The NYC Water Supply Operations Support Tool (OST): Planned Upgrades of Interim Functionality

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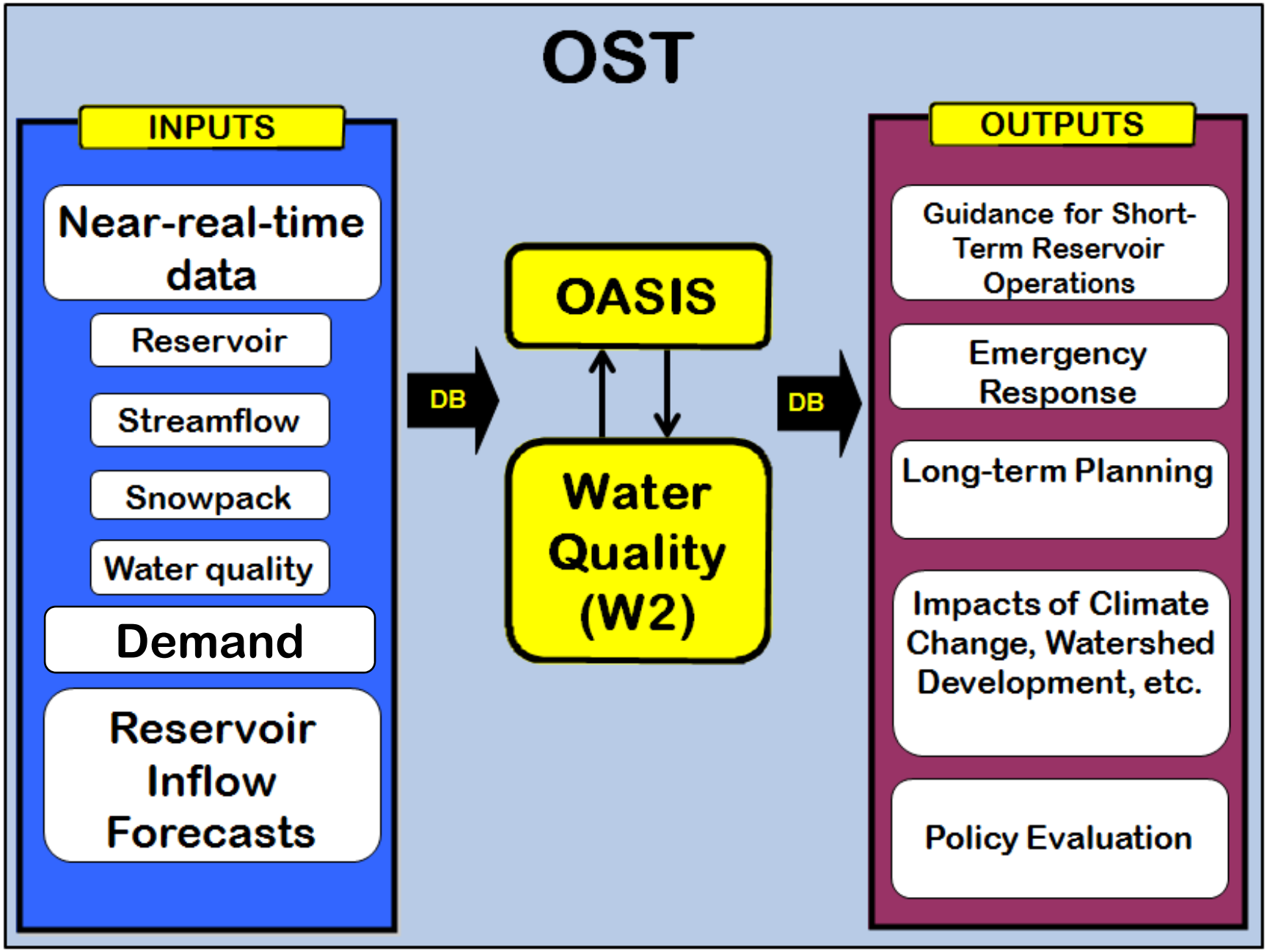
What is OST?

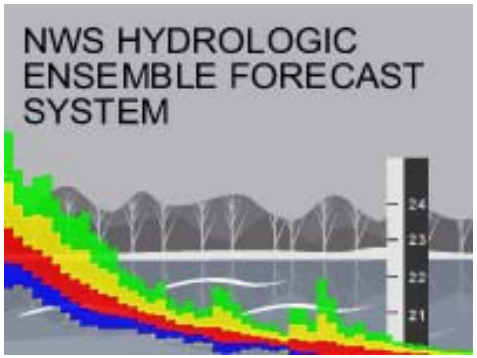

OST
INPUTS
Near-real-time data
Reservoir
Streamflow
Snowpack
Water quality
Demand
Reservoir Inflow Forecasts
DB
OASIS
Water Quality (W2)
DB
OUTPUTS
Guidance for Short-Term Reservoir Operations
Emergency Response
Long-term Planning
Impacts of Climate Change, Watershed Development, etc.
Policy Evaluation

