

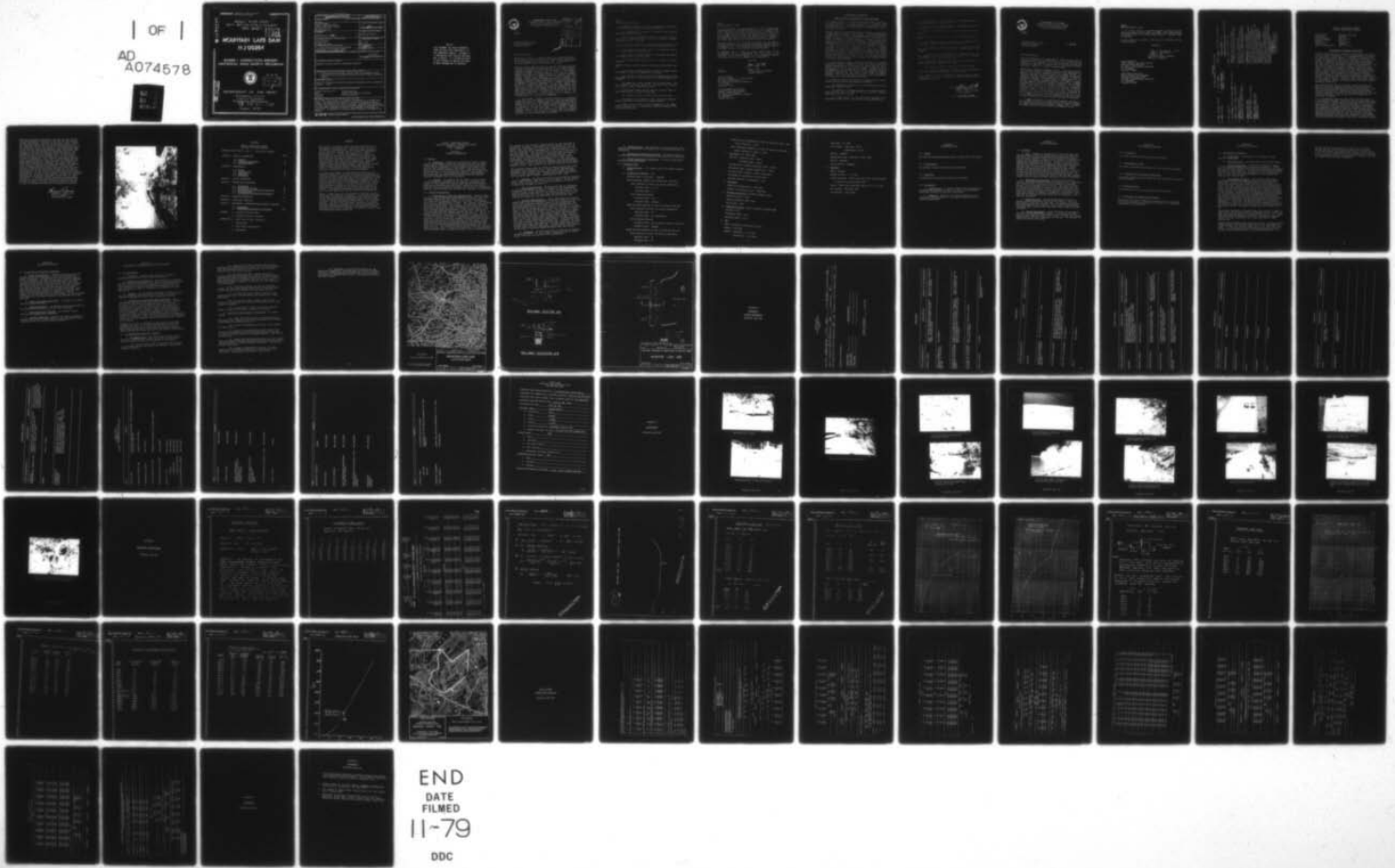
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NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON  
NATIONAL DAM SAFETY PROGRAM. MOUNTAIN LAKE DAM (NJ-00284), PASS--ETC(U)  
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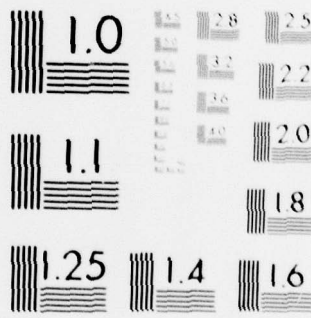
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NEW JERSEY

LEVEL #

MOUNTAIN LAKE DAM

NJ 00284

PHASE 1 INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM



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DEPARTMENT OF THE ARMY

Philadelphia District  
Corps of Engineers  
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| REPORT DOCUMENTATION PAGE  |   | READ INSTRUCTIONS<br>BEFORE COMPLETING FORM |
|--|---|---|
| 1. REPORT NUMBER<br>NJ00284  | 2. GOVT ACCESSION NO.   | 3. RECIPIENT'S CATALOG NUMBER               |
| 4. TITLE (and Subtitle)<br>Phase I Inspection Report<br>National Dam Safety Program<br>Mountain Lake Dam<br>Morris County, N.J.  | 5. TYPE OF REPORT & PERIOD COVERED<br>(9) FINAL rept.                     |   |
|  | 6. PERFORMING ORG. REPORT NUMBER  |   |
| 7. AUTHOR(s)<br>(10) Guinan, Warren A. <del>W.A.</del> / Guinan  | 8. CONTRACT OR GRANT NUMBER(s)<br>(15) DACW61-79-C-0011 ✓                 |   |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br>Anderson-Nichols<br>6 Loudon Road<br>Concord, NH 03301  | 10. PROGRAM ELEMENT, PROJECT, TASK<br>AREA & WORK UNIT NUMBERS<br>(12) 86 |   |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br>U.S. Army Engineer District, Philadelphia<br>Custom House, 2d & Chestnut Streets<br>Philadelphia, Pennsylvania 19106  | 12. REPORT DATE<br>(11) August 1979                                       |   |
|  | 13. NUMBER OF PAGES<br>40   |   |
| 14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)  | 15. SECURITY CLASS. (of this report)<br>Unclassified                      |   |
|  | 15a. DECLASSIFICATION/DOWNGRADING<br>SCHEDULE                             |   |
| 16. DISTRIBUTION STATEMENT (of this Report)<br>Approved for public release; distribution unlimited.  |   |   |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)<br>(6) National Dam Safety Program. Mountain Lake Dam (NJ-00284), Passaic River Basin, Troy Brook, Morris County, New Jersey. Phase I Inspection Report.  |   |   |
| 18. SUPPLEMENTARY NOTES<br>Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.  |   |   |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)<br>Mountain Lake Dam, N.J.      Visual Inspection<br>Dams      National Dam Inspection Act Report<br>Spillways      Structural Analysis<br>Seepage  |   |   |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report. |   |   |

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IN REPLY REFER TO

NAPEN-D

Honorable Brendan T. Byrne  
 Governor of New Jersey  
 Trenton, NJ 08621

25 SEP 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Mountain Lake Dam in Morris County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Mountain Lake Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate since 48 percent of the Probable Maximum Flood (PMF) would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard of loss of life downstream from the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

- a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

NAPEN-D

Honorable Brendan T. Byrne

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Investigate the seepages at the downstream toe and design appropriate remedial measures.

(2) Specify and supervise procedures for removing trees and brush from the downstream slope of the dam and for a distance downstream of the toe of the dam.

(3) Design repairs for the deteriorated concrete on the upstream face of the dam and in the corewall and spillway structure.

(4) Design repairs for the erosion on the downstream slope of the dam and appropriate slope protection.

(5) Inspect the contact between the downstream face and the east abutment after the removal of debris.

(6) Design adequate means to drain the reservoir in case of emergency.

Resulting remedial measures should be initiated within calendar year 1980.

c. The following remedial actions should be completed within three months from the date of approval of this report:

(1) Initiate a program to check the condition of the dam periodically and monitor the seepage until remedial measures are effected.

(2) Repair the rusted spillway gate and gate slides. The gate operating mechanism should be lubricated and operated periodically to ensure continued functioning.

d. The following remedial actions should be completed within six months from the date of approval of this report:

(1) Initiate a program to control trespassing on the dam.

(2) Clear trees and brush on either side of the downstream channel to facilitate identification of seepage problems.

e. Within one year from the date of approval of this report, initiate a program to make a comprehensive technical inspection of the dam once every two years.

NAPEN-D

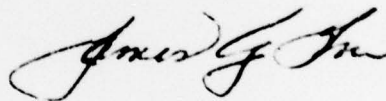
Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James A. Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



JAMES G. TON  
Colonel, Corps of Engineers  
District Engineer

1 Incl  
As stated

Copies furnished:  
Mr. Dirk C. Hofman, P.E., Deputy Director  
Division of Water Resources  
N.J. Dept. of Environmental Protection  
P.O. Box CNO29  
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief  
Bureau of Flood Plain Management  
Division of Water Resources  
N.J. Dept. of Environmental Protection  
P.O. Box CNO29  
Trenton, NJ 08625

MOUNTAIN LAKE DAM (NJ00284)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 17 May 1979 by Anderson-Nichols and Company, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Mountain Lake Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate since 48 percent of the Probable Maximum Flood (PMF) would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard of loss of life downstream from the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Investigate the seepages at the downstream toe and design appropriate remedial measures.

(2) Specify and supervise procedures for removing trees and brush from the downstream slope of the dam and for a distance downstream of the toe of the dam.

(3) Design repairs for the deteriorated concrete on the upstream face of the dam and in the corewall and spillway structure.

(4) Design repairs for the erosion on the downstream slope of the dam and appropriate slope protection.

(5) Inspect the contact between the downstream face and the east abutment after the removal of debris.

(6) Design adequate means to drain the reservoir in case of emergency.

Resulting remedial measures should be initiated within calendar year 1980.

c. The following remedial actions should be completed within three months from the date of approval of this report:

(1) Initiate a program to check the condition of the dam periodically and monitor the seepage until remedial measures are effected.

(2) Repair the rusted spillway gate and gate slides. The gate operating mechanism should be lubricated and operated periodically to ensure continued functioning.

d. The following remedial actions should be completed within six months from the date of approval of this report:

(1) Initiate a program to control trespassing on the dam.

(2) Clear trees and brush on either side of the downstream channel to facilitate identification of seepage problems.

e. Within one year from the date of approval of this report, initiate a program to make a comprehensive technical inspection of the dam once every two years.

APPROVED:

*James G. Ton*  
JAMES G. TON

Colonel, Corps of Engineers  
District Engineer

DATE:

*22 Sep 1979*



IN REPLY REFER TO  
NAPEN-D

DEPARTMENT OF THE ARMY  
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS  
CUSTOM HOUSE - 2 D & CHESTNUT STREETS  
PHILADELPHIA, PENNSYLVANIA 19106

Honorable Brendan T. Byrne  
Governor of New Jersey  
Trenton, NJ 08621

13 SEP 1979

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Mountain Lake Dam (Federal I.D. No. NJ00284), a high hazard potential structure has recently been inspected. The dam is owned by the Borough of Mountain Lakes and is located on Troy Brook in Mountain Lakes.

Using Corps of Engineers screening criteria, it has been determined that the dam's spillway is seriously inadequate since approximately 48 percent of the Probable Maximum Flood would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE unclassification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owner take the following measures within 30 days of the date of this letter:

- a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

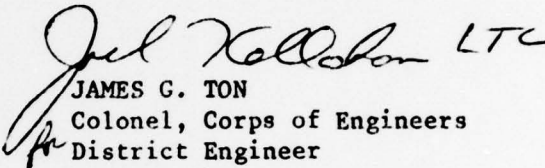
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Honorable Brendan T. Byrne

b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, round-the-clock surveillance should be provided during periods of unusually heavy precipitation.

A final report on this Phase I Inspection will be forwarded to you within two months.

Sincerely,

  
JAMES G. TON  
Colonel, Corps of Engineers  
District Engineer

**Copies Furnished:**

Dirk C. Hofman, Actg. Deputy Director  
Division of Water Resources  
N.J. Dept. of Environmental Protection  
P.O. Box CNO29  
Trenton, NJ 08625

John O'Dowd, Acting Chief  
Bureau of Flood Plain Management  
Division of Water Resources  
N.J. Dept. of Environmental Protection  
P.O. Box CNO29  
Trenton, NJ 08625

UNSAFE DAM  
NATIONAL PROGRAM OF INSPECTION OF DAMS

a. NAME: Mountain Lake Dam      b. ID NO.: NJ00284      c. LOCATION State: New Jersey. County: Morris.  
d. HEIGHT: 13 feet.      e. MAXIMUM IMPOUNDMENT CAPACITY: 1154 ac ft.  
f. TYPE: Earthfill.      g. OWNER: Borough of Mountain Lakes.  
h. DATE GOVERNOR NOTIFIED OF UNSAFE CONDITIONS: 13 Sep 79.      i. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT Preliminary report calculations indicate 48% of PMF would overtop the dam.  
l. URGENCY CATEGORY: UNSAFE, Non-Emergency.

m. EMERGENCY ACTIONS TAKEN:  
Gov. notified of this condition by District Engineer's letter of 13 Sep 79.

h. REMEDIAL ACTIONS TAKEN:  
N.J.D.E.P. will notify dam's owner upon receipt of our letter.

o. REMARKS: Final report, to be issued within six weeks, will have WHITE cover.

j. DESCRIPTION OF DANGER INVOLVED:  
Overtopping and failure of the dam would significantly increase hazard potential to loss of life and property downstream of dam.

k. RECOMMENDATIONS GIVEN TO GOVERNOR:  
Within 30 days of date of District Engineer letter the owner to do the following:  
a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.  
b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipitation.

