45 Elsworthy Road

London, NW3 3BS

Flood Risk Assessment and Drainage Strategy

for

Wolff Architects

20230188

July 2024

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Appendices

A **Topographical Survey**
B **Existing & Proposed Site Plans**
C **Thames Water Sewer Records**
D **Existing Surface Water Flow Rates**
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1.0 Introduction

1.1 This Flood Risk Assessment (FRA) and Drainage Strategy (DS) report has been produced by Green Structural Engineering (GSE) on behalf of Wolff Architects to support a planning application for the development proposals at the site 45 Elsworthy Road, London, NW3 3BS. Figure 1 below shows the location of the site.

Figure 1 – Site Location Plan

1.2 This FRA / DS had been prepared in accordance with the requirements of the National Planning Policy Framework (NPPF) and its planning practice guidance, national design standards, local surface water policies and nationally recognised SuDS Hierarchy, to demonstrate that the proposed development can be drained in an acceptable and sustainable manner and will not increase the risk of flooding to the site and surrounding area.

1.3 This report is not intended to provide the final details of the detailed drainage design for the proposed development. It rather provides essential information regarding the assessment of the potential risks of flooding from all sources and the design concepts and systematic approach used for the surface and foul water drainage strategy to meet the requirements of the relevant guidelines. The scope of this Report is as follows:

(i) Identification of the potential risk of flooding at the site from all sources (i.e. fluvial, tidal, pluvial, groundwater and surface water);

(ii) To show that flood risk from the site associated with surface water (pluvial) can be satisfactorily managed so that the site and adjacent land/ properties will not be subject to unacceptable flood risk whilst considering the potential allowance for climate change over the anticipated lifespan of the development. Developments must be appropriately resilient to the potential impacts of climate change;

(iii) To demonstrate that there will be no increased risk of flooding off site or on adjacent land and nearby property elsewhere; and

(iv) To demonstrate that wastewater and surface water runoff from the proposed development has satisfactory and achievable sustainable disposal strategies.

2.0 Site Parameters

Site Description

2.1 The site is located within the London Borough of Camden, at the address 45 Elsworthy Road, London, NW3 3BS, it lies approximately 650m to the northwest of the Regent's Canal and 4.8km to the northwest of the River Thames at its nearest position. The existing site is currently occupied by a detached residential dwelling.

Site Topography

2.2 A topographical survey of the site was undertaken in August 2023 by RGL Surveys Ltd. The survey shows that the site is generally flat in nature, with levels of approximately 46.30 AOD at the site entrance. Levels drop slightly to 45.40 AOD in the rear of the existing garden. A copy of the sites topographical survey is included in **Appendix A**.

Site Geology

2.3 The British Geological Survey (BGS) indicates that the site sits on a sedimentary bedrock formation of London Clay, a mixture of clay, silt and sand, there aren't any superficial deposits shown on the mapping overlaying this.

2.4 The nearest known historical borehole information to the site available on the BGS website is located approximately 330m to the northeast of the site on Elsworthy Road, recorded in 1990. The borehole records show layers of hard clay.

2.5 The various boreholes were struck to depths up to 20m, where one borehole recorded water seepage at 1.20m BGL and another recorded a water strike at 3.40m BGL which rose to 3.30m after 20 minutes.

2.6 A site-specific Preliminary Basement Impact Assessment Report was produced by Chelmer Global Ltd in April 2024. As part of this a series of boreholes were excavated to a maximum depth of 8m, with the findings matching the historical borehole records, and summarised in Table 1 below.

Stratum	From	To	Thickness (m)
	m bgl	m bgl	
Made Ground	0	3.20	3.20
Weathered London Clay Formation	3.20	4.00	0.80
London Clay Formation	4.00	>8.00	>4.00

Table 1 – Summary of borehole records.

2.7 The Preliminary Basement Impact Assessment Report states that ' During the ground investigation, a *'slight water seepage" was recorded in BH1 within the London Clay Formation at 6.50mbgl. Dry conditions were recorded in boreholes BH2 and BH3'.*

2.8 The full findings of the borehole records are appended in the Basement Impact Assessment Engineering Method Statement produced by Green Structural Engineering in July 2024.

2.9 Defra Magic maps have been reviewed and show the site is not located within a source protection zone or above a designated aquifer, the maps also show the site to be located within an unproductive groundwater vulnerability zone.

Development Proposals

2.10 The proposed development will include the extension of the existing building, lowering and extension of the single-storey basement extending beyond the footprint of the existing property. Several internal alterations to the main building are also proposed as part of the remodelling works, as well as a rear extension to the lower ground floor. The existing and proposed site and floor plans are included in **Appendix B**.

3.0 Planning Policy Context

National Planning Policy Framework and Planning Practice Guidance

3.1 The National Planning Policy Framework (NPPF), originally published in 2012, was reissued in December 2023. The NPPF includes policies on flood risk and minimising the effect of flooding. The NPPF requires local authorities to adopt proactive strategies to mitigate and adapt to climate change, taking account of flood risk, coastal change and water supply and demand considerations.

3.2 Section 14 of this document list when a Flood Risk Assessment is required:

3.3 All development within Flood Zones 2 (Medium Risk) and 3 (High Risk);

3.4 In Flood Zone 1 an assessment should accompany all proposals involving:

- Sites of 1ha or more;
- Land identified by the Environment Agency as having critical drainage problems;
- Land identified in a Strategic Flood Risk Assessment as being at increased flood risk in future; or
- Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.'

3.5 The NPPF goes on to state 'When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood risk assessment. Development should only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exceptions tests, as applicable), it can be demonstrated that:

a) Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;

c) It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) Any residual risk can be safely managed; and

e) Safe access and escape routes are included, where appropriate, as part of an agreed emergency plan'.

3.6 Within the context of a drainage strategy the most applicable requirements of National and Local Planning Policy are that development should not cause new, or exacerbate, existing flooding problems either on the proposal site, or elsewhere, and should incorporate Sustainable Drainage Systems (SuDS) in order to restrict or reduce surface water run-off.

3.7 Planning Practice Guidance has been issued to ensure the effective implementation of the planning policies set out in the NPPF on development in areas at risk of flooding. The guidance sets out an expectation that for major development SuDS will be provided unless demonstrated inappropriate but also that SuDS may not be practical for all development types and this will depend upon the nature of the proposed, development, its location and the existing flood risk. New development will, however, only be considered appropriate if priority has been given to sustainable drainage. The Planning Practice Guidance to the NPPF outlines the following drainage hierarchy to be considered when disposing of surface water, with the aim of discharging as high up the hierarchy as possible:

- To the ground (infiltration)
- To a surface water body
- To a surface water sewer, highway drain or other drainage system
- To a combined sewer

3.8 The Planning Practice Guidance to the NPPF also provides an overview of the expected effect of climate change and, amongst other issues, recommends contingency allowances for peak rainfall intensities to be applied to drainage modelling based upon the expected lifetime of the development. Table 2 outlines the recommended peak rainfall intensity climate change allowances.

Allowance category (applies across all of England)	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

Table 2 – Peak rainfall intensity climate change allowances for small and urban catchments

The Non-Statutory technical standards for sustainable drainage systems (2015)

3.9 In March, 2015, the Department for Environment, Food and Rural Affairs (DEFRA) published the Non-statutory technical standards for sustainable drainage systems; which are intended to be used in conjunction with the NPPF and the planning practice guidance. The Non-statutory technical standards for sustainable drainage systems provide guidance for developers to ensure that flood risk, from surface water, is managed appropriately so as not to lead to an increase in flood risk on and off site. This non-statutory guidance includes advisory standards on the peak flow rate, runoff volume and flood risk within the development. These standards also set out that that pumping would not normally be acceptable unless it is not reasonably practice to provide gravity drainage, that drainage systems should be structurally sound and that any damage from its construction must be minimised and rectified before the drainage system is considered completed.

The London Plan and supplementary planning guidance

3.10 The London Plan (2021), prepared by the Mayor of London, is the statutory Spatial Development Strategy for Greater London. The London Plan sets out the Mayors general policies for development and use of land within Greater London. The London Plan sets out specific polices with respect to flood risk and sustainable drainage. The most relevant of these policies to the current application are Policies SI 12 (Flood Risk Management) and SI 13 (Sustainable Drainage).

3.11 Policy SI 12 (Flood Risk Management) states that flood risk should "be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers". The policy also states that "Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies", should be adhered to and that "Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed".

3.12 Policy SI 13 (Sustainable Drainage) states that development should utilise Sustainable Urban Drainage Systems unless demonstrated impractical. In addition Policy SI 13 indicates that all developments, making no distinction between greenfield and brownfield sites, should aim to achieve greenfield runoff rates and that drainage should aim to deliver other policy objectives such as water use efficiency and quality, bio-diversity, amenity and recreation. Policy SI 13 also states that surface water run-off should be managed as close to source as possible, with preference for green over grey features, and sets out the following drainage hierarchy for the consideration of developments within London:

1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. rainwater infiltration to ground at or close to source.
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. controlled rainwater discharge to a surface water sewer or drain.
6. controlled rainwater discharge to a combined sewer

3.13 Key notes within this policy are:

- Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.
- Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

London Borough of Camden – Local Plan (July 2017)

3.14 The local plan was adopted by The London Borough of Camden in July 2017 that will *'play an essential role in the delivery of the Camden Plan, which sets out the Council's vision for the borough, through 5 strategic objectives as set out in para 1.34. The Local Plan in particular will help deliver the objectives of creating the conditions for harnessing the benefits of economic growth, reducing inequality and securing sustainable neighbourhoods. It will also assist the delivery of other plans and strategies prepared by the Council and other service bodies, for example master plans and planning briefs.'*

3.15 Policy CC3 of this document relates to flood risk and sustainable drainage, stating:

3.16 *'The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible. We will require development to:*

a. incorporate water efficiency measures;

b. avoid harm to the water environment and improve water quality;

c. consider the impact of development in areas at risk of flooding (including drainage);

d. incorporate flood resilient measures in areas prone to flooding;

e. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and

f. not locate vulnerable development in flood-prone areas.

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

The Council will protect the borough's existing drinking water and foul water infrastructure, including the reservoirs at Barrow Hill, Hampstead Heath, Highgate and Kidderpore.'

3.17 Policy CC2 of this document relates to adapting to climate change, stating:

'The Council will require development to be resilient to climate change. All development should adopt appropriate climate change adaptation measures such as:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;

b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;

c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.'

London Borough of Camden – Camden Planning Guidance Water and Flooding (March 2019)

3.18 The London Borough of Camden –Planning Guidance Water and Flooding was produced in March 2019 and identifies different types of SuDS that can be utilised within the borough, and provides council expectations. The document states: *'A drainage report is required for all major applications, basement development, and vulnerable development in areas identified as at risk of flooding (details of what this should include can be found in paragraph 8.67 of the Local Plan). The Council will expect plans and application documents to describe how water will be managed within the development, including an explanation of the proposed SuDS, the reasons why certain SuDS have been ruled out and detailed information on materials and landscaping.*

The Council will expect developments to achieve a greenfield surface water run-off rate where feasible once SuDS have been installed.'

Policy Analysis

3.19 As can be seen from the planning policies and guidance, the main requirements are that developments should not result in additional flood risk to the site and surrounding area. The policies stipulate that more vulnerable use classes should be located outside areas of greater flood risk, and that developments should be flood resilient, residual risk should be managed correctly and safe access and egress will be needed.

3.20 The drainage hierarchy presented by all levels of policy documents, largely follow the same concept. In line with the current London Plan the drainage hierarchy should be considered as following; re-use of water, infiltration to ground, rainwater attenuation in green infrastructure, rainwater discharge direct to a watercourse, controlled discharge to surface water sewers and finally controlled discharge to combined sewers.

3.21 The London Plan sets an expectation that, wherever possible, green infrastructure SuDS features and the multiple benefits they provide will be preferred, and that space should be made for water as part of the layout design.

3.22 There is an expectation that the Non-technical standards for sustainable drainage systems will be applied, alongside the more stringent expectations of the London Plans in regard to the greenfield runoff rate and potential betterment. Both local and national planning policy and guidance indicate that, wherever possible, developments should aim for discharge of surface water at greenfield rates regardless of development type. The different levels of policy and guidance vary as to what should be achieved in the case of brownfield sites, or where discharge at greenfield rates is not practical. It is, however, provided in Camden's advice note on surface water drainage that: *'Camden Planning Guidance 3 (CPG3) requires developments to achieve a greenfield run off rate once SuDS have been installed. Where it can be demonstrated that this is not feasible, a minimum 50% reduction in run off rate across the development is required.'*

3.23 Planning guidance indicates that supporting geological studies, information on maintenance arrangements, water quality and agreement, in principle, from the sewerage undertaker for any new connections should be provided as appropriate. In addition, where infiltration SuDS are not provided this should be justified by reference to relevant site-specific information.

4.0 Flood Risk

Fluvial/Tidal Flooding

4.1 The National Planning Policy Framework identify the Flood Zones 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).

4.2 Figure 2 below has been extracted from the EA's flood map for planning and shows the various flood zone extents in the area around the site.

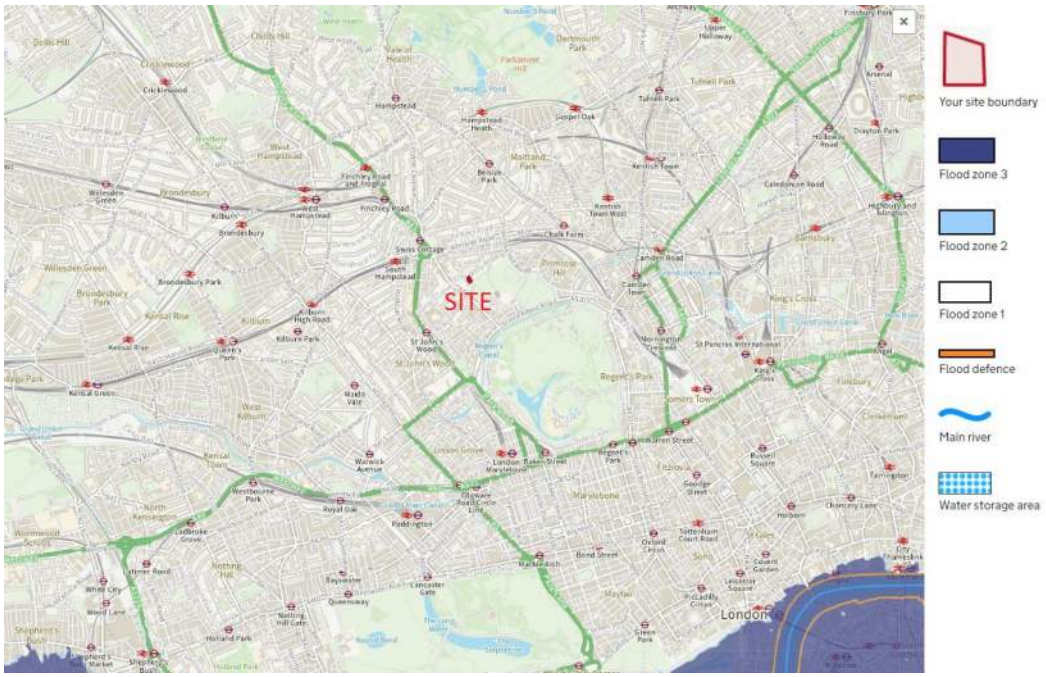


Figure 2 – EA Flood Map for Planning

4.3 As can be seen the site is shown to be located within Flood Zone 1, with the nearest areas of Flood Zone 3 more than 4km to the southeast of the site, near Embankment, emanating from the River Thames.

Surface Water Flooding

4.4 Figure 3 below has been derived from the EA flood maps and shows the risk of flooding from surface water to the site and surrounding area.

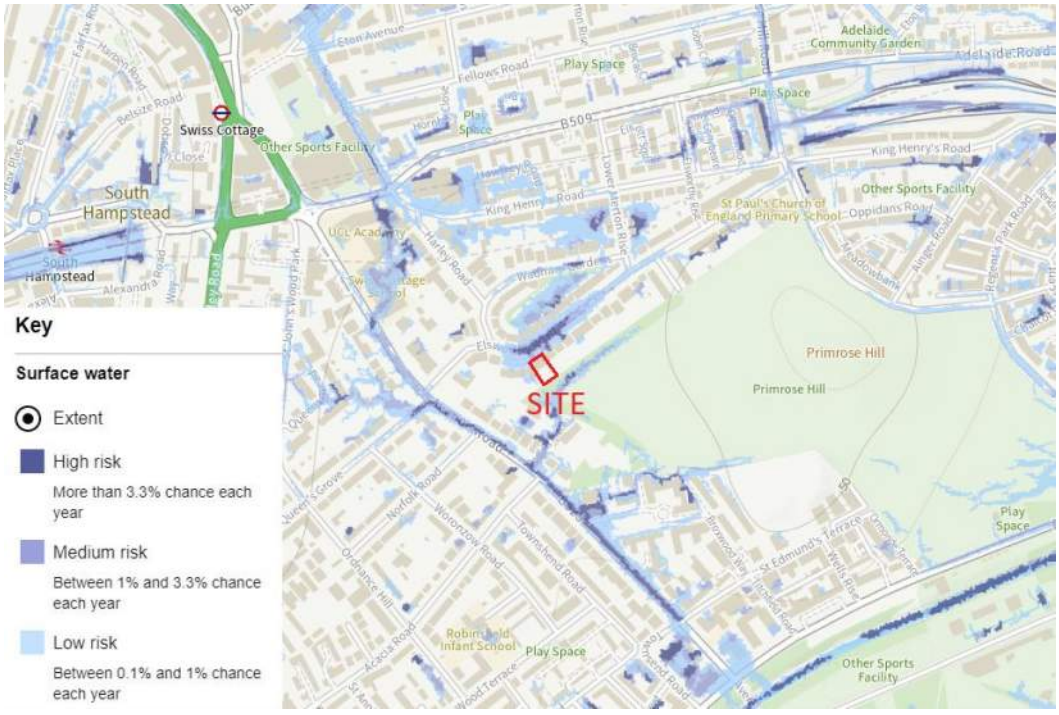


Figure 3 – EA Surface Water Flood Map

4.5 As can be seen, Elsworthy Road has a medium to high risk of surface water flood risk outside the site, whereas the application site itself has a very low risk. The surface water flood maps provided by the EA take into account topography and do not consider positive drainage system. Any areas of higher surface water flood risk can therefore not be assessed without detailed interrogation of the local highway drainage networks.

Groundwater Flooding

4.6 A Strategic Flood Risk Assessment (SFRA) was undertaken between Capita URS Infrastructure & Environment UK Ltd in July 2014 on behalf of London Borough of Camden. This document was produced to assess the risk of flooding to the Borough from a number of sources and provide key policies to the Borough in relation to drainage and flooding.

4.7 The SFRA states that groundwater flooding *"usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground."*

4.8 Figures 4 below have been extracted from the London Borough of Camden (LBoC) SFRA and shows the susceptibility of groundwater flooding within the borough.

