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PASSAIC RIVER BASIN
ROCKAWAY RIVER, MORRIS COUNTY
MORRIS COUNTY
NEW JERSEY

(15) DACW 61-77-3-00111

LEVEL II

ROCK RIDGE LAKE DAM

NJ 00178

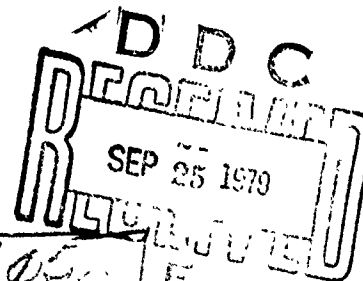
Official Report

(10)

Warren A. Guinan

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

(6) National Dam Safety Program.
Rock Ridge Lake Dam (NJ 00178), Passaic
River Basin, Rockaway River, Morris
County, Morris County, New Jersey.
Phase 1 Inspection Report.



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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NJ00178	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program Rock Ridge Lake Dam Morris County, N.J		5. TYPE OF REPORT & PERIOD COVERED FINAL
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Guinan, Warren A., P.E.		8. CONTRACT OR GRANT NUMBER(s) DACW61-79-C-0011 <i>in</i>
9. PERFORMING ORGANIZATION NAME AND ADDRESS Anderson-Nichols 6 Loudon Rd. Concord, NH 03301		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106		12. REPORT DATE August, 1979
		13. NUMBER OF PAGES 50
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES 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) Dams Visual inspection Spillways National Dam Inspection Act Report Structural Analysis Safety		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) 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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NAPEN-D

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

17 SEP 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Rock Ridge 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, Rock Ridge Lake Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure, as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 20 percent of the Probable Maximum Flood--PMF - would overtop the dam. The spillway is considered "inadequate" instead of "seriously inadequate" because dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. 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, the owner should retain the services of a professional engineer qualified in the design and inspection of dams to accomplish the following:

NAPEN-D

Honorable Brendan T. Byrne

(1) Design and oversee procedures for removing trees and brush from the upstream slope, downstream slope and downstream toe area of the dam.

(2) Investigate the large soft wet area near the west abutment and design appropriate remedial measures.

(3) Inspect the downstream slope and toe of the dam after the trees, brush, and debris have been removed.

(4) Design and supervise repairs for the eroded areas on the upstream slope at the spillway training walls and at two locations between the spillway and the west abutment.

(5) Design repairs to the concrete spillway apron and areas of spalling and erosion on the weir and training wall.

(6) Provide a paved surface for the walkway on the dam crest.

(7) Establish grassy vegetation or other protective covering on the cleared slopes and remaining portions of the crest of the dam.

(8) Investigate the need to install an upstream valve on the low level outlet pipe to relieve constant pressure in the pipe in the embankment as it presently exists.

c. Within 30 days from the date of approval of this report, the owner should carry out the following remedial measures:

(1) Remove the raft floating against the upstream edge at the spillway crest.

(2) Check the condition of the dam periodically and monitor the seepage at the wet areas at the downstream toe until remedial measures are effected.

d. Within six months from the date of approval of this report, the owner should carry out the following additional remedial measures:

(1) Remove the two trees that have fallen into the discharge channel.

(2) Clear trees and brush on either side of the discharge channel.

(3) 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.

NAPEN-D

Honorable Brendan T. Byrne

(4) 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.

(5) Periodically operate the low level outlet valve to prevent silting and seizing by rust.

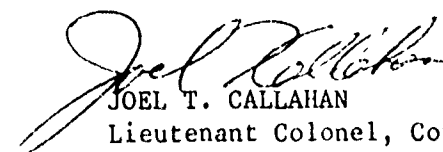
A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James A. Courter of the Thirteenth District. Under 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,

1 Incl
As stated


JOEL T. CALLAHAN
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

Copies furnished:
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ROCK RIDGE LAKE DAM (NJ00178)

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.

Rock Ridge Lake Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure, as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 20 percent of the Probable Maximum Flood--PMF - would overtop the dam. The spillway is considered "inadequate" instead of "seriously inadequate" because dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. 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, the owner should retain the services of a professional engineer qualified in the design and inspection of dams to accomplish the following:

(1) Design and oversee procedures for removing trees and brush from the upstream slope, downstream slope and downstream toe area of the dam.

(2) Investigate the large soft wet area near the west abutment and design appropriate remedial measures.

(3) Inspect the downstream slope and toe of the dam after the trees, brush, and debris have been removed.

(4) Design and supervise repairs for the eroded areas on the upstream slope at the spillway training walls and at two locations between the spillway and the west abutment.

(5) Design repairs to the concrete spillway apron and areas of spalling and erosion on the weir and training wall.

(6) Provide a paved surface for the walkway on the dam crest.

(7) Establish grassy vegetation or other protective covering on the cleared slopes and remaining portions of the crest of the dam.

(8) Investigate the need to install an upstream valve on the low level outlet pipe to relieve constant pressure in the pipe in the embankment as it presently exists.

c. Within 30 days from the date of approval of this report, the owner should carry out the following remedial measures:

(1) Remove the raft floating against the upstream edge at the spillway crest.

(2) Check the condition of the dam periodically and monitor the seepage at the wet areas at the downstream toe until remedial measures are effected.

d. Within six months from the date of approval of this report, the owner should carry out the following additional remedial measures:

(1) Remove the two trees that have fallen into the discharge channel.

(2) Clear trees and brush on either side of the discharge channel.

(3) 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.

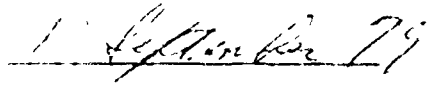
(4) Engage a professional engineer qualified in the design and inspection of dams to make a comprehensive technical inspection of the dam once every two years.

(5) Periodically operate the low level outlet valve to prevent silting and seizing by rust.

APPROVED: 

JOEL T. CALLAHAN

Lieutenant Colonel, Corps of Engineers
Acting District Engineer

DATE:  1 September 79

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Rock Ridge Lake Dam
ID Number:	Fed. ID No. NJ00178
State Located:	New Jersey
County Located:	Morris
Stream:	Denney Brook
River Basin:	Passaic
Date of Inspection:	May 17, 1979

ASSESSMENT OF GENERAL CONDITIONS

Rock Ridge Lake Dam is about 53 years old and in fair overall condition. It is small in size and is classified as Significant Hazard. The crest of the dam shows evidence of trespassing and is bare of vegetation. Large trees and brush are growing on the upstream and downstream slopes of the dam. Extensive erosion has occurred to the upstream slope next to the training walls on both sides of the concrete spillway, and in two locations on the right crest of the dam. A large soft wet area was observed at the downstream toe near the right abutment. Debris has been dumped on the downstream slope near the right abutment. The concrete spillway apron has an open and unsealed expansion joint. Erosion and spalling of the surface of the spillway is visible. Several drill holes have been made in the top surface of the spillway apron. The spillway can pass approximately 20 percent of the PMF and is inadequate.

It is recommended that the owner retain the services of a professional engineer, qualified in the design and construction of dams, to accomplish the following in the near future: remove trees, their root systems and brush from the upstream slope, downstream slope, and downstream toe area of the dam; investigate the soft wet area near the right abutment of the dam and design and implement appropriate remedial measures; inspect the downstream slope and toe of the dam after the trees, brush, and debris have been removed; design and implement repairs for the eroded areas on the upstream slope at the spillway training walls and westerly embankment; conduct a more detailed hydrologic and hydraulic analysis of the watershed, dam, and spillway, and design and implement appropriate

mitigating measures to provide adequate discharge capacity; repair the drill holes, eroded and spalled areas in the apron, weir, and spillway concrete; provide a paved surface for the walkway on the dam crest; establish grassy vegetation or other protective covering on the cleared slopes and remaining portions of the crest of the dam; and investigate the need to install an upstream valve on the low level outlet pipe to relieve constant pressure in the pipe in the embankment as it presently exists.

It is further recommended that the owner accomplish the following tasks as a part of operating and maintenance procedures: immediately, remove the raft floating against the upstream edge of the spillway crest; starting immediately, check the condition of the dam periodically until remedial measures are effected; starting soon, clear trees from the banks of the discharge channel and remove the two trees that have already fallen; 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 flood-flow conditions or imminent dam failure. In addition, the owner should 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. This should be started in the near future. Starting soon, the low level outlet valve should be operated periodically to prevent silting and seizing by rust.

Warren A. Guinan

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



17 MAY 1979

OVERVIEW

ROCK RIDGE LAKE DAM

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ROCK RIDGE LAKE DAM N.J. NO. 440 FED ID NO. NJ00178

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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. 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
ROCK RIDGE LAKE DAM
U.S. #NJ00178 N.J. #440

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Rock Ridge 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 by agreement between the State 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 Rock Ridge 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. Rock Ridge Lake Dam is a 10-foot high, 235-foot long earthfill dam, built around 1926 and rebuilt in 1949. The downstream and upstream faces have 3H:1V slopes. The 40-foot long free overflow spillway is near the center of the dam. The crest of the spillway is capped by a concrete slab. Immediately downstream of the crest is a sloping spillway apron about 42 feet long. A 12-inch diameter concrete, low level outlet pipe is located left of center of the spillway and one foot above the downstream toe. The 2.5' x 2.9' valve box, located in the center of the spillway apron just downstream of the 1-foot pier of the service bridge, contains one 12-inch gate valve. The service bridge is constructed of steel beams with wooden deck and railing and is set on one concrete pier. It spans the spillway about one foot upstream of the spillway crest and about 1.8 feet above the crest. A dirt path extends along the dam crest from each end of the service bridge. Essential features of the dam are given in Figure 2.

b. Location. The dam is located in Morris County, New Jersey on Denney Brook, a tributary to the Rockaway River, approximately 1 mile northwest of Denville. It is at north latitude 40°54.6' and west longitude 74°27.9'. A location map is given in Figure 1.

c. Size Classification. Rock Ridge Lake Dam is classified as being "small" on the basis of storage at the dam crest of 174 acre-feet, which is less than 1000 acre-feet, but more than 50 acre-feet, and on the basis of its height of 10.2 feet, which is less than 40 feet, in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Visual inspection of the downstream area and the breach analysis contained herein show that failure of Rock Ridge Lake Dam could possibly lead to the overtopping of Denney Pond Dam downstream and subsequent overtopping of Florence Avenue, leading to appreciable but not excessive damage to 2 houses just downstream of Florence Avenue. Loss of any lives is unlikely. Thus Rock Ridge Lake Dam is classified as Significant Hazard.

e. Ownership. The dam is owned by the Rock Ridge Community Club, Denville, New Jersey. The President, Kenneth McQueen, 31 Edgewater Drive, Denville, New Jersey, was contacted for information.

f. Purpose of Dam. The lake was originally designed and is currently used for recreational purposes.

g. Design and Construction History. Little information was disclosed regarding the original design and construction of the dam, which took place around 1926. The dam was repaired and spillway rebuilt in 1949 after a cloudburst caused failure of the dam in 1947. Plans are on file at New Jersey Department of Environmental Protection. Little information was disclosed regarding the reconstruction.

h. Normal Operational Procedures. Rock Ridge Lake Dam is operated for recreational purposes. The lake level is lowered every 2 to 3 years to repair docks.

1.3 Pertinent Data

a. Drainage Areas

Drainage Area - .87 square miles (See Appendix 4.)

Normal Water Surface - 17.4 acres (See Appendix 4)

b. Discharge at Damsite

Maximum flood at damsite - unknown

Low level outlet at pool elevation - 7 cfs

Ungated total spillway capacity at maximum pool elevation - 579 cfs

c. Elevation (ft. above MSL)

Top Dam - 523.6 minimum point
525.2 maximum point

Maximum pool-design surcharge ($\frac{1}{2}$ PMF) - 525.1

Recreation pool - 521.1

Spillway crest - 521.1

Upstream portal invert low level outlet (from design plans) - 515.6

Downstream portal invert low level outlet -
514.4

Streambed at centerline of dam - downstream - 513.4

Maximum tailwater (estimated) - 519

d. Reservoir (feet)

Length of maximum pool - 1920

Length of recreation pool - 1800

e. Storage (acre-feet)

Recreation pool - 174

Design surcharge ($\frac{1}{2}$ PMF) - 251

Top of dam - 218

f. Reservoir Surface (acres)

Top dam - 17.6

Spillway crest - 17.4

g. Dam

Type - earthfill

Length - 235'

Height - 10.2'

Top width - 10⁺_—

Side Slopes - Upstream - 3H:1V
Downstream - 3H:1V

Zoning - Clay fill on upstream side of spillway
shown on plans.

Impervious core - none indicated on design plans

Cutoff - 1 foot thick concrete cutoff wall at downstream end of spillway indicated on design plans.

Grout curtain - none indicated on design plans

h. Spillway

Type - free overflow

Length of weir - 40' nominal, 39' effective length

Crest elevation - 521.1

U/S Channel - Rock Ridge Lake

D/S Channel - Denney Pond

i. Regulating Outlets

Type - One 12-inch part concrete and part cast iron
low level outlet pipe.

Length - 72'_—⁺

Access - Concrete housing in center of concrete
spillway apron just downstream of crest.

Regulating facilities - gate valve

SECTION 2 ENGINEERING DATA

2.1 Design

No plans, hydraulic, or hydrologic design data for the original Rock Ridge Lake Dam are available. Plans, hydraulic and hydrologic data for the rebuilt part of the dam and the spillway are on file at the New Jersey Department of Environmental Protection. The plans show an earth-filled dam with a 40-foot long, 12-foot wide spillway, with 4 expansion joints. The spillway apron is shown to extend for 9 feet downstream of the crest. The valve box with 12-inch gate valve is shown on the plans in the center of the apron by the downstream edge. The 12-inch diameter low-level outlet pipe is shown to be cast iron, with an intake upstream of the spillway and an outlet just below the gate valve.

2.2 Construction

No recorded data concerning construction of Rock Ridge Lake Dam were disclosed. Reference data on file with the New Jersey Department of Environmental Protection indicate that the dam was repaired and spillway rebuilt in 1949. The current Rock Ridge Lake Association president stated that concrete was added to the spillway in 1978 to repair erosion and undermining.

2.3 Operation

No engineering data pertaining to operation of the dam were disclosed.

2.4 Evaluation

a. Availability. A search of the New Jersey Department of Environmental Protection files, contact with community officials and contact with the owner revealed a limited amount of recorded information. All disclosed information was retrieved.

b. Adequacy. Because of the limited amount of recorded data available, evaluation of this dam was based primarily on visual observations.

c. Validity. Parts of the recorded data reviewed did not agree with visual observations. Specific discrepancies are discussed in Sections 5.1 a. and 6.1 b.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. Dam. The crest of the dam appears to be used extensively as a footpath and is bare of vegetation. Large trees and a heavy cover of brush are growing on both the upstream and downstream slopes of the dam. Extensive erosion has occurred on the upstream slope next to the training walls on each side of the spillway and at two locations between the spillway and the west abutment. One large soft wet area was observed at the downstream toe near the right abutment. Brush, stumps, leaves, and grass clippings which have been dumped on the downstream slope of the dam near the west abutment and a very heavy growth of rose bushes, brush, and trees on the downstream slope and at the downstream toe of the dam make it impossible to inspect adequately for evidence of seepage along the entire length of the dam. A raft was floating against the upstream edge of the spillway crest.

b. Appurtenant Structures. The concrete spillway apron has an open and unsealed expansion joint. Several drill holes have been made in the top surface of the concrete middle apron of the spillway. The concrete weir and training wall exhibited evidence of minor spalling and surface erosion to a maximum depth of 1 inch. The concrete spillway apron appears to have been recently extended. The 12-inch low-level outlet pipe and valve appeared to be in fair condition but were not operated during the inspection. The service bridge beams and decking were in good condition.

c. Reservoir Area. The watershed above the dam is gently sloping and wooded. Slopes adjacent to the reservoir appear stable. Some homes and a bathhouse are located on the shore of the reservoir. No evidence of significant sedimentation was observed.

d. Downstream Channel. Two trees have blown over across the channel immediately downstream of the dam. Many trees overhang the area downstream of the dam.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were disclosed. Water is lowered every 2 or 3 years for dock maintenance purposes.

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 b. should be implemented as prescribed.

SECTION 5 HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Design spillway capacity was based on "a 16K storm of 6 hours duration," which produced the maximum discharge for a 50-year storm. Several other durations were investigated. The peak inflow of 450 cfs was routed through the lake to obtain a peak outflow of 266 cfs. In a letter dated October 17, 1949 to Newell C. Harrison, Engineer for the owner, from H. T. Critchlow, Director and Chief Engineer for the State Division of Water Policy and Supply, a minimum freeboard of 2.5 feet is specified for a forty-foot long broad-crested spillway. Two hydraulic features of the structure did not agree with the original design plans. A one-foot wide concrete pier supports the service bridge which spans the spillway, and reduces the effective weir length to 39 feet and the freeboard to 1.8 feet. The downstream spillway apron was found to extend downstream about 42 feet. It appears that several downstream sections have been added to the spillway apron shown on the plans. The 12-inch low level pipe is concrete at its outlet. It is believed to be concrete pipe under the new spillway and is shown in the design plans to be cast iron pipe at the valve box. Engineering data are given in Appendix 1.

b. Experience Data. The original dam was overtopped and breached during a cloudburst on May 25, 1947. The peak inflow and frequency of the storm were not determined. The breach formed was about 30 feet wide by 30 feet long. Recorded descriptions are included in Appendix 1 and state that no significant property damage occurred. No experience data were disclosed regarding the current dam and spillway.

c. Visual Observations. No visual evidence was found of damage to the structure caused by overtopping. At the time of inspection, water less than one inch deep was passing over the spillway crest.

d. Overtopping Potential. The hydrologic/hydraulic evaluation of Rock Ridge Lake Dam is based on a spillway design flood (SDF) equal to one-half the probable maximum flood (PMF) in accordance with the range of test floods given in the evaluation guidelines for dams classified Significant Hazard and small in size. The PMF has been determined by application of the SCS dimensionless unit hydrograph to a 24-hour PMP storm of 22.5 inches. Hydrologic computations are given in Appendix 4. The routed half-PMF peak discharge for the subject watershed is 2,197 cfs.

The minimum elevation of the dam allows 2.4 feet of depth in the spillway before overtopping occurs. Under this head, the spillway capacity is 579 cfs, which is less than the required SDF.

Flood routing calculations indicate that Rock Ridge Lake Dam will be overtopped for four hours to a maximum depth of 1.5 feet, under half-PMF conditions. It is estimated that the dam can pass less than 20 percent of the PMF without overtopping, thus the spillway is considered inadequate.

