

# **OVERVIEW OF ACTIVE MINE DRAINAGE TREATMENT FACILITIES CURRENTLY OPERATED BY THE PA-DEP-BUREAU OF ABANDONED MINE RECLAMATION**

## **Expanded Abstract**

**Richard L. Beam, P.G.<sup>1</sup>**

Coal Mining began in Pennsylvania (PA) in the mid-18th century. As a result of two-and-one-half (2 ½) centuries of bituminous and anthracite coal mining activities, most of which occurred prior to any environmental regulations, significant damage to water resources has occurred. PA currently has in excess of 5,500 miles of streams impaired due to coal mine drainage (CMD). PA began to quantify and attempt to deal with this enormous environmental issue in 1968 with the passage of a state law, The Land and Water Conservation Act (a.k.a. “Operation Scarlift”) which authorized a \$500 million bond issue to assess and deal with legacy abandoned coal mine problems including CMD. The Commonwealth of Pennsylvania, Department of Environmental Protection (PA-DEP), and its predecessor agencies, the Department of Environmental Resources and the Department of Mines & Mineral Industries have constructed and operated active mine drainage (AMD) treatment facilities in the Anthracite and Bituminous Regions of PA since 1968.

The initial sources of funding for the construction, operation and maintenance of these facilities was the Scarlift Bond Issue (Project 500 or Operation Scarlift). In recent years funding for ongoing operation and maintenance is provided from both the PA Capital Budget and Title IV of the Surface Mining Control and Reclamation Act of 1977 through the AMD Set-Aside Program. PA DEP Bureau of Abandoned Mine Reclamation (BAMR) currently operates and maintains four (4) of those original treatment facilities. In addition, four (4) more facilities have been added. An additional seven (7) new active treatment facilities are in either the planning, design or construction phase.

This presentation provides an overview of PA’s current and planned active treatment facilities. The decision on how and when to construct and operate active treatment facilities is never easy. Not only do these facilities require significant capital costs, but annual operating and maintenance costs must also be taken into consideration when deciding on such long-term endeavors. First, the history and treatment configurations of the sites are presented. Second, a cost benefit analysis is provided for each of the facilities. The presentation also shares some unique challenges, practical applications and lessons learned.

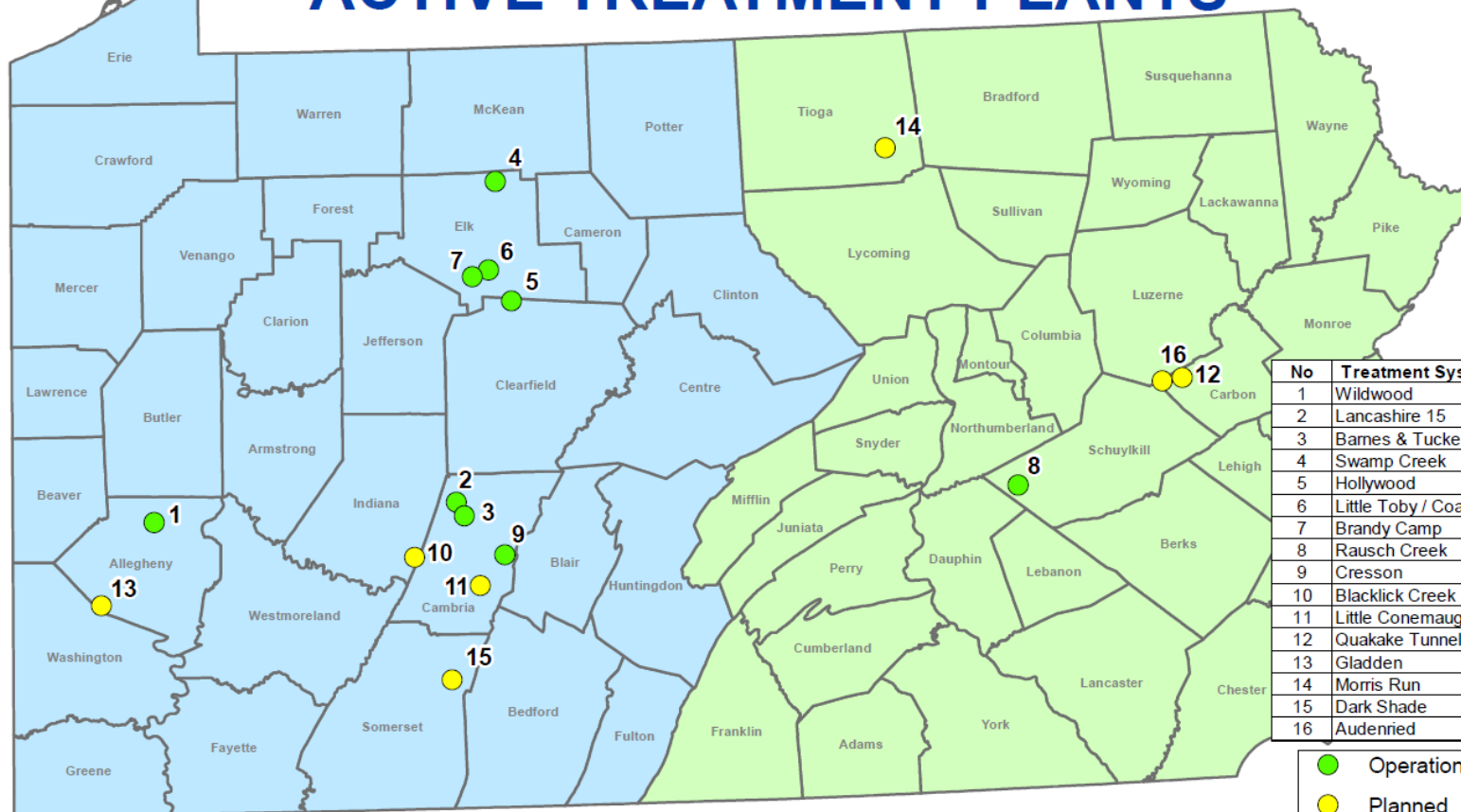
<sup>1</sup>Richard Beam is a geologist manager with BAMR - [ribeam@pa.gov](mailto:ribeam@pa.gov).  
PA DEP-BAMR, Cambria District Office, 286 Industrial Park Road, Ebensburg, PA 15931,  
814-472-1800.

