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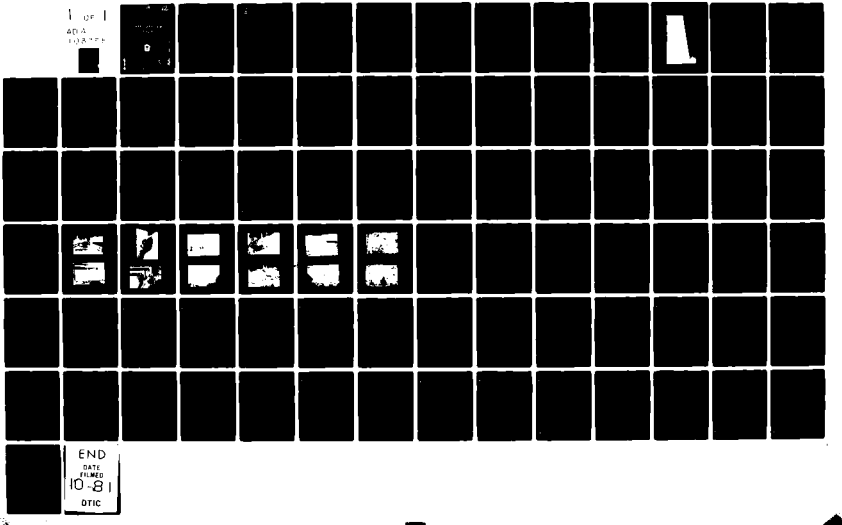

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LEVEL II

PASSAIC RIVER BASIN
TRIBUTARY TO MORSETOWN BROOK,
PASSAIC COUNTY
NEW JERSEY.

CARPI LAKE DAM
NJ 00192

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

JULY 1981

REPT. NO: DAEN/NAP-53842/NJ00192-81/07

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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National Dam Safety Program
Carpi Lake Dam, NJ00192
Passaic County, New Jersey

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Warren A. Guinan

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150 Causeway St.
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Embankments	Carpi Lake Dam, N.J.
Visual Inspection	Spillways
Structural Analysis	Erosion

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. → page 2

National Dam Safety Program. Carpi Lake Dam (NJ 00192) Passaic River Basin, Tributary to Morsetown Brook, Passaic County, New Jersey. Phase I Inspection Report.

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

IN REPLY REFER TO

NAPEN-N

31 AUG 1981

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

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Carpi Lake Dam in Passaic 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, Carpi 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 poor overall condition. The dam's spillway is considered inadequate because a flow equivalent to 47 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood). To ensure 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. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated.

b. Within one year from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Investigate the cause of wet, soft areas and standing water at the downstream toe of the dam.

(2) Investigate the uneven condition of the dam crest and design or specify measures to correct this condition.

(3) Design or specify the repairs for the erosion of the upstream slope and oversee the placement of adequate erosion protection for the upstream slope of the dam.

(4) Specify and oversee removal of trees, brush and vines from the entire embankment.

(5) Design and oversee replacement of the collapsed right, downstream concrete spillway training wingwall.

(6) Design and oversee the placement of adequate erosion protection along the toe of the embankment adjacent to the discharge channel.

(7) Design and oversee repairs to deteriorated concrete on the spillway and low-level outlet valve pit.

c. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Start a program of periodically checking the condition of the dam and monitoring the wet area along the toe of the downstream slope.

(2) Remove trees and brush for a distance of 25 feet downstream from the toe of the dam or to the property line, whichever is less.

(3) Control trespassing on the dam.

d. Within one year from the date of approval of this report the following remedial actions should be initiated:

(1) Re-establish and maintain grassy vegetation on the dam after removal of trees, brush, vines and repair of eroded areas on the dam.

(2) Clear trees and brush on either side of the spillway discharge channel for distance of 100 feet from the spillway crest or to the limits of the property line whichever is less.

(3) Clean and paint all rusted steel on the service bridge.

(4) Repair or replace steel ladder in valve pit.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam, within one year from the date of approval of this report.

f. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

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 Roe of the Eighth 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.

NAPEN-N
Honorable Brendan T. Byrne

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 Inspection 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,

ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and 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 CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

CARPI LAKE DAM (NJ00192)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 23 April 1981 by Anderson-Nichols and Co. 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.

Carpi 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 poor overall condition. The dam's spillway is considered inadequate because a flow equivalent to 47 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood). To ensure 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. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated.

b. Within one year from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Investigate the cause of wet, soft areas and standing water at the downstream toe of the dam.

(2) Investigate the uneven condition of the dam crest and design or specify measures to correct this condition.

(3) Design or specify the repairs for the erosion of the upstream slope and oversee the placement of adequate erosion protection for the upstream slope of the dam.

(4) Specify and oversee removal of trees, brush and vines from the entire embankment.

(5) Design and oversee replacement of the collapsed right, downstream concrete spillway training wingwall.

(6) Design and oversee the placement of adequate erosion protection along the toe of the embankment adjacent to the discharge channel.

(7) Design and oversee repairs to deteriorated concrete on the spillway and low-level outlet valve pit.

c. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Start a program of periodically checking the condition of the dam and monitoring the wet area along the toe of the downstream slope.

(2) Remove trees and brush for a distance of 25 feet downstream from the toe of the dam or to the property line, whichever is less.

(3) Control trespassing on the dam.

d. Within one year from the date of approval of this report the following remedial actions should be initiated:

(1) Re-establish and maintain grassy vegetation on the dam after removal of trees, brush, vines and repair of eroded areas on the dam.

(2) Clear trees and brush on either side of the spillway discharge channel for distance of 100 feet from the spillway crest or to the limits of the property line whichever is less.

(3) Clean and paint all rusted steel on the service bridge.

(4) Repair or replace steel ladder in valve pit.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam, within one year from the date of approval of this report.

f. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

APPROVED: Roger L. Baldwin

ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE: 31 Aug 81

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Carpi Lake
Identification No.:	Fed ID No. NJ00192
State Located:	New Jersey
County Located:	Passaic
Stream:	Morsetown Brook
River Basin:	Passaic
Date of Inspection:	April 23, 1981

ASSESSMENT OF GENERAL CONDITIONS

Carpi Lake Dam is about 50 years old and is in poor condition. The dam is 300 feet long, 12.1 feet high, and about 20 feet wide. The dam is small and its hazard classification is significant. The earthen embankment contains a central axial concrete core wall, a 12-inch low-level outlet with valve box cast integrally with the core wall, and a 25-foot ogee spillway located near the left abutment. The downstream slope is covered with vines, brush, and trees and the area downstream of the toe is generally wet and soft. The retreat channel runs along the downstream toe for about 50 feet. The right side training wingwall from the spillway has collapsed into the channel exposing the embankment and dumped riprap. The upstream slope, with several trees growing at or above the waterline, shows evidence of erosion and displacement of riprap at and above the waterline. The grass covered dam crest is rather uneven. Several roots of trees extend the entire width of the crest. The spillway's crest has some minor spalling of concrete and a small crack near the toe. The spillway is capable of passing 46 percent of the selected spillway design flood inflow hydrograph of one-half PMF (652 cfs) and is considered inadequate.

The owner should engage a professional engineer, qualified in the design and construction of dams to accomplish the following in the near future: evaluate further the adequacy of the spillway capacity and design and oversee construction of additional capacity, if found necessary; investigate the cause of wet, soft areas and standing water at the downstream toe of the dam; investigate the uneven condition of the dam crest and design or specify remedial measures to correct the condition; design or specify the repairs for the erosion of the upstream slope and oversee the placement of adequate erosion protection for the upstream slope of the dam; specify and oversee removal of trees, brush and vines from the entire embankment; design and oversee replacement of the collapsed right, downstream concrete training wingwall; design and oversee the placement of adequate erosion protection along the toe of the embankment adjacent to the discharge channel; design and oversee repairs to deteriorated concrete on the spillway and low-level outlet valve pit.

It is further recommended that the owner accomplish the following tasks as part of operational and maintenance procedures. Beginning soon: start a program of periodically checking the condition of the dam and monitoring the wet area along the toe of the downstream slope; develop an emergency action plan which outlines actions taken by the owner to minimize downstream effects of an emergency at the dam; remove trees and brush for a distance of 25 feet downstream from the toe of the dam or to the property line, whichever is less; control trespassing on the dam. In the near future: re-establish and maintain grassy vegetation on the dam embankment; clear trees and brush on either side of the spillway discharge channel for a distance of 100 feet from the spillway crest or to the limits of the property line, whichever is less; clear and paint all rusted steel on the service bridge; repair or replace steel ladder in valve pit; and develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

ANDERSON-NICHOLS & COMPANY, INC.

Warren A. Guinan

Warren A. Guinan, P.E.
Project Manager
New Jersey 16848

April 23, 1981

OVERVIEW PHOTO

CARPI LAKE DAM

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 reasonable 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.

CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY REPORT

CARPI LAKE DAM FED ID NO. NJ00192

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
CARPI LAKE DAM
FED ID NO. #NJ00192

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Carpi Lake Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 12 December 1980 under Basic Contract No. FPM-39 and Contract No. A01093 dated 10 October, 1979. 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.

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

1.2 Project Description

a. Description of Dam and Appurtenances. Carpi Lake Dam is a 300-foot long, 12.1-foot high earthfill dam with a concrete core wall. The dam crest is approximately 20 feet wide; the slopes are 3H:1V on the upstream side and 2H:1V on the downstream side. The ogee spillway is 25 feet long, 16 feet wide including the downstream apron, and 8.5 feet high. The spillway has concrete abutment training walls and is located on the left (west) side of the dam. A concrete slab bridge crosses the spillway.

b. Location. Carpi Lake Dam is located on Morsetown Brook in West Milford Township, Passaic County, New Jersey. The dam is at 41° 06.7' north latitude 74° 21.3' west longitude on the Wanaque Quadrangle. To reach the dam from the nearby township of West Milford go east from the center of town on Marshall Hill Road. Turn right and proceed south for approximately 1 mile on Morsetown Road. Carpi Lake is on the right (west) side of the road. A location map has been included as Figure 2.

c. Size Classification. Carpi Lake Dam is classified as being small in size on the basis of storage at top of dam of 83 acre-feet, which is less than 1000 acre-feet but more than 50 acre-feet, and on the basis of its structural height of 12.1 feet, which is less than 40 feet, in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Downstream of Carpi Lake Dam are two small ponds. Morsetown Road crosses Morsetown Brook, the downstream channel, between the two ponds. Around the second pond are several houses whose back porches are approximately 6 feet above the water. If the dam were overtopped, Morsetown Road could possibly be damaged and minor flooding might occur at 4 to 6 houses around the second downstream pond. Damage to Morsetown Road would probably be appreciable; but few, if any, lives would be lost. Therefore, Carpi Lake Dam is given a significant hazard classification.

e. Ownership. The dam is owned by Helen Iafrate, West Milford, New Jersey 07480; for information she may be reached at the above address.

f. Purpose. The dam impounds a lake which is used for recreational purposes.

g. Design and Construction History. According to the owner, the dam was constructed between 1929-1939 and designed by Caesar Carpiniano. Plans for the dam were found in the files of the New Jersey Department of Environmental Protection, 1474 Prospect Street, Trenton, New Jersey 08625. However, no hydraulic or hydrologic data were discovered.

h. Normal Operational Procedure. No operational procedures exist for the dam.

i. Site Geology. No site specific geologic information (such as borings) was available at the time the dam was inspected. Information derived from the Geologic Map of New Jersey (Kummel and Lewis, 1912) and the Glacial Drift Map of New Jersey (Salisbury, Kummel, Peet and Whitson, 1902) indicates that soils within the immediate site area consist of ground moraine overlying bedrock. Bedrock was observed in several outcrops at the left side of the downstream channel during inspection of this dam. The previously mentioned map indicates that bedrock in this area consists of granitoid gneiss of Precambrian age.

1.3 Pertinent Data

a. Drainage Area

.28 square miles

b. Discharge at Damsite (cfs)

Maximum flood at damsite - unknown

Total ungated spillway capacity at maximum pool (top of dam) elevation - 205

c. Elevation (ft. above NGVD)

Top of dam - 937.4

Maximum pool test flood - (1/2 PMF) - 938.4

Recreation pool (at time of inspection) - 935.8

Spillway crest - 935.7

Streambed at centerline of spillway - 927.2

Maximum tailwater - (estimated) 928.5

d. Reservoir (feet)

Length of maximum pool - 3000 (estimated)

Spillway crest - 1400

e. Storage (acre-feet)

Spillway crest - 57

Top of dam - 83

Test Flood - (1/2 PMF) - 100

f. Reservoir Surface (acres)

Top of dam - 19 (estimated)

Spillway crest - 12.8

g. Dam

Type - earthfill with concrete corewall and spillway

Length - 300 feet

Height - 10.2 feet (hydraulic)

- 12.1 feet (structural)

Top width - 20 feet

Side slopes - upstream 3H:1V, downstream 2H:1V

Zoning - unknown

Impervious core - concrete

Cutoff - unknown

Grout curtain - unknown

h. Spillway

Type - Ogee

Length of weir - 25 feet

Crest elevation - 935.7' NGVD

Low level outlet - 12-inch C.I.P.

U/S Channel - Carpi Lake

D/S Channel - Morsetown Brook

i. Low-Level Outlet

Size - 12-inch C.I.P.

Access - Valve box near spillway, centered on corewall

Upstream invert elevation - 927.2 (est.)

Downstream invert elevation - 927.0 (est.)

SECTION 2
ENGINEERING DATA

2.1 Design

The original plans for Carpi Lake Dam are on file at the New Jersey Department of Environmental Protection, 1474 Prospect Street, Trenton, New Jersey 08625. According to the owner of the dam, Ms. Helen Iafrate, the dam was designed by Caesar Carpiniano. No hydraulic or hydrologic engineering data were disclosed.

2.2 Construction

No recorded data concerning the original construction of Carpi Lake Dam were revealed.

2.3 Operation

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

2.4 Evaluation

a. Availability. A search of the New Jersey Department of Environmental Protection files and contact with the owner and community officials revealed no other pertinent information except for the plan of the dam.

b. Adequacy. Evaluation was based primarily on visual observations which are deemed adequate for this Phase I inspection.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. Dam. The downstream slope of the dam is covered with a very dense growth of trees, brush, vines, and miscellaneous debris which makes it impossible to inspect the downstream slope adequately. The right concrete training wing wall of the spillway, which is 15 feet long, has collapsed into the discharge channel immediately downstream from the spillway exposing the embankment soils. The downstream slope is covered with dumped riprap from the crest to the toe adjacent to the downstream end of the collapsed concrete training wing wall. At one location to the left of the service bridge over the spillway is a footpath which is mostly bare of vegetation from the crest to the toe of the slope.

The crest of the dam is rather uneven and mostly covered with grass. Several trees are growing at or above the waterline on the upstream slope. Several large roots were observed extending the entire width of the crest. Considerable erosion has occurred on the upstream slope at and above the waterline resulting in displacement of several sections of riprap.

The area downstream of the toe of the dam is covered with trees, vines, and brush and is generally wet and soft. Some standing water was noted downstream of the dam but no evidence of flowing water was observed. Several trees have blown over downstream of the toe.

The top of the concrete corewall is spalled and eroded. No evidence of major thru wall cracking or movement was noted.

b. Appurtenant Structures.