Because the dam was initially classified as high hazard based on visual observation, a breach analysis was performed to assess the increase in downstream hazard under dam failure conditions. The results of breach analysis, contained in Appendix 4, show that the downstream hazard is not increased under dam failure conditions. The inundation at the potential damage area downstream is such that the hazard is more appropriately classified as Significant.

e. Drawdown Capacity. If the low level outlet is in operable condition, it is estimated that the pond can be drained in approximately 13½ days, assuming no significant inflow. This time period is considered marginal for draining the reservoir in an emergency situation.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The use of the crest of the dam as a footpath and the absence of vegetation on the crest could lead to serious erosion of the dam if not remedied. If the trees growing on the upstream and downstream slopes of the dam blow over and pull out their roots, or if a tree dies and its roots rot, serious seepage and erosion problems may result. Erosion of the upstream slope at the spillway training walls and at two other locations, if allowed to continue, may lead to breaching of the dam. The large soft wet area near the west abutment, if uncorrected, could lead to a stability problem in the future.

Based on the visual inspection alone it is not possible to determine the physical properties of the foundation soil or the character of the interior of the cross section. Therefore, it is not possible to evaluate the factor of safety of the dam against slope failure. The open and unsealed joint and the open drill holes in the spillway apron could lead to rapid deterioration and undermining of the concrete in the apron.

b. Design and Construction Data. A drawing dated 1950 indicates that the existing cross section of the dam consisted principally of a sand and gravel fill and an upstream slope of "riprap over clay." A concrete cutoff wall is shown to be under the concrete spillway apron several feet downstream from the downstream edge of the crest of the dam. No riprap was found on the upstream face of the dam during the inspection.

c. Operating Records. An inspection report dated June 2, 1947 indicates that "on Sunday night, May 25, a severe cloud-burst occurred in this section of Morris County, resulting in the overtopping of the dam and washing out a section of the dam about 30 feet wide."

d. Post-Construction Changes. After the May 25, 1947 breach the dam was reconstructed based on design data included in Appendix 1.

e. Seismic Stability. Rock Ridge 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. Rock Ridge Lake Dam is 53 years old and in fair 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.
- c. Urgency. The recommendations made in 7.2 a. and the operating and maintenance procedures 7.2 c. should be implemented by the owner as prescribed below.
- d. Necessity for Additional Information. The dam should be inspected again after the trees, brush, and debris have been removed from the downstream slope and downstream toe area. The information available from the present visual inspection is adequate to identify the potential problems that are listed in Sections 5 and 6. These problems will require the attention of a professional engineer who will have to make additional engineering studies to design or specify remedial measures to rectify the problems. If left unattended, the problems could lead to instability of the structure.

7.2 Recommendations/Remedial Measures

- a. Recommendations. The owner should retain the services of a professional engineer qualified in the design and inspection of dams to accomplish the following in the near future:
 - (1) Design and oversee procedures for removing trees and brush from the upstream slope, downstream slope and downstream toe area of the dam.
 - (2) Investigate the large soft wet area near the west abutment and design appropriate remedial measures.
 - (3) Inspect the downstream slope and toe of the dam after the trees, brush, and debris have been removed.
 - (4) Design and supervise repairs for the eroded areas on the upstream slope at the spillway training walls and at two locations between the spillway and the west abutment.

(5) Conduct a more detailed hydrologic and hydraulic analysis of the spillway to determine the need and type of remedial measures necessary.

(6) Design repairs to the concrete spillway apron and areas of spalling and erosion on the weir and training wall.

(7) Provide a paved surface for the walkway on the dam crest.

(8) Establish grassy vegetation or other protective covering on the cleared slopes and remaining portions of the crest of the dam.

(9) Investigate the need to install an upstream valve on the low level outlet pipe to relieve constant pressure in the pipe in the embankment as it presently exists.

b. Operating and Maintenance Procedures. The owner should:

(1) Remove the raft floating against the upstream edge at the spillway crest. This should be done immediately.

(2) Check the condition of the dam periodically and monitor the seepage at the wet area at the downstream toe until remedial measures are effected. This should be started immediately.

(3) Remove the two trees that have fallen into the discharge channel. This should be done soon.

(4) Clear trees and brush on either side of the discharge channel. This should be done soon.

(5) 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.

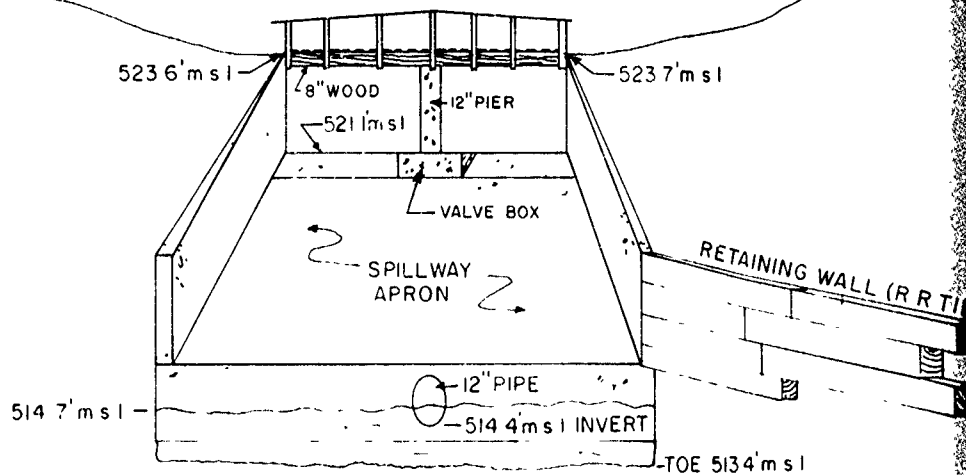
(6) Engage a professional engineer qualified in the design and inspection of dams to make a comprehensive technical inspection of the dam once every two years. This should be started in the near future.

(7) Periodically operate the low level outlet valve to prevent silting and seizing by rust. This should be started soon.

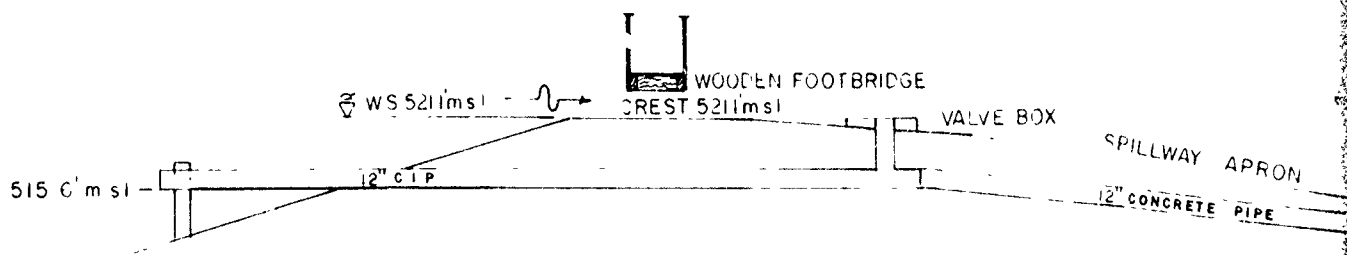


Anderson-Nichols & Co., Inc.		U.S. ARMY ENGINEER DIST. PHILADELPHIA	
BOSTON		CORPS OF ENGINEERS	
MASSACHUSETTS		PHILADELPHIA, PA.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
ROCK RIDGE LAKE DAM			
LOCATION MAP			
TRIBUTARY TO ROCKAWAY RIVER		NEW JERSEY	
		SCALE SEE BAR SCALE	
		DATE.	

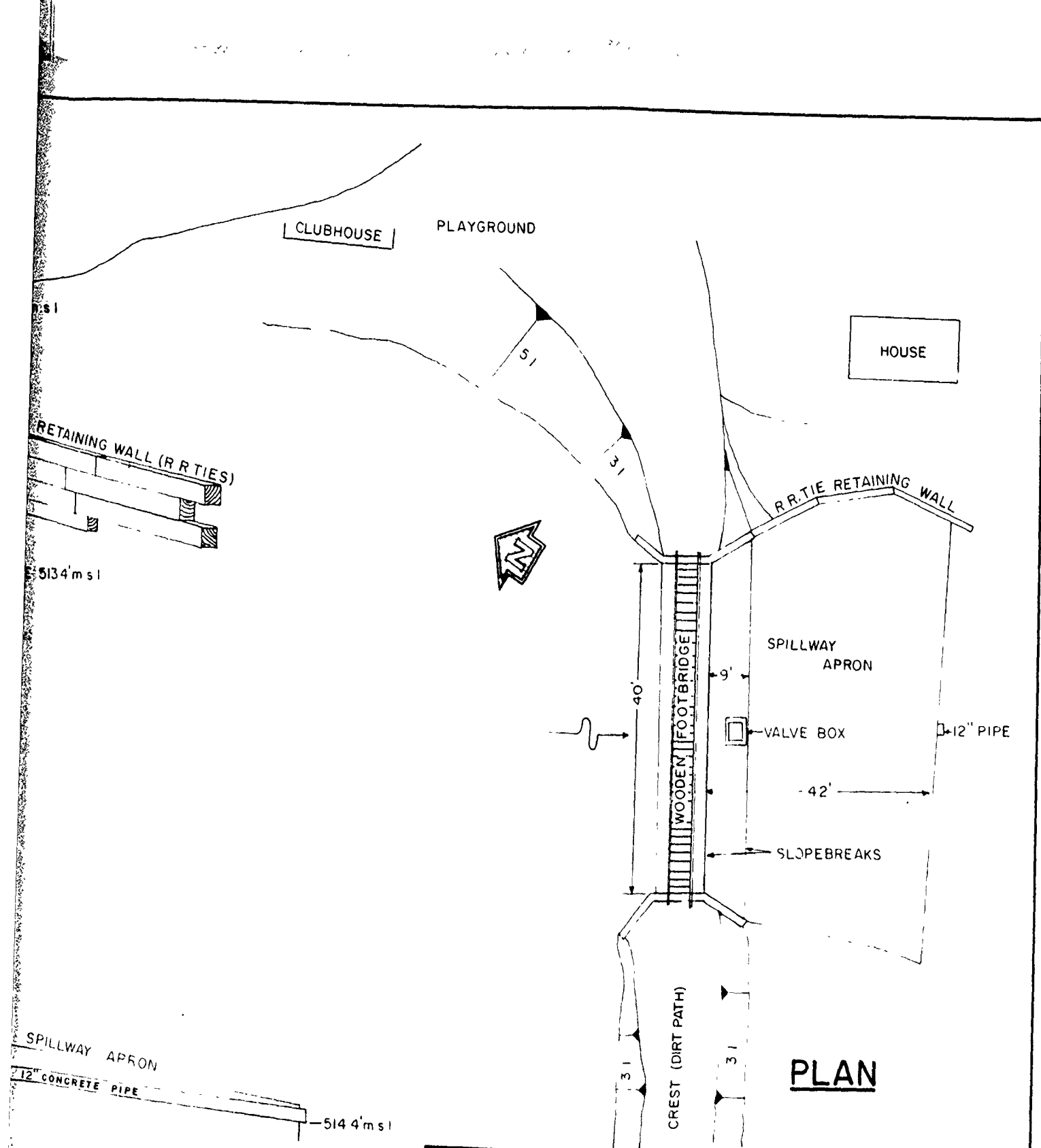
MAP BASED ON STATE OF NEW JERSEY
OFFICIAL HIGHWAY MAP AND GUIDE



ELEVATION



SPILLWAY SECTION



Anderson - Nichols & Co, Inc BOSTON MASSACHUSETTS		U.S. ARMY ENGINEER DIST PHILADELPHIA CORPS OF ENGINEERS PHILADELPHIA, PA	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
ROCK RIDGE LAKE DAM			
ROCK RIDGE LAKE		NEW JERSEY	
		SCALE NOT TO SCALE	
		DATE JULY 1979	

APPENDIX 1

ENGINEERING AND EXPERIENCE DATA

ROCK RIDGE LAKE DAM

The required capacity of the spillway was determined as follows:

(1) The storm duration which would produce the maximum discharge for a storm of estimated 50-year frequency was determined by the approximate computations shown on Sheet #1, attached. A 16K storm of 6 hours duration, when routed through the lake, was shown to produce a maximum discharge over the spillway.

(2) Central Jersey curve run-off is estimated to represent the peak flow from a 15-year flood in this watershed. The ratio of a 6-hour duration, 50-year frequency flood to a 6-hour duration, 15-year frequency was estimated from the rainfall I-D curves to be 1.22. Thus, a 50-year flood peak is estimated at 436 c.s.m. (Central Jersey) $\times 1.22 = 533$ c.s.m., or 450 sec. ft. By using 450 sec. ft. as the peak inflow into the lake during a 16K or 6-hour storm, an inflow hydrograph was plotted and the flood routed through the lake as shown on Sheet #2, attached.

The maximum discharge for this flood is 266 second feet.

DONE BY STATE WATER POLICY COMMISSION
(see header on left of next page)
DATE 1/10/50

NOTE: EXTENSIVE HYDROLOGIC COMPUTATIONS
BACKUP IS ON FILE WITH
N.J. DEP. IN MICROFILME FORM.
COPIES OF A QUALITY SUITABLE
FOR REPRODUCTION WERE NOT
OBTAINABLE AND THUS HAVE
NOT BEEN INCLUDED IN THIS
REPORT

STATE
RIVER POLICY
COMMISSION

ROCK RIVER LAKE - SUPPRESSION COMPUTATIONS see Appl. 440
TO DETERMINE 50-YR. PEAK DISCHARGE
K=22.5 min, A=537 acft, SPILLWAY=40 FT. LG, C=2.66 sheet 1 of 2
COMPUTED SPILLWAY CREST=EL. 98.00 CHECKER 7/1/11 DATE 1/10 NSO

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
STORM DURATION	LAKE LEVEL OF INFLOW PEAK	CONGR. SPILLWAY	DISCH. VOL. UP TO INFLOW PEAK	STORAGE VOL. UP TO INFLOW PEAK	INFLOW VOL. UP TO INFLOW PEAK	TOTAL INFLOW VOLUME	INFLOW PEAK	SEE NOTE BELOW	SEE NOTE BELOW	DISCHARGE PEAK	LAKE LEVEL at time of MAX. DISCH.	RUN-OFF RAINFALL COEFF. R.	TOTAL RAINFALL VOLUME	TOTAL RAINFALL IN/HR	AVERAGE RAINFALL	CONGR. STORM FREQ.	50-YR. DISCH.
2K	98.5	360	97	10.25	11.12	30.9	533	7.1	15.0	520	98.83	.30	1030	2.30	3.07	50	80
8K	99.2 99.5	138 145	98 104	24.16 25.17	33.96 35.59	77.3 80.9	536 562	24.8 26.0	40.0 41.5	223 233	99.60 99.71	.46	168.0 176.0	3.76 3.94	1.25 1.3	45 55	229
16K	99.5 99.6 99.8	192 211 222	24.5 26.8 28.2	30.25 32.80 33.83	54.25 57.60 62.03	108.50 119.20 124.06	467 513 535	46.2 46.2 46.5	55.5 55.7 56.0	259 285 300	99.83 99.95 100.20	.60	181.0 192.0 207.0	4.24 4.4 4.53	.67 .74 .77	25 45 55	300
24K	99.65	222	41.9	33.83	75.73	140.0	418	54.0	65.0	272	99.90	.65	233.0	5.20			350

Notes:
 Col. 4 - Computed at mean rate of discharge.
 Col. 5 - Computed from Col. 6, using appropriate ratio shown on page 11 of section 13 of the code.
 Col. 6 - Computed from Col. 6, using appropriate factor "C".
 Col. 7 - Ratio of discharge rate at time of peak inflow to the peak inflow rate. Peak inflow rate determined from inflow hydrograph by extending discharge hydrograph to recession of peak.
 Col. 8 - Ratio of peak discharge rate to the peak inflow rate. Peak inflow rate determined from inflow hydrograph by extending discharge hydrograph to recession of peak.
 Col. 9 - Computed from Col. 8, using percent given in Col. 10.
 Col. 10 - Estimated coefficients for various lengths of storm given in Col. 11.
 Col. 11 - Dis. in Col. 7 by coefficient in Col. 13.
 Col. 12 - Rainfall in inches over entire area.
 Col. 13 - Obtained from appropriate rainfall frequency curves.
 Result - 16K storm has mid rate of discharge over spillway. Proceed with hydrograph routing.

Dam Application No. 110
(25-191)State of New Jersey
State Water Policy Commission

REPORT ON DAM APPLICATION

To the State Water Policy Commission,
State of New Jersey.

Gentlemen:

The application of William Wetmore, Rock Ridge Lake, Denville, N. J.

filed December 16, 1949 for approval of plans and for a permit to reconstruct a dam

known as Rock Ridge Lake on a small branch of the Rockaway River

situated in Denville, Morris County, New Jersey.

has been examined by Norman C. Wittwer, Principal Hydraulic
Assistant-District Engineer.

PRINCIPAL FEATURES

Location 25.1.1.7.1 ☒

Site inspected 9/21/49 - N.C.M.

Purpose of dam Summer colony

Length of dam 17½ feet

Drainage area 0.84 sq. mi.

Elevation of flow line 98.00 (Assumed H.A.M.)

Area of Lake 20.5 acres

Capacity of lake 162 MBL gals.

Type of dam Earth embankment

Top width 12 feet

Upstream slope 2:1 *irregular*

Downstream slope 2:1

Foundation material Unknown

Max. height 8.92 feet

Type of spillway Concrete broad-crested weir, C = 2.64

Length of spillway 40 feet

Max. head on spillway 1.95 feet with .55-foot freeboard

Spillway capacity 266 sec. ft. = 319 sec. ft. per sq. mi. (See reverse side)

Estimated maximum flood flow, inflow peak = 150 sec. ft. per sq. mi. (8-hr. 10-year flood)

Outlets other than spillway 12" C.I. pipe and gate valve

Drawing filed by Howell C. Harrison, Engineer, License No. 766

It has been found that the site for the dam is suitable and the plans adequate to ensure the construction of a structure which will not be a menace to life or property. It is therefore recommended that the plans be approved and that a permit be issued, subject, however, to the following terms and conditions:—

1. That this permit does not give any property rights, either in real estate or material, nor any exclusive privileges; neither does it authorize any injury to private property nor invasion of private rights, nor any infringement of Federal, State or local laws or regulations, nor does it waive the obtaining of Federal assent, when necessary.



