Project: Drainage and SUDS Design, 88-90 Broadwood Ave, Ruisilip

Project No: 1903-C-R01

Date: March 2020

Revision	Date	Author	Checker
-	06.03.20	AW	CA

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Executive Summary

This Drainage Assessment reviews the existing drainage arrangement at the application site and proposes a surface water drainage strategy in line with Hillingdon Council and Buckinghamshire County Council guidance.

The site is currently occupied by a single building with associated hardstanding and is located at 88 Broadwood Avenue, Ruislip.

The proposed development comprises the construction of 2 new dwellings with associated hardstanding.

While the site is less than 1 hectare in size and within flood zone 1, it is susceptible to surface water flooding.

Surface Water Drainage

The proposed strategy presented in detail in this report aims to reduce the surface water discharge to greenfield rates. All post development run-off from the entire site 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. Sustainable Drainage Systems (SuDS) shall be used, including an area of tanked permeable paving for surface water attenuation and silt traps.

It is proposed to reuse the existing sewer connections. Both foul and surface water sewer currently discharge uncontrolled into the existing chamber within the site frontage.

An additional 10% allowance for urban creep has been included in the sizing of attenuation.

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.

Overall, 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 Severn Trent Water sewers.

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1 Introduction

1.1.1 Arcelle Consulting was commissioned to undertake a Drainage Assessment for the proposed development of land located at 88 Broadwood Ave, Ruislip.

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

1.1.3 The development proposal comprises the construction of 2 new dwellings and associated hardstanding. Development proposals are provided in Appendix A.

1.1.4 The total site area is 1400 square metres. The existing development site contains a single dwelling and hardstanding and is approximately 30% impermeable. The proposed development will increase the the impermeable area.

1.1.5 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 details for planning approval.

- 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 SuDS structures, and the type of SuDS system in accordance with the CIRIA C753 SuDS Manual.

2 Site Description

2.1.1 The total site area is 1400 square metres. The existing development site contains a derelict building and hardstanding. The proposed development includes a block of flats, associated hardstanding and a garden area.

2.1.2 The site location information is as follows:

- Nearest Postcode: HA4 7XR

2.2 *Topography*

Site Topography

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

2.2.2 The site is generally rectangular in shape and flat with levels varying by only 300mm across the site.

3 Design principles and policy requirements

3.1 *General Principles for Proposed Site Run-Off*

3.1.1 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

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

3.1.3 The area in which this site is located is generally underlain by impermeable clays. A soakaway test was completed in March 2020. Water levels within the test pit did not reduce over the test period of 6 hours and so infiltration is not possible.

3.1.4 As well as the underlying ground conditions, the site and surrounds are urban in nature and have existing sewer connections. Hence it is considered that infiltration is not possible on this site.

Discharge to Surface Water Body

3.1.5 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

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

3.1.7 The existing site has a surface and foul water connection to the public sewer. It is proposed to reuse this existing connection.

3.1.8 Attenuation will be provided in the form of a large area of tanked permeable paving. The proposed attenuation structure will discharge to the private sewer on site, which in turn discharges into the Thames Water sewer in Broadwood Ave. See Appendix C for design drawings, calculations and location of Thames Water sewers.

3.2 *Sustainable Drainage Systems (SuDS)*

3.2.1 To maximise the potential use of SuDS at the site, a review has been undertaken as shown in Table 1 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 1: SuDS Selection Based on the SuDS Hierarchy

Component	Recommendation
Green (living) roofs	Whilst the use of green 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. If feasible, depending on the roof design, a green roof will provide water quality, biodiversity and aesthetic benefits to the site. Additionally, the green 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. The roof will be pitched and so is not suitable for a green roof.
Basins and Ponds	Ponds and attenuation basins can provide overland storage of surface water whilst also providing additional biodiversity and aesthetic/amenity value. There are no open areas on the site which are suitable for basins or ponds.
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.
Infiltration Devices	Infiltration devices are not suitable for this site in accordance with the recommendations of the section above.
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. A large area of tanked permeable paving is proposed for the 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

Component	Recommendation
	an acceptable discharge rate. There are no tanks proposed for the site.

4 Surface Water Drainage Design

4.1 *Surface Water Flooding*

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

4.1.2 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.

4.1.3 The map shows the entire country within four different risk categories, defined below in Table 2.

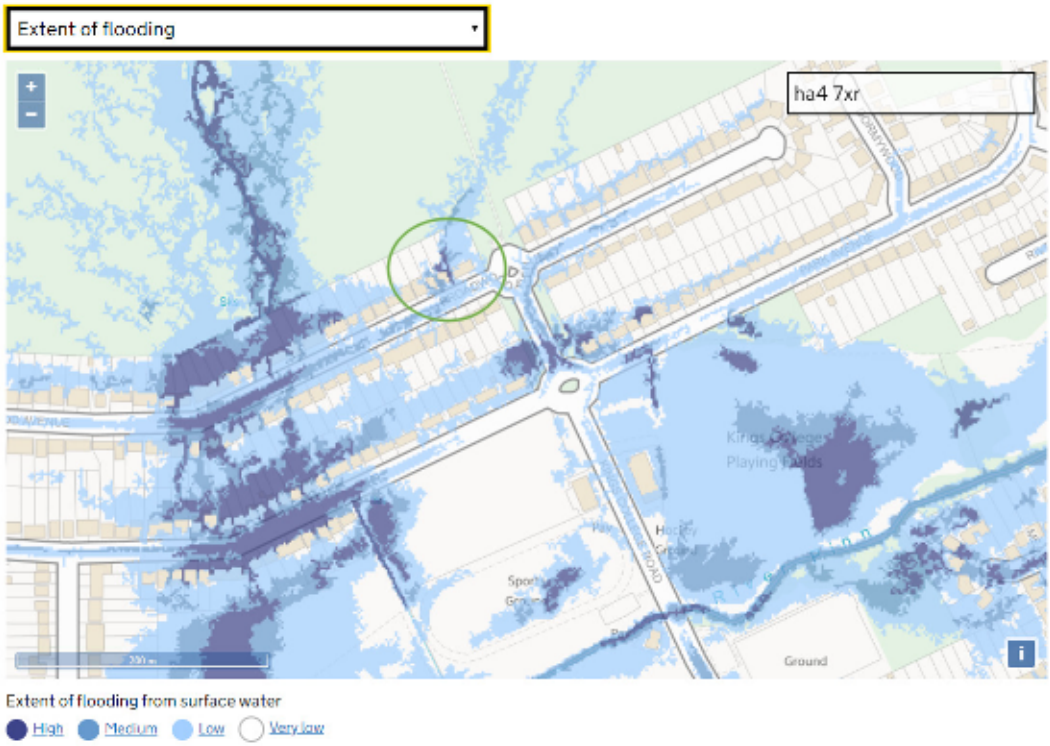
Table 2: EA Surface Water Flood Risk Categories

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%)

4.1.4 An extract of the map, provided below, shows that the area is susceptible to surface water flooding.

4.1.5 In order to ensure existing flow routes are maintained, it is proposed to maintain ground levels across the site. This will ensure existing overland flow routes are maintained. It is also proposed to construct all new areas of hardstanding in permeable paving to minimise the increase in impermeable area.

