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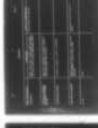
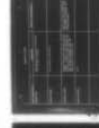
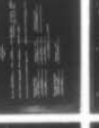
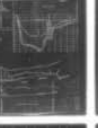
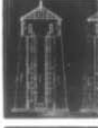
NEW JERSEY STATE DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/2
NATIONAL DAM SAFETY PROGRAM. GREAT NOTCH RESERVOIR (NJ 00244), --ETC(U)
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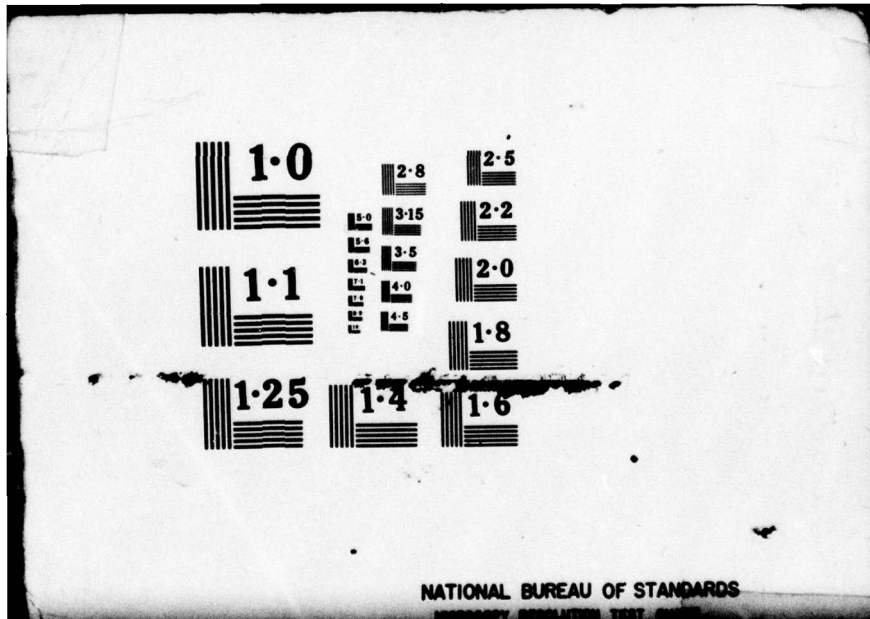
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PASSAIC RIVER BASIN
YANTECAW BROOK
PASSAIC COUNTY
NEW JERSEY

①
LEVEL II

GREAT NOTCH RESERVOIR NJ 00244

⑥
PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.

Great Notch Reservoir (NJ 00244). Passaic River Basin, Yantecaw Brook, Passaic County, New Jersey. Phase 1 Inspection Report.



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⑨ Final report.,

⑩ Robert J. / Jenny

⑮ DACW61-78-C-0124

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DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NJ00244	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program Great Notch Reservoir Passaic County, New Jersey		5. TYPE OF REPORT & PERIOD COVERED FINAL
7. AUTHOR(s) Robert J. Jenny P.E.		6. PERFORMING ORG. REPORT NUMBER
8. PERFORMING ORGANIZATION NAME AND ADDRESS Jenny-Leedshill Engineering 318 South Orange Ave. South Orange, N.J. 07079		9. CONTRACT OR GRANT NUMBER(s) DACW61-78-C-0124
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams Visual Inspection Spillway National Dam Inspection Act report Embankments Structural Analysis Safety Great Notch Reservoir, N.J.		
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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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
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Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

15 MAY 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Great Notch Reservoir 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, Great Notch Reservoir Dam, a high hazard potential structure, is judged to be in good overall condition. However, the spillway is considered seriously inadequate since 36 percent of the Probable Maximum Flood (PMF) would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

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

NAPEN-D

Honorable Brendan T. Byrne

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to determine the dam's embankment and foundation condition and structural stability. This should include test borings to determine material properties relative to stability and seepage and installation of piezometers to facilitate seepage studies. Any remedial measures found necessary should be initiated within calendar year 1980. Make a topographic survey of the dam site and monument the results for use in future inspections.

