

CRESP DOE LANDFILL PARTNERSHIP

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Hanford's ERDF



On-Site Disposal Facility (OSDF): aka LLW or MW Landfill

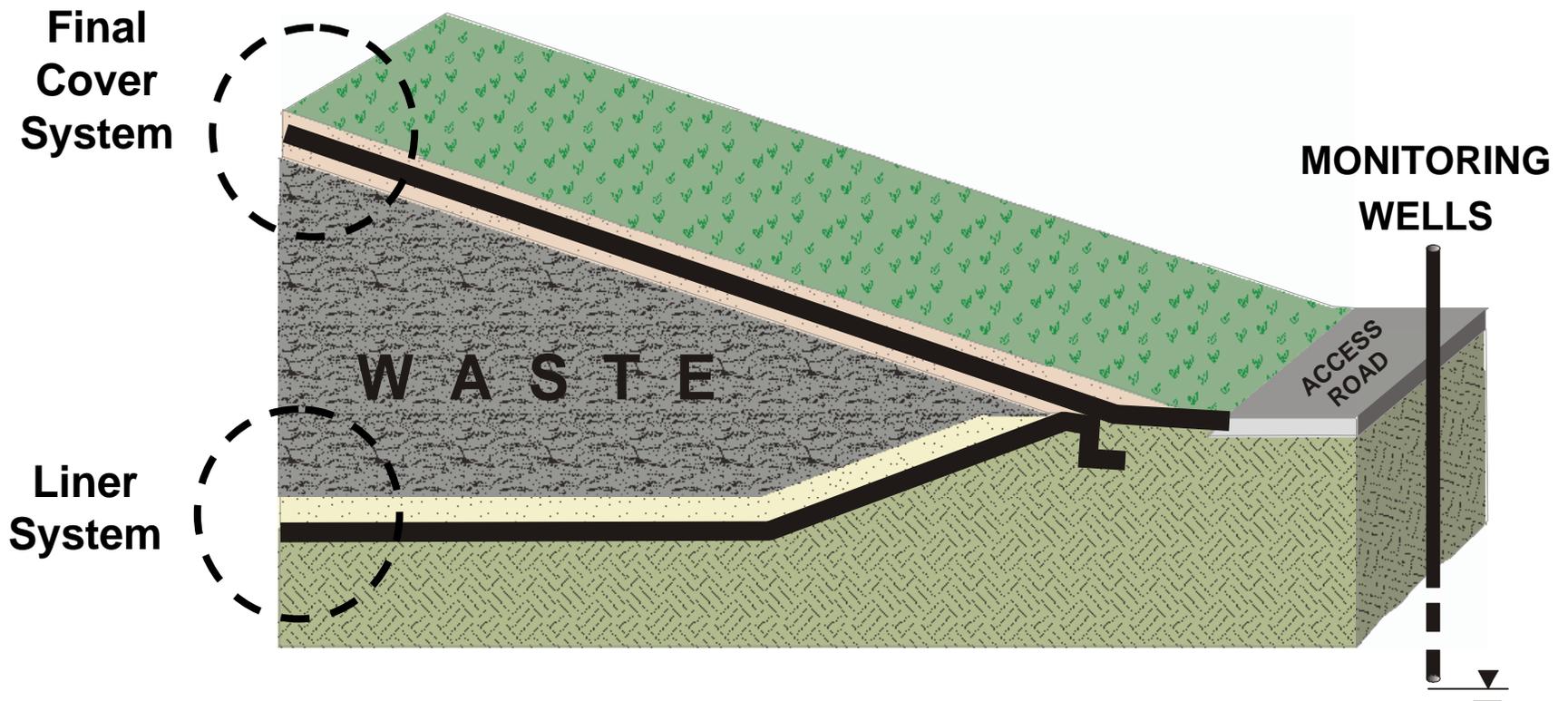


Figure courtesy M. Othman, Geosyntec Consultants

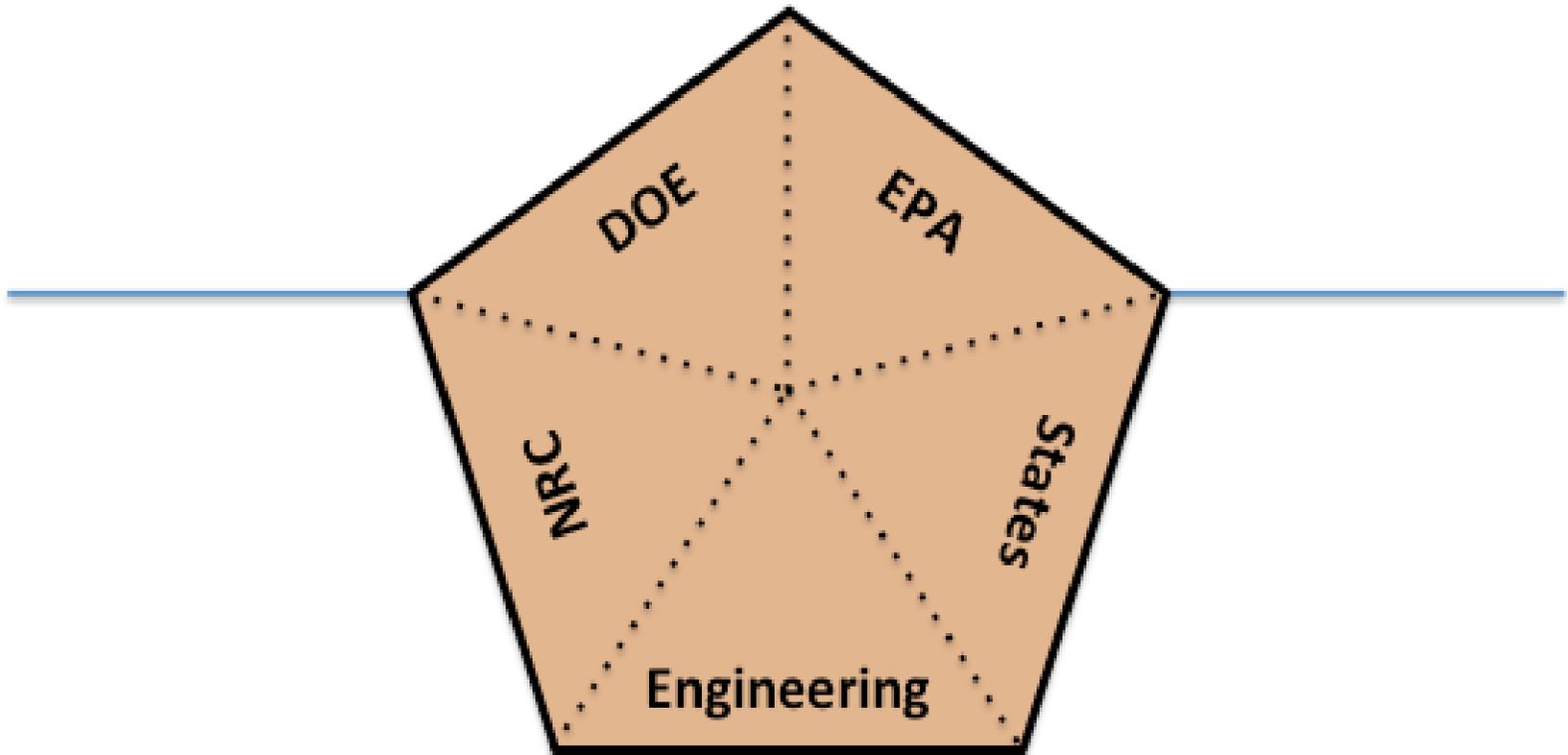
Purpose of Landfill Partnership

- Conduct *independent* applied research to address landfill technology issues that cross-cut the DOE complex.
- Provide forum to discuss regulatory conflicts and shortcomings, and to recommend technological solutions.
- Participate in independent technical reviews related to DOE technologies or sites.

