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FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

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Prepared by	A Wallace
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1 EXECUTIVE SUMMARY

This Drainage Assessment reviews the existing drainage arrangement at the application site and proposes a Flood Risk Assessment in accordance with the National Planning Policy Framework (NPPF) and surface water drainage strategy in line with Local Authority and Lead Local Flood Authority (LLFA) guidance.

The site is currently occupied by Industrial buildings and hardstanding and is located at Waldegrave Motors, Waldegrave Road, TW11 8NA

The proposed development comprises the construction of a new 7 dwelling residential development with associated hardstanding and external works.

Flooding

The site is less than 1 hectare in size and within flood zone 1. The sources of flooding assessed and proposed mitigation measures are listed in the table below.

Source	Risk Category (after mitigation)	Comments
Fluvial (Rivers and Sea)	Very Low	Site within flood zone 1
Coastal and tidal	Negligible	Not near coast or tidal waterbody
Groundwater	Medium	Proposed finished floor levels are 150mm above external ground levels and natural topography reduces risk.
Surface water	Very Low	Low due to natural topography and presence of existing surface water drainage
Sewers	Very Low	Low due to natural topography and sewer location
Reservoirs	Very Low	Reservoir at low danger of failure

Surface Water Drainage

The proposed strategy presented in detail in this report aims to attenuate all surface water in an area of tanked permeable paving throughout the site. Discharge will be via a hydrobrake to the sewers in Waldegrave Rd.

Discharge will be limited to 5 litres/second in accordance with best practice. Attenuation and reduced discharge will be provided for all storm events up to and including the 1 in 100-year storm plus 40% allowance for climate change.

An additional 10% allowance for urban creep has been included in the sizing of surface water storage by adding 10% to the areas in the modelled calculations.

Maintenance/management of all onsite drainage infrastructure has been considered within a separate maintenance plan appended to this report. This will be updated through the development process.

The proposed drainage strategy is entirely based on-site and therefore the only off-site works will be the foul and surface water outlet to the Thames Water sewer in the street should the existing connection not be able to be reused.

Overall, the proposed development has an acceptable flood risk within the terms and requirements of the NPPF. The proposals provide a high level of water treatment, runoff reduction and flooding protection for the proposed development and are in accordance with all requirements of the Lead Local Flood Authority (LLFA).

Foul Drainage

It is proposed to discharge the foul drainage from the site into the existing Thames Water sewer in the street via the existing connection if possible.

2 INTRODUCTION

2.1.1 Jomas was commissioned to undertake a Drainage Assessment for the proposed development of land located at Waldegrave Motors, Waldegrave Road, TW11 8NA

2.1.2 This Drainage Assessment has been produced in support of a planning application and should be read in conjunction with the other planning documents.

2.1.3 The proposed development comprises the construction of a new 7 dwelling residential development with associated hardstanding and external works. Proposed development details are provided in Appendix A.

3 SITE DESCRIPTION

3.1.1 The site is approximately 1170 square metres in size and located at 39 Grimwade Avenue, Croydon.

3.1.2 Pre-development, the site is approximately 100% (1070 square metres) impermeable. Post development, the impermeable area will be reduced to approximately 1000 square metres (94% impermeable).

3.1.3 The site location information is as follows:

- Nearest Postcode: TW11 8NA

3.2 Topography

Site Topography

3.2.1 An onsite topographic survey has been carried out and is provided in Appendix B.

3.2.2 The site is irregular in shape and generally flat, with a slight fall from the rear of the site to the street.

4 DESIGN PRINCIPLES AND POLICY REQUIREMENTS

4.1.1 Since April 2015, Lead Local Flood Authorities (LLFA's) have become a statutory consultee on surface water drainage for many planning applications. For this site, the following is considered to be the required level of detail required for planning approval:

- A Flood Risk Assessment in accordance with the National Planning Policy Framework (NPPF) and National Planning Guidance (NPG)
- SuDS: Designs, Maintenance Plans & Calculations - for SuDS proposed, the LLFA require product specifications or design drawings, all supporting calculations and a maintenance plan. This needs to include details of any attenuation structures and in accordance with the CIRIA C753 SuDS Manual.

4.2 General Principles for Flooding

4.2.1 The National Planning Policy Framework (NPPF) states that when determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where informed by a site-specific FRA. This assessment is required for:

"Proposals of 1 hectare (ha) or greater in Flood Zone 1, all new development (including minor development and change of use) in Flood Zones 2 and 3 and an area within Flood Zone 1, which has critical drainage problems as notified to the local planning authority by the Environment Agency (EA)."

4.2.2 In accordance with the March 2014 Planning Practice Guidance (PPG), which supports the NPPF, the objectives of this FRA are to establish:

- *Whether a proposed development is likely to be affected by current or future flooding from any source;*
- *Whether it will increase flood risk elsewhere;*
- *Whether the measures proposed to deal with these effects and risks are appropriate.*

4.3 General Principles for Surface Water Drainage

4.3.1 The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015) and LLFA Policy DM25.3 requires sustainable drainage systems in all development to reduce surface water runoff and provide water treatment on site. This includes but is not limited to addressing the following issues in order of preference:

- store rainwater for later use
- use infiltration techniques, such as porous surfaces in non-clay areas
- attenuate rainwater in ponds or open water features for gradual release
- attenuate rainwater by storing in tanks or sealed water features for gradual release
- discharge rainwater direct to a watercourse
- discharge rainwater to a surface water sewer/drain

- discharge rainwater to the combined sewer.

Consideration must be given to the direction of water flow across the site and where this may be dispersed and incorporating any features that will help reduce surface water run-off. All developments should achieve greenfield runoff rates where possible and this needs to be demonstrated as part of the planning submission.

5 FLOODING INFORMATION

5.1 Flood Risk from Rivers (Fluvial)

5.1.1 As the site is within Flood Zone 1, there is a low risk of fluvial flooding to the site.

5.1.2 Based on the above, the risk of flooding from rivers is considered very low.

5.2 Coastal and Tidal Flood Risk

5.2.1 The site is located inland and is not near any tidally influenced watercourses; therefore, there is negligible risk of flooding from this source.

5.3 Geology and Hydrogeology

5.3.1 Groundwater flooding occurs when the water table rises to the surface and is most likely to occur in low-lying areas underlain by permeable ground.

5.3.2 The Aquifer Maps on the MAGIC map identifies the area as follows:

Bedrock –nothing of note

Superficial Drift –nothing of note

Groundwater Vulnerability – Medium-Low groundwater vulnerability.

5.3.3 The British Geological Survey (BGS) indicates bedrock and superficial drift geology for the site. The strata of the site (bedrock geology) comprises London Clay described as follows:

London Clay Formation - Clay And Silt. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas.

The superficial geology is as follows:
Kempton Park Gravel Member - Sand And Gravel. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by rivers (U).

5.3.4 The site is listed as potentially underlain by highly permeable geology. This is to be confirmed by site investigation.

5.3.5 While the ground may be permeable, the site is shown to be of low groundwater vulnerability and due to the site topography with a natural fall towards the street, the site is considered to be at medium risk of groundwater flooding.

5.4 Surface Water Flood Risk (Overland Flows)

5.4.1 Surface water flooding occurs when the rainwater does not drain away through the normal drainage system or infiltrate the ground, but instead lies on or flows over the ground.

5.4.2 The EA produced a Risk of Flooding from Surface Water Map in December 2013. The maps were produced using 'direct rainfall' modelling. Although they consider local drainage capacity, non-surface water influences such as rivers, seas or groundwater are not considered. The map is based on LIDAR topographic data which is not suitable for site specific assessment and therefore, where available, topographic survey data should be used to provide a more accurate understanding of potential flow paths.

5.4.3 The map shows the entire country within four different risk categories, defined below in Table 1.

Table 1: EA Surface Water Flood Risk Categories

Risk Category	**Definition**
High	Each year, there is a chance of flooding of greater than 1 in 30 (3.3%)
Medium	Each year, there is a chance of flooding of between 1 in 30 (3.3%) and 1 in 100 (1%)
Low	Each year, there is a chance of flooding of between 1 in 100 (1%) and 1 in 1000 (0.1%)
Very Low	Each year, there is a chance of flooding of less than 1 in 1000 (0.1%)

5.4.4 An extract of the map, provided below, shows that the area is generally not susceptible to surface water flooding. This is confirmed by the site topography which shows the levels fall away from the building towards the street.

