

Lucerne 3A AMD Passive Treatment System Construction Technical Report

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White Township, Indiana County



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Project Location

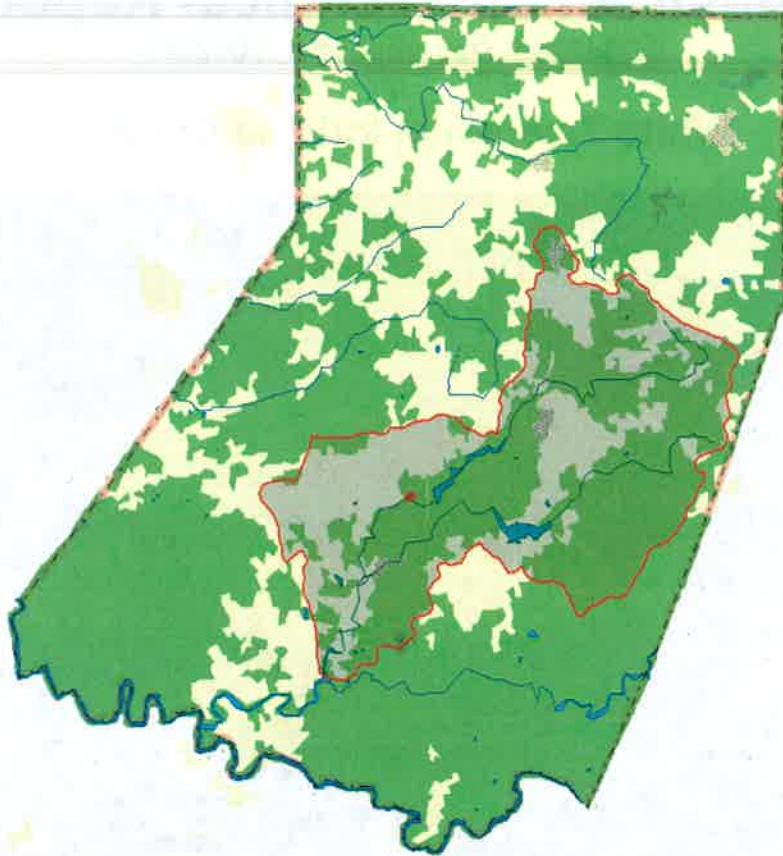


Figure 1. Location of the Two Lick Creek Watershed and the Lucerne 3A Discharge.



Figure 2. Lucerne 3A Discharge and treatment area noted.

Introduction

The Two Lick Creek Watershed, located in State Water Plan (SWP) 18D, is the largest tributary, at approximately 190 square mile, of Blacklick Creek. The confluence of the South Branch and North Branch of Two Lick Creek is located in the town of Wandin Junction, Indiana County, Two Lick Creek then flows generally southwest into the Two Lick Reservoir.

Two Lick Reservoir was built by the owners of the Homer City Generating Station (Pennsylvania Electric Company and New York Gas and Electric Company) and was placed into service in 1969. The original purpose of the reservoir was to provide sufficient quantities of water for production use at the Homer City Generating Station during times of significant drought thereby keeping the station online. However, even though Two Lick Creek enters Two Lick Reservoir impacted by abandoned mine drainage (AMD), water has improved enough that Two Lick Reservoir has become a heavily used recreational destination for sport fisherman and boating enthusiasts.

Within the last decade, the reservoir has been also serving in another capacity as an AMD treatment system. Two Lick Creek enters Two Lick Reservoir and is retained which allows it to precipitate its high metal concentration. Water then exits Two Lick Reservoir possessing high pH (6.5-7.5) and alkalinity concentrations and very low metal (iron, aluminum, and manganese) concentrations (Table 1). This along with the underflow exit of the water creates a high quality, cold water, tailrace fishery for approximately seven miles down to the town of Homer City where the Risinger Discharge once again impacts Two Lick Creek negatively (Figure 3).