Relevance

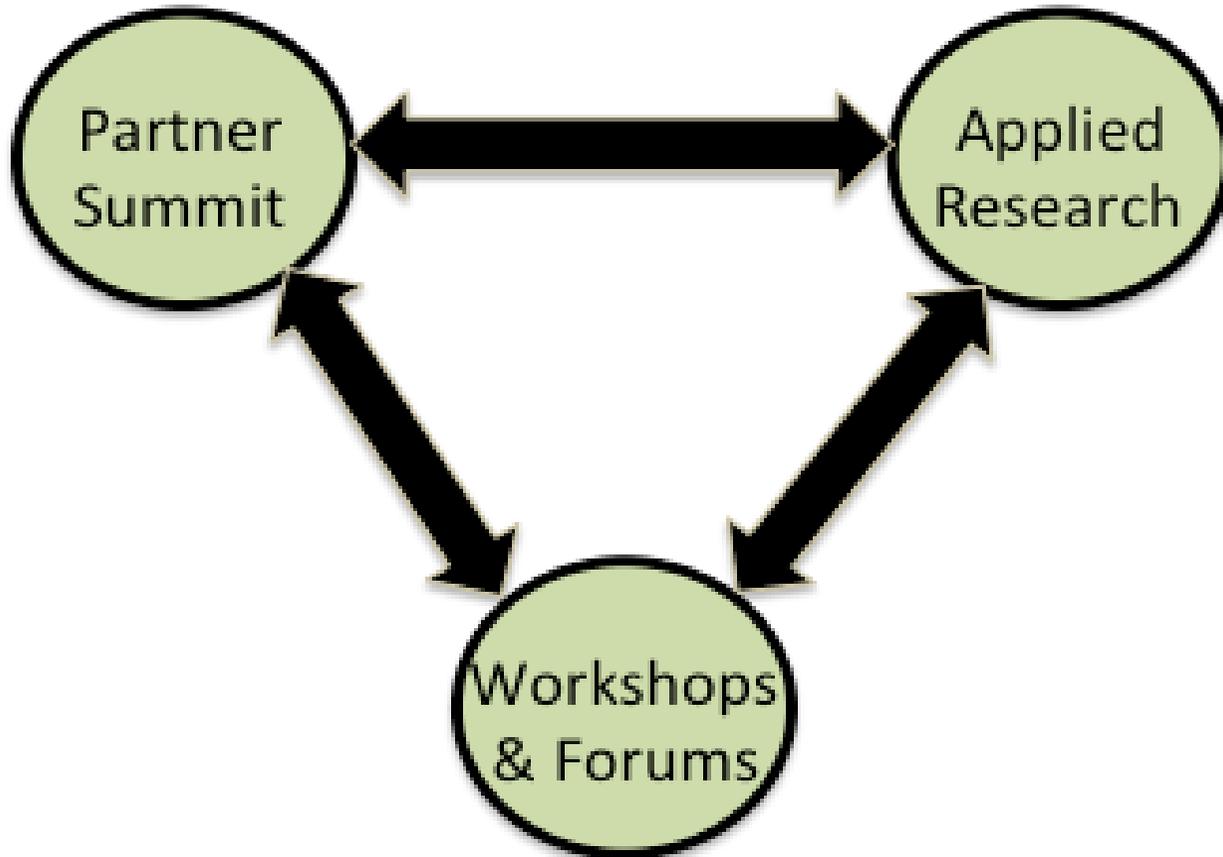
- OSDFs (landfills) are key step in D&D/restoration at EM sites; stakeholder concerns regarding long-term performance impede acceptance/permitting.
- NAS (2009) identifies existing knowledge on long-term performance of waste containment structures as a principle science and technology gap for EM.
- LP to provide source terms for EM's ASCEM(analogous to CBP)

Partnership Pentagon



**Landfill Partnership – Building
Consensus & Confidence in
Containment**

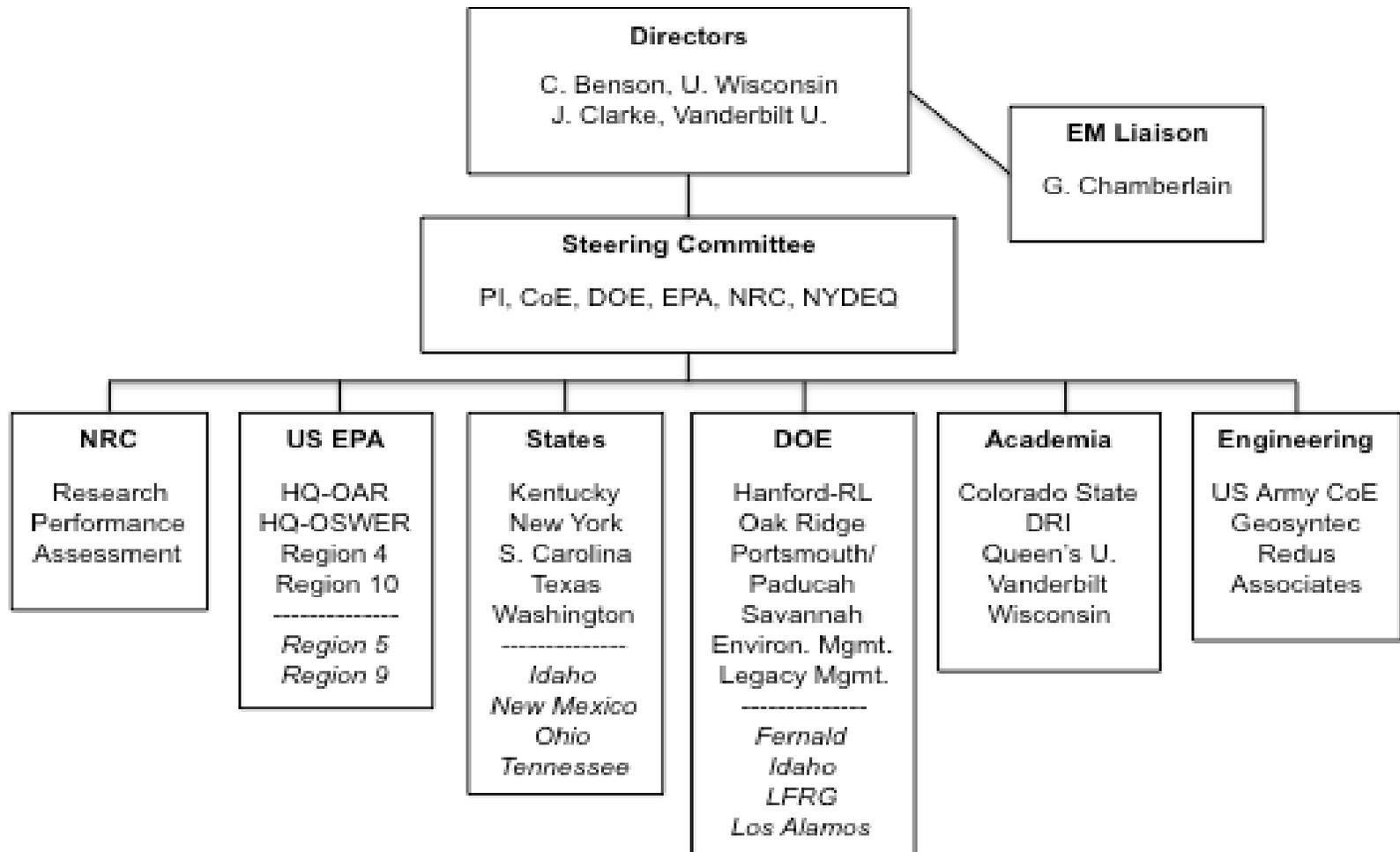
Outreach – Research Triad



August 2010 Partnership Meeting

- August 6 in Rockville, MD immediately after NRC Workshop on LLW Containment
- 23 participants from DOE, NRC, EPA, states, private sector, and academia (SRS, RL, PORTS, Paducah, Fernald, UMTRA represented from DOE)
- Review and discussion of regulatory paradigms, follow-up with survey
- Presentations on kick-off projects