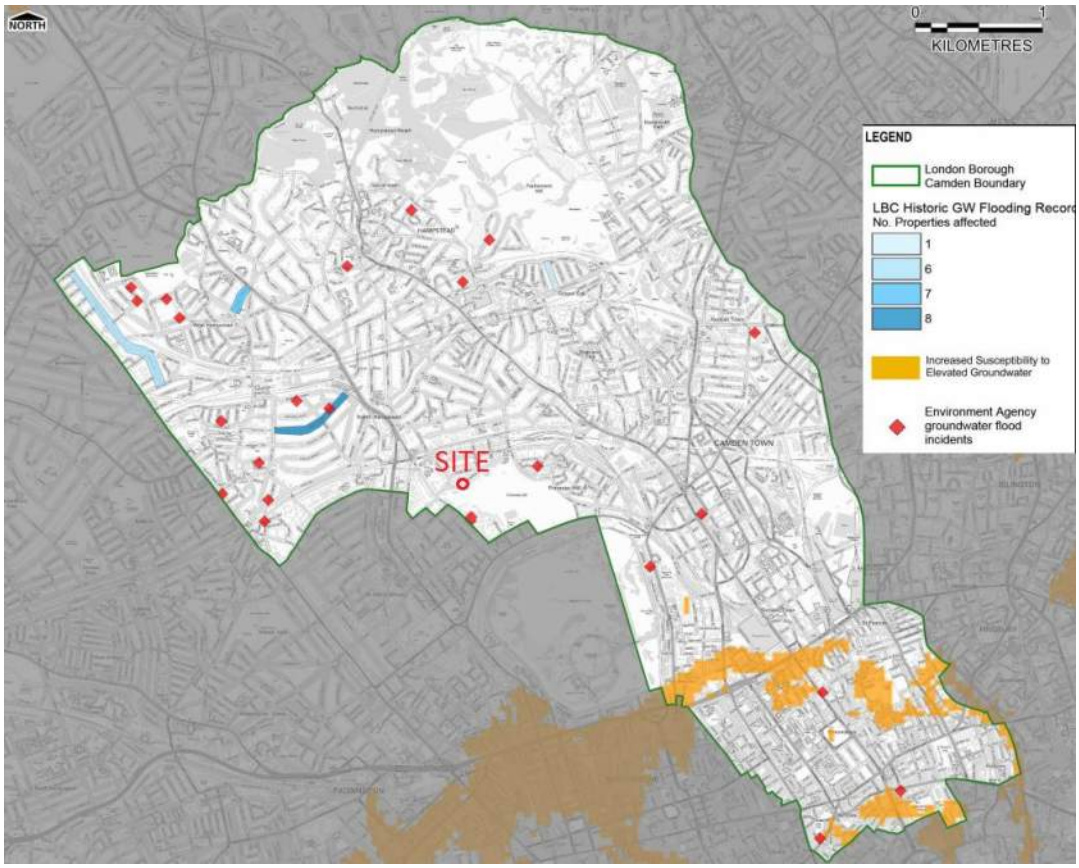


Figure 4 – LBoC SFRA Environment Agency Areas Susceptible to Groundwater Flooding

4.1 As can be seen, the site is shown to be in the least susceptible category of groundwater flooding. Defra Magic Mapping shows that the site is located an unproductive bedrock aquifer, an unproductive superficial aquifer and is located in a low groundwater vulnerability area.

Sewer Flooding

4.2 The London Borough of Camden SFRA flood maps also include sewer flood events mapping based on postcode areas, from incident recordings provided by Thames Water. The mapping shows that the NW3 3 postcode area has had 8 recorded incidents of internal sewer flooding in the past 10 years (from the year of writing in 2014) and no recorded incidents of external sewer flooding.

4.3 The SFRA notes that "*TWUL target these areas for maintenance and improvements, areas that experienced flooding in the past may no longer be at greatest risk of flooding.*"

Lost Rivers

4.4 Historical mapping and The London Borough of Camden SFRA mapping shows the potential presence of a Lost River within the vicinity of the site. A Ground Penetrating Radar (GPR) survey was undertaken by Murphy Geospatial in June 2024 to a depth of approximately 4m below ground level. The survey did not identify the presence of any culverted watercourse as part of their investigations, which correlates with the Thames Water asset records that does not identify any culverts in this area. It is therefore considered highly unlikely that there are any Lost Rivers within the site extent, that may impact the development proposals, however, further intrusive testing will be undertaken prior to the commencement of works, to confirm this. Please refer to the Basement Impact Assessment Engineering Method Statement produced by Green Structural Engineering in July 2024 for further details.

Summary

4.5 As detailed throughout this section, on preliminary review, the sources of flooding that may affect the site are considered low to negligible.

5.0 Development Impact on Flooding

Impact on Flood Waters

5.1 The entire site is located within Flood Zone 1 and will not impact or restrict the flow of flood waters for an event with a probability of 0.1% or greater.

Impact on Flood Storage Volumes

5.2 The site is located fully within Flood Zone 1 and therefore does not accommodate any flood storage volumes for all events up to and including the 0.1% AEP event. The development proposals will therefore have no impact on flood storage volumes for all events with a probability of 0.1% or greater.

Access from site

5.3 Access from the proposed development is achievable via Elsworthy Road, to the north. Access to and from the site, free from fluvial/tidal flood water up to and including the 0.1% AEP event can therefore be achieved via Elsworthy Road.

Residual Risk

5.4 The site is located in Flood Zone 1, the property and surrounding infrastructure will be free from flood waters generated by a 1 in 100-year storm event. It is therefore concluded that the residual risk for this development will be low.

6.0 Existing Drainage

Public Sewers

6.1 Thames Water serves the site and surrounding area for the disposal of wastewater. Asset records have been obtained from Thames Water showing the public sewer networks surrounding the site, a copy of which is included in Appendix C. The records show the surrounding area is served by combined networks only, the closest being a 940mm x 610mm sewer directly to the north of the site, along Elsworthy Road, flowing from east to west. The records also show a proposed new Thames Water sewer in Elsworthy Road and it is assumed that this may be replacing part of the existing public sewer in the future.

Site Drainage

6.2 No formal drainage CCTV survey has been undertaken on the site; it is however known that existing manholes are located at the front of the site which is assumed to serve the existing property and discharges to the combined Thames Water combined sewer in Elsworthy Road.

6.3 An assessment has been undertaken to model the existing 520m^2 of hardstanding area, for the 1-, 30-, and 100-year intensities, the results are shown in Table 3 below, with a copy of the calculations included in Appendix D.

Storm Intensity	Flow Rate
1-year	5.9 l/s
30-year	14.1 l/s
100-year	18.3 l/s

Table 3 – Existing surface water flow rates

6.4 The site area is approximately 1,185m^2, an assessment has been undertaken to review the existing greenfield runoff rate from site via the ICP SUDS method, the results are shown in Figure 5 below:

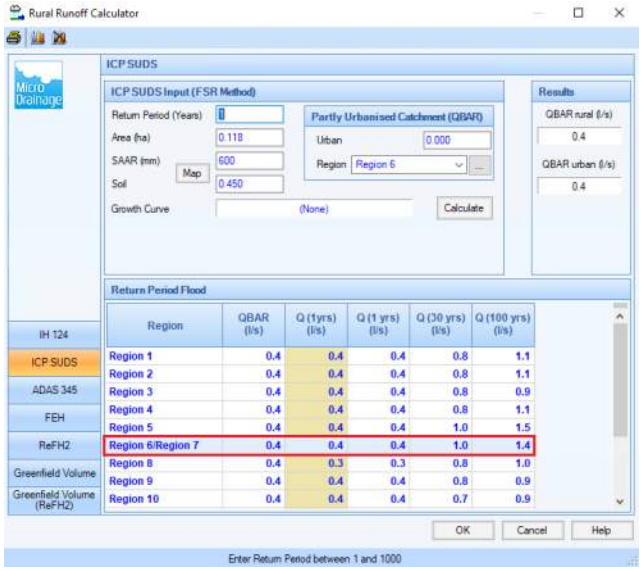


Figure 5 – Greenfield runoff rate

6.5 As can be seen the site is shown to have Greenfield runoff rates between 0.4l/s and 1.4l/s, depending on the return period.

7.0 SuDS Hierarchy

Table 4 has been produced and shows the SuDS Hierarchy in order along with comments specific to the development site and their suitability:

Discharge hierarchy	Viable	Comments
Rainwater use as a resource (for example rainwater harvesting), Blue and Green Roofs	Partially	Rainwater harvesting systems require full pipe networks in addition to drainage networks, to and from the buildings. Due to space constraints, incorporating an additional rainwater harvesting network will not be practical. It is proposed that a section of the rear roof will incorporate a green roof area, to act as a source control provision, before draining to a below ground network.
Rainwater infiltration to ground at or close to source	No	The BGS shows the site sits on a bedrock formation of London Clay, a material unsuitable for infiltration due to its poor soakage potential. The use of infiltration as a means of surface water disposal is therefore not possible.
Rainwater discharge direct to a watercourse	No	No watercourses located within the immediate vicinity of the site to discharge to.
Controlled rainwater discharge to a surface water sewer or drain.	No	No surface water sewers located within the immediate vicinity of the site to discharge to.
Controlled rainwater discharge to a combined sewer	Yes	Existing private combined water drainage to Thames Water combined sewer in Elsworthy Road to be reutilised.

Table 4 – SuDS Hierarchy

8.0 Proposed Drainage

8.1 The existing site comprises of a residential dwelling with associated landscaping and garden area which has the potential to discharge at 18.3l/s for storm intensities of 100-years as shown on the existing drainage calculations in Appendix D. Greenfield runoff rates have been calculated between 0.4l/s, and 1.4l/s, depending on the return period.

8.2 Given the low greenfield runoff rates, it is not considered that utilising greenfield runoff flow rates will be practical, as these will be prone to blockages causing greater risks of flooding, contrary to the intent of the initiative. As the site currently discharges at uncontrolled rates it is considered that a proposed surface water discharge rate of 2l/s would provide noticeable betterment than the existing scenario, without reducing rates to a value that may cause maintenance issues on site due to blockages. Table 5 below shows the percentage improvement that the proposed 2l/s discharge rate would have from the existing scenario.

Storm Intensity	Existing Flow Rate	Proposed Flow Rate	Percentage Betterment
1-year	5.9 l/s	2.0 l/s	66%
30-year	14.1 l/s	2.0 l/s	86%
100-year	18.3 l/s	2.0 l/s	89%

Table 5 – Existing and proposed flow rate comparisons.

8.3 As can be seen the proposed 2l/s would provide a vast improvement from the existing surface water flow rates, with a 66% betterment from the existing 5.9l/s generated from the 1-year event and a 89% betterment from the existing 18.3l/s generated from the 100-year event.

8.4 It is proposed that all surface water generated from the redevelopment and extension will be stored within a new attenuation tank located at the front of the property. The proposed attenuation tank will be approximately 31.5m^2 x 1.2m deep with 95% porosity, to accommodate all runoff for the 100-year storm, including a 40% allowance for climate change for the proposed hardstanding area of 630m^2, based on a maximum discharge rate of 2l/s. A part of the rear roof will incorporate a green roof area, to act as a source control provision, before draining to the below ground network and then to the tank.

8.5 It is proposed that the runoff stored within the attenuation tank will drain via the existing private combined drainage into the existing combined Thames Water sewer in Elsworthy Road at a restricted flow rate of 2.0l/s, subject to a S106 application and CCTV survey. The piped connection will also accommodate the foul water drainage from the redeveloped property.

8.6 A drainage strategy plan showing the indicative arrangement of the proposed foul and surface water network is included in Appendix E. MicroDrainage was used to assist in the design of the proposed attenuation tank, a copy of the calculations is included in Appendix F.

9.0 SuDS Maintenance, Management & Construction

Maintenance & Management

It is recommended that catchpit sumps be monitored 3 monthly, and after periods of intense rainfall and cleared where required. Jetting of the pipework may be required on occasion, if and when a decrease in the performance of the drainage network has been identified. For the correct methods of maintenance on the various drainage features, refer to S.H.W., Volume 1, Series 500, Clauses 520, 521 and 526.

The following maintenance regime for tanks should be adopted to ensure efficient performance.

Maintenance Schedule	Required Actions	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter- remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
	System inspection after heavy storms	After every extreme storm event
Remedial actions	Repair/rehabilitate inlets, outlet, 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 tank for sediment build-up and remove if necessary	Every 5 years or as required

Construction Works

9.1 It will be the duty of the site owner/management team to ensure that the proposed surface water drainage system is maintained correctly during the lifetime of the site, as per the regime listed above, to mitigate the risk of drainage failure that may lead to flooding.

9.2 Listed below are some potential risks that may be encountered during the construction of the new drainage network, and how these risks can be mitigated.

Item	Potential Effects	Recommended Actions
Deep excavations required for installation of drainage	Excavations required for drainage installation may be subject to collapse, and/or workers/plant/material falling in.	Temporary support to be provided along excavations. Edge support required along excavations.
Protection of installed infrastructure during work suspensions	During work suspensions, excavations and installed drainage that are exposed may be subject to ingress of debris and other material, also presenting risk to site operators.	Contractor to utilise appropriate protection measures including but not limited to temporary pipe stoppers and trench covers.
Storage of construction materials and surplus materials.	Construction materials and surplus materials to be exported from site may be obstructive to working areas and access routes.	Designated areas to store materials away from working areas and pedestrian/vehicle access routes to be provided.
Perched groundwater	Perched groundwater encountered during the construction phase may impact on work proposals	Appropriate dewatering techniques to be utilised to mitigate the risk of groundwater effects.

10.0 Summary/Conclusion

10.1 This report has been produced to assess the risk of flooding and review the proposed drainage strategy for the proposed development at 45 Elsworthy Road, London, NW3 3BS. The proposed development will include the extension of the existing building, lowering and extension of the single-storey basement extending beyond the footprint of the existing property. Several internal alterations to the main building are also proposed as part of the remodelling works, as well as a rear extension to the lower ground floor.

10.2 The site is located within Flood Zone 1, land assessed as having less than a 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year. The risk of flooding affecting the site from surface water, ground water and all other sources is considered low to negligible.

10.3 The existing site is currently occupied by a detached residential dwelling and associated landscaping. There are existing drains within the site boundary that is assumed to serve the property and drains unrestricted via a combined water network to the adjacent Thames Water combined sewer in Elsworthy Road.

10.4 National and local policies have been reviewed regarding preferred methods of surface water disposal. The use of infiltration as a means of surface water disposal will not be possible due to the impermeable nature of the London Clay bedrock formation on site. The option of discharging to a watercourse or surface water sewer is not possible, as there are none within the vicinity of the site to discharge to.

10.5 It is proposed that surface water generated on site will be stored within an attenuation tank, before discharging to the Thames Water combined water sewer via an existing assumed connection from the site, subject to S106 approval and CCTV survey. The surface water drainage network has been designed to cater for all flood events up to and including the 100-year storm, including a 40% allowance for climate change. A part of the rear roof will incorporate a green roof area, to act as a source control provision, before draining to the below ground network and then to the tank.

10.6 Surface water runoff from site is proposed to discharge at 2l/s, a considerable improvement to the 18.3/s flow rates generated from the existing network. The proposed rate provides significant betterment to the existing flows generated on site and is considered the minimum flow rate achievable that won't be prone to blockages, that may cause flooding. The surface water will be restricted by a flow control unit.

10.7 This report clearly demonstrates that the proposed drainage strategy will represent a vast improvement to the existing scenario, reducing the risk of flooding to the site and surrounding area, also providing betterment and relief to the public sewer at which it currently discharges.

APPENDIX A – Topographical Survey

Legend

OS ACTIVE GPS NETWORK

BT	British Telecom	Sycamore MB	Species Multi Bowl
CATV	Cable Television	0.3/4/8	Trunk(Dia)/Spread(Dia)/Height(Approx)
CB	Control Box	TL	Traffic Light
CBF	Closed Board Fence	TOB	Top of Bank
CBP	Concrete Block Paving	TP	Telegraph Pole
CL	Cover Level	UTL	Unable To Lift
CLF	Chain Link Fence	VP	Vent Pipe
CPS	Concrete Paving Slabs	WL	Water Level
DC	Drainage Channel	WV	Water Valve
DK	Drop Kerb		
DP	Down Pipe	▽ 0.00	Floor Level
ER	Earth Rod		
FB	Flowerbed		
FH	Fire Hydrant	△ 0.00	Ceiling Height/Level (metres)
FP	Flag Pole		
G	Gully		
GV	Gas Valve	△ 0.00	False Ceiling Height/Level (metres)
IC	Inspection Cover		
IRF	Iron Railing Fence		
IL	Invert Level	△ BL 0.00	Beam Height/Level (metres)
KW	Kerb Weir		
LP	Lamp Post		
MH	Manhole	+ 0.00	Spot Level
MKR	Marker Post		
P	Post	→	All Arrows Indicate Direction Up
PRF	Post & Rail Fence		
PS	Pipe Size		
PWF	Post & Wire Fence	WCL 0.00	Window Cill Level
RE	Rodding Eye	WHL 0.00	Window Head Level
RN	Road Name		
RS	Road Sign		
SY	Stay Wire	△ DL 0.00	Door Level

RGL Surveys Ltd
Land & Measured Building Surveyors
Building S8
Westcott Venture Park
Westcott
Bucks HP18 0XB
Tel: 01296 651833
Email: mail@rglsurveys.co.uk
www.rglsurveys.co.uk
Topographic . Measured Building . Revit . Site Engineering . Pointclouds

Drawn GW	Checked MK
Levelling	All levels relate to OS Active GPS Network.
Scale	1:100 @A1
Date of Survey	August 2023
Drawing Number	RGL-23-4007-01
Notes	

