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Achieving Flood Reduction with Natural Water Retention Measures in Agricultural Catchments in Ireland

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In recent decades, land-use and climate change have dramatically altered catchment runoff rates. For example, agriculture intensification has led to increased flood risks by decreasing soil permeability and reducing channel-floodplain connectivity. Natural Water Retention Measures (NWRM) is an approach that has been adopted European-wide for the attenuation of peak floods and the provision of wider ecosystem services. A reduction in peak flow is achieved by increasing water storage potential in the landscape and by modifying natural flow pathways. In agricultural areas (~70% of Irish land use), runoff attenuation features such as offline ponds, earthen bunds, sediment traps and leaky dams are frequently deployed natural retention measures.

Despite the growing evidence across Europe of their efficacy for flood peak reduction, water quality enhancement and biodiversity on the local scale, NWRM features have not been adopted in Ireland as a flood mitigation approach. In order to build a case that will help address this, this presentation will detail a NWRM demonstrate site in Ballygow, Co. Wexford. The construction and instrumentation of a network of features developed at the field-scale (~1km^2) is shown. This site is an intensive pasture, small-hold farm. We aim to quantify the effectiveness of these NWRM features to demonstrate their potential to attenuate flood peaks on agricultural areas using temporary storage, whilst minimising the impact on farming.

The constructed measures consist of a flood swale that connects the channel to the floodplain during high flows, an earthen bund, an offline pond with a sediment trap, that can retain the water from the channel and contributing field slopes, for <12 hours. On-site video footage and eyewitnesses confirm that the flood water flows along the field without draining back into the stream. At approximately 800m across the field, the water is retained temporarily, permitting water storage and the opportunity for suspended sediment to settle out of the water column. Flood water is returned to the channel via a perched 20 cm diameter pipe in the bund. Four automated water level recorders (In-Situ Rugged Troll 100) continuously monitor water levels in the stream and the offline pond at 5 min intervals. In addition, local rainfall (EML Event

Logger) is monitored. These data are used to identify the hydrograph characteristics of several storm events and are used to determine the effectiveness of the NWRM structures for flood attenuation. The quantification of the effectiveness of NWRM features will use the observed time series combined with hydraulic and hydrological modelling.

The quantitative evidence provided by our findings will contribute to establishing vital evidence for the implementation of local and national NWRM schemes in Ireland.