

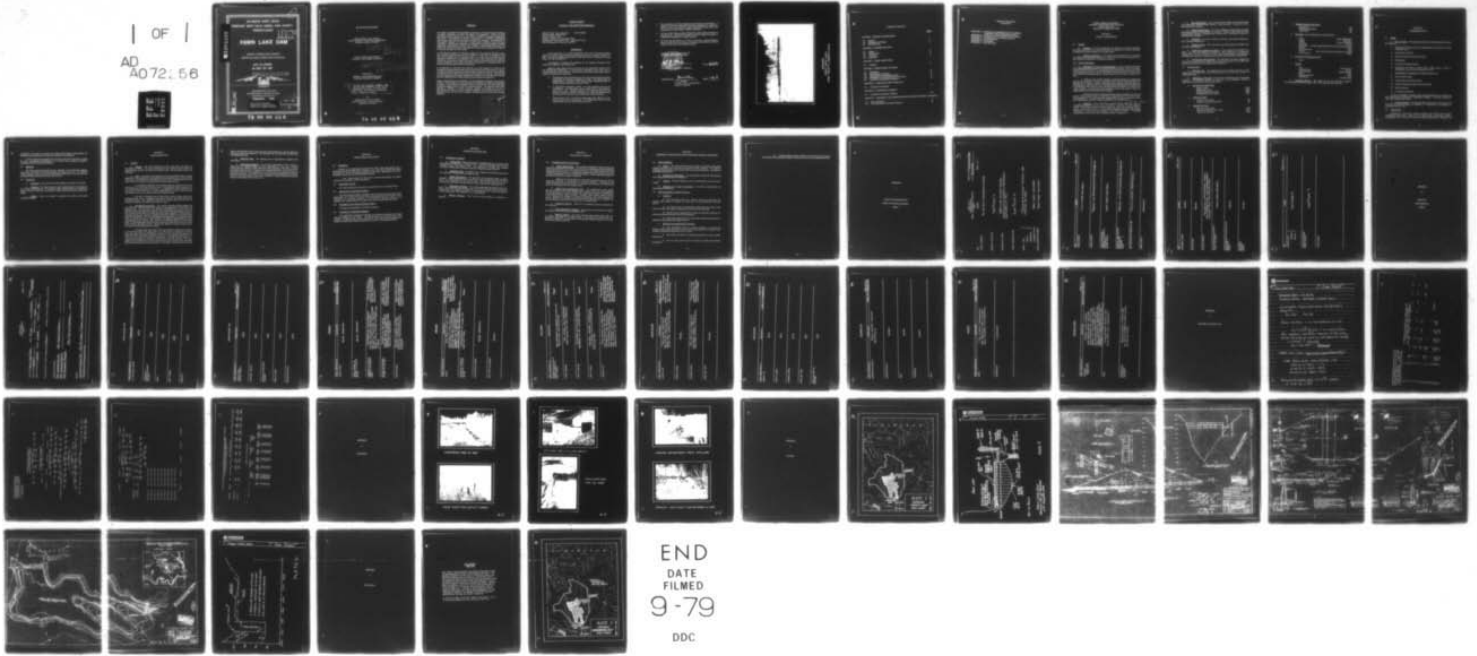
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O'BRIEN AND GERE ENGINEERS INC PHILADELPHIA PA JUSTIN--ETC F/G 13/2
NATIONAL DAM INSPECTION PROGRAM. FAWN LAKE DAM (NDI PA-00309, P--ETC(U)
FEB 79 W M HEISER DACW31-79-C-0010

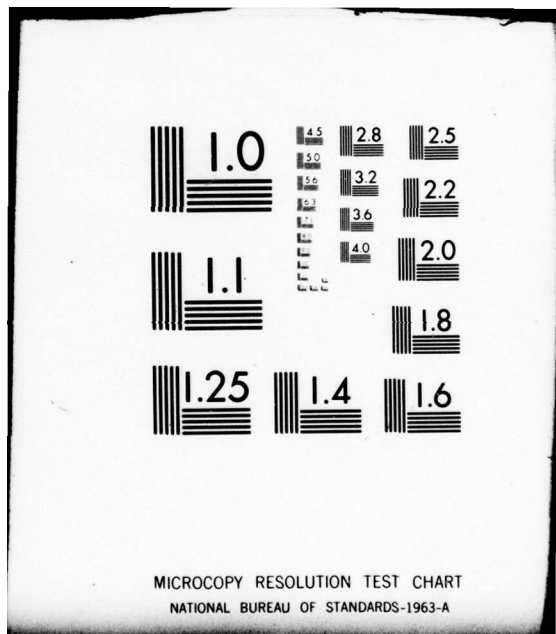
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

B.S. /

DELAWARE RIVER BASIN
TRIBUTARY WEST FALLS CREEK, PIKE COUNTY
PENNSYLVANIA

LEVEL 4

FAWN LAKE DAM

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NDI PA 00309
PA DER 52-168

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



PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

FEBRUARY 1979

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DELAWARE RIVER BASIN

Name of Dam: Fawn Lake Dam
County and State: Pike County, Pennsylvania
Inventory Number: PA 00309

(11) Feb 79

(12) 61P.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

(10) Will M. Heiser

(15) DACW31-79-C-0010

Prepared by:

O'BRIEN & GERE ENGINEERS, INC.
JUSTIN & COURTNEY DIVISION

(6)

National Dam Inspection Program. Fawn
Lake Dam (NDI PA-00309, PA DER 52-168),
Delaware River Basin, Tributary West
Falls Creek, Pike County, Pennsylvania.
Phase I Inspection Report,

For:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, MD 21203

410 760

JTB

79 08 06 05 8

PREFACE

This report is 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 investigations, 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.

Accession for	
NTIS GSA&I	<input checked="" type="checkbox"/>
DDC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or special
A	

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Fawn Lake Dam ID # PA 00309
State Located: Pennsylvania
County Located: Pike
Stream: Tributary to West Falls Creek
Coordinates: Latitude 41° 30.2' Longitude 75° 04.0'
Date of Inspection: November 20, 1978

ASSESSMENT

Fawn Lake Dam is an earth embankment dam with a concrete overflow spillway. The dam is approximately 400 feet long and has a maximum height of 41 feet. The dam is located approximately 3,000 feet north of Pennsylvania Route 590 at the Town of Bohemia.

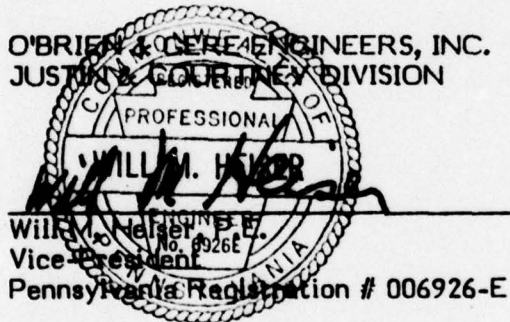
The spillway is adequate for discharge of the Probable Maximum Flood without overtopping of the embankment.

Based on visual observations and review of the information obtained from the Pennsylvania Department of Environmental Resources, Fawn Lake Dam is considered to be in fair condition. However, several conditions were observed that require maintenance or monitoring:

1. The riprap on the upstream face of the dam is poorly graded, unevenly distributed, and provides inadequate coverage. The riprap should be supplemented to provide a well graded, evenly distributed layer of slope protection extending to the top of dam.
2. A longitudinal depression extends across the upstream face of the embankment. The depression varies in depth from a few inches to more than 2 feet. Another depression was observed along the left abutment parallel to the left training wall. These depressions should be monitored to determine if any differential movement occurs.
3. Animal burrow holes and several small bushes were observed on the upstream face of the embankment. The animal holes should be filled with suitable material, and the bushes removed.

4. The conditions at the site evidence a general lack of maintenance. A program of periodic maintenance should be established to include but not be limited to mowing the grass, exercising the gate valve, and clearing the toe drain pipes of weeds and sediment.
5. The top of dam has an uneven profile and is below design elevation in two locations. Additional fill material should be placed as needed to regrade the embankment to design elevation.
6. No flood warning system is in effect at this site. During periods of heavy rainfall, the dam should be monitored, and downstream residents alerted in the event of an impending failure.

O'BRIEN & GERE ENGINEERS, INC.
 JUSTIN S. COURTNEY DIVISION



William M. Heiser, P.E.
 Vice President
 Pennsylvania Registration # 006926-E

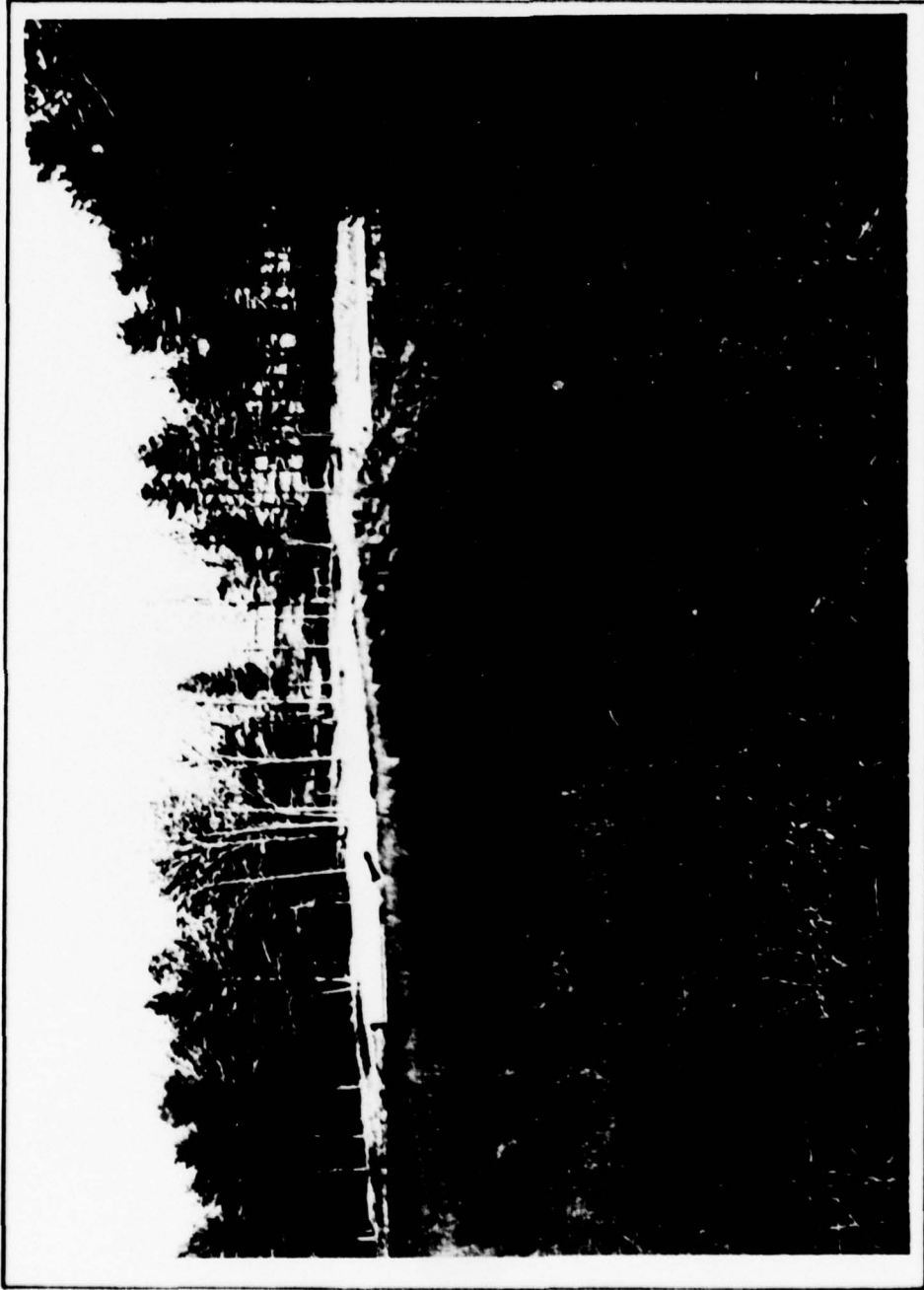
Date: 3/15/79

APPROVED BY

G. K. Withers

G. K. WITHERS
 Colonel, Corps of Engineers
 District Engineer

Date: 11 Apr 79



*OVERVIEW
FAWN LAKE DAM
PIKE COUNTY, PENNSYLVANIA*

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- APPENDIX E - DRAWINGS**
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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
FAWN LAKE DAM
INVENTORY NUMBER-PA 00309

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 this inspection is to evaluate the structural and hydraulic conditions at Fawn Lake Dam and to determine if the dam constitutes a hazard to human life or property.

