8B. Lower Portion, Yellow Creek Watershed (excluding Little Yellow Creek

a. General

The Lower Portion of Yellow Creek Watershed covers an area of 23.4 square miles. Major tributaries include Ferrier Run and two unnamed streams of considerable length.

The total stream length including all tributaries (excluding Little Yellow Creek) is approximately 35.3 miles.

b. Stream Condition

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

Table 69

Stream Condition

Lower Portion, Yellow Creek Watershed

Stream Classification	Stream Length Miles	Percent Total Stream Length
Non-pollurted	25.1	71
Severely Polluted	6.0	17
Moderately Polluted	4.2	12

As indicated above, approximately 29 percent of the watershed is seriously degraded by mine drainage.

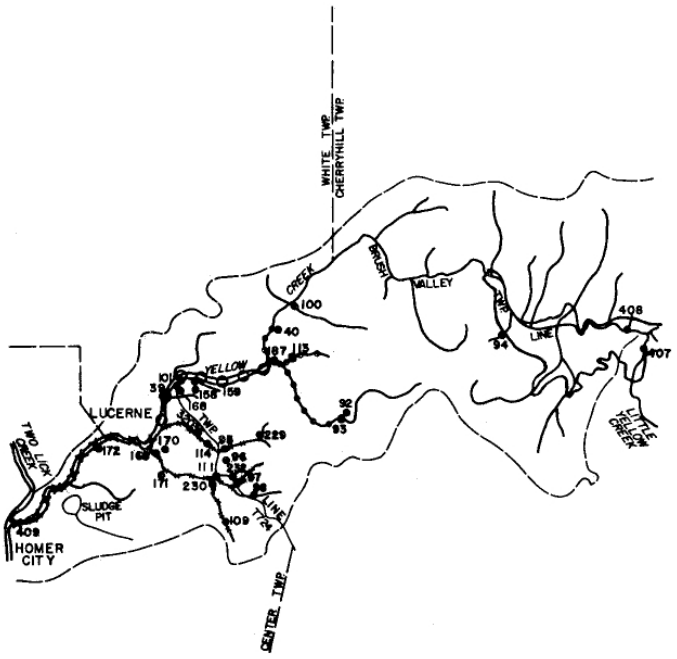
Plate 70 shows the locations of sampling stations and the extent of mine drainage pollution within the watershed. The upper half of this watershed is not seriously degraded by mine drainage. Several tributaries are completely unaffected by mine water.

c. Sampling Station Data

Twenty-six (26) sampling stations were installed and monitored.

LOWER PORTION: YELLOW CREEK WATERSHED (EXCLUDING LITTLE YELLOW CREEK)

