

Coal Combustion Byproducts (CCBs)

PPRAC Meeting

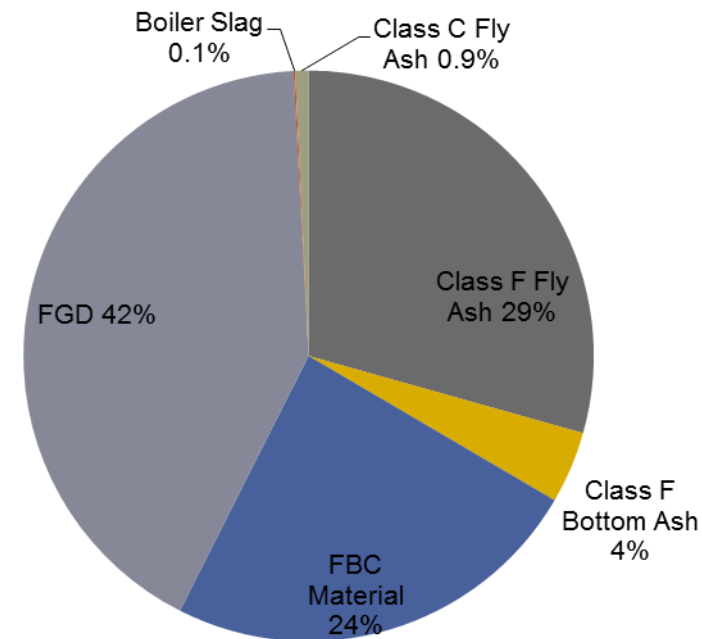
May 17, 2017

Coal Combustion By-Products



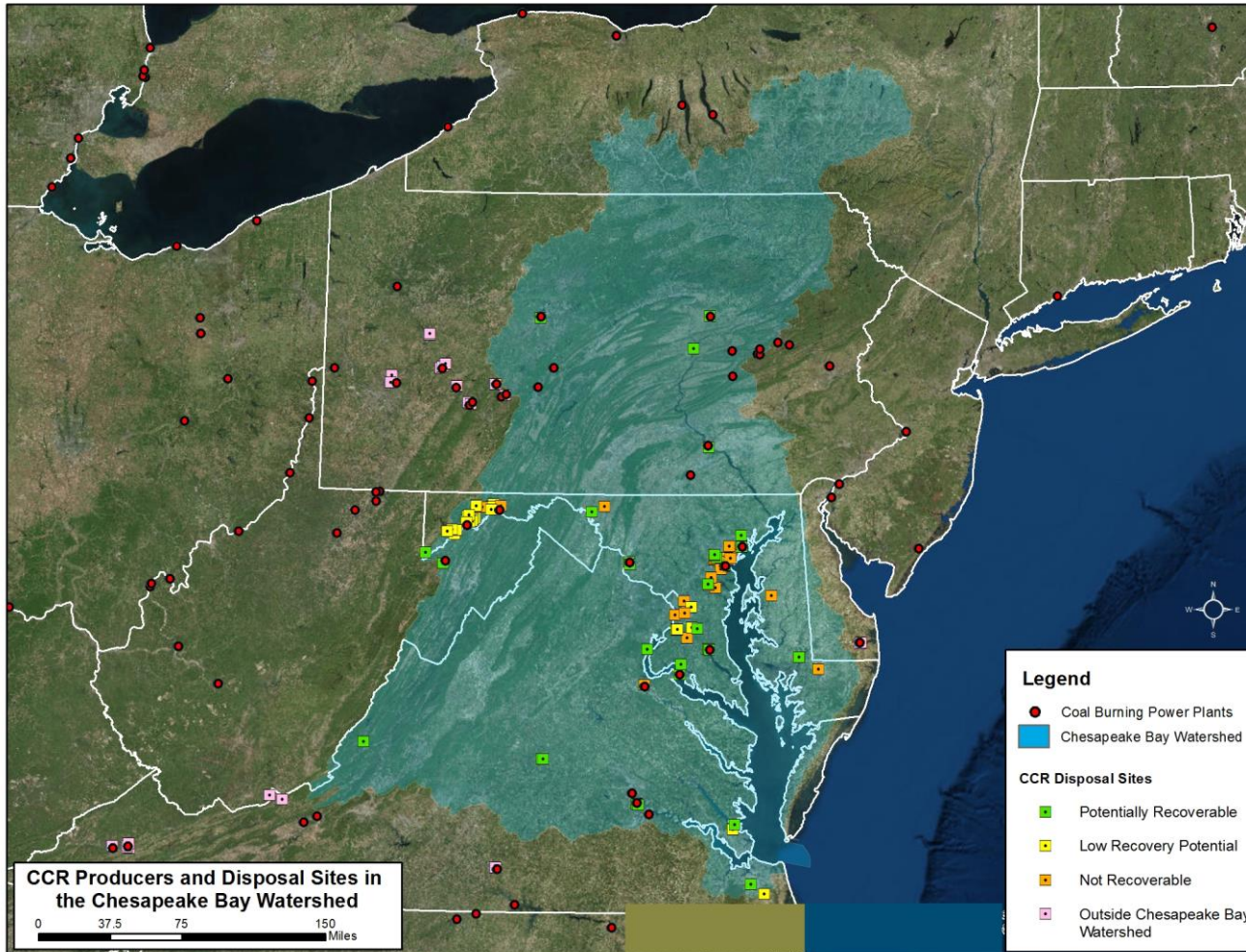
CCB Type	Recent Uses in Maryland
Class F Fly Ash – Particles of unburned mineral component of coal small enough to be emitted through stack and contains < 20% calcium oxide.	Cement Manufacture Ready-Mix Concrete Grout
Class C Fly Ash – Similar to Class F fly ash, but containing >20% calcium oxide.	None
Class F Bottom Ash - Unburned mineral component of coal. Particles are larger and heavier than fly ash and fall to the bottom of the boiler. Contains < 20% calcium.	Cement Manufacture Traction Control
Boiler Slag – Particle size and composition are similar to bottom ash, but is glassy in nature because it falls to the bottom of the boiler in a molten state.	Shingles Abrasives
Flue Gas Desulfurization Material – Product of scrubbers that remove sulfur compounds from flue gas. Also known as synthetic gypsum.	Wallboard Cement Manufacture Agriculture Research and Development
Fluidized Bed Combustion Material – fly ash and bottom ash that result when coal is burned with limestone to absorb sulfur. Composition is similar to Class C fly ash.	Coal Mine Reclamation Research and Development