Client

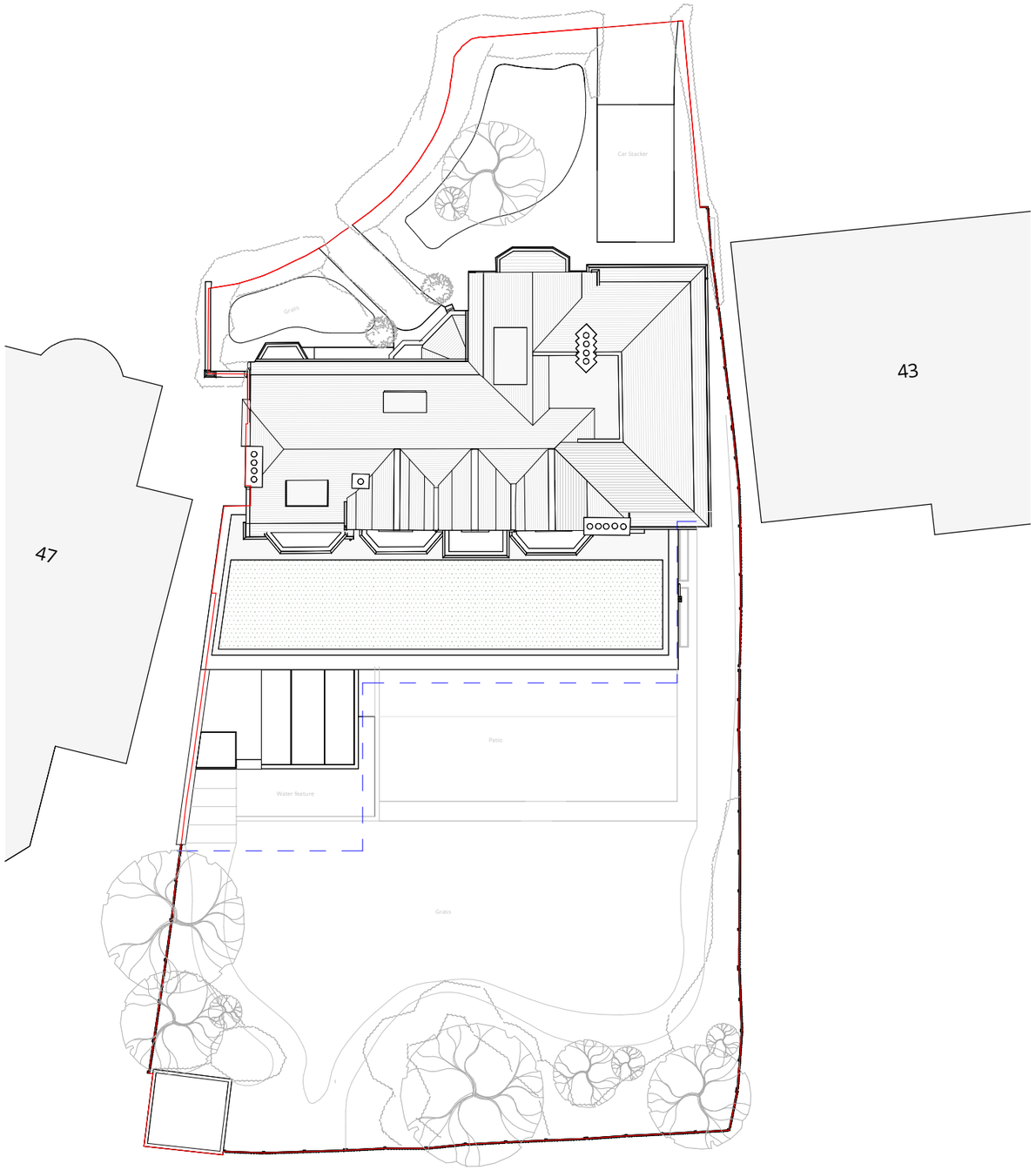
SHH Architecture
Vencourt Place
Ravenscourt Park
Hammersmith
London, W6 9NU

Job Title

45 Elsworthy Road
Primrose Hill, London

Site Survey

APPENDIX B – Existing & Proposed Site Plans



Existing footprint

Pre-App Footprint

Proposed Site Plan

1 : 250

2 0 2 4 6 8 10

SCALE 1:250 m

Rev	Description	Date
0	Planning Issue	11/04/24

WOLFF ARCHITECTS
16 lambton place
notting hill
london w11 2sh
t 02072293225
f 02072293251
e info@wolffarchitects.co.uk

WORK IN PROGRESS

status: PLANNING

project: **45 Elsworthy Rd London NW3 3BS**

drawing title: **Proposed Site Plan**

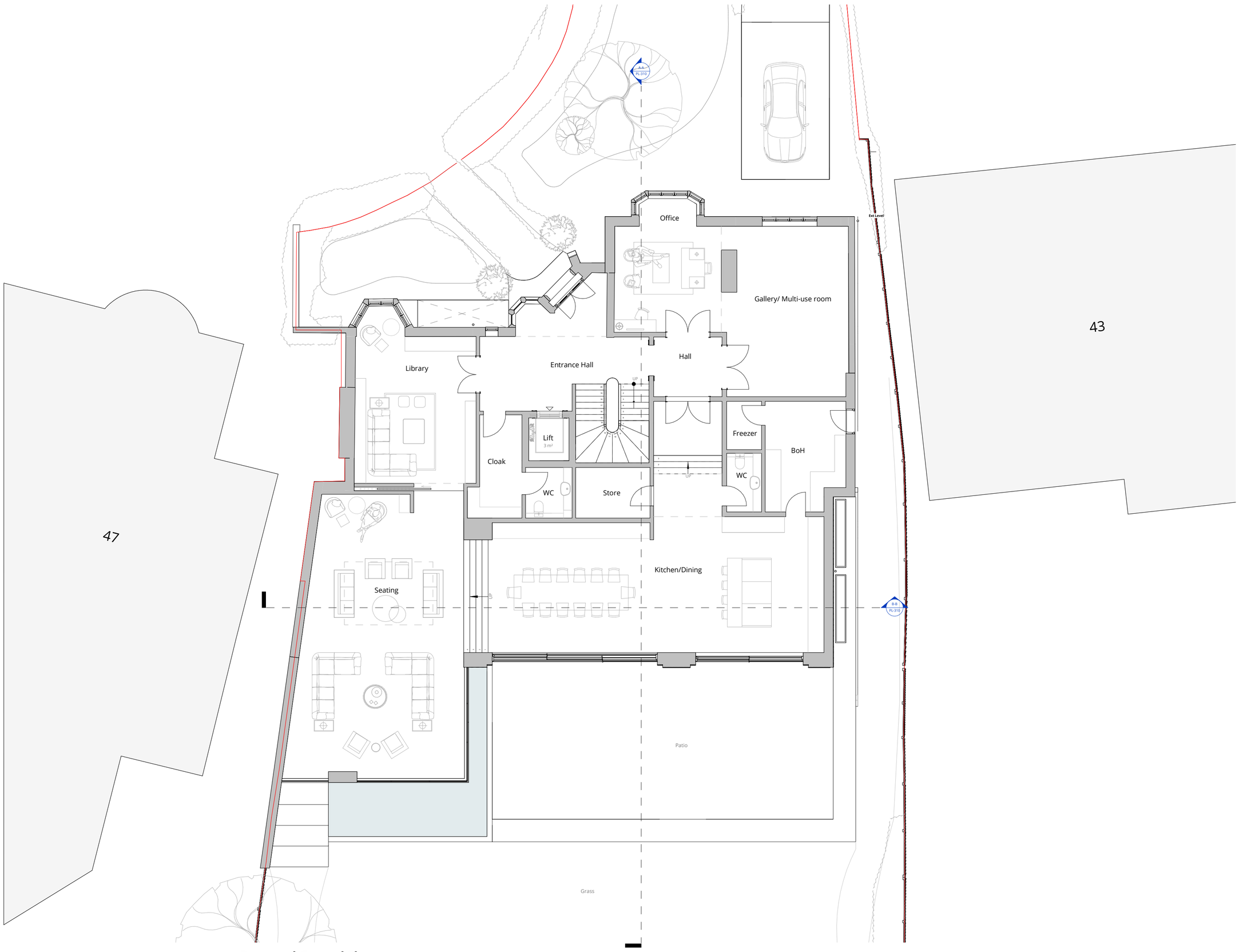
date: **01/23/07** | scale: **1 : 250**

dwg no: **2333-PL-199** | rev no: **0**

Notes:

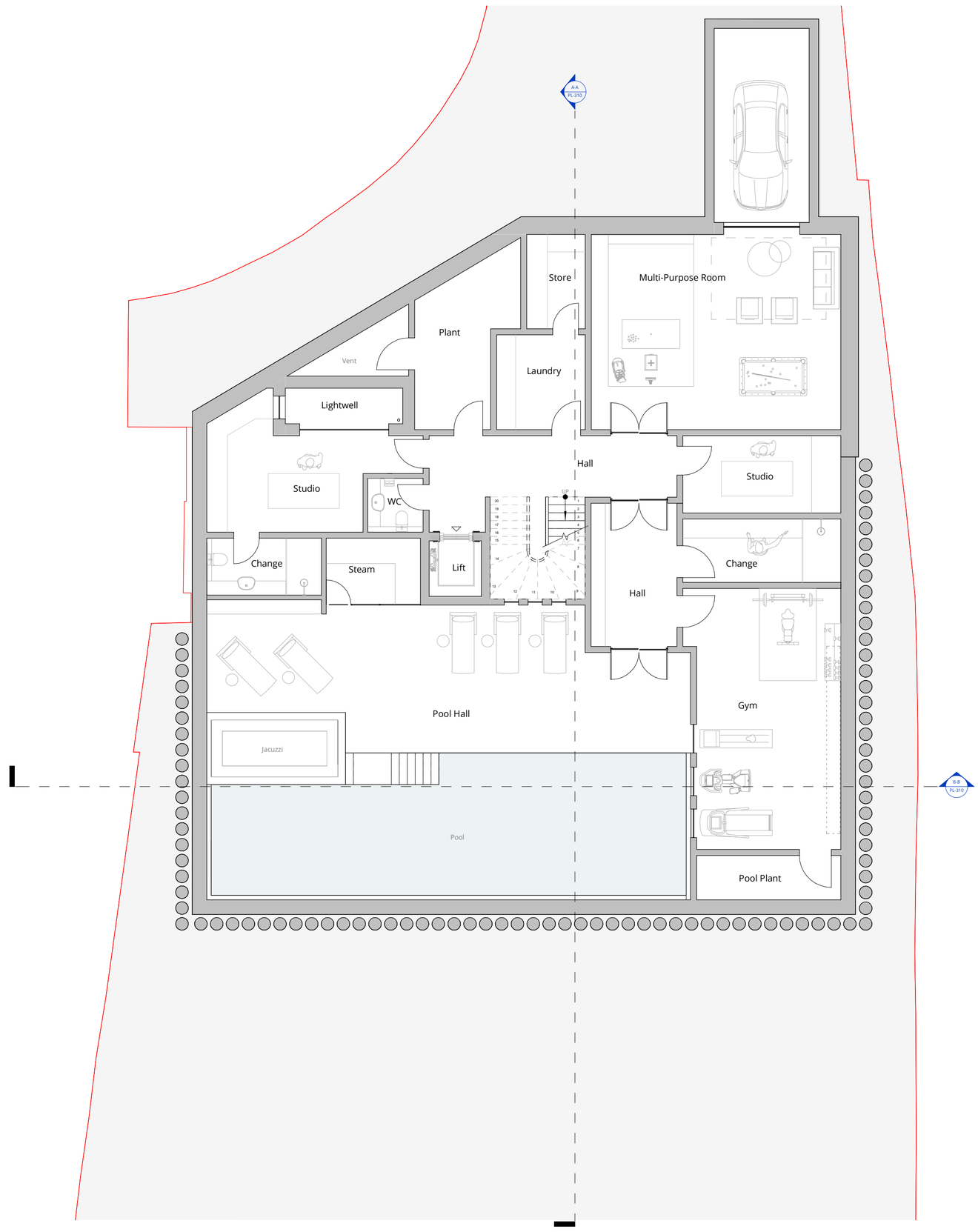
1 0 1 2 3 4 5
SCALE 1:100 m

Property boundary
Outline of existing
1.8m cut line



Proposed Ground Floor

1 : 100



Proposed Basement

1 : 100

Rev	Description	Date
0	Planning Issue	11/04/24

WOLFF ARCHITECTS

London 16 Lambton Place Notting Hill
London W11 2SH T+44 (020) 7229 3125
Oxford Chandos Yard 83 Bicester Road
Long Crendon HP18 9EE T+44 (0)1844 203310
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status:

PLANNING

project:

45 Elsworthy Rd

drawing title:

Proposed Plans

WORK IN PROGRESS

date: **03/15/23**

scale: **As Indicated**

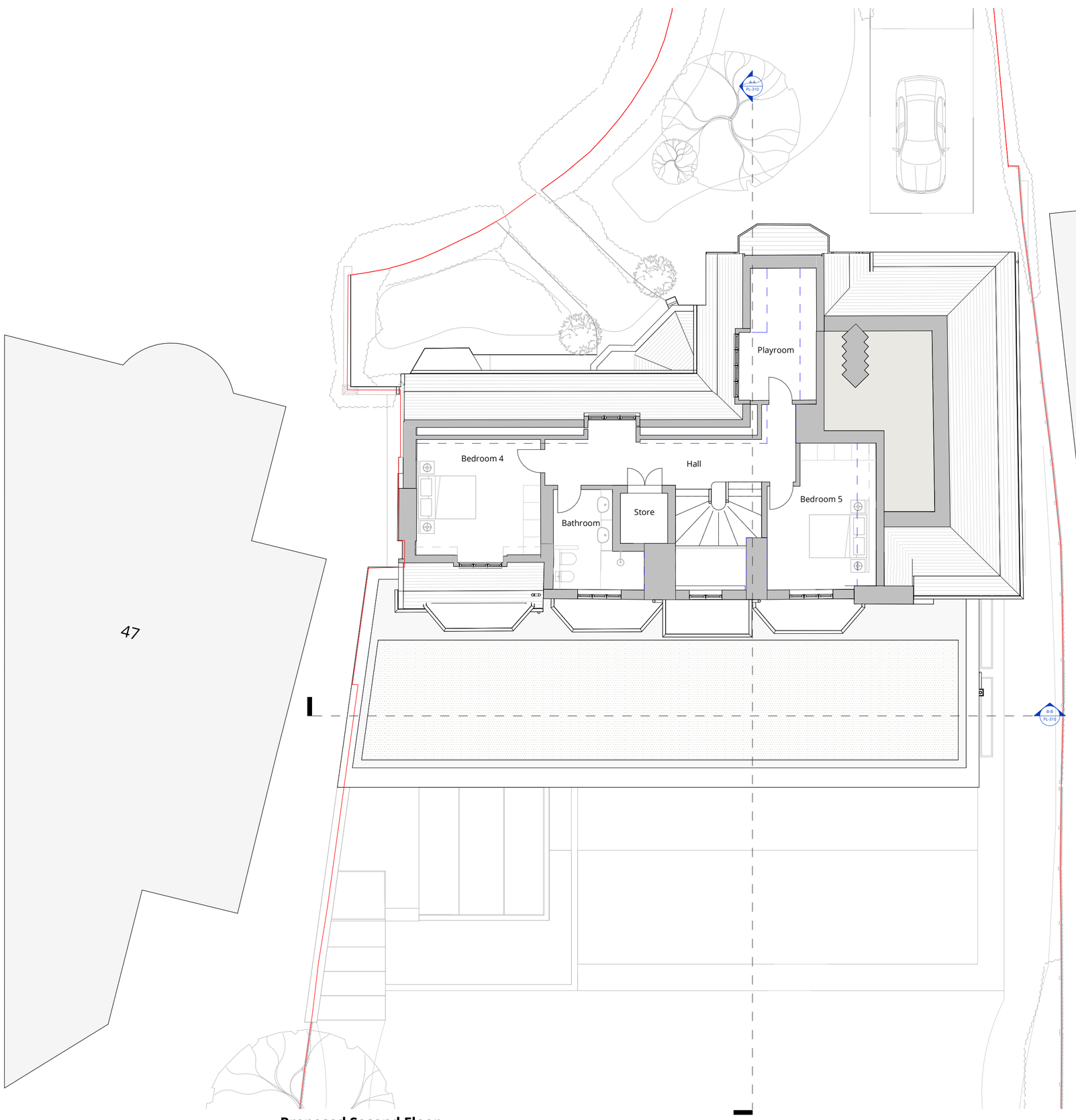
dwg no: **2333-PL-200**

rev no: **0**

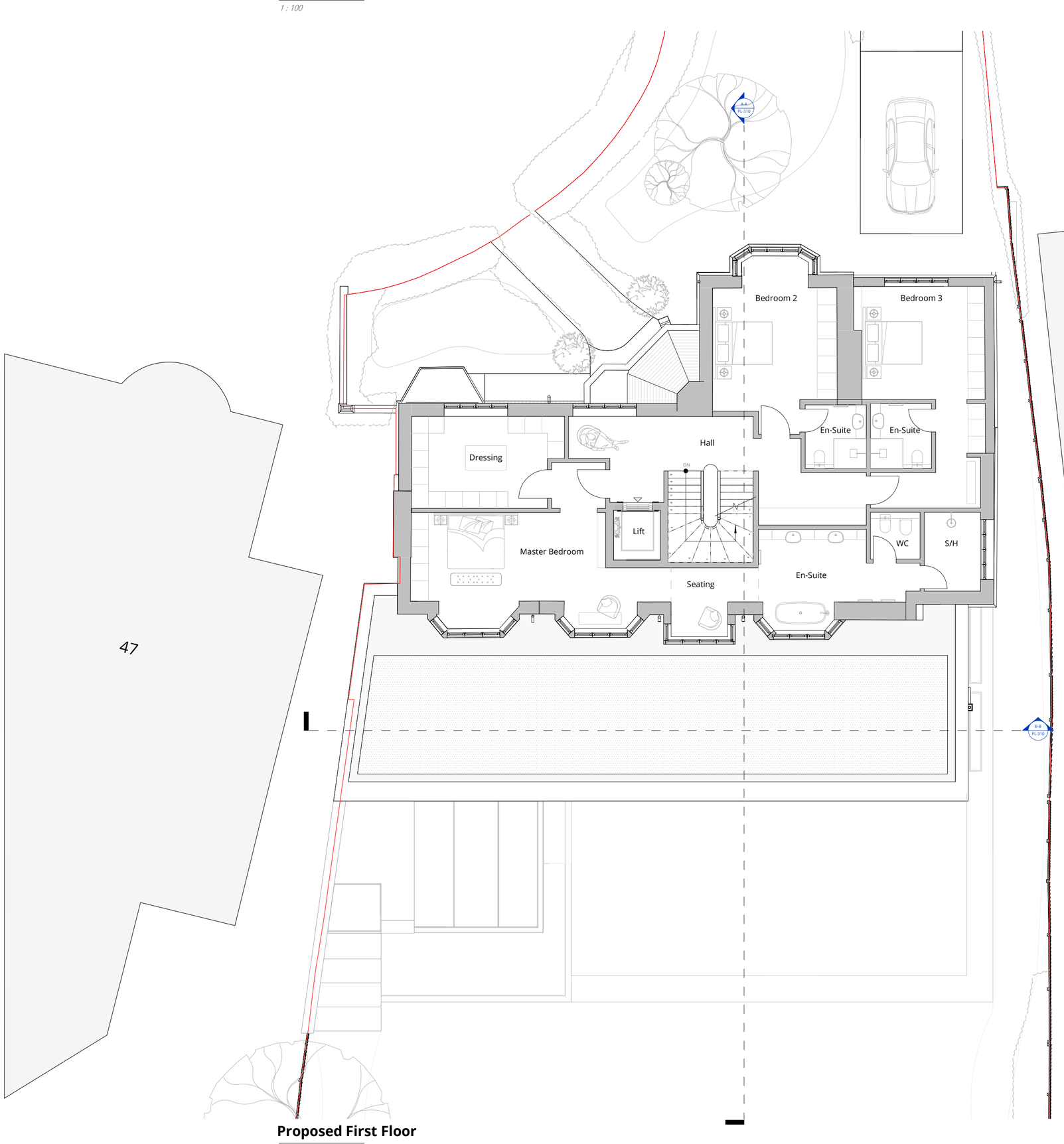
Notes:

