

Flood Risk Assessment

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Flood risk, water and environment

AEG3458_TW19_Royal Borough of
Windsor and Maidenhead _01

Site Address: 32 Friary Road
Wraysbury
Royal Borough of Windsor and Maidenhead
TW19 5JP

**UK Experts in Flood Modelling, Flood Risk
Assessments, and Surface Water Drainage
Strategies**

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Flood risk, water and environment

Document Issue Record

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Prepared for: Sandeep Anand

Reference: AEG3458_TW19_Royal Borough of Windsor and Maidenhead_01

Site Location: 32 Friary Road, Wraysbury, Royal Borough of Windsor and Maidenhead, TW19 5JP

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Table of Contents

Summary	1
1. Introduction	4
Site Overview.....	4
Planning Policy and Guidance	7
2. National Planning Policy Framework	8
Climate Change	11
Local Plan	11
Sequential and Exception Tests	13
Summary	13
3. Consultation and Review	14
Sources of Information.....	14
4. Sources of Flood Risk	17
Fluvial Flood Risk.....	17
Tidal.....	24
Canals.....	24
Pluvial	25
Reservoirs	29
Groundwater.....	30
Sewer	31
5. Flood Risk Mitigation	33
Finished Floor Levels.....	33
Flood Resistance and Resilience Measures	33
EA Flood Warning Service.....	34
Impact on Flood Risk Elsewhere	34

6. Conclusions..... 35

Appendix A - Development Proposals 38

Summary

Development Description	Existing	Proposed
Development Type	A residential dwelling	Construction of a car port (with home office at first floor) and replacement of an existing access bridge to allow for vehicular access
EA Vulnerability Classification	More Vulnerable	No change - More Vulnerable
Ground Floor Level	As seen in the topographic survey, the existing FFLs are between 17.20m AOD and 17.46m AOD.	Carport ground level to be set to ground level of 16.00m AOD
Level of Sleeping Accommodation	1st Floor	No Change – no new sleeping accommodation proposed as part of application
Impermeable Surface Area	N/A ¹	N/A ¹
Surface Water Drainage	N/A ¹	N/A ¹
Site Size	Approximately 1200m ²	Carport <250m ²
Risk to Development	Summary	Comment
EA Flood Zone	Flood Zone 3	Defined as land assessed to be at a >1% probability of flooding from fluvial sources annually.
Flood Source	Fluvial	River Thames (fluvial)
SFRA Available	Strategic Flood Risk Assessment (Level 1 SFRA) (Royal Borough of Windsor and Maidenhead, 2017)	
Management Measures	Summary	Comment
Ground floor level above extreme flood levels	N/A ²	Finished Floor Levels (FFLs) of carport to be set flush with external

		ground levels, considered appropriate given use.
Safe Access/Egress Route (Surface Water)	No as flood depths exceed 'safe' threshold	Sign up to the EA Flood Warning and Alert Service (River Thames at Wraysbury village including Welley). Access/ egress arrangements would not differ from existing as proposal is Minor Development. The development in include changes to the existing bridge. Access/egress could be affected in the pluvial 'Low Risk' and 'Medium Risk' events, however, as the car port is part of the existing dwelling on site, the access/egress situation should be the same as the existing.
Flood Resilient Design	Yes	Carport should be constructed in flood resilient manner in accordance with CLG <i>Improving the Flood Performance of New Buildings Flood Resilient Construction (2007)</i> . See section 5 of this report.
Site Drainage Plan	N/A ¹	N/A ¹
Flood Warning & Evacuation Plan	N/A ¹	Sign up to the EA flood alert and warning service – River Thames at Wraysbury village including Welley
Offsite Impacts	Summary	Comment
Displacement of floodwater	No	The carport is considered minor development, and will be open at ground floor to allow water to ingress into the structure, and thus the displacement of flood water is expected to be negligible.
Increase in surface run-off generation	No increase. Proposed carport will be built on existing hardstanding area.	There will be no increase in hardstanding area as a result of the development proposals. Therefore,

Impact on hydraulic performance of channels		the volume, and rate of surface water generated at the site will remain as existing.
	The site is within 8m of the River Thames, an Environment Agency fluvial Main River.	A Flood Risk Activity Permit (FRAP) will be required.

¹ not required for this assessment

² data not available.

1. Introduction

- 1.1. Aegaea were commissioned by Sandeep Anand to undertake a Flood Risk Assessment (FRA) to facilitate a planning application for the proposed development. This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.
- 1.2. This FRA is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Site Overview

- 1.3. The site of the proposed development is 32 Friary Road, Wraysbury, Royal Borough of Windsor and Maidenhead, TW19 5JP. The existing site is a residential dwelling, with a patio area and landscaping to the rear and sides of the dwelling (Figure 1).

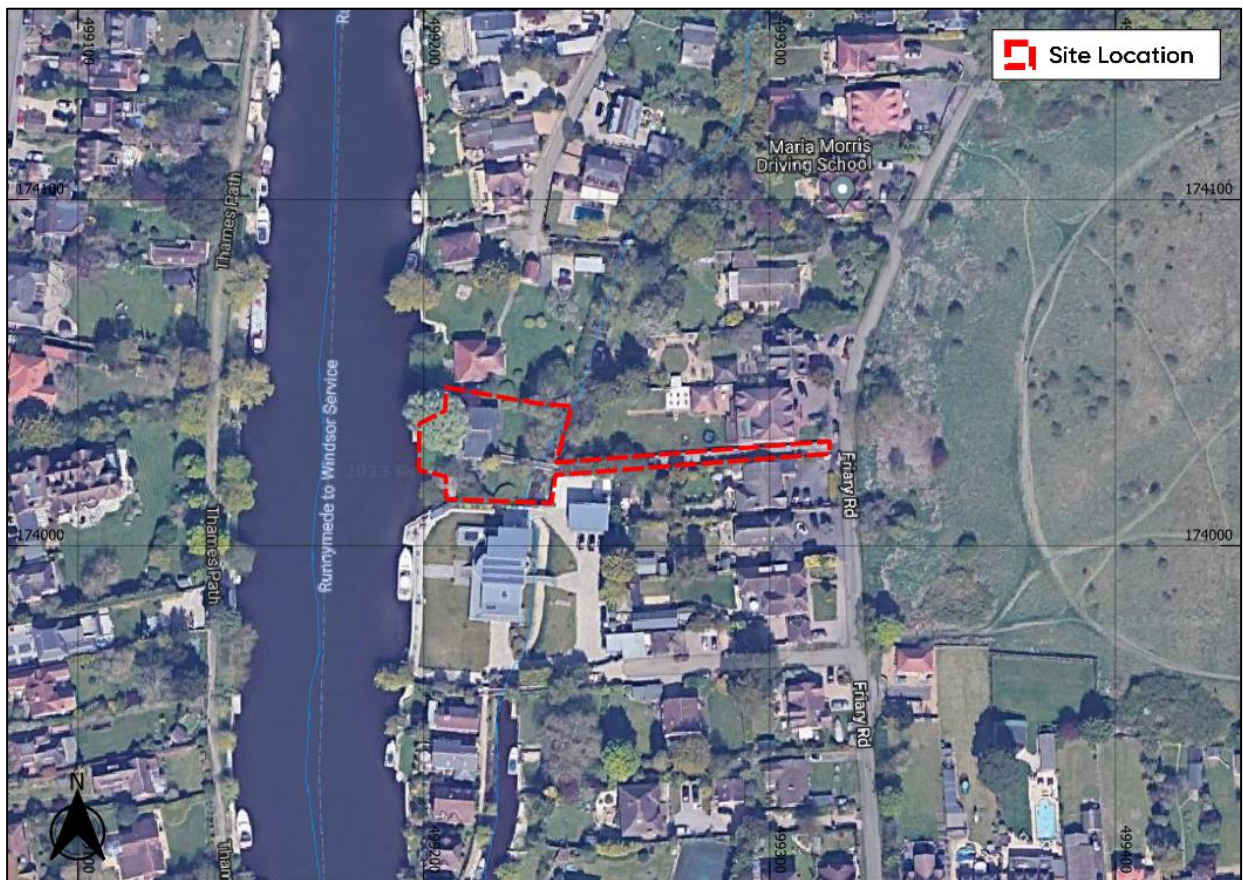


Figure 1: Site Location (Base map from Google Hybrid ©)

- 1.4. The proposed development is for the construction of a carport with a home office room above. This also include changes to the access bridge to make to property more car accessible.
- 1.5. It is noted that planning permission (reference 22/02022/FULL) has already been accepted, for the construction of an extension to the existing dwelling on site. This FRA has been updated to account for the new car port and bridge alteration application.
- 1.6. Analysis of topographic levels (Appendix B) indicates that the site generally slopes with a fall to the southwest. Interrogation of the topographic levels in the location of the proposed carport footprint shows ground elevations of between 15.83m Above Ordnance Datum (AOD) and 16.02 AOD. The east end of the bridge can be seen to have an elevation of 16.95m AOD and the west end has an elevation of 16.00m AOD. It is noted that this does not change between the proposed and existing.
- 1.7. Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model (1m resolution) has also been utilised to visualise the topography of the site (Figure 2).

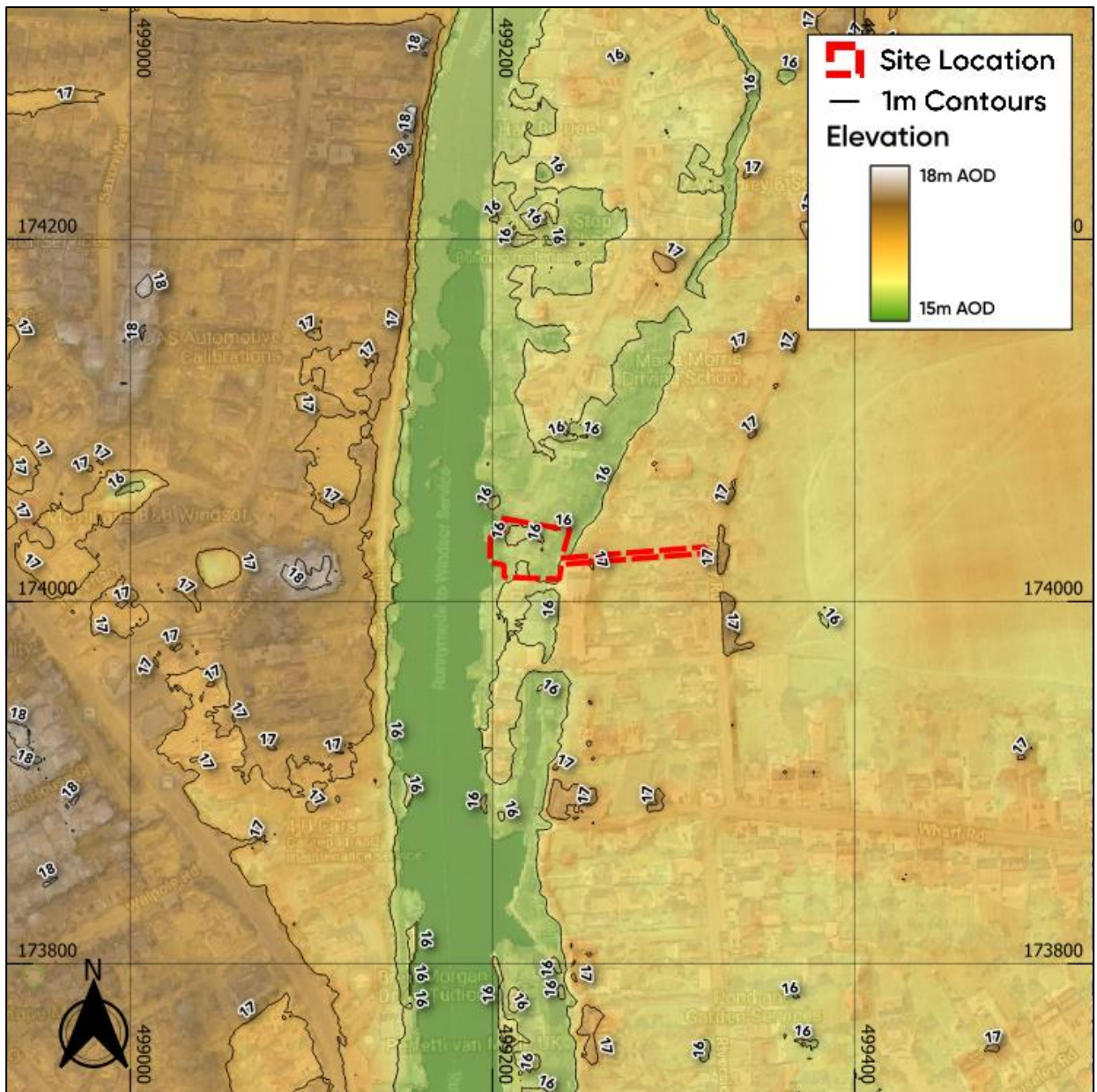


Figure 2: Site Topography (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

- 1.8. Royal Borough of Windsor and Maidenhead is the Local Planning Authority (LPA) for the site and also the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Thames region.