1.2 Project Description

ABSTRACT
a. Description of Dam and Appurtenances. (From information obtained from the Pennsylvania Department of Environmental Resources - DER, Dam Safety Section). Fawn Lake Dam is a homogeneous earth embankment structure provided with a blanket drain and a rock toe. The design includes provision of a key trench. The embankment is approximately 400 feet long and has a maximum height of 41 feet.

→ A 90-foot long overflow spillway is located between the embankment and the left abutment. The dam is provided with 5 feet of freeboard above the spillway crest. Spillway training walls extend both upstream and downstream of the spillway, as shown on Plate 4. A concrete apron extends 100 feet downstream of the spillway, and varies in width from 90 feet at the spillway to 25 feet at the outlet channel. A trapezoidal outlet channel is lined with grouted riprap for approximately 250 feet downstream of the apron.

→ A 24-inch diameter reinforced concrete pipe is provided as a low level outlet. Flow through the pipe is controlled by a gate valve at the upstream toe of the embankment. The operating stem extends from the valve to the top of dam, and is supported on concrete columns embedded in the embankment. ← *ABSTRACT*

b. Location. Fawn Lake Dam is located about 3,000 feet north of Pennsylvania Route 590 at the Town of Bohemia. The dam is located approximately 7 miles from Hawley, Pennsylvania, and 3 miles from Rowland, Pennsylvania. The dam site is shown on the USGS Quadrangle entitled "Narrowsburg, Pennsylvania - New York at coordinates N 41° 30.2', W 75° 04.0'. A regional location plan of Fawn Lake Dam is enclosed as Plate 1, Appendix E.

c. Size Classification. Fawn Lake Dam has a maximum structural height of 41 feet and a normal storage volume of 1,200 acre-feet. The dam is in the intermediate size category.

d. Hazard Classification. The Town of Bohemia, Pennsylvania is located approximately one mile downstream of the dam. Failure of the structure would cause property damage and probable loss of human lives. Therefore, the dam is in the high hazard category.

e. Ownership. The dam is owned by the Fawn Lake Forest Association, RD 1, Hawley, Pennsylvania.

f. Purpose of Dam. Fawn Lake Dam was constructed for recreation and real estate development.

g. Design and Construction History. (From information obtained from DER). The dam was designed by Edward C. Hess Associates of Stroudsburg, Pennsylvania. The construction contractor was Bonhann's General Contracting of Honesdale, Pennsylvania. Construction of the dam was completed in May of 1971.

h. Normal Operating Procedure. The reservoir is normally maintained at the spillway crest elevation. Inflow occurring when the reservoir is at or above the spillway crest elevation is discharged over the spillway.

1.3 Pertinent Data

a. Drainage Area. The drainage area to the Fawn Lake Dam is 1.17 square miles, as taken from information provided by the DER, and verified on topographic maps.

b. Discharges at Dam Site. No high pool or discharge records were made available. The spillway capacity for the top of dam (Elevation 1241.0) is approximately 3,520 cubic feet per second (cfs).

c. Elevation (feet above MSL)

Spillway Crest	1,236
Design Top of Dam	1,241
Drainage Pipe Invert (inlet)	1,205
Drainage Pipe Invert (outlet)	1,201

d. Reservoir (miles)

Length of normal pool	.85
Length of maximum pool (PMF)	.86

e. Storage (acre-feet)

Normal Pool (El.1236)	1,200
Maximum Pool (El.1239.7 - PMF)	1,754
Top of Dam (El.1241)	1,960

f. Reservoir Surface Area (acres)

Normal Pool	146
Maximum Pool (PMF)	153
Top of Dam	155

g. Dam Data. (From information provided by DER)

Type	Earth Embankment
Length	400 feet +
Height	41 feet (maximum)
Top Width	29 feet
Side Slopes	2.5H:1V (upstream); 2.5H:1V to 3H:1V (downstream)
Zoning	None
Impervious Core	None
Cutoff	Trench with compacted embankment material
Grout Curtain	None

h. Diversion and Regulating Tunnel

None

i. Spillway

Type	Overflow weir
Length of Weir	90 feet
Crest Elevation	1,236.0 feet MSL
Gates	None
Upstream Channel	None
Downstream	Grouted riprap

j. Regulating Outlets. The outlet is a 24 inch diameter reinforced concrete pipe controlled by a gate valve at the upstream toe of the dam.

SECTION 2 ENGINEERING DATA

2.1 Design

a. Data Available. The engineering data made available by DER includes the following:

1. "Application", "Report Upon the Application", and "Permit" for Fawn Lake Dam, 1970.
2. Construction Drawings.
3. Contract Provisions and Specifications.
4. Photographs.
5. Construction Progress Report.
6. Application for Permit to Draw Dam or Other Body of Water in Accordance with the Act of December 15, 1959.
7. Miscellaneous correspondence, inspection reports, etc.
8. Outlet Works Details.
9. Cross Section and Profile of Dam.
10. Spillway Discharge Channel and Cut Off Wall.
11. Spillway Details.
12. Location and Site Plan.

A soils investigation including design recommendations was prepared for Hess Associates by Northeastern Engineering Company. No design calculations were made available for review.

b. Design Features. The principal design features for the structure are shown on the drawings enclosed in Appendix E. A description of the features is discussed in Section 1.2.a.

2.2 Construction

Construction information includes extensive field density and concrete compression test results. Review of the field density test results reveals a conscientious effort to meet the minimum density requirements. Wherever the

compaction was found to be below the design requirements, recompaction and retesting was required until the specified compaction was obtained.

A final construction inspection of the Fawn Lake Dam took place on April 20, 1971. Construction photographs from the DER files revealed no apparent inconsistencies with the design drawings.

2.3 Operation

No formal operating procedures were included in the information obtained from DER, other than a minimum statutory discharge of 0.18 cfs. Mr. Richard Tussel, Manager, Fawn Lake Forrest Association, stated that he was not aware of any operational procedures associated with the dam.

2.4 Evaluation

- a. Availability. All information made available was obtained from DER.
- b. Adequacy. The design drawings made available appear to be adequate for a Phase I investigation. If provided, design computations and embankment stability analyses would have been helpful in determining the suitability of the dam design.
- c. Validity. There is no reason to question the validity of the data obtained from DER.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of Fawn Lake Dam took place on November 20, 1978. At the time of inspection, the reservoir water surface was approximately one-half inch above the spillway crest. No underwater areas were inspected.

b. Dam. The riprap on the upstream face of the embankment is a poorly graded mix of large, relatively flat, angular rocks and smaller stone. There is little uniformity in the distribution and placement of the rock. Small bushes and animal burrow holes are located at several points along the upstream face.

An undulating depression was observed along the upstream face of the dam, about 1 to 3 feet from the top of dam. The depression extends across much of the embankment parallel to the crest. The depression varies in depth from a few inches to more than 2 feet. Field measurements of the top of dam and both side slopes reveal no inconsistencies with the design drawings.

The dam is overgrown with a thick 2-foot cover of grass, which could conceal problem areas. Undulations were observed on the top of dam and on the downstream slope. The undulations appeared at regular intervals, and could be caused by clumping of the grass cover near the roots.

c. Appurtenant Structures. The concrete overflow spillway adjoins the left abutment. The silt level at the spillway is approximately 3 feet below the spillway crest. The top foot of the spillway crest appears to have been formed separately from the underlying concrete. The contact area between the two pours has a rough surface which is evident across the entire spillway. Minor spalling of concrete surfaces has occurred at several construction joints on the training walls adjoining the spillway. The apron downstream of the spillway is a trapezoid in plan view, as shown on Plate 4. Weep holes are located at approximately 10-foot intervals along each training wall. No flow was observed from any of the weep holes. At the downstream end of the apron, there is a 2-foot drop to the bed of the grouted riprap discharge channel. Some minor spalling of concrete was noted at the contact between the apron and channel.

The gate valve control for the 24-inch diameter outlet pipe is located at the upstream edge of the top of dam. The valve stem is supported on concrete piers that appear to have differentially settled, and are now inclined towards the reservoir, which will impair operation of the gate. The operating handle for the valve was not in place at the time of inspection. The outlet pipe terminates at a concrete outlet structure located at the downstream toe of the dam. Toe drain outlet pipes terminating at the side walls of the outlet structure were partially filled with sediment and weeds at the time of inspection. Flow from the toe drain

pipe at the left side of the outlet structure was estimated at one-half gallon per minute at the time of inspection. The discharge from the right side toe drain pipe was substantially less.

d. Reservoir Area. The drainage area is predominately woodland with mild slopes.

e. Downstream Channel. The channel downstream of the spillway is riprap lined for approximately 350 feet downstream of the dam. Further downstream the channel is mildly obstructed with vegetation. The stream channel is partially blocked where it crosses under Township Road 439 via two culverts. In the area of the road, the vegetation is heavy and one of the culverts is partially filled with sediment. The stream is clear of obstructions and parallels the township road from the road crossing to the town of Bohemia. Failure would cause property damage and probable loss of human lives.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

Review of the information received from DER, field observations, and a discussion with Mr. Richard Tussel, Manager, Fawn Lake Forrest Association failed to reveal any formal operational procedures other than maintaining a minimum discharge of 0.18 cfs. into the downstream channel.

Mr. Tussel stated that the grass is mowed periodically and debris removed from the spillway apron as needed.

4.2 Maintenance of Dam

Mr. Tussel stated that maintenance is performed on an "as needed" basis.

4.3 Maintenance of Operating Facilities

The only operating facility associated with the dam is the gate valve for the outlet pipe. Mr. Tussel did not have the operating handle for the gate valve. Therefore, the operating condition of the drawdown facilities could not be assessed. Mr. Tussel stated that the gate valve was not periodically exercised.