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

- (1) Remove the spillway flashboards.
- (2) Relocate the chain link fence at the spillway.

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

- (1) Determine the source of seepage in the spillway channel and take remedial measures as needed.
- (2) Investigate alternative methods of draining the reservoir.
- (3) Operate all valves on a regular basis.
- (4) Replace dislodged rocks on the embankment facing.
- (5) Regularly inspect the dam and record all maintenance work.

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 Joseph Minish of the Eleventh District. Under the provisions 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.

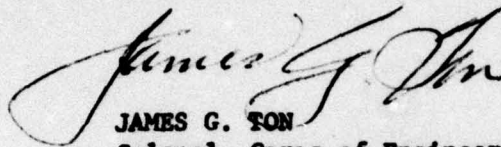
Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

NAPEN-D

Honorable Brendan T. Byrne

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

Sincerely,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
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Division of Water Resources
N. J. Dept. of Environmental Protection
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Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
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N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

GREAT NOTCH RESERVOIR DAM (NJ00302)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 2 and 20 December 1978 by Jenny-Leedshill Engineers 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.

Great Notch Reservoir Dam, a high hazard potential structure, is judged to be in good overall condition. However, the spillway is considered seriously inadequate since 36 percent of the Probable Maximum Flood (PMF) would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

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

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to determine the dam's embankment and foundation condition and structural stability. This should include test borings to determine material properties relative to stability and seepage and installation of piezometers to facilitate seepage studies. Any remedial measures found necessary should be initiated within calendar year 1980. Make a topographic survey of the dam site and monument the results for use in future inspections.

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

- (1) Remove the spillway flashboards.

(2) Relocate the chain link fence at the spillway.

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

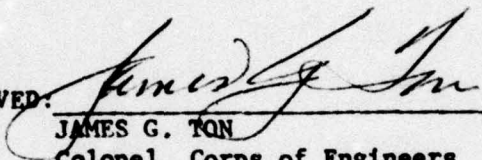
(1) Determine the source of seepage in the spillway channel and take remedial measures as needed.

(2) Investigate alternative methods of draining the reservoir.

(3) Operate all valves on a regular basis.

(4) Replace dislodged rocks on the embankment facing.

(5) Regularly inspect the dam and record all maintenance work.

APPROVED: 

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 11 May 1979



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

IN REPLY REFER TO
NAPEN-D

11 APR 1979

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

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Great Notch Reservoir Dam (Federal I.D. No. 00244), a high hazard potential structure, has recently been inspected. The dam is owned by the Passaic Valley Water Commission and is located on Yanticau Brook in West Paterson, Passaic County.

Using Corps of Engineers screening criteria, it has been determined that the dam's spillway is seriously inadequate since approximately 41 percent of the Probable Maximum Flood would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owner take the following measures within 30 days of the date of this letter:

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

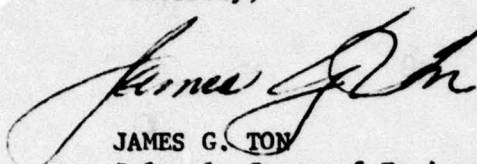
b. Develop and initiate a detailed emergency operation plan and downstream warning system. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipitation.

NAPEN-D

Honorable Brendan T. Byrne

A final report on this Phase I Inspection with a detailed analysis of the situation, will be forwarded to you within two months.

Sincerely,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Cy Furn:

Dirk C. Hofman, Actg. Deputy Director
Division of Water Resources
N.J. Dept of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
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P.O. Box CN029
Trenton, NJ 08625

