IV. POLLUTION SOURCES, SUBSURFACE EXPLORATION AND ABATEMENT PROGRAM

IV. POLLUTION SOURCES AND ABATEMENT PROGRAM

A. General

A complete field inspection of the project area was made in an effort to locate all potential pollution sources. Out of the one hundred plus sources which were found, water samples were taken and flow measurements were made at sixty five. Thirty of these were selected as regular test stations. These sources were selected since they were considered to be most representative of the major contributors of pollution in the area or the best place to monitor total sub-area contributions to the total pollution found in Little Toby Creek. The results from this sampling program, found in the Appendix of this report, served as a basis for determining reclamation recommendations.

A subsurface exploration program was undertaken to validate information derived from mine maps, to determine the suitability of subsurface conditions for abatement measures and to be able to monitor results of corrective measures in the future. A total of 15 rotary holes and 32 core borings were drilled. One mine water standpipe and four monitor wells were installed.

The boring logs are depicted graphically in the Appendix of this report. Their locations are shown on Plate 19.

Utilizing the data obtained from the field investigation, the sampling program, the subsurface exploration and other background data, presented herein we have formulated the abatement program as described in this section of the report on a sub-project area basis.

For clarification of intent we are listing hereunder various terms and an explanation of their usage in this section.

1. Strip Mine Reclamation - includes clearing, dewatering, earthwork, grading to obtain slopes away from high walls and elimination of pooling places, and revegetation.

2. Diversion ditches - includes clearing, excavation, seeding and mulching.

3. Channels of Conveyance - includes excavation, riprap, and concrete endwalls

4. Impervious Surface Seals - includes excavation-and/or placement of compacted impervious material along existing highwalls and extending ever sections of spoil to reduce the percolation of surface water through the spoil.

5. Deep mine seals - standard double bulkhead seals with sufficient grout curtain or a reinforced concrete seal.

6. Grout Curtain - includes clearing, drilling and grout placement.

7. Re-channelization of Stream - includes excavation required to improve stream flow characteristics and avoid the passing through areas of potential contamination.

8. Anticipated Reduction - the percent of the total acid load which is expected to be eliminated by abatement measures outlined in this report.

9. Treatment Plant - the construction of a neutralization plant complete with settling basins of sufficient size to allow for retention with adequate sludge holding capacity.

The details of this program are listed herein and depicted on individual area maps. Within the text they have been listed as follows in order of their. priority.

TOP PRIORITY - Work commencing as soon as possible.

SECOND PRIORITY - Results of top priority projects should be known for proper installation.

B. Cartwright Mine Area

Caved headings completely encircle this hill top. If the mine map obtained is accurate, the headings on the Sawmill Run side are not part of the main workings. Minor acid discharges are found at three of six locations on the Sawmill Run Side.

On the Little Toby Creek side, water was found to be acid in some locations and near neutral at others. Old refuse piles of some magnitude were found at two locations. Since no elevations were shown on the mine map, a field survey was made to ascertain coal elevations and one core boring was made into the caved section of the mine. Also investigated were two strip mines located south of Sawmill Run. The pollution sources investigated consist of:

Ref. Nos.	Drainage To	Average Acid Load In Pounds Per Day	Description and Remarks
2	Sawmill Run	Negligible	Caved Drift-could be house coal bank
3	Sawmill Run	1	Caved Drift-could be house coal bank
4	Sawmill Run	No Flow	Caved Drift-could be house coal bank
5	Sawmill Run	No Flow	Caved Drift-could be house coal bank
6	Sawmill Run	Negligible	Caved Drift-could be house coal bank
7	Sawmill Run	No Flow	Caved Drift
8	Sawmill Run	Negligible	Spring
9.	Little Toby Creek	No Flow	Caved Drift
10	Little Toby Creek	No Flow	Caved Drift
11*	Little Toby Creek	3	Caved Drift and leaching refuse pile
12	Little Toby Creek	No Flow	
13	Little Toby Creek	Alk-2	Caved Drift
14	Little Toby Creek	Alk-1	Caved Drift
15	Little Toby Creek	8	
16	Little Toby Creek	5	Caved Drift and leaching refuse pile
17	Little Toby Creek	Alk-23	Field survey shows this to be approx. 50 ft. lower than other drifts. Could be from ferrifourous limestone
18	Little Toby Creek	Negligible	Caved Drift
19	Little Toby Creek	Negligible	Caved Drift
146	Little Toby Creek	5	Runoff from surface mine
147	Sawmill Run	8	Runoff from surface mine

*Regular sampling station

As indicated, the acid load from the Cartwright Mine to Little Toby Creek is approximately 16 pounds while the strip mine to south totals five pounds. The acid load from the Cartwright Mine to Sawmill Run is negligible while the strip mine to the south contributes approximately eight pounds.

No reclamation work is proposed for this area due to the minor amounts of acid discharge. Iron emissions are above the 7 ppm level desired but discharges are small enough that there will be no appreciable effect by the time they reach Sawmill Run or Little Toby Creek.

PLATE 1
DEPT. OF ENVIRONMENTAL RESOURCES

PROJECT SL 132-5

CARTWRIGHT MINE

POLLUTION SOURCE & ABATEMENT MAP

POLLUTION SOURCE LEGEND

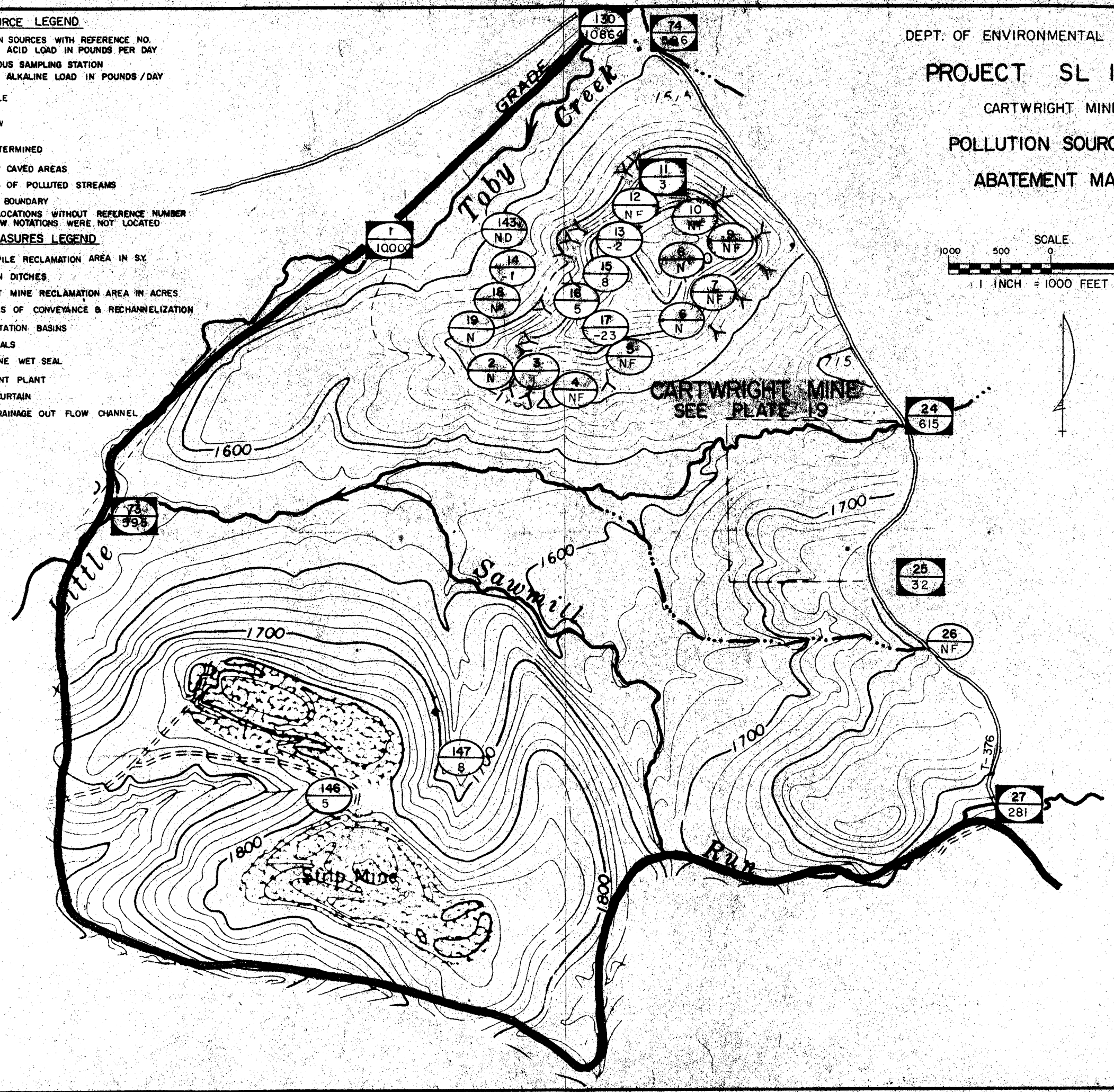
- (0/12) POLLUTION SOURCES WITH REFERENCE NO. AVERAGE ACID LOAD IN POUNDS PER DAY
- [0/-5] CONTINUOUS SAMPLING STATION AVERAGE ALKALINE LOAD IN POUNDS / DAY
- (N) NEGLIGIBLE
- (NF) NO FLOW
- (ND) NOT DETERMINED
- DRIFT OR CAVED AREAS
- PORTIONS OF POLLUTED STREAMS
- PROJECT BOUNDARY

