

SWAMP CREEK SUB-BASIN

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## SWAMP CREEK SUB-BASIN

### Discussion of Sub-Basin

Swamp Creek has a total drainage area of approximately 3, 275 acres. Approximately a mile upstream from the mouth, the stream is bifurcated into an east and a west branch. East Branch Swamp Creek has a drainage area of about 1, 580 acres and the drainage area of West Branch Swamp Creek contains about 787 acres. There are 15 significant sources of acid mine drainage within or partly within the Swamp Creek Sub-Basin and most of the sources are above the confluence of the east and west branches. The acid discharges from these sources are responsible for almost half the total acid mine drainage pollution in the East Branch Clarion River Watershed.

### Water Quality Sampling Stations

Seven sampling stations were established in the sub-basin to determine the sources of acid mine drainage and the pollutional effects of each source on the water quality of Swamp Creek and the East Branch Reservoir.

The location, drainage area, summary of water quality test results, and sources of pollution with the drainage area, for each of the sampling stations are:

Station 5912 was located on West Branch Swamp Creek at the downstream end of a culvert under the Baltimore and Ohio Railroad embankment which at this point is 850 feet south of Legislative Route 24011. The drainage area is approximately 147 acres and the sampling station received the acid discharges from the site of a former coal processing plant operated by the Wabash Ridge Corporation (Area 3), a stretch of lowland below the site of the coal processing plant in which the soil has been affected by acid discharges (Area 4), and a swampy area above the Baltimore and Ohio Railroad embankment which has an irregular, thin cover of culm and fine coal mixed with silt (Area 5).

Station 5912 was sampled 23 times between November 29, 1968 and December 18, 1969 and the maximum acid load was 4, 062 lbs. per day on November 29, 1968, Ten of the water quality tests indicated the acid load was over 1, 500 lbs. per day and for 15 of the tests the acid load was over 650 lbs. per day. In all but four of the water quality test results, the acid load exceeded 200 lbs. per day.

Minimum and maximum values of the water quality tests were as follows:

	<u>Minimum</u>	<u>Maximum</u>
pH	2.60	3.30
Total Acidity (mg/l)	170.0	1840.0
Free Acidity (mg/l)	123.0	1210.0
Alkalinity (mg/l)	0.0	0.0
Sulfate (mg/l)	172.	2063.
Total Iron (mg/l)	39.48	385.40
Manganese (mg/l)	1.0	3.5
Flow (cfs)	0.02	1.70

Station 5913 was located on a western tributary of East Branch Swamp Creek just north of Legislative Route 24011 and approximately 150 feet west of a culvert that collects this drainage and carries it south of the roadway. The drainage area at this point is about 50 acres. The sampling station received the drainage from the site where the Wabash Ridge Corporation had their settling ponds (Area 1) and an area of swampy ground below the settling ponds and north of Legislative Route 24011 which received the acid discharges from the settling ponds (part of Area 2). Area 2 has a thin covering of culm and fine coal mixed with silt and contains many dead trees.

Station 5913 was sampled 21 times between November 20, 1968 and December 18, 1969. It is estimated the average daily acid discharge was about 35 lbs. per day but occasionally it was as high as 100 lbs. per day. Water quality tests indicated the following minimum and maximum values.

	<u>Minimum</u>	<u>Maximum</u>
pH	2.95	3.75
Total Acidity (mg/l)	45.0	289.0
Free Acidity (mg/l)	15.0	187.0
Alkalinity (mg/l)	0.0	0.0
Sulfate (mg/l)	72.	361.
Total Iron (mg/l)	0.74	31.96
Manganese (mg/l)	1.6	5.7
Flow (cfs)	0.02	1.55

Station 5914 was located near the mouth of West Branch Swamp Creek at the downstream end of a culvert under Township Road 367. The drainage area at this point is about 783 acres, West Branch Swamp Creek at Station 5914, in addition to receiving the acid discharge from sources above Station 5912, received acid mine drainage from the following sources: the western half of two strip-mines along the saddle separating the drainage of West Branch Swamp Creek from that of East Branch Swamp Creek (Areas 6 and 7), the eastern part of a strip-mine along the saddle separating the drainage of West Branch Swamp Creek from that of Johnson Run (Area 8), most of a strip-mine in the southern part of the drainage area and paralleling Township Road 367 (Area 9), a few acres of a strip-mine south of Township Road 367 (Area 10), a small part of a large strip-mine south and east of Area 10 Strip-Mine (Area 11), and the northern 600 feet of the haul road from the Area 7 Strip-Mine to Township Road 367 (Area 29).

Station 5914 was sampled 25 times between November 28, 1968 and December 18, 1969 and the acid load was 1, 100 lbs. per day or more for nine of the tests; for 12 of the water quality tests the acid load exceeded 625 lbs. per day. The maximum acid load was 2, 270 lbs. per day on November 19, 1969 and on this day, the water quality test result for the sample taken at Station 5912 showed an acid load of 1, 515 lbs. per day, 775 lbs. per day less than Station 5914. Following are the minimum and maximum water quality test results:

	<u>Minimum</u>	<u>Maximum</u>
pH	3.00	3.75
Total Acidity (mg/l)	41.0	240.0
Free Acidity (mg/l)	23.0	180.0
Alkalinity (mg/l)	0.0	0.0
Sulfate (mg/l)	82.	550.
Total Iron (mg/l)	1.41	27.26
Manganese (mg/l)	2.8	21.0
Flow (cfs)	0.08	4.19

Station 5915 was located on East Branch Swamp Creek just upstream of the bridge spanning Township Road 367. The sampling station was about 950 feet northeast of the confluence of the east and west branches and the drainage area at this point is about 1, 575 acres. East Branch Swamp Creek at Station 5915, in addition to receiving the acid discharges from sources above Station 5913 and the remainder of Area 2, received acid mine drainage from the following sources: the eastern half of the two strip-mines along the saddle separating the drainage of the east and west branches of Swamp Creek (Areas 6 and 7), the northern and western parts of the largest strip-mined area in the East Branch Clarion River Watershed (Area 14), some mine waste material along Township Road 374 North (Area 26), a haul road from the Area 6 strip-mine to Legislative Route 24011 (Area 28), the southern 1, 000 feet of the haul road from the Area 7 Strip-Mine to Township Road 367 (Area 29), and an abandoned section of Township Road 374 South which was probably used as a haul road (Area 31).

Station 5915 was sampled 25 times between November 28, 1968 and December 18, 1969 and the maximum acid load was 3, 790 lbs. per day on February 4, 1969. Five of the water quality tests indicated the acid load exceeded 2, 000 lbs. per day and for 15 of the tests the acid load was over 900 lbs. per day. In all but four of the water quality test results, the acid load exceeded 300 lbs. per day. The ranges of the water quality test values were as follows:

	<u>Minimum</u>	<u>Maximum</u>
pH	3.25	3.75
Total Acidity (mg/l)	35.0	164.0
Free Acidity (mg/l)	16.0	79.0
Alkalinity (mg/l)	0.0	0.0
Sulfate (mg/l)	82.	748.
Total Iron (mg/l)	3.67	11.28
Manganese (mg/l)	3.3	19.0
Flow (cfs)	0.16	13.41

Station 5916 was established about 550 feet below the confluence of the east and west branches of Swamp Creek. and just south of the construction site of the mine drainage treatment plant. The drainage area at this point is about 2, 407 acres. Swamp Creek at Station 5916 measured the combined stream flow and acid discharge of the east and west branches with little additional runoff or acid mine drainage pollution between this station and Stations 5914 and 5915.