Figure 1: EA Flood Risk from Surface Water Map



4.1.6

4.2 *Surface Water Drainage*

4.2.1 The development area currently contains a single dwelling with hardstanding. The existing and proposed areas are summarised below.

Table 3: Site Areas

Parameter	Existing (m2)	Existing (%)	Proposed (m2)	Proposed (%)
Impermeable area	420	30	610	44
Permeable area	980	70	790	56
Total area	1400	100	1400	100

4.3 *Design Considerations*

4.3.1 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.

4.3.2 Site discharge should be as close to greenfield rates as possible. However, 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 5 litres/second.

4.3.3 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.

4.4 *Existing Greenfield Run-Off Rates*

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

4.4.2 The greenfield run-off rates are based on the parameters provided below in Table 4.

Table 4: Rural Run-off Calculator Parameters

Parameter	Value
Area (ha)	0.14
SAAR (mm)	654
Soil Type	6

4.4.3 The calculations are presented in Appendix C and summarised below in Table 5.

Table 5: Existing Greenfield Run-off Rates

Parameter	Value for site (l/s)
QBAR	0.62
Q1	5
Q30	5
Q100	5

4.4.4 As the greenfield rates from this site are low, in accordance with best practice, outflow controls will be set to discharge at a rate of 5 litres/second.

4.5 *Flood Risk Reduction*

4.5.1 As infiltration is not possible on this site, reducing post development run-off volumes to pre-development volumes is achieved through attenuation.

4.5.2 By controlling run-off rates to 5 litres/second and providing attenuation for all storm events up to and including a 1 in 100-year storm plus climate change allowance, the risk of downstream flooding will be minimised.

4.5.3 Details of the drainage system and attenuation structures are presented in the design drawings and calculations in Appendix C.

4.5.4 The calculations include an assessment of the attenuation for the 100-year storm +40% climate change.

4.5.5 A total attenuation volume of approximately 13 cubic metres is proposed to cater for the 100 year +40% storm event.

4.6 *Exceedance Flooding*

4.6.1 As the general layout of the site is unchanged, the proposed flow routes will mimic existing, and fall toward the neighbouring property and street frontages.

4.6.2 It should be noted that 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 flow route will only be in use in the event of drainage network failure or storms in excess of the 1 in 100 year + 40% climate change storm.

4.7 *Consents, Offsite Works and Diversions*

4.7.1 The proposed surface water drainage strategy is accommodated entirely on-site, with the only requirement for off-site works being the indirect sewer connection to the Thames Water sewer.

4.8 *Maintenance*

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

5 Foul Run-off

5.1 *Discharge to Public Sewer Network*

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

5.1.2 The identified point of connection from the site is into the private foul sewer network at the site frontage which in turn discharges into the Thames Water sewer in Broadwood Avenue. A Sewer connection application will be submitted to Thames Water for approval.

6 Water Quality

6.1 *Post-Development Water Quality Treatment*

6.1.1 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

6.1.2 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.

6.1.3 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]

6.1.4 The proposed drainage strategy utilises the following SuDS features:

- Permeable paving

6.1.5 The indicative SuDS mitigation indices, provided in Table 26.3 of the 2015 SuDS Manual (C753) have been reviewed for the 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.		

6.1.6 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)

6.1.7 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			

6.1.8 Therefore, it can be concluded that the provision of permeable 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).

7 Drainage during construction

7.1 *Construction Run-off Management*

7.1.1 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).

7.1.2 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.

7.2 *Management of Construction (Including Drainage)*

7.2.1 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.

7.2.2 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.

7.3 *Temporary Drainage During Construction*

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

7.3.2 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.

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

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

7.3.5 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.

7.3.6 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.

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

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

7.4 *Protection of Drainage Infrastructure during Construction*

7.4.1 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

PLANTING SCHEDULE

P01 Privet hedge
P02 Existing hedge and shrubs
P03 Privet hedge
P04 Laurel hedge
P05 Privet hedge
P06 Existing conifer hedge
P07 Existing hornbeam hedge
P08 Existing conifers mixed with red robin
P09 Existing golden privet shrubs
P10 Existing conifers
P11 Existing low shrubs
P12 Low shrubs
P13 Low shrubs
P14 Low shrubs
P15 Low shrubs
P16 Low shrubs
P17 Low shrubs

KEY

NORTH

PLANTING

LAWN

HEDGE

PAVING (permeable)

PEBBLE

CRETE GRASS

DRIVEWAY (permeable)

