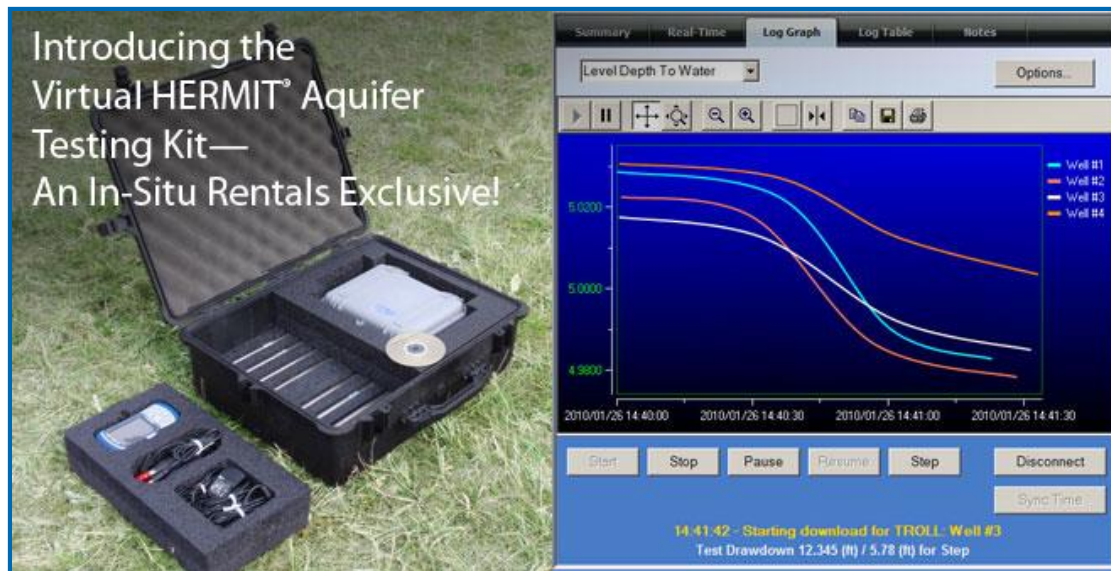


Real Time Monitoring of Aquifer: Direct Sensing Equipment



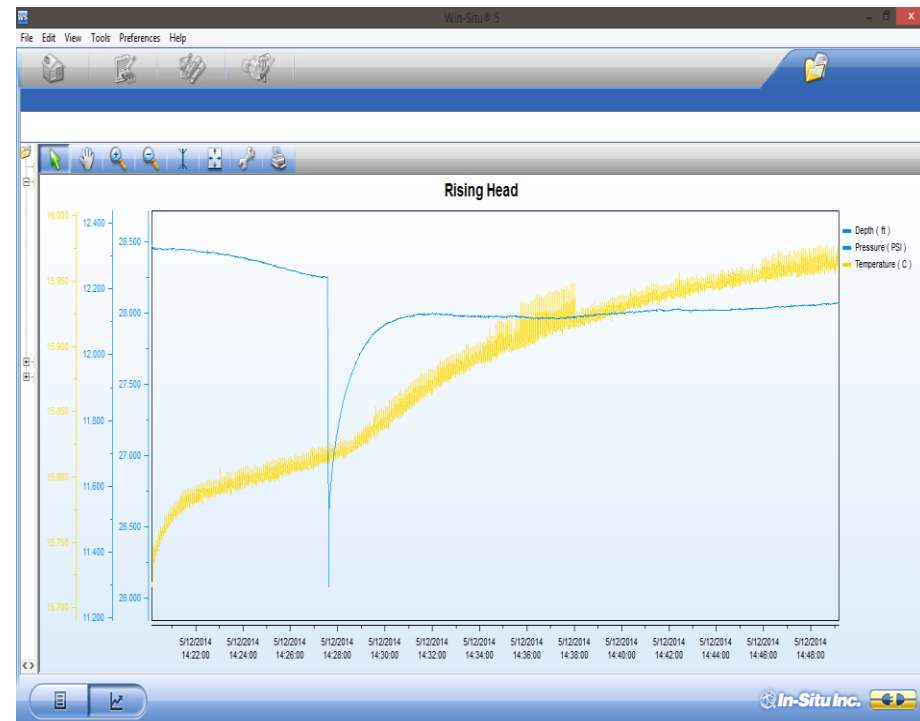
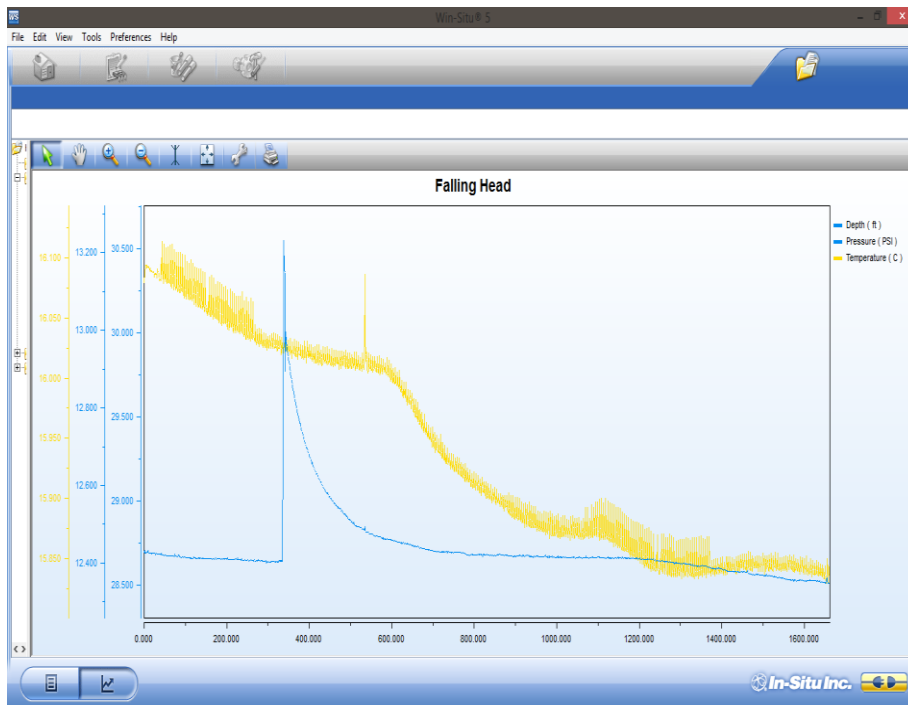
Traditional Aquifer Testing

- Individual Transducers
 - Slug Tests
 - Delayed Feedback
 - Individual records and graphs
 - Manpower
 - Time to reset and sync
- Water Level Tapes
 - Accuracy
 - Frequency
 - Data Management



Traditional Aquifer Testing

- Slug Test



Evolution of Aquifer Testing The Shrinking of a Hermit

- Original Aquifer Testing Kits Size
 - Van
 - Chest
 - Carry-on
 - Car Battery
 - Laptop



Virtual HERMIT Aquifer Testing Kit

- Use for step-drawdown tests, constant-rate pump tests and injection tests
- Simplifies set up and testing
- Steps a logarithmic log to account for pump and recovery data on the same log without reprogramming
- Streamlines data processing by synchronizing data files
- Win-Situ[®] 5 & Mobile compatible