Organizational Structure



Landfill Partnership Survey

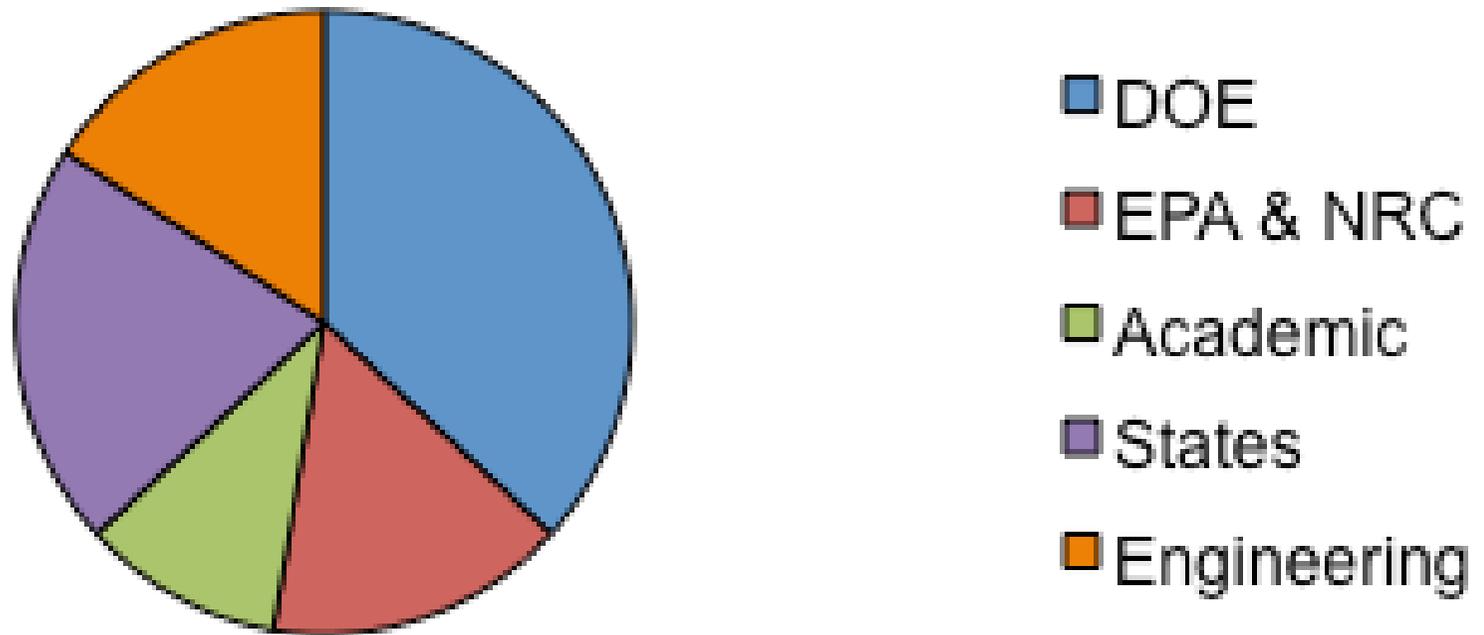
1. What are the three most pressing technical issues affecting success of on-site disposal facilities for LLW and mixed waste?
2. What are the three most significant regulatory conflicts for on-site disposal facilities receiving LLW and mixed waste?

Survey Response

- 17 partners responded
- 99 comments provided
- 5 major technical issues identified (> 5 comments)
- 4 major regulatory issues identified (> 5 comments)
- Issues ranked by number of responses

Survey Respondents

Roles of LP Survey Respondents



Technical Issues

1. Develop confidence in the long-term (1000 yr) performance of OSDF designs. 
2. Develop an understanding of degradation mechanisms affecting containment systems in OSDFs. 
3. Understand and quantify how final covers evolve over the design life of OSDFs. 
4. Develop confidence in models used for PAs of OSDFs and characterize uncertainty in model predictions. 
5. Create and evaluate monitoring strategies that build confidence in the performance of OSDFs.

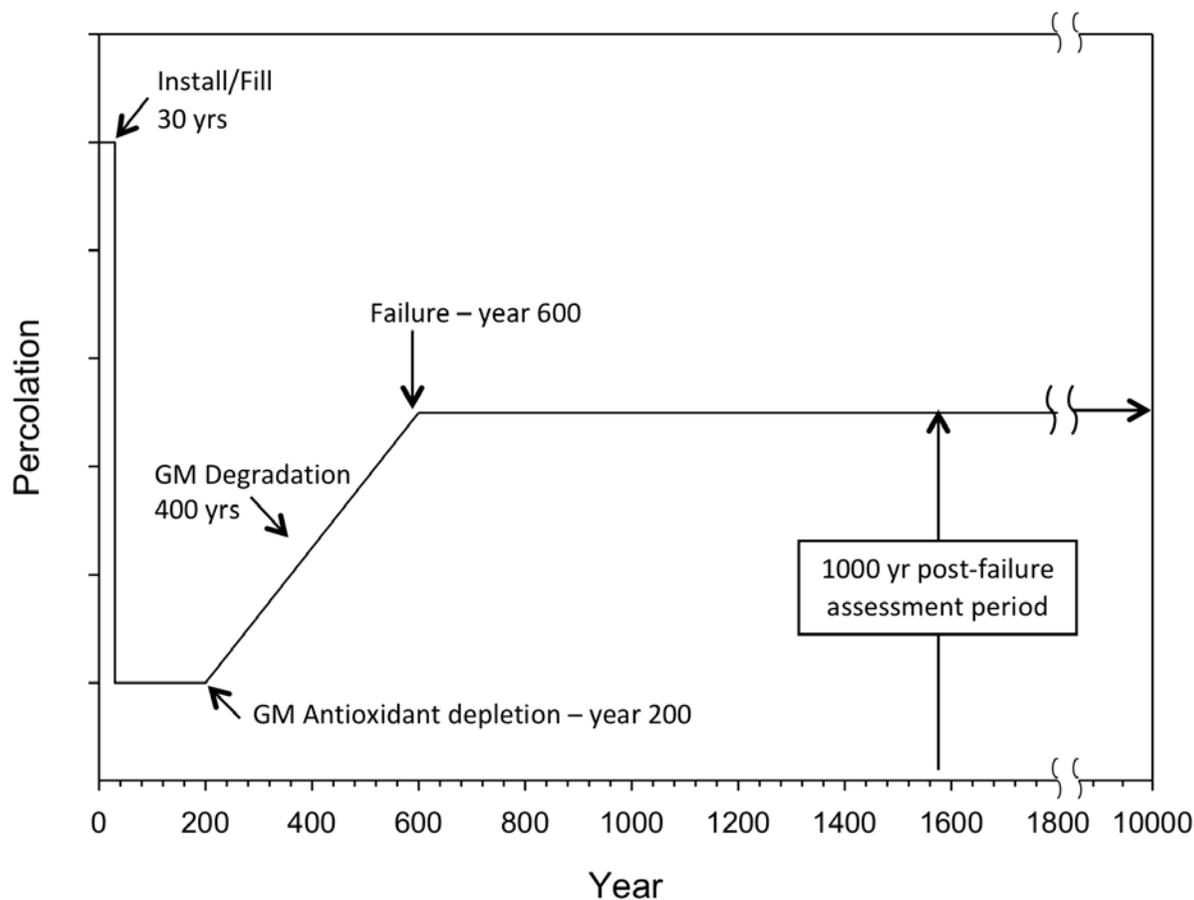
Regulatory Issues

1. Consistent and universal design approach is needed that applies to all wastes. This approach should address prescriptive vs. performance-based approaches, including the need for liners.
2. Consistent definition of performance requirements is needed that is applied universally by all regulatory agencies (e.g., risk vs. dose, design time frame, etc.)
3. Create a logical time frame for performance expectations that is consistent with waste characteristics and performance requirements.
4. Create performance requirements that explicitly acknowledge uncertainty and the degradation of containment systems.

