AUTODESK

aws Australian Water School

AI & Operational Water Management

End-to-End Water Management Series – Part 3

Water Infrastructure - APAC

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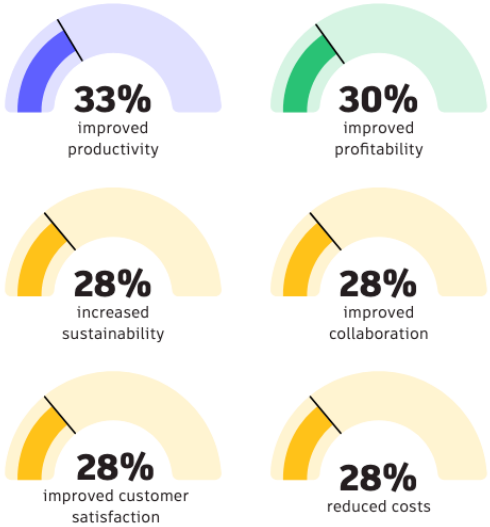
Agenda

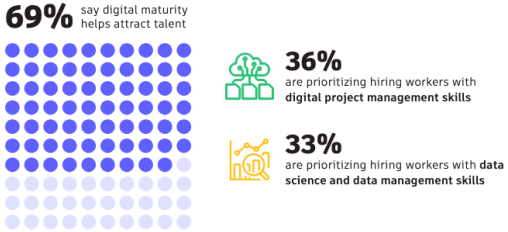
1. Autodesk AI
2. Surrogate Modelling
3. Enhanced Scripting with AI Agents
4. Autodesk Assistant
5. Questions

