Limpopo Early Warning Flood Forecasting System

01 March 2017

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Agenda

- EWFF System Architecture
  - Mike Customised Platform
- Flood Forecasting
  - Lead Time
  - Accuracy of Prediction
- Limpopo EWFFS
  - Real time data
  - Hydraulic Modelling
  - Scenario Manager
  - Reporting
  - Verification and Validation

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01. Early Warning Flood Forecasting System Architecture

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EWFF System Overview

Real Time Data

- Satellite
- Radar
- Measurement

Forecast information

Decision Support System

Toolbox

- Hydraulic model
- Customised Platform

Real Time Operation Centre Early Warning Unit

Early Warning
Appropriate Response
National, Provincial and Municipal Operational Coordination Committee

- Police
- Fire Department
- Civil Defence
- Hospitals

Public Web

Disaster Management

Civilians

Mike customised Platform

…get the full benefit of real-time **monitoring** and early warning systems

…manage, organise and analyse large amounts of **data**

…optimise **operations** and planning

…make wise and robust water management **decisions**

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Flood Forecasting

- Flood events are generally managed by continuously monitoring waterbodies and assessing their potential for flooding in real-time.
- Where flooding is likely, those potentially affected (the public and businesses), and those protecting them (emergency services and local government) are warned, and warning recipients then act to reduce losses.
- It is typically represented as a process with component activities of Detection, Forecasting, Warning and Response

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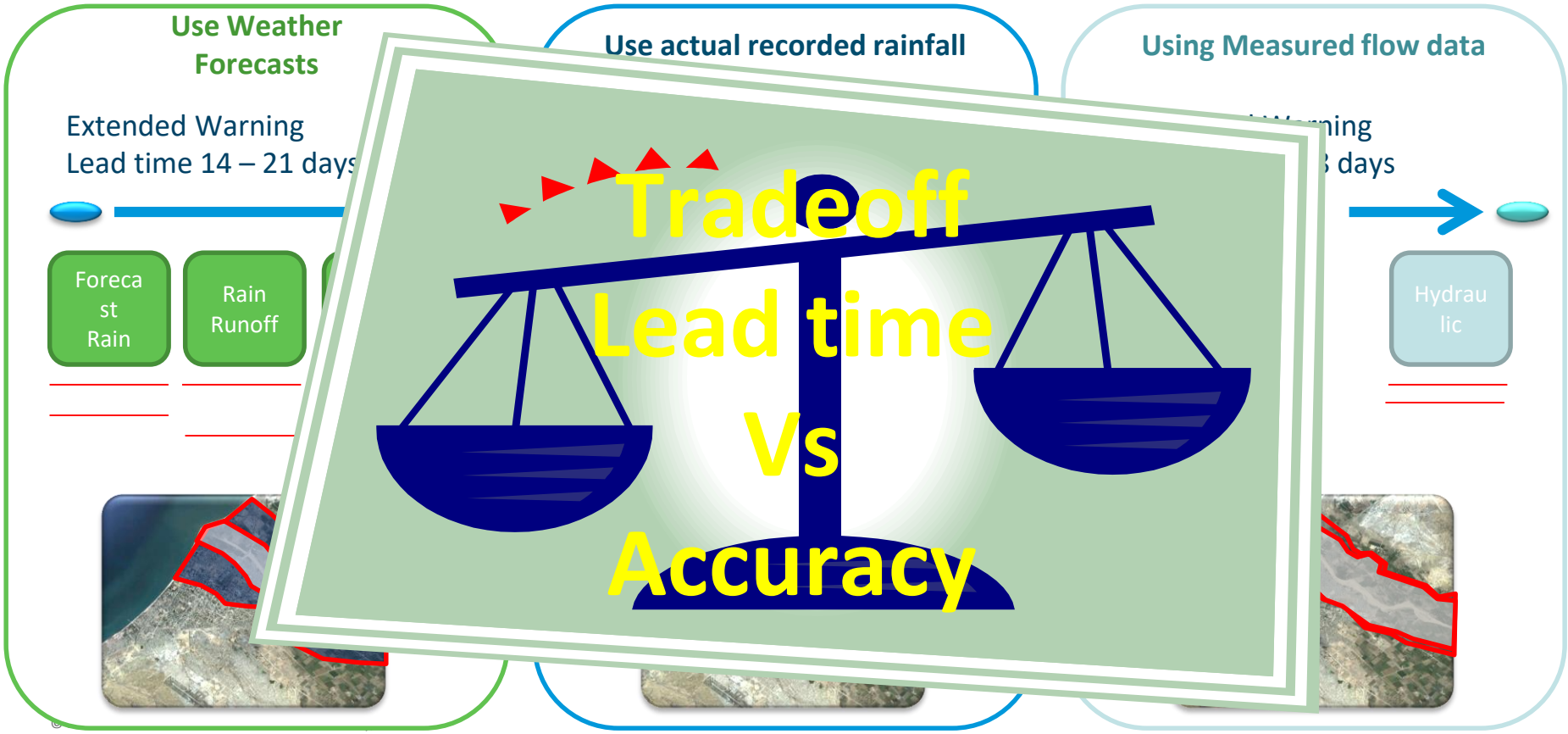
Lead time and Accuracy of prediction



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Limpopo EWFFS

- Objectives
  - Establish a system to transmit near real-time data from critical flood flow monitoring points in the lower Limpopo in each LIMCOM Member State to a central server, and
  - establish a flood routing model to determine the likely extent and timing of floods
  - establish an early warning system that detect, and forecasting the likelihood of flood and send warning on time for stakeholders to act on time on perceived flood danger

