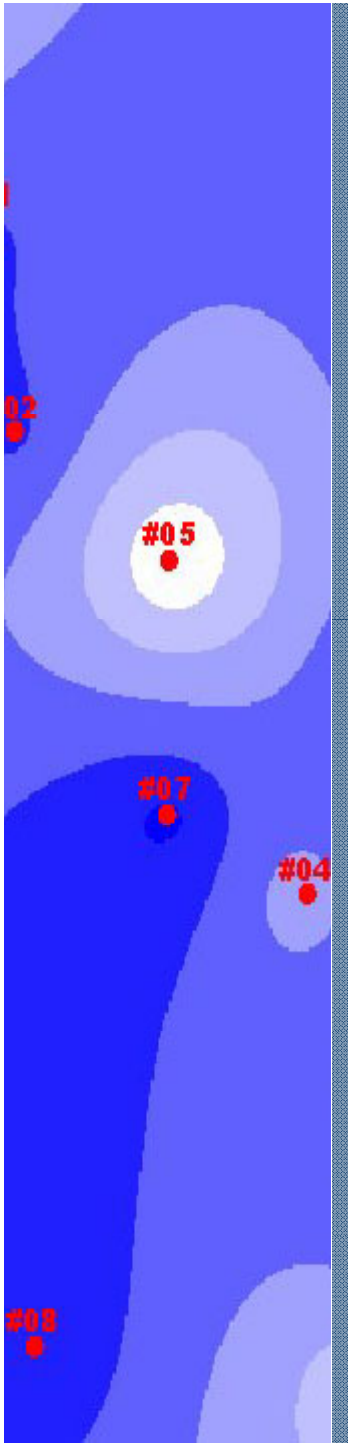


Elevating Water Level Data to Dynamic Groundwater Visualization

John Dustman

Summit Envirosolutions, Inc.

2012 MWGWA Midwest Groundwater Conference

Presentation Overview

- Technology Overview
  - Field Instrumentation
  - Software
- Field Applications
- Demonstration
- The Future

Technologies and Definitions – Perfect Storm of Convergence

Hardware

- Chemical and physical parameter sensors with data loggers
- Programmable Logic Controllers (PLCs)
- Variable Frequency Drives (VFDs)
- Computer processing speeds

