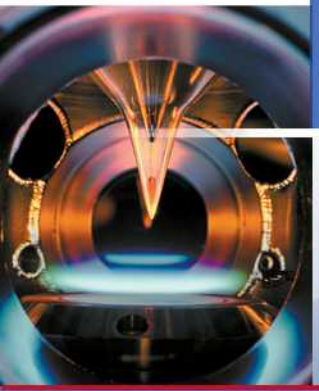
SAND2008-0663P

SANDIA NATIONAL LABORATORIES

Overview of Earth Sciences Capabilities



Meeting with Strathmore Mining February 8th, 2008

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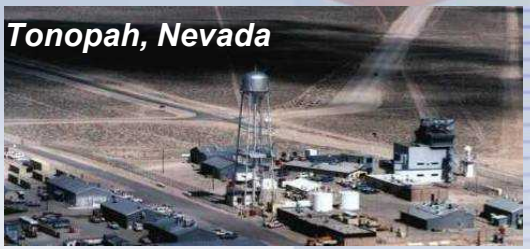
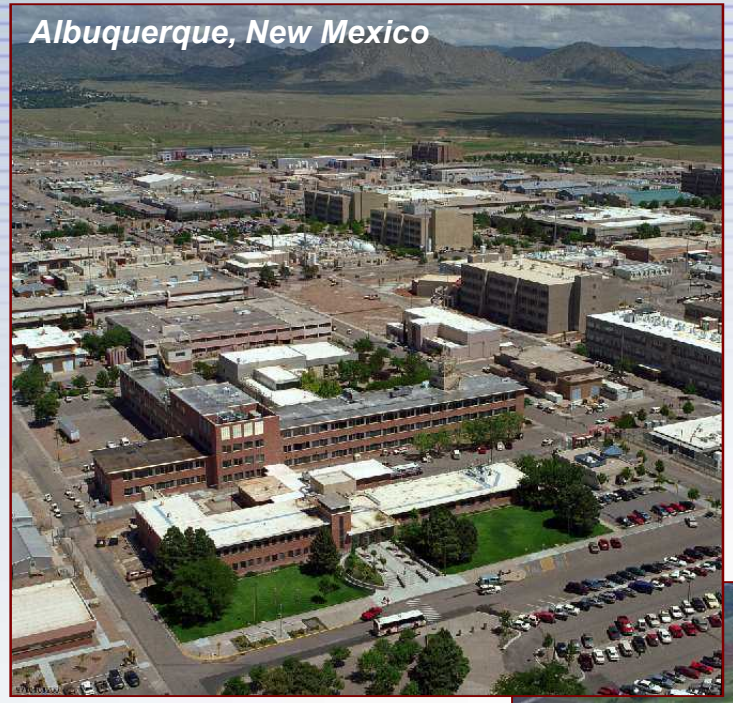
Sandia National Laboratories

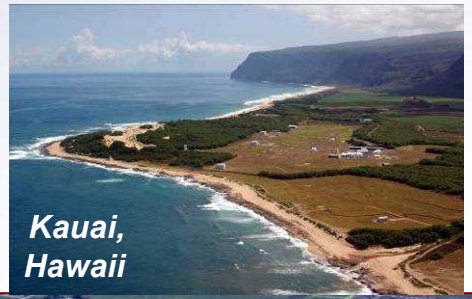
Topics for Discussion

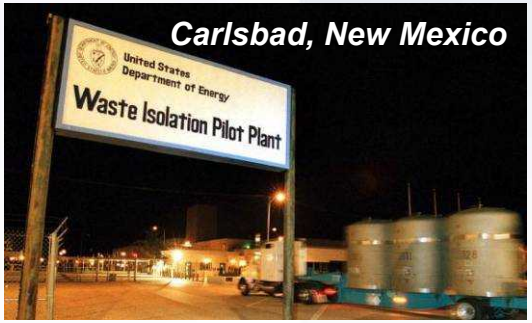
- **Sandia National Laboratories Overview**
- **Sandia's Geosciences-related Programs and Capabilities**
- **Future Directions in Uranium Mining**
- **How Sandia does Business**