Digital transformation is no longer optional

Productivity tops the list of digital transformation benefits



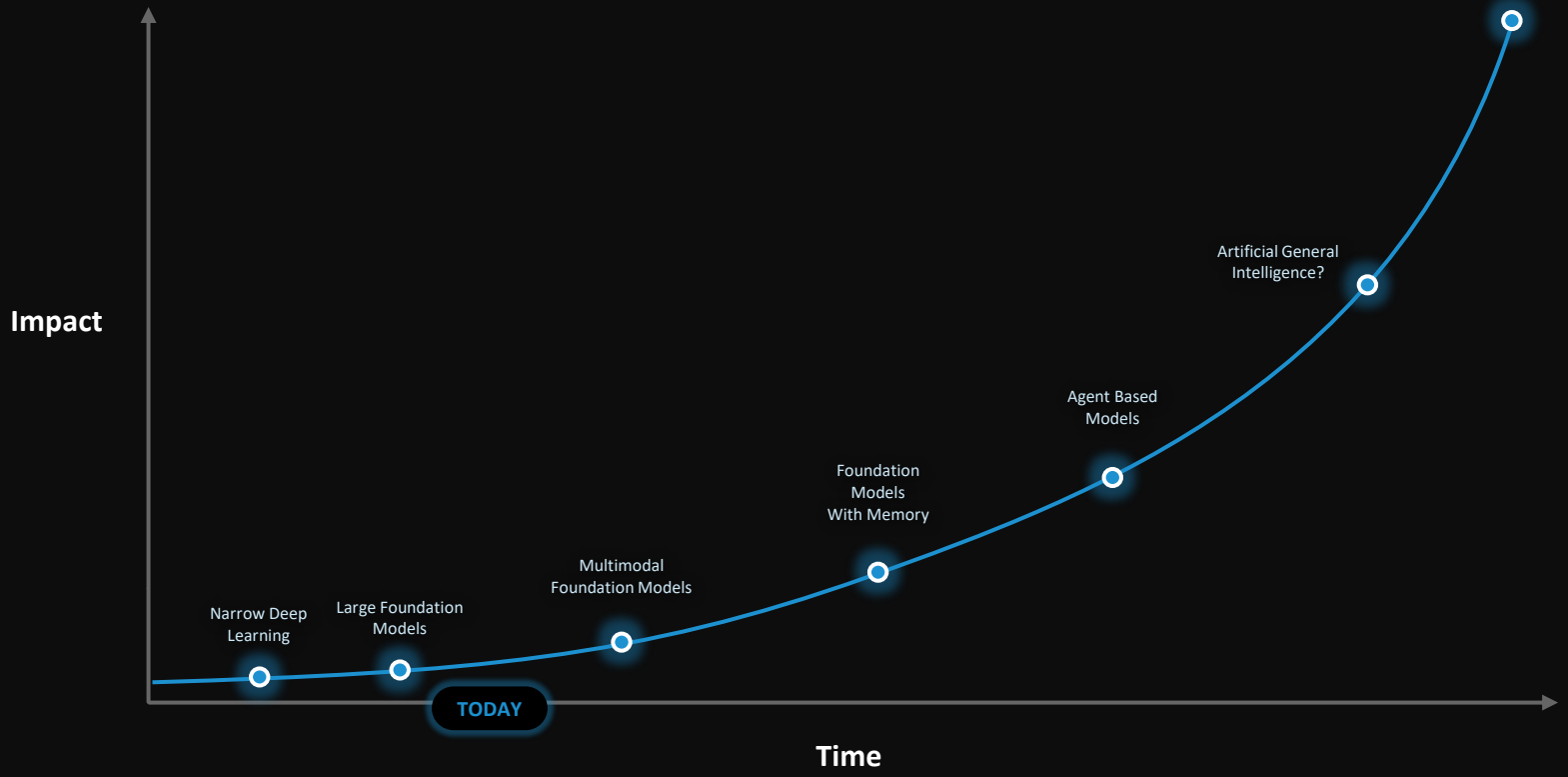
Technology and talent

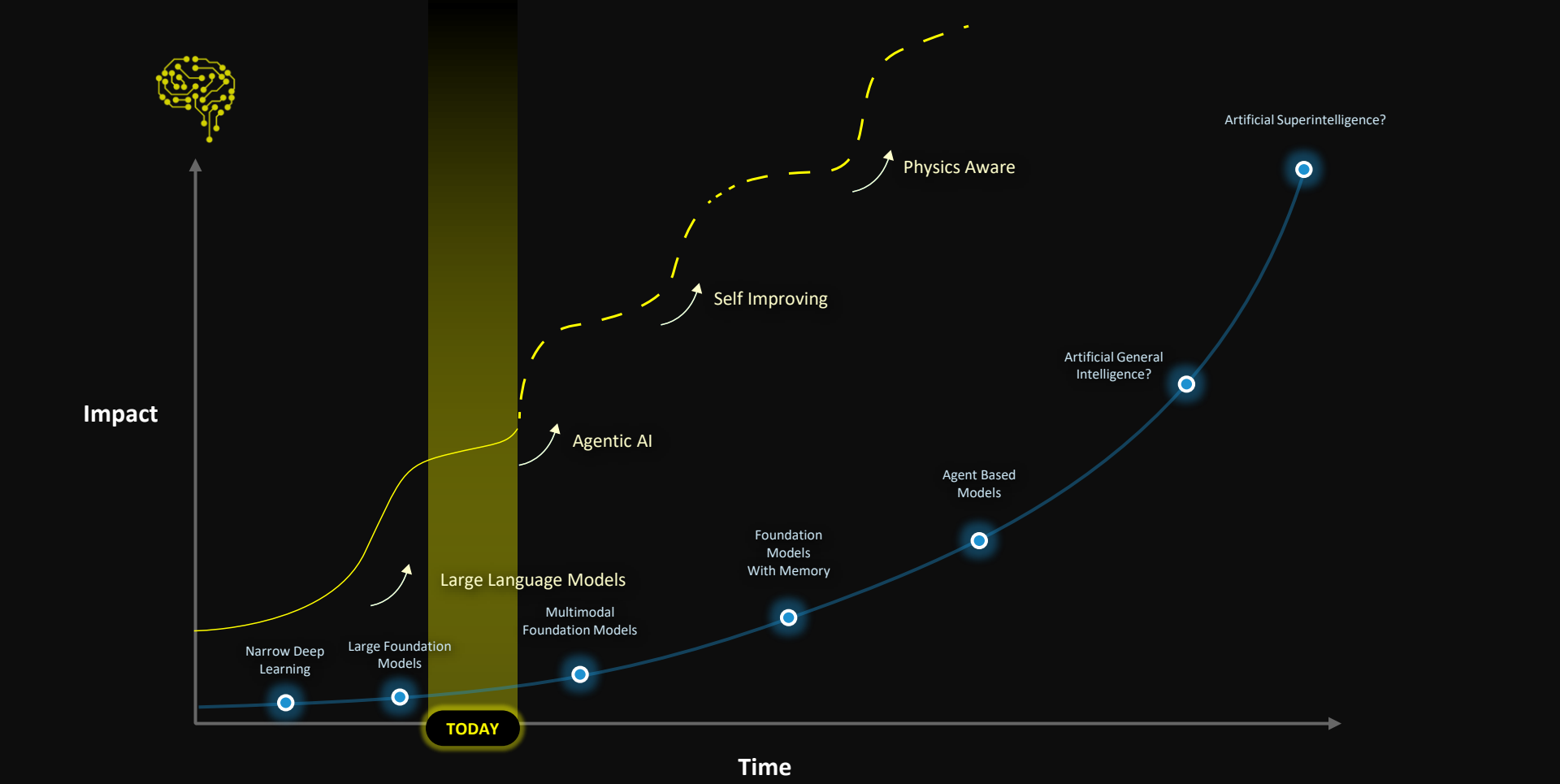


Cost is the top barrier to digital transformation

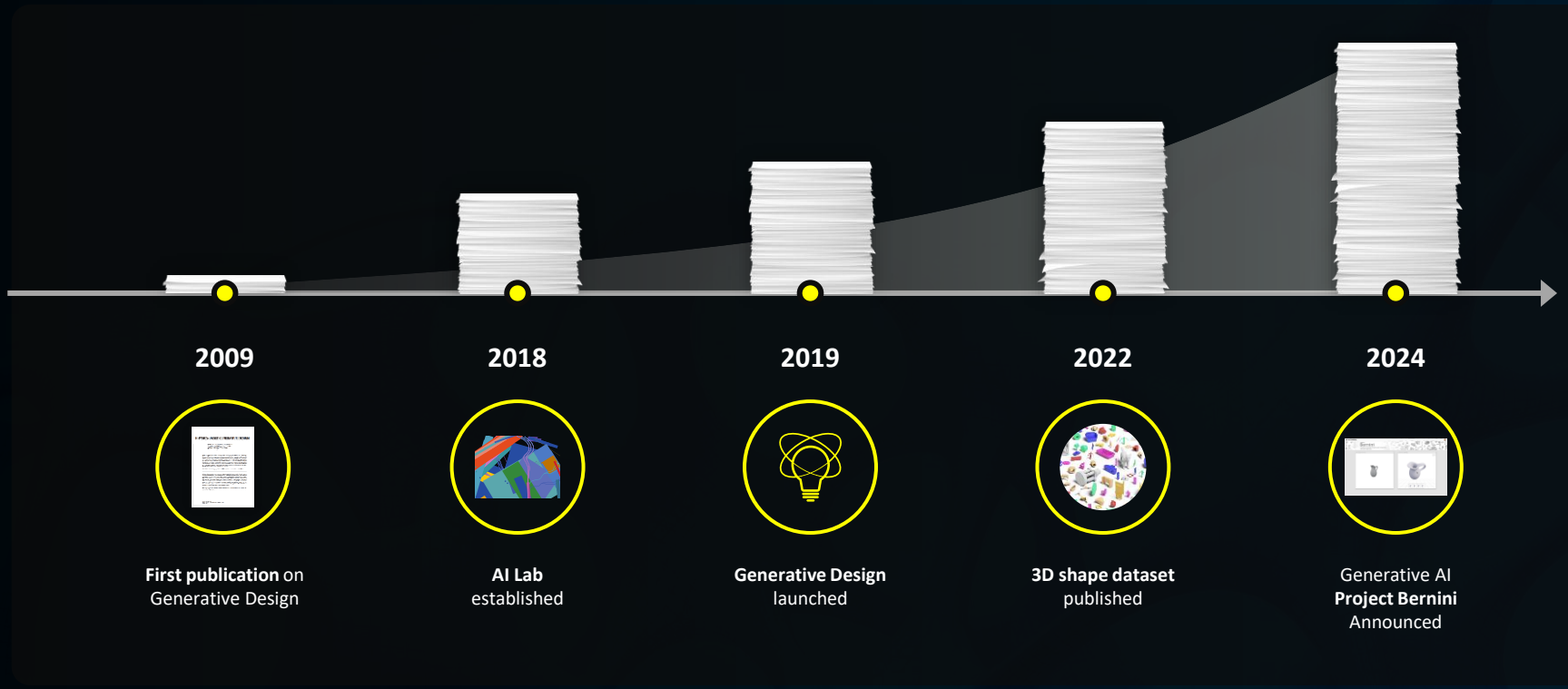
AI use cases across the water industry

Sources:
2024 State of Design & Make Report
2024 Spotlight on Data and Digitalization in the Water Industry

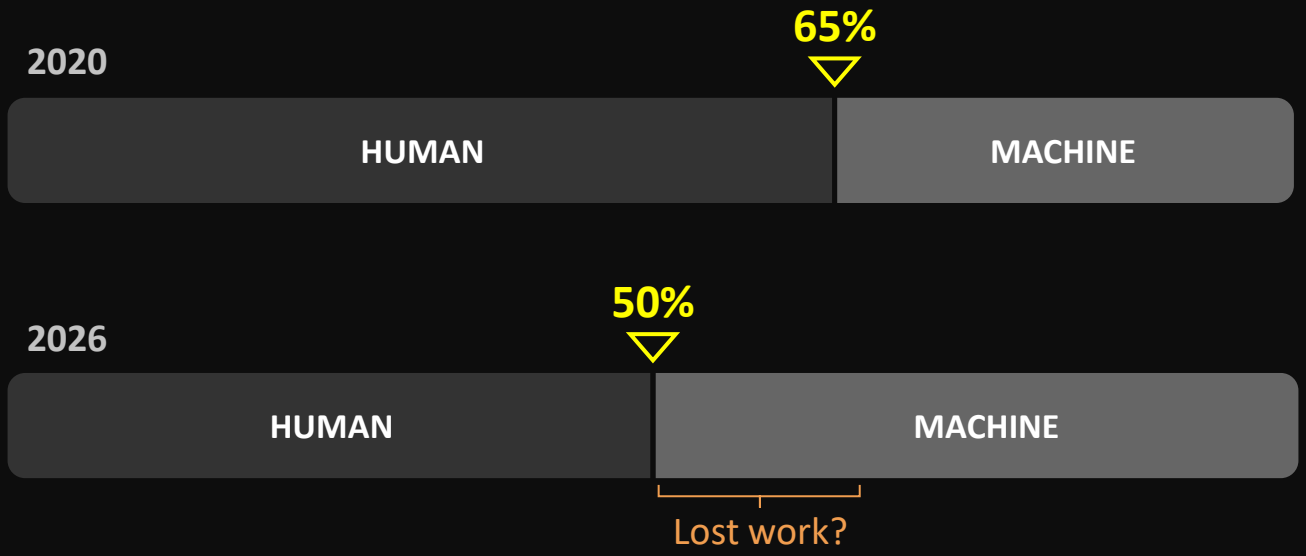




Autodesk’s history with AI



A new relationship with machines



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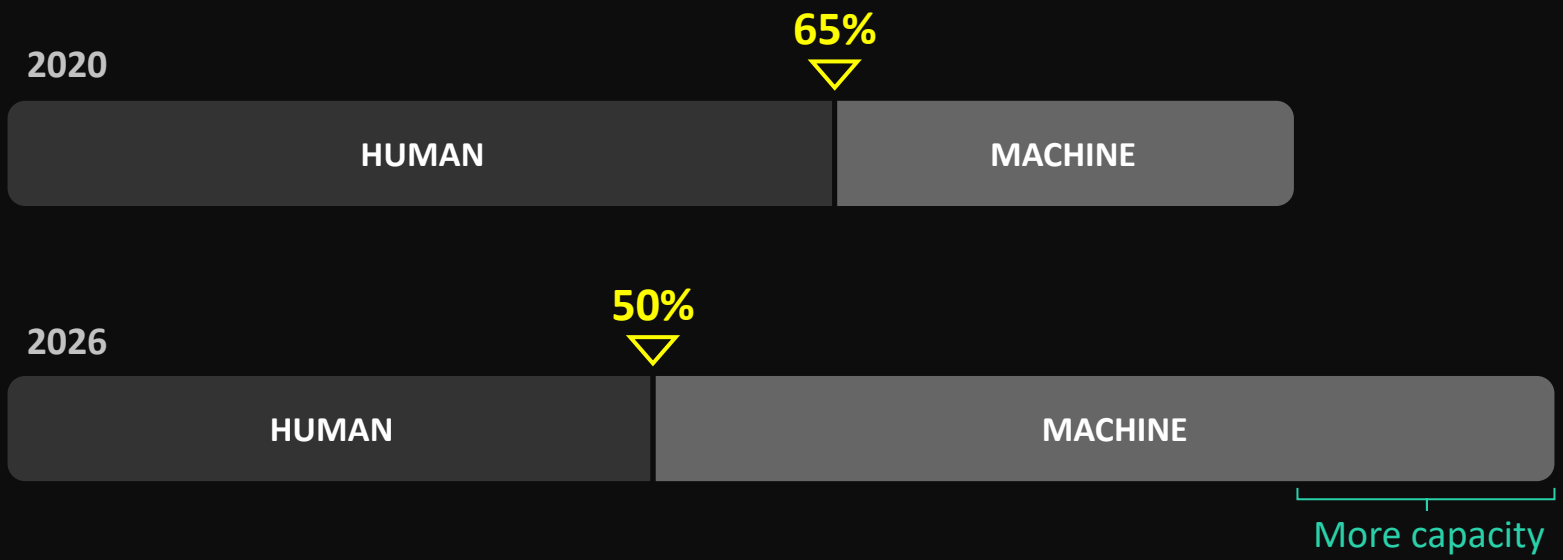
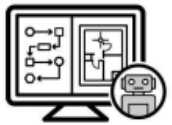


Types of AI

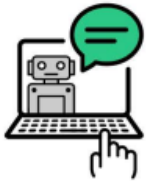
Machine learning (ML)

- A subset of AI that enables computers to “learn” and make decisions based on data sets without being explicitly programmed.



