FLOOD RISK ASSESSMENT

Site Address

61 Thornhill Road
Ickenham
Uxbridge
UB10 8SQ

Client

MZA Planning

Date

23/03/2021

1 Document Control

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Site Address:	61 Thornhill Road Ickenham Uxbridge UB10 8SQ
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Report Author:	James Hodgkinson (MSc, BSc) **Environmental Consultant**
Authorised by:	Francesca Caggiano (MSc, BSc) **Environmental Consultant**

Contents

2 Abbreviations

Abbreviation	Description
STM	STM Environmental Consultants Limited
BGS	British Geological Survey
EA	Environment Agency
OS	Ordnance Survey of Great Britain
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
FWD	Floodline Warning Direct
FRMS	Flood Risk Management Strategy
HBC	Hillingdon Borough Council
SWMP	Surface Water Management Plan
SFRA	Strategic Flood Risk Assessment
CDA	Critical Drainage Area
SuDS	Sustainable Drainage Systems
GWSPZ	Groundwater Source Protection Zone
LLFA	Lead Local Flood Authority
mbgl	metres below ground level
DCLG	Department for Communities and Local Government
PPGPS	Planning practice guidance and Planning system

3 Disclaimer

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4 Executive Summary

Location	61 Thornhill Road, Ickenham, Uxbridge, UB10 8SQ Grid reference: 507026 , 185812
Proposed Development	A two-storey side extension, single-storey side extension, rear extension and associated alterations.
Flood Zone	Flood Zone 2, 3a and 3b.
Topography	The average ground level is 36.23mAOD and slopes significantly downwards from 36.6mAOD in the West to 35.85mAOD in the East. The proposed development is at 36.50mAOD.
Sequential and Exception Tests	Development is minor and more vulnerable so Sequential and Exception Tests should not be required.
Main Sources of Flooding	Fluvial from the River Pinn and Surface water.
Flood Defences	No flood defences are identified in the EA data.
Records of Historic Flooding	The EA data identifies two fluvial flooding events from 1977 and 1988.
Fluvial (River) and Tidal (Sea) Flood Risk	Medium – Site experiences flood levels of 36.88mAOD during the 100 year + 35% climate change events, which results in 0.65m of flooding on site and 0.38m at the proposed extension location.
Pluvial (Surface Water) Flood Risk	Medium – Only 1 to 5 recorded sewer flooding incidents. Flood depths for the 1 in 100-year event are between 150 and 600mm and cover approximately 50% of the site. Flood depths for the 1 in 1000-year event range between 150 and 1200mm and cover the entire site.
Flood Risk from Artificial (Canals and Reservoirs) Sources	Low – No significant artificial sources identified.
Groundwater Flood Risk	Low – Although site is potentially susceptible to groundwater flooding, no recorded incidents have been identified.
Development Impacts on Local Flood Risk	The development is external and will increase the site impermeable area. As such it may have an adverse impact on local flood risk if unmitigated.
Proposed Flood Risk Mitigation Measures	• It is recommended that finished floor levels are set to 300mm above flood levels which is 37.18mAOD. • Construction will utilise flood resistant materials and services will be placed as high as practicable to reduce impact of flooding; • Occupants will sign up for EA Emergency Flood Warning Direct Service; • Safe egress to flood zone 1 is a 1-minute walk away and safe refuge is available on upper floors.
Surface Water Management (SuDS)	SuDS would reduce current surface water run off rates and given the size of the site (760m^2), there is good potential for implementation. Consideration should be given to rainwater harvesting and permeable paving where possible.

Conclusions	With the implementation of the recommended mitigation measures including raised finished floor levels, flood compensation storage and the implementation of a suitable surface water drainage strategy, the development is unlikely to have a significant impact on local flood risk.

5 Introduction

STM Environmental Consultants Limited (STM) has been appointed by MZA Planning (Client) to provide a Flood Risk Assessment (FRA) at a site located at 61 Thornhill Road, Ickenham, Uxbridge, UB10 8SQ.

6 Development Proposal

The FRA is required to support a planning application to a two-storey side extension, single storey side extension, rear extension and associated alterations to an existing residential dwelling.

Further details including drawings of the development plans are available in Appendix 2.

7 Report Aims and Objectives

The purpose of this report is to establish the flood risk to the site from all potential sources and, where possible, to propose suitable mitigation methods to reduce any risks to an acceptable level. It aims to make an assessment of whether the development will be safe for its lifetime, taking into account climate change and the vulnerability of its users, without increasing flood risk elsewhere.

The FRA assesses flood risk to the site from tidal, fluvial, surface water, groundwater, sewers and artificial sources. The FRA has been produced in accordance with the National Planning Policy Framework (NPPF) and its supporting guidance.

8 Summary of Data Review Undertaken

The following research has been undertaken as part of the FRA:

- Desktop assessment of topographical, hydrological and hydrogeological settings through review of the information sourced from the British Geological Survey (BGS), the Environment Agency (EA) and the Ordnance Survey (OS);
- Review of publicly available flood risk mapping provided by the EA;
- Review of the Preliminary Flood Risk Assessment (PFRA) and Level 1 Strategic Flood Risk Assessment (SFRA) produced by the LLFA outlining flood risk from various sources within the borough.

9 Legislative and Policy Context

9.1 Legislative Context

The Flood and Water Management Act was introduced in 2010. The Act defines the role of lead local flood authority (LLFA) for an area. All LLFA are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area, called “local flood risk management strategy”.

Alongside the Act, Flood Risk Regulations (2009) outline the roles and responsibilities of the various authorities, which include preparing Flood Risk Management Plans and identifying how significant flood risks are to be mitigated.

9.2 Policy Context

9.2.1 National Planning Policy Framework (NPPF)

The NPPF sets out the government’s planning policies for England and how these are expected to be applied. It also provides a set of guidelines and philosophy with which local planning authorities (LPAs) can build their own unique policies to appropriately regulate development within their jurisdictions.

Section 14 entitled “Meeting the challenge of climate change, flooding and coastal change” deals specifically with flood risk. Among other things it states that LPAs should try to ensure that “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere”. It further states that when determining planning application, LPAs 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 the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- 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;
- development is appropriately flood resilient and resistant;
- it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
- any residual risk can be safely managed; and
- safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Applications for minor development and changes of use should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 50.

Footnote 50 states: “A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future;

or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

The NPPF also lays out requirements for how LPAs should deal with planning applications in coastal areas. They should ensure that should they "reduce risk from coastal change by avoiding inappropriate development in vulnerable areas or adding to the impacts of physical changes to the coast."

Developments in Coastal Change Management Areas should only be considered appropriate where it is demonstrated that:

- it will be safe over its planned lifetime and will not have an unacceptable impact on coastal change;
- the character of the coast including designations is not compromised;
- the development provides wider sustainability benefits;
- the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast.

9.2.2 Local Planning Policy

Hillingdon Council's Policy EM6 addresses flood risk management in the borough.

The Council will require new development to be directed away from Flood Zones 2 and 3 in accordance with the principles of the National Planning Policy Framework (NPPF). The subsequent Hillingdon Local Plan: Part 2 -Site Specific Allocations LDD will be subjected to the Sequential Test in accordance with the NPPF.

Sites will only be allocated within Flood Zones 2 or 3 where there are overriding issues that outweigh flood risk. In these instances, policy criteria will be set requiring future applicants of these sites to demonstrate that flood risk can be suitably mitigated. The Council will require all development across the borough to use sustainable urban drainage systems (SUDS) unless demonstrated that it is not viable. The Council will encourage SUDS to be linked to water efficiency methods. The Council may require

developer contributions to guarantee the long-term maintenance and performance of SUDS is to an appropriate standard.

Implementation of Policy EM6 - The Council will implement Policy EM6 by: Working with the Environment Agency, British Waterways, Natural England and other partners to develop a management plan for the Grand Union Canal and other Blue-Ribbon Networks where they are not currently in place. Developing flood risk policies including SUDS in the Hillingdon Local Plan: Part 2- Development Management Policies LDD.

Monitoring of Policy EM6 - Monitoring of Policy EM6 will be through the Annual Monitoring Report with a specific link to: E1 (Core) Indicator: Number of planning permissions granted contrary to the advice of the Environment Agency on either flood defence grounds or water quality. Target: No planning permission will be granted contrary to the advice of the Environment Agency on either flood defence grounds or water quality. NI 189 - Flood risk management indicator. Number of planning permissions granted contrary to the advice of the Environment Agency. Number of new homes built in medium and high flood risk areas.

9.3 EA Standing Advice on Flood Risk

The Environment Agency's standing advice lays out the process that must be followed when carrying out flood risk assessments for developments.

Flood risk assessments are required for developments within one of the flood zones. This includes developments:

- in flood zone 2 or 3 including minor development and change of use more than 1 hectare (ha) in flood zone 1;
- less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs);

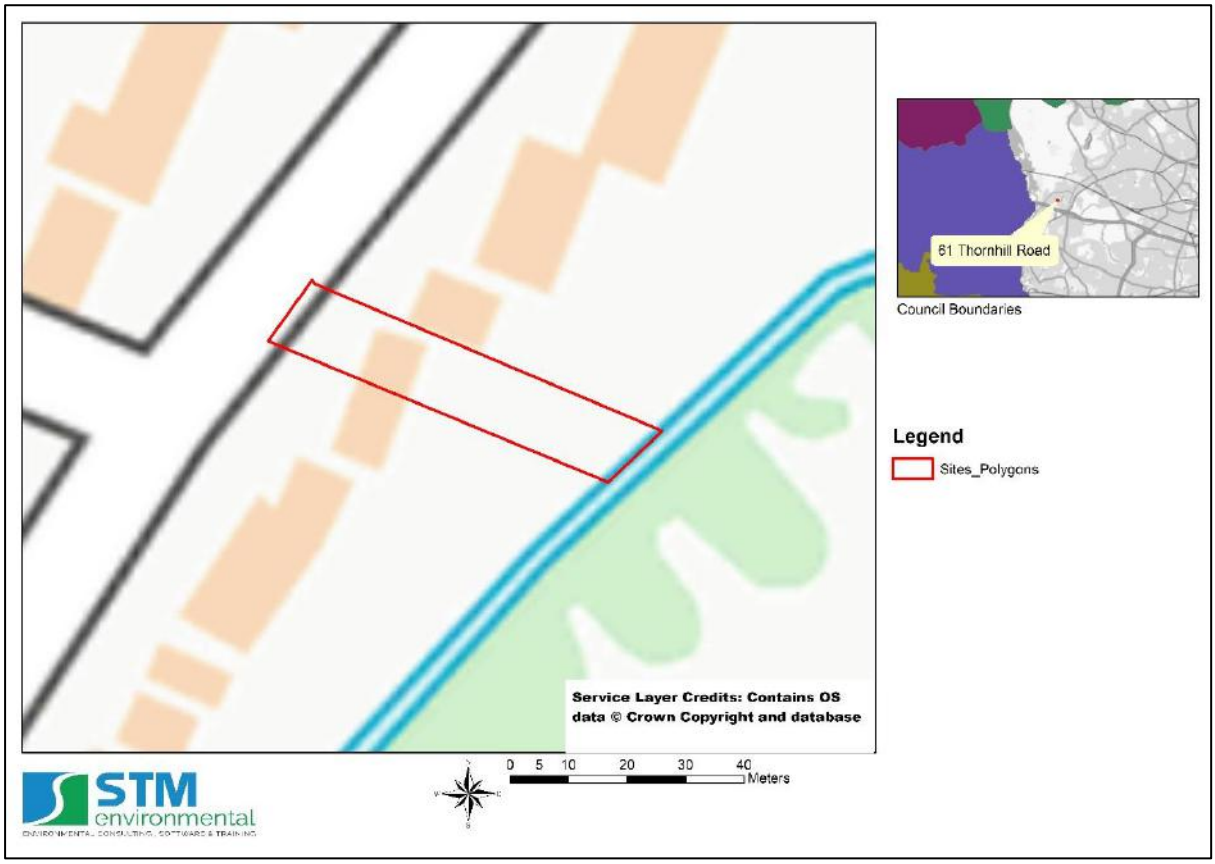
- in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency.

10 Site Description and Environmental Characteristics

10.1 Site Location and Area

The site is located at 61 Thornhill Road, Ickenham, Uxbridge, UB10 8SQ. It is centred at national grid reference 507026, 185812. The site has an area of 760m^2.

A site location map and aerial photo are shown below.



10.2 Site Access

The site is accessed via Thornhill Road.

10.3 Local Planning Authority

The site falls within the jurisdiction of Hillingdon Borough Council in terms of the planning process.

10.4 Lead Local Flood Authority

Hillingdon Borough Council is also the Lead Local Flood Authority (LLFA).

10.5 Flood Zone

For planning purposes, the site is located in Flood Zone 2 and 3 as defined by the EA and LLFA.

10.6 Site and Surrounding Land Uses

10.6.1 Site Current Land Use

The site is currently used as an existing residential dwelling.

10.6.2 Surrounding Land Uses

A description of current land uses surrounding the boundaries of the site is given below in

Table 1 below.

Table 1: Summary of surrounding land uses

Boundary	Land Use Description	
	Immediately Adjacent (within 0 – 25m)	General Local Area (i.e. within 25 - 250m)
Northern	Residential	Residential
Eastern	Residential	Swakeleys Park
Southern	Residential	Swakeleys Park
Western	Residential	Residential

10.7 Hydrology

The nearest main watercourse is the River Pinn which is located directly along the eastern boundary of the site.

10.8 Geology

Data from the British Geological Survey indicates that the underlying superficial geology is characterised as Alluvium Deposits. The underlying bedrock geology is characterized as Lambeth Group.

10.9 Hydrogeology

The site lies upon a Secondary A superficial and bedrock aquifers.

Appendix 3 provides BGS mapping showing the hydrogeology at the site location.

10.10 Topography

The average ground level is 36.23mAOD and slopes downwards from 36.6mAOD in the West to 35.85mAOD in the East. The proposed development extensions are at 36.50mAOD.

A LIDAR map showing the topology of the site and surrounding area is available in Appendix 3.

A topographic survey has been conducted and is available in Appendix 3.

11 The Sequential and Exception Tests

11.1 The Sequential Test

The Sequential Test aims to steer developments and redevelopments to areas of lower flood risk. The test compares the proposed development site with other available sites, in terms of flood risk, to aid the steering process. The Sequential Test is not required if the proposed development is a minor development or if it involves a change of use unless the development is a caravan, camping chalet, mobile home or park home site.

Minor development means:

- minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square metre.
- alterations: development that does not increase the size of buildings eg alterations to external appearance.
- householder development: For example; sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development

that would create a separate dwelling within the curtilage of the existing dwelling eg subdivision of houses into flats.

The development is considered to be minor and as such the Sequential Test should not be required by the LLFA.

11.2 The Exception Test

If alternative sites of lower flood risk are not available then the proposed development may require an Exception Test to be granted planning permission. Where the exception test is required, it should be applied as soon as possible to all local development document allocations for developments and all planning applications other than for minor developments. All three elements of the exception test have to be passed before development is allocated or permitted. For the exception test to be passed:

- It must demonstrate that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by an SFRA, where one has been prepared;
- The development should be on developed land or on previously developed land;
- A flood risk assessment must demonstrate that the development will be safe without increasing flood risk elsewhere, and where possible will reduce the overall flood risk.

The requirements for an Exception Test are given in Table 2 and are defined in terms of Flood Zone and development vulnerability classification.

The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site.

Table 2: NPPF flood zone vulnerability compatibility (source: NPPF).

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	✗	Exception Test required	✓'	✓
Zone 3b	Exception Test required	✗	✗	✗	✓

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Based on its scale and nature, the proposal is classified as a minor "more vulnerable" development and as such an Exception Test should not be required.

12 Site Specific Flood Risk Analysis

The PFRA and Level 1 SFRA produced by the LLFA and maps from the EA provide information regarding historic flooding events and incidents as well as predictions of flood extents and depths during extreme rainfall events.

12.1 Fluvial (River) and Tidal (Sea) Flood Risk

12.1.1 Mechanisms for Fluvial Flooding

Fluvial, or river flooding, occurs when excessive rainfall over an extended period of time or heavy snow melt causes a river to exceed its capacity. The damage from a fluvial flood can be widespread as the overflow may affect downstream tributaries,

overtopping defences and flooding nearby inhabited areas. Fluvial flooding consists of two main types:

- Overbank flooding – this occurs when water rises steadily and overflows over the edges of a river or stream;
- Flash flooding – this is characterized by an intense, high velocity torrent of water that occurs in an existing river channel with little to no notice. Flash floods are very dangerous and destructive not only because of the force of the water, but also the hurtling debris that is often swept up in the flow.

12.1.2 Definition of EA Modelled Fluvial Flood Risk Zones

Fluvial flood risk is assessed using flooding maps produced by the Environment Agency. These maps use available historic data and hydraulic modelling to define zones of flood risk. The maps allow a site to be defined in terms of its flood zone (e.g. 1, 2, 3) and in terms of the overall flood risk (very low, low, medium or high). It is important to note that existing flood defences are not taken into account within the models or the maps. The EA fluvial flood zones are defined as follows:

- Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 2: Between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 3: Greater than 1 in 100 (1%) annual probability of fluvial flooding.

Flood zone 3 is split into two sub-categories (3a and 3b) by LLFAs depending on whether the land is considered to be a functional flood plain (i.e. an important storage area for flood waters in extreme events).

- Flood zone 3a: Greater than 1 in 100 (1%) annual probability of fluvial flooding and/or greater than 1 in 200 (0.5%) annual probability of tidal flooding;

- Flood zone 3b: Functional flood plain (definition specific to the LLFA). Less than a 1 in 20 (5%) annual probability of fluvial and/or tidal flooding.

12.1.3 Main Potential Sources of Local Fluvial Flooding

The nearest potential source of fluvial flooding to the site is considered to be the River Pinn.

12.1.4 Records of Historic Fluvial Flooding Incidents

The EA data identifies two fluvial flooding events from 1977 and 1988.

12.1.5 Designated Fluvial Flood Risk Zone for the Site

The site is considered to be located within flood zone Flood Zone 2 and 3 as defined by the Environment Agency and the LLFA indicating that it has greater than 1 in 100 annual probability of fluvial flooding in some areas of the site.

12.1.6 Mechanisms for Tidal Flooding

Tidal flooding may be described simply as the inundation of low lying coastal areas by the sea, or the overtopping or breaching of sea defences. Tidal flooding may be caused by seasonal high tides, storm surges and where increase in water level above the astronomical tide level is created by strong on shore winds or by storm driven wave action.

12.1.7 Definition of EA Tidal Flood Risk Zones

As with fluvial flood risk, tidal flood risk is assessed using flooding maps produced by the Environment Agency. The difference is in the probability return periods used to define tidal flood zones. The EA tidal flood zones are defined as:

- Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 2: Between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of tidal flooding;
- Flood zone 3: Greater 1 in 200 (0.5%) annual probability of tidal flooding.

12.1.8 Potential Sources of Tidal Flooding

The area in which the site is located is considered unlikely to be affected by tidal flooding.

12.1.9 Flood Defences

The EA does not identify any flood defences in the area.

12.1.10 Climate Change - EA Modelled Predictions of Fluvial and Tidal Flood Levels and Extents

The EA Product 4 dataset which is presented in Appendix 10 provides modelled flood levels and flows for model node points close to the site. These are summarised in table 4 below.

Table 4 – Product 4 data summary

	Modelled flood level return period / Flood levels (mAOD)				
Node Label	100yr	100yr + 35%	100yr + 70%	250yr	1000yr
P76(Closest node)	36.63	36.88	37.11	36.85	37.23
On site	36.64	36.88	37.1	36.85	37.22

The ground level of the proposed development is 36.50mAOD. During the 100yr + 35% climate change event, flood levels are at 36.88mAOD which results in flood depths of approximately 0.38m.

12.1.11 Long Term Fluvial Flood Risk Considering Flood Defences

The EA's long term flood risk maps give an indication of the actual risk associated with flooding after taking into account the effect of any flood defences in the area. Copies of maps for the site which are available in Appendix 8 indicate that the long-term risk from fluvial flooding to the site is low to medium.

12.2 Pluvial (Surface Water) Flood Risk

A pluvial, or surface water flood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. Surface water flooding occurs when high intensity rainfall leads to run-off which flows over the ground surface, causing ponding in low-lying areas when the precipitation rate or overland flow rate is greater than the rate of infiltration, or return into watercourses. Surface water flooding can be exacerbated when the underlying soil and geology is saturated (as a result of prolonged precipitation or a high-water table) or when the drainage network has insufficient capacity.

12.2.1 Mechanisms of Pluvial Flooding

The chief mechanisms for surface water flooding can be divided into the following categories:

- Runoff from higher topography;
- Localised surface water runoff – as a result of localised ponding of surface water;
- Sewer Flooding – areas where extensive and deep surface water flooding is likely to be influenced by sewer flooding. Where the sewer network has reached capacity, and surcharged, this will exacerbate the flood risk in these areas;
- Low Lying Areas – areas such as underpasses, subways and lowered roads beneath railway lines are more susceptible to surface water flooding;
- Railway Cuttings –railway infrastructure cut into the natural geological formations can cause extra surface run off and pooling disrupting service and potentially affecting adjacent structures;
- Railway Embankments – discrete surface water flooding locations along the up-stream side of the raised network rail embankments where water flows are interrupted and ponding can occur;
- Failure of artificial sources (i.e. man-made structures) such as such as canals and reservoirs.

12.2.2 Main Potential Sources of Local Pluvial Flooding

The main potential source of pluvial flooding to the site is considered to be surface water ponding and flooding associated with heavy rainfall.

12.2.3 Records of Historic Pluvial Flooding Incidents

Examination of the LLFA's Level 1 SFRA revealed no evidence of records of pluvial flooding on or in the vicinity of the site.

A map showing the location of surface water flooding incidents is available in Appendix 4 .

12.2.4 Surface Water Flood Risk from Artificial Sources (Reservoirs and Canals)

An examination of OS mapping and the EA's mapping revealed no indications of significant reservoirs or canals in the area of the site.

The EA's reservoir flood risk map indicates that the site does lie within an area that is at risk of reservoir flooding due to downstream flooding along the River Pinn from Ruislip Lido. However, reservoirs in the UK have an extremely good safety record, as such, the residual risk associated with them is classified as being low.

12.2.5 Sewer Flooding

A map showing recorded incidents of sewer flooding is available in Appendix 4. It indicates the site is in an area that has had 1 – 5 sewer flooding events from 2011 – 2017.

12.2.6 Climate Change - Modelled Predictions of Surface Water Run-off Flooding

Mapping of the predicted extent and depth of surface water flooding for the 1 in 100-year and 1 in 1000-year rainfall return periods provided by the EA are available in Appendix 6.

The mapping indicates the Eastern half of the site will flood during the 1 in 100-year event and flood entirely during the 1 in 1000-year event. The flood extent during the 1 in 100-year event does not impact the development location.

Flood depths for the 1 in 100-year event are between 150 and 600mm. Flood depths for the 1 in 1000-year event range between 150 and 1200mm.

12.2.7 Long Term Surface Water Flood Risk

The EA's long term flood risk maps which are available in Appendix 8 indicate that the long term risk of flooding from surface water is considered to be low to medium.

12.3 Risk of Flooding from Multiple Sources (ROFMS)

The Environment Agency provides a map which gives an indication the overall flood risk from fluvial, tidal and surface water sources considering the presence of river defences. This map indicates that there is between 0.1% to greater than 3.3% chance of flooding at the site in any year. A copy of the map is presented in Appendix 8.

12.4 Groundwater Flood Risk

Groundwater flooding occurs when water rises from the underlying aquifer at the location of a spring – where the underlying impermeable geology meets the ground surface. This tends to occur after much longer periods of intense precipitation, in often low-lying areas where the water table is likely to be at a shallow depth. Groundwater flooding is known to occur in areas underlain by principal aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels. A high groundwater table also has the potential to exacerbate the risk of surface water and fluvial flooding by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer/groundwater interactions.

12.4.1 Historic Records of Groundwater Flooding

A map showing the locations of historic groundwater flooding incidents is available in Appendix 4. The map indicates that there have been no recorded incidents of groundwater flooding at or within 500m of the site.

12.4.2 Susceptibility to Groundwater Flooding

The Groundwater Flood Susceptibility Map provided by BGS, which is available in Appendix 9 indicates that the potential for groundwater flooding to occur at the surface exists. The Groundwater Depth map also provided by BGS indicates that the groundwater level may be at approximately less than 3 mbgl.

12.5 Critical Drainage Area

A Critical Drainage Area (CDA) may be defined as "a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure". A CDA is defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 as "an area within Flood Zone 1 which has critical drainage problems and which has been notified… [to]…the local planning authority by the Environment Agency".

The site is not located within a Critical Drainage Area.

13 Potential Impacts of the Development on Local Flood Risk

13.1 Impacts on Flood Storage

13.1.1 Changes to Impermeable Area and Building Footprint

Changes in ground cover arising from the development are presented in Table 3 below. The change to the impermeable area of the site is considered to be significant.

Table 3: Existing and proposed site ground cover.

	Impermeable Area (m2)	Permeable Area (m2)	Total Area (m2)
Existing	65.9	694.1	760
Proposed	126.5	633.5	760

As the development will significantly alter the site impermeable area, it is considered possible that it will impact upon surface water runoff rates.

Additionally, as it will change the site's built-up area, it is likely to impact upon local flood storage. Flood compensatory storage is addressed in Section 14 below.

13.2 Impacts on Flood Flow Routes

As the development does involve the significant redesign of buildings at the site, it may alter flood flow paths. However, this is not considered to be significant.