Station 5916 was sampled 24 times between November 28, 1968 and December 18, 1969 and the maximum acid load was 4, 935 lbs. per day on March 21, 1969; on February 4, 1969 the acid load was 4, 901 lbs. per day. Eight of the water quality tests indicated the acid load was over 2, 600 lbs. per day and for 13 of the tests the acid load was over 1, 800 lbs. per day. In all but five of the water quality test results the acid load exceeded 540 lbs. per day. Minimum and maximum values of the water quality tests were as follows:

Stations 5914, 5915 and 5916 were sampled on the same day 23 times. The water quality test results for 13 of the sampling days indicate the difference between the combined acid load of Stations 5914 and 5915 and the acid load at Station 5916, below the confluence of the east and west branches

	<u>Minimum</u>	<u>Maximum</u>
pH	3.20	3.65
Total Acidity (mg/l)	37.0	180.0
Free Acidity (mg/l)	19.0	95.0
Alkalinity (mg/l)	0.0	0.0
Sulfate (mg/l)	86.0	602.0
Total Iron (mg/l)	3.01	14.10
Manganese (mg/l)	2.9	16.0
Flow (cfs)	0.27	20.50

of Swamp Creek, was small; the difference ranged from -26 lbs. per day to +34 lbs. per day at Station 5916. The acid load at Station 5916 was 71 lbs. per day or greater for six of the test results (maximum 339 lbs. per day) and less by 208 lbs. per day or more for four of the tests (minimum 499 lbs. per day).

Station 5917 was located on an eastern tributary of Swamp Creek at the downstream end of a culvert under Township Road 367. The drainage area of the tributary at this point is about 42 acres and the south end of a strip-mine (Area 14) accounts for 14.3 acres.

Station 5917 was sampled 23 times between November 22, 1968 and November 19, 1969 and the acid load exceeded 20 lbs. per day for 12 of the tests; the maximum was 58 lbs. per day on April 2, 1969. The average acid load was less than 3 lbs. per day for the seven water quality test results for the period between June 13, 1969 and October 24, 1969. The average daily acid discharge was 17 lbs. per day for the year 1969. The water quality tests indicated the following minimum and maximum values.

	<u>Minimum</u>	<u>Maximum</u>
pH	3.40	4.45
Total Acidity (mg/l)	27.0	131.0
Free Acidity (mg/l)	0.5	48.0
Alkalinity (mg/l)	0.0	0.0
Sulfate (mg/l)	172.	834.
Total Iron	0.24	6.30
Manganese (mg/l)	7.5	25.0
Flow (cfs)	0.00	0.31

Station 5918 was located about a thousand feet above the mouth of Swamp Creek. The drainage area at this point contains 3,413 acres which is all but about 132 acres of the entire Swamp Creek Sub-Basin. Station 5918, in addition to receiving the acid discharges from sources above Station 5916 and Station 5917, received acid mine drainage from parts of two strip-mines (Area 11 and 12).

Station 5918 was sampled 25 times between November 28, 1968 and November 19, 1969 and the maximum acid load was 8,647 lbs. per day on July 27, 1969; the acid load exceeded 5,700 lbs. per day for six of the water quality test results. Eleven of the tests indicated the acid load was over 3,000 lbs. per day and for 16 of the tests the acid load was over 2,100 lbs. per day. For all but three of the water quality test results, the acid load exceeded 600 lbs. per day. Minimum and maximum test values were as follows

	<u>Minimum</u>	<u>Maximum</u>
pH	3.35	3.70
Total Acidity (mg/l)	39.0	135.0
Free Acidity (mg/l)	19.0	58.0
Alkalinity (mg/l)	0.0	0.0
Sulfate (mg/l)	103.	490.
Total Iron (mg/l)	2.26	12.22
Manganese (mg/l)	4.0	12.0
Flow (cfs)	0.40	34.42

## Water Quality Prior to Strip-Mining

Water quality tests made by the Pennsylvania Department of Health show that Swamp Creek had a relatively high pH and it was alkaline prior to strip-mining operations. The only exception would be the swamp area above and below Legislative Route 24011 where the water quality was marginal. The water quality deteriorated as more and more of the land was stripped for coal. Three of the sampling stations were at locations that were used in this investigation (Stations 5914, 5915 and 5916) and one of the stations is comparable to Station 5918. Their station at Legislative Route 24011 was east of Station 5913 and at this point the tributary did not receive the acid drainage from the coal processing plant.

The Pennsylvania Department of Health's Water Quality Test results for the first few years of testing are as follows:

1) East Branch Swamp Creek at Legislative Route 24011, 1150' W of Township Road 374 (North)

<u>Date</u>	<u>pH</u>	<u>Total Acidity</u>	<u>Sulfates</u>	<u>Total Iron</u>
6/10/48	5.14	6.8		
7/8/48	4.8	10.0		
5/4/50	4.95	2.0		
4/11/51	4.95	8.0		
3/10/53	4.85	8.0	25.	
7/28/53	4.35	10.0	24.	1.1
1/7/54	4.9	10.0	25.	

2) East Branch Swamp Creek at Township Road 367 - Same Location as Station 5915.

<u>Date</u>	<u>pH</u>	<u>Total Acidity</u>	<u>Sulfates</u>	<u>Total Iron</u>
7/8/48	6.43	4.0		
2/25/49	6.63	4.0		
5/4/50	4.7	8.0		
8/9/50	4.25	56.0		
9/29/50	4.61	28.0		
4/10/51	4.6	14.0		
3/10/53	4.75	28.0	105.	
7/23/53	4.1	120.0	230.	3.4



3) West Branch Swamp Creek at Township Road 367 - Same Location as Station 5914

<u>Date</u>	<u>pH</u>	<u>Total Acidity</u>	<u>Sulfates</u>	<u>Total Iron</u>
7/8/48	6.71	2.0		
4/10/51	4.58	14.0		
3/10/53	3.55	250.0	620.	
7/23/53	3.4	400.0	1000.	16.0

4) Below the Confluence of the East and West Branches - Same Location as Station 5916

<u>Date</u>	<u>pH</u>	<u>Total Acidity</u>	<u>Sulfates</u>
6/10/48	6.25	4.4	
7/8/48	6.6	2.0	
4/10/51	4.6	16.0	
5/9/54	3.34	190.0	510.

5) Swamp Creek Near the Mouth - Comparable to Station 5918

<u>Date</u>	<u>pH</u>	<u>Total Acidity</u>	<u>Sulfates</u>	<u>Total Iron</u>
6/10/48	6.3	4.0		
7/8/48	6.13	2.0		
2/25/49	5.25	6.0		
4/11/51	4.1	12.0		
3/12/53	3.55	88.0	200.	
7/24/53	3.6	210.0	350.	3.4

## Sources of Pollution

### AREAS 1 & 2

Areas 1 and 2 are located in the headwaters of a western tributary of East Branch Swamp Creek. Area 1, covering about 17.4 acres, was the site of two settling ponds used by the Wabash Ridge Corporation when their coal processing plant was in operation. Area 2 is just below the site of the settling ponds and covers about 3.2 acres in which all vegetation has been killed by acid discharges from the ponds and there presently exists a thin deposit of culm and fine coal mixed with silt.

The coal processing plant first went into operation in 1950 and the settling ponds, each with a capacity of about 10 million gallons, were probably the largest single source of acid mine drainage pollution in the Swamp Creek Sub-Basin, at least to the year 1956 (See Table 3).

In January, 1956, the Sanitary Water Board issued orders to the Corporation that there should be no further discharge of acid waste water from the processing plant to the waters of the Commonwealth "by seepage, direct overflow or otherwise." The Wabash Ridge Corporation submitted a proposal in March, 1956, that, in their opinion, would prevent further acid discharges. The scheme consisted of a closed water system within the coal processing plant, i.e., recirculation and reuse of the water for washing coal. A settling tank was to be used for the collection of fine solids from the circulating water and the fine material would then be placed on stock piles of slack coal or returned to the strip pits for burial. The system required lime treatment of the water in order to prevent corrosion of plant equipment. It was expected there would be no normal discharge of waste water from the plant, but the upper settling pond was retained to receive such surges of waste water that might occur under unusual circumstances.

