CUMBERLAND FOSSIL PLANT

Tennessee Valley Authority

welcomes you to

Cumberland Fossil Plant

Public Open House

CUMBERLAND FOSSIL PLANT

EVENT GUIDE

This event is to provide updates on the Environmental Investigation Plan (EIP) being conducted at the Cumberland Fossil Plant (CUF).

The following acronyms appear frequently on the boards:

- Environmental Investigation Plan (EIP)
- Environmental Assessment Report (EAR)
- Coal Combustion Residuals (CCR)
- Tennessee Valley Authority (TVA)
- Tennessee Department of Environment and Conservation (TDEC)
- Sampling and Analysis Plan (SAP)
- Environmental Protection Agency (EPA)

The information boards are color-coded according to the technical focus area they cover in the EIP. For instance, if they contain general information regarding the EIP process, the information board will be color-coded in blue.

General Information

Below are the main areas of technical focus in the EIP, divided by study area. More information on the activities within each area has been provided at the stations around the room.

The evaluation of existing data from the site serves as the foundation to support the additional studies planned for each area of focus.

Civil/Mapping Activities	Environmental	Geotechnical	Hydrogeological
• Coal Combustion Residuals Material Quantity	• Benthic Investigation	• Exploratory Drilling	• Hydrogeologic Investigation
	• Surface Stream Investigation	• Slope Stability	• Groundwater Investigation
	• Fish Tissue Investigation		• Water Use Survey
	• Seepage Investigation		• Background Soil Investigation
	• CCR Material Characteristics		

CUMBERLAND FOSSIL PLANT

Facility Overview

1968 Cumberland Fossil Plant construction began

1972 Ash Pond Construction Completed

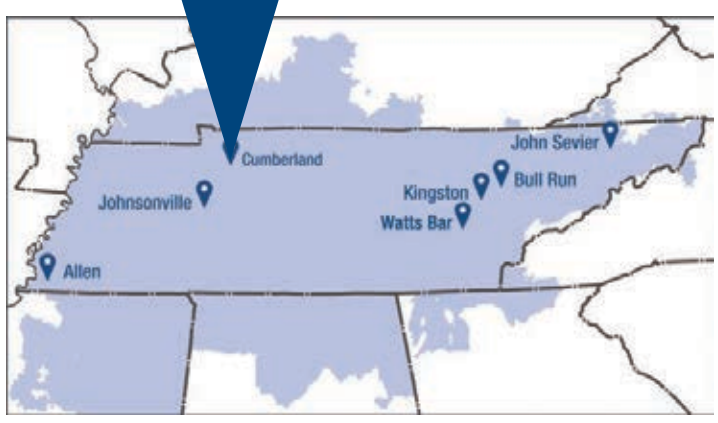
446 Jobs in Clarksville area that support the Cumberland Fossil Plant

16 billion kilowatt-hours, enough to supply **1.1 million** homes

12% of TVA's total electricity generation

75% Beneficial reuse sales (Fly Ash)

90% Beneficial reuse sales (Gypsum)



CCR Units: Gypsum Storage Area, Dry Ash Stack, Bottom Ash Pond, and Retention Pond (including Stilling Pond)

CUMBERLAND FOSSIL PLANT

COAL COMBUSTION RESIDUALS COMPLIANCE ORDER

What is the TDEC Order and why was it put in place?

On August 6, 2015, the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 to the Tennessee Valley Authority (TVA) for Coal Combustion Residuals (CCR) compliance pursuant to the provisions of Tennessee's solid waste management and disposal laws.

This order establishes a transparent, comprehensive process to investigate, assess, and remedy any unacceptable risks resulting from the management and disposal of CCR at TVA coal-fired power plants within the state:

Did you know…

Cumberland is also active in sales of gypsum and fly ash used as raw manufacturing material.

In fact, Georgia Pacific runs a wallboard plant near the site to utilize Cumberland's high quality gypsum in its manufacturing process. Fly ash is used by area companies for road construction.

What are coal combustion residuals?

Coal combustion residuals, commonly known as coal ash, are created when power plants burn coal to produce electricity.

These residuals include fly ash, bottom ash/ slag, and gypsum, and are collected separately from different areas of the facility.

Fly ash originates from the flue gas electrostatic precipitators, bottom ash from the boilers, and gypsum from the sulfur dioxide scrubbers.

What is the EIP?

What it is and why we do it

TDEC has requested certain information about Cumberland's CCR management.

What TVA has already done

TVA has ongoing programs and monitoring that can help answer TDEC's questions.

Proposed EIP Activities

The Environmental Investigation Plan (EIP) lays out the proposed investigation TVA is conducting to provide additional information that TDEC has requested.

TVA has already completed several tasks under the EIP at Cumberland. The completed tasks are identified throughout the information in each of focus areas.

Bottom Ash/Slag

Gypsum

Fly Ash

CUMBERLAND FOSSIL PLANT

BENEFICIAL USE OF GYPSUM AND FLY ASH

Gypsum

Synthetic gypsum **conserves** natural resources by replacing natural mined gypsum.

Of the gypsum produced every year,
90% (approximately)
or
750,000 tons (approximately)
is reused.

That produces enough wallboard to build over **71,500 homes.**

Georgia Pacific runs a wallboard plant near the site to utilize **Cumberland's high quality gypsum** in its manufacturing process.

Since the wallboard plant was constructed, more than **15 million tons** have been **beneficially used**.

The Georgia Pacific Cumberland City Plant **employs 140 people** directly and created **306 indirect jobs**.

Fly Ash

Fly ash is used in **roads**, bridges, **buildings**, airport runways, **dams**, **precast concrete products**, driveways

Concrete with fly ash is **stronger**, more durable, lower cost and **environmentally friendly**.

Cumberland Fossil Plant supplies over **200 concrete plants** in TN, AL, AR, GA, MS, KY, NC, IL, MO

In concrete, every ton of fly ash that replaces Portland cement **reduces** carbon emissions by **1 ton**.

Every year,
75% or
about **300,000 tons**
of ash is reused

This produces enough concrete to pave approximately **1,225 miles** of interstate highway annually.

About **20,000 tons** of ash went into the new Hankook Tire plant in Clarksville.

Cumberland Fossil Plant **fly ash Department of Transportation (DOT) Certified** in Tennessee, Kentucky, Georgia, Mississippi, Alabama, Virginia, North Carolina and Louisiana

TVA

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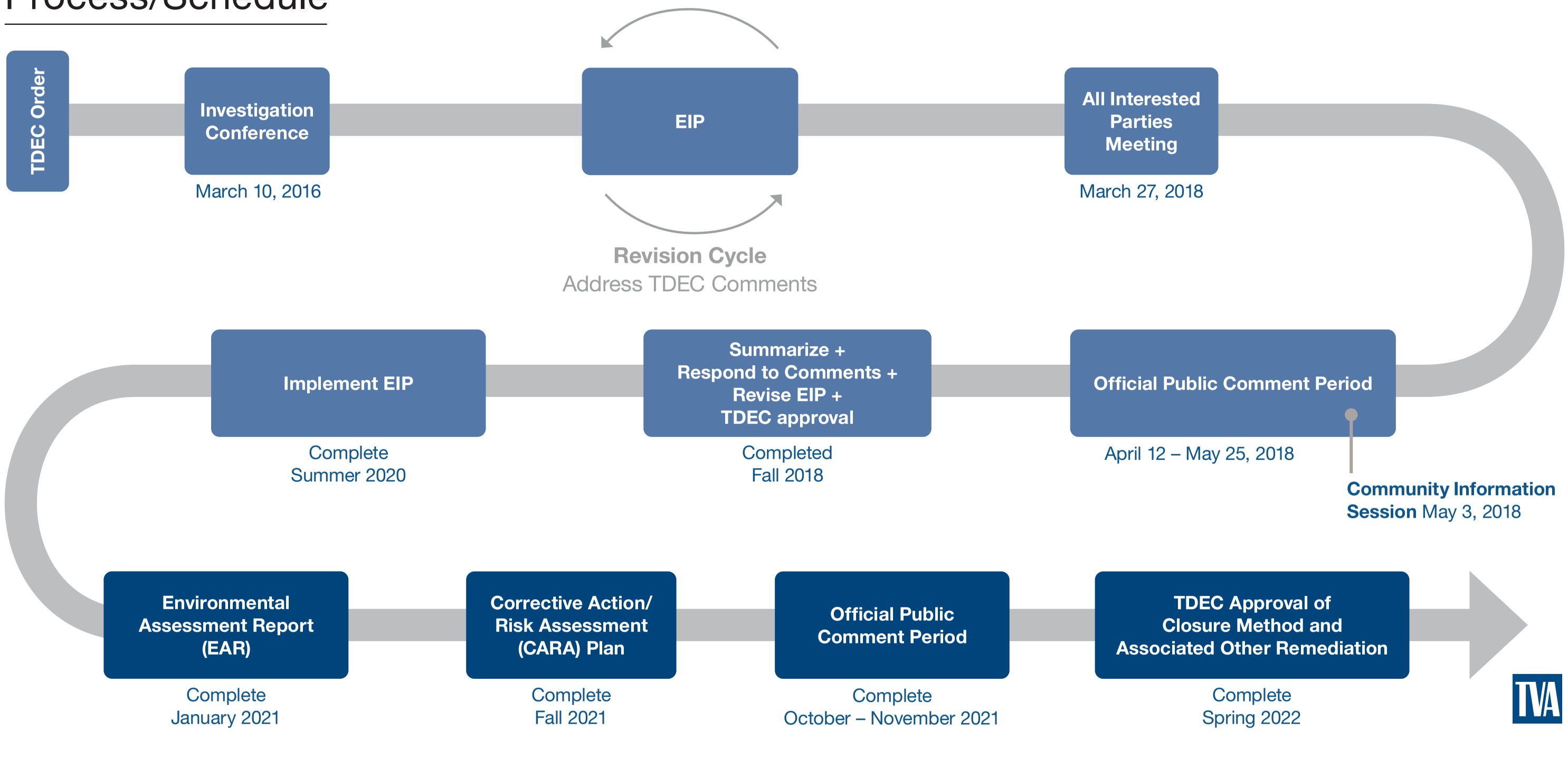
ENVIRONMENTAL INVESTIGATION PLAN

Process/Schedule



CUMBERLAND FOSSIL PLANT

ACTIVITIES MATRIX

FOCUS AREA	EXISTING INFORMATION	PROPOSED EIP ACTIVITIES
Coal Combustion Residuals (CCR) Material Quantity	• As built/record drawings performed as required since 1973 • Aerial surveys performed as required for specific projects • Drilled borings history beginning in 1958	C Review existing surveys, drawings and borings. C Develop three-dimensional models of CCR units ✓ Incorporate new EIP borings and field data into model. ✓ Confirm CCR volumes
Benthic Investigation (sediment, benthic macroinvertebrate, and mayfly sampling)	• Benthic invertebrate community sampling completed from 2009 to 2015 • Limited sediment sampling completed by TVA in 2002 in tributary to Wells Creek	C Collect sediment, benthic macroinvertebrates, and mayfly samples ✓ Analyze sediment samples for CCR constituents and percentage of ash ✓ Analyze benthic macroinvertebrates and mayfly samples for CCR constituents ✓ Comparative analysis against upstream samples and existing data ✓ Report on analytical assessment
Surface Stream Investigation	• NPDES permit: – Various effluent parameters sampled on weekly, monthly, quarterly and annual basis – Whole effluent toxicity analyses conducted annually • United States Army Corps of Engineers – water quality data available for specific years	✓ Collect water samples from transects in Cumberland River and Wells Creek ✓ Analyze samples for CCR constituents ✓ Comparative analysis against upstream samples and existing surface stream data ✓ Report on analytical assessment
Fish Tissue Investigation	• Fish community data collected and analyzed from 2001 to 2015 • No previous fish tissue studies conducted at site	C Capture and identify target fish species at sampling locations C Remove and transport fish tissue samples to laboratory ✓ Analyze tissue samples for CCR constituents ✓ Comparative analysis against upstream samples ✓ Report on analytical assessment
Seepage Investigation	• Quarterly site inspections per NPDES permit • Annual report submitted to TDEC	C Conduct seepage investigation to identify active seeps C Collect soil and water samples at identified seeps C Analyze samples for CCR constituents ✓ Comparative analysis against background soils ✓ Report on analytical assessment

✓ **Proposed EIP activities are underway**

C **Proposed EIP activities have been completed**

CUMBERLAND FOSSIL PLANT

ACTIVITIES MATRIX

FOCUS AREA	EXISTING INFORMATION	PROPOSED EIP ACTIVITIES
CCR Material Characteristics	• CCR leachability characterization of gypsum, fly ash and bottom ash	C Collect CCR material samples from borings in units C Collect pore water samples from temporary wells in units C Analyze samples for CCR constituents ✓ Comparative analysis against exiting data ✓ Report on analytical assessment
Exploratory Drilling	• Performed as required for specific projects • Over 270 existing borings and over 80 water level instruments	✓ Geotechnical drilling and soil and rock sampling ✓ Install water level instruments ✓ Laboratory testing
Slope Stability	• Routine visual monitoring and instrumentation monitoring • Existing analyses meet industry standards	✓ Compare existing models to new data ✓ If needed, update models and reanalyze ✓ Compare slope stability results to acceptance criteria
Hydrogeologic Investigation	• Monitoring well networks in place for CCR Rule and State permitting requirements	C Install 3 background wells C Install 3 downgradient wells
Groundwater Investigation	• Groundwater monitoring has been ongoing since 1993	✓ Bimonthly groundwater sampling for 1 year (6 events)
Water Use Survey	• Existing TDEC water well database	✓ Review existing water supply information and compare to addresses listed for these water sources ✓ Perform a door-to-door water use survey ✓ Record water use data and GPS locations of identified water sources ✓ Conduct one round of sampling and compare to United States Environmental Protection Agency drinking water standards ✓ Test for CCR constituents and geochemical parameters
Background Soil Investigation	• Background soil samples collected with background monitoring wells	C Test additional background sampling locations for CCR constituents ✓ Review existing data for comparative analysis

✓ **Proposed EIP activities are underway**

C **Proposed EIP activities have been completed**

CUMBERLAND FOSSIL PLANT

COAL COMBUSTION RESIDUALS MATERIAL QUANTITY

What it is and why we do it

Frequent surveys of the site track the location and quantity of coal combustion residuals (CCR).

