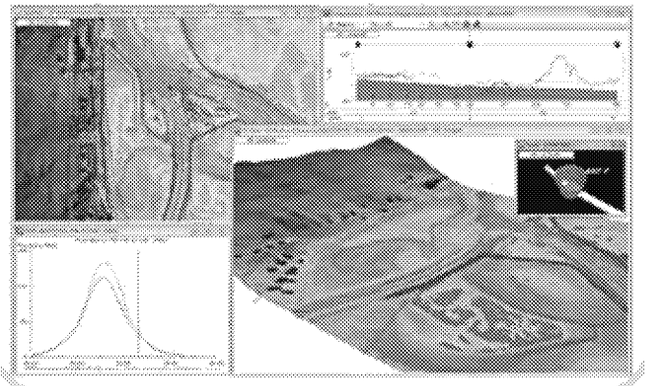
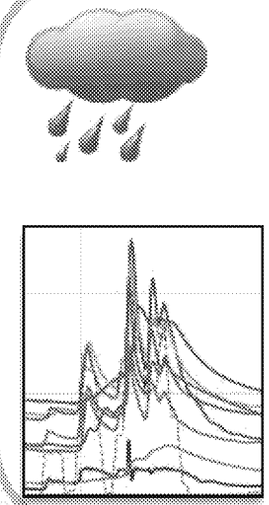
Real-time Modeling System

InfoWorks® ICM





Real-Time Data

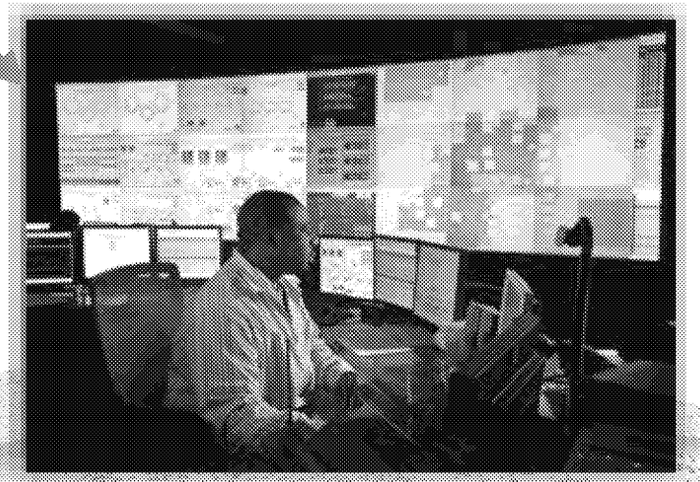
- Raingages
- Radar
- Forecast
- SCADA
- Telemetry

ICMLive™

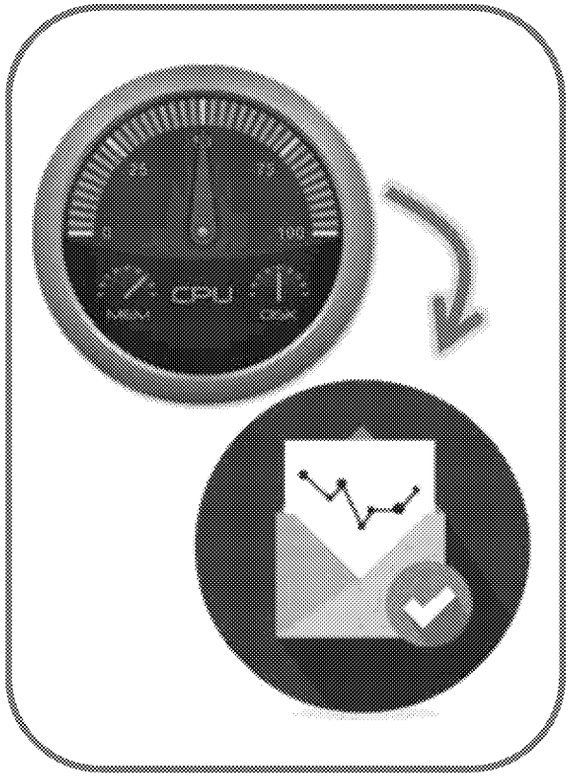
- ✓ A System that runs continuously
- ✓ Harvests, checks and screens live data
- ✓ Forecasts whole system at regular intervals

