Enhancing TUFLOW Output

BMT WBM TUFLOW

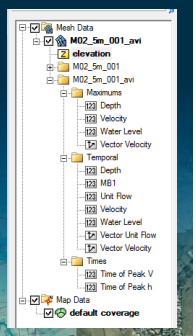
Introduction

- New output options in TUFLOW
- Animations
- Recap some underutilised outputs
- GIS techniques

BMT WBM 2 TUFLOW

XMDF Output Files

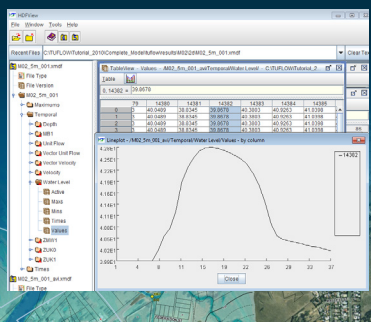
- Benefits
  - All outputs in one XMDF file
  - Very quick load times (indexing data in the file header)
  - Folder structure, much neater
  - Open format, C and Fortran libraries
  - Utilises HDF5 for data storage and compression
  - http://www.xmswiki.com/xms/XMDF



BMT WBM 3 TUFLOW

XMDF Output Files

- Alternate Viewers
  - HDFViewer
  - HDF Explorer
  - Matlab



BMT WBM 4 TUFLOW

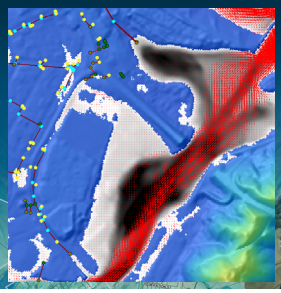
ArcGIS file formats

- Now written (and read) by TUFLOW for GIS based TUFLOW outputs
  - 1D results, messages, check files
  - `GIS Format == SHP`
  - `SHP Projection == Projection.prj`
- TUFLOW_to_GIS
  - Now writes out shape files with –shp option

BMT WBM 5 TUFLOW

ArcGIS file formats

- Three file types
  - _P (points)
  - _L (lines)
  - _R (regions)



BMT WBM 6 TUFLOW

User Defined Output

- Model Output == Area1 | Area2
- Output Control File == a.toc
  that contains blocks such as:

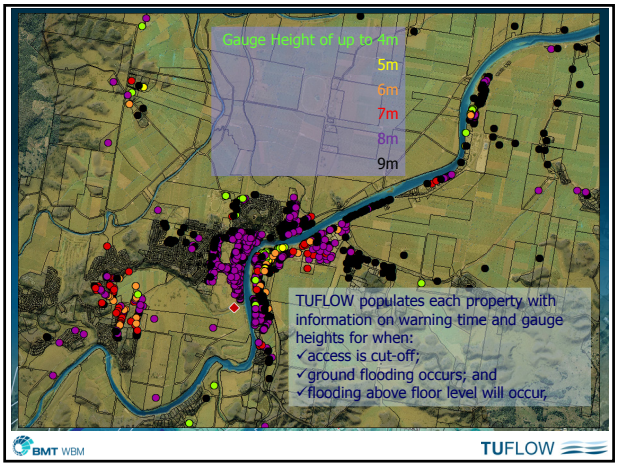
```
Define Output == Area1
  Start Map Output == 1
  Output Folder == ..\results\area1  ! Send TUFLOW 2D output to this folder
  Map Output Format == xmdf
  Map Output Data Types == hV
  Map Output Area == mi\Area1.mif
  Read GIS PO == mi\...
  ........
End Define
```

BMT WBM 7 TUFLOW

Gauge Outputs

- New .tgc command:
  Read GIS Gauge Output == mi\2d_go_buildings.mif
- Trigger level (eg. floor level) at each GIS object provided otherwise ZC (lowest ZC for a polygon) used
- For each point location or polygon (eg. building or property), TUFLOW outputs when the trigger level is inundated:
  - Time of inundation
  - Water level at each gauge
- Gauges are specified as a "G_" in a 2d_po layer
- Available in 2011-09-AA (not documented yet!)

