EPA Environmental Response Team's Viper Data Management System and Snapper Air Sampling Platform

Informational briefing on the capabilities of ERT's sensor data management system

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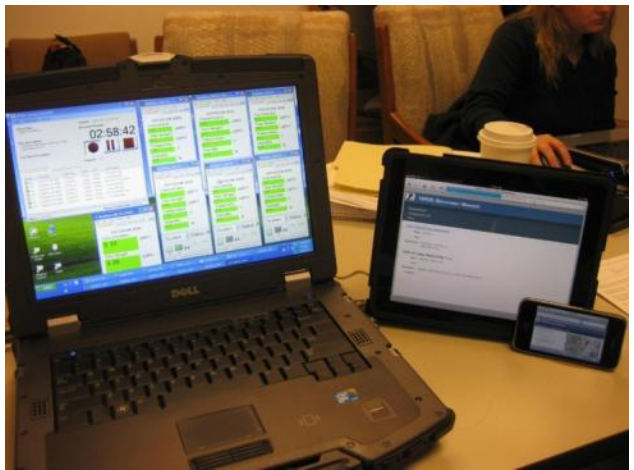
Environmental Response Team



Sensor Data Challenges for Superfund

- Volume of data
- Real-time does not always mean “real-time”
- Raw data does not correspond to our human health benchmarks
- Time required to acquire, store, transform and re-format for dissemination

Addressing the Challenges: VIPER

- ERT developed and launched VIPER in 2011
- VIPER was built to
  - Handle the unique volume & frequency inherent to sensor data
  - Utilize federal data standards
  - Require no core system modification for new sensor types
  - Provide monitoring data in real-time
    - Processes data for comparison to human health benchmarks
    - Can immediately determine exceedances of health-based benchmarks and notify users of the exceedances

Instrument + Telemetry + Translation

= VIPER!

Integrating Instruments

- Most common setup uses equipment from Safe Environment Engineering
- Vendor provides telemetry hardware and software to translate native instrument signal into the standard format
- Full list available at www.safeenv.com
- Connecting VIPER to existing data acquisition networks and vendor's telemetry system is possible and has been done many times

Workflow

Local or remote connection

Control Laptop

Data push via the internet to the VIPER server

VIPER: Deployment Manager

Welcome **schaefer.joe@epa.gov**! [Log Out] [Change Password]

Deployments (130) | Unassigned Runs (2) | Admin | Help

R02 American Cyanamid Site Deployment [Edit]

All Times Eastern, DST Observed

Start: 1/23/2014

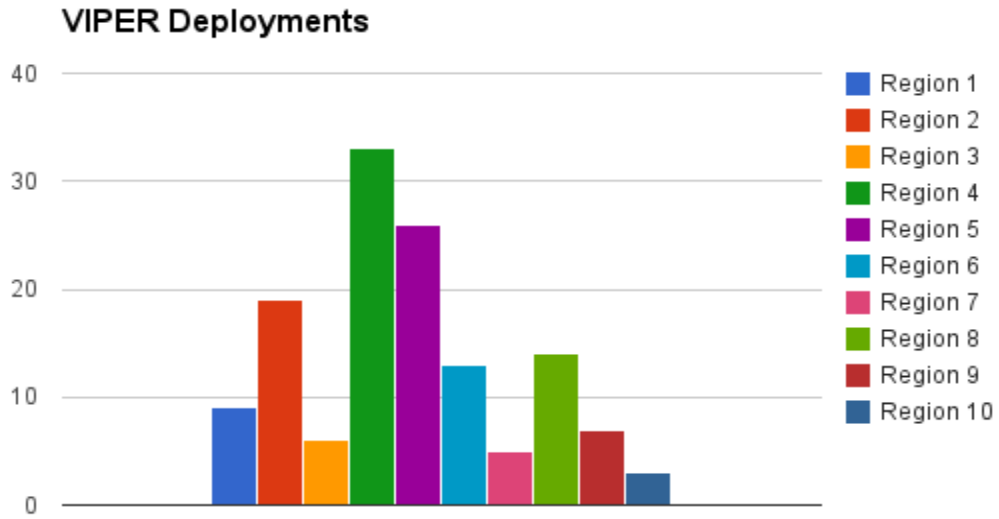
End:

