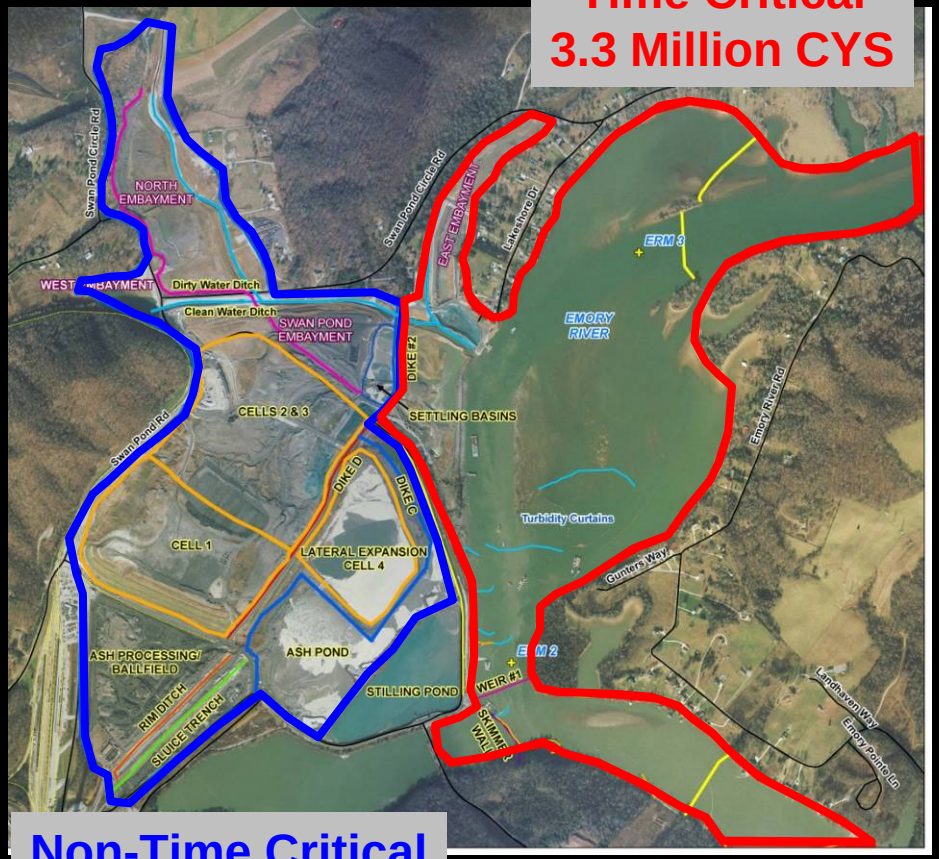
TVA Kingston Fossil Fuel Plant Release Site

Selected Remedy for Embayment and Dredge Cell EE/CA

May 2010

Engineering Evaluation/ Cost Analysis (EE/CA)

- 3 alternatives developed and released for 75-day public comment period (January 19 – April 5, 2010)
- Seamless transition of work at the completion of Time-Critical dredging



Engineering Evaluation/ Cost Analysis (EE/CA)

Removal Action Objectives (RAOs): (All alternatives met)

- Minimize contact
- Minimize migration
- Minimize exposure
- Restore embayment
- Close former dredge cell
- Safely dispose of all waste streams

EE/CA Alternatives

- **Common Elements**
  - Restoration of embayments to pre-spill conditions
  - Closure of failed dredge cell and adjacent Ash Pond
  - Enhanced perimeter dikes (designed to withstand liquefaction of foundation ash at earthquake loads)

- **Significant Differences**
  - Disposal off-site vs. on-site
  - Final elevation
  - Construction traffic
  - Duration of work
  - Cost

EE/CA Alternatives

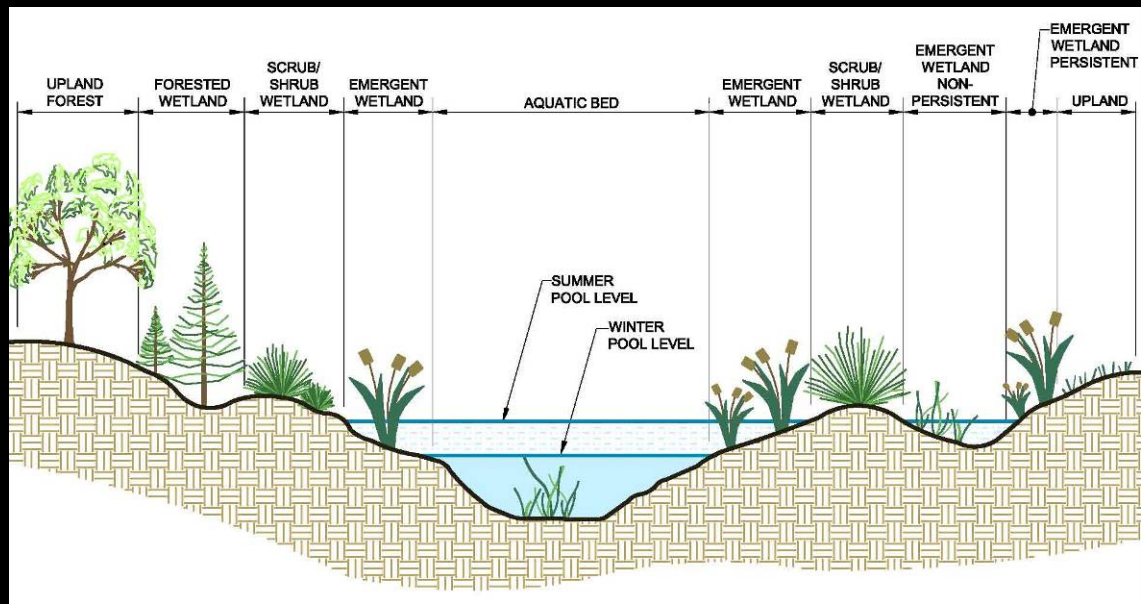
Alt.	Offsite disposal	Closure Elevation	Project Duration	Cost
1	2.8 million cys	790’ MSL	3.5 years	$440 million
2	6.8 million cys	765’ – 780’ MSL	5 years	$720 million
3	0	790’ – 805’ MSL	4.1 years	$270 million