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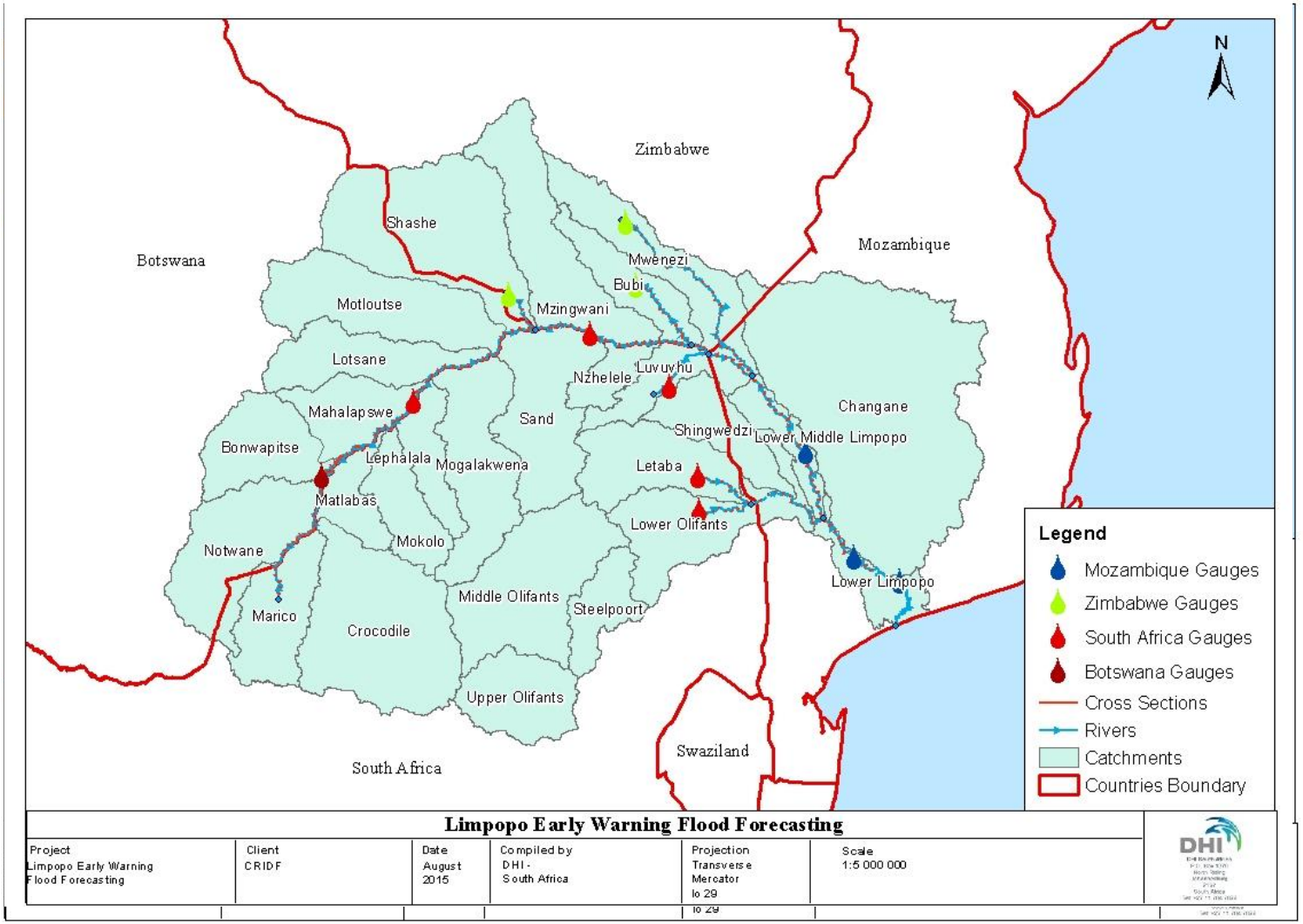
Limpopo EWFFS



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Real time data acquisition

- Real time data acquisition
  - Real Time Flow rates for selected gauges are stored in the MIKE Customised data base
    - link to the south Africa DWS real-time sites established
    - The GPRS system for the selected gauges have not been installed, once it is installed the data will be available in the platform
  - Real-time data are captured through the “script and job manager” of MIKE Customised and stored in a database

