

# CHULEY ROAD - FLOOD ALLEVIATION OPTIONS SUMMARY

*Dartmoor National Park Authority*

3512820A-SSR

*Draft*



# **Chuley Road - Flood Alleviation Options Summary**

**3512820A-SSR**

**Prepared for**  
Dartmoor NPA  
Parke  
Bovey Tracey  
Newton Abbot  
Devon  
TQ13 9JG

**Prepared by**  
Parsons Brinckerhoff

[www.pbworld.com](http://www.pbworld.com)



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|----------------------|---|--|
| <b>Report Title</b>  | : | <b>Chuley Road – Flood Alleviation Options Summary</b> |
| <b>Report Status</b> | : | <b>Draft</b>   |
| <b>Job No</b>        | : | <b>3512820A-SSR</b>                                    |
| <b>Date</b>          | : | <b>December 2013</b>                                   |

### DOCUMENT HISTORY AND STATUS

| Document control   |                 |   |                |
|--------------------|-----------------|---|----------------|
| <b>Prepared by</b> | Charles Bennett | <b>Checked by</b><br><i>(technical)</i>         | Joanna Goodwin |
| <b>Approved by</b> | Jonathan Ralph  | <b>Checked by</b><br><i>(quality assurance)</i> | Joanna Goodwin |
| Revision details   |                 |   |                |
| Version            | Date            | Pages affected                                  | Comments       |
| 1.0                | December 2013   | -   | First draft    |



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## 1 FLOOD MITIGATION OPTIONS

A Level 2 Strategic Flood Risk Assessment (SFRA) was prepared by Parsons Brinckerhoff to provide a detailed assessment of the existing fluvial flood risk in Ashburton, based on a 1D-2D ISIS-TUFLOW model. The SFRA focused on Chuley Road, an area in the south of Ashburton identified as a potential site for mixed use redevelopment. The modelling in the SFRA shows high fluvial flood risk through much of Ashburton, including throughout the Chuley Road site.

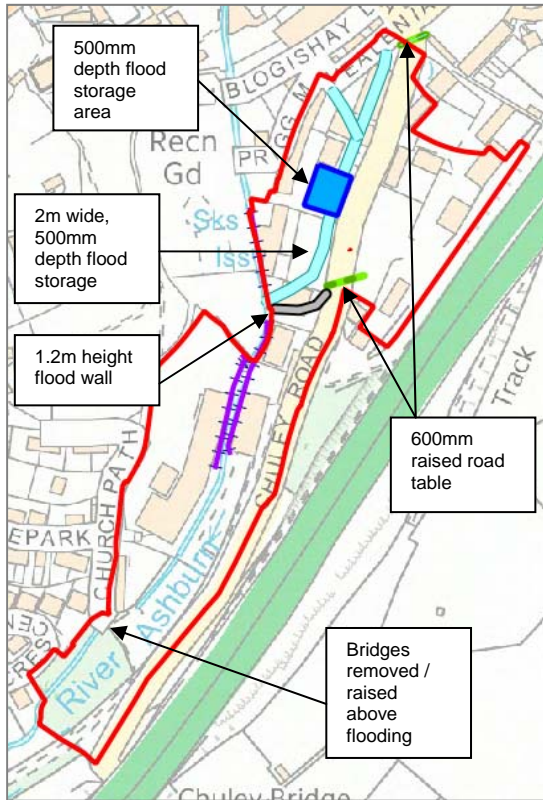
The SFRA identified that there may be potential for relatively small scale flood alleviation measures to reduce flood risk and increase the potential for redevelopment within the Chuley Road site. This report provides a summary of the assessment of a range of these measures, using modifications to the baseline ISIS-TUFLOW model to provide a quantitative assessment of the proposed alleviations.

Nine flood mitigation scenarios were assessed, described in the table below.

