ATKINS

Member of the SNC-Lavalin Group

Alveston Hill cycleway scheme

Flood Risk Assessment

South Gloucestershire Council

16 October 23023

5220316

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1. Site Details

1.1. Site location

The Alveston Hill cycleway scheme is located near the B4061 highway between the village of Alveston and town of Thornbury, north of Bristol.

Figure 1-1 - Location plan

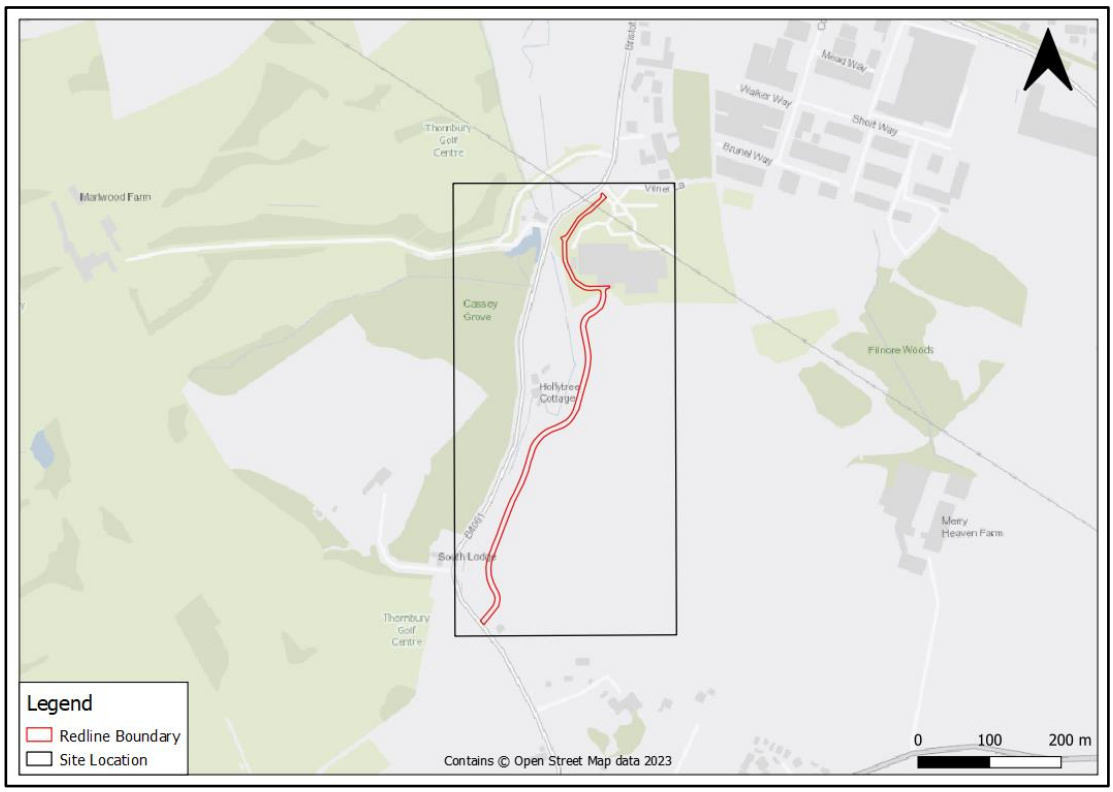


Table 1-1 - Site location

Lead local flood authority	South Gloucestershire
Borough council	n/a
River Basin	Severn
River management catchment	Avon Bristol and Somerset North Streams Management Catchment Severn Lower Vale Operational Catchment Oldbury Naite Rhine Water Body

Table 1-2 - Site details

Site centroid grid reference	363495, 189000
Maximum / minimum elevation	82.45 mAOD / 51.21 mAOD
Site area	4729.0 m
General direction slope across site	North

1.2. Development proposals

1.2.1. The Alveston Hill cycle scheme is to augment the A38 Bus & Cycle Corridor scheme in order to connect the town of Alveston with the rest of the A38 scheme, to the south.

1.2.2. The scheme route connects with the A38 at the junction with the A38 and the B4061/Alveston Hill and extends northwards as far as Midland Way, providing a link to the town. The route aligns with the existing footway to the A38 but deviates from Alveston Hill (running parallel to the main highway across some fields) in order to directly connect with the Thornbury Leisure Centre. This route enables the vertical profile of the cycle lane to adopt a shallower, more manageable gradient than that offered by the B4016 at that section

1.2.3. The pre-application proposals comprise the following:

- Creation of a multi-use path including a 3m 2-way cycle track and 2m footpath from Alveston Hill to Thornbury Leisure Centre;
- Removal of some trees and hedgerows to facilitate new path;
- New connection point on Alveston Hill to link multi-use path with the existing highway;

1.2.4. This new path would replace the current PRoW that runs to the east of the site, providing a dedicated path suitable for multiple modes of sustainable transport in lieu of the current field.

1.3. Flood risk assessment

1.3.1. A flood risk assessment is required for most 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

1.3.2. 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, and to demonstrate that any residual risks to the development and its users would be acceptable;
- whether it will increase flood risk elsewhere (to demonstrate that the development would not increase flood risk elsewhere);
- whether the measures proposed to deal with these effects and risks are appropriate;
- the evidence for the local planning authority to apply (if necessary) the Sequential Test, and, where applicable, whether the development will be safe and pass the Exception Test; and
- to satisfy the requirements of the National Planning Policy Framework (NPPF), and specifically the NPPF Guidance on Flood risk and coastal change (Flood risk and coastal change - GOV.UK (www.gov.uk)).

1.3.3. Flood risk should be considered alongside other spatial planning issues such as transport, housing, economic growth, natural resources, regeneration, biodiversity, the historic environment and the management of other hazards.

1.3.4. CIRIA C624[1] , from 2004, provides guidance on the implementation and good practice in assessing flood risks through the development process. The aim of C624 is to promote developments that are sustainable with regard to flood risk. The document recommends that an FRA should be undertaken in phases so that the type of development corresponds with the detail required.

[1] Lancaster, J.W., Preene, M. & Marshall, C.T. (2004) Development & Flood Risk – Guidance for the Construction Industry. CIRIA publication C624.

1.3.5. There are three levels of assessment:

- **Level 1 FRA (Screening Study):** To identify if there are any flooding issues related to a development site which may warrant further consideration. The screening study will ascertain whether a Level 2 or Level 3 FRA is required.
- **Level 2 FRA (Scoping Study):** Undertaken if a Level 1 study indicates that the site may lie within an area which is prone to flooding or that the site may increase flood risk due to increased runoff; and to confirm the possible sources of flooding which may affect the site. The Scoping Study will identify any residual risks that cannot easily be controlled and, if necessary, will recommend that a Level 3 FRA is undertaken. It is typically a qualitative assessment using available data.
- **Level 3 FRA (Detailed Study):** Undertaken if the Level 2 study concludes that quantitative analysis is required to assess flood risk issues related to the development site. This may include detailed hydraulic modelling of rivers or drainage systems.

1.3.6. This report forms a Level 1 FRA. Hence this report provides a screening assessment of the risks arising to the Scheme as a result of its location and design.

