

Overview of Breakout Session 1

Monitoring and Modeling to Support Performance Assessment

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Screening Characterization

- Conceptual Model Development
- Identify major attenuating mechanisms
- Identify data required to select remedy
- Identify future environmental scenarios
- Establish blend of empirical and deterministic approaches

Decision Characterization

- Estimate system capacity
- Verify attenuation processes
- Determine Rates of attenuation
- Address sustainability
- Evaluate potential attenuation enhancements
- Develop contingency plan for remedy

Process Monitoring

(short-term monitoring; 1- 10 years)

- Refine conceptual model as needed
- Confirm remedy effective
- Prepare to Transition to Long-Term Monitoring
 - Establish baseline
 - Establish performance envelope
 - Identify indicator parameters
- Contingencies
 - Enhance attenuation as needed
 - Modify remedy; return to decision characterization as needed.

System Performance Monitoring

(long-term monitoring > 5 years)

- Adapt/incorporate new monitoring methods
- Account for changes to environmental system
- Monitoring System
 - Use indicator parameters
 - Measure change from baseline
 - Evaluate against predicted performance envelope
- Contingencies
 - Assessment monitoring if outside performance envelope;
 - Return to process monitoring as needed

Remediation Objectives Met

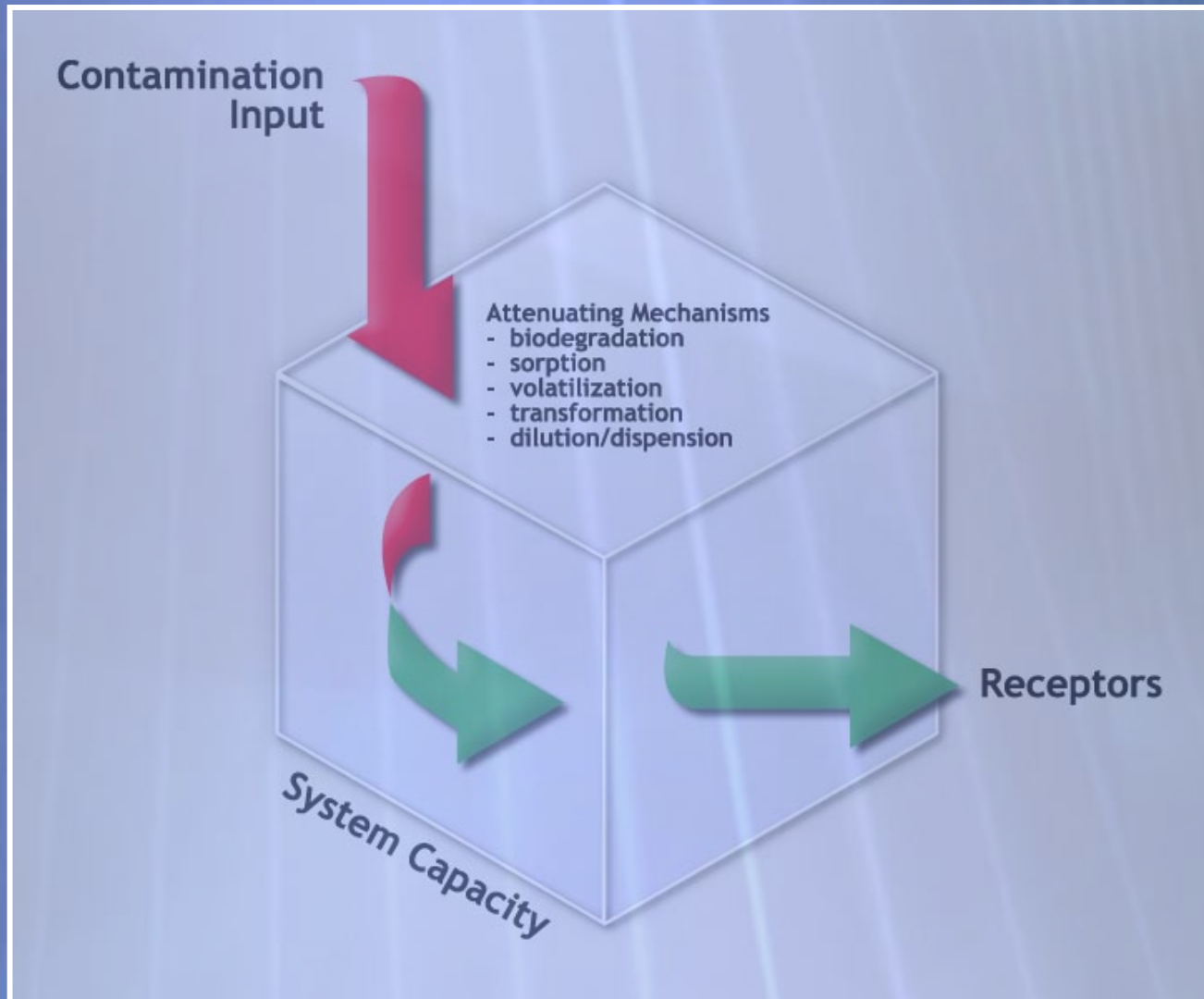
No Further Action

Contingency

Contingency



Mass Balance Approach



Attributes of Performance Monitoring

- ✦ Measure change from baseline
- ✦ Passive
- ✦ Robust
- ✦ Low maintenance
- ✦ Low cost
- ✦ Flexible to handle new technologies
- ✦ Utilize leading (failure) Indicators
- ✦ Measures of Ecological health
- ✦ Redundancy

Adherence to these attributes should promote development of non-traditional monitoring configurations

Compliance monitoring vs Long-term monitoring

- ✦ Current strategy is to ring the waste site with detection wells
- ✦ Is this by default the “long term” monitoring network?
- ✦ How can modeling be used to facilitate monitoring