STATE OF NEW JERSEY
DEPARTMENT OF CONSERVATION & ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY AND SUPPLY
28 WEST STATE STREET
TRENTON, NEW JERSEY

DAM APPLICATION No. _____

APPLICATION FOR PERMIT FOR CONSTRUCTION
OR REPAIR OF DAM

Denville, Morris County, New Jersey

December 15, 1949

To the Division of Water Policy and Supply,

Gentlemen:—

In compliance with the provisions of Title 58, Chapter 4, Revised Statutes

William Wetmore, Rock Ridge Lake, Denville, Morris County, New Jersey

(Here insert name and address of public authority, private person or corporation which will be the owner of the dam)

hereby makes application for the approval of drawings and for the issuance of a permit to
construct (reconstruct, repair) a dam known as Rock Ridge Lake Dam

(Here insert name of dam)

across Rockaway river in Morris County, New Jersey,

(Here insert name of stream)

at a point near the boundary line between Boonton Township and Berngh of Denville

(Here give location by distance from mouth of stream, county or municipal boundary or other political feature.)

for the purpose of real estate development

(Here state the purpose of the proposed lake.)

in accordance with the following information and with the complete specifications and
drawings filed with this application and made part hereof, as follows:

Area of water shed 1.28 square miles.

Maximum depth of lake 12 feet.

Area of water surface 30 acres.

Capacity of spillway at 2 feet head, is 400 cubic feet per second.

The character of the foundation material is from observations made by excavation through
the section of the present dam, found to be clay and large boulders.

As determined by _____

October 17, 1919

Mr. Merrill C. Harrison
98 High Street
Butler, New Jersey

Rock Ridge Lake Dam - Morris County

Dear Mr. Harrison:

In accordance with the promise made to you by Mr. Norman C. Hittner of this office relative to the spillway requirements for the Rock Ridge Lake Dam across a small branch of the Rockaway River in Donville, a restudy of this question has been made. By evaluating the effect of suppression by the lake upon the magnitude of flood discharge peaks, it has been determined that a broad-crested spillway having a length of 140 feet between end walls can be considered favorably by this Division, provided the minimum freeboard between spillway crest and the top of the dam is not less than 2.5 feet.

Yours very truly,

H. F. Critchlow
Director and Chief Engineer

ECW:KES

Report on Dam Inspection

ROCK RIDGE LAKE

BRANCH OF ROCKAWAY RIVER

DENVILLE TOWNSHIP, MORRIS COUNTY

On May 29, 1947 inspection was made of the subject dam, in company with Mr. H. A. Heller, President of the Rock Ridge Community Club, and Mr. Walter Reise, member of the Board of Governors of the same club. The present dam is an earth fill dam without core wall, approximately 10 feet wide at the top. The spillway consists of an open concrete sluice 8 feet wide with notches in the upstream face of the concrete to receive flashboards. The normal water level, according to Mr. Heller, has always been maintained not over 6 inches below the top of the dam. The drainage area is ³⁴ 1.4 square miles. The front of the dam was completely silted in and downstream from the dam was so completely overgrown that it was difficult to determine the exact height of the dam. However, it was estimated at approximately 8 feet.

On Sunday night, May 25, a severe cloud-burst occurred in this section of Morris County, resulting in the overtopping of the dam and washing out a section of the dam about 30 feet wide. The washed out section is approximately 30 feet distant from the sluiceway. Mr. Heller advised that all the flashboards were in at the time of the cloud-burst. At the time of this inspection trucks were already hauling in fill to close the gap in the dam, and a bulldozer was at work moving the fill and compacting same. Sand bags were being placed upstream of the gap for a width of about 6 feet and were being added as the fill was being placed. The intention is to back up the new fill with a "backstop" of rocks.

*Look
y B-12
page 2*

Reak Ridge Lake is one of several lakes in this region which is the center of a colony of homes, approximately 50 per cent winter and 50 per cent summer homes. The writer appreciates the urgency of making temporary repairs to this dam in order that the lake can be restored for the summer season. Therefore, the work was not ordered stopped but was permitted to proceed according to present plans, subject to confirmation from this office. Channel conditions between the dam and Rockaway River were examined and it is apparent that no damage resulted from the failure of this dam. The only house adjacent to the flood plain of the stream is the residence of F. Hamm on the northerly side of Diamond Spring Road and west of the stream. Mr. Hamm assured the writer that no damage was done to his property. The bridge over Diamond Spring Road at this point is 20 feet high, wide, with a clear opening of 4 feet above present water level and the underclearance of the bridge. Mr. Hamm stated that the Sunday night flood rose to within 3 inches of the underclearance of the bridge. It is reported that Cedar Lake dam was also overtopped but that no damage was done.

It is recommended that permission be granted for the temporary restoration of the dam as outlined above, on condition that the club will immediately engage an engineer to prepare drawings for permanent construction of the dam with adequate cutoff wall in the new fill and adequate overflow spillway capacity satisfactory to this Division. This, Mr. Heller and Mr. Reise agreed to do. Copies of the dam booklet and application blanks were left with Mr. Heller.

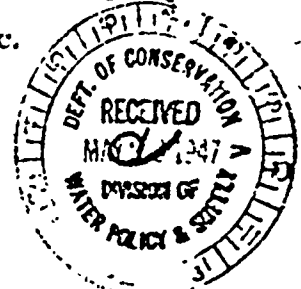
Trenton, N. J.
June 2, 1917

N. C. Wittwer
Norman C. Wittwer
Hydraulic Engineer

THOMPSON-STARRETT COMPANY, INC.
GENERAL CONTRACTORS AND BUILDERS
444 MADISON AVENUE

NEW YORK 22, N.Y.

May 27, 1947.



Mr. H.T. Critchlow,
Chief Engineer, Division of Water Policy Commission,
N.J. Department of Conservation & Development,
28 West State Street,
Trenton, N.J.

Re. Earth Dam at Rocky Ridge Lake,
Danville, N.J.

Dear Sir:-

On Monday morning May 26, 1947, at 9 A.M., a portion of the Earth Dam constraining the water of the Rocky Ridge Lake gave way and resulted in the following:

1. The loss of 5'-0 head of water.
2. A portion of the Dam roughly 30'-0 wide and 30'-0 long washed out.

The following method will be used to repair the break:

1. On the Lake side sand bags will be placed in such a manner as to form a base 6'-0 wide and graduating to the top of the new fill the full width of the cut.
2. On the rear side of the Dam, a back-stop of rocks 10'-0 wide, the full width of the cut will be used to hold in the fill which will consist of clay and earth. The crest of the new fill will be kept approximately 2 to 3 feet above high water mark. The full depth of the new fill in a horizontal direction will be about 30'-0.

The repair job will start under my supervision at once and unless other instructions are received from you the work will be done as outlined.

Very truly yours,

Walter R. Supt.
Asst. Supt.

Box 186,

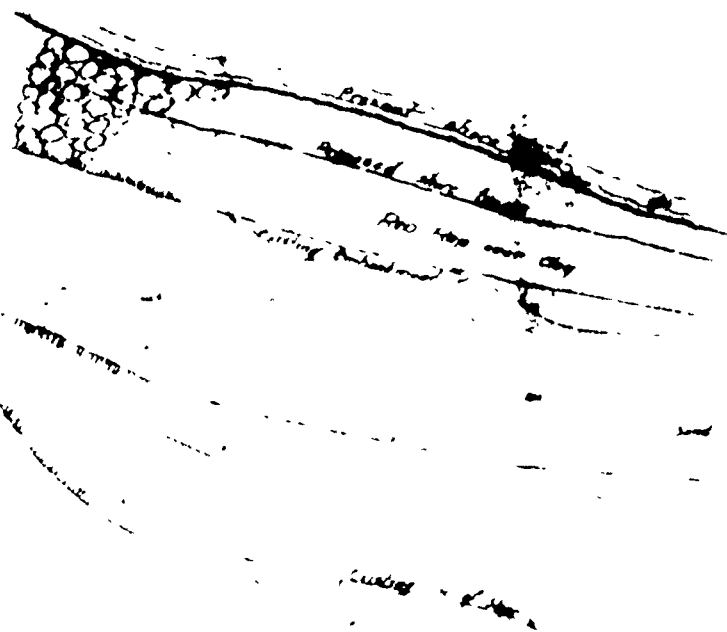
Denville, N.J.

APPENDIX 2

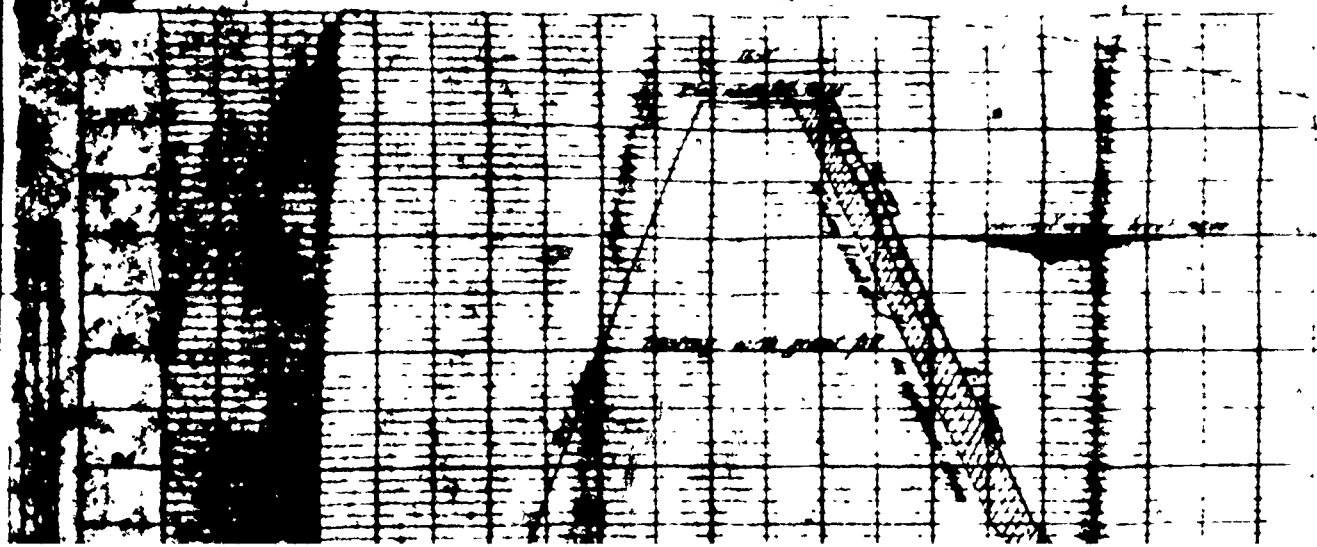
CHECK LIST

VISUAL INSPECTION

ROCK RIDGE LAKE DAM



to 1000 ft. clay



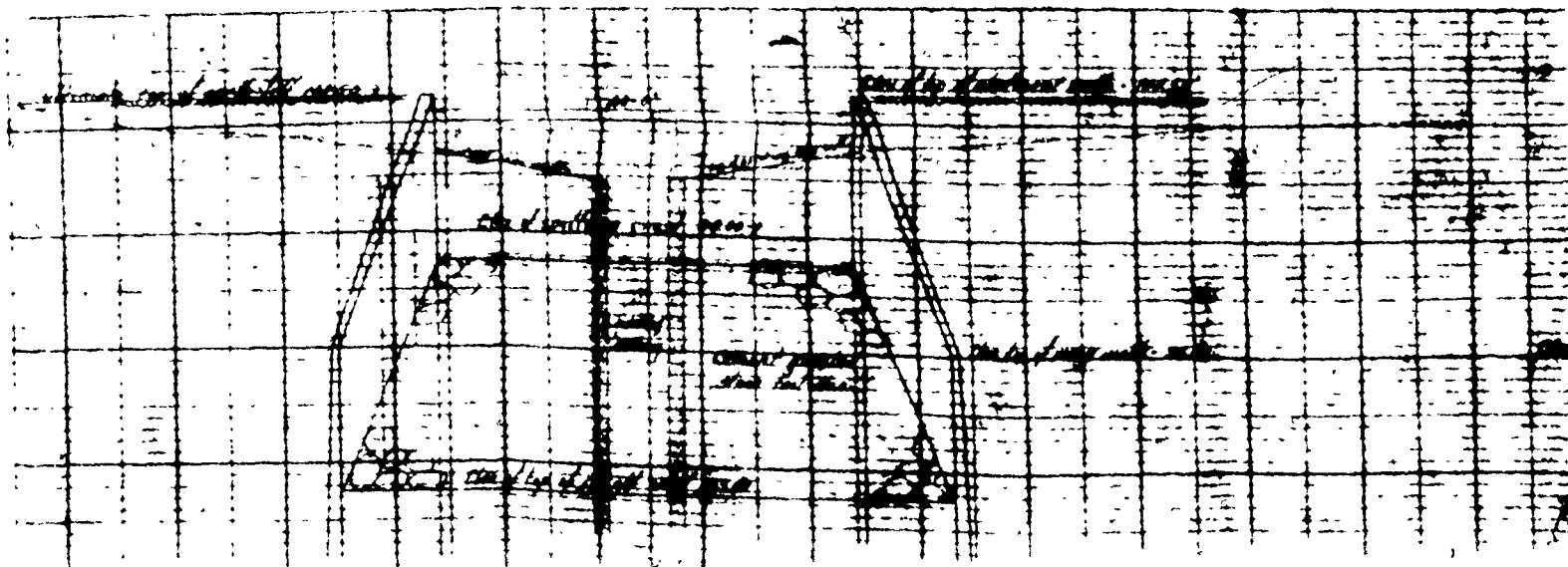
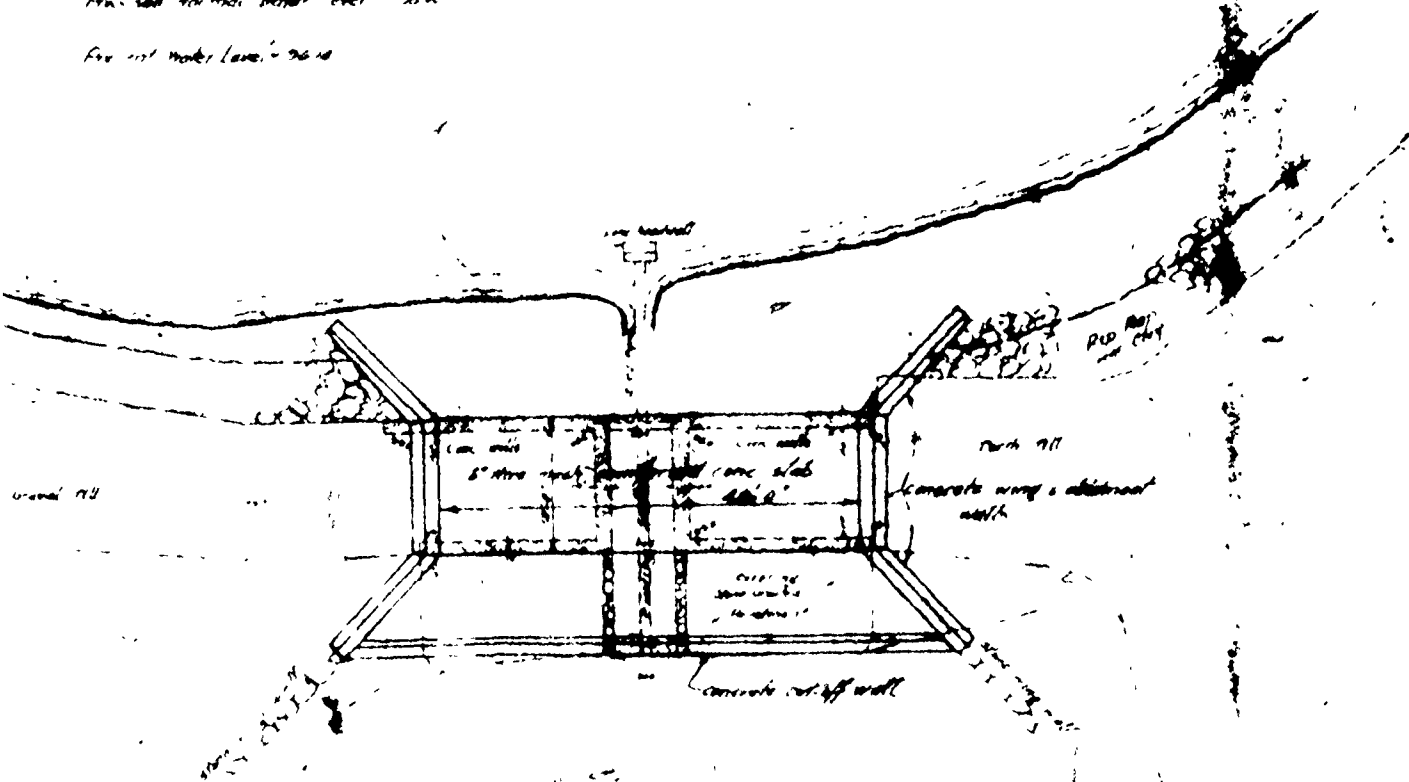
PLAN