Deep learning

- Uses ML algorithms with biologically inspired logical structures called “artificial neural networks”. It focuses on deep neural networks to model and solve complex problems.



Generative AI

- Produces novel creations based on pretrained deep neural networks that produce probable, albeit unvalidated, outputs.

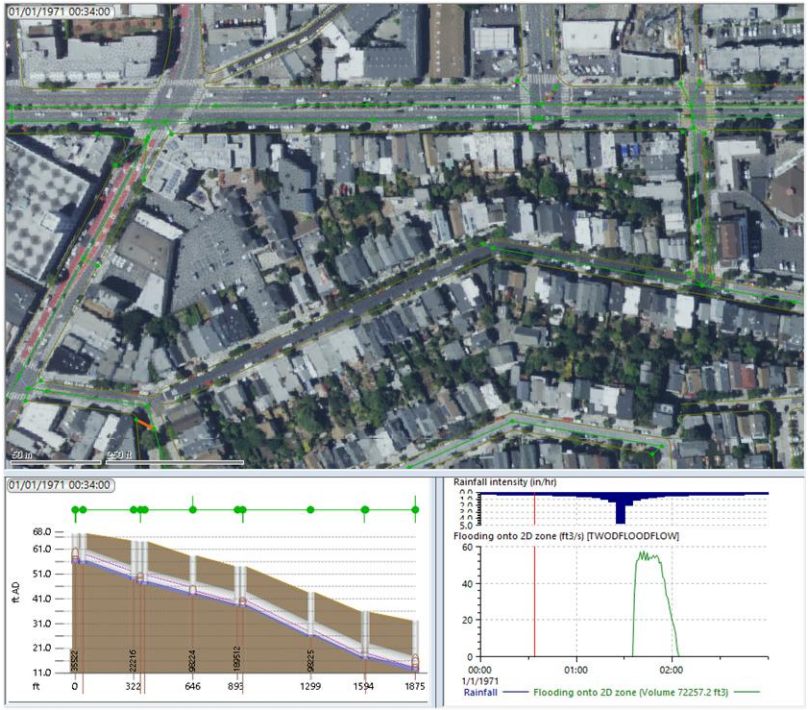
Generative design

- Uses computation to run many real-world simulations and arrive at optimal designs. It produces outputs defined by specific parameters.

Running hydraulic models today

Integrated Catchment Models

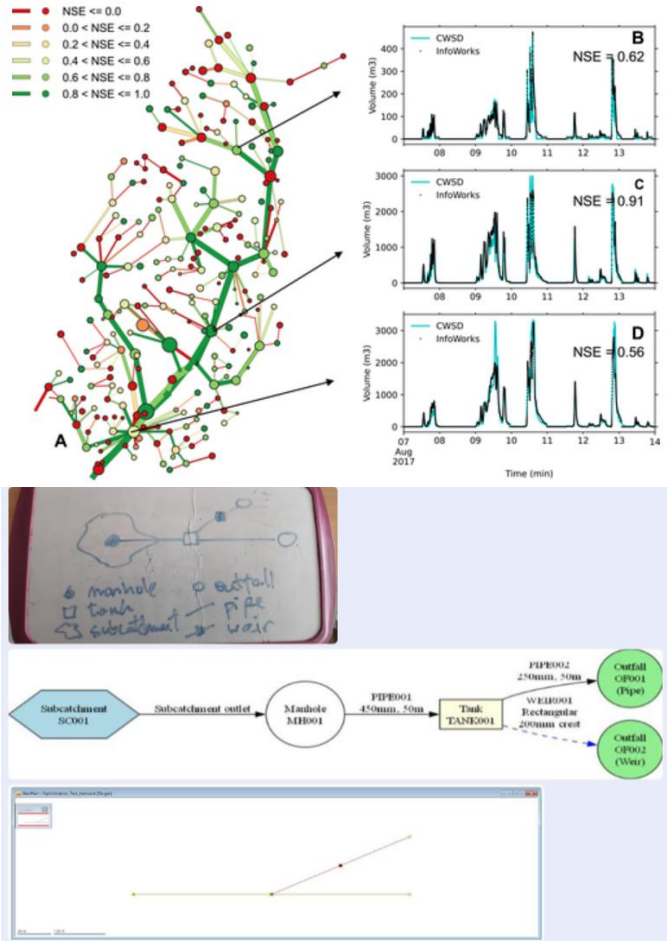
- **Core outputs:** flows, velocities, water levels, flood volumes
- **Based on first principles:** conservation of mass, energy and momentum
- **Advantages:** reality-driven, robust under interventions
- **Limitation:** computationally expensive, especially for multiple scenarios



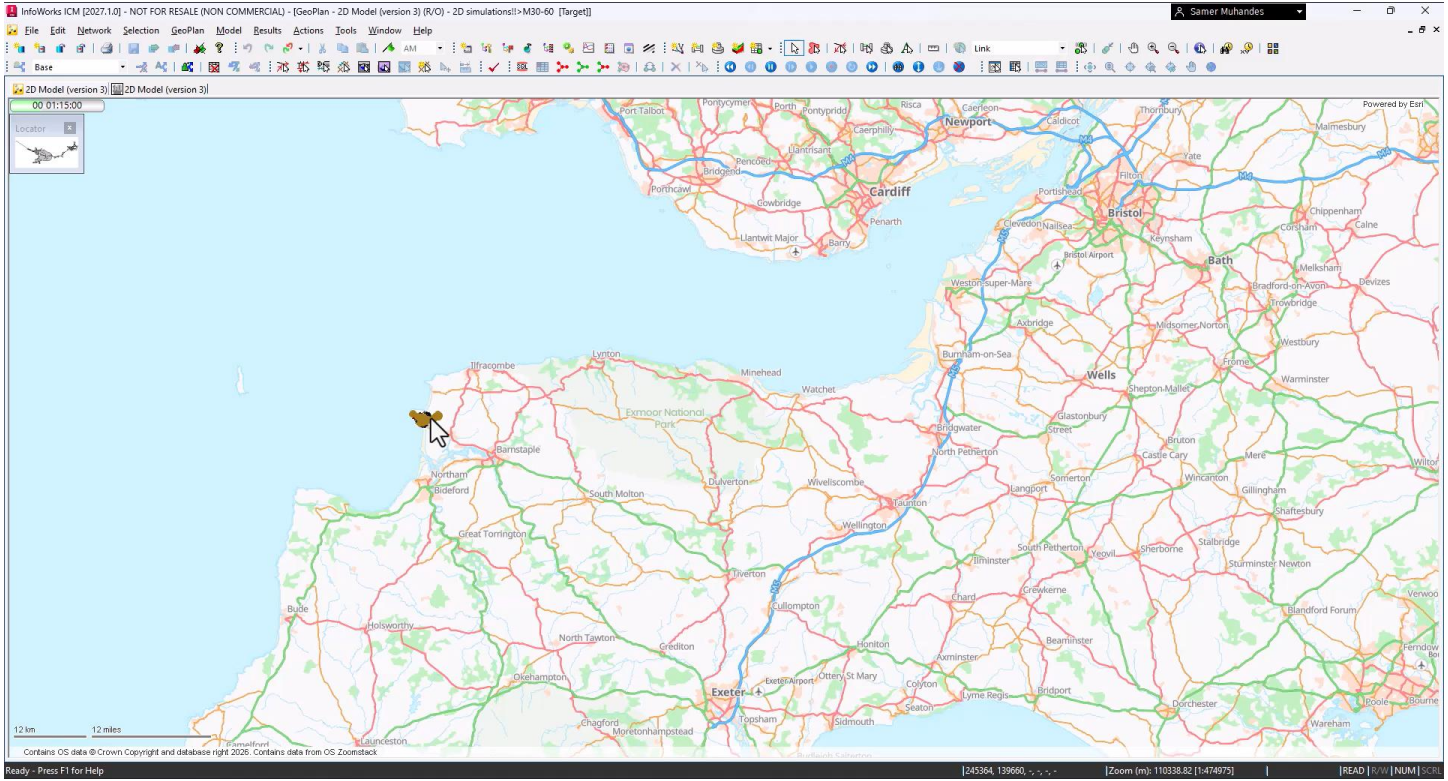
Surrogate Modelling

Integrated Catchment Models

- Computationally expensive to run full hydraulic simulations slowing down operational decision-making
- Approximation, data-driven model trained from outputs from physics-based models
- Input–output pairs from detailed simulations or observed data, learning the relationship between conditions and outcomes
- Provides fast predictions without needing to run the full hydrodynamic model each time



Catchment specific surrogate modelling



- **Machine Learning (ML)** flow prediction
- **Proof of Concept** interface while co-developing with existing digitally mature utilities/asset owners

Catchment specific surrogate modelling

Using Machine Learning for flow prediction

01

Identify locations of interest (e.g., common/critical flooding locations)