Description:

AreaRAE(s):

~	Instrument ID	Connection	Location	VOC	VOC 15-Min TWA	Received
	(.109) AreaRAE * EPA Location 3 PRP Location I2	OK	40.5552210, -74.5506540	0.0 ppm	0.000000 ppm	3/19/2014 2:59 PM
	(.115) AreaRAE * EPA Location 4 PRP Location I3	OK	40.5554270, -74.5459520	0.3 ppm	0.201444 ppm	3/19/2014 2:59 PM
	(.28) AreaRAE * EPA Location 6 Behind Ballpark	OK	40.5591460, -74.5535940	0.0 ppm	0.000000 ppm	3/19/2014 2:59 PM
	(.42) AreaRAE * EPA Location 5 PRP Location I1	OK	40.5537540, -74.5540280	0.0 ppm	0.000000 ppm	3/19/2014 2:59 PM
	(.76) AreaRAE * EPA Location 2 Pumping Station	OK	40.5509280, -74.5471480	0.0 ppm	0.000000 ppm	3/19/2014 2:59 PM
	(.97) AreaRAE * EPA Location 1 Residential	OK	40.5543300, -74.5422390	0.0 ppm	0.000000 ppm	3/19/2014 2:59 PM

Implementation Status



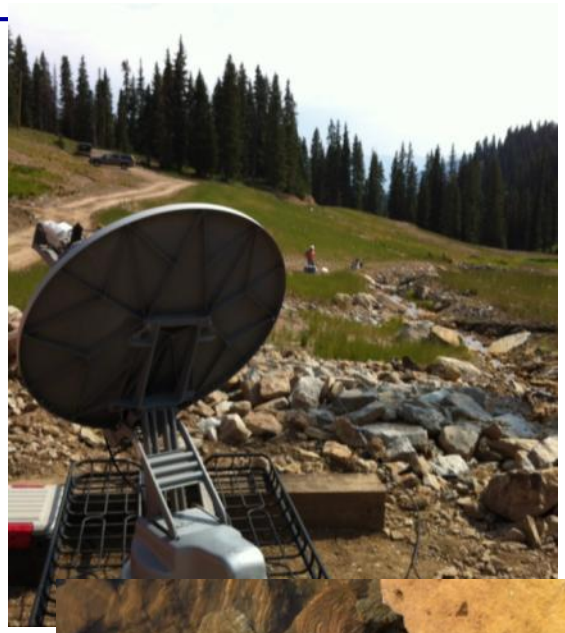
- There have been 250 deployments on removal and remedial sites since 2011
- Removal programs in all Regions have equipment and have received training

Benefit: Real-Time Decision Making

- Collect real-time data and actually use it in real-time
- Ability to receive data in real-time from PRPs and site partners allows EPA to have full situational awareness of all sensor data
- The monitors in VIPER allow an OSC or RPM to evaluate data in a way that matches DQOs without the need for any data post-processing. Examples:
  - If dust levels exceed X at the fenceline for a period of 10 minutes, notify the PRP to stop work
  - Notify the local fire chief immediately if there is break through detected in the exhaust stack

NPL Case Study: Standard Mine (R8)

- Rehabbing of abandoned adit
- VIPER-ized water quality meters (pH, conductivity, water level) were placed downstream of treatment cell
- Monitoring was 24/7 so if the cell had a breach overnight, the work crews would have been notified and mobilized to stabilize the situation
- Work was being done at 11K ft. so satellite dish was necessary for internet uplink