BMT WBM 8 TUFLOW



BMT WBM TUFLOW

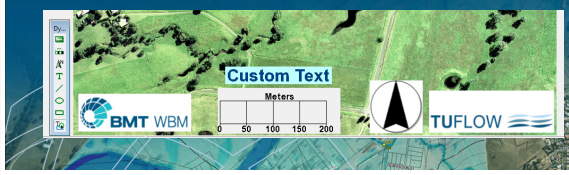
Animations - General

- Tips
  - Output Frequency (high as possible!)
  - Avoid running the animation for long periods where nothing is happening
  - Avoid cluttering the animation (clear and concise)
  - Allow yourself time: avoid starting at 5pm the day before a meeting….

BMT WBM 10 TUFLOW

Animations in SMS

- Annotation Module
  - Logos
  - Scale bars / North Arrows
  - Text



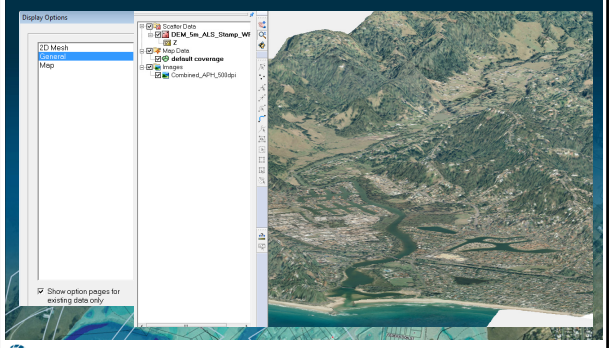
BMT WBM 11 TUFLOW

Animations in SMS – 3D

- To switch from plan view select the rotate tool
- Aerial Photo Draping
  - Texture Mapping (General Display Options)
  - Use scatter dataset to extend beyond model area
- Use Relief Shading

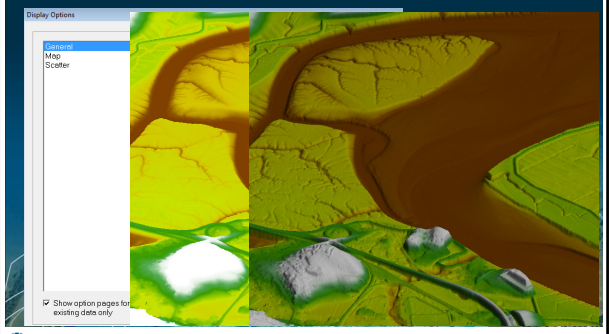
BMT WBM 12 TUFLOW

Animations in SMS – Aerials



BMT WBM 13 TUFLOW

Animations in SMS – Relief Shading



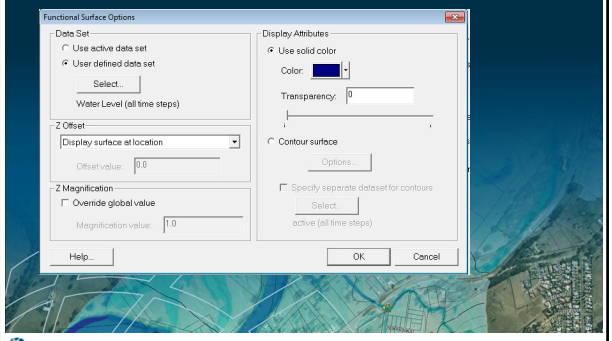
BMT WBM 14 TUFLOW

Animations in SMS – 3D

- The functional surface can be used to:
  - Display multiple datasets
  - Display results at the correct elevation (not at the topography surface)
- A separate dataset can be specified for contouring

