Coal Combustion Facility Assessment Report

October 20, 2010

Introduction

- Stantec Consulting Services Inc.
  - North American Consulting Firm
  - 10,000 Engineers, Geologists, Architects, Scientists and Technicians
  - 140 Geotechnical Engineers
  - Clients include:
    - USACE
    - FEMA
    - Power Generating Industry
- John S. Montgomery, PE
  - Senior Principal
  - Licensed Professional Engineer in Tennessee, Kentucky and Alabama
  - Over 23 Years Experience Dam and CCP Disposal Design and Construction

Presentation Outline

- Program Overview
- Phase 1 – Facility Review
- Phase 2 – Engineering Assessment
- Phase 3 – Remediation Design and Construction
- Phase 4 – Programmatic Improvements

Presentation Outline

- Program Goals
  - Assess Structural Conditions of Impoundments
  - Implement Improvements
- Program Statistics
  - FY10 Man-hours ~ 472,324
  - FY 09 Engineering Man-hours ~ 168,074
  - Borings ~781 (47,000 ft of footage drilled)
  - Instruments ~ 594
  - Rock Placed ~ 455,305 tons
  - Sand ~ 26,277 tons
- Phases 1,2,3 and 4 in Parallel

Construction of Improvements at Bull Run

Program Overview

- Phase 1 – Facility Review ✓ COMPLETE
  - Records Review/Staff Interviews
  - Site Condition Review
  - Recommendations for Future Analysis, Studies, and Program Improvements
  - Final Report Issued June 24, 2009
- Phase 2 – Engineering Assessments ✓ COMPLETE
  - Geotechnical Explorations
  - Hydrologic and Hydraulic Analysis
  - Dam Safety Hazard Classifications
  - Spillway Inventories

Program Overview

- Phase 3 – Remediation Design and Construction
  - Structural Deficiencies
  - Improve Freeboard (Storage)
  - Risk Reduction
- Phase 4 – Programmatic Improvements ✓ COMPLETE
  - Dam Safety Inspection Training
  - Programmatic Documents

Phase 2 Engineering Assessments
General Findings

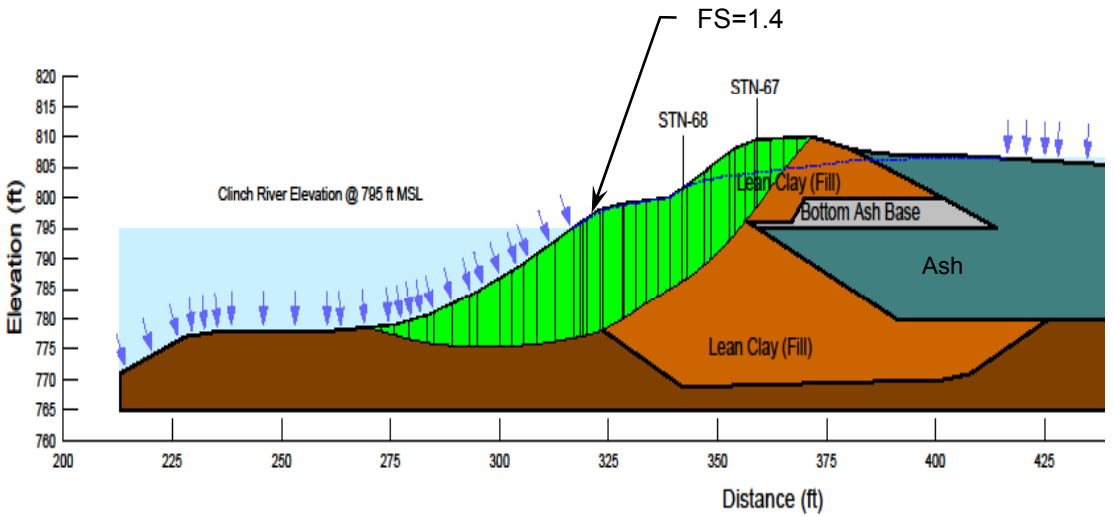
- Seepage
- Steep Slopes
- Slope Stability
- Occasional Surface Slumps
- Operational and Storm Freeboard (Storage)
- Poor Surface Drainage / Standing Water

- All Issues Are Being Addressed

Geotechnical Drilling
at Cumberland

Phase 2 Engineering Assessments
Geotechnical Explorations

- Geotechnical Exploration Statistics
  - 781 Borings
  - 47,000 Linear Feet of Drilling
  - 20,000 Samples Retrieved
  - 17,000 Tests Performed
  - 594 Instruments Installed
- Slope Stability Findings
  - All Facilities ≥ 1.0
  - 12 Met Criteria
  - Aggressively Working to Improve Others
  - Conditions Suggesting Imminent Failure not Observed



FS – Factor of Safety : $\frac{\text{Strength}}{\text{Driving Force}}$

Minimum Criteria:
FS ≥ 1.5 (Long Term, Static)
Source – US Army Corps of Engineers
EM 1110-2-1902

Phase 2 Engineering Assessments
Geotechnical Explorations

- Comparison to Kingston Root Cause Analysis
  - Increased Loads Due to Higher Fill
  - Fill Geometry and Setbacks
  - Unusual Weak Silt/Ash Slime Foundation
  - Hydraulically Placed Loose Wet Ash
- This Combination of Conditions Was Not Observed at Any Other Facility

