Post-Closure Monitoring – Can We Be Done Yet?

Presenter:
Joan A. Smyth, P.G. – Vice President
Define Termination

Performance-Based Guidance

State Examples
  - WA, VA and NC
What Does Termination of Post-Closure Care (PCC) Look Like?

- Is it impossible?
- Is it just a reduction in monitoring?
- Can the owner/operator walk away?
Who Allows it?

- Some states that have provision for modification of post-closure care: AL, DE, FL, GA, IL, MA, MN, NH, NY, ND, OH, SD, TN, VA, VT, WY
- Focus is protection of human health and the environment
- No specific consistency between them
Performance-Based Evaluation of PCC (ITRC Guidance 2006)

- Leachate Management Module
- Groundwater Management Module
- Landfill Gas Management Module
- Cover Monitoring and Maintenance Module

Evaluate Proposed Change
Implement Change
Monitor Change
Pre-Requisites for Performance Based Evaluation

- Data for Evaluation
  - Site Survey
  - Construction History
  - LFG Collection System As-Builts
  - Post-Closure Monitoring Data
  - Leachate Data (if available)
  - Meteorological Data
  - **Defined End-Use of Site**
- Closure and Post-Closure Plans
  - Have they been followed?
Post-Closure Monitoring – Can We Be Done Yet?

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Leachate Module

- Define Future Leachate Management Strategy
- Perform Generation/Quality Trend Analysis
- Evaluate Leachate Release Impact

- Tier 1 – Compare Leachate as a Direct Discharge
- Tier 2 – Compare Point of Compliance Groundwater Quality to GW Standards
- Tier 3 - Evaluates the threat at the Point of Exposure
Landfill Gas Module

- Evaluate LFG Generation Rate
- Evaluate LFG Quality
- Future LFG Strategy Must Be Defined
- Will Future Strategy Protect Human Health and Environment
Groundwater Module

- If Site is in Assessment or Corrective Action Module can’t be performed
- If No Impact (above standards) Can Evaluate
- Determines Length of Monitoring
  After Change of Leachate or LFG Strategies
Cover Maintenance Module

- Define Expected Performance of Cap
  - Stability, settlement rate, maintenance
- Propose Changes
- Will Changes Meet Reg. Requirements?
- Will Changes Meet Functional Requirements?
Performance Based Module Summary

- Determine Post-Closure End Use
- Review Historical Data for All Modules
- Does Data Meet Minimum Requirements to Protect Human Health and Environment?
- Evaluate Effect of Proposed Changes
- Get Approval for Changes
- Monitor Changes to Evaluate Anticipated vs. Real Effect
- Modify Changes, If Necessary, Based on Evaluation
Washington State Guidance

- For Pre-Subtitle-D Landfills Only
- WA – 20 Year Post-Closure for These Facilities
- Focus is on “Stabilized State” of Waste Management Units
  - Little or No Settlement
  - Little or No Gas Production
  - Little or No Leachate Production
- What Does THAT Mean??
Washington State (Continued)

- Leachate Production Data Can’t Always Be Measured
- LFG Production Calcs Not Required for Post-Closure
- Some Sites Granted Reduced Monitoring in Post-Closure
- Data Evaluation Still Necessary
- Review Historical Data for All Modules
- Data Gaps Need to be Addressed to Establish Trends
  - Plan for Additional Monitoring
  - Groundwater Data can Replace Leachate Data
  - Landfill Gas Production Modeling (LandGEMS)
  - Landfill Surface Gas Monitoring
Washington State (Continued)

What About all the “Little or No” Requirements?

Landfill Gas – Little or No =

- LFG Concentration at Monitoring Points Meet Requirements for 8 consecutive events
- LFG Concentrations in Vent Pipes <25% LEL (8 events)
- Data Exhibits Steady or Declining Trends
- No Ongoing Air Permit Requirements
Washington State (Continued)

- What About all the “Little or No” Requirements?
  - Leachate Production – Little or No =
    - Leachate Volumes Reduce Over Time (Over 2 years)
    - Landfills with Lysimeters Have No Liquid Accumulation
    - No Exceedances of Groundwater Standards
    - Statistical Analysis of GW Data - No Significant Trends
Post-Closure Monitoring – Can We Be Done Yet?

