

GARAGES AT BERKELEY CLOSE, RUISLIP, HA4 6LE

Flood Risk Assessment



HLEF74351
Berkeley Close
2
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REPORT

Quality Management

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EXECUTIVE SUMMARY

RPS was commissioned to undertake a Flood Risk Assessment (FRA) of *Garages at Berkeley Close, Ruislip, HA4 6LE* in relation to the proposed residential development.

The site is identified by the EA to be located in Flood Zone 1 and whilst it is indicated to be partially in the 1 in 1,000 year fluvial flood extent, comparison of modelled flood levels with site levels indicates that only a negligible area on the southwestern periphery could be impacted by a 1 in 1,000 year fluvial flood event. The area of the proposed built development would not be affected. The site is located significantly outside of the 1 in 100 year plus 70% climate change flood extent and dry access and egress is available during this event.

No surface water flooding is predicted on-site during a 1 in 100 year rainfall event by the EA and SFRA. During the same event however, surface water flooding is predicted to occur on Berkeley Close adjacent-south to the proposed development. Berkeley Close has been identified to be within surface water Flood Zone 3a, however, flood depths are generally less than 0.3m to the west of the site during a 1 in 100 year rainfall event. In an event exceeding this magnitude, safe access and egress may not be available from the site. In this instance, safe refuge should be sought in the proposed development.

As limited on-site flooding could occur during a 1 in 1,000 year event – taken as a proxy for the 1 in 100 year plus climate change event – ground floor levels are recommended to be elevated 300mm above existing site levels. This will help mitigate against the ingress of surface water and provide mitigation against the residual risk of flooding from other sources.

Surface water management measures appropriate to the size of the development have been proposed. Given the provision of private garden space, water butts should be included at the development in addition to maximising the permeable surfaces at the site. This will enable a reduction in the surface water runoff from the site.

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1 INTRODUCTION

- 1.1 RPS was commissioned to undertake a Flood Risk Assessment (FRA) of *Garages at Berkeley Close, Ruislip, HA4 6LE* in relation to the proposed residential development.
- 1.2 The aim of the FRA is to outline the potential for the site to be impacted by flooding, the impacts of the proposed development on flooding in the vicinity of the site, and the proposed measures which could be incorporated into the development to mitigate the identified risk. The report has been produced in accordance with the guidance detailed in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance (PPG). Reference has also been made to the, the West London Strategic Flood Risk Assessment (SFRA) and the Hillingdon Council Surface Water Management Plan (SWMP).
- 1.3 This report has been produced in consultation with the Environment Agency (EA) and the Lead Local Flood Authority (LLFA). The site is not located within an Internal Drainage Board (IDB) District.
- 1.4 This report is not intended to provide formal details of the final drainage design for the development. However, it provides information regarding the capabilities of the conceptual surface water drainage strategy to meet the requirements of the NPPF.
- 1.5 The desk study was undertaken by reference to information provided / published by the following bodies:
- EA;
 - Centre for Ecology and Hydrology;
 - British Geological Survey (BGS);
 - Ordnance Survey (OS); and
 - Thames Water.

2 PLANNING POLICY CONTEXT

National Planning Policy

- 2.1 The National Planning Policy Framework (NPPF) was released in March 2012 and was updated in July 2018. The document advises of the requirements for a site-specific Flood Risk Assessment (FRA) for any of the following cases (Planning and Flood Risk paragraph 163 (footnote 50)):
- All proposals (including minor development and change of use) located within the EA designated floodplain, recognised as either Flood Zone 2 (medium probability) or Flood Zone 3 (high probability);
 - All proposals of 1 hectare (ha) or greater in an area located in Flood Zone 1 (low probability);
 - All proposals within an area which has critical drainage problems (as notified to the Local Planning Authority by the EA);
 - Land identified in a strategic flood risk assessment as being at increased flood risk in future; and
 - Where proposed development may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

Regional Planning Policy

- 2.2 The development site is within the London Borough of Hillingdon which is covered by The London Plan, as amended March 2016. The London Plan contains various policies pertaining to flood risk and drainage, the relevant aspects of which are reproduced below.

Policy 5.11 Green roofs and development site environs

- 2.3 This policy promotes the use of green roofs and walls where feasible, to deliver objectives including sustainable urban drainage amongst other wider environmental and sustainability benefits.

Policy 5.12 Flood risk management

- 2.4 This Policy states that 'the Mayor will work with all relevant agencies including the Environment Agency to address current and future flood issues and minimise risks in a sustainable and cost effective way'.

Development proposals must comply with the flood risk assessment and management requirements set out in the NPPF and the associated technical Guidance on flood risk over the lifetime of the development and have regard to measures proposed in Thames Estuary 2100 and Catchment Flood Management Plans.

- 2.5 The Policy sets out requirements for developments for which the NPPF Exception Test is applicable and developments adjacent to flood defences.

Policy 5.13 Sustainable drainage

- 2.6 This policy states 'development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve Greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

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

- *Attenuate rainwater in ponds or open water features for gradual release;*
- *Attenuate rainwater by storing in tanks or sealed water features for gradual release;*
- *Discharge rainwater direct to a watercourse;*
- *Discharge rainwater to a surface water sewer/drain; and*
- *Discharge rainwater to the combined sewer.*

- 2.7 Drainage should be designed and implemented in ways that deliver other policy objectives of the Plan, including water use efficiency and quality, biodiversity, amenity and recreation.'
- 2.8 The London Plan is supported by the Supplementary Planning Guidance: Sustainable Design and Construction, April 2014. In relation to Surface Water Flooding and Sustainable Drainage, the guidance states that developers should design Sustainable Drainage Systems (SuDS) that incorporate attenuation for surface water runoff. The minimum expectation is to achieve 50% attenuation of the undeveloped site's surface water run off at peak times. The Mayor's priority is to achieve greenfield runoff rates. Development on greenfield sites must maintain a greenfield runoff rate. Development on previously developed sites should have a runoff rate no greater than three times the calculated greenfield runoff rate.
- 2.9 The Consultation Draft of the Draft New London Plan was published in August 2018. The Draft New London Plan retains consideration of the above policies through the draft policies:

Policy G1 Green Infrastructure

- A. London's network of green and open spaces, and green features in the built environment such as green roofs and street trees, should be protected, planned, designed and managed as integrated features of green infrastructure.*
- B. Boroughs should prepare green infrastructure strategies that integrate objectives relating to open space provision, biodiversity conservation, flood management, health and wellbeing, sport and recreation.*
- C. Development Plans and Opportunity Area Planning Frameworks should:*
 - 1. Identify key green infrastructure assets, their function and their potential function*
 - 2. Identify opportunities for addressing environmental and social challenges through strategic green infrastructure interventions.*

Policy G5 Urban Greening

- A. Major development proposals should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainable drainage.*
- B. Boroughs should develop an Urban Greening Factor (UGF) to identify the appropriate amount of urban greening required in new developments. The UGF should be based on the factors set out in Table 8.2, but tailored to local circumstances. In the interim, the Mayor recommends a target score of 0.4 for developments that are predominately residential, and a target score of 0.3 for predominately commercial development.*

Policy SI12 Flood Risk Management

- A. Current and expected flood risk from all sources across London 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.*

- B. Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Surface Water Management Plan, where necessary, to identify areas where particular flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should co-operate and jointly address cross-boundary flood risk issues including with authorities outside London.*
- C. Development proposals which require specific flood risk assessments should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.*
- D. Development Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.*
- E. Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.*
- F. Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Where possible, development proposals should set permanent built development back from flood defences to allow for any foreseeable future upgrades.*

Policy SI13 Sustainable Drainage

- A. Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks.*
- B. Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy [as aforementioned in Policy 5.13]:*
- C. Development proposals for impermeable paving should be refused where appropriate, including on small surfaces such as front gardens and driveways.*
- D. Drainage should be designed and implemented in ways that address issues of water use efficiency, river water quality, biodiversity, amenity and recreation.*

N.B. The benefit of attenuation above compared to below ground or in a basement is that pumping is normally not required to empty the attenuation tank.

Local Planning Policy

2.10 The London Borough of Hillingdon Local Plan Part 2, the new local plan, is currently in examination phase and due to be adopted in the near future. The following policies are due to be adopted however are still subject to change following the examination phase.

Policy DMEI 9: Management of Flood Risk

- A. Development proposals in flood zones 2 and 3a will be required to demonstrate that there are no suitable sites available in areas of lower flood risk. Where no appropriate sites are available, development should be located on the areas of lowest flood risk within the site. Flood defences should provide protection for the lifetime of the development. Finished floor levels should reflect the Environment Agency's latest guidance on climate change.*
- B. Development proposals in these areas will be required to submit an appropriate level Flood Risk Assessment (FRA) to demonstrate that the development is resilient to all sources of flooding.*

- C. Development in Flood Zone 3b will be refused in principle unless identified as an appropriate development in Flood Risk Planning Policy Guidance. Development for appropriate uses in Flood Zone 3b will only be approved if accompanied by an appropriate FRA that demonstrates the development will be resistant and resilient to flooding and suitable warning and evacuation methods are in place.*
- D. Developments may be required to make contributions (through legal agreements) to previously identified flood improvement works that will benefit the development site.*
- E. Proposals that fail to make appropriate provision for flood risk mitigation, or which would increase the risk or consequences of flooding, will be refused.*

Policy DMEI 10: Water Management, Efficiency and Quality

- A. Applications for all new build developments (not conversions, change of use, or refurbishment) are required to include a drainage assessment demonstrating that appropriate sustainable drainage systems (SuDS) have been incorporated in accordance with the London Plan Hierarchy (Policy 5.13: Sustainable drainage).*
- B. All major new build developments, as well as minor developments in Critical Drainage Areas or an area identified at risk from surface water flooding must be designed to reduce surface water run-off rates to no higher than the pre-development greenfield run-off rate in a 1:100 year storm scenario, plus 30% an appropriate allowance for climate change for the worst storm duration. The assessment is required regardless of the changes in impermeable areas and the fact that a site has an existing high run-off rate will not constitute justification.*
- C. Rain Gardens and non-householder development should be designed to reduce surface water run-off rates to Greenfield run-off rates.*
- D. Schemes for the use of SuDS must be accompanied by adequate arrangements for the management and maintenance of the measures used, with appropriate contributions made to the Council where necessary.*
- E. Proposals that would fail to make adequate provision for the control and reduction of surface water run-off rates will be refused.*
- F. Developments should be drained by a SuDS system and must include appropriate methods to avoid pollution of the water environment. Preference should be given to utilising the drainage options in the SuDS hierarchy which remove the key pollutants that hinder improving water quality in Hillingdon. Major development should adopt a 'treatment train' approach where water flows through different SuDS to ensure resilience in the system.*

- 2.11 The West London SFRA identifies and maps flood risk from all sources at a strategic scale as well as providing guidance on producing site specific FRAs. Relevant information from the SFRA has been referenced throughout this FRA report.
- 2.12 The Hillingdon Council SWMP assesses the risk of surface water flooding within the borough and identifies options to manage risk to acceptable level. Relevant information from the SWMP has been reproduced throughout this FRA report.

3 CONSULTATION

Environment Agency (EA)

- 3.1 The EA was contacted to clarify the flood risk present at the site and provided detailed flood data, which is referred to throughout the report and has been included in full as Appendix A.

Thames Water

- 3.2 The public sewer network within the vicinity of the site is operated by Thames Water. Thames Water have been contacted to review their records of sewer flooding at the site. Details of the outcome are given in Section 6.

Lead Local Flood Authority (LLFA)

- 3.3 The site is within the administrative boundary of Hillingdon Council. More information on acceptable SuDS measures and flood risk mitigation measures has been sought by the Council, who are yet to respond.