SHED

10m
5m
1m

SCALE AT A1:
PLANS 1:100

ISSUE
24.12.19

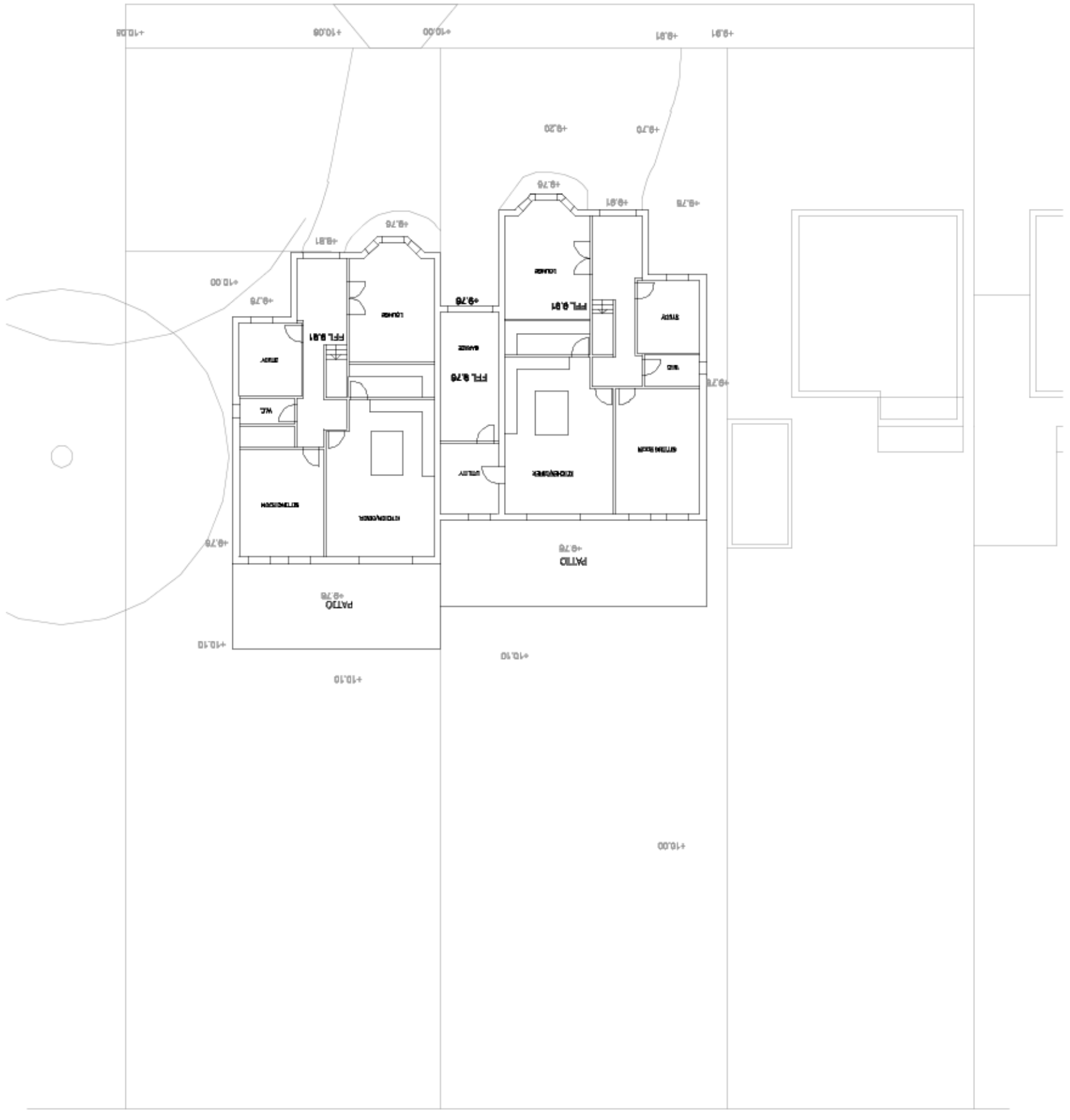
PROJECT NO.
2018/88
88 Broadwood Avenue
Ruislip, HA4 7XR

DRAWN BY
AB
DESCRIPTION
LANDSCAPE PLAN

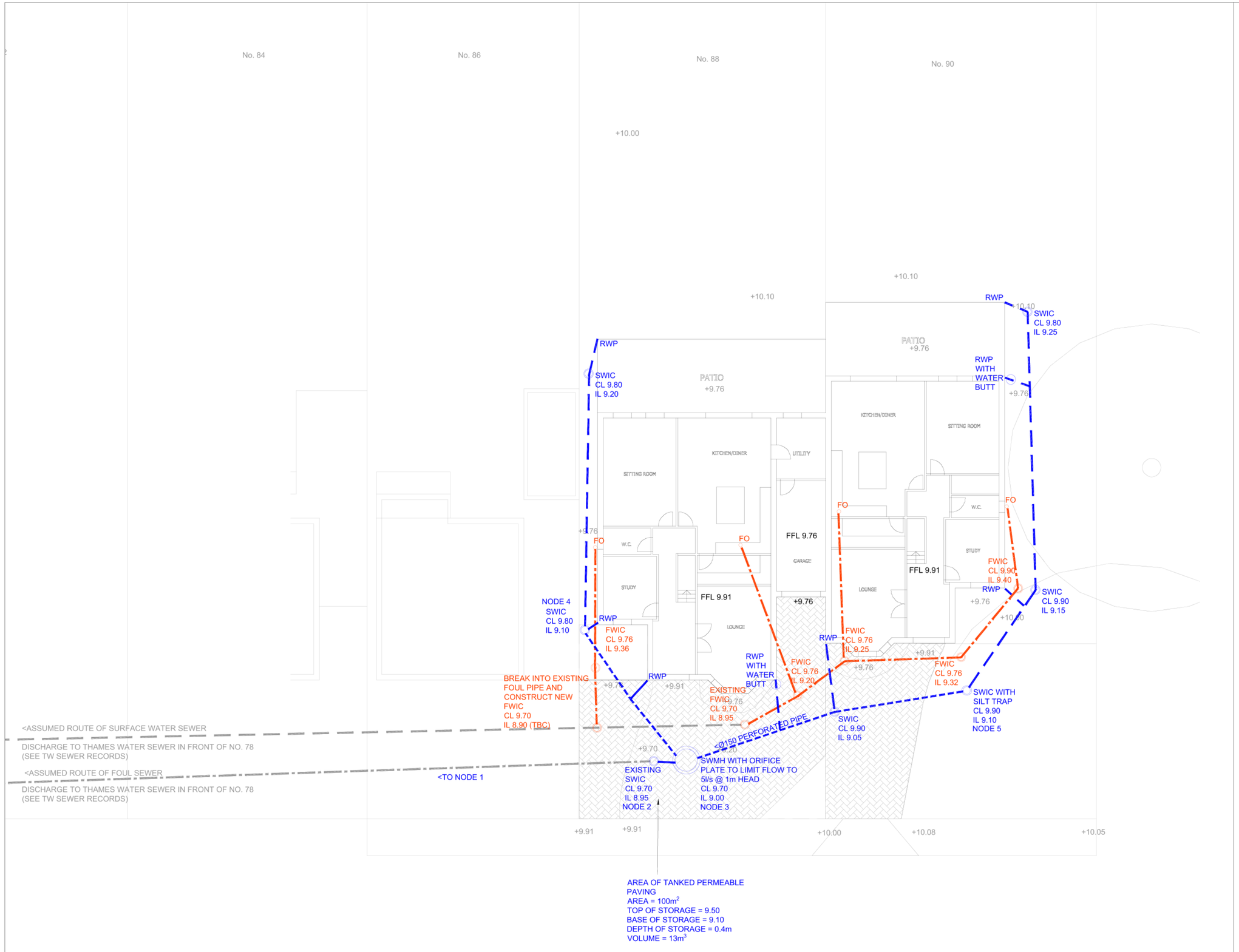
Avon Builds

2

Appendix B: Topographic Survey


+10.06
+10.00
+8.91
+8.91
+8.20
+8.70
+8.76
+8.81
+8.78
+8.81
+8.76
+10.00
+8.76
LOUNGE
FFL 8.81
STUDY
W.C.
KITCHEN/DINER
BATHROOM
FFL 8.76
GARAGE
UTILITY
LOUNGE
FFL 8.81
STUDY
W.C.
KITCHEN/DINER
BATHROOM
+8.78
PATIO
+8.78
PATIO
+8.78
+10.10
+10.10
+10.10
+10.00