*Table 1 – Flood alleviation scenarios assessed*

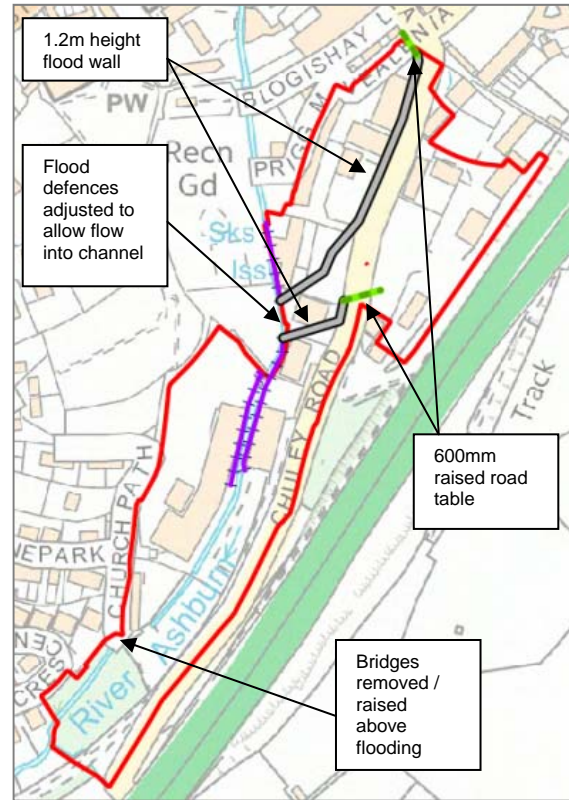
| Scenario    | Description   |
|-------------|---|
| ASH_V13_E1  | ~150m reach of the River Ashburn re-profiled from chainage 545 to chainage 686 to increase on-line conveyance and storage.  |
| ASH_V13_E2  | Bridges 5 & 6 removed and ~150m reach of River Ashburn re-profiled from chainage 545 to chainage 686 to increase on-line conveyance and storage.  |
| ASH_V13_E3  | Overland flow channel and storage area added through Station Yard   |
| ASH_V13_E4  | Flood walls constructed around the outside of Station Yard  |
| ASH_V13_E5  | Overland flow channel through Station Yard, bridges 5 & 6 removed and reach of River Ashburn re-profiled from chainage 545 to chainage 686.   |
| ASH_V13_E6  | Flood walls around Station Yard, bridges 5 & 6 removed and reach of River Ashburn re-profiled from chainage 545 to chainage 686.  |
| ASH_V13_E9  | As E5, but with overland flow route added through Blogishay Lane (depth of 0.5m), road hump added at junction of Vealenia Terrace and road hump on Chuley Road increased to 0.75m.<br>Flood walls extended along southern boundary of recreation ground and raised through Tuckers Yard site. |
| ASH_V13_E10 | As E6, but with overland flow route added through Blogishay Lane (depth of 0.5m), road hump added at junction of Vealenia Terrace and road hump on Chuley Road increased to 0.75m.<br>Flood walls extended along southern boundary of recreation ground and raised through Tuckers Yard site. |
| ASH_V13_E11 | Flood walls extended south along Chuley Road and along southern boundary of recreation ground.<br>Flood walls extended along southern boundary of recreation ground and raised through Tuckers Yard site.   |

These measures are shown in Figures 1 – 7.



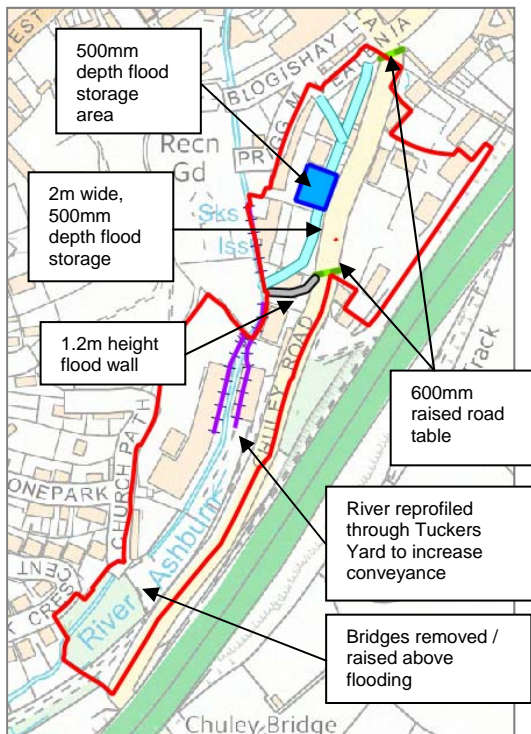
**Figure 1 – Scenario E3**

A 500mm depth overland flow channel and storage area modelled through Station Yard.  
 A 600mm road hump / raised road table has been modelled at the junction of Chuley Road and Vealenia Terrace to seek to direct overland flow through the constructed flow channel.  
 A 1.2m flood wall has been modelled at the south of the Station Yard site at the south of the site to convey overland flow back into the River Ashburn and attempt to minimise flood risk to the eastern half of the Tuckers Yard site.