A method of disposing of the large volume of water in the settling ponds was also proposed by the Corporation. It was recommended the water be treated with hydrated lime to obtain a pH of not less than 5.5, and after such treatment, hoses were to be used to siphon water from the lower basin. After all the water was removed, the embankment of the lower settling pond was to be breached, and after the site dried out, additional lime was to be distributed on the ground. The ground was to be restored to its original contour by grading the material used in construction of the embankment,

TABLE 3  
 SAMPLE LOCATION: WABASH RIDGE CORPORATION COAL PROCESSING PLANT AT MIDMONT  
Northeast of Junction of T-372 and L.R. 24011  
 Water Quality Tests of Impounded Water in Settling Basin

PA. DEPT. OF HEALTH SAMPLE NO.	MO.	DAY	YR.	pH	TOTAL ACID MG/L	ALK. MG/L	SO4 MG/L	TOTAL IRON MG/L	REMARKS
436	9	27	55	2.3	7220.0	-3800.0	8200.0	1910.0	Upper Settling Basin
437	9	27	55	2.3	2560.0	-1030.0	4600.0	299.0	Lower Settling Basin
870	7	19	56	2.8	4690.0	-2530.0	3725.0	1088.0	Upper Settling Basin
871	7	19	56	2.98	1480.0	-568.0	1800.0	171.0	Lower Settling Basin
936	8	15	56	2.80	3890.0	-2100.0	3450.0	950.0	Settling Basin # 1
998	10	31	56	2.88	5070.0	-2690.0	5350.0	1238.0	Settling Basin # 1
1171	4	9	57	3.12	3000.0	-1400.0	3210.0	828.0	Settling Basin
1285	5	16	57	2.84	4000.0	-1780.0	3940.0	849.0	Settling Basin
2026	4	9	59	2.65	1800.0	-140.0	1863.0	548.0	Settling Basin
2292	9	11	59	2.7	18460.0	-1260.0	25000.0	5880.0	Settling Basin
2720	8	4	60	2.81	1447.0	-1280.0	12900.0	4542.0	Settling Basin
2757	8	31	60	2.22	8100.0	-4560	9950.0	1996.0	Settling Basin

The Bureau of Engineering, Pennsylvania Department of Health, recommended the proposal be approved as a procedure complying with the Sanitary Water Board's order. It is assumed the methods proposed by the Wabash Ridge Corporation for restoration of the lower settling pond area were used, and that later when they abandoned the operation, a similar method was used in restoring the upper settling pond area.

Aerial photographs, made for the U. S. Department of Agriculture in July, 1959, show a large volume of water in the upper settling pond and the lower pond area graded.

The Pennsylvania Department of Health reported the Wabash Ridge Corporation was dissolved several years ago, but according to the Elk County Tax Assessor, this property is still being carried on the tax rolls as belonging to the Corporation and taxes are being paid. It is doubtful this area will again be used as a site for the construction of settling ponds because of the more stringent regulations on discharging acid mine drainage.

The investigation of the area showed very little coal waste exposed on the surface, and it appears that some effort was made to cover the bottom of the ponds, but it should be pointed out that the proposed methods of restoring the area did not call for removal of the fine coal sediments in the bottom of the ponds.

Recommended Abatement Measures - The average acid discharge from these sources is estimated, on the basis of water quality tests performed over a one year period, to be approximately 50 lbs. per day or less than 1.0 percent of the total average daily acid load contributed by pollution sources in the East Branch Clarion River Watershed. If soil erosion continues in Area 1, and the fine culm and coal sediments are exposed this area could become a major source of pollution.

It is recommended that grading be done in Area 1 to improve drainage and to cover coal waste exposures. In Area 2, the dead trees and thin culm and fine coal mixed with silt should be removed. Areas 1 and 2 should be seeded to grass and legumes. The reclamation requirements are as follows:

#### Reclamation Requirements

##### Earthwork

Area 1 Contour grading to improve drainage and to cover coal waste exposures.

17.4 Ac.

Area 2 Clearing and grubbing of dead trees and thin culm deposit. Ditch and channel grading.

Soil Treatment

Areas 1 and 2

Standard Ground Limestone (Total application 7 tons per Ac. to contain a minimum of 240 lbs. magnesium per Acre.)

50-200-200 in lbs. N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O per Ac.

Planting

Area 1	Creeping red fescue	15 lbs. per Ac.
	Birdsfoot trefoil (Viking or Empire)	10 lbs. per Ac.
Area 2	Reed canarygrass	15 lbs. per Ac.

Mulching

Area 1	Hay	2 Tons per Ac.
Area 2	None	

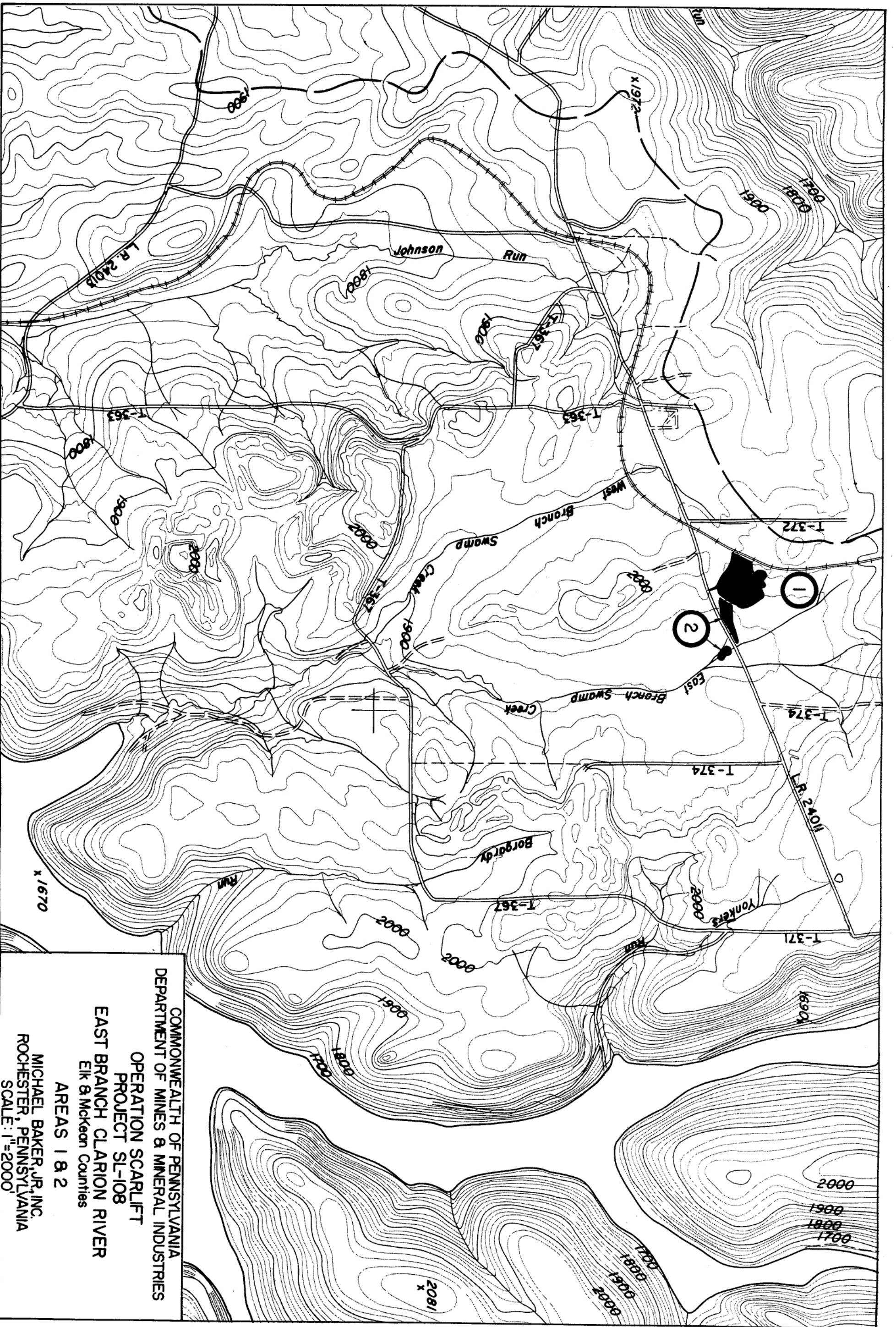
Special Requirements

The excavated material shall be dumped into the pit in the northeastern part of the Area 11 Strip-Mine.