Virtual HERMIT Aquifer Testing Kit



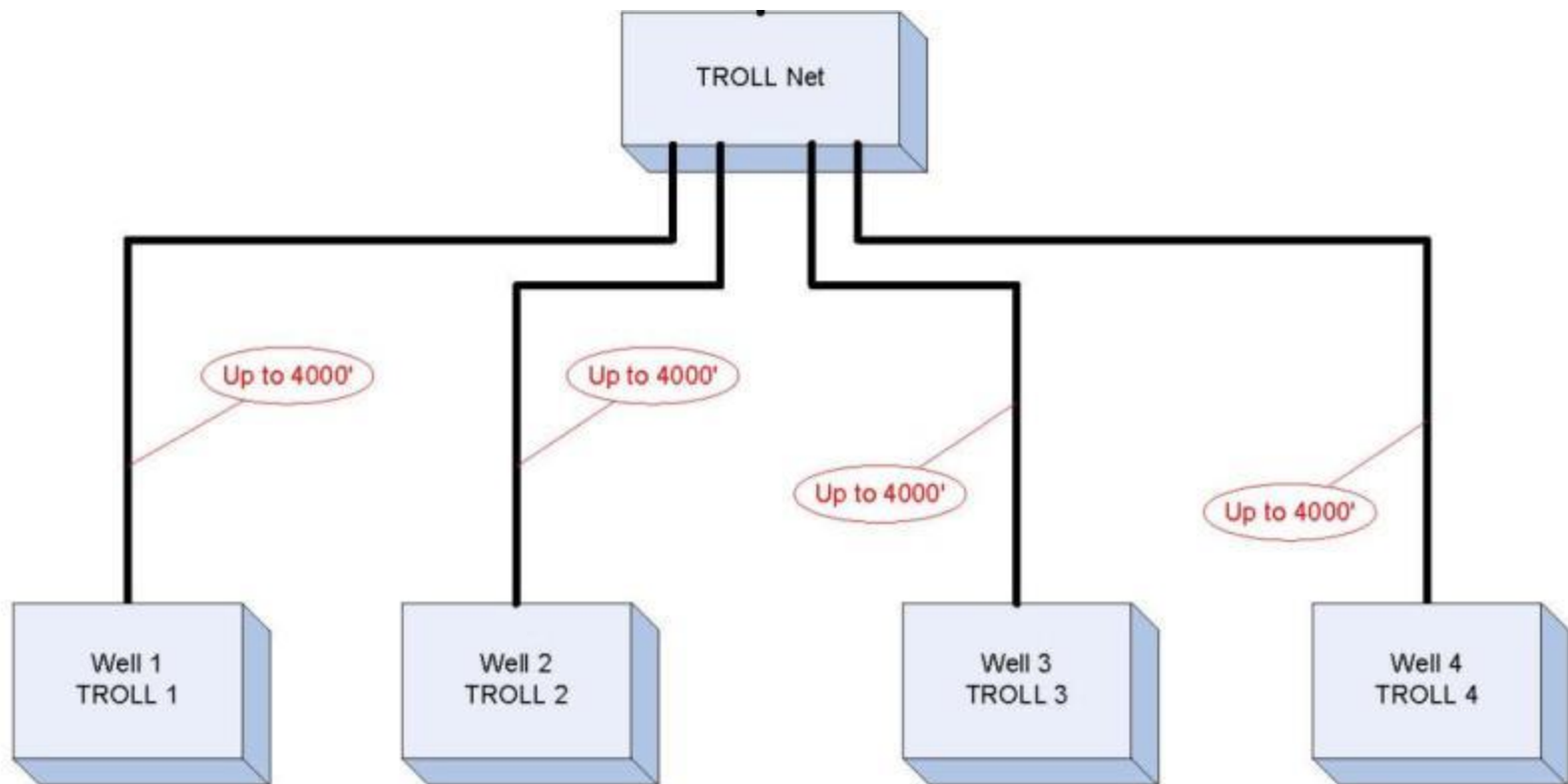
- Rental bundle includes:
 - Virtual HERMIT Software for PC
 - 8-port Rugged TROLL® Net Hub – Networks up to 8 Level TROLL 700s/hub
 - Vented Level TROLL 700 instruments
 - RuggedReader® Handheld PC (to download data from remote Level TROLL 700s where long cable lengths are impractical)
 - USB TROLL® Com
 - RS232 TROLL Com

Additional Equipment & Consumables

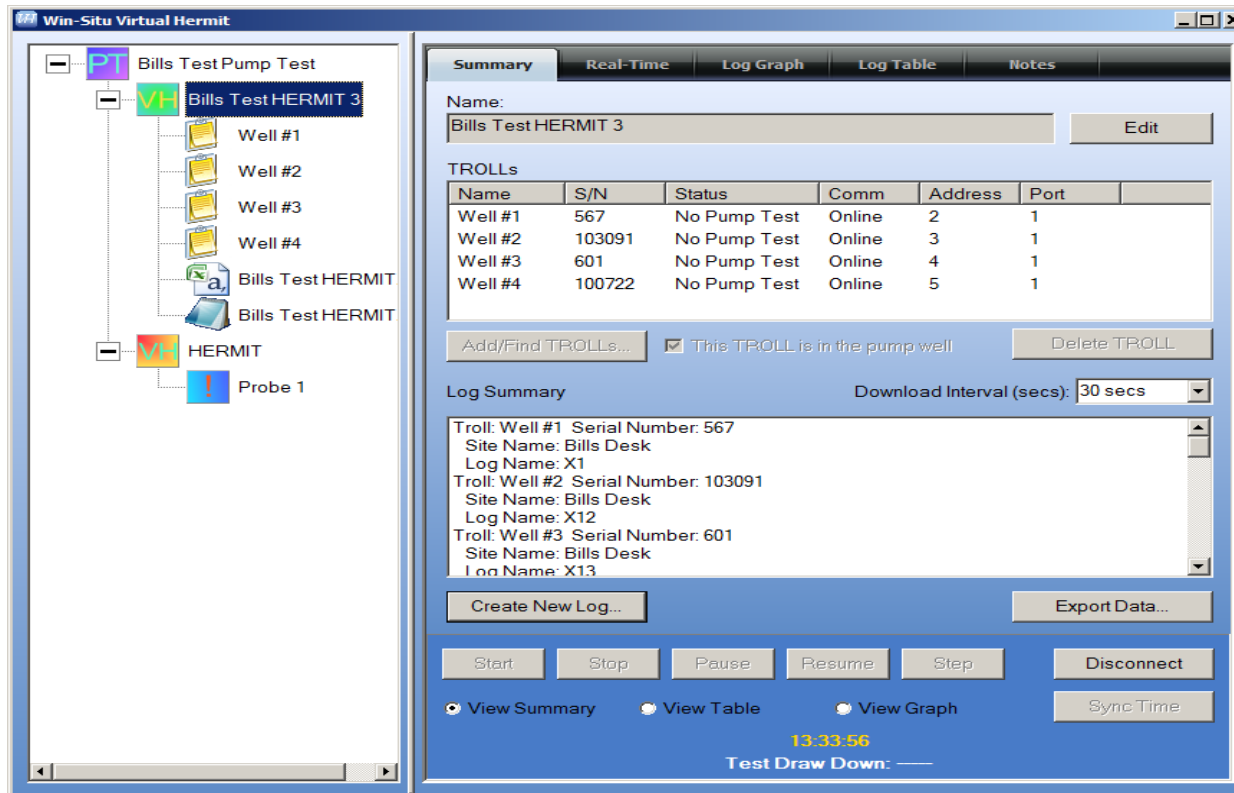
- Equipment
 - RuggedCable® System and cable extenders
 - Water level tape
 - BaroTROLL® Instrument
 - GPI flow meter
 - Pump
 - ◆ Geotech Geosub Sampling Pump & DC Controller
 - ◆ Grundfos® Redi-Flow2 Submersible Pump
 - PID detectors
- Consumables
 - Large desiccant for vented RuggedCable System
 - Submersible pump tubing



Rugged TROLL Net Hub – Networks Multiple Devices



Virtual HERMIT Software



Win-Situ Virtual Hermit

Summary | Real-Time | Log Graph | Log Table | Notes

Name: Bills Test HERMIT 3 Edit

Name	S/N	Status	Comm	Address	Port
Well #1	567	No Pump Test	Online	2	1
Well #2	103091	No Pump Test	Online	3	1
Well #3	601	No Pump Test	Online	4	1
Well #4	100722	No Pump Test	Online	5	1

Add/Find TROLLs... This TROLL is in the pump well Delete TROLL

Log Summary Download Interval (secs): 30 secs

Troll: Well #1 Serial Number: 567
Site Name: Bills Desk
Log Name: X1
Troll: Well #2 Serial Number: 103091
Site Name: Bills Desk
Log Name: X12
Troll: Well #3 Serial Number: 601
Site Name: Bills Desk
Log Name: X13

Create New Log... Export Data...

Start Stop Pause Resume Step Disconnect

View Summary View Table View Graph Sync Time

13:33:56
Test Draw Down: —

- Connect up to 16 Level TROLL 700 instruments to each “HERMIT” when connecting 2 or more Rugged TROLL Net Hubs.
- Limitless number of “HERMITs” can be associated with each aquifer test.

