Document

Flood Risk Assessment and Drainage Statement

Project

Elleray Hall

Site

Elleray Hall & Residential Scheme

Client

London Borough of Richmond upon Thames

Date

June 2021

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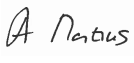
Signature for and on behalf of McBains Ltd				

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1.0 EXECUTIVE SUMMARY

Site name	Elleray Hall & Residential Scheme
Location	Elleray Hall, Teddington
Client	Richmond Borough Council
Grid Reference	515710 , 170868
Area (ha)	0.2385 Ha.
EA Flood zone classification	Flood zone 1
SFRA	London Borough of Richmond SFRA 2020
Current Site Usage	Car park area and Community Centre
Description of Proposed Development	A replacement community centre on the existing car park and proposed residential development on existing community centre site.
Vulnerability Classification	Less vulnerable (Community Centre) / More Vulnerable (Residential)
History of flooding	None
Flood defenses	There is no existing flood risk management infrastructure at the site itself.
Pre development flood risk	Flood compatible (Car Park) / Less vulnerable (Existing Community Centre)
Change in flood risk	Change from flood compatible infrastructure (Existing Car Park) to less vulnerable (Proposed Community Centre) and change from less vulnerable (Existing Community Centre) to more vulnerable (Proposed Community Centre).
Management of Flood Risk	Flood risk to building managed through positive drainage features. Evacuation plan provided for new Community Centre.
Additional surveys required	CCTV survey to determine existing drainage condition.

2.0 INTRODUCTION

2.1 Purpose of This Report

2.1.1 McBains have been commissioned by the London Borough of Richmond Upon Thames (RBC) to undertake a combined Flood Risk Assessment (FRA) with Drainage Statement and to produce a Sustainable Drainage features maintenance plan in support of a scheme formed of a proposed community centre construction, demolition of the existing community centre and construction of a residential block.

2.1.2 The report will be structured with each item being addressed in a separate section within this report.

2.2 Development outline

2.2.1 The proposed development is for the community centre construction, demolition of the existing community centre and construction of a residential block.

2.2.2 The proposed development site is split across two distinct and separate areas. The northern section rests on the corner of North Lane and an alleyway leading to Middle Lane, with existing residential areas to the north and east and is currently a car park. The southern development area is currently a community hall bounded by middle Lane to the north and residential areas to the east south and west.

Figure 1 - Location of existing Elleray Hall Site. New residential scheme to be located on existing hall site.

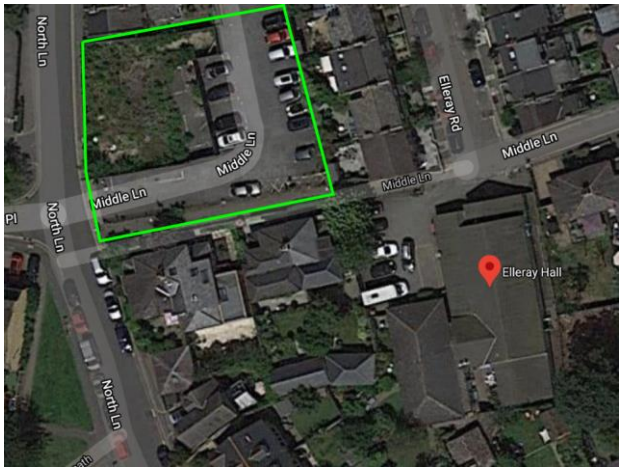


Figure 2 - Location of existing car park and new site location for community hall and centre.

2.3 Requirement for a Flood Risk Assessment

2.3.1 The local Strategic Flood Risk Assessment (SFRA) document for Richmond Borough Council provides a framework for the delivery of Flood Risk Assessments (FRAs) in the local area.

2.3.2 The requirement for a Flood Risk Assessment is set out in Section 14 of the updated National Planning Policy Framework (NPPF) published in February 2019.

2.3.3 Footnote50 accompanying Paragraph 163 states: A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

2.3.4 The SFRA outlines the requirement that any development within an area deemed to be at risk from flooding due to surface water should be considered as though it is in flood zone 3a.

2.3.5 In the context of drainage and surface water disposal the site is brownfield due to the presence of

existing structures. Although local policy determines that the surface water management strategy should keep the site as close to greenfield conditions as feasible.

2.3.6 The proposed Community Centre development being within an area deemed at risk of flooding due to surface water has determined the requirement for this flood risk assessment to be undertaken.

2.4 Sources of Information

2.4.1 Richmond Borough Council (RBC), in their role as Lead Local Flood Authority (LLFA), have published local guidance intended to assist developers in the design of all surface water drainage systems, and to support Local Planning Authorities in considering drainage proposals for new development in Richmond. The guide 'Delivering SuDS in Richmond' sets out the standards that should be applied in assessing all surface water drainage proposals and has been used to inform the SUDS and surface water section of this report.

2.4.2 Environment Agency Standing Advice has been consulted and reviewed during the production of this FRA.

2.4.3 Information with regards to sewer and water main flooding contained within the RBC SFRA has been consulted as part of this FRA. All Water Companies have a statutory obligation to maintain a register of properties/areas which are at risk of flooding from the public sewerage system.

2.4.4 The Department for Environment, Food and Rural Affairs published Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems in March 2015. This FRA and drainage statement will draw upon the principles set out and demonstrate compliance with the technical standards.

2.4.5 A desktop study of the Site was carried out using the Environment Agency, The British Geological Survey, and the GOV.uk websites to ascertain local features, hydrology and soil characteristics.

2.4.6 Flood mapping and site characteristics, as published on the Environment Agency's (EA) and the GOV.uk websites, has been used as an information source. Guidance set out within the NPPF, the SFRA, and EA Guidance has also been used as the base for this site-specific FRA.

2.4.7 A site topographical survey and utilities sub scan has been undertaken for this development and the surrounding area.

2.5 Site Drainage

2.5.1 Thames Water is responsible for the disposal of surface water and waste water for the local area. The drains and sewers forming the network within the boundaries of the site are privately owned and may be moved and amended as part of the on site works.

2.5.2 The sites sit either side of Middle Lane in the vicinity of Teddington Station. There are multiple storm drains in various locations beneath the local public highways as shown in the Thames Water Asset records.

2.5.3 Thames Water asset records show available surface and foul water connection points under North Lane and middle lane. Viable connection should not inhibit the progression of the planning application.