CCBs Produced in Maryland 2015



In 2015 a total of 1.4 million tons of CCBs were produced in Maryland

CCB Sites in the Chesapeake Bay Watershed



Other Environmental Challenges

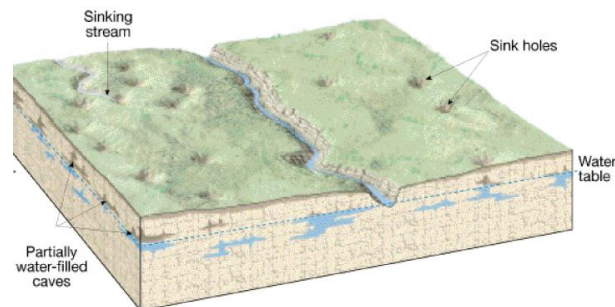
- Acid Mine Drainage



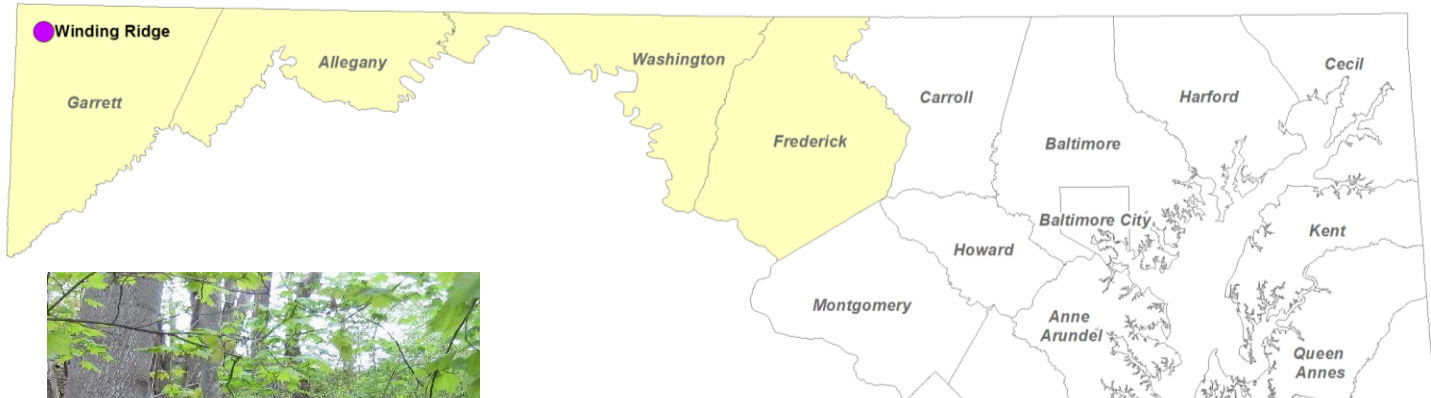
- Abandoned Mine Tunnels



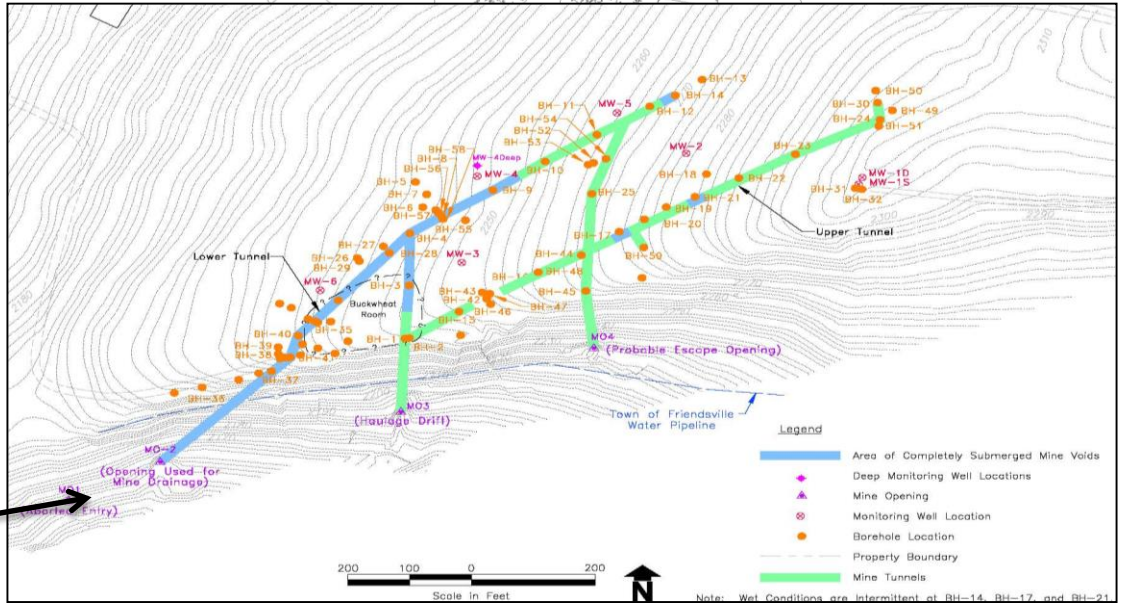
- Karst Geology



Winding Ridge



Mine Opening



Winding Ridge Grout Injection and Coring

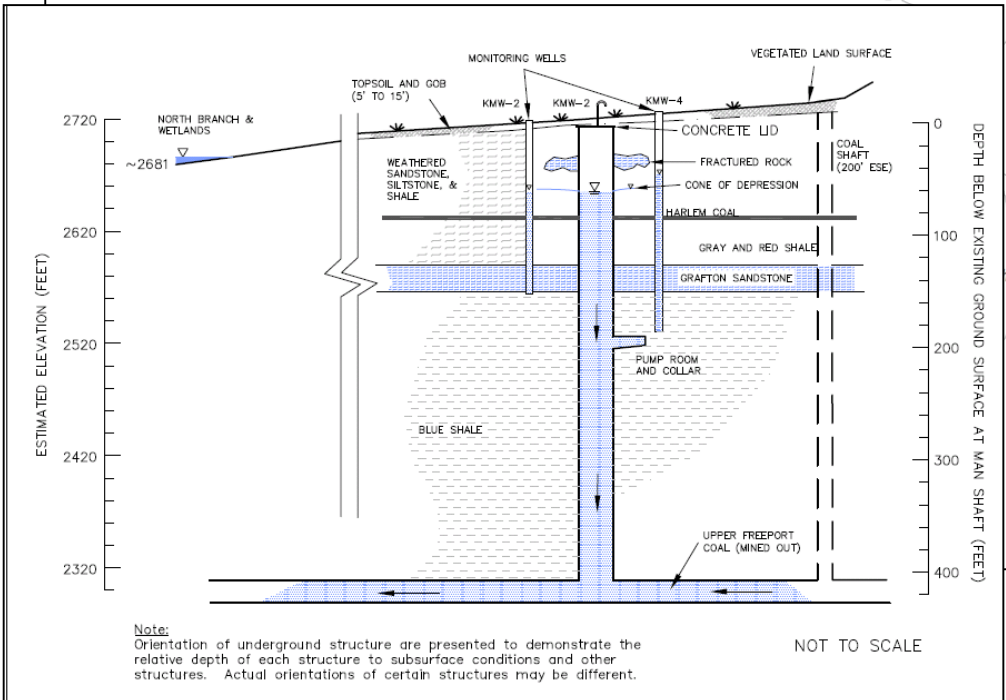
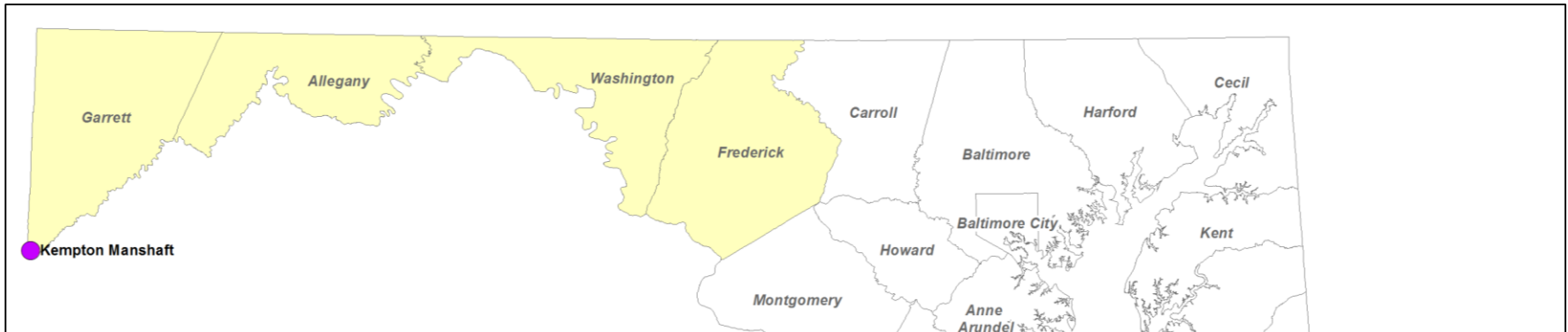