NOTES : DRIFT LOCATIONS WITHOUT REFERENCE NUMBER OR FLOW NOTATIONS WERE NOT LOCATED

ABATEMENT MEASURES LEGEND

- (1,000) REFUSE PILE RECLAMATION AREA IN S.Y.
- DIVERSION DITCHES
- OPEN PIT MINE RECLAMATION AREA IN ACRES
- CHANNELS OF CONVEYANCE & RECHANNELIZATION
- SB SEDIMENTATION BASINS
- CLAY SEALS
- DEEP MINE WET SEAL
- T TREATMENT PLANT
- GROUT CURTAIN
- MINE DRAINAGE OUT FLOW CHANNEL

SCALE
1000 500 0 1000
1 INCH = 1000 FEET



C. Toby Mine Area

Sources of pollution in this area consist of one open heading, caved mine drifts, open pit mine operations cutting into the old mine workings and the acid forming spoil of the open pit mining operations.

The major contributor to Sawmill Run is located at the head waters of its northern most tributary and comes from a heavily strip mined area. Of less magnitude is an old mine heading believed to be tied into the Toby Mine but referred to locally as the Gavazzi Mine.

Acid mine drainage sources with flows going directly to Little Toby Creek emanate from the Toby Mine and consist of an open mine heading at sample point #43 and a caved mine heading designated as #136. Other minor seepages were found along the spoil and at other caved sections of the mine.

The only major flow to Limestone Run from Toby Mine is designated as reference point #112 and comes from a caved mine heading.

The un-reclaimed strip mines in this area are believed to contribute heavily to the flow through the mine thereby increasing the pollution discharge to Little Toby Creek and Sawmill Run. Additional pollution is derived from the spoil banks during periods of surface runoff as the water percolates through spoil containing acid bearing materials.

The pollution sources in this area consist of:

Ref. Nos.	Drainage To	Average Acid Load In Pounds Per Day	Description and Remarks
21	Sawmill Run	Not Determined	Pond at Strip Mine probably fed from old mine workings
22	Sawmill Run	Not Determined	Seepage at toe of spoil
24 *	Sawmill Run	615	Point on unnamed stream Acid load from Ref. Pts. 21, 22 and runoff from inactive New Shawmut Strip Mine
25 *	Sawmill Run	32	Caved Mine heading (Gavazzi) and leaching refuse pile
26	Sawmill Run	No Flow	Caved Drift
27 *	Sawmill Run	281	Point on Sawmill Run. Acid load from inactive strip mine
29	Limestone Run	Negligible	Caved drift within inactive strip mine area

* Regular Sampling Station

Ref. Nos.	Drainage to	Average Acid Load In Pounds Per Day	Description and Remarks
112*	Limestone Run	379	Caved mine heading
43 *	Little Toby Creek	1005	Open heading
44	Little Toby Creek	Negligible	Caved Drift
45	Little Toby Creek	Negligible	Spring
46	Little Toby Creek	Negligible	Seepage through spoil
47	Little Toby Creek	Negligible	Spring
48	Little Toby Creek	No Flow	Caved Drift
49	Little Toby Creek	0.5	Caved Drift
50	Little Toby Creek	Not Determined	Flow from strip mine
51	Little Toby Creek	175	Point on unnamed stream, acid load from Ref. Pt. 50 and inactive Starr Strip Mine
102	Toby Mine	No Flow	Pond in open pit collects surface water
136	Little Toby Creek	22	two caved drifts
137	Little Toby Creek	No Flow	Caved Drift
148	Limestone Run	No Flow	Caved Drift

* Regular Sampling Station

From the results of the subsurface exploration program it was determined that the sealing of the western perimeter of the northern portion of the mine would require approximately 5100 feet of heavy grout curtains in addition to four seals. Mine seals would be required in headings found at test holes M, N-1, N-5 and MM. Pressure tests results indicated that heavy grouting would be required in the area surrounding drill holes K, L, M, N-l, N-3, N, 0-1 and NN. The estimated cost of over $1,000,000 for grouting and sealing is considered prohibitive.

Along the western side in the southern section of the mine it was found that the spoil from the surface mines varied from 13 feet to 65 feet in depth. The cost to remove and replace a sufficient amount of spoil so that dry seals could be installed along the periphery of the old mine workings is estimated at $397,250. The depths of spoil were determined from the logs of drill holes V, W, X, Y, Z, and AA.

The mine roof was found to be caved at drill hole J and subsidence had occurred for approximately 40 feet above a solid seam of fire clay which indicated that the Lower Kittanning Coal Seam had been removed in this area. A short distance away at drill hole T, the mine roof was found to be intact. Because of this situation we have concluded that sealing a large portion of the mine would be technically impractical due to caved conditions.. Consideration was given to the installation of a grout curtain and the removal of overburden and placement of a clay seal. Horizontal augering with subsequent placement of aggregates and grout was ruled out as a possibility due to the caved condition of the mine. The grout curtain, estimated to cost $173,540 would only eliminate 22 pounds of acid per day. The cost of excavation and placement of a clay seal would exceed the grout curtain.

Based on the above described findings we recommend that the following surface reclamation measures be taken.

Construct 6000 linear feet of diversion ditches along portions of the highwall to eliminate runoff from entering the existing pits and filtering through loose spoil piles.

Place an impervious surface seal over portions of previously surface areas mined to prevent surface water from entering the mine and minimize acid seepage from the spoil piles. This would require the placement and compaction of 44,500 C.Y. of impervious material along the highwall.

Drainage from the diversion ditches and blanketed areas will flow through conveyance channels to a discharge point below the spoil. This will require the construction of 4500 linear feet of channels.

The location of the proposed surface reclamation is shown on Plate 2.

The total cost for these three items is estimated at $450,300. The anticipated reduction in acid load to Toby Creek and Sawmill Run is 842 pounds per day which equates to a cost of $535 per pound of permanent reduction.

The second phase of reclamation consists of the collection and conveyance of discharges from Ref. Pts. 43 and 112 to the proposed treatment plant at Kyler Run. This work will consist of:

1. The excavation and construction of reinforced concrete mine seals with outflow pipes at reference points #43 and #112. These seals would be located at an elevation sufficiently high to provide for gravity flow to the proposed treatment plant.

2. The installation of 7000 feet of PVC water line. The pipe from reference point #112 would be designed to handle 400 gpm (recorded peak 282 gpm) while the line from point #43 should be capable of carrying 1000 gpm (recorded peak 754 gpm).

These two construction items are estimated to cost -$95,800. They will reduce average daily acid loads to Little Toby Creek by 1375 pounds at a cost of $70 per pound without consideration of treatment costs.

