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NATIONAL DAM INSPECTION PROGRAM. PANTHER LAKE DAM. DELAWARE RIV--ETC(U)
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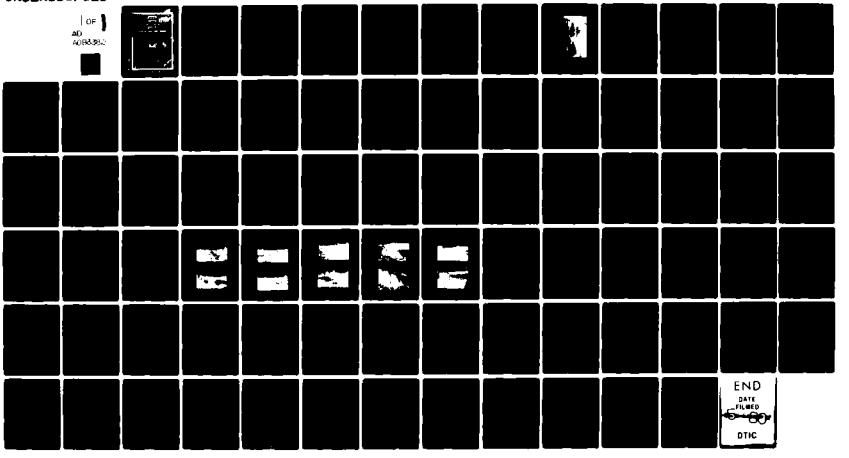

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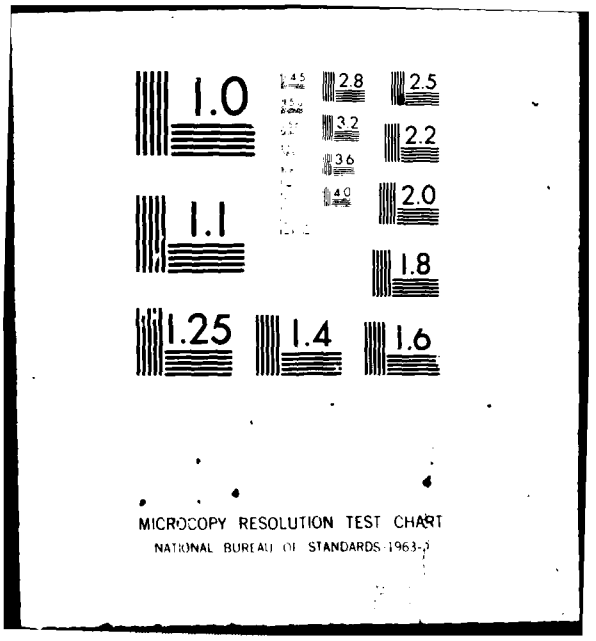
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DELAWARE RIVER BASIN,

FREELING RUN, PIKE COUNTY,

PENNSYLVANIA

PANTHER LAKE DAM

(NDI ID No. PA-00416
DER ID No. 52-157),

PANTHER LAKE PROPERTY OWNERS ASSOCIATION

PHASE I INSPECTION REPORT,

NATIONAL DAM INSPECTION PROGRAM

DACW 31-80-C-0017

Prepared by

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
P.O. Box 1963
Harrisburg, Pennsylvania 17105

For

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

FEBRUARY 1980

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 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.

DELAWARE RIVER BASIN

FREELING RUN, PIKE COUNTY

PENNSYLVANIA

PANTHER LAKE DAM

NDI ID No. PA-00416
DER ID No. 52-157

PANTHER LAKE PROPERTY OWNERS ASSOCIATION

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

FEBRUARY 1980

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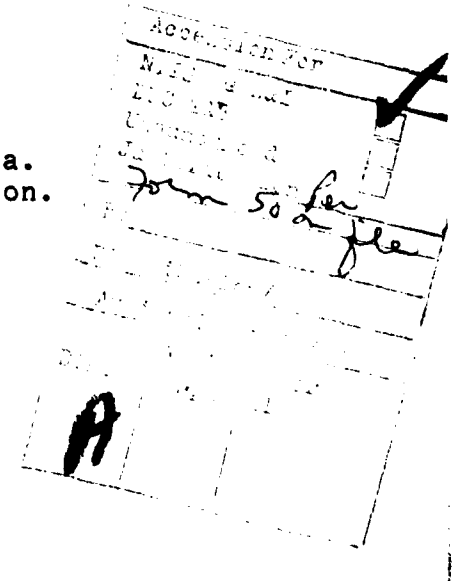
SECTION 4 - Operational Procedures	10
SECTION 5 - Hydrology and Hydraulics	11
SECTION 6 - Structural Stability	13
SECTION 7 - Assessment, Recommendations, and Proposed Remedial Measures	15

APPENDICES

Appendix	Title
A	Checklist - Engineering Data.
B	Checklist - Visual Inspection.
C	Photographs.
D	Hydrology and Hydraulics.
E	Plates.
F	Geology.



PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Panther Lake Dam NDI ID No. PA-00416 DER ID No. 52-157
Size:	Small (19 feet high; 503 acre-ft)
Hazard Classification:	High
Owner:	Panther Lake Property Owners Association Robert Dunbar, Jr., Chairman of Lake and Dam Committee P.O. Box 473 Martinsville, N.J. 08836
State Located:	Pennsylvania
County Located:	Pike
Stream:	Freeling Run
Date of Inspection:	24 October 1979

Based on visual inspection, available records, calculations, past operational performance, and according to criteria established for these studies, Panther Lake Dam is judged to be in good condition. The spillway will pass about 60 percent of the Probable Maximum Flood (PMF) without overtopping of the dam. Based on the criteria and downstream conditions, the Spillway Design Flood (SDF) is the 1/2 PMF. Since the dam can pass the SDF, the spillway capacity is rated as adequate.

No stability problems were evident for the embankment or the appurtenant structures at the time of the visual inspection.

The ability of the outlet works to function is unknown because it has not been operated recently.

Maintenance of the dam and appurtenant structures is inadequate.

The following remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, without delay:

(1) Ensure the operational adequacy of the outlet works and operate the gate at regular intervals.

(2) Remove trees and brush from the embankment and the spillway outlet channel.

In addition, the Owner should institute the following operational and maintenance procedures:

(1) Develop a detailed emergency operation and warning system for Panther Lake Dam.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Panther Lake Dam.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) Institute an inspection program such that the dam is inspected frequently. As presently required by the Commonwealth, the inspection program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary.

(5) Institute a maintenance program so that all features of the dam are properly maintained.

PANTHER LAKE DAM

Submitted by:

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

FREDERICK FUTCHKO
Project Manager, Dam Section

Date: 21 March 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 10 APR 1980

PANTHER LAKE DAM

Overview

DELAWARE RIVER BASIN

FREELING RUN, PIKE COUNTY

PENNSYLVANIA

PANTHER LAKE DAM

NDI ID No. PA-00416
DER ID No. 52-157

PANTHER LAKE PROPERTY OWNERS ASSOCIATION

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

FEBRUARY 1980

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. 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. Dam and Appurtenances. Panther Lake Dam is a homogeneous, earthfill embankment. It is about 19 feet high at its maximum section and is 665 feet long, including the spillway. The embankment is founded on earth.

The spillway is located at the right abutment and consists of an approach channel, a concrete weir, a stilling basin, and an outlet channel. The crest length is 67.2 feet. The spillway crest is 4 feet lower than the top of the dam.

The outlet works is located at the maximum section of the embankment and consists of an intake structure, a 30-inch diameter reinforced concrete conduit, and an outlet structure. A sluice gate is on the intake structure. The gate stem is supported at intervals along the upstream slope, and the gate operating mechanism is on the top of the dam.

The various features of the dam are shown on the Photographs in Appendix C and on the Plates in Appendix E. A description of the geology is included in Appendix F.

b. Location. Panther Lake Dam is located on Freeling Run in Greene Township, Pike County, Pennsylvania, approximately 3 miles south of Newfoundland. Panther Lake Dam is shown on USGS Quadrangle, Newfoundland, Pennsylvania, at latitude N 41° 15' 50" and longitude W 75° 19' 05". A location map is shown on Plate E-1.

c. Size Classification. Small (19 feet high, 503 acre-feet).

d. Hazard Classification. High hazard. Downstream conditions indicate that a high hazard classification is warranted for Panther Lake Dam (Paragraphs 3.1e and 5.1c (5)).

e. Ownership. Panther Lake Property Owners Association, Robert Dunbar, Jr., Chairman of Lake and Dam Committee, P.O. Box 473, Martinsville, New Jersey 08836.

f. Purpose of Dam. Recreation.

g. Design and Construction History. The dam was designed by F. C. Schoenagel Jr., Civil Engineer, of Greentown, Pa. in 1966. Construction was started late in 1966 and completed in 1967. The Contractor was S. E. Chapman of Lake Ariel, Pa. Supervision of construction was performed by Mr. Schoenagel.

At an unknown time, several cracks developed in the right wall of the stilling basin. The cracks were attributed to frost action, and plans for repair were prepared in 1979. Repairs were in progress at the time of this inspection.

h. Normal Operational Procedure. The pool is maintained at the spillway crest level with excess inflow discharging over the spillway. The outlet works is not used. Spillway discharge flows downstream to the confluence with Wallenpaupack Creek.

1.3 Pertinent Data.

a.	Drainage Area. (square miles)	1.9
b.	Discharge at Damsite. (cfs.)	
	Maximum known flood at damsite	Unknown.
	Outlet works at maximum pool elevation	114
	Spillway capacity at maximum pool elevation	2,100
c.	Elevation. (feet above msl.)	
	Top of dam	1729.0
	Maximum pool	1729.0
	Normal pool (spillway crest)	1725.0
	Upstream invert outlet works	1712.0
	Downstream invert outlet works	1710.5
	Streambed at toe of dam	1710.5
d.	Reservoir Length. (miles)	
	Normal pool	0.63
	Maximum pool	0.69
e.	Storage. (acre-feet)	
	Normal pool	276
	Maximum pool	503
f.	Reservoir Surface. (acres)	
	Normal pool	50
	Maximum pool	64
g.	Dam.	
	Type	Homogeneous earthfill.

g.	Dam. (cont'd.)	
	Length (feet)	598
	Height (feet)	19
	Topwidth (feet)	15
	Side Slopes Upstream Downstream	 1V on 2.5H 1V on 2H
	Zoning	None.
	Cutoff	Shallow cutoff trench.
	Grout Curtain	None.
h.	Diversion and Regulating Tunnel.	None.
i.	Spillway. Type	Concrete weir.
	Length of Weir (feet)	67.2
	Crest Elevation	1725.0
	Upstream Channel	Reservoir, vertical concrete walls.
	Downstream Channel	Stilling basin and riprap-lined channel.
j.	Regulating Outlets. Type	One 30-inch diameter reinforced concrete pipe.
	Length (feet)	86

j. Regulating Outlets. (cont'd.)

Closure	Sluice gate at intake structure at upstream end.
Access	Top of dam.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. Design data available for review included the following: approved design drawings and specifications; foundation data from test pits; and the permit application report.

b. Design Features. The project is described in Paragraph 1.2a. The various features of the dam are shown on the Photographs in Appendix C and on Plates E-2 through E-4 in Appendix E. The embankment is shown on Photographs A through D. The spillway is shown on Photographs E and F. The outlet works is shown on Photographs G and H.

c. Design Considerations. Hydraulic and structural design considerations for the spillway weir are covered in Sections 5 and 6, respectively. For the dam, nothing was noted in the review of the design data that would cause concern.

2.2 Construction.

a. Data Available. Construction data available for review included construction progress reports prepared by the Design Engineer and construction inspection reports prepared by the Commonwealth.

b. Construction Considerations. The Commonwealth inspected the foundations for the dam and the spillway structures and judged them to be satisfactory. A final inspection of the project by the Commonwealth indicated that the work was completed in a satisfactory manner.

2.3 Operation. There are no records of operation.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dams and Waterway Management, Department of Environmental Resources, Commonwealth of Pennsylvania (PennDER). The Owner was not available for information during the visual inspection. Information was obtained later through telephone conversations with the Chairman of the Lake and Dam Committee and with the Engineer who designed and supervised construction of the dam.

b. Adequacy. The type and amount of available design data and other engineering data are limited, and the assessment must be based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam is good. Deficiencies were observed as noted below. A sketch of the dam with the locations of deficiencies is presented on Exhibit B-1 in Appendix B. Survey information acquired for this Report is summarized in Appendix B. On the day of the inspection, the pool was 0.1 foot above spillway crest.

b. Embankment. The top of the dam is covered with high grass and weeds (Photograph A). The measured average topwidth is 15 feet. The survey performed for this inspection indicated that all portions of the top of the embankment are at or above the design elevation.

The exposed portion of the upstream slope is protected by riprap, but it is overgrown with brush and small trees (Photographs A and B). At the surveyed section, the exposed portion of the slope measured approximately 1V on 2.5H.

The downstream slope of the dam is covered with grass and high weeds (Photographs C and D). No other deficiencies were apparent. The downstream slope at the maximum section is approximately 1V on 2.2H.

c. Appurtenant Structures. The spillway weir and stilling basin are generally in good condition (Photograph E). The right sidewall of the stilling basin is cracked at several locations, but no tilting or displacement has occurred. Repairs were in progress at the time of the inspection (Photograph E). The repairs consist of installing a drain behind the wall and repairing the cracks. Water was flowing from the right hillside above the area where repairs were being made.

The spillway outlet channel is excavated into earth. The channel is lined with riprap. Substantial amounts of high weeds and brush are growing in the outlet channel (Photograph F).

The outlet works consists of a submerged intake structure, a sluice gate with its operating mechanism at the top of the dam, a 30-inch diameter reinforced concrete outlet conduit, and a small concrete outlet structure. The Owner was not available during the inspection, so the sluice gate could not be operated. Later conversations with the Owner indicated that the handle for the operating mechanism is missing and that the gate has not been opened since the dam was completed. The gate operating mechanism appeared to be in satisfactory condition, but the exposed portion of the stem is rusty (Photograph G). The gate was sealed and had no leakage. Both the outlet conduit and the outlet structure are in satisfactory condition (Photograph H). Some high weeds and brush are growing in the outlet channel.

d. Reservoir Area. The watershed area is about 90 percent wooded and about 10 percent grassland. Only a minor amount of development is present. Lake Russell Dam, a 21-foot high dam, is located within the watershed about 1.3 miles upstream from Panther Lake Dam (Photographs I and J). Data for Lake Russell Dam obtained during the visual inspection are included in Appendix B.

e. Downstream Channel. The valley downstream from Panther Lake Dam is relatively narrow and steep. The confluence of Freeling Run with Wallenpaupack Creek is about 1.3 miles downstream. One permanent dwelling and one summer cottage are located between the dam and the confluence. The dwelling is 0.3 mile from the dam. It was estimated that the dwelling would be flooded, with a resultant loss of life, if Panther Lake Dam were to fail. Damage to one paved roadway would occur, and some property damage along Wallenpaupack Creek is also possible.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at the spillway crest level with excess inflow discharging over the spillway and into the downstream channel. The outlet works is not used.