WATERSHED AREA



LEGEND

- YELLOW CREEK DRAINAGE BASIN
- • SAMPLING STATION
- ° O MODERATELY ACID
- × ✖ SEVERELY ACID

1 0 2 MILES
SCALE
MARCH 1970

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

Table 70

Water Quality Data

Lower Portion, Yellow Creek Watershed

Sampling Station	Flow GPM	pH Range	Acid Load Lbs./Day	Acidity Mg./L.	Iron Mg./L.	Sulfate Mg./L.
409	Max. 33,000	3.6 5.3	29,000	Max. 620	Max. 100	Max. 1,500
	Min. 792			Min. 28	Min. 5	Min. 135
	Ave. 28,619			Ave. 84	Ave. 7	Ave. 216
408	Max. 80,846	3.8 - 6.5	1,412	Max. 60	Max. 96	Max. 270
	Min. 2,087			Min. 1	Min. 1	Min. 38
	Ave. 22,995			Ave. 5	Ave. 2	Ave. 120
232	Max. 3	3.1 - 3.6	212	Max. 20,500	Max. 4,000	Max. 31,000
	Min. 1			Min. 10,000	Min. 2,500	Min. 10,800
	Ave. 2			Ave. 11,011	Ave. 2,939	Ave. 22,369
229	Max. 32	3.4 - 4.1	16	Max. 250	Max. 13	Max. 765
	Min. 2			Min. 130	Min. 2	Min. 250
	Ave. 8			Ave. 157	Ave. 6	Ave. 405
187	Max. 4,176	4.6 - 5.2	66	Max. 12	Max. 1	Max. 300
	Min. 84			Min. 4	Min. 0	Min. 66
	Ave. 511			Ave. 11	Ave. 0.2	Ave. 100
172	Max. 21	2.9 - 3.6	5,937	Max. 74,600	Max. 40,000	Max. 82,500
	Min. 10			Min. 25,000	Min. 1,150	Min. 6,200
	Ave. 16			Ave. 30,203	Ave. 12,296	Ave. 50,889
170	Max. 181	2.8 - 4.4	752	Max. 1,266	Max. 400	Max. 61,895
	Min. 1			Min. 123	Min. 2	Min. 750
	Ave. 62			Ave. 1,014	Ave. 130	Ave. 2,790
169	Max. 1,530	3.0 - 4.1	1,984	Max. 920	Max. 150	Max. 3,000
	Min. 39			Min. 5	Min. 36	Min. 900
	Ave. 373			Ave. 441	Ave. 99	Ave. 1,482

Table 70 Continued

Water Quality Data

Lower Portion, Yellow Creek Watershed

Sampling Station	Flow GPM	pH Range	Acid Load Lbs./Day	Acidity Mg./L.	Iron Mg./L.	Sulfate Mg./L.
168	Max. 200	3.4 - 4.6	137	Max. 630	Max. 260	Max. 1,625
	Min. 1			Min. 0	Min. 11	Min. 625
	Ave. 50			Ave. 227	Ave. 22	Ave. 797
159	Max. 32	3.3 - 4.0	72	Max. 1,046	Max. 1,600	Max. 3,000
	Min. 6			Min. 410	Min. 60	Min. 875
	Ave. 10			Ave. 630	Ave. 210	Ave. 1,709
158	Max. 200	3.3 - 5.6	77	Max. 550	Max. 125	Max. 1,650
	Min. 1			Min. 10	Min. 13	Min. 410
	Ave. 27			Ave. 235	Ave. 68	Ave. 797
114	Max. 983	2.8 - 4.7	1,506	Max. 2,150	Max. 500	Max. 5,000
	Min. 16			Min. 94	Min. 1	Min. 375
	Ave. 234			Ave. 679	Ave. 161	Ave. 1,743
113	Max. 181	3.8 - 5.6	48	Max. 528	Max. 87	Max. 850
	Min. 1			Min. 1	Min. 0	Min. 21
	Ave. 43			Ave. 92	Ave. 7	Ave. 183
111	Max. 602	3.0 - 4.6	299	Max. 10,600	Max. 4,200	Max. 9,250
	Min. 1			Min. 68	Min. 6	Min. 215
	Ave. 107			Ave. 231	Ave. 31	Ave. 736
109	Max. 190	2.1 - 4.1	363	Max. 2,250	Max. 1,475	Max. 3,750
	Min. 1			Min. 116	Min. 3	Min. 500
	Ave. 30			Ave. 1,004	Ave. 234	Ave. 1,531
101	Max. 190	4.5 - 7.1	4	Max. 78	Max. 3	Max. 2,100
	Min. 2			Min. 4	Min. 1	Min. 60
	Ave. 14			Ave. 25	Ave. 1	Ave. 693

