Development of an Online Receiving Environment Digital Twin to Enhance Liveability Outcomes

Dr Kalyan Chakravarthy
cmka@dhigroup.com

Acknowledgments

- **Cameron Jackson** and **Tan Trieu** (UU)
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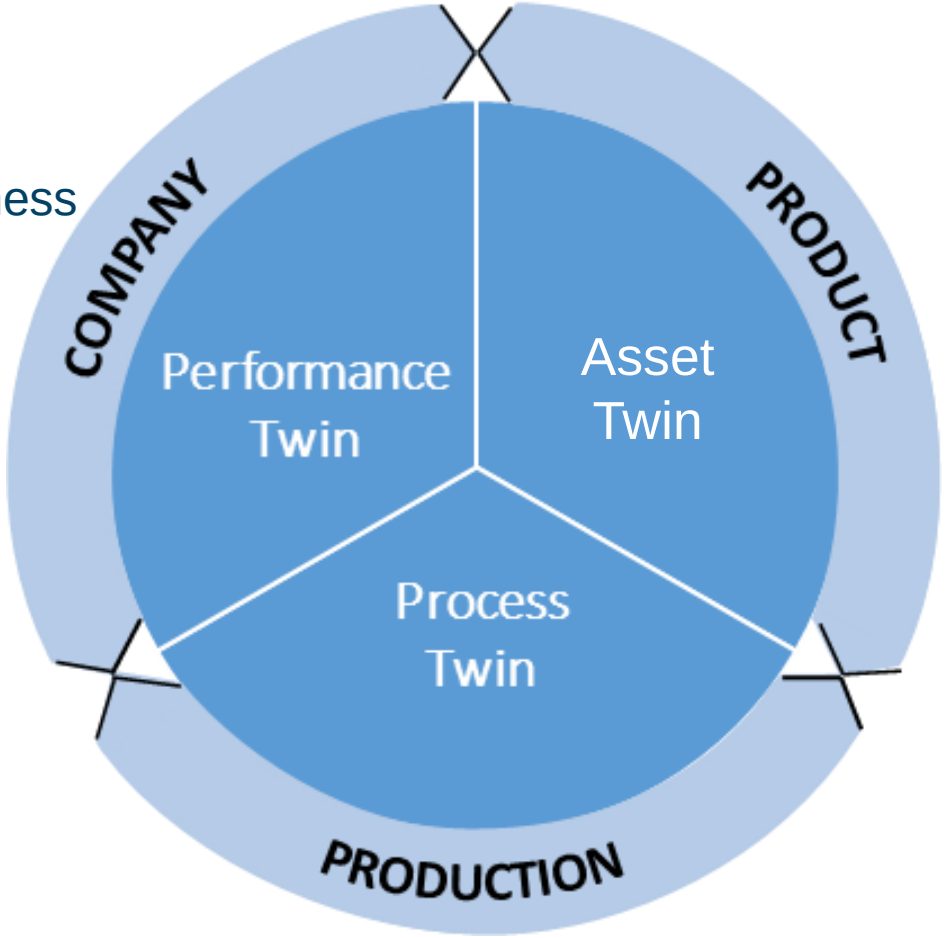
Digital Twin

E.g. Tracks and forecast business and operations performance



E.g. Digital drawings or models of tanks, valves, pump for design, manufacturing and maintenance purposes

E.g. Simulation models of the process, "what if" scenarios, and optimizing processes

Digital Twins: Value-add to Utilities

- Holistic understanding
- Reactive to pro-active problem solving
- Transparency
- Speeds up optioneering
- Faster decision-making
- Optimal Training Tool
- Cost efficiency
- Increased efficiency