Overall Approach

- ★ Empirical

- ★ Site and plume data can be directly interpreted to assess MNA or other remedies

- ★ Deterministic

- ★ Fate and transport processes are described by equations and plume behavior is simulated with a model

All sites from simple to complex require a conceptual model that allows the ability to predict and therefore validate modeling, understanding and facilitates stakeholders acceptance of characterization and monitoring strategies.

Streamlining current networks

- ✦ Data-Quality Objective (EPA)
- ✦ Automated networks
- ✦ Combining waste sites (SRS)
- ✦ Optimization
 - ✦ Trail and error
 - ✦ Decision making
 - ✦ Mathematical Optimization

Mathematical Optimization

- ✦ Applied to remediation
- ✦ Can be adapted for Process and Performance monitoring

Automated Networks

- ✦ Frameworks data organization
- ✦ Object-oriented user interface
- ✦ Neural networks (tie data sets together)

Indicator Parameters

- ✦ Further develop concept
- ✦ Amplify measures
(tracers/indicators)

Performance Envelope

- ✦ Established during process monitoring
- ✦ Use modeling to help set performance envelope
- ✦ Use to trigger assessment

Iterative Process

- ✦ Remediation is iterative, frequent reviews and exit strategies
- ✦ Modeling is iterative and needs to be validated
- ✦ Adaptive Management (data gaps)

Research Areas

- ✦ Spatial Integrated measurements (fka, volumetric)
- ✦ Remote sensing
- ✦ Indicator parameters
- ✦ Accumulator samplers
- ✦ Mathematical optimizing approaches
- ✦ "Disposible" access
- ✦ Novel networks (horz wells, diffusion tubes)
- ✦ Direct measures of parameters
 - ✦ Contaminant flux
 - ✦ Biofilm sensors
 - ✦ DNA/RNA arrays

“Other” Areas

- ✦ National Registry for Institutional controls
- ✦ Trust Fund
- ✦ Independent evaluators of
 - ✦ Monitoring systems
 - ✦ Remediation systems

Summary

- ✦ Use phased (and iterative) approach
- ✦ Set up for Performance Monitoring early
- ✦ Predictive, scenario-based modeling can be used to design performance monitoring
- ✦ Technologies identified for further development