HYDRO Portal: DHI's response to AR&R

DHI UK & Ireland Symposium
27th June 2017

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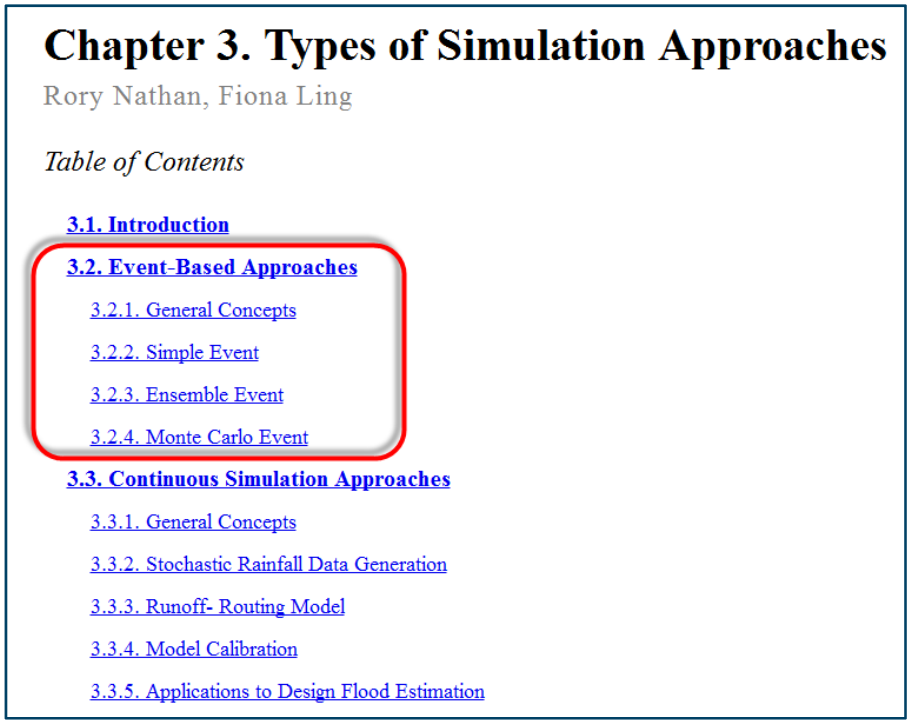
What is Australian Rainfall & Runoff (AR&R) 2016

- Revised design rainfall estimates based on gauge records (last updated in 1987)
- Broad guidelines for peak flow estimation in urban and rural catchments
- Advice on how to handle rare and extreme floods and develop Flood Frequency Analyses (FFA)
- Web and e-Pub

What is Australian Rainfall & Runoff 2016

- The biggest change is the move from one temporal pattern (TP) for each ARI/Duration combination to an ensemble of 10 TP's
- Also, the Monte Carlo method is prescribed and recommended



Chapter 3. Types of Simulation Approaches

Rory Nathan, Fiona Ling

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What is Australian Rainfall & Runoff 2016

- Industry reaction is that there is now 10 times more work in a Flood Study due to the ensemble of temporal patterns

What can DHI do to make the transition easier for MIKE Software users?

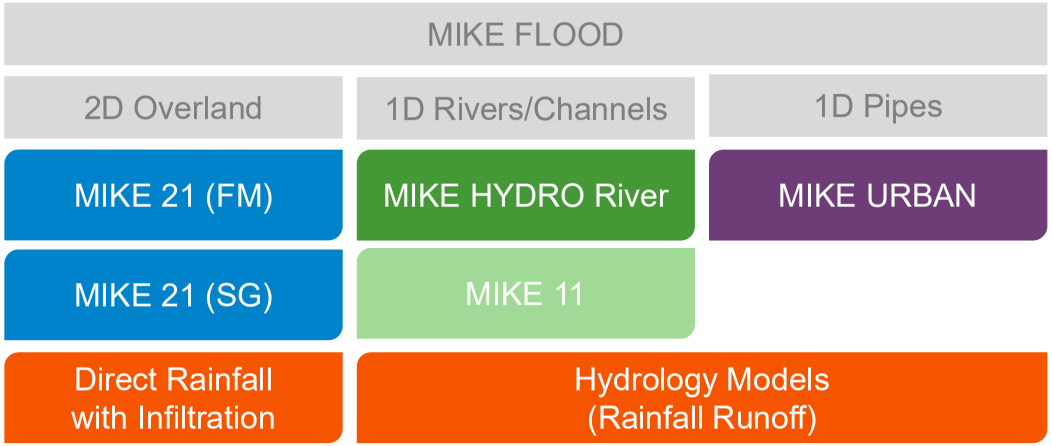
Does all the extra hydrology simulations spill over to Hydraulics?