(1) Ungated Spillway. The downstream face of the spillway in the vicinity of the 2-inch notch in the crest is surface eroded approximately 3/4 of an inch exposing the coarse aggregate. A wet spot on the downstream face was visible near the bottom left end. The concrete abutments at the end of the spillway are eroded at the waterline upstream of the spillway. A large section of the right concrete spillway training wing wall has collapsed adjacent to the spillway (See Section 3.1.a above).

(2) Service Bridge. The steel beams are surface corroded and the center piers are rusting where they have been in contact with water. The upstream edge of the concrete deck is spalled and eroded.

(3) Low Level Outlet. A crack runs the full height of the low-level outlet valve pit on both sides. The steel stairs in the pit are badly corroded, and the downstream end of the outlet pipe is covered with debris and could not be seen.

c. Reservoir Area. The watershed above the lake is gently to moderately sloping and wooded. Morsetown Road runs parallel to the east edge of the reservoir. The reservoir slopes appear to be stable. No evidence of significant sedimentation was observed in the reservoir. Several trees are overhanging the pond at the approach to the spillway at the left abutment.

d. Downstream Channel. The channel downstream from the spillway runs along the toe of the embankment for about 50 feet before making a turn downstream. Considerable erosion has occurred on the right and left banks of the channel immediately downstream of the spillway for a distance of 100 to 200 feet. The channel bottom is in soil and there is limited erosion protection on the side of the channel adjacent to the toe.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were disclosed. Water level is controlled as the situation dictates.

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. The owner said that she opens the drawdown line to lower the water level about 2 feet each fall and allows spring freshets to refill the reservoir.

4.4 Warning System

No description of any warning system was found.

4.5 Evaluation of Operational Adequacy

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

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Because no hydrologic or hydraulic data were revealed, an evaluation could not be performed.

b. Experience Data. No experience data were found.

c. Visual Inspection. The ogee spillway is, in general, in good condition with minor crest spalling and a wet spot on the ogee face. The right downstream training wall of the spillway has collapsed. The owner states that this big block of concrete now serves in part as an energy dissipator on the right side. However, the embankment is exposed and is ravelling behind the overturned wingwall. Vertical cracks were noted in the walls of the valve box, and its steel access ladder was badly corroded. The downstream outlet of the drawdown pipe was covered with debris and the outlet was not observed. The downstream channel empties into a small dammed pond about 100 yards downstream of the dam. The channel downstream from this low dam runs through a 3 x 4 foot box culvert under Morsetown Road and empties into a second small pond. Several houses have their first floor 6 feet above the normal water surface of this second pond.

d. Carpi Lake Dam Overtopping Potential. The hydraulic/hydrologic evaluation for the dam is based on a selected 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 as significant hazard and small in size. The PMF was determined by application of the SCS dimensionless unit hydrograph to a 24-hour probable maximum precipitation of 22.0 inches. Hydrologic computations are given in Appendix 3.

The one-half PMF peak inflow to the reservoir is 870 cfs. The routed, one-half PMF discharge from the reservoir is 637 cfs.

The minimum elevation of the top of dam allows 1.7 feet of depth above the spillway. Under this head the total spillway capacity is 205 cfs, which is capable of passing 46 percent of the selected SDF inflow hydrograph. Thus the spillway is considered inadequate.

Flood routing calculations indicate that Carpi Lake Dam will be overtopped for 3 hours to a maximum depth of 0.9 foot under one-half PMF conditions.

e. Drawdown Capability. The 12-inch low-level outlet is capable of dewatering the dam in about 4 days, assuming no inflow; this is considered adequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

The presence of a dense growth of trees, vines, miscellaneous debris, and brush on the downstream slope of the embankment makes it impossible to make an adequate visual inspection of the embankment.

Trees growing on the embankment and in the area downstream of the toe may blow over and pull out their roots, or they may die with the result that the roots rot. Either of these events may result in serious seepage and erosion problems.

The collapse of the right concrete spillway training wall and adjacent erosion along the embankment toe that is due to the flow of water in the discharge channel could lead to a breach of the embankment and could also contribute to stability problems in the spillway structure.

The pedestrian path to the left of the spillway, mostly bare of vegetation from the crest to the downstream toe of the embankment, is susceptible to additional erosion and consequent damage to the embankment due to both runoff of rainfall and, if it should occur, overtopping.

The crest of the dam is uneven. Although the cause of the unevenness cannot be determined on the basis of visual inspection alone, it may be a sign of a potential stability problem. The soft, wet area and standing water at the downstream toe of the dam may be indicative of seepage through and under the dam which, if not properly controlled, could lead to failure of the dam by piping or sloughing of the downstream slope.

The deteriorating concrete in the spillway and the cracks in the valve pit box (because it is on the core wall) could contribute to stability problems if allowed to advance.

Serious erosion of the upstream slope of the dam at and above the waterline, if allowed to continue, could result in eventual breaching of the embankment.

6.2 Design and Construction Data

No design or construction data pertinent to the structural stability of the dam are available.

6.3 Operating Records

No operating records pertinent to the structural stability of the dam were available.

6.4 Post-Construction Changes

No record of post-construction changes was available.

6.5 Seismic Stability

This dam is in Seismic Zone 1. According to the Recommended Guidelines, dams located in Seismic Zone 1 "may be assumed to present no hazard from earthquake provided static stability conditions are satisfactory and conventional safety margins exist." The observations made during the visual inspection provided an indication of unstable embankments as mentioned in Section 6.1. However, because no data are available concerning the engineering properties of the embankment and foundation materials for this dam or the condition at the base of the core wall, it is not possible to make an engineering evaluation of the stability of the slope or the factor of safety under static conditions.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Carpi Dam is approximately 50 years old and is in poor 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 7.2.b should be implemented by the owner as prescribed.

d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which are listed in 7.2.a. These problems 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 failure of the dam.

7.2 Recommendations/Remedial Measures

a. Recommendations.

The owner should engage a professional engineer qualified in the design and construction of dams to accomplish the following in the near future:

(1) Evaluate further the adequacy of the spillway capacity and design and oversee construction of additional capacity if found necessary.

(2) Investigate the cause of wet, soft areas and standing water at the downstream toe of the dam.

(3) Investigate the uneven condition of the dam crest and design or specify measures to correct this condition.

(4) Design or specify the repairs for the erosion of the upstream slope and oversee the placement of adequate erosion protection for the upstream slope of the dam.

(5) Specify and oversee removal of trees, brush and vines from the entire embankment.

(6) Design and oversee replacement of the collapsed right, downstream concrete spillway training wingwall.

(7) Design and oversee the placement of adequate erosion protection along the toe of the embankment adjacent to the discharge channel.

(8) Design and oversee repairs to deteriorated concrete on the spillway and low-level outlet valve pit.

b. Alternatives. No alternative measures are recommended unless the owner determines that the reservoir is no longer required. In that case, the dam may be breached.

c. Operating and Maintenance Procedures.

The owner should accomplish the following soon:

(1) Start a program of periodically checking the condition of the dam and monitoring the wet area along the toe of the downstream slope.

(2) Develop an emergency action plan which outlines actions taken by the owner to minimize downstream effects of an emergency at the dam.

(3) Remove trees and brush for a distance of 25 feet downstream from the toe of the dam or to the property line, whichever is less.

(4) Control trespassing on the dam.

In the near future:

(1) Re-establish and maintain grassy vegetation on the dam after removal of trees, brush, vines and repair of eroded areas on the dam.

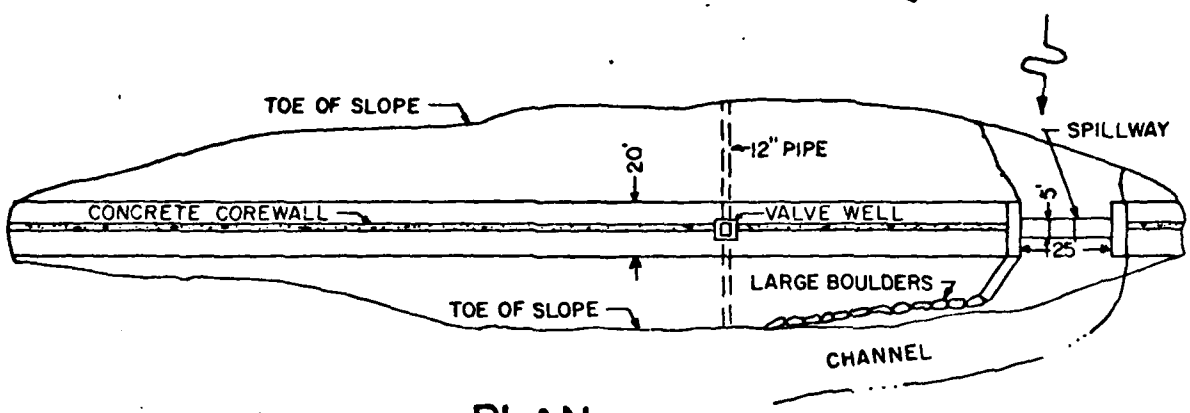
(2) Clear trees and brush on either side of the spillway discharge channel for distance of 100 feet from the spillway crest or to the limits of the property line whichever is less.

(3) Clean and paint all rusted steel on the service bridge.

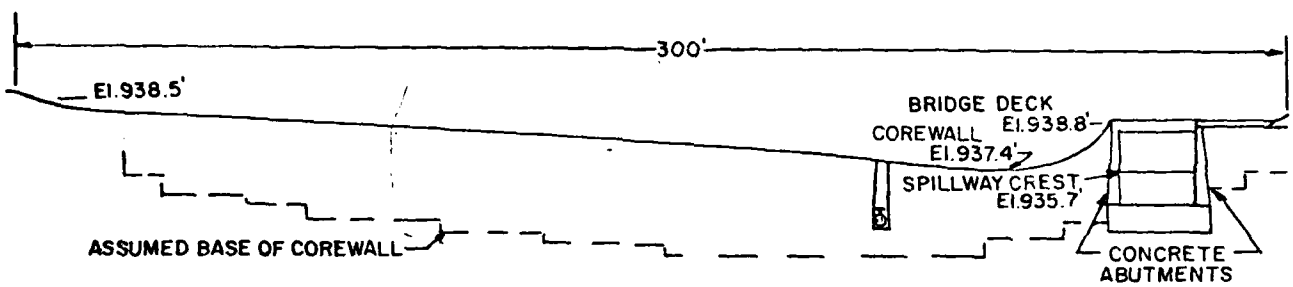
(4) Repair or replace steel ladder in valve pit.

(5) Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

CARPI LAKE



PLAN



ELEVATION

12" C.I.P. INVERT El.927.2'

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

CARPI LAKE DAM

TRIB. TO MORSETOWN BROOK — NEW JERSEY

SCALE NOT TO SCALE

DATE JUNE 1981

FIGURE - 1

Anderson-Nichols & Co, Inc.	U.S. ARMY ENGINEER DIST. PHILADELPHIA
BOSTON MASSACHUSETTS	CORPS OF ENGINEERS PHILADELPHIA, PA.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

CARPI LAKE DAM
LOCATION MAP

TRIB. TO MORSETOWN BROOK NEW JERSEY

SCALE: 1" = 4 Miles Approx.

DATE: JUNE 1981

SCALE IN MILES

0 4 8

MAP BASED ON STATE OF NEW JERSEY OFFICIAL MAP & GUIDE.

FIGURE

APPENDIX 1

CHECK LIST

VISUAL INSPECTION

CARPI LAKE DAM

Check List
Visual Inspection
Phase 1

Name Dam Carpi Lake Dam County Passaic State NJ (00192) Coordinators NJDEP

Date(s) Inspection 2/17/81, 4/23/81 Weather Sunny, warm; Rain Temperature 52°, 55°

Pool Elevation at Time of Inspection 934.7' NGVD Tailwater at Time of Inspection None NGVD

Inspection Personnel:

W. Guinan
S. Gilman
R. Murdock
K. Stuart
D. Deane
C. Plaud

R. Murdock/K. Stuart Recorder

Owner did not accompany inspection party

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete in fair condition. Erosion of concrete surface in vicinity of 2-inch notch is eroded 3/4-inch exposing coarse aggregate. Face of spillway is surface eroded exposing coarse aggregate. Minor wet spot noted near bottom left of center.	Repair concrete
APPROACH CHANNEL	Clear - unobstructed	
DISCHARGE CHANNEL	Brush, trees. Training wall on right side d/s collapsed into channel about 4 years ago. Natural stream bed, erosion on both banks.	Repair or replace training wall
BRIDGE AND PIERS OVER SPILLWAY	Concrete deck in fair condition. Piers in fair condition. Deck in good condition except for spalling and erosion on u/s edge. Abutments - both u/s faces are eroded and spalled at the water line and beneath the deck. Beams - Surface corroded - no paint. Columns - Painted but rusting where in contact with water - other minor areas of corrosion. Railing - fair - u/s railing is loose.	Repair deteriorated concrete. Clean and paint rusting steel. Repair railings.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Sloughing on upstream face, some trees, sloughing and erosion on downstream slope, extensive vegetation, difficult to inspect slope thoroughly.	Clear vegetation; repair erosion and provide adequate erosion protection.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal - Good Vertical - Slight undulation of surface near downstream edge of crest.	Investigate cause and correct undulation.
RIPRAP FAILURES	Many areas of displaced riprap along crest.	Repair riprap.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS	None apparent	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Erosion on both sides of spillway, right concrete spillway training wall collapsed downstream of spillway.	
ANY NOTICEABLE SEEPAGE	Entire toe wet and soggy, standing water evident, no seepage observed, may be obscured by extensive vegetation.	
STAFF GAGE AND RECORDER	None apparent	
DRAINS	None apparent	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Crack running full height of concrete valve pit, both sides. Steel steps in chamber are badly corroded.	Repair cracks Replace steps
INTAKE STRUCTURE	Under ice - not visible	
OUTLET PIPE	Not visible, covered by brush and rocks, operated recently.	Remove brush and restore end of pipe.
OUTLET CHANNEL	Brush	
EMERGENCY GATE	Approximate 10-inch gate valve with hand wheel.	Verify operating capability of valve.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gradual to steeply sloped, some open fields.	
SEDIMENTATION	No appreciable sedimentation noted in reservoir.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Brush filled, trees 6 inches to 8 inches	Cut trees/brush
SLOPES	Gentle slopes	
APPROXIMATE NO. OF HOMES AND POPULATION	One house - 9-ft sill One house - 12-ft sill 2 Houses - 3 ft above d/s pond d/s bridge - 4 ft deep - 4.5 ft wide - 34 ft long	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	An undated plan, #22-129, is on file at the New Jersey Department of Environmental Protection, Prospect Street, Trenton, New Jersey 08625.
REGIONAL VICINITY MAP	Prepared for this report
CONSTRUCTION HISTORY	None found
TYPICAL SECTIONS OF DAM	See "PLAN OF DAM" above
HYDROLOGIC/HYDRAULIC DATA	None found
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	None found
RAINFALL/RESERVOIR RECORDS	None found

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

ITEM	REMARKS
MONITORING SYSTEMS	None found
MODIFICATIONS	None found
HIGH POOL RECORDS	None found
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None found
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None found
MAINTENANCE OPERATION RECORDS	None found

ITEMS	REMARKS
SPILLWAY PLAN	See "PLAN OF DAM"
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	None found