Planning Policy and Guidance

1.9. UK government planning guidance states¹ that an FRA is required for sites which are:

- *In Flood Zone 2 or 3 including minor development and change of use,*
- *More than 1 hectare 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 river and the sea (for example surface water drains or reservoirs),*
- *In an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency.*

1.10. The site is located within Flood Zone 3. According to NPPF Footnote 55 an FRA is required.

1.11. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Fluvial flood risk
- Surface water flood risk
- Risk of flooding from other sources.

¹ <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment>

2. National Planning Policy Framework

- 2.1. The potential consequences of inappropriate development in a flood risk area for occupiers, either of the development or elsewhere, pose significant risks in terms of personal safety and damage to property. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. The following section summarises the key policies and guidance relevant to the proposed development.
- 2.2. The National Planning Policy Framework² (NPPF) (DLUHC, 2023) which includes UK Government policy on development and flood risk states:

159. 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.

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

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed; and*

²<https://www.gov.uk/guidance/national-planning-policy-framework>, last updated Sept 2023

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

168. Applications for some 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 55.

2.3. Paragraph 051 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states:

Minor development means:

- *minor non-residential extensions (industrial/commercial/leisure etc): extensions with a floorspace not in excess of 250 square metres.*
- *alterations: development that does not increase the size of buildings, e.g. 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) or any other development with a purpose not incidental to the enjoyment of the dwelling.*

2.4. As such, the proposal would be considered a Minor Development under the PPG.

2.5. Footnote 55 of the NPPF 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.

2.6. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	<p>This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:</p> <ul style="list-style-type: none"> land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). <p>Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)</p>

2.7. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.

Climate Change

- 2.8. Predicted future change in peak river flows as a result of climate change are provided by the Environment Agency with a range of projections applied to regionalised 'River Management Catchments'.
- 2.9. The site is within the Maidenhead and Sunbury Management Catchment. The relevant peak river flow allowances for this river basin district are identified below.

Table 2: Maidenhead and Sunbury Management Catchment Climate Change Allowances

Epoch	Central	Higher	Upper
2020s	14%	19%	32%
2050s	17%	25%	45%
2080s	35%	47%	81%

- 2.10. The proposed development is for the construction a carport to the existing residential dwelling on site, the dwelling could be considered to have an anticipated lifetime of a minimum of 100 years. Therefore, the Central allowance of 35% should be applied.

Local Plan

- 2.11. Local Plans, also known as Development Plans, set out the policies for development in a local area.
- 2.12. The Royal Borough of Windsor and Maidenhead Local Plan⁴ (adopted 2022) includes a policy on managing flood risk and waterways (Policy NR 1). It states:

1. *Flood zones are defined in the National Planning Practice Guidance and the Council's Strategic Flood Risk Assessment (Level 1). Within designated Flood Zones 2 and 3 (and also in Flood Zone 1 on sites of 1 hectare or more in size*

4 Borough Local Plan <https://www.rbwm.gov.uk/home/planning-and-building-control/planning-policy/development-plan/adopted-local-plan>

and in other circumstances as set out in the NPPF) development proposals will only be supported where an appropriate flood risk assessment has been carried out and it has been demonstrated that development is located and designed to ensure that flood risk from all sources of flooding is acceptable in planning terms.

2. The sequential test is required for all development in areas at risk of flooding, except for proposed developments on sites allocated in this Plan or in a made Neighbourhood Plan which accord with the provisions of those Plans so far as material to the application. In applying this test, development proposals should show how they have had regard to:

- a. the availability of suitable alternative sites in areas of lower flood risk*
- b. the vulnerability of the proposed use and the Flood Zone designation*
- c. the present and future flood risk*
- d. the scale of potential consequences e. site evacuation plan in the event of potential flooding.*

Only water compatible uses and essential infrastructure development will be supported in the area defined as functional floodplain. The exception test will still apply.

3. The sequential approach should be followed by developers for all development so that the most vulnerable development is located in the lowest risk flood areas within a site, taking account of all sources of flood risk.

4. Development proposals should include an assessment of the impact of climate change using appropriate climate change allowances over the lifetime of the development so that future flood risk is taken into account.

5. In all cases, development should not itself, or cumulatively with other development, materially:

- a. impede the flow of flood water*
- b. reduce the capacity of the floodplain to store water*
- c. increase the number of people, property or infrastructure at risk of flooding*

d. cause new or exacerbate existing flooding problems, either on the proposal site or elsewhere.

e. reduce the waterway's viability as an ecological network or habitat for notable species of flora or fauna.

Sequential and Exception Tests

- 2.13. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.
- 2.14. Under the NPPF all new planning applications should undergo a Sequential Test accordance with paragraph 168 and footnotes 55 and 56. This test should be implemented by local planning authorities with a view to location particularly vulnerable new developments outside of the floodplain.
- 2.15. Paragraph 168 of the NPPF states:

*"168. Applications for some **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 55."*

- 2.16. As such, a site-specific Sequential Test and Exception Test for the proposed developments is not considered necessary in line with the NPPF given that the proposal is for a minor development.

Summary

- 2.17. This flood risk assessment has been prepared with due consideration to the above local and national policy.

3. Consultation and Review

Sources of Information

Consultation

- 3.1. It should be noted that Aegaea have previously been provided with a Product 6 (raw data) for this area, which has been used to inform this FRA. Should the EA respond to the aforementioned Product 4 request with different or new data, this FRA should be updated to account for the revised data.

Documents

- 3.2. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.
- 3.3. The following sources of information have been reviewed for this assessment:
- The Interactive Flood Risk Mapping available on the Environment Agency (EA) website⁵.
 - The National Planning Policy Framework (NPPF) technical guide (Communities and Local Government, 2019).
 - British Geological Survey - Geology of Britain Viewer (British Geological Society, 2017).
 - Royal Borough of Windsor and Maidenhead Strategic Flood Risk Assessment⁶ (2017).

5 Environment Agency, Flood Map for Planning, <https://flood-map-for-planning.service.gov.uk/>

6 Royal Borough of Windsor and Maidenhead Strategic Flood Risk Assessment 2017

<https://consult.rbwm.gov.uk/file/4603403>

- Royal Borough of Windsor and Maidenhead Preliminary Flood Risk Assessment Addendum⁷ (2017).
- Royal Borough of Windsor & Maidenhead Local Flood Risk Management Strategy⁸ (2014).

Strategic Flood Risk Assessment (SFRA)

- 3.4. The SFRA, adopted in 2017, provides the evidence base for the Local Plan and guidance for consideration when determining planning applications. The SFRA seeks to place new development into areas of lower flood risk, taking into account current flood risk, future flood risk and the effect a proposed development would have on the risk of flooding.
- 3.5. The SFRA online mapping provided by the SFRA has been used throughout production of this report as a source of information, particularly pertaining to historic flood incidents.

Royal Borough of Windsor and Maidenhead Preliminary Flood Risk Assessment Addendum⁹ (2017).

- 3.6. The preliminary flood risk assessment (PFRA) and flood risk areas (FRAs) for the Royal Borough of Windsor and Maidenhead were reviewed during 2017, using all relevant current flood risk data and information.
- 3.7. The addendum by the Royal Borough of Windsor and Maidenhead (2017) updates the council's preliminary flood risk assessment report published in 2011 and was referred to where applicable in this report.

7 Royal Borough of Windsor and Maidenhead Preliminary Flood Risk Assessment Addendum 2017

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698708/PFRA_Royal_Borough_of_Windsor_and_Maidenhead_2017.pdf

8 Royal Borough of Windsor and Maidenhead Local Flood Risk Management Strategy 2014

https://www.rbwm.gov.uk/sites/default/files/2020-04/highways_flood_risk_management_strategy.pdf

9 Royal Borough of Windsor and Maidenhead Preliminary Flood Risk Assessment Addendum 2017

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698708/PFRA_Royal_Borough_of_Windsor_and_Maidenhead_2017.pdf

Royal Borough of Windsor and Maidenhead Local Flood Risk Management Strategy (LFRMS)

- 3.8. The Royal Borough of Windsor and Maidenhead LFRMS sets out how the Council carries out its flood risk responsibilities that are a statutory requirement of the Flood and Water Management Act 2010.
- 3.9. The LFRMS is referenced where applicable within the report.

4. Sources of Flood Risk

Fluvial Flood Risk

- 4.1. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.
- 4.2. The site is located within Flood Zone 3 (Figure 3). Flood Zone 3 denotes a risk of flooding from fluvial sources greater than 1 in 100-year (1% AEP).