Input from Community on EE/CA Alternatives

- **Individual Citizens/Civic Groups**
  - Based on written and verbal comments, majority support on-site disposal options (Alternative 3)
- **Roane County Community Advisory Group**
  - Supported none of the EE/CA alternatives
- **Environmental Groups: Environmental Integrity Project/Earth Justice**
  - Appear to support hybrid approach (Alternative 2 with liner and leachate collection)
  - Environmental Justice concerns at Arrowhead Landfill
- Responses to comments received provided in Attachment B of Action Memo (Responsiveness Summary)

Alternative Evaluation Criteria

- **Effectiveness**
  - Achieve Removal Action Objectives (RAOs)
  - Compliance with other laws/regulations (ARARs)
  - Short and Long-term protection of human health & environment
- **Implementability**
  - Time to achieve RAOs
  - Construction and technology performance for excavation, dewatering, transportation, disposal, foundation treatment and restoration
- **Cost**
  - Capital Costs (Net Present Value) in 2009 dollars
  - Annual Operation and Maintenance (O&M) costs



Selected Alternative (3B)
On-Site Disposal

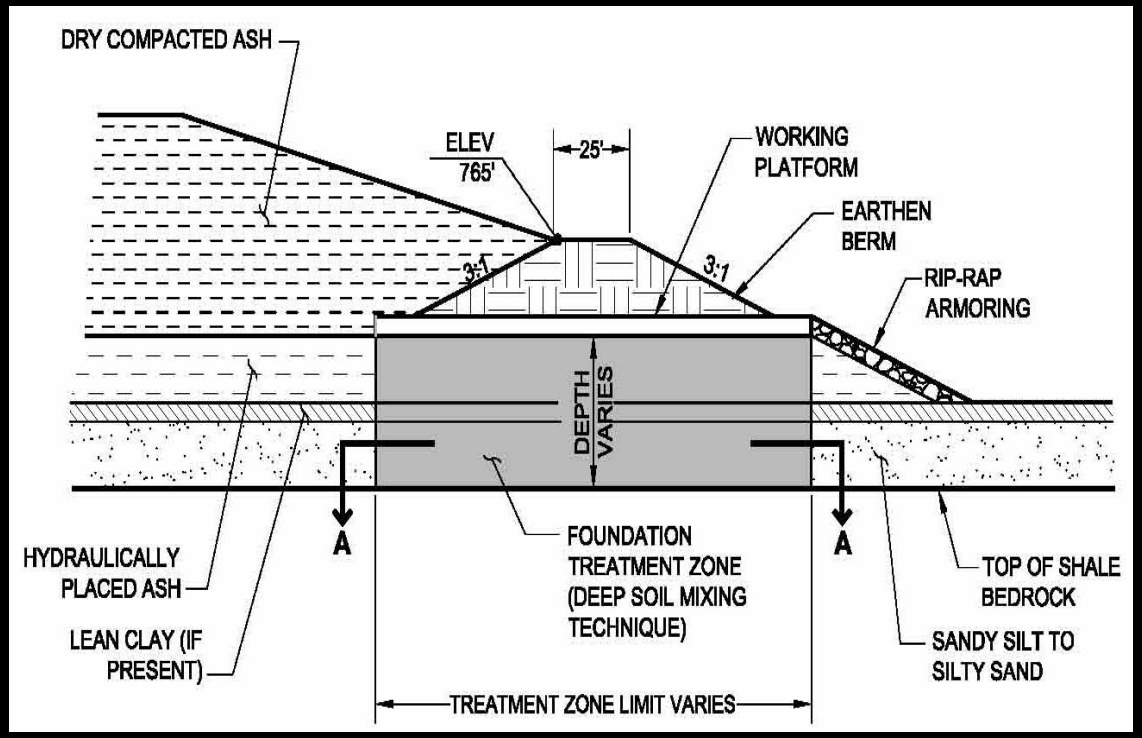
Alt.	Offsite disposal	Closure Elevation	Project Duration	Cost
3B	0	790’ MSL	4.1 years	$268 million
	Shipping and Disposal risks eliminated	Largest, most robust perimeter dike	Closes permitted landfill	Lowest cost alternative

Major Components Alternative (3b)