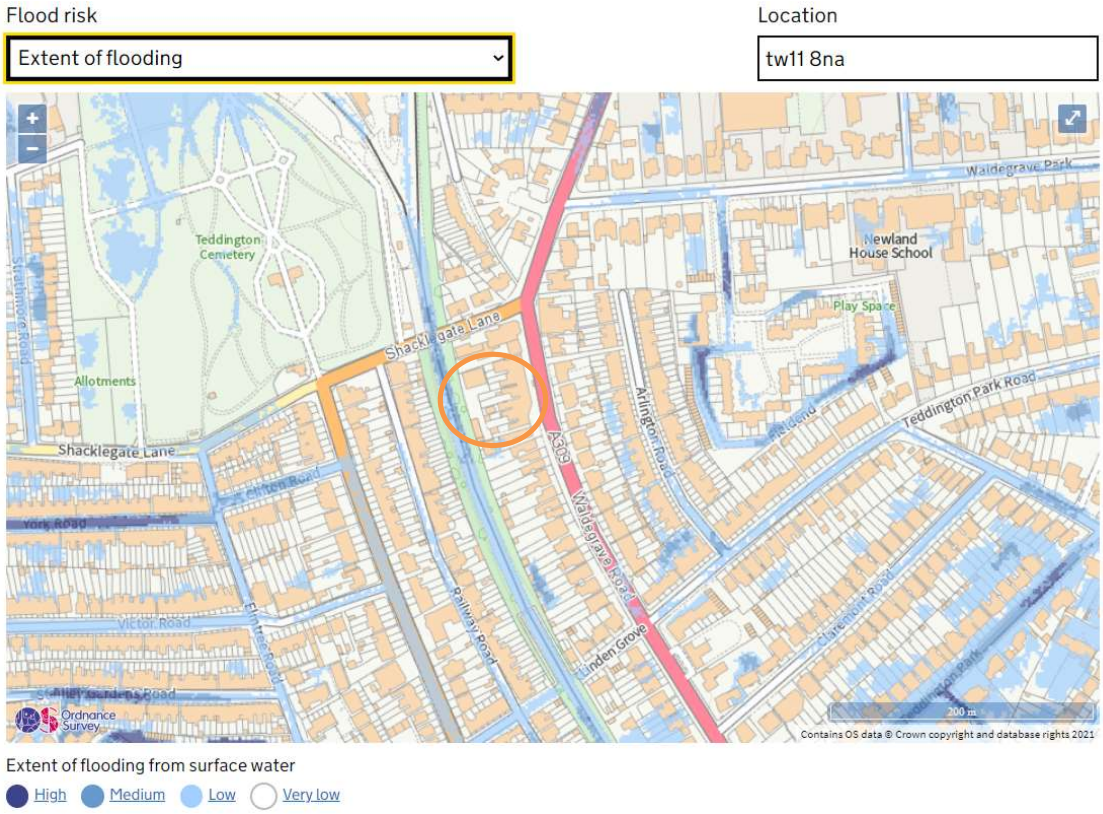


Figure 1: EA Flood Risk from Surface Water Map

5.4.5 Based on the EA's mapping, historical data and local topography, risk of surface water flooding to the site is considered to be very low.

5.5 Sewer/Drainage Flood Risk

5.5.1 Sewer flooding is often caused by excess surface water entering the drainage system when there is insufficient sewer capacity to cope with this excess water, but also due to 'one off' events such as blockages.

5.5.2 Thames Water is the statutory undertaker for the local public sewer network. The nearest Thames Water sewers to the site are located within Waldegrave Rd at the site frontage. See Appendix C for details.

5.5.3 The local PFRA states that no flood events have been considered to have 'significant harmful consequences' at the site.

5.5.4 On the basis there is considered to be a very low risk of sewer flooding to the site.

5.6 Reservoir Flood Risk

5.6.1 The EA has produced a Reservoir Flood Map that shows that the site is at risk from reservoir flooding. This map indicates very low risk of reservoir flooding at this site.

5.6.2 It should be emphasised that the risk of flooding from reservoir breach is very small since the EA is the enforcement authority for the Reservoirs Act (1975) and all large raised reservoirs are inspected and supervised by reservoir panel engineers.

5.6.3 On the basis there is considered to be a very low risk of reservoir flooding to the site.

5.7 Summary of risk levels

5.7.1 Pre-development, the risk of flooding is summarised below.

Table 2: Flood Risk Categories

Source	Risk Category
Fluvial (Rivers and Sea)	Very low
Coastal and tidal	Negligible
Groundwater	Medium
Surface water	Very low
Sewers	Very low
Reservoirs	Very low

6 SITE DRAINAGE INFORMATION

6.1.1 The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015) states that the following options must be considered for disposal of surface water runoff in order of preference:

- Discharge to ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

Discharge to Ground

6.1.2 The potential for surface water to discharge to ground has been assessed through a review of the likely ground conditions and possible infiltration structures.

6.1.3 The surface geology of this site is within an area generally underlain by permeable gravel formations and may be suitable for infiltration. This is to be confirmed by site investigation.

6.1.4 Further to the above it is noted that while there may be some permeable superficial geology in the area, the bedrock is impermeable clay and the site and surrounds have existing surface water sewer connections. It is also noted that as the site is narrow, there is not sufficient clearance from buildings to use soakaways (soakaways must be a minimum of 5m from buildings) and so it is assumed that infiltration is unlikely to the possible.

Discharge to Surface Water Body

6.1.5 There are no suitable surface water bodies near to the site that can be used for surface water discharge.

Discharge to Surface Water Sewer/Combined Sewer

6.1.6 Discharge to the public sewer network should only be considered once all other options for draining surface water from the site have been exhausted.

6.2 Sustainable Drainage Systems (SuDS)

6.2.1 To maximise the potential use of SuDS at the site, a review has been undertaken as shown in Table 3 in accordance with the SuDS Hierarchy. This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.

Table 3: SuDS Selection Based on the SuDS Hierarchy

Component	Recommendation
Green/Blue roofs	Whilst the use of green and blue roofs provides additional environmental benefits such as enhanced aesthetics and ecology, its exposure to wind and orientation must be considered. Access to undertake the construction and maintenance easily and safely is also a high priority.

Component	Recommendation
	If feasible, depending on the roof design, a green/blue roof will provide water quality, biodiversity and aesthetic benefits to the site. Additionally, the green/blue roof/s will offer some attenuation for run-off, reducing volumes of run-off and in higher frequency events (i.e. 1in2 year storms) will result in no run-off for the building. Green/Blue roofs have not been considered for the pitched roof.
Basins and Ponds	Ponds and attenuation basins can provide overland storage of surface water whilst also providing additional biodiversity and aesthetic/amenity value. The rear garden area of the site is not suitable for a pond as it limited in space.
Filter Strips and Swales	Swales are linear vegetated drainage features, which provide overland conveyance and storage of surface water whilst trapping sediments and hydrocarbons within run-off. They also create biodiverse areas for planting and habitat. Swales are not considered suitable for this site due to the urban setting restricting the availability of space and suitability of swales and the steep fall across the site.
Infiltration Devices	Infiltration devices are likely to be suitable for the main drainage system due to the permeable nature of the existing ground. Infiltration may be suitable.
Permeable Paving	Whilst incorporating attenuation storage, permeable paving also provides treatment through filtration of silt (and attached pollutants), settlement and retention of solids, adsorption of pollutants and biodegradation of organic pollutants, including petrol and diesel. Permeable paving is proposed for this site.
Tanked Systems	This is the least sustainable option in terms of the SuDS Hierarchy. However, the use of tanked systems would still be of benefit compared to traditional drainage systems as it does allow run-off to be slowed down to an acceptable discharge rate. There are no tanks proposed for the site.

7 SURFACE WATER DRAINAGE DESIGN

7.1 Site Areas

7.1.1 The development area currently comprises existing buildings and hardstanding. The existing and proposed areas are summarised below.

Table 4: Site Areas

Parameter	Existing (m2)	Existing (%)	Proposed (m2)	Proposed (%)
Impermeable area	1070	100	1000	94
Permeable area	0	0	70	6
Total area	1070	100	1070	100

7.1.2 It is assumed that the surface water runoff from the site is currently picked up in the site drainage system and discharges into the sewer in Waldegrave Ave or soaks into the ground.

7.2 Design Considerations

7.2.1 Consideration has been given to the following when calculating the proposed impermeable areas.

- The 2013 EA 'Rainfall Run-off Management for Developments' Report (SC030219) states that urban creep, the process of gradually increasing impermeable area within an urban area (through paving soft landscaped surfaces and constructed outbuildings etc), is an acknowledged issue. To include an allowance for urban creep, the impermeable area used in the drainage calculations has been increased by 10% in accordance with the recommendation made in SC030219.

7.2.2 The climate change allowance used in the Drainage Strategy is in line with updated EA guidance values published in February 2016 for increased rainfall intensities by 2115.

7.3 Greenfield Run-Off Rates

7.3.1 The greenfield run off rates have been calculated using the Wallingford method. Calculations are provided in Appendix C and summarised in the table below.

7.4 Existing Run-Off Rates

7.4.1 The existing run-off rates for a variety of return periods have been calculated using the Wallingford method.

7.4.2 The total site area is 1070 square metres and is 10% impermeable, resulting in an impermeable area of 1070 square metres. Taking conservative peak 1 year, 30 year and 100 year rainfall rates of 50mm/hr, 125mm/hr and 185mm/hr respectively, the maximum existing peak discharge rates have been calculated as follows.

Contributing Area (ha) x 1 yr Rainfall (mm/hr) x 2.78

1070/1000 x 50 x 2.78 = **14.8 l/s**

Contributing Area (ha) x 30 yr Rainfall (mm/hr) x 2.78

1070/1000 x 125 x 2.78 = **37.2 l/s**

Contributing Area (ha) x 100yr Rainfall (mm/hr) x 2.78

1070/1000 x 185 x 2.78 = **55.0 l/s**

7.4.3 The discharge rates for the existing and proposed site are summarised below.

Table 5: Existing Greenfield Run-off Rates

Parameter	Existing Discharge (l/s)	Greenfield Discharge (l/s)	Proposed Discharge (l/s)
QBAR	NA	0.16	NA
1 year	14.8	0.14	4..9
30 year	37.2	0.37	4.9
100 year	55.0	0.52	4.9
100 year +40%	NA	NA	5

7.4.4 Site discharge should be as close to greenfield rates as possible, up to a maximum discharge rate of 50% of the existing rate. It is proposed to restrict the discharge to 5l/s into the sewer in the street for all storm events up to and including the 100 year +40% climate change storm. This is significantly lower than 50% of the existing discharge rate

7.5 Attenuation

7.5.1 As the greenfield rates from this site are low (See Appendix C), in accordance with best practice, outflow controls will be set to discharge at a rate of less than 50% of the existing discharge at 5 litres/second.