4.4 Description of any Warning System in Effect

No flood warning system is in effect at this site.

4.5 Evaluation of Operational Adequacy

The operational condition of the gate valve should be evaluated by regular periodic exercise of the system. The grass should be mowed at least twice annually. During periods of heavy rainfall, the dam should be monitored periodically, and downstream residents alerted in the event of an impending failure.

SECTION 5
HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data. Fawn Lake Dam has a drainage area of 1.17 square miles and impounds a reservoir of 1,200 acre-feet. The dam is provided with 5 feet of freeboard above the spillway crest. The spillway is a 90-foot long concrete overflow structure with a maximum capacity of approximately 3,520 cfs.

b. Experience Data. According to Mr. Tussel, the maximum stage at the dam was about 3 inches above the spillway crest.

c. Visual Observations. The geometry of the spillway apron is poorly designed. Water discharged over the spillway would accelerate across the apron due to the contraction of the training walls. The training walls may act as a constriction under high flows and limit the effectiveness of the spillway system.

d. Overtopping Potential. The recommended Spillway Design Flood is the PMF. The peak inflow and outflow rates for the PMF are 3,570 cfs and 2,260 cfs respectively. The spillway is capable of discharging the PMF without overtopping of the embankment. (See Appendix C for computations.)

e. Spillway Adequacy. The Fawn Lake Dam spillway is classified as adequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The undulating depression observed along the upstream face of the dam could be a result of poor compaction during construction, wave action above the limit of riprap protection, or the combined effects of poor compaction and wave action. The depression parallel to the left training wall could be due to settlement of poorly compacted backfill. Neither depression appears to presently threaten the stability of the dam.

Based on the field inspection, the concrete spillway shows no signs of structural instability or deterioration of concrete surfaces. According to the design drawings, reinforcing bars join the spillway and the apron, and construction joints tie the spillway into the training walls.

b. Design and Construction Data. The embankment cross section geometry shown on the design drawings was verified during the field inspection. The soil properties of proposed embankment material, as analysed by Northeastern Engineering Company, appear suitable. Although a filter blanket design is shown on the drawings, no seepage or stability calculations were made available for review. Review of an extensive file of field density tests appears to indicate that the embankment construction was inspected on a regular basis.

c. Operating Records. There are no operating records maintained for this structure.

d. Post Construction Changes. No reported post construction changes are included in the information provided by DER.

e. Seismic Stability. The dam is located within Seismic Risk Zone 1 of the Seismic Zone Map of Contiguous States. A dam located in Seismic Zone 1 is generally considered to be safe under any earthquake loading conditions if it is safe under static loading conditions.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety. The visual observations and review of available information indicate that the Fawn Lake Dam is presently in fair condition. The areas of depression observed during the visual inspection could be settlement. The spillway is classified as adequate.

b. Adequacy of Information. The information provided by DER appears to be adequate for a Phase I investigation.

c. Urgency. Recommendations should be implemented as soon as practicable.

d. Necessity for Further Investigation. No further investigations are recommended at this site.

7.2 Recommendations, Remedial Measures

a. Facilities.

1) The depressions along the upstream slope and along the left training wall should be monitored to determine if any differential movement occurs.

2) The riprap should be supplemented with large and medium sized rock to provide a well graded riprap layer to extend to the top of dam.

3) Animal burrow holes should be filled with suitable material, and all bushes should be removed from the embankment.

4) Areas below design elevation should have additional fill placed to regrade the embankment to design elevation.

b. Operation and Maintenance Procedures.

1) The embankment should be mowed regularly to prevent the growth of deep rooted vegetation, to deter burrowing animals, and to uncover other conditions potentially hazardous to the structure.

2) The outlet gate should be operated periodically to insure proper maintenance.

3) The toe drain pipes should be cleared of weeds and sediment periodically.

4) During periods of heavy rainfall, the dam should be monitored periodically and downstream residents alerted in the event of an impending failure.

APPENDIX

A

Check List Engineering Data
Design, Construction, Operation
Phase I

NAME OF DAM FAWN LAKE DAM
ID # PA00309

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

Sheet 1 of 4

ITEM

REMARKS

AS-BUILT DRAWINGS

NO AS-BUILT DRAWINGS INCLUDED.

REGIONAL VICINITY MAP

SEE PLATE 1.

CONSTRUCTION HISTORY

DER FILES INCLUDE PERIODIC
CONSTRUCTION REPORTS. CONSTRUCTION
COMPLETED IN 1971.

TYPICAL SECTIONS OF DAM

SEE PLATE 3.

OUTLETS - PLAN

DRAWING OF OUTLET DETAILS WAS
PROVIDE BY DER.

DETAILS

CONSTRAINTS

DISCHARGE RATINGS

NONE MADE AVAILABLE.

RAINFALL/RESERVOIR RECORDS

NONE MADE AVAILABLE.

ITEM

REMARKS

MONITORING SYSTEMS

NONE.

MODIFICATIONS

NONE.

HIGH POOL RECORDS

ACCORDING TO MR. RICHARD TUSSEL,
THE HIGHEST POOL WAS APPROXIMATELY
3 INCHES ABOVE THE SPILLWAY CREST.

POST CONSTRUCTION ENGINEERING
STUDIES AND REPORTS

NONE MADE AVAILABLE.

PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS

NONE.

MAINTENANCE
OPERATION
RECORDS

NONE.

ITEM

REMARKS

SPILLWAY PLAN

SECTIONS

DETAILS

SEE PLATE 4.

OPERATING EQUIPMENT
PLANS & DETAILS

SEE PLATE 3.

MISCELLANEOUS

APPENDIX

B

Check List

Visual Inspection

Phase I

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam FAWN LAKE DAM County PIKE State Pennsylvania National ID # PA00309
Type of Dam EARTH Hazard Category HIGH
Date(s) Inspection 11/20/78 Weather CLEAR Temperature 40°

Pool Elevation at Time of Inspection 1236.0 M.S.L. Tailwater at Time of Inspection — M.S.L.

Inspection Personnel:

MR. GEORGE ELIAS MR. DAVID CAMPBELL
MR. LEONARD BECK _____
MR. ROBERT BOWERS _____
MR. DAVID CAMPBELL Recorder

Remarks:

ACCOMPANIED BY: MR. RICHARD TUSSEL, MANAGER, FAWN LAKE
FOREST ASSOCIATION

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF OBSERVATIONS REMARKS OR RECOMMENDATIONS

ANY NOTICEABLE SEEPAGE

N/A

STRUCTURE TO
ABUTMENT/EMBANKMENT
JUNCTIONS

N/A

DRAINS

N/A

WATER PASSAGES

N/A

FOUNDATION

N/A

20

CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MOHOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

Sheet 4 of 11

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

SURFACE CRACKS

NONE OBSERVED.

UNUSUAL MOVEMENT OR
CRACKING AT OR BEYOND
THE TOE

NONE OBSERVED.

SLOUGHING OR EROSION OF
EMBANKMENT AND ABUTMENT
SLOPES

DEPRESSIONS WERE OBSERVED
ALONG THE LEFT ABUTMENT
CONTACT AND ALONG THE UPSTREAM
SLOPE OF THE DAM, VARIED
FROM A FEW INCHES TO MORE THAN
2 FEET.

THESE DEPRESSIONS
SHOULD BE MONITORED
FOR ANY FURTHER
MOVEMENT.

VERTICAL AND HORIZONTAL
ALIGNMENT OF THE CREST

SURVEY OF THE TOP OF
DAM REVEALS AN APPARENT
CAMBER TO THE CREST WITH
POSSIBLE SETTLEMENT NEAR
THE RIGHT ABUTMENT.

CREST OF THE DAM
SHOULD BE SURVEYED
PERIODICALLY TO DETECT
DIFFERENTIAL MOVEMENT.

RIPRAP FAILURES

RIPRAP IS POORLY GRADED,
UNEVENLY DISTRIBUTED, AND
DOES NOT PROVIDE ADEQUATE
COVERAGE.

ADDITIONAL RIPRAP
NEEDED TO PROVIDE
ADEQUATE PROTECTION
AGAINST WAVE ACTION.

EMBANKMENT

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
DRAINS	TOE DRAIN OUTLET PIPES, LOCATED AT THE OUTLET STRUCTURE AT THE DOWNSTREAM TOE OF THE DAM, WERE PARTIALLY CLOGGED WITH SEDIMENT AND WEEDS. FLOW FROM THE LEFT PIPE WAS ABOUT 5 GPM. MUCH LESS FROM OTHER PIPE.	TOE DRAIN PIPES SHOULD BE CLEANED PERIODICALLY TO ALLOW FREE OUTFLOW.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	DEPRESSIONS AS NOTED ON PREVIOUS PAGE.	None.
ANY NOTICEABLE SEEPAGE	NONE OBSERVED.	
STAFF GAGE AND RECORDER	None.	

OUTLET WORKS

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	REINFORCED CONCRETE OUTLET PIPE COULD NOT BE INSPECTED.	NONE
INTAKE STRUCTURE	THE INTAKE WAS SUBMERGED AND COULD NOT BE INSPECTED.	NONE.
OUTLET STRUCTURE	CONCRETE OUTLET STRUCTURE APPEARS TO BE IN GOOD CONDITION.	NONE.
OUTLET CHANNEL	NATURAL CHANNEL PROTECTED WITH RIPRAP JUST DOWNSTREAM OF THE OUTLET.	NONE.
EMERGENCY GATE	THE OPERATING HANDLE WAS NOT IN PLACE AT THE TIME OF INSPECTION. THE VALVE STEM IS SUPPORTED ON CONCRETE PIERS THAT APPEAR TO HAVE DIFFERENTIALLY SETTLED AND COULD IMPED E OPERATION OF THE VALVE.	THE OPERATING CONDITION OF THE VALVE SHOULD BE ESTABLISHED. IF THE VALVE DOES NOT FUNCTION PROPERLY, THE SYSTEM SHOULD BE REPAIRED.

UNIGATED SPILLWAY

Sheet 7 of 11

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

CONCRETE WEIR

THE CURVED SECTION AT THE TOP OF THE SPILLWAY CREST HAS A ROUGHED CONTACT WITH THE UNDERLYING CONCRETE.

BECAUSE OF THE LOW HEADS EXPECTED AT THIS SITE, NO PROBLEMS ARE ANTICIPATED.

APPROACH CHANNEL

NONE.

DISCHARGE CHANNEL

THE SPILLWAY APRON AND DISCHARGE CHANNEL APPEAR TO HAVE POOR HYDRAULIC PROPORTIONS.

POSSIBLE FLOW CONSTRICTION AT APRON OUTLET FOR HIGH DISCHARGES.

BRIDGE AND PIERS

NONE.

GATED SPILLWAY

Sheet 8 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

<u>VISUAL EXAMINATION</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
MONUMENTATION/SURVEYS	FIELD SURVEY INCLUDED AS PLATE G.	
OBSERVATION WELLS	NONE.	
WEIRS	NONE.	
PIEZOMETERS	NONE.	
OTHER		

RESERVOIR

Sheet 10 of 11

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

SLOPES

THE SLOPES SURROUNDING
THE RESERVOIR ARE MILD AND
WELL COVERED WITH VEGETATION.