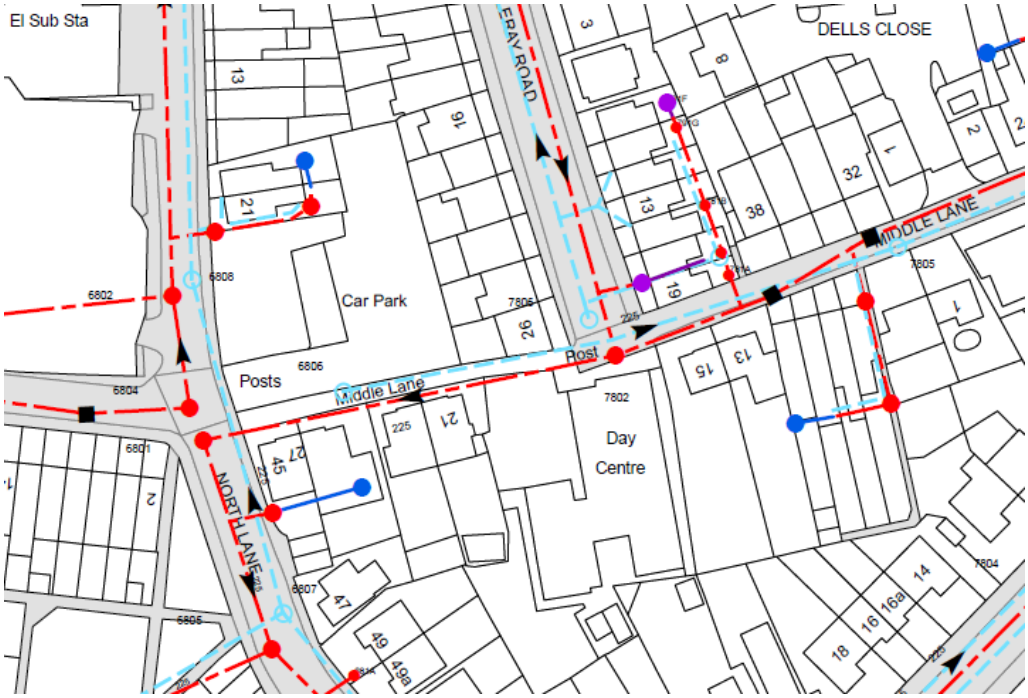


Figure 3 – Extract of Thames Water Asset Location Search Sewer Map

2.6 Site Topography

2.6.1 The topography of the northern site of the proposed community hall falls at a rough rate of 1:30 from east to west through the development area from a high point in the region of 9.1m AOD to a low point around 8.3m AOD. The southern site of the proposed residential area sits relatively flat at a level in the region of 8.9m – 9.0m AOD

2.6.2 The proposed community centre has a finished floor level of 8.0 mAOD, the topographical changes will be made back by minor earthworks and small retaining features keeping all works within the red line boundary. The development works will also incur an amount of material to be removed from the site for SuDS features.

2.6.3 The residential site will have a split finished floor level with the frontage set at a level of 9.0m AOD with the back end lowered to a level of 8.2m AOD.

2.7 Site Geology

2.7.1 Site investigation results indicate the site is generally overlain with high level made ground up to 1.6m bgl followed by a Kempton park gravel formation to a depth of 6.60mbgl overlaying London clay up to 20mbgl.

2.7.2 Ground water monitoring between February 2021 and March 2021 have recorded highest standing water levels of between 4 and 4.3mbgl. Groundwater was struck while boring at a depths of 10mbgl and 19.3mbgl, it is stipulated that the 4mbgl water is formed as part of a perched water table.

2.7.3 Preliminary infiltration measurements taken from 3 samples in and around the site suggest that at a depth of 0.6m below ground level the site has an infiltration rate of circa $5x10^{-6}$ m/s. This assumption can serve the basis of the drainage design but the feasibility of infiltration as the surface water disposal method will require analysis of site constraints.

3.0 FLOOD RISK ASSESSMENT

3.1 Flood Risk To The Site From Fluvial Sources

3.1.1 A main river, the Thames, is located approximately 1250m to the northeast of the development looping around from the south west approximately 2000m away, the site is wholly located within EA flood zone 1, an area with a low probability of flooding from fluvial sources.

3.1.2 Flood Zone 1 comprises land where flooding from rivers and the sea is very unlikely. There is less than 0.1 percent (1 in 1000) chance of flooding occurring each year. This site is shown in context with the local flood areas in Figure 1 shown below.

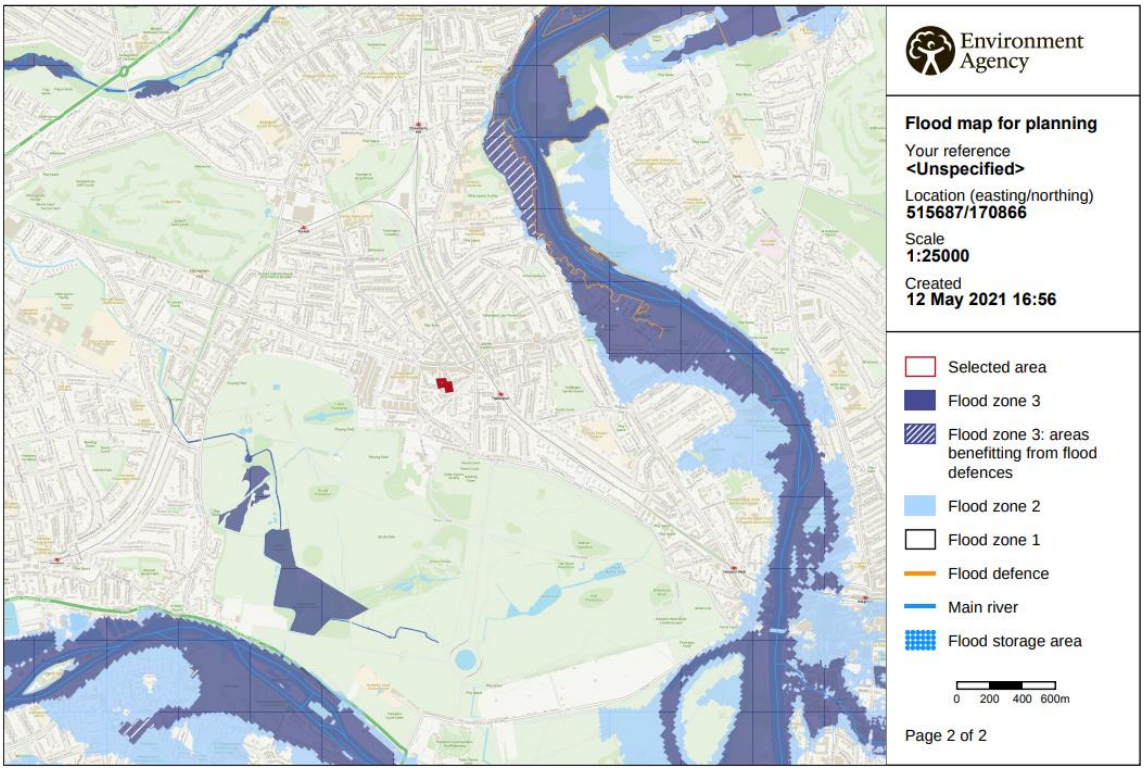


Figure 4 - Environment Agency Flood map for planning extract

3.2 Flood Risk To The Site From Groundwater

3.2.1 Groundwater flooding tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels.

3.2.2 The SFRA outlines areas at risk of flooding. According to BGS data the development area is shown in an area there potential for groundwater to flooding to occur at the surface. Environment Agency maps show the site to be in an area at more than 75% susceptibility to ground water.

3.2.3 Groundwater monitoring is being undertaken as part of the site investigation works. Early groundwater monitoring results have the level of groundwater for the area settling at a level circa 4m below ground level, this deep level and the lack of basements mean that groundwater flooding is not an exceptional risk to the development and in the event groundwater floods the site the water will flow through the surface water management system and drain naturally to the watercourse.