1.3.7. Specifically, this report seeks to consider the 'key questions':

- Is the site likely to be at risk of flooding from: a watercourse, the sea, an estuary, groundwater, overland flow, an artificial drainage system, infrastructure failure?
- Is the Scheme likely to obstruct the maintenance access requirements or affect the integrity of an existing flood defence?
- Is the Scheme likely to increase flood risk elsewhere due to increased runoff rates and volumes from the site?
- Given the above and the nature of the development, is continued promotion of a possible development at the site appropriate?

1.3.8. The requirements from the practice guide (Paragraph 020 Flood risk and coastal change) are also relevant: 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;
- the evidence for the local planning authority to apply (if necessary) the Sequential Test, and;
- whether the development will be safe and pass the Exception Test, if applicable.

1.3.9. The report has been completed in line with the NPPF and makes use of readily available information from the following sources:

- Environment Agency online flood map for planning.
- Environment Agency online long term flood risk map.
- LiDAR data for the site obtained from the .Gov website.

2. Flood risk data

2.1. FRA information

Table 2-1 – Flood risk information

HISTORICAL FLOODING	
Site within EA historic flood extent	No
Distance and direction to nearest historic flooding[2]	2.702 km, North
FLUVIAL FLOODING	
Flood zone	Fluvial Flood Zone 3. The unnamed tributary of the Oldbury Pill is indicated by the Environment Agency to present Flood Zone 3, despite not being a Main River.
Flood Zone 2	Within scheme boundary -Yes Distance from scheme boundary: 0 m,
Flood Zone 3	Within scheme boundary-Yes Distance from scheme boundary: 0 m,
Nearest watercourses	The cycle scheme crosses the Pool Brook and another unnamed tributary of the Oldbury Pill near the Bristol Road. These are Ordinary Watercourses. There are no Main Rivers present.
Distance to nearest watercourses	291 m, North
Nearest flood defence	2.371 km, South East
Nearest flood defence description	Fluvial. High ground
Within an area benefitting from defences	Yes. Flood defences along the eastern bank of the tidal River Severn maybe proving benefit to the Alveston Area.
HYDROMETRIC DATA	
Number of flow gauges within search radius	2
Closest flow gauge	Frampton Cotterell, gauge number 530240
Distance to closest flow gauge	7.187 km, South
Number of rain gauges within search radius	4
Closest rain gauge	Cromhall, gauge number 1811
Distance to closest rain gauge	4.423 km, East
TIDAL FLOODING	
Flood zone	No tidal flood risk indicated with ground levels above 50m AOD.
Flood Zone 2	Within scheme boundary - No
Flood Zone 3	Within scheme boundary - No

[2] Distance to nearest historic flood extent within the given dataset. Absence of historic flood extent does not confirm it has not previously flooded.

Distance to nearest mean tidal high water	4.716 km, North West
SURFACE WATER FLOODING	
High risk zone (1 in 30)	Within scheme boundary - Yes Distance from scheme boundary: 0 m, NA
Medium risk zone (1 in 100)	Within scheme boundary - Yes Distance from scheme boundary: 0 m, NA
Low risk zone (1 in 1000)	Within scheme boundary - Yes Distance from scheme boundary: 0 m, NA
Overall risk of SW flooding	30 year
GROUNDWATER FLOODING	
Geology	The National river Flow Archive described the area as a responsive to rainfall with steep headwaters which drain complex sequence of limestones, sandstones and clays of Lower and Middle Jurassic; The flat Vale of Berkeley is underlain by Cambrian inlier, Keuper Marl and Lias clays. Generally low or mixed permeability bedrock not overly supportive of groundwater flooding. The UK Water Resources portal indicates the presence of a low to moderately productive aquifer.
RESERVOIRS	
Within reservoir wet day inundation flood extent?	N/A
Reservoir name	-
Reservoir operator	-
Risk designation	No Risk
OTHER	
Canals – nearest canal	No Canals within 10km
Water transmission infrastructure – distance to…	Unknown