*W. M. ZANK*  
W. M. ZANK, Coordinator  
Dam Inspection Program  
U.S.A.E.D., Philadelphia

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Mountain Lake Dam  
ID Number: NJ00284  
State Located: New Jersey  
County Located: Morris  
Stream: Troy Brook  
River Basin: Passaic  
Date of Inspection: May 17, 1979

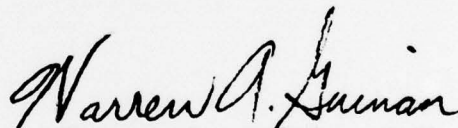
ASSESSMENT OF GENERAL CONDITIONS

Mountain Lake Dam is an old dam of undetermined age and is in fair overall condition. It is intermediate in size and is classified as High Hazard. A seepage estimated as 10-15 gpm was observed at the toe of the dam. Trees up to 18 inches in diameter are growing on the downstream slope of the dam. Extensive evidence of trespassing and erosion was observed on the downstream slope of the embankment. The top of the concrete core wall, which is visible on the crest of the dam, has numerous surface cracks and spalled areas. The concrete facing on the upstream slope of the dam has cracks, some of which are open. Some cracks have been patched. The wingwalls of the concrete spillway structure exhibit numerous areas of spalling, cracking and erosion. There are two cracks in the concrete deck over the spillway structure. The steel gate is severely corroded on the surface. There is surface rust on the rest of the operating mechanism.

The Wildwood Lake Dam and Spillway, and the spillway of Mountain Lake are capable of passing 47 percent of the PMF without causing the Mountain Lake Dam to overtop. Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream over the non-failure condition. Thus the spillway is judged to be seriously inadequate.

It is recommended that the owner retain the services of a professional engineer, qualified in the design and inspection of dams, to accomplish the following tasks within the specified time frames. Starting very soon: investigate the seepages at the downstream toe and design and implement appropriate remedial measures; specify and supervise procedures for removing trees, their root systems and brush from the downstream slope of the dam and for a distance downstream of the toe of the dam; and conduct additional detailed hydrologic and hydraulic analysis of the Mountain and Wildwood Lake watersheds, reservoirs, connector channel,

dams and spillways to determine the need for and type of mitigating measures required to provide for safe passage of high discharges. Starting in the near future: design and implement repairs for the deteriorated concrete on the upstream face of the dam and in the corewall and spillway structure; repair the erosion on the downstream slope of the dam and provide appropriate slope protection; and inspect the contact between the downstream face of the embankment and the left abutment after the debris that has been dumped there is cleared away. In the future, design and install adequate means to drain the reservoir in case of emergency. It is further recommended that the owner undertake the following as a part of operating and maintenance procedures. Starting very soon, check the condition of the dam periodically and monitor the seepage until remedial measures are effected. Starting soon, control trespassing on the dam, and clear trees and brush on either side of the downstream channel for a distance downstream of the dam to allow for identification of seepage problems. In the future, engage a professional engineer, qualified in the design and inspection of dams, to make a comprehensive technical inspection of the dam once every two years. In the near future, establish a surveillance program for use during and immediately following periods of heavy rainfall, and also a warning program to follow in case of floodflow conditions or imminent dam failure.



Warren A. Guinan, P.E.  
Project Manager  
New Jersey No. 16848



17 May 1979

OVERVIEW  
MOUNTAIN LAKE DAM

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MOUNTAIN LAKE DAM N.J. NO.--- FED ID NO. NJ00284

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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 review 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. 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 continued care and inspection can there be any chance that unsafe conditions be detected.

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

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY INSPECTION PROGRAM  
MOUNTAIN LAKE DAM  
U.S. #NJ00284

SECTION I  
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Mountain Lake Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 4 April 1979 under Contract NO. FPM-39 dated 28 June 1978. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and the U.S. Army Engineers District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Company, Inc. on 17 May 1979.

b. Purpose. The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to the safety of Mountain Lake Dam and appurtenances based upon available data and visual inspection, and determine any need for emergency measures and conclude if additional studies, investigations and analyses are necessary and warranted.

1.2 Project Description

a. Description of Dam and Appurtenances. Mountain Lake Dam is an old (construction date unknown) earthfill dam, which is approximately 100 feet long, has a structural height of 12.3 feet and a hydraulic height of 12.0 feet. The topwidth of the dam is approximately 13 feet. The upstream face is paved with concrete and has a 3H:1V slope. The dam has a concrete core wall 2 feet thick. The downstream face slopes at 2H:1V. A concrete spillway structure is located at the center of the dam. Concrete spillway abutments, 2-feet thick, define the 3.3-foot wide spillway opening through the dam. The top of the spillway structure is covered with a concrete deck. The upstream opening is limited by wood stoplogs (3 inches thick) to a size of 3.3-foot x 2.6-foot. Immediately downstream of the stoplogs, flow is discharged through an opening controlled by a steel gate and into a 3.3-foot wide by 3.2-foot high, 5-foot long concrete box which discharges between the spillway abutments at an elevation approximately halfway between the dam crest and toe. The mechanical operating mechanism for the steel gate is on the top of the spillway structure. At the northeast end of Mountain Lake a connector channel leads to Wildwood Lake.

The channel is well defined, approximately 20 feet wide and is spanned by 3 bridges. The gradient of the channel is flat, or nearly flat, and allows for free flow of water between the two lakes. Wildwood Lake is impounded by a 836-foot long by 7- to 12- foot high dam. The dam crest is 0.8 foot below the crest of Mountain Lake Dam. The spillway of Wildwood Lake Dam consists of a concrete structure with a 3.3-foot wide opening. The water level is controlled by stoplogs, which at the time of measurement limited the spillway opening to 3.3 feet wide by 1.9 feet high. Downstream of the stoplogs, flow passes beneath a steel gate and into a conduit of undetermined size which leads beneath a road. The outlet of the culvert could not be located.

The watershed above these two lakes is gently sloping and fully developed as a residential area. Three tandem impoundments, Birchwood Lake, Crystal Lake and Sunset Lake occupy the upper portion of the drainage area. Sunset Lake drains into Mountain Lake through a small channel, approximately 1500' long.

b. Location. The dam is located in the Borough of Mountain Lakes, Morris County, New Jersey, on Troy Brook. It has coordinates north latitude  $40^{\circ} 53.0'$  and west longitude  $74^{\circ} 26.8'$ . A location map is shown in Figure 1.

c. Size Classification. Mountain Lake Dam is classified as being intermediate in size, as defined in the Recommended Guidelines for Safety Inspection of Dams, on the basis of its storage volume at the dam crest of 1154 acre-feet which is less than 50,000 acre-feet, but more than 1000 acre-feet, and its structural height is 12.3 feet which is less than 40 feet.

d. Hazard Classification. Visual inspection of the area downstream of the dam showed that a failure of Mountain Lake Dam could cause excessive property damage to two houses with an estimated population of 8 persons, located approximately 500 feet downstream of the dam. The houses are adjacent to a road culvert for the discharge channel and have first floor elevations about 4 feet above the channel invert. The culvert is 3 feet high by 7 feet wide by 36 feet long and would likely be washed out should the dam fail. The steeply sloping and relatively narrow discharge channel would clearly cause a high hazard to loss of life from large flows downstream of the dam. Mountain Lake Dam is thus classified as High Hazard. Furthermore, Mountain Lake controls flow from Wildwood Lake. Wildwood Lake Dam is lower (0.8 feet) than Mountain Lake Dam; therefore, it would overtop before Mountain Lake Dam. A grade school building is located about 200 feet downstream of Wildwood Lake Dam directly in the path of the water should Wildwood Lake Dam overtop.

e. Ownership. Mountain Lake Dam is owned by the Borough of Mountain Lakes. Mr. Carl Danser, Superintendent of Public Works (334-3131) was contacted for information.

f. Purpose of Dam. The reservoir is the focal point for substantial residential development and is extensively used for recreation.

g. Design and Construction History. No plans, hydraulic or hydrologic data for the original construction were disclosed.

h. Normal Operational Procedures. No formal operational procedures were disclosed.

### 1.3 Pertinent Data

a. Drainage Areas - 1.27 square miles (includes Wildwood Lake)

b. Discharge at Damsite - cfs

Maximum flood at dam site - unknown

Gated spillway capacity at normal pool elevation

With stoplogs in place (as during inspection)

Mountain Lake - + 1.0

Wildwood Lake - 0

With stoplogs removed

Mountain Lake - 114

Wildwood Lake - unknown

Gated spillway capacity at top of Mountain Lake Dam

With stoplogs in place (as during inspection)

Mountain Lake - 57

Wildwood Lake - 28 (estimated)

With stoplogs removed

Mountain Lake - 163 (concrete conduit controls)

Wildwood Lake - unknown

Gated spillway capacity at top of Wildwood Lake Dam

With stoplogs in place (as during inspection)

Mountain Lake - 35

Wildwood Lake - 28

Discharge over Wildwood Dam crest at Mountain Lake - dam  
crest elevation - 2146

Total discharge capacity at crest of Mountain Lake Dam -  
(With stoplogs in place) - 2230

c. Elevation (ft. above MSL)

Top Dam - Mountain Lake - 492.3

- Wildwood Lake - 491.5

Maximum pool - design surcharge (PMF) - 493.2

Recreation pool (during inspection) - 489.6

Spillway crest (gated) - 489.4 (stoplogs)

Streambed at centerline of dam - 480.0

Maximum tailwater (estimated) - 483

d. Reservoir

Length of maximum pool - 3070 feet

Length of recreation pool - 3000 feet

e. Storage (acre-feet) includes Wildwood Lake

Recreation pool - 899

Design surcharge (PMF) 1269

Top of dam - 1154

f. Reservoir Surface (acres) includes Wildwood Lake

Top dam - 92.1

Recreation pool - 91.3

Spillway crest - 91.3

g. Dam

Type - earthfill with concrete core

Length - 100 feet

Height - hydraulic - 12.0 feet

- structural - 12.3 feet

Top width - 13 feet

Side Slopes - upstream 3H:1V

- downstream 2H:1V

Zoning - unknown

Impervious core - concrete 2 feet thick

Cutoff - unknown

Grout curtain - unknown

h. Spillway

Type - stoplog

Length of weir - 3.3 feet

Crest elevation - 489.4 feet above MSL (with stoplogs  
in place as during inspection)

Gates - steel gate regulates opening 3.2 x 3.3 feet

U/S Channel - Mountain Lake

D/S Channel - Troy Brook

SECTION 2  
ENGINEERING DATA

2.1 Design

No original engineering design data or plans were disclosed.

2.2 Construction

No original construction data were disclosed.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. A search of New Jersey Department of Environmental Protection files and contact with community officials revealed no recorded information.

b. Adequacy. Because no recorded information was disclosed, the evaluation of this dam was based solely on visual observations.

SECTION 3  
VISUAL INSPECTION

3.1 Findings

a. Dam. Seepage is discharging at 10-15 gpm near the downstream toe of the dam between the discharge channel and the east (left) abutment and between the discharge channel and the west abutment. Trees up to 18 inches in diameter are growing on the downstream slope of the dam and in the area immediately downstream of the dam. There is extensive trespassing and erosion on the downstream slope, particularly on the east side of the concrete spillway structure. Debris (mostly leaves and grass) has been dumped on the contact between the downstream slope and the west abutment. The top of the concrete core wall which is visible on the crest of the dam has numerous surface cracks and spalled areas. The concrete facing on the upstream slope of the dam has numerous cracks, some of which are open and some of which are patched.

b. Appurtenant Structures. The wing walls of the concrete spillway structure exhibit numerous areas of spalling and erosion, minor cracking with efflorescence, and some erosion of the concrete at cold joints. The interior faces of the walls are spalled about one inch deep where they are in contact with the water. There is surface rusting of the steel gate slides and operating mechanism. The one-half inch thick gate itself is severely corroded on the surface. The gate was not operated during inspection but appeared to be in operable condition.

c. Reservoir Area. The watershed above the lake is gently sloping and heavily built up with homes. There are many homes on the shore of the lake. No evidence of significant sedimentation was observed. Three tandem impoundments, Brichwood Lake, Crystal Lake and Sunset Lake occupy the upper watershed.

d. Downstream Channel. Trees and brush are growing on the banks of the downstream channel. A residential street with a 3-foot high by 7-foot wide culvert, crosses the channel approximately 500 feet downstream of the dam. The channel and valley are steep and narrow.

SECTION 4  
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were disclosed.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were disclosed.

4.3 Maintenance of Operating Facilities

No formal maintenance procedures for the operating facilities were disclosed.

4.4 Warning System

No description of any warning system was disclosed.

4.5 Evaluation of Operational Adequacy

Because of the lack of operation and maintenance procedures the remedial measures described in Section 7.2 c. should be implemented as prescribed.

SECTION 5  
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. No hydrologic or hydraulic design data were disclosed.

b. Experience Data. No experience data were disclosed.

c. Visual Observation. No visible evidence of damage to the structure caused by overtopping was observed. There was rust-stained standing water near the downstream toe between spillway and west abutment. On the east side of the spillway, at the toe, clear water was discharging at an estimated 10-15 gpm. At the time of inspection about 1.0 cfs of water was flowing over the stoplogs.

d. Overtopping Potential. The hydraulic/hydrologic evaluation for Mountain Lake is based on a Spillway Design Flood (SDF) equal to the Probable Maximum Flood (PMF) in accordance with the test flood given in the evaluation guidelines, for dams classified as high hazard and intermediate in size. The PMF has been determined by application of the SCS dimensionless unit hydrograph procedure to a 6-hour PMP storm of 25.5 inches. Mountain Lake and Wildwood Lake were treated as one reservoir to develop the storage-discharge relationship. The inflow hydrograph from the intermediate drainage area was added to routed outflow from Crystal Lake to develop the total inflow hydrograph. Hydrologic computations are given in Appendix 3. The routed PMF peak discharge for the subject watershed is 7,188 cfs. Of this drainage, approximately 590 cfs passes through the spillway and over the Mountain Lake Dam. The remaining 6600 cfs passes through and over Wildwood Lake Dam.

The minimum elevation of Mountain Lake Dam allows 2.9 feet of depth above the stoplogs before overtopping begins. Under this head the spillway capacity of Mountain Lake is 5.7 cfs. Under this same head the Wildwood Lake Dam is discharging approximately 2175 cfs, almost all of it over the crest of this earthen dam.

Assuming that Wildwood Lake Dam will not fail, routing calculations indicate that Mountain Lake Dam will be overtopped for almost 2 hours to a maximum depth of 0.9 feet under PMF conditions. It is estimated that the Wildwood Spillway and Dam, and the Mountain Lake Spillway can pass approximately 47% of

the PMF without causing Mountain Lake Dam to overtop. Because the dam is high hazard, cannot pass 50 percent of the PMF without overtopping and failure, and the hazard to loss of life downstream would be significantly increased with overtopping failure, the spillway of Mountain Lake Dam is judged to be seriously inadequate.