- **Infrastructure**
  - Ash consolidation in North Embayment to isolate fresh water springs
  - Swan Pond Circle Road underpass/bridge
  - North Embayment construction traffic connects to East/West haul road
- **Excavation of Swan Pond Embayment**
  - Conducted primarily with excavators, bulldozers, and trucks
  - Small dredging equipment may be used where necessary
  - Ash consolidation, dewatering, and trucking to on-site disposal area

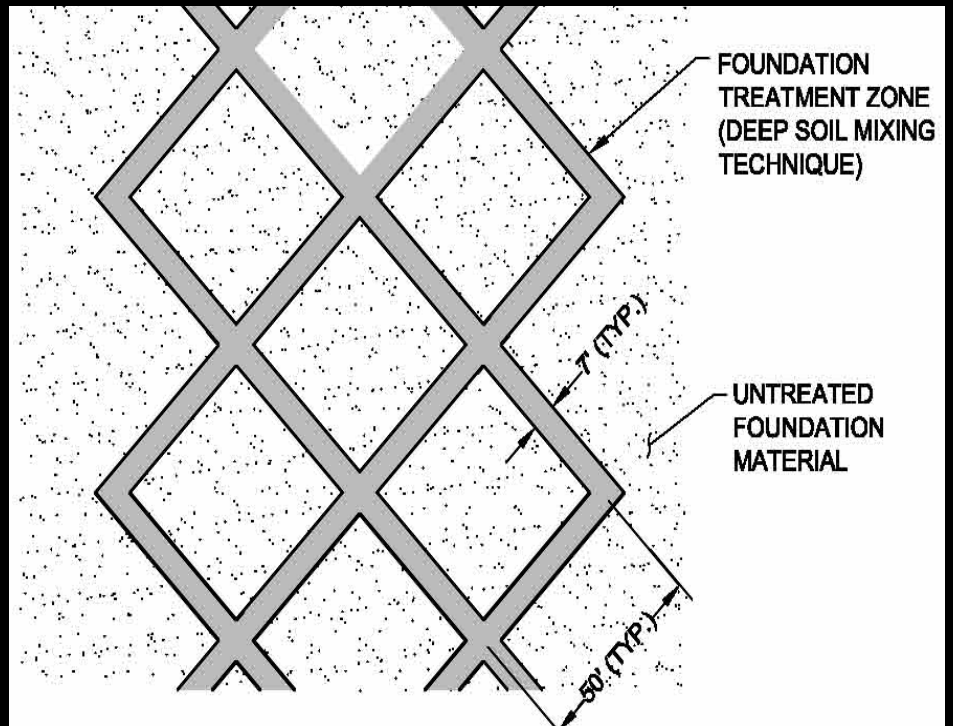
Major Components Alternative (3b)

- **Construct Working Platform/Dry Ash Stacking**
  - Working platform constructed of geo-grid, sand, and stone for capillary break and stable working surface
  - Place thin layers of dry ash at optimum moisture content per test embankment program criteria



Major Components Alternative (3b)

- **Install Perimeter Dike Stabilization**
  - > 16,000 linear feet of perimeter dike foundation to prevent release of ash after liquefaction of foundation ash under earthquake loads
  - > 12,000 soil-cement borings installed to bedrock (60 – 70 feet deep) requiring 260,000 cys of cement
  - Lattice-grid wall varying in width 15 – 130 feet



Major Components Alternative (3b)

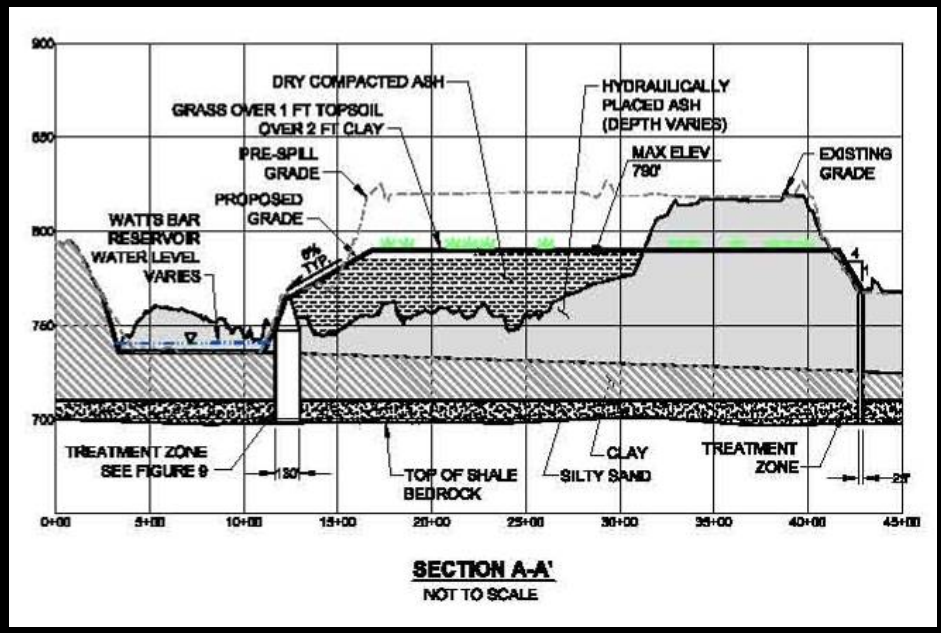
- **Water Management**
  - Relocate existing clean water ditch to access adjacent ash
  - Continue best management practices for storm water runoff
- **Dike 2 and Settling Basins**
  - Remove 1,400 ft Dike 2 that served as containment barrier and haul road for Time-Critical activities
  - Relocate Time-Critical settling basins west of Dike 2

