SHILTON - FLOOD INVESTIGATION

VERSION	DATE	PROJECT NUMBER AND NAME	CREATED	CHECKED	REVIEWED
1.0	06/05/2025	5028671 – Shilton Flood Investigation	GM	SW	BM

1. INTRODUCTION

1.1.1. Shilton has a history of flooding from the Shill Brook, which runs through the village, with notable events in 2007 and more recently in November 2024. Flood storage areas have been provided upstream which have helped to alleviate the issue but have not fully resolved it as evidenced by the recent flooding, with four properties affected during Storm Bert in November 2024.

1.1.2. This flood investigation aims to provide an improved understanding of the catchment, how it floods, and what mitigation measures may be possible to reduce flood risk.

2. AVAILABLE INFORMATION

2.1. Publicly available information

2.1.1. Flood mapping:

- The Environment Agency (EA) provide flood mapping, based on modelled and observed data, to represent the risk posed to areas due to flooding. This indicates the flood risk at any given location for a specified Annual Probability. The mapping is available here: https://flood-map-for-planning.service.gov.uk/ and flood zone mapping presented in Appendix A.
- The EA advised that there is no detailed flood modelling for this location, with the Flood Map for Planning based on their New National Model.

2.1.2. Department for Environment Food & Rural Affairs Hydrology Data Explorer:

- The Hydrology data explorer provides access to EA open hydrology data: river flow, river level, rainfall and groundwater level readings for open hydrometric stations, and water quality data from water quality units for open and historic sites throughout England. This data is available here: https://environment.data.gov.uk/hydrology/explore

2.1.3. British Geological Survey (BGS) mapping:

- The BGS geology viewer provides information of underlying bedrock and superficial deposit geology across the UK via an interactive mapping tool. The mapping is available here: https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/
- The mapping indicates that the catchment is underlain by limestone, with superficial deposits associated with the river comprising clay, silt, sand, and gravel.

2.1.4. EA National Light Detecting Aerial Radar (LiDAR) programme:

- The EA National LIDAR Programme provides accurate elevation data at 1m spatial resolution for all of England. This provides a good overview of topographic information across the country. The data is available her: https://environment.data.gov.uk/survey
- Ground levels have been assessed based on LiDAR information to identify low points at particular risk of flooding and to gain an understanding of ground levels across the village.
    - The upstream bund has a crest elevation of 96.3 m AOD and the downstream bund a crest elevation of approximately 95.4 m AOD.
    - The low point of Bridge Street is located between Fairfield and Shillbrook Cottage, and it is expected that flooding would initially accumulate at this location.
    - The properties across the village are generally between 93 and 94m AOD.

2.1.5. Flood Estimation Handbook Web Service[1]

- The catchment feeding into the Shill Brook covers approximately 25 km² and is predominantly rural.

2.1.6. West Oxfordshire District Council Strategic Flood Risk Assessment (SFRA), 2016[2] – summarised below:

- The SFRA collates and presents the most up to date flood risk information for use by WODC.
- Most notably for Shilton Parish Council, when the need for a scheme to reduce flood risk is identified, a Parish Flood Group can raise this to the West Oxfordshire Flood Group which will present it to the Lead Local Flood Authority (OCC) Strategic Flooding Group where potential funding will be discussed further.

2.1.7. Shilton Flood Report[3]– summarised below:

- Shill Brook is spring fed.
- Flow in the Brook is restricted through the two bridges in the village.
- There is a Thames Water sewage pumping station that was not flooded but failed during the 2007 flood event, leading to sewer flooding.
- There was a lag time of approximately 7 hours between flooding in Signet (located approximately 3 kilometres upstream) and flooding in Shilton – this indicates that the source of flooding is from groundwater as river / surface water flooding would not be subject to such a delay based on the proximity of the settlements.
- Groundwater has been reported to rise through old floors, which are laid directly onto ground without foundations or damp proof courses, and groundwater therefore can rise through property.
- An long-list of options and suggested short, medium, and long-term actions were proposed.
- The installation of a Flood Gauge (flow / level) within the Shill Brook at Shilton was previously recommended – this would provide a better understanding of how the catchment, and in particular groundwater, responds to rainfall.

