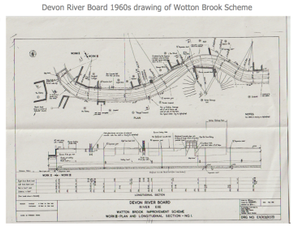
Lympstone flood resilience

Our Partners

Our Modelling

Devon River Board 1960s drawing of Wotton Brook Scheme



Our strategic partners

As a working group of the Lympstone Parish Council, the Flood Group reports back regularly to LPC and receives strong support and some funding. We also engage with District and County Councillors, who have also kindly provided support and funding. The Environment Agency and Devon County Council have direct responsibilities for flooding, and we enjoy good relations with them.
Our work has only been possible through building robust relationships, which need to be maintained and progressed for the long term benefit of the community.

Working with our partners

Environment Agency
Flood warning
Floodgate directives
Model commissioning
Equipment provision
Floodplain capital works
Regular maintenance
Operational works
LFRG support
Devon County Council
LFRG financial support
Highways drainage
Gully clearance
Strategic support
South West Water
Drainage network
Model input
Planning matters
Regular maintenance
West Country Rivers Trust
Upper catchment soil survey
Landowner liaison
NFM advice
East Devon District Council
Soil Survey support
Asset maintenance
LFRG support
Woodland Trust
NFM in upper catchment
LFRG support

Monitoring developments around the catchment that may impact flooding

The LFRG engage with partners on aspects of planning applications which may have an impact on flooding in the Village, seeking at least improvements of storm water flows into the Wotton Brook, and no transfer of water from other catchments. Detailed requirements are stated in our Note for Developers for Flood Risk in Lympstone.
We have been actively involved in the drainage from the developments at Strawberry Hill and Charles Court, and we are currently in discussions with DCC over the drainage requirements for the proposed Dinan Way extension project.

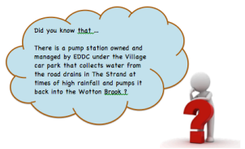
Engaging on developments outside of the catchment

The Exe Estuary is subject to changes and we are concerned to maintain the protection offered to the Estuary by Dawlish Warren. If the Warren were to be eroded, in addition to rising sea levels, this would influence the wave climate in the Estuary, necessitating Lympstone's ageing Estuary flood defenses to be considerably raised and strengthened. We regularly engage on such wider flooding concerns through webinars and meetings.

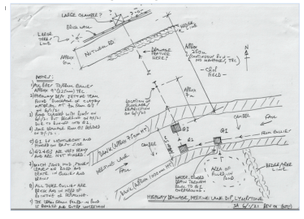
Building our knowledge about the Village drainage

Since 2017, the LFRG have been gathering information on how Lympstone's drainage and waterways work, and in some cases generating our own records where none exist.
We have records and a full survey of the Wotton Brook from the Sailing Club to just beyond the Wotton Lane Bridge.
The EA have also provided us with the drawings showing the walled channel, produced by the Devon River Board in 1963.
South West Water have kindly given us access to their Information Management system, of particular interest for combined sewers (rainwater and sewage combined) and some storm water pipes.
Similarly, Devon County Highways have provided access to their drain location and numbering system, necessary for requests for clearance work. This is part of a wider asset register of the facilities in the Village that relate to flooding and drainage.
We have had some of the level information surveyed for us at the known hotspots in the Village, information that helps us prepare us for localised flooding.

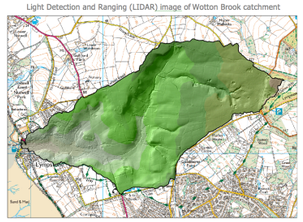
The collation and cataloguing of this Lympstone information is extremely valuable for the future resolution of drainage and associated flooding problems.



Detail of drainage at Meeting Lane – *(Courtesy of Steve Archer)*



Light Detection and Ranging (LIDAR) image of Wotton Brook catchment



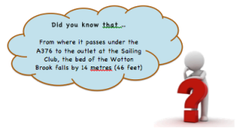
How has the Brook Flood Risk been modelled ?

In conjunction with The EA an Integrated Catchment computer model for the 4.2Km² Wotton Brook catchment was commissioned in 2018 and completed by modelling consultants JBA in 2022.