Current AR&R Project Workflow in 1 minute

DEMO

DHI's Product Suite for Flood Modelling

- MIKE FLOOD
  - MIKE21 Flexible Mesh
  - MIKE21 Single Grid
  - MIKE HYDRO River
  - MIKE11
  - MIKE Urban



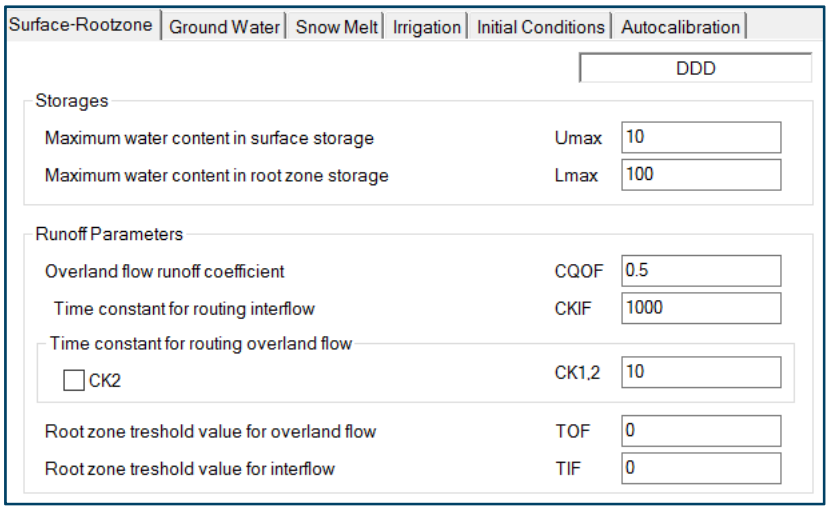
- DHI Hydrology Models are generally considered Global and/or Generic

Urban Models	:	Time Area, Kinematic Wave (Hortonian Infiltration)
NAM, SMAP	:	Continuous Simulation, Soil Moisture Accounting
UHM	:	Unit Hydrograph Method
DRiFt	:	Semi-distributed Morphological Approach

What we didn't do….

We have not added AR&R links and concepts into DHI Hydrology Models

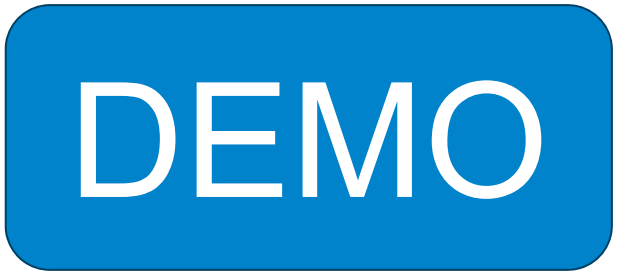
1. In Australia, products like RAFTS, RORB and URBS dominate
2. DHI's strongest differentiators in hydrology (like the NAM model) are not well aligned to the design event methods described in AR&R 2016
3. Clients typically connect output from other hydrology models to MIKE models as boundary conditions or source points



