Environmental Investigations – Lessons Learned from the Three Largest U.S. Environmental Disasters

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- Incident Similarities
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- Some Harsh Numbers
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- Data Management and Data Review
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A Tale of Three Emergency Responses

PPL Fossil Plant - Martins Creek, Pennsylvania

August 23, 2005 - 100 million gallons of coal combustion residuals (CCR) and water spread across local fields and creeks into the Delaware River.

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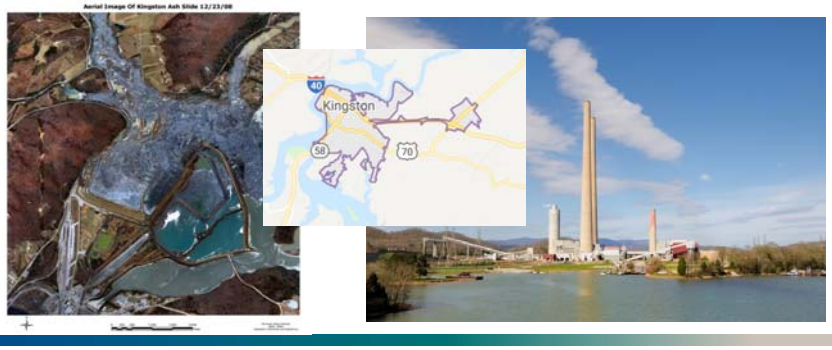
A Tale of Three Emergency Responses

TVA Kingston Fossil Plant – Kingston, Tennessee

December 22, 2008 - 1.1 billion gallons of CCR & water covered 300 acres of land and flowed up and down stream in the Emory & Clinch Rivers (tributaries of the Tennessee River.) This was the largest fly ash release in U.S. history.



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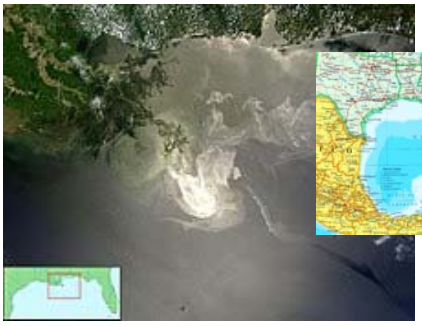
A Tale of Three Emergency Responses

MC252 Deepwater Horizon - The Gulf of Mexico

April 20, 2010 ~ 4.9 million barrels of crude flowed into the Gulf of Mexico. It was the largest oil release in U.S. history and continued releasing crude for 87 days.



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Incident Similarities

- Each had detailed emergency plans in place for recovery and health and safety.
- None had detailed plans for sample collection, laboratory analysis or data management.
- Sample collection began by responsible party (RP) personnel within hours, BUT without plans in place.
- Regulatory agencies arrived on site.
- Incident Command System (ICS) set up within days.
- High-quality response and Natural Resource Damage Assessment (NRDA) data were needed.

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Incident Similarities

- Decisions were made rapidly, but total chaos ensued.
  - Arguments, fist fights (literally) and total breakdowns occurred.
  - Even with ICS in place and a well constructed Team, no one was clearly accountable and responsible for sampling, analysis, and data management.
- RP environmental professionals rotated in on periodic basis, but they still had responsibilities elsewhere and their emergency response (ER) efforts were not sustainable.
  - The RP personnel maintained their normal job function in addition to ER responsibilities.
- The need to gather information was clear, but the uses for those data were not defined, and in many cases, requests were haphazard and chaotic.

Incident Similarities

- No standard operating procedures (SOPs) applicable to specific project collection activities.
  - Little to no coordination among Sampling Teams
  - Lack of a consistent sample nomenclature across the multiple responding organizations – there were many "Sample 1s"
- No (or limited) laboratory contracts in place to deal with the capacity and turn-around-time (TAT) requirements (*everything* was 24-hr TAT).
- No Quality Assurance Plan or Data Management Plan.
- No centralized system for gathering field & laboratory data.
- Many (up to 170) projects were executed simultaneously – several without a stated intended use or purpose.