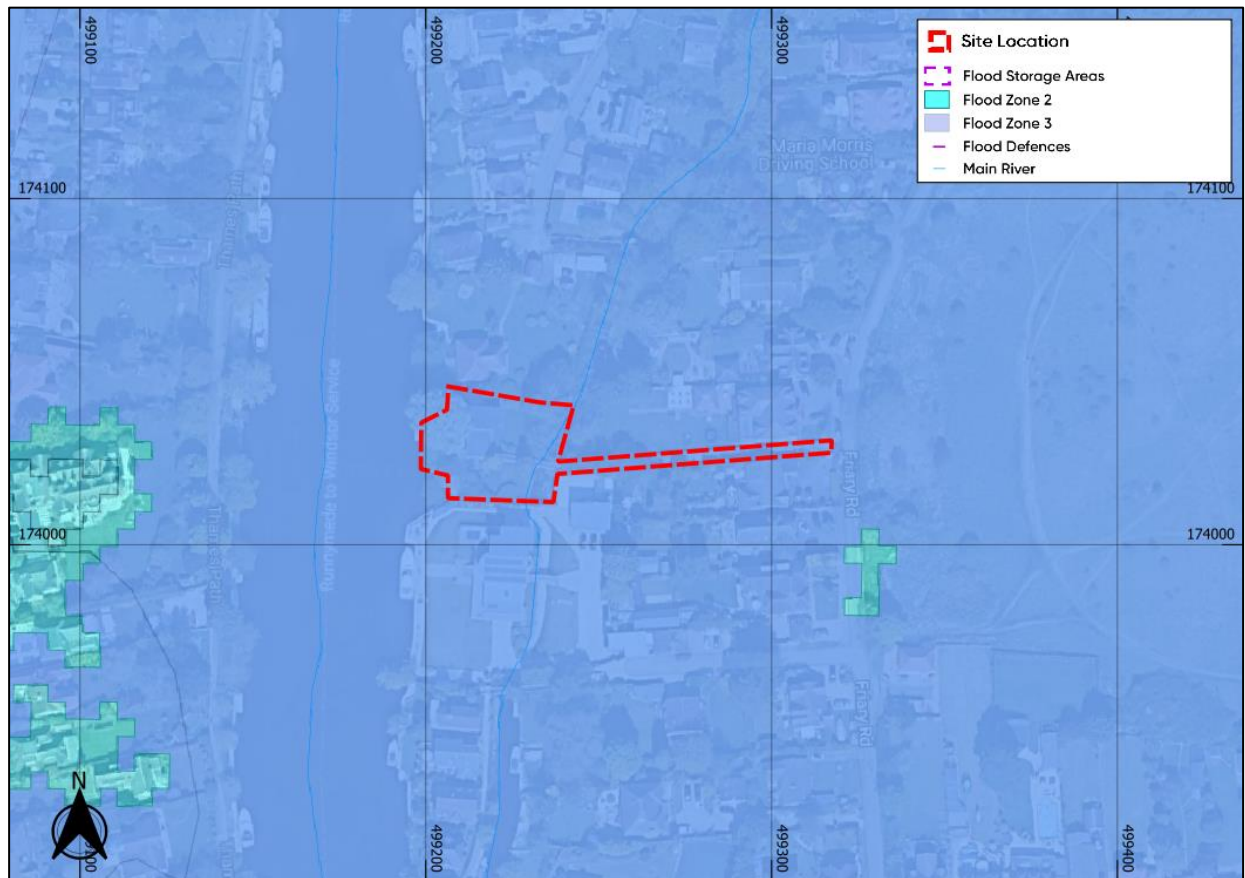


Figure 3: EA Flood Mapping for Planning (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

Main Rivers

- 4.3. The nearest Main River to the site is the River Thames which is directly west of the site boundary. There is also a separate branch of the River Thames which intersects the site boundary to the east of the existing dwelling.
- 4.4. The Flood Zone 2 and 3 extents are derived from the Lower Thames Model and associated with the River Thames at this location.

Ordinary Watercourses

- 4.5. There are no recorded other watercourses in the vicinity of the site.

EA Flood Data

- 4.6. Aegaea have previously been provided with Product 6 (raw data) for this area by the Environment Agency which has been used to inform this FRA. This information is based on the Lower Thames model, dated 2019.
- 4.7. The Lower Thames model includes three separate model domains – the Thames Domain; the Hammersmith Domain, and the Hurley to Teddington (tributaries) Domain. The site is located outside the Hammersmith Domain. The site is at a greater risk based on the Thames Domain rather than the Hurley to Teddington (tributaries) Domain and therefore the Thames Domain model outputs have been used to inform the assessment.
- 4.8. The proposed carport and bridge are located entirely within the 1 in 30-year modelled flood extent (Figure 4). As such the site can be considered as being in Flood Zone 3b.
- 4.9. However, the car port is considered a Minor Development in terms of flood risk, and will be open at ground level so should not result in the loss of floodplain storage in Flood Zone 3b.
- 4.10. Additionally, Figure 5 and Figure 6 shows flood depths for the 1 in 100-year +climate change (35%) and 1 in 1000 year modelled flood event.

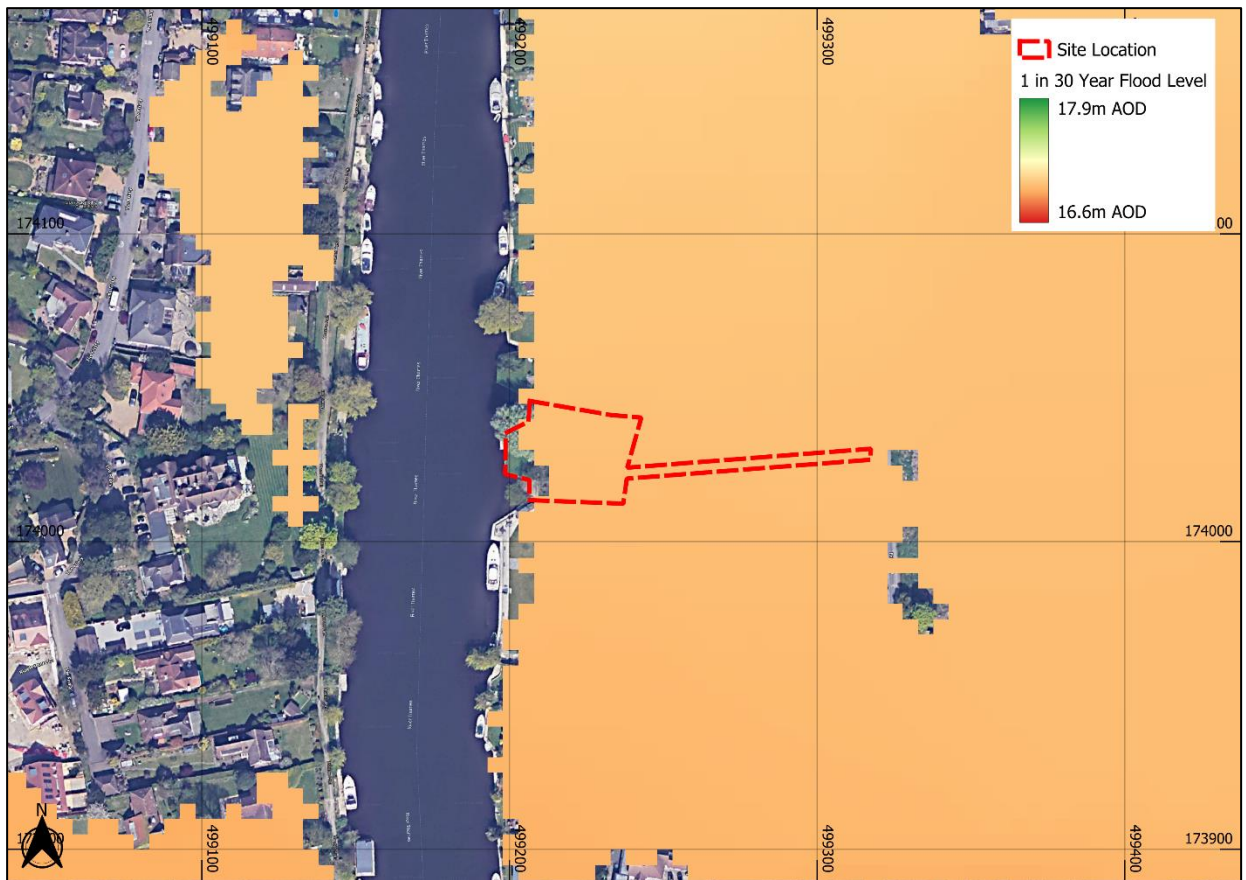


Figure 4: 1:20 year flood levels (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)



Figure 5: 1:100 year + climate change (35%) flood level (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)



Figure 6: 1:1000 year flood level (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

- 4.11. The flood level grids provided by the EA indicate that the site as a whole could experience a maximum flood levels of 17.00m AOD in the 1 in 30-year event (Figure 4). The location of the proposed carport could experience a maximum flood levels of 16.99m AOD. As shown in the topographic survey the elevation at the proposed carport is 15.83m AOD and 16.02m AOD. As such, a max depth of 1.16m (16.99m AOD – 15.83m AOD) could be expected at the proposed carport in the 1 in 30-year event.
- 4.12. Observing the topographic survey, the east end of the bridge can be seen to have an elevation of 16.95m AOD and the west end has an elevation of 16.00m AOD. The flood level grids indicate that the max flood level at the bridge is 16.99m AOD. As such, the max depth at the bridge is 0.99m (16.99m AOD – 16.00m AOD) in the 1 in 30-year event. It is noted that the east end of the bridge sits above the flood level in the 1 in 30 year event.
- 4.13. Furthermore, the EA data provided indicates that the wider site could experience a maximum flood level of 17.71m AOD in the 1 in 100-year +climate change (35%) event (Figure 5). The

location of the proposed carport could also experience a maximum flood level of 17.71m AOD. As shown in the topographic survey the elevation at the proposed carport is between 15.83m AOD and 16.02m AOD. As such, a max depth of 1.88m (17.71m – 15.83m) can be recorded at the proposed carport in the 1 in 100-year + CC event.

- 4.14. Observing the topographic survey, the east end of the bridge can be seen to have an elevation of 16.95m AOD and the west end has an elevation of 16.00m AOD. The flood level grids indicate that the max flood level at the bridge is 17.71m AOD. As such, the max depth at the bridge is 1.71m (17.71m – 16.00m) in the 1 in 100-year + CC event.
- 4.15. The EA data provided indicates that the wider site could experience a maximum flood level of 17.75m AOD in the 1 in 1000-year event (Figure 6). The location of the proposed carport could also experience a maximum flood level of 17.75m AOD. As shown in the topographic survey the elevation at the proposed carport is between 15.83m AOD and 16.02m AOD. As such, a max depth of 1.92m (17.75m – 15.83m) can be recorded at the proposed carport in the 1 in 1000-year event.
- 4.16. Observing the topographic survey, the east end of the bridge can be seen to have an elevation of 16.95m AOD and the west end has an elevation of 16.00m AOD. The flood level grids indicate that the max flood level at the bridge is 17.75m AOD. As such, the max depth at the bridge is 1.75m (17.75m – 16.00m) in the 1 in 1000-year event.
- 4.17. Due to the nature of the development (carport), the FFLs of the car port will be set at the ground level of the site:16.00m AOD. It is noted that this is below all modelled flood levels. However, as the proposed car port is to be open at ground level this should not result in the loss of floodplain storage.
- 4.18. It is noted from the plans provided by the client that the FFLs of the first floor office above the car port will be set approximately 2.27m above the finished car port level, and thus above the maximum expected depths in the aforementioned events (1.92m in the modelled 1:1000 year event).

Historic Flooding

- 4.19. The EA Recorded and Historical Flood Outlines shows the site is within multiple historical flood extents. The historical flood extents indicate the site flooded in Spring 1947, Winter 2000, Winter 2003 (New Year), and Winter 2013-2014. The SFRA states that the historic flood outlines and

records were used to inform the Flood Zone 2 and 3 extents in the study area. Figure 7 shows the historic flood event outlines in the vicinity of the site.