Table 1. Two Lick Creek Water Quality Entering and Exiting Two Lick Reservoir.

| Location | pH | Conductivity | Alkalinity | Acidity | Fe | Mn | Al | SO ₄ |
|---------------------|-----|--------------|------------|---------|------|------|-------|-----------------|
| | Lab | ucm/s | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| TLC US of Reservoir | 7.6 | 520 | 114.00 | 0.00 | 1.62 | 0.22 | 1.13 | 125.00 |
| TLC DS of Reservoir | 7.5 | 304 | 33.46 | 0.00 | 0.11 | 0.23 | <0.10 | 71.00 |

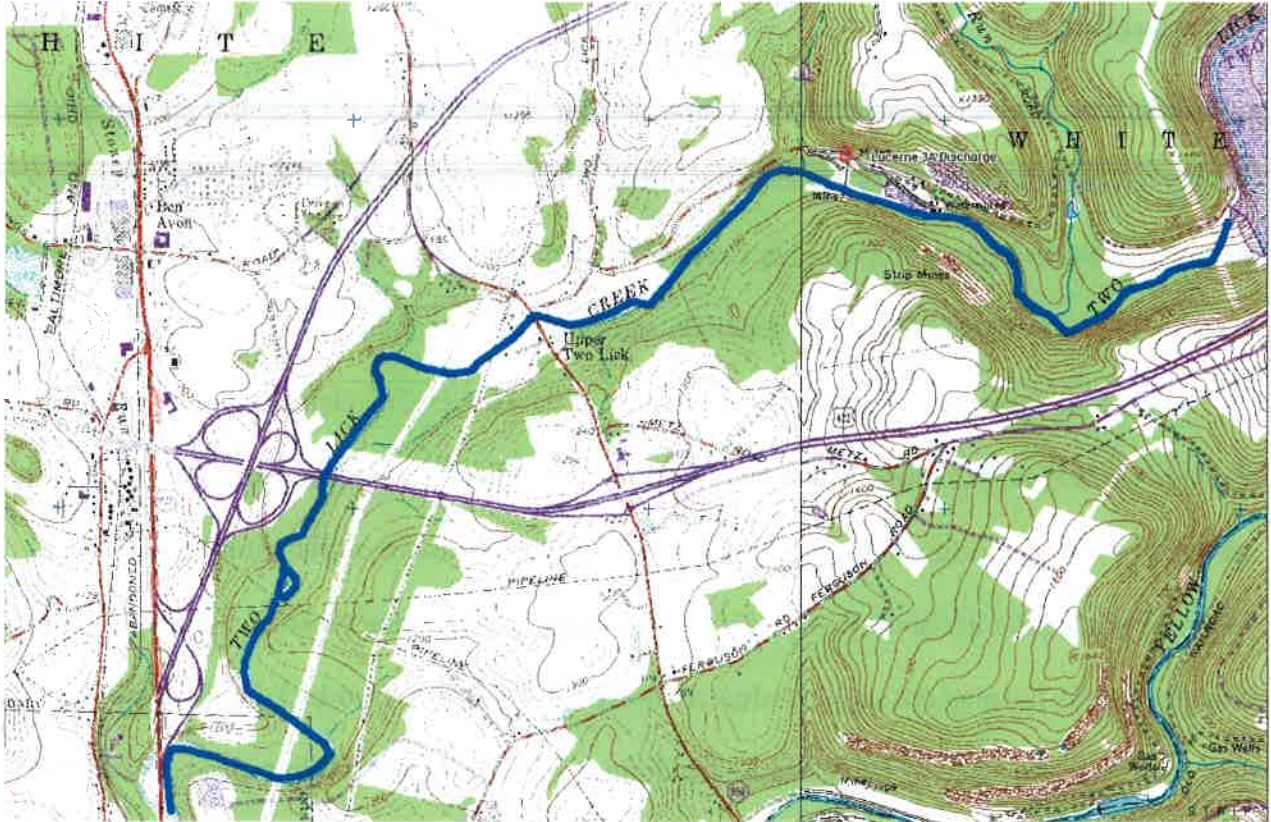


Figure 3. Wild Trout Section of Two Lick Creek (~7.0 miles).

Because of this clean and cold water, Brown Trout (*Salmo trutta*) from stockings by the Two Lick Trout Club have begun to reproduce tremendously in this section of Two Lick Creek. A fish electroshocking survey conducted in August 2002 by the Indiana University of Pennsylvania (IUP) and the Ken Sink Chapter of Trout Unlimited (KSTU) concluded that there are approximately five age classes of wild Brown Trout in Two Lick Creek, including fish hatched that year (Figure 4). Anglers have even occasionally landed what looks to be wild Rainbow Trout (*Oncorhynchus mykiss*), a rarity for waters of this region and the size of Two Lick Creek (Figure 5).



Figure 4. Young-of-the-year Two Lick Creek wild brown trout.



Figure 5. Wild Rainbow Trout caught on Two Lick Creek by a local angler.