UNSAFE DAM

NATIONAL PROGRAM OF INSPECTION OF DAMS

- a. NAME: Great Notch Reservoir b. ID NO.: NJ00244 c. LOCATION State: New Jersey County: Passaic
River or Stream: Yanticaw Brook
- d. HEIGHT: 74 feet e. MAXIMUM INPOUNDMENT
CAPACITY: 640 ac. ft.
- f. TYPE: Earthfill with concrete core g. OWNER: Passaic Valley Water Commission
Nearest D/D City or Town: Clifton
- h. DATE GOVERNOR NOTIFIED OF UNSAFE CONDITIONS: 11 Apr 79 i. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT
Preliminary report calculations indicate 41%
of PWT would overturn the dam.
- l. URGENCY CATEGORY: UNSAFE, Non-Emergency
- m. EMERGENCY ACTIONS TAKEN:
Gov. notified of this condition
by District Engineer's letter of 11 Apr 79
- n. REMEDIAL ACTIONS TAKEN:
N.J.D.E.P. will notify
dam's owner upon receipt of our letter
- o. REMARKS: Final report, to be
issued within six weeks,
will have WHITE cover.
- k. RECOMMENDATIONS GIVEN TO GOVERNOR:
Within 30 days of date of District Engineer
letter the owner do the following:
a. Engage the services of a qualified professional consultant to more accurately
determine the spillway adequacy by using more
detailed and sophisticated hydrologic and
hydraulic analyses, and to recommend any
remedial measures required to prevent over-
topping of the dam.
- b. In the interim, a detailed emergency
operation plan and downstream warning
system should be developed. Also,
round-the-clock surveillance should be
provided during periods of unusually heavy
precipitation.

for
W. H. ZINF, Coordinator
Inspection Program
N.J.D.E.P., Philadelphia

6283 name 4/20/79

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Great Notch Reservoir, Fed. I.D.
No.NJ00244
State Located: New Jersey
County Located: Passaic
Stream: Yantecaw Brook (Primarily off-stream
pumped storage)
Dates of Inspection: December 2 and 20, 1978

Brief Assessment of General Condition of Dam

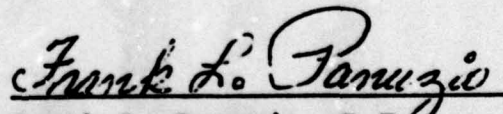
The visual inspection of the dam indicated the embankment to be in good overall condition and without any critical signs of distress.

The hydrologic and hydraulic analyses indicate that the spillway, with flashboards in place as they presently are, is seriously inadequate because it can pass only about 35 percent of the Probable Maximum Flood (PMF). If the flashboards were removed, the spillway could pass about 65 percent of the PMF and the spillway would thus be classified as inadequate, not seriously inadequate.

Minor seepage was noted below the spillway, and there are certain maintenance tasks that have been neglected. Most valves controlling the discharge through the outlet works have not been operated in many years and are thus in questionable operating condition. There is no emergency outlet and the reservoir can be drained only by releases into the owner's distribution system.

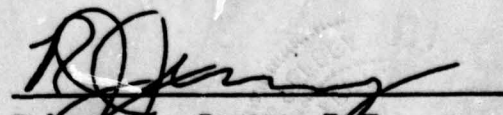
It is recommended that the spillway flashboards and downstream security fence be removed very soon. Other recommendations are of a less urgent nature and should be implemented in the near future. These include determination of the source of seepage in the spillway channel and taking remedial measures as needed, investigation of alternative methods of draining the reservoir, regular operation of all valves, removal of vegetation on the embankment, replacement of rock facing on the embankment, regular inspection of the dam, installation of survey monuments and piezometers on the downstream embankment to monitor phreatic surface.

More detailed and sophisticated hydraulic and hydrologic studies to more accurately determine the spillway capacity should be undertaken by the owner within 6 months. Remedial action, as a result of these studies, should be initiated within one year. In the interim, a warning and evacuation plan should be implemented to provide adequate warning to downstream residents. Also, surveillance of the dam should be provided during periods of heavy precipitation.



Frank L. Panuzio, P.E.

Project Manager



Robert J. Jenny, P.E.