02

Run simulations to generate training data for a specific catchment

03

Train surrogate model on variety of conditions and rainfall patterns

04

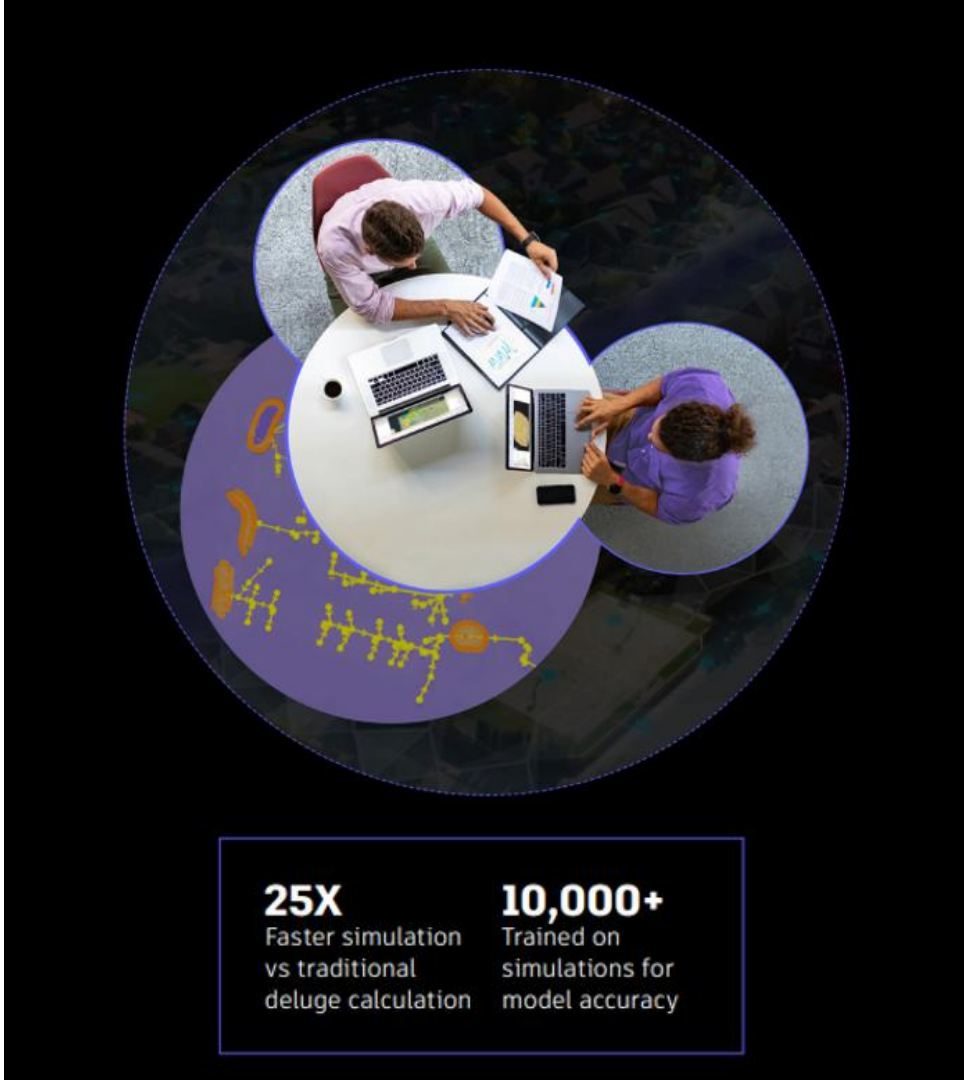
Deploy surrogate for rapid flow predictions

05

Retrain when new interventions are introduced in the catchment

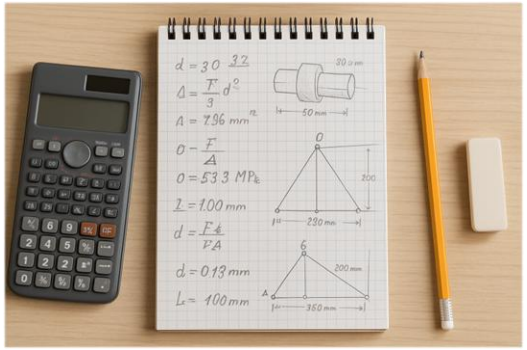
Site-based Flood Mapping

- Instant feedback on site drainage
- Highlight flooding hotspots to establish optimal locations for drainage structures such as swales, ponds, basins, etc.
- Explore multiple drainage solutions early in the design process enabling a better design process
- **Faster analysis, Enhanced stability, Iterative Design**

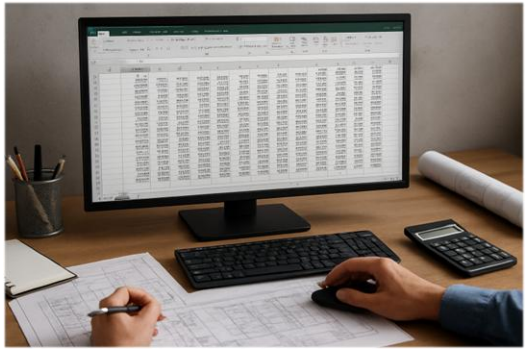


Progression of engineering work

Hand Calculations



Spreadsheets

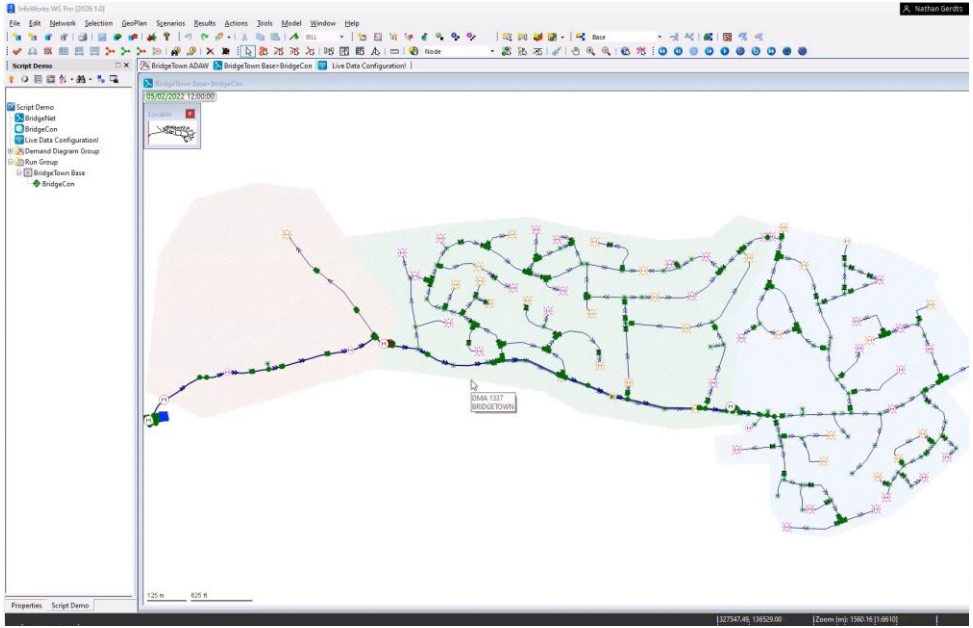


Automation

Past → **Recent** → **Future**

Automation in Hydraulic Modelling

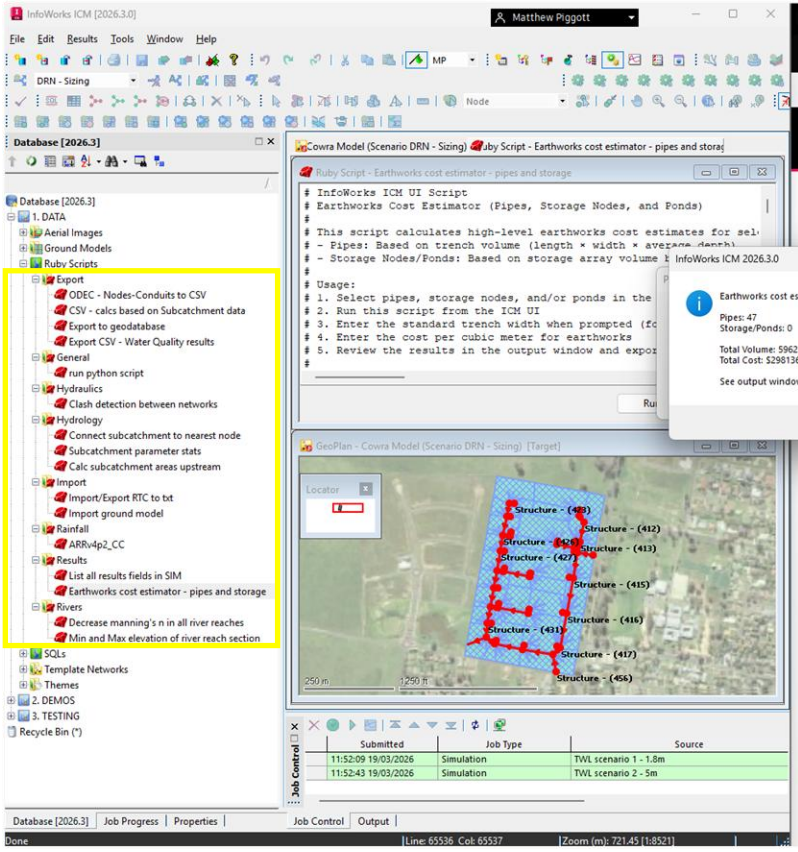
- **Data model tools:** data exchange, data inferencing, spatial analyses
- **Query-based tools:** dynamic selection, automated editing and custom reports
- **Scripting:** programming to solve complex problems