Phase 2 Engineering Assessments
Dam Safety Hazard Classification

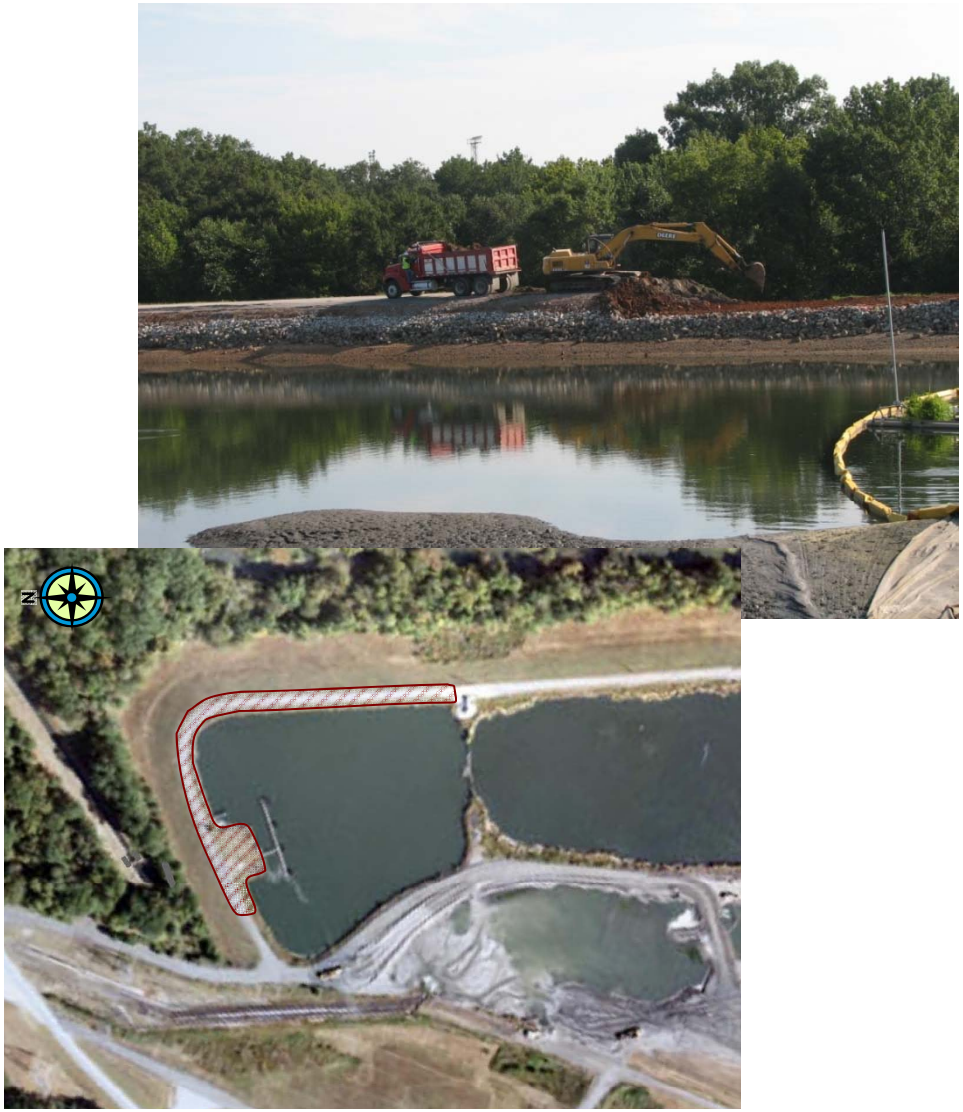
- Low Hazard Potential –
  - No Probable Loss of Human Life
  - Low Economic/Environmental Losses
  - Losses Principally Limited to Owners Property.
- Significant Hazard Potential –
  - No Probable Loss of Human Life
  - Can Cause:
    - Economic Loss
    - Environmental Damage
    - Disruption of Lifeline Facilities
    - Impacts to Other Concerns
- High Hazard Potential –
  - Probable Loss of Human Life

Source: FEMA 333 Issued April 2004

Phase 2 Engineering Assessments
Dam Safety Hazard Classification - Initial

TVA Fossil Plants	Facility	Initial Hazard Classification
Allen	Ash Disposal	
Bull Run	Ash Pond	
	Gypsum	
Colbert	Dry Stack	N/A
	Bottom Ash	
Cumberland	Ash Pond	
	Gypsum	
Gallatin	Ash Disposal	
John Sevier	Dry Stack	N/A
	Bottom Ash	
Johnsonville	Ash Disposal	
Kingston	Dike C	
Paradise	Ash Pond	
	Scrubber Complex	
Shawnee	Dry Stack	N/A
	Ash Pond	
Widows Creek	Ash Pond	
	Gypsum	

Hazard Classification	
High	
Significant	
Low	



Colbert Bottom Ash Pond – Dike Lowering to Remove High Hazard

Phase 2 Engineering Assessments
Dam Safety Hazard Classification – Current

TVA Fossil Plants	Facility	Current Hazard Classification
Allen	Ash Disposal	
Bull Run	Ash Pond	
	Gypsum	
Colbert	Dry Stack	N/A
	Bottom Ash	
Cumberland	Ash Pond	
	Gypsum	
Gallatin	Ash Disposal	
John Sevier	Dry Stack	N/A
	Bottom Ash	
Johnsonville	Ash Disposal	
Kingston	Dike C	
Paradise	Ash Pond	
	Scrubber Complex	
Shawnee	Dry Stack	N/A
	Ash Pond	
Widows Creek	Ash Pond	
	Gypsum	

Hazard Classification	
High	
Significant	
Low	


Coal Combustion Products Engineering

TVA

September 28, 2010 Memo No: COP10-0001

Coal Combustion Products Engineering

TVA

September 28, 2010 Memo No: WCP10-0002

Coal Combustion Products Engineering

TVA

September 21, 2010 Memo No: CUF 10-0002

Coal Combustion Products Engineering

TVA

August 05, 2010 Memo No: ERF10-0001

Dam Safety Officer, Michael T. Scott, LP 3D-C

BULL RUN FLY ASH POND - HAZARD CLASSIFICATION "SIGNIFICANT"

The Bull Run Fossil Plant is located at the confluence of Bull Run Creek and the Clinch River in Anderson County, Tennessee. The Fly Ash Pond has a footprint of approximately 50 acres with a dike crest of approximately 810 feet.