4.2 Maintenance of Dam. There are no established procedures for maintenance of the dam. Some maintenance work has been performed on an as-needed basis. There is no program of regular inspection.

4.3 Maintenance of Operating Facilities. The outlet works is not maintained.

4.4 Warning Systems in Effect. The Owner has no emergency operating and warning system.

4.5 Evaluation of Operational Adequacy. Although the Owner does perform some maintenance, the current program is not adequate. Inspections are necessary to detect hazardous conditions at the dam. An emergency operation and warning system is necessary to reduce the risk of dam failure should adverse conditions develop and to prevent loss of life should the dam fail.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The available data indicates that the spillway was designed to pass the Commonwealth's Curve "C" discharge for a 1.6 square mile drainage area. The design discharge indicated in the records is 2,090 cfs. Using the design dimensions, the design discharge coefficient is 3.9. This coefficient is considered reasonable and was used in computations for this Report. The drainage area computed and used for this study was determined from recent USGS mapping and is 1.9 square miles, which is about 19 percent greater than the design value of 1.6 square miles.

b. Experience Data. No records of maximum pool levels were available.

c. Visual Observations.

(1) General. The visual inspection of Panther Lake Dam, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.

(2) Embankment. There are no low areas on the top of the dam. The spillway design head of 4 feet is available under existing conditions.

(3) Appurtenant Structures. The measured spillway crest length is 67.2 feet, which is slightly greater than the design length of 67.0 feet. The actual length was used in computing spillway capacity.

The spillway outlet channel has considerable amounts of brush and high weeds. Such growth reduces the hydraulic efficiency of the channel and can cause damage to the riprap lining. The brush does not affect the capacity of the spillway.

The ability of the outlet works to function is uncertain. It has not been operated since the dam was constructed.

(4) Reservoir Area. Lake Russell Dam, located 1.3 miles upstream, does affect the hydrology of Panther Lake Dam. Its effects have been included in the hydrologic analysis. Lake Russell Dam controls about 0.7 square mile of the 1.9-square mile watershed of Panther Lake Dam.

(5) Downstream Conditions. No conditions were observed downstream from the dam that would reduce the hydraulic capacity of the spillway. Failure of Panther Lake Dam would probably cause flooding with resultant loss of life at one dwelling located along Freeling Run and cause damage to two roadways. The downstream conditions indicate that a high hazard classification is warranted for Panther Lake Dam.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (Small) and hazard potential (High) of Panther Lake Dam is between one-half of the Probable Maximum Flood (PMF) and the PMF. Because of the downstream conditions, the 1/2 PMF is selected as the SDF for Panther Lake Dam. The watershed was modeled with the HEC-1DB computer program. A description of the model is included in Appendix D. The assessment of the dam is based on existing conditions, and the effects of future development are not considered.

(2) Summary of Results. Pertinent results are tabulated at the end of Appendix D. The analysis reveals that Panther Lake Dam can pass about 60 percent of the PMF before overtopping of the dam occurs.

(3) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix D. Since the spillway can pass the 1/2 PMF, which is the SDF for Panther Lake Dam, the spillway capacity is rated as adequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Panther Lake Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for the various features.

(2) Embankment. The growth of trees and brush on the upstream slope is undesirable. Root systems can loosen embankment material, displace slope protection, and eventually create paths along which seepage and piping (internal erosion) might occur. High weeds on the slopes are also undesirable because they hinder inspections.

(3) Appurtenant Structures. Construction of drainage facilities behind the right wall of the stilling basin was in progress at the time of the inspection. The presence of flowing water from the hillside above the area to be repaired indicates that drainage facilities, as are now being constructed, are warranted. Details of the proposed repairs are shown on Plate E-5.

b. Design and Construction Data. The Design Engineer stated that no stability analyses were performed for the embankment or the spillway structures. Stability analyses for the embankment are beyond the scope of this Report. The spillway weir, which has a significant depth of embedment, behaves partially as a gravity structure and partially as an embedded cantilever structure. Detailed analysis of the stability of this structure is beyond the scope of this Report. Based on inspection and approximate methods of analysis, however, it is judged that the weir would be stable for the expected loading conditions.

c. Operating Records. There are no formal records of operation. According to available data, no stability problems have occurred over the operational history of the dam.

d. Post-construction Changes. The only post-construction change is the construction of a drainage system behind the right wall of the spillway. The work is currently in progress.

e. Seismic Stability. Panther Lake Dam is located in Seismic Zone 1. Earthquake loadings are not considered to be significant for small dams located in Zone 1 when there are no readily apparent stability problems at the dam. Since there were no readily apparent stability problems at the dam, its ability to resist earthquake loadings is assumed to be adequate.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on available records, visual inspection, calculations, and past operational performance, Panther Lake Dam is judged to be in good condition. The spillway will pass about 60 percent of the PMF before overtopping of the dam occurs. Based on the criteria and the downstream conditions, the Spillway Design Flood is the 1/2 PMF. Since the spillway can pass the SDF, the spillway capacity is rated as adequate.

(2) No stability problems were evident for the embankment or appurtenant structures at the time of the visual inspection.

(3) The ability of the outlet works to function is unknown because it has not been operated recently.

(4) Maintenance of the dam and appurtenant structures is inadequate.

(5) A summary of the features and observed deficiencies is listed below:

Feature and Location	Observed Deficiency
Embankment:	Brush and small trees on upstream slope; high weeds on downstream slope.
Spillway:	Cracks in right wall (repairs in progress); brush and weeds in outlet channel.
Outlet Works:	Handle for gate operating mechanism missing; operational adequacy uncertain.

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented without delay.

d. Necessity for Further Investigations. In order to accomplish the remedial measures outlined in Paragraph 7.2, further investigations by the Owner will not be required.

7.2 Recommendations and Remedial Measures.

a. The following remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, without delay:

(1) Ensure the operational adequacy of the outlet works and operate the gate at regular intervals.

(2) Remove trees and brush from the embankment and the spillway outlet channel.

b. In addition, the Owner should institute the following operational and maintenance procedures:

(1) Develop a detailed emergency operation and warning system for Panther Lake Dam.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Panther Lake Dam.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) Institute an inspection program such that the dam is inspected frequently. As presently required by the Commonwealth, the inspection program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary.

(5) Institute a maintenance program so that all features of the dam are properly maintained.

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: Panther Lake Dam

NDI ID NO.: PA-00416 DER ID NO.: 52-157

Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	Design drawings only. See Plates in Appendix E.
REGIONAL VICINITY MAP	See Location Map, Plate E-1.
CONSTRUCTION HISTORY	Designed 1966 and constructed 1966-1967. Design and supervision of construction by F. C. Schoenagel. Repairs in progress October 1979.
TYPICAL SECTIONS OF DAM	Available. See Plates in Appendix E.
OUTLETS: Plan Details Constraints Discharge Ratings	Plan and details in Appendix E. No discharge ratings.

A-1

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	None.
DESIGN REPORTS	Permit application report prepared by Commonwealth in 1966.
GEOLOGY REPORTS	Brief description in permit application report.
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	Design discharge = 2,090 cfs (from permit application report). No stability analyses for dam. No seepage studies.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	Test pits. Description of findings in permit application report.
POSTCONSTRUCTION SURVEYS OF DAM	None.

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	Onsite.
MONITORING SYSTEMS	None.
MODIFICATIONS	Installation of drain behind stilling basin wall in progress October 1979.
HIGH POOL RECORDS	None.
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	None.

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	None.
SPILLWAY: Plan Sections Details	See Plates in Appendix E.
OPERATING EQUIPMENT: Plans Details	See Plates in Appendix E.
PREVIOUS INSPECTIONS Dates Deficiencies	None.

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: Panther Lake Dam County: Pike State: Pennsylvania

NDI ID No.: PA-00416 DER ID No.: 52-157

Type of Dam: Homogeneous Earthfill Hazard Category: High

Date(s) Inspection: 24 October 1979 Weather: Clear Temperature: 40°

Rain occurred on evening prior to inspection.

Pool Elevation at Time of Inspection: 1725.1 msl/Tailwater at Time of Inspection: 1710.7 msl

Inspection Personnel:

A.H. Whitman (GFCC) J. Boswell (Penn DER)

D.R. Ebersole (GFCC)

D.B. Wilson (GFCC) Recorder

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None apparent.	High weeds and brush hindered inspection.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	None observed.	
CREST ALIGNMENT: Vertical Horizontal	See survey data at end of Appendix.	
RIPRAP FAILURES	No failures. Riprap in satisfactory condition.	

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	No observed deficiencies.	
ANY NOTICEABLE SEEPAGE	None.	
STAFF GAGE AND RECORDER	None.	
DRAINS	None.	
TREES / BRUSH	Upstream slope overgrown with brush and small trees. High weeds on top and on downstream slope.	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	No deficiencies.	
APPROACH CHANNEL	Reservoir area; no obstructions.	
DISCHARGE CHANNEL	Stilling basin and channel excavated into earth. Sides of channel are riprapped.	Excavated channel overgrown with weeds and brush for entire length.
BRIDGE AND PIERS	None.	
STILLING BASIN RIGHT SIDE WALL	Several cracks; repair work in progress (installing drain behind wall). No tilting or displacement.	Excavation indicates no wall drains were present. Substantial flow of water from right hillside above right abutment.

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	30-inch Dia. RCP. Conduit inspected - no deficiencies.	
INTAKE STRUCTURE	Submerged - could not inspect.	
OUTLET STRUCTURE	Small outlet structure at end of conduit. No deficiencies.	
OUTLET CHANNEL	Minor amount of weeds and brush.	
EMERGENCY GATE	Gate operator at top of dam No apparent deficiencies but not operated. Stem rusty.	Gate was tightly sealed and had no leakage. Owner was not on site during inspection.

RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	No evidence of instability.	
SEDIMENTATION	None reported.	
WATERSHED DESCRIPTION	Approx. 90% wooded with only minor development Lake Russell Dam located 1.3 miles upstream.	See survey data at end of Appendix for information on Lake Russell Dam (DER I.D. 52-133)

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: **Obstructions** **Debris** **Other**	No obstructions that would affect dam.	Bridge located 0.3 mile downstream. Opening is 7' high x 14.5' wide. Deck 8.3' above streambed.
SLOPES	No evidence of instability.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	One dwelling 0.3 mile downstream. One cottage 0.4 mile downstream. Confluence with Wallenpaupack Creek 1.3 miles downstream.	Estimate that one dwelling would be flooded by failure.

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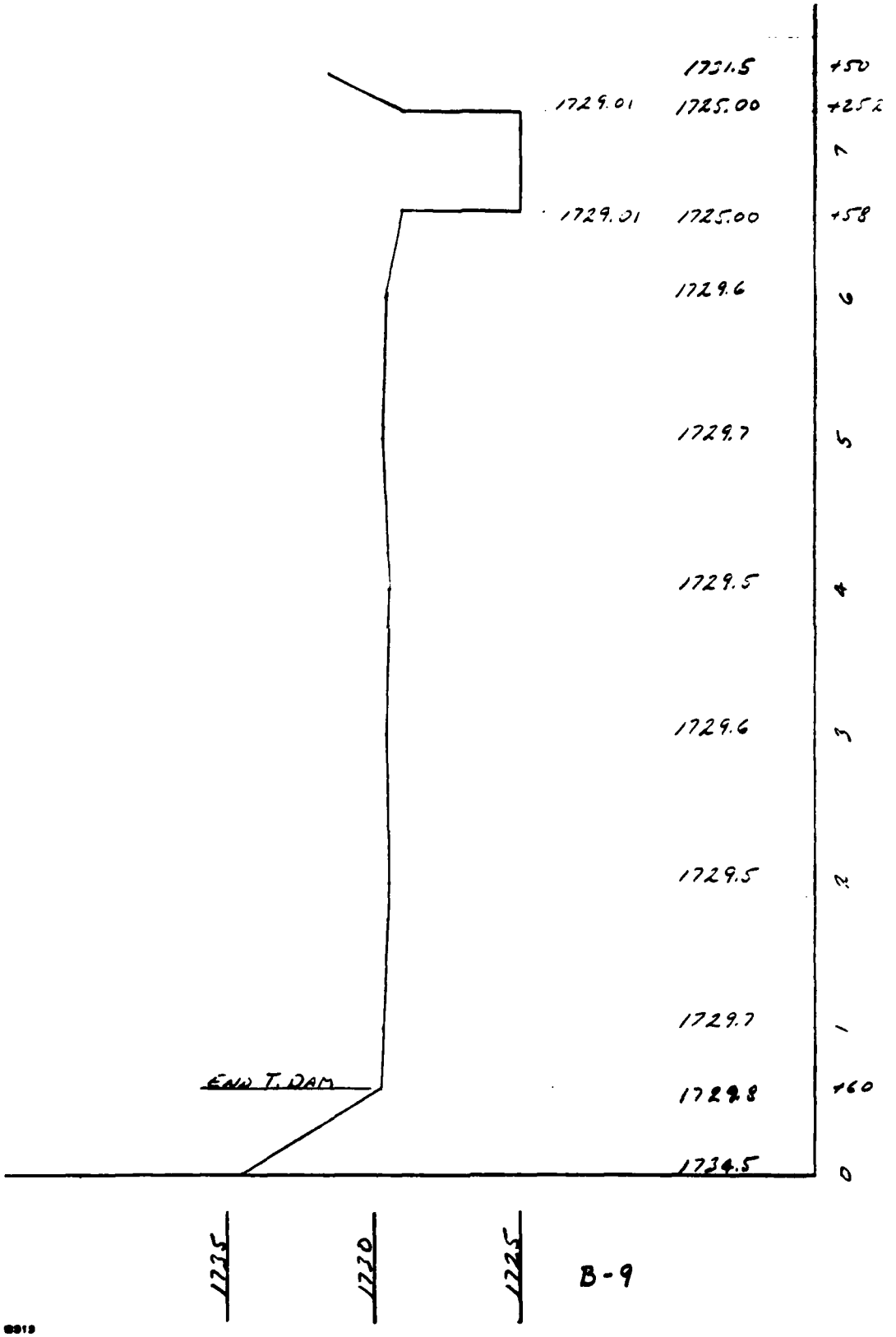

