2. Buck Run Watershed

a. General

Buck Run originates north of the village of Buck Run and the stream flows in a southerly direction for approximately 3.5 miles where it discharges into Two Lick Creek Proper near Clymer.

Total stream length including all tributaries is approximately 5.5 miles. The total area of the watershed is approximately 3.5 square miles.

b. Stream Condition

An analysis of mine drainage contamination within the watershed provides the following breakdown on stream condition.

Table 30

Stream Condition

Buck Run Watershed

Stream Classification	Stream Length Miles	Percent Total Stream Length
Non-Polluted	2.3	42
Severely Polluted	2.0	36
Moderately Polluted	1.2	12

Approximately 48 percent of the Buck Run Watershed is seriously degraded by mine drainage.

Plate 27 shows the location of sampling stations and the extent of spine drainage pollution within the various portions of the watershed.

c. Sampling Station Data

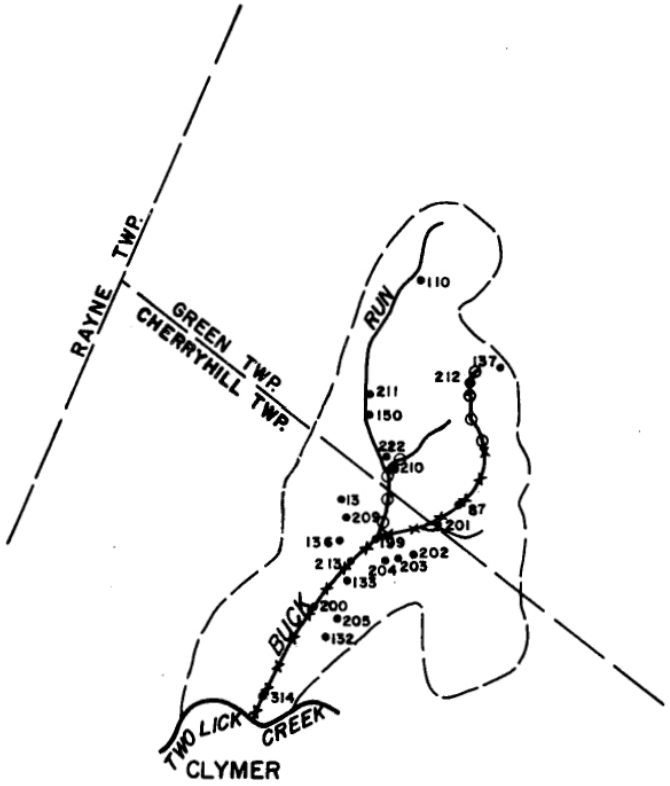
Twenty-two (22) sampling stations were installed and monitored. The minimums, maximums, and yearly averages of water quality data obtained from these stations are listed in Table 31 on Page 110.

Plate 28 graphically illustrates the monthly relationship between stream flow, pollution load, and weather elements within the watershed based on measurements taken at Sampling Station #314 located at the mouth of Buck Run.

Flow, pH levels, and pollution loads coincided throughout the study period with peaks occurring from December through April and lows during the fall.

BUCK RUN WATERSHED

WATERSHED AREA



LEGEND

- BUCK RUN DRAINING BASIN
- • SAMPLING STATION
- O MODERATELY ACID
- × SEVERELY ACID

½ 0 1 MILE

SCALE

MARCH 1970

PREPARED BY	TWO LICK CREEK MINE DRAINAGE POLLUTION ABATEMENT PROJECT	PREPARED FOR
L. ROBERT KIMBALL *Consulting Engineers* EBENSBURG, PENNSYLVANIA	INDIANA COUNTY, PENNSYLVANIA	PENNSYLVANIA DEPARTMENT OF MINES AND MINERAL INDUSTRIES