Immediate Concerns

- Concerns about integrity & quality of data being generated
- RPs & regulators expect bulletproof legally defensible data for Response and NRDA purposes – right ***now***
  - Sampling – Initially "unqualified" personnel collecting samples
  - Laboratory – Initially local "Mom & Pop" laboratory providers
  - Data Management– Initially lack of a central repository for all the
    data that were being generated

Some Harsh Numbers

- **Collectively, Between the Three Incidents**
  - > 300 Sampling Plans, SOPs & procedures required
  - > 1.1 Million samples collected
    - Water, soil/sediment, air/industrial hygiene (IH), biota/vegetation, source and waste
  - > 80 Laboratories - commercial, universities and overseas
  - > $90,000,000 Spent on sample analyses
  - > $900,000,000 Spent on sample collection (est. 10× analyses)
  - Untold number of days that ER personnel were away from home

The Big Picture

- Many ER sampling projects executed simultaneously
  - Litigation-driven investigations, source control, human health and ecological concerns
- Data serving multiple purposes
  - Response, NRDA and IH
- Data being shared across state and federal programs, which required comparability
- Data quality and defensibility can be impacted at every step in the process.
  - Sample Planning
  - Sample Collection & Handling
  - Laboratory Analysis
  - Reporting
- Need to control liability

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Solutions – Much Better Built Beforehand

- Control Document Preparation
  - Create ER Quality Assurance Plan
  - Prepare ER Sample and Data Management SOPs
  - Develop Overarching ER Data Management Plan
- Train Personnel on Project Control Documents*
- Laboratory Program/Contract
  - Negotiate Contracts with Laboratories for Requisite Testing and Data Reporting
  - Implement Technical Specifications that Define Quality, Service Aspects, Reporting Requirements and Sample Retain Requirements
  - "Cradle-to-Grave" approach for samples
- Centralized Data Management System

* – This activity can be performed beforehand to a limited extent

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What's at Risk if Response Data are Suspect?

- Poorly defined media of concern
- Incorrect assessments/decisions
- Data challenged in legal proceedings
- Wasted time and money
  - Repeated efforts for Response and/or NRDA
  - Increased fines and legal peril for RP (and officers)
- Loss of "good will" and trust with regulators and public

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Best Practices at Incident Command

- Incident Command Center Staffing – ICS Planning
  - Chemist, Geoscientist, and Data Manager – On site, on rotations
  - Rotation personnel all need to be calibrated and following events
- Stage Sample Receiving/Bottleware Location
  - Implement a Sample Receiving Office (SRO) and Source/Retain Center
- Design Source Collection/Sample Retain, Storage and Inventory Controls
  - Source Collection is critical for forensics

- Perform Laboratory Coordination
- Perform Field and Laboratory Oversights
- Assessing Data Quality Real-Time Before Release

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Laboratory Data Quality Oversight

- Formal technical requirements for analytical work
  - Embedded in contracts - eliminates "gray areas" in published methods and ensures consistent quality and service during emergency situations
- Include consistent processes and communications
  - Analytical request forms – Why is the project happening?
  - Sample planning module and electronic Chain-of-Custody
  - Laboratory coordination
  - Problem resolution and corrective action

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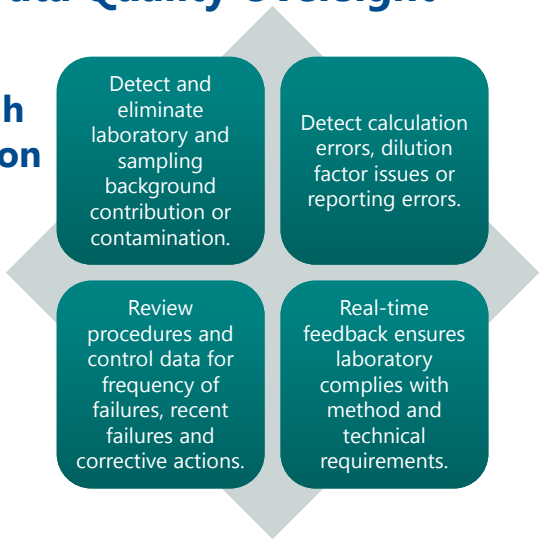
Laboratory Data Quality Oversight