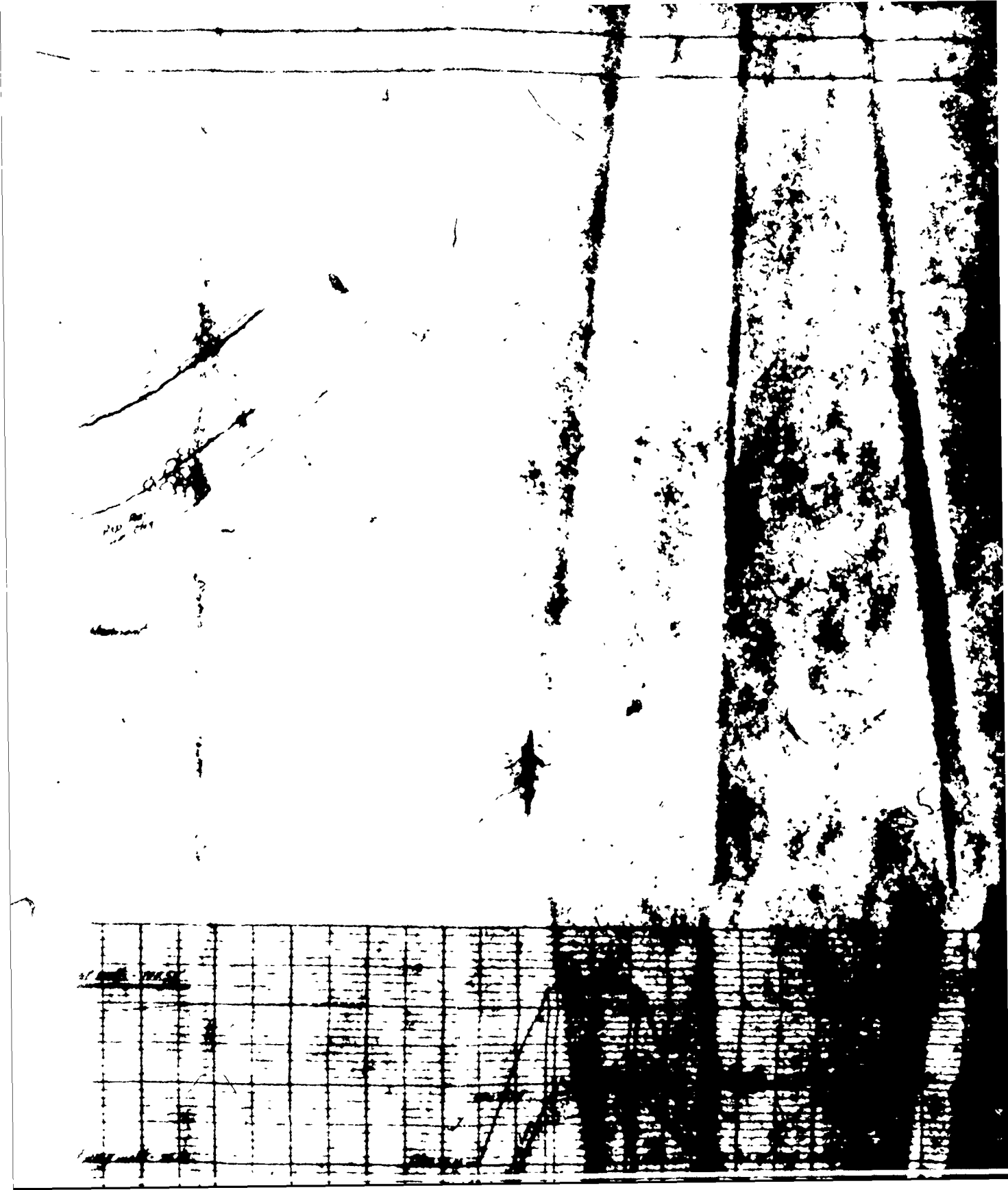
1/16 - 1/16

ROCK RIDGE LAKE

Plan and Elevation of the dam over the lake

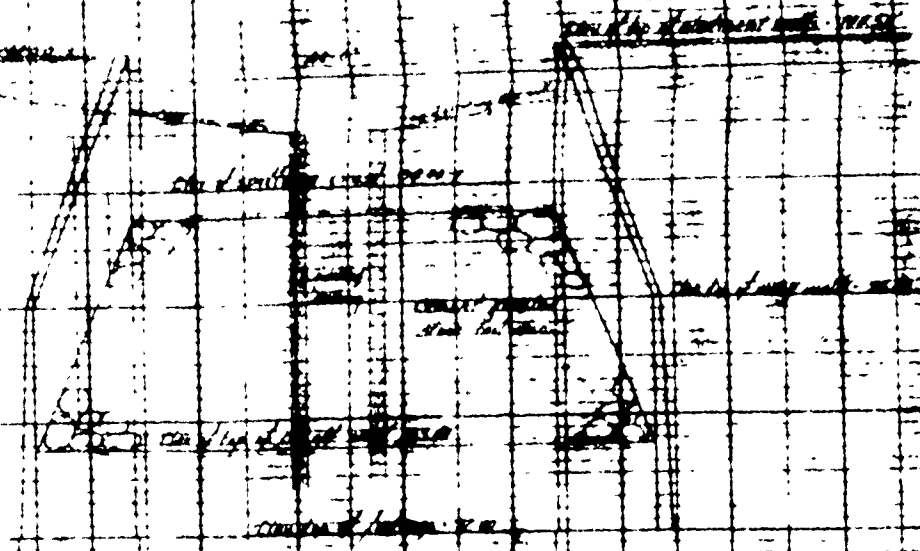
For the water level - 76.10





EARTH-FILL SECTION

SCALE 1 IN. = 10 FT.

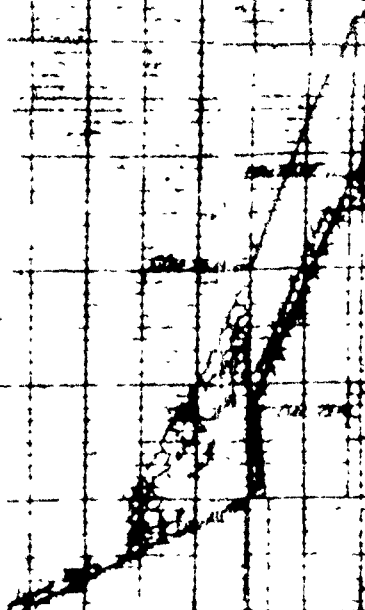


Principles

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	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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AM APPLC.

17.5



H. T. Cutshaw
AM APPLICANT

440



DEVELOPMENT OF THE ROCK RIDGE LAKE AREA

ROCK RIDGE LAKE

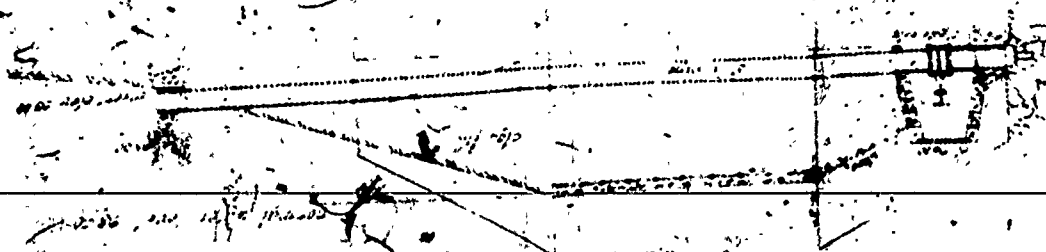
FOR THE DEVELOPMENT OF THE ROCK RIDGE LAKE AREA

PLANS & PROFILES

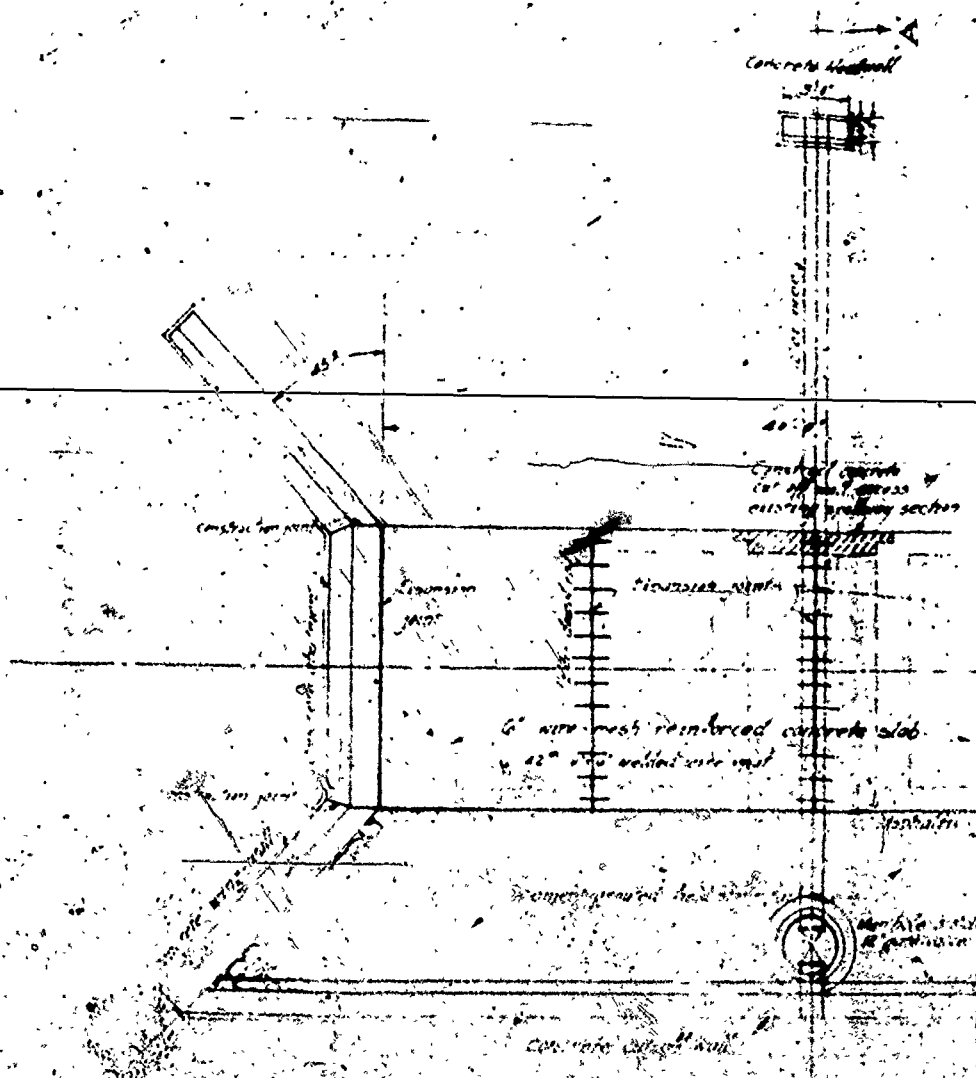
W. C. Johnson
Rock Ridge, N.Y.

SECTION A-A

Scale: 1" = 100'



ROCK RIDGE LAKE



PLAN OF SPILLWAY
Scale 1" = 10'

center existing

concrete sub.
2' 0" high
2' 0" wide
dies 10' 0"
masonry joint

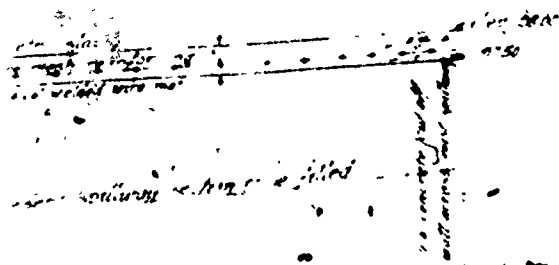
present 100

SPILLWAY
Scale

WAY

elev. 100.00 at 100' of fall 100.50

STANDARD CONCRETE AND STEEL JOINT



WILLWAY DETAIL

Scale - 1/2 inch = 1 foot



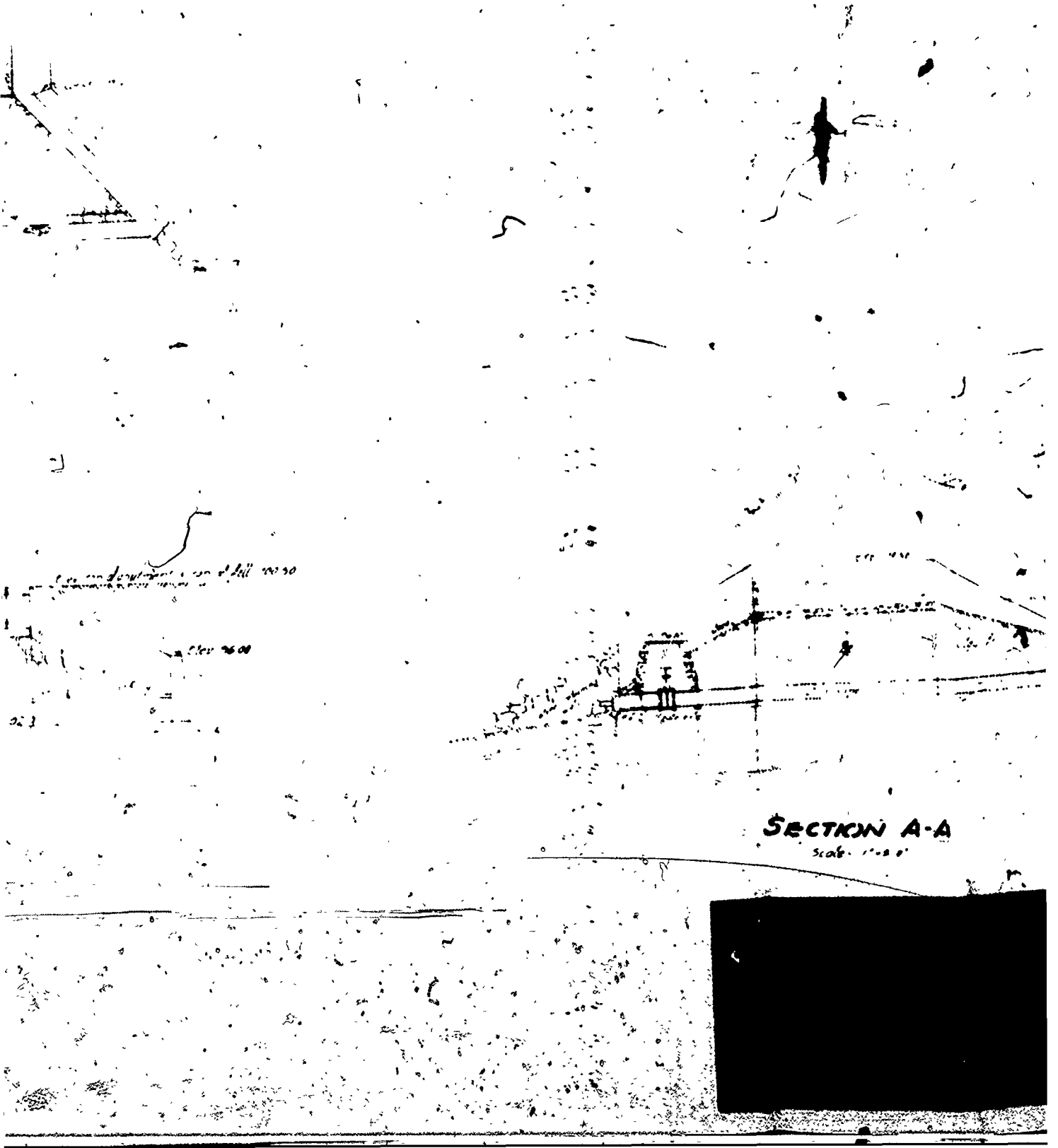
SEE PAGE

STANDARD CONCRETE AND STEEL JOINT

STANDARD CONCRETE AND STEEL JOINT

PLAN OF SPILLWAY
scale 1" = 50'

SPILLWAY ELEVATION
scale 1" = 50'



SECTION A-A

Scale: 1" = 10'

SECTION A-A

Scale 1" = 50'

PLANS & PROFILES

FOR THE RECONSTRUCTION OF ROCK RIDGE LAKE

ROCK RIDGE LAKE

NEWARK MORRIS COUNTY NEW JERSEY

Scale 1" = 50'

MAURICE C. HARRISON

Prof. Engineer

Princeton, N.J.



Name Dam	Rock Ridge Lake Dam	County	Morris	State New Jersey	Coordinators	NJDEP
Date(s)	Inspection May 16, 1979	Weather	Sunny	Temperature	70°	
Pocl	Elevation at Time of Inspection	521.0	MSL	Tailwater at Time of Inspection	514.7	MSL

Inspection Personnel:

Warren Guinan	Ronald Hirschfeld
Stephen Gilman	
David Deane	

Gilman and Hirschfeld Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None apparent.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None apparent.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Crest of dam is bare of vegetation because of its use as footpath. Evidence of trespassing and erosion at several locations on upstream face. Also, see "JUNCTION OF EMBANKMENT..." below.	Provide walkway surface on crest of dam. Prevent trespassing on slopes. Repair erosion and establish grassy vegetation.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Good	
RIPRAP FAILURES	No riprap.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS	None	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Erosion of embankment next to right and left training walls on upstream side of spillway structure.	Repair erosion and establish grassy vegetation.
ANY NOTICEABLE SEEPAGE	Wet area at downstream toe near right abutment.	Downstream toe could not be adequately inspected because of dense growth of rose bushes and other vegetation and cover of brush, stumps, leaves, and grass clippings which have been dumped on much of downstream face near right abutment.
STAFF GAGE AND RECORDER	None apparent.	Vegetation and debris should be removed from entire embankment.
DRAINS	None apparent.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Concrete valve box good condition, only surface laitance eroded away. Steel plate cover; surface rusted only, not in place at time of inspection.	Steel cover should be put back in place.
INTAKE STRUCTURE	None.	
OUTLET PIPE	12" concrete pipe, fair condition. Surface of pipe eroded exposing aggregate.	Investigate the need for inlet valve. Outlet valve is under constant pressure.
OUTLET CHANNEL	Sand and gravel channel bottom. Trees and brush overhanging channel. Two small (6-inch) trees have fallen across channel.	Clear trees and brush 25 feet on either side of channel for a distance of 100 feet downstream from the dam. Remove trees that have blown over into channel.
EMERGENCY GATE	12" gate valve in good condition, appears to be in operable condition.	Valve should be operated periodically to prevent silting and rusting.

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATION'S	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Upper portion has only surface erosion to $\frac{1}{4}$ " exposing coarse aggregate. Numerous spalled areas 1" maximum depth. Lower portion constructed recently, in good condition. Abutments in good condition with minor undermining at water line.	Spalled areas should be repaired.
APPROACH CHANNEL	Wide and unobstructed.	
DISCHARGE CHANNEL	Channel has same width as spillway apron. Channel bottom is sand and gravel. Trees and brush overhanging channel. Two 6-inch trees have fallen across channel.	See "Outlet Channel" under "Outlet Works" above.
BRIDGE AND PIERS OVER SPILLWAY	Concrete pier in good condition, with minor undermining at water line. Railings and bridge deck of untreated wood are surface weathered, in fair condition. Steel bearing plate is surface rusted.	Bridge should be painted.
EXPANSION JOINTS	2 expansion joints, not sealed, compressible joint material weathered and eroded. Upper expansion joint seems to have separated approximately $\frac{1}{4}$ ".	Joints should be cleaned and rescaled.

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

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

SLOPES

Gentle, wooded.

SEDIMENTATION

No visible evidence of
significant sedimentation.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Channel is same width as spillway apron. Trees and brush overhang channel. Two 6-inch trees have fallen across channel.	Two trees should be removed from channel.
SLOPES	Gentle to flat. Wooded.	
APPROXIMATE NO. OF HOMES AND POPULATION	Two homes, estimated population 6, located downstream of Florence Avenue.	Possible appreciable property damage. Loss of life unlikely.