Degradation of Barrier Systems



Geomembrane Degradation



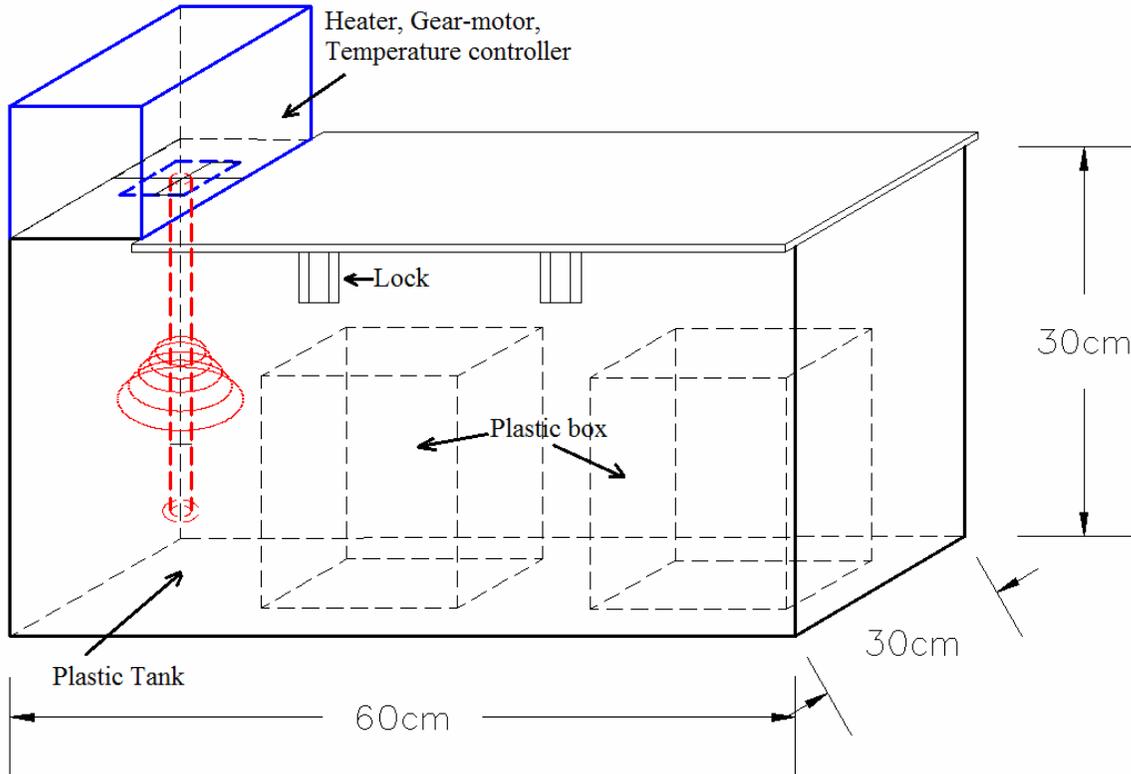
Day-long discussion at Paducah in March '11.

Literature suggests lifespan may be more than 1000 yr.

No data for conditions in LLW or MW facilities.

No credible scientific data for LLW or MW to draw inference, but methods from solid waste literature

Durability Tests in Synthetic LLW Leachate



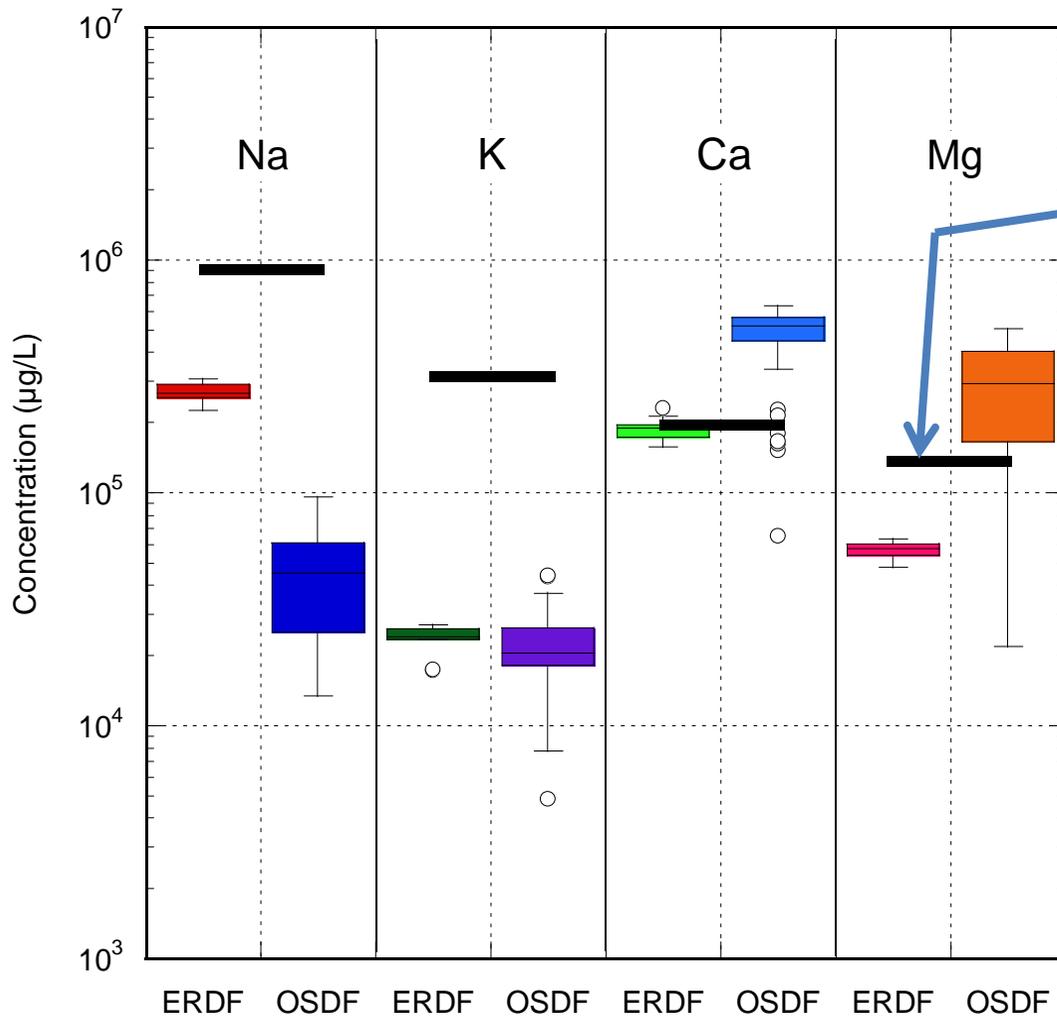
Data from Oak Ridge, Fernald, Hanford, Idaho, & CNSC to define realistic OSDF LLW/MW leachates.

Accelerated degradation tests using elevated temperature in immersion cells..