SECTION 6  
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. Seepage discharging near the downstream toe, if uncorrected, could lead to long-term stability problems. Trespassing and the resulting erosion, if not controlled, may lead to long-term stability problems. If trees growing on the downstream slope and in the area immediately downstream of the dam should blow over and pull out their roots, or if a tree dies or is cut and its roots rot, serious seepage and erosion problems could result. Deterioration of the concrete in the upstream facing, core wall, and spillway structure, if allowed to continue, will impair the long-term structural stability of the dam. Rusting of the spillway gate and gate slides, if not corrected, will impair the structural stability and operability of the spillway.

b. Design and Construction Data. No design or construction data were disclosed.

c. Operating Records. No operating records pertinent to the structural stability of the dam were disclosed.

d. Post-Construction Changes. No records of post-construction changes were disclosed.

e. Seismic Stability. Mountain Lake Dam is located in Seismic Zone 1 and in accordance with the recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7  
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Mountain Lake Dam is an old dam of undetermined age and in fair overall condition.

b. Adequacy of Information. The information available is such that the assessment of the dam must be based primarily on the results of the visual inspection. Debris which has been dumped on the contact between the downstream face and the left abutment makes it impossible to inspect that area adequately.

c. Urgency. The recommendations made in Section 7.2 a. and the operating and maintenance procedures in Section 7.2 c. should be implemented by the owner as prescribed below.

d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which are listed in Sections 5 and 6. These problems require the attention of a professional engineer who will have to make additional engineering studies to design or specify remedial measures. If left unattended, the problems could lead to instability of the structure. Because the spillway is judged to be seriously inadequate further detailed hydrologic and hydraulic analysis is required. Also, the contact between the downstream slope and the left abutment should be inspected after removal of the debris.

Although it is not the purpose of this report to evaluate Wildwood Lake Dam, it is clear that because Mountain Lake and Wildwood Lake are an interconnected system, future hydrologic and hydraulic evaluations and remedial measures should address the system and not the structures individually.

7.2 Recommendations/Remedial Measures

a. Recommendations. The owner should retain the services of a professional engineer qualified in the design and construction of dams to accomplish the following:

(1) Starting very soon, investigate the seepages at the downstream toe and design and implement appropriate remedial measures.

(2) Starting very soon, specify and supervise procedures for removing trees, their root systems and brush from the downstream slope of the dam and for a distance downstream of the toe of the dam.

(3) Starting very soon, conduct additional detailed hydrologic and hydraulic analyses of the Mountain and Wildwood Lake watersheds, reservoirs, connector channel, dams and spillways to determine the need for and type of mitigating measures required to provide for safe passage of high discharges.

(4) In the near future, design and implement repairs for the deteriorated concrete on the upstream face of the dam and in the corewall and spillway structure.

(5) In the near future, repair erosion on the downstream slope of the dam and provide appropriate slope protection.

(6) In the near future, inspect the contact between the downstream face and the east abutment after the removal of debris.

(7) In the future, design and install adequate means to drain the reservoir in case of emergency.

b. Operating and Maintenance Procedures. The owner should:

(1) Check the condition of the dam periodically and monitor the seepage until remedial measures are effected. This should be started very soon.

(2) Control trespassing on the dam. This should be started soon.

(3) Clear trees and brush on either side of the downstream channel for a distance downstream from the dam to allow for identification of seepage problems. This should be done soon.

(4) Repair the rusted spillway gate and gate slides. The gate operating mechanism should be lubricated and periodically exercised to ensure continued operation. This should be done very soon.

(5) Engage a professional engineer to make a comprehensive technical inspection of the dam once every two years. This should be started in the future.

(6) Establish a surveillance program for use during and immediately following periods of heavy rainfall, and also a warning program to follow in case of floodflow conditions or imminent dam failure. This should be done in the near future.



Anderson-Nichols & Co, Inc.

U. S. ARMY ENGINEER DIST. PHILADELPHIA  
CORPS OF ENGINEERS  
PHILADELPHIA, PA.

BOSTON MASSACHUSETTS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

# MOUNTAIN LAKE DAM LOCATION MAP

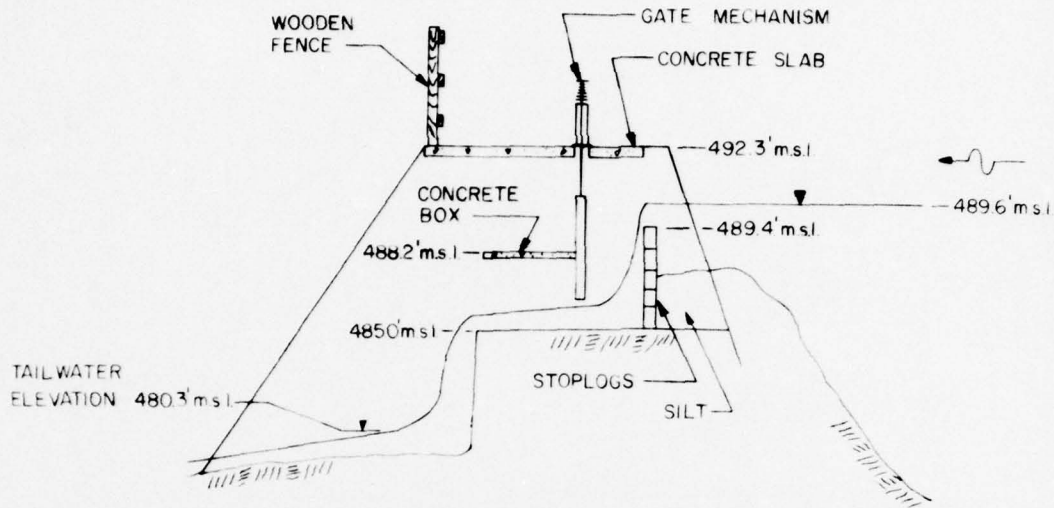
TROY BROOK

NEW JERSEY

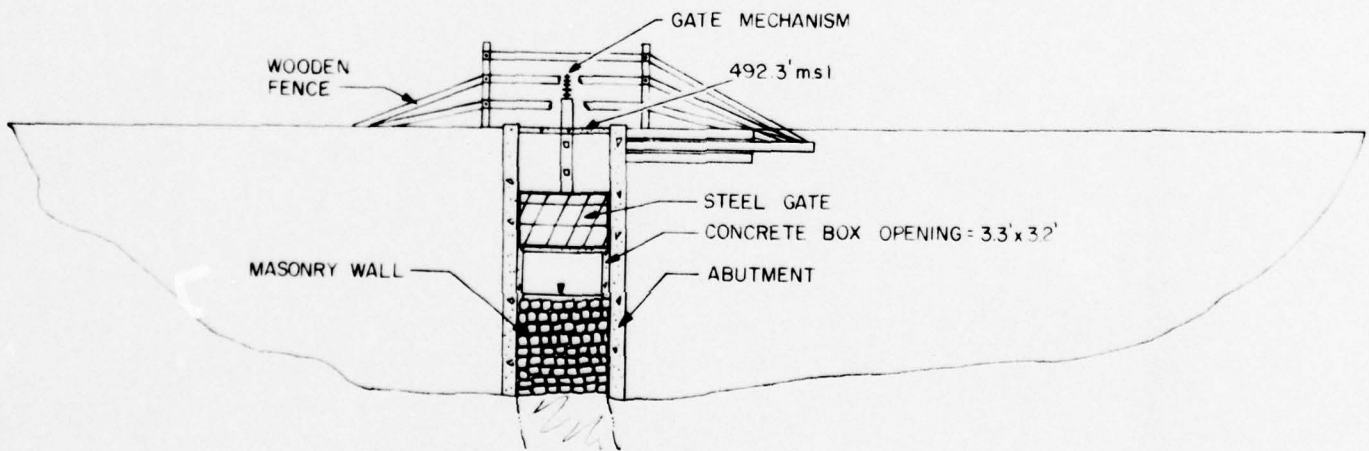
SCALE: SEE BAR SCALE

DATE: AUGUST, 1979

MAP BASED ON STATE OF NEW JERSEY  
OFFICIAL HIGHWAY MAP AND GUIDE.

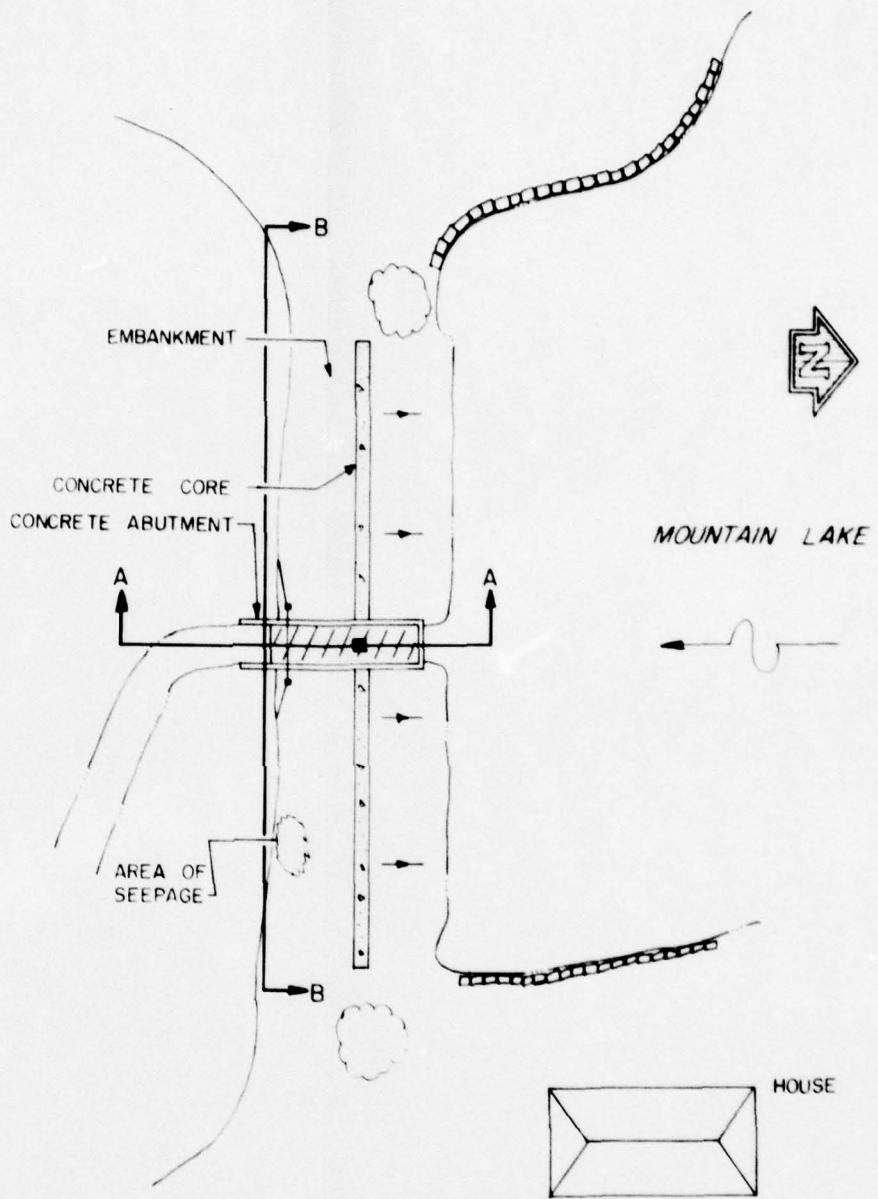


**SPILLWAY SECTION A-A**



**SPILLWAY ELEVATION B-B**

489.6' msl



**PLAN**

DATA FROM FIELD INSPECTION MAY 17, 1979

|  |  |
|--|--|
| Anderson - Nichols & Co., Inc<br>BOSTON<br>MASSACHUSETTS | U.S. ARMY ENGINEER DIST PHILADELPHIA<br>CORPS OF ENGINEERS<br>PHILADELPHIA, PA |
| NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS          |  |
| MOUNTAIN LAKE DAM  |  |
| TROY BROOK   | NEW JERSEY   |
| SCALE: NOT TO SCALE                                      |  |
| DATE: AUGUST, 1979                                       |  |

FIGURE 2

APPENDIX 1

CHECKLIST

VISUAL INSPECTION

MOUNTAIN LAKE DAM

Check List  
Visual Inspection  
Phase 1

Name Dam Mountain Lake Dam County Morris State New Jersey Coordinators NJDEP  
Date(s) Inspection May 17, 1979 Weather Sunny Temperature 60° F  
Pool Elevation at Time of Inspection 489.6 MSL Tailwater at Time of Inspection 480.3 MSL

Inspection Personnel:

Warren Guinan

Stephen Gilman

David Deane

Ronald Hirschfeld

Gilman & Hirschfeld Recorder

EMBANKMENT

| VISUAL EXAMINATION OF                                  | OBSERVATIONS  | REMARKS OR RECOMMENDATIONS                            |
|--|---|---|
| SURFACE CRACKS   | Top of core wall has numerous cracks and spalled areas. Concrete pavement on upstream face has numerous surface cracks.   | Design and implement appropriate repairs to concrete. |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE      | None apparent.  |   |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | Evidence of trespassing and erosion on downstream slope, particularly next to spillway. Canoes being stored on downstream edge of crest between spillway and left abutment. | Control trespassing on dam.<br>Repair erosion on dam. |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST         | Good. No indication of distress or movement in core wall alignment.   |   |
| RIPRAP FAILURES  | No riprap.  | Provide appropriate slope protection.                 |

EMBANKMENT

| VISUAL EXAMINATION OF                                 | OBSERVATIONS  | REMARKS OR RECOMMENDATIONS                                    |
|---|---|---|
| RAILINGS  |   |   |
| JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM | See "Sloughing and Erosion...." above   |   |
| ANY NOTICEABLE SEEPAGE                                | Standing water (rust-stained) near downstream toe between spillway and right abutment. Soft, wet area near downstream toe between spillway and left abutment with clear water discharging at an estimated 10-15 GPM | Investigate seepage and design appropriate remedial measures. |
| STAFF GAGE AND RECORDER                               | None apparent.  |   |
| DRAINS  |   | None apparent.  |

GATED SPILLWAY

| VISUAL EXAMINATION OF         | OBSERVATIONS  | REMARKS OR RECOMMENDATIONS   |
|-------------------------------|---|--|
| CONCRETE                      | Concrete buttress walls fair condition - numerous areas of spalling and eroding. Minor cracking with efflorescence. Some erosion of concrete at cold joints. Interior face of concrete walls spalled 1" deep where in contact with water. | Repair cracking and erosion.   |
| APPROACH CHANNEL              | Wide and unobstructed.  |  |
| DISCHARGE CHANNEL             | Boulders and soil in bottom channel, trees and brush in and adjacent to channel.  | Clear trees and brush on both sides of discharge channel for a distance downstream of the dam. |
| BRIDGE AND PIERS              | Concrete deck over outlet - good condition. 2 cracks in deck around gate structure. Underside of deck - good condition.   |  |
| GATES AND OPERATION EQUIPMENT | Steel gate slides and operating mechanism - surface rusted. 1/4" thick gate severely corroded on surface.   | Clean and paint gates and operating mechanism - lubricate gate operating mechanism.            |

INSTRUMENTATION

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

RESERVOIR

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

SLOPES

Gentle wooded. Houses with lawns close to shore.