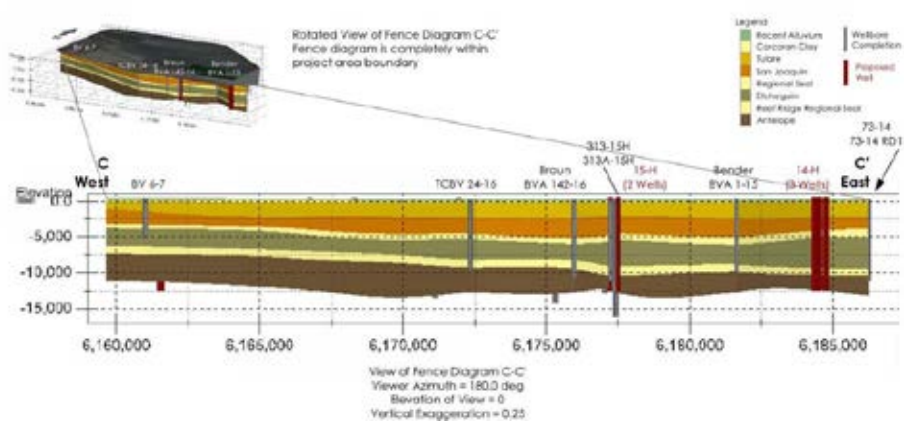
This aids in overall site management as well as byproduct sales.

What do we already know?

- Pre-development Topographic Maps
- Aerial Surveys
- As-Built/Record Drawings
- Drilled Borings

Even before construction began, the facility had been extensively mapped. These site topographic maps, aerial surveys and construction updates are used for site management.

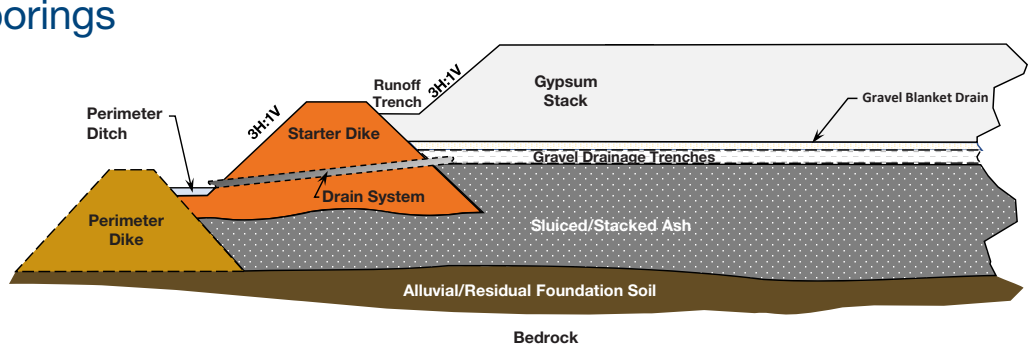
Site mapping is typically updated annually as well as any time significant changes are made to the layout of the site — whether that means a shift of operations from one area to another or an increase/decrease in the volumes of materials that are stored on site. These mapping updates are for both inventory management as well as site management, ensuring that the CCR units are used to their best potential.



Example of a 3-dimensional model developed and used to calculate volumes

Proposed EIP Activities

- Review existing surveys, drawings and borings
- Develop 3-dimensional models of CCR units
- Incorporate data from new EIP soil and rock borings and monitoring wells into model
- Confirm CCR volumes



Gypsum Stack Typical Cross Section
(Not to Scale)

CUMBERLAND FOSSIL PLANT

BENTHIC INVESTIGATION–BIOLOGICAL STUDIES

What it is and why we do it

Evaluations are performed on the Cumberland River both upstream and downstream to compare the health of aquatic wildlife, before and after water is released from the plant into the Cumberland River.

These evaluations have two parts:

- Testing mayfly adults and nymphs to see if there are CCR constituents in their tissues, and
- Counting the types and numbers of different benthic macroinvertebrates in rivers and streams adjacent to site

What are benthic macroinvertebrates?

Aquatic organisms that live in and on the sediment substrate.

Why do we study them?

They are an important part of the local food chain, and are good indicators of changes in the environment.

What do we already know?

- From 2009 to 2015 we have collected samples upstream and downstream of the Cumberland Fossil Plant during all seasons but most consistently during summer and autumn
- Scores for summer samples at both sites were similar or better downstream during all years except summer 2013

Examples of benthic macroinvertebrates

Note: nymphs are immature mayflies found in the sediment

Proposed EIP Activities

- Collect 5 benthic macroinvertebrate sediment samples per transect (location), at 11 separate locations, for a total of 55 samples
- Collect mayfly nymph samples from submerged sediments and adult mayflies from the surface at multiple locations in 5 designated areas
- Analyze benthic macroinvertebrate samples using community metrics (e.g., abundance, diversity, percent dominance)
- Analyze mayfly samples for CCR metal constituent levels
- Review existing data for comparative analysis
- Provide assessment of analytical results in Environmental Assessment Report (EAR)

CUMBERLAND FOSSIL PLANT

BENTHIC INVESTIGATION–BIOLOGICAL STUDIES

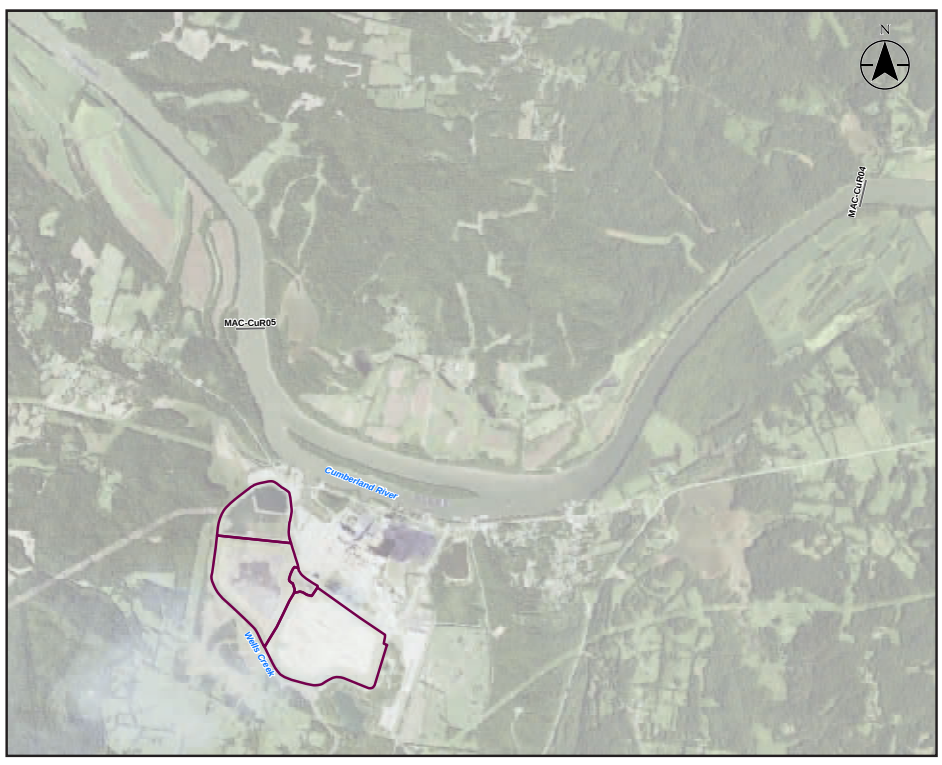
Where will the sampling take place?

Benthic Macroinvertebrates Sampling Transects

Legend

- Area of Interest
- Historic Seep (Approximate Location)
- Stream
- Transects
- CCR Unit Area (Approximate)

Off-Site Benthic Macroinvertebrates Sampling Transects



Legend

- Transects
- CCR Unit Area (Approximate)

Mayfly Sampling Transects: Adult Mayflies & Mayfly Nymphs

Legend

- Mayfly Sample Location
- CCR Unit Area (Approximate)

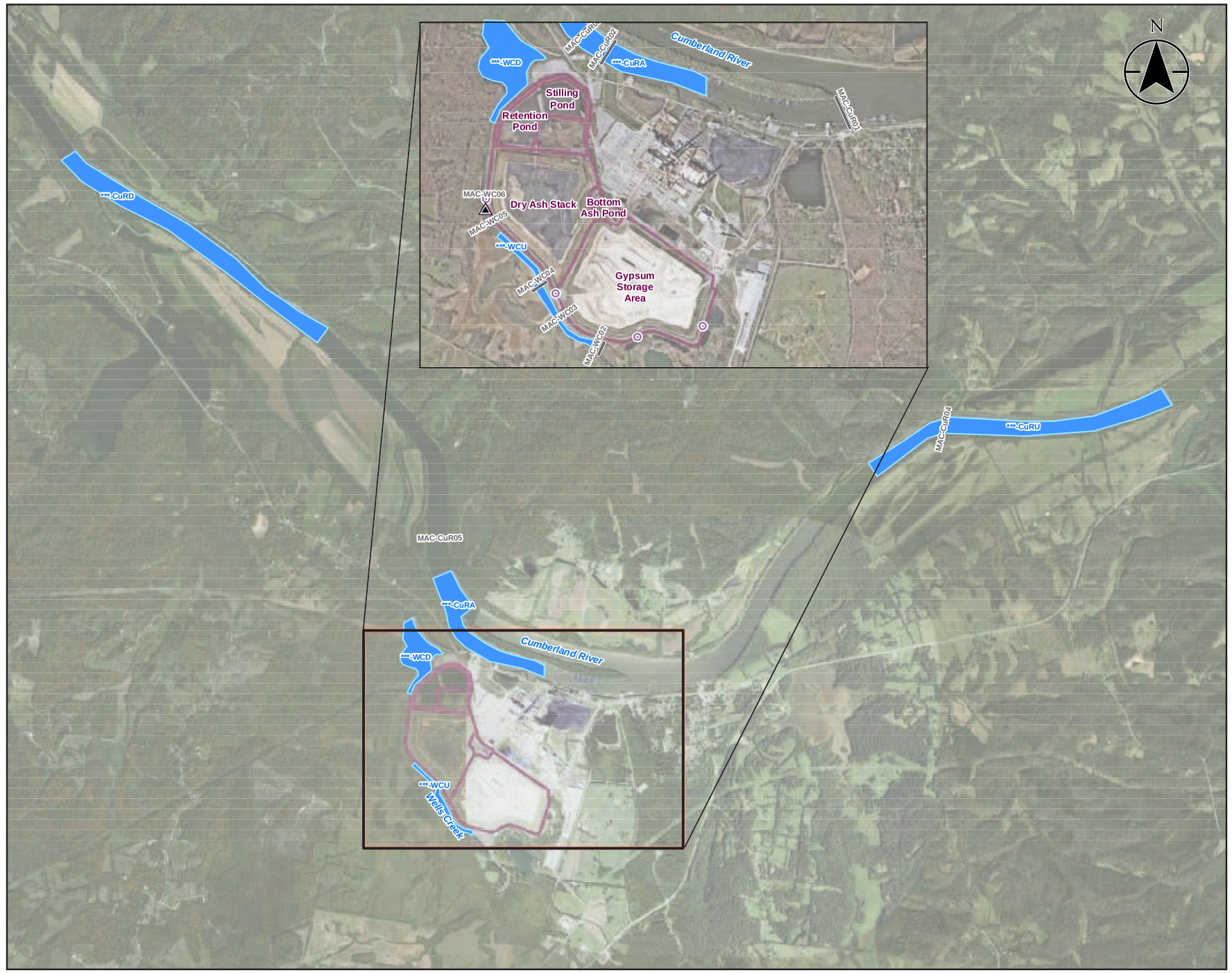
CUMBERLAND FOSSIL PLANT

BENTHIC INVESTIGATION–BIOLOGICAL STUDIES

Benthic Macroinvertebrates Sampling Transects

Off-Site Benthic Macroinvertebrates Sampling Transects

Mayfly Sampling Transects: Adult Mayflies & Mayfly Nymphs



Legend

- Transects
- Mayfly Sample Location
- CCR Unit Area (Approximate)