No credible scientific data for LLW or MW to draw inference, but methods from solid waste literature

Major Cations - ERDF & OSDF Leachates

Major Cations

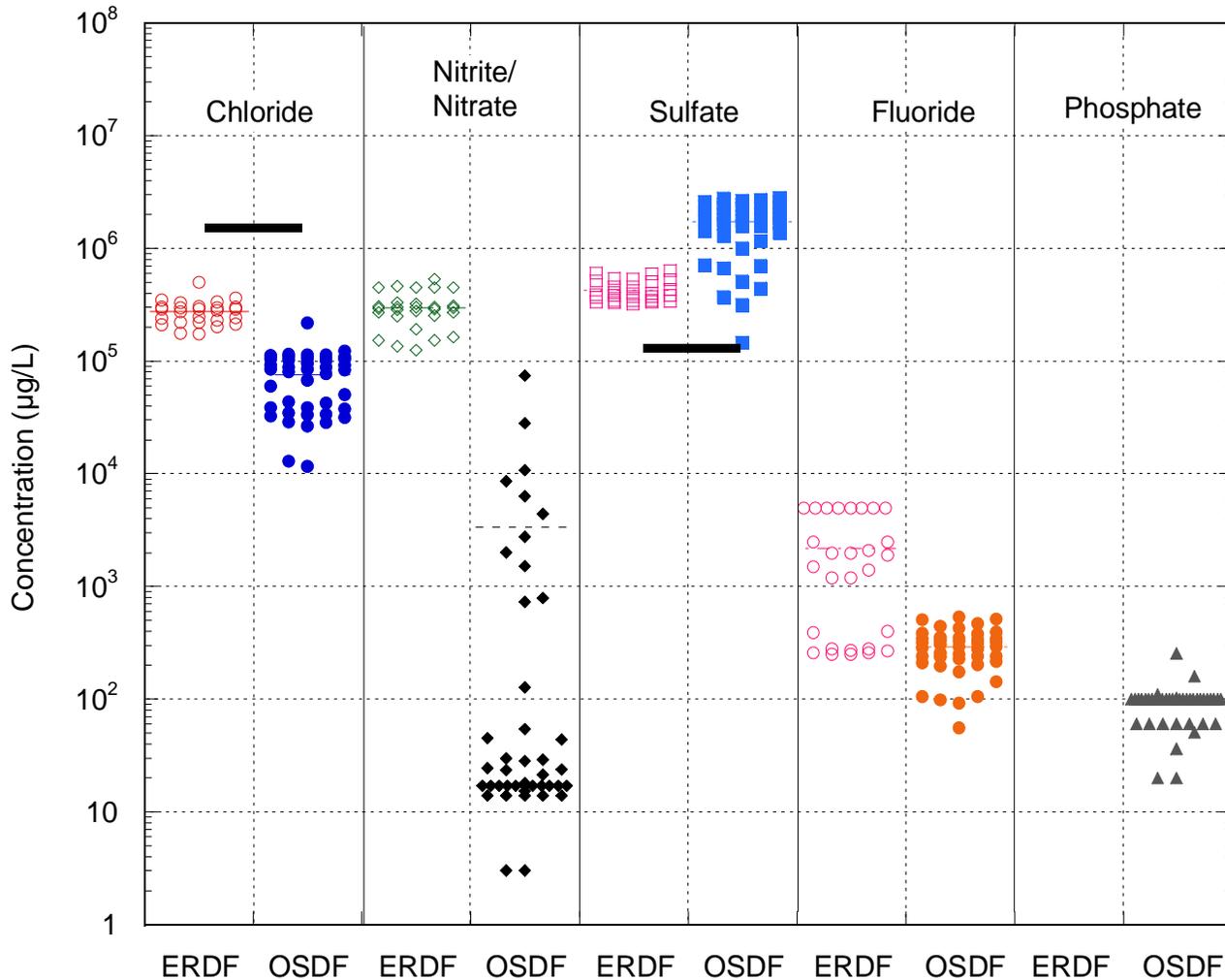


Solid bars correspond to MSW leachate.

Na and K less abundant in LLW/MW leachate compared to MSW leachate

Major Anions - ERDF & OSDF Leachates

Major Anions



Note: the blank column is lack of data

---- represents typical MSW leachate data

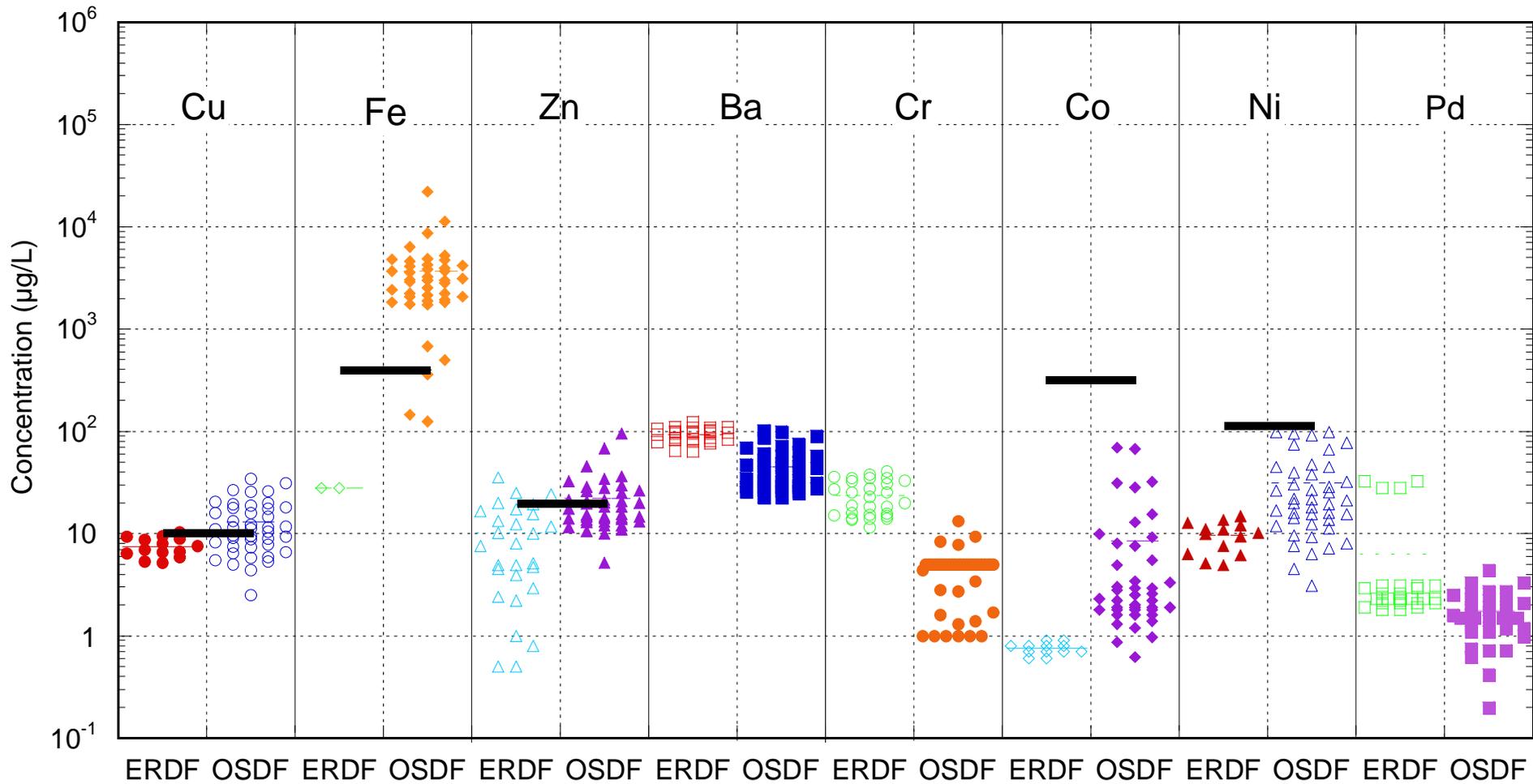
No ---- means the component does not measured in MSW leachate

Chlorides lower than MSW leachates (fewer salts).