Virtual HERMIT Aquifer Testing Kit – Highlights



- Simplifies testing
 - Monitors an entire well field with one system
 - Simultaneously configures all Level TROLL 700s
 - Simultaneously starts, steps, or stops all Level TROLL 700s
- Reduces field time and saves money
 - Steps a logarithmic log to account for pump and recovery data on the same log without reprogramming
 - Facilitates real-time troubleshooting and adjustments to aquifer test protocols
 - Minimizes data processing – Time-synchronized data logs are exported to a single file

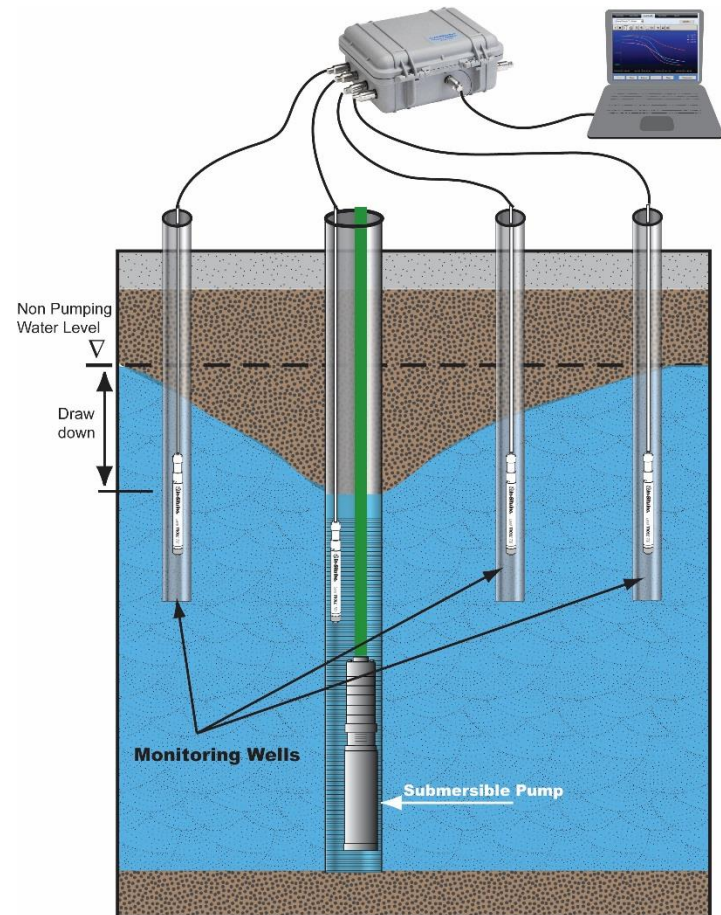
Virtual HERMIT Aquifer Testing Kit – Highlights

- Offers expert functionality
 - Displays real-time data of all Level TROLL 700s on a single graph/table
 - Automates drawdown calculations
 - Allows fast data downloads, even while the test is running
 - Collects closely-spaced drawdown measurements for constant-rate or step tests
 - Digitizes note-taking and report preparation



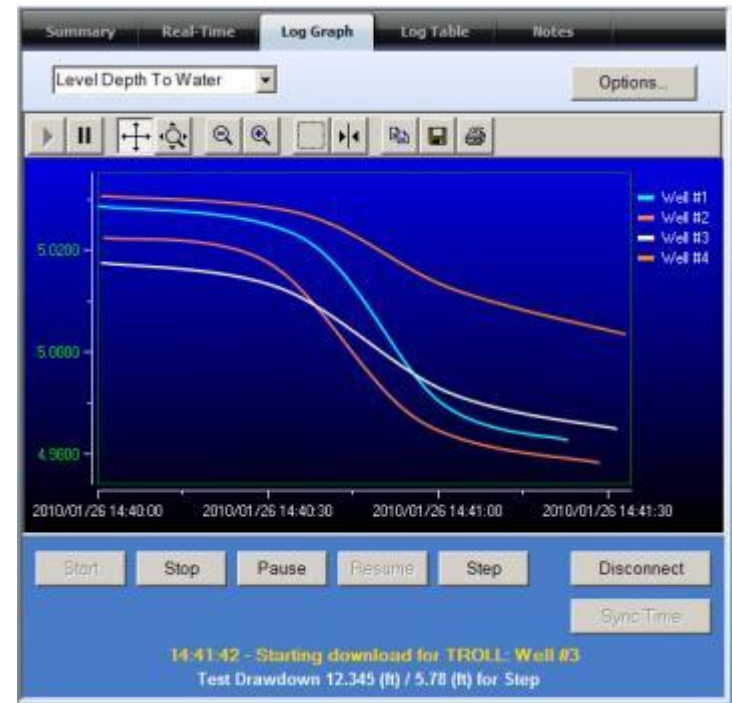
Manages Unique Situations

- Collects data during aquifer recovery—Disconnect and secure laptop PC, Rugged TROLL Net Hub, and cables.
 - Level TROLL 700s continue to log data while locked inside wells.
- Allows for data collection at difficult to reach sites.
 - Instruments can be set up in wells prior to the test and set to start logging data at a pre-determined time. After recovery, data is downloaded and merged with other level data.



Compatibility

- Must configure logs with Virtual HERMIT Software
- Data logs in Level TROLL Instruments work normally with:
 - Win-Situ 5 Software
 - Win-Situ Mobile Software
 - Win-Situ Sync Software
 - Win-Situ Baro Merge[®] Software



Additional Information

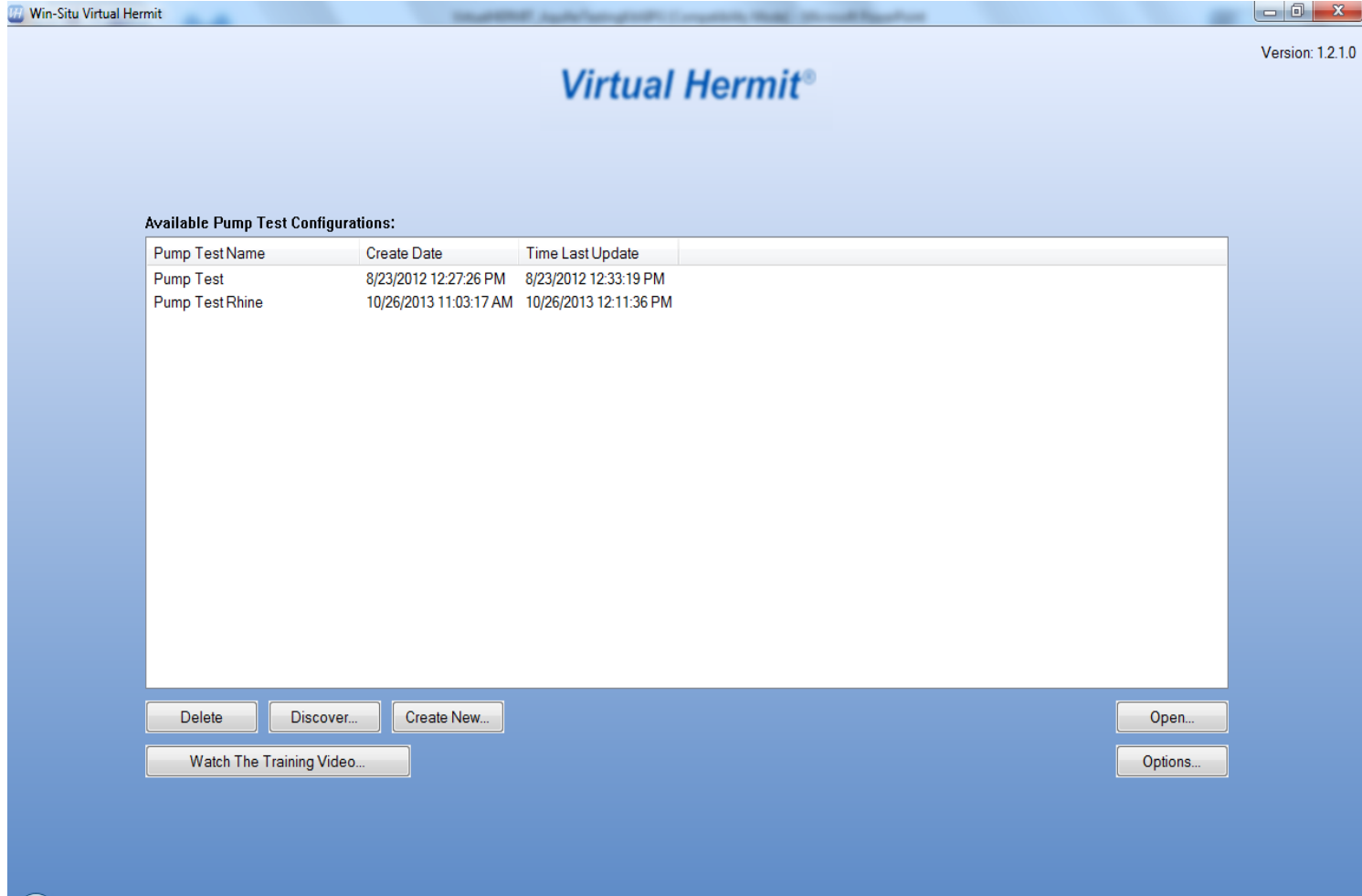
- Supports only Level TROLL 700s from In-Situ Rentals
- Virtual HERMIT Software available only from In-Situ Rentals
- Maximum 16 Level TROLL 700s per “HERMIT”
- All instruments within a “HERMIT” must be running the same log type
- Integrates BaroTROLL Instrument for barometric pressure compensation.
 - Use barometric pressure to calculate barometric efficiency for confined/semi-confined systems (requires aquifer test analysis software).
- No wireless support