Appendix C: Drainage Drawings and Calculations



Notes

1. This drawing is for planning only and to be read in conjunction with all relevant series design drawings, specifications and documentation.
2. Dimensions must not be scaled from this drawing.
3. The contractor shall be responsible for the setting out of the works and the accuracy of all dimensions. he shall satisfy himself that the information given is correct and notify the relevant parties immediately of any discrepancies.
4. The building contractor is responsible for the design and coordination of all temporary works required on this project.
5. All services are to be located by the contractor and clearly marked prior to commencing work on site.
6. Construction to be in accordance with all British and European standards and building regulations.
7. All dimensions are in millimetres and levels in metres above local datum.
8. Any discrepancies in the details shown are to be reported to the employer's representative/engineer prior to construction.
9. 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.
10. All surface water drainage is subject to detailed design and all RWP and FO shown are indicative only and subject to approval and setting out by the architect.
11. Unless noted otherwise, pipes to be:
    foul pipes under building Ø100@1:40,
    foul pipes external Ø100@1:80,
    surface water pipes Ø100@1:100

DRAINAGE KEY

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/Foul Outlet

EXTERNAL WORKS KEY

18.30+	Proposed Level
FFL 80.90	Finished floor level
	Tanked Permeable Paving - See detail

Rev	Description	Drawn Date	Checked Date
–	Preliminary	XX DDMMMYY	XX DDMMMYY

Drawn By AW Date 06.03.20 | Checked By AW Date 06.03.20 | Approved By AW Date 06.03.20

Base drawing scale 1:100 at A1

Client: BROADWOOD AVE

Project: 88-90 BROADWOOD AVE
RUISLIP

Title: DRAINAGE PLAN

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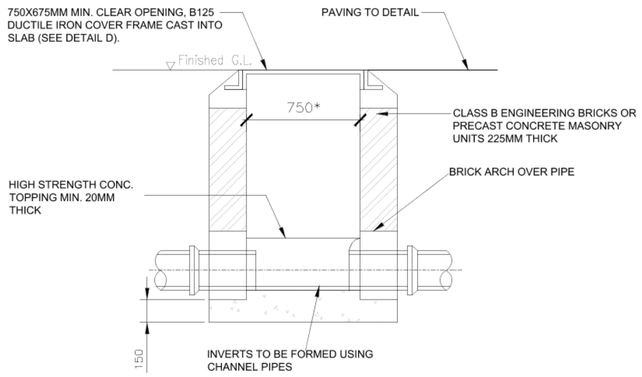
Architect: -

Drawing No. 1903/C01

Revision -

Status: Preliminary ● | Tender | Construction | As Built

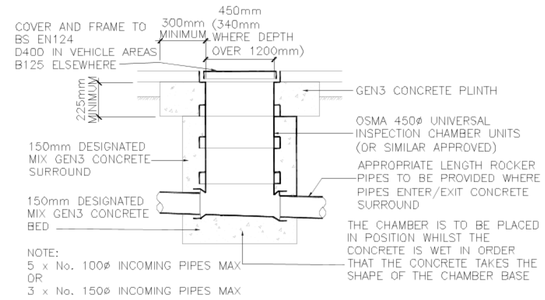


TYPICAL BRICK MANHOLE DETAIL - TYPE C

* Note 1200x750 for stormwater manhole

Max. depth from ground level to soffit of pipe 1.5m

SCALE 1:20

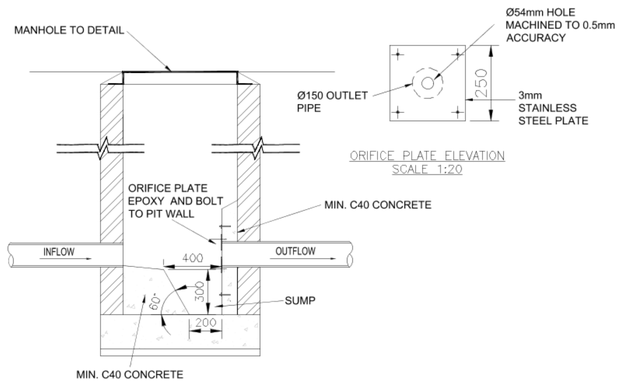


EXTERNAL POLYPROPYLENE INSPECTION CHAMBER (PPIC)