2.2. Site Visit / Discussions with Residents

2.2.1. A site walkover was undertaken on 24th April 2025 which established the following information:

- Flooding occurred most recently following Storm Bert on 26th November 2024.
- Two bunds, upstream of Shilton, were installed in September 2014 perpendicular to the Shill Brook to hold back flows, with culverts to allow flows to pass through.
- The upstream bund is approximately 1.4 m high, with a 575 mm culvert, and the downstream bund is approximately 1.7 m high, with a 900 mm culvert, as measured on site.
- Railway sleepers are put in place over the inlet to the culvert to control flows through it. These bunds appeared to be effective up until the 2024 event, with no flooding reported to have occurred at the village prior to 2024 in the 10 years following the bund construction.
- There is a mix of clay (impermeable) and sandy (permeable) soils. Groundwater would be prevented from emerging above ground level by the clays and would therefore spring out of the sandy areas during period of high groundwater.
- The brook is spring fed and was dry where the bunds are located but running closer to the bridge.
- Flows through the Sheep Bridge were constricted at the upstream end due to having to pass through the three-arched stone bridge with a secondary two-arched structure approximately 1 metre upstream.
    - Approx. dimensions (WxH) left arch = 1 m x 1 m; middle arch = 1.8 m x 1 m; right arch = 1.2 m x 1 m.
- The bridge is prone to blockage due to debris carried downstream during high flows.
- The blockage and constriction at the bridge causes flows to back up and flow through the garden and garage and under floors of the adjacent cottage (Brook Cottage) and into Bridge Street.

[1] Map - FEH Web Service
[2] env9-west-oxfordshire-district-council-strategic-flood-risk-assessment-update-report-november-2016.pdf
[3] https://www.westoxon.gov.uk/media/fzccmovs/shilton-flood-report.pdf

