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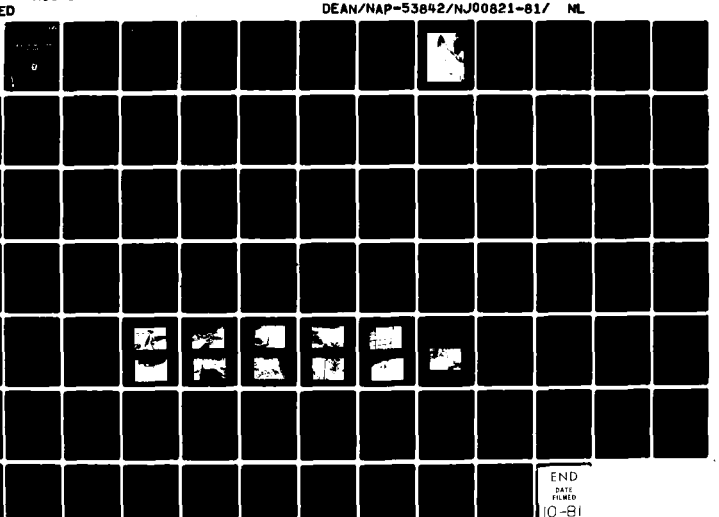

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NEW JERSEY.

BEATTIES MILL DAM
NJ 00821

PHASE I INSPECTION REPORT.
NATIONAL DAM SAFETY PROGRAM

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

REPT NO: DAEN/NAP-53842/NJ00821-81/08
AUGUST 1981

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Visual Inspection
Structural Analysis
National Dam Safety Program
Beatties Mill Dam, N.J.
Spillways

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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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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 Beatties Mill 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, Beatties Mill 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 because a flow equivalent to 30 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.) However, more detailed hydraulic and hydrologic studies are not recommended due to the limited site condition and the intended purpose of the dam. To ensure the adequacy of the structure, the following actions as a minimum, are recommended:

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

(1) Design and oversee repair procedures for the replacement of the large masonry blocks which have been dislodged from the north side of the training wall which is at the left center of the dam.

(2) Evaluate the potential for undermining of the foundation support at the downstream end of the masonry spillway training wall at the left center of the dam caused by the loss of several large bedrock blocks, and design and oversee corrective measures as needed.

(3) Investigate measures to assure the stability of the dam under severe overtopping conditions.

NAPEN-N
Honorable Brendan T. Byrne

b. Within one year from the date of approval of this report the owner should repair the eroded construction joints.

c. 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.

d. 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 Minish of the Eleventh 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 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

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

BEATTIES MILL DAM (NJ00824)

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.

Beatties Mill 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 because a flow equivalent to 30 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.) However, more detailed hydraulic and hydrologic studies are not recommended due to the limited site condition and the intended purpose of the dam. To ensure the adequacy of the structure, the following actions as a minimum, are recommended:

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

(1) Design and oversee repair procedures for the replacement of the large masonry blocks which have been dislodged from the north side of the training wall which is at the left center of the dam.

(2) Evaluate the potential for undermining of the foundation support at the downstream end of the masonry spillway training wall at the left center of the dam caused by the loss of several large bedrock blocks, and design and oversee corrective measures as needed.

(3) Investigate measures to assure the stability of the dam under severe overtopping conditions.

b. Within one year from the date of approval of this report the owner should repair the eroded construction joints.

c. 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.

d. 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
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE: 7 Aug 81

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Beatties Mill
Identification No.:	Fed ID No. NJ00821
State Located:	New Jersey
County Located:	Passaic
Stream:	Passaic River
River Basin:	Passaic
Date of Inspection	April 23, 1981

ASSESSMENT OF GENERAL CONDITIONS

Beatties Mill Dam is a 19-foot high concrete run-of-the-river dam with 267 feet of its 287 foot crest serving as a spillway. A 3-foot wide, 1-foot deep notch in the spillway crest carries low flows. The dam is 85 years old and underwent major reconstruction in 1945-1946. It is of intermediate size and in fair condition, and serves to create a pool allowing diversion of 75 mgd from the Passaic River to the Passaic Valley Water Commission's water treatment plant for treatment and municipal use.

Several stones are missing from the upstream end of a stone masonry training wall at the left center of the dam. This has caused vertical and horizontal displacement of other stones in the training wall, and could lead to seepage and undermining of the spillway. In addition, some erosion and undermining of the rock foundation at the downstream end of the training wall has occured.

The spillway would pass 29% of the Spillway Design Flood, which is one-half of the PMF. Failure of the dam would cause interruption of raw water supply (75 mgd) to the Passaic Valley Water Commission's water treatment plant. This interruption of a public utility would entail economic losses but would cause little, if any, threat of loss of life. Therefore the hazard classification of Beatties Mill Dam is significant.

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 tasks in the near future: Design and oversee repairs to the training wall at the left center of the dam, evaluate the potential for undermining of the foundation at the downstream end of the training wall and design and oversee corrective measures as needed, and investigate measures to assure the stability of the dam under severe overtopping conditions.

It is further recommended that the owner accomplish the following in the near future as part of operating and maintenance procedures: repair construction joints on the dam and develop a written operation and maintenance schedule to ensure the safety of the dam.

ANDERSON-NICHOLS & COMPANY, INC.

Warren A. Guinan

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

April 23, 1981

OVERVIEW PHOTO

BEATTIES MILL 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

BEATTIES MILL DAM FED ID NO. NJ00821

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
BEATTIES MILL DAM
FED ID NO. #NJ00821

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Beatties Mill 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 Beatties Mill Dam and appurtenances. Conclusions are based upon available data and visual inspection. The results of this study are 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. Beatties Mill Dam is a concrete run-of-the-river dam with a structural and hydraulic height of 19.3 feet. Most of the dam's crest is a 267 foot long broad-crested overflow spillway in three sections - an arched 152-foot center section (concave upstream), a 55-foot right wingwall tying into a factory building which serves as the right abutment, and a 60-foot left wingwall tying into the left abutment. There is a 3-foot wide, 1-foot deep notch in the right wingwall for low flows. The dam's crest width is about 5 feet, the upstream face is 2H:1V (4 feet) and then nearly vertical, and the downstream face slopes 1H:1-1/2V.

The pond created by Beatties Mill Dam serves to create a diversion pool for a canal leading to a water treatment plant. This canal is controlled from a gate house about 300 feet upstream of the left abutment.

b. Location. The dam is located in Little Falls, New Jersey, on the Passaic River. It is at 40°53.1' north latitude and 74°14.1' west longitude on the Paterson Quadrangle. To reach Beatties Mill Dam, take exit 53 from U.S. Interstate Highway 80 to Riverview Drive South. After about 0.7 miles, turn right on Union Avenue. The gate leading to Beatties Dam is 0.2 miles south on Union Avenue on the right.

c. Size Classification. Beatties Mill Dam is classified as being intermediate in size on the basis of storage at the dam crest of 4,870 acre-feet, which is less than 50,000 acre-feet but more than 1,000 acre-feet, in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. The failure of Beatties Mill Dam would cause a threat of loss to few, if any, lives. However, the hazard classification is considered to be significant because failure of the dam would interrupt inflow to the Passaic Valley Water Commission's water treatment plant, which is an important public utility.

e. Ownership. The dam is owned by the Passaic Valley Water Commission. Information may be obtained by writing the Commission at P.O. Box 230, Clifton, New Jersey, or by calling (201)772-3900.

f. Purpose. Beatties Mill Dam creates a pond from which an average of 75 mgd of Passaic River water is diverted to Passaic Valley Water Commission water treatment plant for treatment and use as water supply.

g. Design and Construction History. The cornerstone of the gatehouse controlling diversions to the water treatment plant indicates that Beatties Mill Dam was originally constructed in 1896. The dam was damaged by flooding in 1945, and major reconstruction designed by Bogert-Childs Engineering Associates was carried out in 1945-1946.

h. Normal Operational Procedure. Water for the Passaic Valley Water Commission is diverted to treatment as needed by canal. The average rate of diversion is 75 mgd. No other operational procedures were disclosed for this dam.

i. Site Geology. No boring information was available at the time the dam was inspected. Information derived from the Geologic Map of New Jersey (Kummel and Johnson, 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 stratified drift which may include sand and gravel in plains, deltas, eskers, kames, and terraces.

Bedrock of igneous origin was observed in massive outcrops along the entire foundation during the inspection of this dam. The previously mentioned map (Kummel and Johnson) indicates that bedrock in this area consists of shale and sandstone with igneous intrusives of Triassic age.

1.3 Pertinent Data

a. Drainage Area

762 square miles

b. Discharge at Damsite (cfs)

Maximum flood at damsite - For USGS Gage 013895000, Passaic River at Little Falls, N.J., the maximum discharge from 1897 to the present is 28,000 cfs on October 10, 1903. The gage is 0.6 miles downstream of the dam, and has a drainage area of 762 square miles.

Total ungated spillway capacity at maximum pool elevation (at top of dam) - 12,701 cfs

c. Elevation (ft. above NGVD)

Top of dam - 164.1

Test flood (1/2 PMF) - 171.6

Recreation pool (at time of inspection) - about 157.2

Spillway crest - 156.8

Streambed at centerline of spillway - low point 144.8

Maximum tailwater - (F.l.S. 500 year flood) - 156

d. Reservoir (length in feet)

Length of maximum pool - (at 164.1' NGVD) - 117,000 (estimated)

Spillway crest - 76,000 (estimated)

e. Storage (acre-feet)

Spillway crest - 1,435

Test Flood (1/2 PMF) - 9,218

Top of dam - 4,870

f. Reservoir Surface (acres)

Top of dam - 536

Spillway crest - 350

g. Dam

Type - concrete gravity

Length - 287 feet

Height - 19.3 feet (hydraulic)

- 19.3 feet (structural)

Top width - about 5 feet

Side slopes - upstream 2H:1V for four feet then nearly vertical; downstream 1H:1-1/2V

Zoning - Not applicable

Impervious core - Not applicable

Cutoff - unknown

Grout curtain - unknown

h. Spillway

Type - Concrete overflow

Length of weir - 267 feet

Crest elevation - 157.8' NGVD - 3 foot notch at 156.8' NGVD

Low level outlet - None

U/S Channel - Passaic River

D/S Channel - Passaic River

i. Regulating Outlets

Type - Diversion canal controlled by gate located in gate house; seven 10' x 12' liftgates. Trash racks located at edge of reservoir outside gate house.

Width - Canal about 75 feet wide

Access - From left (north) bank through gate house to gates. Trash racks accessible from walkway upstream of gate house. Debris collected are passed downstream through trash flume and connecting 30-inch pipe.

SECTION 2
ENGINEERING DATA

2.1 Design

No hydraulic or hydrologic engineering data were disclosed. The plans for the 1945-1946 reconstruction were obtained.

2.2 Construction

Extensive correspondence exists between the Passaic Valley Water Commission and the New Jersey Department of Conservation concerning the 1945-1946 reconstruction of the dam. This correspondence is reproduced in Appendix 1.

2.3 Operation

No written operational data were found.

2.4 Evaluation

a. Availability. A search of the New Jersey Department of Environmental Protection files revealed the information discussed above.

b. Adequacy. The data obtained combined with the visual inspection are deemed adequate to complete this Phase 1 Inspection Report

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. Dam. Some erosion and undermining of the large rock outcrop downstream of the left abutment of the dam has occured. Several large masonry blocks are missing at the junction of the spillway and the masonry block training wall which is perpendicular to the spillway at the left center of the dam. The existence of former root systems was observed behind several of the adjacent blocks which had remained in place. Several of the top cap stones on the training wall had been displaced up to 3 inches vertically downward adjacent to the intersection with the spillway. Horizontal separations up to 5 inches wide were measured between blocks located in the spillway and the adjacent center masonry block training wall. Some undermining of the large stones was observed near the downstream end of the masonry training wall. The toe of the concrete spillway is undermined 2-4 inches along its entire length. The downstream face of the dam is eroded, exposing the coarse aggregate, with deeper erosion at the construction joints and apparent cold joints.

b. Appurtenant Structures. The trash racks, walkway, and gate house all appeared to be in good condition. The trash flume and connecting pipe were free of debris. Some debris had collected on the trash racks. The diversion canal was essentially free of debris; however, brush and small trees line the canal banks.

c. Reservoir Area. The watershed above the lake is gently sloping and urbanized with numerous mill buildings and homes. Slopes on the shore appear to be stable. Some sedimentation was observed in the reservoir.

d. Downstream Channel. Bedrock channel with some displacement of large blocks of massive rock outcrop has occurred along the right and left sides of the channel downstream of the dam. Trees are growing along the top of the rock outcrops along the left side of the channel downstream of the dam.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No written operating procedures were revealed. Acceptable procedures are followed for operation of the diversion to the water treatment plant.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were found.

4.3 Maintenance of Operating Facilities

No formal maintenance procedures for the operating facilities were discovered. However, maintenance is adequate for continual use.

4.4 Warning System

No description of any warning system was found.

4.5 Evaluation of Operational Adequacy

The remedial measures described in Section 7.2 should be implemented as described to improve operation and maintenance for the dam.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Because no original hydrologic design data were revealed, an evaluation of such data could not be performed.

b. Experience Data. The water surface elevation caused by the flood of record for the dam, in October 1903, is shown on a stone in the diversion structure controlling the canal to the water treatment plant. The peak elevation was about 169 feet above NGVD, 11 feet above the present spillway crest. The peak flow from the October 1903 flood at the USGS gage 0.6 miles downstream of the dam was 28,000 cfs. Since the dam was rebuilt in 1945, the stage-discharge relationship in the 1903 flood cannot be compared to the stage discharge curve developed in this report. In 1945, the dam was damaged by high waters. No record of the peak stage in the reservoir from this flood could be found.

c. Visual Inspection. At the time of the inspection, all flow was through the 3-foot wide notch in the main spillway, allowing a clear view of the spillway crest and downstream face.

d. Beatties Mill Dam Overtopping Potential. The hydraulic/hydrologic evaluation for this 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 intermediate size. The PMF was obtained from Passaic River Basin - New Jersey and New York - Survey Report for Water Resources by the New York District of the Corps of Engineers. The half-PMF inflow to the pond is 44,000 cfs, with a peak outflow of 43,785 cfs causing a stage of 171.6 feet above NGVD. (Hydrologic/hydraulic computations are attached as Appendix 4.)

Water could rise 7.3 feet above the crest of the low flow notch in the spillway, to 164.1 feet above NGVD, before overtopping the left abutment of the dam. Under this head the spillway capacity is 12,701 cfs, 29% of the selected SDF. Flood routing calculations indicate that Beatties Mill Dam would be overtopped for 91 hours to a maximum elevation of 171.6 feet NGVD, 7.5 feet above the crest of the left abutment, under half-PMF conditions.

e. Draw-down Capacity. Water could be diverted from Beatties Mill Dam at times of low flow through the canal leading to the water treatment plant. The time required to draw the reservoir down would depend on inflow and on the capacity of the canal.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

The displacement of large masonry blocks at the junction of the spillway and center masonry block training wall may lead to seepage and undermining of the spillway. The dislodgment of several large blocks of bedrock at the downstream end of the masonry block training wall may cause stability problems to the training wall if allowed to continue.

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 are available.

6.4 Post-Construction Changes.

Plans and sections from the 1945-1946 reconstruction of the dam are available; however no computational data pertinent to the structural stability of the dam are 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". None of the visual observations made during the inspection are indicative of unstable conditions. However, because no data are available concerning the engineering properties of the foundation materials for this dam, it is not possible to make an engineering evaluation of the stability of the structure or the factor of safety under static conditions.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Beatties Mill Dam is 85 years old and is 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 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 Recommendation/Remedial Measures

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

(1) Design and oversee repair procedures for the replacement of the large masonry blocks which have been dislodged from the north side of the training wall which is at the left center of the dam.

(2) Evaluate the potential for undermining of the foundation support at the downstream end of the masonry spillway training wall at the left center of the dam caused by the loss of several large bedrock blocks, and design and oversee corrective measures as needed.