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

CUT TO INTERMEDIATE SIZES

SCALE 1:20

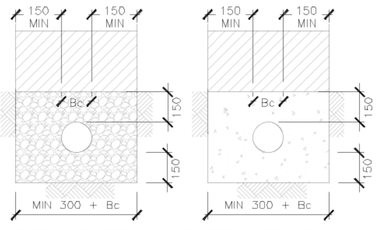


ORIFICE PLATE ELEVATION

SCALE 1:20

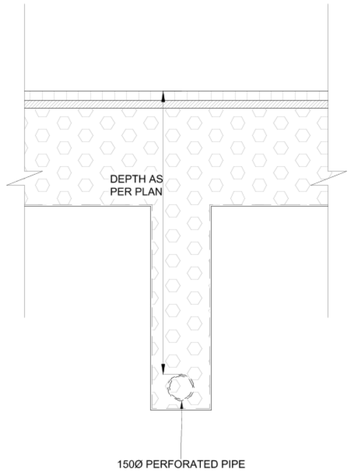
ORIFICE PLATE MANHOLE

NOT TO SCALE

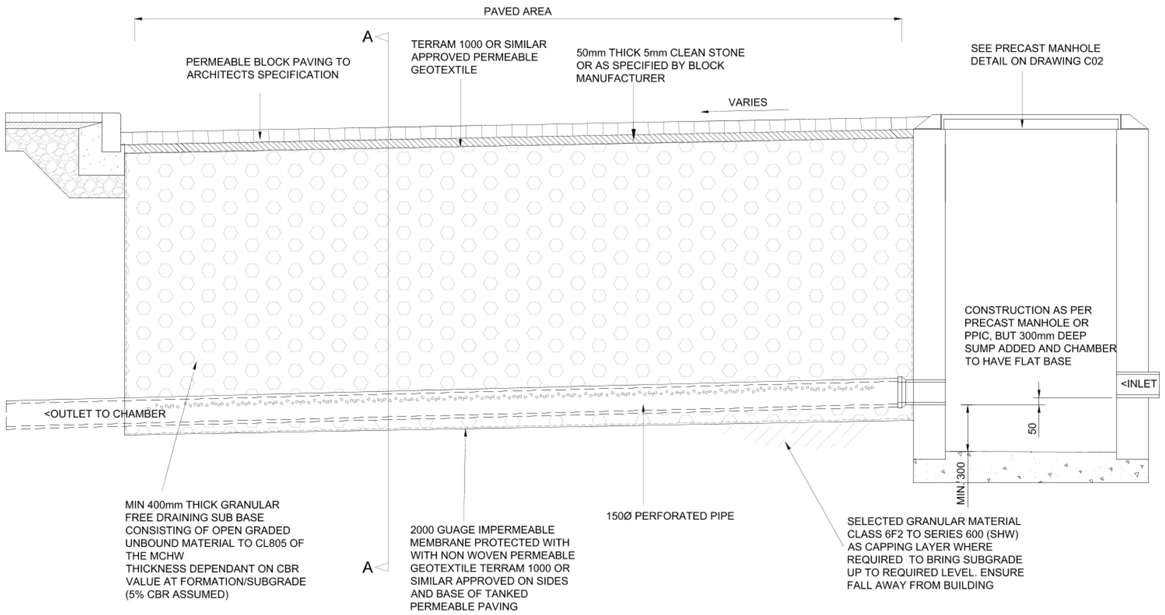


GENERAL PIPE BEDDING DETAIL

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



SECTION A-A



TANKED PERMEABLE PAVING DETAIL WITH SILT TRAP MANHOLE

SCALE 1:20

SELECTED FILL: FREE FROM STONES LARGER THAN 40mm, LUMPS OF CLAY OVER 100mm, TIMBER, FROZEN MATERIAL, VEGETABLE MATTER.

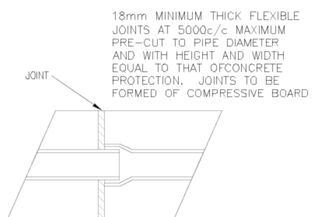
GRANULAR MATERIAL: TO CONFORM TO BS EN 1610 ANNEX B TABLE B.15 AND SHOULD BE SINGLE SIZE MATERIAL OR GRADED MATERIAL FROM 5mm UP TO A MAXIMUM SIZE OF 10mm FOR 100mm PIPES, 14mm FOR 150mm PIPES, 20mm FOR PIPES FROM 150mm UP TO 600mm DIAMETER AND 40mm FOR PIPES MORE THAN 600mm DIAMETER.

GEN1 CONCRETE IN ACCORDANCE WITH BS 8500-1:2002.

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

Notes

1. This drawing is to be read in conjunction with all relevant series design drawings, specifications and documentation.
2. Construction to be in accordance with all British and European standards and building regulations.
3. All dimensions are in millimetres and levels in metres above local datum.
4. Any discrepancies in the details shown are to be reported to the employer's representative/engineer prior to construction
5. all existing services are to be located prior to the commencement of any works. the contractor must notify the engineer immediately of any conflict with the proposed works.
6. For gravity sewers, all drainage and fittings are to be flexibly jointed UPVC to BSEN 1401-1 or clayware to BSEN 295 or concrete to BS5911 part 100
7. 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
8. Chamber walls and cover slab to be constructed in precast concrete to BSEN 1917 and BS 5911-3.
9. Concrete mixes indicated on this drawing are designated mixes in accordance with BS8500-1:2006. all concrete to be sulphate resistant
10. 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.
11. 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.
12. 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.
13. All pipes to be laid soffit to soffit unless noted otherwise.
14. Manhole covers and frames shall comply with BSEN124 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.

Rev	Description	Drawn Date	Checked Date
–	Preliminary	XX DDMMMYY	XX DDMMMYY

Drawn By	Checked By	Approved By
AW	AW	AW
Date 06.03.20	Date 06.03.20	Date 06.03.20

Base drawing scale as noted at A1

Client: BROADWOOD AVE

Project: 88-90 BROADWOOD AVE RUISLIP

Title: DRAINAGE CONSTRUCTION DETAILS

arcelle Consulting
T: 0116 254 5058 E: info@arcelleconsulting.co.uk
Leicester Office
18 De Montfort Street Leicester LE1 7GL
London Office
49 Constable House Adelaide Road London NW3 3QA

Architect	Status	
-	Preliminary	●
Drawing No. 1903/C02	Tender	
	Construction	
Revision -	As Built	

Notes

1. This drawing is for planning only and to be read in conjunction with all relevant series design drawings, specifications and documentation.
2. Dimensions must not be scaled from this drawing.
3. The contractor shall be responsible for the setting out of the works and the accuracy of all dimensions. he shall satisfy himself that the information given is correct and notify the relevant parties immediately of any discrepancies.
4. The building contractor is responsible for the design and coordination of all temporary works required on this project.
5. All services are to be located by the contractor and clearly marked prior to commencing work on site.
6. Construction to be in accordance with all British and European standards and building regulations.
7. All dimensions are in millimetres and levels in metres above local datum.
8. Any discrepancies in the details shown are to be reported to the employer's representative/engineer prior to construction.
9. 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.
10. All surface water drainage is subject to detailed design and all RWP and FO shown are indicative only and subject to approval and setting out by the architect.
11. Unless noted otherwise, pipes to be:
    foul pipes under building Ø100@1:40,
    foul pipes external Ø100@1:80,
    surface water pipes Ø100@1:100

OVERLAND FLOW LEGEND

Overland Flow Direction

Rev	Description	Drawn Date	Checked Date
–	Preliminary	XX DDMMMYY	XX DDMMMYY

Drawn By	Checked By	Approved By
AW	AW	AW
Date 06.03.20	Date 06.03.20	Date 06.03.20

Base drawing scale 1:100 at A1

Client: BROADWOOD AVE

Project: 88-90 BROADWOOD AVE RUISLIP

Title: OVERLAND FLOW PLAN

arcelle Consulting
T: 0116 254 5058 E: info@arcelleconsulting.co.uk
Leicester Office
18 De Montfort Street Leicester LE1 7GL
London Office
49 Constable House Adelaide Road London NW3 3QA