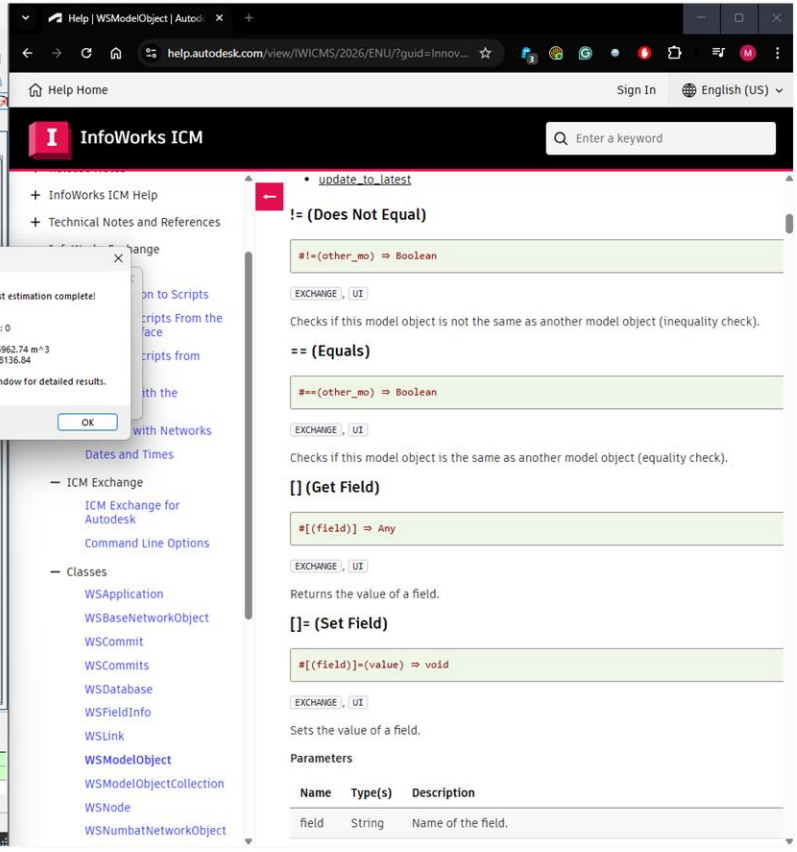


Manual → **Consultative** → **Agentic**

Modes of scripting

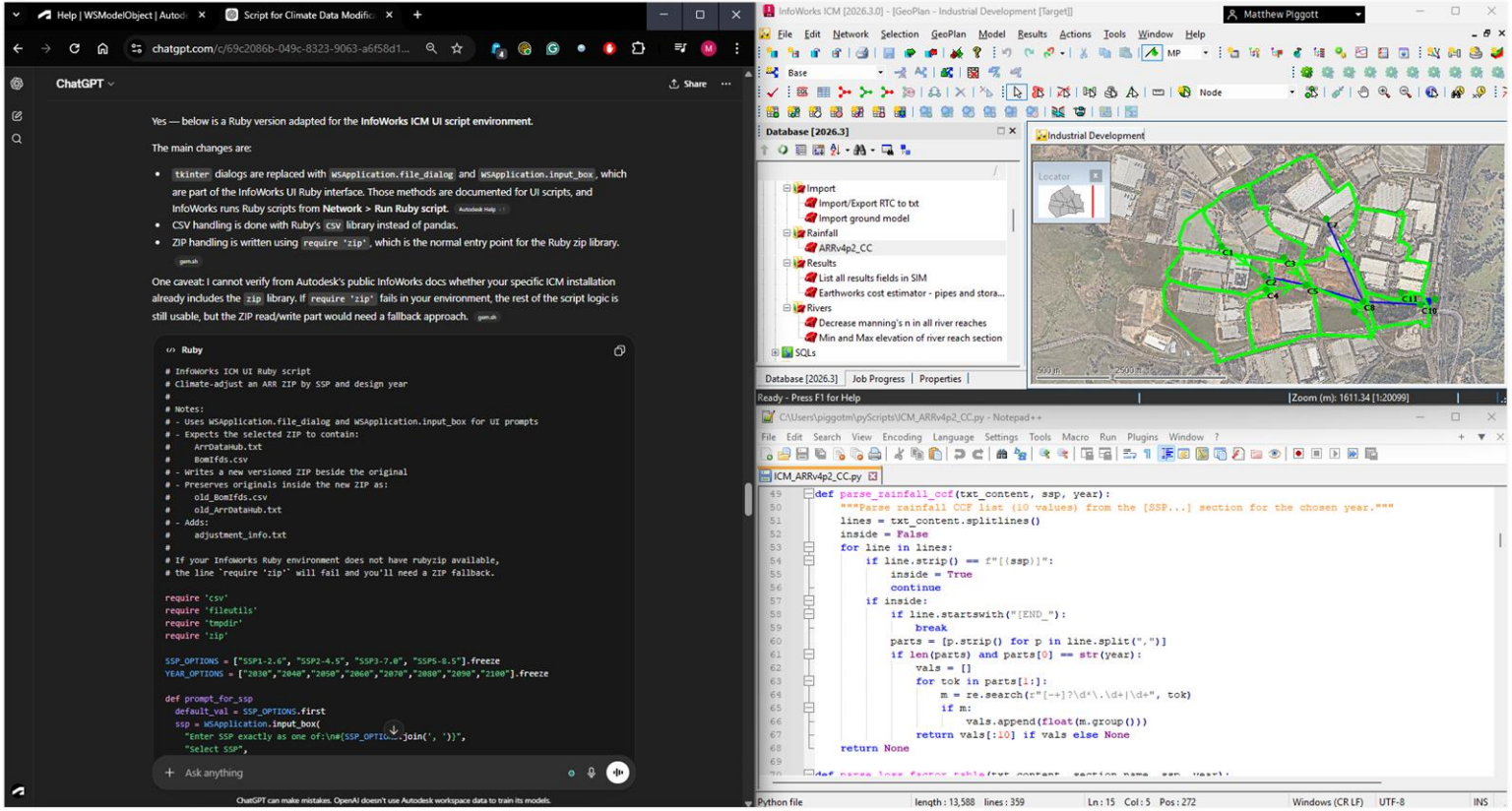
Manual → **Consultative** → **Agentic**





Modes of scripting

Manual | **Consultative** | Agentic



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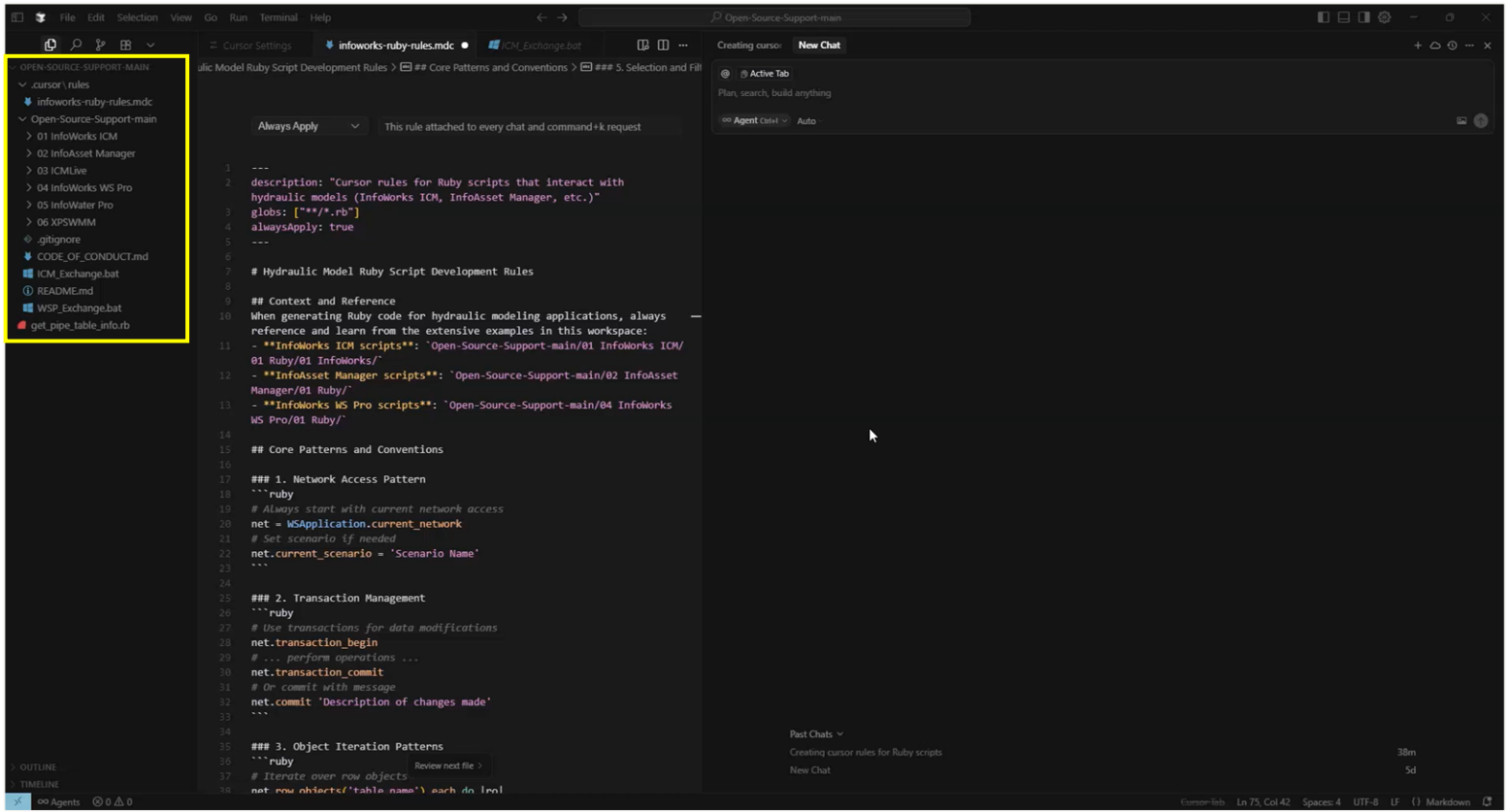


