3. Dixon Run Watershed

a. General

Dixon Run originates north of Dixonville and flows in a southerly direction for approximately 7.5 miles where it discharges into Two Lick Creek Proper at Clymer.

Total stream length including all tributaries is approximately 15.1 miles. The total area of the watershed is approximately 10.0 square miles.

b. Stream Condition

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

Table 35

Stream Condition

Dixon Run Watershed

Stream Classification	Stream Length Miles	Percent Total Stream Length
Non-Polluted	11.9	79
Severely Polluted	0.0	0
Moderately Polluted	3.2	21

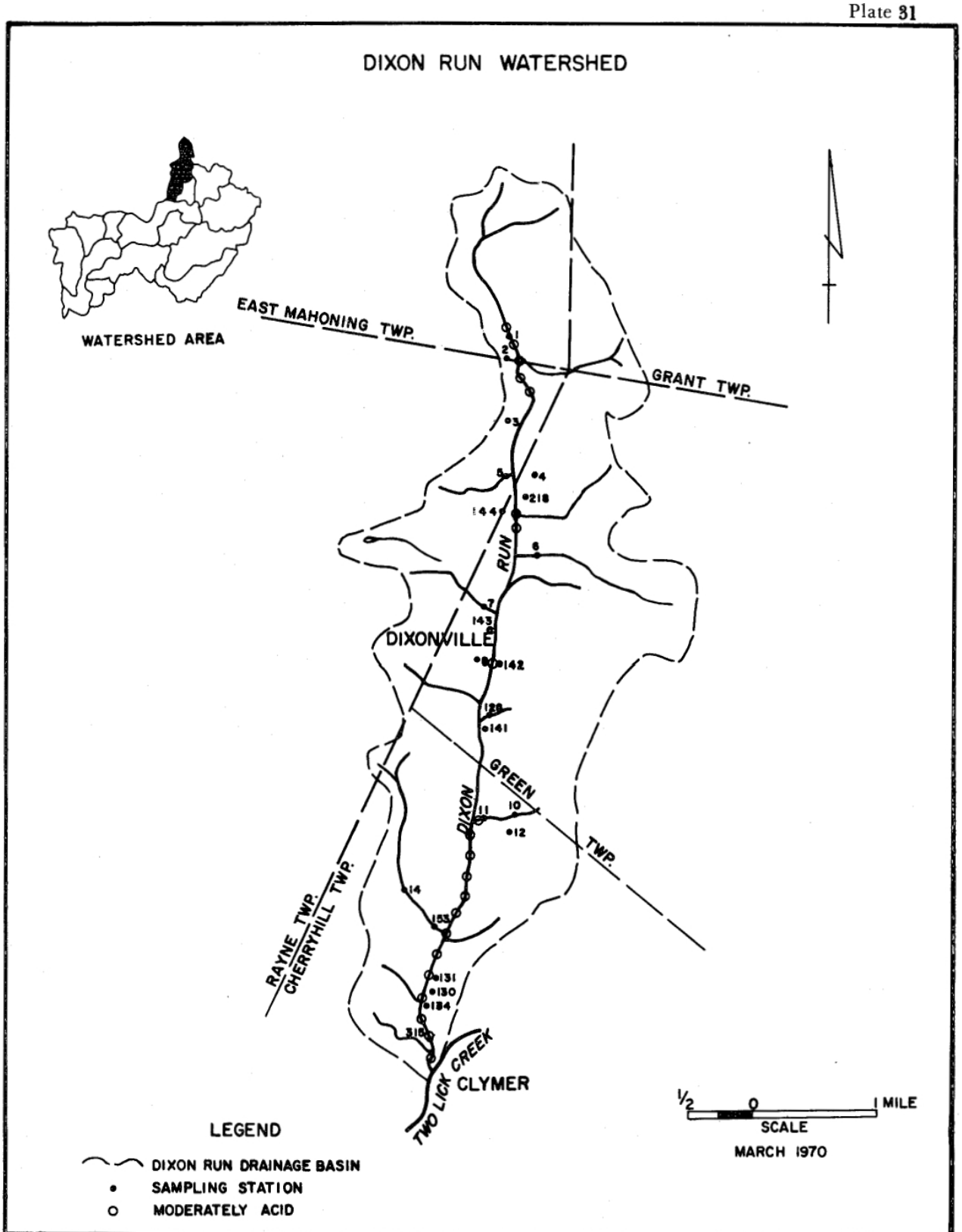
Approximately 21 percent of the Dixon Run Watershed is seriously degraded by mine drainage.

Plate 31 shows the locations of the sampling stations and the extent of mine drainage pollution within the various portions of the watershed.

c. Sampling Station Data

Twenty-three (23) sampling stations were installed and monitored. The minimums, maximums, and yearly averages of water quality data obtained from these stations are listed on Page 126 in Table 36.

Plate 32 graphically illustrates the monthly relationship between stream flow, pollution load, and weather elements within the watershed based on measurements taken at Sampling Station #315 located near the mouth of Dixon Run.