1 0 1 2 3 4 5
SCALE 1:100 m

Property boundary
Outline of existing
1.8m cut line



Proposed Second Floor
1 : 100



Proposed First Floor
1 : 100

Rev	Description	Date
0	Planning Issue	11/04/24

WOLFF ARCHITECTS

London 16 Lambton Place Notting Hill
London W11 2SH T+44 (020) 7229 3125
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status:

PLANNING

project:

45 Elsworthy Rd

drawing title:

Proposed Plans

WORK IN PROGRESS

date: **03/15/23**

scale: **As Indicated**

dwg no: **2333-PL-201**

rev no: **0**

Notes:

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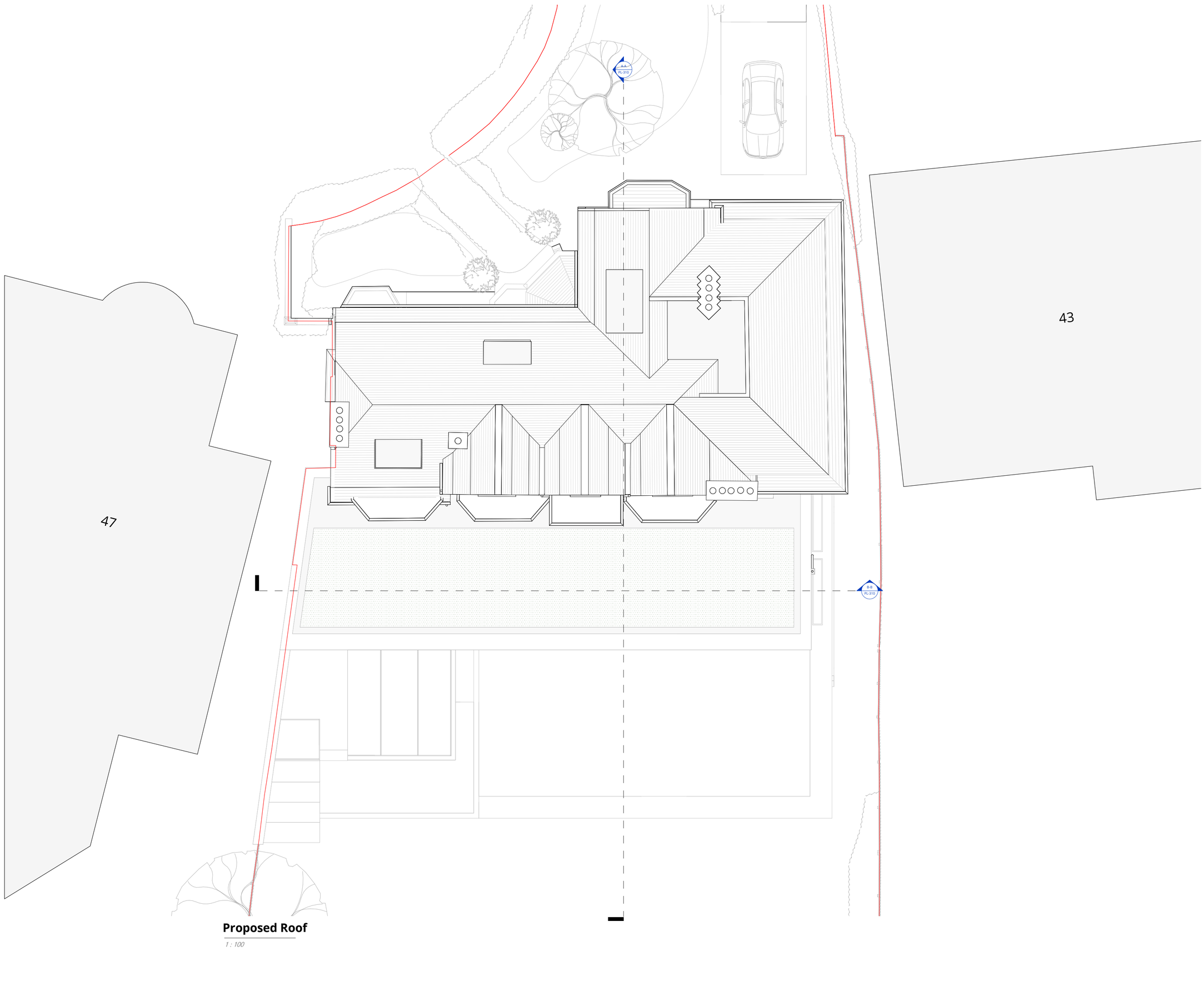
SCALE 1:100 m

Property boundary

Outline of existing

1.8m cut line



Proposed Roof

1 : 100

Rev	Description	Date
0	Planning Issue	11/04/24

WOLFF ARCHITECTS

London 16 Lambton Place Notting Hill
London W11 2SH T+44 (020) 7229 3125
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status:

PLANNING

project:

45 Elsworthy Rd

drawing title:

Proposed Plans

WORK IN PROGRESS

date: **03/15/23**

scale: **As Indicated**

dwg no: **2333-PL-202**

rev no: **0**

Notes:

1 0 1 2 3 4 5
SCALE 1:100 m

Notes:

All drawings subject to final coordination with structural engineer and M&E engineer

- Property boundary
- Outline of existing

1. Brown plain clay roof tiles matching existing in size, texture and colour
2. Red plain hanging clay roof tiles matching existing in size, texture and colour
3. Red multi-stock brick
4. Existing white painted hardwood windows and doors
5. New white painted hardwood windows and doors matching existing
6. White painted entrance portico
7. Existing dormer with lead roof, white painted timber moulding and hanging roof tiles to cheeks to be refurbished
8. Water feature
9. Existing Chimney stack retained, repointed and made good
10. White painted render
11. 440mm linear brown brick soldier course
12. Brown coping stone matching extension brick colour
13. Stack bond surrounding slinding door
14. Projecting header bond in brown colour
15. Aluminium sliding door system
16. Cantilevered glass box conservatory
17. Corten steel clad column

Proposed Front Elevation

1 : 100

Proposed Side Elevation

1 : 100

Proposed Rear Elevation

1 : 100

Proposed Side Elevation

1 : 100

Rev	Description	Date	Drwn	Ckd
0	Planning Issue	11/04/24	MM	EW

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status:

PLANNING

project:

45 Elsworthy Rd
London NW3 3BS

drawing title:

Proposed Elevations

date: **03/24/23**

scale: **As indicated**

dwg no: **2333-PL-300**

rev no: **0**

Notes:

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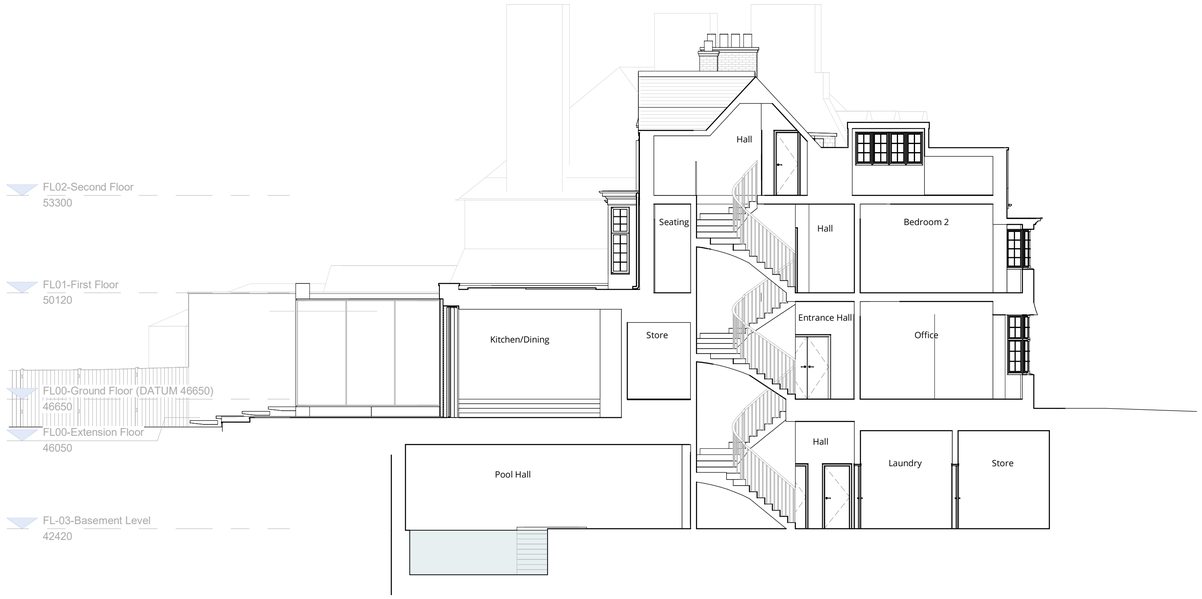
SCALE 1:100 m



Proposed Section A-A

1 : 100

Proposed Section B-B

1 : 100

Rev	Description	Date	Drwn	Ckd
0	Planning Issue	11/04/24	MM	EW

WOLFF ARCHITECTS

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status:

PLANNING

project:
45 Elsworthy Rd
London NW3 3BS

drawing title:
Proposed Sections

date: **11/19/21**
scale: **1 : 100**

dwg no: **2333-PL-310**
rev no: **0**

Notes:

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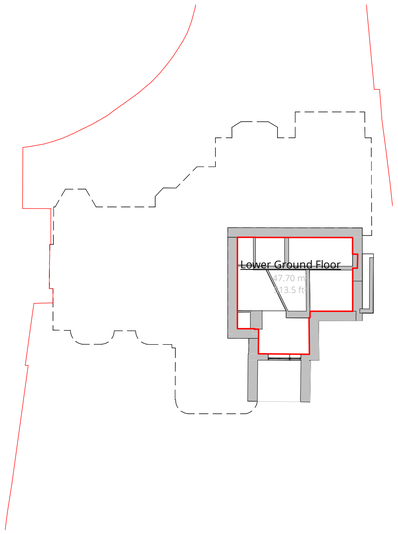
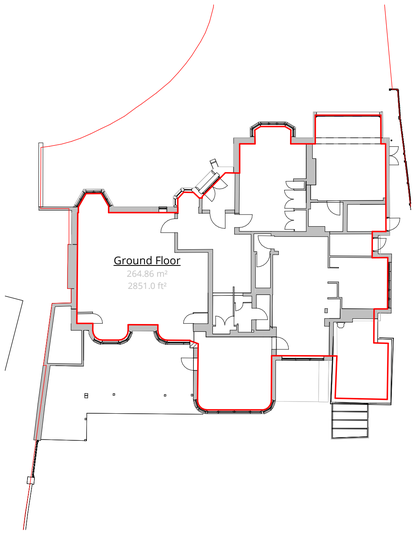
SCALE 1:100 m



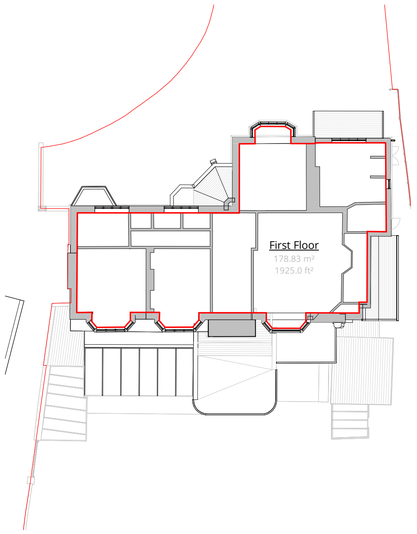
Existing Lower Ground Floor

1 : 200



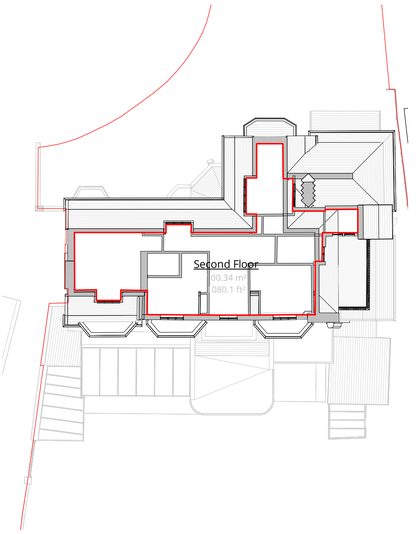
Existing Ground Floor

1 : 200



Existing First Floor

1 : 200

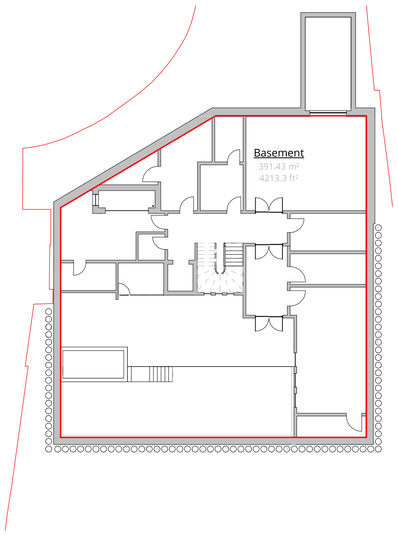


Existing Second Floor

1 : 200

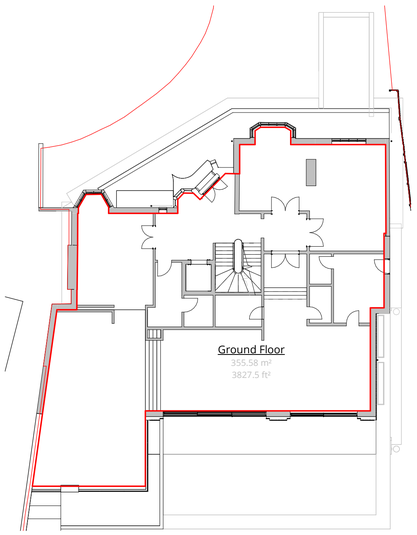
Gross Internal Area Schedule (Existing)

Name	Area (m2)	Area (ft2)
Lower Ground Floor	48 m²	513.5 ft²
Ground Floor	265 m²	2851.0 ft²
First Floor	179 m²	1925.0 ft²
Second Floor	100 m²	1080.1 ft²
Grand total: 4	592 m²	6369.5 ft²



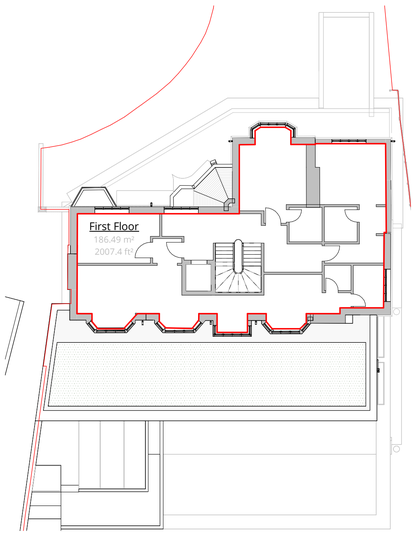
Proposed Basement

1 : 200



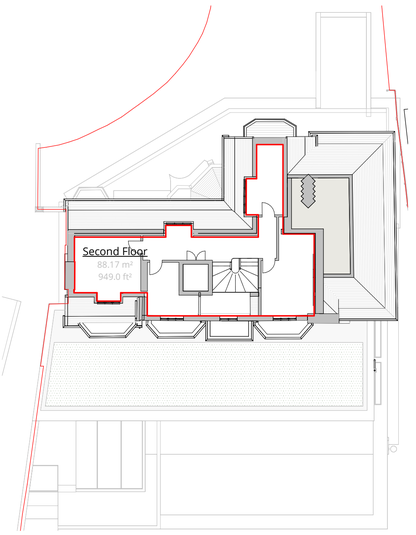
Proposed Ground Floor

1 : 200



Proposed First Floor

1 : 200



Proposed Second Floor

1 : 200

Gross Internal Area Schedule (Proposed)

Name	Area (m2)	Area (ft2)
Ground Floor	355.6 m²	3827.5 ft²
First Floor	186.5 m²	2007.4 ft²
Second Floor	88.2 m²	949.0 ft²
Basement	391.4 m²	4213.3 ft²
Grand total	1021.7 m²	10997.1 ft²

Rev	Description	Date	Drwn	Ckd

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status:

PLANNING

project:
45 Elsworthy Rd
London NW3 3BS

drawing title:
Existing and Proposed GIA

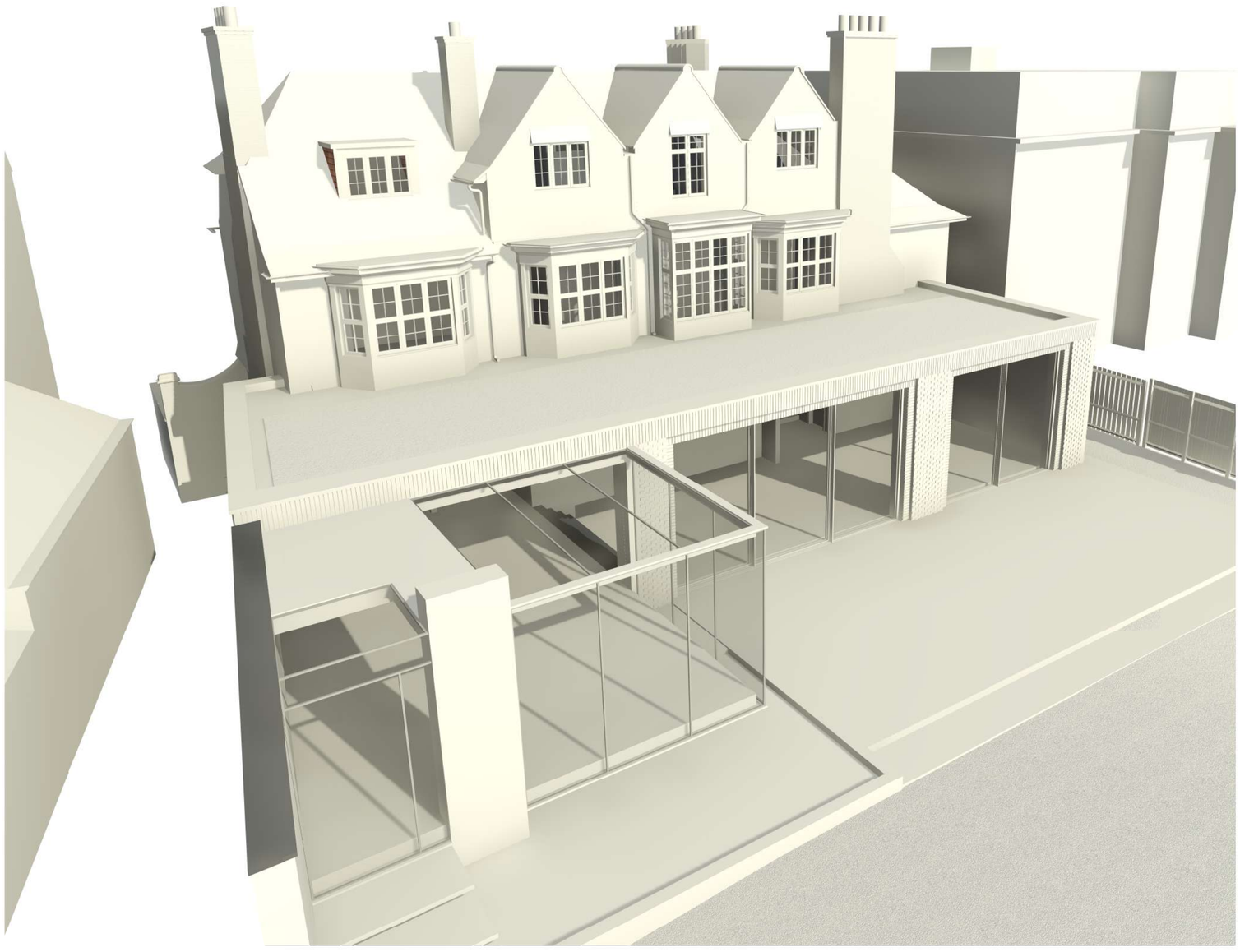
WORK IN PROGRESS

date:
01/08/24

scale:
1 : 200

dwg no:
2333-PL-710

rev no:



