe sizes (where shown) have been gauged from the surface for safety reasons and should be regarded as approximate only.
- Tree species (where shown) should be treated with caution and expert identification is advised.
- Although this is a digital survey the accuracy and amount of detail shown is only commensurate with the graphical scale of mapping as specified. Care should be exercised when working to larger scales.
- Visible features in the vicinity of the boundaries as shown above, may not represent the extent of legally conveyed ownership.
- Whilst every effort has been made to achieve accuracy on this plan, CRUCIAL clearance dimensions, levels and invert levels should be checked prior to design and construction.
- Kerb levels have been taken in the bottom of the channel.

SHEET LAYOUT
NOT TO SCALE

2

1

ALEXANDER HOUSE, READING RG1 4HX

TOPOGRAPHICAL SURVEY

SURVEYED FOR	BY ALEXANDER ESTATES LIMITED C/O A. JANSONS, ESQ. JANSONS PROPERTY 135 STATION ROAD READING, RG1 1NL	SURVEYED BY H. GOSWAMI DATE December 2018
DATE	12/12/18	REVISION
1	12/12/18	Neighbouring building footprint to be given credit to show context
2	12/12/18	Present Outline to Public sewer line in Ground Rd

DRAWING NO	G 9179/2	REV	2
DRAWING TITLE	TOPOGRAPHICAL		
SCALE	1 : 200 (A2)		
SEE ALSO DWG NOS			
SHEET	2 of 2		
REF NO	G 9179		

Appendix B Proposed Landscape General Arrangement, Drawing No. L-90-100, dated Nov 2018, Broadway Malyan



Contractors and consultants are not to scale dimensions from this drawing

- Key**
- Block paving blend 150x200mm Stretcher bond
 - Block paving 150x200mm Basket weave with stretcher bond course
 - Flag paving
 - Tactile paving to top and bottom of stepping steps
 - Stepping steps Concrete with natural aggregate finish
 - Seating steps Brick facing
 - Retaining walls Brick coping
 - Retaining walls Metal coping
 - Handrail to stepping steps
 - Existing brick boundary wall to be retained
 - New metal gate and fencing
 - New glass balustrade
 - Bench seating
 - Bins
 - New tree planting
 - New ornamental planting
 - New hedge planting
 - New lawn
 - Paving strip lighting
 - Steps strip lighting
 - Bench strip lighting
 - Tree and wall uplighting
 - Wayfinding spot lighting
 - Electric vehicle charging point
 - Proposed slot drains

Revision	Date	Description
00	07.12.18	Issued for comment
01	11.01.19	Planning submission

BroadwayMalyan^{BM}

Eastgate, 2 Castle Street
Castlefield, Manchester
M3 4LZ

T: +44 (0)161 819 2277
F: +44 (0)161 819 2332
E: Man@BroadwayMalyan.com

www.BroadwayMalyan.com

Client
P.J. Alexander Estates Ltd.

Project
**Alexander House, King's Road,
Reading**

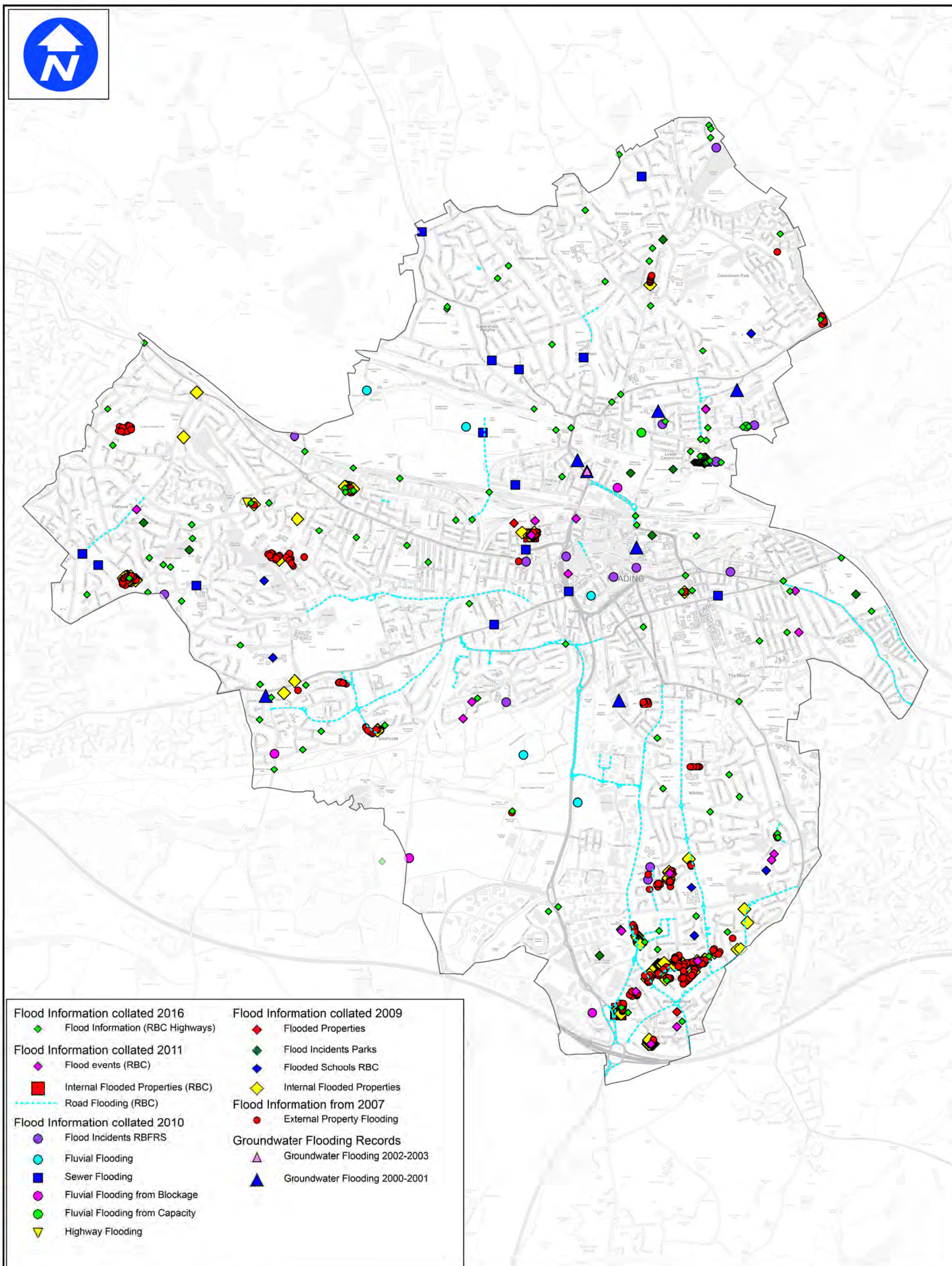
Description
**Proposed Landscape
General Arrangement**