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

Table 36

Water Quality Data

Dixon Run Watershed

Sampling Station	Flow GPM		pH Range	Acid Load Lbs./Day	Acidity Mg./L.		Iron Mg./L.		Sulfate Mg./L.	
315	Max.	6,660	3.6 - 5.5	613	Max.	104	Max.	21	Max.	960
	Min.	194			Min.	4	Min.	1	Min.	0
	Ave.	2,377			Ave.	21	Ave.	5	Ave.	368
218	Max.	490	4.8 - 5.8	26	Max.	14	Max.	1	Max.	950
	Min.	88			Min.	2	Min.	0	Min.	300
	Ave.	247			Ave.	9	Ave.	0.3	Ave.	467
153	Max.	512	4.4 - 6.0	7	Max.	50	Max.	3	Max.	600
	Min.	1			Min.	1	Min.	1	Min.	30
	Ave.	94			Ave.	6	Ave.	1	Ave.	109
144	Max.	61	3.6 - 6.0	8	Max.	200	Max.	73	Max.	1,200
	Min.	3			Min.	12	Min.	1	Min.	170
	Ave.	16			Ave.	42	Ave.	4	Ave.	466
143	Max.	56	4.8 - 6.3	15	Max.	106	Max.	2	Max.	600
	Min.	8			Min.	6	Min.	0.1	Min.	190
	Ave.	31			Ave.	39	Ave.	0.5	Ave.	297
142	Max.	253	4.1 - 5.9	8	Max.	24	Max.	5	Max.	880
	Min.	1			Min.	4	Min.	0.1	Min.	150
	Ave.	73			Ave.	9	Ave.	1	Ave.	375
141	Max.	71	4.9 - 6.1	1	Max.	24	Max.	1	Max.	600
	Min.	1			Min.	0	Min.	0.1	Min.	60
	Ave.	11			Ave.	6	Ave.	1	Ave.	236
134	Max.	36	2.8 - 4.3	43	Max.	11,000	Max.	150	Max.	5,000
	Min.	1			Min.	10	Min.	10	Min.	300
	Ave.	4			Ave.	938	Ave.	135	Ave.	2,405

Table 36 Continued

Water Quality Data

Dixon Run Watershed

Sampling Station	Flow GPM		pH Range	Acid Load Lbs./Day	Acidity Mg./L.		Iron Mg./L.		Sulfate Mg./L.	
131	Max.	26	4.4 - 6.5	1	Max.	23	Max.	1	Max.	375
	Min.	1			Min.	0	Min.	0	Min.	45
	Ave.	10			Ave.	7	Ave.	0.5	Ave.	105
130	Max.	122	3.2 - 4.8	214	Max.	1,310	Max.	175	Max.	3,400
	Min.	21			Min.	248	Min.	32	Min.	750
	Ave.	35			Ave.	507	Ave.	61	Ave.	1,754
128	Max.	88	4.5 - 6.1	1	Max.	30	Max.	5	Max.	750
	Min.	1			Min.	4	Min.	0.1	Min.	175
	Ave.	8			Ave.	7	Ave.	3	Ave.	263
14	Max.	642	2.9 - 6.4	4	Max.	130	Max.	6	Max.	1,150
	Min.	1			Min.	2	Min.	1	Min.	38
	Ave.	81			Ave.	4	Ave.	1	Ave.	76
12	Max.	29	3.4 - 6.1	2	Max.	130	Max.	3	Max.	550
	Min.	1			Min.	6	Min.	1	Min.	51
	Ave.	13			Ave.	13	Ave.	1	Ave.	219
11	Max.	862	3.9 - 5.6	307	Max.	244	Max.	130	Max.	1,250
	Min.	94			Min.	48	Min.	6	Min.	140
	Ave.	162			Ave.	157	Ave.	44	Ave.	636
10	Max.	956	3.8 - 7.2	16	Max.	80	Max.	2	Max.	425
	Min.	16			Min.	0	Min.	1	Min.	50
	Ave.	158			Ave.	8	Ave.	2	Ave.	135
8	Max.	387	4.7 - 7.0	26	Max.	140	Max.	6	Max.	1,000
	Min.	1			Min.	12	Min.	1	Min.	175
	Ave.	34			Ave.	63	Ave.	1	Ave.	523