Major Components Alternative (3b)

- **Restore Embayment Ecosystem**
  - Excavate to native material
  - Restore complex mosaic of forested, scrub-shrub, aquatic, and emergent wetland plant communities
  - Species composition and density based on historical embayment habitat and surrounding reference stations

Major Components Alternative (3b)

- **Grade and Cover Dredge Cell and Ash Pond**
  - Re-grade dredge cell and ash pond to 790 feet msl
  - Place 2 feet of clay and 1 foot of topsoil on top of graded ash
  - Vegetate cover to control dust generation, promote water runoff, and provide erosion control
- **Monitoring/Institutional Controls**
  - Long-term groundwater monitoring of dredge cell
  - Air and surface water monitoring during remedy construction
  - Evaluate opportunities for beneficial re-use of closed dredge cell



Rationale for Selecting Alternative (3b)

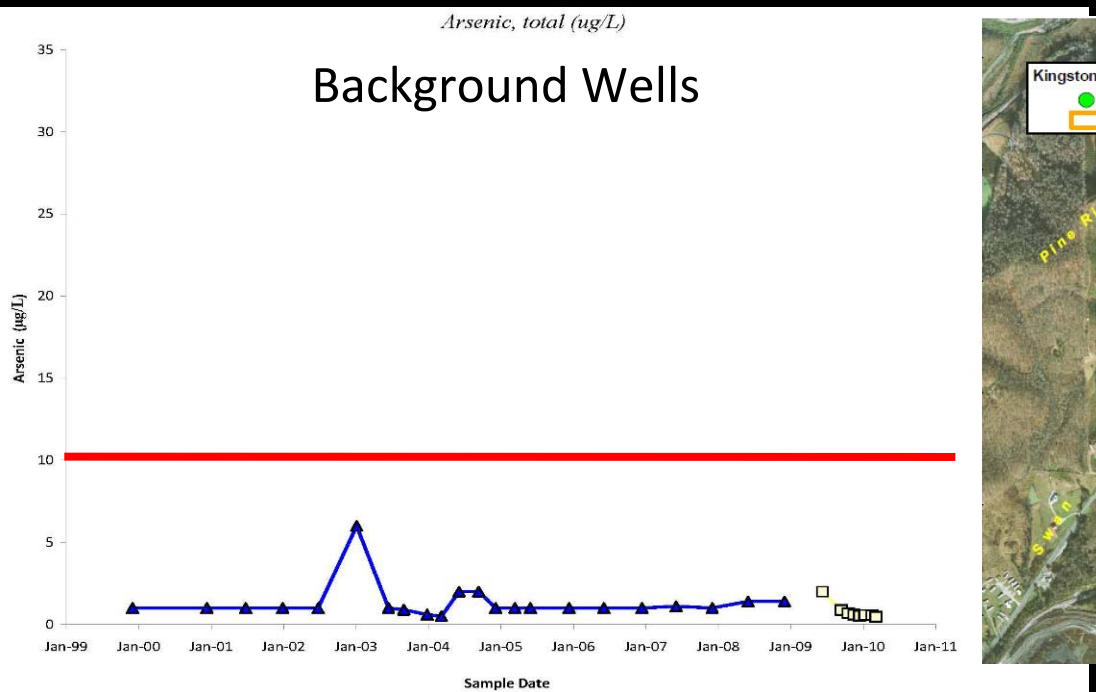
- **Eliminates Off-Site Disposal Impacts and Risks**
  - Transportation risks
  - Disposal capacity issues
  - Acceptability of offsite disposal
- **Safe Containment of Ash**
  - Perimeter diking system addresses identified failure factors (fill geometry, fill rate, foundation soils, and ash moisture)
- **Groundwater Protection**
  - Private drinking water wells not impacted
  - Groundwater monitoring data indicates metals are not leaching and no groundwater plume is present

No Liner or Leachate Collection

- **Groundwater Flow to Site**
  - Silty clay layer beneath site acts as barrier to metal migration
  - Groundwater does not migrate to drinking water wells, moves downgradient to river
  - New perimeter dike will reduce lateral groundwater movement
  - Clay and soil cover will reduce water infiltration