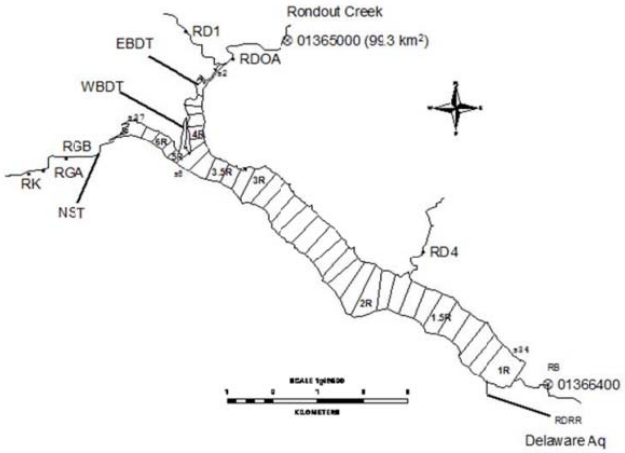
How is OST used?

- Supply reliability
- Turbidity control
- Tailwater fisheries
- Ecological flows
- Enhanced flood mitigation
- Climate change impacts
- Long-term supply/demand
- New infrastructure
- Infrastructure repairs

OST – Planned Upgrades

- ❖NWS inflow forecasts
- ❖Demand forecasts
- ❖Rondout turbidity model
- ❖Snow water network
- ❖Data management
- ❖Graphical user interface





Inflow Forecasts

- Why needed?
  - Primary input to water quantity models
- Current
  - Statistical forecasts
  - Do not include meteorological drivers
  - Do not include real-time snowpack
- Future
  - Will include met drivers, snowpack
  - Increased, longer-term skill