SEDIMENTATION

UNKNOWN.

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS; DEBRIS, ETC.)	RIPRAP LINED CHANNEL FOR APPROXIMATELY 350 FEET DOWNSTREAM OF THE SPILLWAY APRON. AT THE STREAM CROSSING OF TOWNSHIP ROAD 439, SOME HEAVY VEGETATION OBSTRUCTS THE CHANNEL. TWO CULVERTS ARE LOCATED UNDER THE ROAD, AND ONE OF THE CULVERTS IS PARTIALLY FILLED WITH SILT.	
SLOPES	DOWNSTREAM SLOPES ARE MILD AND WELL VEGETATED.	
APPROXIMATE NO. OF HOMES AND POPULATION		APPROXIMATELY 15 DWELLINGS AT TOWN OF BOHEMIA. (POPULATION OF 30 OR MORE).

APPENDIX

C

Hydrologic & Hydraulic Data

SUBJECT	SHEET	BY	DATE	JOB NO
FAWN LAKE DAM	1	DBC	1/19/19	

DRAINAGE AREA = 1.17 SQ. MI.

SURFACE AREA = 146 ACRES (NORMAL POOL)

HYDROGRAPH COEFFICIENTS (FROM COE, BALT. DIST.)

ZONE # 1

$$C_t = 1.23 \quad C_p = .45$$

BASIN CENTROID IS IN THE RESERVOIR, SO USE

$t_p = C_t(L)^6$ (where L is measured from the upstream end of the reservoir to the basin divide - Formula provided by COE, Baltimore District)

$$L \approx 3000' \approx .57 \text{ miles}$$

$$t_p = 1.23 \times .57^6 = \underline{\underline{.88 \text{ hours}}}$$

PMP DATA (FROM Hydro-meteorological Report #33)

6 HR - 200 SQ. MI. INDEX RAINFALL = 22"

6 HR % OF INDEX = 111%

12 HR % OF INDEX = 124%

24 HR % OF INDEX = 133%

① SPILLWAY DISCHARGE (Q) = $C L H^{3/2}$, WHERE

$$C = 3.5 \quad \& \quad L = 90'$$

.....
 FLOOD HYDROGRAPH PACKAGE (MEC-11)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 25 SEP 78

RUN DATE 02/14/79.
 TIME 16.18.29.

HYDROLOGIC ANALYSIS OF FAWN LAKE DAM
 NATIONAL DAM SAFETY PROGRAM
 BALTIMORE DISTRICT CORPS OF ENGINEERS

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	MSTAN
100	0	30	0	0	0	0	0	-4	0
		JOPER	NWT	LROPT	TRACE				
		5	0	0	0				

MULTI-PLAN ANALYSES TO BE PERFORMED

RTIOS= .20 .30 .40 .50 .60 .70 .80 .90 1.00
 NPLAN= 1 NRTIO= 9 LRTIO= 1

.....

SUB-AREA RUNOFF COMPUTATION

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

HYDROGRAPH DATA

IHYDG	IUMG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.17	0.00	1.17	0.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	124.00	133.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STPXL	CNSTL	ALSNX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	.21	0.00

TP= .88 CP= .45 NTA= 0

RECESSION DATA

STRTO= -1.50 ORCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 15 END-OF-PERIOD ORDINATES. LAG= .89 HOURS. CP= .45 VOL= 1.00 20.
 13. 9. 6. 4. 3.
 155. 353. 330. 221. 148. 99. 67. 45. 30. 20.

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP
0													

SUM 23.41 21.59 1.82 34298.
 (595.)(548.)(46.)(971.21)

.....

ISTAD	ICOMP	HYDROGRAPH ROUTING									
2	1	TECON	ITAPE	JPLY	JPBT	INAME	ISTAGF	IAUTO			
		ROUTING DATA									
		IRIS	ISAME	ISPY	IPWP	LSTP					
		1	1	0	0	0					
		DAM DATA									
		TOPEL	COOD	ERPD	DAMWID						
		1241.0	3.1	1.5	400.						

MSSTPS	MSIDL	LAG	AMSK	X	TSK	STORA	ISPRAY
1	0	0	0.000	0.000	0.000	-1236.	0

SURFACE AREA	0.	120.	146.	154.	166.
CAPACITY	0.	400.	1197.	1797.	3367.
ELEVATION	1220.	1230.	1236.	1240.	1250.

CREL	SPWID	COOD	ERPD	ELEV	COOL	CAREA	EXPL
1236.0	90.0	3.5	1.5	0.0	0.0	0.0	0.0

PEAK OUTFLOW IS 337. AT TIME 19.00 HOURS

PEAK OUTFLOW IS 546. AT TIME 18.50 HOURS

PEAK OUTFLOW IS 778. AT TIME 18.50 HOURS

PEAK OUTFLOW IS 1015. AT TIME 18.50 HOURS

PEAK OUTFLOW IS 1250. AT TIME 18.50 HOURS

PEAK OUTFLOW IS 1595. AT TIME 18.50 HOURS

PEAK OUTFLOW IS 1756. AT TIME 18.50 HOURS

PEAK OUTFLOW IS 2009. AT TIME 18.50 HOURS

PEAK OUTFLOW IS 2265. AT TIME 18.50 HOURS

.....

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	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9		
				.20	.30	.40	.50	.60	.70	.80	.90	1.00		
HYDROGRAPH AT	1	1.17	1	716.	1072.	1429.	1786.	2143.	2500.	2858.	3215.	3572.		
	(3.03)	(28.23)	(30.34)	(40.46)	(50.57)	(60.69)		
ROUTED TO	2	1.17	1	337.	549.	778.	1015.	1258.	1505.	1756.	2009.	2265.		
	(3.03)	(9.54)	(15.56)	(22.02)	(28.73)	(35.61)	(42.62)

SUMMARY OF DAM SAFETY ANALYSIS

PLAY 1	ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM	DURATION OVER TOP HOURS	MAXIMUM OUTFLOW CFS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
		1236.10	1236.00	1241.00	0.00	337.	19.00	0.00
		1211.	1197.	1921.	0.00	549.	18.50	0.00
		10.	0.	3522.	0.00	778.	18.50	0.00
RATIO OF PHF	MAXIMUM RESERVOIR W.S.+ELEV	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	MAXIMUM OUTFLOW CFS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS	
.20	1237.05	1350.	337.	0.00	337.	19.00	0.00	
.30	1237.45	1410.	549.	0.00	549.	18.50	0.00	
.40	1237.83	1467.	778.	0.00	778.	18.50	0.00	
.50	1238.18	1520.	1015.	0.00	1015.	18.50	0.00	
.60	1238.52	1570.	1258.	0.00	1258.	18.50	0.00	
.70	1238.84	1619.	1505.	0.00	1505.	18.50	0.00	
.80	1239.14	1666.	1756.	0.00	1756.	18.50	0.00	
.90	1239.44	1711.	2009.	0.00	2009.	18.50	0.00	
1.00	1239.73	1754.	2265.	0.00	2265.	18.50	0.00	

6

APPENDIX

D

Photographs

0



UPSTREAM FACE OF DAM



VALVE STEM FOR OUTLET WORKS



SPELLWAY AND STILLING BASIN



*SPELLWAY AND
TOP OF DAM*



LOOKING DOWNSTREAM FROM SPILLWAY



ROADWAY 1500 FEET DOWNSTREAM OF DAM

APPENDIX

E

Drawings

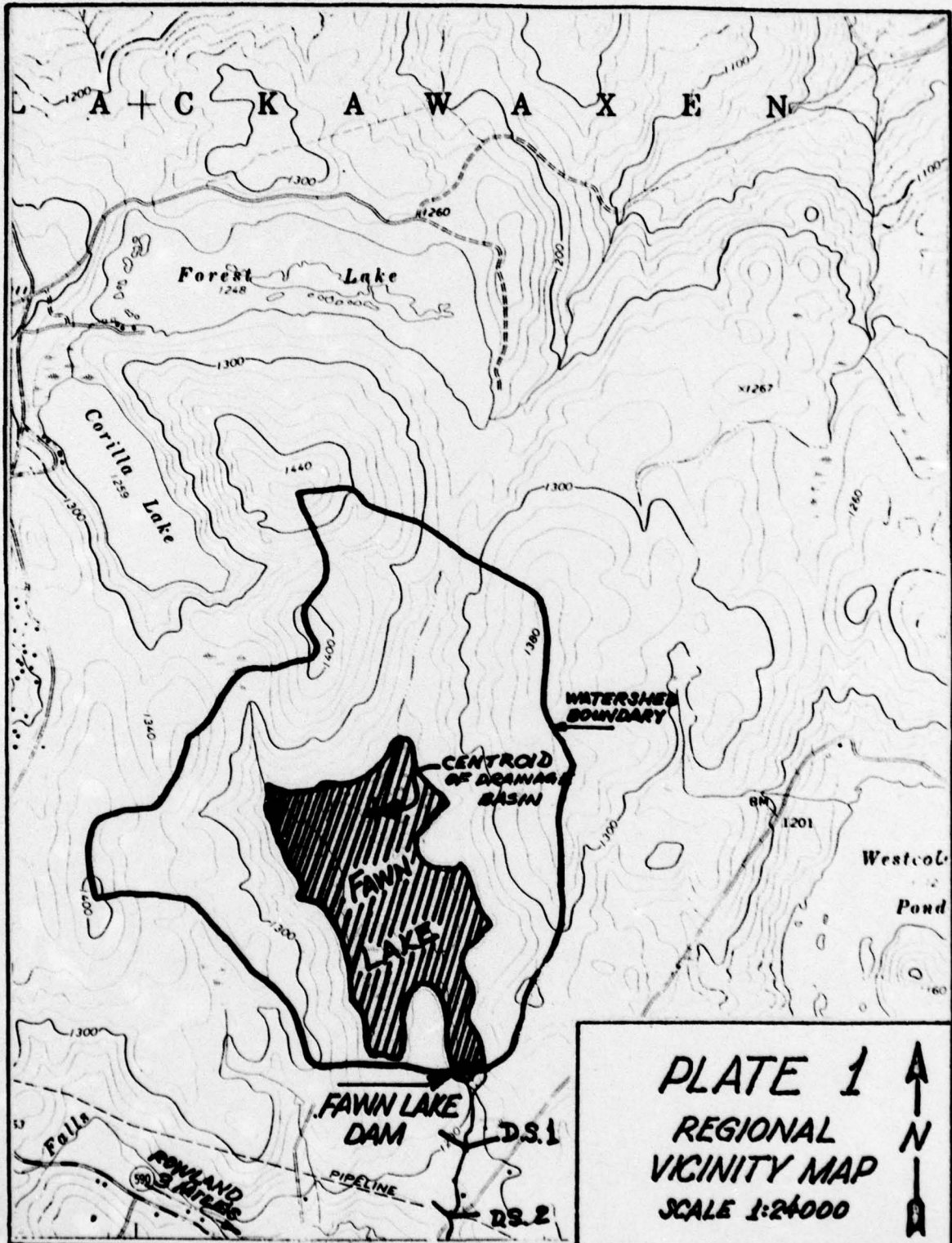
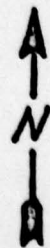
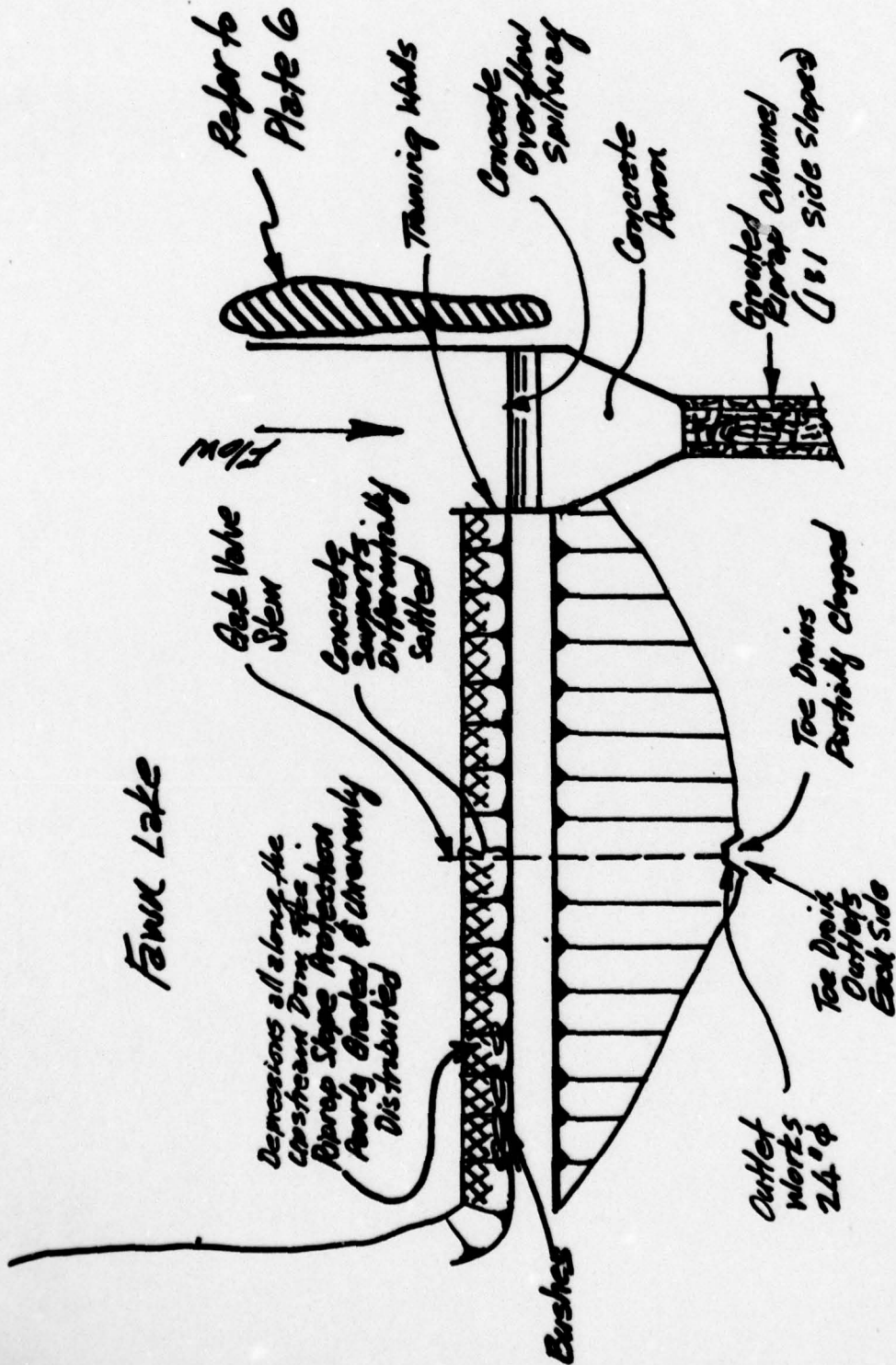