Benefit: Rapid Deployment

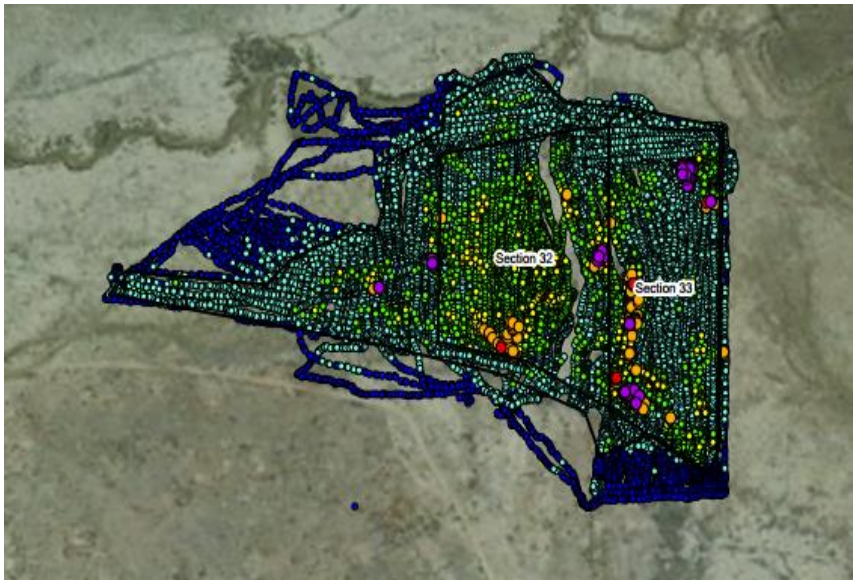
- Design allows for very quick setup and data communication
- Can watch sensors come on-line as they are being deployed
- Rapid deployment time enables system to be used on responses where resources are limited
  - Cape Cod Ice Ammonia Incident (R1)
  - Bennett Landfill Fire (R4)
  - And many more….

NPL Case Study: Libby, MT (R8)

- Repaving operation on the main road through downtown
- Particulate monitors were deployed on the sidewalks in front of the local business
- Notification of elevated readings sent to MTDOT, so they could adjust dust suppression controls

Assessment Case Study: Tronox Section 32 AUM (R9)

- Navajo nation uranium mine
- Rapid assessment of site using ATVs and baby carriages to transport radiation monitoring equipment
- Data was displayed in real-time on the site specific GIS viewer

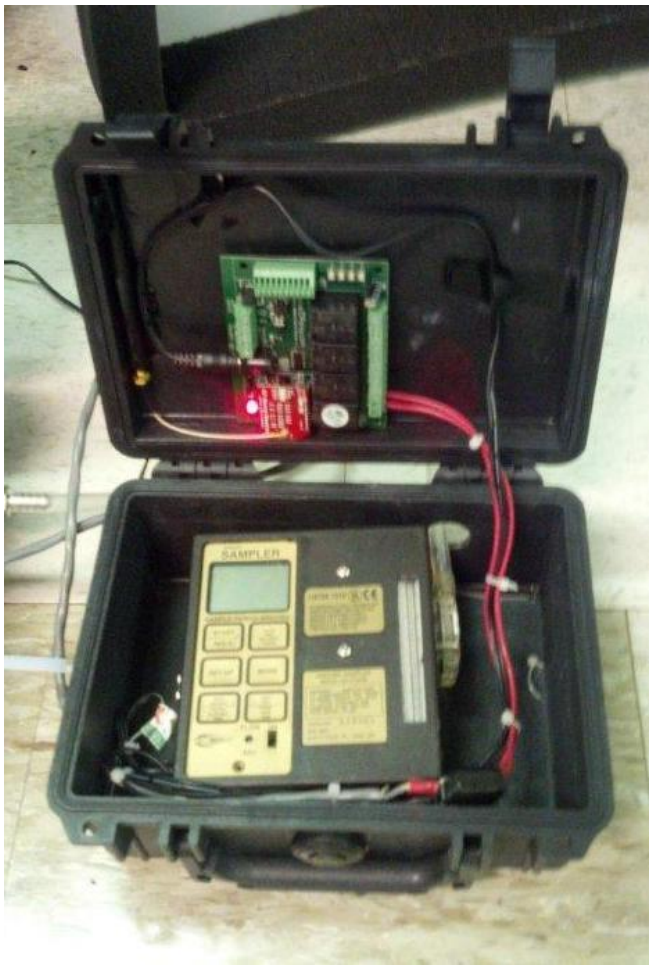


Benefit: Data Storage

- All sensor data for a site can be sorted in VIPER, eliminating need for data reduction or averaging.
- Once instruments are connected, VIPER handles the acquisition and storage. No contractor LOE for managing the database.
- Complete datasets are immediately available for FOIA requests or any other records needs