- Overland flow was also reported to from the hill to the west (upstream) of Brook Cottage. This happens a day or two after rain so most likely due to groundwater.
- Once in the road, flooding affects houses at the eastern side of Bridge Street which trap flooding without a connection back into the Shill Brook.
- Willow Cottage have built a wall along Bridge Street to help keep water out of the property and have pumps to remove water and put it back into the Shill Brook.
- Shill Brook Cottage has experienced flooding within the back garden, with water reported to come up out of the ground.
- Rose Cottage experiences flooding at the back of the property.
- The village pub (Rose and Crown) experienced some flooding under the floorboards.
- At the downstream extent of the village, the ford pond floods where flow is restricted from leaving the village by an arched bridge (Packhorse Bridge) with two openings separated by a central support – each opening is approx. 2 m wide x 1 m high.
- Flow is well contained within the channel downstream of the village pond.
- Flooding is reported to rise through the tiles in the shed of The Forge, located along the channel downstream of the village pond and Packhorse Bridge.

3. SUMMARY OF EXISTING RISK OF FLOODING FROM ALL SOURCES

3.1.1. The existing risk of flooding has been assessed based on a desktop study of publicly available information (mapping is provided in Appendix A), discussions with residents, and local conditions identified during the site walkover on the 24 April 2025. A summary of the risk from all sources is provided within Table 1.

Table 1 - Flood Risk Summary to the site.

SOURCE OF FLOODING	EXISTING RISK	COMMENTS
Fluvial (river)	High	Flooding from the Shill Brook.
Surface Water	Low - High	Generally low but a small area at high risk at the southern end of Bridge Street near the pond.
Groundwater	High	Rising up through gardens and flowing off the hillside upstream of the village.
Artificial Sources	Low	

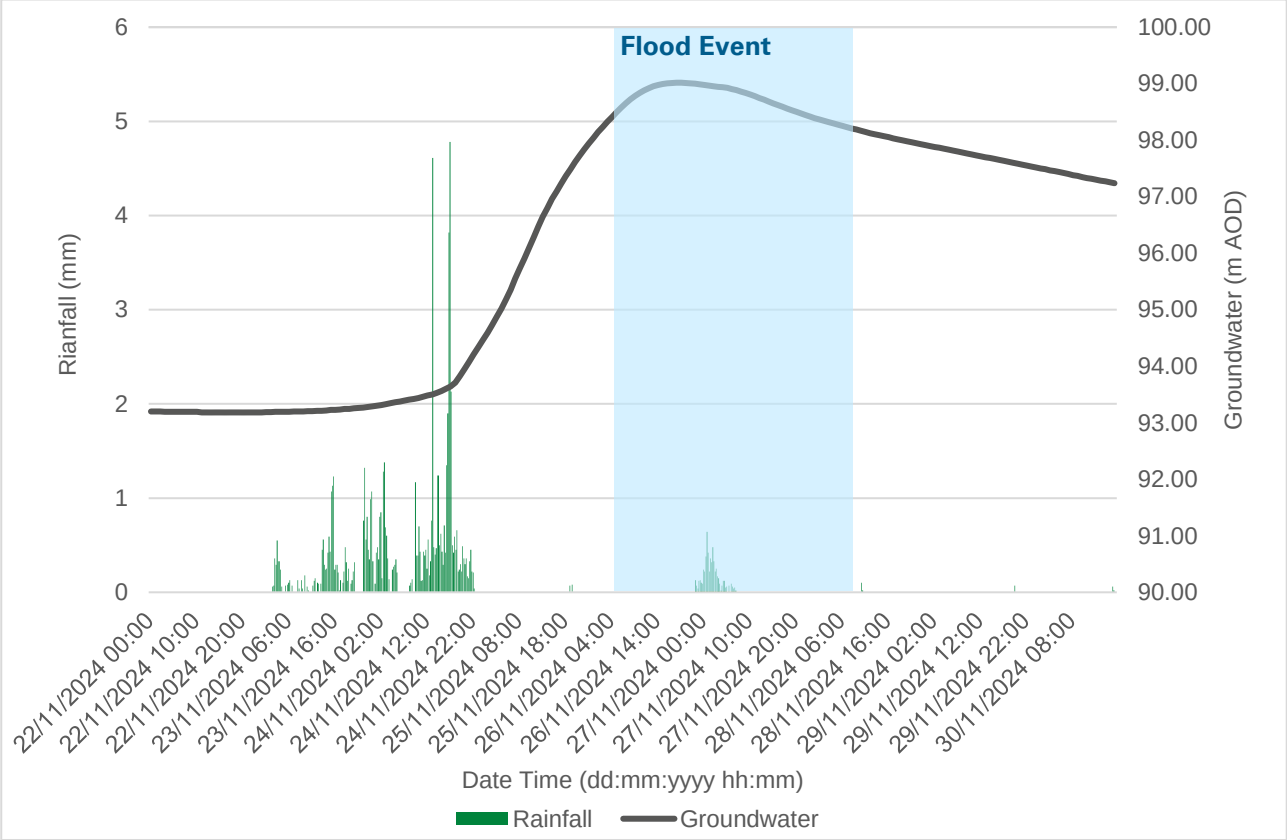
4. NOVEMBER 2024 FLOOD EVENT – STORM BERT