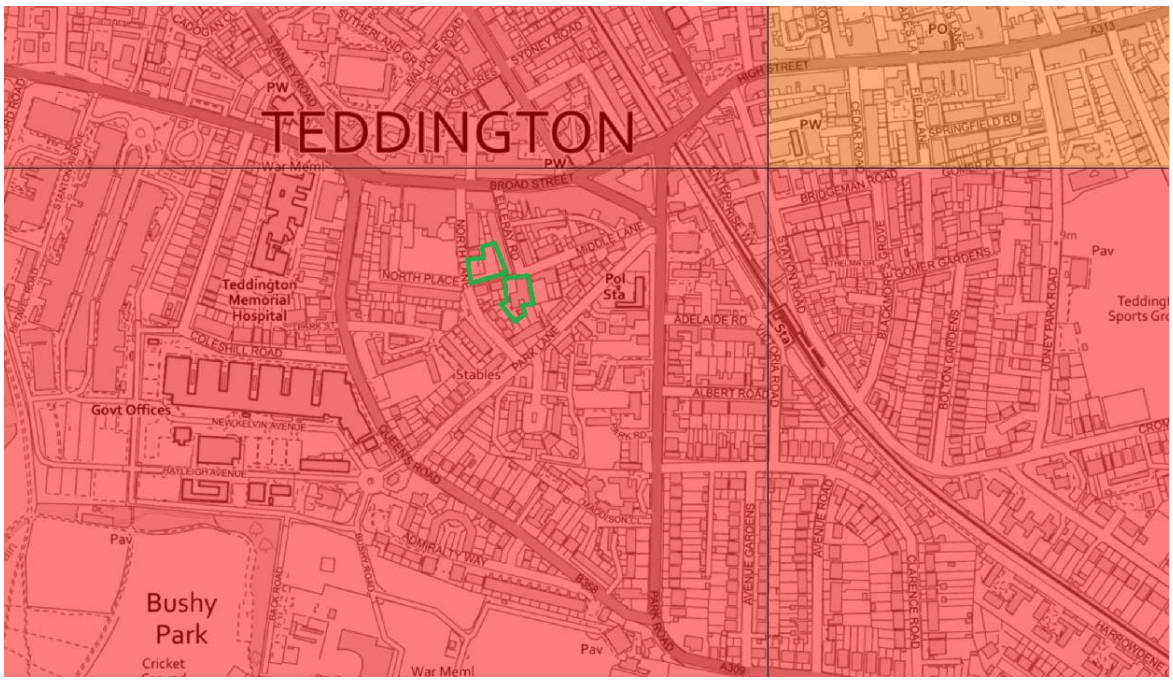


Figure 5 – EA Groundwater Risk Map

3.3 Flood Risk To The Site From Pluvial Sources

3.3.1 The Environment Agency long term flood risk map shows flooding due to pluvial sources in the development area, this area is isolated and small in the context of the wider flood model and indicates a medium risk of flooding due to surface water runoff. The map in the context of the local area is shown below in figure 3.

3.3.2 The general topography of the site will naturally convey overland flow into the proposed drainage system and then carry it offsite.

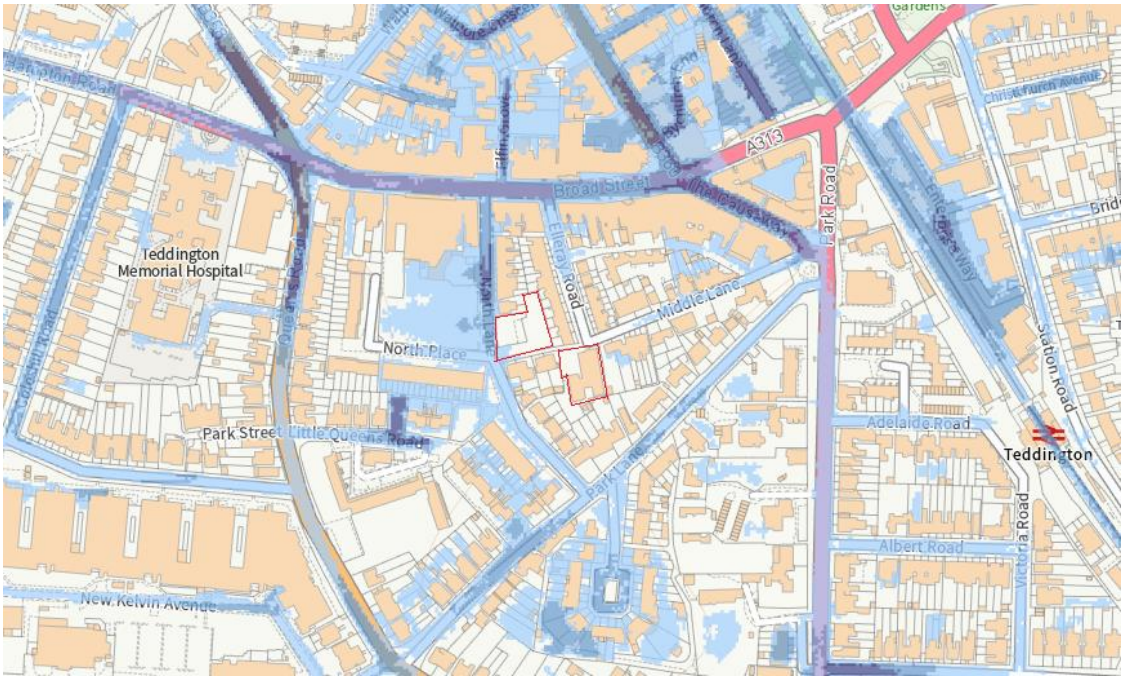


Figure 6 - Environment Agency Flood map for planning extract

3.4 Flood Risk To The Site From Sewers

3.4.1 The SFRA extract below shows the site to be located in an area with 0-10 number of recorded sewer flooding incidents. Therefore, the risk from sewer flooding at the development site can be considered low.

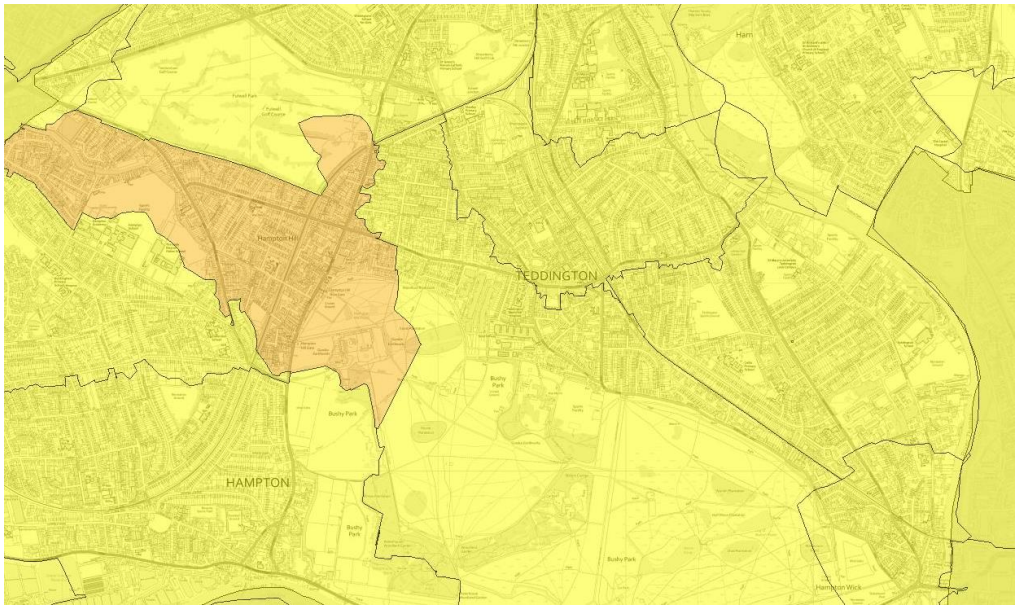


Figure 7 - Recorded Sewer Flooding incidents

3.5 Residual Risk of Flooding

3.5.1 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- The failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- failure of a reservoir, or;
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.

3.5.2 These items are individually assessed in the following sections.

3.6 Defence Breach

3.6.1 The development sits outside of regions outlined by the environment agency as being protected by flood defences, for this reason flood defence breach analysis is not required to assess the flood risk to this development.

3.7 Flood Risk Warning Service

3.7.1 The EA operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. Further information can be found on www.environment-agency.gov.uk/floodline.Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager.

3.7.2 The development is not within a flood warning area and the flood warnings do not apply to the impact of flooding due to surface water.