Project Director

New Jersey License No. 9878

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Pipes
6. Section and Elevation of Gate House
7. Details of Rack for Culvert (Intake Structure)
8. Plan and Cross Section of Spillway
9. Plan and Profiles of Pipelines and Core Wall

APPENDICES

- APPENDIX A - Check List - Visual Observations
 Check List - Engineering, Construction
 Maintenance Data

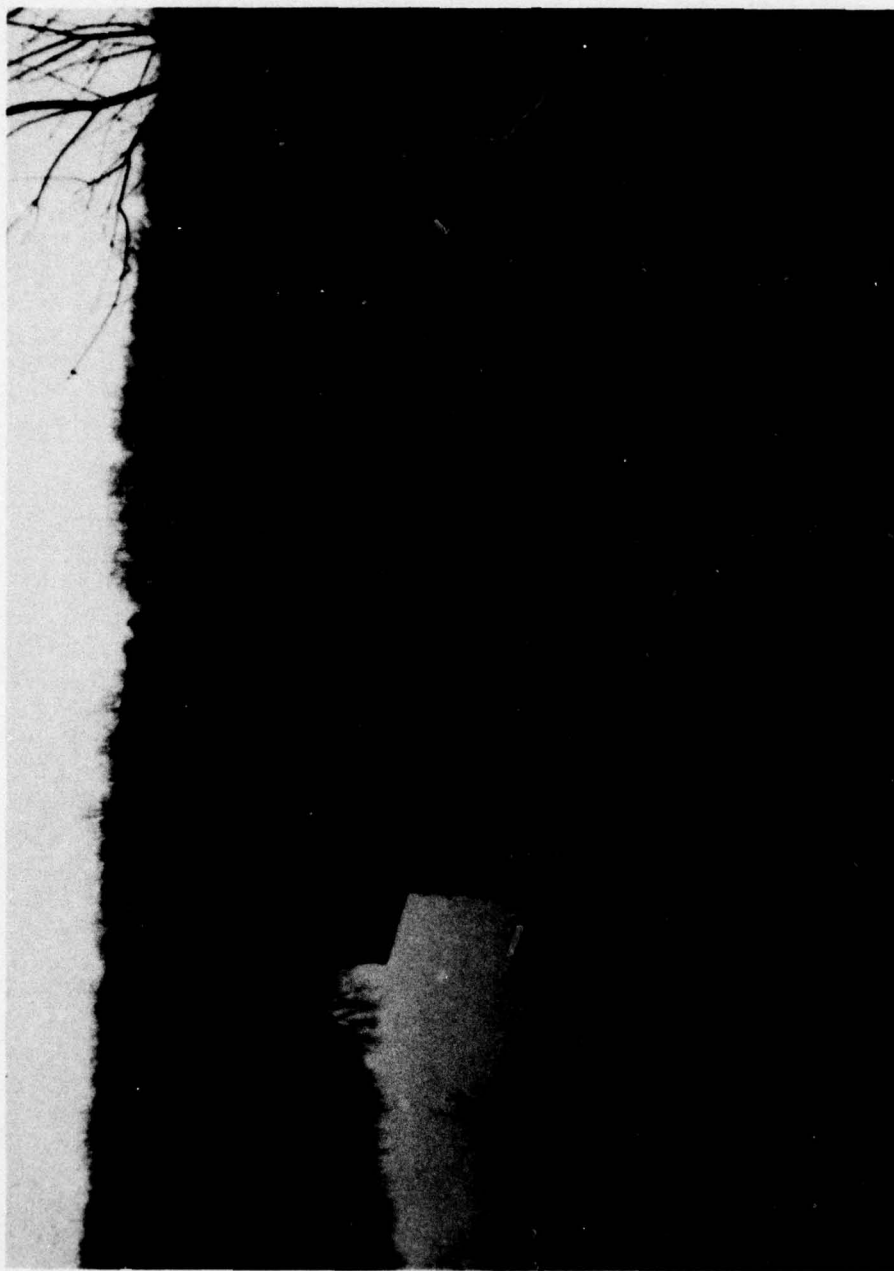
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APPENDIX B - Photographs

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APPENDIX D - Hydrologic and Hydraulic Computations



GREAT NOTCH DAM
View eastward from right abutment.
(December 2, 1978)

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

GREAT NOTCH RESERVOIR DAM
Federal I.D. No. NJ 00244
New Jersey I.D. No. 153

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The National Dam Inspection Act, Public Law 92-367, 1972, provides for the National Inventory and Inspection Program by the U. S. Army Corps of Engineers. This report has been prepared in accordance with this authority, through contract between the State of New Jersey and Jenny-Leedshill Engineers. The State of New Jersey has also entered into an agreement with the U. S. Army Engineer District, Philadelphia, to have this work performed.