CUMBERLAND FOSSIL PLANT

BENTHIC INVESTIGATION–SEDIMENT STUDIES

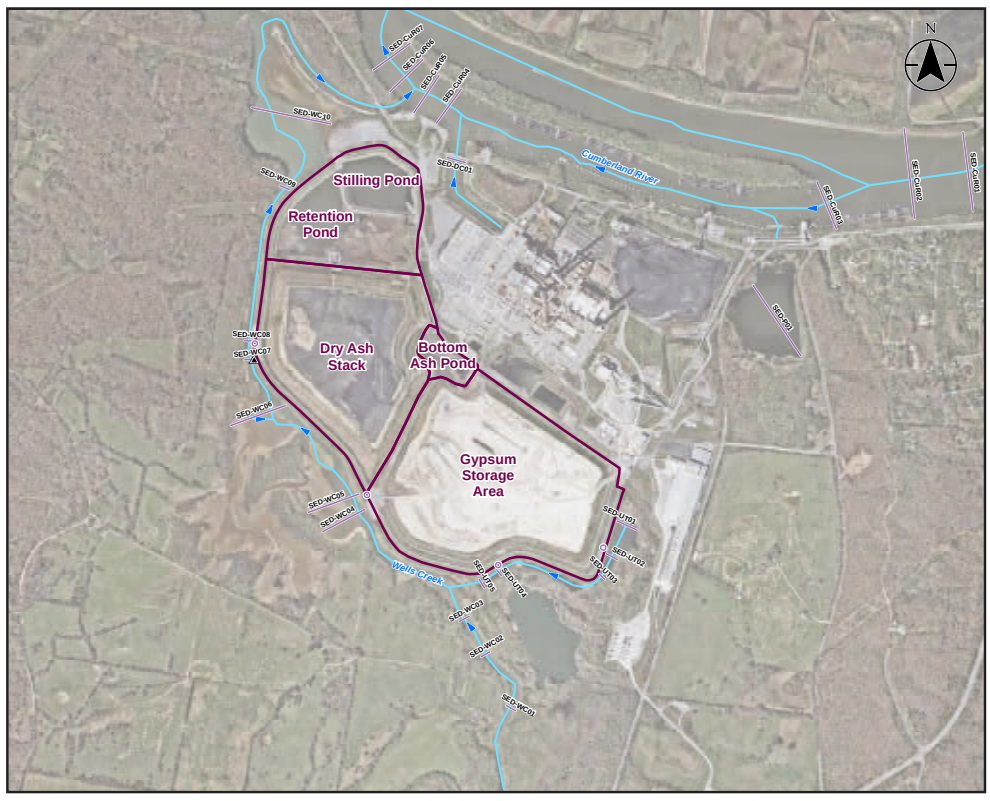
What it is and why we do it

Sediment samples are taken from the river bottom to determine whether CCR material and/or constituents have migrated from the site to Wells Creek, Cumberland River, and other surface waters.

What do we already know?

- TVA conducted a limited Wells Creek sediment investigation in 2002
- The Army Corps of Engineers regularly collects sediment data in the Cumberland River. The nearest sampling location is approximately 3 miles downstream from the plant and the data for the years 1997, 2002, 2007, and 2012 will be included in the review

Proposed Sediment Sampling Locations



Proposed EIP Activities

- Collect 3 sediment samples per transect, along 24 transects, for a total of 72 sediment samples
- Analyze Phase 1 sediment samples for:
  - CCR constituents (Top 6 inches during Phase 1 — deeper sediment samples to be held for potential analysis of CCR constituents during Phase 2)
  - Percentage of ash (All sediment samples)
- If ash percentage exceeds 20%, initiate Phase 2 sampling
- Phase 2 sampling will consist of analysis of deeper sediment samples from Phase 1 for the CCR constituents and potential collection of additional sediment samples
- Provide assessment of analytical results in Environmental Assessment Report (EAR)

CUMBERLAND FOSSIL PLANT

SURFACE STREAM INVESTIGATION

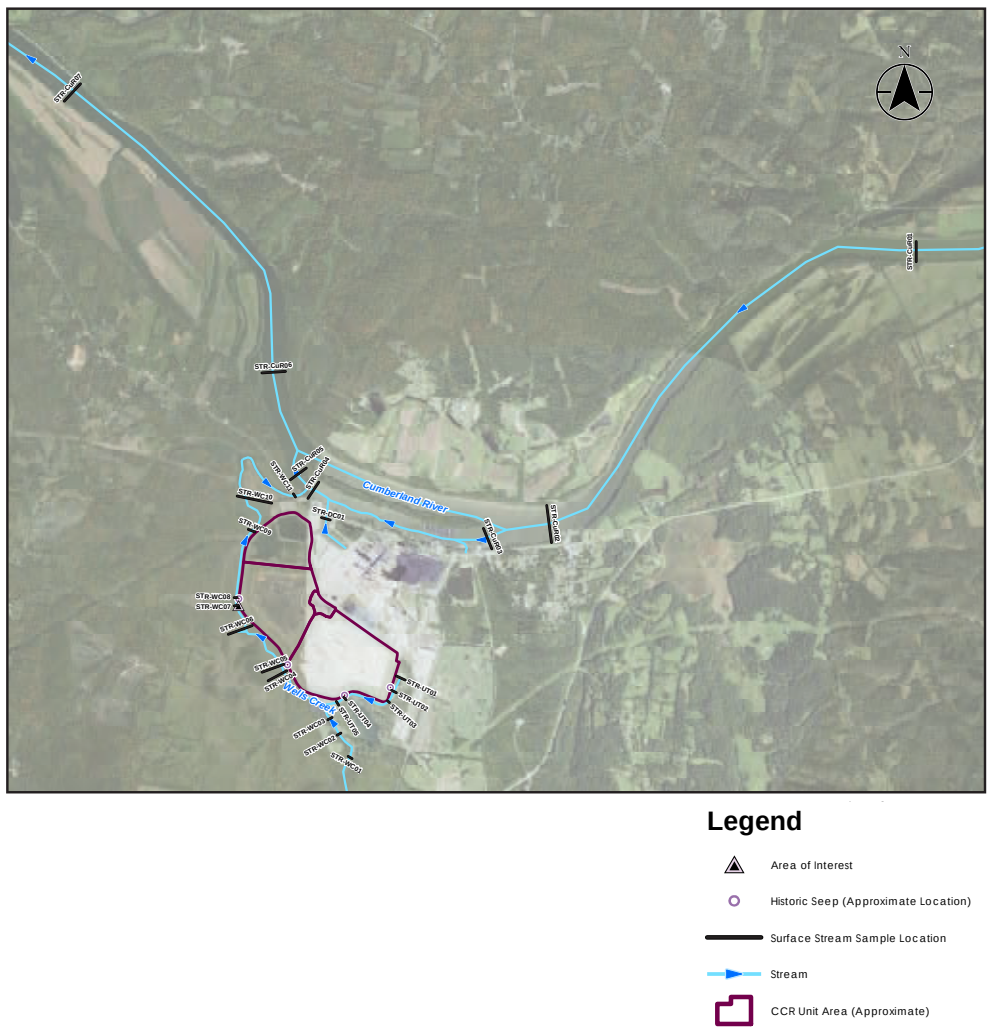
What it is and why we do it

Surface stream sampling is performed both upstream and downstream to determine if CCR materials and/or constituents have migrated from the site to adjacent water bodies.

What do we already know?

- Testing of outfall discharge occurs on a regular basis to comply with our National Pollutant Discharge Elimination System (NPDES) permit
- Dikes are monitored for seepage, with a corrective action plan if any is observed
- Frequent testing and analysis of the local aquatic community and whole effluent toxicity per NPDES permit requirements
- The Army Corps of Engineers collects water quality data in the Cumberland River

Proposed Surface Stream Sampling Locations



Wells Creek

Permitted Outfall: Ash Pond Discharge

Proposed EIP Activities

- Collect surface water samples from 24 transects in the Cumberland River, Wells Creek and its tributary, and the NPDES outfall discharge channel
- Analyze samples for CCR constituents
- A second phase of surface stream sampling will be conducted if associated sediment samples indicate that greater than 20% ash is present.
- Provide assessment of analytical results in Environmental Assessment Report (EAR)

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FISH TISSUE INVESTIGATION

What it is and why we do it

Fish are captured using electrofishing and gill netting, and tissue samples are taken.

These tissues samples are used to test the levels of CCR constituents in fish.

What do we already know?

- Although fish tissue studies have not been previously conducted, an analysis of the types and number of fish in the area has been completed using data collected annually from 2001-2015
- Overall Fish Community Assessment scores were similar between the upstream and downstream sites during all seasons sampled in 2015, an indication that the Plant has not had an adverse environmental impact on fish communities adjacent to the site

Proposed Fish Sampling Locations

Legend

Fish Sample Location

CCR Unit Area (Approximate)

Electroshock fishing

Proposed EIP Activities

- Verify proposed sampling locations, at five locations, based on:
  - Access
  - Current hydrogeologic knowledge
  - Greatest expectation of success in capturing target fish species
- Capture target fish species through electrofishing and gill netting at each sampling location
- Remove tissue samples and transport to laboratory
- Analyze fish tissue samples for CCR constituent levels
- Compare analytical tissue results to upstream reference location
- Provide assessment of analytical results in Environmental Assessment Report (EAR)

CUMBERLAND FOSSIL PLANT

SEEPAGE INVESTIGATION

What it is and why we do it

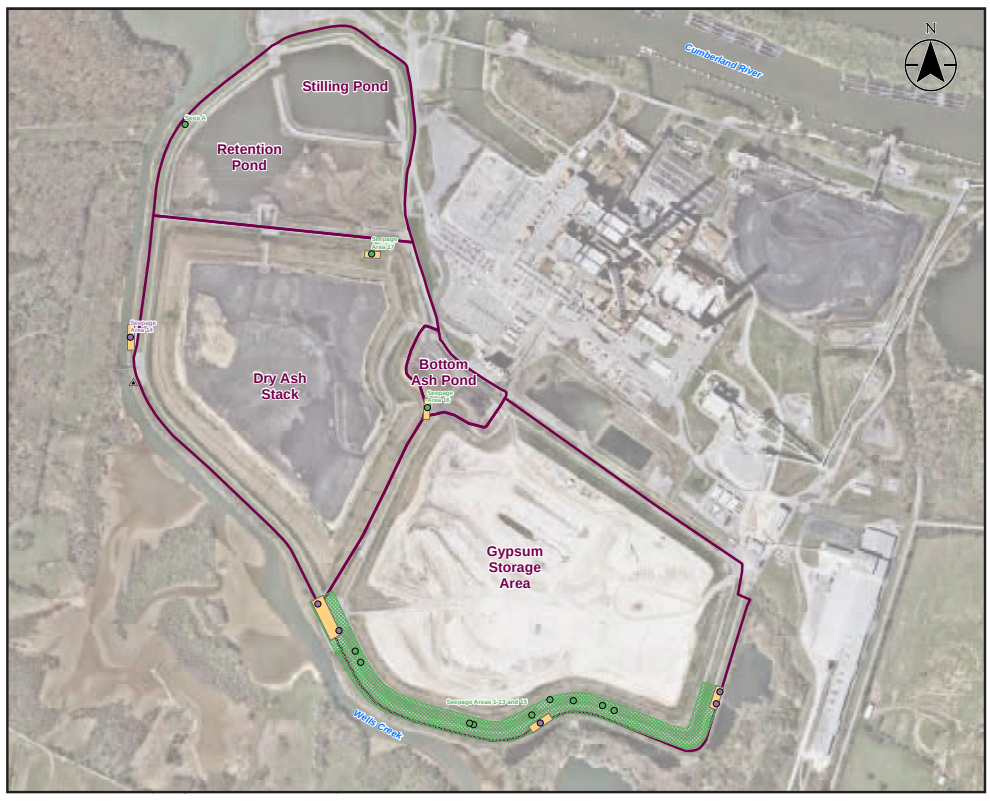
Dikes on the property are checked frequently to identify active seeps.