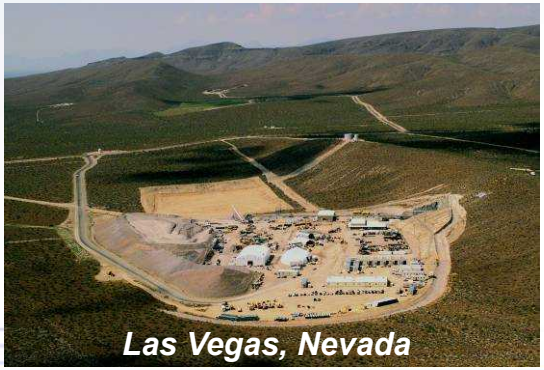
Sandia National Laboratories is Geographically Distributed





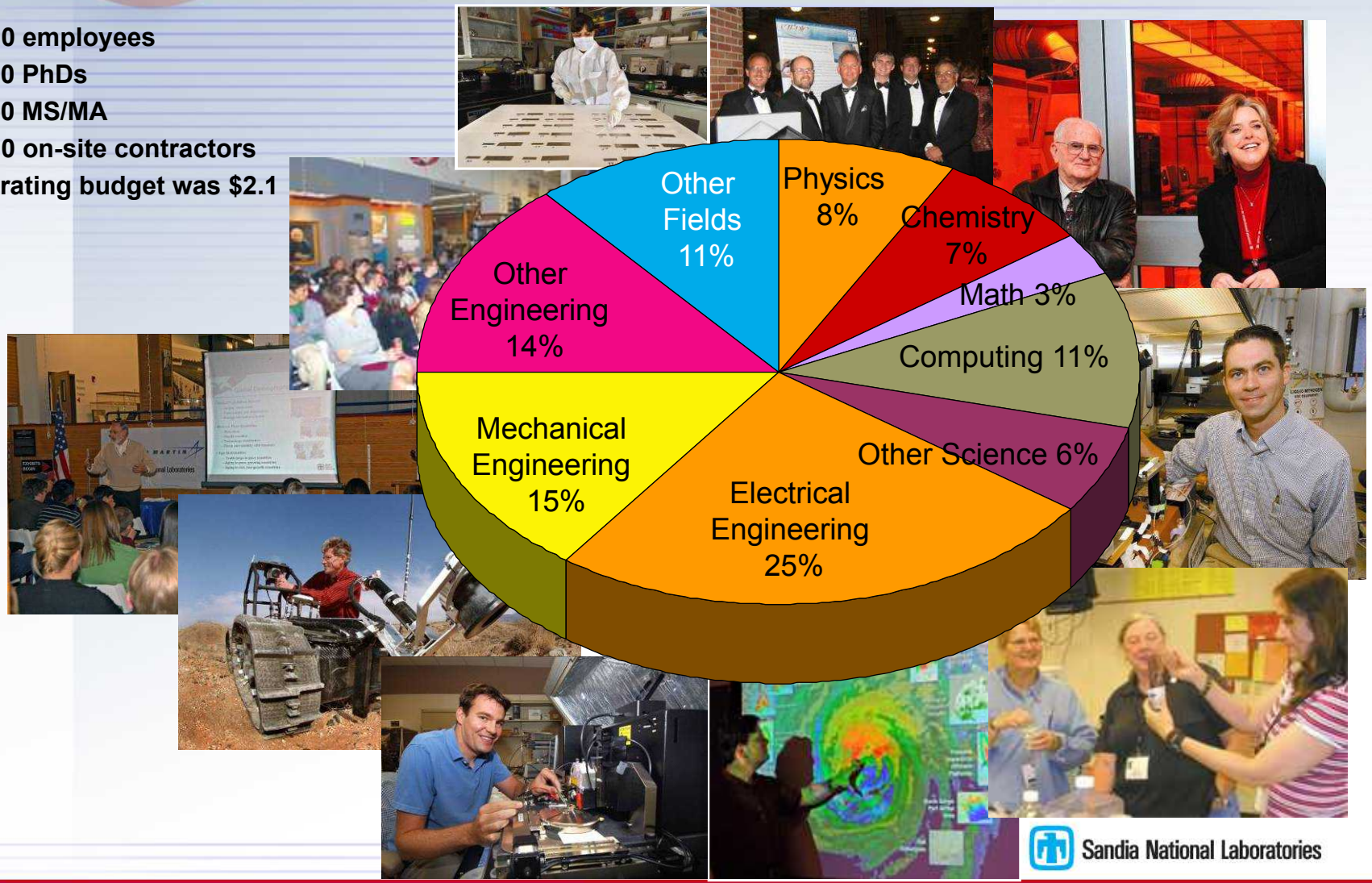






Sandia Employs More Than 8,500 Highly Skilled Workers

- Over 8,500 employees
- Over 1,500 PhDs
- Over 2,500 MS/MA
- Over 1,000 on-site contractors
- FY06 operating budget was $2.1 billion

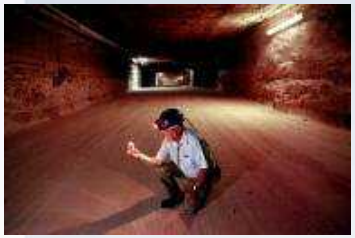


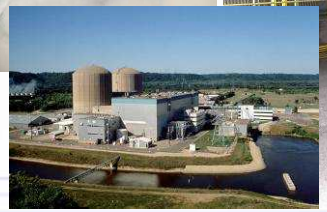
Sandia National Laboratories

Sandia is Organized into Three Strategic Management Groups

Integrated Technologies and Systems
Three Management Units

- *Energy, Resources, and Nonproliferation*
- *Homeland Security & Defense*