7.5.2 A calculation of the required attenuation is provided in Appendix C. A total attenuation volume of approximately 50 cubic metres is proposed to cater for the 100 year +40% storm event.

7.5.3 The attenuation will be provided in tanked permeable paving throughout the site and a hydrobrake installed to limit discharge to the sewers.

7.6 Should infiltration provide to be possible after on-site testing has been completed, the permeable paving can be revised to an un-tanked system.

7.7 Exceedance Flooding and Overland Flow

7.7.1 The area is not subject to overland flow routes or surface water flooding as discussed in the Flooding section above.

7.7.2 The drainage system has been designed to cater for the 1 in 100 year + 40% climate change storm. ie in this storm event all surface water will be collected on site and slowly released. Thus, the overland flow route will only be in use in the event of drainage network failure, storms in excess of the 1 in 100 year + 40% climate change storm or flows from offsite flowing through the site.

7.8 Consents, Offsite Works and Diversions

7.8.1 The proposed surface water drainage strategy is accommodated totally on-site, with the only requirement for off-site works being the possible connection to the Thames Water Sewers should the existing connection not be suitable for reuse.

7.9 Maintenance

7.9.1 A SuDS maintenance plan has been prepared to outline the management of the potential SuDS features. The maintenance plan is provided in Appendix D.

8 WATER QUALITY

8.1 Post-Development Water Quality Treatment

8.1.1 In line with the 2015 SuDS Manual (CIRIA C753), certain criteria should be applied to manage the quality of run-off to support and protect the natural environment effectively. Treatment design, wherever practicable, should be based on good practice, comprising the following principles:

- Manage surface water run-off close to source
- Treat surface water run-off on the surface
- Treat surface water run-off to remove a range of contaminants
- Minimise risk of sediment remobilisation
- Minimise impacts from accidental spills

8.1.2 Managing pollution close to the source can help keep pollutant levels and accumulation rates low, essentially allowing natural treatment processes to be effective. This in turn can help maximise the amenity and biodiversity value of downstream surface SuDS components and keep maintenance activities straightforward and cost-effective.

8.1.3 The proposed development comprises two types of land use; residential roofs and a car parks/low traffic driveway. These land uses are classified as having very low and low hazard pollution levels, respectively. This table is provided below in Table 6.

Table 6: Pollution Hazard Indices from 2015 SuDS Manual (C753)

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

8.1.4 The proposed drainage strategy utilises the following SuDS features:

- Permeable Paving

8.1.5 The indicative SuDS mitigation indices, provided in Table 26.3 of the 2015 SuDS Manual (C753) have been reviewed for the roof and paving. This table is provided below in Table 7.

Table 7: Indicative SuDS Mitigation Indices from 2015 SuDS Manual (C753)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

8.1.6 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type), as follows:

Total SuDS mitigation index ≥ pollution hazard index

(for each contaminant type) (for each contaminant type)

8.1.7 For each type of land-use, the pollution hazard indices, mitigation indices and concluding hazard have been outlined in Table 8 below.

Table 8: Roof Space Water Quality Mitigation Summary

Residential Roofs				SuDS Manual Reference
	TSS	Metals	Hydrocarbons	
Pollution Hazard Index	0.2	0.2	0.05	Table 26.2
Mitigation Index (Permeable Paving)	0.7	0.6	0.7	Table 26.3
Total Mitigation index	0.7	0.6	0.7	Worst case only
Result	Total SuDS mitigation index ≥ pollution hazard index and therefore hazard is exceeded			

Table 9: External Pavement Space Water Quality Mitigation Summary

Residential Roofs				SuDS Manual Reference
	TSS	Metals	Hydrocarbons	
Pollution Hazard Index	0.5	0.4	0.4	Table 26.2
Mitigation Index (Permeable Paving)	0.7	0.6	0.7	Table 26.3
Total Mitigation index	0.7	0.6	0.7	Worst case only
Result	Total SuDS mitigation index ≥ pollution hazard index and therefore hazard is exceeded			

8.1.8 Therefore, it can be concluded that the provision of the permeable paving exceeds the required pollution mitigation indices and provides sufficient treatment as part of the surface water management train, in accordance with the 2015 SuDS Manual (CIRIA C753).

8.1.9 As the site is located in an area of medium groundwater vulnerability, the proposals provide a high level of treatment to the discharge and nothing further is considered necessary.

9 FOUL RUN-OFF

9.1 Discharge to Public Sewer Network

9.1.1 Thames Water are the foul sewerage suppliers for the area.

9.1.2 The identified point of connection from the site is into the public foul sewer network in the street. A Sewer connection application will be submitted to Thames Water for approval.

10 DRAINAGE DURING CONSTRUCTION

10.1 Construction Run-off Management

10.1.1 Installing the surface water and foul drainage system, whilst managing temporary run-off, are key aspects of the construction works involved in any development. The information provided below is in accordance with the 'C698 Site handbook for the construction of SUDS' (CIRIA, 2007).

10.1.2 Please note that the measures recommended below are recommendations only and need to be confirmed at the construction stage by the client and the contractor.

10.2 Management of Construction (Including Drainage)

10.2.1 Drainage is typically an early activity in the construction stage of a development, taking form during the earthworks phase. However, final construction i.e. piped drainage system connections to the SuDS devices, should not take place until the end of site development work, unless a robust strategy for silt-removal is implemented prior to occupation of the site.

10.2.2 A plan for the management of construction (including phasing of works, details of any offsite works etc.) cannot be provided at this early stage, as construction work plans are not yet known. However, the following key points are general construction issues associated with SuDS which will be addressed when these plans are complete:

- Silt-laden waters from construction sites represent a common form of waterborne pollution;
- These silt-laden waters cannot enter SUDS drainage systems unless specifically designed to accept this as it can clog the systems and pollute receiving waters. Therefore, piped drainage systems should not be connected to the attenuation SuDS devices until the late stages of construction.
- Any gullies and piped systems should be capped off during construction and fully jetted and cleaned prior to connection to the attenuation SuDS devices.

10.3 Temporary Drainage During Construction

10.3.1 The three principal aspects of drainage control during construction are trapping sediment, conveying run-off, and controlling run-off.

10.3.2 Sediment traps and barriers can include basin traps and sediment fences (with any necessary boundary controls). The principal basins are to be installed after the construction site is accessed. Sediment fences and barriers will then be installed as needed during grading.

10.3.3 Conveyance of run-off can be achieved through small ditches/stream, storm drains, channels and sloped drains with sufficient inlet/outlet protection.

10.3.4 Slope stability needs to be considered when using any channels to convey run-off across the site into any basins etc.

10.3.5 Run-off control measures will need to be implemented in order not overwhelm the temporary system and cause flooding issues. Run-off rates from the site will be managed so they are no greater than pre-development or in keeping with the best practice guidance to minimise risk of blockage. Any additional conveyance measures are to be installed as needed during grading.

10.3.6 Run-off control to include provision of perimeter ditches or appropriate levels grading to direct any water from the construction site to remain on site.

10.3.7 Any necessary surface stabilisation measures are to be applied immediately on all disturbed areas where construction work is either delayed or incomplete.

10.3.8 Maintenance inspections are to be performed weekly, and maintenance repairs to be made immediately after periods of rainfall.

10.4 Protection of Drainage Infrastructure during Construction

10.4.1 All drainage infrastructure should be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers, and storing construction materials away from the drainage infrastructure.

Appendix A: Proposed Development Details

ISO 9001
Certificate No. GB2005290

General Notes:

Do not scale from this drawing. Use marked dimensions only.
Should any discrepancies be noted, please inform this office immediately.

N

- 1B/1P
- 1B/2P
- 2B/3P
- 2B/4P
- Commercial

Rev:	Description:	Date:	Drw:	Chk:
P05	Issue For Information	06.05.2021	AQ	SSB
P04	Issue For Information	05.05.2021	AQ	SSB
P03	Issue For Information	30.04.2021	AQ	SSB
P02	Issue For Information	28.04.2021	AQ	SSB
P01	Issue For Information	01.04.2021	AQ	SSB

MAA Architects
the boathouse design studio
27 ferry road teddington tw11 9nn
t: 020 8973 0050
e: info@maa-architects.com
w: www.maa-architects.com

