SECTION X

LOYALHANNA WATERSHED AMD ABATEMENT PLAN

SECTION X

LOYALHANNA WATERSHED AMD ABATEMENT PLAN

STUDY PHASE INPUTS

The following conclusions relevant to the formulation of an abatement plan may be drawn from the study phase.

1. The primary water quality related needs of the Loyalhanna watershed relate to recreation use. Water quality improvements for domestic, municipal, industrial or consumptive uses are of a much lower priority.

2. To fully utilize the waters of Loyalhanna Reservoir for water contact recreation and sport fishing the PH of the reservoir should be elevated to a PH of 6. 0, or at least maintained at a PH of 4. 5 or higher. A higher degree of improvement is not required. The presence of mine drainage related dissolved solids does not appear to affect recreational utilization. To improve the water quality of the watershed to a lesser degree than that required for recreation use will produce no benefit.

3. The focus of potential recreation use is Loyalhanna Reservoir and Loyalhanna Creek. The water quality of tributaries to the Loyalhanna is of primary importance only as it affects mainstream water quality. .The improvement of tributary water quality non- related to the mainstream is of a much lower priority as it affects localized potential uses only.

4. Under summer conditions, if the PH of the reservoir is to be maintained at PH 6.0, the acidity of inflow cannot exceed 10 ppm. To

maintain a minimum pH of 4.5, inflow cannot exceed 20 ppm of acidity (as $CaCO_3$).

5. During the low flow period, which corresponds to the summer recreation season, inflow into Loyalhanna Reservoir decreases to an average flow of about 100 cfs. At an inflow of 100 cfs, acid inflow must be limited to 5,400 lbs. per day to maintain a pH of 6.0. An increase in acid inflow to 11,000 lbs. per day would reduce pH to 4. 5, Because of the low-flow regulation function of Loyalhanna Reservoir, the storage of dilution water to offset low flow acidity is not feasible.

6. During low flow periods, acidity inflow decreases to as little as 10,000 lbs. per day as ground water acquifers are depleted and the transport mechanisms for removing acidic materials are curtailed, Average total low flow acid discharges are about 30, 000 lbs of acid per day, excluding runoff from stormflows. To maintain a pH of 6.0, a minimum of 25,000 lbs. of acidity must be removed, neutralized or prevented from flowing into the reservoir each day.

7. The three major sources of acid mine drainage, discharges #5356, #5177 and #5364 contribute respectively 36%, 25% and 26% or a total of 87% of the average annual acid loading. During low flow periods, as upland discharges inter connected with these major discharges cease flowing, and refuse pile drainage flows decrease, these three discharges may account for almost 100% of the daily acidity flowing into the reservoir.

8. It would not be possible to reduce acid inflow to the reservoir to below 5, 000 lbs. per day unless acid discharges from all three major sources were reduced or eliminated. Reduction of flows from any of the other 57 existing discharges will be of less than significant value in maintaining reservoir water quality.

9. A secondary and sporadic source of acid discharge into the reservoir is runoff from surface gob piles. Runoff immediately after precipitation contains extremely high acid loadings on a total weight basis, but acid concentrations are equal to or less than acid concentrations which occur during dry weather. This is due to the dilution effect of runoff from areas without sources of surface pollution.

10. Due to a combination of pre-existing geological and topographic conditions and the methods of mining employed during the early exploitation of the Pittsburgh Coal Seam, effective termination of acidic flows from the three major discharges is not feasible.

11. The primary direct benefit attributable to improved water quality in Loyalhanna Creek is an additional 3,150, 000 annual recreation days possible at Loyalhanna reservoir. Secondary indirect benefits include improved recreation conditions in and along Loyalhanna Creek west of Latrobe.,

OUTLINE OF AN ABATEMENT PLAN

Major Elements

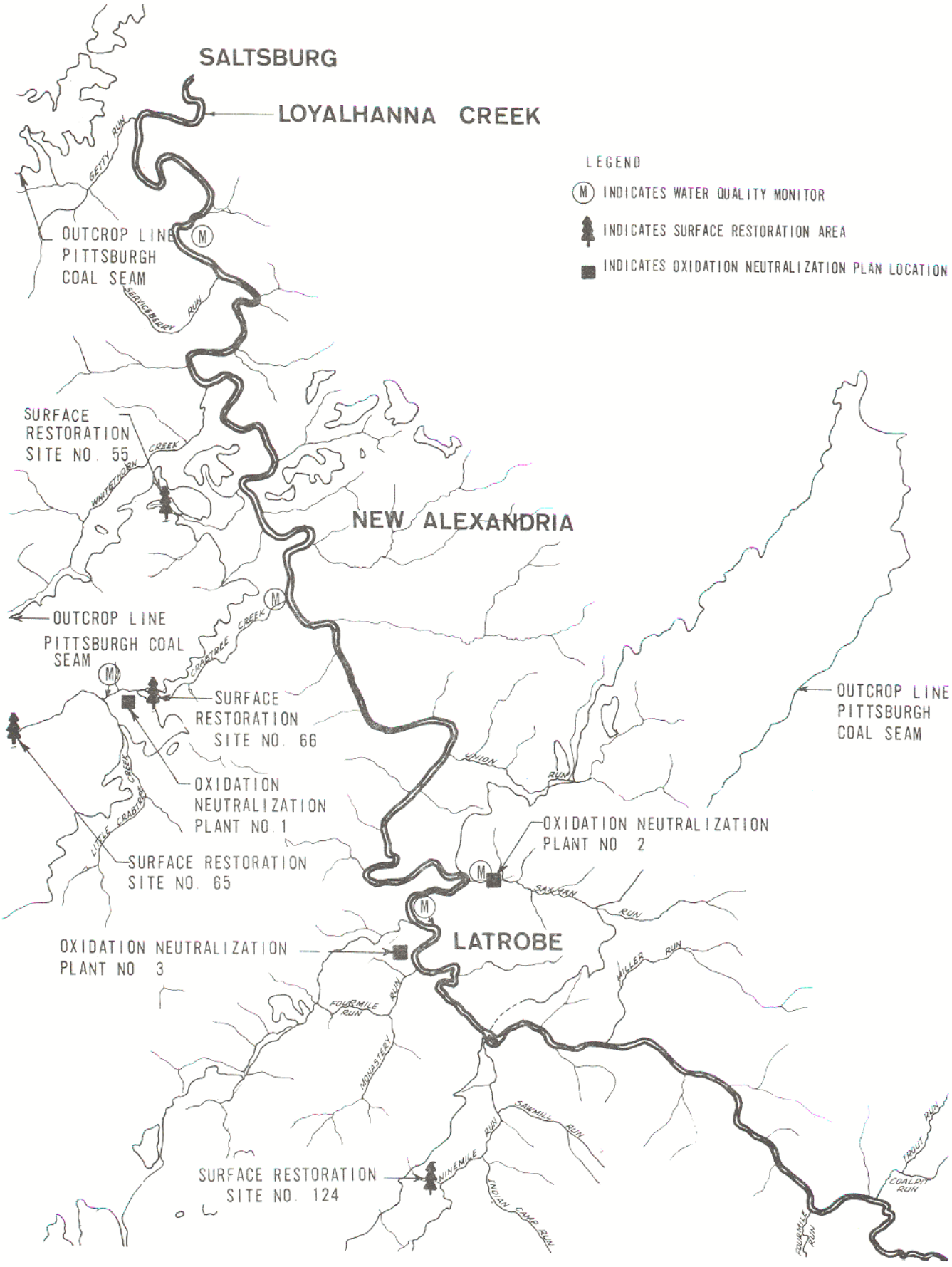
The major elements of the proposed Loyalhanna Acid Mine Drainage Abatement Plan are three neutralizationoxidation plants which will

intercept flows from the three major discharge sources and neutralize these discharges sufficiently to maintain an acceptable instrearn pH in Loyalhanna Creek and Reservoir. In conjunction with the installation of these plants it is recommended that an instream pH monitoring and feedback system be placed in the reservoir to regulate the degree of neutralization provided.