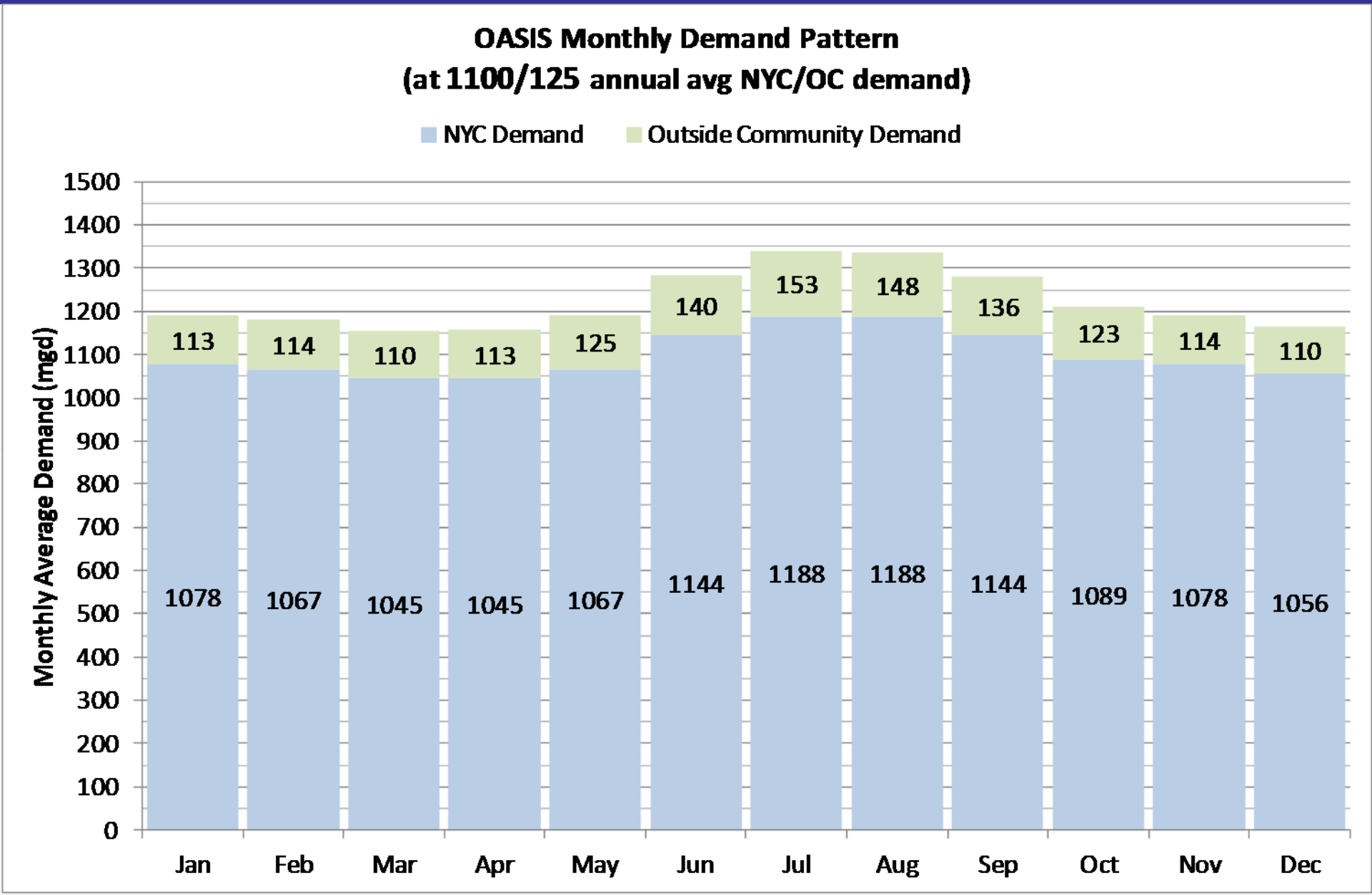
NWS Inflow Forecasts

- HEFS: Hydrologic Ensemble Forecast Service
  - New system being developed by NWS
  - Probabilistic (ensemble)
  - Nationwide rollout 2015, water supply 2013
  - $1 million funding from DEP to accelerate development
- Daily forecasts to 15 days
  - Meteorological drivers
  - Snow pack data
- 5-day forecasts 15 days - 9 months
  - Met drivers and snow pack
- 5-day forecasts 9 months and beyond
  - Based on climatology

Demand Forecasts

- Why needed?
  - Primary driver of system operations
- Current
  - Based on historical patterns
  - Does not account for near-future conditions
- Future
  - Will estimate demand based on expected conditions

OASIS Inputs: Demand Pattern



Demand Forecasts

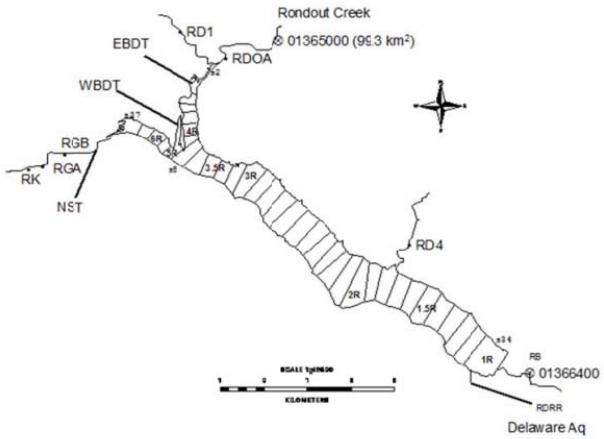
- Near-term forecasts to 15 days
  - Based on weather forecasts
  - Recent demand may be included
- Long-term forecasts to 1-2 years
  - Based on climatological normals and variability
- Development to begin this year
- Complete by late 2013 (end of project)

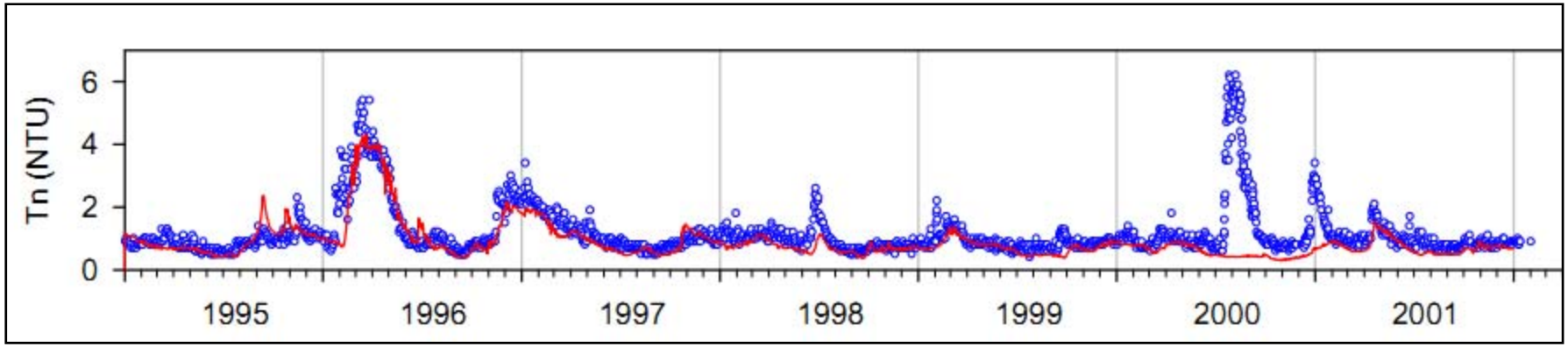
Rondout Turbidity Model

- Why needed?
  - Simulate turbidity in Rondout Reservoir
- Current
  - None
- Future
  - Mechanistic model of turbidity

