1. Introduction

- Winter 2015/2016 was defined by a procession of severe storms, bringing extreme rainfall, and widespread flooding.
- There were severe impacts on properties, infrastructure and livelihoods across northern Britain.
- This paper describes the hydrological aspects, impacts, and historical context of the event.

2. Rainfall

- Early autumn 2015 was notably dry and the majority of rivers flows were in the normal range.
- November to January mean flows (Fig. 3) show the widespread nature of peak flow maxima – with many catchments recording more than 200% of average.
- Great Britain outflows for winter 2015/2016 were the largest on record in a series from 1961 (Fig. 4).
- Highest recorded peak flow in the England & Wales instrumented record. The Eden, Lune & Tyne each recorded ~1700m³/s on 5th/6th December (Fig. 5).
- Return periods over 1-in-200 years in many catchments across northern Britain (Table 1).

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4. Impacts

- Flooding: Widespread flooding across northern Britain, in rural areas as well as cities (e.g. Carlisle, Leeds, Manchester, York).
- Property: Approximately 16,000 properties flooded in England in December alone more than double that of winter 2013/2014 (7,000 properties flooded¹).
- Transport infrastructure: Heavily affected with numerous roads, bridges, canals and sections of railway damaged and closed.
- Business: Nearly 5,000 affected businesses across Cumbria, Lancashire, Yorkshire, Greater Manchester & Northumberland.
- Agriculture: Extensive flood plain inundation, cattle swept downstream, 2,000 sheep were lost in Cumbria.
- Cost: At the time of writing, £200million additional investment pledged to aid recovery. Figures suggest pay-outs will be more than £1.3billion².

5. Historical Context & Trends

- Events came only two years after winter 2013/2014 flooding, making these two winters the wettest on record for the UK (in records from 1910).
- As well as further demonstrating the exceptional nature of winter 2015/2016, Fig. 7 shows a statistically significant increase in high flows on the Eden in Cumbria (since records began in 1967).
- Currently little compelling evidence for any upward trend in long instrumented records of flood magnitude or frequency³.
- A ‘real time’ attribution study published in December 2015, claimed that the Storm Desmond rainfall was made 40% more likely as a result of anthropogenic warming⁴.

6. Summary

- Winter 2015/2016 was an extreme hydrological episode in many ways; new peak flow maxima were established across northern Britain; November to January runoff was exceptional in terms of its magnitude, duration and spatial context.
- As with previous events there was intense media coverage, some of it highly politicised; a particular focus on land use management and natural flood protection.