

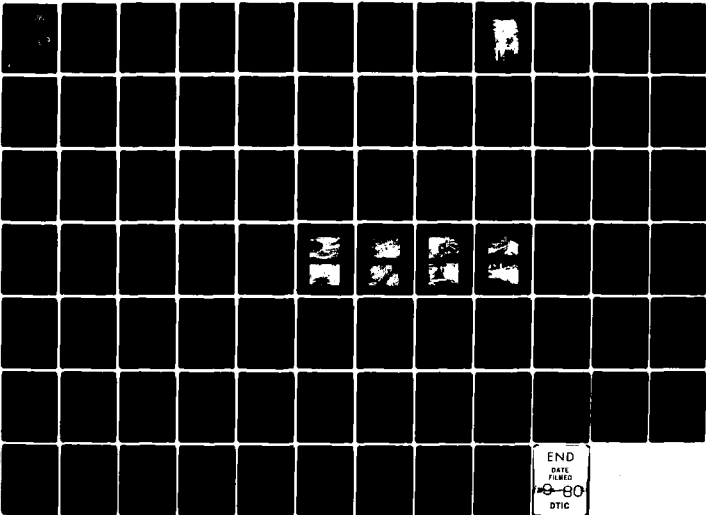
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GANNETT FLEMING CORDRY AND CARPENTER INC. HARRISBURG PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. MOUNTAIN LAKE DAM (NDI ID NUMB--EYC(U)
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DELAWARE RIVER BASIN
MEADOW RUN, LUZERNE COUNTY

PENNSYLVANIA

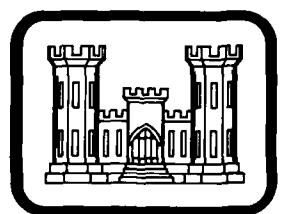
LEVEL II

MOUNTAIN LAKE DAM

NDI ID NO. PA-00546
DER ID NO. 40-50

MRS. ELEANOR TAYLOR

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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Prepared by
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
Harrisburg, Pennsylvania 17105

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

JUNE 1980

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DELAWARE RIVER BASIN
MEADOW RUN, LUZERNE COUNTY
PENNSYLVANIA

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MOUNTAIN LAKE DAM

NDI ID No. PA-00546
DER ID No. 40-50

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MRS. ELEANOR TAYLOR

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PHASE I INSPECTION REPORT

① NATIONAL DAM INSPECTION PROGRAM, Mountain Lake
Dam (NDI ID Number PA-00546, DER ID
Number 40-50), Delaware River Basin,
Meadow Run, Luzerne County,
Pennsylvania, Phase I
Inspection Report

AUG 13 1980
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Prepared by

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Harrisburg, Pennsylvania 17105

For

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

JUNE 1980

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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
MEADOW RUN, LUZERNE COUNTY
 PENNSYLVANIA

MOUNTAIN LAKE DAM

NDI ID No. PA-00546
 DER ID No. 40-50

MRS. ELEANOR TAYLOR

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JUNE 1980

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APPENDICES

Appendix

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

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam: Mountain Lake Dam
NDI ID No. PA-00546
DER ID No. 40-50

Size: Small (15 feet high; 253 acre-ft)

Hazard Classification: High

Owner: Mrs. Eleanor Taylor
1360 Jack Road
Monterey, California 93940

c/o Corresponding Agent
Mr. Lee Sweinburg
589 Wyoming Ave.
Wyoming, Pennsylvania 18644

State Located: Pennsylvania

County Located: Luzerne

Stream: Meadow Run

Date of Inspection: 17 April 1980

Based on criteria established for these studies, Mountain Lake Dam is judged to be unsafe, nonemergency, because the spillway capacity is seriously inadequate. The recommended Spillway Design Flood (SDF) for the size and hazard category of the dam varies between 1/2 of the Probable Maximum Flood (PMF) and the PMF. Based on the criteria and the downstream conditions, the selected SDF is the PMF. Based on existing conditions, the spillway will pass about 20 percent of the PMF before overtopping of the dam occurs. Failure of the dam would increase the hazard to loss of life downstream. If the dam were raised

to its design elevation, the spillway would pass about 28 percent of the PMF. The spillway capacity would still be rated as seriously inadequate.

As a whole, the dam is judged to be in poor condition. Lack of maintenance has caused the spillway to deteriorate to such an extent that it is on the verge of collapse. It is unlikely that the spillway could withstand any flood of significant duration.

Because of the nature of its construction, the steep downstream slope, bulges, and possible seepage, the stability of the embankment is only considered marginal.

There is no evidence to suggest that the emergency drawdown facility is operational. It is in poor condition. Maintenance at the dam is inadequate.

The following studies and remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Remove the spillway bridge. Also remove brush and debris from the spillway. Until the recommendations below are completed, provide temporary measures to ensure the structural stability of the spillway.

(2) Perform additional studies to more accurately ascertain the spillway capacity required for Mountain Lake Dam as well as the nature and extent of measures required to provide adequate spillway capacity. Take appropriate action as required. If the existing spillway is to remain, it should be completely replaced.

(3) Perform comprehensive investigations and studies as required to assess the structural stability for the dam. The investigations and studies should address conditions within the dam and foundation. Take appropriate action as required. These studies should also address the slope protection required to prevent erosion. The final top of dam elevation should be coordinated with the spillway study recommended above. Until the studies are complete and any necessary remedial action taken, the Owner should monitor the condition of the dam. If any changes occur, immediate remedial action should be taken.

(4) Provide whatever measures are necessary to make the outlet works operational. Once operational, it should be maintained and operated on a regular basis. Also provide an upstream closure facility and a structurally adequate valve pit for the outlet works and assess the need for a structure around the gate valve to protect it from freezing.

(5) Remove trees and brush growing on or near the embankment.

All investigations, studies, designs, and inspection of construction should be performed by a professional engineer experienced in the design and construction of dams. Tree removal should also be guided by a professional engineer.

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

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

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Mountain 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 at the dam 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 such that all features of the dam are properly maintained.

MOUNTAIN LAKE DAM

Submitted by:

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.



Frederick Futchko
FREDERICK FUTCHKO
Project Manager, Dam Section

Date: 27 June 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT,
CORPS OF ENGINEERS

James W. Peck
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 14 July 1980

MOUNTAIN LAKE DAM



Overview

DELAWARE RIVER BASIN
MEADOW RUN, LUZERNE COUNTY
PENNSYLVANIA

MOUNTAIN LAKE DAM

NDI ID No. PA-00546
DER ID No. 40-50

MRS. ELEANOR TAYLOR
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
JUNE 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. Mountain Lake Dam is a homogeneous earthfill embankment with a timber corewall. The dam is 365 feet long and is 15 feet high at maximum section.

The spillway is located near the left abutment of the dam. It is a 22 foot long broad-crested, concrete weir. The crest is 3.5 feet below the design top of the dam. A timber bridge spans the spillway.

The outlet works is located near the center of the embankment. It consists of a 24-inch diameter cast-iron pipe with a gate valve in a valve pit near the downstream end. It is not known if there is an intake structure.

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. Mountain Lake Dam is located on Meadow Run in Bear Creek Township, Luzerne County, Pennsylvania, approximately 5 miles northeast of the community of Bear Creek. Mountain Lake Dam is shown on USGS Quadrangle, Pleasant View Summit, Pennsylvania, at latitude N 41° 12' 50" and longitude W 75° 40' 35". A location map is shown on Plate E-1.

c. Size Classification. Small (15 feet high, 253 acre-feet).

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

e. Ownership. Mrs. Eleanor Taylor, 1360 Jack Road, Monterey, California 93940, c/o Corresponding Agent Mr. Lee Sweinburg, 589 Wyoming Ave., Wyoming, Pennsylvania 18644.

f. Purpose of Dam. Recreation.

g. Design and Construction History. Mountain Lake Dam was originally an ice dam. It was constructed in 1910 under force account for the Bear Creek Ice Company by George Aeslin. The Pennsylvania Water Supply Commission (PWSC) described Mr. Aeslin as "an 'old time' surveyor who furnished the lines and grades during the progress of construction." The dam was originally known as the No. 4 Dam of the Bear Creek Ice Company.

h. Normal Operational Procedure. The pool is maintained at the spillway crest level with excess inflow discharging over the spillway. The emergency drawdown

facilities are not used. Spillway discharge flows downstream in Meadow Run to the confluence with Bear Creek.

1.3 Pertinent Data.

a.	<u>Drainage Area.</u> (square miles)	2.0
b.	<u>Discharge at Damsite.</u> (cfs.)	
	Maximum known flood at damsite	Unknown.
	Outlet works at maximum pool elevation	60
	Spillway capacity at maximum pool elevation	
	Design conditions	390
	Existing conditions	240
c.	<u>Elevation.</u> (feet above msl.)	
	<u>Top of dam</u>	
	Design conditions	1990.1
	Existing conditions	1989.1
	<u>Maximum pool</u>	
	Design conditions	1990.1
	Existing conditions	1989.1
	Normal pool (spillway crest)	1986.6
	Upstream invert outlet works	Not available.
	Downstream invert outlet works	1975.6
	Streambed at toe of dam	1974.5
d.	<u>Reservoir Length.</u> (miles)	
	Normal pool	0.50
	Maximum pool (design)	0.51
e.	<u>Storage.</u> (acre-feet)	
	Normal pool	152
	Maximum pool (design)	299
	Maximum pool (existing)	253
f.	<u>Reservoir Surface.</u> (acres)	
	Normal pool	37
	Maximum pool (design)	47
g.	<u>Dam.</u>	
	<u>Type</u>	Earthfill with timber corewall.
	<u>Length (feet)</u>	365

g.	<u>Dam. (cont'd.)</u>	
	<u>Height (feet)</u>	
	Design	16
	Existing	15
	<u>Topwidth (feet)</u>	
	Design	15
	Existing	13
	<u>Sides Slopes</u>	
	<u>Upstream</u>	
	Design	1V on 2H
	Existing	Varies, about 1V on 2H
	<u>Downstream</u>	
	Design	1V on 2H
	Existing	1V on 1.7H
	<u>Zoning</u>	Corewall.
	<u>Cut-off</u>	Corewall founded in cutoff trench.
	<u>Grout Curtain</u>	None.
h.	<u>Diversion and Regulating Tunnel.</u>	None.
i.	<u>Spillway.</u>	
	<u>Type</u>	Broad-crested, concrete weir.
	<u>Length of Weir (feet)</u>	22
	<u>Crest Elevation</u>	1986.6
	<u>Upstream Channel</u>	Reservoir.
	<u>Downstream Channel</u>	Concrete Apron.
j.	<u>Regulating Outlets.</u>	
	<u>Type.</u>	One 24-inch dia. CIP
	<u>Length (feet)</u>	85
	<u>Closure</u>	Valve near down- stream end.
	<u>Access</u>	At toe of embank- ment.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. No design data are available for the original dam. In 1915, the Pennsylvania Water Supply Commission (PWSC) prepared a report on the dam. Their description of the design is in Paragraph 1.2g.

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 the Plates in Appendix E.

c. Design Considerations. There is insufficient data to assess the design.

2.2 Construction

a. Data Available. Available construction data is limited to a description contained in the 1915 PWSC Report. It states that

"Prior to the placing of the embankment the surface material was removed for a depth of from about 18 inches to 2 feet, after which selected material was placed in thin layers and compacted by the teams and scrapers passing over the embankment during the progress of the work. A puddle trench was constructed throughout the entire length of the dam, and a double layer of sheet piling was placed in this trench, extending into the embankment. The up and downstream slopes are carefully hand-paved and the top of the dam is finished with gravel."

b. Construction Considerations. The PWSC Report indicates that the construction was adequate. Although not specifically stated, from the description of the corewall it is assumed that it is constructed of timber.

2.3 Operation. There are no formal records of operation. A record of operation does exist in the form of inspection reports prepared by the Commonwealth between 1920 and 1964. The previous inspections only note maintenance discrepancies, some of which were fairly serious.

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 made available her agent for information during the visual inspection. He stated that no additional data were available.

b. Adequacy. The type and amount of available design data and other engineering data are very 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. However, some of the data in the 1915 PWSC Report is in conflict with existing conditions. Because no design drawings were available, it is surmised that the data in that report were based on rough measurements.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam is poor. Deficiencies were observed as noted below. A sketch of the dam with the locations of deficiencies is presented on Exhibits B-1 and B-2 in Appendix B. Survey information acquired for this Report is summarized in Appendix B. Datum for the survey was taken at the USGS horizontal control point at the dam, Elevation 1989.0, as shown on USGS mapping. On the day of the inspection, the pool was at the spillway crest level.

b. Embankment. The upstream slope is covered with tall brush and small trees except at many slightly eroded areas that are typically 5 to 10 feet long (Photograph A). The areas appear as if they had been used for access to the lake. The top of the dam is curved in plan, with the length of embankment near the right abutment deflecting upstream.

The downstream slope has mature trees growing on the slope and near the toe (Photographs C and D). The slope is slightly uneven. One uneven area on the slope is a bulge just to the right of the spillway. The bulge protrudes about 1.5 feet and is about 10 feet long. Another 20-foot long bulge protrudes about 2 feet near the outlet works. Both bulges are not pronounced; they appear like waves on the slope.

No seepage was observed at the dam. However, there is a soft and swampy area at the downstream toe on each side of the spillway. Water that emanates from the left abutment above the pool level flows along the toe and into the left soft area. The flow was estimated at 1 gpm.

The survey performed for this inspection reveals that the upstream slope above normal pool level and the downstream slope are steeper than their reported design values, while the lower part of the upstream slope is flatter than its design value. The topwidth also varies from the reported design. The survey also reveals that the top of the dam is below its design elevation. The

lowest area, which is at the right spillway wall, is 1.0 foot below its design elevation. A section and profile are in Appendix B.

c. Appurtenant Structures. The valve pit at the outlet works is sheared and broken throughout (Photograph E). The nuts securing the gate housing are severely rusted. The Owner's agent offered to operate the outlet works until he discovered that there was no operating mechanism. He did not recollect it ever being operated.