SEDIMENTATION

No visible evidence of significant sedimentation.

DOWNSTREAM CHANNEL

| VISUAL EXAMINATION OF                     | OBSERVATIONS   | REMARKS OR RECOMMENDATIONS  |
|---|--|---|
| CONDITION<br>(OBSTRUCTIONS, DEBRIS, ETC.) | Boulders and soil in bottom of channel.<br>Trees and brush in and adjacent to<br>channel. Steep and rocky. | Clear trees and brush<br>25 feet on either side<br>of discharge channel for<br>a distance downstream<br>from the dam. |

SLOPES

Gentle, wooded.

APPROXIMATE NO.  
OF HOMES AND  
POPULATION

Residential street bridge with 3x7 foot  
opening 500 feet downstream of dam. Two  
houses with estimated 8 people have first  
flood elevations approximately 4 feet above  
the discharge channel invert.

CHECK LIST  
ENGINEERING DATA  
DESIGN, CONSTRUCTION, OPERATION

| ITEM                       | REMARKS  |
|----------------------------|--|
| PLAN OF DAM                | No original plans were disclosed. Plans for this report were developed from visual inspection. |
| REGIONAL VICINITY MAP      | Prepared for this report.  |
| CONSTRUCTION HISTORY       | None disclosed.  |
| TYPICAL SECTIONS OF DAM    | Prepared for this report from visual inspection.   |
| HYDROLOGIC/HYDRAULIC DATA  | None disclosed.  |
| OUTLETS -- PLAN            | None disclosed.  |
| - DETAILS                  | None disclosed.  |
| - CONSTRAINTS              | None disclosed.  |
| - DISCHARGE RATINGS        | None disclosed.  |
| RAINFALL/RESERVOIR RECORDS | None disclosed.  |

| ITEM  | REMARKS         |
|---|-----------------|
| DESIGN REPORTS  | None disclosed. |
| GEOLOGY REPORTS   | None disclosed. |
| DESIGN COMPUTATIONS<br>HYDROLOGY & HYDRAULICS<br>DAM STABILITY<br>SEEPAGE STUDIES | None disclosed. |
| MATERIALS INVESTIGATIONS<br>BORING RECORDS<br>LABORATORY<br>FIELD                 | None disclosed. |
| POST-CONSTRUCTION SURVEYS OF DAM  | None disclosed. |
| BORROW SOURCES  | Unknown         |

ITEM

REMARKS

MONITORING SERVICES

Unknown.

MODIFICATIONS

None disclosed.

HIGH POOL RECORDS

None disclosed.

POST CONSTRUCTION ENGINEERING  
STUDIES AND REPORTS

None disclosed.

PRIOR ACCIDENTS OR FAILURE OF DAM  
DESCRIPTION  
REPORTS

None disclosed.

MAINTENANCE  
OPERATION  
RECORDS

None disclosed.



CHECK LIST  
HYDROLOGIC AND HYDRAULIC DATA  
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.27 square miles, gently sloping  
ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 489.4 ft. MSL (881 ac-ft)  
ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not applicable  
ELEVATION MAXIMUM DESIGN POOL: 493.2 ft. MSL (PMF)  
ELEVATION TOP DAM: 492.3 ft. MSL  
SPILLWAY CREST: Stoplog section  
a. Elevation 489.4  
b. Type Stoplog  
c. Width 3 inches  
d. Length 3.3 feet  
e. Location Spillover approximate center of dam  
f. Number and Type of Gates one steel gate with threaded post  
OUTLET WORKS: None  
a. Type \_\_\_\_\_  
b. Location \_\_\_\_\_  
c. Entrance Inverts \_\_\_\_\_  
d. Exit Inverts \_\_\_\_\_  
e. Emergency Draindown Facilities \_\_\_\_\_  
HYDROMETEOROLOGICAL GAGES: None  
a. Type \_\_\_\_\_  
b. Location \_\_\_\_\_  
c. Records \_\_\_\_\_  
MAXIMUM NON-DAMAGING DISCHARGE: 65 cfs (top of Wildwood Lake Dam)

APPENDIX 2

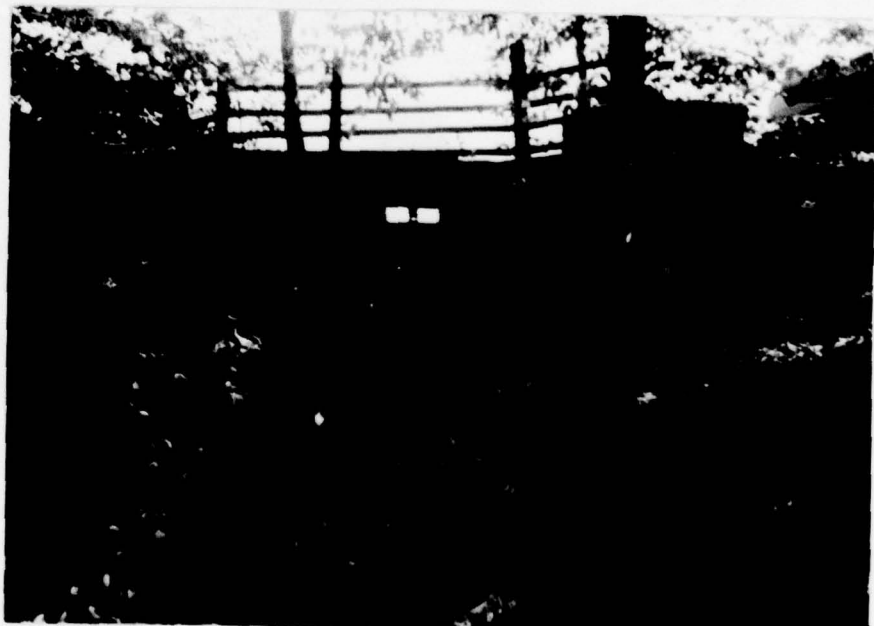
PHOTOGRAPHS

MOUNTAIN LAKE DAM



17 May 1979

Upstream Face of Dam



17 May 1979

Downstream Face of Dam and Spillway



17 May 1979

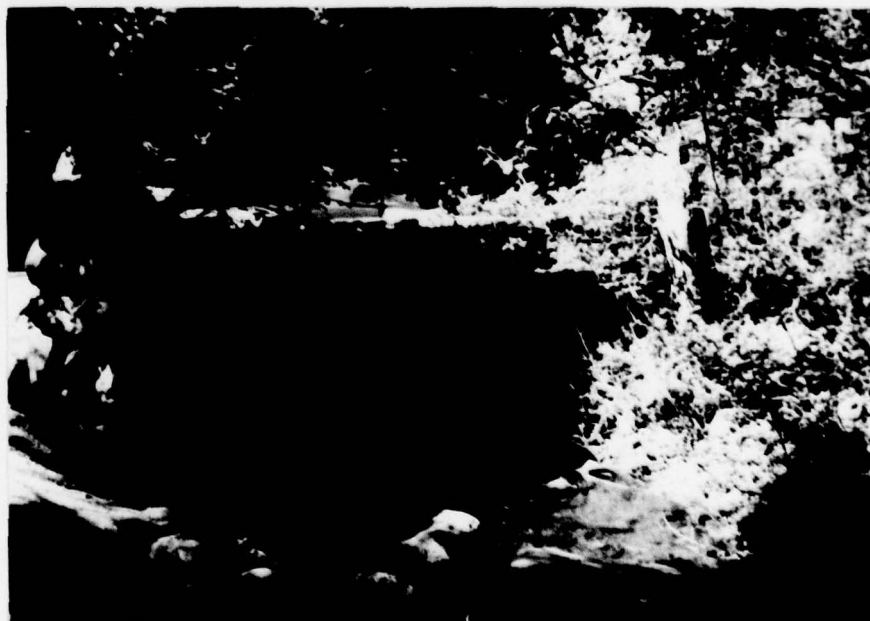
View Across Dam Crest Looking West

MOUNTAIN LAKE DAM



17 May 1979

View Downstream From Spillway  
At Center of Dam



17 May 1979

Culvert Under Road Immediately  
Downstream of Dam



17 May 1979

View of Reservoir From the  
Spillway Structure



17 May 1979

View of East Bank of Reservoir  
Looking Northeast from Dam



17 May 1979

Channel Between Mountain Lake  
and Wildwood Lake



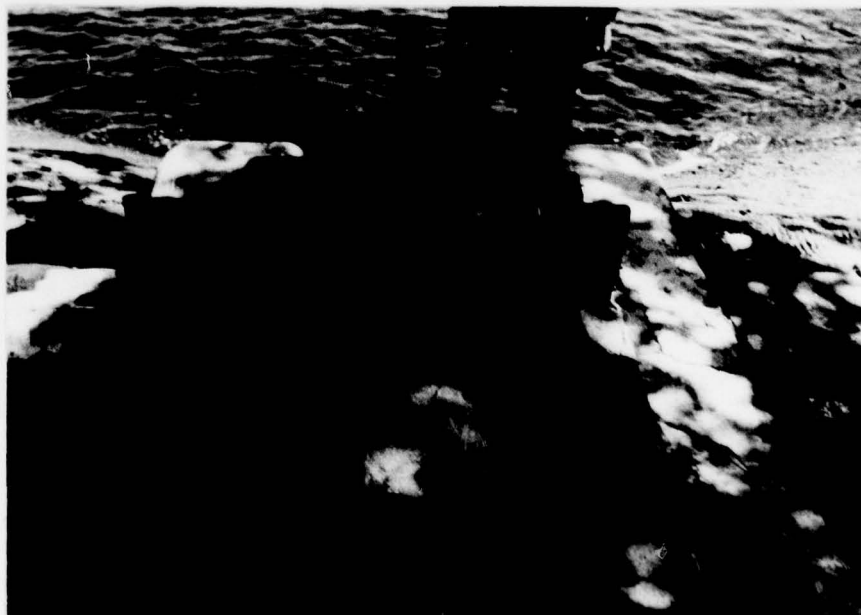
17 May 1979

Culvert Across Channel Between  
Mountain Lake and Wildwood Lake



17 May 1979

Downstream Face of Spillway  
Structure



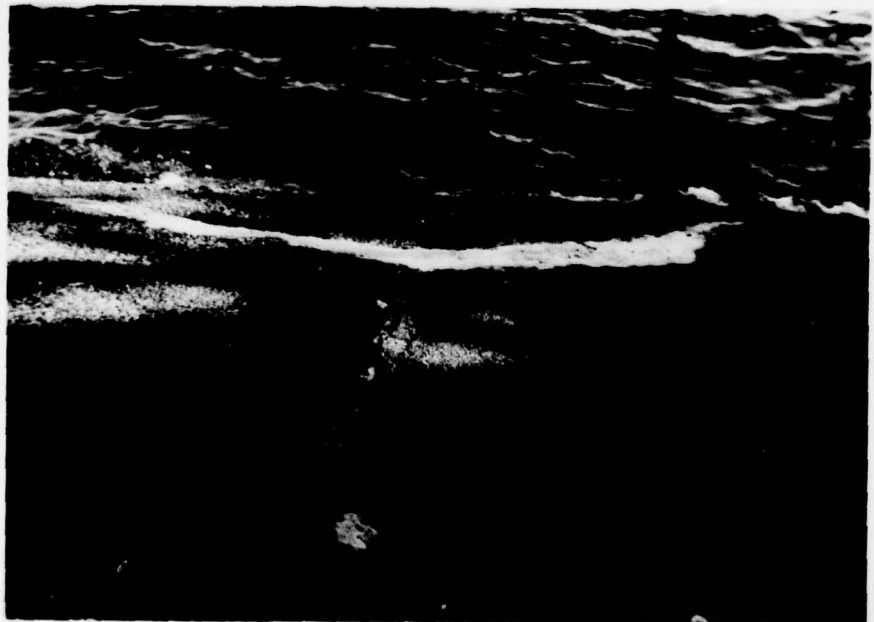
17 May 1979

Spillway Gate Mechanism



17 May 1979

Erosion of Downstream Slope on  
Left Side of Spillway



17 May 1979

Crack on Concrete Pavement on Upstream  
Face of Dam, Between Spillway and East  
Bank



17 May 1979

Major Seepage at Downstream Toe Between  
Downstream Channel and East Abutment

MOUNTAIN LAKE DAM

APPENDIX 3

HYDROLOGIC COMPUTATIONS

MOUNTAIN LAKE DAM

JOB NO. 3290-05

S  
CALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

MOUNTAIN LAKE DAM

HYDROLOGIC CALCULATIONS

LOCATION : MORRIS COUNTY , N.J.

