

Laboratory and Field Practices That Seemed Like a Good Idea at the Time

August 10, 2017



Agenda

- Components of a Successful Project
- Blunders
 - Field Blunders
 - “Funny?” Snippets
 - Laboratory Blunders
 - “Funny?” Snippets

Components of a Successful Project

Inserting Intelligent QA Components into Programs

- Thoughtful written sampling procedures
- Thoughtful analytical specifications
 - Modify/develop methods when objectives justify
- Audit laboratories in early phases
- Audit Sampling Teams in early phases
- Perform critical data validation as data are reported
- Troubleshoot/correct suspicious data
- Centralize the data management for larger-scale programs
 - Suspicious data can be found quickly with powerful IT tools

Components of a Successful Project (Cont.)

- Inserting intelligent QA components into programs minimizes the possibility of bad things happening:
 - Samples being mishandled/contaminated in the field
 - Poor and/or improper extraction and laboratory analysis
- Imagine having to spend money to disprove your own badly generated initial data set?
- Inserting intelligent QA components into programs is critical.

Components of a Successful Project (Cont.)

Inserting intelligent QA components into programs starts with:

Planning, Planning, Planning

- Plan>Train> Execute> Audit> Evaluate> Report

But even with the best laid plans, as humans ...

- Carefully crafted and brilliantly written plans are:
 - Rarely read by the people executing the work
 - If they are read they are often misunderstood
 - If they are read and understood
 - They are ignored
 - They are altered with no regard for outcome
 - And the RESULTS??

IT'S THE WILD, WILD WEST! AND WE HAVE ... BLUNDERS



Blunders

- Blunders come in various shapes and sizes
- Sometimes originating in the field
- Sometimes originating in the laboratory
- Sometimes originating in both
- Sometimes they reverberate back and forth



Field Blunders



“Mercury Boots”

- Surface soil sampling in and around a mercury metering station along a natural gas pipeline.
- Beads of elemental mercury strewn across the floor in the metering station room.
- Field Team Leader walked the extent of the floor of the metering station, oblivious as to whether he was stepping on the mercury with his boots.
- Walked out the back station door and used the heel of his boot to mark the surface soil sampling locations to determine the extent of surface soil mercury contamination.

Field Blunders (Cont.)

“The Lowes Hose”

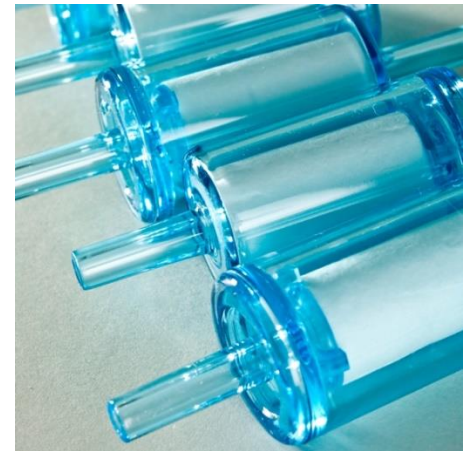
- From an upstream gas drilling project, flow back water was released to the aquifer.
- Sixteen residential wells were sampled weekly, and four of the wells revealed consistent PAHs.
- The laboratory blanks were clean, and the bottles were certified for PAHs.
- No field blanks were collected because samples were collected directly in bottles – or so the plan said. When asked about those four locations, it seems that the spigot was too large to fit the bottles under so personnel said they, “bought and used new sections of hose.”



Field Blunders (Cont.)

Dissolved Metals *Everywhere*

- Groundwater studies on Alaska's North Slope
- ADEC required T/D metals at ultra-trace levels.
- After weeks of sampling, the total metals data made perfect sense with regard to the CSM.
- For the filtered metals, nine metals were consistently present at the same levels in all filtered samples and the filtered blanks, but not in the total samples.
- Dedicated filters and new lengths of tubing were used, BUT no one thought to flush both with sample before collecting the actual site samples.
 - Flushing the tubing and filters was specified in the SOP.
- Timed samples from new tubing/filters confirmed the origin of the nine metals.