Capability: Remote Sampling - Snapper

- WiFi enabled switches can trigger a pump for the collection of a sample
- Opportunity to automatically trigger sampling based on readings recorded by VIPER-ized monitoring instruments
  - If the stack has a reading > X, start the collection of 24 hour samples at the fenceline
  - Allows collection of water samples post storm event. This eliminates the need for a field mobilization while maximizing ability to immediate sample the aftermath of an event



Snapper Components

- Wifi Connection
  - Piggybacks on Viper telemetry setup
- 4 relays
  - Turn things on or off
  - Open and close valves
- 8 sensor inputs
  - Working with types of sensors like vibration sensors to monitor pumps

Snapper Integration into Viper

- Functions as an instrument
- Outputs:
  - Sensor data
  - Connection Status
  - Relay Status
- Controls:
  - Solenoids to open/close Summa Canisters
  - Solenoids to turn on/off Pumps for Tedlar Bags
- Status:
  - Ability to see how Snapper is functioning in Viper

SNAPPER - ACQUIRE

Overview Snapper 21 X

TEMPLATE

START Next Run: 1/13/2016 8:40 AM Status: Off Time Remaining: 00:00:00

RELAYS

Relay1		Relay2	
Delay:	00:00:00	Delay:	00:00:00
Duration:	00:00:05	Duration:	00:00:05
Remaining:	00:00:00	Remaining:	00:00:00

CONNECTION HEALTH

Good

01/13/2016 08:44:21

SENSORS

LOG

1/13/2016 8:43:43 AM 9 Stopping Template Run.
1/13/2016 8:43:51 AM 10 Starting Template Run.
1/13/2016 8:43:55 AM 11 Remote Trigger has been triggered; starting relay sequence.
1/13/2016 8:43:55 AM 12 Relay1 started for 00:00:05.
1/13/2016 8:44:00 AM 13 Relay1 was stopped by the timer.
1/13/2016 8:44:01 AM 14 Received:
1/13/2016 8:44:10 AM 15 Relay2 started for 00:00:05.
1/13/2016 8:44:11 AM 16 Received:
1/13/2016 8:44:15 AM 17 Relay2 was stopped by the timer.
1/13/2016 8:44:21 AM 18 Received:
1/13/2016 8:44:24 AM 19 Stopping Template Run.

SAVE

NPL Case Study: American Cyanamid (R2)

- Concern about impact to nearby residents during the operation of the thermal oxidizer unit during the OU8 pilot study
- EPA pre-positioned summa canisters at the fenceline and in the community equipped with the remote activation switches
- If monitoring instruments show an exceedance, sample collection can be remotely triggered providing analytical data

Benefit: Building Public Confidence

- EPA routinely deploys monitoring instruments to show the public we are taking necessary precautions to monitor exposure during cleanup operations.
- VIPER allows EPA OSCs or RPMs to show they have a real-time feed of data from those instruments. Any exceedance results in immediate notification so they can take action.

