THE ABATEMENT PLAN

GENERAL PLAN

Preventing surface waters from entering deep mine workings apparently offers the most beneficial abatement plan. For the purpose of defining the pollution potential of surface waters entering deep mines, it is reasonable to assume infiltrating waters should attain acid concentrations equivalent to those recorded for the deep mine discharges within the study area. Thus, obstructing flow into underground mines should prevent this same amount of acid pollution. This logic was applied to calculate acid loadings at the abatement sites.

Diversion of surface waters entering the deep mine complex may serve other purposes. In addition to reducing deep mine discharge volume, this abatement may lower the potential for both surface subsidence and mine pool breakouts Extraction of large volumes of subsurface strata with multi-seam coal mining has resulted in a major subsidence hazard in the anthracite coal fields. Fluctuating ground water levels are thought to enhance the potential for subsidence. Therefore, reducing surface water entering deep mines aids in preventing subsidence by, limiting ground water fluctuation. This abatement should have its greatest effect during periods of excessive surface runoff when significant volumes of water can be excluded from mine workings.

Techniques suggested to reduce or eliminate infiltration losses inelude stream channel lining, rechanneling of flow, and regrading of abandoned strip areas. For abatement projects involving stream channel lining or rechanneling of flow, the quantity of water lost via infiltration was monitored during monthly sampling rounds. Average flow losses were used to compute the pollution loadings eliminated by abatement project construction. Determination of expected flow from strip mine regrading projects was done in a manner similar to the hydrologic balance.

Most of the abandoned strip mine areas intercept all of the potential surface runoff.

Establishment of abatement benefits was complicated in the final two months of the study. The major sources of acid pollution in the Newport Creek Watershed were a high acid discharge from the Glen Nan active deep mine (sample station N5) and a partially treated discharge from a borehole pump installed by the United States Geological, Survey (sample station F2). The latter source was water pumped from the Old Forge slope in the Glen Nan mine to help prevent flooding of active workings. Since these pumps are no longer operating, determination of degraded water quality parameters for waters lost to deep mines was difficult. The average constituent concentrations recorded for stations N5 and F2 prior to cessation of pumping were used to establish the

i

eventual degradation of infiltrating surface waters. It should be noted that with time this degradation should become less severe. If treatment is considered as an alternative to infiltration control,

r

the eventual gravity discharge will require treatment (N5 and F2 pumps could be used to regulate plant flow). Initial flows and quality will be equivalent to a combination of stations N5 and F2 which is approximately 15.2 cfs and 820 ppm acidity. The estimated capital for construction and annual operating costs are respectively: $5.3 million and from $0.89 to $3.2 million (reference 18). Operating costs will become lower if discharge quality improves with time.

The abatement is further complicated by the discharge of raw sewage from local communities. It is possible to reduce infiltration to deep mines and eliminate some acid production. However, the presence of sewage prevents 'local beneficial use of the added waters following infiltration reduction. This problem could be corrected if sewage treatment facilities are installed by 1975 as scheduled. Thus considering a 50% evapo-transpiration loss, it was established that prior to abatement construction, infiltration losses amounted to 50% of the total precipitation per acre of strip mines to be reclaimed. (Since some portions of the watershed do have surface runoff, the infiltration rate calculated for the total watershed is 41%.) Applying a 39 in/year average precipitation rate (75 year record), the infiltration loss is approximately 0.0023 cfs per acre. Due to the high permeability of regraded spoil and the structural conditions existing within the watershed, it is estimated that only 20% of the total infiltration will be prevented by the abatement construction. The reduction in infiltration is 10% of the total precipitation; or 0.00046 cfs per acre of drainage area associated with the abatement projects. This value was used to determine potential pollution loadings abated by strip mine reclamation.

Abatement projects numbered 1 , 2 and 3 were developed early in the study and included in the Newport Creek Watershed Study Interim Report. The amount of acid abated and the cost benefit ratio for each project were updated to reflect data collected during the entire study period. These are presented in the following section of the report. Construction cost estimates and cost benefit ratios are included with a brief discussion of each abatement project.

ABATEMENT PROJECT #1

Abatement project #1 is located in the southeastern portion of the watershed at Kielar Lake. The site is indicated on the mine development map. The discharge from Kielar Lake flows directly into the deep mines via an extensive coal cropfall. This location was chosen because it is a feasible abatement site for preventing significant volumes of surface water from entering deep mine workings.

The numerous benefits accrued by exclusion of surface waters from deep mines have been discussed in preceding sections. Some of these benefits are: preventing potential acid formation, lessening subsidence potential, and reducing mine pumping loads. Pollutant loadings can be calculated assuming that waters entering deep mines acquire pollution concentrations equivalent to those recorded at mine discharge stations. Applying this logic, the Kielar Lake discharge (Station H2) which has an average flow of 0.97 cfs will obtain an average acid concentration of 800 ppm. This is the average acid concentration recorded at the deep mine discharge stations (N5 and F2). The calculated acid loading is approximately 4,200 lbs/day. Thus, abatement at this site should eliminate 4,200 lbs/day of acid discharge to Newport Creek.

The recommended abatement plan for Project #1 is to change the Kielar Lake discharge point and excavate a channel to carry flow from the lake into a natural channel leading to the Wanamie Reservoir. Fill from the excavation will be used to build-up a love area along the north shore of Kielar Lake. Earth and rock fill will also be employed for minimal repair work on the Wanamie spillway. The stream channel from the reservoir was investigated and determined capable of carrying the added flow.

This particular abatement plan was selected for the following advantageous reasons:

1) Low cost, yet high effectiveness

2) All construction work will be outside of the coal basin, eliminating the possibility of destruction by mining operations.

3) The abatement requires little, if any, maintenance

4) Augmenting the Wanamie Reservoir Water Supply makes available additional water that is always in great demand for human consumption

Estimated Construction Cost
(Abatement Project #1)

1.	Clearing and Grubbing 10 Acres @ $500/Acre	= $	5,000
2.	Excavate 10,000 yd^3 @ $1.20/$yd^3$	=	12,000
3.	Dike Fill 10,000 yd^3 @ $1.00/$yd^3$	=	10,000
4.	Erosion Protection (Jute Matting and Riprap)	=	12,000
5.	Plug Existing Overflow	=	500
6.	Revegetation of 10 Acs. @ $500/Ac	=	5,000
7.	Access Roads	=	2,500
8.	Wanamie Dam Restoration	=	16,000
9.	Anti- Pollution Measures	=	1,200
	Total	=	$64,200

The computed cost effectiveness is: $64,200 per 4,200 lbs/day acid abated = $15 per lb/day acid abated.

The capacities of all bridges, culverts, and pipes have been calculated for the stream channel from Abatement Project #1 to the Susquehanna River.

This data is listed in the following table.

It was determined that only two structures (numbers 2 and 7) will have less than a fifty year storm capacity. Structure No. 2 is presently capable of conveying all of the water generated during a slightly greater than 10 year storm. On the basis of a 10 year storm, the proposed abatement construction will add an additional 8 cfs to the flow channel. This additional flow will reduce the capacity of structure No. 2 to less than a 10 year storm. Should Department policy dictate construction of a new concrete bridge at structure No. 2, the estimated cost is $9,000.

Structure No. 7 has a present capacity for a 25 year storm frequency. The additional drainage resulting from Abatement Project #1 will reduce the capacity to a 10 year storm frequency. Since only a little-used earthen access road crosses the stream channel at this location, a 10 year storm frequency rating should be sufficient. Thus, reconstruction is not recommended for structure No. 7.