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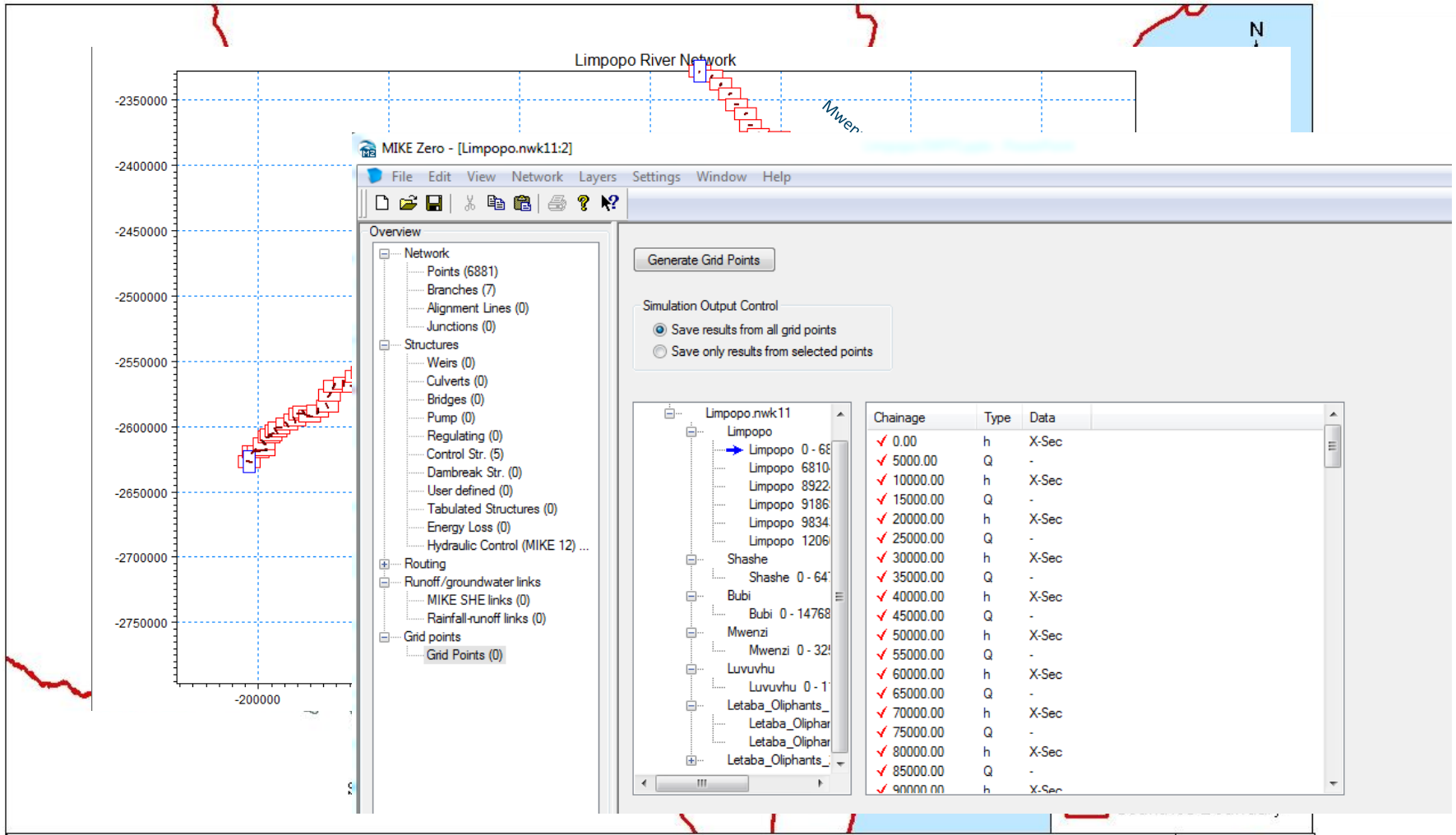
Hydraulic Modelling

- Hydraulic Modelling
  - A MIKE 11 hydraulic model was setup for Limpopo catchment
    - to route flow from upstream to downstream
    - predict the transition of water in time and space in a one dimensional direction
    - If the model is run on near real time, the model predicts downstream flood extent with certain lead time
    - Cross sections for the catchment were derived from a 90 m resolution ASTER SRTM DEM, every 10 km distance
    - However, the DEM don't represents the river cross-section very accurately
  - External boundary conditions are required at all model boundaries,
    - i.e. all upstream and downstream ends of model branches which are not connected at a junction.
    - The selected gauges in activity D02 were used as boundary files in the MIKE 11 setup, except for AH006, AH009 and E33 which was used as data assimilation points.

Hydraulic Modelling



Limpopo Early Warning Flood Forecasting

Project	Client	Date	Compiled by	Projection	Scale
Limpopo Early Warning Flood Forecasting	CRIDF	August 2015	DHI - South Africa	Transverse Mercator lo 29	1:5 000 000

