



FLOOD RISK ASSESSMENT

Site Address

85 Spring Gardens

Buxton

SK17 6BP

Client

Katie Wright

Date

27/01/2021



1 Document Control



FLOOD RISK ASSESSMENT



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Report Author:	Francesca Caggiano (MSc, BSc) Environmental Consultant
Authorised by:	Simon Makoni (MSc, BSc) Environmental Consultant / Director

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2 Abbreviations

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

3 Disclaimer

This report and any information or advice which it contains, is provided by STM Environmental Consultants Ltd (STM) and can only be used and relied upon by Katie Wright (Client).

STM has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant when undertaking works of this nature. However, STM gives no warranty, representation or assurance as to the accuracy or completeness of any information, assessments or evaluations presented within this report. Furthermore, STM accepts no liability whatsoever for any loss or damage arising from the interpretation or use of the information contained within this report. Any party other than the Client using or placing reliance upon any information contained in this report, do so at their own risk.

4 Executive Summary

Location	85 Spring Gardens, Buxton, SK17 6BP Grid reference: 406150, 373624
Proposed Development	Change of use from existing fast-food restaurant to one person, one bedroom flat.
Flood Zone	Flood Zone 3.
Topography	285.9mAOD (NE) to 287mAOD (SW).
Sequential and Exception Tests	Development is for a change of use so Sequential and Exception Tests may not be required. LLFA to decide.
Main Sources of Flooding	River Wye.
Flood Defences	None.
Records of Historic Flooding	None.
Fluvial (River) and Tidal (Sea) Flood Risk	Medium to High – the site witnesses between 400mm to 1.5m of flooding during the 1 in 100-year event.
Pluvial (Surface Water) Flood Risk	Low – site will remain dry during the 1 in 100-year event. Flood depths up to 300mm during the 1 in 1000-year event.
Flood Risk from Artificial (Canals and Reservoirs) Sources	Low – No significant artificial sources identified.
Groundwater Flood Risk	Low – Although site is potentially susceptible to groundwater flooding, no recorded incidents have been identified.
Development Impacts on Local Flood Risk	The development is internal and therefore will not increase the site impermeable area. As such it is unlikely to have an adverse impact on local flood risk.
Proposed Flood Risk Mitigation Measures	- Finished floor levels of the first floor can be retained as existing; - Construction will utilise flood resistant materials and services will be placed as high as practicable to reduce impact of flooding; - Occupants will sign up for EA Emergency Flood Warning Direct Service; - Safe egress to flood zone 1 is a 1-minute walk away and safe refuge is available on upper floors.
Surface Water Management (SuDS)	SuDS would reduce current surface water run off rates however given the small size of the site (200m ²), there is limited potential for implementation. Consideration should be given to rainwater harvesting and permeable paving where possible.
Conclusions	Given the information reviewed, the overall flood risk to the site is considered to be moderate. With the proposed mitigation measures in place and considering that the proposal is for a change of use of the first floor only, the development will be safe for its residents and it is unlikely to have a significant impact on local flood risk.

5 Introduction

STM Environmental Consultants Limited (STM) has been appointed by Katie Wright (Client) to provide a Flood Risk Assessment (FRA) at a site located at 85 Spring Gardens, Buxton, SK17 6BP.

6 Development Proposal

The FRA is required to support a planning application for the change of use from existing fast-food restaurant to one person, one bedroom flat. Existing building shell is used.

Further details including drawings of the development plans are available in [Appendix 2](#).

7 Report Aims and Objectives

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

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

8 Summary of Data Review Undertaken

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

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

9 Legislative and Policy Context

9.1 Legislative Context

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

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

9.2 Policy Context

9.2.1 National Planning Policy Framework (NPPF)

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

Section 14 entitled “Meeting the challenge of climate change, flooding and coastal change” deals specifically with flood risk. Among other things it states that LPAs should try to ensure that “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere”. It further states that when determining planning application, LPAs should “ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

-  within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
-  development is appropriately flood resilient and resistant;
-  it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
-  any residual risk can be safely managed; and
-  safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

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

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

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

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

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

9.2.2 Local Planning Policy

Policy EQ 11 addresses Flood Risk Management.

The Council will support development proposals that avoid areas of current or future flood risk and which do not increase the risk of flooding elsewhere, where this is viable and compatible with other policies aimed at achieving a sustainable pattern of development. When considering planning applications, the Council will also have regard to all relevant Catchment Flood Management Plans and the Local Flood Risk Management Strategy.

Only permitting development within areas at risk from flooding as defined by the Environment Agency if:

-  a sequential test as set out in the technical guidance to the NPPF demonstrates that this is the only site where the development can be located;

-  on a site which has passed the sequential test but where flood risk still exists, the sequential approach has been used to locate the most vulnerable parts of the development in the areas of lowest flood risk;
-  where necessary an exception test as set out in the technical guidance to the NPPF demonstrates that the proposed development can be accommodated with an acceptable degree of safety;
-  a site-specific flood risk assessment shows that the site is protected adequately from flooding, or the scheme includes adequate flood defences or flood risk management measures;
-  it does not damage or inhibit existing flood defence and flood risk management structures or measures; and
-  it will not cause or worsen flooding on the site or elsewhere, and will reduce flood risk elsewhere where possible.

Development proposals should consider opportunities to contribute towards the objectives of the relevant Catchment Flood Management Plan. Wherever possible, development should promote the reduction of flood risk by seeking to reinstate the natural floodplain, the de-culverting of watercourses and the limiting of surface water runoff to Greenfield rates via the use of sustainable drainage techniques.

Where a watercourse is present on a development site, it should be retained or restored into a natural state and enhanced where possible. The culverting of any watercourse will not normally be permitted, and development should wherever possible remove any existing culverts and increase on-site flood storage. Development should be laid out to enable maintenance of the watercourse.

Wherever possible SuDS will be expected to contribute towards wider sustainability considerations, including amenity, recreation, conservation of biodiversity and landscape character, making use of the role that trees, woodland and other green infrastructure can play in flood alleviation and water quality control.

9.3 EA Standing Advice on Flood Risk

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

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

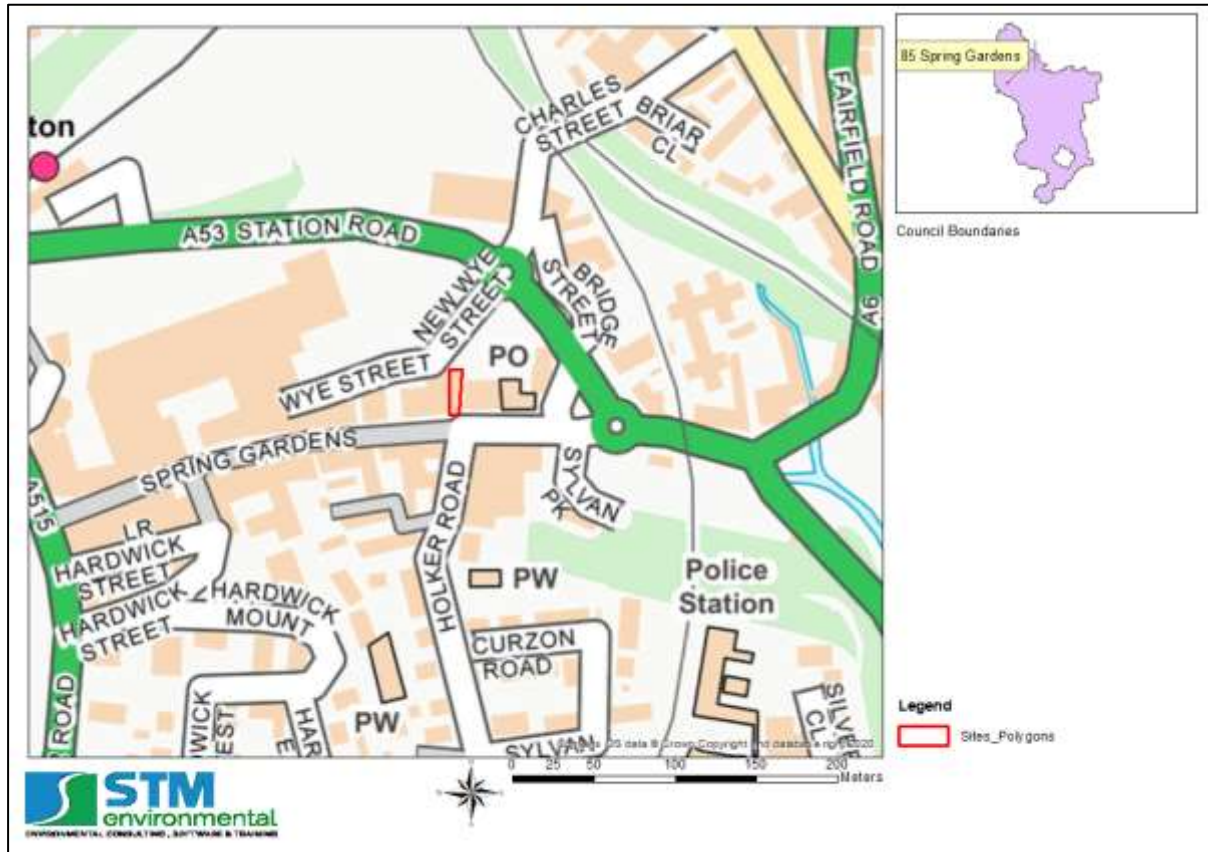
-  in flood zone 2 or 3 including minor development and change of use more than 1 hectare (ha) in flood zone 1;
-  less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs);
-  in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency.

10 Site Description and Environmental Characteristics

10.1 Site Location and Area

The site is located at 85 Spring Gardens, Buxton, SK17 6BP. It is centred at national grid reference 406150, 373624. The site has an area of approximately 200m².

A site location map and aerial photo are shown below. Photographs of the site are available in [Appendix 1](#).



10.2 Site Access

The site is accessed via Spring Gardens.

10.3 Local Planning Authority

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

10.4 Lead Local Flood Authority

Derbyshire County Council is also the Lead Local Flood Authority (LLFA).

10.5 Flood Zone

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

10.6 Site and Surrounding Land Uses

10.6.1 Site Current Land Use

The proposed development is currently used as commercial.

10.6.2 Surrounding Land Uses

The land use surrounding the site is mainly commercial and residential.

10.7 Hydrology

The nearest main watercourse is the River Wye which runs along the norther boundary of the site at approximately 15m.

10.8 Geology

Data from the British Geological Survey indicates that the underlying superficial geology is characterised as Alluvium. The underlying bedrock geology is characterized as Bowland Shale Formation.

10.9 Hydrogeology

The site lies upon a secondary A superficial and bedrock aquifer.

[Appendix 3](#) provides BGS mapping showing the hydrogeology at the site location.

10.10 Topography

A LIDAR map showing the topology of the site and surrounding area is available in [Appendix 3](#). The ground level at the site ranges from 285.9mAOD in the North-east to 287mAOD in the South-west.

A topographic survey has not been conducted.

11 The Sequential and Exception Tests

11.1 The Sequential Test

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

Minor development means:

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

The development is for a change of use, as such the Sequential Test should not be required by the LLFA.

11.2 The Exception Test

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

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

The requirements for an Exception Test are given in Table 1 and are defined in terms of Flood Zone and development vulnerability classification.

Table 1: NPPF flood zone vulnerability compatibility (source: NPPF).

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓

Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	X	Exception Test required	✓	✓
Zone 3b	Exception Test required	X	X	X	✓

Key:

✓ Development is appropriate

X Development should not be permitted.

Based on its scale and nature, the development is considered to be “more vulnerable”. However, it is for a change of use and as such the Exception Test should not be required by the LLFA.

12 Site Specific Flood Risk Analysis

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

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

12.1.1 Mechanisms for Fluvial Flooding

Fluvial, or river flooding, occurs when excessive rainfall over an extended period of time or heavy snow melt causes a river to exceed its capacity. The damage from a fluvial flood can be widespread as the overflow may affect downstream tributaries, overtopping defences and flooding nearby inhabited areas. Fluvial flooding consists of two main types:

 Overbank flooding – this occurs when water rises steadily and overflows over the edges of a river or stream;

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

12.1.2 Definition of EA Modelled Fluvial Flood Risk Zones

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

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

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

- Flood zone 3a: Greater than 1 in 100 (1%) annual probability of fluvial flooding and/or greater than 1 in 200 (0.5%) annual probability of tidal flooding;
- Flood zone 3b: Functional flood plain (definition specific to the LLFA). Less than a 1 in 20 (5%) annual probability of fluvial and/or tidal flooding.

12.1.3 Main Potential Sources of Local Fluvial Flooding

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

12.1.4 Records of Historic Fluvial Flooding Incidents

The EA's historic and recorded flood outline maps show the locations and extents of historic flooding. These maps indicate that there has been historic flooding in the vicinity of the site in 1984. Copies of the maps at the site location are available in [Appendix 4](#). The flood extent did not impact the site.

12.1.5 Designated Fluvial Flood Risk Zone for the Site

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

12.1.6 Mechanisms for Tidal Flooding

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

12.1.7 Definition of EA Tidal Flood Risk Zones

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

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

12.1.8 Potential Sources of Tidal Flooding

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

12.1.9 Flood Defences

The EA's Areas benefitting from flood defences and current flood defences map which is available in [Appendix 7](#) shows that the site does not benefit from flood defences.

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

The EA Product 4 dataset which is presented in [Appendix 10](#) provides modelled flood levels for model node points at the site. These are summarised in Table 2 below.

Table 2: EA modelled flood levels for different return periods and scenarios.

Flood Level in mAOD during different AEP		
1 in 100	1 in 100 + CC	1 in 1000
287.4	287.5	287.74

As the ground levels at the site range from 285.9mAOD to 287mAOD, flood depths could reach 1.5m during the 1 in 100-year event, 1.6m when including climate change and 1.84m during the 1 in 1000-year event. Flood depths would decrease to the front of the site to depths of 400mm, 500mm and 740mm respectively for the three events.