Table 31

Water Quality Data

Buck Run Watershed

Sampling Station	Flow GPM		pH Range	Acid Load Lbs./Day	Acidity Mg./L.		Iron Mg./L.		Sulfate Mg./L.	
314	Max.	5,130	2.6 - 4.9	7,777	Max.	1,580	Max.	631	Max.	3,000
	Min.	71			Min.	4	Min.	0	Min.	0
	Ave.	1,175			Ave.	549	Ave.	188	Ave.	1,283
222	Max.	7	3.9 - 4.8	8	Max.	290	Max.	2	Max.	875
	Min.	1			Min.	104	Min.	1	Min.	400
	Ave.	1			Ave.	143	Ave.	1	Ave.	618
213	Max.	1,530	3.9 - 5.1	1,094	Max.	180	Max.	25	Max.	900
	Min.	137			Min.	60	Min.	6	Min.	400
	Ave.	768			Ave.	118	Ave.	13	Ave.	713
212	Max.	108	3.8 - 5.3	18	Max.	100	Max.	10	Max.	961
	Min.	3			Min.	8	Min.	1	Min.	360
	Ave.	24			Ave.	64	Ave.	4	Ave.	726
211	Max.	23	3.3 - 4.0	33	Max.	2,000	Max.	825	Max.	6,000
	Min.	1			Min.	184	Min.	40	Min.	625
	Ave.	5			Ave.	539	Ave.	198	Ave.	1,543
210	Max.	21	3.8 - 4.7	5	Max.	76	Max.	1	Max.	812
	Min.	2			Min.	44	Min.	0.3	Min.	330
	Ave.	7			Ave.	60	Ave.	1	Ave.	633
209	Max.	6	3.9 - 4.5	2	Max.	98	Max.	5	Max.	900
	Min.	1			Min.	47	Min.	1	Min.	400
	Ave.	2			Ave.	63	Ave.	4	Ave.	529
205	Max.	61	3.2 - 3.9	45	Max.	1,680	Max.	180	Max.	4,500
	Min.	1			Min.	412	Min.	52	Min.	1,000
	Ave.	5			Ave.	686	Ave.	94	Ave.	2,819

Table 31 Continued

Water Quality Data

Buck Run Watershed

Sampling Station	Flow GPM	pH Range	Acid Load Lbs./Day	Acidity Mg./L.	Iron Mg./L.	Sulfate Mg./L.
204	Max. 7	3.3 - 4.5	8	Max. 380	Max. 21	Max. 1,600
	Min. 1			Min. 100	Min. 5	Min. 105
	Ave. 3			Ave. 232	Ave. 14	Ave. 721
203	Max. 8	3.4 - 4.7	7	Max. 460	Max. 50	Max. 1,500
	Min. 1			Min. 156	Min. 14	Min. 700
	Ave. 2			Ave. 356	Ave. 29	Ave. 1,424
202	Max. 14	3.5 - 4.7	10	Max. 300	Max. 11	Max. 1,010
	Min. 2			Min. 98	Min. 4	Min. 400
	Ave. 5			Ave. 157	Ave. 8	Ave. 613
201	Max. 39	3.5 - 5.0	9	Max. 120	Max. 11	Max. 1,200
	Min. 4			Min. 22	Min. 1	Min. 400
	Ave. 14			Ave. 51	Ave. 3	Ave. 697
200	Max. 3,910	3.4 - 4.3	5,794	Max. 1,490	Max. 750	Max. 3,880
	Min. 139			Min. 256	Min. 6	Min. 750
	Ave. 840			Ave. 572	Ave. 176	Ave. 1,536
199	Max. 3,748	4.0 - 5.2	384	Max. 76	Max. 4	Max. 1,000
	Min. 111			Min. 30	Min. 1	Min. 400
	Ave. 758			Ave. 42	Ave. 1	Ave. 557
150	Max. 2,065	4.4 - 5.8	26	Max. 42	Max. 9	Max. 517
	Min. 31			Min. 1	Min. 0.1	Min. 175
	Ave. 341			Ave. 6	Ave. 0.5	Ave. 271
137	Max. 71	3.3 - 4.4	34	Max. 550	Max. 84	Max. 2,000
	Min. 1			Min. 60	Min. 12	Min. 65
	Ave. 17			Ave. 165	Ave. 31	Ave. 628