Table 70 Continued

Water Quality Data

Lower Portion, Yellow Creek Watershed

Sampling Station	Flow GPM		pH Range	Acid Load Lbs./Day	Acidity Mg./L.		Iron Mg./L.		Sulfate Mg./L.	
100	Max.	664	4.4 - 5.7	8	Max.	30	Max.	0.3	Max.	100
	Min.	1			Min.	1	Min.	0.01	Min.	18
	Ave.	161			Ave.	4	Ave.	0.1	Ave.	29
98	Max.	341	4.5 - 5.7	11	Max.	68	Max.	4	Max.	1,250
	Min.	8			Min.	4	Min.	0.1	Min.	45
	Ave.	62			Ave.	15	Ave.	1	Ave.	291
97	Max.	210	2.6 - 4.4	213	Max.	880	Max.	175	Max.	2,500
	Min.	2			Min.	6	Min.	4	Min.	600
	Ave.	42			Ave.	417	Ave.	61	Ave.	1,552
96	Max.	548	2.4 - 4.1	987	Max.	3,250	Max.	700	Max.	8,750
	Min.	1			Min.	212	Min.	1	Min.	700
	Ave.	72			Ave.	1,143	Ave.	301	Ave.	2,137
95	Max.	983	3.0 - 4.6	336	Max.	1,300	Max.	165	Max.	1,500
	Min.	4			Min.	24	Min.	2	Min.	10
	Ave.	164			Ave.	170	Ave.	9	Ave.	214
94	Max.	265	4.1 - 5.8	3	Max.	10	Max.	1	Max.	110
	Min.	1			Min.	1	Min.	0	Min.	12
	Ave.	58			Ave.	4	Ave.	0.5	Ave.	36
93	Max.	1,172	3.8 - 7.0	27	Max.	182	Max.	12	Max.	400
	Min.	1			Min.	2	Min.	0.2	Min.	25
	Ave.	157			Ave.	14	Ave.	1	Ave.	100
92	Max.	265	3.0 - 4.8	21	Max.	620	Max.	22	Max.	3,755
	Min.	1			Min.	15	Min.	1	Min.	55
	Ave.	75			Ave.	23	Ave.	1	Ave.	97

Table 70 Continued

Water Quality Data

Lower Portion, Yellow Creek Watershed

Sampling Station	Flow GPM	pH Range	Acid Load Lbs./Day	Acidity Mg./L.	Iron Mg./L.	Sulfate Mg./L.
40	Max. 130 Min. 1 Ave. 27	3.1 - 5.3	19	Max. 250 Min. 2 Ave. 74	Max. 12 Min. 0.1 Ave. 2	Max. 650 Min. 90 Ave. 396
39	Max. 36 Min. 1 Ave. 10	3.1 - 4.5	32	Max. 350 Min. 2 Ave. 256	Max. 30 Min. 2 Ave. 7	Max. 1,800 Min. 550 Ave. 1,041

Plate 71 graphically illustrates the monthly relationship between stream flow, pollution load, and weather elements within the watershed based on measurements taken at Sampling Station #409 located near the mouth of Yellow Creek.

Measurements were recorded for only the later 4 months of the study period due to difficulty in establishing a gaging station on this portion of Yellow Creek.

Flow and contamination loads reached an overall high during the month of July. PH averages remained fairly constant with a low of 3.8 recorded in September. The Lower Portion of Yellow Creek contributed the following estimated percentages of flow and pollution load to the total flow and load of Two Lick Creek as measured at Sampling Station #410 at Homer City: Flow - 42%; Acidity - 66%; Iron - 38%; and Sulfate - 31%.

Yellow Creek discharged approximately 41,212,000 gallons of water per day into Two Lick Creek Proper during the study period.

d. Coal Mining Activity General

The Lower Portion of the watershed in the vicinity of Lucerne is the most extensively mined area in the Two Lick Creek Watershed.

Both the Upper Freeport (E) and Lower Kittanning (B) seams were mined. Most of the coal resources have now been exhausted.

Map Sheets 6, 9, 10, and 11, Appendix A show the locations and extent of both deep and strip mines.

Deep Mines

There are presently no deep mines in operation. Several mines operated into the late 1950's and early 1960's.

One of these, Lucerne #3, is the largest mine complex in the Two Lick Creek Watershed and extends into the Stoney Run, Cherry Run, and Lower Two Lick Creek Watersheds.

Table 71 on Page 253 lists the major abandoned mines and the following information: Type of opening, total number of openings, seam mined, maximum head, whether or not the mine is discharging mine drainage, and number of acres mined.