DHI

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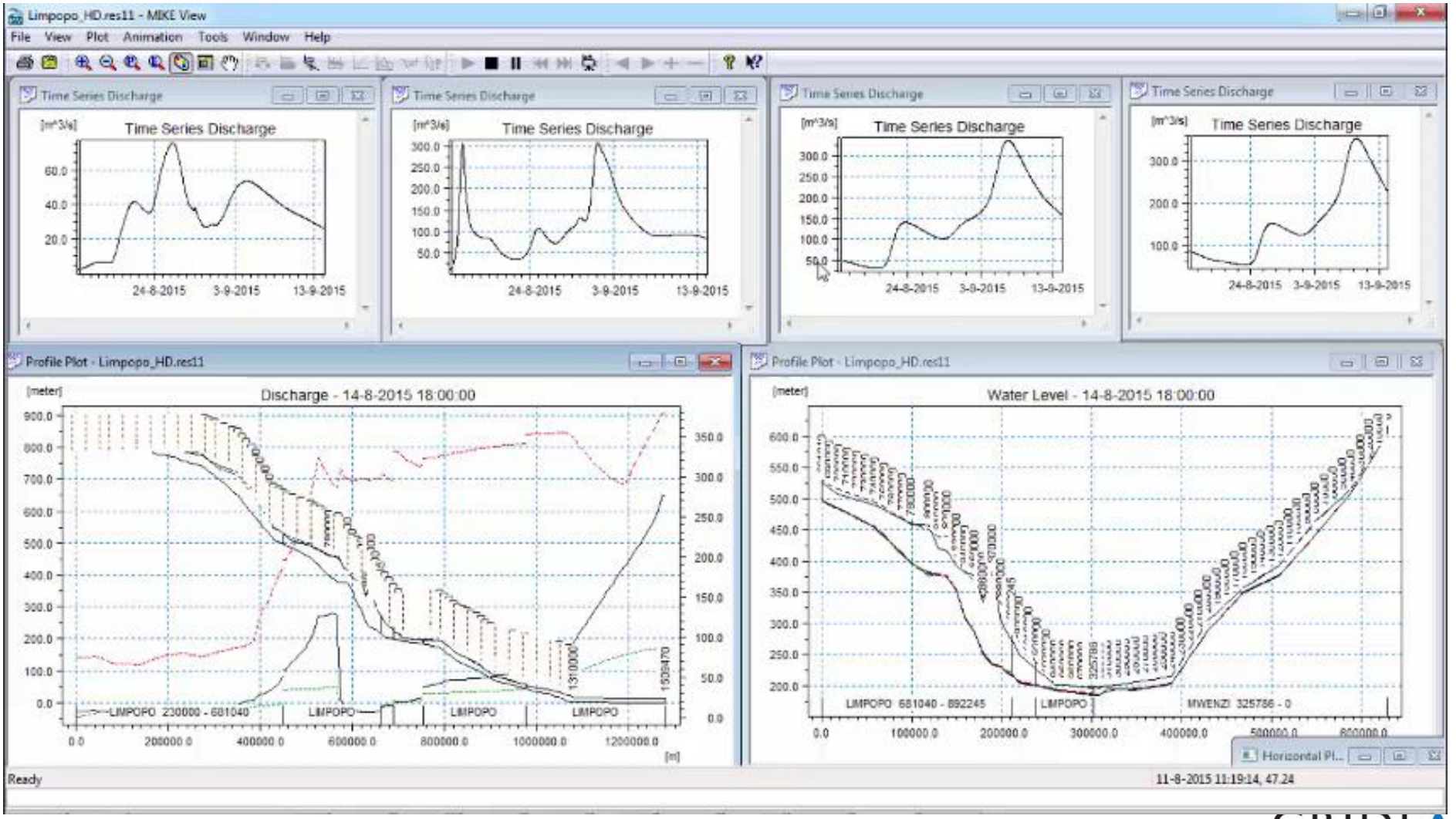
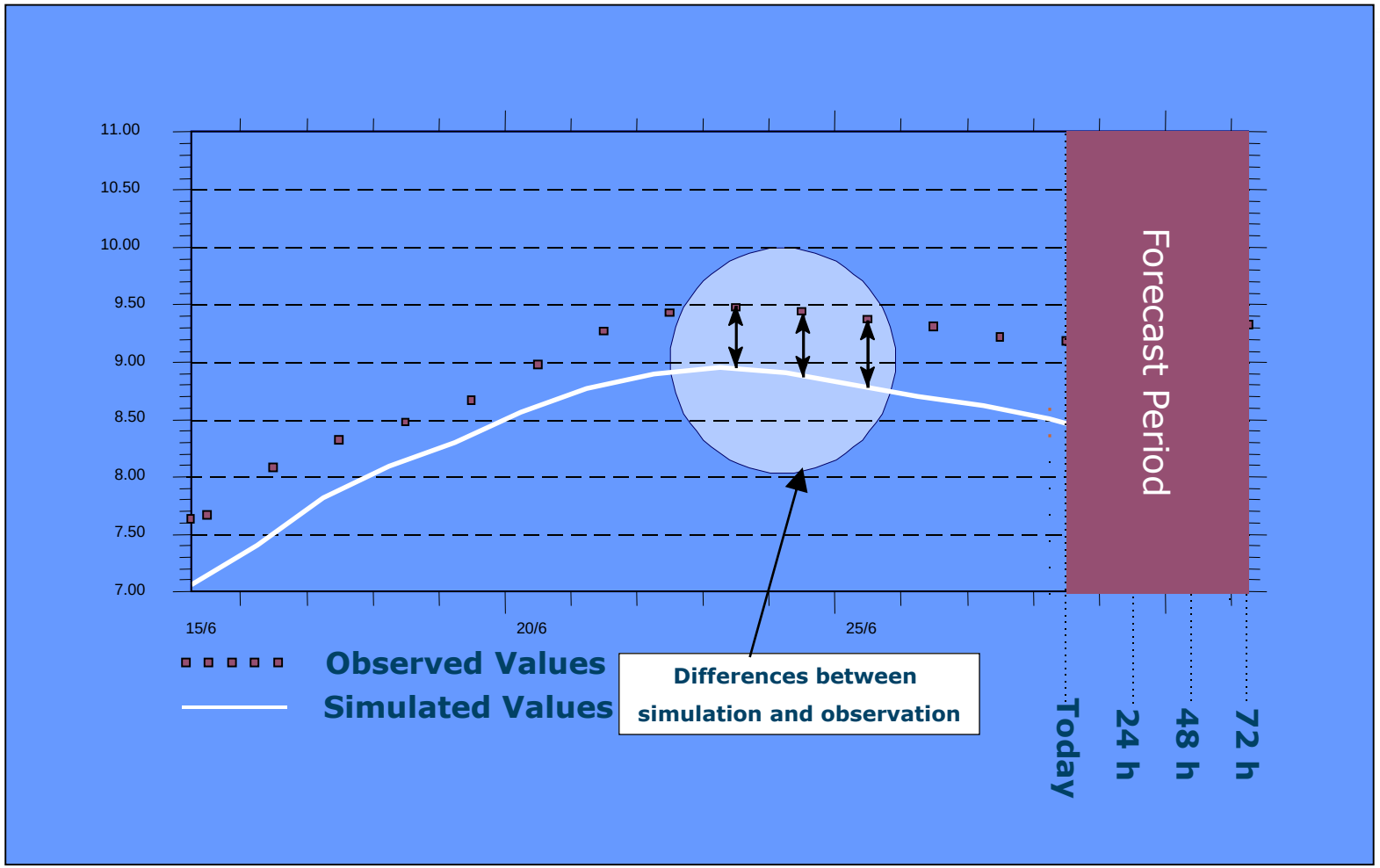
Limpopo EWFFS