Mixing and Injection of Grout

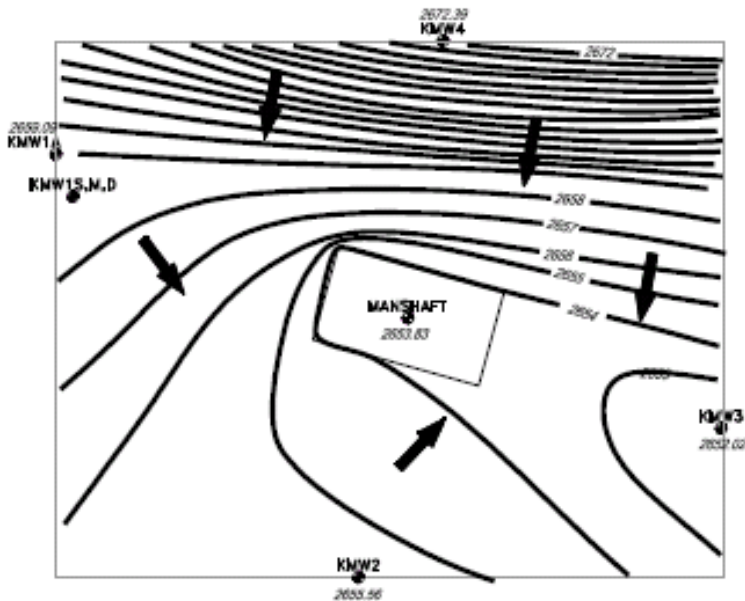


Core samples of grout that cured inside the mine.

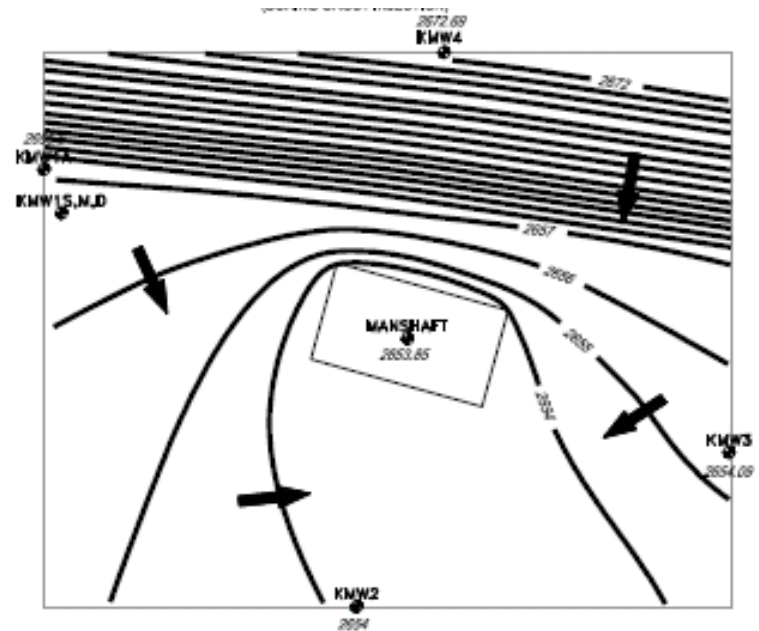
Kempton Man Shaft



Kempton Man Shaft Ground Water Flow

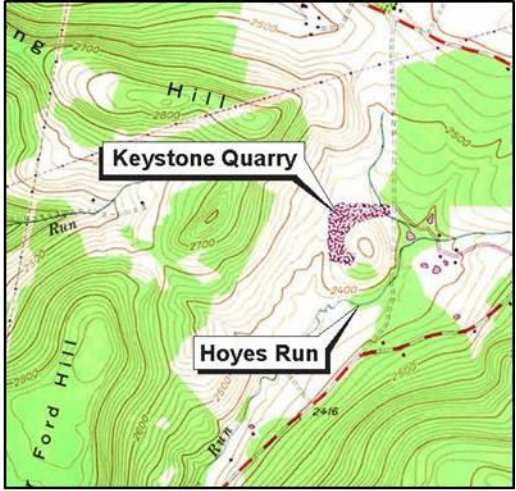
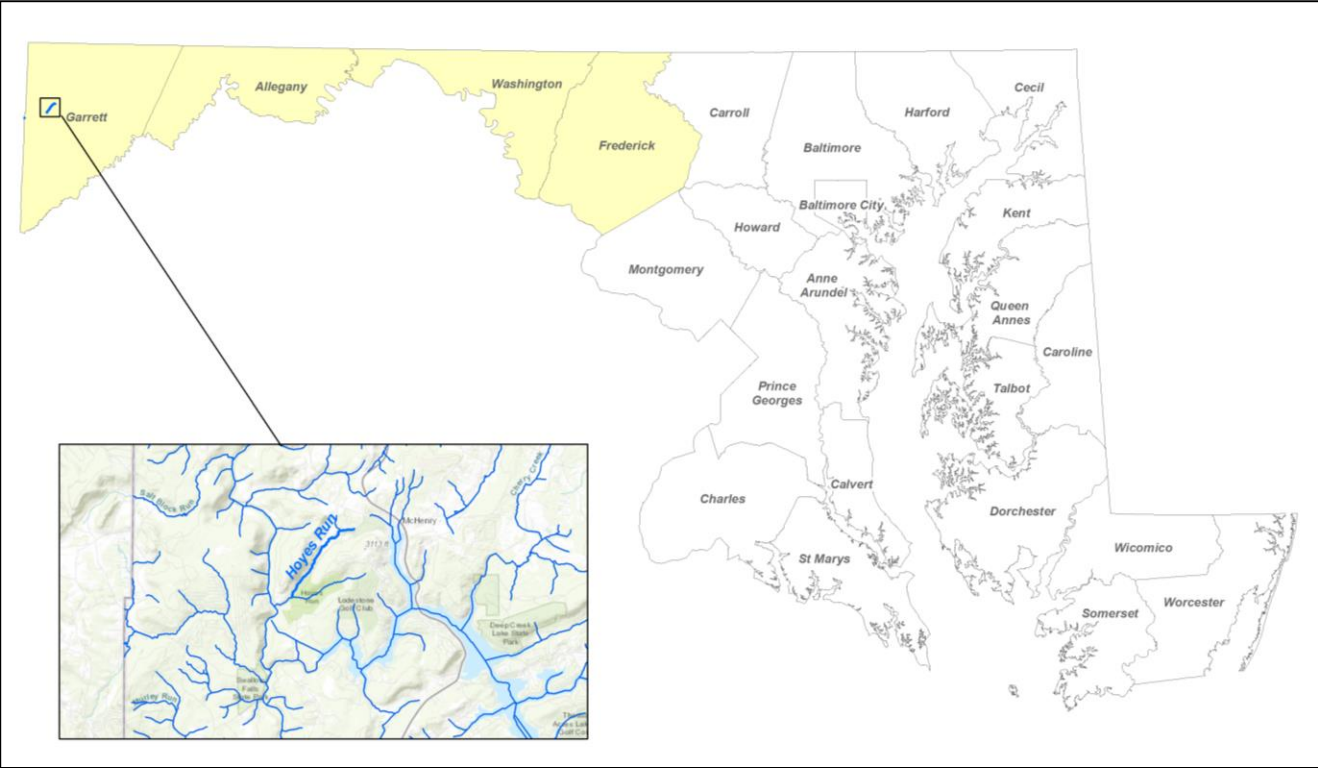