12.1.11 Long Term Fluvial Flood Risk Considering Flood Defences

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

12.2 Pluvial (Surface Water) Flood Risk

A pluvial, or surface water flood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. Surface water flooding occurs when high

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

12.2.1 Mechanisms of Pluvial Flooding

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

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

12.2.2 Main Potential Sources of Local Pluvial Flooding

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

12.2.3 Records of Historic Pluvial Flooding Incidents

Examination of the LLFA's Level 1 SFRA revealed evidence of records of pluvial flooding in the vicinity of the site.

The data has been provided at four-digit postcode level, hence no street level information on flooding was available. In summary it is evident that seven postcode areas within the High Peak plan area have properties which have flooded from artificial drainage systems and surface water runoff. It is not possible to identify the exact location of these properties due to the Data Protection Act. In general, the level of flood risk from artificial drainage systems within both the plan area and the remainder of the Borough has been medium to low. The postcode area SK17 6 has witnessed 10 incidents and it is classified as being in an overall medium risk area.

A Table showing the number of artificial drainage incidents is available in [Appendix 4](#).

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

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

The EA's reservoir flood risk map indicates that the site does not lie within an area that is at risk of reservoir flooding.

12.2.5 Sewer Flooding

A table showing recorded artificial drainage incidents is available in [Appendix 4](#).

The postcode area SK17 6 has witnessed 10 incidents and it is classified as being in an overall medium risk area.

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

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

The maps show that the site would remain dry during the 1 in 100-year event. During the 1 in 1000-year event, the whole site would be impacted by shallow flooding up to 300mm.

12.2.7 Long Term Surface Water Flood Risk

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

12.3 Risk of Flooding from Multiple Sources (ROFMS)

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

12.4 Groundwater Flood Risk

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

12.4.1 Historic Records of Groundwater Flooding

Local knowledge suggests that the Authority is covered by springs which are not identified on OS maps. Consultation with the Environment Agency has suggested that there are no other known problems with flooding from groundwater within the Borough. It should however be noted that peat deposits are found on the south eastern side of the plan area, and occur in abundance at the northern side of the Borough. These are typically waterlogged and may breach the surface. A map showing the locations of historic groundwater flooding incidents is not available in the SFRA.

12.4.2 Susceptibility to Groundwater Flooding

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

12.5 Critical Drainage Area

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

The SFRA does not detail any information on Critical Drainage Areas (CDA) within the council.

13 Potential Impacts of the Development on Local Flood Risk

13.1 Impacts on Flood Storage

13.1.1 Changes to Impermeable Area and Building Footprint

The change to the impermeable area of the site is considered to be insignificant as the proposal is for a change of use only.

As the development will not significantly alter the site impermeable area, it is considered unlikely that it will impact upon surface water runoff rates.

Additionally, as it will not change the site's built-up area, it is unlikely to impact upon local flood storage.

13.2 Impacts on Flood Flow Routes

As the development does not involve the significant redesign of buildings at the site, it will not alter flood flow paths.

14 Flood Risk Mitigation Measures

14.1 SuDS

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

As such, the developer can implement a SuDS strategy in line with the drainage hierarchy as outlined in Table 3 below to reduce surface water discharges from the site.

Table 3: SuDs Options

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

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

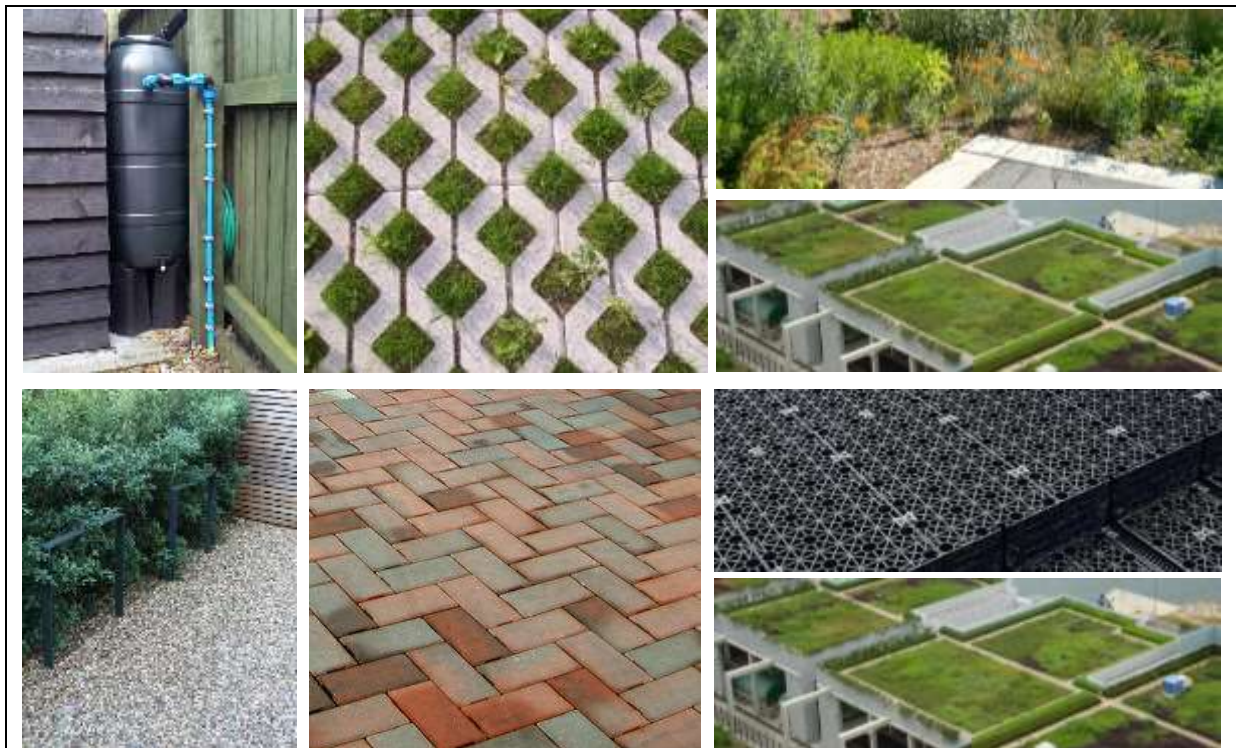


Figure 1: Surface water storage facilities and potential SuDS features - rainwater harvesting, on-site tank storage, rain garden soak-away and green roofs. (Source: UK SuDS Manual)

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

14.2 Flood Resilience

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

14.2.1 Finished Floor Levels

For vulnerable developments, EA Standing Advice states that finished floor level of the lowest habitable room in any building Ground floor levels should be a minimum of 300millimetres (mm) above the general ground level of the site or 300mm above the estimated river or sea flood level including climate change whichever is higher.

The one-bedroom flat will be placed on the first floor. As such, finished floor levels can be retained as existing. Existing finished floor levels of the first floor are set to 4.18m above ground floor levels. As the ground floor would potentially witness a maximum flood depth of 1.84m during the 1 in 1000-year event, proposed finished floor levels of the residential flat are 2.34m above predicted flood levels during extreme scenarios.

14.2.2 Flood displacement storage

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

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

As the proposal is for a change of use only, flood compensatory storage is not considered to be required.

14.2.3 Flood Resilience Measures

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

- | |
|--|
|  Water exclusion strategy - where emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction |
|--|

techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m);

- Water entry strategy - buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m).

Given that flood depths greater than 0.6m are predicted during extreme scenarios, the water entry strategy is the most applicable for this development.

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

Floor construction:

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

Wall construction:

- Include in the external face of the extension a damp – proof course, 2m above ground level, to prevent damp rising through the wall;
- Use rigid closed – cell material for insulation above the DPC;
- Spread hardcore over the site within the external walls of the building to such thickness as required to raise the finished surface of the site concrete. The

hardcore should be spread until it is roughly level and rammed until it forms a compact bed for the oversite concrete. This hardcore bed will be 100 mm thick and composed by well compacted inert material, blinded with fine inert material.

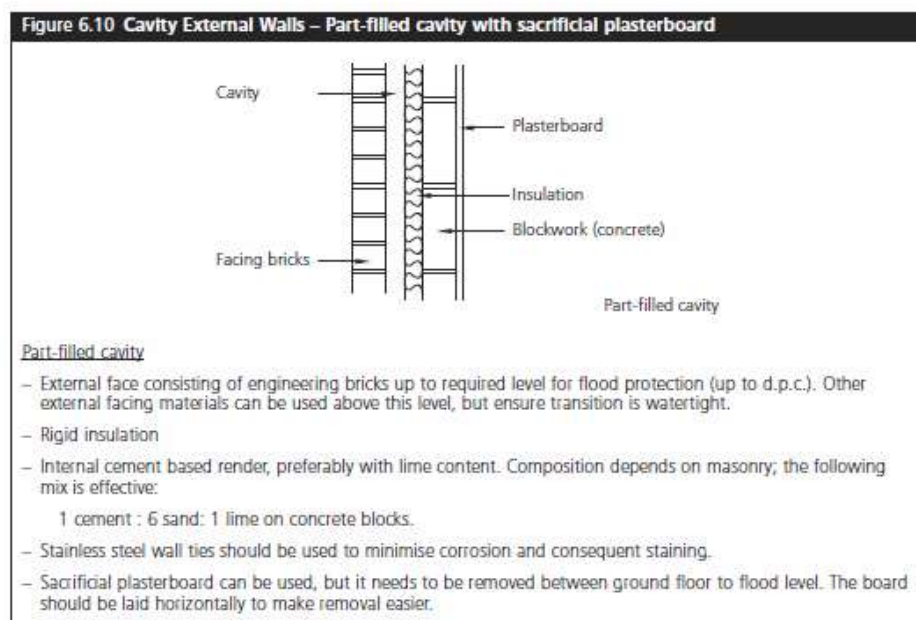
Doors:

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

Underground drainage:

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

Improving the flood performance of new buildings



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

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

14.3 Emergency Plan

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

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

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

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

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

The EA Product 4 Data only provides in-channel flood flows. It is therefore not possible to calculate the flood hazard at the site. However, due to the high predicted flood levels at the site, flood hazard is unlikely to be classified as low.

The key elements of the emergency plan are described below.

14.3.1 EA Flood Warnings Direct Service Subscription

The occupants will subscribe to the EA Flood Warnings Direct Service which is a free service offered by the EA providing flood warnings direct to people by telephone, mobile, email, SMS text message and fax. The EA aims to provide 2 hours' notice of flood, day or night, allowing timely evacuation of the site.

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

14.3.2 Access and Safe Egress

Safe egress to Flood Zone 1 is available by a 1-min walk to the south. Directions of this route are presented in [Appendix 11](#).

14.3.3 Safe Refuge

Should it not be possible to evacuate the building or should the lead time not be sufficient, as the proposed development is located on upper floors in the property, it will act to provide sufficient safe refuge in the event of an extreme flood event.

15 Conclusions and Recommendations

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

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

-  The proposal is for a change of use, as such, sequential and exception tests should not be required to be undertaken; LLFA to decide;
-  The main source of potential flooding to the site is the River Wye;
-  The EA define the site as being within flood zone 3;
-  No records of fluvial, tidal or artificial flooding incidents were identified at or in the vicinity of the site;
-  10 records of artificial drainage flooding were recorded within the postcode area SK17 6;
-  The development will not result in a significant change in the impermeable area of the site and therefore is unlikely to increase local flood risk;
-  There is very limited opportunity for implementing SuDS mitigation measures. Consideration should be given to use of rainwater harvesting and/or permeable paving where possible;
-  Flood resilient materials and construction methods will be used so as to ensure that the impacts of any potential flooding are minimised as much as possible;
-  Occupants will subscribe to the EA Flood Warnings Direct Service;
-  Safe egress routes to flood zone 1 are easily accessible;
-  In the event that evacuation is not possible, safe refuge is available in the upper floors of the building which are accessible via an internal staircase.

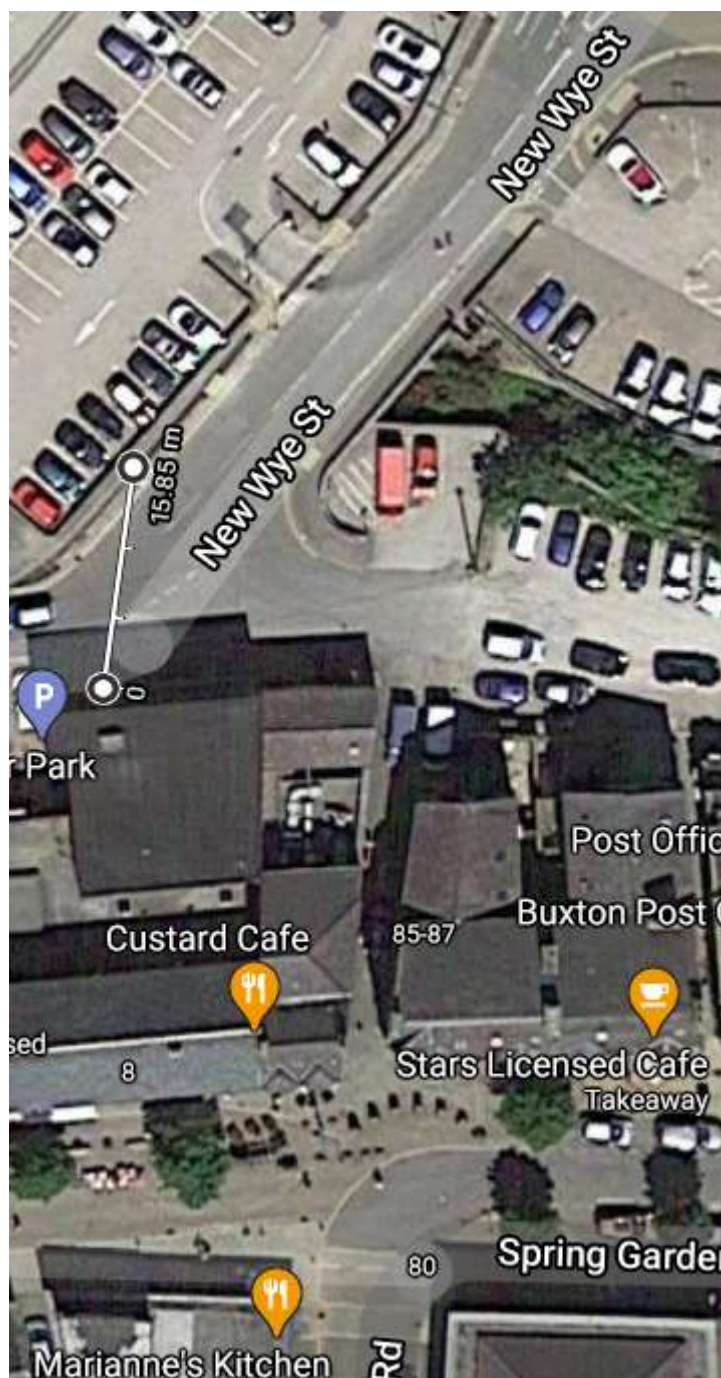
Given the information reviewed, the overall flood risk to the site is considered to be moderate. With the proposed mitigation measures in place and considering that the proposal is for a change of use of the first floor only, the development will be safe for its residents and it is unlikely to have a significant impact on local flood risk.

