



Flood Risk Assessment

65, Carlyon Road, Hayes, UB4 0NS

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1 Introduction

National planning policy and local planning policy require a Flood Risk Assessment (FRA) to support development planning applications, to demonstrate how risks from all sources of flooding to the site and elsewhere will be managed.

This report details the FRA in respect of development proposals for 65 Carlyon Road, Hayes, UB4 0NS. A full assessment of the flood risk to the site and consideration of the surface water management as a result of the development has been considered as part of this analysis.

Data has been analysed from several sources to inform this assessment, including: the Environment Agency (EA), the British Geological Society (BGS), National Soil Research Institute (NSRI), Ordnance Survey (OS), commercially available historical mapping and relevant strategic documents developed by Hillingdon Council, in their capacity as the Lead Local Flood Authority and Local Planning Authority.

2 Policy Requirements

2.1 National Planning Policy

Paragraph 181 of the NPPF states "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 assessment⁶³. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (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;
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
- d) any residual risk can be safely managed; and
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan".

Footnote 63 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".

Furthermore paragraph 30 of the Planning Practice Guide on Flood Risk and Climate Change states "A site-specific flood risk assessment is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary, the assessment should accompany a planning application submitted to the local planning authority. The

assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.

The objectives of a site-specific flood risk assessment are to establish:

- whether a proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- evidence for the local planning authority to apply (necessary) the Sequential Test, and;
- whether the development will be safe and pass the Exception Test, if applicable".

Continuing paragraph 31 of the Planning Practice Guidance quotes "The information provided in the flood risk assessment should be credible and fit for purpose. Site-specific flood risk assessments should always be proportionate to the degree of flood risk and make optimum use of information already available, including information in a Strategic Flood Risk Assessment for the area, and the interactive flood risk maps available on the Environment Agency's web site.

A flood risk assessment should also be appropriate to the scale, nature and location of the development. For example, where the development is an extension to an existing house (for which planning permission is required) which would not significantly increase the number of people present in an area at risk of flooding, the local planning authority would generally need a less detailed assessment to be able to reach an informed decision on the planning application. For a new development comprising a greater number of houses in a similar location, or one where the flood risk is greater, the local planning authority would need a more detailed assessment".

2.2 Local Planning Policy

Local Authorities consider flood risk through relevant environmental and climate change policies which enforce the requirements of the NPPF. Relevant local policy, as outlined by Hillingdon Council, is contained within the;

- i) Strategic Flood Risk Assessment
- ii) Local Flood Risk Management Strategy

The Strategic Flood Risk Assessment (SFRA) and the Local Flood Risk Management Strategy (LFRMS) are key sources of flood risk specific information for the area. The SFRA provides a more detailed review of flood risks and recommendations for ensuring developments can be constructed and operated safely in accordance with the NPPF. Furthermore, reference to the London Plan Policy 5.12 is considered within this assessment.

2.3 Flood Risk Zones, Vulnerability and Classification

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning available on the Environment Agency's web site, as indicated in the table below.

Table 1 - Flood Zones

Flood Zone	Definition
Zone 1 <i>Low Probability</i>	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 <i>Medium Probability</i>	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. (Land shown in light blue on the Flood Map)
Zone 3a <i>High Probability</i>	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. (Land shown in dark blue on the Flood Map)
Zone 3b <i>The Functional Floodplain</i>	This zone comprises land where water has to flow or be stored in times of flood. 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)

Table 2 - Flood Risk Vulnerability Classification

Essential Infrastructure
<ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable
<ul style="list-style-type: none"> • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable
<ul style="list-style-type: none"> • Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.

<ul style="list-style-type: none"> • Non-residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable
<ul style="list-style-type: none"> • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water Compatible Development
<ul style="list-style-type: none"> • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

* Landfill as defined in Schedule 10 to the Environmental Permitting (England and Wales) Regulations 2010.

Table 3 - Flood risk vulnerability and flood zone 'compatibility'

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a†	Exception Test required†	X	Exception Test required	✓	✓
Zone 3b*	Exception Test required*	X	X	X	✓*

Key:

✓ Development is appropriate

X Development should not be permitted.