The spillway is in very poor condition. The wooden beams supporting the timber spillway bridge have snapped, leaving the bridge bowed (Photograph F). The bridge is partially supported in the center by a pier constructed of timber and loose stones. To the left of the pier, a 0.9-foot high stoplog extends across the crest (Photograph H). The top 0.4-foot thick layer of concrete has peeled off the crest to the left of the pier. Portions of the peeled concrete lie loosely on the crest. To the right of the pier, a steel I-beam and a rotten log lie skewed to the crest (Photograph G). Upstream from the crest, the left spillway wall is tilted about 30° towards the centerline of the spillway. At the crest, the left wall is cracked through and open. Just downstream, the wall is skewed about 20°. Further downstream, the wall is almost totally undermined along its entire length. The right wall is in slightly better condition, although the part that is just downstream from the crest is skewed about 10° and tilted inward. The right wall upstream of the crest is scoured from 0.1 to 0.2 foot deep. Downstream of the crest, the scoured area is about 1.2 feet high and 0.7 foot deep. At the crest, the wall is cracked and separated.

The left part of the spillway apron downstream from the crest is scoured to a depth of about 2 feet. A rule can be inserted about 1 foot under the crest.

At the right spillway wall, adjacent to the crest, there is a concrete keywall. A 1-foot length of the embankment at this area is open to a width of 0.1 to 0.2 foot. The keywall is visible in the opening. Brush and trees are growing in and adjacent to the spillway. The spillway is shown on Exhibit B-2.

d. Reservoir Area. At the lake, the slopes are relatively mild. The shores of the lake are quite developed. The remainder of the watershed is mostly wooded. At the upstream end of the lake is Meadow Run Dam.

e. Downstream Conditions. About 200 feet downstream from the dam, the stream extends through a culvert beneath a road. It then flows for about 0.4 mile to an area with 4 low-lying dwellings. The stream then flows for 3.0 mile through an uninhabited reach to its confluence with Bear Creek. About 2.5 miles downstream of the confluence is Bear Creek Lake Dam.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at spillway crest, with excess inflow discharging over the spillway and into Meadow Run. The emergency drawdown facilities are not used.

4.2 Maintenance of Dam. The dam is visited at irregular intervals, except during the winter, by the Owner's agent. The dam is not visited in winter. The agent, who is a professional engineer and who is related to the Owner, stated that the association between himself and the Owner is informal and uncompensated. He gives verbal reports to the Owner. Formal inspections are not made. Maintenance is performed on an as-needed basis, with brush reportedly being cut 2 years ago.

4.3 Maintenance of Operating Facilities. The outlet works is not maintained. It has not been operated recently.

4.4 Warning Systems in Effect. The Owner's agent stated that there is no emergency operation and warning system.

4.5 Evaluation of Operational Adequacy. The maintenance of the dam is inadequate. Inspections are necessary to detect hazardous conditions at the dam. A detailed 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. No design data are available for the hydraulics of the original structure. The Pennsylvania Water Supply Commission analyzed the hydraulics in their 1915 Report. Using a net crest length of 20 feet and a discharge coefficient of 3.0, they determined the spillway capacity to be 390 cfs. The discharge coefficient is slightly high for the existing conditions. A discharge coefficient of 2.7 is used in the analysis described hereafter, which also uses the measured crest length of 22.0 feet.

b. Experience Data. The Owner's agent believed that the flood of record was Tropical Storm Agnes in June 1972. There are no pool elevations to estimate the flow for this storm.

c. Visual Observations.

(1) General. The visual inspection of Mountain 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. The low areas on the top of the embankment limit the existing spillway to less than the design capacity.

(3) Appurtenant Structures. There is no evidence to suggest that the outlet works is operational, which leaves no means of drawing down the lake in case of emergency. There is no upstream closure facility for the outlet works.

The obstructions in the spillway, such as the steel I-beam, rotten timber, the collapsed bridge, and the stoplogs, will all reduce the spillway capacity. Many of these items would probably wash downstream during any significant flood. The I-beam has the potential to collect debris. The items that might wash downstream could block the spillway channel, thus raising tailwater.

None of these effects have been included in the analysis described hereafter. The spillway is further evaluated in Section 6.

(4) Reservoir Area. The development in the watershed is negligible. About 85 percent of the watershed is controlled by Meadow Run Dam. A Phase I National Dam Inspection Report is concurrently being prepared for Meadow Run Dam, which is a small size, high hazard dam with a seriously inadequate spillway. The effects of the dam have been included in the analysis described hereafter.

(5) Downstream Conditions. Failure of Mountain Lake Dam would flood 4 dwellings located about 0.5 mile downstream. In addition, the failure could cause the overtopping of Bear Creek Lake Dam, if there were additional inflow to Bear Creek Lake. A Phase I National Dam Inspection Report has previously been prepared for Bear Creek Lake Dam, which is a small size, high hazard dam with a seriously inadequate spillway. The downstream conditions indicate tht a high hazard classification is warranted for Mountain 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 Mountain Lake Dam is between one-half of the Probable Maximum Flood (PMF) and the PMF. Because of the downstream conditions, the PMF is selected as the SDF for Mountain 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 hydrology and hydraulics 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 Mountain Lake Dam can pass about 20 percent of the PMF before overtopping of the dam occurs. The dam is rated at its existing top elevation. At its design top elevation, the dam could pass about 28 percent of the PMF. As noted in Section 6, it is doubtful if the spillway can withstand any flood of significant duration.

(3) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in

Appendix D. Because Mountain Lake Dam cannot pass the 1/2 PMF, a further analyses was performed. For both the 50 percent and 25 percent PMF, analyses were performed assuming that Mountain Lake Dam fails with and without the failure of Meadow Run Dam, which is upstream. The results indicate that for the 25 percent PMF, even without the failure of Meadow Run Dam, the stream would rise near the dwellings to a level that is 8.8 feet above the level that would exist if the dam were not to fail. During the 50 percent PMF, the failure of Mountain Lake Dam by itself would not overtop Bear Creek Lake Dam, assuming no other inflow to Bear Creek Lake. During the 50 percent PMF, the combined failure of Meadow Run and Mountain Lake Dams would cause Bear Creek Lake Dam to overtop by 1.0 foot, even with no other inflow to Bear Creek Lake. There is an increased hazard to loss of life; the spillway capacity of Meadow Run Dam is rated as seriously inadequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Mountain 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 the trees and brush on the slopes is a hazard to the dam. Root systems of trees and large brush can loosen embankment material, displace slope protection, and create paths along which seepage and piping (internal erosion) might occur. No particular significance can be attached to the variations between the reported design data and the existing conditions. As noted in Paragraph 2.4c, the design data was probably based on rough measurements. The uneven slopes could be an as-constructed condition, although the bulges could indicate a more serious condition.

It is not possible to determine if the wet areas are caused by seepage through the dam or leaks through the spillway walls. The flow from the left abutment, which is not seepage from the dam, is contributing to the wet area to the left of the spillway.

(3) Appurtenant Structures. The valve pit at the outlet works is obviously structurally inadequate. The upstream wall of the pit is at the toe of the embankment. The sheared wall leaves the toe with no support in this area. Because of the severely rusted nuts, it is possible that the gate housing would not be securely attached to the valve, if it were operated. There would then be no effective means of closing the valve. Because there is no protective structure, the valve is susceptible to freezing during the winter.

The conditions at the spillway indicate a lack of maintenance. They are of major concern because the spillway walls are on the verge of collapse. It is unlikely that the spillway could withstand any flood of significant duration. The open section of the embankment is probably caused by the movement of the spillway walls.

b. Design and Construction Data. No stability analyses were available for the embankment. The downstream slope is significantly steeper than normally used for this type of dam. As noted above, it is not possible to assess the cause of the wet areas near the spillway. The flat area between the toe of the embankment and the stream acts as a berm; this improves the stability of the embankment. However, the steep slope, the possible seepage, and the presence of the bulges indicate that the stability of the embankment is considered marginal.

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

d. Post-construction Changes. There have been no post-construction changes to the dam.

e. Seismic Stability. Mountain Lake Dam is located in Seismic Zone 1. Earthquake loadings are not considered to be significant for small dams located in Seismic Zone 1 when there are no readily apparent stability problems. However, because of the steep slopes, the bulges, and possible seepage at the embankment, the seismic stability of the embankment is considered marginal.

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, Mountain Lake Dam is judged to be in poor condition. The recommended SDF for the size and hazard category of the dam varies between the 1/2 PMF and the PMF. Based on the criteria and the downstream conditions, the selected SDF at the dam is the PMF. Based on existing conditions, the spillway will pass about 20 percent of the PMF before overtopping of the dam occurs. Failure of the dam would cause an increased hazard to loss of life downstream. If the low area on the top of the embankment were filled to the design elevation, the spillway would pass about 28 percent of the PMF. For either condition, the spillway capacity is rated as seriously inadequate. According to criteria established for these studies, the dam is considered to be unsafe, nonemergency, because the spillway capacity is seriously inadequate.

(2) Lack of maintenance has caused the spillway to deteriorate to such an extent that it is on the verge of collapse. It is unlikely that the spillway could withstand any flood of significant duration.

(3) Because of the nature of its construction, the steep downstream slope, bulges, and possible seepage, the stability of the embankment is only considered marginal.

(4) There is no evidence to suggest that the emergency drawdown facility is operational. It is in poor condition.

(5) Maintenance at the dam is inadequate.

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

<u>Feature and Location</u>	<u>Observed Deficiency</u>
<u>Embankment:</u>	Low area; trees and brush; bulges on downstream slope; eroded areas on upstream slope; possible seepage.
<u>Spillway:</u>	Near collapse due to lack of maintenance.
<u>Outlet Works:</u>	No operating mechanism, severely rusted securing nuts; valve pit collapsed.

b. Adequacy of Information. The information available is such that a preliminary 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 immediately.

d. Necessity for Further Investigations. In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations by the Owner will be required.

7.2 Recommendations and Remedial Measures.

a. The following studies and remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Remove the spillway bridge. Also remove brush and debris from the spillway. Until the recommendations below are completed, provide temporary measures to ensure the structural stability of the spillway.

(2) Perform additional studies to more accurately ascertain the spillway capacity required for Mountain Lake Dam as well as the nature and extent of measures required to provide adequate spillway capacity. Take appropriate action as required. If the existing spillway is to remain, it should be completely replaced.

(3) Perform comprehensive investigations and studies as required to assess the structural stability for

the dam. The investigations and studies should address conditions within the dam and foundation. Take appropriate action as required. These studies should also address the slope protection required to prevent erosion. The final top of dam elevation should be coordinated with the spillway study recommended above. Until the studies are complete and any necessary remedial action taken, the Owner should monitor the condition of the dam. If any changes occur, immediate remedial action should be taken.

(4) Provide whatever measures are necessary to make the outlet works operational. Once operational, it should be maintained and operated on a regular basis. Also provide an upstream closure facility and a structurally adequate valve pit for the outlet works and assess the need for a structure around the gate valve to protect it from freezing.

(5) Remove trees and brush growing on or near the embankment.

All investigations, studies, designs, and inspection of construction should be performed by a professional engineer experienced in the design and construction of dams. Tree removal should also be guided by a professional engineer.

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

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

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Mountain 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 at the dam 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 such 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: MOUNTAIN LAKE
NDI ID NO.: PA-00546 DER ID NO.: 40-50

Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	None
REGIONAL VICINITY MAP	SEE PLATE E-1
CONSTRUCTION HISTORY	Built 1910
TYPICAL SECTIONS OF DAM	None
OUTLETS: Plan Details Constraints Discharge Ratings	None

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	None
DESIGN REPORTS	1915 Report by PENNSYLVANIA WATER SUPPLY COMMISSION.
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	None
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	None
POSTCONSTRUCTION SURVEYS OF DAM	None

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	NONE
MONITORING SYSTEMS	NONE
MODIFICATIONS	NONE
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	None
OPERATING EQUIPMENT: Plans Details	None
PREVIOUS INSPECTIONS Dates Deficiencies	1920 - No deficiencies - ice chute in spillway. 1923 - No deficiencies - ice chute in spillway. 1925 - 8" Timber & ice chute in spillway. MAY BE LOW NEAR MIDDLE OF EMBANKMENT. "PAVING" ON DOWNSTREAM SLOPE BULGING IN A FEW SPOTS. 1926 - PER 1925 (2 INSPECTIONS 1 IN MAY & 1 IN JUNE). 1927 - PER 1923
(CONTINUED)	1928 - Both spillway walls cracked & PER 1925. 1930 - PER 1928 1934 - Remains of log chute in spillway Brush on slopes, moist near right end.

ENGINEERING DATA

Sheet 4a of 4

ITEM	REMARKS
PREVIOUS INSPECTIONS (CONTINUED)	1935 - RUTS ON TOP OF DAM, OLD ICE CHUTE IN SPILLWAY. LEFT SPILLWAY WALL DISINTEGRATING. 1938 - SLIGHT LEAKAGE BEHIND LEFT SPILLWAY WALL. OLD ICE CHUTE IN SPILLWAY.
	Spillway walls cracked and disintegrating 1944 - BRUSH AND WEEDS ON SLOPES, SLIGHT SEEPAGE "BEHIND" LEFT ABUTMENT Both spillway walls badly
	disintegrated. 6" FLASHBOARDS IN SPILLWAY. 1964 - TREES AND BRUSH ON SLOPES, CONCRETE BROKEN AT SPILLWAY.

