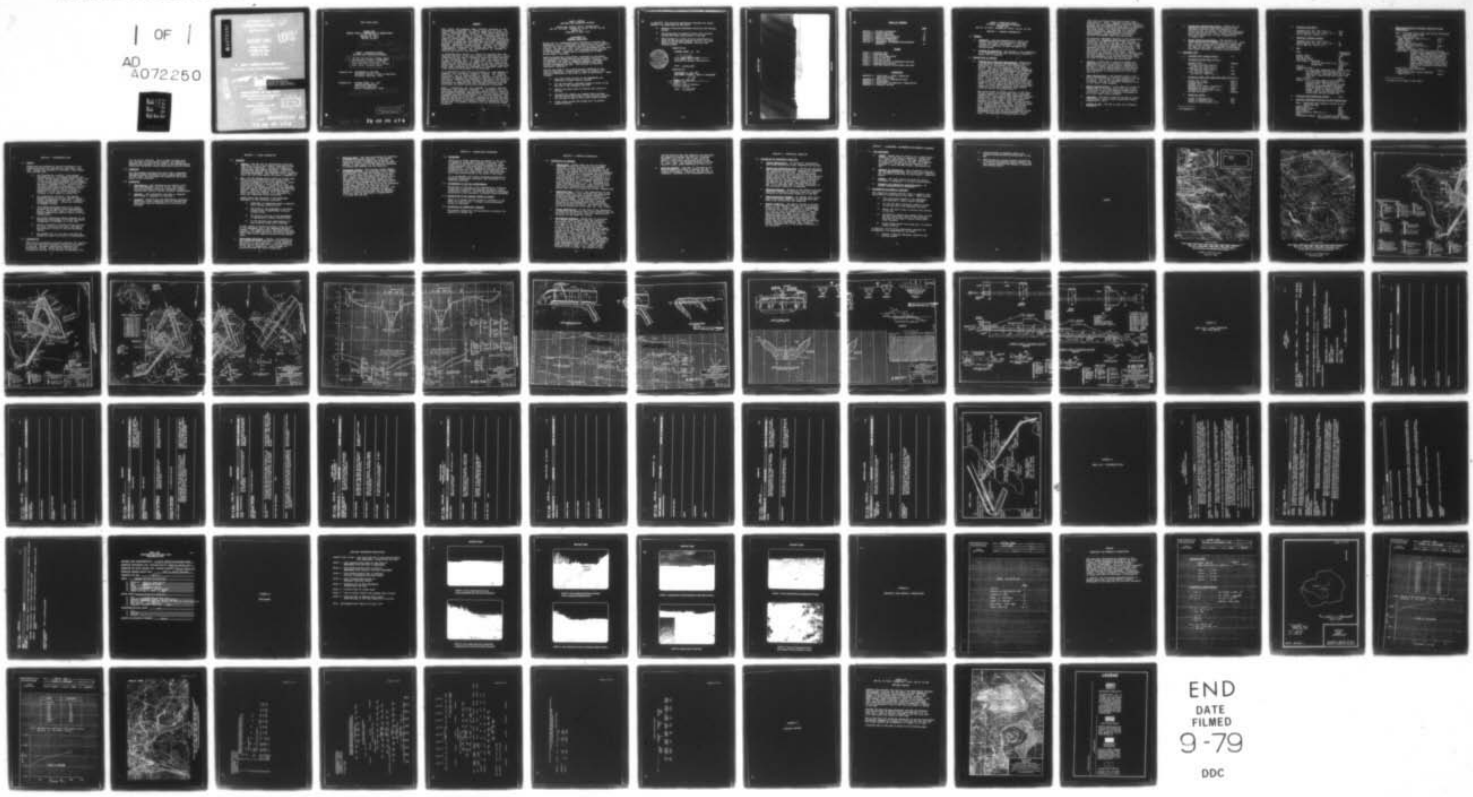
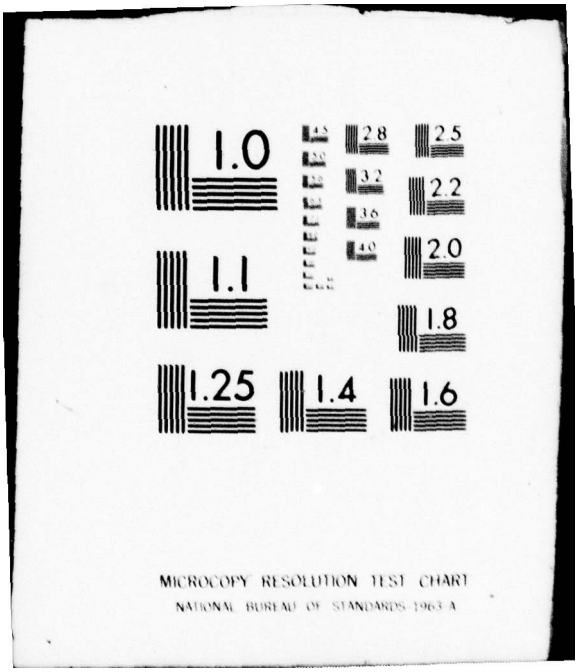
AD-A072 250 BAKER (MICHAEL) JR INC BEAVER PA F/G 13/2
NATIONAL DAM INSPECTION PROGRAM. MATHAY DAM (NDI NUMBER PA-0024--ETC(U)
JUL 79 C Y CHEN DACW31-79-C-0011
UNCLASSIFIED NL



END
DATE FILMED
9-79
DDC


1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

AD A072250

[illegible] RIVER BASIN

[illegible] COUNTY

PENNSYLVANIA

LEVEL II

[illegible] DAM

[illegible] No. PA [illegible]

[illegible] No. [illegible]

[illegible] No. PA [illegible]

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

Distribution Unlimited
Approved for Public Release
Contract No. DACW31-79-C-0011

prepared for

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland [illegible]

prepared by

MICHAEL BAKER, JR., INC.

Consulting Engineers

[illegible]

[illegible], Pennsylvania [illegible]

July [illegible]

ORIGINAL CONTAINS COLOR PLATES: ALL DDC REPRODUCTIONS WILL BE IN BLACK AND WHITE

79 08 06 074

OHIO RIVER BASIN

MATHAY DAM
MERCER COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00247
PennDER No. 43-46
SCS No. PA 459

(10) Chuan Yuan Chen

(11) Jul 79

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

(12) 79p.

(6) National Dam Inspection Program. Mathay Dam (NDI Number PA-00247, PennDER Number 43-46, SCS Number PA-459), Ohio River Basin, Mathay Run, Mercer County, Pennsylvania. Phase I Inspection Report,

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: MICHAEL BAKER, JR., INC.
Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

(15) DACW31-79-C-0011

JOB

PREFACE

This report was prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Mathay Dam, Mercer County, Pennsylvania
NDI No. PA 00247, PennDER No. 43-46, SCS No. PA 459
Mathay Run
Inspected 26 April 1979

ASSESSMENT OF GENERAL CONDITIONS

Mathay Dam is a homogeneous earth floodwater retarding dam designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS) and owned by the Mercer County Commissioners. The dam has a crest length of approximately 3260 feet, a maximum height of 22 feet, and a maximum storage capacity of 755 acre-feet. Mathay Dam is classified as a "High" hazard-"Small" size dam.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will pass the Probable Maximum Flood (PMF) without overtopping the dam. The spillway is therefore considered "adequate."

The dam was found to be in good overall condition at the time of inspection. Several minor items of remedial work should be performed by the owner as soon as practicable. These include:

1) Fill the animal burrows in the embankment and establish a rodent control program.

2) Cut the few small scattered clumps of brush on the dam and in the emergency spillway.

3) Repair the minor areas of erosion and rutting on the dam.

4) Periodically inspect the seepage drain outlets, and the intake and outlet of the principal spillway for buildup of debris which could cause blockage.

5) Place riprap around the plunge pool to prevent ongoing erosion.

In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

Submitted by:

MICHAEL BAKER, JR., INC.

C. Y. Chen

C. Y. Chen, Ph.D., P.E.
Engineering Manager-Geotechnical

Date: 6 July 1979

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

James W. Peck

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 21 July 1979

MATHAY DAM

Overall View

TABLE OF CONTENTS

PLATES

APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
MATHAY DAM
NDI No. PA 00247, PennDER No. 43-46, SCS No. PA 459

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances - Mathay Dam, a flood water retarding dam designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS), is also known by its SCS number PA 459. The dam is a homogeneous earth embankment with a crest length of approximately 3260 feet and a maximum height of about 22 feet. The material available for construction of the dam consisted primarily of silty (ML) and silty clay (ML-CL) soils, with a lesser amount of silty sand (SM) soil. A 5-foot deep foundation cutoff trench with a base width of 15 feet was constructed along the centerline of the dam from Station 13+30 to Station 19+34. A filter trench with two drain outlets was installed in the main embankment from Station 14+94 to Station 18+41 (see Plate 7).

The outlet works (principal spillway in SCS terminology) consists of a two-stage inlet reinforced concrete riser unit and 36-inch reinforced concrete outlet pipe. The concrete riser has a low stage orifice 1 foot by 2 feet in size with invert elevation of 1207.8 feet. This low stage orifice controls the sediment pool level. The second stage is an overflow weir on both sides of the riser unit. These weirs are 9-feet long and have a crest elevation of 1212.0 feet. A pond drain consisting of 20 feet of 24-inch bituminous coated corrugated metal pipe extends upstream from the riser. The entrance of the pond drain to the

riser unit is bolted closed with a steel plate (see Plate 8). [Note: Siphons have been used to drawdown the pool approximately 2 feet for inspection purposes and could easily be used again if necessary.] The outlet pipe, with three reinforced concrete anti-seep collars, was installed on a concrete cradle founded on compacted clay (CL) material. Approximately 5 feet of backfill CL material overlies the bedrock under the outlet pipe.

The spillway (emergency spillway in SCS terminology) consists of a vegetated earth channel curving around the left end of the dam. The elevation of the control section of the spillway is 1218.0 feet or 5.2 feet below the embankment crest level. The emergency spillway is approximately 2500-feet long and 110-feet wide at the base, and has 3H:1V (Horizontal to Vertical) side slopes. Riprap protection was provided at the curve of the emergency spillway channel for the excavated natural slope, the dam embankment slope and the small dike along the left of the emergency spillway channel.

b. Location - Mathay Dam is located on Mathay Run approximately 2 miles southeast of Greenville in Hempfield Township, Mercer County, Pennsylvania. The dam is located approximately 2 miles east of PA Route 58 and 2.5 miles south of PA Route 358. The coordinates of the dam are N 41° 23.0' and W 80° 20.7'.

c. Size Classification - The maximum height of the dam is 22 feet and the reservoir volume to the top of dam (El. 1223.2 feet) is approximately 755 acre-feet. The dam is therefore considered to be in the "Small" size category.

d. Hazard Classification - In the event of failure of Mathay Dam, it is likely that "more than a few" lives would be lost and economic losses would be "excessive." The dam is therefore considered to be in the "High" hazard category.

e. Ownership - The dam is owned by the Mercer County Commissioners, Mercer County Courthouse, Mercer, Pennsylvania 16137.

f. Purpose of Dam - The dam is used for floodwater detention.

g. Design and Construction History - Mathay Dam was designed by the SCS under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566, as amended. The dam was constructed by Hilliard Mining Co., RD #7, Butler, Pennsylvania from early Spring 1961 to final acceptance on 13 August 1962.

h. Normal Operating Procedures - The spillway is uncontrolled and the sediment pool level is El. 1208± feet. Mercer County and SCS personnel inspect the dam each year according to standard procedures for SCS dams of this type. Maintenance is performed, when deemed necessary, by Mercer County personnel.

1.3 PERTINENT DATA

a. Drainage Area (square-miles) - 1.4

b. Discharge at Dam Site (c.f.s.) -

Maximum Flood -	Unknown
Principal Spillway Capacity (at Pool El. 1223.2 ft.) -	160
Emergency Spillway Capacity (at Pool El. 1223.2 ft.) -	3720
Total Spillway Capacity (at Pool El. 1223.2 ft.) -	3880

c. Elevation (feet above Mean Sea Level [M.S.L.]) -

Design Top of Dam -	1223.2
Minimum Top of Dam -	1223.2
Sediment Pool -	1207.8
Maximum Pool (Phase I Analysis*) -	1221.1
Emergency Spillway Crest -	1218.0
Streambed at Centerline of Dam -	1201
Maximum Tailwater -	Unknown

d. Reservoir (feet) -

Length of Maximum Pool -	1150
Length of Sediment Pool -	500
Length of Flood Control Pool -	1050

---

* See Appendix D.

e. Storage (acre-feet) -

Sediment Pool (El. 1207.8 ft.) -	18.5
Flood Control Pool (El. 1218.0 ft.) -	325
Top of Dam (El. 1223.2 ft.) -	755

f. Reservoir Surface (acres) -

Sediment Pool (El. 1207.8 ft.) -	8
Flood Control Pool (El. 1218.0 ft.) -	70
Top of Dam (El. 1223.2 ft.) -	96

g. Dam -

Type -	Homogeneous earthfill
Length (feet) -	3260
Height (feet) -	22
Top Width (feet) -	12
Side Slopes - Upstream -	3H:1V
(with 10-foot berm at El.	1207.5 ft.)
Downstream -	2.5H:1V
Zoning -	None
Impervious Core -	None

Cutoff - A 5-foot deep compacted fill cutoff trench was constructed from Station 13+30 to Station 19+34. The base width was 15 feet with 1H:1V construction side slopes (see Plate 5).

Grout Curtain - None

Drains - A 5- to 8-foot deep filter trench was installed from Station 14+94 to Station 18+41. Two perforated 8-inch diameter corrugated metal drainpipes were installed to drain the filter trench. These two drains outlet on either side of the principal spillway outlet pipe into the plunge pool.

h. Diversion and Regulating Tunnel - None

i. Spillway (Emergency Spillway in SCS Terminology) -

Type -	Vegetated earth channel located at left end of the dam
Length (feet) -	2500
Base Width (feet) -	110
Side Slopes -	3H:1V
Crest Elevation (feet M.S.L.) -	1218.0
Gates -	None

Downstream Channel - Well vegetated earth channel flowing into natural streambed

j. Regulating Outlets (Principal Spillway in SCS Terminology) -

Type - Two-stage inlet riser and 36-inch reinforced concrete outlet pipe	
First Stage Orifice -	
Crest Elevation (feet M.S.L.) -	1207.8
Width (feet) -	2.0
Height (feet) -	1.0
Second Stage Overflow Weir -	
Crest Elevation (feet M.S.L.) -	1212.0
Length (feet)* -	9
Vertical Clearance (feet) -	1
Outlet Pipe - Consists of a 36-inch reinforced concrete pipe supported on a concrete cradle. Three reinforced concrete anti-seep collars were provided on approximately 24-foot centers from the downstream edge of the intake riser. The remaining 59 feet of the approximately 130-foot long outlet pipe is not provided with anti-seep collars.	
Riser Floor Invert Elevation (feet M.S.L.) -	1201.0
Outlet Conduit Exit Invert Elevation (feet M.S.L.) -	1200.0

---

* On each of two sides of the riser.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Mathay Dam was designed by the SCS according to its standard practice for structures of this type, circa 1960. Design data reviewed or included in this report were obtained from:

1) SCS Drawings No. PA-459-P, "Saul-Mathay Watershed Project, Floodwater Retarding Dam PA-459, Mercer County, Pennsylvania," April 1961. (Prints of the design drawings are available in the Pennsylvania Department of Environmental Resource's [PennDER] files. Prints of the "as built" drawings are available in both the SCS Harrisburg office and the Mercer County Conservation District Office in Mercer. Sheets 2-7 of the "as built" drawings are included in this report as Plates 3-8.)

2) SCS Drawings No. PA-459-H, "Saul-Mathay Watershed Protection Project PA-459, Mercer County, Pennsylvania," June 1961, 2 sheets of hydrograph drawings. (Prints are available in PennDER's files.)

3) "Saul-Mathay Watershed Work Plan," report prepared by the Mercer County Commissioners, et. al., March 1960 (copy in file of Mercer County Conservation District Office in Mercer, Pennsylvania).

4) Dam Permit Application Report prepared by the Pennsylvania Department of Forests and Waters (predecessor of PennDER) on 7 July 1961.

5) Design information (including boring and test pit logs, laboratory soil data, and design calculations in files of the SCS Harrisburg office).

6) The PennDER file for the dam (including SCS inspection reports and various correspondence).

2.2 CONSTRUCTION

There was no information reviewed concerning the construction of the dam which indicates concern for the safety of the dam. Resident construction inspection was provided by the SCS. Modifications and the post-construction surveys of the dam were incorporated into

the "as built" drawings. Most of these drawings have been included in this report; however, all additional drawings are available in the files of the SCS Harrisburg office and the Mercer County Conservation District office.

2.3 OPERATION

The "Saul-Mathay Watershed Work Plan" and a subsequent agreement between the Mercer County Commissioners and the SCS detail the provisions for operation and maintenance of this structure.

2.4 EVALUATION

a. Availability - The information was readily available from PennDER's file No. 43-46, the files of the SCS Harrisburg office and the Mercer County Conservation District office in Mercer, Pennsylvania.

b. Adequacy - The information available is adequate for a Phase I Inspection of this dam.

c. Validity - Observations and measurements performed during the visual inspection did not indicate any deviations from the information on the "as built" drawings.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The dam and its appurtenant structures were found to be in good overall condition at the time of the inspection. (During the inspection intermittent rain showers occurred.) Noteworthy deficiencies observed are described briefly in the following paragraphs. The complete visual inspection check list and field sketch are given in Appendix A.

b. Dam - The two seepage drain outlets on either side of the principal spillway outlet conduit were partially clogged with silt and vegetation. After clearing this debris, a minor amount of flow exited from the drains. A drain outlet along the left side of the upstream portion of the emergency spillway channel was totally clogged with silt and debris. From the volume of water that exited after the drain was opened, it is estimated the drain was completely filled with water.

Rodent holes were observed in the downstream embankment at the following locations:

1) Midheight of downstream slope at approximate original Station 12+50.

2) Two holes at the midheight of the downstream slope at approximate original Station 17+50.

3) Two holes at the toe of the embankment at approximate original Station 24+00.

4) On the upstream face approximately 50 feet from the right end of the dam.