Architect: -

Drawing No. 1903/C03

Revision -

Status: Preliminary ●, Tender, Construction, As Built

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)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
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			9.000	1200	0.000	0.000	1.658
2			9.900	1200	50.000	2.000	1.717
3	0.010	5.00	9.900	1200	53.000	3.000	1.685
4	0.030	5.00	9.800	1200	48.000	16.000	1.350
5	0.030	5.00	9.800	1200	62.000	8.000	1.350

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)
1.01	2	1	50.040	0.600	8.183	7.342	0.841	59.5	150	5.87	50.0
1.02	3	2	3.162	0.600	8.215	8.183	0.032	98.8	150	5.23	50.0
1.03	4	3	13.928	0.600	8.450	8.215	0.235	59.3	150	5.18	50.0
2.00	5	3	10.296	0.600	8.450	8.215	0.235	43.8	150	5.11	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)
1.01	1.306	23.1	9.5	1.567	1.508	0.070	0.0	67	1.244
1.02	1.011	17.9	9.5	1.535	1.567	0.070	0.0	78	1.025
1.03	1.309	23.1	4.1	1.200	1.535	0.030	0.0	42	0.987
2.00	1.524	26.9	4.1	1.200	1.535	0.030	0.0	40	1.105

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.01	50.040	59.5	150	Circular	9.900	8.183	1.567	9.000	7.342	1.508
1.02	3.162	98.8	150	Circular	9.900	8.215	1.535	9.900	8.183	1.567
1.03	13.928	59.3	150	Circular	9.800	8.450	1.200	9.900	8.215	1.535
2.00	10.296	43.8	150	Circular	9.800	8.450	1.200	9.900	8.215	1.535

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.01	2	1200	Manhole	Adoptable	1	1200	Manhole	Adoptable
1.02	3	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.03	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
2.00	5	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	0.000	0.000	9.000	1.658	1200	1	1.01	7.342	150
2	50.000	2.000	9.900	1.717	1200	1	1.02	8.183	150
						0	1.01	8.183	150
3	53.000	3.000	9.900	1.685	1200	1	2.00	8.215	150
						2	1.03	8.215	150
						0	1.02	8.215	150
4	48.000	16.000	9.800	1.350	1200	0	1.03	8.450	150
5	62.000	8.000	9.800	1.350	1200	0	2.00	8.450	150

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node 3 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.800	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	5.0		
Invert Level (m)	9.000	Diameter (m)	0.053		

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	50

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	0.300	150.0	0.0	0.310	1.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 95.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	1	70	7.378	0.036	2.9	0.0000	0.0000	OK
120 minute summer	2	70	8.219	0.036	2.9	0.0408	0.0000	OK
120 minute summer	3	70	9.268	1.053	3.0	1.3168	0.0000	SURCHARGED
120 minute summer	4	70	9.269	0.819	1.8	1.2903	0.0000	SURCHARGED
120 minute summer	5	70	9.269	0.819	1.8	1.2900	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	1.01	1	2.9	0.891	0.125	0.1618	5.5
120 minute summer	3	Orifice	2	2.9				
120 minute summer	4	1.03	3	1.3	0.356	0.055	0.2452	
120 minute summer	5	2.00	3	1.3	0.414	0.047	0.1813	

Results for 10 year Critical Storm Duration. Lowest mass balance: 95.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	44	7.383	0.041	3.8	0.0000	0.0000	OK
60 minute winter	2	44	8.225	0.042	3.8	0.0470	0.0000	OK
60 minute winter	3	43	9.449	1.234	8.8	3.7470	0.0000	SURCHARGED
60 minute winter	4	43	9.450	1.000	3.8	1.5746	0.0000	SURCHARGED
60 minute winter	5	43	9.450	1.000	3.8	1.5742	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	1.01	1	3.8	0.965	0.165	0.1975	9.8
60 minute winter	3	Orifice	2	3.8				
60 minute winter	4	1.03	3	3.9	0.338	0.169	0.2452	
60 minute winter	5	2.00	3	3.7	0.398	0.136	0.1813	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	46	7.385	0.043	4.1	0.0000	0.0000	OK
60 minute winter	2	46	8.226	0.043	4.1	0.0486	0.0000	OK
60 minute winter	3	45	9.505	1.290	11.2	6.3722	0.0000	SURCHARGED
60 minute winter	4	45	9.507	1.057	5.0	1.6645	0.0000	FLOOD RISK
60 minute winter	5	45	9.506	1.056	5.0	1.6639	0.0000	FLOOD RISK

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	1.01	1	4.1	0.983	0.176	0.2066	13.8
60 minute winter	3	Orifice	2	4.1				
60 minute winter	4	1.03	3	4.7	0.338	0.205	0.2452	
60 minute winter	5	2.00	3	4.7	0.398	0.176	0.1813	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	47	7.386	0.044	4.4	0.0000	0.0000	OK
60 minute winter	2	47	8.228	0.045	4.4	0.0504	0.0000	OK
60 minute winter	3	47	9.577	1.362	14.2	9.6993	0.0000	SURCHARGED
60 minute winter	4	46	9.579	1.129	6.4	1.7781	0.0000	FLOOD RISK
60 minute winter	5	46	9.579	1.129	6.4	1.7774	0.0000	FLOOD RISK

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	1.01	1	4.4	1.002	0.189	0.2174	18.7
60 minute winter	3	Orifice	2	4.4				
60 minute winter	4	1.03	3	6.0	0.391	0.262	0.2452	
60 minute winter	5	2.00	3	6.0	0.462	0.225	0.1813	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	49	7.390	0.048	5.1	0.0000	0.0000	OK
60 minute winter	2	49	8.231	0.048	5.1	0.0546	0.0000	OK
60 minute winter	3	48	9.775	1.560	19.9	15.7189	0.0000	FLOOD RISK
60 minute winter	4	48	9.778	1.328	9.0	2.0914	0.0000	FLOOD RISK
60 minute winter	5	48	9.777	1.327	9.0	2.0905	0.0000	FLOOD RISK

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	1.01	1	5.1	1.045	0.220	0.2428	27.5
60 minute winter	3	Orifice	2	5.1				
60 minute winter	4	1.03	3	8.5	0.481	0.366	0.2452	
60 minute winter	5	2.00	3	8.5	0.481	0.314	0.1813	

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	andrew wallace
Site name:	Broadwood
Site location:	Ruislip

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:	51.58404° N
Longitude:	0.42133° W
Reference:	1440305652
Date:	Mar 06 2020 15:26

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): .14

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	654	654
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):	0.62	0.62
1 in 1 year (l/s):	0.53	0.53
1 in 30 years (l/s):	1.44	1.44
1 in 100 year (l/s):	1.99	1.99
1 in 200 years (l/s):	2.33	2.33

Asset location search

Thames Water Property Searches

wallace engineering
22,PARK RISE
HARPENDEN
HERTFORDSHIRE
AL5 3AL

Search address supplied 88
Broadwood Avenue
Ruislip
HA4 7XR

Your reference Ruislip

Our reference ALS/ALS Standard/2020_4165917

Search date 4 March 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: 88, Broadwood Avenue, Ruislip, HA4 7XR

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.