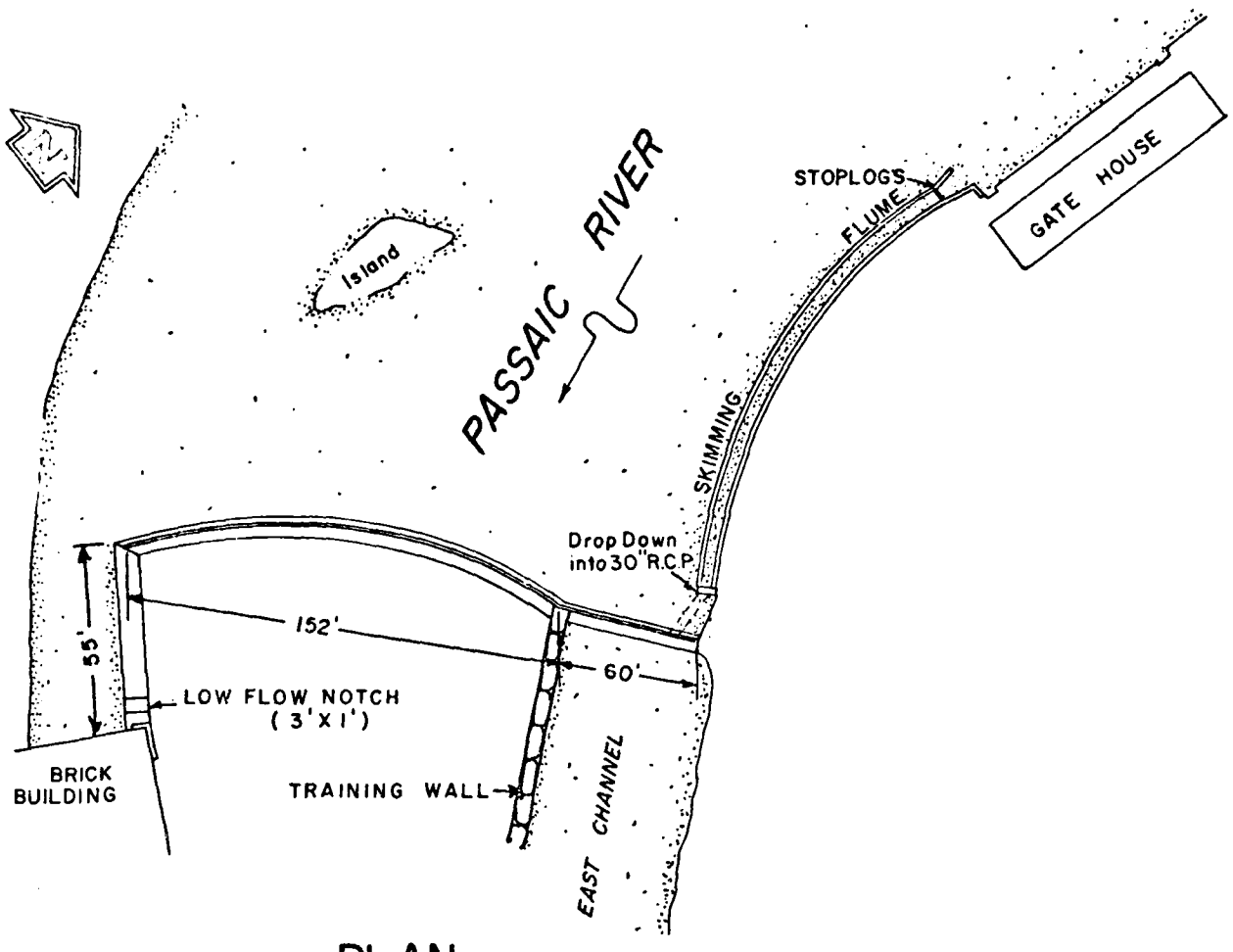
(3) Investigate measures to assure the stability of the dam under severe overtopping conditions.

b. Alternatives. None recommended.

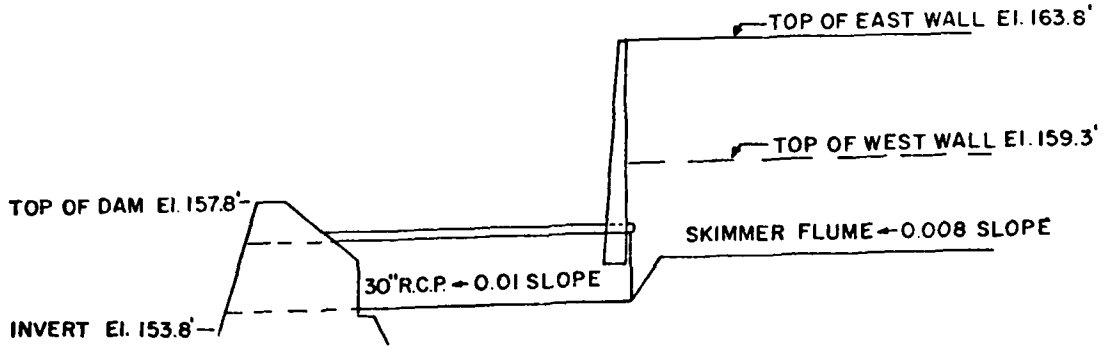
c. Operating and Maintenance Procedures. The owner should accomplish the following in the near future:

(1) Repair the eroded construction joints.

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



PLAN



ELEVATION

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

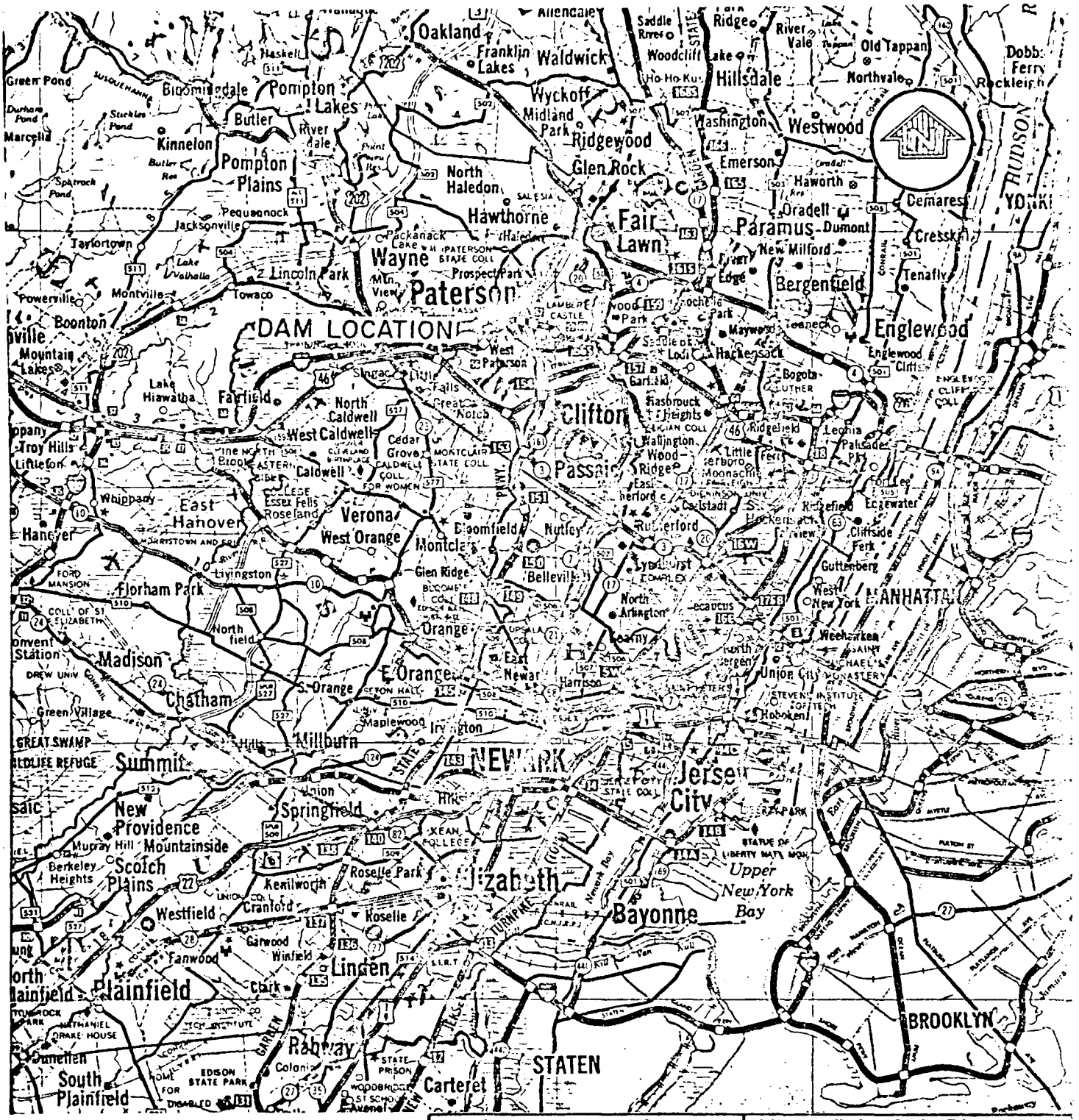
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

BEATTIES MILL DAM

PASSAIC RIVER NEW JERSEY

SCALE NOT TO SCALE

DATE JUNE 1981



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

BEATTIES MILL DAM
LOCATION MAP

PASSAIC RIVER 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

ENGINEERING AND EXPERIENCE DATA

BEATTIES MILL DAM

Borough of West Paterson

PASSAIC COUNTY, N. J.

Department of Administration

ALFRED A. REDA
Municipal Clerk
Administrator

533 McBRIDE AVENUE,
WEST PATERSON, N. J. 07424
(201) 278 0400

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DIV. OF WATER RESOURCES

August 21, 1972

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Mr. Axis
State Department of Environmental Protection,
Division of Water Resources
Trenton, NJ

RE: Beattie Dam Little Falls
Township Passaic County NJ

Dear Mr. Axis:

With respect to the above noted matter please be advised that on August 15, 1972 Mr. Wendell Inhoffer, General Superintendent of the Passaic Valley Water Commission, made a visual inspection of the Beattie Dam and was accompanied by Mr. Robert P. Schilling, Municipal Engineer, for the Borough of West Paterson.

For your information I am enclosing herewith a copy of Mr. Schilling's report dated August 15th wherein it is indicated the aforenoted found no evidence of cracks or other structural defects etc.

Please note that at the time of this inspection Mayor Alfred H. Baumann of West Paterson was away on vacation and has just returned. Upon his direction I am forwarding this report to you.

Should you desire any additional information on this matter, please do not hesitate to call my office. Thanking you for your cooperation, I wish to remain,

Sincerely yours,

Alfred A. Reda
Municipal Clerk
Administrator

AAR:gd
Enc.

CC: Mayor Alfred H. Baumann

Robert P. Schilling
Municipal Engineer

PASSAIC VALLEY WATER COMMISSION

1525 MAIN AVENUE
CLIFTON, NEW JERSEY
P. O. BOX 280

August 14, 1972

Mr. Dirk C. Hofman, P.E.
Chief - Bureau of Water Control
State of New Jersey
Department of Environmental Protection
Division of Water Resources
Trenton, New Jersey 08625

Dear Mr. Hofman:

Re: Beattie Dam, Application No. 804

This is to inform you that on Saturday, August 12, 1972, the writer personally inspected Beattie Dam after all overflow had been diverted to the Commission's intake canal.

You are hereby advised that cracks and leaks reported in the Herald News on June 26, 1972, were not apparent during this inspection.

A number of photographs were taken and will be forwarded to your office in the near future.

Very truly yours,

PASSAIC VALLEY WATER COMMISSION

Wendell R. Inhoffer
General Superintendent
and Chief Engineer

WRI:grt

Honorable Mayor and Council
Borough of East Paterson, N.J.

Re: Beattie Dam
Little Falls Township,
Passaic County, N.J.

Gentlemen:

This is to advise that on this date I met with Mr. Wendell Inhoffer, General Superintendent and Chief Engineer, Passaic Valley Water Commission, in connection with an earlier report received regarding possible structural defects in the Beattie Dam, in Little Falls, N.J.

At the present time there is no overflow occurring at the dam and we were able to observe the entire top and external face of the structure during this inspection. We found no evidence of any deterioration, cracks or other structural defects and in Mr. Inhoffer's opinion the dam appears to be in a sound condition. Mr. Inhoffer also stated that he has had photographs taken of the dam and has submitted a report of his findings to the New Jersey Dept. of Environmental Protection, Division of Water Resources.

Respectfully submitted,

Robert P. Schilling

RPS/ce

Robert P. Schilling
Municipal Engineer

Morris County Mosquito Extermination Commission

3 Franklin Place

COMMISSIONERS
A. THOMAS SCOTT, President
WILLARD V. KING, Vice-President
REV. JOSEPH E. WALSH, Treasurer
SPENCER S. MARSH, JR., Secretary
DR. JOHN T. MORRISON
GEORGE E. LAUBACH

JAMES T. HART, JR.
Superintendent
Telephone Morristown 4-1200

MORRIS PLAINS, N. J.
October 28, 1946.

N.J. State Water Policy Commission
28 West State Street
Trenton, New Jersey.

DEPT. OF CONSERVATION
RECEIVED
OCT 29 1946
DIVISION OF
WATER POLICY & SUPPLY

Attention: Mr. Howard T. Critchlow

Gentlemen:

I am writing to inquire whether the State Water Policy Commission has checked the work completed at Beattie's Dam, Little Falls, by the Passaic Valley Water Commission with respect to the following:

1. Elevation of the re-capped spillway.

2. Length of present spillway including wall on the mill side.

I have been informed by my associates in Little Falls that great secrecy surrounded the work, with watchmen, etc. All were forbidden to discuss the work; however, information is abroad that the spillway was raised a few inches in the re-capping process and the portion of the dam paralleling the mill side was cut off so that it can be no longer considered spillway area. This may be rumor as most reports are; however, we must be prepared to answer.

Our position is one opposing even a fraction of an inch rise in the elevation of the spillway and the curtailment of any spillway area. If your Department has checked the work by running levels from the B.M. established by the Riparian Stream and Waterway Survey to the points on the spillway as shown on the plan of that survey and found no increase we will be more than pleased. If this was not done in the course of approving the final work we will take the steps necessary to make the survey in order to answer the rumors.

With best regards to you and your assistants, I remain,

Yours truly,

Robert L. Vannote, Exec. Sec'y
Four County Committee for Mosquito Control in the Passaic Valley

RLV:m

Report on Dam Inspection

BRATTY'S DAM

PASSAIC RIVER, PASSAIC COUNTY

APPLICATION NO. 164

DAM NO. 86-30

On August 23, 1946 inspection was made in company with Richard E. Berglund, Superintendent, Passaic Valley Sewerage Commissioners, of the spillway repair which has been completed recently under Permit approved November 1, 1945 for the subject dam. Inspection disclosed that the work on the spillway has been completed in accordance with the approved drawings and is an excellent job. Instructions were issued from these offices. It is recommended that the approved letter accepting the repairs to the spillway be sent to Mr. Berglund.

At the time of inspection, the contractor was removing the earth dike which had been constructed upstream of the spillway to permit repairs and was using that material to build a dike along the left bank to permit construction of the skimming flume.

This dike is being removed to below the original stream bed level where rock permits.