## PA DEP-BAMR Scarlift Era Mine Drainage Treatment Facilities

Facility	County	Project ID	Avg Flow (MGD)	Plant Cap. (MGD)	Treatment Process	Capital Cost	Operational Period
Slippery Rock Creek	Butler	SL 104	3.6	12 - 15	Lime (CaOH <sub>2</sub> ), Clarifier, Ponds	\$804,845	1970 to 1990
Sandy Run	Luzerne	SL 106-1	5	15	Lime Doser	\$48,516	1970 to 1990
Buck Mt. Tunnel	Carbon	SL 106-2	2	5	Lime Doser	\$40,025	1970 to 1990
Swamp Creek	Elk	SL 106-3	3.9	10	Lime Doser	\$70,730	1970 to present
Ernest / Creekside	Indiana	SL 107-5-3	4.5	4.5	Lime (CaOH <sub>2</sub> ), Clarifier	\$4,327,797	1982 to 1984
Rausch Creek	Schuylkill	SL 112-1	8.8	16	Lime (CaO), Clarifier, Ponds	\$3,555,297	1974 to present
Altoona Water Auth.	Blair	SL 116-3	12.5	15	Lime (CaOH <sub>2</sub> ), Clarifier	\$5,074,529	1975 to present
Hawk Run	Clearfield	SL 117-1	0.5	0.5	Ion Exchange, Filtration	\$2,713,236	1972 to 1974
Toby Ck / Coal Hollow	Elk	SL 132-5	1.44	1.44	Limestone drums, siphons	\$2,735,374	1992 to present
Quakake Demo	Carbon	SL 135-10		3	Limestone drums, barriers	\$331,185	1979 to 1981
Aylesworth Creek	Lackawanna	SL 139-1-5	1.2	11	Limestone drums / doser	\$344,519	1983 to 1986
Pigeon Creek	Washington	SL 142-1	0.43	1.15	Passive aeration, Pond	\$53,187	1970 to present
Wildwood	Allegheny	SL 198-2	1.0	1.15	Chem. Oxidation (H <sub>2</sub> O <sub>2</sub> ), ponds	\$214,884	1974 to present
Little Scrubgrass	Butler	BM 113	?	?	Lime Doser	?	? To 1980
Smith Township	Washington	SL 114-1	?	0.5	Ion Exchange, Filtration	\$576,993	1974 to ?

# PA DEP-BAMR Existing and Planned Active Mine Drainage Treatment Facilities

## BUREAU OF ABANDONED MINE RECLAMATION ACTIVE TREATMENT PLANTS



No	Treatment System Name
1	Wildwood
2	Lancashire 15
3	Barnes & Tucker 20
4	Swamp Creek
5	Hollywood
6	Little Toby / Coal Hollow
7	Brandy Camp
8	Rausch Creek
9	Cresson
10	Blacklick Creek
11	Little Conemaugh
12	Quakake Tunnel
13	Gladden
14	Morris Run
15	Dark Shade
16	Audenried

- Operational
- Planned
- Anthracite Region
- Bituminous Region

Date: February 19, 2019  
 Data Source: BAMR  
 Prepared by: M. Staybrook  
 Projection: USA Contiguous  
 Albers Equal Area Conic Albers