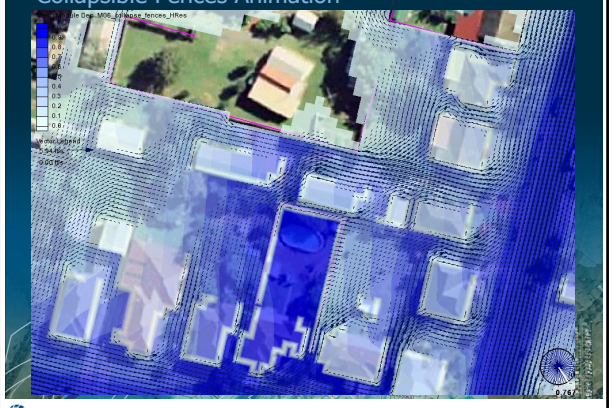
BMT WBM 15 TUFLOW

SMS Functional Surfaces



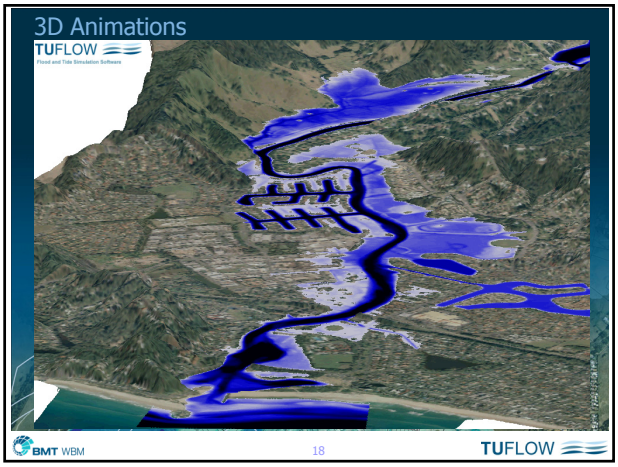
BMT WBM 16 TUFLOW

Collapsible Fences Animation



BMT WBM 17 TUFLOW

3D Animations

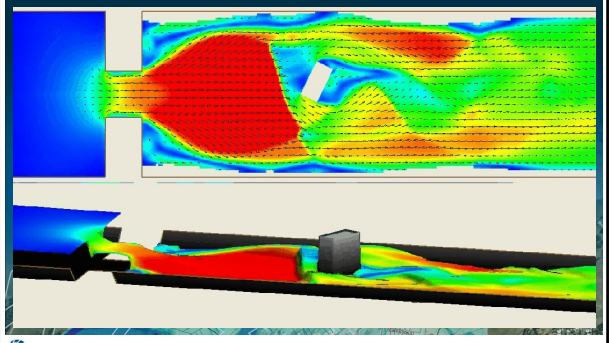


BMT WBM 18 TUFLOW

Fine-Scale Modelling

TUFLOW FV Flexible Mesh Engine

UK EA benchmarking to flume test – smallest element a 2½ cm triangle



BMT WBM 19 TUFLOW

Animations in ArcGIS

- Geodatabase
  - Raster Catalogue
  - Enable temporal data in catalogue
  - Time-slider
- To be documented:
  - Example on the wiki
  - Python scripts to go on the website

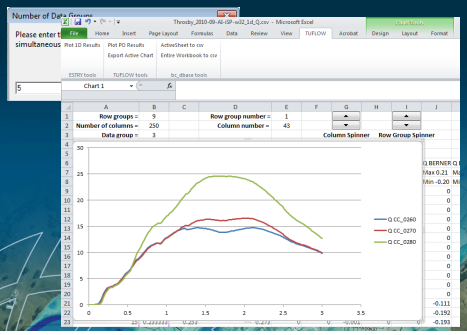
BMT WBM 20 TUFLOW

Excel Utilities

- Viewing timeseries of results (1D and PO)
  - Exporting as .jpg files
- Animating profiles
  - Exported images can be used to create a movie file, e.g. using Windows Movie Maker
- Also export tools, e.g. bc databases
- Download on web