Ground water flow prior to injection



Ground water flow after injection (little change – intensely fractured bedrock prevented sealing.)

Hoyes Run

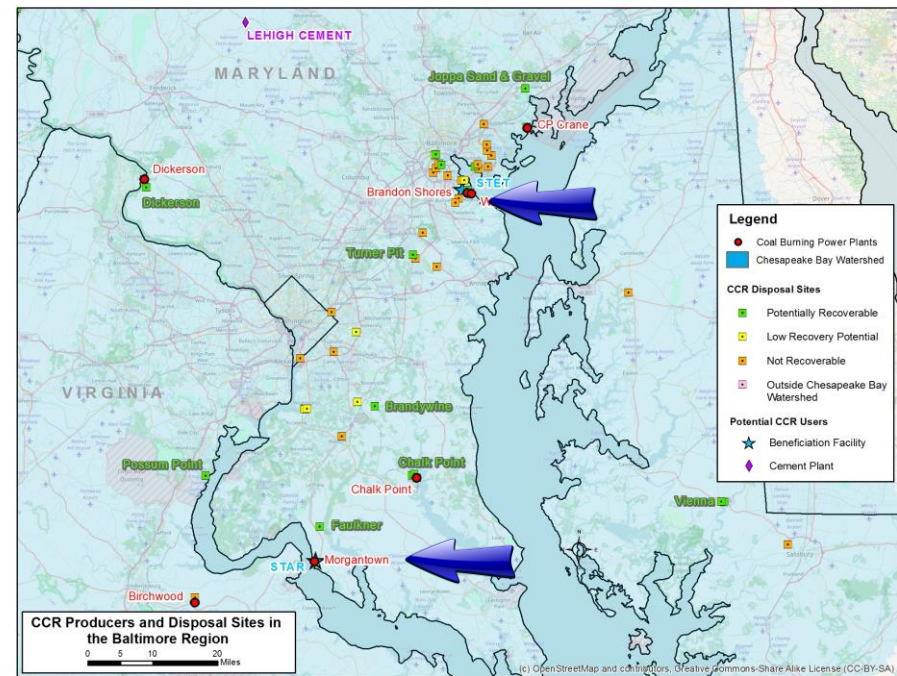
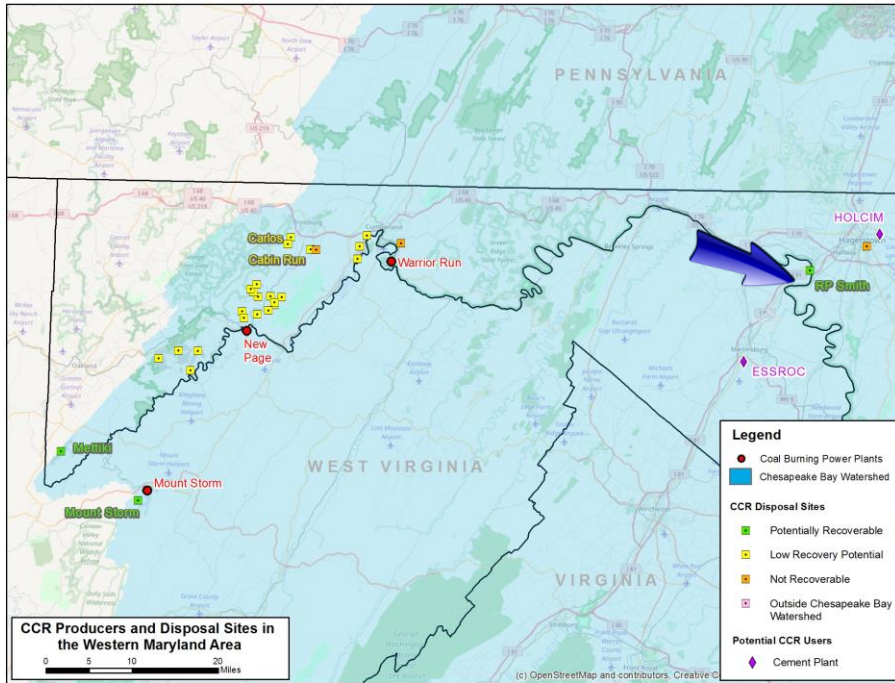