Physical System

Automation & control

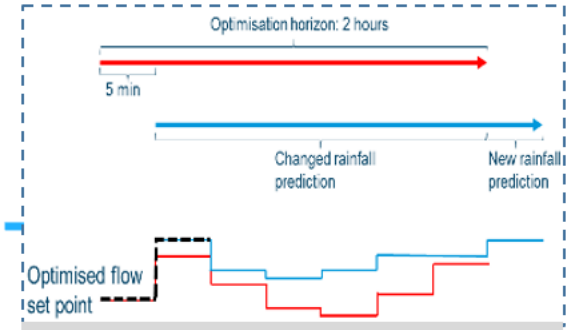
Sensors

4. Prescribe

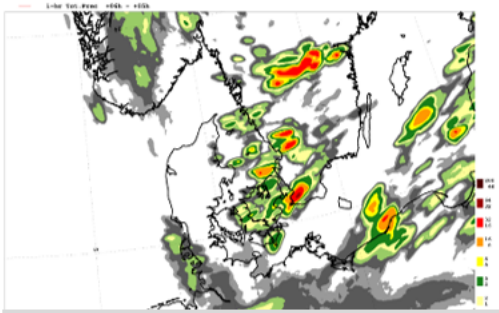
3. Predict

2. Diagnose

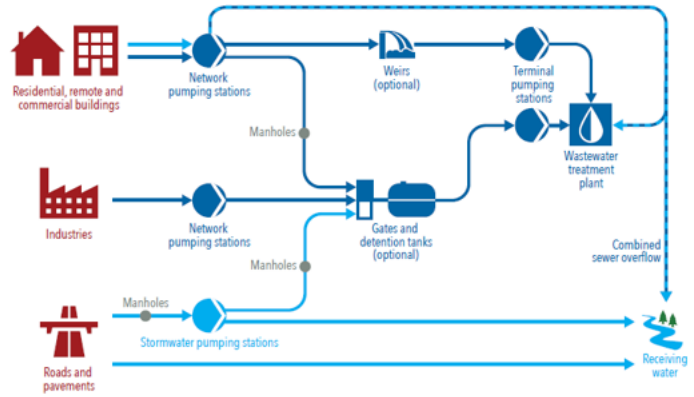
1. Describe



Optimisation Model



System Loads Forecast Model



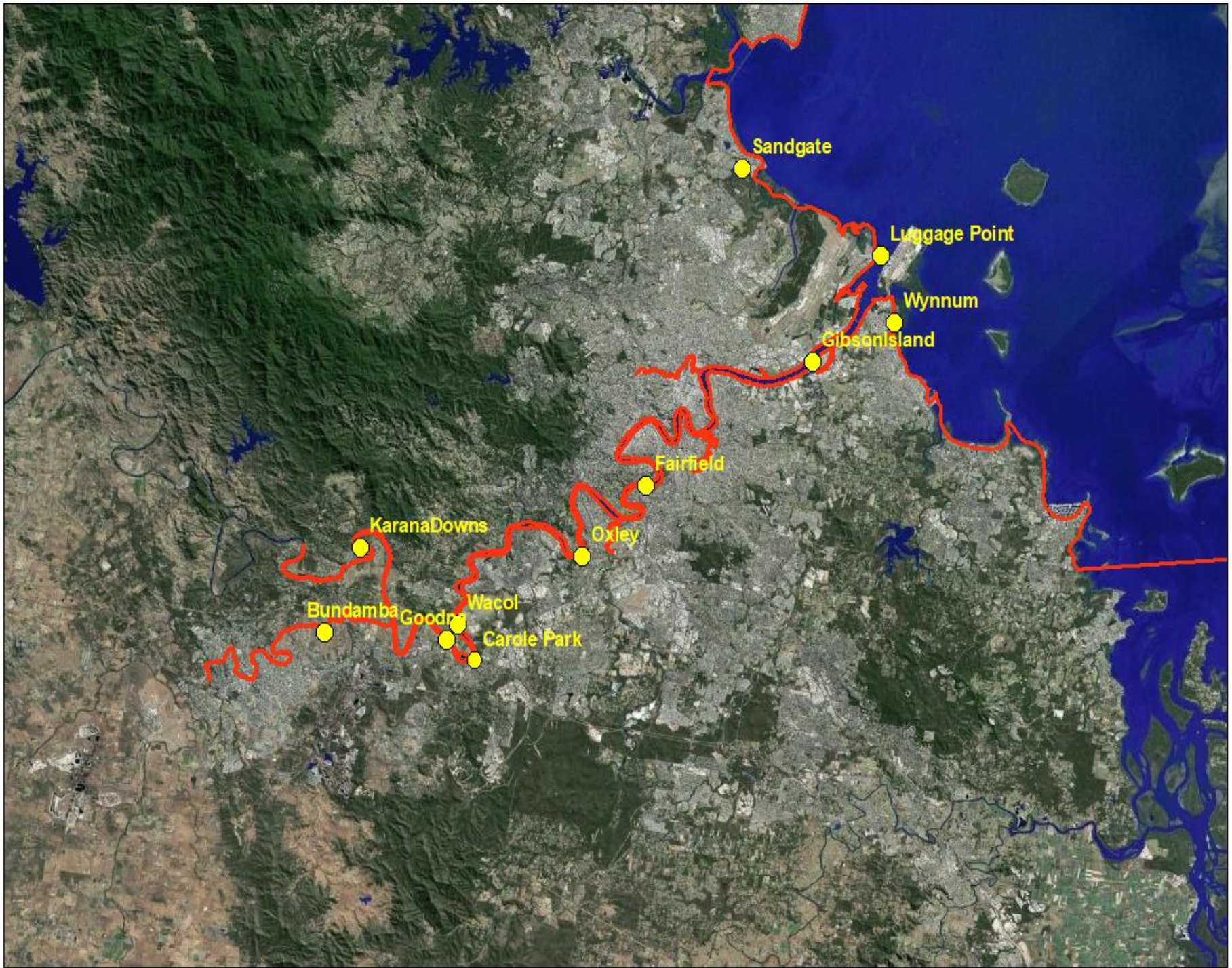
Process Model(s)