On July 24, 2009, Stantec submitted a preliminary breach analyses report of the Fly Ash Pond at the Bull Run Fossil plant, based on approximate methods. The results of the study were documented in the summary titled, "Preliminary Dam Breach Approximate Limits of Impact - Methodology," which classified the Fly Ash Pond as "High Hazard."

In 2010, TVA contracted Stantec to perform a more detailed analysis using recently developed topographic data to determine the limit of impact caused by a breach of the ash pond dike. The report titled, "Dam Breach Analysis and Inundation Mapping - Bull Run Fly Ash Pond," summarizes the additional study of the breach impacts using HEC-HMS, a hydrologic routing software, and HEC-RAS, hydraulic modeling software capable of performing unsteady flow routing.

The analysis was performed for two basic failure scenarios: (1) A "Sunny Day" breach consisting of a piping failure that is assumed to occur during normal operational inflows; and (2) A "Probable Maximum Precipitation (PMP) Event" consisting of an overtopping failure during a PMP event. The results of the detailed analysis indicated that no structures or bridges were within the impact zone of either of the two scenarios. Thus, the report recommends that the hazard classification be lowered from "High Hazard" to "Significant Hazard."

TVA CCP Engineering, along with River Operations, have reviewed the report and concur with the methodology of analysis and the subsequent results. Based on the report and reviews, CCP Engineering is sending this memo to Dam Safety to document the lowering of the Hazard Classification of the Bull Run Fly Ash Pond to "Significant."

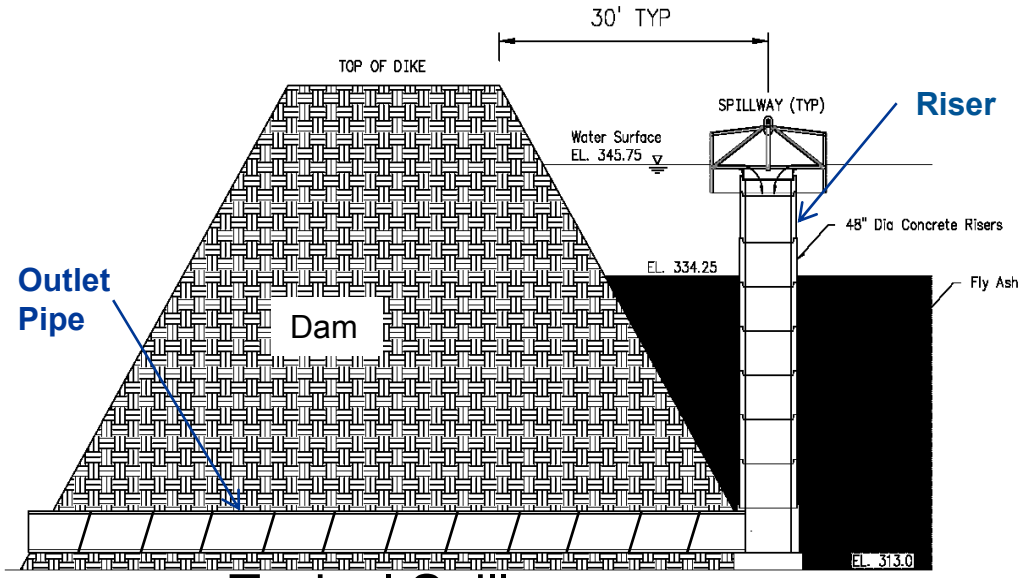
Scott Turnbow
Senior Manager, CCP Engineering
LP 6E-C

MBT:MBT
Attachment: Stantec rpt_001_175669090
cc (Attachment):
J. C. Kammeyer, LP 5D-C
R. W. Tompkins, LP 3D-C
R. B. Combs, LP 5E-C

Phase 2 Engineering Assessments
Spillway Inventory

- Spillway – Pipe That Discharges Permitted Flows From an Impoundment
- Tall Unsupported Risers
- Outlet Pipes
- Spillway Replacement
  - Johnsonville
  - Colbert
  - Shawnee
  - Widows Creek
  - Cumberland