In July and August 2004, informed of this wild trout population increasing in Two Lick Creek, the Pennsylvania Fish and Boat Commission (PFBC) conducted several fish surveys throughout this section to confirm. Not only was this population confirmed, it was found to be flourishing (Table 2 and Figure 6 and 7).

Table 2. Estimated abundance and biomass of Brown Trout from Two Lick Creek Section 0201 (Upstream of SR 954 Bridge) at RM 11.8 using a Peterson estimator on 7/20/04.

| Size Group | Population Estimate | Estimated #/Ha | Estimated Kg/Ha | Estimated #/Km |
|---------------|---------------------|----------------|-----------------|----------------|
| 50 mm | 208 | 263 | 0.64 | 570 |
| 75 mm | 111 | 140 | 0.88 | 304 |
| 125 mm | 1 | 1 | 0.04 | 3 |
| 150 mm | 14 | 18 | 0.77 | 38 |
| 175 mm | 8 | 10 | 0.68 | 22 |
| 200 mm | 2 | 3 | 0.24 | 5 |
| 225 mm | 1 | 1 | 0.16 | 3 |
| 250 mm | 3 | 4 | 0.69 | 8 |
| 275 mm | 5 | 6 | 1.5 | 14 |
| 300 mm | 3 | 4 | 1.15 | 8 |
| 350 mm | 1 | 1 | 0.61 | 3 |
| 375 mm | 1 | 1 | 0.73 | 3 |
| 525 mm | 1 | 1 | 2.32 | 3 |
| Totals | 359 | 453 | 10.41 | 984 |



Figure 6. The 375 mm wild Brown Trout collected at Section 0201 on Two Lick Creek.



Figure 7. A 24" wild Brown Trout captured by the PFBC at RM 8.4 in August 2004.

With the potential of Two Lick Creek more evident, focus is now being centered on this watershed from numerous area environmental agencies and organizations namely the Indiana County Conservation District (ICCD) and the KSTU.

In early 2003, Rochester and Pittsburgh Coal and its parent company, Consolidated Coal, donated a 10.7 acre parcel of land along Two Lick Creek to Indiana County that will enable the ICCD and its partners to treat the only major pollution source, the Lucerne 3A Discharge, impacting this seven mile stretch of Two Lick Creek. The Lucerne 3A Discharge inputs highly acidic and metal laden water into Two Lick Creek making it a priority discharge for treatment (Table 3).

Consequently, the ICCD submitted and was awarded a 2004 Pennsylvania Department of Environmental Growing Greener Initiative Grant for \$7,000 to complete two items; the excavation of the Lucerne 3A Mine Portal and to conceptualize the best treatment method for the

Lucerne 3A Discharge. This report documents the success of this project and the future steps needed for the remediation of this significant discharge to Two Lick Creek.

Table 3. The water quality of the Lucerne 3A Discharge.

| Date | Flow | pH | Cond | Acid. | Alk. | Total Fe | Al | Mn | TSS | SO4 |
|------------------|---------------|-------------|----------------|---------------|-------------|--------------|--------------|-------------|--------------|---------------|
| | GPM | Lab | Field | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| 7/31/2001 | 100.82 | 2.60 | 1500 | 572.40 | 0.00 | 46.80 | 37.70 | 2.16 | 4.00 | 550.00 |
| 8/30/2001 | 70.91 | 2.60 | nd | 636.20 | 0.00 | 57.90 | 48.30 | 2.11 | 20.00 | 445.00 |
| 9/20/2001 | 49.09 | 2.70 | 1850 | 680.60 | 0.00 | 69.80 | 55.90 | 2.52 | 12.00 | 269.00 |
| 11/2/2001 | 29.03 | 2.70 | 2000 | 767.00 | 0.00 | 72.50 | 57.10 | 2.64 | 26.00 | 777.10 |
| 12/5/2001 | 25.53 | 2.60 | nd | 790.40 | 0.00 | 78.50 | 62.70 | 2.51 | <2.00 | 1160.00 |
| 3/27/2002 | 346.52 | 2.73 | 1400 | 343.00 | 0.00 | 32.94 | 21.82 | 0.93 | 16.00 | 551.00 |
| 8/20/2003 | 87.82 | 2.70 | 1708 | 404.00 | 0.00 | 34.72 | 25.69 | 1.33 | 5.00 | 661.00 |
| Average | 101.39 | 2.66 | 1691.60 | 599.09 | 0.00 | 56.17 | 44.17 | 2.03 | 13.83 | 630.44 |
| Tons/Year | | | | 104 | | 10 | 7 | | | |

Mine Portal Excavation

In May of 2005, the ICCD contracted the mine portal excavation of this project to Grguric Excavating Inc. of Clarksburg, Indiana County. At that time, the Lucerne 3A Discharge originated away from the mine portal leading many to believe a pipe may have been installed in the portal to carry the discharge and that over time; this pipe was covered with material (Figure 8). Consequently, the first task to be completed was the removal of vegetation from the project site and excavation from the Lucerne 3A Discharge origination point to the mine portal. After completion it was found that our theory was correct and a pipe was discovered exiting through the mine portal (Figure 9).



