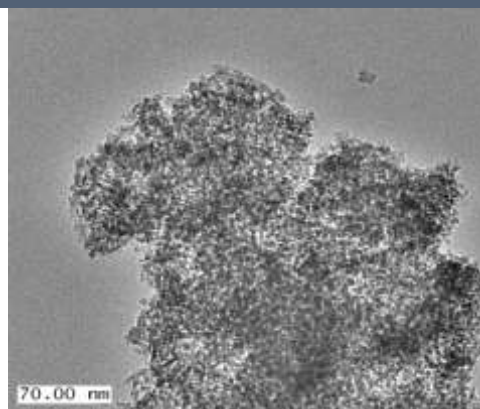
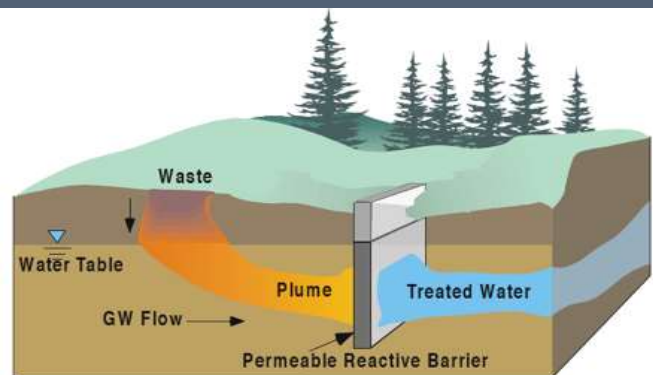
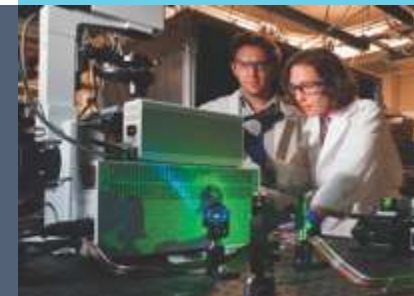




NNLEMS Site Evaluations



Mark J Rigali – Sandia National Laboratories

RadWaste Summit 2023 - Innovations from the National Labs

Las Vegas, Nevada

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NNLEMS Leadership and Functions

- Partnership of Federally Funded Research and Development Centers (FFRDC) managed by DOE.
- Savannah River National Laboratory (SRNL) is the lead laboratory for managing the NNLEMS Team.
- The NNLEMS charter identifies the role and objectives for the group:

Response - Identify and coordinate resources for technical support to address emergent events associated with DOE sites.

Review - Identify and coordinate resources for independent technical review of DOE plans or activities.

Collaborate - Supplement existing and ongoing DOE innovative applied research through collaboration.

Policy- Provide scientific and technical analysis to DOE and to stakeholders as directed by DOE.

Planning - Provide integrated science and technology perspective to support strategic planning for EM and LM.

Resource - Coordinate and serve as gateway for DOE and its contractors into the broader set of 17 National Labs.

Consult – Provide expertise to inform DOE contract decisions and language, funding allocations, and technical feasibility of contractor proposals.

Evaluation of DOE LM and EM Sites

Over the past two years the NNLEMS has addressed soil and groundwater challenges at selected “High Risk” sites in the LM portfolio (**Shiprock, Tuba City**, Bluewater, Rifle, Mound, Monument Valley, Fernald, West Valley) as well as other sites such as Moab groundwater, Los Alamos groundwater, and collaborations with the US Army Corps of Engineers

High Risk Site Example: The Department of Energy (DOE), Office of Legacy Management (LM) indexes their portfolio of over 100 sites to rank and prioritize those that have the greatest potential liabilities. Considerations include:

- human health - effects of exposure to site contaminants, particularly in groundwater
- stakeholders - likelihood of community activism about/against current site status
- regulatory - site conditions that do not meet regulatory requirements
- institutional controls - robustness of existing physical and/or administrative controls to prevent harm to human health or the environment.

LM set up a series of collaborations, including the National Labs, LM, contractors and stakeholders, to address some of the highest risk sites

Synopsis

- Review Technical Risk at 5 High Risk Sites
 - Shiprock
 - Tuba City
 - Bluewater
 - Monument Valley
 - Fernald
- Identify
 - Key Perspectives
 - Notable Items
 - Summary Outcomes
- Lessons Learned



Shiprock and Tuba City Site Evaluation Team

- Diverse 30+ member team with a broad set of technical disciplines including geology, hydrology, geochemistry, chemistry, site monitoring, regulatory and others.
- **DOE-LM:** Deborah Barr, Angelita Denny, Mark Kautsky, Bernadette Tsosie
- **Navarro (RSIEnTech, LLC):** Clay Carpenter, Jennifer Harris, Dr. Ray Johnson, Nick Kiusalaas, Al Laase, Chrissy Largo, Peter Lemke, Dr. Michael Morse, Dr. Peter Schillig, Bryan Wells, Kate Whysner
- **National Laboratory Network:** Dr. John Barger (SLAC), Carol Eddy-Dilek (SRNL), Dr. Vicky Freedman (PNNL), Dr. Hansell Gonzalez-Raymat (SRNL), Dr. Christian Johnson (PNNL), Dr. Brian Looney (SRNL), Dr. Vincent Noel (SLAC), Dr. Mark Rigali (SNL), Dr. Mike Truex (PNNL), Dr. Ken Williams (LBNL)
- **Navajo Nation AML/UMTRA:** Notah Silversmith, Joni Tallbull
- **Navajo Nation EPA:** Steve Austin, Eric Rich
- **Hopi Surface Mining Program:** Norman Honie, Lewis Leslie
- **NRC:** Hans Arlt, Nick Orlando
- Team members divided across the five focus areas based on expertise and interest.