A minor amount of brush was present along the toe of the embankment and in the emergency spillway channel. Also observed were a few areas where the vegetation is absent and minor rutting has occurred. These items can be repaired during routine maintenance.

c. Appurtenant Structures - Overall, the concrete in the intake and outlet structures of the principal spillway is in good condition. A minor amount of debris was on the trash rack of the riser orifice at the time of inspection. Minor erosion is occurring around the outlet plunge pool.

d. Reservoir Area - The area surrounding the reservoir is moderately sloping farmland. A few wooded areas are located throughout the watershed. No significant amount of sedimentation has occurred; however, a minor amount of the reservoir shoreline is eroding and washing into the reservoir.

e. Downstream Channel - The original stream channel of Mathay Run forms the downstream outlet channel. Approximately six homes are located in low lying areas in the first 6000 feet downstream of the dam. Several other residences are located along the stream's remaining two mile course to the Shenango River, including areas which were noted to have sustained damage during the 1956 flood in Greenville. Between the dam site and the confluence of the Shenango River and Saul Run are five roadway culverts and two railroad culverts. The Mathay Run and Saul Run confluence is approximately 2.7 miles from the dam, and the Shenango River and Saul Run confluence is approximately 3.5 miles from the dam.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no formal emergency procedures in the event of impending catastrophic failure of the dam. The condition of the dam is reportedly checked by Mercer County personnel following each occurrence of heavy precipitation. Partial drawdown of the pool was accomplished previous to the inspection by siphoning the reservoir into the intake riser, since the pond drain has a steel plate bolted on its inlet to the riser.

It is recommended that formal emergency procedures be prepared, prominently displayed, and furnished to all operating personnel.

4.2 MAINTENANCE OF DAM AND APPURTENANCES

Maintenance of the dam is the responsibility of Mercer County and is administered through the Mercer County Conservation District. Routine maintenance is performed periodically (when necessary) by Mercer County personnel.

4.3 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no formal warning system or procedure in the event of a dam failure. A formal warning procedure should be developed.

4.4 EVALUATION OF OPERATIONAL ADEQUACY

The present operational and maintenance procedures are adequate for Mathay Dam.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data - Design plans for the Saul-Mathay Watershed Project were obtained from PennDER. Contained in these plans were hydrographs for the design flood routing and for the freeboard flood routing. The design flood routing for the emergency spillway was based on a hydrograph developed using a 6-hour rainfall of 9.6 inches, resulting in a peak discharge of 3240 c.f.s. The freeboard flood routing was based on a hydrograph developed using a 6-hour rainfall of 19.2 inches, resulting in a peak discharge of 6685 c.f.s. In accordance with normal SCS design practices, these flood routings were used to establish the elevations of the design high water and design top of dam, respectively.

b. Experience Data - Prior to the construction of the existing structure, this watershed had experienced several floods resulting in severe damage to downstream bridges and inundation of several homes to various degrees. Since construction of the dam, however, flooding has not been a problem. According to the representative from the Mercer County Conservation District, the reservoir level has never reached the riser crest (El. 1212.0 feet).

c. Visual Observations - At the time of the inspection, no condition was observed that would indicate that the spillway and outlet works could not operate satisfactorily in the event of a flood.

d. Overtopping Potential - Mathay Dam is classified as a "High" hazard-"Small" size dam requiring evaluation for a spillway design flood (SDF) in the range of the 1/2 Probable Maximum Flood (1/2 PMF) to the Probable Maximum Flood (PMF). Since the dam has a storage capacity nearly equal to that of an "Intermediate" size dam, the PMF was chosen as the SDF. The spillways consist of a typical SCS concrete riser and a vegetated earth side channel. The hydrologic and hydraulic capabilities of the reservoir and spillways were evaluated by routing the PMF through the reservoir with the aid of the U.S. Army Corps of Engineer's Flood Hydrograph Package, HEC-1. The PMF hydrograph developed as part of this analysis had a peak discharge of 2038 c.f.s., using a 6-hour rainfall of 22.0 inches. The results of this

routing indicate that the reservoir and spillways are capable of passing the PMF with a maximum reservoir level of El. 1221.1 feet, which is about 2.1 feet below the minimum crest of dam El. 1223.2 feet. The maximum discharge from the reservoir under these conditions is 1714 c.f.s.

e. Spillway Adequacy - The dam, as outlined in the above analysis is capable of passing the PMF without overtopping. Therefore, the spillway is "adequate" according to the recommended criteria.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - No structural inadequacies were noted during the visual inspection of the dam.

b. Design and Construction Data - The dam was designed and constructed according to standard SCS procedures for structures of this type. According to the information in the files of the SCS Harrisburg office, the slopes have satisfactory slope stability safety factors for the configuration of the dam as constructed and the type of material available at the dam site for construction. Based upon this information and the visual observations of the dam, it is concluded that no further assessment of the structural stability is necessary.

c. Operating Records - Nothing in the readily available operating information indicates cause for concern relative to the structural stability of the dam.

d. Post-Construction Changes - No changes which would affect structural stability of the dam have been made since construction was completed.

e. Seismic Stability - The dam is located in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended Guidelines for Safety Inspections of Dams." This is a zone of very low seismic activity. Experience indicates that dams in this zone will have adequate stability under seismic loading conditions provided static stability conditions are satisfied and conventional safety margins exist. Mathay Dam could be shown to meet the conventional static stability requirements and, therefore, further consideration of the seismic stability is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety - Mathay Dam was found to be in good overall condition at the time of inspection. Mathay Dam is a "High" hazard-"Small" size dam requiring a spillway capacity equal to the PMF. As presented in Section 5, the spillways and reservoir are adequate to pass the PMF without overtopping the dam.

b. Adequacy of Information - The information available and the observations made during the field inspection are considered sufficient for this Phase I Inspection Report.

c. Urgency - The owner should initiate the action discussed in paragraph 7.2 as soon as practicable.

d. Necessity for Additional Data/Evaluation - No further investigation is necessary.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed certain items of remedial work which should be performed by the owner. These include:

1) Fill the animal burrows in the embankment and establish a rodent control program.

2) Cut the few small scattered clumps of brush on the dam and in the emergency spillway.

3) Repair the minor areas of erosion and rutting on the dam.

4) Periodically inspect the seepage drain outlets and the intake and outlet of the principal spillway for buildup of debris which could cause blockage.

5) Place riprap around the plunge pool to prevent ongoing erosion.

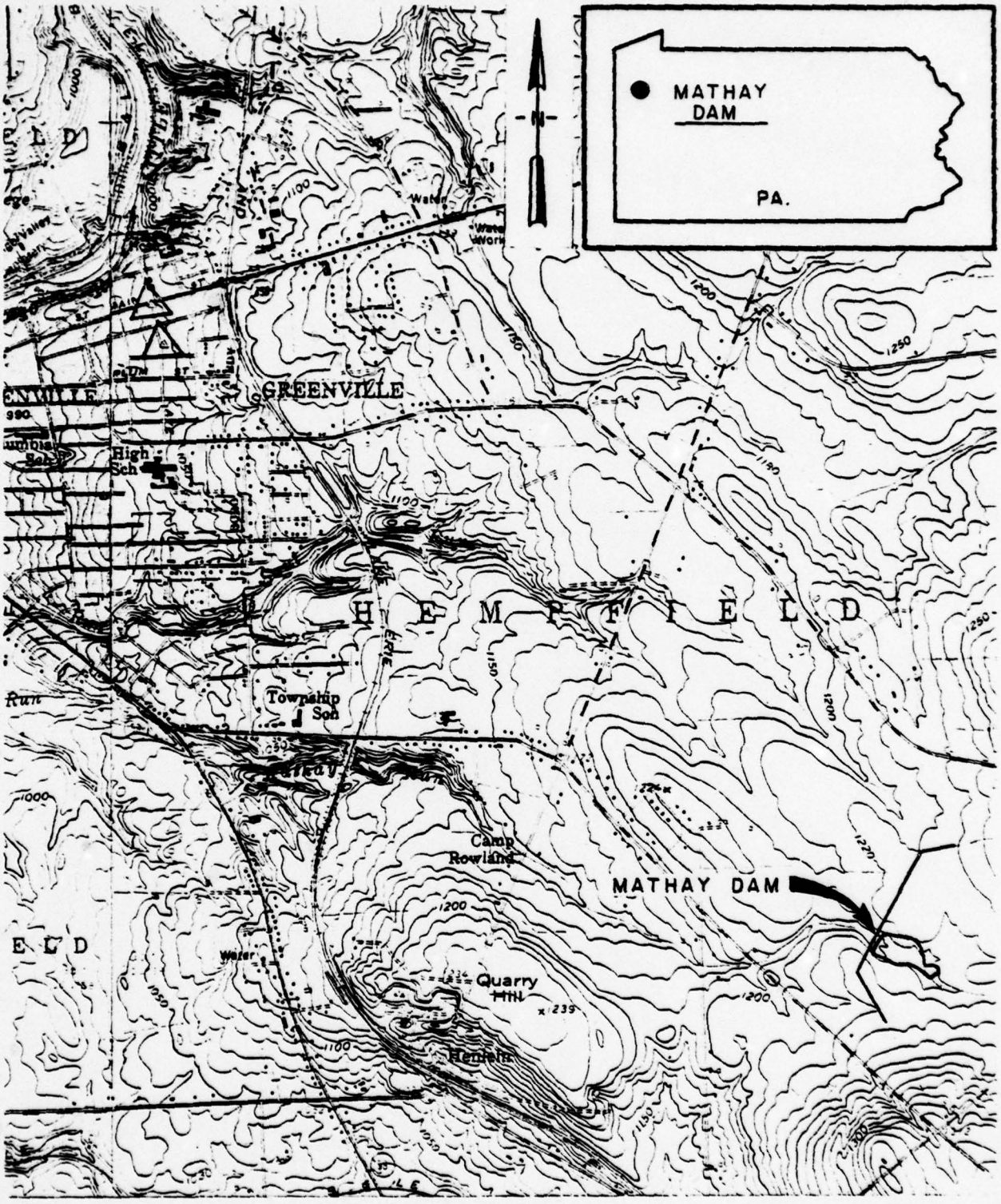
In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

PLATES



SCALE 1:24000

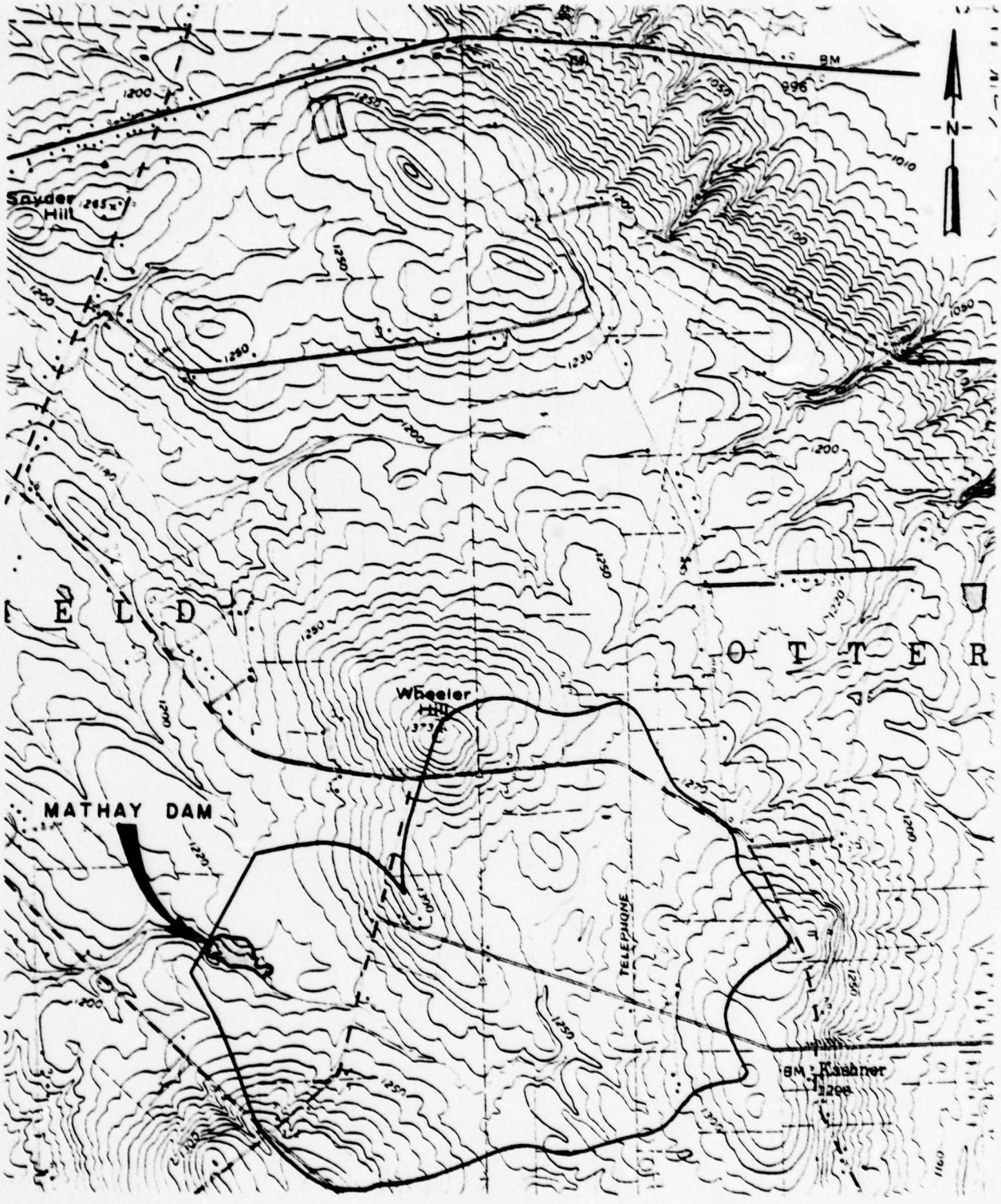
1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