DRAINAGE AREA : 1.27 SQ. MILE

EVALUATION CRITERIA: SIZE - INTERMEDIATE  
HAZARD - HIGH

APPROACH : AS DIRECTED BY DEPARTMENT OF THE ARMY, PHILADELPHIA DISTRICT CORPS OF ENGINEERS (CUSTOM HOUSE - 2D & CHESTNUT STREETS , PHILADELPHIA, PENNSYLVANIA 19106) IN THE LETTER DATED 29 MAY 1979 FROM LEONARD J. LIPSKI CHIEF OF HYDROLOGY - HYDRAULICS BRANCH, THE FOLLOWING APPROACH WAS TAKEN: THE OUTFLOW FROM CRYSTAL LAKE DAM WAS ROUTED TO MOUNTAIN LAKE DAM, IGNORING THE EFFECT OF SUNSET LAKE, AND ADDED TO THE LOCAL INFLOW. THE SCS TRIANGULAR UNIT HYDROGRAPH WITH THE CURVILINEAR TRANSFORMATION (K-484) WAS USED TO DEVELOP THE LOCAL INFLOW. SINCE MOUNTAIN LAKE AND WILDWOOD LAKE ARE INTER-CONNECTED AND AT APPROXIMATELY THE SAME ELEVATION, THEY WERE TREATED AS ONE RESERVOIR IN TERMS OF DEVELOPING THE STORAGE-DISCHARGE RELATIONSHIP.

JOB NO. 3290 - 05

S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30  
 SCALE

MOUNTAIN LAKE DAM

OUTFLOW HYDROGRAPH FROM CRYSTAL LAKE  
 UNDER FULL PMF CONDITION

|    |      |      |      |      |      |       |       |      |      |      |
|----|------|------|------|------|------|-------|-------|------|------|------|
| 8  | 0.   | 0.   | 0.   | 0.   | 0.   | 0.    | 0.    | 0.   | 1.   | 1.   |
| 9  | 1.   | 1.   | 1.   | 2.   | 2.   | 2.    | 3.    | 3.   | 3.   | 4.   |
| 10 | 4.   | 5.   | 5.   | 6.   | 6.   | 7.    | 11.   | 17.  | 23.  | 39.  |
| 11 | 53.  | 70.  | 93.  | 116. | 135. | 152.  | 165.  | 178. | 190. | 206. |
| 12 | 228. | 268. | 367. | 592. | 866. | 1030. | 1047. | 950. | 847. | 735. |
| 13 | 626. | 533. | 458. | 416. | 383. | 355.  | 332.  | 313. | 298. | 285. |
| 14 | 274. | 263. | 252. | 240. | 230. | 220.  | 212.  | 204. | 197. | 191. |
| 15 | 185. | 179. | 172. | 160. | 145. | 128.  | 111.  | 96.  | 83.  | 72.  |
| 16 | 87.  | 62.  | 54.  | 53.  | 50.  | 46.   | 43.   | 40.  | 37.  | 35.  |



JOB NO. 3290-05

S  
SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

MOUNTAIN LAKE (AND WILDWOOD LAKE AS A ONE RESERVOIR)

TC - TIME OF CONCENTRATION

OVERLAND FLOW L - 2500' H - 225' S - .09

① BY KIRPICH NOMOGRAPH TC - 7.3 MINUTES

② BY IZZARD FORMULA

$$T_c = \frac{L^{1.115}}{7700 H^{.28}} = \frac{2500^{1.115}}{7700 \cdot 225^{.28}} = 6.1 \text{ MINS}$$

③ BY EQUATION - CALIFORNIA CULVERT P. 71 DESIGN OF SMALL DAM

$$T_c = \left( \frac{11.9 \cdot L^2 [in^2]}{H [ft]} \right)^{.285} = \left( \frac{11.9 \cdot 473^2}{225} \right)^{.285} = 8.1 \text{ MINS}$$

④ WESTON FORMULA

$$T_c = \frac{L}{3600 V} = \frac{2500}{3600 \cdot 3.5 \text{ (fps)}} = 11.9 \text{ MINS}$$

AVERAGE TC = 8.5 MINUTES

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DATE: 2-20-05  
COMPUTED BY: [signature]  
CHECKED: RDD

MOUNTAIN LAKE DAM - X-SECTION ALONG THE DAM



5/16

SCALE: 1" = 5' V.F.R.  
1" = 50' H.O.C.

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FROM COPY FURNISHED TO DDC

JOB NO. 2290-05

SQUARES  
1/4 IN. LE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

MOUNTAIN LAKE DAM - RATING CURVE  
COMPUTATION

FLOW OVER THE STOP LOGS ONLY

C = 3.5 L = 3.3 FT.

|               | ELEV. | H   | Q    |
|---------------|-------|-----|------|
| 10            | 489.6 | .2  | 1.0  |
| 11            | 489.8 | .4  | 2.9  |
| 12            | 490.0 | .6  | 5.4  |
| 13            | 490.2 | .8  | 8.3  |
| 14            | 490.4 | 1.0 | 11.6 |
| 15            | 490.6 | 1.2 | 15.2 |
| 16            | 490.8 | 1.4 | 19.1 |
| 17            | 491.0 | 1.6 | 23.4 |
| 18            | 491.5 | 2.1 | 35.1 |
| 19            | 492.0 | 2.6 | 48.4 |
| 20 TOP OF DAM | 492.3 | 2.9 | 57.0 |

FLOW THROUGH CONCRETE BOX ONLY

A = 10.6 SQ.FT. C = .8

|               | ELEV. | H   | Q     |
|---------------|-------|-----|-------|
| 28            | 488.4 | 1.8 | 91.2  |
| 29            | 488.6 | 2.0 | 96.2  |
| 30            | 488.8 | 2.2 | 101.0 |
| 31            | 489.0 | 2.4 | 105.4 |
| 32            | 489.2 | 2.6 | 109.7 |
| 33            | S     | S   | S     |
| 34 TOP OF DAM | 492.3 | 5.7 | 162.5 |

THIS PAGE IS BEST QUALITY PRIORITY  
FROM COPY FURNISHED TO DDC

JOB NO. 3290-05

SQUARES  
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

MOUNTAIN LAKE DAM

FLOW THROUGH OPENING ABOVE THE STOPS

$C = .8$      $A = 3.6$  SQ.FT.

| ELEV. | H.  | Q.    | Q ABOVE DAM | TOTAL [CFS] |
|-------|-----|-------|-------------|-------------|
| 492.6 | 1.9 | 76.   | 46.         | 122.        |
| 492.8 | 2.1 | 80.   |             |             |
| 493.0 | 2.3 | 83.7  | 328.        | ~ 412       |
| 493.2 | 2.5 | 87.3  |             |             |
| 493.4 | 2.7 | 90.7  | 727.        | ~ 818.      |
| 493.6 | 2.9 | 94.0  |             |             |
| 493.8 | 3.1 | 97.2  |             |             |
| 494.0 | 3.3 | 100.3 | 1552.       | ~ 1652.     |
| 494.5 | 3.8 | 107.6 | 2513.       | ~ 2620.     |

FLOW OVER THE DAM ONLY

$C = 3.5$

| ELEV. | H.  | L    | Q [CFS] |
|-------|-----|------|---------|
| 492.6 | .3  | 30.  | 46.     |
| 493.0 | .7  | 160. | 328.    |
| 493.4 | 1.1 | 150. | 727.    |
| 494.0 | 1.7 | 200. | 1552.   |
| 494.5 | 2.2 | 220. | 2513.   |

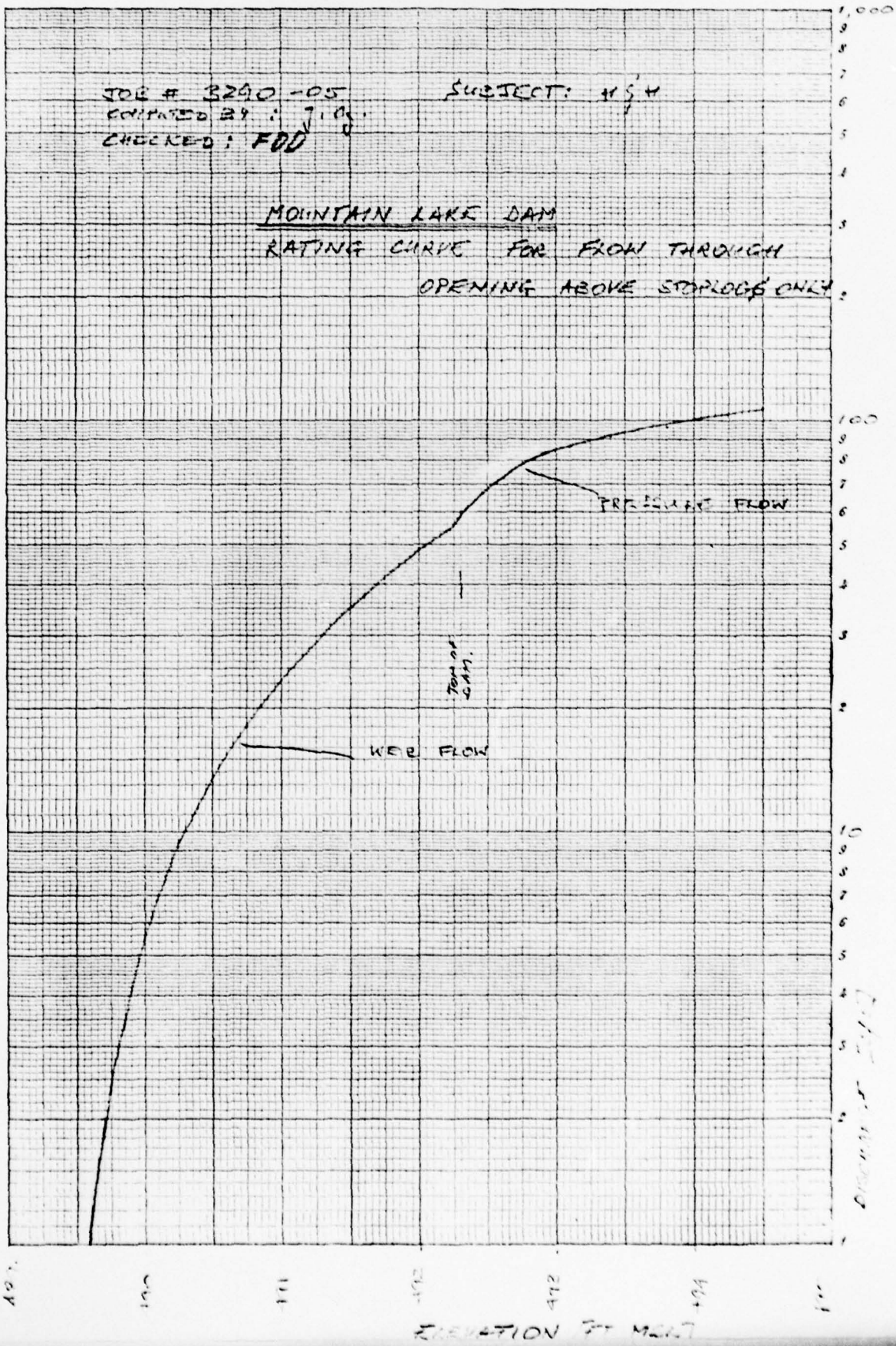
THIS PAPER IS BEST QUALITY FRAGILE  
 FROM ONLY AVAILABLE TO YOU

5/16

JOB # 3240-05  
COMPUTED BY: J. G.  
CHECKED: FDD

SUBJECT: HSM

MOUNTAIN LAKE DAM  
RATING CURVE FOR FLOW THROUGH  
OPENING ABOVE STOPLOGS ONLY



DISCHARGE (CFS)

ELEVATION FT MSL

9/16

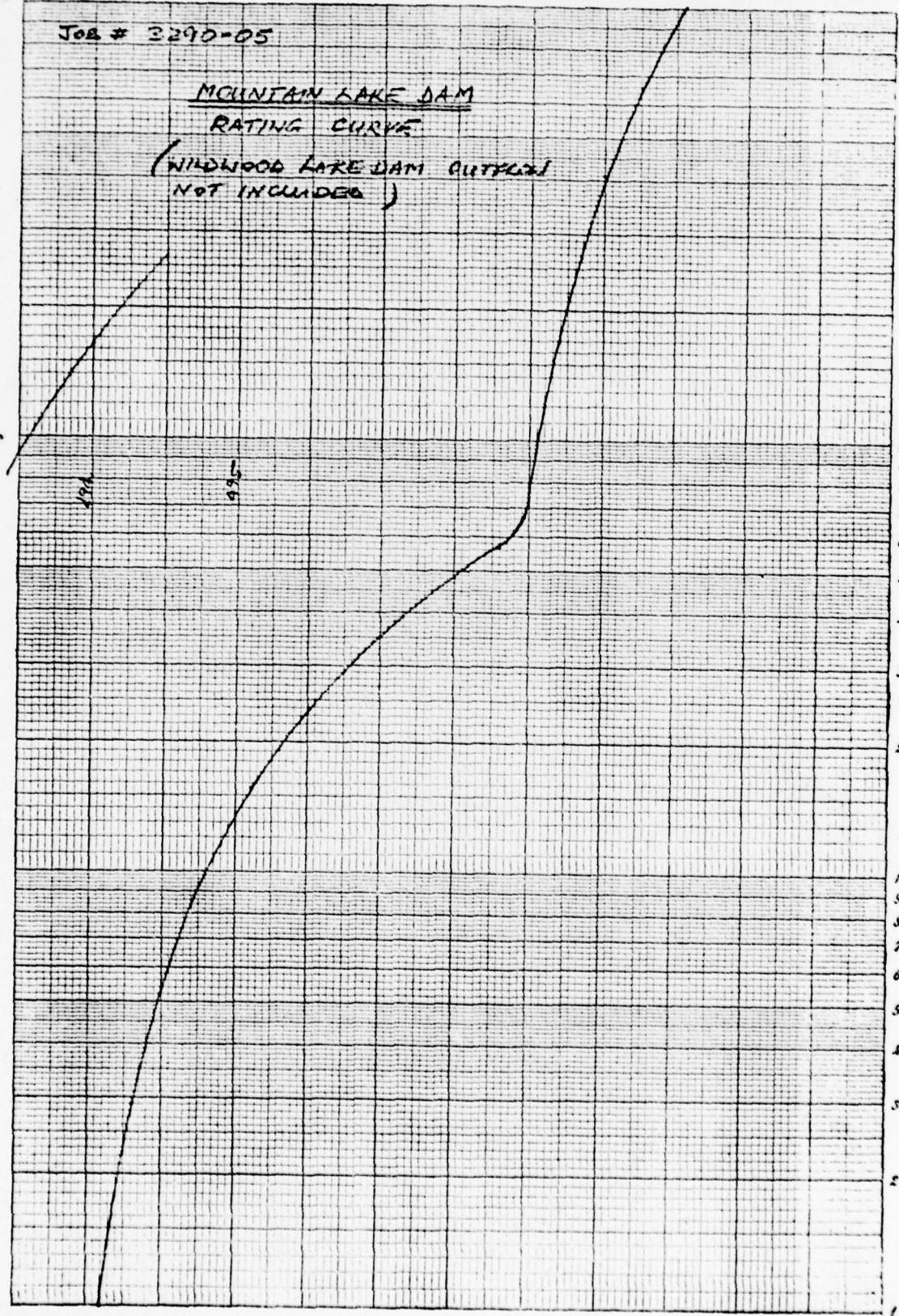
10,000

JOB # 3290-05

MOUNTAIN LAKE DAM  
RATING CURVE

(WINDWOOD LAKE DAM OUTPUT  
NOT INCLUDED)