Sampling and flow data were evaluated to determine the effects that the abatement projects will have in Newport Creek. The addition of unpolluted waters to Newport Creek will have a diluting effect, thus improving the water quality to a limited extent. Newport Creek is receiving acid loadings from deep mine discharges and acid seeps emanating from mine spoil banks. The augmentation of stream flow will not cause any increase in pollution loads but should result in decreased acid loads, due to decreased infiltration to deep mine pools which

ABATEMENT PROJECT #1
ANALYSES OF STRUCTURAL FLOW CAPACITIES

			Storm Frequency Capacity (years)	
Structure No.	Description	General Location	Pre-Construction	Post-Construction
1	10.0' x 3.0' Box culvert	On Wanamie Reservoir discharge approximately 0.7 miles from reservoir spillway.	50	50
2	10.8' x 2.7' Wood bridge	Approximately 20' downstream from No. 1.	50	50
3	10.0' x 0.8' Concrete box bridge	Approximately 75' downstream from No. 1a.	10-25	5-10
4	14.0' x 3.7' Concrete bridge	Approximately 30' downstream from No. 2 (Bridge for L.R. 40031).	50	50
5	13.5' x 1.8' Wood box culvert	On South Branch Newport Creek approximately 150' downstream from confluence of reservoir discharge and South Branch Newport Creek.	50	50
6	7.5' x 3.9' Concrete box culvert	Approximately 20' downstream from No. 4.	50	50

ABATEMENT PROJECT #1
ANALYSES OF STRUCTURAL FLOW CAPACITIES
(CONTINUED)

Structure No.	Description	General Location	Storm Frequency Capacity (years) Pre-Construction	Storm Frequency Capacity (years) Post-Construction
7	9.0' x 5.2' Concrete culvert	Approximately 30' downstream from No. 4a.	50	50
8	11.0' x 2.6' Box culvert	Approximately 50' downstream from No. 4b.	50	50
9	8.5' x 2.5' Box culvert	Approximately 40' downstream from 5 (culvert for L.R. 40031).	50	50
10	20.0' x 3.7' Box culvert	On South Branch Newport Creek approximately 0.5 miles downstream from No. 5a (culvert under L.R. 40031).	50	50
11	(2) 42" I.D. Iron pipes	Approximately 0.5 miles down stream from No. 6 (under earth access road).	25	10
12	21.0' x 5.7' Concrete bridge and abutment	Approximately 0.2 miles downstream No. 7 (under L.R. 40033, south Sheatown).	50	50
13	22.5' x x 5.4' Concrete bridge and abutment	Approximately 0.5 miles down South Branch Newport Creek from No. 8.	50	50

ABATEMENT PROJECT #1
ANALYSES OF STRUCTURAL FLOW CAPACITIES
(CONTINUED)

Structure No.	Description	General Location	Storm Frequency Capacity (years) Pre-Construction	Storm Frequency Capacity (years) Post Construction
14	13.5' x 8.0' Box culvert	Approximately 0.2 miles downstream from No. 13.	50	50
15	24.0' x 9.8' Concrete bridge and abutment	Approximately 0.2 miles downstream from No. 14.	50	50
16	18.0' x 6.4' Bridge	On Newport Creek approximately 0.3 miles downstream from confluence with South Branch Newport Creek.	50	50

eventually discharge to the surface channels.

Flow data indicate that water from the abatement areas will not infiltrate to underlying deep mines, as evidenced by the lack of flow losses in the South Branch Newport Creek which will carry these flows. ABATEMENT PROJECT #2

This project site is located to the west of Abatement Project #1 . Abatement Project #2 pertains to the discharge of water from Najaka Pond into the deep mines through a cropfall. This project site was selected using the same criteria applied to select the Project #1 abatement site.

All benefits associated with preventing surface waters from entering deep mines will be accrued. The average discharge from Najaka Pond (station H1) is 0.40 cfs. Therefore, applying an acid concentration of 800 ppm, the computed acid loading abated will be 1,700 lbs/day.

The proposed abatement for Project #2 entails channeling the Najaka Pond discharge away from the cropfall into the headwaters of Turtle Creek. Turtle Creek is located outside of the Newport Creek Watershed and to the west of Najaka Pond. Approximately 650 linear feet of pipe will be required to channel flow under the highway and past homes in the village of Glen Lee. This amount of piping is necessary because an open channel would encroach on local residences. An open channel will be used for the remainder of the distance to Turtle Creek.

The proposed abatement was selected by the following criteria:

1) All construction work will be outside of the coal measures, avoiding future mining complications

2) Little maintenance will be required

3) The water from Turtle Creek is used for human consumption, and the supply will be augmented by the Najaka Pond discharge.

An alternate plan whereby this discharge would be flumed directly to Black Creek was rejected because:

1) The route would be through a coal bearing area, presenting the possibility of destruction by future mining

2) Black Creek is polluted, Turtle Creek is not

3) The additional flow in Turtle Creek is needed for water supply

Estimated Construction Cost
(Abatement Project #2)

1.	Clearing & Grubbing 5 Acs. @ $500/Acre	=	$ 2,500
2.	Ditch Excavation 35,000 yd^3 @ $2.00/$yd^3$	=	70,000
3.	Trench Excavation & 650 Linear Feet of 48" Pipe @ $60.00/Linear Foot	=	39,000
4.	Four Endwalls @ $600/Endwall	=	2,400
5.	Pavement Replacement 20 yd^2 @ $10.00/$yd^2$	=	200
6.	Erosion Protection (Riprap)	=	1,800
7.	Revegetation of 5 Acs. @ $500/Ac	=	2,500
8.	Anti-Pollution Measures	=	1,200
	Total	=	$ 119,600

The cost effectiveness is: $119,600 per 1 ,700 lbs/day acid abated =, $70 per lb/day acid abated.

All bridges, culverts, pipes and spillways from the headwaters of Turtle Creek to its confluence with the Susquehanna River were evaluated to determine storm frequency capacities. The study results are listed in the

ABATEMENT PROJECT #2
ANALYSES OF STRUCTURAL FLOW CAPACITIES

Structure No.	Description	General Location	Storm Frequency Capacity (years) Pre-Construction	Storm Frequency Capacity (years) Post-Construction
19	(1) 24" I.D. concrete pipe and endwall	At the headwaters of Turtle Creek, approximately 0.5 miles from Najaka Pond.	2	50
20	45.0' x 3.0' Concrete spillway	Approximately 2.2 miles down Turtle Creek from No. 13 (Reservoir spillway).	50	50
21	11.5' x 7.3' corrugated metal pipe arch	Approximately 0.1 miles down-stream from No. 15a (Under L.R. 40030, east Mocanaqua).	50	50
22	8.0' x 7.4' concrete bridge abutment	Approximately 0.2 miles down-stream from No. 14.	50	50
23	8.0' x 4.5' corrugated metal pipe arch	Approximately 300' downstream from No. 16a.	50	50
24	9.5' x 5.15' corrugated metal pipe arch	Approximately 0.1 miles down stream from No. 15.	50	50

preceding table.

Storm frequency capacities were calculated with the additional drainage area from Abatement Project #2 included. The results show that all structures in Turtle Creek have at least a 50 year storm frequency capacity. Field investigations also indicate sufficient flow capacity within the Turtle Creek stream channel.