Shawnee Spillway



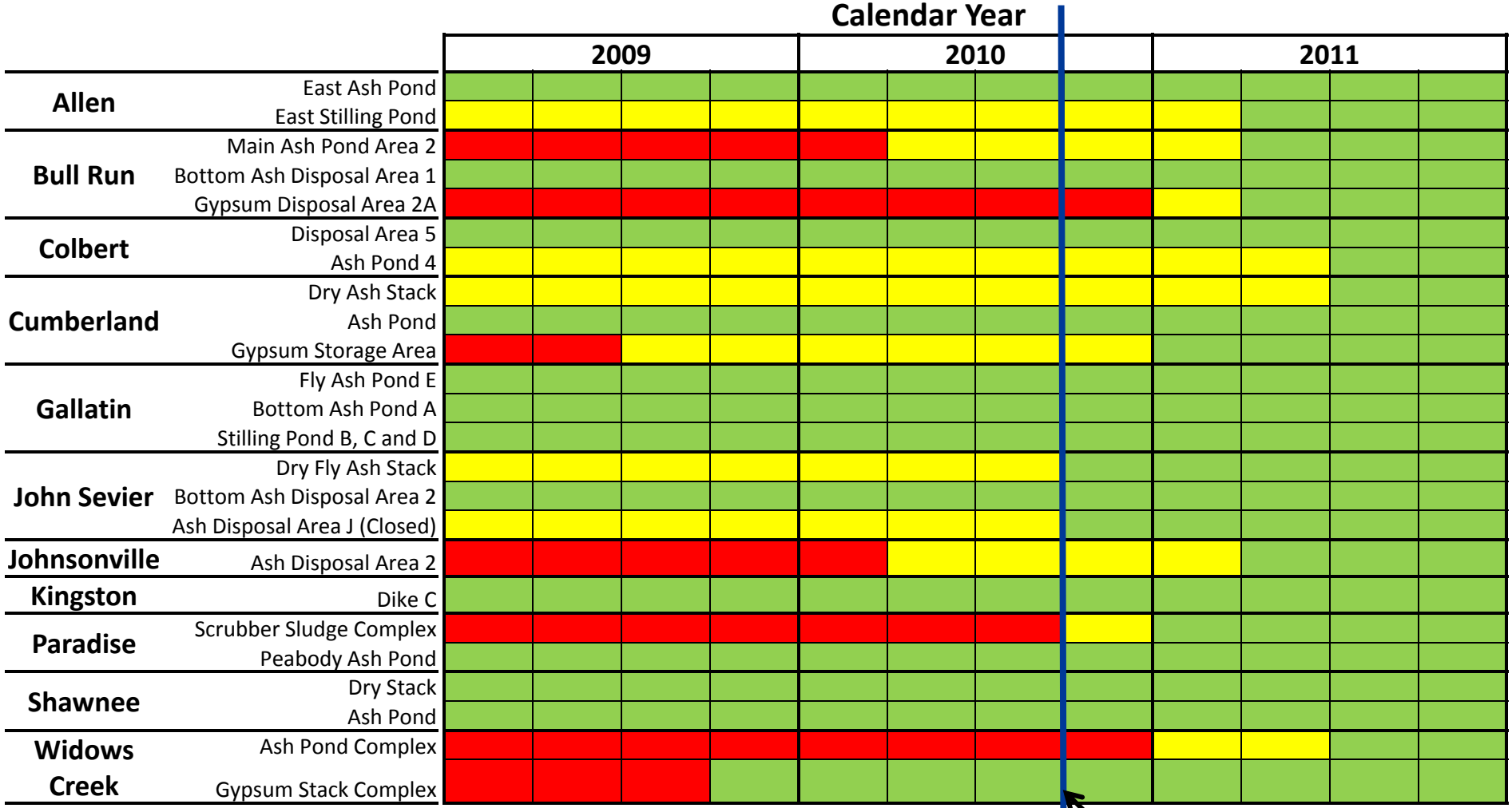
Typical Spillway

Phase 3 Remediation Design and Construction Status

- 76 Capital Projects Currently in Planning, Design, Construction or Completed Phase

TVA Fossil Plant	Planning	Design	Implementation/ Complete
Allen	-	1	1
Bull Run	5	2	4
Colbert	2	1	4
Cumberland	3	2	1
Gallatin	1	-	1
John Sevier	2	-	1
Johnsonville	3	-	6
Kingston	2	1	1
Paradise	4	1	5
Shawnee	-	-	2
Widows Creek	5	1	3
System Wide	-	-	11

Phase 3 Remediation Design and Construction Status



Global Stability	As-Found	Current	July -2011
1.5 or Greater	12	15	24
1.3 to 1.5	5	6	0
Less than 1.3	7	3	0