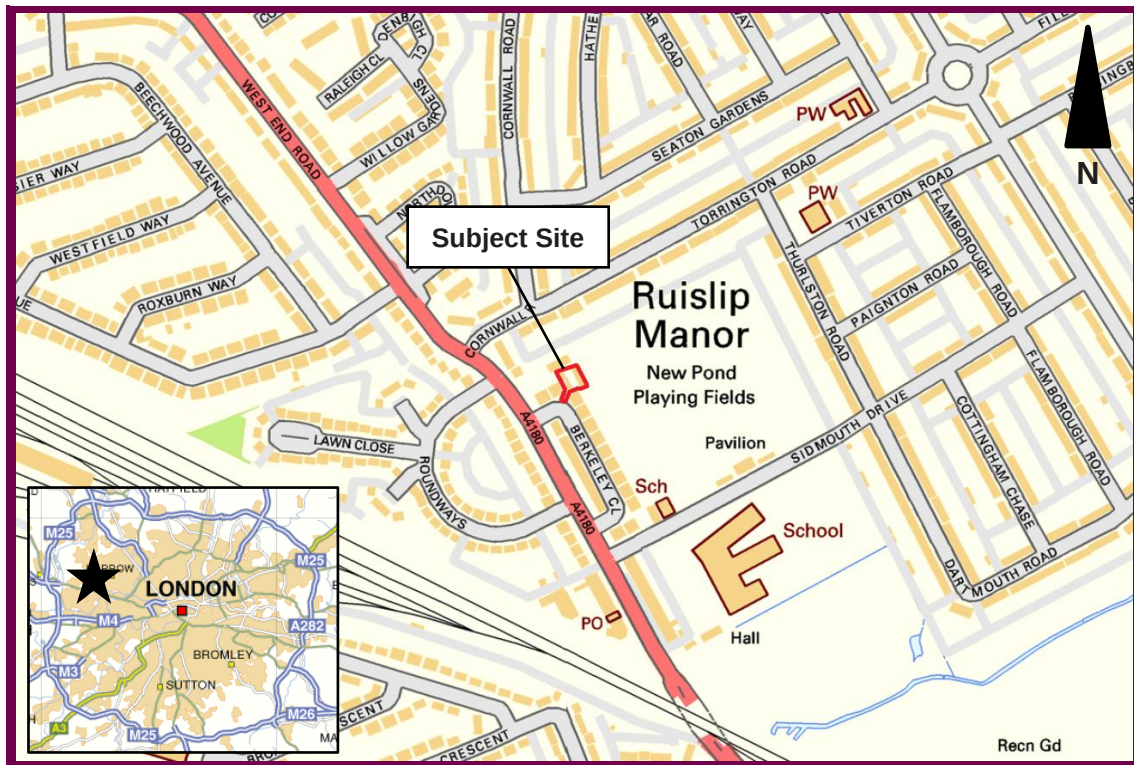
Internal Drainage Board (IDB)

- 3.4 The site is not located within an IDB District.

4 SITE DESCRIPTION

Site Description

- 4.1 The site is located at National Grid Reference TQ 10005 86282. It is irregular in shape, occupying an area of approximately 0.05 hectares (ha). Site location is presented in Figure 1.



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Figure 1. Site Location

- 4.2 The site is currently occupied by 2 garage blocks.
- 4.3 The main access to the site is from Berkeley Close, south of the site.
- 4.4 The current proportion of land use at the site is approximately 20% building footprint and 80% hardstanding.

Surrounding Land Uses

- 4.5 The site is located in a predominantly residential area with playing fields located adjacent-north to the site, residential housing located east and west and a school south of the site.
- 4.6 There are no designated sensitive areas (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Special Scientific Interest (SSSI)) within close proximity to the site.

Topography

- 4.7 A topographic survey completed by Skilltran Ltd., reference 19040_1, and illustrates the site is located on a downward slope in a southerly direction. The topographic level at the north western limit of the site is recorded at 37.57 metres (m) above ordnance datum (AOD). A level of 37.21mAOD is recorded adjacent-south to the garages, indicating a southerly downward slope of 0.32m. A southerly downward slope of 0.48m is also indicated across the driveway, from 37.21mAOD to

36.73mAOD recorded at the driveway entrance on the corner of Berkeley Close. The topographic survey is included as Appendix B.

Ordnance Survey (OS) Spot Heights

- 4.8 Local OS spot heights suggest the site is located on a downward slope in a southerly direction. A spot height located approximately 90m north east of the site on West End Road records the level at 37.5mAOD. Another spot height records the level at 37.2mAOD approximately 50m south east of the site on West End Road, indicating a southerly slope of 0.3m.

5 PROPOSED DEVELOPMENT

- 5.1 A new residential development is proposed to be erected arranged over ground and first floor levels providing 2 new residential flats, one at each floor level and each with access to garden space and a private shared driveway. Development plans are shown in Appendix C.
- 5.2 The main access will remain the same via Berkeley Close.
- 5.3 The proportion of land use at the proposed development will be approximately one third building footprint, one third hardstanding and one third soft landscaping.
- 5.4 As a result of the proposed development, there will be a significant increase in permeable area at the site.
- 5.5 The proposed use of the site is classified as '*more vulnerable*' within the PPG.
- 5.6 At this stage, an indicative drainage layout has not been designed for the site. However, surface water runoff is anticipated to continue to pass to the Thames Water sewer network, as at present. The acceptable discharge rate to the existing mains sewer will need to be agreed with Thames Water in consultation with the LLFA.
- 5.7 The potential to provide surface water attenuation, including the use of Sustainable Drainage Systems (SuDS), has been considered as part of the preliminary design process (see Section 10 – Surface Water Management).

6 HYDROLOGICAL SETTING

Nearby Watercourses

- 6.1 OS Mapping indicates that the nearest surface water feature is a surface water drain located approximately 210m east of the site.
- 6.2 The Yeading Brook, an EA designated Main River, is located approximately 410m south east of the site and flows in a south westerly direction.
- 6.3 No significant artificial watercourses / features (e.g. canals, reservoirs) have been identified within 1km of the site.

Fluvial / Tidal Flood Risk Classification

- 6.4 The EA Flood Map for Planning, which is available online, indicates that the site is located within Flood Zone 1, whereby the annual probability of flooding from fluvial or tidal sources is classified as less than 1 in 1,000. The EA Flood Map for Planning is provided in Figure 2.



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Figure 2. EA Flood Map for Planning

EA Detailed Flood Data

- 6.5 The EA has been consulted for additional information related to the fluvial flood risk at the site and provided detailed flood data including modelled flood levels, historic flooding records and flood defence details to clarify the fluvial flood risk present at the site. The effects of climate change are considered by applying a percentage increase in peak flow river discharge on to a modelled flood event and is referred to as a 'climate change allowance'. Relevant information is detailed below and included in full as Appendix A.

- The Flood Map for Planning provided indicates that the site is located in Flood Zone 1;

- Modelled flood data has been extracted from the River Crane Mapping Study completed by Halcrow in 2008;
- The site is located a significant distance outside of the modelled flood extents for all events up to and including a 1 in 100 year event plus 70% climate change allowance;
- The site is partially located in the modelled extent for a 1 in 1,000 year fluvial event;
- Modelled in-channel flood levels were extracted from the nearest node to the site, reference TW902, located in the channel of the Yeading Brook approximately 420m south east of the site. The modelled in-channel levels are presented in Table 1, and the location is presented in the detailed flood data included as Appendix A;

Table 1. Modelled in-channel levels

Node	Modelled In-Channel Level (mAOD)			
	1 in 100 year	1 in 100 year plus 35% CC*	1 in 100 year plus 70% CC*	1 in 1,000 year
YW902	36.063	36.224	36.379	36.991

*CC = Climate change allowance

- Historic flood mapping provided by the EA illustrates that the site is not recorded to have been affected by historic flooding;
- Details of the nearest river defences to the site, located on the northern bank of the Yeading Brook, are given in Table 2 and the map is included in full, with the detailed data in Appendix A.

Table 2. Flood defence details

Defence I.D.	Defence Type	Defence Details	Downstream Crest Level (mAOD)	Upstream Crest Level (mAOD)	Condition of Defences*
156279	Bank protection	Concrete block bank protection extending from culvert.	36.23	36.18	3

* 1 = good, 5 = poor

EA Flood Warning Area

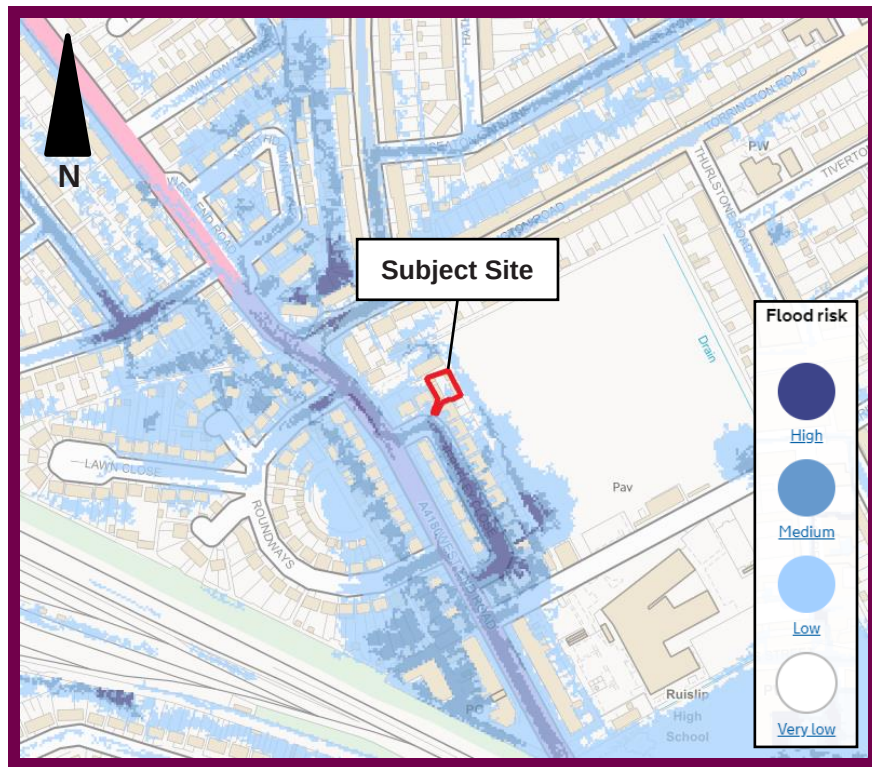
- 6.6 The EA defines a Flood Warning Area as “geographical areas where we expect flooding to occur and where we provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater.”
- 6.7 The site is located in the Flood Warning Area “Yeading Brooks in London Boroughs of Harrow and Hillingdon”.

Surface Water Flood Risk Classification

- 6.8 The EA’s updated Flood Map for Surface Water, which is available online, indicates that the majority of the site is classified as having a ‘very low’ surface water flood risk. This corresponds with an annual probability of flooding that is less than 1 in 1,000. The south and south east of the site are indicated to be at a ‘low’ risk, whereby the annual probability of flooding is between 1 in 100 and 1 in 1,000. Berkeley Close adjacent south west to the site is classified as having a ‘medium’ and ‘high’ surface water flood risk, corresponding with an annual probability of between 1 in 100 and 1 in 30,

and greater than 1 in 30, respectively. The updated Flood Map for Surface Water is presented in Figure 3.

- 6.9 EA surface water flood modelling predicts that the site would not experience surface water flooding during a 1 in 100 year rainfall event. The land adjacent-south to the site on Berkeley Close is predicted to experience flooding to a depth of '300 to 900mm'.



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Figure 3. Updated Flood Map for Surface Water

Reservoir Flood Risk Classification

- 6.10 EA mapping also indicates that the site is not located within an area potentially at risk from reservoir flooding.