Since Turtle Creek flows entirely outside of the coal measures, the abatement area discharge will not be polluted by mine drainage or be lost to coal mines via streamed infiltration. The Najaka Pond discharge will serve to augment the public water supply that is presently obtained from Turtle Creek.

ABATEMENT PROJECT #3

Abatement Project #3 is located west of the town of Alden. Project construction will be along a reach of the surface channel that conducts the Fairchild Pond discharge to the south branch of Newport Creek. Under normal low flow conditions the entire flow is lost to the deep mines via streambed infiltration. The abatement plan is to clear and line the stream segment where rapid infiltration is presently occurring. Approximately 1,200 yd^3 of ditch excavation and 700 yd^3 of clay lining will be required to prevent the present streambed infiltration.

The benefits accrued are similar to those accrued from Abatement Projects #1 and #2. The average flow lost from Fairchild Pond is 0.06 cfs. Thus, the potential reduction in acid loading using an average acid concentration of 800 ppm is 260 lbs/day.

The proposed abatement plan was selected after considering alternative abatement measures. Excavation of a trench to carry flow from Fairchild Pond to the Wanamie Reservoir proved economically unfeasible. This alternate plan was estimated to cost between $250,000 and $400,000.

The cost effectiveness is: $27,000 per 260 lbs/day acid abated = $104 pet lb/day acid abated.

Estimated Construction Cost
(Abatement Project #3)

1.	Clearing & Grubbing 2 Acs. @ $500/Ac	= $ 1,000
2.	Ditch Excavation 1200 yd^3 @ $1.50/$yd^3$	= 1,800
3.	Clay Liner 700 yd^3 @ $5.00/$yd^3$	= 3,500
4.	Erosion Protection (Riprap)	= 18,000
5.	Channel Cleaning	= 500
6.	Revegetation 2 Acs. @ $500/Ac	= 1,000
7.	Anti- Pollution Measures	= 1,200
	Total	= $27,000

The capacities of pipes and culverts were calculated from Fairchild Pond to its confluence with the South Branch Newport Creek. All structures located downstream from this point of confluence were evaluated for Project 1, which included the Fairchild Pond drainage area.

Results listed in the following table indicate that all pipes and culverts on the Fairchild Pond discharge are capable of carrying a 50 year storm flow. It should be noted that during periods of high flow, little streambed infiltration occurs along the proposed abatement area. Thus, Abatement Project #3 construction will not result in flow increases during storm periods.

ABATEMENT PROJECT #3

ANALYSES OF STRUCTURAL FLOW CAPACITIES

Structure No.	Description	General Location	Storm Frequency Capacity (years) Pre-Construction	Post-Construction
11	See Project #1	See Project #1	See Project #1	See Project #1
12	See Project #1	See Project #1	See Project #1	See Project #1
13	See Project #1	See Project #1	See Project #1	See Project #1
14	See Project #1	See Project #1	See Project #1	See Project #1
15	See Project #1	See Project #1	See Project #1	See Project #1
16	See Project #1	See Project #1	See Project #1	See Project #1
17	(2) 60" I.D. Steel pipes	On the Fairchild Pond discharge approximately 0.8 miles downstream from Fairchild Pond spillway.	50	50
18	7.5' x 5.2' Corrugated metal pipe arch	Approximately 0.1 miles downstream from No. 11 before confluence with South Branch Newport Creek.	50	50

The abatement discharge will have the same effect on Newport Creek as was discussed for the discharge from Abatement Project #1. There will be a diluting effect on South Branch Newport Creek and no significant flow loss will occur through streambed infiltration into underground coal mines.

ABATEMENT PROJECT #4

Abatement Project #4 includes two abandoned strip mine areas (#125 and #126) and a portion of culm pile #127. This area is not a direct source of pollution. However, most of the potential surface flow is lost via infiltration into the deep mine workings. As previously discussed, the mine drainage pollution occurs within the deep mines and waters are assumed to acquire degradation similar to recorded deep mine discharges.

Abatement construction in Area No. 4 consists of regrading and revegetation of approximately 160 acres. In addition to the regrading, a channel should be excavated to drain ponded water from several depressions. The flow must bee piped under an earthen road located at the northeast corner of strip mine #125.

The strip mine reclamation will eliminate about 0.20 cfs of infiltration into deep mine workings. Considering an average acid concentration of 800 ppm (average for stations N5 and F2), the proposed construction will abate approximately 870 lbs/day of acid.

Total construction cost estimate for regrading, trench excavation and placing pipe is $483,300. For 870 lbs/day of acid abated, the cost effectiveness ratio is $556 per pound of acid abated.

Estimated Construction Cost
(Abatement Project #4)

1.	Clearing Grubbing 160 Acs. @ $500/Ac	= $ 80,000
2.	Regrading & Channel Excavation 160 Acs. @ $2000/Ac	= 320,000
3.	Pipe Culvert (24") 50 Linear Feet @ $35/ Linear Foot	= 1,800
4.	Revegetation 160 Acs. @ $500/Ac	= 80,000
5.	Anit-Pollution Measures	= 1,500
	Total	= $ 483,300

ABATEMENT PROJECT #5

Abatement Project #5 includes a portion of the Stearns deep mine refuse pile #1 12. Surface drainage from about 250 acres is blocked by this refuse pile.. The water is then lost through infiltration and evaporation. It was assumed that the greatest portion of the blocked flow reaches the underlying. mine complex. Thus, water pollution was defined in the same manner as for Abatement Project #4.

Proposed abatement construction consists of excavating a channel through the refuse pile to permit flow into the North Branch Newport Creek. Minimal infiltration control should also be employed. However, with the unobstructed flow there will be limited loss by infiltration.

Approximately 0.12 cfs of infiltration loss will be ameliorated as a result of project construction. Considering a potential degradation of 800 ppm acidity, about 500 lbs/day of acid will be abated following construction.

The total construction cost estimate for excavation and slope protection is $89,200. The cost-effectiveness ratio associated with abatement of

500 lbs/day of acid is $178 per pound of acid abated.

Estimated Construction Cost
(Abatement Project #5)

1.	Clearing & Grubbing 10 Acs. @ $100/Ac	= $ 1,000
2.	Channel Grading 150,000 yd^3 @ $0.50/$yd^3$	= 75,000
3.	Erosion Control (Jute Matting & Riprap)	= 7,000
4.	Revegetation 10 Acs. @ $500/Ac	= 5,000
5.	Anti-Pollution Measures	= 1,200
	Total	= $89,200

ABATEMENT PROJECT #6

This abatement project is a segment of the North Branch Newport Creek between sample stations N8 and N5. Again the abatement does not involve a direct pollution source. During the watershed study, approximately 0.39 cfs of flow was being lost via streambed infiltration. In addition to the infiltration, flow from a small, intermittent tributary adjacent to refuse pile #122 was being obstructed.

Abatement construction developed for this area "involved excavation of a ditch to allow flow from the obstructed tributary channel, and lining of the permeable segment of the North Branch Newport Creek. The abatement area may convey additional drainage if Abatement Projects #7 and #10 are implemented. In fact, the ditch excavation would be required to facilitate flow from Abatement Areas #7 and #10.

Considering only the prevention of 0.39 cfs of infiltration, the stream channel lining will abate approximately 1,700 lbs/day of acid. The construction may also help prevent infiltration losses of the added tributary flow. However, it would be difficult to establish the actual increased infiltration losses.