PANTHER LAKE DAM
PROFILE - TOP of DAM

8913

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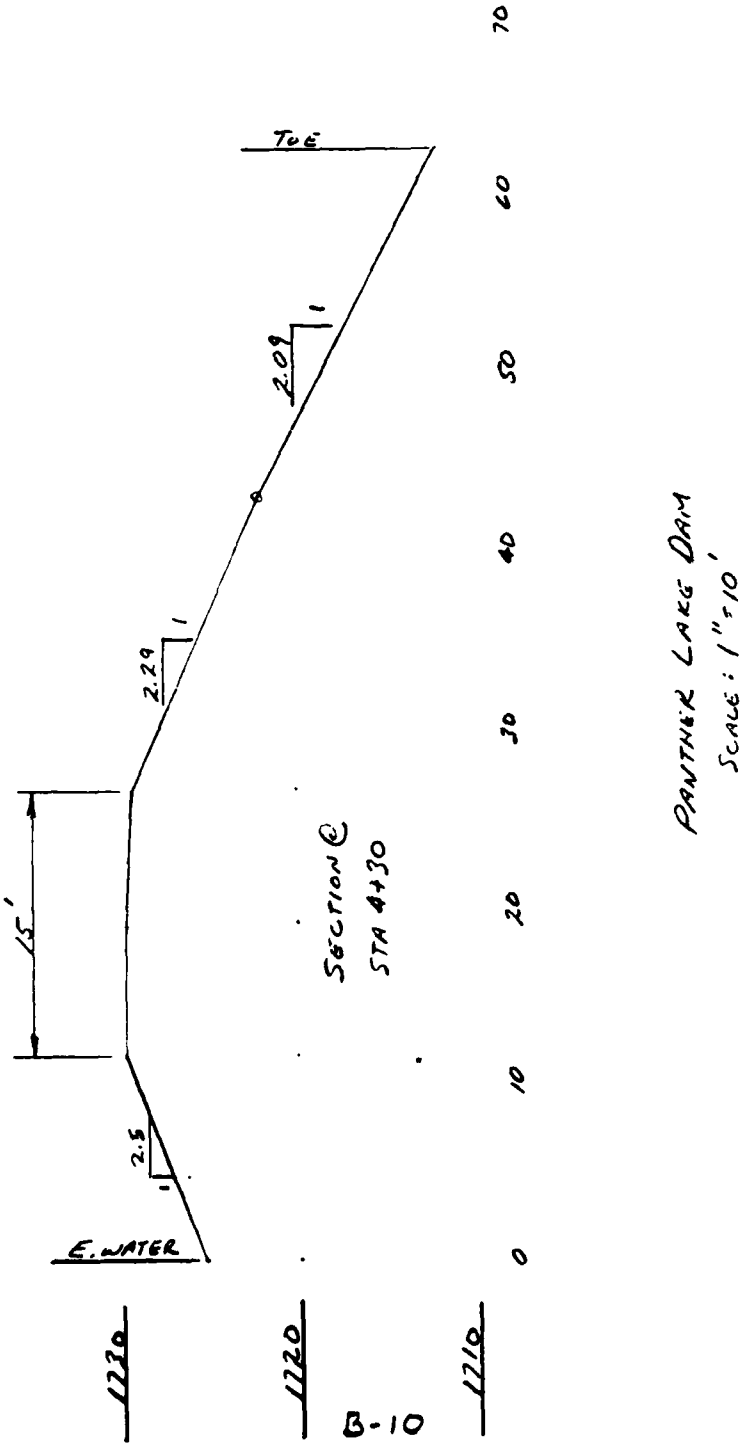

SECTION ℄
STA 4+30

PANTHER LAKE DAM
SCALE: 1" = 10'

B-10

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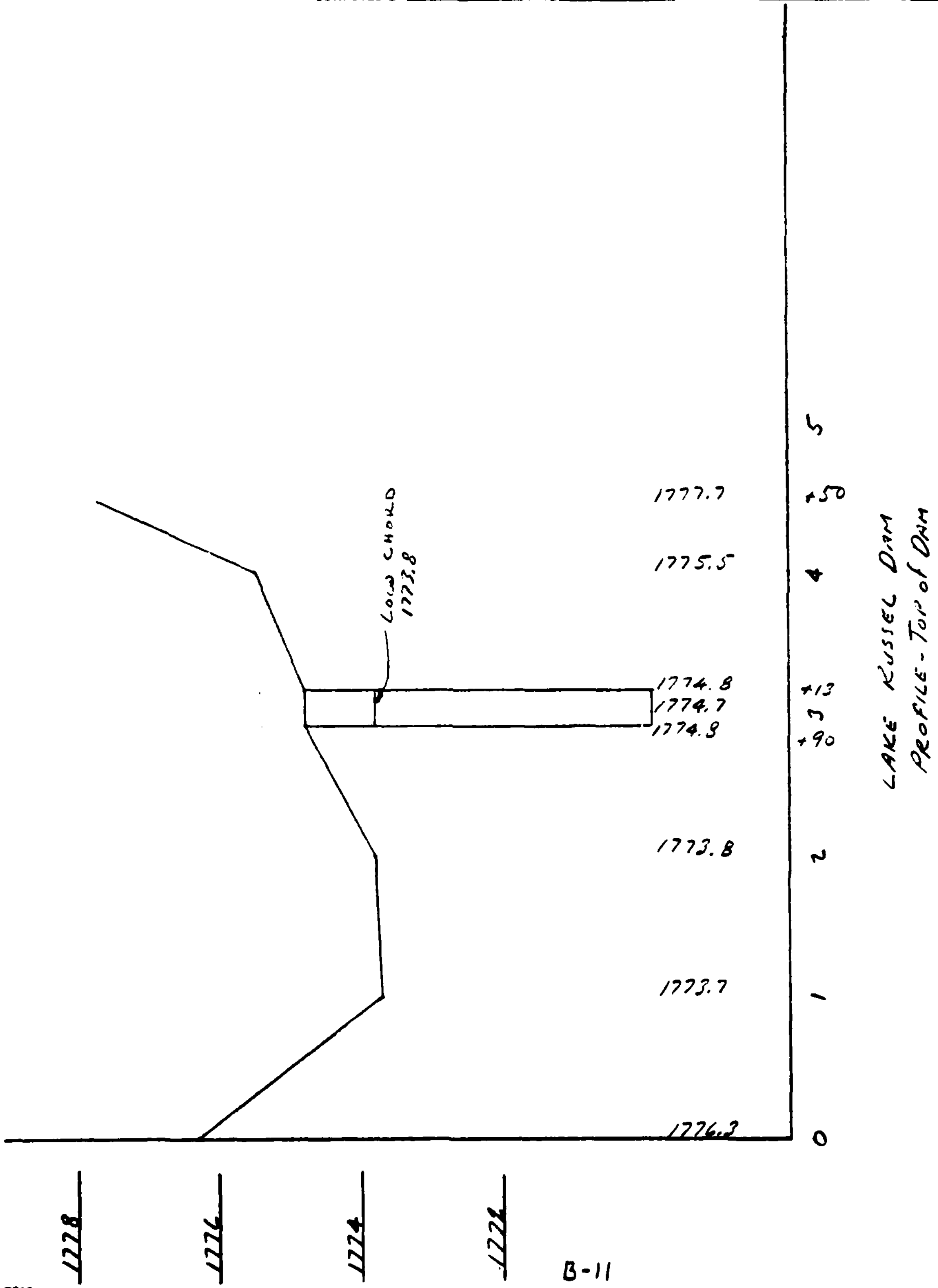

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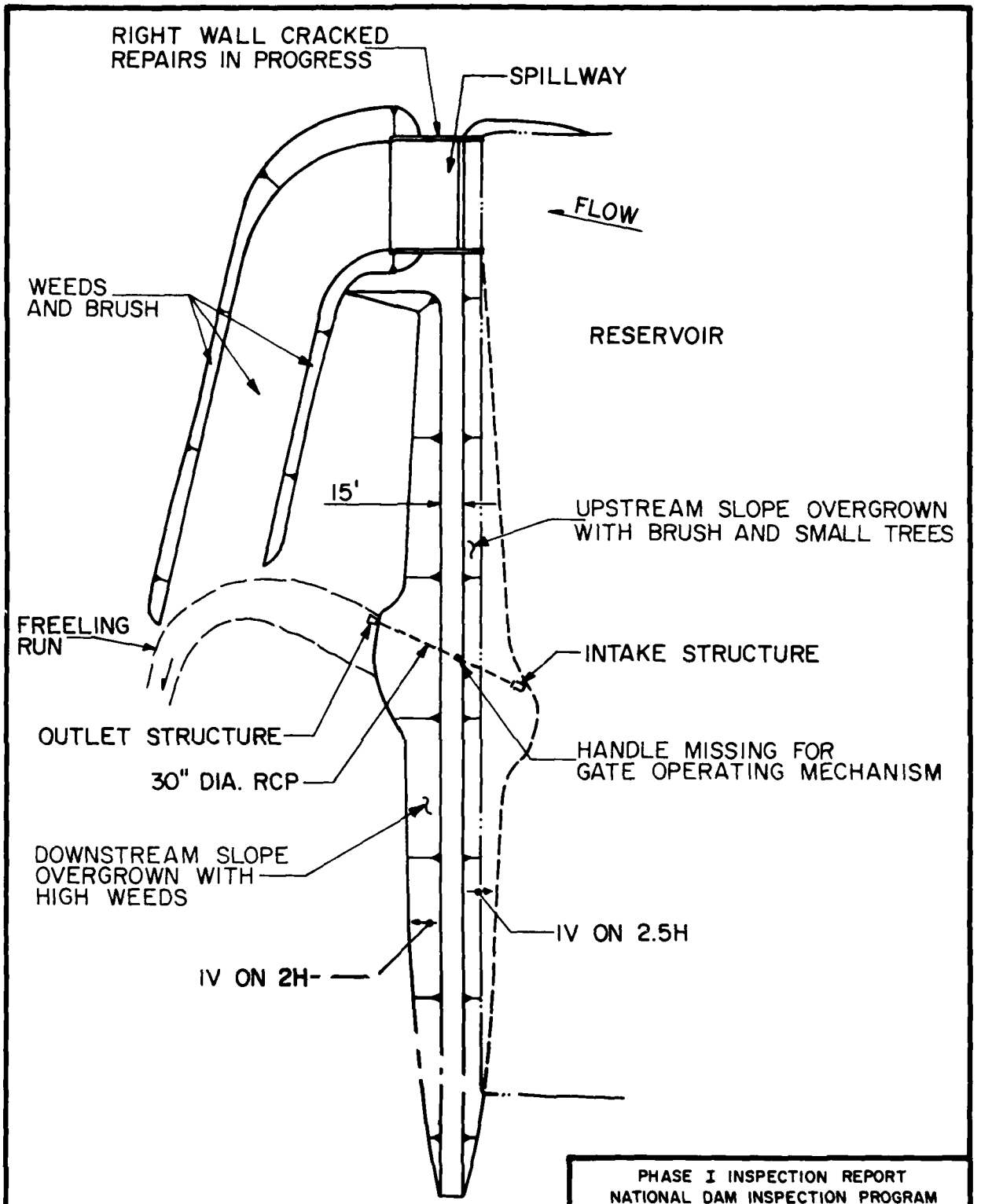


NOT TO SCALE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PANTHER LAKE DAM

PANTHER LAKE PROPERTY
OWNERS ASSOCIATION

RESULTS OF VISUAL INSPECTION

FEBRUARY 1980 EXHIBIT B-1

APPENDIX C

PHOTOGRAPHS

A. Top of Dam.

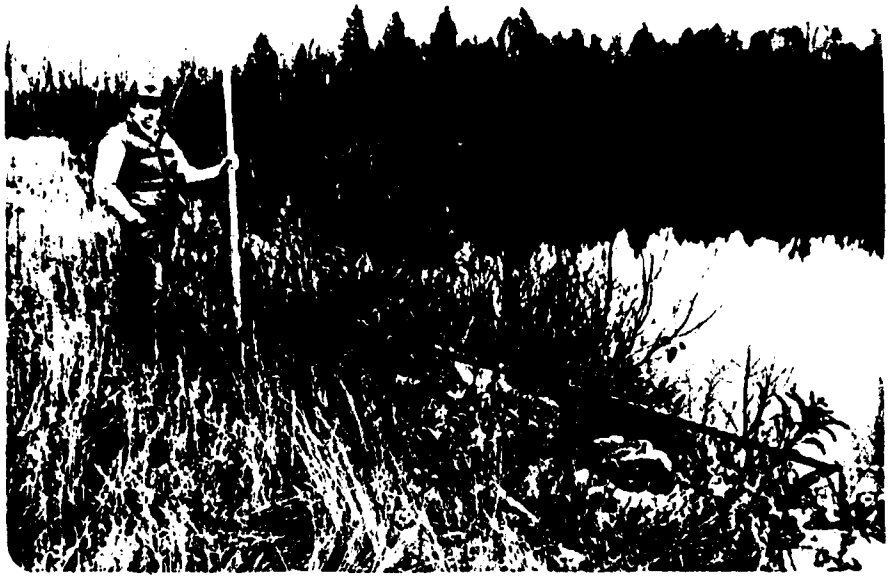
B. Upstream Slope

C. Downstream Slope.

D. Downstream Slope.

E. Spillway.

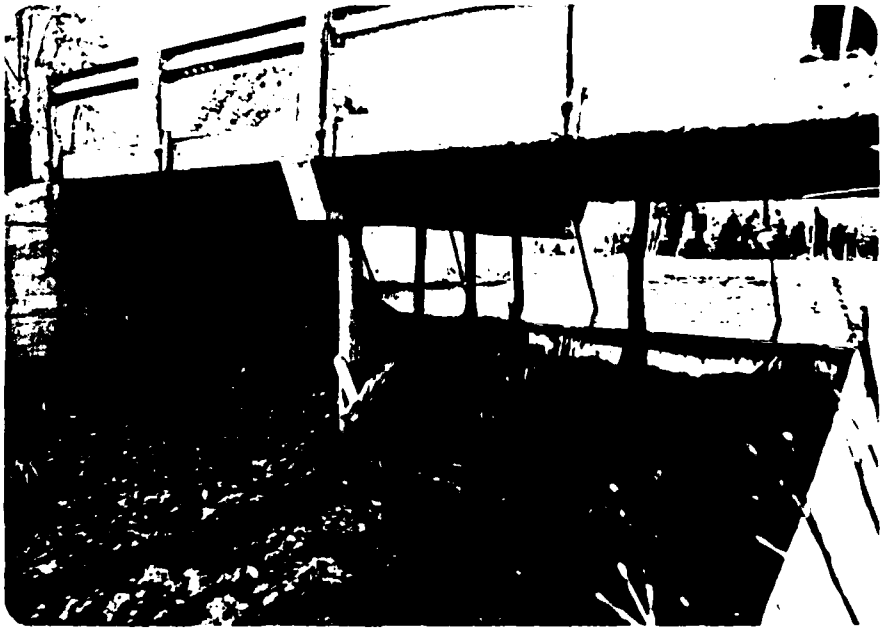
F. Spillway Outlet Channel.