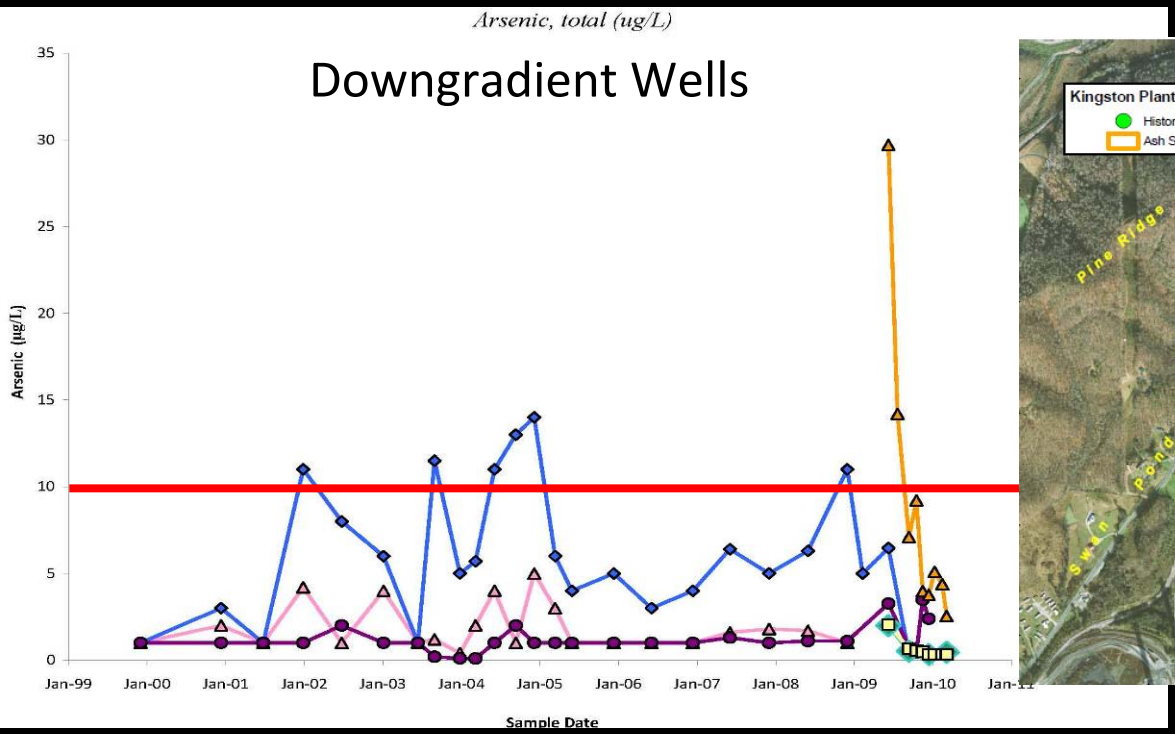
No Liner or Leachate Collection

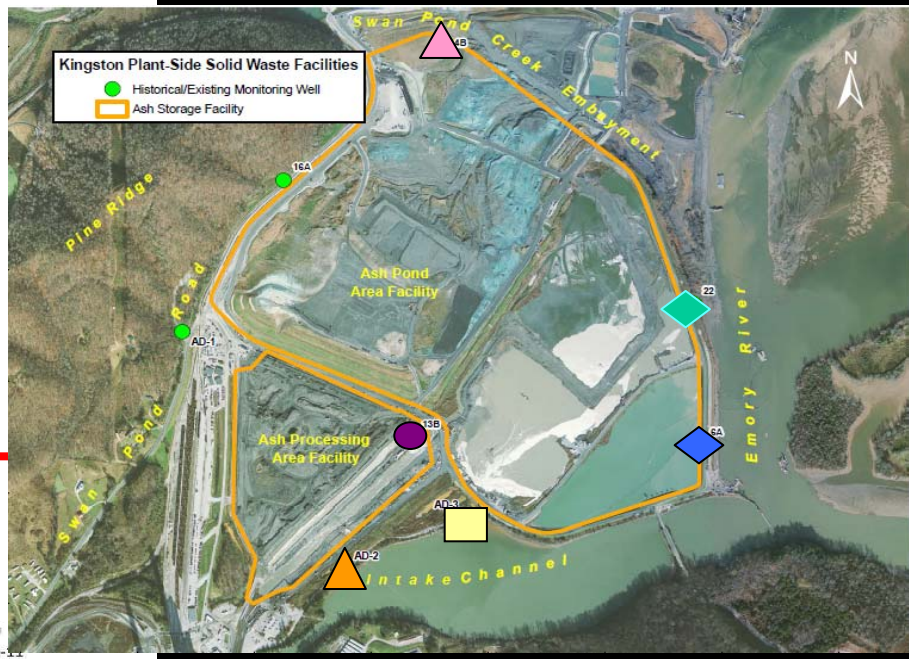
- **No Metals Leaching**
  - After over 50 years of groundwater in contact with ash, water quality does not currently exceed drinking water standards
  - EPA Science Panel and USACE/ERDC studies after spill conclude metals not readily leaching off ash under site-specific conditions
  - TCLP (leaching test) does not exceed limits, thus ash is not a hazardous waste



No Liner or Leachate Collection

- **No Groundwater Plume**
  - Semiannual monitoring over past 10 years
  - 2 of 40 samples since release in ballfield exceeded arsenic levels
  - No arsenic exceedances in past 7 months