PLATE 1
REGIONAL
VICINITY MAP
SCALE 1:24000



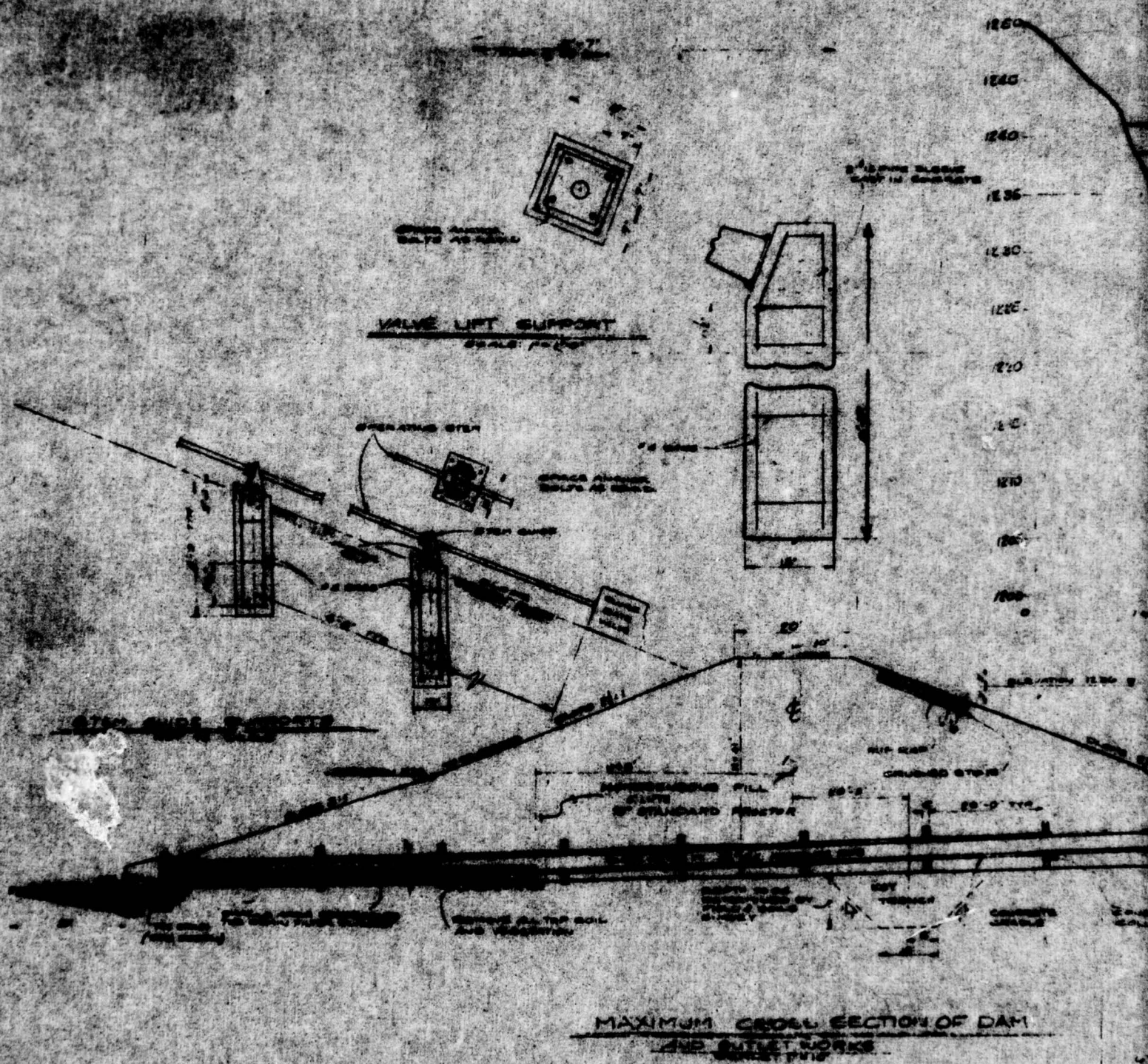
SUBJECT <i>Fawn Lake</i>	SHEET	BY	DATE	JOB NO
-----------------------------	-------	----	------	--------

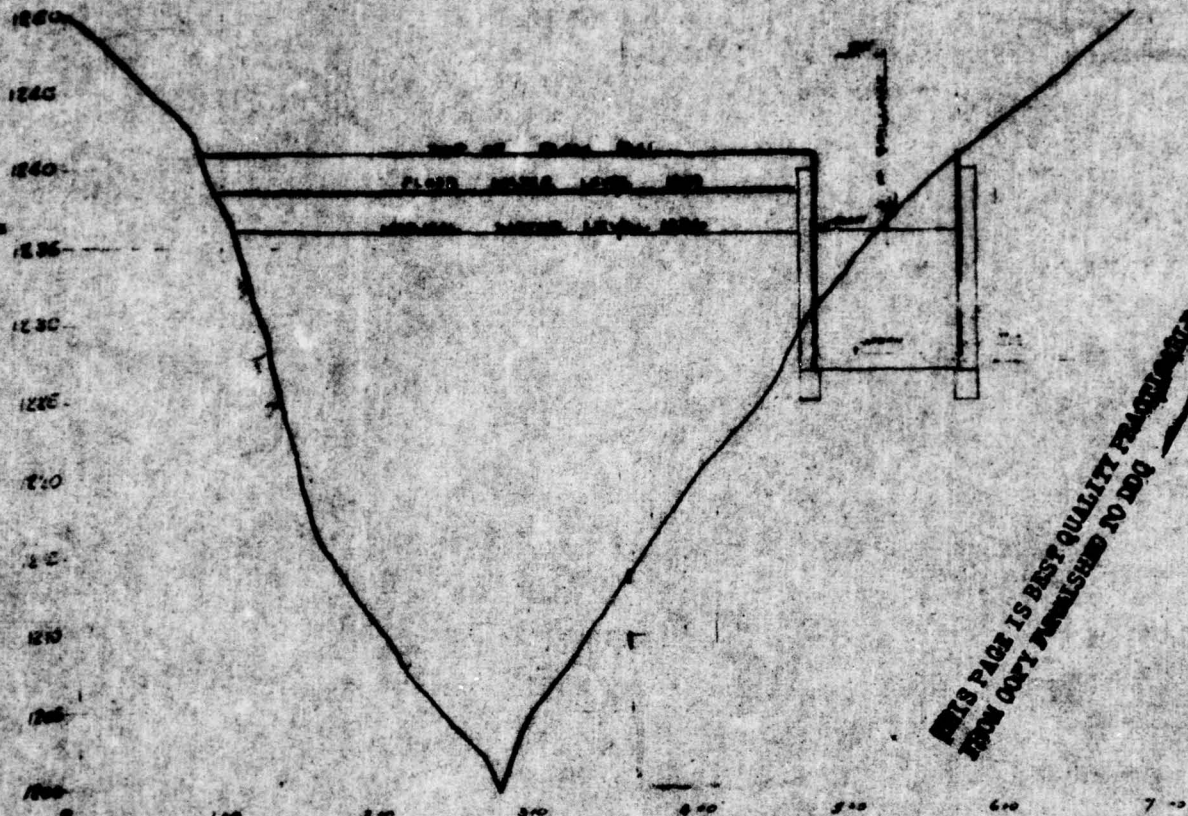


NOT TO SCALE

FAWN LAKE DAM
General Plan of Features
with Inspection Notes

PLATE 2

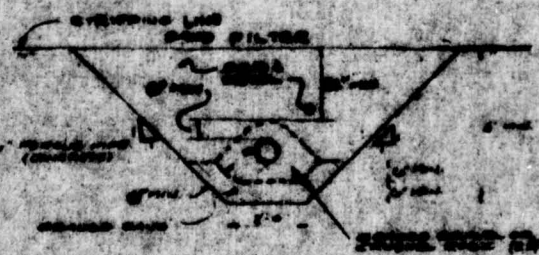
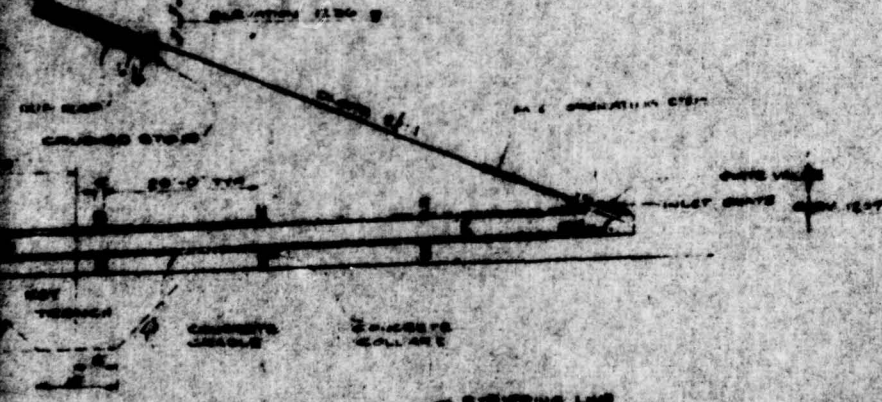