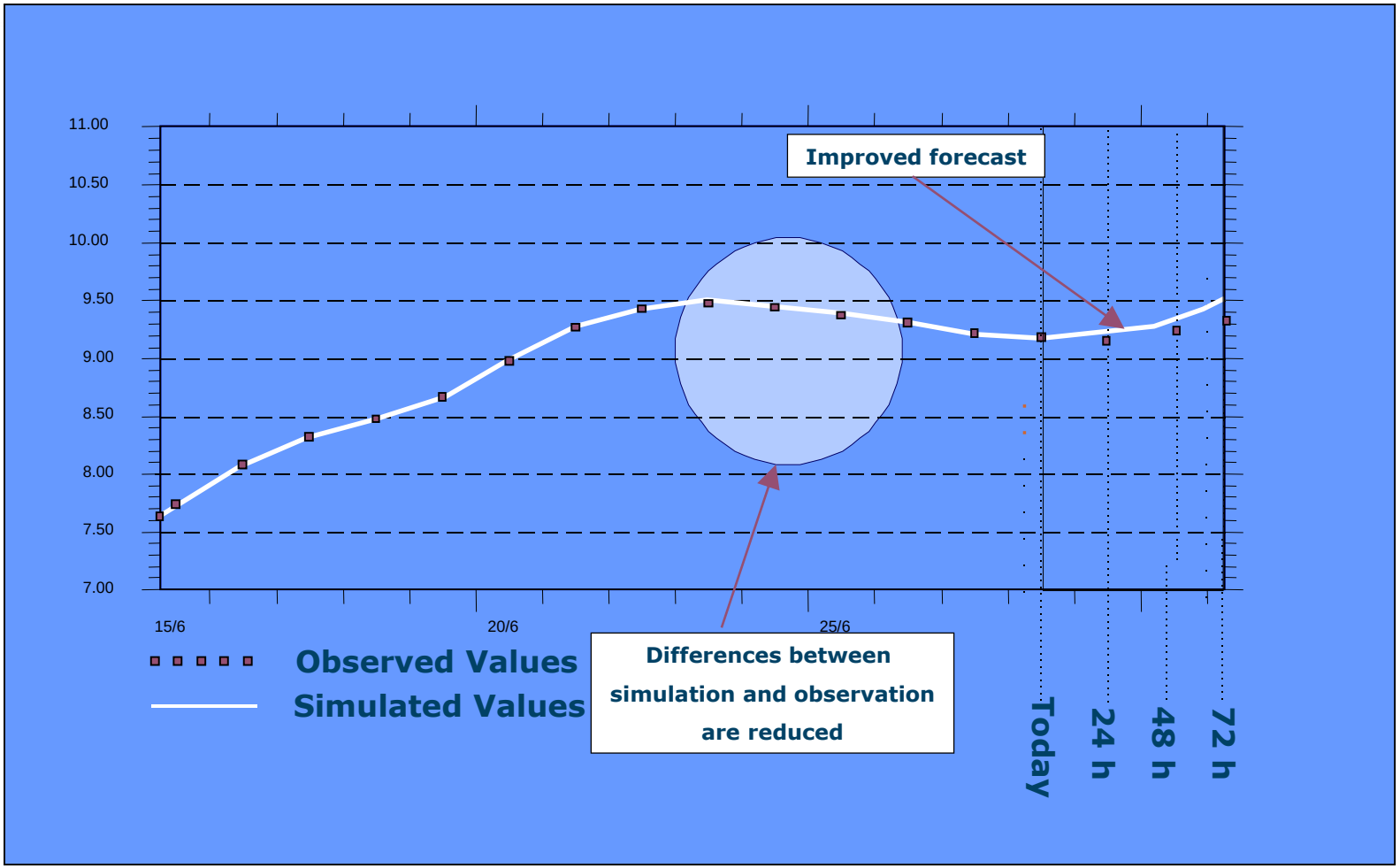
Data Assimilation

- Data assimilation
  - Data assimilation is a technique for combining any measurements of the state of the system with the model dynamics in order to improve the knowledge of the system
    - In this Limpopo MIKE 11 setup, data assimilation were performed at four points namely at AH006, A7H008, E32 (on the Limpopo mainstream) and at Massingir Dam on the Oliphants tributary