Assessing Quality Through Data Validation



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Geoscience Quality Oversight

- Develop one set of SOPs, SAPs, HASPs, *etc.*
  - A consistent set of documents to Field Sampling Teams.
- Conduct hands-on training of sampling personnel.
- Conduct third-party field audits.
  - Verify that samples are collected in a defensible manner.
  - Verify that documentation is completed properly.
- Liability control/minimization
  - Properly trained personnel
  - Waste handling practices
  - Health and safety

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Data Management and Data Review

- Create an Environmental Data Quality Management System (EDQMS).
- Track status of data reporting.
- Evaluate data across programs or for multiple purposes.
- Design, build, and publish tables and graphs.
- Set alerts for critical information.
- Meet reporting requirements efficiently.
- Maintain control of your data.

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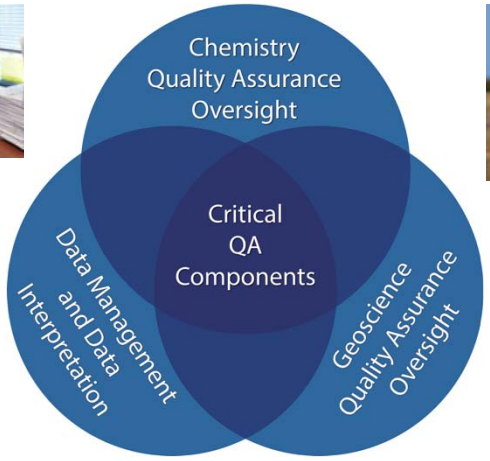
Data Management and Data Review
Multidisciplinary Approach



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Top-10 List – Lessons Learned

10) Identify Emergency Response Off Ramps

9) Tribal Knowledge Sharing, ICS Size & Rotation Logistics

8) Source Materials, SRO & Sample Retain Center

7) Drilling, Training and Auditing

6) Formal Project Requests/Analytical Request Forms

5) Data Management - Nomenclature & Positional Data (meta data)

4) Third-party QA Oversight - Support Decisions/Litigation

3) Prepare Project Documents - SOPs, QAPP and DMP

2) Sign Laboratory and Support Contracts - Assess Team Capacity

1) Prepare & Drill - ICS Planning – Sample Management/QA

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Closing Thoughts

- No one was ever scolded for over planning for ERs.
- Does it withstand the New York Times test?
- Data defensibility requires a robust QA program.
- Data quality can be driven and managed.
- Data collection with legal challenges must be assumed.
- Robust QA programs add value and reduce costs.
- With enough data, close *each* project.
- Overarching goal to generate usable, meaningful, defensible data to support the ER and cleanup efforts.
- In the end, for an ER – all you have are data.

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Thank You

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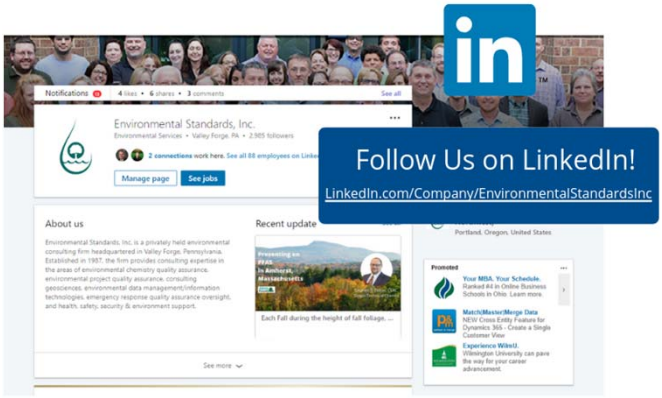

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