4.1. Storm details

4.1.1. On 26th November 2024, Storm Bert caused flooding in Shilton, affecting several properties, and restricting access around the village.

4.1.2. Recorded rainfall from the Worsham rain gauge, 2.3 km east of the village, and groundwater levels from the Alvescot Field Farm, approximately 2 km to the south of Shilton, were obtained from the EA's Hydrology explorer, as shown on Figure 1.

Figure 1 - Rainfall and groundwater levels during the flood event.



4.1.3. A large rainfall event occurred on 23rd and 24th November, with 68.69 mm of rainfall recorded over the two days at Worsham.

4.1.4. As a result, groundwater levels rose by 6m following the rainfall event, with groundwater recorded at over 99 m AOD on the evening of 26th November 2024, during the flood event at the village.

4.1.5. Since the groundwater record began (January 2019) there has been only one other instance of groundwater levels exceeding 98 m AOD, from 31st January to 2nd February 2021.

4.1.6. The groundwater levels remained high for several days after the initial rise in levels.

4.1.7. A smaller rainfall event is recorded during the flooding which is likely to have exacerbated the situation due to the already high groundwater.

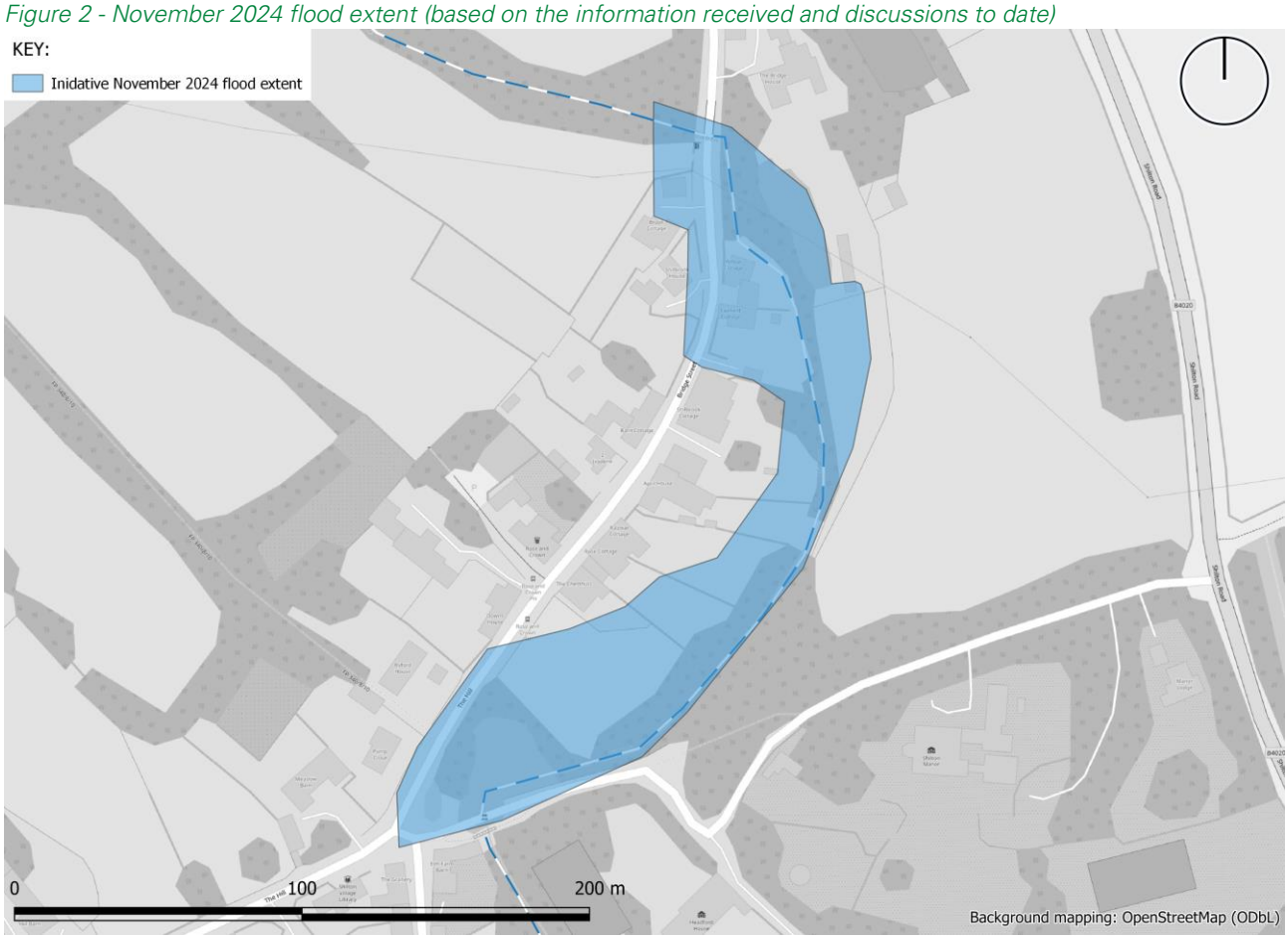
4.1.8. Although not located within the village, these records provide a good indication of conditions (i.e. combination of high groundwater and rainfall) during the flood event.

4.2. Impacts:

4.2.1. A summary of the impacts of the flooding is provided below and an image of the flood extent (based on the information received and discussions to date) is provided in Figure 2.

- Brook Cottage: Flooding from the Shill Brook enters garden and garage.
- Shill Brook Cottage: Garden flooding due to water rising from the ground.
- Rose Cottage: Flooding at the back of the property.
- Rose and Crown Pub: Flooding observed under floor boards.
- Willow Cottage: External flooding and have since installed a wall along Bridge Street to block flows and a pump to return water to the brook.
- The Forge: Flooding through floor tiles in a shed near the channel.

