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# Flood-excess volume (or how Wetropolis inspired a new tool for flood-mitigation assessment)

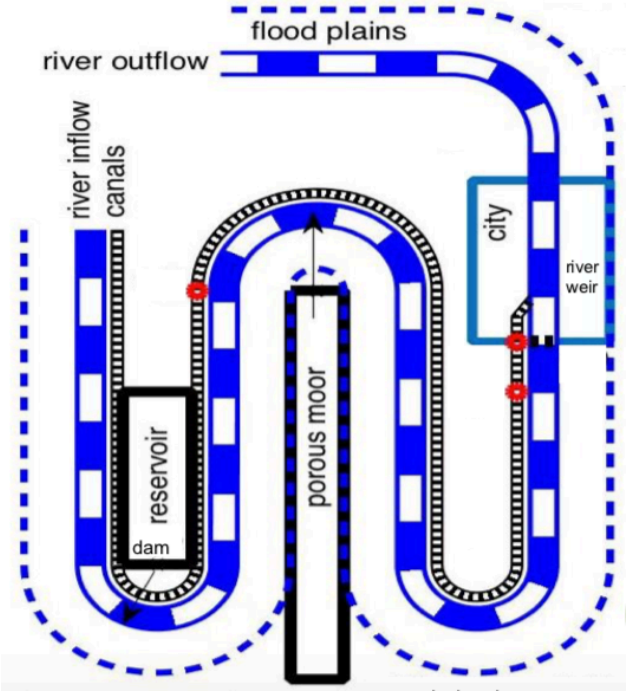


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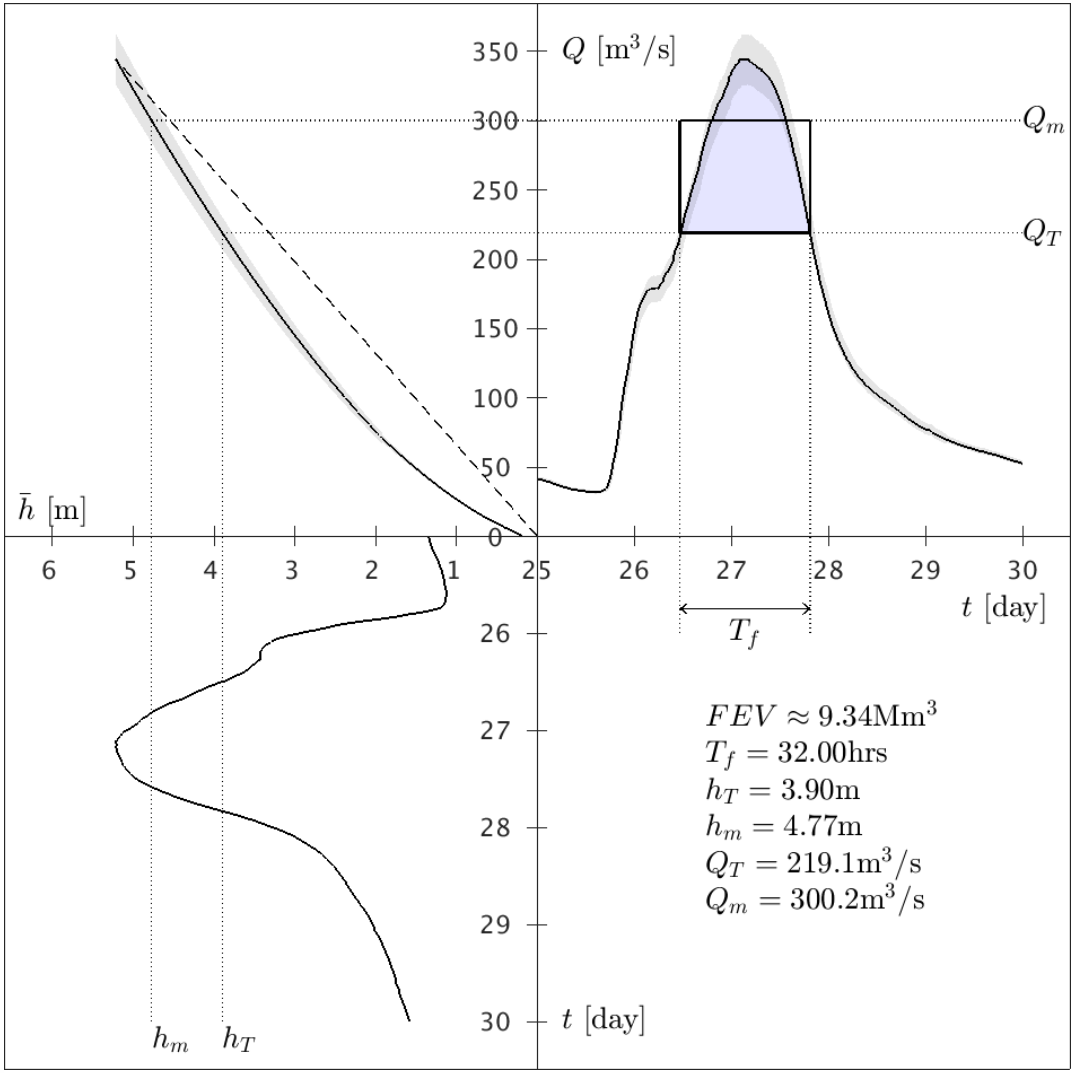
**Figure**: Armley gauge data around the Boxing Day 2015 floods. Bottom left: water level time series (*raw data*); top left: rating curve (stage–discharge relationship); top right: resulting discharge time series.