6,000



DISCHARGE (CFS)  
THIS PAGE IS BEST QUALITY FRACIABLE  
FROM COPY REPRODUCED TO 100

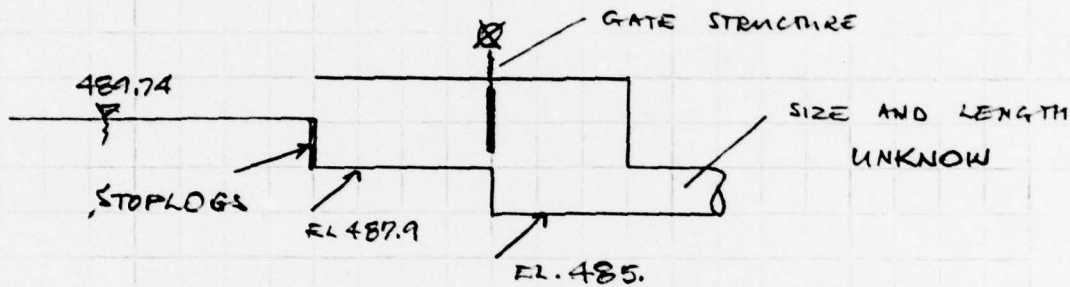
481. 490. 497. 498. 499. 494. 115.  
ELEVATION (FT. MSL)

JOB NO. 3290-05 MOUNTAIN LAKE DAM

INCHES IN SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

COMPUTATIONS FOR WILDWOOD LAKE DAM  
 SPILLWAY DISCHARGE ONLY.



NOTE:

INFORMATION ABOUT WILDWOOD LAKE DAM WAS RECEIVED (Aug 17 1979) FROM STATE OF N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF WATER RESOURCES TRENTON, N.J. WHICH WAS BASED ON FIELD INSPECTION DONE BY LARRY LINDGREN.

BECAUSE OF LACK INFORMATION ABOUT SIZE AND LENGTH OF OUTLET PIPE DISCHARGE THROUGH THE SPILLWAY STRUCTURE IS ESTIMATED TO BE NOT HIGHER THAN DISCHARGE OVER THE STOPLOGS.

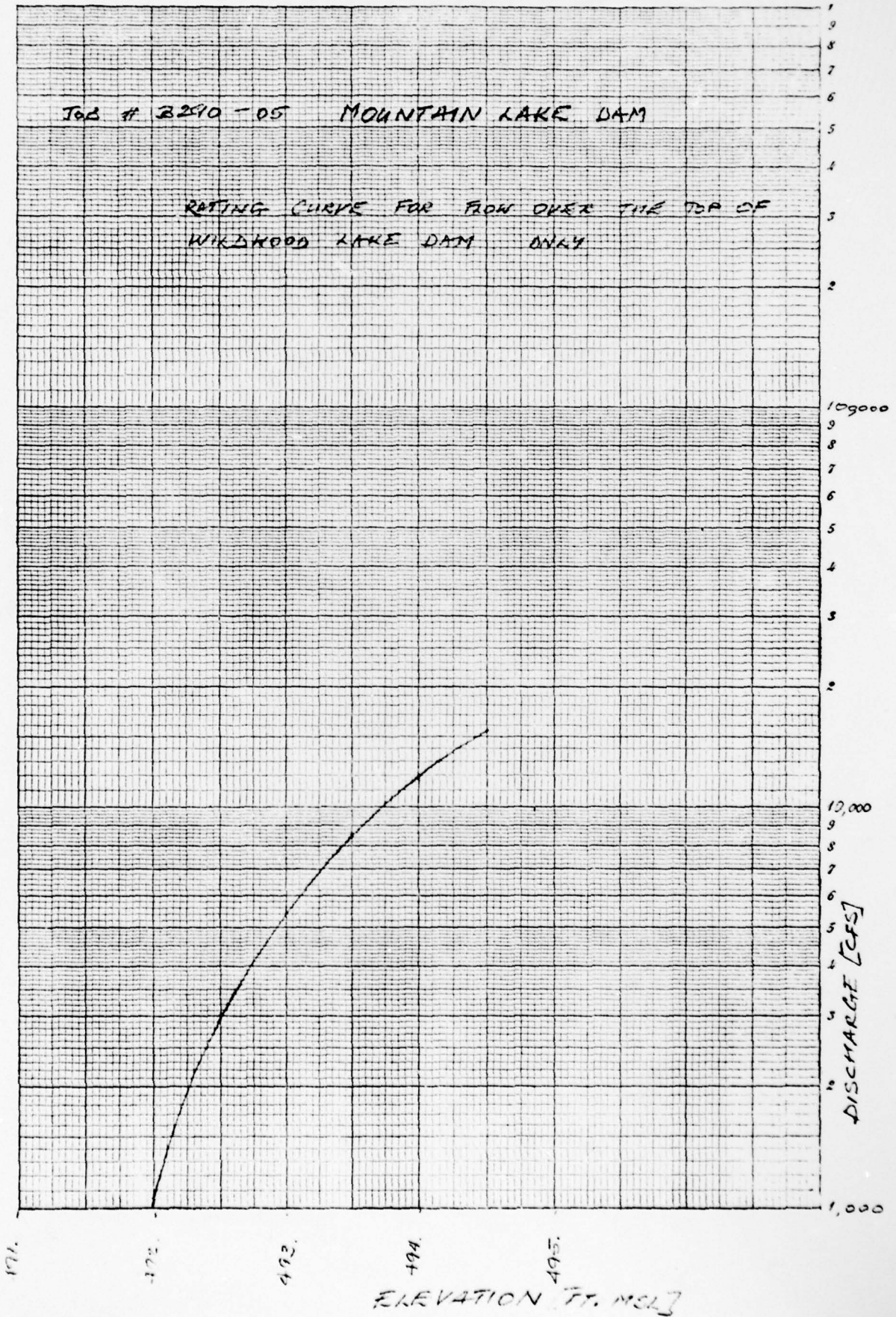
| ELEV. (F. MSL.) | H (FT) | Q (cfs) |
|-----------------|--------|---------|
| 489.8           | .1     | .4      |
| 490.0           | .3     | 1.9     |
| 490.2           | .5     | 4.1     |
| 490.4           | .7     | 6.8     |
| 490.6           | .9     | 9.9     |
| 490.8           | 1.1    | 11.6    |
| 491.0           | 1.3    | 17.1    |
| 491.5           | 1.8    | 27.9    |



12/16

JOB # B290 - 05 MOUNTAIN LAKE DAM

RATING CURVE FOR FLOW OVER THE TOP OF  
WILKWOOD LAKE DAM ONLY



JOB NO. 2290-05

ARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29  
 N. SCA'

STORAGE CALCULATION - ALDWOOD LAKE ONLY

<sup>Area</sup>  
 (WITH CONNECTION TO MOUNTAIN LAKE)

|    | <u>ELEV.</u><br><u>FT. MSL</u> | <u>AVERAGE</u><br><u>H. (FT)</u> | <u>AVERAGE</u><br><u>SURFACE</u><br><u>(AC)</u> | <u>STORAGE</u><br><u>(AC-FT)</u> |
|----|--------------------------------|----------------------------------|---|----------------------------------|
| 8  | 487.4                          | 8.                               | 16.0  | 128.                             |
| 9  | 487.6                          | 8.2                              | 16.0  | 131.                             |
| 10 | 487.8                          | 8.4                              | 16.0  | 134.                             |
| 11 | 490.0                          | 8.6                              | 16.0  | 138.                             |
| 12 | 490.5                          | 9.1                              | 16.1  | 146.                             |
| 13 | 491.0                          | 9.6                              | 16.1  | 155.                             |
| 14 | 491.5                          | 10.1                             | 16.2  | 164.                             |
| 15 | 492.0                          | 10.6                             | 16.2  | 172.                             |
| 16 | 492.3                          | 10.9                             | 16.2  | 178.                             |
| 17 | 492.5                          | 11.4                             | 16.4  | 187.                             |
| 18 | 493.0                          | 11.9                             | 16.4  | 195.                             |
| 19 | 493.5                          | 12.4                             | 16.5  | 205.                             |
| 20 | 494.0                          | 12.9                             | 16.5  | 213.                             |
| 21 | 494.5                          | 13.4                             | 16.6  | 222.                             |

22  
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38

JOB NO. 3290-05 MOUNTAIN LAKE DAM

SQUARES  
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

ELEVATION - DISCHARGE RELATIONSHIP

| ELEV.<br>[FT.] | MOUNTAIN LAKE<br>DISCHARGE<br>[CFS] | WINDHOOD LAKE<br>DISCHARGE<br>[CFS] | TOTAL<br>DISCHARGE<br>[CFS] |
|----------------|-------------------------------------|-------------------------------------|-----------------------------|
| 489.6          | 1.0                                 | —                                   | 1.0                         |
| 489.8          | 2.9                                 | .4                                  | 3.3                         |
| 490.0          | 5.4                                 | 1.9                                 | 7.3                         |
| 490.2          | 8.3                                 | 4.1                                 | 12.4                        |
| 490.4          | 11.6                                | 6.8                                 | 18.4                        |
| 490.6          | 15.2                                | 9.9                                 | 25.1                        |
| 490.8          | 19.1                                | 11.6                                | 30.7                        |
| 491.0          | 23.4                                | 12.1                                | 40.5                        |
| 491.5          | 25.1                                | 27.9                                | 63.0                        |
| 492.0          | 48.4                                | 1087.                               | ~ 1135.                     |
| 492.3          | 59.0                                | 2175.                               | ~ 2,230.                    |
| 492.6          | 122.0                               | 3488.                               | ~ 3,610.                    |
| 493.0          | 412.0                               | 5538.                               | ~ 5,950.                    |
| 493.4          | 818.                                | 7892.                               | ~ 8,710.                    |
| 494.           | 1652.                               | 11,900.                             | ~ 13,550.                   |
| 494.5          | 2620.                               | 15,650.                             | ~ 16,270.                   |

TOP OF  
WINDHOOD L.D.

TOP OF  
MOUNTAIN  
LAKE DAM

JOB NO. 3290-05

S  
SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

STORAGE CALCULATION -

| ELEV. | MOUNTAIN LAKE ONLY |                         | WILLOWOOD LAKE     |                    | TOTAL<br>[AC-FT] |
|-------|--------------------|-------------------------|--------------------|--------------------|------------------|
|       | AVERAGE H.<br>[FT] | AVERAGE SURFACE<br>[AC] | STORAGE<br>[AC-FT] | STORAGE<br>[AC-FT] |                  |
| 489.4 | 10.                | 75.3                    | 753.               | 125                | 881.             |
| 489.6 | 10.2               | 75.3                    | 768.               | 131                | 899.             |
| 489.8 | 10.4               | 75.3                    | 783.               | 134                | 917.             |
| 490.0 | 10.6               | 75.3                    | 798.               | 138.               | 936.             |
| 490.5 | 11.1               | 75.4                    | 837.               | 146.               | 982.             |
| 491.0 | 11.6               | 75.5                    | 876.               | 155.               | 1031.            |
| 491.5 | 12.1               | 75.6                    | 915.               | 164.               | 1079.            |
| 492.0 | 12.6               | 75.7                    | 954.               | 172.               | 1126.            |
| 492.3 | 12.9               | 75.8                    | 976.               | 178.               | 1154.            |
| 492.5 | 13.4               | 75.9                    | 1017.              | 187.               | 1204.            |
| 493.0 | 13.9               | 76.0                    | 1056.              | 195.               | 1251.            |
| 493.5 | 14.4               | 76.1                    | 1096.              | 205.               | 1301.            |
| 494.0 | 14.9               | 76.2                    | 1135.              | 213.               | 1348.            |
| 494.5 | 15.4               | 76.3                    | 1175.              | 222.               | 1397.            |

Anderson-Nichols & Company, Inc.