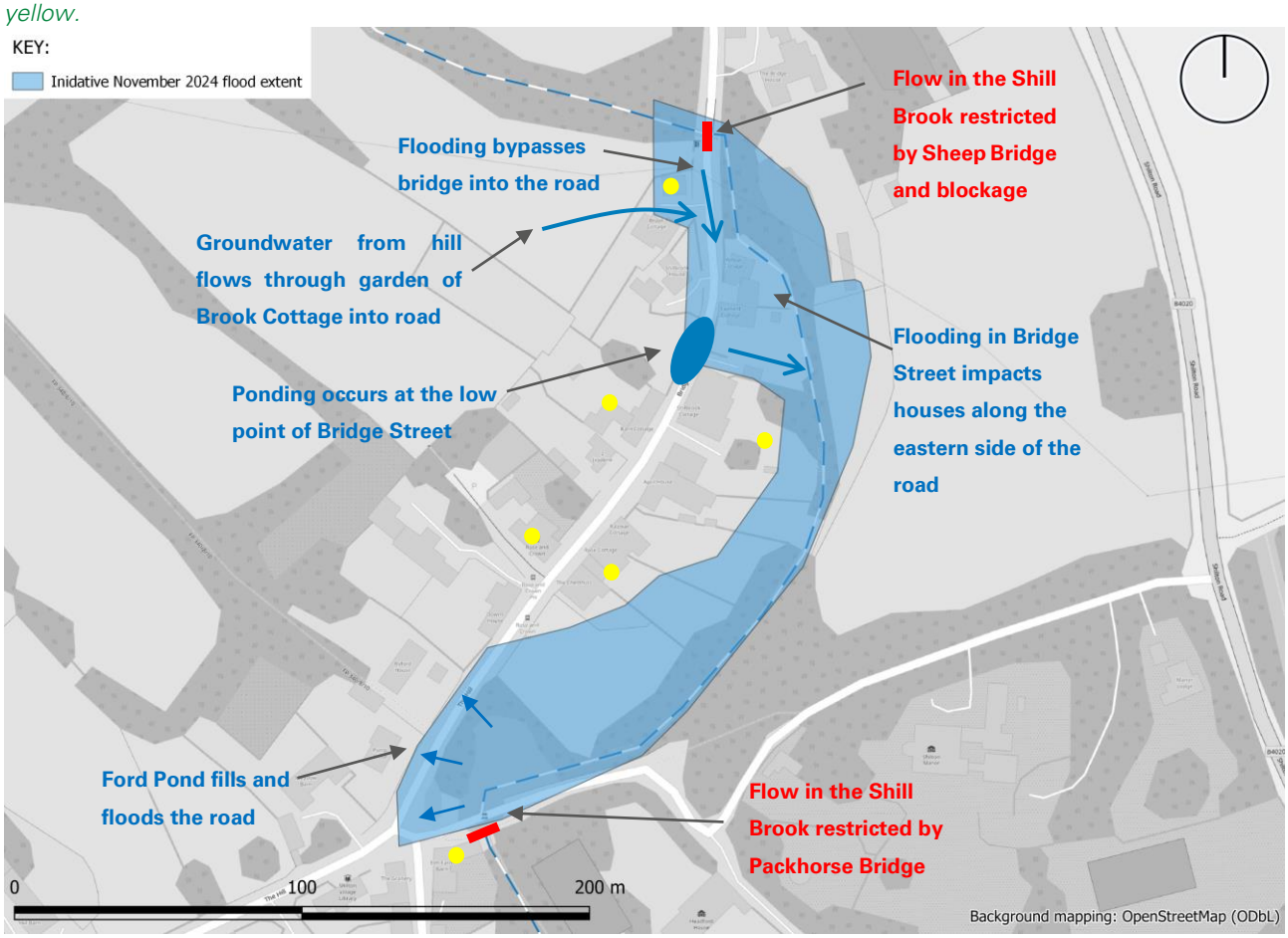
Figure 2 - November 2024 flood extent (based on the information received and discussions to date)



4.3. Flooding Mechanisms

4.3.1. The flow mechanisms associated with the 2024 flood event are presented in Figure 3.

Figure 3 – Flood Mechanisms during the 2024 flood event. Locations of reported groundwater emergence indicated in yellow.



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4.3.2. The principal mechanism of flooding appears to be the constriction of fluvial and groundwater flows at two bridges within the village, the Sheep Bridge and Packhorse Bridge:

- The Sheep Bridge is a three-arched stone bridge with a secondary two-arched structure approximately 1 metre upstream.
- The Packhorse Bridge is a small, two-arch footbridge located at the outlet of the pond.

4.3.3. The capacity of the Sheep Bridge was exceeded with debris such as willow reported to have blocked the bridge, further restricting flows. Floodwater backed up before flowing through the garden of Brook Cottage and into Bridge Street. Once in the road, flooding affected houses at the eastern side of Bridge Street and flooding was trapped without a connection back into the Shill Brook.

4.3.4. Overland flows were reported to have come from the hillside west of Brook Cottage, one to two days after the rainfall. The delayed response suggests that this overland flow was due to groundwater emergence within the adjacent field. There were also several reports of flooding rising up through internal floors and gardens.

4.3.5. At the downstream extent of the village, the Packhorse Bridge also contributed to flooding in the village. The pond fills during high flows and can overflow, impacting nearby roads and buildings. While flow is generally contained within the Shill Brook channel downstream of the village pond, flooding has been observed to rise through floors and tiles in outbuildings such as The Forge.

5. POTENTIAL MITIGATION OPTIONS

5.1.1. Currently, there is no detailed hydraulic model available from the EA for this area, which limits the ability to test and quantify the effectiveness of flood mitigation options. However, potential mitigation options (shown on Figure 4) are outlined below based on the understanding of flooding mechanisms outlined in the previous section.

Figure 4 - proposed mitigation measures.

1. Debris shield - Install a debris shield upstream of Sheep Bridge to intercept debris before it can reach the bridge and result in blockage. This should be regularly maintained and cleared to ensure there is no debris build up and flows can pass freely through.
2. Increase the flow capacity of the bridges:
   - Amend existing structures - remove double upstream face of Bridge Street bridge and central support of the ford bridge to increase flow capacity. However, it is understood that both bridges are listed, which may limit opportunities for physical changes
   - High flow spills over bridges – it has been reported that there is sufficient channel capacity downstream of both bridges. As such installing high-level bypass culverts or other spills at both bridges to allow floodwaters to bypass the structures should be considered. It should be noted however that any proposals to increase the flow capacity of these structures would need to demonstrate that they do not increase flood risk downstream, requiring a flood modelling assessment.
3. Redirect flooding from Bridge Street back into the Brook:
   - Install a ramp or speed bump along Bridge Street to divert flows back into the Brook before they can pass down the street and impact houses.