**Figure 2 - Scenario E4**

Scenario E4 is similar to Scenario E3, but with the flood walls adjusted to direct flow outside of the Station Yard, using Chuley Road as the overland flow route.

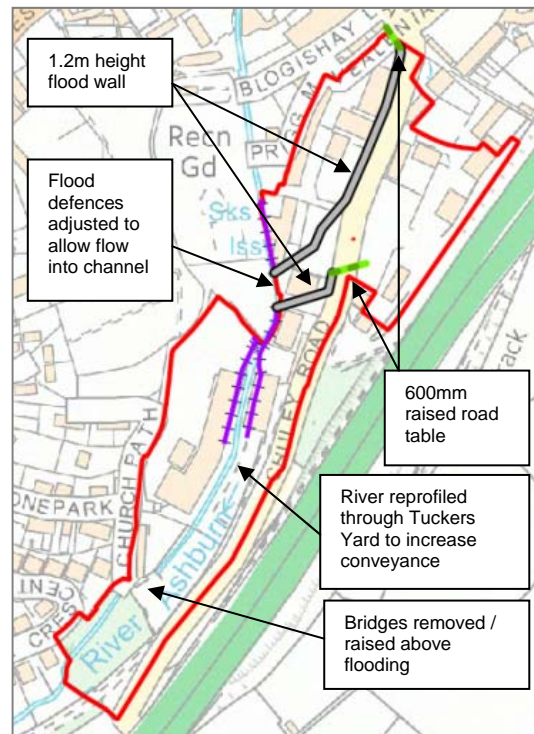


**Figure 3 - Scenario E5**

An overland flow channel has been modelled through Station Yard (as per Scenario E3).

The bridges adjacent to the Auction House have removed from the model and a ~150m reach of River Ashburn has been re-profiled from chainage 545 to chainage 686 to increase on-line conveyance and storage.

This scenario represents the extent of the flood alleviations agreed with the EA.



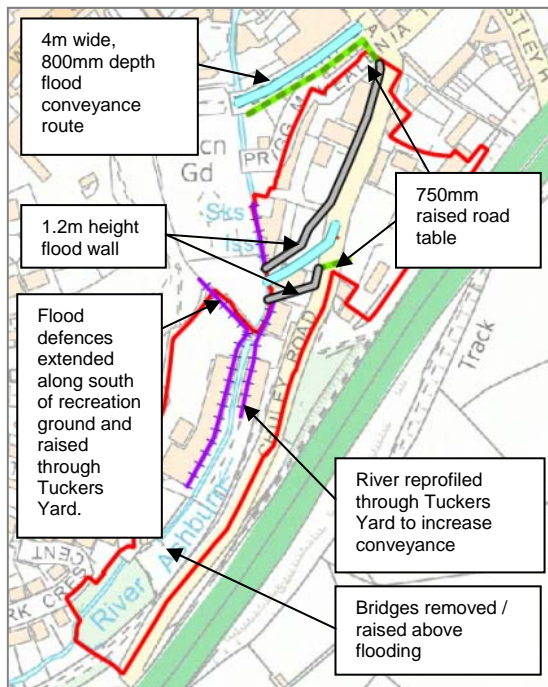
**Figure 4 - Scenario E6**

Flood walls have been modelled around Station Yard, (as per Scenario E4).

The bridges adjacent to the Auction House have removed from the model and a ~150m reach of River Ashburn has been re-profiled from chainage 545 to chainage 686 to increase on-line conveyance and storage.

This scenario represents the extent of the flood alleviations agreed with the EA.



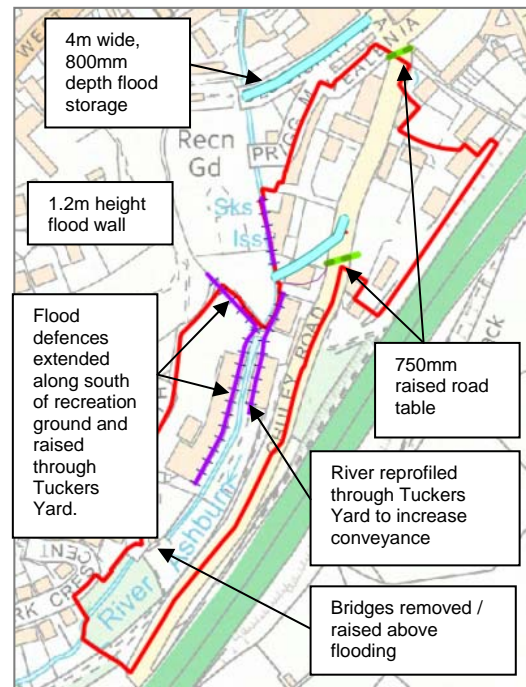


**Figure 5 - Scenario E9**

Scenario E9 is as Scenario E5, but with an additional overland flow route added through Blogishay Lane (depth of 0.8m) to attempt to collect overland flow from the River Ashburn upstream of the site.