Status
PLANNING

Scale	Drawn By	Date
1:200@A1	AS	NOV 18
Job Number	Drawing Number	Revision
33443	L-90-100	01

Original size 100mm @ A1 Copyright Broadway Malyan Limited

Appendix C RBC Historic Flood Records, Figure F3, dated 06/12/16



Flood Information collated 2016

- Flood Information (RBC Highways)

Flood Information collated 2011

- Flood events (RBC)
- Internal Flooded Properties (RBC)
- Road Flooding (RBC)

Flood Information collated 2010

- Flood Incidents RBFRS
- Fluvial Flooding
- Sewer Flooding
- Fluvial Flooding from Blockage
- Fluvial Flooding from Capacity
- Highway Flooding

Flood Information collated 2009

- Flooded Properties
- Flood Incidents Parks
- Flooded Schools RBC
- Internal Flooded Properties

Flood Information from 2007

- External Property Flooding

Groundwater Flooding Records

- Groundwater Flooding 2002-2003
- Groundwater Flooding 2000-2001



www.peterbrett.com

Peter Brett Associates LLP
READING
Tel: 0118 950 0761 Fax: 0118 959 7498

Client



Contains Ordnance Survey data © Crown copyright
and database right 2010

RBC SFRA

RBC Historic Flood Records

Date: 06/12/2016

Scale: NTS

Drawn By: SB Checked By: RF

Rev: -

Figure Number

Figure F3

J:\27560\RBC_LLFA_support\WC2 - Reading SFRA\MapInfo\Maps

Appendix D Thames Water Asset Records, Ref: 2018_3915221, dated 26/11/18

Peter Brett Associates LLP
Caversham Bridge House Caversham Bridge House

READING
RG1 8DN

Search address supplied Aon
Alexander House 205-207
Kings Road
Reading
RG1 4LS

Your reference Alexander house

Our reference ALS/ALS Standard/2018_3915221

Search date 26 November 2018

Keeping you up-to-date

Notification of Price Changes

From 1 September 2018 Thames Water Property Searches will be increasing the price of its Asset Location Search in line with RPI at 3.23%.

For further details on the price increase please visit our website: www.thameswater-propertysearches.co.uk
Please note that any orders received with a higher payment prior to the 1 September 2018 will be non-refundable.



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



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



0845 070 9148



Search address supplied: Aon, Alexander House 205-207, Kings Road, Reading, RG1 4LS

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

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

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

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

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

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

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

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

For your guidance:

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

Clean Water Services

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

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

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

pressure test to be carried out for a fee.

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

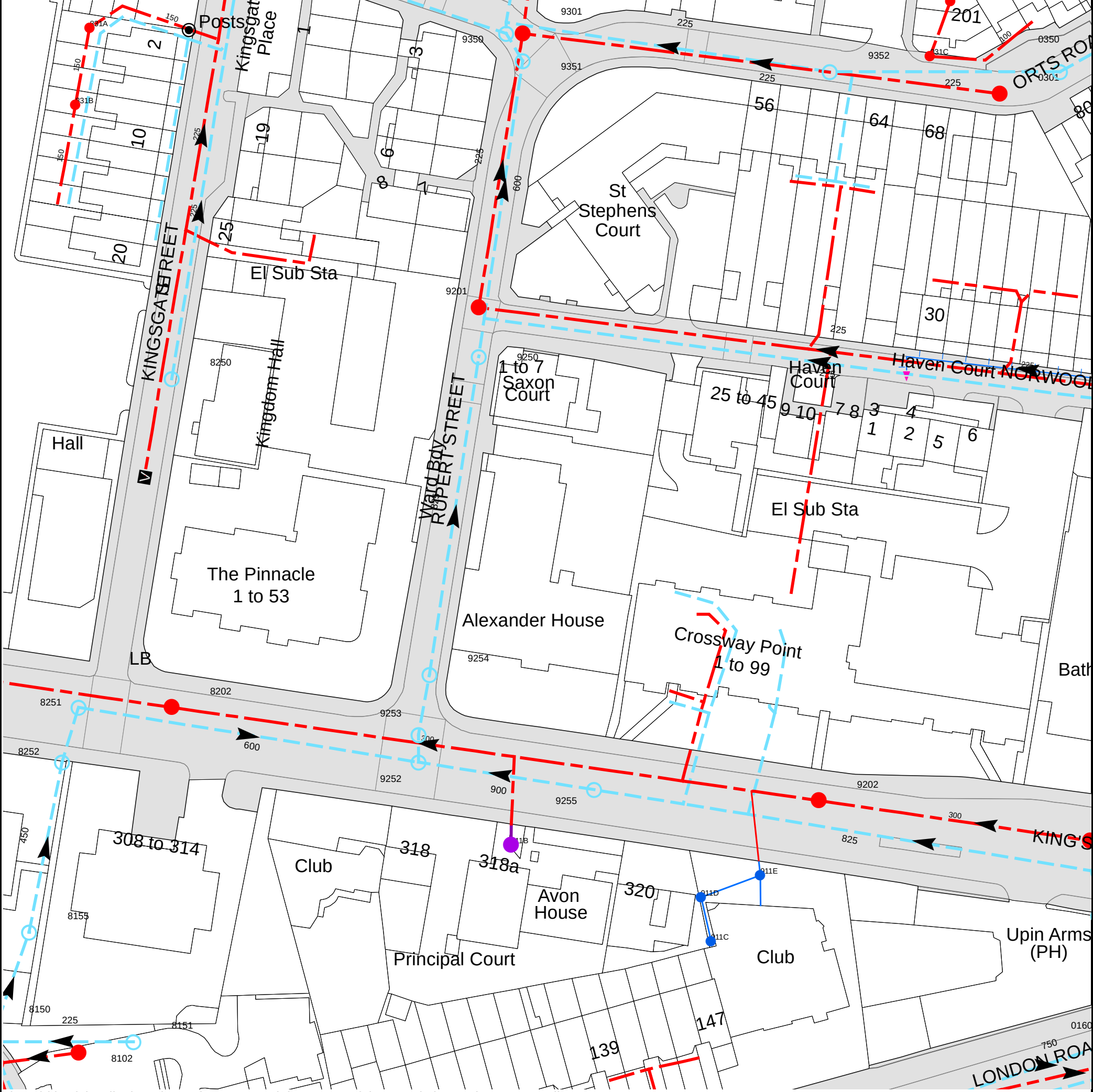
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

