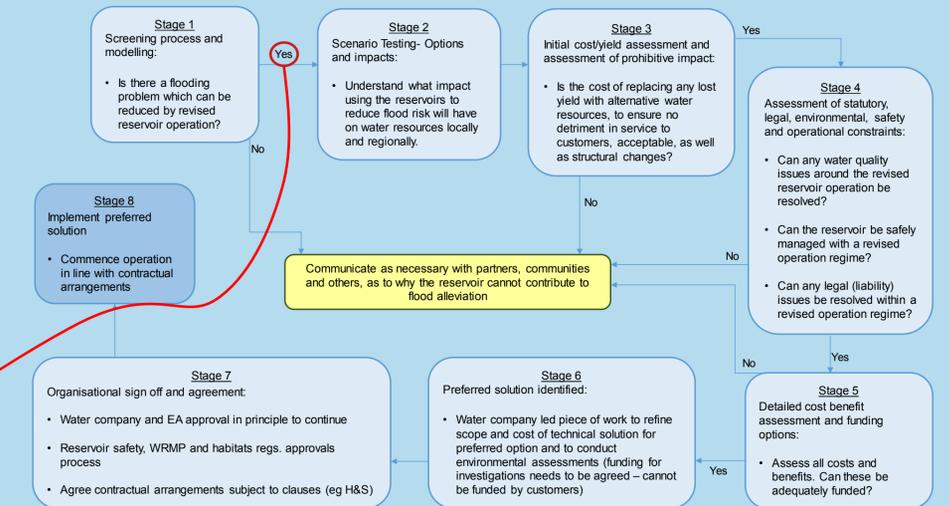


Water Supply Reservoirs and Flooding - Balancing Needs

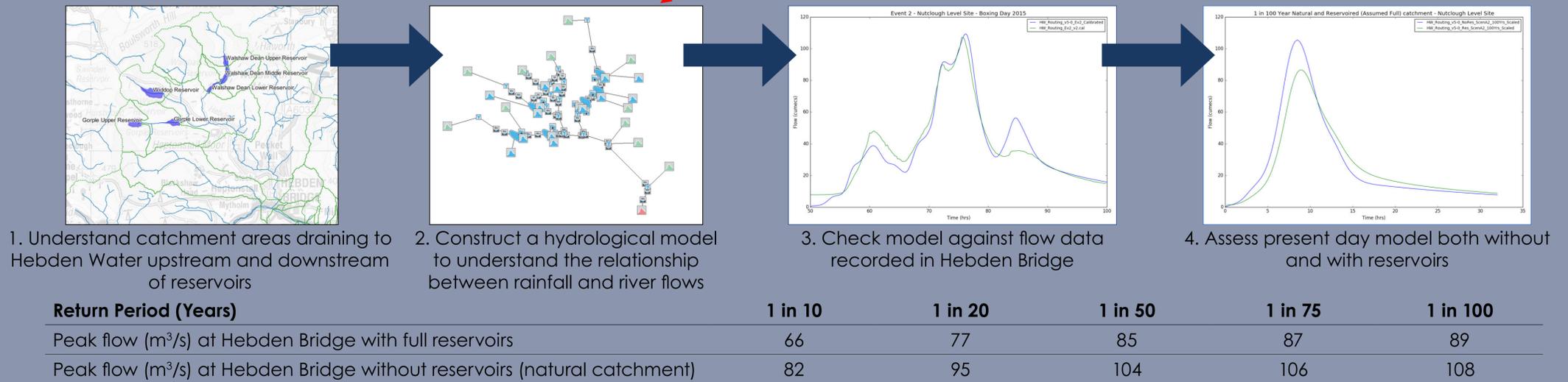
A) Investigating scope for reservoirs to support flood alleviation

- In order for supply reservoirs to be utilised for flood storage there are a number of technical, environmental, legal and regulatory challenges to overcome. The Environment Agency, United Utilities, Yorkshire Water, DEFRA and OFWAT have established a working group and developed a process to allow the potential use of reservoir storage in support of Flood Alleviation. This is a process that all parties have signed up to and are currently working their way through. This is outlined in the flow chart to the right.
- The focus of the work in Stage 1 at Hebden Bridge is presented below.
- A Yorkshire wide screening study has also been undertaken in order to determine which reservoirs are likely to have the greatest potential to reduce flood risk. This would guide where the Environment Agency and Yorkshire Water would consider viable for further study. The screening exercise also allowed us to understand what the regional ask on water resources might be. Three areas were highlighted that had the greatest potential and Calderdale was one of these areas.
- Stage 2 is ongoing.

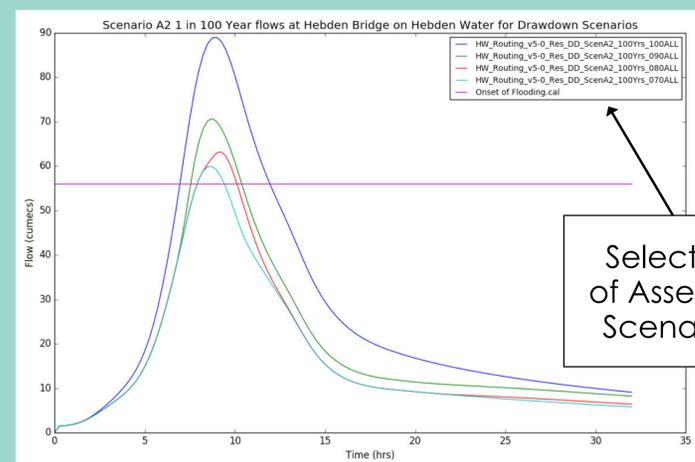


B) Hydrological modelling

- We assessed the Hebden Water catchment by building a hydrological model. This models how rainfall makes it way across the catchment, into the six reservoirs in the valley and then flows in the rivers down into Hebden Bridge. We used this model to understand how the catchment works both with and without the reservoirs using the steps shown on the right.
- The model shows that even full reservoirs provide significant reduction in peak flows due to the temporary storage.



C) Testing different reservoir drawdown scenarios with the river model



Scenario	Method	Outcome and issues
Constant lower water level	This would aim to keep reservoir water levels drawn down to a certain level at all times of the year.	This option will reduce flood risk on Hebden Water significantly. This option has the greater impact on water resources but is the easiest management option.
Variable water level	Drawdown reservoir water levels for 48 hours prior to a storm event arriving.	Hard to predict storms and manage the release of water. The rate at which reservoirs can be drawn down is limited. Should have a reduced impact on water resources but also a reduced flood risk benefit over permanent drawdown.

We used the river model to test a wide variety of different scenarios. If you lower or 'draw down' the reservoir levels then flood water can be stored in the reservoirs during a flood event. Our assessment has shown that the majority of benefits are gained when the reservoirs are 10% (scenario 090ALL) below full prior to an event as shown in the hydrograph to the right. This also shows the pre scheme indicative channel capacity of 56 cumecs (assuming no influence from the Calder). The impacts of drawdown options on peak flows at Hebden Bridge for the 100% full reservoirs (100ALL) through to 70% full (070ALL) reservoirs are also shown in the table below.

Return Period \ Scenario	100ALL	090ALL	080ALL	070ALL
1 in 10 years	66m ³ /s	51m ³ /s	44m ³ /s	44m ³ /s
1 in 50 years	85m ³ /s	67m ³ /s	59m ³ /s	57m ³ /s
1 in 100 years	89m ³ /s	71m ³ /s	63m ³ /s	60m ³ /s