Pricing – Virtual HERMIT Aquifer Testing Kit

Part Number	Description	Rental Rate (Daily/Weekly/Monthly/Daily after 31days)
0089940	Virtual HERMIT activation fee	\$110/\$330/\$990/\$31.50
0087750	Rugged TROLL Net Hub	\$150/\$450/\$1350/\$40
Pressure sensor dependent	Level TROLL 700	\$50/\$150/\$450/\$14.50
0071870	BaroTROLL Instrument	\$40/\$120/\$360/\$11.50
0059230	RuggedReader Handheld	\$40/\$120/\$360/\$11.50
0052500 or 0056140	USB or RS232 TROLL Com	\$0
Varies by length	Rugged Cable	\$30/\$90/\$270/\$8.50

Virtual Hermit First Screen



Win-Situ Virtual Hermit

Version: 1.2.1.0

Virtual Hermit®

Available Pump Test Configurations:

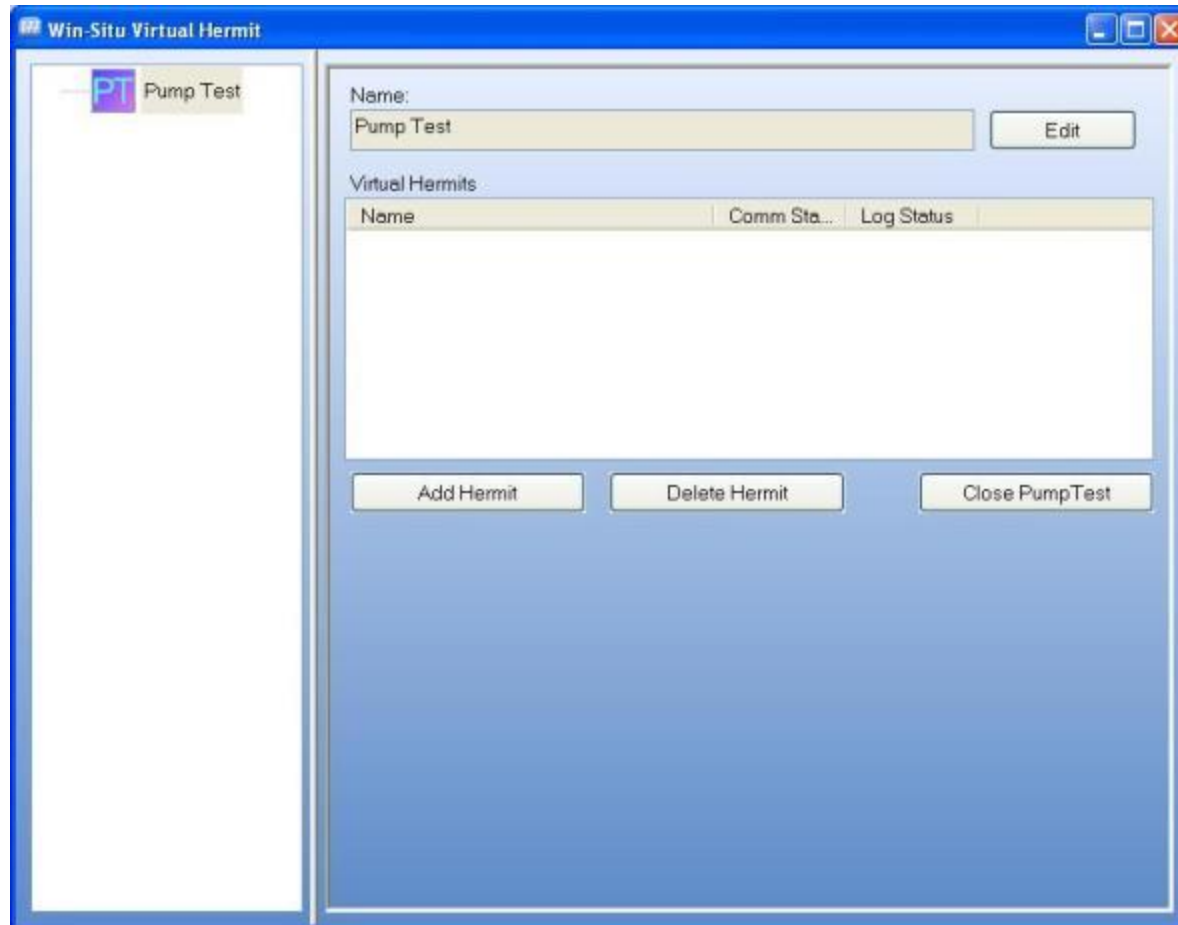
Pump Test Name	Create Date	Time Last Update
Pump Test	8/23/2012 12:27:26 PM	8/23/2012 12:33:19 PM
Pump Test Rhine	10/26/2013 11:03:17 AM	10/26/2013 12:11:36 PM

Delete Discover... Create New... Open... Watch The Training Video... Options...

