Scheme "A" - Individual Plants

This approach has certain possibilities since all of the active operations have controlled discharges and as such can be coupled to small lime neutralization package plants. Operation of these plants can be geared to the schedule of operations for each mine. Those with continuous discharges could be set up to operate continuously. Plants for mining operations with intermittent discharges could be controlled by the operation of the pumping facilities. The problems of sludge disposal could be satisfied by dissipation in the outfall trench of a small lagoon at each site prior to entry into the main stream. In almost all cases the mine water discharges are sufficiently remote from the main streams to allow this dissipation construction. This procedure, however, does not provide for treatment of three (3) major sources of acid water being carried by Rausch Creek:

1) Orchard Airway & Borehole	1.1 mgd
2) Valley View Tunnel	2.2 mgd
3) Markson Columnway & Buck Mountain Drift	1.8 mgd

Another problem presented by this procedure would be that of "policing", since all plants would have to provide the treated quality of water required at all times in order to prevent a shock loading of the main stream. With twenty-eight (28) individual plants operating or irregular schedules with inexperienced operating and maintenance personnel, the problem of policing could reach major proportions.

Of the twenty-eight (28) active operations in the watershed area, they could be broken down into two (2) categories based upon daily flow and lime treatment needed:

Group (1) Plants

discharge less than 100,000 gpd

(a) 10 active operators

Group (2) Plants

Discharge greater than 100,000 gpd

(b) 10 active operators

Plant Description

Schemes "A" & "B"

For the purposes of estimating constructional and operational costs of the treatment plants required, they are segregated into groups based upon daily lime feed requirements, as follows:

Group	Size*	Number Required	Scheme
1	0 to 200 lbs./day	10	"A"
2	200 to 500 lbs./day	18	"A"
4	1,000 to 1,500 lbs./day	1	"A" & "B"
5	1,500 to 2,000 lbs./day	2 & 4	"A" & "B"

*Based on daily lime feed requirements.

Cost Estimate for Plants in Schemes "A" & "B"

Description	Group 1	Group 2	Group 4	Group 5
Site Work	$ 3,000	$ 5,000	$ 7,500	$10,000
Flash Mixer	2,000	3,000	5,000	8,000
Lime Storage	4,000	6,000	15,500	18,000
Lime Feeder	5,000	10,000	20,000	25,000
Clarifier or Lagoon	Not Required	5,000	40,000	75,000
Sludge Lagoon	Not Required	Not Required	5,000	8,000
Piping	2,000	6,000	15,000	25,000
Electrical	2,500	5,000	50,000	65,000
Control Building	Not Required	5,000	25,000	40,000
Misc. Equipment	1,000	1,500	7,500	10,000
	$ 19,500	$46,500	$190,500	$284,000

Construction Cost Estimate

Scheme "A"

10 Group 1 Plants @	$ 19,500	$ 195,000
18 Group 2 Plants @	46,500	837,000
1 Group 4 Plant		190,500
2 Group 5 Plants @	284,000	568,000
Total Plant Construction		$1,790,500
Site Acquisition		24,000
		$1,814,500

Conduit from Markson Columnway
& Buck Mountain Drift to Plant Site

A. Right-of-Way - 4,000 feet	$5,000	
B. Headworks	10,000	
C. Conduit - 4,000 feet	80,000	
Total		$ 95,000
Total Construction Costs		$1,909,500
Contingency (10%)		190,950
		$2,100,450
Engineering & Supervision		236,000
		$2,336,450
Policing Operations*		25,000
Total		$2,361,450

This plan does not include provision for iron removal. In the case of the smaller plants in Group 1 and 2, the iron sludge would be deposited on the stream bed.

*Annual Cost of Policing Individual Operations

Salaries		
2 Inspectors @ $8,000	$16,000	
Fringe Benefits	4,000	$ 20,000
Transportation		
2 Cars @ $2,000		4,000
Miscellaneous		
Lab Equipment & Supplies	$ 500	
Administrative Supplies	500	$ 1,000
TOTAL		$ 25,000

Operational Costs - Scheme "A"

The costs to the Commonwealth for operating plants at the Orchard Airway at the Valley View Tunnel, and at the site 4,000 feet north of the Gap in Bear Mountain would be as follows:

I. Salaries			
A. Superintendent	$ 12,000		
B. operators	27,000		
C. Laborers	21,000		
		$ 60,000	
D. Fringe Benefits (25%)		15,000	
		$ 75,000	
II. Electrical			
A. Pumping	$ 2,000		
B. Treatment Plants	10,000		
C. Misc.Plant Power	1,000		
		$ 13,000	
III. Chemicals			
A. Lime (av. requirements @ ll5 tons/day @ $20.00 per ton - $30.00/day)			$ 10,800
IV. Fuel			
A. Building Heat			$ 1,500

V. Transportation

A. One Car & One Pickup	$ 4,000	
B. Sludge Hauling	40,000	
		$ 44,000

VI. Miscellaneous

A. Telephone	$ 250	
B. Laboratory Supplies	2,000	
C. Administrative Supplies	750	
D. Repairs	6,000	
E. Tools & Supplies	3,000	
F. Insurance	1,500	
		$ 13,500

Recapitulation of Annual Operation & Maintenance Costs:

I.	Salaries	$ 75,000
II.	Electrical	13,000
III.	Chemicals	10,800
IV.	Fuels	1,500
V.	Transportation	44,000
VI.	Miscellaneous	13,500
	TOTAL	$ 157,800

Total Estimated Costs For $cheme "A"

Construction Costs (1)		$ 2,100,450
Engineering & Supervision		236,000
Total Project Cost		$ 2,336,450
Debt Service @ 6% Interest for 40 Years Amortization	$155,100	
Operating & Maintenance (2)	157,800	
Total Annual Expense (3)		$ 312,900

(1) Includes costs of construction of twenty-eight (28) plants for individual operations and three (3) plants for abandoned operations.

(2) Does not include costs of operations of twenty-eight (28) individual plants.

(3) Does not include annual cost of "policing" individual operations.

Scheme "B"

Strategically Located Plantson each Branch of Rausch Creek

This approach to the treatment:, problem could effect a savings in chemicals since the combination of lime and limestone, which is not feasible in package plant treatment, can be utilized. This plan would locate a plant on the West Branch of Rausch Creek approximately 3,000 feet west of the junction with the East Branch of Rausch Creek, a plant at the Valley View Tunnel, a plant just south of the Orchard Airway and a plant approximately 1.3 miles east of the gap in Bear Mountain. Another plant would also have to be built to treat the flows from the Markson Columnway and Buck Mountain Drift.

Due to the topography of the area, the construction of the plant needed in the gap in Bear Mountain would be physically impossible. The area required for sludge removal equipment, consisting of a large clariflocculator tank and a thickener tank, is not readily available. The flow from the Markson Columnway and the Buck Mountain Drift would have to be conduited, approximately 4,000 feet, to a site downstream, in a northerly direction. Neutralization of these flows is possible at the discharge points, but the area required

for sludge removal facilities is not available at those points. The sludge accumulated, if not separated, would be deposited in the stream bed and thus contaminate the stream as a home for aquatic life.

Another factor against this approach would be the circumstances involved in the acquisition of a site and construction of the plant indicated for treatment of the Valley View Tunnel discharge. This plant would have to be constructed upon the Legal Coal Company property, the site of their breaker and preparation plant, and this would create two (2) problems. The breaker operation utilizes most of the area, and, secondly, the company utilizes the mine water discharge from the Valley View Tunnel in its operations.

These factors are indications that this area would have to be taken by condemnation, and consequently, the costs of acquisition would be greatly increased.

Construction Cost Estimate

Scheme "B"

1 Group (4) Plant		$ 190,500
4 Group (5) Plants @ $284,00O		1,136,000
		$1,326,500
Conduit from Markson Columnway & Buck Mountain Drift to Plant Site		
A. Right-of-Way 4,000 feet	$5,000	
B. Headworks	10,000	
C. Conduit - 4,000 Feet	80,000	
		$ 95,000
Site Acquisition		$ 24,000
	TOTAL	$1,445,500
Contingency (10%)		144,550
		$1,590,050
Engineering & Supervision		236,000
		$1,826,050
Policing of twenty-eight (28) individual plants at the active operation_		25,000
		$1,851,050

As in Scheme "A" this plan does not provide for iron removal. Sludge removal will be accomplished by hauling as in Scheme "C".