The road table height has been increased to 0.75m to increase the protection against overland flow and the flood defences have been extended along the south of the Recreation Ground and raised by 1.5m through Tuckers Yard.

The extension to the flood defences has not been agreed with the EA. Additionally, the works in Blogishay Lane are outside of the Chuley Road site and would be unlikely to be undertaken as part of developer funded works.

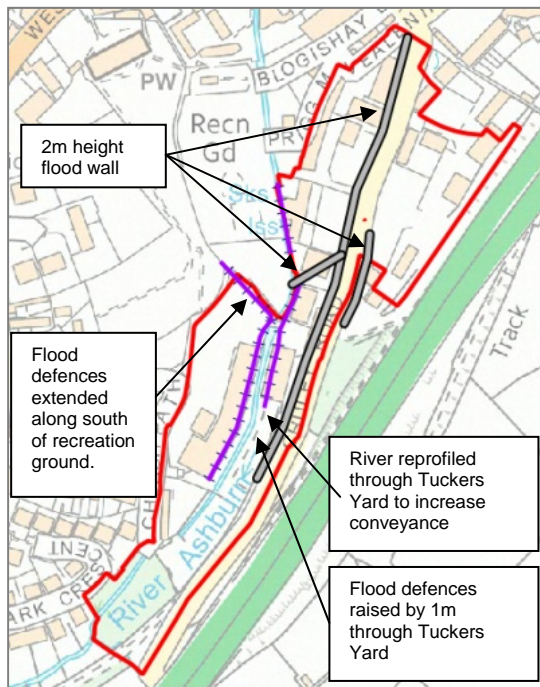


**Figure 6 – Scenario E10**

Scenario E10 is as Scenario E6, but with overland flow route added through Blogishay Lane (depth of 0.8m) to attempt to collect overland flow from the River Ashburn upstream of the site.

The road table height has been increased to 0.75m to increase the protection against overland flow and the flood defences have been extended along the south of the Recreation Ground and raised by 1.5m through Tuckers Yard.

As previously, the extension to the flood defences has not been agreed with the EA. Additionally, the works in Blogishay Lane are outside of the Chuley Road site and would be unlikely to be undertaken as part of developer funded works.



**Figure 7 – Scenario E11**

Scenario E11 has been assessed to show the impact of flood walls directing overland flow the Balland Stream along Chuley Road and into the south of the site.

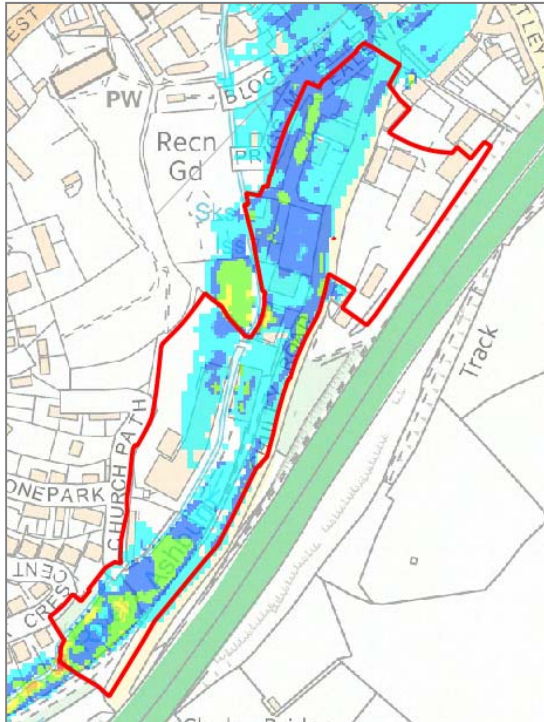
w 2m flood defence walls added along Chuley Road to direct flood flow along road.

As per Scenarios E9 and E10, flood defences have been extended along the southern boundary of recreation ground and raised through Tuckers Yard.