Figure 8. The location of the Lucerne 3A Discharge origination point pre-excitation.



Figure 9. The pipe exiting the Lucerne 3A Mine Portal, the true origination point.

The second task was to excavate into the mine to investigate the source of the discharge flow and to figure out whether the discharge elevation could be easily increased in anyway to ease the AMD treatment system construction outside the mine portal. A lack in elevation from the discharge to Two Lick Creek was a slight problem.

First, it was found that the discharge water was not emanating from the Lucerne 3A Mine, but from the Two Lick Valley Mine (AKA the Campbell Mine). The Lucerne 3A and the Campbell Mine are on the same seam of coal, but were mined in different directions, the Lucerne 3A generally westward, the Campbell Mine generally northeastward (Figure 10 and 11). The discharge water was found to be exiting the upslope Campbell Mine.

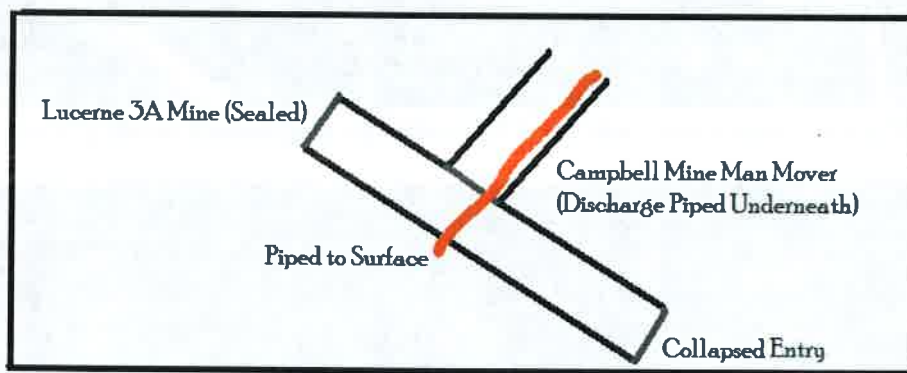


Figure 10. Schematic of the Lucerne 3A and Campbell Mine entries.

Second, by inserting a six inch pipe and tire inner tube into the pipe exiting the Campbell Mine, the discharge elevation was able to be increased about thirty inches before the pipe exiting the Campbell Mine began to leak into other areas. With the Campbell Mine being upslope at a sharp incline, a better conceptual plan to increase the elevation of the “Lucerne 3A Discharge” was devised. This will be discussed in more detail in the AMD Conceptual Plan section of this report.



Figure 11. The “Lucerne 3A Mine Discharge” exiting the Campbell Mine and piped underneath the man mover to surface.

AMD Conceptual Design

At first, a typical vertical flow wetland (VFW) treatment system was conceptualized for the “Lucerne 3A Discharge.” After discussions with numerous experts, including Dr. Robert Hedin of Hedin Environmental and Jon Smoyer, PA DEP Bureau of Abandoned Mine Reclamation Geologist, it was decided to investigate other possible treatment technologies since the adverse water quality (elevated ferric iron and total aluminum) of the “Lucerne 3A Mine Discharge” may short-circuit a typical VFW.

After extensive review, the Environmental Dosers International’s Water Operated Lime Doser was selected as the most practical technique to treat the adverse water quality of the “Lucerne 3A Mine Discharge.” A report documenting the installation of this type of doser at another site is attached to this report.

After treatment with the Water Operated Lime Doser, the discharge will empty into a ~2.0 acre sediment pond to precipitate metals and then into a ~2.5 acre polishing wetland before exiting to Two Lick Creek (Figure 12).