COST OF OPERATION - SCHEME “B"

I. Salaries			
Superintedent	(1)	$ 12,000	
Operators	(5)	45,000	
Laborers	(5)	35,000	
			$ 92,000
Fringe Benefits (25%)			23,000
			$ 115,000
II. Electrical Work			
Pumping		$ 4,000	
Treatment Plants		15,000	
Miscellaneous Plant Power		2,000	
			$ 21,000
III. Chemicals			
Lime			
Av. requirements			
2.5 tons/day @ $20.00/ton:			
$50.00/day			$ 18,000
IV. Fuel			
Building Heat			$ 2,000
V. Transportation			
1 Car & 4 Pick-ups		$ 7,500	
Sludge Hauling		55,000	
			$ 62,500

VI. Miscellaneous

Telephone	$ 300	
Laboratory Supplies	2,500	
Administration Supplies	800	
Repairs	8,000	
Insurance	2,000	
		$ 17,600

Recapitulation:

Salaries		$ 115,000
Electrical		21,000
Chemical		18,000
Fuel		2,000
Transportation		62,500
Miscellaneous		17,600
	TOTAL	$ 236,100

Total Annual Expense for Strategically Located Plants -

Scheme "B"

Construction Cost	$1,326,500
Site Acquisition	24,000
Conduit from Markson Collumnway & Buck Mountain Drift	95,000
	$1,445,500
Contingency (10%)	144,550
	$1,590,050

Debt Service @ 6% Interest for 40 Years Amortization	$ 128,520
Operation & Maintenance	236,100
Total Annual Expense	$ 364,620
GRAND TOTAL	$1,954,670

Scheme "C"

Universal Plant

For the purpose at treating the entire flow of Rausch Creek with a single plant, the topography of the area approximately 4,000 feet north of the gap in Bear Mountain lends itself to this concept. At this point the entire runoff at the Rausch Creek Watershed could be intercepted and treated before its confluence with Pine Creek.

An intensive study has been carried out regarding this concept of one large plant treating the entire flow of Rausch creek. The data accumulated is as follows:

Flow records for a twelve (12) month period indicate that a single plant would necessitate a maximum flow-through capacity of twenty million gallons per day (20 mgd) with a minimum capacity of three million gallons per day (3 mgd). (See drawing 6805-P-5 in Appendix). The 20 mgd capacity is required only for sizing of piping and areas of restricted flow, since this peak flow has only been exceeded for three (3) days. A flow of seventeen million gallons per day (17 mgd) has only been exceeded nine days of the year during recording of flows. Complete treating

facilities should be designed for a flow of ten million gallons per day (10 mgd), with provisions for neutralization of any by-passed flow, While present records do not indicate peak flow chemical characteristics, it is reasonably safe to assume that the large flows are mainly attributable to surface run-off and as such offer enough dilution to prevent any shock loading downstream.

A series of pilot plant studies have been performed using the "Yellow Boy" trailer of the Department of Mines and Mineral Industries. This data has been compiled to determine the extent and type of treatment required to render an acceptable discharge to the receiving stream. (The tables of results appear in the Appendix).

It has been revealed through these studies that this stream will react favorably to neutralization and extension to a pH of 8.0+ for complete reduction of acidity and an iron reduction by aeration, well within acceptable limits. It is further noted, a manganese reduction occurs as an added side effect. The principal reagents used in these pilot studies were:

Hydrated Lime -- Commercial grade

Powdered Limestone

Mechanical Aeration

A Po1ymer, Garret-Callahan

Formula #74

The operating results of the three (3) sample runs are presented in Tables in the Appendix.

In the "Yellow Boy" operation limestone and lime were used to neutralize the acidity and increase the pH of the waters of Rausch Creek. First, they were used separately and then in combination. The results indicated better results with the use of lime only. In order to confirm this finding, a set of laboratory tests was performed. In the first test, limestone was used to raise the pH to 4.5, and then lime was used to raise the pH to 8.0+. The second test was performed using only lime to raise the pH to 8.0+.

The results are given in tables in the Appendix. Both lime and limestone solutions were of the same strength. It is evident that lime alone would be more economical than a combination of lime and limestone. Also, the quantity of limestone required to raise the pH to 4.5 was 4.7 times greater than the quantity of lime needed for the same purpose, whereas the cost of lime is only 2.5 times greater than the cost of limestone. The

quantity of sludge produced by limestone treatment was more than double the quantity produced by using lime alone. Because of these findings, it was decided that lime would be used in the treatment plant for neutralization. In addition to lime solution, a polyelectrolyte would be used for better settling of flocculants. The poly-electrolyte used was that of Garret-Callahan Formula #74.