16 References

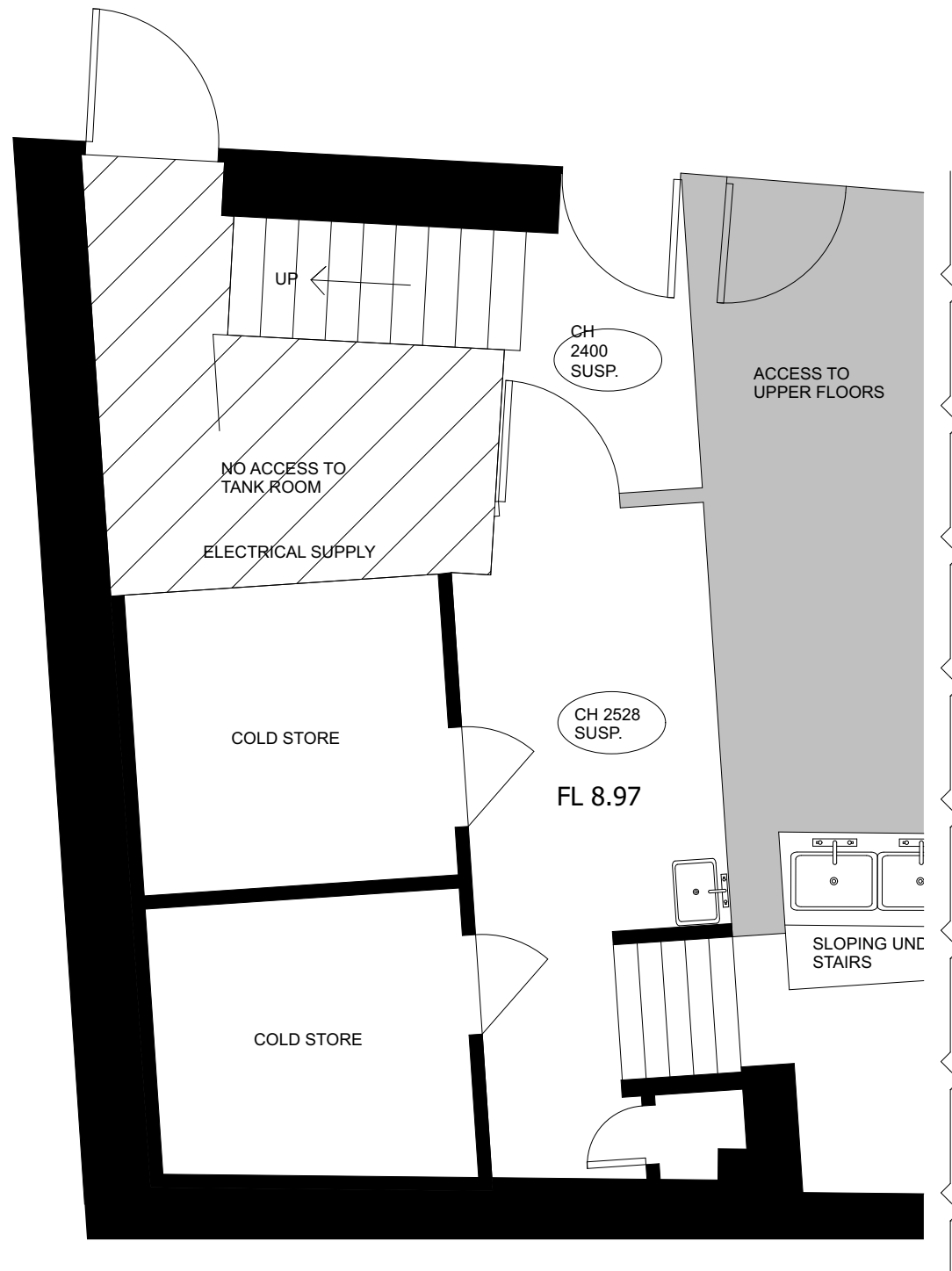
1. Communities and Local Government - National Planning Policy Framework NPPF, March 2012.
2. Communities and Local Government - Planning Practice Guidance: Flood Risk and Coastal Change, Updated 06 March 2014.
3. Strategic Flood Risk Assessment - High Peak Borough Council, 2008.
4. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.
5. Google Maps accessed January 21.