Local Authority Flood Risk Assessment

- 6.11 The West London SFRA was published in February 2018. It provides an overview of flood risk from various sources within the borough. Information relevant to this assessment is summarised below:

- The SFRA uses the EA's definition for a Critical Drainage Area (CDA): '*specific geographic areas (usually catchment areas) that have been identified as having multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) during heavy weather periods, leaving people, property and local infrastructure at risk. These areas are defined by a Borough's Surface Water Management Plan (SWMP) and does not include areas with critical drainage problems as designated by the EA.*';
- The site is located in a CDA;
- The site is located in an area designated as Flood Zone 1 for surface water flood risk. Berkeley Close is indicated to be in surface water Flood Zone 3a;

- Surface water flood modelling undertaken by the EA is presented in the SFRA and predicts depth of flooding experienced during rainfall events;
 - During a 1 in 100 year rainfall event, the site is not predicted to experience surface water flooding, however flooding to a maximum depth of 0.60m is predicted on Berkeley Close to the south to the site. The majority of Berkeley Close to the west of the site and the main roads to the north and east are indicated to experience flood depths of less than 0.30m;
 - During a 1 in 1,000 year rainfall event, limited parts of the site is predicted to experience partial surface water flooding to a depth of '0.15 – 0.30m'. The majority of the site is not indicated to experience flooding;
- The site is not located in a recorded historic fluvial flood extent;
- The site is not predicted to be affected by modelled fluvial flood extents on the River Crane for all events including a 1 in 100 year event plus 70% climate change allowance. Modelled extents for a 1 in 1,000 year event are not presented by the SFRA;
- As of 2017, Thames Water has 0 recorded instances of sewer flooding in the postcode area of the site;
- The site is not located on land classified as being 'susceptible to groundwater flooding'; and
- The site is not located on land identified by the Greater London Authority (GLA) as having an 'increased potential for elevated groundwater'.

6.12 The London Borough of Hillingdon SWMP was published in January 2013. It provides an overview of surface water flood risk within the borough. Information relevant to this assessment is summarised below:

- The site is located in CDA 'Group1_018'; and
- A surface water flow path is identified flowing in a southerly direction west of the site, with it flowing approximately 100m west of the site at its closest point.

Sewer Flooding History

6.13 Thames Water were contacted and confirmed that they have no records of sewer flooding at the site.

7 HYDROGEOLOGICAL SETTING

- 7.1 British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by the Lambeth Group consisting of clay, silt and sand. No superficial deposits are reported to be present under the site.
- 7.2 There are no representative BGS borehole logs available in proximity to the site.
- 7.3 The soils are described as '*slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils*' by the National Soils Research Institute.
- 7.4 According to the EA's Aquifer Designation Mapping, the Lambeth Group is classified as a Secondary A Aquifer. This is described by the EA as '*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.*'
- 7.5 EA online groundwater Source Protection Zone (SPZ) mapping indicates that the site is not located within a groundwater SPZ.

8 EXISTING DRAINAGE / WATER MAINS

- 8.1 Thames Water plans of public sewers, included as Appendix D, indicates that the site is served by a surface water sewer and a foul sewer. A trunk surface water sewer of dimensions 1,830mm by 910mm is located within 5m from the eastern boundary of the site, and is indicated to be flowing in a southerly direction with the nearest manhole to the site located approximately 25m north, reference 9309. A foul sewer manhole is located approximately 5m south west to the entrance of the site on Berkeley Close, reference 9209, with a southerly flowing sewer extending from it. Manhole cover levels and invert levels are given in Table 3.

Table 3. Manhole level details

Manhole Reference	Type of Sewer	Manhole Cover Level (mAOD)	Manhole Invert Level (mAOD)	Invert Depth (m)
9309	SW	37.28	35.36	1.92
9209	FS	36.73	35.63	1.10

- 8.2 Potable water in the area is operated and distributed by Affinity Water and no details have been provided by Thames Water.

9 FLOOD RISK AND MITIGATION

- 9.1 The key sources of flooding that could potentially impact the site are discussed below:

Fluvial / Tidal Flooding

- 9.2 The EA Flood Map for Planning, as seen in Figure 2, indicates that the site is located in Flood Zone 1. The annual probability of flooding is classified as less than 1 in 1,000 in the absence of any defences.
- 9.3 The EA was contacted to clarify the flood risk at the site as Flood Zone 2 is indicated to be present in its proximity. The EA provided detailed flood data including modelled flood extents and in-channel levels. The site is located a significant distance outside of the modelled extent for a 1 in 100 year event plus 70% climate change allowance. It is indicated to be located partially within the modelled extent for a 1 in 1,000 year event where the modelled in-channel level is 36.99mAOD. The lowest on-site level is 36.88mAOD at the south western boundary, however, levels increase along the access road to the site and are in excess of 37.0mAOD prior to reaching the main area of the site. Therefore, the area of the proposed built development would not be affected by a 1 in 1,000 year flood event.
- 9.4 SFRA mapping supports this illustrating that modelled fluvial flooding for the River Crane (watercourse south of the site) for a 1 in 100 year event plus 70% climate change allowance is not predicted to affect the site. In addition, SFRA mapping also illustrates the site has not been affected by recorded historic flood extents.
- 9.5 The EA also confirmed that they have no records of the site being affected by historic flooding. In addition, details of flood defences present on the Yeading Brook were provided, indicating that the nearest defences present have a 1 in 100 year standard of protection.
- 9.6 Dry access and egress would remain available during a 1 in 100 year plus 70% climate change event as Berkeley Close and West End Road (north of Sidmouth Drive) are outside of the flood extent.
- 9.7 The PPG details the suitability of different land uses within each flood zone. The proposed land use is classified as '*more vulnerable*' and such uses are generally considered appropriate within Flood Zone 1.

Proposed Mitigation

- 9.8 No mitigation considered necessary.

Flooding from Sewers

- 9.9 Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity.
- 9.10 SFRA mapping illustrates that there are 0 records of sewer flooding in the postcode area of the site. Thames Water were contacted and have confirmed that they have no records of sewer flooding at the site.
- 9.11 The discharge rate to the existing sewer will be agreed with Thames Water to ensure that there is capacity to receive discharge from the site without significantly increasing flood risk.

Proposed Mitigation

- 9.12 No mitigation considered necessary.
- 9.13 The elevation of ground floor levels, as below, will help provide mitigation against the ingress of sewer flooding in the unlikely event that it occurs.

Surface Water Flooding (Overland Flow)

- 9.14 This can occur during intense rainfall events, when water cannot soak into the ground or enter drainage systems.
- 9.15 EA surface water flood modelling indicates that during a 1 in 100 year rainfall event, the site is not predicted to experience flooding. Surface water flood modelling undertaken for the SFRA supports this, also not predicting that the site will experience flooding during such an event.
- 9.16 Both the SFRA and SWMP classify the site as being located in a CDA, a classification intended to highlight areas of elevated flood risk and their contributing catchments. From surface water flood modelling, the SWMP predicts a flow path west of the site flowing in a southerly direction. Therefore, the CDA was likely classified on the basis of the identified flow path, rather than indicating that the site itself is at an elevated risk.
- 9.17 However, limited surface water flood depths are indicated in the southeast corner of the site during a 1 in 1,000 year rainfall event. This event could be taken to be a proxy for the 1 in 100 year plus climate change rainfall event. As such, it is recommended that ground floor levels are elevated 300mm above external site levels in the area shown to be at risk.
- 9.18 In the construction the access off Berkeley Close, no elevation of land levels should occur in order to avoid displacing surface floodwater.
- 9.19 Flooding is predicted on Berkeley Close during a 1 in 100 year rainfall event by both the EA and SFRA, indicating that safe access and egress may not be available to the south of the site during such an event. However, surface water flood depths are indicated to be generally below 300mm on Berkeley Road to the west of the site and following a northerly route along West End North and east along Torrington Road, a route of safe access / egress is likely to be available in a 1 in 100 year event. In an event exceeding this magnitude, safe refuge could be sought on the site. Surface water flooding is likely to be of short duration and therefore it is unlikely that residents would need to seek refuge for a prolonged period of time.
- 9.20 Surface water flooding from on-site sources is considered in Section 9 of this report.

Proposed Mitigation

- 9.21 Ground floor levels of the proposed building are recommended to be elevated 300mm above existing ground levels, to help mitigate the ingress of surface water during a 1 in 100 year plus climate change rainfall event.
- 9.22 No elevation of existing land levels should occur in the creation of the site access from Berkeley Close.

Groundwater Flooding

- 9.23 This can occur in low-lying areas when groundwater levels rise above surface levels, or within underground structures. BGS mapping indicates that the site is underlain by a Secondary A Aquifer, which is likely to have good water-bearing properties. There are no BGS borehole logs available in proximity to the site to confirm the groundwater level.
- 9.24 The SFRA illustrates that the site is not located on land susceptible to groundwater flooding. In addition, the site is not located in an area highlighted by the GLA as having an increased potential for groundwater flooding.
- 9.25 No basement levels are proposed at the development, contributing to reducing the hazard associated with groundwater flooding.

Proposed Mitigation

- 9.26 No mitigation considered necessary.

Other Sources

- 9.27 There is a limited risk of flooding occurring as a result of a break in a water main. The risk of flooding associated with reservoirs, canals and other artificial structures is considered to be low given the absence of any such structures in the site vicinity.
- 9.28 EA flood risk from reservoir mapping illustrates that the site is not indicated to be located in an area considered to be at risk from reservoir failure.

Proposed Mitigation

- 9.29 No mitigation considered necessary.
- 9.30 The elevation of ground floor levels for surface water mitigation will also help provide mitigation against the ingress of water from a burst water main in the unlikely event it occurs.

Event Exceedance and Residual Risk

- 9.31 The mitigation measures proposed as part of the development scheme are considered appropriate to mitigate against residual risks or event exceedance scenarios.

10 SURFACE WATER MANAGEMENT

Introduction

- 10.1 The proposed development comprises the erection of two new residential dwellings and will result in a significant reduction of impermeable area by approximately 100m², introducing soft landscaping into the site. Opportunities to increase this landscaping area should be maximised.
- 10.2 Policy DMEI 10 is noted stipulating that '*all new building developments are required to include a drainage assessment*'. The small size of the development significantly limits the range of SuDS measures that are appropriate or feasible at the site. Recommendations of surface water management measures have therefore been made considering the scale of the development.

Existing Surface Water Runoff Rates

Brownfield Runoff Rate

- 10.3 The site is located on a former parking area and is therefore considered brownfield land. The brownfield runoff rate has been estimated using the Rational Method:

$$Q \text{ (standardised flow)} \times \text{Existing impermeable area (ha)} \times \text{Average rainfall* (mm)}$$

**London Heathrow station data, Met Office, 2018 (1981 – 2018)*

$$2.78 \times 0.05 \times 50.50 = \mathbf{7.02 \text{ l/s}}$$

Consideration of Sustainable Drainage Systems

- 10.4 The potential for the use of Sustainable Drainage Systems (SuDS) to provide attenuation within the development has been considered as follows:

Infiltration SuDS Features

- 10.5 The site is very small and on the basis of recommendations made in Part H of the Building Regulations, stating that infiltration features should not be within 5m of a building, the use of traditional infiltration techniques such as soakaways is not considered feasible at the site.

Rainwater Harvesting

- 10.6 Given the provision of a private garden, domestic-scale rainwater harvesting systems such as water butts are recommended to be included at the development.

Green Roofs

- 10.7 As the proposed building incorporates a pitched roof design, a green roof is not considered feasible.

Permeable / Porous Paving

- 10.8 The area suitable to implement permeable paving is minimal at the site and therefore it has not been proposed.

Swales, Detention Basins and Ponds

- 10.9 Given the site's small size; open storage features such as swales, detention basins and ponds are not considered feasible.

Modular Underground Attenuation Tanks

- 10.10 Underground attenuation is useful when surface space is limited at a site. In this case, although the site is small, aforementioned recommendations of maximising permeable surfaces and including water butts at the site are considered to negate the need for underground storage.