It is also proposed that as a primary abatement measure the four major surface refuse piles be regraded, sealed with flyash and revegetated. This measure will reduce the acidic contribution of first flush runoff caused by watershed precipitation and allow the utilization of runoff as a flushing medium in the reservoir.

Secondary Elements

In many instances the water quality of tributaries to Loyalhanna Creek may be improved through the installation of mine seals or the diversion of surface flows away from refuse areas. These opportunities exist primarily in the Millers Run and Hannas Run watersheds. The effects of these measures will not be sufficient to significantly alter water quality in the reservoir itself but may be of local importance. Each proposed secondary element should be evaluated in the context of local user benefit only. Other secondary plan elements consists of those miscellaneous measures which will result in a moderate increase in mainstem but are not



LOCATION OF MAJOR PLAN ELEMENTS	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X-1
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essential to the overall plan. Included in this group of measures is the elimination of borehole drainage of storm runoff and the elimination of seepage into the coal seam from artificial ponds. The elimination of these sources of mine drainage flow will not lessen the required neutralization but will reduce hydraulic loads and load fluctuation at the treatment facilities.

Optional Elements

Reference has been made to those surface features which are not major causes of water quality deterioration but which do detract from the watershed environment. These features consist of unreclaimed strip mine cuts and smaller refuse piles. Reclamation of these areas will result in only a minimal improvement of water quality but may be important in terms of the local environment.

CONSTRUCTION & ANNUAL COST ESTIMATES-MAJOR PLAN ELEMENTS

Treatment Plants

Plant #1 - Crabtree Creek east of Crabtree - Design flow 11 MGD.

	Cost Estimate	
Lagoons		
Equalization	$25,700	
Aeration	$ 3,800	
Settling	$72,500	
Total Lagoons		$102,000
Operations Building		$ 43,000
Site Preparation		$ 20,000
Equipment		
Blowers	$21,000	
Lime Bin	$16,000	
Lime Feeder	$ 3,500	
Piping	$25,000	
Instrumentation	$20,000	
Electrical	$10,000	
Total Equipment		$ 95,599
Total Construction Cost		$260,500
Total Project Cost		$390,750

Plant #2 - Saxman Run north of Latrobe - Design Flow 4. 9 MGD.

Lagoons		
Equalization	$12,610	
Aeration	$ 2,440	
Settling	$34,000	
Total Lagoons		$49,050
Operations Building		$43,000
Site Preparation		$20,000
Equipment		
Blowers	$11,000	
Lime Bin	$16,000	
Lime Feeder	$ 2,500	
Piping	$20,000	
Instrumentation	$20,000	
Electrical	$10,000	
Total Equipment		$ 79,500
Total Construction Cost		$191,550
Total Project Cost		$287,500

Plant #3 - Loyalhanna Creek at Latrobe - Design flow 4.3 MGD

	Cost Estimate	
Lagoons		
Equalization	$11,490	
Aeration	$ 2,370	
Settling	$30,500	
Total Lagoons		$ 44,360
Operations Building		$ 43,000
Site Preparation		$ 20,000
Equipment		
Blowers	$11,000	
Lime Bin	$16,000	
Lime Feeder	$ 2,500	
Piping	$20,000	
Instrumentation	$20,000	
Electrical	$10,000	
Total Equipment		$ 79,500
Total Construction Cost		$186,860
Total Project Cost		$280,000

WATER QUALITY MONITORING STATIONS:

5 Stations at the following locations @ $10,000

1) Loyalhanna Reservoir Pool	$10,000
2) Crabtree Creek at mouth	$10,000
3) Crabtree Creek at U.S. 119 Bridge	$10,000
4) Saxman Run at mouth	$10,000
5) Loyalhanna Creek at Rt. 981 Bridge	$10,000
	$50,000

Refuse Pile Treatment

Cost per acre of sealing and revegetation = $2,250

Cost per 100 linear feet of slope regrading = $0.83h^2

Refuse Pile #65 - located in the vicinity of Hannastown, source of discharge # 5355

Area	114 acres	
Height	70'	
Perimeter	7,500'	
Sealing & Revegetation cost		$257,000
Regrading cost		$300,000
Total Construction Cost		$557,000

Refuse Pile #124 - located in the vicinity of Hostetter, source of discharge #5351

Area	59 acres	
Height	70'	
Perimeter	3,800'	
Sealing & Revegetation cost		$133,000
Regrading cost		$155,000
Total Construction Cost		$288,000

Refuse Pile #66 - located near Crabtree

Area	44 acres	
Height	70'	
Perimeter	4,200'	
Sealing & Revegetation cost		$ 99,000
Regrading cost		$170,000
Total Construction Cost		$269,000

Refuse Pile #55 - located near Sheildsburg, associated with discharge #6152

Area	44 acres	
Height	70'	
Perimeter	4,000'	
Sealing & Revegetation cost		$ 99,000
Regrading cost		$163,000
Total Construction Cost		$262,000

CONSTRUCTION COST SUMMARY

Treatment Plant #1	$261,000	
Treatment Plant #2	$192,000	
Treatment Plant #3	$187,000	
Treatment Plant		$640,000
Refuse Pile Restoration		
Pile #65	$560,000	
Pile #124	$290,000	
Pile #66	$270,000	
Pile #55	$260,000	
		$1,380,000
Total Construction Cost Major Plan Elements		$2,070,000

Ratio of Total Project to Construction Cost

Assume 50% development cost surcharge to include engineering and surveying services, project administration, etc.

Estimated Project Costs

1. Treatment Facilities	$ 960,000
2. Refuse Pile Restoration	$2,075,000
3. Water Monitor System	75,000
Total Project Cost	$3,100,000

ANNUAL COST ESTIMATES

Plant #1

Fixed annual expenses:		
Personnel		
2 men @ $38.50/day		$28,000
Maintainence		$15,000
Daily expenses when operating		
Lime @ $93 / day		
Power@$119 / day		
Polyelectrolyte @ $20 day		
Daily operating expense	= $232	
x 180 operating days	=	$42,000
Annual Operating Expenses		$85,000
Annual Capital Cost Recovery @ 6%		$34,000
Total Annual Cost		$119,000

Plant #2

Fixed annual expenses:		
Personnel		
2 men @ $38.50/day		$28,000
Maintenance		$15,000
Daily Expenses when operating		
Lime @ $59 / day		
Power @ $65 / day		
Polyelectrolyte @ $20 / day		
Daily operating expense	= $144	
x 180 operating days		$26,000
Annual Operating Expense		$69,000
Annual Capital Cost Recovery		$25,000
Total Annual Cost		$94,000

Plant #3

Fixed annual expenses:

Personnel		
2 men @ 38.50/day		$28,000
Maintenance		$15,000
Daily expenses when operating		
Lime @ $81 /day		
Power @ $65/day		
Polyelectrolyte @ $20/day		
Daily operating expense =	$166	
x 180 operating days		$30,000
Annual Operating Expense		$73,000
Annual Capital Cost Recovery		$24,500
Total Annual Cost		$97,500

WATER QUALITY MONITOR SYSTEM

Annual Operating expenses included in treatment plant operation costs

Annual Capital Cost Recovery	$ 5,500

PRIMARY PLAN ELEMENTS

Summary of Annual Cost

Treatment Plants	Operating Expenses	Capital Recover	Total
#1	$85,000	$34,000	$119,000
#2	$69,000	$25,000	$ 94,000
#3	$73,000	$24,500	$ 97,500
	$227,000	$83,500	$310,500
Refuse Pile Restoration			
#65	0	$72,000	$72,000
#124	0	$38,000	$38,000
#55	0	$34,000	$34,000
#66	0	$35,000	$35,000
		$179,000	$179,000
Water Quality Monitor System		5,500	
TOTAL ANNUAL COST			$495,000
Say			$500,000

ALTERNATE ESTIMATED TREATMENT PLANT CONSTRUCTION COSTS

The estimated construction, project and annual costs of the proposed oxidation-neutralization plants have been based upon minimal realistic engineering design standards. These designs used for estimating purposes presuppose the extensive use of clay lined earthen lagoons located within the flood plains of the affected streams. The justification for the use of these minimal facilities is that 100% neutralization is not essential and that when a dilute nonbiological -non-pathological waste is being treated, a limited amount of seepage is acceptable if it substantially reduces project and construction costs. Additionally, the lagoons may be located in the flood plain because at times of flooding, the neutralization of subsurface discharges, unlike the treatment of sewage, is non-essential.