Table 31 Continued

Water Quality Data

Buck Run Watershed

Sampling Station	Flow GPM		pH Range	Acid Load Lbs./Day	Acidity Mg./L.		Iron Mg./L.		Sulfate Mg./L.	
136	Max.	190	3.1 - 4.2	6,260	Max.	37,800	Max.	21,000	Max.	67,400
	Min.	4			Min.	850	Min.	1,000	Min.	1,375
	Ave.	53			Ave.	9,757	Ave.	4,073	Ave.	13,208
133	Max.	101	3.6 - 4.7	86	Max.	228	Max.	7	Max.	1,500
	Min.	26			Min.	100	Min.	2	Min.	450
	Ave.	44			Ave.	162	Ave.	6	Ave.	943
132	Max.	88	3.2 - 4.2	299	Max.	1,000	Max.	680	Max.	6,250
	Min.	16			Min.	154	Min.	1	Min.	750
	Ave.	35			Ave.	750	Ave.	224	Ave.	2,699
110	Max.	26	3.8 - 6.4	3	Max.	64	Max.	50	Max.	2,400
	Min.	1			Min.	4	Min.	1	Min.	200
	Ave.	6			Ave.	40	Ave.	1	Ave.	511
87	Max.	200	3.3 - 4.5	65	Max.	244	Max.	90	Max.	2,000
	Min.	8			Min.	54	Min.	1	Min.	312
	Ave.	40			Ave.	153	Ave.	12	Ave.	1,180
13	Max.	20	3.7 - 4.7	5	Max.	166	Max.	15	Max.	2,100
	Min.	1			Min.	34	Min.	1	Min.	350
	Ave.	4			Ave.	109	Ave.	8	Ave.	1,375

RELATIONSHIP BETWEEN STREAM FLOW, POLLUTION LOAD AND WEATHER ELEMENTS

STATION 314 BUCK RUN (At Mouth)