Notes to *Table 3*:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability, and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

2.4 Minor development in context of Planning Practice Guidance

Section 17 of the Planning Practice Guidance for Flood Risk and Coastal Change defines minor development as:

- minor non-residential extensions with a footprint less than 250 square metres;
- development that does not increase the size of buildings e.g. alterations to external appearance;
- householder development, e.g. 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 e.g. subdivision of houses into flats.

Furthermore section 18 of the Planning Practice Guidance for Flood Risk and Coastal Change looks at whether minor developments likely to raise flood risk issues? It 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.

The Environment Agency’s advice on flood risk assessments is helpful for ensuring extensions or alterations are designed and constructed to conform to any flood protection already incorporated within the property and include flood resilience measures in the design.

The Environment Agency’s advice for minor developments is to ensure floor levels are either no lower than existing floor levels or 300 millimetres (mm) above the estimated flood level.

3 Summary of Site Characteristics and Development Proposals

The proposals are for a rear extension to replace existing conservatory at 65 Carlyon Road, Hayes, UB4 0NS.

The site is a brownfield / developed plot. The approximate area of the site is 280m², of which 260m² is covered by impermeable surfaces such as hardstanding and roofing. The proposals are classified as minor development in the context of Planning Policy Guidance.

Figure 1 provides the location details and *Figure 2* shows an aerial photograph of the development site.

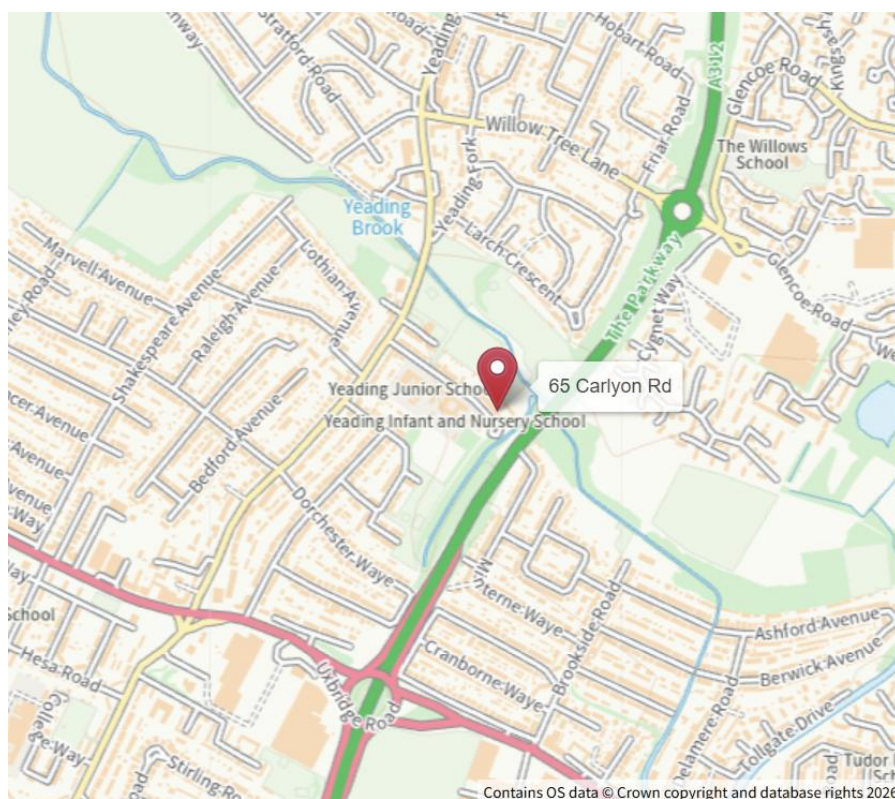


Figure 1 - Detailed location plan of the development site, highlighted.