Automatic Alert System

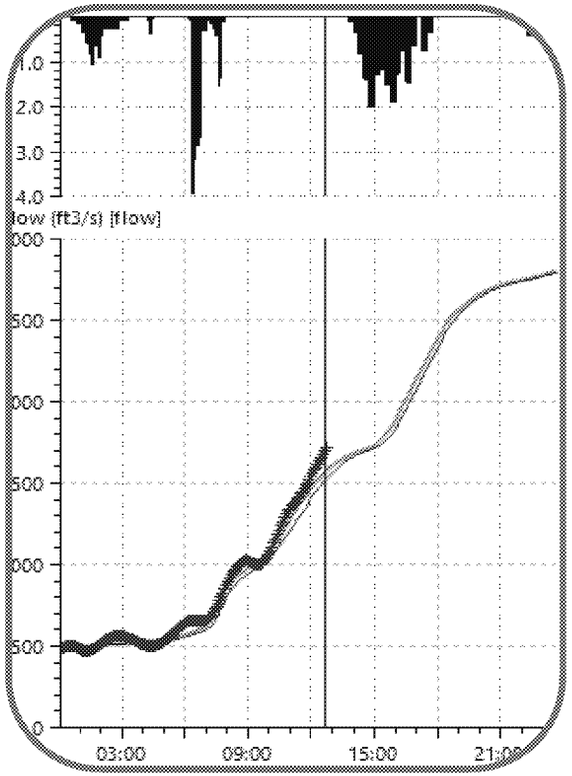
Operational Forecasting



Tenants of Operational Forecasting

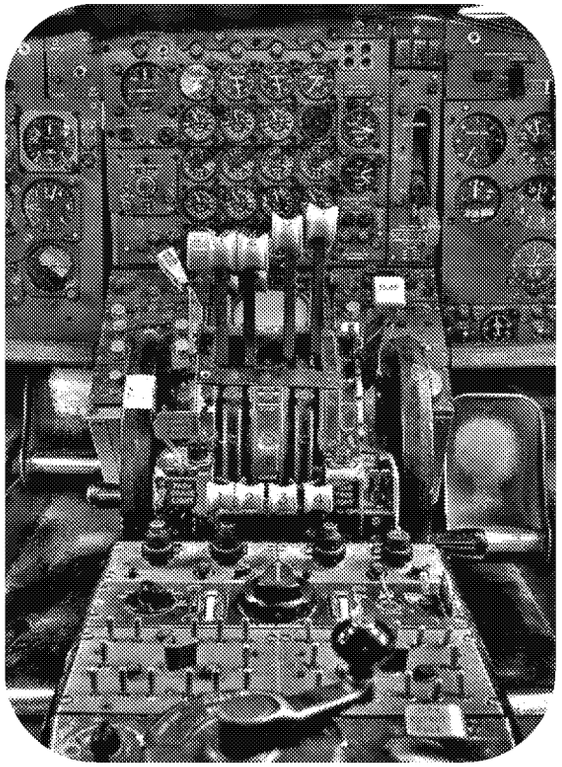


Timely



Accurate

Reliable



Adaptable

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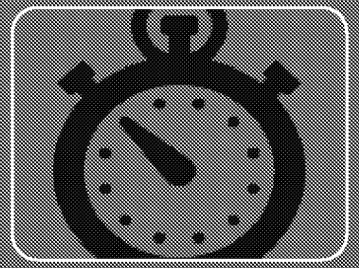
Common Questions

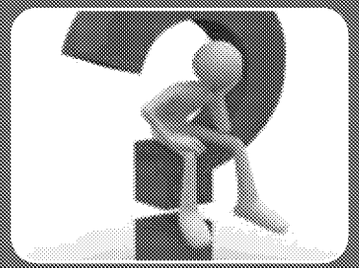


My model takes 1+ hours to run, will it be useful?

- ICMLive lets you deploy multiple scenarios that can be triggered
- Make a simplified Network or break down to smaller catchments
- ICMLive only needs to simulate new forecast period

What Forecast data is available?

- National Weather Service provides free forecast data up to 18 hours ahead
- Proprietary services can be bought separately (e.g. OneRain, Vieux, etc.)