PLATE 1 LOCATION PLAN

MATHAY DAM



SCALE 1:24000

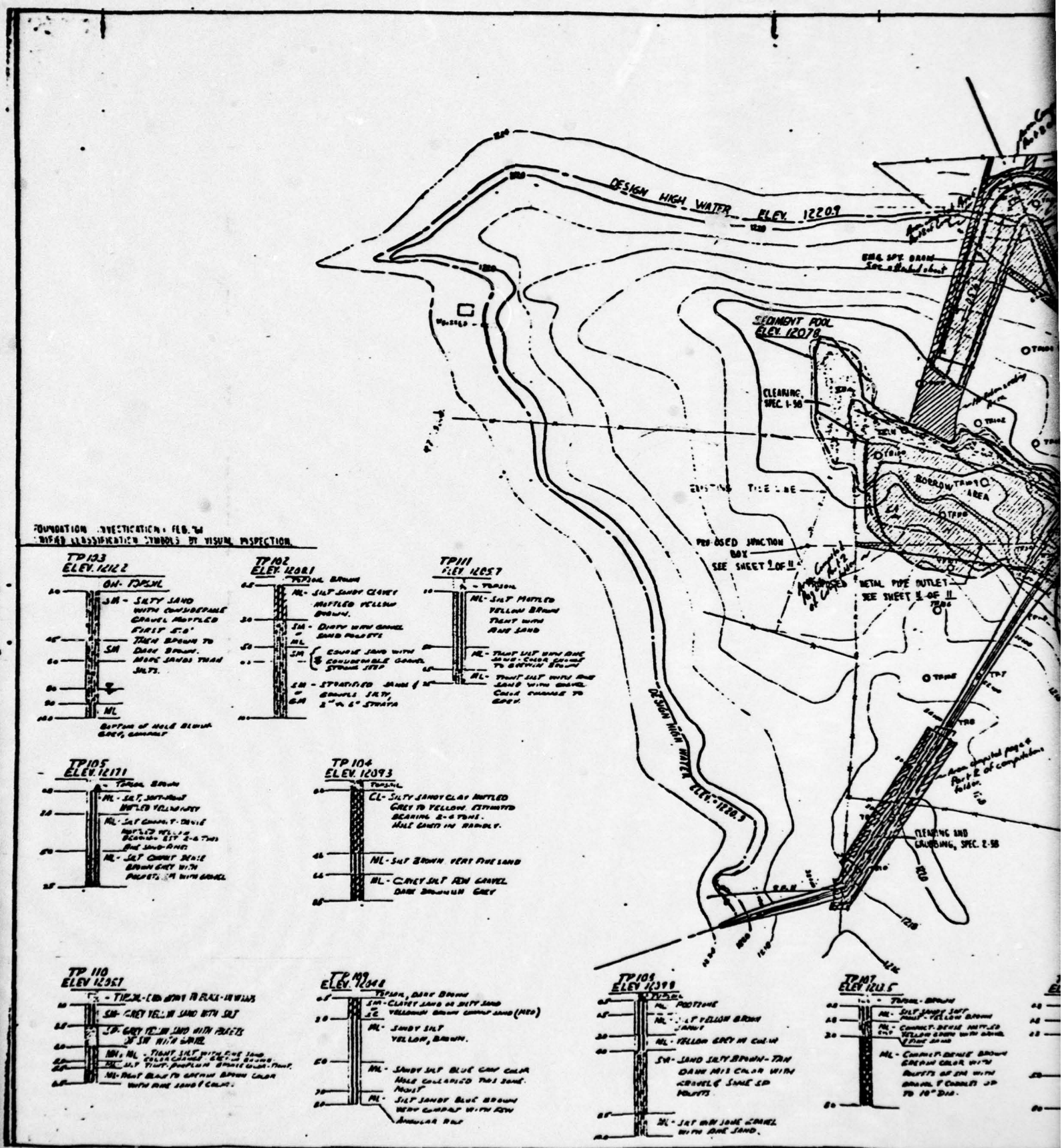
1/2 0 1 MILE

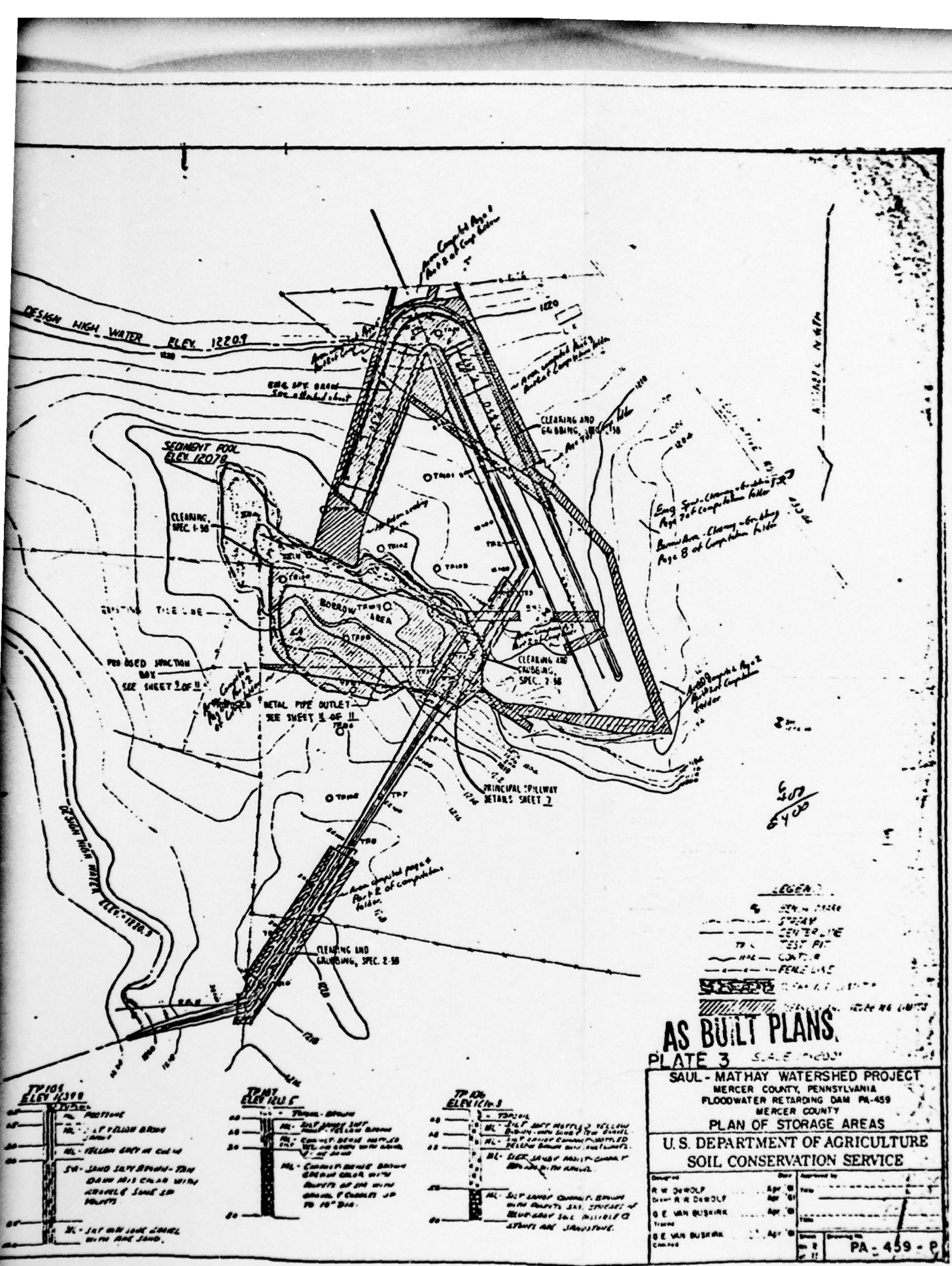
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

.5 0 1 KILOMETER

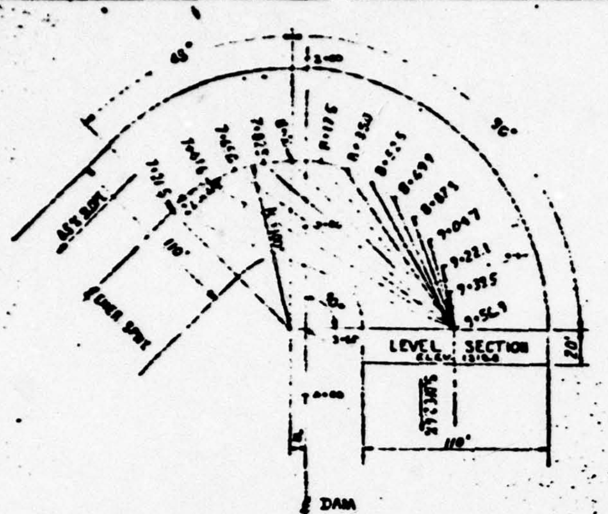
PLATE 2 WATERSHED MAP

MATHAY DAM


DESIGN HIGH WATER ELEV. 12209
SEDIMENT POOL ELEV. 12078
CLEARING, SPEC. 1-58
BORROW AREA
PROPOSED JUNCTION BOX SEE SHEET 9 OF 11
METAL PIPE OUTLET SEE SHEET 4 OF 11
DESIGN HIGH WATER ELEV. 12209
CLEARING AND GRUBBING, SPEC. 2-58
FOUNDATION INVESTIGATION - FEB. '64
TP 133 ELEV. 12112
TP 102 ELEV. 12081
TP 111 ELEV. 12057
TP 105 ELEV. 12171
TP 104 ELEV. 12093
TP 110 ELEV. 12051
TP 103 ELEV. 12048
TP 109 ELEV. 12099
TP 107 ELEV. 12015



THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

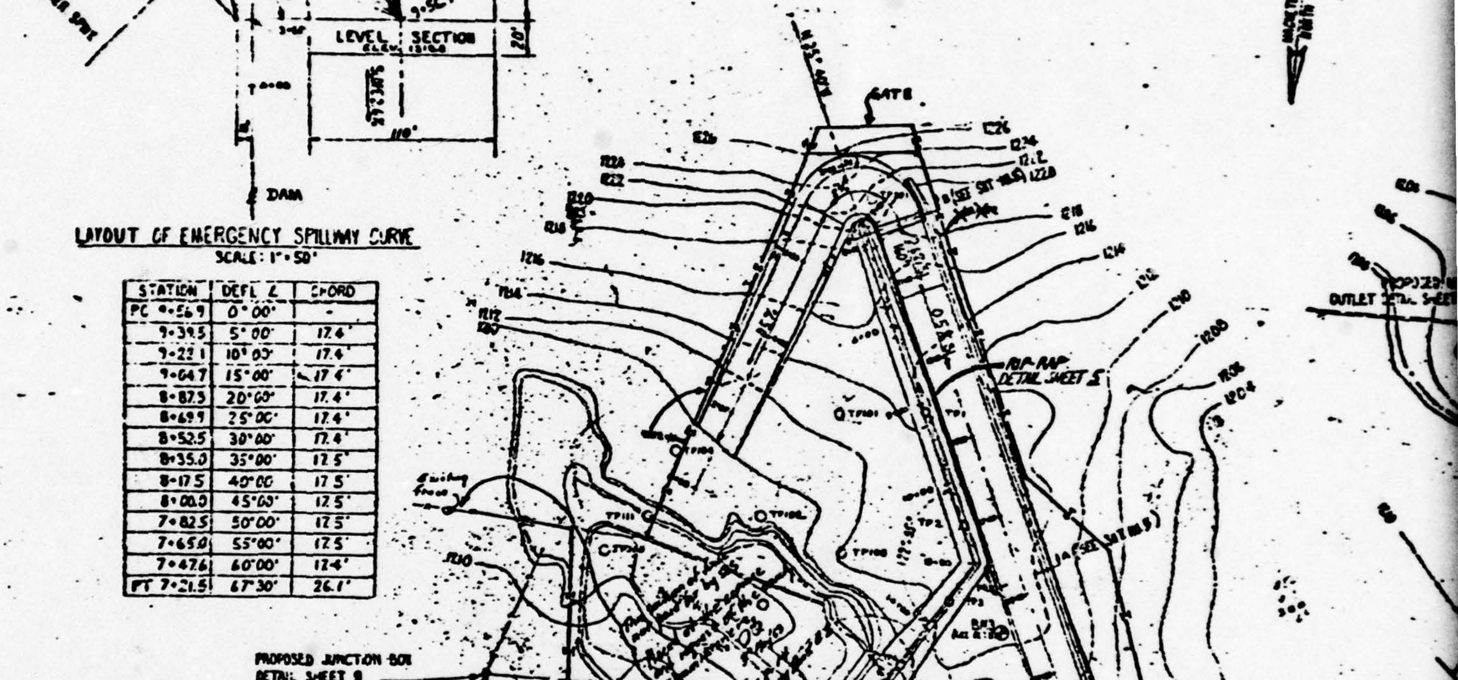


LAYOUT OF EMERGENCY SPILLWAY CURVE
SCALE: 1" = 50'

STATION	DEFL ∠	CHORD
PC 9+56.9	0°00'	-
9+39.5	5°00'	17.4'
9+22.1	10°00'	17.4'
9+04.7	15°00'	17.4'
8+87.3	20°00'	17.4'
8+69.9	25°00'	17.4'
8+52.5	30°00'	17.4'
8+35.0	35°00'	17.5'
8+17.5	40°00'	17.5'
8+00.0	45°00'	17.5'
7+82.5	50°00'	17.5'
7+65.0	55°00'	17.5'
7+47.6	60°00'	17.4'
PT 7+21.5	67°30'	26.1'

CURVE DATA

R = 100'	M = 61.7'
Δ = 135°	E = [illegible]
L = [illegible]	PC = 9+56.9
C = 184.8	PT = 7+21.5
T = 241.4	



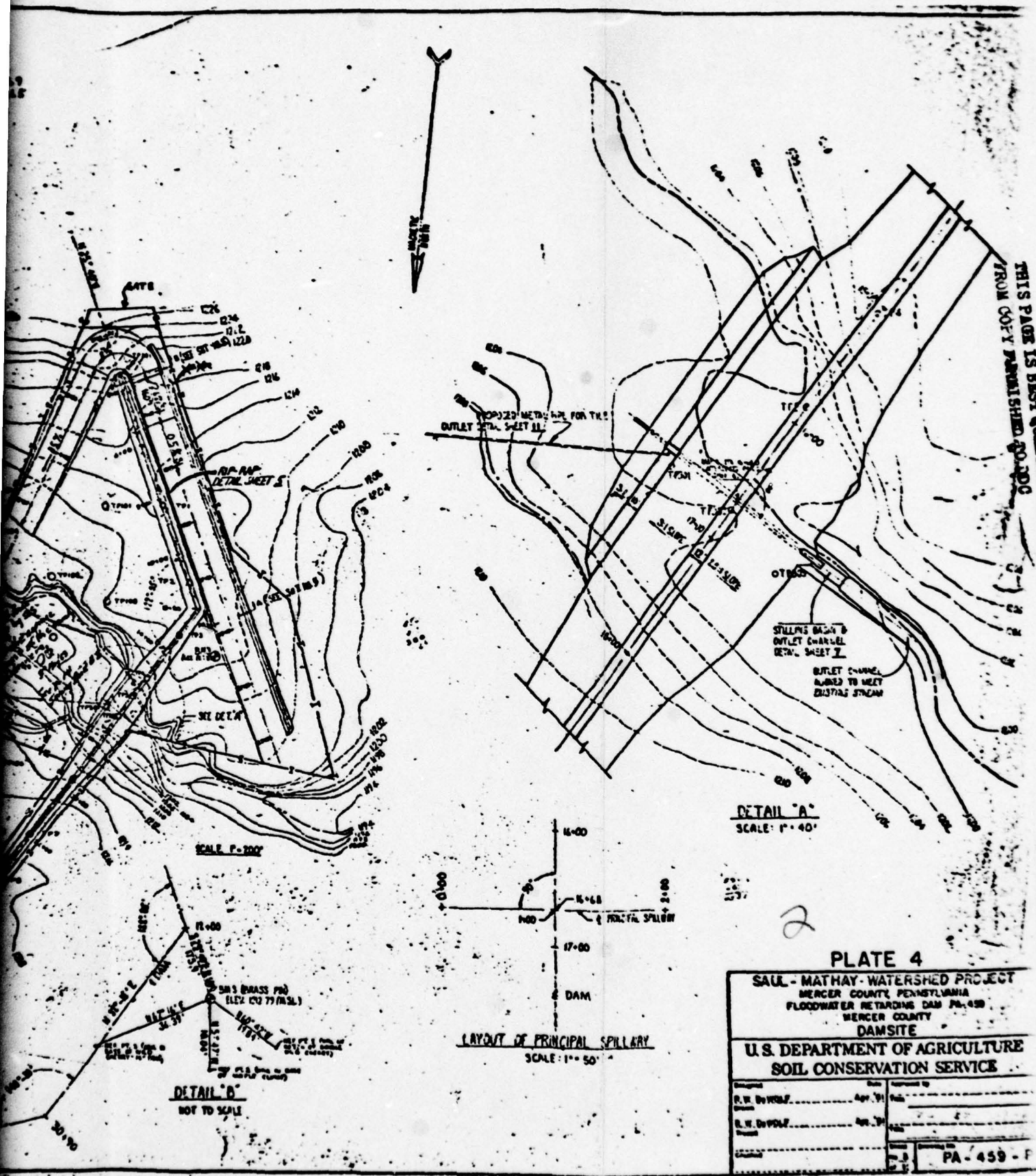


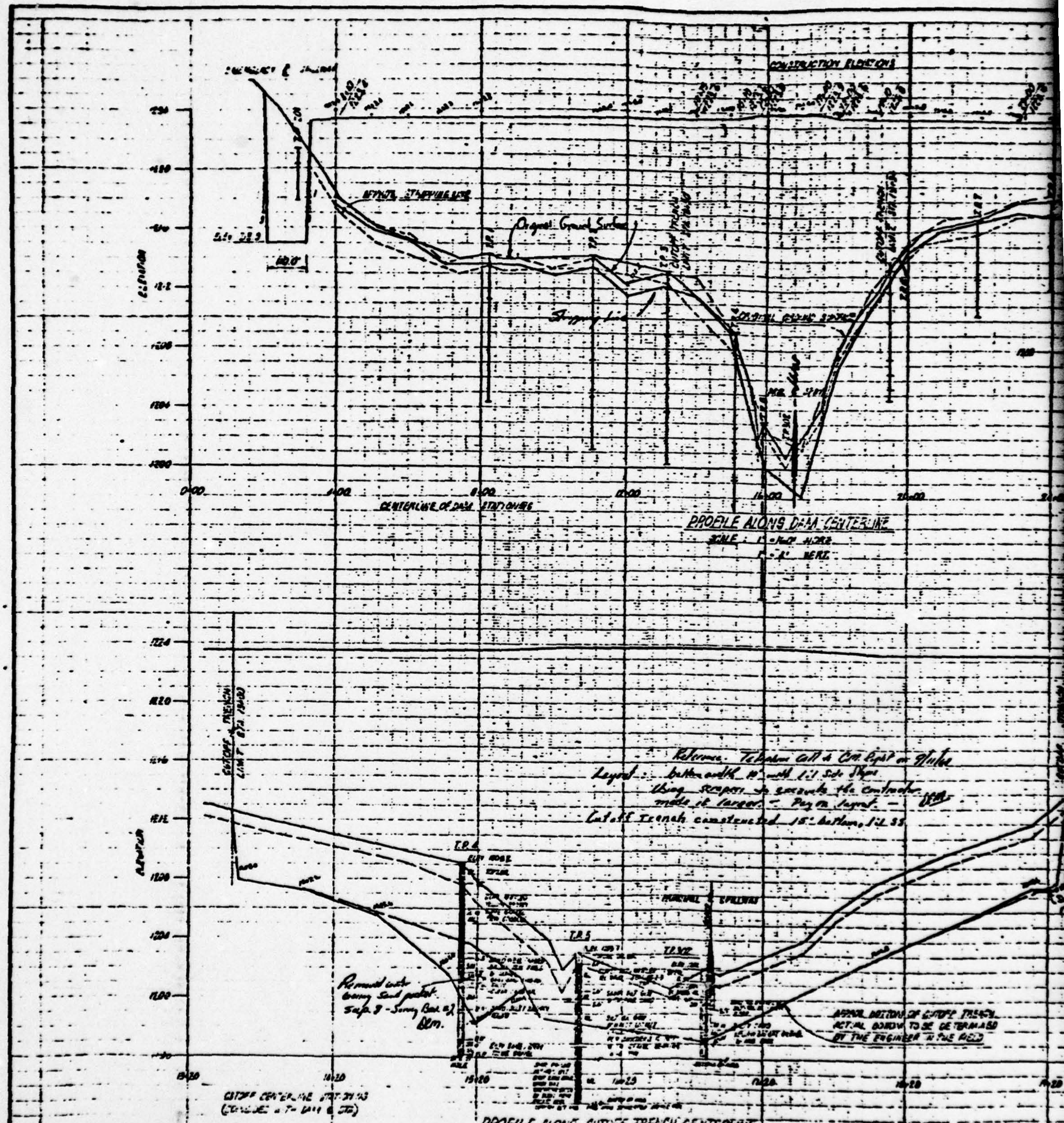
PLATE 4

SAUL - MATHAY - WATERSHED PROJECT
MERCER COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-459
MERCER COUNTY
DAMSITE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed R.W. DeWOLF Apr. '81
Drawn R.W. DeWOLF Apr. '81
Checked
Approved by
Date

PA - 459 - F


CONSTRUCTION ELEVATIONS
Original Ground Surface
Stripping Line
ORIGINAL GROUND SURFACE
ELEVATION
CENTERLINE OF DAM STATIONING
PROFILE ALONG DAM CENTERLINE
Layout: bottom width 10' with 1:1 side slopes
Using scrapers to excavate the contractor made it larger. - Pay on layout.
Cutoff Trench constructed 15' bottom, 1:1 SS
T.P. 4
T.P. 5
PRINCIPAL SPILLWAY
APPROX. BOTTOM OF CUTOFF TRENCH. ACTUAL BOTTOM TO BE DETERMINED BY THE ENGINEER IN THE FIELD
PROFILE ALONG CUTOFF TRENCH CENTERLINE