CHECK LIST
ENGINEERING DATA,
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	copy on file at New Jersey Department of Environmental Protection
REGIONAL VICINITY MAP	prepared for this report
CONSTRUCTION HISTORY	none disclosed
TYPICAL SECTIONS OF DAM	copy on file at New Jersey Department of Environmental Protection
HYDROLOGIC/HYDRAULIC DATA	on file at New Jersey Department of Environmental Protection
OUTLETS - PLAN	copy on file at New Jersey Department of Environmental Protection
- DETAILS	copy on file at New Jersey Department of Environmental Protection
- CONSTRAINTS	copy on file at New Jersey Department of Environmental Protection
- DISCHARGE RATINGS	none disclosed
RAINFALL/RESERVOIR RECORDS	none disclosed

ITEM	REMARKS
DESIGN REPORTS	copies on file at New Jersey Department of Environmental Protection
GEOLOGY REPORTS	none disclosed
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	on file at New Jersey Department of Environmental Protection none disclosed none disclosed
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	none disclosed
POST-CONSTRUCTION SURVEYS OF DAM	none disclosed
BORROW SOURCES	unknown

ITEM	REMARKS
MONITORING SERVICES	none
MODIFICATIONS	spillway repaired in 1949 concrete added to spillway in 1970's
HIGH POOL RECORDS	none disclosed
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	determination of spillway capacity for current spillway (1949) on file at New Jersey Department of Environmental Protection
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	overtopped in 1947, dam repaired and spillway replaced reports on file at New Jersey Department of Environmental Protection
MAINTENANCE OPERATION RECORDS	none disclosed

ITEM	REMARKS
------	---------

SPILLWAY PLAN

SECTIONS

DETAILS

copies on file at New Jersey Department of Environmental Protection
copies on file at New Jersey Department of Environmental Protection

OPERATING EQUIPMENT

PLANS & DETAILS

gate valve

copies on file at New Jersey Department of Environmental Protection

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: .87 square miles; wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 521.1 (174 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 523.6 (215 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 524.7

ELEVATION TOP DAM: Low pt. 523.6, High pt. 525.2

CREST: free overflow concrete spillway

a. Elevation 521.1

b. Type concrete weir

c. Width 10'

d. Length 39'

e. Location Spillover approximate center of dam

f. Number and Type of Gates none

OUTLET WORKS: low-level outlet pipe

a. Type gate valve, part 12" CIP and part 12" concrete pipe

b. Location left of center of spillway

c. Entrance Inverts 515.6 (estimated)

d. Exit Inverts 514.4

e. Emergency Draindown Facilities none

HYDROMETEOROLOGICAL GAGES: none

a. Type _____

b. Location _____

c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: 579 cfs

APPENDIX 3

PHOTOGRAPHS

ROCK RIDGE LAKE DAM



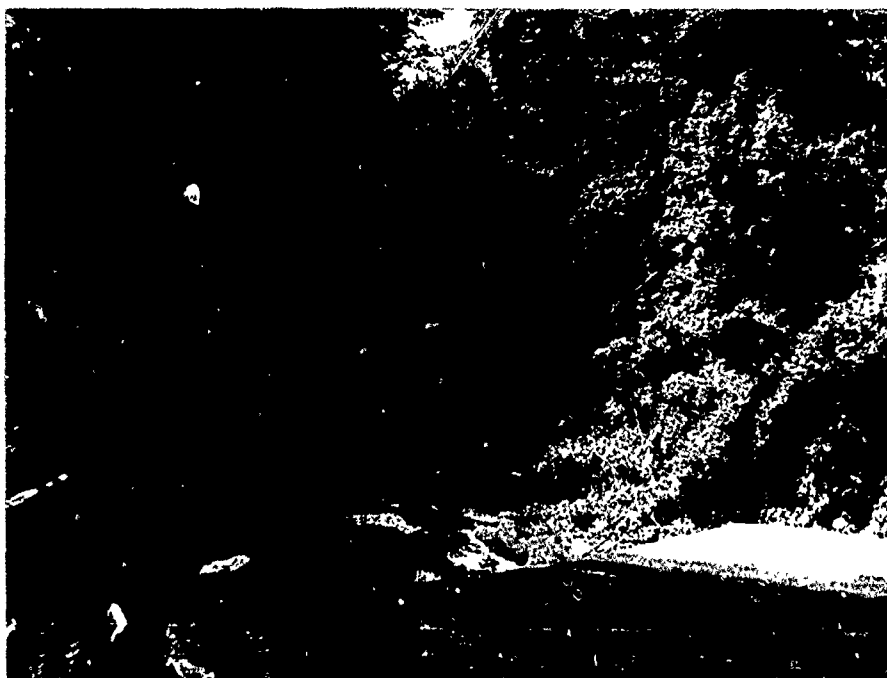
17 MAY 1979

VIEW FROM LEFT SIDE OF LAKE LOOKING TOWARDS SPILLWAY



17 MAY 1979

VIEW FROM LEFT SPILLWAY ABUTMENT LOOKING AT SPILLWAY CREST
AND SERVICE BRIDGE



17 MAY 1979

VIEW OF DOWNSTREAM CHANNEL



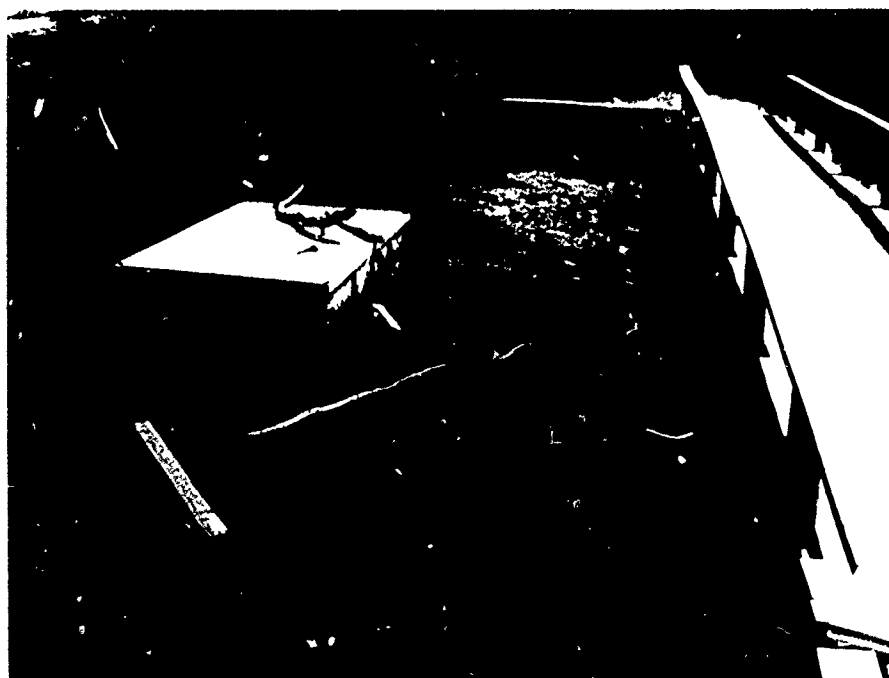
17 MAY 1979

VIEW UPSTREAM FROM CENTER OF SPILLWAY



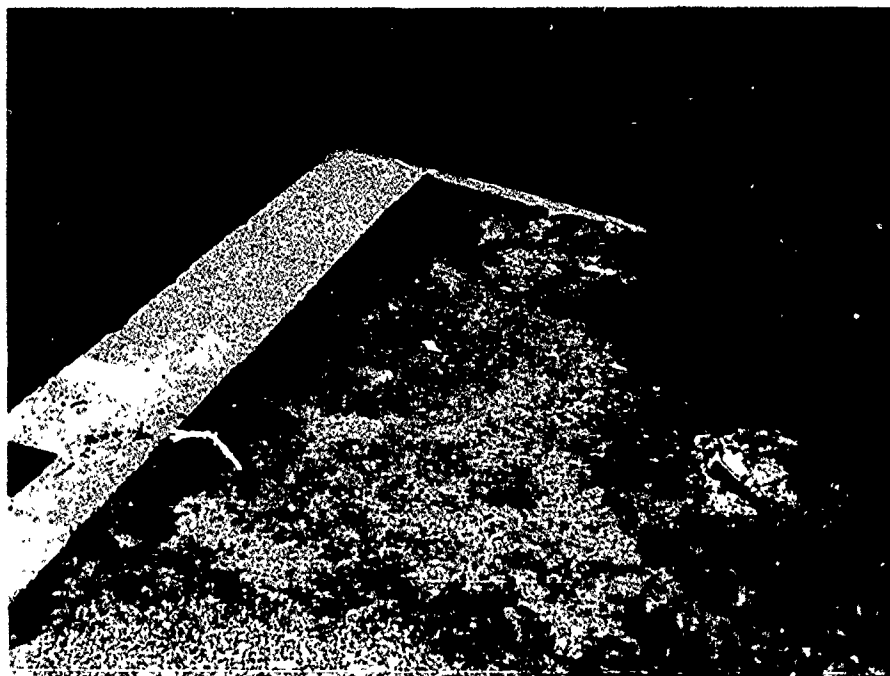
17 MAY 1979

VIEW OF DOWNSTREAM FACE OF SPILLWAY SHOWING OUTLET PIPE



17 MAY 1979

VIEW LOOKING NORTHEAST ACROSS SPILLWAY APRON UPSTREAM OF
SERVICE BRIDGE



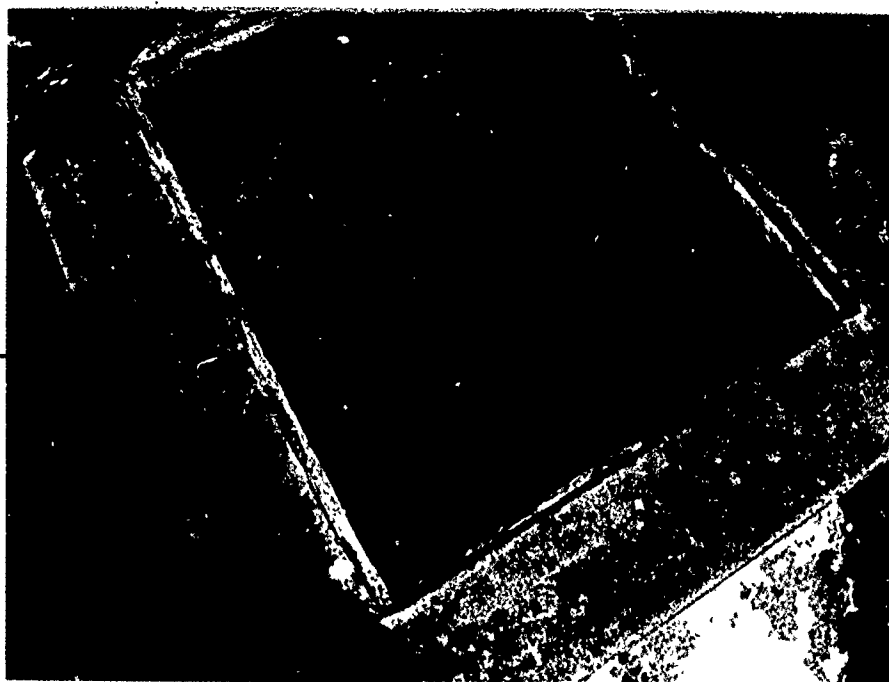
17 MAY 1979

EROSION NEXT TO LEFT TRAINING WALL (SIMILAR EROSION AT RIGHT TRAINING WALL)



17 MAY 1979

VIEW OF DOWNSTREAM PORTION OF SPILLWAY LOOKING NORTHEAST



17 MAY 1979

VIEW OF VALVE BOX



17 MAY 1979

VIEW OF RETAINING WALL AT LEFT OF SPILLWAY



17 MAY 1979

VIEW LOOKING SOUTHWEST ALONG CREST OF DAM FROM RIGHT SPILLWAY
ABUTMENT TOWARDS THE RIGHT ABUTMENT



17 MAY 1979

BRUSH AND DEBRIS ON DOWNSTREAM FACE OF DAM NEAR RIGHT ABUTMENT



17 MAY 1979

VIEW OF DENNEY POND

APPENDIX 4

HYDROLOGIC COMPUTATIONS

ROCK RIDGE LAKE DAM

Anderson-Nichols & Company, Inc.

Subject ROCK RIDGE LAKE DAM

Sheet No. 1 of 11
Date 6/15/79
Computed KAT
Checked EDD

JOB NO. 3220-01

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 29 30

HYDROLOGIC COMPUTATIONS

NAME: ROCK RIDGE LAKE DAM

LOCATION: MORRIS COUNTY, NJ

DRAINAGE AREA: 87 mi²

SURFACE AREA (NORMAL POOL): 17.4 ACRES

EVALUATION CRITERIA: SIZE: SMALL
HAZARD: SIGNIFICANT

SPILLWAY DESIGN FLOOD: BASED ON SIZE AND
HAZARD CLASSIFICATION, THE SPILLWAY
DESIGN FLOOD WILL BE THE 1/2 PMF (1/2 THE
PROBABLE MAXIMUM FLOOD), WITH A PEAK
INFLOW OF 2476 CFS.

NOTE: DRAINAGE AREA AND SURFACE AREA OF
ROCK RIDGE LAKE WERE PLANNIMETERED DUE
TO DISCREPANCIES IN REPORTED AREAS.
D.A. WAS VARIOUSLY REPORTED AS 0.84 mi²
AND 1.25 mi²; S.A. WAS VARIOUSLY REPORTED
TO BE 20.5 ACRES AND 30 ACRES

JOB NO. 3290-01SQUARES
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 29 30

DETERMINE TIME OF CONCENTRATIONREACH 1 OVERLAND FLOW, WOODED
LENGTH = 1350'
HEAD = 20'A. BY KIRPICH NOMOGRAPH $T_c = 10$ minsB. BY IZZARDS FORMULA $T_c = \frac{L_{FT}^{1.115}}{(7700)(H_{FT}^{.38})}$
 $T_c = \frac{1350^{1.115}}{(7700)(20^{.38})} = .13 \text{ hrs} = 7.8 \text{ mins}$

C. BY CALIFORNIA CULVERT EQUATION

$$T_c = \left[\frac{(11.9)(L_{mi}^3)}{H_{FT}} \right]^{.385}$$
$$= \left[\frac{(11.9)(256^3)}{20} \right]^{.385} = .17 \text{ hrs} = 10.2 \text{ mins}$$

D. BY WESTON FORMULA $T_c = \frac{L_{FT}}{(3600)V}$

WHERE V = VELOCITY

DERIVED FROM NAVY TABLE P.70 DESIGN OF SMALL DAMS

$$T_c = \frac{1350}{3600(.2)} = .19 \text{ hrs} = 11.4 \text{ mins}$$

AVG T_c REACH 1 = $(10 + 7.8 + 10.2 + 11.4) \div 4 = 9.9 \text{ mins}$ REACH 2 CHANNEL FLOW
LENGTH = 9300'
HEAD = 100'A. BY KIRPICH NOMOGRAPH $T_c = 51$ minsB. BY IZZARDS FORMULA $T_c = \frac{L_{FT}^{1.115}}{7700(H_{FT}^{.38})}$
 $T_c = \frac{9300^{1.115}}{7700(100^{.38})} = .6 \text{ hrs} = 36 \text{ mins}$

Anderson-Nichols & Company, Inc.

Subject ROCK RIDGE

Sheet No. 3 of 11
 Date 8/15/79
 Computed KATE
 Checked _____

JOB NO. 3200-01

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 29 30

REACH 2 CONTINUED:

C BY CALIFORNIA CULVERT EQUATION:

$$T_L = \left[\frac{11.9 (L H^3)}{H^2} \right]^{.385}$$

$$T_L = \left[\frac{(11.9)(1.76^3)}{100} \right]^{.385} = .65 \text{ hrs} = 51 \text{ mins}$$

D. BY WESTON FORMULA: $T_L = \frac{L \text{ FT}}{3600 (V)}$

WHERE V = VELOCITY

DERIVED FROM NAWM TABLE P. 70 DESIGN OF SMALL DAMS

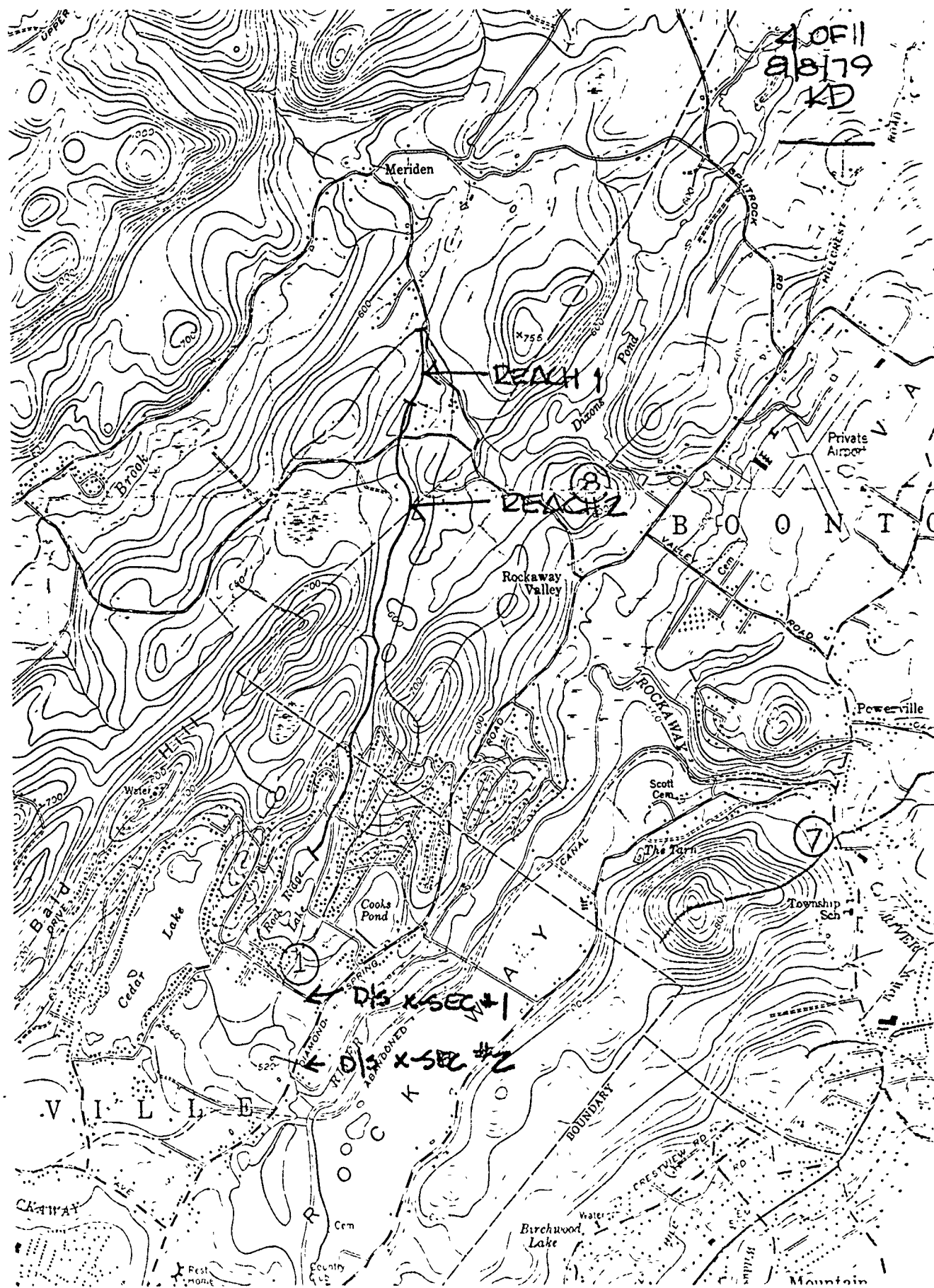
$$T_L = \frac{9300}{3600(2)} = 1.3 \text{ hrs} = 78 \text{ mins}$$

$$\text{AVG } T_L \text{ REACH 2} = (51 + 36 + 51 + 78) \div 4 = 54 \text{ mins}$$

$$\begin{aligned} T_L \text{ TOTAL} &= T_L \text{ REACH 1} + T_L \text{ REACH 2} \\ &= 9.9 + 54 \\ &= \underline{\underline{63.9 \text{ mins}}} \end{aligned}$$

$$\begin{aligned} \text{LAG} &= .6 (T_L) = (.6)(63.9) = 38.3 \text{ mins} \\ &= .64 \text{ hrs} \end{aligned}$$

4 OF 11
9/8/79
KD



Anderson-Nichols & Company, Inc.