Grading shall be done just prior to soil treatment and planting. Limestone and fertilizer in separate applications shall be spread and incorporated into the soil to a minimum depth of 4 inches. Seed shall be applied by disc drill or comparable method.

Cost of Methods of Abatement

<u>Description</u>	<u>Estimated Percent Abatement</u>	<u>Estimated Cost</u>
<u>AREA 1</u>		
Contour grading, soil treatment and planting	65%	\$10,000
<u>AREA 2</u>		
Remove culm deposit, improve drainage soil treatment and planting	90%	\$ 4,800



COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF MINES & MINERAL INDUSTRIES

OPERATION SCARLIFT  
 PROJECT SL-108  
 EAST BRANCH CLARION RIVER  
 Elk & Mckean Counties

AREAS 1 & 2  
 MICHAEL BAKER, JR., INC.  
 ROCHESTER, PENNSYLVANIA  
 SCALE: 1"=2000'

## Sources of Pollution

### AREAS 3 and 4

Areas 3 and 4 are located at the headwaters of West Branch Swamp Creek. Area 3, covering about 7.1 acres, was the site of the Wabash Ridge Corporation Coal processing plant, and Area 4, just below the former plant site and covering about 0.91 acre, was affected by acid discharges from the coal processing plant.

Ten shallow borings were made by Michael Baker, Jr., Inc. at the site of the coal processing plant (Area 3) using a portable power auger. The results of the test borings indicate the area is overlain by highly objectionable coal waste material, containing a high percentage of culm and fine coal, to an average depth of 4.5 feet. The coal waste material is uncompacted and the subsurface is moist to wet. These conditions are ideal for the formation of acid waters with high total acidities. After heavy precipitation, the acid water accumulated in the coal waste is flushed out causing a large slug of acid to be emptied into West Branch Swamp Creek.

The following is a tabulation of the test boring results for Area 3. The location of the borings are shown on Map Sheet A-1 (Annendix A).

#### Portable Power Auger Borings

<u>Boring No.</u>	<u>Depth in Feet</u>	<u>Soil Classification</u>
B-1	0.0 - 2.7 2.7 - 3.0	Coal, fine, fragmental, moist Silt, sandy w/trace clay, soft, wet
B-2	0.0 - 3.7 3.7 - 4.2	Coal, fine, fragmental, damp to moist Silt, sandy w/trace clay soft, wet
B-3	0.0 - 1.9 1.9 - 2.0	Coal, fine, fragmental, damp Silt, clayey, soft, wet
B-4	0.0 - 4.8 4.8 - 5.7	Coal, fine, fragmental, moist Silt, sandy w/trace clay, soft, wet

<u>Boring No.</u>	<u>Depth in Feet</u>	<u>Soil Classification</u>
B-5	0.0 - 2.5	Coal, fine, fragmental, moist
	2.5 - 2.6	Silt, sandy, damp
B-8	0.0 - 1.0	Clay, silty and culm w/coal fragments, damp (Coal content - 40%)
	1.0 - 4.0	Culm and silt, clayey w/coal fragments, damp (Coal content-50%)
	4.0 - 5.5	Clay, silty w/culm, coal fragments and organic material, moist (Coal content-5%)
	5.5 - 6.0	Silt, clayey, damp Refusal
B-9	0.0 - 3.5	Clay, silty and culm w/coal fragments, damp (Coal content-30-40%, mostly very fine)
	3.5 - 4.0	Clay, silty w/few small coal and sandstone fragments, wet
B-10	0.0 - 1.0	Culm w/coal fragments, damp
	1.0 - 5.0	Clay, silty w/culm and coal fragments, damp (Coal content -20%)
	5.0 - 5.5	Silt, clayey and culm w/coal fragments, moist to wet (Coal content-20%)
B-11	0.0 - 1.0	Culm w/coal fragments, damp
	1.0 - 4.5	Silt, clayey w/little culm and few coal fragments, damp
	4.5 - 5.5	Clay, silty w/trace culm, coal fragments and organic material, moist
	5.5 - 6.2	Silt, Clayey, damp
	6.2 - 6.3	Shale, highly weathered, damp Refusal
B-12	0.0 - 3.0	Culm w/coal fragments, damp
	3.0 - 4.0	Clay, silty w/little culm, coal fragments and organic material, moist
	4.0 - 4.5	Silt, clayey, damp



All vegetation has. been killed in Area 4 by acid discharges from the coal processing plant site. No coal waste material was noted but some of the surface coating may be a form of "yellowboy". The overall pollutional effect is negligible and would be derived from the acid condition of the soil.

Recommended Abatement Measures - From an analysis of water quality data obtained for Station 59.12, and from test boring results

It is obvious that the site of the former coal processing plant is a major source of acid drainage. The average acid discharge from Area 3 is estimated, on the basis of water quality tests performed over a one year period, to be approximately 850 lbs. per day or over 15 percent of the total average daily acid load contributed by pollution sources in the East Branch Clarion River Watershed. The average daily acid discharge for Area 4 is estimated to be about 10 lbs. per day or less than 0, 2 percent of the total average daily acid load.

It is recommended in Area 3, the coal waste material be removed, and after removal, the area be graded to improve the drainage. Areas 3 and 4 should be seeded to grass and legumes. The reclamation requirements are as follows:

### Reclamation Requirements

#### Earthwork

Area 3	Removal of coal mine waste and trash (Estimated at 40,000 cu. yds.) Contour grading to improve drainage including reconstruction of ditch along eastside of Twp. Rd. 372 parallel to affected area.	7.1 Ac.
Area 4	None	

#### Soil Treatment

Areas 3 & 4	Standard Ground Limestone (Total application to contain a minimum of 240 lbs. magnesium per Ac.)	7-1/2 ton per Ac.
	50-200-200 in lbs. N-P <sub>2</sub> O <sub>5</sub> -K <sub>2</sub> O	per Ac.

### Planting

Areas 3 & 4

Creeping red fescue	15 lbs. per Ac.
Birdsfoot trefoil (Viking or Empire)	10 lbs. per Ac.