b. Purpose of Inspection

The purpose of this inspection was to evaluate the general structural integrity and hydraulic adequacy of the dam, and to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Description of Dam and Appurtenances

Great Notch Dam is an earthfill dam with a concrete core. The dam impounds a 537 acre feet pumped storage reservoir with little natural drainage. The dam is approximately 460 feet long, 74 feet high, and has a crest width of 16 feet. Embankment slopes are 2H:1V on both the upstream and downstream sides, with a 16-foot wide and 12-foot wide berm, respectively, on the upstream and downstream sides. Rock riprap covers the upstream face, and the downstream slope is covered with rock facing. A 50-foot wide spillway is located on the left abutment.

b. Location

The dam is located across Yantecaw Brook, a branch of Third River in the Passaic River valley, in northeastern New Jersey in Passaic County, near West Paterson, one mile west of Clifton. The location of the dam is shown on Plate 1.

c. Size Classification

The size classification of the dam based on its 74-foot height and the maximum reservoir capacity of 640 acre feet is intermediate. The criteria for size classification of dams are set forth in the Corps' Guidelines. An intermediate size dam is one in which the reservoir capacity is equal to or greater than 1000 acre feet and less than 50,000 acre feet, and/or the maximum height is equal to or greater than 40 feet and less than 100 feet.

d. Hazard Classification

Great Notch Dam is classified as a high hazard dam because of the serious damage and loss of more than a few lives that could occur in the event of dam failure at a major highway 2000 feet downstream and in certain western areas of the city of Clifton (population 80,000) and other communities further downstream in the Third River flood plain.

e. Ownership

The dam is owned by the Passaic Valley Water Commission, 1525 Main Avenue, Clifton, New Jersey 07442.

f. Purpose of Dam

The dam and reservoir provide storage of treated water pumped into the reservoir. The water is used as

a potable supply for certain topographically high areas in the city of Clifton and the reservoir serves a secondary function as a balancing reservoir for the owner's distribution system.

g. Design and Construction History

Great Notch Dam, sometimes called Garrett Mountain Reservoir Dam, was constructed in 1898-1899 for the East Jersey Water Company. In 1929 the owner at that time, Passaic Consolidated Water Company, proposed to raise the dam 10 feet to increase the reservoir capacity. The application to raise the dam was denied, even though some preliminary construction work had been started, apparently because of a condemnation action which was pending against the owner. Shortly thereafter the dam and appurtenant works became the property of the Passaic Valley Water Commission, the present owner. Available plans indicate that reinforcement was added to the inlet and outlet conduits in 1951 and that the spillway crest was raised sometime prior to 1962 at which time flashboards were added to the crest.

h. Normal Operational Procedures

The owner endeavors to keep the reservoir level as close as possible to the spillway crest elevation of 427 feet. The level must be above elevation 422 feet to provide sufficient head to serve topographically high areas. Water is pumped into the reservoir whenever it is available, normally at nighttime or on weekends. The reservoir is not lowered prior to a storm. The spillway flashboards are apparently kept in place at all times.

1.3 Pertinent Data

a. Drainage Area - 0.3 square miles (Yantecaw Brook)

b. Discharge at Damsite

- Spillway capacity without flashboards at maximum pool elevation - 675 cfs.
- Spillway capacity with flashboards at maximum pool elevation - 335 cfs.

c. Elevation (ft. above MSL)

- Top Dam 430
- Spillway crest
 - without flashboards 427.0
 - with flashboards 428.25
- Streambed at centerline of dam 356 (Approx.)

d. Reservoir

- Length of maximum pool 3300 ft. (el. 428.25)

e. Storage (acre-feet)

- Design surcharge
 - without flashboards 537
 - with flashboards 580
- Top of dam 640

f. Reservoir Surface (acres)

- Top dam 38
- Spillway crest 33

g. Dam

- Type Earthfill with concrete core wall
- Length 460 ft.
- Height 74 ft.