Modes of scripting

Automation in hydraulic modelling

Manual

- Understand **language** to write code
- **Run** scripts via software UI or Command prompt

Consultative

- **Generative AI** acts reactively based on pretrained info e.g., free license of ChatGPT
- **Helps** write, refine and debug scripts
- Requires a lot of context and can be quite **iterative** for complex workflows

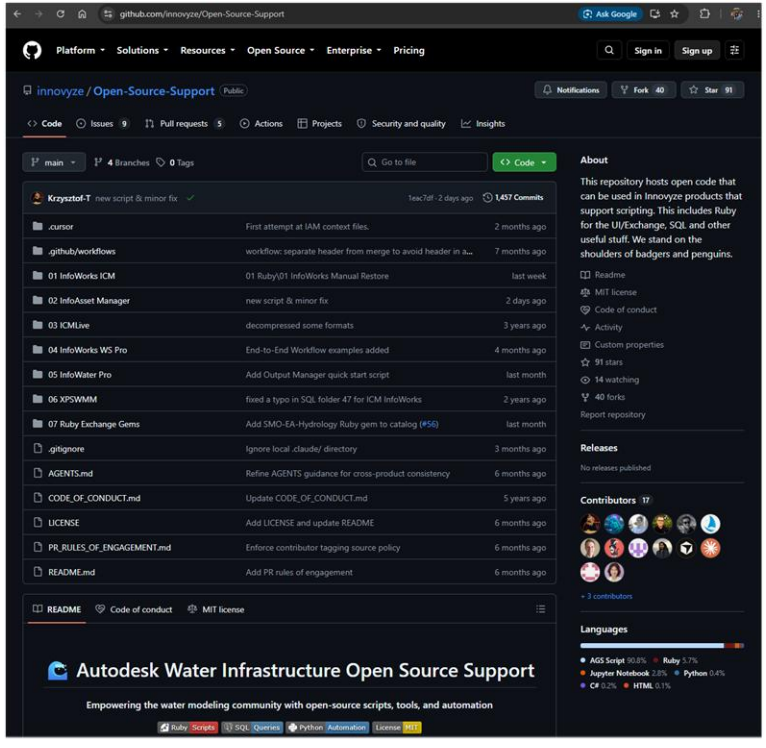
Agentic

- **Agentic AI** acts proactively interacts with connected info e.g., Cursor AI
- **Helps** plan, write, guide (ask) and debug scripts
- More **efficient** since connected with external open resources e.g., GitHub, online help files

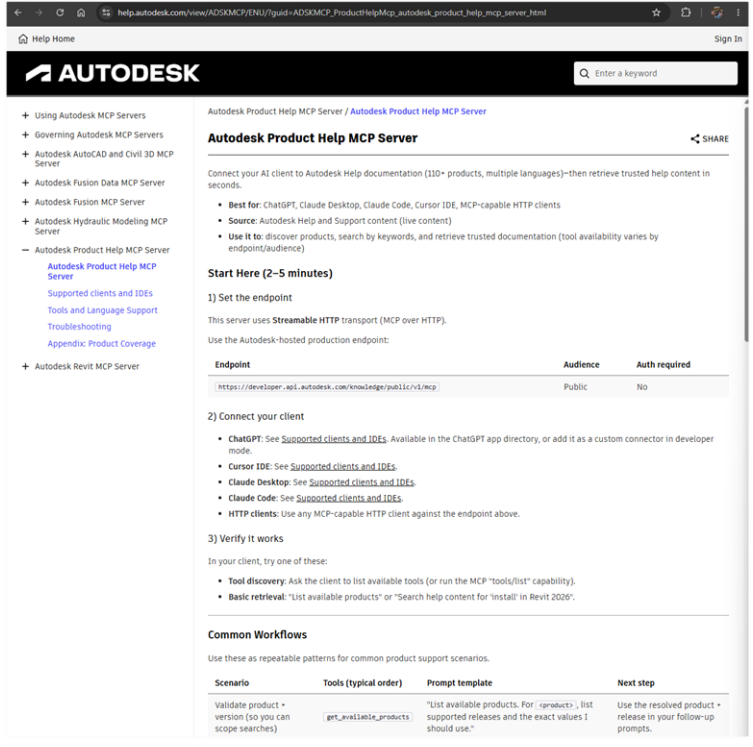
Running AI-enhanced scripting

InfoWorks ICM InfoWorks WS Pro

AWI GitHub repository https://github.com/innovyze



Autodesk Product Help MCP Server



Scripting examples

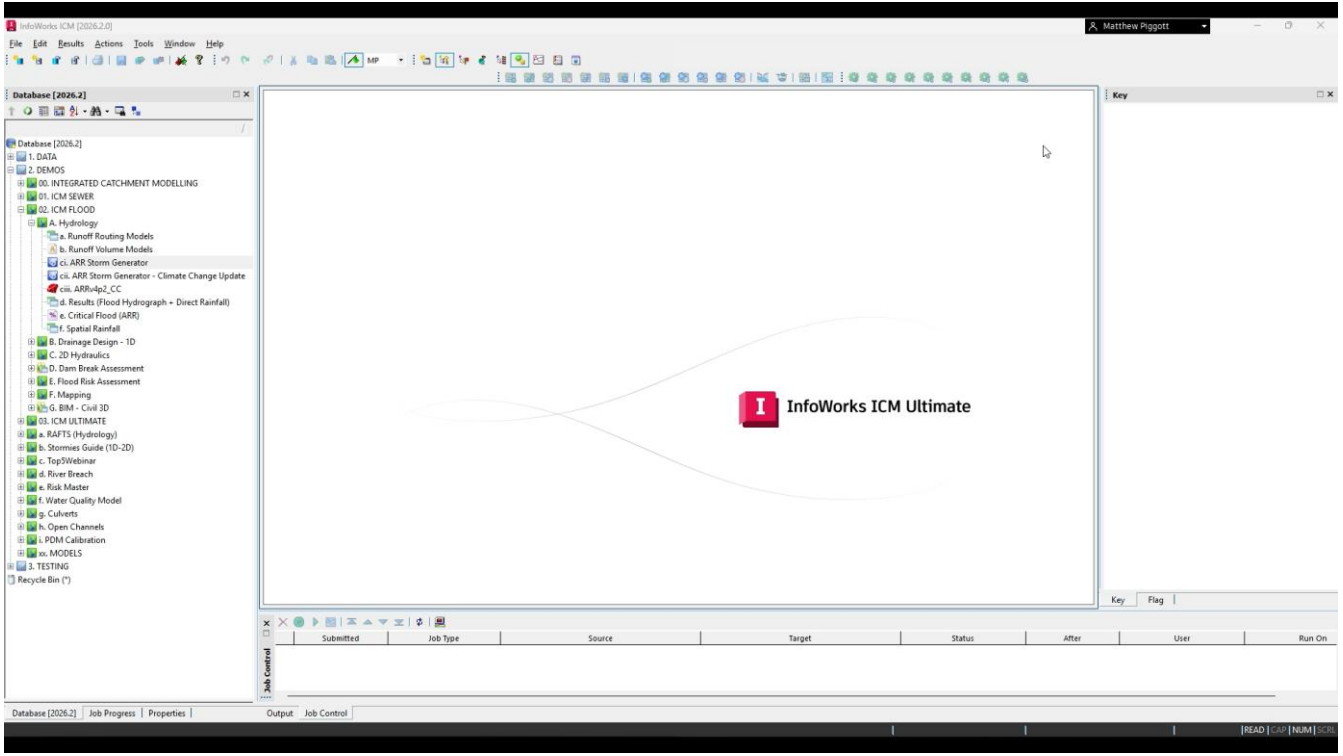
InfoWorks ICM

Custom Workflows

Manual → Consultative → **Agentic**

Stay up to date with changing local guidance

- ARR Climate Change update (version 4.2)