The soils and water at active seep areas are tested for CCR constituent levels.

What do we already know?

- Quarterly inspections of ash pond dikes for seepage, per National Pollutant Discharge Elimination System (NPDES) permit
- Annual report submitted to TDEC on results of seepage inspections and any remedial activities implemented
- A historic seep summary has been provided in the EIP
- Historically, seeps have been monitored and repaired for structural reasons (i.e., to reduce potential for dike failures); active seeps are now subject to environmental sampling and analysis protocols for the detection of CCR constituents

Historic Seepage Areas (Approximate Location)



Proposed EIP Activities

- Visually inspect perimeter dike for signs of seepage (discoloration, flowing water, unnatural saturation)
- If potential signs encountered, mark location
- Observe any water discharge flow
- Collect soil and water samples
- Analyze soil and water samples for CCR constituent levels
- Provide assessment of analytical results in Environmental Assessment Report (EAR)

CUMBERLAND FOSSIL PLANT

COAL COMBUSTION RESIDUALS MATERIAL CHARACTERISTICS

What it is and why we do it

The different CCR materials on site are tested for levels and types of chemical constituents. This helps us understand their ability to leach from (or leave) the ash and enter the water in the CCR units.

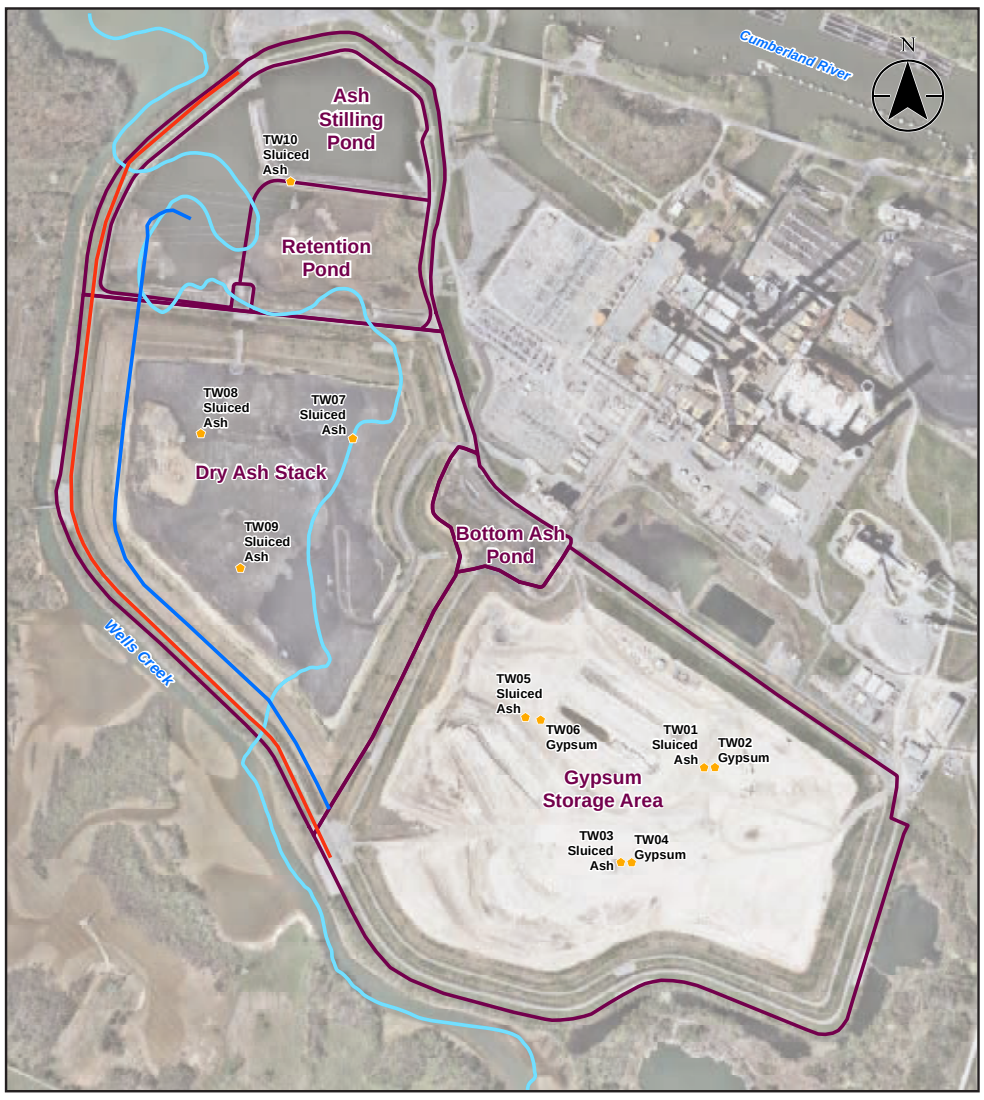
What do we already know?

A comprehensive study, using 2 different methods, is performed every 3 years (most recently in 2016) to characterize the CCR constituents.

The materials sampled include: Dry Fly Ash, Bottom Ash, Gypsum Product (wallboard plant), and Gypsum Fines (not used by wallboard plant).

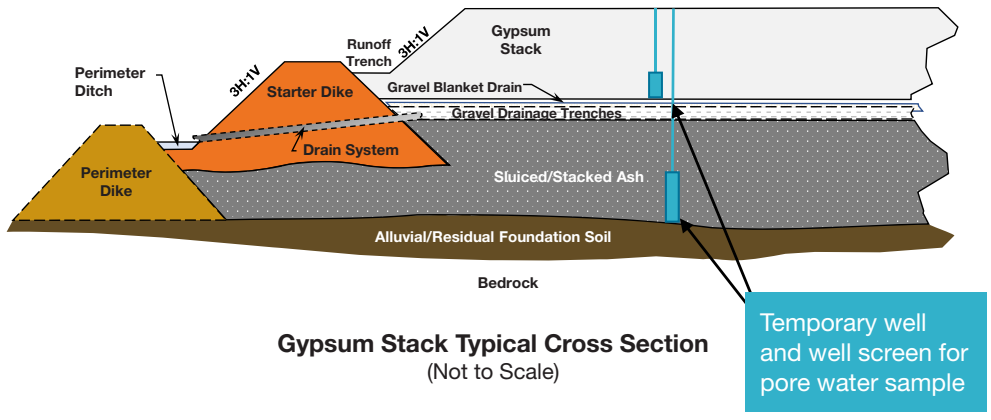
Each material was tested for physical and chemical characteristics, including leachability and total metals.

Proposed Temporary Wells



Proposed EIP Activities

- During exploratory drilling, collect CCR material (i.e., ash) samples for analytical testing
- Install temporary wells in CCR and collect pore water samples (i.e., water trapped in the materials)
- Analyze ash samples for leachability potential
- Analyze pore water samples for CCR constituent levels
- Review existing data for comparative analysis
- Provide assessment of analytical results in Environmental Assessment Report (EAR)



Gypsum Stack Typical Cross Section
(Not to Scale)

CUMBERLAND FOSSIL PLANT

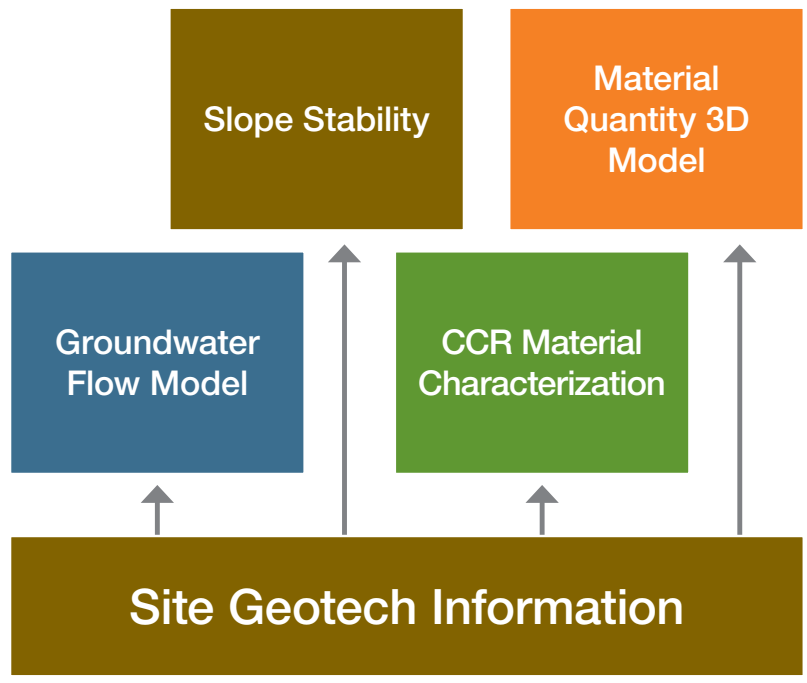
EXPLORATORY DRILLING (1 of 2)

What it is and why we do it

Exploratory drilling provides a better understanding of what is in and under each CCR unit.

It tells us:

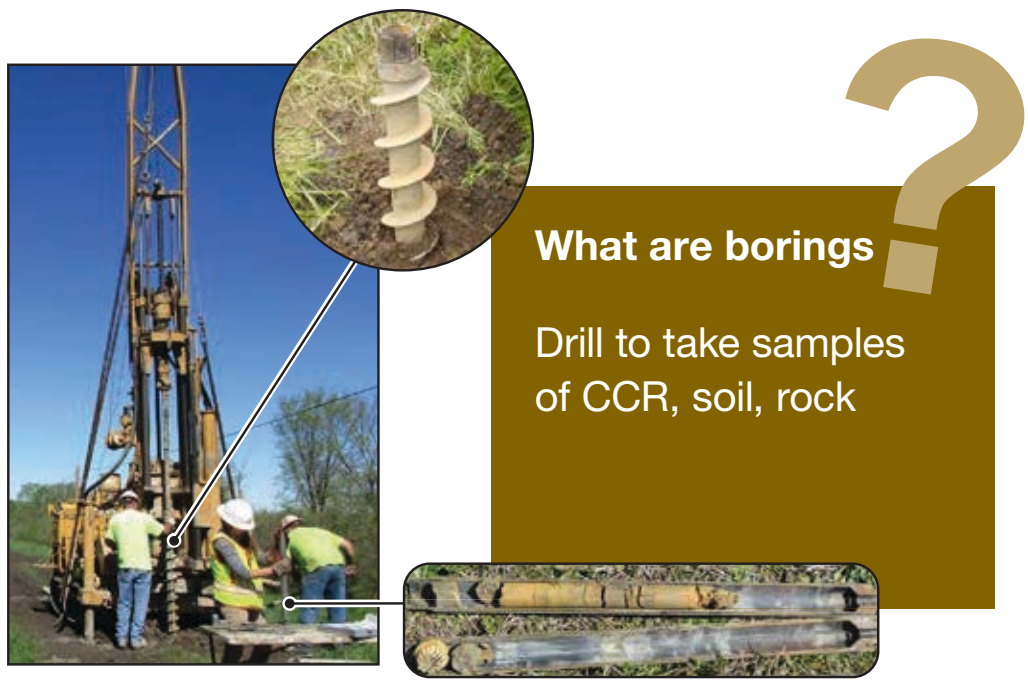
- What is there: material types (CCR, soil, rock) and properties (strength, permeability, etc.)
- Where it is (material locations), and
- Where the water level(s) are located (material saturation)



What do we already know?

The EIP includes an evaluation of existing geotechnical data. This includes a review of design and construction records, inspection records, field data (including 270+ borings and 80+ water level instruments), laboratory data, and engineering analyses.

Each piece of information has been evaluated to confirm that it was collected and analyzed properly in the past. This existing data is very valuable to understand the CCR unit conditions.