3.8 Flood Evacuation Plan

3.8.1 The EA Map for planning shows the development as being in flood zone 1 with a low probability of flooding

from rivers and the sea. For this reason, a flood evacuation plan for rivers and see flood risk is not required for this development.

3.8.2 The flood evacuation plan for flood risk due to pluvial sources can be found in Appendix C.

3.9 Flood Plain Displacement

3.9.1 The development is located entirely within flood zone 1 therefore flood plain displacement analysis is not required to satisfy the development works.

3.10 The Sequential Test

3.10.1 The NPPF states that Local Planning Authorities allocating land for development should apply the Sequential Test to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed. The Environment Agency Flood Zones and acceptable development types are explained in the Table below.

3.10.2 PPG ID:7 (Table 1) appropriate uses have been identified for the Flood Zones. Applying the Flood Risk Vulnerability Classification in Table 2 and 3 of PPG ID: 7, the proposed Community Centre development is regarded as 'financial, professional and other services' usage and can therefore be regarded as 'Less Vulnerable' and therefore be treated as such. The residential scheme is regarded as 'Buildings used for dwelling houses' usage and can therefore be regarded as 'More Vulnerable' and therefore be treated as such.

3.10.3 Applying the Sequential Test, Less and More Vulnerable development types are accepted in Flood Zone 1 without an Exception Test.

Flood Risk Vulnerability classification (see Table 1 PPG ID: 7)	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	Yes	Yes	Yes	Yes	Yes
Zone 2	Yes	Yes	Exception test required	Yes	Yes
Zone 3a	Exception test required	Yes	No	Exception test required	Yes
Zone 3b 'Functional Floodplain'	Exception test required	Yes	No	No	no

Yes: development is appropriate, No: development should not be permitted.

3.10.4 Due to the local policy within the London borough of Richmond the proposed Community Centre site shall be considered as being within flood zone 3a due to being in an area at risk of flooding from surface water.

3.10.5 The Richmond Strategic flood risk assessment notes the importance of keeping development close to the town centres located in the local area, as part of this note they deem areas within 800m of a "town centre" as having passed the exception test.

3.10.6 The development is located within 800m of the designated town centre of Teddington and therefore passes the exception test.

3.10.7 It is therefore considered that, within the context of a site-specific FRA, the site is deemed to have passed the Sequential Test with respect to NPPF and is suitable for the type of development proposed.

3.11 Groundwater Protection

3.11.1 Magic Map services provided by DEFRA (Department for Environment Food and Rural Affairs) were analysed to determine the groundwater vulnerability for the area of the development.

3.11.2 Groundwater protection measures are allocated areas where groundwater is abstracted for commercial or domestic usage, these are designated as aquifers. The map below shows the site and the surrounding

area, with the development area has a high risk for groundwater vulnerability.

3.11.3 The site sits on a principle aquifer in a densely populated area.

3.11.4 With these items considered when infiltration systems are utilised appropriate SuDS mitigation measures must be implemented to protect the natural water system.

4.0 DRAINAGE STRATEGY

4.1 Existing Site Runoff

4.1.1 The existing site is considered brownfield from a drainage perspective, although to keep in line with Richmond Borough guidance the development will be designed to greenfield runoff rates.

4.1.2 The existing greenfield runoff rate has been modelled utilising the IH124 method for small catchments, the utilized SAAR value is 599 in the hydraulic region 6. The SOIL type is 2 giving an SPR value of 0.3. These values give an annual greenfield runoff rate QBar in the region of 1l/s for the development.

4.2 Surface Water Management Strategy

4.2.1 A surface water management strategy for development will be required to manage on site flooding and reduce the flood risk to the surrounding area. In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development.

4.2.2 Paragraph 80 of the Planning Practice Guidance of the National Planning Policy Framework (NPPF) states that: generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable, see the table below.

4.2.3 The drainage strategy will follow the drainage hierarchy, with the preference being to discharge through a method higher up the hierarchy (this hierarchy is detailed in both the building regulations Part H and Ciria 753 the SuDS Manal 3.2.3).

Discharge Method	Suitability	Comment
Infiltration	NA	Not possible due to site constraints and potential effect on neighbouring properties
Discharge to Surface water catchment	NA	No Watercourse available on site to discharge to
Discharge to surface water sewer system	Applicable	Most viable method for surface water discharge
Discharge to combined water system	NA	No combined water system to discharge to

Figure 8 - Surface Water Discharge Hierarchy.

4.2.4 Across the 2no sites, the development consists of a proposed impermeable area of 0.18Ha. and a permeable area of 0.0585Ha.

4.2.5 The drainage proposals will work on the basis that 100% of the impermeable area will drain positively through a drainage system and discharged via an attenuation tank to the surface water sewer system, with permeable soft areas acting as isolated self-draining.

4.2.6 The attenuation has been sized in accordance with Environmental Agency guidance and best practice to account for the 1:100 year storm with a 40% allowance for climate change. The surface water sewer will be designed in accordance with building regulations part H, and the design and construction guidance for foul and surface water sewers.

4.3 Sustainable Drainage Features

4.3.1 Sustainable Drainage features as well as being utilised to provide attenuation for the development are utilised to provide surface water treatment. This treatment is required to protect the water and ecosystems down the catchment.

4.3.2 CIRIA report C753 The SuDS Manual outlines the methodology for assessing water quality risks associated with new developments. The document suggests for small scale sites where the risks are low to implement the “simple index approach” which provides a high level scoping analysis of the land usage and gives guidelines for appropriate treatment stages.

4.3.3 The "Simple Index Approach" is a process which identifies features necessary to provide adequate substance removal in line with Environment Agency requirements. This is a three step process of Allocation, Mitigation and Review.

4.3.4 Surfaces generating runoff are 'graded' on their potential to contribute to various harmful pollutants and gives each surface a risk of pollution from each element. An extract of Table 26.2 within the SuDS Manual is set out below. This table highlights the land usages present within the proposals.

Land Use	Pollution Level	Total suspended Solids	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Other roofs	Low	0.3	0.2-0.8	0.05
Low traffic residential roads and non-residential parking with infrequent change.	Low	0.5	0.4	0.4
Commercial yard, parking with frequent change, other roads.	Medium	0.7	0.6	0.7
Sites with heavy pollution	high	0.8	0.8	0.9

Figure 9 – land use classification

4.3.5 The respective cleansing abilities of common SuDS features are given by corresponding mitigation indices within the SuDS Manual. An extract of Table 26.3 is set out below.

Type of SuDS component	Total Suspended Solid	Meteals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary Treatment	As designed	As designed	As designed

Figure 10 – SuDS feature mitigation indices

Type of SUDS	Description	Applicability to the Site
Water butts	Small storage tanks to store rain water for external uses.	Water butts are appropriate for this type of development with localised rainwater collection implemented for external reuse.
Grey water recycling	Water collected from residential and commercial use and reused.	This can be considered for this type of development, although the scale of the development limits the viability.
Rainwater harvesting	Recycling of water from roofs and impermeable areas.	This can be considered for this type of development, although the scale of the development limits the viability.
Green roofs	Vegetated roofs that reduce runoff and remove pollutants.	Green roof systems are a viable system for the flat roof of the residential development area, but the pitched roof of the proposed hall limits the viability
Filter drains/ filter strips/ French drain	Linear drains or trenches filled with granular material that allow infiltration to the surrounding ground or conveyance to an underground system.	This can be considered for this type of development.
Pervious surfaces	Surfaces that allow surface water inflow into underlying surfaces.	This can be considered for this type of development in local areas but topographical constraints limit the viability on a site wide level.
Swales	Vegetated channels to convey store and treat runoff.	Swales are not feasible due to topographical and site area constraints.
Local Shallow basins/ponds	Shallow areas of open space that temporarily hold water and collect silt.	Local shallow basins/ ponds are not viable due to topographical and site area constraints.
Infiltration features	Generally granular trenches or soakaways that store water and allow infiltration to the surrounding ground.	Site constraints limit the viability of this type of system.
Rain Garden	Densely vegetated area of wet planting, designed to treat surface water runoff.	Site constraints limit the viability of this type of system.
Attenuation Crate	Subsurface water attenuation to provide storage for restricted storm waters.	The space efficiency of this device makes the use of crates appropriate for a development of this nature.
Proprietary Treatment products	Subsurface designed treatment systems e.g. petrol interceptor.	Applicable to this site and should be implemented in areas of polluting runoff
Biofilter lagoon	Shallow swales and ponds retained as wet to encourage plant growth.	Site area constraints make biofilters difficult to implement.