George R. Shanklin

Trenton, N. J.
August 28, 1946

George R. Shanklin
Acting Chief Engineer

Law Offices
SIDNEY B. SILVERSTEIN
126 Washington Street

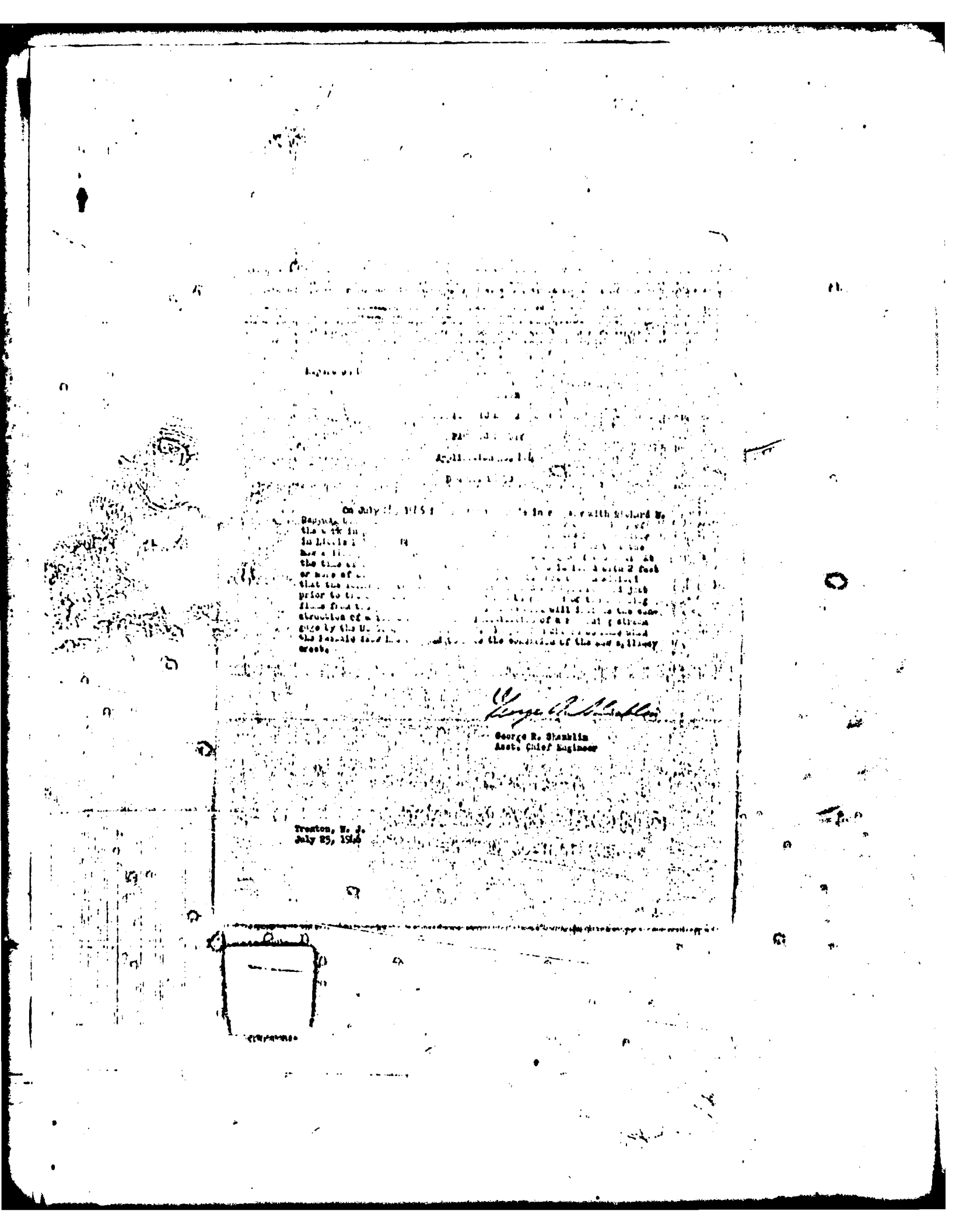
[illegible]

Gentlemen:

Several [illegible] wrote to you regarding the modific[illegible] Bottle Exchange [illegible] Jersey. My client, [illegible] in Lincoln Park, [illegible] result of the alteration [illegible] mentioned dam, his [illegible] rendered worthless. [illegible] kind enough to [illegible] this matter.

Sincerely yours,

SBS:CSR



George R. Shanklin
Asst. Chief Engineer

Trenton, N. J.
July 25, 1946

Report on Site Inspection

[illegible]

[illegible] COUNTY

APPLICATION NO. [illegible]

DRB NO. 56-30

On May 17, 1956 inspection was made of the work in progress on the raising to this dam on the Passaic River in Little Falls, Passaic County. The inspection disclosed that the new spillway crest has been completed to the elevation of the crest section in the middle of the dam. At the time of the inspection all work had been [illegible] by high flows. The head observed on the new section was approximately 8 inches.

Trenton, N. J.
May 27, 1956

George R. Franklin
Asst. Chief Engineer

[illegible]

[illegible]

[illegible]

Dear Sir or Madam:

Receipt is acknowledged of your letter of May 14, 1945 [illegible] for the repair of [illegible] at Little Falls, [illegible] is in error [illegible] entitled Little Falls Dam [illegible] have been [illegible] of the design originally approved [illegible] are returning for your files, approved [illegible]

Sheet No. 3, entitled "Proposed Flashboard Details" cannot be accepted for the reason that the permit was issued subject to special condition 11, "It is hereby understood that approval herein does not permit the placing of flashboards on the crest of the structure".

Yours very truly,

H. F. Critchlow
Chief Engineer

HFC:EK

May 9, 1946

Mr. Richard E. Burgess, Secretary
[illegible]
[illegible]
[illegible]

Dear Mr. Burgess:

In reply to your letter of May 7, 1946 suggesting that the top of the ring wall on the left abutment of Seattle's dam on the Cedar River at Lincoln Park, be raised 8 inches higher than the crest elevation 19/.0 of the main dam, we can advise you that this office has no objection to this change in the design as proposed however, if this change is adopted, please file in duplicate revised drawings showing same.

Yours very truly,

H. T. Critchlow
Chief Engineer

HTC:LMB

[illegible]

[illegible]

[illegible]

[illegible]

On [illegible] 1945, in company with O. W. Bartwell, District Engineer, U. S. Geol. [illegible] and B. Bunyon, Electrical [illegible] said site and the exist[illegible] [illegible] of the work in progress on this and the Delaware River in Little Falls, [illegible].

The [illegible] disclosed that the old spillway crest has been [illegible] two weak channels. [illegible] and it appeared to be [illegible] Large bolts have been placed [illegible] across for this section. Mr. [illegible] said that we should expect the work on the repairs to [illegible] to be completed both before July 1.

Following the inspection, Messrs. Bartwell and Bunyon discussed the location of a gaging station to be located at this point for [illegible] and agreed that a site for the recorder [illegible] about 100 feet above the [illegible] station is to be [illegible] the records of the flume to be kept at [illegible] gaging station to be located in the gorge below the point of discharge of the turbines and other plant waters.

George B. Shanklin

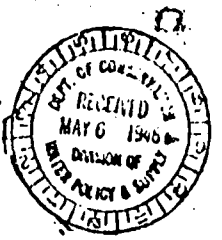
Trenton, N. J.
May 6, 1945

George B. Shanklin
Asst. Chief Engineer

PASSAIC VALLEY WATER COMMISSION

137 ELLISON STREET
PATERSON, I
NEW JERSEY

May 5, 1948



BPS

Department of Conservation
Division of Water Policy and Supply
28 West State Street
Trenton, N.J.

Attention: H.T.Critchlow, Chief Engineer

Re: Repairs "Beattie's Dam"

Gentlemen:

It has just been suggested that the top of the wing-wall on the Beattie's mill side of the above captioned structure, be held at an elevation 8 inches higher than the crest of the main dam. This would materially improve the operating appearance when a small amount of water is flowing over the dam, and would confine the flow to the main section.

The plans, as approved, call for holding the same crest level throughout, namely, elevation 187.80.

Would you approve of the change suggested above?

Very truly yours,
PASSAIC VALLEY WATER COMMISSION

Richard K. Bonyun
General Superintendent

RKB:G

Report on [illegible]

[illegible]'S DAM

LITTLE FALLS, PASSAIC RIVER

APPLICATION No. [illegible]

DAM NO. 26-30

On October 10, 1945 inspection was made and conference was held with Richard E. [illegible], Consulting Conservationist Passaic Valley Water Commission and Mr. [illegible] of Engineering Associates, Consulting [illegible] the repair and construction of a skimming flume at [illegible]'s Dam on the Passaic River at Little Falls.

The inspection disclosed that the crest of the main dam had been severely damaged by the July 1945 flood, wherein two courses of the stone masonry had been washed off the top of the dam for a distance of 12 feet near the right end of the [illegible] for a distance of 6 feet near the left end of the main spillway. The left wing wall was in good condition with a concrete cap. Fifteen feet, however, of this wing wall is somewhat obstructed at the left end by an outcrop of ledge rock on the downstream face. The right wing wall, opposite the Beattie Manufacturing Company plant, is in very poor condition and leaks badly.

The preliminary drawings filed October 1 were discussed with Messrs. Bonyun and Bogert, who were advised (1) that no approval to start construction could be granted before the next Council meeting on November 1; (2) that approval of the repairs and the skimming flume would be recommended without the provisions for flashboards; (3) that the outlet of the skimming flume be modified to reduce its obstruction of the left wing wall. Mr. Bogert agreed to eliminate the two concrete sills shown on the spillway for future flashboards, but requested that the pipe sockets and eye-bolts shown on the final drawings for use with flashboards at some future date be approved, since the cost of installing these items at the future date would be large as compared with the cost of installing them at this time. In order to avoid a serious obstruction to the left wing wall and heavy rock excavation below this wing wall, it was decided to end the skimming flume 20 feet above the dam and discharge through a concrete pipe, the top of which would be located below the crest of the dam. In support of the flashboard provisions Mr. [illegible] was requested to file a letter with his application substantiating the need of the flashboards.

Trenton, New Jersey
October 25, 1945

George E. Shanklin
Asst. Chief Engineer

Dam Application No. 101
(26-50)

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 Passaic Valley Water Commission, 157 William St., Paterson, N.J.

filed October 22, 1945 for approval of plans and for a permit to repair a dam
construct a skimming flume above this dam

known as Beattie's Dam and its/ race in Little Falls on Passaic River

tributary to Newark Bay in Passaic County, New Jersey,

has been examined by George E. Shanklin Chief Assistant Division Engineer.

PRINCIPAL FEATURES

Location 26.1.6.6.6	Site inspected Oct. 10, '45 - G.E.S.
Purpose of dam Potable public water supply	Length of dam 160 feet main & right wing wall 61 "
Drainage area 772.9 sq. mi.	Elevation of low line 157.8 Applicant's datum 157.5 N.J. Geodetic "
Area of Lake natural channelbeds	Capacity of lake —— Mil gals.
Type of dam Stone masonry dam capped with concrete Top width 8.25 feet	
Upstream slope 2-1/2 to 1 or flatter	Downstream slope 1 to 1-1/2
Foundation material Trap rock ledge	Max. height 8± feet
Type of spillway Freefall overflow, stone dam	Length of spillway 285 feet
Max. head on spillway 11.12 feet See other side.	
Spillway capacity 31,075 cu. ft.	cu. ft. per sq. mi. See other side.
Estimated maximum flood flow	cu. ft. per sq. mi. Oct. 10, 1903
Outlets other than spillway Intake canal and gate house for Passaic Valley Water Comm. plant on left bank upstream of dam and intake works for Beattie's Mfg. plant on right bank at dam.	
Drawings filed	

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.

PASSAIC VALLEY WATER COMMISSION

157 ELLISON STREET
PATERSON, 1
NEW JERSEY

DAM APPLICATION No. 42 11 October 16, 1942.

N. J. Dept. of Conservation
Division of Water Policy & Supply
20 West State Street
Trenton 8, New Jersey

Attention: H. T. Critchlow,
Chief Engineer.

Re: Dam #26.10 Passaic County

Gentlemen:

We are enclosing herewith application forms for permission to repair this Commission's Dam, known as "Beattie's Dam", across the Passaic River at Little Falls. Also enclosed is a complete set of plans and specifications for the project.

Following our conference on the site with Mr. Shanklin on October 10th, we have revised the design of the outlet end of the skimming flume in accordance with your suggestions to eliminate any obstruction at the crest of the dam. The proposed elevation of the new crest is the same as that of the existing crest of the arched section. This elevation of crest will be held throughout the entire spillway and will effect a betterment in discharge capacity, since the crests of the existing wing walls on either side of the arched section are now and have been some three to four inches higher than the crest of the arched section.

You will note on the drawings that we are requesting approval for the installation of pipe sockets in the new dam crest for the future installation of flashboards, if and when applied for and approved by your Board.

We submit the following arguments to justify our request:

(1) The pipe sockets would be flush with the top of the dam, filled and sealed with material of a

removable nature, and would offer no resistance to free discharge.

(2) Flashboards would not be installed unless formal approval were granted by your Board. This policy would be confirmed by the Commission by formal resolution, if you request such action.

(3) The design of the flashboard supports, if and when applied for and approval granted, would consist of stainless steel pins with a calibrated cut-away section at crest level, and designed and tested to fail at a predetermined elevation of water level above the permanent crest of the dam. The flashboards would then fall to the downstream face of the dam and be held there by chains fastened to the eye bolts set in the face of the dam. Such a design for flashboards would cause no hardship to upstream property owners during times of low flow conditions and would fail and create no obstruction to the free discharge over the dam during times of high water.

We are anticipating, at this time, the need for flashboards on this dam at some time in the future for the following reasons:

(1) The Little Falls Purification Plant on this Commission's Passaic River source of potable water supply is designed on gravity flow of water from the river through intake canal, screen house, coagulation basins, influent piping and on to the filters. It is estimated that the present maximum gradient

with water level at the river of 157.8 (crest level of the dam) will not permit production of potable water from this source in excess of 50 m.g.d. The future installation of flashboards to permit the carrying of 1 ft. higher elevation of water at the river intake, during times of low flow, would materially increase the potable water yield from this source of supply.

(2) The future installation of the flashboards would provide certain other advantages such as increased hydro-electric generation, which might be vital in our ability to pump water during failure of our auxiliary source of power.

As stated in our letter of September 28th, the Commission considers the repair of the dam urgent, and time to be of the essence. For this reason we have explained at length our present and future plans in anticipation of your deliberation on the application. The work has been advertised and bids will be received by the Commission on October 24th, and we respectfully request your approval of the project by that date or shortly after, in order that the contract may be awarded without delay.

Very truly yours,

PASSAIC VALLEY WATER COMMISSION

Richard E. Bonyun

Richard E. Bonyun
General Superintendent

REB:VM

PASSAIC VALLEY WATER COMMISSION

PASSAIC VALLEY WATER COMMISSION

137 ELLISON STREET

PATERSON, I
NEW JERSEY

September 20, 1945

H.T. Critchlow, Chief Engineer
New Jersey Department of Conservation
Division of Water Policy and Supply
20 West State Street
Trenton 8, New Jersey

Re: Dam No. PC-20-Passaic County

Gentlemen:

In response to your letter of September 11th, regarding repairs to our [illegible], at Little Falls, we hereby make formal application for approval to proceed with this construction.

Enclosed herewith is a copy of a preliminary report of Bogert-Childs Engineering Associates, together with preliminary drawings of the work to be undertaken. It is proposed to do the following work:

(1) Reconstruct the crest and down stream slope of the curved section of the dam and the straight section on gate house side, with poured concrete of typical cross-section as shown on scheme 1. of the drawing.

(2) To reinforce the existing side wall on the Feattie Manufacturing side with poured concrete typical section L-R as shown on the drawing.

(3) To hold the elevation of the new concrete crest of the main dam and side wall, at the same elevation as the crest of the present dam.

(4) To construct a "skimming flume" from the floating boom at the gate house to and through the dam as shown on the drawings.

Not approve provision for flash boards (5) To provide in the new crest of the dam and side walls, slots for the future installation of flash boards if and when approved by your department.

This application does not include a request for any change in elevation of the crest of the existing dam, or for the installation of flash boards previously mentioned in our letter of September 6th, but is merely a request for approval to proceed with the permanent

rebuilding of the existing structure, the maintenance of which is vital to the operation of this Commission's Passaic River water supply.