### Mulching

Areas 3 & 4

Hay	2 Tons per Ac.
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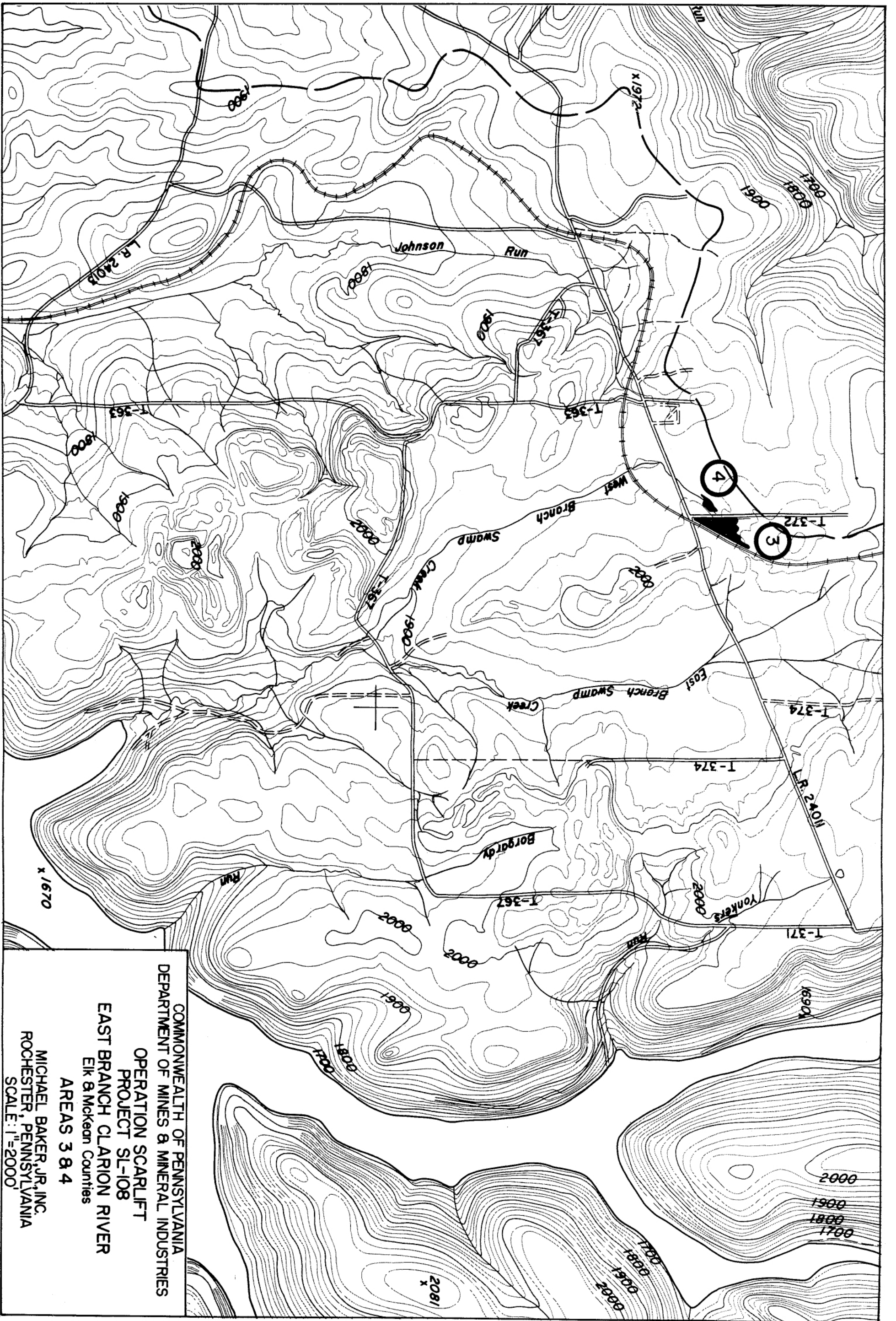
### Special Requirements

The coal mine waste and trash shall be dumped into the pit in the northeastern part of the Area 11 Strip-Mine.

Grading shall be done just prior to soil treatment and planting. Limestone and fertilizer in separate applications shall be spread and incorporated into the soil to a minimum depth of 4 inches. Seed shall be applied by disc drill or comparable method.

### Cost of Methods of Abatement

<u>Description</u>	<u>Estimate Per Cent Abatement</u>	<u>Estimated Cost</u>
<u>AREA 3</u>		
Remove coal waste material, improve drainage, soil treatment and planting	100%	\$168,000
<u>AREA 4</u>		
Soil Treatment and Planting	65%	1,200



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 OPERATION SCARLIFT  
 PROJECT SL-108  
 EAST BRANCH CLARION RIVER  
 Elk & McKean Counties  
 AREAS 3 & 4  
 MICHAEL BAKER JR., INC.  
 ROCHESTER, PENNSYLVANIA  
 SCALE: 1"=2000'



Source of Pollution

AREA 5

Area 5 is located in the headwaters of West Branch Swamp Creek just below Area 4 and downstream to the embankment of the Baltimore and Ohio Railroad, It is a swampy area in which about 7.9 acres are covered by a thin, irregular deposit of culm and fine coal mixed with silt. This deposit is the result of uncontrolled acid discharges from the coal processing plant. Six shallow borings were made in this area using a portable power auger and it was determined this deposit is mostly less than 0.5 feet thick.

The following is a tabulation of the test boring results for Area 5. The location of the borings are shown on Map Sheet A-4 (Appendix A).

Portable Power Auger Borings

<u>Boring No.</u>	<u>Depth in Feet</u>	<u>Soil Classification</u>
B-6	0.0 - 0.5 0.5 - 4.0	Sand, fine, loose, moist Silt, clayey, slightly organic, soft, wet below 2.5'
B-7	0.0 - 0.5 0.5 - 2.3	Sand, fine, loose, moist Silt and clay, soft, wet
C-1	0.0 - 2.2	Silt, w/little to some clay, and and organic material, culm and coal fragments on surface, soft to medium stiff, wet.
C-2	0.0 - 3.3	Silt, clayey and organic w/ trace sand layers, mud cracked at surface, soft, wet

<u>Boring No.</u>	<u>Depth in Feet</u>	<u>Soil Classification</u>
C-3	0.0 - 0.5	Sand, fine to medium w/trace culm and coal fragments, loose, moist to wet (this material irregularly distributed near or on surface as channel deposit)
C-4	0.0 - 1.0  1.0 - 4.0	Culm and silt, sandy interbedded in thin layers, saturated No recovery

Recommended Abatement Measures - The average acid discharge from this source is estimated, on the basis of water quality tests performed over a one year period, to be approximately 90 lbs. per day or about 1.5 percent of the total average daily acid load contributed by pollution sources in the East Branch Clarion River Watershed.

It is recommended the coal waste material be covered and grading be done to establish a well defined channel. Reed canary grass is recommended for slope protection because of its tolerance for wet conditions. The reclamation requirements are as follows:

### Reclamation Requirements

#### Earthwork

Grading using an estimated 15,000 cu. yds. of earth to cover the thin culm and fine coat mixed with silt. Grading should establish a well defined channel from L. R. 24011 to the culvert at the railroad embankment and the graded area shall slope toward the channel

#### Soil Treatment

Standard Ground Limestone 7 tons per Ac.  
(Total application to contain a minimum of 240 lbs. magnesium per Ac.)

50-200-200 in lbs. N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O per Ac.

Planting

Reed Canarygrass	20 lbs. per Ac.
Redtop	3 lbs. per Ac.