RELATIONSHIP BETWEEN STREAM FLOW, POLLUTION LOAD AND WEATHER ELEMENTS

STATION 409 YELLOW CREEK (Near Mouth)

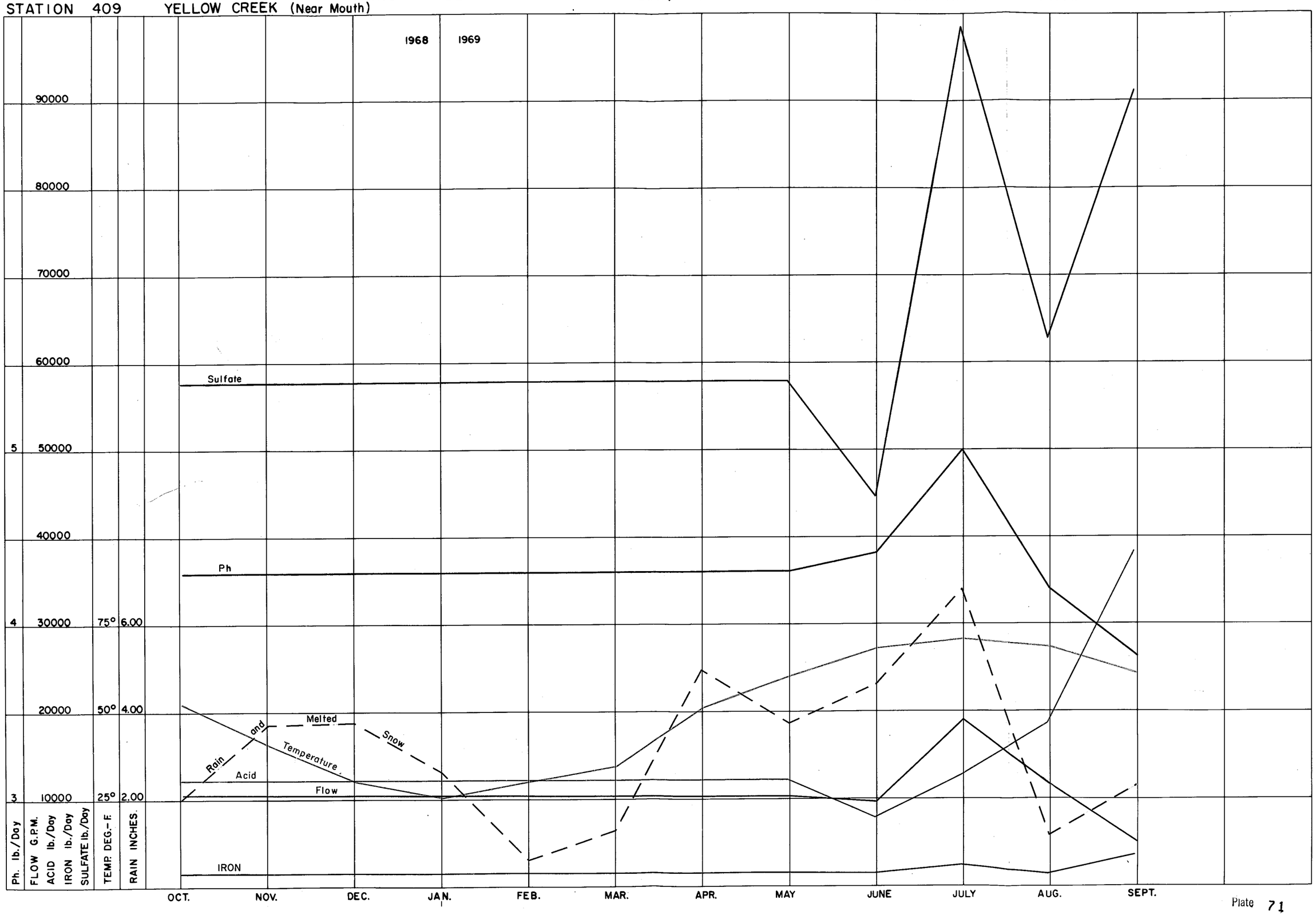


Table 71

Abandoned Mines

Lower Portion, Yellow Creek Watershed

Name of Mine	Type of Opening	Seam Mined	Draining Water	Total No. Openings	Area Mined (Acres)	Maximum Head (Feet)	
1. Lucerne #1*	Drift	E	X	6	1,396	221	
2. Lucerne #2	Drift and Churn Drill Holes	E	X	6	1,997	130	(576)**
3. Lucerne #3	Drift	E	X	3	10,070	241	
4. Snyder #2	Drift	B	-	2	2,620****	0	
5. Tide #1*	Drift	B	X	2	56	180	
6. Tide #2*	Drift	B	X	1	86	240	
7. Tide #3	Drift	E	-	4	63	27	
8. Krolick	Drift	B	X	2	84	42	
9. Judy #14	Drift	B	X	8	295	163	(27)***
10. Pete Snyder	Drift	E	X	8	98	80	
11. Mecco	Drift	E	X	3	102	265	
12. Crown Hill	Drift	B	X	4	139	174	
13. Appalachia	Drift	E	-	3	137	159	
14. Ferrier Run	Drift	B	X	2	28	22	
15. Sipos	Drift	B	X	2	7	100	

*Interconnected mines

**Figure in parenthesis is the maximum head on two churn drill holes.

***Figure in parenthesis is the local head on two drifts that are discharging mine drainage.

****Indicates total acreage of Snyder #2 with 393 acres in Tearing Run Watershed.

Coal Refuse

The most extensive coal refuse piles in the Two Lick Creek Watershed are located in the Lower Portion, Yellow Creek Watershed.

Most of the older refuse piles contain bony that has been burned or deactivated over the years.

The Lucerne Complex coal refuse pile is very large and contains a considerable amount of newly deposited and unburned material.

The locations and extent of the various coal refuse piles are shown on Map Sheet 10.

Strip Mines

Approximately 124 acres have been stripped in the Lower Portion of Yellow Creek Watershed.

Most of the strip mining was accomplished in the early 1950's when the peripheries of abandoned deep mines were mined with narrow and shallow cuts. Most of the older strips were partially backfilled and are now adequately revegetated.

Several areas where stripped in the early 1960's. These mines were much deeper and wider then the earlier strips and were backfilled and reforested in accordance with state law. Reforestation was not successful in most areas and as a result considerable erosion has taken place.

e. Description of Mine Drainage Sources

The major sources of mine drainage are listed on the following two pages in Table 72 beginning with the most serious contributor of acid load. Plates 72, 73, and 74 show the locations of the various sources.

Each source is associated with the sampling station(s) measuring the mine drainage and the respective contamination load.

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

Deep mines that are interconnected are in most cases listed collectively as one source.