Since the flood of July 22nd, recent high water over the dam has caused more damage to the structure and for this reason it is imperative that work on the repairs be placed under way as soon as possible.

Will you therefore kindly give this matter your prompt consideration so that there may be no undue delay in proceeding with the project.

Very truly yours,
PASSAIC VALLEY WATER COMMISSION

Richard E. Bonyun
General Superintendent

REB:G

PASSAIC VALLEY WATER COMMISSION

137 ELLISON STREET

PATERSON 1, NEW JERSEY

Pom Passaic Co

September 6, 1945.

R. T. Critchlow, Chief Engineer
N. J. Dept. of Conservation
Division of Water Policy & Supply
28 West State Street
Trenton 8, New Jersey

Pom. 26-30

RECEIVED
SEP 7 - 1945
DIVISION OF WATER POLICY & SUPPLY

Dear Mr. Critchlow:

During the recent flood of July 22nd and 23rd, material damage was done to this Commission's dam across the Passaic River at Little Falls. The dam is known as "Beattie's Ford". Several of the coping stones forming the crest of the stone masonry dam were washed away.

We are starting with the preparations of plans and specifications for the work of making a permanent repair to the structure. To be included in the project is a new sluiceway from the floating boom at our River intake, to and through the dam to facilitate removal of debris which collects at the intake. Also contemplated is the installation of collapsible flashboards on the top of the dam which would permit the carrying of approximately 1 ft. higher elevation of water in the pond above the dam during dry flow conditions, but which would collapse at time of high water and not interfer with the free discharge over the dam.

It is my understanding that such work is subject to the approval of your department and for this reason I am advising you of the project. We have engaged the services of Bogert-Childs Engineering Associates in the preparation of design, plans and specifications.

Please advise if I am correct in assuming that your approval is necessary, and if so please inform us of the procedure to follow.

Very truly yours,
PASSAIC VALLEY WATER COMMISSION

Richard E. Bonyun

(over)

Richard E. Bonyun
General Superintendent

APPENDIX 2

CHECK LIST

VISUAL INSPECTION

BEATTIES MILL DAM

Check List
Visual Inspection
Phase 1

Name Dam Beatties Mill Dam County Passaic State NJ (00821) Coordinators NJDEP

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

Pool Elevation at Time of Inspection 157.2' NGVD Tailwater at Time of Inspection 152' NGVD

Inspection Personnel:

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

R. Murdock/K. Stuart/S. Gilman Recorder

Mr. L. O'Brien - Owner's Representative

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	None observed	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Considerable loss of stone support at junction of spillway and buttress and underneath downstream end of buttress.	Repair training wall and downstream support.
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	Entire structure is founded on bedrock.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Surface of dam is eroded exposing the coarse aggregate	
STRUCTURAL CRACKING	Evidence of horizontal cracks or cold construction joints in d/s right end face.	Repair joint
VERTICAL AND HORIZONTAL ALIGNMENT	No indication of horizontal or vertical movement	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	Vertical joints are eroded to 1-inch deep. No leakage noted. Bottom of weir is undermined at base approximately 2-4 inches all along toe of concrete dam.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Canal diversion for Passaic Valley Water Commission.	Canal - good condition
INTAKE STRUCTURE	Building over intake channel Diversion to canal controlled from gate house. Channel in good condition.	Channel with cut stone walls
OUTLET STRUCTURE	N/A	
OUTLET CHANNEL	Canal to water treatment plant	
EMERGENCY GATE	N/A	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Good shape	
APPROACH CHANNEL	Passaic River	
DISCHARGE CHANNEL	Passaic River - open channel, bedrock channel bottom.	Beattie Mill building adjacent to right bank d/s
BRIDGE AND PIERS OVER SPILLWAY	N/A	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gradually to moderately sloped. Mill buildings on right side of reservoir; wooded.	
SEDIMENTATION	Some sedimentation observed in the reservoir.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Rocky, well-defined channel	
SLOPES	Stable, steep slopes	
APPROXIMATE NO. OF HOMES AND POPULATION	None threatened	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Plans from 1945-1946 reconstruction on file at NJDEP, Post Office Box CN-029, Trenton, N.J. 08625
REGIONAL VICINITY MAP	Prepared for this report
CONSTRUCTION HISTORY	No information available on the original construction in 1896 (est.). General information is available, however, in the NJDEP files on the 1945-1946 reconstruction. Copies of this information are included in Appendix 1 of this report.
TYPICAL SECTIONS OF DAM	Dam sections pertinent to the 1945-1946 reconstruction are on file at NJDEP; see "PLAN OF DAM" above.
HYDROLOGIC/HYDRAULIC DATA	84 years of discharge record at U.S.G.S. gage, 0.6 miles downstream of dam. 28,000 cfs in October 1903 is flood of record. No other information disclosed.
OUTLETS - PLAN	Not available
- DETAILS	Not available
- CONSTRAINTS	Not available
- DISCHARGE RATINGS	Not available
RAINFALL/RESERVOIR RECORDS	Not available. Peak stage from 1903 storm 11.1 feet above spillway crest.

ITEM	REMARKS
DESIGN REPORTS	Letters regarding 1945-1946 reconstruction available at NJDEP. See "PLAN OF DAM" on page 2-8.
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not available
POST-CONSTRUCTION SURVEYS OF DAM	Not available
BORROW SOURCES	Not applicable

ITEMS	REMARKS
SPILLWAY PLAN	
SECTIONS	On file at NJDEP. See "PLAN OF DAM" on page 2-8 of this report.
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Not available

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Plans for 1945-1946 reconstruction at NJDEP. See "PLAN OF DAM" on page 2-8 of this report.
HIGH POOL RECORDS	October 1903, 11.1 feet over crest of dam. (1945 reconstruction changed stage-discharge relationship.)
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Damaged by high flows in 1945 (see Engineering Data, Appendix 1)
MAINTENANCE OPERATION RECORDS	Not available

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 762 square miles, wetlands, urban areas, wooded areas

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 156.8 feet NGVD (1,435 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY) Not applicable

ELEVATION MAXIMUM TEST FLOOD POOL: 171.6 feet NGVD

ELEVATION TOP DAM: 164.1 feet NGVD (4,870 acre-feet)

SPILLWAY CREST: free overflow concrete spillway

a. Elevation 157.8 feet NGVD (3 foot notch at 156.8)

b. Type broad-crested

c. Width 5 feet

d. Length 267 feet

e. Location Spillover entire top of dam

f. Number and Type of Gates None

OUTLET WORKS: gated canal

a. Type lift gates

b. Location 300 feet upstream of left abutment

c. Entrance Invert unknown

d. Exit Invert unknown

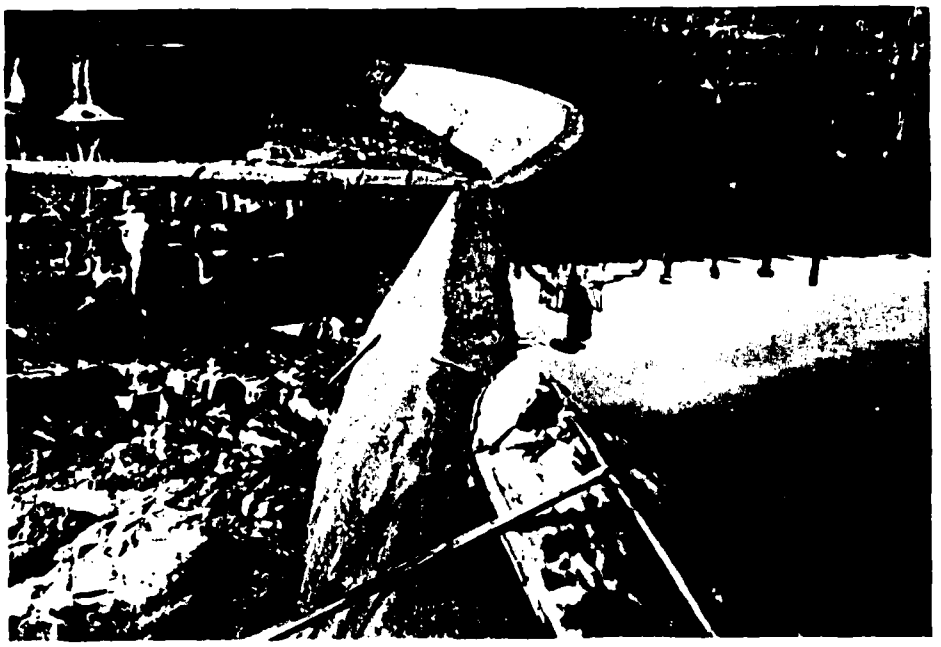
HYDROMETEOROLOGICAL GAGES: None

MAXIMUM NON-DAMAGING DISCHARGE: 12,701 cfs

APPENDIX 3

PHOTOGRAPHS

BEATTIES MILL DAM



April 23, 1981

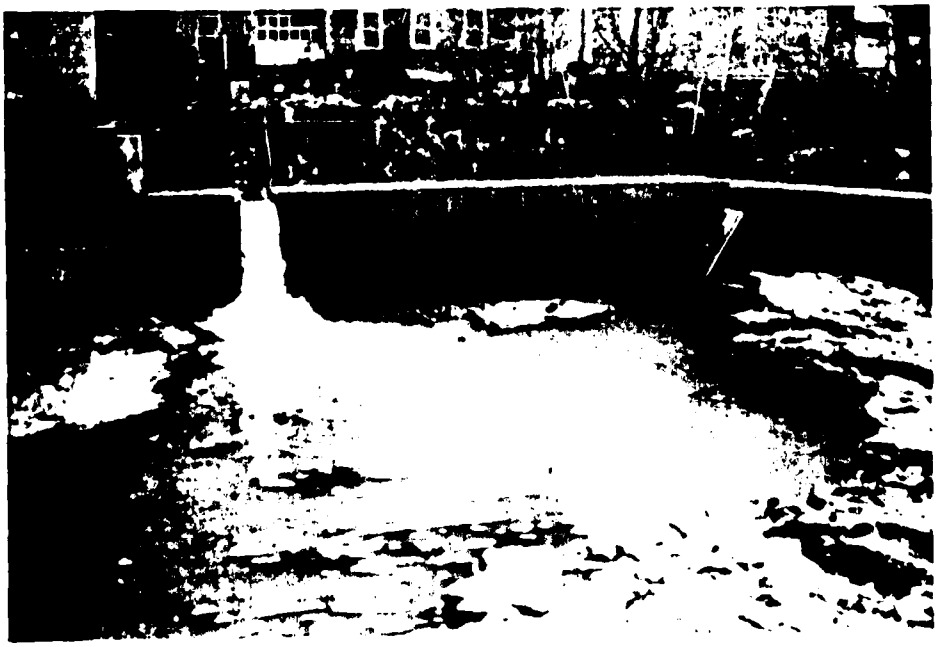
View along axis of dam from left (north) abutment

April 23, 1981

View of dam and pool area from downstream left bank

April 23, 1981

View of left wingwall and abutment



April 23, 1981

View of right wingwall and abutment. Note low level flow notch.

February 17, 1981

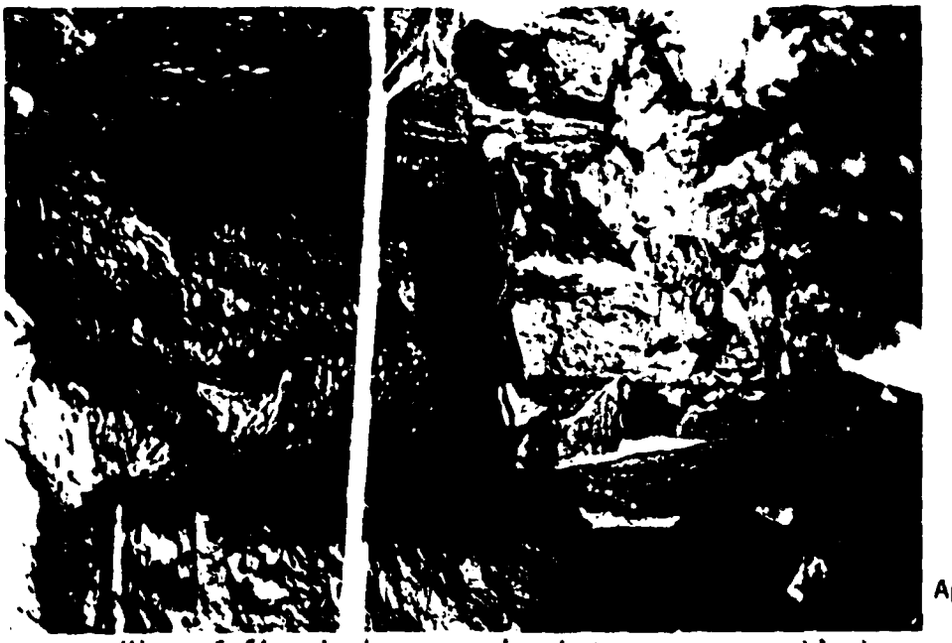
Small overflow spillway in right side, straight section of dam. Note large log in notch.

April 23, 1981

Erosion of training wall adjacent to spillway.

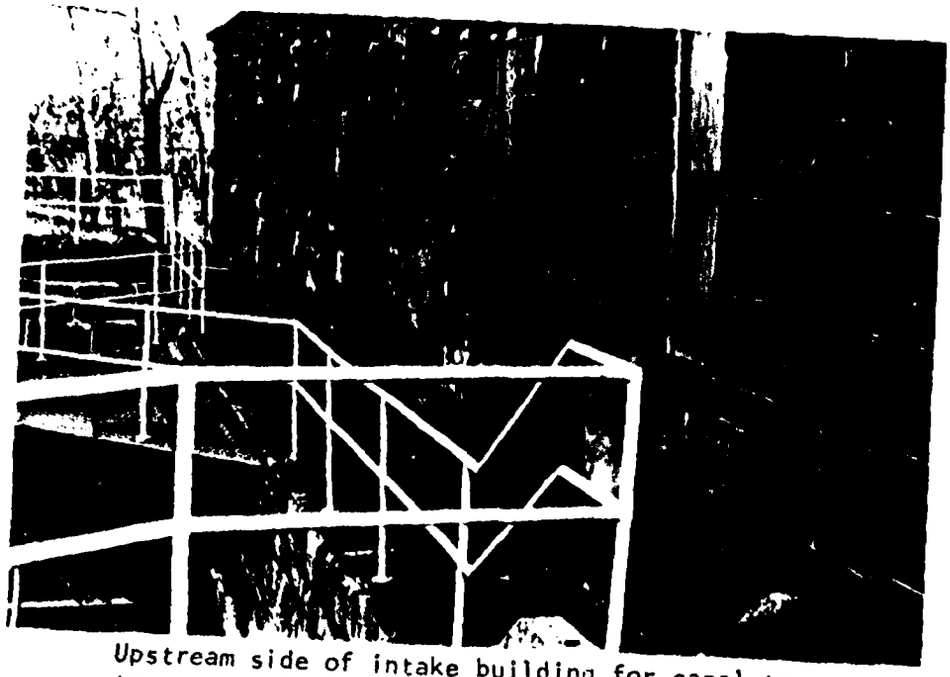
April 23, 1981

Root system visible behind missing stones. Stone block at crest (top of photo) is displaced three inches downward.