Hoyes Run

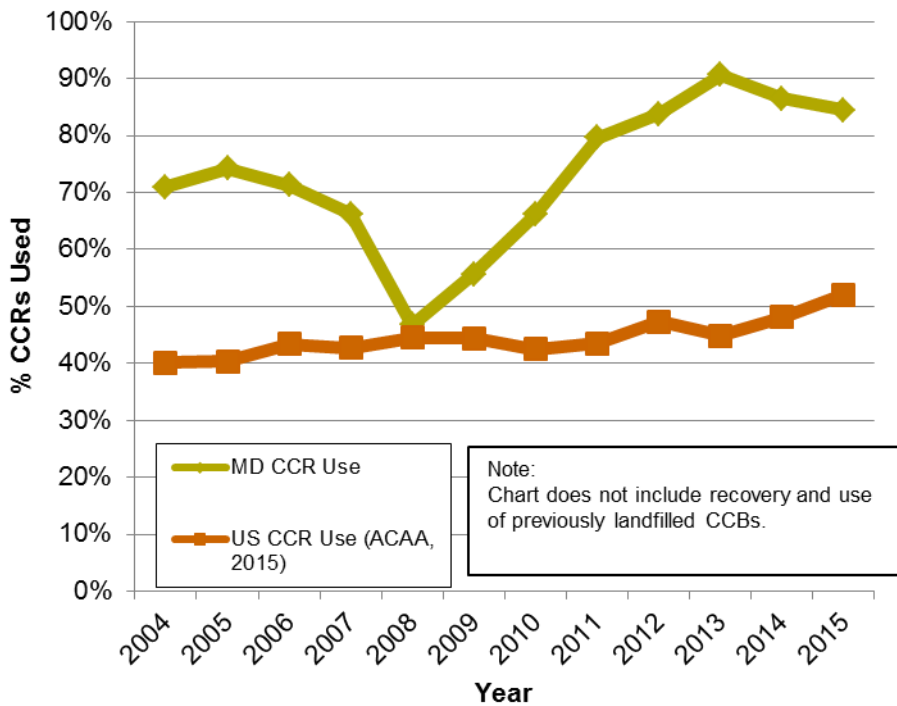
The Hoyes Run Project was a joint project with the U.S. Department of Energy and DNR Bureau of Fisheries.



