Geophysical Research Abstracts
Vol. 21, EGU2019-18499, 2019
EGU General Assembly 2019

Flood Alleviation – Alternative storage compensation scenarios on lowland valley floors

Brian Durham
Oxford, United Kingdom (brian@oxpot.demon.co.uk)

Flood plain developments in UK are required to demonstrate that they make flooding no worse elsewhere, by compensating for any proposed new displacement.
Discussion between two UK flood plain communities and the Environment Agency (EA) suggest that there are alternative compensation 'scenarios', including adjustment: of flow rate; of storage; or a combination thereof. For a natural valley floor, MacCartney and Nadan (1995) illustrated comparative hydrographs for the River Severn at Montford, UK, with a 'shoulder' showing how the flood plain was absorbing the effect of peak flows (Fig. 1). They concluded: 'The availability of natural flood-plain storage significantly reduced the magnitude of major floods'. Their approach was refined by O'Sullivan et al (2012), who 'generate[d] downstream flow hydrographs in a generalised river reach for defined upstream hydrographs encompassing a range of flows and duration'. They concluded that 'in the 5-year to 50-year return period range, the floodplain provides a significant area for extra storage of water'.
How then would this be changed by the introduction of an artificial displacement arising from a development proposal in a flood plain location? Lancaster et al (2004, henceforward 'CIRIA C624'), published engineering guidance for the construction industry, distinguishing 'direct or level for level storage compensation' (i.e. at the same level as the proposed displacement) from 'indirect storage compensation' (i.e. at a level different from the displacement). Indirect compensation is described as 'usually more expensive' arising from the need for control structures and devices with moving parts (CIRIA C624, p 168).
The EA follows CIRIA C624, using an in-house way of applying the guidance (pers. comm. L Purbrick). However two recent planning applications offer no comparison between the alleviating effect of indirect against level for level compensation. The present poster is intended therefore to consolidate the work of O'Sullivan et al (2012) by encouraging the use of numerical modelling to build a library of quasi-empirical data in the form of comparative hydrographs achieved: by flow alone; by level for level volume; and by indirect volume. Three strands of data-collection are envisaged:
Strand 1: Numerical modelling of alternative compensatory storage scenarios in a generalised river reach, applying a nominal simulated displacement to the O'Sullivan et al (2012) index.
Strand 2: Use of the UK planning process to build a quasi-empirical library of numerically-modelled attenuation outcomes arising from alternative compensation scenarios.
Strand 3: Audit of extent of landfill occupying flood plains where recovery of the fill might provide cost-effective direct compensation.

The aims are:
Aim 1: Ensure that engineering design attenuates flooding at levels that are sensitive to communities and infrastructure;
Aim 2: Promote discussion on how defended areas that are compensated by flow adjustment might tend long-term to reduce the availability of natural flood-plain storage.