LANMOR Consulting

Civil Engineers & Transport Planners

7 Meadow Close, Ruislip

Flood Risk Assessment Including Sequential Test

October 2020

191228/FRA/JR/02

LANMOR Consulting

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1 INTRODUCTION

1.1 Scope

1.1.1 Lanmor Consulting Ltd have been commissioned to prepare a site-specific Flood Risk Assessment for the proposed development at the site of 7 Meadow Close, Ruislip, Hillingdon, HA4 8AP. Figure 1.1 below shows the location of the proposed development.

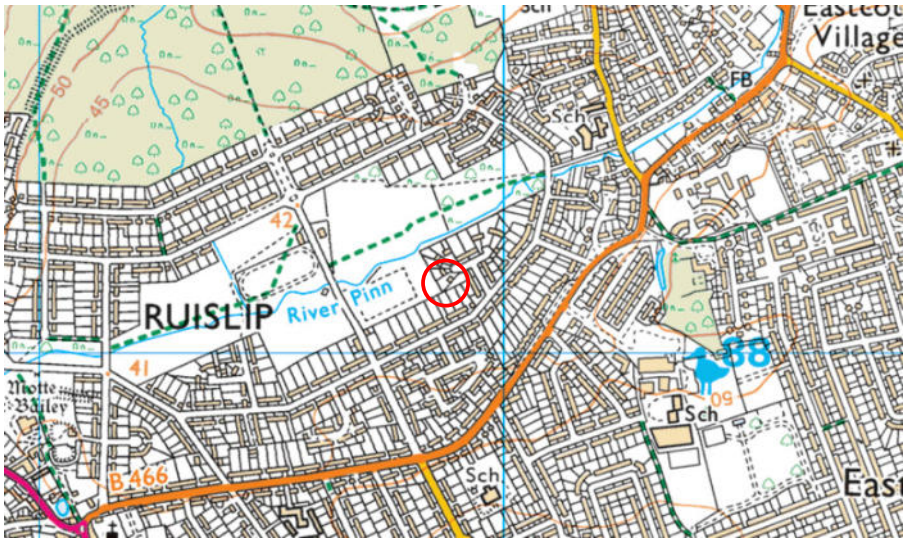


Figure 1.1 – Location Plan

1.1.2 This report describes the existing and proposed development, the implications of flooding and the impact the development will have on the flood plain in accordance with the governments guidance document; National Planning Policy Framework (NPPF) and its planning practice guidance.

1.1.3 This report will consider the following:

- Location of the site;
- Development Proposals;
- Existing information on extents and depths of flood events or on flood predictions;
- Sources of flooding;
- The impact of flooding on site;
- An assessment of the run-off likely to be generated.

1.1.4 This Flood Risk Assessment has been prepared in accordance with the requirements of the National Planning Policy Framework and will demonstrate that the proposed development will be safe and will not increase the risk of flooding in the surrounding areas.

2 BASELINE PARAMETERS

2.1 Existing

2.1.1 The existing site is located within the London Borough of Hillingdon, with an approximate site area of 1,093m^2. The River Pinn is the closet watercourse to the site, located to the north, approximately 87m away.

2.1.2 The existing site is currently located with the corner of a cul-de-sac and contains a single residential bungalow. The site falls from the northeast to the southwest, with highest levels surveyed at 42.163m to the front of the property, with lowest around 41.775m to the rear of the property.

2.1.3 The topographical survey for the site is included in Appendix A of this report.

2.2 Proposed Development

2.2.1 The proposed development will see the demolition of the existing bungalow to make way for one new detached residential dwelling. The dwelling will have two parking spaces located within the front dive, alongside new soft landscaping to accommodate new trees, hedgerows and ornamental planting. Drawing L1050 in Appendix A shows the proposed block plan for the site.

2.3 Existing Geology

2.3.1 The British Geological Survey indicates that the site has an underlying bedrock of Lambeth Group, which consists primarily of clay, silt and sand. Sedimentary Bedrock formed approximately 48 to 59 million years ago in the Palaeogene Period. Local environment previously dominated by swamps, estuaries and deltas.

2.3.2 Superficial deposits have also been recorded at the site. The superficial geology consists of Alluvium, which is made up of clay, silt, sand and gravel. These deposits were formed 2 million years ago in the Quaternary Period. Local Environment Previously dominated by rivers.

3 SOURCES OF FLOODING

3.1 Fluvial/Tidal Flooding

3.1.1 Detailed flood information was requested from the Environment Agency (EA) for this site and can be found in Appendix B. The information supplied included flood extent maps for different return periods. National Planning Policy Framework (NPPF) defines the Flood Zone as follows:

- Zone 1: 'Low Probability' This zone comprises land assessed as having a less than a 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.

- Zone 2: 'Medium Probability' – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-0.1%) in any year.

- Zone 3a: 'High Probability' – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

- Zone 3b: 'The Functional Floodplain' – This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

3.1.2 The proposed site is shown within Flood Zone 2, this is defined as land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between a 1 in 200 and 1 in 1000 annual probability of sea flooding in any year. The site is not at risk of tidal flooding. Figure 3.1 below shows an extract from the Environment Agency Flood Map for Planning.

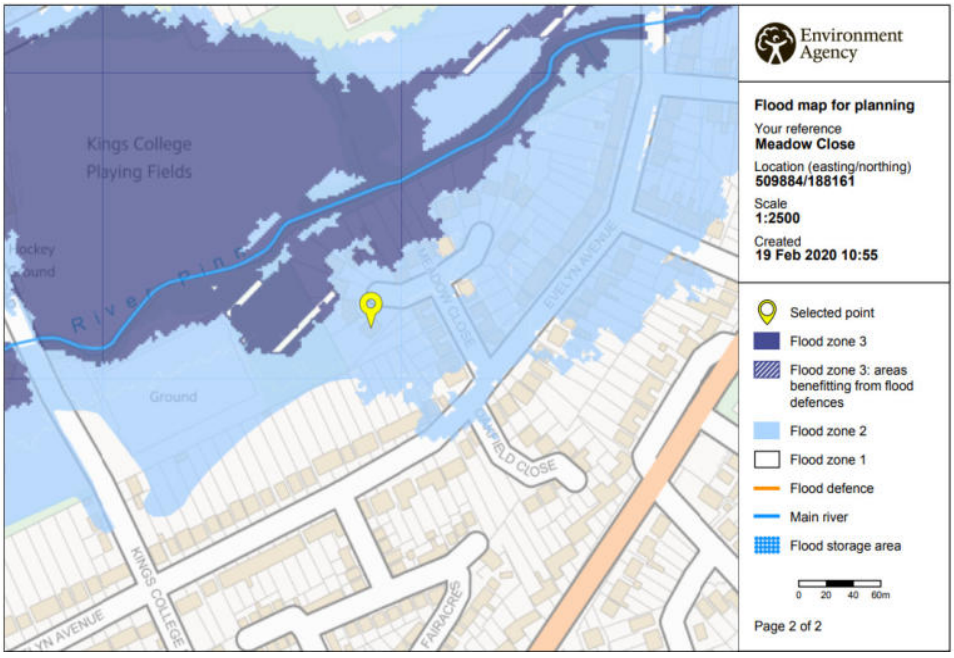


Figure 3.1 – EA Flood Map

3.1.3 The Environment Agency online mapping of the extent of surface water flooding in the local area shows that the site is not at risk of surface water flooding except for some spots in the rear garden. Figure 3.2 below indicates that areas prone to surface water flooding with depths of between 0mm to 900mm. The majority of the site is at very low risk of surface water flooding.

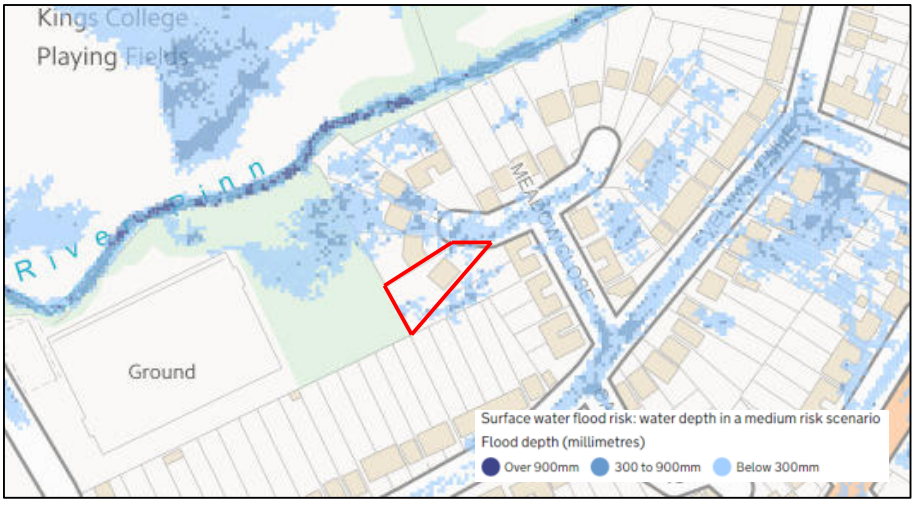


Figure 3.2 – Surface Water Flood Map

3.1.4 The West London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow have commissioned the production of a joint Level 1 Strategic Flood Risk Assessment. The mapping provided for the surface water flood extents matches that shown in figure 3.1 above.