14 Flood Risk Mitigation Measures

14.1 SuDS

Planning practice guidance (PPG) which is prepared by the Ministry of Housing, Communities and Local Government (DCLG) states that developers and Local Authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

As such, the developer has the option to implement a SuDS strategy in line with the drainage hierarchy as outlined in Table 4 below to reduce surface water discharges from the site.

Table 5: SuDs Options

- Store rainwater for later use;
- Use infiltration techniques, such as porous surfaces in non-clay areas;

- Attenuate rainwater in ponds or open water features for gradual release;
- Attenuate rainwater by storing in tanks or sealed water features for gradual release;
- Discharge directly to a water course;
- Discharge rainwater directly to a surface water sewer/drain;
- Discharge to a combined sewer.

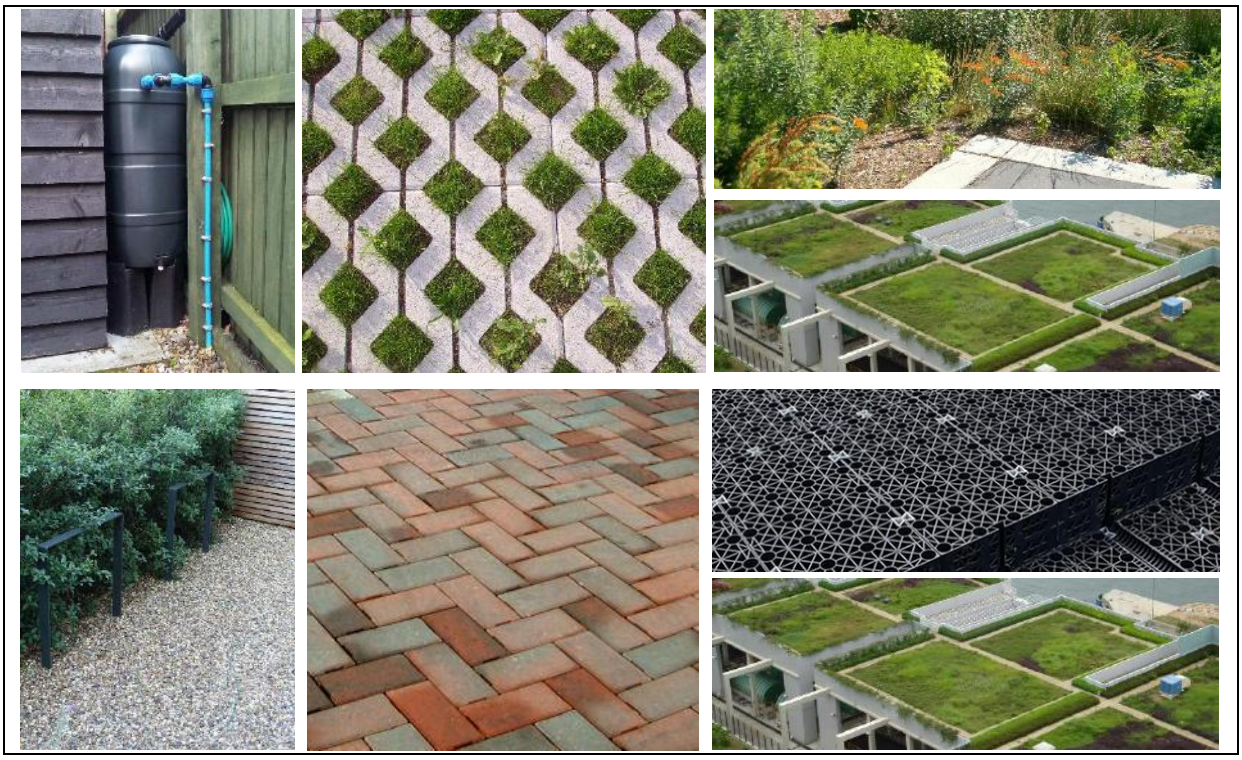


Figure 1: Surface water storage facilities and potential SuDS features - rainwater harvesting, on-site tank storage, rain garden soak-away and green roofs. (Source: UK SuDS Manual)

Given the nature of the development and the size of the site, it is considered that there are good opportunities for implementing SuDS. Measures such as green roofs, rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) or attenuation storage tanks should be considered. If required, the SuDS strategy will be detailed in a separate report as is outside the scope of works of this FRA. The existing surface water on site is discharged through a soakaway.

14.2 Flood Resilience

Flood resilient construction uses methods and materials that reduce the impact from a flood, ensuring that structural integrity is maintained, and the drying out and cleaning required, following inundation and before reoccupation, is minimised.

14.2.1 Finished Floor Levels

The average ground level at the proposed extension on site is 36.50 mAOD.

For **minor extensions** EA Standing Advice states that finished floor levels are either no lower than existing floor levels or 300 millimetres (mm) above the estimated flood level. Where floor levels cannot be set to 300mm above existing flood levels, applicants should check with the LPA if they need to take flood resistance and resilience measures.

The EA's maximum predicted flood level at the extension location for the 1% AEP + 35%cc event is 36.88mAOD (see Appendix 10). Based on this finished ground floor levels across internal areas of the development should be set at a minimum of 37.18mAOD.

14.2.2 Flood displacement storage

All new development within Flood Zone 3 must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

Where proposed development results in a change in building footprint, the developer must ensure that it does not impact upon the ability of the floodplain to store water, and should seek opportunities to provide a betterment with respect to floodplain storage.

Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain must be provided to ensure that the total volume of the floodplain storage is not reduced. The requirement for no loss of floodplain storage means that it is not

possible to modify ground levels on sites which lie completely within the floodplain (when viewed in isolation), as there is no land available for lowering to bring it into the floodplain. It is possible to provide off-site compensation within the local area e.g. on a neighbouring or adjacent site, or indirect compensation, by lowering land already within the floodplain, however, this would be subject to detailed investigations and agreement with the Environment Agency to demonstrate (using an appropriate flood model where necessary) that the proposals would improve and not worsen the existing flooding situation or could be used in combination with other measures to limit the impact on floodplain storage.

The use of under-floor voids with adequate openings beneath the raised finished floor levels can be considered for development in Flood Zone 2 and 3. They are generally considered to provide indirect compensation or mitigation, but not true compensation for loss of floodplain storage.

Should it not be possible to achieve all the level for level compensation required, the Environment Agency may consider that the remainder be provided through the use of under-floor voids instead. The amount of level for level compensation would need to be maximised and any under-floor voids would need to be appropriately designed and kept clear to enable them to function effectively.

Ideally, void openings should be a minimum of 1m long and open from existing ground levels to at least the 1% annual probability (1 in 100-year) plus climate change flood level. By setting finished floor levels at 300mm above the design flood level, there is usually enough space provision for voids below. There should be a minimum of 1m of open void length per 5m length of wall. Void openings should be provided along all external walls of the proposed extension. If security is an issue, 10mm diameter vertical bars set at 100mm centres can be incorporated into the void openings.

As the Local Authority have detailed that voids will be unsuitable for the development as they are not compatible with the proposed bifold doors and steps at the rear of the

development, an area outside the floodplain but hydraulically connected to it will need to be lowered in order to provide compensatory storage.

As a portion of the front garden is in flood zone 2, the client plans to lower a section of the same volume as the displaced flood volume to allow for no loss of or a betterment of flood storage on a level for level, volume for volume basis. The estimated displaced flood storage is equal to 0.38m of flood depths over the 60.6m^2 proposed extension which results in approcimately 23.03m^2 of lost flood storage.

An area for flood compensation storage has been outlined on the flood zone 2/3 boundary towards the roadside of the property.

The FCS would involve lowering a section of the front garden to a ground level of 36.50mAOD,

The calculations provided have split the areas into three parts due to the front gardens sloping topography and have been grouped into 3 sections with similar ground hights and averaged using the topographic survey in Appendix 3.

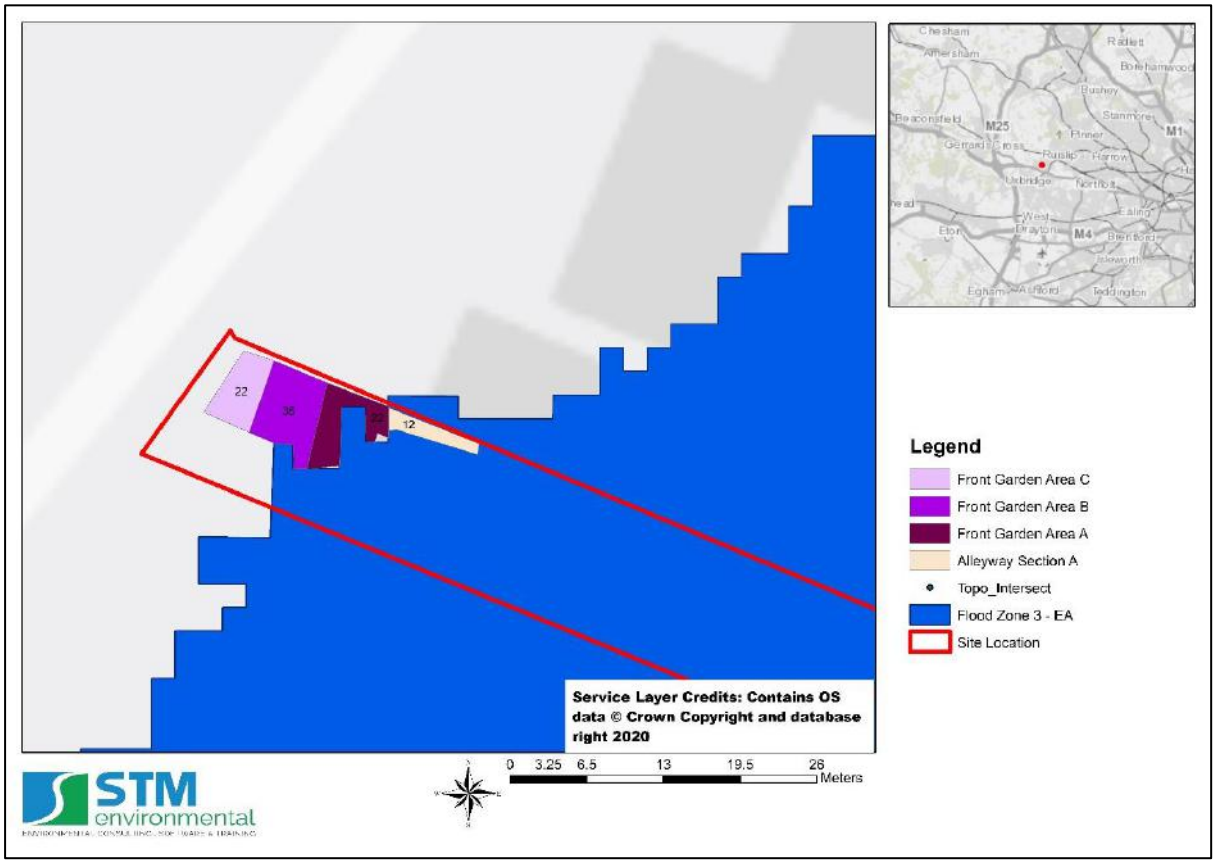
It is also key the side alleyway is kept at 36.50mAOD post-development to maintain flow routes between the back and front garden.

Table 6 – Flood Compensation storage calculations

	Storage calculations after lowering ground levels to 36.50mAOD			
Section	**Current average ground level**	**Lowered by**	**Size of Section**	**Total FCS**
AlleyWay Section A	36.50mAOD	N/A	12m^2	NA
Front Garden Section A	36.55mAOD	0.05m	22m^2	1.1m^3

Front Garden Section B	36.94mAOD	0.44m	35m^2	15.4m^3
Front Garden Section C	36.95mAOD	0.45m	22m^2	9.9m^3

The above table details the flood storage gained by lowering each section to 36.50mAOD. The proposed FCS area is 79m^2 , which when lowered to 36.50mAOD would provide a total storage capacity of 26.4m^3 and therefore a betterment in terms of flood storage capapcity of the local area. The below map identifies a suitable area in flood zone 2 on the boundary of flood zone 3 which could be lowered with each section in the above table outlined.



A cross-section is also available in Appendix 2.

14.2.3 Flood Resilience Measures

In terms of achieving resilience, there are two main strategies, whose applicability is dependent on the water depth the property is subjected to. These are:

- Water exclusion strategy - where emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m);
- Water entry strategy - buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m).

Given the predicted flood depths less than 0.6m, the water exclusion strategy is recommended for this development.

Flood resilience design and measures that will be implemented are outlined below. Water-resistant and resilient materials will be utilized through the construction to minimize the flood risk and potential impacts.

Floor construction:

- Use of resilient flooring materials as ceramic tiles or stone floor finishes;
- Use of a concrete slab 150mm thick;
- Use of ceramic tiles or stone floor finishes is recommended;
- Maintain existing under floor ventilation by UPVC telescopic vents above 400 mm to external face of extension;
- Damp proof membrane of impermeable polythene at least 1200 gauge;
- Avoid the use of MDF carpentry.

Wall construction:

- Include in the external face of the extension a damp – proof course, 600 mm above ground level, to prevent damp rising through the wall;
- Use rigid closed – cell material for insulation above the DPC;
- Spread hardcore over the site within the external walls of the building to such thickness as required to raise the finished surface of the site concrete. The hardcore should be spread until it is roughly level and rammed until it forms a compact bed for the oversite concrete. This hardcore bed will be 100 mm thick and composed by well compacted inert material, blinded with fine inert material.

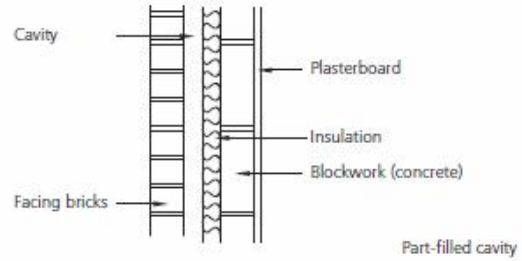
Doors:

- Seal doors around edges and openings. UPVC or composite material will be used with passive protection meaning that minimal intervention will be required in the event of flooding.

Underground drainage:

- Avoid use of metal for any underground piping;
- Use closed cell insulation for pipes that are below the predicted flood level;
- Provide non – return valves for the drainage system to prevent back water flow;
- Use UPVC or clay pipework for fouls and surface water drainage.

Figure 6.10 Cavity External Walls – Part-filled cavity with sacrificial plasterboard



Part-filled cavity

- External face consisting of engineering bricks up to required level for flood protection (up to d.p.c.). Other external facing materials can be used above this level, but ensure transition is watertight.
- Rigid insulation
- Internal cement based render, preferably with lime content. Composition depends on masonry; the following mix is effective:

  1 cement : 6 sand: 1 lime on concrete blocks.
- Stainless steel wall ties should be used to minimise corrosion and consequent staining.
- Sacrificial plasterboard can be used, but it needs to be removed between ground floor to flood level. The board should be laid horizontally to make removal easier.

As well as the above the following flood resilience features should be applied as part of the development:

- Electrical sockets should be installed above flood level for the ground floor;
- Utility services such as fuse boxes, meters, main cables, gas pipes, phone lines and sockets will be positioned as high as practicable;
- All external openings for pipes or vents below 400mm to be sealed around pipe or vent with expanding foam and mastic.

14.3 Emergency Plan

The dangers associated with flood water to people are possible injury and/or death. This can occur as a result of drowning or being carried along by the waters into hard objects or vice versa.

The risk to life is largely a function of the depth and velocity of the floodwater as it crosses the floodplain. Fast flowing deep water that contains debris would represent the greatest hazard.

The assessment of danger to people from walking in floodwater is described in the Flood Risks to People guidance documents (FD2321_TR1 and FD2321_TR2) by DEFRA/EA. Danger can be estimated by the simple formula:

$$HR = d \times (v + 0.5) + DF$$

where, HR = (flood) hazard rating; d = depth of flooding (m); v = velocity of floodwaters (m/sec); and DF = debris factor.
The scoring methodology and calculation matrix for this is summarised in Appendix 12.

The EA have only provided in channel flow rates in the product 4 data. As such any hazard ranking values are for in channel velocity and therefore an overestimation of on-site velocity.

The hazard ranking on the Northern portion of the site from the front door (36.6mAOD – with 0.22m flood depths during the 1 in 100yr + 35%CC event) is calculated as follows. HR = 0.22 x (12.87 + 0.5) + 0 (Urban with depths < 0.25)

The calculation gives a hazard ranking of 2.94 which signifies Extreme – Danger for all.

The EA data identifies no flood depths along the safe egress to flood zone 1 route on Thornhill Road and therefore its related flood hazard is 0, very low.

The use of a flood emergency plan is therefore sufficient for the proposed development. The key elements of the emergency plan are described below.

14.3.1 EA Flood Warnings Direct Service Subscription

The occupants will subscribe to the EA Flood Warnings Direct Service which is a free service offered by the EA providing flood warnings direct to people by telephone,

mobile, email, SMS text message and fax. The EA aims to provide 2 hours' notice of flood, day or night, allowing timely evacuation of the site.

The agency operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. In addition, this information can also be found at https://fwd.environment-agency.gov.uk/app/olr/home along with recommendations on what steps should be taken to prepare for floods, what to do when warnings are issued, and how best to cope with the aftermath of floods.

14.3.2 Access and Safe Egress

Access to and egress from the site is via Thornhill Road. LIDAR data indicates that the ground levels along Thornhill Road range from 36.8mAOD to 37.8mAOD.

Safe egress to Flood Zone 1 is available by a one-minute walk north up Thornhill Road. Directions of this route are presented in Appendix 11 .

14.3.3 Safe Refuge

The proposed development will have internal connections to upper floors in the property which will act to provide sufficient safe refuge in the event of an extreme flood event.

15 Conclusions and Recommendations

This assessment has considered the potential risks to the application site associated with flooding from fluvial, tidal, surface water, artificial and groundwater sources and the potential impacts of climate change.

A review of LLFA's PFRA and SFRA as well as data provided by the EA was undertaken. The main findings of the review and assessment are provided below:

- The site is classified as a more vulnerable minor development and therefore Sequential and Exception Tests should not be required;
- The main sources of potential flooding to the site are from the River Pinn and surface water;
- The EA defines the site as being within Flood Zone 2 and 3a/b;
- The EA data identifies two fluvial flooding events from 1977 and 1988;
- No records of surface water or artificial flooding incidents were identified at or in the vicinity of the site;
- The site is not within a CDA. It is in an area that has had a 1 - 5 sewage flooding incidents between 2011 and 2017;
- No records of groundwater flooding incidents were identified at or in the vicinity of the site;
- The development will result in a significant change in the impermeable area of the site and therefore is likely to increase local flood risk if unmitigated;
- There is good opportunity for implementing SuDS mitigation measures. Consideration should be given to use of soakaways, green roofs and rainwater harvesting;
- Flood resilient materials and construction methods will be used so as to ensure that the impacts of any potential flooding are minimised as much as possible;
- Occupants will subscribe to the EA Flood Warnings Direct Service;
- Safe egress routes to flood zone 1 are accessible;
- In the event that evacuation is not possible, safe refuge is available in the upper floors of the building which are accessible via an internal staircase.

With the implementation of the recommended mitigation measures including raised finished floor levels, flood compensation storage and the implementation of a suitable surface water drainage strategy, the development is unlikely to have a significant impact on local flood risk.

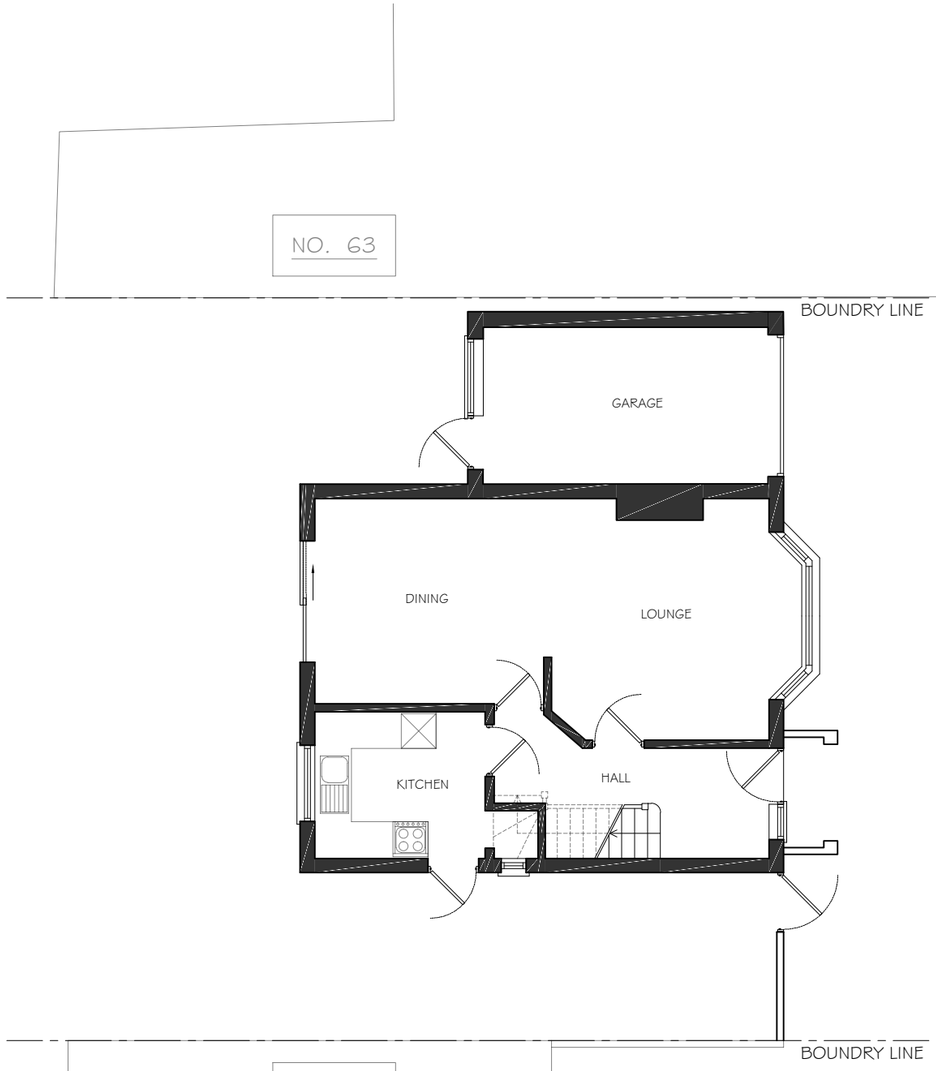
16 References

1. Communities and Local Government - National Planning Policy Framework NPPF, March 2012.
2. Communities and Local Government - Planning Practice Guidance: Flood Risk and Coastal Change, Updated 06 March 2014.
3. Strategic Flood Risk Assessment - Hillingdon Borough Council 2011
4. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.
5. Greater London Authority – London Sustainable Drainage Action Plan, 2015.
6. Google Maps accessed March 21.

