SECTION V

ABATEMENT COSTS

RECOMMENDED VERSUS ALTERNATIVE SCHEMES

5.0 ABATEMENT' COST COMPARISONS

The recommended and alternative abatement schemes discussed in Sections III and IV can be weighed with respect to common benefits: the unit cost of preventing the acid and iron from entering the watercourse. It should be noted that land-oriented costs have been omitted from the cost estimates. Included in this category would be (a) treatment plant right-of-way (b) raw AMD pipeline easements such as would be required in practically all of the recommended schemes and (c) deep mine sludge disposal conduit easements. Although these costs might constitute less then 3% of the total capital cost, they are dependent on the total required acreage and the general locale of the facility, variables that cannot be equitably accounted for when the unit abatement costs are compared.

5.1 EXPORT-DELMONT AREA

5.1.1 Recommended Schemes

Sections 3.1 and 3.2 describe how the pollution loads emitted by the Export and Delmont discharges would be removed from the headwaters of Turtle Creek: by allowing the acid mine water to be absorbed by the Irwin Syncline basin mine pool.

EXPORT DISCHARGE (re: Section 3.1)

Total Capital Cost $273,250 Average flow 1.14 MGD

Total Capital Cost amortized at 7% over 20 year period	$ 25,790
Operation and maintenance costs (consists mainly of power to operate delivery pumps)	12,000
Total Annual Cost	$ 37,790

Average pollution loads (from Appendix A)

Iron: 257 pounds per day
Acid (net): 4172 pounds per day

Unit removal costs

Iron: $\frac{\$37,790}{257\#/day \times 365} = \$0.40/lb.$

Acid: $\frac{\$37,790}{4172\#/day \times 365} = \$0.03/lb.$

DELMONT DISCHARGE (re: Section 3.2)

If only the cost of redirecting the Delmont discharge into the basin pool is considered the following unit removal costs result:

Total Capital Cost $ 72,110 Average flow 1.13 MGD

Total Capital Cost amortized at 7% over 20 years.....	$ 6,800
Operation and maintenance costs (consists of daily operation checks; minimal power req.'s).....	3,000
Total Annual Cost	$ 9,800

Average pollution loads

Iron: 283 pounds per day
Acid (net): 1310 pounds per day

Unit removal costs

Iron: $\frac{\$9,800}{283\ \#/\ day \times 365} = \$0.10/lb.$

Acid: $\frac{\$9,800}{1310\ \#/day \times 365} = \$0.02/lb.$

However, Section 3.2.1 further recommends that the TR-1 discharge in the Thorn Run watershed be investigated to determine if it can be redirected into the Delmont mine. It is estimated that the total cost of exploratory excavation and related subsurface work is $100,000. Thus the unit pollution load removal costs become:

Total Capital Cost $72,110 + 100,000 = $172,110

Total Capital Cost of $172,110 amortized @ 7%/20 years.....	$16,245
Same operation and maintenance costs.....	3,000
Total Cost	$19,245

Average pollution loads

Iron: 283 pounds per day + 43 pounds per day (TR-1 discharge, re: Section 6.2)

Acid (net): 1310 pounds per day + 400 pounds per day (TR-1)

Unit removal costs:

Iron: $\frac{\$19,245}{(283+43)\ \#/day \times 365}$ = \$0.16/lb. vs. \$0.10 for Delmont alone

Acid: $\frac{\$19,245}{(1310 + 400)\ \#/day \times 365}$ = \$0.03/lb. vs. \$0.02

5.1.2 ALTERNATE SCHEMES (re: Section 4.3)

A. Convey Export discharge to basin pool via No. 2 Export mine main.

Total Capital Cost	\$205,000	
Capital Cost @ 7%/20 yr.....		\$ 19,350
Operation and Maintenance (at 75% of recommended scheme O/M).....		9,000
	Total Annual Cost	\$ 28,350

Unit removal costs:

Iron: $\frac{\$28,350}{257\ \#/day \times 365}$ = \$0.30/lb.