Other data

Digital Twin

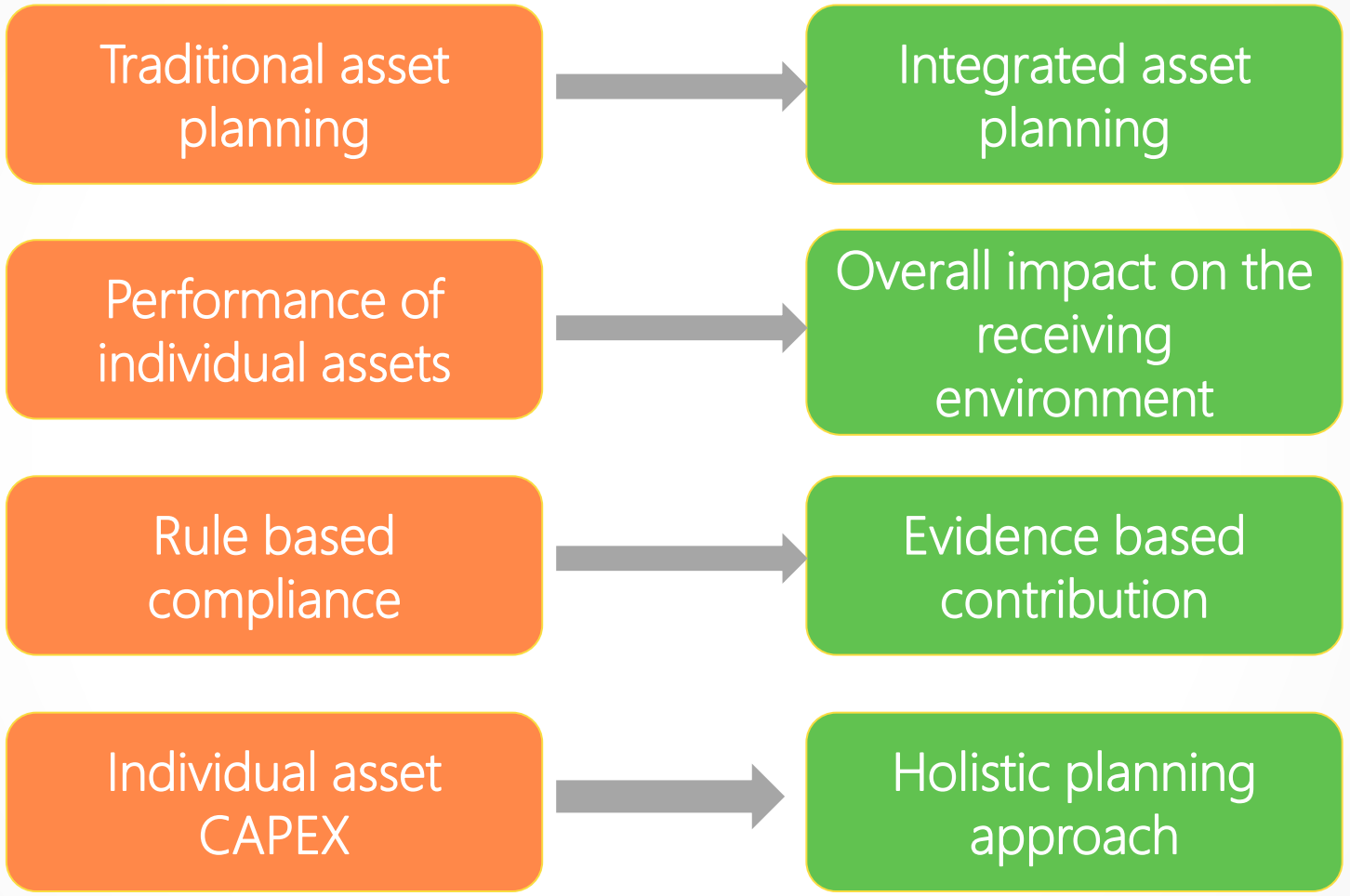
Pressures on Urban Utilities

- Population growth
- Ageing infrastructure
- Enhanced environmental outcomes
- Community expectations
- Increased Regulation



STP (Treatment Level)	Receiving Environment
Bundamba (Secondary)	Bremer River
Karana Downs (Secondary)	Brisbane River
Goodna (Secondary)	Brisbane River
Carole Park (Secondary)	Brisbane River
Wacol (BNR)	Brisbane River
Oxley (BNR)	Brisbane River
Fairfield (Secondary)	Brisbane River
Gibson Island (Secondary)	Brisbane River
Luggage Point (Secondary)	Brisbane River
Wynnum (Secondary)	Moreton Bay
Sandgate (Secondary)	Cabbage Tree Creek

Traditional vs Integrated Planning



Integrated Planning – Current Challenges

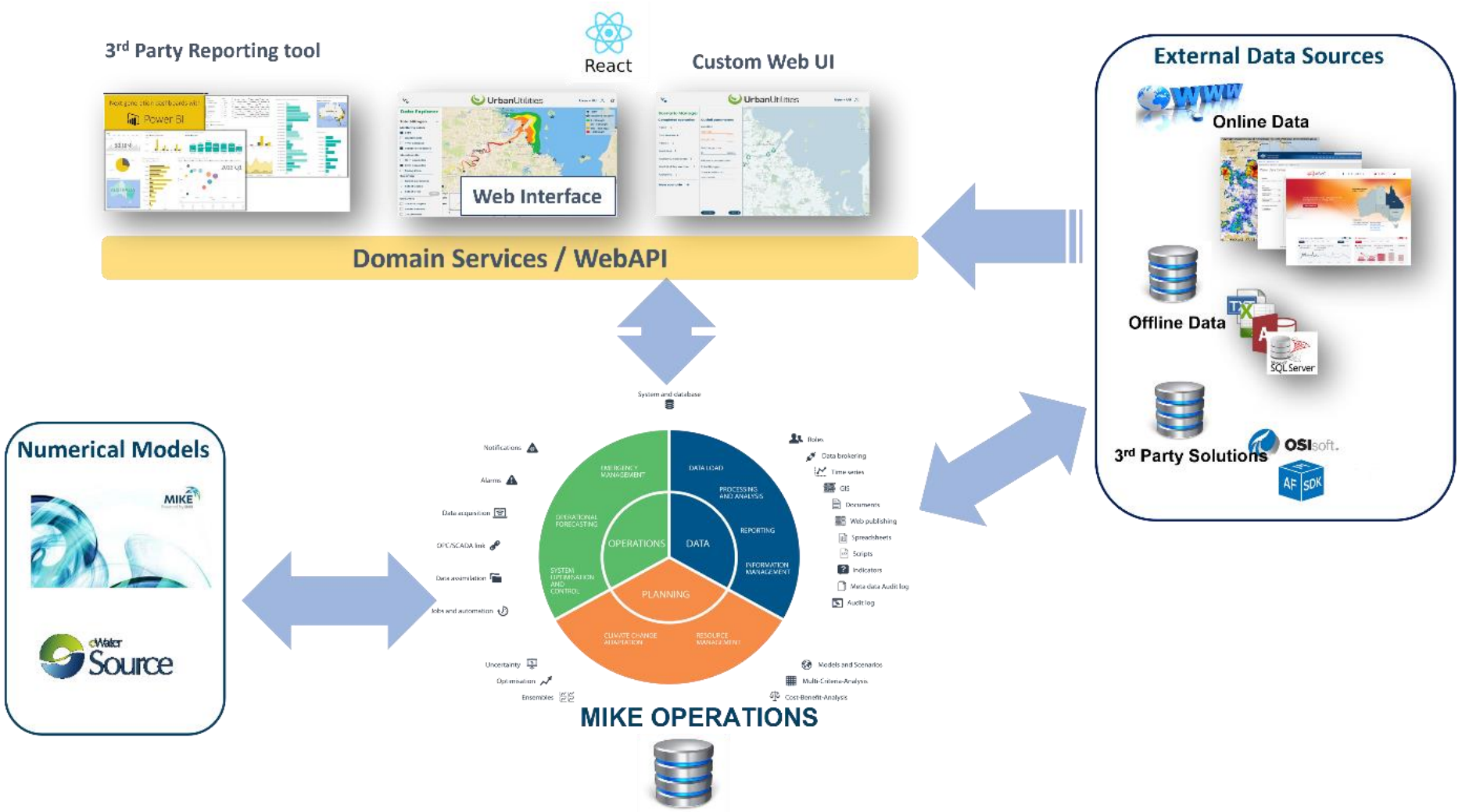
- Difficult for a water utility to quantify the **cumulative impacts** of STP discharge (treated and bypass) and sewerage overflows in combination with diffuse pollution on the Receiving Environment.
- Water utility' impact on the Receiving Environment varies **spatially** and **temporally** (unplanned spills, STP bypassing, catchment health, …).
- Can be difficult to **communicate** the science to internal management and the regulator using paper-based reports.
- Can be **time-consuming** and costly to investigate multiple planning scenarios.
  - Can result in many one-off and costly consulting engagements
- Sewerage and catchment planning teams typically in **silos** or differing organisations.