Operators don't want to learn new software

- Operator Client interface is simplified & optimized for "lite" users.
- Results, alerts, graphs, and maps can be exported for uptake to websites, GIS, and other formats

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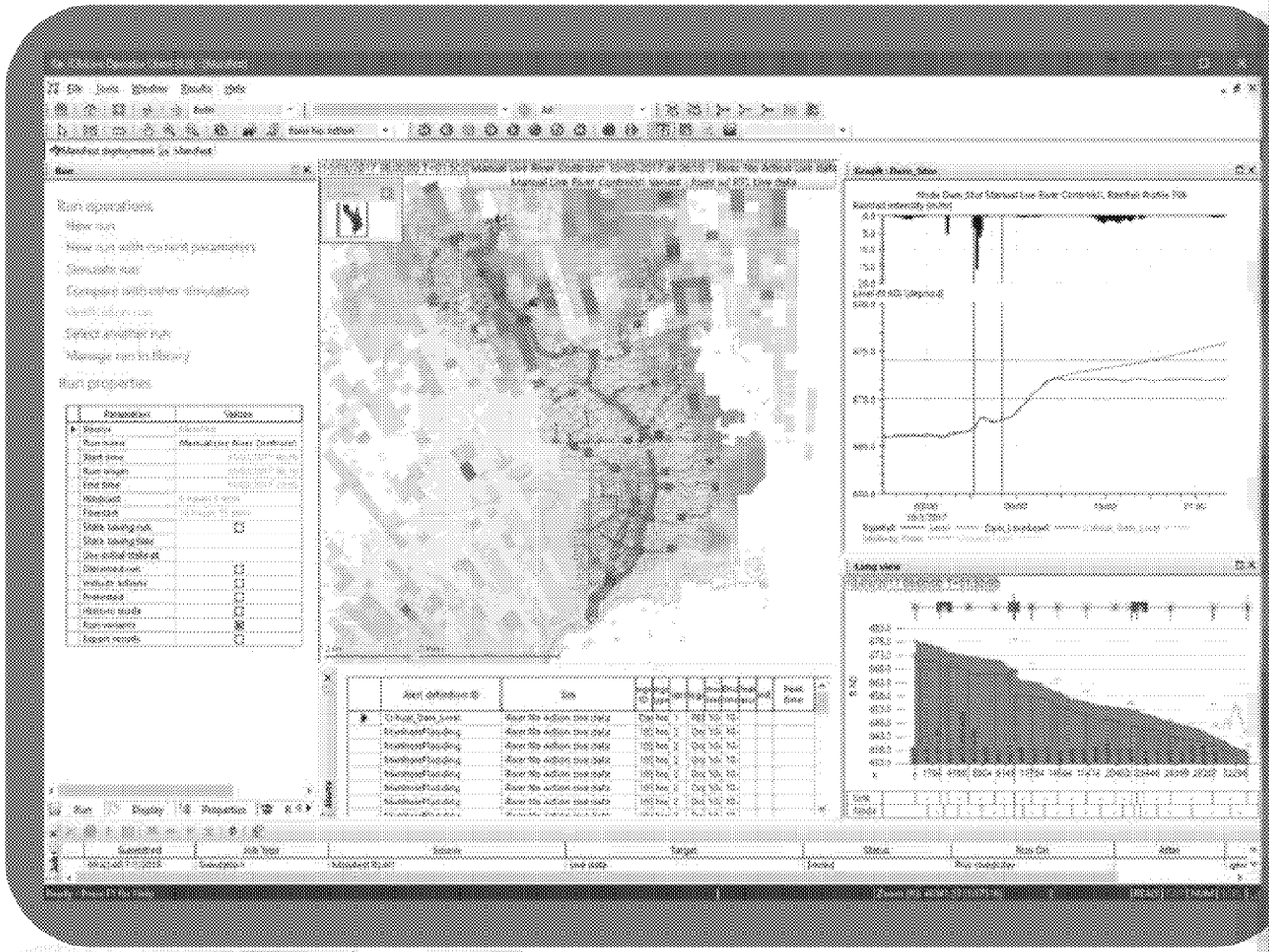
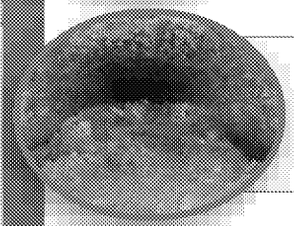
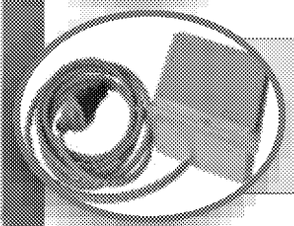
Benefits of a Real-time Modeling System



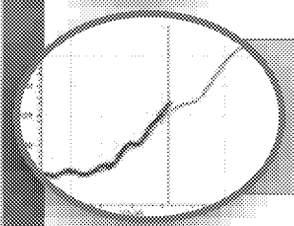
Automated reporting of spills with validation checks for compliance