Table 36 Continued

Water Quality Data

Dixon Run Watershed

Sampling Station	Flow GPM		pH Range	Acid Load Lbs./Day	Acidity Mg./L.		Iron Mg./L.		Sulfate Mg./L.	
7	Max.	512	3.9 - 6.1	25	Max.	26	Max.	30	Max.	450
	Min.	1			Min.	2	Min.	1	Min.	37
	Ave.	108			Ave.	19	Ave.	3	Ave.	195
6	Max.	1,656	4.8 - 7.2	25	Max.	26	Max.	1	Max.	150
	Min.	6			Min.	2	Min.	0.02	Min.	0
	Ave.	277			Ave.	7	Ave.	0.3	Ave.	91
5	Max.	320	4.4 - 6.1	4	Max.	20	Max.	1	Max.	350
	Min.	4			Min.	1	Min.	0.1	Min.	14
	Ave.	58			Ave.	6	Ave.	1	Ave.	56
4	Max.	253	4.5 - 7.0	4	Max.	20	Max.	0.3	Max.	750
	Min.	1			Min.	1	Min.	0.1	Min.	14
	Ave.	47			Ave.	7	Ave.	0.2	Ave.	416
3	Max.	220	4.9 - 6.8	2	Max.	12	Max.	7	Max.	750
	Min.	4			Min.	1	Min.	0	Min.	60
	Ave.	35			Ave.	5	Ave.	7	Ave.	170
2	Max.	10	4.3 - 7.5	307	Max.	16	Max.	2	Max.	1,500
	Min.	1			Min.	2	Min.	0	Min.	225
	Ave.	2			Ave.	10	Ave.	0.4	Ave.	773
1	Max.	1,431	3.8 - 8.2	136	Max.	160	Max.	2	Max.	550
	Min.	12			Min.	2	Min.	0	Min.	50
	Ave.	411			Ave.	27	Ave.	1	Ave.	297

RELATIONSHIP BETWEEN STREAM FLOW, POLLUTION LOAD AND WEATHER ELEMENTS

STATION 315 DIXON RUN (At Mouth)

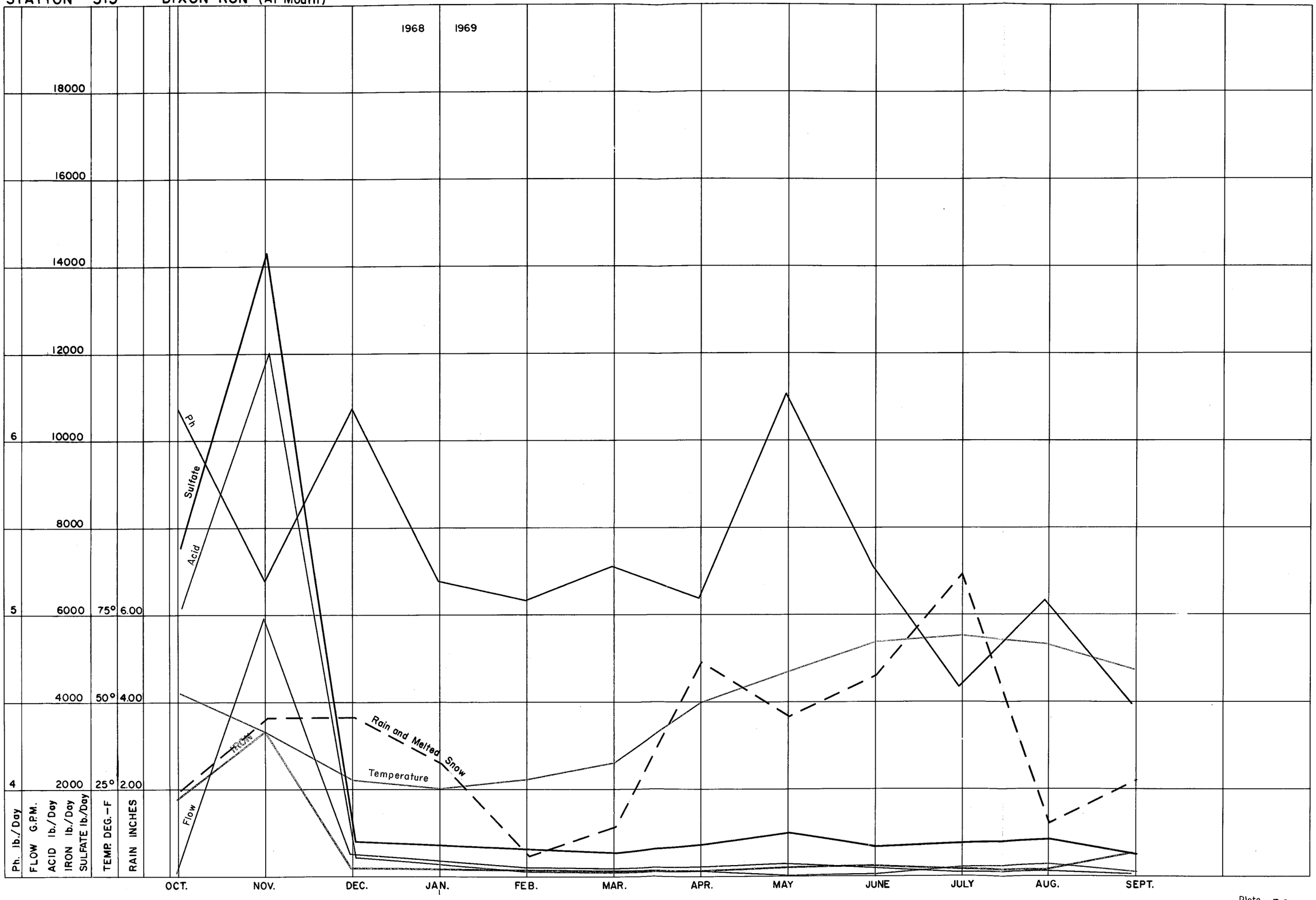


Plate 32

Stream flow, pH levels, and contamination loads fluctuated correspondingly throughout the study period with peaks occurring from December through April and lows during the fall. The acid load was relatively constant.