Conceptual Surface Water Drainage Strategy

- 10.11 The site's small size precludes the limited feasibility of many SuDS measures. SuDS measures that are appropriate to the size of the development have therefore been proposed. On this basis, the vegetated surface area is recommended to be maximised across the site and given the provision of private garden space, water butts are recommended to be installed. This will enable a reduction in the surface water runoff rate from the site. Runoff generated by the development is proposed to be discharged to the surface water sewer east of the site.

11 SEQUENTIAL TEST AND EXCEPTION TEST

Sequential Test

- 11.1 The NPPF requires the Local Authority to apply the Sequential Test in consideration of new development. The aim of the Test is to steer new development to areas at the lowest probability of flooding. Given that the subject site has not been allocated as one of the Council's proposed future development sites, it has not been specifically assessed within the SFRA. Therefore, the Sequential Test is based on the EA Flood Zones and information contained within the SFRA.
- 11.2 As the site is located in Flood Zone 1 and not at an elevated risk of flooding from any of the other sources assessed, the site is considered to be in a sequentially preferable location and therefore a Sequential Test is not required.

The Exception Test

- 11.3 According to Table 3 of the PPG to the NPPF, '*more vulnerable*' developments are considered appropriate within Flood Zone 1 without the requirement to apply the Exception Test. Therefore, application of the Exception Test is not required for the proposed development.

12 SUMMARY AND CONCLUSIONS

- 12.1 The aim of the FRA is to outline the potential for the site to be impacted by flooding, the potential impacts of the development on flooding both onsite and in the vicinity, and the proposed measures which can be incorporated into the development to mitigate the identified risks. The report has been produced in accordance with the guidance detailed in the NPPF. Reference has also been made to the CIRIA SuDS manual (C753), the SFRA and the SWMP and following consultation with the EA.
- 12.2 The potential flood risks to the site, and the measures proposed to mitigate the identified risks, are summarised in Table 4.

Table 4. Proposed mitigation

Source of Flooding	Identified Risk			Mitigation Proposed	Residual Risk		
	L	M	H		L	M	H
Fluvial	✓			No mitigation considered necessary.	✓		
Sewers	✓				✓		
Surface Water	✓			- Ground floor levels to be elevated 300mm above surrounding external levels; and - No elevation of land levels in the creation of the access from Berkeley Close.	✓		
Groundwater	✓			No further mitigation considered necessary.	✓		
Other Sources (e.g. reservoirs, water mains)	✓				✓		

- 12.3 The site is identified by the EA to be located in Flood Zone 1 and whilst it is indicated to be partially in the 1 in 1,000 year fluvial flood extent, comparison of modelled flood levels with site levels indicates that only a negligible area on the southwestern periphery could be impacted by a 1 in 1,000 year fluvial flood event. The area of the proposed built development would not be affected. The site is located significantly outside of the 1 in 100 year plus 70% climate change flood extent and dry access and egress is available during this event.
- 12.4 No surface water flooding is predicted on-site during a 1 in 100 year rainfall event by the EA and SFRA. During the same event however, surface water flooding is predicted to occur on Berkeley Close adjacent-south to the proposed development. Berkeley Close has been identified to be within surface water Flood Zone 3a, however, flood depths are generally less than 0.3m to the west of the site during a 1 in 100 year rainfall event. In an event exceeding this magnitude, safe access and egress may not be available from the site. In this instance, safe refuge should be sought in the proposed development.
- 12.5 As limited on-site flooding could occur during a 1 in 1,000 year event – taken as a proxy for the 1 in 100 year plus climate change event – ground floor levels are recommended to be elevated 300mm above existing site levels. This will help mitigate against the ingress of surface water and provide mitigation against the residual risk of flooding from other sources.
- 12.6 Surface water management measures appropriate to the size of the development have been proposed. Given the provision of private garden space, water butts should be included at the

development in addition to maximising the permeable surfaces at the site. This will result in a reduction in surface water runoff leaving the site.

- 12.7 Overall, it has been demonstrated that the development would be safe, without increasing flood risk elsewhere.

APPENDICES

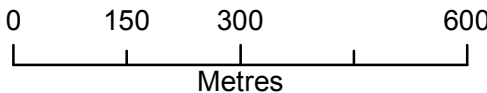
Appendix A

EA Detailed Flood Data

Flood Map for Planning centred on Berkeley Close, Ruislip, HA4 6LE - 14/08/2019 - HNL 138273 CB



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AL7 1HE



Legend

Main Rivers

Flood Map for Planning

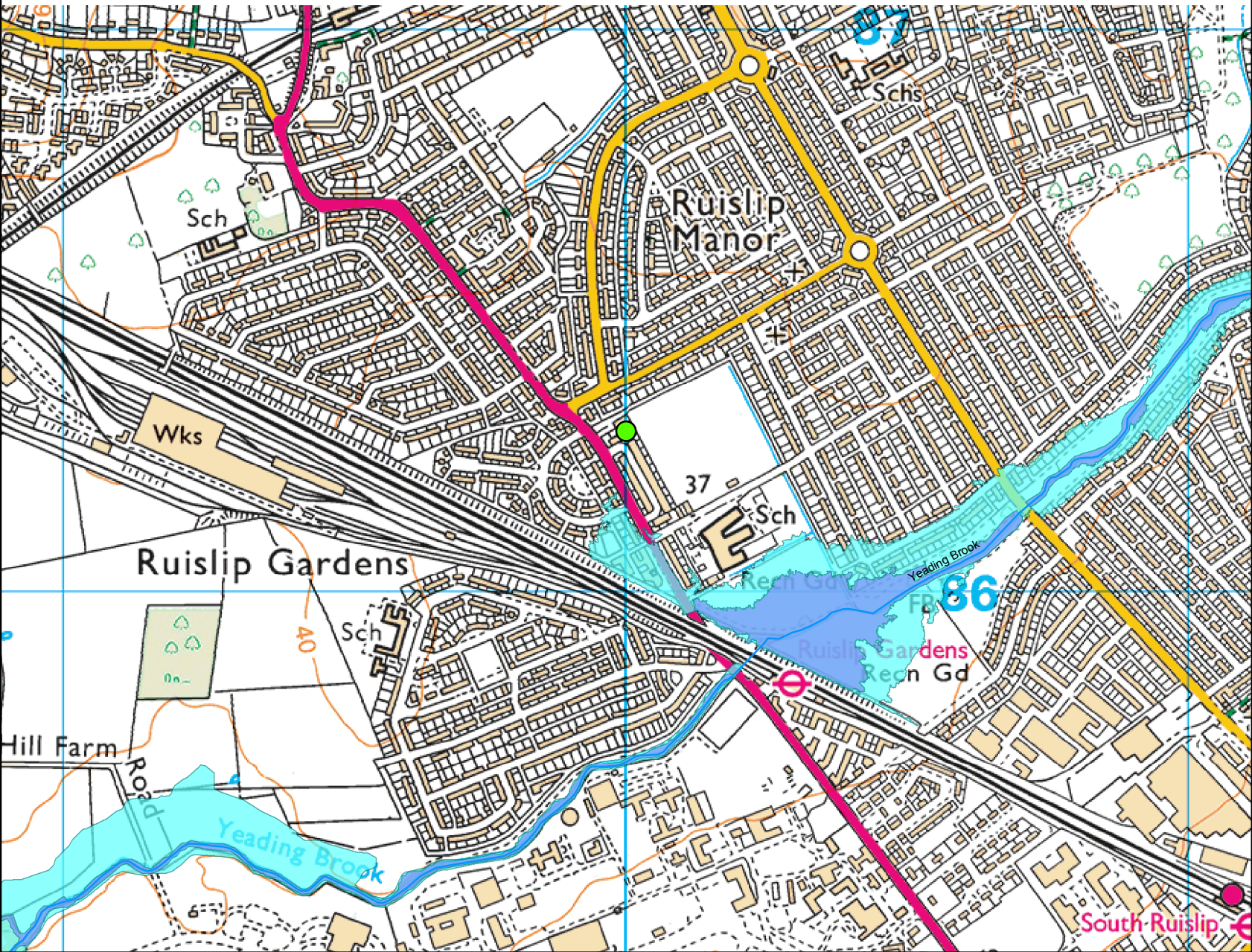
- Flood Storage Area
- Areas Benefiting from Flood Defences
- Flood Zone 3
- Flood Zone 2

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

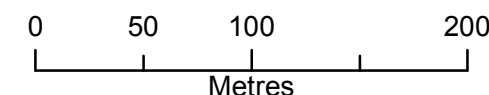
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— Main Rivers

Defended Flood Outlines

- 1 in 5 (20%) Defended
- 1 in 10 (10%) Defended
- 1 in 20 (5%) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). 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.

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>

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Ruislip Manor

New Pond
Playing Fields

Pavilion

Sch

School

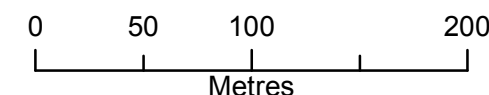
Hall

Recreation
Ground

Ruislip Gardens Station
(LUL)



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— Main Rivers

Defended Flood Outlines

- 1 in 50 (2%) Defended
- 1 in 100 (1%) Defended
- 1 in 100+20% (*CC) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). 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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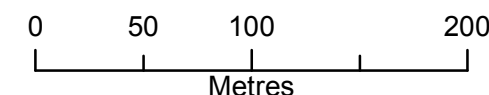
Hall

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Legend

— Main Rivers

Defended Flood Outlines

- 1 in 100+25% (*CC) Defended
- 1 in 100+30% (*CC) Defended
- 1 in 100+70% (*CC) Defended
- 1 in 1000 (0.1%) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). 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.

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>

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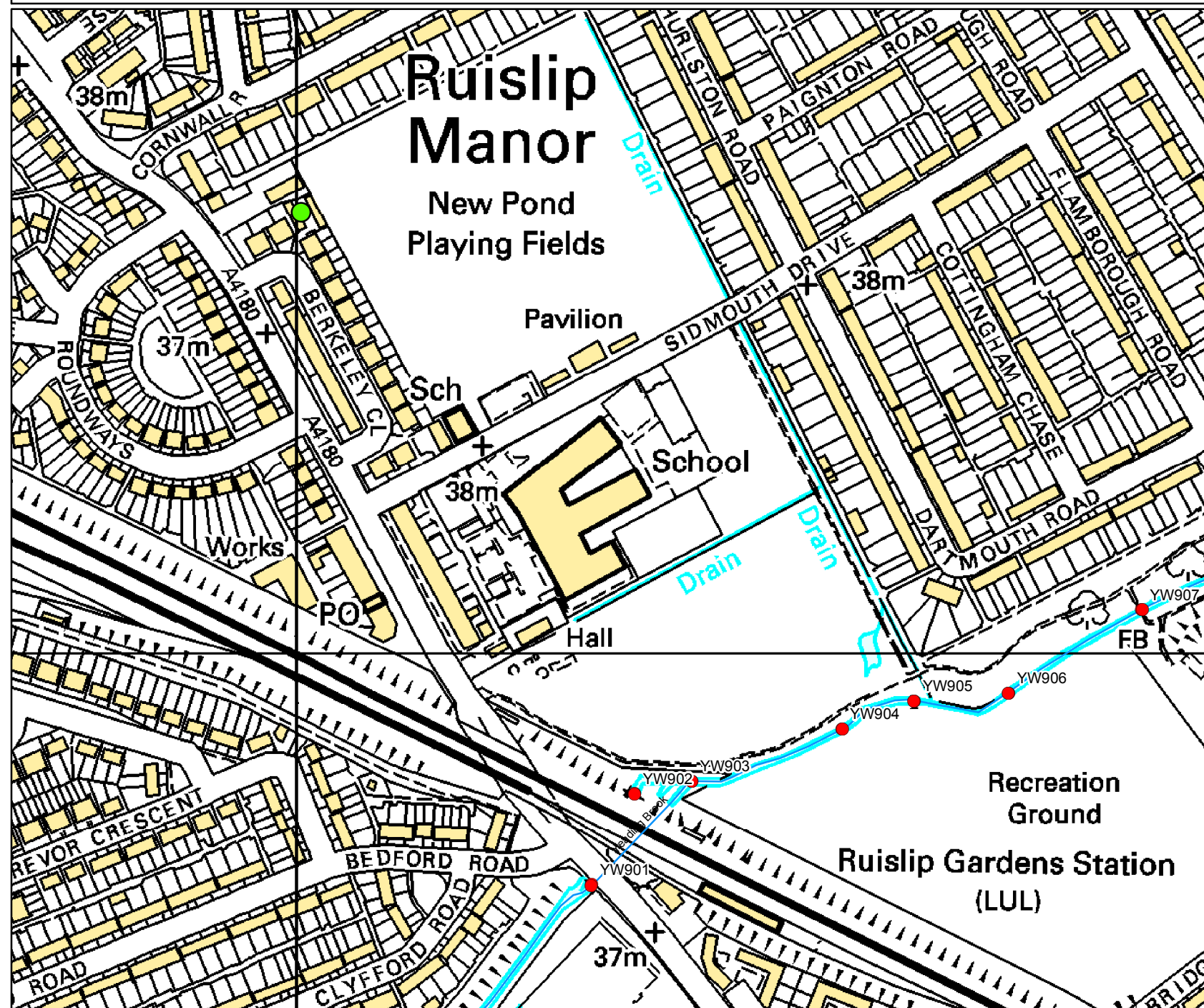
Works