Scale: 0m 2 5 10 20m

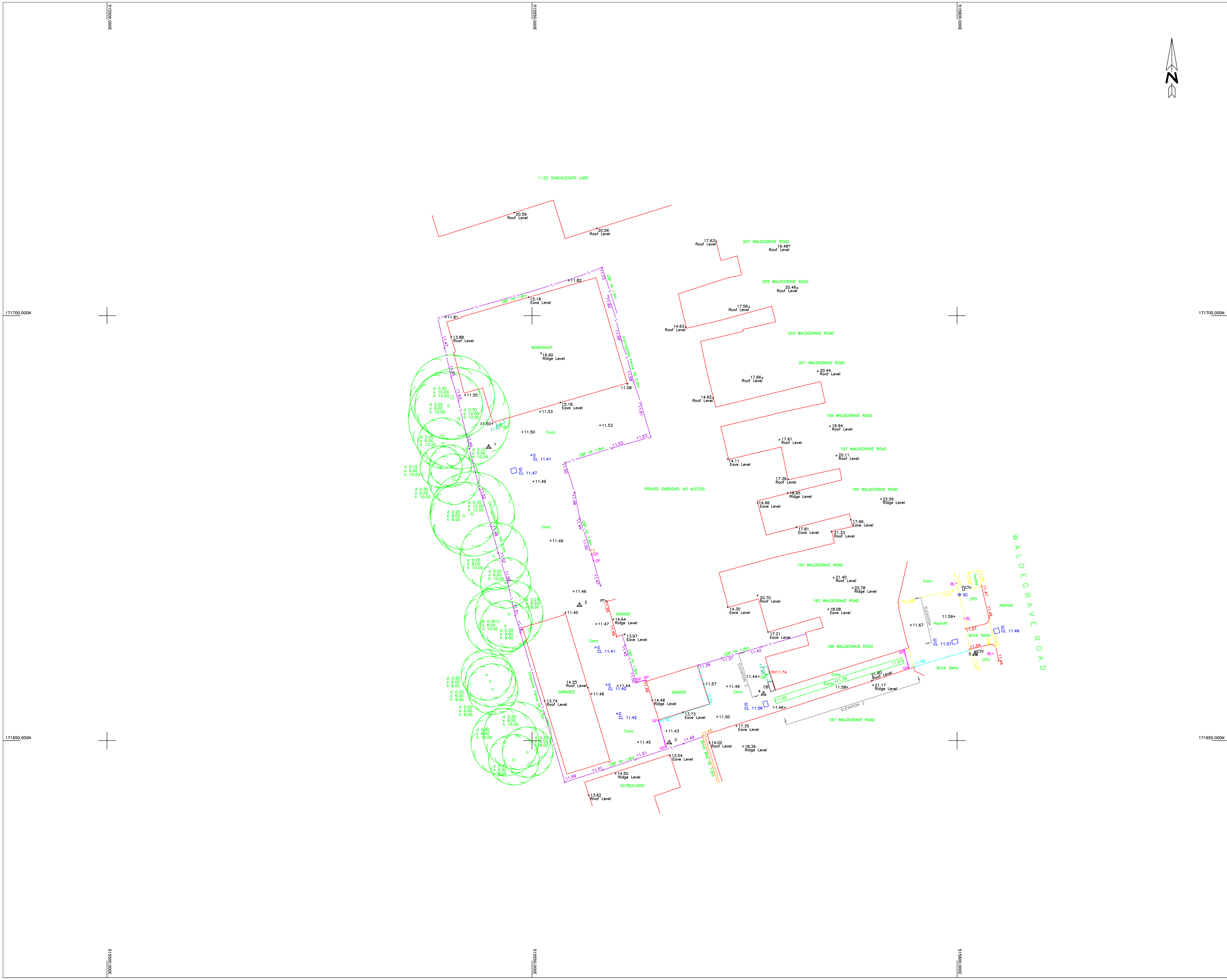
Client:
Matthew Allchurch

Project Name:
Waldegrave Mews

Drawing Title:
Proposed Site Plan: Ground Floor

Drawing Status:	Status Code:	Project No:	Scale at A1:
Preliminary	**S0**	**MA014**	**1:200**
Drawing No:	**Revision:**	**Date:**	**Scale at A3:**
MA014-MAA-XX-DR-A-01011	**P05**	**06.05.21**	**1:400**

Appendix B: Topographic Survey



LASER SURVEYS

LAND AND BUILDING SURVEYS, UNDERGROUND SERVICES LOCATION, CCTV DRAINAGE SURVEYS.

Established 1975. Member of The Survey Association.

OPEN SPACE, UPPER INTERFIELDS, LEIGH SINTON ROAD, MALVERN, WORCESTERSHIRE, WR14 1UT
TEL 01886 833173 email: worcester@lasersurveys.com

THE OLD DAIRY, STUBBERS FARM, MOUNTNESSING ROAD, BLACKMORE, ESSEX, CM4 0NX
TEL 01277 821555 email: london@lasersurveys.com

DATUM NOTES

GRID ORIGIN IS BASED UPON SURVEY STATION 3 FIXED TO THE ORDNANCE SURVEY NATIONAL GRID BY LEICA SMARTNET GPS NETWORK. A SCALE FACTOR OF 1 APPLIES TO THIS DRAWING.

ie. MEASURED DISTANCES ON THE GROUND WITHOUT GPS WILL BE THE SAME AS THOSE MEASURED ON THIS DRAWING

LEVELS ARE RELATED TO :-
ORDNANCE SURVEY GPS ACTIVE NETWORK AND TRANSFORMED USING THE OSGM15 & OSTN15 MODEL

SITE BENCH MARK ESTABLISHED IS LOCATED AT :-
SURVEY STATION 3

VALUE GIVEN AS 11.430m

SURVEY CONTROL STATIONS SHOWN

ABBREVIATIONS (where applicable)

AV	Air Valve	MH	Manhole Cover
BK	Brick	MK	Marker
BL	Bollard	MS	Milestone
BS	Bus Stop	MT	Meter
BT	British Telecom	MY	Mercury
CB	Control Box	OH	Overhead
C/B	Close Boarded	PAV	Paving
CL	Cover Level	PB	Post Box
CLK	Chainlink	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
CATV	Cable Television	RE	Rodding Eye
DC	Drainage Channel	RET	Retaining
DP	Drain Pipe	RS	Road Sign
EC	Electricity Cover	RSJ	Rolled Steel Joist
ER	Earthing Rod	SC	Stop Cock
FB	Flower Bed	SK	Soakaway
FE	Fence	SP	Signpost
FH	Fire Hydrant	ST	Silt Trap
FL	Floor Level	SV	Stop Valve
FP	Flag Pole	SVC	Security Video Camera
GP	Gate Post	TCB	Telephone Call Box
GV	Gas Valve	TK	Tank
GY, G	Gully	TL	Traffic Light
HT	Height	TP	Telegraph Pole
IC	Inspection Cover	UG	Underground
IL	Invert Level	UTF	Unable To Trace Further
IN	Interceptor	UTL	Unable To Lift
I/R	Iron Railings	VP	Vent Pipe
KO	Kerb Outlet	WL	Water Level
LB	Litter Bin	WM	Water Meter
LP	Lamp Post	WO	Wash Out

B	Floor to Beam Height in cms
C	Floor to Ceiling Height in cms
Cr.	Floor to Crown Height in cms
D	Floor to Door Head Height in cms
FC	Floor to False Ceiling Height in cms
FF	False Floor Level
H	Floor to Head Height in cms
S	Floor to Sill Height in cms
Spr.	Floor to Springer Height in cms

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.
* Areas of dense undergrowth cannot be surveyed in detail, these areas will be shown in outline only and marked as 'dense undergrowth' on the plan.

SHEET LAYOUT
NOT TO SCALE

189 WALDEGRAVE ROAD TEDDINGTON MIDDLESEX TW11 8NA

TOPOGRAPHICAL SURVEY

SURVEYED FOR
MATTHEW ALLCHURCH ARCHITECTS LTD
THE BOATHOUSE
27 FERRY ROAD
TEDDINGTON
TW11 9NN

SURVEYOR J.E
DATE MARCH 2021

NO	DATE	REVISION

DRAWING NO	L 10276/1	REV 0
SCALE	1 : 200 @A1	
SEE ALSO DWG NOS		
SHEET	1 of 5	
REF NO	L 10276	

Appendix C: Drainage Drawings and Calculations

Asset location search

Property Searches

andrew wallace
22

HARPENDEN
AL5 3AL

Search address supplied

Flat
195
Waldegrave Road
Teddington
TW11 8LX

Your reference Waldegrave

Our reference ALS/ALS Standard/2021_4468819

Search date 15 July 2021

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

0800 009 4540

Asset location search

Property Searches

Search address supplied: Flat, 195, Waldegrave Road, Teddington, TW11 8LX

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 0800 009 4540, 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