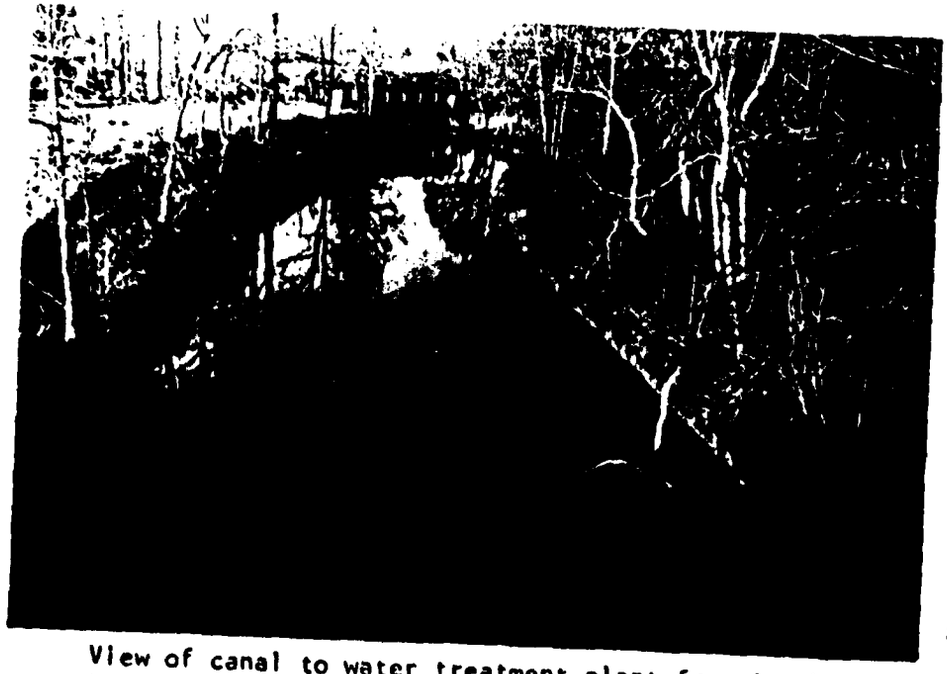
April 23, 1981

View of five-inch separation between masonry blocks near the base of the intersection between the training wall and the spillway.



April 23, 1981

Upstream side of intake building for canal to water treatment plant. Note high water mark from 1903 flood to the right of and below the right window.



April 23, 1981

View of canal to water treatment plant from intake building.

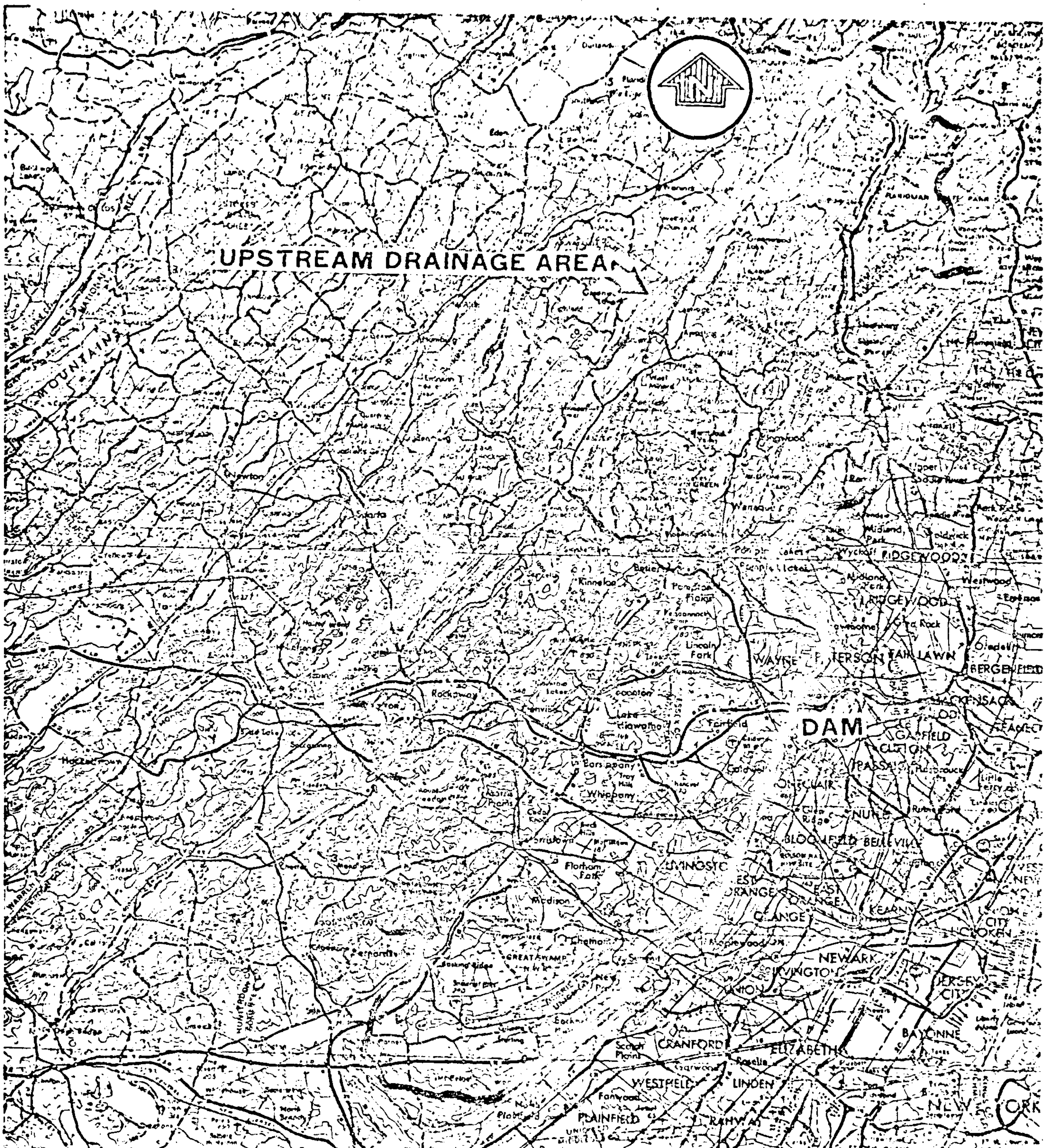
April 23, 1981

View of loss of rock support below downstream end of training wall.

APPENDIX 4

HYDROLOGIC COMPUTATIONS

BEATTIES MILL DAM



NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

BETTIES MILL DAM

REGIONAL VICINITY MAP

JUNE 1981

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

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

SCALE IN MILES

0 10 20

MAP BASED ON U.S.G.S. 1:250,000 SERIES SHEET NK 18-8 SCRANTON, PA., N.Y., N.J. 1962, REVISED 1976, AND NK 18-11 NEWARK, N.J., PA., N.Y. 1944, REVISED 1969.

.ols & Company, Inc. Subject Beatties Mill

Sheet No. 1 of 8
Date 11/6/
Computed
Checked

JOB NO.

SQUARES 1/4 IN. SCALE

PMF

The PMF is from Passaic River Basin Survey Report for Water Resources Volume 2, Appendix A, Figure A-64. (Report by New York District, Corps of Engineers).

Time (hours)	PMF flow at Beatties Dam
0	2,300
6	2,300
12	2,300
18	2,300
24	2,300
30	2,300
36	3,000
42	7,700
48	21,000
54	40,000
60	60,000
66	73,500
72	83,500
78	88,000
84	87,000
90	83,500
96	77,500
102	69,000
108	62,000
114	54,500
120	47,500
126	40,500 *
132	34,000 *
138	28,000 *
144	22,000 *
150	16,000 *
156	11,000 *
162	6,000 *

* Estimates of recession values

Anderson-Nichols & Company, Inc. Subject Beatties Mill

Sheet No. 2 of 8
Date 4/6/81
Computed TLL
Checked CJP

JOB NO.

SQUARES 1/4 IN. SCALE

Stage Vs Discharge

The hydraulic profile for Beatties Mill Dam is shown on p. 3.

Spillway

Q: Low flow notch + crest: $3(3)(E-156.8)^{3/2} + 3(264)(E-157.8)^{3/2}$

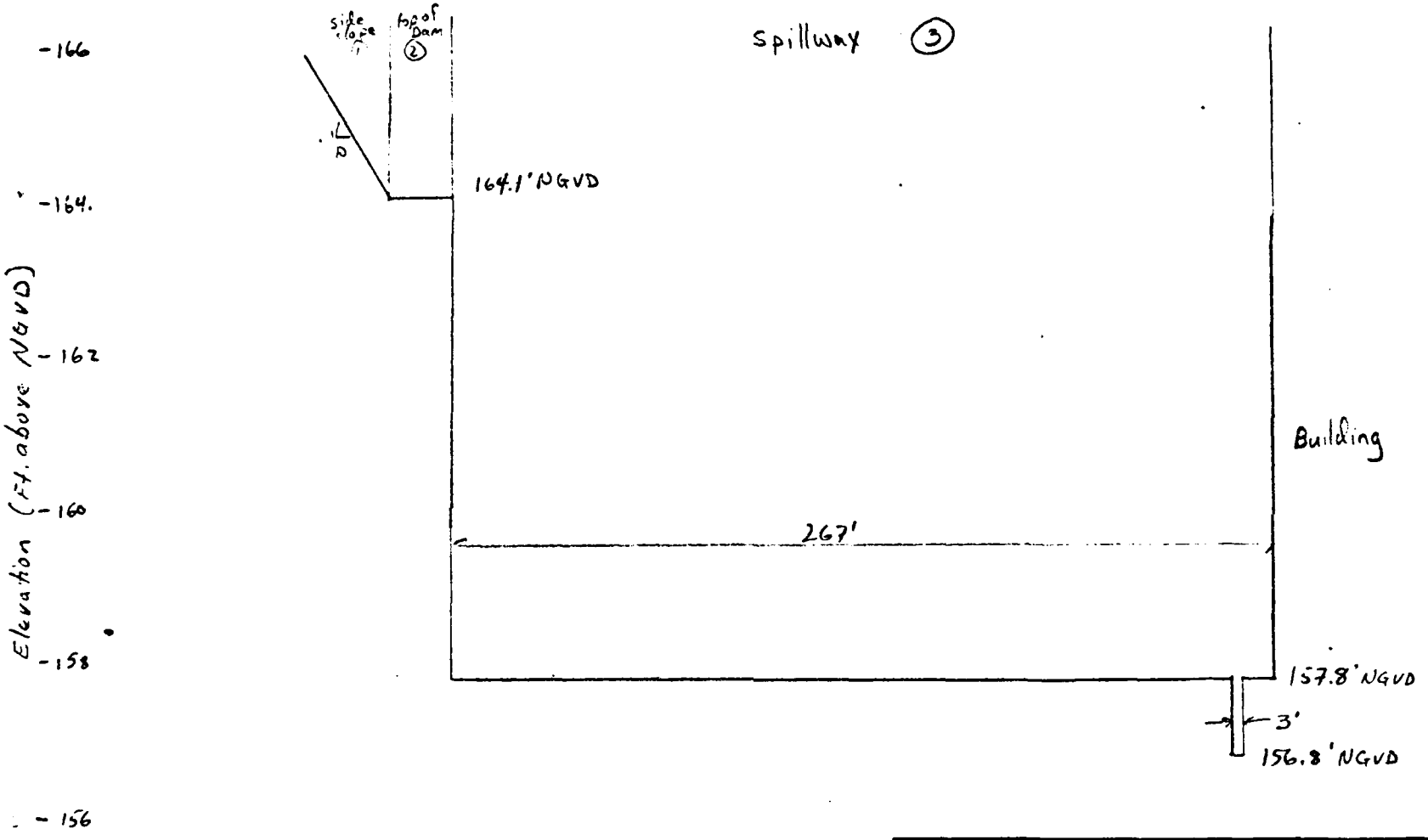
Top of Dam

$Q = 3.0(20)(E-164.1)^{3/2}$

Side Slope

$Q = C L H_{10}^{3/2} = 2.6(10)(E-164.1)(0.5(E-164.1))^{3/2}$

Elevation (Ft. above Nevd)	$Q_{spillway}$ (cfs)	$Q_{top\ of\ Dam}$ (cfs)	$Q_{side\ Slope}$ (cfs)	Q_{Total} (cfs)
148.6	0	0	0	0
156.8	0	0	0	0
157.8	9.0	0	0	9
158	83	0	0	83
159	1,070	0	0	1,070
160	2,636	0	0	2,636
161	4,611	0	0	4,611
162	6,924	0	0	6,924
163	9,530	0	0	9,530
164.1	12,701	0	0	12,701
165	15,512	51	7	15,570
166	18,848	157	46	19,051
167	22,394	296	132	22,822
168	26,138	462	276	26,876
169	30,070	651	489	31,210
171	38,464	1,087	1,150	40,701
173	47,521	1,593	2,172	51,286
174	52,283	1,868	2,835	56,986



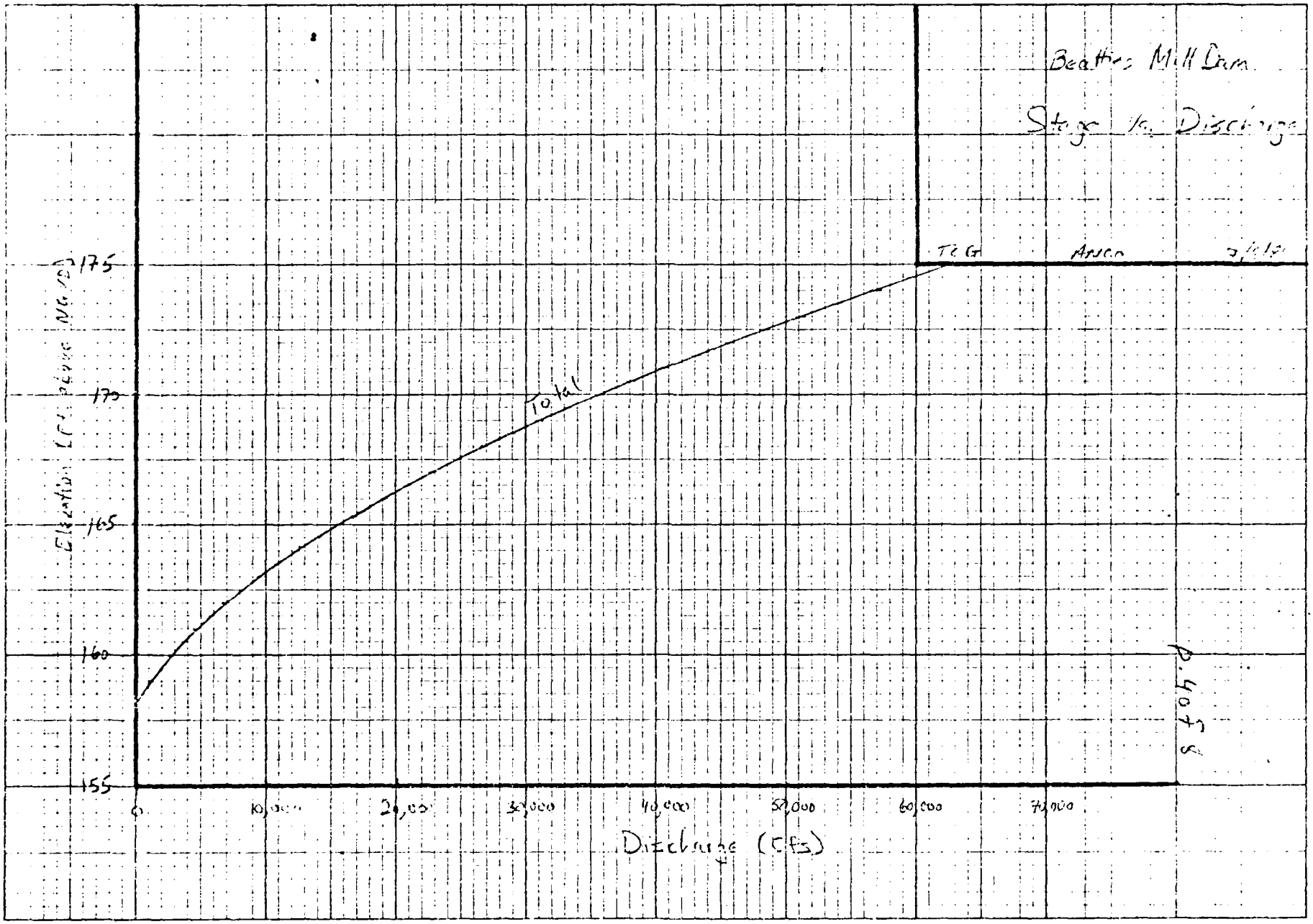
ANDERSON-NICHOLS

VERNON BOSTON CONCORD

Beatties Mill Dam

Hydraulic Profile

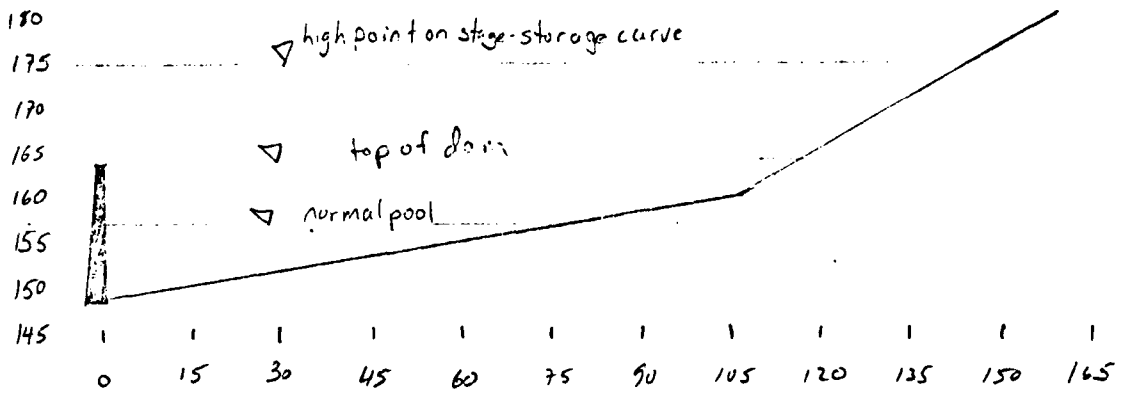
DATE	SCALE	JOB NO.	SHEET NO.
7/6/81	1" = 50' H 1" = 2' V		P. 3 of 8