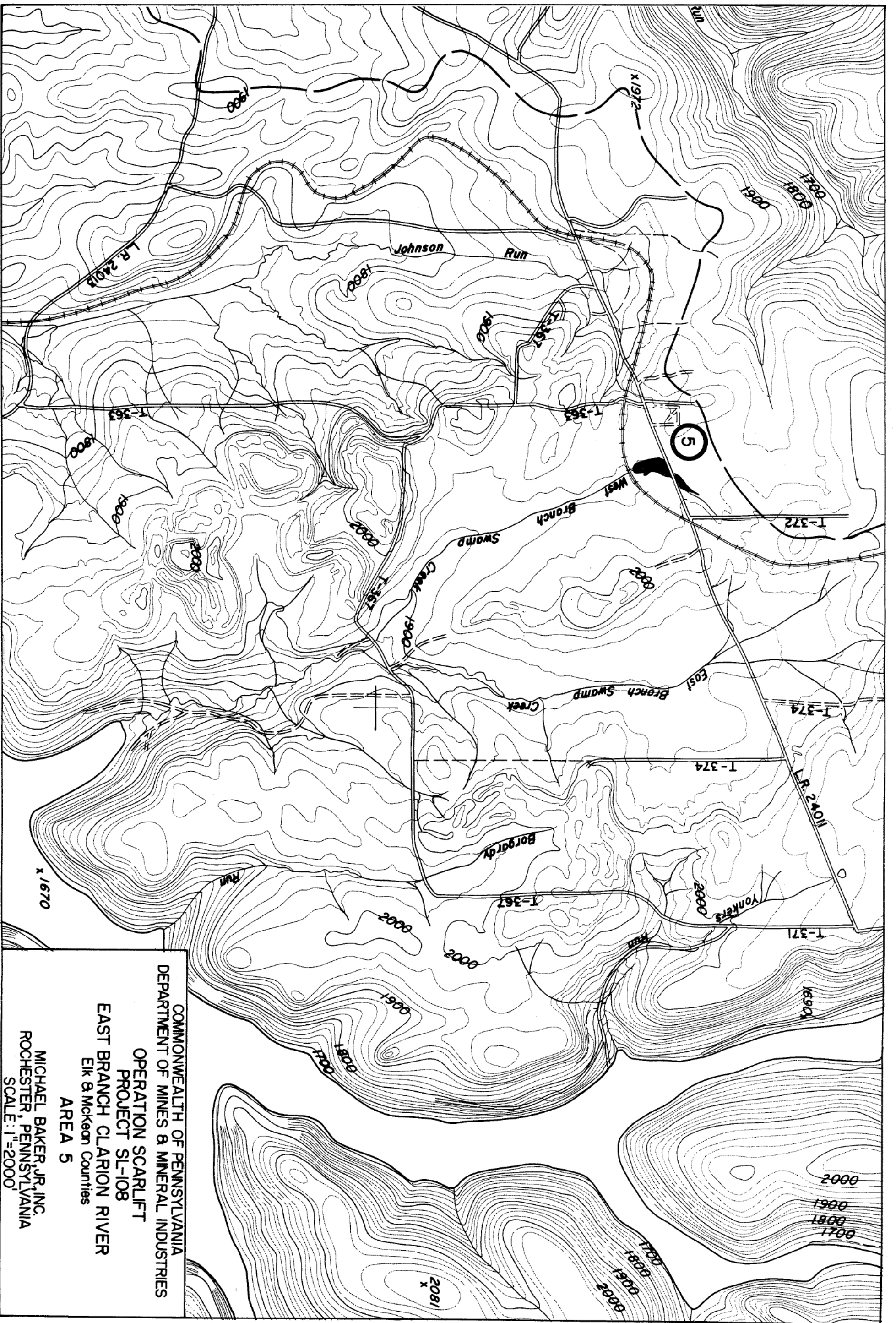
Special Requirements

This area should not be seeded until the later part of July. Grading and soil treatment shall be done just prior to seeding. Limestone and fertilizer in separate application shall be spread and incorporated into the soil to a minimum depth of 4 inches. Seed shall be applied by disc drill or comparable method.

It is recommended that the Contractor first establish the channel allowing enough time for the area to be drained.

Cost of Methods of Abatement

<u>Description</u>	<u>Estimated Percent Abatement</u>	<u>Estimated Cost</u>
<u>AREA 5</u>		
Cover coal waste material, improve drainage, soil treatment and planting	90%	\$42,000



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 AREA 5  
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 ROCHESTER, PENNSYLVANIA  
 SCALE: 1"=2000'





Source of Pollution

AREA 6

Area 6 is a 24 acre strip-mine located along the saddle separating the drainage of the east and west branches of Swamp Creek. This area was stripped for the Lower Kittanning Coal, probably by the Wabash Ridge Corporation.

The strip-mine can be conveniently divided in half by an east-west property line fence. The 12 acres north of the fence have a light to moderate tree cover, but there is very little ground cover and some areas have traces of coaly material at the surface. The south 12 acres are barren except for some poverty grass, ferns and an annual sage.

Intermittent acid seepage from Area 6 was noted at two locations, and during rainfall seepage of short duration occurs at a number of places.

Recommended Abatement Measures - The average acid discharge from this source is estimated, on the basis of water quality tests performed over a one year period, to be approximately 120 lbs. per day or about 2 percent of the total average daily acid load contributed by pollution sources in the East Branch Clarion River Watershed.

For the purpose of making reclamation recommendations, the source is divided into a north area and a south area separated by the property line fence. The reclamation requirements are as follows:

Reclamation Requirements

Earthwork

North Area	None
South Area	Grading prior to soil treatment of areas, gullied by erosion and to improve drainage

Soil Treatment

North Area	Standard Ground Limestone	6 tons per Ac.
	(Total application to contain a minimum of 240 lbs. magnesium per Ac.)	
	50-200-200 in lbs. N-P <sub>2</sub> O <sub>5</sub> -K <sub>2</sub> O	per Ac.

South Area      Standard Ground Limestone      7 tons per Ac.  
 (Total application to contain a  
 minimum of 240 lbs. magnesium  
 per Ac.)  
 50-200-200 in lbs. N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O      per Ac.

Planting

Areas North and South

Creeping red fescue      30 lbs. per Ac.  
 Birdsfoot trefoil (Viking or Empire) 10 lbs. per Ac.

Mulching

North Area      None  
 South Area      Hay      2 Tons per Ac.