Introducing HYDRO Portal

au.dhigroup.com/arr/

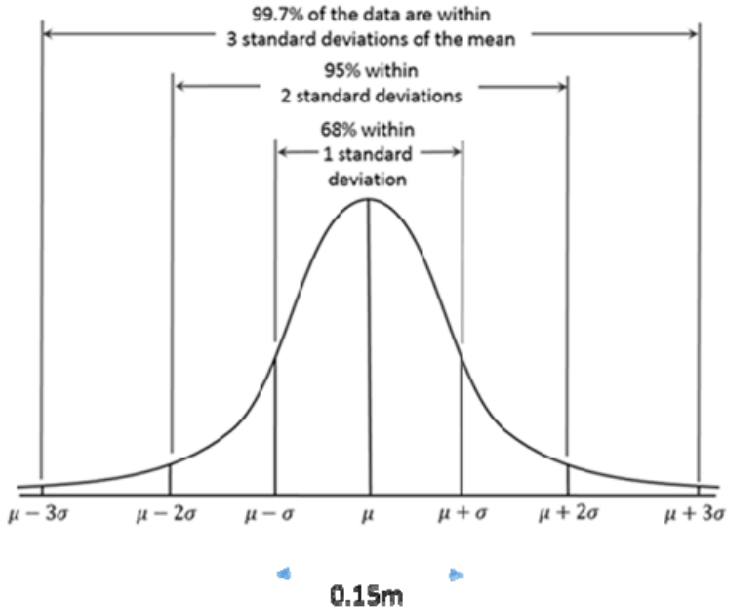
HYDRO Portal DEMO



Hydraulic Uncertainty Research Project

- Bathymetry z-values have uncertainty from two main sources

Vertical data:
Spatial Accuracy
0.15m @ 67 % CI



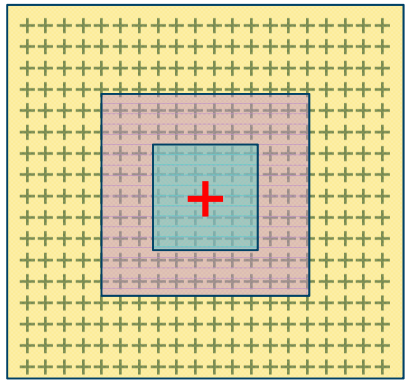
$SD_{(source)}$ = 0.075m

Raw DEM data supplied with a quoted accuracy

Hydraulic Uncertainty Research Project

- Bathymetry z-values have uncertainty from two main sources

1m raw DEM



Interpolation error calculated from analysing differences between interpolated value and raw data within a model cell or element

Grid Size (m)	SD $_{(interpolation)}$*
6m	0.12m
8m	0.18m
10m	0.23m
20m	0.31m

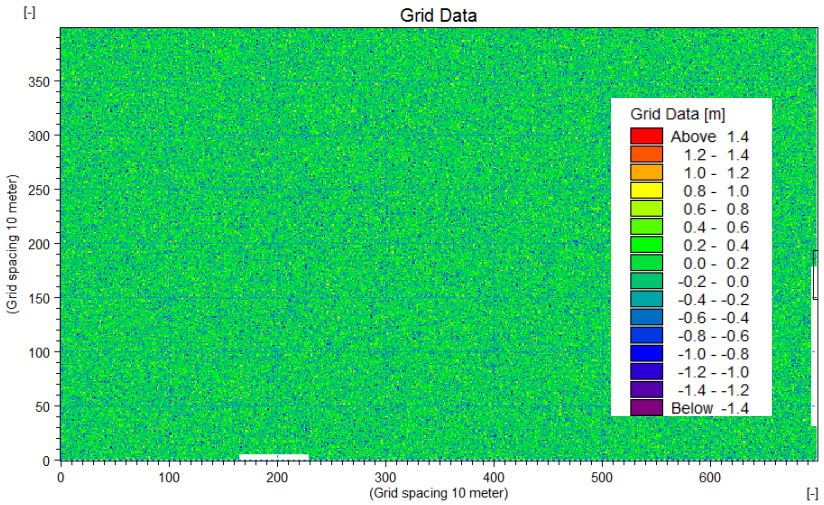
$SD_{(int,10)}$ = 0.23m
(*project specific)

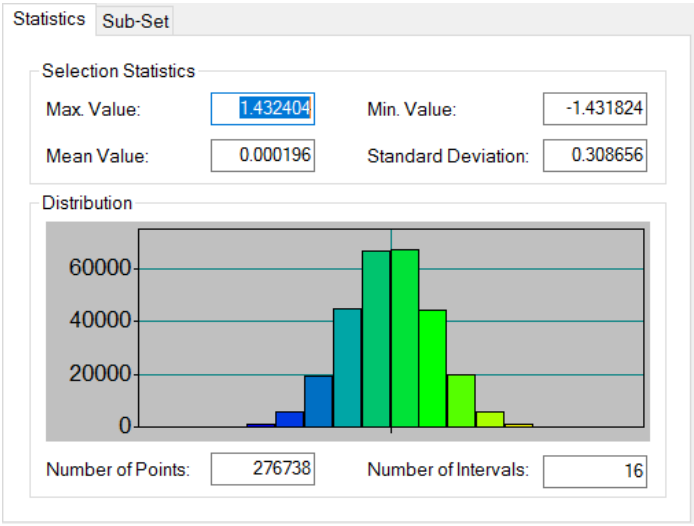
Error from interpolation of Raw DEM onto coarser grid or mesh