Construction cost estimated for the ditch excavation and the stream channel lining is about $31,500. The cost-effectiveness ratio is approximately $19 per pound of acid abated.

Estimated Construction Cost
(Abatement Project #6)

1.	Channel 1300 Linear Feet @ $2.50/Linear Foot	=	$ 3,300
2.	Temporary Stream Diversion 7100 Linear Feet @ $1.70/Linear Foot	=	12,100
3.	Stream Liner 8000 yd^2 @ $1.70/$yd^2$	=	13,600
4.	Revegetation 1 Ac. @ $500/Ac	=	500
5.	Anti-Pollution Measures	=	2,000
	Total	=	$31,500

ABATEMENT PROJECT #7

Abatement Project #7 includes abandoned strip mines #118 and #119 and is located just south of the community of Glen Lyon. Numerous thick coal seams with near vertical dips were extracted along the strike o` the coal between resistant sandstone rock units. This excavation created many parallel open pits which intercept surface drainage. In one particular pit an opening directly into Glen Lyon deep mine can be seen. No surface drainage was observed emanating from this area during the study.

Regrading and revegetation is the proposed abatement construction for this particular area. As a result of the extraction of large volumes of coal with little overburden, there will be a deficit of backfill material. Refuse, or some other material, must be trucked in to help fill these voids. Reclamation of the strip mines will prohibit 0.26 cfs of infiltration from occurring to the deep mine workings. This reclamation will indirectly, abate 1 ,100 lbs/day of acid formation.

The construction cost estimate is $614,500 for approximately 175 acres of regrading and revegetation. The cost-effectiveness ratio is $559 per pound of acid abated.

Estimated Construction Cost
(Abatement Project #7)

1.	Clearing & Grubbing 175 Acs. @ $500/Ac	= $ 87,500
2.	Regrading 175 Acs. @ $2500/Ac	= 437,500
3.	Revegetation 175 Acs @ $500/Ac	= 87,500
4.	Anti-Pollution Measures	= 2,000
	Total	= $614,500

ABATEMENT PROJECT #8

Abatement Project #8 incorporates strip mine #134 and part of the strip mined area designated as #138. The area is characterized by long narrow strip pits similar to Abatement Project #7; and by wider open pits. These Extensive strip pits intercept all of the surface flow within the immediate drainage area. As is common throughout the Newport Creek Watershed, this intercepted surface flow is directed into the abandoned deep mines.

Regrading and revegetation of approximately 417 acres of abandoned strip mines is the proposed abatement construction. Barriers between individual pits must be excavated to provide a sufficient gradient to facilitate gravity flow from the reclaimed area. The abatement construction should eliminate about 0.22 cfs of infiltration into deep mine workings.. This reduction in water loss to the deep mines will abate approximately 940 lbs/day of acid.

The total construction cost estimate for regrading and revegetation is $1 Y461,500. This abatement project will have a cost-effectiveness ratio of $1,555 per pound of acid abated.

Estimated Construction Cost
(Abatement Project #8)

1.	Clearing & Grubbing 417 Acs. @ $500/Ac	= $ 208,500
2.	Regrading 417 Acs. @ $2500/Ac	= 1,042,500
3.	Revegetation 417 Acs. @ $500/Ac	= 208,500
4.	Anti-Pollution Measures	= 2,000
	Total	= $1,461,500

ABATEMENT PROJECT #9

Mine refuse piles #134 and #136 comprise Abatement Project #9. Pollution from these refuse piles was discussed in the "Evaluation of Pollution Sources" section of this report. Unlike all of the other abatement projects, this particular area can be defined as a pollution source. Acid seepage from these refuse piles causes severe degradation of the South Branch Newport Creek.

The abatement plan for this area involves slope reduction, applying topsoil, and revegetation. Due to limited space, significant volumes of material must be trucked to nearby strip pits in order to reduce refuse slopes. With 100% project effectiveness, approximately 1,700 lbs/day of acid will be abated.

The construction cost estimate determined for this project is $719,000. Thus, the minimum cost effectiveness associated with the abatement is $423 per pound of acid abated.

Estimated Construction Cost
(Abatement Project #9)

1.	Clearing and Grubbing 70 Acs. @ $100/Ac	= $ 7,000
2.	Regrading 70 Acs. @ $1500/Ac	= 105,000
3.	Topsoil 57,000 yd^3 @ $10.00/$yd^3$	= 570,000
4.	Revegetation 70 Acs. @ $500/Ac	= 35,000
5.	Anti-Pollution Measures	= 2,000
	Total	= $719,000

ABATEMENT PROJECT #10

This abatement project includes only strip mine #117. The area is located in the far northwest corner. of the Newport Creek Watershed. Strip mine conditions are similar to those described in Abatement Project #8. All surface flow is prevented from reaching Abatement Project #7. This surface flow infiltrates into the Glen Lyon deep mine complex.

The abatement construction proposed for this area is regrading and revegetation of 55 acres. Abatement Project #6 and #7 must be completed prior to implementation of construction at this location. If project #6 and #7 are completed, the potential 0.10 cfs flow from this abatement area will be lost in strip mine #118. Approximately 440 lbs/day of acid production can be prevented by the abatement project.

Abatement costs are estimated at $193,700 for regrading and revegetation. The cost-effectiveness is $440 per pound of acid abated by the proposed construction.

Estimated Construction Cost
(Abatement Project #10)

1. Clearing & Grubbing 55 Acs. @ $500/Ac		= $ 27,500
2. Regrading 55 Acs. @ $2500/Ac		= 137,500
3. Revegetation 55 Acs. @ $500/Ac		= 27,500
4. Anti-Pollution Measures		= 1,200
	Total	= $193,700