Rear Bird's eye view

External View Rear 1

External View Rear 2

External View Rear 3

Notes:

1 0 1 2 3 4 5
SCALE 1:100 m

Rev	Description	Date

WOLFF ARCHITECTS

London 16 Lambton Place Notting Hill
London W11 2SH T+44 (020) 7229 3125
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status:

PLANNING

project:

45 Elsworthy Rd

drawing title:

External 3D views

WORK IN PROGRESS

date: **02/23/24**

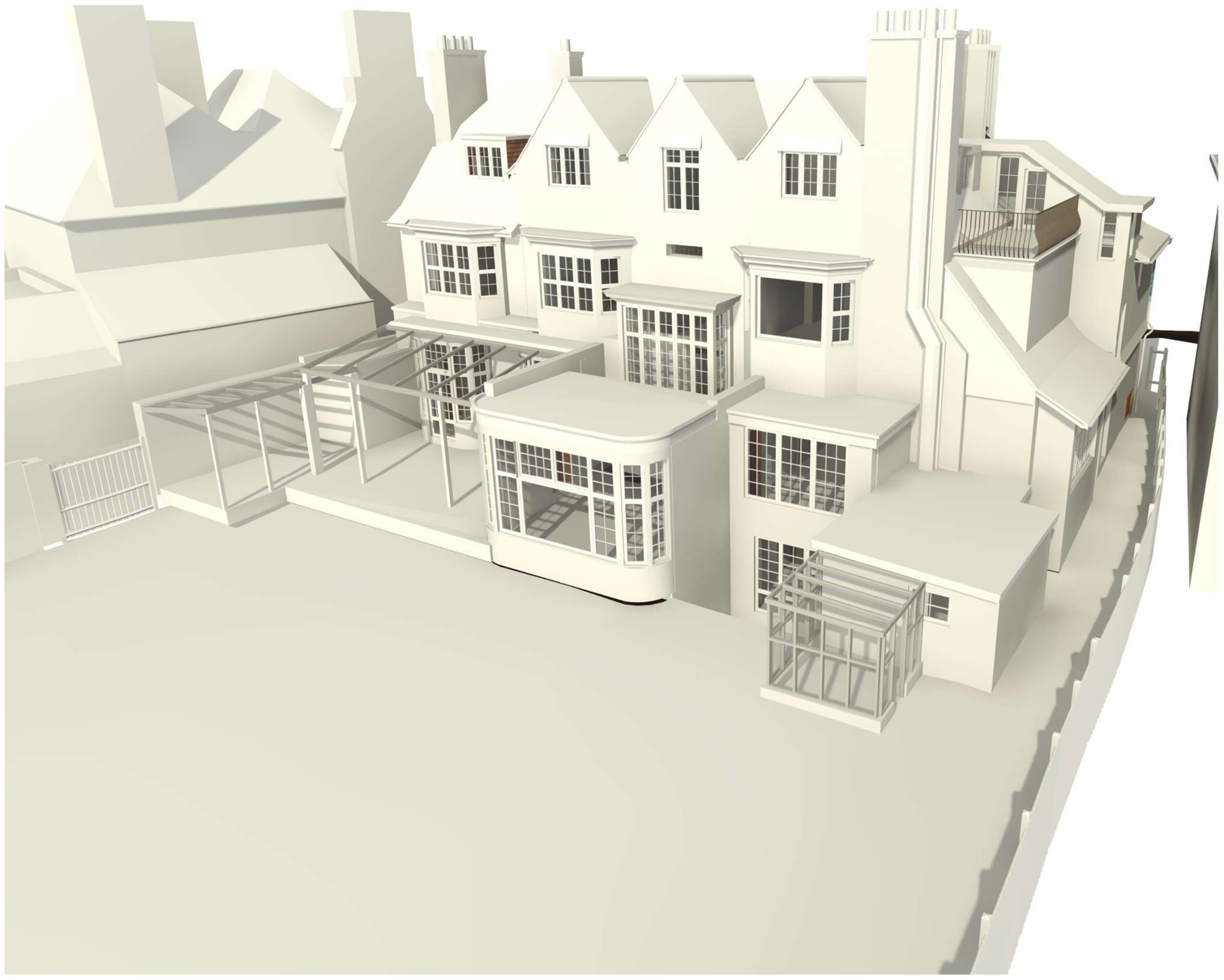
scale:

dwg no: **2333-SK-050**

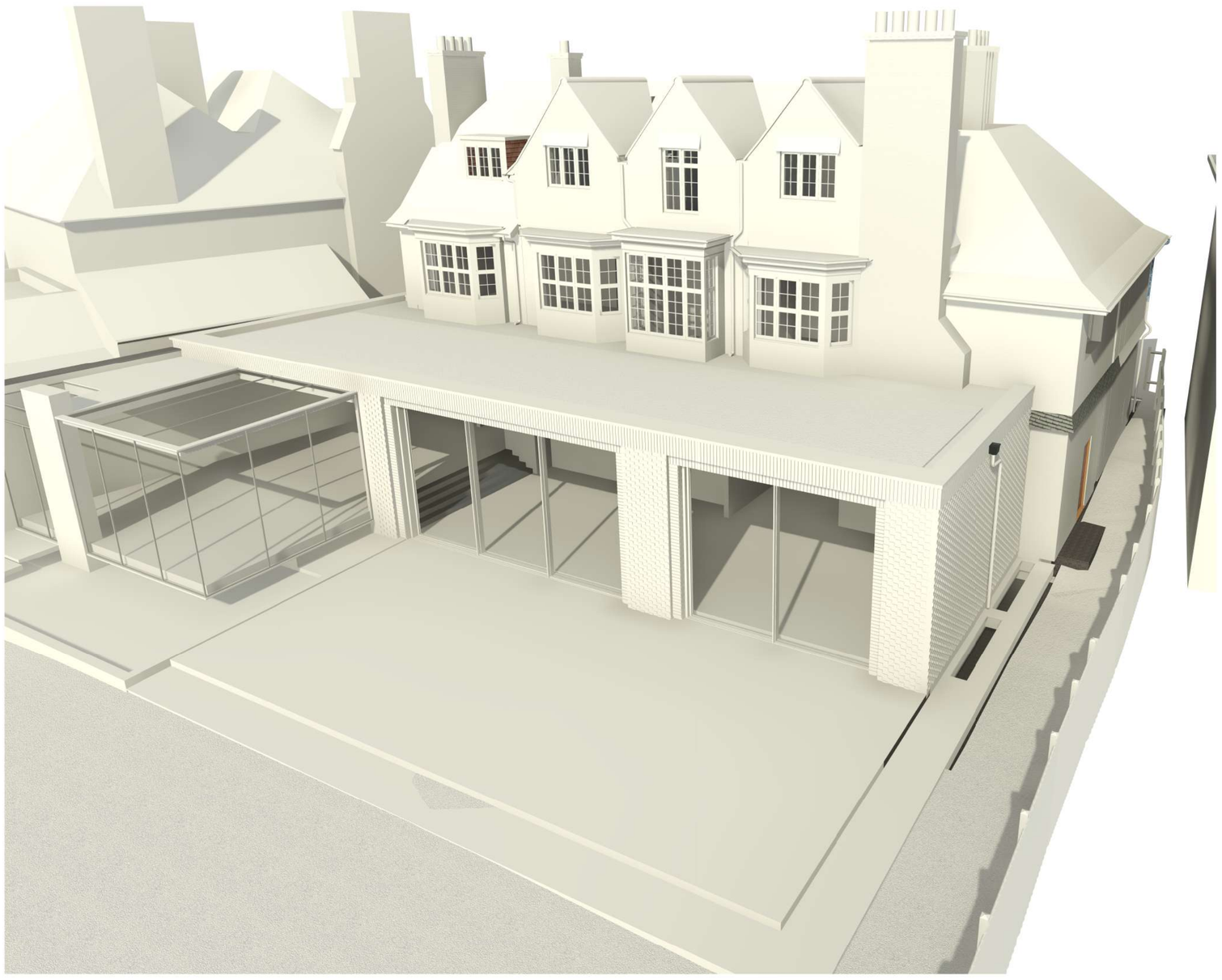
rev no:

Notes:

1 0 1 2 3 4 5
SCALE 1:100 m



Existing Bird's eye view at rear



Proposed Bird's eye view at rear

Rev	Description	Date

WOLFF ARCHITECTS

London 16 Lambton Place Notting Hill
London W11 2SH T+44 (020) 7229 3125
Oxford Chandos Yard 83 Bicester Road
Long Crendon HP18 9EE T+44 (0)1844 203310
W www.wolffarchitects.co.uk **E** info@wolffarchitects.co.uk

status:

PLANNING

project:

45 Elsworthy Rd

drawing title:

External 3D views

WORK IN PROGRESS

date: **02/23/24**

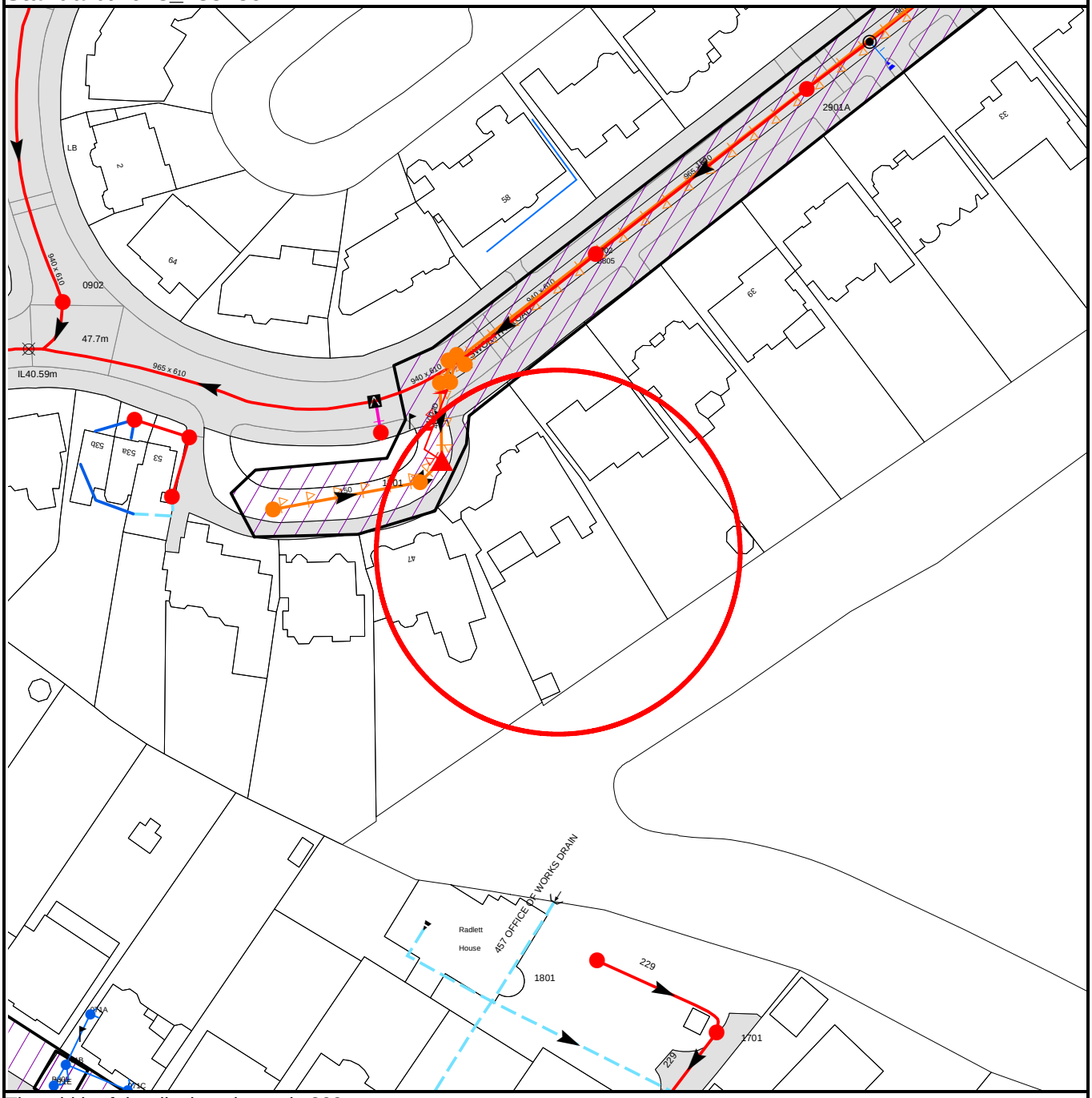
scale:

dwg no: **2333-SK-053**

rev no:

APPENDIX C – Thames Water Sewer Records

Residential CON29DW Drainage & Water Search Sewer Map-DWS/DWS Standard/2023_4857591



The width of the displayed area is 200m

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 (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

Con29DW Residential Drainage and Water Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

Trunk Sewer: A strategic sewer which collects either foul or surface water flow from a number of subsidiary catchments and transfers this flow to a pumping station, river outfall or treatment works.

Storm Overflow Sewer: A sewer designed to convey excess rainfall to rivers or watercourses so that the flow does not exceed the capacity of normal sewers (which could cause flooding).

Sludge Sewer: A sewer designed to convey sludge from one treatment works to another.

Vent Pipe: A section of sewer pipe connected between the top of a sewer and vent column, used to prevent the accumulation of gas in a sewer and thus allowing the system to operate properly.

Rising Main: A pipe carrying pumped flow under pressure from a low point to a high point on the sewerage network. The direction of the fleck indicates the direction of flow within the pipe.

Vacuum: A foul sewer designed to remove foul sewage under pressure (vacuum sewers cannot accept direct new connections).

Thames Water Proposed Sewer

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

Foul Sewer: Any foul sewer that is not owned by Thames Water.

Gulley: A sewer designed to convey surface water from large roads, motorways, etc. to watercourses or to public surface water sewers. These sewers are generally maintained by the relevant highway authority.

Culverted Watercourse: A watercourse running through a culvert or pipe which is the responsibility of the property owner or the Environment Agency.

Decommissioned Sewer: A disused sewer. Usually filled with cement mixture or removed from the ground.

Content of this drainage network is currently unknown.

Ownership of this drainage network is currently unknown.

Other Symbols

Undefined Ends: These symbols represent the point at which a pipe continues but no records of its position are currently held by Thames Water. These symbols are rare but may be found on any of the public sewer types.

Public / Private Pumping Station: Foul or Surface Water pumping station.

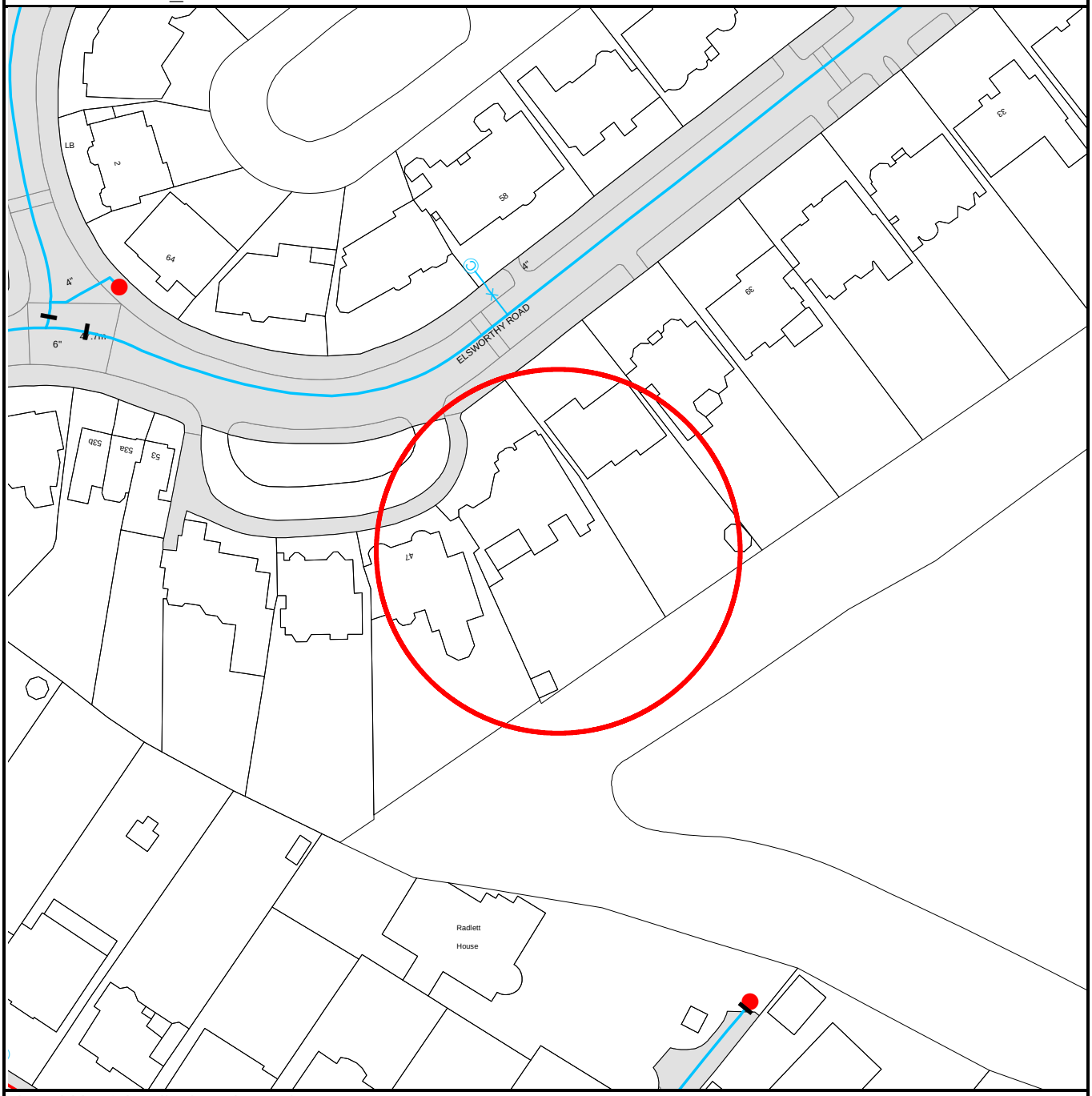
Casement: Ducts may contain high voltage cables. Please check with Thames Water.

