

Appendix D

Option Development Phase

Three options for testing flood mitigation measures have been examined through this commission.

The first option (Option 1) introduced the basic form of the flood corridor to assess the impact of channelling overland flows through the site. No attenuation measures were introduced in the corridor or the site in order to allow comparison against the baseline flood risk to understand the quantity of flow which needed to be attenuated on site in order to avoid increasing flood risk downstream.

The second option (Option 2) added an attenuation pond located adjacent to the downstream boundary of the Brewery Quarter in the vicinity of Little Vauxhall. The results from this option run showed that there is a requirement to store approximately 310m³ of water at the 1% AEP event plus climate change. This quantity is approximately equal to the amount of water which may be expected to flow across the site and pond around buildings in the existing site layout at the 1% AEP event plus climate change. The redevelopment of the site will change the building layout and the introduction of the flood corridor to safely contain and transfer flows, will mean that flows will be conveyed through the site more quickly increasing the peak flow downstream and therefore, increasing flood risk to areas downstream of the site. It is a requirement of PPS25 to attenuate this quantity of water in a safe way, in order to slowly release any retained water after the peak flow has passed, in order to avoid increasing flood risk downstream.

The requirement to attenuate approximately 310m³ is a significant reduction in the volume estimated, on precautionary lines, in the Level 2 SFRA. Greater confidence in the modelling undertaken for this outline design phase, because of the improvements made to the model as described in Appendix A, means that we can now estimate this amount through modelling (rather than the previous manual adjustment for overland flows made in the SFRA Level 2 report January 2011).

The Option 2 model results were presented at a meeting with CPRR, Environment Agency and Cornwall Council representatives held 25th March 2011. The Option 2 model run demonstrated that the required attenuation could be achieved using the attenuation pond at Little Vauxhall alone (based on the pond draining the SWW surface water sewer which was assumed in this model run) and therefore no other flood attenuation measures in the flood corridor were a requirement.

Discussions at that meeting (and immediately following through feedback from Cornwall Council and Environment Agency via CPRR) considered and agreed on the design principles of the flood corridor and attenuation pond. These did not significantly affect the model run in Option 2, with the exception of the wish to consider the following functional aspects for the attenuation pond:

- The pond to remain off-line

- Allow run-off from the site to be stored in order to meet the permitted flow requirements set out in the RAPP Level 2 SFRA (taken from CPR Integrated Urban Drainage Study and Redruth Corridor SWMP permitted flows (Entec 2009)).
- Remain wet at all times with an amenity depth of water present, to be fed by a small pipe flow connected to the Town Leat to provide a sweetening flow to prevent stagnation.
- Pond drainage arrangements to be contained within site 4.1

These considerations therefore formed the basis of the Option 3 model run investigations.

1.1.1 Option run test results

The modelling results from the outline design option modelling runs (Options 2 and 3) are presented in Appendix E.

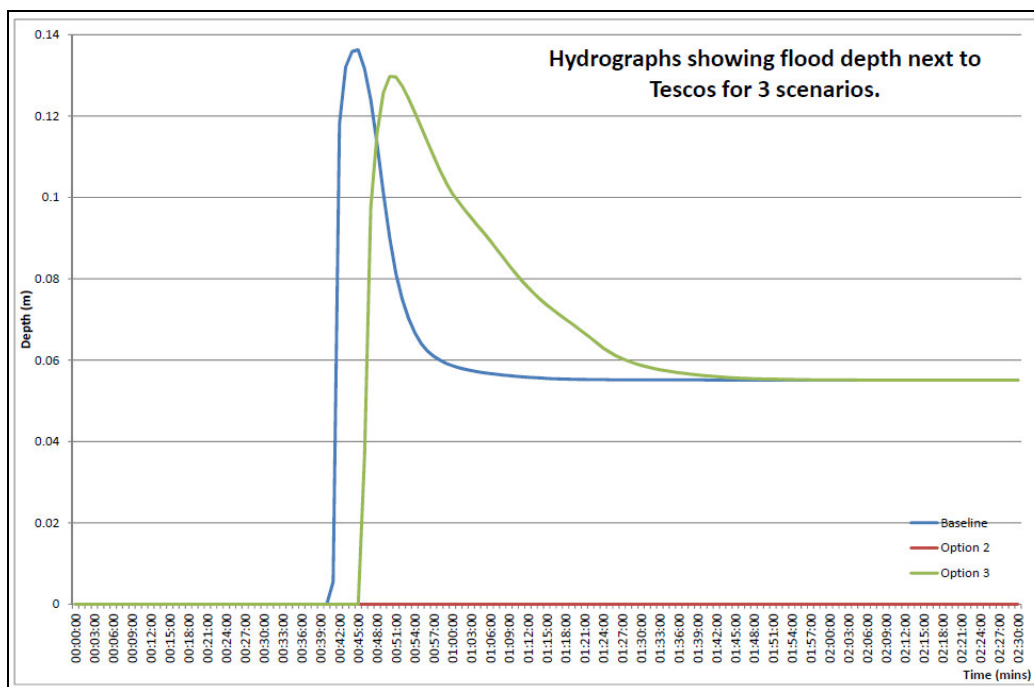
1% AEP plus climate change flood event

The model results from the Option 2 and 3 runs show the outline design flood risk measures working to safely contain flood flows within the flood corridor and attenuation pond. A comparison of these results can be made by referring to the pre-development (baseline) model result for the same scale of event presented in Appendix C) to demonstrate that flood risk is reduced through the option modelling.

The results for Option 2 and 3 show that across the site, where previously there was flooding, this is now contained within the flood corridor and the attenuation pond (the flood corridor does not show any depth of flooding in the mapping because the results mapped are just where water is on the ground surface of the model). There is a great improvement to flood risk along Chapel Street, Little Vauxhall and across both sites by directing the overland flows into the flood corridor and using the attenuation pond to manage the safe release of these flows downstream.

There is also an improvement in the depths of flooding that could be expected in the immediate off-site area at Tesco. The depth hydrograph below, from the south-east corner of the store shows flood depth at Tesco in the baseline situation and in Options 2 and 3 for the 1% AEP event plus climate change. This shows that under Option 2 as currently modelled there is no flooding at Tesco at this scale of flood event. Under Option 3 there is still some flooding, however the depth of flooding is less than in the baseline situation.

Hydrograph showing flood depth at south-east corner of Tesco store in the 1% AEP plus climate change event.



There are some discrete areas showing shallow water depths within the site, for example along the southern boundary of Chapel Street. This is shallow surface water and it is anticipated that this would be picked up through kerb and gully arrangements for the new development as this is developed.

The main difference between the Option 2 and 3 model run relates to downstream water levels in the flood corridor and the attenuation pond. Under Option 3 water levels are higher by approximately 0.3m than in Option 2. This is due to the pond discharge method, amenity volume of water within the attenuation pond and measures investigated to control the release of SUDS run-off at all return periods from the pond.

A hydrograph of the downstream limit of the study area is provided below to demonstrate that the introduction of the flood risk measures in the Brewery Quarter to manage the 1% AEP plus climate change flood event, does not increase peak flows further downstream at the boundary of the model (at the open channel just downstream of the A30 viaduct), and in fact, through the use of the attenuation pond actually decreases the peak flow very slightly at the 1% AEP plus climate change event.

Total discharge hydrograph for Options 2 and 3 compared against the baseline for the 1% AEP + climate change flood event at the downstream model limit.