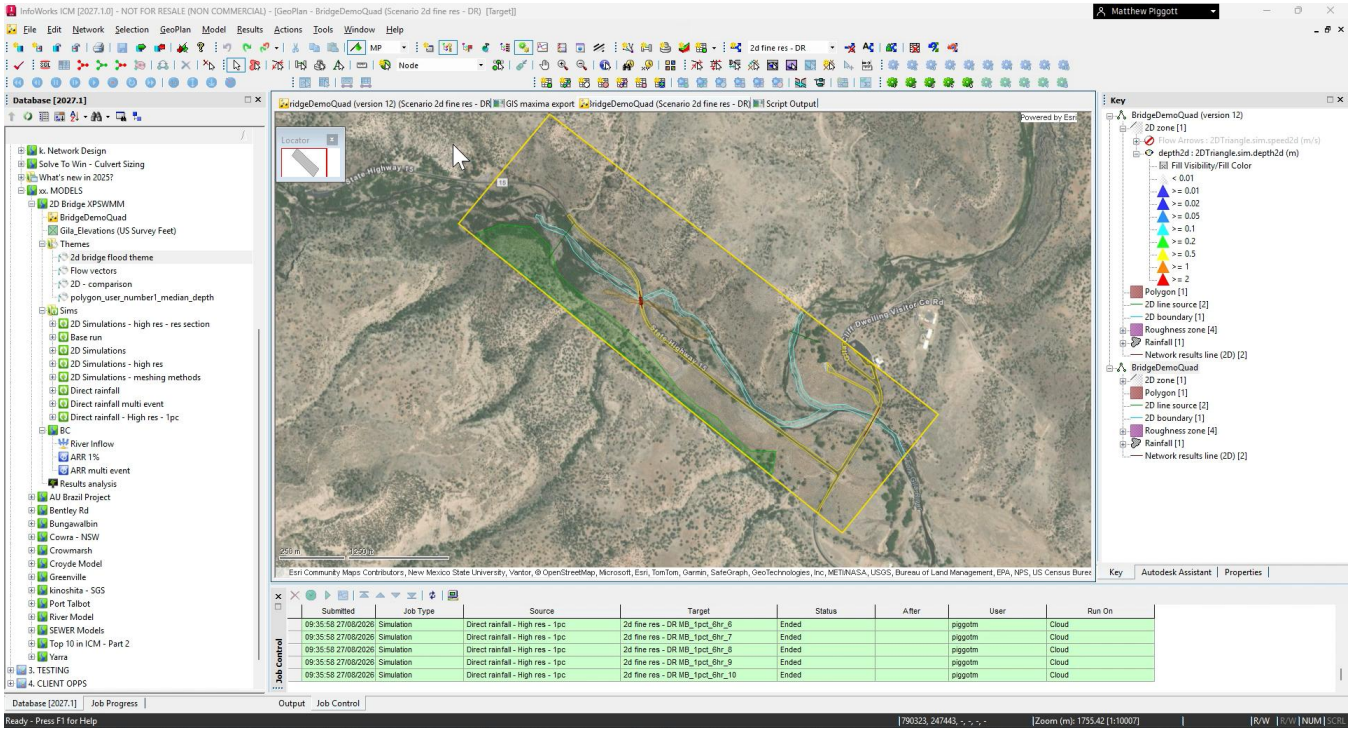


Custom Workflows

Manual | Consultative | Agentic

End user request – result processing

- ARR Statistics – 2D Zone Elements

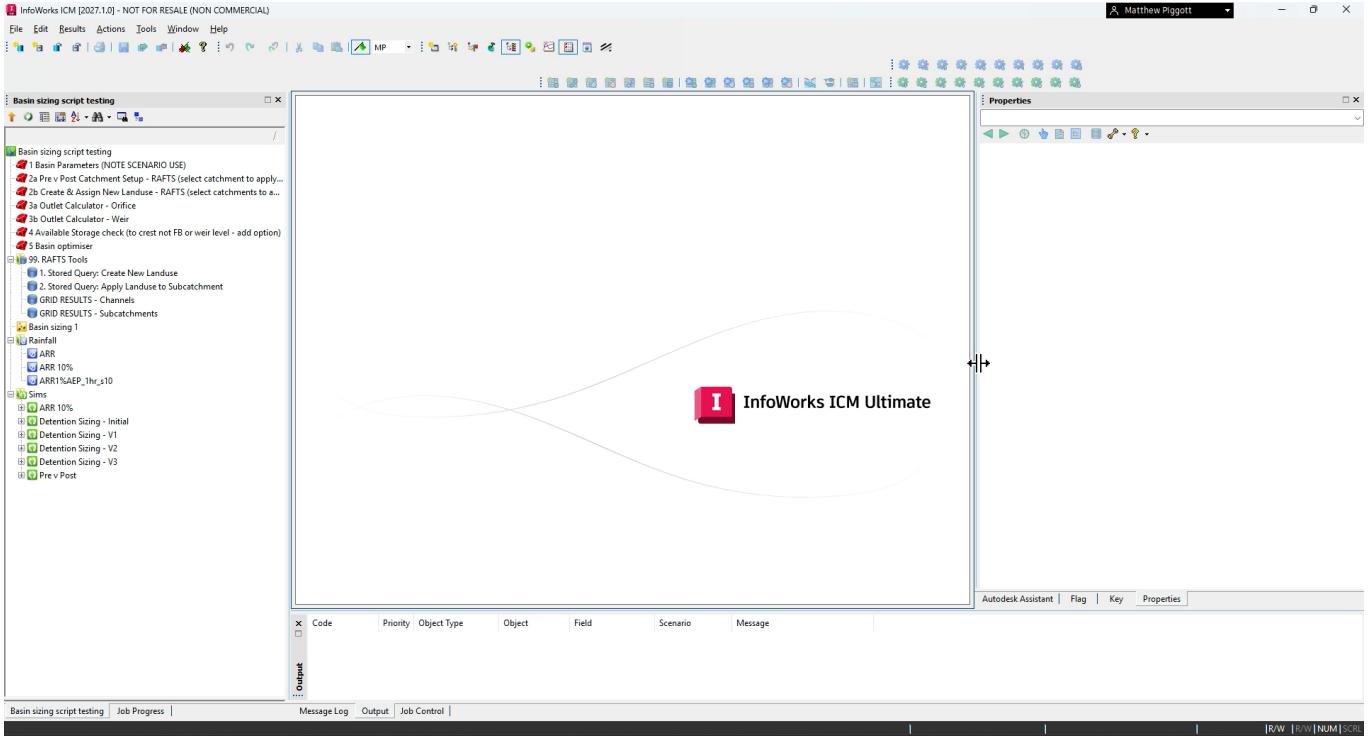


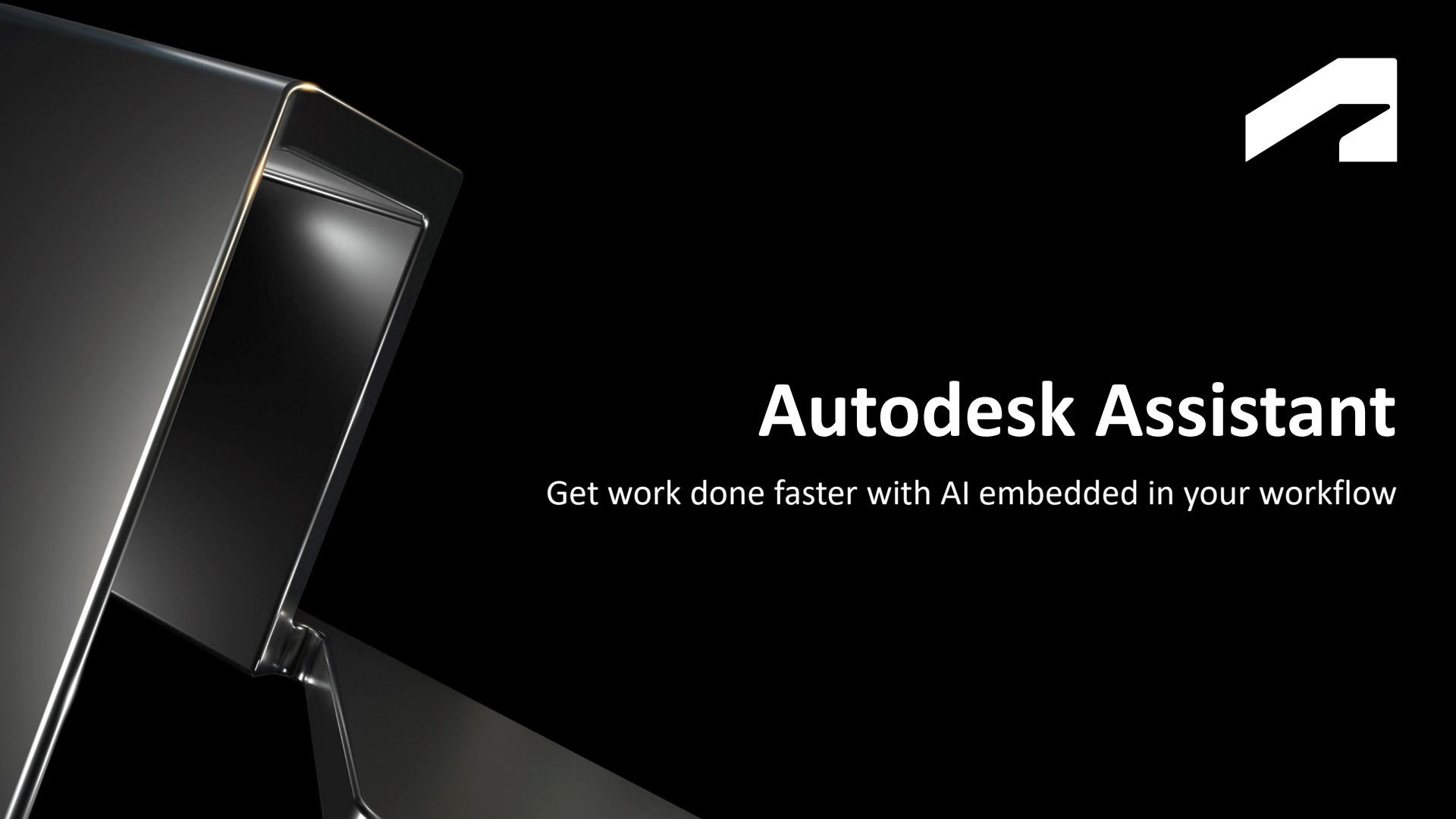
Custom Workflows

Manual | Consultative | Agentic

Streamline stormwater design process

- Basin Sizing Tools





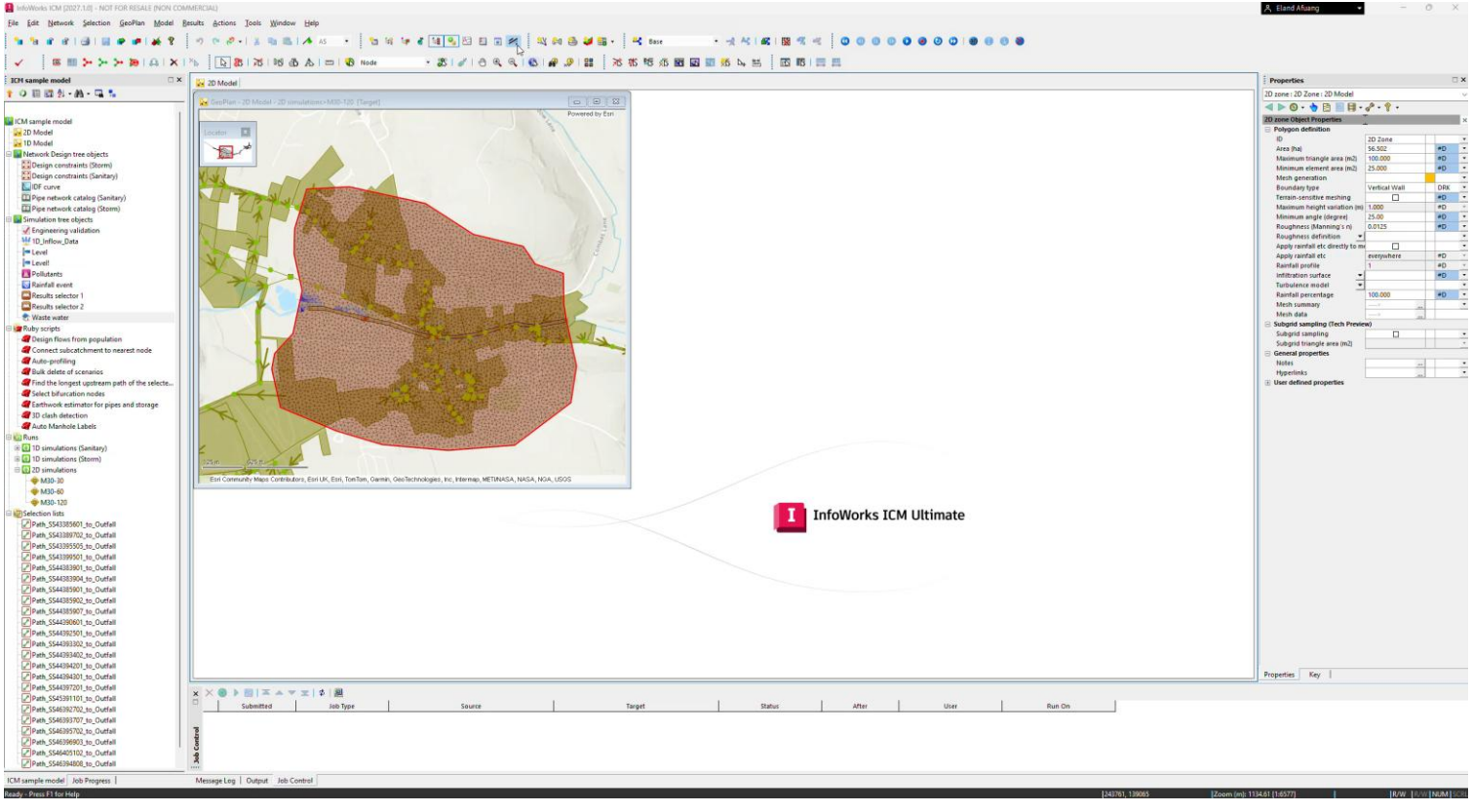
Autodesk Assistant

Get work done faster with AI embedded in your workflow

Autodesk Assistant

InfoWorks ICM

InfoWorks WS Pro



Autodesk Assistant

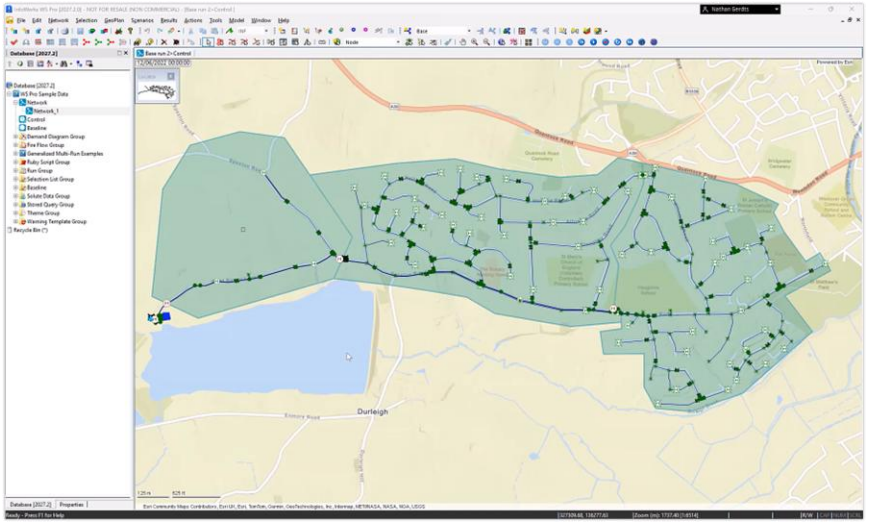
InfoWorks ICM InfoWorks WS Pro

Current release

- Help guidance and troubleshoot errors
- Write SQL queries and scripts

Upcoming release

- Query model data and results for reporting and insights
  - "Summarise the demand, pressure, and leakage in each DMA“
  - “Show me my critical points in the system"
- Automate data editing
  - “Create multiple scenarios and run simulations to evaluate the optimal PRV settings"



Keeping AI and ML trusted

Advancing hydraulic models of water networks

AI and ML capability	Required control
Script generation	Review, testing, version control
Scenario automation	Documented assumptions and model standards
KPI reporting	Outcome-based with consistent definitions
Surrogate prediction	Validation against model simulations
Operational use	Documented engineering review
Network changes	Document retraining triggers

- The **physics-based hydraulic model** remains the engineering **source of truth**

Conclusions

AI & Operational Water Management

- **AI** use cases across hydraulic modelling are evolving to increase productivity, automate repetitive tasks and less rework
- **Catchment surrogate ML models** act as assistants to the hydraulic model (1D & 2D) enabling quicker evaluation and development of planning and operational strategies
- **AI enhanced scripting & AI Agents** automate key modelling workflows with generative and agentic AI lowering the barrier to scripting
- Demonstrate practical, incremental pathway for engineers to advance physics-based hydraulic modelling

Resources

- **Technical Hubs**
  - InfoWorks ICM
- **Autodesk Viewer licenses**
  - https://www.autodesk.com/viewers
- **Educational licenses**
  - Autodesk Education Community
- **Trail downloads**
  - InfoDrainage Free Trial

Resources

Scripting

- Load factory scripts and examples from the InfoWorks **sample database**
- Full paper - Unlock the Power of AI-Enhanced Scripting for Hydraulic Modeling in InfoWorks ICM and InfoWorks WS Pro
- Please reach out for script ideas or start with AI-coding applications if available e.g., Cursor, Claude or ChatGPT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