- Top Width 16 ft.
 - Side Slopes 1V:2H
 - Zoning Not known
 - Impervious Core Concrete core wall
- h. Diversion and Regulating Tunnel
- Type Twin 9-ft. diameter tunnels in downstream embankment housing 48-in. inlet and outlet pipes
 - Length 150 ft.
 - Access Doors at downstream toe of dam. Also manholes.
- i. Spillway
- Type 1 ft. wide weir on top of old broad crested weir
 - Length of weir 49.9 ft.
 - Crest elevation
 - without flashboards 427.0 ft.
 - with flashboards 428.25 ft.
 - Flashboard height 1.25 ft.
 - U/S Channel Rock masonry training walls
 - D/S Channel Natural soil channel
- j. Regulating Outlets
- 1-48 in. diameter steel distribution main
 - 1-48 in. diameter steel force main
 - Multi-level gated inlets in gate house

SECTION 2: ENGINEERING DATA

2.1 Design

a. Geologic Conditions

Great Notch Dam is situated on top of the First Watchung Mountain in the Piedmont Lowlands physiographic province. This province and its regional geology are described in Appendix C to this report.

The dam and its reservoir are located in a small, narrow, bedrock bordered valley which is oriented approximately north-south, parallel to the strike of the "Newark" basalt bedrock. While this orientation is somewhat anomalous to the general structure, it is parallel to the direction of movement of the Wisconsin age glacier and large glacial striations (grooves cut in the bedrock by movement of the glacier) were observed on both abutments.

The right abutment of the dam is constructed against a near vertical rock face while on the left abutment the rock slope is more gentle with a very thin (typically less than 5 feet) mantle of glacial till.

Bedrock can be seen at the toe of the dam near the abutments but cannot be seen in the relatively narrow flat valley floor in the central portion of the dam. It would appear, however, that the dam was probably built on top of rock for its full width.

While the soil depth on the top of both abutments is shallow, thick deposits of alluvium were observed in old borrow pits downstream of the dam. In one pit, well stratified layers of gravel, sand and cobbles could be seen in a steep cut approximately 30 feet high.

These deposits may represent drumlins or glacial outwash deposited on the southern "shadow" side of the bedrock exposure in front of the advancing glacier.

The project is located in an area classified as Seismic Zone 1 and should only be subject to shaking from distant earthquakes.

b. Design History

Engineering data pertaining to the design of the dam are limited to various plans and drawings, most of which are included herein as Plates 2 through 9. The dam was designed to span a small stream, Yantecaw Brook, with the spillway in the left abutment (Plate 2). A section of the dam (Plate 3) indicates both upstream and downstream slopes to be 2H:1V, with a 2.5 feet thick rock facing. Nothing is known about embankment materials but it appears reasonable to assume that some or all of the borrow materials were taken from the excavated reservoir (Plate 4).

The concrete core wall extends the length of the embankment to about 30 feet beyond the spillway on the left abutment. In section, it is 9 feet wide at the base and 5 feet wide at top (Plate 3). The top of the core wall is at elevation 427 or 3 feet below the top of the embankment.

The gate house was designed as a rubble masonry structure rising 61 feet from the base of the dam to the top, with the house itself resting on top of the rubble masonry structure (Plates 3, 5 and 6). Water from the reservoir enters the base of the structure through an arched passageway on the upstream side. A trashrack consisting of 4-inch by $\frac{1}{4}$ -inch bars, 4 inches on center, covers the opening (Plate 7). After entering

the base of the structure, water rises by hydrostatic head in the upstream of 2 chambers from which it can be released into a downstream chamber through 6 gated openings at 3 different elevations. From there water flows into a 48-inch distribution main. Water is pumped into the reservoir through a parallel 48-inch force main, entering a 36-inch line at the gate house and discharging near the center of the reservoir.

The original spillway (Plate 2) was raised sometime prior to 1962 by the addition of a 2-foot high, 1-foot wide concrete sill (Plate 8). In 1962 15-inch high flashboards were added. No hydraulic or hydrologic computations for the spillway design are available.

2.2 Construction

Almost nothing is known of the original construction practices, and as-built properties of the materials are not known. A drawing dated after construction indicates that the foundation for the core wall was extended about 3 to 5 feet into the bedrock (Plate 9). This same drawing indicates the gate house structure may be resting on fill material.