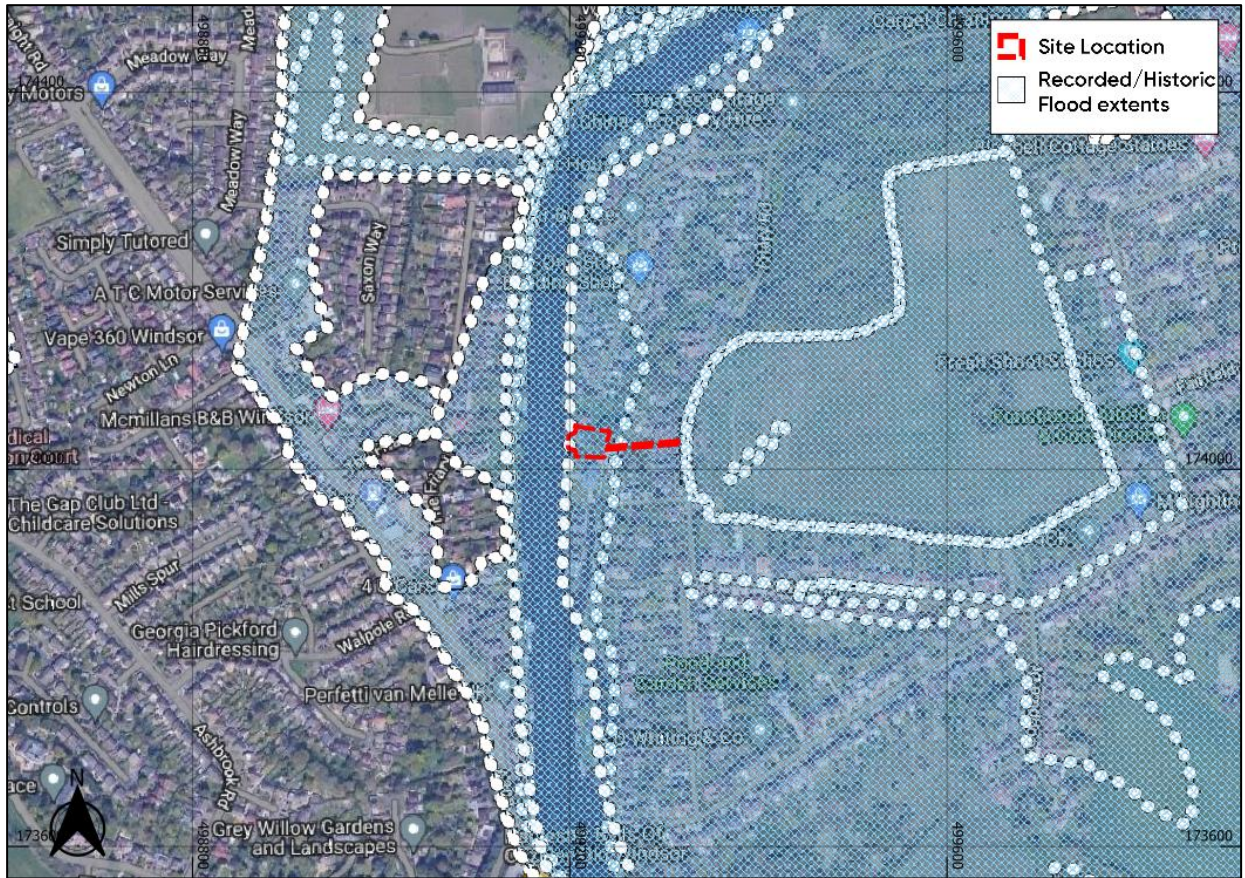


Figure 7: EA Historic Flood Mapping (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

Bridge Alterations

4.20. It is noted that the changes to the bridge from existing to proposed are only minor. The proposed changes are:

- Increase in bridge width from 1.5m to 3m
- The addition of three support pillars below the bridge

4.21. Three approximately 0.22m wide pillars will be used to support the bridge to make it car compatible. With a channel length of 6.4m, the pillars only reduce the conveyance capacity of the river by 10.3%. As such this could be considered a minor impact on flow conveyance.

4.22. Nevertheless, it is noted that, due to the proposed changes to the bridge being over a fluvial main river, an EA Flood Risk Activity Permit will be required.

Summary

4.23. Based on the information presented above, the site is considered to be at high risk of fluvial flooding.

4.24. However it is important to note that the proposed car port is considered a Minor Development in terms of flood risk and will be open at ground floor to allow water to enter the structure should the site flood. It is noted from the plans provided by the client that the FFLs of the first floor office above the car port will be set approximately 2.27m above the finished car port level, and thus above the maximum expected depths in the aforementioned events (1.92m in the modelled 1:1000 year event).

Tidal

4.25. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the river bank or river defences when tide levels are high.

4.26. The site is a significant distance from any tidal source and above the anticipated extreme tidal levels, even when considering the impacts of climate change. The risk of flooding from tidal sources is considered low.

Canals

4.27. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders, and boreholes and manages water levels by transferring it within the canal system.

4.28. There are no CRT canals identified within 1000m of the site. The risk of flooding to this site from canals is considered to be low.

4.29. The site is not in the vicinity of any canals and is therefore not at risk of canal flooding.

Pluvial

4.30. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.

4.31. Annual surface water flood risk is labelled by the EA as:

- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
- 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
- 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).
- 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).

4.32. Examination of the EA's Flood Risk from Surface Water mapping (Figure 5) shows the site is at risk of flooding in the modelled 'Low Risk', 'Medium Risk' and 'High Risk' surface water flood events. It is noted that the location of the carport is not affected in the modelled events, however the bridge is affected in the 'Low Risk' event.

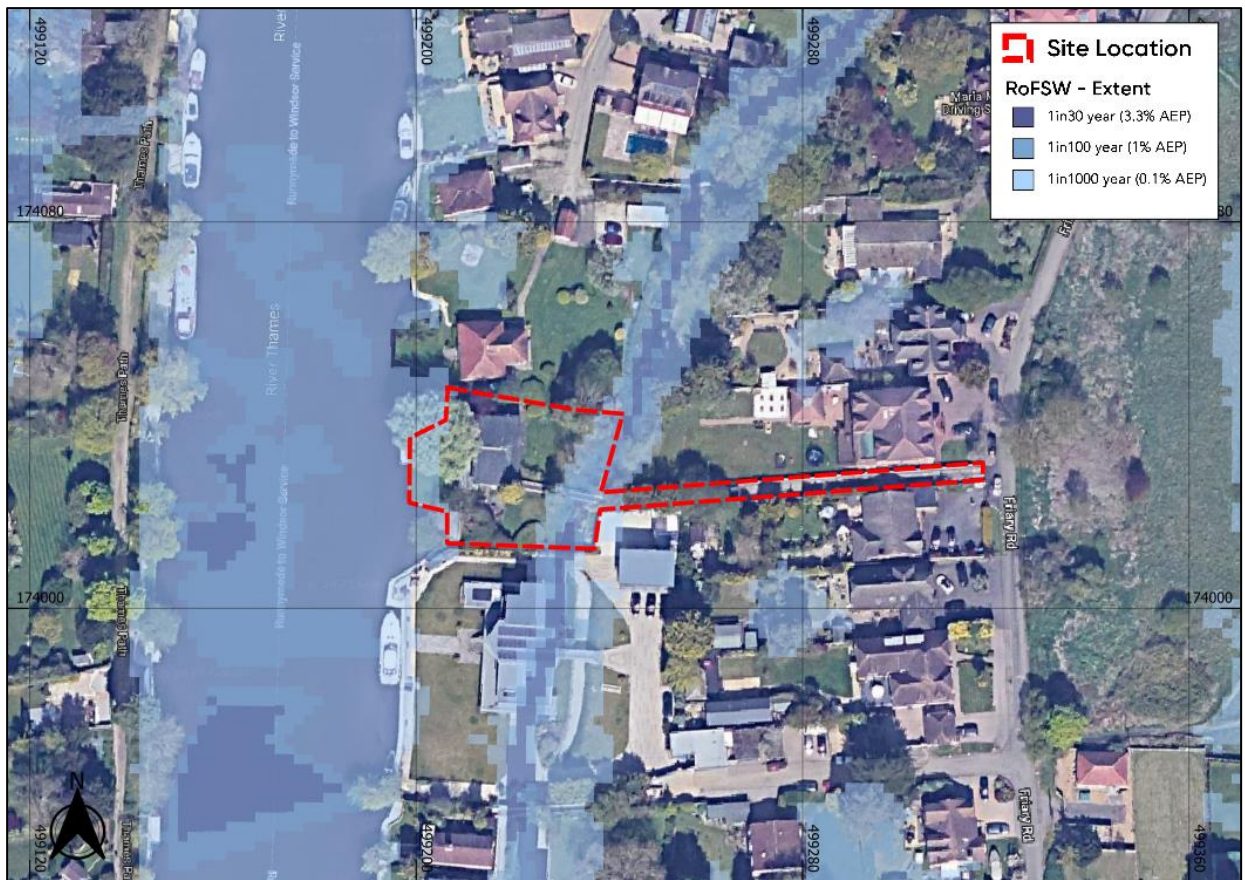


Figure 8: EA Surface Water Flood Risk Mapping (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.33. As can be seen in Figure 9, during the modelled 1 in 100 year probability event, surface water flooding depths could reach 300mm to 600mm in the watercourse below the bridge. Due to this being confined to the watercourse, this may not affect the site or its access/egress.

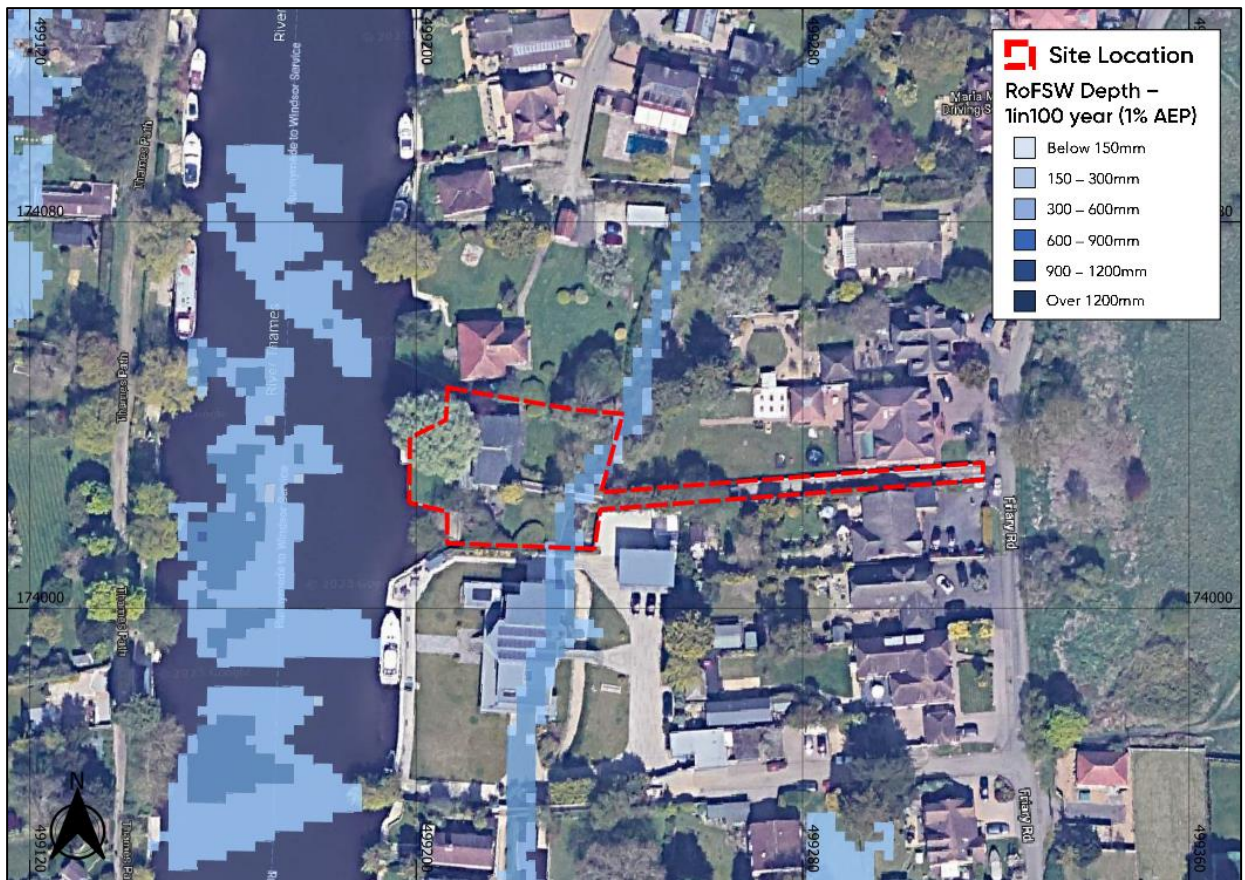


Figure 9: EA Surface Water Flood Risk Mapping 1 in 100 Year Depth (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.34. As can be seen in Figure 10, during the modelled 1 in 1000 year probability event, surface water flooding depths could reach 300mm to 600mm at the proposed bridge and water may spill out of the channel onto the site/ road itself. As can be seen in Figure 11, the hazard rating at the access bridge is high meaning access and egress could be affected.