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

Affinity Water Ltd
Tamblin Way
Hatfield
AL10 9EZ
Tel: 0345 3572401

Asset location search

Property Searches

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.

Asset location search

Property Searches

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

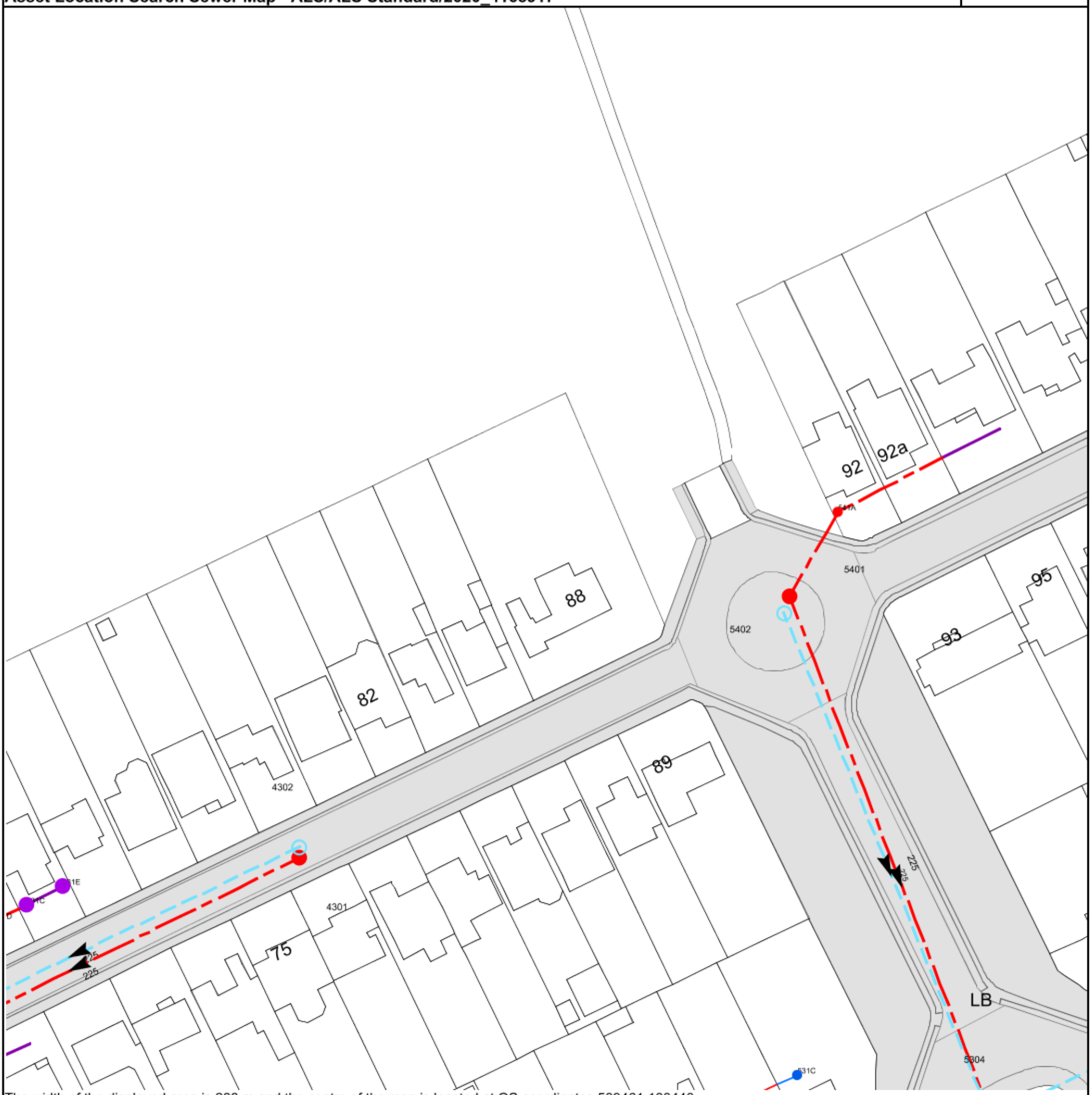
Clean Water queries

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_4165917



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 509461,188440

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

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

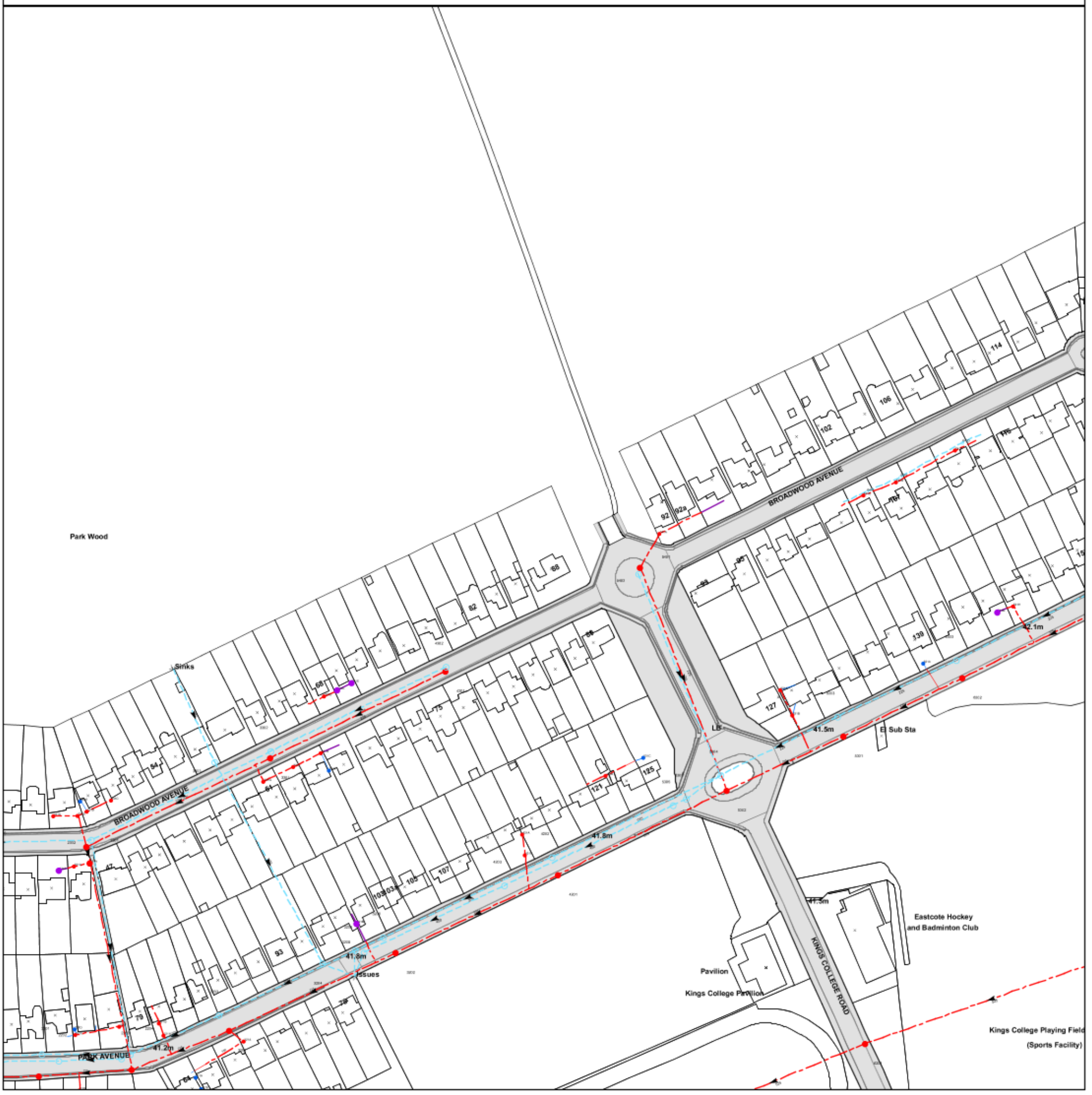
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5402	43.48	41.43
5401	43.54	41.8
531C	n/a	n/a
541A	n/a	n/a
331C	n/a	n/a
331E	n/a	n/a
4301	42.78	41.01
4302	42.8	41.32

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 Stationary Office License Number 10019345

ALS/ALS Standard/2020_4165917



Scale:	1:1792
Width:	500m
Printed By:	G1KANAGA
Print Date:	04/03/2020
Map Centre:	509460,188440
Grid Reference:	TQ0988SW

Comments:

ALS/ALS Standard/2020_4165917

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
321B		
2101	41.31	39.44
4201	41.83	40.05
5401	43.54	41.8
2202	41.28	39.53
2302	41.9	40.38
5301	41.68	40.76
4203	41.58	40.23
5302	42.2	40.61
4302	42.8	41.32
3206	41.37	40.24
5308	42.03	40.37
221H		
3201	40.99	39.66
3202	41.4	39.8
641A		
641F		
2301	42.06	40.24
2204	41.1	40.09
221A		
221C		
431A		
531C		
641C		
211A		
231C		
641E		
531A		9.4
231E		
421A		
221E		
231A		
3303	42.37	41.25
321A		
331H		
3301	42.37	40.63
641G		

REFERENCE	COVER LEVEL	INVERT LEVEL
6201	41.78	37.36
2201	41.45	40.08
5402	43.48	41.43
6303	41.96	40.71
3208	41.25	40.13
5303	41.71	40.69
3203	41.03	40.23
5304	42.22	40.57
4301	42.78	41.01
4202	41.78	40.44
5305	41.99	40.36
221G		
3205	41.3	40.21
3204	41.22	40.48
3302	42.38	40.98
641D		
6302	41.92	40.84
2203	41.13	39.58
2102	41.12	39.56
221B		
331C		
431B		
641B		
311A		
331E		
231D		
531B		8.548
331D		
631A		
221D		
221F		
231B		
541A		
331F		
331I		
331G		
641H		

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.

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.

Appendix D: SuDS Maintenance Report

Project: Drainage maintenance report, Broadwood Ave, Ruislip

Project No: 1903-C-R02

Date: March 2020

Revision	Date	Author	Checker
-	06.03.20	AW	CA

Arcelle Consulting

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London Office 49 Constable House Adelaide Road London NW3 3QA