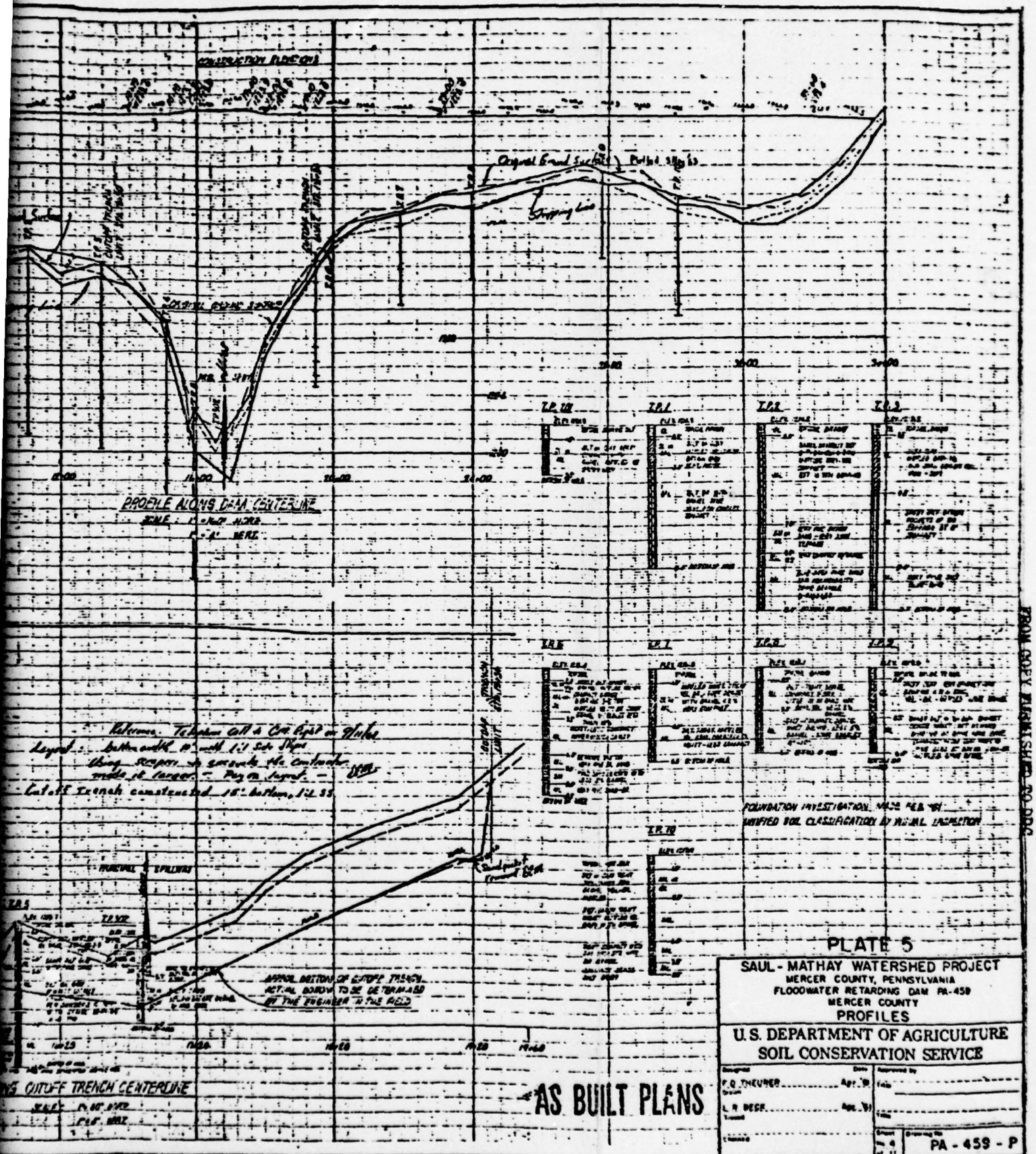


PLATE 5

SAUL - MATHAY WATERSHED PROJECT
MERCER COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-459
MERCER COUNTY
PROFILES

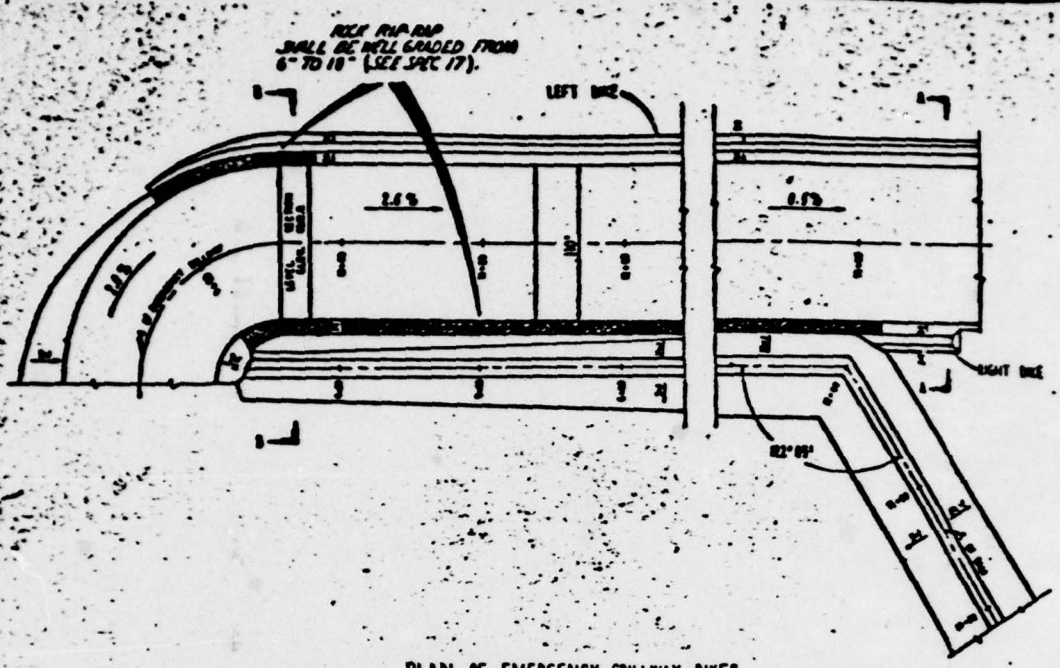
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P.O. THEURER ..... Apr. '61

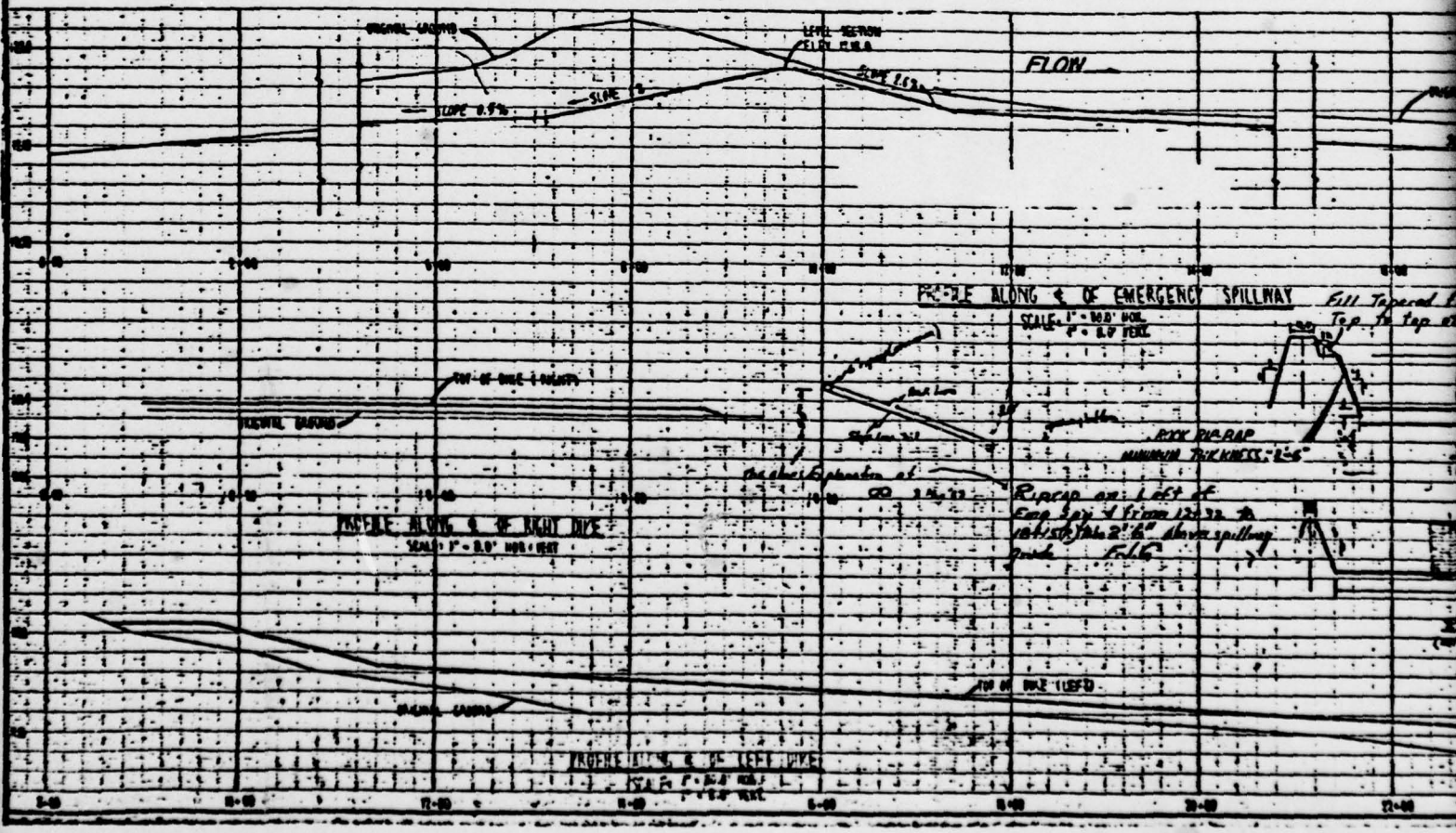
L.R. BEER ..... Apr. '61

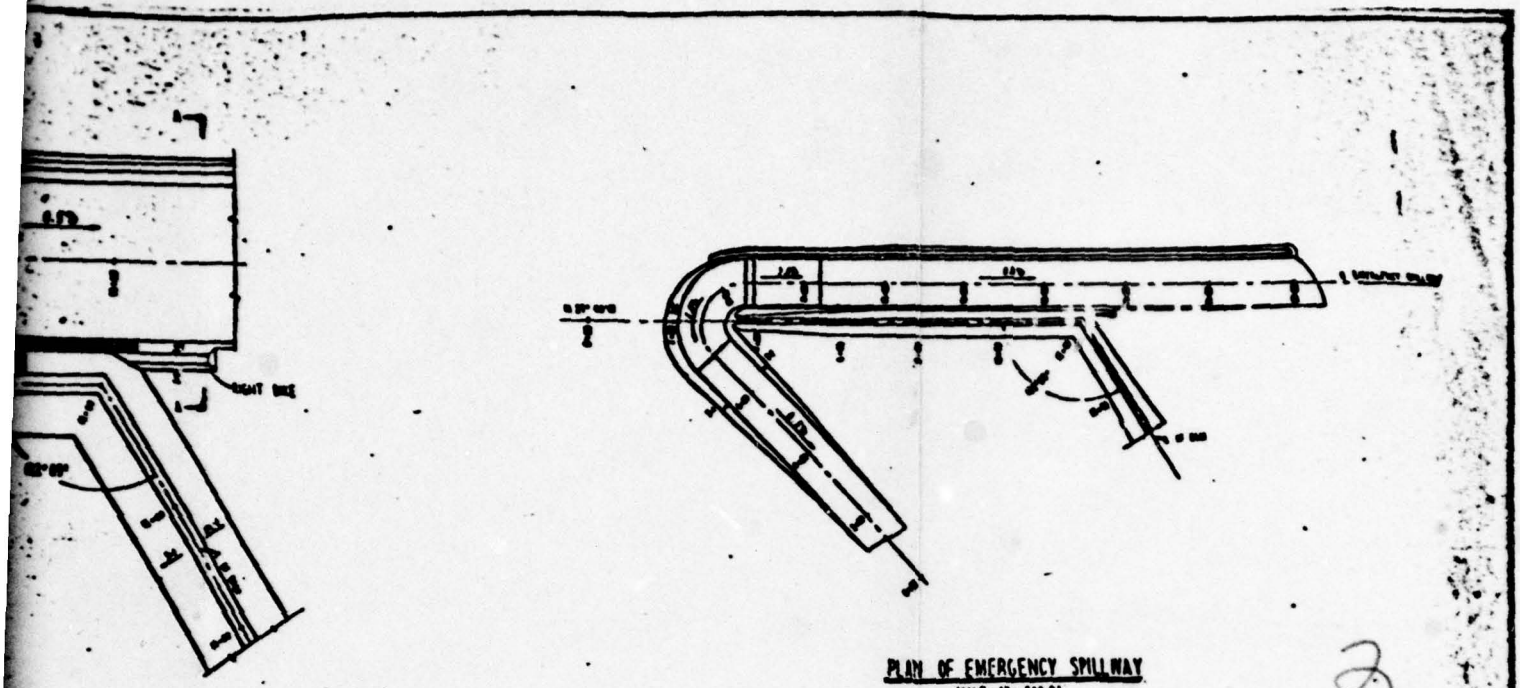
PA - 459 - P

2



PLAN OF EMERGENCY SPILLWAY DIKES
SCALE: 1" = 60.0'





PLAN OF EMERGENCY SPILLWAY

SCALE: 1" = 200.0'

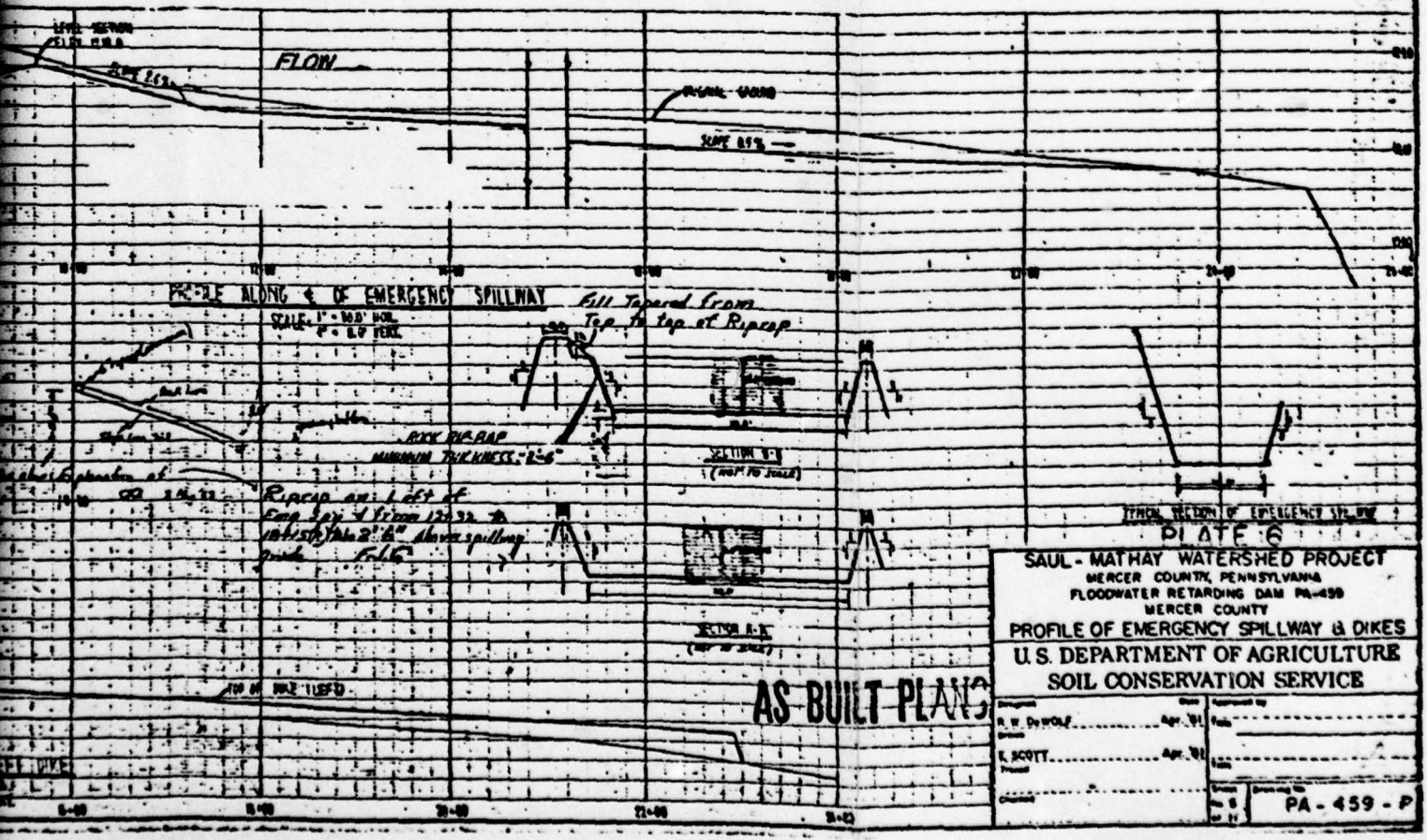


PLATE 6

SAUL - MATHAY WATERSHED PROJECT
MERCER COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-459
MERCER COUNTY

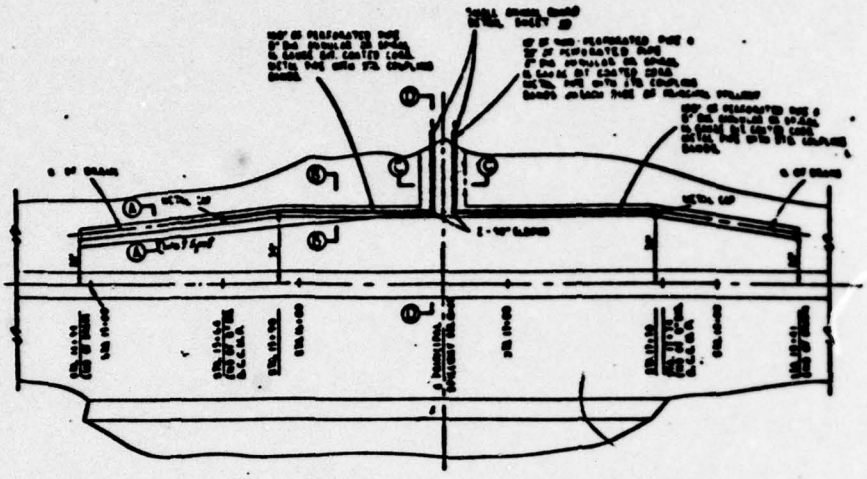
PROFILE OF EMERGENCY SPILLWAY & DIKES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