3.2 Groundwater Flooding

3.2.1 The SFRA for West London have also provided mapping for the areas susceptible to groundwater flooding. According to the mapping the site is located within an area which has a '>=25% <50%' probability of experiencing groundwater flooding. Figure 3.3 below has been extracted from the online portal for groundwater flooding.

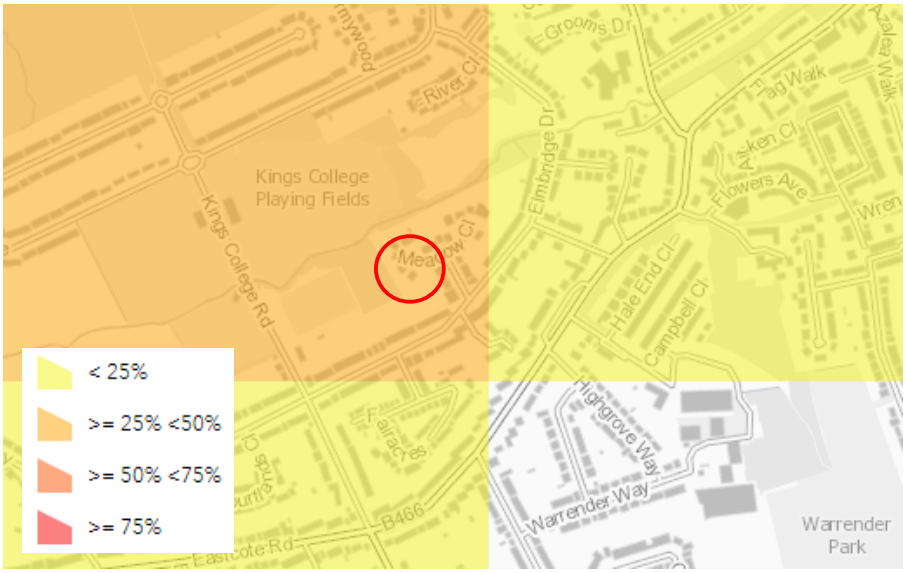


Figure 3.3 – Groundwater Flood Map

3.3 Sewer Flooding

3.3.1 The SFRA for West London have provided details with regard to sewer flooding in terms of postal codes. Figure 3.4 below has been extracted from the mapping portal and indicates that 7 Meadow Close is located within an area which has experienced between 1-20 flood events caused by sewers.

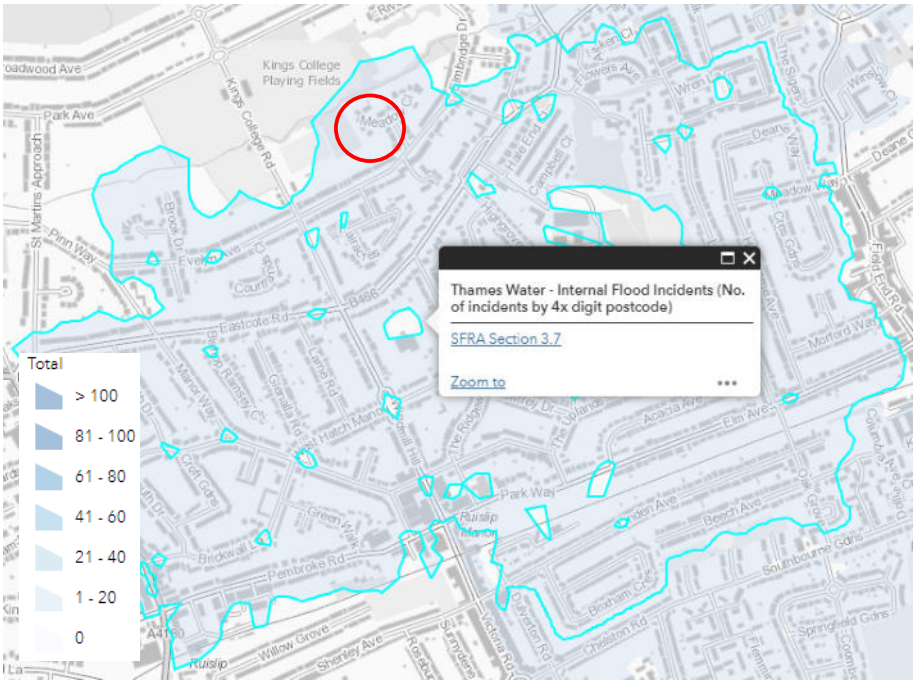


Figure 3.4 – Sewer Flood Records

3.4 Flooding from Reservoirs

3.4.1 The EA's mapping indicates the site is not at risk of flooding from a failure of any reservoirs.

4 MODELLED FLOOD EVENTS AND CLIMATE CHANGE

4.1 Modelled Flood Levels

4.1.1 The principal source of flooding to the site comes from the River Pinn which is located approximately 87m away to the north of the site flowing east to west. The site is shown to be in Flood Zone 2 as indicated on the Environment Agency (EA) flood mapping.

4.1.2 Flood levels have been provided by the EA for the various storm return periods plus climate change allowances, including the 1% AEP + 35% CC. The level for the 1% AEP + 35% CC provided by the EA is 41.98m. When these flood levels are compared to the ground levels the rear garden of the existing dwelling the flood extent will encourage into the rear garden. The rear garden falls away from the property. The lowest levels at the site are located along the southwestern boundary, which are 41.789 and 41.775.

4.2 Climate Change

4.2.1 Climate change allowances have been published by the Environment Agency. The allowance to be applied is based on the river basin district, flood zone and site vulnerability. The site lies within the Thames River Basin District. The site is located within Flood Zone 2 and is a More Vulnerable development. Based on this the Environment Agencies guidance suggests the central or higher central bands be used for climate change allowances.

4.2.2 Paragraph 26 of the Flood risk and coastal change Guidance published by the Department for Communities and Local Government on the 6th of March 2014 states that:

4.2.3 “Developers would be expected to justify why they have adopted a given lifetime for the development, for example, when they are preparing a site-specific flood risk assessment”.

4.2.4 Given that the development is classed as More Vulnerable under the Nation Planning Policy Framework, is in Flood Zone 2 and has a proposed design life of 100 years, the climate change should be based on the central to higher central allowance category (25% and 35% respectively). Flood level for the 35% climate change allowance has been provided by the EA and will be used for the benefit of this assessment.

5 IMPACT ON FLOODING

5.1 Impact on Flood Waters

5.1.1 The proposed development will see the demolition of the existing dwelling to make way for one new residential dwellings. The site is located outside of the 1 in 100 year flood extent, however is it located within the EA's flood extent for the 1% + 35% CC event. The proposed dwelling will have a finished floor level of 42.53m which is more than 500mm above the estimated flood level. The dwelling will also be constructed above the flood extent for a 100 year + 35%. The underside of the ground floor slab will be above the flood level, voids will be provided around the perimeter of the building to allow flood waters to flow free in and out of the area.

5.1.2 The voids will be 1m wide at maximum of 5m intervals, the voids will open from under ground floor slab down to ground level. Therefore, it is concluded that the flow of flood waters for the design event will not be restricted by the development proposals.

5.2 Impact on Storage Volumes

5.2.1 The existing site is located in Flood Zone 2, which is outside of the 1 in 100 year flooding extent (Flood Zone 3). As mentioned previously, the site could be prone to flooding when climate change allowances are factored in. Drawing 191228-FRA-01 in Appendix B show the extent of flooding once climate change allowances have been factored in.

5.2.2 As shown in the drawing, the 35% CC extent is restricted to the rear garden of the existing plot. Currently, there is small section of higher ground located in the rear garden which is indicated to be free from flooding. Drawing 191228-FRA-03 in Appendix B shows the existing flood volumes for the current site for the design flood event with a probability of 1.0% plus a 35% allowance.

5.2.3 As part of the proposals the rear garden will be re-profiled and the higher ground lowered. The proposed development will consist of 2 new residential properties replacing the existing. The new properties will extend in the rear garden compared to the existing site and in the area of flood extent for the 1.0% probability event plus 35%.

5.2.4 The proposed buildings as explained above will have suspended floors above the flood level so with voids around the perimeter to allow flood water to enter under the property so the flood storage volumes across the site can be maintained.

5.2.5 Drawing 191228-FRA-04 included in Appendix B shows the proposed flood volumes achievable post development. The floor level of the proposed dwelling will be located more 500mm above the 1% AEP + 35% CC flood extent and the underside of the floor slab will be 42.03m AOD, 50mm above the flood level and with therefore not result in the loss of flood storage across the site.