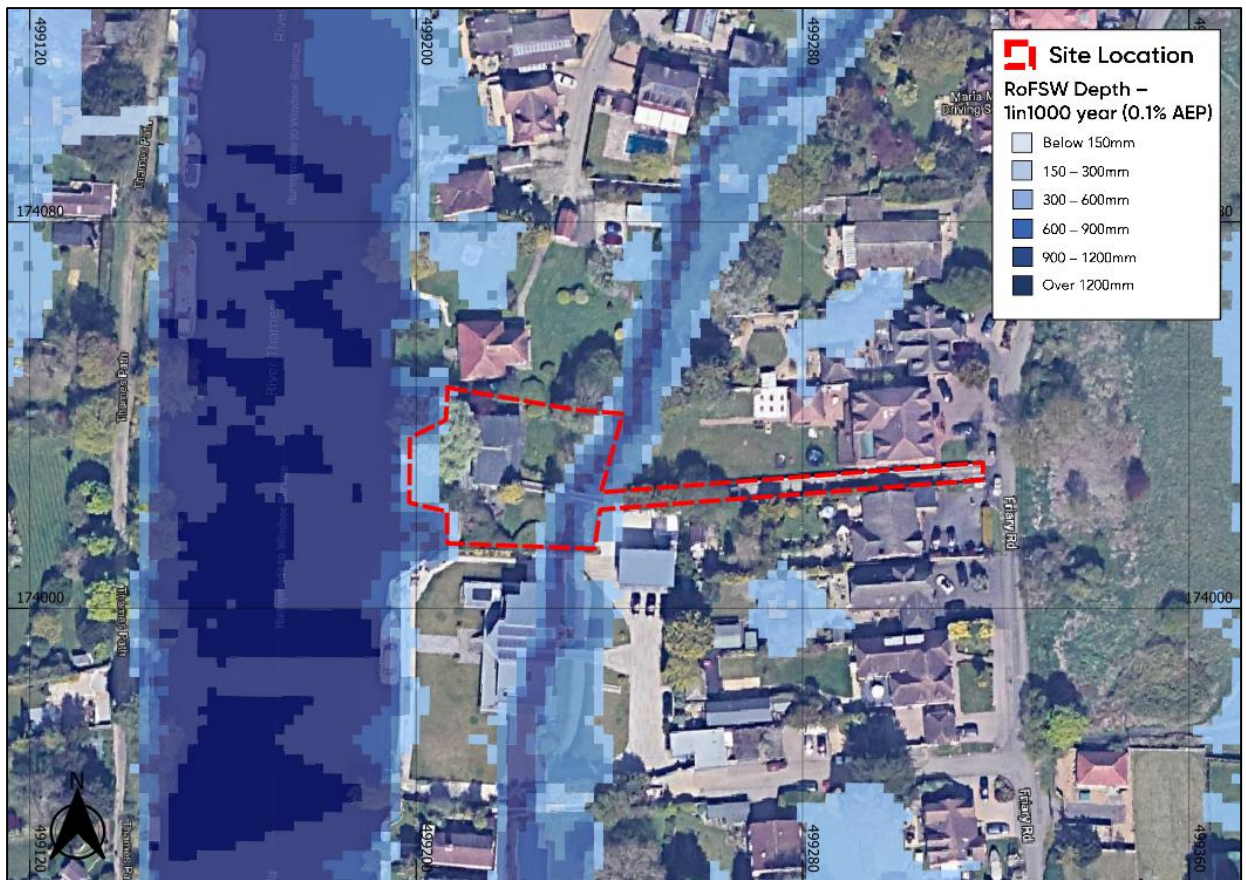


Figure 10: EA Surface Water Flood Risk Mapping 1 in 1000 Year Depth (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

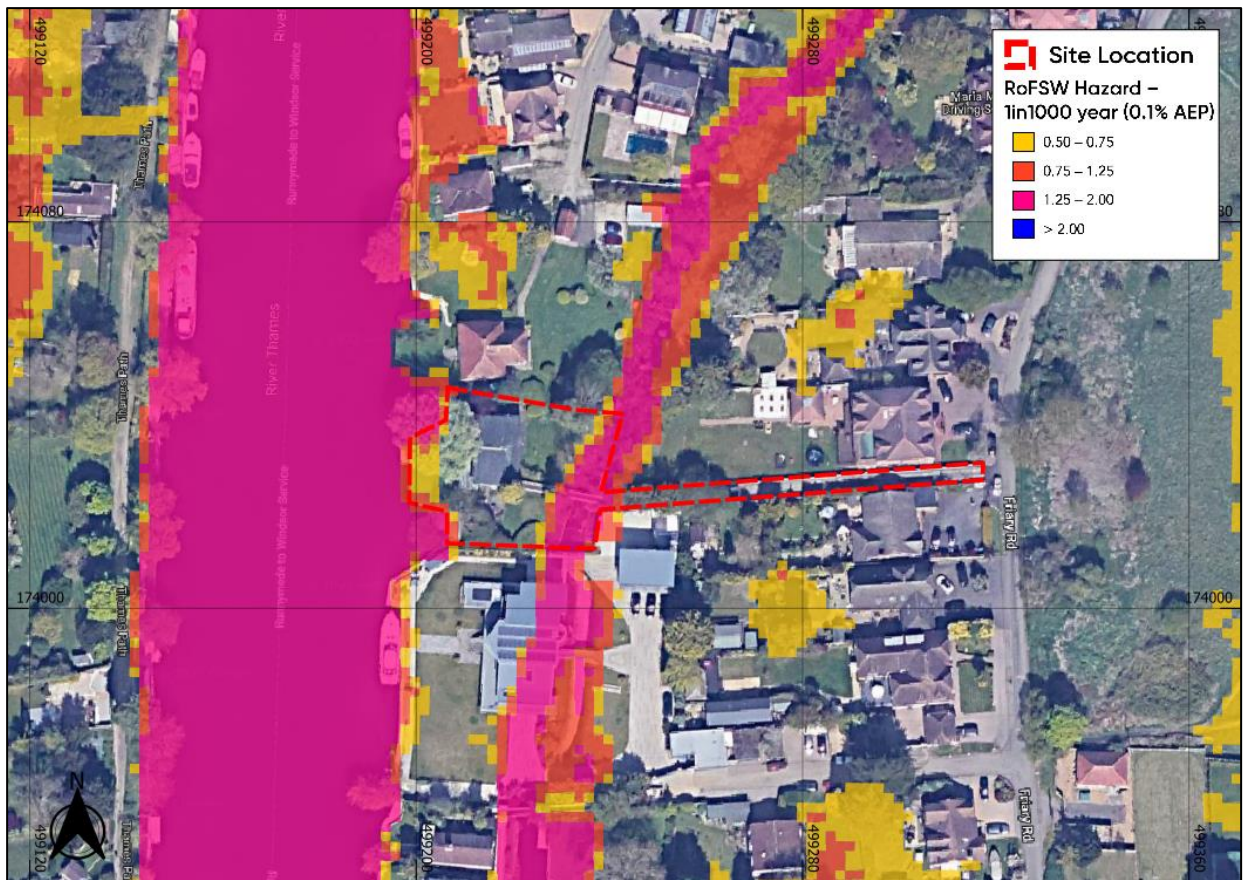


Figure 11: EA Surface Water Flood Risk Mapping 1 in 1000 Year Hazard (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

- 4.35. As mentioned above, the location of the bridge is affected by the pluvial 'Low Risk' and 'Medium Risk' events. As such, the risk to the bridge can be considered as moderate.
- 4.36. Access/egress could be affected in the pluvial 'Low Risk' and 'Medium Risk' events. However, the existing bridge is the existing access point to the site and the proposal is to make this a vehicular bridge. As such, the change in risk is considered negligible as access/ egress arrangements would not differ from the existing situation.

Reservoirs

- 4.37. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.

4.38. According to EA flood risk from reservoirs mapping (Figure 13) the site is at risk of flooding in the event of a breach at the King George VI, Queen Mother, Wraysbury, George V FSA, Hilfield Park, Black Park Lake, Staines North, Staines South, Stoke Park Upper Lake, Ruislip Lido, Bourne Ditch, and Fulmer Wood Lake reservoirs.

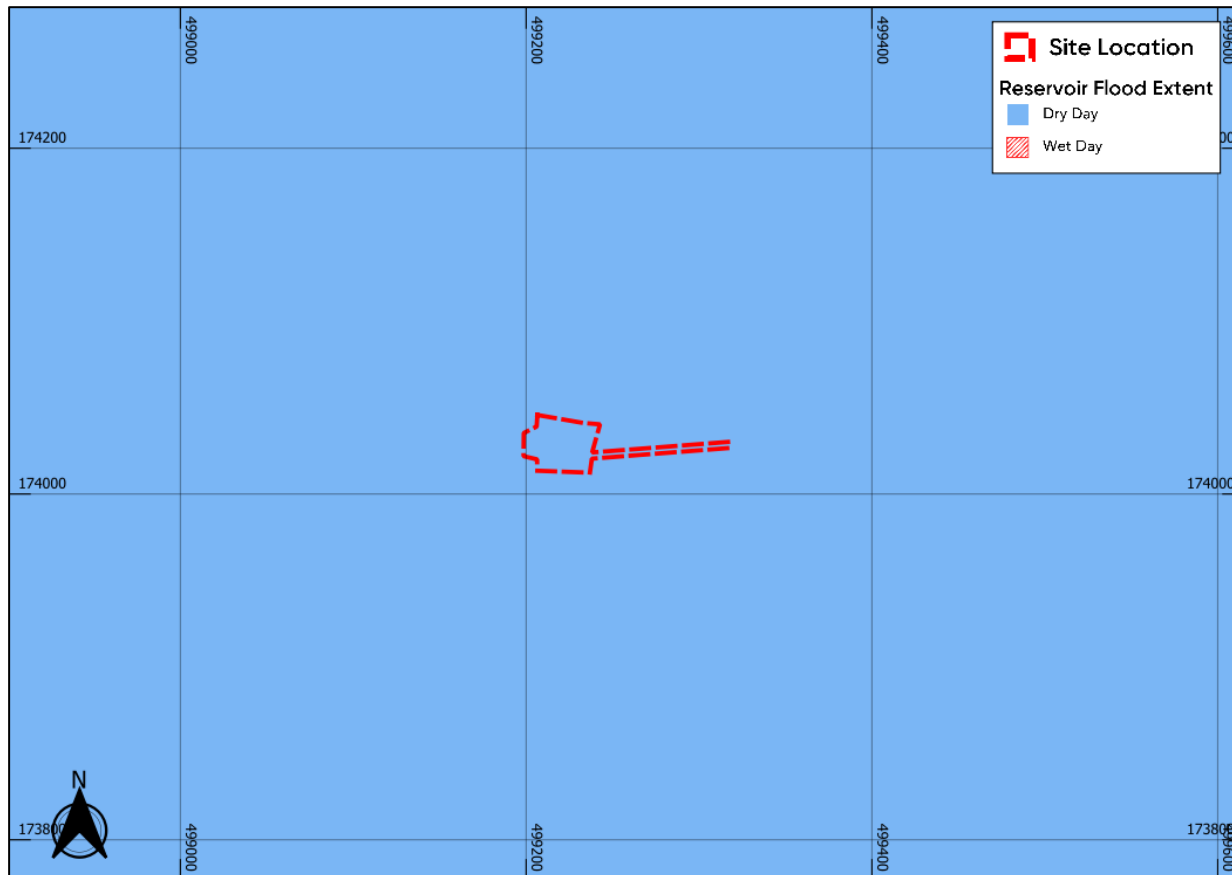


Figure 12: EA Reservoir Flood Risk Mapping (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.39. As reservoirs are highly managed, the maximum flood extent provided in the EA Risk of Flooding from Reservoir mapping is considered a worst-case scenario.