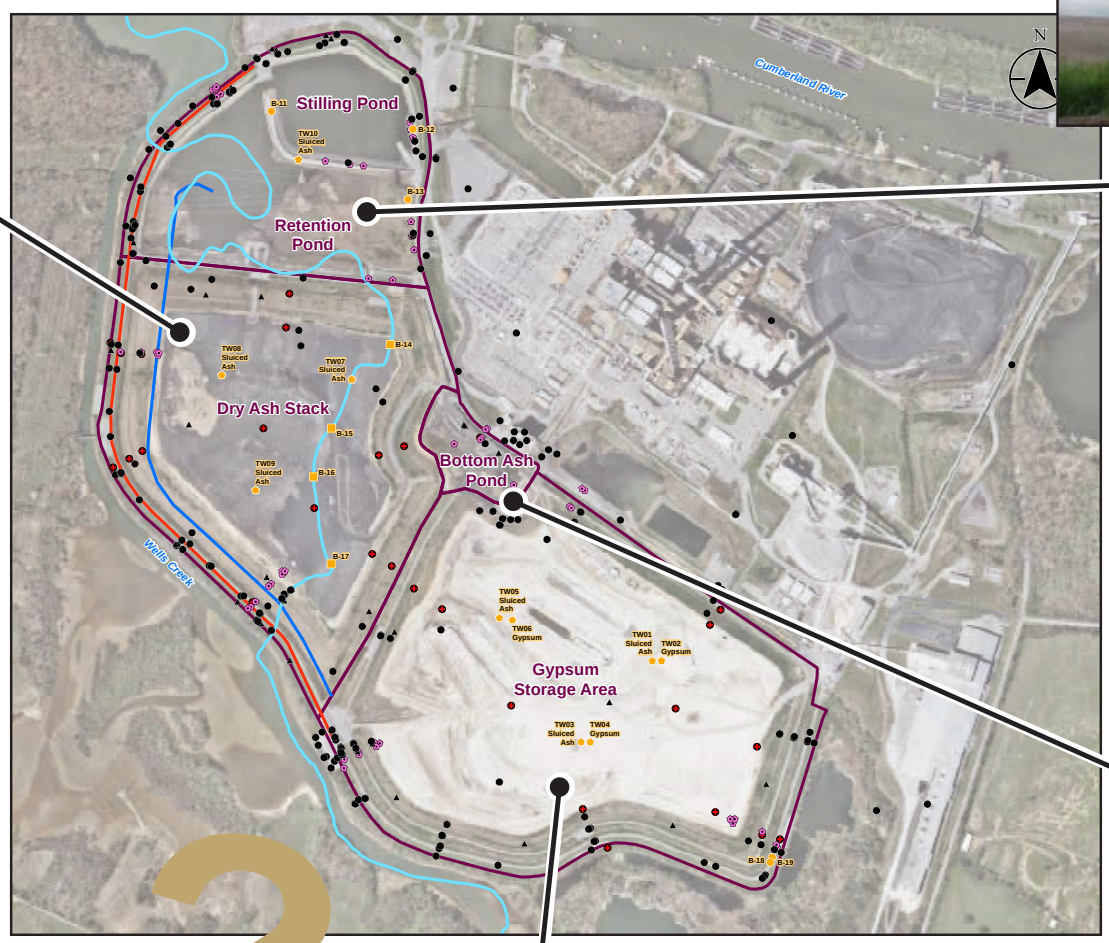
Proposed EIP Activities

- Additional borings within the interior of the CCR units
- Install temporary wells and piezometers in CCR
- Targeted borings in specific areas along unit borders
- Shallow bedrock characterization
- Share data with hydrogeological, environmental, and civil/mapping discipline teams

CUMBERLAND FOSSIL PLANT

EXPLORATORY DRILLING (2 of 2)

Where will the drilling take place?



Dry Ash Stack

- **7** Borings
  - **3** Borings with Temporary Wells and Rock Coring
  - **4** Borings with Vibrating Wire Piezometers and Rock Coring
- **19** Cone Penetration Tests

Stilling Pond (including Retention Pond)

- **4** Borings
  - **1** Boring with Temporary Wells and Rock Coring
  - **3** Borings with Rock Coring
- **7** Cone Penetration Tests

Bottom Ash Pond

No additional drilling necessary

Gypsum Storage Area

- **8** Borings
  - **3** Borings with Temporary Wells and Rock Coring
  - **3** Borings with Temporary Wells and No Rock Coring
  - **2** Borings with Rock Coring

Legend

- Boring with Temporary Well (Saturation Level in CCR, Pore Water Sampling, Geotechnical Data)(Screened Interval)
- Boring (Geotechnical Data)
- Boring with Piezometer Vibrating Wire
- Existing Boring
- Existing CPT

Proposed Boring Locations for Other Ongoing TVA Projects

- Seismic Stability Evaluation Boring or CCR Rule Boring
- Proposed Closure Instrumentation Boring
- Historical Wells Creek Alignment (Approximate)
- 1990's Perimeter Dike and Foundation Soil Grouting Alignment (Approximate)
- 1980's Interior Bottom Ash Dike (Approximate)
- CCR Unit Area (Approximate)

What are Water Level Instruments/Piezometers?

Sensors that measure water pressures in CCR, soil, rock

Example of a vibrating wire piezometer

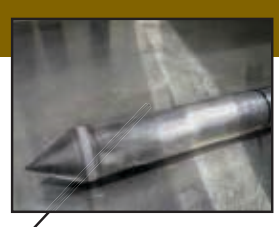
Slotted well screen

Surface protection for top of well

Install a PVC pipe with slots that allow water to enter at a selected depth in the boring

What are Cone Penetration Tests?

- Measure resistance to pushing cone
- Relate to engineering properties
- Quick, cost effective



CUMBERLAND FOSSIL PLANT

SLOPE STABILITY (1 of 2)

What it is and why we do it

These analyses tell us if the slopes of the CCR units are stable. Multiple locations around each CCR unit are checked for stability.

Normal (long-term) conditions and earthquake conditions are evaluated.

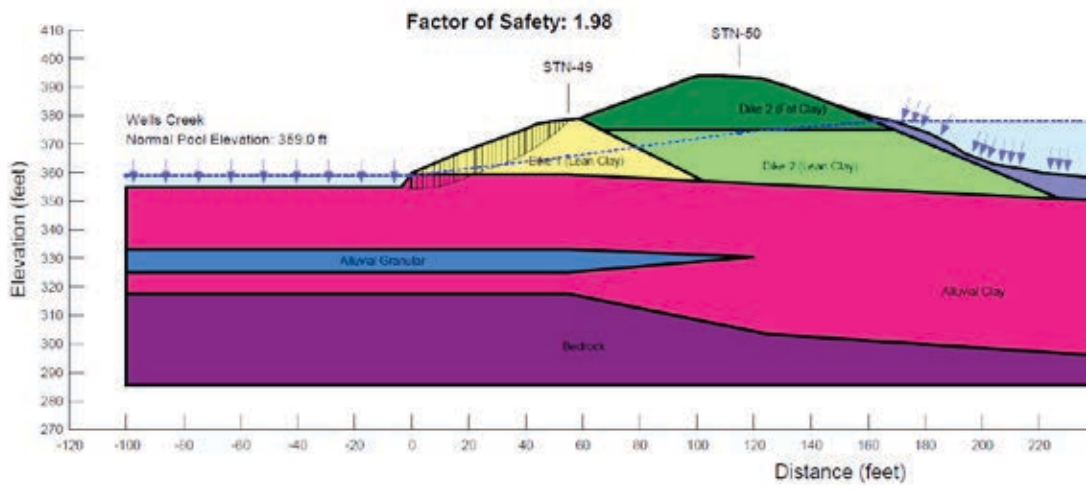
What do we already know?

Slope stability has been analyzed many times over the years, for various conditions.

The existing analyses were reviewed as part of the evaluation of existing geotechnical data.

Each analysis was reviewed for adequate documentation, appropriate methods, and representative conditions. This existing data is very valuable to understand the CCR unit conditions.

Example of Existing Slope Stability Analysis



Inputs: Surface and subsurface geometry/zones, engineering properties, water levels/ pressures, external loads

Outputs: Factor of Safety against Sliding

Existing/Ongoing analyses satisfy EIP requirements

CCR Unit	Normal	Earthquake
Bottom Ash Pond	✓	✓
Stilling Pond (including Retention Pond)	✓	✓
Dry Ash Stack	✓	✓
Gypsum Storage Area	✓	✓

Proposed EIP Activities

- Compare existing models to new data from Exploratory Drilling Sampling and Analysis Plan
  - If models are still representative, no changes
  - If not, update models and reanalyze
- Compare stability results to acceptance criteria

CUMBERLAND FOSSIL PLANT

SLOPE STABILITY

(2 of 2)

What it is and why we do it

Slope stability is influenced by water levels/ pressures (among other factors).

Monitoring water levels also supports the hydrogeologic investigation and the CCR material quantity estimate (saturated vs. unsaturated material).

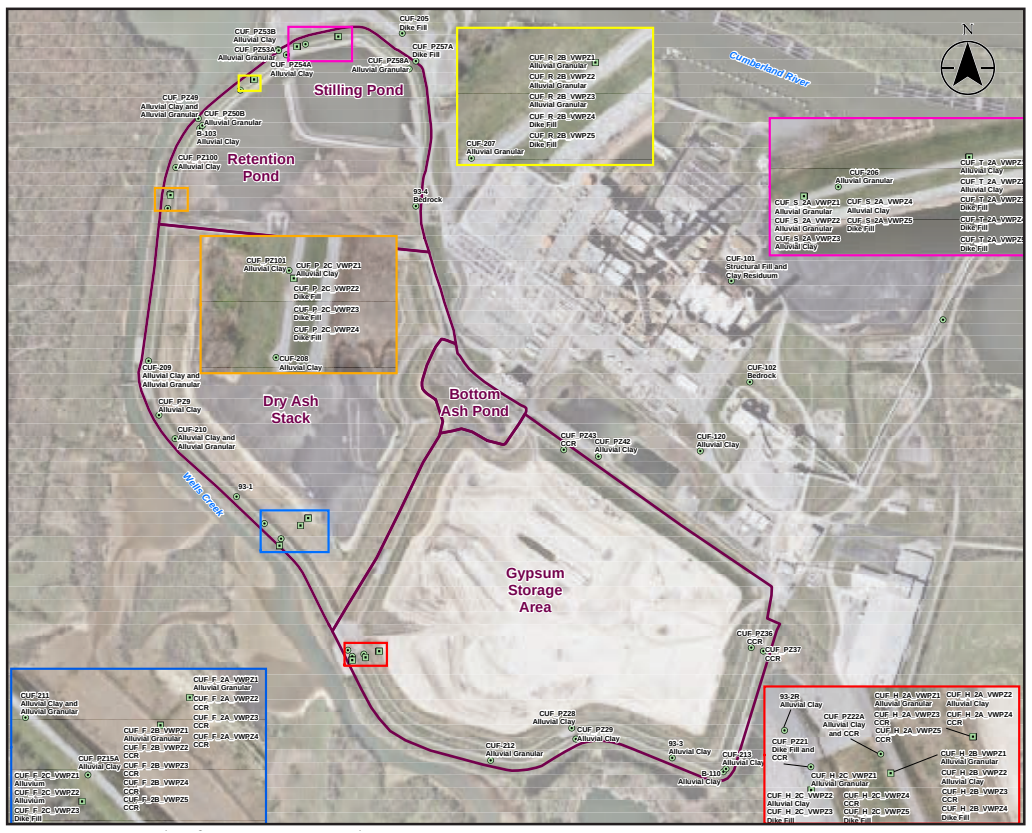
What do we already know?

TVA has multiple types of water level instruments on site, as well as a number of monitoring wells, to track water levels in many areas. These instruments have been installed over many years, for various purposes. There are currently over 80 water level instruments (including piezometers) installed.

Since 2012, TVA has operated an Instrumentation Monitoring Program. This program includes automated and manual readings of select piezometers. The monitoring instruments will send warnings to site personnel if the water levels rise enough to start affecting slope stability.

Data is routinely assessed and correlated to rainfall, the amount of water in the surface impoundment pool, river levels, etc.

Existing Instrumentation



Water Level Instrumentation

- New Instruments are added
  - Due to other ongoing TVA projects
  - Due to Exploratory Drilling Sampling and Analysis Plan
  - Due to Hydrogeological Investigation Sampling and Analysis Plan (Monitoring Wells)

CUMBERLAND FOSSIL PLANT

HYDROGEOLOGIC INVESTIGATION

What it is and why we do it

Hydrogeologic investigations are used to better understand how groundwater moves in a particular area, as well as its interaction with the surrounding soils and rocks.