Phase 3 Remediation Design and Construction
Johnsonville Ash Pond

Improvement Actions

Phase 3 Remediation Design and Construction
Johnsonville Ash Pond

South Spillway Inlets - Before

South Spillway Inlets - After

Phase 3 Remediation Design and Construction
Johnsonville Ash Pond

South Spillway Outlets - Before

South Spillway Outlets - After

Phase 3 Remediation Design and Construction
Johnsonville Ash Pond

North East Dike - Before

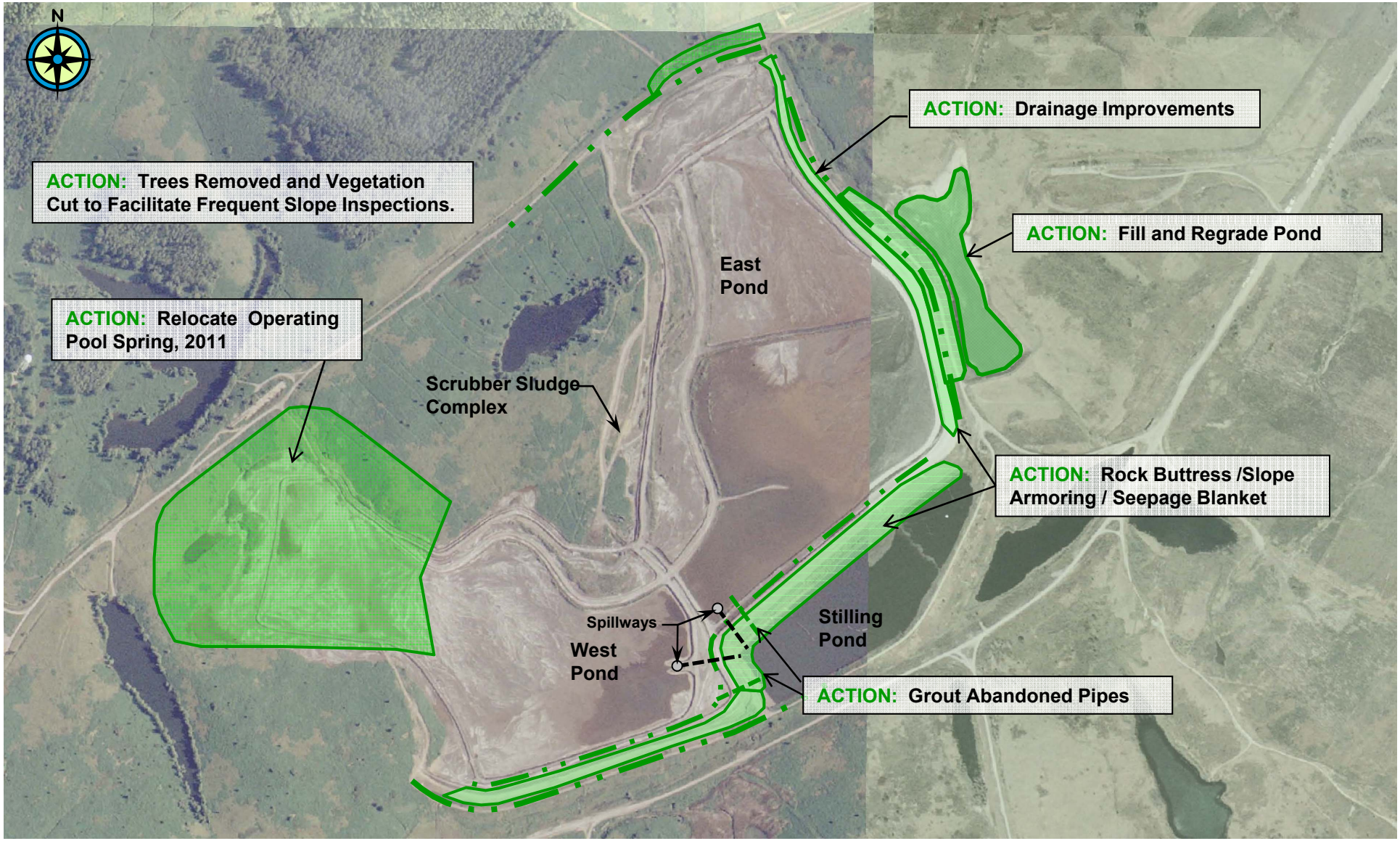
North East Dike - After

Phase 3 Remediation Design and Construction
Johnsonville Ash Pond

North East Dike - Before

North East Dike - After

Phase 3 Remediation Design and Construction
Paradise Scrubber Sludge Complex



Improvement Actions

Phase 3 Remediation Design and Construction
Paradise Scrubber Sludge Complex

East Pond South Slope Buttress - Before