ABATEMENT PROJECT #11

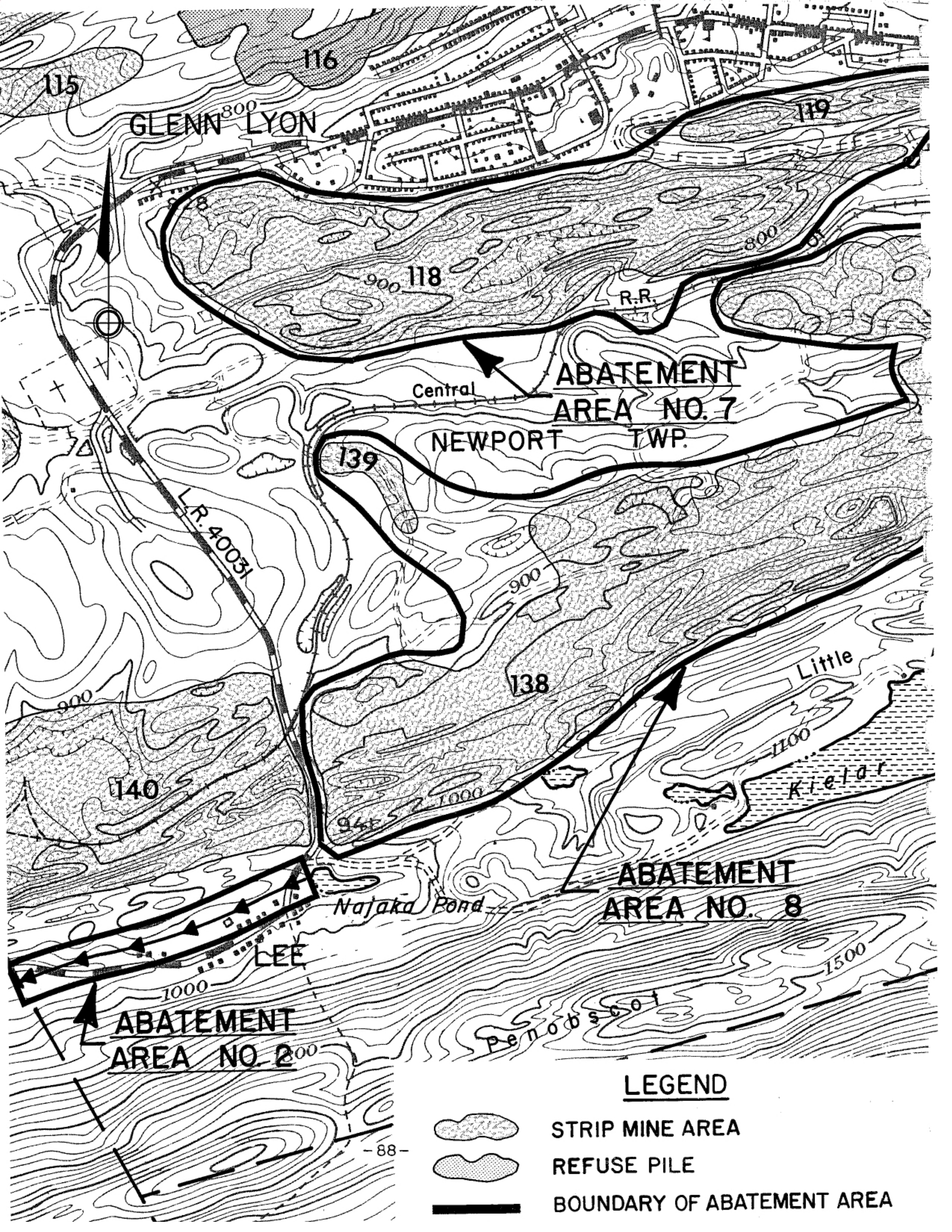
Abatement Project #11 includes strip mine #108 and is located adjacent to Abatement Project #5. Strip pits are extremely large and deep in this locale. Spoil banks are comprised of large rock slopes that provide very little runoff. Most of the potential surface runoff is lost to the deep mine workings. Some of this surface flow was collected in a sump located above the Glen Nan deep mine and pumped into the mine for use during active mining.

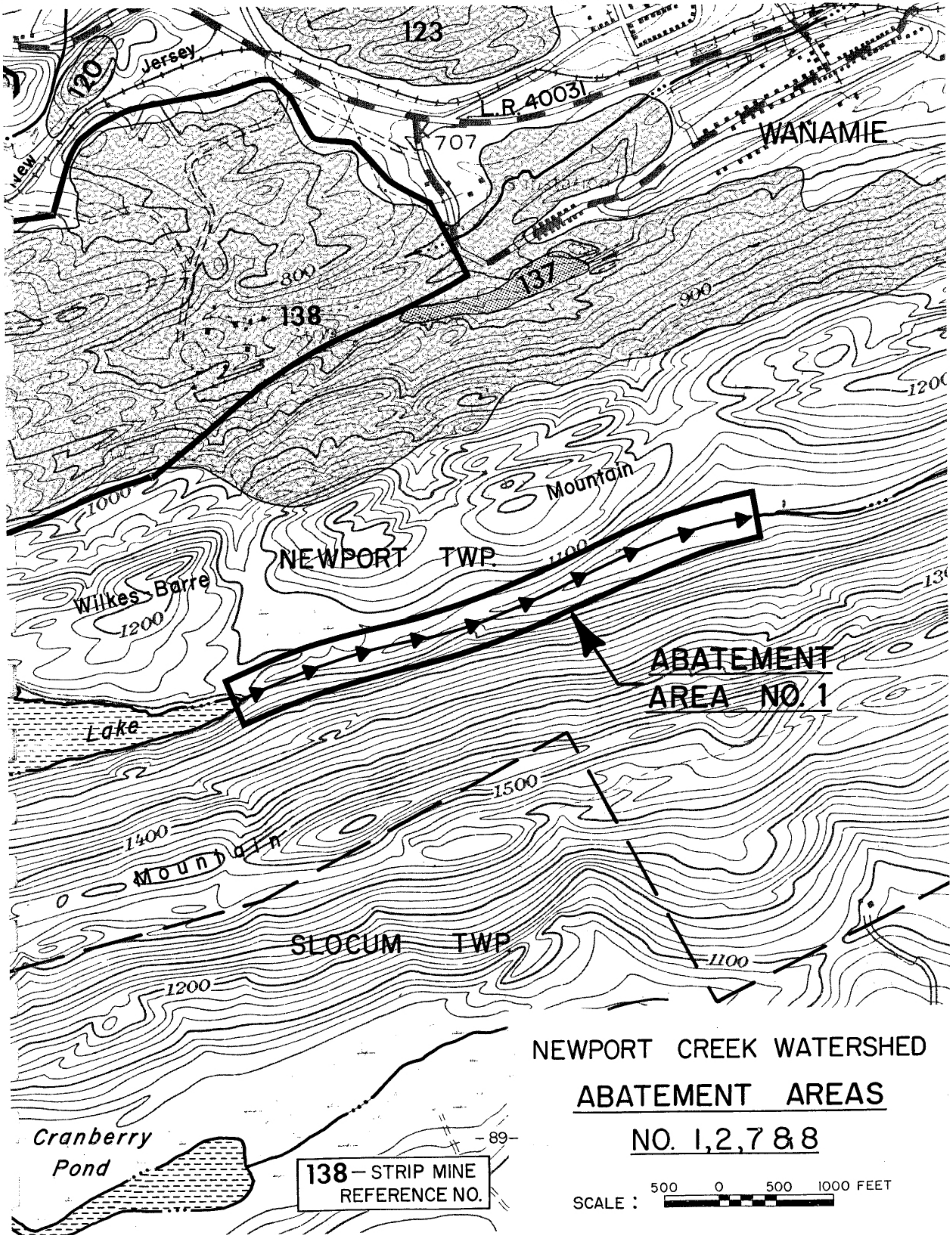
Construction proposed for this area consists of regrading and revegetating approximately 654 acres. Infiltration excluded from deep mine workings will be 0.39 cfs. Thus, 1,700 lbs/day of acid will be ameliorated.