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Washington State (Continued)

- What About all the “Little or No” Requirements?

- Settlement - Little or No =
  - Uniform Slope between 2% and 33%.
  - Designed Slopes Are Consistent with Current
  - No Evidence of Differential Settlement
  - Settlement Trend Curve Approaches Zero
  - Uniform Settlement is <0.5” Over 2-Years

- Termination of PCC Ends Facility Permit
Virginia

- Pre-Subtitle-D Landfills - 10 Years Post-Closure Care
- Subtitle-D – 30 years, C&D Landfill – 10 Years
- Termination is Modular
  - Modules Include:
    - Groundwater Monitoring
    - Surface Water Monitoring
    - Landfill Gas Monitoring
    - Leachate Management
    - Stormwater Management
    - Cover and Monitoring System Maintenance
  - Must Be Protective of HH&E
Virginia (Continued)

- Groundwater Module
  - Not In Corrective Action
  - Meets Groundwater Standards for 3 years
  - Residual Effects of Remediation Must Be Considered and That Time Is “Corrective Action” Time
  - VADEQ May Require Additional Wells/Time to Evaluate
  - Data Gap Resolution Must Be Addressed
  - Must Prove LFG Generation Will Not Impact GW
  - Statistical Steady or Downward Data Trends
  - Discussion of Parent/Daughter Constituents
Virginia (Continued)

- Landfill Gas
  - Not in Corrective Action
  - Concentrations Must Meet Standards for 3 years
- Leachate Management
  - Evaluation of Leachate Seeps (if any)
  - Sites with Toe Drain Must Evaluate Performance/Trends
  - Evaluation of Impact of a Release
- Surface Water
  - Provide Historical Data
  - Provide Parent/Daughter Discussion if Relevant
  - Evaluate Potential Impact if Monitoring Ceased
Virginia (Continued)

- **Stormwater**
  - Evaluate Stormwater Controls at Site
  - Evaluate Performance When Maintenance Ceases
- **Cover System and Monitoring Systems**
  - Summarize Historical Maintenance
  - Evaluate Impact of Termination of Maintenance
- **Certification by a P.E.**
  - Summarize Impact Termination will have on HH&E
North Carolina

- March 2017 Guidance Applies to Many Types of Sites
- No Landfill Has Gone Through the Process
- Identify Site End Use – Unrestricted or Restricted?
- Fees
  - Based on Acreage Including Plume Acreage
  - Max. Fee = $100,000
North Carolina (Continued)

Data Requirements:
- Conceptual Site Model (inc. Fate and Transport)
- Potable Water Supplies/Sensitive Receptors
- Indoor Air Evaluation
- Soil Quality Evaluation – includes PCBs
- Water Quality Evaluation – includes Hexavalent Chromium, PCBs, Dioxins, Cyanide, Formaldehyde, TICs
- Evaluation of GW Discharge to Surface Water
- Evaluation of Plume Stability
- Evaluate Risk with Calculator

Theoretically Can Be Reduced For End Use
North Carolina (Continued)

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<td>E. CONSTRUCTION WORKER Soil Combined Pathways</td>
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<td>F. USER DEFINED Soil Combined Pathways</td>
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<td>G. USER DEFINED Surface Water Combined Pathways</td>
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<th><strong>4. Contaminant Migration to Point of Exposure (POE) Worksheets</strong></th>
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North Carolina (Continued)

Termination Yields:
- Recorded Land Use Restrictions
- Continued Monitoring Requirements?
  - Still Evaluating These
- Any Reporting That May Be Required
- Revocation of Permit?
  - Still Being Considered
- Without Permit There is No Compliance Boundary
Summary

Consistent Requirements Include
- Defined End Use
- Understanding of Site Model/Dynamics
- No Current Corrective Action
- Historical Data to Evaluate
- Trend Evaluation for Leachate, LFG, Groundwater, Surface Water, Cover Maintenance/Stability
- Understanding of Effect of Projected Changes
- Certification by a P.E.
Questions?

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