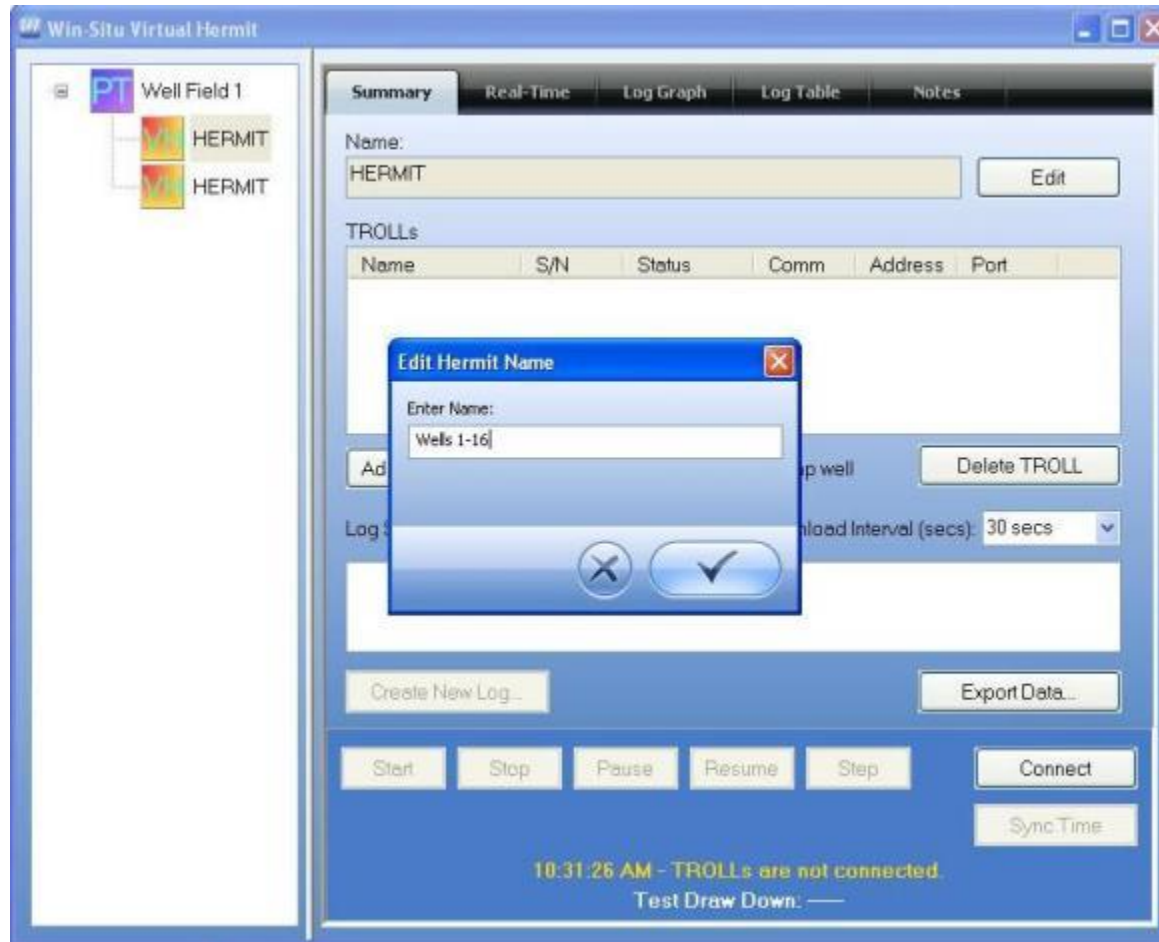
Search



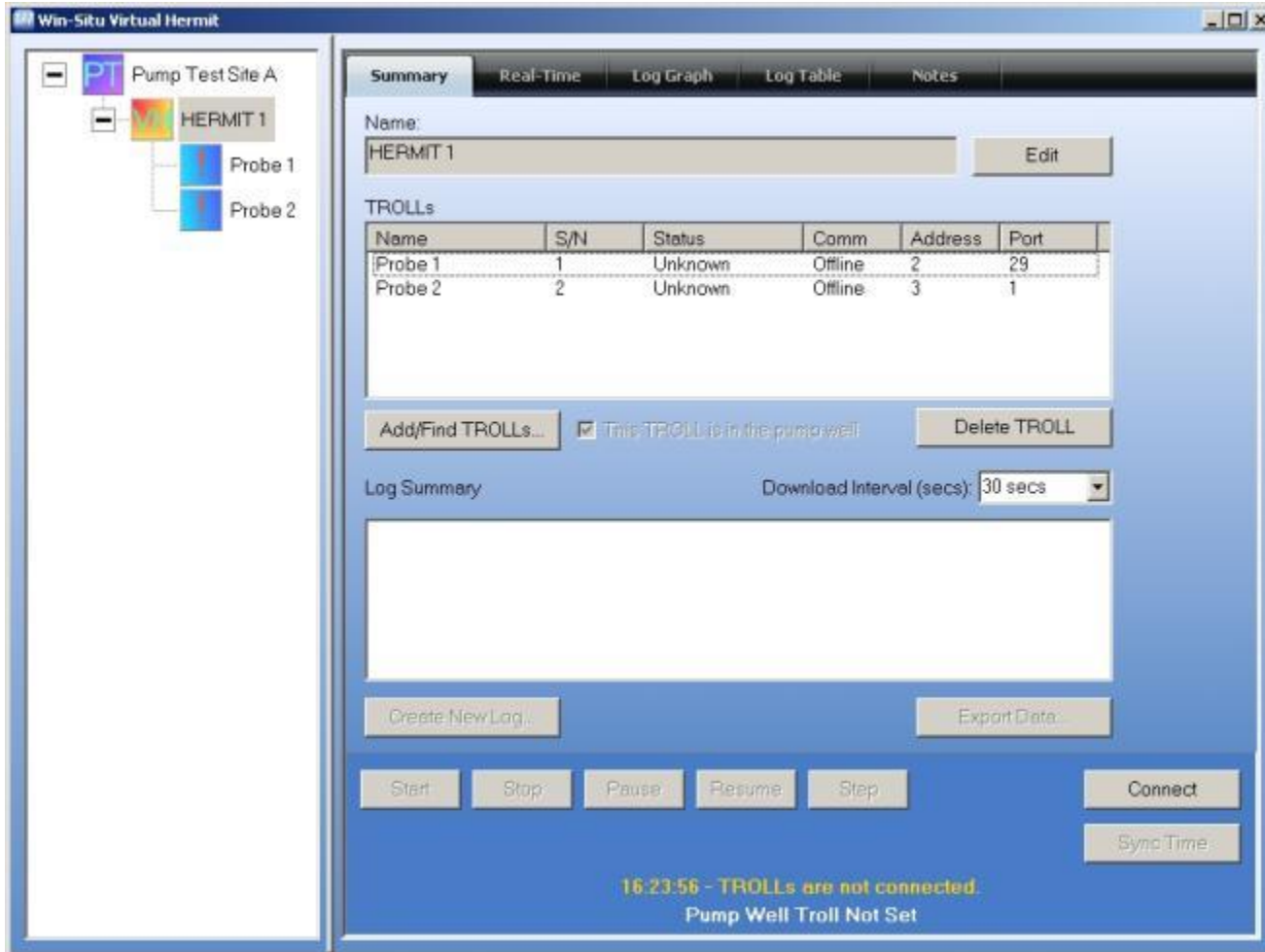
Configure



Configure



Run Multiple Probes



The screenshot shows the Win-Situ Virtual Hermit software interface. On the left, a tree view shows the hierarchy: Pump Test Site A (PT) containing HERMIT 1, which in turn contains Probe 1 and Probe 2. The main window has several tabs: Summary (selected), Real-Time, Log Graph, Log Table, and Notes. The Summary tab displays the following information:

Name: HERMIT 1 [Edit]

TROLLs

Name	S/N	Status	Comm	Address	Port
Probe 1	1	Unknown	Offline	2	29
Probe 2	2	Unknown	Offline	3	1

Buttons: Add/Find TROLLs..., This TROLL is in the pump well, Delete TROLL

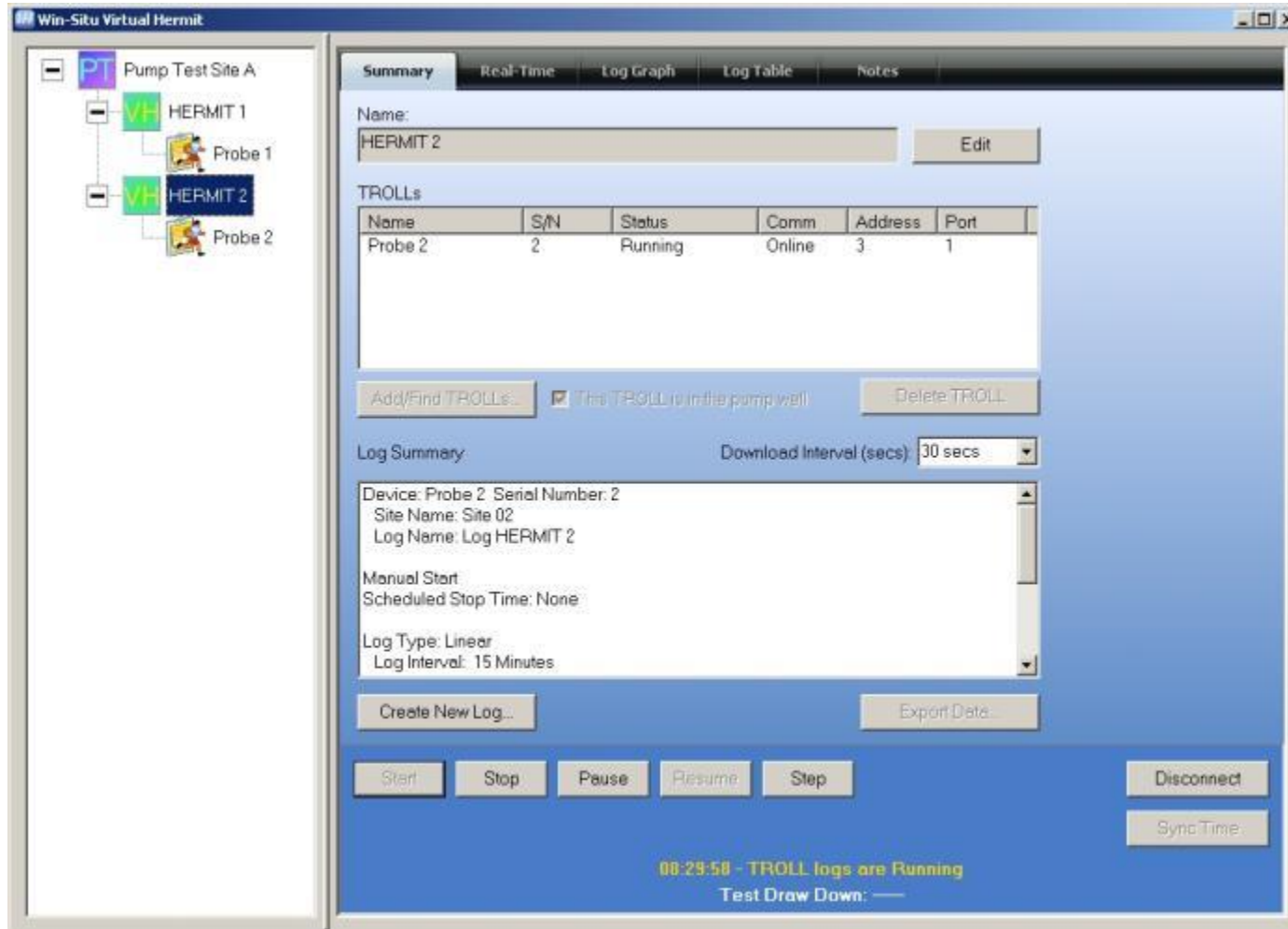
Log Summary Download Interval (secs): 30 secs

Buttons: Create New Log..., Export Data...

Buttons: Start, Stop, Pause, Resume, Step, Connect, Sync Time

Status: 16:23:56 - TROLLs are not connected.
Pump Well Troll Not Set

Run Multiple HERMITs



The screenshot shows the Win-Situ Virtual Hermit software interface. On the left, a tree view shows a hierarchy: Pump Test Site A (PT) containing two Virtual Hermit (VH) units, HERMIT 1 and HERMIT 2. HERMIT 1 is connected to Probe 1, and HERMIT 2 is connected to Probe 2. The main window displays the configuration for HERMIT 2.