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the 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 indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters.

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, please contact Property Searches on 0800 009 4540.

Residential CON29DW Drainage & Water Search Water Map-DWS/DWS Standard/2023_4857591



The width of the displayed area is 200m

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 (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

Con29DW Residential Drainage and Water Search - Water Key

Public Water Pipes (Operated & Maintained by Thames Water)

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

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

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

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

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

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

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

Depth of Water Pipes (Normal Cover)

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

Pipe fittings and controls (Operated & Maintained by Thames Water)

Hydrant: A point on a water main which is used by fire services or operational purposes by Thames Water.

Meter: Used to measure water flowing through a water main for domestic metering or operational purposes by Thames Water.

General Purpose Valve: Valves allowing control of water flow or pressure within the system.

Air Valve: A valve which allows the release of trapped air within a water pipe.

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

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

Other Water Company or Unknown: Occasionally other water companies' water pipes may overlap the border of our clean coverage area. The mains are denoted in purple and in most cases the owner of the pipe is displayed along them.

Other Symbols

Casement: Ducts may contain high voltage cables. Please check with Thames Water.

Note:
Most private pipe work and assets i.e. stopcocks, are not shown on our plans (in the past this information had not been recorded).

Thames Water Utilities Ltd, Property Searches, PO Box 3189, Slough SL1 4W,
T 0800 009 4540 E searches@thameswater.co.uk I www.thameswater-propertysearches.co.uk

APPENDIX D – Existing Surface Water Flow Rates

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Summer	0.116	0.116	6.8	0.2	O K
60 min Winter	0.092	0.092	4.9	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Summer	13.524	0.0	7.0	32
60 min Winter	13.524	0.0	7.0	32

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	21.000	Shortest Storm (mins)	60
Ratio R	0.436	Longest Storm (mins)	60
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.052

Time (mins) From:	To:	Area (ha)
0	4	0.052

Model Details

Storage is Online Cover Level (m) 1.000

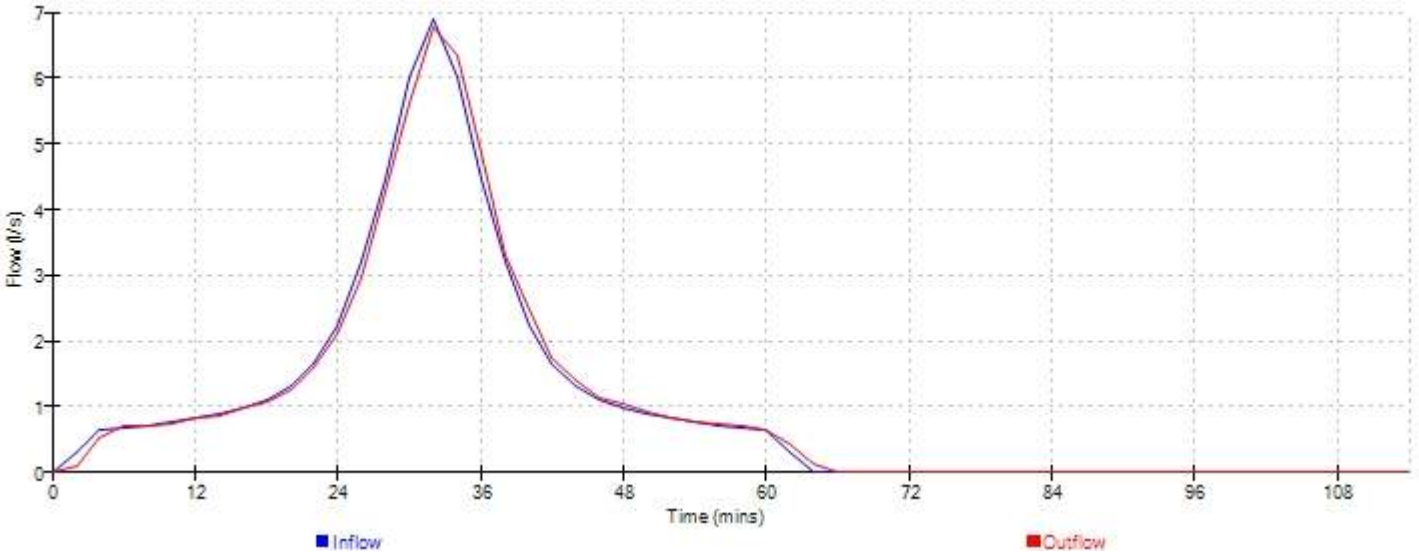
Pipe Structure

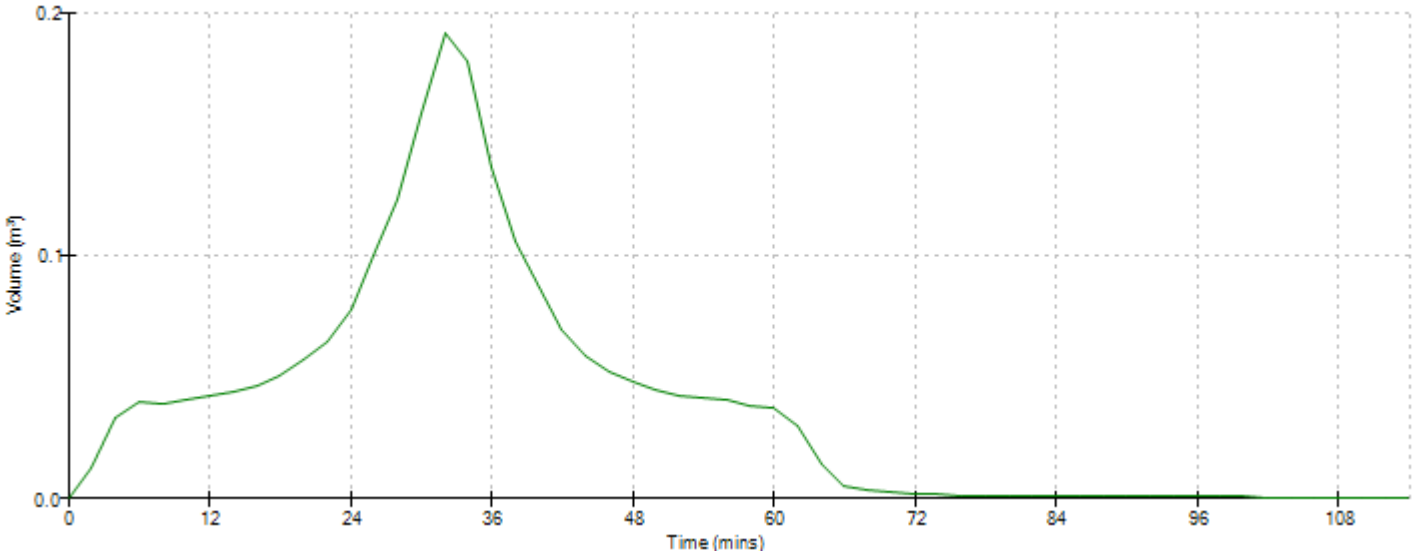
Diameter (m) 0.150 Slope (1:X) 100.000 Length (m) 10.000 Invert Level (m) 0.000

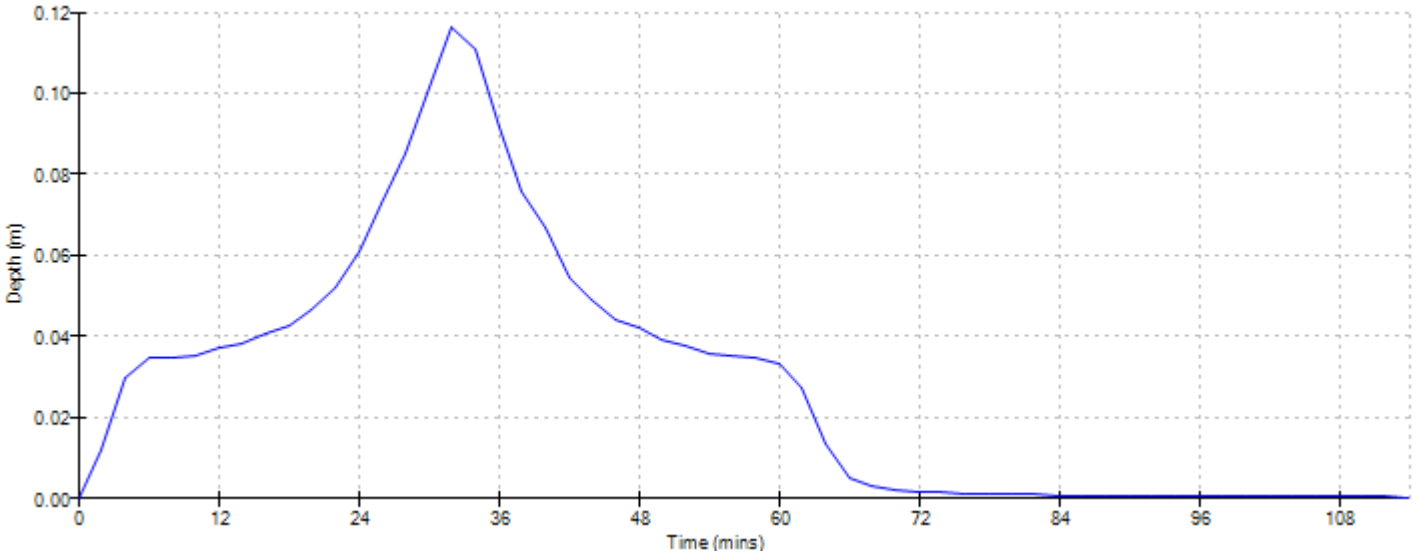
Pipe Outflow Control

Diameter (m) 0.150 Roughness k (mm) 0.600 Upstream Invert Level (m) 0.000
Slope (1:X) 100.0 Entry Loss Coefficient 0.500
Length (m) 10.000 Coefficient of Contraction 0.600

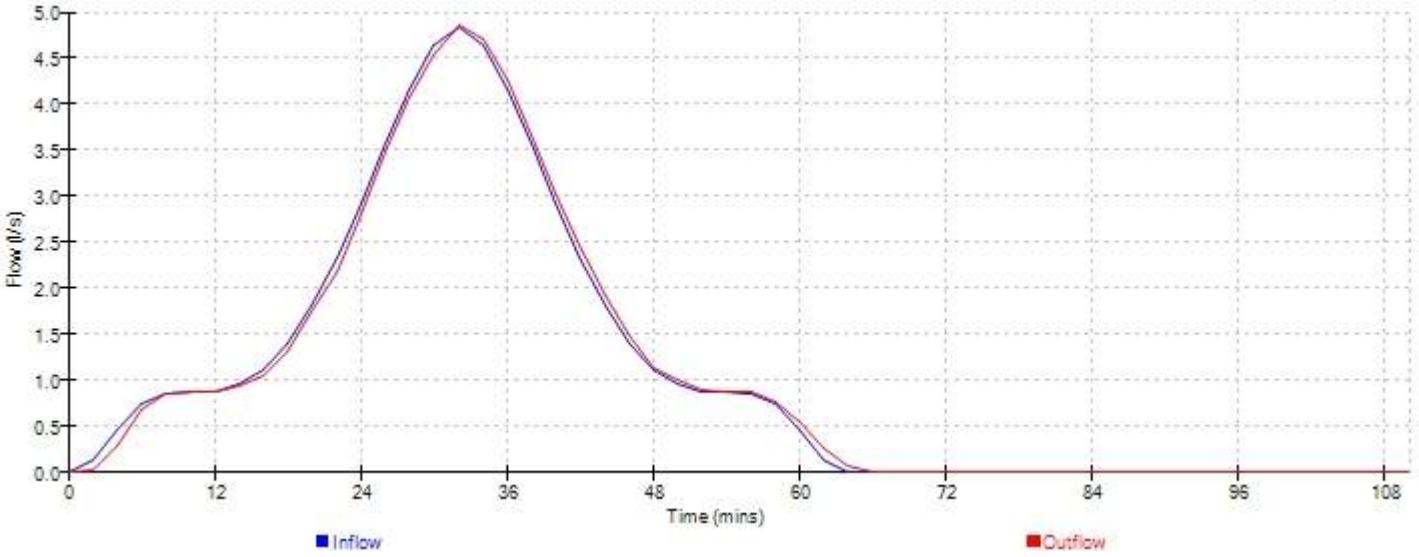
Event: 60 min Summer

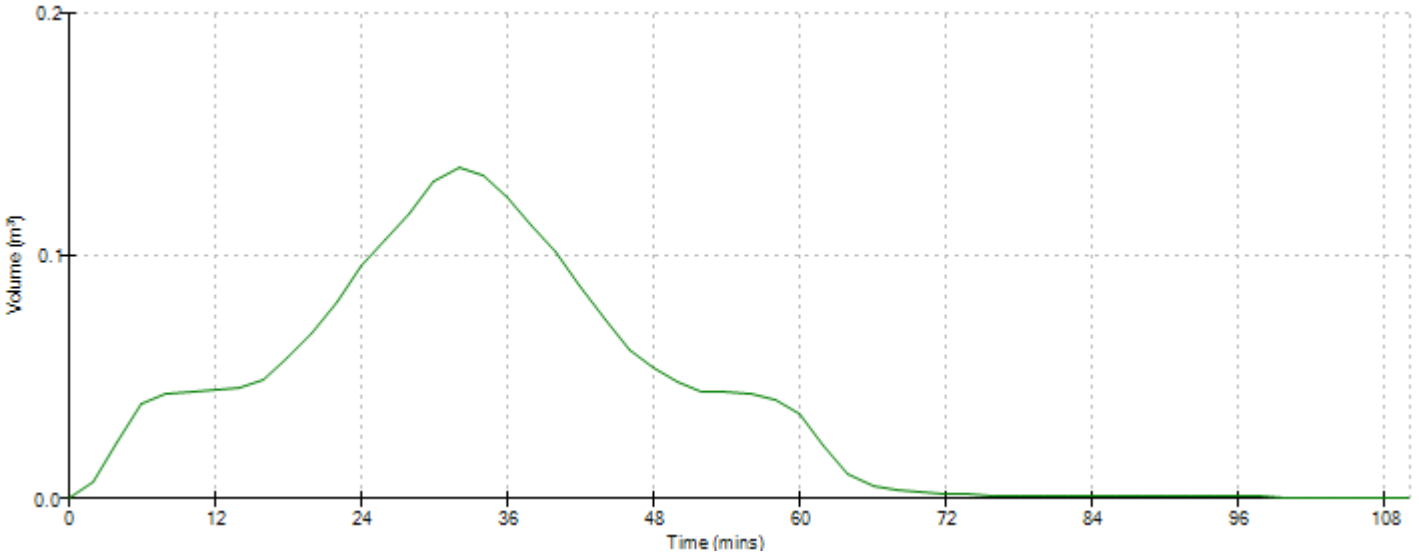


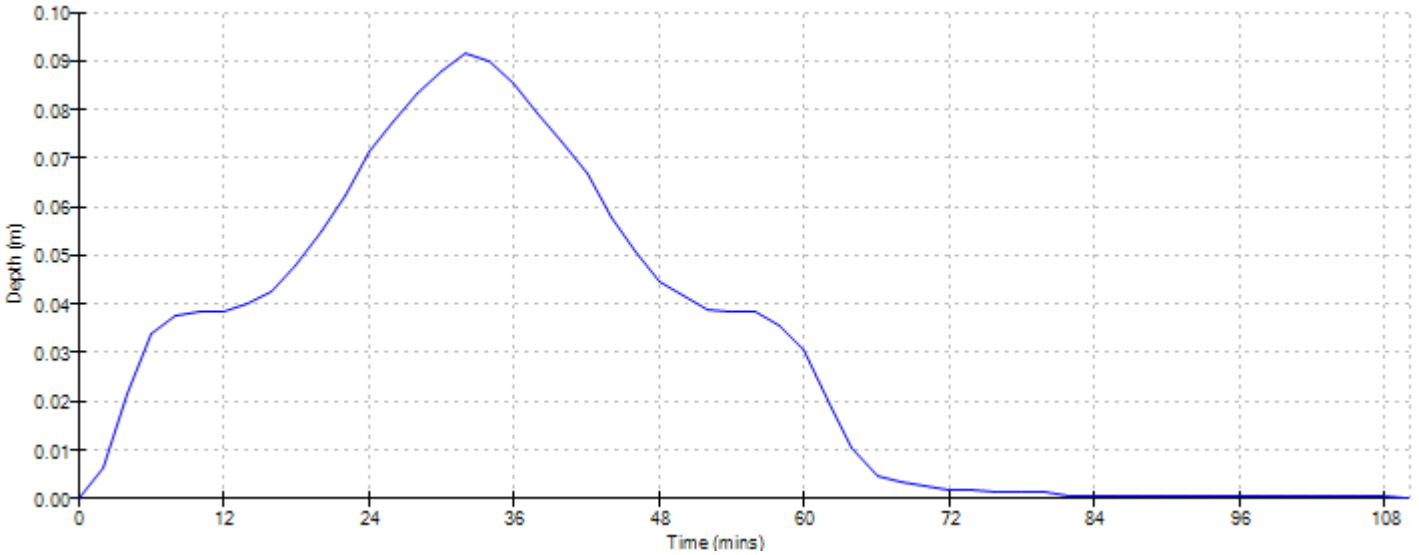




Event: 60 min Winter







Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Summer	0.205	0.205	16.5	0.4	O K
60 min Winter	0.161	0.161	11.6	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Summer	32.372	0.0	16.8	32
60 min Winter	32.372	0.0	16.8	32

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	21.000	Shortest Storm (mins)	60
Ratio R	0.436	Longest Storm (mins)	60
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.052

