

Beneficial Reuse of Coal Ash from Riverbend Steam Station

Presented to Charlotte City Council

March 24, 2014



Duke Energy

- Dave Mitchell, Director of Environmental Programs

Beneficial Reuse of Coal Ash from Riverbend Station

- Transfer 4 million tons of coal ash from un-lined ponds to a safe, fully-lined engineered structural fill with a wastewater collection system.
- Provide flat, stable land for future development at Charlotte-Douglas Airport.
- Proven project at the Asheville Regional Airport.

Engineered Structural Fill Project Overview

- Riverbend Steam Station began operating in 1929 and retired in 2013.
- Due diligence would explore relocating all ash (about 4 million tons) to fully-lined engineered structural fill at airport.
 - 2.7 million tons in basins
 - 1.5 million tons in fills
- Environmentally, scientifically, technically and fiscally sound solution.



Beneficial Reuse of Coal Ash

- 10% of the coal consumed for power generation remains as ash.
- Duke Energy continually explores beneficial reuse opportunities to safely recycle ash.
- The company reused 67 percent of the ash produced in North Carolina in 2013 through on-site or off-site projects and through the manufacture of concrete and other products.

Charah, Inc.

- Charles Price, President and CEO
- Scott Sewell, Chief Operating Officer

Company Overview of Charah

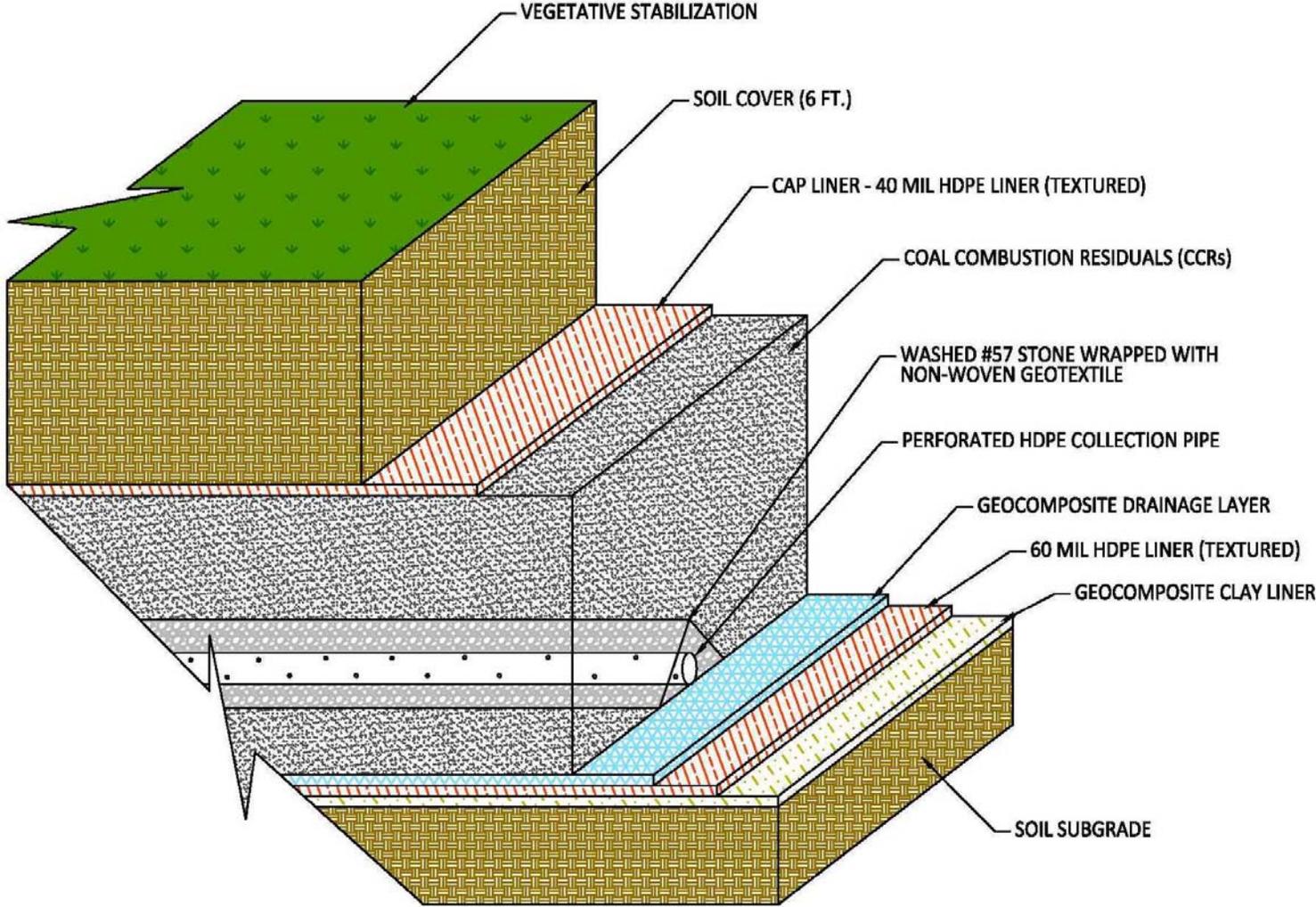
- Privately held company based in Louisville, Kentucky
 - Founded in 1987
- Dedicated to providing the power industry the highest quality performance with total safety and environmental compliance
 - 50+ Long-Term Ash Management Contracts
 - 34 Power Plants in 18 States
 - 16 Million (+) Tons of Coal Combustion Residuals (CCR) Handled Annually