However, it is recognized that the Commonwealth may desire the substitution of lined lagoons or concrete tanks for the earthen lagoons and the upgrading of other aspects of the plant, particularly mechanical, equipment and instrumentation. This upgrading could increase the construction cost of facilities to as much as $800, 000. To demonstrate the effects upon annual cost of a 400% increase in treatment plant construction cost, a revised summary of Primary Plan Element annual costs has been calculated.

SUMMARY OF ANNUAL COSTS (UPGRADED FACILITIES)

Treatment Plants	Operating Expenses	Capital Recovery	Total
#1	$ 85,000	$136,000	$221,000
#2	69,000	100,000	169,000
#3	73,000	96,000	169,000
	$227,000	$332,000	$559,000
Refuse Pile Restoration (unchanged)	$179,000		$179,000
	Total Annual Cost		$738,000

SECONDARY PLAN ELEMENTS

As indicated in Section V, eight tributaries of Loyalhanna Creek are polluted by acid mine drainage discharges. While the abatement of AMD sources other than primary plan elements discharging into these tributaries would not greatly affect the water quality of the mainstream, the local effects of such abatement might be considered as a beneficial and worthwhile investment. Secondary plan elements are grouped below by tributary watersheds.

A. Fourmile Run Watershed

Fourmile Run water quality is affected by discharges #5352, #5359, #5360, #5361 and #5362. These discharges, with the exception of discharge #5352, are all located within a swampy area adjacent to Fourmile Run immediately upstream of St. Vincent's Lake. Dis charges #5361 and #5362 are identified as swamp areas and no single discharge source has been isolated. Discharge #5360 is a large bore hole rising into the bed of Fourmile Run. The only discharge amena- ble to abatement is #5360 which should be plugged. Abatement of mine drainage pollution is possible in the St. Vincent's Lake area by the lowering of the mine drainage water table in the Latrobe South coal mining area of the Pittsburgh Coal seam until acid discharges cease. This could be accomplished by increasing flows from discharge #5364 and monitoring the pH in St. Vincent's Lake. If the rate of flow from discharge #5364 is to be increased for this purpose, the water table should be lowered only the minimum level required to reduce the acidity of Four Mile Run.

Increases in the flow from discharge #5364 beyond that which is necessary to reduce upland discharges will serve to divert surface flows from Fourmile Run into the coal seam, diluting the strength of the discharge

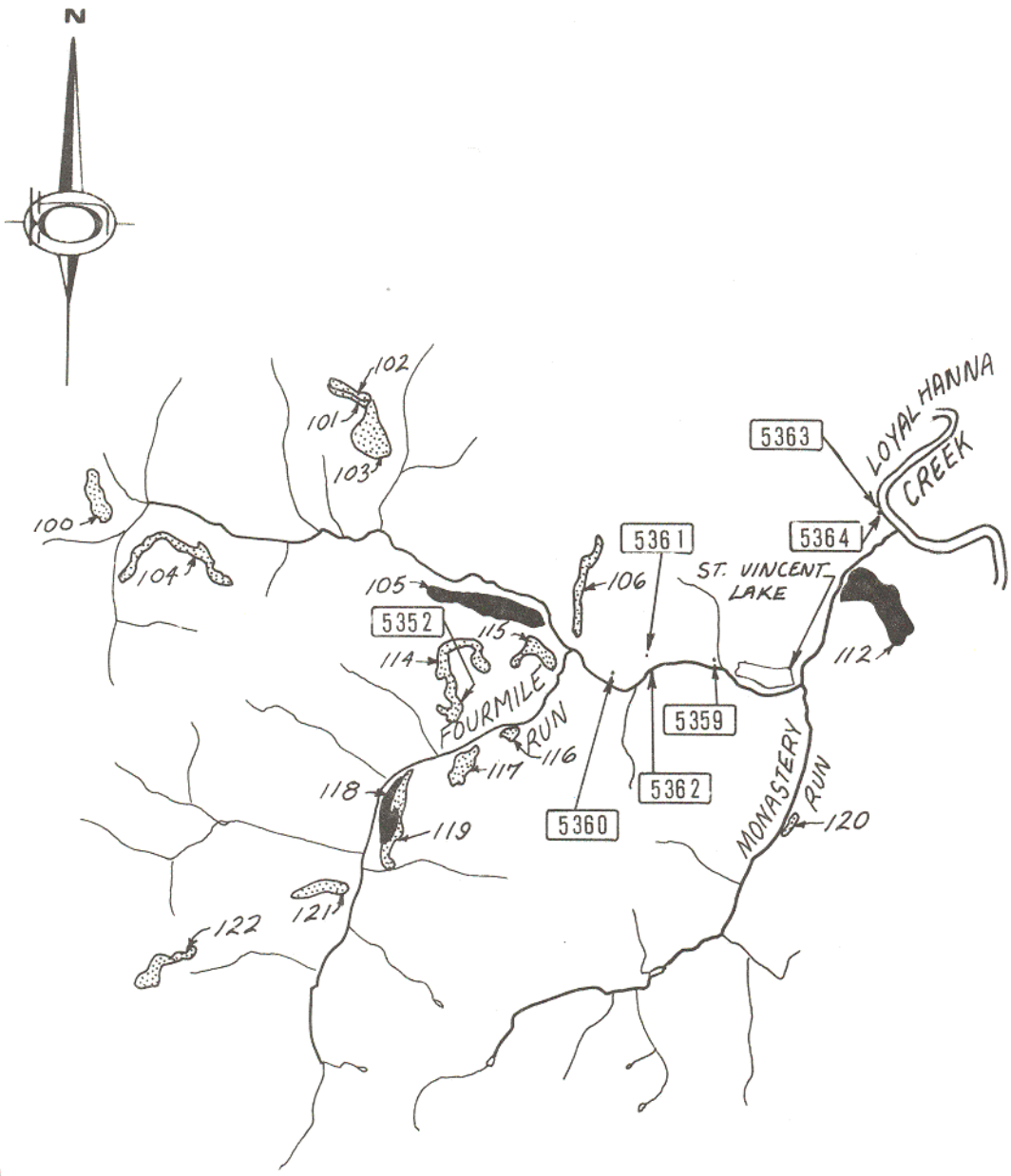
and unnecessarily increasing the flows to be treated at neutralization - oxidation plant #3.

Construction Cost Summary

1.	Plug bore hole discharge #5360 to prevent flow into coal seam:	$10,000
	Total Cost Fourmile Run Watershed	$10,000

B. Union Run Watershed

The water quality of the headwaters of Union Run is affected by discharges #5301, #5302, #5303, #6156, #6157 and #6158. These discharges are located in the valley of Union Run at its intersection with the Pittsburgh coal seam on the western limb of the Latrobe Syncline North Coal Mining Area. This area is above and interconnected with the mines discharging through discharge #5177 into lower Saxman Run. Discharges #5302, #5303 and #6158 are associated with the mouths of abandoned mines. Flows from these sources could be eliminated by the application of seals. Discharges #5301, #6156 and #6157 are associated with seeps or surface sources and may also be abated by surface or subsurface sealing. Two alternate methods of water quality improvement are applicable to Union Run. Water quality may be improved by 1) regulation of the mine water surface at times of high mine water by increasing flows at discharge #5177 or 2) sealing



LEGEND

- 5271 ACID MINE DRAINAGE INVENTORY NUMBER
- 123 STRIP MINE SPOIL BANK OR REFUSE-PILE NUMBER
- MINE TUNNEL OPENING AND DIRECTION
- PITS, GRAVEL OR OTHER
- STRIP MINES AND SPOIL BANKS
- COAL MINE REFUSE PILES

