

## **Appendix 14.8**

### **Report on the Development of the Large Flood Storage Bund**

#### **Background**

A flood storage scheme had been developed by the Environment Agency (EA) during Phase I of the project, comprising the planned construction of two, 1.5 – 2.5 m high, earthen bunds across the floodplain at Newbridge, upstream of Pickering. The L-shaped bunds abutted the North Yorkshire Moors Railway and were linked to a culvert in the river channel, which was designed to divert flows into the bunds above a critical flood level. The bunds would store around 85,000 cubic metres of flood water and help to protect Pickering from a 1 in 25 year flood. Funding was secured from Ryedale District Council, the Yorkshire Regional Flood Defence Committee and the EA to meet the estimated £1.15m cost. Two planning applications had been submitted to the North Yorkshire County Council and the North York Moors National Park Authority (NYMNP) in February 2011 and planning permission obtained to import clay onto the site. Construction work was expected to start in June 2011 and be completed by end October 2011.

A major problem arose early in Phase II following a revised assessment of the scheme. New modelled data showed that a failure of the bunds would pose a risk to public safety, requiring the scheme to be upgraded to a Category A reservoir and be able to withstand a 1 in 10,000 year flood (as directed by the Reservoirs Act (1975) and Reservoirs Act Guidance). This substantially increased the build cost from £1.15m to £3.2m, taking it well over the available budget. An emergency Partnership meeting was held in June 2011 to discuss the problem, followed by a wider Programme Delivery Group meeting to explain the issue and next steps. The EA began a new programme of work, including reviewing the cost and design of the scheme, evaluating alternative options, and assessing the scope for revising the Reservoirs Act Guidance to determine whether a lower specification bund would be acceptable.

The Partnership met in August 2011 to consider the findings of this work. The high cost of the new bund design was found to be appropriate and there appeared to be little scope for making cost savings. It was also considered unlikely that a review of the Reservoirs Act Guidance would lower the standards for the design of large flood storage bunds. Instead, it was proposed that the EA should re-evaluate the original idea of the Ryedale Flood Research Group to create a number of smaller and potentially cheaper flood storage bunds to provide the required level of flood protection.

A subsequent evaluation found that it was not feasible to construct a sufficient number of small bunds due to site constraints, including the potential impact on designated habitats. As a result, the Partnership agreed in November 2011 to focus on a ‘mix and match’ approach, comprising fewer small bunds but with added below ground storage, installing soft engineered channel restrictions to improve their effectiveness, plus incorporating the contribution of the already secured land management measures. An update on progress was provided to a meeting of the Wider Programme Delivery Group in December 2011.

The EA appointed Arup to conduct a feasibility study of the mix and match approach, and the project hosted a site visit by the Institute of Chartered Engineers Reservoir Safety Review Group in January 2012 to explore the issues surrounding the Reservoirs Act (1975). A project response was submitted in February 2012 to the EA's national Consultation on the approach to designating large raised reservoirs as high risk.

Early investigations by Arup revealed that the small bunds may not offer the target level of protection and were likely to be classed as 'reservoirs in cascade' under proposed revisions to the Reservoirs Act (1975). This would increase the engineering and associated costs of meeting the required safety standards, making the option unaffordable. Instead, the original design for building larger flood storage bunds was re-examined in light of new LiDAR data and a revised assessment of requirements to protect the adjacent railway from flooding. Resulting amendments to the bund alignment and flood storage volumes significantly reduced the build cost to £1.8m, bringing this option closer to the available budget of £1.1m.

Following a Partnership Meeting in May 2012, Arup and Birse Civils were appointed to develop a revised design for a single large flood storage bund. This involved checking the feasibility and costs of the design, including completing site investigations to reduce uncertainties. The results were considered at a Partnership meeting in October 2012 at which the costs of the scheme were reported to have increased to £2.5m, including risk contingency and compensation payments.

Work continued on advancing the detailed design of the scheme during the winter, including holding discussions with the railway and local landowners. Construction costs were reduced through value engineering and by obtaining a cheaper source of clay fill from another flood defence scheme. Additional funding contributions were secured from North Yorkshire County Council, the Yorkshire Flood and Coastal Committee and Pickering Town Council.

A public drop-in event was held in Pickering in January 2013 to explain the revised design to the local community, as well as provide an update on the performance of the land management measures. A number of briefing papers were subsequently produced by partners to keep the local community and wider stakeholders informed of progress.

The EA proceeded to complete a full Environmental Report on the proposed scheme as part of a new planning application, including an assessment of Water Framework Directive issues. The planning authorities confirmed that the proposed bund did not qualify as an EIA Development and as such did not need to be accompanied by an Environmental Statement. The application for planning consent was submitted in February 2013.

The Partnership met in March 2013 to consider further changes to the design of the scheme and progress on reducing costs. The funding gap had been closed to £0.13m and it was agreed that the EA should finalise the design and address the remaining issues relating to planning, maintenance and material costs.

Jackson Civil Engineering was appointed to construct the scheme following a competitive tendering process. A collaborative agreement between the EA, Ryedale District Council and North Yorkshire County Council clarifying the basis of the

partnership funding element of the budget was finalised, while a separate agreement was reached with Pickering Town Council on funding the annual maintenance work. Planning applications were heard by the NYMNPA in May 2013 and by North Yorkshire County Council in June 2013. Planning consent was awarded subject to certain conditions, primarily covering environmental and highways issues. These issues were resolved between June and September 2013, with further applications made to both planning authorities to discharge all pre-construction conditions. Landowner agreements with the Duchy of Lancaster regarding site access and compensation, and with the North Yorkshire Moors Railway on access, design interactions and compensation, were concluded between October and December 2013.

Work on improving site access began in October 2013 and completed by the end of the year. On-site preparatory engineering works started in January 2014 following a formal launch of the scheme. Construction progressed during the year with completion of the concrete control structure, channel re-alignment, 80% of the spillway and 50% of the railway embankment during the spring and summer. A Partnership meeting was held in September 2014 to review progress and while it was hoped to complete the bund by October, a return of heavy rainfall made ground conditions unsuitable for further working. It was agreed to suspend works until May 2015, with the bund 90% completed. Around 10 weeks of construction work remain and should be finished by July 2015. Delays increased costs but these remained manageable. The final construction cost is estimated to be around £2.0m, with a total cost of ~£3.2m (including development, design, risk management and landowner agreements, but not future maintenance).