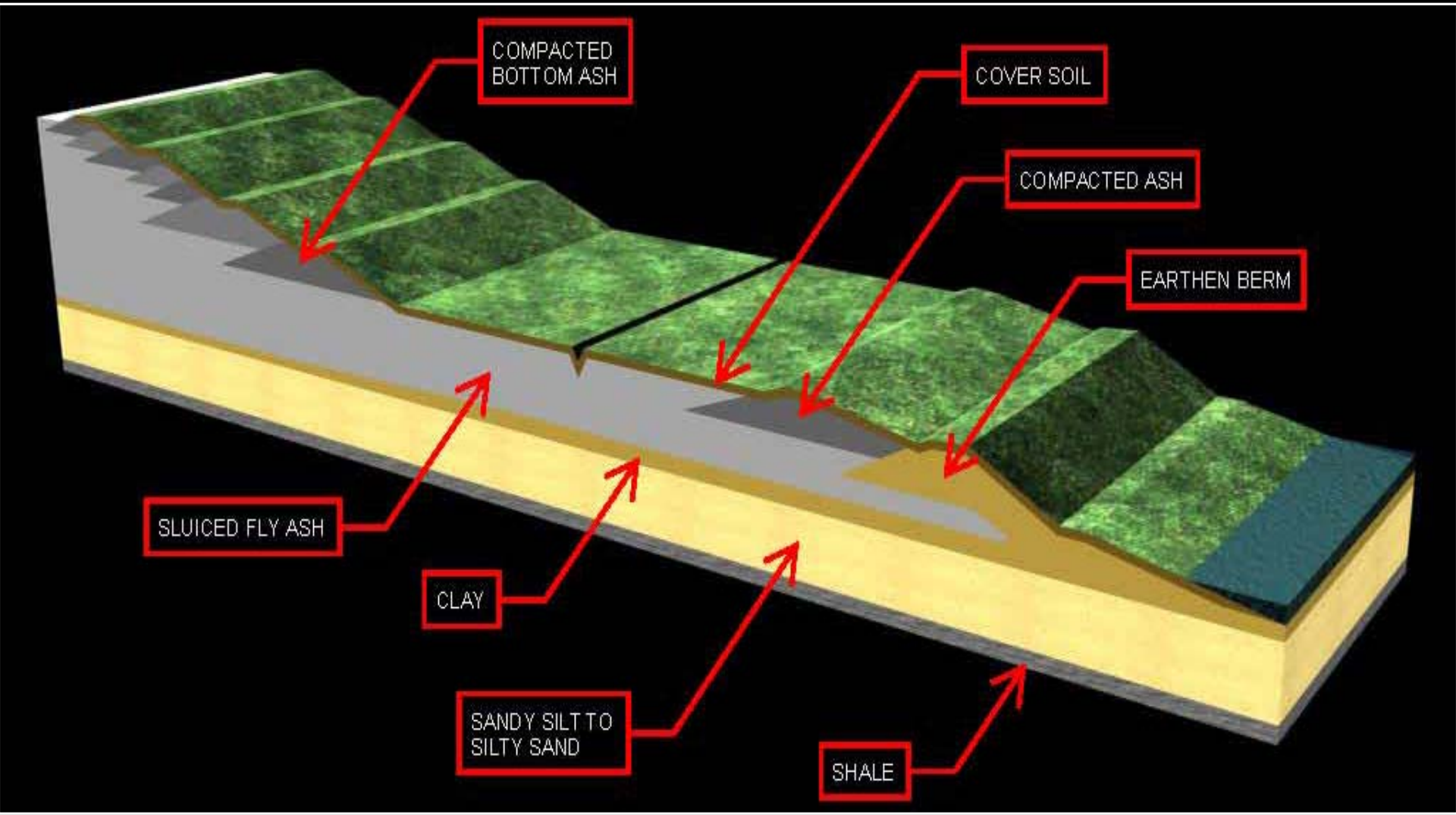
Proposed Coal Ash Regulation

- In its proposed regulation, EPA is proposing to allow any state or federally required cleanup that begins prior to the effective date of the final coal ash rule to be completed. The cleanup would of course need to be performed in accordance with the respective order that was determined appropriate for the specific cleanup. These orders should provide for protective conditions of coal ash disposal. The Kingston TVA disposal area will be closed, which is consistent with the EPA's recently proposed coal ash rule.
- Contact LaTisha Petteway for any additional questions pertaining to the proposed coal ash regulation.