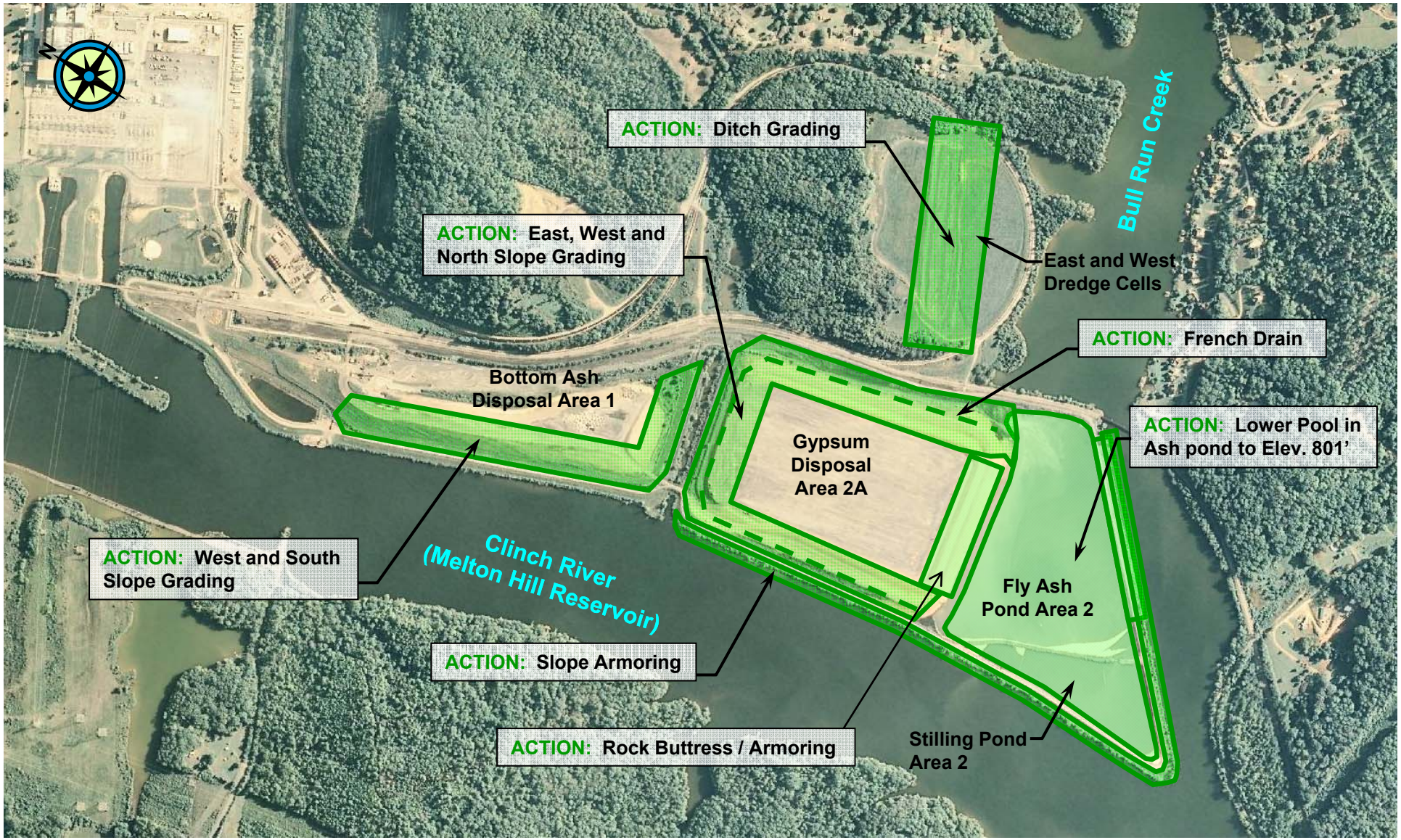
East Pond South Slope Buttress - After

Phase 3 Remediation Design and Construction
Paradise Scrubber Sludge Complex

East Pond East Slope Armoring - Before

East Pond East Slope Armoring - After

Phase 3 Remediation Design and Construction
Bull Run Ash Pond and Gypsum Stack



Improvement Actions

Phase 3 Remediation Design and Construction
Bull Run Gypsum Stack

Gypsum Stack Buttress - Before

Gypsum Stack Buttress - After

Phase 3 Remediation Design and Construction
Bull Run Gypsum Stack

Ash Pond Pool – Before Pool Lowering

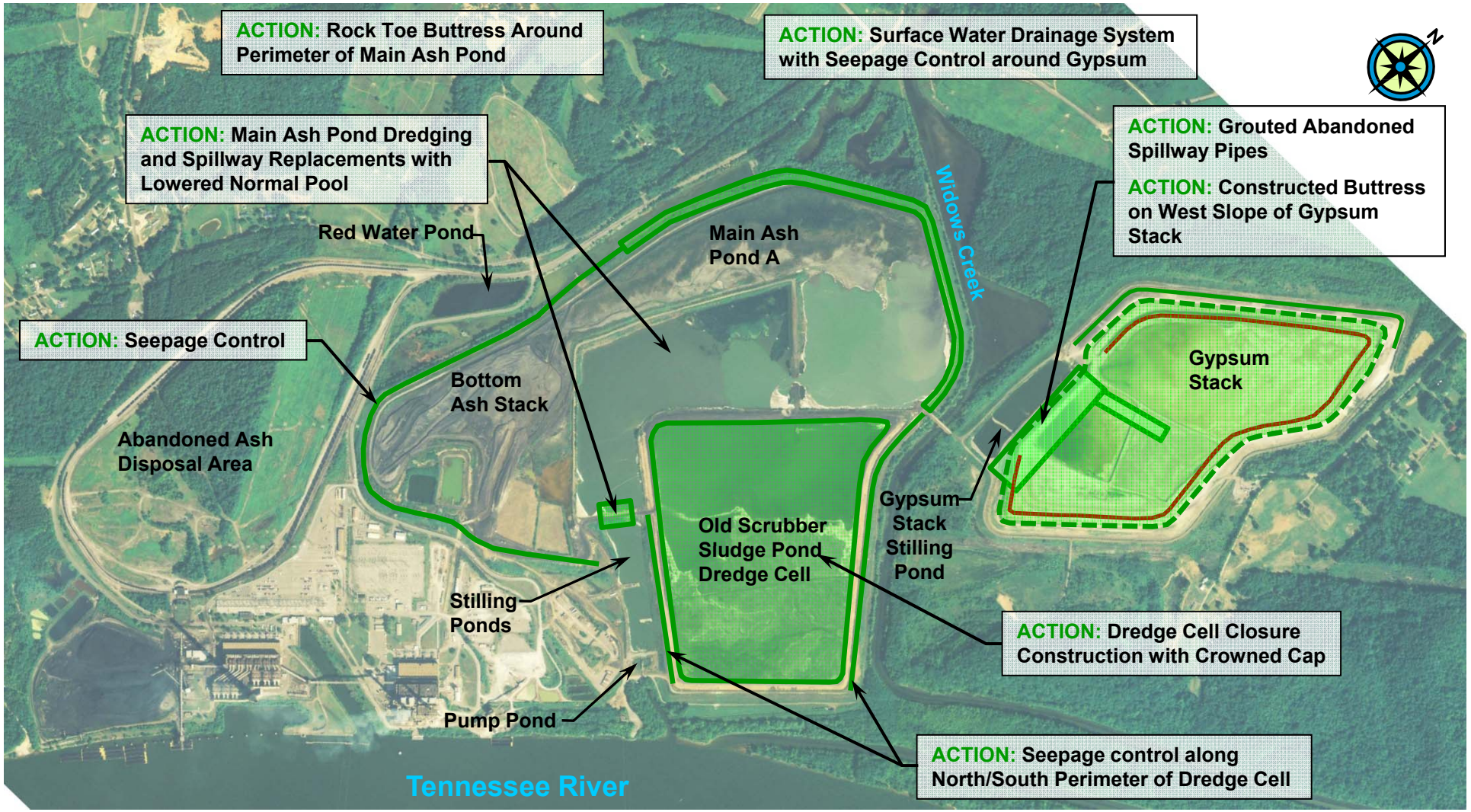
Gypsum Stack Buttress – After Pool Lowering

Phase 3 Remediation Design and Construction
Bull Run Gypsum Stack

Slope and Drainage Improvements

Slope and Drainage Improvements

Phase 3 Remediation Design and Construction
Widows Creek Gypsum Stack and Ash Pond