1 0 1 2

SCALE IN MILES

ACID DISCHARGES OF THE FOURMILE RUN WATERSHED

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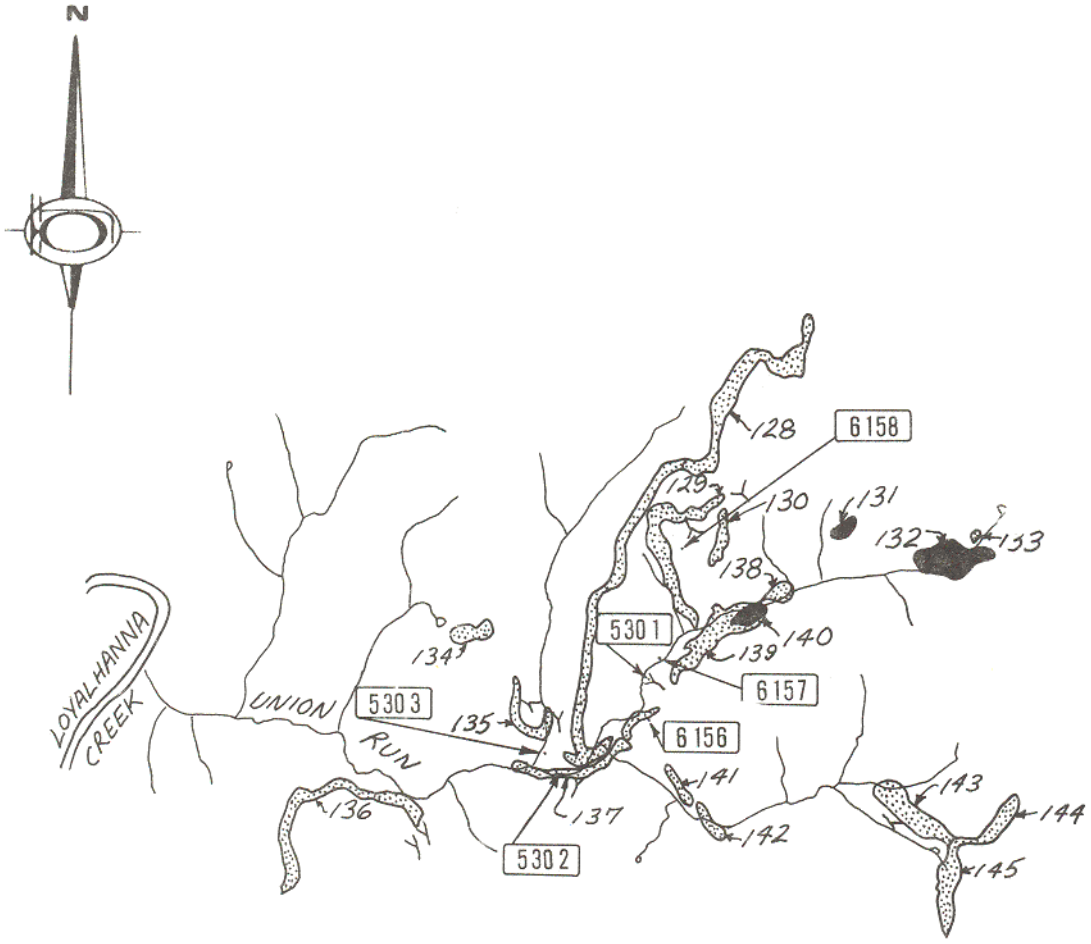
MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED

PLATE X-2



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1 0 1 2

SCALE IN MILES

ACID DISCHARGES OF THE UNION RUN WATERSHED

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MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED

PLATE X-3

all apparent discharges in the Union Run Valley. If all discharges were located, alternate two could be effective. However, alternate one which does not require the application of seals or remedial construction may be preferred.

Construction Cost Summary

1	Seals at discharges #5302, #5303, #6158 @ $10, 000 ea. =		$30,000
2.	Regrading and sealing discharges #5301 #6156 and #6157 @ $15, 000 ea.		$45,000
		Total	$75,000

C. Getty Run

Excluding Crabtree Creek and Saxman Run which are affected in their downstream reaches by major discharge sources, Getty Run is the most acid mine drainage polluted tributary stream in the watershed. The Getty Run watershed, because of the geologic and topographic structure at its intersection with the Elders Ridge Syncline, is the most difficult area in the Loyalhanna Watershed in which to achieve any degree of water quality improvement

There are 12 acid mine discharges in the watershed discharging an acid load averaging 8, 100 lbs. per day to Getty Run- Unlike other watersheds, there is no single dominant discharge. The major discharge #5170, accounts for only 50% of the total acid load. Abatement is made difficult by the up-dip of the coal seam away from the outcrop line. Unlike other synclinal coal mine areas, the

outcrop line in the Getty Run Valley is at the low point of the coal seam, so that the natural drainage of the coal seam is towards the outcrop line.

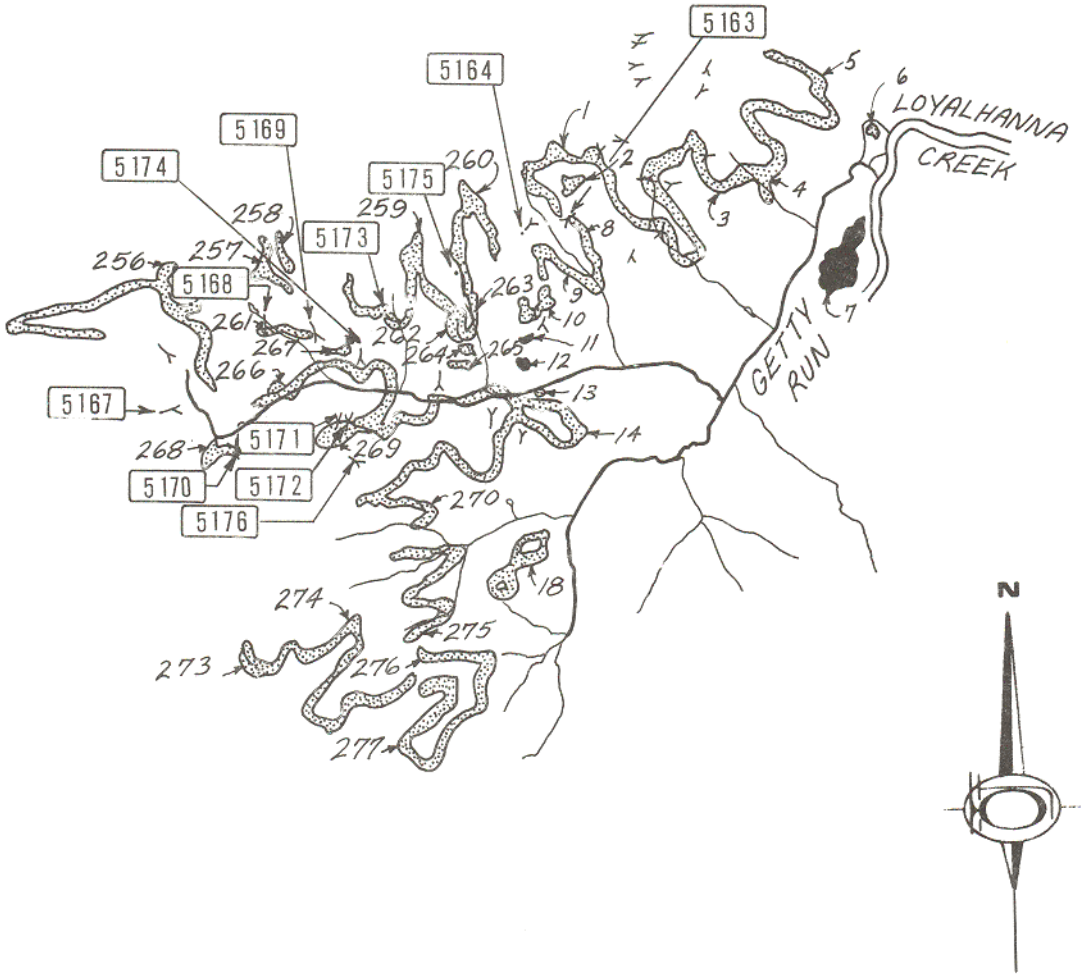
The sealing of any or all of the 12 discharges in the Elders Ridge area would only serve to divert discharge flows to other points along the outcrop. The fragmented nature of the coal seam prevents the utilization of any single discharge as a drainway for the area to conduct flows to a single treatment facility. The only method of mine drainage abatement feasible in the watershed is in-stream neutralization. A treatment facility, similar to that at Little Scrubgrass Creek, could be installed near the mouth of the run for an initial cost of $70,000. However, in view of the continuous operating. cost and minimal resulting benefit to the upstream Getty Run watershed, it is recommended that no abatement measures be provided in this area.