Acid: $\frac{\$28,350}{4172\ \#/day \times 365}$ = \$0.02/lb.

B. Combined treatment of Export and Delmont discharges

Total Capital Cost	\$1,500,000	
Total Capital Cost @ 7%/20 year.....		\$141,590
Operation and Maintenance (based on \$0.25 per 1000 gallons treated and average combined discharge flow rate of 2.27 MGD).....		207,140
	Total Annual Cost	\$348,730

Average combined pollution loads

Iron: 540 pounds per day
Acid (net): 5482 pounds per day

Unit removal costs:

Iron: $\frac{\$348,730}{540\ \#/day \times 365}$ = \$1.77/lb.

Acid: $\frac{\$348,730}{5482\ \#/day \times 365}$ = \$0.17/lb.

C. Treatment of Delmont discharge alone . . . as an indicator
(has higher unit removal costs than Export)

Total Capital Cost	$1,074,000	
Total Capital Cost @ 7%/20 yr.....		$101,380
Operation & maintenance (based on $0.25 per 1000 gallons treated and average flow of 1.13 MGD.....		103,110
	Total Annual Cost	$204,490

Unit removal costs:

Iron: $\frac{\$204,490}{283\ \#/day \times 365} = \$1.98/lb.$

Acid: $\frac{\$204,490}{1310\ \#/day \times 365} = \$0.43/lb.$

This could be implemented in conjunction with the recommended scheme at Export.

D. Combined treatment of acid mine drainage and sewage. No realistic figures available.

5.2 LOWER IRWIN SYNCLINE BASIN AREA

5.2.1 Recommended Schemes

IRWIN-COAL RUN COMBINED TREATMENT FACILITY (re: Section 3.3)

Total Capital Cost $4,200,000 Average flow 12.0 MGD

Total Capital Cost at 7%/20 years.....	$ 396,467
Operation and maintenance (based on $0.25 per 1000 gallons treated and average flow of 12.0 MGD).....	1,095,000
Total Annual Cost	$ 1,491,467

Average combined pollution loads:

Iron: 11,896 pounds per day

Acid (net): 25,765 pounds per day

Unit removal costs:

Iron: $\frac{\$1,491,467}{11,896\ \#/day \times 365} = \$0.34/lb.$

Acid: $\frac{\$1,491,467}{25,765\ \#/day \times 365} = \$0.16/lb.$

MARCHAND DISCHARGE TREATMENT (re: Section 3.4)

Total Capital Cost $1,200,000 Average flow 2.75 MGD

Total Capital Cost @ 7%/20 years.....	$113,250
Operation and maintenance ($0.25/1000 gal.).....	250,938
Total Annual Cost	$364,188

Average pollution loads:

Iron: 4504 pounds per day
Acid (net): 2482 pounds per day

Unit removal costs:

Iron: $\frac{\$364,188}{4504\ \#/day \times 365} = \$0.22/lb.$

Acid: $\frac{\$364,188}{2482\ \#/day \times 365} = \$0.40/lb.$

UPPER AND LOWER GUFFEY STATION DISCHARGES
COMBINED TREATMENT (re: Section 3.5)

Total Capital Cost $1,600,000 Average flow: 3.6 MGD

Total Capital Cost at 7%/20 years.....	$ 151,030
Operation and maintenance (25/1000 gallons).....	328,500
Total Annual Cost	$ 479,530

Average pollution loads

Iron: 1711 pounds per day
Acid: -673 pounds per day (alkaline)

Unit removal costs

Iron only: $\frac{\$479,530}{1711\ \#/day \times 365} = \$0.77/lb.$

5.2.2 Alternate Schemes

A. Centralized Pump Scheme (re: Section 4.1)

BIDDLE SITE (re: Table B, Section 4.1)

Total Capital Cost $4,200,000

Total Capital Costs @ 7% over 20 years	$ 396,467
Amortization of Pump costs	31,245
Operation and maintenance	876,000
Total Annual Cost	$1,303,712

Average pollution loads (Irwin & Coal Run)