Summary | Real-Time | Log Graph | Log Table | Notes

Name: HERMIT 2 [Edit]

TROLLs

Name	S/N	Status	Comm	Address	Port
Probe 2	2	Running	Online	3	1

Add/Find TROLLs... This TROLL is in the pump well [Delete TROLL]

Log Summary: Download Interval (secs): 30 secs

Device: Probe 2 Serial Number: 2
Site Name: Site 02
Log Name: Log HERMIT 2

Manual Start
Scheduled Stop Time: None

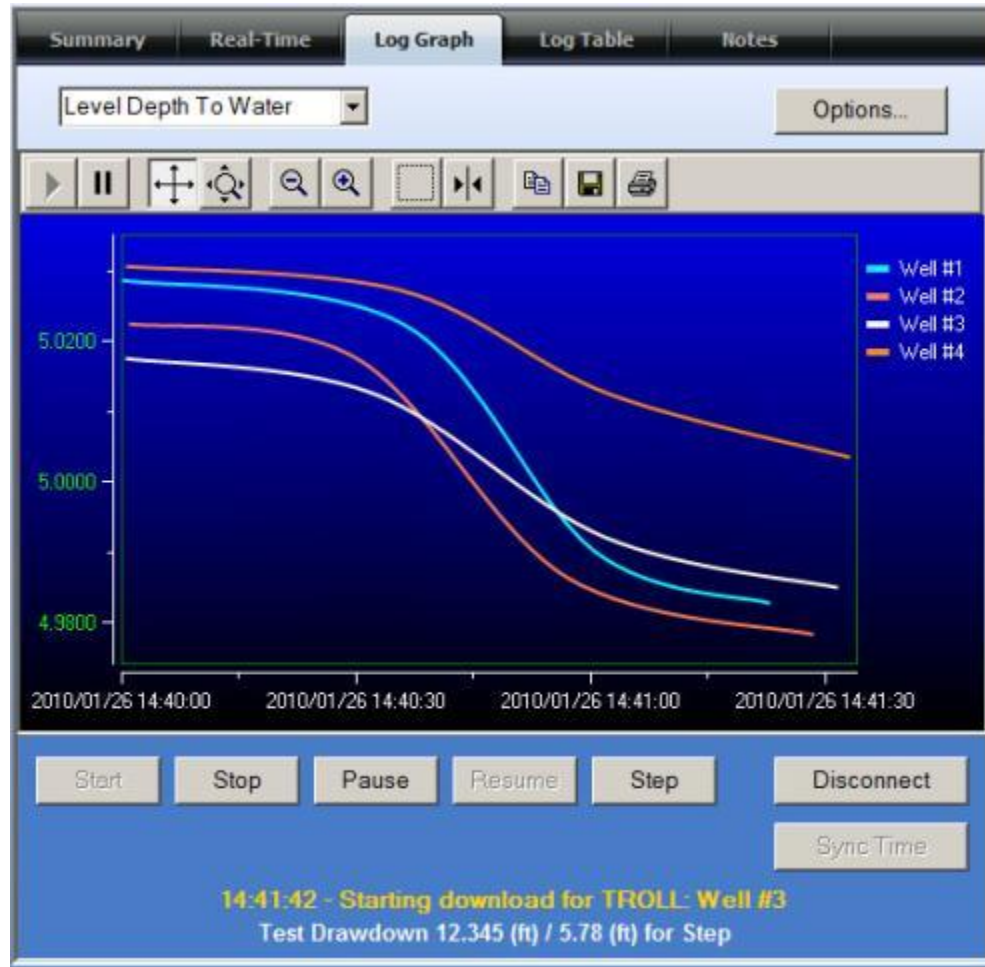
Log Type: Linear
Log Interval: 15 Minutes

[Create New Log...] [Export Data...]

[Start] [Stop] [Pause] [Resume] [Step] [Disconnect] [Sync Time]

00:29:58 - TROLL logs are Running
Test Draw Down: —

Data Analysis



Aquifer Characterization—Step-Drawdown Test

Purpose: To determine well performance under pumping conditions, to determine well losses in the pumped well, and to design the optimal pumping rate for a constant-rate test or long-term pumping rate of an extraction/injection well. Tests are usually of short duration.

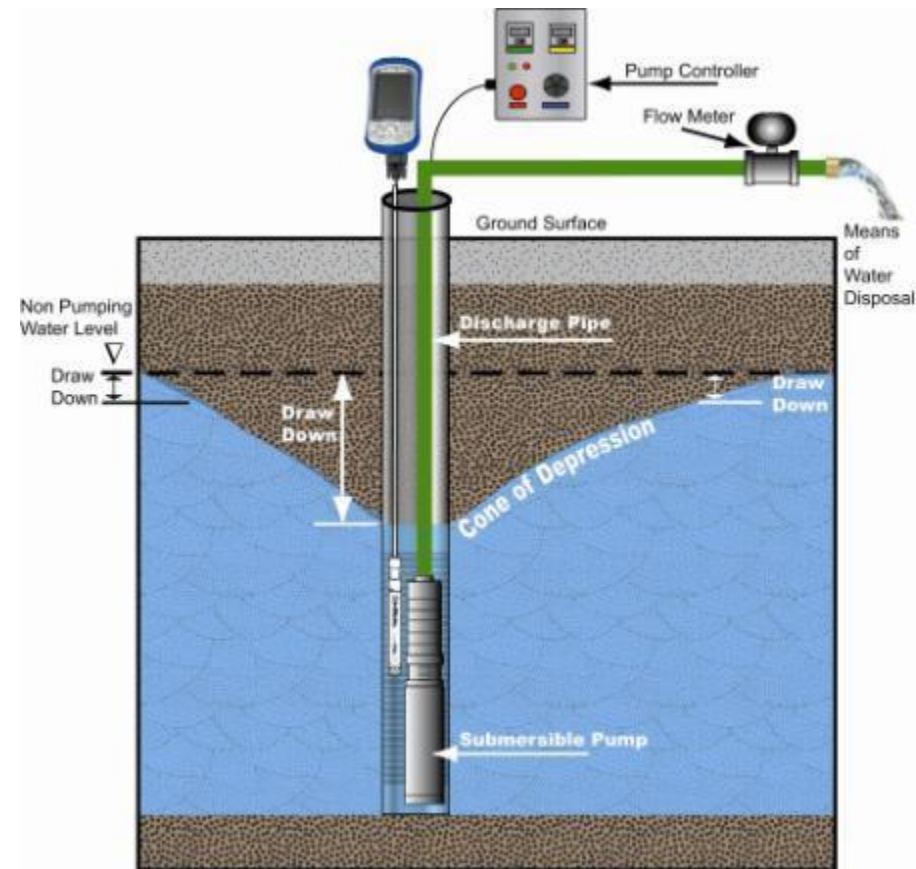
Method/Steps: A pumping well is instrumented with Level and Temperature sensors. The well is pumped at increasing step rates for a given period of time. The drawdown is calculated for each pumping rate. The aquifer's response or drawdown is measured to determine well efficiency or the effective pump rate for a constant rate pump test.

Logging Type: Logarithmic with restart function in pumping well.

User: Consultants

Recommended System: Level TROLL 700

Considerations: Always recommend a vented system for this application.



Aquifer Characterization—Constant-Rate Pumping Test

Purpose: Preferred option for estimating hydraulic properties of aquifer systems and for identifying boundaries. Typically performed after a step-drawdown test. Pumping tests deliver a more accurate hydraulic conductivity value (K) compared to slug tests. The constant-rate test is also used to determine transmissivity (T), hydraulic conductivity (K), the storage coefficient (S), and other hydrologic parameters. Used to verify yield of a production well and long-term sustainability of an aquifer.