Next, a comparison was made to check the advantages and disadvantages of using pebble lime or hydrated lime. The use of hydrated lime does not need any slaking equipment, thereby reducing the costs. But hydrated lime is more expensive and the operation of the lime feeder would be an intermittent process. Intermittent operation of this equipment under these feeding conditions is not recommended. On the other hand, the use of pebble lime involves the use of slaking equipment, but the operation is continuous and has a wider range of feeding possibilities. Also, the handling of pebble lime is much easier. In view of these facts, pebble lime was chosen for treatment of the waters of Rausch Creek. A schematic flow diagram of the treatment plant is shown in Drawing No. 6805-P-3 in the Appendix. The raw water would enter the flash mixer where it would then flow into the aeration tanks,

from there into the clariflocculator tanks where the coagulated solids would be separated. The supernatant will then flow into a large polishing lagoon and later enter the Creek. The sludge from the clariflocculating tanks would be pumped into a sludge thickener and then into a sludge holding pond before final disposal. A plot plan of the treatment plant along with the hydraulic profile of the plant is shown on Drawing No. 6805-P-4. The supernatant from the sludge thickener and a portion of the sludge from the clarifier are proposed to be recirculated into the aeration tanks for better stabilization.

COST ESTIMATES

In order to construct a manually operated plant with chemical (polymer) flocculation, the total estimated cost of the project was $997,200. Assuming an amortization period of forty (40) years, at a 6% rate of interest, the annual payment would be $66,300.

The cost of operating and maintaining the treatment plant, including the cost of sludge disposal, is estimated to be $255,475. per year. Therefore, the estimated total annual expense would be $321,775.

This amount would be required to treat 2.46 billion gallons of mine water (the total flow of Rausch Creek). The estimated cost of treating the mine waters would be at the rate of ten cents ($.10) per 1,000 gallons.

After discussion with the Department of Mines and Mineral Industries, it was determined that in order to reduce the total annual costs, the following should be enacted:

a. the plant size should be increased
b. the plant should be automated to reduce the labor force required for operations, and

c. the use of polymers as flocculating agents should be eliminated.

These changes are reflected in the detailed cost analyses. The actual cost of plant construction is $1,753,605. The cost of operation and maintenance of the treatment plant including sludge disposal is estimated to be $148,000. per year; i.e.,--$93,000. for operation and maintenance and $55,000. for sludge disposal. With debt service of $132,280., the total combined annual expense would. be $280,280. With a total yearly expense figure of $148,000 for operation and maintenance, the estimated costs for water treatment for individual operations can be found in the following tables. The costs are estimated on a pro-rata basis, calculated on percentages of total acid load Of all discharges.

Preliminary Construction Cost Estimate

Scheme "C"	
Site Work	$ 15,000.
Head Works	30,000.
Flash Mixer	12,000.
Aeration Tanks	50,000.
Clariflocculator Tanks	80,000.
Sludge Thickener	65,000.
Polishing Lagoon	75,000.
Sludge Holding Pond	10,000.
Chemical Storage facilities	40,000.
Chemical Feeders, S1akers, etc.	75,000.
Control Building	100,000.
Piping	50,000.
Roads & Landscaping	25,000.
Laboratory Equipment	15,000.
Miscellaneous	50,000.
	$ 692,000.
Contingencies	(10%) 69,200.
Engineering & Supervision	$ 236,000
TOTAL	$ 997,200.

Cost of Operation

Scheme "C"

I. Salaries

Superintendent (1)	$12,000.
Operators (5)	45,000.
Laborers (3)	21,000.
	$78,000.
Fringe _Benefits (25%)	19,500.
	$97,500.

II. Electrical

Pumping	$ 5,000.
Treatment Plant	15,000.
Miscellaneous Plant Power	2,000.
	$22,000.

III. Chemicals

Lime = @ 0.33 g./gal. of water

Av. Requirement = 2.5 tons/day

@ $20.00/ton = $50.00/day

for one_ year $18,250.

Polymer = 8 x 10^{-4} oz./gal. water

Av. requirement = 338 lbs./day

@ $0.34/lb. = $115.00 per day

or for one year: $41,975.

IV. Fuel		
Building heat		$ 1,000.
V. Transportation		
Pickups (2) and Car (1)	$5,000.	
Sludge Hauling	55,000.	
		$60,000.
VI. Miscellaneous		
Telephone	$ 250.	
Laboratory Supplies	2,500.	
Administrative Supplies	1,000.	
Repairs	6,000.	
Tools & Supplies	4,000.	
Insurance	1,000.	
		$14,750.
TOTAL		$255,475.