5.3 Impact of Flooding on Development

5.3.1 The EA flood modelling has shown that the existing site is located in Flood Zone 2. The proposed dwelling will also be located in Flood Zone 2. Flooding from a 1 in 100 year storm will therefore have no impact on the building. Although the site is susceptible to flooding from the 1% AEP +35% CC extent, as mentioned previously the finished floor levels will be a minimum of 500mm above the flood level for the 1.0 AEP +35% so it will not suffer damage from such a flood event.

5.4 Access from Site

5.4.1 The site is located approximately 87m to south of the nearest watercourse. The site is located Flood Zone 2, with the closest area of Flood Zone 1 being located on Evelyn Road to the south, approximately 184m walk. As mentioned, the development is not at risk of fluvial flooding from a 1 in 100 year storm, however it is susceptible to flooding from a 1% AEP + 35% CC flood. As stated, the proposed dwelling will have finished floor levels set a minimum of 500mm above the 35% CC flood level.

5.4.2 The footpath located to the north of the site, running alongside Meadow Close, is also at a higher level that the 1 in 100 +35 % CC extent. Therefore, a safe and dry access to and from the site can be provided at all times.

5.4.3 If for any reason it is not possible to leave the dwelling, residents are able to stay within their home since the FFL are set higher than the estimated flood level.

5.5 Residual Risk

5.5.1 The building is located in Flood Zone 2, the properties will be free from flood waters generated by a 1 in 100 year +35% storm event, it is therefore concluded that the residual risk for this development will be low.

6 SEQUENTIAL TEST

6.1 Approach

6.1.1 The principal of the sequential test is to assess locations and prioritise developments to area at less risk of flooding. National Planning Policy Framework suggests that Regional Planning Bodies and Local Planning Authorities should ensure their regional spatial strategies include a broad consideration of flood risk.

6.1.2 The Application site is located partly in flood zone 2 and therefore a sequential test has been completed to assess the sites suitability for development.

6.2 Investigation

6.2.1 In accordance with the National Planning Policy Framework 2019, Councils should identify a 5 year housing land of deliverable sites. The NPPF sets out the requirement for local planning authorities to identify and update annually a supply of specific deliverable sites to provide a minimum of 5 years' worth of housing against their housing requirement set out in adopted strategic policies.

6.2.2 In 2017, a Strategic Housing Land Availability Assessment (SHLAA) for London was carried out. Within the document it states that that London has the capacity for 649,350 more homes during the 10 year period covered by the London Plan housing targets (from 2019 to 2029), which equates to an average of 64,935 homes a year.

6.2.3 According to the SHLAA, 21% of the total number of homes is expected to be built in West London with the London Borough of Hillingdon expected to build between 15,000 to 19,999 homes between the 10 year period. Figure 2.1 below shows the extracted figure from the SHLAA report with regard to housing capacity by local council planning authority.

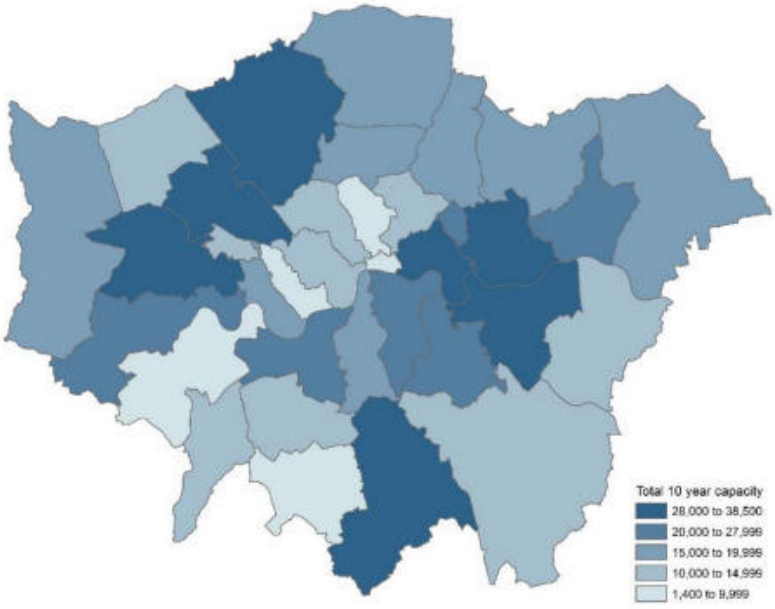


Figure 6.1 – Housing Capacity by local council

6.2.4 The London Borough of Hillingdon adopted their Local Plan in September 2013. Part 2 of the plan was adopted in January 2020, which, through the allocation of sites and Development Management Policies, sets out how the LPA will deliver the growth set out in the Local Plan Part 1 (Strategic Policies).

6.2.5 During the assessment of Local Plan Part 2, the Inspector charged with assessing Soundness of the Plan, confirmed that the LPA have committed to an early review of the Plan, to account for the growth sought by the Intend to Publish London Plan. The commitment to an early review is recognition of both the length of time that passed between adoption of Part 1 of the Plan and Part 2 of the Plan and to take account of the Intend to Publish London Plan housing target for Hillingdon of 10,830 dwellings (1,083 dwellings per annum). It should be noted, at this juncture, that the housing target should not be seen as a numerical cap for development, and exceedance of this figure, through sustainable development, is encouraged.

6.2.6 The borough's current housing target as set out in part 1 is to provide an additional 4,250 dwellings, annualised as 425 dwellings per year, for the ten year period between 2011 and 2021. Rolled forward to 2026, this target equates to a minimum provision of 6,375 dwellings over the period of the Hillingdon Local Plan.

6.2.7 The Spatial Development Strategy for London consolidated with alterations since 2011 (hereafter referred to as the London Plan) was published in March 2015 and increases Hillingdon's target to 5,590 dwellings, for the ten year period between 2011 and 2021, equating to 559 new dwellings per year.

6.2.8 The above target does not take account the revised targets in the draft local plan or the latest Intend to Publish London Plan which sets a higher target of 1,083 dwelling per year compared to the councils current target of 559 per year.

6.2.9 The London Borough of Hillingdon adopted their Local Plan in September 2013. Part 2 of the plan was adopted in January 2020 and detailed the proposed site allocations, it lists potential sites for future developments. The LPA assert that, when considered against the annualized target of 1,083 dwellings per annum, there are able to show 6.22 years of Housing Land Supply. The Supply is, in the main, made up of sites that have secured Planning Consent and subsequently been allocated in Local Plan Part 2.

6.2.10 The nature of the allocations essentially front load the delivery to the first five years of the plan, given that the majority of sites benefit from consent are either under construction or indeed complete. This is a symptom of the retrospective nature of the Site Allocations in Local Plan Part 2, which sought to allocate consented sites.

6.2.11 The allocated site document provides a list of 48 sites, three of which are located in or have part of the site in Flood Zone 2 or 3. The local plan part 2 shows that of the site in flood zones 2 or 3 there is a substantial area in zone 1 that could accommodate development.

6.2.12 One of the allocated sites Royal Quay, Summerhouse Lane is indicated to provided 87 units in the period 2016-2021. The site is within flood zones 1, 2 and 3, in the allocation document it is assumed that sufficient development with be provided outside of zones 2 & 3. The FRA for the overall development states that the southern end of Block E and a thin strip along the eastern edge of Block D are within flood zone 3.

6.2.13 Another site allocated in the document is St Andrews Park, this site is identified as having capacity for 1,340 dwellings, it is located in flood zones 3b, 3a, 2 and 1. The assess states sufficient developable area is provided in flood zone 1. The FRA approved for the development states that some elements of residential development area are affected by flooding and therefore flood compensation has been approved. This demonstrates that part of the development is within flood 3.

6.2.14 The application site is a small site and therefore considered a windfall site, the council doesn't have a list of windfall sites to compare against because of the natural of these types of development. It is therefore difficult to compare the application site to other sites sequentially. A review of local sites in the area that could be demolished to make way for a new dwelling found there were many potential sites but none were available as they are all developed.

6.2.15 In terms of need for housing the local plan shows that up to 2021 3,261 residential units are potentially achievable and between 2021-2026 5,258 units have been identified. Based on the allocated sites over the next five years an average of 1051 units per year which is slightly less than targets in the London Plan, so even with the allocated sites additional housing will be required to meet the emerging housing targets.

6.2.16 The review of the local sites could not find sites suitable for development that were at less risk of flooding, the council are short of the emerging target for new dwelling in the borough and that they have already consented 2 sites "St Andrews" & "Royal Quay" in the allocation document, it is considered that Hillingdon accepted that new residential development is required in areas at greater flood risk.

6.2.17 It is therefore considered the site meets the requirements of the sequential test as there no other sites at less of flooding and approvals have been grated for developments partly in zone 3 which is at higher risk than the application site.

6.2.18 The proposals involve the construction of a new dwelling in an area identified as flood zone 2, the dwelling will replace an existing dwelling so there will not be any increase in the number of people in a flood risk zone. As there will be no greater demand placed on the emergency services as the dwelling will be a straight replacement the proposals are considered to meet the sequential test.