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: .28 square miles, woods

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 935.7' NGVD (57.2 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not applicable

ELEVATION MAXIMUM TEST FLOOD POOL: 938.4' NGVD

ELEVATION TOP DAM: 937.4' NGVD

SPILLWAY CREST: Overflow, low notch in weir

a. Elevation 935.7' NGVD

b. Type Ogee

c. Width 16 feet

d. Length 25 feet

e. Location Spillover Right end of dam

f. Number and Type of Gates None

OUTLET WORKS: 1-12" C.I.P., Invert at 927.2' NGVD

HYDROMETEOROLOGICAL GAGES: None

MAXIMUM NON-DAMAGING DISCHARGE: 205 cfs

APPENDIX 2

PHOTOGRAPHS

CARPI LAKE DAM

February 17, 1981

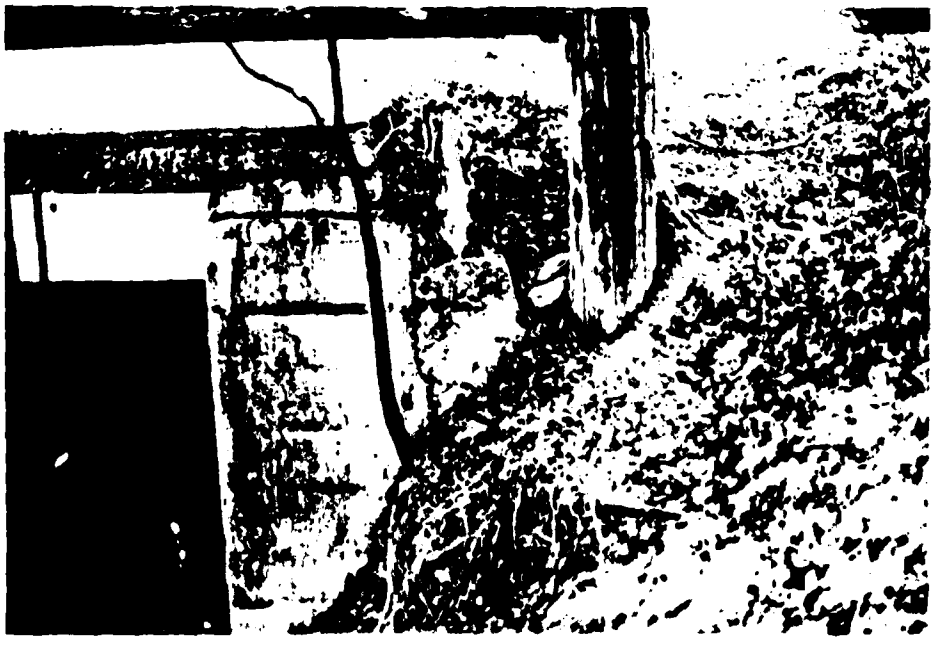
Bridge deck slab, core wall and valve box, looking from left (west) to right (east) along axis of dam.

February 17, 1981

Overflow spillway downstream face.

April 23, 1981

Erosion and spalling of concrete spillway training wall below bridge slab on upstream left side of dam.

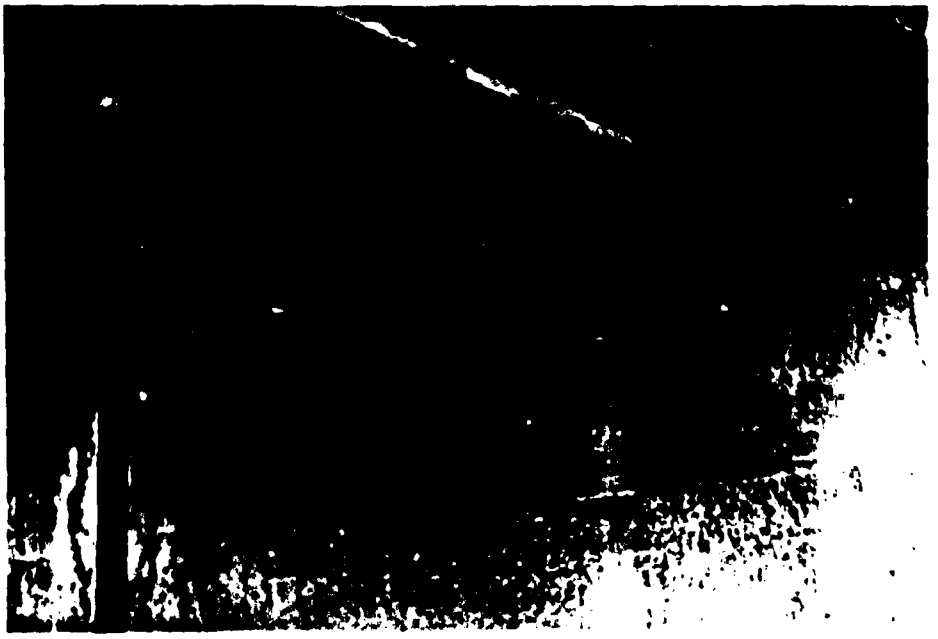


April 23, 1981

Erosion adjacent to spillway, downstream left side.

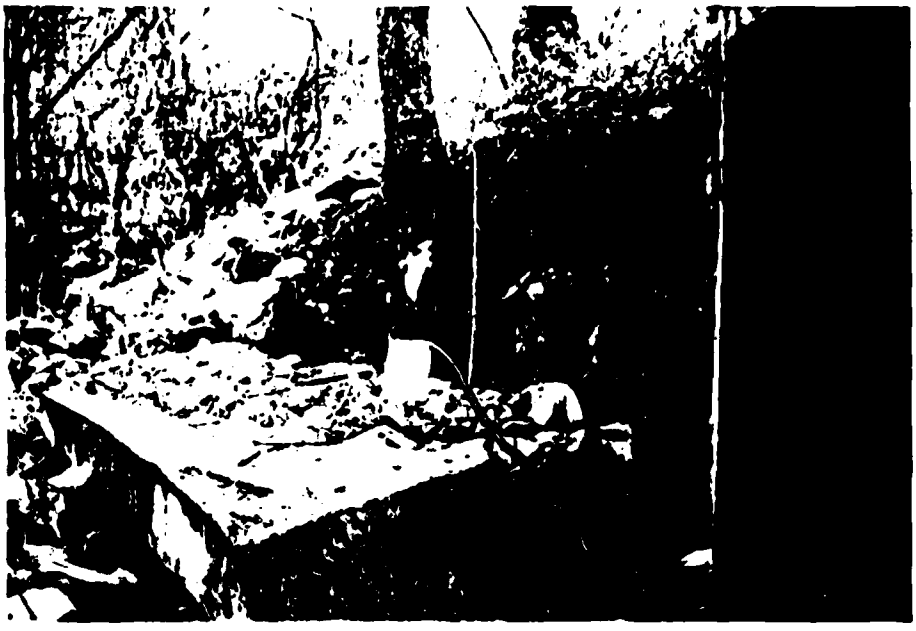
April 23, 1981

Ogee spillway contact with left training wall. Note crack across face near bottom and wet spot near left bottom of photograph.



April 23, 1981

Beam anchorage under deck.



April 23, 1981

Collapsed right training wingwall of spillway; rule extended 6 feet.

April 23, 1981

Undercutting at toe of slope caused by the close proximity of discharge channel; looking upstream.

April 23, 1981

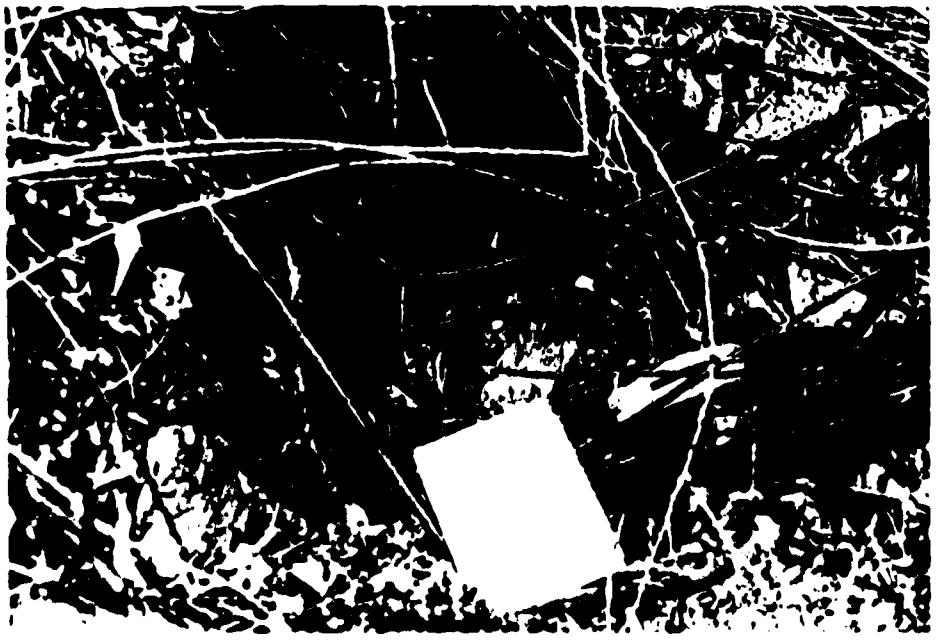
Crest is slightly undulating in elevation.

April 23, 1981

Large berm on downstream slope: may be due to former sloughing.

April 23, 1981

Ground wet and soggy with some standing water along toe of slope.



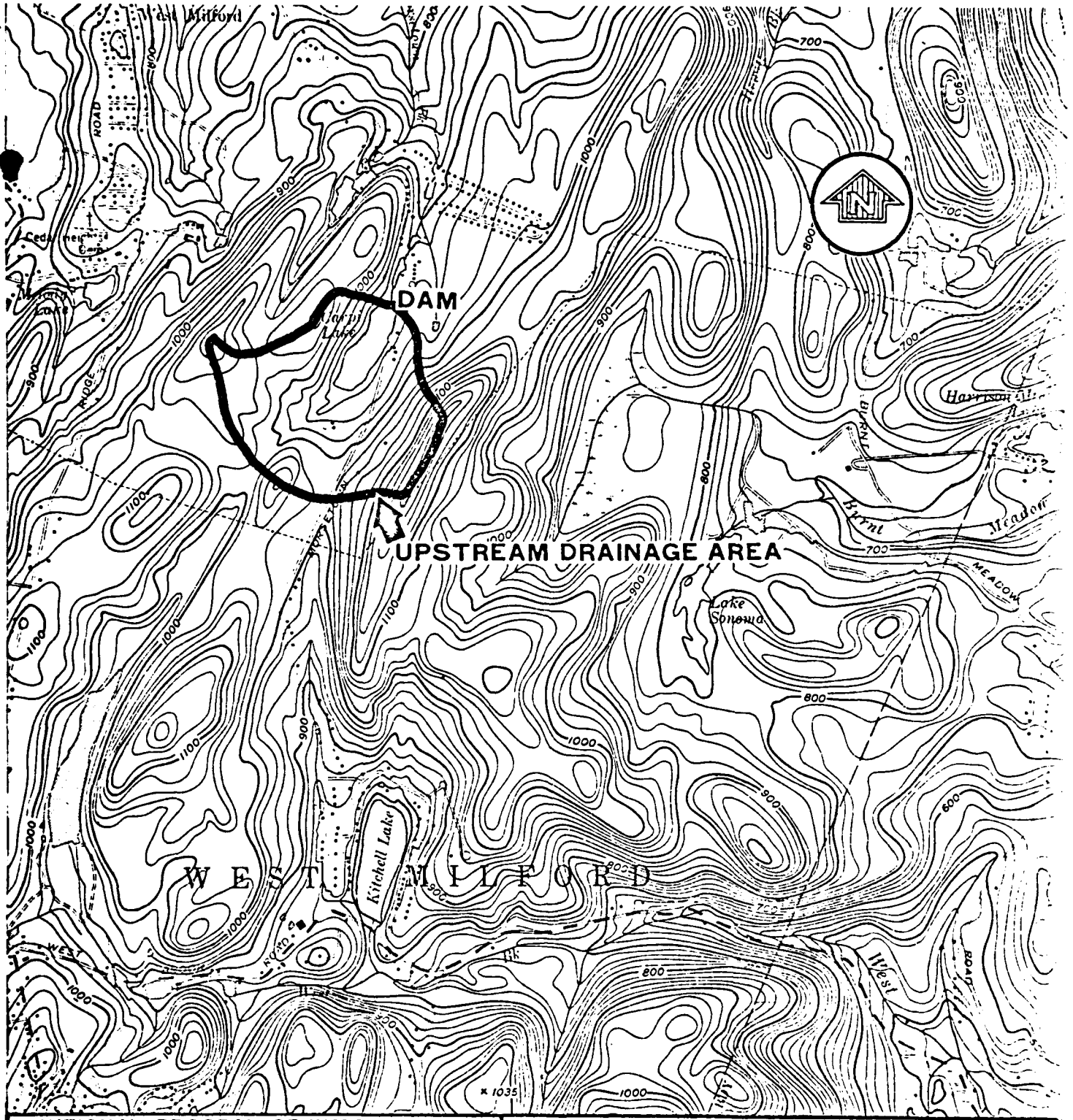
April 23, 1981

Large erosion feature at the toe of slope 3 feet wide, 4 feet along slope, and 2 feet deep.

APPENDIX 3

HYDROLOGIC COMPUTATIONS

CARPI LAKE DAM



NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

CARPI LAKE DAM

WEST MILFORD TOWNSHIP, NEW JERSEY

REGIONAL VICINITY MAP

JUNE 1981

DEPARTMENT OF THE ARMY

PHILADELPHIA DISTRICT, CORPS OF ENGINEERS

PHILADELPHIA, PENNSYLVANIA

Andersen-Nichols & Company, Inc. BOSTON, MA.

SCALE IN MILES

0 1/2 1

MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE SHEET WANAQUE, N.J. 1954, REVISED 1971.

Time of Concentration

① Texas Highway Method

all overland - longest flowpath = 2,300 ft.

$\text{Slope} = \frac{1100-935}{2,300} = 0.072 = 7.2\%$

velocity = 2.0 fps for woodlands

$\text{Time} = \frac{2,300}{2.0} = 1150 \text{ sec} = 0.32 \text{ hours}$

② Soil and Water Conservation Method

$L = 0.6\,T_c = \frac{\ell^{0.8}\,(s+1)^{1.67}}{9,000\,y^{0.5}}$ $\qquad S = \frac{1,000-CN}{10}$

$y = 7.2\%$
$\ell = 2,300$
CN = 70 for good condition woods, soil group C → $S = 4.29$

$T_c = 0.55$ hours

③ Weston, or SCS T.R. #55 Method

all overland. Slope = 7.2%, length = 2,300 ft

From T.R. #55 graph, $v = 0.7$ fps

$\text{Time} = \frac{2,300}{0.7} = 3,286 \text{ sec} = 0.91 \text{ hours}$

④ Kerby Method

all overland. $T_c = 0.83\left(\frac{N\ell}{\sqrt{s}}\right)^{0.467}$, $N = 0.7$, $L = 2,300$ ft, $S = 0.072$

$T_c = 0.83\left(\frac{0.7\,(2,300)}{\sqrt{0.072}}\right)^{0.467} = 48.2 \text{ min} = 0.80 \text{ hours}$

Anderson-Nichols & Company, Inc.

