Tutta Beck - Reducing Flood Risk Through Soft Engineering

Introduction

Extreme weather events are occurring with greater frequency in the UK. Flooding is increasing and testing (and often finding lacking) flood defences. Changes in land use and development of flood plains are compounding the problem. Whole catchment approaches to managing and reducing flood risk can both augment effectiveness of and relieve pressure from traditional engineered solutions.

The principle of whole catchment management of floodwater is to remove the peak from a hydrograph – ie temporarily storing excess water on land to lower peak flow levels. In rural areas this can be achieved through small changes in land management and introduction of measures to slow flow. In urban areas, SUDS can contribute to further reducing pressure.

In the light of the 2015/16 winter floods, it is important to put this into context and be clear that the volume and prolonged rainfall would likely have breached defences and caused flooding in some situations regardless of any measures that may have been implemented. However, it is worth noting that the Pickering 'slow the flow' scheme appears to have worked successfully as the town did not suffer from flooding over the winter.

Pickering also serves as a good example of the scale of cost savings that can be achieved through natural flood management. The town's planned flood defence, a concrete structure through the middle of the town was expected to cost in the region of £20m and failed to pass cost benefit analysis. The wider catchment measures cost just over £2m.

Other, smaller examples of 'slow the flow' projects exist at Belford in Northumbria and also in Stokesley. The latter award-winning project was initiated by the Environment Agency in Partnership with the North York Moors National Parks apprentice team.

In this instance, low lying areas were identified through farmer liaison with the Tees RT and measures installed by the NYMNP Apprentices under the guidance of the Tees RT. In the village of Great Ayton, a bund was installed by the EA at the end of a playing field adjacent to the River Leven and ingress/egress valved pipes installed to allow water to flood onto the playing field once the river reaches a certain height and flow back to the river once the river level has fallen. The local community were consulted and engaged with this process from the outset and properties at risk community was given items such as air brick covers and threshold barriers. The scheme completed in 2012 and is so far working successfully. A post project paper is appended to this document.

Tutta Beck Overview.

In 2012 Tutta Beck flooded three properties at Tutta Beck Cottages, Greta Bridge. A case was made to the Flood Levy Board and the project was considered to meet cost benefit requirements and notionally allocated £96k.

Durham CC commissioned Aecom consultants to model the beck 500m upstream and 200m downstream of the properties. From this modelling and report, DCC proposed that a plastic flood fence be erected alongside the properties. This was deemed unsuitable by the Rokeby Estate as it did not fit the unique character of the houses or landscape in this conservation area.

The Tees Rivers Trust were approached by the estate for a conversation around alternative flood defence measures, specifically whole catchment management and the opportunity for temporary storage of flood water in woodlands and low lying field corners.

The Trust (Ben Lamb), the Estate (William Salvin) and Durham CC (Paul Armin) met and discussed the possibilities of this nature of work. DCC consented that the Flood Levy allocation could be spent on such works provided that they took place within the 2015-16 FY.

The Tees RT secured a £10k allocation from the Heart of Teesdale Landscape Partnership (run through DCC) to fund a MSc research project for the beck under the tutelage of Durham University (Dr Sim Reaney and Dr Richard Hardy). Following a nine month MSc research project carried out By Alex Fraser, a number of recommendations have now been made and costed. The project now requires the funding to implement the measures. Further work is being undertaken at Durham University by Alex Fraser to fully quantify the effectiveness of each of the proposed measures.

In addition to the physical construction of floodwater storage / flow attenuation measures, the final report will include an assessment of the contribution to flood risk being made by compacted land and overland run-off. This will inform which areas might be prioritised for advisory visits to farmers to highlight financial benefits of careful soil husbandry (i.e. greater root development, take up of nutrient, infiltration, reduced risk of sediment pollution and breach of cross compliance).

The total costs for these measures are £33450 , **55% less** than the original allocation of £96k. The added benefits of this scheme are that they will promote and encourage take up of improved soil husbandry techniques and improve water quality and biodiversity by reducing nutrient load from overland run-off, impounding sediment, increasing the area of wet woodland by 1ha and increasing marginal and wetland area by >0.5ha. All of these will contribute towards ensuring that the waterbody ecological status does not deteriorate and therefore contribute positively towards achieving WFD targets.

Following installation, responsibility for maintaining the measures will fall to DCC for a five year period and subsequently to the Estate.

Measures from US to DS.

No.	NGR	Description	Cost
1	NZ 07448 13228	This will catch and temporarily impound high flows from Graham's Gill on the north easterly side of the catchment in Jack Wood. Track will be raised approx. 0.6m from current level using limestone from local quarry. This will drain naturally.	Limestone £4000 Pipes £250 Labour £2200 **Total - £6950**
2	NZ 07826 13150	Create channels throughout the wood to take excess flow. Clean out existing pond in Jack Wood.	**Labour - £1500**
3.	NZ 08252 13201	Create 6 offline ponds through valley area and install timber throttle either side of channel at DS end of the section	Labour - £4k Materials - £2k **Total - £6000**
4.	NZ 08355 13333	Construct earth bund around Beck and housed edge of low area with pipes at US end fitted with flap valves on pond side to allow ingress and DS on beck side to allow egress of water once flow receded. This feature has the potential to become a permanent pond.	Materials £10k Labour £4k **Total - £14 000**
5.	NZ 08361 13294	Trees felled along beck corridor past houses to clear channel.	**Labour - £4000**
		Grand Total	**£33 450**