17 Appendices

17.1 Appendix 1 – Site Photographs

17.2 Appendix 2 – Development Plans



EXISTING GROUND FLOOR PLAN 1:100

EXISTING FIRST FLOOR PLAN 1:100

1:100

2m 0 2m 4m 6m

mza planning
planning permission without the headaches

14 Devonshire Mews
Chiswick
London, W4 2HA

T. 0844 500 5050
office@mzaplanning.com

Title: **EXISTING FLOOR PLANS**

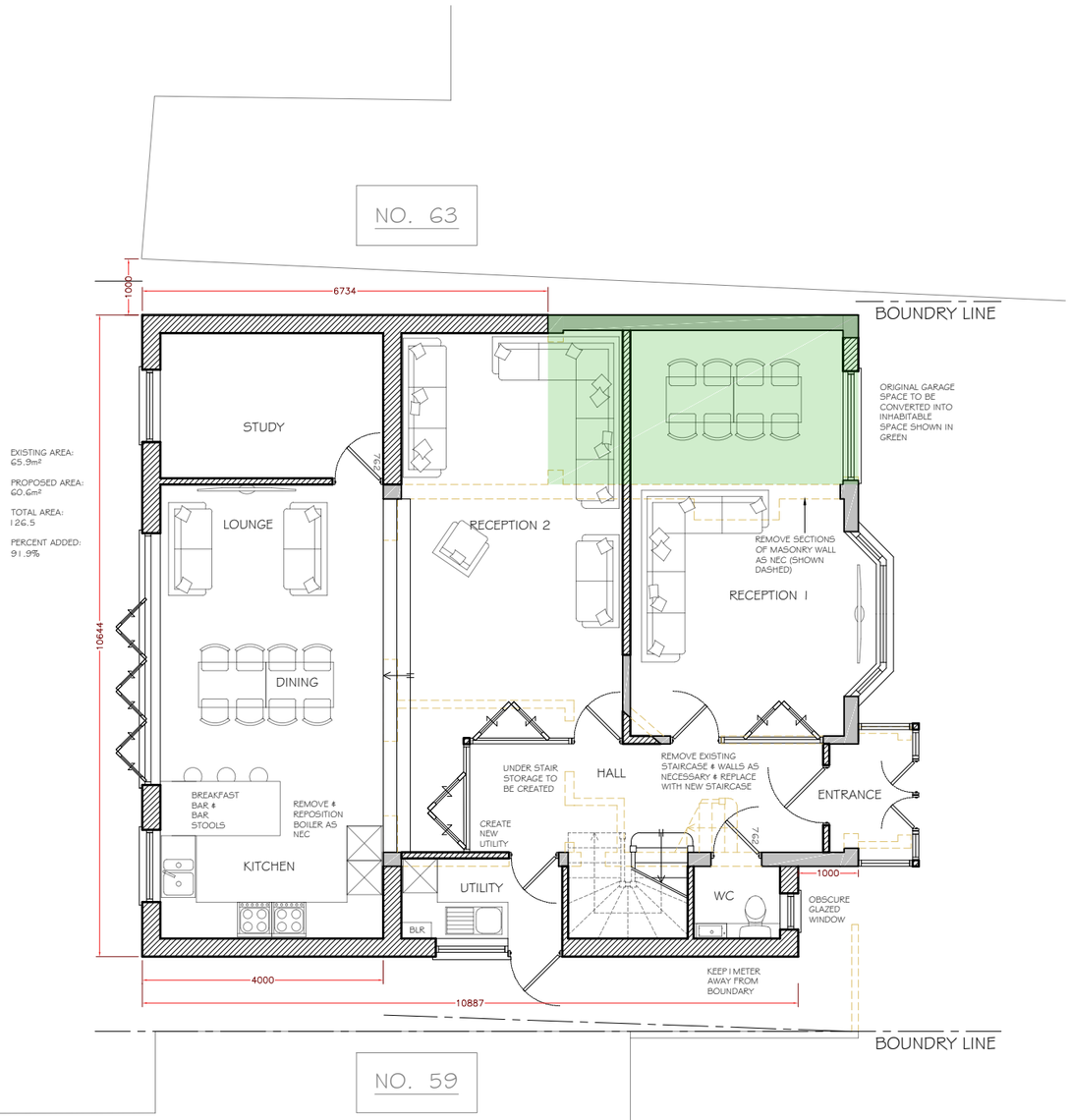
Dwg.No: 248-EXT-01

REV A : 20-07-20

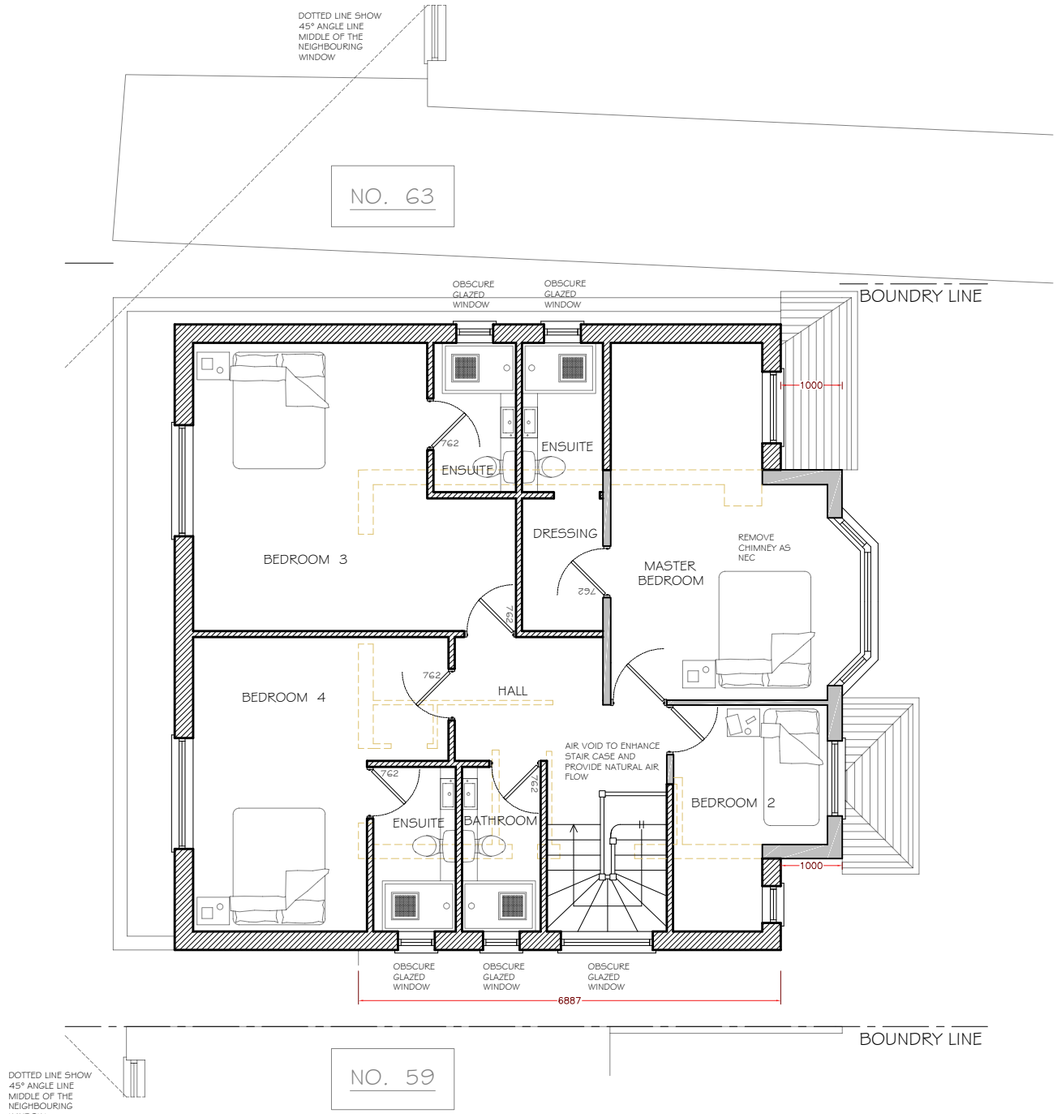
Project: 61 Thornhill Road
Ickenham
UB10 8SQ

Date: 12-07-20

Scale:1:100 @ A3



PROPOSED GROUND FLOOR PLAN 1:100



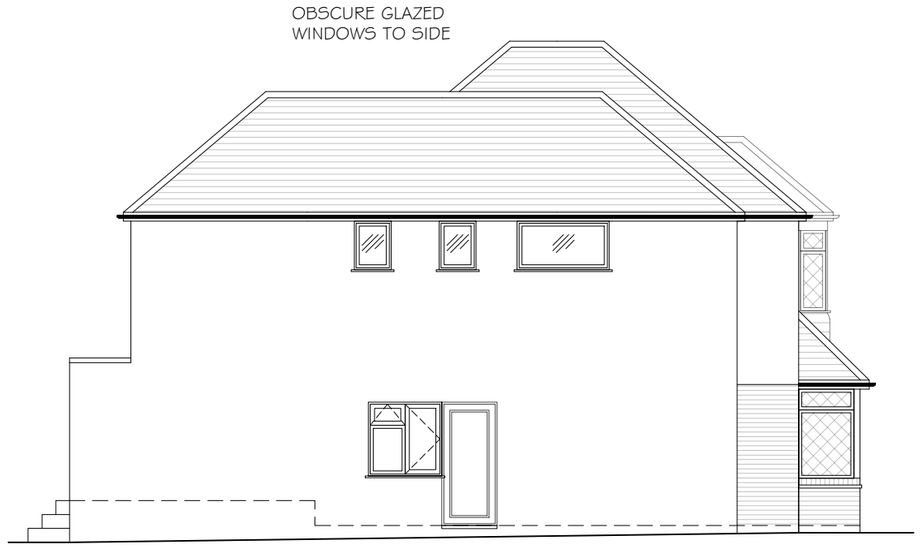
PROPOSED FIRST FLOOR PLAN 1:100

1:100

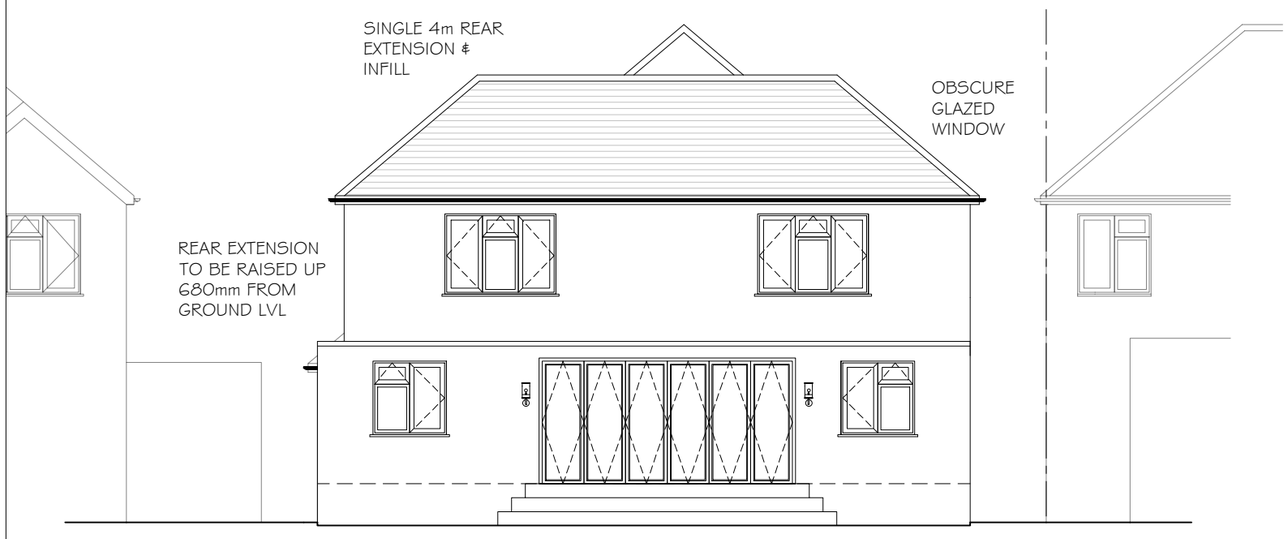
2m 0 2m 4m 6m

mza planning planning permission without the headaches	Title: **PROPOSED FLOOR PLANS** **Dwg.No: 248-PROP-04**	**REV A :** 20-07-20
14 Devonshire Mews Chiswick London, W4 2HA T. 0844 500 5050 office@mzaplanning.com	Project: 61 Thornhill Road Ickenham UB10 8SQ	**Date:** 12-07-20 **Scale:** 1:100 @ A3

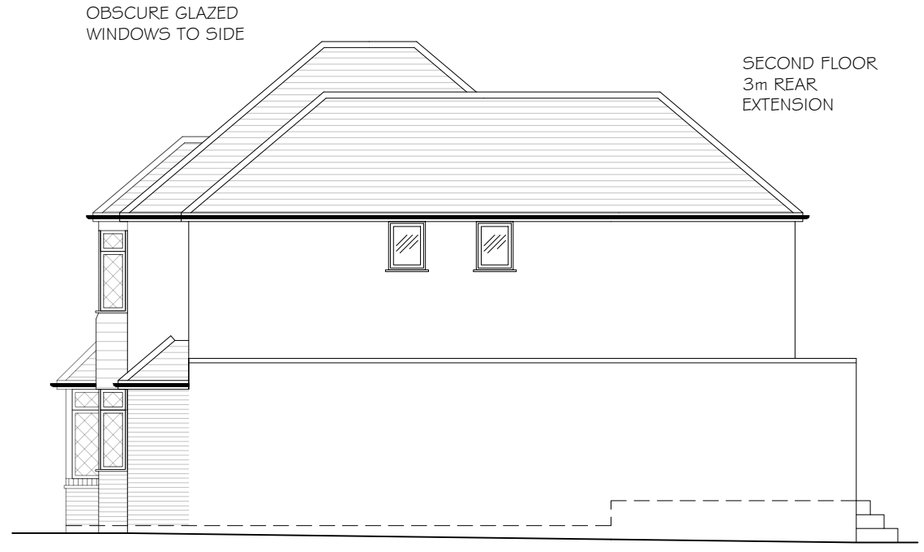
PROPOSED FRONT ELEVATION 1:100



PROPOSED SIDE ELEVATION 1:100



PROPOSED REAR ELEVATION 1:100



PROPOSED SIDE ELEVATION 1:100

1:100

2m 0 2m 4m 6m

mza planning
planning permission without the headaches

14 Devonshire Mews
Chiswick
London, W4 2HA

T. 0844 500 5050
office@mzaplanning.com

Title: **PROPOSED ELEVATIONS**

Dwg.No: 248-PROP-06

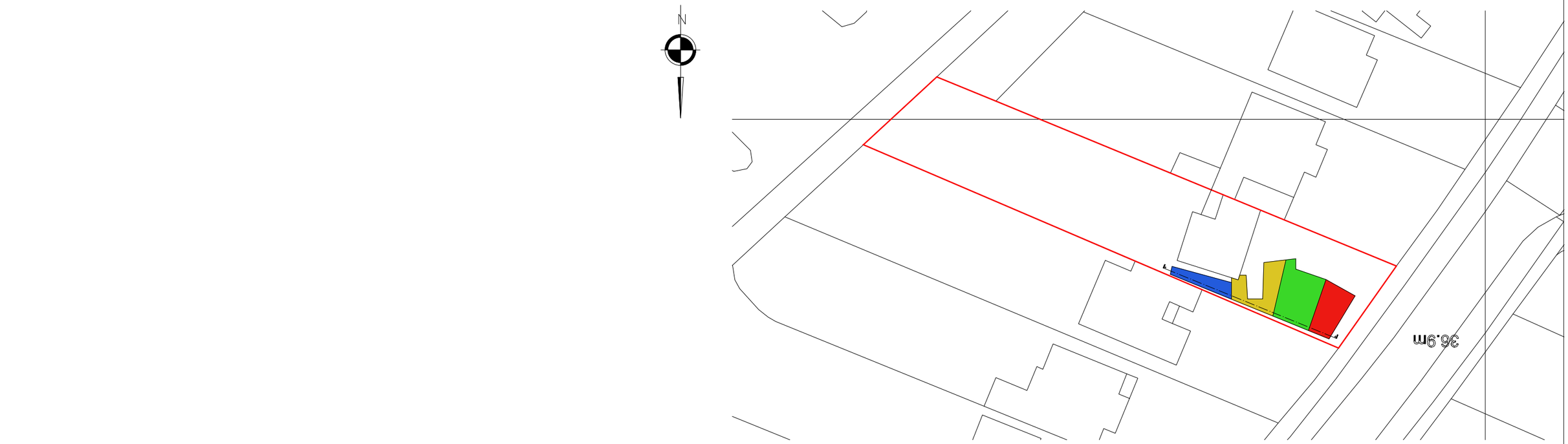
REV A : 20-07-20

Project: 61 Thornhill Road
Ickenham
UB10 8SQ

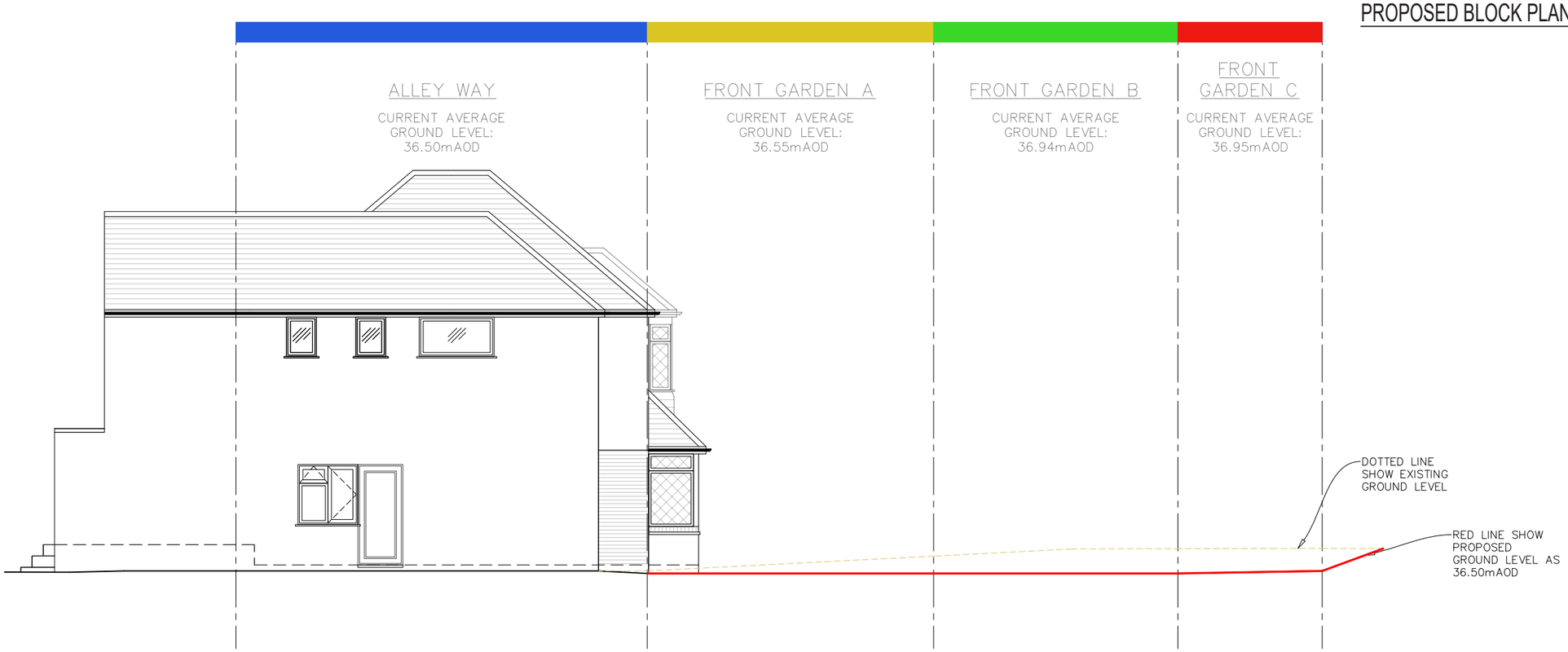
Date: 12-07-20

Scale:1:100 @ A3

17.2.1 Flood Compensation Storage Plans



PROPOSED BLOCK PLAN 1:500



PROPOSED ELEVATION 1:100

1:500

10m 0 10m 20m 30m

1:100

2m 0 2m 4m 6m

mza planning

planning permission without the headaches

14 Devonshire Mews
Chiswick
London, W4 2HA

T. 0844 500 5050
office@mzaplanning.com

Title: **PROPOSED FLOOD DISPLACEMENT STORAGE PLAN**

Dwg.No: 248-PROP-05

REV B : 09-02-21

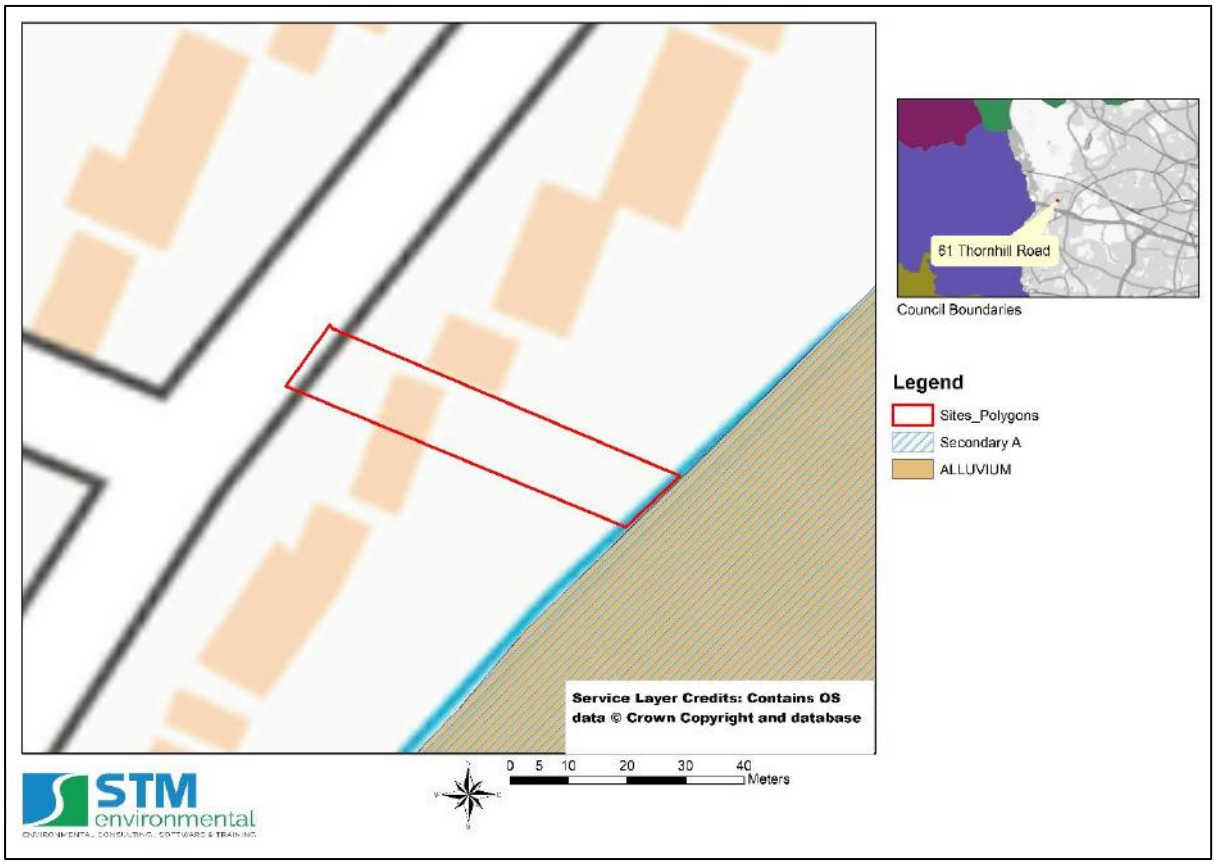
Project: 61 Thornhill Road
Ickenham
UB10 8SQ

Date: 12-07-20

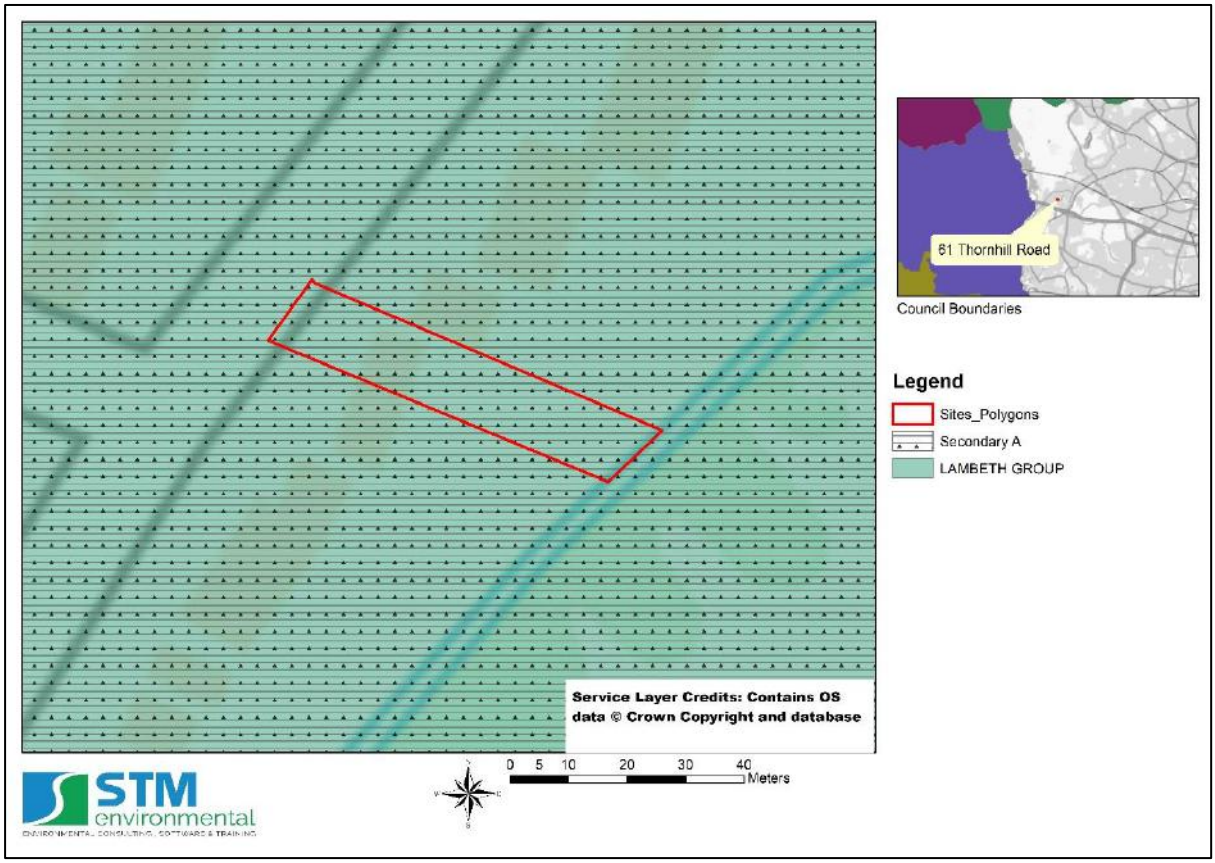
Scale: 1:100 @ A3

17.3 Appendix 3 – Environmental Characteristics

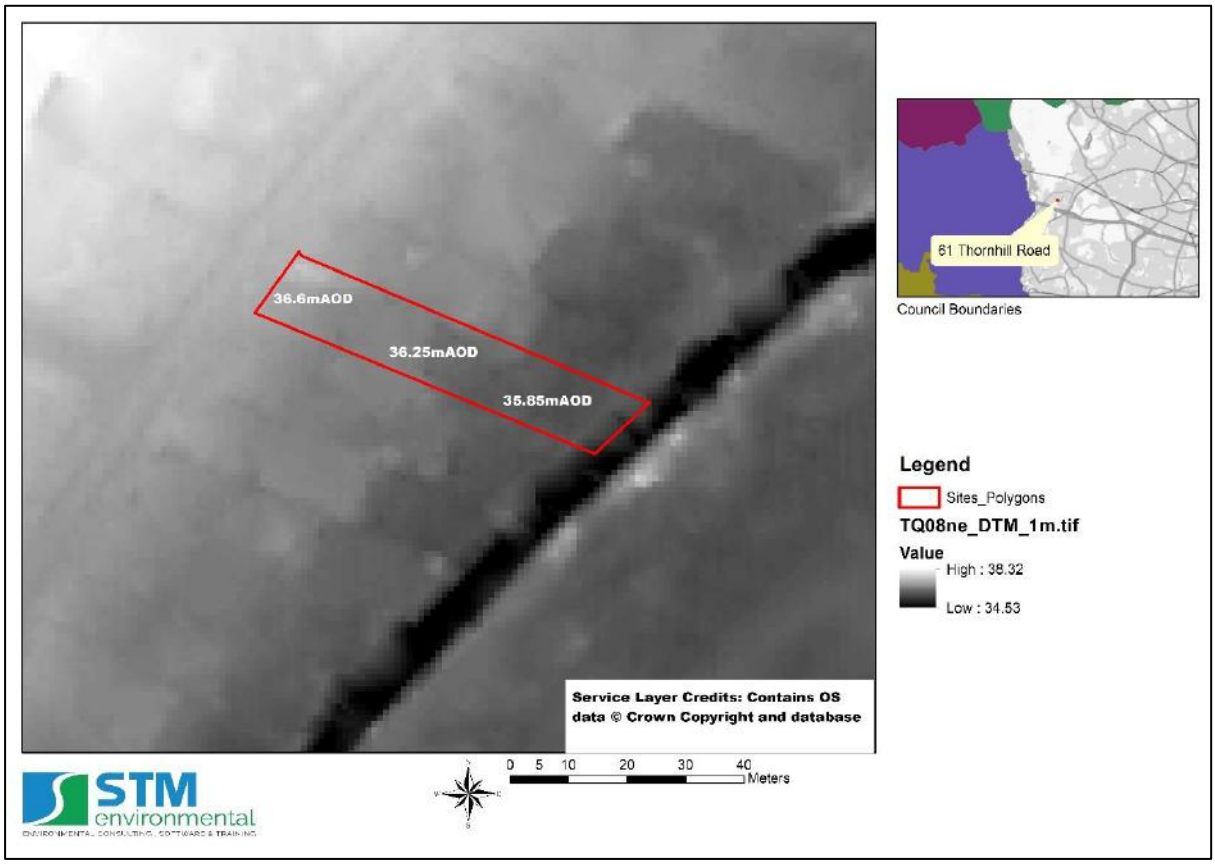
17.3.1 Superficial Hydrogeology Map



17.3.2 Bedrock Hydrogeology Map



17.3.3 Topology Map



17.3.4 - Topography Survey

NOTES

Levels relate to GPS Ordonance Survey

DRAWING REFERENCE

Topographic Survey — 10600.01

ABBREVIATIONS

B	Bollard
BC	Barrier Control
BT	British Telecom
ER	Earth Rod
FH	Fire Hydrant
FL	Flood Light
FP	Flag Pole
IB	Illuminated Bollard
IC	Inspection Cover
JB	Junction Box
LP	Lamp Post
RWP	Rain Water Pipe
SV	Stop Valve
WV	Water Valve
UP	Utility pole
Fr.L.	Frame Level
G.L.	Gully Level