The increased cost to provide sufficient capacity at the Kyler Run Treatment Plant and its operational costs are shown in that section of the report.

Should further reduction in acid loads be considered desirable upon completion of these two reclamation measures we recommend:

1. Additional surface mine reclamation work over Toby Mine and along Limestone Run. This should further reduce flows to Toby Mine and reduce pollution derived from percolation through acid bearing spoil.

2. Installation of slurry trenches along low points of mines in areas of seeps. This would further curtail the flow of acid mine drainage along the western periphery of the mine.

3. The installation of a Scrubgrass Type Treatment Plant near the junction of Limestone Run and Little Toby Creek. This is considered a last resort reclamation measure to provide further reduction in the acid load being carried to Little Toby Creek.

The need for and anticipated effect of these measures should be evaluated upon completion of the specific recommendations.

A summation of costs is listed hereunder:

TOP PRIORITY

Construct Diversion Ditches 6000 linear feet @$4.20	$ 28,200
Construct Clay Blankets 44,500 cubic yards @$4.50	200,250
Construct Channels of Conveyance 4500 linear feet @$49.30	221,850
Total Top Priority	$450,300

SECOND PRIORITY

Construct Reinforced Concrete Seals with Outlet Pipe 2 @$6,500	$ 13,000
Construct Water Lines 6000 feet @$13.80	82,800
Total Second Priority	$ 95,800
Total Cost	$546,100

PLATE 2
DEPT. OF ENVIRONMENTAL RESOURCES

PROJECT SL 132-5

TOBY MINE

POLLUTION SOURCE & ABATEMENT MAP

SCALE
1000 500 0 1000
1 INCH = 1000 FEET

TO KERSEY RUN

POTENTIAL SANITARY LANDFILL SITE

TOBY MINE
SEE PLATE 19

FOUR POINTS

Limestone Run

Strip Mine

Sawmill Run

Little Toby Creek

Kylers Corners

REINFORCED CONCRETE

PIPE LINE

1300' TO KYLER RUN TREATMENT PLANT

TO SAWMILL RUN

GAVAZZI MINE

T-315

T-376

T-380

L.R. 24009

L.R. 24023

29 N
28 98
102 NF
21 ND
148 NF
112 379
48 NF
46 N
44 N
45 N
76 1174
43 1005
47 N
50 ND
22 ND
136 22
137 NF
24 615
25 32
26 NF
27 281
51 175
49 0.5
101 6799
74 696

POLLUTION SOURCE LEGEND

- 0 / 12 — POLLUTION SOURCES WITH REFERENCE NO. AVERAGE ACID LOAD IN POUNDS PER DAY
- 0 / -5 — CONTINUOUS SAMPLING STATION AVERAGE ALKALINE LOAD IN POUNDS/ DAY
- N — NEGLIGIBLE
- NF — NO FLOW
- ND — NOT DETERMINED
- DRIFT OR CAVED AREAS
- PORTIONS OF POLLUTED STREAMS
- PROJECT BOUNDARY

NOTES: DRIFT LOCATIONS WITHOUT REFERENCE NUMBER OR FLOW NOTATIONS WERE NOT LOCATED

ABATEMENT MEASURES LEGEND

- 1000S — REFUSE PILE RECLAMATION AREA IN S.Y.
- DIVERSION DITCHES
- OPEN PIT MINE RECLAMATION AREA IN ACRES
- CHANNELS OF CONVEYANCE & RECHANNELIZATION
- SB — SEDIMENTATION BASINS
- CLAY SEALS
- DEEP MINE
- T — TREATMENT PLANT
- GROUT CURTAIN
- MINE DRAINAGE OUT FLOW CHANNEL

D. Dagus Mine - Limestone Run Area

The major contributor of mine drainage in this area is the WPA installed air seal located along LR 24029. Two other sources found along Limestone Run are caved mine openings.

The pollution sources investigated are:

Ref. Nos.	Drainage To	Average Acid Load in Pounds Per Day	Description and Remarks
28 *	Limestone Run	98	Caved Drift
30	Limestone Run	Not Determined	Caved Drift
104*	Little Toby Creek	237	Air Seal
113*	Limestone Run	20	Caved Heading
132	Limestone Run	Alk.-3	Spring
133	Limestone Run	2	Small Stream fed by Ref. Pt. 113 and 132

* Regular Sampling Station

From the results of the drilling program it was determined that the mine opening was intact and would be suitable for sealing. Strata on the sides of the opening were found to be quite pervious when pressure tested and would require heavy grouting thereby making the installation expensive. Even after sealing at this point discharges to Limestone Run would occur from seepage or other caved mine entries.

Since the existing air seal appears to be in good condition with only minor amounts of seepage around it the need for expensive sealing and grouting can be eliminated by utilizing it for an intake structure and piping the discharge to the pipe lines leading from the Toby Mine to the Kyler Run Treatment Plant. To convert the air seal for this purpose a new pipe outlet should be installed at its base and the existing discharge pipe should be sealed. We also recommend the replacement of earth surrounding the air seal with an impervious material to further reduce seepage.

One problem associated with this installation is the lowering of the water level in the mine thereby exposing additional acid forming materials to the mine. However the area of exposure should not be increased significantly since the mine floor has a 2% slope in the direction of the outlet and the water level will only be lowered five feet. The discharge pipe would be at an elevation of 1725 which would provide 75 feet of drop at the site of the proposed treatment plant. The discharge pipe would be designed to carry 1000 gpm. The recorded peak is 651 gpm.

This work should be carried out simultaneously with the phase 2 work proposed in the Toby Mine Area.

This reclamation work is expected to eliminate an acid load, which averages 237 pounds per day at a cost of $24,450.00 as shown below. Without an allowance for the treatment plant, these measures will cost $103.00 per pound of acid eliminated.

SECOND PRIORITY

Construct outlet structure at air seal **1 @$1,500**	**$ 1,500**
Construct water lines **2700 feet @$8.50**	**22,950**
Total Cost	**$24,450**