- *Defense Systems & Assessments*



Nuclear Weapons
One Management Unit

- *Nuclear Weapons*

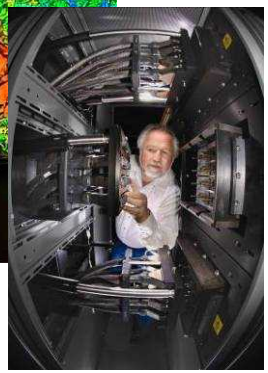



Laboratory Transformation
Two Management Units

- *Integrated Enabling Services*
- *Science, Technology, and Engineering*



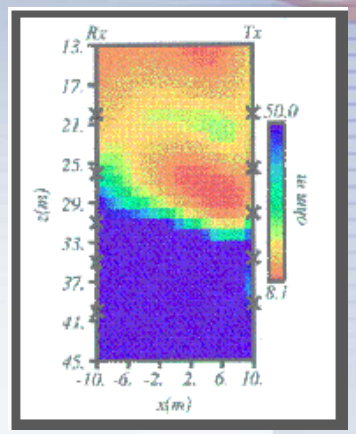




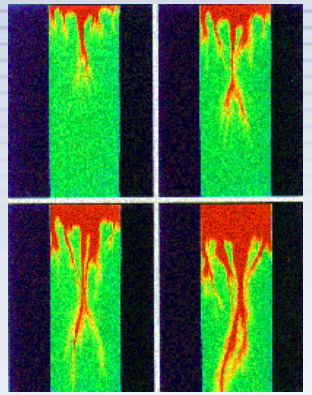
Sandia National Laboratories

Earth Science Capabilities

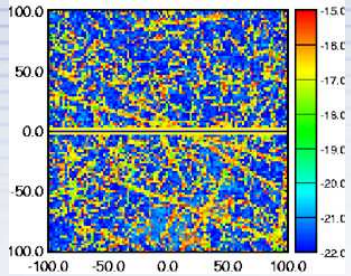
Geoscientists at Sandia are advancing the fundamental state of knowledge in their fields, are leaders in the broad technical community, and are enabling a breadth of Sandia programmatic goals.