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

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

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



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 472936,173254

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

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0350	41.95	40.62
9352	42.46	n/a
9351	42.3	40.1
031C	n/a	n/a
9350	42.28	40.08
9301	42.25	38.82
031B	n/a	n/a
911C	n/a	n/a
0163	43.59	41.21
911D	n/a	n/a
911E	n/a	n/a
0162	43.56	41.1
911B	n/a	n/a
011A	n/a	n/a
9202	43.56	40.2
9255	43.46	41.09
9252	43.45	40.94
9253	43.45	40.67
9254	43.5	40.39
9250	43.37	41.02
9201	43.25	39.26
0301	42.23	39.51
8102	43.18	41.19
8151	42.78	42.04
8155	42.38	41.54
8252	43.59	41.34
831B	n/a	n/a
8251	43.54	41.25
831A	n/a	n/a
8202	43.52	39.56
8250	43.1	41.71
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

	Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Trunk Surface Water
	Trunk Foul
	Storm Relief
	Trunk Combined
	Vent Pipe
	Bio-solids (Sludge)
	Proposed Thames Surface Water Sewer
	Proposed Thames Water Foul Sewer
	Gallery
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Sludge Rising Main
	Proposed Thames Water Rising Main
	Vacuum

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

Sewer Fittings

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

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

Operational Controls

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

	Control Valve
	Drop Pipe
	Ancillary
	Weir

End Items

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

	Outfall
	Undefined End
	Inlet

Other Symbols

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

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

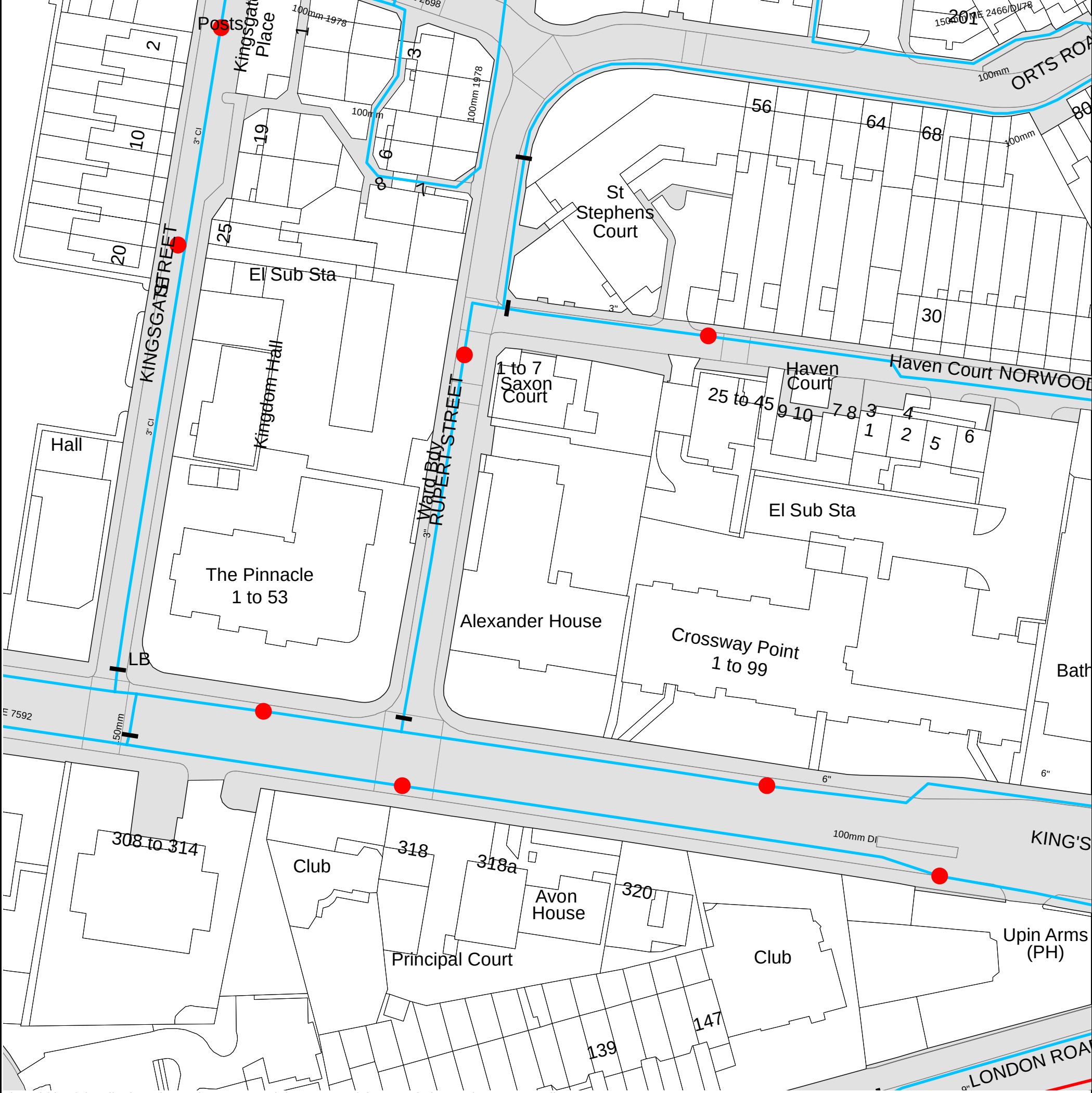
Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

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

	Foul Sewer		Surface Water Sewer
	Combined Sewer		Gully
	Culverted Watercourse		Proposed
			Abandoned Sewer



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 472936, 173254.

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

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ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"	Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
16"	Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.
3" SUPPLY	Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.
3" FIRE	Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.
3" METERED	Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.
	Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.
	Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

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

Valves

	General Purpose Valve
	Air Valve
	Pressure Control Valve
	Customer Valve

Hydrants

	Single Hydrant
--	----------------

Meters

	Meter
--	-------

End Items

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

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

Operational Sites

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

Other Symbols

	Data Logger
--	-------------

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

	Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.
	Private Main: Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

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

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

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

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

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

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

Ways to pay your bill

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

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.



Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Appendix E Brownfield and Greenfield Discharge Calculations

	Alexander House, Reading Surface Water Drainage Strategy Existing Brownfield Runoff	JOB NO: 45076/2001	SHEET: 1 of 1
		DATE: 13.12.2018	BY: JPS

Calculation based on 'Modified Rational Method', HR Wallingford.

Assumes that water travels across the site at 1m/s from the furthest point to the connection with the existing network

Data

M5-60min 18.8 mm Q=2.78CiA
 r 0.40

Calculation - 1 in 1 Year

Catchment Area	Impermeable Area ha	Duration (D) min	Z1	M5-Dmin mm	Z2	M1-Dmin mm	i mm/hr	Impermeable Runoff l/s	
1	0.139	5	0.38	7.14	0.62	4.39	52.7	20.4	
								Total	20.4 l/s

Note: Duration relates to time of concentration for the catchment including allowance for time of entry

<u>D</u>	<u>Z1</u>	<u>M5</u>	<u>Z2 for 1 in 1yr</u>
5	0.38	5	0.620
10	0.53	7.60	0.615
15	0.64	10	0.610

Calculation - 1 in 30 Year

Catchment Area	Impermeable Area ha	Duration (D) min	Z1	M5-Dmin mm	Z2	M1-Dmin mm	i mm/hr	Impermeable Runoff l/s	
1	0.139	5	0.38	7.14	1.49	10.67	128.0	49.6	
								Total	49.6 l/s

Note: Duration relates to time of concentration for the catchment including allowance for time of entry

<u>D</u>	<u>Z1</u>	<u>M5</u>	<u>Z2 for 1 in 30yr</u>
5	0.38	5	1.460
10	0.53	7.60	1.494
15	0.64	10	1.530

Calculation - 1 in 100 Year

Catchment Area	Impermeable Area ha	Duration (D) min	Z1	M5-Dmin mm	Z2	M100-Dmin mm	i mm/hr	Impermeable Runoff l/s	
1	0.139	5	0.38	7.14	1.91	13.65	163.7	63.4	
								Total	63.4 l/s

Note: Duration relates to time of concentration for the catchment including allowance for time of entry

<u>D</u>	<u>Z1</u>	<u>M5</u>	<u>Z2 for 1 in 100yr</u>
5	0.38	5	1.790
10	0.53	7.6	1.910
15	0.64	10	1.910

Calculated by: Joseph Pook

Site name: Alexander House

Site location: 205-207 King's Road

Site coordinates

Latitude: 51.45348° N

Longitude: 0.95177° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference: 6507328

Date: 2018-12-17T09:16:40

Methodology

IH124

Site characteristics

Total site area (ha)	0.16
----------------------	------

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	643	643
Hydrological region	6	6
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

Normally limiting discharge rates which are less than 2.0 l/s/ha are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consents are usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

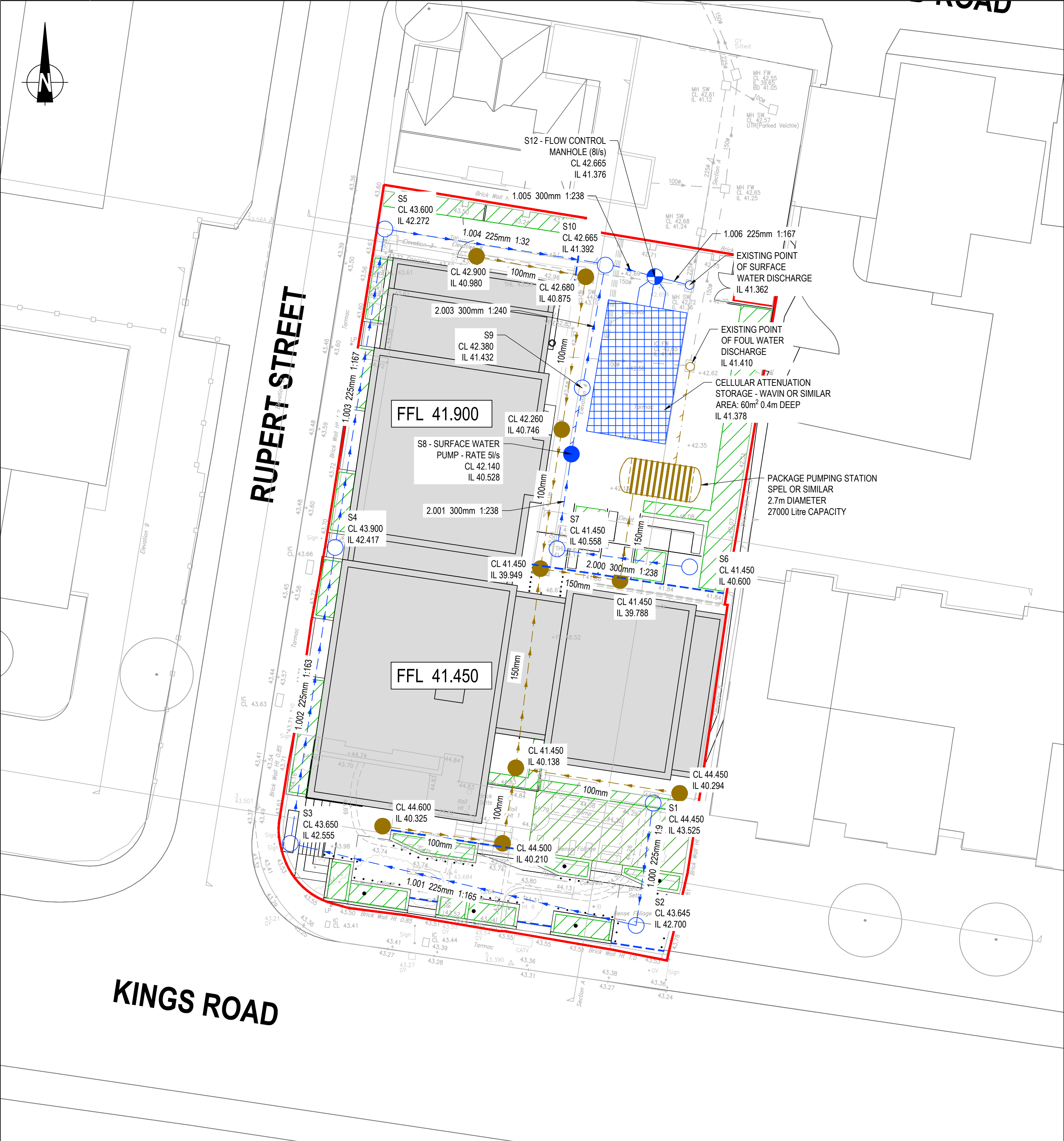
(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	0.26	0.26
1 in 1 year (l/s)	0.22	0.22
1 in 30 years (l/s)	0.61	0.61
1 in 100 years (l/s)	0.84	0.84

Appendix F Proposed Drainage Layout, Drawing No. 45074/2001/001 and Exceedance Event, Drawing No. 45074/2001/002



NOTES:

- DO NOT SCALE THIS DRAWING. IF IN DOUBT PLEASE REQUEST FURTHER INFORMATION.
- ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT CONTRACT DRAWINGS, CONSTRUCTION DETAILS AND SPECIFICATIONS.

