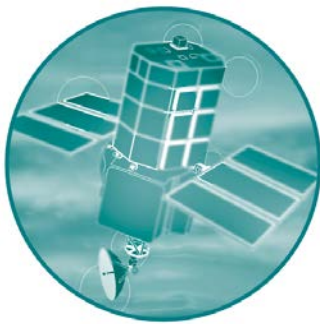


# Defra FCERM Multi-objective Flood Management Demonstration project



PROJECT RMP5455: SLOWING THE FLOW AT PICKERING

## Final Report

May 2015



Department  
for Environment  
Food & Rural Affairs

**The Slowing the  
Flow Partnership**



The Slowing the Flow Partnership, comprising:



**Sinnington  
Parish  
Council**



## Project RMP5455: Slowing the Flow at Pickering

### Final Report: Phase II

Tom Nisbet, Philip Roe, Simon Marrington, Huw Thomas, Samantha Broadmeadow & Gregory Valatin  
Centre for Ecosystems, Society & Biosecurity, Forest Research

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Department for Environment, Food and Rural Affairs  
Flood Management Division,  
Ergon House,  
Horseferry Road  
London SW1P 2AL  
Tel: 020 7238 3000 Fax: 020 7238 6187  
[www.defra.gov.uk/environ/fcd](http://www.defra.gov.uk/environ/fcd)

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## Executive Summary

This report presents the results of Phase II of the Slowing the Flow at Pickering project in North Yorkshire (2011-2015). The project was originally set up in April 2009 to look at how changes in land use and land management can help to reduce flood risk. It was one of three pilot projects funded by Defra in response to Sir Michael Pitt's Review of the 2007 floods in England and Wales, which called for Defra, the Environment Agency and Natural England to work with partners to deliver flood risk management involving greater working with natural processes. The overall aim of the project was to demonstrate how the integrated application of a range of land management interventions can help reduce flood risk at the catchment scale, as well as provide wider multiple benefits for local communities.

A strong local partnership was formed in Phase I to deliver an agreed set of interventions that would protect Pickering from a 1 in 25 year flood. This report describes progress made by the partnership in implementing the outstanding interventions (as documented in the Final Report on Phase I (2009-11); Nisbet *et al.* (2011)) in the Pickering Beck and neighbouring River Seven catchments. The 4-year extension of the project has allowed nearly all of the original objectives to be achieved or exceeded. By March 2015, the following had been delivered:

1. 129 large woody debris (LWD) dams constructed within the Pickering Beck catchment and a further 38 in the River Seven, exceeding the project target of 150 dams. An additional trial of two novel 'timber bunds' installed in the latter catchment.
2. 187 heather bale check dams constructed within moorland drains and gullies, no-burn buffer zones established along all moorland watercourses, 3.2 ha of heather reseeded and 800 m of eroding footpaths repaired in the Pickering Beck catchment, achieving the original target of blocking any problem drains and establishing no-burn buffers.
3. 19 ha of riparian woodland planted within the Pickering Beck catchment and 10 ha in the River Seven. The partnership worked hard to maximise the level of woodland creation but could not meet the target of 50 ha riparian woodland and 30 ha floodplain woodland due to biodiversity and landscape sensitivities in the Pickering Beck catchment and landowner financial considerations in the River Seven catchment.
4. 15 ha of farm woodland planted in the River Seven catchment, exceeding 5 ha target.
5. Site operational planning revised within Cropton Forest and the wider Forest District to help secure opportunities for forest re-design and management to maximise benefits and minimise risks for flood mitigation, in line with project target. 5.9 ha of riparian buffer restored in the two catchments; 3.3 ha (1,470 m of streamside) in the Pickering Beck catchment and 2.6 ha (1,309 m of streamside) in the River Seven catchment.
6. Roof, yard and related works undertaken on 10 farms in the Pickering Beck and River Seven catchments under Catchment Sensitive Farming, including the construction of check dams (no specific target set for the number of farms or works).
7. A large flood storage bund constructed in the Pickering Beck catchment (subject to completion of the embankment in May-July 2015), as per the original target.

Modelling predicted that these measures will deliver the primary objective of protecting Pickering from at least a 1 in 25 year flood, reducing the chance of flooding in the town from 25% to 4% or less in any given year. The flood storage bund alone was designed to deliver this standard of protection by providing 120,000 m<sup>3</sup> flood water storage, with the other measures acting to further reduce the flood risk. It has not been possible to model the interaction between the different measures but an assessment was made of the additional flood storage created. This gave rough estimates of ~8,000-9,000 m<sup>3</sup> flood storage created by

the woodland measures and ~500 m<sup>3</sup> for the moorland and farm measures in the Pickering Beck catchment, and ~7000-8,000 m<sup>3</sup> (mainly from the woodland measures) in the River Seven catchment. The delaying effects of the wider catchment measures are not accounted for in these figures and were predicted to significantly enhance the flood attenuation effect.

A monitoring programme has been established to quantify the effect of the measures in reducing flood flows. Although some of the land management interventions such as woodland creation will take time to become fully effective, an attempt was made to determine if they had any impact on a near-flood recorded in Pickering in November 2012. The local community believe that the measures implemented by then (pre-dated bund construction) helped to prevent an expected flood but an analysis of the data proved inconclusive, possibly due to the multiple peak nature of the event. A longer run of data and larger number of flood peaks are required for a more robust assessment.

The ecosystem services provided by the different measures were evaluated, with the most significant being climate regulation, flood regulation, habitat provision, community engagement, erosion regulation, and education/knowledge. The costs of the measures, as well as losses in agricultural income resulting from land use change, were also assessed. Combined values for all services for all measures, and for a subset that excludes the main flood storage bund, gave mean annual gains of £194k and £53k, respectively. Allowing for the costs of the measures and for the timing of these plus benefits (over a nominal 100 year period) gave aggregated net present values (NPV) ranging from £0.6m to £3.2m for the complete set, with a central estimate of £1.9m. This compared to a range of -£0.3m to £2.4m and a central estimate of £1.0m for all measures minus the main bund. The positive NPV in each case for the Pickering Beck catchment for the whole set of interventions indicate that from a societal perspective the benefits significantly outweighed the costs. A comparison of the benefit-cost ratios gave values ranging between 1.3 for the large bund to 5.6 for the woodland measures.

Knowledge transfer was another major outcome. The project has gained a very strong national profile and is well cited as a case study demonstrating the value of working with natural processes. Of special note has been its role in guiding and integrating government policy on flood risk and land use management. In particular, it has underpinned key regional and national initiatives on woodlands for water, including introduction of a woodland for water grant payment of £2,000/ha under the previous English Woodland Grant Scheme that closed in December 2013. More recently, it has informed the Countryside Stewardship scheme and a new forest industry initiative on the role of productive woodland in water management. Locally, the project is guiding the development of the Local Flood Risk Strategy and Flood Risk Management Plans, the new Derwent Catchment Strategic Plan, and an on-going joint FC/EA Woodland for Water project aimed at securing targeted planting on private land.

The project has received much local and regional media attention, as well as national interest, most notably as part of an episode of the BBC's science programme 'Bang Goes the Theory', which was aired on BBC 1 on 14 April 2014. It has also been the subject of many invited presentations at conferences, workshops and training events held around the country. A total of 14 site visits were hosted for a range of key individuals and groups to share knowledge and experience. The local community in Pickering have been fully engaged with the project and readily embraced the concept of a whole-catchment approach to flood risk management. The project has clearly demonstrated how a strong partnership approach can succeed in delivering an integrated set of land management measures to reduce flood risk at the catchment scale, as well as provide wider multiple benefits for local communities.