17 Appendices

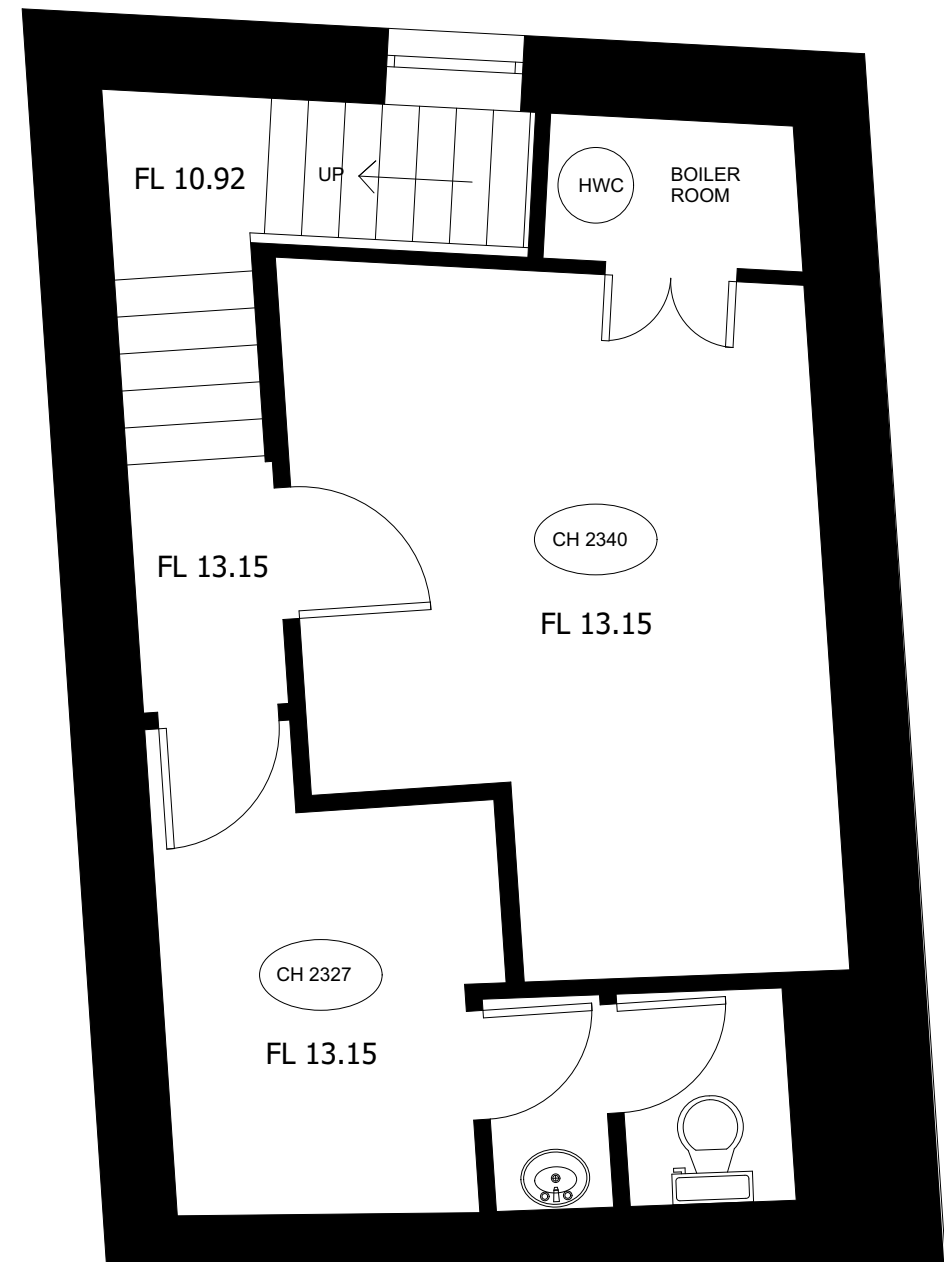
17.1 Appendix 1 – Site Photographs



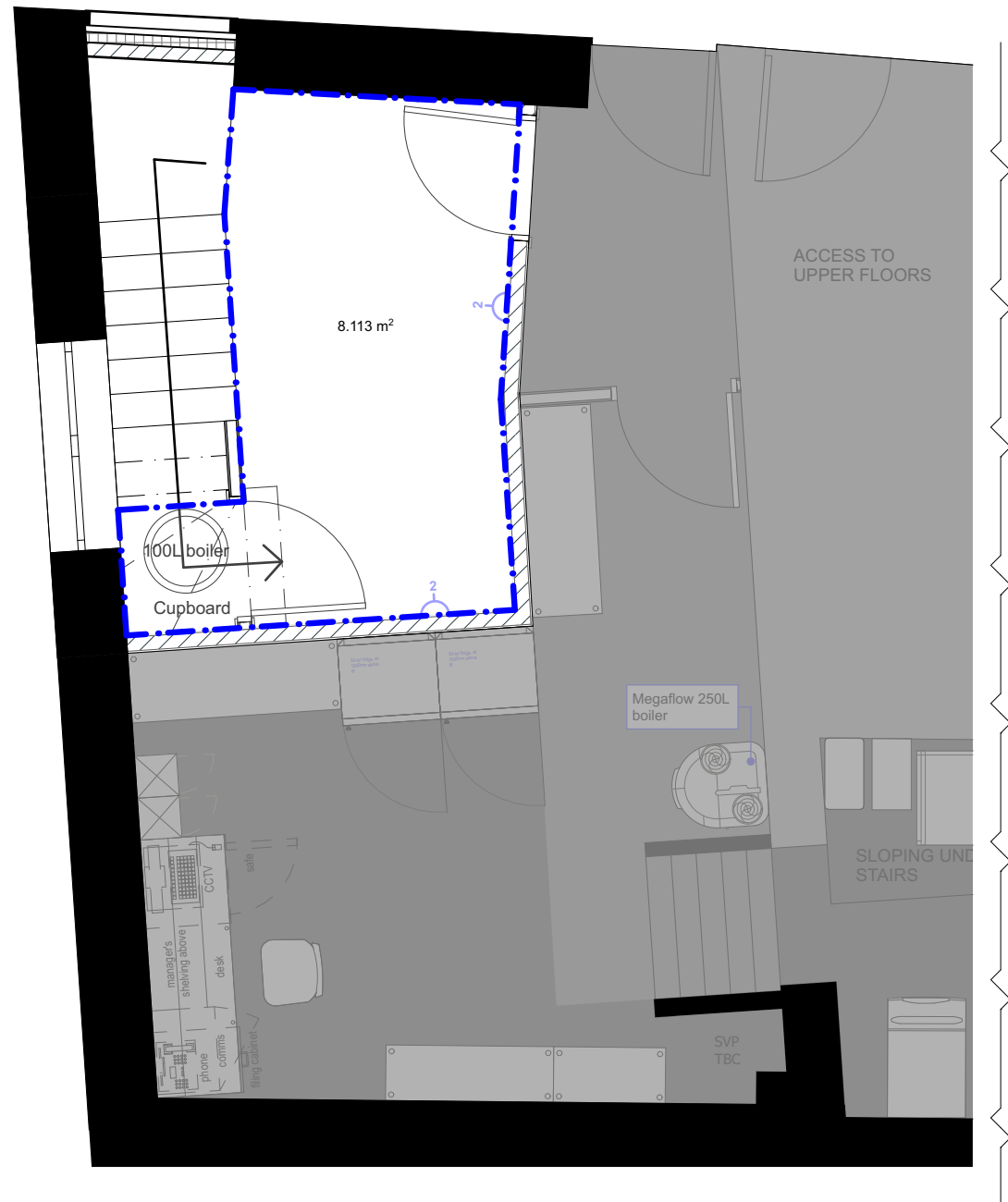
17.2 Appendix 2 – Development Plans



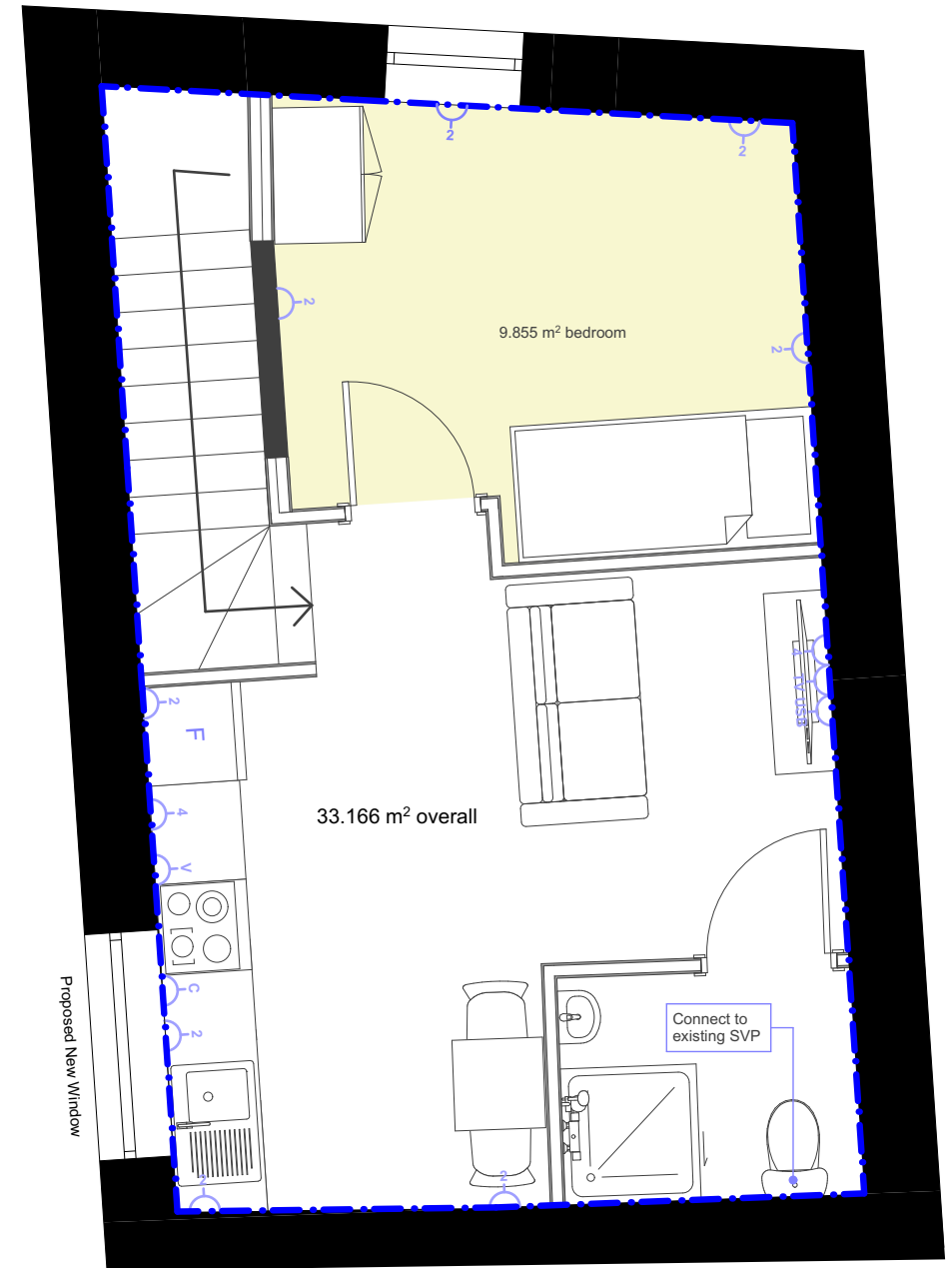
GROUND FLOOR



FIRST FLOOR



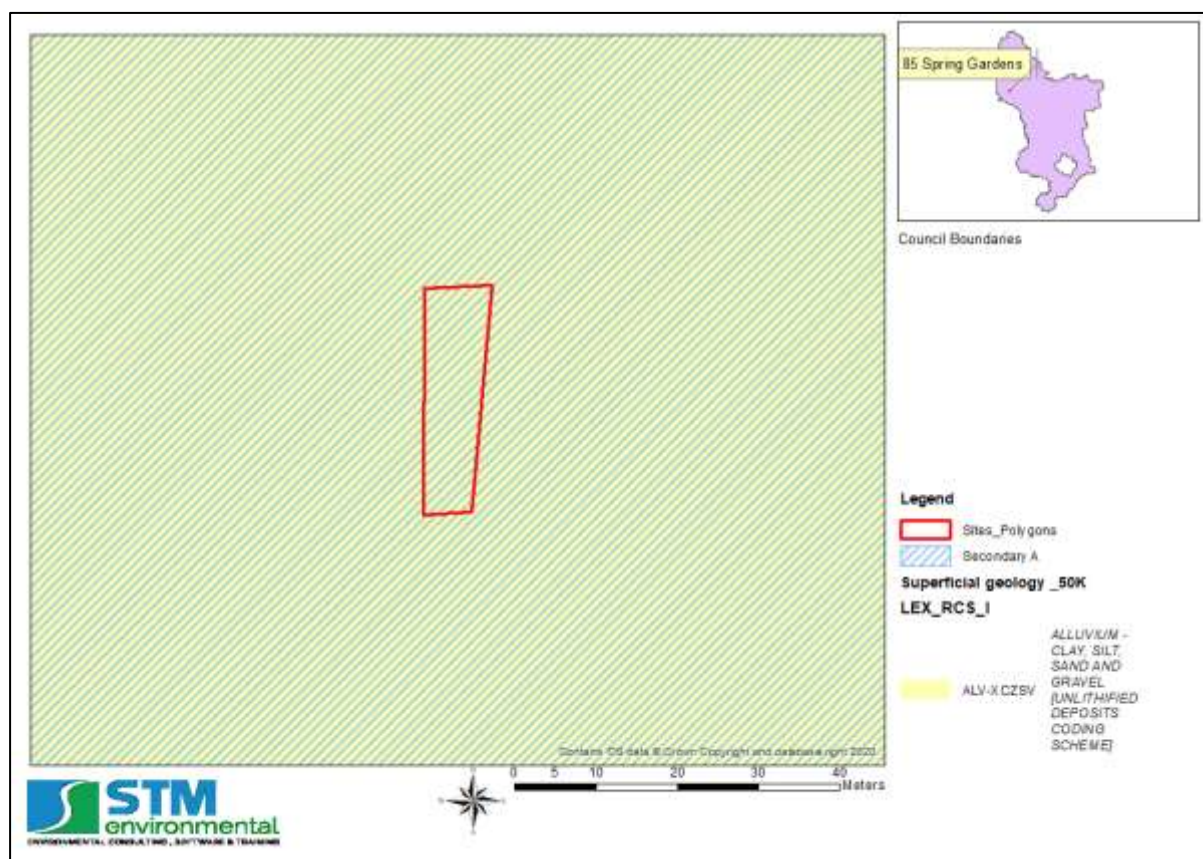
GROUND FLOOR



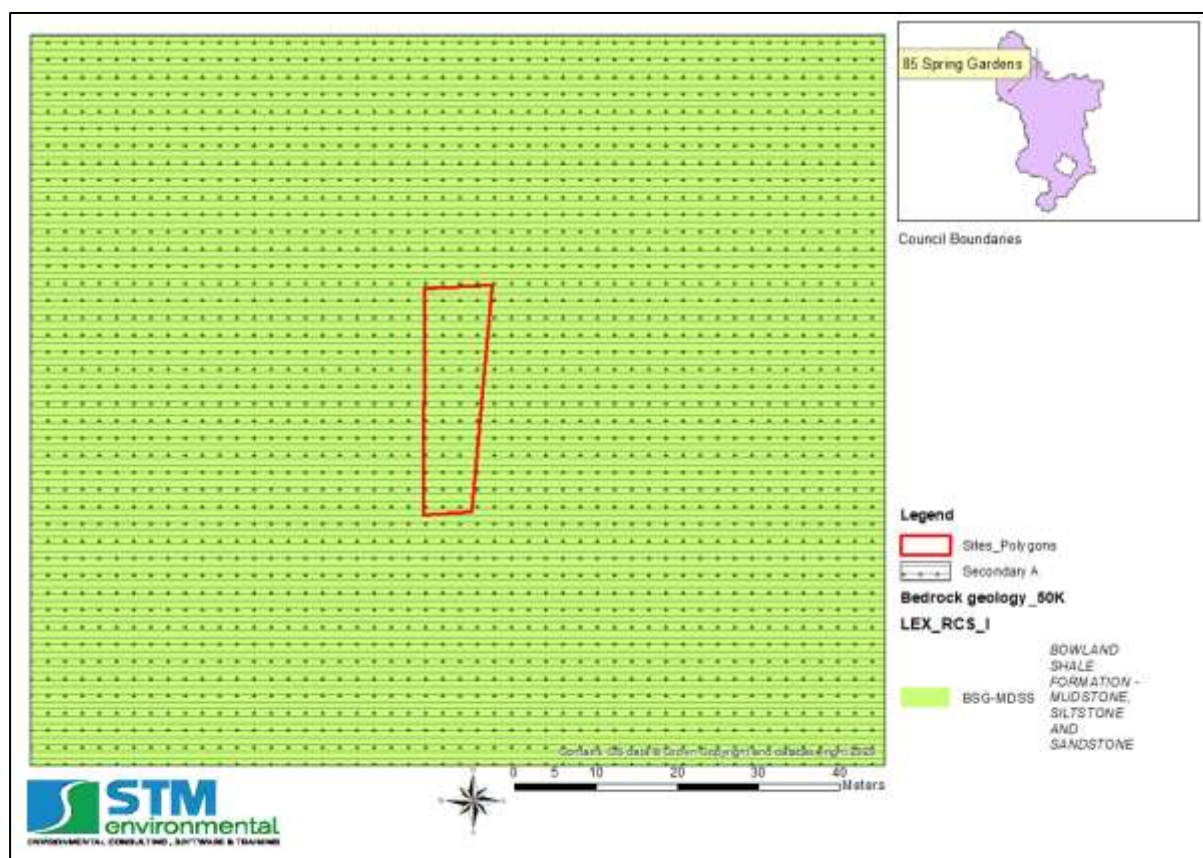
FIRST FLOOR

17.3 Appendix 3 – Environmental Characteristics

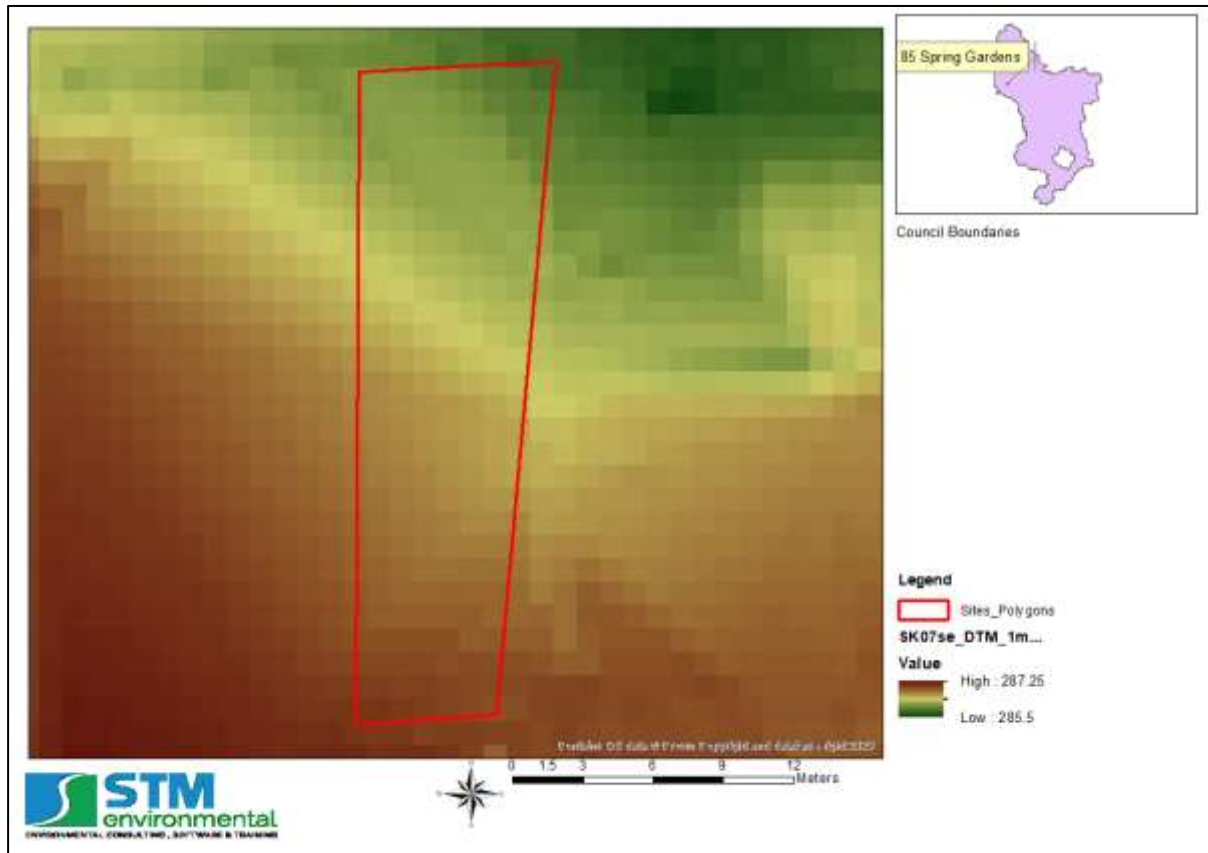
17.3.1 Superficial Hydrogeology Map



17.3.2 Bedrock Hydrogeology Map

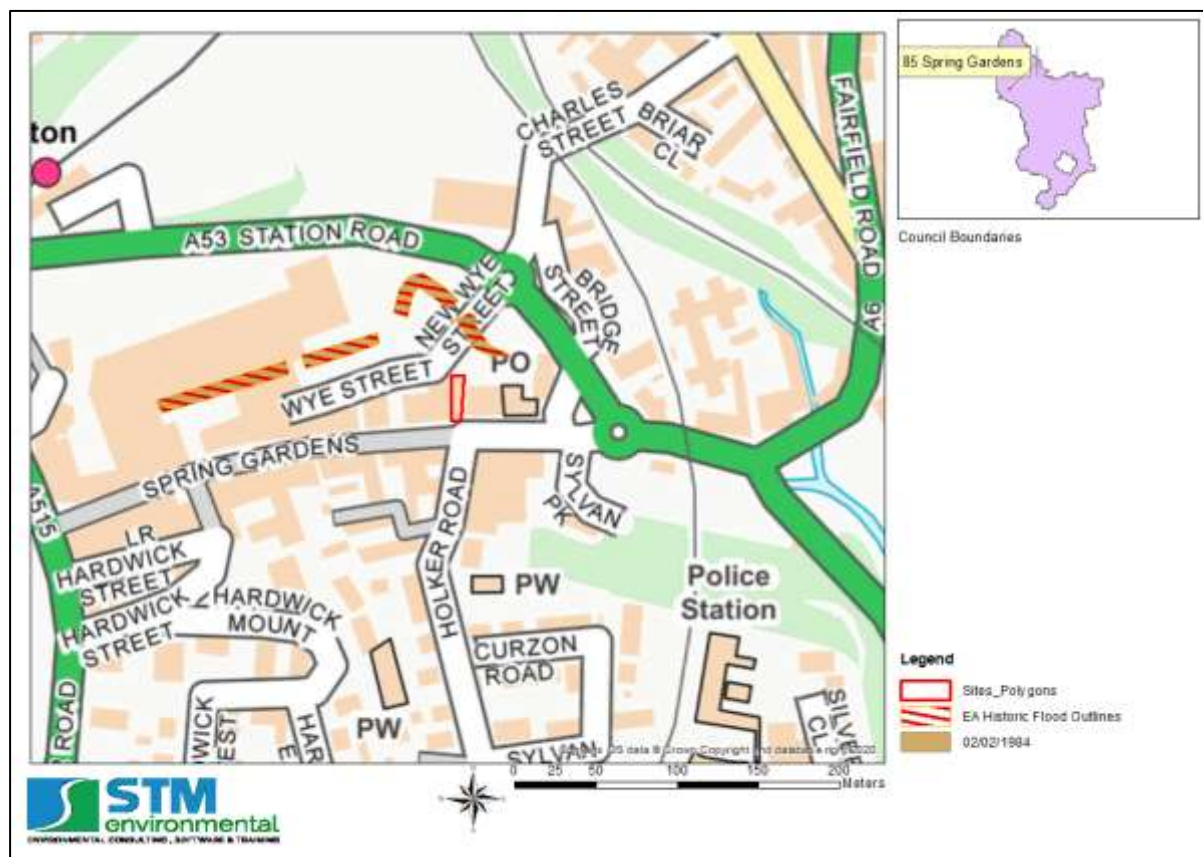


17.3.3 Topology Map