Receiving Environment Digital Twin (REDiT)

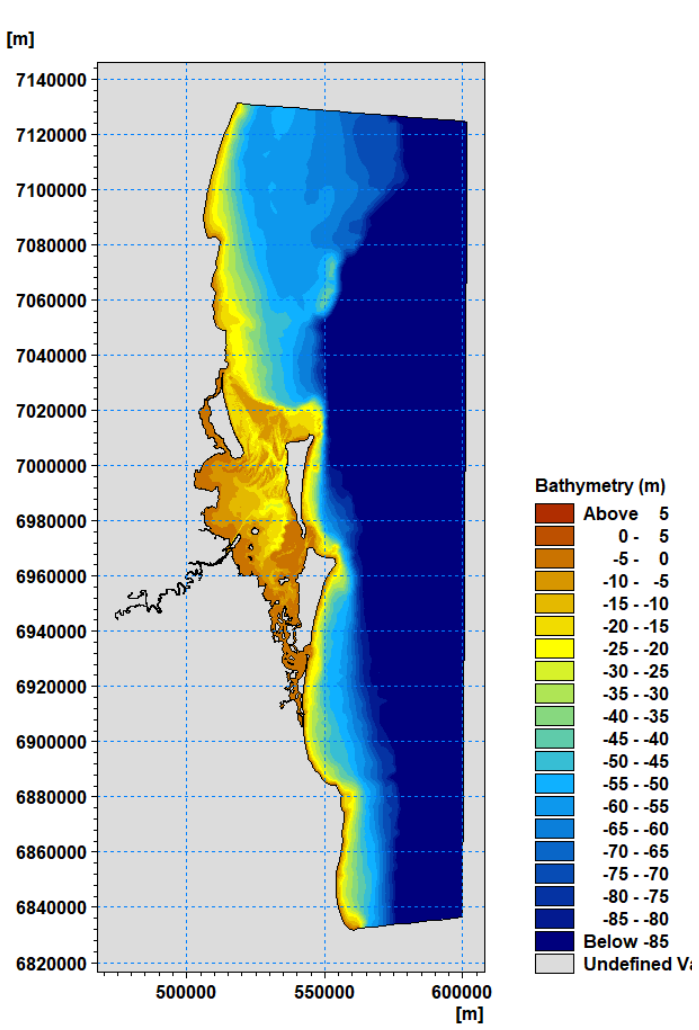
An online environmental Decision Support System (DSS) that assists a water utility to accurately determine its environmental footprint and assist in "effects-based" approach for Integrated Planning