Figure 11 – Feasibility of viable SuDS features

4.3.6 The individual pollution indices are totalled, with the first SuDS component utilising its full value and subsequent downstream SuDS features acting with 50% efficiency. This provides a realistic strategy which mimics the reduced cleansing effectiveness as the concentration of a pollutant decreases along the SuDS train.

4.3.7 In line with Environment Agency guidance, before the design phase is concluded, the proposals are reviewed and analysed in order to identify any potential shortcomings and to ensure that adequate volume of SuDS features are provided to mitigate the risk of pollution from each source.

4.4 Proposed Surface Water Drainage Strategy

4.4.1 The proposed surface water drainage strategy will be calculated through an outfall based system to the local thames water sewer, the outfall rate has been confirmed with Thames Water with the letter of discussion found in the appendices.

4.4.2 Earlier in the report the drainage hierarchy was examined and the conclusions showed that discharge through the means of surface water sewer is the only viable method for disposal, to this end each site will be assumed to discharge from the development at a rate of 1l/s into an appropriately located sewer, with the flow restricted by a vortex control manhole.

4.4.3 The proposed development layout is shown in the drainage strategy drawing in appendix C, showing the main body of the proposed drainage and attenuation features, supplementary to the shown drainage are the interlocking gullies, pipes, filter strips, drainage channels, and chambers to convey the water from the structure and impermeable surfaces to the attenuation feature.

4.4.4 The required volume of attenuation has been assessed below giving an indicative requirement for the development, each site has an impermeable area in the region of 900m^2.:

M5-60 : 20mm
Ratio: 0.4
Summer CV: 0.75
Winter CV: 0.84

Storage Estimate

Return Period (years)	100
Climate Change (%)	40
Impermeable Area (ha)	0.090
Peak Discharge (l/s)	1.000
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	0.00000
Required Storage (m³)	Calc
from	47
to	64

Preliminary attenuation calculations, for each development area.

4.4.5 The calculations found in the figure above show that a conservative assessment of the required attenuation for the development is in the region of 65 m^3. This attenuation will be provided utilising attenuation crates within the site area. The flows for the development will be restricted through a vortex flow control and sized to cater for all storms up to and including the 1:100 years + climate change.

4.4.6 The detailed design of the surface water drainage system is subject to further design development and confirmation of the flood mitigation measures.

4.5 Flood mitigation measures

4.5.1 Due to the presence of surface water flooding possibility on this site a selection of flood mitigation measures have been proposed for the detail of the site, these mitigation measures are shown on the drawing in the appendices.

- Site egress points above potential flood lines
- Raised perimeter boundary/crossover restricting surface water access
- Flood barriers available for installation at all doorways and thresholds
- Pump systems provided to assist in removing water from the building
- Threshold drains at all doorways
- Sacrificial floors to aid in cleaning measures
- Implementing additional landscaped areas

4.5.2 In the event of a flood on the proposed community centre site the occupier is to evacuate the site.

4.6 Foul water management strategy

4.6.1 The foul water management will consist of a classical system of interlinked piped and manholes lain at falls connecting to the existing adopted Thames Water network foul drains on Middle and North Lanes. This connection will be subject to a Section 106 application to Thames Water for connection to a public sewer.

5.0 SUSTAINABLE DRAINAGE FEATURES MAINTENANCE

5.1 Ownership and Responsibility

5.1.1 During the construction of the development responsibility of maintenance and upkeep of SuDS features is assigned to the Site Manager. The Site Manager should ensure the maintenance contractor tasked with carrying out maintenance work provides and follows an appropriate risk assessment and method statement for the work being undertaken, with appropriate health and safety practices followed.

5.1.2 Upon occupation of the development the responsibility for maintenance of SuDS features will fall under the remit of the landowner for the development. It is the responsibility of the Landowner to include a SuDS maintenance and management plan as part of the overall management and maintenance manual for the development, with tasks outlined in accordance with the plans set out in this document.

5.1.3 It is also the responsibility of the landowner to ensure the maintenance regime is followed and that logs are kept ensuring the drainage system retains use through the lifetime of the development.

5.1.4 If the land is sold by landowner, responsibility for the maintenance of the SuDS features will be passed on to the new land owner as part of the development handover.

5.2 Maintenance Tasks

5.2.1 The tasks to be undertaken, their frequency and the general actions are outlined in the table contained in appendix D.

5.3 Possible Attenuation features

5.3.1 The attenuation features outlined for the proposal are listed below:

- Filter drain
- Permeable paving
- Attenuation crate
- Proprietary Treatment product

5.3.2 The schedule for the above features is found in the appendices.

6.0 CONCLUSIONS

6.1 Flood Risk

6.1.1 The site has been analysed and assessed to determine the flood risk to the development from appropriate sources and has been deemed to be at risk of flooding from surface water, but appropriate mitigation measures are to be implemented permitting the development to proceed with the implementation of a robust management structure and plan.

6.1.2 The analysis concluded that the risk of flooding is low and should not have an impact on the approvals for the development.

6.2 Drainage Statement

6.2.1 The outline drainage strategy in appendix C with supporting calculations outlined earlier in the report addresses the constraints for the development and provides a robust drainage strategy.

6.2.2 A Thames Water pre-development enquiry has been undertaken to confirm existing sewer networks have the capacity for the development.

6.3 Sustainable Drainage Features Maintenance

6.3.1 The sustainable drainage features have been developed into a viable system alongside the maintenance schedule contained within appendix D.

APPENDIX A - THAMES WATER LETTER

Asset location search

Property Searches

Search address supplied	Elleray Hall Social Club Elleray Road Teddington TW11 0HG
Your reference	Elleray Community Center
Our reference	ALS/ALS Standard/2020_4251031
Search date	9 September 2020

Knowledge of features below the surface is essential for every development

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

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

Contact us to find out more.