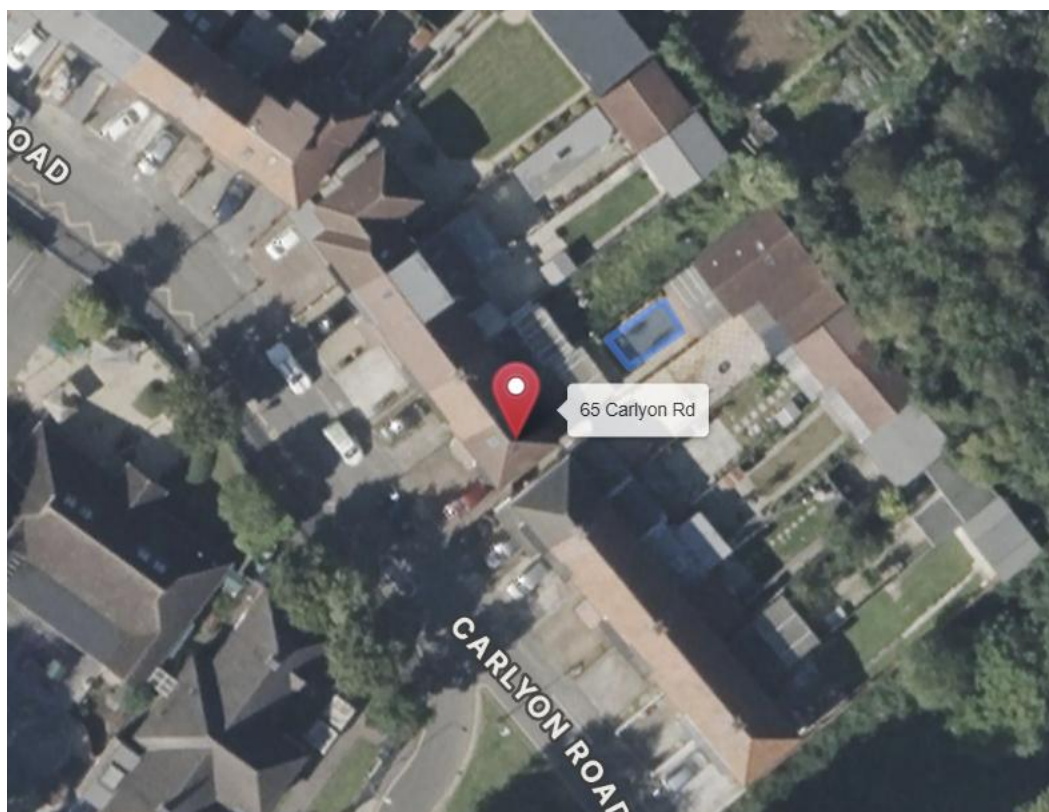


Figure 2 - Aerial view of the development site.

The development will be built on existing hard / impermeable ground therefore will result in no change in impermeable area, and there will be a decrease in overall footprint of 3.3m².

Residential dwellings are classified as More Vulnerable development within *Table 2 - Flood Risk Vulnerability Classification* of the Planning Practice Guidance.

Figure 3 shows the proposed ground floor layout for the development.

Ground Floor Plan.

1 : 100

Ground Floor Plan.