4.40. Therefore, given these criteria the site is deemed at a low risk of flooding from this source.

Groundwater

4.41. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.

- 4.42. The British Geological Survey's (BGS) mapping indicate the bedrock at the site is comprised of London Clay Formation – clay, silt, and sand. Additionally, superficial deposits are present in the form of Alluvium – Clay, Silt, Sand and Gravel. The site borders another superficial deposit formation comprised of Shepperton Gravel Member – sand and gravel.
- 4.43. The SFRA presents the EA's Areas Susceptible to Groundwater Flooding mapping. The site is within a 1km cell of which $\geq 75\%$ is considered susceptible to groundwater flooding (Figure 14).
- 4.44. The risk from groundwater to the site is considered moderate to high.

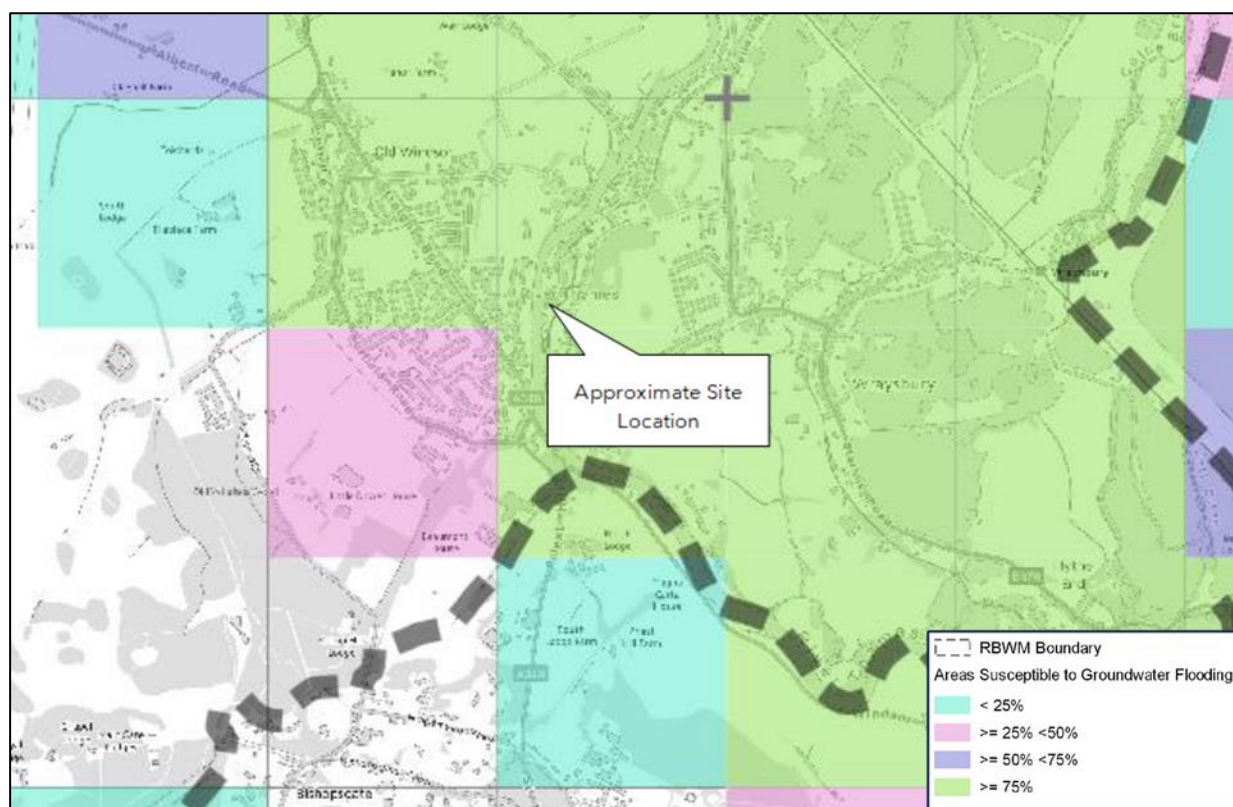


Figure 13: Excerpt of Figure E, Areas Susceptible to Groundwater Flooding (RBWM SFRA, 2017)

Sewer

- 4.45. Surface water sewers can be a cause of flooding where the drainage network has become overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.

- 4.46. The SFRA provides mapping of historic sewer flood incident records (Figure 15). No historical sewer surcharging incidents have been recorded in the vicinity of the site. The nearest recorded sewer flooding event is approximately 250m southeast of the site.
- 4.47. No records of Critical Drainage Areas we're found through available Local policy documentation. It is understood that Critical Drainage Areas have not been defined within the Local Authority Area.
- 4.48. The development is therefore considered to be at low risk of flooding from sewers.

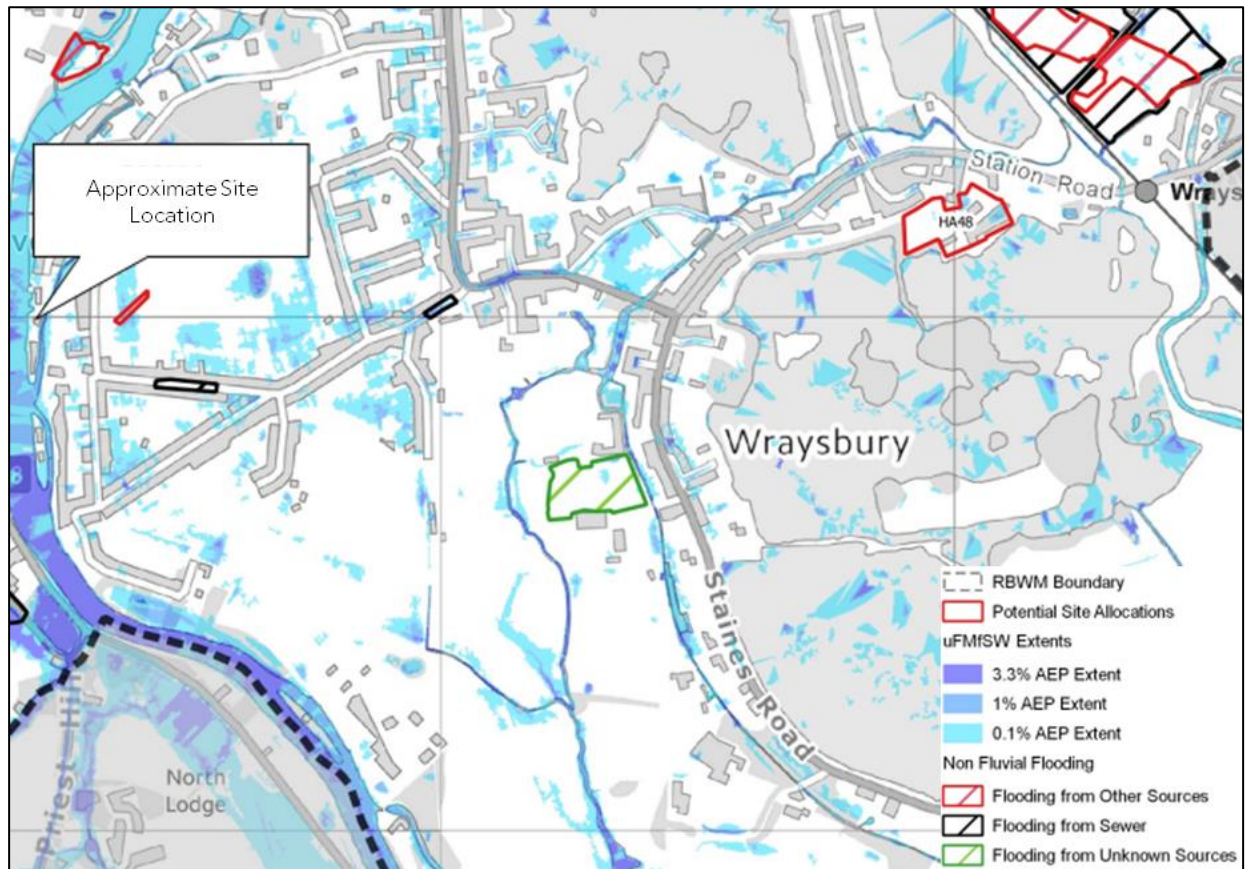


Figure 14: Non-Fluvial Flood Sources (RBWM SFRA, 2017)

5. Flood Risk Mitigation

- 5.1. Analysis within this report indicates that the site would be affected in the 1 in 30-year, 1 in 100-year, 1 in 100-year + climate change (35%) and 1 in 1000-year fluvial events based on the EA Lower Thames (2019) model outputs.
- 5.2. However it is important to note that the proposed car port is considered a Minor Development in terms of flood risk and will be open at ground floor to allow water to enter the structure should the site flood. It is noted from the plans provided by the client that the FFLs of the first floor office above the car port will be set approximately 2.27m above the finished car port level, and thus above the maximum expected depths in the aforementioned events (1.92m in the modelled 1:1000 year event).
- 5.3. The site is considered to be at low to high pluvial risk, with surface water extents generally confined to the watercourse that intersects the site, and at high risk from groundwater flooding.

Finished Floor Levels

- 5.4. Due to the nature of the development (carport), the FFLs of the car port will be set at the ground level of the site:16.00m AOD. It is noted that this is below all modelled flood levels. However, the FFLs of the first floor office above the car port will be set approximately 2.27m above the finished car port level, and thus above the maximum expected depths in the aforementioned events (1.92m in the modelled 1:1000 year event).
- 5.5. Additional flood mitigation measures should be incorporated into the proposed carport.

Flood Resistance and Resilience Measures

- 5.6. The proposed carport should also be constructed in a flood resilient manner, in accordance with CLG Report *Improving the Flood Performance of New Buildings Flood Resilient Construction (2007)*.
- 5.7. The following mitigation measures are recommended:
 - Solid (i.e. concrete floors) with waterproof screed.
 - Raised wiring and power outlets at ground level.
 - Waterproof plasterboard used at ground floor.