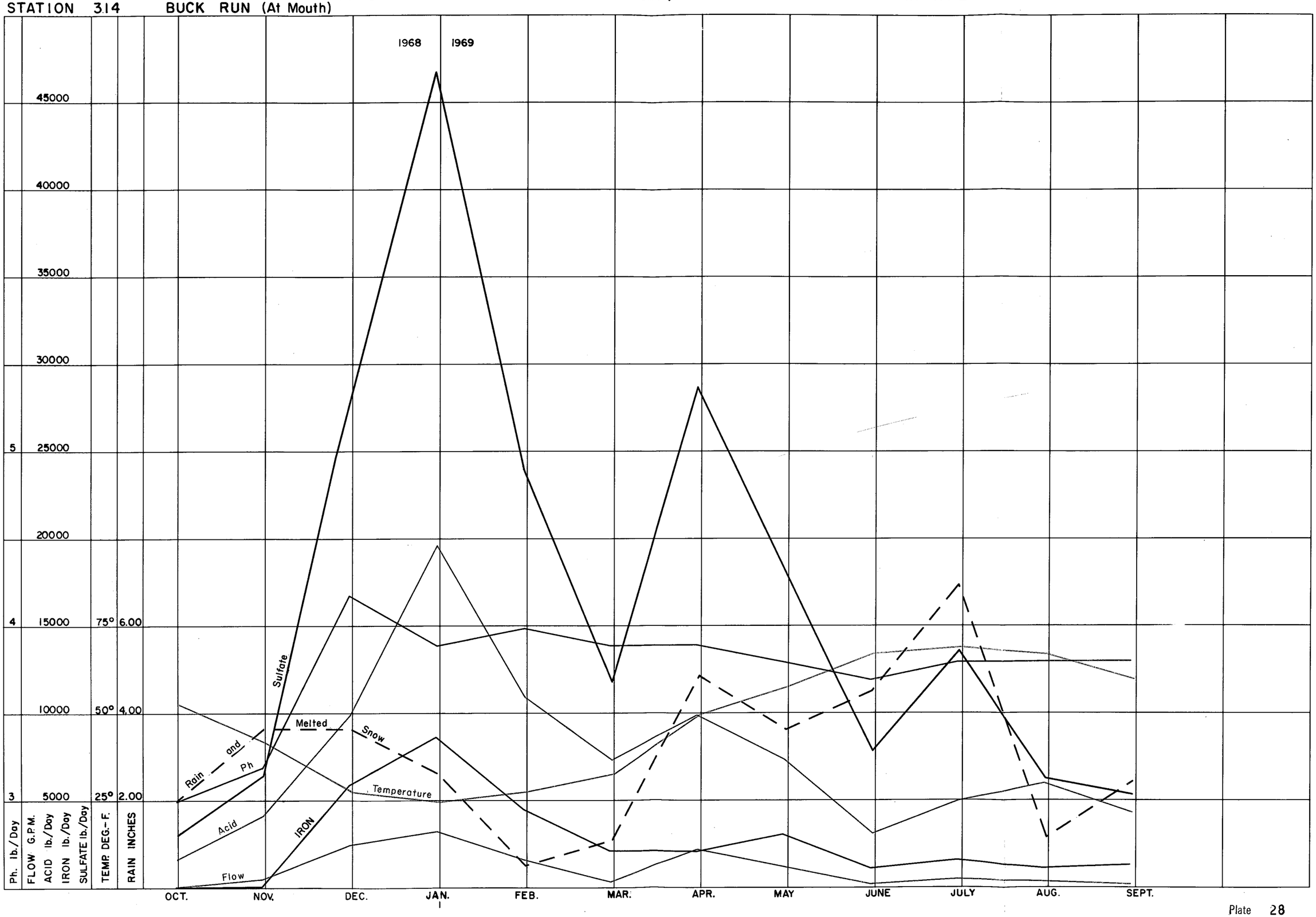


Plate 28

The acid load concentration remained fairly constant. This probably accounts for the low pH's that occurred during periods of low flow.

Buck Run contributed the following percentages of flow and pollution load to the total flow and load of Two Lick Creek as measured at Sampling Station #416 at Clymer: Flow - 7%; Acidity - 65%; Iron - 51%; and, Sulfate - 25%.

Buck Run discharged approximately 1,692,000 gallons of water per day into Two Lick Creek during the study period.

d. Coal Mining Activity

General

The area was extensively mined from 1910 to the 1950's. Map Sheet # 3 , Appendix A shows the location and extent of both deep and strip mines.

Deep Mines

There are no deep mines presently in operation. The last active mine, the Imperial Coal Company's Keystone Mine, ceased operations in the 1950's.

The majority of the abandoned mines were worked in the World War I era.

Table 32 below lists the abandoned mines in the watershed. The following information is also listed: Type of opening, total number of openings, seam mined, maximum head, whether or not the mine is draining water, and number of acres mined.

Table 32

Abandoned Mines

Buck Run Watershed

Name of Mine	Type of Opening	Seam Mined	Draining Water	Total No. Openings	Area Mined (Acres)	Maximum Head (Feet)
1. Rodkey	Drift	B	X	12	221	40
2. McKean	Drift	B	X	4	212	76
3. Pontani (H & J)	Drift	D	X	2	81	45
4. Capizzi	Drift	D	X	2	112	12

Table 32 Continued

Abandoned Mines

Buck Run Watershed

Name of Mine	Type of Opening	Seam Mined	Draining Water	Total No. Openings	Area Mined (Acres)	Maximum Head (Feet)
5. A. K. Wright	Drift	B	X	3	83	13
6. Widdowson	Drift	D	X	2	147	5
7. Imperial Keystone	Drift*	B	-	4	676	-
8. Victor #29**	Drift	B	X	4	99	-

*Utilized Victor #29 main entries and headings. Workings located beneath the Dixon Run and Crooked Creek Watersheds. No mine drainage discharge.

**Indicates drainage toward and discharging into Dixon Run Watershed.

In addition to the above mines, several small country mines were sporadically operated over the years. Both the Lower Kittanning (B) and Lower Freeport (D) seams were mined. Seven of the mines are draining water. These sources are further described in Paragraph e.