Software

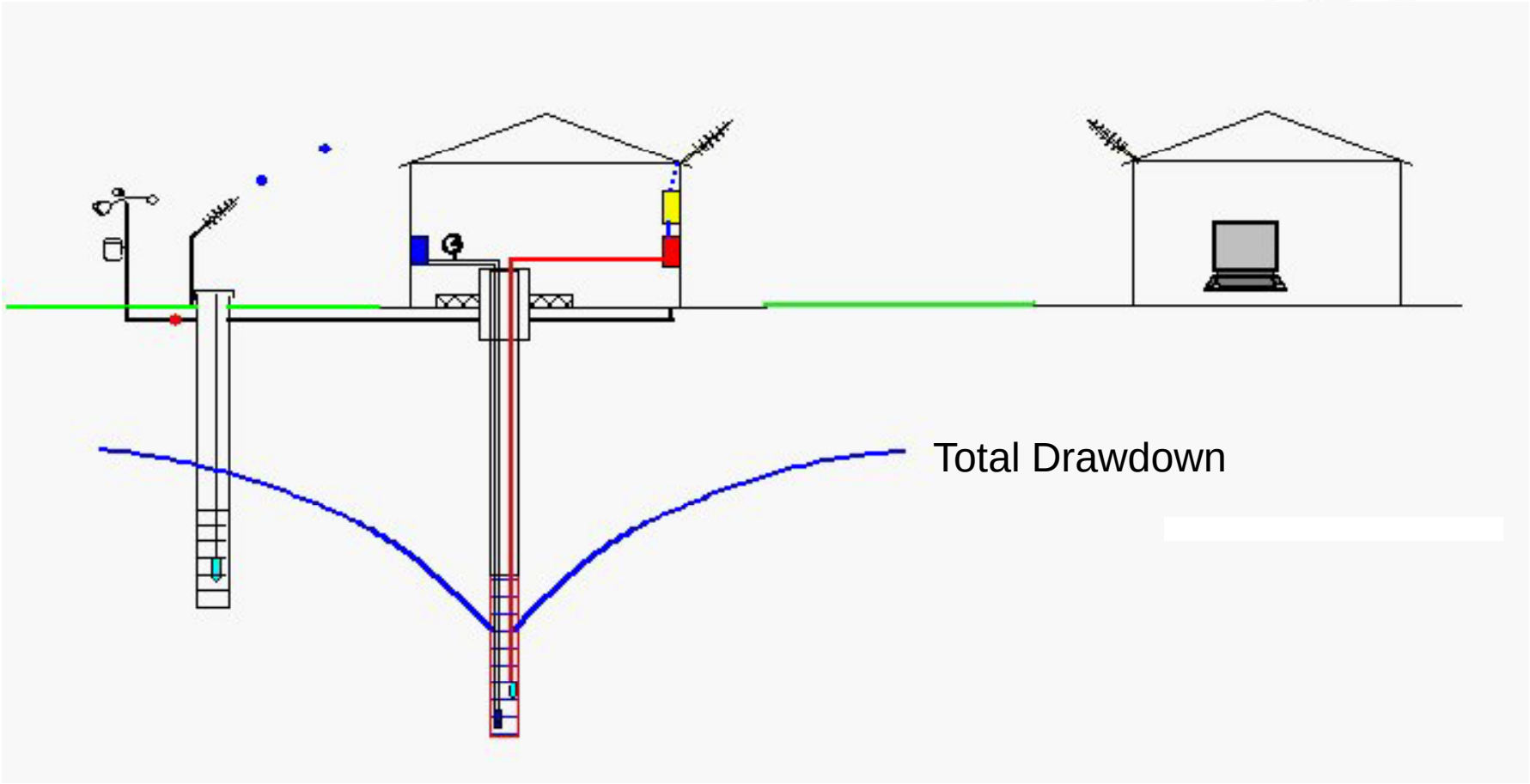
- Data visualization and rendering software
- Database programming
- Global Positioning Systems (GPS) and related software
- Geographic Information Systems (GIS) software
- Supervisory Control and Data Acquisition (SCADA) software