Subject Carpi Lake

Sheet No. 1 of 12
Date 6/29/81
Computed TCG
Checked KWS

JOB NO.

SQUARES 1/4 IN. SCALE

Average of 4 methods: $T_c = \frac{0.32 + 0.55 + 0.91 + 0.80}{4} = 0.645$ hours

$t_{ag} = 0.6\, T_c = 0.387$ hrs.

SQUARES 1/4 IN. SCALE

Stage Versus Discharge

A hydraulic profile of Carpi Lake Dam is given on page 4. E = water surface elevation (feet above NGVD). Numbers in circles (①, ②, etc.) refer to sections numbered on page 4.

Spillway (section ③):

From 935.7 to about 938.5 weir flow, $Q = C L H^{3/2}$, $C = 3.7$ for ogee

$Q = 3.7(25)(E-935.7)^{3/2}$

Above 938.50 so, the spillway becomes an orifice with a broad-crested weir above.

$Q = Q_{orifice} + Q_{B.C.\ weir}$

$= C_{orifice} A_{orifice} \sqrt{2g H_{orifice}} + C_{weir} L H_{weir}^{3/2}$

$C_{orifice} = 0.61$
$A_{orifice} = 25(2.4) = 60 ft^2$
$H_{orifice} = E - 936.9$

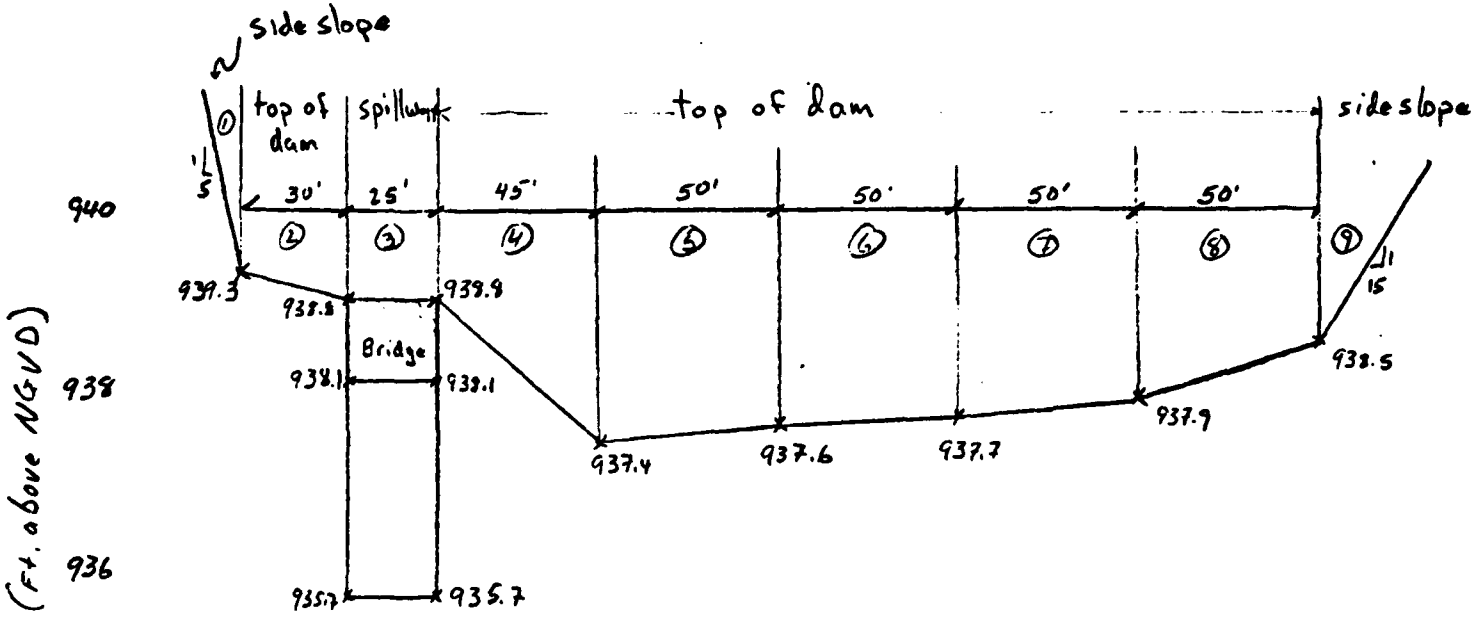
$C_{weir} = 3.0$
$L = 25'$
$H_{weir} = E - 938.8$

$Q = 0.61\ (60)\ \sqrt{64.4}\ (E-936.9)^{\frac{1}{2}} + 3.0\ (25)(E-938.8)^{\frac{3}{2}}$

$= 293.7\ (E-936.9)^{1/2} + 3\ (25)\ (E-938.8)^{3/2}$

Top of Dam (sections ②, ④, ⑤, ⑥, ⑦, ⑧):

We will get stage vs. Q. at 927.2, 935.7, 936, 936.5, 937, 937.4, 938, 938.5, 939, 939.5. $C = 2.7$ for all top of dam sections



⊗ 12" C.I.P., invert at 927.2

ANDERSON-NICHOLS

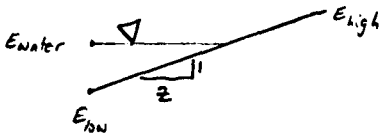
VERNON BOSTON CONCORD

Carpi Lake Dam
Hydraulic Profile

DATE	SCALE: V. 1" = 2' H. 1" = 50'	JOB NO.	SHEET NO.
6/29/81			D 4 of 12

Section ② is a 60H:1V sloping weir with avg height 939.05, one end at 938.8, and the other at 939.3. Length = 30 ft.
Section ④ is a 45' long 32.1H:1V sloping weir with avg. height 938.1, one end at 937.4, and the other at 938.8
Section ⑤ is a 50' 250 H:1V sloping weir, avg. ht. 937.5, ends 937.4 and 937.6
Section ⑥ is a 50' 500H:1V sloping weir, avg. ht. 937.65, ends 937.6 and 937.
Section ⑦ is a 50' 250 H:1V sloping weir, avg. ht. 937.8, ends 937.7 and 937.9
Section ⑧ is a 50' 83.3H:1V sloping weir, avg. ht. 938.2, ends 937.9 and 938.5

for a paritially submerged sloping weir:



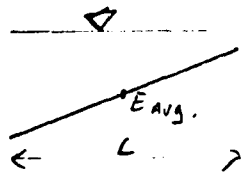
$$Q = C\, L_{submerged}\, H_{avg}^{3/2}$$

$$C_{submerged} = 2\,(E_{water} - E_{low})$$

$$H_{avg} = \frac{0 + (E_{water} - E_{low})}{2} = 0.5(E_{water} - E_{low})$$

$$Q = C\,(2)(E_{water} - E_{low})\,(0.5(E_{water} - E_{low}))^{3/2}$$

for a fully submerged sloping weir:



$$Q = C\,L\,H_{avg}^{3/2} = C\,L\,(E_{water} - E_{avg})^{3/2}$$

for stage of 927.2, 935.7, 936, 936.5, 937, 932.4: $Q = 0.0$

for stage of 938-938.5: $Q = 2.7\,(32.1)\,(E-937.4)^{④}\,(0.5(E-937.4))^{3/2} + 2.7\,(50)^{⑤}\,(E-937.5)^{3/2}$
$+ 2.7\,(50)^{⑥}\,(E-937.65)^{3/2} + 2.7\,(50)^{⑦}\,(E-937.8)^{3/2}$
$+ 2.7\,(83.3)^{⑧}\,(E-937.9)\,(0.5(E-937.9))^{3/2}$

for stage of 939: $Q = 2.7\,(60)^{②}\,(E-938.8)\,(0.5(E-938.8))^{3/2} + 2.7\,(45)^{④}\,(E-938.1)^{3/2}$
$+ 2.7\,(50)^{⑤}\,(E-937.5)^{3/2} + 2.7\,(50)^{⑥}\,(E\,937.65)^{3/2} + 2.7\,(50)^{⑦}\,(E-937.8)^{3/2} + 2.7\,(50)^{⑧}\,(E\,93$

Anderson-Nichols & Company, Inc. Subject Carp Lake

Sheet No. 6 of 12
Date 6/29/81
Computed TCT
Checked LRS

JOB NO.

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

for a stage of 939.5 : $Q = 2.7(30)(E-939.05)^{3/2}$ (2) $+ 2.7(45)(E-937.1)^{3/2}$ (4)

$+ 2.7(50)(E-937.5)^{3/2}$ (5) $+ 2.7(50)(E-937.65)^{3/2}$ (6) $+ 2.7(50)(E-937.8)^{3}$ (7)

$+ 2.7(50)(E-938.2)^{3/2}$ (9)

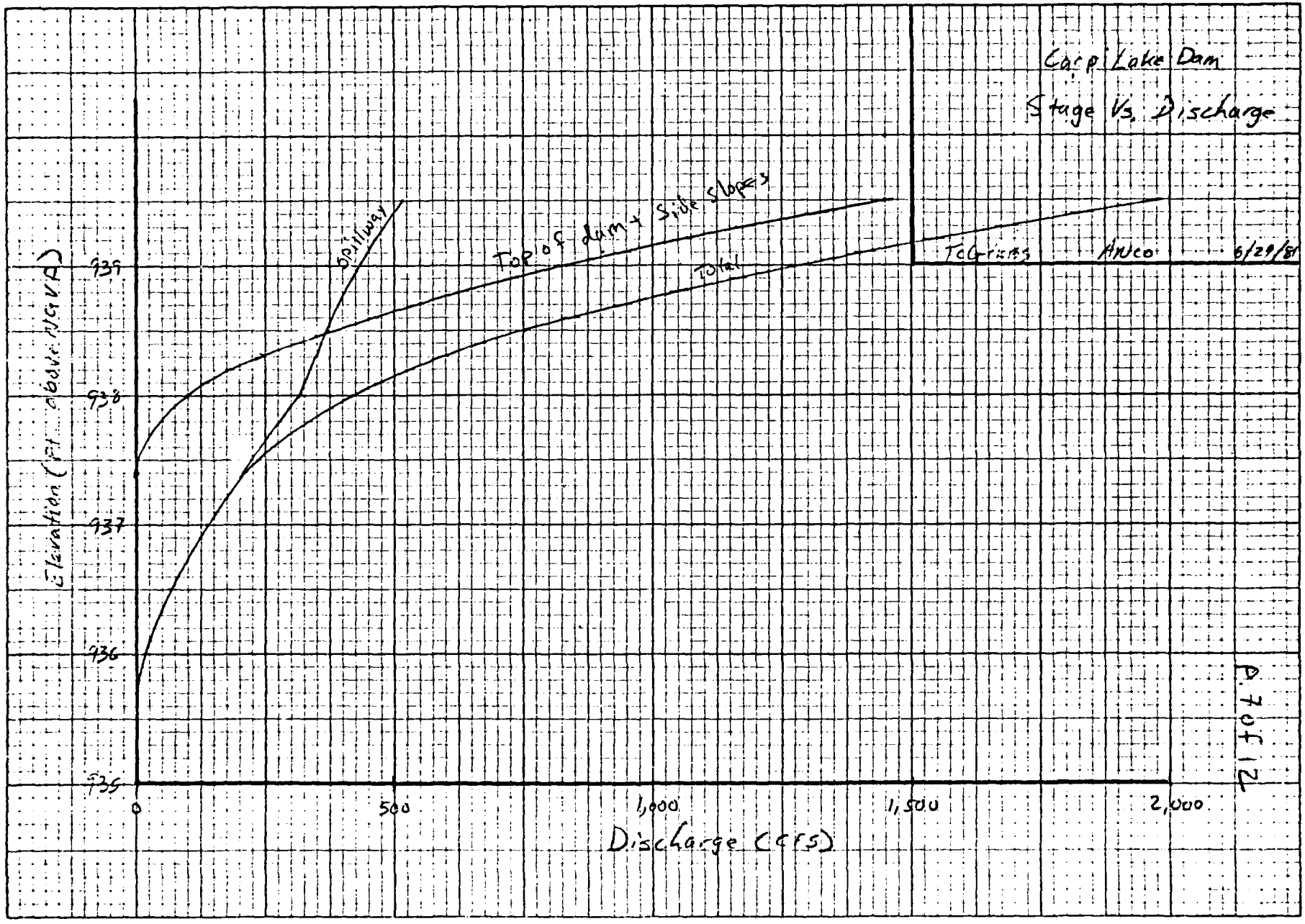
Side Slopes (sections (1) and (8)): C = 2.6

for 927.2 - 938.5, Q = 00

for 939.0 $Q = 2.6(15)(E-938.5)(0.5(E-938.5))^{3/2}$ (8)

for 939.5 $Q = 2.6(5)(E-939.3)(0.5(E-939.3))^{3/2}$ (1) $+ 2.6(15)(E-938.5)(0.5(E-938.5))^{3/2}$

Elevation (Ft. above NGVD)	Description	$Q_{spillway}$ (cfs)	$Q_{Top\ of\ Dam}$ (cfs)	$Q_{side\ slopes}$ (cfs)	Q_{Total} (cfs)
927.2	invert of blow-off, 0 storage	0	0	0	0
935.7	Spillway crest	0	0	0	0
936.0		15	0	0	15
936.5		66	0	0	66
937.0		137	0	0	137
937.4	top of dam	205	0	0	205
938.0		323	97	0	420
938.5		372	381	0	753
939.0		432	839	2	1,273
939.5		518	1,447	14	1,979

