



Flood Modelling

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About this service

BMT is a leading international multi-disciplinary consultancy, with the in-house skills to provide an integrated engineering, ecological, and scientific service to our clients, including our proprietary **TUFLOW** hydraulic flood and coastal engine. We are uniquely positioned to deliver **cloud-based** modelling services, with TUFLOW workflows able to run efficiently within scalable cloud environments for data transfer, computation and sharing model outputs.

Our global expertise in **hydrology, hydraulics and coastal processes**, supported by BMT's **digital twin initiatives**, enables highly accurate assessments of flood risk, surface water behaviour, stormwater systems, river dynamics and coastal flood hazards. We offer end-to-end modelling support, from data preparation and scenario development to analysis, visualisation and decision support.

- Flood frequency analysis for peak and low flows
- Rainfall-runoff modelling, including calibration, for design flood estimation
- 1D and 2D floodplain modelling using both proprietary and in-house software (TUFLOW)
- Surface water modelling and mapping
- Extreme flood estimation, including Probable Maximum Floods
- Open channel hydraulics including unsteady flow and 2D modelling and bridge hydraulics
- Urban surface water pipe network and detention pond/ flood storage area design and analysis.

When to use this service

The management of floodwaters is crucial. A major flood can be devastating for communities and industry, while a minor flood can be beneficial to the natural environment and agricultural industries. Decisions that have to be made when managing floodplains are complex and must consider the needs of the community and the environment. Use this service when your organisation needs to:

- Assess current and future flood, surface water or coastal inundation risks.
- Understand flood behaviour for planning, resilience or climate adaptation.
- Support cloud-enabled modelling workflows requiring scalable computing.
- Produce evidence for business cases, investment planning or regulatory submissions.
- Evaluate mitigation options and understand impacts on critical infrastructure.
- Develop modelling capability within a cloud, digital or GIS environment.
- Understand the water transport of dissolved and particulate pollution through catchments from source to sea.

This service is particularly valuable for local authorities, environmental management agencies, infrastructure owners, utilities, and organisations responsible for water management, climate adaptation and emergency planning.

What we deliver

We offer the following specialist floodplain management skills:

- Practical flood management plan formulation
- Hydrological (catchment rainfall/runoff) modelling
- 1D and 2D hydraulic flood modelling, including calibration, validation and design application/impact analysis
- Community consultation and surveys
- Flood mapping
- Flood risk assessment
- Flood damage cost benefit analysis for management options
- Post-flood damage reconnaissance and assessment
- Flood mark identification and GIS-based database development
- Catchment-wide water transport of dissolved and particulate pollutants.

What benefits we provide

Our flood and coastal risk modelling service provides:

- **High-quality modelling outputs** from BMT's proprietary TUFLOW engine.
- **Scalable, cloud-integrated workflows**, reducing processing time and enabling collaboration.
- **Improved decision-making** supported by accurate hydrological and hydraulic insight.
- **Evidence-based planning** for resilience, flood mitigation and climate adaptation.
- **Enhanced organisational capability** through knowledge transfer and access to digital twin technologies.

How we deliver this service

Our modelling platform — TUFLOW

- **TUFLOW** is BMT's industry-leading suite of advanced **1D/2D/3D hydrodynamic engines and tools** for simulating free-surface water flow across rivers, floodplains, estuaries, coastal zones and urban drainage systems.
- The engines are **developed collaboratively** with universities and research bodies, ensuring they are scientifically robust and extensively benchmarked.

- TUFLOW is designed to **integrate with third-party GIS and modelling tools** and operates efficiently within **scalable cloud environments** for model execution, data ingestion and secure output sharing.
- This approach provides **confidence that outputs are technically sound, transparent and defensible** for regulatory, planning and investment decisions.



Example: TUFLOW mapped out.

Our delivery approach typically includes:

1. **Data collection and preparation** – Collating hydrological, topographic, LiDAR and land-use datasets, and confirming modelling assumptions with stakeholders.
2. **Model build** – Developing 1D, 2D or combined hydraulic models using TUFLOW (and HECRAS or other engines where appropriate).
3. **Cloud-enabled computation** – Executing simulations using cloud compute environments to increase performance, scalability and efficiency.
4. **Scenario development** – Producing baseline, mitigation, extreme weather and climate-change scenarios; incorporating coastal inundation and storm surge where required.
5. **Calibration and validation** – Using historic flood events, observed data and sensitivity tests to assess model behaviour and evidence accuracy.
6. **Results analysis** – Generating spatial outputs such as extent, depth, velocity and hazard maps, and carrying out impact assessments and option comparisons.
7. **Digital twin integration** – Supporting dynamic visualisation, data linkage and interactive scenario exploration through digital twin environments.
8. **Reporting and presentation** – Providing comprehensive technical reports, evidence packs, GIS outputs and clear summaries for non-technical stakeholders.

Assumptions

To deliver this service successfully, we work on the following reasonable assumptions:

- **Model extents and core scenarios** are agreed at initiation. Unless specified otherwise, modelling includes a standard set of AEP events (3.33%, 1% and 0.1%). Additional scenarios—such as climate uplifts, critical duration/seasonality testing or broader sensitivity ranges—are delivered via change control.
- **Data prerequisites** are met, including suitable LiDAR coverage and quality, availability of OSM datasets, and agreed hydrological inputs (e.g., hyetographs) at project start.
- **Data access and licensing** for third-party datasets and cloud compute resources is confirmed in advance.
- **Timely access to stakeholders** is provided for validating assumptions, confirming scenarios and reviewing results.
- **Timely review cycles** are maintained to progress draft outputs and ensure planned delivery milestones can be met.
- **Model stability expectations:** no unusual instabilities are anticipated. Significant issues arising from input data or required topographic edits (e.g., culverts, cut-throughs) may require change control.
- **Engagement model:** meetings are assumed to be held virtually unless otherwise agreed.

Exclusions (unless explicitly included in the contract)

- Full hydrological analyses including gauge data analysis, spatially varying rainfall, QMED studies, or bespoke hyetograph generation.
- OSM or NRD processing to generate building footprints, upstands or other feature extraction.
- Delineation or representation of watercourses or drainage ditches requiring 1D cross-sections or detailed drainage network modelling.
- Inclusion of baseflows or initial water level conditions beyond project defaults.
- Critical duration or seasonality testing outside the agreed scenario set.
- Do-Nothing or deterioration epochs; collection and analysis of Section 19 data.
- Economic analysis (including costs, counts, damages) unless explicitly included.
- Mapping or conversion of output formats not listed within the deliverables.
- Contingency for unforeseen issues or extensive model troubleshooting.
- Conceptual optioneering, longlisting or shortlisting of flood mitigation options.
- PFC, FCERM, OBC or other business-case documentation.
- Workshop delivery, stakeholder consultations or site visits.
- Collection, analysis or implementation of survey data

These assumptions and exclusions ensure clarity of scope and help maintain a predictable, efficient modelling process, while protecting delivery quality.

Previous customers who have used this service

We have delivered flood and coastal modelling services for:

- UK public-sector agencies responsible for flood risk management.
- Local authorities and regional resilience partnerships.
- International water management and coastal protection authorities.
- Utilities, energy infrastructure and transport organisations



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