17.4 Appendix 4 – Historical Flood Incident Maps

17.4.1 EA Historic Flood Outlines

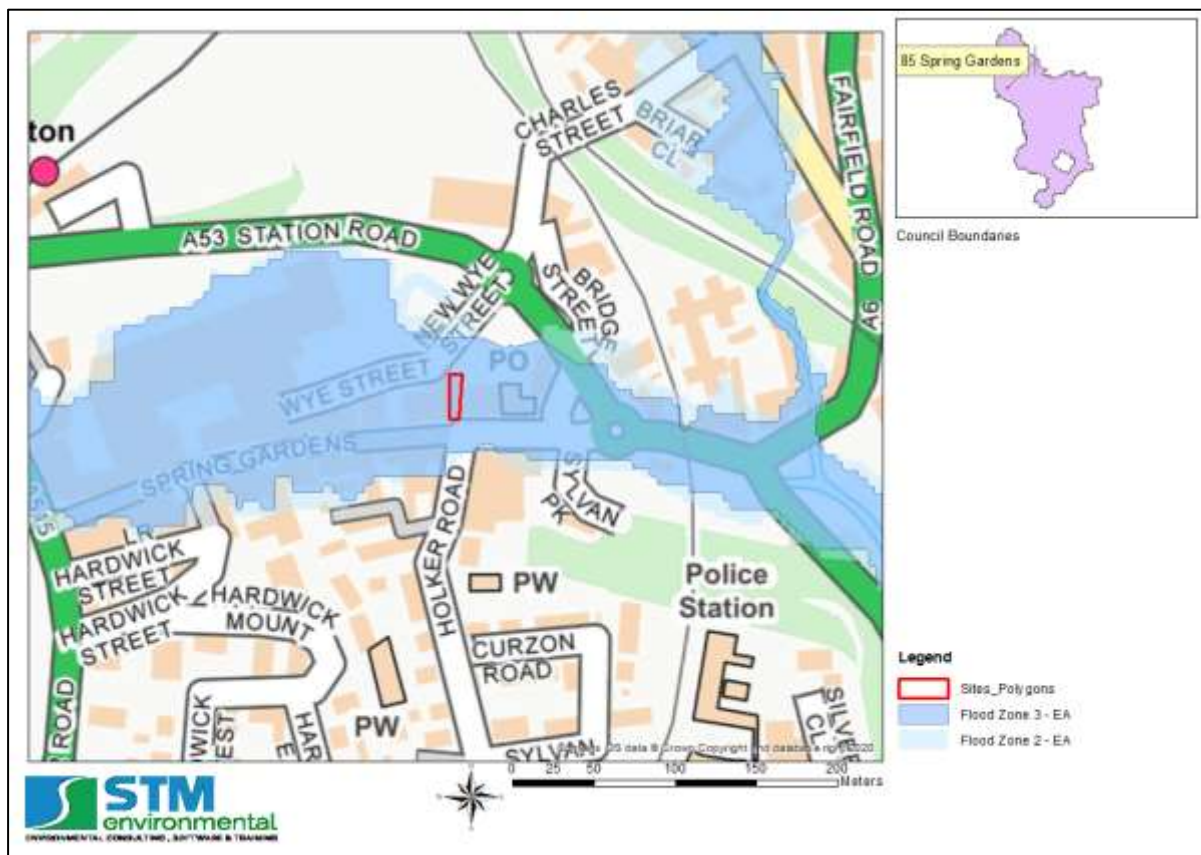


17.4.2 SFRA Artificial Drainage Incidents Table

Table 4. 4: Flooding From Artificial Sources as Recorded in the Severn Trent Water & United Utilities DG5 Register

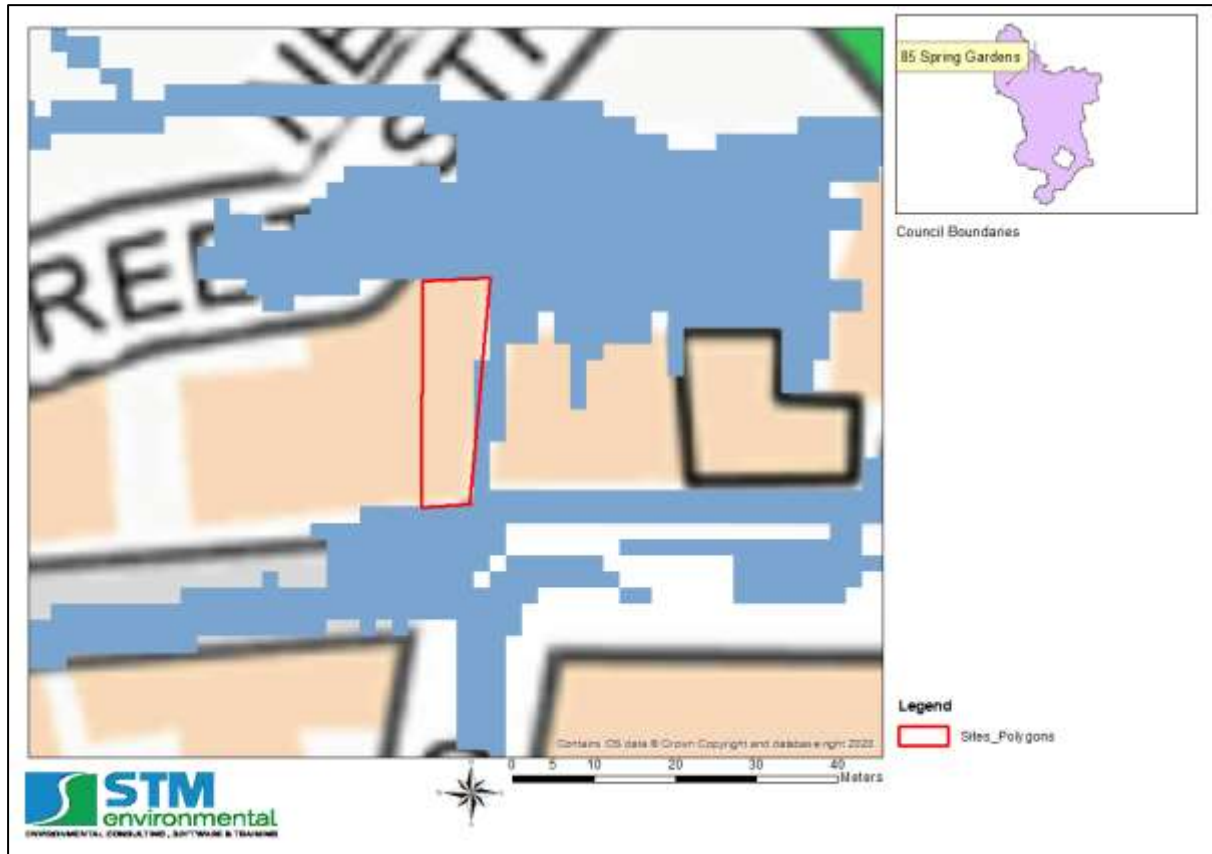
Postcode Area	No. Properties Affected	Level of Risk
SK13 1	1	Low
SK17 0	2	Low
SK17 6	10	Medium
SK17 7	5	Medium
SK17 8	1	Medium
SK17 9	3	High
SK23 7	1	Low

17.5 Appendix 5 - EA Flood Zone Map



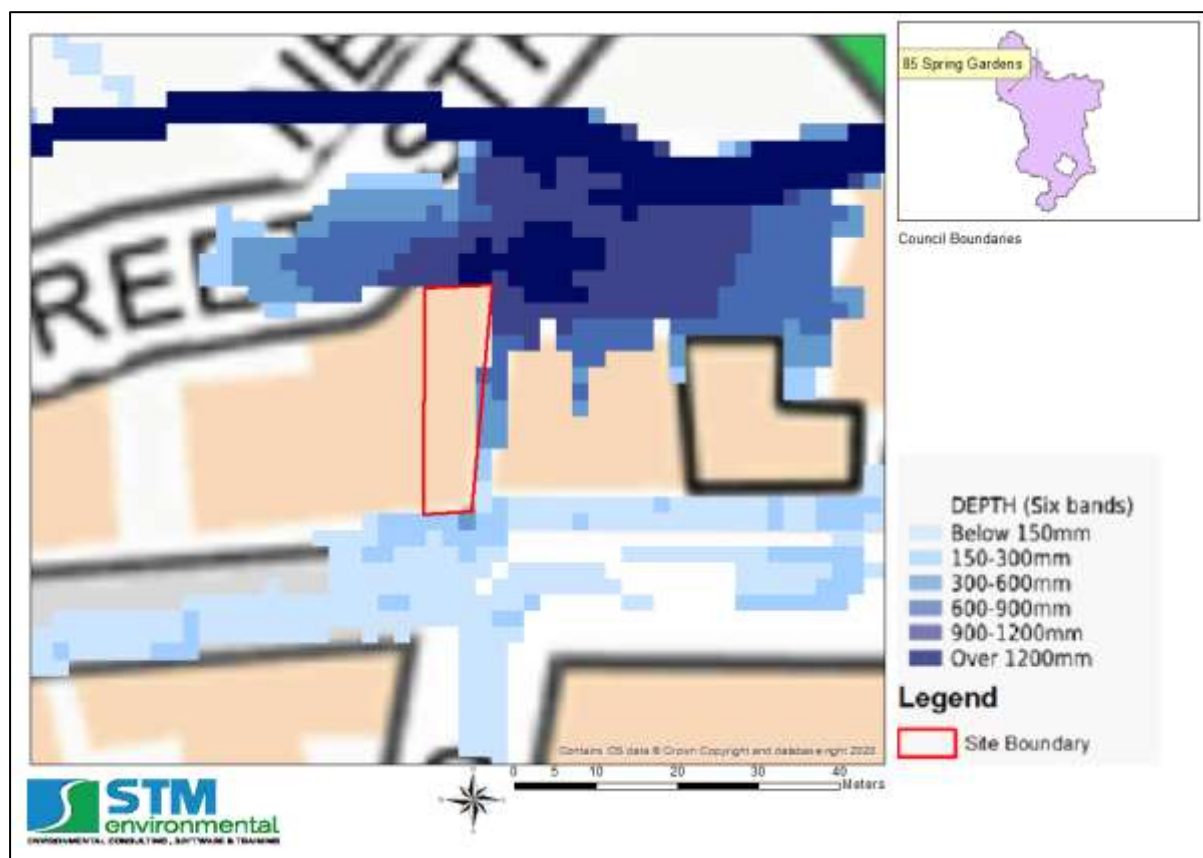
17.6 Appendix 6 – Surface Water Flood Extent and Depth Maps