2.2. Figures

Figure 2-1 - Fluvial flooding

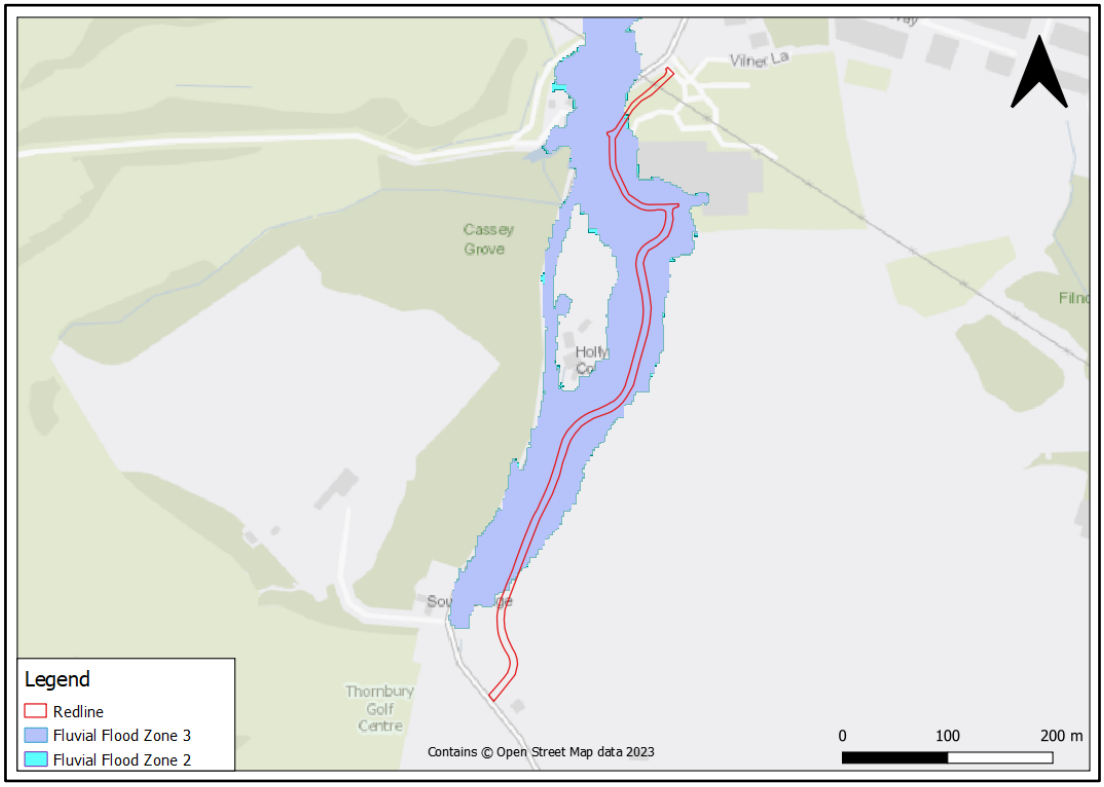


Figure 2-2 - Surface water flooding

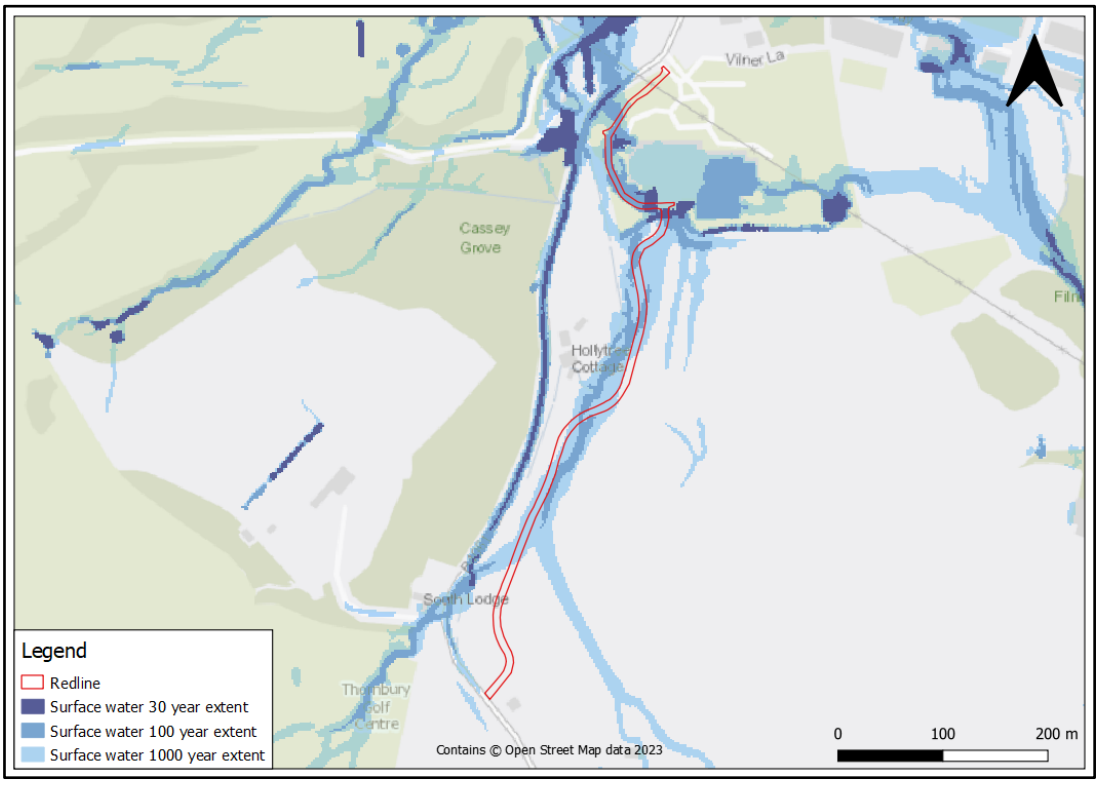


Figure 2-3 - Historic flooding

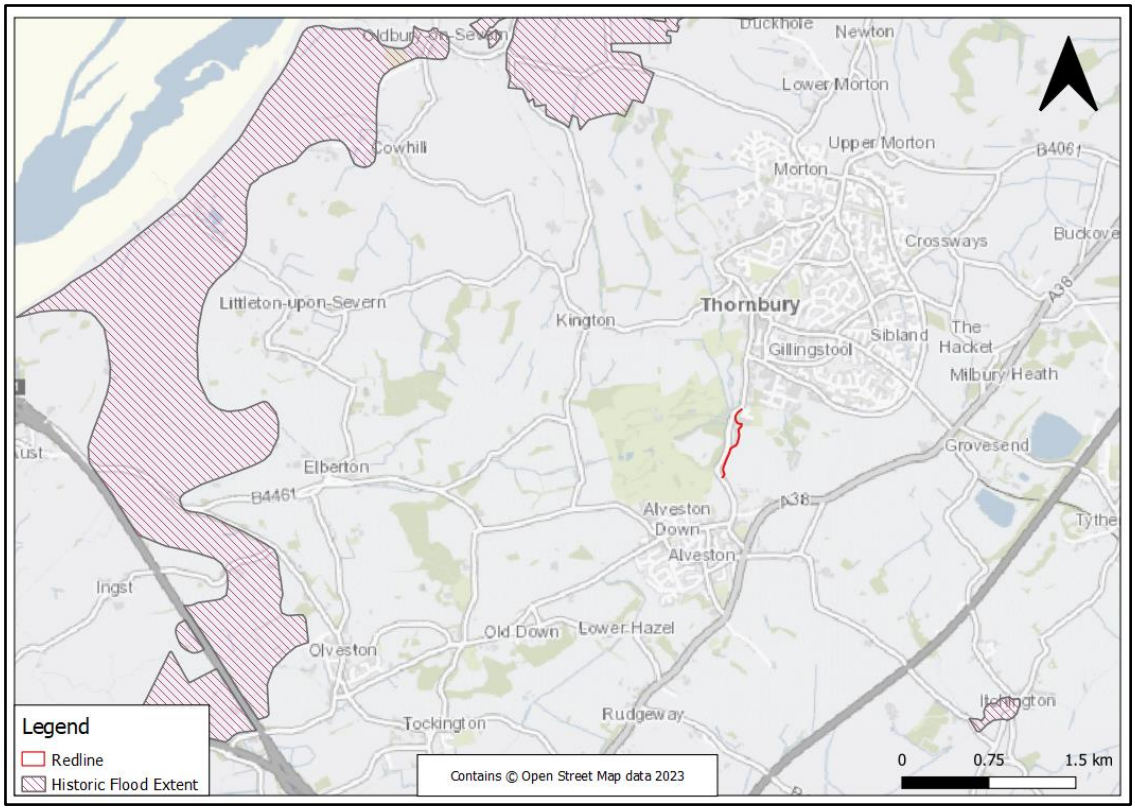


Figure 2-4 – Flood defences

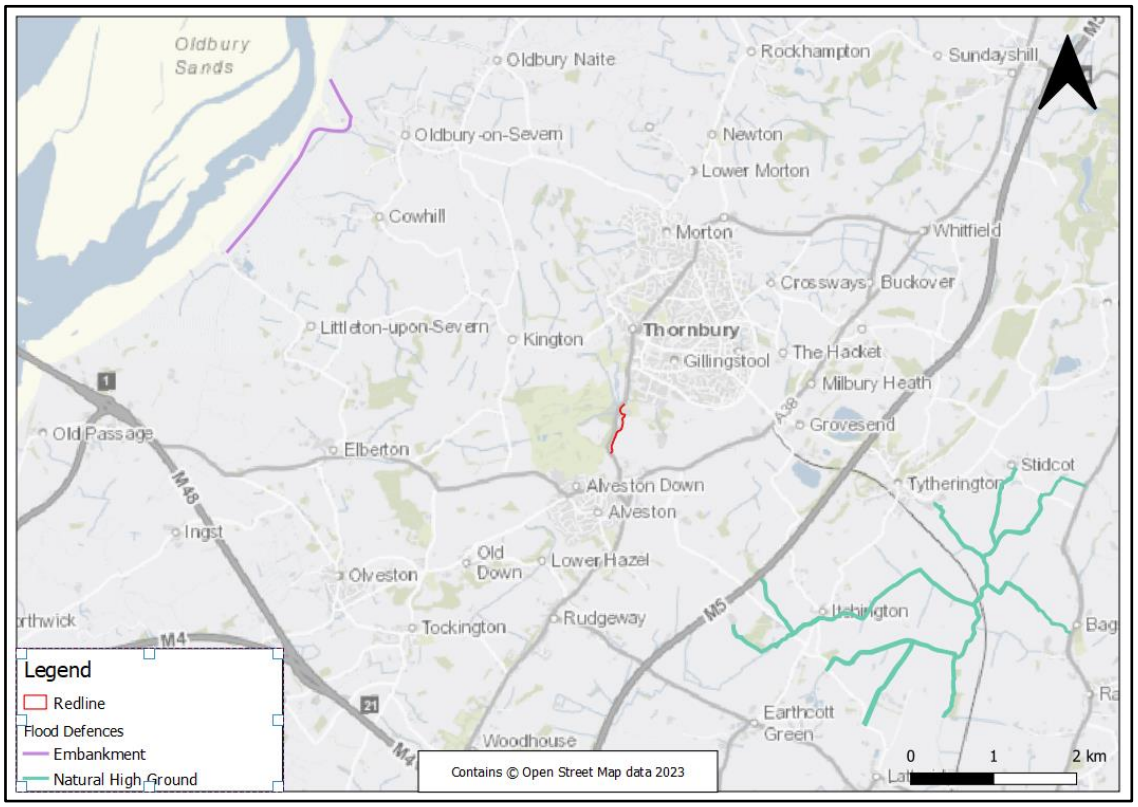


Figure 2-5 - Gauge locations

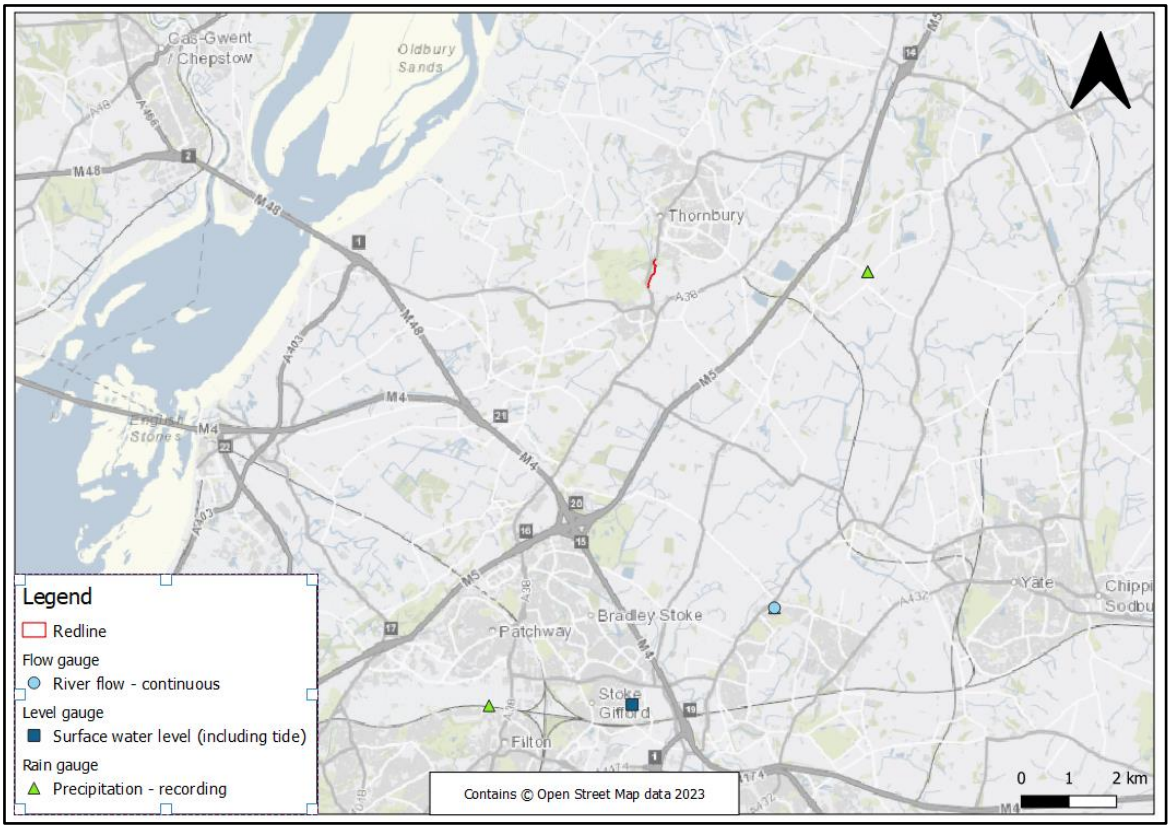


Figure 2-6 – Lidar

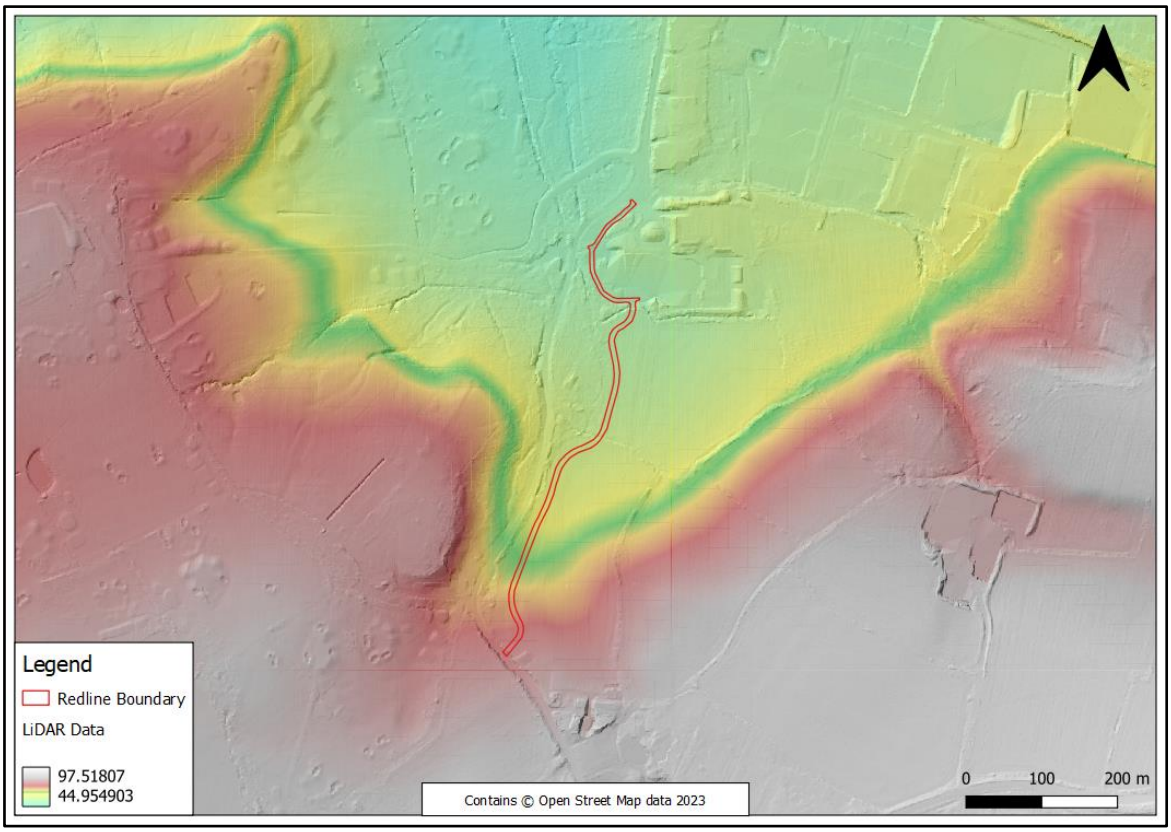


Figure 2-7 – Superficial geology

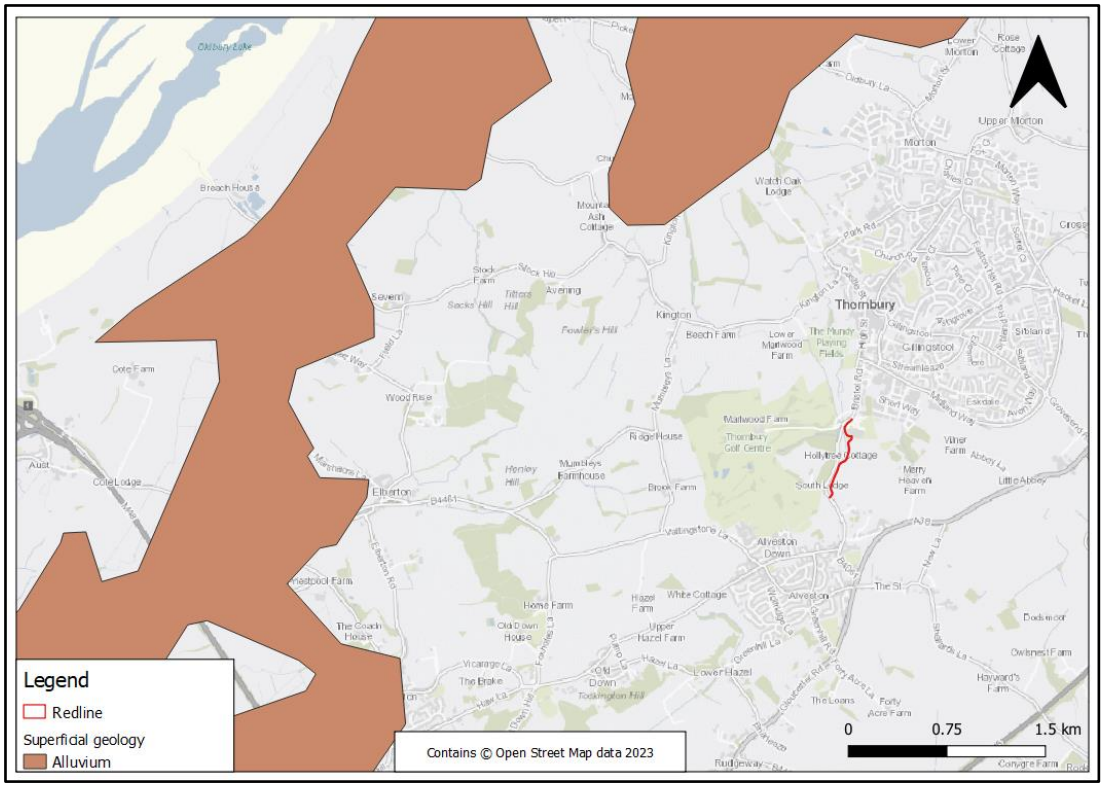
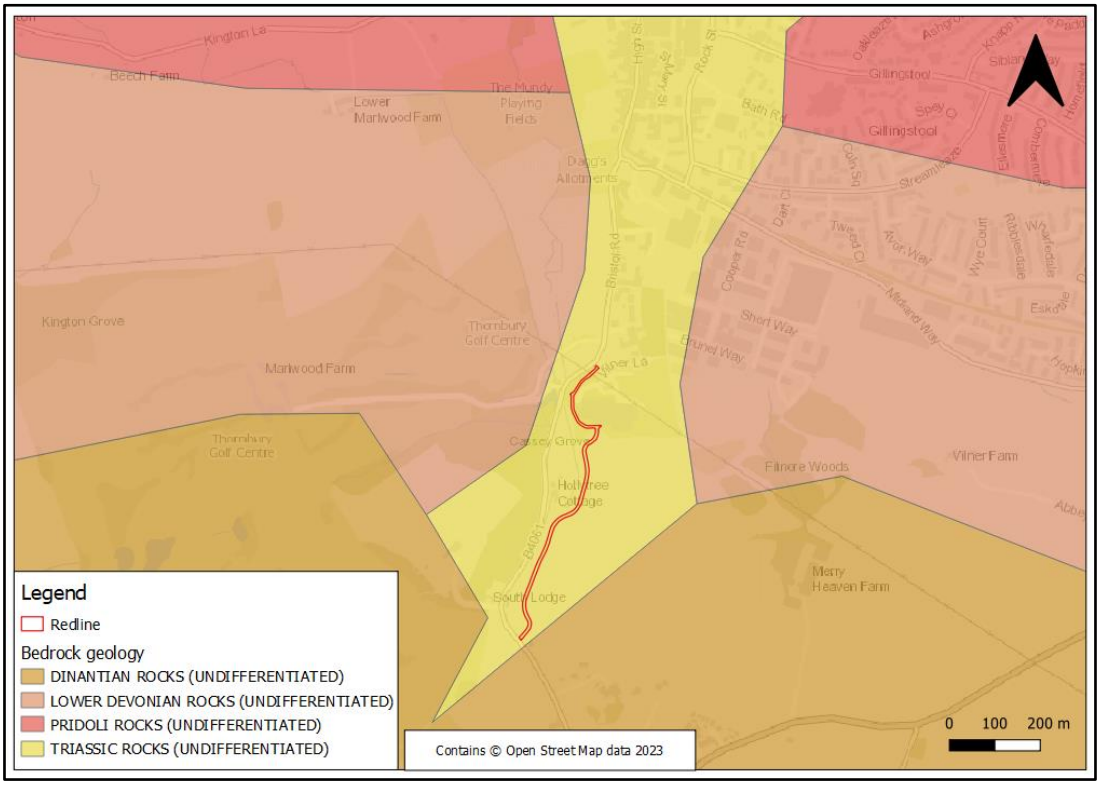


Figure 2-8 – Bedrock geology



2.3. Summary of flood risk sources

2.3.1. Table below summarises the likely sources of flood risk to this Scheme.

Table 2-2 – Sources of flood risk summary

Flood risk	Baseline risk	Commentary
Fluvial	High	Flood risk from the Oldbury Pill and its tributaries.
Tidal	None	Not applicable - no tidal influences.
Surface Water	High	Surface water flood risk arising from runoff from the south, draining into the Oldbury Pill and its tributaries.
Groundwater	Low	Based on geology the risk of groundwater flooding is low.
Sewers	Low	Low risk in rural area.
Other sources	Low	Risk of flooding from the Dowdeswell Reservoir should failure occur. Reservoirs Act requirements reduce this risk to an acceptable level.

2.3.2. The predominant risk of flooding to the site arises from fluvial and surface water flooding.

3. Assessment of flood risk

3.1. Initial assessment

3.1.1. The primary source of flood risk for consideration with the Scheme is fluvial and surface water. The risk of surface water flooding is connected with the fluvial flood risk.