Improvement Actions

Phase 3 Remediation Design and Construction
Widows Creek Gypsum Stack

Gypsum Stack West Slope Buttress - Before

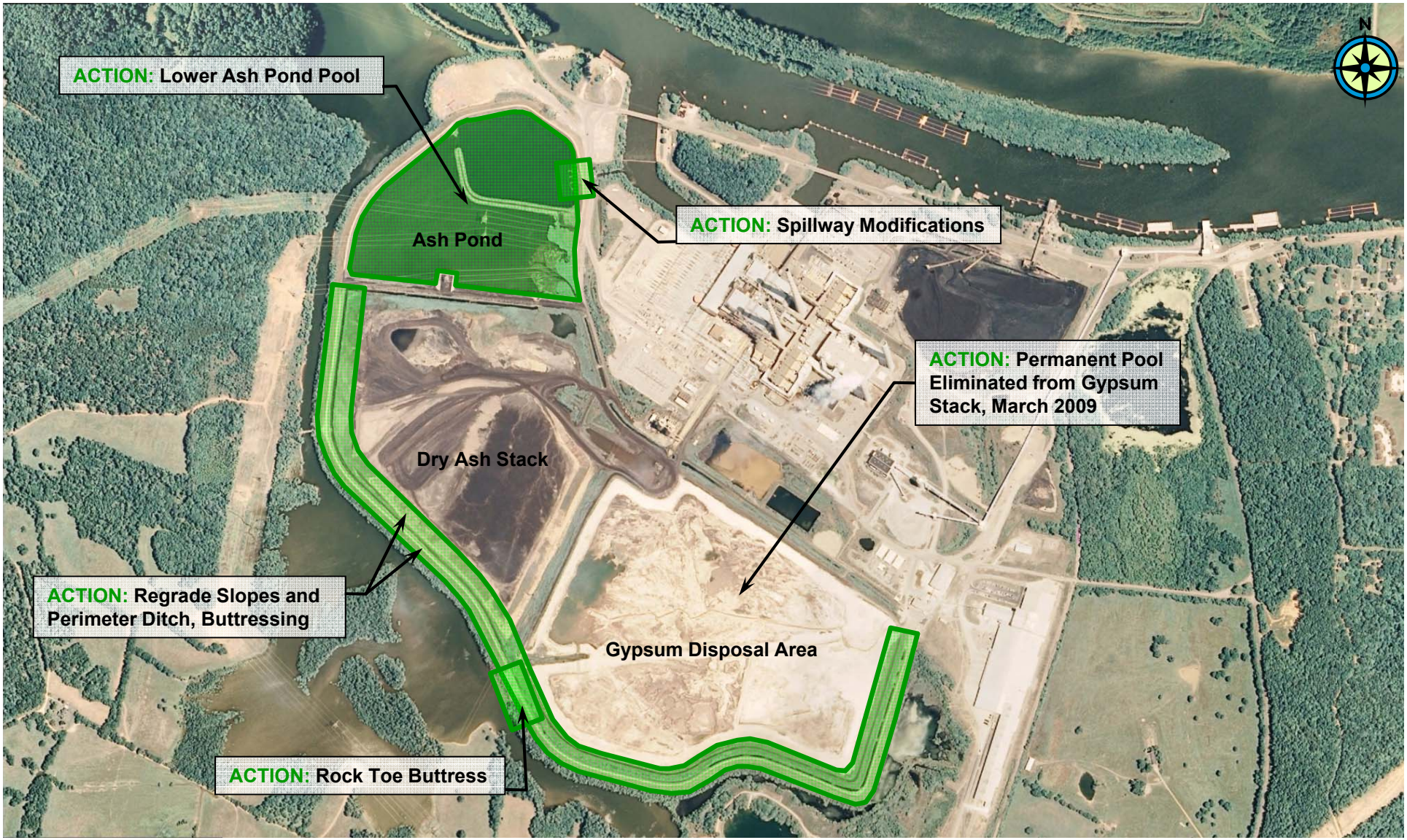
Gypsum Stack West Slope Buttress - After

