

6th West Branch Susquehanna Restoration Symposium

April 28th, 2012

Lancashire #15 AMD Treatment Plant and Glasgow AMD Treatment System Tour

Cambria County, Pennsylvania

Tour Hosts

Patrick Webb, PA Department of Environmental Protection
Dr. Arthur Rose, Clearfield Creek Watershed Association
Bill Gongaware, Gongaware Environmental Services



Foundation for Pennsylvania Watersheds

Tour Itinerary

8:30 a.m.

Depart Ramada Conference Center

10:00 a.m.

Arrive at Lancashire #15 AMD treatment plant and
tour facility

11:30 a.m.

Depart Lancashire #15 treatment plant

12:00 p.m.

Arrive at Prince Gallitzin State Park and enjoy a picnic
lunch on the shores of Glendale Lake

12:45 p.m.

Depart picnic area

1:15 p.m.

Arrive at Glasgow and tour AMD treatment system

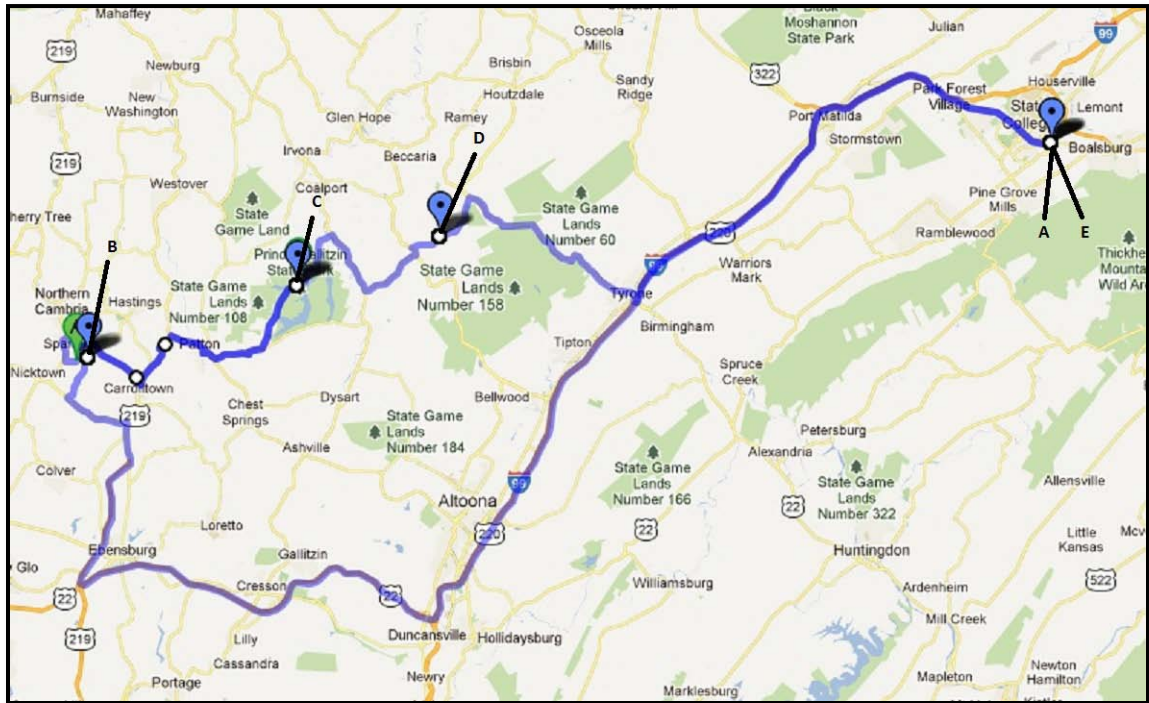
2:45 p.m.

Depart Glasgow treatment system

4:00 p.m.

Arrive back at Ramada Conference Center

Tour Driving Route



- (A) Depart Ramada Conference Center, State College
- (B) Travel on US-322 W to I-99 S to US-22 W to US-219 N to Oak St to Deveaux St (changes to Oil Tank Hill Rd) to Patterson Rd arriving at **Lancashire #15 Treatment Plant**
- (C) Depart Lancashire #15 Treatment Plant and travel on Patterson Rd to Deveaux St to Oak St to US-219 N to Carroll Rd/SR4015 to Mellon Ave to 5th Ave to Lang Ave to 4th Ave then follow PA-36 S to Glendale Lake Rd to Beaver Valley Rd arriving at **Prince Gallitzin State Park – Children’s Area**
- (D) Depart picnic area and travel on Beaver Valley Rd to PA-53 S to PA-253 N arriving at **Glasgow Treatment System**
- (E) Depart Glasgow Treatment System and travel on PA-253 S to PA-453 S to I-99 N to US-322 E arriving back at the **Ramada Conference Center**