Table 72

Major Mine Drainage Sources

Lower Portion, Yellow Creek Watershed

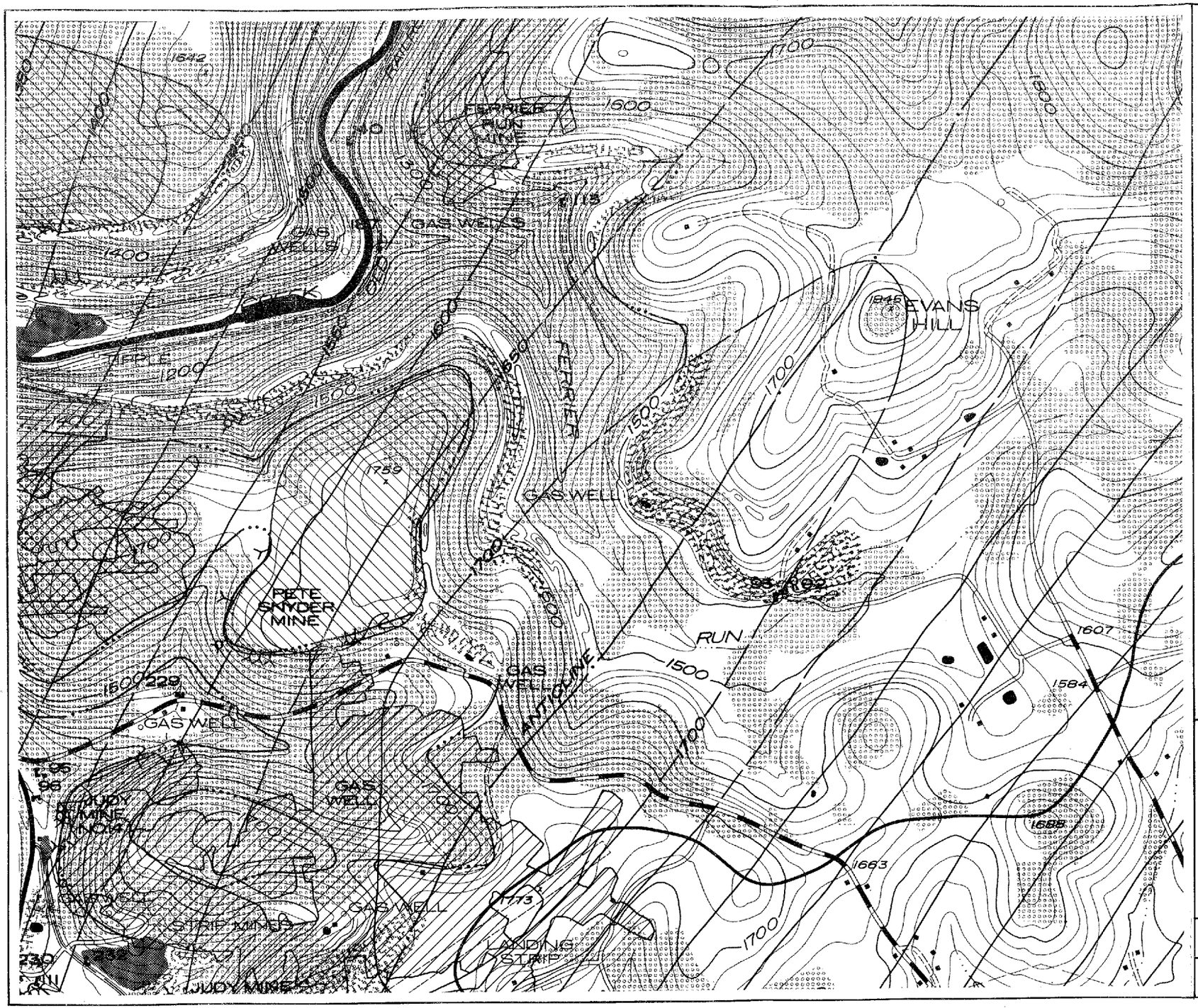
Source Description	Flow GPM	Sampling Station(s)	Pollution Load - Lbs./Day Acid	Iron	Sulfate	Combined Maximum Head (Feet)
1. Lucerne #2 Mine Churn Drill Holes	1,500	Catch Samples Estimated	17,178	4,882	42,089	576
2. Lucerne #1 and #3 Mines (Main Entry)	2,778	Catch Samples Estimated	6,700	833	33,000	241
3. Lucerne #2 Mine (Main Entries)	16	172	5,937	417	10,003	130
4. Lucerne Complex Coal Refuse Pile	1,984	409 and Estimates	4,000	500	12,000	-
5. Judy #14 Mine	116	96, 97, 232	1,412	348	1,371	163
6. Tide Complex Coal Refuse	82	170 and Estimates	1,000	100	3,000	-
7. Appalachia Mine and Coal Refuse Pile	333	Catch Samples Estimated	400	40	1,200	-
8. Krolick Mine	30	109	363	85	554	42
9. Strip Pit Coal Refuse	250	Estimated	300	30	900	-
10. Lucerne Sludge Pit (Coal Refuse)	125	Estimated	300	30	900	-

