

Abatement Alternatives

1. Surface Mine and Coal Fines Washery Reclamation.

Two alternatives are recommended here. The first alternative involves backfilling to approximate original contour, installation of continuous upgradient diversion facilities, and revegetation. This will minimize surface water degradation effects by:

- a. Diversion of a substantial portion of current runoff which enters the pit from above the highwall.
- b. Promotion of rapid runoff, by backfilling and regrading, minimizing contact time with toxic spoil.
- c. Promotion of evapotranspiration by revegetation efforts over the site.
- d. Minimization of off-site erosion and sedimentation effects by establishing ground cover and root development.

Additionally, this abatement alternative will reduce the polluttional effects to the groundwater systems by:

- a. Covering potentially toxic spoil to minimize contact with oxygen, reducing the generation of acidity and subsequent leaching of metal s.
- b. Minimizing the infiltration to groundwater systems through backfilling. Backfilling reduces the available infiltration component by promoting rapid runoff.
- c. Elimination or reduction of flow fraill the surface impoundments through the coal barrier and into the mines. This should be achieved by proper, possibly extraordinary, compaction efforts during backfilling along the highwall.

A detailed work cost estimate has been prepared for this option (See page 95 of this report), - Option A.

The second option involves an extension of the first option to include placement of a compacted, twelve (12) inch clay liner over the site. The purpose of the clay liner is described below:

- a. Further reduce the infiltration potential, by restricting downward movement of soil water.
- b. Eliminate or greatly reduce the influx of oxygen into the subsurface, removing the potential for oxidation of potentially acidic spoils, thereby minimizing the production of acidity and subsequent leaching of metals.

The drawbacks associated with the placement of a clay liner are:

- a. If the operator or contractor fails to segregate sufficient soils material prior to placement of the liner, then the liner may act as a barrier to normal root development and inhibit revegetation efforts.
- b. The reduction of infiltration potential may cause saturation to occur with abnormally high recurrence frequencies, thereby limiting revegetation species.
- c. The slopes may have a tendency towards failure (slips) due to extended saturation during high intensity, long duration storms.

A detailed work cost estimate has been prepared for this option (See page 95 of this report) - Option B.

2. Flowing Artesian Well Reclamation

Only one proposal is presented for additional work at the flowing artesian well (Big Bertha), as the alternative is to allow the present setup to continue. The proposed reclamation involves the extension of the steel casing to 100' depth with the annular space between the casing and the strata grouted. This would eliminate the recharge from the remaining polluted aquifer currently recharging Big Bertha. The positive effects of this alternative are:

- a. The isolation of the remaining polluted aquifer from recharging the well will result in an alkaline discharge of good pH to Slippery Rock Creek.
- D. A marked reduction in total iron loadings to Slippery Rock Creek will occur.

A detailed work cost estimate has been prepared for this option (See page 95 of this report) - Option C.

A. WORK COST ESTIMATE - BACKFILL OPTION

<u>Item</u>	<u>Description</u>	<u>Estimated</u>		<u>Unit Cost</u>	<u>Total Cost</u>
		<u>Quantities & Units</u>			
1.	Mobilization/Demobilization	--	JOB	\$ 2,000.00	\$ 2,000.00
2.	Site Preparation	--	JOB	3,000.00	3,000.00
3.	Diversion Ditches	3,200	L.F.	2.00	6,400.00
4.	Earth Backfill	45,000	C.Y.	1.00	45,000.00
6.	Soil Treatment/Planting	27.9	Acres	1,000.00	\$ 27,900.00
TOTAL ESTIMATED COST					\$ 84,300.00

B. WORK COST ESTIMATE - CLAY LINER OPTION

<u>Item</u>	<u>Description</u>	<u>Estimated</u>		<u>Unit Cost</u>	<u>Total Cost</u>
		<u>Quantities & Units</u>			
1.	Mobilization/Demobilization	--	JOB	\$ 2,000.00	\$ 2,000.00
2.	Site Preparation	--	JOB	3,000.00	3,000.00
3.	Diversion Ditches	3,200	L.F.	2.00	6,400.00
4.	Earth Backfill	92,000	C.Y.	0.80	73,600.00
5.	12" Clay Liner	45,000	C.Y.	1.50	67,500.00
6.	Soil Treatment/Planting	27.9	Acres	1,000.00	\$ 27,900.00
TOTAL ESTIMATED COST					\$180,400.00

C. WORK COST ESTIMATE - PARTIAL WELL CLOSURE

<u>Item</u>	<u>Description</u>	<u>Estimated</u>		<u>Unit Cost</u>	<u>Total Cost</u>
		<u>Quantities & Units</u>			
1.	Mobilization/Demobilization	--	JOB	\$ 5,000.00	\$ 5,000.00
2.	Casing Placement	105	L.F.	20.00	2,200.00
3.	Pressure Grouting	10	C.F.	40.00	400.00
TOTAL ESTIMATED COST					\$ 7,600.00