Strip Mines

Strip mining activity reached its peak in the early 1950's. There are presently no active strips in the basin.

Approximately 344 acres have been stripped. Most of the strip cuts were relatively shallow. This is particularly true of the coal mined in the Lower Freeport (D) seam where highwalls average about 15 feet. Consequently, very little overburden was disturbed. For this reason and because backfilling and revegetation was practiced, in most cases, strip mines are only minor sources of mine drainage in the basin.

There are several instances, however, where strip mining operations broke into or cut close to abandoned deep mine workings. Water from these old workings is draining into the strip cuts and over or through the strip spoil increasing the contamination of the water.

e. Description of Mine Drainage Sources

The major mine drainage sources are listed on the following page in Table 33 beginning with the most serious contributor of acid load. Each source is associated with the sampling station(s) measuring the mine drainage and the respective contamination load.

Deep mines that are interconnected are listed collectively as one source. Plates 29 and 30 shows the locations of the various sources.

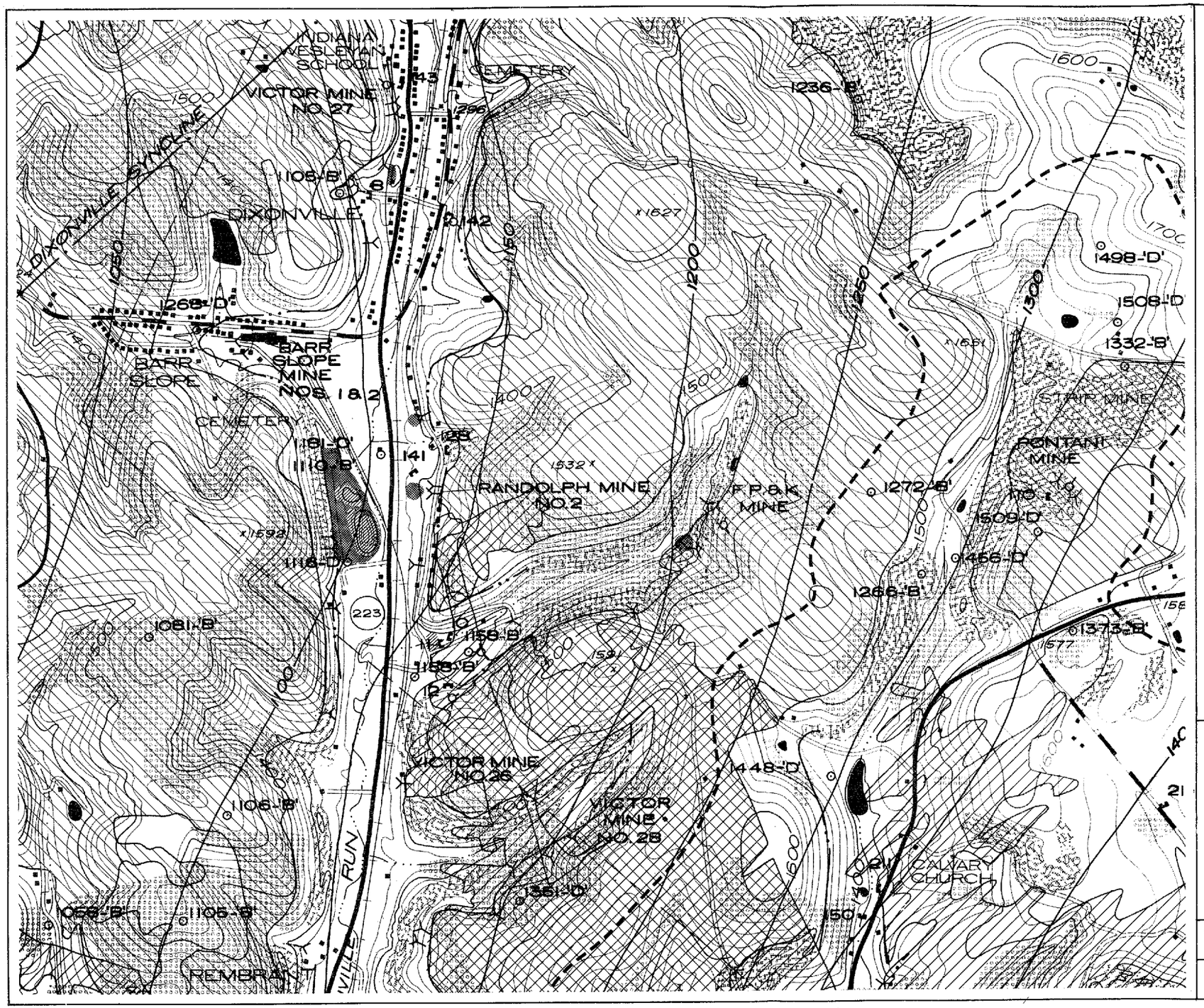
Combined maximum heads are given for deep mines that are discharging mine drainage.