3.1.2. Table 3-1 sets out the NPPF flood risk vulnerability and Flood Zone compatibility assessment, as taken from Table 2 of the NPPF Planning Practice Guidance (paragraph 079). The definitions for vulnerability type and Flood Zone compatibility are available on the Gov.uk website. The table indicates which development types are appropriate within each Flood Zone.

Table 3-1 – 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 †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓ *

✓ Development is appropriate ✗ Development should not be permitted

† 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.

3.1.3. The Scheme will be part of a transport infrastructure that can be described as recreation and sports link, being a non-key transport link. Under the NPPF guidance (Annex 3), the development could be classified as Water Compatible, or at worst, Less Vulnerable, although this will need to be confirmed by the planning authority.

The Scheme is considered by this FRA to be classified as Less Vulnerable.

3.1.4. Based on its Less Vulnerable classification, and crossing Environment Agency Flood Zone 3, Table 3-1indicates that the Scheme is compatible with the flood risk.

The Scheme is compatible with the flood risk

3.2. Sequential Test

3.2.1. The proposed scheme is a development to improve transport infrastructure at a regional level by upgrading an existing active travel route across a field to create a multi-modal, fit for purpose path. It is not specifically described in the Local Plan, although policy CS8 of the Core Strategy seeks to improve accessibility supporting sustainable travel links by the integration of walking and cycling into the local network.

3.2.2. Alternative options were considered for the Scheme, however:

- as the site is located within the Green Belt any development must not impact on its openness. By aligning the route broadly adjacent to the existing highway and edge of the agricultural fields, it would preserve the openness of the Green Belt and would not conflict with the purposes of including land within it.
- This is preferable in design, landscape and Green Belt terms to surfacing the current Public Right of Way that runs through the fields, which would not likely receive planning permission due to it impacting on the openness of the Green Belt and therefore constituting inappropriate development under the NPPF.
- Any alternative route positioned outside of Flood Zone 2 or 3 would be sited within the centre of the fields. This would not likely receive planning permission due to it impacting on the openness of the Green Belt and therefore constituting inappropriate development under the NPPF.
- The proposed scheme provides enhanced cycle provision connecting to the A38 and a milder gradient shared route between Thornbury Leisure Centre and Alveston, avoiding the steep Bristol Road via Alveston Hill .

3.2.3. As there are no alternative routes that are available and have reasonable prospects of securing planning permission, the proposed scheme is the sequentially preferable route and therefore satisfies the application of the Sequential Test to justify the location of the development.

3.2.4. Table 3-2, below, addresses the steps in the Sequential Test.

Table 3-2 – NPPF Sequential Test application on the Scheme

Sequential Test step	Test step question	Test outcome
1	Can development be allocated in Flood Zone 1?	No, the cycleway has to cross the floodplain as it connects with existing highways at either end, and seeks an appropriate route up Alveston Hill.
2	Can development be allocated in Flood Zone 2?	No, the cycleway has to cross the floodplain.
3	Can development be allocated within lowest risk sites available in Flood Zone 3?	No ,the cycleway has to cross the floodplain
4	Is development appropriate in remaining areas?	Yes. Development considered to be “Less Vulnerable”, It crosses Flood Zone 3 “Floodplain (defined in NPPF, Table 1, Paragraph 078. Development can be allocated to the area

3.3. Exception Test

3.3.1. In accordance with Table 2: Flood risk vulnerability and flood zone ‘incompatibility’ of Planning Practice Guidance (paragraph 079 Reference ID: 7-079-20220825), the Scheme does not require application of the Exception Test. However, as the Scheme crosses Flood Zone 3a it should be designed and constructed to remain operational and safe in times of flood. It is not understood to cross Flood Zone 3b (functional floodplain) or its equivalent, although may cross an area at high risk of flooding.

3.3.2. As deep floodwater is predicted along the path consideration on the design is needed to ensure it remains operational and safe, or that emergency plan is in place to prevent its use during such times. Use should be made of the Defra flood hazard ratings to confirm the safety of users.

3.4. Impact of future climate change

3.4.1. The published Environment Agency mapping does not include for the effects of future climate change.

3.4.2. The climate change uplift for the flows was determined using the Environment Agency's May 2022 climate change guidance for river flow in Flood Risk Assessments. The Avon Bristol and Somerset North Streams management catchment was used (Severn river basin district), indicating a 2080s Central estimate of 26% increase in flow over the next 100 years

Table 3-3 – Climate change allowances for peak river flow

River Basin	Severn
River management catchment	Avon Bristol and Somerset North Streams
Central allowance	26%
Higher Central allowance	39%
Upper End allowance	71%

3.4.3. As a Less Vulnerable the **Central allowance (+26%)** should be applied to the assessment design.

3.4.4. Increased rainfall affects river levels and land and urban drainage systems. The anticipated changes in peak rainfall intensity in small catchments (less than 5 km^2), or urbanised drainage catchments are shown below. For flood risk assessments the Environment Agency advice is to assess both the central and upper end allowances to understand the range of impact.

Table 3-4 –Climate change predictions on rainfall intensity for the Scheme site

Allowance category	Total potential change anticipated for the		
	2020s' (2015 to 2039)	2050s' (2040 to 2069)	2080s' (2070 to 2115)
Rainfall intensity in small catchments (less than 5km2), or urbanised drainage catchments			
Upper End	10%	20%	40%
Central	5%	10%	20%

3.4.5. There is no specific guidance on drainage standards for cycle paths, with the Department of Transport's Cycle Infrastructure Design (Local Transport Note 1/20 of July 2020) nor Manual for Streets, not describing any specific design standards on this matter.

3.4.6. As indicative guidance, the Design Manual for Roads and Bridges (DMRB) technical note on the Design of Highway Drainage Systems (for motorways and all-purpose trunk roads, of which this cycleway is not) states that drainage designs shall be developed on the basis that all new road drainage has a minimum design lifetime of 60 years, unless otherwise instructed. And with a 20% uplift in peak rainfall intensity as the basic climate change factor. It also recommends a sensitivity test with 40% uplift in peak rainfall intensity to establish a robust drainage design that accounts for the inherent uncertainty in the estimation of flow and climate change impacts on rainfall.