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: MOUNTAIN LAKE County: LUZERNE State: PENNSYLVANIA
NDI ID No.: PA-00546 DER ID No.: 40-50
Type of Dam: EARTHFILL Hazard Category: HIGH
Date(s) Inspection: 17 APRIL 1980 Weather: CLEAR-LIGHT BREEZE Temperature: 45°F
SOME SNOW ON GROUND
SOIL-WET
Pool Elevation at Time of Inspection: 1986.6 msl/Tailwater at Time of Inspection: 1975.2 msl
Inspection Personnel:
J. CHERNICKY (PENNDER) D. EBERSOLE (GFCC)
A. KAHLER (PENNDER)
D. WILSON (GFCC)
A. WHITMAN (GFCC) Recorder

B-1

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None DOWNSTREAM SLOPE SLIGHTLY UNEVEN	Most uneven areas are bulge that is 1.5' high and about 10' long. Near spillway and bulge 2' high and 20' long near outlet works
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	UPSTREAM SLOPE: MANY SLIGHTLY SLOUGHED OR ERODED AREAS. TYPICALLY 5' TO 10' LONG. ALSO, SEE RIPRAP	AREAS APPEAR AS IF THEY HAD BEEN USED FOR BOAT LAUNCHING
CREST ALIGNMENT: Vertical Horizontal	HORIZONTAL - NO DEFICIENCIES VERTICAL - SEE SURVEY DATA FOLLOWING INSPECTION FORMS.	
RIPRAP FAILURES	None EXCEPT ERODED AREAS - SEE "EROSION"	FOOT TRAIL ERODED in downstream slope.

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	Abutment - no deficiencies Spillway - SEE "Spillway"	
ANY NOTICEABLE SEEPAGE	NONE	SOFT AREAS DOWNSTREAM OF TOE AT EACH SIDE OF SPILLWAY. 18PM FLOW FROM LEFT ABUTMENT ABOVE POOL EL.
STAFF GAGE AND RECORDER	NONE	
DRAINS	NONE	
Vegetation	BRUSH/SMALL TREES ON UPSTREAM SLOPE. MATURE TREES ON DOWNSTREAM SLOPE.	

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	CAST IRON PIPE CIP	
INTAKE STRUCTURE	SUBMERGED NOT VISIBLE	
OUTLET STRUCTURE	OUTFALL AT DRY MASONRY WALL BY STREAM	VALVE SURROUNDED BY CONCRETE WALL PIT. WALLS SHEARED AND BROKEN
OUTLET CHANNEL	NATURAL STREAM	
EMERGENCY GATE	OWNER'S AGENT UNABLE TO LOCATE OPERATING MECHANISM.	NUTS SECURING GATE VALVE HOUSING VERY RUSTED.

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	<p style="text-align: center;">↑ SEE EXHIBIT B-2</p>	
APPROACH CHANNEL	<p style="text-align: center;">ENTIRE STRUCTURE ALMOST TOTALLY DETERIORATED</p>	
DISCHARGE CHANNEL	<p style="text-align: center;">↓</p>	
BRIDGE AND PIERS		

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	USGS HORIZONTAL CONTROL MARKER AT LEFT UPSTREAM WALL OF SPILLWAY.	MARKER, EL 1989.0, USED AS CONTROL. CONTROL NOT EXACT BECAUSE OF TILTING WALL.
OBSERVATION WELLS	NONE AT SITE	
WEIRS		
PIEZOMETERS		
OTHER	NONE AT SITE	

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	CLEAR NEAR DAMSITE.	
SLOPES	GENERALLY MILD	
APPROXIMATE NUMBER OF HOMES AND POPULATION	4 dwellings THAT WOULD BE FLOODED BY FAILURE.	ALSO BEAR CREEK LAKE DAM.

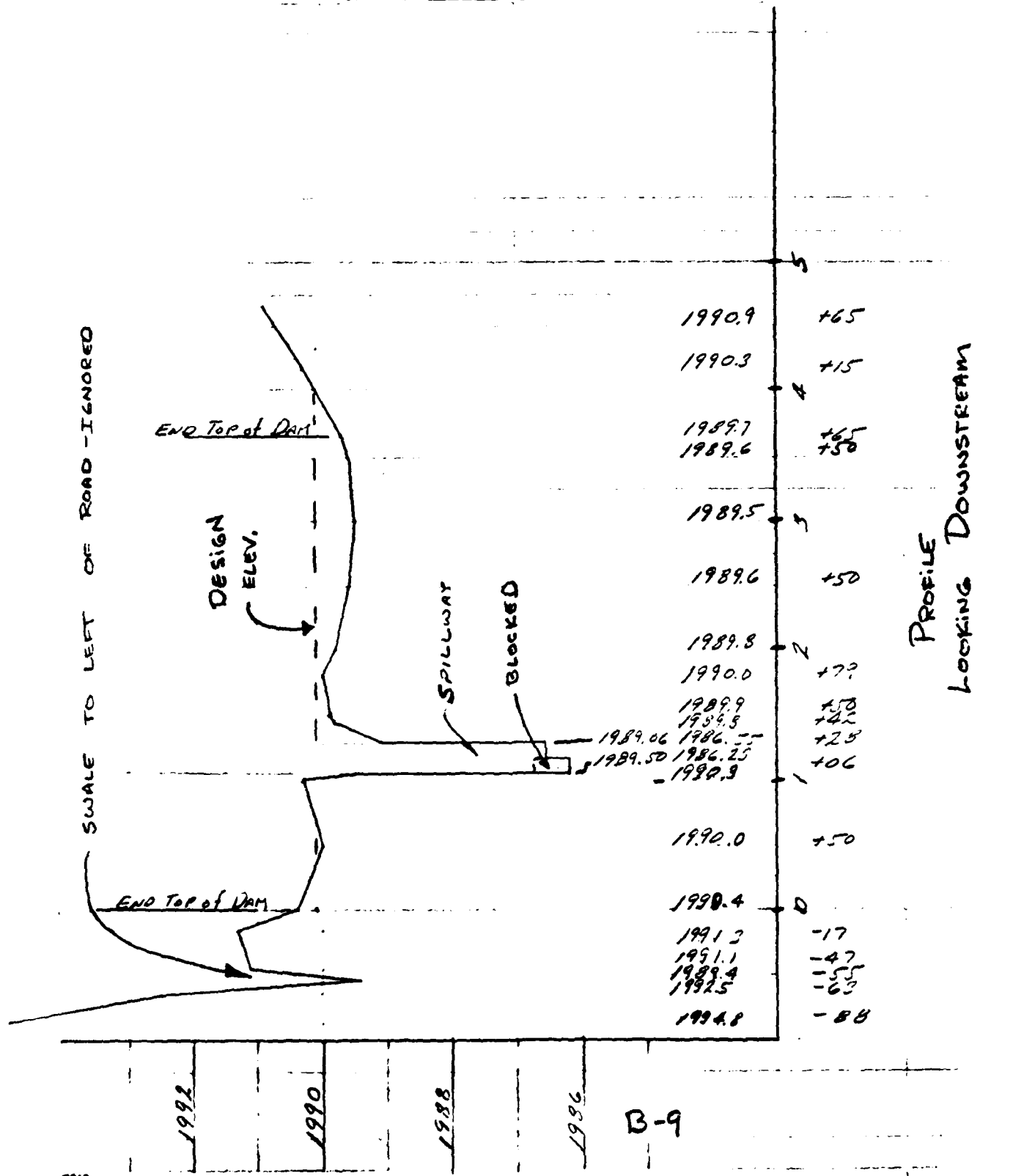
RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	GENERALLY MILD	
SEDIMENTATION	No observed PROBLEMS.	
WATERSHED DESCRIPTION	Minor Development REMAINDER WOODED	Meadow Run Dam immediately UPSTREAM.

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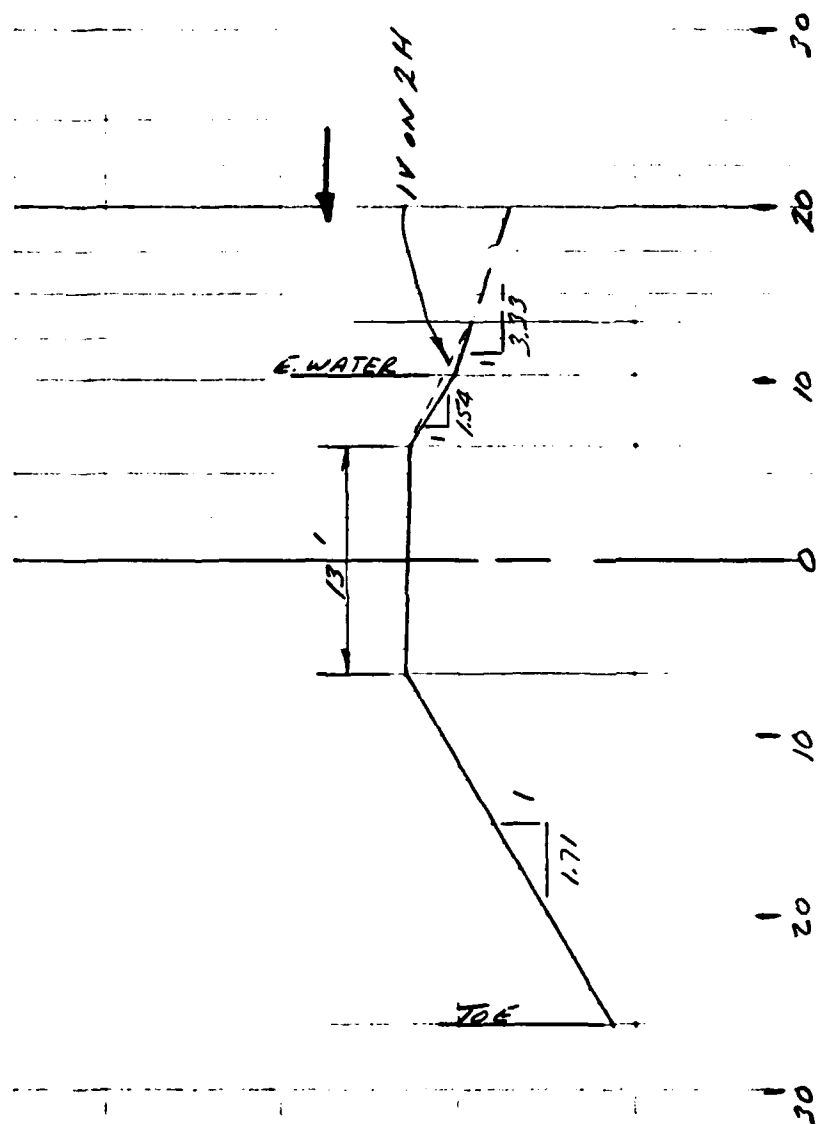
SUBJECT MOUNTAIN LAKE DAM FILE NO. B202
PROFILE - TOP of DAM SHEET NO. 1 OF 1 SHEETS
FOR _____
COMPUTED BY DLE DATE 4-80 CHECKED BY _____ DATE _____



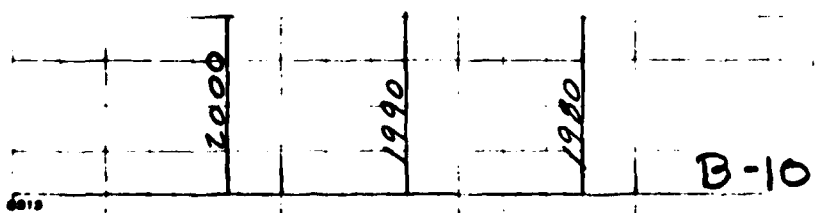
B-9

GANNETT FLEMING CORDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT MOUNTAIN LAKE DAM FILE NO. 8202
CROSS SECTION OF EMBANKMENT SHEET NO. 2 OF SHEETS
FOR
COMPUTED BY DLE DATE 4-30 CHECKED BY DATE

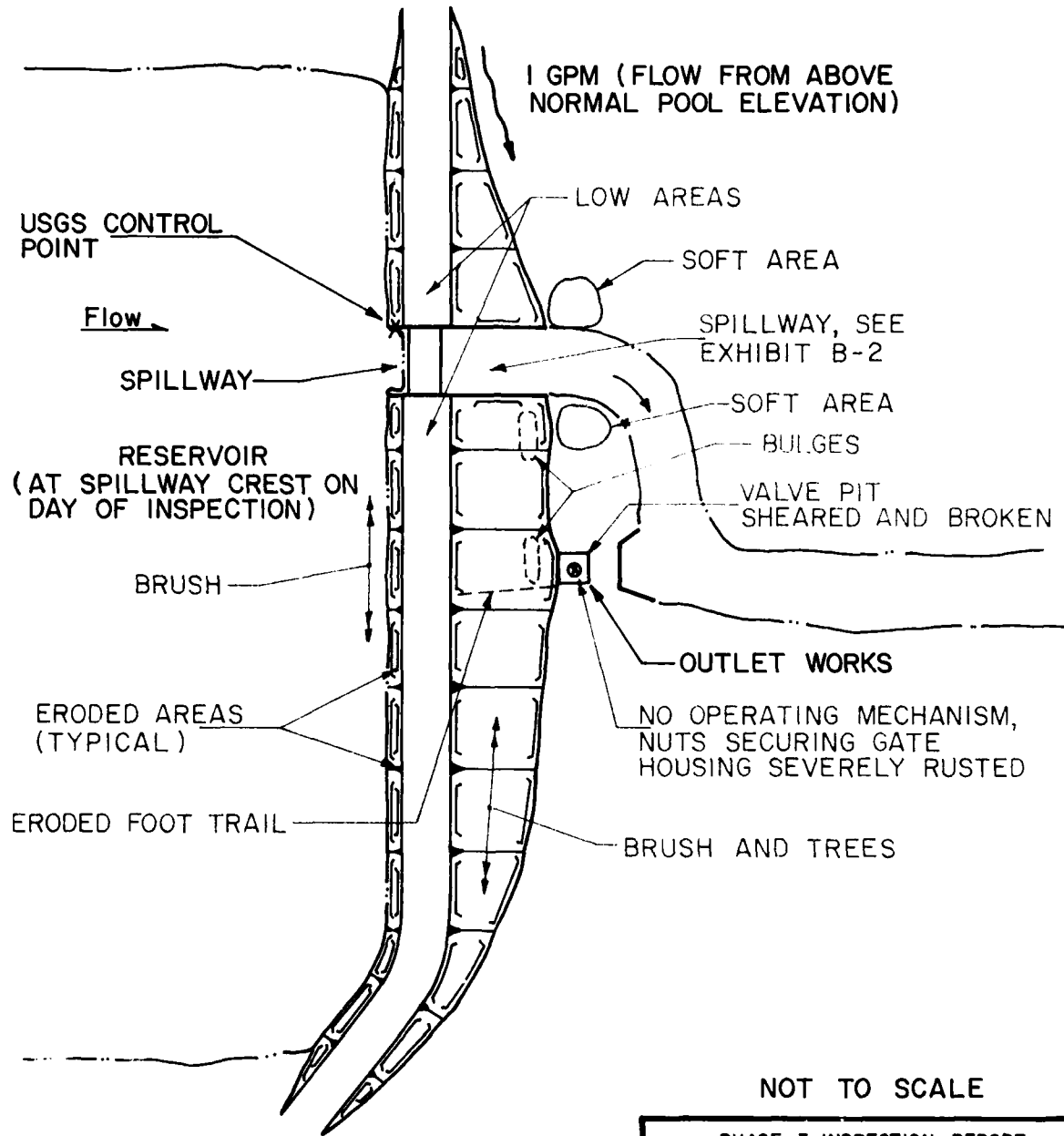


SECTION @ STA 2+85



NOTE:

THE UPPER PART OF THE UPSTREAM SLOPE AND THE DOWNSTREAM SLOPE ARE STEEPER THAN THE REPORTED DESIGN.



NOT TO SCALE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

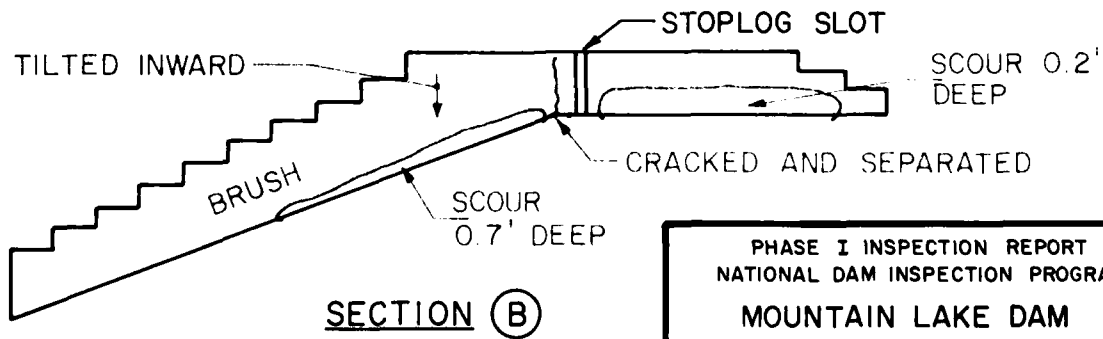
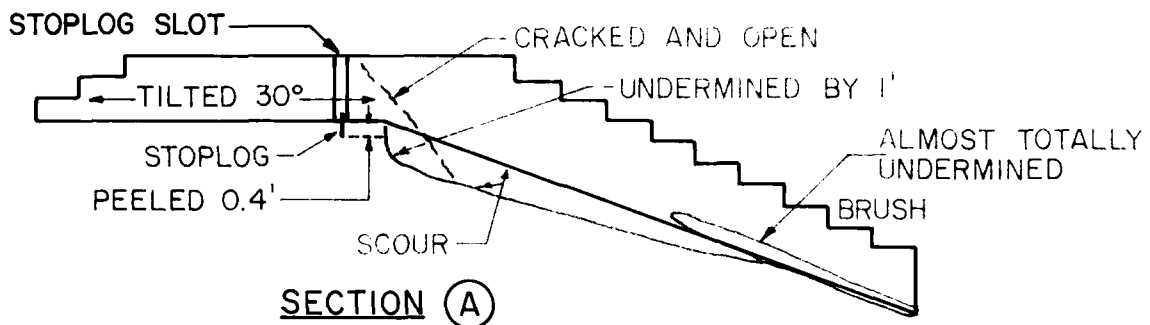
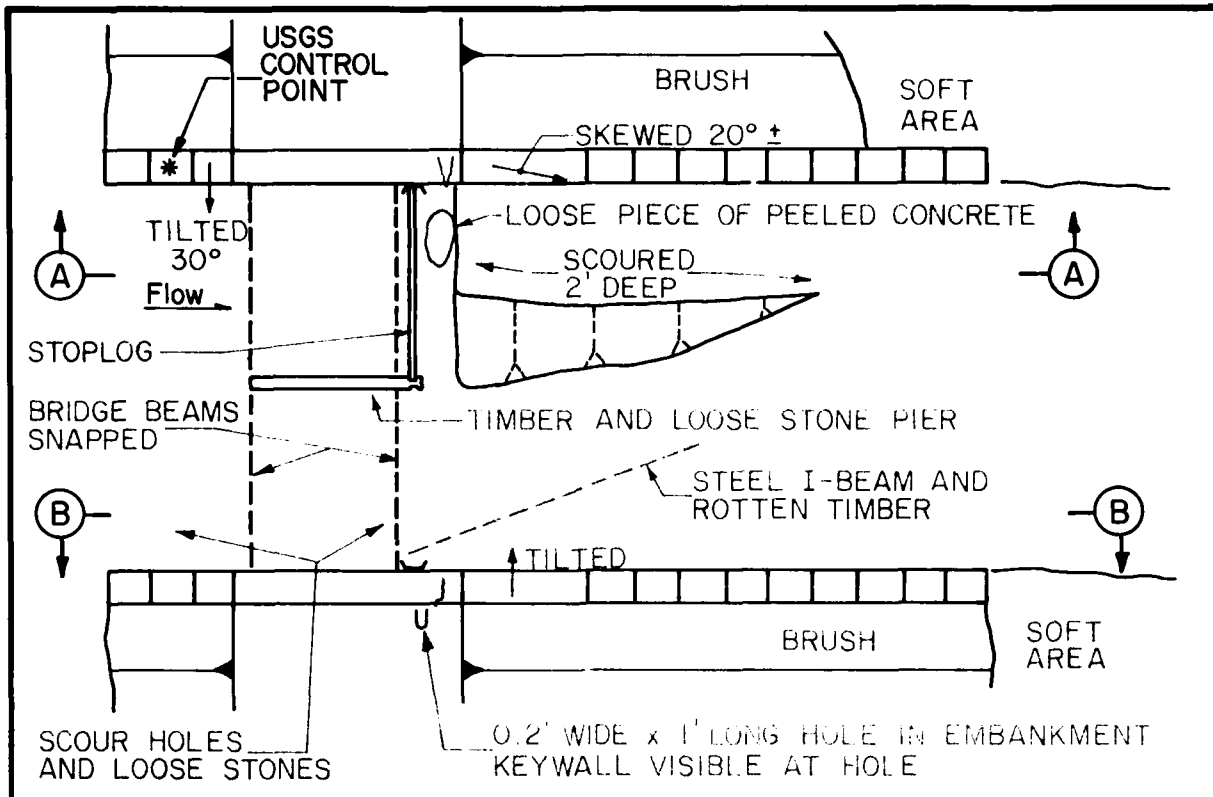
MOUNTAIN LAKE DAM

ELEANOR TAYLOR

RESULTS OF
VISUAL INSPECTION

JUNE 1980

EXHIBIT B-1



SCALE: 1 IN. = 10 FT.

PHASE I INSPECTION REPORT
 NATIONAL DAM INSPECTION PROGRAM
 MOUNTAIN LAKE DAM
 ELEANOR TAYLOR
 RESULTS OF VISUAL
 INSPECTION AT SPILLWAY
 JUNE 1980 EXHIBIT B-2