North Carolina Presence of Charah

- Working in the Charlotte area since 2001
- 8 active projects in North Carolina
- 120 employees in North Carolina
- N.C. Department of Labor Gold Certificate in Safety

Design of a Fully-Lined Engineered Structural Fill



ILLUSTRATIVE PURPOSES ONLY - NOT TO SCALE

Safe Transportation of Ash to the Airport



Trucks are loaded at Duke facility and fully-tarped, washed, and inspected

Fully-Lined Engineered Structural Fill at the Airport



Base liner installation and subgrade preparation at Airport

Fully-Lined Engineered Structural Fill at the Airport



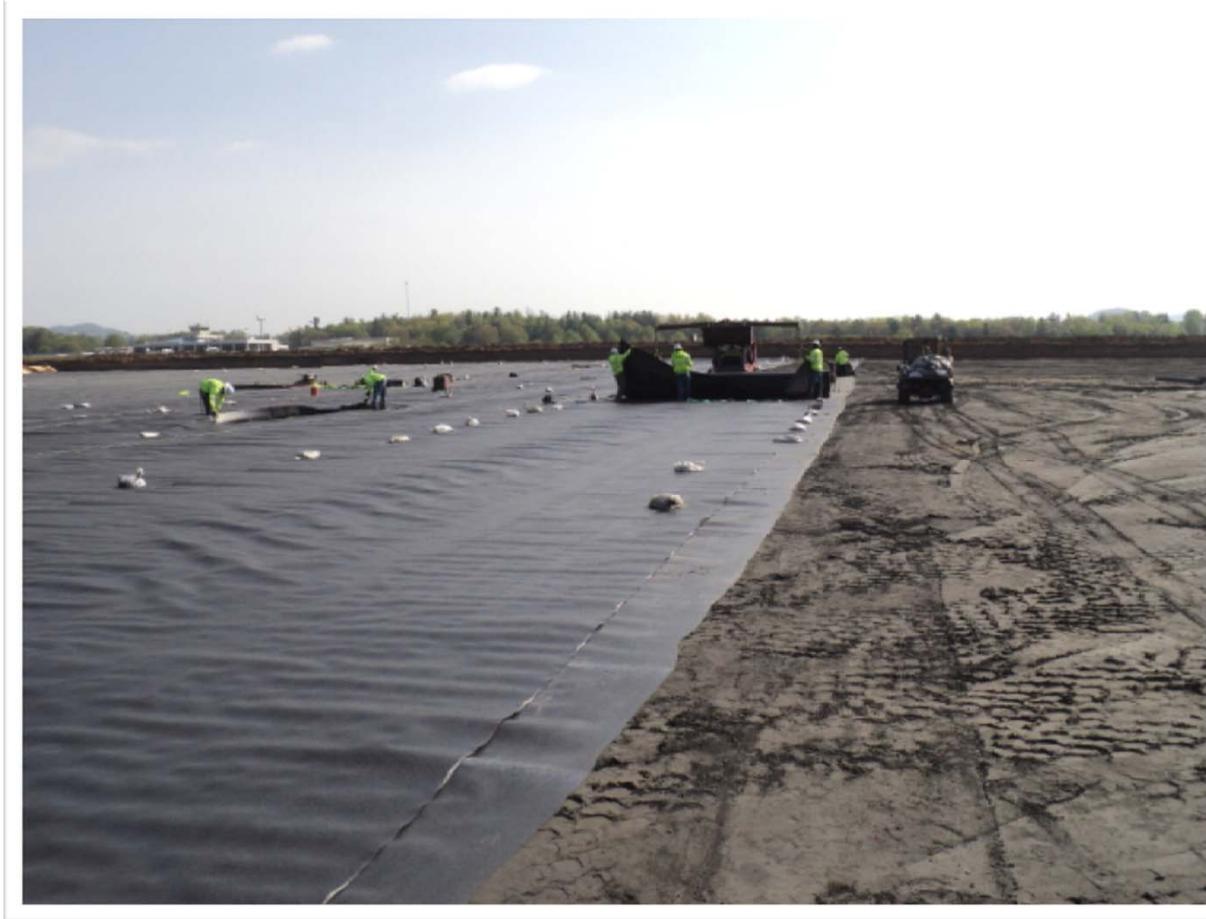
Drainage layer deployment over base liner

Fully-Lined Engineered Structural Fill at the Airport



Ash placement over liner system

Fully-Lined Engineered Structural Fill at the Airport



Deployment of cap liner across finished ash surface
(Note: Cap liner secured to base liner anchor providing full encapsulation)

