

Using a Consensus Conference to Characterize Regulatory Concerns Regarding Bioremediation of Radionuclides and Heavy Metals in Mixed Wastes at Department of Energy Sites



Stephanie Sanford, Ph.D. & Denise Lach, Ph.D.
Oregon State University



Project Design

The goal of the project was to identify the range of concerns held by state regulators about using bioremediation strategies for in-situ cleanup of radio-nuclides and metals at Department of Energy (DOE) sites. A "consensus workshop" was used to inform regulators about bioremediation for radionuclides and metals and have them identify their key concerns about the technology. An interdisciplinary team of sociologists and environmental engineers worked together to plan the consensus workshop for regulators from seven states. The state regulator panel read the NABIR Primer, heard from a NABIR scientist about ongoing research, and worked with panel-identified experts to articulate their concerns about bioremediation of radionuclides and metals. With this background, the state regulators wrote a final report. State regulator panel members also responded to pre-workshop and post-workshop surveys about their knowledge of and attitudes toward using bioremediation for radionuclides and metals.



State Regulator Panel



From left:

Steve Gunderson, Colorado; Dale Rector, Tennessee; Kathleen Trever, Idaho; Carl Spreng, Colorado; Chuck Gorman, South Carolina; Larry Erickson, Missouri; Don Siron, South Carolina; Laura Cusack, Washington; Nancy Uziemblo, Washington; Susan Timm, California

P.I.s and Steering Committee

Denise Lach, Principle Investigator, OSU

Stephanie Sanford, Co-P.I., OSU

Kenneth Williamson, Co-P.I., OSU

Lewis Semprini, Co-P.I., OSU

Paul Hadley, Steering Committee, California EPA

Janet Gillaspie, Steering Committee and Facilitator, Environmental Strategies, LLC

State Regulator Recommendations

A. Use of Bioremediation for Radionuclides and Metals Contamination

Implementation Opportunities

Characteristics that would influence the acceptability of bioremediation for a particular application:

- ✓ Potential for hazardous byproducts
- ✓ Long-term stewardship requirements
- ✓ Likelihood that failure results in catastrophe
- ✓ Amount of change in geochemical environment
- ✓ Concentrations of contaminants
- ✓ Stability of reaction
- ✓ Complexity of waste and site conditions
- ✓ Degree of sorption onto material surface
- ✓ Existence of geological analog
- ✓ Other cost-effective remedies
- ✓ Extent to which technology process has been demonstrated or observed

Deployment / Implementation Issues

For bioremediation to be used, deployment and implementation aspects must be addressed:

- ✓ Adequate hydrogeological characterization
- ✓ Adequate geochemistry characterization
- ✓ Using bioremediation as a secondary or polishing technique for caps, landfills, and in-place disposal
- ✓ Using bioremediation to mobilize a contaminant for extraction
- ✓ Using bioremediation to stabilize a contaminant

Monitoring and Maintenance Considerations

Suggestions for bioremediation project monitoring:

- ✓ Match performance monitoring parameters to remediation objectives
- ✓ Incorporate flexibility in monitoring plan
- ✓ Establish and operate a monitoring network
- ✓ Identify leading indicators of failure and establish contingencies
- ✓ Consider monitoring requirements up front, during design
- ✓ Make long-term budget commitments
- ✓ Make maintenance and monitoring part of periodic reviews
- ✓ Stabilization and isolation remedies require more long-term monitoring; extraction requires more short-term monitoring

B. State Regulatory Perspective

Successful deployment of bioremediation requires the following ingredients:

- US DOE must accept state authority in making cleanup decisions
- US DOE must commit to appropriate long-term stewardship
- Clear communication and collaboration are key to success

C. Use of Consensus Workshop

The consensus workshop worked well for these reasons:

- Clear scope of work
- Limited and manageable group size
- Appropriate mix of members with technical/policy knowledge
- Group members familiar with the technology
- Topic of keen interest to participants
- Good educational forum
- Good, flexible facilitation
- Workshop has potential to influence US DOE research

Pre- and Post-Workshop Surveys

Comparison of survey results show changes such as:

- Perceived knowledge of bioremediation increased
- More participants comfortable or very comfortable using bioremediation for radionuclides and metals
- Acceptability of using bioremediation increased "...given existing state rules and regulations"
- All technologies for cleaning up rads and metals were more acceptable

"The consensus workshop substantially enhanced my understanding and acceptance of the potential application of using bioremediation technologies for metals and radionuclides." - State Regulator Participant



Visit our Project Website:

<http://www.cwest.orst.edu/nabir2/index.htm>

Center for Water and Environmental Sustainability (CWEST)

210 Strand Agricultural Hall; Oregon State University; Corvallis, OR 97331-2208

Phone: 541-737-4022; Fax: 541-737-2735; cwest@engr.orst.edu; <http://cwest.orst.edu>

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Consensus Workshop

Bioremediation of Metals and Radionuclides