Pond Closures: Solving a Complicated Puzzle

Presented by

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Presentation Outline

• Introductions
• Pond closure overview and key steps
• Discussion of major challenges
• Timeline considerations
• Summary
There are many pieces...

629 impoundments at 228 plants in 35 states

49 High Hazard sites, but none failed to meet rigorous stability / structural standards

~32,000 total acres of ponds to close (50 square miles!)

GSE (leading producer of geomembrane) produces 12,000 acres per year
There are many pieces...to solve!

629 impoundments at 228 plants in 35 states

49 High Hazard sites, but none failed to meet rigorous stability / structural standards

CCR Impoundments close in 5 to 7 years*

~32,000 total acres of ponds to close, the equivalent of ...

GSE (leading producer of geomembrane) produces over 12,000 acres

*Depends on outcome of proposed role and begins when the role takes effect.
CCR Surface Impoundments (Ash Ponds) – Some Key Features

- Regulatory setting varies from state to state
- Ponds built beginning in 1920
- Large variation in configurations / geometries / operations
CCR Surface Impoundments (Ash Ponds) – Some Key Features

- Regulatory setting varies from state to state
- Ponds built beginning in 1920
- Large variation in configurations / geometries / operations
- Depending upon the facility, GW monitoring and pond liners may also be used
Steps to Solving the Puzzle of Pond Closure

- Identify project objectives
- Conditions to consider
  - Assess and stabilize berms
  - Review groundwater data
  - Evaluate operational functions
  - Resolve maintenance issues

Diagram:
- CCR Impacted water
- Non CCR Impacted water
- Freeboard
- FS > 1.5
- Erosion ruts, other maintenance
- Stilling Pond
- GW monitoring
Steps to Solving the Puzzle of Pond Closure

1. Review objectives and conditions
2. Explore alternatives (be innovative)
3. Understand regulatory setting
4. Evaluate and select

Assess Conditions

Planning

Water Management

Pond (Pore) Water Management

Design / Prepare for Closure

Cap Closure

Post Closure

Closure Strategy:
- Close in place
- Partial removal
- Clean closure

Be systematic

Scope of Work
Steps to Solving the Puzzle of Pond Closure

1. Assess Conditions
2. Planning
3. Water Management
4. Pond (Pore) Water Management
5. Design / Prepare for Closure
6. Cap Closure
7. Post Closure

- CCR Impacted water
- Non CCR Impacted water

Redirect Waters

- Landfill
- WWTP

- Remove free water

GW monitoring

Stilling Pond
Steps to Solving the Puzzle of Pond Closure

- Assess and install a pond/pore water management system
  - Stabilize for cap construction
  - Improve for future use

- Pond / Pore Water Management System
  - CCR Impacted water
  - Non CCR Impacted water
  - Monitoring to verify performance

- Design / Prepare for Closure
- Cap Closure
- Post Closure

- Stilling Pond
- GW monitoring
Steps to Solving the Puzzle of Pond Closure

Unlike other solid waste facilities, generally ponds were not designed and permitted for closure.

Challenges:
- Flat, uneven surface
- Soft, wet surface
- Dikes hold rain water

Considerations:
- Phased closure (improves operations)
- Soil material needs / constructability
- Regulatory requirements
- Be innovative
Steps to Solving the Puzzle of Pond Closure

- Evaluate and select cap system
- Establish storm water controls

Assess Conditions
Planning
Water Management
Pond (Pore) Water Management
Design / Prepare for Closure
Cap Closure
Post Closure

Cap system

Establish storm water ponds, ditches, etc.

CCR

GW monitoring

Stilling Pond
Steps to Solving the Puzzle of Pond Closure

• Post Closure Care
  – Maintain site, inspections
  – Monitoring
  – Reporting
Existing Ponds Summary Subtitle C

**Cap System**
- Minimize Infiltration

Monitoring and Inspection
- GW Monitoring
- Site Inspection
- Report to EPA

Time Line
- Stop receipt of CCRs, 5 years
- Closure, 2 years later

Reporting / Long-Term Care
- Annual Reporting
- Financial Assurance
- Closure / Post-Closure Care
- Land Disposal Restrictions

Applies To (at time of closure)
- Active Ponds
- Inactive Ponds
- Closed Ponds
Existing Ponds Summary Subtitle