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

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

0845 070 9148

Asset location search

Property Searches

Search address supplied: Elleray Hall Social Club, Elleray Road, Teddington, TW11 0HG

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

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

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

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

Asset location search

Thames Water Property Searches

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

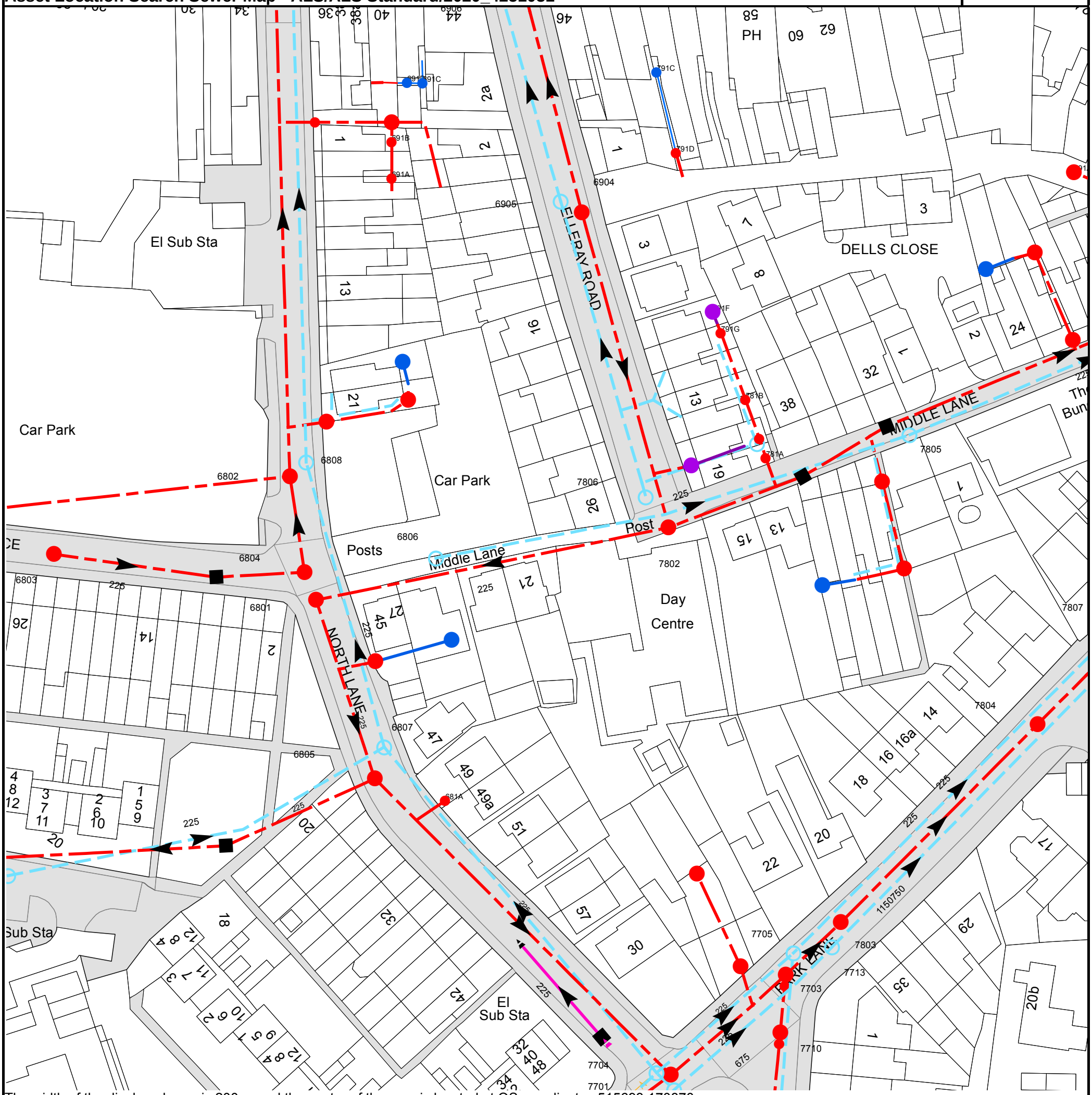
Clean Water queries

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

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4251031



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 515693,170870

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
78YZ	n/a	n/a
781A	n/a	n/a
78ZY	n/a	n/a
78ZV	n/a	n/a
78ZW	n/a	n/a
7805	n/a	n/a
79ZY	n/a	n/a
79ZW	n/a	n/a
7804	8.53	4.49
79ZV	n/a	n/a
791A	n/a	n/a
6803	n/a	n/a
6802	8.18	n/a
6804	n/a	n/a
6808	8.17	6.42
69ZX	n/a	n/a
6801	n/a	n/a
68ZS	n/a	n/a
6805	n/a	n/a
68ZX	n/a	n/a
6807	n/a	n/a
691A	n/a	n/a
69ZY	n/a	n/a
691B	n/a	n/a
69ZS	n/a	n/a
691D	n/a	n/a
68ZV	n/a	n/a
691C	n/a	n/a
6806	n/a	n/a
68ZY	n/a	n/a
6905	8.51	6.91
6904	8.49	6.96
7806	8.78	7.49
791C	n/a	n/a
7802	8.87	6.61
791D	n/a	n/a
78YY	n/a	n/a
791F	n/a	n/a
791G	n/a	n/a
781B	n/a	n/a
78YW	n/a	n/a
5805	n/a	n/a
7709	8.58	6.53
7701	8.6	6
7704	8.57	6.56
7710	n/a	6.02
7703	8.49	4.83
77ZY	n/a	n/a
7705	8.41	6.4
7713	8.52	6.47
7803	8.38	4.7
78YQ	n/a	n/a
681A	n/a	n/a

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

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

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

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

- Trunk Surface Water
- Trunk Foul
- Storm Relief
- Trunk Combined
- Vent Pipe
- Bio-solids (Sludge)
- Proposed Thames Surface Water Sewer
- Proposed Thames Water Foul Sewer
- Gallery
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Sludge Rising Main
- Proposed Thames Water Rising Main
- Vacuum

Sewer Fittings

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

- Air Valve
- Dam Chase
- Fitting
- Meter
- Vent Column

Operational Controls

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

- Control Valve
- Drop Pipe
- Ancillary
- Weir

End Items

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

- Outfall
- Undefined End
- Inlet

Other Symbols

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

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

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Operational Site
- Chamber
- Tunnel
- Conduit Bridge

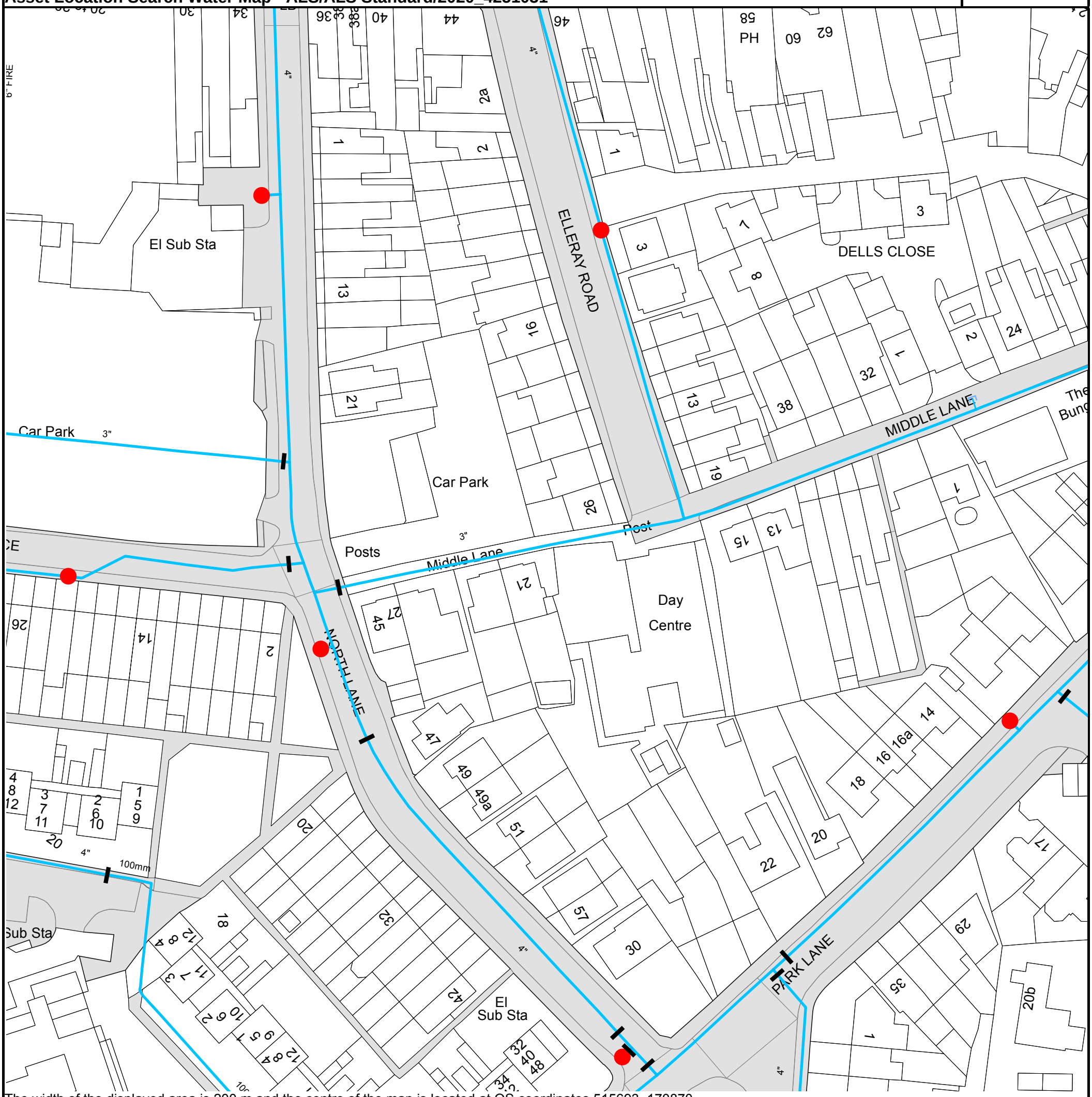
Other Sewer Types (Not Operated or Maintained by Thames Water)