SQUARES 1/4 IN. SCALE

Stage Vs Storage

The Passaic River upstream of Beatties Mill Dam is very flat. From U.S.G.S. quads, the 160' contour line is 106,000 feet upstream of the dam, and the 180' contour is 158,000 feet upstream. The low point in the reservoir pool is shown to be 148.6' NGVD on the plans, with the low point on the low flow weir at 156.8'. Top of dam is 164.1'



at normal pool (156.8)

Surface area = length x Avg. width

Length = $\frac{156.8-148.6}{160-148.6}(106{,}000) = 76{,}246$ ft.

avg. width = 200 ft

area = $(76{,}246)(200)$ ft.^{2} = 350.1 acres

Storage = Area (Avg Depth) = $350.1\left(\frac{156.8-148.6+0}{2}\right) = 1435$ Ac...

Anderson-Nichols & Company, Inc. Subject Keatties Mill Sheet No. 6 of 8
Date 7/6/01
Computed TCG
Checked CEP
JOB NO.

at top of dam

Surface area = length x Avg. width

Length = $106{,}000 + \frac{4.1}{20}(52{,}000)$

= 116,660 ft

Avg. width = 200 ft

area = $116{,}660\,(200)\left(\frac{1}{43{,}560}\right)$ = 536 ac.

Storage = Surface area to 160 (Avg. Depth) + S.A. to 164.1 (Avg. Da

$$= \frac{106{,}000\,(200)}{43{,}560}\left(\frac{(164.1-148.6)+(164.1-160)}{2}\right) + \frac{10{,}660\,(200)}{43560}\left(\frac{(164.1-160)+0}{2}\right)$$

$$= (486.7)(9.8) + 48.9(2.05) = 4{,}870 \text{ ac-ft.}$$

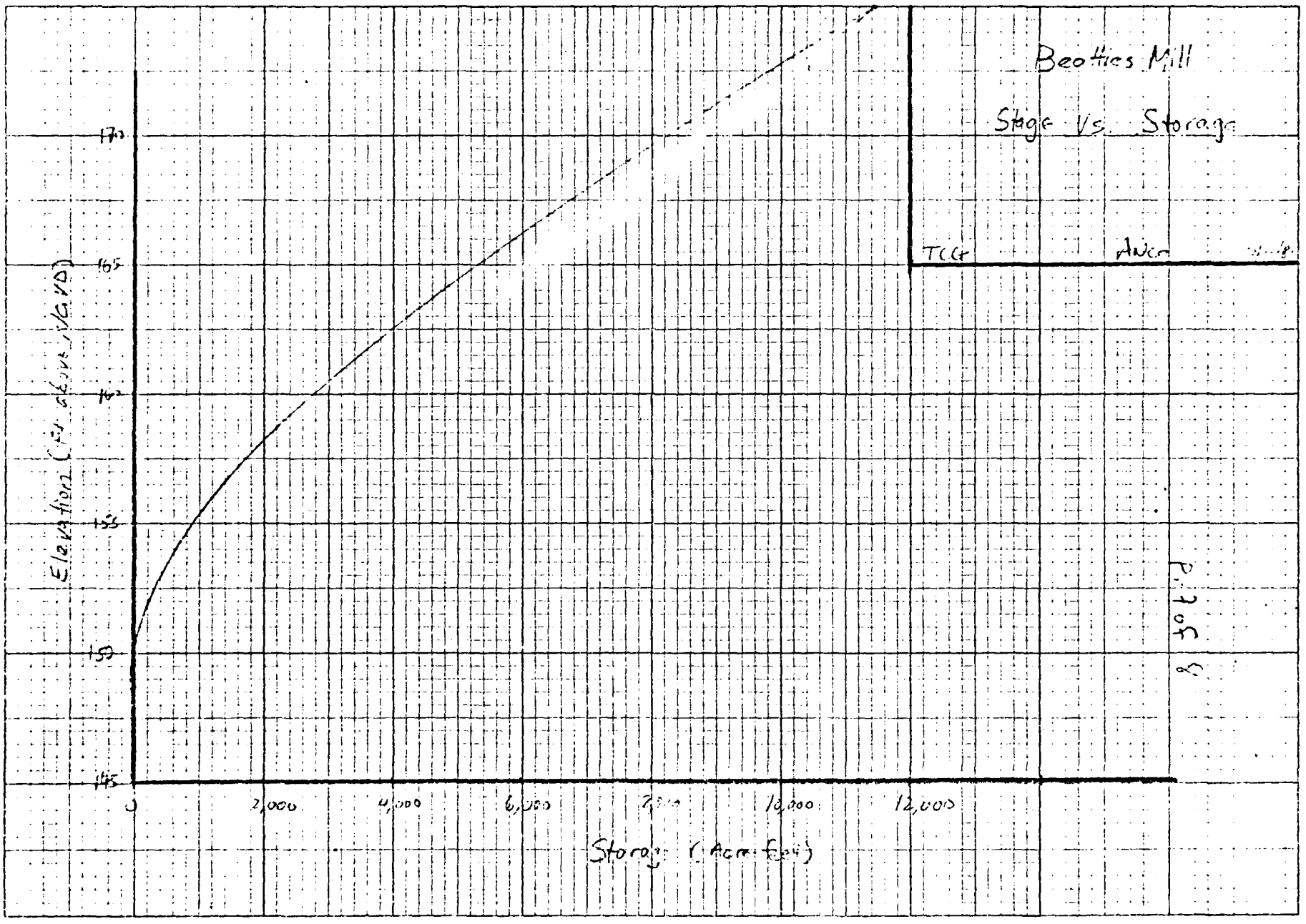
at 175' NGVD

$$\text{Storage} = \frac{106{,}000\,(200)}{43{,}560}\left(\frac{(175-148.6)+(175-160)}{2}\right) + \frac{52{,}000\left(\frac{15}{20}\right)200}{43560}\left(\frac{(175-160)+0}{2}\right)$$

$$= 486.7\,(20.7) + 179.1\,(7.5) = 11{,}418 \text{ ac-ft.}$$

Stage Vs. Storage is plotted on page . The following points are i
to HEC-1.

Elev (ft NGVD)	Stor (Ac-Ft)
148.6	0
156.8	1,435
157.8	1,820
160	2,790
162	3,740
164.1	4,870
167	6,410
169	7,600
171	8,830
173	10,160



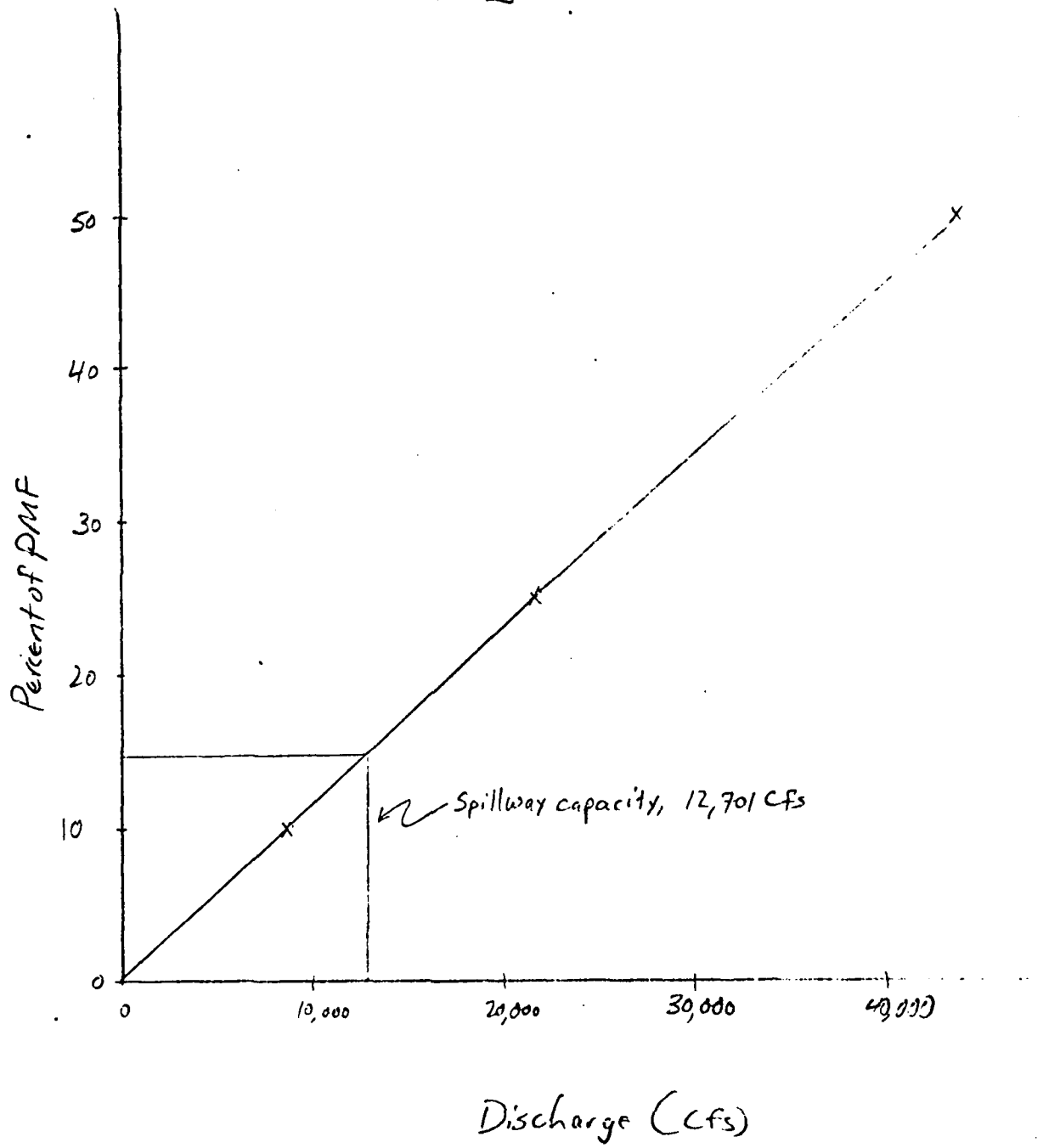
Anderson-Nichols & Company, Inc.

Subject Beatties Mill

Sheet No. 8 of 8
Date 7/9/81
Computed TCG
Checked TCG

JOB NO.

Overtopping Analysis



APPENDIX 5

HEC 1 OUTPUT

BEATTIES MILL DAM

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
   1          ID    BEATTIES MILL DAM   OVERTOPPING ANALYSIS    TOM GOOCH    ANCO
   2          ID    NEW JERSEY DAM NO. 821 - PASSAIC COUNTY - LITTLE FALLS
   3          ID    0.1, 0.25, 0.5 MULTIPLES OF THE PMF
   4          IT       60          0       200
   5          IO        3          0
   6          JR    FLOW      0.1     0.25      0.5

   7          KK      A1  BEATTIES MILL POND INFLOW HYDROGRAPH
   8          KM      INFLOW FROM PASSAIC RIVER BASIN SURVEY REPORT FOR WATER RESOURCES
   9          IN      360
  10          QI   2300.   2300.   2300.   2300.   2300.   2300.   3000.   7700.  21000.  40000.
  11          QI  60000.  73500.  83500.  88000.  87000.  83500.  77500.  69000.  62000.  54500.
  12          QI  47500.  40500.  34000.  28000.  22000.  16000.  11000.   6000.   2300.   2300.

  13          KK      A2  ROUTE INFLOW HYDROGRAPH THROUGH BEATTIES MILL POND
  14          RS       1    STOR    1435.
  15          SV       0    1435.   1620.   2790.   3740.   4870.   6410.   7600.   8830.  10160.
  16          SE   148.6   156.8   157.8    160.    162.   164.1    167.    169.    171.    173.
  17          SQ       0.      0.      9.   2636.   6924.  12701.  22622.  31210.  40701.  51286.
  18          SE   148.6   156.8   157.8    160.    162.   164.1    167.    169.    171.    173.
  19          SS   156.8   267.0     3.0     1.5
  20          SI   164.1   287.0     0.0     1.5
  21          ZZ
```

```
                        BEATTIES MILL DAM   OVERTOPPING ANALYSIS    TOM GOOCH    ANCO
                        NEW JERSEY DAM NO. 821 - PASSAIC COUNTY - LITTLE FALLS
                        0.1, 0.25, 0.5 MULTIPLES OF THE PMF

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

    IT          HYDROGRAPH TIME DATA
                       NMIN         60  MINUTES IN COMPUTATION INTERVAL
                      IDATE       1    0  STARTING DATE
                      ITIME          0000  STARTING TIME
                         NQ          200  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      9    0  ENDING DATE
                      NDTIME         0700  ENDING TIME

                    COMPUTATION INTERVAL     1.00 HOURS
                      TOTAL TIME BASE   199.00 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     *      BEATTIES MILL POND INFLOW HYDROGRAPH
            *             *
            ***************
                          INFLOW FROM PASSAIC RIVER BASIN SURVEY REPORT FOR WATER RESOURCES

  9 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN        360  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
                      JXTIME           0  STARTING TIME

              SUBBASIN RUNOFF DATA

  C BA          SUBBASIN CHARACTERISTICS
                      TAREA        0.0  SUBBASIN AREA

                                                        ***

PEAK FLOW     TIME                                MAXIMUM AVERAGE FLOW
  (CFS)       (HR)                    6-HR          24-HR          72-HR       199.00-HR
  88000.     78.00        (CFS)      87590.         85027.         68854.         31383.
                         (INCHES)       0.000          0.000          0.000          0.000
                         (AC-FT)    43433.        168648.        409707.        516137.

                        CUMULATIVE AREA =    0.0  SQ MI
```

```
                          HYDROGRAPH AT STATION       A1
                            FOR PLAN 1, RATIO = 0.10

PEAK FLOW      TIME                               MAXIMUM AVERAGE FLOW
  (CFS)        (HR)                    6-HR         24-HR         72-HR        199.00-HR
  8800.       78.00          (CFS)     8759.         8503.         6885.          3138.
                          (INCHES)     0.000         0.000         0.000          0.000
                           (AC-FT)     4343.        16865.        40971.         51614.