D. Mill Creek Watershed

Mill Creek and its tributary, Hanna's Run, are polluted by fourteen dis charges originating in the Ligonier Syncline Coal Mine area. Each of these 14 discharges is relatively small without interconnection leading to a major discharge source. The high alkalinity of the headwaters of Mill Creek due to the continuing erosion of the lime stone slopes of Laurel Hill quickly neutralizes most of the acidity except during periods of high surface runoff.

LEGEND

5271	ACID MINE DRAINAGE INVENTORY NUMBER
123	STRIP MINE SPOIL BANK OR REFUSE PILE NUMBER
	MINE TUNNEL OPENING AND DIRECTION
	PITS, GRAVEL OR OTHER
	STRIP MINES AND SPOIL BANKS
	COAL MINE REFUSE PILES



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SCALE IN MILES

ACID DISCHARGES OF THE GETTY RUN WATERSHED	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X-4
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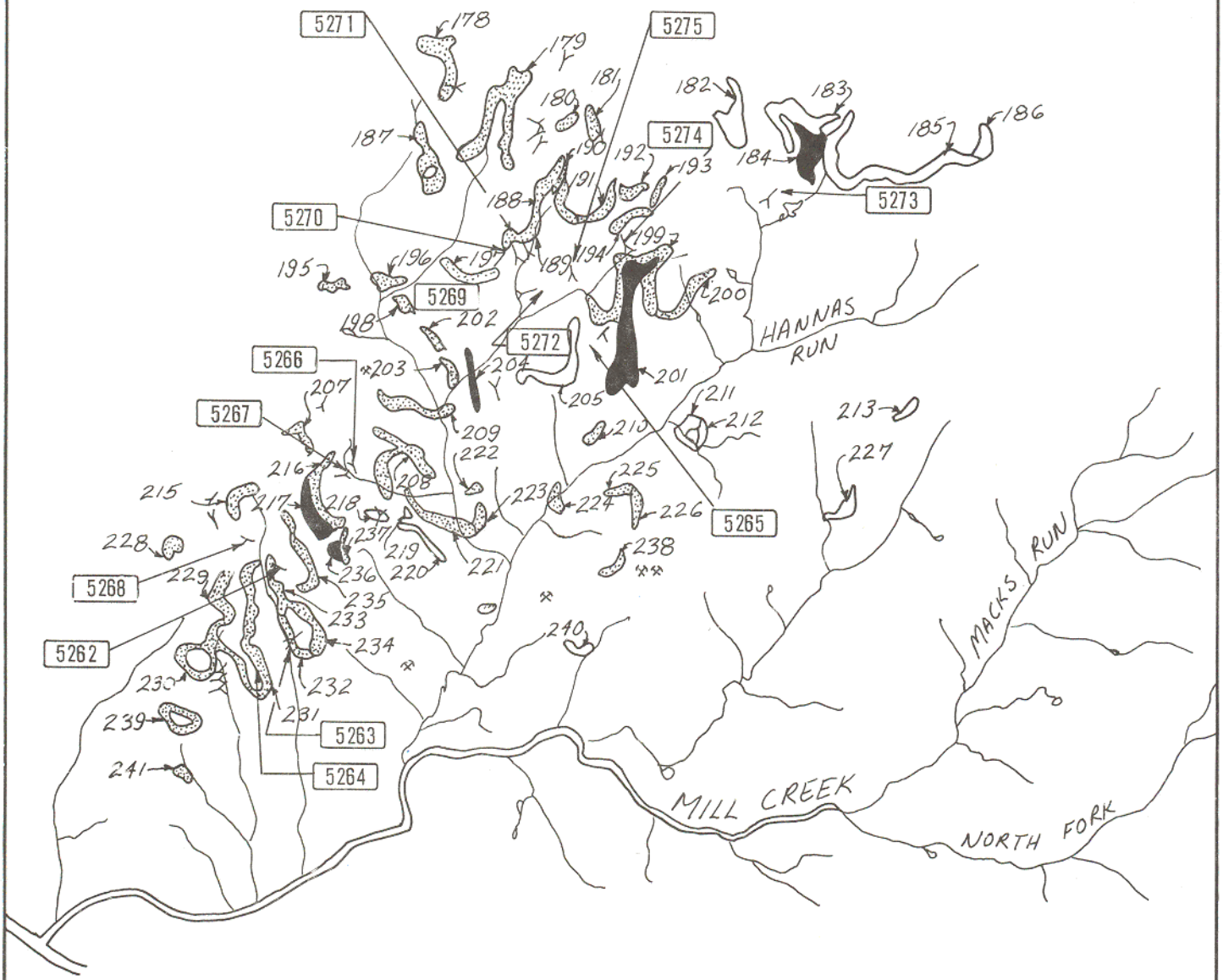


ACID DISCHARGES OF THE MILL CREEK WATERSHED	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X-5
BUCHART-HORN CONSULTING ENGINEERS & PLANNERS		

Several of the mine drainage discharges, #5264, #5265, #5266, #5269, #5270, #5272 and #5275 are associated with drift opening and could be abated with seals. However, the long length of the outcrop line relative to the limited coal seam area, and the presence of numerous seeps such as discharges #5262, #5263, #5267, #5268 and #5274, suggest that sealing might not be a permanent abatement method. Some reduction in acid discharge could be accomplished by the regrading of spoil piles and mine dumps where surface waters now seep through. This could be accomplished at discharge #5365.

Construction Cost Summary

1. Mine seals at 7 discharges @ $10,000 ea.		$70,000
2. Regrade at discharge #5365		$10,000
	Total Cost	$80,000

E. Upper Saxman Run

Saxman Run, upstream of discharge #5177 is affected by discharges #5074 and #5075. These discharges drain a limited area of the Upper Freeport seam and may be amenable to sealing.

Construction Cost Summary

1. Mine seals at discharges #5074 and #5075 @ $10,000 ea.		$20,000
	Total Cost	$20,000

F. Miller Run Watershed

Miller Run is affected by discharges #5073 and #6155. Discharge #5073 is a minor discharge of 11 lbs. per day from a wet seal. The acidity is only 22 mg/L indicating almost complete mine flooding. Discharge #6155, a seep contributing 2 lbs. per day of acid. No abatement is recommended.

G. CrabtreeCreek

Discussed under major elements.