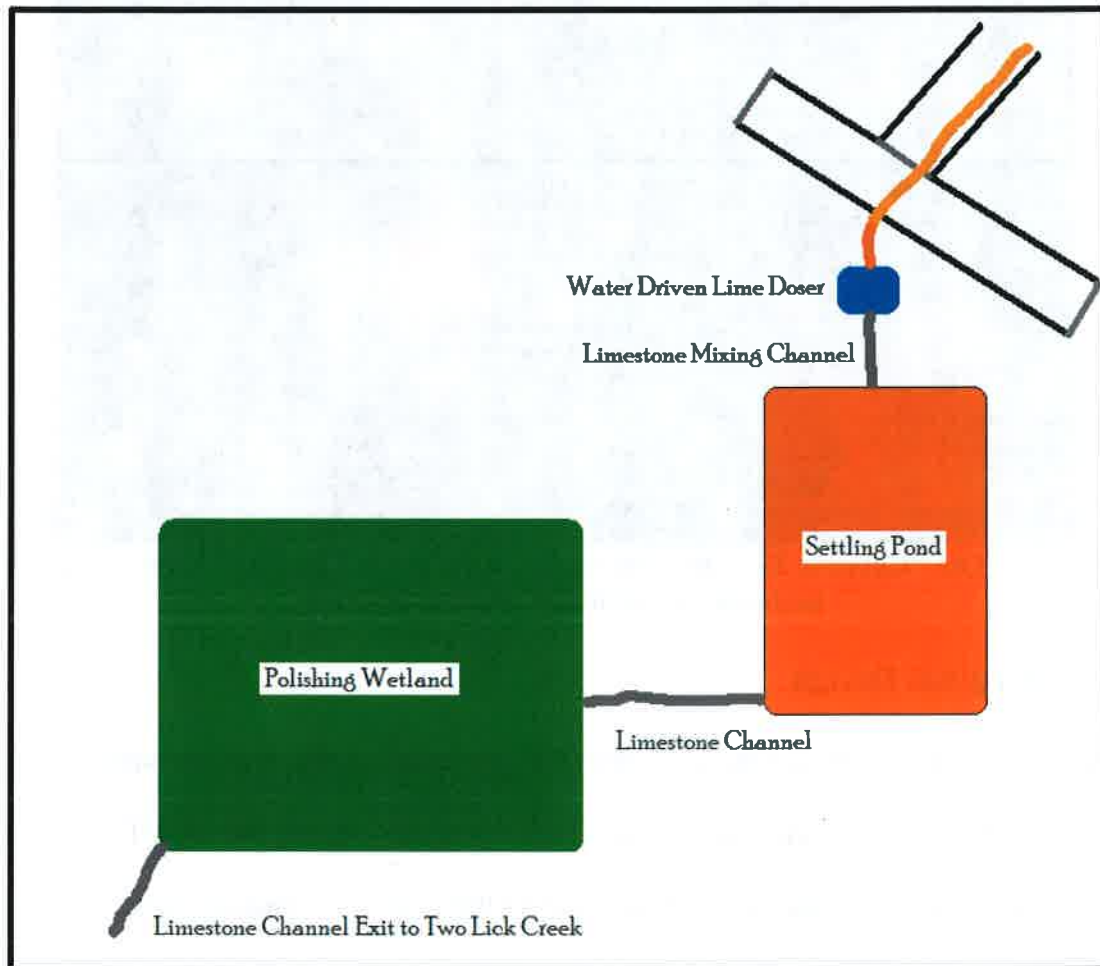


Figure 12. Conceptual design of the “Lucerne 3A” AMD Treatment System.

The issues with the discharge elevation at the surface will be remedied by the construction of a small weir inside the Campbell Mine that will back the discharge water to the desired surface elevation. This water will then be captured by pipe and exited to the surface and into the Water Driven Lime Doser for treatment (Figure 13).

The weir pipe should be sized to handle a maximum of 150 gallons/minute (GPM) of water. Excess water from the discharge when it is flowing more than 150 GPM, which is rare,

should be diverted into the settling pond as well. Treatment during these rare times may not be at desired levels, but Two Lick Creek will also be elevated in flow making impacts very minimal.



Figure 13. Profile of the technique that will be utilized to capture the “Lucerne 3A” Mine Discharge at the desired surface elevation.

Conclusion

The ICCD obtained a 2006 PA DEP Growing Greener Initiative Grant in the amount of \$193,000 to construct this treatment system. In addition, the ICCD also obtained a \$100,000 2006 Department of Conservation and Natural Resources Community Conservation Partnership Program Grant to construct an Indiana County Park surrounding the treatment system that will include, stream access, a canoe launch, a pavilion, a special needs and kids’ fishing area, a recreational trail and environmental and historical kiosks. Construction of the treatment system is slated for fall 2007. The construction of the Indiana County Park is slated for summer 2008.