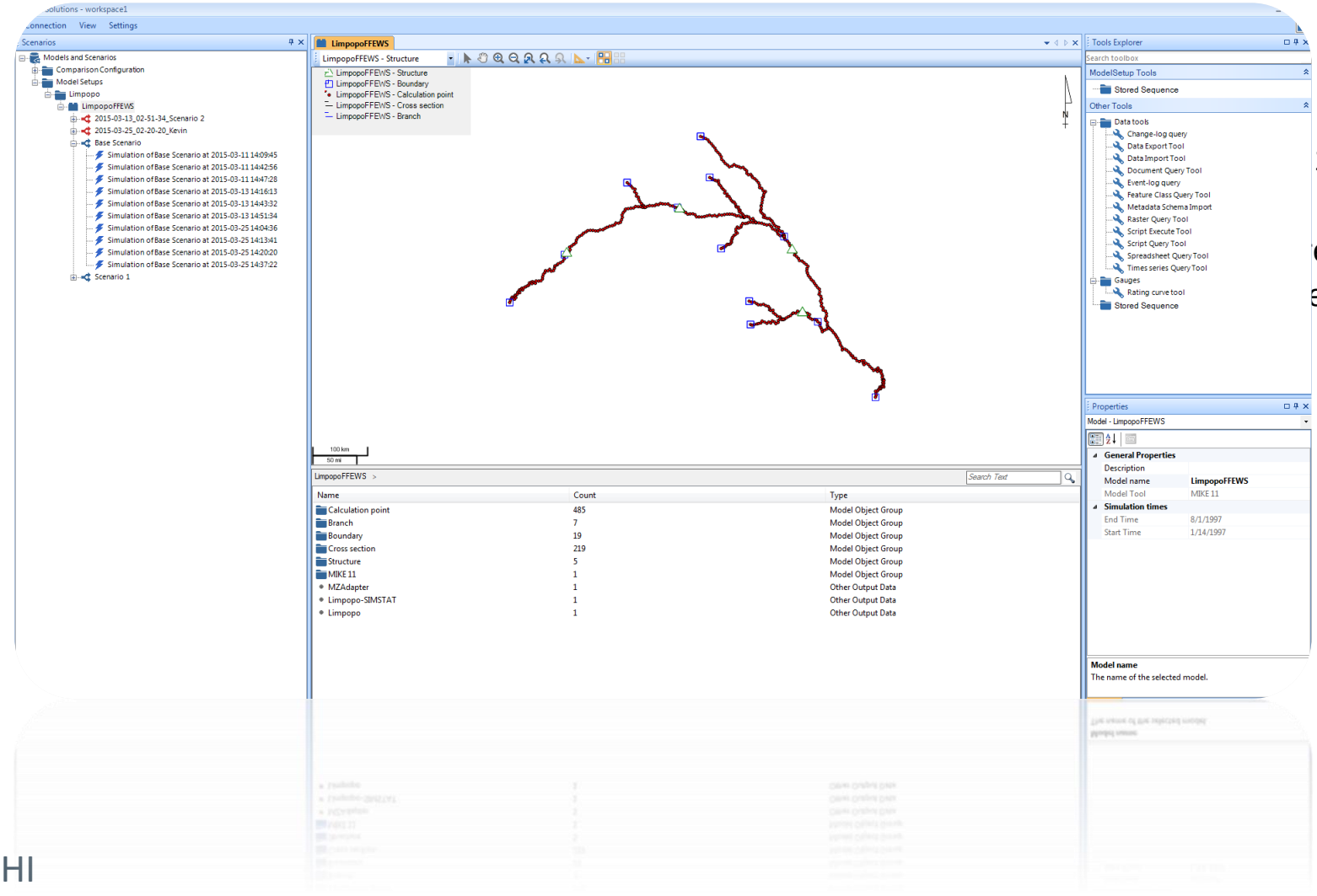
Simulation Without Updating



Simulation With Updating



Scenario Manager



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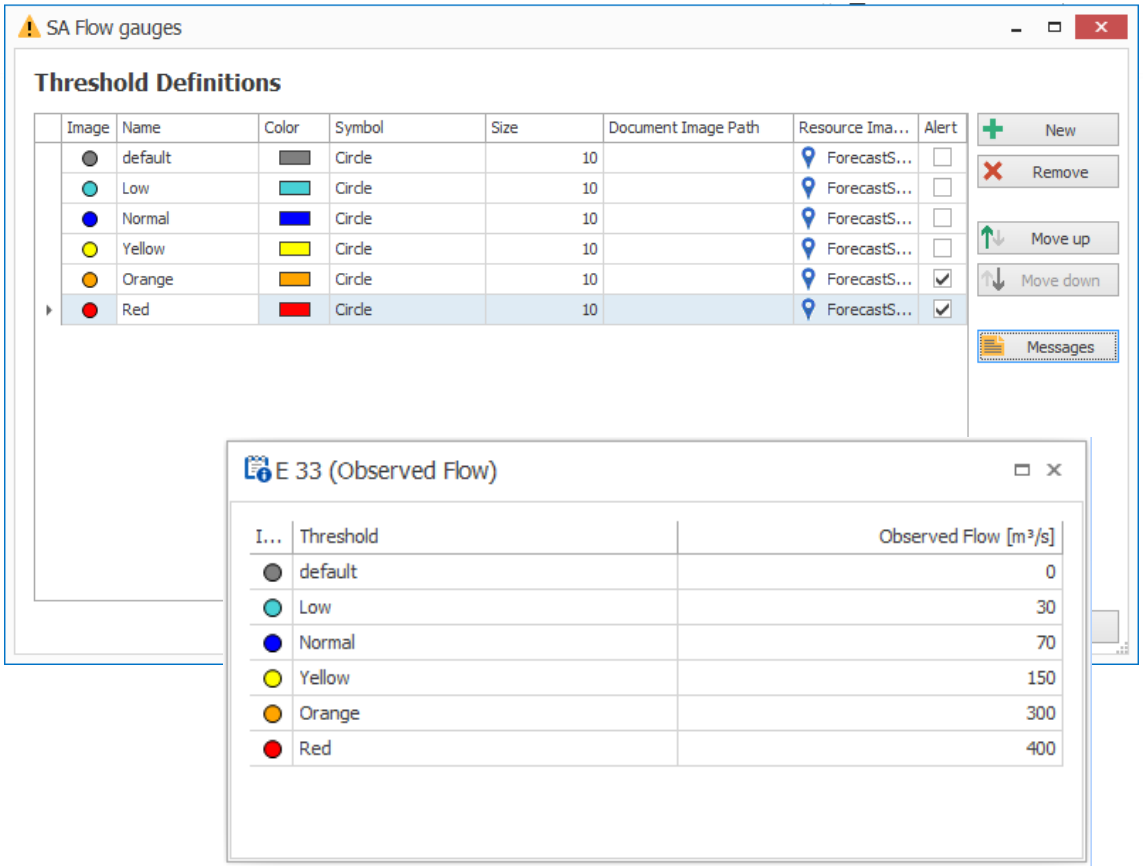
Thresholds