KEY:

- SITE BOUNDARY
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED SURFACE WATER RAISING MAIN
- PROPOSED FOUL WATER RAISING MAIN
- PROPOSED SURFACE WATER SLOT DRAIN
- PROPOSED SURFACE WATER MANHOLE
- PROPOSES SURFACE WATER MANHOLE WITH PUMP
- PROPOSED FLOW CONTROL MANHOLE
- PROPOSED FOUL WATER MANHOLE
- PROPOSED SURFACE WATER CELLULAR ATTENUATION STORAGE
- PROPOSED FOUL WATER WET WELL PUMPING STATION

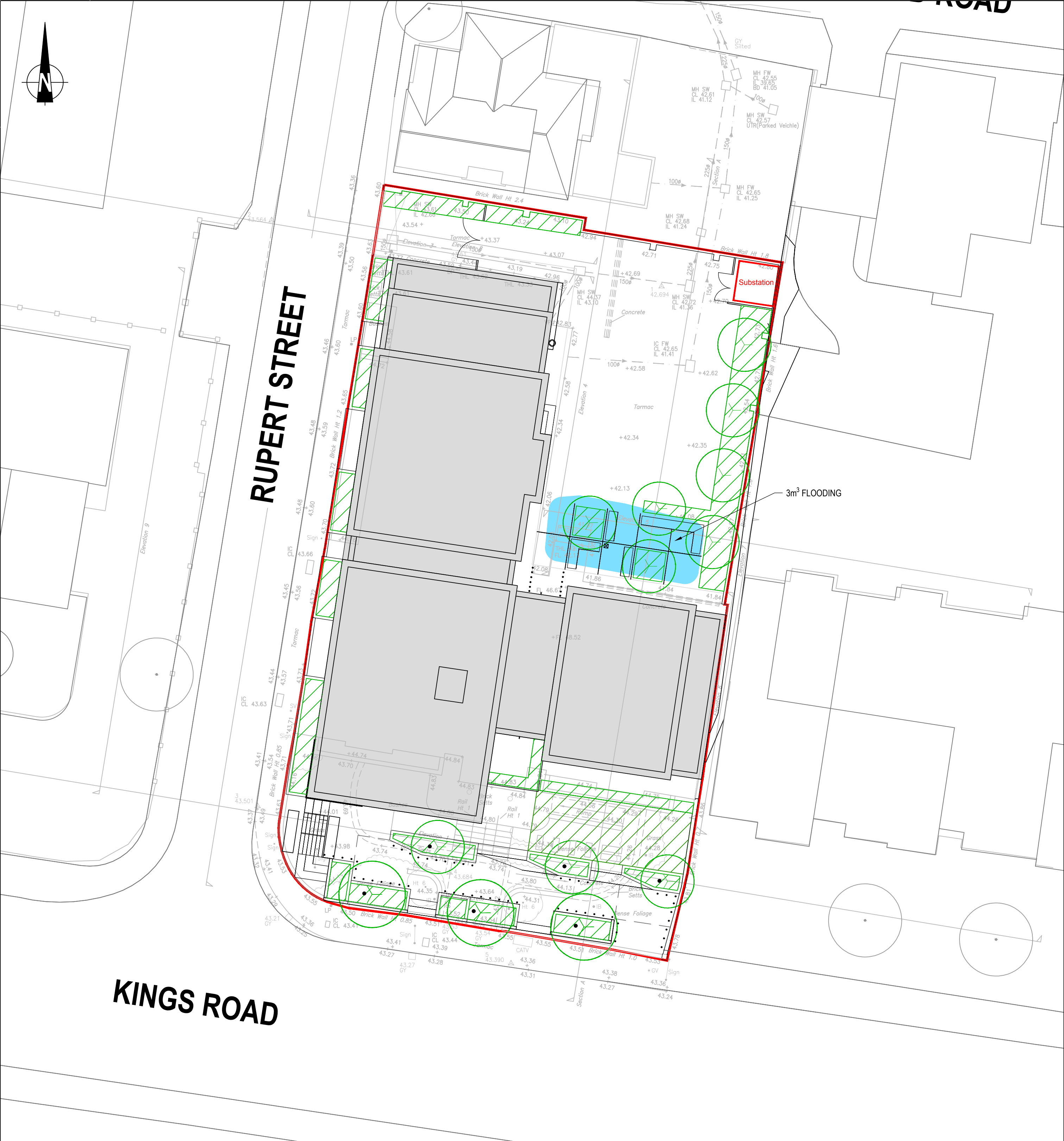
B	LOCATION OF PUMPING STATION ALTERED	11.01.19	CD	JS	PJG
A	Levels ammended to reflect architects comments	08/01/19	CD	JS	PJG
Mark	Revision	Date	Drawn	Chkd	Appd

SCALING NOTE: Do not scale from this drawing. If in doubt, ask.
UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status
PLANNING

**ALEXANDER HOUSE
READING
PROPOSED DRAINAGE LAYOUT**

Client PJ ALEXANDER ESTATES LTD			 now part of peterbrett.com © Peter Brett Associates LLP READING Tel: 01189 500 761		
Date of 1st Issue 10/01/19	Designed JP	Drawn CD			
A2 Scale 1:200	Checked JS	Approved PJG			
Drawing Number 45074/2001/001		Revision B			



NOTES:

- DO NOT SCALE THIS DRAWING. IF IN DOUBT PLEASE REQUEST FURTHER INFORMATION.
- ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT CONTRACT DRAWINGS, CONSTRUCTION DETAILS AND SPECIFICATIONS.