Site Evaluation Focus Areas

- Stakeholder Risks, Institutional Controls, and End-State Vision (Jennifer Nyman, Navarro/RSIEnTech, LLC)
- Site Characterization Technologies and Investigation Tools: Hydrology and Geophysics (Kenneth Williams, LBNL)
- Source Mass Characterization, Natural Attenuation, Solid Phase Analysis (Hanzel Gonzalez Raymat, SRNL)
- Remedy Evaluation: In Situ and Ex Situ Treatment Technologies (Mark Rigali, SNL)
- Hydraulic and Boundary Condition Controls: Cover, ET, Containment, Bypass (Brian Looney, SRNL)

Shiprock and Tuba City Site Evaluation Process

- A two day kick off workshop was conducted to provide details on the Shiprock and Tuba City Sites, on-going remedial actions, virtual site tours.
- Followed by a series of focused weekly meetings with each of the five teams working independently on-going and planned site activities through the lens of the five focus areas. Focus questions included:

What are we currently doing that is effectively reducing risk, and should continue?

What are we doing that is not effectively reducing risk, and should stop?

What are some new and different things we should start doing, to become more effective in risk reduction?

- The five teams then reported out weekly to the group on progress and recommendations.

Site 1 - Shiprock

- **Key Perspectives**

- Complex-diverse challenges resulted in wide-ranging recommendations
- Emphasized local conditions and stakeholder values to down-select/prioritize
- Beneficial focus on interfaces and controlling flux and mass balance

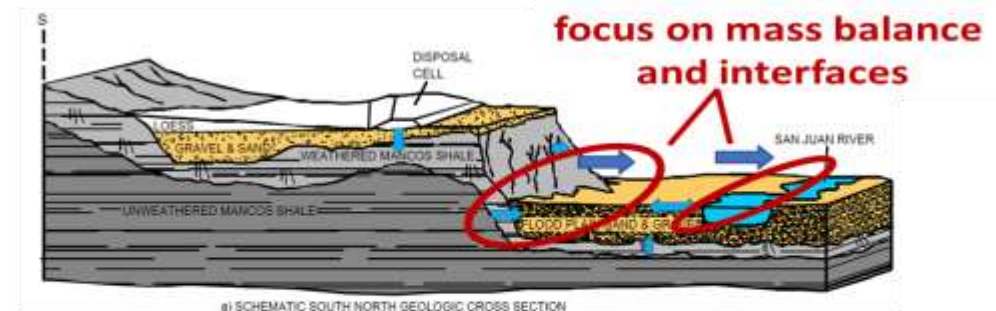
- **Notable**

- Stakeholders emphasized floodplain! (requested sincere evaluation of relocating cell but acknowledged that might not be best path)
- LM team in process of developing Groundwater Corrective Action Plan – provided target insertion point and real-world timeline (“actionable”)
- Poor regional water quality in the Mancos Shale was a important factor

- **Summary Outcomes:**

- Low-cost-impactful stakeholder activities identified (many)
- Innovative characterization approaches
- Scoping studies to support GCAP development

Conceptual Site Model



focus on water quality and stakeholder values/objectives

Site 2 – Tuba City

- **Key Perspectives**

- Terraced system transitioning to Moenkopi Wash
- Pristine “high-value” N-Aquifer
- Elicited stakeholder values through use of innovative survey

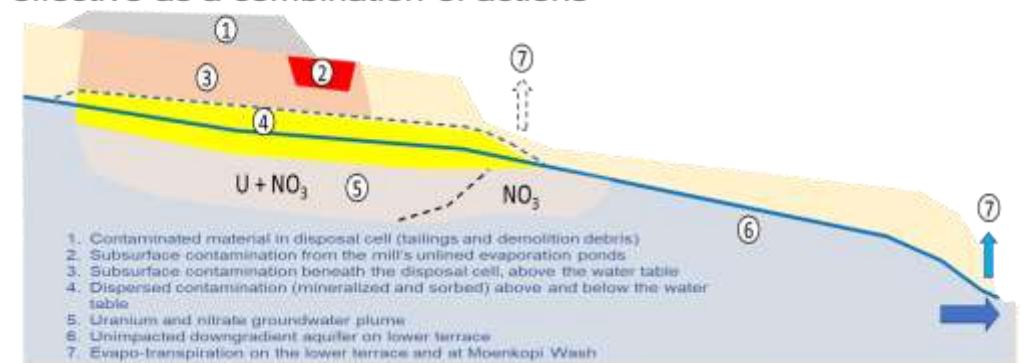
- **Notable**

- Stakeholder expectations included three components: 1) limit expansion of groundwater plume, 2) remove or isolate residual sources, and 3) preserve the quantity and quality of water in the N- Aquifer
- Many combinations of actions to meet expectations and associated regulatory requirements -- GCAP insertion point

- **Summary Outcomes:**

- Developed technology recommendations organized into portfolios
 - Provided examples that emphasized different end-state priorities
- Provides maximum flexibility for DOE to optimize their strategic decision-making

• Multiple source zones exist, and no standalone action will be as effective as a combination of actions



Lessons Learned

- Focused on clear-actionable recommendations that can be incorporated into the LM program
- Teams collaborated well and generally reached consensus
- Virtual Conferencing worked better than expected
- Affirmed many ongoing LM actions – validating high quality “state-of-practice” work by LM
- Each site was different – the process was flexible and responsive
- Participation by the stakeholders and regulators was a significant factor in success
- The logistics, processes and products improved over time based on lessons learned