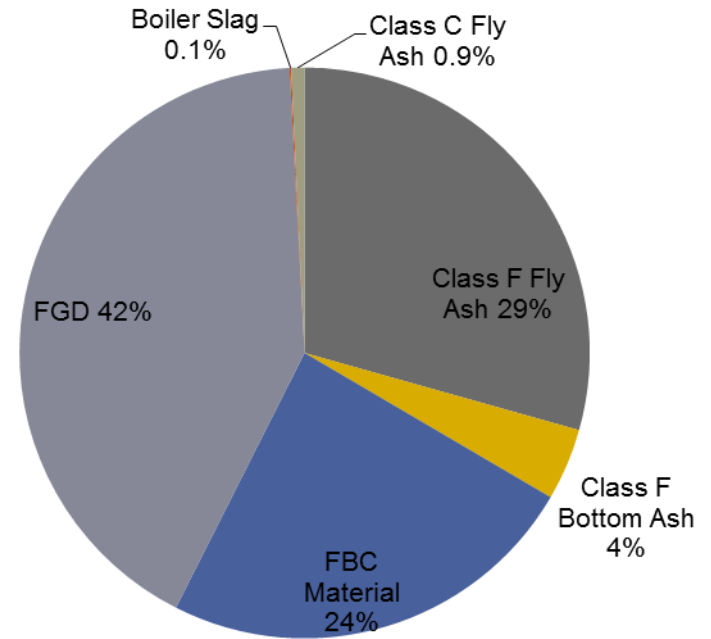
3 Success Stories



CCB Production and Use in Maryland

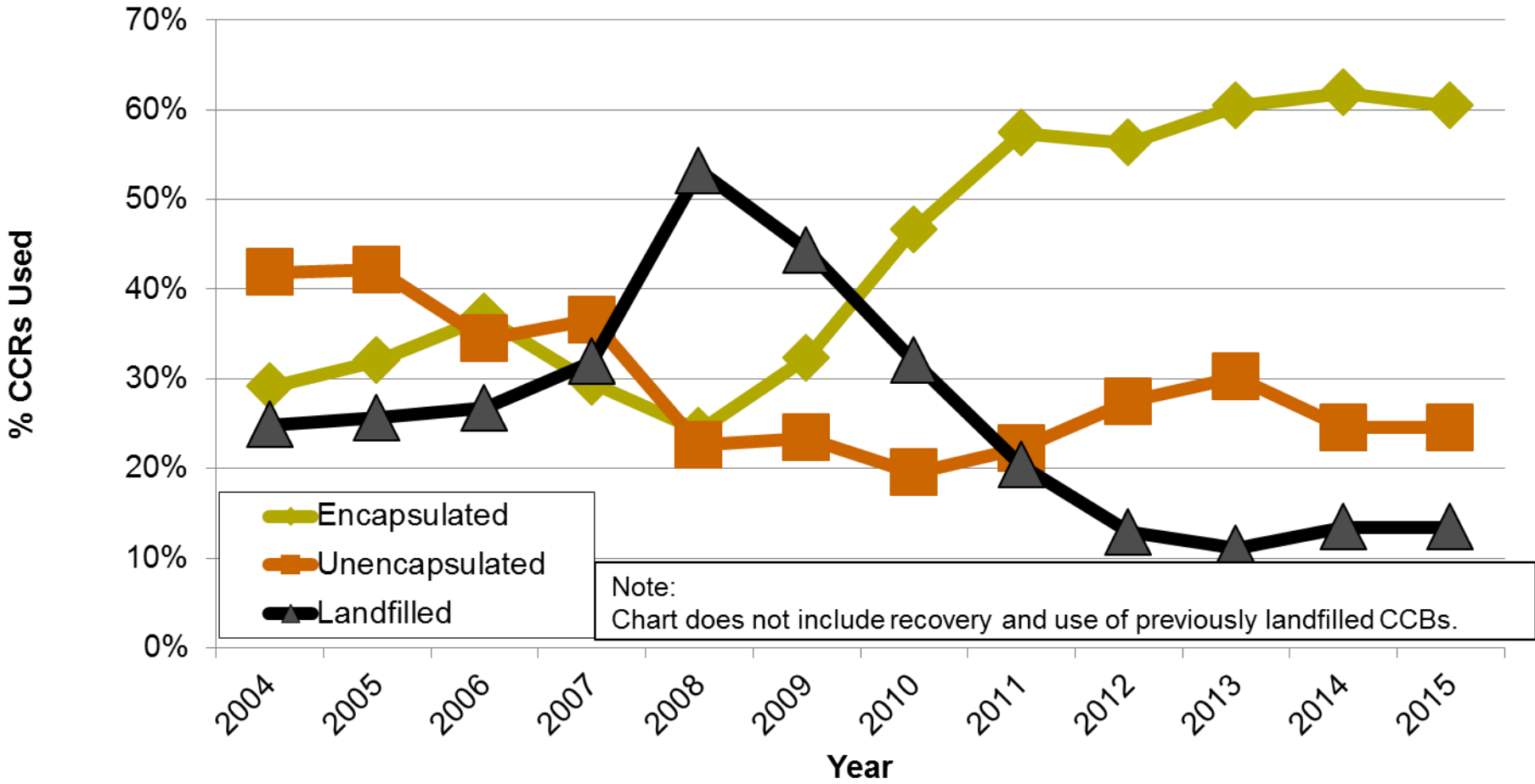


CCBs Produced in Maryland 2015



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Encapsulated Use, Unencapsulated Use, and Disposal in Maryland



