



Beneficial Use and Reclamation Strategy for CCR

Golder is helping power clients across the United States develop closure strategies which includes beneficial use and reclamation benefits. The rule imposes location, design, operating and impoundment closure criteria on existing landfills and surface impoundments and inactive surface impoundments.

Our closure strategies can deliver unique and significant value-added closure alternatives using our paste technology for clean closure and hybrid consolidation closures. With these strategies, along with beneficial use strategy, clients can reduce closure schedule by 50% and costs greater than \$100 M.

As your preferred consultant or EPC partner, the services we provide to support beneficial use of stored (pond and landfill) CCR include:

CCR Characterization

Desktop Study and Data Gap Identification

- Plant fuel and production history
- Determine gaps and provide recommendations for data gaps

CCR Beneficial Use Laboratory Testing

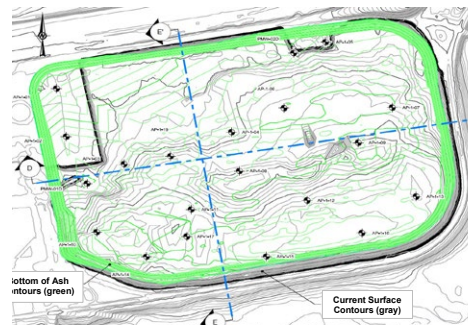
- Chemical
- Physical

Dashboard preparation

- Site bore sample plan
- Chemical test results
- Physical test results

Market Study

- Market Data Collection and Analysis
- Coordination with ash marketers for beneficiation remedies and market capacity
- Market survey dashboard preparation

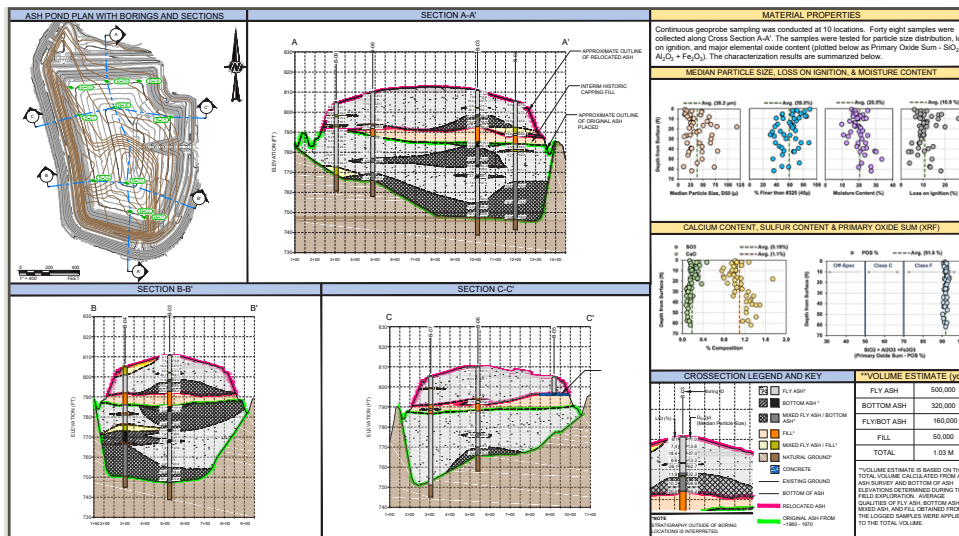


Site layout for CCR core sampling.



CCR fill sampling equipment.

BENEFICIAL USE AND RECLAMATION STRATEGY FOR CCR



Dashboard for Potential Beneficial Use of Stored CCR in a closed CCR Landfill

Key metrics displayed on the dashboard are developed through:

- Plant site history, fuel source, deposition points, operation changes
- Site layout – cross section core sample representation of area
- Material characteristics – location and depth based on core sample evaluation
- Chemical and physical analysis and key metrics evaluation

Beneficial use options

- Ready Mix Concrete – All DOTs require 20% replacement of cement with FA: Class F & C
- Brick and CMU (concrete masonry units): bottom ash, fly ash
- Wall Board – >50% of wall board is created by coal plant scrubbers.
- Embankment/ Structural Fill
- Mine Reclamation – fill and acid drainage neutralization (CFB and Class C)
- Road Subbase: Class F & C
- Soil Stabilization: Class C Ash
- Flowable Fills (CLSM) typical 50-400 psi
- Waste Stabilization and Solidification: Class C and CFB ash
- Raw Feed for Cement Clinkers
- Aggregate: pelletized and sintered fly ash
- Asphaltic Mineral Filler: carbonate filler replacement
- Agricultural Applications: FGD: corn, peanuts soybean etc.
- Inert fillers for carpet backing and roofing shingles: carbonate replacement

Market Analysis for Beneficial Use

Collate and summarize beneficial use information

- Cement Kiln locations within the state
- Ready Mix Plant locations within the state
- Concrete Block locations within the state
- Mine sites for potential backfill
- Wallboard plant locations within the state
- Agricultural land areas for potential gypsum application

Collate and Summarize Market Information

- Roadway and Rail network information
- State and Regional population and growth data
- State and Regional Active and Retired Coal Fired Generation (“Competing”) Facilities

Beneficial use as part of CCR pond closure strategy

Golder’s value-added impoundment closure approach using paste applications in combination with dredge systems significantly reduces closure schedule, reduces costs, and improves all safety metrics. Once Golder has performed the CCR beneficial use characterization and market analysis, the paste closure application will allow Golder to:

- Track each yard of CCR placed for QC/QA
- Provides homogeneous CCR placement for consistent quality
- Place material into a specific cell: volume and quality
- Provide direct feed to beneficiation systems. Eliminates double handling costs.