6.2.19 As the development is within flood 2 the exception test needs to be applied. To meet the exception test it must be demonstrated that

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

(b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

6.2.20 The site will provided housing needed to meet the housing targets in the emerging London Plan which the councils current allocations do not meet, therefore the site will assist in the council meeting housing needs which out weight the flood risk as there are no other site at less risk of flooding, satisfying part a of the exception test.

6.2.21 The proposed development will raise the ground floor level above the estimated flood levels, compensation will be provided on site to ensure flood risk in the area is not increased and a safe dry access can be provided from the front of the building to Meadow Close which is in flood zone 1 in compliance with part b of the sequential test.

6.2.22 The application site meets the requirements of both the sequential and exception test and is therefore suitable for development.

7 ONSITE DRAINAGE

7.1 Existing Drainage

7.1.1 As part of the investigation into the existing drainage regime, Thames Water sewer records were obtained. According to the mapping there is an existing foul water sewer located just to the northeast of the site beneath Meadow Close. The sewer consists of a 225mm diameter pipe which falls away from the site to the north west.

7.1.2 The nearest manhole to the site is located just outside of the sites entrance and is listed as 8101. The manhole has a cover level of 42.13m and an invert level of 41.60m.

7.1.3 There is also a Thames Water surface water sewer located beneath Meadow Close. The sewer consists of a 750mm diameter pipe which falls towards the River Pinn located to the north/northwest of the site.

7.1.4 The nearest manhole to the site is located just outside by the entrance and is listed as 9106. The manhole has a cover level 42.11m and an invert level 40.86m. The Thames Water asset records can be found in Appendix C of this report.

7.2 Proposed Drainage

7.2.1 Foul water discharge from the development will simply flow to the existing Thames Water foul sewer located beneath Meadow Close. A section 106 application will be made post planning approval.

7.2.2 Sustainable Drainage Systems (SuDS) were considered as part of this assessment for disposal of Surface Water run from the development. The proposed buildings will have pitched roofs and so the use of green or blue roofs is not viable for the new development and have therefore been discounted.

7.2.3 Rainwater harvesting was also considered to reuse surface water runoff within the dwelling. These systems require a separate network of pipework in the property, tanks and pumps to store the rainwater and distribute it throughout the building. Rainwater harvesting is suitable for large scale developments where the uptake matches the runoff.

7.2.4 Also, if there were consecutive storms the harvesting tank would be full at the start of the storm and all the runoff would discharge via the overflow, so the attenuation would need to be sized ignoring the harvesting facility. Given the rainwater harvesting cannot be relied upon to reduce the rate of runoff from the site and the additional costs for the necessary infrastructure to implement it, rainwater harvesting has therefore been discounted.

7.2.5 Next on the sustainable drainage hierarchy is the use of ground infiltration techniques such as soakaways and infiltration basins. Local geology records indicate that the underlying bedrock consists of clay. Therefore, due to poor ground conditions, discharge of surface water run-off via infiltration systems has been discounted.

7.2.6 Discharge to watercourse is the next option on the drainage hierarchy. The River Pinn is located approximately 87m away to the north of the site, however this is deemed to be too far from site to discharge directly to it. Therefore this method has been discounted also.

7.2.7 Thames Water asset records indicate that there is an existing Thames Water regime located beneath Meadow Close to the northeast of the site. Therefore, in accordance with the Sustainable Drainage Hierarchy, the surface water run-off will be collected and stored within an attenuation tank before discharge to the nearby Thames Water manhole via a pumping station at a restricted rate.

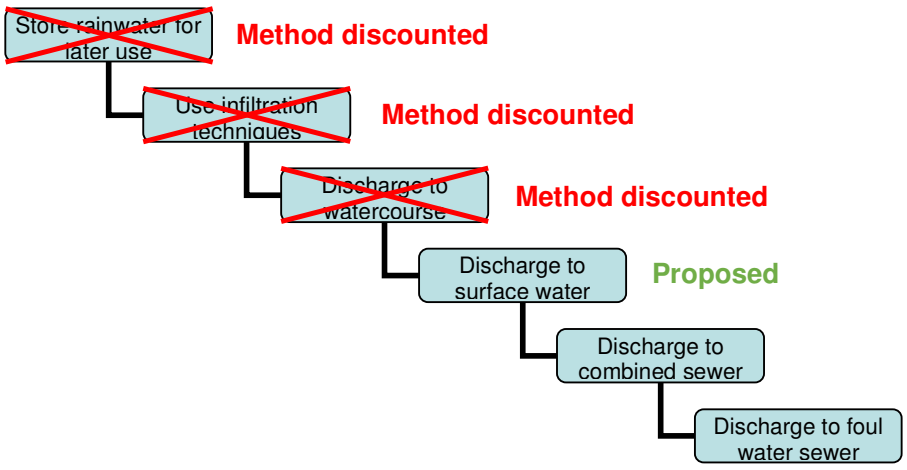


Figure 7.1 – Sustainable Drainage Hierarchy

7.2.8 Calculations have been undertaken to determine the existing brownfield run-off rates for the site, to set the maximum rate from the proposed development. These are tabulated below in table 7.1.

Return Period	Brownfield Rate	Proposed Rate	Percentage Decrease
Q_{bar}	-	-	
1 in 1	8.80 l/s	4.40	50%
1 in 30	21.25 l/s	4.40	79%
1 in 100	27.75 l/s	4.40	84%
1 in 100 +40% CC	39.10 l/s	4.40	88%

Table 7.1 – Existing and Proposed Discharge Rates

7.2.9 As you can see from the table above, the 1 in 1 year brownfield run-off rate has been calculated at 8.8 l/s. It would be fine to use this rate for the proposed drainage system, however it is recommended to reduce this flow to relieve strain on the existing Thames Water sewer. Therefore the discharge rate of 4.4 l/s has been proposed.

7.2.10 The proposed buildings will drain via rainwater pipes from the roof to a series of manholes and pipes, before discharging to an attenuation tank located beneath the driveway of the first property.

7.2.11 The tank has been designed to cater for all storms up to and including the 1 in 100 + 40% climate change allowance. The tank will be sized at 7.0m x 2.0m x 0.8m to provide storage of up to 11.2m^3. The attenuation tank will take the form of underground crate systems with catchpits on the inlet and outlet to collect silt and pollutants in the run-off. A typical layout for the attenuation tank is provided below.

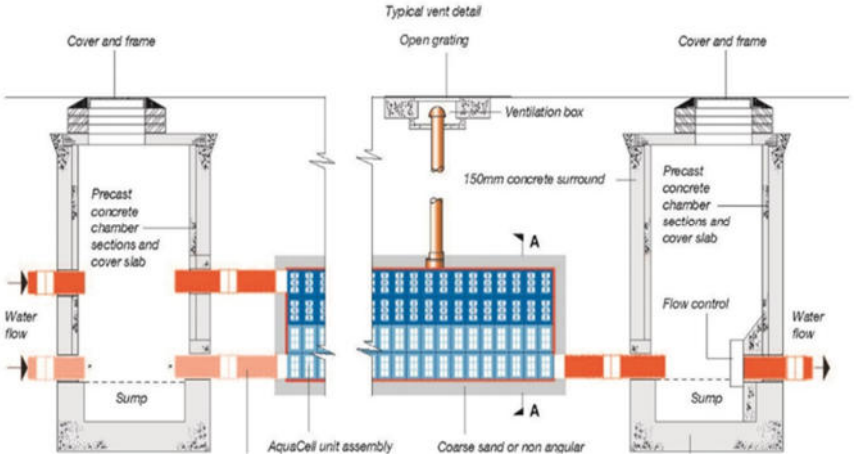


Figure 7.2 – Aquacell Attenuation Tank

7.2.12 An indicative drainage layout for the proposed development has been prepared and is included in Appendix D as drawing 191228/DS/02. Micro Drainage has been used to design the attenuation tank system and a copy of these calculations are included in Appendix E.

8 SURFACE WATER/SUDS MAINTENANCE

8.1 Maintenance

8.1.1 Regularly inspection of the surface water drainage network for blockages and clearing unwanted debris / silt from the system should improve the performance of the surface water network and decrease the need for future repairs. In the event of blockages, high pressure water jets can be used to clear the gullies and pipes to ensure they are functioning correctly, this should be undertaken by certified trained professionals.

8.1.2 The level and frequency of maintenance required on site is dependent on the type of facility. The type of maintenance will fall into one of three categories “regular maintenance”, “occasional maintenance” and “remedial maintenance”.

8.1.3 Regular maintenance of the drainage and SuDS features will include, inspections, removal of litter / debris and sweeping of the surfaces. Occasional maintenance will include removal of sediment etc. and remedial maintenance may include structural repairs and infiltration reconditioning if required.

8.1.4 The drainage and SuDS elements after an initial inspection following construction should be inspected on a monthly basis for the first 12 months and after large storms, thereafter the following maintenance regime should be applied and adjusted if the 12-month monitoring process has identified any issues.