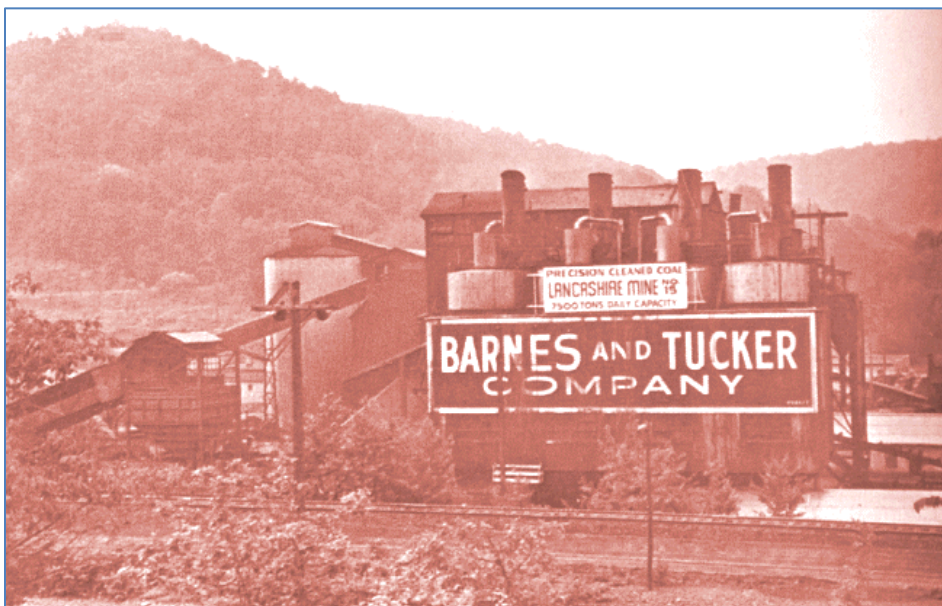
Lancashire No. 15 Treatment Plant Information

History of Barnes and Tucker Lancashire #15 (1903 to 2008)

- The Lancashire #15 Mine Complex is located on the Lower Kittanning Coal Seam.
- Mining started on the what was to be the Lancashire #15 Mine Complex in approximately 1903 and continued through 1969.
- Barnes & Tucker closed Lancashire #15 on July 14, 1969 (pumps were shut off).
- The Lancashire #15 mine incorporated approximately 7,600 acres, with mines that contribute to the mine complex encompassing over 14,000 acres or more than 22 square miles.
- Overburden ranges from 68ft to 550ft.

Impacts and Cost from the 1970 Blowout

- The mine pool blowout occurred in late June 1970 when the mine water level reached 1518' msl.
- At the location of the blowout the overburden is approximately 68ft thick.
- The discharge was estimated to be 3 million gallons per day.
- Significant impacts were seen up to 100 miles downstream.
- The emergency in-stream treatment project cost \$1.5 million.



Lancashire No. 15 Treatment Plant Information (cont)

- Date system went online: 11/8/2011
- Design Cost = *\$764,000 - Michael Baker Jr.
- Construction Cost = *\$12.8 Million – H.R.I. Inc.
- Consultant Inspection Cost = *\$117,000 – Michael Baker Jr.
* Costs do no include DEP BAMR staffing from 2000 to the Present
- Annual O&M Cost = 2/1/2012 to 4/14/2012 (74 days) - \$121,129
(Lime, Polymer, Electric, Labor)
- 200 Tons of Hydrated Lime and 1 Ton of Polymer used monthly
- Max. Design Flow = 12.5 million gallons per day (mgd)
- Permitted Max. Flow = 10.0 mgd
- Anticipated Average Daily Flow = 7.4 mgd
- Designed Effluent Water Quality = 7.3 – 8.1 pH, Fe <1 mg/l, Al <0.5 mg/l
- Anticipated stream miles to receive water quality benefits = 25 - 28 miles
- Unique features of the system = Dense lime sludge recirculation system
- 11/08/2011 to 12/31/2011 = 376,000,000 gallons treated
- 01/01/2012 to 03/31/2012 = 648,554,825 gallons treated



PASSIVE TREATMENT AT THE C&K GLASGOW SITE

The C&K Glasgow passive treatment system was constructed by C&K Coal Co in 1998 to treat highly acid and metal-rich water emerging from the toe of a large area of surface mining adjacent to Muddy Run just east of PA 253. The discharge in 2005-08 flowed at 40-200 gpm with pH 3.3-3.8, acidity 600-900 mg/L, Fe 150 mg/L, Mn 150-200 mg/L, and Al 40-60 mg/L. After C&K bankruptcy in 2004, members of the Clearfield Creek Watershed Association flushed the system and evaluated treatment. VFP 1 (see Figure 1) continued to treat moderately well, but VFP 2 was largely plugged and overflowing and the limestone bed for Mn treatment was only partly treating because of Fe and Al influx, with significant acidity and metals at the outflow. A parallel active treatment system using caustic had been built by C&K to treat higher flows. In the passive system, an “autopsy” under a TAG grant in 2005 showed that accumulation of Fe and Al precipitate on top of the limestone in both VFP’s was largely responsible for the problems (Figure 2). Thin and degraded compost, and coating of some limestone was also noted.