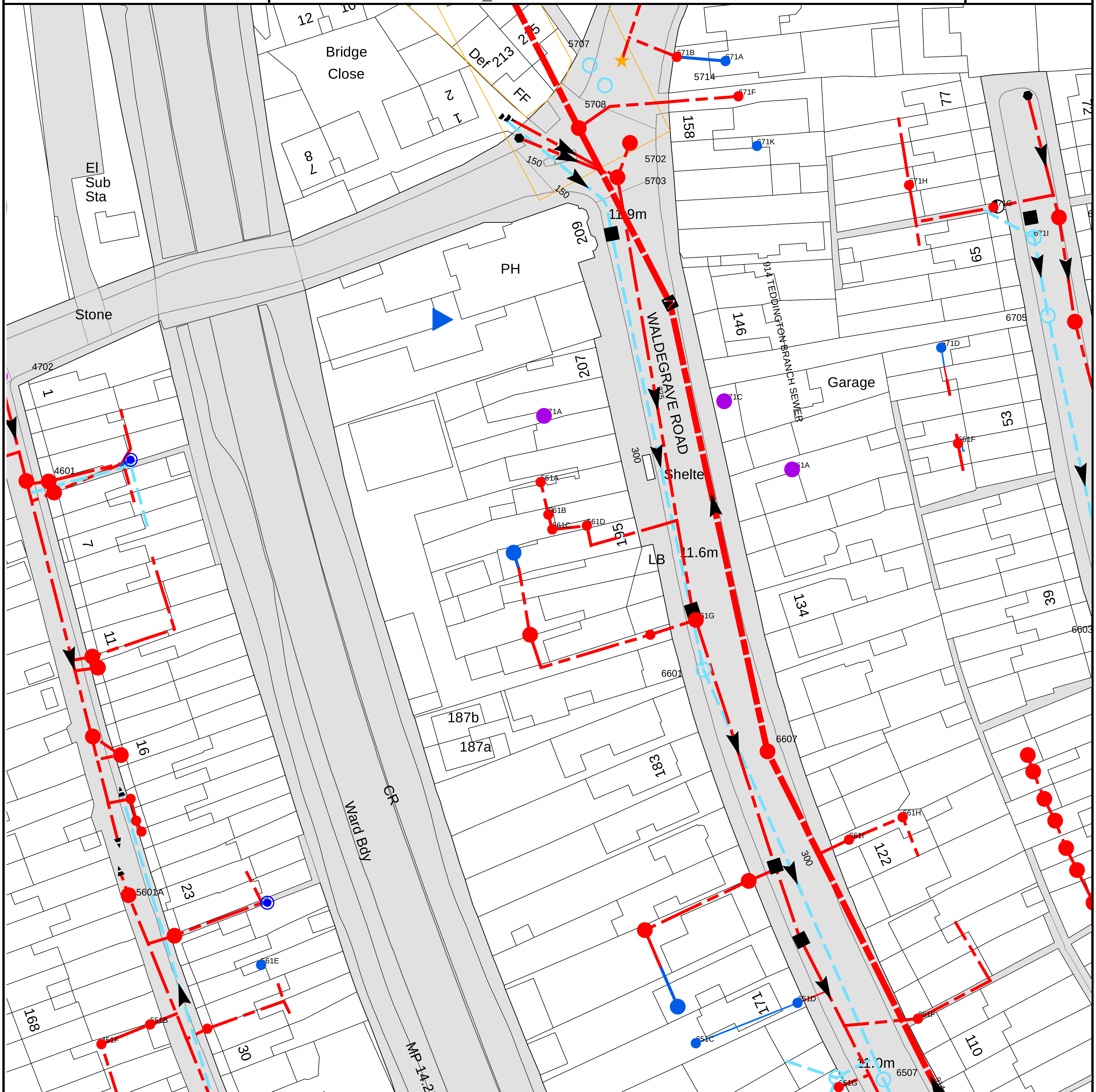
Clean Water queries

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

Asset Location Search Sewer Map - ALS/ALS Standard/2021_4468819



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 515579,171677

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.

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
671K	n/a	n/a
671G	n/a	n/a
671I	n/a	n/a
6705	n/a	n/a
6703	n/a	n/a
6704	n/a	n/a
66ZX	n/a	n/a
66YY	n/a	n/a
66YZ	n/a	n/a
661I	n/a	n/a
66YS	n/a	n/a
661H	n/a	n/a
66ZQ	n/a	n/a
66ZR	n/a	n/a
66ZS	n/a	n/a
6607	11.45	-4.11
6601	n/a	n/a
56XS	n/a	n/a
661G	n/a	n/a
651G	n/a	n/a
6507	n/a	n/a
65YT	n/a	n/a
651C	n/a	n/a
651F	n/a	n/a
65YR	n/a	n/a
651D	n/a	n/a
56YW	n/a	n/a
66YW	n/a	n/a
66YX	n/a	n/a
46YV	n/a	n/a
46YY	n/a	n/a
46ZY	n/a	n/a
4601	n/a	n/a
46ZQ	n/a	n/a
46ZS	n/a	n/a
451F	n/a	n/a
56ZP	n/a	n/a
5601A	n/a	n/a
56YZ	n/a	n/a
56YY	n/a	n/a
56YX	n/a	n/a
551B	n/a	n/a
56ZS	n/a	n/a
55ZV	n/a	n/a
561E	n/a	n/a
56XX	n/a	n/a
56XV	n/a	n/a
561A	n/a	n/a
561B	n/a	n/a
561C	n/a	n/a
561D	n/a	n/a
671B	n/a	n/a
671C	n/a	n/a
671A	n/a	n/a
671F	n/a	n/a
661A	n/a	n/a
671H	n/a	n/a
671D	n/a	n/a
661F	n/a	n/a
571A	n/a	n/a
5703	11.96	9.39
5702	n/a	n/a
5714	11.92	-4.31
5708	n/a	n/a
5707	n/a	n/a

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

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.

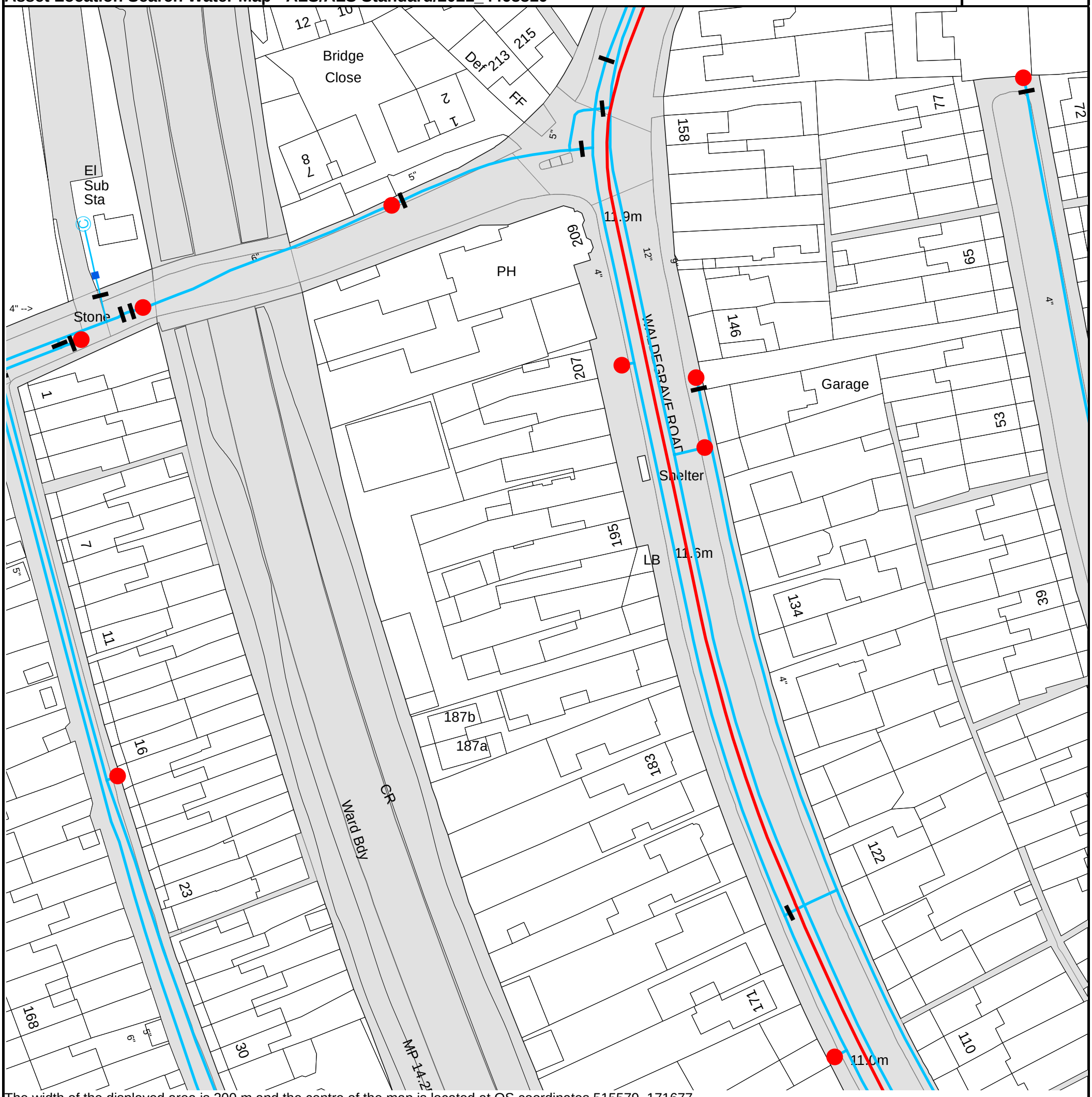
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

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 Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS Standard/2021_4468819



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 515579, 171677.

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.

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 **0800 009 4540** 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.

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	andrew wallace
Site name:	Waldegrave
Site location:	Waldegrave

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.43195° N
Longitude:	0.33869° W
Reference:	344349675
Date:	Jul 25 2021 21:55

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.107

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	599	599
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates 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 consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

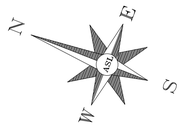
Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.16	0.16
1 in 1 year (l/s):	0.14	0.14
1 in 30 years (l/s):	0.37	0.37
1 in 100 year (l/s):	0.52	0.52
1 in 200 years (l/s):	0.61	0.61

ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR
NOTE: CONTRACTOR TO NOTE THE LIKELY PRESENCE OF MULTIPLE EXISTING SERVICES.
ALL SERVICES TO BE CONFIRMED PRIOR TO CONSTRUCTION AND DIVERTED AS NECESSARY

DRAINAGE CONCEPT LEGEND

Ø100@1:100>	Stormwater Pipe - Diameter and fall
Ø100@1:100>	Perforated Pipe - Diameter and fall
SMH Ø1200 CL 80.90 IL 80.00	Manhole type - SMH Surface Water Diameter Cover Level Invert Level
SWIC Ø450	Polypropylene Inspection Chamber (PPIC)
RWP	Rain Water Pipe
Ø150@1:100>	Foul Pipe - Diameter and fall
FMH Ø1200 CL 80.90 IL 80.00	Manhole type - FMH Foul Water Diameter Cover Level Invert Level
FWIC Ø450	Polypropylene Inspection Chamber (PPIC)
FO	Sewer Vent Pipe/Sub Stack/Outlet
18.30+	Proposed Level
FFL 80.90	Finished floor level
Ø150@1:100>	Ex. Foul Pipe - Diameter and fall
Ø150@1:100>	Ex. SW Pipe - Diameter and fall
	Permeable Paving