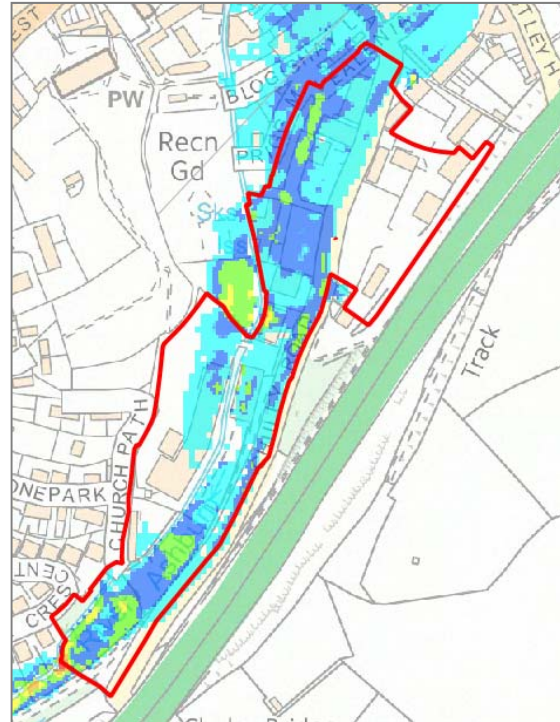
**2 REVIEW OF RESULTS**

Each scenario has been assessed for the 1 in 100 year return period event with flows increased by 20% to allow for the potential impact of climate change.

The results from each scenario are shown in Figures 8 – 14.



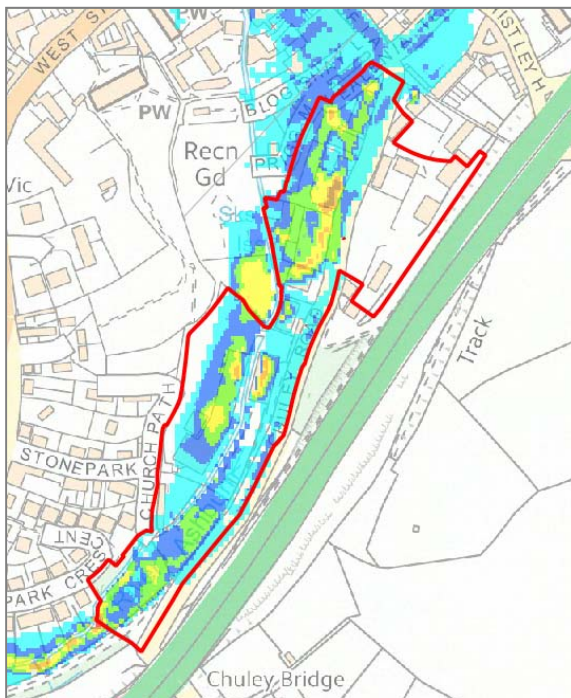
**Figure 8 – Scenario E1**



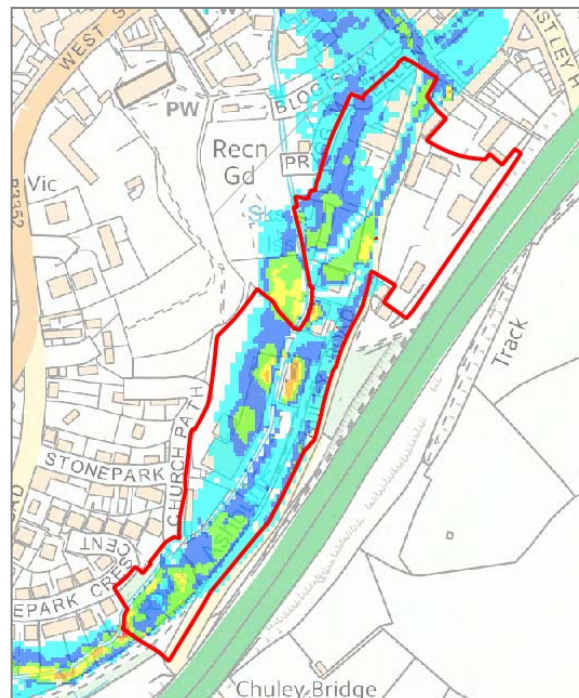
**Figure 9 – Scenario E2**

Scenarios E1 and E2 show that increasing the conveyance in the River Ashburn has a positive impact on flooding, with shallower flow shown through the Tuckers Yard areas. E2 shows that removing the bridges at the south of the Auction House has limited impact on flooding in the 1 in 100 year event.