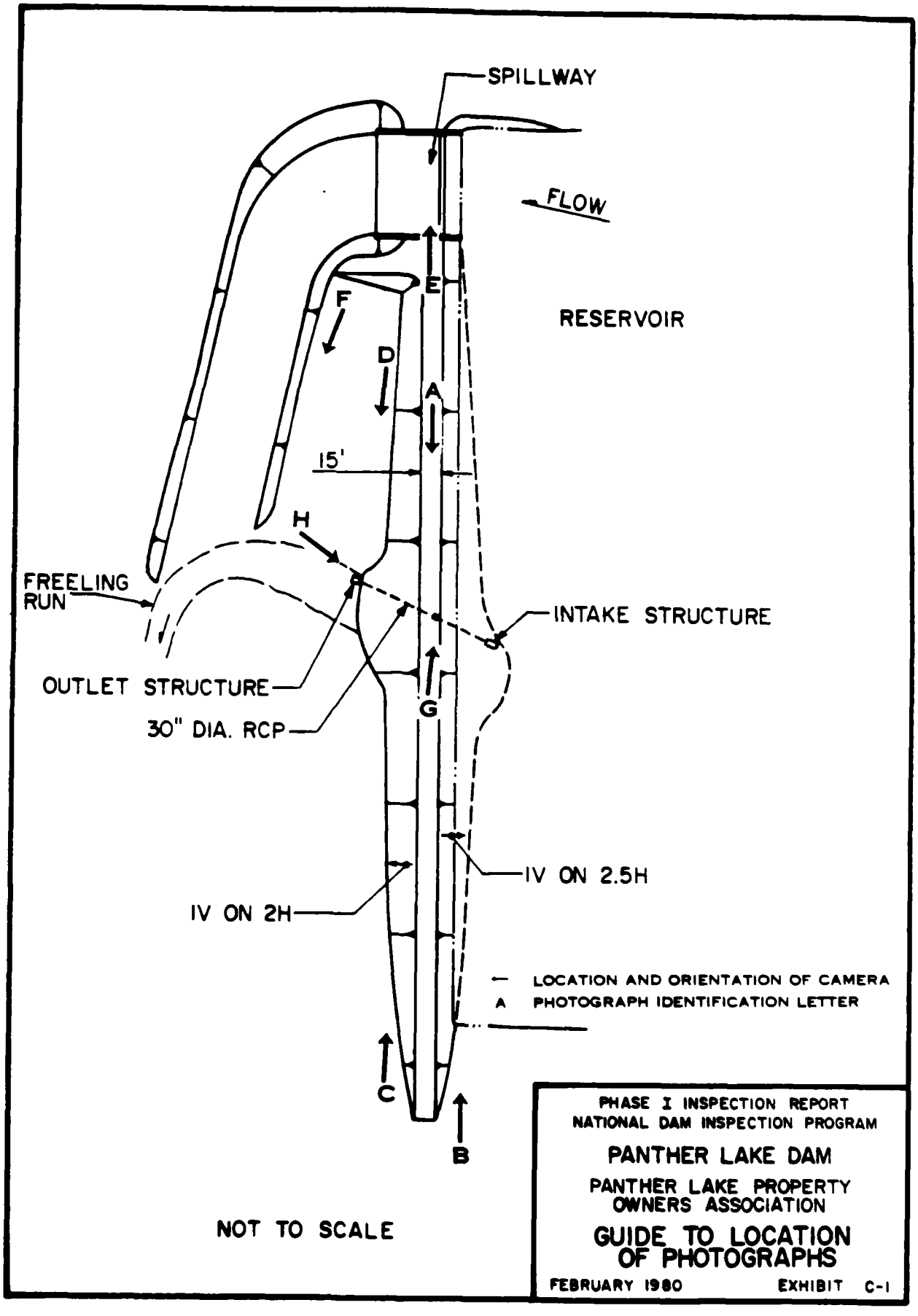
G. Gate Operating Mechanism.

H. Outlet Conduit.

I. Lake Russell Dam. Located 1.3 Miles Upstream from Panther Lake Dam.



J. Spillway of Lake Russell Dam.



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PANTHER LAKE DAM

PANTHER LAKE PROPERTY
OWNERS ASSOCIATION

GUIDE TO LOCATION
OF PHOTOGRAPHS

FEBRUARY 1980 EXHIBIT C-1

APPENDIX D

HYDROLOGY AND HYDRAULICS

APPENDIX D

HYDROLOGY AND HYDRAULICS

Spillway Capacity Rating:

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

Description of Model:

If the Owner has not developed a PMF for the dam, the watershed is modeled with the HEC-1DB computer program, which was developed by the U.S. Army Corps of Engineers. The HEC-1DB computer program calculates a PMF runoff hydrograph (and percentages thereof) and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure. By modifying the rainfall criteria, it is also possible to model the 100-year flood with the program.

APPENDIX D

Delaware River Basin
Name of Stream: Freeling Run
Name of Dam: Panther Lake Dam
NDI ID No.: PA-00416
DER ID No.: 52-157
Latitude: N 41° 15' 50" Longitude: W 75° 19' 05"
Top of Dam Elevation: 1729.0
Streambed Elevation: 1710.4 Height of Dam: 18.6 ft
Reservoir Storage at Top of Dam Elevation: 503 acre-ft
Size Category: Small
Hazard Category: High (see Section 5)
Spillway Design Flood: SDF varies from 1/2 PMF to PMF
Select 1/2 PMF based on downstream cond'l for.

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
				DER ID No. 52-133
Lake Russell Dam	1.3	21		

DOWNSTREAM DAMS

	NONE.			

Name of Stream: Freeling Run Delaware River Basin
Name of Dam: Panther Lake Dam

DETERMINATION OF PMF RAINFALL & UNIT HYDROGRAPH

UNIT HYDROGRAPH DATA:

Sub-area	Drainage Area (square miles)	Cp (1)	Ct (2)	L miles (3)	L_{ca} miles (4)	L' miles (5)	Tp hours (6)	Map Area (7)	Plate (8)
A-1	0.70	0.45	1.23	1.17	0.53	—	1.07	1	A
A-2	1.22	0.45	1.23	1.70	0.70	—	1.30	1	A
Total	1.92								

(See Sketch on Sheet D-4)

(1) & (2): Snyder Unit Hydrograph coefficients supplied by Baltimore District, Corps of Engineers on maps and plates referenced in (7) & (8)

The following are measured from the outlet of the subarea:

(3): Length of main watercourse extended to divide

(4): Length of main watercourse to the centroid

The following is measured from the upstream end of the reservoir at normal pool:

(5): Length of main watercourse extended to divide

(6): $Tp=C_t \times (L \times L_{ca})^{0.3}$, except where the centroid of the subarea is located in the reservoir. Then $Tp=C_t \times (L')^{0.6}$

Initial flow is assumed at 1.5 cfs/sq. mile

Computer Data: QRCSN = -0.05 (5% of peak flow)
RTIOR = 2.0

RAINFALL DATA:

PMF Rainfall Index= 22.0 in., 24 hr., 200 sq. mile.

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone:	N/A	1
Geographic Adjustment Factor:	N/A	1.0
Revised Index Rainfall:	N/A	22.0

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	111
12 hours	123
24 hours	133
48 hours	142
72 hours	N/A
96 hours	N/A

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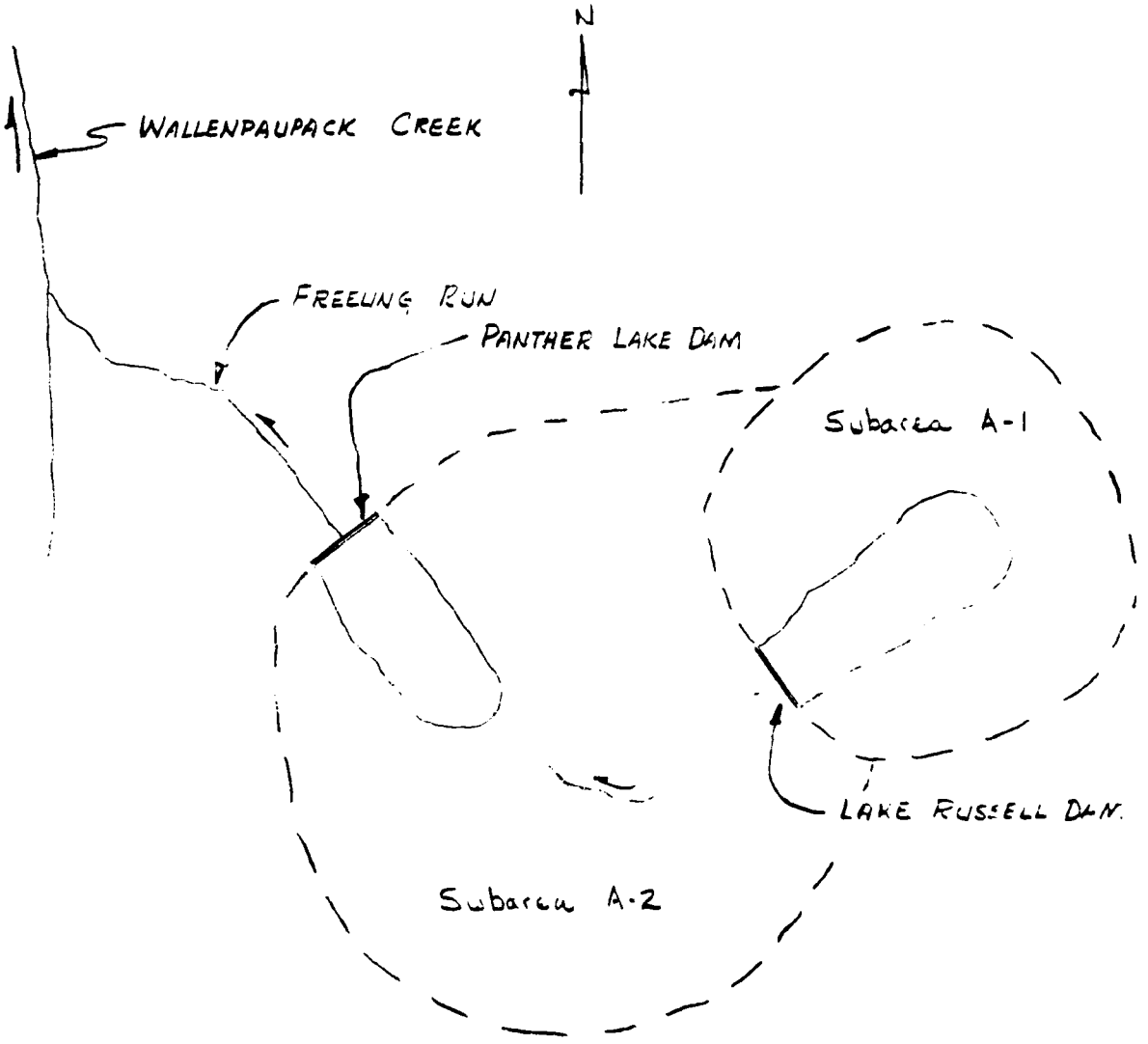

Panther Lake Dam
Sketch of System

NOT TO SCALE

8313

Data for Dam at Outlet of Subarea A-1 (See sketch on Sheet C-4)

Name of Dam: Lake Russell Dam

STORAGE DATA:

Elevation		Area (acres)		Storage million gals	acre-ft		Remarks
1754.1	=ELEVO*	0		0	0		
1770.0	=ELEV1⊕	45	=A1	78	239	=S1	Storage at E-EV1 obtained from HEC DEP data.
1773.7		52		136	418		
1780.0	**	65		256	786		
1800.0	**	90		759	2,329		

⊕ ELEV1 obtained from USGS Sheet
* ELEVO = ELEV1 - $(3S_1/A_1)$
** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Normal Pool is 10 percent of subarea watershed.

BREACH DATA: Failure of Lake Russell Dam Not Considered.

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: _____

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) _____ fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = _____ ft., C = ____ Top of Dam El.= ____

HMAX + Top of Dam El. = _____ = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = _____ ft (width of bottom of breach)
Z = _____ (side slopes of breach)
ELBM = _____ (bottom of breach elevation, minimum of zero storage elevation)
WSEL = _____ (normal pool elevation)
T FAIL= _____ mins = _____ hrs (time for breach to develop)

Data for Dam at Outlet of Subarea A-1 (see Sketch on Sheet D-4)

Name of Dam: Lake Russell Dam

SPILLWAY DATA:	Existing Conditions	Design Conditions
Top of Dam Elevation	1773.7	
Spillway Crest Elevation	1769.9	
Spillway Head Available (ft)	3.8	
Type Spillway	Concrete weir: near-ogee	
"C" Value - Spillway	See next sheet	
Crest Length - Spillway (ft)	23	
Spillway Peak Discharge (cfs)	562	
Auxiliary Spillway Crest Elev.	N/A	N/A FOR ANALYSIS OF PANTHER LAKE DAM
Auxiliary Spill. Head Avail. (ft)		
Type Auxiliary Spillway		
"C" Value - Auxiliary Spill. (ft)		
Crest Length - Auxil. Spill. (ft)		
Auxiliary Spillway Peak Discharge (cfs)		
Combined Spillway Discharge (cfs)		

Spillway Rating Curve: See next sheet.