                         CUMULATIVE AREA =     0.0  SQ MI

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

                          HYDROGRAPH AT STATION       A1
                            FOR PLAN 1, RATIO = 0.25

PEAK FLOW      TIME                               MAXIMUM AVERAGE FLOW
  (CFS)        (HR)                    6-HR         24-HR         72-HR        199.00-HR
  22000.      78.00          (CFS)    21897.        21257.        17213.          7845.
                          (INCHES)     0.000         0.000         0.000          0.000
                           (AC-FT)    10858.        42162.       102425.        129029.

                         CUMULATIVE AREA =     0.0  SQ MI

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

                          HYDROGRAPH AT STATION       A1
                            FOR PLAN 1 RATIO = 0.50

PEAK FLOW      TIME                               MAXIMUM AVERAGE FLOW
  (CFS)        (HR)                    6-HR         24-HR         72-HR        199.00-HR
  44000.      78.00          (CFS)    4379[illegible]        42514.        34426.         15691.
                          (INCHES)     0.00[illegible]         0.000         0.000          0.000
                           (AC-FT)    2171[illegible]        84325.       204852.        258062.

                         CUMULATIVE ARE[illegible]     0.0  SQ MI

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

              **************
              *            *
  13 KK       *      A2    *       ROUTE INFLOW HYDROGRAPH THROUGH BEATTIES MILL POND
              *            *
              **************
```

HYDROGRAPH ROUTING DATA

```
 14 RS          STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                    ITYP        STOR  TYPE OF INITIAL CONDITION
                   RSVRIC     1435.00  INITIAL CONDITION
                        X         0.0  WORKING R AND D COEFFICIENT

 15 SV            STORAGE         0.0    1435.0    1820.0    2790.0    3740.0    4870.0    6410.0    7600.0    8830.0   10160.0

 16 SE          ELEVATION      148.60    156.80    157.80    160.00    162.00    164.10    167.00    169.00    171.00    173.00

 17 SQ          DISCHARGE          0.         0.        9.      2636.     6924.    12701.    22822.    31210.    40701.    51286.

 18 SE          ELEVATION      148.60    156.80    157.80    160.00    162.00    164.10    167.00    169.00    171.00    173.00

 19 SS          SPILLWAY
                    CREL       156.80  SPILLWAY CREST ELEVATION
                   SPWID       267.00  SPILLWAY WIDTH
                    COQW         3.00  WEIR COEFFICIENT
                    EXPW         1.50  EXPONENT OF HEAD