Hydraulic Uncertainty Research Project

$SD_{(z\text{-}error)}^{*} = SD_{(source)} + SD_{(int,\Delta X)}$

** assumes interpolation error is normally distributed*





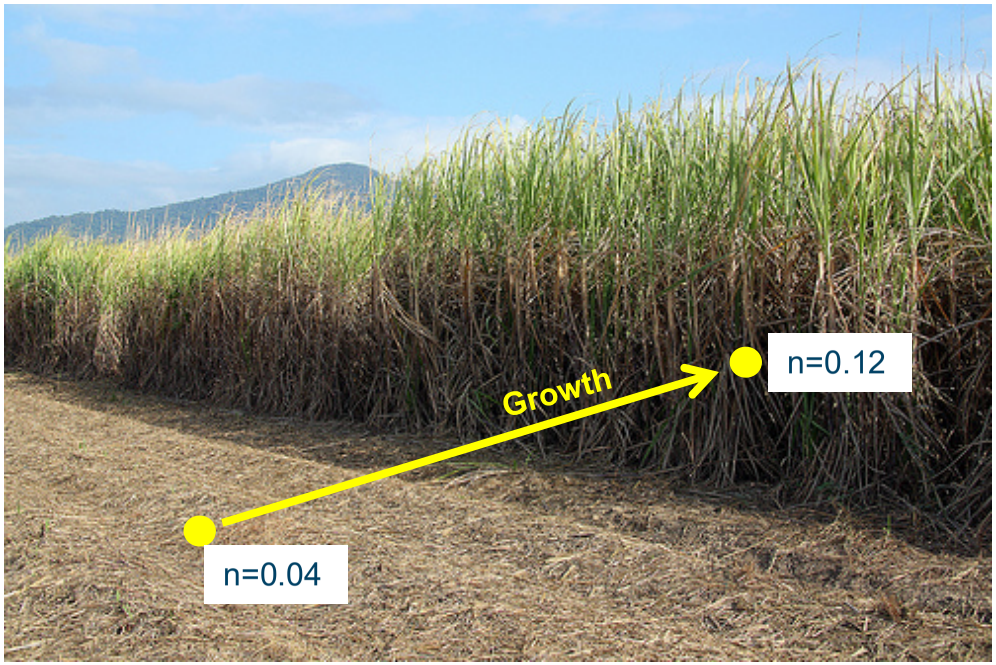
Delta maps for z-value

Hydraulic Uncertainty Research Project

- Manning's "n" is variable with space

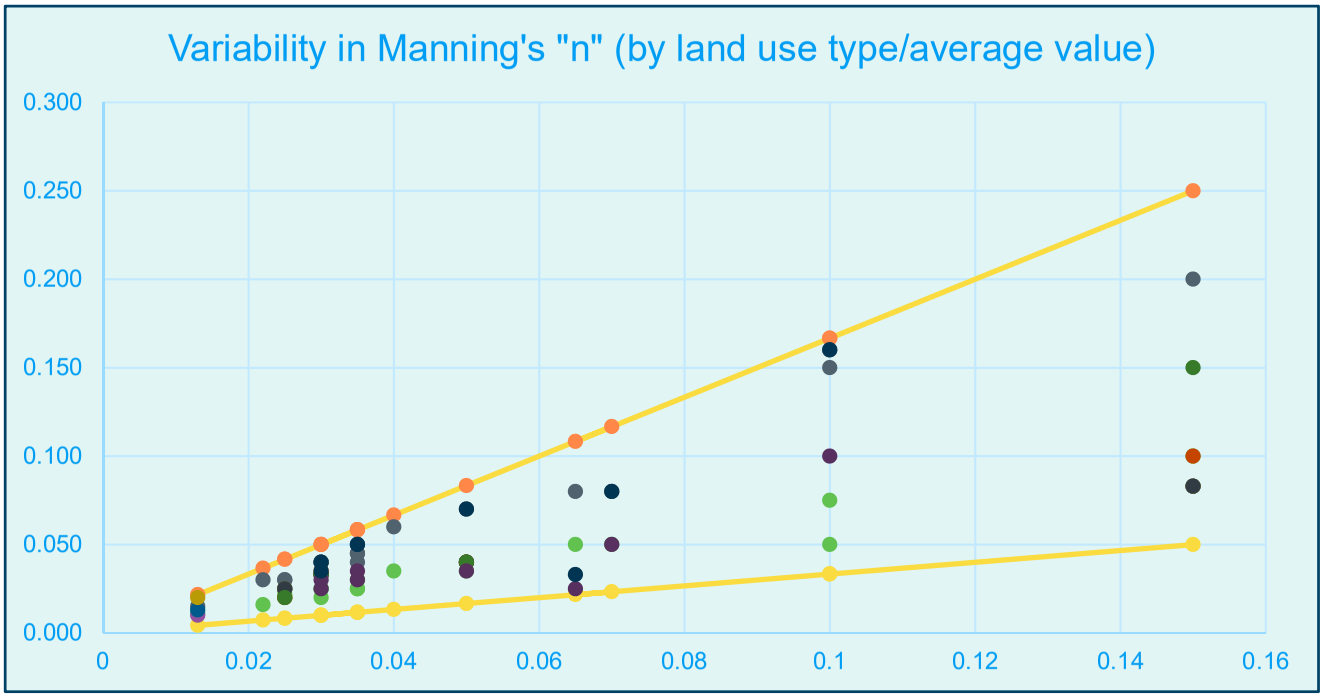
Hydraulic Uncertainty Research Project

- Manning's "n" is variable with time