PLATE 3

DEPT. OF ENVIRONMENTAL RESOURCES

PROJECT SL 132-5

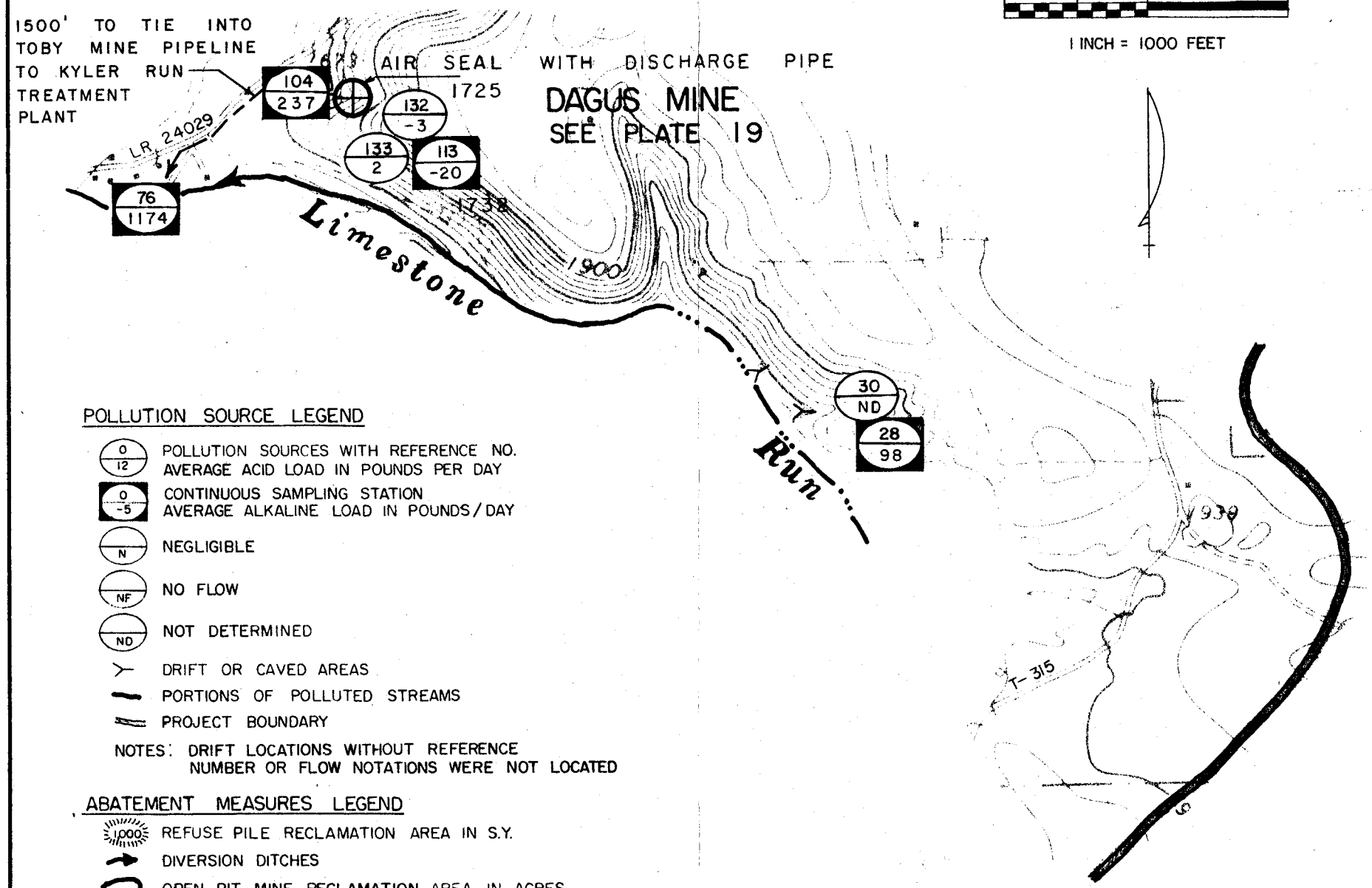
DAGUS MINE-LIMESTONE RUN

POLLUTION SOURCE & ABATEMENT MAP

SCALE

1000 500 0 1000

1 INCH = 1000 FEET



POLLUTION SOURCE LEGEND

- 0 / 12 — POLLUTION SOURCES WITH REFERENCE NO. AVERAGE ACID LOAD IN POUNDS PER DAY
- 0 / -5 — CONTINUOUS SAMPLING STATION AVERAGE ALKALINE LOAD IN POUNDS/DAY
- N — NEGLIGIBLE
- NF — NO FLOW
- ND — NOT DETERMINED
- DRIFT OR CAVED AREAS
- PORTIONS OF POLLUTED STREAMS
- PROJECT BOUNDARY

NOTES: DRIFT LOCATIONS WITHOUT REFERENCE NUMBER OR FLOW NOTATIONS WERE NOT LOCATED

ABATEMENT MEASURES LEGEND

- 1000 — REFUSE PILE RECLAMATION AREA IN S.Y.
- DIVERSION DITCHES
- OPEN PIT MINE RECLAMATION AREA IN ACRES
- CHANNELS OF CONVEYANCE & RECHANNELIZATION
- SB — SEDIMENTATION BASINS
- CLAY SEALS
- DEEP MINE SEAL
- T — TREATMENT PLANT
- GROUT CURTAIN
- MINE DRAINAGE OUT FLOW CHANNEL

E. Dagus Mine - Upper Little Toby Creek Area

The major source of pollution in this area occurs at Coal Hollow and consists of open pit mining areas which have intercepted the old mine workings, air seals, caved mine headings and large quantities of mine refuse.

Due to the southwesterly dip of the Lower Kittanning coal in this area the water accumulating in strip mines located in the north and east of Coal Hollow are considered as water sources feeding the mine.

Flow from the Ticossi Mine was found to be alkaline with acceptable limits of sulfate ions (150 ppm); and total iron content (3.1 ppm).

The Malone and Pontzer Mines located over the Dagus Mine appear to have been stripped out.

Several WPA air seals located along the old highway between Toby and Coal Hollow contribute 15% of the load in the headwaters of Little Toby Creek.

Along this same stretch of Little Toby Creek, it was found that ponding and flow in and around refuse piles was also contributing to the acid load.

A compilation of all sources investigated appear as follows:

Ref. No.	Drainage to	Average Acid Load In Pounds Per Day	Description and Remarks
31	Daguscahonda Run	No Flow	Coal Refuse Pile
32	Daguscahonda Run	Negligible	Caved Mines and Leaching Refuse Pile
33	Beaver Run	27	Caved Mine with Pond
34	Beaver Run	Negligible	Caved Mine with Pond
36	Beaver Run	No Flow	Caved Mine with Pond
37	Kersey Run	No Flow	Old workings stripped out
38	Kersey Run	No Flow	Old strippings with pond
39	Daguscahonda Run	No Flow	Caved Drift
40	Daguscahonda Run	No Flow	Caved Drift
41	Daguscahonda Run	Negligible	Caved Heading-Ticossi Mine
42	Daguscahonda Run	No Flow	Caved Heading
52	Beaver Run	Negligible	Caved Drift
53	Kersey Run	Not Determined	Flow from stripping operations and caved heading

Ref. Nos.	Drainage To	Average Acid Load In Pounds Per Day	Description and Remarks
54 *	Little Toby Creek	257	Caved Heading
55	Little Toby Creek	No Flow	Caved Heading
56	Little Toby Creek	Not Determined	Caved Heading
57	Little Toby Creek	Negligible	Spring
58	Little Toby Creek	No Flow	Caved Workings
59	Little Toby Creek	Not Determined	Spring above strip cut
60	Little Toby Creek	Not Determined	Spring below spoil
61	Little Toby Creek	Not Determined	Spring below spoil
62	Little Toby Creek	30	Limed outflow from strip cut
63	Little Toby Creek	Negligible	Seepage from inactive stripping spoil
64	Little Toby Creek	Not Determined	Caved Heading
65	Little Toby Creek	Not Determined	Air Seal
66	Little Toby Creek	No Flow	Caved Drift
67 *	Little Toby Creek	348	Point on stream. Acid load from Ref. Pts. 63 thru 66
68 *	Little Toby Creek	186	Point on stream. Acid load from Ref. Pts. 56 thru 62 & 90, 122 & 123
69	Dagus Mine	No Flow	Sealed Shaft in swamp
70	Daguscahonda Run	Not Determined	Air Seal-Doubtful affect on project
77 *	Little Toby Creek	19	Point on Stream. Acid load from Ref. Pt. 110, 111 and inactive strip mine.
78 *	Little Toby Creek	66	Air Seal
79	Little Toby Creek	Negligible (Alk)	Caved Drift
80	Little Toby Creek	0	Caved Drift
81 *	Little Toby Creek	24	Air Seal
82	Little Toby Creek	Not Determined	Caved Drift
83	Little Toby Creek	7	Air Seal
84	Little Toby Creek	2	Air Seal
85 *	Little Toby Creek	8	Caved Drift
86	Little Toby Creek	0.5 Alk.	Caved Drift
87	Little Toby Creek	Negligible	Strip Mine Seepage
88	Little Toby Creek	Not Determined	Caved Drift
89	Little Toby Creek	No Flow	Caved Drift-Eureka No.2 Mine
90	Little Toby Creek	43	Air Seal
105	Dagus Mine	3	Stream from strip mine, potential source of surface water entering deep mine
109	Little Toby Creek	No Flow	Caved Drift
110	Little Toby Creek	Negligible	Outflow from open pit cut
111	Little Toby Creek	Negligible (Alk)	Spring below spoil
122	Little Toby Creek	Alk 7	Cropline breakthrough Ticossi Mine
123	Little Toby Creek	No Flow	Caved Heading
141	Little Toby Creek	Negligible	Pond above leaching refuse pile
142	Little Toby Creek	Negligible	Leaching refuse pile
124	Daguscahonda Run	Near Neutral	Pond
125	Daguscahonda Run	Not Determined	Pond

* Regular Sampling Station

Since all work proposed for this area in an interim submission consisted of surface reclamation measures there was no subsurface exploration conducted.