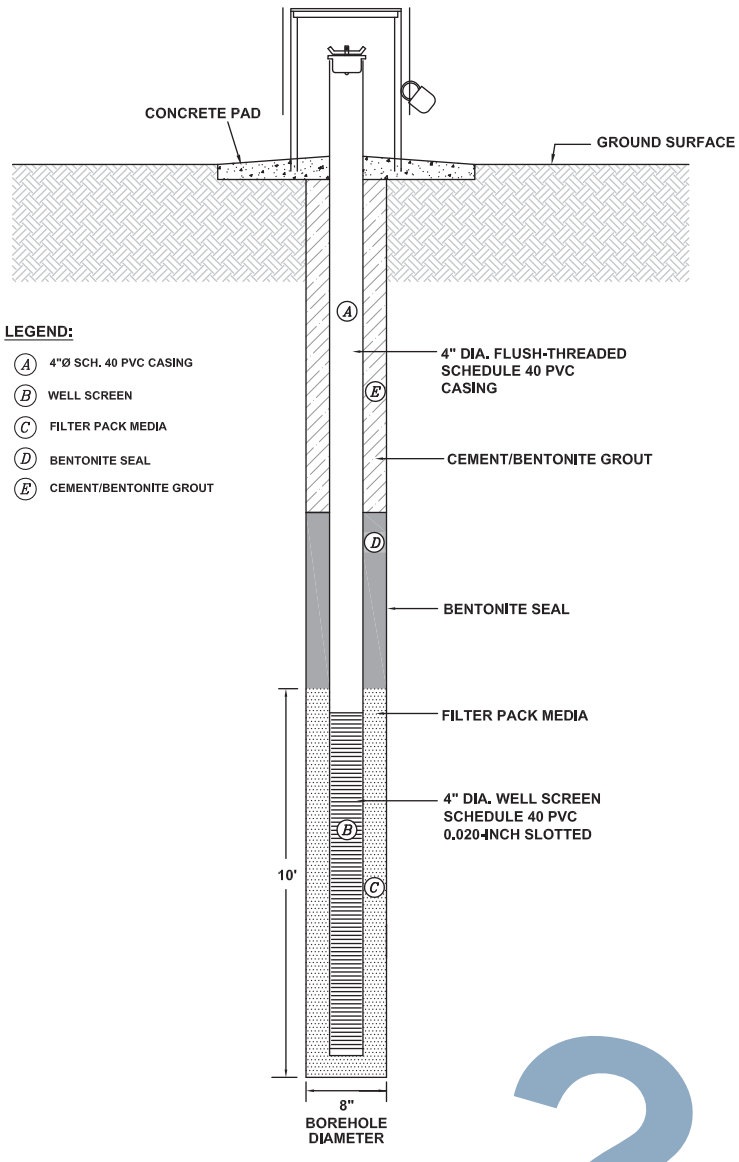
These investigations consist of installing groundwater monitoring wells, which are used to collect information about groundwater.

Background and downgradient wells are used to study water quality changes.

What do we already know?

Hydrogeologic investigations have been conducted at the Cumberland site. These activities monitor groundwater for quality and flow direction in order to determine compliance with State and Federal regulations.

Groundwater Monitoring Well



What is a groundwater monitoring well?
A well specially designed and installed to obtain representative groundwater quality samples and hydrogeologic information.

Proposed EIP Activities

- Additional monitoring wells will be installed to supplement current groundwater monitoring well networks to further investigate groundwater quality and flow direction:
  - 3 background monitoring wells
  - 3 downgradient monitoring wells
- Results will be provided in the Environmental Assessment Report (EAR)

CUMBERLAND FOSSIL PLANT

GROUNDWATER INVESTIGATION

What it is and why we do it

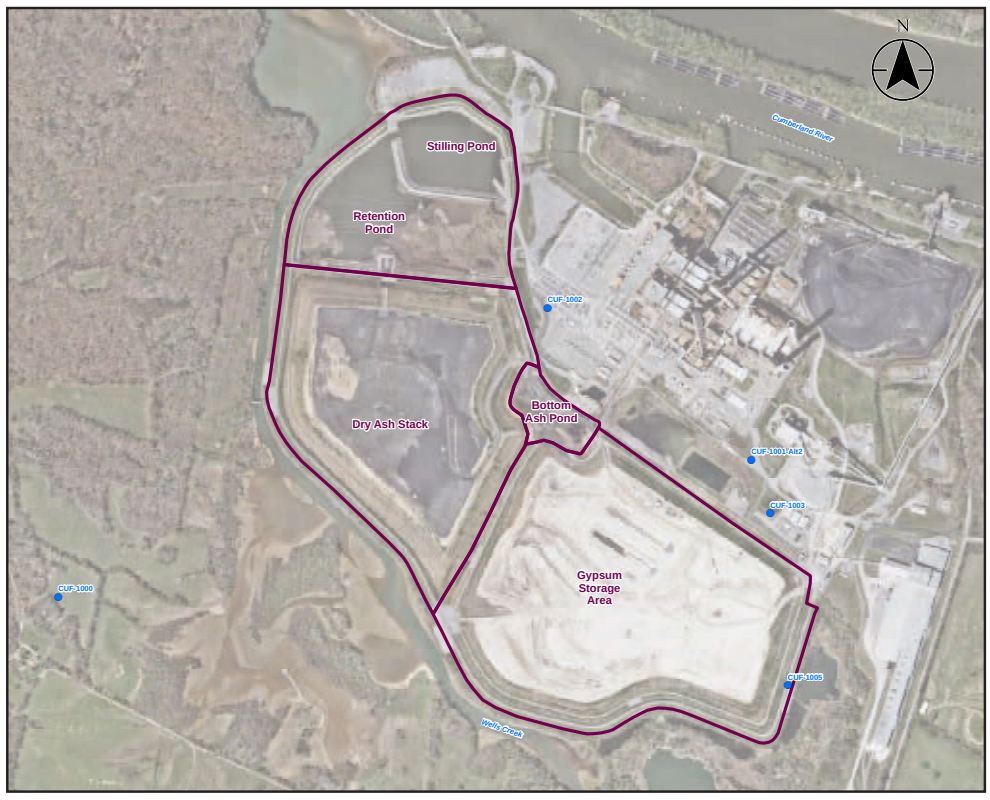
Samples of the groundwater are taken on a frequent basis to test for a number of quality measures. By testing the groundwater regularly, TVA can track compliance with regulatory permits and requirements.

What do we already know?

Groundwater monitoring has been occurring on the Cumberland site since 1993 and currently consists of 2 programs:

- State permit monitoring:
  - Dry Ash Stack and Gypsum Storage Area
- CCR Rule monitoring:
  - Stilling Pond/Retention Pond, Dry Ash Stack, Gypsum Storage Area and Bottom Ash Pond

Proposed Groundwater Wells



Proposed EIP Activities

- Groundwater monitoring will be bimonthly for 1 year (6 events)
- Sample 5 new wells
- Groundwater samples will be collected from background and downgradient locations
- Provide an investigation to understand the movement of groundwater
- Investigate how the ash storage units affect groundwater movement and quality

CUMBERLAND FOSSIL PLANT

WATER USE SURVEY

What it is and why we do it

A water use survey is a search for private water supplies (e.g. wells, springs) located within a ½ mile radius of the CUF Plant. It is used to evaluate the quality of groundwater used in these private wells.

What do we already know?

A survey of this type has not been conducted in recent history. The purpose of the water use survey is to provide an understanding of local groundwater quality and to measure if CCR is influencing local groundwater supply.

Facility 1/2 Mile Buffer

Legend

- CCR Unit Area (Approximate)
- CUF Plant 1/2 Mile Buffer

Proposed EIP Activities

- Review existing information on private water wells and springs
- Perform a door-to-door water use survey
- Record water use data and GPS locations of identified water wells and springs
- Conduct sampling for CCR parameters and compare to United States Environmental Protection Agency drinking water standards
- Test water for potential impacts from CCR constituents
- Results will be provided in the Environmental Assessment Report (EAR)

CUMBERLAND FOSSIL PLANT

BACKGROUND SOIL INVESTIGATION

What it is and why we do it

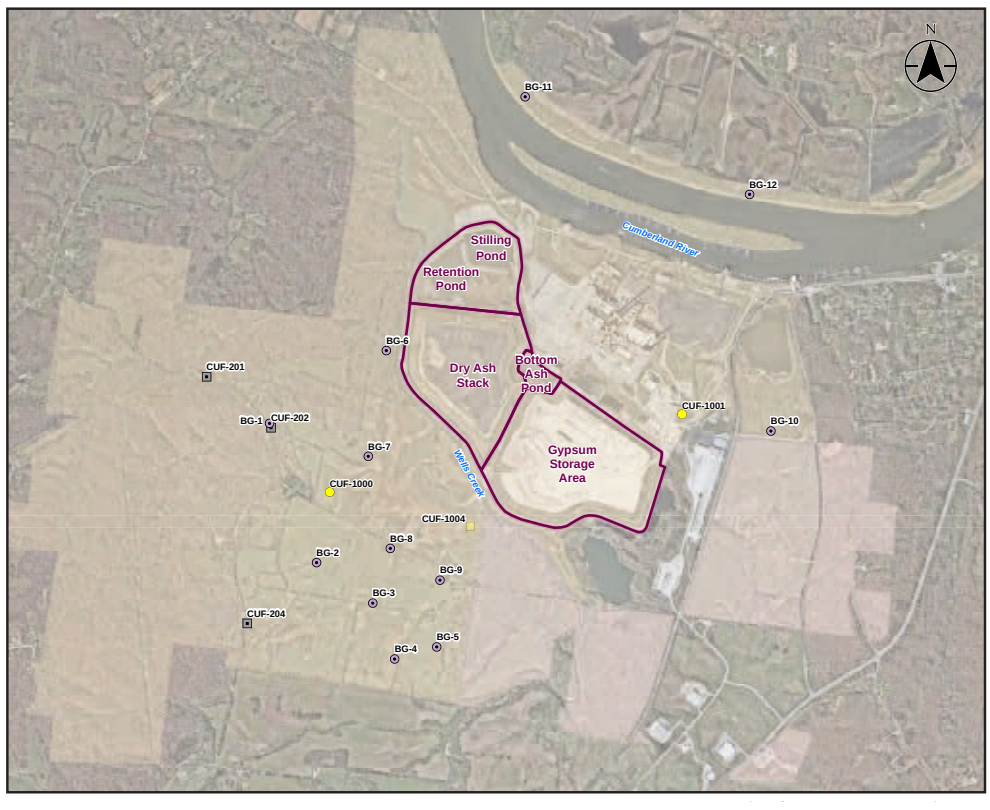
The constituents found in CCR are also found in nature. This investigation would detect CCR constituent levels in background soils.

These levels can be compared to other soils to determine if they are higher than natural levels and used to determine if CCR constituents are naturally occurring in native soils.

What do we already know?

Background soil samples were collected during the installation of two background monitoring wells. This data will be reviewed for inclusion with the set of data gathered during implementation of the Investigation.