During the low flows of the fall months, the acid concentration was high which probably accounts for the low pH's recorded during that time of the year.

Dixon 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 - 14%; Acidity - 5%; Iron - 3%; and Sulfate - 15%.

Dixon Run Watershed discharged approximately 3,422,000 gallons of water per day into Two Lick Creek during the study period,

d. Coal Mining Activity

General

The area has been extensively mined from 1905 to the present date. Map Sheets 1 , 2 , and 3, Appendix A shows the location and extent of both deep and strip mines.

Deep Mines

There is only one small mine, the F. P, and K. Mine, still in operation. The last large scale mine, the Barr Slope complex, ceased operations in 1962.

The majority of the abandoned mines were worked from 1910 to 1930. The earliest large scale mine, the Dixon (Edwards) Mine, was opened in 1905.

Table 37 below lists the abandoned mines and the following information: 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 37

Abandoned Mines

Dixon Run Watershed

Name of Mine	Type of Opening	Seam Mined	Draining Water	Total No. Openings	Area Mined (Acres)	Maximim Head (Feet)
1. Victor #24* (Clymer #3)	Drift	D	-	5	204	-
2. Victor #25*	Slope	D	-	7	395	-

Table 37 Continued

Abandoned Mines

Dixon Run Watershed

	Name of Mine	Type of Opening	Seam Mined	Draining Water	Total No. Openings	Area Mined (Acres)	Maximum Head (Feet)
3.	Victor #26	Drift	D	X	3	197	20
4.	Victor #27	Drift	D	X	8	267	75
5.	Victor #28	Drift	B	-	4	357	-
6.	Victor #29**	Drift	B	X	4	276	100
7.	Barr #1*	Slope	D	X	1	118	-
8.	Barr #2*	Slope	D	-	1	63	-
9.	Randolph #2	Drift	D	X	6	477	75
10.	Edwards (Dixon #1)	Drift	D	X	4	106	226
11.	Edwards (Dixon #2)	Drift	D	X	5	337	193
12.	Edwards (Dixon #3)	Drift	D	X	3	252	-
13.	P. & G.	Drift	D	X	3	10	22
14.	Edwards Bros.	Drift	D	X	2	10	33
15.	Hess	Drift	D	X	5	49	41
16.	Black Bank (Victor #34)	Drift	D	X	2	15	13
17.	Gibson	Drift	D	-	2	3	-
18.	E. B. Widdowson	Drift	D	-	3	65	-
19.	Lorraine	Drift	D	-	3	14	-

*Indicates drainage toward and discharging into Crooked Creek near Tanoma.

**Victor #29 has (4) additional slope openings located on the Buck Run Watershed. Drainage is to Dixon Run.

In addition to the aforementioned mines, there are a number of abandoned small coal banks scattered throughout the watershed which are not discharging any appreciable mine drainage.

Four of the largest complexes, as indicated by an asterisk above, are draining toward and discharging into the Crooked Creek Watershed from a bore hole located near Tanoma.

Eleven of the above mines are sources of mine drainage in the Dixon Run Watershed. These sources are further described in Paragraph e.

Strip Mines

Strip mining activity reached its peak in the late 1950's and early 1960's. There are presently no active strips in the basin. Approximately 908 acres have been stripped.

Most of the early strips were relatively shallow and few were backfilled. Most of these have been revegetated by nature and are only minor sources of mine drainage.

The later strips were much deeper. Most of these were backfilled and revegetated to some extent and consequently are only minor sources of mine drainage. However, a few operations broke into or cut close to abandoned deep mine workings. As a result, water from the old workings is draining over and through the stripped areas.

e. Description of Mine Drainage Sources

The major mine drainage sources are listed on the following two pages in Table 38 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. Plates 33, 34, 35, and 36 show the locations of the various sources.

Deep mines that are interconnected are listed collectively as one source. Combined maximum heads are given for deep mines that are discharging mine drainage.

Table 38

Major Mine Drainage Sources

Dixon Run Watershed

Source Description	Flow GPM	Sampling Station(s)	Pollution Load - Lbs./Day Acid	Iron	Sulfate	Combined Maximum Head (Feet)
1. Victor #29 Mine	62	130, 131, 134	351	53	1,081	100
2. Victor #26 Mine	175	11, 12	309	87	1,278	20
3. Lorraine Mine Coal Refuse	411	1	136	5	1,472	-
4. Mears Coal Tipple Refuse*	83	Estimated	100	10	1,500	-
5. Idamar Strip Mine	667	Estimated	80	2	1,000	-
6. Hess Mine Black Bank Mine (Victor #34) Victor #27 Mine	189	7, 8, 144, 143	73	5	673	75
7. Edwards Mines (Dixon #1, #2, and #3) & Strip Mine	294	4, 218	30	1	1,627	226
8. Brencetown Strip Mines	277	6	25	1	303	-
9. Clymer #1 Strip Mine	167	Estimated	20	1	500	-
10. Victor #29 Strip Mines	167	Estimated	20	1	500	-