Time (mins) From:	To:	Area (ha)
0	4	0.052

Model Details

Storage is Online Cover Level (m) 1.000

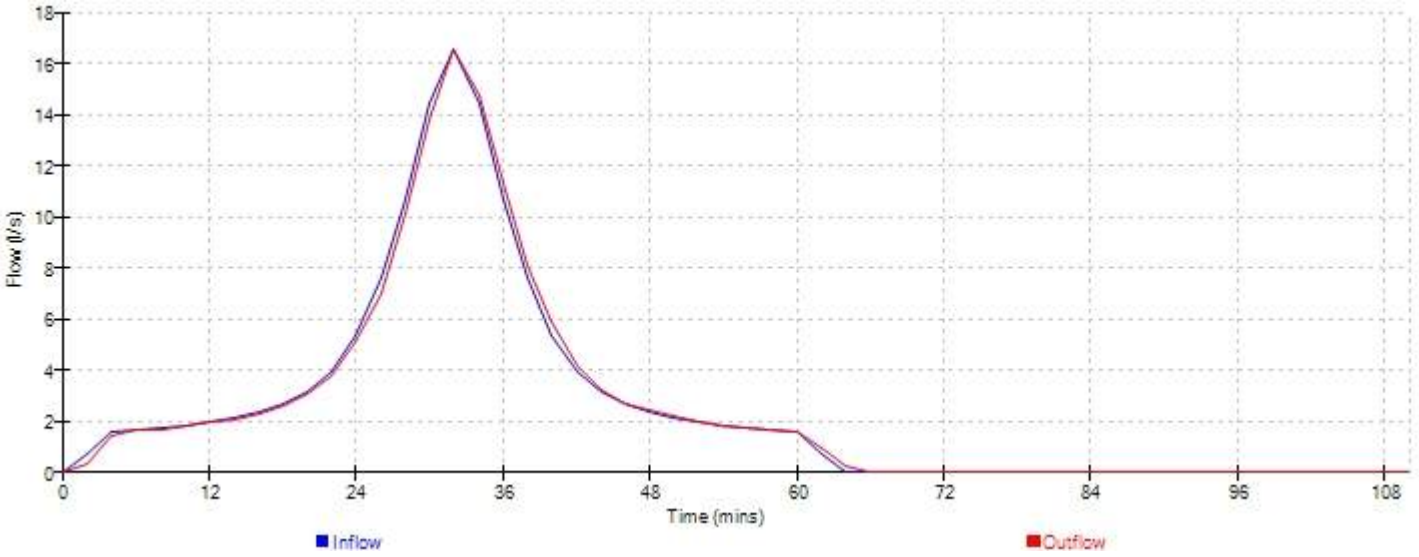
Pipe Structure

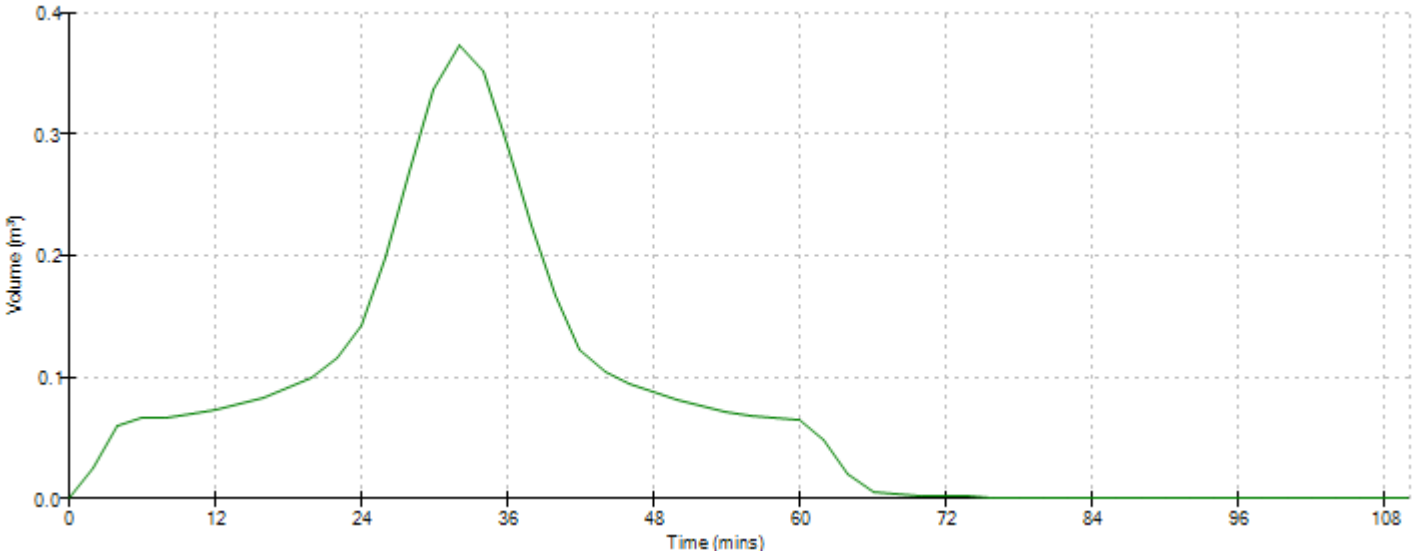
Diameter (m) 0.150 Slope (1:X) 100.000 Length (m) 10.000 Invert Level (m) 0.000

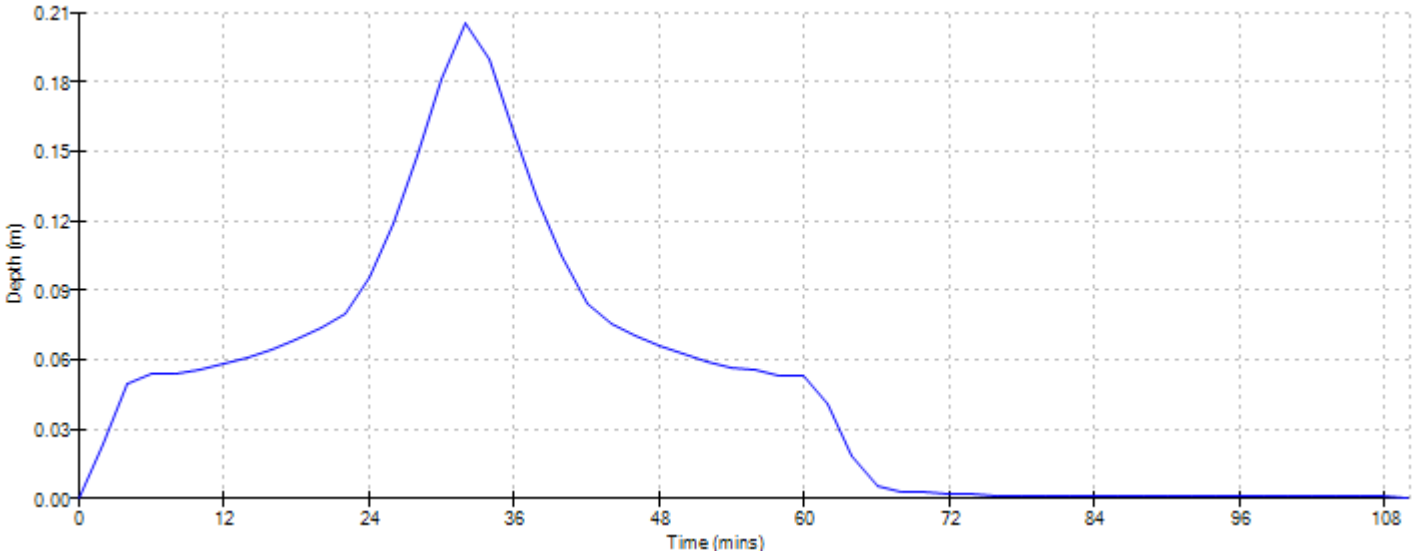
Pipe Outflow Control

Diameter (m) 0.150 Roughness k (mm) 0.600 Upstream Invert Level (m) 0.000
Slope (1:X) 100.0 Entry Loss Coefficient 0.500
Length (m) 10.000 Coefficient of Contraction 0.600

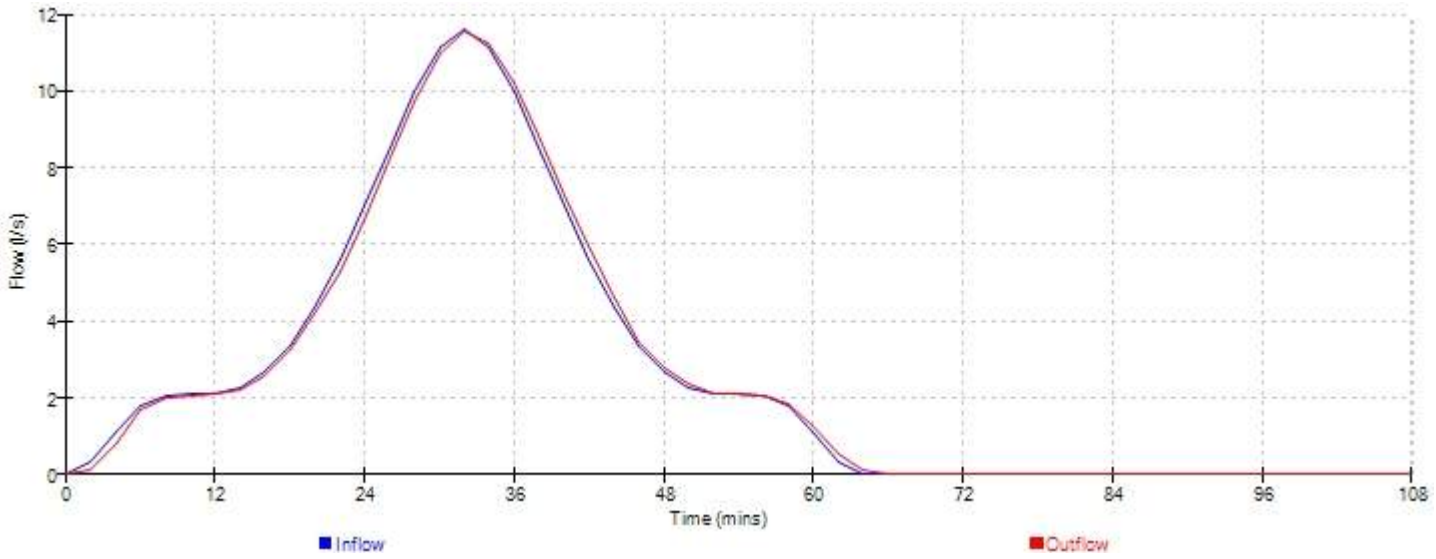
Event: 60 min Summer

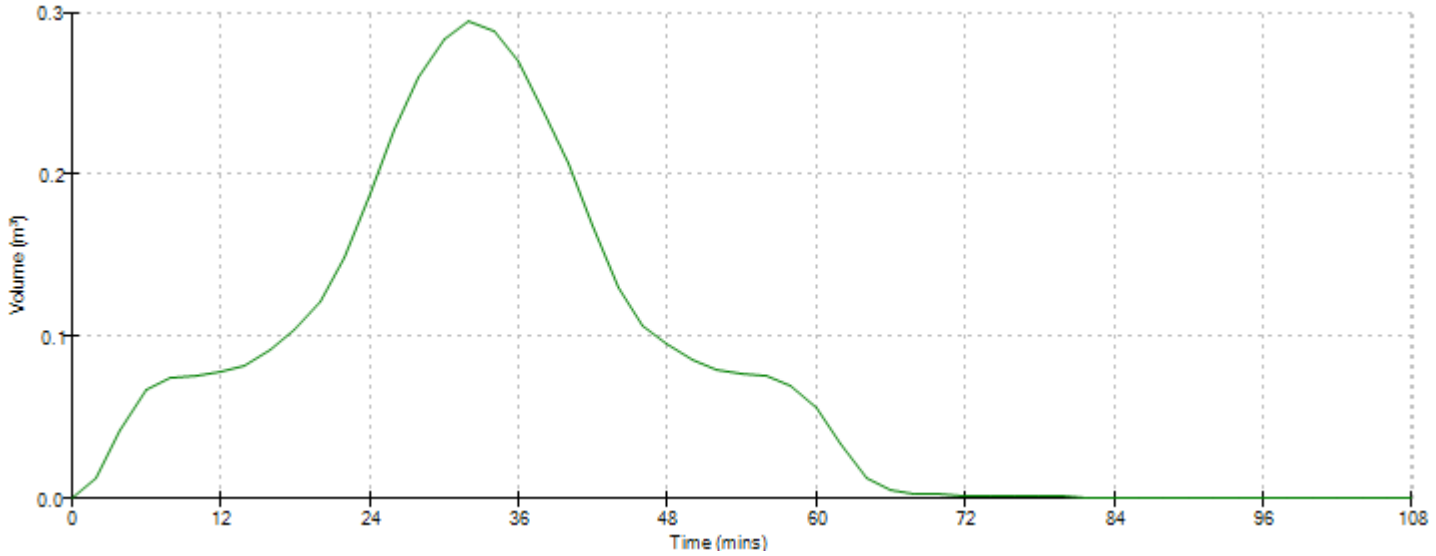


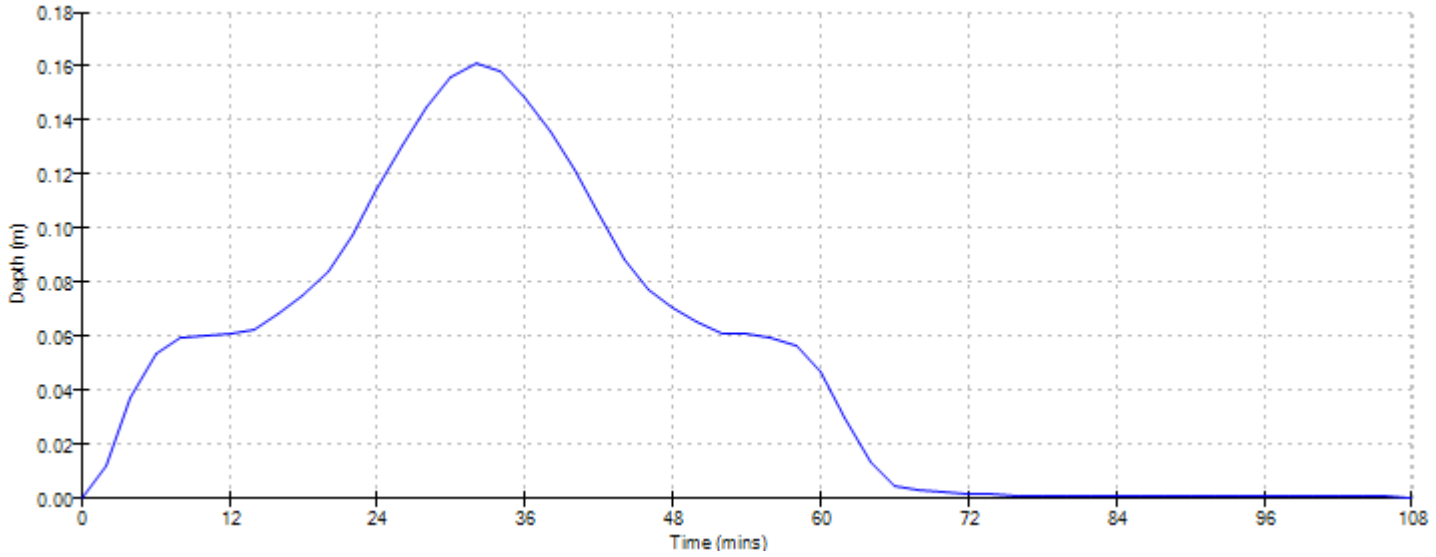




Event: 60 min Winter







Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Summer	0.306	0.306	21.4	0.5	O K
60 min Winter	0.194	0.194	15.2	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Summer	42.578	0.0	22.1	32
60 min Winter	42.578	0.0	22.1	32

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	21.000	Shortest Storm (mins)	60
Ratio R	0.436	Longest Storm (mins)	60
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.052

Time (mins) From:	To:	Area (ha)
0	4	0.052

Model Details

Storage is Online Cover Level (m) 1.000

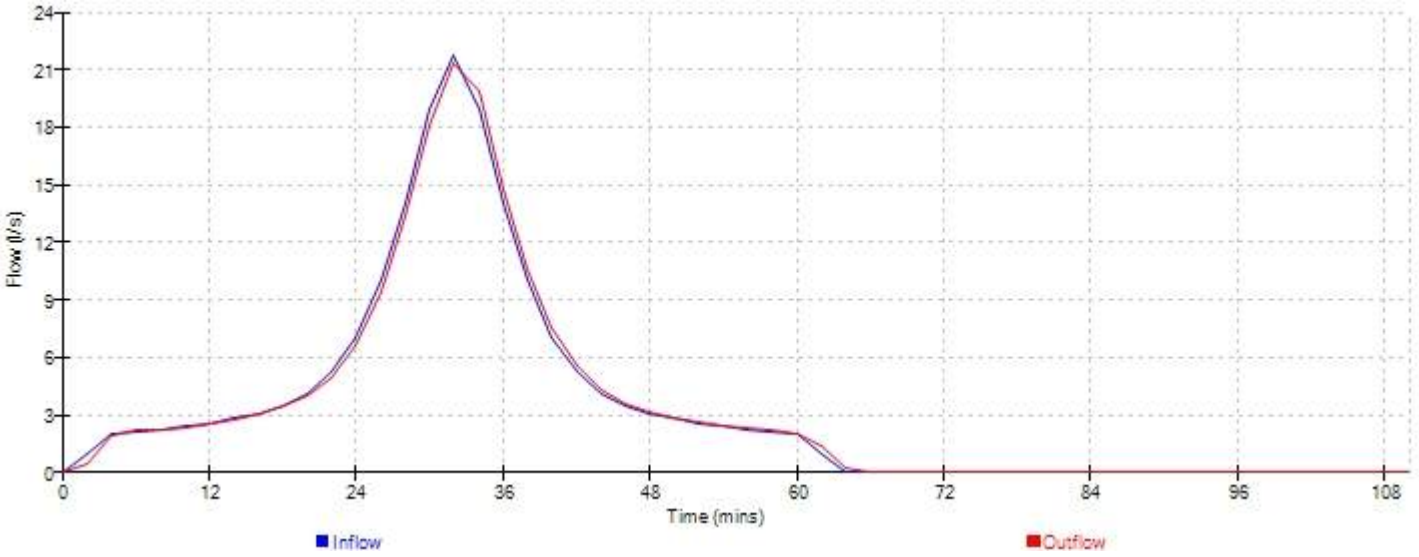
Pipe Structure

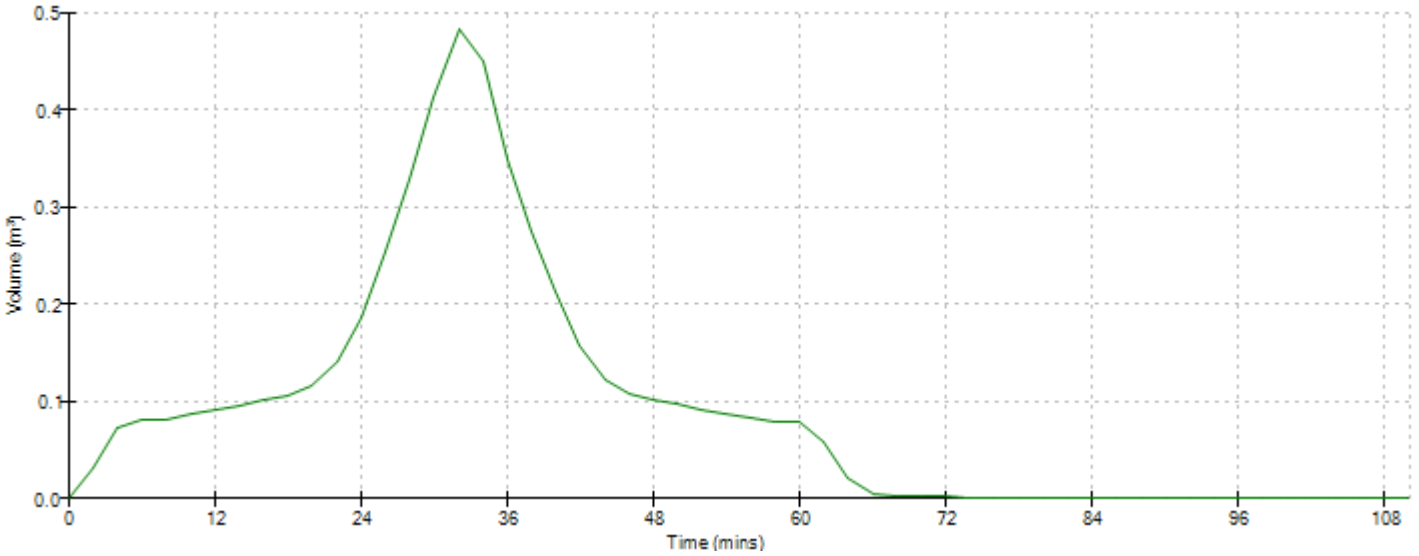
Diameter (m) 0.150 Slope (1:X) 100.000 Length (m) 10.000 Invert Level (m) 0.000