8.1.5 Following completion of the development a Management Company will be set up to maintain all the communal areas, including the drainage. It will be their responsibility to maintain the drainage network, including the SuDS elements.

8.2 Attenuation Tanks

8.2.1 For the attenuation tanks, the following maintenance is recommended.

Attenuation Tank Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required take remedial action	Annually
	Remove debris from the catchment surface (where it may cause risk to performance).	Monthly
	For systems where rainfall infiltrates in the tank from above, check surface of filter for blockage by sediment, algae or other matter, remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures.	Annually or as required
Remedial Actions	Repair/rehabilitate inlets/outlets, overflows and vents.	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tanks for sediment build-up and remove if necessary	Every 5 years or as required

Table 8.1 – Attenuation Tank Maintenance

9 SUMMARY AND CONCLUSION

9.1.1 This Flood Risk assessment has been prepared for the proposed development of one new detached dwelling at 7 Meadow Close, Ruislip, Hillingdon, HA4 8AP. The report has considered all aspects of flooding in the area that might impact the proposed development.

9.1.2 The development site is located within Flood Zone 2, according to the Environment Agency's flood mapping, with the greatest risk of flooding from the River Pinn, which is located approximately 87m to the north of the site.

9.1.3 The development proposal will increase the overall footprint and since the development is located within the 1%AEP + 35% CC flood extent, the site is susceptible to flooding, however since the proposals will have finished floor levels more than 500mm above the flood level and flood voids will be implemented within the design, there will be no impact on the flow of waters and there will be no loss of flood storage.

9.1.4 As part of this report, an investigation was undertaken into the proposed drainage regime for the site. Since ground conditions do not favour the implementation of infiltration techniques, the proposed run-off from the development will be store in an attenuation tank and discharged via a pump at a restricted rate of 4.4 l/s. The tank has been designed to cater for all events up to and including the 1 in 100 + 40% climate change allowance.

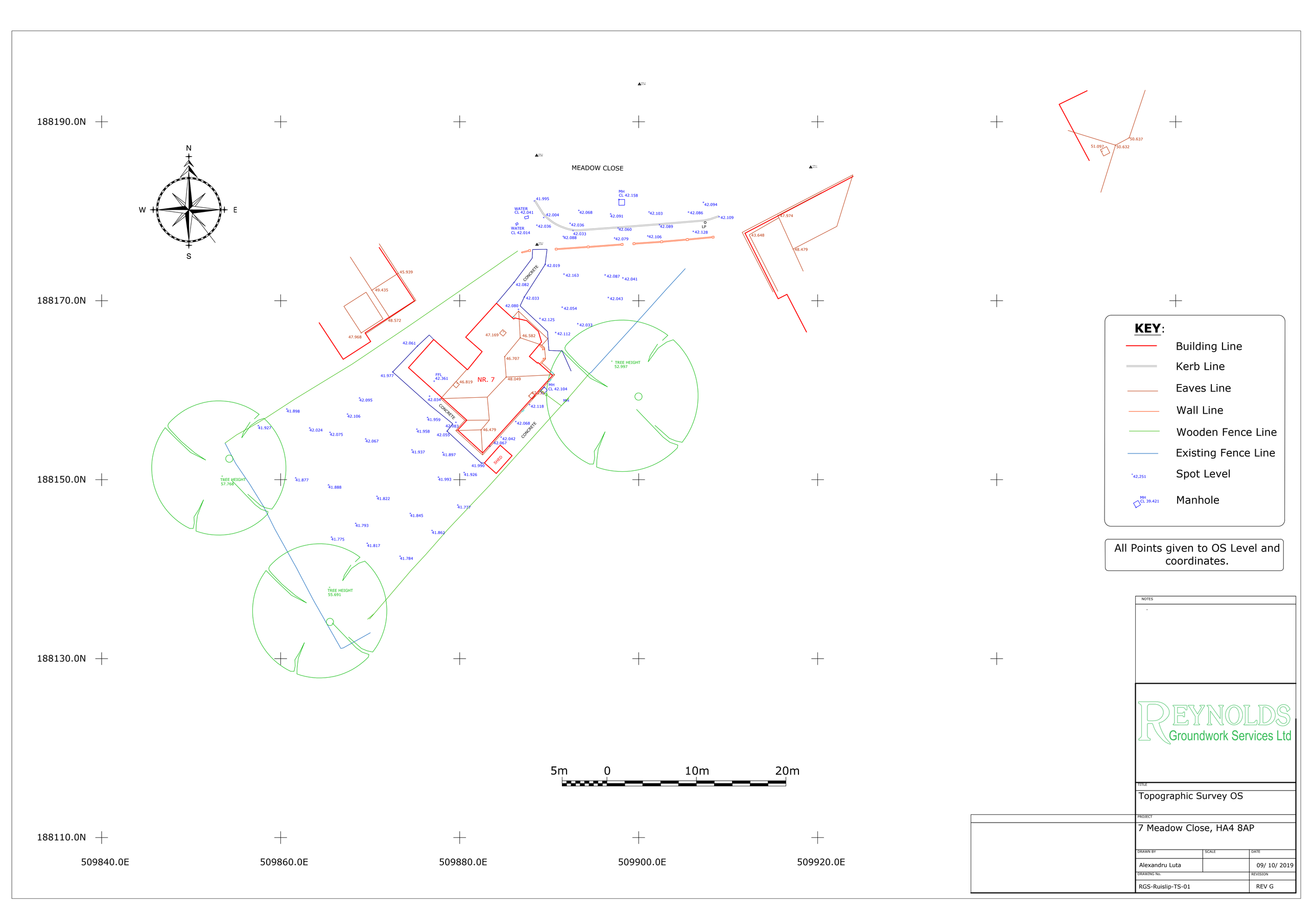
9.1.5 This report has demonstrate that the drainage strategy proposed is in accordance with the Sustainable Drainage Hierarchy and therefore suitable drainage measures provided for the development.

9.1.6 The sequential test has been applied to the proposed site, and found that the proposals are appropriate for the flood zone they are located in. A dry and safe access to and from the site can be provided at all times, ensuring that the residents will not be put at risk if flooding was to occur.

9.1.7 For the above reasons, the proposed application should be considered suitable for development, since the extension will not have any impact on the flood plain, flow paths or flood storage volumes. Therefore we see no reason why the application should be refused based on the grounds of flooding.

APPENDIX A

Topographical Survey



KEY:

- Building Line
- Kerb Line
- Eaves Line
- Wall Line
- Wooden Fence Line
- Existing Fence Line
- 42.251 Spot Level
- MH CL 39.421 Manhole

All Points given to OS Level and coordinates.

NOTES

-

REYNOLDS
Groundwork Services Ltd

TITLE	Topographic Survey OS
PROJECT	7 Meadow Close, HA4 8AP
DRAWN BY	Alexandru Luta
SCALE	
DATE	09/ 10/ 2019
DRAWING No.	RGS-Ruislip-TS-01
REVISION	REV G

Drawing L1050 – Proposed Block Plan

1 Proposed Block Plan
Scale: 1:500

0 5 10 15 20 M

Rev	Date	Reason for Issue	Chk
P1	18.09.20	Preliminary	KL

Rev	Date	Reason for Issue	Chk

PROGRESS / ARCHITECTURE
Waterside House 20 Riverside Way
Uxbridge UB8 2YF
info@progressarchitecture.co.uk