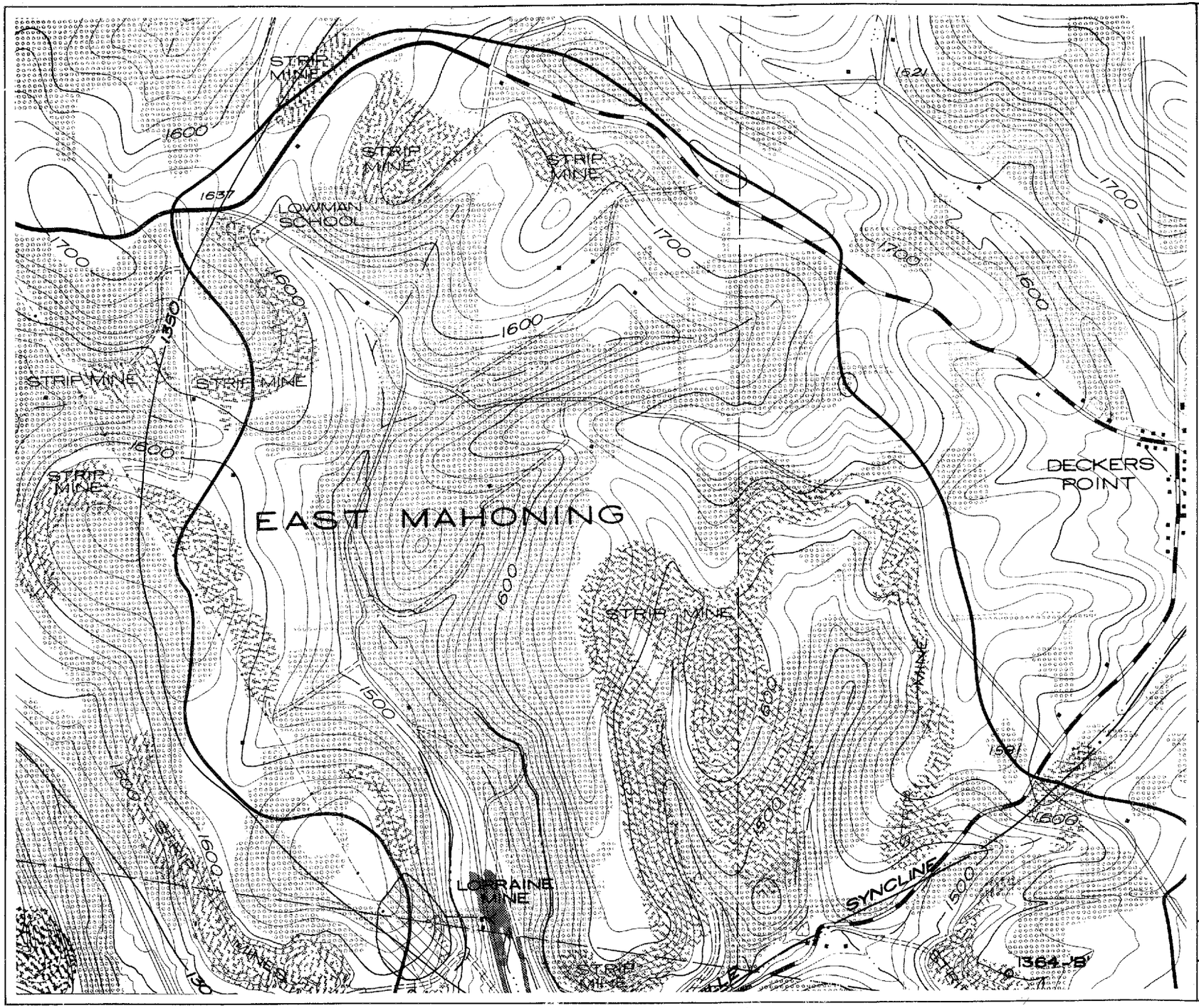
Table 38 Continued

Major Mine Drainage Sources

Dixon Run Watershed

Source Description	Flow GPM	Sampling Station(s)	Pollution Load - Lbs./Day Acid	Iron	Sulfate	Combined Maximum Head (Feet)
11. Randolph #2 Victor #26 Strip Mines	158	10	16	3	229	-
12. Randolph #2 Mine	92	128, 141, 142	10	1	390	75
13. Barr Slope Strip Mine and Old Coal Refuse	67	Catch Samples	8	1	169	-
14. Victor #24 and #25 Strip Mines	94	153	7	1	124	-
15. Victor #28 Strip Mine	42	Estimated	5	0	100	-
16. Edwards Bros. Mine	35	3	2	3	72	33