- General Thresholds are decision-making elements incorporated in a FWS to evaluate predicted or real-time hydrographs
  - Gauge thresholds are defined based on
    - a flow frequency analysis of the historical observed data or
    - user defined
  - Is the predicted discharge higher than a predefined critical threshold? If the answer is, an Alert/alarm is raised



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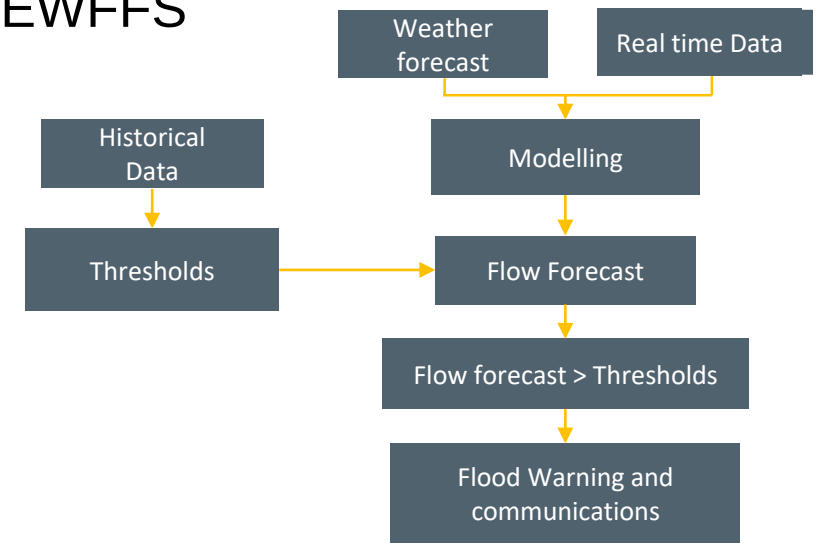
Alerts/Flood warning Thresholds

- Alerts or Flood warning thresholds
  - Flood warning thresholds define river or gauge conditions at which decisions are taken to issue flood warnings.
  - Flood warning thresholds are set to achievable reasonable lead time before the flood is reached where it is perceived to cause damage
  - When flood warning thresholds are transgressed an alert or alarm is raised in EWFFS



Reporting Facilities

- User interface and Reporting facilities
  - Desktop Real time User Interface – accessible by the Administrator/Operator of the system
  - Website
  - Email
    - Every daily email will be send that shows real time data information of catchment/s
    - Example of daily email
  - SMS
    - alert SMS are send to selected contacts to warn the perceived danger of flood once thresholds are transgressed (Expensive, Whats App?)