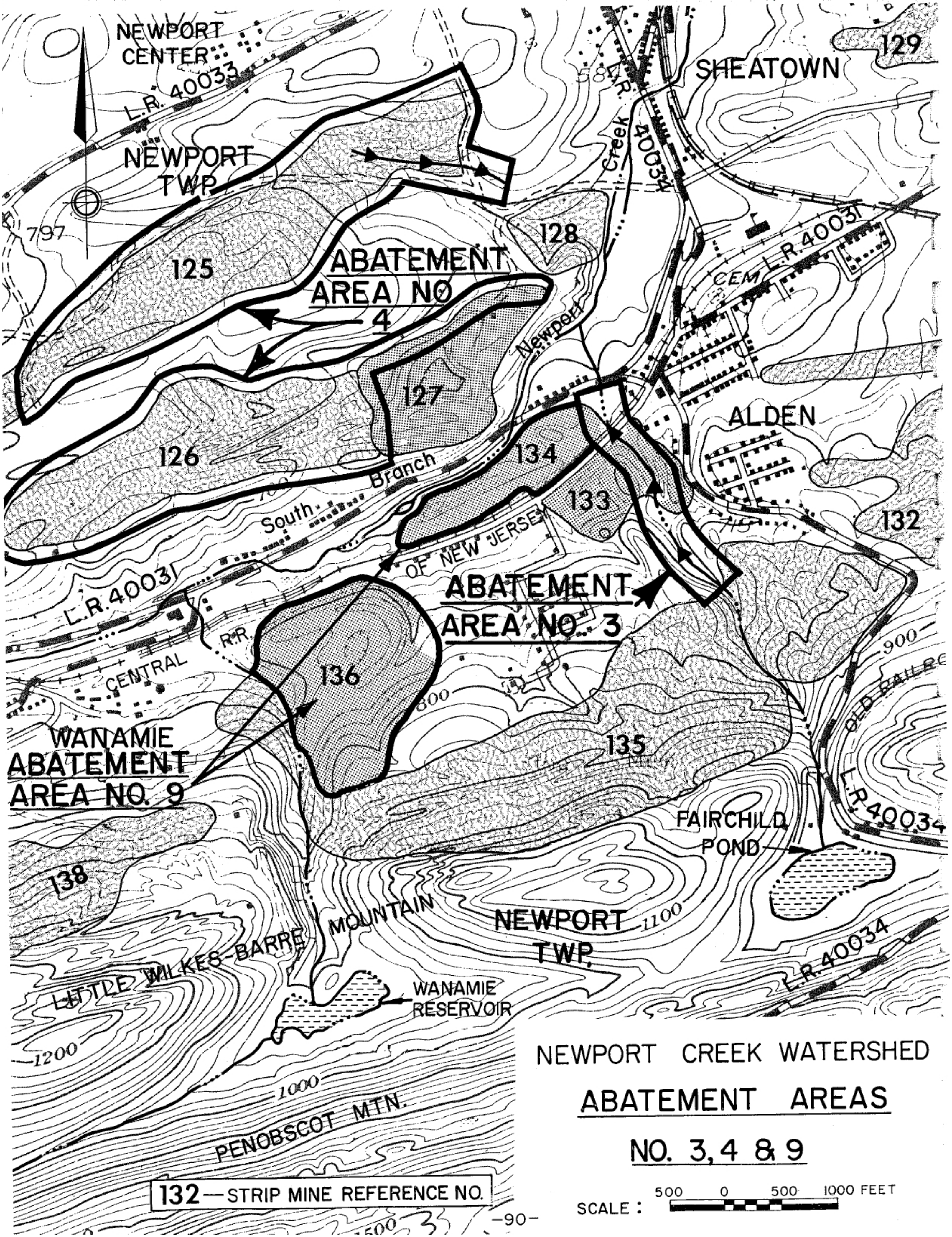
The estimated construction cost is $1,964,000 for regrading and revegetation of the stripped area. A cost-effectiveness ratio' of $1,155 lbs/day of acid abated is associated with the abatement project.

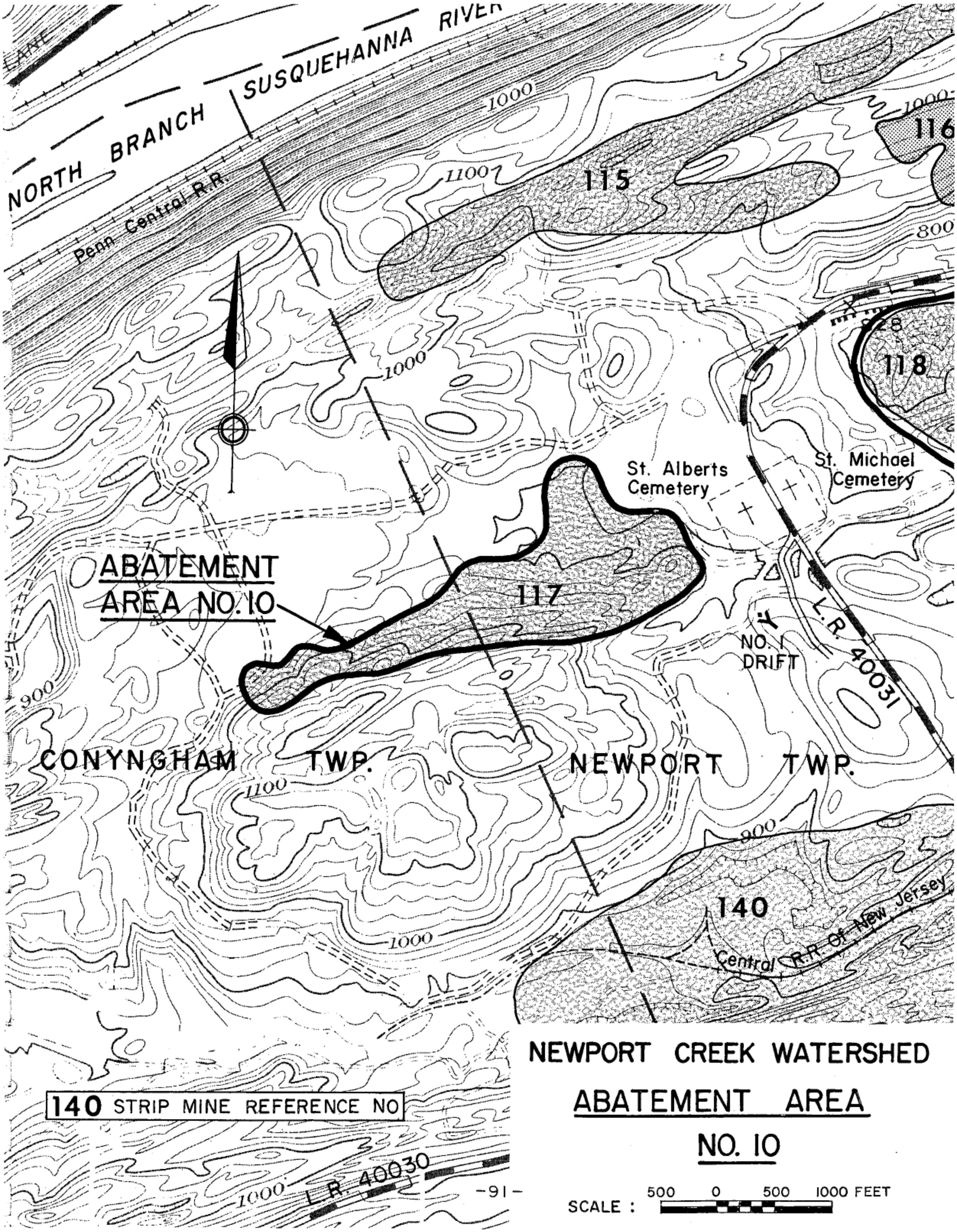
Estimated Construction Cost
(Abatement Project #11)