REDiT's Modules

REDiT's Technology Stack



Case study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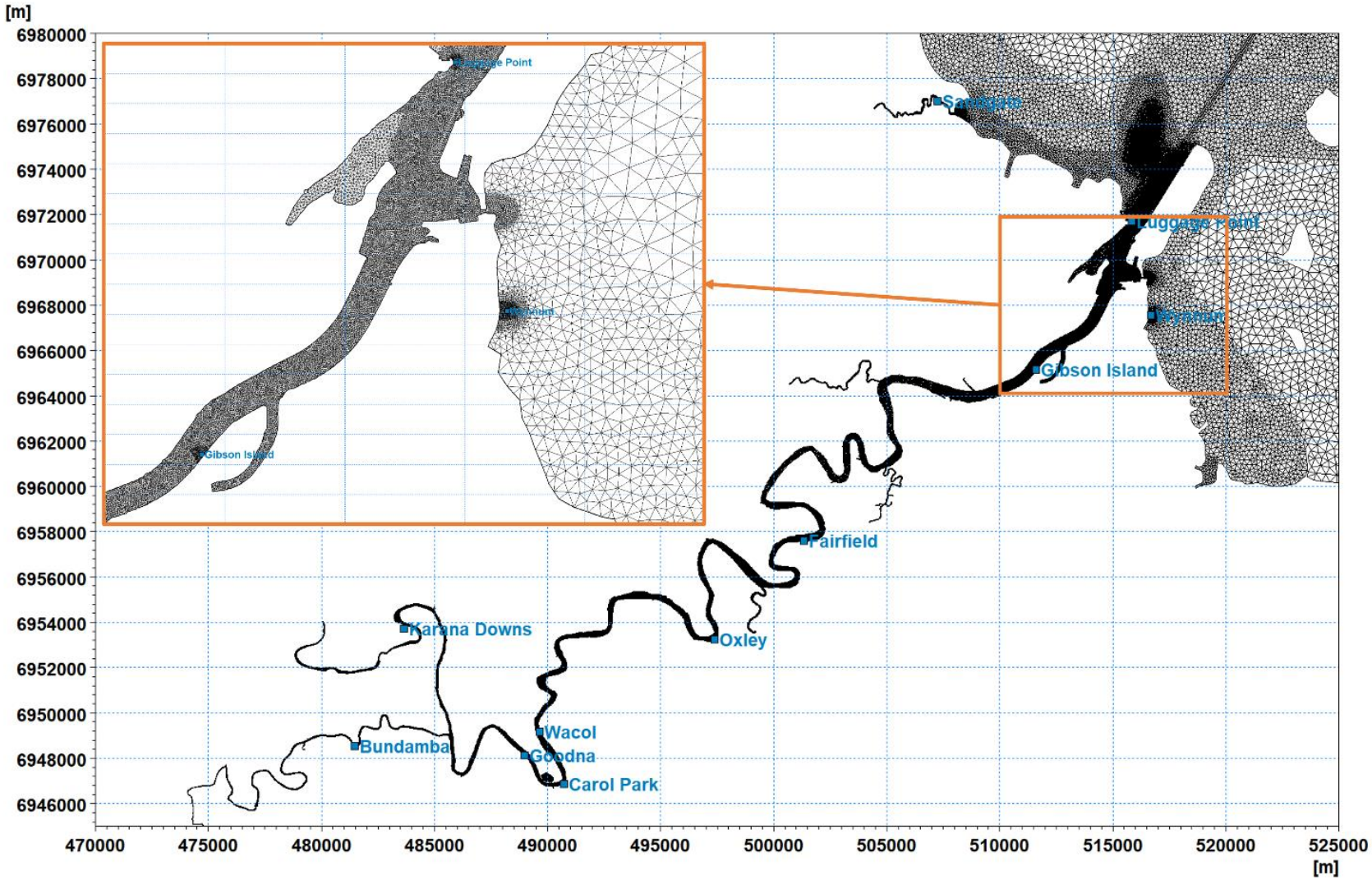
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Luggage Point
Gibson Island