Tree bole diameter (mm)
Tree spread (m)
Tree Height (m)
150 / 6 / 6

LEGEND

- Services
- Step
- Surface change line
- Building
- Foothpath
- Gate
- Handrail
- Kerb/upstand
- Landscape detail
- Plinth
- Ramp
- Roof detail
- Stairs
- Structure
- Trees
- Fence

Topo M Surveys LTD
45
Carnegie House
Harrow
HA1 2AX
Web : topomsurveys.co.uk
Tel: 07533568649

61 Thornhill Road
Ickenham
Uxbridge
UB1 08SQ

To be used for any architectural works, also as a support for planning applications and flood risk assessment.

Topographic Survey

surveyed	drawn	checked
MM	MM/UC	MM

Scale 1:100 | Date: Mar 2021

Revisions: A

10600.01

REVISION A
Levels changed to Ordonance Survey National Datum

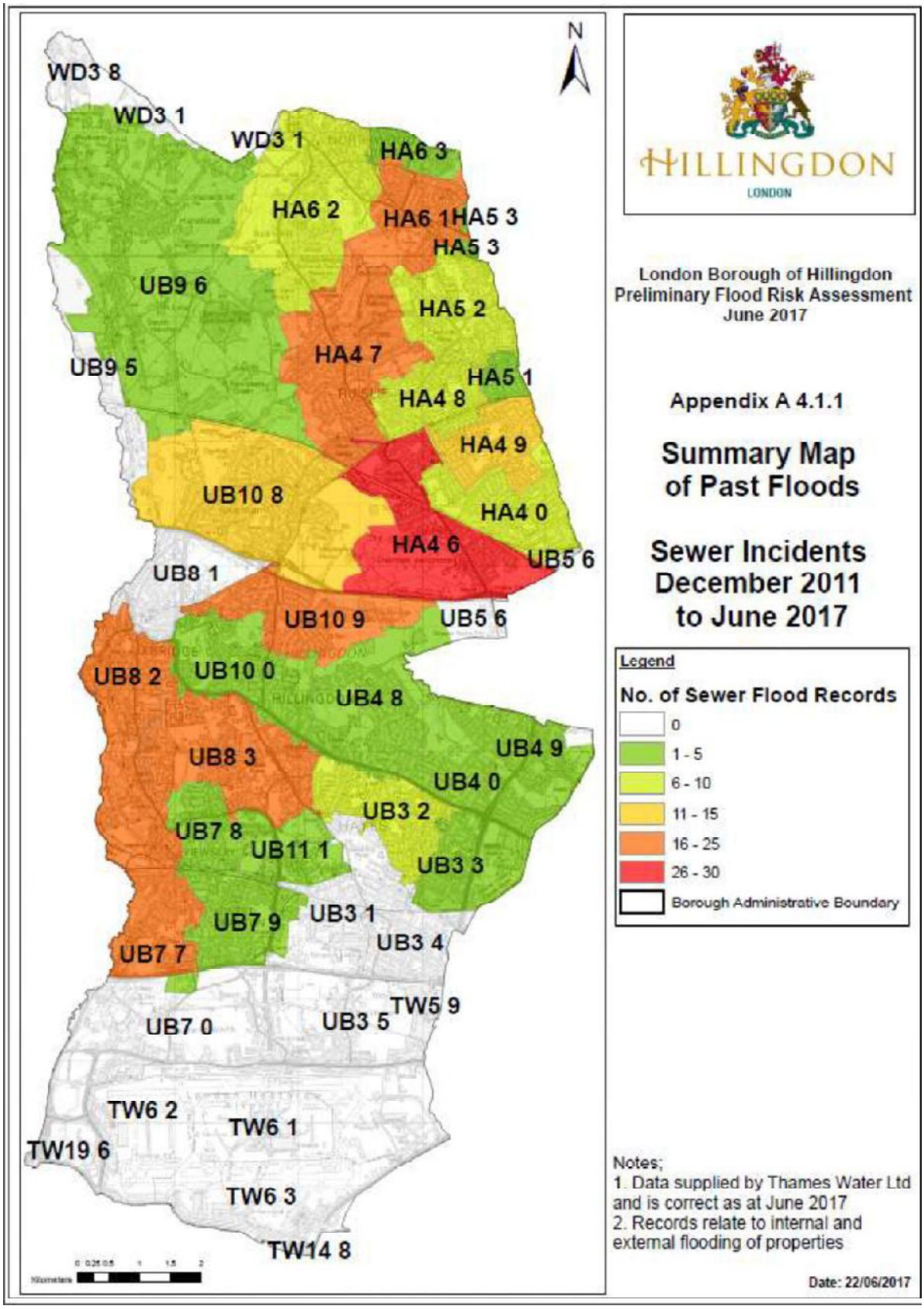
Scale 1:100 @A1
0m 5m 10m

17.4 Appendix 4 – Historical Flood Incident Maps

17.4.1 EA Historic Flood Outlines

See EA Data

17.4.2 Map Recorded Sewer Flooding


N
WD3 8
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WD3 1
HA6 3
HA6 2
HA6 1
HA5 3
HA5 3
UB9 6
HA5 2
HA4 7
UB9 5
HA5 1
HA4 8
HA4 9
UB10 8
HA4 0
HA4 6
UB5 6
UB8 1
UB10 9
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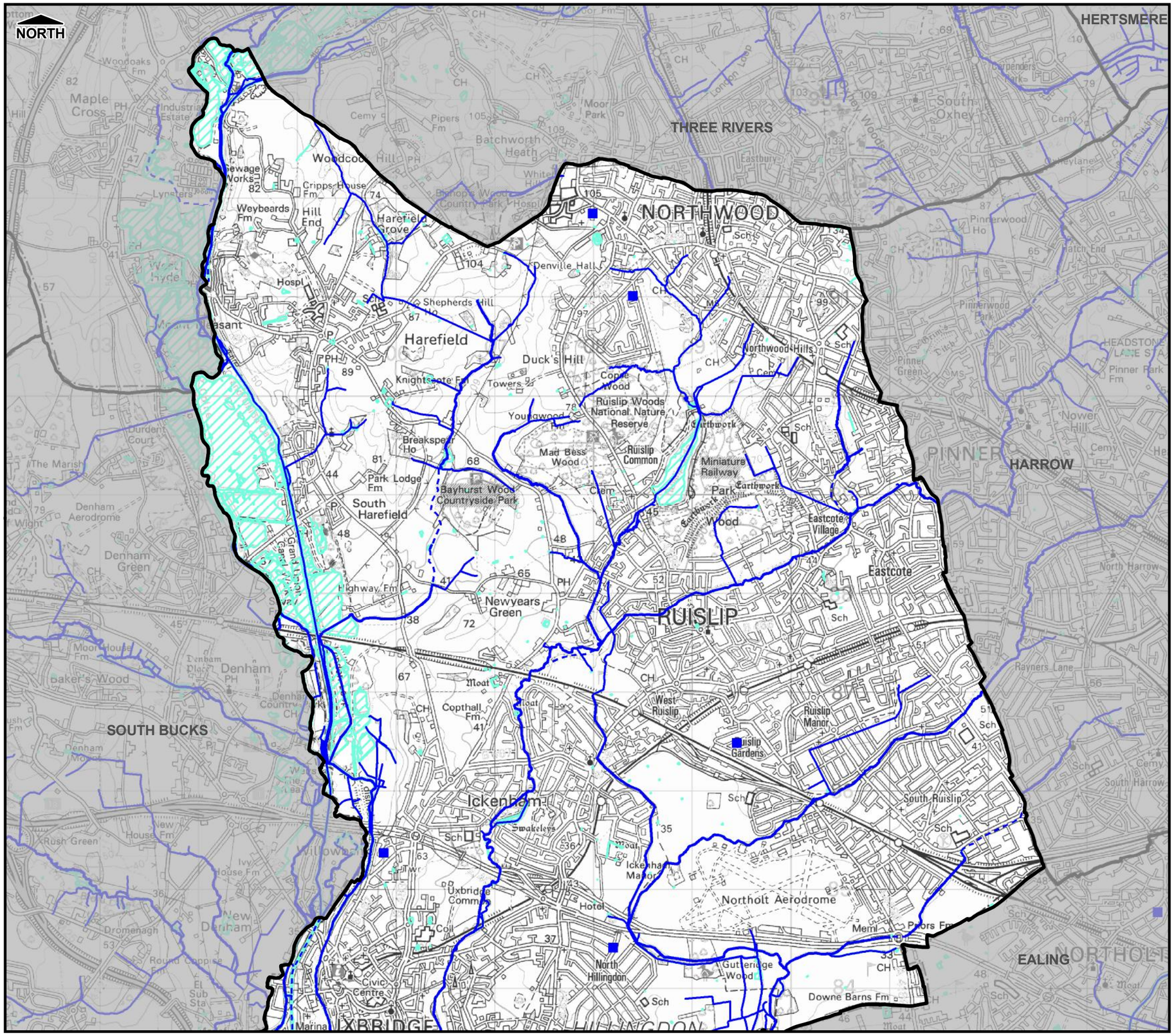
UB8 2
UB10 0
UB4 8
UB4 9
UB8 3
UB4 0
UB3 2
UB7 8
UB11 1
UB3 3
UB7 9
UB3 1
UB3 4
UB7 7
TW5 9
UB7 0
UB3 5
TW6 2
TW6 1
TW19 6
TW6 3
TW14 8
HILLINGDON
LONDON
London Borough of Hillingdon
Preliminary Flood Risk Assessment
June 2017
Appendix A 4.1.1
Summary Map of Past Floods
Sewer Incidents December 2011 to June 2017
Legend
No. of Sewer Flood Records
0
1 - 5
6 - 10
11 - 15
16 - 25
26 - 30
Borough Administrative Boundary
Notes;
1. Data supplied by Thames Water Ltd and is correct as at June 2017
2. Records relate to internal and external flooding of properties
Date: 22/06/2017

17.4.3 Map of Recorded Groundwater Flooding



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED

Legend

- Borough Administrative Boundary
- Main River
- Ordinary Watercourse
- Culverted Watercourse (Main River)
- Permanent Water Bodies
- Groundwater Flood Incident (EA Records)
- Ground Water Flood Outline

Notes

London Borough of Hillingdon

HILLINGDON LONDON

Preliminary Flood Risk Assessment

Scale at A3	Date	Drawn by	Approved by
1:40,000	06/04/2011	R.MOORE	P.HLINOVSKY

Summary Map of Past Floods - Ground Water Incidents

Consultants
CAPITA SYMONDS
Scott Wilson
Flood Risk Management
Capita Symonds
Level Seven,
52 Grosvenor Gardens,
Belgravia,
London
SW1W 0AU

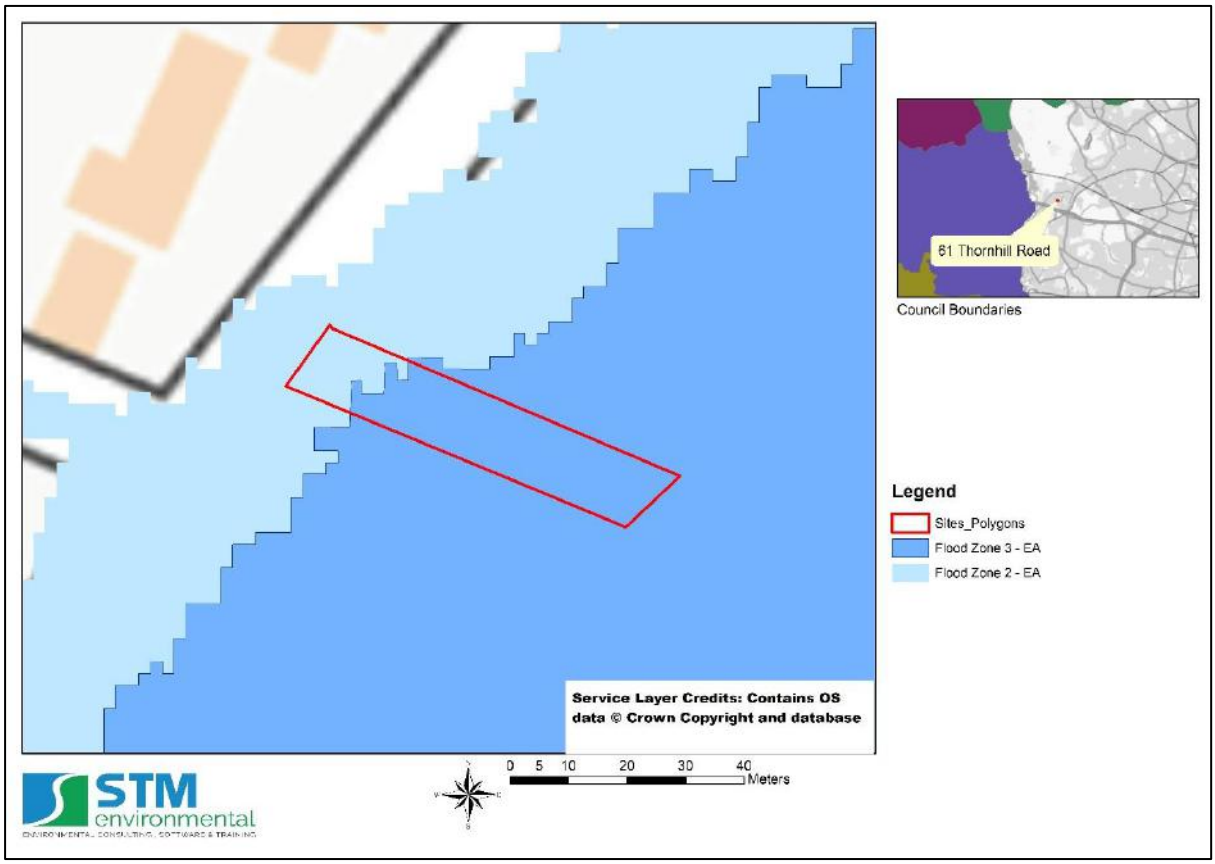
Drain London Programme Board Members

Environment Agency · Thames Water · LONDON COUNCILS · GREATERLONDONAUTHORITY

FIGURE A-3.1

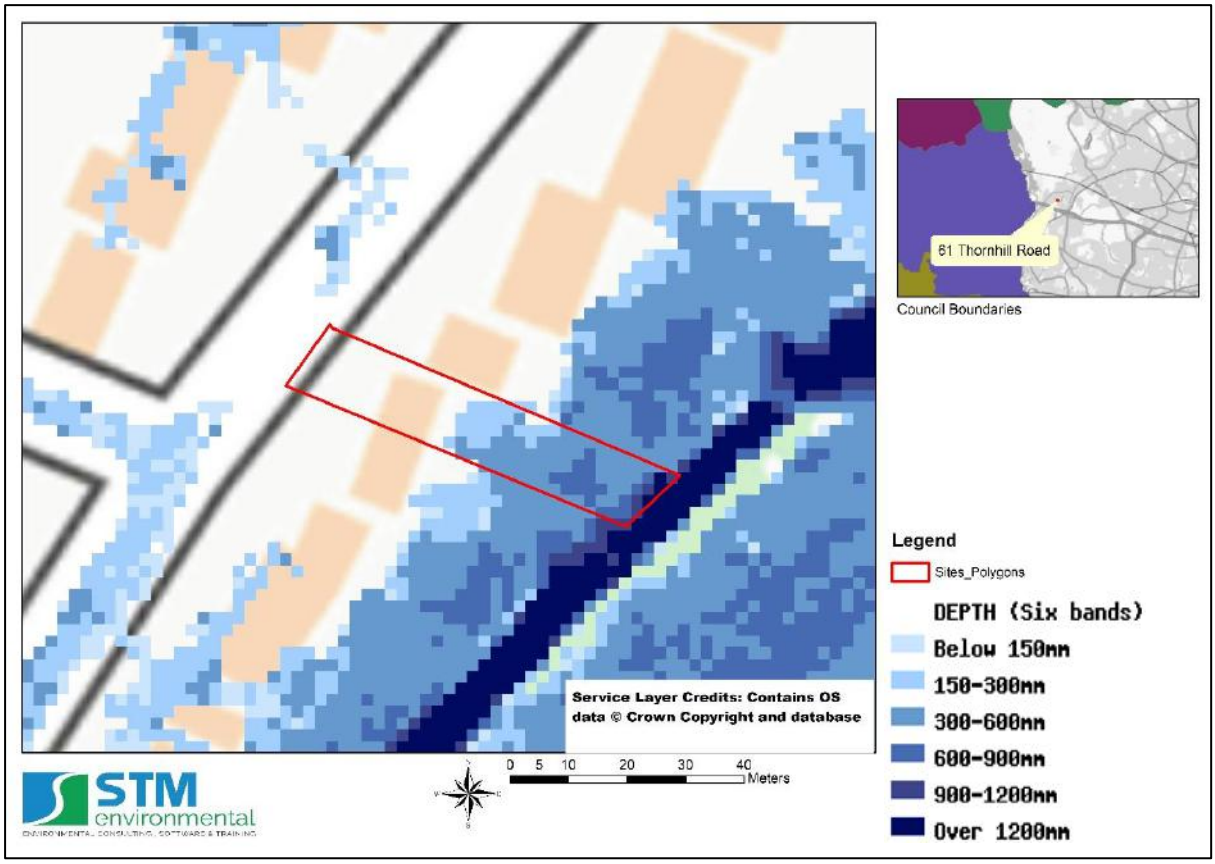
Filepath: L:\Environment\zwet\CS046913_DrainLondon_Tier2\Group1\ARC\mxds\PFRA\GP1_Hillingdon_FigA-3.1_GWIncidents.mxd