APPENDIX C
PHOTOGRAPHS

MOUNTAIN LAKE DAM



A. Upstream Slope



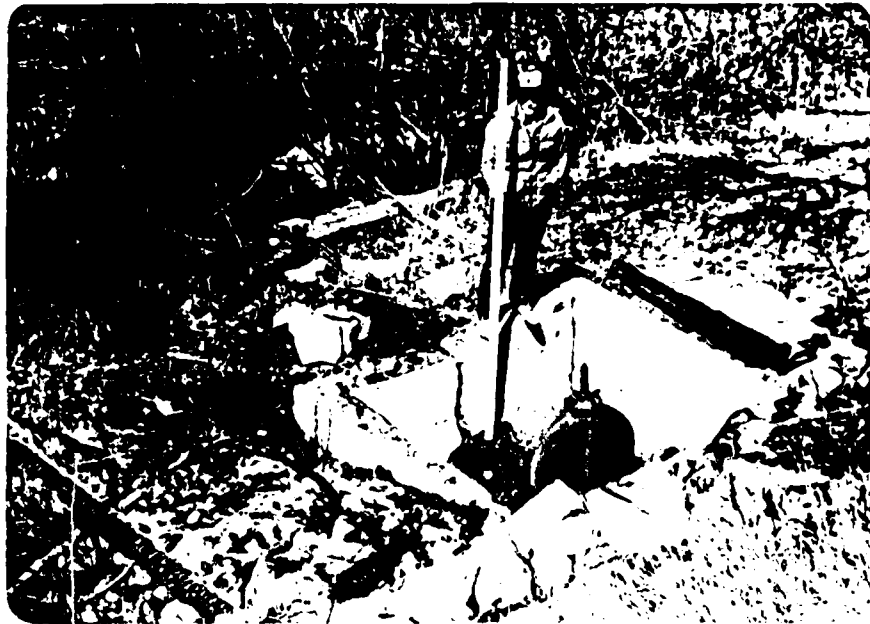
B. Top of Dam



C. Downstream Slope



D. Downstream Slope



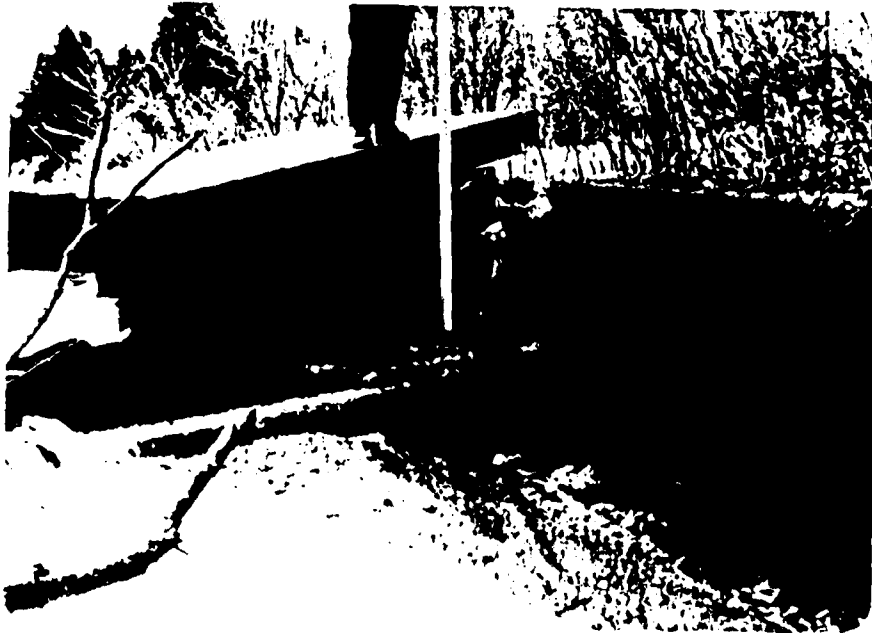
E. Outlet Works



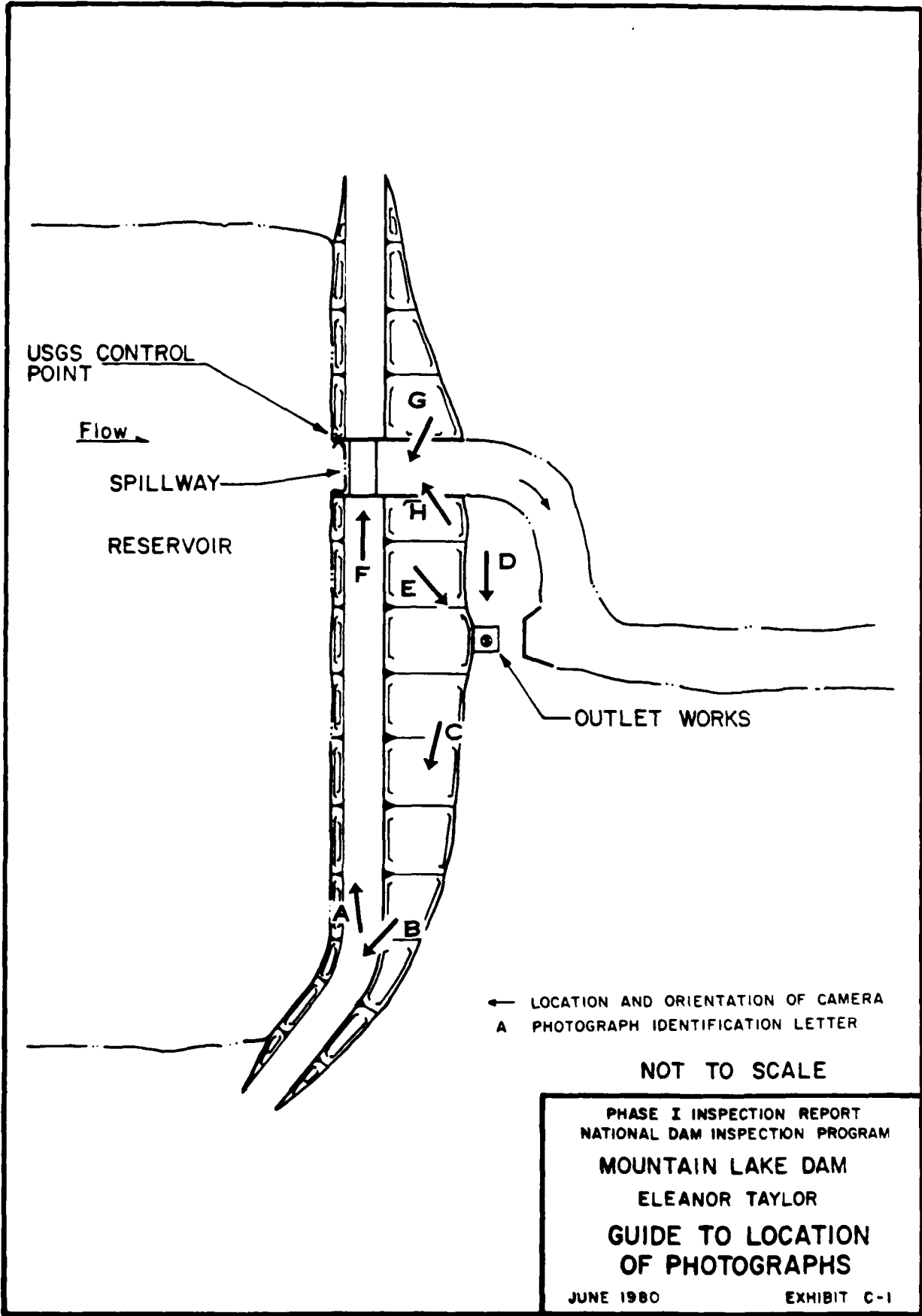
F. Spillway Bridge



G. Right Spillway Wall



H. Left Spillway Wall



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: MEADOW RUN
 Name of Dam: MOUNTAIN LAKE
 NDI ID No.: PA-00546
 DER ID No.: 40-50
 Latitude: N 41° 12' 50" Longitude: W 75° 40' 35"
 Top of Dam Elevation: 1989.5 (EXISTING)
 Streambed Elevation: 1974.5 Height of Dam: 15 ft
 Reservoir Storage at Top of Dam Elevation: 253 acre-ft
 Size Category: SMALL
 Hazard Category: HIGH (see Section 5)
 Spillway Design Flood: VARIES 1/2 PMF TO PMF
SELECT PMF

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
<u>MEADOW RUN</u>	<u>0.5</u>	<u>15</u>	<u>567 (1)</u>	<u>NDI PA-00555</u> <u>DER 40-51</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

DOWNSTREAM DAMS

<u>BEAR CREEK LAKE</u>	<u>17</u>	<u>765 (2)</u>	<u>NDI PA-00545</u> <u>DER 40-47</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

- (1) PHASE I REPORT BEING PREPARED CONCURRENTLY.
 (2) PHASE I REPORT PREVIOUSLY PREPARED.

DELAWARE

River Basin

Name of Stream: MEADOW RUN

Name of Dam: MOUNTAIN LAKE

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	1.67	0.45	2.1	2.27	.795	N/A	2.51	2	B
A-2	0.29	0.45	2.1	N/A	N/A	0.38	1.18	2	B
Total	1.96								

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

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

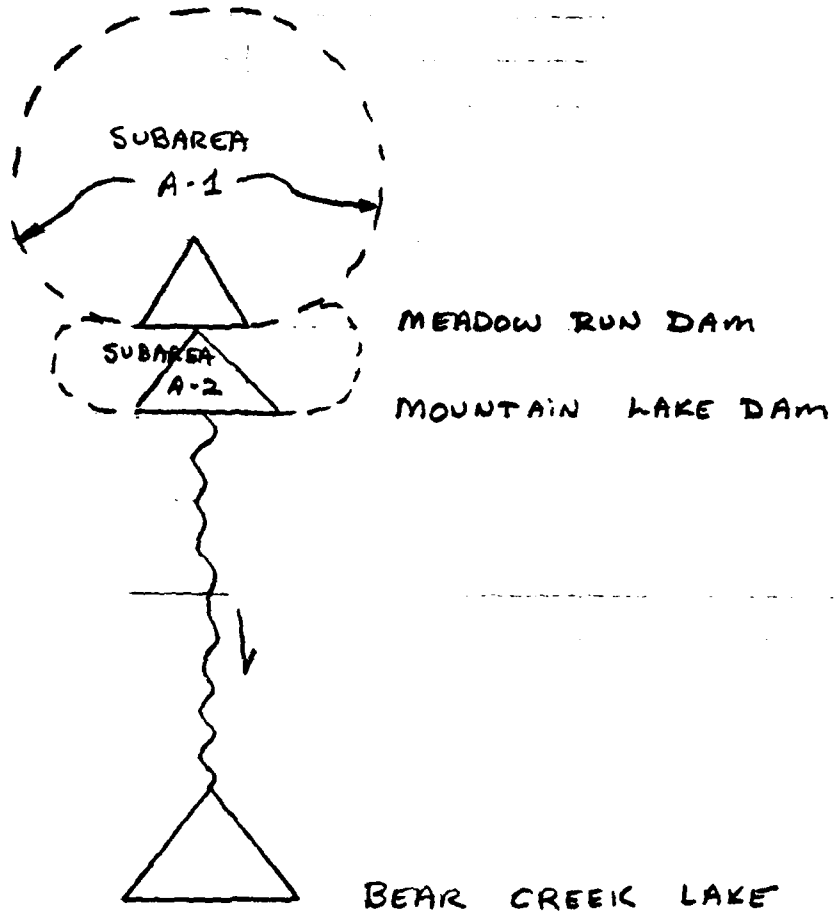
Revised Index Rainfall: N/A 22.0

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	<u>111</u>
12 hours	<u>123</u>
24 hours	<u>132</u>
48 hours	<u>142</u>
72 hours	_____
96 hours	_____

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



D-4

SKETCH
OF
SYSTEM

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

Name of Dam: MEADOW RUN

STORAGE DATA: FROM PHASE I REPORT

Elevation	Area (acres)	Storage		Remarks
		million gals	acre-ft	
<u>1986.3</u> =ELEVO*	<u>0</u>	<u>0</u>	<u>0</u>	
<u>2000.1</u> =ELEV1	<u>90</u> =A1		<u>418</u> =S1	
<u>2001.7</u>	<u>95</u>		<u>567</u>	
<u>2003.6</u>	<u>102</u>		<u>754</u>	
<u>2020.0</u> **	<u>167</u>			

* ELEVO = ELEV1 - (3S₁/A₁)

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

Reservoir Area at Normal Pool is 8 percent of subarea watershed.

BREACH DATA: FROM PHASE I REPORT

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 = $(2/3) \times H$) & $A = L \cdot \text{depth}$

HMAX = $(4/9 v^2/c^2)$ = _____ ft., C = _____ Top of Dam El. = _____

HMAX + Top of Dam El. = 2002.1 = FAILLEL
(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 = 1986.3 (bottom of breach elevation, minimum of zero storage elevation)
WSEL = 2000.1 (normal pool elevation)
T FAIL = 6 mins = 0.1 hrs (time for breach to develop)

D-5

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

Name of Dam: MOUNTAIN LAKE

STORAGE DATA: NO DESIGN DATA - ONLY DATA IN
DER FILES DESCRIBED AS "ESTIMATE"
Storage

<u>Elevation</u>	<u>Area</u> <u>(acres)</u>	<u>million</u> <u>gals</u>	<u>acre-ft</u>	<u>Remarks</u>
<u>1974.5</u> =ELEVO*	<u>0</u>	<u>0</u>	<u>0</u>	<u>STREAMBED</u>
<u>1986.6</u> =ELEV1	<u>37</u> =A1	<u> </u>	<u>152</u> =S1	<u>SPILLWAY</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>CREST</u>
<u>1989.1</u>	<u>44</u>	<u> </u>	<u>253</u>	<u>EXISTING TOP</u>
<u>1990.1</u>	<u>47</u>	<u> </u>	<u>299</u>	<u>DESIGN TOP</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>2000</u> **	<u>84</u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

* ~~ELEVO - ELEV1~~ = (36 / A) S1 = (ELEV1 - ELEVO) x A^{1/3}

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

Reservoir Area at Normal Pool is 20 percent of subarea watershed.

BREACH DATA:

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

Soil Type from Visual Inspection: SAND

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

HMAX = $(4/9 V^2/C^2)$ = 0.2 ft., C = 3.1 Top of Dam El. = 1989.5

HMAX + Top of Dam El. = 1989.7 = FAILURE
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = 75 ft (width of bottom of breach)
Z = 1 (side slopes of breach)
ELBM = 1974.5 (bottom of breach elevation, minimum of zero storage elevation)
WSEL = 1989.5 (normal pool elevation)
T FAIL = 6 mins = 0.1 hrs (time for breach to develop)

Data for Dam at Outlet of Subarea (See sketch on Sheet D-4)

Name of Dam: BEAR CREEK LAKE

STORAGE DATA: FROM PHASE I REPORT

Elevation	Area (acres)	Storage		Remarks
		million gals	acre-ft	
<u>1512</u> =ELEVO*	<u>0</u>	<u>0</u>	<u>0</u>	
<u>1521</u> =ELEV1	<u> </u> -A1	<u> </u>	<u>490</u> -S1	
<u>1524</u>	<u> </u>	<u> </u>	<u>765</u>	
<u>1540</u>	<u> </u>	<u> </u>	<u>4,109</u>	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	
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<u> </u>	<u> </u>	<u> </u>	<u> </u>	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	

* ELEVO = ELEV1 - (3S₁/A₁)
** Planimetered contour at least 10 feet above top of dam
Reservoir Area at Normal Pool is N/A percent of subarea watershed.

BREACH DATA: NOT USED

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 = $(2/3) \times H$) & $A = L \cdot \text{depth}$

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

HMAX + Top of Dam El. = = FAIL EL
(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

Name of Dam: BEAR CREEK LAKE

SPILLWAY DATA: FROM PHASE I
REPORT

	<u>Existing</u> <u>Conditions</u>	<u>Design</u> <u>Conditions</u>
Top of Dam Elevation	_____	_____
Spillway Crest Elevation	_____	_____
Spillway Head Available (ft)	_____	_____
Type Spillway	_____	_____
"C" Value - Spillway	_____	_____
Crest Length - Spillway (ft)	_____	_____
Spillway Peak Discharge (cfs)	_____	_____
Auxiliary Spillway Crest Elev.	_____	_____
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:

<u>Elevation</u>	<u>Q Spillway (cfs)</u>	<u>Q Auxiliary</u> <u>Spillway (cfs)</u>	<u>Combined (cfs)</u>
1521.0	_____	_____	0
1521.5	_____	_____	190
1522.0	_____	_____	537
1522.5	_____	_____	987
1523.0	_____	_____	1,519
1523.5	_____	_____	2,123
1524.0	_____	_____	2,791
1525.0	_____	_____	4,296
1530.0	_____	_____	14,504
1540.0	_____	_____	44,490

OUTLET WORKS RATING: Outlet 1 Outlet 2 Outlet 3

Invert of Outlet	<u>NOT PERTINENT TO THIS</u>		
Invert of Inlet	<u>REPORT</u>		
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)	_____	_____	_____

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

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

SELECTED COMPUTER OUTPUT

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BREACH ANALYSIS:	
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PLAN 2 - ASSUMES ONLY MOUNTAIN LAKE DAM FAILS	
PLAN 3 - ASSUMES MEADOW RUN AND MOUNTAIN LAKE DAMS FAIL	
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 FLOOD HYDROGRAPH PACKAGE (HFC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 01 APR 80

	A2	A3	R	P	J	J1	K	K1	M	P	T	N	X	K	K1	Y	Y1	SA	SE1986.3	SE2000.1	SD2001.7	SL	SV2001.7	K	M	P	T	Y	X	K	K1	K	K1	Y	Y1	SA	SE1974.5	SE1986.6	SD1989.1	SL	SV1989.1	K							
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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CURIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILLS (SQWART KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 1.00	RATIO 2 .80	RATIO 3 .70	RATIO 4 .60	RATIO 5 .50	RATIO 6 .40	RATIO 7 .30	RATIO 8 .20	RATIO 9 .10
HYDROGRAPH AT	1	1.67 (4.33)	1	2007. (82.12)	2326. (65.85)	2035. (57.62)	1746. (49.39)	1454. (41.16)	1163. (32.93)	872. (24.70)	581. (16.46)	291. (8.23)
ROUTED TO	1	1.67 (4.33)	1	2822. (79.92)	2235. (63.29)	1935. (54.79)	1626. (46.04)	1303. (36.90)	959. (27.15)	594. (16.81)	274. (7.77)	101. (2.87)
HYDROGRAPH AT	2	.29 (.74)	1	762. (21.58)	610. (17.76)	533. (15.11)	457. (12.93)	381. (10.79)	305. (8.63)	229. (6.67)	152. (4.32)	76. (2.16)
2 COMBINED	2	1.96 (5.08)	1	3357. (95.07)	2644. (74.86)	2261. (64.58)	1898. (53.76)	1501. (42.49)	1083. (30.67)	655. (18.55)	296. (8.39)	109. (3.08)
ROUTED TO	2	1.96 (5.08)	1	3312. (94.16)	2620. (74.20)	2251. (63.74)	1869. (52.93)	1466. (41.50)	1035. (29.30)	584. (16.53)	239. (6.78)	91. (2.57)