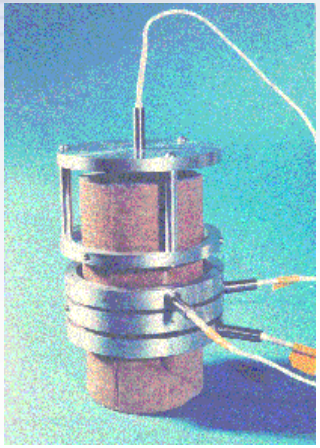
Geophysics



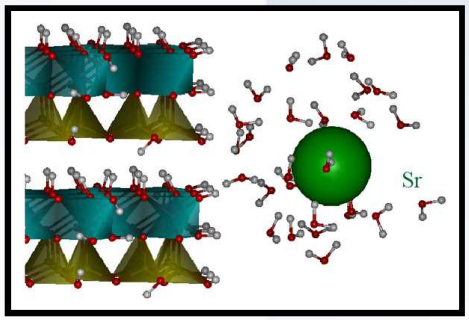
Geohydrology



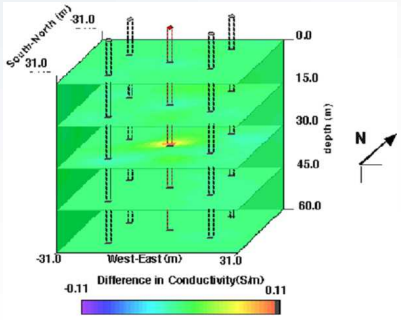
Geostatistics



Geomechanics



Geochemistry



Numerical Modeling

Geotechnology

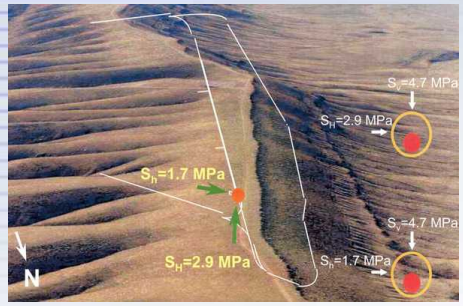
Sandia National Laboratories

Earth Science Focused Projects

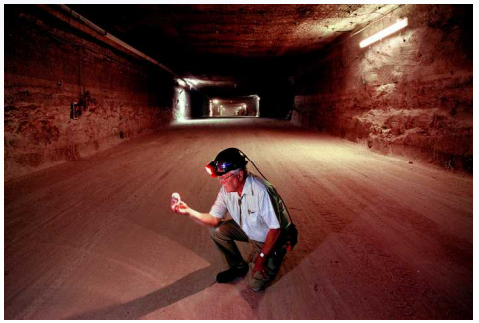
Underground Storage: Strategic Petroleum Reserve

The Water Initiative

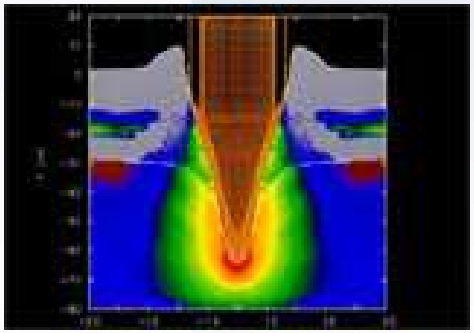
Natural Gas and Oil Technology Partnership