KEY:

- SITE BOUNDARY
- FLOODING

Mark	Revision	Date	Drawn	Chkd	Appd
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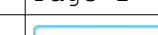
SCALING NOTE: Do not scale from this drawing. If in doubt, ask.
UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status
PLANNING

ALEXANDER HOUSE
READING
1:100 + 40% EXCEEDANCE EVENT

Client PJ ALEXANDER ESTATES LTD			 now part of  peterbrett.com © Peter Brett Associates LLP READING Tel: 01189 500 761	
Date of 1st Issue 10.01.2019	Designed JP	Drawn CD		
A2 Scale 1:200	Checked JS	Approved -		
Drawing Number 45074/2001/002		Revision -		

Appendix G MicroDrainage Calculations

Peter Brett Associates LLP		Page 1
Caversham Bridge House Waterman Place Reading Berkshire RG1 8DN	ALEXANDER HOUSE SURFACE WATER STRATEGY	
Date 20/12/2018 File INITIAL SW MODEL.MDX	Designed by J POOK Checked by	
Micro Drainage	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

« - Indicates pipe capacity < flow

Network Results Table

Peter Brett Associates LLP		Page 2
Caversham Bridge House Waterman Place Reading Berkshire RG1 8DN	ALEXANDER HOUSE SURFACE WATER STRATEGY	
Date 20/12/2018	Designed by J POOK	
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Micro Drainage	Network 2018.1	

Network Design Table for 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	2.573	0.000	0.0	0.000	4.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	2.667	0.016	167.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	50.00	4.29	41.378	0.000	0.0	0.0	0.0	0.15	10.5	0.0
1.006	50.00	5.42	41.378	0.135	0.0	0.0	0.0	1.01	40.1	18.3

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Micro Drainage Network 2018.1

Manhole Schedules for 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	44.450	0.925	Open Manhole	1200	1.000	43.525	225				
2	43.645	0.945	Open Manhole	1200	1.001	42.700	225	1.000	42.700	225	
3	43.650	1.095	Open Manhole	1200	1.002	42.555	225	1.001	42.555	225	
4	43.900	1.483	Open Manhole	1200	1.003	42.417	225	1.002	42.417	225	
5	43.600	1.328	Open Manhole	1200	1.004	42.272	225	1.003	42.272	225	
6	41.450	0.850	Open Manhole	1800	2.000	40.600	300				
7	41.450	0.892	Open Manhole	1800	2.001	40.558	300	2.000	40.558	300	
8	42.140	1.612	Open Manhole	1500	2.002	40.528	225	2.001	40.528	300	
9	42.380	0.948	Open Manhole	1500	2.003	41.432	300	2.002	41.432	225	
10	42.665	1.273	Open Manhole	1800	1.005	41.392	300	1.004	41.743	225	276
								2.003	41.392	300	
11	42.610	1.232	Open Manhole	1200	3.000	41.378	300				
12	42.665	1.289	Open Manhole	1500	1.006	41.378	225	1.005	41.376	300	
								3.000	41.378	300	
	42.665	1.303	Open Manhole	0		OUTFALL		1.006	41.362	225	

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Micro Drainage		Network 2018.1

PIPELINE SCHEDULES for 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	44.450	43.525	0.700	Open Manhole	1200
1.001	o	225	2	43.645	42.700	0.720	Open Manhole	1200
1.002	o	225	3	43.650	42.555	0.870	Open Manhole	1200
1.003	o	225	4	43.900	42.417	1.258	Open Manhole	1200
1.004	o	225	5	43.600	42.272	1.103	Open Manhole	1200
2.000	o	300	6	41.450	40.600	0.550	Open Manhole	1800
2.001	o	300	7	41.450	40.558	0.592	Open Manhole	1800
2.002	o	225	8	42.140	40.528	1.387	Open Manhole	1500
2.003	o	300	9	42.380	41.432	0.648	Open Manhole	1500
1.005	o	300	10	42.665	41.392	0.973	Open Manhole	1800
3.000	o	300	11	42.610	41.378	0.932	Open Manhole	1200
1.006	o	225	12	42.665	41.378	1.062	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	7.675	9.3	2	43.645	42.700	0.720	Open Manhole	1200
1.001	23.918	165.0	3	43.650	42.555	0.870	Open Manhole	1200
1.002	22.500	163.0	4	43.900	42.417	1.258	Open Manhole	1200
1.003	24.283	167.5	5	43.600	42.272	1.103	Open Manhole	1200
1.004	16.729	31.6	10	42.665	41.743	0.697	Open Manhole	1800
2.000	10.089	238.0	7	41.450	40.558	0.592	Open Manhole	1800
2.001	7.257	238.0	8	42.140	40.528	1.312	Open Manhole	1500
2.002	4.997	-5.5	9	42.380	41.432	0.723	Open Manhole	1500
2.003	9.591	239.8	10	42.665	41.392	0.973	Open Manhole	1800
1.005	3.918	238.0	12	42.665	41.376	0.989	Open Manhole	1500
3.000	2.573	0.0	12	42.665	41.378	0.987	Open Manhole	1500
1.006	2.667	167.0		42.665	41.362	1.078	Open Manhole	0

Free Flowing Outfall Details for 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		42.665	41.362	0.000	0	0

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Caversham Bridge House Waterman Place Reading Berkshire RG1 8DN	ALEXANDER HOUSE SURFACE WATER STRATEGY	
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Micro Drainage		Network 2018.1

Simulation Criteria for 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.800	Storm Duration (mins)	30
Ratio R	0.400		

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Micro Drainage		Network 2018.1		

Online Controls for 1

Pump Manhole: 8, DS/PN: 2.002, Volume (m³): 3.2

Invert Level (m) 40.528

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0000	1.200	5.0000	3.000	5.0000	7.000	5.0000
0.200	5.0000	1.400	5.0000	3.500	5.0000	7.500	5.0000
0.300	5.0000	1.600	5.0000	4.000	5.0000	8.000	5.0000
0.400	5.0000	1.800	5.0000	4.500	5.0000	8.500	5.0000
0.500	5.0000	2.000	5.0000	5.000	5.0000	9.000	5.0000
0.600	5.0000	2.200	5.0000	5.500	5.0000	9.500	5.0000
0.800	5.0000	2.400	5.0000	6.000	5.0000		
1.000	5.0000	2.600	5.0000	6.500	5.0000		