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PLAN 1

SUMMARY OF DAM SAFETY ANALYSIS

Meadow Run Dam

RATIO OF PMF	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 2000.10	SPILLWAY CREST 2000.10	TOP OF DAM 2001.70	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	2004.02	2.32	414.0	0.	24.00	42.75	0.00
.80	2003.79	2.09	414.0	0.	22.50	43.00	0.00
.70	2003.66	1.96	414.0	0.	21.50	43.00	0.00
.60	2003.52	1.82	414.0	0.	20.50	43.25	0.00
.50	2003.36	1.66	414.0	0.	19.25	43.50	0.00
.40	2003.17	1.67	414.0	0.	18.00	44.00	0.00
.30	2002.89	1.19	414.0	0.	16.00	44.75	0.00
.20	2002.36	.66	414.0	0.	12.50	46.50	0.00
.10	2001.41	0.00	414.0	0.	0.00	47.75	0.00

MAXIMUM STORAGE AC-FY

MAXIMUM OUTFLOW CFS

MAXIMUM DEPTH OVER DAM

MAXIMUM RESERVOIR W.S. ELEV

SUMMARY OF DAM SAFETY ANALYSIS
Mountain Lake Dam

PLAN 1

RATIO OF PMF	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 1986.60 149. 0.	SPILLWAY CREST 1986.60 149. 0.	TOP OF DAM 1989.10 251. 235.	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	1991.52	1986.60	1986.60	1989.10	1991.52	2.42	367.	3332.	21.00	42.75	0.00
.80	1991.23	1986.60	1986.60	1989.10	1991.23	2.13	352.	2620.	19.25	43.00	0.00
.70	1991.07	1986.60	1986.60	1989.10	1991.07	1.97	344.	2751.	18.50	43.00	0.00
.60	1990.89	1986.60	1986.60	1989.10	1990.89	1.79	335.	1869.	17.50	43.25	0.00
.50	1990.69	1986.60	1986.60	1989.10	1990.69	1.59	325.	1466.	16.25	43.75	0.00
.40	1990.43	1986.60	1986.60	1989.10	1990.43	1.33	313.	1075.	14.50	44.50	0.00
.30	1990.06	1986.60	1986.60	1989.10	1990.06	.96	295.	584.	12.00	46.00	0.00
.20	1989.13	1986.60	1986.60	1989.10	1989.13	.03	252.	239.	2.50	49.25	0.00
.10	1987.93	1986.60	1986.60	1989.10	1987.93	0.00	201.	91.	0.00	51.75	0.00

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MTN
BENCH

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80

	NATIONAL DAM INSPECTION PROGRAM									
	MEADOW RUN	MEADOW RUN	MOUNTAIN LAKE	MOUNTAIN LAKE	DAM					
1	A1									
2	A2									
3	A3									
4	B	300	0	6	0	0	0	0	-4	0
5	B1	5	2	1						
6	J	5								
7	J1	.25								
8	K	0								
9	K1									
10	M	1								
11	P	1	1.67		1.96					
12	T	22	111	123	132					
13	V	2.51	.45							.08
14	X	-1.5	-0.05	2.0						
15	K	1								
16	K1									
17	Y									
18	Y1	1								
19	SA	0	90	167						
20	SE1986.3	2000.1	2020							
21	SE2000.1	25	2.7	1.5						
22	SE2001.7									
23	SL	1	15	120	225	320	425	465	490	600
24	SV2001.7	2001.9	2002.6	2002.61	2002.69	2003.1	2003.1	2003.6	2004.2	2005.4
25	SB	80	1	1986.3	.1	2000.1	2040			630
26	SB	80	1	1986.3	.1	2000.1	2040			2006.0
27	SB	80	1	1986.3	.1	2000.1	2002.1			
28	K	0	2							
29	K1									
30	M	1								
31	P	1	.29							
32	T	22	111	123	132					
33	V	1.18	.45							.02
34	X	-1.5	-0.05	2.0						
35	K	2								
36	K1									
37	K	1								
38	K1									
39	V									
40	Y1	1								
41	SA	0	37	54						
42	SE1974.5	1986.6	2000							
43	SE1986.6	22	2.7	1.5						
44	SE1989.1									
45	SL	1	10	115	155	190	260	400	530	
46	SV1989.1	1989.5	1989.6	1989.7	1989.8	1990	1990.4	1990.4	2000	
47	SB	75	1	1974.5	.1	1986.6	2020			
48	SB	75	1	1974.5	.1	1986.6	1989.4			
49	SB	75	1	1974.5	.1	1986.6	1989.4			
50	K	1	3							

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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	RATIO 1	RATIO 2	RATIOS APPLIED TO FLOWS
			.50	.25		
HYDROGRAPH AT	1	1.67				
	(	4.33)				
			1437.	719.		
ROUTED TO	1	1.67				
	(	4.33)				
			40.69)(	20.35)(
HYDROGRAPH AT	2					
	(
			1437.	719.		
ROUTED TO	1	1.67				
	(	4.33)				
			40.69)(	20.35)(
HYDROGRAPH AT	3					
	(
			1437.	719.		
ROUTED TO	1	1.67				
	(	4.33)				
			40.69)(	20.35)(
HYDROGRAPH AT	1	1.67				
	(	4.33)				
			1251.	379.		
ROUTED TO	1	1.67				
	(	4.33)				
			35.42)(	10.72)(
HYDROGRAPH AT	2					
	(
			1251.	379.		
ROUTED TO	1	1.67				
	(	4.33)				
			35.42)(	10.72)(
HYDROGRAPH AT	3					
	(
			17490.	17.78.		
ROUTED TO	1	1.67				
	(	4.33)				
			495.25)(	492.10)(
HYDROGRAPH AT	1	1.67				
	(	4.33)				
			387.	193.		
ROUTED TO	1	1.67				
	(	4.33)				
			10.96)(	5.48)(
HYDROGRAPH AT	2					
	(
			387.	193.		
ROUTED TO	1	1.67				
	(	4.33)				
			10.96)(	5.48)(
HYDROGRAPH AT	3					
	(
			387.	193.		
ROUTED TO	1	1.67				
	(	4.33)				
			10.96)(	5.48)(
HYDROGRAPH AT	1	1.67				
	(	4.33)				
			1433.	411.		
ROUTED TO	1	1.67				
	(	4.33)				
			40.57)(	11.63)(
HYDROGRAPH AT	2					
	(
			1433.	411.		
ROUTED TO	1	1.67				
	(	4.33)				
			40.57)(	11.63)(
HYDROGRAPH AT	3					
	(
			17852.	17483.		
ROUTED TO	1	1.67				
	(	4.33)				
			505.51)(	495.07)(
HYDROGRAPH AT	1	1.67				
	(	4.33)				
			39.38)(	9.15)(
ROUTED TO	1	1.67				
	(	4.33)				
			14537.	14277.		
HYDROGRAPH AT	2					
	(
			411.63)(	404.29)(
ROUTED TO	1	1.67				
	(	4.33)				
			575.48)(	562.52)(
HYDROGRAPH AT	1	1.67				
	(	4.33)				
			39.23)(	9.14)(
ROUTED TO	1	1.67				
	(	4.33)				
			10037.	9769.		
HYDROGRAPH AT	2					
	(
			284.21)(	276.62)(
ROUTED TO	1	1.67				
	(	4.33)				
			17573.	17086.		
HYDROGRAPH AT	3					
	(
			497.61)(	483.81)(
ROUTED TO	1	1.67				
	(	4.33)				
			37.49)(	9.02)(
HYDROGRAPH AT	2					
	(
			2262.	4912.		
ROUTED TO	1	1.67				
	(	4.33)				
			149.00)(	139.10)(
HYDROGRAPH AT	3					
	(
			12.114.	11932.		

G

ROUTED TO	5	(	1,96	(	348,713	(	335,043
			5,08)		1322.		318.
					37,433		9,023
					5049.		4045.
					142,793		131,543
					12182.		11673.
					344,963		330,553
ROUTED TO	6	(	1,96	(	313.	(	318.
			5,08)		37,173		9,003
					4629.		4060.
					125,423		114,963
					11505.		10962.
					325,783		310,413
ROUTED TO	7	(	1,96	(	1255.	(	311.
			5,08)		35,543		8,813
					3026.		2630.
					85,693		74,483
					8962.		8355.
					253,773		236,593
ROUTED TO	8	(1,96	(1044.	(288.
			5,08)		29,563		8,163
					1767.		1369.
					50,053		38,763
					4899.		4330.
					138,723		122,613

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SUMMARY OF DAM SAFETY ANALYSIS

MEADOW RUN DAM

PLAN 1		ELEVATION STORAGE		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM						
STORAGE		OUTFLOW		2000.10		2000.10		2001.70						
414.0		0.0		414.0		414.0		562.0						
0.0		0.0		0.0		0.0		137.0						
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
.50		2003.34		1.64		723.0		1251.0		13.50		19.60		0.00
.25		2002.62		.92		651.0		379.0		11.90		21.80		0.00

PLAN 2		ELEVATION STORAGE		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM						
STORAGE		OUTFLOW		2000.10		2000.10		2001.70						
414.0		0.0		414.0		414.0		562.0						
0.0		0.0		0.0		0.0		137.0						
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
.50		2003.34		1.64		723.0		1251.0		13.50		19.60		0.00
.25		2002.62		.92		651.0		379.0		11.90		21.80		0.00

PLAN 3		ELEVATION STORAGE		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM						
STORAGE		OUTFLOW		2000.10		2000.10		2001.70						
414.0		0.0		414.0		414.0		562.0						
0.0		0.0		0.0		0.0		137.0						
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
.50		2002.17		.67		607.0		174.90		.71		17.20		17.10
.25		2002.614		.44		605.0		17378.0		1.10		19.20		19.10

G

SUMMARY OF DAM SAFETY ANALYSIS
MOUNTAIN LAKE DAM

PLAN 1		ELEVATION STORAGE OUTFLOW		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM	
				1986.60		1986.60		1989.10	
				149.		149.		251.	
				0.		0.		235.	
RATIO OF PMF		MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM STORAGE AC-FT	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50		1990.65	323.	1.55	323.	1391.	12.40	19.90	0.00
.25		1989.62	274.	.52	274.	323.	7.90	24.30	0.00

PLAN 2		ELEVATION STORAGE OUTFLOW		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM	
				1986.60		1986.60		1989.10	
				149.		149.		251.	
				0.		0.		235.	
RATIO OF PMF		MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM STORAGE AC-FT	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50		1989.49	268.	.38	268.	14537.	.48	18.10	18.00
.25		1989.40	264.	.30	264.	14277.	1.18	22.30	22.20

PLAN 3		ELEVATION STORAGE OUTFLOW		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM	
				1986.60		1986.60		1989.10	
				149.		149.		251.	
				0.		0.		235.	
RATIO OF PMF		MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM STORAGE AC-FT	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50		1991.82	383.	2.72	383.	20323.	.40	17.30	17.20
.25		1991.60	372.	2.50	372.	19965.	.40	19.30	19.20

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1385.	1954.6	20.00
.25	323.	1951.5	24.40

PLAN 2 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	10077.	1900.4	18.20

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0.25 9769. 1980.3 22.60

PLAN 3 STATION 3

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
0.50	17573.	1962.6	17.50
0.25	17086.	1962.5	19.50

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
0.50	1324.	1851.3	20.70
0.25	319.	1849.2	25.00

PLAN 2 STATION 4

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
0.50	5262.	1856.4	18.50
0.25	4912.	1856.2	22.70

PLAN 3 STATION 4

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
0.50	12314.	1857.3	17.80
0.25	11832.	1857.1	19.80

PLAN 1 STATION 5

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
0.50	1322.	1806.5	20.80
0.25	318.	1806.8	25.20

PLAN 2 STATION 5

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
0.50	5043.	1807.0	18.60
0.25	4645.	1806.8	22.80

PLAN 3 STATION 5

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
0.50	5043.	1807.0	18.60
0.25	4645.	1806.8	22.80

G

RATIO	FLOW,CFS	STAGE,FT	HOURS
.50	12182.	1811.5	17.90
.25	11673.	1811.4	19.90

PLAN 1 STATION 6

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1313.	1681.4	21.00
.25	518.	1679.4	25.40

PLAN 2 STATION 6

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	4429.	1686.4	18.80
.25	4060.	1686.2	22.90

PLAN 3 STATION 6

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	11505.	1688.4	18.10
.25	10962.	1688.1	20.00

PLAN 1 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1255.	1576.0	21.70
.25	311.	1573.9	26.50

PLAN 2 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	3026.	1576.1	19.20
.25	2650.	1577.7	23.30

PLAN 3 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	896.2.	1582.3	18.40
.25	8355.	1582.0	20.40

SUMMARY OF DAM SAFETY ANALYSIS

BEAR CREEK LAKE DAM

INITIAL VALUE
 1521.00
 490.
 0.
 0.
 2791.

ELEVATION
 STORAGE
 OUTFLOW

PLAN 1

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
.50	1522.55	0.00	632.	1044.	0.00	23.20	0.00
.25	1521.64	0.00	549.	288.	0.00	28.40	0.00

PLAN 2

ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
1521.00	1521.00	1524.00	1524.00
490.	490.	765.	765.
0.	0.	2791.	2791.

PLAN 3

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
.50	1523.21	0.00	692.	1767.	0.00	20.40	0.00
.25	1522.86	0.00	660.	1369.	0.00	24.20	0.00

PLAN 3

ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
1521.00	1521.00	1524.00	1524.00
490.	490.	765.	765.
0.	0.	2791.	2791.