Numerous mine drainage permits have been issued throughout this sub-project area as shown on Plate 20. In many instances these permits border or encompass inactive surface mines. This leads us to believe that varying degrees of abatement will result as newly mined areas are restored. Because of this and the likelihood that additional surface mining operations will be carried out in the future we have not proposed any reclamation for the numerous un-reclaimed mines overlying the mine.

A portion of the reclamation measures proposed in the previously submitted interim report along Little Toby Creek were undertaken and completed at a cost of $71,500. This work consisted of the grading and revegetation of an existing refuse pile, the re-channelization of Little Toby Creek through areas where flows were previously restricted, and the construction of diversion ditches above the work area. Samples were taken by DER immediately upon completion of the results of this work through a periodic sampling program. A comparison of results appear as follows:

Location	PH	Acidity PPM	Total Iron PPM	Sulfates PPM
141 - Upstream				
LSA - 1974	3.4	92	4.1	380
DER - 1976	3.2	136	2.2	325
142 - Downstream				
LSA - 1974	2.6	360	72	590
DER - 1976	3.3	140	2.9	318

Similar reclamation measures are proposed for two areas upstream. The one area requires removal of an acid producing bony pile containing approximately 52,000 cubic yards of refuse. The material is to be placed in a nearby unreclaimed surface mine. The removal of this pile coupled with re-channelization 3s expected to reduce the acid load by 190 pounds per day at a cost of $110,530 or $581 per pound.

The second pile is estimated to contain 378,000 cubic yards of bony. The top portion of this pile is to be spread evenly on the down slopes and natural ground surrounding it so as to eliminate the existing mound and provide an even downslope in the direction of the existing streams. This will involve grading approximately one third of the total volume. The resulting graded area will then be covered with impervious material and clean fill prior to seeding. The existing channels in this area should also be cleaned and graded. This work is expected to result in an acid reduction of 300 pounds per day at a cost of $217,700 or $726 per pound.

The itemized cost for this work is shown below.

TOP PRIORITY

Channelization of stream 2900 linear feet @$21.00	**$ 60,900**
Bony Pile Removal or Regarding 178,000 cubic yards @$1.30	**231,400**
Surface Covering and Revegation 18 acres @$2,000.00	**36,000**
Total Cost	**$328,300**

An additional measure which may be considered is piping the discharge from the air seal at point 78 to the proposed treatment plant on Kyler Run. This is not included as a firm recommendation since the average daily acid load is only 66 pounds and would require increasing the treatment plant by one half million gallons per day to handle peak flows of 305 gpm. The installation of 3,000 feet of pipe and the conversion of the air seal to a discharge structure is estimated to cost $27,000 which equates to $409 per pound. Cost for treatment would be added to this figure.

PLATE 4

DEPT. OF ENVIRONMENTAL RESOURCES

PROJECT SL 132-5

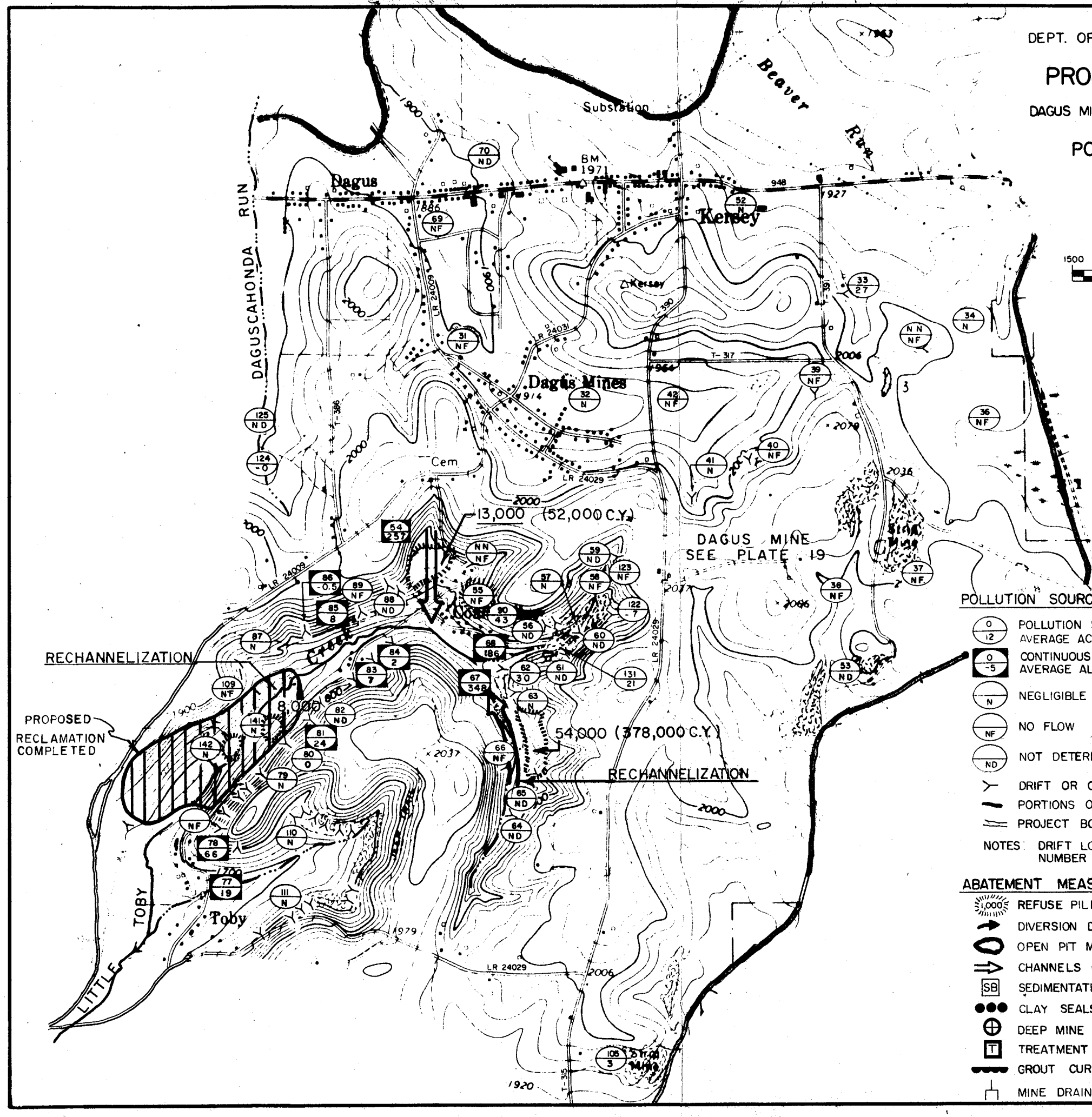
DAGUS MINE-UPPER LITTLE TOBY CREEK

POLLUTION SOURCE & ABATEMENT MAP

SCALE

1500 750 0 1500

1 INCH = 1500 FEET



POLLUTION SOURCE LEGEND

- POLLUTION SOURCES WITH REFERENCE NO. AVERAGE ACID LOAD IN POUNDS PER DAY
- CONTINUOUS SAMPLING STATION AVERAGE ALKALINE LOAD IN POUNDS/DAY
- N — NEGLIGIBLE
- NF — NO FLOW
- ND — NOT DETERMINED
- DRIFT OR CAVED AREAS
- PORTIONS OF POLLUTED STREAMS
- PROJECT BOUNDARY

NOTES: DRIFT LOCATIONS WITHOUT REFERENCE NUMBER OR FLOW NOTATIONS WERE NOT LOCATED

ABATEMENT MEASURES LEGEND

- 1,000 S — REFUSE PILE RECLAMATION AREA IN S.Y. (VOLUME)
- DIVERSION DITCHES
- OPEN PIT MINE RECLAMATION AREA IN ACRES
- CHANNELS OF CONVEYANCE & RECHANNELIZATION
- SB — SEDIMENTATION BASINS
- CLAY SEALS
- DEEP MINE SEAL
- T — TREATMENT PLANT
- GROUT CURTAIN
- MINE DRAINAGE OUT FLOW CHANNEL

F. Kyler Mine Area

The major pollution sources in this area are large flows from the old mine Reference Points #93. #99 and #107. Number 93 results from a stipping operation cutting into an old mine heading or airshaft and feeds Kyler Run. Number 107 is a pipe outlet from the old mine workings discharging towards Hays Run. Number 99 is a small stream fed by an opening in the Eureka #2 Mine and other openings in the Kyler Mine.