Yucca Mountain Project: High Level Waste



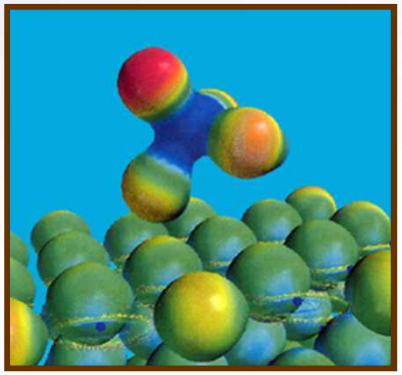
Waste Isolation Pilot Plant : TRU Waste

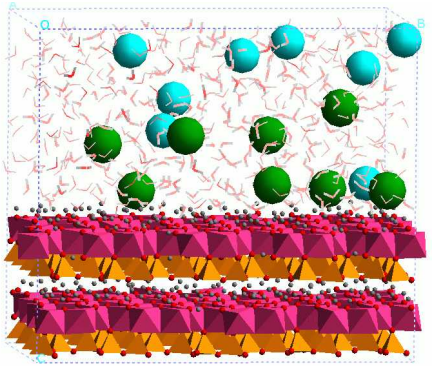


WAGTech: Geomechanics of Earth Penetration

SNL Capabilities Applicable to U Resource Development

- **Characterization of groundwater flow and radionuclide transport**
  - Well tests and well test analysis
  - Tracer tests
  - Subsurface flow and transport modeling
  - Monitoring network design
- **Water treatment**
  - In-situ and Ex-situ Removal of Contaminants
  - Novel Membrane Technologies
  - Desalination and Water Reuse
- **Geochemical modeling and analysis**
  - Design of enhanced safety *in situ* recovery methods
  - Natural attenuation/sequestration of uranium
  - Molecular Dynamics Simulations: sorbtion of radionuclides, interactions at water-mineral interfaces





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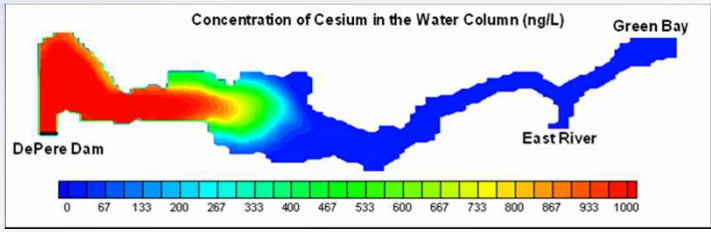
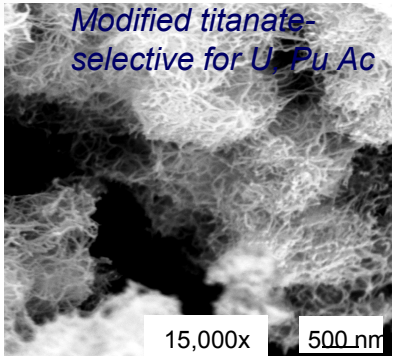
SNL Capabilities Applicable to U Resource Development

- **Disposal cell/landfill cover design and analysis**
  - Geomechanical testing and analysis
  - Probabilistic, risk-based performance assessment
  - Sampling, site characterization, long-term monitoring

- **Soil and Sediment Transport**
  - Erosion and transport measurements
  - Contaminated sediment transport modeling
  - Habitat impacts



- **Materials Development**
  - Radionuclide Getters
  - High capacity, rapid exchange materials that are element selective



- **Performance Assessment**
  - Probabilistic modeling
  - Sensitivity and uncertainty analysis

Sandia National Laboratories

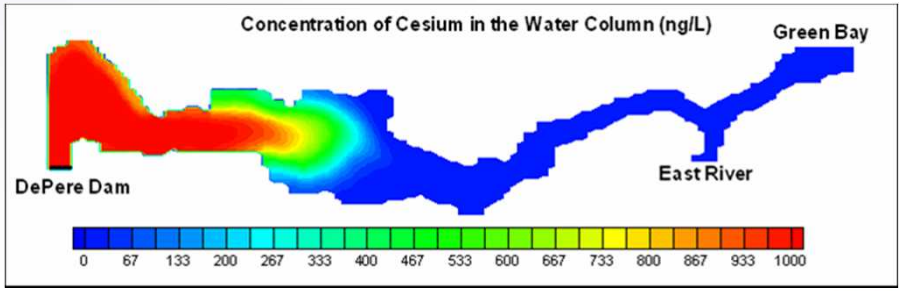
Improved Tailings Disposal Cell Design

- Probabilistic modeling of subsurface and atmospheric releases, flow and transport, human exposure
- Alternative covers for waste isolation
- Sampling network design and long-term monitoring
- Erosion and sediment transport measurement and modeling