- Foul Sewer
- Surface Water Sewer
- Combined Sewer
- Gulley
- Culverted Watercourse
- Proposed
- Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2020_4251031



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 515693, 170870.

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

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

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

16"

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

3" SUPPLY

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

3" FIRE

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

3" METERED

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

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

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

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

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')

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

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

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

Terms and Conditions

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

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

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

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

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

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

Ways to pay your bill

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

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

Mr R Wright
McBains
26 finsbury Square
London EC2A 1DS

Our ref: DS6083393

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

19th Apr 2021

Pre-planning enquiry: Wastewater Capacity check

Dear Mr Wright

Thank you for providing details of your development with the Pre-Planning application dated 15th Apr 21 for development @ Elleray Hall Middle Lane Teddington TW11 0HG

Brownfield site developed to {16 Flats+Assembly hall} as detailed in your above application.

We have completed the current assessment of the foul water flows & surface water discharges based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network, in liaison with TW Asset Planners.

Foul

If your proposals progress in line with the details you've provided as above, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent TW foul sewer network to serve your foul discharges from your proposed development, provided it is by gravity

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

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

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means

When developing a site, policy SI 13 of the London Plan states "Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:"

The disposal hierarchy being:

1. store rainwater for later use.
2. use infiltration techniques where possible.
3. attenuate rainwater in ponds or open water features for gradual release.
4. attenuate rainwater by storing in tanks or sealed water features for gradual release.
5. discharge rainwater direct to a watercourse.;; *and if above cannot be achieved*
6. discharge rainwater to a surface water sewer/drain.
7. discharge rainwater to the combined sewer.

Where connection to the public sewerage network is still required after examining the hierarchy {1-5} to manage surface water flows we will accept these flows at a discharge rate in line with ***CIRIA's best practice guide on SuDS or that stated within the sites planning approval.***

If the above surface water hierarchy has been followed and if the flows are restricted to 1 l/s, discharging to TW surface water network, as per your application details , then we would not have any objections to the proposal.

Please see the attached 'Planning your wastewater' leaflet for additional information. At the appropriate time, you will have to apply for a S106 connection application to DS Connection team

Source Protection Zone

Please check whether your development falls within a Source Protection Zone for groundwater abstraction. These zones may be at particular risk from polluting activities on or below the land surface. To prevent pollution, the Environment Agency and Thames Water (or other local water undertaker) will use a tiered, risk-based approach to regulate activities that may impact groundwater resources. The applicant is encouraged to read the Environment Agency's approach to groundwater protection (available at https://www.gov.uk/government/publications/groundwater-protection-position-statements) and may wish to discuss the implications for their development with a suitably qualified environmental consultant.

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

Please note that you must keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient sewerage capacity.

What happens next?

Please make sure you submit your connection application, when you are ready, 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.

Yours sincerely

Sgd: *Siva.sivarajan*

Siva Sivarajan

Developer Services- Wastewater Adoptions Engineer

Office:0203 577 7752 Mobile: 07747842608
siva.sivarajan@thameswater.co.uk

Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, Berkshire, RG1 8DB
Find us online at developers.thameswater.co.uk

TW Ref no: DTS69316

Planning your wastewater

We've put together some information on sewerage to help you plan your new development.

How long does it take to get consent to connect to a sewer?

If you're applying for consent to connect to a sewer under Section 106 of the Water Industry Act 1991, you'll need to give us 21 days' notice.

I think I'll need to connect to a trunk sewer – is that possible?

Connecting directly to trunk sewers can be complex and dangerous, and we won't permit this at all in London. If you're considering a trunk sewer as a point of connection, please contact us as soon as possible to discuss.

How do I handle trade effluent and groundwater discharges?

You mustn't discharge non-domestic waste to our sewers without a valid trade effluent consent - doing this is an offence under Section 109(1) of the Water Industry Act 1991. You can call our trade effluent team on 0203 577 9200 to get help with trade effluent consents and ground water discharge permits.

Where can I discharge surface water?

The Lead Local Flood Authority, or if you are in a London Borough, 'The London Plan', advises that your development should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so. You should aim to achieve greenfield run-off rates and ensure you manage surface water run-off as close to its source as possible in line with the following drainage hierarchy:

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

Please note that if you're discharging surface water anywhere other than to a public sewer – such as to a watercourse – you'll need approval from the relevant authority, for example the Environment Agency, the local authority or the Canals and Rivers Trust.

If you don't follow the surface water hierarchy you may not be granted planning permission, and Thames Water may seek to put conditions on the planning application.

There's no right of discharge of highway drainage into the public sewerage system, and we'd need to agree this with the relevant highway authority under Section 115 of the Water Industry Act 1991. You can contact us to discuss this further.

What can I do about redundant sewers and rising mains on my site?

On brownfield sites where existing sewers or rising mains need to be made redundant or diverted, the developer will need to fund the work, as set out in Section 185 of the Water Industry Act. If there's no practical way of making a diversion, we'll apply the standoff distances in Sewers for Adoption 7th edition to assess the width of easement required.