AS-BUILT PLANS

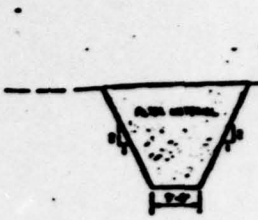
R. W. DeWOLF Apr. '61
E. SCOTT Apr. '61

PA - 459 - P

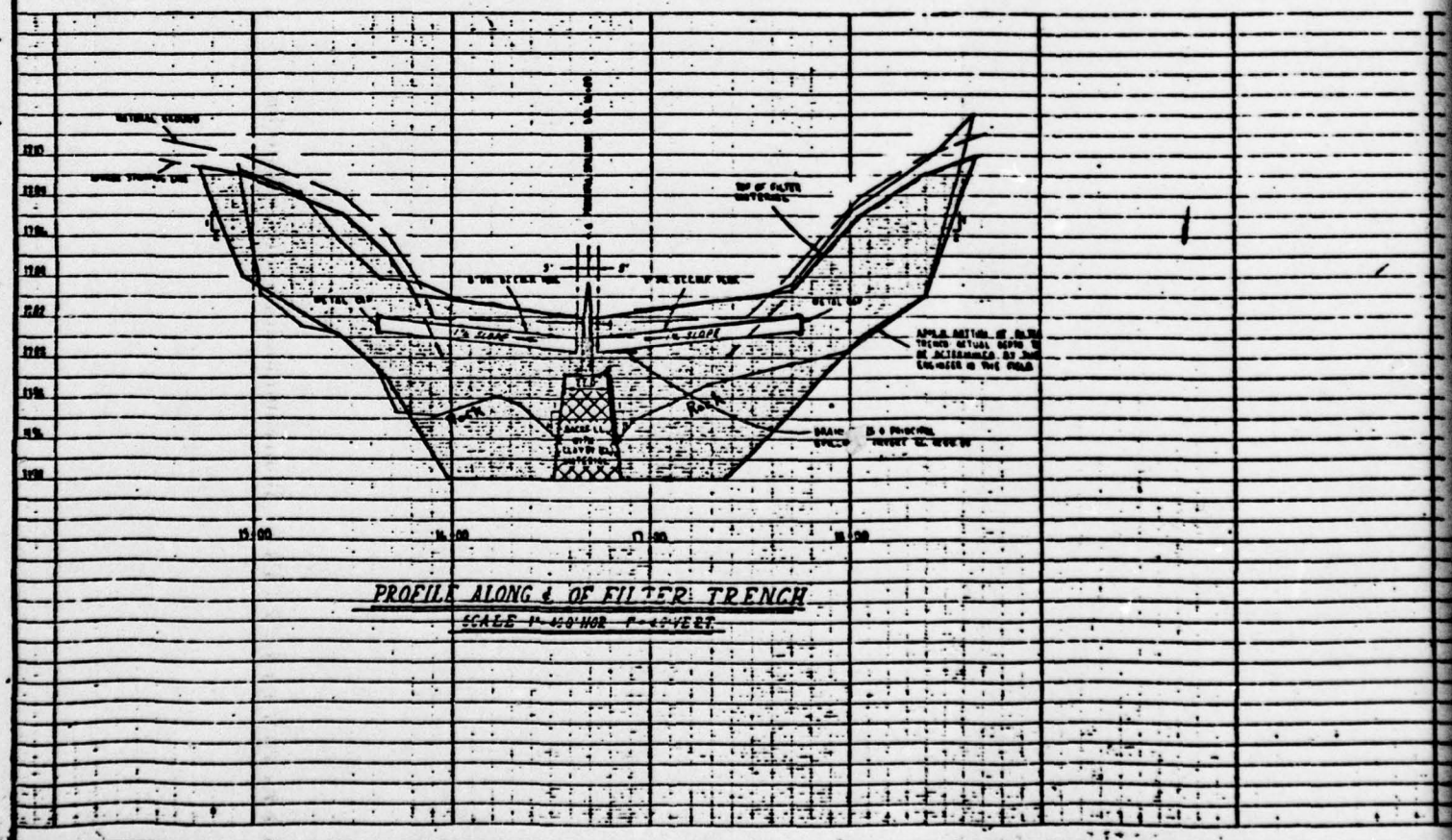


PLAN OF SEEPAGE DRAIN

SCALE 1" = 40'

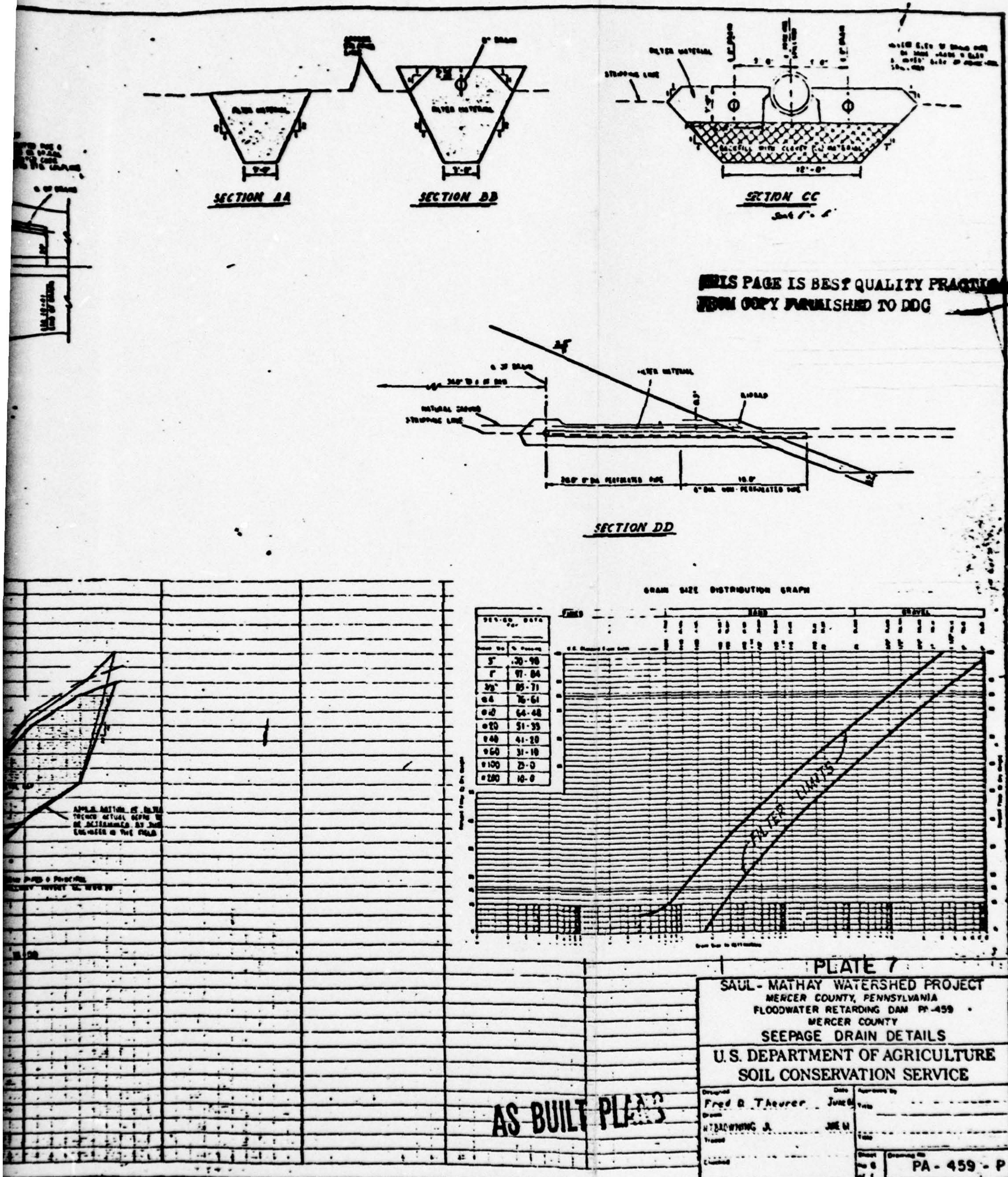


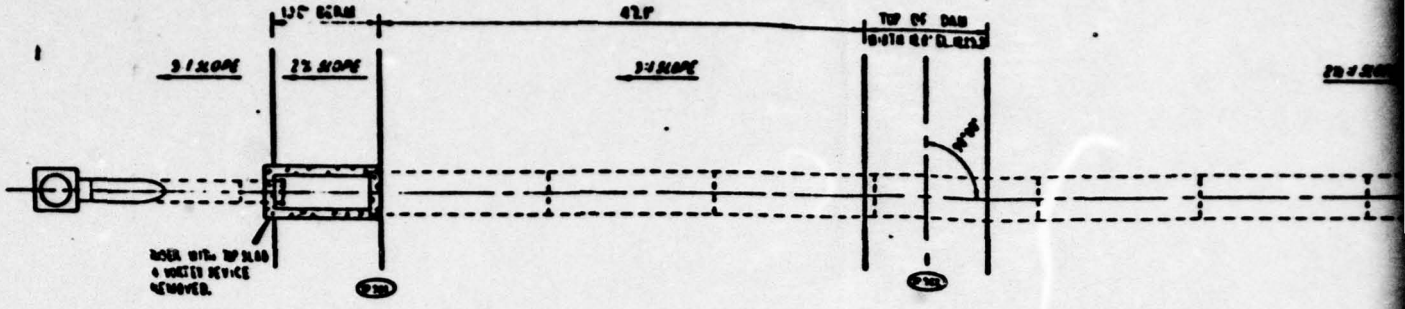
SECTION AA



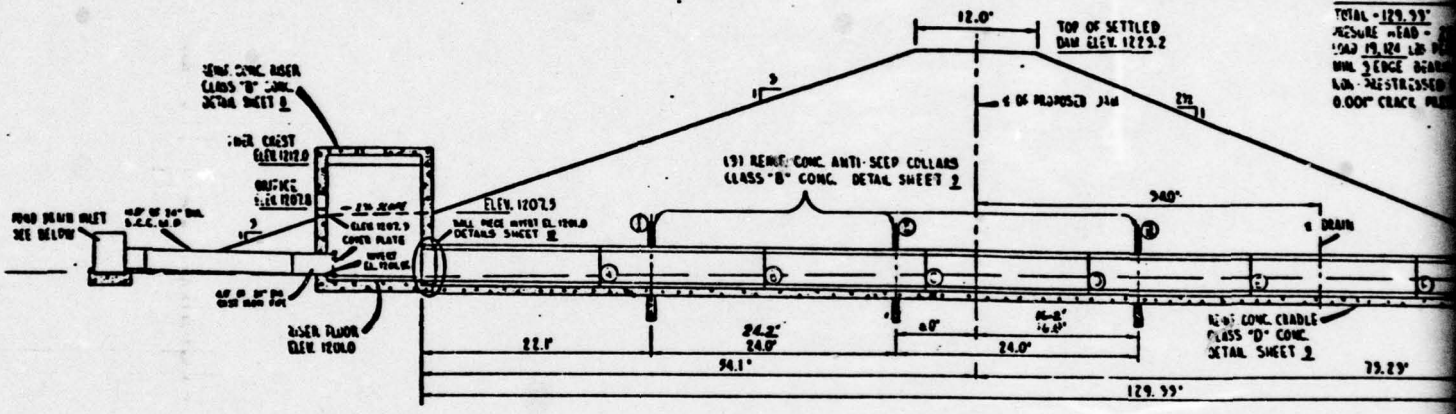
PROFILE ALONG ℄ OF FILTER TRENCH

SCALE 1" = 40' HOR 1" = 4' VERT

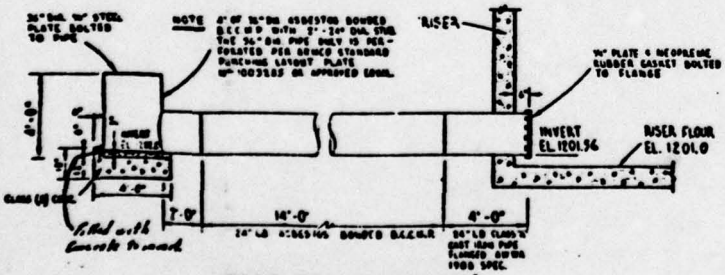




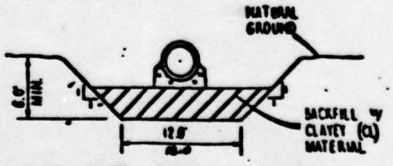
PLAN
SCALE 1"=40'



PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY
SCALE 1"=40'

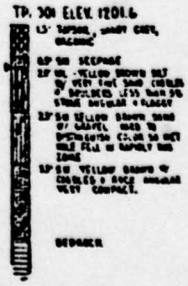


POND DRAIN DETAILS
SCALE 3/8"=1'-0"



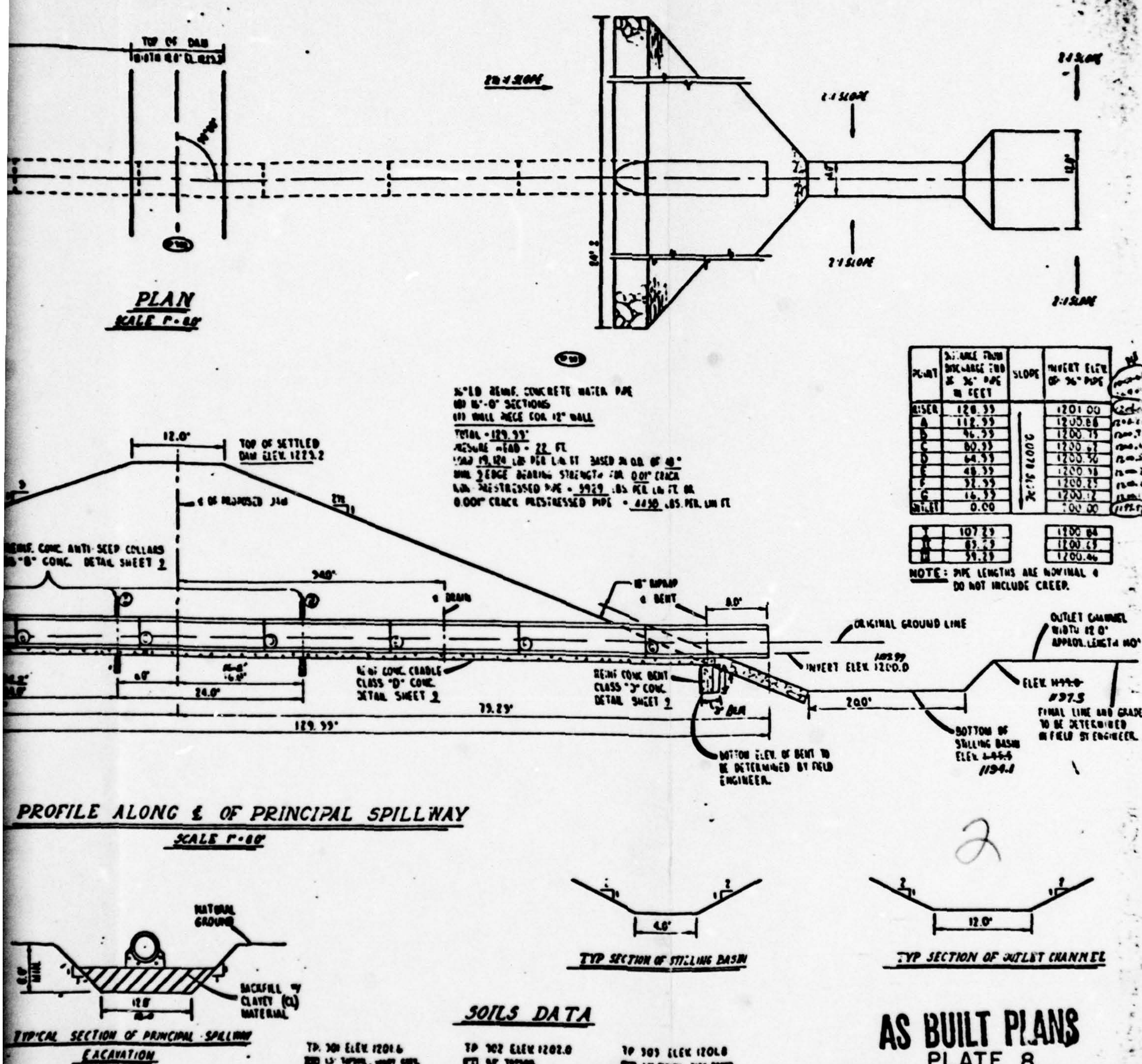
TYPICAL SECTION OF PRINCIPAL SPILLWAY EXCAVATION

SOILS D



TP. 101 ELEV. 1201.6

TP 102 ELEV



POINT	DISTANCE FROM DISCHARGE END OF 36" PIPE IN FEET	SLOPE	INVERT ELEV. OF 36" PIPE
RISER	128.33	.0010'/'	1201.00
A	112.33		1200.88
B	96.33		1200.75
C	80.33		1200.62
D	64.33		1200.50
E	48.33		1200.38
F	32.33		1200.25
G	16.33		1200.12
OUTLET	0.00		1200.00

I	107.29		1200.84
II	83.29		1200.65
III	59.29		1200.46

NOTE: PIPE LENGTHS ARE NOMINAL & DO NOT INCLUDE CREEP.

SOILS DATA

TP 301 ELEV. 1201.6

TP 302 ELEV. 1202.0

TP 303 ELEV. 1201.8

NOTE: DATE OF GEOLOGIC INVESTIGATION
UNIFIED SOIL CLASSIFICATIONS BY VISUAL INSPECTION.

AS BUILT PLANS

PLATE 8

SAUL - MATHAY WATERSHED PROJECT
MERCER COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-459
MERCER COUNTY

PLAN - PROFILE OF PRINCIPAL SPILLWAY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PA-459-P

2

APPENDIX A

CHECK LIST - VISUAL INSPECTION AND FIELD SKETCH

Check List
Visual Inspection
Phase 1

Name of Dam Mathay Dam County Mercer State PA Coordinates Lat. N 41° 23.0'
NDI # PA 00247
PennDER # 43-46
SCS # PA 459
Long. W 80° 20.7'

Date of Inspection 26 April 1979 Weather Rainy, Windy Temperature 45-50°F.

Pool Elevation at Time of Inspection 1208.3 ft.* M.S.L. Tailwater at Time of Inspection 1198.0 ft.* M.S.L.

*Elevations are referenced to the crest of the riser orifice (El. 1207.8 ft.).