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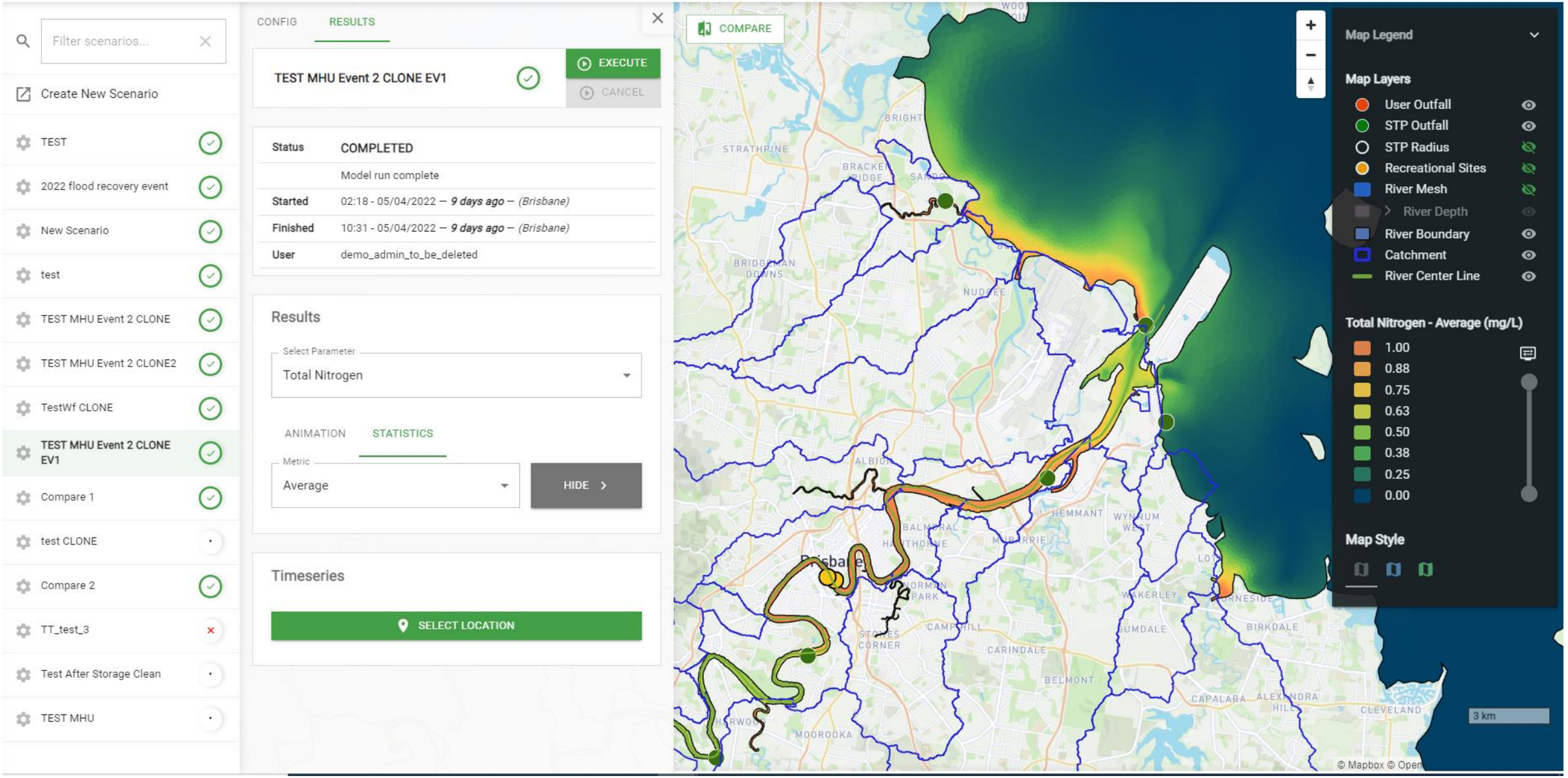
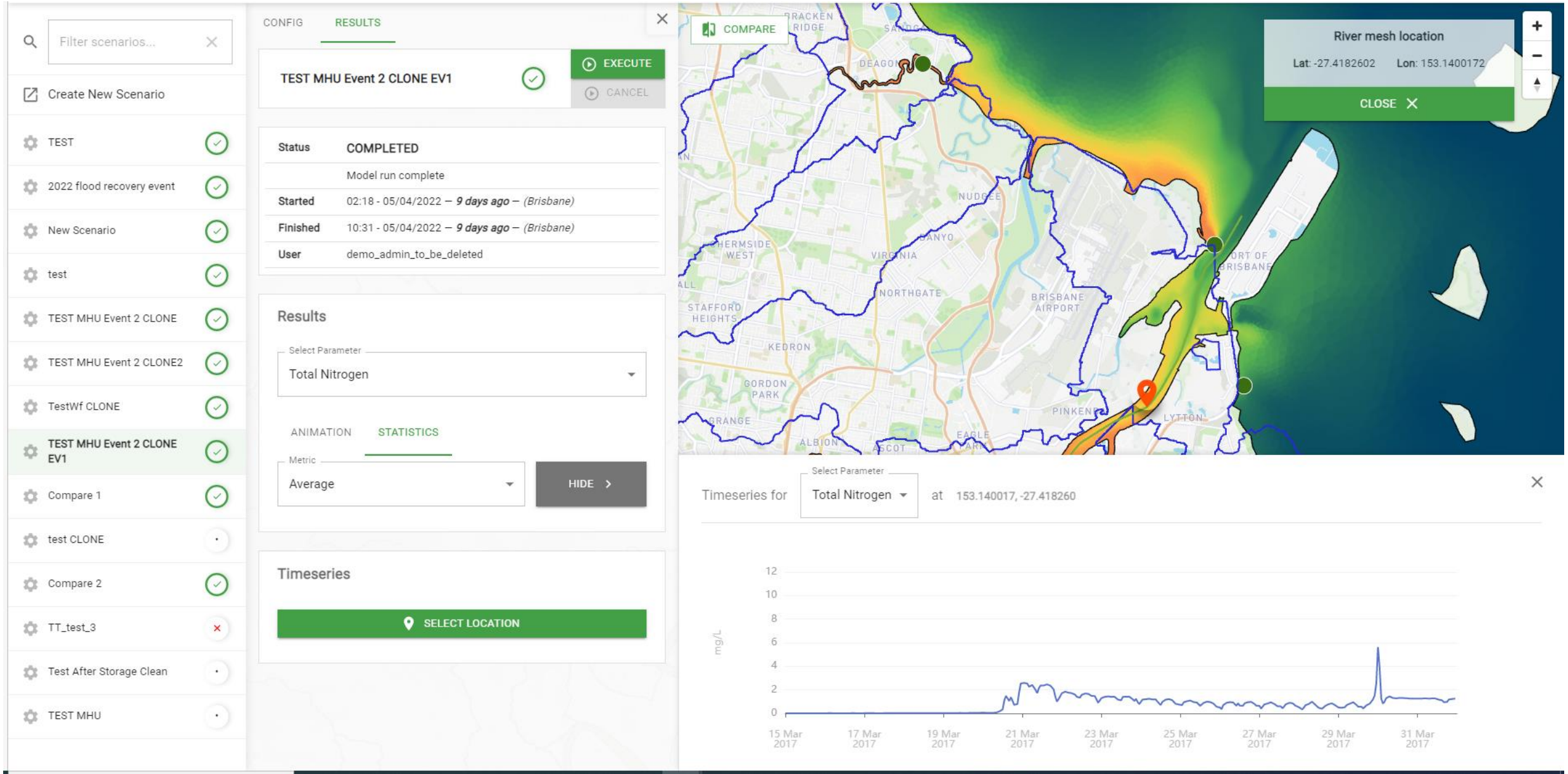
Luggage Point
Gibson Island
Fairfield
Karana Downs
Oxley
Wacol
Bundamba
Goodna
Carol Park