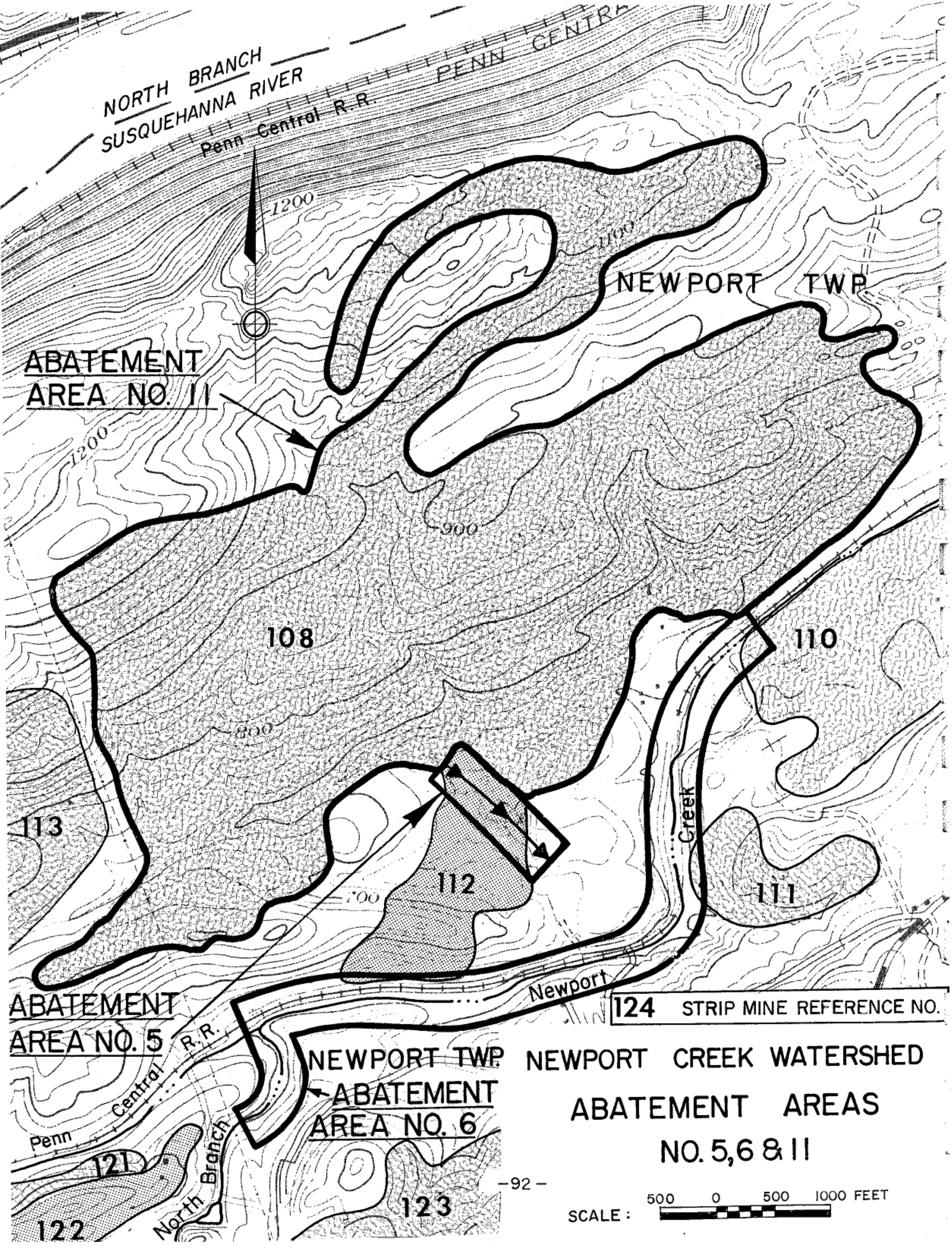
1. Clearing & Grubbing 654 Acs. @ $500/Ac		= $ 327,000
2. Regrading 654 Acs. @ $2,000/Ac		= 1,308,000
3. Revegetation 654 Acs @ $500/Ac		= 327,000
4. Anti-Pollution Measures		= 2,000
	Total	= $1,964,000


115
116
119
GLENN LYON
800
118
900
800
R.R.
ABATEMENT
AREA NO. 7
Central
NEWPORT TWP.
139
L.R. 40031
900
900
138
Little
140
1100
Kielar
1000
ABATEMENT
AREA NO. 8
Najaka Pond
LEE
1500
1000
ABATEMENT
AREA NO. 2
Penobscot
LEGEND
STRIP MINE AREA
REFUSE PILE
BOUNDARY OF ABATEMENT AREA


123
120
Jersey
New
L.R. 40031
707
WANAMIE
800
138
137
900
1200
1000
Mountain
NEWPORT TWP.
1100
Wilkes-Barre
1200
ABATEMENT
AREA NO. 1
Lake
1500
1400
Mountain
SLOCUM TWP.
1100
1200
Cranberry
Pond
138 – STRIP MINE
REFERENCE NO.
NEWPORT CREEK WATERSHED
ABATEMENT AREAS
NO. 1,2,7 & 8
SCALE : 500 0 500 1000 FEET


NEWPORT CENTER
L.R. 40033
NEWPORT TWP.
797
125
ABATEMENT AREA NO 4
126
127
128
129
SHEATOWN
L.R. 40034
Creek
Newport
South Branch
L.R. 40031
CEM
ALDEN
134
133
132
OF NEW JERSEY
CENTRAL R.R.
ABATEMENT AREA NO. 3
136
800
900
OLD RAILRO
135
WANAMIE
ABATEMENT AREA NO. 9
138
FAIRCHILD POND
L.R. 40034
LITTLE WILKES-BARRE MOUNTAIN
NEWPORT TWP.
1100
WANAMIE RESERVOIR
1200
1000
PENOBSCOT MTN.
132 — STRIP MINE REFERENCE NO.
NEWPORT CREEK WATERSHED
ABATEMENT AREAS
NO. 3,4 & 9
SCALE: 500 0 500 1000 FEET


NORTH BRANCH SUSQUEHANNA RIVER
Penn Central R.R.
115
116
118
117
ABATEMENT
AREA NO. 10
St. Alberts
Cemetery
St. Michael
Cemetery
NO. 1
DRIFT
L.R. 40031
CONYNGHAM TWP.
NEWPORT TWP.
140
Central R.R. of New Jersey
1000
1100
900
800
140 STRIP MINE REFERENCE NO
L.R. 40030
NEWPORT CREEK WATERSHED
ABATEMENT AREA
NO. 10
SCALE : 500 0 500 1000 FEET


NORTH BRANCH
SUSQUEHANNA RIVER
Penn Central R.R.
PENN CENTRAL
1200
1100
NEWPORT TWP.
ABATEMENT AREA NO. 11
900
108
110
800
113
Creek
112
700
111
Newport
124 STRIP MINE REFERENCE NO.
ABATEMENT AREA NO. 5
Penn Central R.R.
NEWPORT TWP.
ABATEMENT AREA NO. 6
North Branch
121
122
123
NEWPORT CREEK WATERSHED
ABATEMENT AREAS
NO. 5,6 & 11
SCALE: 500 0 500 1000 FEET

PROPERTY AND MINERAL RIGHTS OWNERSHIP
(ABATEMENT PROJECT CONSTRUCTION SITES)

Abatement Area Number	Property Owner	Mineral Rights
1.	Blue Coal Corporation Edward J. Kielar	Blue Coal Corporation
2.	Blue Coal Corporation Glen Lyon Realty Incorporated Edward J. Kielar Village of Glen Lee	Blue Coal Corporation
3.	Biscontini and Sons Coal Co. Harsey, Blouse, Inc.	Biscontini & Sons Coal Co.
4.	Biscontini and Sons Coal Co.	Biscontini & Sons Coal Co.
5.	Susquehanna Coal Co. Glen Nan Coal Co.	Susquehanna Coal Co. Glen Nan Coal Co.
6.	Glen Nan Coal Co. Blue Coal Corporation Susquehanna Coal Co.	Glen Nan Coal Co. Glen Nan Coal Co. Susquehanna Coal Co.
7.	Blue Coal Corporation	Blue Coal Corporation
8.	Blue Coal Corporation	Blue Coal Corporation
9.	Biscontini and Sons Coal Co.	Biscontini & Sons Coal Co.
10.	Blue Coal Corporation Glen Alden Coal Co. Susquehanna Coal Co. Nanticoke Industrial Development Authority	Blue Coal Corporation Glen Alden Coal Co. Susquehanna Coal Co.
11.	Blue Coal Corporation	Blue Coal Corporation