Inspection Personnel:

Michael Baker, Jr., Inc.:

David Johns
Rodney E. Holderbaum
James G. Ulinski

Site Visit (5 June 1979):

Dr. C. Y. Chen
James G. Ulinski

Owner's Representatives
Mercer County Conservation District:

James Mondok (part-time)

James G. Ulinski Recorder

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: MATHAY DAM
NDI # PA 00247

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: MATHAY DAM

NDI # PA 00247

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT		
MONOLITH JOINTS		
CONSTRUCTION JOINTS		

Name of Dam: MATHAY DAM

NDI # PA 00247

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	The embankment is well vegetated with grasses. The few small clumps of bushes should be cut during routine maintenance.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion and rutting on crest of dam are due to vehicular and pedestrian traffic.	Should be repaired during routine maintenance of the dam.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No problems were observed.	
RIPRAP FAILURES	There is no riprap along the reservoir shore or in the outlet plunge pool. The shoreline of the reservoir is presently eroding and a minor amount of the shore is washing into the reservoir. The riprap in the emergency spillway channel was in good condition.	Plunge pool should be riprapped to prevent on-going erosion. The absence of riprap along the sediment pool shore of the embankment is not a problem at this time.

Name of Dam: MATHAY DAM
NDI # PA 00247

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANIMAL BURROWS/RODENT HOLES	Several rodent holes/animal burrows were observed in the embankment. The locations are shown on the field sketch.	The holes should be repaired and a rodent control program should be implemented.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems were observed.	
ANY NOTICEABLE SEEPAGE	Several wet areas were observed around the dam site. It is estimated these areas are locations of surface runoff accumulation (and lack of infiltration). The locations and approximate extents are shown on the field sketch.	No noticeable seepage could be found in these areas. They should be checked periodically in future inspections of the dam.
STAFF GAGE AND RECORDER	None	
DRAINS	Both drain outlets to the stilling pool were partially clogged with silt and vegetation. An underdrain along the left upstream portion of the emergency spillway channel was totally clogged with silt and vegetation.	These drains should be checked during routine maintenance.

Name of Dam: MATHAY DAM
NDI # PA 00247

OUTLET WORKS
(PRINCIPAL SPILLWAY IN SCS TERMINOLOGY)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Most of the outlet conduit was inaccessible. The condition of the conduit, at its outlet, appeared to be in good condition.	
INTAKE STRUCTURE	The intake structure (above the water level) was in good condition. Some minor debris was located on the trash rack around the riser orifice.	The debris should be removed periodically.
OUTLET STRUCTURE	There is no outlet structure. The 36-in. diameter reinforced concrete outlet pipe discharges directly into the plunge pool.	
OUTLET CHANNEL	The outlet channel is in good condition. No debris or other obstructions were observed.	
EMERGENCY GATE	None	

Name of Dam: MATHAY DAM
NDI # PA 00247

UNGATED SPILLWAY
(EMERGENCY SPILLWAY IN SCS TERMINOLOGY)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	There is no concrete weir. The spillway is a well vegetated earth channel.	
APPROACH CHANNEL	Well vegetated with thick grasses. Several areas have a minor amount of ponded water (from surface runoff) on the surface.	
DISCHARGE CHANNEL	The channel is well vegetated and in good overall condition. No obstructions were observed that could limit discharges from the reservoir.	
BRIDGE AND PIERS	None	

GATED SPILLWAY - Not Applicable

Name of Dam: MATHAY DAM
NDI # PA 00247

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		

INSTRUMENTATION - None

Name of Dam: MATHAY DAM
NDI # PA 00247

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS		
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER		

RESERVOIR

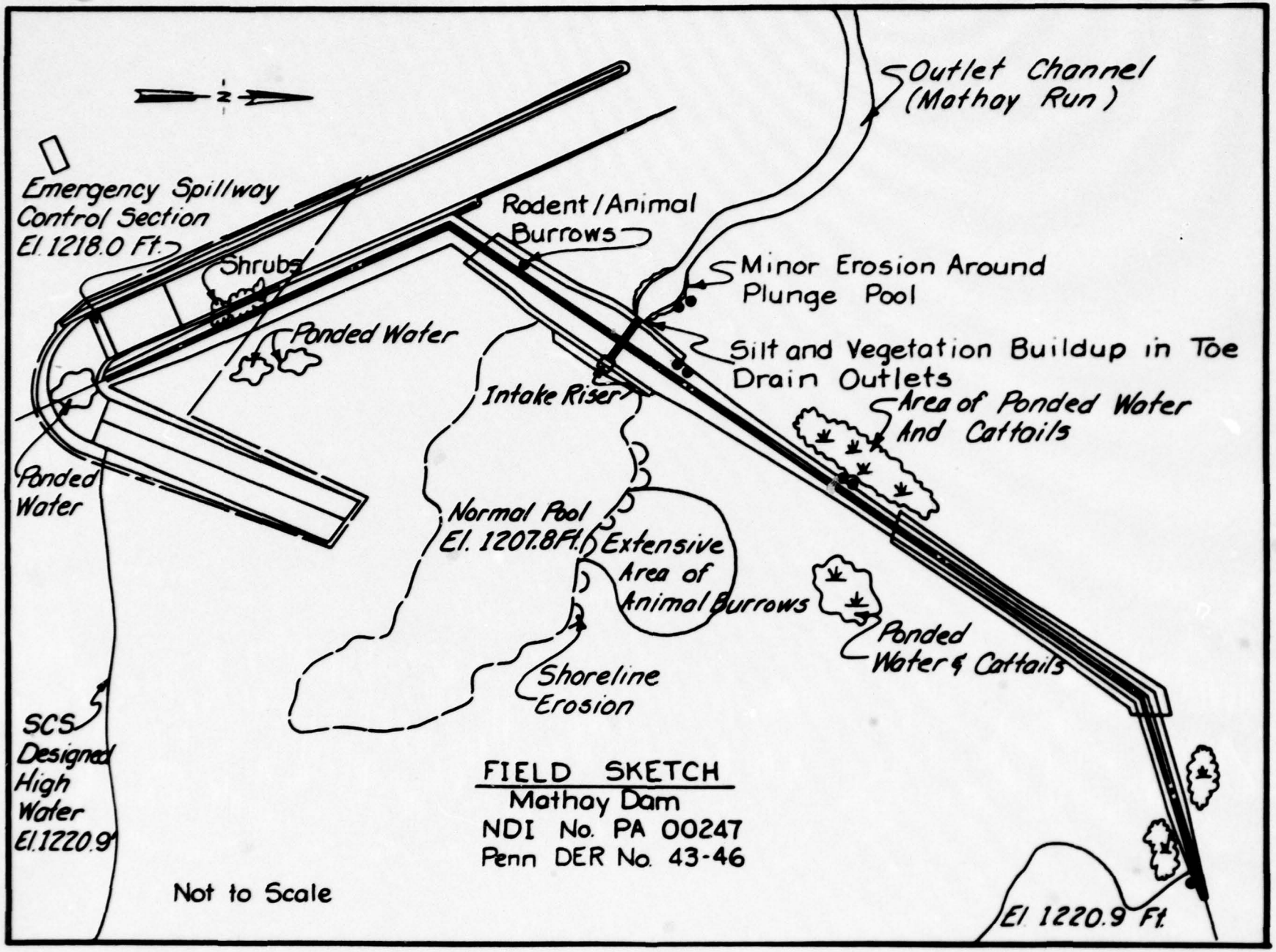
Name of Dam: MATHAY DAM
NDI # PA 00247

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The area surrounding the reservoir is moderately sloping agricultural land. There are a few wooded areas throughout the watershed.	The reservoir slopes are stable from soil mechanics and hydraulics (erosion) standpoints.
SEDIMENTATION	No significant amount of sedimentation has occurred due to the watershed characteristics.	The reservoir was designed by the SCS with allowance for 50 years of sediment accumulation.

DOWNSTREAM CHANNEL

Name of Dam: MATHAY DAM
NDI # PA 00247

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Mathay Run flows through primarily wooded and agricultural lands downstream of the dam.	
SLOPES	The slope of the downstream channel is moderate, averaging approximately 1%.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately six homes are located in low lying areas in the first 6000 ft. downstream of the dam. Several other residences are located along the stream's remaining 2 mile course to the Shenango River.	


Outlet Channel
(Mathay Run)
Emergency Spillway
Control Section
El. 1218.0 Ft.
Rodent / Animal
Burrows
Shrubs
Minor Erosion Around
Plunge Pool
Ponded Water
Silt and Vegetation Buildup in Toe
Drain Outlets
Intake Riser
Area of Ponded Water
And Cattails
Ponded
Water
Normal Pool
El. 1207.8 Ft.
Extensive
Area of
Animal Burrows
Ponded
Water & Cattails
Shoreline
Erosion
SCS
Designed
High
Water
El. 1220.9
FIELD SKETCH
Mathay Dam
NDI No. PA 00247
Penn DER No. 43-46
Not to Scale
El 1220.9 Ft.

APPENDIX B

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: MATHAY DAM
NDI # PA 00247

ITEM	REMARKS
PLAN OF DAM	Reference Drawings: "Saul-Mathay Watershed Project, Flood Retarding Dam PA-459, Mercer County, Pennsylvania," U.S. Department of Agriculture, Soil Conservation Service (SCS). April 1961 (12 sheets of the "as built" drawings available in files of SCS Harrisburg office and Mercer County Conservation District office. Prints of the design drawings are available in the PennDER files.) Plan of Dam - Reference Drawings sheets 2 and 3, included in this report as Plates 3 and 4.
REGIONAL VICINITY MAP	Reference Drawings - Sheet 1. Also a portion of a USGS 7.5 minute topographic quadrangle, Greenville East, Pennsylvania, is included in this report as Plate 1.
CONSTRUCTION HISTORY	Mathay Dam was designed by the SCS, circa 1960. The dam was constructed by Hilliard Mining Co. of Butler, Pennsylvania from Spring 1961 to final acceptance on 13 August 1962. The SCS provided resident inspection during construction.
TYPICAL SECTIONS OF DAM	Reference Drawings - Sheets 4-7 (included as Plates 5-8 of this report).
HYDROLOGIC/ HYDRAULIC DATA	Some hydrologic/hydraulic data are included in the "Saul-Mathay Watershed Work Plan" report prepared by the Mercer County Commissioners, et. al., March 1960. Other information is included in the Dam Permit Application Report prepared by the Pennsylvania Department of Forests and Waters (PDFW) on 7 July 1961. This report is in PennDER's files. Prints of SCS drawings "Freeboard Flood Routing" and "Design Flood Routing," June 1961, are also in the PennDER files. Additional hydrologic/hydraulic data are available in files of the SCS Harrisburg office.
OUTLETS - PLAN	Reference Drawings - Sheets 2, 3, and 7. (Included in this report as Plates 3, 4, and 8).
- DETAILS	Reference Drawings - Sheets 2, 3, 7, 8, 9, and 10.
- CONSTRAINTS	No constraints are indicated.
- DISCHARGE RATINGS	are included as part of the design flood routing drawings ("Freeboard Flood Routing" and "Design Flood Routing") by the SCS.
RAINFALL/RESERVOIR RECORDS	None are readily available.

Name of Dam: MATHAY DAM
NDI # PA 00247

ITEM	REMARKS
DESIGN REPORTS	No complete design report is readily available, but design report components are available in the files of the SCS Harrisburg office. Additional design information is included in the "Saul-Mathay Watershed Work Plan" and in the PennDER Dam Permit Application Report.
GEOLOGY REPORTS	No geology report is readily available. Some geology information is included in the following: a) "Saul-Mathay Watershed Work Plan," b) PennDER's Permit Report, c) files of the SCS Harrisburg office, and d) selected references of the Pennsylvania Geological Survey.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Design computations are available in the SCS Harrisburg office files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Boring and test pit locations are shown on Sheets 2, 3, 4, and 7 of the Reference Drawings (included as Plates 3, 4, 5, and 8, respectively, in this report). Additional information exists in the files of the SCS Harrisburg office.
POST-CONSTRUCTION SURVEYS OF DAM	Annual inspections are performed by representatives of the Mercer County Commissioners (Conservation District) and the SCS. Copies of the inspections are available in the Mercer County Conservation District office in Mercer and most are available in PennDER's files. A post-construction survey was performed to prepare the "as built" drawings.
BORROW SOURCES	The borrow was obtained primarily from the reservoir area; however, some borrow was from the emergency spillway excavation (see Plate 3 - Plan of Dam). Most of the test pits opened in the borrow areas were classified as predominately ML material. Additional information on borrow sources is available in the files of the SCS Harrisburg office.

ITEM	REMARKS
MONITORING SYSTEMS	There are no monitoring systems.
MODIFICATIONS	No modifications have been performed.
HIGH POOL RECORDS	No information is readily available. According to a representative of the Mercer County Conservation District, the reservoir level has never reached the second stage of the riser.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	A study was performed approximately 4 yrs. ago to determine the amount of sediment accumulation in the reservoir. The SCS found the amount of sediment negligible.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	There have been no accidents or failures.
MAINTENANCE OPERATION RECORDS	No maintenance or operations records are readily available.

ITEM	REMARKS
EMERGENCY SPILLWAY PLAN	Reference Drawings - Sheets 2, 3, and 5 (included as Plates 3, 4, and 6, respectively, of this report).
SECTIONS	Reference Drawings - Sheet 5 (included as Plate 6 of this report).
DETAILS	Reference Drawings - Sheets 2, 3, and 5 (included as Plates 3, 4, and 6, respectively, of this report).
OPERATING EQUIPMENT PLANS & DETAILS	There is no operating equipment.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.4 sq.mi. (primarily agricultural lands)

ELEVATION TOP SEDIMENT POOL (STORAGE CAPACITY): 1207.8 ft. (18.5 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1218.0 ft. (325 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 1220.9 ft. (Design High Water)

ELEVATION TOP DAM: 1223.2 ft.

CREST: Emergency Spillway (SCS Terminology)

a. **Elevation** 1218.0 ft. (level section)
b. **Type** Vegetated side channel
c. **Width** 100 ft.
d. **Length** Approximately 2500 ft.
e. **Location Spillover** At left abutment
f. **Number and Type of Gates** None

OUTLET WORKS: Principal Spillway (SCS Terminology)

a. **Type** Concrete riser and 36 in. R.C.P.
b. **Location** Approximately 1900 ft. from right abutment
c. **Entrance inverts** El. 1207.8 ft. (orifice), El. 1212.0 ft. (high stage inlet)
d. **Exit inverts** El. 1200.0 ft.
e. **Emergency draindown facilities** None

HYDROMETEOROLOGICAL GAGES: None

a. **Type**
b. **Location**
c. **Records**

MAXIMUM NON-DAMAGING DISCHARGE Unknown

APPENDIX C

PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View of Dam - View from Left End of Dam Looking Toward Main Embankment, Intake Riser and Pond

Photo 1 - View Looking Along Crest of Left Wing of Embankment from Left End of Embankment

Photo 2 - View Looking Along Crest of Wing of Embankment from Junction with Main Embankment

Photo 3 - View Looking Toward Pond in Upstream Portion of Emergency Spillway Channel

Photo 4 - View of Downstream Portion of Emergency Spillway Channel

Photo 5 - Upstream View of Main Embankment, Intake Riser and Pond

Photo 6 - Close-up View of Intake Riser

Photo 7 - View of Outlet Conduit and Seepage Drain Outlets

Photo 8 - Close-up View of Seepage Drain Outlet (Note Buildup of Silt and Vegetation in Outlet)

Note: Photographs were taken on 26 April 1979.

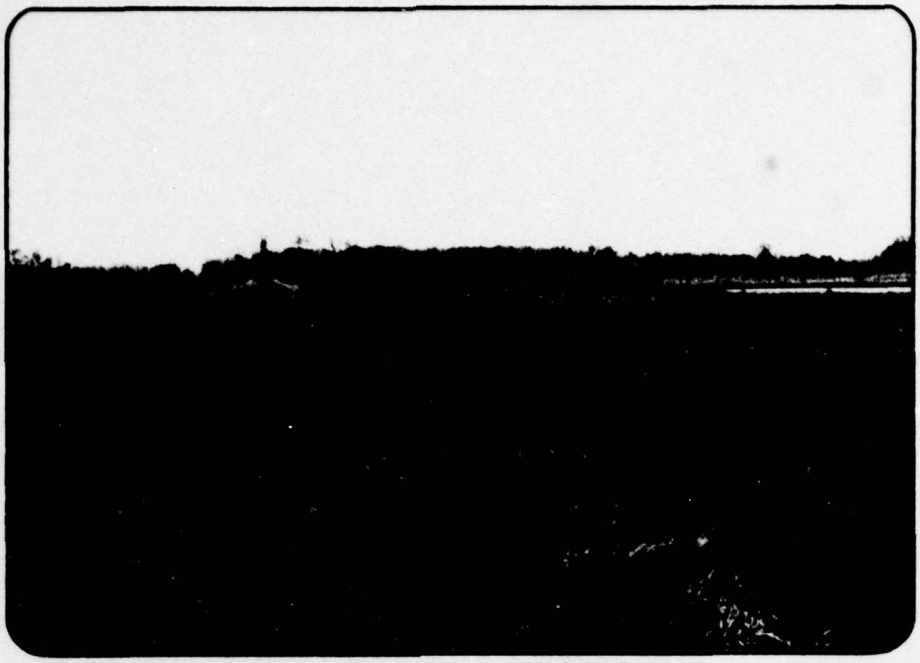


PHOTO 1. View Looking Along Crest of Left Wing of Embankment from Left End of Embankment

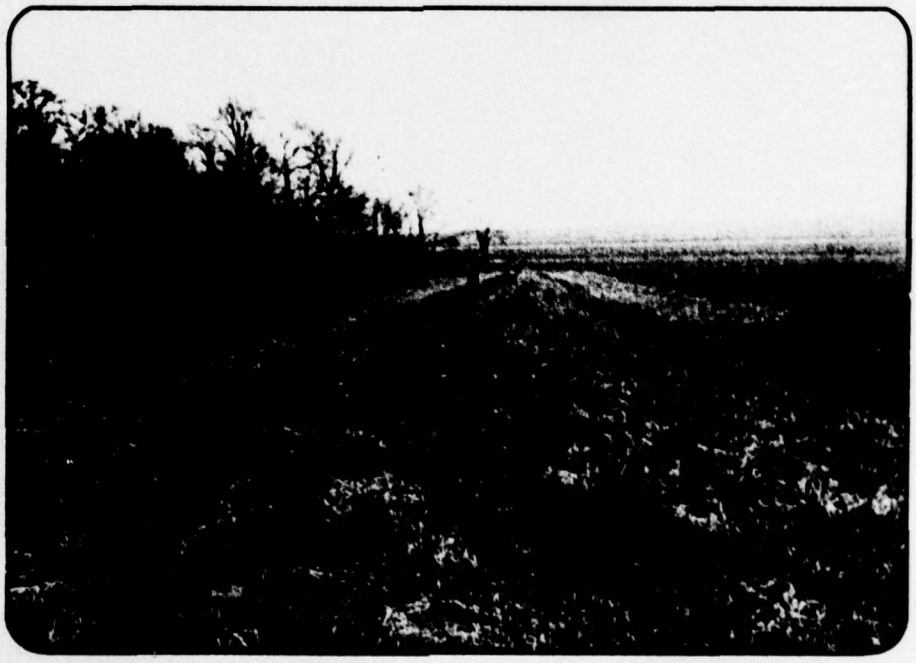


PHOTO 2. View Looking Along Crest of Right Wing of Embankment from Junction with Main Embankment