17.5 Appendix 5 - EA Flood Zone Map

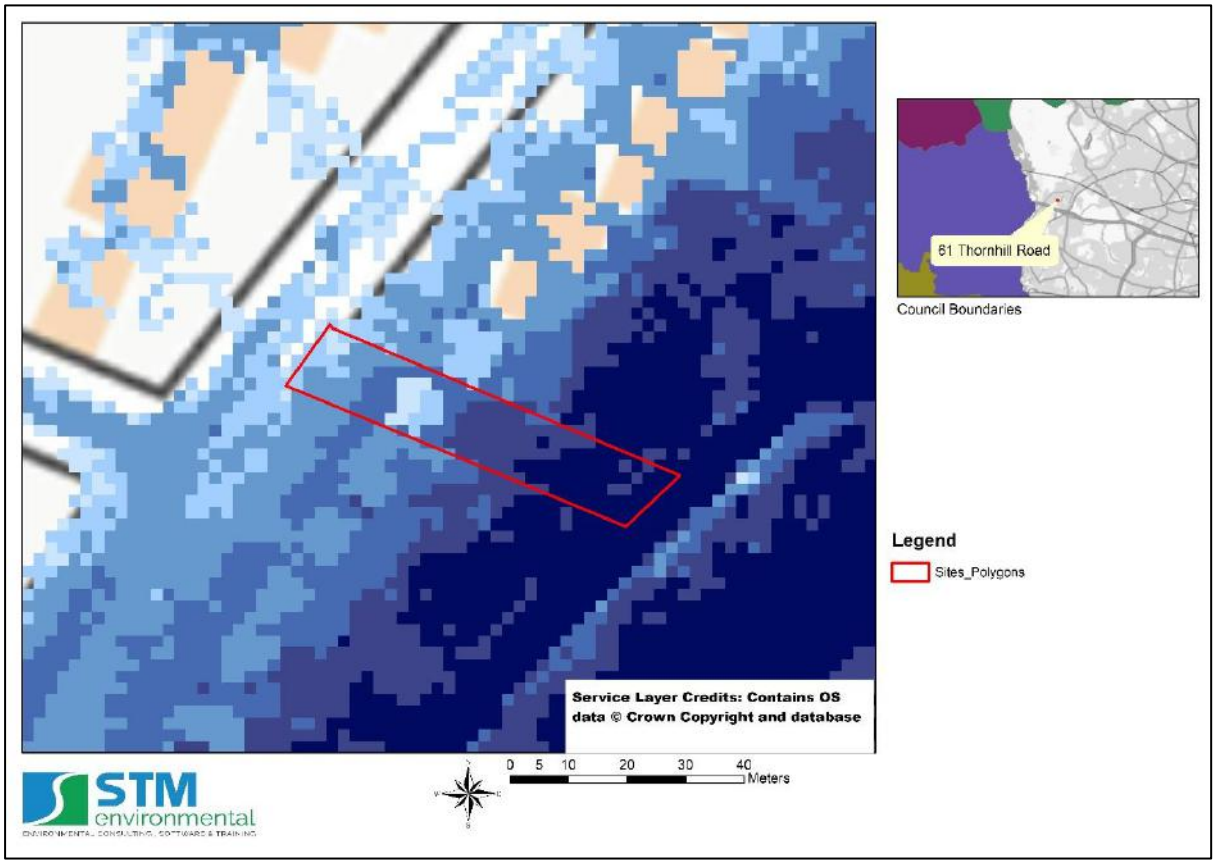


17.6 Appendix 6 – Surface Water Flood Extent and Depth Maps

17.6.1 Map showing surface water flood depth for the 1 in 100-year rainfall return period (Source: EA, 2020).



17.6.2 Predicted surface water flood depth for the 1 in 1000-year return period (Source: EA, 2020).

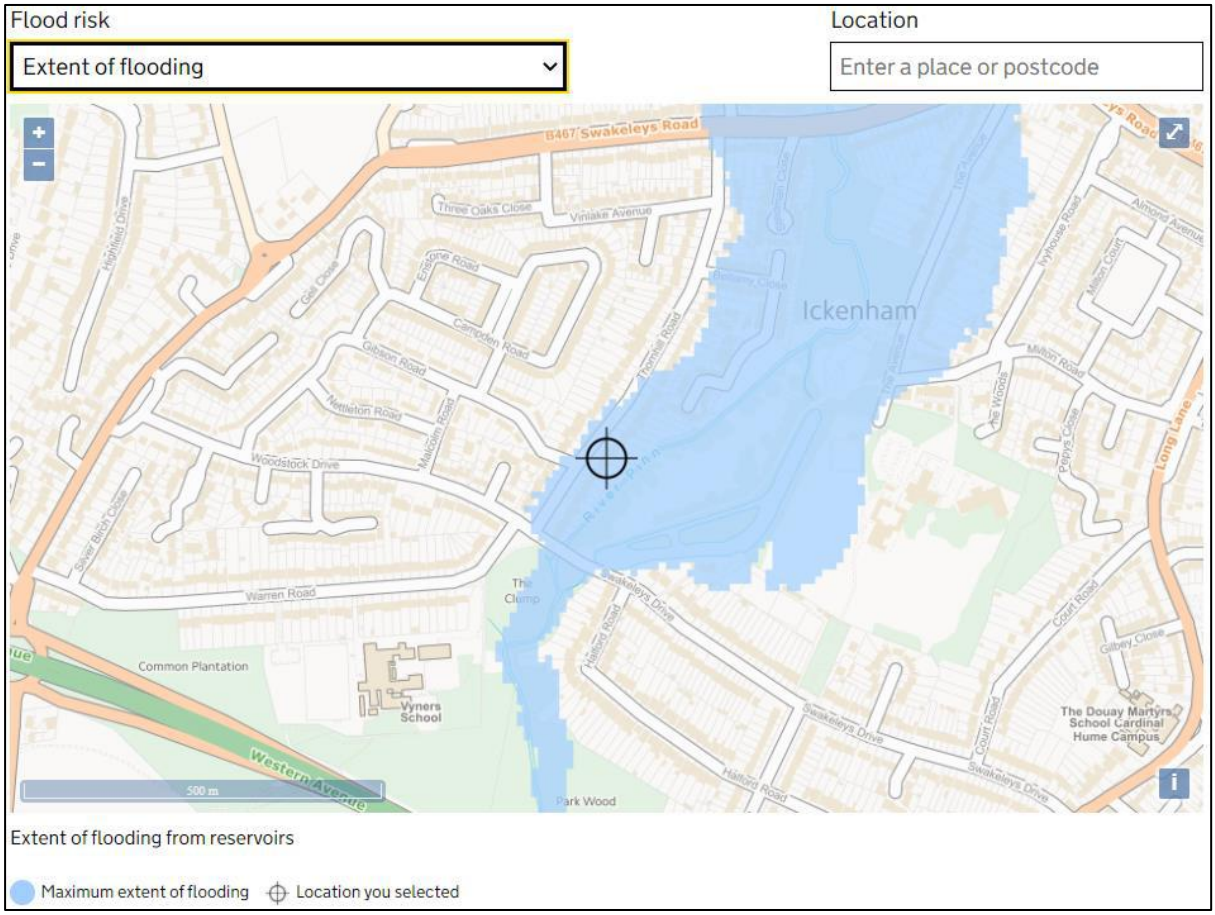


17.7 Appendix 7 –Flood Defence and Reservoir Flood Risk Maps

17.7.1 EA Map showing areas benefitting from flood defences

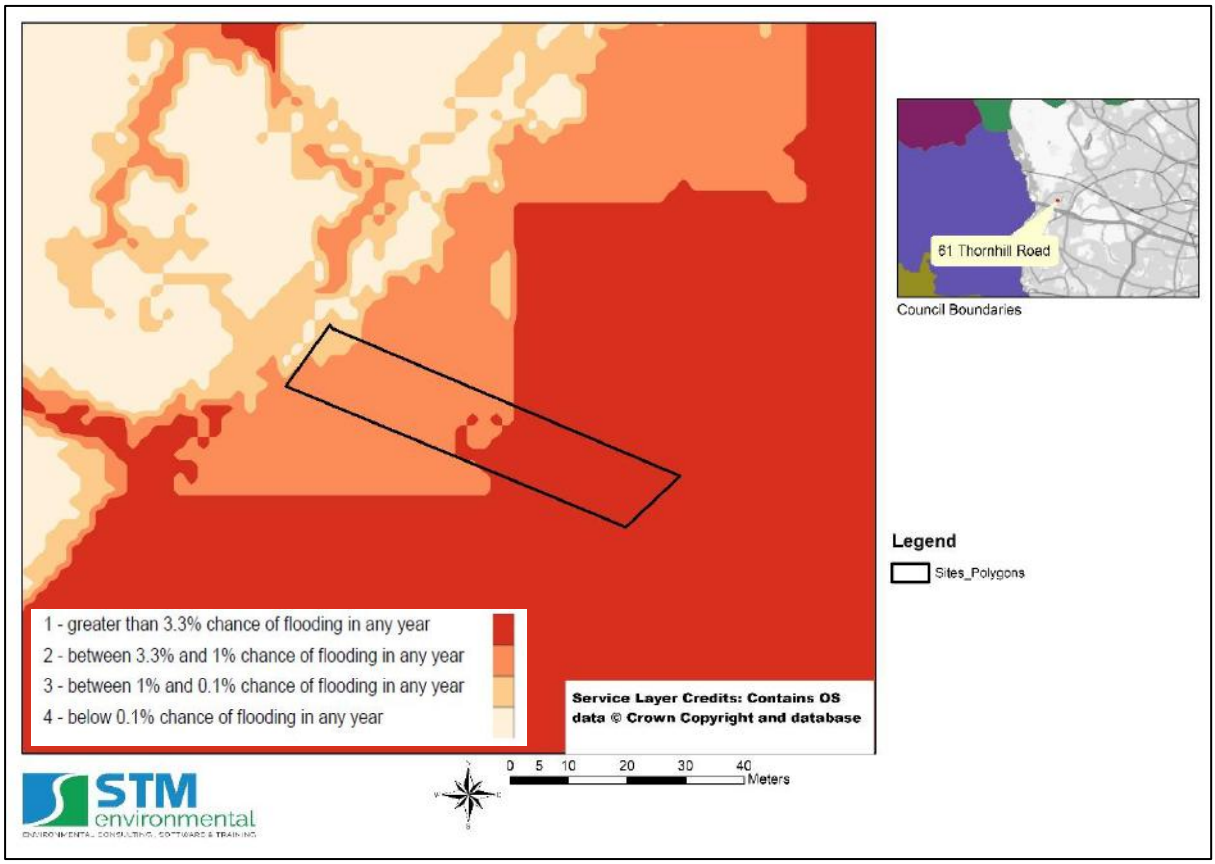
N/A - Not available as EA P4 data

17.7.2 Reservoir Flood Risk Map

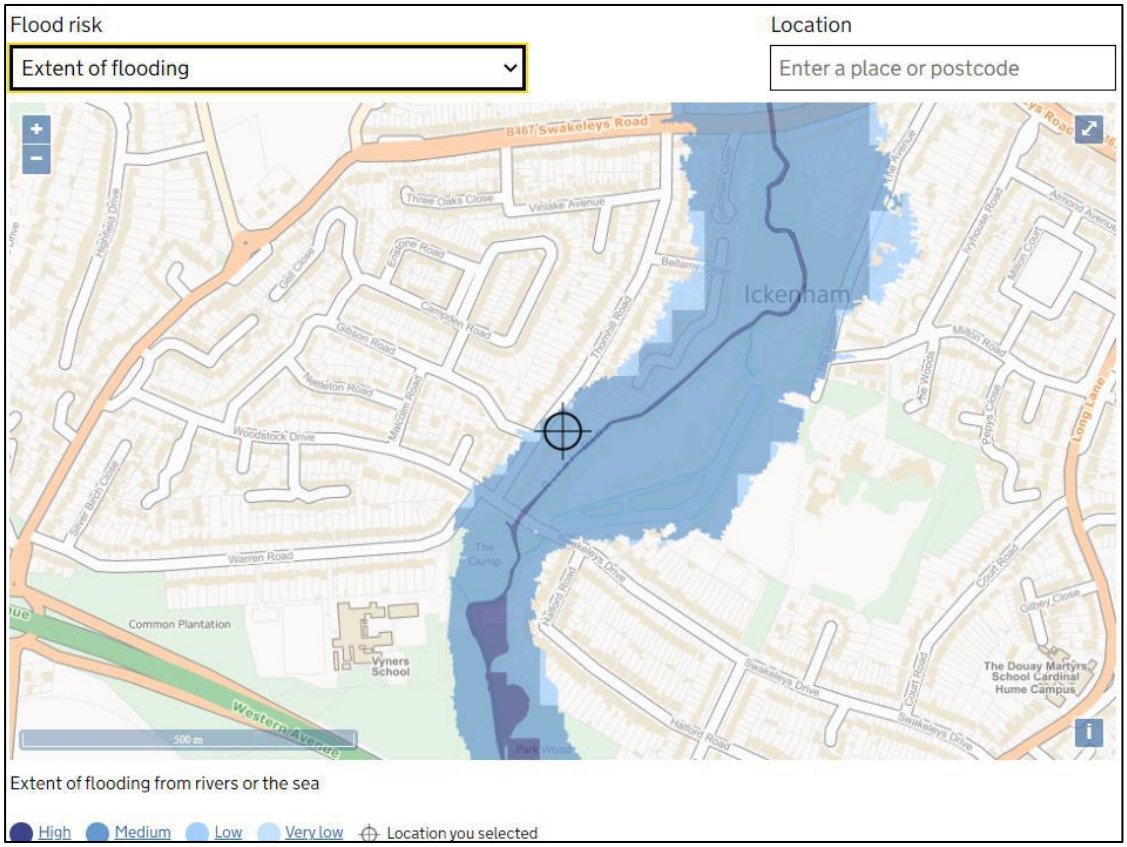


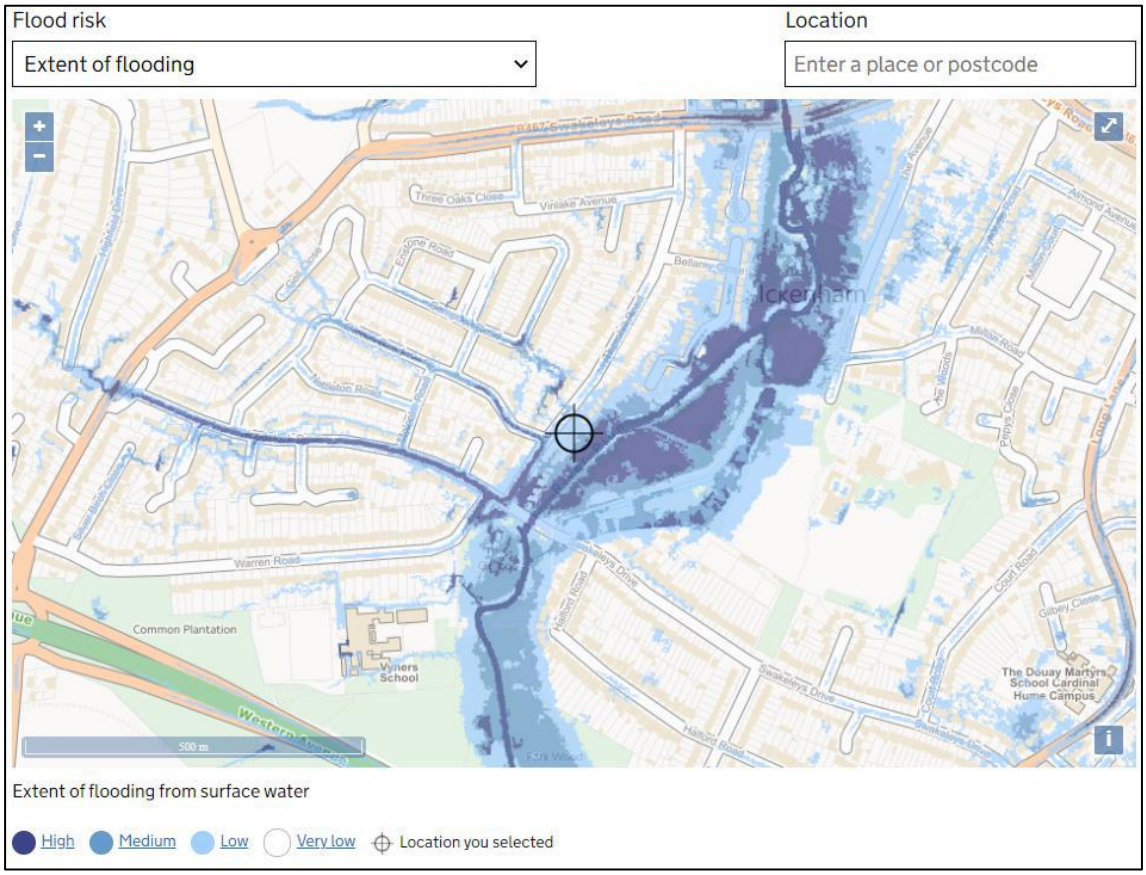
17.8 Appendix 8 – Flood Risk Maps

17.8.1 Risk of Flooding from Multiple Sources Map

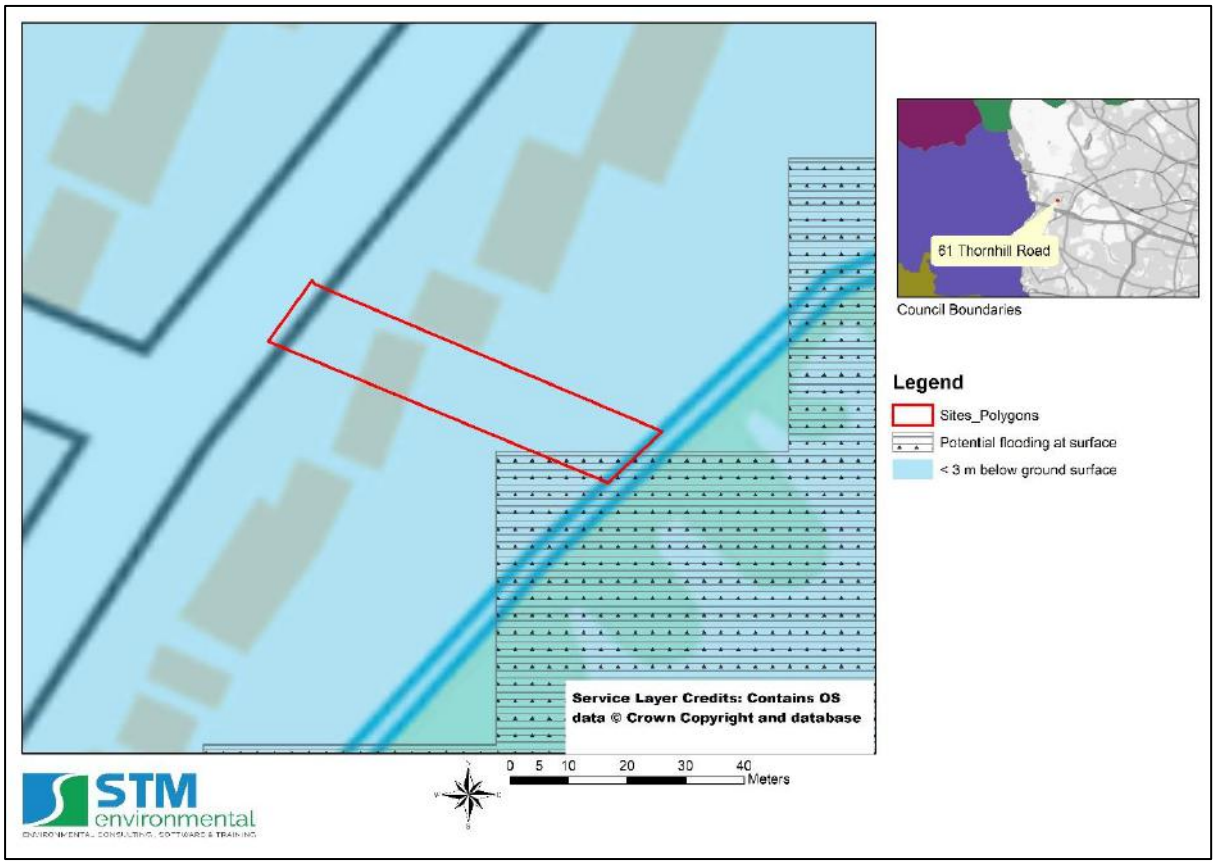


17.8.2 Long Term Flood Risk Maps



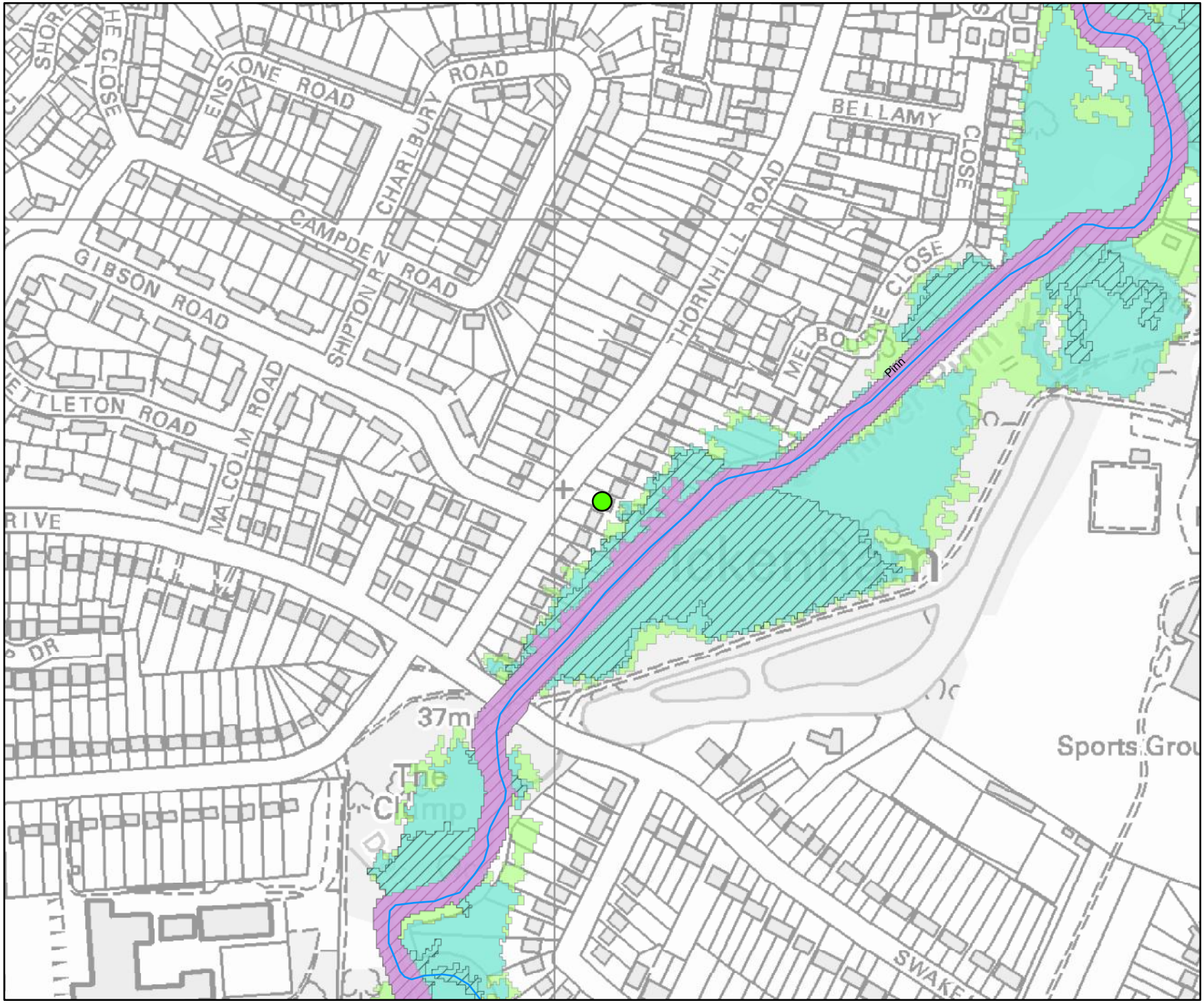


17.9 Appendix 9 – Groundwater Flood Susceptibility Map



17.10 Appendix 10 - EA Product 4 (Detailed Flood Risk) Data

Detailed FRA centred on: 61 Thornhill Road, Ickenham, Uxbridge - 28/09/2020 - HNL 186633 AS



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 50 100 200
Metres

Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 2 year (50%) Defended
- 1 in 5 year (20%) Defended
- 1 in 10 year (10%) Defended
- 1 in 20 year (5%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
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https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

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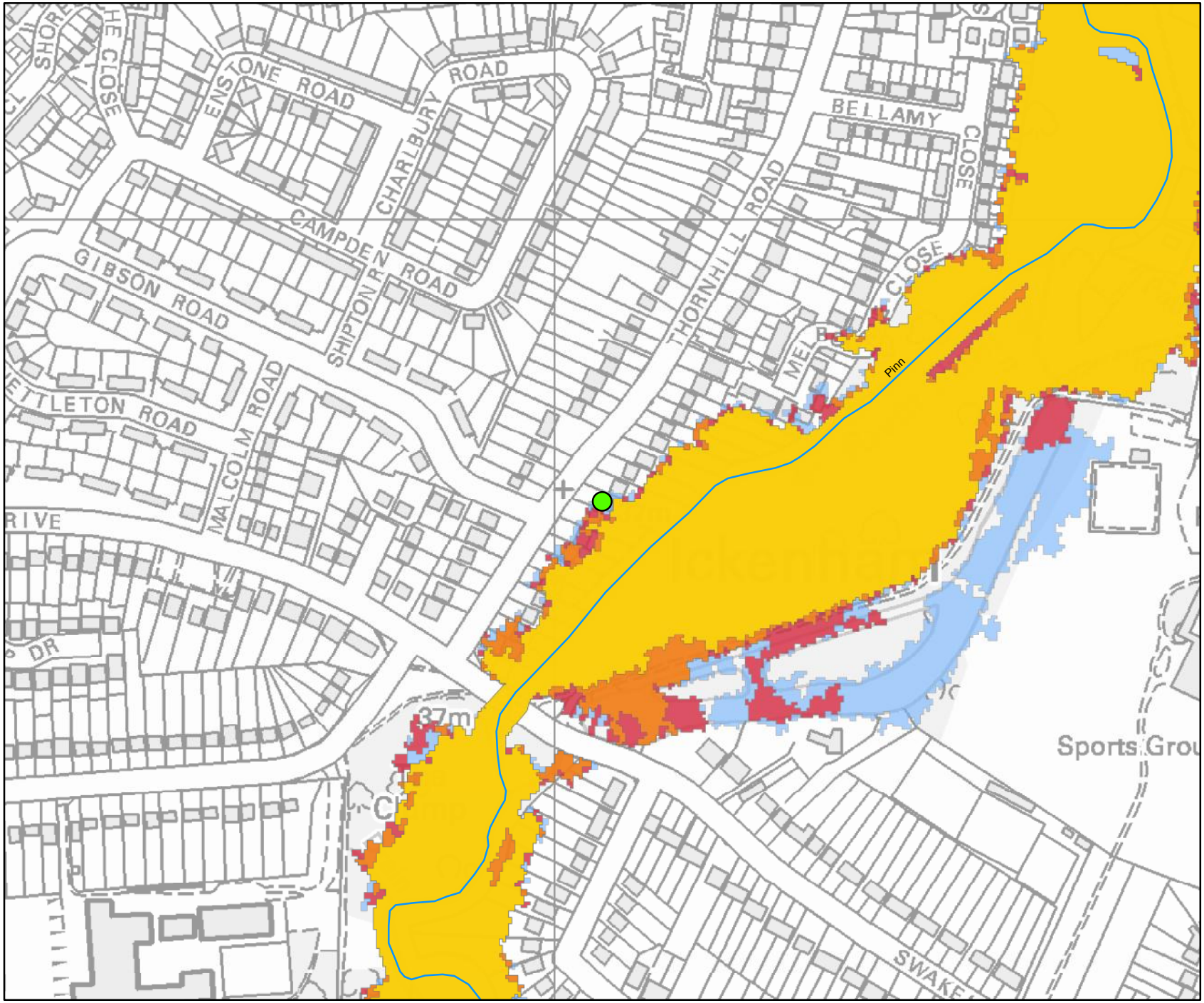

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Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 50 100 200
Metres

Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 30 year (3.33%) Defended
- 1 in 50 year (2%) Defended
- 1 in 75 year (1.33%) Defended
- 1 in 100 year (1%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
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https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