Iron: 11,896 pounds/day
Acid: 25,765 pounds/day

Unit removal costs:

Iron: $\frac{\$1,303,712}{11,896 \times 365} = \$0.30/lb.$

Acid: $\frac{\$1,303,712}{25,765 \times 365} = \$0.14/lb.$

AIR SHAFT 2ND NORTH (re: Table B)

Total Capital Cost $1,200,000
Total Capital Costs @ 7%/20 ..... $ 113,250

Operation & Maintenance ($0.20 per 1000/gal) 200,750

Total Annual Cost $ 314,000

Unit removal costs:

Iron: $\frac{\$314,000}{4504 \times 365} = \$0.19/lb.$

Acid: $\frac{\$314,000}{2482 \times 365} = \$0.35/lb.$

B. Treatment of Irwin Discharge Individually (re: Section 4.2)

Total Capital Cost $3,600,000 Average Flow 11.16 MGD
Total Capital Cost at 7%/20 years ..... $ 339,815

Operation and maintenance (25/1000 gal.)..... 1,018,350

Total Annual Cost $1,358,165

Unit removal costs:

Iron.: $\frac{\$1,358,165}{11,718 \times 365} = \$0.32/1b.$

Acid: $\frac{\$1,358,165}{26,040 \times 365} = \$0.14/lb.$

C. Delivery of Coal Run Discharge via Penn Shaft (re: Section 4.2)

Total Capital Cost $5,000,000 Average Combined Flow 12.0 MGD

Total Capital Cost at 7%/20 years	$ 471,965
Operation and maintenance @ 250/1000 gallons.....	1,095,000
Total Annual Cost	$1,566,965

Unit removal costs (same pollution loads as Irwin-Coal Run Combined Treatment)

Iron: $\frac{\$1,566,965}{11,896\ \#/day \times 365} = \$0.36/lb.$

Acid: $\frac{\$1,566,965}{25,765\ \#/day \times 365} = \$0.17/lb.$

D. Upper and Lower Guffey and Marchand Combined Treatment (re: Section 4.2)

Total Capital Cost $2,500,000 Average Flow 6.38 MGD

Total Capital Cost at 7%/20 years	$ 235,983
Operation and Maintenance @ 25/1000 gallons treated (6.38 MGD)	582,175
Total Annual Cost	$ 818,158

Average pollution loads:

Iron: 4504 + 1001 + 710 = 6215 pounds per day

Acid (net): 2482 - 363 - 310 = 1809 pounds per day

Unit removal costs:

Iron: $\frac{\$818,158}{6215 \times 365} = \$0.36/lb.$

Acid: $\frac{\$818,158}{1809 \times 365} = \$1.24/lb.$

5.3 DISCUSSION

The economics support the recommended scheme. This is obvious regarding the Delmont and Export discharges. The simple conveyance schemes, whereby the Export and Delmont discharges (including the TR-1 discharge from Thorn Run) are added to the Irwin syncline pool, are substantially less expensive than a neutralization-oxidation facility. Regardless of the route dictated by the exploratory excavation for the Export discharge, the unit abatement costs are still about one-third of those for treatment. Treatment of only one discharge results in even higher costs as demonstrated by the Delmont discharge.

In the lower basin area, the unit abatement costs for the recommended scheme are comparable to those of the alternatives, with the exception of treating the Guffey Station and Marchand discharges jointly. In that case the net alkaline Guffey discharges have a neutralizing effect on Marchand, resulting in a lowered net acid load, in turn generating higher unit costs for about the same capital expenditure. (In the recommended scheme, a unit cost for acid removal at the Guffey Station facility is not given since, in the long term, the AMD is net alkaline) The recommended scheme, in this case, does not require a total commitment to treating the Marchand AND Guffey Station discharges as one project.

The recommended scheme outlined in Section III is favored primarily because of the technical aspects. Versus the centralized pump scheme the use of individual treatment facilities forgoes the year long experimental pump tests. In addition the recommended scheme can be implemented more readily. With the current inflation rate, continued delays in initiating design and construction contracts are unwarranted.