Hydraulic Uncertainty Research Project

- Manning's "n" is variable with application/guidelines



Sources:

- *AR&R (suggested min/max)*
- *Open Channel Hydraulics (Chow) (min/max)*
- *Adopted values from various DHI modelling studies*

Data limits shown on graph are $\pm \frac{2}{3} n$

(95% CI, 4xSD, SD=n/3)

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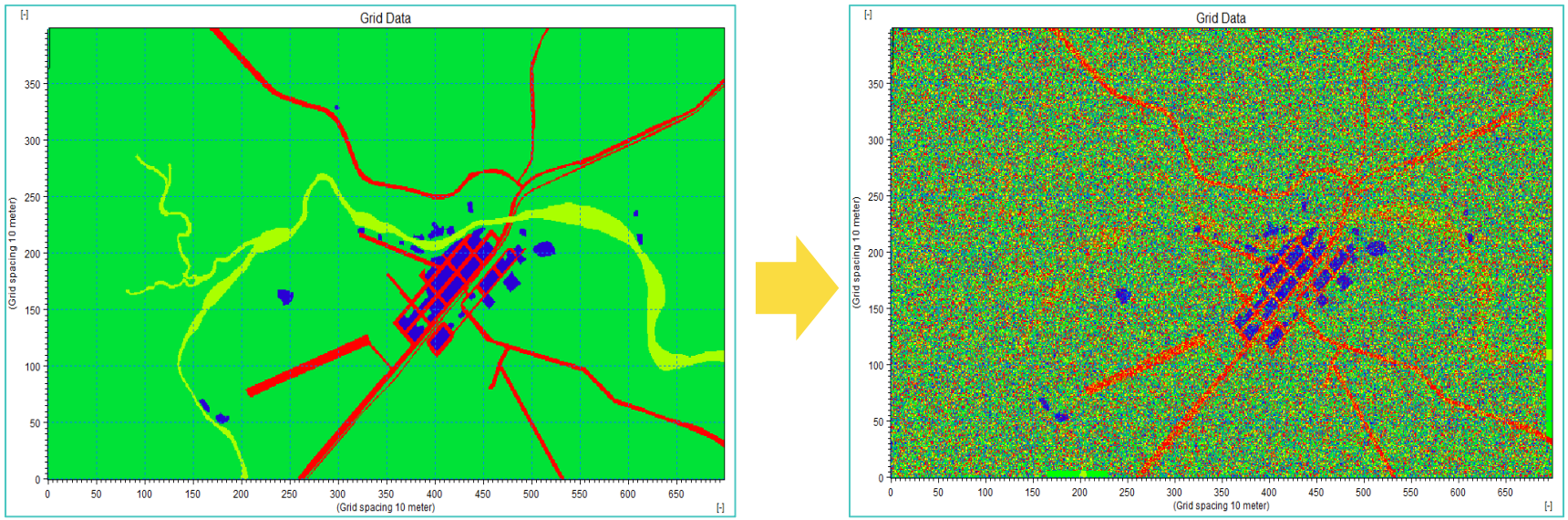
Hydraulic Uncertainty Research Project