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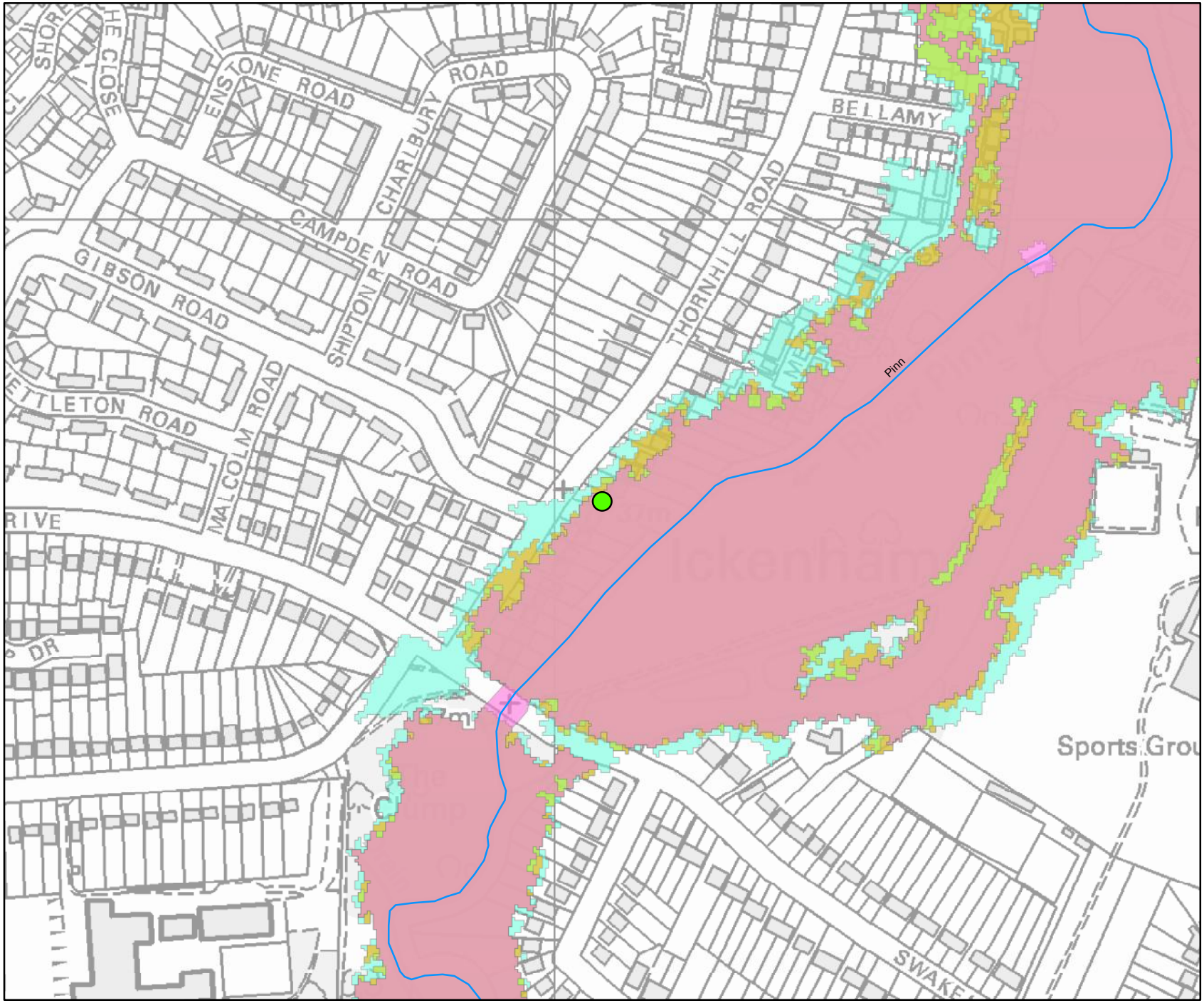

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Welwyn Garden City,
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AL7 1HE

N

0 50 100 200
Metres

Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 100 year + 20% (*CC) Defended
- 1 in 100 year + 25% (*CC) Defended
- 1 in 100 year + 35% (*CC) Defended
- 1 in 100 year + 70% (*CC) Defended

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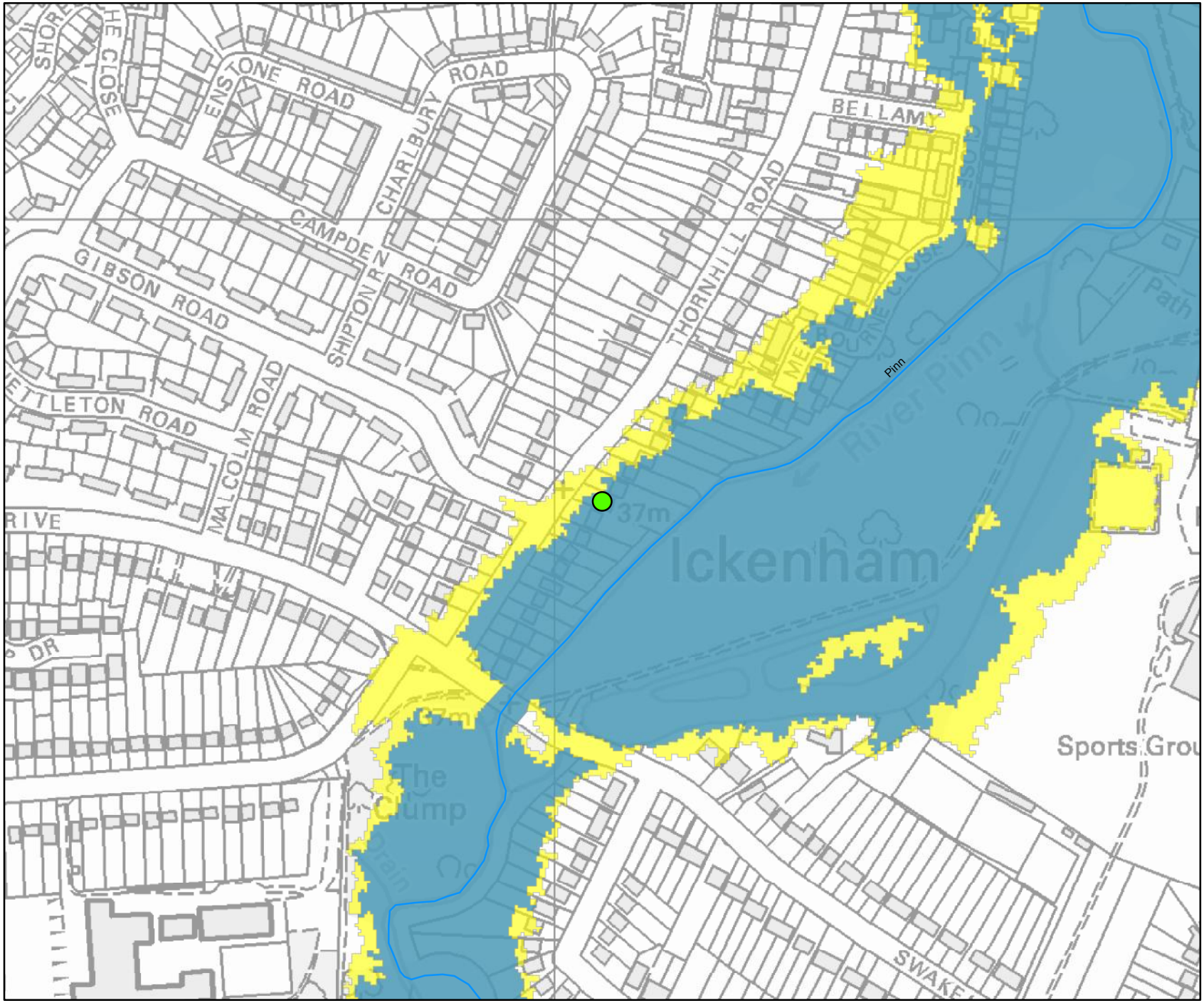

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Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 50 100 200

Metres

Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 250 year (0.4%) Defended
- 1 in 1000 year (0.1%) Defended

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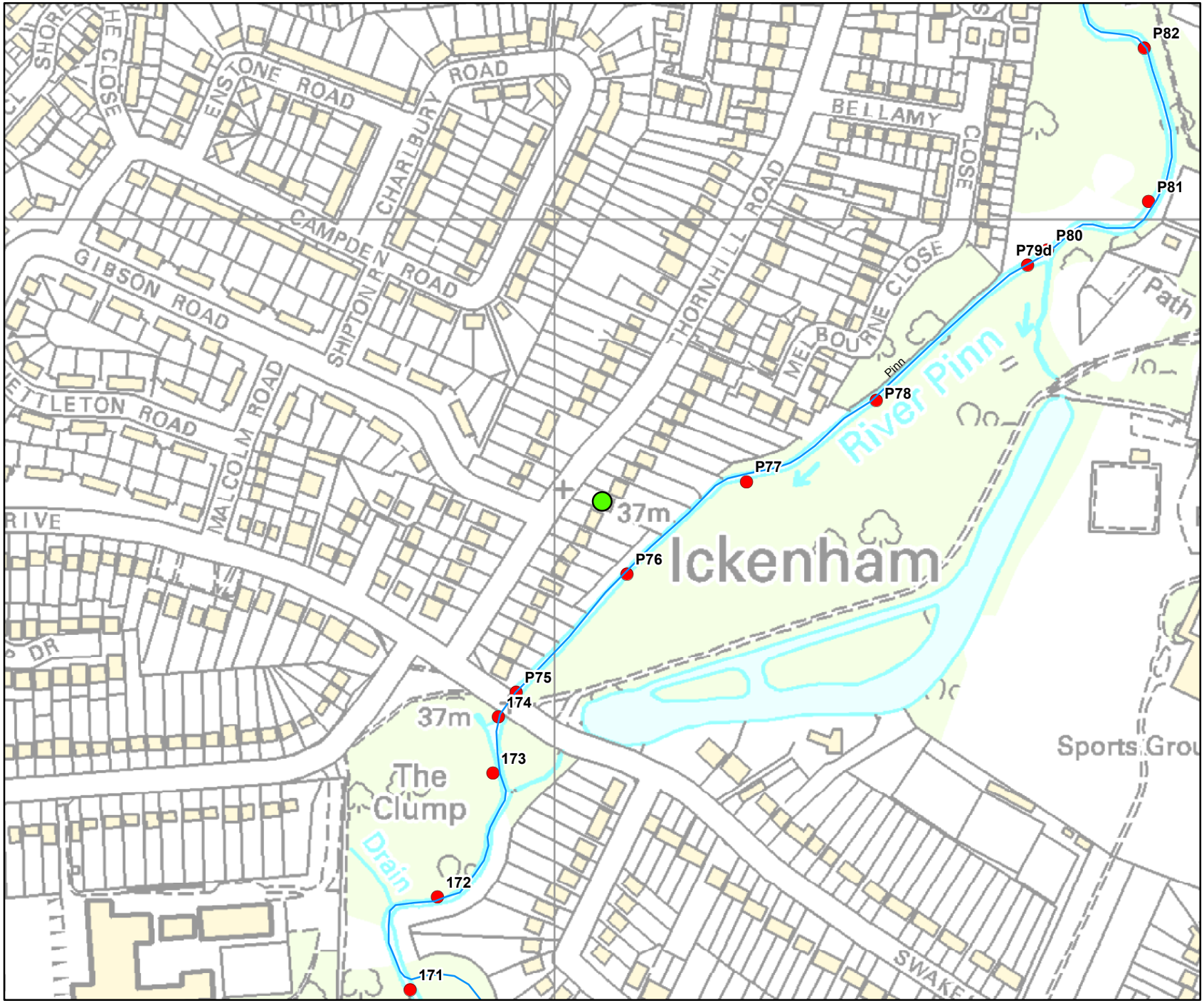

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N

0 50 100 200
Metres

Legend

Main Rivers

Site location

1D Node Results

Nodes

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment.
Modelled outlines take into account catchment wide defences.
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https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

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Environment Agency ref: HNL 186633 AS

The following information has been extracted from the River Pinn Mapping Study (JBA, 2015)

Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Caution:

This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites across the entire catchment.

All flood levels are given in metres Above Ordnance Datum (mAOD)
All flows are given in cubic metres per second (cumecs)

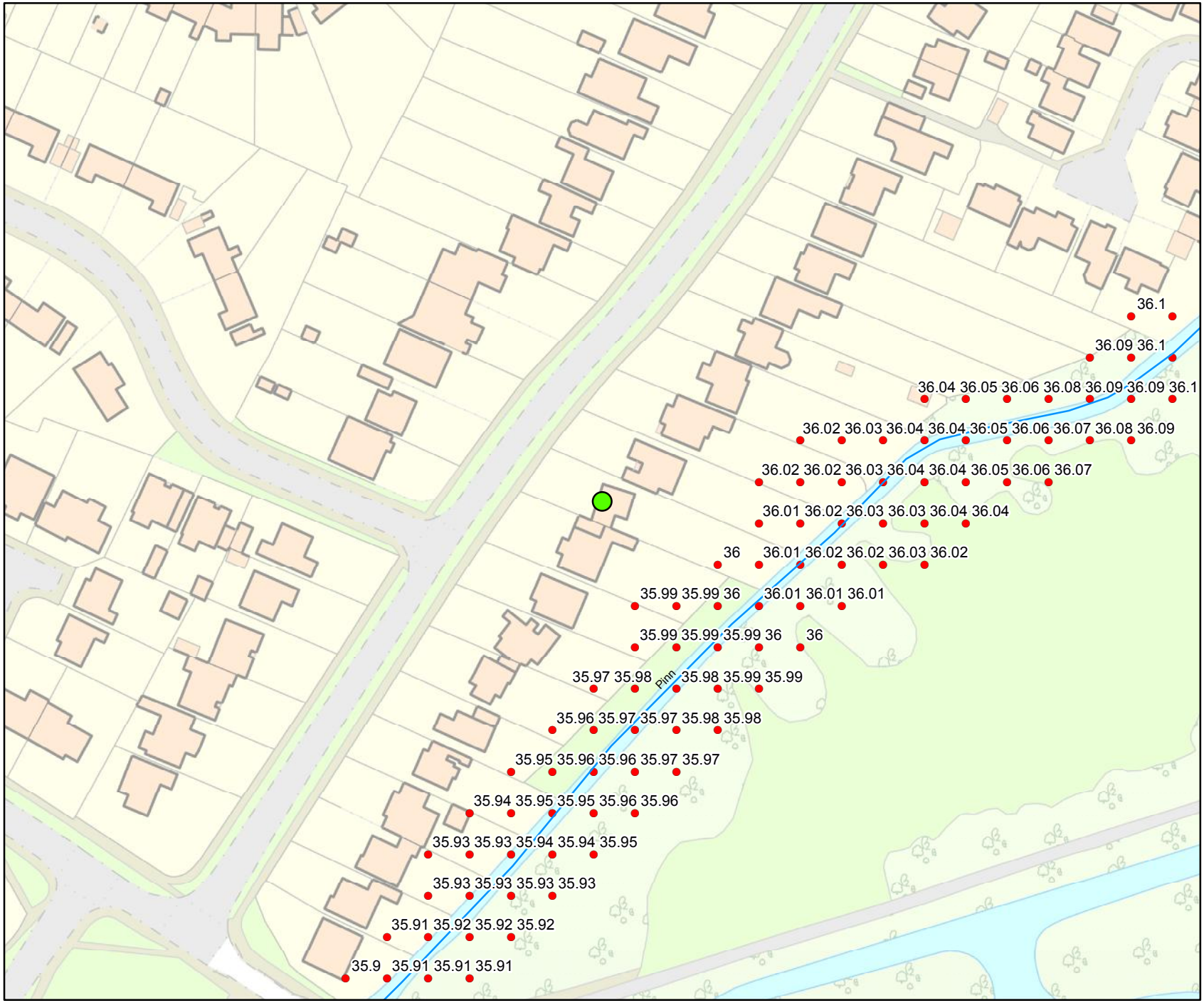
MODELLED FLOOD LEVEL

				Return Period												
Node Label	Easting	Northing	2 yr	5 yr	10 yr	20 yr	30 yr	50 yr	75 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	250 yr	1000yr
P82	507384	186111	36.46	36.69	36.83	36.90	36.93	36.98	37.01	37.02	37.07	37.09	37.11	37.24	37.10	37.34
P81	507387	186011	36.35	36.57	36.71	36.79	36.82	36.86	36.90	36.92	36.99	37.01	37.04	37.19	37.02	37.29
P80	507321	185979	36.28	36.50	36.61	36.69	36.73	36.78	36.81	36.84	36.93	36.95	37.00	37.17	36.98	37.28
P79d	507308	185970	36.26	36.46	36.56	36.64	36.67	36.71	36.75	36.78	36.87	36.90	36.95	37.14	36.93	37.26
P78	507209	185882	36.15	36.35	36.44	36.52	36.55	36.60	36.65	36.68	36.81	36.84	36.90	37.12	36.87	37.24
P77	507125	185829	36.05	36.26	36.36	36.47	36.51	36.58	36.63	36.66	36.79	36.82	36.88	37.10	36.85	37.22
P76	507047	185769	35.98	36.18	36.30	36.41	36.46	36.53	36.59	36.63	36.78	36.81	36.88	37.11	36.85	37.23
P75	506975	185692	35.90	36.09	36.20	36.30	36.34	36.40	36.44	36.47	36.59	36.62	36.69	36.90	36.65	37.04
174	506963	185676	35.87	36.04	36.13	36.20	36.23	36.27	36.29	36.31	36.38	36.39	36.43	36.56	36.41	36.72
173	506960	185639	35.84	36.02	36.11	36.18	36.21	36.25	36.27	36.29	36.36	36.38	36.41	36.55	36.39	36.72
172	506924	185559	35.73	35.90	35.99	36.08	36.12	36.17	36.20	36.23	36.31	36.33	36.37	36.53	36.35	36.71
171	506906	185498	35.65	35.80	35.89	35.98	36.02	36.08	36.12	36.14	36.24	36.26	36.31	36.49	36.28	36.68

MODELLED FLOWS

				Return Period												
Node Label	Easting	Northing	2 yr	5 yr	10 yr	20 yr	30 yr	50 yr	75 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	250 yr	1000yr
P82	507384	186111	6.61	8.40	9.54	10.07	10.30	10.50	10.62	10.83	11.42	11.51	11.66	12.18	11.60	12.75
P81	507387	186011	6.61	8.44	9.74	10.48	10.73	10.93	11.06	11.14	11.51	11.61	11.74	12.10	11.71	12.59
P80	507321	185979	6.72	8.54	9.97	11.15	11.53	11.92	12.12	12.29	12.67	12.74	12.87	13.41	12.84	13.88
P79d	507308	185970	6.72	8.54	9.97	11.15	11.53	11.92	12.12	12.29	12.67	12.74	12.87	13.41	12.84	13.88
P78	507209	185882	6.72	8.54	9.94	11.00	11.24	11.54	11.75	11.94	12.33	12.42	12.57	12.92	12.54	13.29
P77	507125	185829	6.71	8.30	8.99	9.22	9.28	9.33	9.32	9.32	9.27	9.25	9.22	9.11	9.24	9.82
P76	507047	185769	6.71	8.21	8.62	8.97	9.05	9.09	9.09	9.08	9.03	9.01	8.98	8.82	8.99	8.70
P75	506975	185692	6.82	8.63	9.93	11.62	12.42	13.65	14.63	15.31	17.98	18.59	19.87	23.67	19.26	24.69
174	506963	185676	6.82	8.63	9.93	11.62	12.42	13.65	14.63	15.31	17.98	18.59	19.87	23.67	19.26	24.69
173	506960	185639	6.82	8.63	9.81	11.14	11.69	12.55	13.28	13.76	15.76	16.21	17.14	20.31	16.70	21.54
172	506924	185559	6.82	8.52	9.25	9.63	9.70	9.78	9.88	9.99	10.35	10.41	10.67	11.37	10.60	12.00
171	506906	185498	6.92	8.74	9.76	10.77	11.07	11.34	11.55	11.77	12.21	12.24	12.41	13.15	12.42	13.95

Detailed FRA centred on: 61 Thornhill Road, Ickenham, Uxbridge - 28/09/2020 - HNL 186633 AS



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 2 year (50%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
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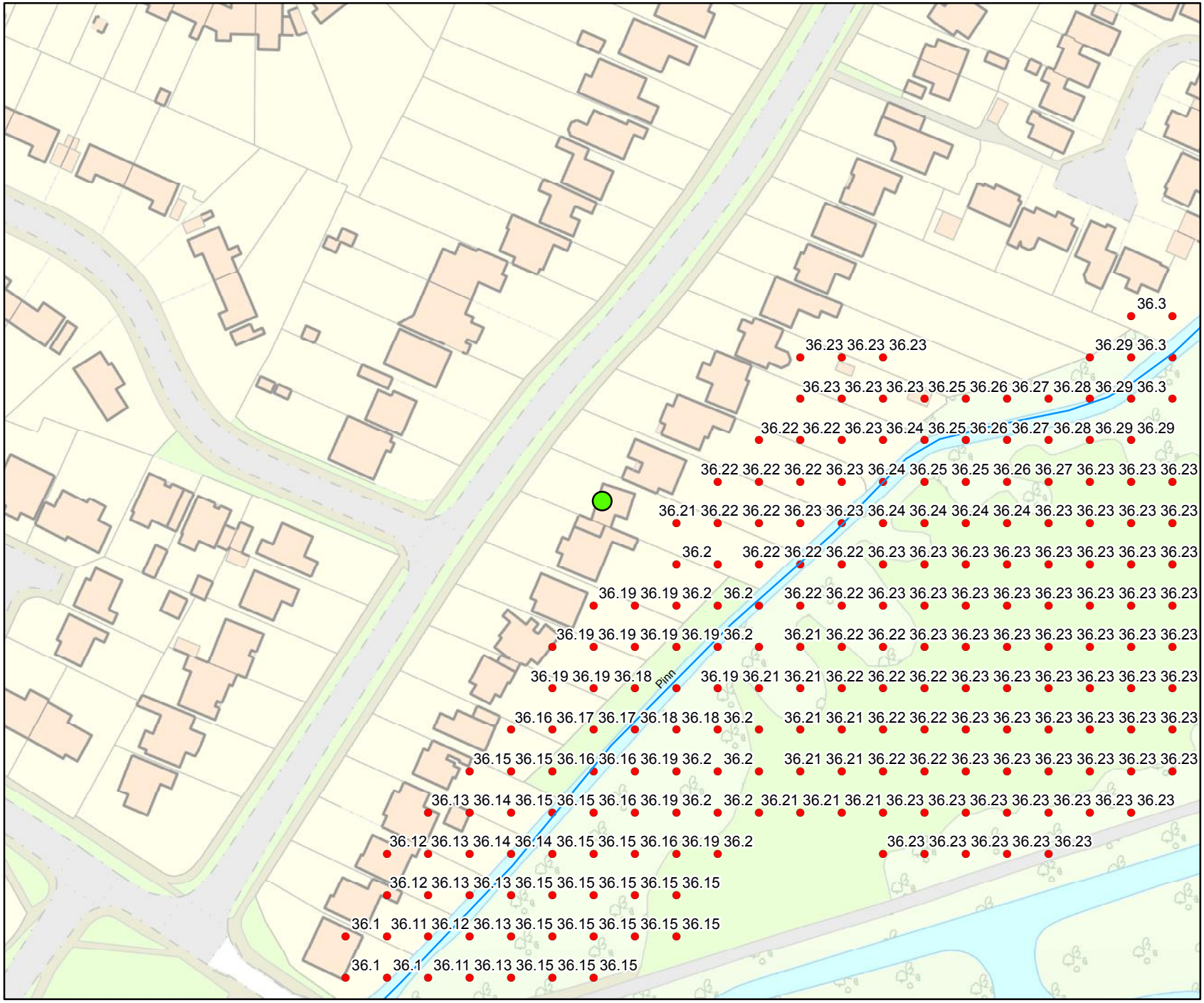
Detailed FRA centred on: 61 Thornhill Road, Ickenham, Uxbridge - 28/09/2020 - HNL 186633 AS



Environment Agency
Alchemy,
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Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 5 year (20%) Defended

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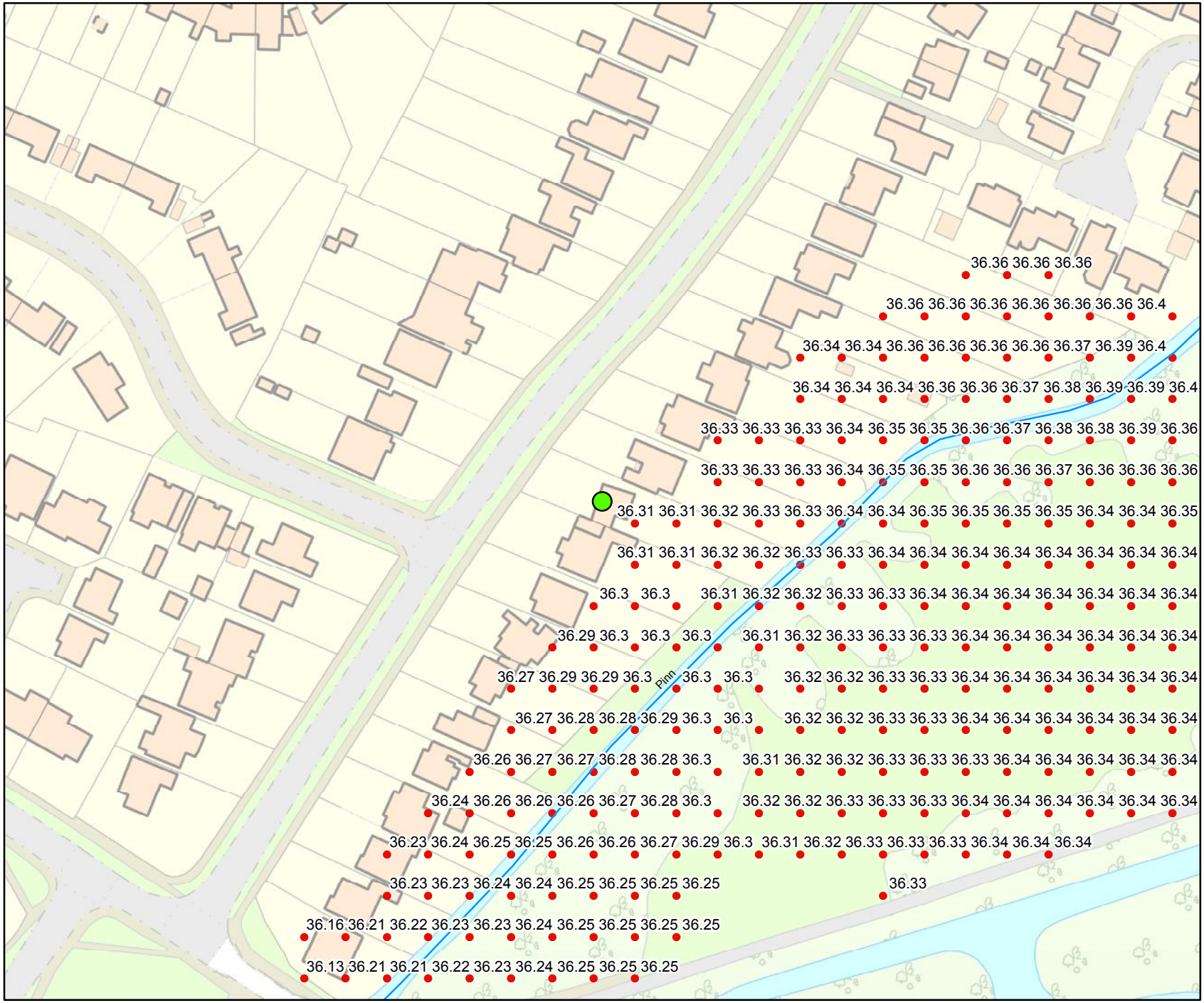