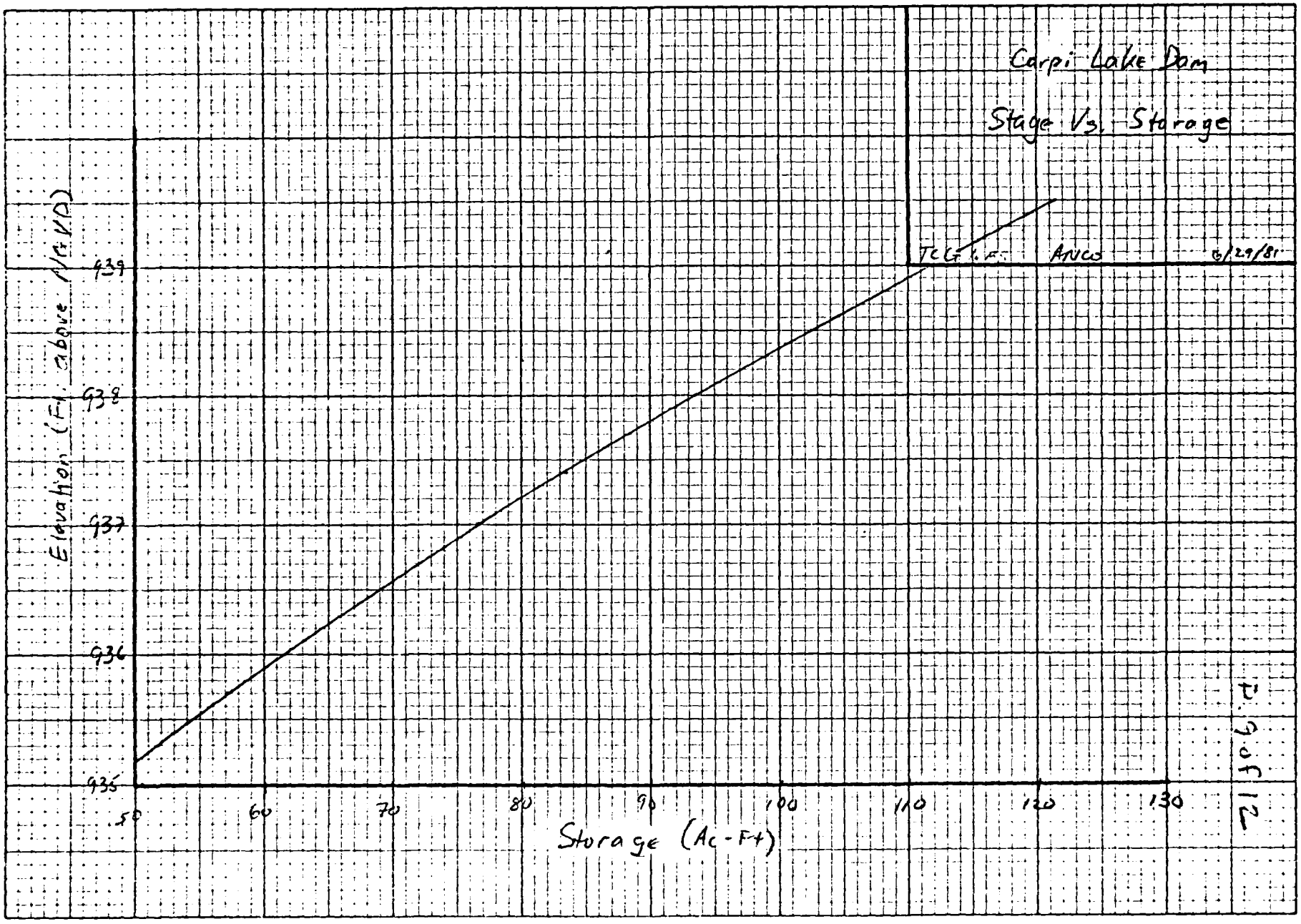


SQUARES 1/4 IN. SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Stage Vs Storage

Surface area at normal pool, 935.7 ft NGVD = 14.3 acres. The surface area at 940 ft. NGVD = 20.1 ac. Assume: 4 ft avg. depth (→ normal storage = 4 (14.3) = 57.2 ac-ft); 0 storage at 927.2; linear increase in surface area with elevation

Elevation (Ft. above NGVD)	ΔH (Feet)	Surface Area (Acres)	Avg. S.A. (Acres)	Incremental Storage (Ac-Ft)	Cumulative Storage (Ac-Ft)
927.2		0			0
	8.5		—	—	
935.7		14.3			57.2
	0.3		14.5	4.4	
936.0		14.7			61.6
	0.5		15.05	7.5	
936.5		15.4			69.1
	0.5		15.7	7.8	
937.0		16.0			76.9
	0.4		16.35	6.5	
937.4		16.7			83.4
	0.6		17.05	10.2	
938.0		17.4			93.6
	0.5		17.75	8.9	
938.5		18.1			102.5
	0.5		18.45	9.2	
939.0		18.8			111.7
	0.5		19.1	9.6	
939.5		19.4			121.3



Anderson-Nichols & Company, Inc.

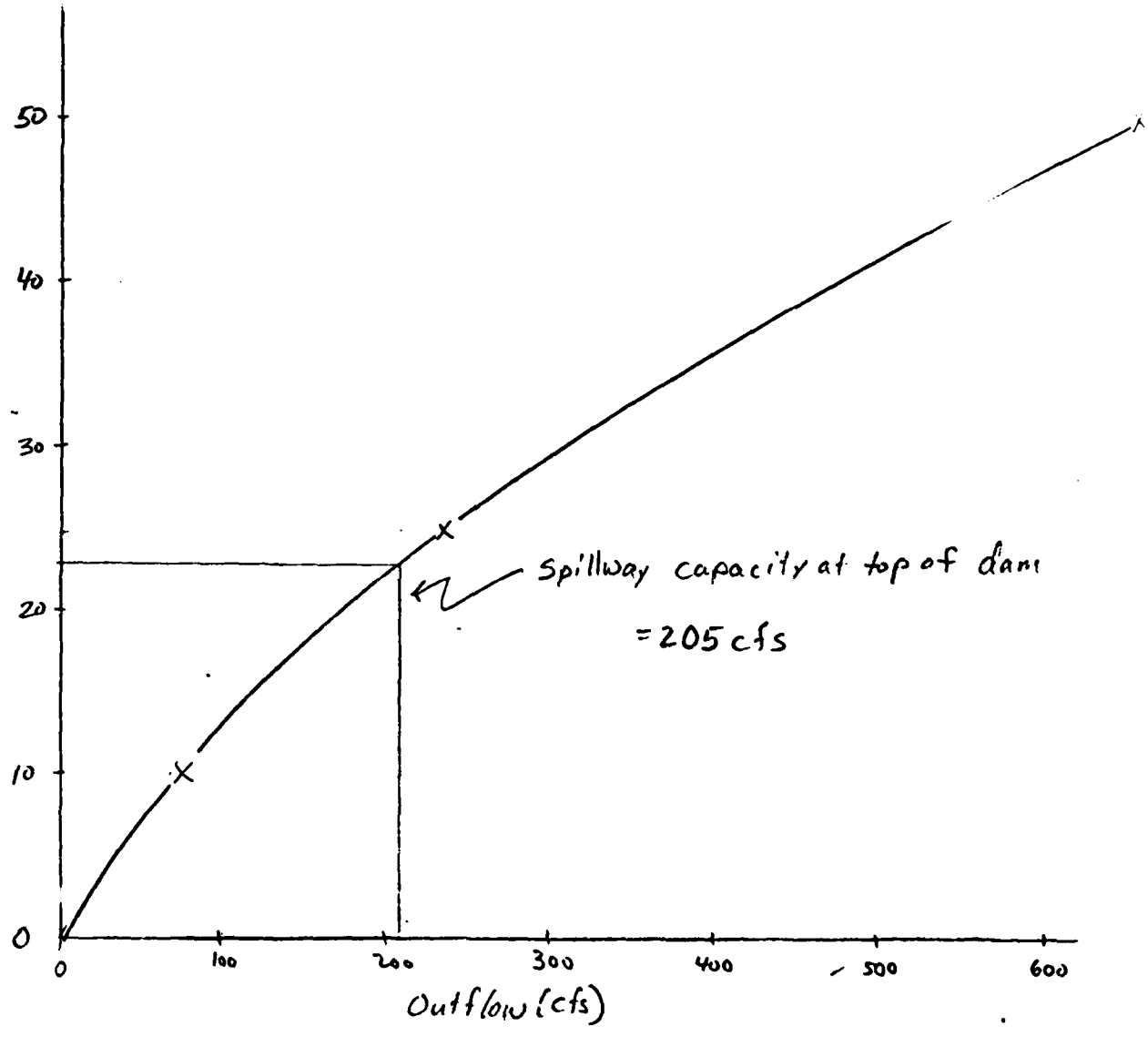
Subject Carpi Lake

Sheet No. 10 of 11
Date 6/29/81
Computed TCR
Checked RLV

JOB NO.

SQUARES 1/4 IN. SCALE

Overtopping Analysis



Drawdown Time

① Plans show one 12" pipe, invert at 927.2. Assume inlet control,

$Q = C A \sqrt{2g} \sqrt{H}$; $C = 0.61$, $A = \frac{\pi}{4}$, $H = E - 927.7$

$$Q = 0.61 \left(\frac{\pi}{4}\right) \sqrt{64.4} \, (E-927.7)^{1/2} = 3.84 \, (E-927.7)^{\frac{1}{2}}$$

② For storage below the water surface, assume:

$S = C_s h^N$. h = height above 0 storage, 927.2',

from p. 8:

	E	h	S
Point 1	935.7	8.5	57.2
Point 2	939.5	12.3	121.3

so $121.3 = C_s (12.3)^N$

$\ln 121.3 = \ln C_s + N \ln 12.3$

$\rightarrow \ln C_s = 4.798 - N (2.510)$

and $57.2 = C_s (8.5)^N$

$\ln 57.2 = \ln C_s + N \ln 8.5$

substitute for $\ln C_s$ from above.

$4.047 = 4.798 - N (2.513) + (N)(2.140)$

$$N = \frac{4.798 - 4.047}{2.51 - 2.14} = 2.03$$

$\ln C_s = 4.798 - 2.03 (2.51) = -0.297$

$\rightarrow C_s = 0.743$

so $S = 0.743 \, (E-927.2)^{2.03}$

③ Ac-ft/day = $1.98 \, Q_{Avg}$

④ Days = $\frac{\Delta S}{\text{Ac-Ft/day}}$

Anderson-Nichols & Company, Inc.

Subject Carpi Lake

Sheet No. 12 of 12
Date 6/29/81
Computed
Checked

JOB NO.

Elevation (Ft above NGVD)	Storage (Ac-Ft)	ΔS (Ac-Ft)	Q (CFS)	Q_{AVG} (CFS)	Ac-Ft per Day	Days
935.7	57.2		10.9			
		9.1		10.65	21.1	0.43
935	48.1		10.4			
		11.7		10.0	19.8	0.59
934	36.4		9.6			
		10.1		9.2	18.2	0.55
933	26.3		8.8			
		8.4		8.4	16.6	0.51
932	17.9		8.0			
		6.7		7.5	14.9	0.45
931	11.2		7.0			
		5.2		6.4	12.7	0.41
930	6.0		5.8			
		3.5		5.1	10.1	0.35
929	2.5		4.4			
		2.0		3.25	6.4	0.31
928	0.5		2.1			
		0.5		1.05	2.1	0.24
927.2	0.0		0			

Σ = 3.84 Days

APPENDIX 4

HEC-1 OUTPUT

CARPI LAKE DAM

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
   1          ID    CARPI LAKE DAM      OVERTOPPING ANALYSIS     TOM GOOCH   ANCO
   2          ID    NEW JERSEY DAM NO. 192 - PASSAIC COUNTY - WEST MELFORD TOWNSHIP
   3          ID    ONE-HALF PMF FROM 24-HOUR PMP
   4          IT       5                0       300
   5          IO       2        1
   6          JR  FLOW      0.5

   7          KK      A1  CARPI LAKE INFLOW HYDROGRAPH
   8          KM      INFLOW FROM SCS UNIT GRAPH COMPUTATIONS
   9          BA   0.28        0
  10          BF    0.9       0.9        1
  11          PM   22.0                            NO     113     123     132
  12          LU       1       0.1
  13          UD  0.387

  14          KK      A2  ROUTE INFLOW HYDROGRAPH THROUGH CARPI LAKE
  15          RS       1     STOR      57.2
  16          SV       0     57.2      61.6      69.1      76.9      83.4      93.6     102.5     111.7     121.3
  17          SE   927.2    935.7      936.      936.5      937.     937.4      938.     938.5      939.     939.5
  18          SQ      0.       0.        15.       66.      137.      205.      420.      753.     1273.     1979.
  19          SE   927.2    935.7      936.      936.5      937.     937.4      938.     938.5      939.     939.5
  20          SS   935.7     25.0       3.7       1.5
  21          SI   937.4    275.0       0.0       1.5
  22          ZZ
```

```
****************************************                    **************************************
*                                      *                    *                                    *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *  U.S. ARMY CORPS OF ENGINEERS      *
*        FEBRUARY 1981                 *                    *  THE HYDROLOGIC ENGINEERING CENTE  *
*                                      *                    *        609 SECOND STREET           *
*  RUN DATE06/30/81     TIME14.21.50   *                    *     DAVIS, CALIFORNIA 95616        *
*                                      *                    *  (916) 440-3285 OR (FTS) 448-3285  *
****************************************                    **************************************

                    CARPI LAKE DAM        OVERTOPPING ANALYSIS       TOM GOOCH   ANCO
                    NEW JERSEY DAM NO. 192 - PASSAIC COUNTY - WEST MELFORD TOWNSHIP
                    ONE-HALF PMF FROM 24-HOUR PMP

  5 IO        OUTPUT CONTROL VARIABLES
                    IPRNT           2  PRINT CONTROL
                    IPLOT           1  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                     DMSG         YES  PRINT DIAGNOSTIC MESSAGES

    IT        HYDROGRAPH TIME DATA
                     NMIN           5  MINUTES IN COMPUTATION INTERVAL
                    IDATE       1   0  STARTING DATE
                    ITIME        0000  STARTING TIME
                       NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE       2   0  ENDING DATE
                   NDTIME        0055  ENDING TIME

               COMPUTATION INTERVAL     0.08 HOURS
                    TOTAL TIME BASE    24.92 HOURS

          ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

    JP        MULTI-PLAN OPTION
                    NPLAN            1  NUMBER OF PLANS

    JR        MULTI-RATIO OPTION
                 RATIOS OF RUNOFF
                  0.50

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         **************
  7 KK   *      A1    *       CARPI LAKE INFLOW HYDROGRAPH
         **************
                          INFLOW FROM SCS UNIT GRAPH COMPUTATIONS