Field Blunders (Cont.)



“Sure Looks Clean to Me”

- Monitoring well (MW) purge water was being discharged to surface of the parking lot, which then flowed down the edge of the property to a nearby creek.
- Despite the Work Plan (WP) specifying that the purge water must be containerized, the Field Samplers decided that the purge water looked pretty clean so there was no reason to containerize the purge water.
- The purge water was very “clean,” but had a pH of 9.3.
- The substantial volume of purge water, running into the nearby creek resulted in a fish kill, a hefty fine, and a furious client.



Field Blunders (Cont.)

“It’s Not PCBs If I Don’t Use It.”

- PCB-impacted soil at a compressor station using a Geoprobe® to delineate horizontal and vertical extent of past releases.
- Once done collecting samples, the remaining soil in the Macro-Core® was dumped on the ground surface.
- The WP was very well written on how to handle investigation-derived waste (IDW).
- When the sampler was questioned about why he was not containerizing the IDW, he responded that since he didn’t use the soil in his investigation, it was not IDW.

Field Blunders – “Funny?” Snippets

- Using off-the-shelf, convenience store “distilled water” without first assessing the purity for its intended purpose.
- Using a lead weight to hold a sampling device in place during a river surface water sampling for lead contamination.
- Filling VOA vials on the tailgate of a pickup truck with its motor AND a generator running.
- Writing down a 1-900 number (sex number) in the field book for “later use” – which was identified later during a deposition by an attorney.

Laboratory Blunders

“What’s in a Vial Anyway?”

- From an upstream gas drilling project, flow back water released to an aquifer
- Sixteen residential wells sampled weekly, and the first 3 weeks of sampling revealed ALL 16 wells had glycol detections.
 - The regulatory authority and the client were VERY concerned.
- The laboratory blanks – ND. No field blanks were collected as sink samples were collected directly in 40-mL HCL- preserved vials
- Upon inquiry, it was determined that the 40-mL HCL- preserved vials were never assessed or certified for use for glycol analysis AND the laboratory used UNPRESERVED 40-mL vials for its MBs.
- Tracking the lot number of the vials verified the HCl was the source of glycol contamination in all 45 samples – DEFCON downgraded.



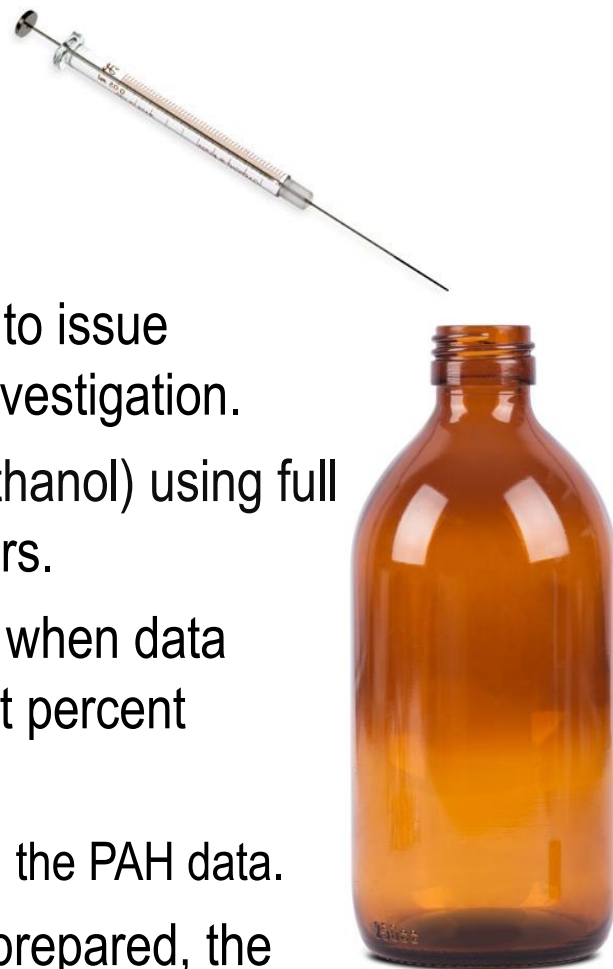
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Laboratory Blunders (Cont.)