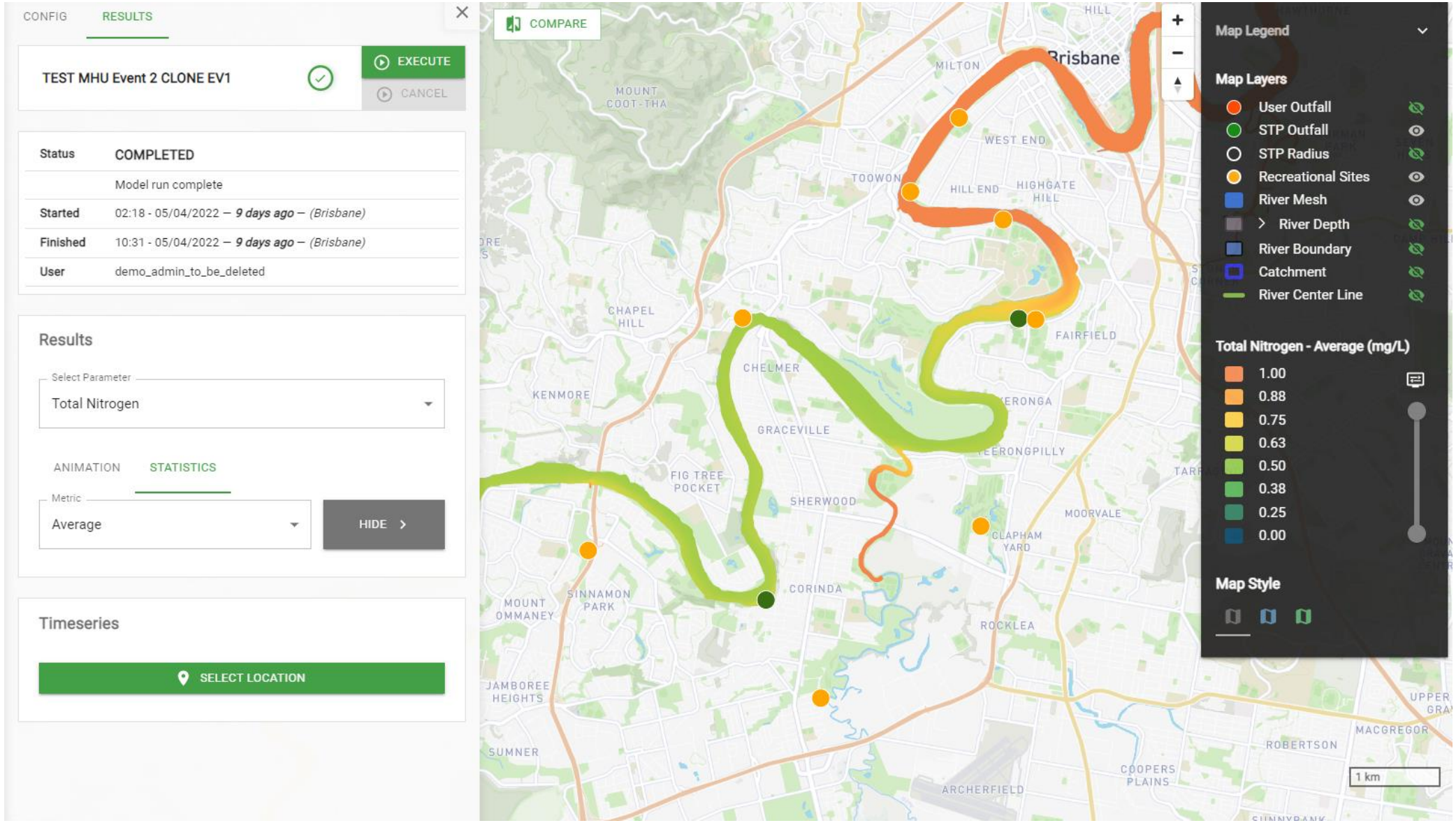
Spatial Visualization



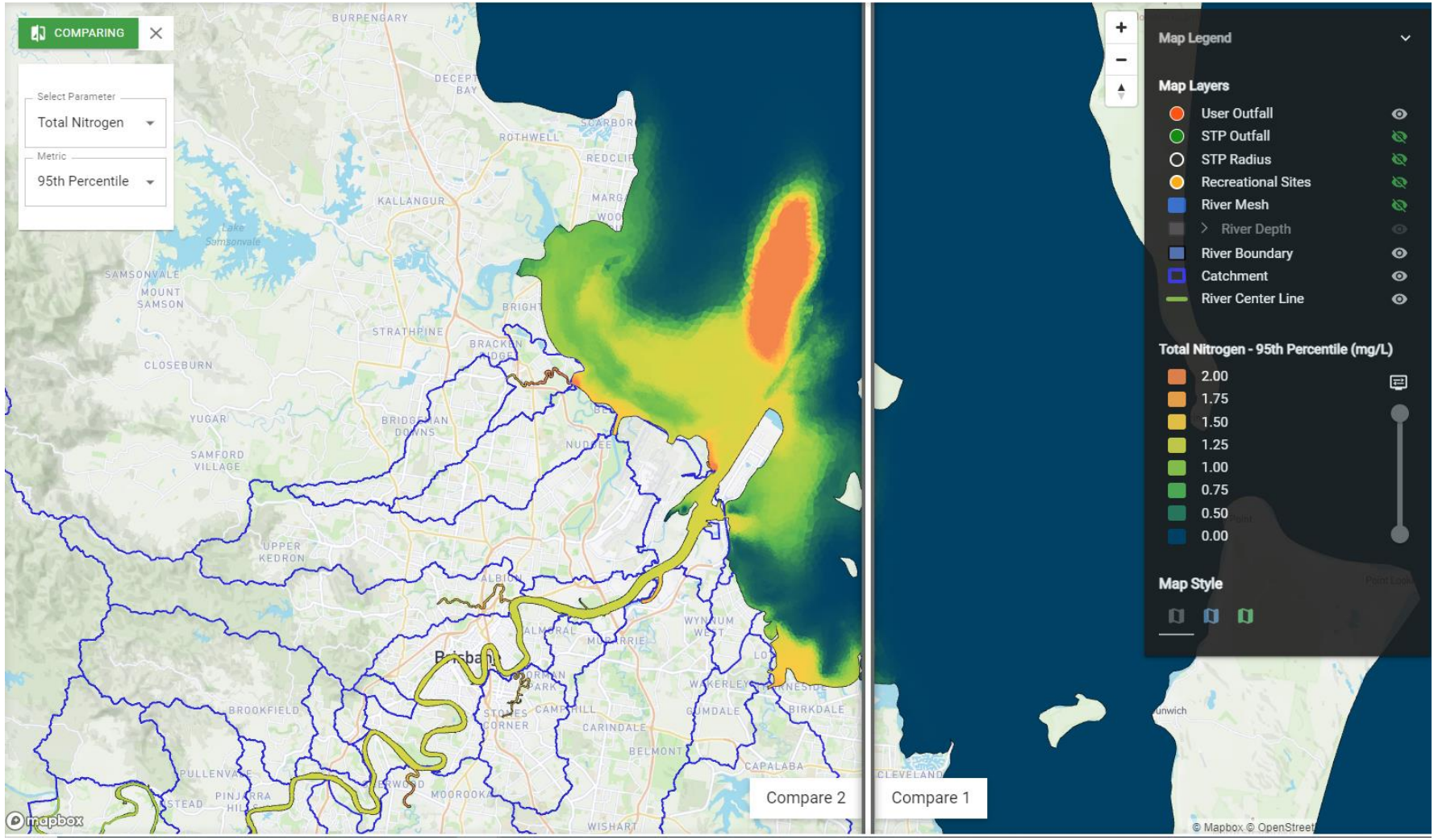
Time Series Visualization



Impact Distribution



Scenario Comparison



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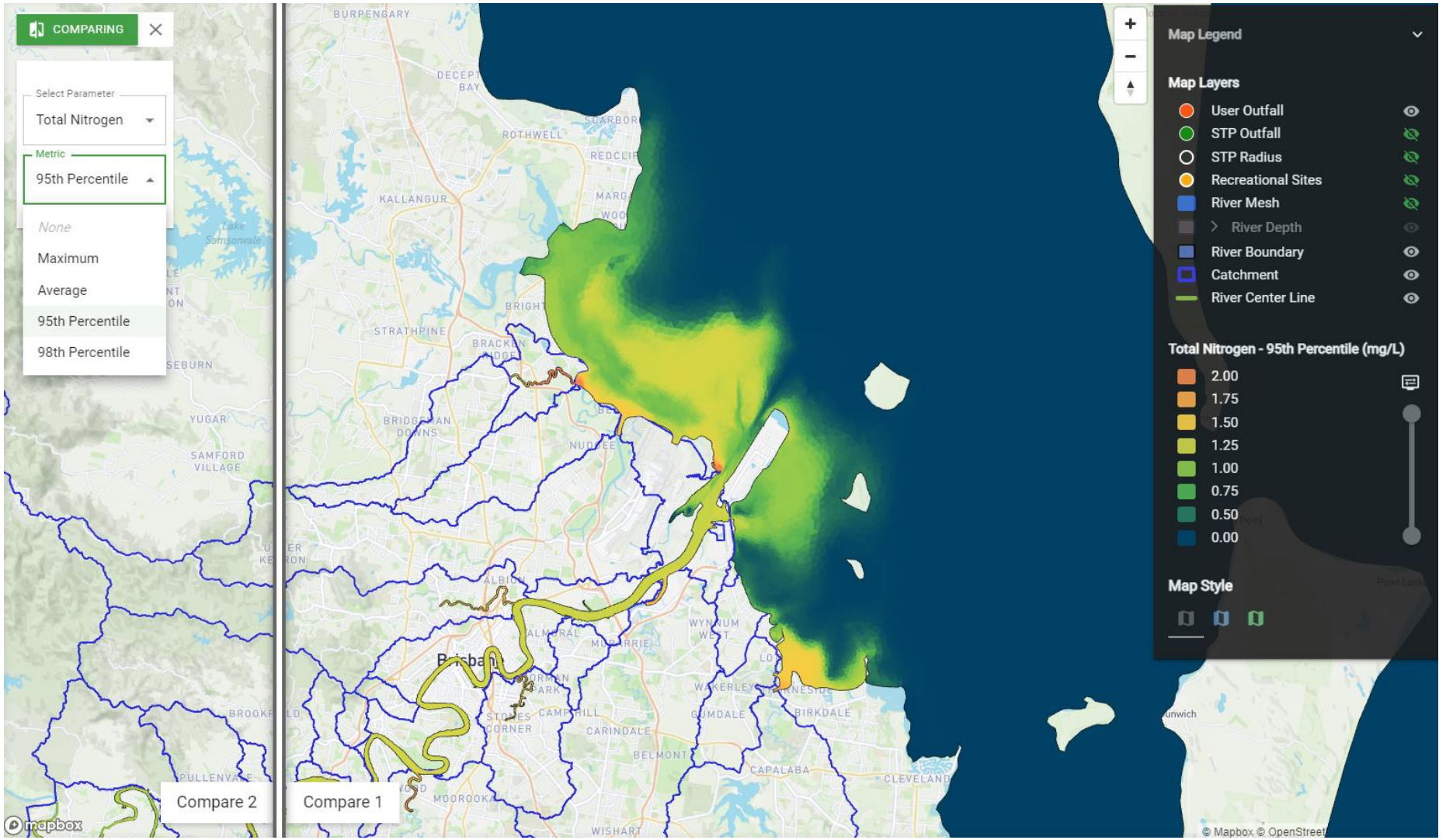

Benefits to Utilities

- Large CAPEX savings / deferment
- Collaboration with Regulators
- Evidence based upgrades
- Holistic view of whole environment
- Framework for Environmental Offsets
- Optimize planning and operations
- Quantify connectivity

Benefits of Digital Twins

- ✓ Helps **lead** ongoing sewerage planning work.
- ✓ **New Revenue** for Advisors:
  - Catchment and Receiving Environment **modelling**
  - **Water Quality Advisory**
  - **Broadens** Advisor's planning **scope**
  - Potentially leads to other projects such as **Feasibility Studies** / Detailed Design
  - Annual Licensing **Revenue** (Recurring revenue)
- ✓ Provides **differentiator** to get onto Panels / win new customers
- ✓ Allows Advisors, Water Utility, and Regulator to be **collaborative**.

Thank you

Dr Kalyan Chakravarthy
cmka@dhigroup.com