17.6.1 Map showing surface water flood extent for the 1 in 100-year rainfall return period (Source: EA, 2016).

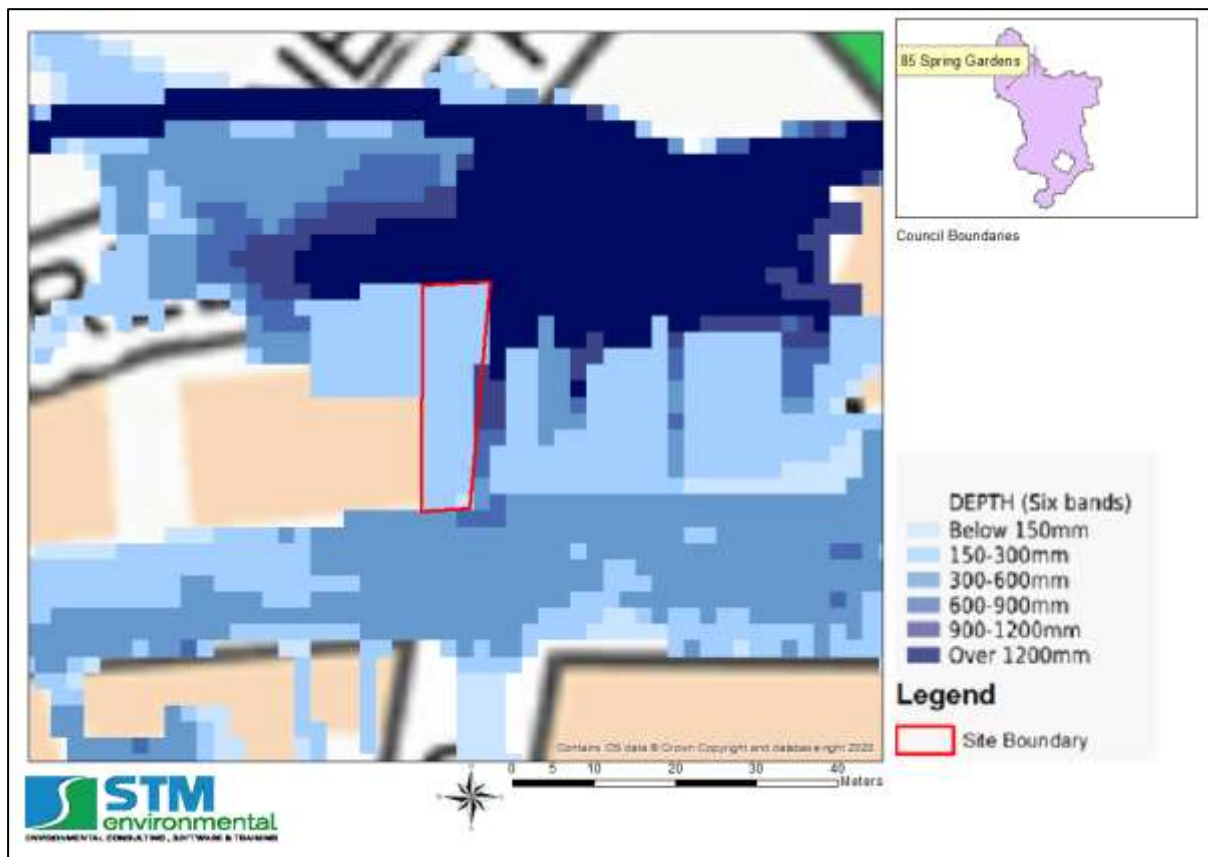


17.6.2 Predicted surface water flood depth for the 1 in 100-year return period

(Source: EA, 2016).



17.6.3 Predicted surface water flood depth for the 1 in 1000-year return period
(Source: EA, 2016).

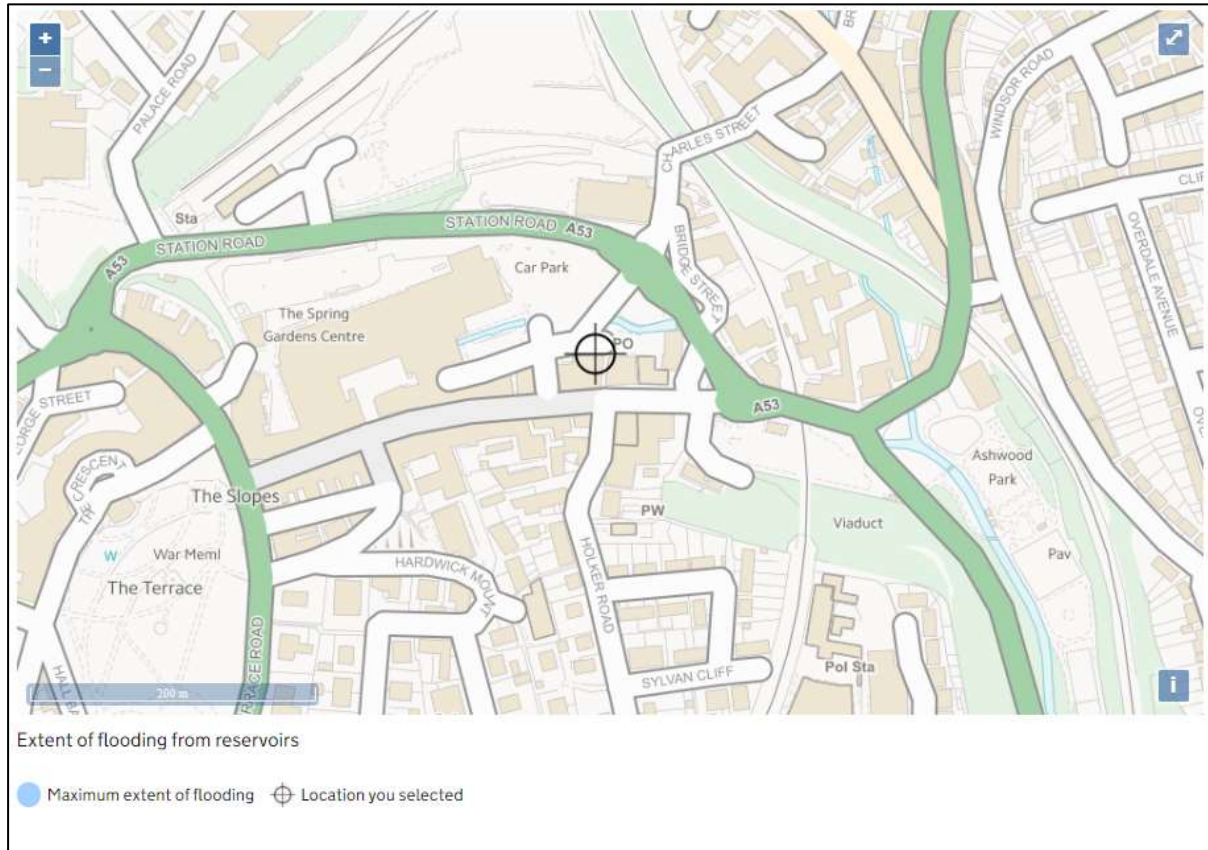


17.7 Appendix 7 –Flood Defence and Reservoir Flood Risk Maps

17.7.1 EA Map showing areas benefitting from flood defences

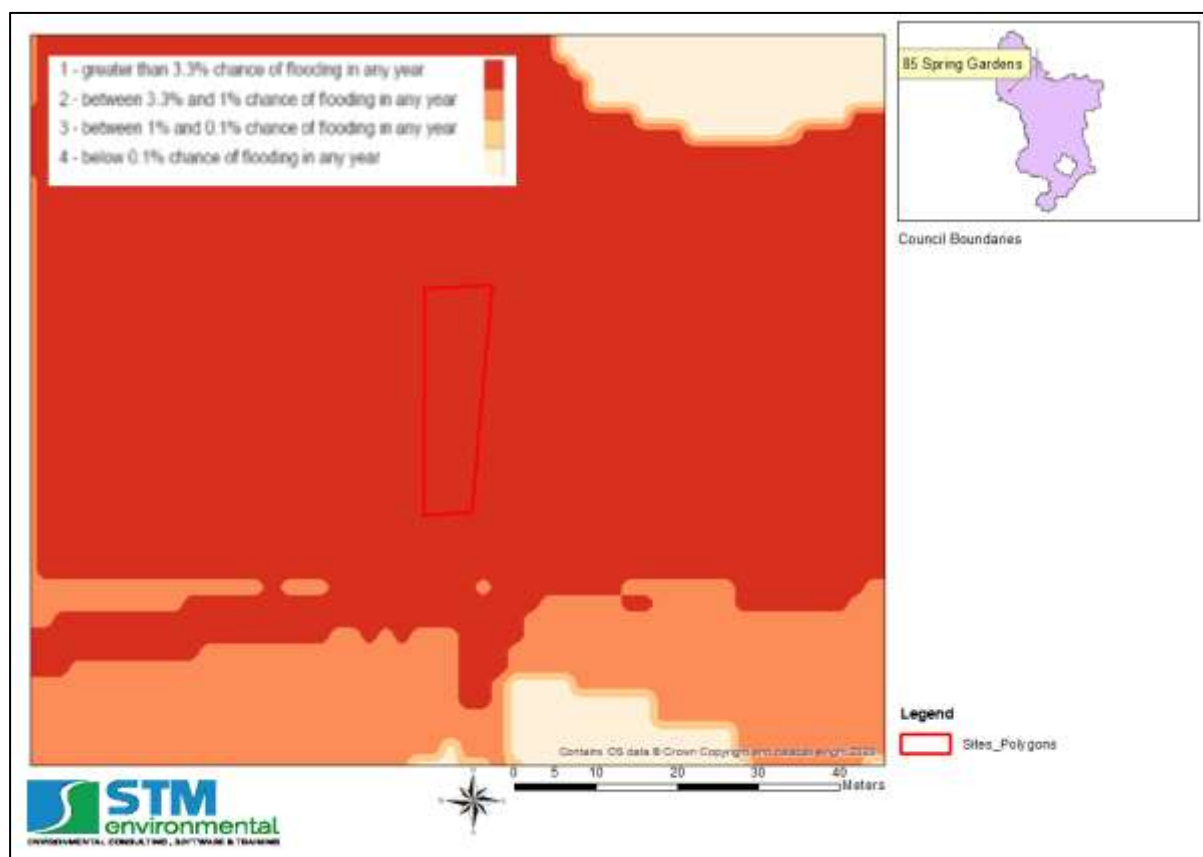
N.A.