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Hertfordshire,
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N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 10 year (10%) Defended

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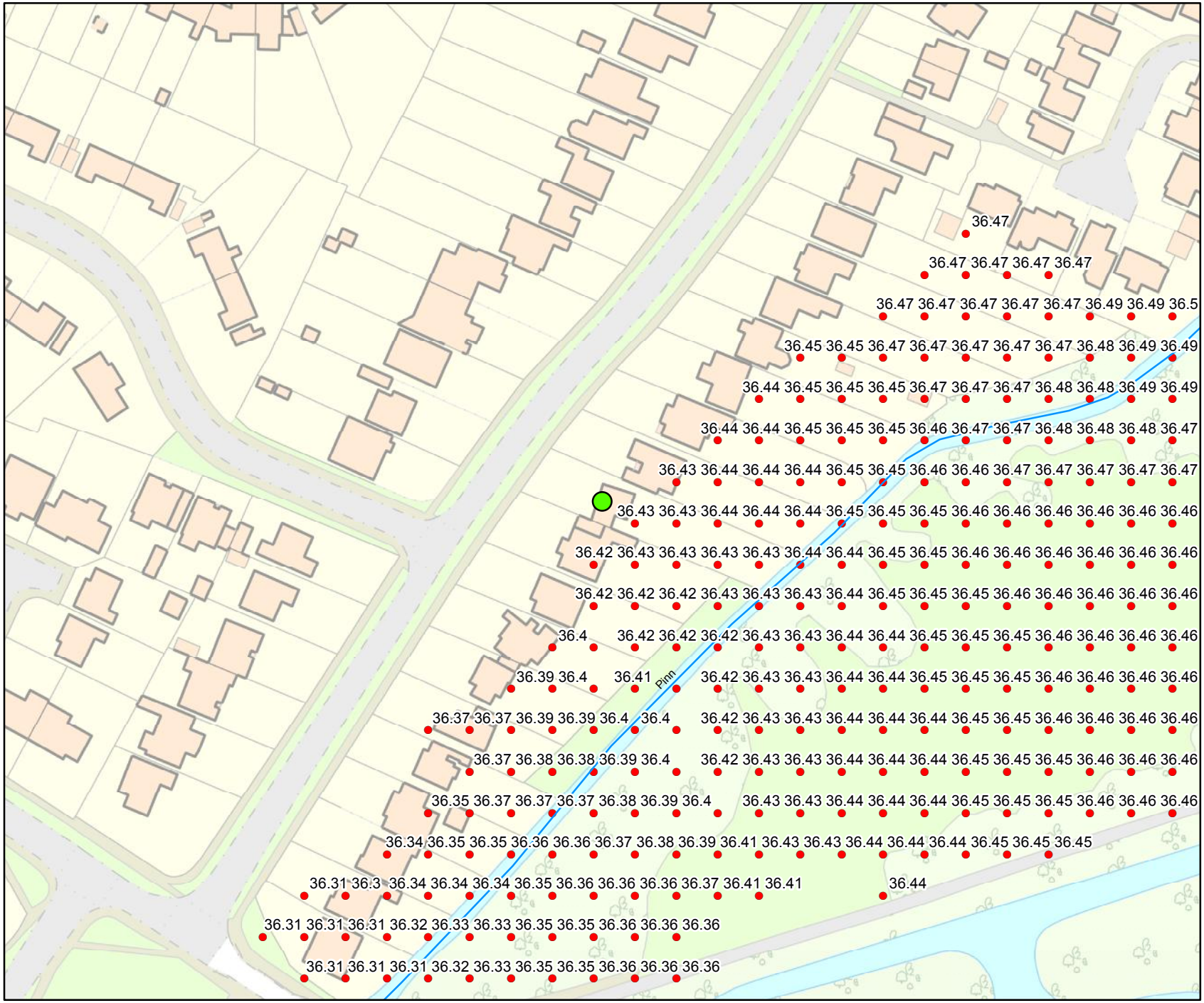

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Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 20 year (5%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
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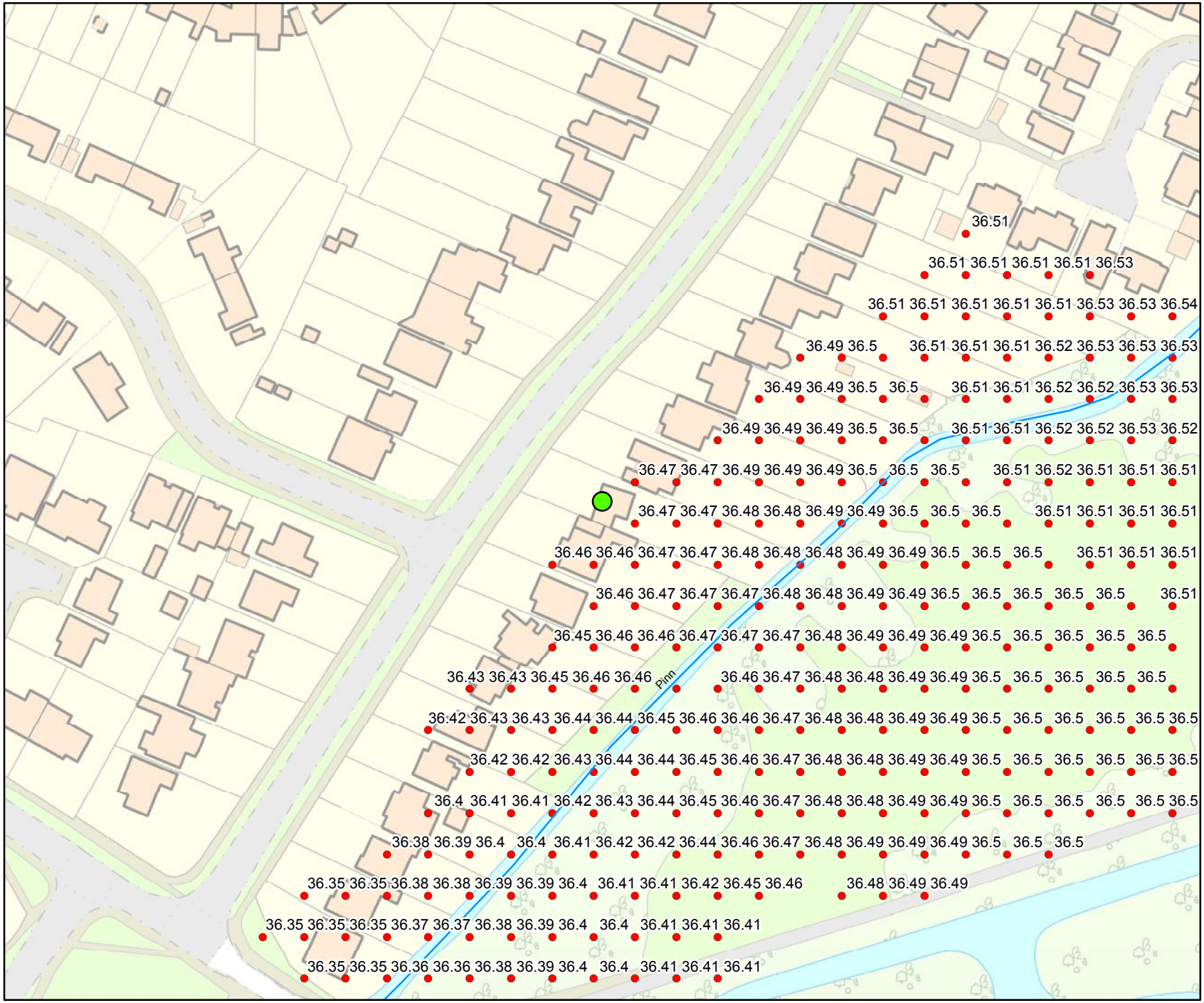

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Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 30 year (3.33%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
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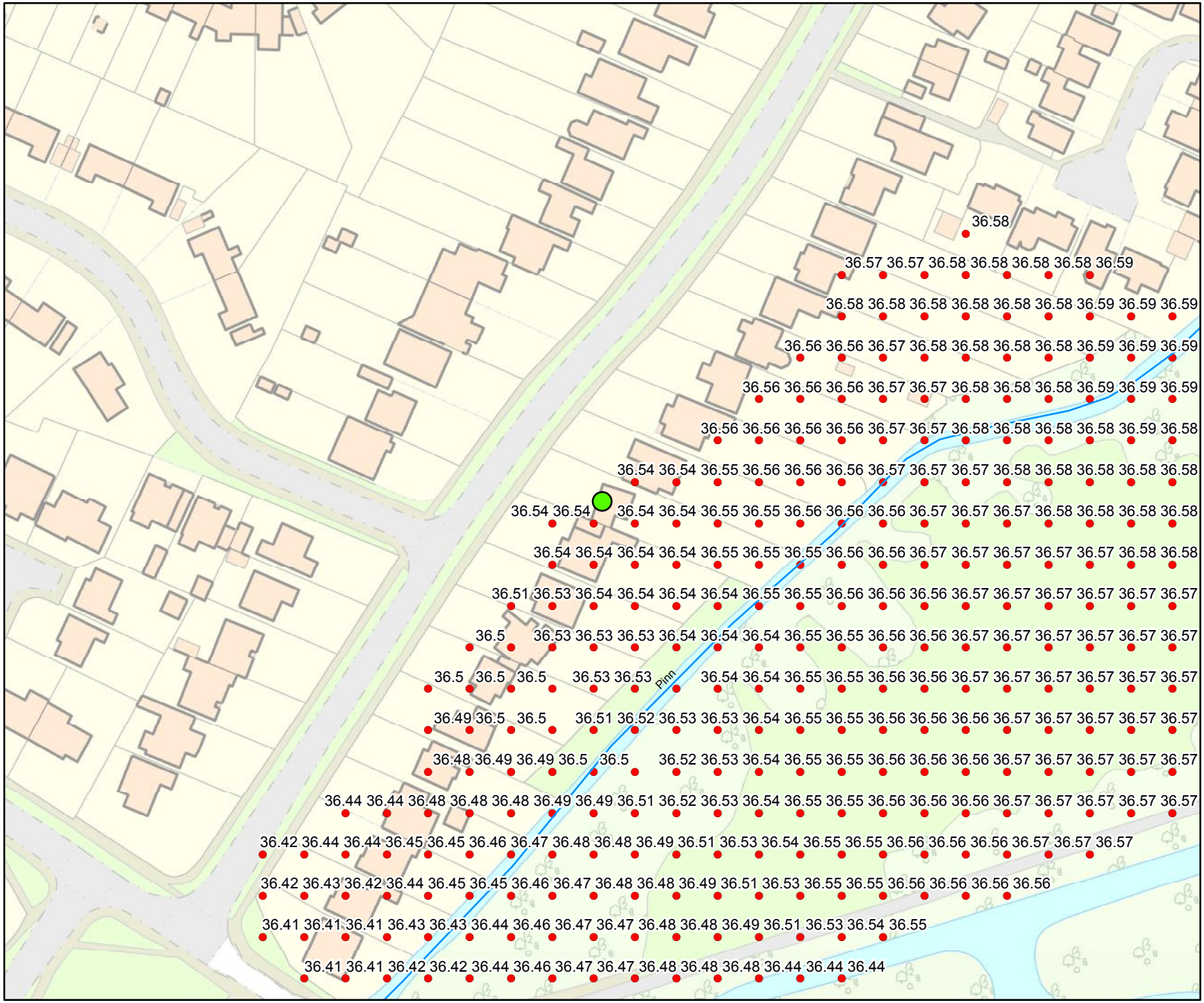

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Hertfordshire,
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N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 50 year (2%) Defended

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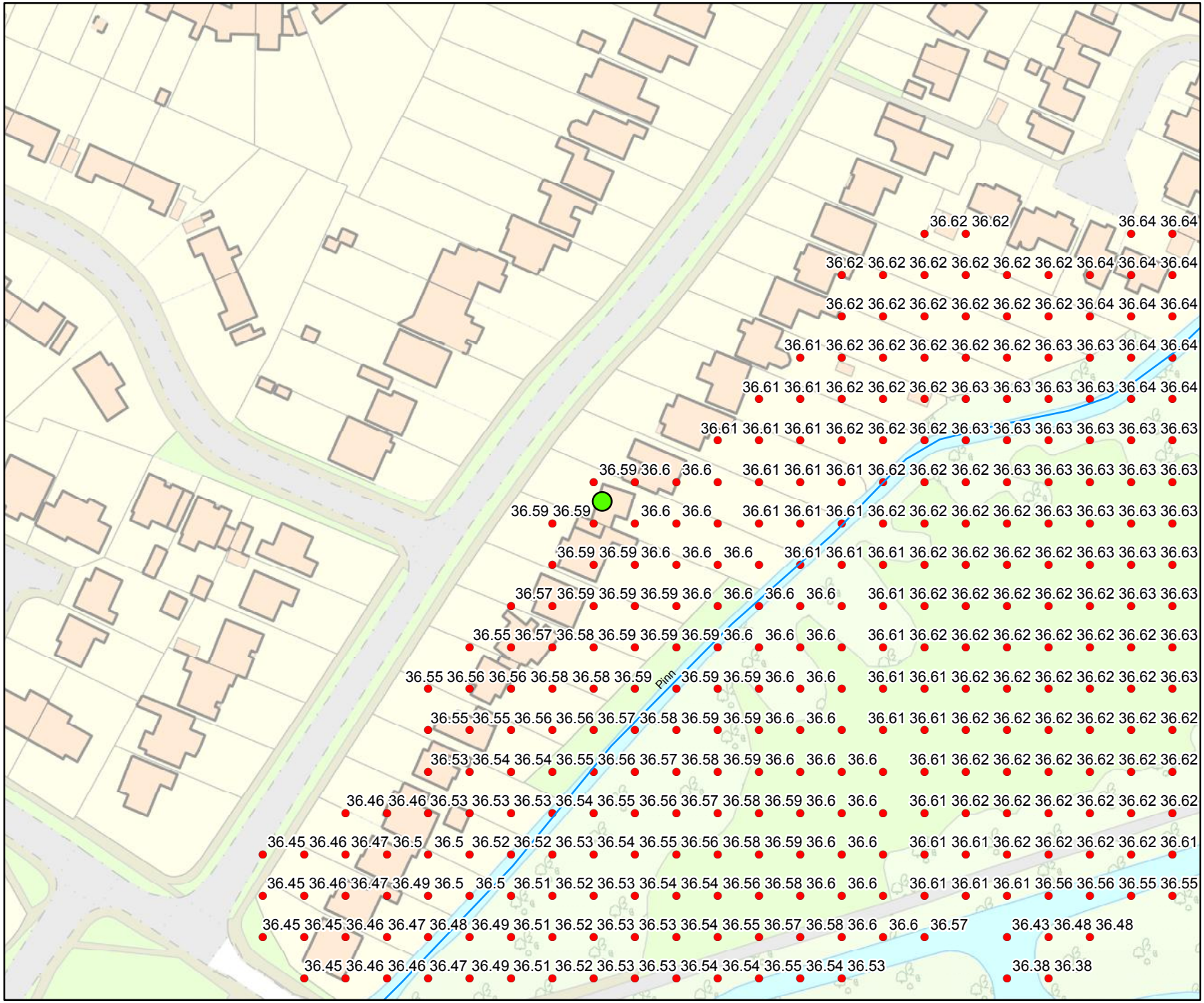

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N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 75 year (1.33%) Defended

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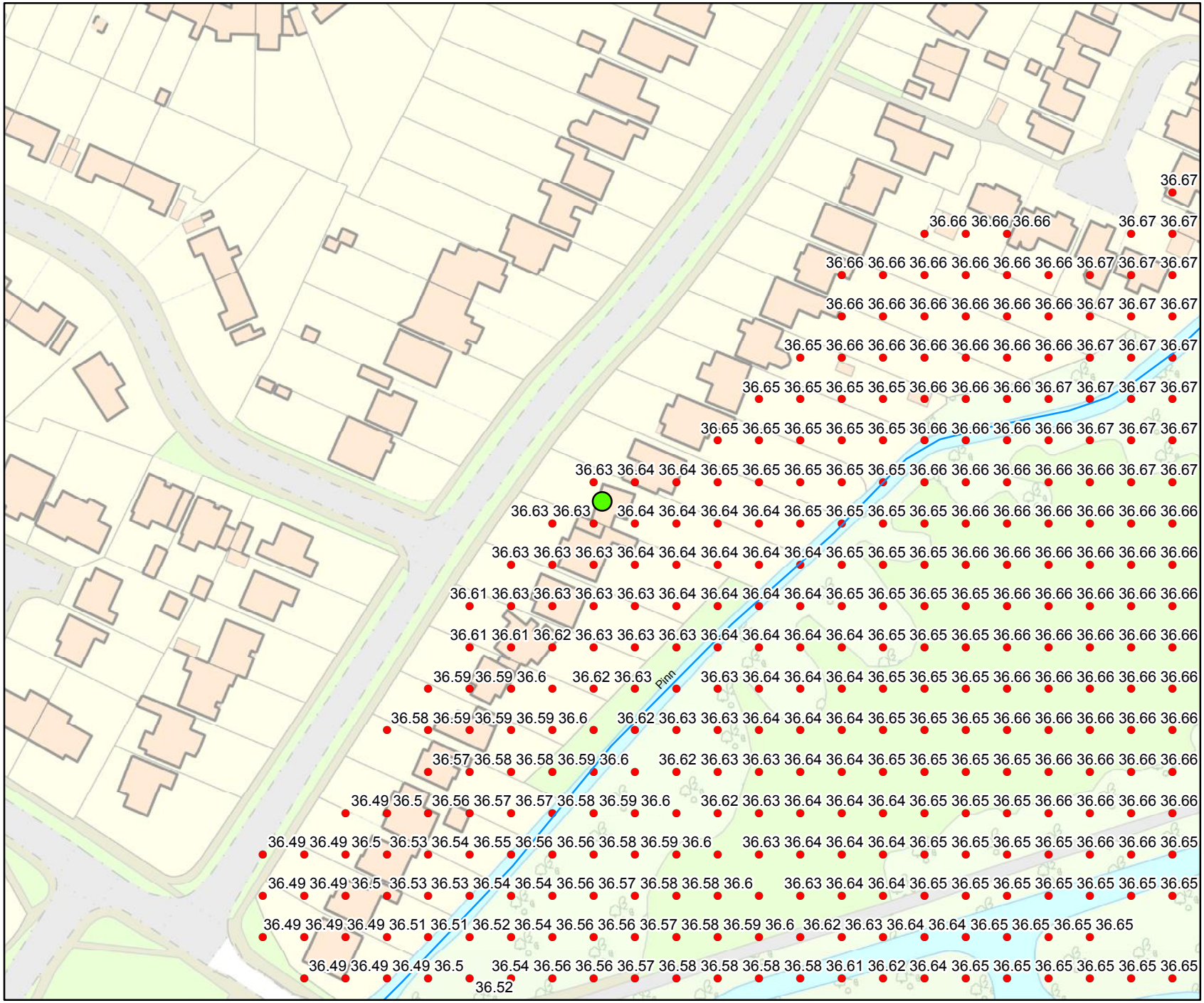

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 100 year (1%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment.
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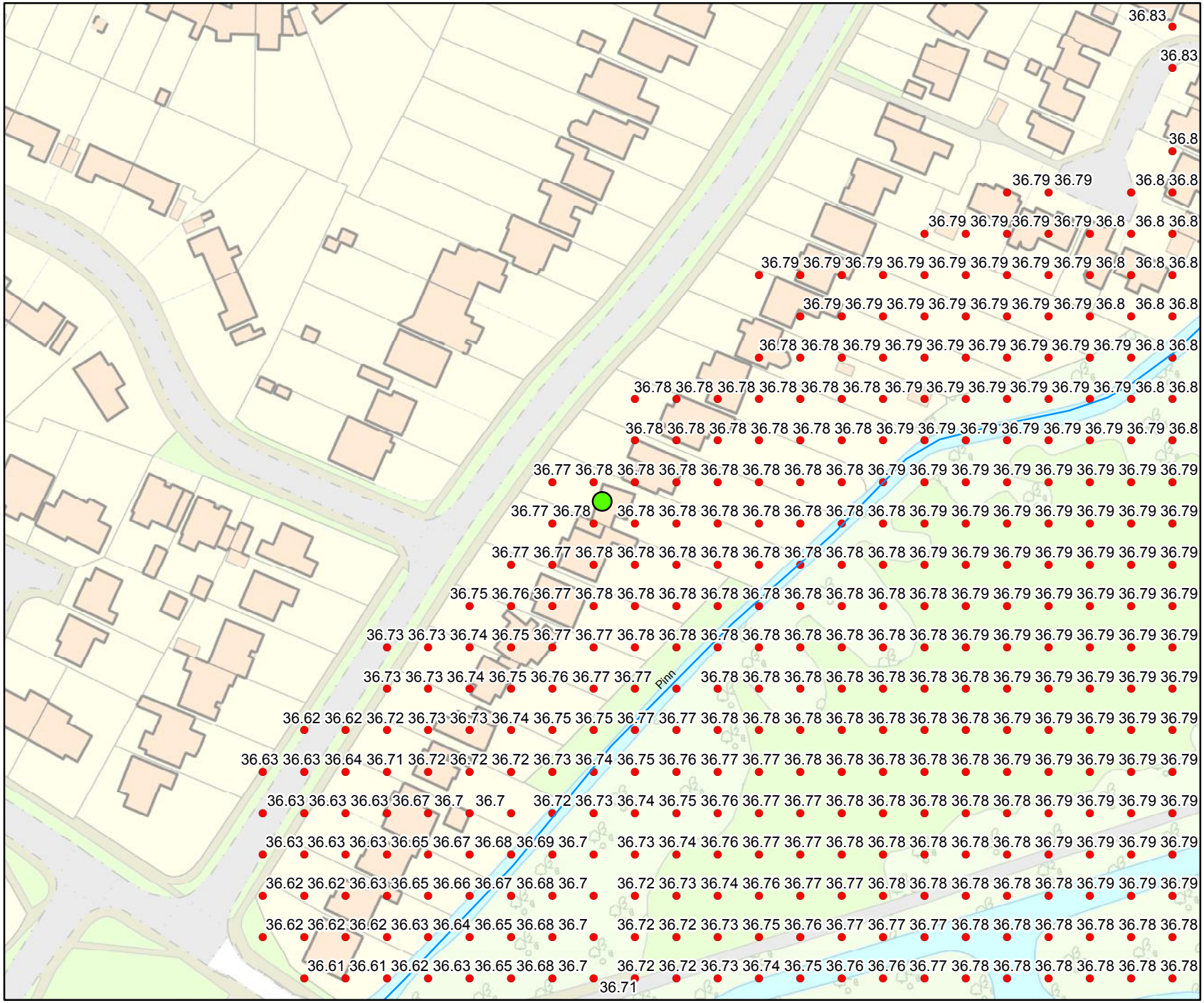
Detailed FRA centred on: 61 Thornhill Road, Ickenham, Uxbridge - 28/09/2020 - HNL 186633 AS



Environment Agency

Environment Agency
Alchemy,
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Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 100 year + 20% (*CC) Defended

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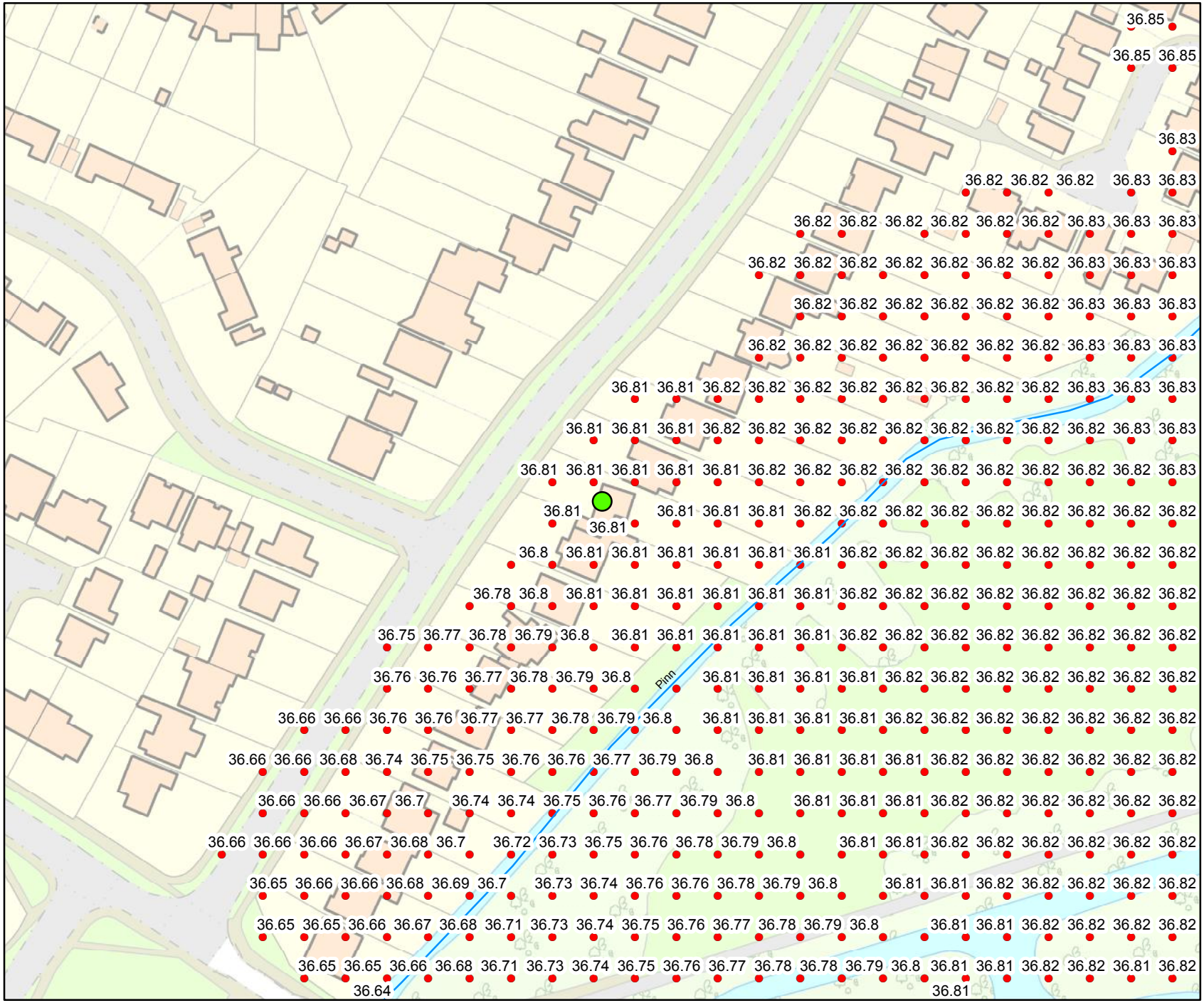