Project Title
7 Meadow Close, Ruislip

Project Number
047

Date
18 September 2020

Drawing Title
Proposed Block Plan

Drawing Number
L1050

Revision
P1

Drawing Status
Preliminary

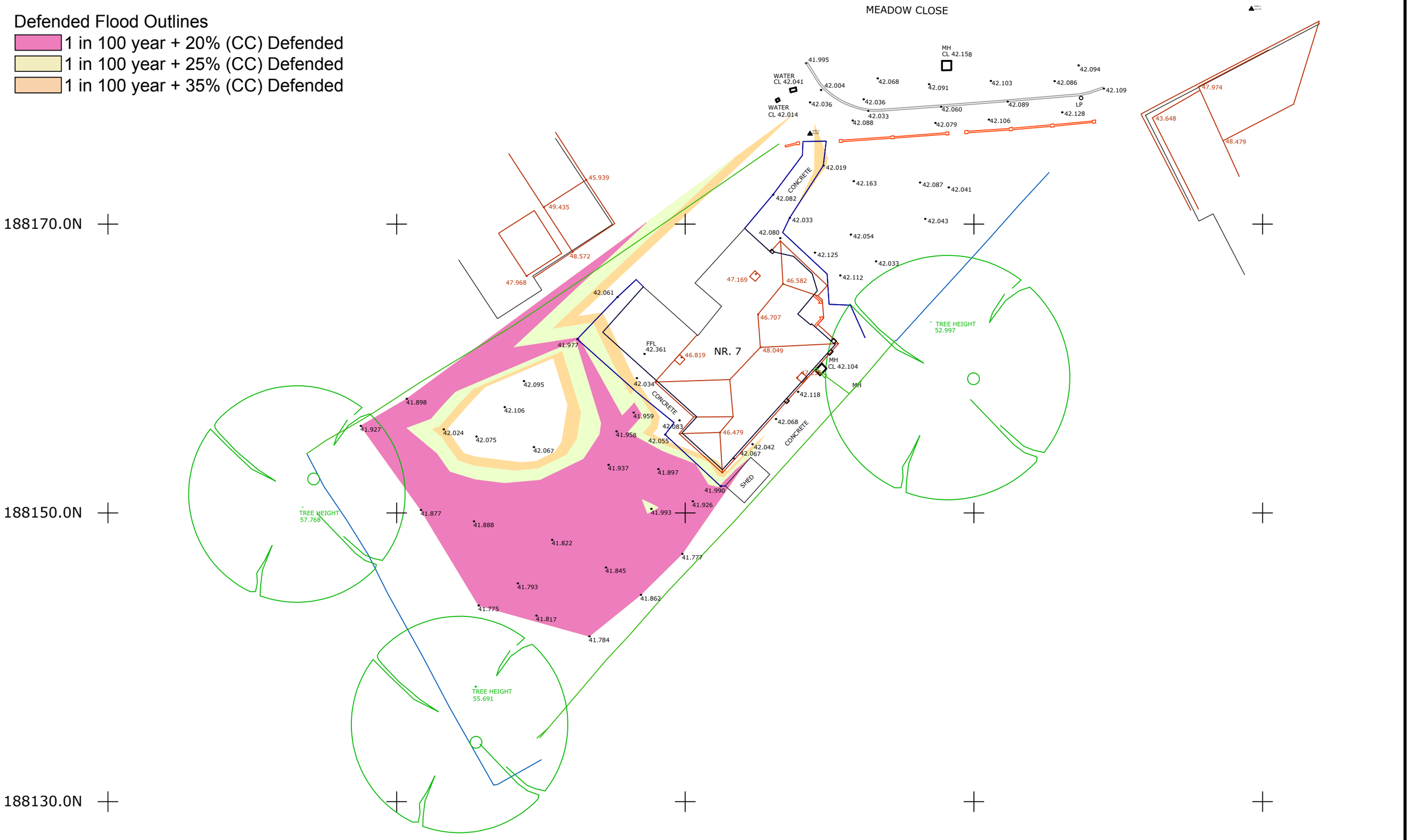
Scale / North Point
1:500 @ A3

N

APPENDIX B

Drawing 191228/FRA/01 – Flood Extent Modelling

Defended Flood Outlines
1 in 100 year + 20% (CC) Defended
1 in 100 year + 25% (CC) Defended
1 in 100 year + 35% (CC) Defended



7 Meadow Close
Ruislip

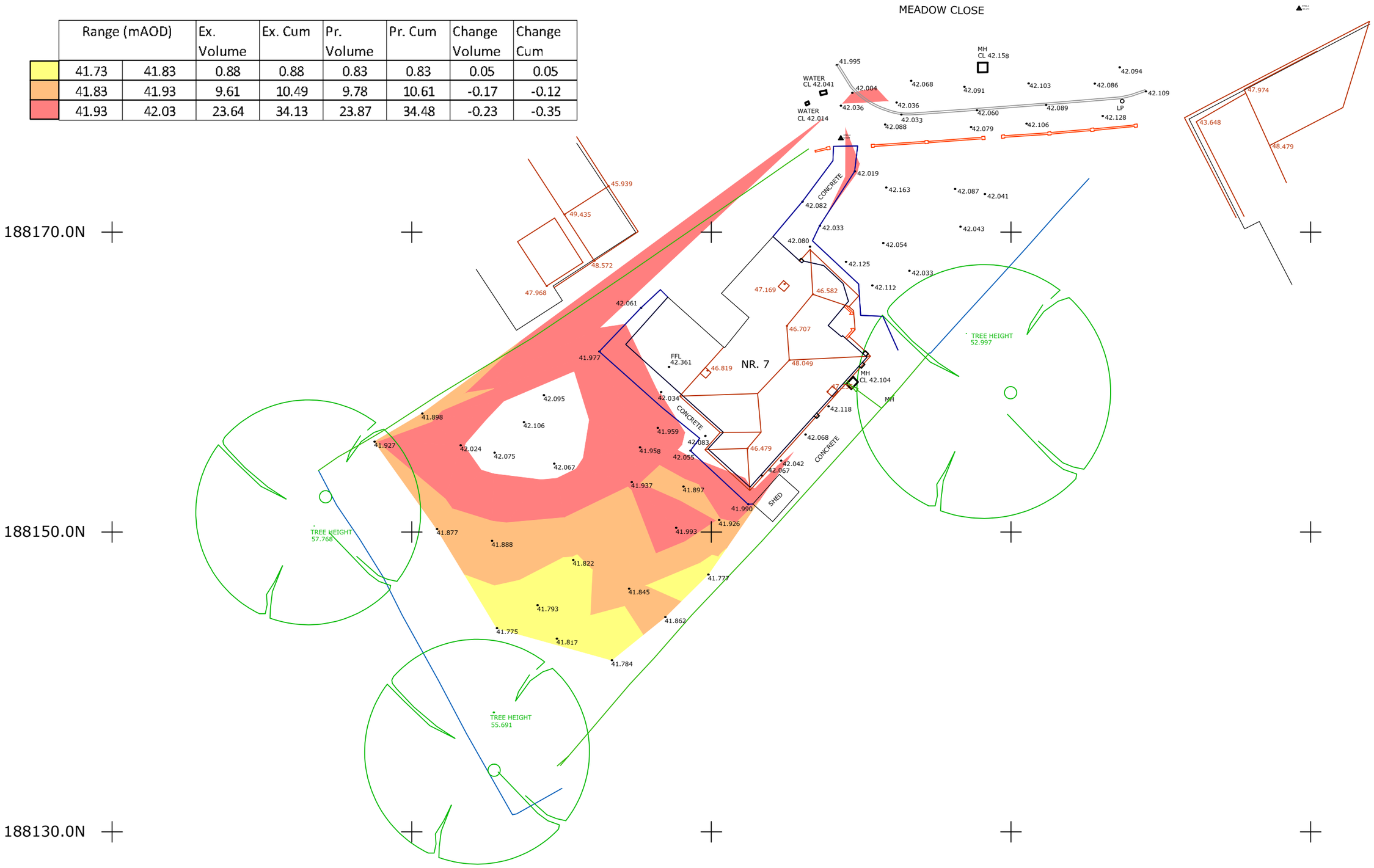
Flood Extent Modelling

SCALE	DRAWN BY	PRJ No.	DWG No.
1:250	JR	191228	191228-FRA-01

LANMOR Consulting
Civil Engineers & Transport Planning
Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
www.lanmor.co.uk

Drawing 191228/FRA/03 – Existing Flood Volumes

	Range (mAOD)		Ex. Volume	Ex. Cum	Pr. Volume	Pr. Cum	Change Volume	Change Cum
	41.73	41.83	0.88	0.88	0.83	0.83	0.05	0.05
	41.83	41.93	9.61	10.49	9.78	10.61	-0.17	-0.12
	41.93	42.03	23.64	34.13	23.87	34.48	-0.23	-0.35



