

## **PASSIVE TREATMENT SYSTEM FOR RELOCATED DISCHARGE T-5**

### **Project Summary**

Point T-5, a pumped degraded discharge on the River Hill Coal, Inc. McCloskey Mine (SMP17793044), is expected to become part of the post-mining subsurface flow regime of the proposed Reese Mine. The existing subsurface water at this proposed minesite is degraded and is monitored at Subchapter F points RR-33 and RR-41 which were established by combining numerous seeps. The receiving stream, Salt Lick Run, is also degraded and is monitored upgradient of these points under Subchapter F at RR-22. All three degraded discharges are considered to represent one hydrologic unit that will be impacted by the proposed mining.

To abate or eliminate the degraded drainage of T-5 and the Subchapter F points, the Reese mining plan proposes the continuation of the CFB coal ash capping operation, currently being conducted on the McCloskey Mine, and the incorporation of alkaline material into the backfill. Because of these and other practices, decreased loadings to Salt Lick Run are anticipated. If the loadings are increased, however, either because of the influence of T-5 and/or the mining operation, a passive system is proposed to treat the site drainage to conform with pre-mining Subchapter F baseline loading.

As all three Subchapter F monitoring points will be impacted and are hydrologically related, the proposed passive system has been designed to provide sufficient treatment to produce final drainage characteristics that will conform with the pre-mining Subchapter F data. Although base flow to RR-22 is to be encountered, the substantial variations in sulfate and metal concentrations indicate that this point is influenced by surface and near-surface flows. RR-22 data was therefore not included in the development of the design. RR-33 and RR-41 were combined and treated as a single discharge (RR-33/41) for the purposes of this evaluation. The design water chemistry and design flow for the conceptual passive treatment system are derived from the combined 95<sup>th</sup> percentile values for T-5 and RR-33/41 on a weighted basis. The quantity of limestone to be consumed is based on the design life of 15 years, combined average flow rate and the design water chemistry. Please note that using the 95<sup>th</sup> percentile concentration values with the average flow rate creates a "built-in" safety factor for the quantity of limestone consumed.

As this is a conservative system design, statistically significant excursions of the pre-mining Subchapter F baseline loading for the hydrologic unit, which includes all three Subchapter F monitoring points, are not anticipated based on the projected final system effluent quality of 6+ pH, alkalinity exceeding acidity, <6 mg/l iron, ~10 mg/l manganese, and <1 mg/l aluminum. Any flow in excess of the design flow will by-pass treatment and be diverted to confluence with the system effluent prior to entering the receiving stream.

The passive system would consist of the following components in series: collection system; Forebay (6,200 SF); Vertical Flow Pond (4100 T, 90% CCE, AASHTO#1, limestone aggregate); Settling Pond/Wetland (1 acre); Horizontal Flow Limestone Bed (3500 T, 90% CCE, AASHTO#1, limestone aggregate).

The selection of components and the sizing may be substantially changed, however, based on the post-mining discharge characteristics and the further development of passive treatment technology. In addition, the location of the components may be revised based on the local attitude of the coalbed seatearth and other setting considerations. The ~5-acre installation area will be graded as part of the mining plan to accommodate the system.

## Brief Outline of Conceptual Passive Treatment System

### Design Basis

As noted previously, the types of components and placement in the system were based on available data from 1994 to date. As alkaline addition and coal ash capping are to be part of the mining plan, the pre-mining conceptual design may be revised substantially based on the monitoring of post-mining drainage. The system installation is expected to be completed within a construction season (6 months). The following table identifies the selected design parameters:

Design Raw Water Parameters - 95<sup>th</sup> Percentile

Description	Flow (gpm)	pH	acidity		T. Fe		T. Mn		T. Al	
			mg/l	lb/day	mg/l	lb/day	mg/l	lb/day	mg/l	lb/day
RR-33/RR-41	206	3	606	1500	36	89	60	149	43	106
T-5	29	3	670	234	68	24	99	35	16	6
combined T-5; RR-33/RR-41	235	3	614	1734	40	113	65	184	40	112

T-5 (n = 26; 06/94 thru 06/02); RR-33 and RR-41 (n = 23; 09/97 thru 08/99); total aluminum concentration for T-5 from 6/27/02 sample analysis only; minimum lab pH used

### Passive Treatment Components

Collection System: After construction of the upland diversion, the collection ditches will be constructed at or near the toe of spoil in order to intercept as much subsurface flow as feasible. Prior to entering the Forebay, the flow will be conveyed to an inlet structure with a weir. Flows exceeding the design flow rate will by-pass the Forebay and be conveyed in a stabilized ditch to confluence with the final system effluent prior to entering the receiving stream.

Forebay: A 6200 SF pond will be constructed prior to the Vertical Flow Pond in order to allow settling of solids. The discharge from the Forebay will be conveyed directly to the Vertical Flow Pond.

Vertical Flow Pond: The Vertical Flow Pond will be constructed by placing geotextile along the bottom and sides to the elevation of the treatment media. A layer (½-foot in thickness) of bedding stone will be placed on the bottom and a tier of 4-inch, Sch40 PVC, perforated laterals with 6-inch, Sch40 PVC, solid headers installed directly on the bedding stone. Within the breastwork, adjustable risers will be plumbed onto the headers as the primary discharge. The headers will also be valved and extended through the breastwork in order to flush the system. This lower tier will be overlain by a two-foot thick layer of 90% CCE, AASHTO#1, limestone aggregate. Another tier of piping will be installed as described above, and a second, two-foot thick layer of limestone aggregate will be placed. The total quantity of limestone aggregate is 4100 tons. The limestone aggregate will then be overlain by a ½-foot thick layer of spent mushroom compost. A two-foot thick water cap will overlay the compost. This component is expected to neutralize the proton acidity as well as the mineral acidity associated with formation of aluminum solids. Additional alkalinity will be generated and some iron solids will be retained.

Settling Pond/Wetland: A 1-acre Settling Pond/Wetland is to follow the Vertical Flow Pond. At the inlet, the pond will be deeper to function as a Settling Pond. The shallow water area near the outlet will function as an Aerobic Wetland and vegetated appropriately. This structure will encourage the formation and settling of iron solids. The alkalinity generated by the Vertical Flow Pond is expected to be sufficient to neutralize the acidity associated with iron hydrolysis. The wetland discharge will be conveyed by rock-lined spillway to the Horizontal Flow Limestone Bed.

Horizontal Flow Limestone Bed: The Horizontal Flow Limestone Bed will consist of a geotextile-lined excavation containing 3500 tons of 90% CCE, AASHTO#1, limestone aggregate. A manifold system constructed at the base along the outlet end of the facility will intercept the flow. Discharge will be to a rock-lined channel that will confluence with the by-pass channel that is anticipated to be dry except during high-flow events. The final effluent is expected to be 6+ pH, alkalinity exceeding acidity, <6 mg/l iron, ~10 mg/l manganese, and <1 mg/l aluminum.

#### Measurable Environmental Results

With the removal of about 300 tons of acidity and 70 tons of metals annually, two miles of Salt Lick Run to its confluence with the West Branch of the Susquehanna River is expected to be significantly improved. In addition, by directing the flow associated with T-5 into the previously degraded Salt Lick Run, Upper Three Runs is expected to retain the current good water quality.