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 FROM COPY FURNISHED TO DDG

PROFILE OF DAM SITE

SCALE: HORIZONTAL 1" = 50'
 VERTICAL 1" = 5'



TOE DRAIN DETAIL
PLATE 3

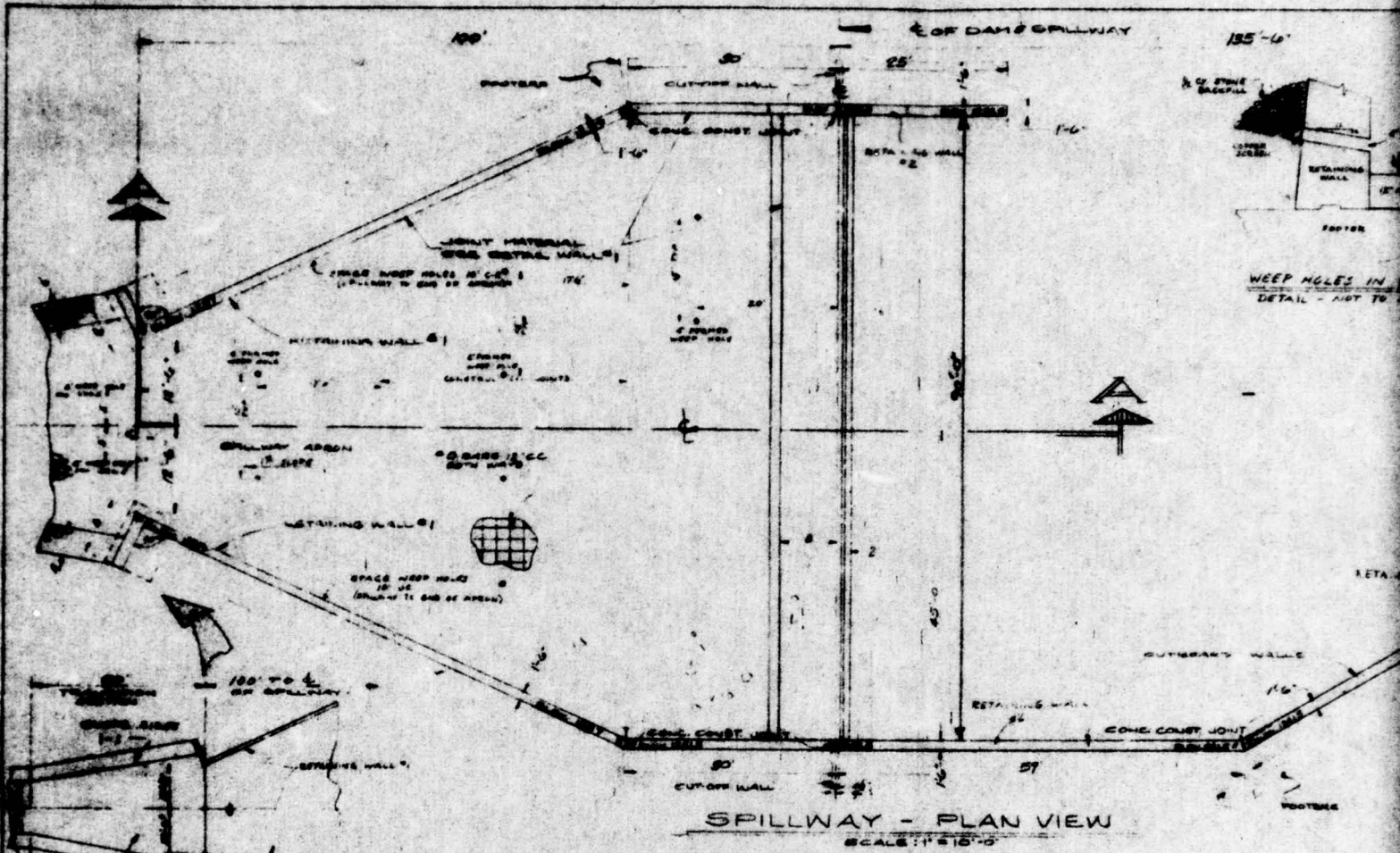
2

NO.	DATE

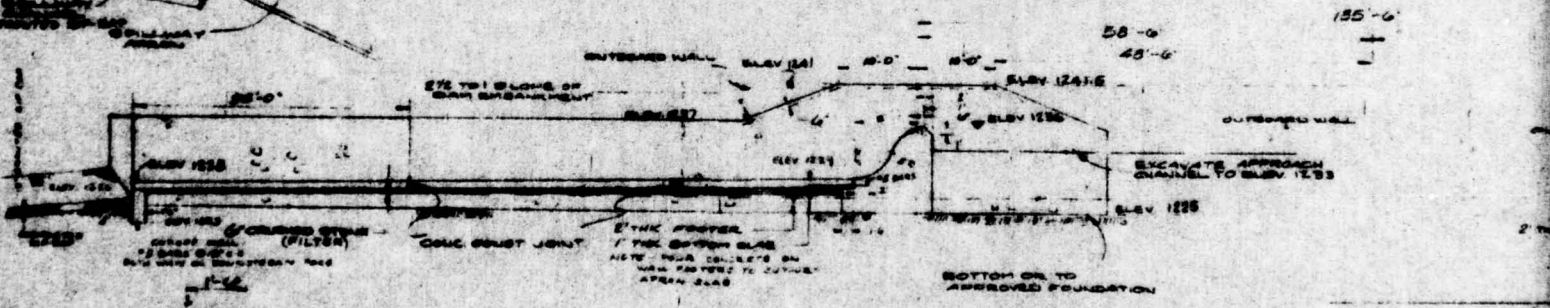
SLUICE GATE DATA

APPROX 21' 0" HIGHEST WATER SURFACE
 APPROX 12' 0" HIGHEST WATER SURFACE
 APPROX 12' 0" HIGHEST WATER SURFACE
 APPROX 12' 0" HIGHEST WATER SURFACE
 APPROX 12' 0" HIGHEST WATER SURFACE

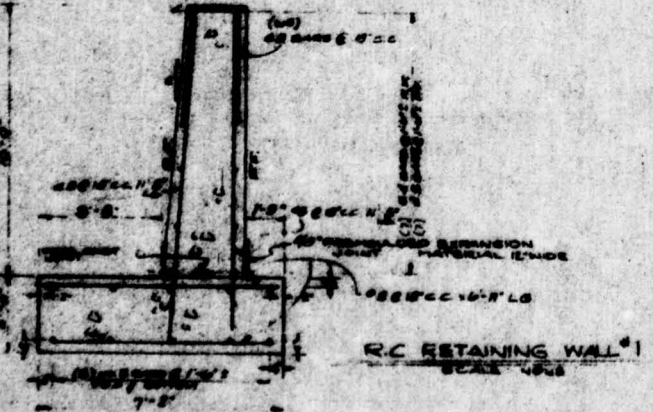
AMERICAN CENTRAL CORP	
SHEET NO. OF SHEETS DATE	FAWN LAKE FOREST DEVELOPMENT FAWN LAKE DAM LOCATION MAP FOR THE COUNTY OF WASHINGTON STATE SHEET NO. 1000 SCALE 1" = 1000' DATE 1954



SPILLWAY - PLAN VIEW
SCALE: 1" = 10'-0"



SECTION AA
SCALE: 1" = 10'-0"



R.C. RETAINING WALL
SCALE: 1" = 10'-0"

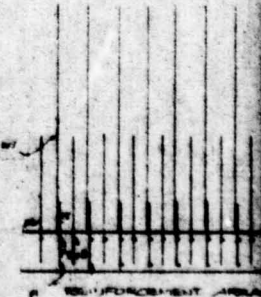
NOTES

REINFORCEMENT BARS SHALL BE OF INTERMEDIATE OR HARD GRADE OR GAL. STEEL, DESIGNED FOR 20,000 P.S.I. AND DETAIL IN ACCORDANCE WITH ACI CODES. MINIMUM LAP SHALL BE 30 DIA. AND MINIMUM COVER SHALL BE 2" EXCEPT AS NOTED.