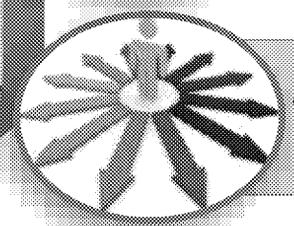
Early detection of system blockages



Identifies sensor problems in the field



Helps to keep the model up to date



Allows testing of multiple scenarios for operations and system improvements

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Example CSO Communities Using ICM

InfoWorks® ICM

City of Chicago

Citizens Energy (Indianapolis, IN)

New York City DEP

Passaic Valley Sewerage Commission, NJ

Narragansett Bay Commission, RI

Louisville Metropolitan Sewer District

City of Atlanta

San Francisco DPW

City of Omaha

City of Kansas City

City of Baltimore

Washington Suburban Sanitary Commission

Northeast Ohio Sewer District

City of Chattanooga

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Case Study: City of Winnipeg

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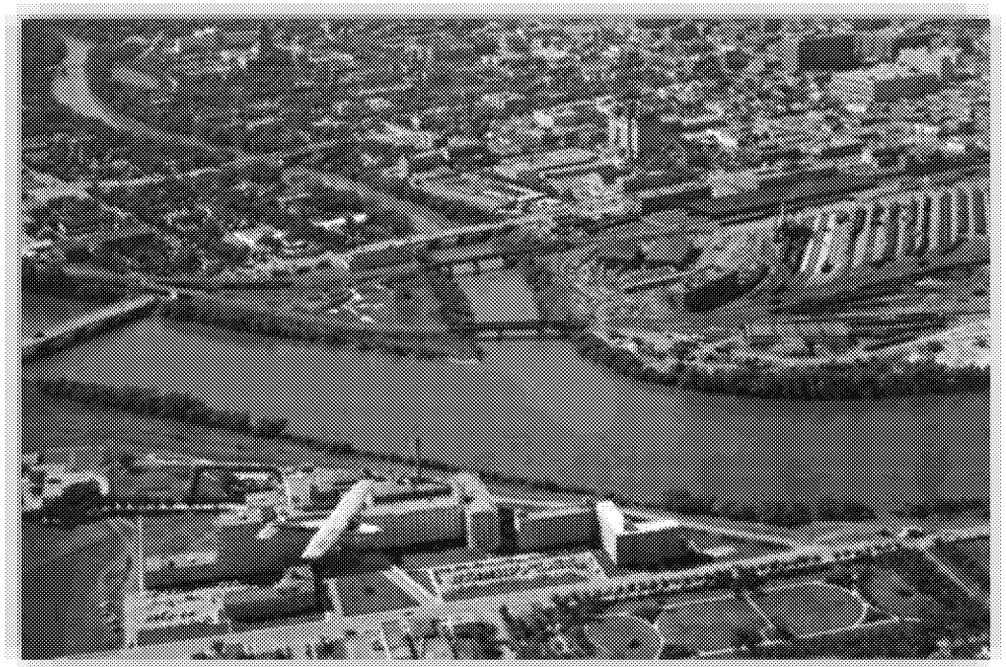
The Challenge: *Can we further preempt CSO's?*

- Winnipeg is home to over **700,000 residents**
- The City's center is shaped by the **Assiniboine and Red rivers**
- As of 2015, the City had **77 CSO outfalls** located along the receiving water system
- In 2017 the provincial government of Manitoba directed the City to progress with a CSO Master Plan. The goal? An **85% volume capture of CSOs** in a representative year



Red and Assiniboine rivers, downtown Winnipeg
https://winnipeg.ca/clerks/archives/pathways/MoreThanTheSumOfItsParts.stm

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Reference: *https://winnipeg.ca/waterandwaste/sewage/annualResults/default.stm*

Case Study: City of Winnipeg

The Solution: *Connecting smart infrastructure to predict CSO's*

- In August 2018 Winnipeg implemented ICMLive
- 39 outfall monitors, SCADA/telemetry, and forecasted rainfall data is **automatically harvested** and handled by a time-series database, then pushed to a **live model** in an end-user interface
- NOAA's High resolution Rapid Refresh (HRRR) model brings in **rainfall from up to an 18 hour forecast**

The Result: *Live alerts for CSO risks, easily reported*

- A live alert system was configured for CSO detection
- In a 3 hour test, it took **5 minutes** to process all alerts
- Results are easily reviewed in data tables or maps

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Summary of Alert Categories Implemented for the Network