Subject H&H

Sheet No. 16 of 16

JOB NO. 3290-05

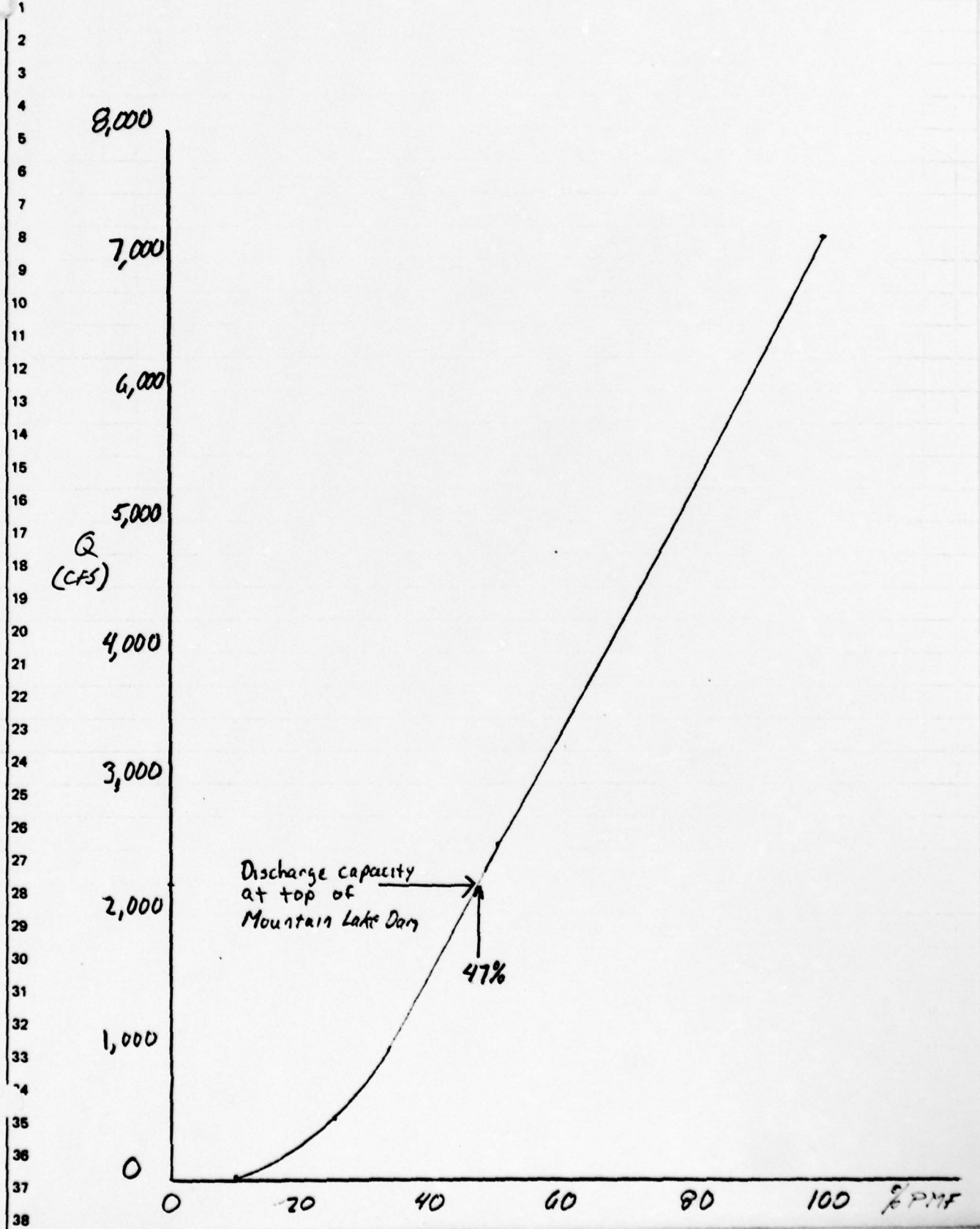
MOUNTAIN LAKE DAM

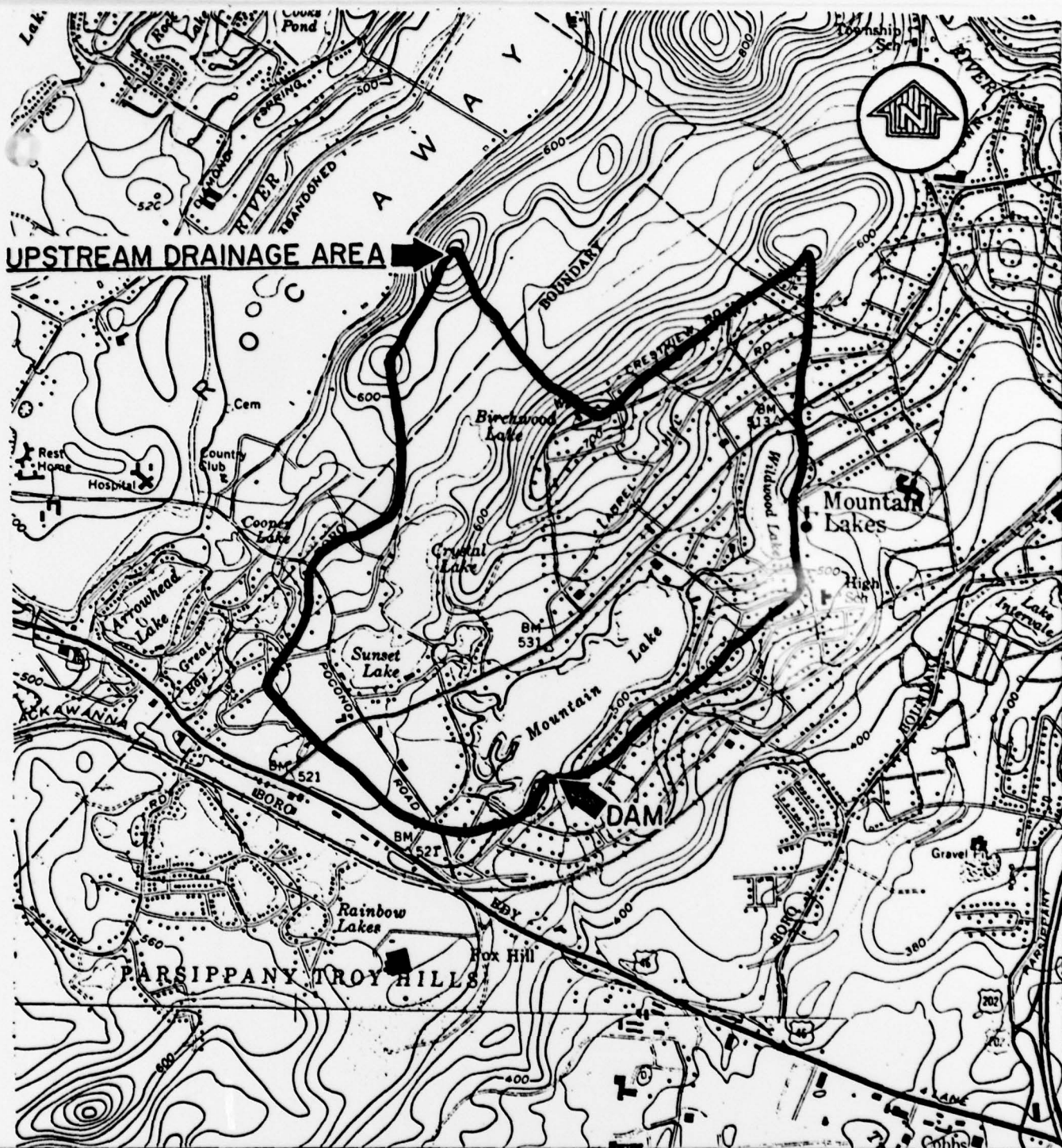
Date 8/17/39

Computed EED

Checked \_\_\_\_\_

JARES IN. SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29





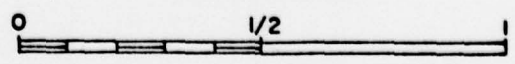
**NATIONAL PROGRAM OF INSPECTION OF  
NON-FED. DAMS**

**MOUNTAIN LAKE DAM  
BOROUGH OF MOUNTAIN LAKES  
REGIONAL VICINITY MAP**

**DEPARTMENT OF THE ARMY  
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS  
PHILADELPHIA, PENNSYLVANIA**

**ANDERSON-NICHOLS & CO., INC. BOSTON, MA.**

**SCALE IN MILES**



**MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE  
SHEETS. BOONTON, N.J., 1954, UPDATED 1970.  
MORRISTOWN, N.J., 1954, UPDATED 1970.**

HEC 1 OUTPUT  
OVERTOPPING ANALYSIS  
MOUNTAIN LAKE DAM



PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT A1  
 ROUTE HYDROGRAPH TO A2  
 RUNOFF HYDROGRAPH AT A3  
 COMBINE 2 HYDROGRAPHS AT A4  
 ROUTE HYDROGRAPH TO A5  
 END OF NETWORK

\*\*\*\*\*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 26 FEB 79  
 \*\*\*\*\*

RUN DATE: 79/08/21  
 TIME: 17.21.56.

JOB 3290-05 MOUNTAIN LAKE DAM BOROUGH OF MOUNTAIN LAKES, N.J. U.S. # 284  
 OVERDIPPING ANALYSIS ANDERSON-NICHOLS & CO., INC. CONCORD, N.H.  
 0.1\*0.25\*0.5 AND 1.0 MULTIPLE OF FMF FROM 6 HOUR FMF

JOB SPECIFICATION  
 NO 90 NHR 0 NMIN 5 IDAY 0 IHR 0 IMIN 0 METRIC 0 IFLT 0 IFRT 0 NSTAN 0  
 .INFER 5 NMT 0 LROPT 0 TRACE 0

RTIUS= .10 .25 .50 1.00  
 MULTI-PLAN ANALYSES TO BE PERFORMED  
 MPLAN= 1 MRATIO= 4 LRTIO= 1

\*\*\*\*\* SUB-AREA RUNOFF COMPUTATION \*\*\*\*\*

SUB-AREA RUNOFF COMPUTATION

OUTFLOW HYDROGRAPH FROM CRYSTAL LAKE

| ISTAD | IUNG | TAREA | SNAP | TRSDA | TRSEC | RATIO | ISNOW | ISAME | ISTAGE | IAUTD |
|-------|------|-------|------|-------|-------|-------|-------|-------|--------|-------|
| 01    | 0    | 0     | 0    | 0     | 0     | 0.000 | 0     | 1     | 0      | 0     |

HYDROGRAPH DATA

| INPUT HYDROGRAPH | ISTAD | IUNG | TAREA | SNAP | TRSDA | TRSEC | RATIO | ISNOW | ISAME | ISTAGE | IAUTD |
|------------------|-------|------|-------|------|-------|-------|-------|-------|-------|--------|-------|
| 0                | 0     | 0    | 0     | 0    | 0     | 0.000 | 0     | 0     | 0     | 0      | 0     |
| 1                | 1     | 1    | 2     | 2    | 2     | 0.000 | 0     | 3     | 3     | 3      | 1     |
| 4                | 5     | 5    | 6     | 6    | 7     | 0.000 | 0     | 11    | 17    | 23     | 37    |
| 50               | 70    | 94   | 116   | 135  | 152   | 0.000 | 0     | 165   | 178   | 190    | 206   |
| 228              | 268   | 367  | 523   | 866  | 1030  | 0.000 | 0     | 1047  | 950   | 847    | 735   |
| 626              | 543   | 458  | 416   | 383  | 355   | 0.000 | 0     | 332   | 313   | 298    | 285   |
| 274              | 263   | 252  | 240   | 230  | 220   | 0.000 | 0     | 212   | 204   | 197    | 191   |
| 185              | 179   | 172  | 160   | 145  | 128   | 0.000 | 0     | 111   | 96    | 83     | 72    |
| 67               | 62    | 57   | 53    | 50   | 46    | 0.000 | 0     | 43    | 40    | 37     | 35    |



STATION A2, PLAN 1, RTIO 4

| STATION | OUTFLOW |        |        |        |        |        |        |        |        |        | STOR   | STAGE  |         |         |        | TOTAL VOLUME |
|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|--------|--------------|
|         | 0.      | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     |        | 6-HOUR | 24-HOUR | 72-HOUR | PEAK   |              |
| 0.      | 0.      | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.     | 0.      | 0.      | 0.     | 0.           |
| 1.      | 1.      | 1.     | 1.     | 2.     | 2.     | 2.     | 2.     | 2.     | 2.     | 2.     | 2.     | 2.     | 2.      | 2.      | 2.     | 2.           |
| 6.      | 10.     | 14.    | 20.    | 27.    | 37.    | 47.    | 58.    | 69.    | 81.    | 91.    | 101.   | 111.   | 121.    | 131.    | 141.   | 151.         |
| 92.     | 111.    | 133.   | 172.   | 239.   | 332.   | 429.   | 515.   | 573.   | 606.   | 642.   | 679.   | 716.   | 753.    | 790.    | 827.   | 864.         |
| 617.    | 611.    | 594.   | 570.   | 544.   | 518.   | 492.   | 466.   | 442.   | 420.   | 401.   | 383.   | 366.   | 349.    | 331.    | 314.   | 297.         |
| 358.    | 249.    | 240.   | 231.   | 221.   | 211.   | 200.   | 188.   | 174.   | 164.   | 153.   | 144.   | 135.   | 126.    | 117.    | 108.   | 99.          |
| 12.     | 11.     | 10.    | 10.    | 10.    | 10.    | 10.    | 10.    | 10.    | 10.    | 10.    | 10.    | 10.    | 10.     | 10.     | 10.    | 10.          |
| 487.6   | 487.6   | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6   | 487.6   | 487.6  | 487.6        |
| 487.6   | 487.6   | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6  | 487.6   | 487.6   | 487.6  | 487.6        |
| 487.8   | 487.8   | 487.8  | 487.8  | 487.8  | 487.8  | 487.8  | 487.8  | 487.8  | 487.8  | 487.8  | 487.8  | 487.8  | 487.8   | 487.8   | 487.8  | 487.8        |
| 488.8   | 489.0   | 489.2  | 489.5  | 489.9  | 490.2  | 490.4  | 490.7  | 491.0  | 491.2  | 491.4  | 491.6  | 491.8  | 492.0   | 492.2   | 492.4  | 492.6        |
| 491.4   | 491.7   | 492.0  | 492.5  | 493.2  | 493.9  | 494.6  | 495.1  | 495.5  | 495.6  | 495.7  | 495.7  | 495.7  | 495.7   | 495.7   | 495.7  | 495.7        |
| 495.7   | 495.7   | 495.6  | 495.4  | 495.3  | 495.2  | 495.0  | 494.9  | 494.7  | 494.6  | 494.4  | 494.3  | 494.2  | 494.1   | 494.0   | 493.9  | 493.8        |
| 494.4   | 494.3   | 494.2  | 494.1  | 494.0  | 493.9  | 493.8  | 493.7  | 493.6  | 493.5  | 493.4  | 493.3  | 493.2  | 493.1   | 493.0   | 492.9  | 492.8        |
| 492.3   | 492.1   | 492.0  | 491.9  | 491.8  | 491.7  | 491.6  | 491.5  | 491.4  | 491.3  | 491.2  | 491.1  | 491.0  | 490.9   | 490.8   | 490.7  | 490.6        |
| 617.    | 617.    | 214.   | 171.   | 171.   | 171.   | 171.   | 171.   | 171.   | 171.   | 171.   | 171.   | 171.   | 171.    | 171.    | 171.   | 171.         |
| 17.     | 17.     | 6.     | 6.     | 5.     | 5.     | 5.     | 5.     | 5.     | 5.     | 5.     | 5.     | 5.     | 5.      | 5.      | 5.     | 5.           |
|         |         | 6.87   | 6.87   | 6.87   | 6.87   | 6.87   | 6.87   | 6.87   | 6.87   | 6.87   | 6.87   | 6.87   | 6.87    | 6.87    | 6.87   | 6.87         |
|         |         | 174.55 | 174.57 | 174.57 | 174.57 | 174.57 | 174.57 | 174.57 | 174.57 | 174.57 | 174.57 | 174.57 | 174.57  | 174.57  | 174.57 | 174.57       |
|         |         | 106.   | 106.   | 106.   | 106.   | 106.   | 106.   | 106.   | 106.   | 106.   | 106.   | 106.   | 106.    | 106.    | 106.   | 106.         |
|         |         | 131.   | 131.   | 131.   | 131.   | 131.   | 131.   | 131.   | 131.   | 131.   | 131.   | 131.   | 131.    | 131.    | 131.   | 131.         |

MAXIMUM STORAGE = 33.