Cap System
- Minimize Infiltration
  - Less Permeable Than Liner
  - $1 \times 10^{-5}$ CM/Sec Max
  - 6 inch Vegetative Cover

Time Line
- Stop receipt of CCRs, 5 years
- Closure, 2 years later
- Closure in 5 years unless 2 year extension

Monitoring and Inspection
- GW Monitoring
- Site Inspection
- Report to EPA

Post to Public Internet Site

Reporting / Long-Term Care
- Annual Reporting
- Financial Assurance
- Closure / Post-Closure Care
- Land Disposal Restrictions

Applies To (at time of closure)
- Active Ponds
- Inactive Ponds
- Closed Ponds

Yes, but...
- More Permeable Than Liner
- $1 \times 10^{-5}$ CM/Sec Max
- 6 inch Vegetative Cover

URS
Major Challenges

- Each pond has a unique set of challenges

- Investigations and Site Conditions
- Positive Site Drainage
- Managing Pond / Pore Water
- Regulatory Challenges
- Management Challenges
Puzzling Challenges: Investigations and Site Conditions

- **Problem**
  - Predicting conditions of an active pond at closure
  - Conducting a thorough investigation

- **Solution**
  - Develop a clear approach (visual inspection/intrusive programs)
  - Include pond structural components and supporting components
  - Experience counts!

- **Concerns**
  - Sample recovery and lab testing
  - Pond condition is difficult to determine
    - Assess pond capacity
    - Consider conditions today vs. closure
  - Complex subsurface and hydrogeologic settings
    - Establishing a GW monitoring network
Puzzling Challenges: Positive Site Drainage

- **Problem**
  - Achieving positive site drainage on large, flat ponds
  - The volume of fill needed is potentially very large
    - An average 40 acre pond requires 280,000 CY+ for a 2% slope (20,000 trucks!)
    - Determining a source may be difficult and costly

- **Solution**
  - Grade the existing CCRs in the pond
  - Lower Dikes
  - Dredge

- **Concerns**
  - Regrading existing ash may not be practical
    - Soft or wet ash below a thin, dry crust
    - Need to bridge over soft material for equipment access
Puzzling Challenges: Positive Site Drainage

• **Problem**
  - Achieving positive site drainage on large, flat ponds
  - The volume of fill needed is potentially very large

• **Potential Strategies for generating fill**
  - Get regulatory approval to beneficially use CCR’s in lieu of traditional fill materials
  - Operate to Close
    - Segment portions of the pond to accumulate CCR materials
    - Create forebays or construct a sluice channel to preferentially accumulate ash materials to help in closure
    - Continually dredge and stockpile ash materials
    - Segregate Bottom ash and fly ash if currently comingled.
  - Begin to make contact with local earthwork and demolition contractors
    - Arrange contracts with contractors to take excavation spoils, clean, hard fill (bricks, concrete, asphalt), etc.
Puzzling Challenges: Managing Pond / Pore Water

• Problem
  – Dewatering pond free water
  – Managing pore water during and after construction
  – The addition of fill and cap system will increase surcharge

• Solution
  – Anticipate how dewatering will affect pond conditions
  – Design or maintain outlet for pond and pore water
  – Consider future use of site (post-closure)
  – Incorporate a pond / pore water management system
    • Active or passive systems
    • Can be installed while pond is operational

• Concerns
  – Clogging of pipes is a significant concern
    • Graded filters or carefully selected geotextiles
  – Fly ash is highly erosive
Puzzling Challenges:
Managing Pond / Pore Water
Puzzling Challenges: Regulatory Challenges

• Challenges before the new regulations
  – Cessation of sluicing may increase NPDES challenges
  – Permitting process is unclear

• Challenges after the new regulations
  – Regulators not familiar with the engineering and operation of conversions (and new dry disposal)
  – Proposed regulations have mandatory closure requirements (180 days), with limited mechanisms for extension.
Puzzling Challenges:
Management Challenges

- **Securing of funds**
  - Include all projects required to convert from wet CCR operations to dry:
    - Wastewater treatment facilities,
    - Dry fly ash handling,
    - Gypsum dewatering, etc.
  - Must phase costs over as long period of time
  - Planning and careful budgeting is key