- Provide a new connection / drainage channel from the low point in Bridge Street back into the Shill Brook. This would enable flooding to quickly return to the Brook and reduce flood risk to properties along Bridge Street.

4. Property Flood Resilience (PFR) – many properties have already installed PFR measures, such a pumps and flood boards. This should be encouraged throughout the village and installed where necessary.
5. Flood Warnings - Ensure all residents are signed up to flood warnings and village wide alert system is in place in case individuals do not receive the warning. The installation of a flood gauge (flow / level) in Signet could be used to provide a warning approximately 7 hours before flooding would be expected to occur, based on the 2007 flood event.

5.1.2. Alongside any interventions, Flow Gauging of the Shill Brook should be carried out. This would provide a much better understanding of how the catchment responds to rainfall. In particular, it would enable a much better assessment of the risk from groundwater, which is difficult to quantify. It could also be used to verify the effectiveness of any mitigation measures implemented and aid in the development of any future hydraulic model.

6. CONCLUSIONS

6.1.1. A review of publicly available data and site walkover were carried out to gain a full understanding of the causes and impacts of the November 2024 flood event and identify suitable mitigation options.

6.1.2. The main flooding mechanisms comprise:

- Flow constriction under the two bridges in the village causing out of bank flows.
- Blockage of the Sheep Bridge.
- Groundwater emergence resulting in internal and external flooding of properties, as well as contributing to the wider flooding issues associated with the Shill Brook.

6.1.3. Suggested flood mitigation options focus on:

- Reducing the risk of blockage to the Sheep Bridge.
- Preventing flooding from entering Bridge Street by rerouting it back into the Shill Brook.
- Removing flooding from Bridge Street when it occurs.

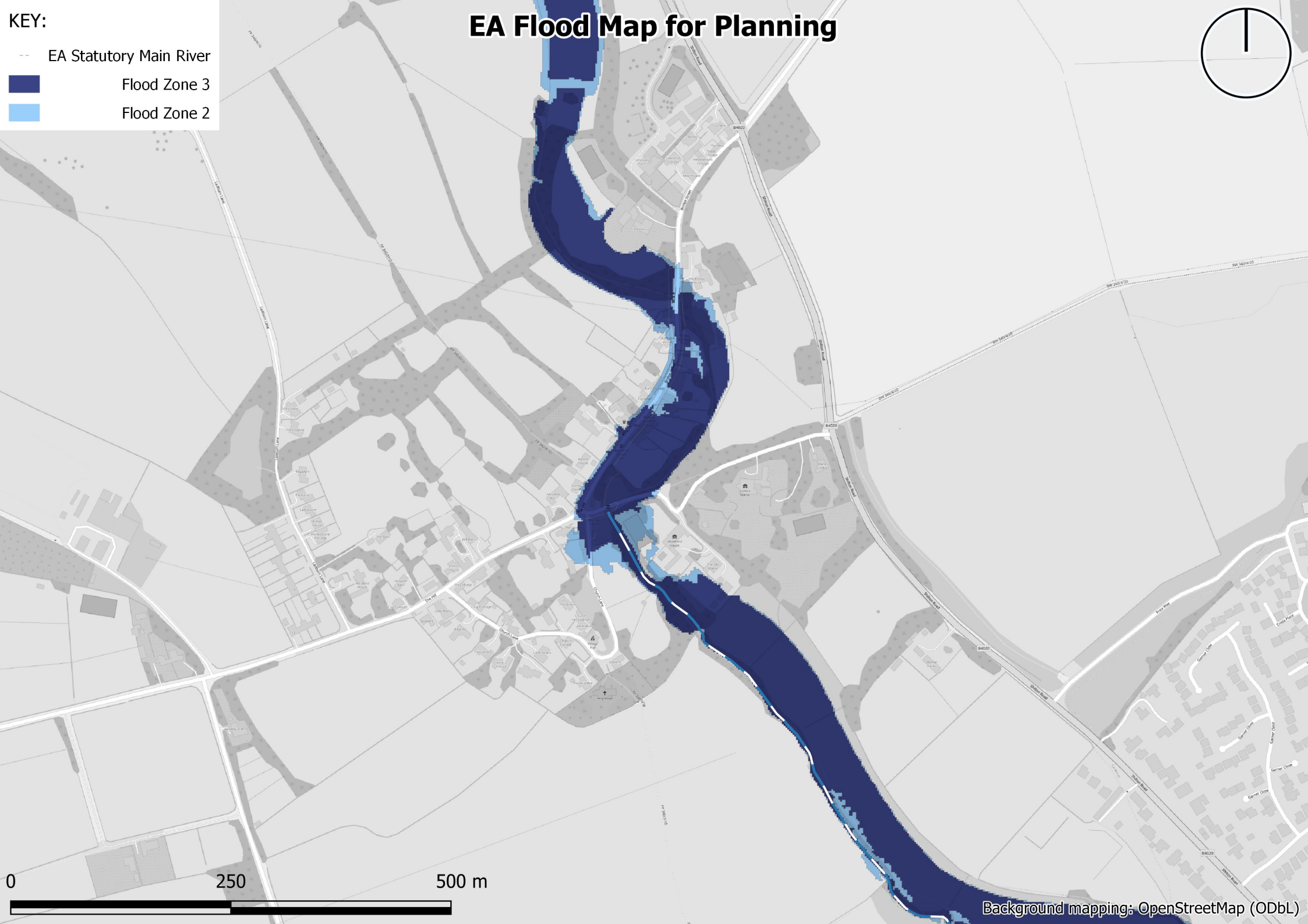
6.1.4. It should be noted that any proposals to increase flow in the Shill Brook would need to demonstrate that they do not increase flood risk elsewhere, requiring a flood modelling assessment.