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
1769.9	0	N/A	N/A
1770.5	35		
1771.0	88		
1772.0	231		
1773.0	414		
1773.7	562		
1774.0	630		
1775.0	879		
1776.0	1020		
1780.0	1434		

OUTLET WORKS RATING:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	N/A		
Invert of Inlet			
Type			
Diameter (ft) = D			
Length (ft) = L			
Area (sq. ft) = A			
N			
K Entrance			
K Exit			
K Friction=$29.1N^2L/R^{4/3}$			
Sum of K			
$(1/K)^{0.5} = C$			
Maximum Head (ft) = HM			
$Q = CA\sqrt{2g(HM)}$ (cfs)			
Q Combined (cfs)			

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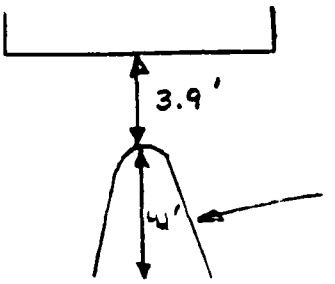
SUBJECT SPILLWAY RATING - LAKE RUSSELL DAM — FILE NO. — SHEET NO. — OF — SHEETS
FOR NATIONAL DAM INSPECTION PROGRAM
COMPUTED BY — DATE — CHECKED BY — DATE

LAKE RUSSELL
Spillway

DOES NOT INCLUDE obstructions IN spillway



— 1773.8

— 1769.9

SHAPE UNCERTAIN
USE C = 3.7

ABOVE POOL ELEV = 1775.0
SWITCH TO ORIFICE FLOW

WEIR : $Q = CL H^{3/2}$ $L = 23$ $C = 3.3$

ORIFICE : $Q = 0.7 \times 3.9 \times 23 \times \sqrt{2g (POOL - 1771.9)}$

POOL	Q (CFS)	
1769.9	0	
1770.5	35	
1771.0	88	
1771.5	154	
1772.0	231	
1772.5	318	
1773.0	414	
1773.5	518	
1773.7	562	
1774.0	630	
1774.5	749	
1775.0	874	
1776.0	1020	← ORIFICE
1780.0	1434	← ORIFICE

8313

Data for Dam at Outlet of Subarea A-2 (See sketch on Sheet L-4)

Name of Dam: Panther Lake Dam

STORAGE DATA:

Elevation		Area (acres)		Storage million gals	acre-ft		Remarks
1708.4	=ELEVO*	0		0	0		
1725.0	=ELEV1	50	=A1	90	276	=S1	Storage at E.E.
1729.0		64		164	503		for Permit
1740.0	**	111		473	1453		

* ELEVO = ELEV1 - $(3S_1/A_1)$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Normal Pool is 6 percent of subarea watershed.

BREACH DATA:

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: Sandy Clay

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) 3 fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = 0.4 ft., C = 3.1 Top of Dam El.= 1729.0

HMAX + Top of Dam El. = 1729.4 = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = 80 ft (width of bottom of breach)
Z = 1 (side slopes of breach)
ELBM = 1710.0 (bottom of breach elevation, minimum of zero storage elevation)
WSEL = 1725.0 (normal pool elevation)
T FAIL= 6 mins = 0.1 hrs (time for breach to develop)

Data for Dam at Outlet of Subarea A-2 (see Sketch on Sheet D-4)

Name of Dam: Panther Lake Dam

SPILLWAY DATA:	Existing Conditions	Design Conditions
Top of Dam Elevation	1729.0	1729.0
Spillway Crest Elevation	1725.0	1725.0
Spillway Head Available (ft)	4.0	4.0
Type Spillway	Concrete ogee	
"C" Value - Spillway*	3.90	3.90
Crest Length - Spillway (ft)	67.2	67.0
Spillway Peak Discharge (cfs)	2,097	2,090
Auxiliary Spillway Crest Elev.	N/A	N/A
Auxiliary Spill. Head Avail. (ft)		
Type Auxiliary Spillway		
"C" Value - Auxiliary Spill. (ft)		
Crest Length - Auxil. Spill. (ft)		
Auxiliary Spillway Peak Discharge (cfs)		
Combined Spillway Discharge (cfs)		

* C value of 3.9 determined from permit report data.

Spillway Rating Curve: $Q = (3.9)(67.2)(H)^{3/2}$

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
		N/A	N/A

OUTLET WORKS RATING:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	1710.5	N/A	N/A
Invert of Inlet	1712.0		
Type	RCP		
Diameter (ft) = D	2.5		
Length (ft) = L	86		
Area (sq. ft) = A	4.9		
N	0.011		
K Entrance	0.5		
K Exit	1.0		
K Friction $=29.1N^2L/R^{4/3}$	0.6		
Sum of K	2.1		
$(1/K)^{0.5} = C$	0.7		
Maximum Head (ft) = HM	17.3		
$Q = CA\sqrt{2g(HM)}$ (cfs)	114		
Q Combined (cfs)	114		

Selected Computer Output

Item	Page
Multi-ratio Analysis :	
Input	D-11
Summary of Peak Flows	D-13
Lake Russell Dam	D-14
Panther Lake Dam	D-15