Table 33

Major Mine Drainage Sources

Buck Run Watershed

Source Description	Flow GPM	Sampling Station(s)	Pollution Load - Lbs./Day Acid	Iron	Sulfate	Combined Maximum Head (Feet)
1. Imperial Keystone Coal Refuse Pile	53	136	6,260	2,613	8,474	-
2. Coal Tipple Coal Refuse Pile	10	213 (minus 199)	710	109	1,519	-
3. A. K. Wright Deep Mine and two strip mines	26	87 (minus 212)	282	5	486	13
4. Rodkey Mine	110	132, 133, 201, 202, 203, 204, and 205	206	92	1,901	40
5. Rodkey (B) Seam Strip Mine	275	Estimated	66	-	-	-
6. Capizzi Mine	17	137	34	6	129	12
7. Small Refuse Pile	341	150	26	-	39	-
8. McKean Mine	7	222, 210	13	-	89	76
9. Victor #29 Mine	58	Estimated	7	1	85	-
10. Widdowson Mine and Strip Mine	6	13, 209	7	1	81	5
11. Pontani Mine	6	110	3	-	34	45



BUCK RUN

LEGEND

- KITTANNING SEAM
- FREEPORT SEAM
- UPPER FREEPORT (E) SEAM
- LOWER FREEPORT (D) SEAM
- LOWER KITTANNING (B) SEAM
- COAL REFUSE AREA (NEW)
- COAL REFUSE AREA (OLD)
- STRIP MINE AREA
- SAMPLING STATION
- DIAMOND DRILL HOLE
- MINE OPENING (DRY)
- MINE OPENING (DRAINING)
- WATERSHED PERIMETER (EXTERIOR)
- WATERSHED PERIMETER (INTERIOR)
- COAL CONTOUR LOWER KITTANNING SEAM
- COAL CONTOUR LOWER KITTANNING SEAM (COAL MISSING DUE TO EROSION)

TWO LICK CREEK MINE DRAINAGE POLLUTION ABATEMENT PROJECT

INDIANA COUNTY, PENNSYLVANIA

PROJECT Nº SL109

INVENTORY MAP

0 500 1000 1500
SCALE IN FEET

MARCH, 1970

L. ROBERT KIMBALL
Consulting Engineers
EBENSBURG, PENNSYLVANIA

SHEET Nº


BUCK RUN
2
LEGEND
KITTANNING SEAM
FREEPORT SEAM
UPPER FREEPORT (E) SEAM
LOWER FREEPORT (D) SEAM
LOWER KITTANNING (B) SEAM
COAL REFUSE AREA (NEW)
COAL REFUSE AREA (OLD)
STRIP MINE AREA
SAMPLING STATION
DIAMOND DRILL HOLE
MINE OPENING (DRY)
MINE OPENING (DRAINING)
WATERSHED PERIMETER (EXTERIOR)
WATERSHED PERIMETER (INTERIOR)
COAL CONTOUR LOWER KITTANNING SEAM
COAL CONTOUR LOWER KITTANNING SEAM (COAL MISSING DUE TO EROSION)
TWO LICK CREEK
MINE DRAINAGE POLLUTION
ABATEMENT PROJECT
INDIANA COUNTY, PENNSYLVANIA
PROJECT N° SL109
INVENTORY MAP
0 500 1000 1500
SCALE IN FEET
MARCH, 1970
L. ROBERT KIMBALL
Consulting Engineers
EBENSBURG, PENNSYLVANIA
SHEET Nº
2
CHERRY HILL
BUCK RUN
STRIP MINE
KILNS
DUMP
SWANK MINE NO. 6
SWANK DRAINAGE
KYMER
WIDDOWSON MINE
VICTOR MINE
RODKEY MINE
RODKEY MINE NO. 32
MCKEAN MINE
FALL SHAFT
WRIGHT MINE
WANCHISN MINE
WANDIK
EMPIRE MINE
AIR SHAFT
1190-B
1264-B
1296-B
1378-B
1266-B