- **Planning for dry handling**
  - Shifting to dry CCR management will require the need for dry landfills
    - Needed in service before pond closure
    - Approach is very involved (site, design, permit, and construct)
  - Consider alternative conveyance methods – rail, barge, or conveyor
  - Evaluate capacity of ash silos/bottom ash storage bins

- **Management of Non-CCR Wastewater**
  - Currently minor wastewater streams may become significant and controlling streams for a new wastewater facility
  - New treatment technologies may be required, with potential higher levels of O&M
For a Typical Power Station with Ponds

- The following is needed prior to the start of final closure construction (i.e. before the spigot is turned off)
  - Design of Final Closure
  - Dry CCR Handling Infrastructure
  - New Non-CCR Wastewater Treatment Facilities
  - New Solid Waste Disposal Facility
Design of Final Closure

• Basic Steps Required for Final Closure
  Design/Permitting
  – Conceptual Design
  – Internal Funding Allocation
  – Site Investigation
  – Development of Construction Work Plan
    • Design Drawings
    • Specifications
    • Contract Documents
  – Permitting
    • NPDES Modifications
    • Storm Water Construction Permit (SWP3)
Design of Final Closure

- Conceptual Design / Site Investigation: 6 to 9 months
- Construction work plan development: 6 to 12 months
- Bidding / Procurement: 1 to 3 months
- Permitting: 3 to 6 months

Total Project Length: 1 to 2 years
Dry CCR Handling Infrastructure

- Fly Ash – Pneumatic Handling and Ash Silos
- Bottom Ash/Slag – Hydrobins or Chain Conveyors most common
  - True dry bottom ash handling very complex and would require very significant changes to the boiler – assume not required under Subtitle D Option
- Gypsum – dewatering facility
Dry CCR Handling Infrastructure

- Feasibility Study: 6 to 12 months
- Detailed Design: 6 months
- Fabrication / Delivery: 12 months
- Construction: 6 months
- Permitting: 12 months

Total Duration: 2 ½ to 3 years
Non-CCR Wastewater Treatment

- Reduction in dilution/ residence time
- New dedicated wastewater facilities needed
  - Non CCR wastewater may require conventional wastewater treatment facilities
  - High-load wastewaters may require additional treatment
    - zero liquid discharge,
    - membranes, etc.
- Recycle/reuse may reduce treatment needs but must be balanced with other costs
  - reuse FGD blowdown for cooling tower make up
  - reuse to moisture condition CCR material for landfilling
Non-CCR Wastewater Treatment

- Feasibility Study: 6 to 12 months
- Detailed Design: 6 to 12 months
- Fabrication / Delivery: 9 to 12 months
- Construction: 6 to 12 months

Permitting: 18 to 24 months

Total Duration: 3 to 4 years
New Solid Waste Disposal Facility

- Management of CCR’s in an existing Subtitle D landfill (MSW) is economically unfeasible due to:
  - high volume wastes,
  - high transportation costs, and
  - high tipping fees
- A dedicated (new) dry landfill for final disposal will be needed
- Prior to the start of final pond closure, a new dry landfill will need to be...
  - sited,
  - permitted,
  - constructed, and
  - begin operation
New Solid Waste Disposal Facility

- **Siting Study**: 6 to 12 months
- **Hydrogeological/geotechnical investigation**: 6 to 18 months
- **Permitting - Solid Waste, NPDES, Air, etc.**: 18 to 24 months
- **Construction of initial phase and associated infrastructure**: 6 to 12 months

**Total Duration**: 3 ½ to 5 ½ years

**End of wet disposal**
Overall Dry CCR Conversion/Pond Closure Process

Federal regulations will require pond closure to be **COMPLETE** in 5 to 7 years!

*The time to begin is...**NOW!!!***
Summary

Solving a complicated puzzle for pond closures:

• Requires careful planning as well as considerations for multi-step processes

• Requires overcoming challenges which
  • Leads to other challenges
  • Requires a systematic approach

• Avoid the learning curve (for all phases of the project)

• Includes more than just pond closures (that may take precedence)
  • Landfills,
  • Dewatering facilities,
  • Wastewater treatment, etc.

• It is a lengthy process...**begin now!**

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