Hydro-Brake® Optimum Manhole: 12, DS/PN: 1.006, Volume (m³): 2.5

Unit Reference MD-SHE-0132-8000-1000-8000	
Design Head (m) 1.000	
Design Flow (l/s) 8.0	
Flush-Flo™ Calculated	
Objective Minimise upstream storage	
Application Surface	
Sump Available Yes	
Diameter (mm) 132	
Invert Level (m) 41.378	
Minimum Outlet Pipe Diameter (mm) 150	
Suggested Manhole Diameter (mm) 1200	

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	8.0	Kick-Flo®	0.664	6.6
Flush-Flo™	0.302	8.0	Mean Flow over Head Range	-	6.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.7	1.200	8.7	3.000	13.4	7.000	20.1
0.200	7.8	1.400	9.4	3.500	14.5	7.500	20.8
0.300	8.0	1.600	10.0	4.000	15.4	8.000	21.5
0.400	7.9	1.800	10.5	4.500	16.3	8.500	22.1
0.500	7.7	2.000	11.1	5.000	17.1	9.000	22.7
0.600	7.2	2.200	11.6	5.500	17.9	9.500	23.3
0.800	7.2	2.400	12.1	6.000	18.7		
1.000	8.0	2.600	12.6	6.500	19.4		

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Micro Drainage	Network 2018.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.800 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 20

US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
PN	Name Storm							
1.000	1 15 Winter	30	+0%					43.559
1.001	2 15 Summer	30	+0%					42.780
1.002	3 15 Winter	30	+0%					42.645
1.003	4 15 Winter	30	+0%					42.526
1.004	5 15 Winter	30	+0%					42.348
2.000	6 15 Winter	30	+0%	100/15 Summer				40.860
2.001	7 15 Winter	30	+0%	100/15 Summer				40.858
2.002	8 15 Winter	30	+0%	30/15 Summer				40.849
2.003	9 60 Winter	30	+0%	100/15 Summer				41.631
1.005	10 60 Winter	30	+0%	100/15 Summer				41.627
3.000	11 60 Winter	30	+0%	100/30 Summer				41.624
1.006	12 60 Winter	30	+0%	30/60 Winter				41.625

US/MH		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
PN	Name							
1.000	1	-0.191	0.000	0.06		7.2	OK	
1.001	2	-0.145	0.000	0.27		10.2	OK	
1.002	3	-0.135	0.000	0.33		12.3	OK	
1.003	4	-0.116	0.000	0.46		17.1	OK	

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Caversham Bridge House Waterman Place Reading Berkshire RG1 8DN	ALEXANDER HOUSE SURFACE WATER STRATEGY	
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Micro Drainage		Network 2018.1

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 1

PN	US/MH Name	Surcharged		Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	
1.004	5	-0.149	0.000	0.24		20.1	OK	
2.000	6	-0.040	0.000	0.08		4.4	OK	
2.001	7	0.000	0.000	0.15		7.7	OK	
2.002	8	0.096	0.000	0.21		5.0	SURCHARGED	
2.003	9	-0.101	0.000	0.14		7.9	OK	
1.005	10	-0.065	0.000	0.39		18.9	OK	
3.000	11	-0.054	0.000	0.11		5.8	OK	
1.006	12	0.022	0.000	0.28		7.8	SURCHARGED	

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Micro Drainage	Network 2018.1	

100 year Return Period Summary of Critical Results by Maximum Level
(Rank 1) for 1

PN	US/MH Name	Surcharged		Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	
1.004	5	-0.129	0.000	0.38		31.0	OK	
2.000	6	0.340	0.000	0.08		4.6	FLOOD RISK	
2.001	7	0.381	0.000	0.16		8.2	FLOOD RISK	
2.002	8	0.483	0.000	0.21		5.0	SURCHARGED	
2.003	9	0.291	0.000	0.14		8.0	SURCHARGED	
1.005	10	0.328	0.000	0.40		19.7	SURCHARGED	
3.000	11	0.340	0.000	0.13		7.0	SURCHARGED	
1.006	12	0.415	0.000	0.29		8.0	SURCHARGED	

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Caversham Bridge House Waterman Place Reading Berkshire RG1 8DN	ALEXANDER HOUSE SURFACE WATER STRATEGY EXCEEDANCE EVENT	
Date 20/12/2018	Designed by J POOK	
File INITIAL SW MODEL.MDX	Checked by	
Micro Drainage		Network 2018.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.800	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	7.675	0.825	9.3	0.021	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	23.918	0.145	165.0	0.009	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	22.500	0.138	163.0	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	24.283	0.145	167.5	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	16.729	0.529	31.6	0.010	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	10.089	0.042	238.0	0.020	4.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	7.257	0.030	238.0	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	4.997	-0.904	-5.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	9.591	0.040	239.8	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	3.918	0.016	238.0	0.011	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.03	43.525	0.021	0.0	0.0	0.0	4.32	171.6	2.8
1.001	50.00	4.42	42.700	0.030	0.0	0.0	0.0	1.02	40.4	4.1
1.002	50.00	4.79	42.555	0.037	0.0	0.0	0.0	1.02	40.6	5.0
1.003	50.00	5.19	42.417	0.052	0.0	0.0	0.0	1.01	40.1	7.0
1.004	50.00	5.31	42.272	0.062	0.0	0.0	0.0	2.33	92.8	8.4
2.000	50.00	4.17	40.600	0.020	0.0	0.0	0.0	1.01	71.7	2.7
2.001	50.00	4.28	40.558	0.043	0.0	0.0	0.0	1.01	71.7	5.8
2.002	50.00	4.96	40.528	0.043	0.0	0.0	0.0	0.12	4.9«	5.8
2.003	50.00	5.12	41.432	0.062	0.0	0.0	0.0	1.01	71.5	8.4
1.005	50.00	5.37	41.392	0.135	0.0	0.0	0.0	1.01	71.7	18.3

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Network Design Table for 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	2.573	0.000	0.0	0.000	4.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	2.667	0.016	167.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	50.00	4.29	41.378	0.000	0.0	0.0	0.0	0.15	10.5	0.0
1.006	50.00	5.42	41.378	0.135	0.0	0.0	0.0	1.01	40.1	18.3