APPENDIX B – LONDON SUSTAINABLE DRAINAGE PROFORMA

LONDON BOROUGH OF RICHMOND UPON THAMES

GREATER**LONDON**AUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Elleray hall Teddington
Address & post code	Elleray hall Teddington, TW11 0HG
OS Grid ref. (Easting, Northing)	E 515714
	N 170853
LPA reference (if applicable)	
Brief description of proposed work	demolition of existing community centre, erection of new community centre and residential building split over 2 separate sites
Total site Area	2385 m^2
Total existing impervious area	1800 m^2
Total proposed impervious area	1800 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	y
Existing drainage connection type and location	2x Gravity connections
Designer Name	Reggie Wright
Designer Position	Civil Project Engineer
Designer Company	Mcbains

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Kempton park Gravel
Bedrock geology classification	London clay
Site infiltration rate	1x10-5 m/s
Depth to groundwater level	19 m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	y
2 use infiltration techniques, such as porous surfaces in non-clay areas	n	n
3 attenuate rainwater in ponds or open water features for gradual release	n	n
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	n	n
5 discharge rainwater direct to a watercourse	n	n
6 discharge rainwater to a surface water sewer/drain	y	y
7 discharge rainwater to the combined sewer.	n	n

2c. Proposed Discharge Details

Proposed discharge location	Thames water sewer
Has the owner/regulator of the discharge location been consulted?	- allowing 1l/s per site subject to LLFA appr

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.36			
1 in 1	0.36	6.2	30	2
1 in 30	0.83	15.1	66	2
1 in 100	1.16	19.8	84	2
1 in 100 + CC			128	2
Climate change allowance used		40%		
3b. Principal Method of Flow Control		vortex flow control chamber		

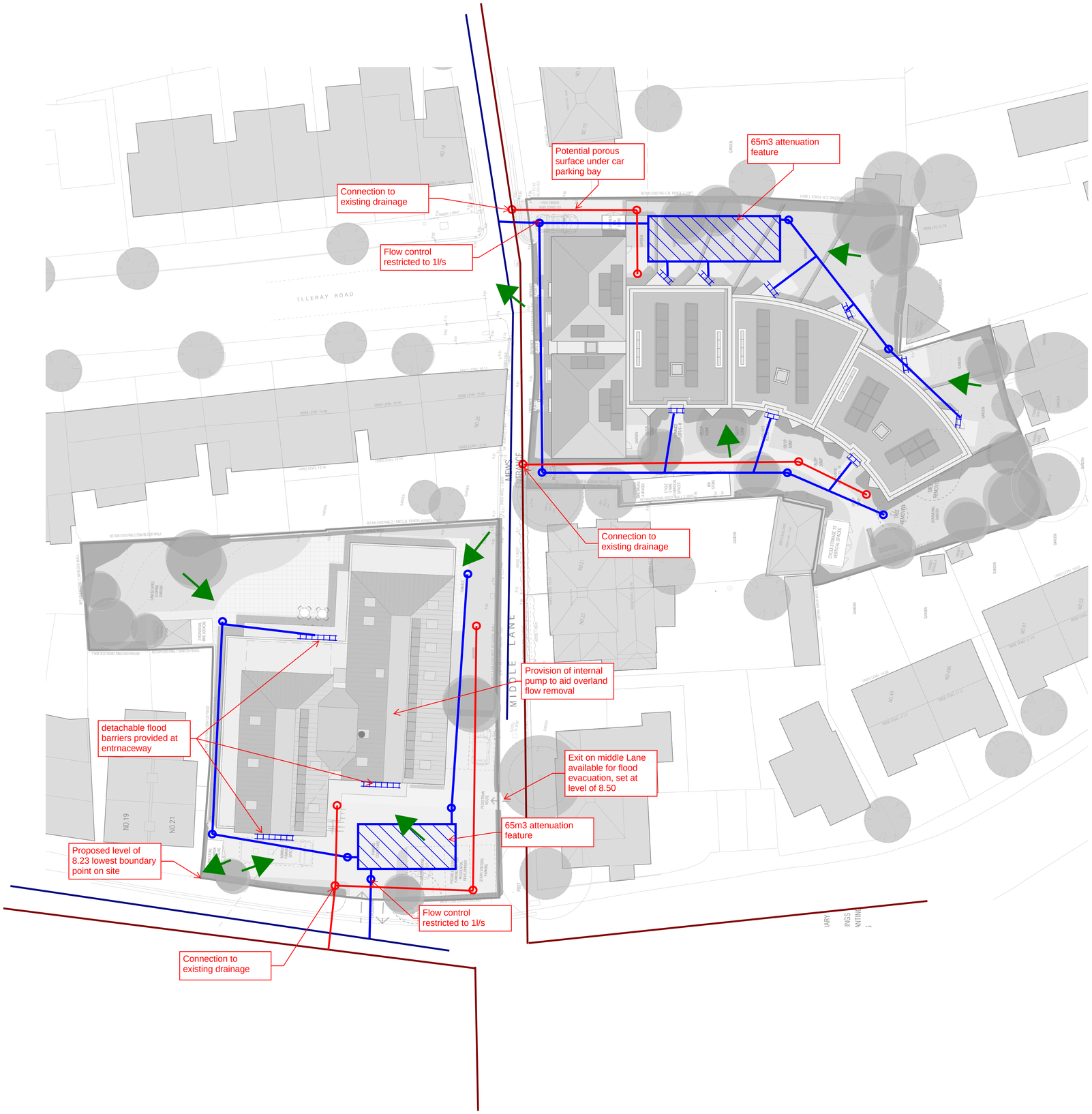
3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	1800		128
Total	**1800**	**0**	**128**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	separate report
Drainage hierarchy (2b)	Page 12
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	appendix A
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	page 11
Proposed SuDS measures & specifications (3b)	Page 13
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	appendix C
Detailed drainage design drawings, including exceedance flow routes	Appendic C
Detailed landscaping plans	Appendix C
Maintenance strategy	Appendix D
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	
b) biodiversity?	
c) amenity?	

APPENDIX C - DRAINAGE STRATEGY AND FLOOD EVACUATION PLAN



Notes:
The contractor must verify all dimensions on site before commencing any work on shop drawings, do not scale from this drawing
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Key

Overland Flow Route

Attenuation Feature

Proposed Drainage
surface foul

Existing Drainage
surface foul

Threshold Drainage

Revision	Amendment	Date
P1	ISSUED FOR PLANNING	24-05-21

Drawn by	Reviewed by	Approved by
RW	RW	AM
MCB Number	**Date created**	**Scale**
61301	MAY-21	NTS @ A1

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Client
LONDON BOROUGH OF RICHMOND UPON THAMES

Project
ELLERAY HALL

Drawing Title
DRAINAGE STRATEGY AND FLOOD EVACUATION PLAN

CIVIL

Drawing / Document Reference								Status	
HER	MCB	XX	XX	DR	C		0305	D5	P1
Project Iden	Originator	Zone	Level	Type	Discipline		Number	Suitability	Revision

Appendix D SuDS Maintenance Schedule

Suds Feature	Maintenance Schedule	Maintenance Requirement	Frequency Details
Filter Drain	Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
		Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
		Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
		Remove sediment from pre-treatment devices	Six monthly, or as required
	Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
		At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
		Clear perforated pipework of blockages	As required

Appendix D SuDS Maintenance Schedule

Suds Feature	Maintenance Schedule	Maintenance Requirement	Frequency Details
Filter strips	Regular maintenance	Remove litter and debris	Monthly (or as required)
		Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
		Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
		Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (eg oils)	Monthly (at start, then half yearly)
		Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
		Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
		Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)
	Occasional maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over >10% of the filter strip area
	Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
		Relevel uneven surfaces and reinstate design levels	As required
		Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
		Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
		Remove and dispose of oils or petrol residues using safe standard practices	As required

Appendix D SuDS Maintenance Schedule

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

Suds Feature	Maintenance Schedule	Maintenance Requirement	Frequency Details
Proprietary treatment systems	Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
		Change the filter media	As recommended by manufacturer
		Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
	Remedial actions	Replace malfunctioning parts or structures	As required
	Monitoring	Inspect for evidence of poor operation	Six monthly
		Inspect filter media and establish appropriate replacement frequencies	Six monthly
		Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during fist half year of operation, then every six months

Appendix D SuDS Maintenance Schedule

Suds Feature	Maintenance Schedule	Maintenance Requirement	Frequency Details
Pervious Pavements	Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumnal leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
	Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
		Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
	Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
		Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
		Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
	Monitoring	Initial inspection	Monthly for three months after installation
		Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
		Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	Annually