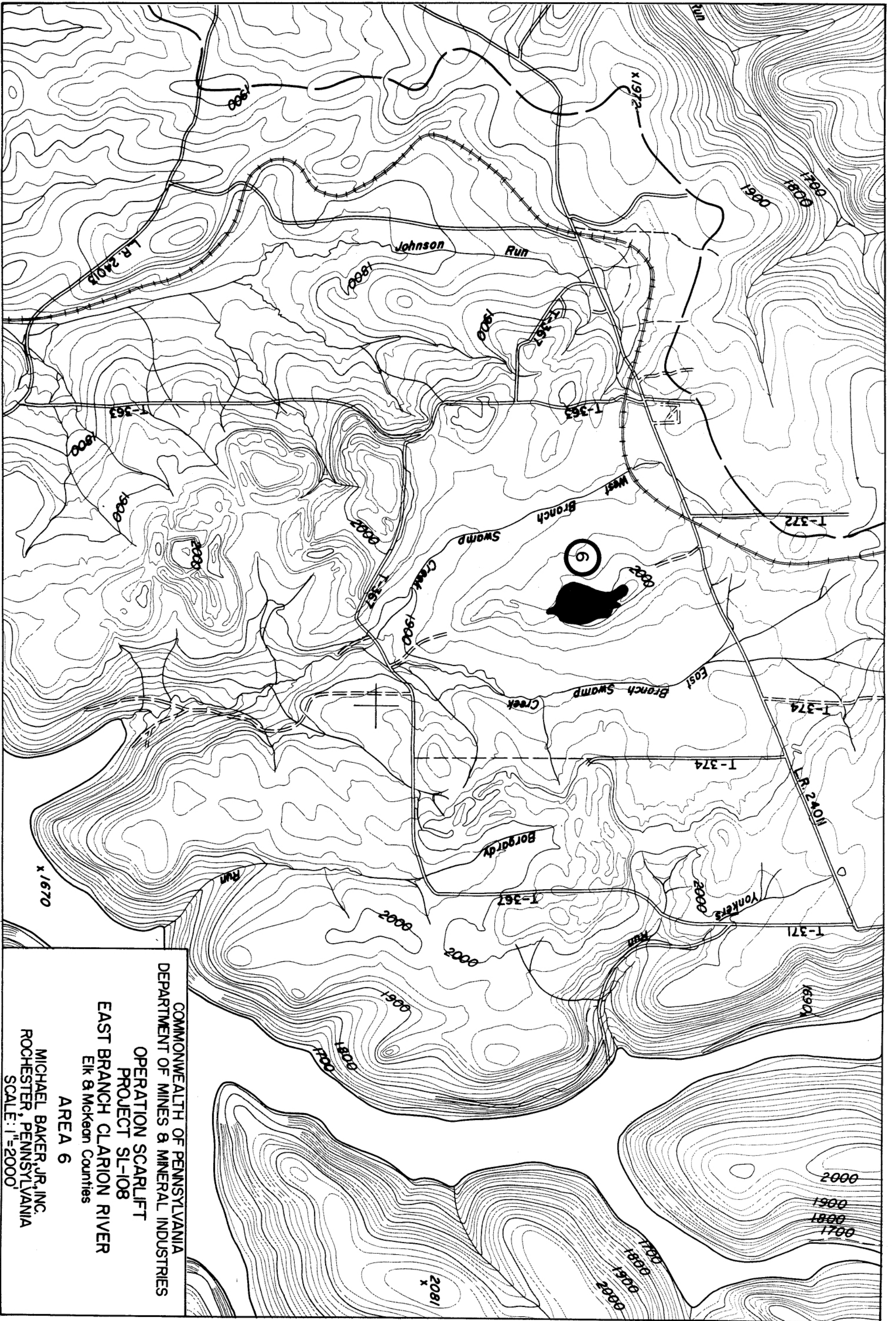
Special Requirements

North Area      Limestone shall be applied using a blowing  
 method or by hand. Seed and 25-100-100  
 lbs. of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O per Ac. shall be  
 hydroseeded in one application in the spring.  
 The remainder of the fertilizer, 25-100-100 Lbs.  
 per Ac. shall be applied in the fall after  
 the seeding has become established.

South Area      Limestone and fertilizer in separate applications  
 shall be spread and incorporated into the soil  
 to a minimum depth of 4 inches. Seed shall be  
 applied by disc drill or comparable method.

Cost of Methods of Abatement

Description	Estimated Percent Abatement	Estimated Cost
<u>AREA 6 (North)</u>		
Soil Treatment and Planting	65%	\$6,000
<u>AREA 6 (South)</u>		
Grading to improve drainage, soil treatment and planting	65%	\$8,000



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AREA 6  
MICHAEL BAKER, JR., INC.  
ROCHESTER, PENNSYLVANIA  
SCALE: 1"=2000'



Source of Pollution

AREA 7

Area 7 is a 14.9 acre strip-mine along the saddle separating the drainage of the east and west branches of Swamp Creek. This strip-mine is just south of the Area 6 strip-mine. The Lower Kittanning Coal was stripped from this area, probably by the Wabash Ridge Corporation.

There are no trees and the area is barren except for some poverty grass, ferns and an annual sage. Intermittent acid seepage occurs at several places and during rainfall ponding occurs in some areas.

Recommended Abatement Measures - The average acid discharge from this source is estimated, on the basis of water quality tests performed over a one year period, to be approximately 90 lbs. per day or less than 2 percent of the total average daily acid load contributed by pollution sources in the East Branch Clarion River Watershed.

It is recommended that the area be graded to improve drainage and to remove irregularities in the ground surface. The reclamation requirements are as follows:

Reclamation Requirements

Earthwork

Grading prior to soil treatment of areas gullied by erosion and to improve drainage.

Soil Treatment

Standard Ground Limestone 6 Tons per Ac.  
(Total application to contain a minimum of 240 lbs. magnesium per Ac.)

50-200-200 in lbs. N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O per Ac.

Planting

Creeping red fescue 30 lbs. per Ac.  
Penngift crownvetch 10 lbs. per Ac.

Mulching

Hay

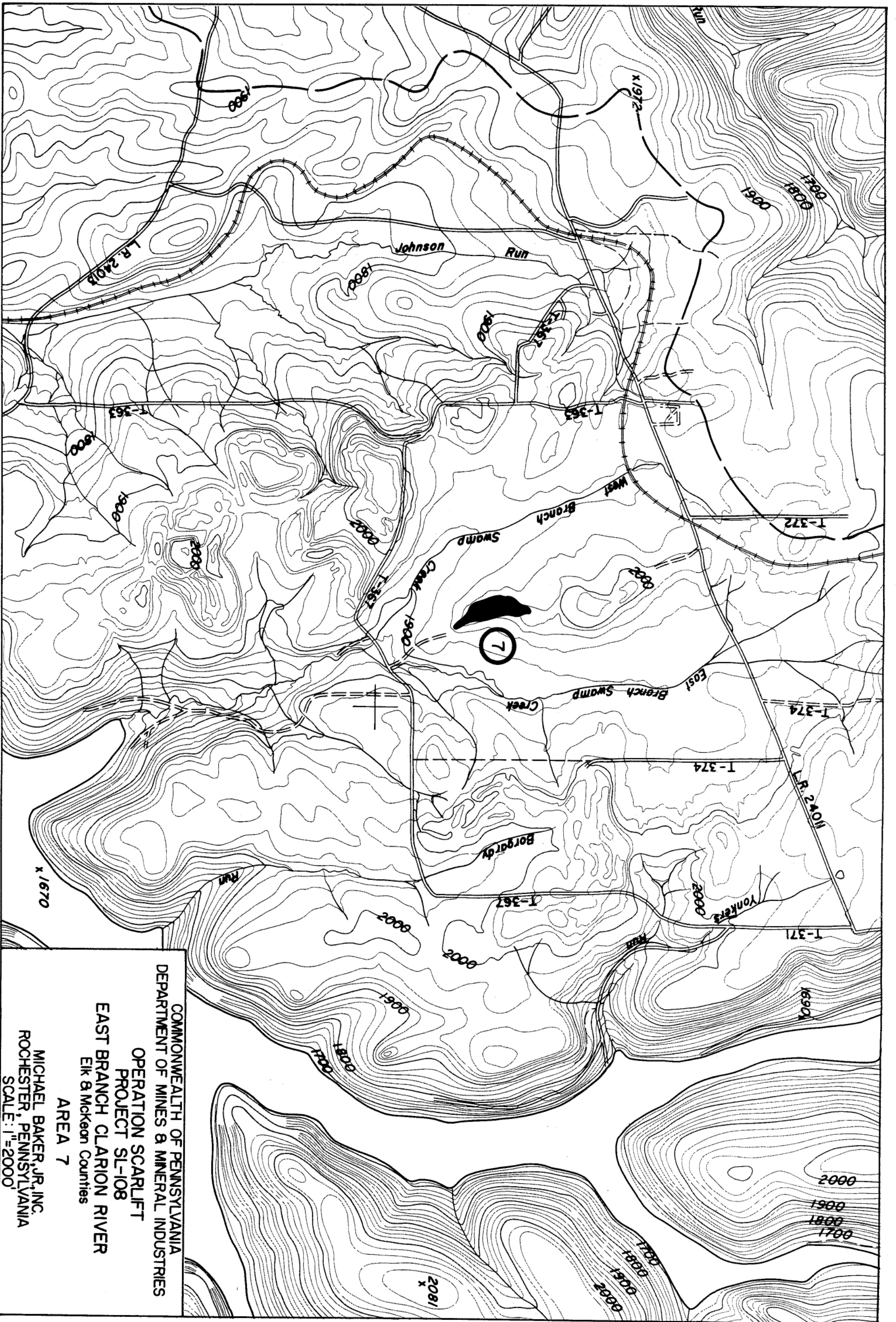
2 tons per Ac.

Special Requirements

In the fall, one half of the limestone requirement (3 tons per Ac. ) shall be spread and incorporated into the soil to a minimum depth of 4 inches. In the spring, the other half of the limestone and the fertilizer requirement, in separate applications, shall be spread and incorporated into the soil to a minimum depth of 4 inches. Seed shall be applied by disc drill or comparable method.