Flood Modelling

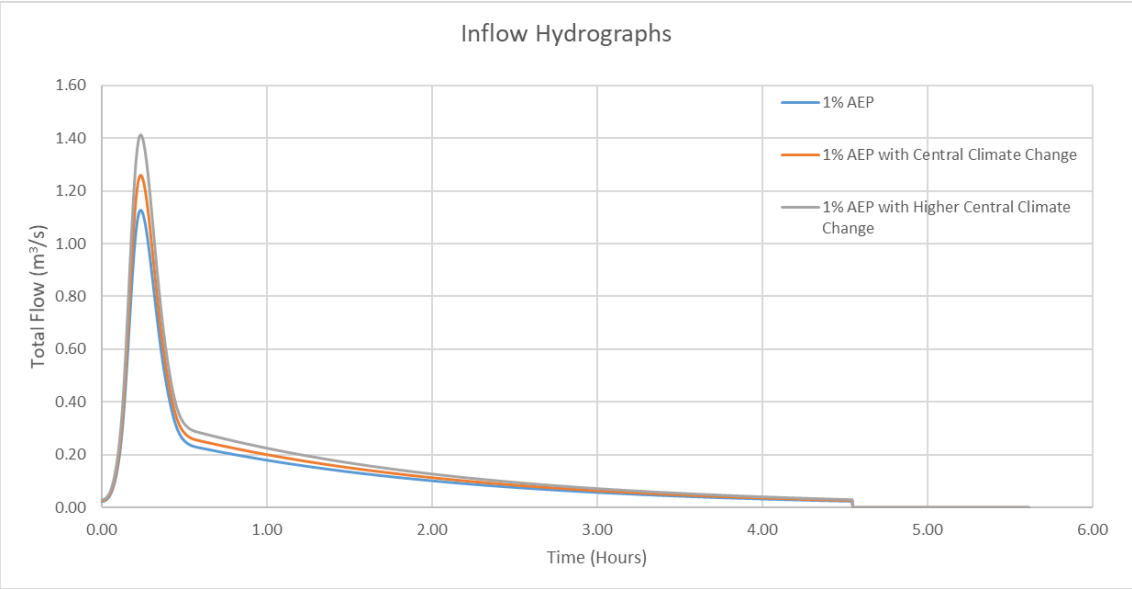
3.4.7. To better understand the depth of flooding at the site a high-level, 2D only, hydraulic model was setup using HEC-RAS version 6.3.1. The available Defra LiDAR data was used to prepare a 2D grid. No grid enhancements were made, and no structures included.

3.4.8. The inflow hydrographs for the HEC-RAS model estimated using the ReFH2 approach, taking catchment descriptors for the online FEH Web service. The inflows were calculated for 1% annual exceedance probability event (1 in 100-year return period) applying the central (26%) and the more precautionary higher central (39%) climate change impact. The resulting flow hydrographs are shown in **Figure 3-1**.

3.4.9. The 1% annual exceedance probability event (1 in 100-year return period) flow peaks at 1.1 m^3/s, rising to 1.25 m^3/s and 1.4 m^3/s with future climate change (26% and 39% respectively).

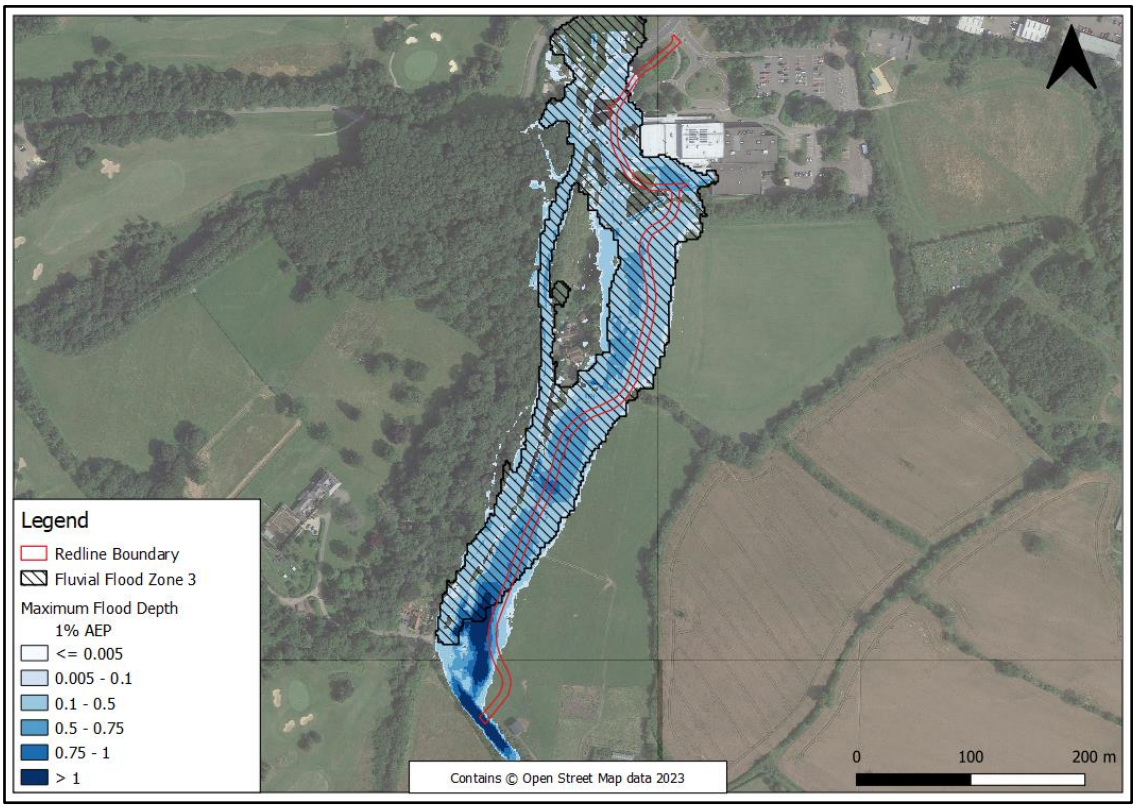
- Present day 1% AEP = 1.1m^3/s

Figure 3-1 – Inflow Hydrograph from ReFH2 Software



3.4.10. The model result (flood extent) obtained from 1% AEP is compared with the EA Fluvial Flood Zone 3 map to demonstrate that it captures the almost the same extent as EA maps and is shown in Figure 3-3.

Figure 3-2 – Comparison of Flood Extent Map

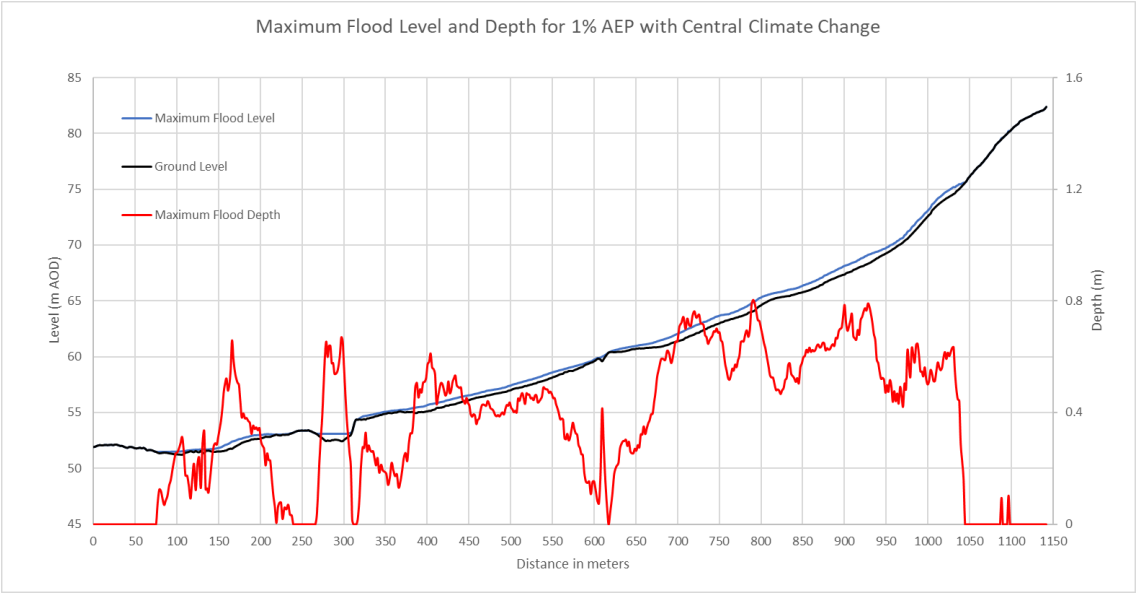


3.4.11. The maximum flood depth map for 1% AEP with central climate change is shown in Figure 3-3.

Figure 3-3 – Maximum Flood Depth Map (1% AEP with Central Climate Change)

3.4.12. The maximum flood level and depth along the cycleway (north to south) for 1% AEP with central climate change allowance is shown in the profile plot Figure 3-4. The range of flood depths along the Alveston Hill cycle way was found to be up to 0.80 m for 1% AEP with the central climate change allowance.