BMT WBM 21 TUFLOW

Excel Utilities



Excel Animations

- Profile, tidal model
- Profile (multiple events)
- Cross-section, levels

Underutilised Outputs

- 1D outputs
  - Culvert Capacity Output
  - Water Level Line Points
- 2D outputs
  - Calibration Points
  - Long Profiles
  - Evacuation Routes

Culvert Capacity and Area

- _ccA.mif (or .shp)
- Colour Coded

BMT WBM 25 TUFLOW

Water Level Lines

- Two inputs layers
  - Lines (commonly used)
  - Points (less used, but powerful feature)
  - Import WLLp check file
    - Inspect Elevations
    - Optional Materials (to assign n values)
  - Not used computationally but makes for much nicer looking results / animations

BMT WBM 26 TUFLOW

Cutoff Depths for mapping

- Useful for direct rainfall modelling
  - Map Cutoff Depth == <depth> (.tcf)
  - Updated asc_to_asc.exe
    - asc_to_asc.exe -cd0.1 depth.asc
    - asc_to_asc.exe -cd0.1 depth.asc levels.asc
    - Optional –output switch to set output name

BMT WBM 27 TUFLOW

Calibration Points

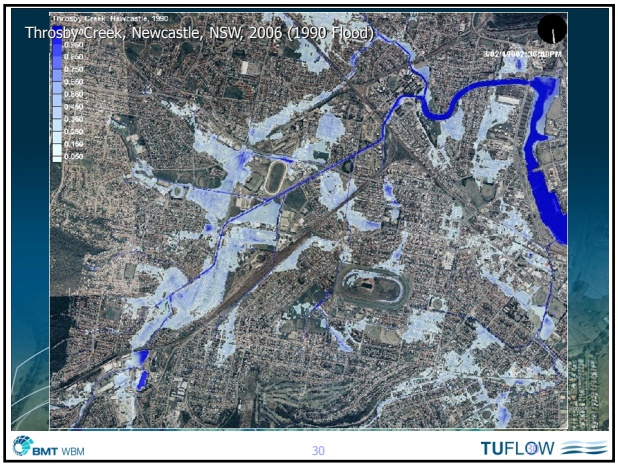
- .tcf command
  - `Calibration Points MI File ==`
- Assigns the peak water level as an additional attribute
- Up to 10 files can be specified