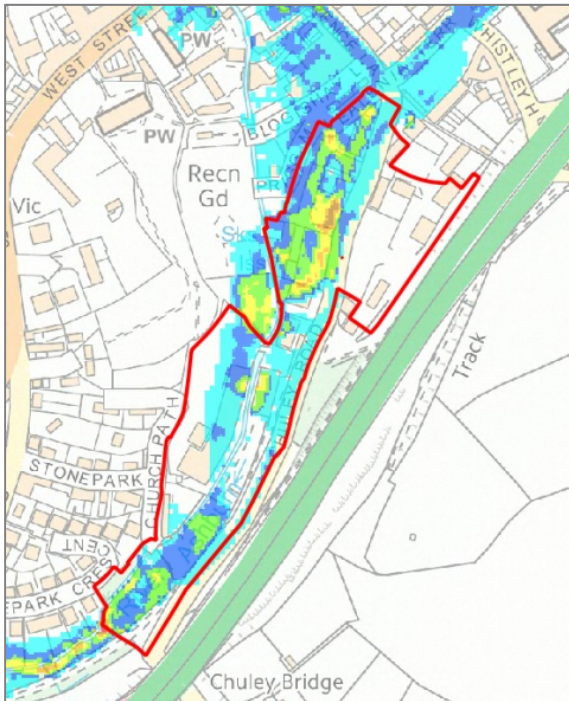
**Figure 10 – Scenario E3**



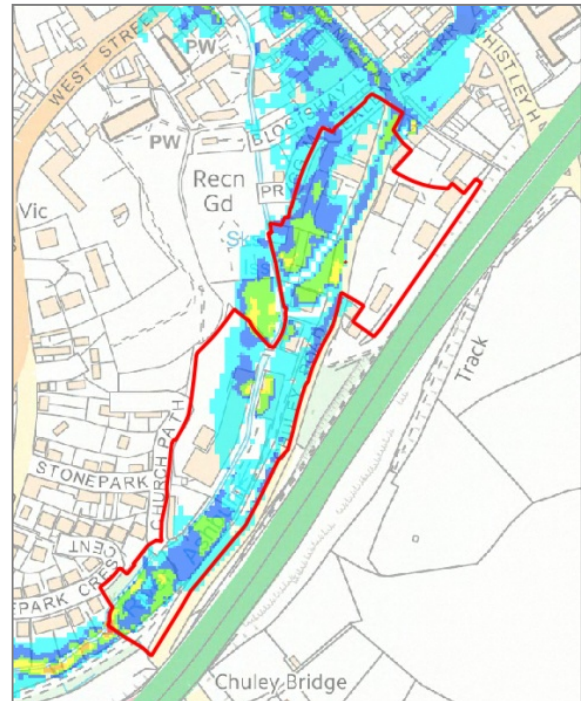
**Figure 11 – Scenario E4**

Scenarios E3 and E4 show that the proposed works within Station Yard have limited effect on reducing or controlling flood risk either within the Station Yard or the Tuckers Yard areas of the site.

Scenario E4 shows that directing flood flows from the Balland Stream outside of Station Yard does have some positive impact, but flooding remains due to the contribution from overland flow from the River Ashburn entering the site from the north-east.