Cost of Methods of Abatement

<u>Description</u>	<u>Estimated Percent Abatement</u>	<u>Estimated Cost</u>
<u>AREA 7</u>		
Graded to improve drainage, soil treatment and planting	65%	\$9,000



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 AREA 7  
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 ROCHESTER, PENNSYLVANIA  
 SCALE: 1"=2000'



## Sources of Pollution

### AREA 8

Area 8 is a strip-mine on a hilltop between the Johnson Run and the Swamp Creek sub-basins. The strip-mine has an area of approximately 23.5 acres and about 40 percent of the strip-mine is in the West Branch Swamp Creek drainage area.

The area was stripped for the Lower Kittanning Coal by the Juliette Coal Company which was dissolved a number of years ago.

Water quality test data from Station 5902 in the Johnson Run Sub-Basin indicated this source produces significant acid discharges. Station 5902 was located at a culvert under Township Road 363 and measured part of the acid discharges from this source. The station was sampled 26 times during a one year period and the acid load was found to be highly variable and ranged from 3 lbs. per day to 614 lbs. per day. The larger acid loads occurred from late March to late April and corresponded to the spring thaw. Based on the assumed direction of dip of the coal seam, it appears most of the acid flow is toward the Johnson Run Sub-Basin.

There are some small trees, such as scotch pine, larch, aspen and sumac growing on the strip-mine but there is little ground cover, although in places, poverty grass, annual sage, blackberry and weeds are growing. There are traces of coaly material on the steep western slope parallel to Township Road 363 and some ponding near the road. It appears the owner is attempting to improve the area as there have been several plantings of evergreen seedlings, but survival and growth are poor.

Recommended Abatement Measures - The average acid discharge from this source is estimated, on the basis of water quality tests performed over a one year period, to be approximately 90 lbs. per day or about 1.5 percent of the total average daily acid load contributed by pollution sources in the East Branch Clarion River Watershed.

For the purpose of making reclamation recommendations, the strip-mine is separated into 1) a Terrace Area which is the relatively level top of the hill (12.8 acres) and 2) a Slope Area which is the steep-outer perimeter of the strip-mine (10.5 acres). The reclamation requirements are as follows:

## Reclamation Requirements

### Earthwork

Terrace None  
Slope Drainage ditch construction  
from ponded area near  
Township Road 363.

### Soil Treatment

Terrace Area Standard Ground Limestone 6 Tons per Ac.  
(Total application to contain  
a minimum of 240 lbs.  
magnesium per Ac.)  
50-200-200 in lbs. N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O Per Ac.

Slope Area Standard Ground Limestone 7-1/2 tons per Ac.  
(Total application to contain  
a minimum of 240 lbs.  
magnesium per Ac.)  
50-200-200 in lbs. N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O per Ac.

### Planting

Terrace Area Kentucky 31 tall fescue 20 lbs. per Ac.  
Birdsfoot trefoil (Viking or Empire) 10 lbs. per Ac.

Slope Area Kentucky 31 tall fescue 20 lbs. per Ac.  
Birdsfoot trefoil (Viking or Empire) 10 lbs. per Ac.

### Mulching

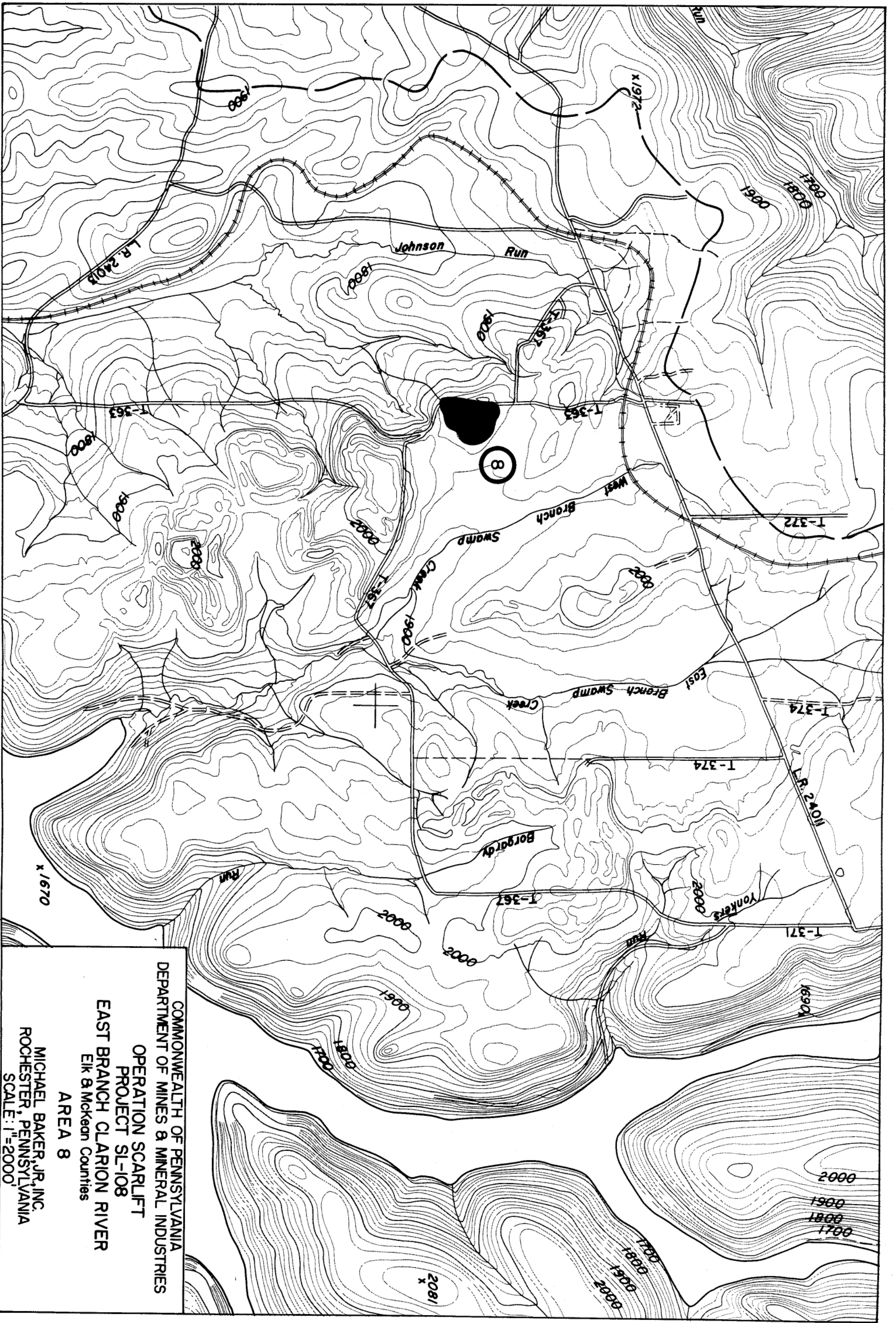
Terrace Area None  
Slope Area Wood cellulose fiber 1200 lbs. per Ac.

### Special Requirements

Limestone shall be applied using a blowing method or by hand. One half of the limestone requirement shall be applied in the fall and the remainder in the early spring before planting. Seed and 25-100-100 lbs. of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O per Ac. shall be hydroseeded in one application in the spring. The remainder of the fertilizer 25-100-100 :L., per Ac. , shall be applied in the fall after the seeding has become established.

Cost of Methods of Abatement

<u>Description</u>	<u>Estimated Percent Abatement</u>	<u>Estimated Cost</u>
<u>AREA 8 (Terrace)</u>		
Soil Treatment and Planting	65%	\$7,000
<u>AREA 8 (Slope)</u>		
Improve drainage, soil treatment and planting	65%	\$9,000



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