<ASSUMED LOCATION OF EXISTING TW FOUL WATER SEWER
<ASSUMED LOCATION OF EXISTING TW SURFACE WATER SEWER
NEW CONNECTION TO EXIZTING TW SEWER TO TW SEWER IL 9.13 (TBC)
NODE1 NEW CONNECTION TO EXISTING TW SURFACE WATER MANHOLE CL 11.43 IL 9.43 (TBC)
DEMARCATION CHAMBER CL 11.60 IL 9.25
NODE 2 DEMARCATION CHAMBER CL 11.58 IL 9.50
NODE 3
SWMH WITH FLOW CONTROL TO LIMIT FLOW TO 5l/s CL 11.60 IL 9.55
RWP
FO
FWIC CL 11.65 IL 9.35
Ø150 PERFORATED PIPE>
FWIC CL 11.50 IL 9.68
FFL 11.60 (TBC)
FWIC CL 11.50 IL 9.78
AREA OF PERMEABLE PAVING
GROUND LEVEL = 11.50
TOP OF STORAGE = 11.30
BASE OF STORAGE = 10.80
AREA = 300m²
DEPTH = 0.5m
VOLUME = 50m³
NODE 4 SWIC CL 11.50 IL 9.75
FWIC CL 11.50 IL 9.98
NODE 5 SWIC CL 11.50 IL 9.80
AREA OF PERMEABLE PAVING FOR ATTENUATION
FFL 11.90 (TBC)
FWIC CL 11.70 IL 10.90
SWIC CL 11.50 IL 10.60
FWIC CL 11.80 IL 10.60
NODE 6 SWIC CL 11.70 IL 10.20
FFL 11.80 (TBC)
FWIC CL 11.50 IL 10.50
FWIC CL 11.60 IL 10.44
FWIC CL 11.60 IL 10.38
FWIC CL 11.50 IL 10.25
FWIC CL 11.50 IL 10.15
FWIC CL 11.50 IL 10.08
FFL 11.70 (TBC)
FFL 11.60 (TBC)
FFL 11.60 (TBC)
SWIC CL 11.50 IL 10.50
FWIC CL 11.50 IL 10.80
FWIC CL 11.50 IL 10.72
FWIC CL 11.50 IL 10.60
SWIC CL 11.50 IL 10.40
SWIC CL 11.50 IL 10.60
SWIC CL 11.50 IL 10.80
+11.80
+11.70
+11.60
+11.50
CBF Ht 1.8m
Corrugated Fence Ht 2.0m
Chainlink Fence Ht 1.3m
Brick Wall Ht 1.6m
PRIVATE GARDENS: NO ACCESS
ELEVATION 1
ELEVATION 2
ELEVATION 3
203 WALDEGRAVE ROAD
201 WALDEGRAVE ROAD
199 WALDEGRAVE ROAD
197 WALDEGRAVE ROAD
195 WALDEGRAVE ROAD
193 WALDEGRAVE ROAD
191 WALDEGRAVE ROAD
190 WALDEGRAVE ROAD
189 WALDEGRAVE ROAD
187 WALDEGRAVE ROAD
OUTBUILDING
GARAGES

Job No. P3508J2313 Rev.

DRAINAGE NOTES

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7. NODE NUMBERS REFER TO CALCULATIONS WITHIN DRAINAGE REPORT
8. ALL RWP AND FO SHOWN ARE INDICATIVE ONLY AND SUBJECT TO APPROVAL AND SETTING OUT BY THE ARCHITECT.
9. NOTE THE PRESENCE OF NUMEROUS TREES. DRAINAGE DESIGN TO BE REVISED AS NECESSARY TO ACCOMMODATE TREE PROTECTION AND HAND DIGGING MAY BE REQUIRED FOR DRAINAGE INSTALLATION.
10. UNLESS NOTED OTHERWISE, PIPES TO BE:
FOUL PIPES UNDER BUILDING ø100@1:40,
FOUL PIPES EXTERNAL ø100@1:80,
SURFACE WATER PIPES ø150@1:100

Notes.

Key dimensions to be checked by engineer before major structural works commence on site.

1. This survey has been computed and drawn about O S National Grid.
2. All levels are in metres and relate to O S National Datum by GPS instruments.
3. This survey was measured for a scale of 1:100, any subsequent enlargements should be verified on site.

Amendments

Rev	Date		By	Chkd

JOMAS
Jomas Associates Ltd.
6-9 The Square
Stockley Park
UB11 1FW
Tel. 0843 2892187

Client
Waldegrave Mews Ltd

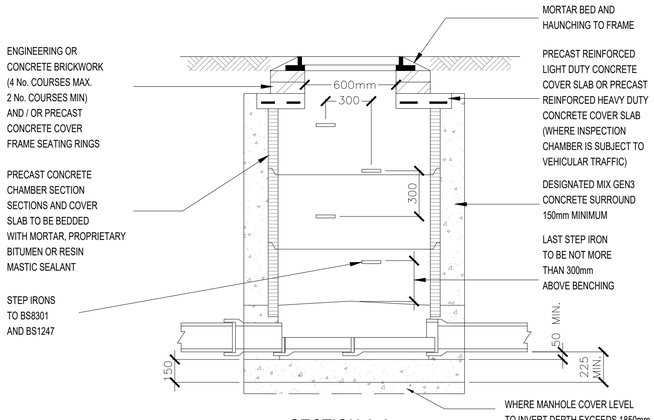
Project
Waldegrave Mews

Drawing
Proposed Drainage Plan

Dwg no	Checked	Surveyor
C01	AW	-
Date 25.07.21	Scale 1:100 @ A1	
Job No. P3508J2313		Rev. -
Grid	Contours	Level Datum

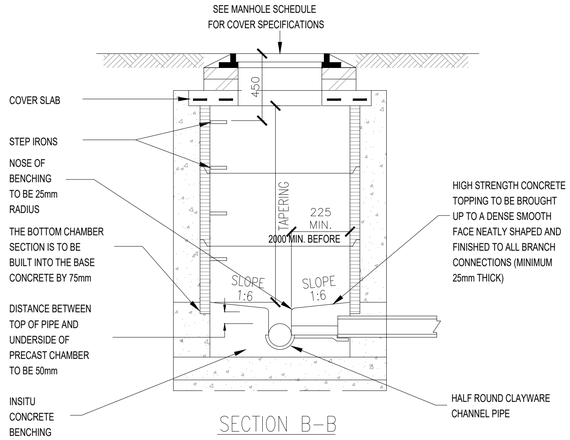
ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR

NOTE: Details for private drainage only.



ALL MANHOLE BASE SLABS TO HAVE ONE LAYER A393 MESH CENTRALLY PLACED

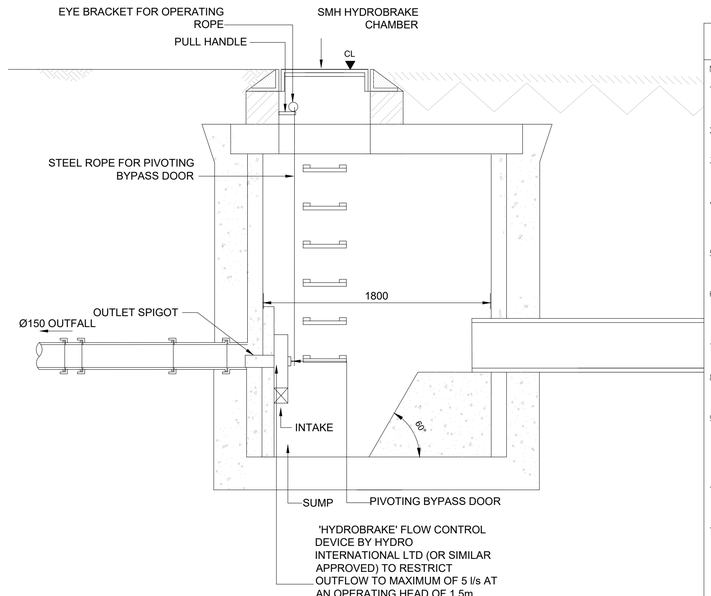
SECTION A-A



SECTION B-B

PRECAST CONCRETE MANHOLE TYPE B (PCC) IN EXTERNAL AREAS DETAIL

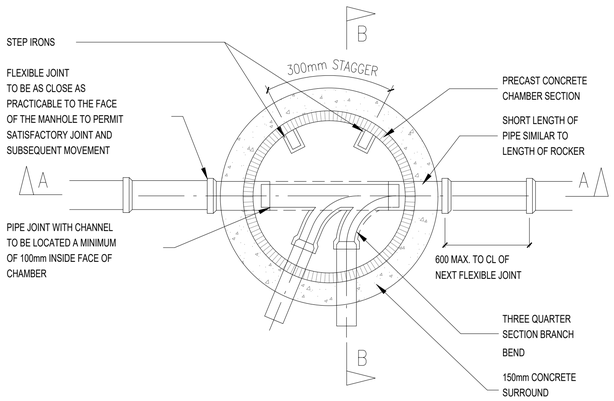
SCALE 1:20



'HYDROBRAKE' FLOW CONTROL DEVICE BY HYDRO INTERNATIONAL LTD (OR SIMILAR APPROVED) TO RESTRICT OUTFLOW TO MAXIMUM OF 5 l/s AT AN OPERATING HEAD OF 1.5m HYDROBRAKE FLOW CONTROL MOUNTING DETAILS ARE SHOWN INDICATIVELY - EXACT MOUNTING DETAILS TO BE AS ADVISED BY THE MANUFACTURER / SUPPLIER