              SUBBASIN RUNOFF DATA

  9 BA          SUBBASIN CHARACTERISTICS
                    TAREA           0.29  SUBBASIN AREA

 10 BF          BASE FLOW CHARACTERISTICS
                    STRTQ           0.90  INITIAL FLOW
                    QRCSN           0.90  BEGIN BASE FLOW RECESSION
                    RTIOR        1.00000  RECESSION CONSTANT
```

PRECIPITATION DATA

11 PM — PROBABLE MAXIMUM STORM

PMS	22.00	INDEX PRECIPITATION
TRSPC	0.80	TRANSPOSITION COEFFICIENT
TRSDA	0.28	TRANSPOSITION AREA
SWD	NU	USE SWD DISTRIBUTION

PERCENT OF INDEX PRECIPITATION OCCURRING IN GIVEN TIME

6-HR	12-HR	24-HR	48-HR	72-HR	96-HR
113.0	123.0	132.0	0.0	0.0	0.0

12 LU — UNIFORM LOSS RATE

STRTL	1.00	INITIAL LOSS
CNSTL	0.10	UNIFORM LOSS RATE
RTIMP	0.0	PERCENT IMPERVIOUS AREA

13 UD — SCS DIMENSIONLESS UNITGRAPH

TLAG	0.39	LAG

***

UNIT HYDROGRAPH
25 END-OF-PERIOD ORDINATES

30.	94.	198.	286.	315.	300.	256.	194.	134.	97.
72.	53.	38.	28.	20.	15.	11.	8.	6.	4.
3.	2.	2.	1.	0.					

HYDROGRAPH AT STATION A1

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1	1	0000	1	0.0	0.0	0.0	1.	1	1	1230	151	0.17	0.01	0.16	209.
1	1	0005	2	0.01	0.01	0.00	1.	1	1	1235	152	0.17	0.01	0.16	245.

1	0010	3	0.01	0.01	0.00	1.	*	1	1240	153	0.17	0.01	0.16	272.
1	0015	4	0.01	0.01	0.00	1.	*	1	1245	154	0.17	0.01	0.16	291.
1	0020	5	0.01	0.01	0.00	1.	*	1	1250	155	0.17	0.01	0.16	305.
1	0025	6	0.01	0.01	0.00	1.	*	1	1255	156	0.17	0.01	0.16	315.
1	0030	7	0.01	0.01	0.00	1.	*	1	1300	157	0.17	0.01	0.16	323.
1	0035	8	0.01	0.01	0.00	1.	*	1	1305	158	0.20	0.01	0.19	329.
1	0040	9	0.01	0.01	0.00	1.	*	1	1310	159	0.20	0.01	0.19	336.
1	0045	10	0.01	0.01	0.00	1.	*	1	1315	160	0.20	0.01	0.19	346.
1	0050	11	0.01	0.01	0.00	1.	*	1	1320	161	0.20	0.01	0.19	357.
1	0055	12	0.01	0.01	0.00	1.	*	1	1325	162	0.20	0.01	0.19	369.
1	0100	13	0.01	0.01	0.00	1.	*	1	1330	163	0.20	0.01	0.19	380.
1	0105	14	0.01	0.01	0.00	1.	*	1	1335	164	0.20	0.01	0.19	389.
1	0110	15	0.01	0.01	0.00	1.	*	1	1340	165	0.20	0.01	0.19	396.
1	0115	16	0.01	0.01	0.00	1.	*	1	1345	166	0.20	0.01	0.19	401.
1	0120	17	0.01	0.01	0.00	1.	*	1	1350	167	0.20	0.01	0.19	405.
1	0125	18	0.01	0.01	0.00	1.	*	1	1355	168	0.20	0.01	0.19	408.
1	0130	19	0.01	0.01	0.00	1.	*	1	1400	169	0.20	0.01	0.19	409.
1	0135	20	0.01	0.01	0.00	1.	*	1	1405	170	0.25	0.01	0.24	412.
1	0140	21	0.01	0.01	0.00	1.	*	1	1410	171	0.25	0.01	0.24	418.
1	0145	22	0.01	0.01	0.00	1.	*	1	1415	172	0.25	0.01	0.24	428.
1	0150	23	0.01	0.01	0.00	1.	*	1	1420	173	0.25	0.01	0.24	443.
1	0155	24	0.01	0.01	0.00	1.	*	1	1425	174	0.25	0.01	0.24	459.
1	0200	25	0.01	0.01	0.00	1.	*	1	1430	175	0.25	0.01	0.24	474.
1	0205	26	0.01	0.01	0.00	1.	*	1	1435	176	0.25	0.01	0.24	487.
1	0210	27	0.01	0.01	0.00	1.	*	1	1440	177	0.25	0.01	0.24	497.
1	0215	28	0.01	0.01	0.00	1.	*	1	1445	178	0.25	0.01	0.24	504.
1	0220	29	0.01	0.01	0.00	1.	*	1	1450	179	0.25	0.01	0.24	509.
1	0225	30	0.01	0.01	0.00	1.	*	1	1455	180	0.25	0.01	0.24	512.
1	0230	31	0.01	0.01	0.00	1.	*	1	1500	181	0.25	0.01	0.24	515.
1	0235	32	0.01	0.01	0.00	1.	*	1	1505	182	0.23	0.01	0.22	516.
1	0240	33	0.01	0.01	0.00	1.	*	1	1510	183	0.30	0.01	0.29	516.
1	0245	34	0.01	0.01	0.00	1.	*	1	1515	184	0.38	0.01	0.37	524.
1	0250	35	0.01	0.01	0.00	1.	*	1	1520	185	0.45	0.01	0.45	543.
1	0255	36	0.01	0.01	0.00	1.	*	1	1525	186	0.68	0.01	0.67	587.
1	0300	37	0.01	0.01	0.00	1.	*	1	1530	187	1.28	0.01	1.28	681.
1	0305	38	0.0	0.01	0.00	1.	*	1	1535	188	1.69	0.01	1.88	863.
1	0310	39	0.01	0.01	0.00	1.	*	1	1540	189	0.83	0.01	0.82	1134.
1	0315	40	0.01	0.01	0.00	1.	*	1	1545	190	0.60	0.01	0.60	1446.
1	0320	41	0.01	0.01	0.00	1.	*	1	1550	191	0.38	0.01	0.37	1682.
1	0325	42	0.01	0.01	0.00	1.	*	1	1555	192	0.30	0.01	0.29	1771.
1	0330	43	0.01	0.01	0.00	1.	*	1	1600	193	0.23	0.01	0.22	1721.
1	0335	44	0.01	0.01	0.00	1.	*	1	1605	194	0.23	0.01	0.22	1564.
1	0340	45	0.01	0.01	0.00	1.	*	1	1610	195	0.23	0.01	0.22	1350.
1	0345	46	0.01	0.01	0.00	1.	*	1	1615	196	0.23	0.01	0.22	1139.
1	0350	47	0.01	0.01	0.00	1.	*	1	1620	197	0.23	0.01	0.22	971.
1	0355	48	0.01	0.01	0.00	1.	*	1	1625	198	0.23	0.01	0.22	862.
1	0400	49	0.01	0.01	0.00	1.	*	1	1630	199	0.23	0.01	0.22	796.
1	0405	50	0.01	0.01	0.00	1.	*	1	1635	200	0.23	0.01	0.22	675.
1	0410	51	0.01	0.01	0.00	1.	*	1	1640	201	0.23	0.01	0.22	624.
1	0415	52	0.01	0.01	0.00	1.	*	1	1645	202	0.23	0.01	0.22	586.
1	0420	53	0.01	0.01	0.00	1.	*	1	1650	203	0.23	0.01	0.22	559.
1	0425	54	0.01	0.01	0.00	1.	*	1	1655	204	0.23	0.01	0.22	539.
1	0430	55	0.01	0.01	0.00	1.	*	1	1700	205	0.23	0.01	0.22	525.
1	0435	56	0.01	0.01	0.00	1.	*	1	1705	206	0.18	0.01	0.17	513.
1	0440	57	0.01	0.01	0.00	1.	*	1	1710	207	0.18	0.01	0.17	501.
1	0445	58	0.01	0.01	0.00	1.	*	1	1715	208	0.18	0.01	0.17	485.
1	0450	59	0.01	0.01	0.00	1.	*	1	1720	209	0.18	0.01	0.17	467.
1	0455	60	0.01	0.01	0.00	1.	*	1	1725	210	0.18	0.01	0.17	446.
1	0500	61	0.01	0.01	0.00	1.	*	1	1730	211	0.18	0.01	0.17	430.
1	0505	62	0.01	0.01	0.00	1.	*	1	1735	212	0.18	0.01	0.17	415.
1	0510	63	0.01	0.01	0.00	1.	*	1	1740	213	0.18	0.01	0.17	404.
1	0515	64	0.01	0.01	0.00	1.	*	1	1745	214	0.18	0.01	0.17	397.
1	0520	65	0.01	0.01	0.00	1.	*	1	1750	215	0.18	0.01	0.17	391.
1	0525	66	0.01	0.01	0.00	1.	*	1	1755	216	0.18	0.01	0.17	386.
1	0530	67	0.01	0.01	0.00	1.	*	1	1800	217	0.18	0.01	0.17	385.
1	0535	68	0.01	0.01	0.00	1.	*	1	1805	218	0.01	0.01	0.00	378.
1	0540	69	0.01	0.01	0.00	1.	*	1	1810	219	0.01	0.01	0.00	361.
1	0545	70	0.01	0.01	0.00	1.	*	1	1815	220	0.01	0.01	0.00	326.
1	0550	71	0.01	0.01	0.00	1.	*	1	1820	221	0.01	0.01	0.00	277.
1	0555	72	0.01	0.01	0.00	1.	*	1	1825	222	0.01	0.01	0.00	223.
1	0600	73	0.01	0.01	0.00	1.	*	1	1830	223	0.01	0.01	0.00	172.
1	0605	74	0.02	0.02	0.00	1.	*	1	1835	224	0.01	0.01	0.00	129.

1	1150	143	0.02	0.01	0.02	36.	*	2	0020	293	0.0	0.0	0.0		7.
1	1155	144	0.02	0.01	0.02	36.	*	2	0025	294	0.0	0.0	0.0		6.
1	1200	145	0.02	0.01	0.02	36.	*	2	0030	295	0.0	0.0	0.0		4.
1	1205	146	0.17	0.01	0.16	40.	*	2	0035	296	0.0	0.0	0.0		3.
1	1210	147	0.17	0.01	0.16	53.	*	2	0040	297	0.0	0.0	0.0		3.
1	1215	148	0.17	0.01	0.16	81.	*	2	0045	298	0.0	0.0	0.0		2.
1	1220	149	0.17	0.01	0.16	122.	*	2	0050	299	0.0	0.0	0.0		2.
1	1225	150	0.17	0.01	0.16	166.	*	2	0055	300	0.0	0.0	0.0		2.
							*			SUM	23.22	2.67	20.55		

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1771.	15.92	(CFS)	570.	156.	150.	150.
		(INCHES)	18.917	20.670	20.675	20.675
		(AC-FT)	283.	309.	309.	309.

CUMULATIVE AREA = 0.28 SQ MI

HYDROGRAPH AT STATION A1
PLAN 1, RATIO = 0.50

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	0.	1		1230	151	104.	1		1845	226	36.
1		0005	2	0.	1		0620	77	0.	1		1235	152	122.	1		1850	227	28.
1		0010	3	0.	1		0625	78	0.	1		1240	153	136.	1		1855	228	22.
1		0015	4	0.	1		0630	79	0.	1		1245	154	146.	1		1900	229	17.
1		0020	5	0.	1		0635	80	0.	1		1250	155	152.	1		1905	230	14.
1		0025	6	0.	1		0640	81	0.	1		1255	156	158.	1		1910	231	12.
1		0030	7	0.	1		0645	82	0.	1		1300	157	161.	1		1915	232	10.
1		0035	8	0.	1		0650	83	0.	1		1305	158	165.	1		1920	233	9.
1		0040	9	0.	1		0655	84	0.	1		1310	159	168.	1		1925	234	8.
1		0045	10	0.	1		0700	85	0.	1		1315	160	173.	1		1930	235	7.
1		0050	11	0.	1		0705	86	0.	1		1320	161	179.	1		1935	236	7.
1		0055	12	0.	1		0710	87	0.	1		1325	162	185.	1		1940	237	6.
1		0100	13	0.	1		0715	88	0.	1		1330	163	190.	1		1945	238	6.
1		0105	14	0.	1		0720	89	1.	1		1335	164	195.	1		1950	239	6.
1		0110	15	0.	1		0725	90	1.	1		1340	165	198.	1		1955	240	6.
1		0115	16	0.	1		0730	91	3.	1		1345	166	201.	1		2000	241	6.
1		0120	17	0.	1		0735	92	5.	1		1350	167	202.	1		2005	242	6.
1		0125	18	0.	1		0740	93	8.	1		1355	168	204.	1		2010	243	6.
1		0130	19	0.	1		0745	94	10.	1		1400	169	205.	1		2015	244	6.
1		0135	20	0.	1		0750	95	12.	1		1405	170	206.	1		2020	245	6.
1		0140	21	0.	1		0755	96	14.	1		1410	171	209.	1		2025	246	6.
1		0145	22	0.	1		0800	97	15.	1		1415	172	214.	1		2030	247	6.
1		0150	23	0.	1		0805	98	16.	1		1420	173	222.	1		2035	248	6.
1		0155	24	0.	1		0810	99	16.	1		1425	174	230.	1		2040	249	6.
1		0200	25	0.	1		0815	100	17.	1		1430	175	237.	1		2045	250	6.
1		0205	26	0.	1		0820	101	17.	1		1435	176	244.	1		2050	251	6.
1		0210	27	0.	1		0825	102	17.	1		1440	177	248.	1		2055	252	6.
1		0215	28	0.	1		0830	103	17.	1		1445	178	252.	1		2100	253	6.
1		0220	29	0.	1		0835	104	18.	1		1450	179	254.	1		2105	254	6.
1		0225	30	0.	1		0840	105	18.	1		1455	180	256.	1		2110	255	6.
1		0230	31	0.	1		0845	106	18.	1		1500	181	257.	1		2115	256	6.
1		0235	32	0.	1		0850	107	18.	1		1505	182	258.	1		2120	257	6.
1		0240	33	0.	1		0855	108	18.	1		1510	183	259.	1		2125	258	6.
1		0245	34	0.	1		0900	109	18.	1		1515	184	262.	1		2130	259	6.
1		0250	35	0.	1		0905	110	18.	1		1520	185	271.	1		2135	260	6.
1		0255	36	0.	1		0910	111	19.	1		1525	186	293.	1		2140	261	6.
1		0300	37	0.	1		0915	112	18.	1		1530	187	340.	1		2145	262	6.
1		0305	38	0.	1		0920	113	18.	1		1535	188	432.	1		2150	263	6.
1		0310	39	0.	1		0925	114	18.	1		1540	189	567.	1		2155	264	6.

1	0315	40	0.	*	1	0930	115	18.	*	1	1545	190	723.	*	1	2200	265	6.
1	0320	41	0.	*	1	0935	116	18.	*	1	1550	191	841.	*	1	2205	266	6.
1	0325	42	0.	*	1	0940	117	18.	*	1	1555	192	886.	*	1	2210	267	6.
1	0330	43	0.	*	1	0945	118	18.	*	1	1600	193	861.	*	1	2215	268	6.
1	0335	44	0.	*	1	0950	119	18.	*	1	1605	194	782.	*	1	2220	269	6.
1	0340	45	0.	*	1	0955	120	18.	*	1	1610	195	675.	*	1	2225	270	6.
1	0345	46	0.	*	1	1000	121	18.	*	1	1615	196	570.	*	1	2230	271	6.
1	0350	47	0.	*	1	1005	122	18.	*	1	1620	197	485.	*	1	2235	272	6.
1	0355	48	0.	*	1	1010	123	18.	*	1	1625	198	421.	*	1	2240	273	6.
1	0400	49	0.	*	1	1015	124	18.	*	1	1630	199	373.	*	1	2245	274	6.
1	0405	50	0.	*	1	1020	125	18.	*	1	1635	200	337.	*	1	2250	275	6.
1	0410	51	0.	*	1	1025	126	18.	*	1	1640	201	312.	*	1	2255	276	6.
1	0415	52	0.	*	1	1030	127	18.	*	1	1645	202	293.	*	1	2300	277	6.
1	0420	53	0.	*	1	1035	128	18.	*	1	1650	203	279.	*	1	2305	278	6.
1	0425	54	0.	*	1	1040	129	18.	*	1	1655	204	270.	*	1	2310	279	6.
1	0430	55	0.	*	1	1045	130	18.	*	1	1700	205	262.	*	1	2315	280	6.
1	0435	56	0.	*	1	1050	131	18.	*	1	1705	206	256.	*	1	2320	281	6.
1	0440	57	0.	*	1	1055	132	18.	*	1	1710	207	250.	*	1	2325	282	6.
1	0445	58	0.	*	1	1100	133	18.	*	1	1715	208	243.	*	1	2330	283	6.
1	0450	59	0.	*	1	1105	134	18.	*	1	1720	209	233.	*	1	2335	284	6.
1	0455	60	0.	*	1	1110	135	18.	*	1	1725	210	224.	*	1	2340	285	6.
1	0500	61	0.	*	1	1115	136	18.	*	1	1730	211	215.	*	1	2345	286	6.
1	0505	62	0.	*	1	1120	137	18.	*	1	1735	212	207.	*	1	2350	287	6.
1	0510	63	0.	*	1	1125	138	18.	*	1	1740	213	202.	*	1	2355	288	6.
1	0515	64	0.	*	1	1130	139	18.	*	1	1745	214	198.	*	2	0000	289	6.
1	0520	65	0.	*	1	1135	140	18.	*	1	1750	215	196.	*	2	0005	290	5.
1	0525	66	0.	*	1	1140	141	18.	*	1	1755	216	194.	*	2	0010	291	5.
1	0530	67	0.	*	1	1145	142	18.	*	1	1800	217	193.	*	2	0015	292	4.
1	0535	68	0.	*	1	1150	143	18.	*	1	1805	218	189.	*	2	0020	293	3.
1	0540	69	0.	*	1	1155	144	18.	*	1	1810	219	180.	*	2	0025	294	3.
1	0545	70	0.	*	1	1200	145	18.	*	1	1815	220	163.	*	2	0030	295	2.