2.3 Operation

Daily records of reservoir levels are maintained by the owner. There are no monitoring devices on the dam. It was reported that there are survey markers on the dam but these were not observed and there are no records of surveys having been made.

2.4 Evaluation

a. Availability

Data available on the original design and construction of the dam are limited to construction drawings,

most of which are included herein. A small amount of information is available on as-built conditions from correspondence in the State files regarding the proposed raising of the dam in 1929. Few data are available on subsequent repair or maintenance work, and there has been no recent survey of the dam. Most of the available data are listed in Appendix A.

b. Adequacy

Available data are insufficient to adequately evaluate the design. Calculations relating to the structural design of the dam or the stability of the as-built structure are not available. Nothing is known of embankment construction methods, testing methods, or as-built material properties. Little is known of foundation conditions.

c. Validity

Plans are old but appear to approximately reflect present conditions regarding details of embankment configuration and locations of appurtenant structures. Because the dam has not been surveyed in recent years, the top elevation of the dam may be somewhat different than indicated on the plans.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The visual inspections of Great Notch Dam were made on December 2, 1978 and on December 20, 1978. The water surface elevation at the time of the first inspection was approximately 425 feet or 2 feet below the spillway crest. Discharge from the reservoir through the distribution system was approximately 4 cfs.

The visual inspection did not reveal any critical signs of distress in the dam. Few remedial measures have been implemented over the years and general maintenance appears to have been rather sporadic.

Detailed inspection was made of the dam, appurtenant structures, reservoir area, and the downstream channel. Descriptions of the findings of these inspections are summarized in the paragraphs which follow. The checklist of visual inspection items is included in Appendix A. Geologic and foundation conditions observed at the time of inspection are noted in greater detail in Section 2.1-a.

b. Dam

The dam was inspected for signs of settlement, seepage, erosion, cracking and any other evidence of undesirable behavior which might affect the stability of the structure. There were no discernable vertical or horizontal misalignments of the crest (see Overview Photo). The exposed riprap above the waterline appears to be in good condition (Photo 1).

Rock facing covers the entire downstream slope of the dam. The rock above the bench in the embankment appears to be carefully hand-placed (Photo 2), while that below the bench is randomly dumped (Photo 3). A small rock slide, about 20 by 50 feet, was observed on the lower right side of the embankment (Photo 4). Small trees have grown in this area. The growth of trees is a general problem on the downstream embankment, but it is particularly acute along the embankment bench (Photo 5). Overall, the downstream side of the dam appears to have a reasonably even slope, with only minor swales and little erosion.

The abutments on each side of the dam were examined for any indications of apparent instability or seepage. On the left abutment, near the top of the dam, there is a small drainage channel cut into the hillside. About 5 gpm of seepage was observed in this channel but at an elevation higher than the reservoir level. Downstream abutments on both sides of the dam are exposed quartzite bedrock. The embankment-abutment contacts appear to be sound. A rock ledge on the lower left abutment separates the natural spillway channel from the dam embankment (Photo 6).

c. Appurtenant Structures

Spillway

The spillway crest has wooden flashboards installed on top of it (Photo 7). The concrete sill and stone masonry training walls appeared to be in satisfactory condition. Immediately downstream there is a chain-link fence installed for security purposes (Photos 7 and 8). This fence could catch floating debris and seriously impede flow through the spillway in the event of flood.

A small amount of seepage was noted in the channel downstream of the spillway. The source of this seepage could not be determined but the condition merits further attention. The downstream natural channel is heavily overgrown with trees.

Outlet Works

The observable structures of the outlet works include the gate house at the top of the dam and the twin tunnels at the downstream toe of the dam housing the force main and the distribution main. The gate house itself is in reasonably good condition, although vandals have broken the windows of the building. Inside the building, most of the gate controls appear not to have been operated for some time (Photo 9). The owner's representatives reported that 2 of the controls were operated in recent years but the remaining have not been operated in more than 20 years. The valve controlling the 48-inch outlet pipe has not been closed for many years, since it is feared that it cannot be reopened.