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 100 year + 25% (*CC) Defended

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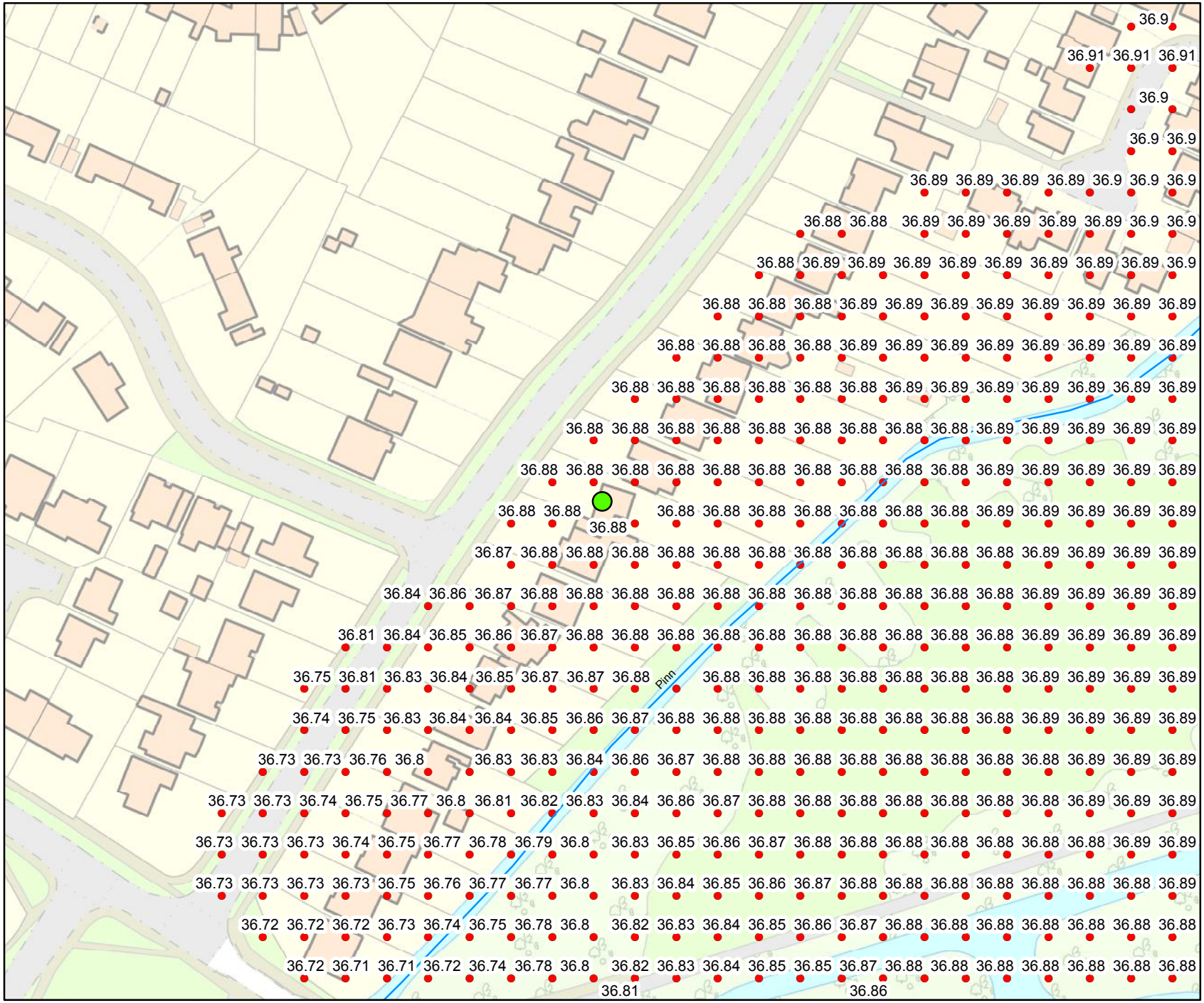

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Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 100 year + 35% (*CC) Defended

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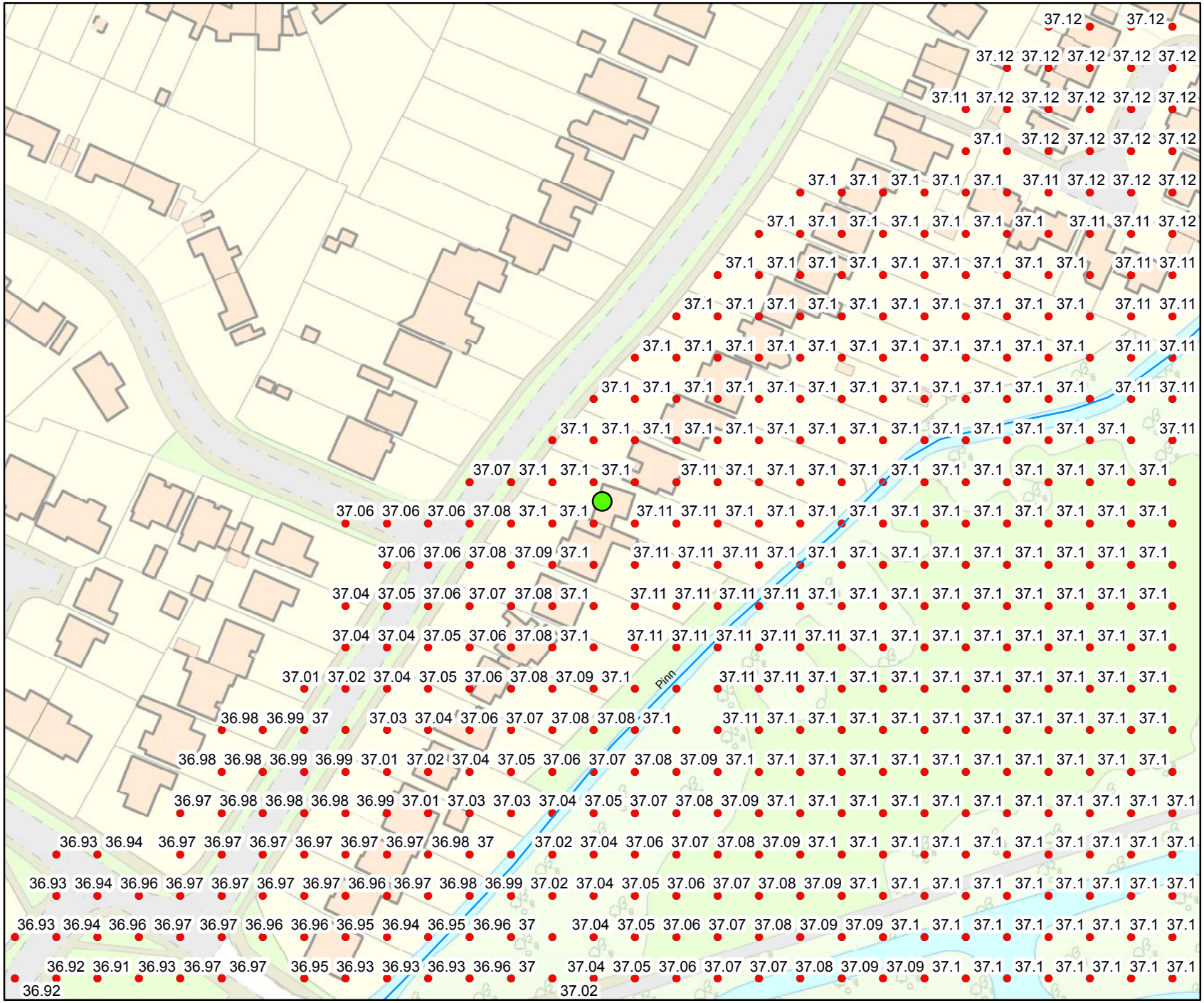

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AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 100 year + 70% (*CC) Defended

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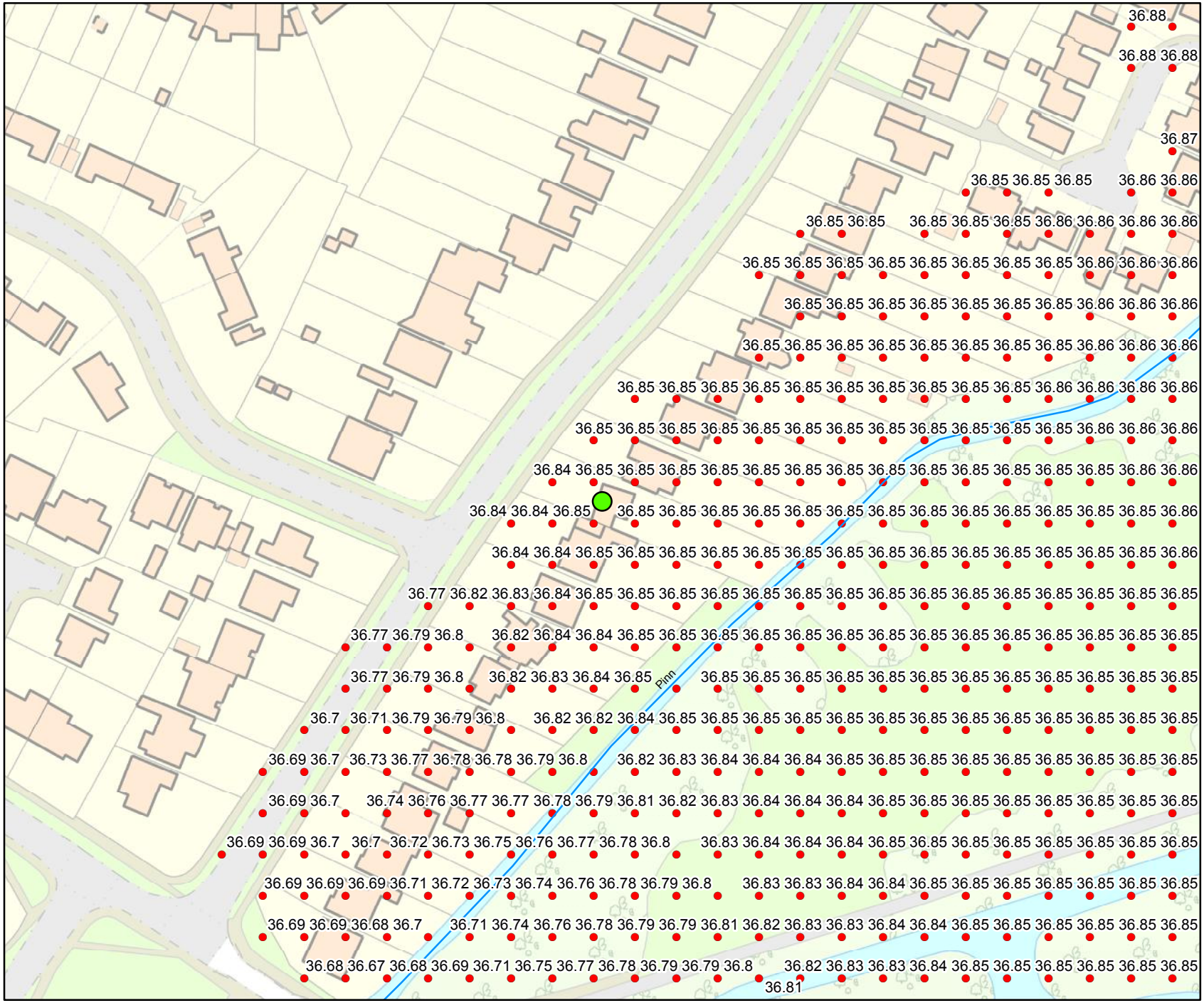

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Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 250 year (0.4%) Defended

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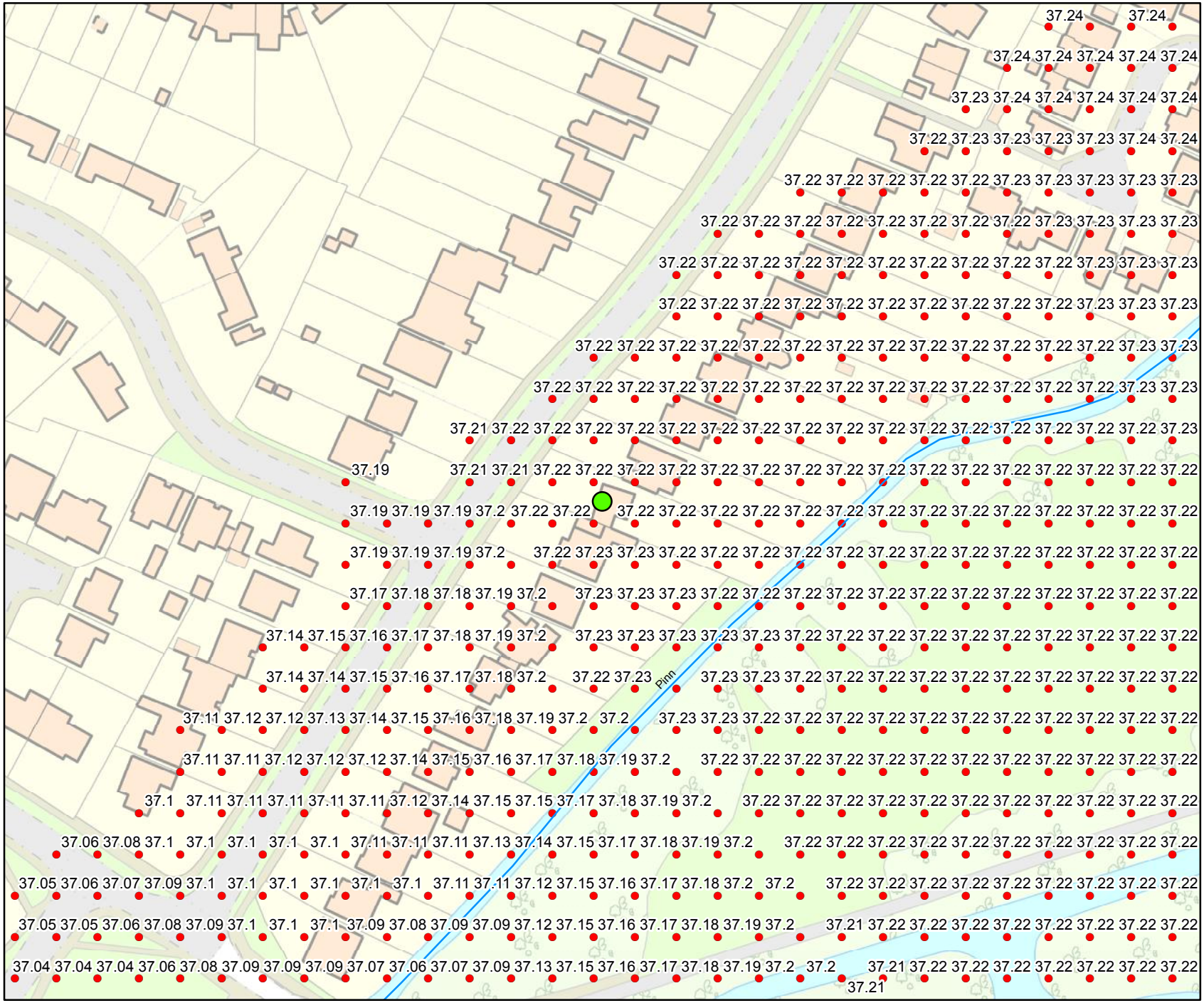

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Alchemy,
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Welwyn Garden City,
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N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 1000 year (0.1%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
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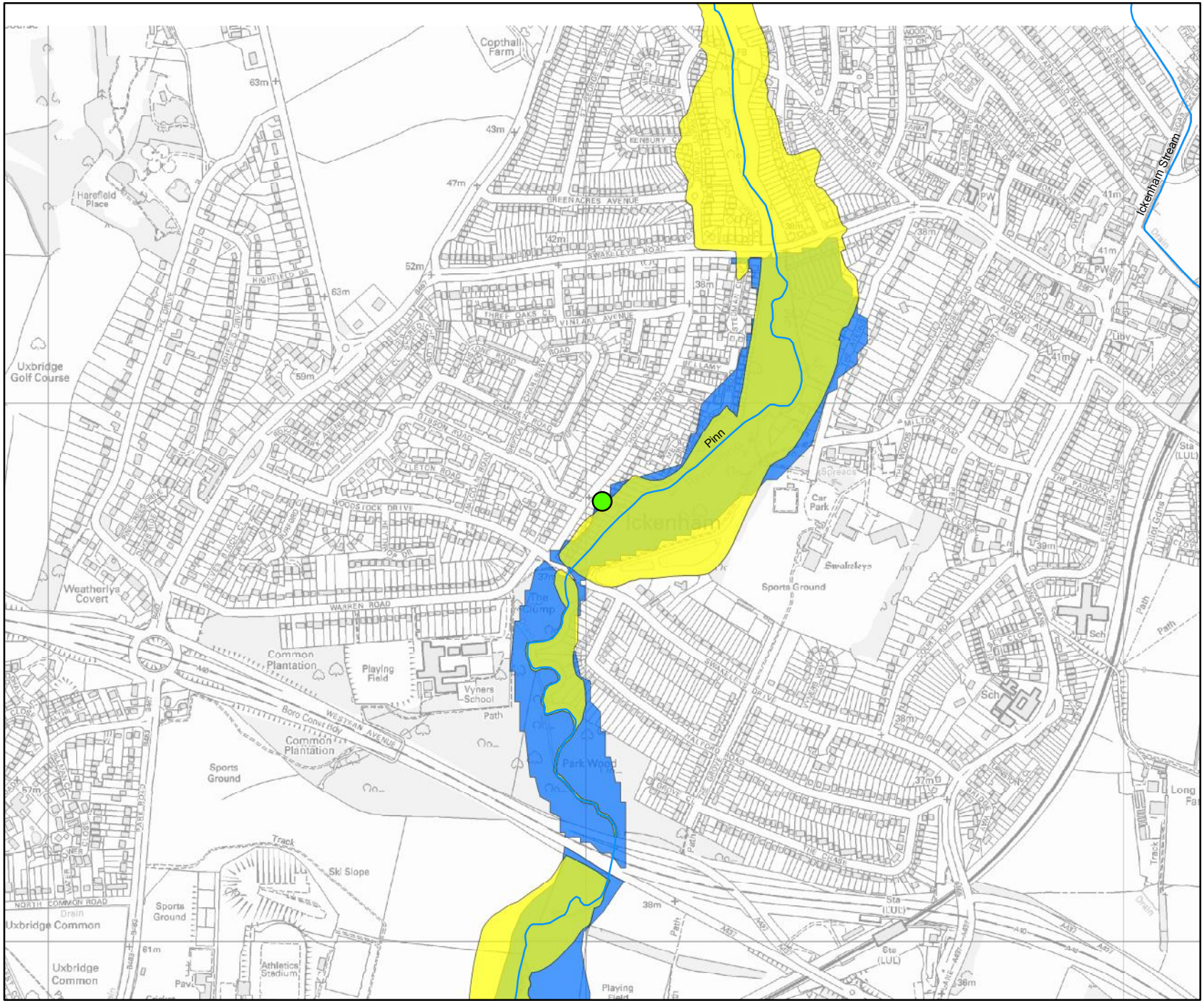
Historic Flood Map centred on: 61 Thornhill Road, Ickenham, Uxbridge - 28/09/2020 - HNL 186633 AS



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
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AL7 1HE

N

0 150 300 600
Metres

Legend

- Main Rivers
- Site location

Flood Event Outlines

- 1977
- 1988

The historic flood event outlines are based on a combination of anecdotal evidence, Environment Agency staff observations and survey.
Our historic flood event outlines do not provide a definitive record of flooding.
It is possible that there will be an absence of datain places where we have not been able to record the extent of flooding.
It is also possible for errors occur in the digitisation of historic records of flooding.

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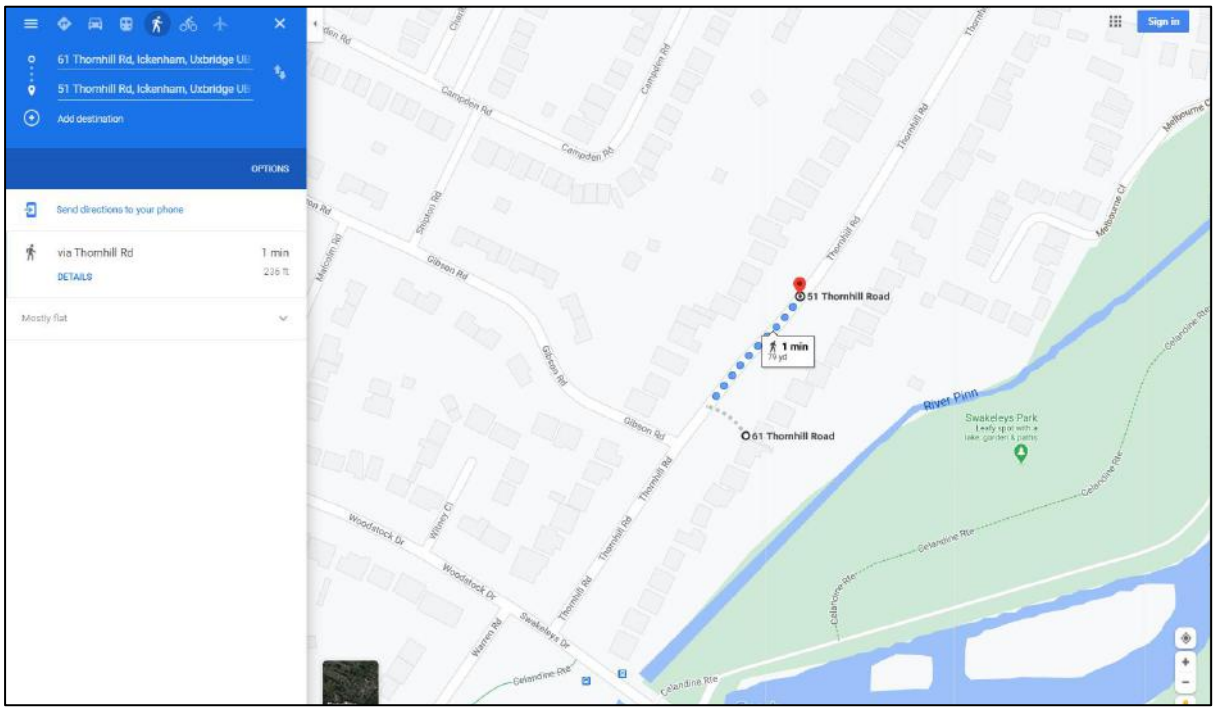
17.11 Appendix 11 – Safe Egress to Flood Zone 1 Map



17.12 Appendix 12 – Calculation of Flood Hazard Rating

Table 6: Flood Hazard Rating Scores – based on DF score of 0

Velocity	Depth									
	0.25	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.0**	**2.25**	**2.50**
0.0	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
0.5	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1.0	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
1.5	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
2.0	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
2.5	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
3.0	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
3.5	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
4.0	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
4.5	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
5.0	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Table 7: Summary of Scores

	Score From	Score To	Flood Hazard	Description
	<0.75	0.75	Low	Exercise Caution
Class 1	0.75	1.5	Moderate	Danger for some
Class 2	1.5	2.5	Significant	Danger for most
Class 3	2.5	20.0	Extreme	Danger for all

Table 8: Values for Debris Factor for different flood depths

Depths	Pasture/Arable Land	Woodland	Urban
0 to 0.25	0	0	0
0.25 to 0.75	0.5	1	1
d>0.75 and/or v > 2	0.5	1	1

- The “danger to some” category includes vulnerable groups such as children, the elderly and infirm. “Danger: Flood zone with deep or fast
- flowing water”
- The “danger to most” category includes the general public.

- The danger to all category includes the emergency services.

A flood emergency plan is considered to be an acceptable way of managing flood risk where the flood hazard has been given a “very low hazard” rating. In some instances, flood emergency plans may also be acceptable where the rating is “danger for some”. However, it is unlikely to be an acceptable way of managing residual flood risk where the hazard to people classification is “danger for most” or “danger for all”.