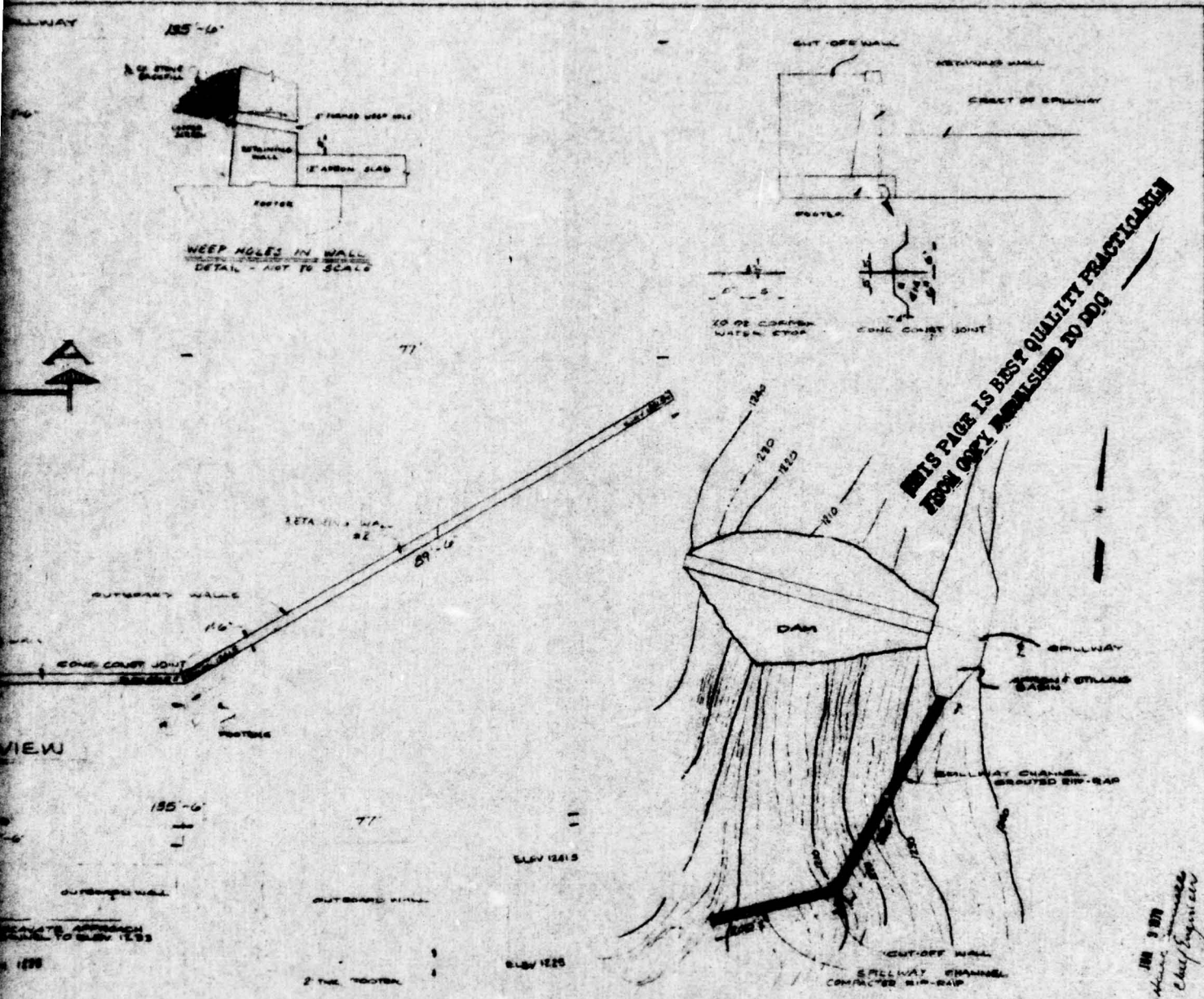
ALL CONCRETE SHALL BE CLASS-B.

THE PROTECTIVE MAY BE ORDERED BY THE ENGINEER TO BE AT ANY ELEVATION OR OF ANY DIMENSIONS NECESSARY TO PROVIDE A FOUNDATION.

EXPOSED CONCRETE TO EROSION SHALL BE CHAMFERED 1/4" EACH AT 45° ANGLES.



R.C. RETAINING WALL

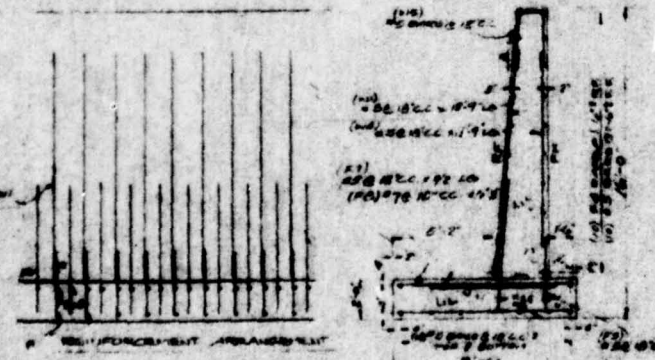


**THIS PLOT IS BEST QUALITY PRACTICAL SIZE
FROM COPY ENLARGED TO 800**

SITE PLAN
SCALE 1"=100'

52-168
 DRAWING NO. 52-168
 DATE 10/25/50
 PROJECT FAWN LAKE FOREST DEVELOPMENT
 LACKAWANNA TWP. PAINE COUNTY, PA.
 DAM - SPILLWAY

NOTE:
 (1) 2" BAR @ 8" C.C. 12' x 12'
 (2) 2" BAR @ 8" C.C. 12' x 12'
 (3) 2" BAR @ 8" C.C. 12' x 12'
 (PLACE ON ALTERNATE CENTER)



AMERICAN CENTRAL CORP	
SCALE AS SHOWN	FAWN LAKE FOREST DEVELOPMENT
REVISIONS 6-9-50	LACKAWANNA TWP. PAINE COUNTY, PA.
	DAM - SPILLWAY
	EDWARD C. NESS ASSOCIATES
	58 NORTH 79 STREET
	STRONDSBURG, PENNA.
DATE MARCH 6, 1950	DRAWN BY
CHECKED BY	DATE
ENGINEER	BY

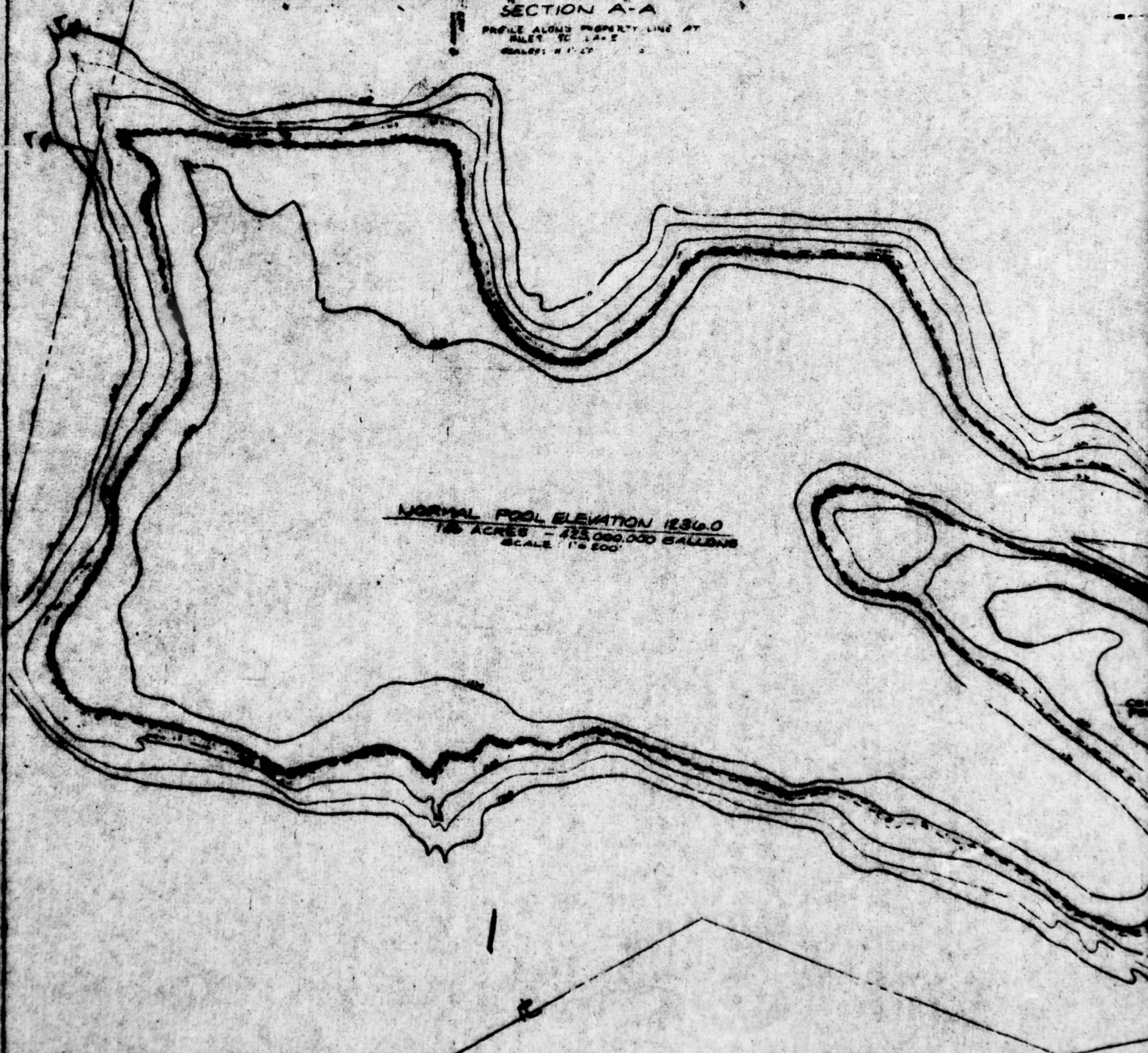
PLATE 4



SECTION A-A

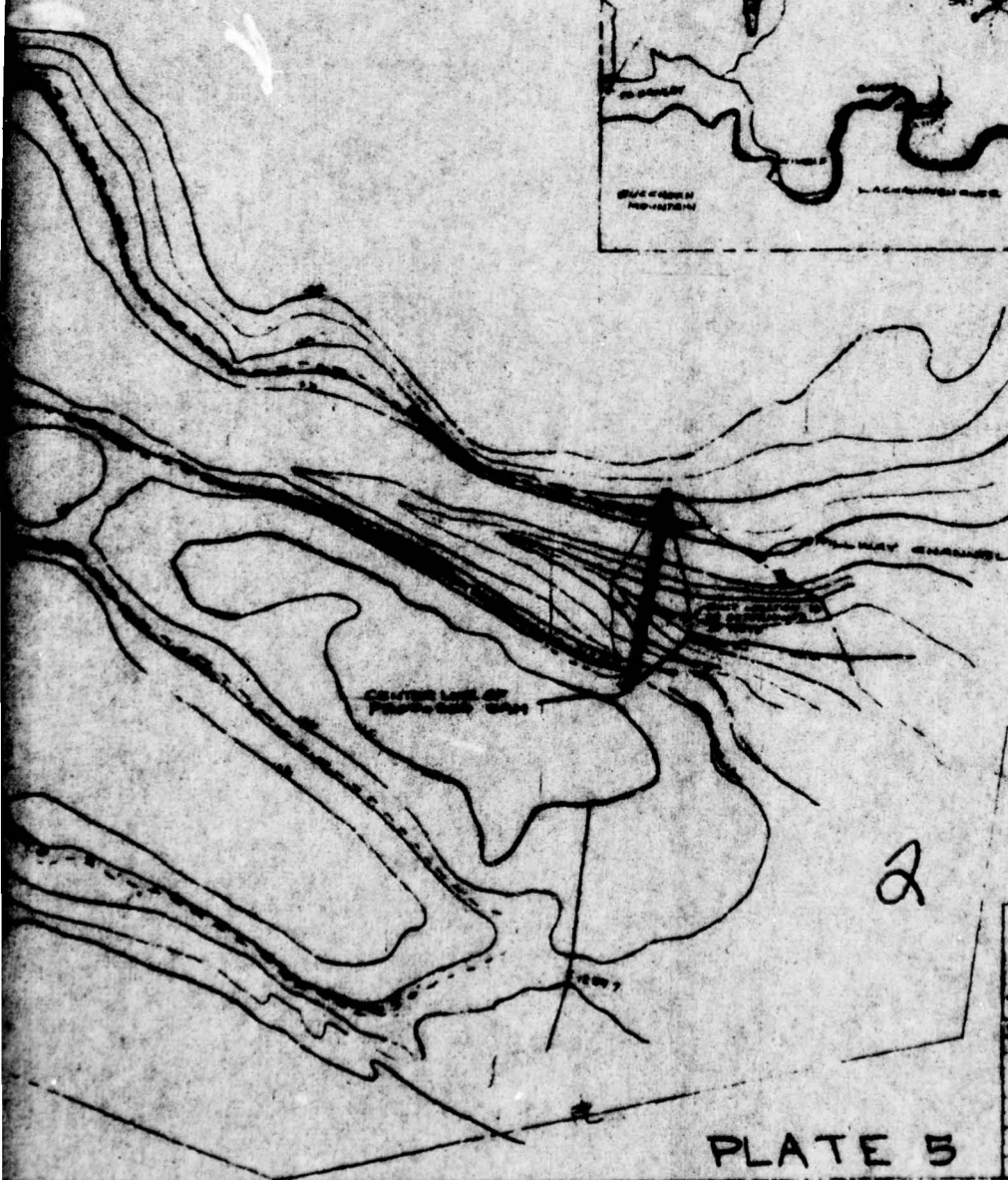
PROFILE ALONG PROPERTY LINE AT
RAILY TO LA 2
SCALE: 1" = 50'