MAXIMUM STAGE IS 495.7

\*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
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SUB-AREA RUNOFF COMPUTATION

DEVELOP INELOW HYDROGRAPH FOR MOUNTAIN LAKE DAM

ISTAO ICOMF IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO  
 A3 0 0 0 0 0 0 1 0 0 0

HYDROGRAPH DATA  
 IHYDQ IUNG TAREA SNAP TRSDA TRSFC RATIO ISNOW ISAME LOCAL  
 0 2 .98 0.00 .98 .80 0.000 0 1 0

PRECIP DATA

| PRECIP PATTERN | DAJ  | DAK  |
|----------------|------|------|
| 72             | 0.00 | 0.00 |
| .21            | .21  | .21  |
| .26            | .26  | .26  |
| .32            | .32  | .32  |
| .39            | .39  | .39  |
| .58            | .58  | .58  |
| .30            | .30  | .30  |
| .23            | .23  | .23  |

LOSS DATA

| LROPT | STKR | DLTKR | RIIOL | ERAIN | STKRS | RIIUK | STRTL | CMSYL | ALSMX | RTIMP |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0     | 0.00 | 0.00  | 1.00  | 0.00  | 0.00  | 1.00  | 1.00  | .10   | 0.00  | 0.00  |

UNIT HYDROGRAPH DATA  
 TC= 0.00 LAG= .09

RECESSION DATA  
 STRIQ= -3.00 ORCSN= 0.00 RTIQR= 1.00

LINE INCREMENT TOO LARGE=(ANHD IS GI LAG/2)

UNIT HYDROGRAPH 7 END OF PERIOD ORDINATES, TC= 54. 0.00 HOURS, LAG= .09 VOL= 1.00  
 2560. 3175. 1188. 433. 153. 21.

| END-OF-PERIOD FLOW |       |        |      |      |      |        |       |       |        |      |      |      |        |
|--------------------|-------|--------|------|------|------|--------|-------|-------|--------|------|------|------|--------|
| MO.DA              | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q | MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q |
| 1.01               | .05   | 1      | .17  | 0.00 | .17  | 3.     | 1.01  | 3.50  | 46     | .46  | .46  | .01  | 5047.  |
| 1.01               | .10   | 2      | .17  | 0.00 | .17  | 3.     | 1.01  | 3.55  | 47     | .31  | .30  | .01  | 3640.  |
| 1.01               | .15   | 3      | .17  | 0.00 | .17  | 3.     | 1.01  | 4.00  | 48     | .31  | .30  | .01  | 2743.  |
| 1.01               | .20   | 4      | .17  | 0.00 | .17  | 3.     | 1.01  | 4.05  | 49     | .24  | .23  | .01  | 2281.  |
| 1.01               | .25   | 5      | .17  | 0.00 | .17  | 3.     | 1.01  | 4.10  | 50     | .24  | .23  | .01  | 1929.  |
| 1.01               | .30   | 6      | .17  | .02  | .15  | .57    | 1.01  | 4.15  | 51     | .24  | .23  | .01  | 1809.  |
| 1.01               | .35   | 7      | .17  | .16  | .01  | 485.   | 1.01  | 4.20  | 52     | .24  | .23  | .01  | 1768.  |
| 1.01               | .40   | 8      | .17  | .16  | .01  | 958.   | 1.01  | 4.25  | 53     | .24  | .23  | .01  | 1753.  |
| 1.01               | .45   | 9      | .17  | .16  | .01  | 1414.  | 1.01  | 4.30  | 54     | .24  | .23  | .01  | 1740.  |
| 1.01               | .50   | 10     | .17  | .16  | .01  | 1199.  | 1.01  | 4.35  | 55     | .24  | .23  | .01  | 1748.  |
| 1.01               | .55   | 11     | .17  | .16  | .01  | 1521.  | 1.01  | 4.40  | 56     | .24  | .23  | .01  | 1748.  |
| 1.01               | 1.00  | 12     | .17  | .14  | .01  | 1279.  | 1.01  | 4.45  | 57     | .24  | .23  | .01  | 1748.  |
| 1.01               | 1.05  | 13     | .20  | .20  | .01  | 1318.  | 1.01  | 4.50  | 58     | .24  | .23  | .01  | 1748.  |
| 1.01               | 1.10  | 14     | .20  | .20  | .01  | 1425.  | 1.01  | 4.55  | 59     | .24  | .23  | .01  | 1748.  |
| 1.01               | 1.15  | 15     | .20  | .20  | .01  | 1463.  | 1.01  | 5.00  | 60     | .24  | .23  | .01  | 1748.  |
| 1.01               | 1.20  | 16     | .20  | .20  | .01  | 1479.  | 1.01  | 5.05  | 61     | .19  | .18  | .01  | 1617.  |
| 1.01               | 1.25  | 17     | .20  | .20  | .01  | 1485.  | 1.01  | 5.10  | 62     | .19  | .18  | .01  | 1454.  |
| 1.01               | 1.30  | 18     | .20  | .20  | .01  | 1484.  | 1.01  | 5.15  | 63     | .19  | .18  | .01  | 1394.  |
| 1.01               | 1.35  | 19     | .20  | .20  | .01  | 1487.  | 1.01  | 5.20  | 64     | .19  | .18  | .01  | 1371.  |
| 1.01               | 1.40  | 20     | .20  | .20  | .01  | 1487.  | 1.01  | 5.25  | 65     | .19  | .18  | .01  | 1364.  |
| 1.01               | 1.45  | 21     | .20  | .20  | .01  | 1487.  | 1.01  | 5.30  | 66     | .19  | .18  | .01  | 1364.  |
| 1.01               | 1.50  | 22     | .20  | .20  | .01  | 1487.  | 1.01  | 5.35  | 67     | .19  | .18  | .01  | 1360.  |
| 1.01               | 1.55  | 23     | .20  | .20  | .01  | 1487.  | 1.01  | 5.40  | 68     | .19  | .18  | .01  | 1360.  |
| 1.01               | 2.00  | 24     | .20  | .20  | .01  | 1487.  | 1.01  | 5.45  | 69     | .19  | .18  | .01  | 1360.  |
| 1.01               | 2.05  | 25     | .26  | .25  | .01  | 1618.  | 1.01  | 5.50  | 70     | .19  | .18  | .01  | 1360.  |
| 1.01               | 2.10  | 26     | .26  | .25  | .01  | 1781.  | 1.01  | 5.55  | 71     | .19  | .18  | .01  | 1360.  |
| 1.01               | 2.15  | 27     | .26  | .25  | .01  | 1842.  | 1.01  | 6.00  | 72     | .19  | .18  | .01  | 1460.  |
| 1.01               | 2.20  | 28     | .26  | .25  | .01  | 1844.  | 1.01  | 6.05  | 73     | 0.00 | 0.00 | 0.00 | 902.   |
| 1.01               | 2.25  | 29     | .26  | .25  | .01  | 1872.  | 1.01  | 6.10  | 74     | 0.00 | 0.00 | 0.00 | 334.   |
| 1.01               | 2.30  | 30     | .26  | .25  | .01  | 1874.  | 1.01  | 6.15  | 75     | 0.00 | 0.00 | 0.00 | 171.   |
| 1.01               | 2.35  | 31     | .26  | .25  | .01  | 1875.  | 1.01  | 6.20  | 76     | 0.00 | 0.00 | 0.00 | 44.    |
| 1.01               | 2.40  | 32     | .26  | .25  | .01  | 1875.  | 1.01  | 6.25  | 77     | 0.00 | 0.00 | 0.00 | 16.    |
| 1.01               | 2.45  | 33     | .26  | .25  | .01  | 1875.  | 1.01  | 6.30  | 78     | 0.00 | 0.00 | 0.00 | 7.     |
| 1.01               | 2.50  | 34     | .26  | .25  | .01  | 1875.  | 1.01  | 6.35  | 79     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 2.55  | 35     | .26  | .25  | .01  | 1875.  | 1.01  | 6.40  | 80     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.00  | 36     | .26  | .25  | .01  | 1875.  | 1.01  | 6.45  | 81     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.05  | 37     | .16  | .15  | .01  | 1619.  | 1.01  | 6.50  | 82     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.10  | 38     | .31  | .30  | .01  | 1699.  | 1.01  | 6.55  | 83     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.15  | 39     | .31  | .30  | .01  | 2071.  | 1.01  | 7.00  | 84     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.20  | 40     | .46  | .46  | .01  | 2610.  | 1.01  | 7.05  | 85     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.25  | 41     | .54  | .53  | .01  | 3350.  | 1.01  | 7.10  | 86     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.30  | 42     | 1.32 | 1.31 | .01  | 5783.  | 1.01  | 7.15  | 87     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.35  | 43     | 2.17 | 2.16 | .01  | 10593. | 1.01  | 7.20  | 88     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.40  | 44     | .85  | .84  | .01  | 10910. | 1.01  | 7.25  | 89     | 0.00 | 0.00 | 0.00 | 3.     |
| 1.01               | 3.45  | 45     | .54  | .53  | .01  | 7401.  | 1.01  | 7.30  | 90     | 0.00 | 0.00 | 0.00 | 3.     |

SUM 20.41 18.86 1.55 143346.  
 ( 519.1)( 479.)( .89.)( 4059.11)

| LF.S   | PEAK   | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|--------|--------|--------|---------|---------|--------------|
| 10910. | 1970.  | 1573.  | 1523.   | 143346. | 4057.        |
| 309.   | 56.    | 45.    | 45.     | 18.90   | 18.90        |
|        | 18.89  | 18.90  | 18.90   | 480.00  | 480.00       |
|        | 479.80 | 480.00 | 480.00  | 987.    | 987.         |
|        | 987.   | 987.   | 987.    | 1218.   | 1218.        |

INCHES  
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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 | RATIOS APPLIED TO FLOWS |          |           |           |
|---------------|---------|-----------------|------|-------------------------|----------|-----------|-----------|
|               |         |                 |      | RATIO 1                 | RATIO 2  | RATIO 3   | RATIO 4   |
| HYDROGRAPH A1 | A1      | .29<br>(.75)    | 1    | .10                     | .25      | .50       | 1.00      |
|               |         |                 |      | 105.                    | 262.     | 524.      | 1047.     |
| ROUTED TO     | A2      | .29<br>(.75)    | 1    | ( 2.96)                 | ( 7.41)  | ( 14.82)  | ( 29.65)  |
|               |         |                 |      | 44.                     | 127.     | 280.      | 617.      |
| HYDROGRAPH A1 | A3      | .98<br>( 2.54)  | 1    | ( 1.24)                 | ( 3.59)  | ( 7.93)   | ( 17.47)  |
|               |         |                 |      | 1091.                   | 2727.    | 5455.     | 10910.    |
| 2 COMBINED    | A4      | 1.27<br>( 3.29) | 1    | ( 30.89)                | ( 77.23) | ( 154.46) | ( 308.92) |
|               |         |                 |      | 2759.                   | 5528.    | 11081.    | 22162.    |
| ROUTED TO     | A5      | 1.27<br>( 3.29) | 1    | ( 31.19)                | ( 78.12) | ( 156.54) | ( 313.78) |
|               |         |                 |      | 27.                     | 466.     | 2535.     | 7188.     |
|               |         |                 |      | (.77)                   | (13.21)  | (71.79)   | (203.54)  |

PLAN 1 STATION A2

| RATIO | MAXIMUM FLOW, CFS | MAXIMUM STAGE, FT | TIME HOURS |
|-------|-------------------|-------------------|------------|
| .10   | 44.               | 490.3             | 4.42       |
| .25   | 127.              | 491.9             | 4.33       |
| .50   | 280.              | 493.6             | 4.33       |
| 1.00  | 617.              | 495.7             | 4.25       |

SUMMARY OF DAM SAFETY ANALYSIS

| PLAN 1 | ELEVATION | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|--------|-----------|---------------|----------------|------------|
|        | STORAGE   | 489.60        | 489.40         | 492.30     |
|        | OUTFLOW   | 899.          | 881.           | 1154.      |
|        |           | 1.            | 0.             | 2230.      |

| RATIO OF FME | 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 |
|--------------|-----------------------------|------------------------|-----------------------|---------------------|-------------------------|---------------------------|-----------------------|
| .10          | 490.67                      | 0.00                   | 1000.                 | 27.                 | 0.00                    | 4.42                      | 0.00                  |
| .25          | 491.69                      | 0.00                   | 1097.                 | 466.                | 0.00                    | 5.17                      | 0.00                  |
| .50          | 492.37                      | .07                    | 1171.                 | 2335.               | .42                     | 3.03                      | 0.00                  |
| 1.00         | 493.18                      | .88                    | 1269.                 | 7188.               | 1.92                    | 3.75                      | 0.00                  |

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 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 26 FEB 79  
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APPENDIX 4

REFERENCES

MOUNTAIN LAKE DAM

APPENDIX 4

REFERENCES

MOUNTAIN LAKE DAM

1. U.S. Army Corps of Engineers, Hydrologic Engineering Center, "Flood Hydrograph Package (HEC-1) for Dam Safety Inspections - User's Manual," Davis, California, September 1978.
2. Brater, Ernest F. and King, Horace, Handbook of Hydraulics, Sixth Edition, McGraw-Hill, New York, 1976.
3. U.S. Bureau of Public Roads, "Design Charts for Open Channel Flow," October 1960.
4. Department of the Army, Philadelphia District, Corps of Engineers, Pennsylvania 19106. Crystal Lake Dam - Phase I Inspection Report, National Dam Safety Program, August 1979.