“Shake, Shake, Shake”

- With the state of Connecticut, samplers were required to issue double-blind PE samples to labs as part of their PAH investigation.
- The PE vendors prepared the PAH PE samples (in methanol) using full bottles with DI water and a syringe in the neck of ambers.
- Seventy-six monitoring wells (MWs) and four PEs later when data reported, the 4- and 5-ring PAHs were in the single digit percent recoveries for all four of the PEs.
 - The client was very concerned the state would reject all the PAH data.
- Inquiry revealed that while the PEs were not optimally prepared, the 4/5-ring PAHs stuck to the amber neck AND the laboratory extraction personnel were not adequately solvent rinsing the empties.
- Proper solvent rinsing demonstrated that the 76 MW PAHs were OK.



Laboratory Blunders (Cont.)

“I Know It’s in There Somewhere.”

- For an important toxicity study being conducted looking into the occurrence of fungicides in feed materials, dosing studies were performed using mice with increasing levels of well-blended fungicide and feed materials.
- Despite laboratory data showing $< 5\%$ of the prepared fungicide doses, the mice exhibited the lethal responses at the prepared expected doses.
- Upon inquiry, the laboratory did not perform any positive controls using the feed materials as part of their method validation or batch QC.
- Subsequent performance of positive controls using feed material confirmed the extraction and solvent were inefficient in extracting the target fungicide.



Laboratory Blunders (Cont.)

“Does It Ding When It’s Done?”

- In a remote part of Alaska, there are small laboratories, which serve a very important function – discharge compliance monitoring.
- Several major industrial clients were being issued a series of NOVs for TDS in their effluent.
- The NOVs between all the industrial parties had one thing in common – the local accredited laboratory being used.
- Logbooks/data appeared in order until an on-site audit was funded and it was discovered that laboratory TDS oven was tagged out of service and instead, a Toastmaster® kitchen broiler and a 5-degree increment thermometer was being used for this 104°C +/- 2°C compliance parameter.
 - Guess what? The clients bought the laboratory a proper oven/thermometer



Laboratory Blunders (Cont.)

“Our DI Water Is Very Clean.”

- Groundwater studies on Alaska’s North Slope
- ADEC required T/D metals at ultra-trace levels and after 9 weeks of sampling, six metals were consistently present at the same levels in filtered and total field blanks, with many metals exceeding sample levels.
- Investigation revealed that while the laboratory diligently vetted each shipment of the DI water being used for site field blanks, at some point, laboratory bottlere personnel made a decision to start shipping the very clean DI water in amber bottles NOT certified for trace metals.



Laboratory Blunders – “Funny?” Snippets

- Laboratory received VOA water samples and very diligently documented receipt at 6°C, then put them on a cart and left them out for almost 4 hours at room temperature before getting around to putting them in cold storage.
- The procedure described by the Analyst did not match the procedure documented in the SOP. When asked about the discrepancy, the Analyst stated, “I know it doesn’t match the lab’s SOP, but I wrote my own SOP.”
- The laboratory SOP specified to run duplicates for each analytical batch. If the duplicates failed, the SOP stated to, “run more duplicates and pick the best two that match best.”

Laboratory Blunders – “Funny?” Snippets (Cont.)

- Laboratory was digesting metals samples uncovered in a block digester. One sample was noted being capped, but not the others. When asked what those were during an audit, the Analyst replied that was the MB, and they were capped “because we need these to pass.”
- One laboratory had perfect TSS Oven temperature records for months, always exactly 104°C each and every day recorded in the logbook. Further investigation during an audit determined the Analyst was reading the “Set Point” on the oven, not the temperature off the thermometer inside.

Look Beyond



The Trees in the Forest



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