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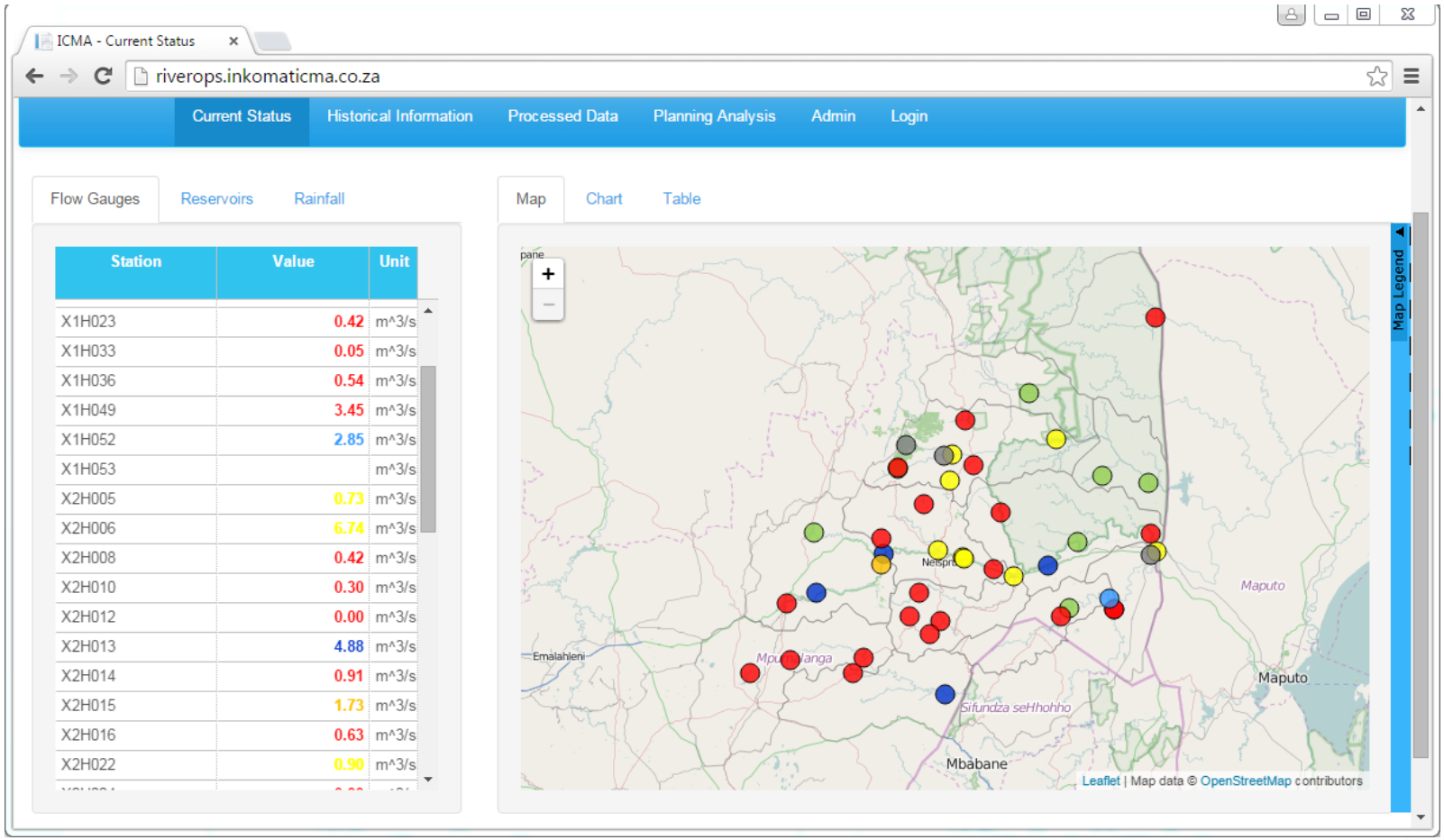
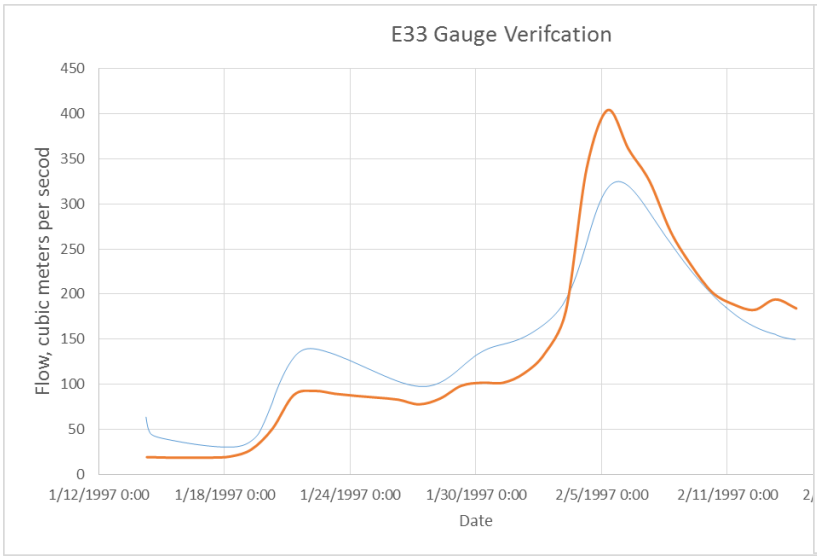
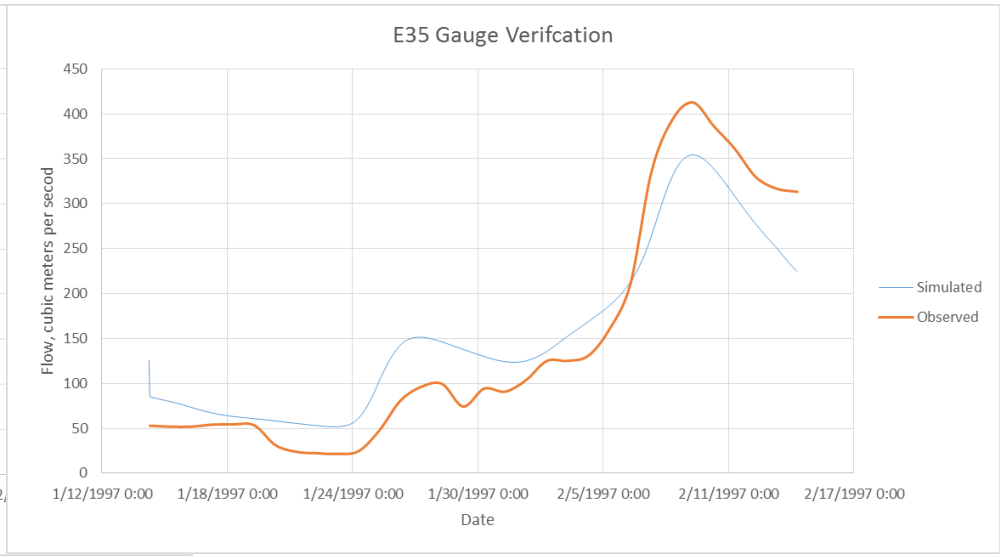
Limpopo EWFFS



Verification

- Hindcast Mode
  - Is a Validation and Verification process of the hydraulic modelling





Thank you

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