PRIORITY LISTING

Recommended Abatement Projects

Priority Number	Abatement Project #	Pollution Abated Pounds Per Day Acid	Pollution Abated Pounds Per Day Iron	Estimated Abatement Cost		Cost Per Pound/Acid
1	1	4,200	1800	$ 64,200	=	$ 15
2	3	260	110	27,000	=	70
3	2	1,700	740	119,600	=	104
4	6	1,700	720	31,500	=	19
5	5	500	220	89,200	=	178
		* 8,360				
			Total Cost =	$ 331,500		

Abatement Projects Not Recommended

Priority Number	Abatement Project #	Pollution Abated Pounds Per Day Acid	Pollution Abated Pounds Per Day Iron	Estimated Abatement Cost		Cost Per Pound/Acid
6	4	870	370	$ 483,300	=	$ 556
7	7	1,100	480	614,500	=	559
8	10	440	190	193,700	=	440
9	11	1,700	720	1,964,000	=	1,155
10	8	940	410	1,461,500	=	1,555
11	9	1,700	200	719,000	=	423
		** 6,750				
			Total Cost	$5,436,000		

* 10% of total pollution load

** 8% of total pollution load

ACTIVE MINING

The Blue Coal Corporation was the only mining company active within the Newport Creek Watershed during most of the study period. In the final months of this study, the Glen Nan deep mine was abandoned and the Blue Coal Corporation curtailed all coal mining operations. Although Blue Coal is no longer mining coal, they did have numerous active strip mine permits that are now being mined or reclaimed by a lessor. A small deep mining operation was being conducted in the Wanamie #18 slope above the mine pool level.

Available water quality and mining permit numbers were obtained and presented in the following table. In most instances the individual deep mine boundaries were permitted under one water quality number, and several mining permits may be covered by one water quality number. Thus, the permit table lists the deep mine name, the water quality permit number and the associated mining permit numbers.

The following numbers refer to strip mine areas as labeled on the "Mine Development and Pollution Source Map" that include active mining permits. Each strip mine area is evaluated with respect to alterations in surface drainage flow paths and future pollution potential.

STRIP MINE NO. 113

This strip mine area includes two active mining permits (30-83,42 and 30-83C) located adjacent to a power line at the east end of the strip area. Most surface flow from the immediate drainage area is being intercepted as a result of strip mining. However, the active permit areas are presently being reclaimed. With effective reclamation, surface drainage will be improved and flow paths should be restored. The surface flow will continue until it reaches Abatement Project #5. Unless the recommended construction is implemented, significant amounts of surface water will be lost to deep mines.

STRIP MINE NO. 135

A portion of this strip area located west of the Wanamie Reservoir discharge includes part of an active mining permit (30-59A). The area has been strip mined and reclamation is apparently completed. There is very little potential for water pollution from this particular permit area. Some seepage into the Wanamie Reservoir discharge will occur, however, the effects on water quality should be minimal.

STRIP MINE NO. 137

One active mining permit (30-91) is located in the southeast corner of this strip area. The active strip mining included extraction of the Red Ash Coal seam from previously mined areas. Near vertical coal seams cause mining along the strike of the coal producing long narrow pits. Unless these pits are backfilled on a grade to allow drainage into the Wanamie Reservoir discharge channel, surface drainage from part of the adjacent Little Wilkes Barre Mountain will be lost via infiltration.

STRIP MINE NO. 138

This strip mine area is listed as Abatement Project #8. Two active mining permits (30-87; 30-88) incorporated a large portion of the eastern corner of strip area No. 138. As indicated in the abatement discussions, most surface drainage is intercepted by existing strip pits. Mining in this area could have beneficial effects if reclamation is completed to facilitate surface flow into the South Branch Newport Creek. Strip mining and subsequent effective reclamation will substantially reduce the scope of work required in Abatement Project #8.

MINING PERMITS ISSUED

Permitted Mine Name	Name of Company	Date Permit Issued	Water Quality Permit Number	Mining Permit Number	Type Mine
Wanamie #18 Colliery	Blue Coal Corp.	8-30-73	167M029*	30-91	Strip
Wanamie South East Stripping	Blue Coal Corp.	--------	168M006*	30-88	Strip
Wanamie #14 Plane	Blue Coal Corp.	12-13-73	168M006*	30-83(A2)	Strip
Glen Nan Mine	Glen Nan Inc.	10-17-72	4072301	------	Deep
Wanamie #14 Plane	Blue Coal Corp.	1-13-72	168M006*	30-83(C)	Strip
Wanamie	Blue Coal Corp.	11-29-73	167M029*	30-59A	Strip
Wanamie South West Stripping	Blue Coal Corp.	---------	168M006*	30-87	Strip

*Applies for Wanamie deep mine boundary

CONCLUSIONS AND RECOMMENDATIONS

The geology of the Newport Creek Watershed is extremely complex with numerous folded and faulted anthracite coal seams. Strip pits, subsidence zones, crop fall areas and permeable streambed materials all act to convey surface drainage into abandoned deep mines underlying the watershed. Subsequent degradation of these surface waters is the major source of mine drainage pollution in the study area - 82,600 lbs./day acid are discharged to the Susquehanna River. The abatement projects developed from this study are all designed to reduce infiltration into abandoned deep mines.

All pollution associated with the individual abatement projects was determined from the quality of deep mine discharges present during the first ten months of this study. Because mine pumping has been stopped, the pollution from each abatement area will not be evident until deep mine gravity discharges occur in the future.

A total of eleven abatement projects were developed for the entire watershed. Projects #1, #2, #3, #5, #6 are recommended for construction. These projects will abate approximately 8,360 lbs. /day acid for a cost of $331,500. The recommended construction areas will be undisturbed by future coal mining operations.

If treatment (neutralization) was implemented for the major discharges -Stations N5 and F2, and the Susquehanna gravity flow, the estimated construction and annual operating costs are as follows:

1) Susquehanna Discharge;
   Treatment Plant Construction - $2,000,000 Operating Cost Range - $124,000 to $450, 000/year

2) Pump Discharges N5 and F2;
   Treatment Plant Construction - $5,300,000 Operating Cost Range - $890,000 to $3,200,000/year

With these high initial and continuous yearly costs, approximately 75,500 lbs/day acid could be abated (8,500 lbs/day and 67,000 lbs/day).

Abatement projects #4, #7, #8, #9, #10 and #11 are not recommended for construction at the present time. Some of these project areas are presently being affected by coal mining and other project sites have been indicated as future strip mine areas. Since these abatement project areas represent potential sources of a valuable energy resource and the abatement construction cost effectiveness-ratios are very high, it

is suggested that the abatement construction should not be performed. However, future mining and associated reclamation should be conducted in such a manner to facilitate surface drainage into the main stream channels. If the reclamation is properly performed, many of the abatement projects will no longer be required.