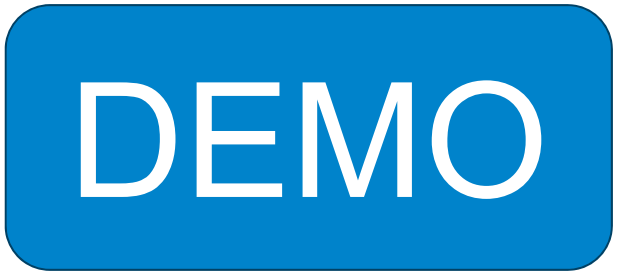
$SD_{(manning)}$* = n/3 (or user value)

** error is assumed to be normally distributed*



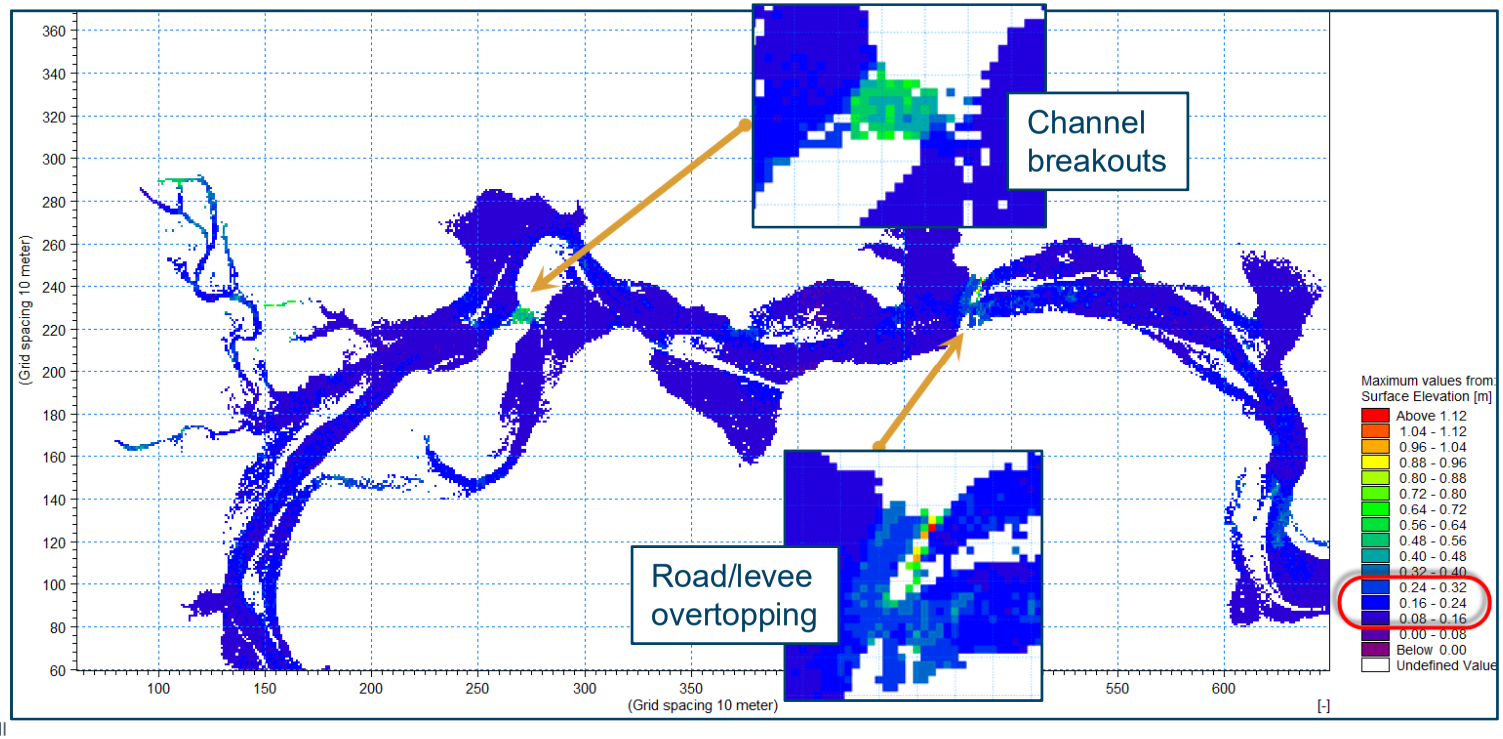
Generate maps for manning roughness with probability distribution