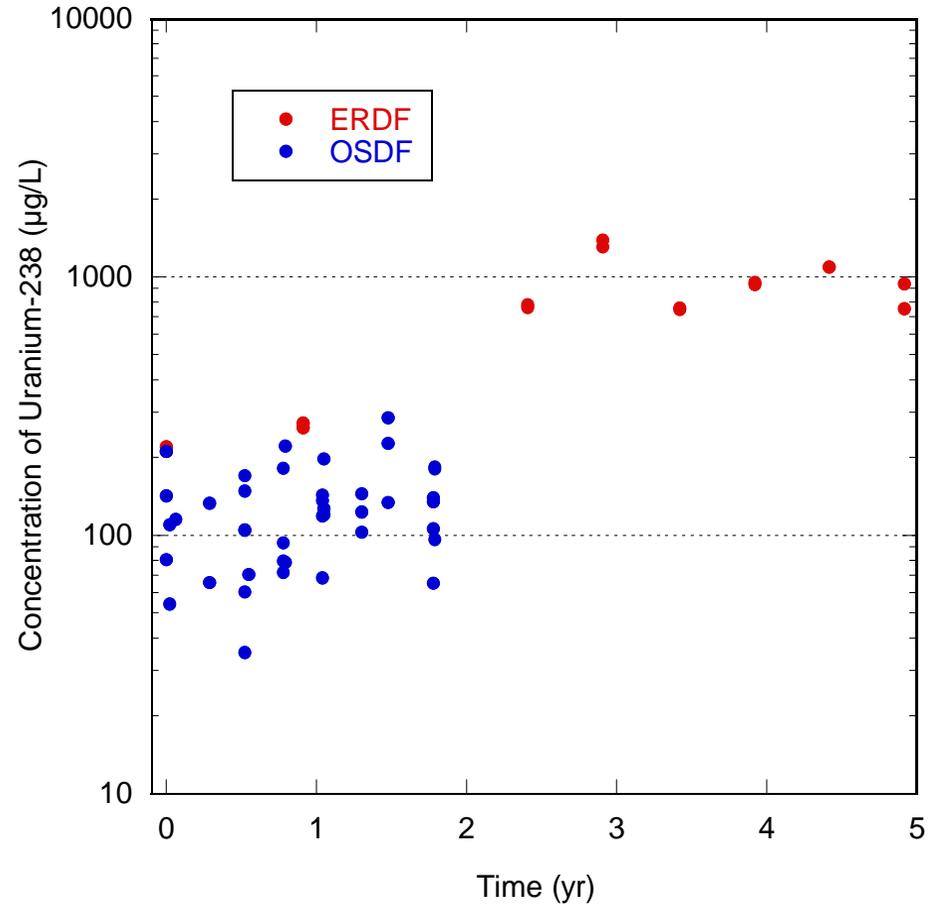
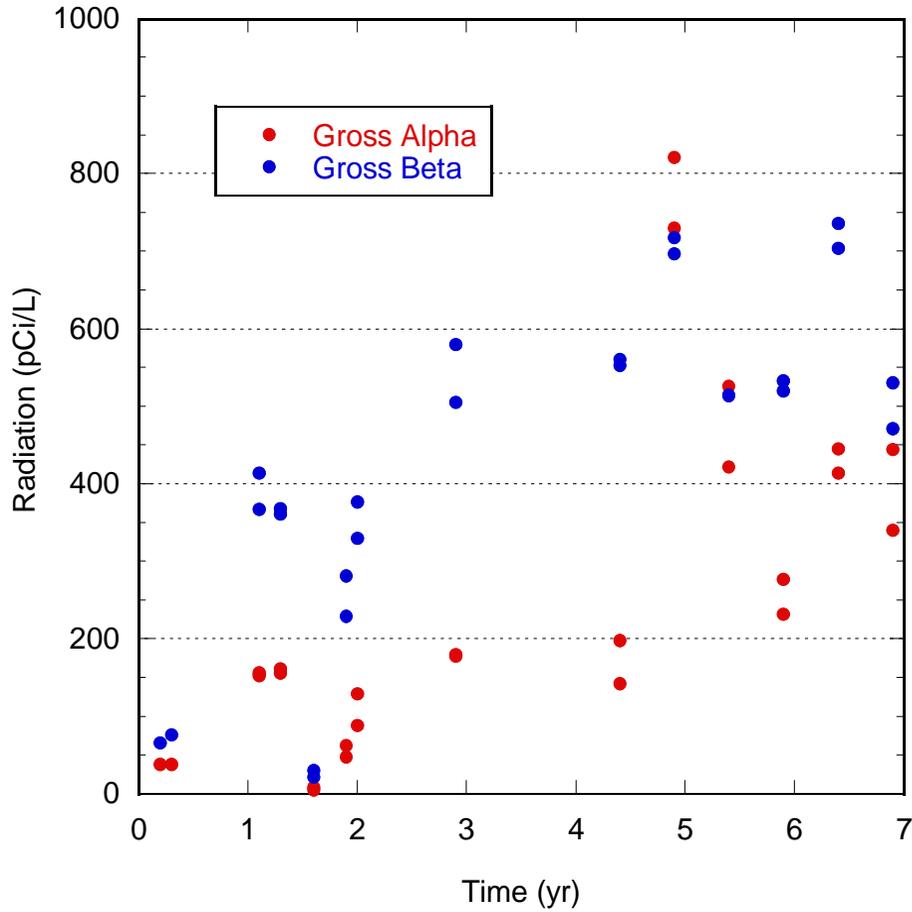
Sulfates higher in LLW – disposal of contaminated drywall.

Nitrate should be lower for LLW...gathering data.

Trace Elements



Radionuclides



Degradation of Cover Systems



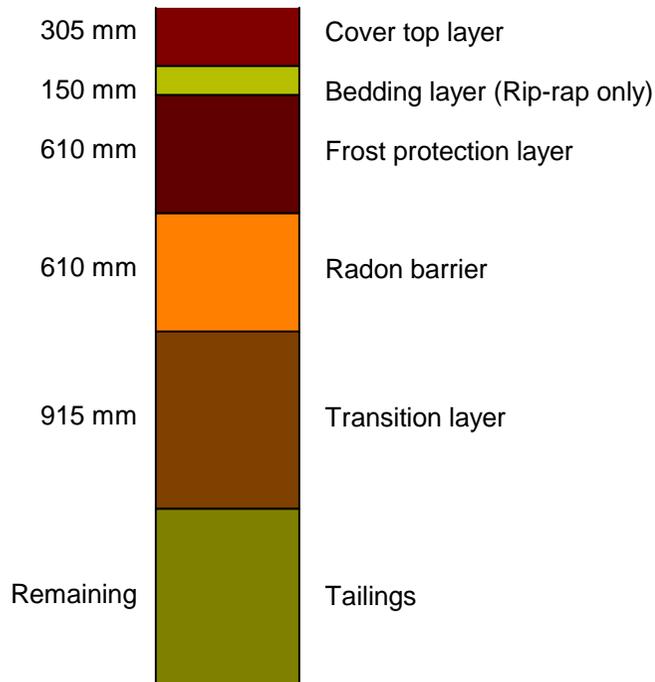
Synthesis of literature on degradation of covers.

Decision support system to evaluate cover type in context of environment & propensity for degradation

Strategies to synergistically control erosion & manage hydrology.