H. Finney Run

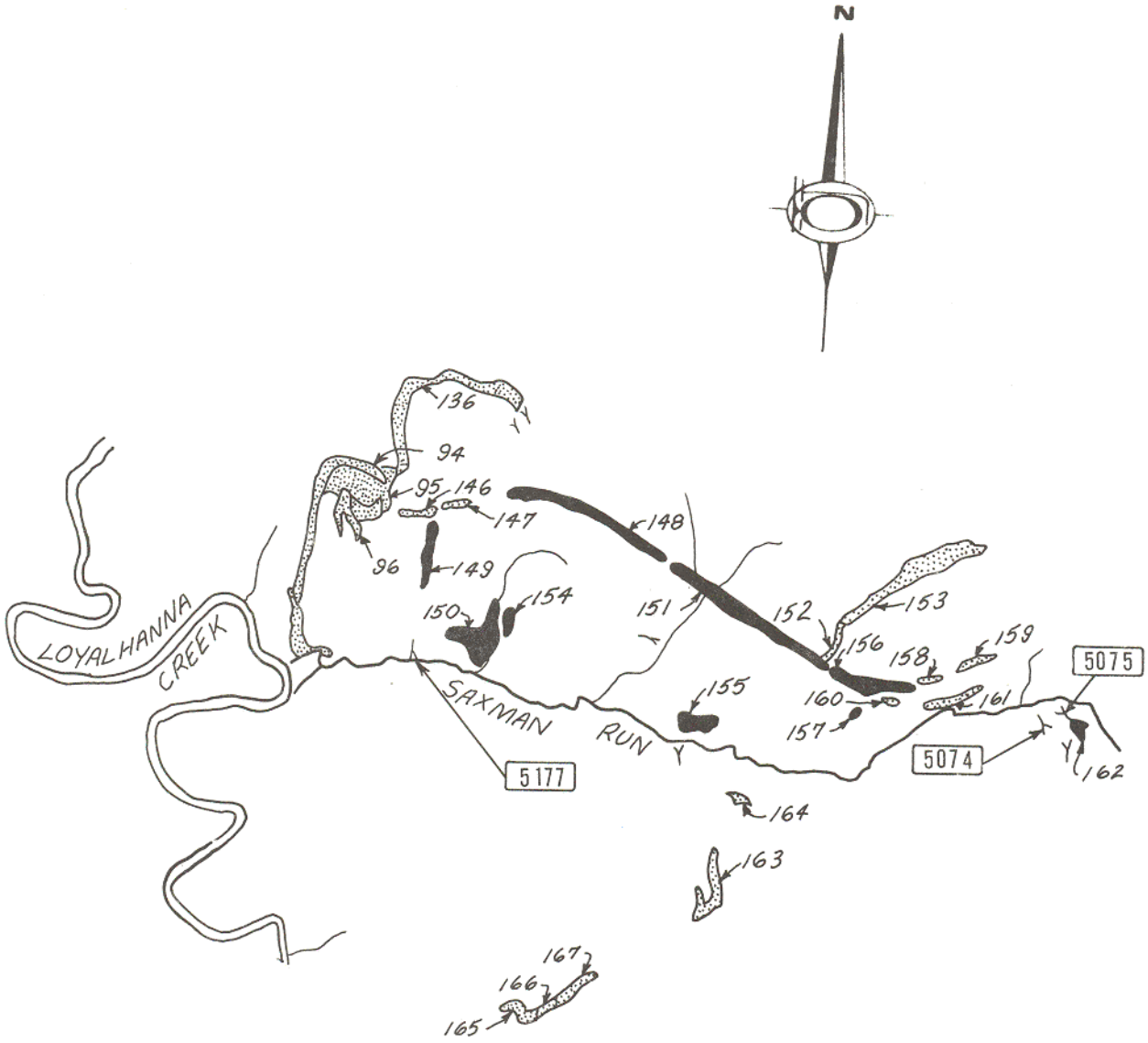
Finney Run is a small creek draining discharges #5165, #5166, #6151 and #6152. The regrading of Refuse Pile #55 at Shieldsburg, a primary plan element, should improve water quality in Finney Run.

I. Other Means

To decrease the volume of flows to be treated at the proposed treat ment facilities two additional actions are recommended as secondary measures.

1. Discontinuance of the Use of Boreholes for Storm Drainage

A survey conducted in 1971 by the Department of Environmental Resources indicated that at least four industrial plants in the Latrobe area were utilizing on-site boreholes to dispose of storm runoff. While this practice does not result in increased acid formation, it will increase the hydraulic loading on the



LEGEND

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	MINE TUNNEL OPENING AND DIRECTION
	PITS, GRAVEL OR OTHER
	STRIP MINES AND SPOIL BANKS
	COAL MINE REFUSE PILES

1 0 1 2

SCALE IN MILES

ACID DISCHARGES OF THE SAXMAN RUN WATERSHED

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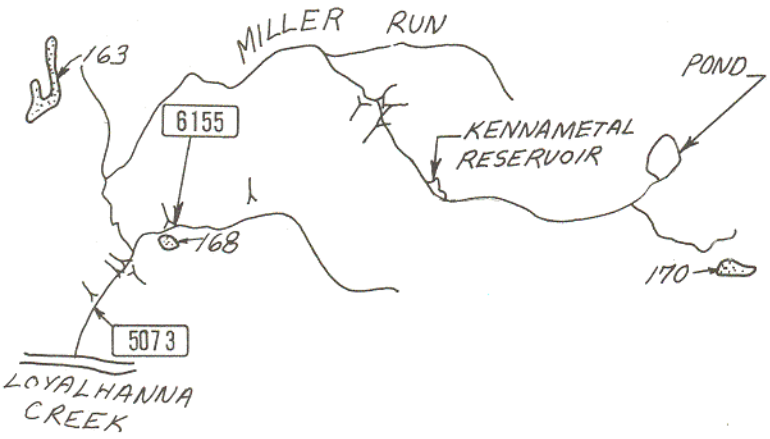
MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED

PLATE X-6



LEGEND:

- 5271 ACID MINE DRAINAGE INVENTORY NUMBER
- 123 STRIP MINE SPOIL BANK OR REFUSE PILE NUMBER
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- COAL MINE REFUSE PILES

1 0 1 2

SCALE IN MILES

ACID DISCHARGES OF THE MILLER RUN WATERSHED	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X -7
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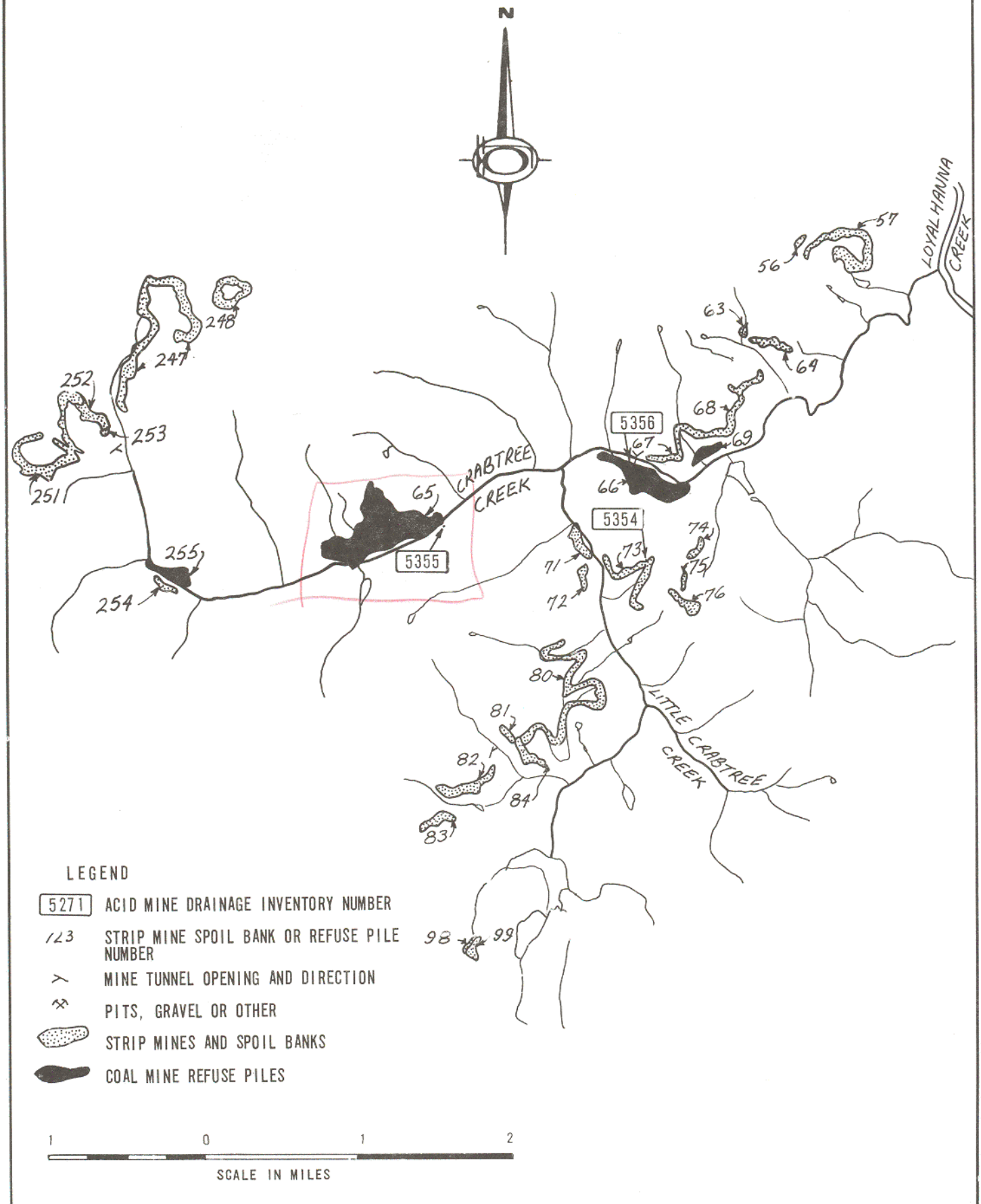