In 2008, a grant of \$174,000 from the Remining Incentive Program was awarded to the Clearfield Creek Watershed Association for renovation of the passive system. The system was rebuilt based on an engineering design by Hedin Environmental. A bid of \$144,300 from Smith Construction and Excavating was awarded for the main construction in June 2009. Construction was completed in November 2009.

The major elements of the renovation were:

1. Removal of 6 in. to 1 foot of Fe and Al precipitate from VFP 1 and VFP 2.
2. Placement of 2 ft. of new compost mixed 3:1 with fine limestone in VFP 1.
3. Placement of a new limestone layer with new underdrain and water level control in VFP 2, and a new 2 ft. compost-limestone layer overtop it.
4. “Stirring” of the Mn-removal limestone bed, which had extensive coatings of Mn and Fe hydroxide, to expose fresh limestone.
5. Separation of the passive system from the active system ponds.
6. Repair of uphill diversion ditches to eliminate flow from them into the system.

Sampling starting in January 2010 shows that effluent from VFP 1 is strongly net alkaline with low metals, VFP 2 is adding some alkalinity, and the Manganese bed is removing most of the Mn, with some Mn removed in the VFP’s. The final effluent has pH above 6 with negligible metals. The total cost of the project came in under budget. Maintenance for the passive system is being accomplished under the Bond Forfeiture Program.

Note that VFP 1 is doing most of the work, and it still has the original limestone layer. Most of the time the Mn limestone bed is in low single digit Mn, with early problems increasing the average due to influx of Fe. The flow thru the passive system is limited to 50-60 gpm, with the excess going to the active system.

Table 1. Average chemistry and flow through the Glasgow passive system (2010-12)

Location	Flow	pH	Alk.	Acid.	Fe	Mn	Al	SO4	TSS
	gpm		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Raw		3.1	0	566	109	112	51	2275	5.5
VFP1 out	53	6.8	226	-64	21	95	0.1	2271	38
VFP2out	61	7.3	240	-94	0.5	47	0	1626	3
Mn in	58	7.6	212	-122	2.5	41	0	1554	9
Final out	44	7.3	167	-112	0.2	9	0	1644	5

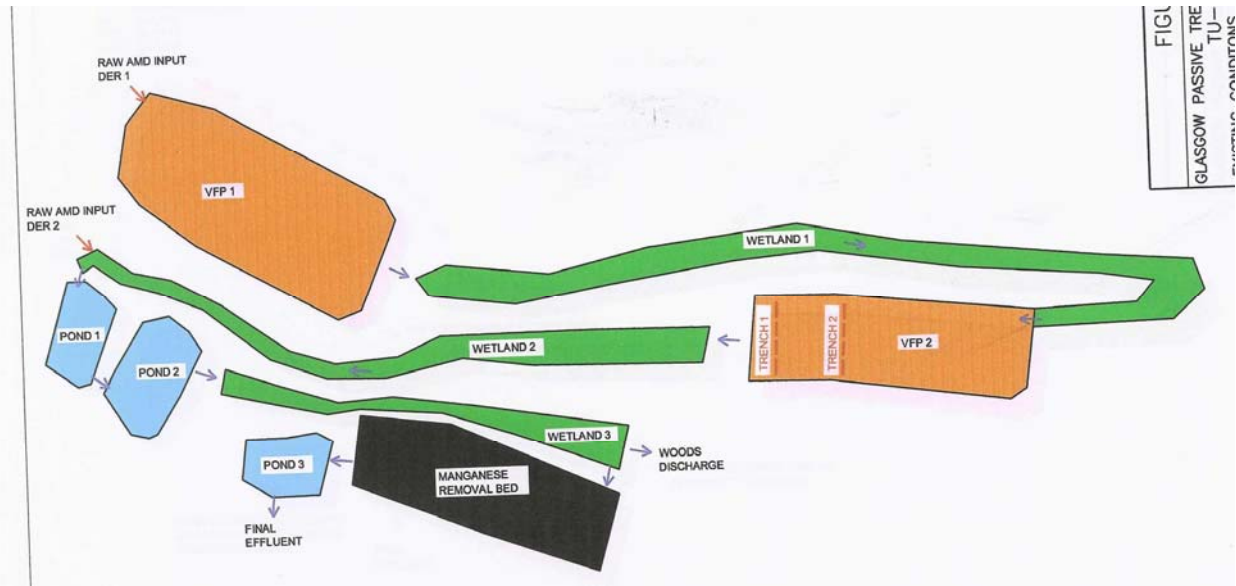


Figure 1. Sketch map of system prior to renovation. In the renovation project, the passive flow was directed from Wetland 2 to Wetland 3, leaving Ponds 1 and 2 for the active system.



Figure 2. Iron accumulation on bottom of VFP1 after draining for rebuilding. But the pond was flowing through this without overflow.