1	0550	71	0.	*	1	1205	146	20.	*	1	1820	221	139.	*	2	0035	296	2.
1	0555	72	0.	*	1	1210	147	27.	*	1	1825	222	112.	*	2	0040	297	1.
1	0600	73	0.	*	1	1215	148	41.	*	1	1830	223	86.	*	2	0045	298	1.
1	0605	74	0.	*	1	1220	149	61.	*	1	1835	224	64.	*	2	0050	299	1.
1	0610	75	0.	*	1	1225	150	83.	*	1	1840	225	48.	*	2	0055	300	1.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
886.	15.92	(CFS)	285.	78.	75.	75.
		(INCHES)	9.459	10.335	10.337	10.337
		(AC-FT)	141.	154.	154.	154.

CUMULATIVE AREA = 0.28 SQ MI

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14 KK          A2          ROUTE INFLOW HYDROGRAPH THROUGH CARPI LAKE

   HYDROGRAPH ROUTING DATA

15 RS      STORAGE ROUTING
              NSTPS          1  NUMBER OF SUBREACHES
               ITYP       STOR  TYPE OF INITIAL CONDITION
             RSVRIC      57.20  INITIAL CONDITION
                  X        0.0  WORKING R AND D COEFFICIENT
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16 SV	STORAGE	0.0	57.2	61.6	69.1	76.9	83.4	93.6	102.5	111.7	121.3
17 SE	ELEVATION	927.20	935.70	936.00	936.50	937.00	937.40	938.00	938.50	939.00	939.50
18 SQ	DISCHARGE	0.	0.	15.	66.	137.	205.	420.	753.	1273.	1979.
19 SE	ELEVATION	927.20	935.70	936.00	936.50	937.00	937.40	938.00	938.50	939.00	939.50

20 SS SPILLWAY

CREL	935.70	SPILLWAY CREST ELEVATION
SPWID	25.00	SPILLWAY WIDTH
COQW	3.70	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

21 ST TOP OF DAM

TOPEL	937.40	ELEVATION AT TOP OF DAM
DAMWID	275.00	DAM WIDTH
COQD	0.0	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

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COMPUTED STORAGE-OUTFLOW CURVE

STORAGE	0.0	57.20	61.60	69.10	76.90	83.40	93.60	102.50	111.70	121.30
OUTFLOW	0.0	0.0	15.00	66.00	137.00	205.00	420.00	753.00	1273.00	1979.00

HYDROGRAPH AT STATION A2
PLAN 1, RATIO = 0.50

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	57.2	935.7	1		0820	101	3.	58.0	935.8	1		1640	201	457.	94.6	938.1
1		0005	2	0.	57.2	935.7	1		0825	102	3.	58.1	935.8	1		1645	202	422.	93.6	938.0
1		0010	3	0.	57.2	935.7	1		0830	103	3.	58.2	935.8	1		1650	203	403.	92.8	938.0
1		0015	4	0.	57.2	935.7	1		0835	104	4.	58.3	935.8	1		1655	204	385.	92.0	937.9
1		0020	5	0.	57.2	935.7	1		0840	105	4.	58.4	935.8	1		1700	205	369.	91.2	937.9
1		0025	6	0.	57.2	935.7	1		0845	106	4.	58.5	935.8	1		1705	206	354.	90.5	937.8
1		0030	7	0.	57.2	935.7	1		0850	107	5.	58.5	935.8	1		1710	207	340.	89.8	937.8
1		0035	8	0.	57.2	935.7	1		0855	108	5.	58.6	935.8	1		1715	208	328.	89.2	937.7
1		0040	9	0.	57.2	935.7	1		0900	109	5.	58.7	935.8	1		1720	209	316.	88.6	937.7
1		0045	10	0.	57.2	935.7	1		0905	110	5.	58.8	935.8	1		1725	210	304.	88.1	937.7
1		0050	11	0.	57.2	935.7	1		0910	111	6.	58.9	935.8	1		1730	211	292.	87.5	937.6
1		0055	12	0.	57.2	935.7	1		0915	112	6.	59.0	935.8	1		1735	212	281.	87.0	937.6
1		0100	13	0.	57.2	935.7	1		0920	113	6.	59.0	935.8	1		1740	213	271.	86.5	937.6
1		0105	14	0.	57.2	935.7	1		0925	114	7.	59.1	935.8	1		1745	214	261.	86.1	937.6
1		0110	15	0.	57.2	935.7	1		0930	115	7.	59.2	935.8	1		1750	215	253.	85.7	937.5
1		0115	16	0.	57.2	935.7	1		0935	116	7.	59.3	935.8	1		1755	216	245.	85.3	937.5
1		0120	17	0.	57.2	935.7	1		0940	117	7.	59.3	935.8	1		1800	217	238.	85.0	937.5
1		0125	18	0.	57.2	935.7	1		0945	118	8.	59.4	935.9	1		1805	218	231.	84.7	937.5
1		0130	19	0.	57.2	935.7	1		0950	119	8.	59.5	935.9	1		1810	219	225.	84.4	937.5
1		0135	20	0.	57.2	935.7	1		0955	120	8.	59.6	935.9	1		1815	220	218.	84.0	937.4
1		0140	21	0.	57.2	935.7	1		1000	121	8.	59.6	935.9	1		1820	221	209.	83.6	937.4

1	0145	22	0.	57.2	935.7	*	1	1005	122	8.	59.7	935.9	*	1	1825	222	201.	83.0	937.4
1	0150	23	0.	57.2	935.7	*	1	1010	123	9.	59.7	935.9	*	1	1830	223	194.	82.3	937.3
1	0155	24	0.	57.2	935.7	*	1	1015	124	9.	59.8	935.9	*	1	1835	224	186.	81.6	937.3
1	0200	25	0.	57.2	935.7	*	1	1020	125	9.	59.9	935.9	*	1	1840	225	177.	80.7	937.2
1	0205	26	0.	57.2	935.7	*	1	1025	126	9.	59.9	935.9	*	1	1845	226	167.	79.8	937.2
1	0210	27	0.	57.2	935.7	*	1	1030	127	9.	60.0	935.9	*	1	1850	227	158.	78.9	937.1
1	0215	28	0.	57.2	935.7	*	1	1035	128	10.	60.0	935.9	*	1	1855	228	149.	78.0	937.1
1	0220	29	0.	57.2	935.7	*	1	1040	129	10.	60.1	935.9	*	1	1900	229	140.	77.1	937.0
1	0225	30	0.	57.2	935.7	*	1	1045	130	10.	60.1	935.9	*	1	1905	230	132.	76.3	937.0
1	0230	31	0.	57.2	935.7	*	1	1050	131	10.	60.2	935.9	*	1	1910	231	125.	75.5	936.9
1	0235	32	0.	57.2	935.7	*	1	1055	132	10.	60.2	935.9	*	1	1915	232	118.	74.8	936.9
1	0240	33	0.	57.2	935.7	*	1	1100	133	11.	60.3	935.9	*	1	1920	233	111.	74.0	936.8
1	0245	34	0.	57.2	935.7	*	1	1105	134	11.	60.3	935.9	*	1	1925	234	105.	73.4	936.8
1	0250	35	0.	57.2	935.7	*	1	1110	135	11.	60.4	935.9	*	1	1930	235	99.	72.7	936.7
1	0255	36	0.	57.2	935.7	*	1	1115	136	11.	60.4	935.9	*	1	1935	236	93.	72.1	936.7
1	0300	37	0.	57.2	935.7	*	1	1120	137	11.	60.5	935.9	*	1	1940	237	88.	71.5	936.7
1	0305	38	0.	57.2	935.7	*	1	1125	138	11.	60.5	935.9	*	1	1945	238	83.	71.0	936.6
1	0310	39	0.	57.2	935.7	*	1	1130	139	11.	60.6	935.9	*	1	1950	239	78.	70.5	936.6
1	0315	40	0.	57.2	935.7	*	1	1135	140	12.	60.6	935.9	*	1	1955	240	74.	70.0	936.6
1	0320	41	0.	57.2	935.7	*	1	1140	141	12.	60.7	935.9	*	1	2000	241	70.	69.5	936.5
1	0325	42	0.	57.2	935.7	*	1	1145	142	12.	60.7	935.9	*	1	2005	242	66.	69.1	936.5
1	0330	43	0.	57.2	935.7	*	1	1150	143	12.	60.7	935.9	*	1	2010	243	63.	68.7	936.5
1	0335	44	0.	57.2	935.7	*	1	1155	144	12.	60.8	935.9	*	1	2015	244	61.	68.3	936.4
1	0340	45	0.	57.2	935.7	*	1	1200	145	12.	60.8	935.9	*	1	2020	245	58.	67.9	936.4
1	0345	46	0.	57.2	935.7	*	1	1205	146	12.	60.8	935.9	*	1	2025	246	56.	67.6	936.4
1	0350	47	0.	57.2	935.7	*	1	1210	147	13.	60.9	936.0	*	1	2030	247	53.	67.2	936.4
1	0355	48	0.	57.2	935.7	*	1	1215	148	13.	61.1	936.0	*	1	2035	248	51.	66.9	936.4
1	0400	49	0.	57.2	935.7	*	1	1220	149	14.	61.3	936.0	*	1	2040	249	49.	66.6	936.3
1	0405	50	0.	57.2	935.7	*	1	1225	150	16.	61.7	936.0	*	1	2045	250	47.	66.3	936.3
1	0410	51	0.	57.2	935.7	*	1	1230	151	19.	62.2	936.0	*	1	2050	251	45.	66.0	936.3
1	0415	52	0.	57.2	935.7	*	1	1235	152	24.	62.9	936.1	*	1	2055	252	43.	65.8	936.3
1	0420	53	0.	57.2	935.7	*	1	1240	153	26.	63.6	936.1	*	1	2100	253	42.	65.5	936.3
1	0425	54	0.	57.2	935.7	*	1	1245	154	34.	64.3	936.2	*	1	2105	254	40.	65.3	936.2
1	0430	55	0.	57.2	935.7	*	1	1250	155	39.	65.1	936.2	*	1	2110	255	38.	65.0	936.2
1	0435	56	0.	57.2	935.7	*	1	1255	156	44.	65.9	936.3	*	1	2115	256	37.	64.8	936.2
1	0440	57	0.	57.2	935.7	*	1	1300	157	49.	66.7	936.3	*	1	2120	257	35.	64.6	936.2
1	0445	58	0.	57.2	935.7	*	1	1305	158	55.	67.4	936.4	*	1	2125	258	34.	64.4	936.2
1	0450	59	0.	57.2	935.7	*	1	1310	159	60.	68.2	936.4	*	1	2130	259	33.	64.2	936.2
1	0455	60	0.	57.2	935.7	*	1	1315	160	65.	68.9	936.5	*	1	2135	260	32.	64.0	936.2
1	0500	61	0.	57.2	935.7	*	1	1320	161	71.	69.6	936.5	*	1	2140	261	30.	63.9	936.2
1	0505	62	0.	57.2	935.7	*	1	1325	162	78.	70.4	936.6	*	1	2145	262	29.	63.7	936.1
1	0510	63	0.	57.2	935.7	*	1	1330	163	84.	71.1	936.6	*	1	2150	263	28.	63.6	936.1
1	0515	64	0.	57.2	935.7	*	1	1335	164	91.	71.8	936.7	*	1	2155	264	27.	63.4	936.1
1	0520	65	0.	57.2	935.7	*	1	1340	165	97.	72.5	936.7	*	1	2200	265	26.	63.3	936.1
1	0525	66	0.	57.2	935.7	*	1	1345	166	104.	73.2	936.8	*	1	2205	266	25.	63.1	936.1
1	0530	67	0.	57.2	935.7	*	1	1350	167	109.	73.9	936.8	*	1	2210	267	24.	63.0	936.1
1	0535	68	0.	57.2	935.7	*	1	1355	168	115.	74.5	936.8	*	1	2215	268	24.	62.9	936.1
1	0540	69	0.	57.2	935.7	*	1	1400	169	121.	75.1	936.9	*	1	2220	269	23.	62.7	936.1
1	0545	70	0.	57.2	935.7	*	1	1405	170	126.	75.7	936.9	*	1	2225	270	22.	62.6	936.1
1	0550	71	0.	57.2	935.7	*	1	1410	171	131.	76.2	937.0	*	1	2230	271	21.	62.5	936.1
1	0555	72	0.	57.2	935.7	*	1	1415	172	136.	76.7	937.0	*	1	2235	272	21.	62.4	936.1
1	0600	73	0.	57.2	935.7	*	1	1420	173	141.	77.3	937.0	*	1	2240	273	20.	62.3	936.0
1	0605	74	0.	57.2	935.7	*	1	1425	174	147.	77.8	937.1	*	1	2245	274	19.	62.2	936.0
1	0610	75	0.	57.2	935.7	*	1	1430	175	153.	78.4	937.1	*	1	2250	275	19.	62.1	936.0
1	0615	76	0.	57.2	935.7	*	1	1435	176	159.	79.0	937.1	*	1	2255	276	18.	62.0	936.0
1	0620	77	0.	57.2	935.7	*	1	1440	177	165.	79.6	937.2	*	1	2300	277	17.	62.0	936.0
1	0625	78	0.	57.2	935.7	*	1	1445	178	171.	80.1	937.2	*	1	2305	278	17.	61.9	936.0
1	0630	79	0.	57.2	935.7	*	1	1450	179	176.	80.7	937.2	*	1	2310	279	16.	61.8	936.0
1	0635	80	0.	57.2	935.7	*	1	1455	180	182.	81.2	937.3	*	1	2315	280	16.	61.7	936.0
1	0640	81	0.	57.2	935.7	*	1	1500	181	187.	81.7	937.3	*	1	2320	281	15.	61.7	936.0
1	0645	82	0.	57.2	935.7	*	1	1505	182	192.	82.2	937.3	*	1	2325	282	15.	61.6	936.0
1	0650	83	0.	57.2	935.7	*	1	1510	183	197.	82.6	937.4	*	1	2330	283	15.	61.5	936.0
1	0655	84	0.	57.2	935.7	*	1	1515	184	201.	83.0	937.4	*	1	2335	284	15.	61.5	936.0
1	0700	85	0.	57.2	935.7	*	1	1520	185	206.	83.4	937.4	*	1	2340	285	14.	61.4	936.0
1	0705	86	0.	57.2	935.7	*	1	1525	186	210.	83.9	937.4	*	1	2345	286	14.	61.3	936.0
1	0710	87	0.	57.2	935.7	*	1	1530	187	230.	84.6	937.5	*	1	2350	287	14.	61.3	936.0
1	0715	88	0.	57.2	935.7	*	1	1535	188	251.	85.6	937.5	*	1	2355	288	14.	61.2	936.0
1	0720	89	0.	57.2	935.7	*	1	1540	189	285.	87.2	937.6	*	2	0000	289	14.	61.2	936.0
1	0725	90	0.	57.2	935.7	*	1	1545	190	333.	89.5	937.8	*	2	0005	290	13.	61.1	936.0
1	0730	91	0.	57.2	935.7	*	1	1550	191	394.	92.4	937.9	*	2	0010	291	13.	61.1	936.0
1	0735	92	0.	57.3	935.7	*	1	1555	192	483.	95.3	938.1	*	2	0015	292	13.	61.0	936.0
1	0740	93	0.	57.3	935.7	*	1	1600	193	572.	97.7	938.2	*	2	0020	293	13.	60.9	936.0
1	0745	94	1.	57.4	935.7	*	1	1605	194	679.	99.2	938.3	*	2	0025	294	13.	60.9	936.0
1	0750	95	1.	57.4	935.7	*	1	1610	195	652.	99.8	938.3	*	2	0030	295	12.	60.8	935.9

1	0755	96	1:	57.5	935.7	*	1	1615	196	645.	99.6	938.3	*	2	0035	296	12.	60.7	935.9
1	0800	97	1:	57.6	935.7	*	1	1620	197	618.	98.9	938.3	*	2	0040	297	12.	60.7	935.9
1	0805	98	2:	57.7	935.7	*	1	1625	198	580.	97.9	938.2	*	2	0045	298	12.	60.6	935.9
1	0810	99	2:	57.8	935.7	*	1	1630	199	538.	96.8	938.2	*	2	0050	299	11.	60.5	935.9
1	0815	100	2:	57.9	935.7	*	1	1635	200	496.	95.6	938.1	*	2	0055	300	11.	60.5	935.9
						*							*							

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EAK OUTFLOW IS 652. AT TIME 16.17 HOURS

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	24.92-HR
652.	16.17	(CFS)	260.	76.	73.	73.
		(INCHES)	8.619	10.081	10.001	10.081
		(AC-FT)	129.	151.	151.	151.

EAK STORAGE (AC-FT)	TIME (HR)		MAXIMUM AVERAGE STORAGE		
		6-HR	24-HR	72-HR	24.92-HR
100.	16.17	84.	66.	66.	66.

PEAK STAGE (FEET)	TIME (HR)		MAXIMUM AVERAGE STAGE		
		6-HR	24-HR	72-HR	24.92-HR
938.35	16.17	937.28	936.27	936.25	936.25

CUMULATIVE AREA = 0.28 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 0.50
HYDROGRAPH-AT	A1	0.28	1	FLOW	886.
				TIME	15.92
ROUTED TO	A2	0.28	1	FLOW	652.
				TIME	16.17
			** PEAK STAGES IN FEET **		
			1	STAGE	938.35
				TIME	16.17

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION A2

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	935.70	935.70	937.60