Proposed Background Soil Sample Locations

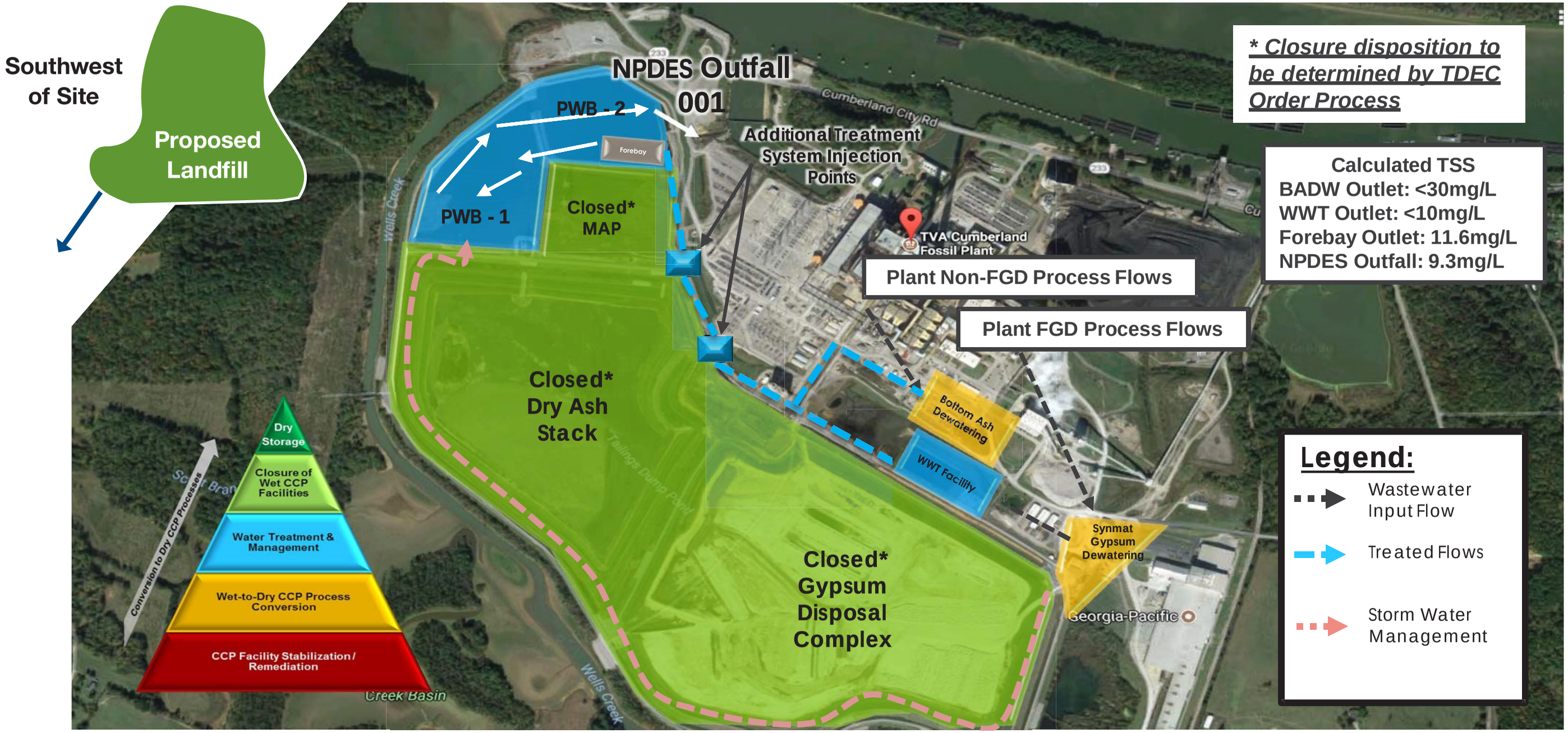


Proposed EIP Activities

- Identify a minimum of 12 sampling locations for representative background soils
- Requires use of a drill rig to collect soil samples
- Collect background soil samples and submit to analytical laboratory for analysis of CCR constituent levels
- Results will be provided in the Environmental Assessment Report (EAR)

CUMBERLAND FOSSIL PLANT

WASTEWATER STRATEGY
LONG TERM SITE STRATEGY (POST-AMENDMENT)



CUMBERLAND FOSSIL PLANT

COMMUNITY ACTION GROUP

TVA is creating a Community Action Group (CAG) to help encourage dialogue and communicate the status and plans for activities at the Cumberland site.

Responsibilities and Terms of Service

- Identify community concerns and share them with TVA
- Identify ways in which to communicate to the larger community about their efforts
- Communicate opportunities for the public to provide comment and/or input
- Educate their community on how to find information that can answer questions and concerns on the safe management of coal combustion residuals (CCR)

Who Can Apply

- Full-time residents of Stewart County (must be age 18 years or older)

Terms and Membership

- Each Community Action Group will consist of no more than 14 community members
- One-year and two-year terms (randomly selected from membership)
- Terms are staggered so that there is always a clear link to previous discussions and activities
- Volunteer opportunity—compensation for service will not be provided.
  Out-of-pocket expenses can be reimbursed, if requested
- Once assembled, the Community Action Group will decide where, when and how often they meet and how they will communicate. Local administrative support will be provided to assist their work.

CUMBERLAND FOSSIL PLANT

ENVIRONMENTAL INVESTIGATION PLAN

Remaining Fieldwork Schedule

TASK	START	END	2019 OCT	2019 NOV	2019 DEC	2020 JAN	2020 FEB	2020 MAR	2020 APR	2020 MAY	2020 JUN	2020 JUL	2020 AUG	2020 SEP	2020 OCT	2020 NOV	2020 DEC
Exploratory Drilling: Temp Well (TW-10)	DEC 2019	DEC 2019			■												
Groundwater Investigation	MAY 2019	MAR 2020	■	■		■		■									
CCR Material: Water Level Monitoring	JUN 2019	NOV 2019	■	■													
Exploratory Drilling: Surface Geophysics	SEP 2019	DEC 2019			■												
Seep Investigation	SEP 2019	JAN 2020	■	■		■											
Water Use Survey: Sampling	NOV 2019	DEC 2019		■	■												
Surface Stream	NOV 2019	DEC 2019			■												

Data from investigative studies will be provided following review for quality and compliance.

CUMBERLAND FOSSIL PLANT

WATER TREATMENT

The Environmental Protection Agency (EPA) put the Steam Electric Power Generating Effluent Guidelines and Standards (40 CFR Part 423) into effect in 1974, and amended the regulations in 1977, 1978, 1980, 1982 and 2015. The regulations cover wastewater discharges from power plants operating as utilities.

TVA has adopted an innovative approach and installed additional process controls on the scrubbers to reduce selenium in the wastewater.

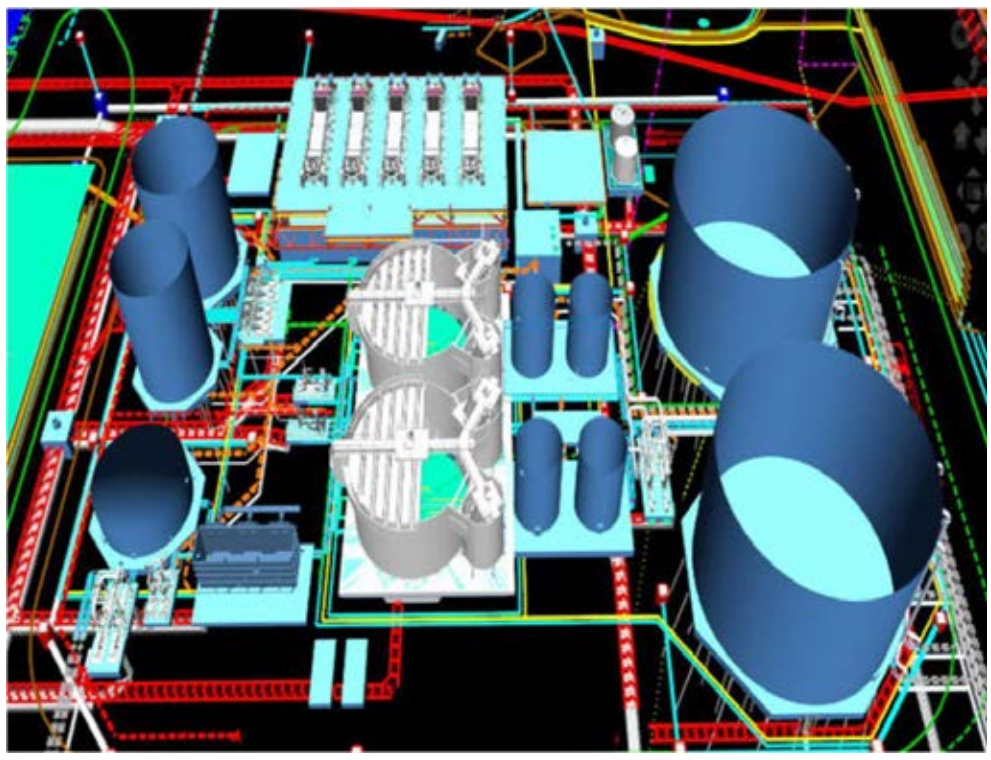
This approach is expected to save significant costs that will benefit the ratepayers in the Tennessee Valley while still being protective of water quality.

TVA is investing $100M to ensure the Cumberland plant meets or exceeds NPDES permit standards

What are effluent limitation guidelines?
Effluent limitation guidelines (ELGs) contain allowable limits for arsenic, mercury, selenium and nitrate-nitrite that can be present in the outflow of water from a structure, such as a fossil plant.

The water treatment will…

- Support effluent limitation guidelines compliance and conversion of wet to dry CCR handling
- Be constructed in a phased approach
- Focus on physical and chemical treatment
- Contain an optimized scrubber to reduce selenium



CUMBERLAND FOSSIL PLANT

PLANT UPDATE

Cumberland Fossil Plant Update

December 10, 2019

Agenda

- Site overview
- Beneficial reuse of gypsum and CCR
- Wet to dry initiative
- Improvements to gypsum wastewater treatment
- TDEC Order investigation/actions
- Continued operation

PLANT UPDATE

Cumberland Fossil Plant

Commissioning Date: 1972

Size of facility:
Approx 1,300 acres

Output: 2,470 megawatts

Number of homes powered: 1.1 million

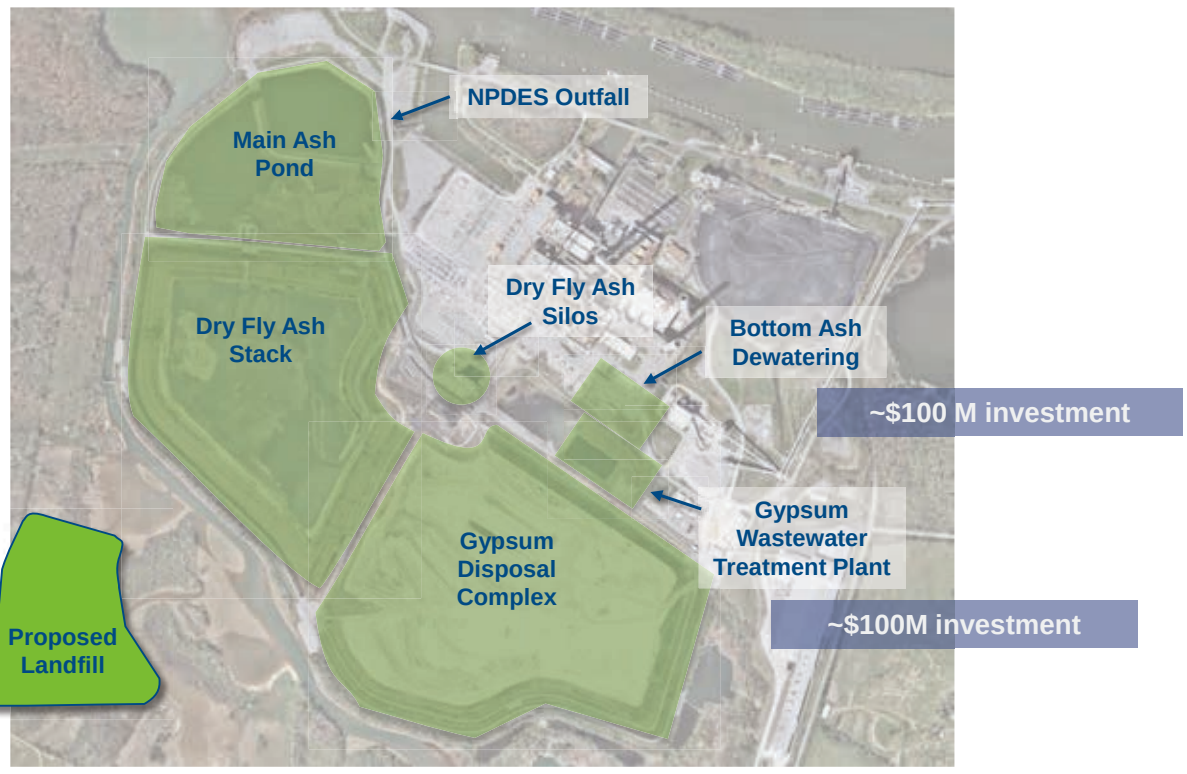
Amount of CCR material:
Approx 21.5 million cubic yards

CCR Beneficial Reuse:
75% reuse of Fly Ash

90% reuse of Gypsum

Jobs in Clarksville Area: 446

Overview



CUMBERLAND FOSSIL PLANT

PLANT UPDATE

Beneficial Reuse of Gypsum

Every year, **90%** (**750,000 tons**) of the gypsum produced is sold for reuse

Adjacent wallboard plant utilizes **Cumberland's high quality gypsum** in its manufacturing process

The wallboard plant **employs 140 people** directly and created **306 indirect jobs**

Since the wallboard plant was constructed, 15+ million tons have been **beneficially used**

Beneficial Reuse of Fly Ash

Every year **75%** (**300,000 tons**) of fly ash is reused

About **20,000 tons** of ash went into the new Hankook Tire plant in Clarksville

Cumberland Fossil Plant supplies over **200 concrete plants** in the U.S.