TYPICAL SECTION THROUGH STORM HYDROBRAKE FLOW CONTROL

SCALE 1:20

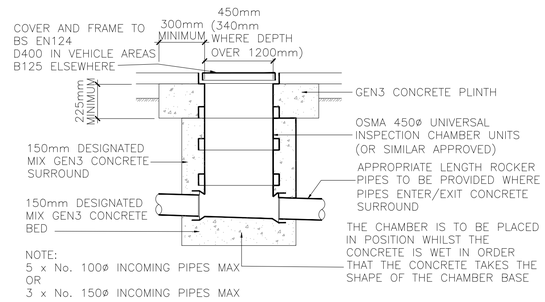


PLAN

NOTES:
CHAMBERS WITH OUTGOING PIPES GREATER THAN 500mm DIAMETER SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER SAFETY DEVICES. TOE HOLES TO BE PROVIDED IN BENCHING OF SEWERS GREATER THAN 450mm DIAMETER FOR ACCESS TO INVERT. WHERE INTERNAL HEIGHT EXCEEDS 1800mm MANHOLE MAY BE PROVIDED WITH REDUCING COVER AND SHAFT. SHAFT DIAMETER TO BE 600mm DIAMETER OR 900mm DIAMETER IF LONGER THAN 900mm.

PIPE DIAMETER	ROCKER PIPE * LENGTH
150mm-450mm	500mm-750mm
475mm-750mm	750mm-1000mm
OVER 750mm	1200mm

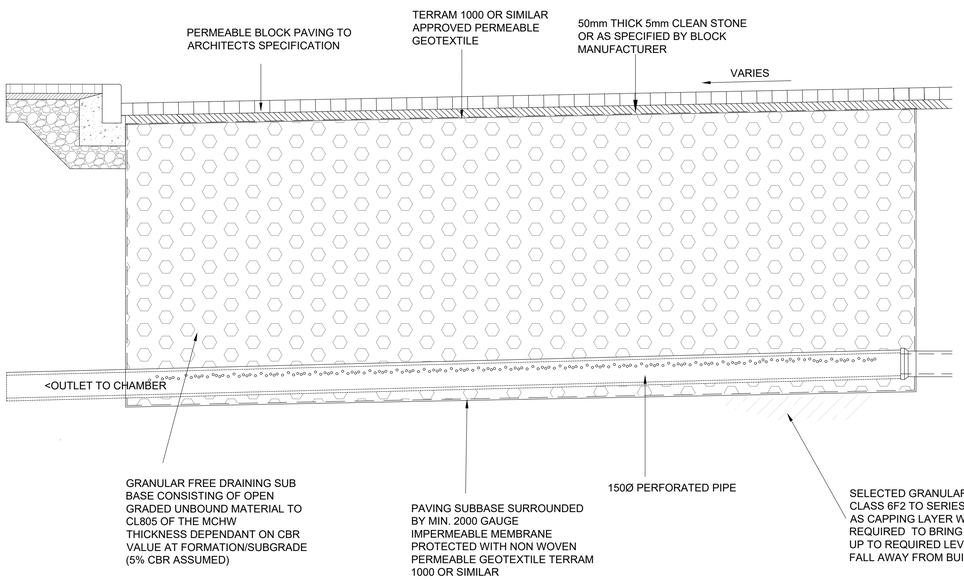
* OR LINTEL AND COMPRESSIBLE SEALANT IN ACCORDANCE WITH CLAUSE 689 OF THE SPECIFICATION.



EXTERNAL POLYPROPYLENE INSPECTION CHAMBER (PPIC)

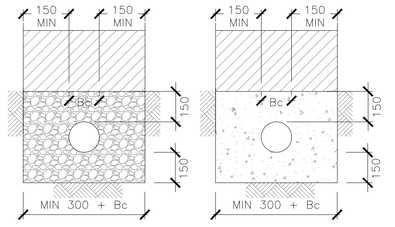
MAXIMUM DEPTH TO INVERT OF CHAMBER TO BE 1200mm (3000mm FOR REDUCED ACCESS)
CUT TO INTERMEDIATE SIZES

SCALE 1:20



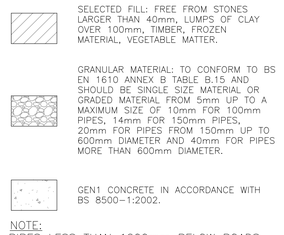
PERMEABLE PAVING DETAIL

SCALE 1:20



GENERAL PIPE BEDDING DETAIL

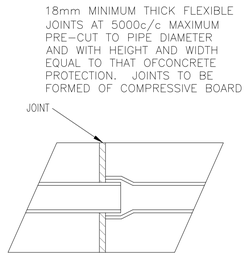
PIPE BEDDING DETAIL FOR ALL PIPES THAT PASS BELOW OR NEAR FOUNDATIONS, PIPES WITH LESS THAN 600mm COVER IN ALL EXTERNAL AREAS AND PIPES WITH LESS THAN 1200mm COVER BELOW ROADS AND DRIVEWAYS



NOTE:
PIPES LESS THAN 1200mm BELOW ROADS AND LESS THAN 600mm BELOW OTHER EXTERNAL AREAS SHALL HAVE A 150mm GEN1 CONCRETE SURROUND. OTHER THAN PIPES CAST WITHIN PILECAPS ALL PIPES BELOW SUSPENDED SLAB SHALL HAVE GRANULAR SURROUND AS SHOWN.

PIPE BEDDING DETAIL

SCALE 1:10



FLEXIBLE JOINTS IN CONCRETE PROTECTION

SCALE 1:10

Job. No.	P3508J2313	Rev.

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5. FOR GRAVITY SEWERS, ALL DRAINAGE AND FITTINGS ARE TO BE FLEXIBLY JOINTED UPVC TO BS EN 1401-1 OR CLAYWARE TO BS EN295 OR CONCRETE TO BS5911 PART 100
6. CHAMBER WALLS 225 THICK TO BE CONSTRUCTED IN CLASS B ENGINEERING BRICKS TO SHW SERIES 2400 IN DESIGNATION (i) MORTAR OR IN-SITU STRENGTH CLASS C16/20 CONCRETE TO CLAUSE 2602
7. CHAMBER WALLS AND COVER SLAB TO BE CONSTRUCTED IN PRECAST CONCRETE TO BS EN 1917 AND BS 5911-3.
8. CONCRETE MIXES INDICATED ON THIS DRAWING ARE DESIGNATED MIXES IN ACCORDANCE WITH BS8500-1:2006. ALL CONCRETE TO BE SULPHATE RESISTANT
9. BACKFILL TO ALL TRENCHES UNDER CARRIAGEWAYS TO BE TYPE 1 SUB-BASE MATERIAL, ELSEWHERE BACKFILL TO BE IN ACCORDANCE WITH THE SPECIFICATION, FREE DRAINING READILY COMPACTIBLE MATERIAL, FREE FROM RUBBISH AND ORGANIC MATTER, FROZEN SOIL CLAY LUMPS AND LARGE STONES. TO BE COMPACTED IN LAYERS NOT EXCEEDING 150mm THICK.
10. A FLEXIBLE JOINT SHALL BE PROVIDED AS CLOSE AS IS FEASIBLE TO OUTSIDE FACE OF ANY STRUCTURE INTO WHICH A PIPE IS BUILT, IN ACCORDANCE WITH THE DETAIL.
11. THE GENERAL SPECIFICATION OF MATERIALS AND WORKMANSHIPS FOR THE CONSTRUCTION OF THE ACCESS ROAD, FOOTPATHS AND OTHER AREAS OF HARDSTANDING SHALL BE THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOLUME 1: SPECIFICATION OF HIGHWAY WORKS (SHW) PUBLISHED BY THE STATIONARY OFFICE.
12. ALL PIPES TO BE LAID SOFFIT TO SOFFIT UNLESS NOTED OTHERWISE.
13. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH BS EN124 AND SHALL BE OF A NON-ROCKING DESIGN WHICH DOES NOT RELY ON THE USE OF CUSHION INSERTS. CLASS D COVERS SHALL BE USED IN CARRIAGEWAYS, HARD SHOULDERS AND PARKING AREAS USED BY ALL TYPE OF ROAD VEHICLES, CLASS C SHALL BE USED IN FOOTWAYS, PEDESTRIAN AREAS AND ALL COMPARABLE LOCATIONS.

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Amendments

Rev	Date		By	Chkd

JOMAS
Jomas Associates Ltd.
6-9 The Square
Stockley Park
UB11 1FW
Tel. 0843 2892187

Client
Waldegrave Mews Ltd

Project
Waldegrave Mews

Drawing
Proposed Drainage Details

Dwg no	Checked	Surveyor
C02	AW	
Date 25.07.21	Scale	AS SHOWN
Job No. P3508J2313		Rev. -
Grid	Contours	Level Datum

ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR
NOTE: CONTRACTOR TO NOTE THE LIKELY PRESENCE OF MULTIPLE EXISTING SERVICES.
ALL SERVICES TO BE CONFIRMED PRIOR TO CONSTRUCTION AND DIVERTED AS NECESSARY

Job No. **P3508J2313** Rev.

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STORMWATER CONCEPT LEGEND

18.30x	Proposed Level
FFL 80.90	Finished floor level
	Overland flow

Notes.