Rondout Turbidity Model

- ❖Under development by UFI
- ❖Similar to Catskill models
- ❖Preliminary testing



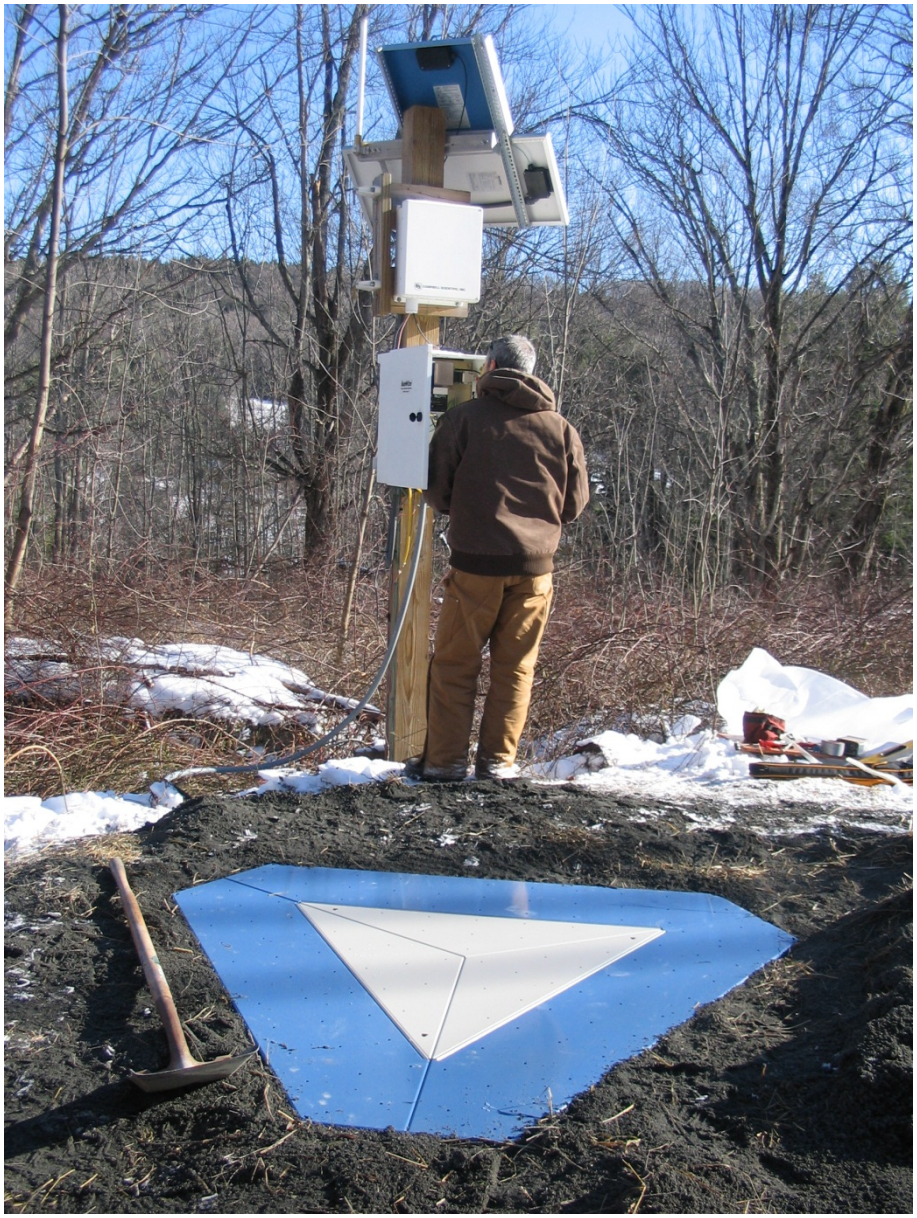


Snow Water Network

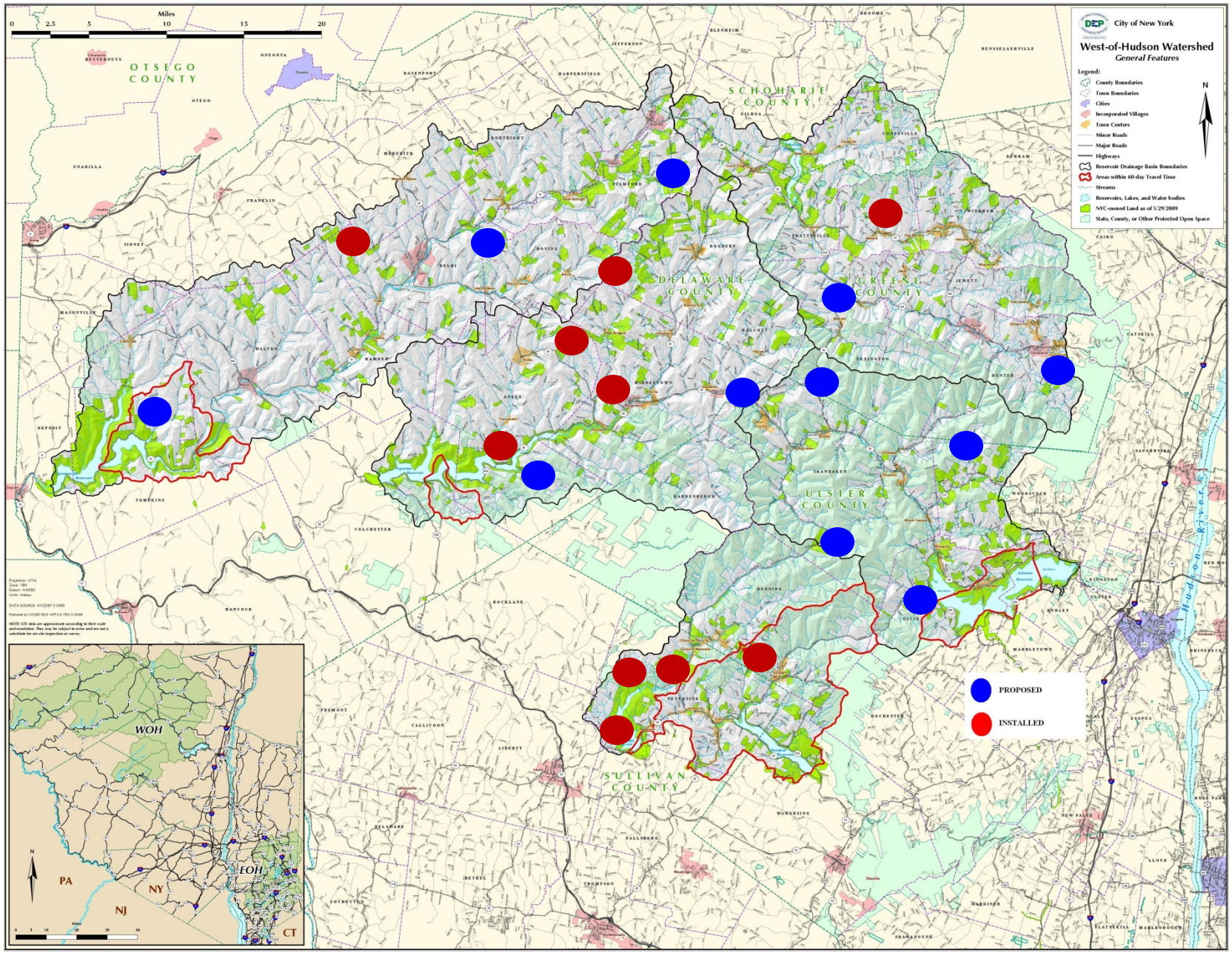
- Why needed?
  - Input to runoff forecasts
- Current
  - Manual measurements
  - Biweekly
- Future
  - Automated sensors
  - Continuous data
  - Near-real-time sharing with NWS

Snow Water Network

- Solid-state sensors
- Provide near-real-time data
- Data shared with NWS
  - Estimate basin-wide snow water content
  - Integrated into HEFS runoff forecasts
- Current: 10 stations
- Future: 35 stations
- 2-4 year effort
- Working with NWS on locations



Snow Water Network



Graphical User Interface

- Why needed?
  - Essential for usability
- Current
  - Does not meet new needs for system usage
  - Outdated format
- Future
  - Designed in concert with new needs
  - Contemporary look and feel

GUI - Current

OASIS with OCL --- Run directory: C:\OST\OASIS\Runs\PosAnalysis\OPS_RUN_2012-03-30_EHIRSCH_JP_V1.3.8 [Position-Analysis Mode]

File Edit Run Output Help

Schematic | Setup | Time | Node | Arc | OCL | Misc | Update Record

Year Month Day

Start of Run 2012 9 11 TODAY

Number of time steps per trace 365

W2-Schoharie