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
.50	1525.03	1.03	980.	4899.	2.70	19.20	0.00
.25	1524.78	.73	929.	4330.	2.00	21.10	0.00

GANNETT FLEMING CORDRY
AND CARPENTER, INC.
HARRISBURG, PA.

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

SUMMARY OF PERTINENT DATA

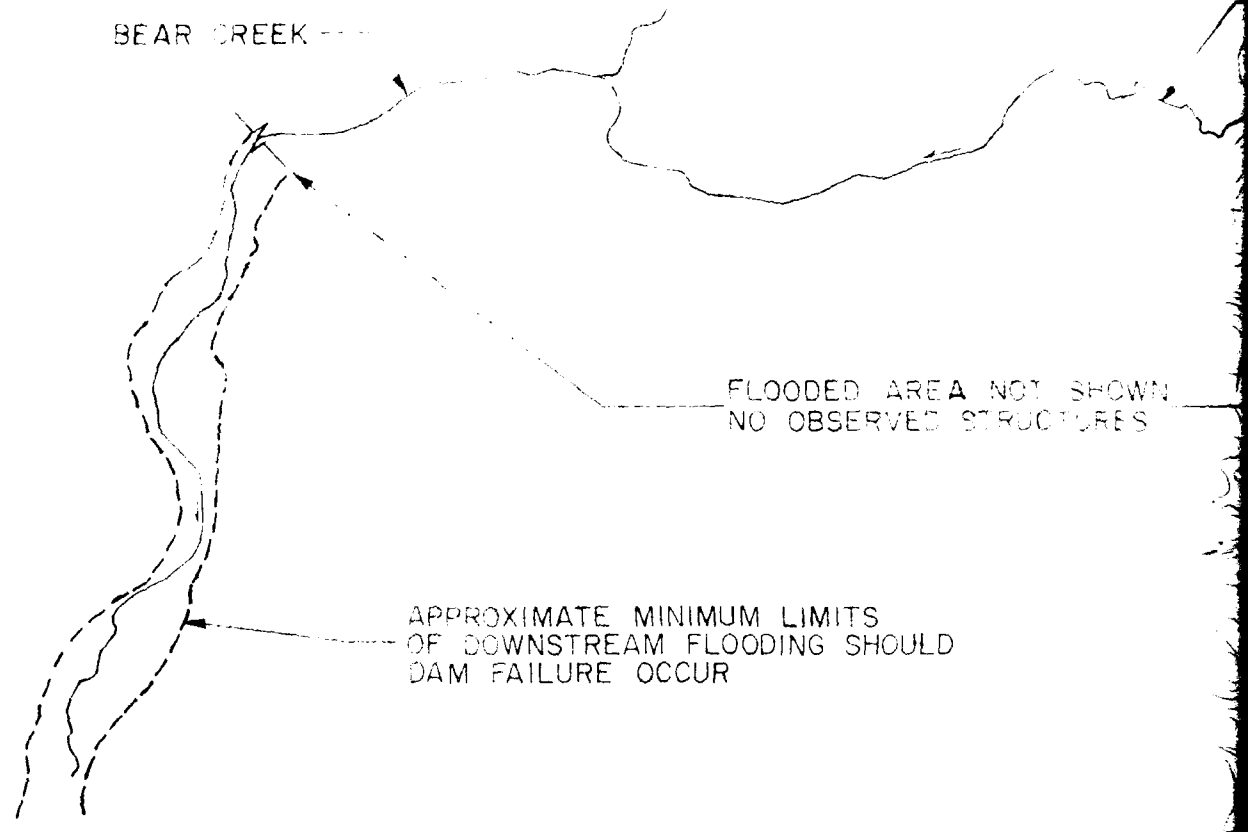
PMF RAINFALL = 24.99"

	PMF	0.5 PMF	0.2 PMF
RUNOFF (INCHES)	22.83	11.42	4.57
MOUNTAIN LAKE DAM:			
PEAK INFLOW (CFS)	3,357	1,501	296
PEAK OUTFLOW (CFS)	3,332	1,466	239
DEPTH OF OVERTOPPING (FT)	2.42	1.59	.03
DURATION OF OVERTOPPING (HRS)	21.00	16.25	2.50
<u>BREACH ANALYSIS</u>		0.5 PMF	0.25 PMF
AT SECTION NO. 3			
NEAR DWELLINGS:			
WATER SURFACE EL:			
① NO DAM FAILURES		1954.6	1951.5
② ONLY MOUNTAIN LAKE FAILS		1960.4	1960.3
③ BOTH DAMS FAIL		1962.6	1962.5
② - ① } NET RISE IN		5.8	8.8
③ - ① } WATER SURFACE (FT)		8.0	11.0
AT BEAR CREEK LAKE DAM			
OVERTOPPING (+ FT.) OR			
FREEBOARD (- FT.)			
NO DAM FAILURES		-1.45	-2.36
ONLY MOUNTAIN LAKE FAILS		-.79	-1.14
BOTH DAMS FAIL		+1.03	+1.78

D-24



BEAR CREEK



FLOODED AREA NOT SHOWN
NO OBSERVED STRUCTURES

APPROXIMATE MINIMUM LIMITS
OF DOWNSTREAM FLOODING SHOULD
DAM FAILURE OCCUR

BEAR CREEK
LAKE DAM

2000 0
SCALE: 1 IN.

2 1

APPROXIMATE MINIMUM LIMITS
OF DOWNSTREAM FLOODING SHOULD
DAM FAILURE OCCUR

MEADOW RUN

4 DWELLINGS


FLOODED AREA NOT SHOWN
NO OBSERVED STRUCTURES

MOUNTAIN
LAKE DAM

MINIMUM LIMITS
OF DOWNSTREAM FLOODING SHOULD

NOTES:

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

2000 0 2000

 SCALE: 1 IN. = 2000 FT.

PHASE I INSPECTION
NATIONAL DAM INSPECTION

MOUNTAIN
ELEANOR
DOWNSTREAM
DEVELOPMENT

JUNE 1980

3

THE MINIMUM LIMITS
STREAM FLOODING SHOULD
BE OCCUR

MEADOW
RUN DAM

MOUNTAIN
LAKE DAM

DOWNSTREAM FLOODING
LIMITS BASED ON VISUAL
INSPECTIONS.

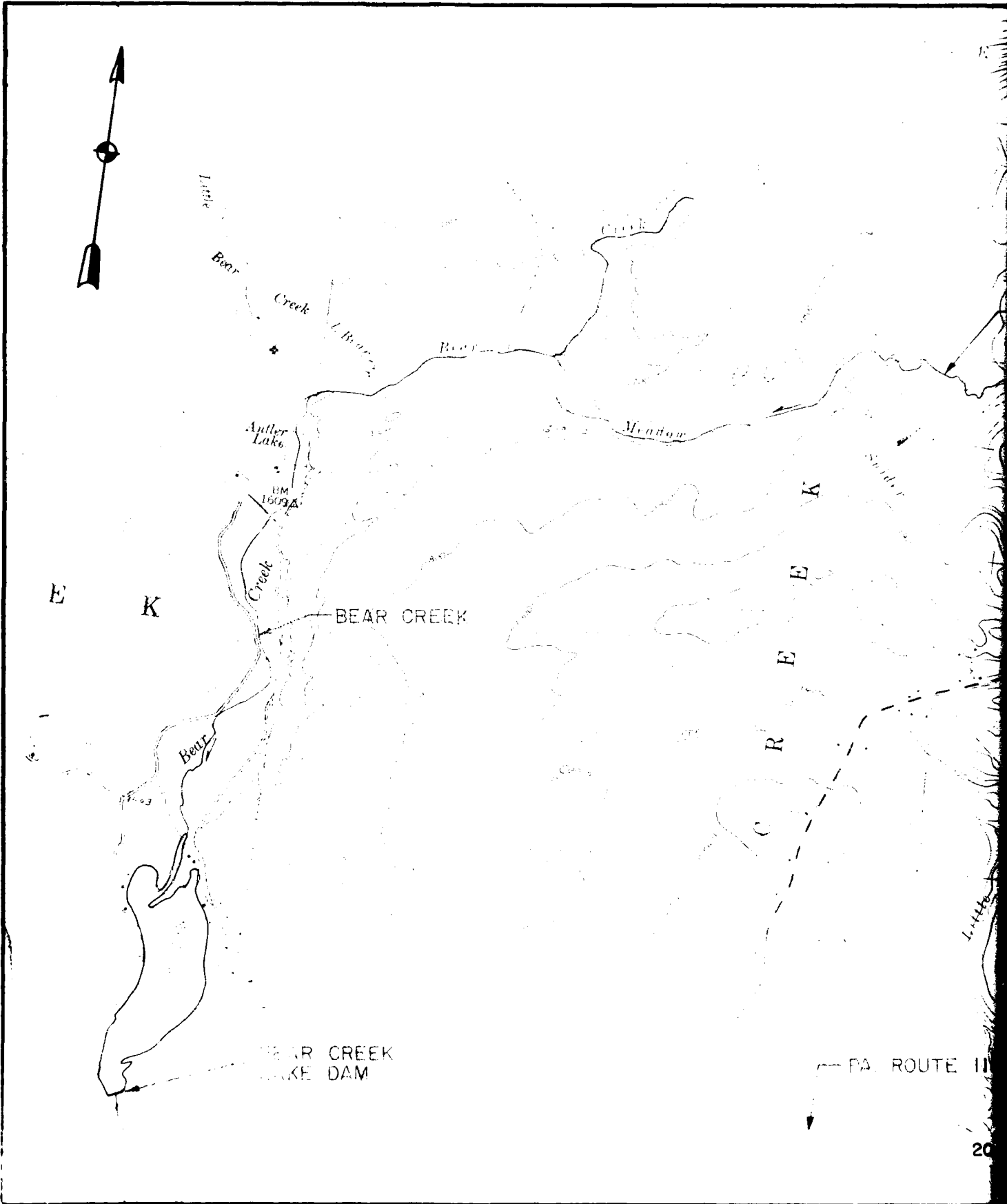
NUMBERS INDICATE
LIMITS SET IN COMPUTER

SHOULD NOT BE USED
IN CONJUNCTION WITH THE
OPERATION AND
MAINTENANCE PLAN.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
MOUNTAIN LAKE DAM
ELEANOR TAYLOR
DOWNSTREAM
DEVELOPMENT MAP
JUNE 1980 EXHIBIT D-1