STORAGE	57.	57.	83.
OUTFLOW	0.	0.	205.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	938.35	0.95	100.	652.	3.08	16.17	0.0

*** NORMAL END OF JOB ***

HEC-1 INPUT

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
   1      ID    CARPI LAKE DAM      OVERTOPPING ANALYSIS     TOM GOOCH   ANCO
   2      ID    NEW JERSEY DAM NO. 192 - PASSAIC COUNTY - WEST MILFORD TOWNSHIP
   3      ID    0.1,0.25,0.5 MULTIPLES OF PMF FROM 24-HOUR PMP
   4      IT       5                0       300
   5      ID       3
   6      JR    FLOW      0.1     0.25      0.5

   7      KK      A1  CARPI LAKE INFLOW HYDROGRAPH
   8      KM      INFLOW FROM SCS UNIT GRAPH COMPUTATIONS
   9      BA    0.28        0
  10      BF     0.9       0.9        1
  11      PM    22.0                          NO      111      123      133
  12      LU       1       0.1
  13      UD   0.387

  14      KK      A2  ROUTE INFLOW HYDROGRAPH THROUGH CARPI LAKE
  15      RS       1      STOR      57.2
  16      SV       0      57.2      61.6      69.1      76.9      83.4      93.6     102.5     111.7     121.3
  17      SE   927.2     935.7      936.     935.5      937.     937.4      938.     938.5      939.     939.5
  18      SQ      0.        0.       15.       66.      137.      205.      420.      753.     1273.     1979.
  19      SE   927.2     935.7      936.     936.5      937.     937.4      938.     938.5      939.     939.5
  20      SS   935.7      25.0       3.7       1.5
  21      ST   937.4     275.0       0.0       1.5
  22      ZZ
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*****************************************          ****************************************
*                                       *          *                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *          *   U.S. ARMY CORPS OF ENGINEERS       *
*        FEBRUARY 1981                  *          * THE HYDROLOGIC ENGINEERING CENTER    *
*                                       *          *       609 SECOND STREET              *
*                                       *          *    DAVIS, CALIFORNIA 95616           *
* RUN DATE08/10/81     TIME10.40.37     *          * (916) 440-3285 OR (FTS) 448-3285     *
*                                       *          *                                      *
*****************************************          ****************************************


                     CARPI LAKE DAM      OVERTOPPING ANALYSIS     TOM GOOCH   ANCO
                     NEW JERSEY DAM NO. 192 - PASSAIC COUNTY - WEST MILFORD TOWNSHIP
                     0.1,0.25,0.5 MULTIPLES OF PMF FROM 24-HOUR PMP

  5 IO         OUTPUT CONTROL VARIABLES
                     IPRNT           3  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                      OMSG         YES  PRINT DIAGNOSTIC MESSAGES

    IT         HYDROGRAPH TIME DATA
                      NMIN           5  MINUTES IN COMPUTATION INTERVAL
                     IDATE       1   0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE       2   0  ENDING DATE
                    NDTIME        0055  ENDING TIME

                 COMPUTATION INTERVAL    0.08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
              DRAINAGE AREA           SQUARE MILES
              PRECIPITATION DEPTH     INCHES
              LENGTH, ELEVATION       FEET
              FLOW                    CUBIC FEET PER SECOND
              STORAGE VOLUME          ACRE-FEET
              SURFACE AREA            ACRES
              TEMPERATURE             DEGREES FAHRENHEIT

    JP         MULTI-PLAN OPTION
                     NPLAN           1  NUMBER OF PLANS

    JR         MULTI-RATIO OPTION
                  RATIOS OF RUNOFF
                 0.10       0.25      0.50

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            ***************
            *             *
  7 KK      *      A1     *        CARPI LAKE INFLOW HYDROGRAPH
            *             *
            ***************
                        INFLOW FROM SCS UNIT GRAPH COMPUTATIONS

             SUBBASIN RUNOFF DATA

  9 BA         SUBBASIN CHARACTERISTICS
                     TAREA        0.28  SUBBASIN AREA

 10 BF         BASE FLOW CHARACTERISTICS
                     STRTQ        0.90  INITIAL FLOW
                     QRCSN        0.90  BEGIN BASE FLOW RECESSION
                     RTIOR     1.00000  RECESSION CONSTANT

               PRECIPITATION DATA

 11 PM         PROBABLE MAXIMUM STORM
                       PMS       22.00  INDEX PRECIPITATION
                     TRSPC        0.80  TRANSPOSITION COEFFICIENT
                     TRSDA        0.28  TRANSPOSITION AREA
                       SWD          NO  USE SWD DISTRIBUTION
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PERCENT OF INDEX PRECIPITATION OCCURRING IN GIVEN TIME

6-HR	12-HR	24-HR	48-HR	72-HR	96-HR
111.0	123.0	133.0	0.0	0.0	0.0

12 LU UNIFORM LOSS RATE

STRTL	1.00	INITIAL LOSS
CNSTL	0.10	UNIFORM LOSS RATE
RTIMP	0.0	PERCENT IMPERVIOUS AREA

13 UD SCS DIMENSIONLESS UNITGRAPH

TLAG	0.39 LAG

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UNIT HYDROGRAPH
25 END-OF-PERIOD ORDINATES

30.	94.	198.	286.	315.	300.	256.	194.	134.	97.
72.	53.	38.	28.	20.	15.	11.	8.	6.	4.
3.	2.	2.	1.	0.					

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
1740.	15.92	(CFS)	560.	157.	151.	151.
		(INCHES)	18.582	20.804	20.808	20.808
		(AC-FT)	277.	311.	311.	311.

CUMULATIVE AREA = 0.28 SQ MI

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HYDROGRAPH AT STATION A1
FOR PLAN 1, RATIO = 0.10

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
174.	15.92	(CFS)	56.	16.	15.	15.
		(INCHES)	1.858	2.080	2.081	2.081
		(AC-FT)	28.	31.	31.	31.

CUMULATIVE AREA = 0.28 SQ MI

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HYDROGRAPH AT STATION A1
FOR PLAN 1, RATIO = 0.25

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
435.	15.92	(CFS)	140.	39.	38.	38.
		(INCHES)	4.645	5.201	5.202	5.202
		(AC-FT)	69.	78.	78.	78.

CUMULATIVE AREA = 0.28 SQ MI

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HYDROGRAPH AT STATION A1
FOR PLAN 1, RATIO = 0.50

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
870.	15.92	(CFS)	280.	78.	75.	75.
		(INCHES)	9.291	10.402	10.404	10.404
		(AC-FT)	139.	155.	155.	155.

CUMULATIVE AREA = 0.28 SQ MI

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14 KK        A2          ROUTE INFLOW HYDROGRAPH THROUGH CARPI LAKE

          HYDROGRAPH ROUTING DATA

15 KS       STORAGE ROUTING
                 NSTPS        1  NUMBER OF SUBREACHES
                  ITYP      STOR  TYPE OF INITIAL CONDITION
                RSVRIC     57.20  INITIAL CONDITION
                     X       0.0  WORKING R AND D COEFFICIENT

16 SV          STORAGE        0.0      57.2      61.6      69.1      76.9      83.4      93.6     102.5     111.7     121.3

17 SE          ELEVATION    927.20    935.70    936.00    936.50    937.00    937.40    938.00    938.50    939.00    939.50

18 SQ          DISCHARGE        0.        0.       15.       66.      137.      205.      420.      753.     1273.     1979.

19 SE          ELEVATION    927.20    935.70    936.00    936.50    937.00    937.40    938.00    938.50    939.00    939.50

20 SS          SPILLWAY
                  CREL      935.70  SPILLWAY CREST ELEVATION
                 SPWID       25.00  SPILLWAY WIDTH
                  COSW        3.70  WEIR COEFFICIENT
                  EXPW        1.50  EXPONENT OF HEAD

21 ST          TOP OF DAM
                 TOPEL      937.40  ELEVATION AT TOP OF DAM
                 DAMWID     275.00  DAM WIDTH
                  COSD        0.0   WEIR COEFFICIENT
                  EXPD        1.50  EXPONENT OF HEAD
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COMPUTED STORAGE-OUTFLOW CURVE

STORAGE	0.0	57.20	61.60	69.10	76.90	83.40	93.60	102.50	111.70	121.30
OUTFLOW	0.0	0.0	15.00	66.00	137.00	205.00	420.00	753.00	1273.00	1979.00

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HYDROGRAPH AT STATION A2
FOR PLAN 1, RATIO = 0.10

PEAK OUTFLOW IS 74. AT TIME 16.50 HOURS

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
74.	16.50	(CFS)	46.	15.	14.	14.
		(INCHES)	1.521	1.951	1.951	1.951
		(AC-FT)	23.	29.	29.	29.

PEAK STORAGE (AC-FT)	TIME (HR)		6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	24.92-HR
70.	16.50		66.	60.	60.	60.
PEAK STAGE (FEET)	TIME (HR)		6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	24.92-HR
936.56	16.50		936.13	935.89	935.88	935.88

CUMULATIVE AREA = 0.28 SQ MI

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HYDROGRAPH AT STATION A2
FOR PLAN 1. RATIO = 0.25

PEAK OUTFLOW IS 227. AT TIME 16.33 HOURS

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	24.92-HR
227.	16.33	(CFS)	122.	38.	36.	36.
		(INCHES)	4.057	5.000	5.000	5.000
		(AC-FT)	61.	75.	75.	75.
PEAK STORAGE (AC-FT)	TIME (HR)		6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	24.92-HR
84.	16.33		75.	63.	63.	63.
PEAK STAGE (FEET)	TIME (HR)		6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	24.92-HR
937.46	16.33		936.71	936.08	936.07	936.07

CUMULATIVE AREA = 0.28 SQ MI

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HYDROGRAPH AT STATION A2
FOR PLAN 1. RATIO = 0.50

PEAK OUTFLOW IS 637. AT TIME 16.17 HOURS

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	24.92-HR
637.	16.17	(CFS)	256.	76.	73.	73.
		(INCHES)	6.501	10.133	10.133	10.133
		(AC-FT)	127.	151.	151.	151.
PEAK STORAGE (AC-FT)	TIME (HR)		6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	24.92-HR
99.	16.17		84.	67.	66.	66.
PEAK STAGE (FEET)	TIME (HR)		6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	24.92-HR
938.33	16.17		937.27	936.29	936.27	936.27

CUMULATIVE AREA = 0.28 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND. AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 0.10	RATIO 2 0.25	RATIO 3 0.50
HYDROGRAPH AT	A1	0.28	1	FLOW	174.	435.	870.
				TIME	15.92	15.92	15.92
ROUTED TO	A2	0.28	1	FLOW	74.	227.	637.
				TIME	16.50	16.33	16.17
			** PEAK STAGES IN FEET **				
			1	STAGE	936.56	937.45	938.33
				TIME	16.50	16.33	16.17

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION A2

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	935.70	935.70	937.40
STORAGE	57.	57.	83.
OUTFLOW	0.	0.	205.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	936.56	0.0	70.	74.	0.0	16.50	0.0
0.25	937.46	0.06	84.	227.	0.58	16.33	0.0
0.50	938.33	0.93	99.	637.	3.00	16.17	0.0

*** NORMAL END OF JOB ***

APPENDIX 5

REFERENCES

CARPI LAKE DAM

APPENDIX 5
REFERENCES

CARPI LAKE DAM

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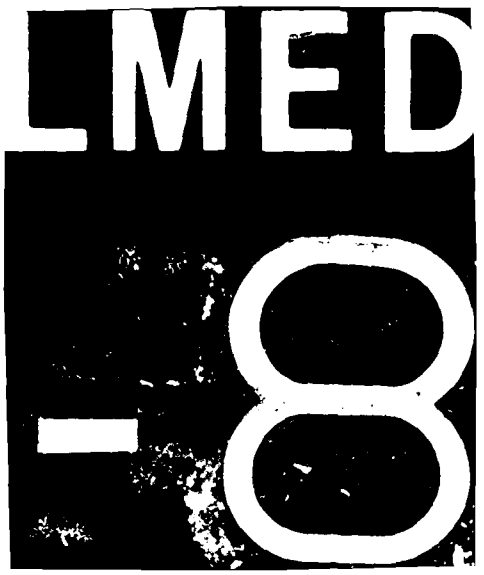
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