- Use W2 — Edit ci1 — Make LPR

W2-Ashokan West
- Use W2 — Edit ci1 — Make LPR

W2-Ashokan East
- Use W2 — Edit ci1 — Make LPR

W2-Kensico
- Use W2 — Edit ci1 — Make LPR

Turn off W2 after 30 days

Inflow Forecasts
- Daily Correlation
- Monthly Correlation
- Non-conditional

Inflow Record: 1927-2008

Current conditions have not been downloaded

Automatic Initial Reservoir Levels from Downloaded Data

Initial Reservoir Levels

Node Number	Node Name	Storage	Units
100	Pepacton	1271.52	ft
120	Cannonsv	1144.91	ft
145	Prompton	0.0	bg
155	Jadwin__	0.0	bg
175	Wallenpa	1182.6	ft
185	MongpRes	0.0	bg
215	NevrsRes	1433.09	ft
255	MerrlRes	16.6	bg
260	FEWalter	1310.08	ft
270	BeltzRes	628.04	ft
345	Nockamix	13.11	bg
455	BlueMRes	285.73	ft
610	Rondout_	838.08	ft
616	Chelsea_	64.07	BG
625	Schohari	1122.78	ft
650	WAshokan	587.32	ft
655	EAshokan	582.67	ft
670	BoydsCor	1.7	BG
675	W_Branch	488.77	ft
700	Kensico_	356.37	ft
710	M_Branch	4.1	BG
715	EBrBogBr	9.9	BG
720	Crot_Div	0.9	BG
725	CrotFall	14.2	BG
735	Titicus_	7.2	BG
745	Amawalk_	7.1	BG
750	CrossRvr	10.3	BG
755	Muscoot_	5.1	BG
760	New_Crot	196.18	ft
780	BQ_Aquif	60.0	BG
800	SourceNY	1000.0	BG
801	Source_Nassau	1000.0	MG
802	SourceNJ_AW	1000.0	MG
803	SourceNJ_MWC	1000.0	MG
992	TT_UpDel	20.0	bg
994	TT_LoDel	20.0	bg