The flow from the Eureka #2 Mine is alkaline in nature but has shown some acidity. Iron and sulfate loads appear tolerable also. Other sources in this area consist of open pit mines, breakth roughs form the Old Kyler Mine and refuse piles throughout the Kyler Run Valley as tabulated on the following page.

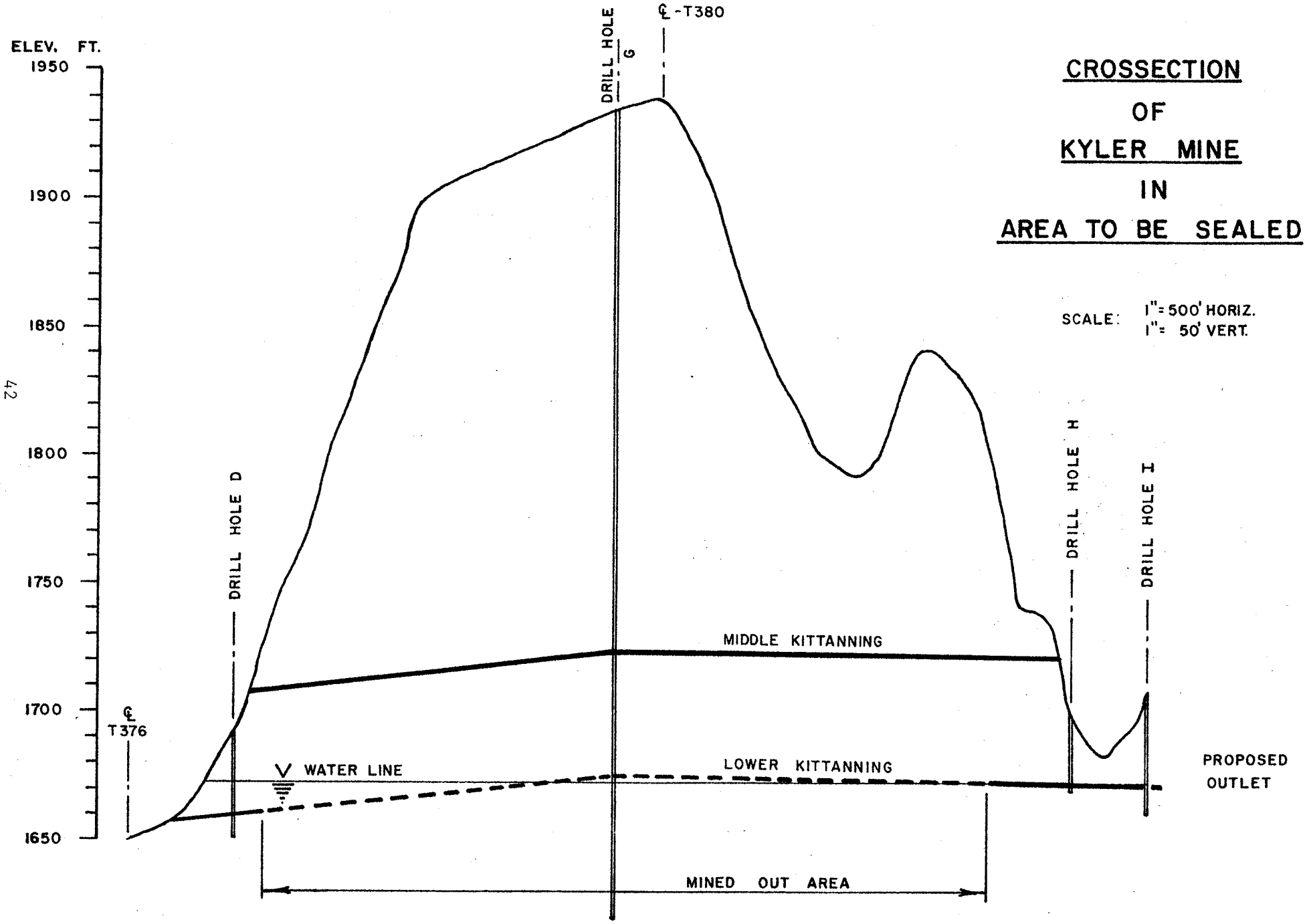
DER has implemented initial abatement measures in the uppermost portions of Kyler Run as recommended in earlier stages of this p roject. The completed work consisted of grading portions of unreclaimed surface mines and grading and covering of coal refuse material and establishing vegetation on the areas. A new channel for Kyler Run was constructed and lined with riprap in places. Si de channels were constructed to cause drainage from deep mine discharges to be directed into the main channel. Those draining sources, 93 and 99, continue to add acid mine drainage to Kyler Run, and are recommended for treatment.

Since the mine in this area has narrow outcrop barriers, numerous breakthroughs, extensive surface mines on its periphery, and the potential for 300 foot heads, effective sealing and flooding is not feasible. This leaves treatment as the only viable method of abating pollution on Kyler Run.

Prior to the construction of a treatment plant however, it is recommended that the mine drainage to Hays Run be diverted to the Kyler Run Basin. From the results of the subsurface exploration program it was found that the nine could be sealed n ear point 107 utilizing a double bulkhead seal with a grout curtain extending 200 feet on both sides. The elevation at the bottom of the seal will be 1661 while the proposed discharge near reference point 140 will be at an elevation of 1671. The cross-sections on pages 42 and 43 depict the mine floor, potential flooding flooring and surface elevations. Past experience has shown that a 10 foot head is well within the holding capabilities of a double bulk head seal.

The sealing as, described above is not exp ected to increase the discharge from the air seal designated as point 106 since the elevation of the air seal is four feet higher than the proposed discharge at point 140. Mine maps also show that there is no interconnection between the mine to be sealed *and* the mine passageway discharging at point 106. However if a significant change should occur in the quantity of the water being discharged at point 106 after sealing the mine at point 107 some form of correction will be required in that area.

The diversion of flow from point 107 to Kyler Run will increase the average acid load in Kyler Run by 4659 pounds per day. The flow averages out at 1777 gpm while the peak flow recorded is 3138. Adding this peak flow to the peak flow on Tyler Run totals 12,355 gpm o r approximately 18 million gallons a day. Flows from the Toby Mine and Dagus Mine near Limestone Run would add another 2k million gallons per day to this flow. To treat this in entirety would require the construction of a 25 mgd treatment facility. However if discharges from points 104, 99 and 93 are piped directly in the treatment facility, its capacity could be decreased to 15 mgd. The daily average acid load for all points 75, 107, 112, 43 and 104 total 11,89 pounds while the direct piping flows from 93, 99, 107, 112, 43 and 104 were found′ to contain 9988 pounds. The completed and proposed surface reclamation work is expected to eliminate the majority of the 1861 pound differential.