6.1.5. A flood gauge (flow / level) should be installed in the Shill Brook at Shilton to provide a better understanding of how the catchment, and in particular groundwater, responds to rainfall.

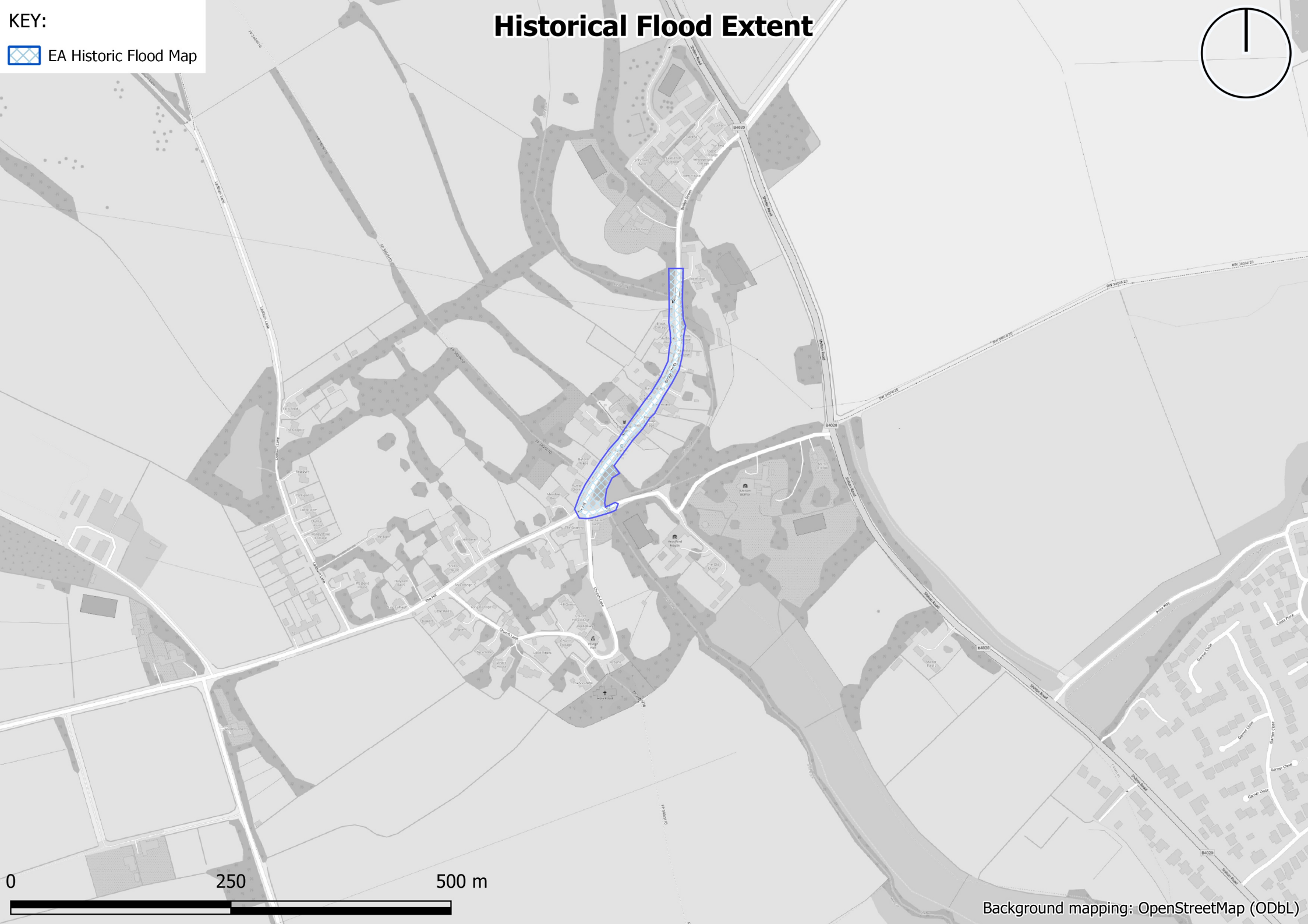
6.1.6. The installation of a flood gauge (flow / level) in Signet could be used to provide a warning approximately 7 hours before flooding would be expected to occur, based on the 2007 flood event.