HYDRO Portal DEMO



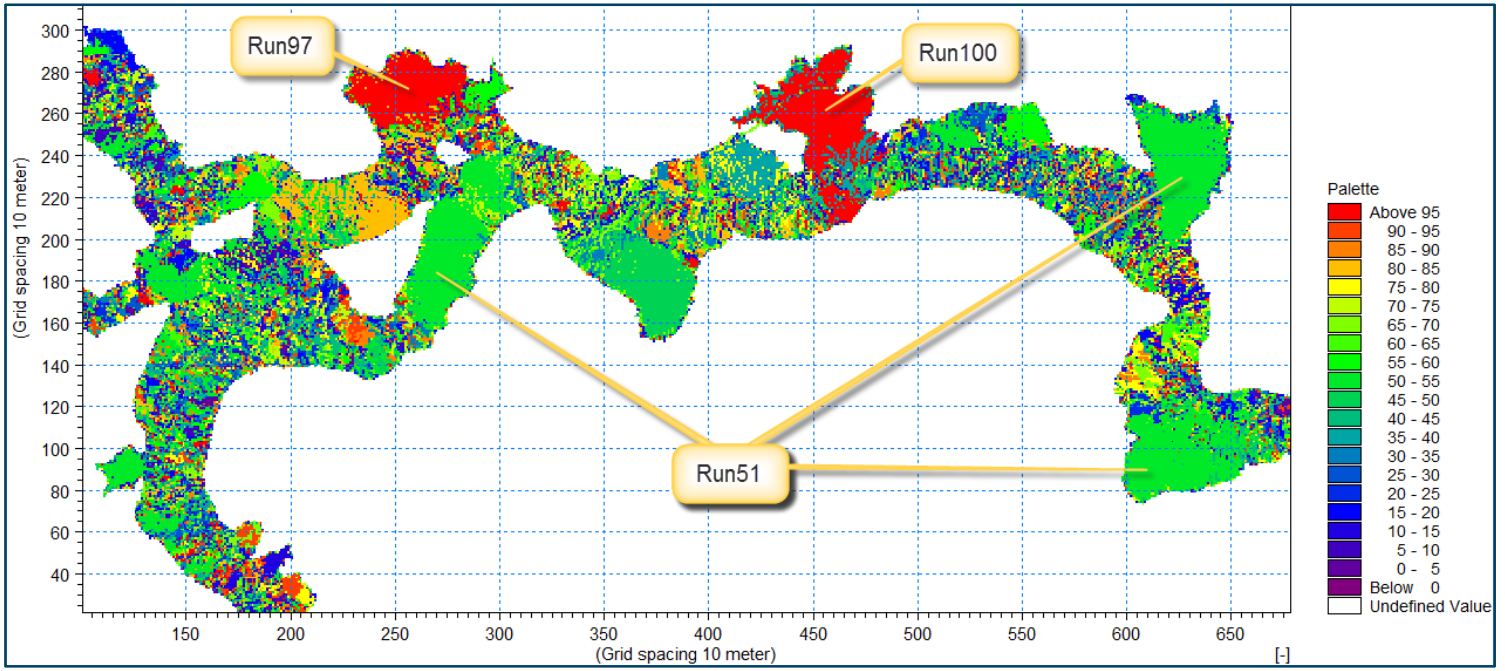
What does hydraulic ensemble modelling provide:

- Range of flood levels, highlighting locations most sensitive to uncertainty



What does hydraulic ensemble modelling provide:

- Indexing of the floods (which event dominates), for further investigation



Future Developments in HYDRO Portal

- More hydrology model formats for conversion to DFS0
  (based on user demand, not limited to Australia)

- Extension of the hydraulic ensemble manager to:
  - MIKE21 FM
  - 1D River models
  - Coupled models (MIKE FLOOD)
  - Cloud Simulation of Ensemble

- More hydraulic parameters implemented in the hydraulic ensemble manager:
  - structure blockage factor

Challenge DHI to make HYDRO Portal relevant for you!

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