Figure 3-4 – Maximum Flood Level and Depth Plot (1% AEP with Central Climate Change)



3.4.13. The greatest depth flooding is between chainage 780m to 800m, on this plot. This is at the southern end of the cycleway, near the driveway to Marlwood Grange (OS NGR 363,373; 188,783). Flood depths in this area just exceed 0.80 m over a distance of only 1 m. The path is inundated over greater lengths for lesser depth:

- Depth over 0.8m over a distance of 1 m
- Depth over 0.5m over a distance of 391 m
- Depth over 0.3m over a distance of 680 m

3.5. Summary of flood risk

3.5.1. The site susceptible to flooding with most of the path being flooded at the 1% annual exceedance probability event (1 in 100-year return period) accounting for future climate change.

4. Management over development lifetime

4.1. Design

4.1.1. A drainage strategy is required to advise the design, specifically on how surface water will drain based on sustainable drainage principle, without increasing flood risk elsewhere. Surface water disposal should be as high up the Sustainable Drainage hierarchy as possible.

4.1.2. Permeable surfacing or over-the edge drainage may be appropriate, so infiltration tests would be required to demonstrate the viability of any discharge to ground (including ground water levels). It may be that the drainage scheme requires a controlled runoff in accordance with greenfield rates, limiting discharge to the Greenfield Qbar rate.

4.1.3. Given the risk of flooding, it is likely that the drainage will be readily overcome and inundated by runoff from the surrounding land and watercourse.

4.1.4. The existing hydrological and land drainage features should be retained and their continued operation (connectivity) ensured.

4.1.5. Ordinary Watercourse Consent for the work and drains structures relating to an ordinary watercourse may be required and further guidance is available from South Gloucestershire Council as the LLFA.

4.2. Management

4.2.1. There are lifetime management issues for the proposed Scheme related to the management and maintenance of the cycleway and its related infrastructure.

4.2.2. Any new hydraulic structures will need regular inspection and maintenance. Accumulations of sediments and debris at these will increase flood risk on the surrounding land, and could cause additional flooding. It should be noted that flood flows will increase with time in line with climate change. This will increase the frequency for structure maintenance.

4.2.3. As the path is predicted to inundate over much of its length, a management plan is required to ensure the path can be cleared of debris and sediments after floodwaters have receded.

4.3. Flood warning and evacuation

4.3.1. This FRA has identified a notable flood risk in terms of depth of inundation, and hence a specific flood warning system should be considered for the Scheme, with an emergency closure/evacuation process being prepared for when the path becomes unsafe to use.

4.3.2. Furthermore, as the Scheme crosses Flood Zone 3a it should be designed and constructed to remain operational and safe in times of flood or a flood-focussed emergency evacuation plan be prepared to prevent use during times of flood.

5. Conclusion

5.1.1. This FRA has presented an assessment of flood risk to the Alveston Hill cycleway. The Scheme is at risk from flood sources as summarised below, with the risk based only on the published Environment Agency data, and reinforced by the high-level flood modelling.

Table 5-1 - Summary of flood risk

Flood risk Source	Relevant Source of flooding	Risk	Requires further assessment?
Fluvial	Yes	High	Yes – the impact of the Scheme on flood risk elsewhere needs to be considered.
Surface water	Yes	High	
Groundwater	Yes	Low	No
Sewers	No	Low	No
Other sources	No	Low	No
Coastal/tidal	No	None	No

5.1.2. At this stage, with limited design, no assessment has been made of the potential flood impacts on external receptors arising from the construction or operation of the cycleway. However, the assessment describes that the cycleway will be at flood risk, with some deep water inundation expected, particularly at the southern end where depths of over 1 m are predicted over the next 100 years.

5.1.3. This FRA concludes that:

- The Scheme crosses Environment Agency Flood Zone 2 and 3, albeit not over a Main River.
- The vulnerability classification of the Scheme is Less Vulnerable.
- The Scheme vulnerability is compatible with the envisaged flood risk.
- The Scheme satisfies the Sequential Test.

5.1.4. The Sequential Test is passed for the Scheme, through demonstration of the site selection process that took flood risk into account alongside other constraints.

5.1.5. Increases in rainfall and river flow arising from future climate change will increase flood risk from all sources.

5.2. Answers to the key questions

5.2.1. The FRA can now consider the questions:

Is the site likely to be at risk of flooding from: a watercourse, the sea, an estuary, groundwater, overland flow, an artificial drainage system, infrastructure failure?

Yes, there is a risk of flooding from the unnamed Ordinary Watercourse, a tributary of the Oldbury Pill, and also from overland flow arising from surface water accumulation.

Is the Scheme likely to obstruct the maintenance access requirements or affect the integrity of an existing flood defence?

No, there are no existing flood defences, or maintenance routes to any watercourse that will be affected by the Scheme.

Is the Scheme likely to increase flood risk elsewhere due to increased runoff rates and volumes from the site?

It is unknown at this stage, without design information, whether the Scheme would increase flood risk elsewhere. Controls on peak discharge rates and volumes will be included in the design and mitigation within the boundary of the scheme will be investigated should the design be predicted to increase flood risk.

Given the above, and the nature of the development, is continued promotion of a possible development at the site appropriate?

Yes – the Scheme satisfies the basic requirements of the NPPF with regards flood risk.

5.3. Concluding remarks

5.3.1. In conclusion, the site at Alveston is at risk of flooding from fluvial and surface water sources. There is a risk that the cycleway infrastructure will be inundated by the 1% annual exceedance probability event (1 in 100-year return period) over a combined distance in excess of 970m. However, much of the site will also remain flood free.

5.3.2. Flood levels across the site are predicted to increase with future climate change, with an uplift of 26% applied to surface flows, and/or 20% on peak rainfall intensity.

5.3.3. Site topographic survey and hydrological and hydraulic modelling would need to be carried out to complete a more detailed assessment of flood risk to the proposed cycleway.

5.4. Recommendations

5.4.1. It is recommended that the Scheme is tested through hydraulic modelling before detailed design, to define the risk over the lifetime of the development and ensure risks to the path and its users are minimised. Furthermore, modelling of the design would be able to confirm the flood risk to users and identify any mitigation required i.e. if floodplain compensation was required or whether the cycle path needs raising to reduce the risk of path closure.

5.4.2. The high-level assessment undertaken does indicate a high risk of flooding with some reasonable depths of inundation along much of the route. This will require a management and maintenance plan, and a documented emergency evaluation plan to describe how South Gloucestershire Council will operate the path during inclement weather.

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