APPENDIX A – FLOOD MAPPING

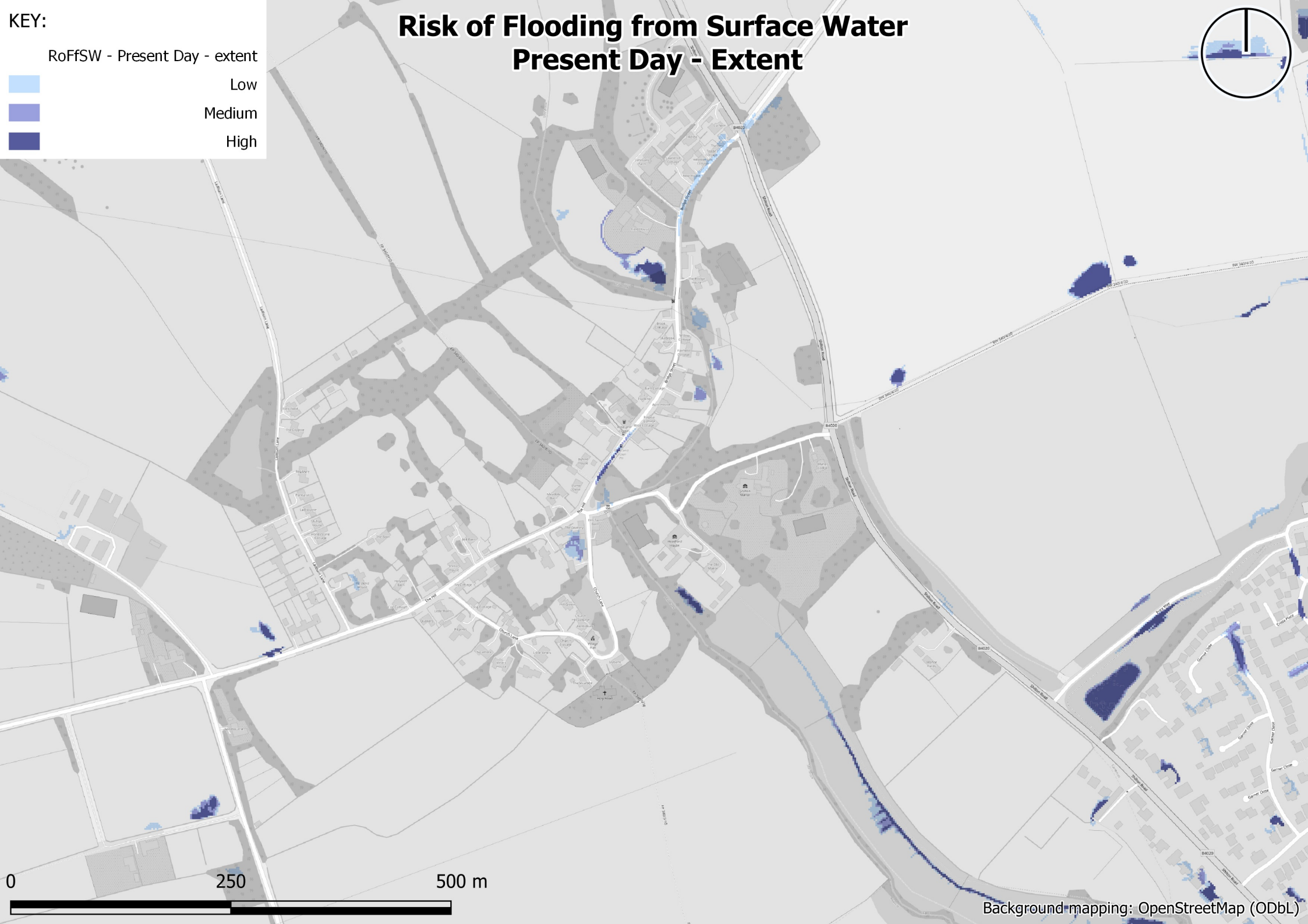
EA Flood Map for Planning



Historical Flood Extent



Risk of Flooding from Surface Water
Present Day - Extent



Risk of Flooding from Surface Water Climate Change (2050s) - Extent