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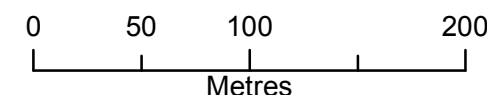
Hall

Recreation
Ground

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Legend

— Main Rivers

1D Node Results

● Node Results

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). 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.

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>

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Environment Agency ref: [HNL 138273 CB](#)

The following information has been extracted from the River Crane Mapping Study (Halcrow 2008)

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:

The modelled flood levels and extents are appropriate for catchment wide strategic flood risk mapping. However, for more detailed flood risk assessment it is recommended that each of the underlying flood mapping, hydraulic modelling and hydrological assumptions are re-evaluated to determine the appropriateness in a more detailed analysis.

All flood levels are given in metres Above Ordnance Datum (mAOD)

All flows are given in cubic metres per second (cumecs)

MODELLED FLOOD LEVEL

Node Label	Easting	Northing	Return Period									
			5 yr	10 yr	20 yr	50 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	1000yr
YW907	510547.31	186027.58	36.15	36.29	36.41	36.46	36.50	36.58	36.598	36.64	36.765	37.36
YW906	510462.25	185971.89	36.064	36.209	36.358	36.412	36.456	36.547	36.57	36.614	36.747	37.357
YW905	510399.75	185965.27	36	36.148	36.294	36.368	36.426	36.53	36.556	36.603	36.741	37.356
YW904	510353.31	185950.86	35.963	36.119	36.297	36.363	36.416	36.523	36.55	36.598	36.738	37.355
YW903	510255.38	185913.52	35.921	36.096	36.278	36.348	36.405	36.517	36.544	36.593	36.735	37.355
YW902	510218.78	185908.66	35.722	35.843	35.968	36.02	36.063	36.156	36.179	36.224	36.379	36.991
YW901	510192	185849.19	35.58	35.681	35.783	35.821	35.852	35.92	35.937	35.968	36.078	36.229

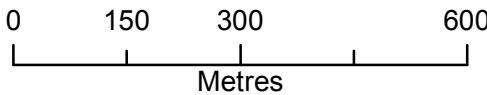
MODELLED FLOWS

Node Label	Easting	Northing	Return Period									
			5 yr	10 yr	20 yr	50 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	1000yr
YW907	510547.31	186027.58	4.265	5.273	6.703	7.427	8.005	9.131	9.39	9.857	11.692	21.003
YW906	510462.25	185971.89	4.263	5.26	6.658	7.364	7.927	8.994	9.239	9.677	11.367	20.035
YW905	510399.75	185965.27	4.262	5.252	6.611	7.27	7.779	8.776	9.013	9.446	10.962	19.18
YW904	510353.31	185950.86	4.262	5.248	6.518	7.106	7.588	8.538	8.778	9.217	10.576	18.532
YW903	510255.38	185913.52	4.261	5.22	6.354	6.892	7.357	8.265	8.518	8.971	10.298	17.82
YW902	510218.78	185908.66	4.262	5.228	6.37	6.911	7.377	8.293	8.539	8.991	10.333	17.801
YW901	510192	185849.19	4.264	5.232	6.376	6.917	7.382	8.298	8.544	8.995	10.337	17.801

Historic Flood Map centred on: Berkeley Close, Ruislip, HA4 6LE - 14/08/2019 - HNL 138273 CB



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Legend

— Main Rivers

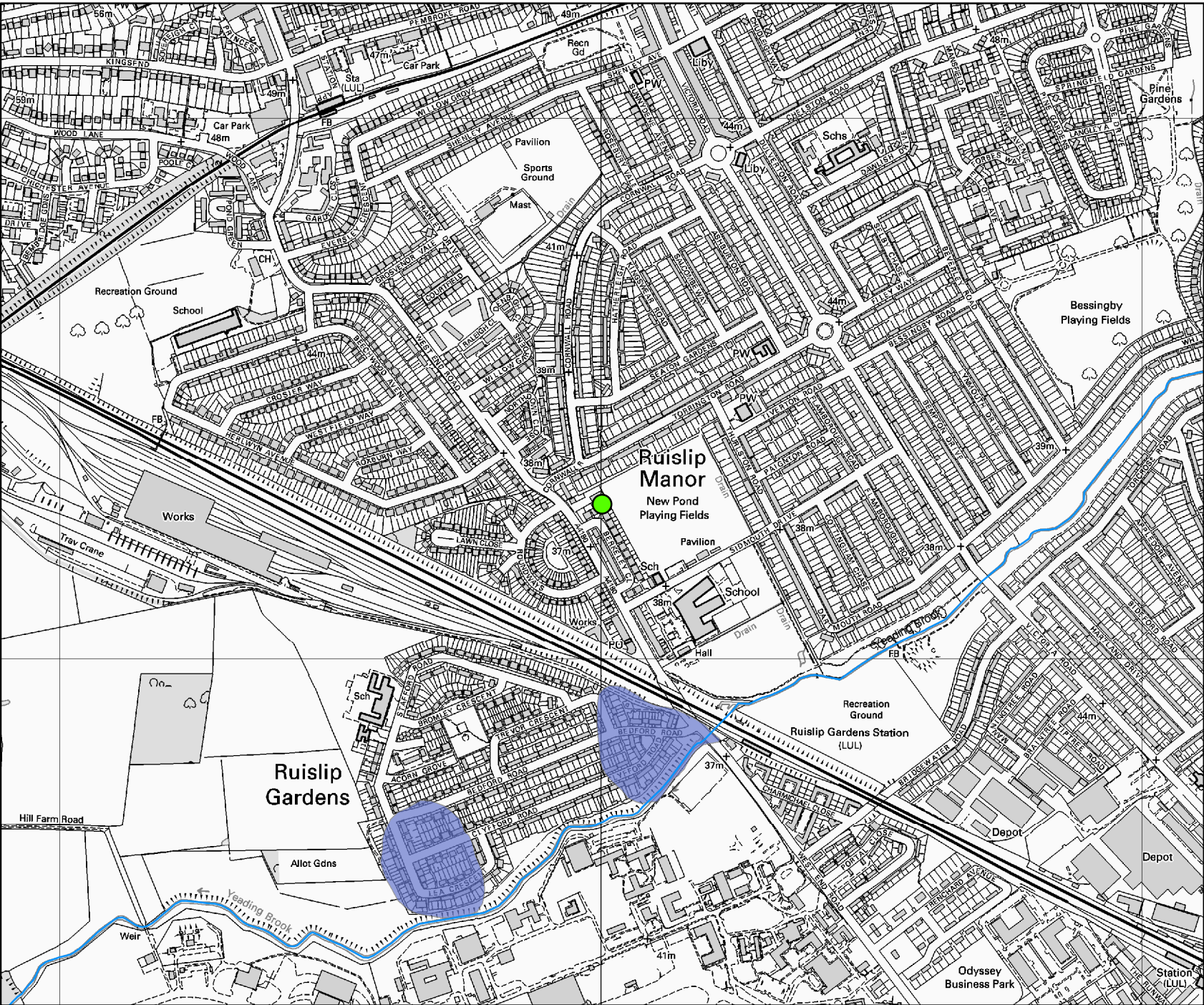
Flood Event Outlines

1959

The historic flood event outlines are based on a combination of anecdotal evidence, Environment Agency staff observations and survey.

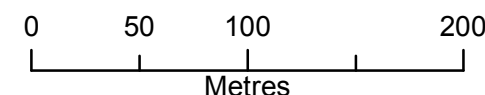
Our historic flood event outlines do not provide a definitive record of flooding. It is possible that there will be an absence of data in places where we have not been able to record the extent of flooding. It is also possible for errors occur in the digitisation of historic records of flooding.

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Welwyn Garden City,
Hertfordshire,
AL7 1HE



Legend

— Main Rivers

Defences

- 28146
- 147386
- 147388
- 147390
- 156279
- 156280

The following information on defences
has been extracted from the Asset
Information Management System
(AIMS)

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Ruislip Manor

New Pond
Playing Fields

Pavilion

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School

Hall

Recreation
Ground

Ruislip Gardens Station
(LUL)

Environment Agency ref: HNL 138273 CB

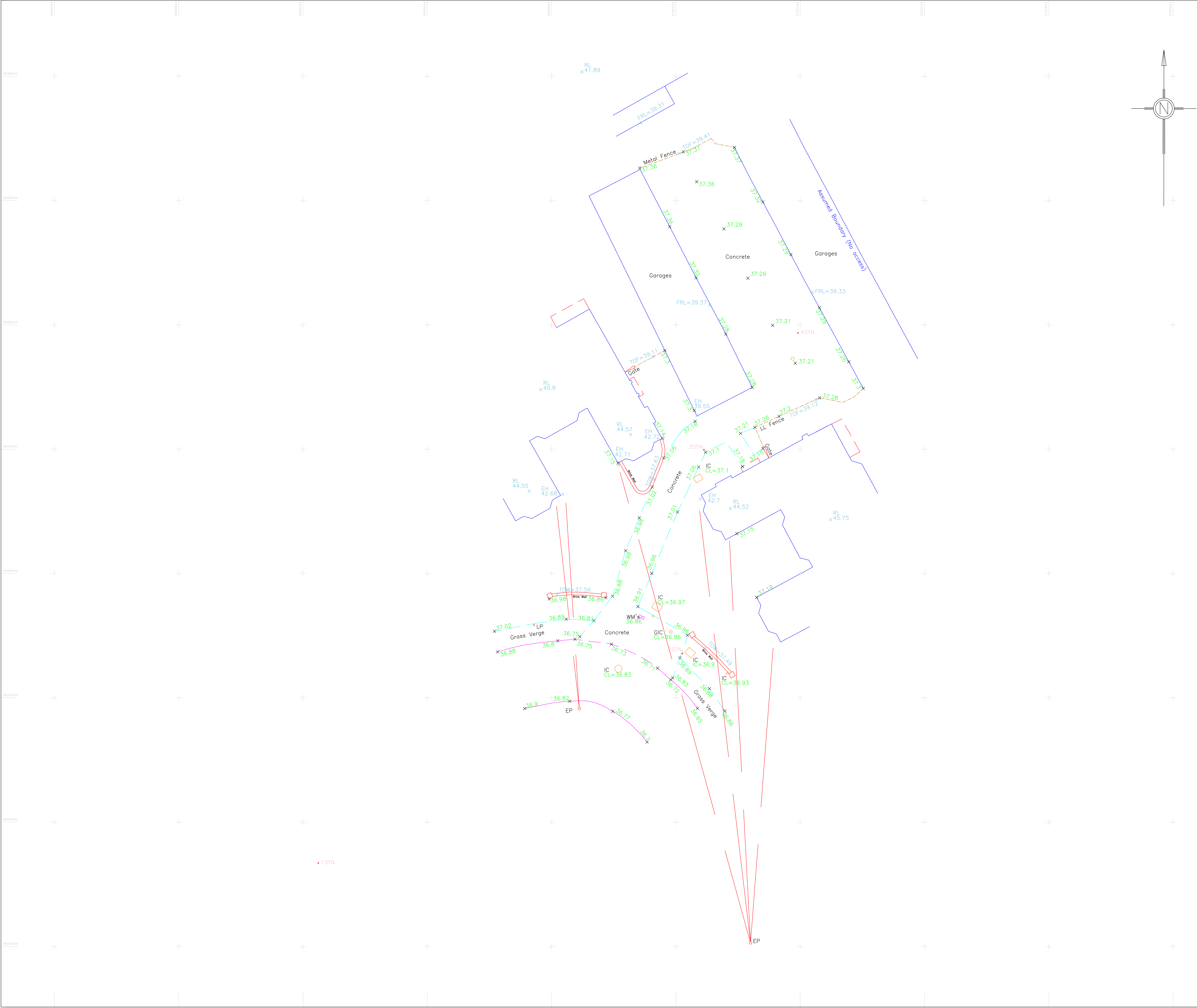
The following information on defences has been extracted from the Asset Information Management System (AIMS)