**Figure 12 – Scenario E5**

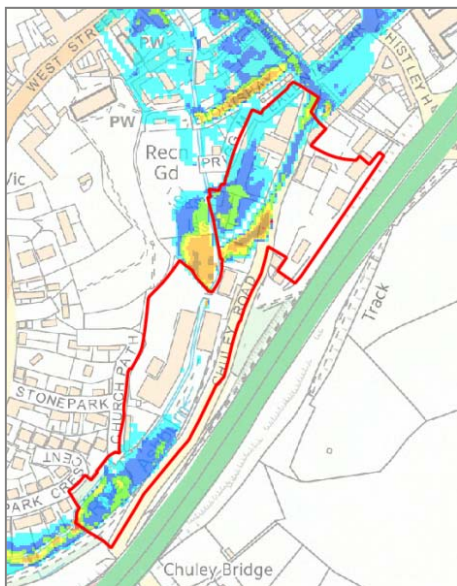


**Figure 13 – Scenario E6**

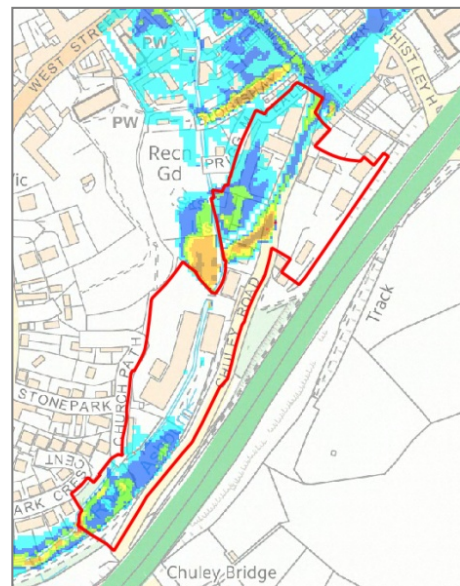
Scenarios E5 and E6 show the assessed flood extents with the flood alleviations agreed with the EA included in the model. The results show that it is very difficult to prevent overland flow entering the Station Yard site from the north-east with development scale flood defence measures. This is because the overland flow routes are complex, entering the site from gardens and alleyways to the north west of the site and it is not feasible to block all these potential flow routes.

In Tuckers Yard, flow from the recreation ground flows south over the site resulting in flooding on the west bank of the Ashburn and flow spills out of bank to the north of Tuckers Yard resulting in shallow flooding on the east of the Ashburn. A small volume of flow also overtops the 600mm road table on Chuley Road to contribute to the shallow flooding.

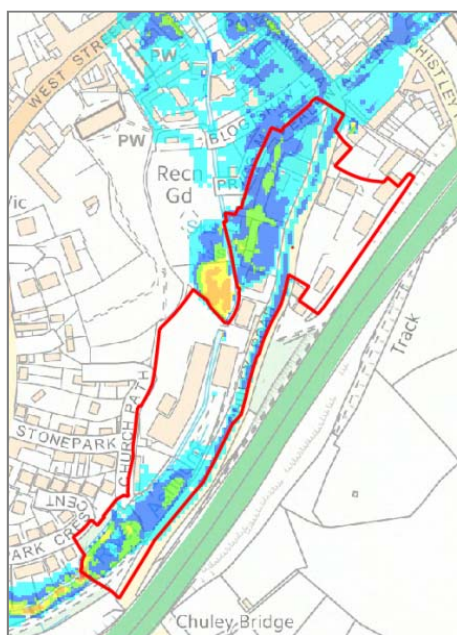




**Figure 14 - E9**



**Figure 15 - E10**



**Figure 16 - E11**

Scenarios E9 – E11 show the impact of additional works to reduce flood risk. It is demonstrated that it may be possible to entirely avoid flooding to the Tuckers Yard site are in the 1:100 year extent. This depends on significant flood defences at the southern end of the recreation ground and along the southern end of Chuley Road. The feasibility of these options would require further consideration.

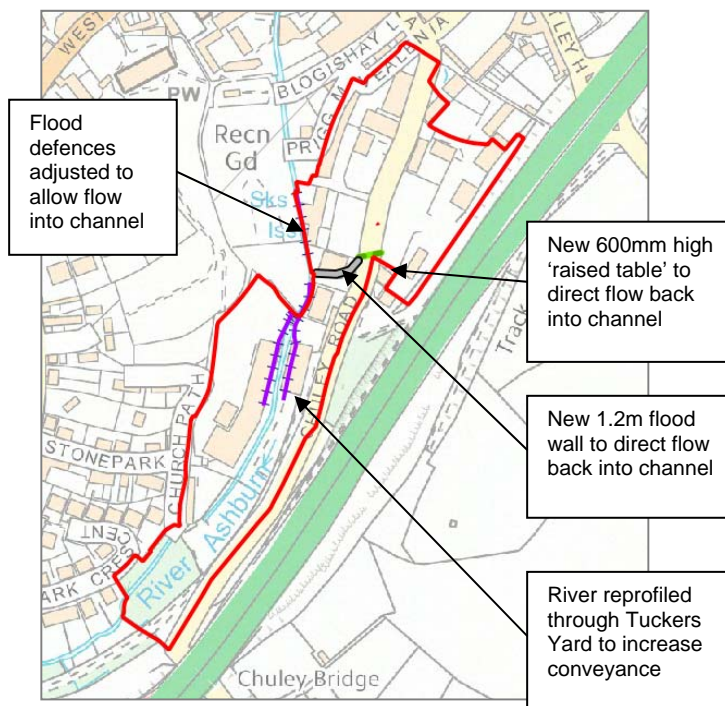
Review of the downstream impacts suggest that these proposed works do not have a detrimental impact on flooding downstream.