Total Annual Expense

Scheme "C"

Construction Cost		$ 761,200.
Engineering & Supervision		236,000.
		$997,200.
Debt Service @ 6% Interest for 40 Year Amortization	$66,300.	
Operationn & Maintenance		255,475.
Total Annual Expense		$321,775.

Comparative Total Annual Expenses

Preliminary vs. Final

	Preliminary	Final
Construction Costs	$ 761,200.	$ 1,753,605.*
Engineering & Supervision	236,000.	242,000.
Total Project Costs	$ 997,200.	$ 1,995,605.
Debt Service @ 6% Interest for 40 Years Amortization	$ 66,300.	$ 132,280.
Operation & Maintenance (without sludge disposal)	199,700.	93,000.
Sludge Disposal	55,000,	55,000.
Total Annual Expense	$ 321,775.	$ 280,280.

*Total of three (3) contracts:

1)	General	$ 1,589,000.
2)	Electrical	$ 159,947.
3)	Water Supply	$ 4,658.
	Total	$ 1,753,605.

COST SUMMARY FOR SCHEME "C"
UNIVERSAL PLANT TREATMENT OF ACID MINE WATER
ACTIVE OPERATIONS

Number	Pollution Source or Name of Company	Tributary Stream	Acid Load lbs./day	Percent Contribution	Estimated Cost Per Year
S-5,	Koppenhaver Coal Co.	W. Branch Rausch Cr.	seeps into ground at wash1ine		------
S-7	Harner Coal Co.	do.	17	.14	$ 207.
S-8	S. & S. Coal Co.	do.	175	1.48	2,190.
S-9	B. & M. Tunnel	do.	69	.58	858.
S-12	Marby Coal Co.	do.	719	6.10	9.028.
S-15	Split Vein Coal Co.	do.	22	.19	281.
S-16	J. &. C. Coal Co.	do.	171	1.45	2,146.
S-17	Williamson Coal Co.	do.	85	.72	1,066.
S-20	Hatter Coal Co.	do	183	1.55	2,294.
S-25	Shade Coal Co.	do.	138	1.17	1,732.
S-28	Sweet Water Coal Co.	E.Branch Rausch Cr.	61	.52	1732.
S-29	Ney & Lehman Coal Co. #2	do.	23	.20	296.
S-30	Ney & Lehman Coal Co #1	do.	29	.25	370.
S-3l	Bush Coal Co.	do.	102	.87	1,288.
		Subtotals	l,794 lbs/day	15.22%	$22,526.

COST SUMMARY FOR SCHEME "C"
UNIVERSAL PLANT TREATMENT OF ACID MINE WATER
ACTIVE OPERATIONS

Number	Pollution Source or Name of Company	Tributary Stream	Acid Load lbs./day	Per Cent Contribution	Estimated Cost Per Year
S-32	Erdman Coal Co.	E. Branch Rausch Cr.	277	2.35	$ 3,478.
S-33	R. & K. Coal Co.	do.	237	2.01	2,975.
S-257	Harmon Coal Co.	Rausch Creek	221	1.88	2,782.
S-258	Goodspring Coal Co.	do.	---	not measurable	----
S-259	High Test Coal Co.	do.	12	.10	148.
S-261	Stahl Coal Co.	do.	124	1.05	1,554.
S-262	Stahl & Shade Coal Co.	do.	352	2.99	4,425.
S-263	R. & J. Coal Co.	do.	54	.46	68l.
S-265	S. & W. Coal Co.	do.	704	5.97	8,836.
S-266	Renninger & Partner	do.	---	not measurable	----
S-267	Clark Coal Co.	do.	170	1.44	2,13l.
S-13	White's Vein Coal Co.	Pine Creek	---	seeps into ground at wash line.	------
S-14	James Mace Coal Co.	do.	----	do.	---
S-2l	Number 4. Coal Co.	do.	----	do.	---
		Subtotal	2,151 lbs/day	18.25%	$ 27,010.
		TOTAL	3,945 lbs/day	33.47%	$ 49,536.