landfill cover study

erosion measurement flume

sediment core collection



sediment transport modeling

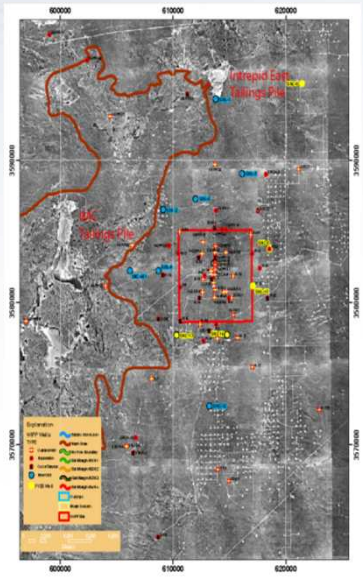
monitoring

Sandia National Laboratories

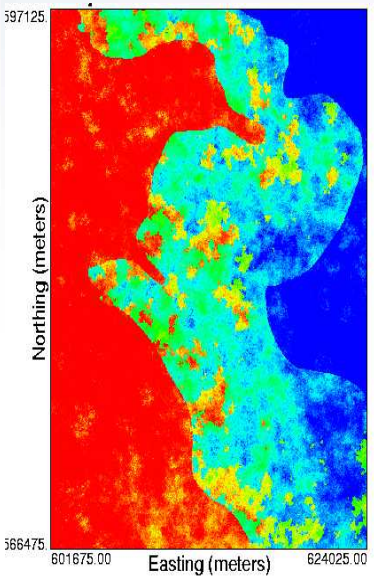
Improved Hydrologic Design of *In Situ* Recovery

- Unique SNL mobile hydraulic testing and data acquisition capabilities for site-specific data collection
- Unique SNL aquifer test analysis software
- Incorporate hydrogeologic facies information of ore body and surrounding rock into 3D groundwater model
- Tracer test characterization of in-situ multirate mass transfer processes
- Stochastic modeling of subsurface flow and transport
- Optimized recovery and injection well network design
- Model total system performance over time

mobile aquifer testing trailer



geologic map



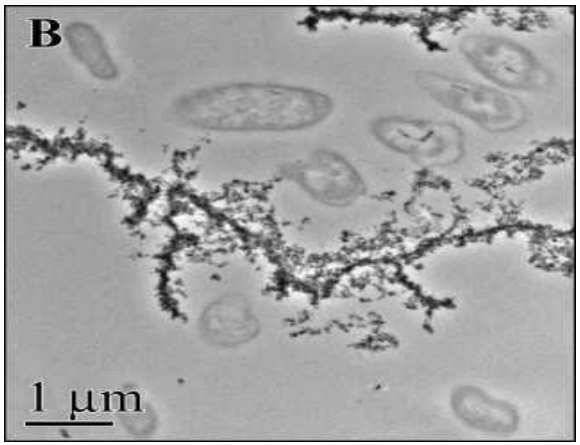
transmissivity map

Sandia National Laboratories

Enhanced Safety *In Situ* Recovery

- New "green" leachants that break down predictably in the subsurface, leaving uranium, and associated trace metals, in immobile form
- Post-leachant uranium/metals-immobilizing washes that provide a backup decontamination process
- Optimized well-field design that increases uranium recovery efficiency and minimizes excursions of contaminated water
- Combined hydrologic/geochemical protocol for designing low-cost post-extraction long-term monitoring

sandstone uranium mineralization



microbial uranium immobilization

Doing Business with Sandia National Labs

- **SNL is a Federally Funded Research and Development Center (FFRDC)**
  - **DOE Laboratory**
  - **Corporately managed (Lockheed Martin)**

- **SNL's Principal Customers include:**

USDA

United States Nuclear Regulatory Commission

National Nuclear Security Administration

Department of Energy

Department of State

Office of Civilian Radioactive Waste Management
OCRWM

Department of Defense

NASA

NE

Office of Science
U.S. Department of Energy

U.S. Department of Energy
Energy Efficiency and Renewable Energy

United States Environmental Protection Agency

Department of Transportation

Sandia National Laboratories

Doing Business with Sandia National Labs

- **Sandia also works closely with industry, small business, universities.**
  - **Work for Others (WFO)**
  - **Memorandum of Understanding (MOU)**
  - **Joint Industry Partnerships (JIP)**
  - **New Mexico Small Business Assistance Program (NMSBA) a collaborative program with LANL**
- **Sandia has been transferring technology to external partners for more than three decades, especially where such agreements benefit Sandia's primary mission for the DOE**
  - **Cooperative Research and Development Agreements (CRADA)**
  - **Technology Licensing**