Subject ROCK RIDGE LAKESheet No. 5 of 11Date 8/6/79Computed KDChecked FDDJOB NO. 3220-01SQUARES
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 29

DEVELOPMENT OF RATING CURVE

① SPILLWAY CURVE

A. COMPUTE Q USING WEIR FLOW EQUATION ($Q = CLH^{3/2}$)
TO BEAM, THEN PRESSURE FLOW ($Q = CA\sqrt{2gH}$)
FROM 522.9 TO 523.6 (BRIDGE), THEN WEIR
FLOW EQUATION AGAIN

B. WEIR COEFFICIENT 2.64 (TAKEN FROM 1949 CULCS)
ORIFICE COEFFICIENTS: .65 (TABLE 4-5 KING & BRATER)

C. EFFECTIVE LENGTH SPILLWAY: 39'

D. A = AREA UNDER BRIDGE = 70.2 SQ FT

E H = HEAD (FT)

② TOP DAM

A. COMPUTE Q USING WEIR FLOW EQUATION

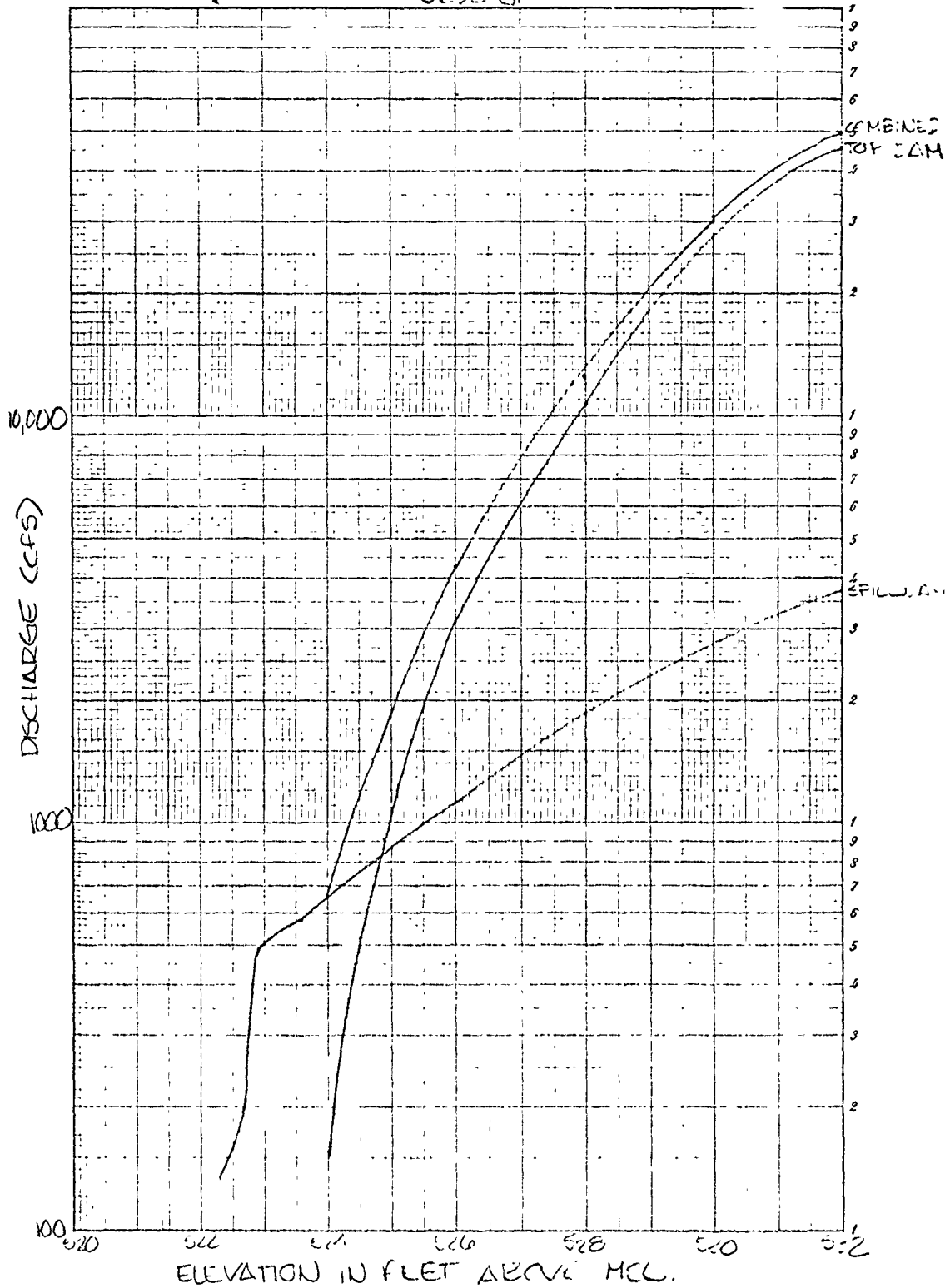
B WEIR COEFFICIENT = 2.6

ELEVATION FT	SPILLWAY		TOP DAM			COMBINED Q CFS
	HEAD FT	Q CFS	HEAD FT	LENGTH FT	Q CFS	
521.1	0	0				0
521.5	.4	26				26
521.9	.8	74				74
522.3	1.2	135				135
522.7	1.6	208				208
522.9	1.8	491				491
523.3	2.2	543				543
523.6	2.5	579	0	235	0	579
524	2.9	508	1.4	235	155	663
524.9	3.8	763	1.3	235	906	1669
526	4.9	1117	2.4	225	3142	4259
528	6.9	1866	4.4	456	10,799	12,665
530	8.9	2734	6.4	650	27,363	30,097
532	10.9	3705	8.4	720	45,575	49,280

NO. 3115 R. 20 DIVISIONS PER INCH (120 DIVISIONS) BY 3 INCH CYCLES RATIO RULING.  IN STOCK DIRECT FROM CODY BOOK CO. NOTABOOD MASS. 02062
GRAPH PAPER
PRINTED IN U.S.A.

ROCK RIDGE LAKE DAM COMBINED RATING CURVE 3220-01

ELEVATION
KD
FED
6 OF 11



Anderson-Nichols & Company, Inc.

Subject ROCK RIDGE

Sheet No. 7 of 11
 Date 6/14/79
 Computed RTE
 Checked EDD

JOB NO. 3200-01

SQUARES 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
 1/4 IN. SCALE

STAGE-STORAGE DETERMINATIONS

TAKE DEPTH OF LAKE TO BE 10'

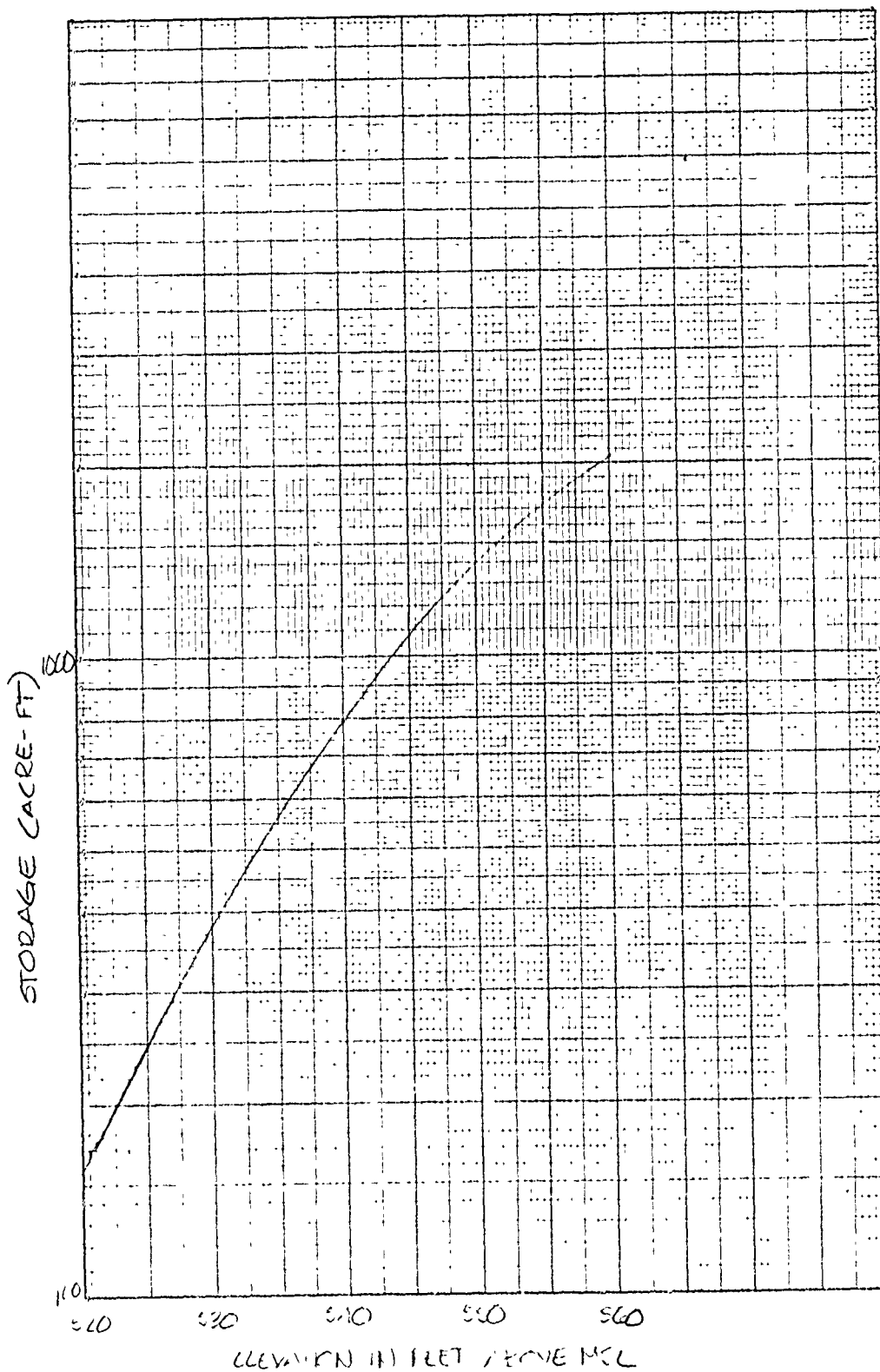
ELEVATION FT	SURFACE AREA ACRES	AVG. S.A. ACRES	INCREMENTAL STORAGE AC-FT	CUMULATIVE STORAGE AC-FT
521.1	17.4	17.4	174	174
540	48.2	32.8	620	794
560	76.7	62.5	1250	2044

INPUT FOR HCC-1 (FROM CURVE)

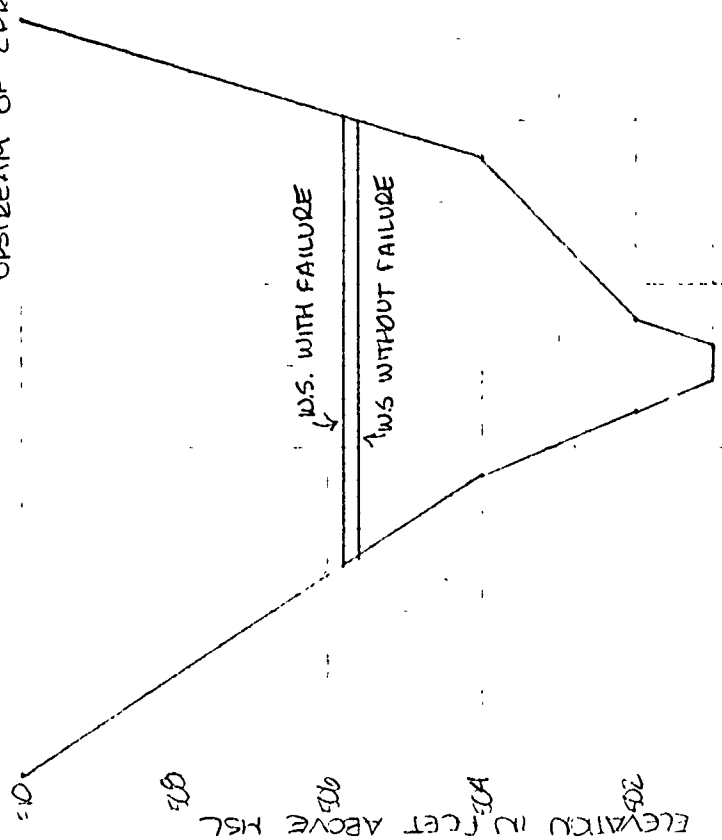
STAGE	STORAGE
511.1	0
521.1	174
523.6	218
526	272
528	320
530	379
535	561
540	794
545	1080
550	1395
560	2044

NO 31 193 R 20 DIVISIONS PER INCH (120 DIVISIONS) BY TWO 4 1/2-INCH CYCLES RATIO RULING.  IN STOCK DIRECT FROM CODEX BOOK CO., NORWOOD, MASS. 02062
PRINTED IN U.S.A.
GRAPH PAPER

ROCK RIDGE LAKE DAM
STORAGE-ELEVATION CURVE



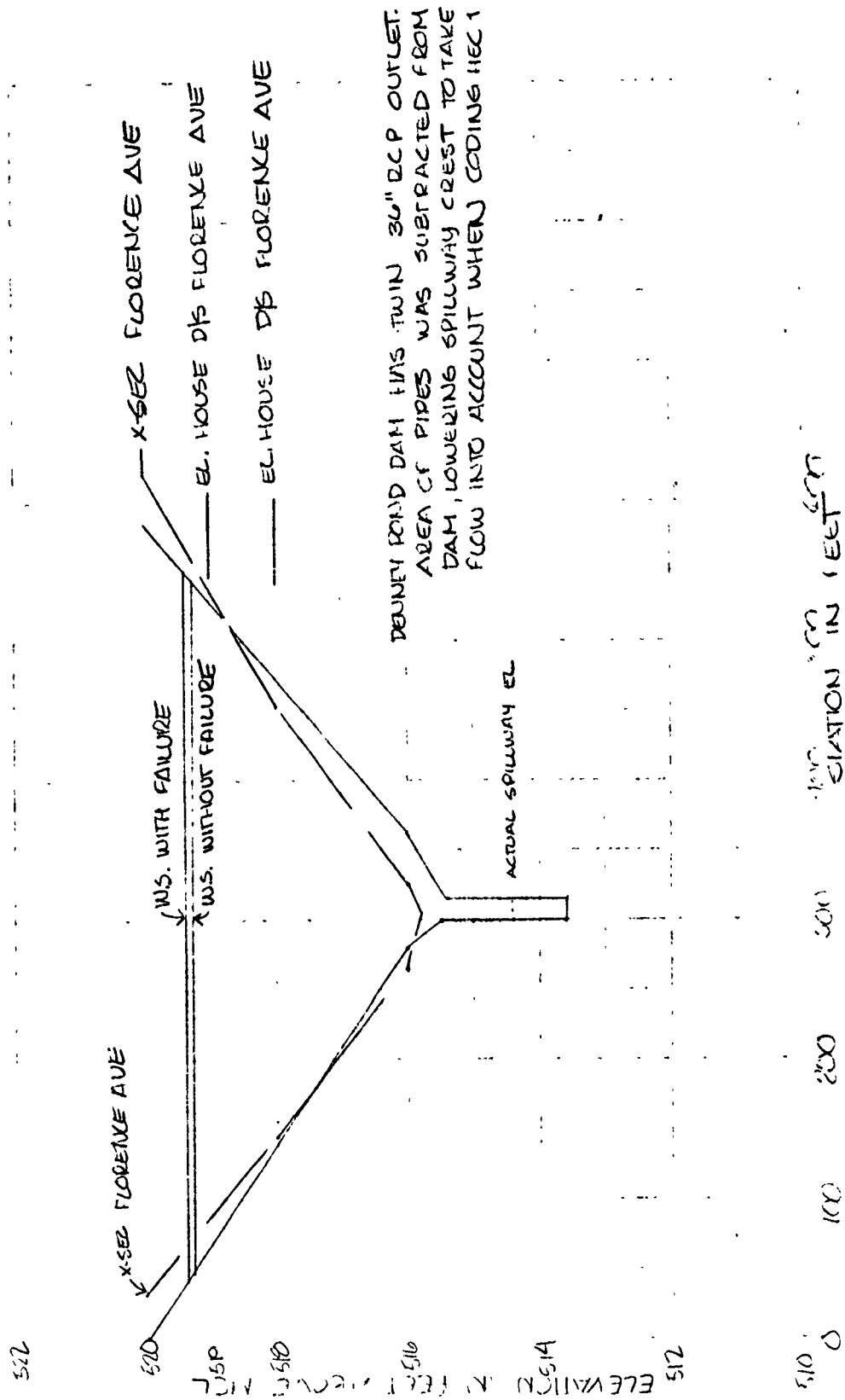
DOWNSTREAM CROSS-SECTION NO. 2
 1600' FROM PENNEY DAM
 UPSTREAM OF (PROPOSED) LAKE AVE. BRIDGE



0 50 100 150 200 250
 STATIONING IN FEET

ELEVATION IN FEET ABOVE MSL
 0
 50
 100
 150
 200
 250

D/S CROSS-SECTION NO 1 AT DENNEY DAM



Anderson-Nichols & Company, Inc.