ACID DISCHARGES OF THE CRABTREE CREEK WATERSHED	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X-8
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LEGEND

5271 ACID MINE DRAINAGE INVENTORY NUMBER

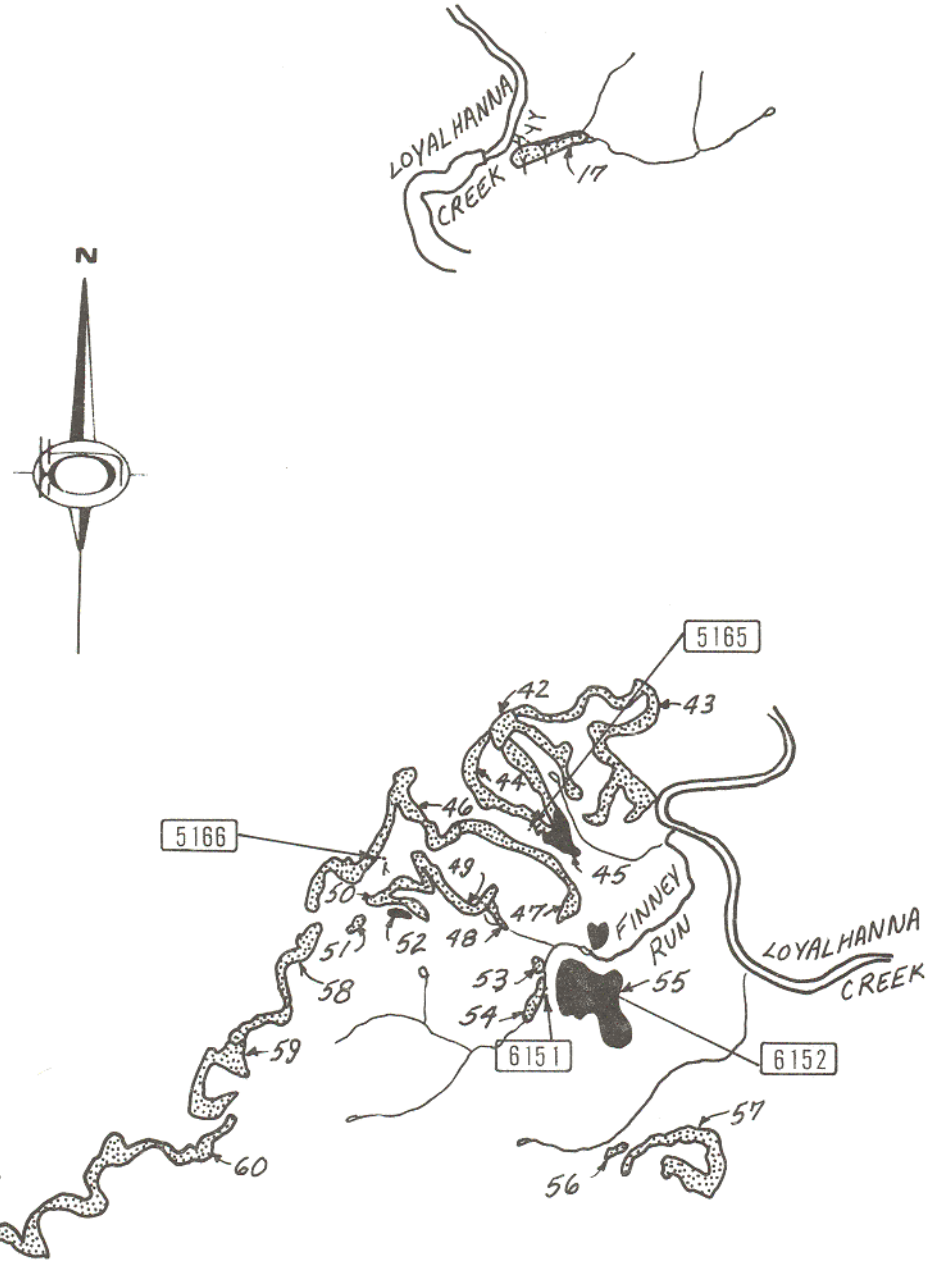
123 STRIP MINE SPOIL BANK OR REFUSE PILE NUMBER

MINE TUNNEL OPENING AND DIRECTION

PITS, GRAVEL OR OTHER

STRIP MINES AND SPOIL BANKS

COAL MINE REFUSE PILES



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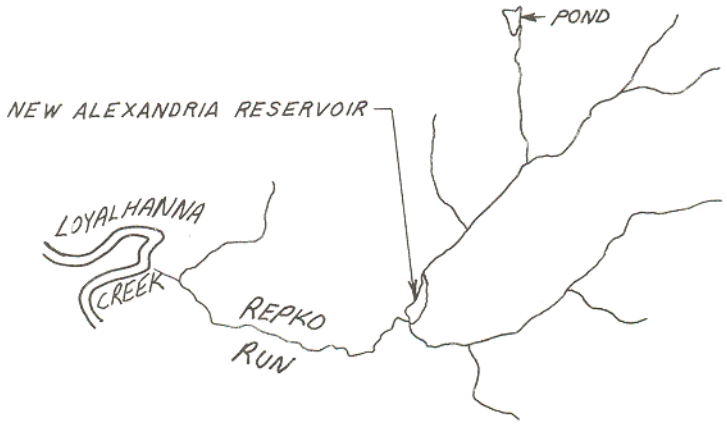
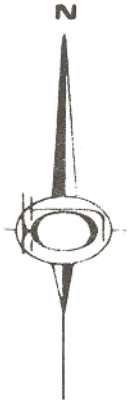
SCALE IN MILES

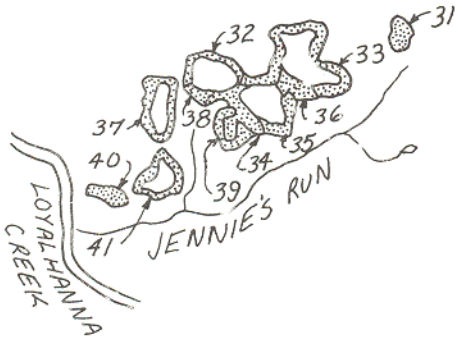
ACID DISCHARGES OF THE FINNEY RUN WATERSHED	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X-9
BUCHART-HORN CONSULTING ENGINEERS & PLANNERS		



LEGEND

- 5271 — ACID MINE DRAINAGE INVENTORY NUMBER
- 123 — STRIP MINE SPOIL BANK OR REFUSE PILE NUMBER
- MINE TUNNEL OPENING AND DIRECTION
- PITS, GRAVEL OR OTHER
- STRIP MINES AND SPOIL BANKS
- COAL MINE REFUSE PILES