CROSSECTION OF KYLER MINE IN AREA TO BE SEALED

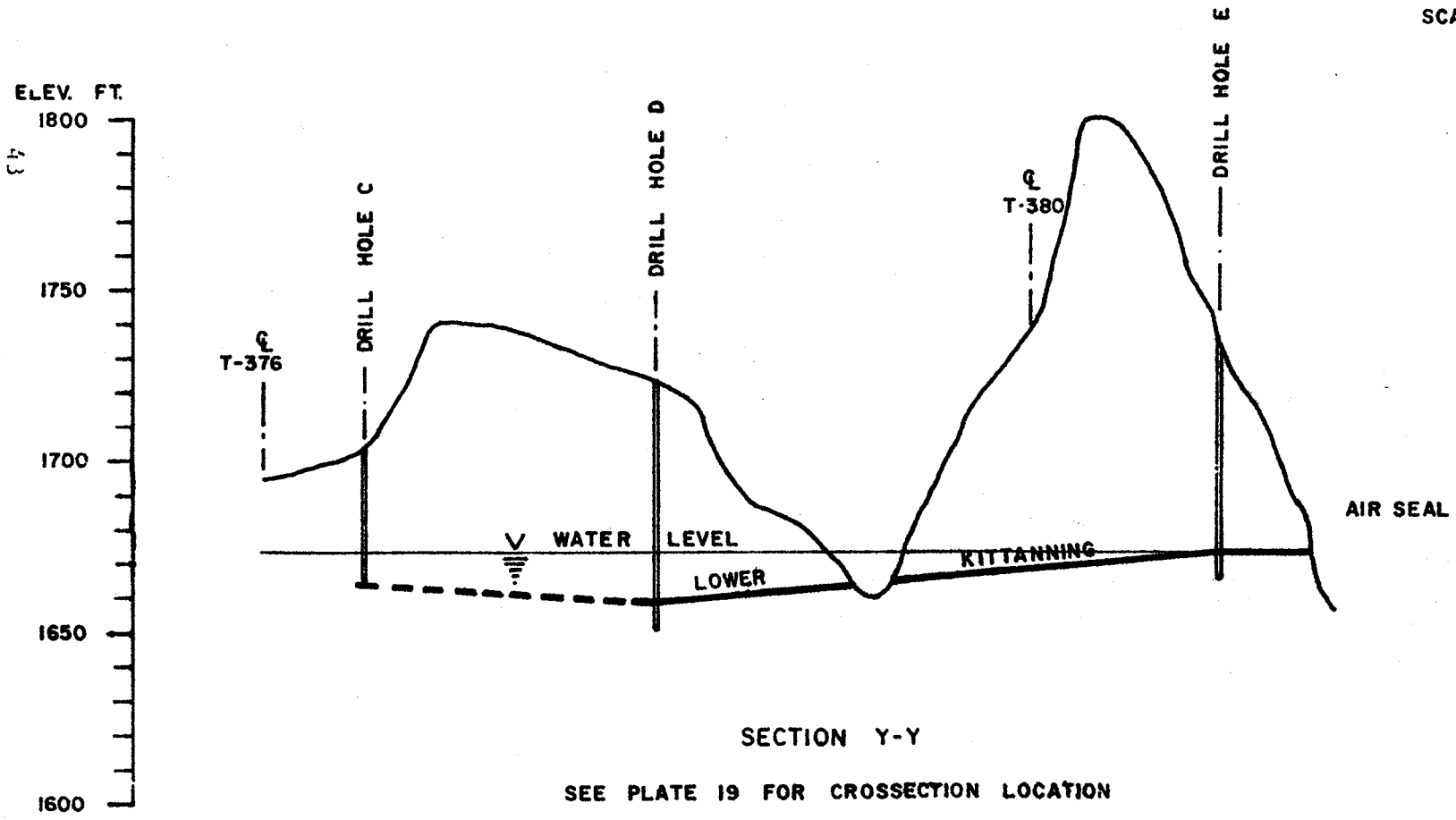
SCALE: 1"= 500' HORIZ.
1"= 50' VERT.

SECTION X-X

SEE PLATE 19 FOR CROSSECTION LOCATION

CROSSECTION
OF
KYLER MINE
IN
AREA TO BE SEALED

SCALE: 1"=500' HORIZ.
1"= 50' VERT.



SECTION Y-Y

SEE PLATE 19 FOR CROSSECTION LOCATION

A reinforced concrete outfall structure should be constructed at points 93 and 140 while a 5.6 million gallon impoundment and a perforated pipe discharge is proposed for point 99. From these structures the water will be piped to a holding pond at the proposed treatment plant. The proposed structures and associated piping are estimated to cost $279,000. This portion of the proposed system results in a one time cost of $28 per pound of acid removed by subsequent treatment.

A neutralization plant shown schematically on page 46 on Kyler Run utilizing limestone as a reagent is proposed for treating the piped discharges. The estimated construction cost for this facility is $1,155,000. Limestone was chosen as a reagent for the following reasons:

1. Ferrous iron contents under 100 ppm.

2. Less sludge than other reagents.

3. The possibility of obtaining the limestone locally.

Annual operating costs without amortization costs are estimated at $142,350 which equates to $390 per day. This cost was derived by utilizing Harold L. Lovell's; formula for reagent requirements and the "Estimation of Costs" found on page 97 of EPA-670/2-73-093 entitled "An Appraisal of Neutralization Process." Broken down by categories the estimates are:

Electric	**$140/day**
Reagent	**$ 81/day**
Labor	**$ 95/day**
Maintenance	**$ 23/day**
Sludge Removal	**$ 33/day**
Innoculation	**$ 16/day**
Total	**$390/day**

The proposed location for the treatment plant is shown on Plate 5. This area was chosen due to the relatively flat terrain, its proximity to the sources requiring treatment and an elevation making gravity flow possible from major pollution contributors. Constructing the plant west of LR 24023 and south of Little Toby Creek near Kyler Corners to treat the entire flow of Little Toby Creek was ruled out due to wide fluctuation in flows. During the sampling periods flows varied from 1.1 mgd to 73 mgd.

As proposed herein this plant would treat discharges from the following points having characteristics as summarized hereinafter:

Parameter	Reference Points					
	104	43	112	107	93	99
Max. Flow (mgd)	0.9	1.1	0.4	4.5	2.6	3.4
Avg. Flow (mgd)	0.3	0.3	0.1	2.6	1.5	1.3
pH at Max. Flow	3.4	3.0	2.8	3.2	3.0	3.2
Avg. pH	3.5	3.0	2.9	3.5	3.1	3.4
Max. Acid (lbs/day)	639	3532	2037	8290	5175	201
Avg. Acid (lbs/day)	237	1005	379	4652	2912	60
Max. Total Iron (lbs/day)	171	164	104	3316	759	40
Max. Ferrous Iron (lbs/day)	90	2	12	1638	330	1
Avg. Total Iron (lbs/day)	72	68	33	1426	351	10
Avg. Ferrous Iron (lbs/day)	32	1	5	820	163	1
Max. Sulfates (lbs/day)	2540	9057	2377	31654	9704	256
Avg. Sulfates (lbs/day)	1114	2504	503	14517	5376	60

The only other work proposed for this sub-project area is the reclamation of a 7 acre surface mine located 1000 feet west of reference point 118. This work is expected to eliminate 58 pounds of acid per day at a cost of approximately $290 per pound.