In concrete, every ton of fly ash that replaces Portland cement **reduces carbon emissions** by **1 ton.**

PLANT UPDATE

Cumberland Environmental Stewardship

Cumberland Fossil Plant construction began

1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025

1968

Cumberland Environmental Stewardship

Ash Disposal Area complete and sluicing began

1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025

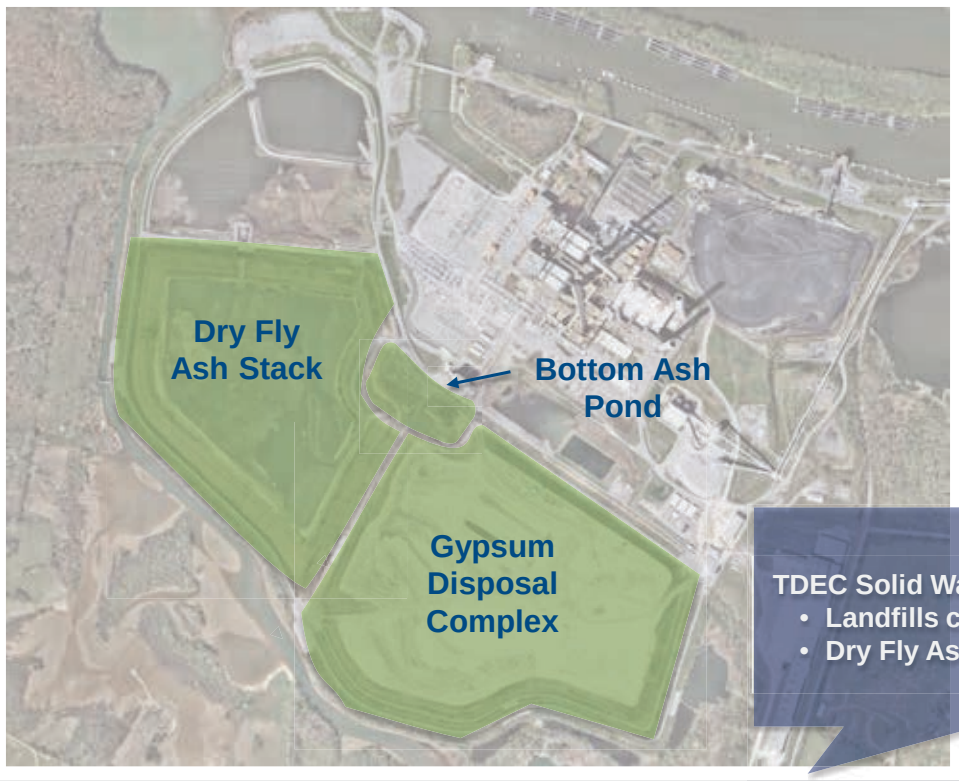
1972

CUMBERLAND FOSSIL PLANT

PLANT UPDATE

Cumberland Environmental Stewardship

Cumberland Environmental Stewardship



PLANT UPDATE

Cumberland Environmental Stewardship

Cumberland Environmental Stewardship

PLANT UPDATE

Cumberland Environmental Stewardship

Temporary lined basin installed

2019

1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025

Cumberland Environmental Stewardship

Planned completion of repurposing the Main Ash Pond

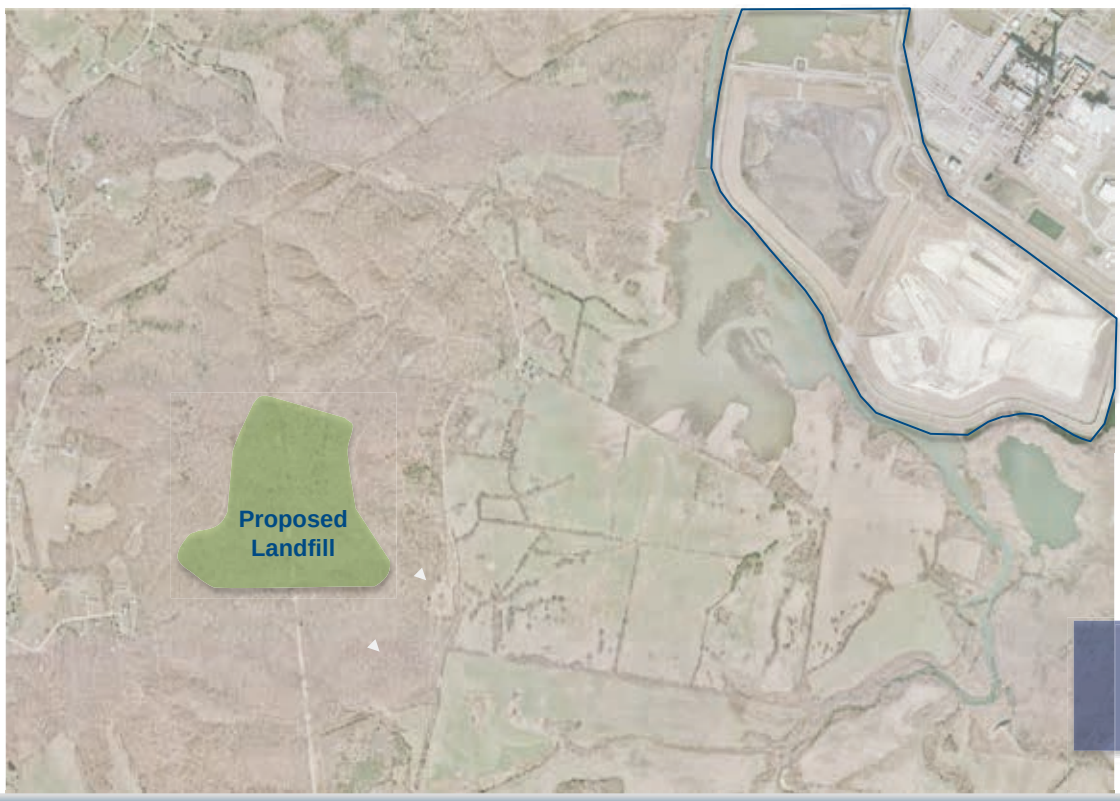
Planned construction of Lined Basins

2020

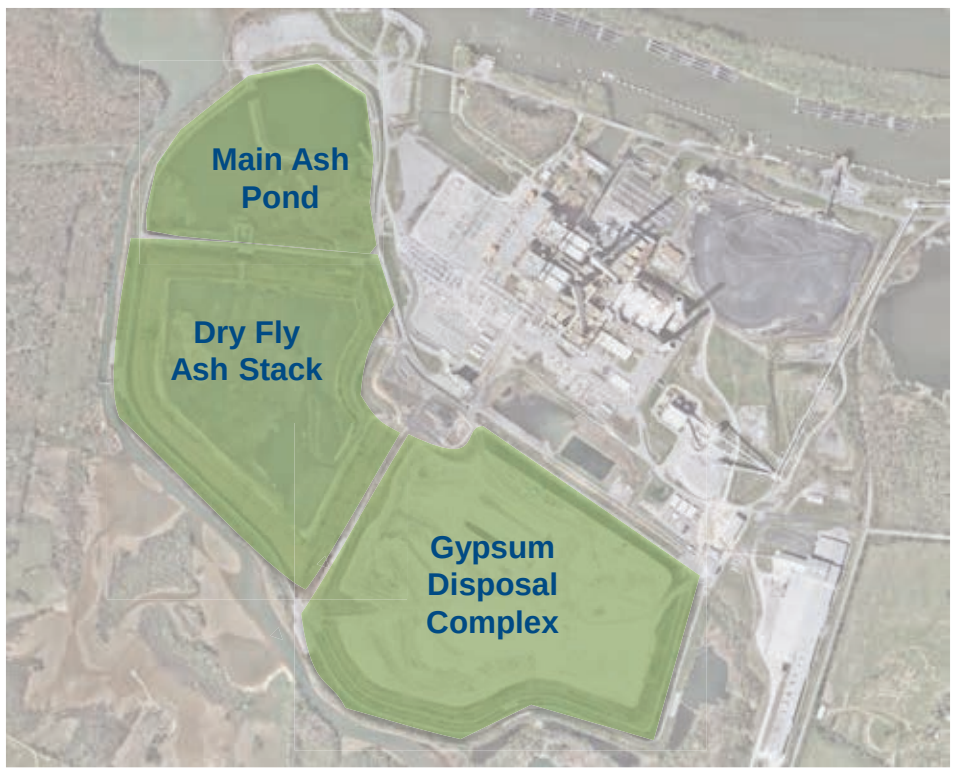
1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025

PLANT UPDATE

Cumberland Environmental Stewardship



Cumberland Environmental Stewardship

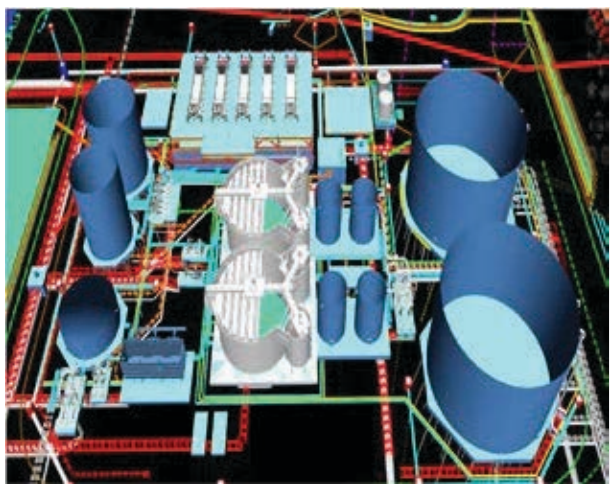


CUMBERLAND FOSSIL PLANT

PLANT UPDATE

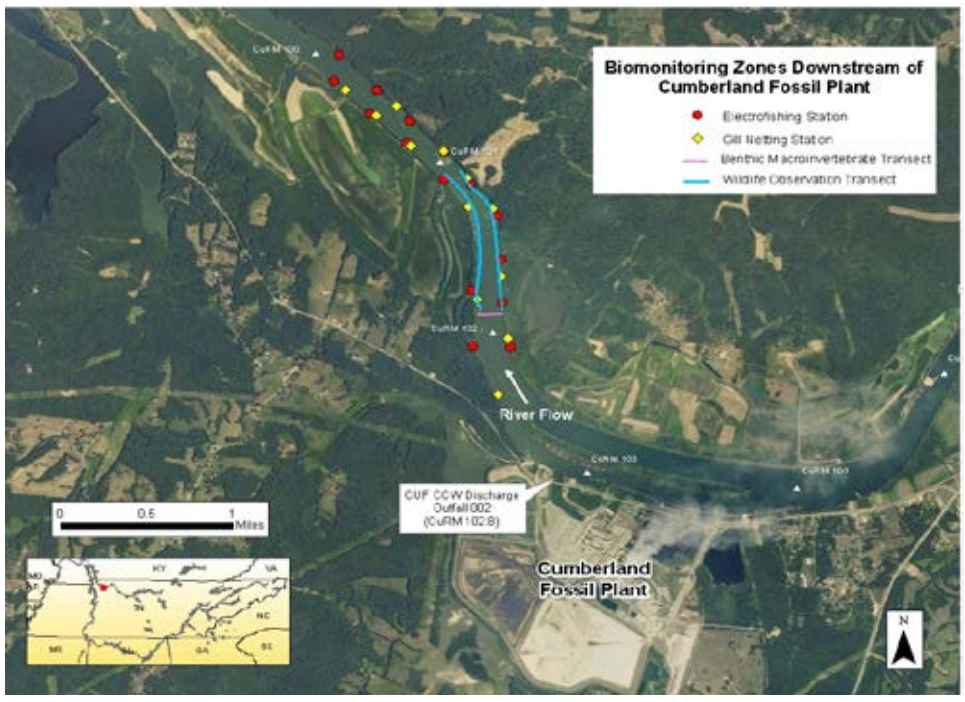
Cumberland Water Treatment

- Supports ELG compliance and conversion of wet to dry CCR handling
- Adopted phased approach to construction
  - Focus on physical and chemical treatment
- Optimized scrubber to reduce selenium
- Investing $100M to ensure TVA meets or exceeds permit standards



Reservoir Health and Water Supply

- Water Quality Supports TDEC-Designated Uses for:
  - Water Supply
  - Fish & Aquatic Life
  - Recreation
  - Livestock Watering & Wildlife
  - Irrigation
  - Navigation
- Long-term Monitoring Program
  - Began monitoring in 1991
  - Fish and benthic communities healthy



PLANT UPDATE

For More Information

Cumberland Fossil Plant

https://www.tva.gov/Energy/Our-Power-System/Coal/Cumberland-Fossil-Plant

Air Quality – Water Quality – Ash Storage

https://www.tva.com/Environment/Environmental-Stewardship

TDEC Order

https://www.tva.com/tdec

Groundwater Monitoring

www.tva.com/ccr