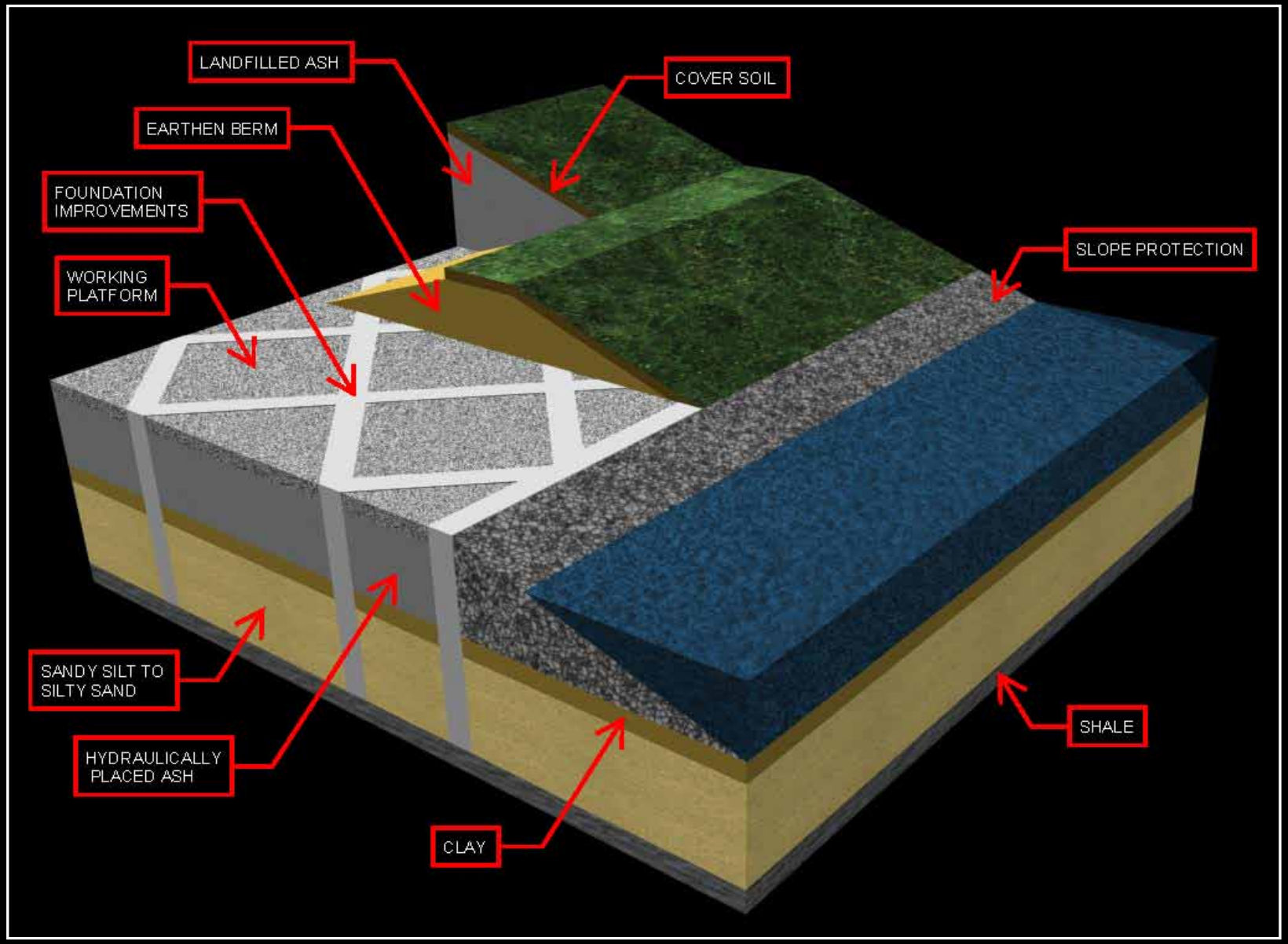
Petteway.Latisha@epa.gov

202-564-3191
202-564-4355

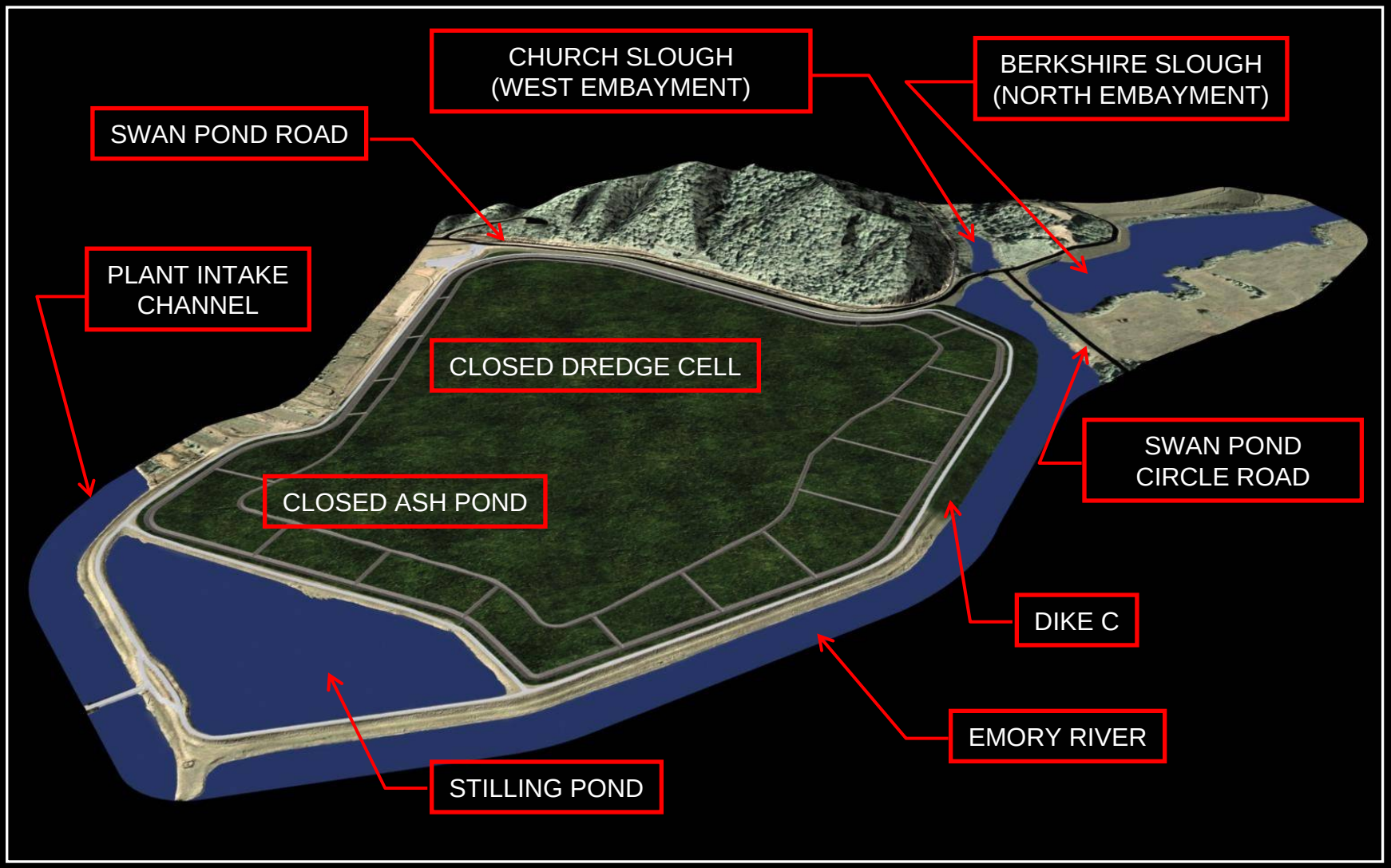
Dike Construction Before Failure



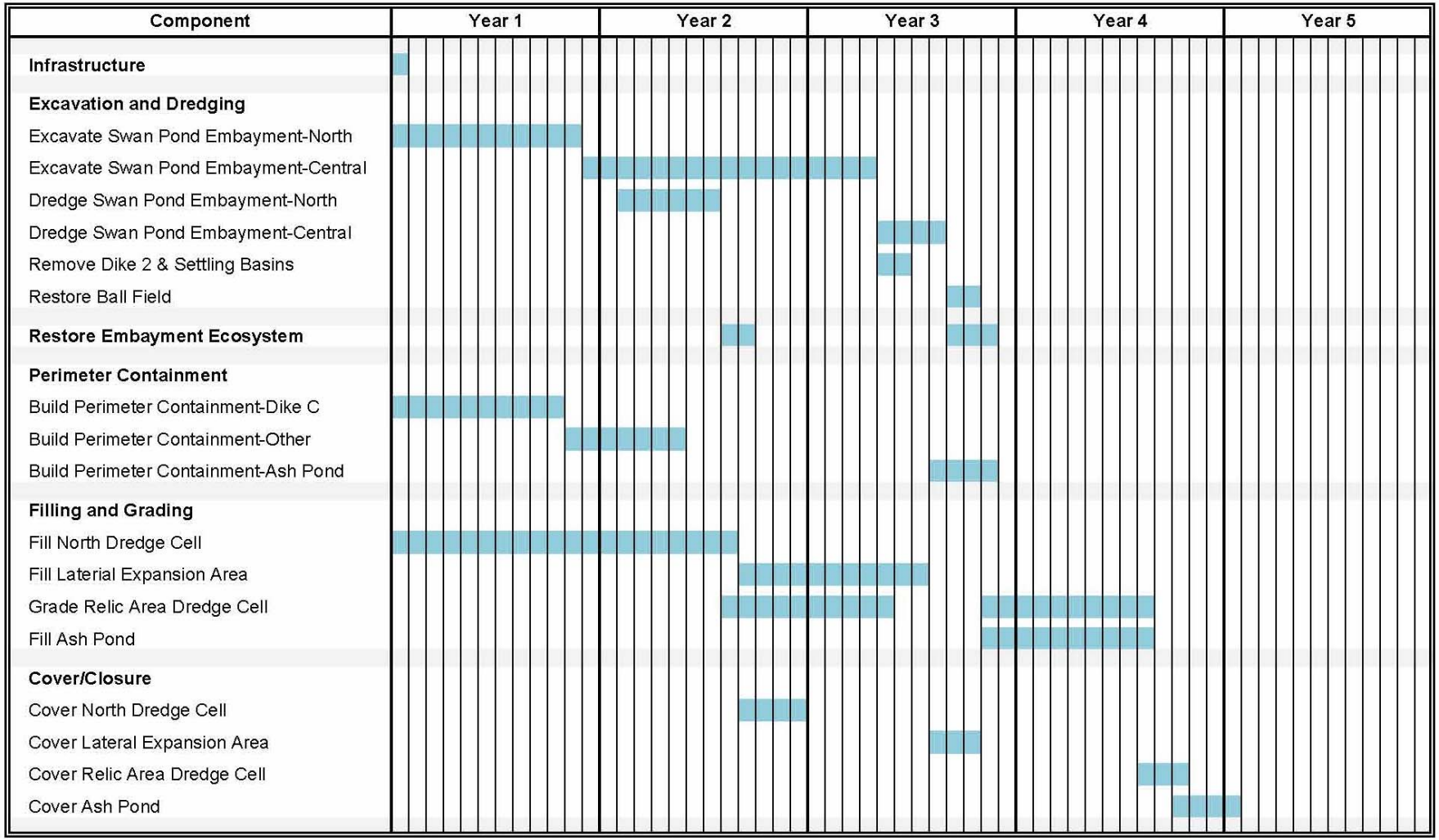
New Perimeter Dike



Aerial View of Impoundment



Schedule for Implementation



Next Steps

- **River System Sampling and Analysis Plan**
  - Characterize ash
  - Assess impacts to human health
  - Assess impacts to ecosystems
  - Continued monitoring after clean-up
  - Will be posted to website end of May
- **Additional Comment Period of at least 30 days**
  - Action Memorandum (May 19 – June 18)
  - Non-Time Critical Removal Work Plan
  - Administrative Record
  - Continued community involvement including quarterly public meetings