1 : 100

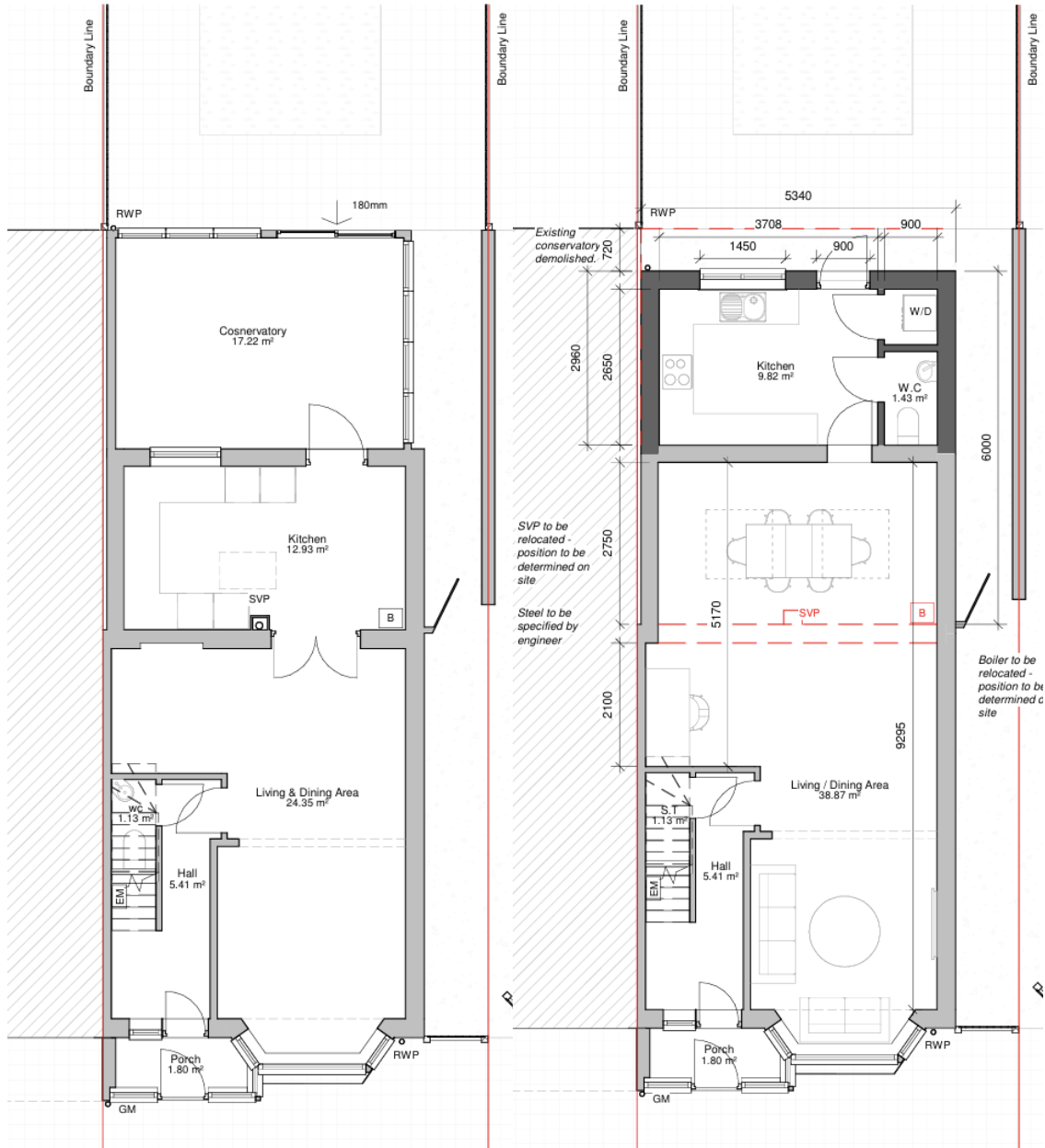


Figure 3 – Existing (left) and proposed (right) ground floor plans

4 Sources of flooding

4.1 Fluvial/Tidal

The Environment Agency's Flood Map for Planning (Rivers and Sea) identifies fluvial and tidal flood zones and provides an indication of whether these zones are protected, due to the presence of flood defences. *Figure 4*, below, presents the Flood Map for the surrounding area and identifies the development site to lie within Defended Flood Zone 2, and having between a 1 in 100 and 1 in 1,000 annual probability of river flooding.



Figure 4 - Flood Map for Planning (Rivers and Sea) allowing for climate change

Climate change information for the site shows no change in flood extent to affect the property.

The Environment Agency's Product 4 data confirms that the property and extension lie outside the extent of the long-term design flood as seen in *Figure 5* which shows the 1 in 100 year plus 54% defended extent. The site is consequently considered to be at low residual risk of fluvial flooding.



Figure 5 – 1 in 100 year plus 54% climate change defended flood extent, extension highlighted (in orange)

4.2 Surface Water

The Environment Agency’s updated Flood Map for Surface Water (uFMfSW) identifies pluvial flood risk. *Figure 6*, below, presents the surface water flood map (with climate change) for the development site and the surrounding area, showing the property and area of proposed extension to be at Very Low risk in the present day and remaining Very Low risk in the climate change scenario.