VIPER: Deployment Manager

Welcome **gallo.christopher@epa.gov**! [Log Out] [Change Password]

Deployments (53) | Unassigned Runs (5) | Help

R04 Burlington Industries Cheraw Deployment

All Times Eastern, DST Observed

3273-3: BIC_201706060855

Start: 6/6/2017 8:57:52 AM

Description: Burlington Industries Cheraw Removal Begin Run Jun 6, 2017

Location: Cheraw, SC

(.227) TSI Dustrak

Connection: Down [Edit]

Intermittent after 45 minute(s)

Down after 90 minute(s)

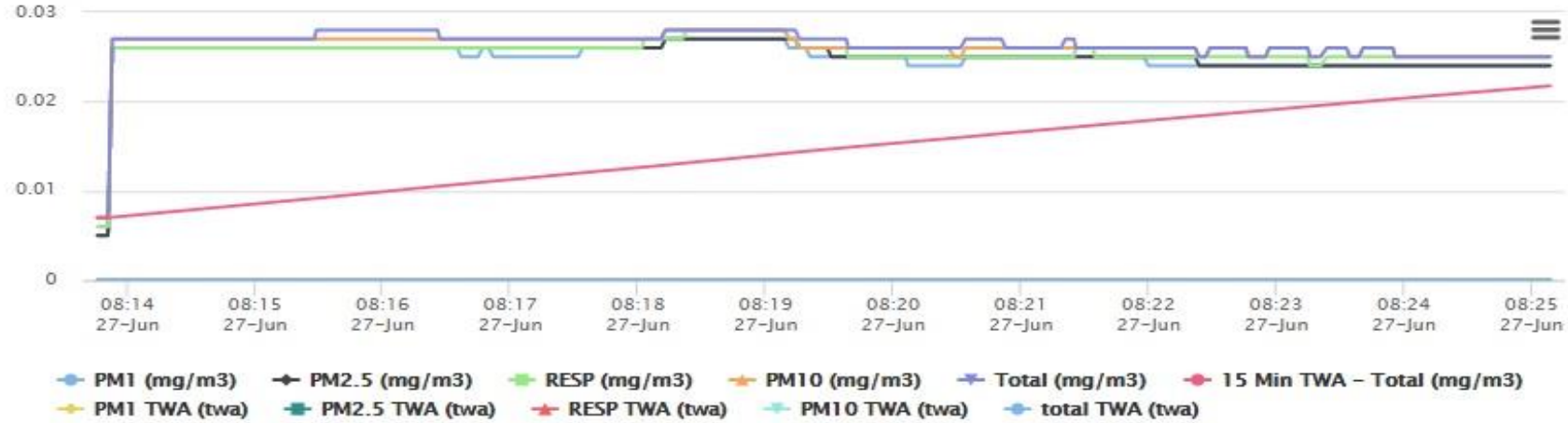
Lat/Lng: 34.6988930 / -79.9132950

Last Update: 6/27/2017 8:25:09 AM

Latest Readings: [Edit]

PM1: 0.024 mg/m3 **PM2.5:** 0.024 mg/m3 **RESP:** 0.025 mg/m3 **PM10:** 0.025 mg/m3 **Total:** 0.025 mg/m3 **15 Min TWA - Total:** 0.021750 mg/m3

PM1 TWA: 0 twa **PM2.5 TWA:** 0 twa **RESP TWA:** 0 twa **PM10 TWA:** 0 twa **total TWA:** 0 twa



Export

Revise Graph

Instrument Monitors

Name	Type	Sensor	Settings	~
15 Min TWA - Total	RollingTWA	Total	Window: 15 Minute(s)	
15 Min TWA - Total >.040 mg/m3	RollingTWAAlarm	15 Min TWA - Total	WARNING - High Alarm: 0.04; Low Alarm: n/a	[Remove]

[Add New Instrument Monitor] [ManageAlarm Notifications]

Removal Case Study: US Finishing/Cone Mills (R4)

- Removal action to deal with asbestos contaminated buildings at the US Finishing/Cone Mills NPL site
- Perimeter particulate monitoring and sampling implemented to assure public there were no issues with fugitive emissions from the site
- Live data was shown at the public meetings to demonstrate how EPA project managers were updated on site conditions in real-time

Summary

- Primary objective of VIPER is to bring all the sensor data together in real-time
- If that mission is accomplished then EPA can:
  - Rapidly analyze and use it
  - Store it
  - Share with other stakeholders and automated systems
  - Retrieve it later for future use

Questions?

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