7 Meadow Close
Ruislip

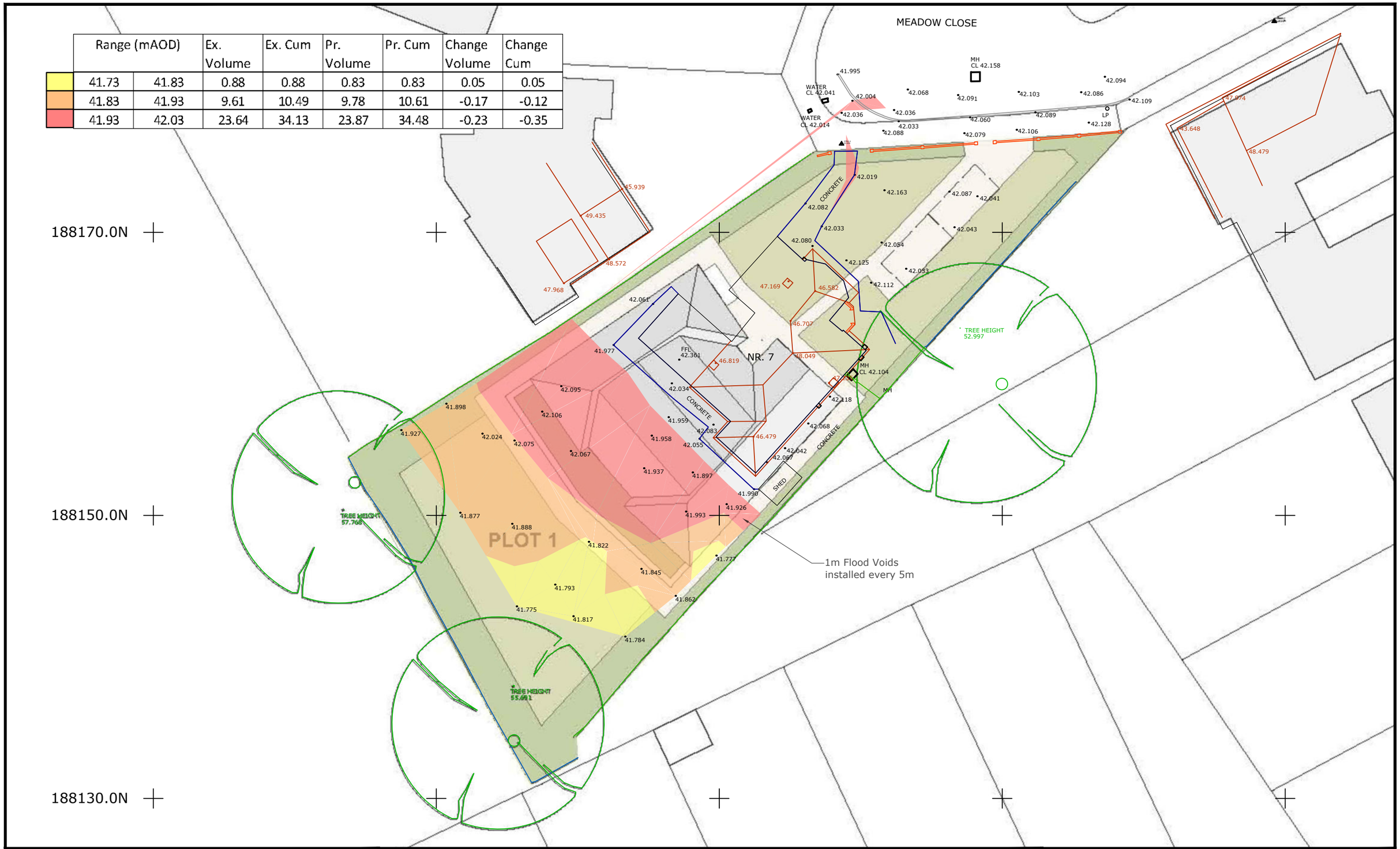
Existing Flood Volumes

SCALE	DRAWN BY	PRJ No.	DWG No.
1:250	JR	191228	191228-FRA-03

LANMOR Consulting
Civil Engineers & Transport Planning
Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
www.lanmor.co.uk

Drawing 191228/FRA/04 – Proposed Flood Volumes

	Range (mAOD)		Ex. Volume	Ex. Cum	Pr. Volume	Pr. Cum	Change Volume	Change Cum
	41.73	41.83	0.88	0.88	0.83	0.83	0.05	0.05
	41.83	41.93	9.61	10.49	9.78	10.61	-0.17	-0.12
	41.93	42.03	23.64	34.13	23.87	34.48	-0.23	-0.35



7 Meadow Close
Ruislip

Proposed Flood Volumes

SCALE	DRAWN BY	PRJ No.	DWG No.
1:250	JR	191228	191228-FRA-04

LANMOR Consulting
Civil Engineers & Transport Planning

Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
www.lanmor.co.uk

APPENDIX C

Thames Water Records

Asset location search

Property Searches

Lanmor Consulting Ltd
34Tolworth Close
SURBITON
KT6 7EW

Search address supplied 7
Meadow Close
Ruislip
HA4 8AP

Your reference 191228 (7 Meadow Close)

Our reference ALS/ALS Standard/2020_4157647

Search date 19 February 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: 7, Meadow Close, Ruislip, HA4 8AP

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

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

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

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

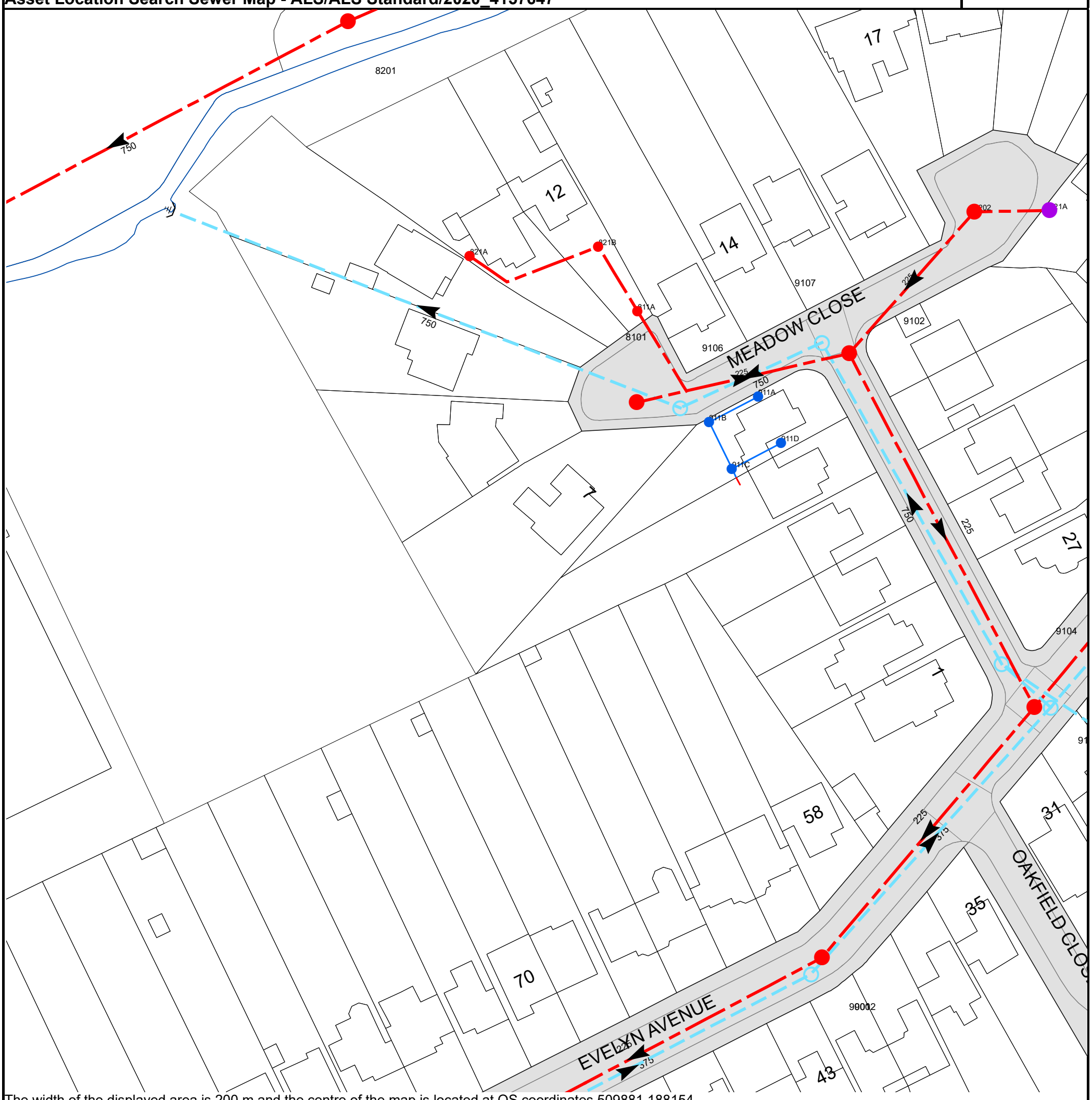
Clean Water queries

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

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4157647



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 509881,188154

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
9001	42.58	38.57
9107	42.14	40.95
9102	43.14	41.25
9104	42.29	41.04
9101	42.4	38.66
9103	42.37	41.42
9202	42.3	40.6
921A	n/a	n/a
821A	n/a	n/a
821B	n/a	n/a
8101	43.13	41.6
811A	n/a	n/a
9106	42.11	40.86
911B	n/a	n/a
911C	n/a	n/a
911A	n/a	n/a
911D	n/a	n/a
9002	42.56	41.56
8201	41.94	38.57

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 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.