**3 SUMMARY**

Following assessment of the range of potential development scale flood alleviations, the following conclusions can be made:

- Station Yard suffers flooding from the overland flow arising from the River Ashburn upstream of the flood relief channel as well as from overland flow arising from the Balland Stream. The flow from the Ashburn flows in a wide flow path through gardens, roads and other urban flow routes and enters the site through Blogishay Lane, Prigg Meadow and Vealenia Terrace. It is very challenging to control this flood risk from within the site whilst retaining access to the existing properties in Prigg Meadow and Vealenia Terrace.
- Review of measures to provide storage and conveyance in the Station Yard area shows that this approach has negligible benefit on flood risk downstream;
- Increasing the conveyance in the River Ashburn through the site has a positive impact on flood risk in the Tuckers Yard site and does not appear to increase flood risk downstream.
- With the re-profiling of the River Ashburn, there remains shallow flooding from flow spilling across the south of the recreation ground and out of the channel upstream of Tuckers Yard. Indicative modelling shows that extending and raising the existing flood defences on the River Ashburn could reduce flooding further in the Tuckers Yard site. Further assessment would be required to consider the feasibility and cost effectiveness of this approach.

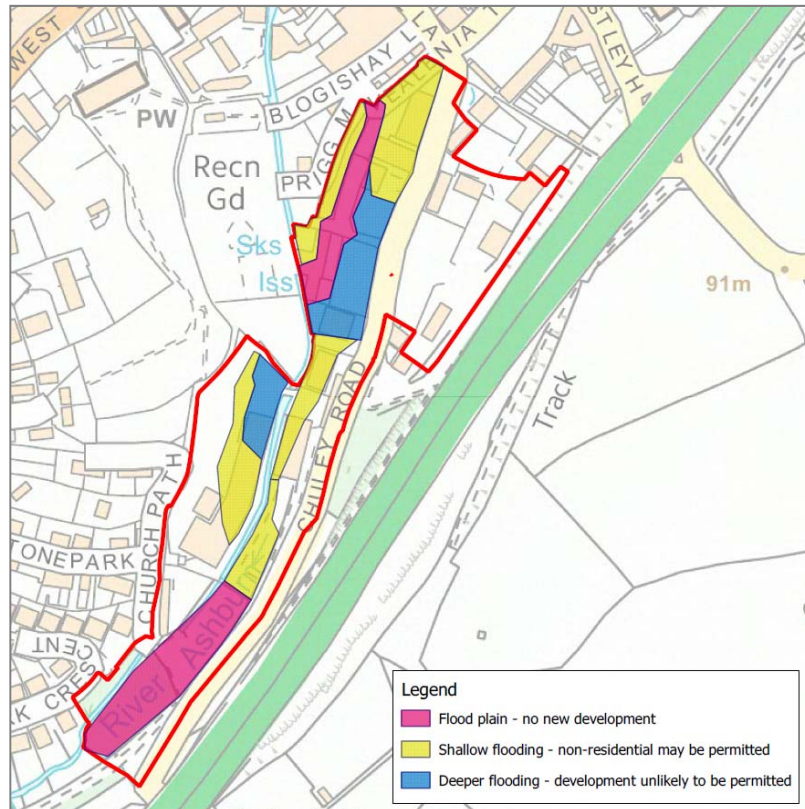
Figure 17 below shows the recommended development-scale measures which will help to control flood risk in the Chuley Road site.



**Figure 17 – Recommended development scale options to reduce flooding within Chuley Road site**

The results indicate that small scale measures are unlikely to be effective in reducing flood risk from the overland flow arising from the River Ashburn. Wider scale measures, such as upstream attenuation in the River Ashburn catchment, may provide the best solution for reducing flood risk to Chuley Road and the remainder of Ashburton.

Figure 18 has been prepared to indicate the likely restrictions to development should the proposed alleviation measures be introduced. This is based on the flood extents shown in Scenarios E5 and E6.



**Figure 18 – Revision to development guidance following implementation of identified works.**

As shown in Scenarios E9 to E11, there may be potential for larger scale measures to further reduce flood risk locally, particularly within the Tuckers Yard site. Further assessment would be required to consider the feasibility and practicality of these larger scale measures.