Defences

Asset ID	Asset Type	Asset Protection	Asset Comment	Asset Description	Design Standard of protection (years)	Downstream Crest Level	Upstream Crest Level	Condition of Defences (1=Good, 5 = Poor)
147388	defence	fluvial	Bank protection.	Poured concrete bank protection	100	44.1	46.16	3
156279	defence	fluvial	Bank protection.	CONCRETE BLOCK BANK PROTECTION EXTENDING FROM CULVERT.	100	36.23	36.18	3
147390	defence	fluvial	Natural Bank	Natural vegetated channel.	10	<Null>	37.43	3
156280	defence	fluvial	Natural Bank	Natural vegetated channel	5	<Null>	37.42	3
147386	defence	fluvial	Natural Bank	Natural Vegetated Channel	5	34.11	36.59	3
28146	defence	fluvial	Natural Channel	Natural Vegetated Bank	10	34.08	36.98	3

Appendix B

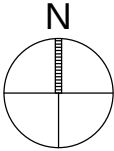
Topographic Survey



Appendix C

Development Plans

DO NOT SCALE FROM THIS DRAWING.
ALL DIMENSION TO BE CHECKED ON SITE.
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--- SITE BOUNDARY

North - Area Schedule (GIA)					
Name	Level	Area	No Bedrooms	No Bed Spaces	Min Area req.

N - Flat 1	00_FFL	80 m²	2b	4p	70 m²
------------	--------	-------	----	----	-------

80 m²

N - Flat 2	00_FFL	6 m²			
------------	--------	------	--	--	--

N - Flat 2	01_FFL	87 m²	2b	4p	79 m²
------------	--------	-------	----	----	-------

93 m²

173 m²

A	Pre-Application meeting comments addressed	SR	09.04.19
REV/ ISSUE	NOTE	DRN	DATE

SCALE	DATE	DRN	CHK
1:500@A3	31.01.2019	SR	MH

PROJECT
Berkeley Close, Ruislip,
HA4 6LE

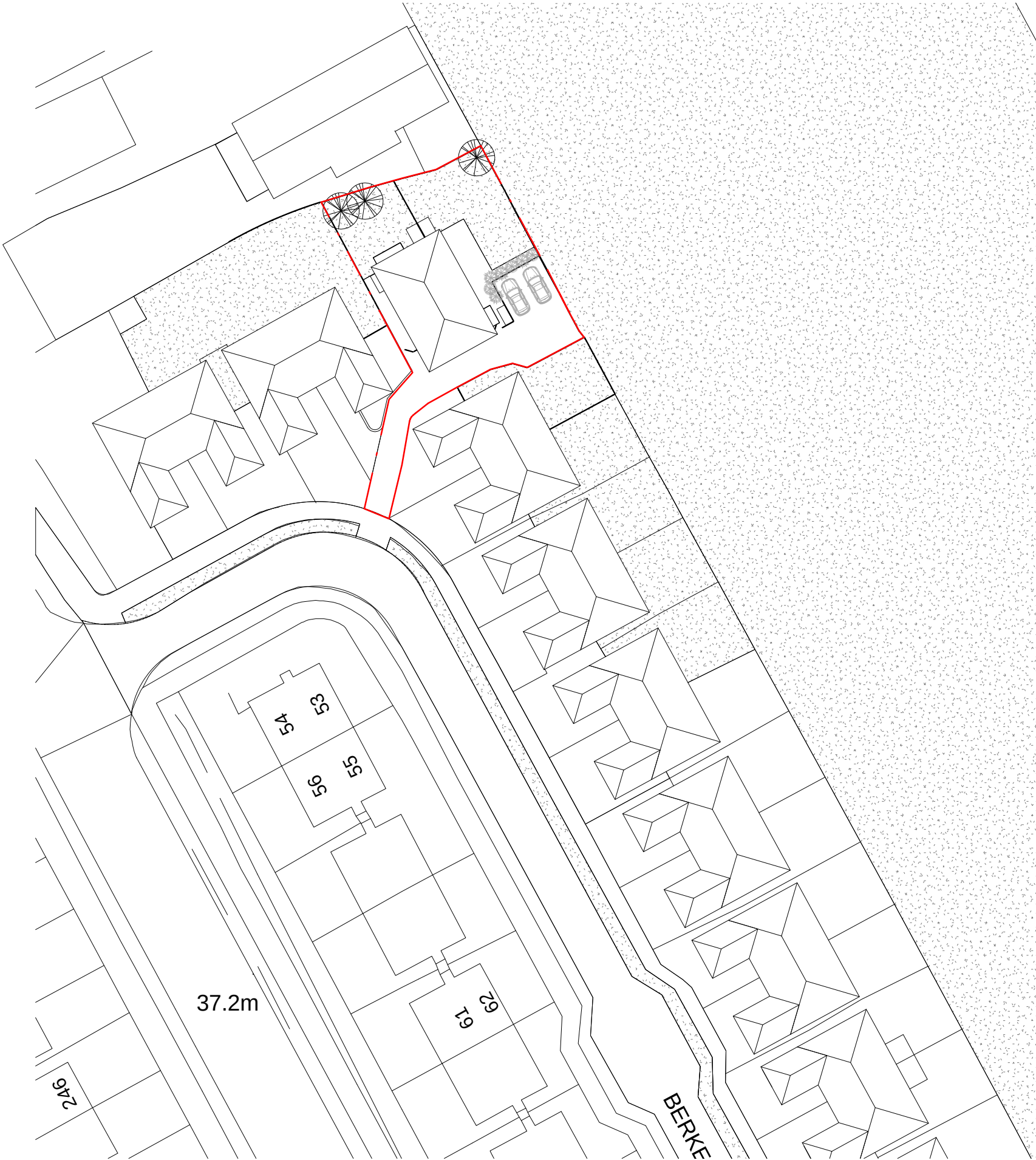
DRAWING
Proposed Site Plan

bubble

architects

STUDIO 205 THE BUSWORKS
39-41 NORTH ROAD
LONDON N7 9DP
WWW.BUBBLEARCHITECTS.CO.UK

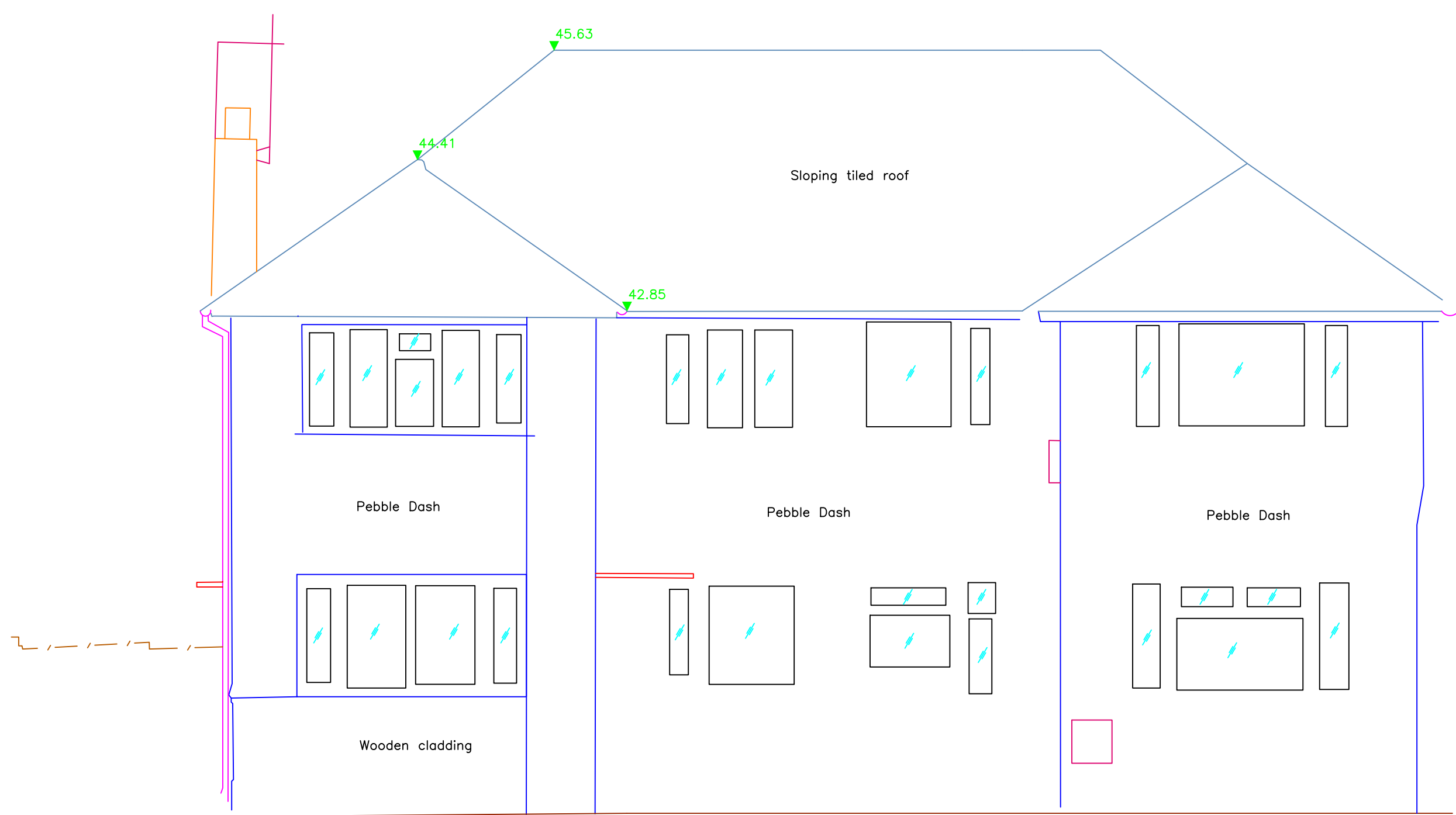
JOB NO	DRAWING NO	REV
018050	P-Si-D-012	A