COST SUMMARY FOR SCHEME "C"
UNIVERSAL PLANT TREATMENT OF ACID MINE WATER
ABANDONED OPERATIONS

Number	Pollution Source or Name of Company	Tributary Stream	Acid Load lbs./day	Per Cent Contribution	Estimated Cost Per Year
S-4	Clark Coal Co.	W.Branch Rausch Cr.	------ sporadic flow to Harner Coal Co.(S-7)		
S-6	A. & J. Coal Co.	do.	do.		
S-11	M.A.C.C. Coal Co.	do.	------ non-contributing source ----		
S-18	Hoffman Coal Co.	do.	------ surface wash non-measurable -----		
S-19	Green Coal Co.	E.Branch Rausch Cr.	do.		
S-22	Buck Mt. Drift	Rausch Creek	1,436	12.19	$ 18,04l.
S-23	Shade Coal Co.	do.----------	surface wash non-measurable_ -----		
S-24	Erdman Co_ Co.	do.	60	.51	$ 755.
S-26	Markson Columnway	do.	2,325	19.73	29,200.
S-27	Valley View Tunnel	W.Branch Rausch Cr.	2,505	21.26	31,465.
S-34	Orchard North Dip Drift	E.Branch Rausch Cr.	-----	sealed at surface	-------
S-35	Diamond North Dip-Drift	do.		do.	
S-36	Diamond South Dip-- Dr£ft	do.		do.	
S-37	Goodspring Nac. 1 Borehole	do.	52	.44	651.
		Subtotals	6,378 lbs/day	54.13%	$80,112.

COST SUMMARY FOR SCHEME: "C"
UNIVERSAL PLANT TREATMENT OF ACID MINE WATER
ABANDONED OPERATIONS

Number	Pollution Source or Name of Company	Tributary Stream	Acid Load lbs./day	Per Cent Contribution	Estimated Cost Per Year
S-37A	Goodspring No.1 Airhole	E.Branch Rausch Cr.	1,06l	9.00	$ 13,320.
S-256	Anspack & Umbenhaver	Rausch Creek	----- not measurable		-----
S-260	Wilson Coal Co.	do.	401	3.40	5,032.
S-264	B. & C. Coal Co.	do.	-----	Green Coal Co.-(out of watershed)	
		Subtotals	1,462	12.40%	$ 18,352.
		TOTALS	7,840	66.53%	$ 98,464.
		Total of Active Operations	3,945 lbs./day	33.47%	$ 49,536.
		Total of Abandoned Operations	7,840	66.53%	98,464.
		TOTAL	11,785	100.00%	$ 148,000.

(Breakers)

42	Kocher Coal Co.*	E.Branch Rausch Cr.	750. gpm	1,080,000. gpd	
43	Legal Coal Co. **	Rausch Creek	670.8	976,000.	

*This operation uses water from the East Branch of Rausch Creek in its coal preparation processes therefore, treatment costs would have to be based upon consumption of acid mine waters used during operations only.

**This operation uses water from Valley Tunnel in its coal preparation processes, etc.

COST SUMMARY FOR SCHEME "C"
UNIVERSAL PLANT TREATMENT OF ACID MINE WATER
ACTIVE OPERATORS SHARE OF CONSTRUCTION COSTS

Number	Pollution Source or Name of Company	Tributary Stream	Acid Load lbs./day	Per Cent Contribution	Estimated Share of Construction Costs
S-5	Koppenhaver Coal Co.	W.Branch Rausch Cr.	seeps into ground at wash line		--------
S-7	Harner Coal Co.	do.	17	.14	$ 2,794.
S-8	S. & S. Coal Co.	do.	175	1.48	29,535.
S-9	B. & M. Tunnel	do.	69	.58	11,574.
S-12	Marby Coal Co.	do.	719	6.10	121,732.
S-15	Split Vein Coal Co.	do.	22	.19	3,791.
S-16	J. & C. Coal Co.	do.	171	1.45	28,936.
S-17	Williamson Coal Co.	do.	85	.72	14,368.
S-20	Hatter CoaI Co.	do.	183	1.55	30,932.
S-25	Shade Coal Co.	do.	138	1.17	23,348.
S-28	Sweet Water Coal Co.	E.Branch Rausch Cr.	61	.52	10,377.
S-29	Ney & Lehman Coal Co. #2	do.	23	.20	3,991.
S-30	Ney & Lehman Coal Co. #1	do.	29	.25	4,989.
S-31	Bush Coal Co.	do.	102	.87	17,362.
		Subtotals	1,794 lbs./day	15.22%	$ 303,729.