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  17 JAN 80
**********
    1              A1                                   NATIONAL DAM INSPECTION PROGRAM
    2              A2                                        FREELING RUN
    3              A3                                      PANTHER LAKE
    4              B     300        0       15        0        0        0        0        0       -4        0
    5              B1      5
    6              J       1        9        1
    7              J1      1       .9       .8       .7       .6       .5       .4       .3       .2
    8              K       0        1                                                    1
    9              K1        RUNOFF INTO LAKE RUSSELL
   10              M       1        1      0.7                1.92                                    1
   11              P                22.0      111      123      133      142
   12              T                                                             1.0      .05               .10
   13              W    1.07     0.65
   14              X    -1.5    -0.05      2.0
   15              K       1        1                                                    1
   16              K1        ROUTE THROUGH LAKE RUSSELL
   17              Y                                 1
   18              Y1      1                                                   -1769.9       -1
   19              YA1769.9  1770.5     1771     1772     1773   1773.7     1774     1775     1776     1780
   20              YS      0       35       88      231      414      562      630      874     1020     1634
   21              SA      0       45       65       90
   22              SE1754.1  1770     1780     1800
   23              SS1769.9
   24              SD1773.7
   25              SL      1      100      230      270      365      420      450
   26              SV1773.7  1773.8   1774.8   1774.9   1775.5   1776.3     1780
   27              K       1        2                                                    1
   28              K1        ROUTE PANTHER LAKE
   29              Y                                 1
   30              Y1      1                                                       -1
   31              Y6    .09      .07      .09     1726     1744     3000     .009
   32              Y7      0     1800      190     1760      350     1760      500     1726      550     1726
   33              Y7    720     1760      850     1760     1000     1800
   34              K       0        3                                                    1
   35              K1        UNCONTROLLED RUNOFF INTO PANTHER LAKE
   36              M       1        1     1.22                1.92                                    1
   37              P                22.0      111      123      133      142
   38              T                                                             1.0      .05               .06
   39              W     1.3     0.65
   40              X    -1.5    -0.05      2.0
   41              K       2        3                                                    1
   42              K1        COMBINE RUNOFF INTO PANTHER LAKE
   43              K       1        3                                                    1
   44              K1        ROUTE THROUGH PANTHER LAKE DAM
   45              Y                                 1
   46              Y1      1                                                   -1725
   47              SA      0       50      111
   48              SE1708.4  1725     1760
   49              SS   1725     67.2      3.9      1.5
   50              SD   1729
```

S1 SL 600 600
S2 SV 1720 1740
S3 K 90

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 .90	RATIO 3 .80	RATIO 4 .70	RATIO 5 .60	RATIO 6 .50	RATIO 7 .40	RATIO 8 .30	RATIO 9 .20
HYDROGRAPH AT	1	.70 (1.81)	1	1955. (55.36)	1759. (49.92)	1564. (44.29)	1368. (38.75)	1173. (33.21)	977. (27.68)	782. (22.14)	586. (16.61)	391. (11.07)
ROUTED TO	1	.70 (1.81)	1	1650. (46.73)	1426. (40.39)	1206. (34.15)	984. (27.87)	761. (21.56)	561. (15.88)	433. (12.26)	311. (8.80)	191. (5.42)
ROUTED TO	2	.70 (1.81)	1	1642. (46.49)	1422. (40.26)	1202. (34.03)	981. (27.79)	756. (21.41)	559. (15.82)	432. (12.22)	309. (8.76)	191. (5.40)
HYDROGRAPH AT	3	1.27 (3.16)	1	3060. (86.66)	2756. (77.99)	2448. (69.33)	2142. (60.66)	1836. (52.00)	1530. (43.33)	1224. (34.66)	919. (26.00)	612. (17.33)
2 COMBINED	3	1.97 (4.97)	1	4672. (126.63)	3909. (110.70)	3351. (94.90)	2786. (78.90)	2297. (65.04)	1888. (53.46)	1496. (42.32)	1103. (31.22)	709. (20.08)