APPENDIX E

PLATES



BEAR CREEK

BEAR CREEK
LAKE DAM

PA. ROUTE 11

2

MEADOW RUN

MEAD
RUN

MOUNTAIN
LAKE DAM

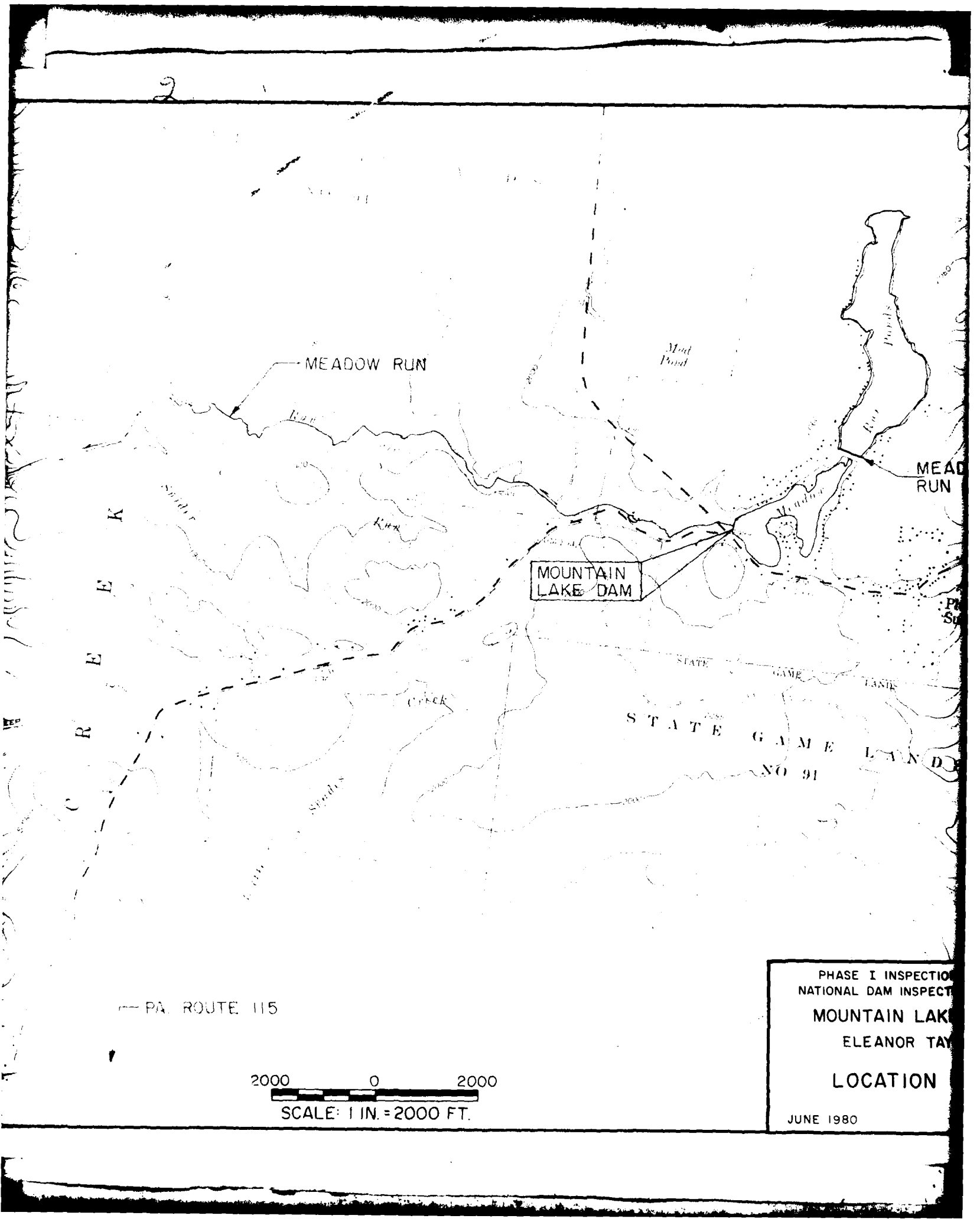
STATE GAME LAND
NO 91

PA. ROUTE 115

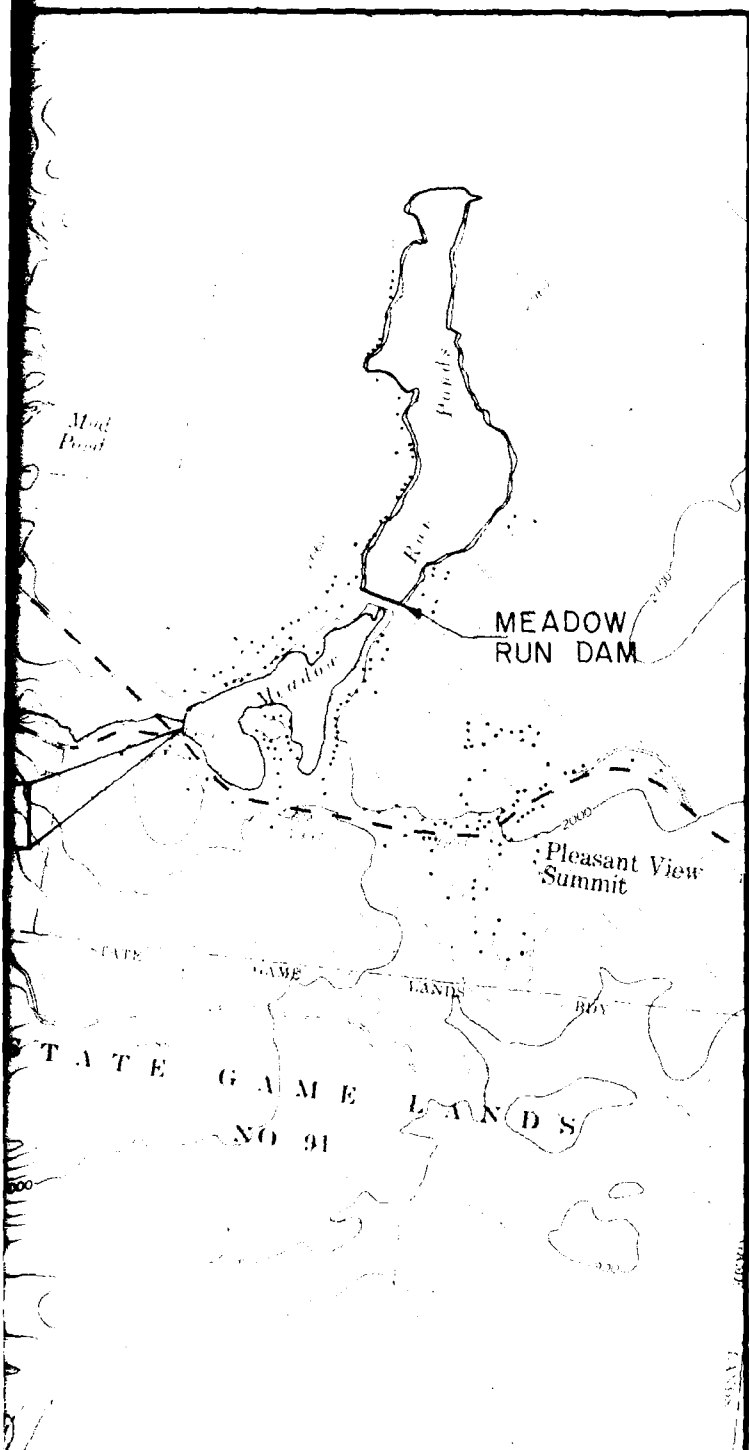
2000 0 2000

SCALE: 1 IN. = 2000 FT.

PHASE I INSPECTION
 NATIONAL DAM INSPECTOR
 MOUNTAIN LAKE
 ELEANOR TAYLOR
 LOCATION
 JUNE 1980

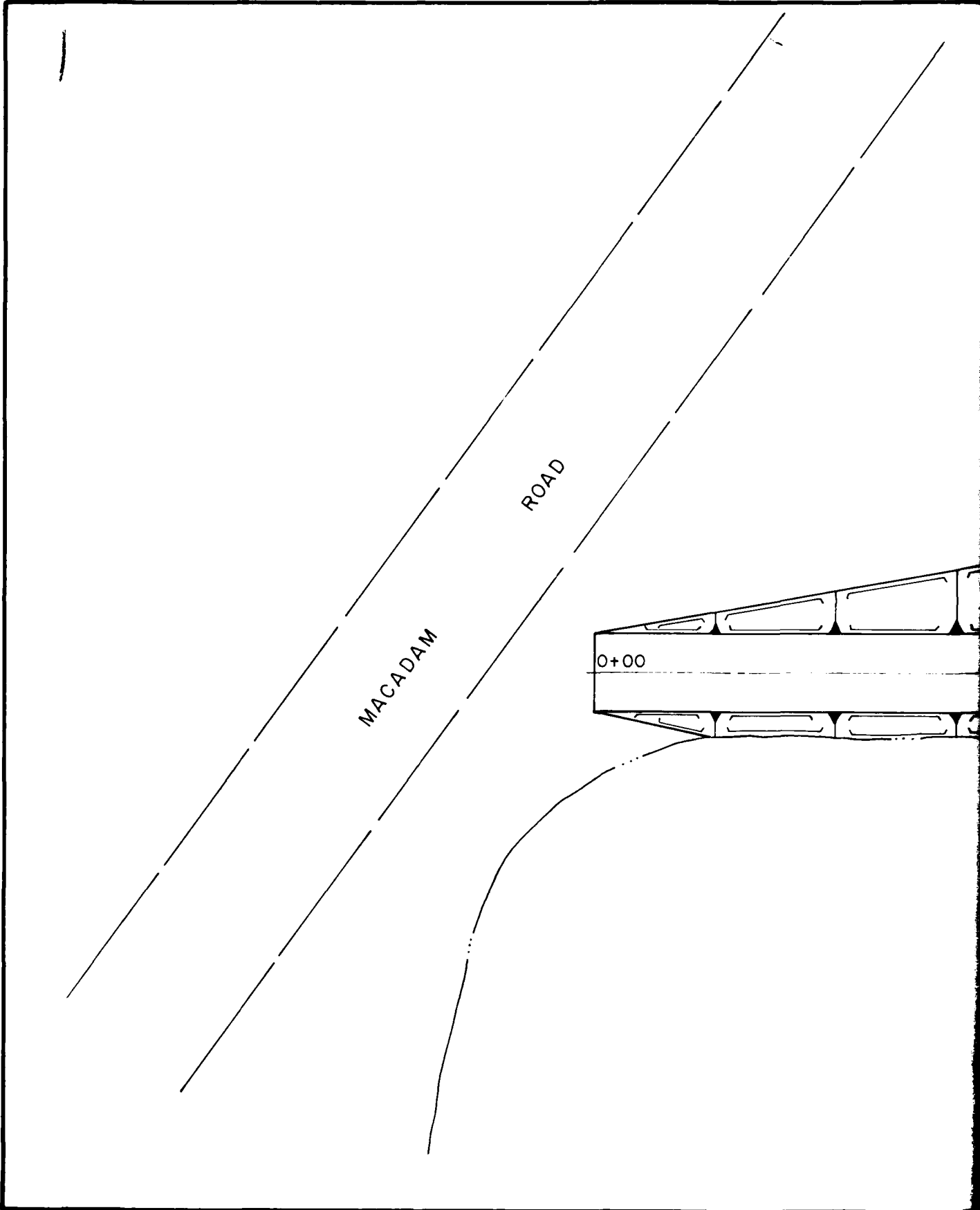


3



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
MOUNTAIN LAKE DAM
ELEANOR TAYLOR
LOCATION MAP
JUNE 1980 PLATE E-1

1

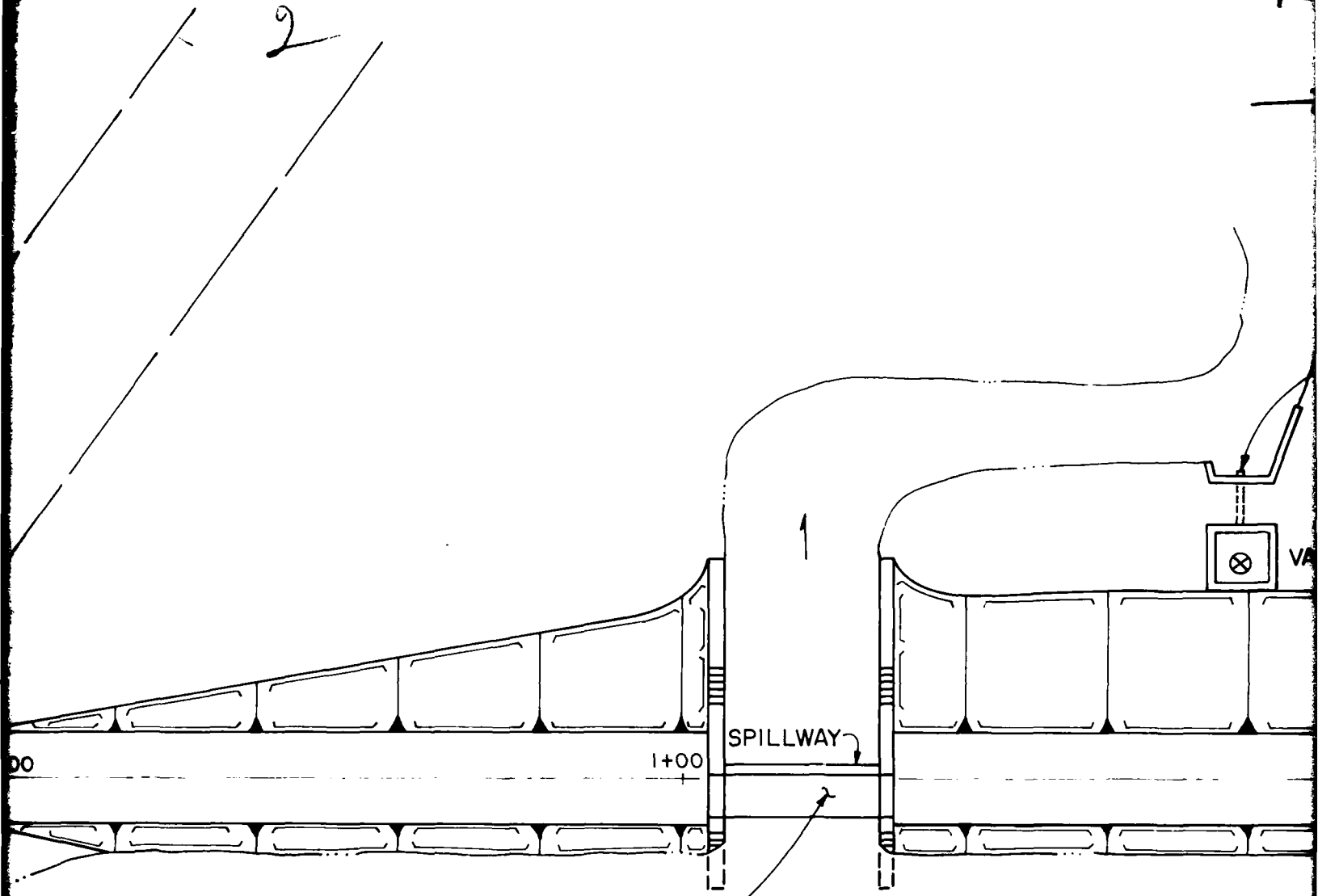


MACADAM

ROAD

0+00

2



WOOD FOOT
BRIDGE

M O U N T A I N

L A

PLAN

SCALE: 1 IN. = 20 FT.



3



24" CIP



VALVE PIT

2+00

3+00

GRAVEL

NOTE:

THIS PLAN WAS DRAWN FROM LIMITED SURVEY DATA OBTAINED FOR THIS INSPECTION. IT SHOULD NOT BE CONSIDERED DEFINITIVE.

L A K E

PLAN

SCALE: 1 IN. = 20 FT.



4

GRAVEL
ROAD

3+00
+

FROM
OBTAINED
IT SHOULD
FINITIVE.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
MOUNTAIN LAKE DAM
ELEANOR TAYLOR

PLAN

JUNE 1980

PLATE E-2

APPENDIX F

GEOLOGY

MOUNTAIN LAKE DAM

APPENDIX F

GEOLOGY

Mountain Lake Dam is located in Luzerne 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 Formation, 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 of 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.

Mountain Lake Dam is underlain by the Duncannon Member of the Catskill Formation. The Duncannon Member is predominantly a conglomerate and sandstone unit with some

red siltstone and shale. Conglomerates present are generally thick-bedded with subangular to well-rounded quartz pebbles in a coarse-grained sandstone matrix. They are very well-indurated and have low porosity due to silica cementation. The sandstones are predominantly fine- to medium-grained, thin- to thick-bedded and well-indurated with a clay and silica cement. Red sandstones near the top of the unit grade into red siltstone and shale, marking the contact with the Spechty Kopf Formation.

The Duncannon Member maintains very steep cut slopes. It is reported to be an excellent foundation for heavy structures.

Bedrock is almost entirely overlain by till of Late Wisconsin Age. This till is basically 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 3 to 100 feet.

Available information, which is scant, indicates that the dam is probably founded on this till.