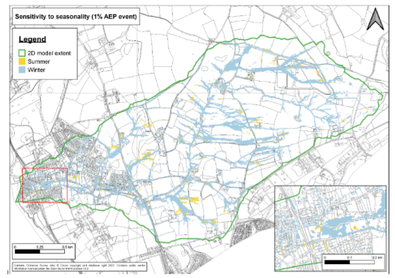
In our Wotton Brook catchment, the soil and topographic characteristics are very significant. Topographical information was input to the model from available information such as a previous EA survey of the middle length of the Brook. This was supplemented by further surveys and Light Detection and Ranging [LIDAR] information which provides a grid of levels showing the height of the ground.
Following this, South West Water's drainage data was incorporated

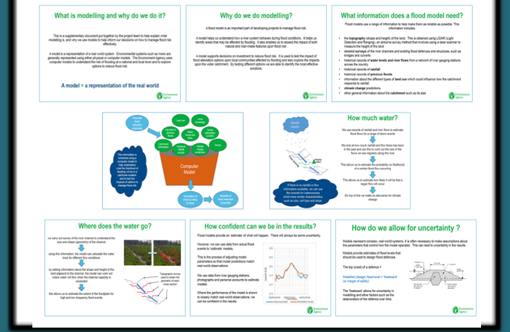
Additionally, the LFRG took the initiative to source funds and then commission The West Country Rivers Trust to carry out land use and soil surveys of the upper catchment. This was in order to determine realistic characteristics for the catchment's soil infiltration and run off, rather than using the normal standard figures to enable a more accurate result.

The model allows rainfall and tidal events of varying severity and combination to be studied. Once the model was established potential beneficial changes in the catchment were applied to determine if improvements to flood resilience would result.

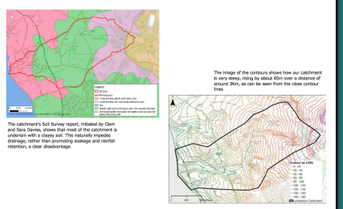


Model image showing sensitivity to seasonality





Wotton Brook catchment geology and contours



The catchment's Soil Survey report, initiated by Clem and Sara Davies, shows that most of the catchment is underlain with a clayey soil. This naturally impedes drainage, rather than promoting soakage and rainfall retention, a clear disadvantage.

The image of the contours shows how our catchment is very steep, rising by about 85m over a distance of around 3Km, as can be seen from the close contour lines

Details of the catchment

The image of the catchment geology shows that, within the area outlined in red, most of the catchment is underlain with a clayey soil. This naturally impedes drainage, rather than promoting soakage and rainfall retention, a clear disadvantage.
The image of the contours shows how our catchment is very steep, rising by about 85m over a distance of around 3Km, as can be seen from the close contour lines.
This makes the Wotton Brook very "flashy", with rainwater running off quickly and moving fast down the waterway.

At an early stage, the model needed to be validated against known observed Lympstone events, of which three were chosen, based on information where data relating to rainfall and tide height was readily available. Villagers' images and information were also valuable in confirming that the model was accurately representing the flooding events

How were rainfall and tide simulated ?

Following on from the topographic and land use characteristics, rainfall and tide data were input into the model, using a series of rainfall intensities and durations, and EA tidal data for the Exe Estuary.
The model is able to simulate the duration of the rise and fall of the tide at the outlet of the Brook at the Sailing Club, and the duration of the rainfall during that time.
The significant factors in the flooding of the Lower Village are the coincidence of high tides and heavy rainfall, where the outlet from the Wotton Brook and the walled channel into the Estuary is blocked by the tide, and the waters from the swollen Brook can't be discharged and hence back up into the channel and the floodplain. At the same time, many of the road gullies which would normally discharge into the Brook are blocked and similarly back up and overflow.

What scenarios were studied ?

When the model was fully set up, twenty three options were chosen to explore measures which, for a series of rainfall events, might improve the response of the upper catchment by slowing the passage of water into the Village. Natural Flood Management (NFM) measures such as woodland growth, leaky barriers, land and soil management, storage, riverbank improvements, and hard barriers were considered, amongst others. We were also able to combine separate options.

What measures were found to deliver valuable benefits ?

The Model User Report provides a very comprehensive and detailed analysis of the model outcomes. During our work very many of the NFM measures have been initiated by The Woodland Trust and these will significantly contribute to our resilience. Similar measures across the remainder of the catchment will be less easy to implement and will need to be considered by landowners in the context of their land use, but soil improvement and land management there provides the opportunity for significant benefits.
Pioneering work in this area was undertaken by Clem and Sara Davies working alongside the West Country Rivers Trust.

What other resilience was identified from the model ?

Outputs showed that there is a weakness on the North side of the floodplain where waters can escape into the Lower Village. To address this, we modelled installing an additional length of floodwall, which showed that flood waters would be contained more effectively than at present. The EA are currently preparing to install this wall.

Most of the other intervention measures considered contribute only very minor benefits to flooding in the Village, and this is due both to the steepness of our catchment, and the underlying impermeable ground, both mentioned elsewhere, and both very strong factors influencing the "flashy" nature of our catchment, and the inevitable ensuing rapid run-off.

Examples of the different options modelled