*Indicates active source



DIXON 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

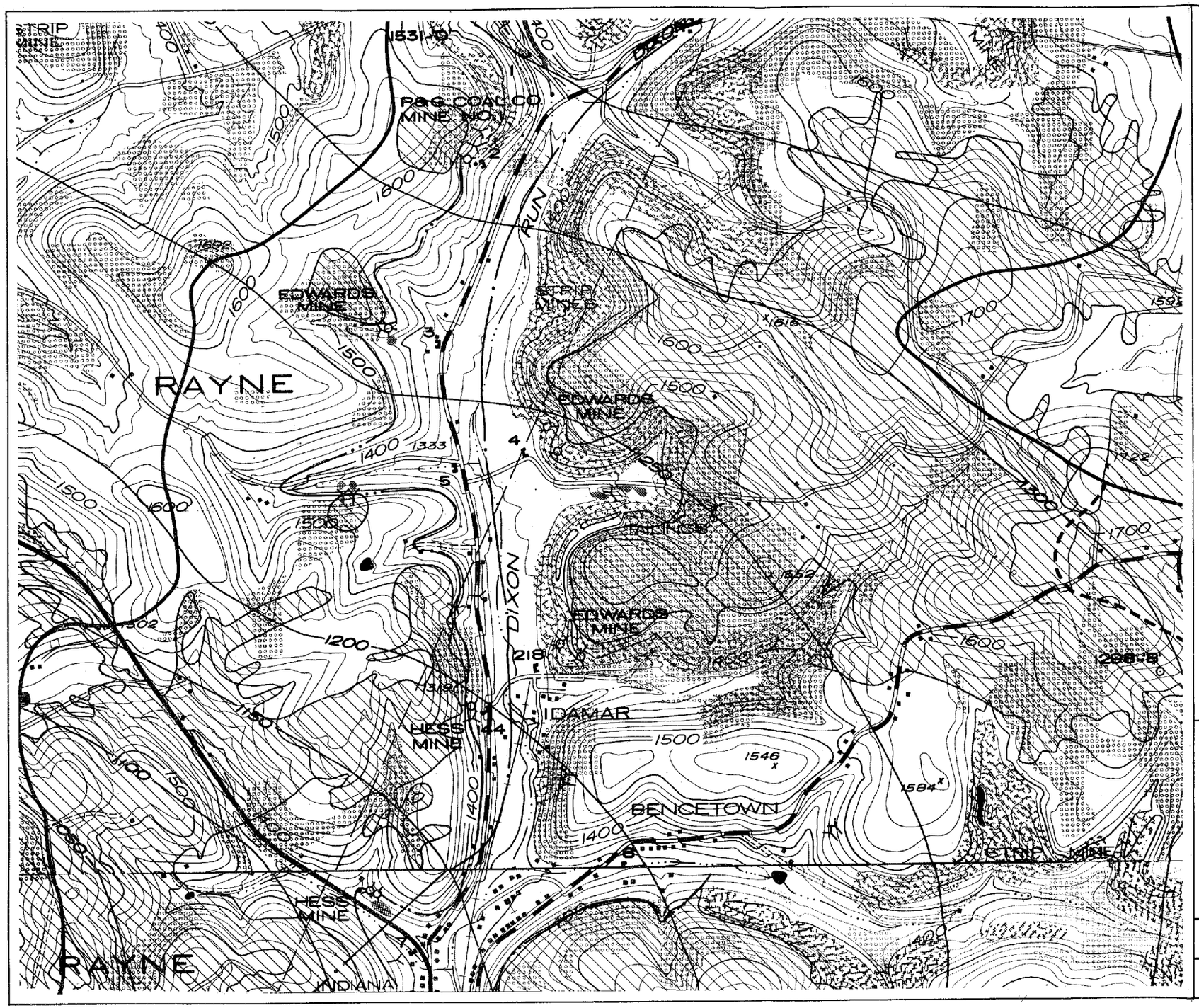
INVENTORY MAP

0 500 1000 1500 SCALE IN FEET

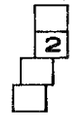
MARCH, 1970

L. ROBERT KIMBALL
Consulting Engineers
EBENSBURG, PENNSYLVANIA

SHEET Nº



DIXON 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
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TWO LICK CREEK MINE DRAINAGE POLLUTION ABATEMENT PROJECT