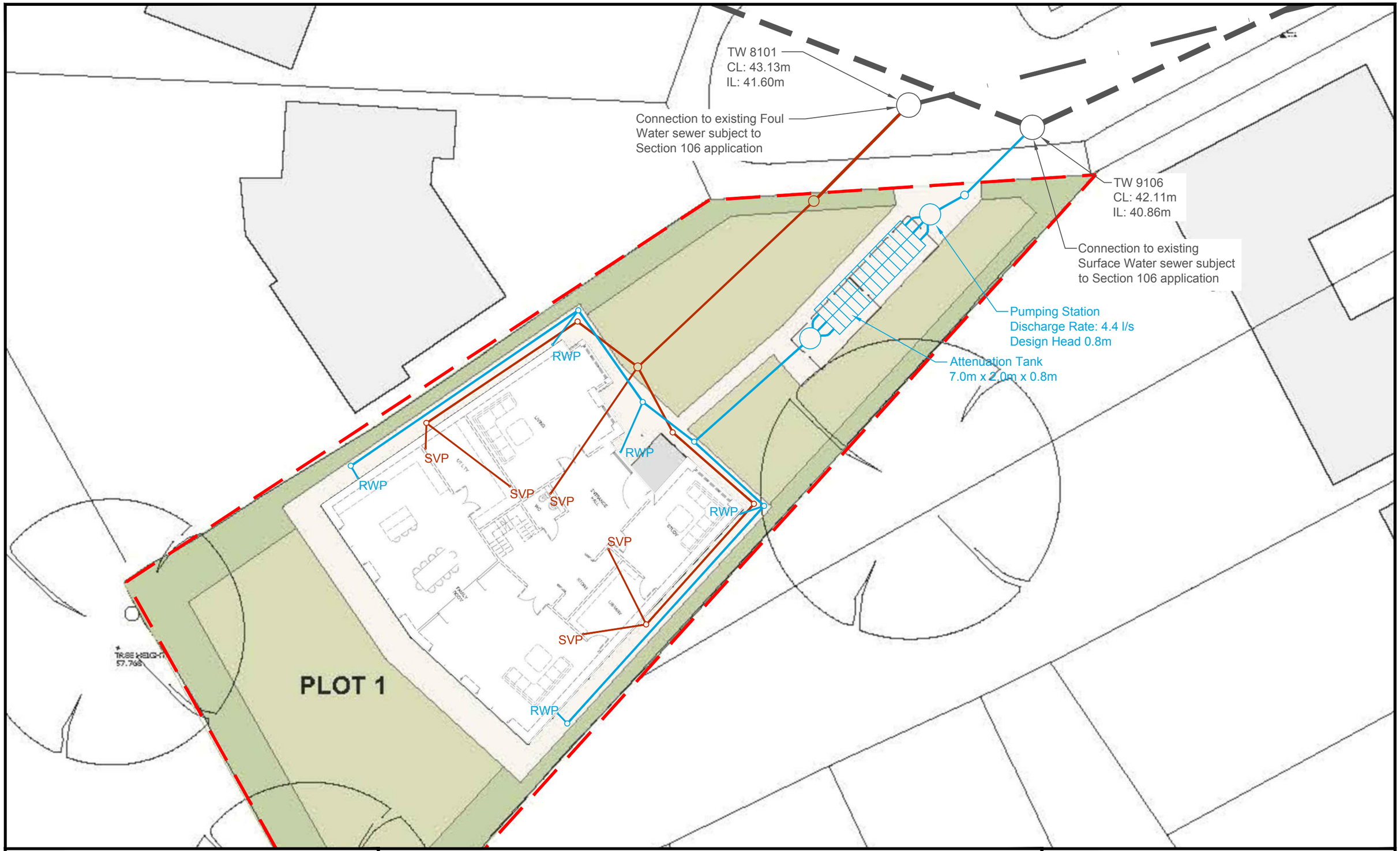
Ways to pay your bill

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

191228/DS/01 – Proposed Drainage Strategy



7 Meadow Close
Ruislip

Drainage Strategy
Site Plan

SCALE	DRAWN BY	PRJ No.	DWG No.
1:200	JR	191228	191228-DS-02

LANMOR Consulting
Civil Engineers & Transport Planning

Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
www.lanmor.co.uk

APPENDIX E

Attenuation Tank Calculations

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	40.658	0.583	4.4	8.2	O K
30 min Summer	40.718	0.643	4.4	9.0	O K
60 min Summer	40.692	0.617	4.4	8.6	O K
120 min Summer	40.563	0.488	4.4	6.8	O K
180 min Summer	40.433	0.358	4.4	5.0	O K
240 min Summer	40.327	0.252	4.4	3.5	O K
360 min Summer	40.198	0.123	4.4	1.7	O K
480 min Summer	40.165	0.090	3.9	1.3	O K
600 min Summer	40.151	0.076	3.3	1.1	O K
720 min Summer	40.141	0.066	2.9	0.9	O K
960 min Summer	40.128	0.053	2.3	0.7	O K
1440 min Summer	40.113	0.038	1.7	0.5	O K
2160 min Summer	40.103	0.028	1.2	0.4	O K
2880 min Summer	40.097	0.022	1.0	0.3	O K
4320 min Summer	40.091	0.016	0.7	0.2	O K
5760 min Summer	40.088	0.013	0.6	0.2	O K
7200 min Summer	40.085	0.010	0.5	0.1	O K
8640 min Summer	40.084	0.009	0.4	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	142.122	0.0	11.5	15
30 min Summer	92.733	0.0	14.9	25
60 min Summer	57.587	0.0	18.6	42
120 min Summer	34.536	0.0	22.3	76
180 min Summer	25.268	0.0	24.4	106
240 min Summer	20.125	0.0	26.0	136
360 min Summer	14.575	0.0	28.2	190
480 min Summer	11.589	0.0	29.9	246
600 min Summer	9.694	0.0	31.3	306
720 min Summer	8.375	0.0	32.4	368
960 min Summer	6.644	0.0	34.3	490
1440 min Summer	4.787	0.0	37.0	724
2160 min Summer	3.444	0.0	40.0	1084
2880 min Summer	2.723	0.0	42.2	1428
4320 min Summer	1.954	0.0	45.4	2188
5760 min Summer	1.543	0.0	47.8	2856
7200 min Summer	1.283	0.0	49.7	3544
8640 min Summer	1.104	0.0	51.3	4304

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	40.083	0.008	0.4	0.1	O K
15 min Winter	40.750	0.675	4.4	9.5	O K
30 min Winter	40.822	0.747	4.4	10.5	O K
60 min Winter	40.773	0.698	4.4	9.8	O K
120 min Winter	40.565	0.490	4.4	6.9	O K
180 min Winter	40.369	0.294	4.4	4.1	O K
240 min Winter	40.226	0.151	4.4	2.1	O K
360 min Winter	40.158	0.083	3.7	1.2	O K
480 min Winter	40.141	0.066	2.9	0.9	O K
600 min Winter	40.131	0.056	2.5	0.8	O K
720 min Winter	40.123	0.048	2.1	0.7	O K
960 min Winter	40.113	0.038	1.7	0.5	O K
1440 min Winter	40.103	0.028	1.2	0.4	O K
2160 min Winter	40.095	0.020	0.9	0.3	O K
2880 min Winter	40.091	0.016	0.7	0.2	O K
4320 min Winter	40.086	0.011	0.5	0.2	O K
5760 min Winter	40.084	0.009	0.4	0.1	O K
7200 min Winter	40.083	0.008	0.3	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.972	0.0	52.6	5080
15 min Winter	142.122	0.0	12.8	16
30 min Winter	92.733	0.0	16.7	27
60 min Winter	57.587	0.0	20.8	46
120 min Winter	34.536	0.0	24.9	80
180 min Winter	25.268	0.0	27.4	112
240 min Winter	20.125	0.0	29.1	136
360 min Winter	14.575	0.0	31.6	186
480 min Winter	11.589	0.0	33.5	248
600 min Winter	9.694	0.0	35.0	306
720 min Winter	8.375	0.0	36.3	366
960 min Winter	6.644	0.0	38.4	490
1440 min Winter	4.787	0.0	41.5	718
2160 min Winter	3.444	0.0	44.8	1104
2880 min Winter	2.723	0.0	47.2	1448
4320 min Winter	1.954	0.0	50.8	2204
5760 min Winter	1.543	0.0	53.5	2800
7200 min Winter	1.283	0.0	55.6	3744

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	40.082	0.007	0.3	0.1	O K
10080 min Winter	40.081	0.006	0.3	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.104	0.0	57.4	4344
10080 min Winter	0.972	0.0	59.0	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.300	Shortest Storm (mins)	15
Ratio R	0.414	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.043

Time (mins) From:	To:	Area (ha)
0	4	0.043

Model Details

Storage is Online Cover Level (m) 42.075

Tank or Pond Structure

Invert Level (m) 40.075

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	14.0	0.800	14.0	0.801	0.0

Pump Outflow Control

Invert Level (m) 40.075

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.4000	0.900	4.4000	1.700	4.4000	2.500	4.4000
0.200	4.4000	1.000	4.4000	1.800	4.4000	2.600	4.4000
0.300	4.4000	1.100	4.4000	1.900	4.4000	2.700	4.4000
0.400	4.4000	1.200	4.4000	2.000	4.4000	2.800	4.4000
0.500	4.4000	1.300	4.4000	2.100	4.4000	2.900	4.4000
0.600	4.4000	1.400	4.4000	2.200	4.4000	3.000	4.4000
0.700	4.4000	1.500	4.4000	2.300	4.4000		
0.800	4.4000	1.600	4.4000	2.400	4.4000		

Event: 30 min Winter