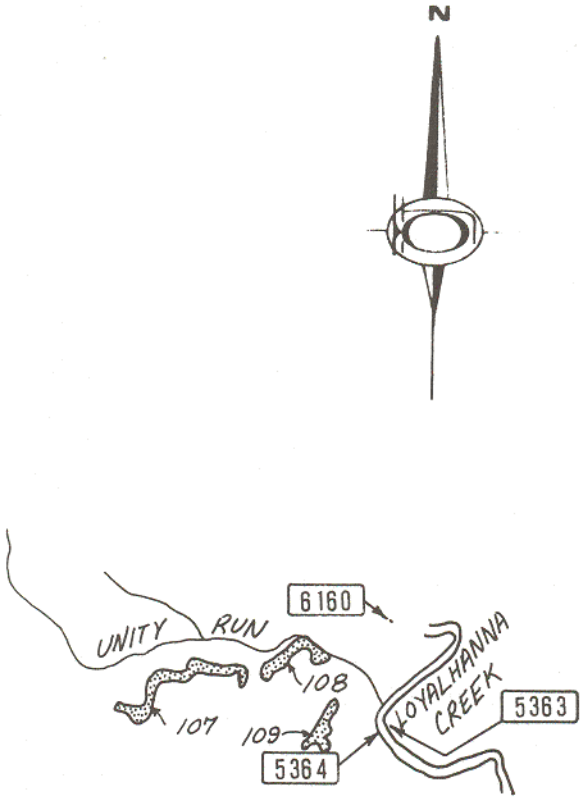




1 0 1 2

SCALE IN MILES

ACID DISCHARGES OF THE REPKO AND JENNIES' RUN WATERSHED	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X-10
BUCHART-HORN CONSULTING ENGINEERS & PLANNERS		



LEGEND

- 5271 ACID MINE DRAINAGE INVENTORY NUMBER
- 123 STRIP MINE SPOIL BANK OR REFUSE PILE NUMBER
- MINE TUNNEL OPENING AND DIRECTION
- PITS, GRAVEL OR OTHER
- STRIP MINES AND SPOIL BANKS
- COAL MINE REFUSE PILES

1 0 1 2

SCALE IN MILES

ACID DISCHARGES OF THE UNITY RUN WATERSHED

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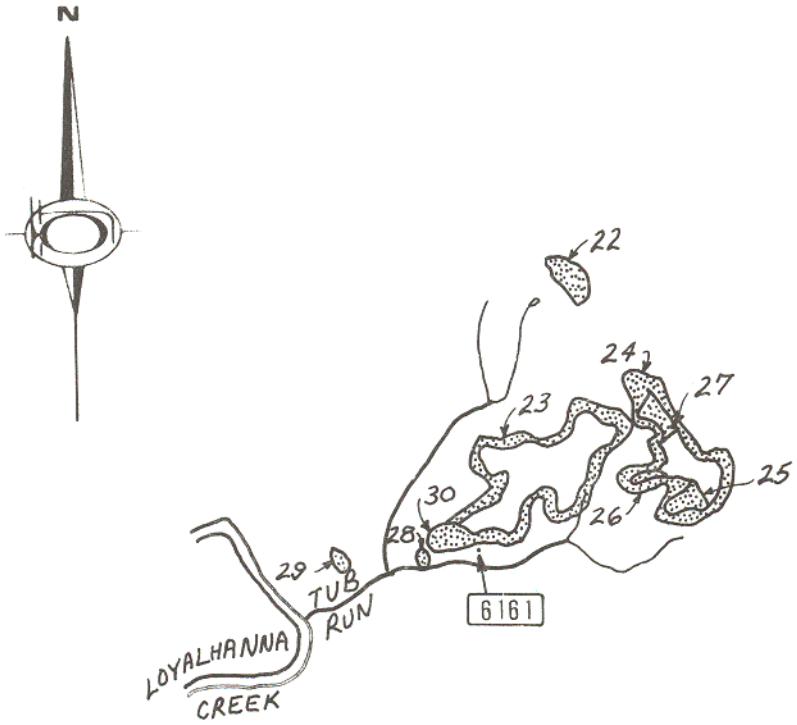
MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED

PLATE X-11



LEGEND

- 5271 — ACID MINE DRAINAGE INVENTORY NUMBER
- 123 — STRIP MINE SPOIL BANK OR REFUSE PILE NUMBER
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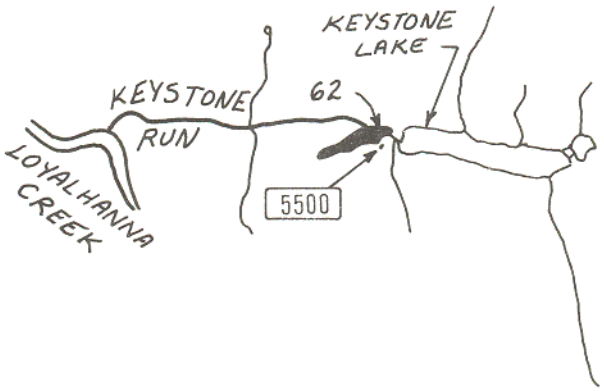
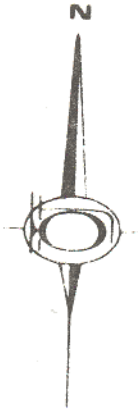
- STRIP MINES AND SPOIL BANKS
- COAL MINE REFUSE PILES

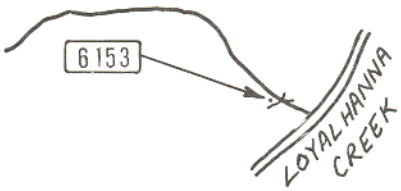
1 0 1 2

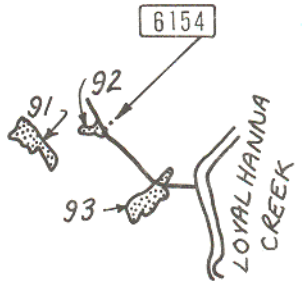
SCALE IN MILES

ACID DISCHARGES OF THE TUB RUN WATERSHED	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X-12
BUCHART-HORN CONSULTING ENGINEERS & PLANNERS		



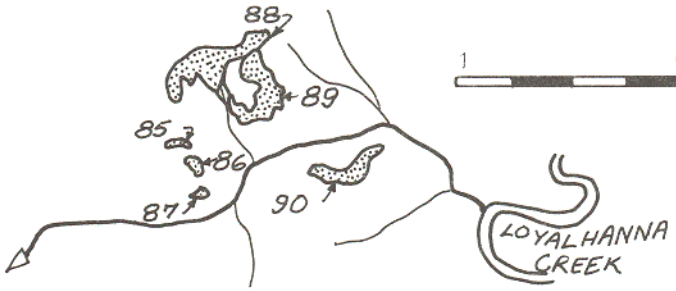






LEGEND:

- 5271 — ACID MINE DRAINAGE INVENTORY NUMBER
- 123 — STRIP MINE SPOIL BANK OR REFUSE PILE NUMBER
- MINE TUNNEL OPENING AND DIRECTION
- PITS, GRAVEL OR OTHER
- STRIP MINES AND SPOIL BANKS
- COAL MINE REFUSE PILES



ACID DISCHARGES OF MISCELLANEOUS WATERSHEDS	MINE DRAINAGE POLLUTION ABATEMENT MEASURES FOR THE LOYALHANNA WATERSHED	PLATE X-13
BUCHART-HORN CONSULTING ENGINEERS & PLANNERS		

proposed treatment facilities. It is recommended that this survey be followed up by a cessation of this practice.

2. Discontinuance of Direct Surface Water Discharge into Coal Seams

At several locations within the watershed, impoundments have been constructed on the headwaters of tributaries to create recreation reservoirs. In one instance it is suspected that a reservoir located on the coal outcrop line is contributing to subsurface flows. It is recommended that the reservoir located on Fourmile Run, north of U.S. 30 in the St. Vincent's Shaft area, be tested for seepage into the Pittsburgh Coal Seam.

OPTIONAL PLAN ELEMENTS

Within the watershed area are several square miles of surface dislocations produced as by products of the extraction of coal. These surface features are not primary generators of Loyalhanna watershed acidity. However, the regrading and revegetation of these strip mines and refuse piles may have local benefits. The location of these features and their computed areas appear in Plates VI-20 through VI-25 and Table VI-10.