- Groundwater data analysis and modeling software
- Artificial Neural Networks (ANN)

Technologies and Definitions – Perfect Storm of Convergence (continued)

Others

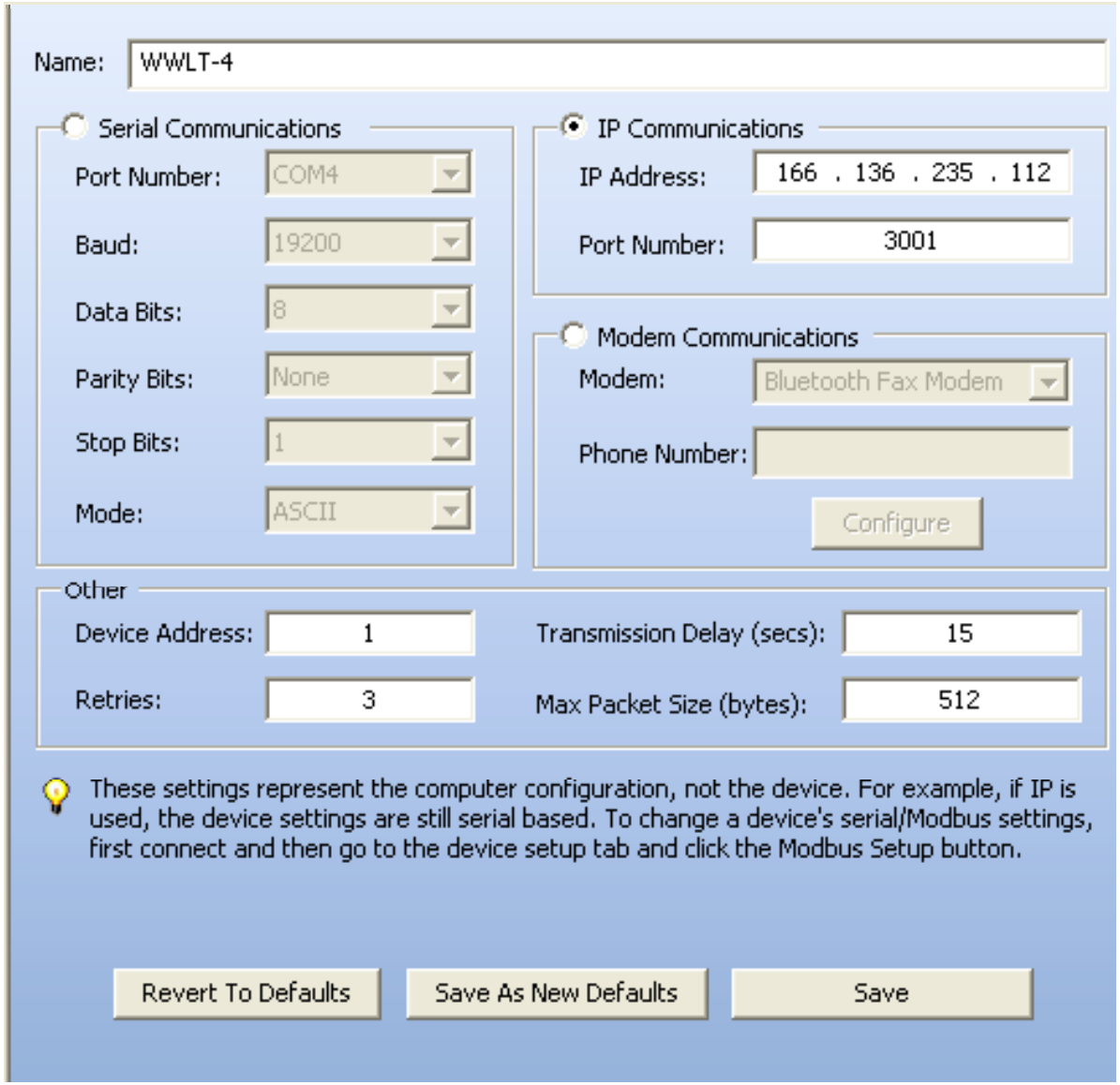
- On-line GIS data
- Wireless telecommunications
- Solar panels
- Artificial Neural Networks (ANN)