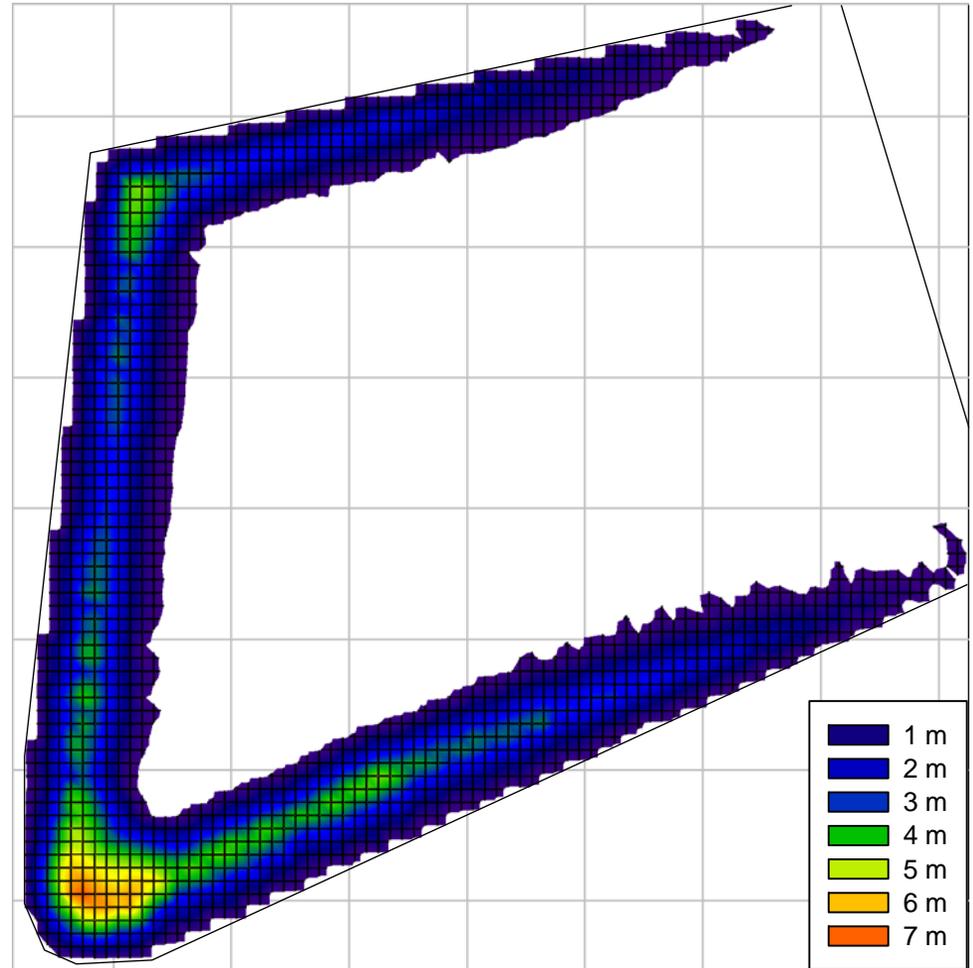
Erosion of Rip-Rap and Gravel Admixture Covers - 1

Resistive Cover Soil Profile



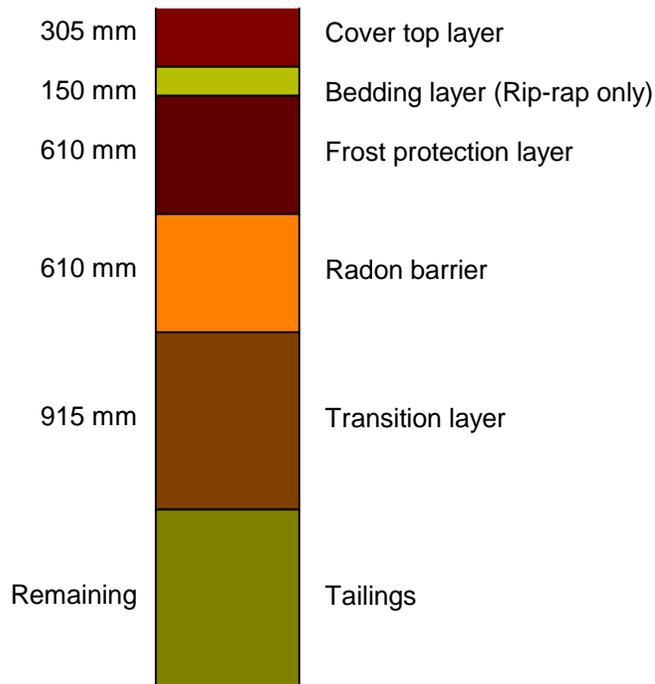
Rip-rap surface layer

1000 Year Erosion - Vegetated Riprap Cover
Semi-Arid Climate



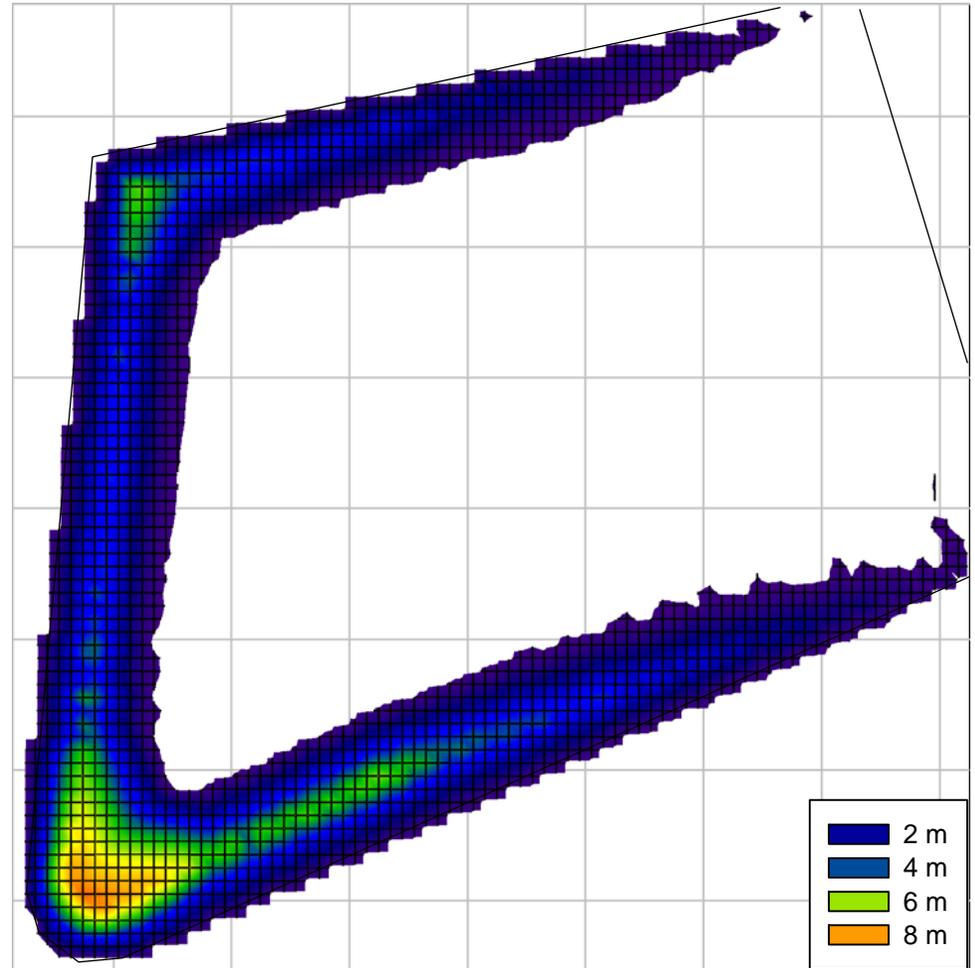
Erosion of Rip-Rap and Gravel Admixture Covers - 2