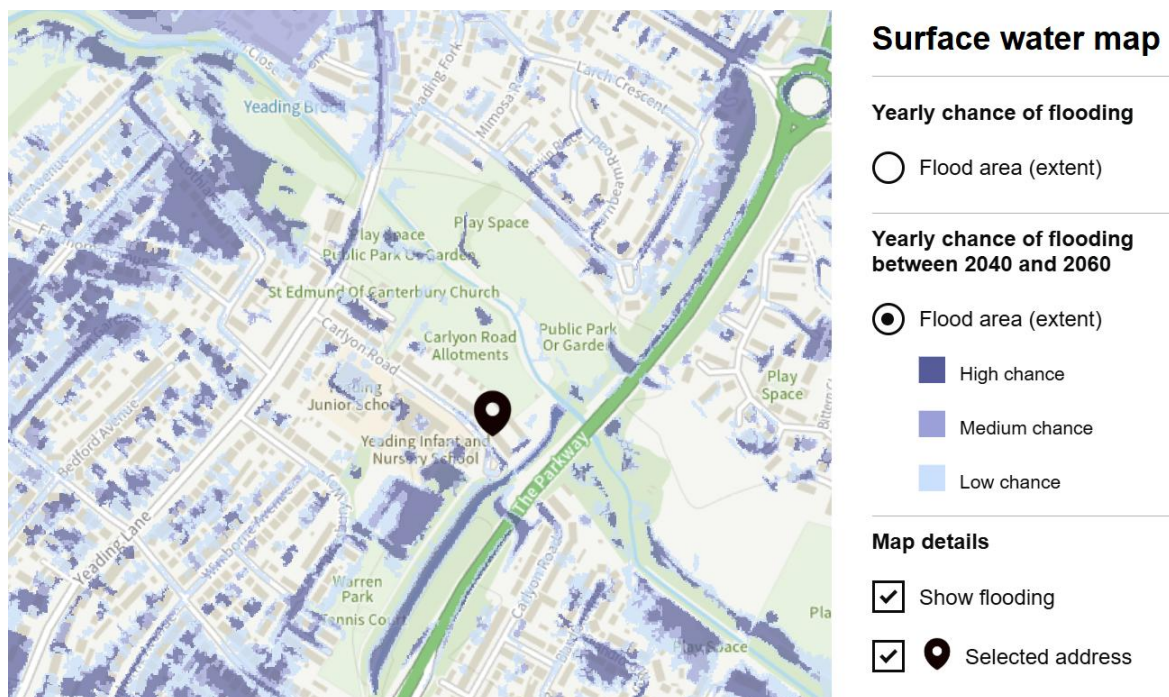


Figure 5 - Flood Map for Surface Water, with Climate Change

4.3 Reservoir

The development is at risk from Charville Lane FSA which is owned by The Environment Agency. Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensures that reservoirs are inspected regularly, and essential safety work is carried out.

4.4 Groundwater

The Environment Agency’s Groundwater Vulnerability Map shows the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a single square kilometre from which the suitability of SuDS can be considered. This mapping indicates that the development site is not situated over an area of groundwater vulnerability.

Further analysis shows that the development site is not situated over a Groundwater Source Protection Zone.

Considering groundwater flooding, the Environment Agency use flood alert data to check the risk of flooding from groundwater. From a review of this information flooding from groundwater is unlikely in this area.

4.5 Flood history

A review of strategic flood risk documents, including Section 19 reports, has not identified there to be a history of flooding on the site.

4.6 Flood displacement

The development will result in a decrease in overall footprint of -3.3m². Therefore, the development is unlikely to displace flood water and increase flood risk elsewhere, compared to present day.

5 Surface Water Drainage

The existing runoff rate for the site has been calculated using the Modified Rational Rainfall Method given the site is already developed. Table 4 details the approach to estimating the existing runoff rate.

Table 4 - Existing Runoff Calculation

Modified Rational Rainfall Method		
where $Q = 2.78 * C_v * C_r * R_i * A$		
CV =	0.75	fully impermeable areas, e.g. roads and hardstanding
Cr =	1.3	Routing Coefficient (CIRIA C697 recommends a value of 1.3)
Ri =	120 mm	rainfall intensity
A =	0.026 ha	current impermeable area
Q =	8 l/s	

At present the site drains via the public sewerage system at $Q = 8 \text{ l/s}$.

6 Hierarchy of disposing surface water

The Planning Practice Guidance and part H of the Building Regulations state that “generally, the aim should be to discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable:

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer”.

6.1 Infiltration

Records from the British Geological Survey have been reviewed to understand the geology of the area. These show that the site is underlain by London Clay Formation-Clay, silt and sand, which generally has low permeability, making it poorly suited for infiltration-based Sustainable Drainage Systems (SuDS). Clay-rich soils tend to impede water movement, leading to slow infiltration rates and potential surface water pooling. London Clay behaves as an unproductive aquifer with negligible infiltration capacity. Any attempt to infiltrate runoff would simply cause water to perch, migrate laterally, or soften the clay near foundations. For a small extension this makes infiltration both ineffective and undesirable.