17.7.2 Reservoir Flood Risk Map

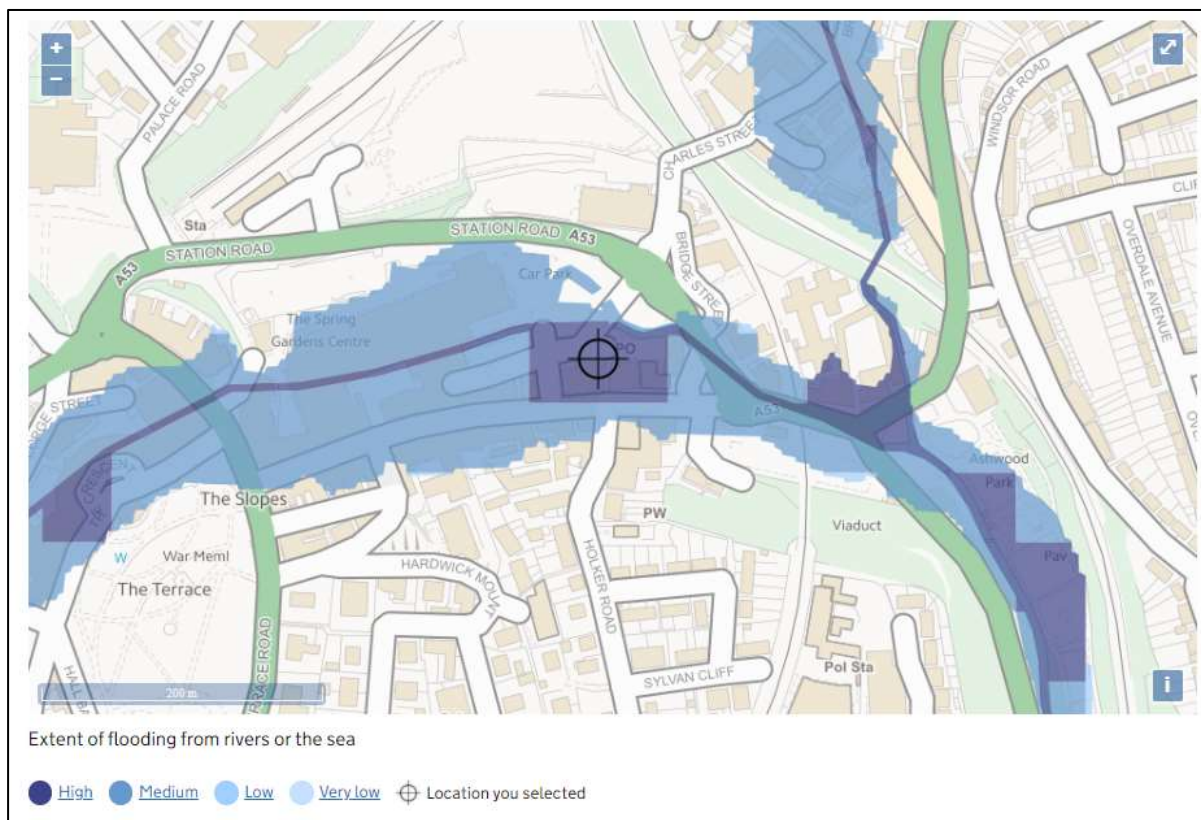


17.8 Appendix 8 – Flood Risk Maps

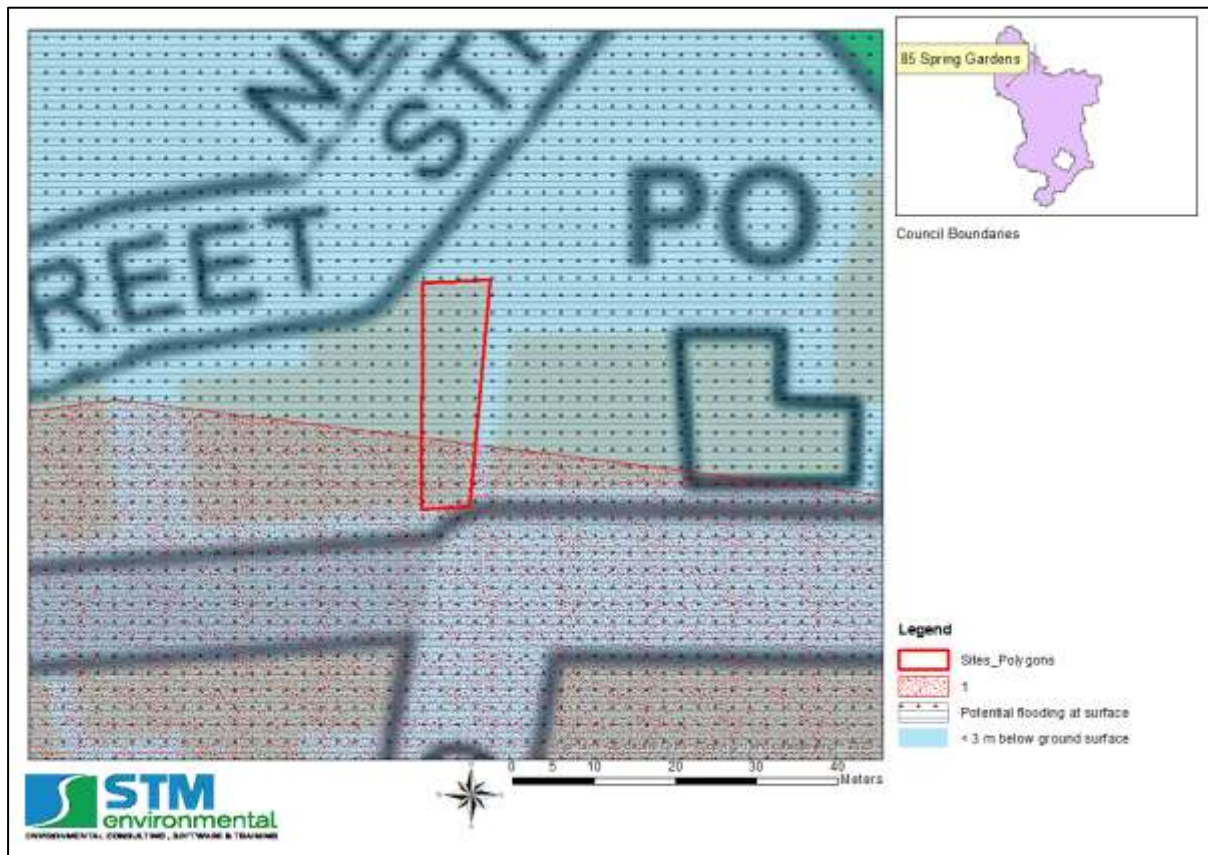
17.8.1 Risk of Flooding from Multiple Sources Map



17.8.2 Long Term Flood Risk Maps



17.9 Appendix 9 – Groundwater Flood Susceptibility Map



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

EMD198097

Flood Map for Planning

The Flood Map for Planning is now classed as Open Data. As such it can be downloaded free of charge under an open data licence from the following address: <https://data.gov.uk/publisher/environment-agency>

Alternatively it can be viewed at the following address: <https://flood-map-for-planning.service.gov.uk/>

Modelled Information

The following information, including the modelled extents mapping, has been produced including the effect of any local defences.

Node point reference	Location	20% (1 in 5 year) modelled level (mAOD)	20% (1 in 5 year) modelled flow (m ³ /s)	10% (1 in 10 year) modelled level (mAOD)
WY134D	SK 05387 73319	293.51	5.64	293.72
WY129-3	SK 06099 73654	286.05	6.19	286.37
WY128	SK 06452 73462	283.83	12.95	283.98

Source: River Wye SFRM Study, Halcrow, August 2010

Node point reference	Location	10% (1 in 10 year) modelled flow (m³/s)	5% (1 in 20 year) modelled level (mAOD)	5% (1 in 20 year) modelled flow (m³/s)
WY134D	SK 05387 73319	8.94	293.83	11.14
WY129-3	SK 06099 73654	9.44	287.11	11.47
WY128	SK 06452 73462	14.51	284.12	16.57

Source: River Wye SFRM Study, Halcrow, August 2010

Node point reference	Location	2% (1 in 50 year) modelled level (mAOD)	2% (1 in 50 year) modelled flow (m³/s)	1.33% (1 in 75 year) modelled level (mAOD)
WY134D	SK 05387 73319	294.01	14.72	294.06
WY129-3	SK 06099 73654	287.48	12.32	287.58
WY128	SK 06452 73462	284.26	19.30	284.34

Source: River Wye SFRM Study, Halcrow, August 2010

Node point reference	Location	1.33% (1 in 75 year) modelled flow (m³/s)	1% (1 in 100 year) modelled level (mAOD)	1% (1 in 100 year) modelled flow (m³/s)
WY134D	SK 05387 73319	15.87	294.08	16.30
WY129-3	SK 06099 73654	12.34	287.62	12.38
WY128	SK 06452 73462	21.03	284.37	21.72

Source: River Wye SFRM Study, Halcrow, August 2010

Node point reference	Location	0.5% (1 in 200 year) modelled level (mAOD)	0.5% (1 in 200 year) modelled flow (m³/s)	0.1% (1 in 1000 year) modelled level (mAOD)
WY134D	SK 05387 73319	294.19	18.47	294.58
WY129-3	SK 06099 73654	287.71	12.43	287.89
WY128	SK 06452 73462	284.48	24.41	284.79

Source: River Wye SFRM Study, Halcrow, August 2010

Node point reference	Location	0.1% (1 in 1000 year) modelled flow (m ³ /s)	1% + 20% flow (1 in 100 year plus climate change) modelled level (mAOD)	1% + 20% flow (1 in 100 year plus climate change) modelled flow (m ³ /s)
WY134D	SK 05387 73319	28.57	294.23	19.48
WY129-3	SK 06099 73654	12.56	287.73	12.45
WY128	SK 06452 73462	34.26	284.52	25.47

Source: River Wye SFRM Study, Halcrow, August 2010

Please note: The flows provided represent **in channel flow only** and do not take into account flow on the floodplain.

Updated Climate Change Guidance

On 19th February 2016, the [Flood risk assessments: climate change allowances](#) was published on www.gov.uk website. It has replaced previous guidance [Climate Change Allowances for Planners](#).

The climate change guidance can be found at: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>
If your RFI is to assist with a Flood Risk Assessment (FRA) for a future planning application, please review this guidance to consider which allowances should be used for your site.

Defence Information

There are no Environment Agency maintained raised defences in this area.

Historic Information

We have records of historic fluvial flooding at this location in 1984. Please note that we may or may not hold the original records in question. We do not make any claim as to the reliability of recorded flood extents or that all flood events in the area have been recorded. Please also be aware that flood defences may have been built subsequent to these historic flood events. Note - This information relates to the area the above named property is in, and is not specific to the property itself - it **does not** provide an indicator of flood risk **at individual property level**.

Open Data Information

The below datasets are now classed as Open Data and as such can be downloaded free of charge under an open data licence from the following address: <https://data.gov.uk/publisher/environment-agency>

- Risk of Flooding from Rivers and Sea (RoFRS) data
- LiDAR Data
- Flood Map for Planning (Rivers and Sea)
- Historic Flooding Data

Permitting Information

Under the Environmental Permitting (England and Wales) Regulations 2016, any permanent or temporary works in, over or under a designated main river will require an Environmental Permit for Flood Risk Activities from the Environment Agency.

Any permanent or temporary works within 8 metres of the top of bank of a designated main river, or landward toe of a flood defence may require an Environmental Permit for Flood Risk Activities from the Environment Agency. In addition, any permanent or temporary works within the floodplain of a designated main river may also require an Environmental Permit for Flood Risk Activities.

To find out whether your activity requires a permit or falls under a relevant exclusion, exemption or standard rule please follow the link below:

<https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>

Please note that a permit is separate to and in addition to any planning permission granted.

Product Information

Below is a brief overview of which Product is likely to be most appropriate for your needs. This information will only be provided where it is available as we do not hold detailed information on all watercourses.

Product 4 – Producing a Flood Risk Assessment (FRA) where you:

- Require mapped and tabulated outputs from an Environment Agency model *e.g flood levels for a range of events*
- Require information on local defences and historic flooding events
- Do not need to undertake additional hydraulic modelling

Product 6 – Producing a Flood Risk Assessment (FRA) where you:

- Require raw modelling results files
- Require modelling results in GIS format

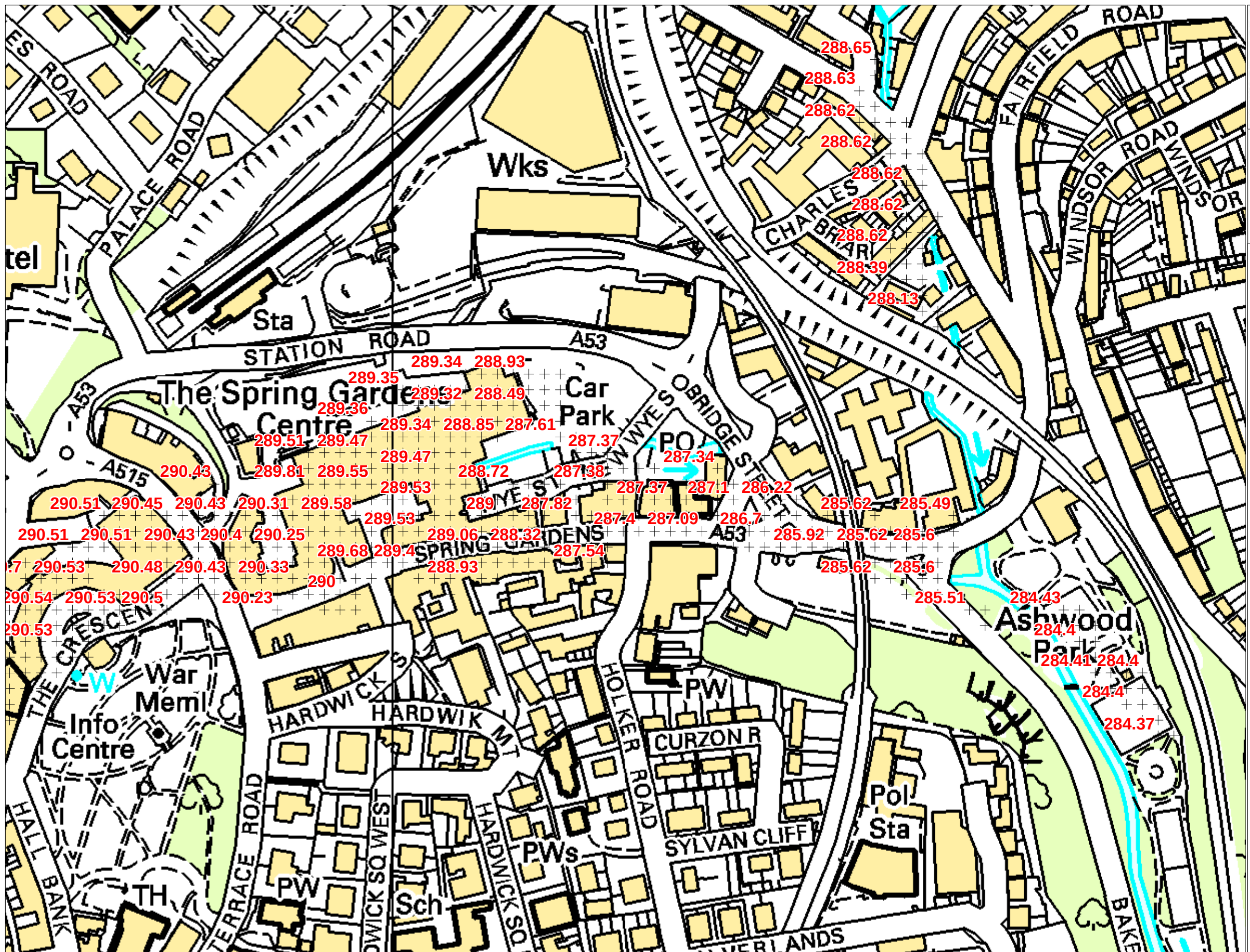
Product 7 - Producing a Flood Risk Assessment (FRA) where you:

- Do need to undertake additional hydraulic modelling using an existing Environment Agency model

In most instances to supply Product 6 and Product 7 data a hard drive will need to be supplied due to the large file sizes associated with this information. Please note that this information will require specialist modelling software to view and run.

A Product 5 (Model Report) will be supplied with all Product 6 and 7 requests and can also be requested separately.