arcelle
CIVIL & STRUCTURAL CONSULTING

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 tanked permeable paving as the main SUDS feature as well as a number of minor features (silt traps). 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	Owner/ Maintenance Company	• 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	Owner/ Maintenance Company	• Remove and clean any soil and vegetation that covers the manhole cover to prevent blockage of the drainage system at the manhole. • Renew/replace any damaged/missing bolts and damaged/missing manhole covers.

Product Type	Period	Responsibility	Maintenance Methods
Drainage Pipes	Six monthly interval	Owner/ Maintenance Company	• Inspect underground drainage pipes to ensure that the distribution pipework arrangement is operational and free from blockages. If required, take remedial action.
Orifice Plate	Monthly for 3 months	Owner/ Maintenance Company	• Inspect and identify any areas that are not operating correctly. If required, take remedial action.
	Monthly	Owner/ Maintenance Company	• Debris removal from catchment surface (where may cause risks to performance).
	Annually	Owner/ Maintenance Company	• Remove sediment from pre-treatment structures.
	Annually and after large storms	Owner/ Maintenance Company	• Inspection/check all inlets and outlets to ensure that they are in good condition and operating as designed.
Permeable Paving	As required	Site Owner for private areas. Maintenance Company for communal areas	• Inspect the paving after any precipitation to ensure no displacement of any organic matter onto the surface of the pavement.
	Six monthly (Ideally, this activity to be carried out in spring and autumn seasons)	Site Owner for private areas. Maintenance Company for communal areas	• Agitate (e.g. brush, vacuum, etc.) the block paving to ensure no vegetation of any sort is allowed to grow and develop in the joints (where may affect performance).
	Winter season	Site Owner for private areas. Maintenance Company for communal areas	• De-icing may be used without causing significant detrimental effects towards the permeable pavement's performance. When used carefully, the use of these chlorides will not result in an increase in the chloride levels in

Product Type	Period	Responsibility	Maintenance Methods
			the local ground.

3.0 Sketches and Plans

3.1 The locations of the above features can be found by examining Drawing 1903/C01