## PA DEP-BAMR Existing Active Treatment Facilities

Facility	Stream Miles improved	Avg. Flow Treated (MGD)	Operation & Maintenance Cost 2017	Benefit Cost Ratio	Cost per 1000 gallons treated 2017
Wildwood	8	1.44	\$10,848	63:1	\$0.021
Lancashire	30	6.48	\$468,400	2.9:1	\$0.198
Swamp Creek	na*	2.88	\$8,675	87:1	\$0.008
Hollywood	33	2.88	\$670,248	4.2:1	\$0.637
Little Toby	6	1.44	\$265,060	1.9:1	\$0.504
Brandy Camp	3.5	1.44	\$263,499	1.1:1	\$0.501
Rausch Creek	31	8.64	\$420,204	6.3:1	\$0.133
<b>Total</b>	<b>111.5</b>	<b>24.7</b>	<b>\$2,106,934</b>		<b>\$0.234</b>

\* Treated effluent discharges to East Branch Clarion River ACOE Dam

Facility	Year Constructed	Treatment Process	Capital Construction Cost	Capital Cost Adjusted to 2017 Cost*
Wildwood	1974	Hydrogen Peroxide / Pond Clarification	\$214,884	\$1,108,677
Lancashire	2011	Hydrogen Peroxide / HDS Clarifier	\$12,887,512	\$14,397,346
Swamp Creek	1970	Lime (CaOH <sup>2</sup> ) Doser	\$70,729	\$526,401
Hollywood	2013	Lime (CaOH <sup>2</sup> ) / HDS Clarifier	\$14,608,912	\$15,509,262
Little Toby	1996	Lime Slurry / Pond Clarification	\$2,735,374	\$5,301,959
Brandy Camp	2001	Hydrogen Peroxide, Lime Slurry / Pond Clarification	\$2,481,339	\$4,236,722
Rausch Creek	1974	Lime (CaO) / Clarifier	\$3,555,297	\$18,343,274
<b>Total</b>			<b>\$36,554,047</b>	<b>\$59,423,641</b>

\* Capital cost adjusted to 2017 dollars using R.S. Means Construction cost index

## PA DEP-BAMR Planned Active Mine Drainage Treatment Facilities

Facility	Design or Construction Status	Treatment Process	Receiving Stream / Watershed	Anticipated Average Annual Flow	Projected Stream Miles Recovered
Cresson	Construction to be Completed Apr. 2019	Decarbonation & Hydrogen Peroxide Pretreatment _ Lime (CaOH <sup>2</sup> ) _ Solids Contact Clarifier _ Polishing Wetlands	Clearfield Creek - WB Susquehanna	2200 gpm (3.2 MGD)	21
Blacklick	Design Completion 2019	Decarbonation _ Lime (CaOH <sup>2</sup> ) _ HDS Clarifier _ Polishing Wetlands *	Blacklick Creek _ Conemaugh River	2800 gpm (4.0 MGD)	25
Little Conemaugh	Conceptual Design - Development	Lime (CaOH <sup>2</sup> ) _ Clarifier *	Little Conemaugh _ Conemaugh River	5000 gpm (7.2 MGD)	20
Quakake	Design Completion 2019	Lime (CaOH <sup>2</sup> ) _ Clarifier*	Wetzel Run _ Black Creek _ Lehigh River	6000 gpm (8.6 MGD)	11
Gladden	Design Completion 2019	Hydrogen Peroxide _ Clarifier *	Millers Run _ Chartiers Creek	700 gpm (1.0 MGD)	7
Tioga / Morris Run	Conceptual Design - Development	Lime (CaOH <sup>2</sup> ) _ Clarifier*	Morris Run_ Tioga River	4000 gpm (5.8 MGD)	20
Audenried / Green Mt.	Conceptual Design - Development	Lime (CaOH <sup>2</sup> ) _ Clarifier*	Catawissa Creek _ Susquehanna River	15,000 gpm (21.6 MGD)	44
<b>Total</b>				<b>51.4</b>	<b>148</b>
* Subject to final design evaluation					

## Additional Information

<https://www.dep.pa.gov/Business/Land/Mining/AbandonedMineReclamation/Pages/AMD-Set-Aside-Program.aspx>



Department of Environmental  
Protection

About DEP

## AMD Treatment Information and Resources

The Bureau of Abandoned Mine Reclamation (BAMR) operates and maintains many large active mine drainage treatment plants and numerous passive treatment systems which are improving or restoring water quality in the receiving streams on which they are located. Currently, BAMR operates eight (8) treatment plants and has another eight (8) under development, design or construction. Additionally, BAMR provides O&M directly for 46 passive mine drainage treatment systems located across the Commonwealth. All of these mine drainage treatment facilities are being operated and maintained with AMD Set-Aside funding, mine drainage treatment trusts, or other funding earmarked for AMD treatment. The following resources will provide more information about BAMR's AMD treatment facilities:

- [Summary of BAMR's Active Mine Drainage Treatment Plants](#) (PDF)
- [Summary of BAMR's Planned Mine Drainage Treatment Plants](#) (PDF)
- [Operating and Planned Mine Drainage Treatment Plants Map](#) (PDF)
- [Summary of Passive Mine Drainage Systems Constructed by BAMR](#) (PDF)
- [BAMR Passive Treatment System Location Map](#) (PDF)
- [Bennett Branch Restoration Video](#) 
- [Lancashire No. 15 AMD Treatment Plant Video](#) (MP4)