Process Schematic



Field Instrumentation

Telemetric Data Acquisition



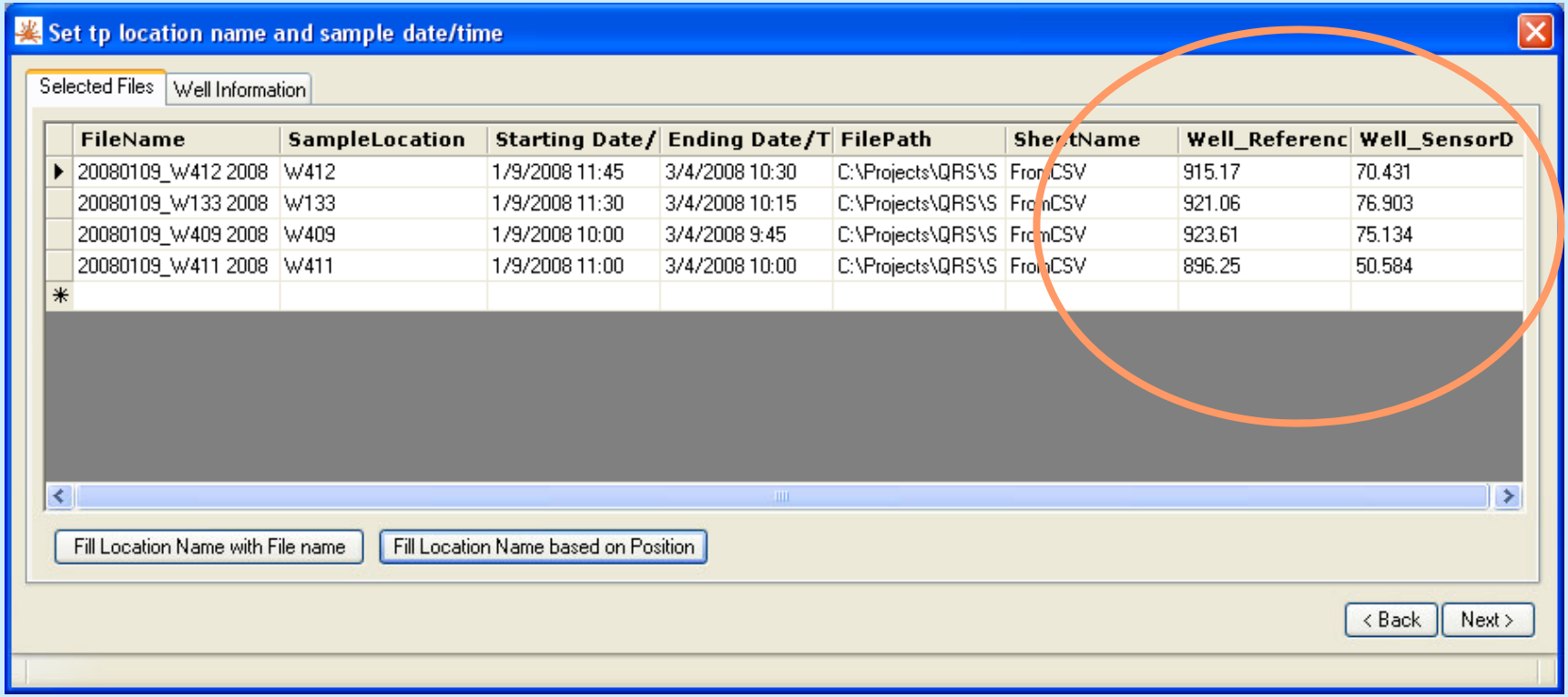
Software

- Campbell Scientific LoggerNet®
- Win-Situ TrollLink and Win-Situ 5 ®
- INW Aqua4Plus ®
- Microsoft Access ®, MySQ L ®, etc.
- EPIPHINY ®
- Aqua TruVue ®

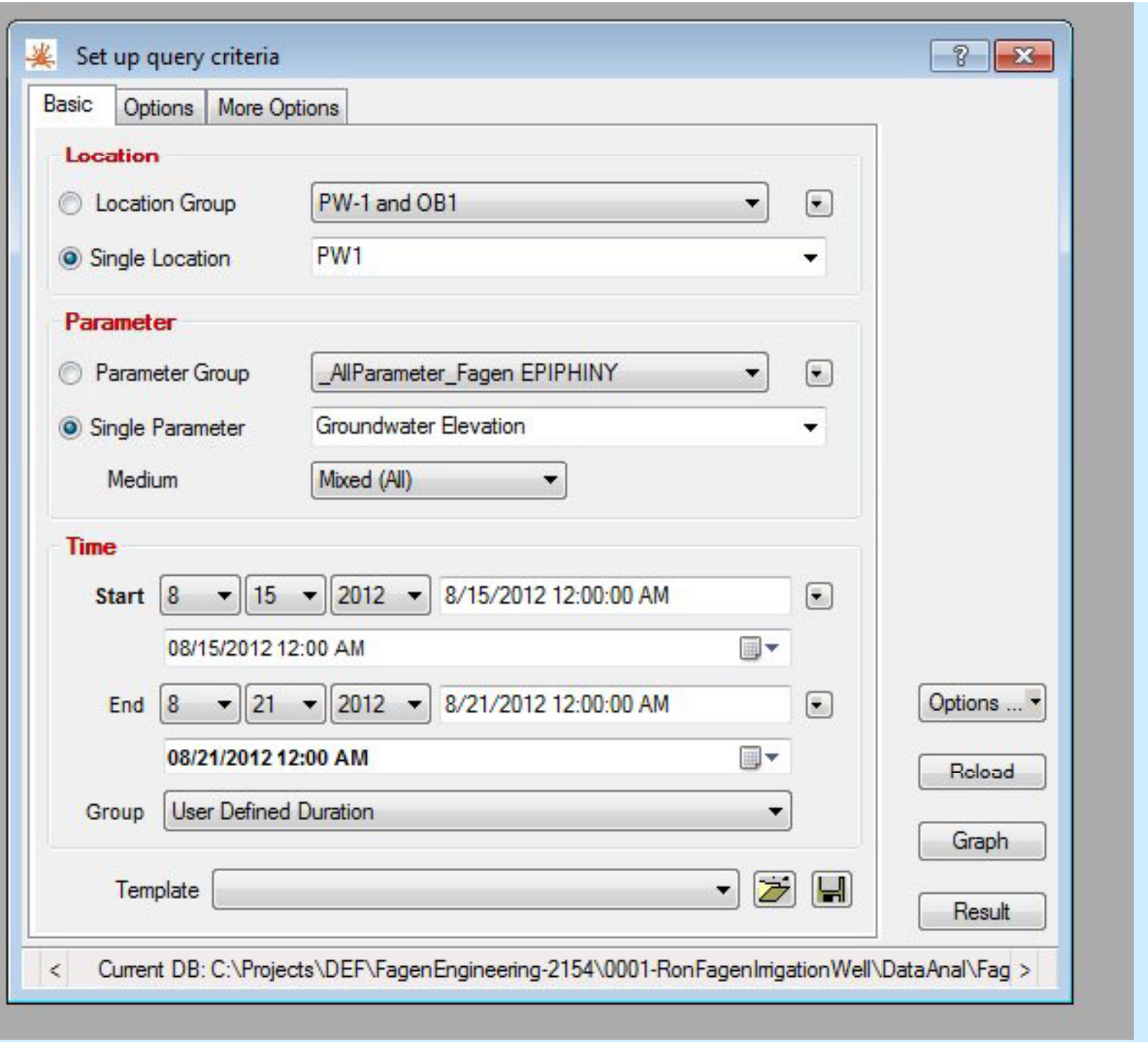
Need for Database Tool:

- Expedient data entry
- Relational database
- Ability to trend, graph, and export report-ready data
- Easily export data into GIS and modeling/visualization software

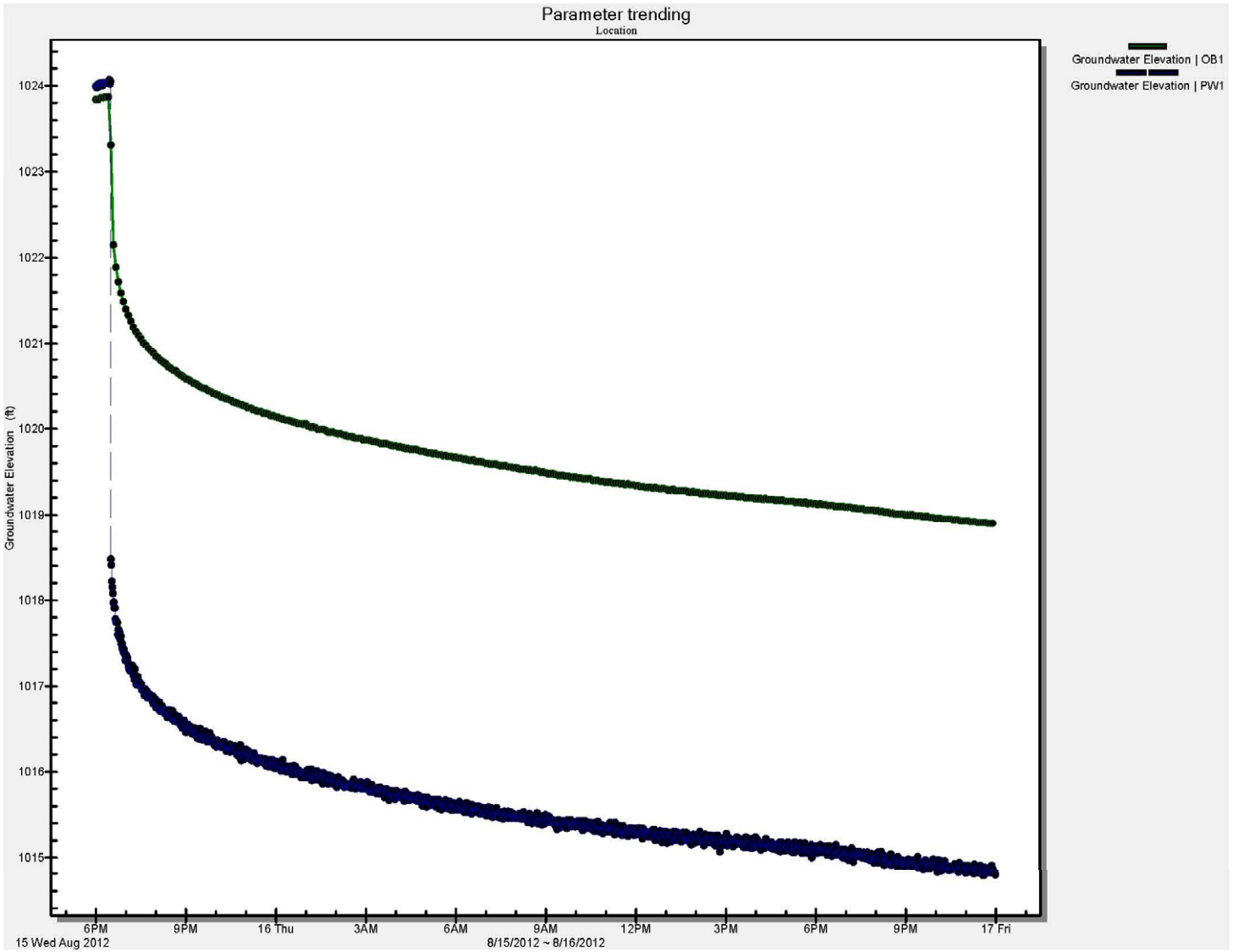
Sensor Data Import



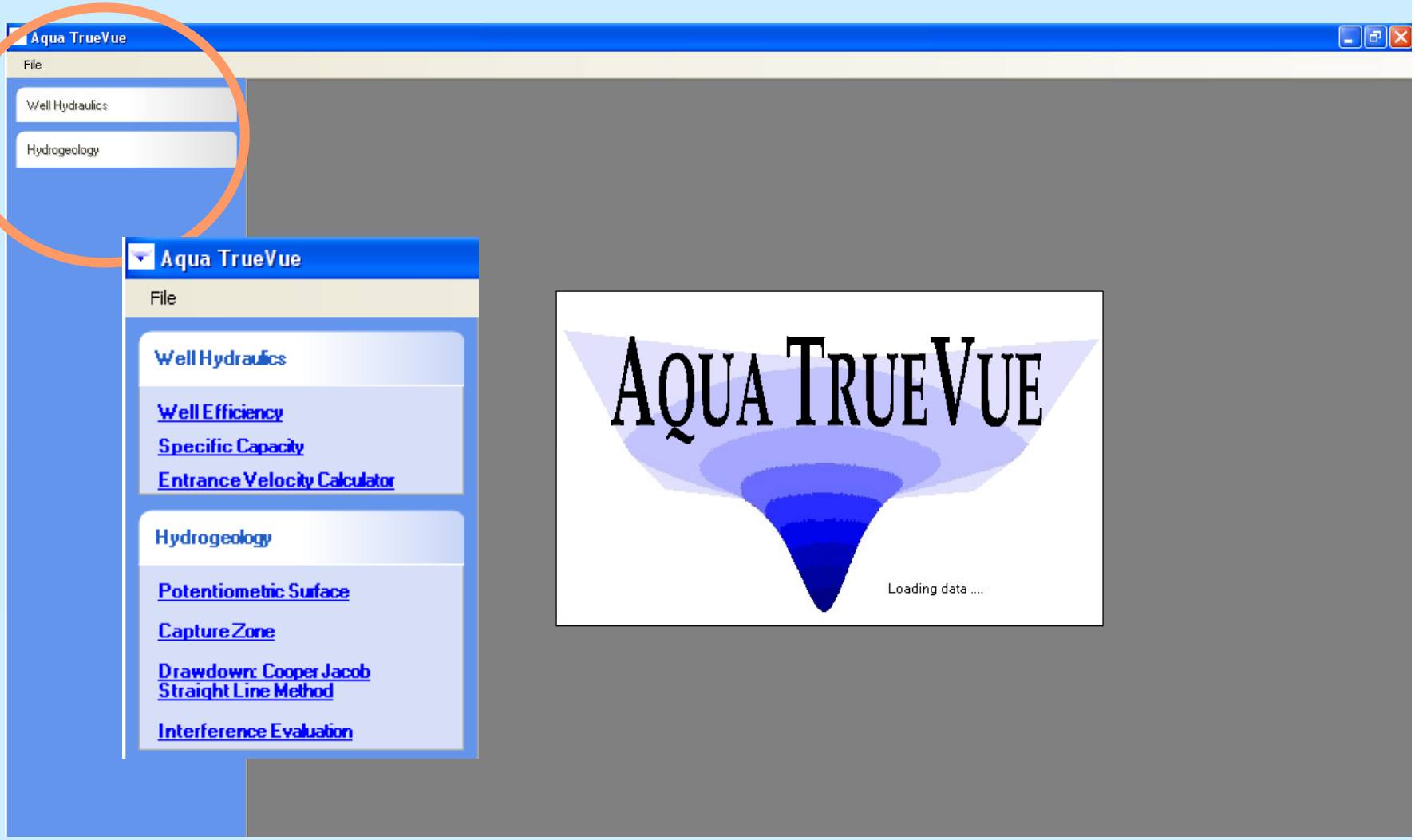
Field Operating Procedures are Important!