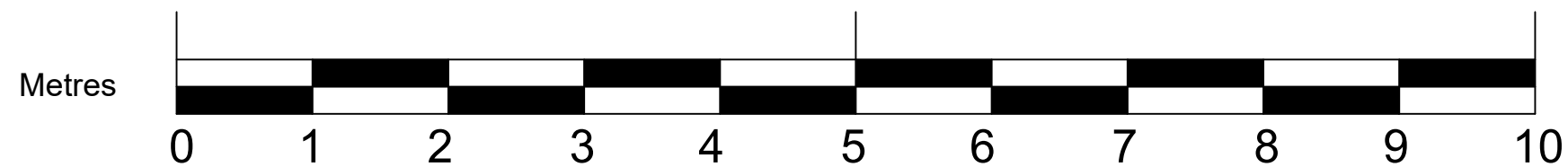
SITE PLAN
1:500



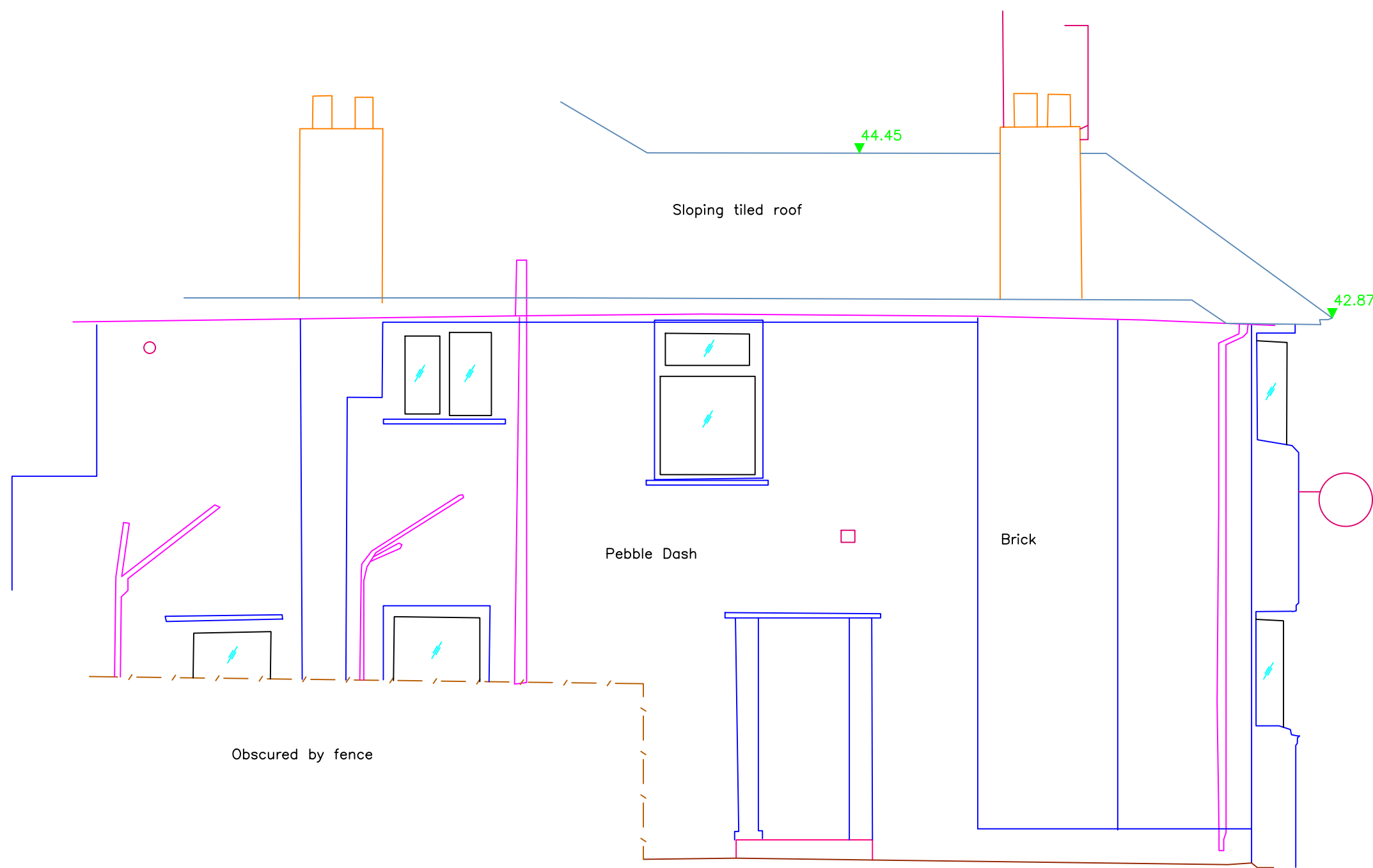
Front Elevation Berkeley CI Number 43



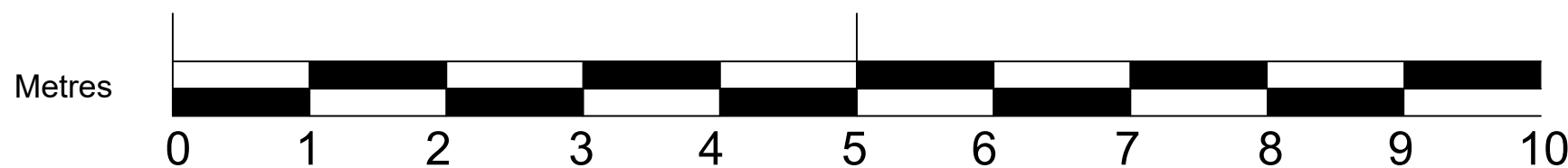
Datum 35.00m



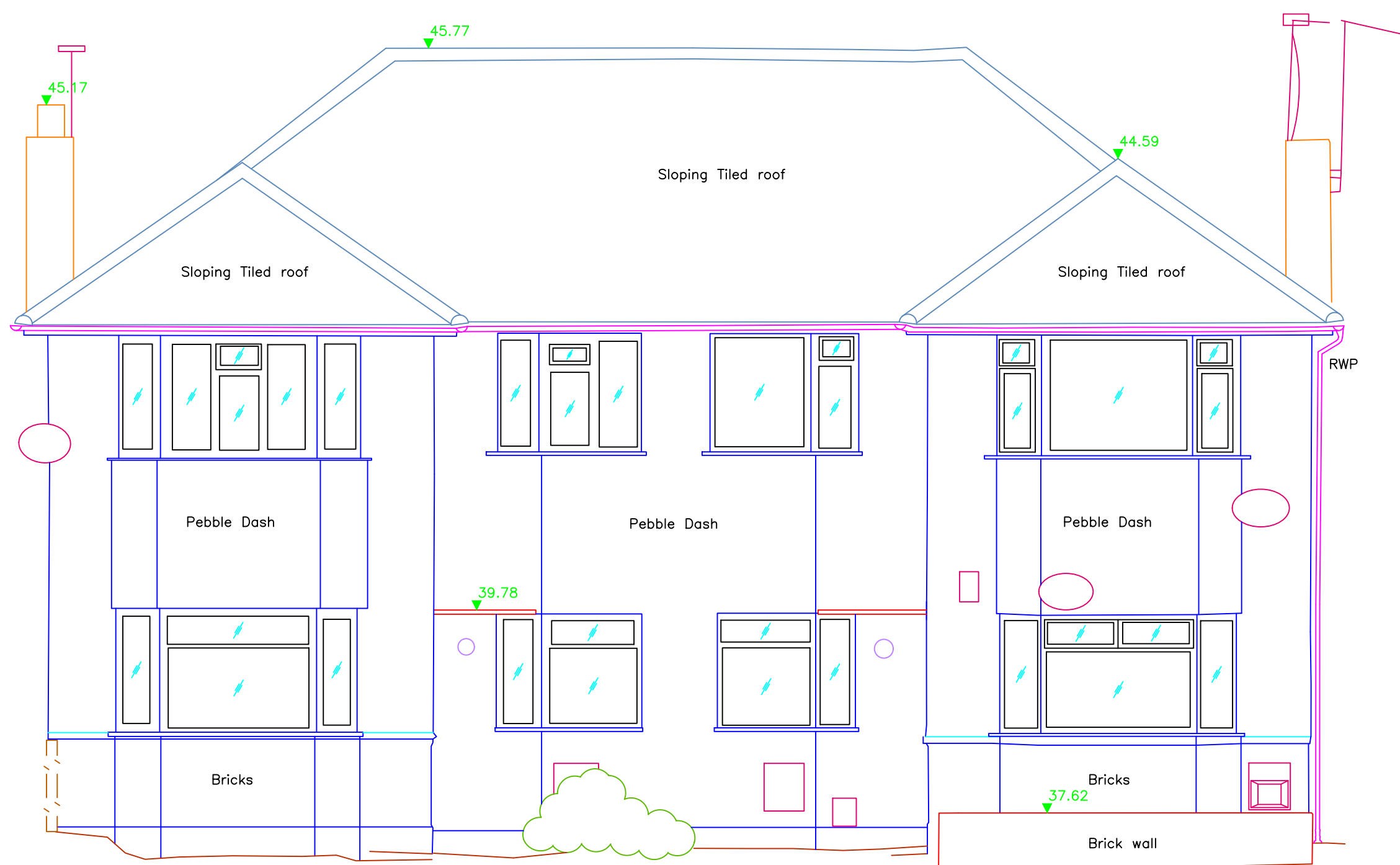
Side Elevation Berkeley CI Number 43



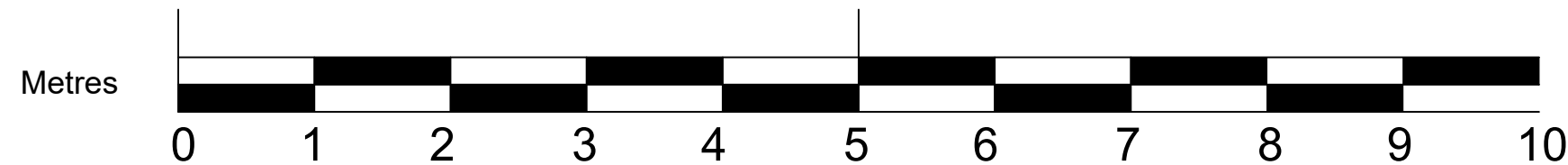
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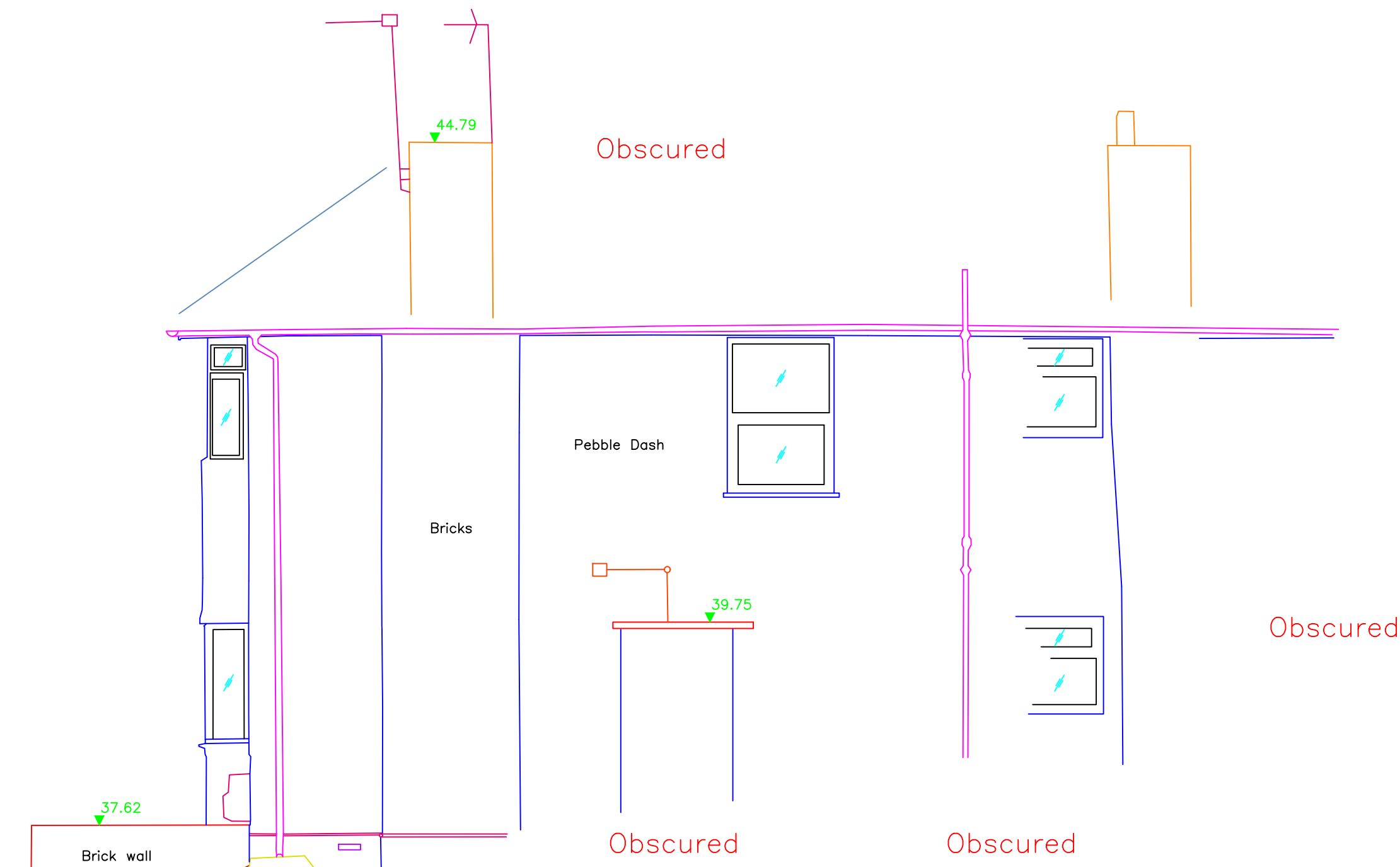
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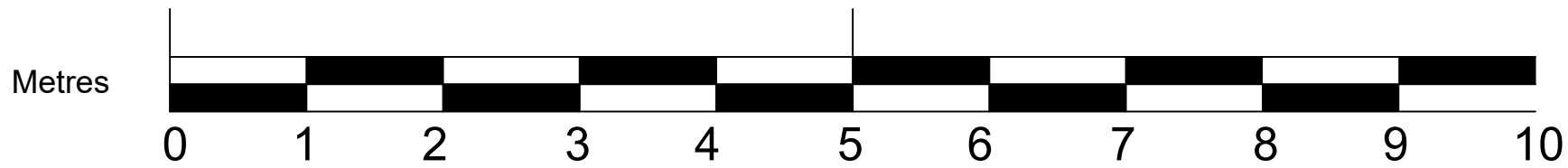
Datum 35.00m



Side Elevation Berkeley CI Number 45



Datum 35.00m



LEGEND	
BANKING	Top Bottom
BUSHES & HEDGES	STILE
MARSH	WALL (Width drawn to scale)
OPEN SIDED BUILDING	BUILDING
GATES	GLASS ROOFED
RETAINING WALL	CONTOURS

ABBREVIATIONS (WHERE APPLICABLE)

FURNITURE	FENCES
AIR VALVE BELISHA BEACON BOLLARD BRITISH TELECOM BOX BUS STOP CABLE MARKER DOWN PIPE EARTH ROD ELECTRICITY CABLE PIT ELECTRICITY CONTROL BOX ELECTRICITY POLE FIRE HYDRANT FLOWER BED FOOTPATH GAS VALVE GULLY INSPECTION COVER LIGHT LAMP POST LETTER BOX MANHOLE NAME PLATE OVERHEAD WIRES PARKING METER ROAD SIGN RODDING EYE RETAINING WALL SLUICE VALVE STOP COCK TELEGRAPH POLE TELEPHONE CALL BOX TOP OF KERB TRAFFIC LIGHT UNDERGROUND UNABLE TO LIFT VENT PIPE WATER METER WATER LEVEL WATER VALVE	BARBED WIRE FENCE CORRUGATED IRON FENCE CLOSE BOARD FENCE CHAIN LINK FENCE CHESTNUT PALING FENCE INTERWOVEN FENCE IRON RAILING FENCE LARCH LAP FENCE MISCELLANEOUS FENCING POST AND CHAIN FENCE POST AND RAIL FENCE POST AND WIRE TUBULAR STEEL RAIL
HEIGHTS	BUILDING
BED LEVEL COVER LEVEL EAVE HEIGHT FLAT ROOF LEVEL FLOOR LEVEL INVERT LEVEL PARAPET WALL HEIGHT RIDGE HEIGHT STRUCTURAL SLAB LEVEL TOP OF WALL TOP OF FENCE	ACCESS HATCH ARCH HEAD LEVEL ARCH SPRINGER LEVEL BEAM SOFFIT LEVEL CILL HEIGHT CEILING LEVEL FALSE CEILING FINISHED FLOOR LEVEL LAVATORY BASIN ROOF LEVEL RADIATOR RAIN WATER PIPE SKYLIGHT SOIL AND VENT PIPE WASH BASIN WATER TANK WINDOW CILL LEVEL WINDOW HEAD LEVEL UNDERSIDE LEVEL
SURFACES	
CONCRETE CONCRETE PAVING TACTILE PAVING TARMAC UNMADE	CONC CP TPav TMC UN

GRID:

DATUM:
All level information relates to OSGM15 GPS Datum,
derived using Leica Smartnet RTK Network.

- NOTES:
- Surveyed boundaries may not be legal boundaries.
 - Dimensions should not be scaled. All information contained in the drawing should be checked and verified on site prior to any fabrication/construction.
 - All utilities have been identified to the best of the surveyors knowledge but cannot be guaranteed. Due to non entry of inspection chambers all pipe sizes should be checked and verified before any works commence.