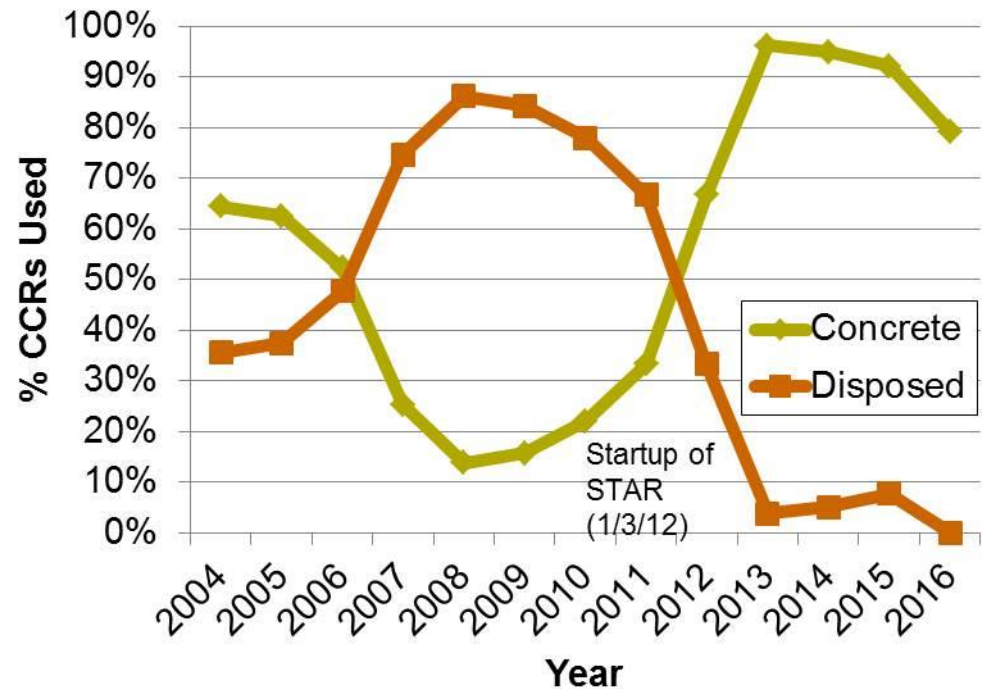
Morgantown STAR



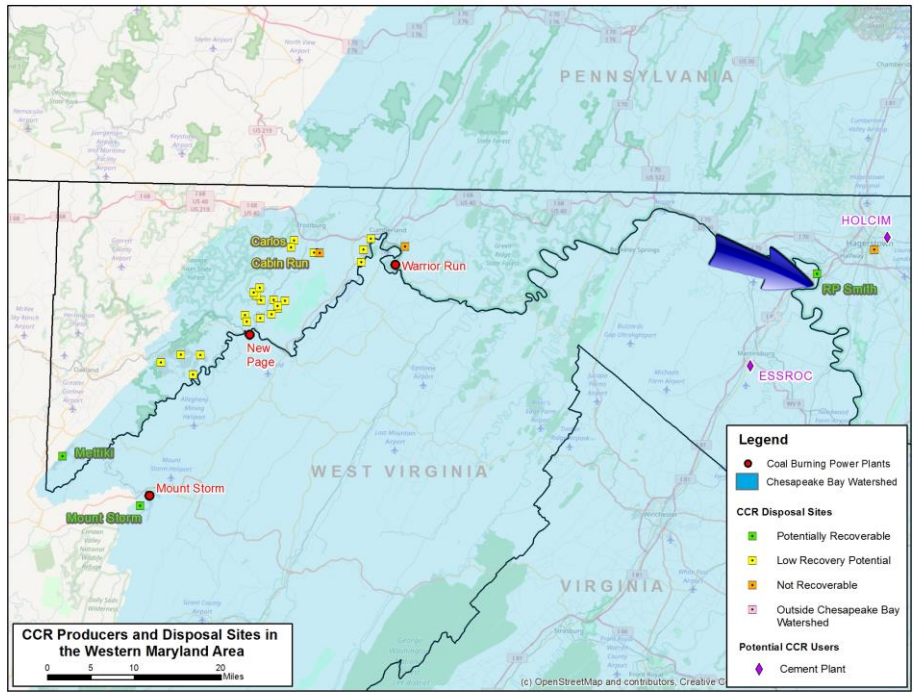
Star

Constructed	2012
Owner	SEFA Group
Beneficiation Method	Thermal
Fly Ash Source	Morgantown
Max LOI of Input CCR	6-10%
Min LOI of Output CCR	0.5%
Fly Ash Processed in 2016 (tons)	126,244

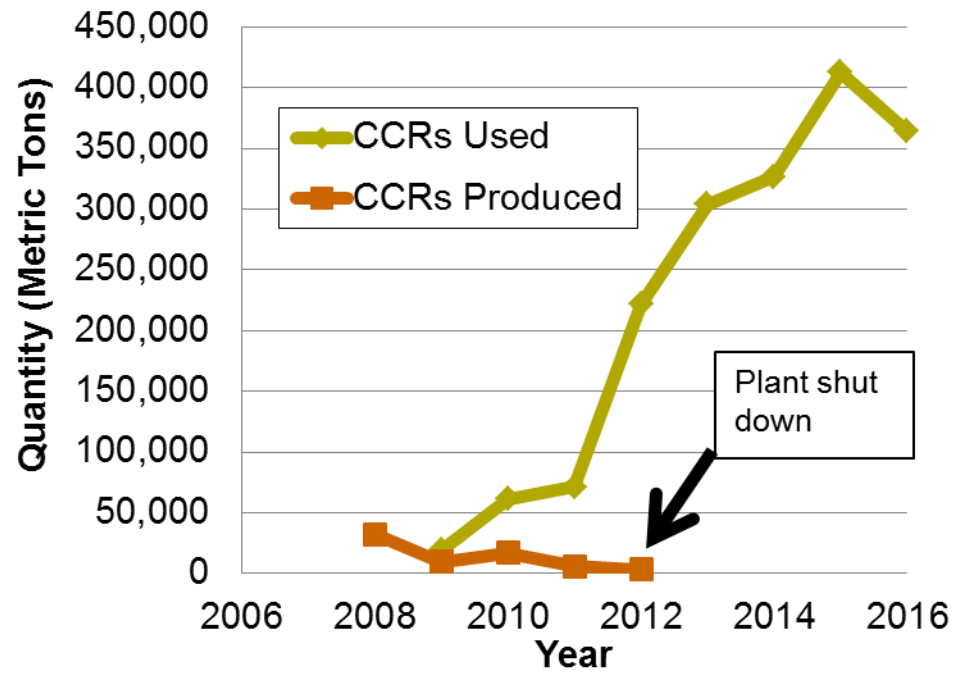
CCB Use versus Disposal



Recovery of Landfilled CCBs at R. Paul Smith Plant



CCB Production vs Recovery from Former R. Paul Smith Landfill



Recovery of Landfilled CCBs at R. Paul Smith Plant

