TUFLLOW
Into the Future
BMT WBM Software Business Unit

- More autonomy on resourcing and financial reporting
- Delivery of software and support less influenced by consulting deadlines
- Greater resourcing directed to market research and marketing
- Focus on developing technical “geeky” tools unchanged – that’s what we’re about!
- Better prioritisation of tasks
- Facilitate branching into new areas
- Nearly all technical staff will still be involved in consulting projects
  - Essential to software being useful!
Staff

- Bill Syme – Manager
- Chris Huxley – market research/strategy, branding, web delivery
- Phil Ryan and Mitchel Smith – TUFLOW Classic
- Ian Teakle and Matt Barnes – TUFLOW FV
- Mat Roberts and Stephanie Dufour to lead UK Sales/Support
- ~ 6 other engineers/scientists coding and support services
- Sandy Thompson and others for licensing, accounts and admin
Integration of Products

- Greater integration of engines
- TUFLOW Classic’s 1D Solver (ESTRY) linked with GPU Solver
  - High resolution modelling of urban areas with pipe networks
  - Virtual Pipes feature stepping stone to achieve this
- 1D Solver also to be linked into TUFLOW FV
  - Flexible mesh modelling of fluvial and surface water
- TUFLOW FV engine on to GPU
- One TUFLOW.exe for all
Other Major R&D

- TUFLOW GPU 2nd Order Solver
- FV Morphologic Module into Classic
- TUFLOW Classic parallelisation and on Linux
- Continued development of miTools, QGIS Plugins and ArcGIS tools
- Incorporation of GDAL GIS libraries
  - Support wide range of GIS formats and on-the-fly projection transformations
- 1D Bridge Losses
- Plus 100+ minor R&D tasks on The List!
Licensing and SaaS

- Subscription (annual) service
- Cloud licensing
- Software as a Service (Cloud simulations)
- Looking into making 2015 Classic Release free for small models
TUFLOW GPU Urban Pipe Modelling

- Heading towards cell sizes of 0.1 to 0.5m
- Suits shallow urbanised areas
- Virtual pipes or full pipe networks
- Needs high quality DEM
Flood Forecasting

- Time varying rainfall grids
  - Interpolated from gauges
  - Radar imagery
  - Meteorological Forecasts

- Together with GPU solver opportunities for 2D flood forecasting
Is 2D Direct Rainfall Modelling the Next Approach to Hydrologic Modelling?

- DEM + Rain + Land-use + Soils = Pretty Flood Map, but is it representative of reality!
- Is the rate of runoff, the timing of the hydrographs, realistic?
- Is infiltration well represented?
- TUFLOW Classic/GPU can do all of the above, but don’t treat it as a “black box”
- Need research, real-world calibrations, benchmarking, guidelines…
TUFLLOW FV
Flexible Mesh Solver
TUFLOW FV

- 2D/3D NLSWE solver
- Finite Volume Scheme
- Flexible Mesh (Triangles and Quads)
- Adaptive time stepping
- Parallelised Scheme
- 1st and 2nd order schemes

- Advection-Diffusion Module
- 3D Baroclinic Module
- Integrated Atmospheric Heat Module
- Sediment and Morphology Module
- Water Quality Module
- Similar interface to TUFLOW Classic
TUFLOW FV
Maroochy River – Australia

- Modelling Overview
  - 630 km² catchment area
  - Single model consolidating 10 past fixed grid hydraulic models
  - 2 model versions:
    - Coarse = 900,000 cells
    - Refined = 2,300,000 cells
  - Calibrated to four historic events
    - 17 Time series height gauges
    - 40 Maximum height gauges
  - 300 Structures (bridges, culverts)
TUFLOW FV
Maroochy River Coarse Model Mesh
3D River Applications

- When might a 3D river model be required?
- To resolve some secondary flow characteristics (e.g. helical flow through a river meander)
- To resolve vertical mixing of water constituents
TUFLLOW FV - 3D Modelling

Transverse Velocity Direction

Depth Averaged Velocity
Tide & Surge Modelling

- Cassowary Coast (North Queensland)
- Coastal Inundation Hazard Study
- Tropical Cyclone Region
- TUFLOW FV Model of offshore waters, coastal floodplain, rivers and creeks
- Mesh size on floodplain <100m
- Forced by tide, wind and atmospheric pressure
Tropical Cyclone Yasi, February 2011
Tropical Cyclone Yasi, February 2011

- Tidal anomaly validation
- Surge plus tide validation
Mooloolaba Harbour Entrance

- Management of the entrance aims to maintain a channel to 3m below LAT
- At times, this objective is not met due to episodic shoaling events
- DTMR commissioned study to assess options to mitigate shoaling using TUFLOW FV
TUFLOW FV Model

Mesh details
- 13,850 mesh elements
- 500m² element size offshore
- 10-15m² element size at entrance

Boundary conditions:
- Bathymetric LiDAR (Nov 2011)
- Mooloolaba tide gauge offshore (15min lag applied)
- Interpolated BOM winds
- SWAN Sunshine Coast 100m grid
- 2-way TUFLOW FV/SWAN coupling within 25m SWAN grid
TUFLLOW FV Mesh

- 10-15m$^2$ elements in shoaling zone
- Incorporation of capital works options
Shoal Event Model Validation

- Morphology modelling scenario
  - Period: 01/11/2011 – 01/05/2012 (key wave/shoal event late December 2011)
  - 2-way coupled wave forcing within vicinity of entrance
  - Wave boundary condition applied in far-field areas
  - Limited sand volume available (0.5m layer of sand above bedrock)
  - van Rijn sand transport scale parameters adjusted as part of the calibration process
Wrapping-Up

- Continue to make bigger and better
- Focus on the engines, modules and interfacing with GIS and GUIs
- Software Business Unit is a plus, especially in terms of accessing resources
- Please keep sending those ideas through!
thank you