 - Services such as Inspection Chambers and Water Meters etc may be obscured by parked cars or debris.
 - Tree spreads shown indicatively only.



SURVEYED	RF/JD
DRAWN	RF/BS
CHECKED	JD

Sheet 1 of 1	SCALE
	A0@1:50

Bubble		
Berkeley Close Ruislip Elevations		

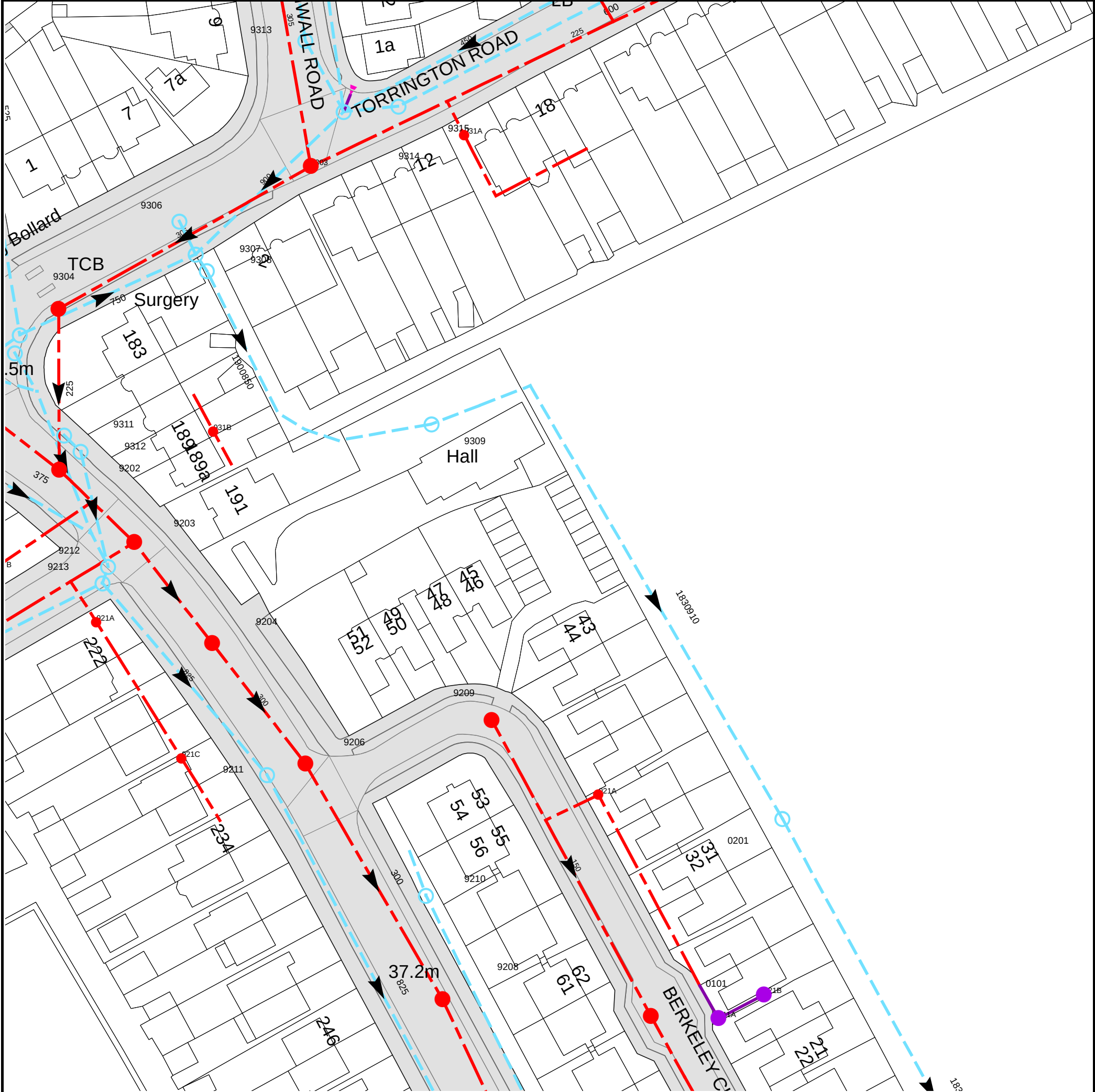
Job No	Rev	Drawing Number
19040	-	19040_2

Date : 30/07/2019

Appendix D

Thames Water Sewer Plans

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4059799	
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The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 510006,186284

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

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
011A	n/a	n/a
0101	36.46	35.3
021B	n/a	n/a
0201	37.03	35.2
021A	n/a	n/a
9209	36.73	35.63
9212	37.27	35.6
9203	37.37	34.93
9202	37.37	34.96
9312	37.38	35.65
9311	37.43	35.66
931B	n/a	n/a
9309	37.28	35.36
9310	37.53	35.72
9305	37.41	36.76
9304	37.64	35.27
9308	37.79	35.4
9307	37.78	35.4
9306	37.69	35.4
9303	37.79	35.59
931A	n/a	n/a
9314	37.89	35.94
9315	37.91	36.15
9313	37.92	36.72
921A	n/a	n/a
9213	37.22	35.62
921C	n/a	n/a
9204	37.31	34.91
9211	37.11	35.5
9206	37.19	34.77
9210	37.15	35.96
9208	37.12	34.7
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

	Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Trunk Surface Water
	Trunk Foul
	Storm Relief
	Trunk Combined
	Vent Pipe
	Bio-solids (Sludge)
	Proposed Thames Surface Water Sewer
	Proposed Thames Water Foul Sewer
	Gallery
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Sludge Rising Main
	Proposed Thames Water Rising Main
	Vacuum

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Control Valve
	Drop Pipe
	Ancillary
	Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Outfall
	Undefined End
	Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

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

	Foul Sewer		Surface Water Sewer
	Combined Sewer		Gully
	Culverted Watercourse		Proposed
			Abandoned Sewer

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If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

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Call 0845 070 9148 quoting your invoice number starting CBA or ADS / OSS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

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- handle complaints speedily and fairly
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TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Web site: www.tpos.co.uk
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

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