Subject ROCK RIDGE LAKE DAM

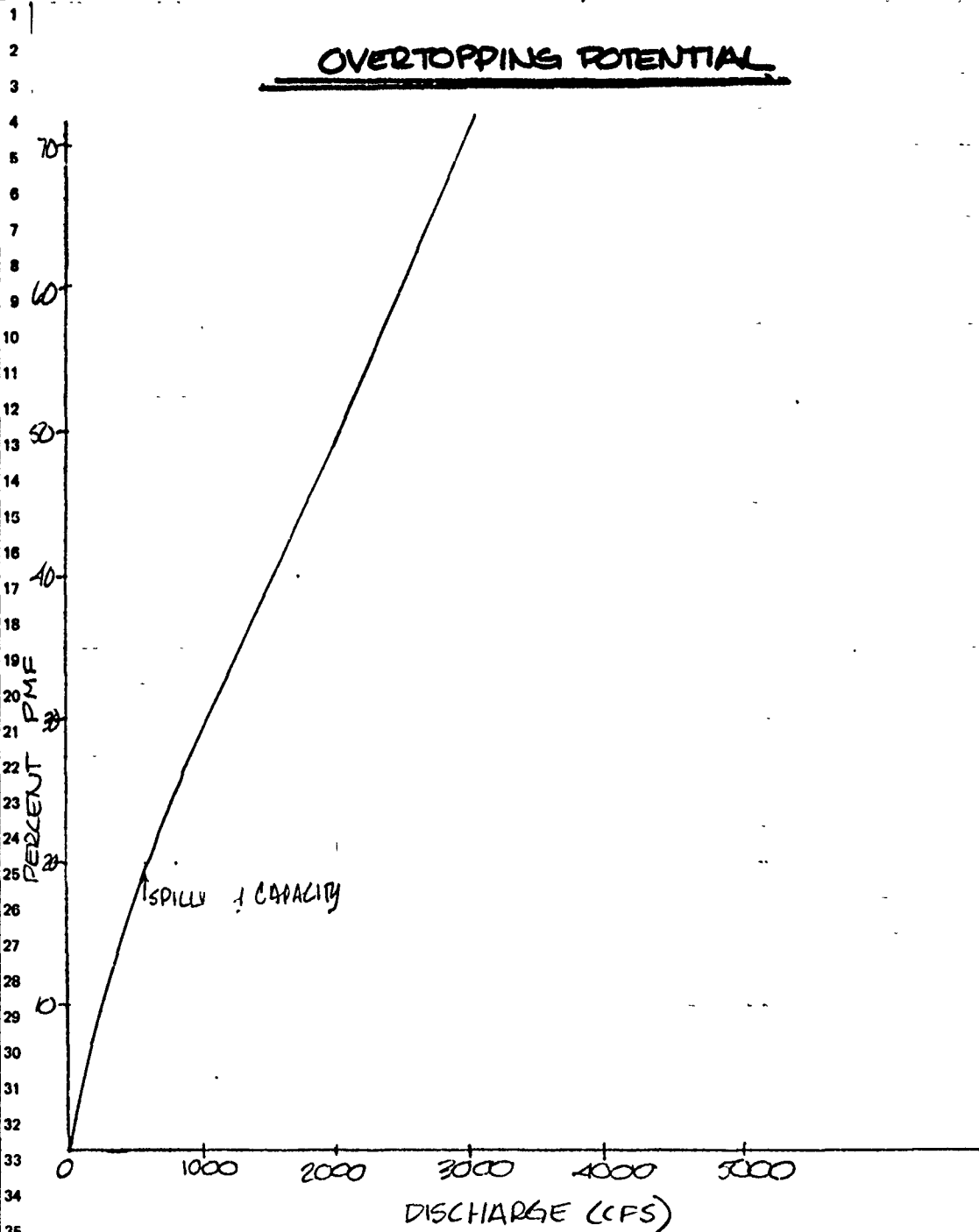
Sheet No. 9 of 11
Date 6/25/79
Computed KAE
Checked EJ

JOB NO. 3290-01

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 29 30

OVERTOPPING POTENTIAL



Anderson-Nichols & Company, Inc.

Subject ROCK RIDGE LAKE DAM

Sheet No. 10 of 11
 Date 6/26/59
 Computed KATE
 Checked EJS

JOB NO. 3290-01

SQUARES 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
 1/4 IN. SCALE

DETERMINATION OF "C" FOR LOW-LEVEL OUTLET

D = DIAMETER = 12" CIP OR 1.0' CIP

N = .015 (SOIL & WATER CONSERVATION ENGINEERING P. 632)

A_p = AREA OF PIPE OPENING = .79 SQ. FT.

L_p = LENGTH PIPE = 72'

K_F = FRICTION LOSS THROUGH PIPE

K_L = ENTRANCE LOSS OF PIPE = .8 (IBID P. 639)

C_p = COEFFICIENT OF DISCHARGE (INCORPORATING A_p & 2g)

C = COEFFICIENT OF DISCHARGE

$$K_F = \frac{5087 n^2}{D^{4/3}} = \frac{5087 (.015)^2}{12^{1.333}} = \frac{1.14}{27.45} = .042$$

$$C_p = A_p \sqrt{\frac{2g}{1 + K_L + K_F L_p}}$$

$$= .79 \sqrt{\frac{64.4}{1 + .8 + (.042)(72)}}$$

$$= 2.89$$

$$C = \frac{2.89}{\frac{.79}{\sqrt{64.4}}}$$

$$\therefore C = .46$$

Anderson-Nichols & Company, Inc.

Subject ROCK RIDGE LAKE DAM
 Sheet No. 11 of 11
 Date 6/26/79
 Computed KATE
 Checked FJD
JOB NO. 3290-01
 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 29 30

DRAWDOWN CALCULATIONSCALCULATIONS ASSUME Φ NO SIGNIFICANT INFLOW

② LOW LEVEL OUTLET TO BE OPERABLE

③ INVERT U/S SAME AS INVERT AT GATE = 515.6

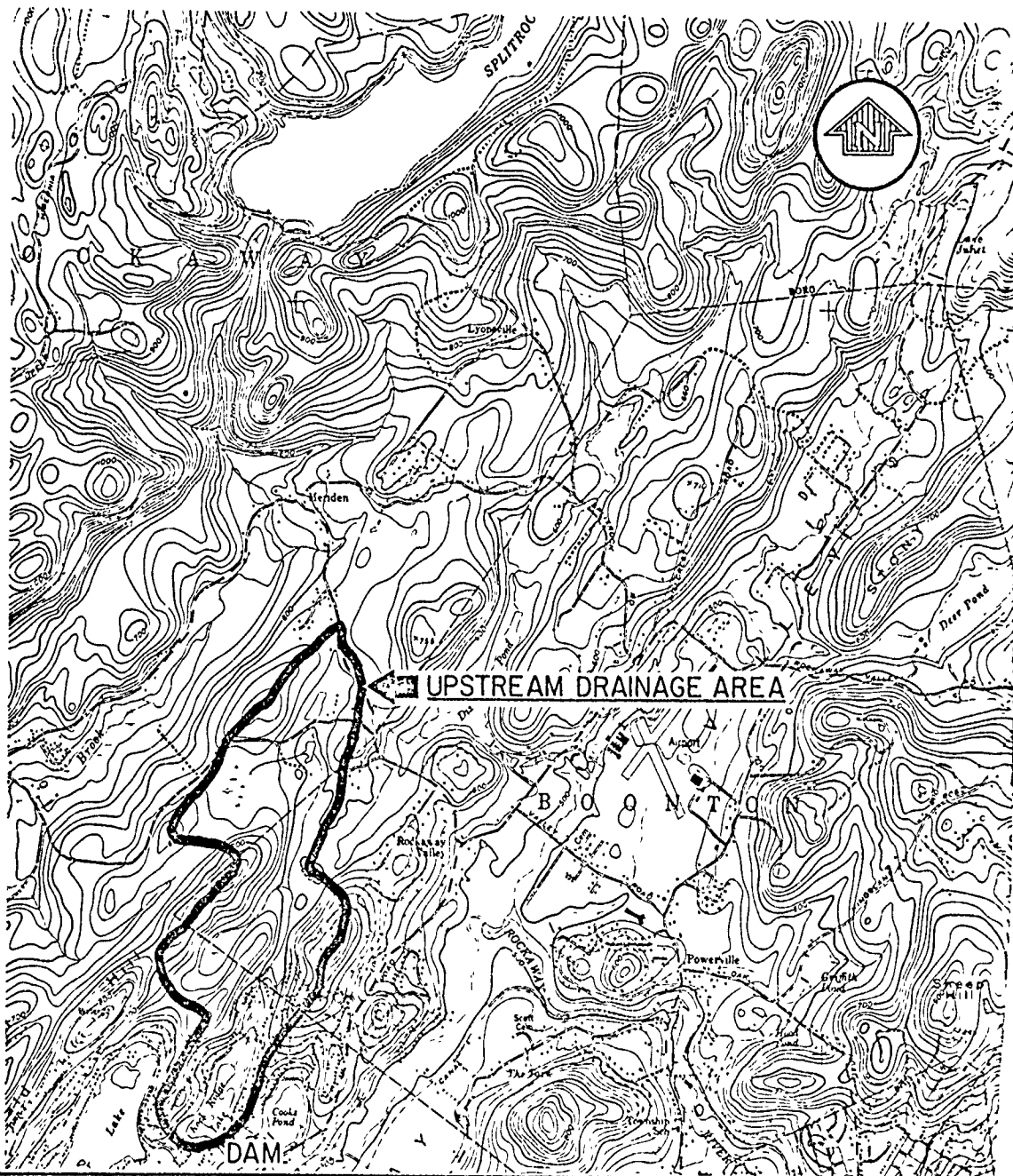
④ $Q_p = C_p H^{1/2} = 2.89 H^{1/2}$ (SEE PREVIOUS PAGE)

⑤ AC-FT-DAY = 1.9835 (AVG Q)

⑥ DAYS = Δ STORAGE / AC-FT-DAY

ELEV. FT.	STORAGE AG-FT	Δ STORAGE AG-FT	H FT	Q CFS	AVG Q CFS	AC-FT PER DAY	DAYS
521.1	174		55	6.78			
		10			6.62	13.13	0.76
520.6	164		5	6.46			
		10			6.31	12.52	0.80
520.1	154		4.5	6.13			
		9			5.96	11.82	0.76
519.6	145		4	5.78			
		9			5.60	11.11	0.81
519.1	136		3.5	5.41			
		9			5.21	10.33	0.87
518.6	127		3	5.01			
		9			4.79	9.50	0.95
518.1	118		2.5	4.57			
		9			4.33	8.59	1.05
517.6	109		2	4.09			
		8			3.82	7.58	1.06
517.1	101		1.5	3.54			
		8			3.22	6.39	1.25
516.6	93		1	2.89			
		8			2.47	4.90	1.63
516.1	85		.5	2.04			
		7			1.02	2.02	3.47
515.6	78		0	0			

TOTAL = 13.41



NATIONAL PROGRAM OF INSPECTION OF
NON-FED. DAMS

ROCK RIDGE LAKE DAM
DENVER TOWNSHIP, NEW JERSEY

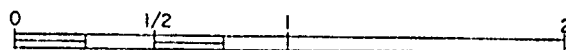
REGIONAL VICINITY MAP

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
SHEET. BOONTON, N.J., 1954, UPDATED 1970.

HEC-1 OUTPUT

OVERTOPPING ANALYSIS

ROCK RIDGE LAKE DAM

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DATA ENTRY VERSION JULY 1978
LAST MODIFICATION 26 SEP 75

AT ROCK RIDGE LAKE DAM OVERTOPPING ANALYSIS - K. DOHERTY ANDERSON-NICHOLS -
A2 NEWJENSEY DAM NUMBER 420
A3 0.1, 0.3, 0.5, AND 1.0 MULTIPLES OF 24-HOUR PMP (SDF=0.5 PVE)

[illegible]