**Flood-excess volume (FEV)**:

$$V_e \approx \sum_{k=1}^{N_m} \left(Q(\bar{h}_k) - Q_T\right) \Delta t$$

... is the volume of flood water one wishes to mitigate (i.e., reduce to zero) by the cumulative effect of various flood-mitigation measures.



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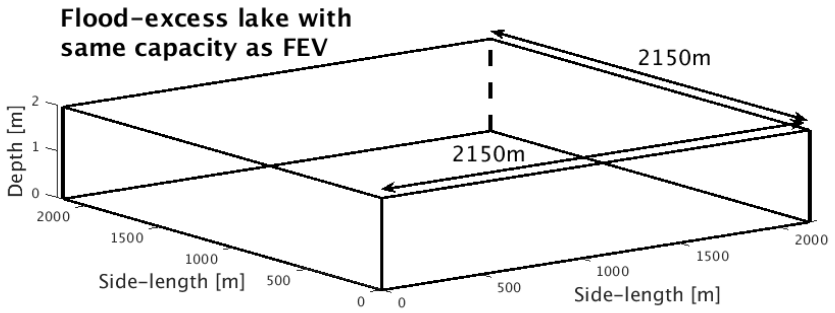
Q1: how can we articulate FEV (typically many million cumecs) in a more comprehensible way?

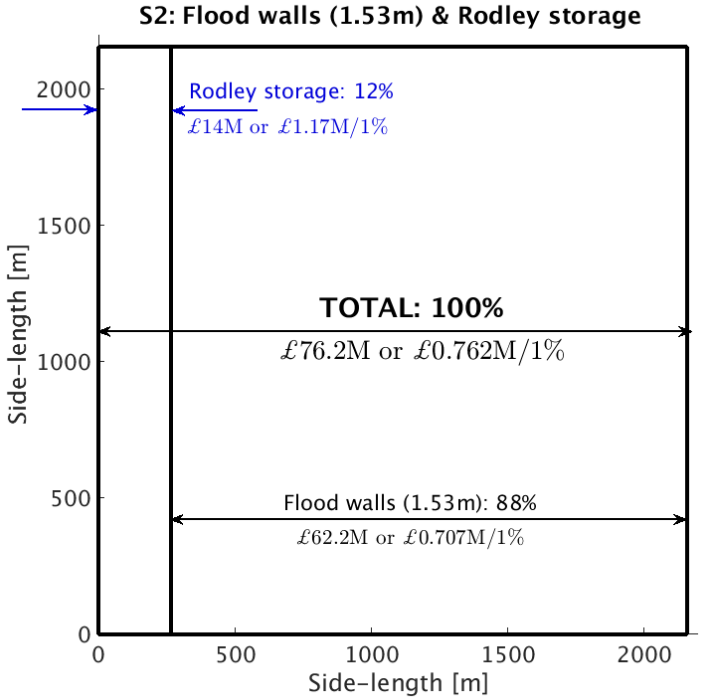
Q2: what fraction of the FEV is reduced, and at what cost, by various flood-mitigation measures?

A1: express as 2m-deep 'flood-excess lake' with same capacity as FEV

$$V_e \approx 9.34\mathrm{Mm}^3 \approx (2150^2 \times 2)\mathrm{m}^3$$




A2:




Take-home message: FEV offers (i) a **complementary** way to classify flood events (historical or simulated), and (ii) a protocol to **assess** and **communicate** the efficacy of mitigation schemes in a concise manner. More elaborate case studies are available: Rivers Calder and Don (incl. NFM) and Bragues, France – ask!