6.2 Surface Water Body

There are no accessible watercourses within the immediate vicinity of the development.

6.3 Public Sewer

The property presently drains to the public sewerage system, and it is proposed this is continued for existing drainage. As the extension replaces existing hardstanding, there will be no increase in impermeable area and therefore no additional downstream flood risk.

7 Use of SuDS

The NPPF, Planning Practice Guide and the Ministerial Statement promote the use of SuDS as a priority to aid the disposal of surface water from new developments. Given there will be no increase in impermeable area there is no additional runoff to manage. However, some betterment can be provided via a high capacity waterbutt connected to the new roof and any replacement patio area should be of permeable construction.

8 Management of flood risk

8.1 Critical / design flood

The analysis of flood risk from fluvial and tidal sources shows that the site is within Defended Flood Zone 2, and having between a 1 in 100 and 1 in 1,000 annual probability of river flooding. However, in practice, the site benefits from defences which protect the property from the 1 in 100 year plus 54% climate change flood.

A review of strategic flood risk documents, including Section 19 reports, has not identified there to be a history of flooding on the site.

Surface water flood risk information predicts Very Low risk of long-term flooding.

The development will result in a decrease in overall footprint of -3.3m². The development is unlikely to displace flood water and increase flood risk elsewhere, although given the Low risk to the site, the risk of displacement is not significant. In line with standing Environment Agency advice, the finished floor level should be set no lower than existing.

The development will not detrimentally affect overland flood flows.

8.2 Surface water runoff

The development will result in no change in impermeable area, therefore, will not increase surface water runoff. There is a public sewerage system available and it is proposed that surface water is discharged to this system with separate connections to the foul and surface water systems, where available.

At present, the impermeable area to be developed discharges to the public surface water sewer. As the extension footprint replaces existing hardstanding, the proposals do not increase impermeable area and will not elevate downstream flood risk.

8.3 Flood Resilience Measures

In line with government guidance, it is not possible to raise finished floors above the design flood level. As such, the building design should:

- prioritise excluding flood water where possible
- speed recovery in case water gets in

All flood resilience options will follow the guidance in the CIRIA Property Flood Resilience Code of Practice. Note that the code of practice uses the term recovery measures. In this report we use resilience measures.

Flood resistance measures can work on extensions, but success is often determined by retrofitting measures across the entire property which is more difficult with adjoining properties. The measures recommended are therefore focused on a 'water entry' strategy – improving the resilience of the property and the ability to recover more quickly should flooding occur.

The design will include the following resilient measures:

- Doors will be adequately sealed to the fabric of the property and include double glazing to relevant standards.
- Where cavity insulation is being utilised, it will be in the form of a rigid closed cell material due to its low moisture take up.
- Standard gypsum plasterboard will be used for linings.
- New service entries will be sealed with expanding foam or similar closed cell material. Closed cell insulation will be used for pipework below flood level
- Sensitive electrical equipment, wiring and sockets will be raised as high as practicable;
- Soil pipes will be protected from back-flow by using non-return valves.

Standards are available for:

- the installation and retrofit of resistance measures - [British Standard 851188-1:2019+A1:2021](#)
- speeding the recovery of buildings after a flood - [British Standard 85500:2015](#)
- dealing with and preventing water from the surrounding ground entering below ground structures such as basements - [British Standard 8102:2022](#)

The development needs to comply with relevant Building Regulations in Part P. They set minimum and maximum heights for certain electrical infrastructure.

8.4 Safe refuge, access and egress

In the event of flooding, users of the development will have internal access to a higher floor for safe refuge.

9 Conclusions

The development is situated in Defended Flood Zone 2; More Vulnerable minor developments are appropriate in Defended Flood Zone 2.

In terms of surface water, the property is at Very Low risk in the long-term scenario.

The finished floor level should be set no lower than existing.

The development will result in a decrease in overall footprint of -3.3m².

The development will result in no change in impermeable area. Any replaced patio will be constructed with permeable materials.

Based on the likely flooding risk, it is considered that the proposed development can be operated safely in flood risk terms, without increasing flood risk elsewhere and is therefore appropriate development in accordance with the NPPF.