Fully-Lined Engineered Structural Fill at the Airport



Placement of soil cover over cap liner

Fully-Lined Engineered Structural Fill at Asheville Airport



Asheville Regional Airport in Spring 2013

Charlotte Airport Overview

- Provide Charlotte Douglas International Airport with graded land for future development
- Encapsulation system exceeds standards required for engineered structural fills
- 4 million tons of ash beneficially reused
- 5 years
- Project will add 100 jobs in the Charlotte area

Next Steps

- Begin robust due diligence discussions with City staff work teams
- In close partnership with the City, engage in project education discussions with key stakeholders
- Within 45-60 days, return to City Council for consideration

APPENDIX

Coal Combustion Byproducts

- Coals produce about 10% ash
- Fly ash (80%) – fine material collected with emissions controls
- Bottom ash (20%) – coarser material that falls to the bottom of the boiler
- Gypsum – fine material resulting from scrubber process



Fly Ash

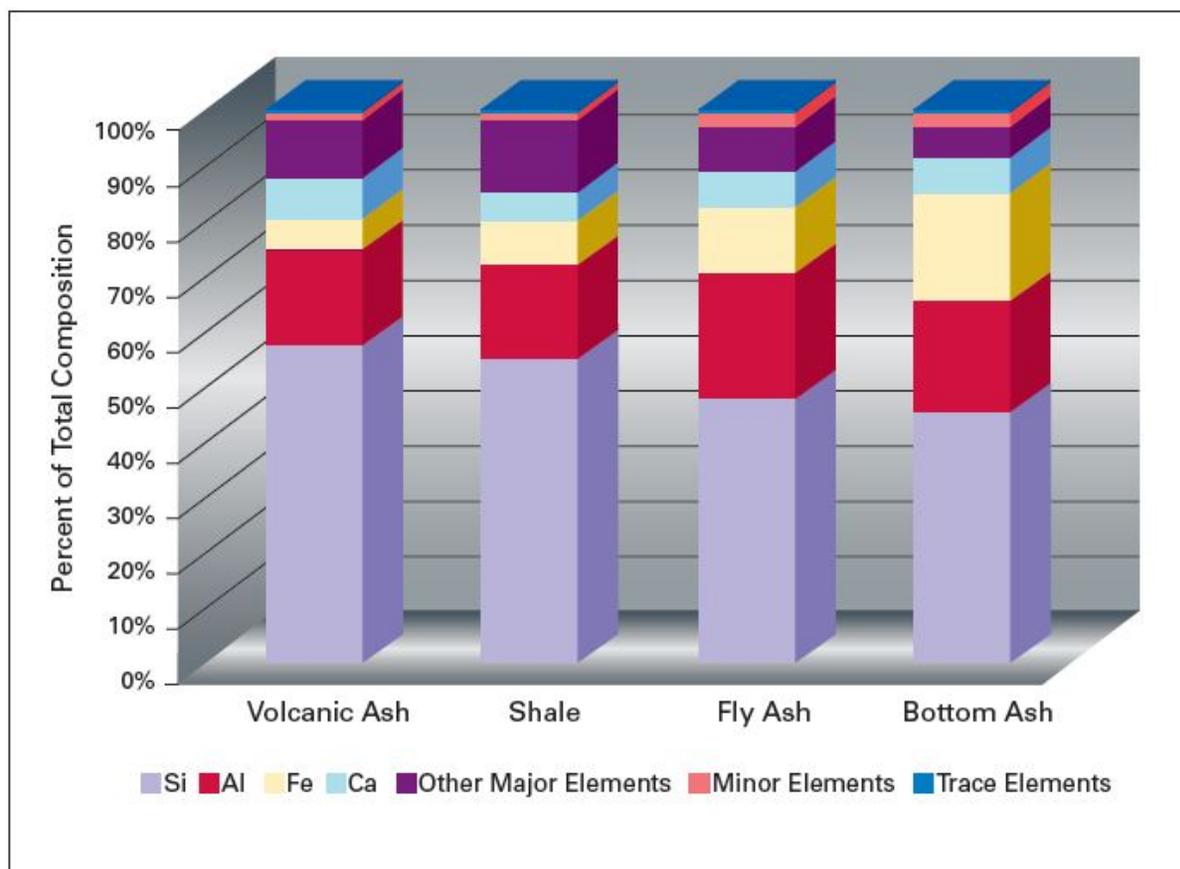


Bottom Ash



Gypsum

Chemical Makeup of Ash is Similar to Shale



Electric Power Research Institute

- 90% — Common elements like silicon, iron, aluminum, calcium
- 8% — Minor elements like magnesium, potassium, sodium, titanium, sulfur
- Less than 1% — Trace elements like arsenic, selenium, lead, mercury

Asheville Airport Overview

- Fill material needed to develop parallel taxiway
- Opportunity for Duke to offer ash for use in fully-lined engineered structural fill
- Encapsulation system exceeds standards required for engineered structural fills
- 4 million tons of ash beneficially reused
- 5 years