INDIANA COUNTY, PENNSYLVANIA

PROJECT Nº SL109

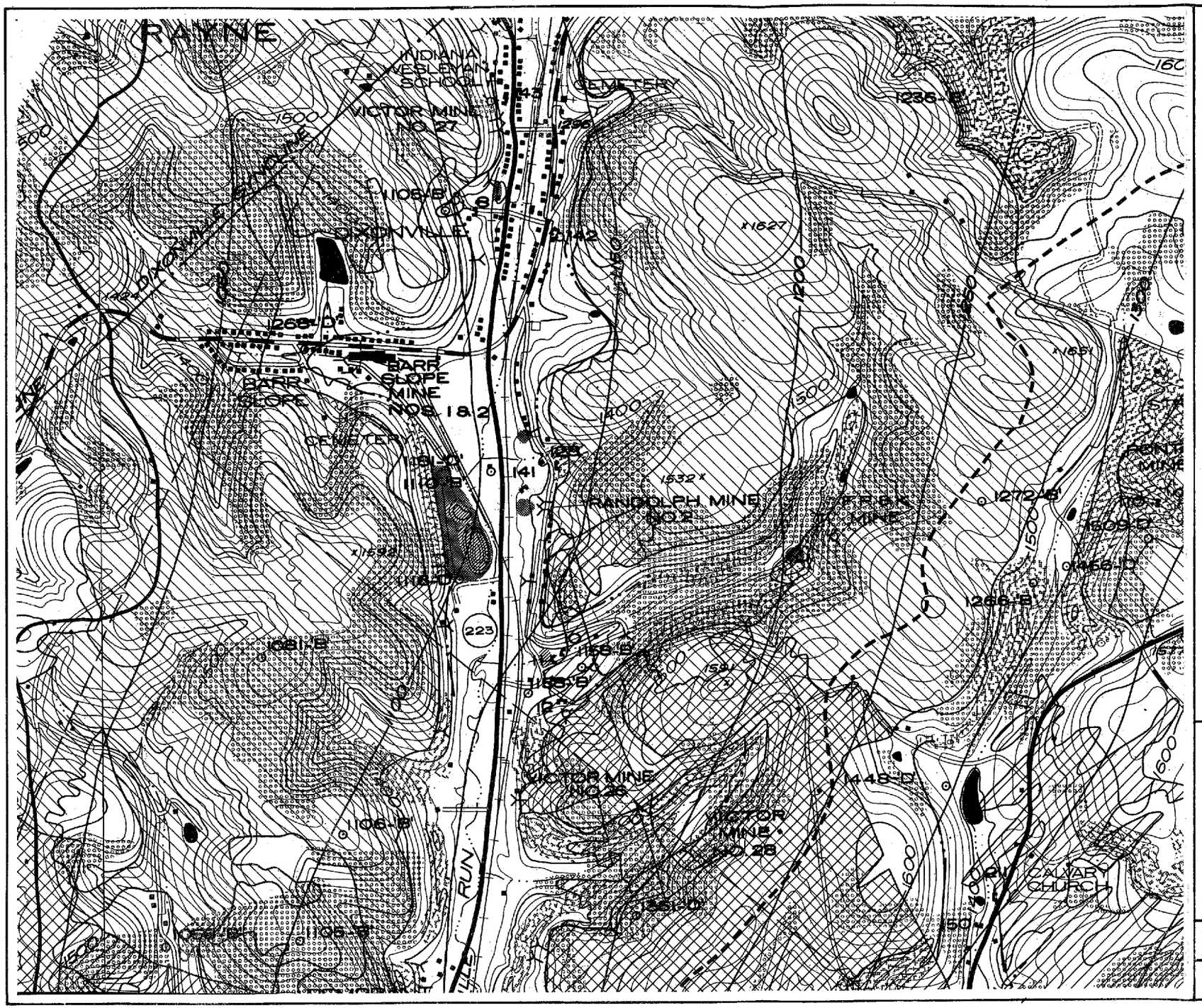
INVENTORY MAP

0 500 1000 1500
SCALE IN FEET

MARCH, 1970

L. ROBERT KIMBALL
Consulting Engineers
EBENSBURG, PENNSYLVANIA

SHEET Nº 2



DIXON RUN

3

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)
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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