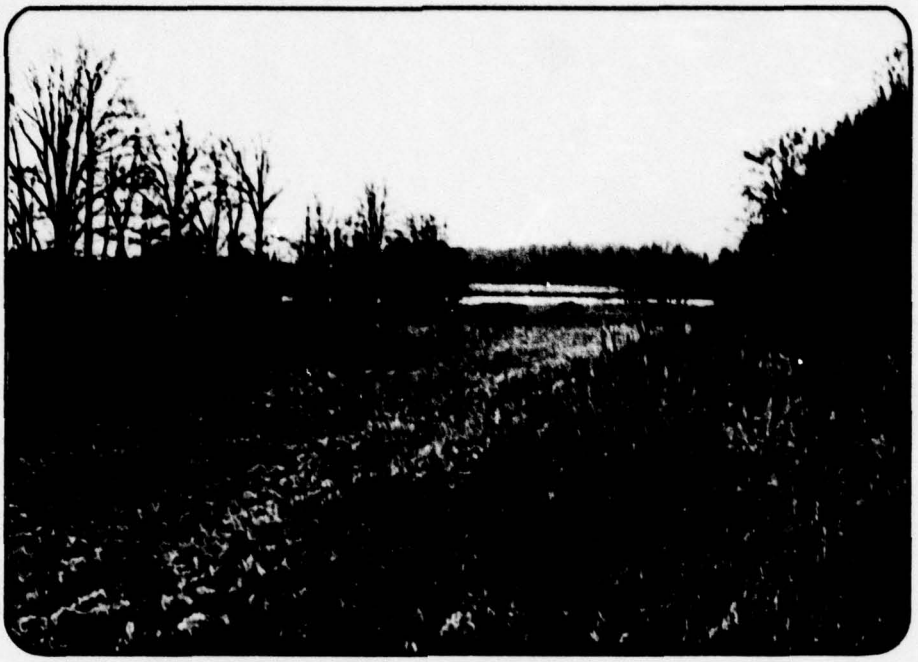


PHOTO 3. View Looking Toward Pond in Upstream Portion of Emergency Spillway Channel

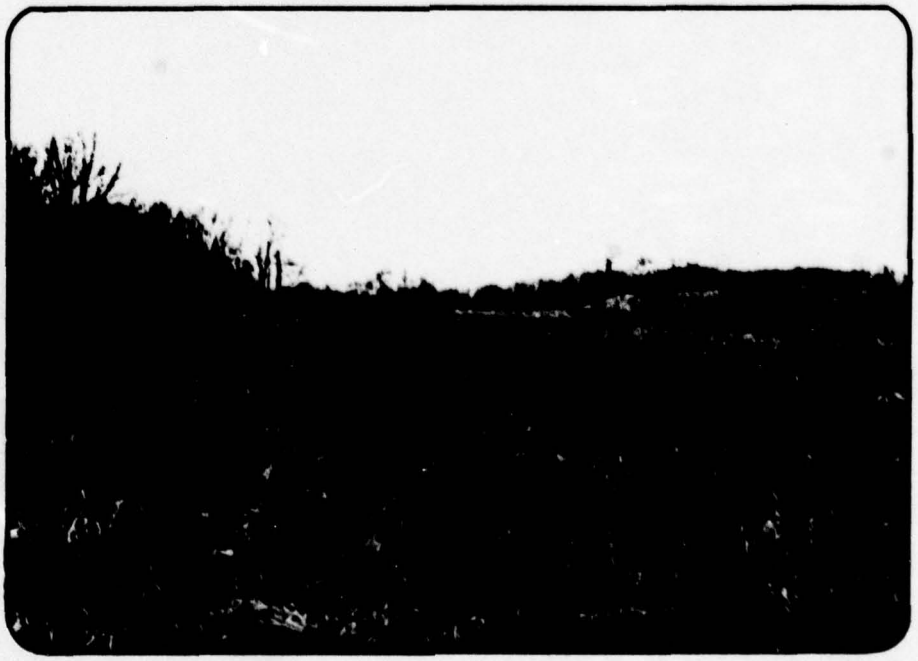


PHOTO 4. View of Downstream Portion of Emergency Spillway Channel

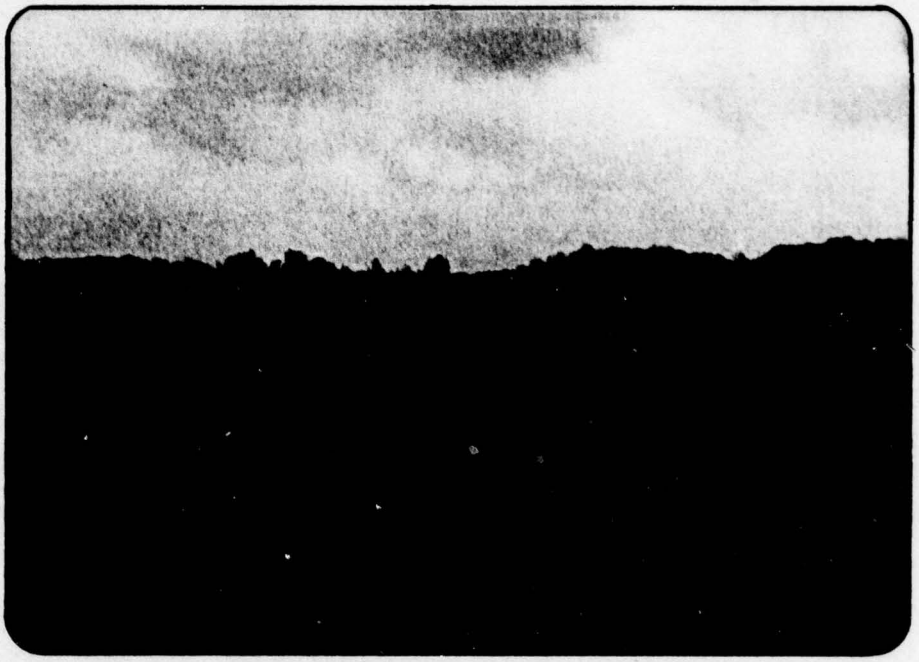


PHOTO 5. Upstream View of Main Embankment, Intake Riser and Pond

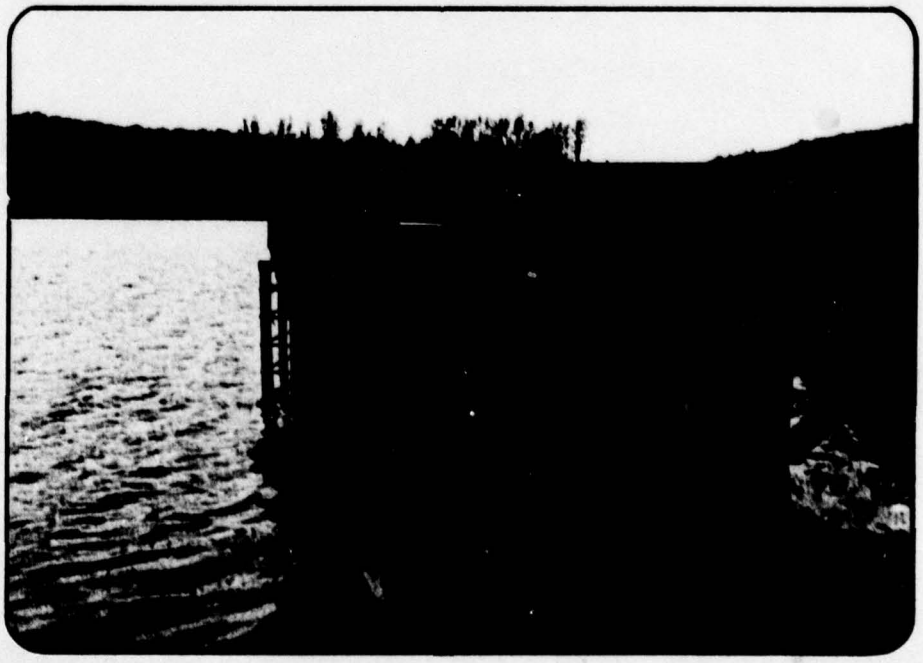


PHOTO 6. Close-up View of Intake Riser

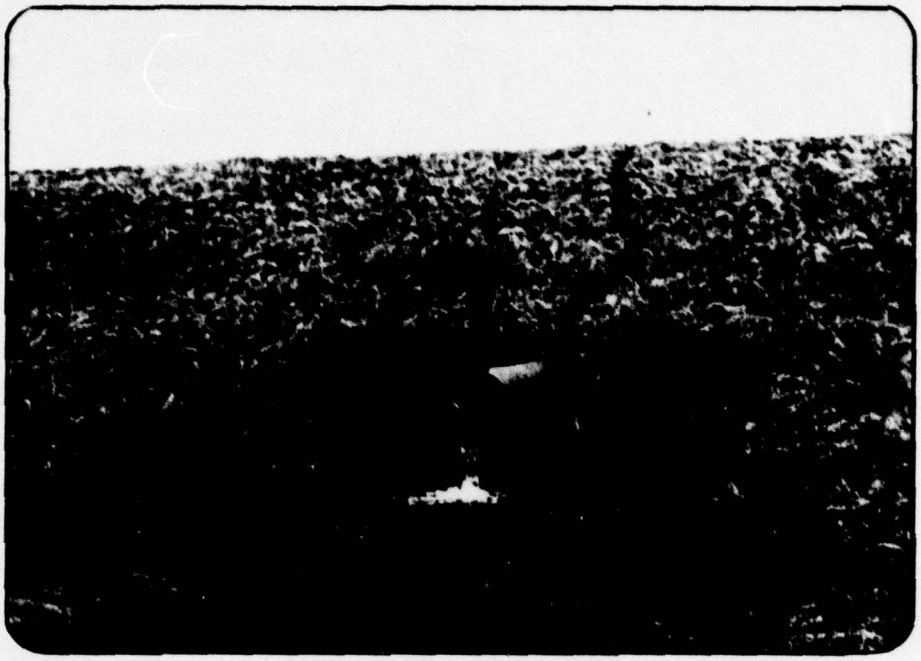


PHOTO 7. View of Outlet Conduit and Seepage Drain Outlets

PHOTO 8. Close-up of Seepage Drain Outlet
(Note Buildup of Silt and Vegetation in Outlet)

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Mathay Dam (PA-459) S.O. No.

Sheet No. of

Drawing No.

Computed by Checked by Date

Table of Contents

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The hydrologic determinations presented in this Phase I Inspection Report are based on the use of a Snyder's unit hydrograph developed by the U.S. Army Corps of Engineers. Due to the limited number of gaging stations available in this hydrologic region and the wide variation of watershed slopes, the Snyder's coefficients may yield results of limited accuracy for this watershed. As directed however, a further refinement of these coefficients is beyond the scope of this Phase I Investigation.

In addition, the conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MATHAY DAM — S.O. No.
RAINFALL & HYDROGRAPH DATA — Sheet No. 1 of 10
Drawing No.
Computed by J.O.S. — Checked by REH — Date 3-8-79

RAINFALL DATA

FROM HMR 33
PMP 24 HR - 200 MI. = 23.5 IN.

ZONE 2
DA = 1.37 sq. mi.

P(6 HR.) = 1.11 PMP
P(12 HR.) = 1.21 PMP
P(24 HR.) = 1.41 PMP
P(48 HR.) = 1.51 PMP

HYDROGRAPH COEFFICIENTS

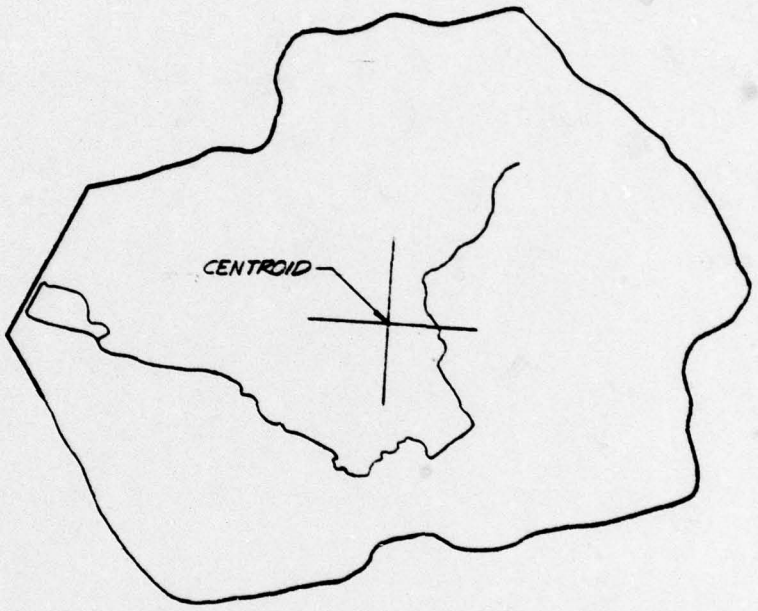
L = 2.22 mi.
Lca = 0.91 mi.
tR = 20 min.

DA LOCATED IN ZONE 2T
USE: PLATE C, Cp = 0.40
$t_p = 2.7 (L L_{ca})^{0.3}$
(BEAVER RIVER BASIN)

$T_p = 2.7 (L L_{ca})^{0.3}$
$= 2.7 (2.22 \times 0.91)^{0.3}$
$= 3.33$ HRS.

$T_r = T_p / 5.5$
$= 3.33 / 5.5$
$= 0.61$ HR.

$T_{pR} = T_p + 0.25 (T_R - T_r)$
$= 3.33 + 0.25 \left(\frac{20}{60} - 0.61\right)$
$= 3.26$ HRS.



2000 0 2000 4000

SCALE IN FEET

U.S.G.S. QUADS:
GREENVILLE WEST
GREENVILLE EAST

D.A. = 1.37 MI.^{2}
L = 2.22 MI.
Lca = 0.91 MI.

DATE: 3-8-79

MATHAY DAM WATERSHED

MICHAEL BAKER JR. INC.
Consulting Engineers & Surveyors

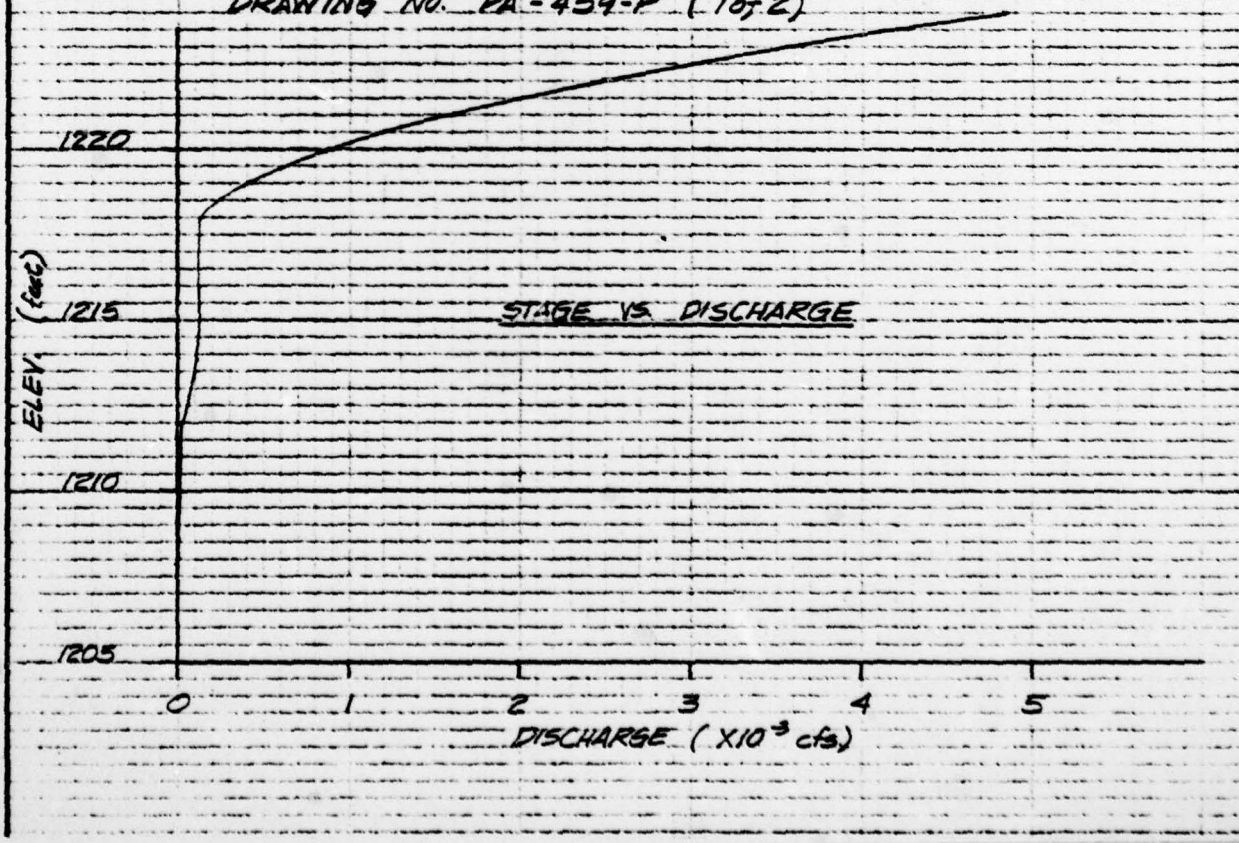
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MATHAY DAM S.O. No.
STAGE VS. DISCHARGE Sheet No. 3 of 10
Drawing No.
Computed by GAS Checked by REH Date 3-8-79