f. Recommended Abatement Procedures - Cost Benefication

Recommended abatement treatments and related costs are listed for the various sources in Table 34. All treatments and costs are based on data described in Section X. A key to define the recommended abatement procedures is shown on Page 123. Two abatement plans, a primary and alternate, are recommended for rehabilitation of the watershed.

Plan A is recommended as the primary plan and Plan B as the alternate. An estimated effectiveness of 75% reduction of pollution load is assigned for each recommended treatment in both plans.*

Plan A is based on an arbitrary maximum cost of $1,000.00 per pound of acid load abated and will provide an estimated reduction of acid load in the magnitude of 82% for the watershed.

Plan B is based on an arbitrary cost of $400.00 per pound of acid load abated and will provide an estimated reduction of acid load of approximately 78% for the watershed.

Table 34a lists the sources to be abated, the amount of benefication, and costs associated with both plans.

*With the exception of treatment plants which are assigned an effectiveness of 100% reduction of pollution load.

Table 34

Recommended Abatement Procedures - Cost Benefication

Buck Run Watershed

Source Name	Pollution Order	Recommended Treatment Procedures	Total Cost $	Cost Per Pound $	Total Abatement Lbs. Acid/Day
1. Rodkey (B) Seam Strip Mine	5	5A - R3 - F	$ 668	$ 13.23	52
2. Imperial Keystone Refuse Pile	1	19A - RP	140,448	29.92	4,695
3. Coal Tipple Refuse Pile	2	5A - RB	52,470	98.55	532
4. Small Refuse Pile	7	1A - RP	7,392	381.03	19
5. A. K. Wright Deep and Strip Mine	3	3 Seals 27A - R2 - F - B	165,165	780.55	212
6. Rodkey Mine	4	12 Seals	132,000	853.82	155
7. Capizzi Mine	6	2 Seals	22,000	862.75	25
8. Victor #29 Strip Mine	9	32A - R2	11,440	2,158.49	5
9. Widdowson Mine	10	2 Seals	22,000	4,150.94	5
10. McKean Mine	8	4 Seals	44,000	4,536.08	10
11. Pontani Mine	11	2 Seals	22,000	13,750.00	2
Total all Sources			$ 619,583		5,712

Table 34a

Benefication - Recommended Plans

Buck Run Watershed

Plan	Above Sources Abated	Benefication Pollution Reduction Acid Lbs./Day - % of Total	Benefication Pollution Reduction Iron Lbs./Day - % of Total	Benefication Pollution Reduction Sulfate Lbs./Day - % of Total	Total Cost
A	1 - 7	5,690 - 75%	2,119 - 75%	9,411 - 73%	$ 520,163
B	1 - 4	5,299 - 70%	2,041 - 72%	7,524 - 59%	200,998

KEY TO RECOMMENDED ABATEMENT PROCEDURES

R1 - Grass and legumes - Method #1

R2 - Grass and legumes - Method #2

R3 - Seedlings

F - Flumes

D - Ditching

B - Terrace backfill

A - Acreage on strip mines and refuse piles

RP - Standard Refuse Pile Reclamation

RB - Refuse Burial and Reclamation

SC - Soil Cover

Plant - Treatment Plant

Pond - Pond Construction and Reclamation

Seal - Mine Seal