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

PUNCEE HYDROGRAPH AT	A1
ROUTE HYDROGRAPH TO	A2
ROUTE HYDROGRAPH TO	A3
ROUTE HYDROGRAPH TO	A4
END OF NETWORK	

9

PC.DA		HR.MN		PERIOD		RAIN		EXCS		LCSS		END-OF-PERIOD FLOW		LCSS		HR.MN		PERIOD		RAIN		EXCS		LCSS		COMP C	
PC.DA	HR.MN	PERIOD	RAIN	EXCS	LCSS	COMP D	PC.DA	HR.MN	PERIOD	RAIN	EXCS	LCSS	COMP D	PC.DA	HR.MN	PERIOD	RAIN	EXCS	LCSS	COMP D	PC.DA	HR.MN	PERIOD	RAIN	EXCS	LCSS	COMP C
1.01	1.10	1	.02	0.00	.02	3	1.01	12.40	76	.34	.32	.02	496.	1.01	1.20	2	.02	0.00	.02	3	1.01	12.50	77	.34	.32	.02	660.
1.01	1.20	2	.02	0.00	.02	3	1.01	13.00	78	.34	.32	.02	795.	1.01	1.30	3	.02	0.00	.02	3	1.01	13.10	79	.34	.32	.02	898.
1.01	1.30	3	.02	0.00	.02	3	1.01	13.20	80	.34	.32	.02	1047.	1.01	1.40	4	.02	0.00	.02	3	1.01	13.30	81	.34	.32	.02	1116.
1.01	1.40	4	.02	0.00	.02	3	1.01	13.40	82	.34	.32	.02	1174.	1.01	1.50	5	.02	0.00	.02	3	1.01	13.50	83	.34	.32	.02	1219.
1.01	1.50	5	.02	0.00	.02	3	1.01	14.00	84	.34	.32	.02	1258.	1.01	2.00	6	.02	0.00	.02	3	1.01	14.10	85	.34	.32	.02	1303.
1.01	2.00	6	.02	0.00	.02	3	1.01	14.20	86	.34	.32	.02	1365.	1.01	2.10	7	.02	0.00	.02	3	1.01	14.30	87	.34	.32	.02	1433.
1.01	2.10	7	.02	0.00	.02	3	1.01	14.40	88	.34	.32	.02	1497.	1.01	2.20	8	.02	0.00	.02	3	1.01	14.50	89	.34	.32	.02	1548.
1.01	2.20	8	.02	0.00	.02	3	1.01	15.00	90	.34	.32	.02	1581.	1.01	2.30	9	.02	0.00	.02	3	1.01	15.10	91	.34	.32	.02	1617.
1.01	2.30	9	.02	0.00	.02	3	1.01	15.20	92	.34	.32	.02	1731.	1.01	2.40	10	.02	0.00	.02	3	1.01	15.30	93	.34	.32	.02	2161.
1.01	2.40	10	.02	0.00	.02	3	1.01	15.40	94	.34	.32	.02	2922.	1.01	2.50	11	.02	0.00	.02	3	1.01	15.50	95	.34	.32	.02	3797.
1.01	2.50	11	.02	0.00	.02	3	1.01	16.00	96	.34	.32	.02	4216.	1.01	3.00	12	.02	0.00	.02	3	1.01	16.10	97	.34	.32	.02	4114.
1.01	3.00	12	.02	0.00	.02	3	1.01	16.20	98	.34	.32	.02	3667.	1.01	3.10	13	.02	0.00	.02	3	1.01	16.30	99	.34	.32	.02	3064.
1.01	3.10	13	.02	0.00	.02	3	1.01	16.30	99	.34	.32	.02	2592.	1.01	3.20	14	.02	0.00	.02	3	1.01	16.40	100	.34	.32	.02	2261.
1.01	3.20	14	.02	0.00	.02	3	1.01	16.40	100	.34	.32	.02	2031.	1.01	3.30	15	.02	0.00	.02	3	1.01	16.50	101	.34	.32	.02	1852.
1.01	3.30	15	.02	0.00	.02	3	1.01	16.50	101	.34	.32	.02	1691.	1.01	3.40	16	.02	0.00	.02	3	1.01	17.00	102	.34	.32	.02	1565.
1.01	3.40	16	.02	0.00	.02	3	1.01	17.00	102	.34	.32	.02	1459.	1.01	3.50	17	.02	0.00	.02	3	1.01	17.10	103	.34	.32	.02	1379.
1.01	3.50	17	.02	0.00	.02	3	1.01	17.10	103	.34	.32	.02	1294.	1.01	4.00	18	.02	0.00	.02	3	1.01	17.20	104	.34	.32	.02	1179.
1.01	4.00	18	.02	0.00	.02	3	1.01	17.20	104	.34	.32	.02	943.	1.01	4.10	19	.02	0.00	.02	3	1.01	17.30	105	.34	.32	.02	777.
1.01	4.10	19	.02	0.00	.02	3	1.01	17.30	105	.34	.32	.02	572.	1.01	4.20	20	.02	0.00	.02	3	1.01	17.40	106	.34	.32	.02	402.
1.01	4.20	20	.02	0.00	.02	3	1.01	17.40	106	.34	.32	.02	288.	1.01	4.30	21	.02	0.00	.02	3	1.01	17.50	107	.34	.32	.02	212.
1.01	4.30	21	.02	0.00	.02	3	1.01	17.50	107	.34	.32	.02	160.	1.01	4.40	22	.02	0.00	.02	3	1.01	18.00	108	.34	.32	.02	124.
1.01	4.40	22	.02	0.00	.02	3	1.01	18.00	108	.34	.32	.02	100.	1.01	4.50	23	.02	0.00	.02	3	1.01	18.10	109	.34	.32	.02	83.
1.01	4.50	23	.02	0.00	.02	3	1.01	18.10	109	.34	.32	.02	71.	1.01	5.00	24	.02	0.00	.02	3	1.01	18.20	110	.34	.32	.02	63.
1.01	5.00	24	.02	0.00	.02	3	1.01	18.20	110	.34	.32	.02	58.	1.01	5.10	25	.02	0.00	.02	3	1.01	18.30	111	.34	.32	.02	54.
1.01	5.10	25	.02	0.00	.02	3	1.01	18.30	111	.34	.32	.02	52.	1.01	5.20	26	.02	0.00	.02	3	1.01	18.40	112	.34	.32	.02	50.
1.01	5.20	26	.02	0.00	.02	3	1.01	18.40	112	.34	.32	.02	48.	1.01	5.30	27	.02	0.00	.02	3	1.01	18.50	113	.34	.32	.02	46.
1.01	5.30	27	.02	0.00	.02	3	1.01	18.50	113	.34	.32	.02	44.	1.01	5.40	28	.02	0.00	.02	3	1.01	19.00	114	.34	.32	.02	42.
1.01	5.40	28	.02	0.00	.02	3	1.01	19.00	114	.34	.32	.02	40.	1.01	5.50	29	.02	0.00	.02	3	1.01	19.10	115	.34	.32	.02	38.
1.01	5.50	29	.02	0.00	.02	3	1.01	19.10	115	.34	.32	.02	36.	1.01	6.00	30	.02	0.00	.02	3	1.01	19.20	116	.34	.32	.02	34.
1.01	6.00	30	.02	0.00	.02	3	1.01	19.20	116	.34	.32	.02	32.	1.01	6.10	31	.02	0.00	.02	3	1.01	19.30	117	.34	.32	.02	30.
1.01	6.10	31	.02	0.00	.02	3	1.01	19.30	117	.34	.32	.02	28.	1.01	6.20	32	.02	0.00	.02	3	1.01	19.40	118	.34	.32	.02	26.
1.01	6.20	32	.02	0.00	.02	3	1.01	19.40	118	.34	.32	.02	24.	1.01	6.30	33	.02	0.00	.02	3	1.01	19.50	119	.34	.32	.02	22.
1.01	6.30	33	.02	0.00	.02	3	1.01	19.50	119	.34	.32	.02	20.	1.01	6.40	34	.02	0.00	.02	3	1.01	20.00	120	.34	.32	.02	18.
1.01	6.40	34	.02	0.00	.02	3	1.01	20.00	120	.34	.32	.02	16.	1.01	6.50	35	.02	0.00	.02	3	1.01	20.10	121	.34	.32	.02	14.
1.01	6.50	35	.02	0.00	.02	3	1.01	20.10	121	.34	.32	.02	12.	1.01	7.00	36	.02	0.00	.02	3	1.01	20.20	122	.34	.32	.02	10.
1.01	7.00	36	.02	0.00	.02	3	1.01	20.20	122	.34	.32	.02	8.	1.01	7.10	37	.02	0.00	.02	3	1.01	20.30	123	.34	.32	.02	8.
1.01	7.10	37	.02	0.00	.02	3	1.01	20.30	123	.34	.32	.02	6.	1.01	7.20	38	.02	0.00	.02	3	1.01	20.40	124	.34	.32	.02	6.
1.01	7.20	38	.02	0.00	.02	3	1.01	20.40	124	.34	.32	.02	4.	1.01	7.30	39	.02	0.00	.02	3	1.01	20.50	125	.34	.32	.02	4.
1.01	7.30	39	.02	0.00	.02	3	1.01	20.50	125	.34	.32	.02	2.	1.01	7.40	40	.02	0.00	.02	3	1.01	21.00	126	.34	.32	.02	2.
1.01	7.40	40	.02	0.00	.02	3	1.01	21.00	126	.34	.32	.02	0.	1.01	7.50	41	.02	0.00	.02	3	1.01	21.10	127	.34	.32	.02	0.
1.01	7.50	41	.02	0.00	.02	3	1.01	21.10	127	.34	.32	.02	0.	1.01	8.00	42	.02	0.00	.02	3	1.01	21.20	128	.34	.32	.02	0.
1.01	8.00	42	.02	0.00	.02	3	1.01	21.20	128	.34	.32	.02	0.	1.01	8.10	43	.02	0.00	.02	3	1.01	21.30	129	.34	.32	.02	0.
1.01	8.10	43	.02	0.00	.02	3	1.01	21.30	129	.34	.32	.02	0.	1.01	8.20	44	.02	0.00	.02	3	1.01	21.40	130	.34	.32	.02	0.
1.01	8.20	44	.02	0.00	.02	3	1.01	21.40	130	.34	.32	.02	0.	1.01	8.30	45	.02	0.00	.02	3	1.01	21.50	131	.34	.32	.02	0.
1.01	8.30	45	.02	0.00	.02	3	1.01	21.50	131	.34	.32	.02	0.	1.01	8.40	46	.02	0.00	.02	3	1.01	22.00	132	.34	.32	.02	0.
1.01	8.40	46	.02	0.00	.02	3	1.01	22.00	132	.34	.32	.02	0.	1.01	8.50	47	.02	0.00	.02	3	1.01	22.10	133	.34	.32	.02	0.
1.01	8.50	47	.02	0.00	.02	3	1.01	22.10	133	.34	.32	.02	0.	1.01	9.00	48	.02	0.00	.02	3	1.01	22.20	134	.34	.32	.02	0.
1.01	9.00	48	.02	0.00	.02	3	1.01	22.20	134	.34	.32	.02	0.	1.01	9.10	49	.02	0.00	.02	3	1.01	22.30	135	.34	.32	.02	0.
1.01	9.10	49	.02	0.00	.02	3	1.01	22.30	135	.34	.32	.02	0.	1.01	9.20	50	.02	0.00	.02	3	1.01	22.40	136	.34	.32	.02	0.
1.01	9.20	50	.02	0.00	.02	3	1.01	22.40	136	.34	.32	.02	0.	1.01	9.30	51	.02	0.00	.02	3	1.01	22.50	137	.34	.32	.02	0.
1.01	9.30	51	.02	0.00	.02	3	1.01	22.50	137	.34	.32	.02	0.	1.01	9.40	52	.02	0.00	.02	3	1.01	23.00	138	.34	.32	.02	0.
1.01	9.40	52	.02	0.00	.02	3	1.01	23.00	138	.34	.32	.02	0.	1.01	9.50	53	.02	0.00	.02	3	1.01	23.10	139	.34	.32	.02	0.
1.01	9.50	53	.02	0.00	.02	3	1.01	23.10	139	.34	.32	.02	0.	1.01	10.00	54	.02	0.00	.02	3	1.01	23.20	140	.34	.32	.02	0.
1.01	10.00	54	.02	0.00	.02	3	1.01	23.20	140	.34	.32	.02	0.	1.01	10.10	55	.02	0.00	.02	3	1.01	23.30	141	.34	.32	.02	0.
1.01	10.10	55	.02	0.00																							

[illegible][illegible]

[illegible]

PEAK OUTFLOW IS 2022. AT TIME 16.33 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2022	865	284	734	3519
CFS	57	24	7	7	994
INCHES		9.43	10.43	10.43	10.43
AC-FT		23.27	764.53	26.94	26.94
THOUS CU M		425	484	484	484
		520	597	597	597

THE NAM PREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .021 HOURS DURING PREACH FORMATION.
 DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS.
 THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED PREACH HYDROGRAPH.
 INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-REACH VALUES.

TIME OF REACH (HOURS)	TIME FROM DEFINING PREACH HYDROGRAPH (HOURS)	INTERPOLATED PREACH (CFS)	COMPUTED BREACH HYDROGRAPH (CFS)	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED FRRR (ACFT)
15.000	0.000	595	595	0	0	0
15.021	.021	608	622	14	14	0
15.042	.042	622	636	14	28	0
15.063	.063	636	650	14	42	0
15.084	.084	650	664	14	56	0
15.104	.104	664	678	14	70	0
15.125	.125	678	692	14	84	0
15.146	.146	692	706	14	98	0
15.167	.167	706	720	14	112	0
15.188	.188	720	734	14	126	0
15.209	.209	734	748	14	140	0
15.229	.229	748	762	14	154	0
15.250	.250	762	776	14	168	0
15.271	.271	776	790	14	182	0
15.292	.292	790	804	14	196	0
15.313	.313	804	818	14	210	0
15.333	.333	818	832	14	224	0
15.354	.354	832	846	14	238	0
15.375	.375	846	860	14	252	0
15.396	.396	860	874	14	266	0
15.417	.417	874	888	14	280	0
15.438	.438	888	902	14	294	0
15.458	.458	902	916	14	308	0
15.479	.479	916	930	14	322	0
15.500	.500	930	944	14	336	0
15.521	.521	944	958	14	350	0
15.542	.542	958	972	14	364	0
15.563	.563	972	986	14	378	0
15.583	.583	986	1000	14	392	0
15.604	.604	1000	1014	14	406	0
15.625	.625	1014	1028	14	420	0
15.646	.646	1028	1042	14	434	0
15.667	.667	1042	1056	14	448	0
15.688	.688	1056	1070	14	462	0
15.709	.709	1070	1084	14	476	0
15.729	.729	1084	1098	14	490	0
15.750	.750	1098	1112	14	504	0
15.771	.771	1112	1126	14	518	0
15.792	.792	1126	1140	14	532	0
15.813	.813	1140	1154	14	546	0
15.833	.833	1154	1168	14	560	0
15.854	.854	1168	1182	14	574	0
15.875	.875	1182	1196	14	588	0
15.896	.896	1196	1210	14	602	0
15.917	.917	1210	1224	14	616	0
15.938	.938	1224	1238	14	630	0
15.958	.958	1238	1252	14	644	0
15.979	.979	1252	1266	14	658	0
16.000	1.000	1266	1280	14	672	0

HYDROGRAPH ROUTING																																																																								
CHANNEL ROUTING - MOD PULS- REACH 2																																																																								
IS10		ICCP		IECN		ITAF		JPLT		JFRT		IATAGE		IATC																																																										
A4		1		0		0		0		0		1		0																																																										
ALL FLAPS HAVE SAME																																																																								
ROUTING DATA																																																																								
GROSS		CLASS		AVC		IPES		ISAP		IMPT		IPPP		LSTR																																																										
0.0		0.000		0.00		1		1		0		0		0																																																										
MSIPS		MSIDL		LAG		AWSKK		X		TSK		STORA		ISPRAT																																																										
1		0		0		0.000		0.000		0.000		0.000		0																																																										
NORMAL DFTM CHANNEL ROUTING																																																																								
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ONE(1)	ONE(2)	ONE(3)	ELNVT	ELMAY	PLNTH	SEL																																																																		
0.000	0.000	0.000	0.000	0.000	0.000	0.000																																																																		
CROSS SECTION COORDINATES--STA+ELEV, STA+ELEV--EIC																																																																								
<table border="1"> <thead> <tr> <th>STA</th> <th>ELEV</th> <th>STA</th> <th>ELEV</th> <th>STA</th> <th>ELEV</th> <th>STA</th> <th>ELEV</th> </tr> </thead> <tbody> <tr> <td>0.00</td> <td>510.00</td> <td>92.00</td> <td>500.00</td> <td>112.00</td> <td>502.00</td> <td>122.00</td> <td>501.00</td> </tr> <tr> <td>132.00</td> <td>502.00</td> <td>100.00</td> <td>500.00</td> <td>232.00</td> <td>510.00</td> <td></td> <td></td> </tr> </tbody> </table>															STA	ELEV	STA	ELEV	STA	ELEV	STA	ELEV	0.00	510.00	92.00	500.00	112.00	502.00	122.00	501.00	132.00	502.00	100.00	500.00	232.00	510.00																																				
STA	ELEV	STA	ELEV	STA	ELEV	STA	ELEV																																																																	
0.00	510.00	92.00	500.00	112.00	502.00	122.00	501.00																																																																	
132.00	502.00	100.00	500.00	232.00	510.00																																																																			
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STORAGE	0.00	12.00	15.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00	38.00	39.00	40.00																																													
0.00	12.00	15.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00	38.00	39.00	40.00																																														
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TAG	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00	501.00																																												
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FLOW	0.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00	38.00	39.00	40.00																																												
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STATION 44. PLAN 1. PTO 2																																																																								
(NO BREACH)																																																																								
OUTFLOW																																																																								

STATION 44, PLAN 1, RATIO 2, CONTINUED (NO BREACH)

[illegible][illegible]

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL	VOLUME
CFS	1924.	862.	244.	234.		35072.
CMS	54.	24.	7.	7.		993.
INCHES		9.22	10.42	10.42		10.42
AC-FT		234.20	264.58	264.58		264.58
THOUS CU FT		420.	483.	483.		483.
		527.	596.	596.		596.

MAXIMUM STAGE IS 505.6
MAXIMUM STORAGE = 12.0

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 FEET (SQUARE KILOMETERS)

OPERATION STATION AREA PLAN RATIO 1 RATIO 2 RATIO 3 RATIOS APPLIED TO FLOWS

.20 .50 1.00

HYDROGRAPH AT A1 .87 1 843. 2100. 4216.

2 2.25 2 25.80 59.59 119.38

843. 2100. 4216.

3 21.80 59.59 119.38

843. 2100. 4216.

ROUTED TO A2 .87 1 594. 2022. 4118.

2 2.25 2 16.83 57.53 116.62

1232. 2131. 3866.

3 34.87 59.59 119.38

900. 2178. 3906.

ROUTED TO A3 .87 1 591. 1971. 4019.

2 2.25 2 16.72 55.82 113.60

1123. 2033. 3803.

3 31.80 59.59 109.39

847. 2158. 3883.

ROUTED TO A4 .87 1 588. 1944. 4026.

2 2.25 2 16.60 54.80 114.01

1124. 2102. 3799.

3 31.83 59.59 107.56

843. 2158. 3839.

ROUTED TO A5 .87 1 585. 1917. 3997.

2 2.25 2 16.48 53.80 111.41

1105. 2083. 3763.

3 31.86 59.59 105.13

843. 2158. 3799.

ROUTED TO A6 .87 1 582. 1890. 3964.

2 2.25 2 16.36 52.72 109.82

1086. 2059. 3729.

3 31.89 59.59 102.86

843. 2158. 3739.

ROUTED TO A7 .87 1 579. 1863. 3931.

2 2.25 2 16.24 51.64 107.50

1068. 2035. 3694.

3 31.92 59.59 100.00

843. 2158. 3709.

ROUTED TO A8 .87 1 576. 1836. 3898.

2 2.25 2 16.12 50.56 105.19

1050. 2011. 3659.

3 31.95 59.59 97.50

843. 2158. 3724.

ROUTED TO A9 .87 1 573. 1809. 3865.

2 2.25 2 16.00 49.48 102.81

1032. 1987. 3620.

3 31.98 59.59 95.00

843. 2158. 3734.

PLAN 1 INITIAL VALUE SPILLWAY CREST TOP OF DAM

WITHOUT BREACH ELEVATION 521.10 521.10 523.68

STORAGE 174. 174. 218.

OUTFLOW 0. 0. 579.

RATIO OF RESERVOIR MAXIMUM DEPTH OVER DAM MAXIMUM STORAGE AC-FT

.20 521.67 .07 220. 594. .50 16.67 0.00

1.00 525.05 1.35 251. 2022. 4.00 16.33 0.00

525.05 2.34 271. 4118. 6.00 16.33 0.00

525.05 2.34 271. 4118. 6.00 16.33 0.00

525.05 2.34 271. 4118. 6.00 16.33 0.00

525.05 2.34 271. 4118. 6.00 16.33 0.00

525.05 2.34 271. 4118. 6.00 16.33 0.00

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525.05 2.34 271. 4118. 6.00 16.33 0.00

525.05 2.34 271. 4118. 6.00 16.33 0.00

525.05 2.34 271. 4118. 6.00 16.33 0.00

PLAN 2 INITIAL VALUE SPILLWAY CREST TOP OF DAM

WITH BREACH ELEVATION 521.10 521.10 523.68

STORAGE 174. 174. 218.

OUTFLOW 0. 0. 579.

RATIO OF RESERVOIR MAXIMUM DEPTH OVER DAM MAXIMUM STORAGE AC-FT

.20 521.67 .06 219. 1232. .44 17.50 16.50

1.00 525.05 1.34 225. 2131. .75 16.50 15.00

525.05 2.34 247. 3886. 2.38 14.50 13.50

525.05 2.34 247. 3886. 2.38 14.50 13.50

525.05 2.34 247. 3886. 2.38 14.50 13.50

525.05 2.34 247. 3886. 2.38 14.50 13.50

525.05 2.34 247. 3886. 2.38 14.50 13.50

525.05 2.34 247. 3886. 2.38 14.50 13.50

WITHOUT BREACH

PLAN 1	STATION	AS	MAXIMUM FLOW.CFS	MAXIMUM STAGE.FT	TIME HOURS
RATIO					
.20			1971.	517.5	16.50
.50			4019.	519.3	16.50
1.00				520.9	16.50

WITH BREACH

PLAN 2	STATION	AS	MAXIMUM FLOW.CFS	MAXIMUM STAGE.FT	TIME HOURS
RATIO					
.20			1123.	518.4	17.67
.50			2093.	519.4	16.33
1.00			3863.	520.7	16.50

WITHOUT BREACH

PLAN 1	STATION	AA	MAXIMUM FLOW.CFS	MAXIMUM STAGE.FT	TIME HOURS
RATIO					
.20			582.	503.7	17.00
.50			1924.	505.6	16.50
1.00			4026.	507.4	16.50

WITH BREACH

PLAN 2	STATION	AA	MAXIMUM FLOW.CFS	MAXIMUM STAGE.FT	TIME HOURS
RATIO					
.20			1124.	504.6	17.67
.50			2102.	505.6	16.23
1.00			3792.	507.2	16.50

APPENDIX 5

REFERENCES

ROCK RIDGE LAKE DAM

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1. King, H. W., and E. F. Brater, Handbook of Hydraulics, McGraw-Hill Book Co., New York, Fifth Edition, 1963.
2. New Jersey Department of Environmental Protection Files, "Dams in New Jersey - Reference Date" Dam Number 440.
3. Robinson Aerial Surveys, Inc., Newton, N.J., Photogrammetric Mapping, Scale 1:1200, Contour Interval 2 Feet (1963).
4. Schwab, G. O., R. K. Frevert, T. W. Edminster, and K. K. Barnes, Soil and Water Conservation Engineering, the Ferguson Foundation Agricultural Engineering Series, John Wiley and Sons, Inc., New York, 1966, 683 pp.
5. U.S. Department of Commerce, Weather Bureau, "Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24 and 48 Hours," Hydrometeorological Report No. 33, Washington, April 1956.
6. United States Department of the Interior, Bureau of Reclamation, Design of Small Dams, U.S. Government Printing Office, Washington 1977, 816 pp.
7. United States Department of the Interior, Geological Survey, 7.5 Minute Series (Topographic) Maps, Scale 1:24,000, Contour Interval 20 Feet: Boonton, N.J., (1954).