Table 72 Continued

Major Mine Drainage Sources

Lower Portion, Yellow Creek Watershed

Source Description	Flow GPM	Sampling Station(s)	Pollution Load - Lbs./Day Acid	Iron	Sulfate	Combined Maximum Head (Feet)
11. Loading Tipple and Old Railroad Bed	167	Estimated	200	20	600	-
12. Pete Snyder Mine	106	229	190	7	490	80
13. Mecco Mine	74	39, 101, 168	173	14	733	265
14. Crown Hill Mine	37	158, 159	149	46	459	174
15. Ferrier Run Strip Mine	43	113	48	3	95	-
16. Judy #14 Strip Mines	167	98 plus Estimate	30	1	220	-
17. Evans Hill Strip Mine	75	92	20	2	88	-
18. Ferrier Run Mine	27	40	19	0	103	22



LOWER YELLOW CREEK

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 UPPER FREEPORT SEAM
- COAL CONTOUR LOWER FREEPORT 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 1

LOWER YELLOW CREEK

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 UPPER FREEPORT SEAM
- COAL CONTOUR LOWER FREEPORT 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 2

LOWER YELLOW CREEK

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)
- WATERSHED PERIMETER (INTERIOR)
- COAL CONTOUR UPPER FREEPORT SEAM
- COAL CONTOUR LOWER FREEPORT 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

N

L. ROBERT KIMBALL
Consulting Engineers
EBENSBURG, PENNSYLVANIA

SHEET Nº 3

f. Recommended Abatement Procedures - Cost Benefication

Recommended abatement treatments and related costs are listed for the various sources of pollution in Table 73.

All treatments and costs are based on data described in Section X. A key to define the recommended abatement procedures is shown on Page 263. 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 73a 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 73

Recommended Abatement Procedures - Cost Benefication

Lower Portion, Yellow Creek Watershed

Source Name	Pollution Order	Recommended Treatment Procedures	Total Cost $	Cost Per Pound $	Total Abatement Lbs. Acid/Day
1. Ferrier Run Strip Mine	15	5A - R2	$ 1,788	$ 49.67	36
2. Krolick Mine	8	2 Seals	22,000	80.79	272
3. Judy #14 Strip Mine	16	48A - R3	2,640	117.33	22
4. Lucerne #2 Mine Churn Drill Holes	1	Plant	2,489,092	144.90	17,178
Lucerne #1 and #3 Mines	2	Plant	970,830	144.90	6,700
Lucerne #2 Mine	3	Plant	860,271	144.90	5,937
Judy #14 Mine	5	Plant	204,599	144.90	1,412
Mecco Mine	13	Plant	25,068	144.90	173
Crown Hill Mine	14	Plant	21,590	144.90	149
5. Loading Tipple and Railroad Bed	11	6A - R2 SC	35,145	234.30	150
6. Strip Pit Refuse Pile	9	9A - R1 - D - SC	56,155	249.58	225
7. Pete Snyder Mine	12	4 Seals	44,000	308.77	142
8. Lucerne Complex Refuse Pile	4	138A - RP	1,020,096	340.03	3,000
9. Lucerne Sludge Pit	10	43A - D	82,500	366.67	225
10. Tide Complex Refuse Pile	6	50A - RP	369,600	492.80	750

Table 73 Continued

Recommended Abatement Procedures - Cost Benefication

Lower Portion, Yellow Creek Watershed

Source Name	Pollution Order	Recommended Treatment Procedures	Total Cost $	Cost Per Pound $	Total Abatement Lbs. Acid/Day
11. Appalachia Refuse Pile	7	25A - R1 - D - SC	$155,023	$ 516.74	300
12. Ferrier Run Mine	18	2 Seals	22,000	1,538.46	14
Total all Sources			$6,382,397		36,685

Table 73a

Benefication - Recommended Plans

Lower Portion, Yellow Creek 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 - 11	36,672 - 95%	7,152 - 97%	102,624 - 95%	$6,360,397
B	1 - 9	35,622 - 93%	7,047 - 96%	99,474 - 92%	5,835,774

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