 20 ST          TOP OF DAM
                   TOPEL       164.10  ELEVATION AT TOP OF DAM
                   DAMWID      287.00  DAM WIDTH
                    COQD         0.0   WEIR COEFFICIENT
                    EXPD         1.50  EXPONENT OF HEAD
```

***

COMPUTED STORAGE-OUTFLOW CURVE

STORAGE	0.0	1435.00	1820.00	2790.00	3740.00	4870.00	6410.00	7600.00	8830.00	10160.00
OUTFLOW	0.0	0.0	9.00	2636.00	6924.00	12701.00	22822.00	31210.00	40701.00	51286.00

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

HYDROGRAPH AT STATION A2
FOR PLAN 1, RATIO = 0.10

PEAK OUTFLOW IS 8730. AT TIME 82.00 HOURS

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	199.00-HR
8730.	82.00	(CFS)	8716.	8471.	6859.	3110.
		(INCHES)	0.000	0.000	0.000	0.000
		(AC-FT)	4322.	16801.	40816.	51146.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	199.00-HR
4093.	82.00	4091.	4042.	3710.	2705.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	199.00-HR
162.66	82.00	162.65	162.56	161.90	159.73

CUMULATIVE AREA = 0.0 SQ MI

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

HYDROGRAPH AT STATION A2
FOR PLAN 1, RATIO = 0.25

PEAK OUTFLOW IS 21669. AT TIME 81.00 HOURS

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	199.00-HR
21769.	81.00	(CFS)	21834.	21208.	17168.	7609.
		(INCHES)	0.000	0.000	0.000	0.000
		(AC-FT)	10827.	42065.	102156.	128436.

PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	199.00-HR
6265.	81.00	6260.	6164.	5540.	3635.

PEAK STAGE (FEET)	TIME (HR)	6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	199.00-HR
166.73	81.00	166.72	166.54	165.36	161.56

CUMULATIVE AREA = 0.0 SQ MI

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

HYDROGRAPH AT STATION A2
FOR PLAN 1, RATIO = 0.50

PEAK OUTFLOW IS 43785. AT TIME 81.00 HOURS

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	199.00-HR
43785.	81.00	(CFS)	43700.	42444.	34374.	15642.
		(INCHES)	0.000	0.000	0.000	0.000
		(AC-FT)	21669.	84187.	204539.	257257.

PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	199.00-HR
9218.	81.00	9207.	9049.	7982.	4876.

PEAK STAGE (FEET)	TIME (HR)	6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	199.00-HR
171.56	81.00	171.56	171.32	169.59	163.82

CUMULATIVE AREA = 0.0 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	0.0	1	FLOW	8800.	22000.	44000.
				TIME	78.00	78.00	78.00
ROUTED TO	A2	0.0	1	FLOW	8730.	21869.	43785.
				TIME	82.00	81.00	81.00
			** PEAK STAGES IN FEET **				
			1	STAGE	162.66	166.73	171.58
				TIME	82.00	81.00	81.00

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION A2

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	156.80	156.80	164.10
STORAGE	1435.	1435.	4870.
OUTFLOW	0.	0.	12701.

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	162.66	0.0	4093.	8730.	0.0	82.00	0.0
0.25	166.73	2.63	6265.	21869.	60.00	81.00	0.0
0.50	171.58	7.48	9218.	43765.	91.00	81.00	0.0

*** NORMAL END OF JOB ***

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
    1     ID    BEATTIES MILL DAM   OVERTOPPING ANALYSIS    TOM GODCH    ANCO
    2     ID    NEW JERSEY DAM NO. 821 - PASSAIC COUNTY - LITTLE FALLS
    3     ID    0.5 MULTIPLE OF THE PMF
    4     IT      60                0      200
    5     IO       2         1
    6     JR    FLOW      0.5

    7     KK       A1  BEATTIES MILL POND INFLOW HYDROGRAPH
    8     KM       INFLOW FROM PASSAIC RIVER BASIN SURVEY REPORT FOR WATER RESOURCES
    9     IN      360
   10     QI  2300      2300.   2300.   2300.   2300.   2300.   3000.   7700.  21000.  40000.
   11     QI  6000     73500.  83500.  88000.  87000.  83500.  77500.  69000.  62000.  54500.
   12     QI  4750     40500.  34000.  28000.  22000.  16000.  11000.   6000.   2300.   2300.

   13     KK       A2  ROUTE INFLOW HYDROGRAPH THROUGH BEATTIES MILL POND
   14     RS        1    STOR   1435.
   15     SV        0    1435.   1820.   2790.   3740.   4870.   6410.   7600.   8830.  10160.
   16     SE    148.6   156.8   157.8    160.    162.   164.1    167.    169.    171.    173.
   17     SQ       0.      0.      9.   2636.   6924.  12701.  22822.  31210.  40701.  51286.
   18     SE    148.6   156.8   157.8    160.    162.   164.1    167.    169.    171.    173.
   19     SS    156.8   267.0     3.0     1.5
   20     ST    164.1   287.0     0.0     1.5
   21     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 DATE07/07/81       TIME13.07.24                 (916) 440-3285 OR (FTS) 448-3285

                      BEATTIES MILL DAM   OVERTOPPING ANALYSIS    TOM GOOCH    ANCO
                      NEW JERSEY DAM NO. 821 - PASSAIC COUNTY - LITTLE FALLS
                      0.5 MULTIPLE OF THE PMF

 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           60  MINUTES IN COMPUTATION INTERVAL
                 IDATE       1    0  STARTING DATE
                 ITIME         0000  STARTING TIME
                    NQ          200  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE       9    0  ENDING DATE
                NDTIME         0700  ENDING TIME

              COMPUTATION INTERVAL    1.00 HOURS
                   TOTAL TIME BASE  199.00 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  *         BEATTIES MILL POND INFLOW HYDROGRAPH
          *            *
          **************
                       INFLOW FROM PASSAIC RIVER BASIN SURVEY REPORT FOR WATER RESOURCES

 9 IN       TIME DATA FOR INPUT TIME SERIES
                 JXMIN          360  TIME INTERVAL IN MINUTES
                JXDATE       1    0  STARTING DATE
                JXTIME            0  STARTING TIME

         SUBBASIN RUNOFF DATA

 0 BA       SUBBASIN CHARACTERISTICS
                 TAREA          0.0  SUBBASIN AREA

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HYDROGRAPH AT STATION A1

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	2300.	3		0200	51	27333.	5		0400	101	71833.	7		0600	151	16000.
1		0100	2	2300.	3		0300	52	30500.	5		0500	102	70417.	7		0700	152	15167.
1		0200	3	2300.	3		0400	53	33667.	5		0600	103	69000.	7		0800	153	14333.
1		0300	4	2300.	3		0500	54	36833.	5		0700	104	67833.	7		0900	154	13500.
1		0400	5	2300.	3		0600	55	40000.	5		0800	105	66667.	7		1000	155	12667.
1		0500	6	2300.	3		0700	56	43233.	5		0900	106	65500.	7		1100	156	11833.
1		0600	7	2300.	3		0800	57	46667.	5		1000	107	64333.	7		1200	157	11000.
1		0700	8	2300.	3		0900	58	50000.	5		1100	108	63167.	7		1300	158	10167.
1		0800	9	2300.	3		1000	59	53333.	5		1200	109	62000.	7		1400	159	9333.
1		0900	10	2300.	3		1100	60	56667.	5		1300	110	60750.	7		1500	160	8500.
1		1000	11	2300.	3		1200	61	60000.	5		1400	111	59500.	7		1600	161	7667.
1		1100	12	2300.	3		1300	62	62250.	5		1500	112	58250.	7		1700	162	6833.
1		1200	13	2300.	3		1400	63	64500.	5		1600	113	57000.	7		1800	163	6000.
1		1300	14	2300.	3		1500	64	66750.	5		1700	114	55750.	7		1900	164	5383.
1		1400	15	2300.	3		1600	65	69000.	5		1800	115	54500.	7		2000	165	4767.
1		1500	16	2300.	3		1700	66	71250.	5		1900	116	53333.	7		2100	166	4150.
1		1600	17	2300.	3		1800	67	73500.	5		2000	117	52167.	7		2200	167	3533.
1		1700	18	2300.	3		1900	68	75167.	5		2100	118	51000.	7		2300	168	2917.
1		1800	19	2300.	3		2000	69	76833.	5		2200	119	49833.	8		0000	169	2300.
1		1900	20	2300.	3		2100	70	78500.	5		2300	120	48667.	8		0100	170	2300.
1		2000	21	2300.	3		2200	71	80167.	6		0000	121	47500.	8		0200	171	2300.
1		2100	22	2300.	3		2300	72	81833.	6		0100	122	46333.	8		0300	172	2300.
1		2200	23	2300.	4		0000	73	83500.	6		0200	123	45167.	8		0400	173	2300.
1		2300	24	2300.	4		0100	74	84250.	6		0300	124	44000.	8		0500	174	2300.
2		0000	25	2300.	4		0200	75	85000.	6		0400	125	42833.	8		0600	175	2300.
2		0100	26	2300.	4		0300	76	85750.	6		0500	126	41667.	8		0700	176	2300.
2		0200	27	2300.	4		0400	77	86500.	6		0600	127	40500.	8		0800	177	2300.
2		0300	28	2300.	4		0500	78	87250.	6		0700	128	39417.	8		0900	178	2300.
2		0400	29	2300.	4		0600	79	88000.	6		0800	129	38333.	8		1000	179	2300.
2		0500	30	2300.	4		0700	80	87833.	6		0900	130	37250.	8		1100	180	2300.
2		0600	31	2300.	4		0800	81	87667.	6		1000	131	36167.	8		1200	181	2300.
2		0700	32	2417.	4		0900	82	87500.	6		1100	132	35083.	8		1300	182	2300.
2		0800	33	2533.	4		1000	83	87333.	6		1200	133	34000.	8		1400	183	2300.
2		0900	34	2650.	4		1100	84	87167.	6		1300	134	33000.	8		1500	184	2300.
2		1000	35	2767.	4		1200	85	87000.	6		1400	135	32000.	8		1600	185	2300.
2		1100	36	2883.	4		1300	86	86417.	6		1500	136	31000.	8		1700	186	2300.
2		1200	37	3000.	4		1400	87	85833.	6		1600	137	30000.	8		1800	187	2300.
2		1300	38	3783.	4		1500	88	85250.	6		1700	138	29000.	8		1900	188	2300.
2		1400	39	4567.	4		1600	89	84667.	6		1800	139	28000.	8		2000	189	2300.
2		1500	40	5350.	4		1700	90	84083.	6		1900	140	27000.	8		2100	190	2300.
2		1600	41	6133.	4		1800	91	83500.	6		2000	141	26000.	8		2200	191	2300.
2		1700	42	6917.	4		1900	92	82500.	6		2100	142	25000.	8		2300	192	2300.
2		1800	43	7700.	4		2000	93	81500.	6		2200	143	24000.	9		0000	193	2300.
2		1900	44	9917.	4		2100	94	80500.	6		2300	144	23000.	9		0100	194	2300.
2		2000	45	12133.	4		2200	95	79500.	7		0000	145	22000.	9		0200	195	2300.
2		2100	46	14350.	4		2300	96	78500.	7		0100	146	21000.	9		0300	196	2300.
2		2200	47	16567.	5		0000	97	77500.	7		0200	147	20000.	9		0400	197	2300.
2		2300	48	18783.	5		0100	98	76083.	7		0300	148	19000.	9		0500	198	2300.
3		0000	49	21000.	5		0200	99	74667.	7		0400	149	18000.	9		0600	199	2300.
3		0100	50	24167.	5		0300	100	73250.	7		0500	150	17000.	9		0700	200	2300.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	199.00-HR
88000.	78.00	(CFS)	87590.	85027.	68854.	31383.
		(INCHES)	0.000	0.000	0.000	0.000
		(AC-FT)	43433.	168648.	409707.	516137.

CUMULATIVE AREA = 0.0 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	1150.	3		0200	51	13667.	5		0400	101	35917.	7		0600	151	8000.
1		0100	2	1150.	3		0300	52	15250.	5		0500	102	35208.	7		0700	152	7583.
1		0200	3	1150.	3		0400	53	16833.	5		0600	103	34500.	7		0800	153	7167.
1		0300	4	1150.	3		0500	54	18417.	5		0700	104	33917.	7		0900	154	6750.
1		0400	5	1150.	3		0600	55	20000.	5		0800	105	33333.	7		1000	155	6333.
1		0500	6	1150.	3		0700	56	21667.	5		0900	106	32750.	7		1100	156	5917.
1		0600	7	1150.	3		0800	57	23333.	5		1000	107	32167.	7		1200	157	5500.
1		0700	8	1150.	3		0900	58	25000.	5		1100	108	31583.	7		1300	158	5083.
1		0800	9	1150.	3		1000	59	26667.	5		1200	109	31000.	7		1400	159	4667.
1		0900	10	1150.	3		1100	60	28333.	5		1300	110	30375.	7		1500	160	4250.
1		1000	11	1150.	3		1200	61	30000.	5		1400	111	29750.	7		1600	161	3833.
1		1100	12	1150.	3		1300	62	31125.	5		1500	112	29125.	7		1700	162	3417.
1		1200	13	1150.	3		1400	63	32250.	5		1600	113	28500.	7		1800	163	3000.
1		1300	14	1150.	3		1500	64	33375.	5		1700	114	27875.	7		1900	164	2692.
1		1400	15	1150.	3		1600	65	34500.	5		1800	115	27250.	7		2000	165	2383.
1		1500	16	1150.	3		1700	66	35625.	5		1900	116	26667.	7		2100	166	2075.
1		1600	17	1150.	3		1800	67	36750.	5		2000	117	26083.	7		2200	167	1767.
1		1700	18	1150.	3		1900	68	37583.	5		2100	118	25500.	7		2300	168	1458.
1		1800	19	1150.	3		2000	69	38417.	5		2200	119	24917.	8		0000	169	1150.
1		1900	20	1150.	3		2100	70	39250.	5		2300	120	24333.	8		0100	170	1150.
1		2000	21	1150.	3		2200	71	40083.	6		0000	121	23750.	8		0200	171	1150.
1		2100	22	1150.	3		2300	72	40917.	6		0100	122	23167.	8		0300	172	1150.
1		2200	23	1150.	4		0000	73	41750.	6		0200	123	22583.	8		0400	173	1150.
1		2300	24	1150.	4		0100	74	42125.	6		0300	124	22000.	8		0500	174	1150.
2		0000	25	1150.	4		0200	75	42500.	6		0400	125	21417.	8		0600	175	1150.
2		0100	26	1150.	4		0300	76	42875.	6		0500	126	20833.	8		0700	176	1150.
2		0200	27	1150.	4		0400	77	43250.	6		0600	127	20250.	8		0800	177	1150.
2		0300	28	1150.	4		0500	78	43625.	6		0700	128	19708.	8		0900	178	1150.
2		0400	29	1150.	4		0600	79	44000.	6		0800	129	19167.	8		1000	179	1150.
2		0500	30	1150.	4		0700	80	43917.	6		0900	130	18625.	8		1100	180	1150.
2		0600	31	1150.	4		0800	81	43833.	6		1000	131	18083.	8		1200	181	1150.
2		0700	32	1208.	4		0900	82	43750.	6		1100	132	17542.	8		1300	182	1150.
2		0800	33	1267.	4		1000	83	43667.	6		1200	133	17000.	8		1400	183	1150.
2		0900	34	1325.	4		1100	84	43583.	6		1300	134	16500.	8		1500	184	1150.
2		1000	35	1383.	4		1200	85	43500.	6		1400	135	16000.	8		1600	185	1150.
2		1100	36	1442.	4		1300	86	43208.	6		1500	136	15500.	8		1700	186	1150.
2		1200	37	1500.	4		1400	87	42917.	6		1600	137	15000.	8		1800	187	1150.
2		1300	38	1822.	4		1500	88	42625.	6		1700	138	14500.	8		1900	188	1150.
2		1400	39	2283.	4		1600	89	42333.	6		1800	139	14000.	8		2000	189	1150.
2		1500	40	2675.	4		1700	90	42042.	6		1900	140	13500.	8		2100	190	1150.
2		1600	41	3067.	4		1800	91	41750.	6		2000	141	13000.	8		2200	191	1150.
2		1700	42	3458.	4		1900	92	41250.	6		2100	142	12500.	8		2300	192	1150.
2		1800	43	3850.	4		2000	93	40750.	6		2200	143	12000.	9		0000	193	1150.
2		1900	44	4958.	4		2100	94	40250.	6		2300	144	11500.	9		0100	194	1150.
2		2000	45	6067.	4		2200	95	39750.	7		0000	145	11000.	9		0200	195	1150.
2		2100	46	7175.	4		2300	96	39250.	7		0100	146	10500.	9		0300	196	1150.
2		2200	47	8283.	5		0000	97	38750.	7		0200	147	10000.	9		0400	197	1150.
2		2300	48	9392.	5		0100	98	38042.	7		0300	148	9500.	9		0500	198	1150.
3		0000	49	10500.	5		0200	99	37333.	7		0400	149	9000.	9		0600	199	1150.
3		0100	50	12083.	5		0300	100	36625.	7		0500	150	8500.	9		0700	200	1150.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	199.00-HR
44706.	78.00	(CFS)	43795.	42514.	34427.	15692.
		(INCHES)	0.000	0.000	0.000	0.000
		(AC-FT)	21716.	84325.	204852.	258067.

CUMULATIVE AREA = 0.0 SQ MI

13 KK A2 ROUTE INFLOW HYDROGRAPH THROUGH BEATTIES MILL POND

HYDROGRAPH ROUTING DATA

14 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	1435.00	INITIAL CONDITION
X	0.0	WORKING R AND D COEFFICIENT

15 SV	STORAGE	0.0	1435.0	1820.0	2790.0	3740.0	4870.0	6410.0	7600.0	8830.0	10160.0
16 SE	ELEVATION	148.60	156.80	157.80	160.00	162.00	164.10	167.00	169.00	171.00	173.00
17 SQ	DISCHARGE	0.	0.	9.	2636.	6924.	12701.	22822.	31210.	40701.	51286.
18 SE	ELEVATION	148.60	156.80	157.80	160.00	162.00	164.10	167.00	169.00	171.00	173.00

19 SS SPILLWAY

CREL	156.80	SPILLWAY CREST ELEVATION
SPWID	267.00	SPILLWAY WIDTH
COQW	3.00	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

20 ST TOP OF DAM

TOPEL	164.10	ELEVATION AT TOP OF DAM
DAMWID	287.00	DAM WIDTH
COQD	0.0	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED STORAGE-OUTFLOW CURVE

STORAGE	0.0	1435.00	1820.00	2790.00	3740.00	4870.00	6410.00	7600.00	8830.00	10160.00
OUTFLOW	0.0	0.0	9.00	2636.00	6924.00	12701.00	22822.00	31210.00	40701.00	51286.00

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	STA
1		0000	1	0.	1435.0	156.6	3		1900	68	36017.	8223.0	170.0	6		1400	135	16946.	5516.0	165
1		0100	2	2.	1529.9	157.0	3		2000	69	36976.	8347.2	170.2	6		1500	136	16435.	5438.2	165
1		0200	3	4.	1624.7	157.3	3		2100	70	37874.	8463.6	170.4	6		1600	137	15929.	5361.2	165
1		0300	4	7.	1719.3	157.5	3		2200	71	38741.	8576.0	170.6	6		1700	138	15425.	5284.5	164
1		0400	5	9.	1813.7	157.8	3		2300	72	39591.	8686.2	170.8	6		1800	139	14923.	5208.1	164
1		0500	6	223.	1899.1	158.0	4		0000	73	40433.	8795.3	170.9	6		1900	140	14422.	5131.9	164
1		0600	7	416.	1968.0	158.1	4		0100	74	41171.	8889.1	171.1	6		2000	141	13921.	5056.7	164
1		0700	8	559.	2023.0	158.3	4		0200	75	41736.	8960.1	171.2	6		2100	142	13421.	4979.6	164
1		0800	9	678.	2066.9	158.4	4		0300	76	42207.	9019.2	171.3	6		2200	143	12921.	4903.4	164
1		0900	10	773.	2102.0	158.4	4		0400	77	42630.	9072.4	171.4	6		2300	144	12472.	4825.2	164
1		1000	11	849.	2130.1	158.5	4		0500	78	43030.	9122.6	171.4	7		0000	145	12046.	4741.8	163
1		1100	12	909.	2152.5	158.6	4		0600	79	43417.	9171.3	171.5	7		0100	146	11594.	4653.4	163
1		1200	13	958.	2170.3	158.6	4		0700	80	43685.	9204.9	171.6	7		0200	147	11125.	4561.7	163
1		1300	14	996.	2184.6	158.6	4		0800	81	43779.	9216.7	171.6	7		0300	148	10645.	4467.9	163
1		1400	15	1027.	2196.0	158.7	4		0900	82	43785.	9217.5	171.6	7		0400	149	10159.	4372.7	163
1		1500	16	1052.	2205.1	158.7	4		1000	83	43747.	9212.7	171.6	7		0500	150	9667.	4276.6	163
1		1600	17	1072.	2212.4	158.7	4		1100	84	43687.	9205.1	171.6	7		0600	151	9173.	4179.9	162
1		1700	18	1088.	2218.2	158.7	4		1200	85	43615.	9196.1	171.6	7		0700	152	8691.	4085.6	162
1		1800	19	1100.	2222.9	158.7	4		1300	86	43456.	9179.9	171.5	7		0800	153	8232.	3995.8	162
1		1900	20	1110.	2226.6	158.7	4		1400	87	43276.	9153.6	171.5	7		0900	154	7798.	3908.9	162
1		2000	21	1118.	2229.5	158.7	4		1500	88	43026.	9122.1	171.4	7		1000	155	7353.	3823.9	162
1		2100	22	1125.	2231.9	158.7	4		1600	89	42755.	9088.1	171.4	7		1100	156	6925.	3740.1	162
1		2200	23	1130.	2233.8	158.7	4		1700	90	42474.	9052.8	171.3	7		1200	157	6542.	3655.4	161
1		2300	24	1134.	2235.3	158.7	4		1800	91	42188.	9016.8	171.3	7		1300	158	6149.	3568.3	161
2		0000	25	1137.	2236.5	158.7	4		1900	92	41847.	8974.0	171.2	7		1400	159	5748.	3479.6	161
2		0100	26	1140.	2237.5	158.7	4		2000	93	41428.	8921.3	171.1	7		1500	160	5343.	3388.7	161
2		0200	27	1142.	2238.2	158.7	4		2100	94	40969.	8863.6	171.1	7		1600	161	4934.	3299.1	161
2		0300	28	1143.	2238.8	158.7	4		2200	95	40494.	8803.2	171.0	7		1700	162	4522.	3207.9	160
2		0400	29	1145.	2239.3	158.8	4		2300	96	40013.	8740.9	170.9	7		1800	163	4109.	3116.4	160
2		0500	30	1146.	2239.7	158.8	5		0000	97	39523.	8677.4	170.8	7		1900	164	3712.	3028.4	160
2		0600	31	1147.	2240.0	158.8	5		0100	98	38978.	8606.7	170.6	7		2000	165	3343.	2946.6	160
2		0700	32	1153.	2242.5	158.8	5		0200	99	38354.	8525.8	170.5	7		2100	166	2993.	2869.0	160
2		0800	33	1170.	2248.7	158.8	5		0300	100	37680.	8439.7	170.4	7		2200	167	2656.	2794.4	160
2		0900	34	1195.	2258.1	158.8	5		0400	101	37003.	8350.8	170.2	7		2300	168	2439.	2717.1	159
2		1000	35	1227.	2269.9	158.8	5		0500	102	36307.	8260.5	170.1	8		0000	169	2210.	2632.8	159
2		1100	36	1265.	2283.6	158.9	5		0600	103	35604.	8169.5	169.9	8		0100	170	1997.	2554.0	159
2		1200	37	1306.	2298.9	158.9	5		0700	104	34929.	8082.0	169.8	8		0200	171	1826.	2491.0	159
2		1300	38	1385.	2327.9	159.0	5		0800	105	34299.	8000.3	169.7	8		0300	172	1690.	2440.8	159
2		1400	39	1526.	2380.2	159.1	5		0900	106	33691.	7921.5	169.5	8		0400	173	1581.	2400.6	159
2		1500	40	1718.	2451.0	159.2	5		1000	107	33095.	7844.3	169.4	8		0500	174	1495.	2368.5	159
2		1600	41	1950.	2536.7	159.4	5		1100	108	32505.	7767.8	169.3	8		0600	175	1425.	2342.9	159
2		1700	42	2214.	2634.2	159.6	5		1200	109	31918.	7691.8	169.1	8		0700	176	1370.	2322.5	159
2		1800	43	2504.	2741.2	159.9	5		1300	110	31323.	7614.7	169.0	8		0800	177	1326.	2306.1	158
2		1900	44	3027.	2876.7	160.2	5		1400	111	30747.	7534.3	168.9	8		0900	178	1290.	2293.1	158
2		2000	45	3809.	3049.8	160.5	5		1500	112	30156.	7450.5	168.7	8		1000	179	1262.	2282.7	158
2		2100	46	4693.	3245.6	161.0	5		1600	113	29550.	7364.5	168.6	8		1100	180	1239.	2274.3	158
2		2200	47	5647.	3457.1	161.4	5		1700	114	28935.	7277.3	168.5	8		1200	181	1221.	2267.7	158
2		2300	48	6650.	3679.4	161.9	5		1800	115	28316.	7189.4	168.3	8		1300	182	1207.	2262.4	158
3		0000	49	7770.	3905.5	162.3	5		1900	116	27703.	7102.5	168.2	8		1400	183	1196.	2258.1	158
3		0100	50	8998.	4145.7	162.8	5		2000	117	27104.	7017.5	168.0	8		1500	184	1186.	2254.7	158
3		0200	51	10351.	4410.2	163.2	5		2100	118	26512.	6933.5	167.9	8		1600	185	1179.	2252.0	158
3		0300	52	11783.	4690.5	163.8	5		2200	119	25924.	6850.1	167.7	8		1700	186	1173.	2249.9	158
3		0400	53	13396.	4975.8	164.3	5		2300	120	25338.	6766.9	167.6	8		1800	187	1169.	2248.1	158
3		0500	54	15203.	5250.6	164.8	6		0000	121	24753.	6684.0	167.5	8		1900	188	1165.	2246.8	158
3		0600	55	16914.	5511.0	165.3	6		0100	122	24169.	6601.1	167.3	8		2000	189	1162.	2245.7	158
3		0700	56	18588.	5765.7	165.8	6		0200	123	23585.	6518.3	167.2	8		2100	190	1159.	2244.8	158
3		0800	57	20259.	6020.0	166.3	6		0300	124	23002.	6435.5	167.0	8		2200	191	1158.	2244.1	158
3		0900	58	21928.	6274.0	166.7	6		0400	125	22440.	6351.8	166.9	8		2300	192	1156.	2243.5	158
3		1000	59	23640.	6526.0	167.2	6		0500	126	21878.	6266.4	166.7	9		0000	193	1155.	2243.1	158
3		1100	60	25381.	6773.1	167.6	6		0600	127	21307.	6179.5	166.6	9		0100	194	1154.	2242.7	158
3		1200	61	27089.	7015.3	168.0	6		0700	128	20740.	6093.2	166.4	9		0200	195	1153.	2242.4	158
3		1300	62	28656.	7237.7	168.4	6		0800	129	20184.	6008.5	166.2	9		0300	196	1152.	2242.2	158
3		1400	63	30024.	7431.7	168.7	6		0900	130	19634.	5924.8	166.1	9		0400	197	1152.	2242.0	158
3		1500	64	31287.	7610.0	169.0	6		1000	131	19087.	5841.7	165.9	9		0500	198	1152.	2241.9	158
3		1600	65	32568.	7776.1	169.3	6		1100	132	18543.	5758.9	165.8	9		0600	199	1151.	2241.8	158
3		1700	66	33774.	7932.3	169.5	6		1200	133	17999.	5676.2	165.6	9		0700	200	1151.	2241.7	158
3		1800	67	34941.	8083.5	169.8	6		1300	134	17466.	5595.0	165.5							

...

EAK OUTFLOW IS 43785. AT TIME 81.00 HOURS

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	199.00-HR
43785.	81.00	(CFS)	43700.	42444.	34374.	15642.
		(INCHES)	0.000	0.000	0.000	0.000
		(AC-FT)	21669.	84187.	204538.	257257.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	199.00-HR
9218.	81.00	9207.	9049.	7982.	4876.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	199.00-HR
171.58	81.00	171.56	171.32	169.59	163.82

CUMULATIVE AREA = 0.0 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	0.0	1	FLOW	44000.
				TIME	78.00
ROUTED TO	A2	0.0	1	FLOW	43785.
				TIME	81.00
			** PEAK STAGES IN FEET **		
			1	STAGE	171.58
				TIME	81.00

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION A2

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	156.80	156.80	164.10
STORAGE	1435.	1435.	4870.
OUTFLOW	0.	0.	12701.

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	171.58	7.48	9218.	43785.	91.00	81.00	0.0

*** NORMAL END OF JOB ***

APPENDIX 6

REFERENCES

BEATTIES MILL DAM

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