Phase 3 Remediation Design and Construction
Widows Creek Gypsum Stack

Gypsum Stack Seepage Drain and Armoring

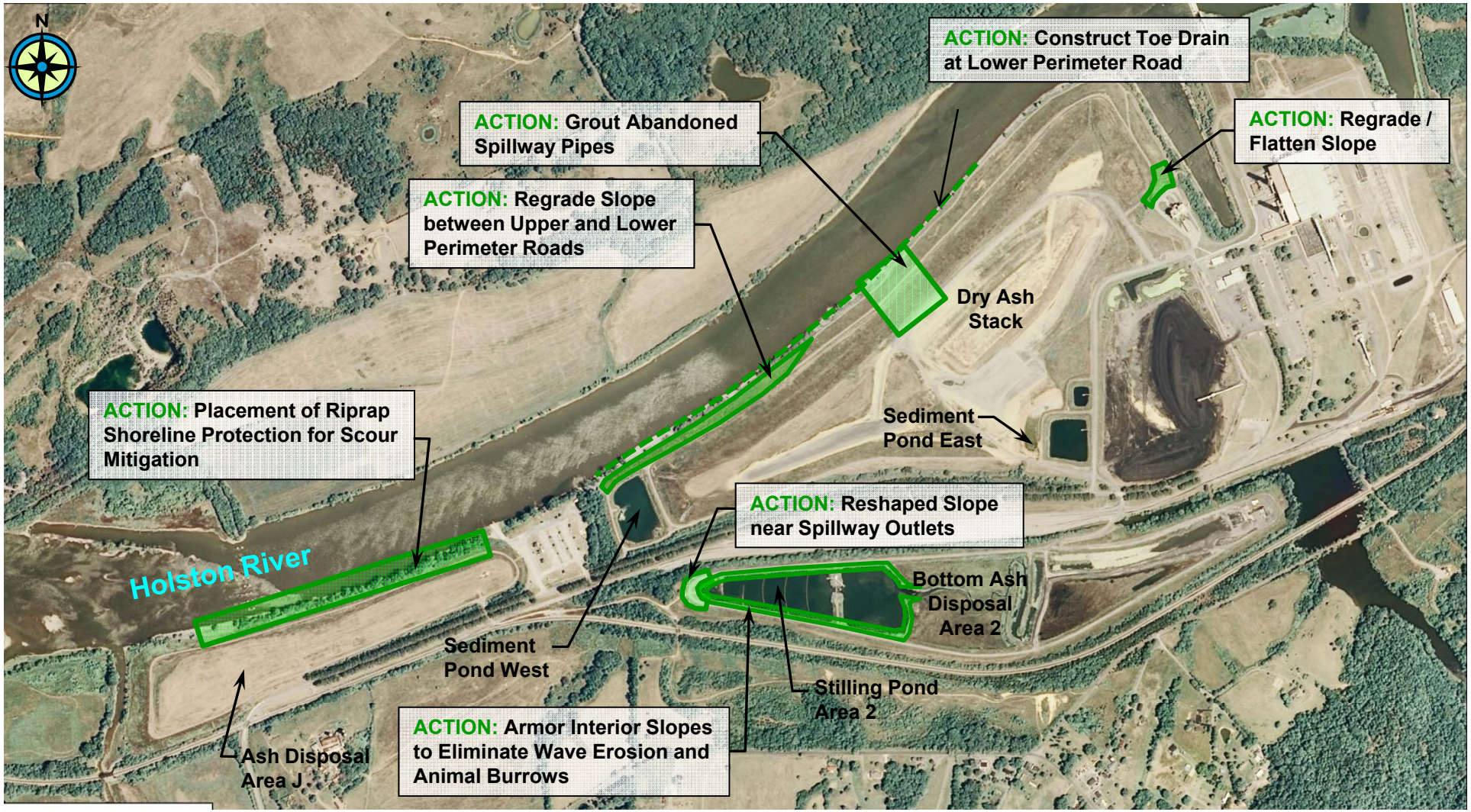
Gypsum Stack Seepage Drain and Armoring

Phase 3 Remediation Design and Construction
Cumberland Ash Pond and Gypsum Stack



Improvement Actions

Phase 3 Remediation Design and Construction
John Sevier Ash Complex



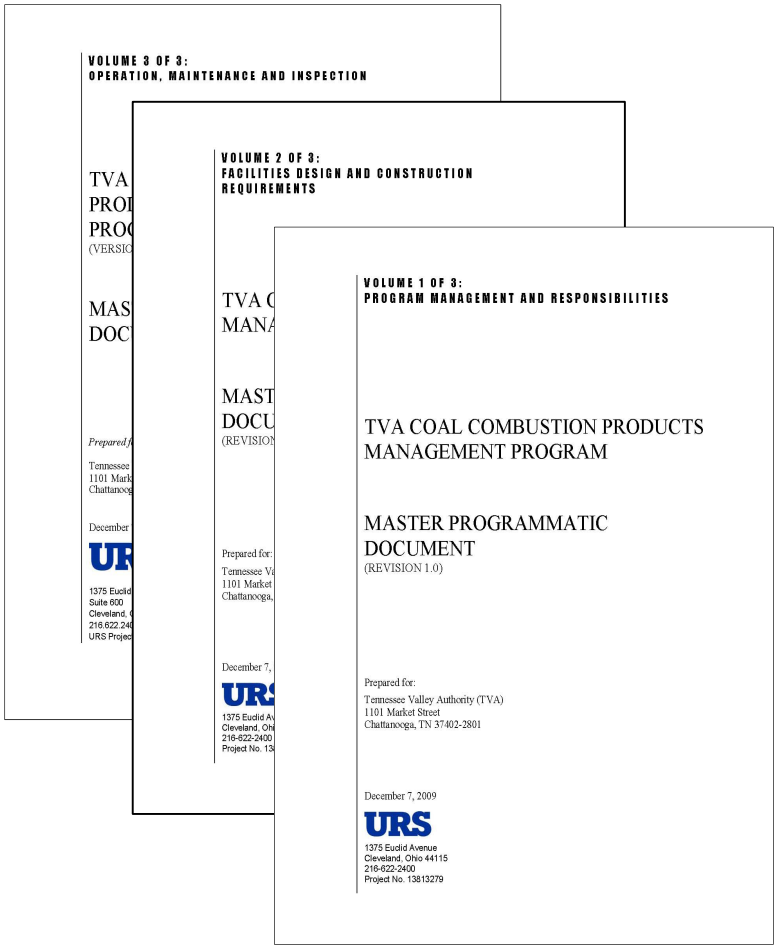
Improvement Actions

Phase 4 Programmatic Improvements
Dam Safety Inspection Training

- **Training Sessions at Each Fossil Plant**
- **Two Sessions in Chattanooga**
- **Over 300 Staff Received Training**
- **Training Elements Included:**
  - Roles and Responsibilities
  - Failure Modes
  - Case Histories
  - Specific Plant CCP Features
  - Design Philosophy
  - Inspection Program

Phase 4 Programmatic Improvements
Programmatic Documents

- **Volume 1 – Program Management and Responsibilities**
- **Volume 2 – Facilities Design and Construction Requirements**
- **Volume 3 – Operation, Maintenance, and Inspection**



Coal Combustion Facility Assessment Report

Thank You

Phase 3 Remediation Design and Construction Status

- Material Totals For FY10 (excluding KIF)
  - Man-hours ~ **472,324**
  - Rock Placed ~ **455,305 tons**
  - Sand ~ **26,277 tons**

Instrumentation at Gallatin

Paradise Scrubber Complex Armoring