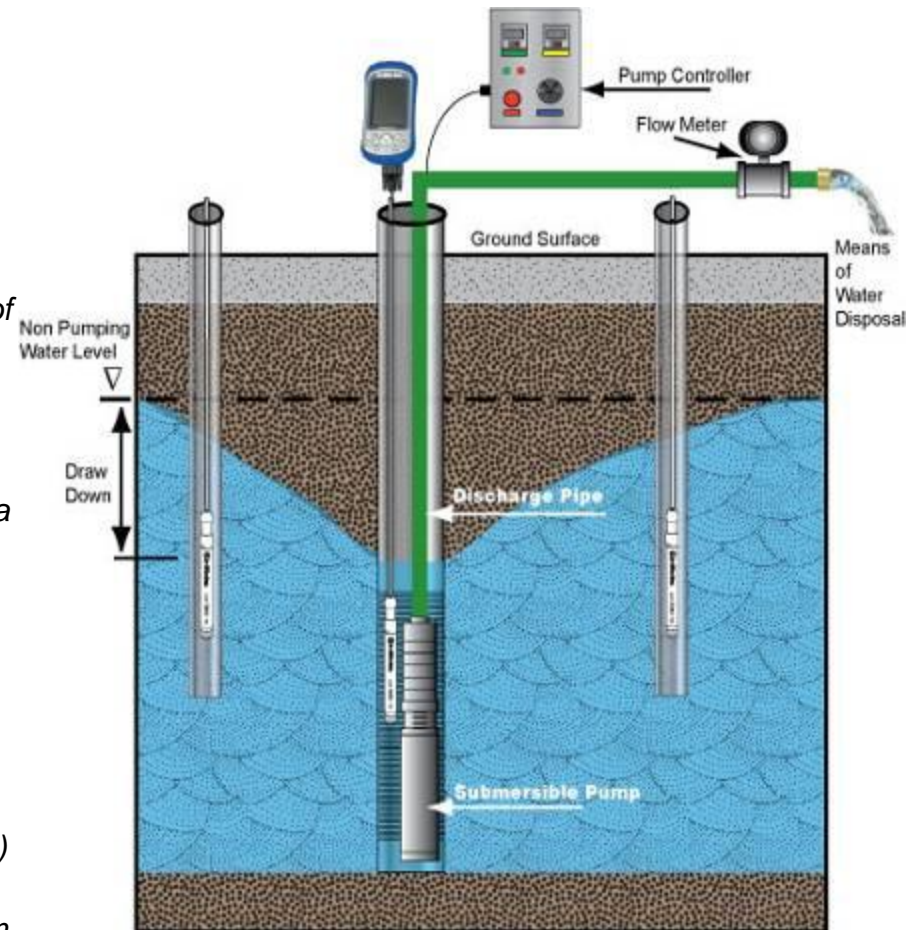
Method/Steps: A pumping well and monitoring wells are instrumented with Level and Temperature sensor. The pumping well is pumped at a constant rate, and water level data is collected in the pumping well and monitoring wells.

Logging Type: Logarithmic or Step Linear

User: Consultants

Recommended System: Virtual Hermit, Level TROLL 700 (pumping well) Level TROLL 500 (monitoring wells)

Considerations: Always recommend a vented system for this application.



Using Aquifer Characterization Data

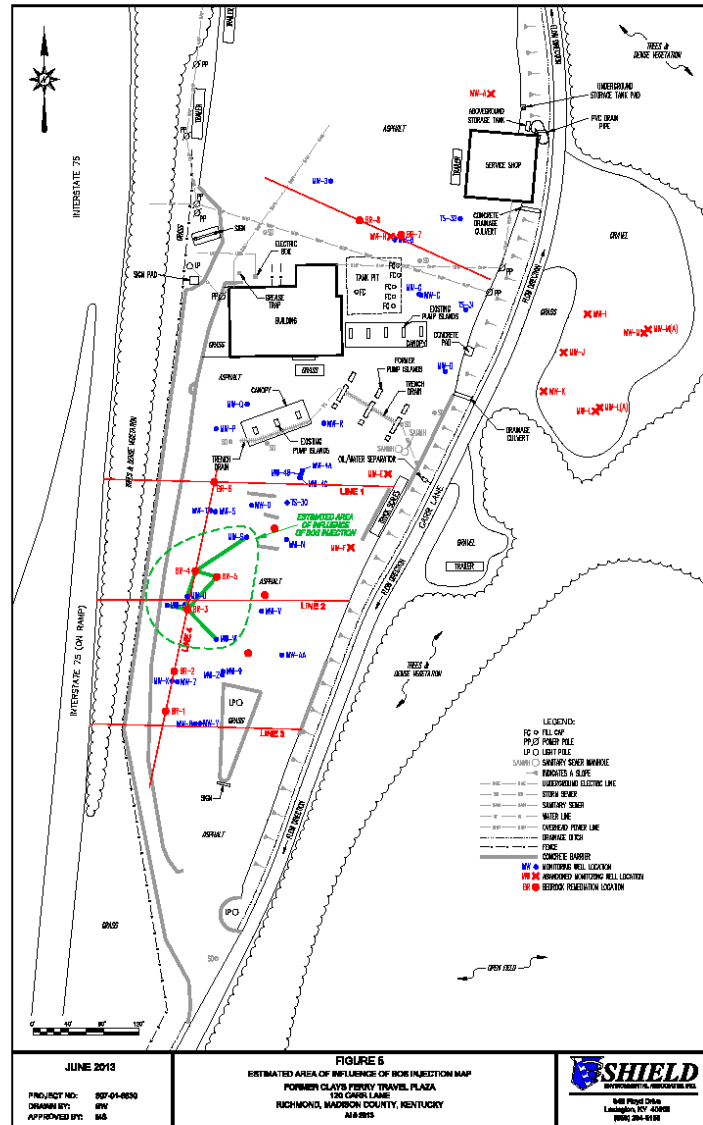
- Assess environmental impacts
 - Contaminated sites
 - Groundwater development projects – Municipal, agricultural, industrial
 - Groundwater dewatering – Construction, mining
- Assess hydrologic feasibility
 - Groundwater development projects
 - Groundwater dewatering
 - In-situ mining
- Determine
 - Well placement
 - Well efficiency
 - Pumping rates
 - Groundwater velocity
 - Impact to nearby wells