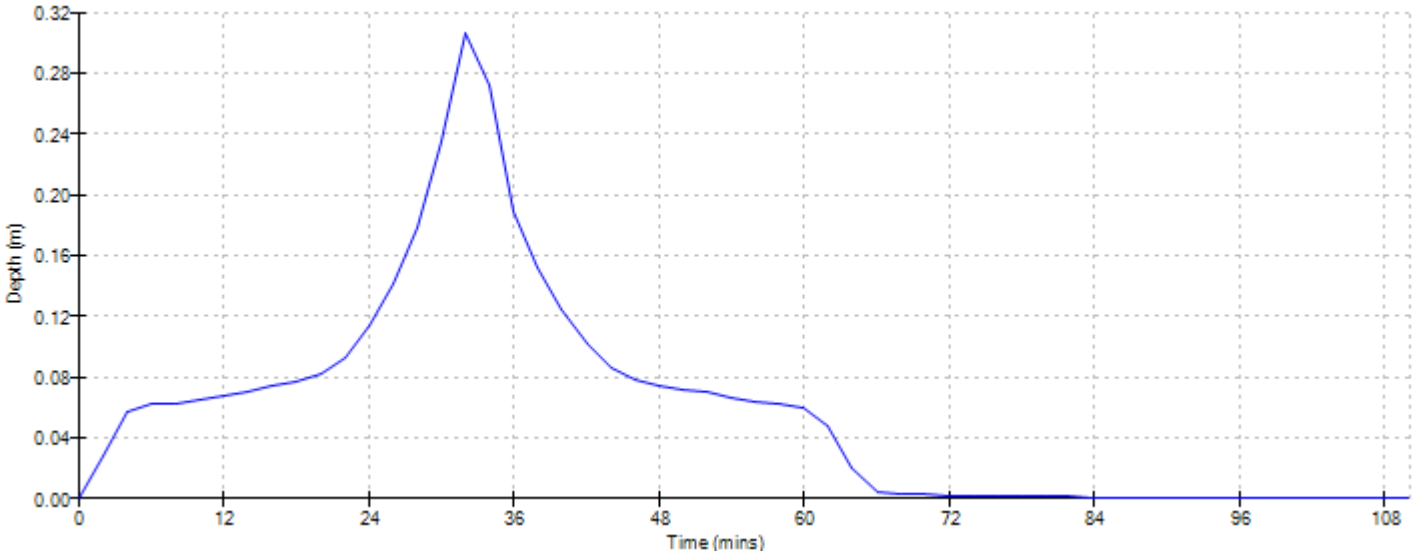
Pipe Outflow Control

Diameter (m) 0.150 Roughness k (mm) 0.600 Upstream Invert Level (m) 0.000
Slope (1:X) 100.0 Entry Loss Coefficient 0.500
Length (m) 10.000 Coefficient of Contraction 0.600

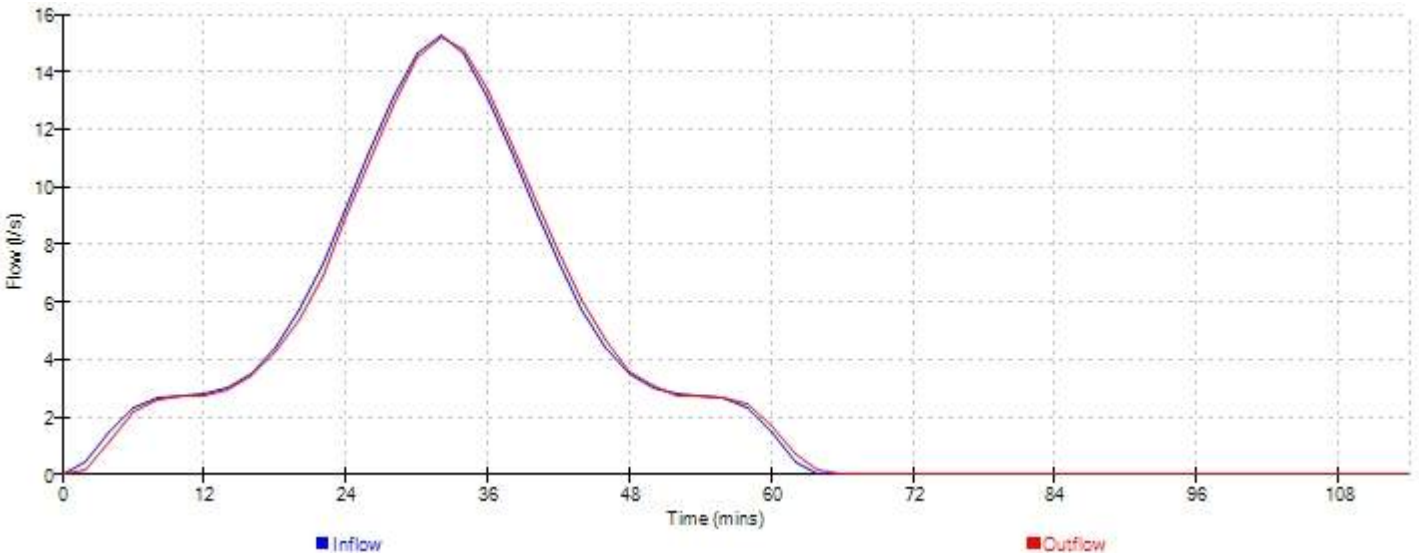
Event: 60 min Summer

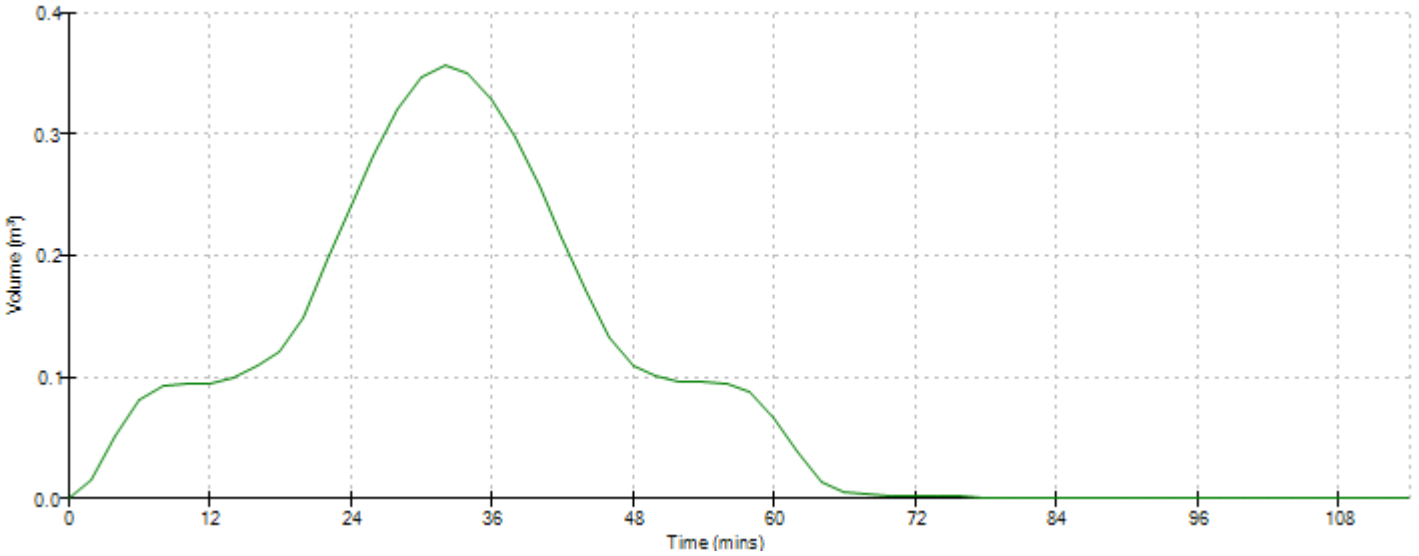


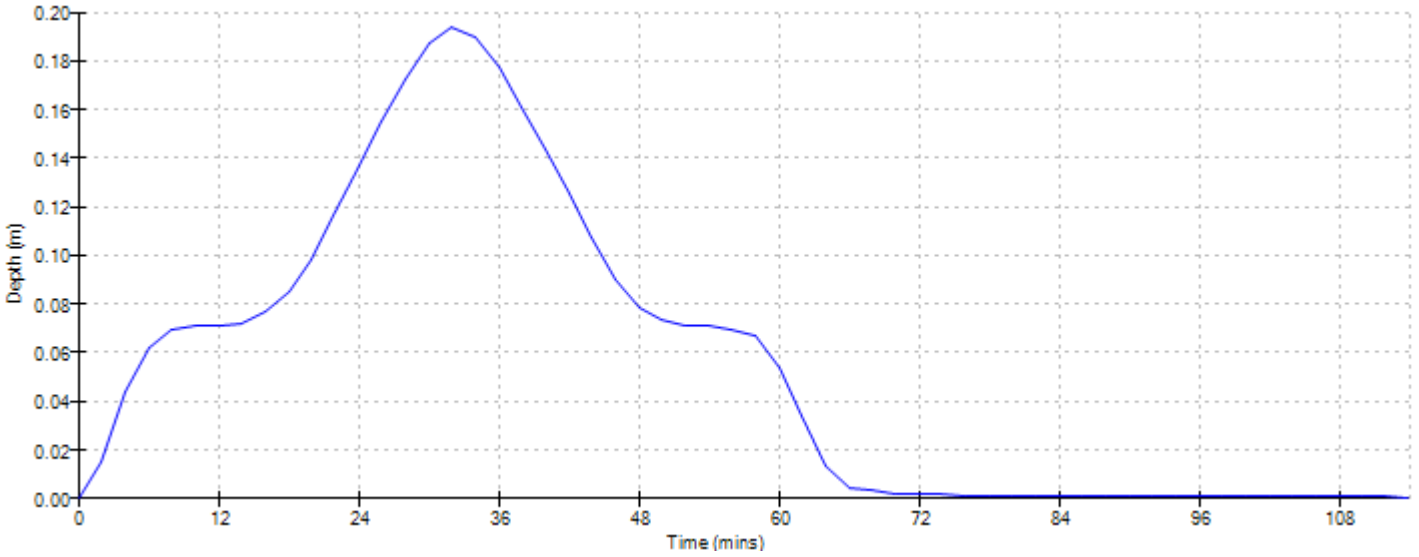




Event: 60 min Winter







APPENDIX E – Drainage Strategy Plan

940 x 610 COMBINED THAMES WATER SEWER

Assumed existing combined connection from site to Thames Water combined sewer, subject to S106 consent and CCTV confirmation

New manhole to be constructed on existing private combined sewer, subject to CCTV line and level confirmation

Assumed existing combined private sewer to be surveyed

Flow Control Unit
Design Head = 1.2m
Design Flow = 2.0 l/s

Attenuation Tank
7m (L) x 4.5m (W) x 1.2m (D)

600 Ø Catchpit

Gallery / Multi-use room

Hall

Entrance Hall

Library

Lift 3 wc

Boh

Freezer

WC

Kitchen/Dining

Seating

Pumped discharge from basement, TBC at detailed design stage

Rainwater pipes and soil vent pipes to be confirmed by Architect at detailed design stage

Adjacent Building

Details Obscured

Legend

- Site Boundary
- Thames Water Combined Sewer
- Proposed Combined Water Drainage
- Proposed Foul Water Drainage
- Proposed Surface Water Drainage

REV	DATE	REVISION NAME	BY	CHKD	APP
P1	27.03.24	Preliminary Issue	MK	TS	TS

PRELIMINARY

Green Structural Engineering
www.gseltd.co.uk
Green Structural Engineering Ltd
Unit 21 Berghem Mews
Blythe Road
Hammersmith
W14 0HN
020 3405 3120

Job Name:
45 Elsworthy Road

Drawing Title:
Drainage Strategy

DRAWN	CHECKED	DATE	PAPER SIZE	SCALE
MK	TS	Mar 2024	A1	1:100

PROJECT NO:	DRAWING NO:	REV:
20230188	251	P1

APPENDIX F – MicroDrainage Calculations

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

Half Drain Time : 169 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.744	0.744	0.0	1.8	1.8	22.3	O K
30 min Summer	0.930	0.930	0.0	1.8	1.8	27.8	O K
60 min Summer	1.070	1.070	0.0	1.9	1.9	32.0	O K
120 min Summer	1.117	1.117	0.0	1.9	1.9	33.4	O K
180 min Summer	1.087	1.087	0.0	1.9	1.9	32.5	O K
240 min Summer	1.048	1.048	0.0	1.9	1.9	31.4	O K
360 min Summer	0.977	0.977	0.0	1.8	1.8	29.2	O K
480 min Summer	0.911	0.911	0.0	1.8	1.8	27.3	O K
600 min Summer	0.849	0.849	0.0	1.8	1.8	25.4	O K
720 min Summer	0.790	0.790	0.0	1.8	1.8	23.6	O K
960 min Summer	0.678	0.678	0.0	1.8	1.8	20.3	O K
1440 min Summer	0.435	0.435	0.0	1.8	1.8	13.0	O K
2160 min Summer	0.229	0.229	0.0	1.8	1.8	6.9	O K
2880 min Summer	0.137	0.137	0.0	1.6	1.6	4.1	O K
4320 min Summer	0.079	0.079	0.0	1.3	1.3	2.4	O K
5760 min Summer	0.062	0.062	0.0	1.0	1.0	1.8	O K
7200 min Summer	0.053	0.053	0.0	0.9	0.9	1.6	O K
8640 min Summer	0.047	0.047	0.0	0.7	0.7	1.4	O K
10080 min Summer	0.044	0.044	0.0	0.7	0.7	1.3	O K
15 min Winter	0.744	0.744	0.0	1.8	1.8	22.3	O K
30 min Winter	0.932	0.932	0.0	1.8	1.8	27.9	O K
60 min Winter	1.075	1.075	0.0	1.9	1.9	32.2	O K
120 min Winter	1.129	1.129	0.0	1.9	1.9	33.8	O K
180 min Winter	1.095	1.095	0.0	1.9	1.9	32.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.056	0.0	23.6	18
30 min Summer	97.000	0.0	30.5	33
60 min Summer	59.609	0.0	37.5	62
120 min Summer	35.366	0.0	44.5	120
180 min Summer	25.717	0.0	48.6	152
240 min Summer	20.398	0.0	51.4	182
360 min Summer	14.717	0.0	55.6	250
480 min Summer	11.664	0.0	58.8	320
600 min Summer	9.733	0.0	61.3	388
720 min Summer	8.392	0.0	63.4	456
960 min Summer	6.636	0.0	66.9	596
1440 min Summer	4.761	0.0	72.0	836
2160 min Summer	3.411	0.0	77.3	1168
2880 min Summer	2.690	0.0	81.3	1500
4320 min Summer	1.923	0.0	87.2	2204
5760 min Summer	1.514	0.0	91.5	2936
7200 min Summer	1.257	0.0	95.0	3640
8640 min Summer	1.079	0.0	97.9	4296
10080 min Summer	0.949	0.0	100.4	5128
15 min Winter	150.056	0.0	23.6	18
30 min Winter	97.000	0.0	30.5	32
60 min Winter	59.609	0.0	37.5	60
120 min Winter	35.366	0.0	44.5	116
180 min Winter	25.717	0.0	48.6	166

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	1.049	1.049	0.0	1.9	1.9	31.4	O K
360 min Winter	0.957	0.957	0.0	1.8	1.8	28.7	O K
480 min Winter	0.866	0.866	0.0	1.8	1.8	25.9	O K
600 min Winter	0.776	0.776	0.0	1.8	1.8	23.2	O K
720 min Winter	0.688	0.688	0.0	1.8	1.8	20.6	O K
960 min Winter	0.481	0.481	0.0	1.8	1.8	14.4	O K
1440 min Winter	0.223	0.223	0.0	1.7	1.7	6.7	O K
2160 min Winter	0.094	0.094	0.0	1.5	1.5	2.8	O K
2880 min Winter	0.071	0.071	0.0	1.2	1.2	2.1	O K
4320 min Winter	0.052	0.052	0.0	0.9	0.9	1.6	O K
5760 min Winter	0.044	0.044	0.0	0.7	0.7	1.3	O K
7200 min Winter	0.039	0.039	0.0	0.6	0.6	1.2	O K
8640 min Winter	0.036	0.036	0.0	0.5	0.5	1.1	O K
10080 min Winter	0.033	0.033	0.0	0.4	0.4	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	20.398	0.0	51.4	188
360 min Winter	14.717	0.0	55.6	266
480 min Winter	11.664	0.0	58.8	344
600 min Winter	9.733	0.0	61.3	418
720 min Winter	8.392	0.0	63.4	492
960 min Winter	6.636	0.0	66.9	618
1440 min Winter	4.761	0.0	72.0	824
2160 min Winter	3.411	0.0	77.3	1128
2880 min Winter	2.690	0.0	81.3	1468
4320 min Winter	1.923	0.0	87.2	2168
5760 min Winter	1.514	0.0	91.5	2928
7200 min Winter	1.257	0.0	95.0	3672
8640 min Winter	1.079	0.0	97.9	4352
10080 min Winter	0.949	0.0	100.4	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	21.000	Shortest Storm (mins)	15
Ratio R	0.435	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Model Details

Storage is Online Cover Level (m) 2.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	31.5	0.0	1.200	31.5	0.0	1.201	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.5	0.800	1.7	2.000	2.5	4.000	3.5	7.000	4.5
0.200	1.7	1.000	1.8	2.200	2.6	4.500	3.7	7.500	4.7
0.300	1.8	1.200	2.0	2.400	2.7	5.000	3.9	8.000	4.8
0.400	1.7	1.400	2.1	2.600	2.8	5.500	4.0	8.500	5.0
0.500	1.6	1.600	2.3	3.000	3.0	6.000	4.2	9.000	5.1
0.600	1.5	1.800	2.4	3.500	3.3	6.500	4.4	9.500	5.2

Event: 120 min Winter