- Residents to sign up to the EA Flood Warning Service (River Thames at Cookham including Cookham Lock, Cookham Village and East Cookham Rise).

EA Flood Warning Service

- 5.8. As a further precaution and risk reduction, the owner of the site should sign up the EA Flood Warning Service (River Thames at Wraysbury village including Welley). This service allows site owners to register an address, which is at risk of flooding, along with contact details so that in the event of a flood being forecast, the site owner will be sent an alert directly to their chosen method of contact.
- 5.9. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site owners some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a breach event). Flood alerts and warnings provide site managers with time to take necessary action, e.g. communication of the risk of flooding to occupants/employees etc, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site specific flood defences.

Impact on Flood Risk Elsewhere

- 5.10. As discussed previously, the proposal could be considered a Minor Development, as it is for the construction of a carport to the existing dwelling on site.
- 5.11. Paragraph 051 of the Flood Risk and Coastal Change PPG states:

Minor developments are unlikely to raise significant flood risk issues unless:

- *they would have an adverse effect on a watercourse, floodplain or its flood defences;*
- *they would impede access to flood defence and management facilities, or;*
- *where the cumulative impact of such developments would have a significant effect on local flood storage capacity or flood flows.*

- 5.12. As such, the proposed development in isolation is not expected to cause significant displacement of flood water.

EA Flood Risk Activity Permit

- 5.13. It is noted that the changes to the bridge from existing to proposed are only minor. The proposed changes are:
- Increase in bridge width from 1.5m to 3m
 - The addition of three support pillars below the bridge
- 5.14. Three approximately 0.22m wide pillars will be used to support the bridge to make it car compatible. With a channel length of 6.4m, the pillars only reduce the conveyance capacity of the river by 10.3%. As such this could be considered a minor impact on flow conveyance.
- 5.15. Nevertheless, it is noted that, due to the proposed changes to the bridge being over a fluvial main river, an EA Flood Risk Activity Permit will be required.

6. Conclusions

- 6.1. This FRA has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at 32 Friary Road, Wraysbury, Royal Borough of Windsor and Maidenhead, TW19 5JP. It has been written to support a planning application and has been prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.
- 6.2. The FRA supports the planning application and demonstrates that there is a high level of flood risk to the site, therefore mitigation strategies are recommended to be implemented in the scheme. The development is not expected to increase flood risk off site or to the wider area.

Source of Flooding	Flood Risk Summary
Fluvial	<p>Analysis within this report indicates that the site would be affected in the 1 in 30-year, 1 in 100-year +CC (35%) and 1 in 1000-year fluvial events based on the EA Lower Thames (2019) model outputs.</p> <p>Due to the nature of the development (carport), the FFLs of the car port will be set at the ground level of the site:16.00m AOD. It is noted that this is below all modelled flood levels. However, the FFLs of the first floor office above the car port will be set approximately 2.27m above the finished car port level, and thus above the maximum expected depths in the aforementioned events (1.92m in the modelled 1:1000 year event).</p> <p>The proposed carport should also be constructed in a flood resilient manner, in accordance with CLG Report Improving the Flood Performance of New Buildings Flood Resilient Construction (2007).</p>
Pluvial	<p>The location of the bridge is affected by the pluvial 'Low Risk' event. As such, the risk to the bridge can be considered as low. Due to the proposed changes to the bridge being minor, the change from the existing situation can also be considered as low.</p> <p>Access/ egress arrangements would not differ from the existing. Residents should sign up to the EA Flood Warning Service - River Thames at Wraysbury village including Welley.</p>
Reservoirs Groundwater Sewers	<p>Flood risk from sewers is considered low.</p> <p>The site is shown to be within a reservoir flood risk extent. However, as reservoirs are highly managed, the maximum flood extent provided in the EA Risk of Flooding from</p>

Canals	<p>Reservoir mapping is considered a worst-case scenario. Therefore, given these criteria the site is deemed at a low risk of flooding from this source. Although, to be precautionary, flood resilient design and building practices could be implemented to further reduce risk.</p> <p>The risk of flooding from groundwater to the site is considered high but to the development is considered low as flood mitigation measures should be incorporated into the proposed carport.</p>
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- 6.3. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

Appendix A – Development Proposals

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Notes:

Rev	Comment	By	Date
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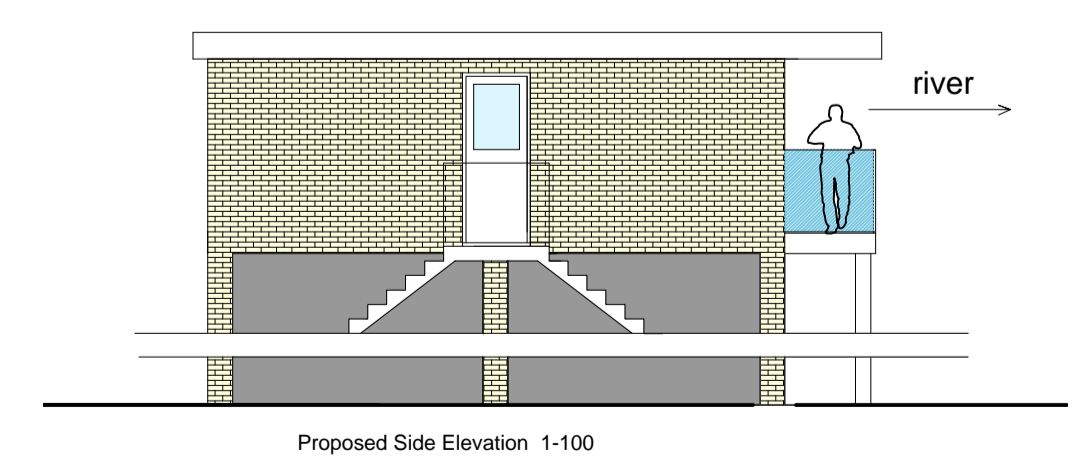
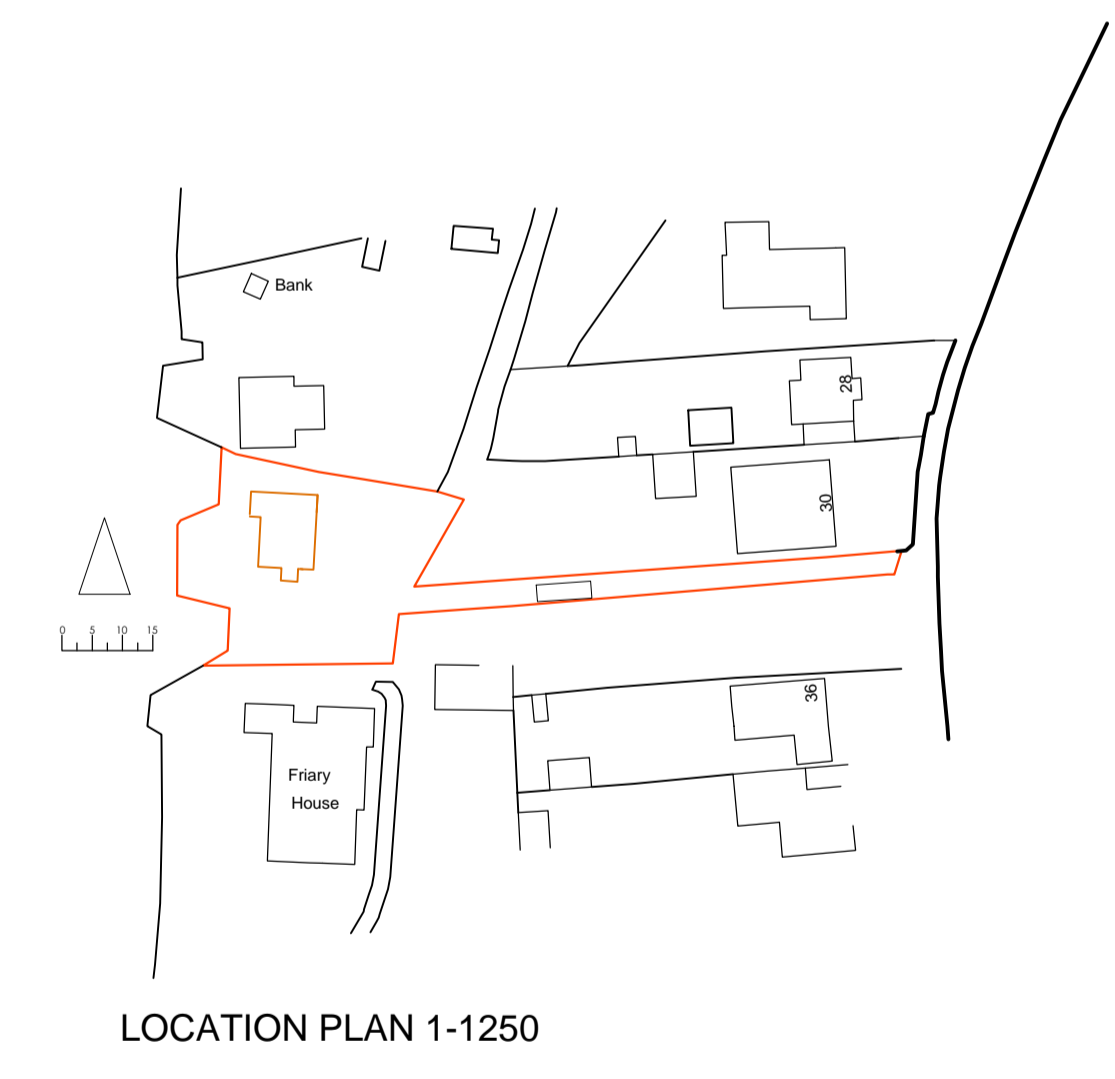
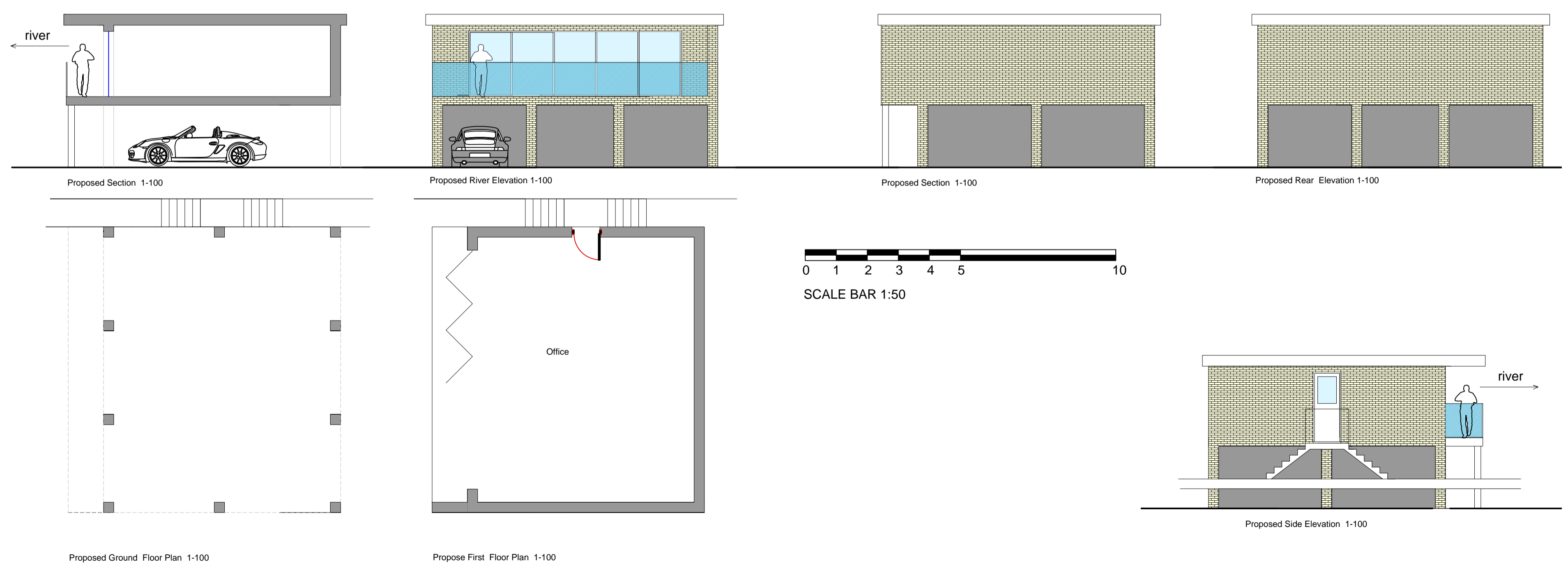
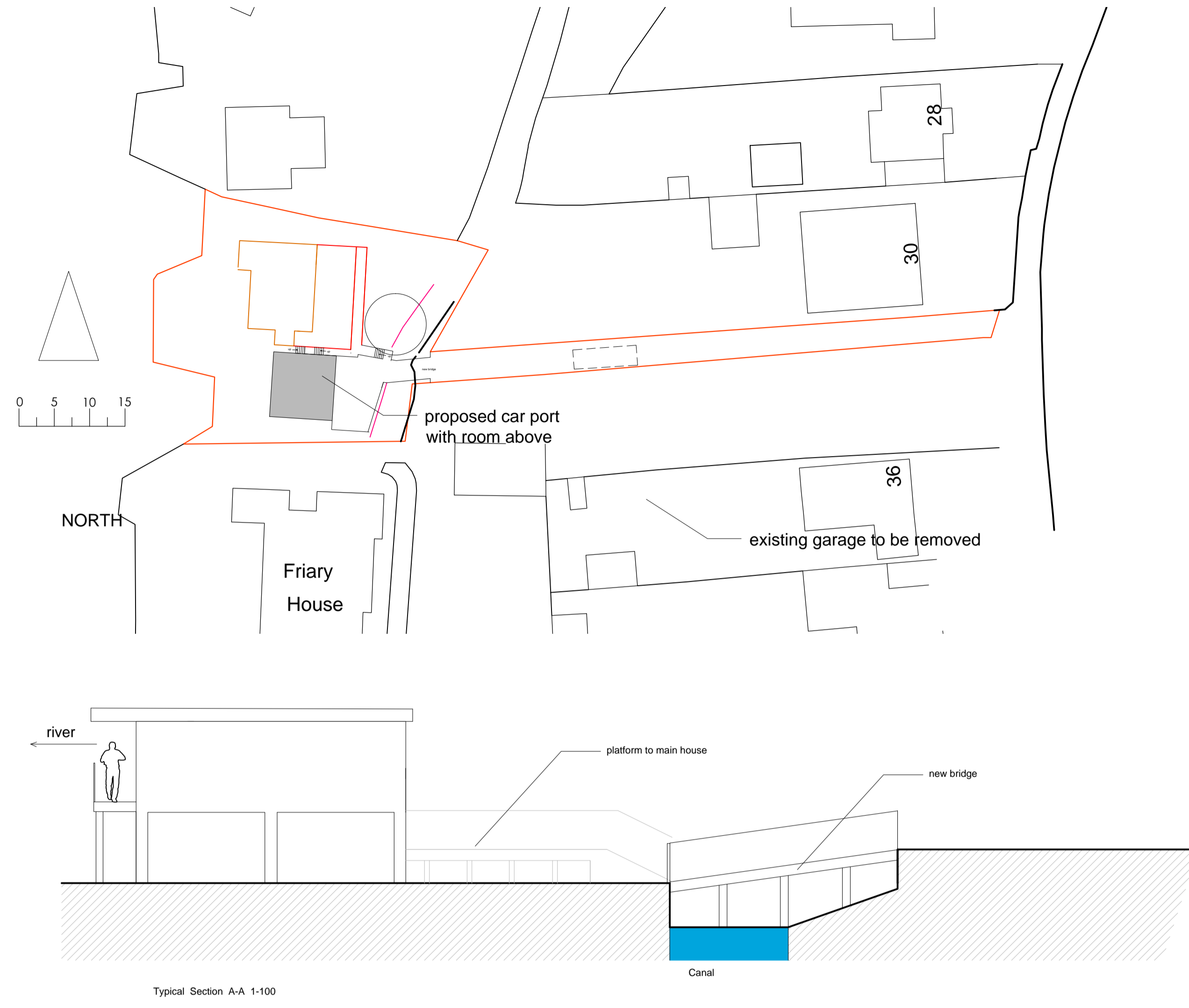
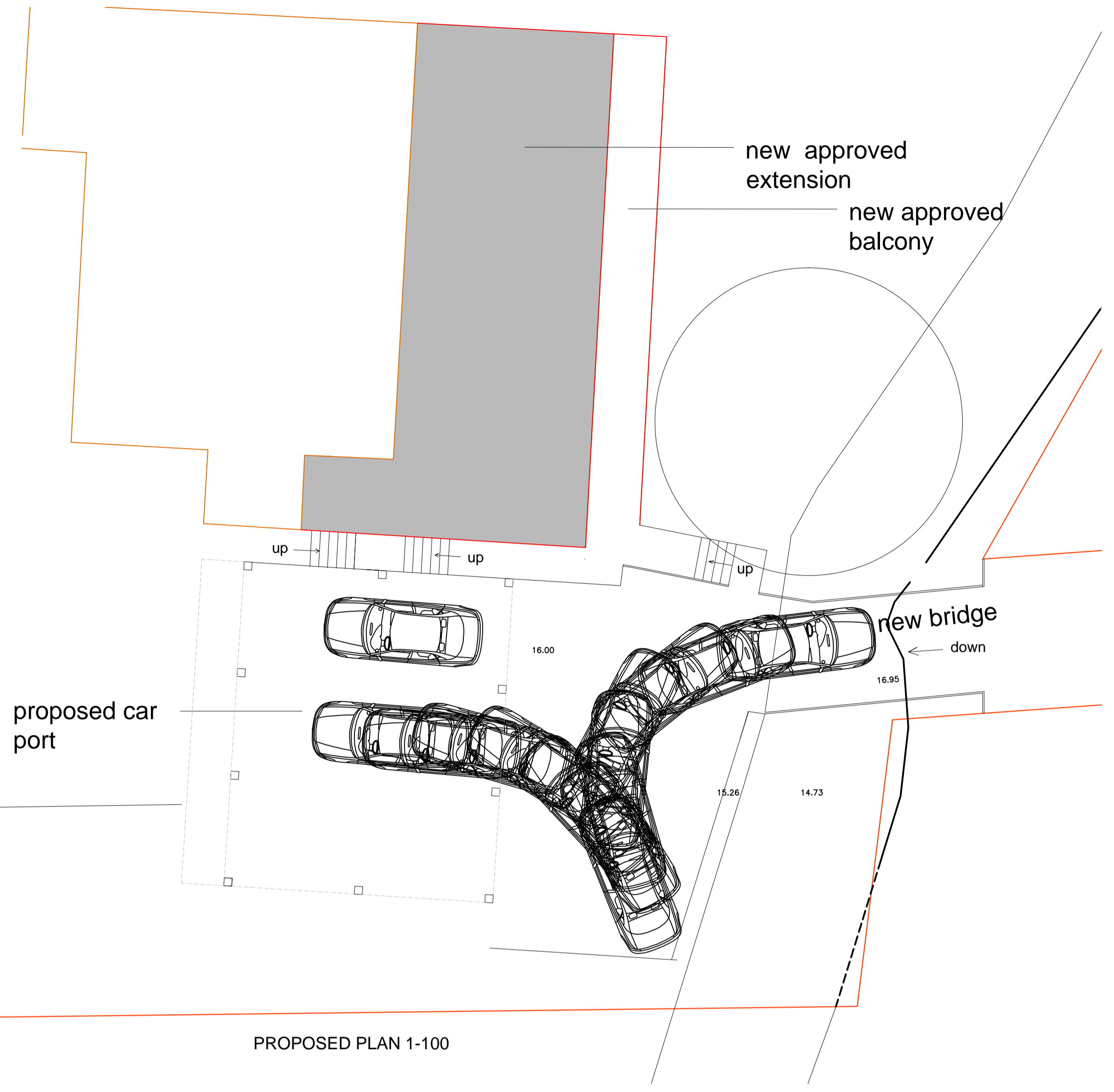
Client:
Mr Saandeep

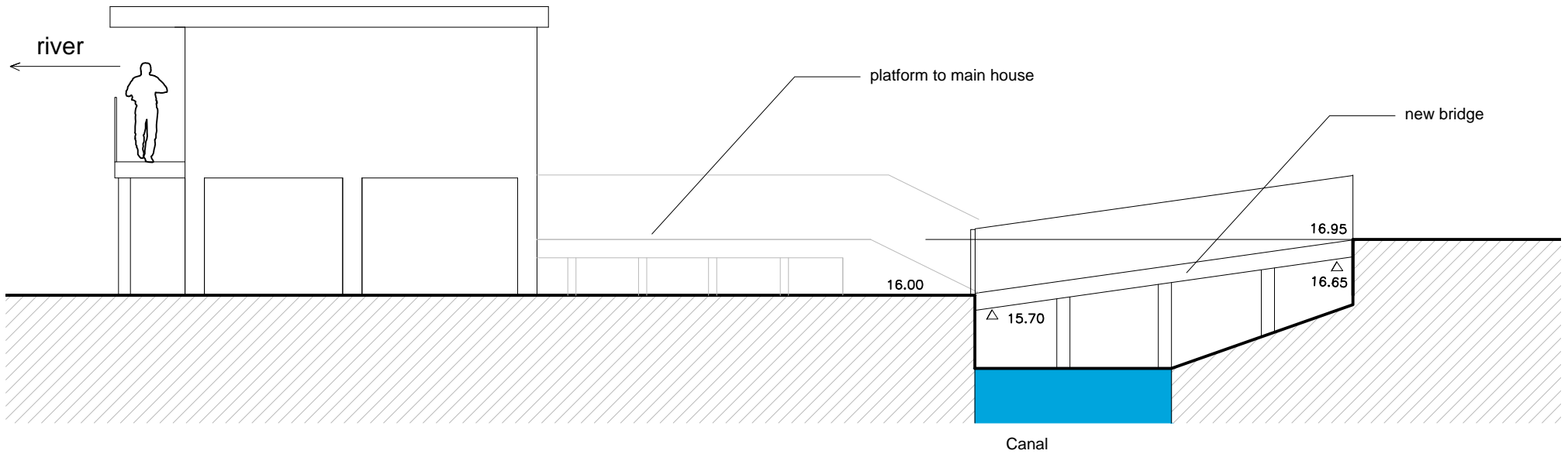
Job Title:
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Drawing Title:
Proposed Car Port

Status:
PLANNING

Date Drawn: June 23	Drawn By: MHG	Scale: 1-50
Job No: 7042	Drg No: 1	Rev: A





Typical View A-A 1-100

Appendix B – Topographic Survey

