

## SLOWING THE FLOW PROJECT UPDATE

### Background

Slowing the Flow is a two-year demonstration project in the Pickering and Sinnington areas of North Yorkshire. It is designed to show how improvements in land management could help to reduce the risk of flooding downstream, as well as provide a range of other benefits, including for water quality, wildlife and soil protection.

Forest Research is leading the project in partnership with the Environment Agency, Forestry Commission, Natural England, Durham University, North York Moors National Park Authority and other local partners. The lead funder is DEFRA.

The partnership recognises that we will never stop flooding in Pickering and Sinnington due to the nature of the landscape but it is hoped that the planned measures will reduce the frequency of future flooding and its impact.

The basic aim of the approach is to increase the time it takes from rain falling on the upper catchment to flood waters arriving at Pickering and Sinnington, and by so doing, decrease the height of the flood peak and therefore the likelihood of flooding.

We want to work with landowners and residents to try to change how the land is used and managed upstream, and to improve the resilience of affected households. This will involve everyone working together to bring about change through a series of relatively small steps that will collectively make a big difference in terms of the risk of flooding.

### Land Management Update

Durham University is carrying out ground-breaking research for the project. This involves the development of a new hydrological model which they have called 'Overflow'. The model allows them to simulate the rivers and streams in the catchment area and identify how each of them contribute to the risk of flooding downstream, in this case at Pickering. The model can then be used to show where we need to hold water back in order to reduce the peak flows which the town experiences during extreme periods of heavy rainfall.



By 'slowing the flow' we can help to protect homes and businesses in the town from flooding. Ways that water can be held back include by planting new woodland along the streams or by building large woody debris dams within them.

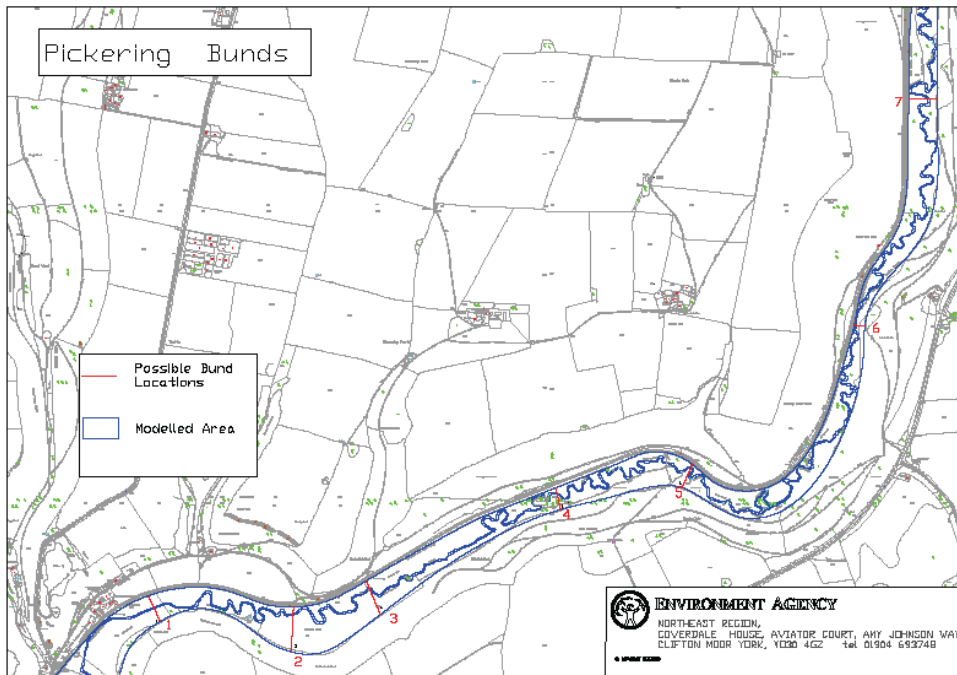
So far 'Overflow' has confirmed that there is significant potential for reducing the flood peak in Pickering by making these interventions, but it has also shown that slowing the water in the wrong places (e.g. near Pickering itself) could make things worse and actually increase the flood peak.

Generally speaking the model tells us that we should be concentrating on slowing the flow in the streams draining the upper reaches of the river system. By carefully selecting the best sites 'Overflow' suggests we should be able to make a significant contribution to reducing the frequency of flooding in Pickering.

# Slowing the Flow

## Upstream Storage Update

The Ryedale Flood Research Group (RFRG) proposed the idea of using upstream storage bunds to help secure better protection from flooding in Pickering. The RFRG created a general model which suggested that installation of a series of low level earth bunds (1 - 2.0 m high) between Newbridge and Farwath, could store between 200,000 – 500,000 m<sup>3</sup> of flood water and provide protection against larger floods such as the 2007 event.



As part of the Slowing the Flow project a more detailed model has been created to investigate the idea of using upstream storage bunds to secure additional flood storage, as proposed by the RFRG. This model has shown that the creation of the bunds alone will not work because the river cannot currently get onto its floodplain due to the channel being too deep and that if the design of the bunds was amended to allow this to happen, it would increase the likelihood that the railway line would flood. Thus, delivering the bund solution requires additional infrastructure to protect the railway line as well as engineered control structures, channel restrictions, to get the water onto the floodplain.

Recent experience gained from the high water levels in December 2009 has led to a major revision of the modelling work. Accurate measurements of the high river flows through Pickering during this event showed that the flow corresponding to the onset of flooding had been greatly underestimated in previous studies of Pickering Beck and would actually occur at a flow of 12 cubic metres per second (cumecs) (equivalent to the 1.2 m reading on the stage board at Ropery Bridge), compared to the previous estimate of 21 cumecs. This means that to provide protection for all properties in Pickering that flooded in 2007 would require 640,000 m<sup>3</sup> of flood storage. Unfortunately this amount of storage is not achievable with the proposed bunds.

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The construction of higher bunds is not possible due to design limitations and other local constraints, such as, the presence of the railway line and river meanders. A number of the bunds have been discounted as they do not provide significant volume compared to the other bunds considered.

The initial results from the model show that the construction of three, 1.5 m high, bunds across the floodplain and along the railway above Newbridge (L-shaped bunds) could store approximately 100,000 m<sup>3</sup> of water on the floodplain. While this would not provide protection against more extreme flood events, it could make a difference for smaller, more regular floods. The storage can be used at different times in a flood event and therefore different levels of protection can be provided to Pickering. Calculations suggest that the bunds could be designed to stop most of the properties from flooding (approximately 50) currently affected by a one-in-25 year flood, and to reduce the magnitude and duration of flooding in those properties for larger events. The 6 properties in the Beck Isle area would still flood because the bunds would be designed not to start filling until a higher flow was reached. Alternatively, the bunds could be designed to flood at a lower level of flow, which would protect the Beck Isle area, but a much smaller number of additional properties. It is hoped that the other land management measures can complement the working of the bunds and so achieve a higher level of protection for Pickering.

### Next steps

The combined effects of the land management measures and bunds will now be evaluated and both the 'Overflow' and bund models thoroughly tested. As soon as we have checked these results, the information will be posted here on the website.