Set up query criteria
Basic
Options
More Options
Location
Location Group
PW-1 and OB1
Single Location
PW1
Parameter
Parameter Group
_AllParameter_Fagen EPIPHINY
Single Parameter
Groundwater Elevation
Medium
Mixed (All)
Time
Start
8
15
2012
8/15/2012 12:00:00 AM
08/15/2012 12:00 AM
End
8
21
2012
8/21/2012 12:00:00 AM
08/21/2012 12:00 AM
Group
User Defined Duration
Template
Options ...
Reload
Graph
Result
Current DB: C:\Projects\DEF\FagenEngineering-2154\0001-RonFagenIrrigationWell\DataAnal\Fag

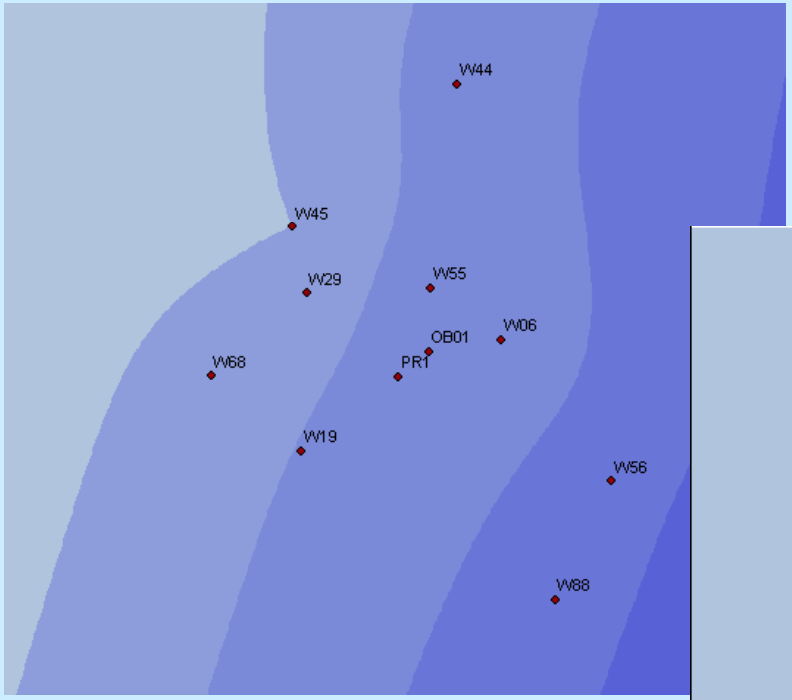
Data Trending



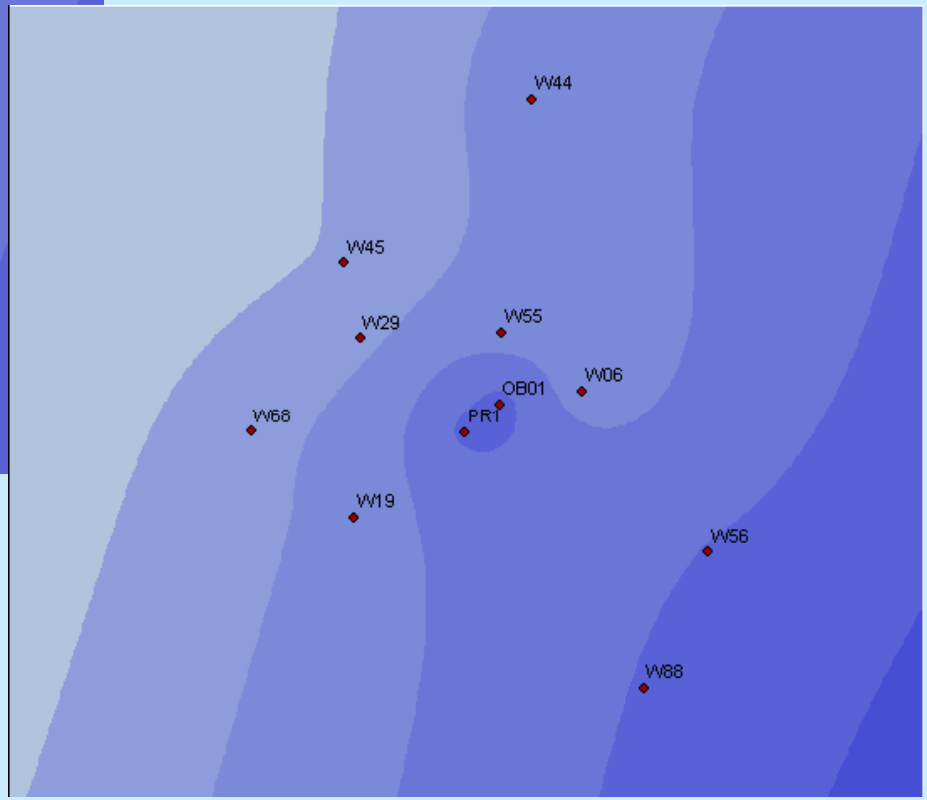
Well Hydraulics and Hydrogeologic Tools



Automated Potentiometric Surfaces



Static Conditions



Pumping Conditions (Linear Log Kriging)

Existing Field Applications

- Municipal (Water Supply and Water Rights)
- Mining (Characterization/Monitoring)
- Industrial (Water Supply/Remediation)
- Agricultural (Irrigation)
- Petroleum Refining/Distribution (Remediation)

Demonstration