Category	Priority	Object	Comparison
Inclinometer	6	Inclinometer Sensors	Angle > Threshold (Flow > 0.0)
Flap Gate Flow	4	Model Flap Valves	Flow > 0.01 m^3/s
Weir Submerged	5	Inflow Level Sensors	Level > Weir Crest & > River Level
CSO - multi criteria	10	Multiple Alerts	2 or more of the above three categories are true
Unmonitored CSO	9	Model Flap Valves	Flow > 0.01 m^3/s
Other Modeled Overflow	8	Model Manholes and Conduits	Flood Depth > 0.0 m Flow > 0.01 m^3/s
Flow Comparison	1	Model Conduits	|Model – Measurement| > 0.1 m^3/s
Level Comparison	2	Model Conduits & Nodes	|Model – Measurement| > 0.1 m
Rain Event	3	Summary Polygon	> 5 mm rainfall within an hour

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Case Study: San Francisco Public Utilities Commission

Background:

- San Francisco is home to over **880,000 residents**
- They are **one of two large cities** in California with a combined sewer system
- The combined sewer system includes:
  - **1,100 miles of pipe,**
  - **3 treatment facilities,**
  - **200** million gallons **(MG) of storage,**
  - **37 combined sewer overflow (CSO) outfalls**
- The combined system facilitates treatment for **70 MG** of flow in **dry weather conditions** and **575 MG** in **wet weather conditions**

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Reference: *https://sfwater.org/Modules/ShowDocument.aspx?documentID=12112*

Case Study: San Francisco Public Utilities Commission

The Challenge: *An aging system, maintaining water quality*

- The combined sewer system is **100 years old**
- Vulnerability to **seismic activity** threatens system integrity
- **Large storm events** may contribute to CSDs into the San Francisco Bay and the Pacific ocean, impacting water quality for residents and the receiving waters

The Solution: *Advanced H&H modeling*

- InfoWorks ICM 2D Module
- Real-Time Control (RTC) Logic
- Multi-processing capabilities
- Multibillion dollar, 20-year Sewer System Improvement Program (SSIP) currently underway

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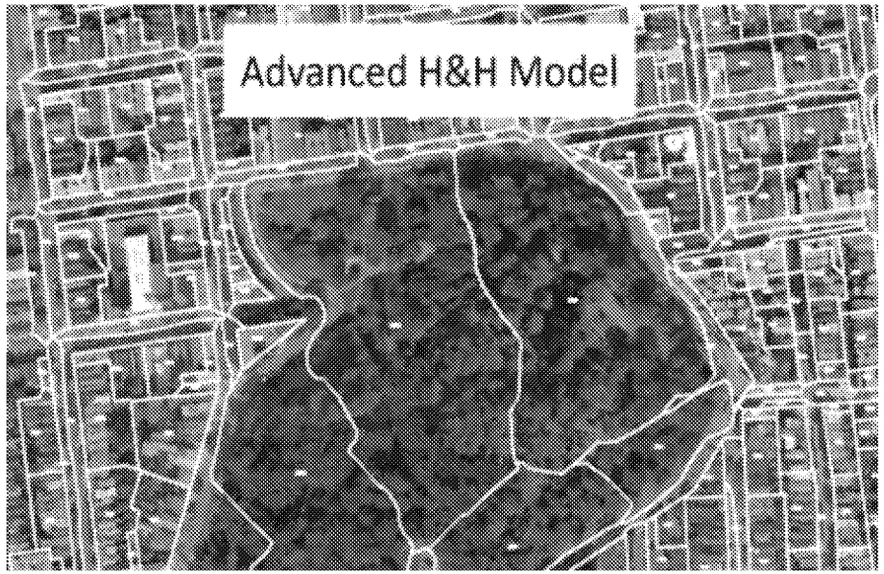

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Reference: *https://www.sfwater.org/index.aspx?page=1147*

The Bottom Line – Pricing Options

ICM Entry Level: Smaller Utilities

- InfoWorks ICM (100 Nodes): $3,300
- InfoWorks ICM (500 Nodes): $9,300
- InfoWorks ICM (1,000 Nodes): $18,000

ICM Mid Level: Medium Size Utilities

- InfoWorks ICM (2,000 Nodes): $28,800
- InfoWorks ICM (5,000 Nodes): $48,600

ICM High Level: Larger Utilities

- InfoWorks ICM (Unlimited Nodes): $72,000

Real-Time Modeling with ICMLive

- Various Options starting at approx. $50k

All Prices Include First Year of Annual Maintenance

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