Edit Notes

Update Initial Cond

RUN

View Output

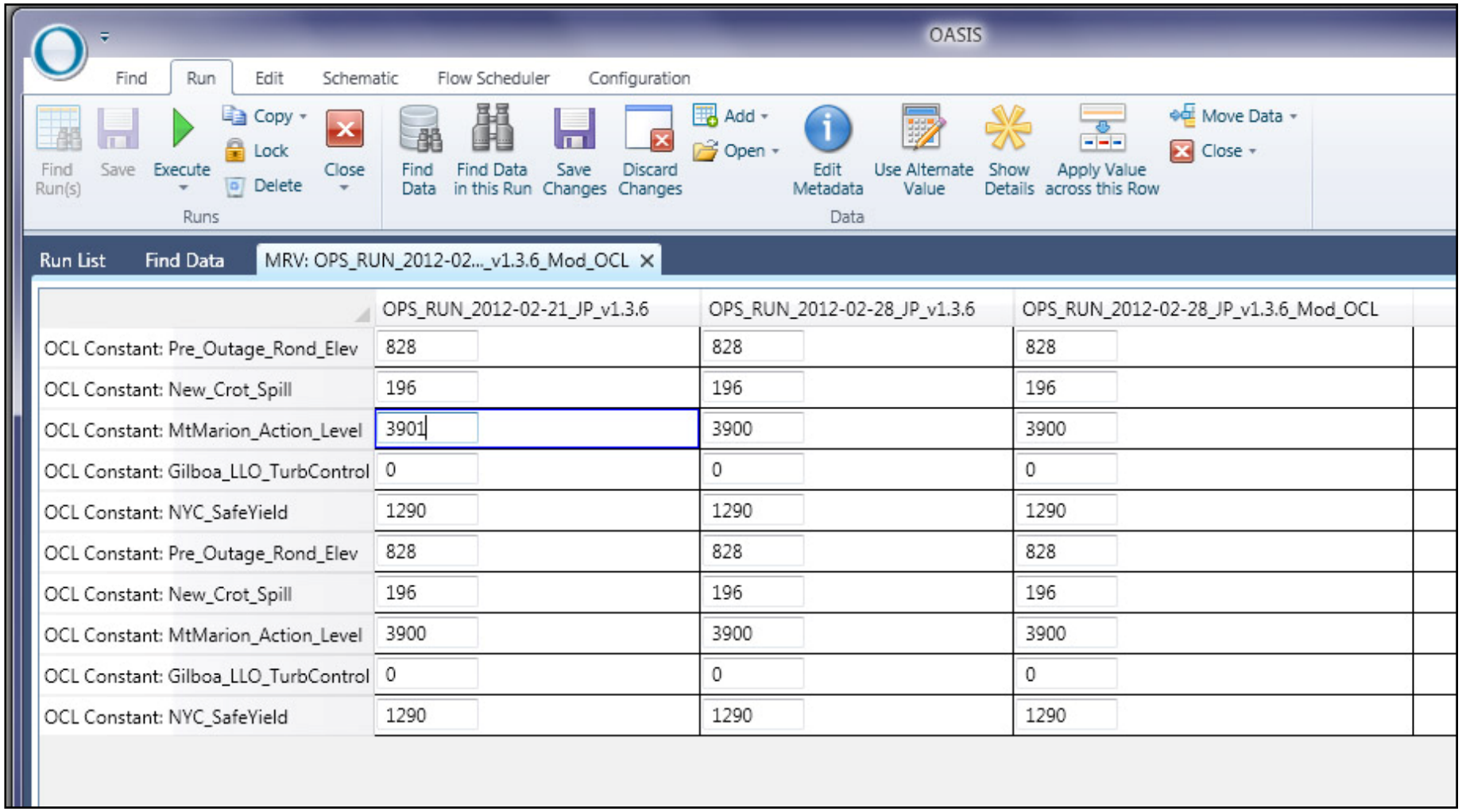
Tables

Plots

Balance Sheet

Quick View

GUI - Future



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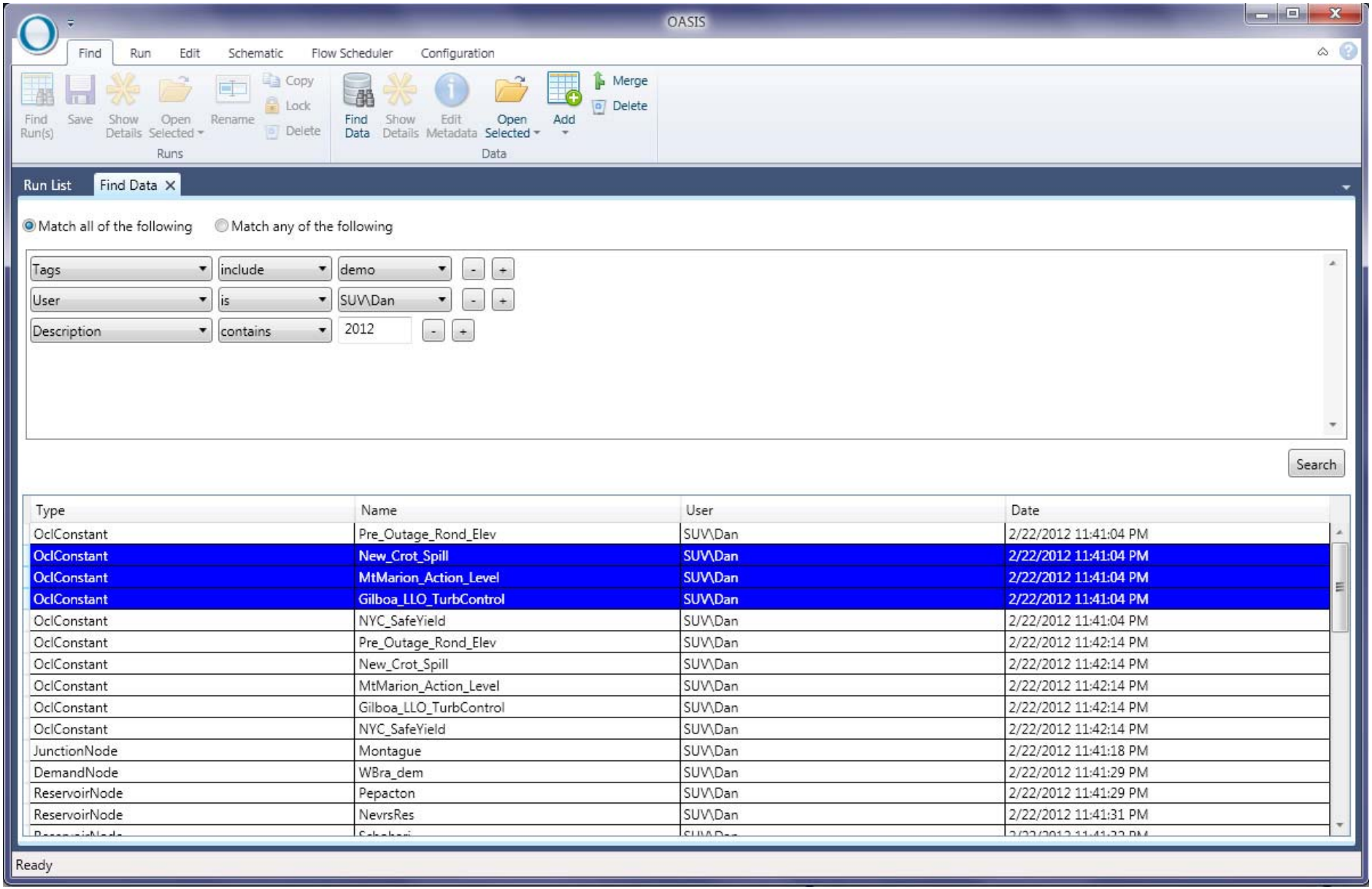
OCL Constant: Pre_Outage_Rond_Elev	828	828	828
OCL Constant: New_Crot_Spill	196	196	196
OCL Constant: MtMarion_Action_Level	3901	3900	3900
OCL Constant: Gilboa_LLO_TurbControl	0	0	0
OCL Constant: NYC_SafeYield	1290	1290	1290
OCL Constant: Pre_Outage_Rond_Elev	828	828	828
OCL Constant: New_Crot_Spill	196	196	196
OCL Constant: MtMarion_Action_Level	3900	3900	3900
OCL Constant: Gilboa_LLO_TurbControl	0	0	0
OCL Constant: NYC_SafeYield	1290	1290	1290

GUI - Future


OASIS
Find
Run
Edit
Schematic
Flow Scheduler
Configuration
Find Run(s)
Save
Show Details
Open Selected
Rename
Copy
Lock
Delete
Runs
Find Data
Show Details
Edit Metadata
Open Selected
Add
Merge
Delete
Data
Run List
Find Data
Match all of the following
Match any of the following
Tags
include
demo
User
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SUV\Dan
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Date
OclConstant
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2/22/2012 11:41:04 PM
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JunctionNode
Montague
SUV\Dan
2/22/2012 11:41:18 PM
DemandNode
WBra_dem
SUV\Dan
2/22/2012 11:41:29 PM
ReservoirNode
Pepacton
SUV\Dan
2/22/2012 11:41:29 PM
ReservoirNode
NevrsRes
SUV\Dan
2/22/2012 11:41:31 PM
Ready

Data Management

- Why needed?
  - OST is data-centric
  - Must ensure input data are accurate
- Current
  - De-centralized system relies on originators
- Future
  - Integrated into OST
  - Automated data review and flagging
  - Automated filling of missing data
  - Daily reports and approval by operators
  - Audit record