ROUTED TO	3	1.97 (4.97)	1	4616. (125.05)	3851. (109.06)	3290. (93.17)	2716. (76.90)	2106. (59.64)	1696. (48.02)	1325. (37.51)	963. (27.26)	610. (17.27)

D-13

SUMMARY OF DAM SAFETY ANALYSIS

LAKE RUSSELL DAM

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1769.90	1769.90	1773.70
STORAGE	234.	234.	418.
OUTFLOW	0.	0.	562.

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	1775.08	1.38	491.	1650.	5.50	41.75	0.00
.90	1774.90	1.20	482.	1426.	5.00	41.75	0.00
.80	1774.70	1.00	471.	1206.	4.50	42.00	0.00
.70	1774.46	.76	458.	986.	4.00	42.25	0.00
.60	1774.16	.46	442.	761.	3.00	42.75	0.00
.50	1773.69	0.00	417.	561.	0.00	43.00	0.00
.40	1773.09	0.00	386.	433.	0.00	43.00	0.00
.30	1772.44	0.00	354.	311.	0.00	43.00	0.00
.20	1771.72	0.00	319.	191.	0.00	43.25	0.00

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	1642.	1728.3	41.75
.90	1422.	1728.0	42.00
.80	1202.	1727.6	42.25
.70	981.	1727.3	42.50
.60	756.	1726.8	42.75
.50	559.	1726.4	43.00
.40	432.	1726.1	43.25
.30	309.	1725.7	43.25
.20	191.	1725.3	43.50

SUMMARY OF DAM SAFETY ANALYSIS

PANTHER LAKE DAM

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1725.00	1725.00	1729.00
STORAGE	277.	277.	504.
OUTFLOW	0.	0.	2097.

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	1729.90	.90	563.	4416.	4.25	41.75	0.00
.90	1729.73	.73	552.	3851.	3.75	42.00	0.00
.80	1729.55	.55	539.	3290.	3.25	42.00	0.00
.70	1729.33	.33	525.	2716.	2.50	42.25	0.00
.60	1729.01	.01	505.	2106.	.25	42.75	0.00
.50	1728.67	0.00	471.	1696.	0.00	42.75	0.00
.40	1727.95	0.00	479.	1325.	0.00	42.75	0.00
.30	1727.38	0.00	405.	963.	0.00	42.75	0.00
.20	1726.76	0.00	320.	610.	0.00	43.00	0.00

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

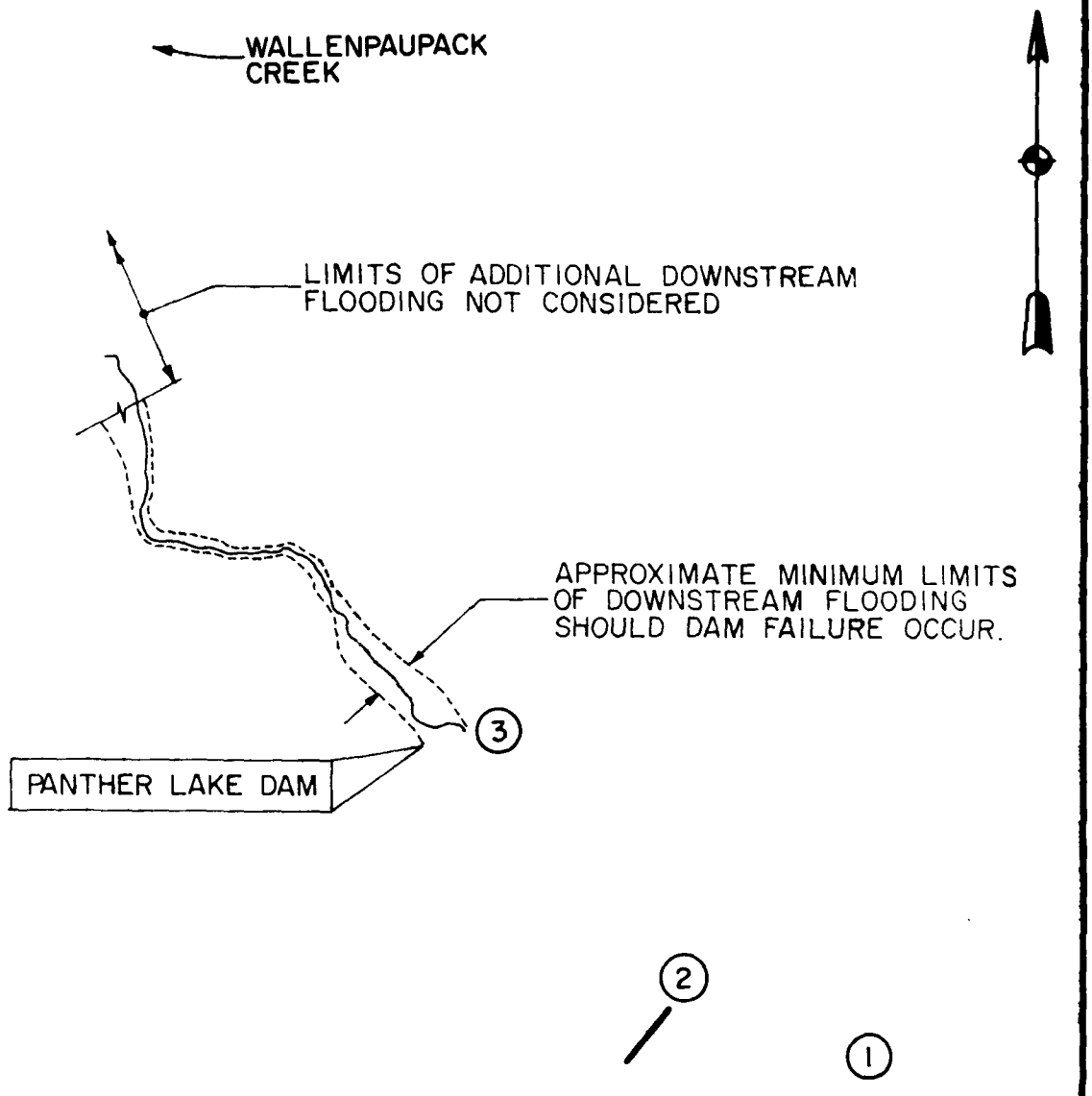
Panther Lake Dam
Summary of Pertinent Results

PMF Rainfall = 24.99 inches

Multi-ratio Analysis

Panther Lake Dam	PMF	½ PMF
Runoff (inches)	22.8	11.4
Inflow (cfs)	4,472	1,888
Outflow (cfs)	4,416	1,696
Depth of Overtopping (ft)	0.90	0.0
Duration of Overtopping (hr)	4.3	0.0

Note: SDF for Panther Lake Dam is ½ PMF.



NOTES:

1. LIMITS OF DOWNSTREAM FLOODING ARE ESTIMATES BASED ON VISUAL OBSERVATIONS. THIS MAP SHOULD NOT BE USED IN CONNECTION WITH THE EMERGENCY OPERATION AND WARNING PLAN.
2. CIRCLED NUMBERS INDICATE STATIONS USED IN COMPUTER ANALYSIS.

2000 0 2000

SCALE: 1 IN. = 2000 FT.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PANTHER LAKE DAM

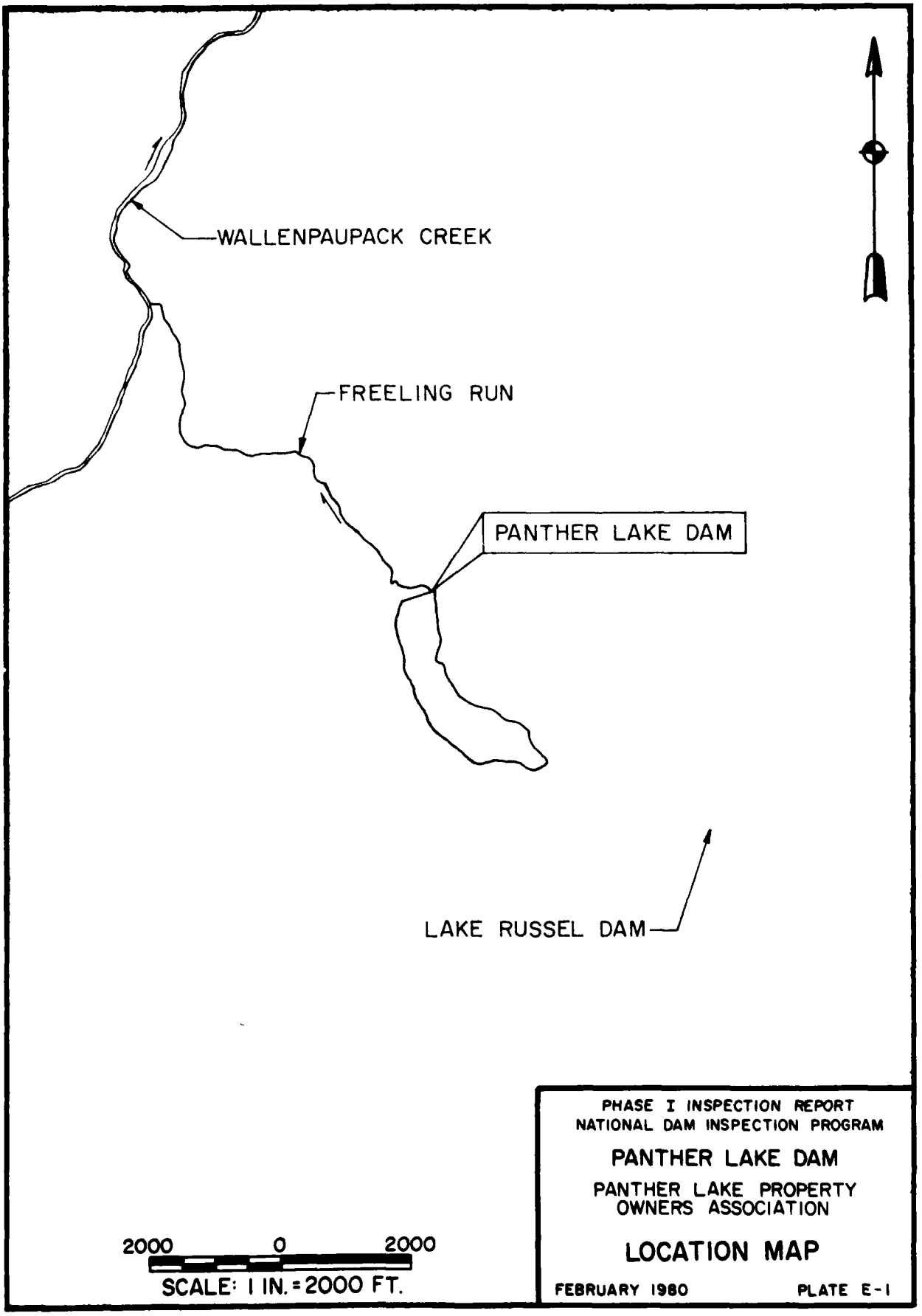
PANTHER LAKE PROPERTY OWNERS ASSOCIATION

DOWNSTREAM DEVELOPMENT PLAN

FEBRUARY 1980 EXHIBIT D-1

APPENDIX E

PLATES



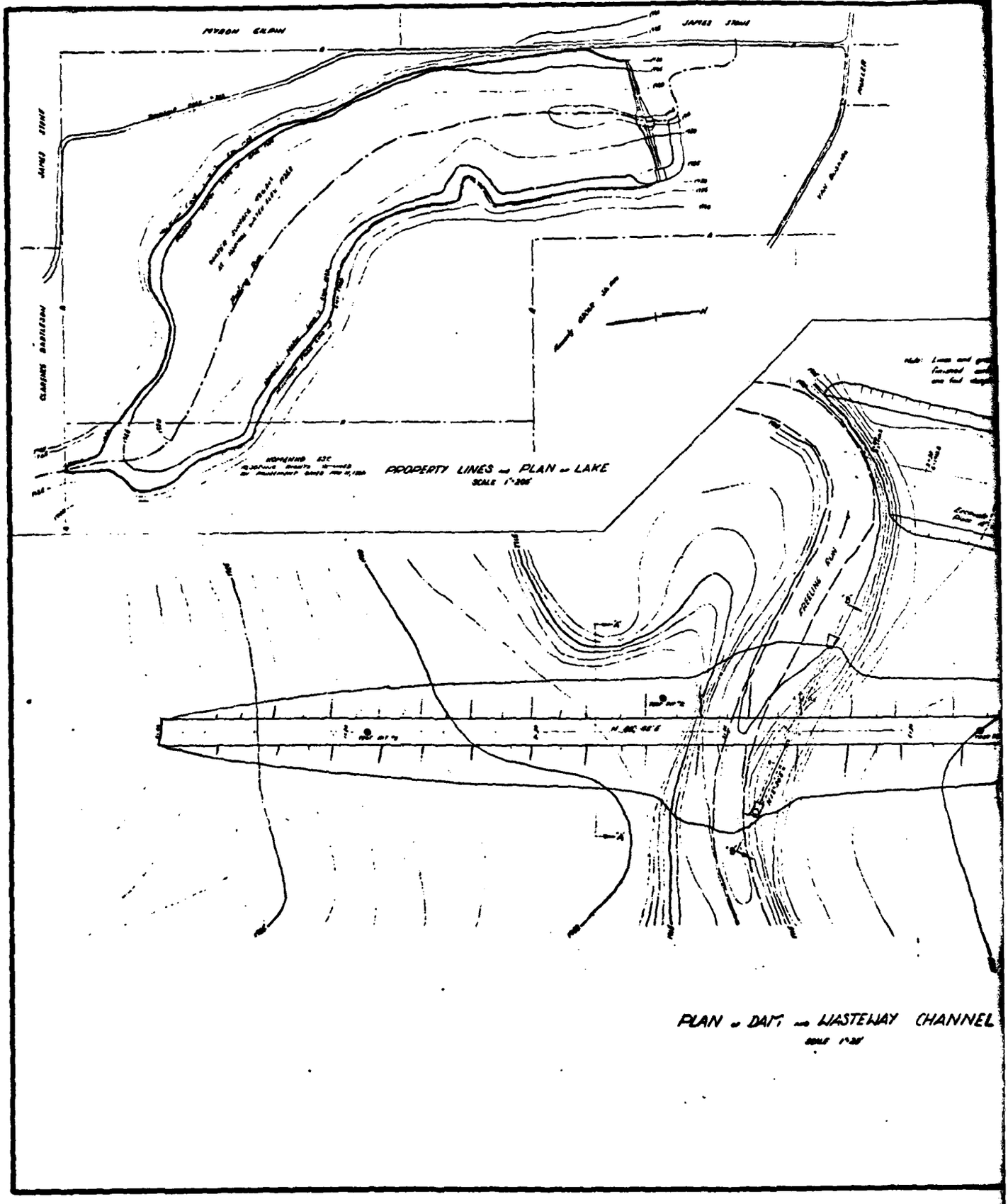
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

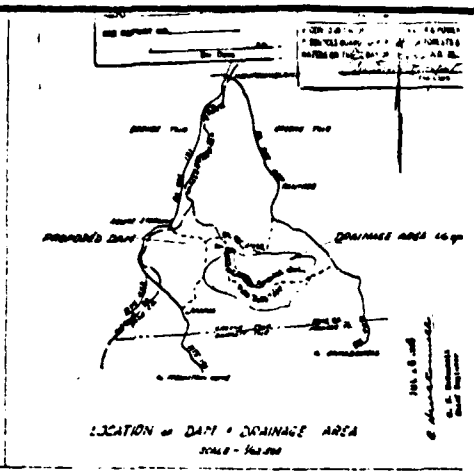
PANTHER LAKE DAM

PANTHER LAKE PROPERTY
OWNERS ASSOCIATION

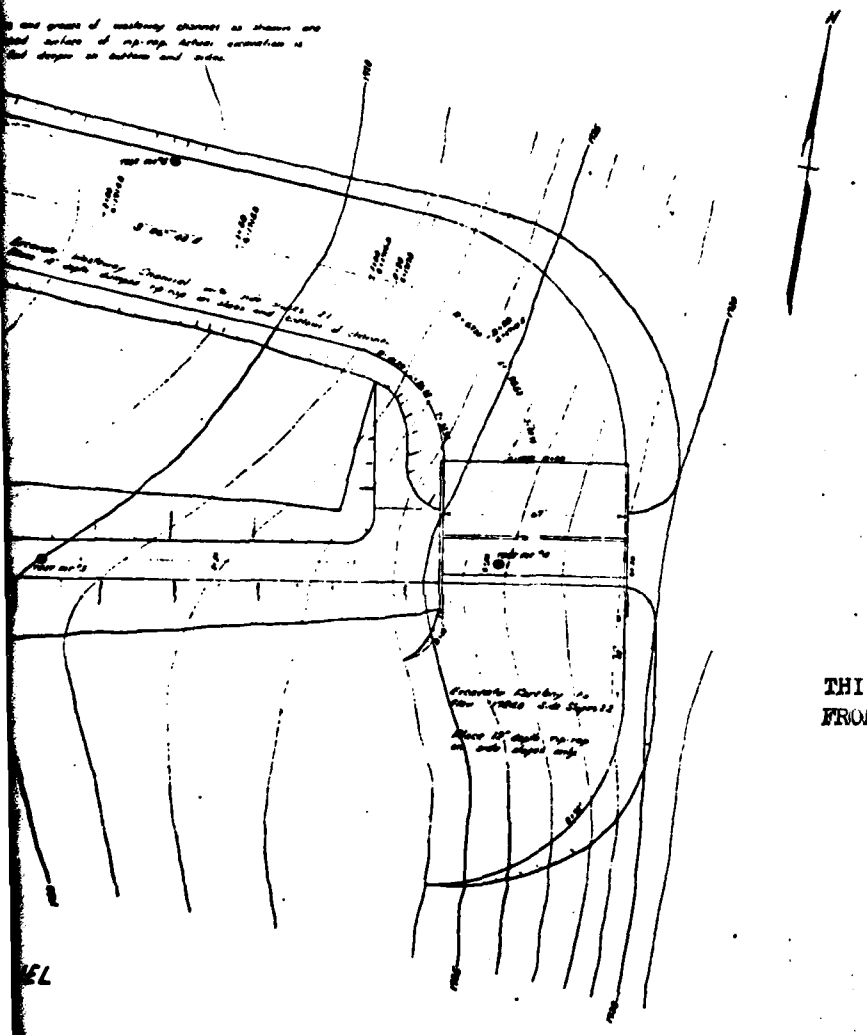
LOCATION MAP

FEBRUARY 1980 PLATE E-1


PROPERTY LINES and PLAN of LAKE
SCALE 1"=200'
PLAN of DAM and WASTEWAY CHANNEL



LOCATION of DAM & DRAINAGE AREA



PROPOSED DAM
JOHN M WALLACE AND WILLIAM V HIXON OWNERS
GREENE TOWNSHIP PIKE COUNTY PA.
LOCATION & PLAN

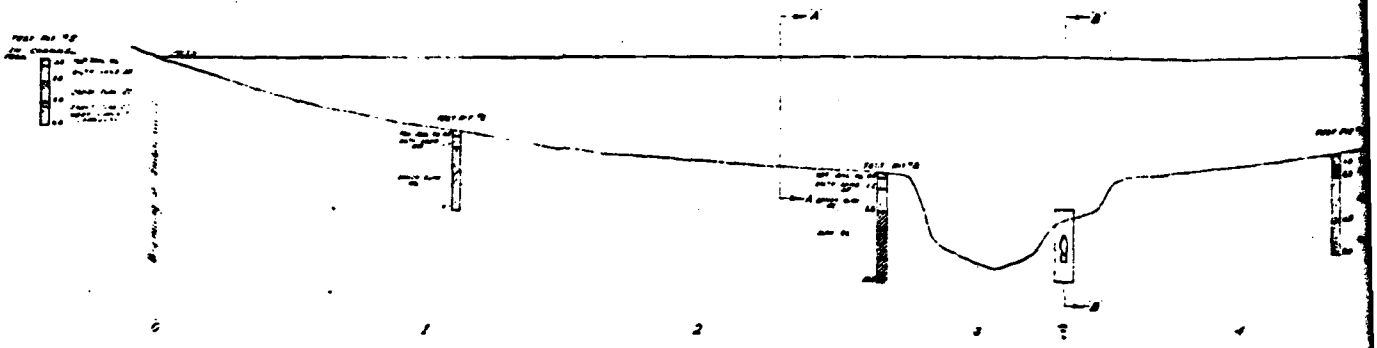
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PANTHER LAKE DAM

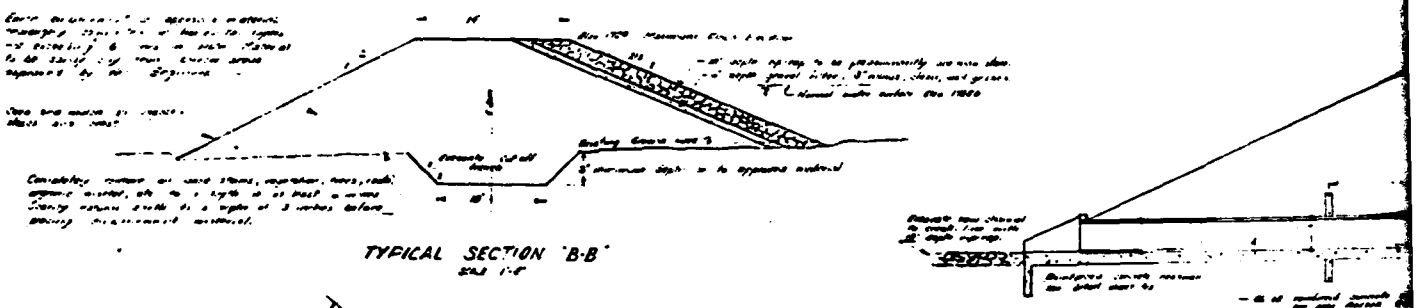
PANTHER LAKE PROPERTY
OWNERS ASSOCIATION

GENERAL PLAN

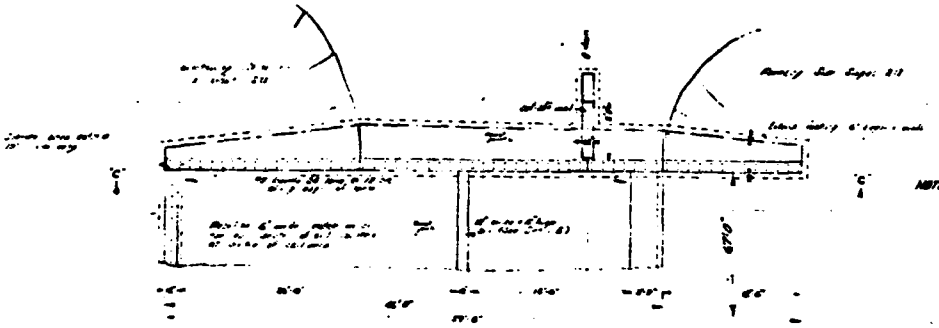
FEBRUARY 1980 PLATE E-2



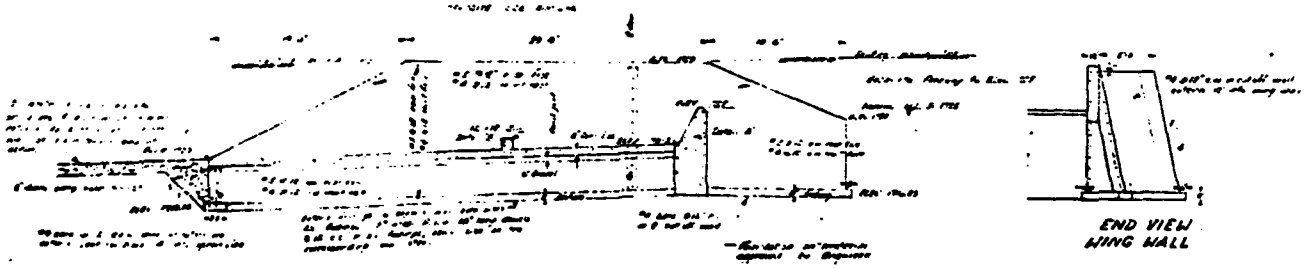
LONGITUDINAL SECTION OF DAM



TYPICAL SECTION 'B-B'



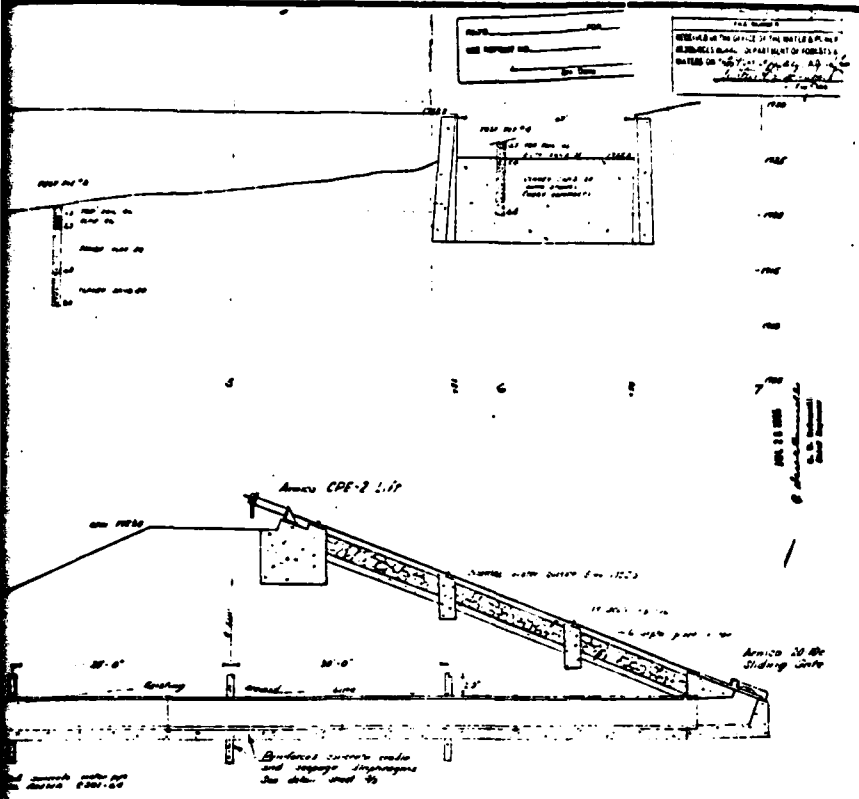
PARTIAL PLAN OF SPILLWAY



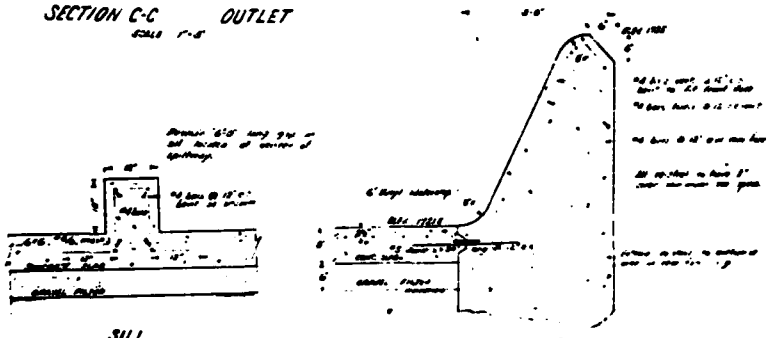
SPILLWAY SECTION 'C-C'

END VIEW WING WALL

DETAIL OF

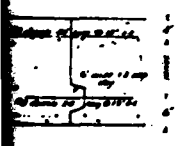


SECTION C-C OUTLET

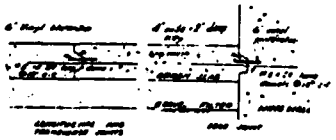


SILL
DETAIL 'B'

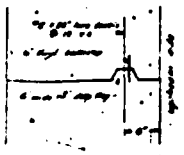
WIER
DETAIL 'A'



CONSTRUCTION JOINT
WINGWALL



DETAIL - CONSTRUCTION JOINTS
- APRON SLAB



DETAIL - CONSTRUCTION JOINT
- SPILLWAY WIER

PROPOSED DAM
JOHN M WALLACE and WILLIAM V HIRSH
GREENE TOWNSHIP PIKE COUNTY PA.
SECTIONS & DETAILS
May 19, 1966 Fred C. Schoenagel, Jr.

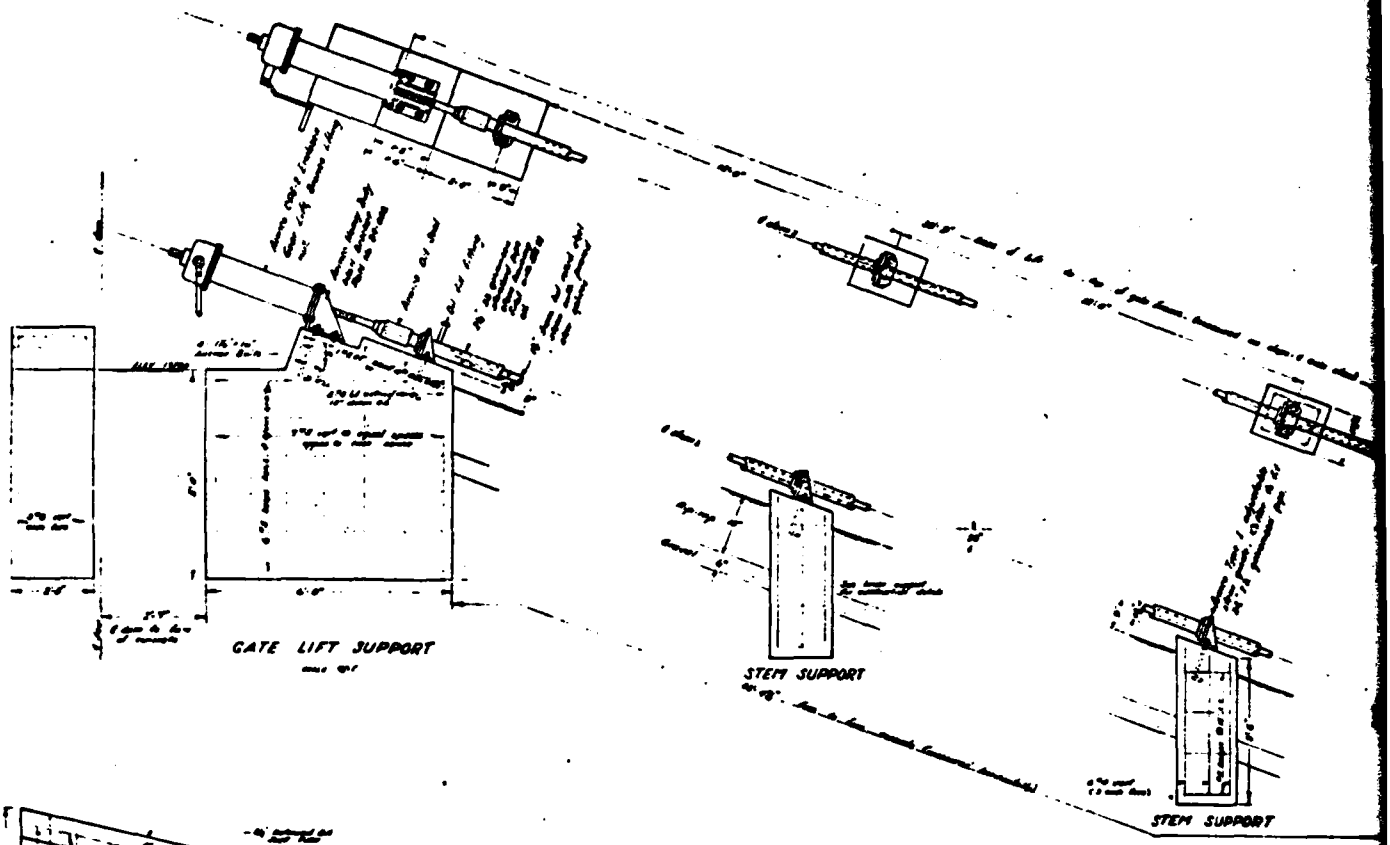
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

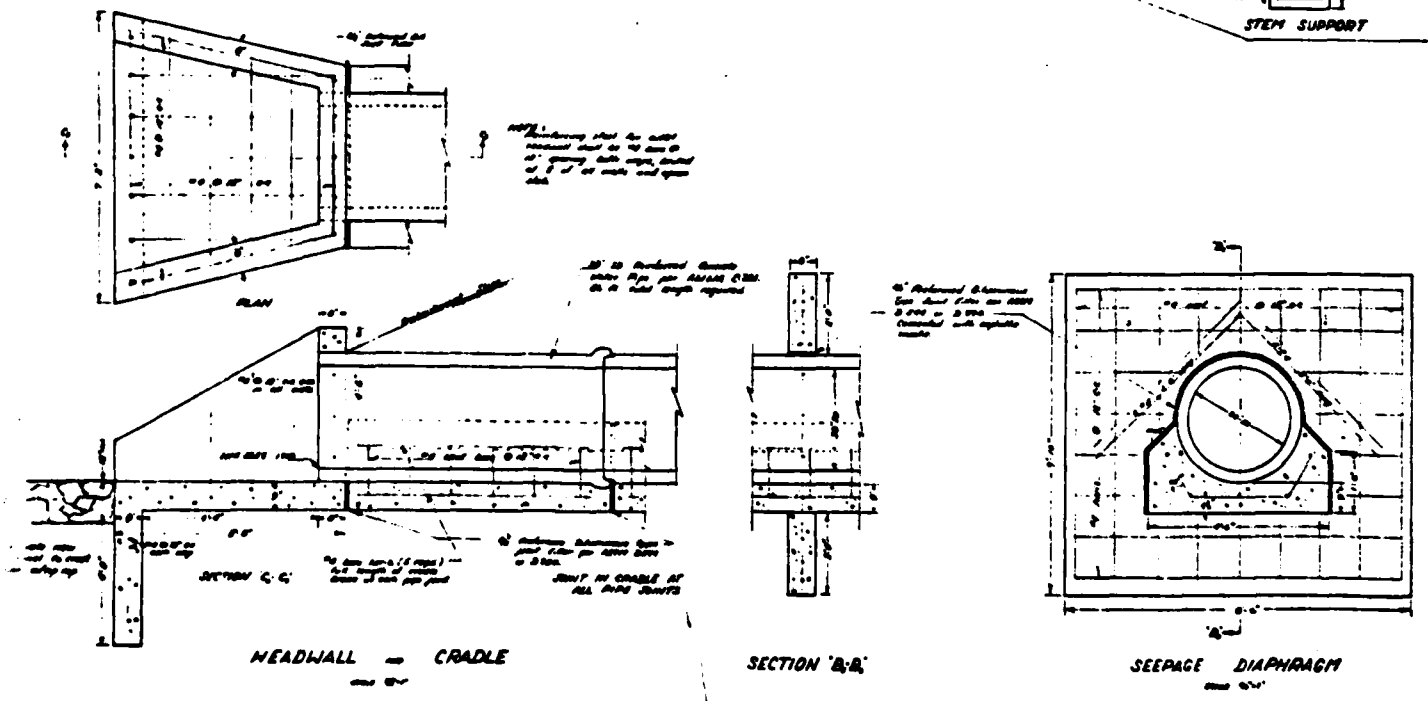
PANTHER LAKE DAM

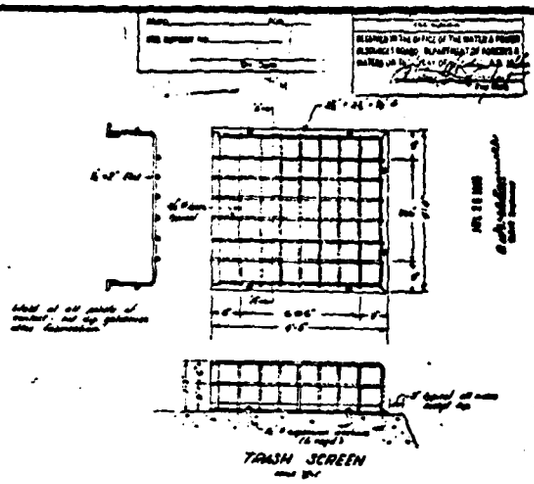
PANTHER LAKE PROPERTY
OWNERS ASSOCIATION

SECTIONS AND DETAILS

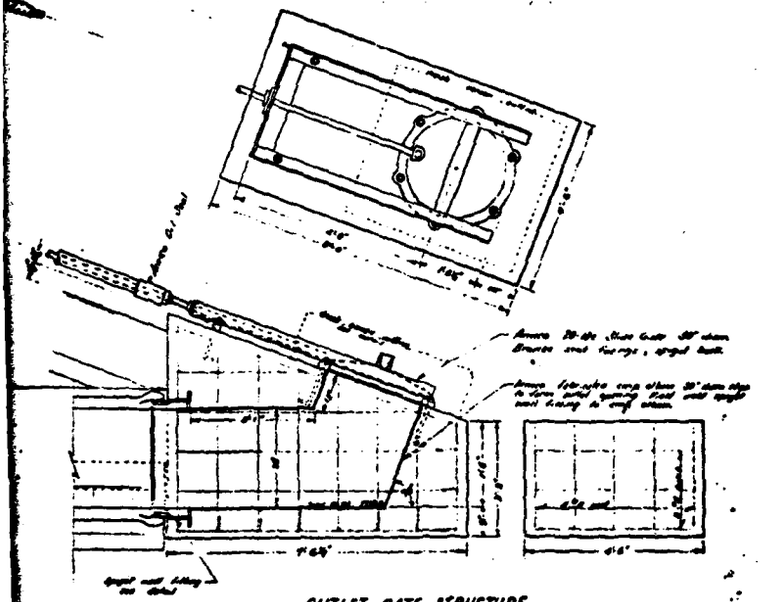
FEBRUARY 1980 PLATE E-3


GATE LIFT SUPPORT
STEM SUPPORT
STEM SUPPORT

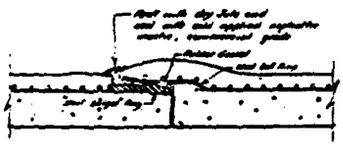

PLAN
SECTION C-C
HEADWALL — CRADLE