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Manhole Schedules for 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	44.450	0.925	Open Manhole	1200	1.000	43.525	225				
2	43.645	0.945	Open Manhole	1200	1.001	42.700	225	1.000	42.700	225	
3	43.650	1.095	Open Manhole	1200	1.002	42.555	225	1.001	42.555	225	
4	43.900	1.483	Open Manhole	1200	1.003	42.417	225	1.002	42.417	225	
5	43.600	1.328	Open Manhole	1200	1.004	42.272	225	1.003	42.272	225	
6	41.450	0.850	Open Manhole	1800	2.000	40.600	300				
7	41.450	0.892	Open Manhole	1800	2.001	40.558	300	2.000	40.558	300	
8	42.140	1.612	Open Manhole	1500	2.002	40.528	225	2.001	40.528	300	
9	42.380	0.948	Open Manhole	1500	2.003	41.432	300	2.002	41.432	225	
10	42.665	1.273	Open Manhole	1800	1.005	41.392	300	1.004	41.743	225	276
								2.003	41.392	300	
11	42.610	1.232	Open Manhole	1200	3.000	41.378	300				
12	42.665	1.289	Open Manhole	1500	1.006	41.378	225	1.005	41.376	300	
								3.000	41.378	300	
	42.665	1.303	Open Manhole	0		OUTFALL		1.006	41.362	225	

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PIPELINE SCHEDULES for 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	44.450	43.525	0.700	Open Manhole	1200
1.001	o	225	2	43.645	42.700	0.720	Open Manhole	1200
1.002	o	225	3	43.650	42.555	0.870	Open Manhole	1200
1.003	o	225	4	43.900	42.417	1.258	Open Manhole	1200
1.004	o	225	5	43.600	42.272	1.103	Open Manhole	1200
2.000	o	300	6	41.450	40.600	0.550	Open Manhole	1800
2.001	o	300	7	41.450	40.558	0.592	Open Manhole	1800
2.002	o	225	8	42.140	40.528	1.387	Open Manhole	1500
2.003	o	300	9	42.380	41.432	0.648	Open Manhole	1500
1.005	o	300	10	42.665	41.392	0.973	Open Manhole	1800
3.000	o	300	11	42.610	41.378	0.932	Open Manhole	1200
1.006	o	225	12	42.665	41.378	1.062	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	7.675	9.3	2	43.645	42.700	0.720	Open Manhole	1200
1.001	23.918	165.0	3	43.650	42.555	0.870	Open Manhole	1200
1.002	22.500	163.0	4	43.900	42.417	1.258	Open Manhole	1200
1.003	24.283	167.5	5	43.600	42.272	1.103	Open Manhole	1200
1.004	16.729	31.6	10	42.665	41.743	0.697	Open Manhole	1800
2.000	10.089	238.0	7	41.450	40.558	0.592	Open Manhole	1800
2.001	7.257	238.0	8	42.140	40.528	1.312	Open Manhole	1500
2.002	4.997	-5.5	9	42.380	41.432	0.723	Open Manhole	1500
2.003	9.591	239.8	10	42.665	41.392	0.973	Open Manhole	1800
1.005	3.918	238.0	12	42.665	41.376	0.989	Open Manhole	1500
3.000	2.573	0.0	12	42.665	41.378	0.987	Open Manhole	1500
1.006	2.667	167.0		42.665	41.362	1.078	Open Manhole	0

Free Flowing Outfall Details for 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		42.665	41.362	0.000	0	0

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Simulation Criteria for 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0
 Number of Offline Controls 0
 Number of Time/Area Diagrams 0
 Number of Online Controls 2
 Number of Storage Structures 1
 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.800	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for 1

Pump Manhole: 8, DS/PN: 2.002, Volume (m³): 3.2

Invert Level (m) 40.528

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0000	1.200	5.0000	3.000	5.0000	7.000	5.0000
0.200	5.0000	1.400	5.0000	3.500	5.0000	7.500	5.0000
0.300	5.0000	1.600	5.0000	4.000	5.0000	8.000	5.0000
0.400	5.0000	1.800	5.0000	4.500	5.0000	8.500	5.0000
0.500	5.0000	2.000	5.0000	5.000	5.0000	9.000	5.0000
0.600	5.0000	2.200	5.0000	5.500	5.0000	9.500	5.0000
0.800	5.0000	2.400	5.0000	6.000	5.0000		
1.000	5.0000	2.600	5.0000	6.500	5.0000		

Hydro-Brake® Optimum Manhole: 12, DS/PN: 1.006, Volume (m³): 2.5

Unit Reference MD-SHE-0132-8000-1000-8000
Design Head (m) 1.000
Design Flow (l/s) 8.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 132
Invert Level (m) 41.378
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	8.0	Kick-Flo®	0.664	6.6
Flush-Flo™	0.302	8.0	Mean Flow over Head Range	-	6.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.7	1.200	8.7	3.000	13.4	7.000	20.1
0.200	7.8	1.400	9.4	3.500	14.5	7.500	20.8
0.300	8.0	1.600	10.0	4.000	15.4	8.000	21.5
0.400	7.9	1.800	10.5	4.500	16.3	8.500	22.1
0.500	7.7	2.000	11.1	5.000	17.1	9.000	22.7
0.600	7.2	2.200	11.6	5.500	17.9	9.500	23.3
0.800	7.2	2.400	12.1	6.000	18.7		
1.000	8.0	2.600	12.6	6.500	19.4		

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Storage Structures for 1 Cellular Storage Manhole: 11, DS/PN: 3.000 Invert Level (m) 41.378 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>60.0</td><td>60.0</td><td>0.401</td><td>0.0</td><td>72.8</td></tr><tr><td>0.400</td><td>60.0</td><td>72.8</td><td></td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	60.0	60.0	0.401	0.0	72.8	0.400	60.0	72.8			
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)															
0.000	60.0	60.0	0.401	0.0	72.8															
0.400	60.0	72.8																		
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100 year Return Period Summary of Critical Results by Maximum Level
(Rank 1) for 1

PN	US/MH Name	Surcharged		Flooded		Pipe		Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)			
1.004	5	-0.110	0.000	0.14		11.7		OK	
2.000	6	0.550	0.049	0.09		4.8		FLOOD	1
2.001	7	0.592	0.004	0.16		8.6		FLOOD	1
2.002	8	0.695	0.000	0.21		5.0		SURCHARGED	
2.003	9	0.651	2.850	0.16		8.6		FLOOD	2
1.005	10	0.688	0.000	0.46		22.2		FLOOD RISK	
3.000	11	0.699	0.000	0.14		7.1		FLOOD RISK	
1.006	12	0.774	0.000	0.29		8.0		FLOOD RISK	