STAGE	DISCHARGE
1207.8	0
1208.0	5
1210.0	17
1212.0	22
1213.8	110
1216.0	120
1218.0	127
1219.0	420
1220.0	870
1221.0	1600
1222.0	2480
1223.0	3640
1224.0	4820

NOTE: THE ABOVE DATA WAS TAKEN FROM SCS DESIGN PLANS, DRAWING NO. PA-459-P (1 of 2)



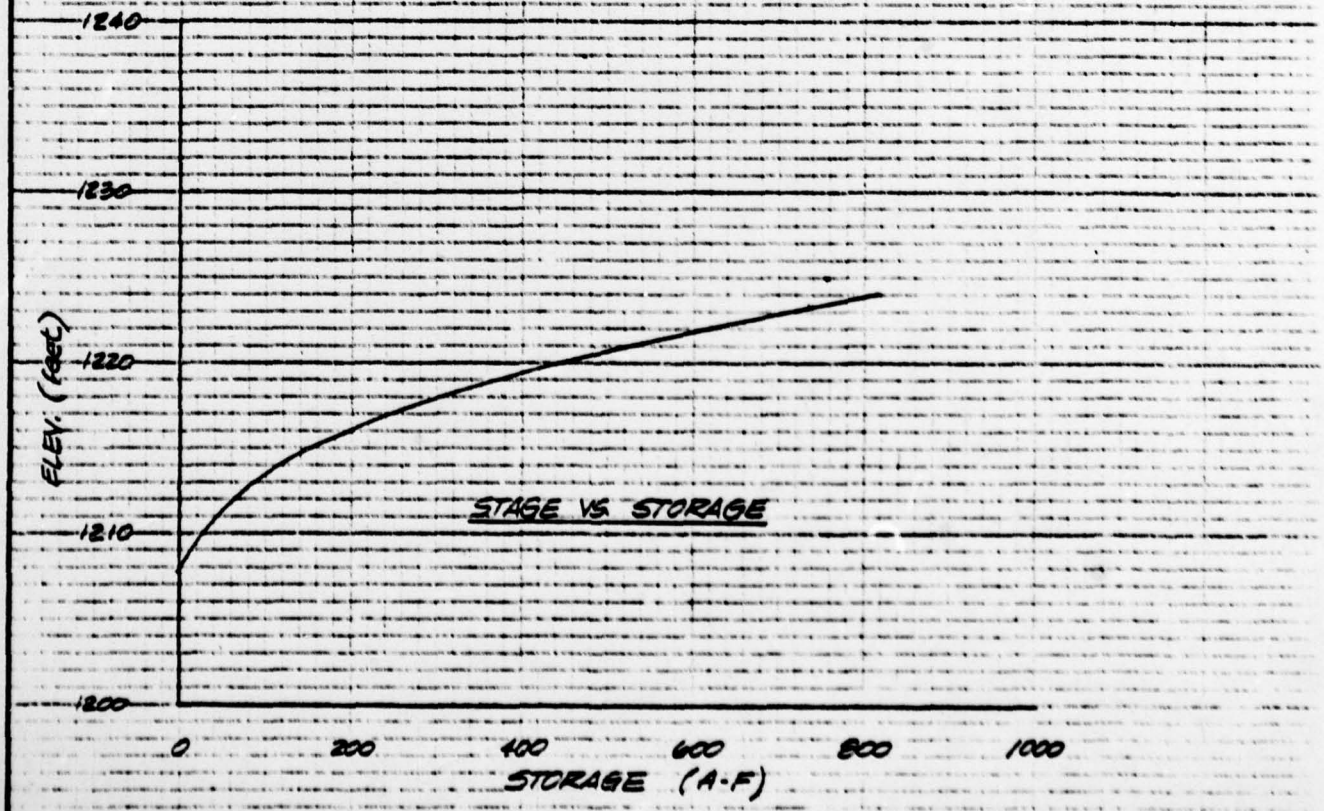
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

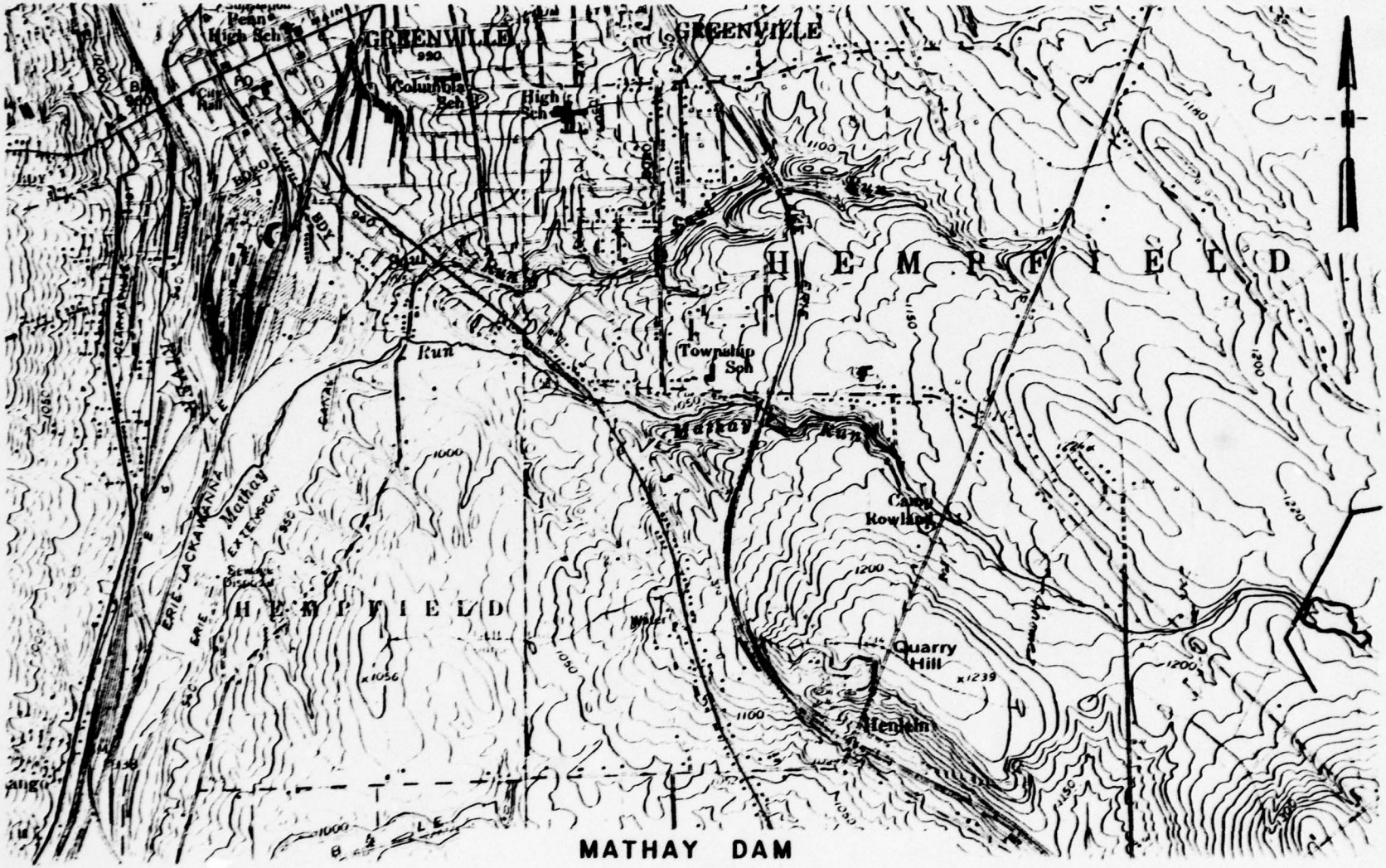
Box 280
Beaver, Pa. 15009

Subject MATHAY DAM S.O. No.
STAGE VS STORAGE Sheet No. 4 of 10
Drawing No.
Computed by G.A.S. Checked by REH Date 3-8-79

STAGE	STORAGE
1207.8	0
1210	28
1212	64
1214	117
1216	196
1218	306
1220	446
1222	618
1223.2	736
1224	814

NOTE: THE ABOVE DATA WAS TAKEN SCS DESIGN PLANS, DRAWING NO. PA.-459-P (2 OF 2)





MATHAY DAM

SCALE 1:24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Sheet 3 of 3

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
  MBJ UPDATE         04 JUN 79
**********
    1                A1       NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
    2                A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF MATHAY DAM MBJ  10
    3                A3       PROBABLE MAXIMUM FLOOD PMF/UNIT GRAPH BY SNYDERS METHOD
    4                B    300       0       20        0        0        0        0        0       -4        0
    5                B1     5
    6                J      1       2        1
    7                J1   1.0     0.5
    8                K      0       1                                          1
    9                K1             SNYDER'S HYDROGRAPH
   10                M      1       1     1.37
   11                P             23.5     117      127      141      151
   12                T                                                    1.0     0.05
   13                W    3.26    0.40
   14                X    -1.5   -0.05      2.0
   15                K      1       DAM                                         1
   16                K1             THIS IS A ROUTING FOR MATHAY DAM
   17                Y                                        1        1
   18                Y1     1                                                -1207.8      -1
   19                Y41207.8     1208     1210     1212  1213.8     1216     1218     1219     1220     1221
   20                Y4  1222     1223     1224
   21                Y5     0        5       17       22      110      120      127      420      870     1600
   22                Y5  2480     3640     4820
   23                $S     0       28       64      117      196      306      446      618      736      814
   24                $E1207.8     1210     1212     1214     1216     1218     1220     1222   1223.2     1224
   25                $$1207.8
   26                $D1223.2     2.65      1.5     3260
   27                K     99
```

Sheet 6 of 10

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
MBJ UPDATE 04 JUN 79
****

RUN DATE 06/13/79
TIME 13.31

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSIS OF MATHAY DAM MBJ 10
PROBABLE MAXIMUM FLOOD PMF/UNIT GRAPH BY SNYDERS METHOD

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	20	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0	0		

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1
RTIOS= 1.00 0.50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

SNYDER'S HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.37	0.0	1.37	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	23.50	117.00	127.00	141.00	151.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.05	0.0	0.0

UNIT HYDROGRAPH DATA
TP= 3.26 CP=0.40 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 3.29 HOURS, CP= 0.40 VOL= 0.99

3.	12.	24.	39.	55.	72.	87.	99.	107.	110.
108.	102.	97.	92.	87.	82.	78.	74.	70.	66.
63.	59.	56.	53.	50.	48.	45.	43.	41.	38.
36.	34.	33.	31.	29.	28.	26.	25.	24.	22.

Sheet 7 of 10

21.	20.	19.	18.	17.	16.	15.	14.	14.	13.
12.	12.	11.	10.	10.	9.	9.	8.	8.	8.
7.	7.	6.	6.	6.	5.	5.	5.	5.	4.
4.	4.	4.	4.	3.	3.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	2.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

0

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
						END-OF-PERIOD FLOW							
									SUM	28.39	25.95	2.44	68617.
										(721.)(	659.)(	62.)(	1943.02)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

THIS IS A ROUTING FOR MATHAY DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK		X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0		0.0	-1208.	-1

STAGE	1207.80	1208.00	1210.00	1212.00	1213.80	1216.00	1218.00	1219.00	1220.00	1221.00
	1222.00	1223.00	1224.00							
FLOW	0.0	5.00	17.00	22.00	110.00	120.00	127.00	420.00	870.00	1600.00
	2480.00	3640.00	4820.00							
CAPACITY=	0.	28.	64.	117.	196.	306.	446.	618.	736.	814.
ELEVATION=	1208.	1210.	1212.	1214.	1216.	1218.	1220.	1222.	1223.	1224.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1207.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1223.2	2.6	1.5	3260.

PEAK OUTFLOW IS 1714. AT TIME 45.00 HOURS

PEAK OUTFLOW IS 633. AT TIME 47.33 HOURS

********** ********** ********** ********** **********

Sheet 8 of 10

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	 RATIO 2 0.50
HYDROGRAPH AT	1	1.37	1	2038.	1019.
		(3.55)		(57.71)(	28.85)(
ROUTED TO	DAM	1.37	1	1714.	633.
		(3.55)		(48.54)(	17.92)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1207.80	1207.80	1223.20
STORAGE	0.	0.	736.
OUTFLOW	0.	0.	3876.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1221.13	0.0	543.	1714.	0.0	45.00	0.0
0.50	1219.47	0.0	409.	633.	0.0	47.33	0.0

APPENDIX E

REGIONAL GEOLOGY

MATHAY DAM
NDI No. PA 00247, PennDER No. 43-46, SCS No. PA 459

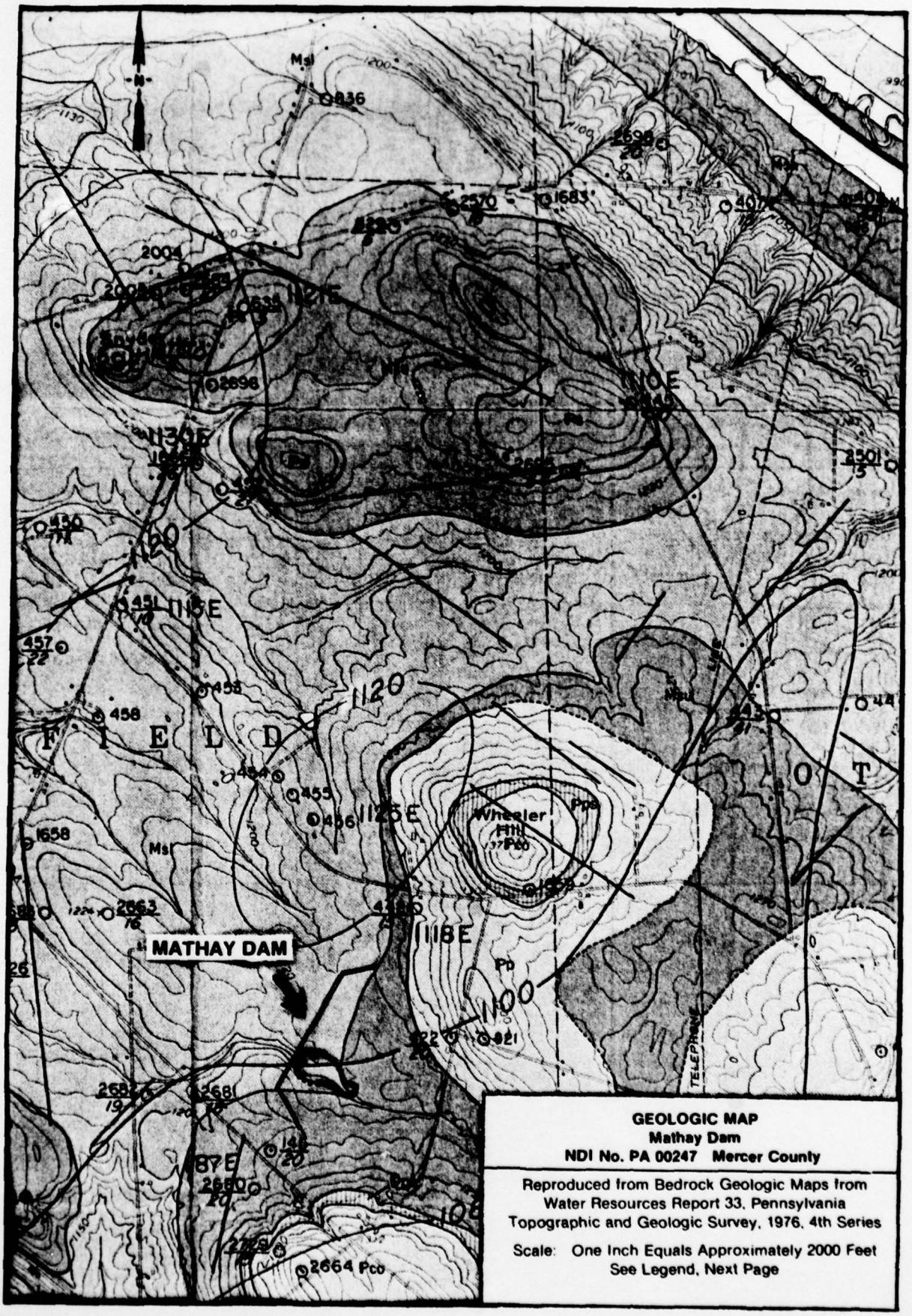
REGIONAL GEOLOGY

Bedrock units beneath this section of the Appalachian Plateaus physiographic province are the upper and lower members of the Shenango formation, Mississippian system. The lower member, on which Mathay Dam is constructed, consists of medium to fine-grained sandstone, shale and siltstone. The upper member, which underlays a portion of the reservoir area, is described in geologic literature as interbedded soft shale and siltstone with lenses of sandstone. Bedrock was not encountered in any of the test pits made for design of the dam.

Because the area has been glaciated, the dam and reservoir site are overlain by glacial drift approximately 15 to 20 feet thick. Most of the soil exposed in the test pits were silts and clays with lenses of fine sand.

One of the test pits along the centerline of the dam encountered groundwater seepage at a depth of 8 feet and one test pit near the stream channel had groundwater at a depth of 3.3 feet.

A geologic map of the area is given on the following page.



GEOLOGIC MAP
Mathay Dam
NDI No. PA 00247 Mercer County

Reproduced from Bedrock Geologic Maps from Water Resources Report 33, Pennsylvania Topographic and Geologic Survey, 1976, 4th Series

Scale: One Inch Equals Approximately 2000 Feet
See Legend, Next Page

LEGEND

MISSISSIPPIAN

Cuyahoga Group

SHENANGO FORMATION

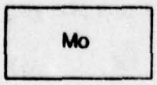
The upper member (Msu) is composed of soft medium- to dark-gray shale with interbeds of siltstone and lenses of fine-grained sandstone. Unimportant as an aquifer. The lower member (Msl) is composed of medium- to fine-grained light-gray sandstone and medium- to dark-gray shale and siltstone. Yields moderate to large quantities of water that is locally high in iron content at shallow depths.

MEADVILLE SHALE

Medium- to dark-gray shale, siltstone, and lenses of fine-grained sandstone and occasional thin beds of limestone. Generally yields sufficient water for domestic and stock use.

SHARPSVILLE SANDSTONE

Very fine grained, light-gray sandstone and medium- to dark-gray shale and siltstone. Yields small to large quantities of water. Largest yields are obtained in the Shenango 15' quadrangle; locally contains saline water.



ORANGEVILLE SHALE

Dark-gray shale, occasionally containing some thin siltstone beds. Unimportant as an aquifer.