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Proposed Overland Flow

Dwg no	Checked	Surveyor
C03	AW	
Date 25.07.21	Scale 1:100 @ A1	
Job No. **P3508J2313**		Rev. -

Grid	Contours	Level Datum

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	10	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.600
Time of Entry (mins)	2.00	Include Intermediate Ground	x
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.000	2.00	11.500	1200	100.000	100.000	2.070
2	0.000	2.00	11.580	1200	100.000	95.000	2.080
3	0.025	2.00	11.600	1200	100.000	92.000	2.050
4	0.025	2.00	11.500	1200	97.000	62.000	1.750
5	0.025	2.00	11.500	1200	95.000	52.000	1.700
6	0.040	2.00	11.700	1200	60.000	50.000	1.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.004	2	1	5.000	0.600	9.500	9.430	0.070	71.4	150	3.51	50.0
1.003	3	2	3.000	0.600	9.550	9.500	0.050	60.0	150	3.44	50.0
1.002	4	3	30.150	0.600	9.750	9.550	0.200	150.7	150	3.40	50.0
1.001	5	4	10.198	0.600	9.800	9.750	0.050	204.0	150	2.79	50.0
1.000	6	5	35.057	0.600	10.200	9.800	0.400	87.6	150	2.54	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.004	1.191	21.0	15.6	1.930	1.920	0.115	0.0	96	1.302
1.003	1.301	23.0	15.6	1.900	1.930	0.115	0.0	91	1.395
1.002	0.816	14.4	12.2	1.600	1.900	0.090	0.0	106	0.913
1.001	0.700	12.4	8.8	1.550	1.600	0.065	0.0	93	0.759
1.000	1.074	19.0	5.4	1.350	1.550	0.040	0.0	55	0.927

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	19.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
10	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node 3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.550	Product Number	CTL-SHE-0098-5000-1500-5000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	10.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	13

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.500	75.0	0.0	0.501	1.0	0.0	0.800	1.0	0.0

Node 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	10.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	34

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.500	75.0	0.0	0.501	1.0	0.0	0.800	1.0	0.0

Node 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	10.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	35

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.500	75.0	0.0	0.501	1.0	0.0	0.800	1.0	0.0

Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	10.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	20

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.500	75.0	0.0	0.501	1.0	0.0	0.800	1.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	35	9.479	0.049	4.9	0.0000	0.0000	OK
60 minute winter	2	35	9.553	0.053	4.9	0.0604	0.0000	OK
15 minute winter	3	12	10.266	0.716	10.5	0.9842	0.0000	SURCHARGED
15 minute winter	4	12	10.273	0.523	9.9	0.7417	0.0000	SURCHARGED
15 minute winter	5	13	10.277	0.477	10.3	0.6798	0.0000	SURCHARGED
15 minute winter	6	13	10.287	0.087	6.3	0.1443	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	2	1.004	1	4.9	0.920	0.232	0.0266	11.6
15 minute winter	3	Hydro-Brake®	2	4.9				
15 minute winter	4	1.002	3	7.4	0.487	0.513	0.5308	
15 minute winter	5	1.001	4	5.9	0.627	0.479	0.1795	
15 minute winter	6	1.000	5	6.3	0.620	0.331	0.4935	

Results for 10 year Critical Storm Duration. Lowest mass balance: 98.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	1	56	9.479	0.049	4.9	0.0000	0.0000	OK
15 minute winter	2	7	9.553	0.053	4.9	0.0604	0.0000	OK
30 minute winter	3	28	10.822	1.272	8.8	2.2588	0.0000	SURCHARGED
30 minute winter	4	27	10.837	1.087	9.1	2.3904	0.0000	SURCHARGED
30 minute winter	5	26	10.840	1.040	11.6	2.4034	0.0000	SURCHARGED
30 minute winter	6	24	10.844	0.644	8.5	2.0823	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	2	1.004	1	4.9	0.920	0.232	0.0266	13.8
30 minute winter	3	Hydro-Brake®	2	4.9				
30 minute winter	4	1.002	3	5.5	0.420	0.381	0.5308	
30 minute winter	5	1.001	4	5.5	0.579	0.445	0.1795	
30 minute winter	6	1.000	5	7.0	0.571	0.367	0.6172	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	52	9.479	0.049	4.9	0.0000	0.0000	OK
120 minute summer	2	130	9.553	0.053	4.9	0.0604	0.0000	OK
30 minute winter	3	29	10.867	1.317	11.4	3.3345	0.0000	SURCHARGED
30 minute winter	4	29	10.883	1.133	11.1	3.4880	0.0000	SURCHARGED
30 minute winter	5	29	10.887	1.087	12.0	3.5060	0.0000	SURCHARGED
30 minute winter	6	28	10.890	0.690	10.9	3.1946	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	2	1.004	1	4.9	0.920	0.232	0.0266	30.3
30 minute winter	3	Hydro-Brake®	2	4.9				
30 minute winter	4	1.002	3	4.9	0.439	0.340	0.5308	
30 minute winter	5	1.001	4	5.2	0.570	0.423	0.1795	
30 minute winter	6	1.000	5	7.0	0.576	0.371	0.6172	

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	1	236	9.479	0.049	4.9	0.0000	0.0000	OK
60 minute summer	2	118	9.553	0.053	4.9	0.0604	0.0000	OK
60 minute winter	3	52	10.942	1.392	9.3	5.1104	0.0000	SURCHARGED
60 minute winter	4	49	10.958	1.208	8.8	5.2804	0.0000	SURCHARGED
60 minute winter	5	49	10.962	1.162	8.6	5.3024	0.0000	SURCHARGED
60 minute winter	6	47	10.966	0.766	9.0	5.0126	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	2	1.004	1	4.9	0.920	0.232	0.0266	33.2
60 minute winter	3	Hydro-Brake®	2	4.9				
60 minute winter	4	1.002	3	4.7	0.405	0.323	0.5308	
60 minute winter	5	1.001	4	4.3	0.546	0.345	0.1795	
60 minute winter	6	1.000	5	5.2	0.533	0.273	0.6172	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	58	9.480	0.050	5.0	0.0000	0.0000	OK
60 minute winter	2	58	9.554	0.054	5.0	0.0615	0.0000	OK
60 minute winter	3	58	11.080	1.530	12.0	8.4196	0.0000	SURCHARGED
60 minute winter	4	58	11.098	1.348	11.9	8.6251	0.0000	SURCHARGED
60 minute winter	5	58	11.102	1.302	11.9	8.6530	0.0000	SURCHARGED
60 minute winter	6	57	11.106	0.906	12.6	8.4019	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	2	1.004	1	5.0	0.928	0.240	0.0272	51.8
60 minute winter	3	Hydro-Brake®	2	5.0				
60 minute winter	4	1.002	3	5.0	0.438	0.344	0.5308	
60 minute winter	5	1.001	4	4.4	0.557	0.357	0.1795	
60 minute winter	6	1.000	5	4.9	0.502	0.259	0.6172	

Appendix D: SuDS Maintenance Report

WE LISTEN, WE PLAN, WE DELIVER

Geotechnical Engineering and Environmental Services across the UK.

DRAINAGE MAINTENANCE PLAN

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V1.0	26-07-21	A Wallace

Prepared by: JOMAS ASSOCIATES LTD **For** **WALDEGRAVE MEWS LTD**

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1.0 GENERAL

1.1 Sustainable Drainage Systems (SuDS) are an environmentally friendly approach to managing rainfall. SuDS techniques use landscape features to deal with surface water with the aim to:

1.1.1 Control the flow, volume and frequency of water leaving a development.

1.1.2 Prevent pollution by intercepting silt and cleaning runoff from hard surfaces.

1.1.3 Provide attractive surroundings for the community.

1.2 The surface water drainage strategy for this development utilises a soakaway as the main SUDS feature along with minor features including silt traps and sumps. The following sections provides a brief description of these features and outlines the maintenance programme that should be adopted.

2.0 CLEANING OF THE DRAINAGE SYSTEM

2.1 Drainage systems should be inspected at regular intervals and where necessary, thoroughly cleaned out at the same time. Any defects discovered should be made good.

2.2 The following operations should be carried out during the periodic cleaning of a drainage system:-

Product Type	Period	Responsibility	Maintenance Methods
Silt Trap	As necessary and before wet season	Maintenance Company for communal areas	• Sediment and debris that accumulated during summer needs to be removed before the wet season. • Inspect and clean out routinely prior to inlet pipework to minimise debris reaching the tank. • Conduct inspections more frequently during the wet season for the area where sediment or trash accumulates more often. Clean and repair as needed.
Standard Manholes/ Inspection Chambers	As necessary	Maintenance Company for communal areas	• Remove and clean any soil and vegetation that covers the manhole cover to prevent blockage of the drainage system at the manhole.

Product Type	Period	Responsibility	Maintenance Methods
			• Renew/replace any damaged/missing bolts and damaged/missing manhole covers.
Drainage Pipes	Six monthly interval	Maintenance Company for communal areas	• Inspect underground drainage pipes to ensure that the distribution pipework arrangement is operational and free from blockages. If required, take remedial action.
Permeable Paving	Monthly for 3 months	Maintenance Company for communal areas	• Inspect and identify any areas that are not operating correctly. If required, take remedial action.
	Monthly	Maintenance Company for communal areas	• Debris removal from catchment surface (where may cause risks to performance).
	Annually	Maintenance Company for communal areas	• Remove sediment from pre-treatment structures.
	As necessary	Maintenance Company for communal areas	• Repair/rehabilitation of inlets, outlet, overflows.

3.0 SKETCHES AND PLANS

3.1 The locations of the above features can be found by examining Drawing P3508J2313-C01

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