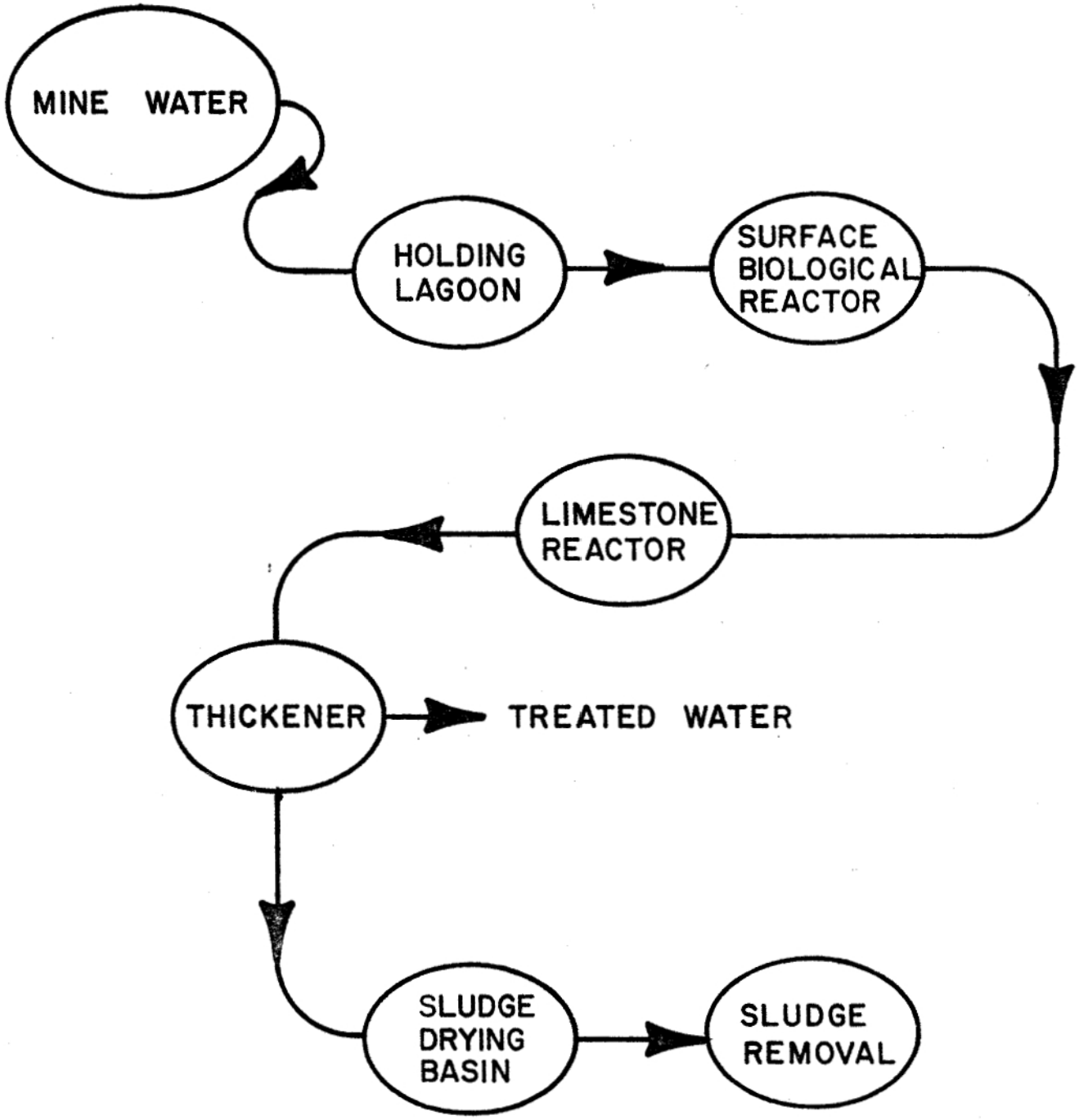
Itemized costs appear as follows:

TOP PRIORITY

Double Bulkhead Seal 1 at $25,000	$ 25,000
Grout Curtain 400 feet at $180	72,000
Surface Mine Reclamation 7 acres at $2,400	16,800
Total Top Priority	$ 113,800

SECOND PRIORITY

Reinforced Concrete Outfall Structures 2 at $8,500	$ 17,000
Impoundment and Discharge Structure 1 at $43,500	43,500
Construct Water Lines 9500 linear feet at $23.00	218,500
Construct Treatment Facility 1 at $1,155,000	1,155,000
Total Second Priority	$1,434,000
Total Cost	$1,547,800



TREATMENT PLANT SCHEMATIC

TOBY CREEK SL 132-5

DRAWN BY:	DATE:	

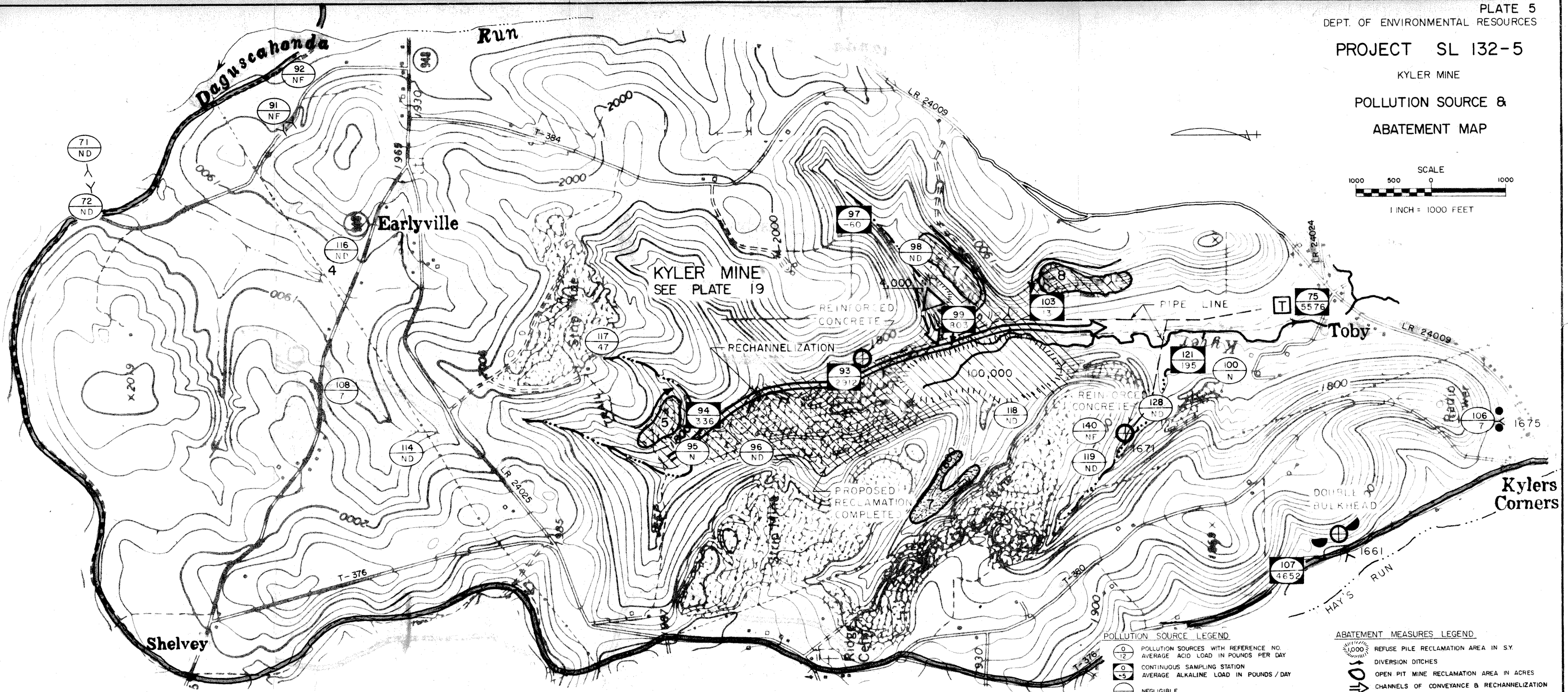
PLATE 5

DEPT. OF ENVIRONMENTAL RESOURCES

PROJECT SL 132-5

KYLER MINE

POLLUTION SOURCE & ABATEMENT MAP



POLLUTION SOURCE LEGEND

- POLLUTION SOURCES WITH REFERENCE NO. / AVERAGE ACID LOAD IN POUNDS PER DAY
- CONTINUOUS SAMPLING STATION / AVERAGE ALKALINE LOAD IN POUNDS / DAY
- N — NEGLIGIBLE
- NF — NO FLOW
- ND — NOT DETERMINED
- DRIFT OR CAVED AREAS
- PORTIONS OF POLLUTED STREAMS
- PROJECT BOUNDARY

NOTES: DRIFT LOCATIONS WITHOUT REFERENCE NUMBER OR FLOW NOTATIONS WERE NOT LOCATED

ABATEMENT MEASURES LEGEND

- 1000 — REFUSE PILE RECLAMATION AREA IN S.Y.
- DIVERSION DITCHES
- OPEN PIT MINE RECLAMATION AREA IN ACRES
- CHANNELS OF CONVEYANCE & RECHANNELIZATION
- CLAY SEALS
- DEEP MINE SEAL
- T — TREATMENT PLANT
- GROUT CURTAIN
- MINE DRAINAGE OUT FLOW CHANNEL
- INTAKE RESERVOIR