Municipal Well Field

Setting: 11 water production wells

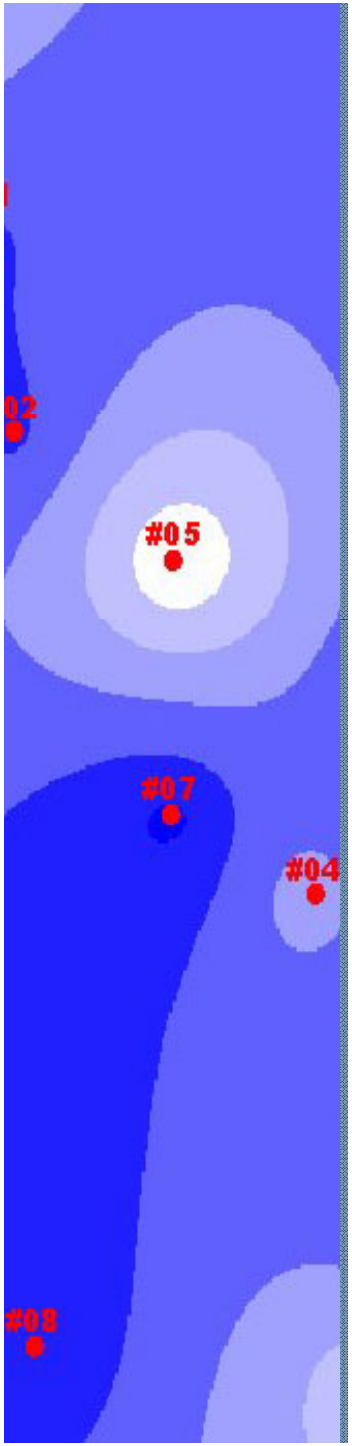
- Transducers continually logging water levels
- Campbell Scientific LoggerNet and Python scripts import data into EPIPHINY platform
- Aqua TrueVue contours data in real time and performs well hydraulic and aquifer parameter calculations

Summary

- Sensors are and will increasingly become available for a wide range of parameters
- Computing power and internet speeds will enable real-time modeling for both physical and chemical parameters
- By combining relational databases, kriging algorithms, and GIS, spatial analysis of continuous data streams is fast and efficient

Conclusions

- The ability to control and continuously monitor groundwater conditions leads to “smart” wellfields that learn over time
- The technology is as applicable to surface water, air quality, and noise as it is to groundwater



Point of Contact

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