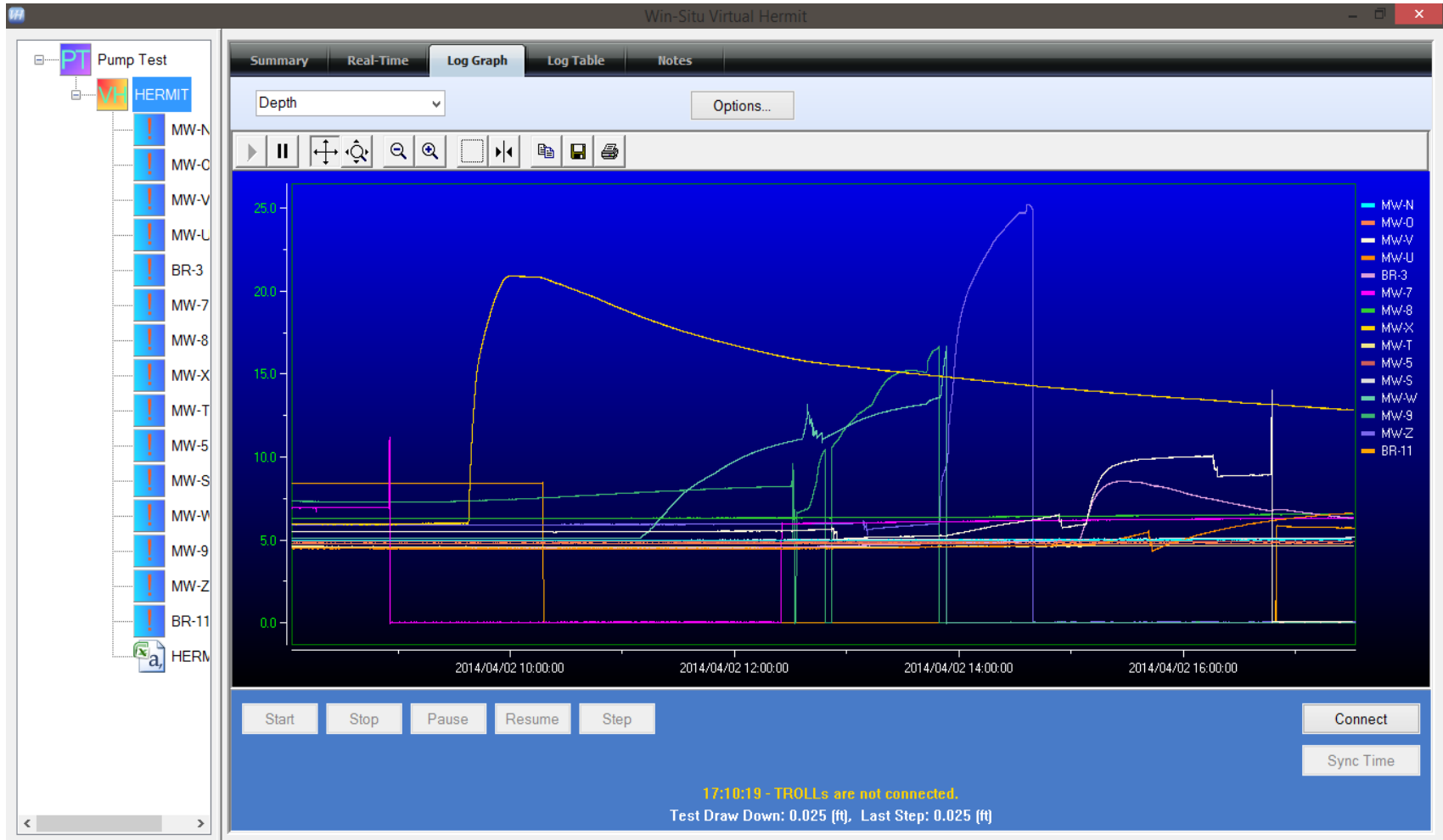
Case Study Clays Ferry Truck Stop

Shield Environmental Associates – Mark Sweet

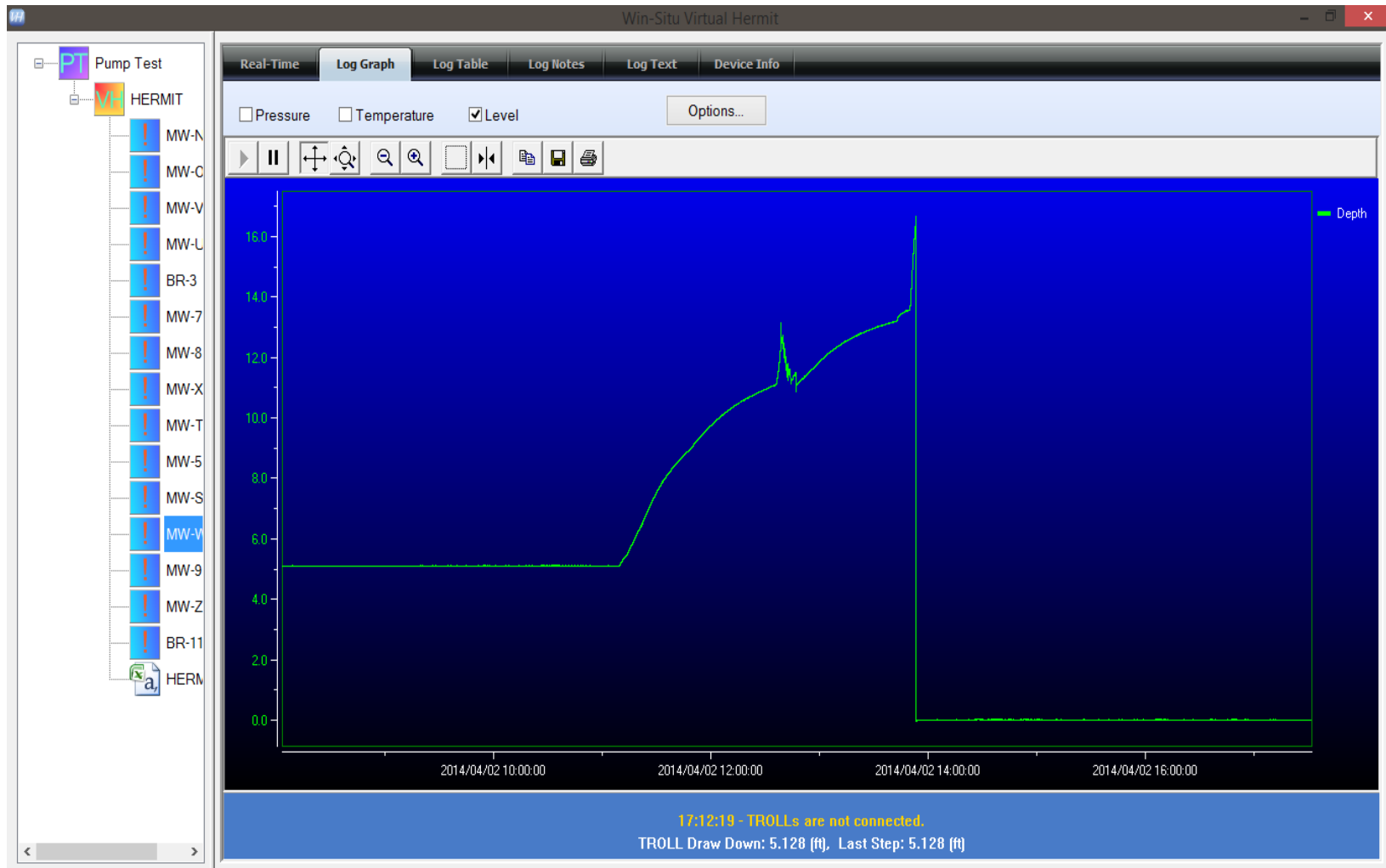
**Truck Stop, BTEX
Groundwater Conc 6 mg/L
60, 000 sq ft
Fractured Bedrock**



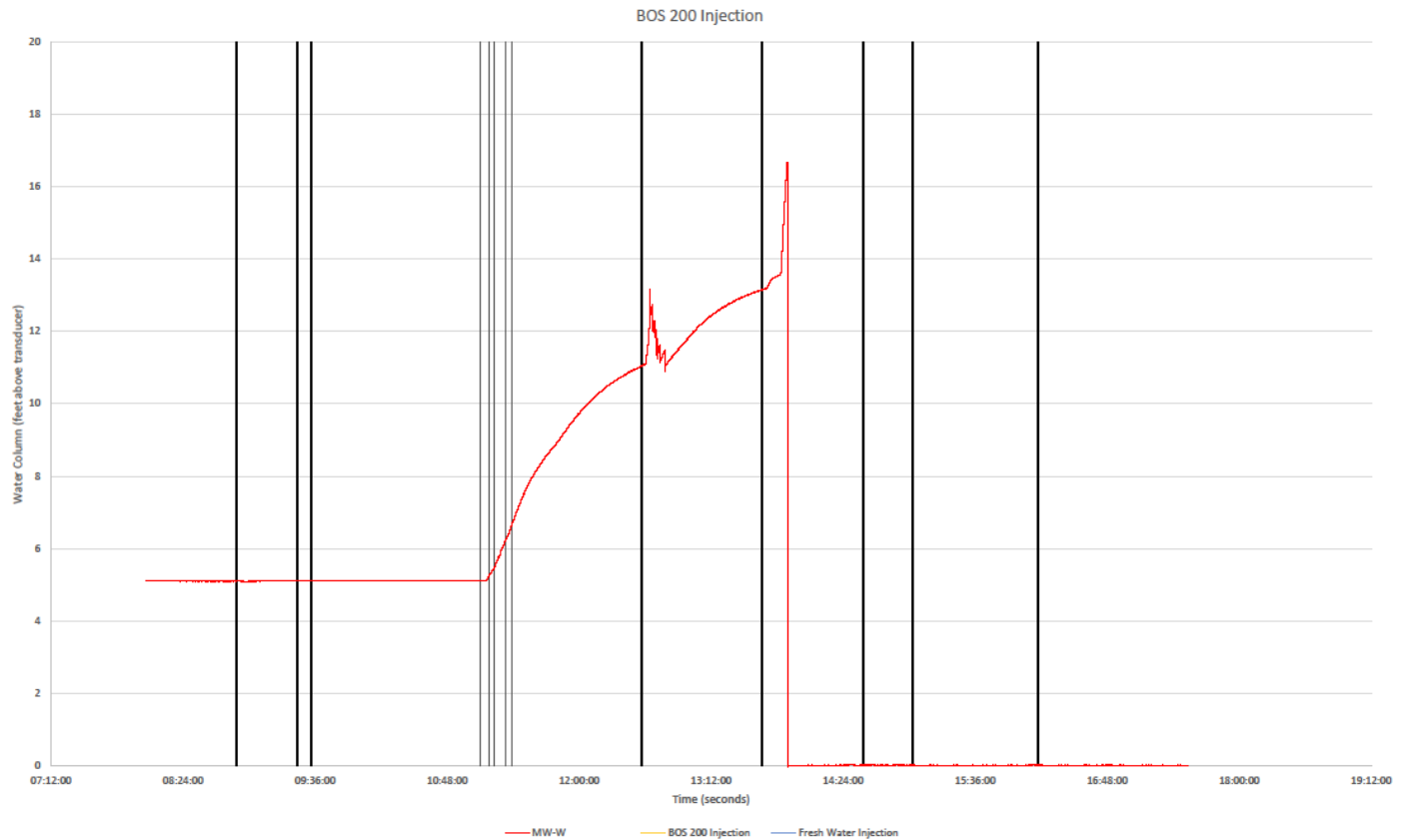
Case Study, Clays Ferry Truck Stop



Case Study, Clays Ferry Truck Stop



Case Study, Clays Ferry Truck Stop



In-Situ



- Dave Vogel
- dvogel@in-situ.com, 608-807-8949