NORMAL POOL ELEVATION 1236.0
125 ACRES - 125,000,000 GALLONS
SCALE: 1" = 500'



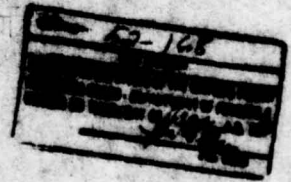
PORTION OF DAMASCUS AND HAWLEY QUADRANGLES
 U.S. GEOLOGICAL SURVEY SHOWING FAWN LAKE & DRAINAGE AREA
 SCALE: 1" = 62,500'

LOCATION PLAN



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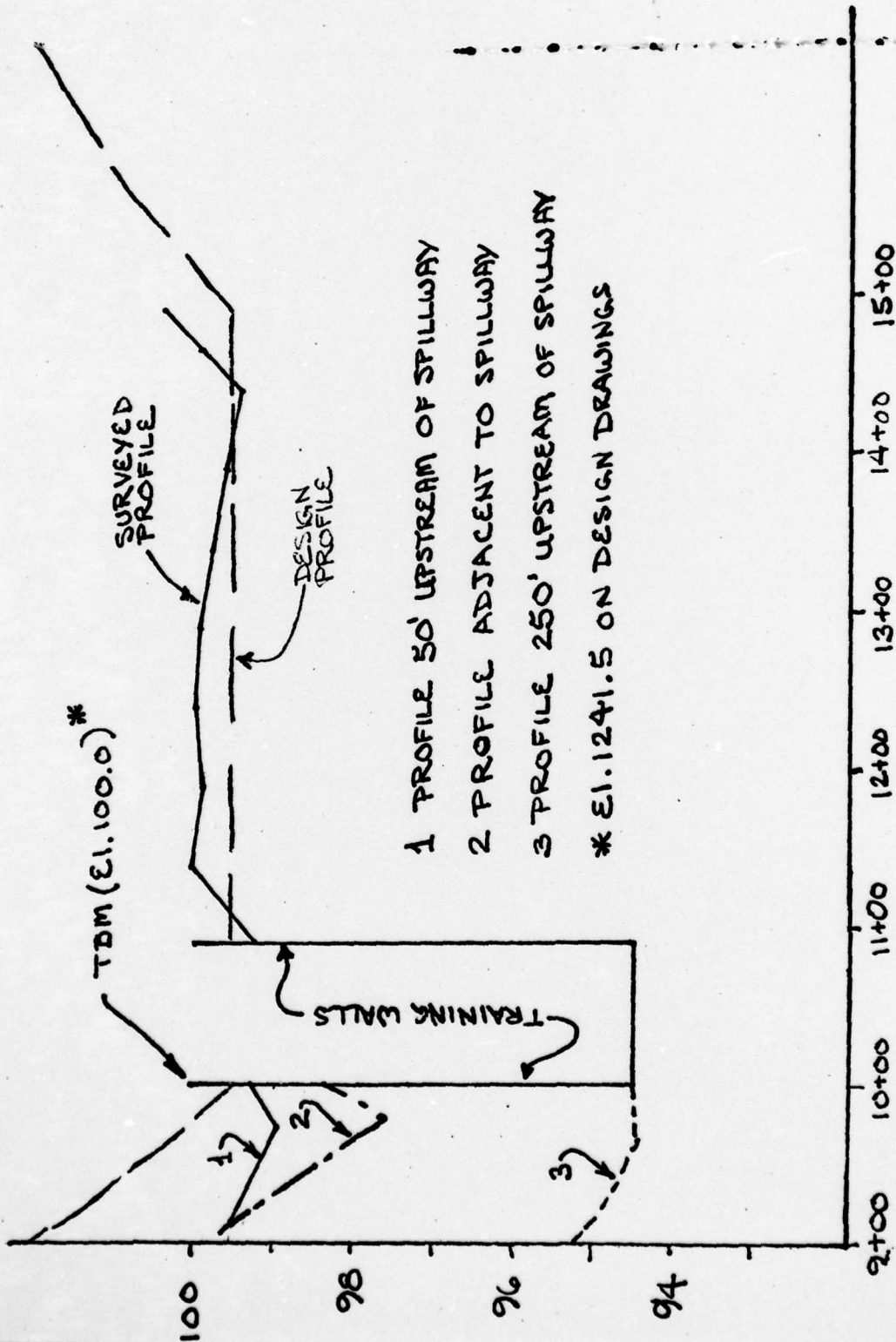
NO. 100
 a. Shuman
 Chief Engineer



AMERICAN CENTRAL CORP	
SCALE AS SHOWN	FAWN LAKE FOREST DEVELOPMENT
DATE OCT 10 1937	FAWN LAKE DAM LACAWAXEN TWP. FIVE COUNTY, MO. EDWARD S. HESS ASSOC. ENGINEERS ST. LOUIS, MO.
NO. 100	DATE OCT 10 1937
100	SHEET 1 OF 5

PLATE 5

SUBJECT FAWN LAKE DAM	SHEET	BY DBC	DATE 1/19/79	JOB NO
---------------------------------	-------	------------------	------------------------	--------



- 1 PROFILE 50' UPSTREAM OF SPILLWAY
- 2 PROFILE ADJACENT TO SPILLWAY
- 3 PROFILE 250' UPSTREAM OF SPILLWAY
- * E1.1241.5 ON DESIGN DRAWINGS

PLATE 6

APPENDIX

F

Site Geology

SITE GEOLOGY
FAWN LAKE

Fawn Lake is located within the Eastern Glaciated section of the Appalachian Plateaus physiographic province. The geologic structure at the site is relatively simple with thick Pleistocene glacial deposits, consisting of till and other rock debris units, overlying the horizontal beds of non-marine red and gray shales and sandstones of the Devonian Catskill continental sedimentary group. Bedrock does not outcrop at the site and was not encountered to 20-foot depths in the design stage exploratory borings along the dam axis. The dam is constructed on glacial deposits considered to be dense and homogeneous, but not impermeable, however, no seepage losses were observed downstream of the dam during this inspection.

No faults or major structural defects are known to exist in the buried bedrock in the vicinity of the site.

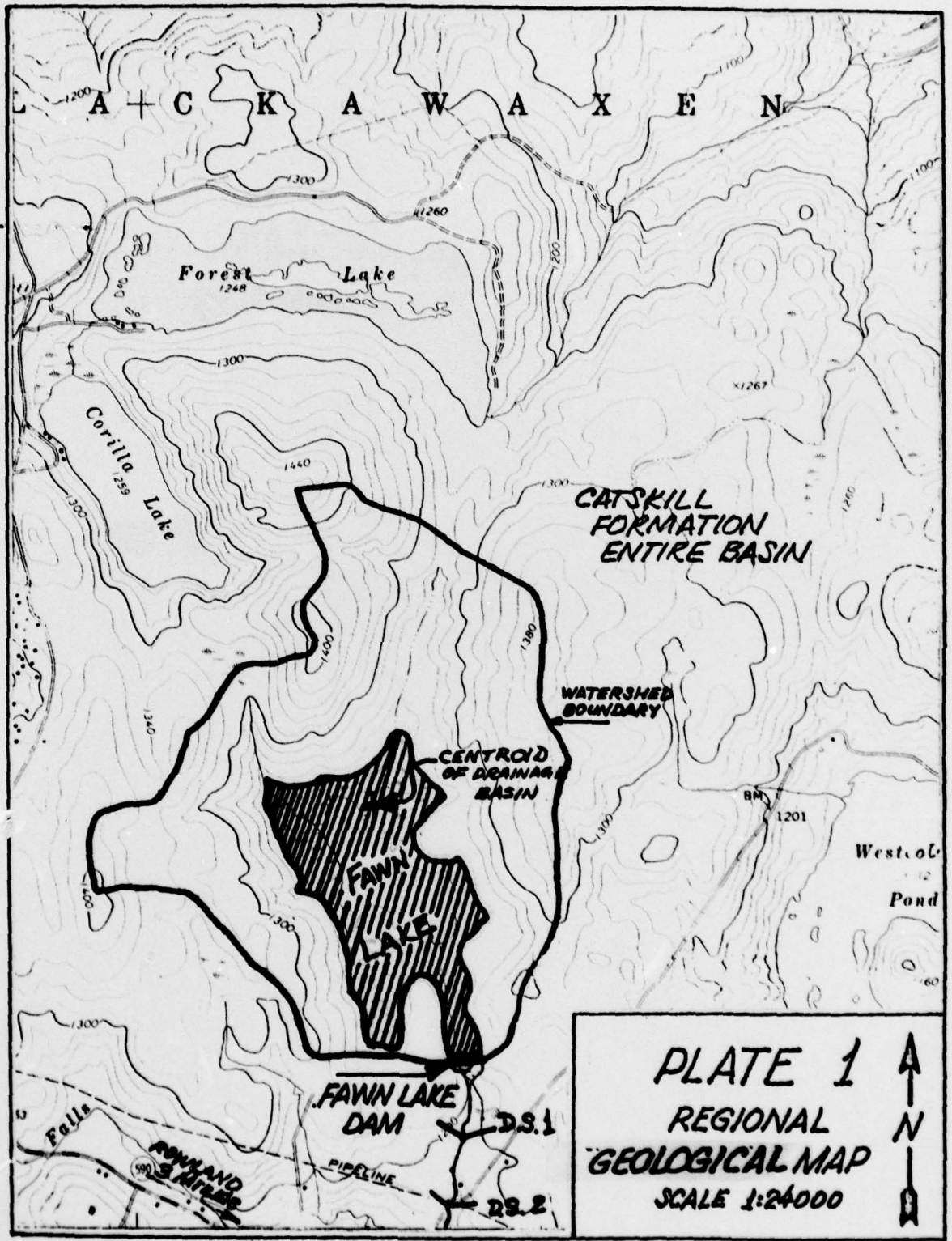


PLATE 1 
 REGIONAL
 GEOLOGICAL MAP
 SCALE 1:24000