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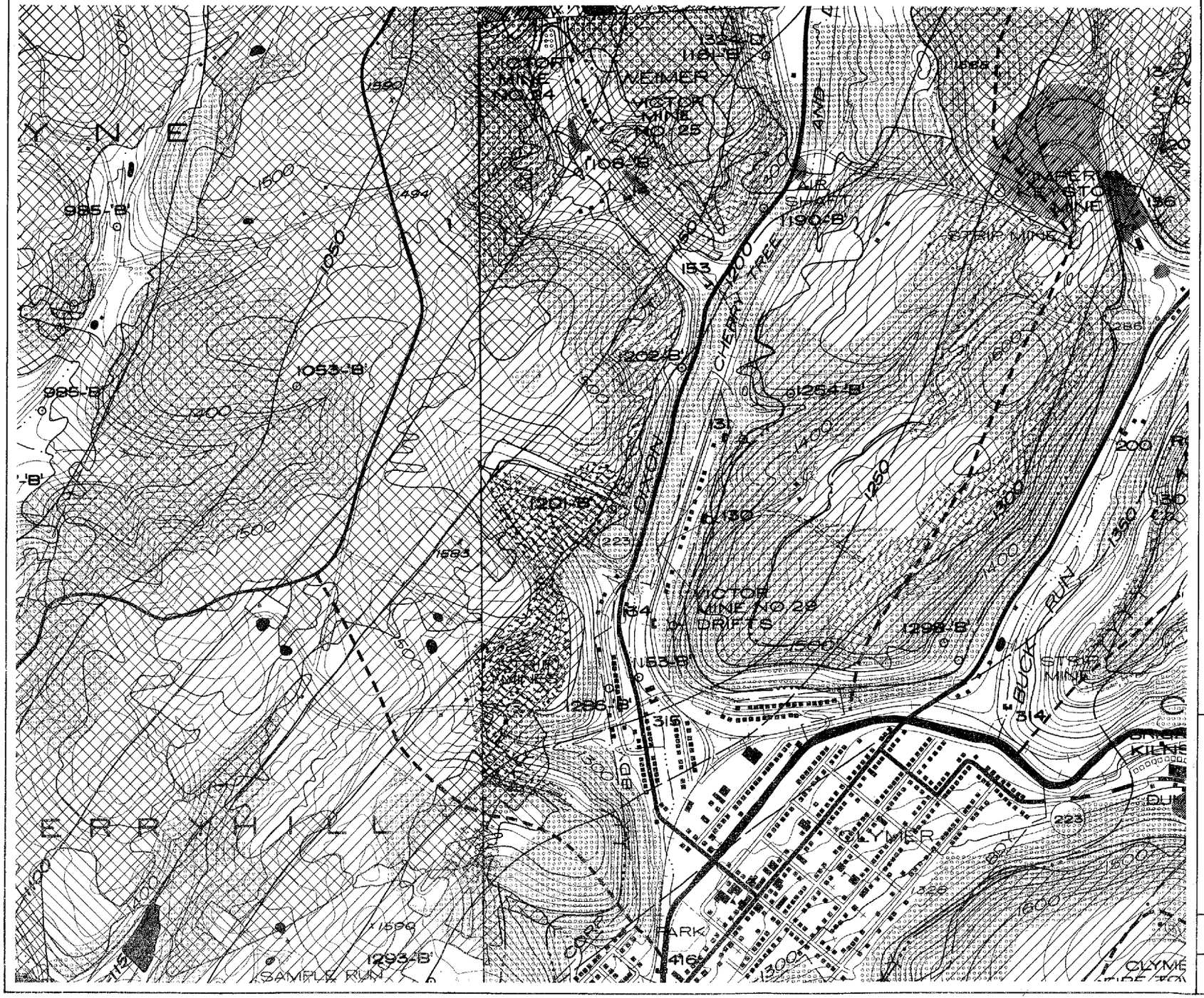
DIXON RUN
4
LEGEND
KITTANNING SEAM
FREEPORT SEAM
UPPER FREEPORT (E) SEAM
LOWER FREEPORT (D) SEAM
LOWER KITTANNING (B) SEAM
COAL REFUSE AREA (NEW)
COAL REFUSE AREA (OLD)
STRIP MINE AREA
SAMPLING STATION
DIAMOND DRILL HOLE
MINE OPENING (DRY)
MINE OPENING (DRAINING)
WATERSHED PERIMETER (EXTERIOR)
WATERSHED 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
4

f. Recommended Abatement Procedures - Cost Benefication

Recommended abatement treatments and related costs are listed for the various sources of pollution in Table 39.

All treatments and costs are based on data described in Section X.

A key to define the recommended abatement procedures is shown on Page 143.

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 39a 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 39

Recommended Abatement Procedures - Cost Benefication

Dixon Run Watershed

Source Name	Pollution Order	Recommended Treatment Procedures	Total Cost $	Cost Per Pound $	Total Abatement Lbs. Acid/Day
1. Victor #28 Strip Mine	15	5A - R3	$ 275	$ 72.37	4
2. Edwards Mine and Strip Mine	7	5A - R2 - F	2,200	98.21	22
3. Victor #26 Mine	2	3 Seals	33,000	142.30	232
4. Victor #29 Mine	1	4 Seals	44,000	167.11	263
5. Brencetown Strip Mine	8	88A - R3	4,840	258.82	19
6. Lorraine Refuse Pile	3	5A - RP	36,960	361.64	102
7. Randolph #2 and Victor #26 Strip Mines	11	21A - R2	7,508	630.92	12
8. Victor #29 Strip Mine	10	43A - R2	15,373	1,024.87	15
9. Idamar Strip Mine	5	111A - R2 - F - D	65,230	1,087.17	60
10. Clymer #1 Strip Mine	9	29A - R2 - F - D	17,204	1,146.93	15
11. Hess, Victor #34 and #37 Mines	6	12 Seals	132,000	2,395.64	55

Table 39 Continued

Recommended Abatement Procedures - Cost Benefication

Dixon Run Watershed

Source Name	Pollution Order	Recommended Treatment Procedures	Total Cost $	Cost Per Pound $	Total Abatement Lbs. Acid/Day
12. Randolph #2	12	6 Seals	$66,000	$ 9,166.67	7
13. Barr Slope Strip Mine and Refuse Pile	13	4A - R2 9A - RP	67,958	11,326.33	6
14. Victor #24 and #25 Strip Mines	14	82A - R3 10A - B	68,860	12,751.85	5
15. Edwards Brothers Mine	16	2 Seals	22,000	13,750.00	2
Total all sources			$ 583,408		817

Table 39a

Benefication - Recommended Plans

Dixon 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	654 - 55%	113 - 64%	4,568 - 41%	$ 128,783
B	1 - 6	642 - 54%	110 - 63%	4,396 - 40%	121,275

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