COST SUMMARY FOR SCHEME "C"
UNIVERSAL PLANT TREATMENT OF ACID MINE WATER
ACTIVE OPERATORS SHARE OF CONSTRUCTION COSTS

Number	Pollution Source or Name of Company	Tributary Stream	Acid Load lbs./day	Per Cent Contribution	Estimated Share of Construction Costs
S-32	Erdman Coal Co.	E.Branch Rausch Cr.	277	2.35	$ 46,897.
S-33	R. & K. Coal Co.	do.	237	2.01	40,112.
S-257	Harmon Coal Co.	Rausch Creek	221	1.88	37,517.
S-258	Goodspring Coal Co.	do.	-----	not measurable	------
S-259	High Test Coal Co.	do.	12	.10	1,996.
S-261	Stahl Coal Co.	do.	124	1.05	20,954.
S-262	Stahl & Shade Coal Co.	do.	352	2.99	59,668.
S-263	R. & J. Coal Co.	do.	54	.46	9,180.
S-265	S. & W. Coal Co.	do.	704	5.97	119,137.
S-266	Renninger & Partner	do.	---	not measurable	-----
S-267	Clark Coal Co.	do.	170	1.44	28,737.
S-13	White's Vein Coal Co.	Pine Creek	-------seeps into ground at wash line --		
S-14	James Mace Coal Co.	do.	----	do.	-----
S-21	Number 4 Coal Co.	do.	----	do.	-----
		Subtotal.	2,151 lbs./day 18.25%		$ 364,198.
		TOTALS.	3,945 lbs./day 33.47%		$ 667,927

COST SUMMARY FOR SCHEME "C"
UNIVERSAL PLANT TREATMENT OF ACID MINE WATER
ABANDONED_OPERATORS SHARE OF CONSTRUCTION COSTS

Number	Pollution Source or Name of Company	Tributary Stream	Acid Load lbs./day	Per. Cent Contribution	Estimated_Costs of Construction Costs
S-4	Clark Coal Co.	W.Branch Rausch Cr.	------- sporadic flow to Harner Coal Co. (S-7)		
S-6	A.& J. Coal Co.	do.	do		
S-11	M.A.C.C. Coal.Co.	do.	------- non-contributing source ------		
S-18	Hoffman Coal Co.	do._	------- surface wash non-measurable ------		
S-19	Green Coal Co.	_E. Branch Rausch Cr.	do.		
S-22	Buck Mt. Drift	Rausch Creek	1,436	12.19	$ 243,264.
S-23	Shade Coal Co.	do.	------- surface wash non-measurable -----		
S-24	Erdman Coal Co.	do.	60	.51	10,178.
S-26	Markson Columnway	do.	2,325	19.73	393,733.
S-27	Valley View Tunnel	W.Branch Rausch. Cr.	2,505	21.26	424,266.
S-34	Orchard North Dip Drift	E. Branch Rausch Cr.	---- Sealed at surface ----------		
S-35	Diamond North Dip Drift	do.	do.		
S-36	Diamond South Dip Drift	do.	do.		
S-37	Goodspring No.1 Borehole	do.	52	.44	8,781.
		Subtotals	6,378 lbs./day	54.13	1,080,222.

COST SUMMARY FOR SCHEME "C"
UNIVERSAL PLANT TREATMENT OF ACID MINE WATER
ABANDONED OPERATORS SHARE OF CONSTRUCTION COSTS_

Number	Pollution Source or Name of Company	Tributary Stream	Acid Load lbs./day	Per Cent Contribution	Estimated Share of Construction Costs
S-37A	Goodspring No.1 Airhole	E.Branch Rausch Cr.	1,061	9.00	$ 179,605.
S-256	Anspack & Umbenhaver	Rausch Creek	------	not measurable	----------
S-260	Wilson Coal Co.	do.	401	3.40	67,851.
S-264	B. & C. Coal Co.	do.	-------	Green Coal Co.-(out of watershed)--	
		Subtotals	1,462	12.40%	$ 247,456.
		TOTALS	7,840	66.53%	1,327,678.
(Breakers)					
42	Kocher Coal Co.	E. Branch Rausch Cr.	750. gpm	1,080,000. gpd	
43	Legal Coal Co.**	Rausch Creek	670.8	976,000. gpd	

*This operation uses water from the East Branch of Rausch creek in its coal preparation processes;_therefore, treatment costs would have to be based upon consumption of acid mine_ water used during operations only.

**This operation uses water from Valley View Tunnel in its coal preparation processes, etc.