BMT WBM 28 TUFLOW

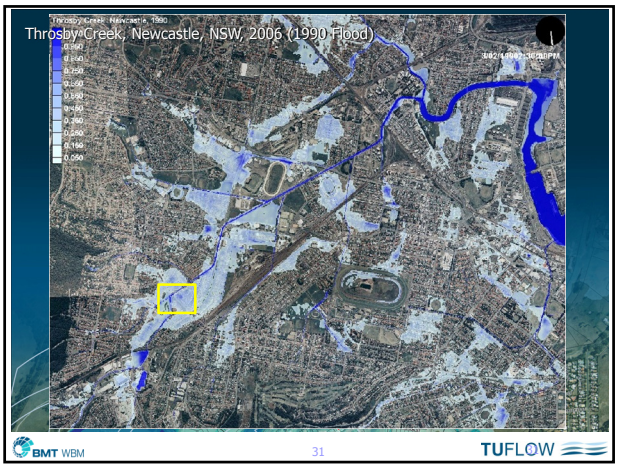
Throsby Creek Newcastle

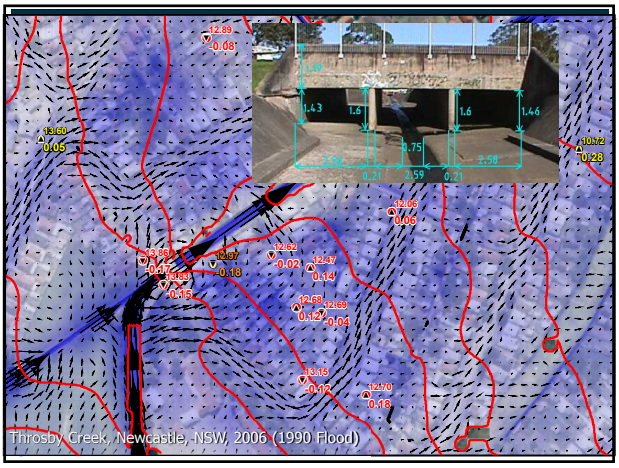
- 1D
  - Sub and super critical flow
  - 700 structures
  - 1,000 pipes, pits and manholes
- 2D
  - Complex overland flows
- Excellent calibration events

BMT WBM 29 TUFLOW

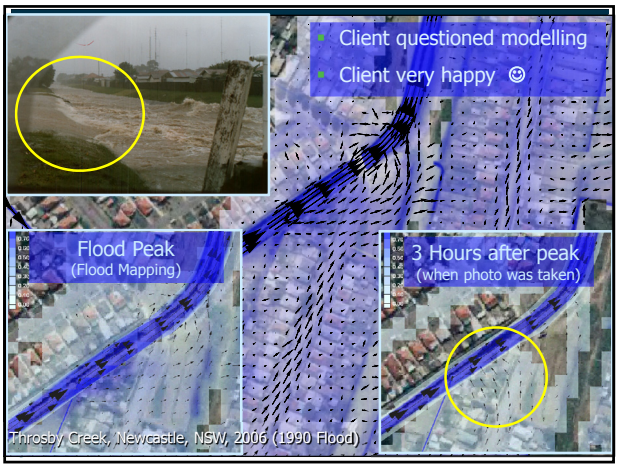


BMT WBM 30 TUFLOW


Throsby Creek, Newcastle, NSW, 2006 (1990 Flood)
BMT WBM
31
TUFLOW

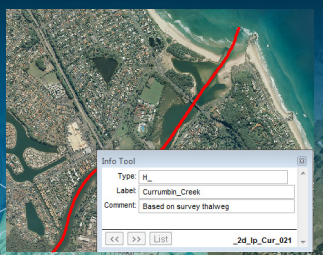

Throsby Creek, Newcastle, NSW, 2006 (1990 Flood)

Throsby Creek, Newcastle, NSW, 2006 (1990 Flood)



Longitudinal Profiles

- Read in prior to simulation (as per PO)
- Can now output velocity (Type = V)
- Set output interval using:
  - `Time Series Output Interval == <seconds>`
- Also TUFLOW_to_GIS



BMT WBM 35 TUFLOW

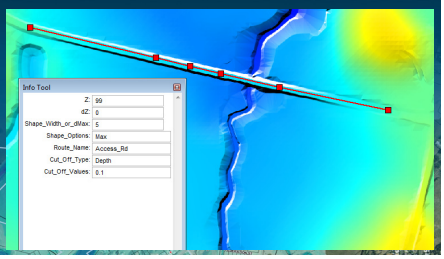
Evacuation Routes (2d_zshr)

- Useful for:
  - Warning Times (time to cut off)
  - Duration the routes are cut-off
  - Degree of inundation
  - Risks
  - 2d Z shape format with additional attributes

BMT WBM 36 TUFLOW

Evacuation Routes (2d_zshr)

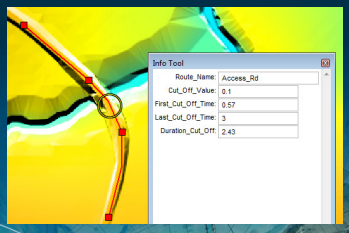
- GIS inputs
  - Multiple cut off values possible



BMT WBM 37 TUFLOW

Evacuation Routes

- Outputs
  - Points
  - Map Output (time varying data)
  - Animation



BMT WBM 38 TUFLOW

Discussion

- Any questions?
- Any suggestions?

BMT WBM 39 TUFLOW