Data Management

AQUATIC INFORMATICS™

Water Survey of Canada - 2400 Stations

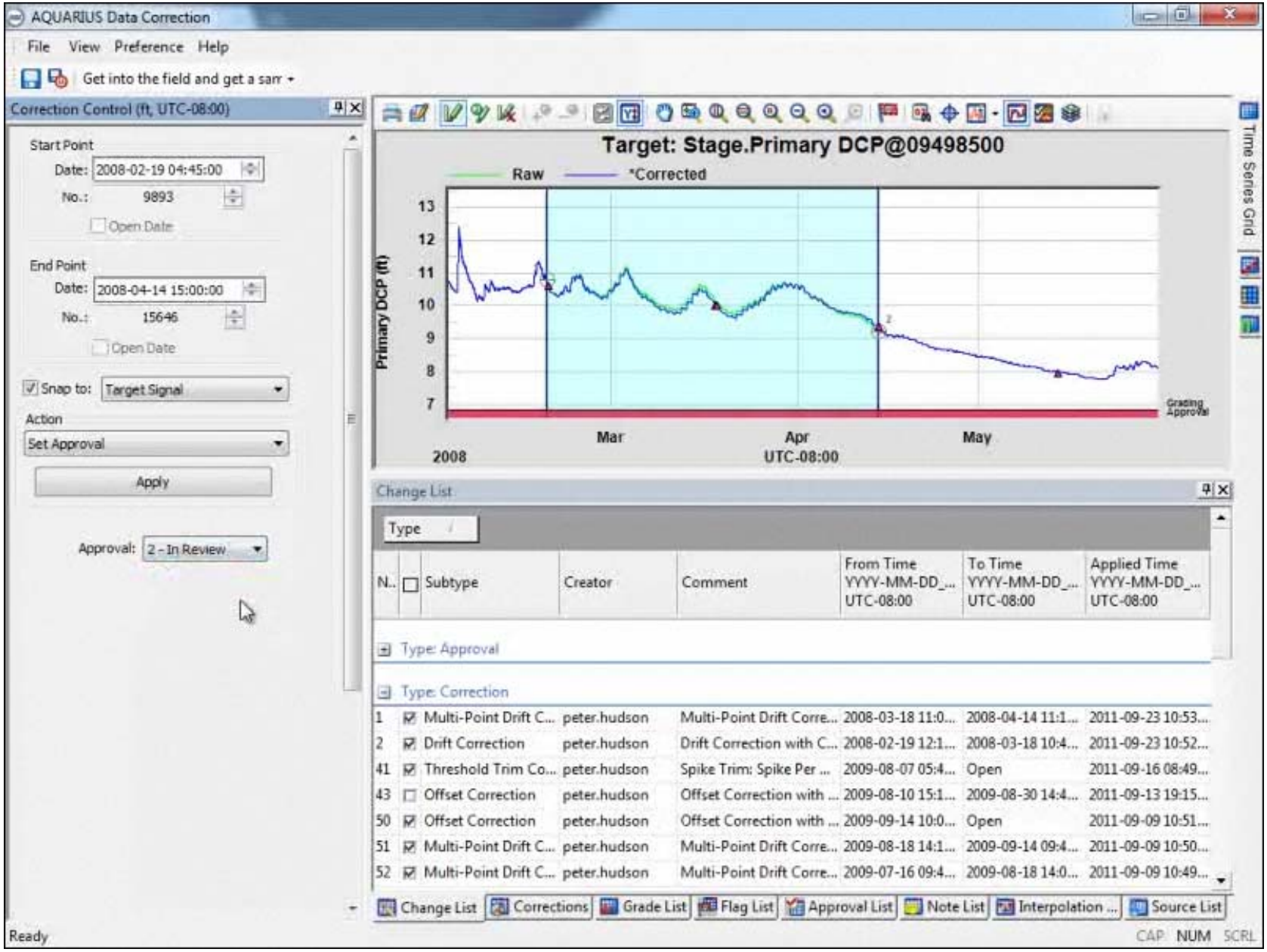
AQUARIUS is used for the acquisition and management of data from over 2400 stream gages, across 28 field offices, for over 200 hydrographers. WSC scientists are leaders on the standards committees of the ISO and the World Meteorological Organization. WSC relies on AQUARIUS to streamline its hydrometric data production and data management.

US Geological Survey - 9700 Stream Gages

The USGS sets the national standards for hydrometric data collection and production. It uses AQUARIUS in all its Water Science Centers to correct time series data and develop rating curves. With AQUARIUS, the USGS saves $3M annually through increased data processing efficiency *(USGS National Streamflow Information Program Fact sheet 2007).*

Hundreds of national agencies, state, regional and local water authorities, hydropower operators, mining companies, consulting organizations, and academic groups around the world trust AQUARIUS Software. Thousands of hydrologists and scientists rely on AQUARIUS every day.

Data Management



OST Schedule

- **OST Beta 10/31/2012**
  - New data management system and GUI
  - Rondout model available stand-alone
  - Server-based deployment and central database to support multiple users
  - New “dashboard”: improved data visualization and dissemination

- **OST Final 10/31/2013**
  - NWS ensemble forecasts for improved skill
  - Rondout model fully integrated
  - Refinements to data, GUI, and dashboard components
  - Demand forecasts operational

Questions?