Appendix F

Thames and Lee BSM and MDSF

Broad Scale Model

In simple terms, the Broad Scale Model (BSM) has helped us to assess the potential impact of future change and flood risk management options on flow.

The model was developed to test broad options at a regional scale and to gauge sensitivity to scenario changes. A BSM has been completed for the non-tidal rivers within both the Thames and Lee basins, including the major tributaries. Smaller rivers are represented as inflows only. The broad scale model is not designed to determine actual solutions, but to test whether there are potential strategic options for managing flood risk in Thames Region. The model will be robust enough to test, for example, the impact of large upstream storage on the hydrographs in the lower catchment. A range of future engineering, land use change, climate change and development scenarios have been tested within the model, in most cases for both the 10% and 1% AEP events.

Catchment models of the Thames and Lee were constructed using the iSIS hydraulic routing software. The Flood Estimation Handbook (FEH) rainfall-runoff method was used to provide inflows to the model. The three main parameters in the FEH rainfall-runoff model (time to peak, standard percentage runoff and the baseflow) were calibrated using observed rainfall and flow data. Channel cross sections were derived from existing channel and supplemented by simple floodplain sections from survey or OS DTM.

Both BSMs were calibrated against observed flood events. The observed flood flows, volume and water levels were compared with the modelled values. The models were then validated by assessing the 10% and 1% AEP design flows with the statistically derived design flows at key locations on the Thames and Lee. This exercise indicated that the models would form a suitable basis for a flood management tool for the Thames and Lee basins at a macro-level.

For further information, please refer to the individual BSM reports, listed in the references.

Modelling and Decision Support Framework

The Modelling and Decision Support Framework (MSDF, originally developed by HR Wallingford, Halcrow, CEH Wallingford and the Flood Hazard Research Centre) was created to support the implementation of CFMPs. MDSF helps to provide objectivity and national consistency in risk and policy appraisal. It is intended to provide a process for investigating flood risk management on a broad scale with a sufficient level of detail to select robust flood risk management policies. It has been used in the Thames CFMP to evaluate the impact of future scenarios on indicators at the major flood risk receptors.

MDSF provides an automated process of predicting economic damages and social impacts through the calculation of flood extents and depths based on a digital terrain model (DTM), river centrelines and flood levels. These are all produced externally to MDSF and imported where appropriate. Flood levels for Thames region were obtained from the Thames and Lee Broad Scale Models (BSMs) and S105 mapping work for the London rivers. The national DTM was only used in locations where photogrammetry or LiDAR was unavailable, as it is less accurate.

The damage calculation made by MDSF involves combining flood depths with depth damage data for each property for five specific events (20%, 10%, 4%, 1% and 0.5% AEP) and aggregating the data to provide an overall assessment of Annual Average Damages (AAD). Damages can also be calculated for a specified event.

Damages for the London rivers could only be calculated for the 20%, 5% and 1% AEP events as these catchments are not included in either BSM. Therefore AAD was calculated externally of MDSF, using the same methodology but with three return periods instead of five.

The calculation of property damage is based on the National Property Dataset (NPD). It is derived from a matching process combining the information from two other datasets – the Ordnance Survey (OS) ADDRESSPOINT and Valuation Office (VO) Rating List FOCUS. ADDRESSPOINT defines and locates residential, business and public postal addresses in Great Britain. The FOCUS data provides rating valuations of non-residential property. Residential properties are not part of the VO list as they are subject to council tax and are therefore included in the local council tax valuations.

The social impacts are based on assessing the population at risk together with an index of social vulnerability. A social flood vulnerability index (SFVI) has been developed to highlight where the social impacts of floods might be greatest and where the population is likely to suffer most from impacts such as stress, trauma and other health effects.