Resistive Cover Soil Profile

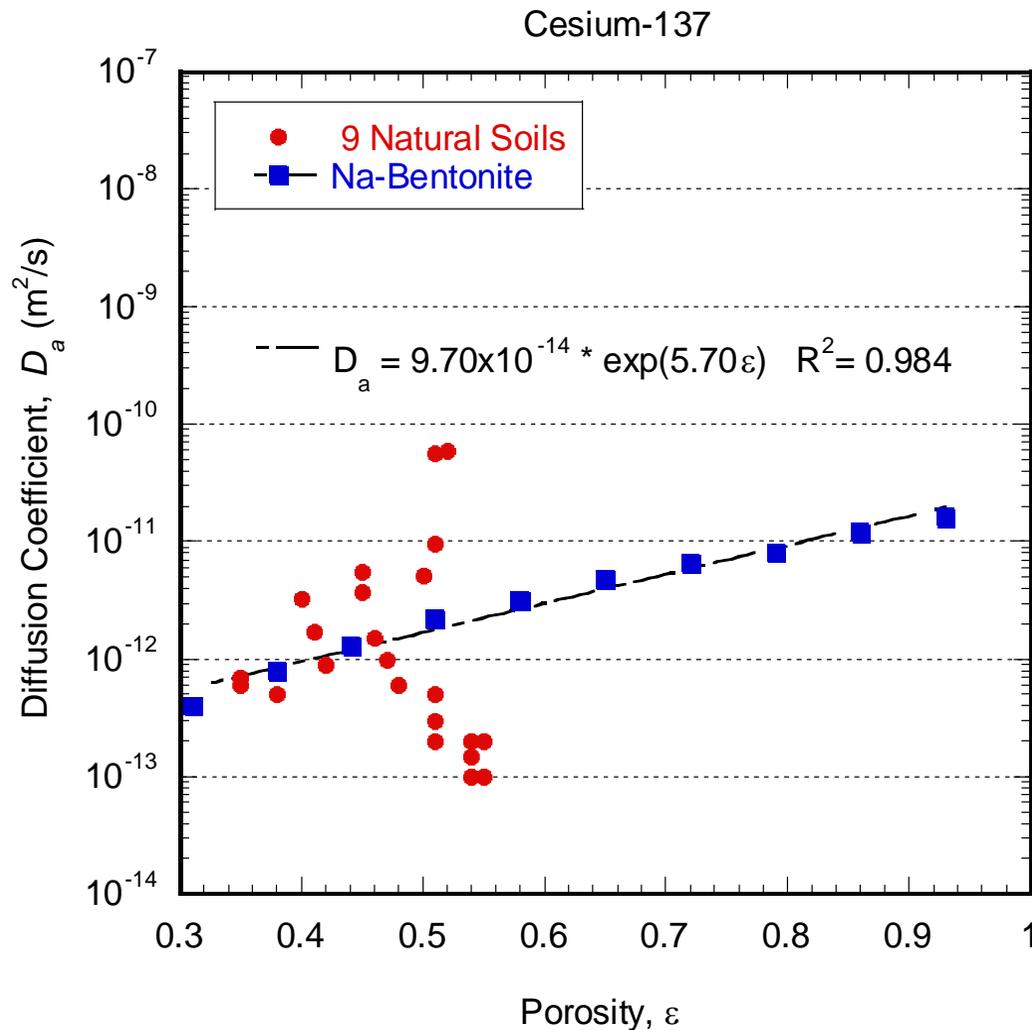


Gravel Admixture Topsoil Surface Layer

1000 Year Erosion - Vegetated 40% Gravel Admixture Cover
Semi-Arid Climate



Transport Parameters for Barriers

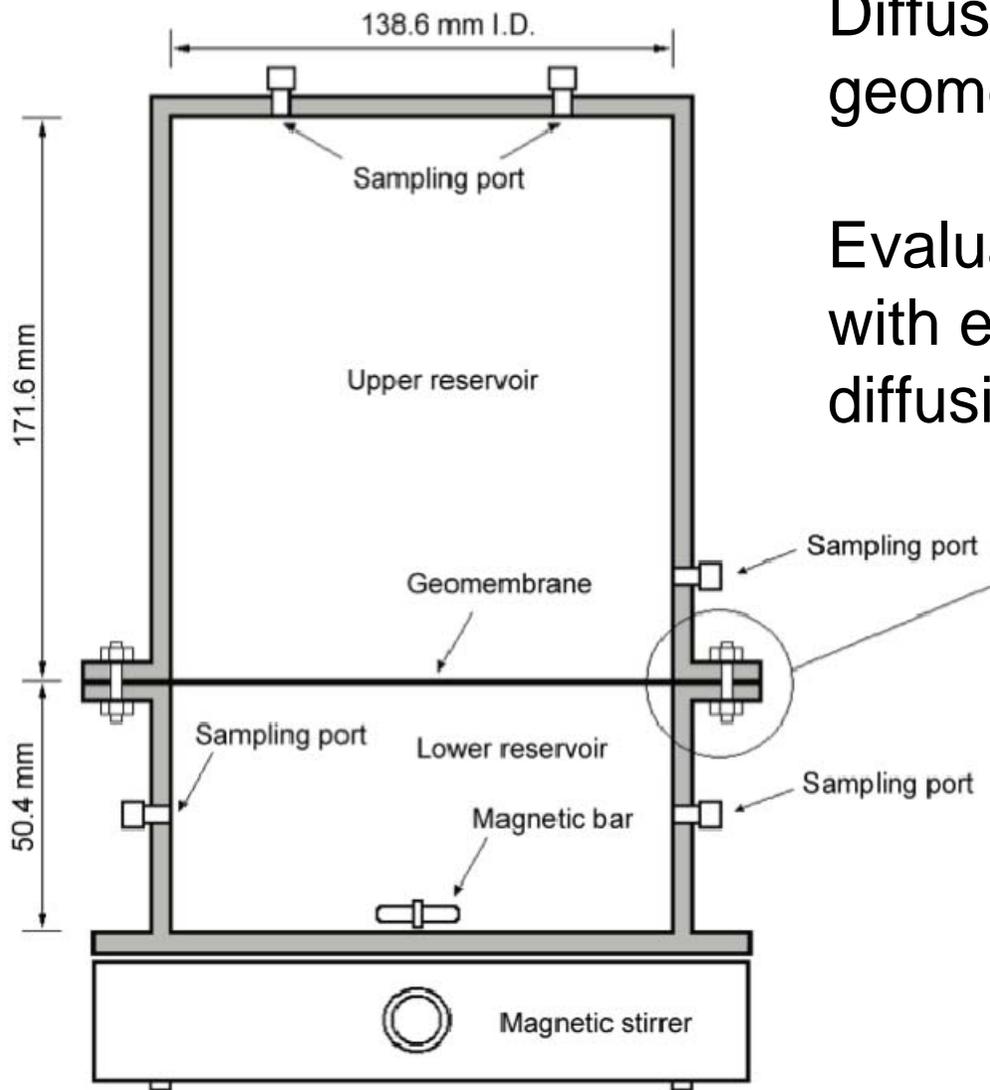


Synthesis of literature on radionuclide transport parameters for barrier materials.

Wealth of information on bentonite and natural soils; non for more traditional clay barriers.

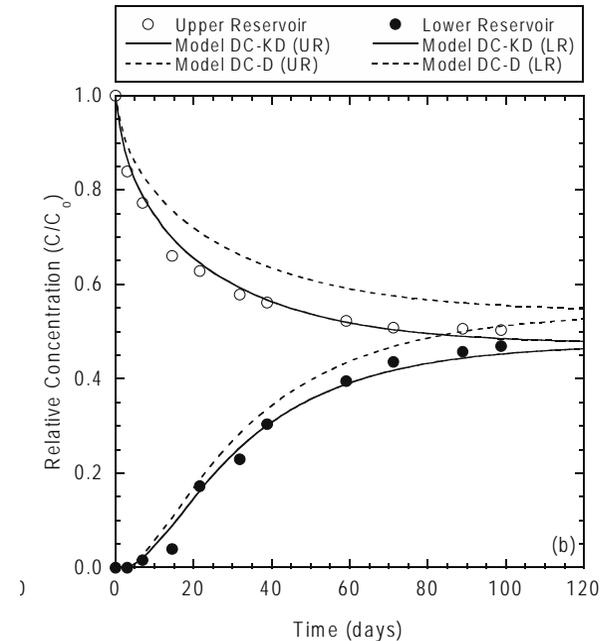
None for geomembranes.

Transport Parameters for Barriers



Diffusion and sorption tests for geomembranes.

Evaluating new geomembrane with exceptionally low radon diffusion coefficient.



Summary

1. Partnership focused on addressing technological and regulatory issues affecting confidence in long-term performance of LLW/MW containment facilities.
2. Kicked off in 2010, partnership meeting in August 2010.
3. Conducting applied research to address technology needs for DOE landfills – but applies broadly to LLW and MW facilities.
4. Conducting technical reviews for DOE sites (SRS, Sandia)
5. Develop workshops and outreach programs; more effective communications.