SECTION 'B-B'
SEEPAGE DIAPHRAGM



TRASH SCREEN



OUTLET GATE STRUCTURE



DETAIL OF REINFORCED CONCRETE WATER PIPE JOINT

DETAIL OF SPIGOT WALL FITTING

PROPOSED DAM
JOHN W WALLACE AND WILLIAM W NIXON
GREENE TOWNSHIP PIKE COUNTY PA.
OUTLET DETAILS
MAY 10 1960 Fred C Shannon

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

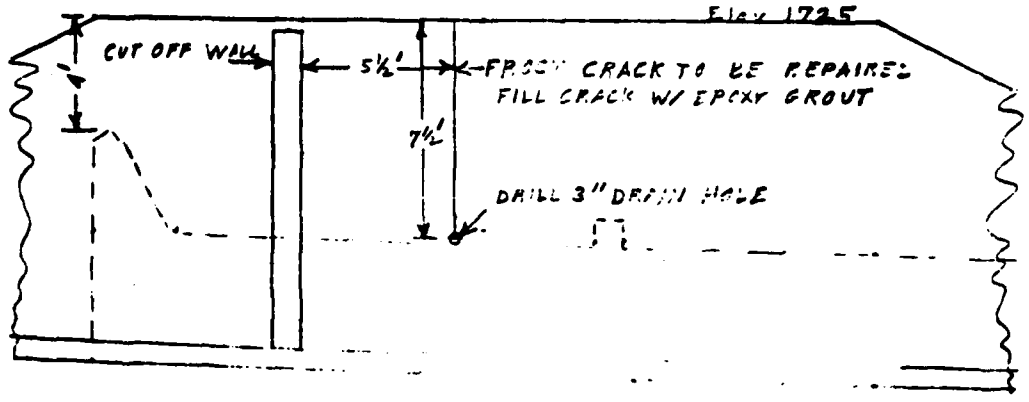
PANTHER LAKE DAM

PANTHER LAKE PROPERTY
OWNERS ASSOCIATION

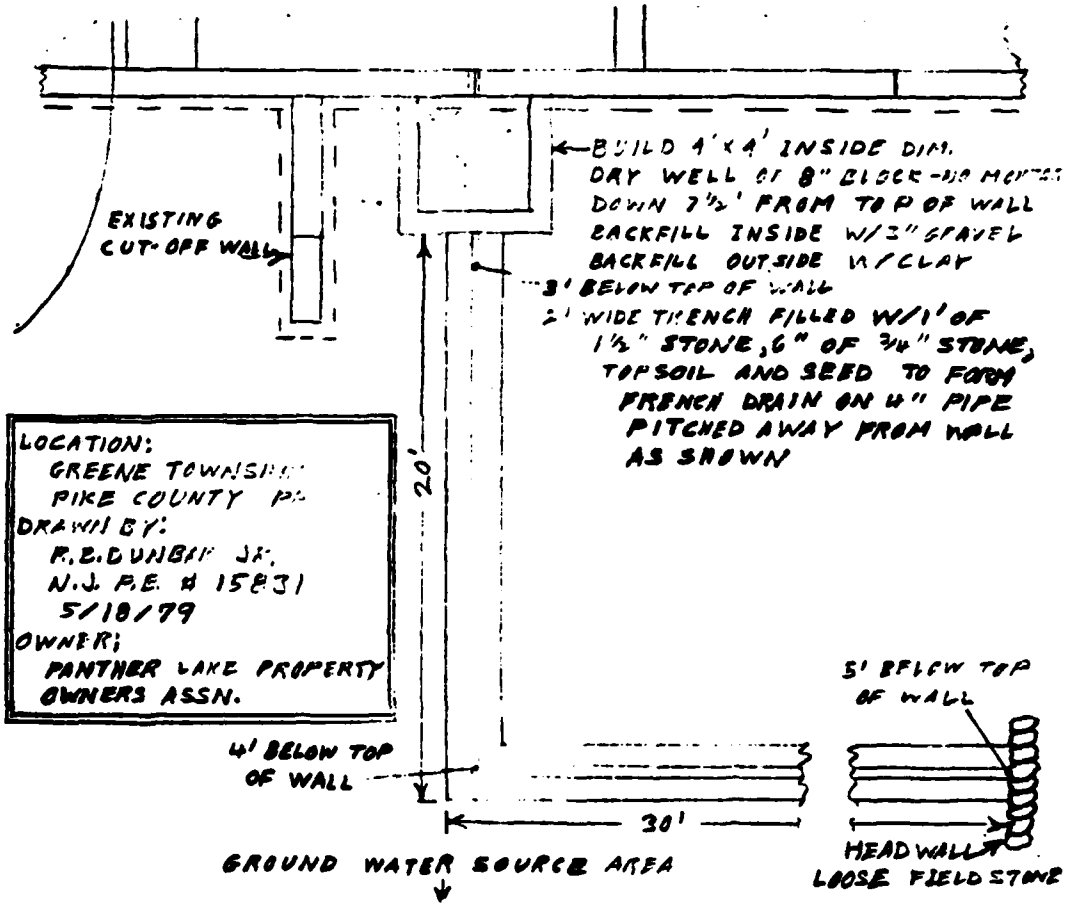
OUTLET WORKS

FEBRUARY 1980 PLATE E-4

PROPOSED REPAIR OF SPILLWAY WALL - PANTHER LAKE



EAST SPILLWAY WALL - ELEVATION LOOKING WEST



LOCATION:
GREENE TOWNSHIP
PIKE COUNTY PA
DRAWN BY:
R. E. DUNBAR JR.
N.J. P.E. # 15831
5/18/79
OWNER:
PANTHER LAKE PROPERTY OWNERS ASSN.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PANTHER LAKE DAM

PANTHER LAKE PROPERTY OWNERS ASSOCIATION

PROPOSED REPAIRS TO STILLING BASIN WALL

FEBRUARY 1980 PLATE E-5

APPENDIX F

GEOLOGY

PANTHER LAKE DAM

APPENDIX F

GEOLOGY

Panther Lake Dam is located in Pike County within the Appalachian Plateau Physiographic Province. The most pronounced topographic feature in the area is Camelback Mountain, which is part of the Pocono Plateau Escarpment. This escarpment has a well-defined southwestward trend from Camelback Mountain, but is irregular between Camelback Mountain and Mt. Pocono, which lies to the north. Streams east of the escarpment drain directly to the Delaware River, while those to the west drain to the Lehigh River.

The Pocono Plateau Section lies to the west of the escarpment. This area is relatively flat, with local relief seldom exceeding 100 feet. The topography has been greatly influenced by continental glaciation. Many features were created by deposition of glacial materials. The entire plateau lacks well-developed drainage.

East of the escarpment is the Glaciated Low Plateaus Section of the province. This area is characterized by pre-glacial erosional topography with locally-thick glacial deposits. Local relief is generally 100 to 300 feet.

Bedrock units of the sections described above are the lithified sediments of offshore marine, marginal marine, deltaic and fluvial environments associated with the Devonian Period. These units include siltstones of the Mahantango Formation, siltstones and shales of the Trimmers Rock, and seven mapped members of the Catskill Formation. These members include sandstones, siltstones, and shales of the Towamensing Member; sandstone, siltstone and shales of the Walcksville Member; sandstones, siltstones and shale of the Beaverdam Run Member; sandstone and shale in the Long Run Member; sandstones and conglomerates in the Packerton Member; sandstone and some conglomerates in the Poplar Gap Member; and sandstones and conglomerates in the Duncannon Member.

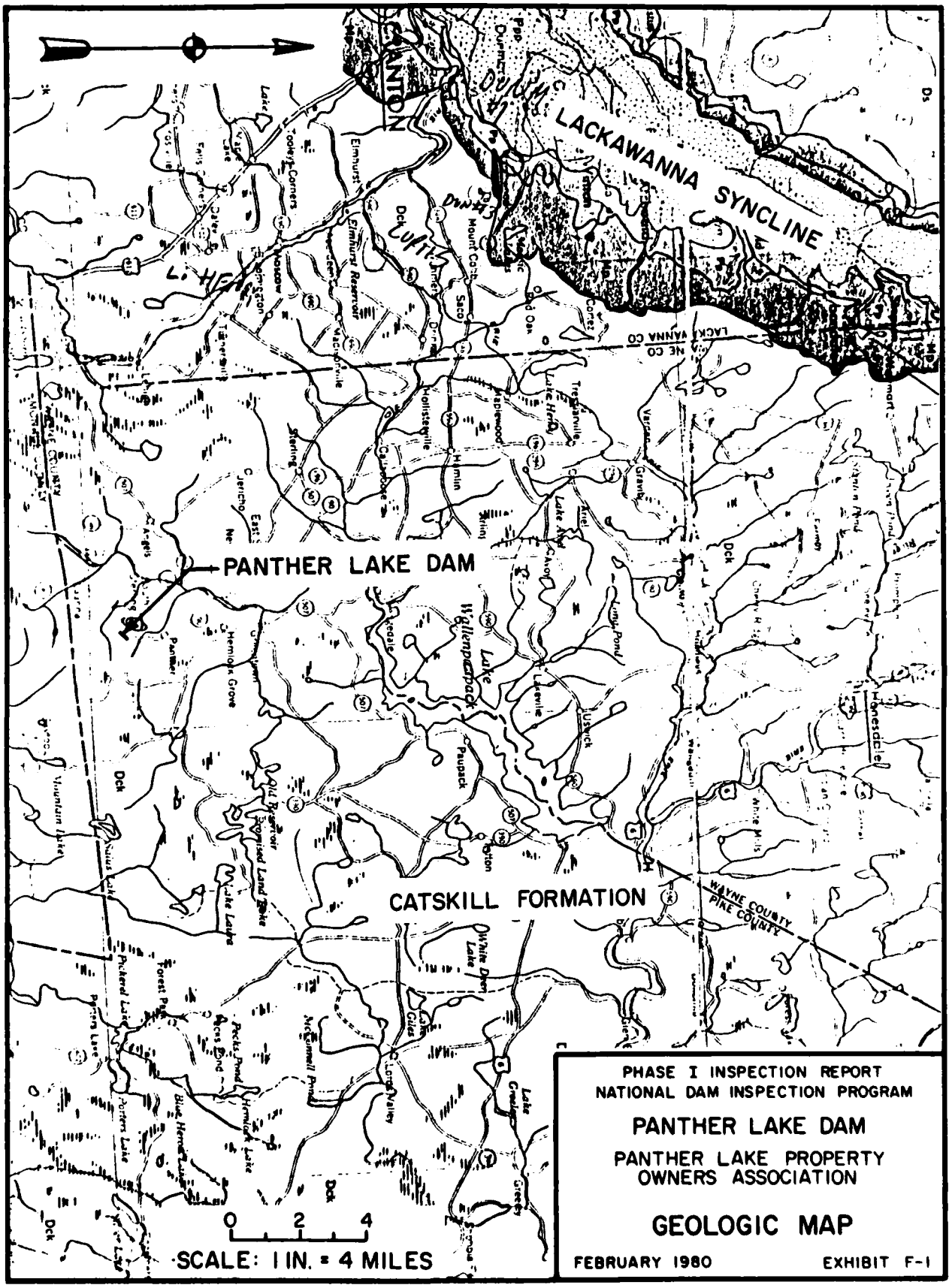
Panther Lake Dam is underlain by the Poplar Gap Member of the Catskill Formation. The Poplar Gap Member is predominantly a gray sandstone and conglomeratic sandstone with interbedded siltstones and shales. Sandstones present are thick-bedded, fine-to coarse-grained, and exhibit very

low primary porosity due to a clay and silica matrix. Effective porosity results from fractures and parting planes. Conglomeratic sandstone occurs primarily as concentrates of sub-round to round quartz pebbles. The siltstones and shales at the site are thin-bedded and also have low porosity.

The rocks are well-indurated and generally are not susceptible to slope failure; however, the presence of well-developed bedding and joint planes will result in some rockfall from vertical and high-angle cut slopes.

Bedrock is entirely overlain by glacial till of Late Wisconsin Age. This till is an unsorted mixture of clay, silt, sand, and gravel. It is moderately cohesive and is generally derived locally from the sandstones of the Catskill Formation. Thickness of the till varies from 5 to 75 feet.

Test pit investigations performed at the site show that the dam and appurtenant structures are founded on the glacial till overburden. Materials encountered at the site include silty sand, clayey sand, sandy clay, and clay. The depth to rock at the site is unknown, but it exceeds 10 feet, which was the maximum depth of test pit investigations.


LACKAWANNA SYNCLINE
PANTHER LAKE DAM
CATSKILL FORMATION
WAYNE COUNTY
PIKE COUNTY
SCALE: 1 IN. = 4 MILES
0 2 4
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PANTHER LAKE DAM
PANTHER LAKE PROPERTY
OWNERS ASSOCIATION
GEOLOGIC MAP
FEBRUARY 1980
EXHIBIT F-1