Floodplain Heights Map centred on Spring Garden, Buxton - created 7 January 2021 Ref: [EMD198907]



Scale 1:2500



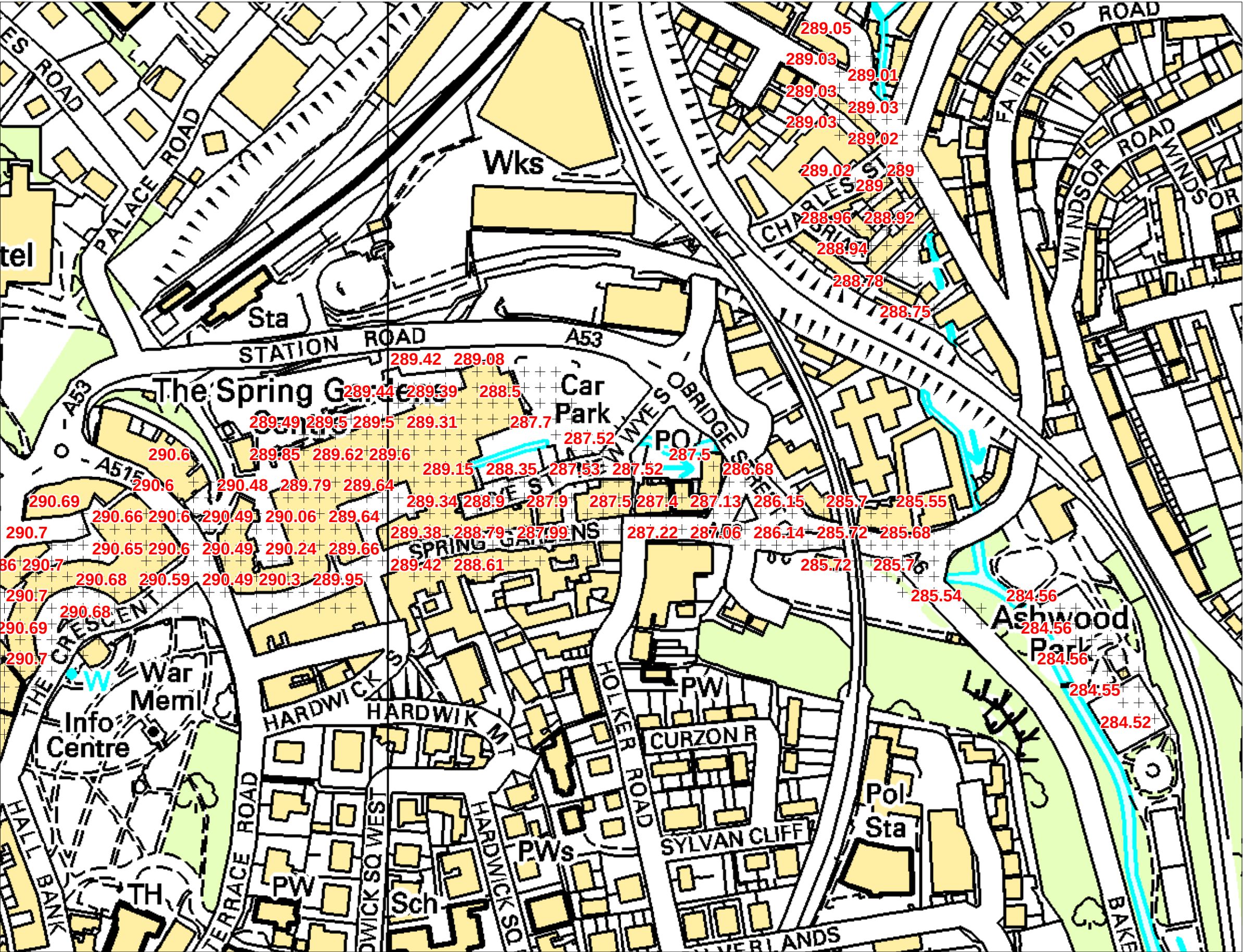
Legend

x.xx + 1 in 100 year
Floodplain Level (mAOD)

Source:
River Wye SFRM 2010

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

Floodplain Heights Map centred on Spring Garden, Buxton - created 7 January 2021 Ref: [EMD198907]



Scale 1:2500



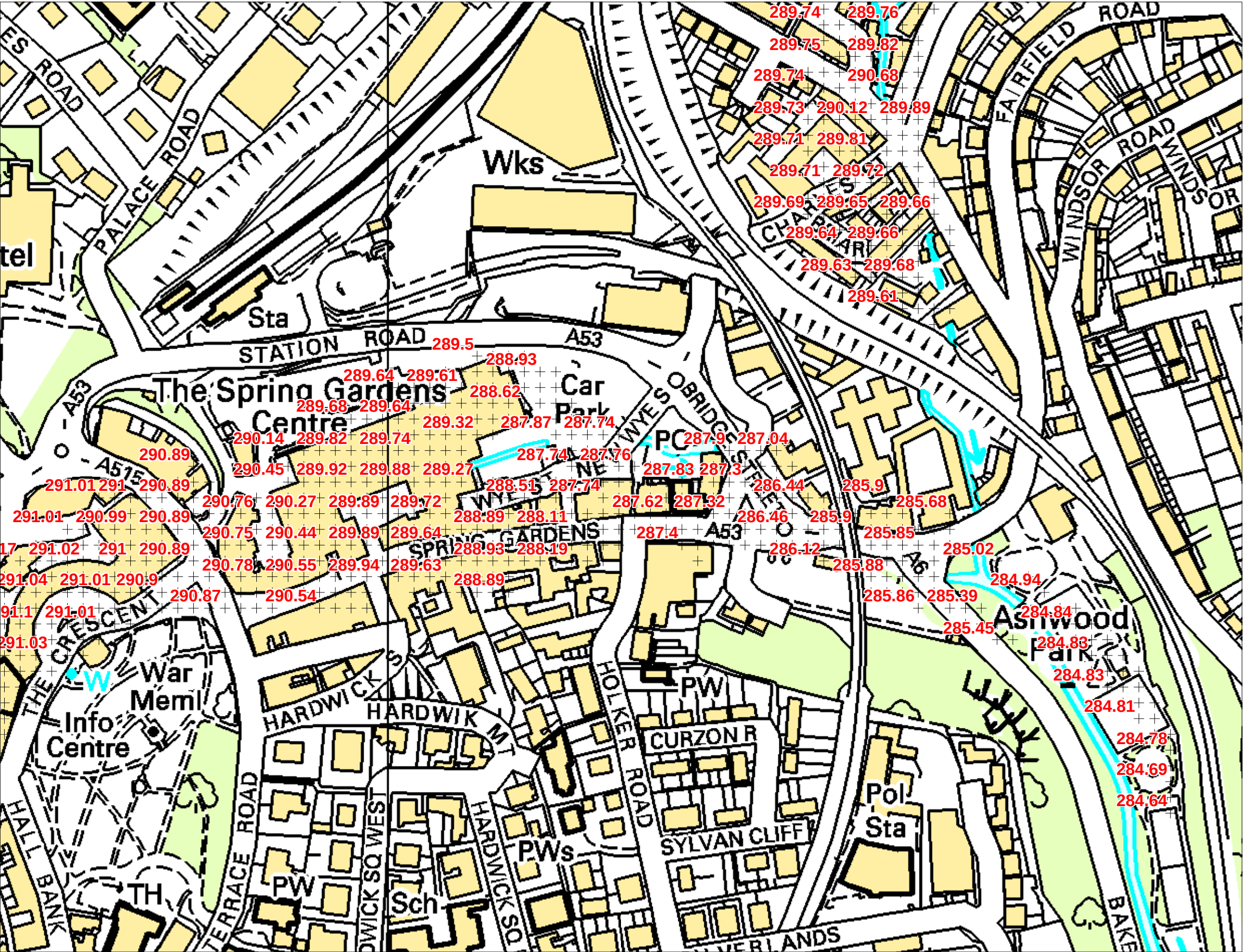
Legend

x.xx + 1 in 100 year
Floodplain Level (mAOD)
(plus climate change forecast)

Source:
River Wye SFRM 2010

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

Floodplain Heights Map centred on Spring Garden, Buxton - created 7 January 2021 Ref: [EMD198907]



Scale 1:2500



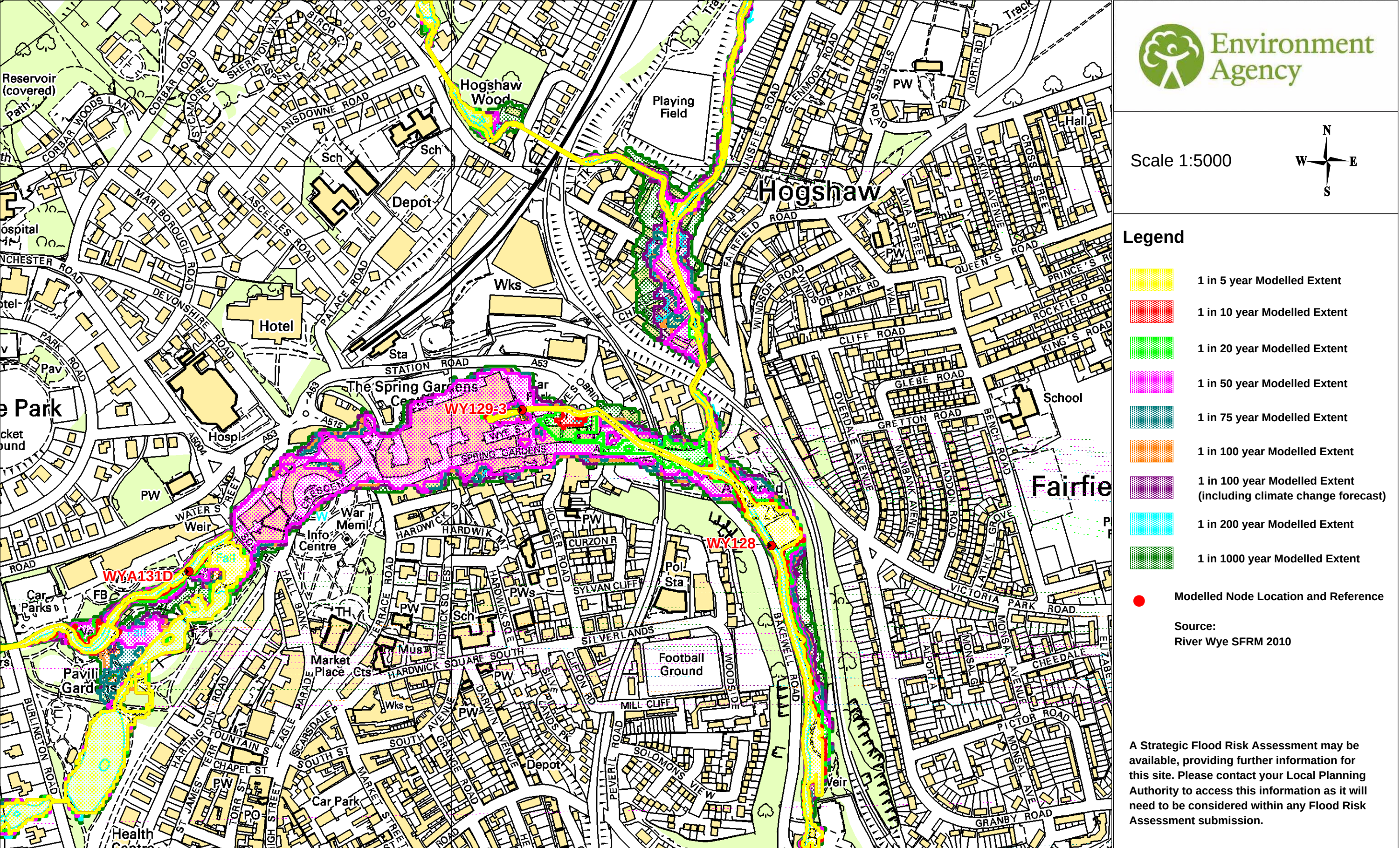
Legend

x.xx
+ 1 in 1000 year
Floodplain Level (mAOD)

Source:
River Wye SFRM 2010

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

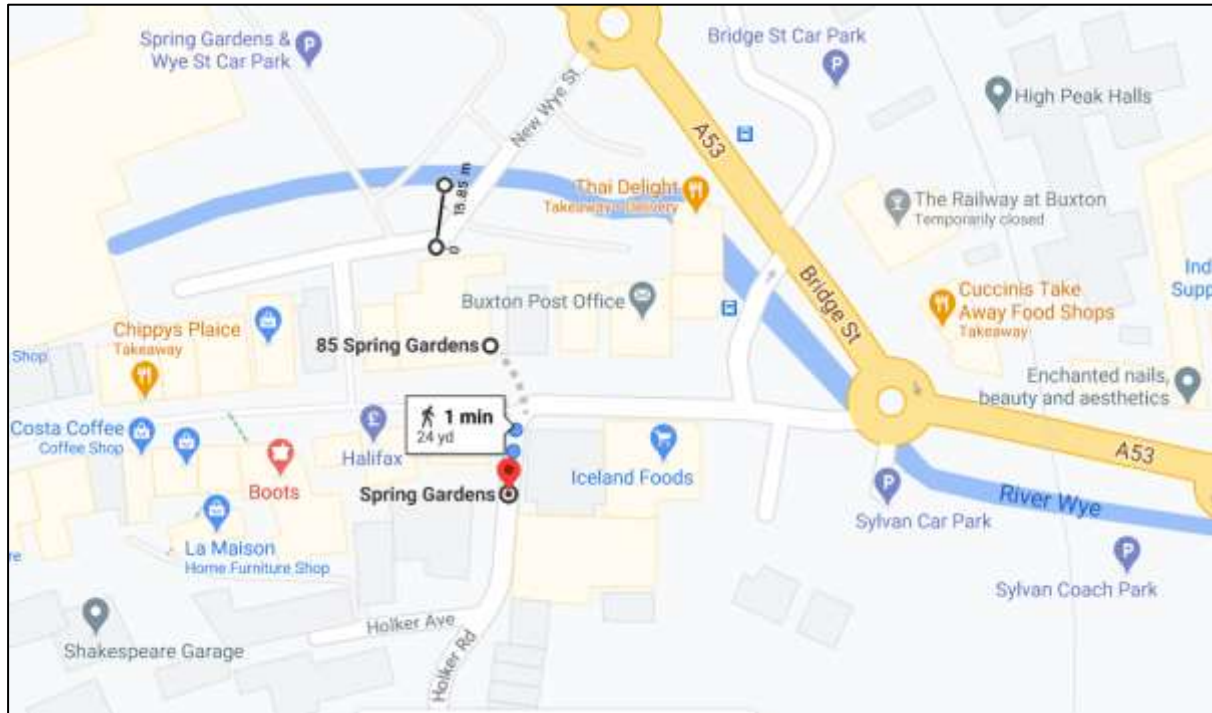
Modelled Extents Map centred on Spring Garden, Buxton - created 7 January 2021 Ref: [EMD198907]



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17.11 Appendix 11 – Safe Egress to Flood Zone 1 Map



17.12 Appendix 12 – Calculation of Flood Hazard Rating

Table 4: Flood Hazard Rating Scores – based on DF score of 0

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

Table 5: Summary of Scores

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

Table 6: Values for Debris Factor for different flood depths

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

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

 The danger to all category includes the emergency services.

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