The tunnels housing the 48-inch force main and distribution main were inspected for a short distance inside the entrances (Photo 10). A small amount of seepage was noted in the bulkhead of the outlet tunnel and the floors of both tunnels were covered with wet slime.

d. Reservoir Area

The reservoir contains treated water and is therefore very clean and free of turbidity. The right bank consists of a high rock outcrop which appears stable (Photo 11). The left bank and upstream areas are heavily wooded with moderate slopes and have some debris

producing potential (Photo 12).

e. Downstream Channel

The downstream channel is poorly defined. It is very heavily wooded and slopes moderately toward a major highway (U.S. Highway 46) 2000 feet downstream. No houses were observed in the immediate area but there are major population centers further downstream.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Great Notch Dam impounds treated water pumped into the reservoir, plus the minor runoff originating from the small reservoir drainage area. The source of the pumped water is Wanaque Reservoir and the Passaic River. The water is pumped from the owner's purification plant at Little Falls through a 51-inch pipeline to the Great Notch Booster Pump Station where it is pumped into a 48-inch line going to the reservoir (Plate 9). The capacity of the 2 booster pumps is 10 mgd total. The pumps are usually operated at night or on weekends when more water is available for storage. When the pumps are not in operation water can be released from the reservoir through the 48-inch force main. An average of 0.5 mgd is released in this manner.

The primary discharge from the reservoir is made through the 48-inch distribution line. Intake is through multi-level gates in the gate house. The maximum rate at which water can be released into the owner's distribution system is reported to be 40 mgd. The average rate is about 2 mgd through the distribution line plus the previously mentioned 0.5 mgd through the force main. In case of emergency there is no way to waste water from the distribution line, other than by opening fire hydrants.

The reservoir normally is kept near the spillway crest elevation of 427 feet and is not allowed to fall below elevation of 422 feet, so as to maintain sufficient head to serve topographically high areas of the

service area. The owner reports that there is occasional flow over the spillway when there is a storm and coincident pumping into the reservoir.

Water is occasionally drawn from the reservoir through a 36-inch siphon to New Street Reservoir, a 50 mg artificial reservoir north of Great Notch Reservoir (Plate 1). This is done to draw off poor quality, stagnant water from Great Notch Reservoir.

4.2 Maintenance of Dam

There has apparently been little maintenance work done on the dam in recent years. Maintenance work is done by the owner. No records of maintenance work were found.

4.3 Maintenance of Operating Facilities

Neither the multi-level intake gates nor the valve controlling the 48-inch distribution line are operated and, in fact, most have not been operated in many years. Two of the gates were successfully operated about 2 years ago when there was a water quality problem in the reservoir.

The 48-inch force main and the 48-inch distribution main in the tunnels were reinforced with steel reinforcement and a concrete jacket in 1957.

4.4 Description of Warning Systems

There is no formal warning system. The dam is checked by the owner's personnel twice daily and there is a caretaker on the property to secure it from vandals. The reservoir is fenced in for security purposes.

4.5 Evaluation of Operational Adequacy

There is presently no way to lower or drain the reservoir other than through the owner's water distri-

bution system. This condition imposes a limitation on emergency operational flexibility.

Maintenance of the dam and operating facilities is somewhat lax. The fact that most of the outlet works controls have not been operated for many years lends doubt as to whether they would work, should an emergency arise.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

As already stated, Great Notch Dam is classified as high hazard and intermediate in size. In accordance with the Corps of Engineers', "Recommended Guidelines for Safety Inspection of Dams," the Spillway Design Flood (SDF) is the Probable Maximum Flood (PMF).

Data obtained from State files indicate the drainage basin area of the Dam is 0.3 square miles. Elevations within the basin range from about 500 feet mean sea level along the perimeter of the drainage basin to about 425 feet in the valley floor. Land use patterns within the watershed consist mostly of forests along the slopes of the valley. The reservoir constitutes about 17 percent of the total watershed area. The drainage basin is delineated on a U. S. Geological Survey topographic map and is presented on Plate D-1, Appendix D.

The hydraulic and hydrologic features of the dam were evaluated using criteria set forth in the Corps of Engineers', "Recommended Guidelines for Safety Inspection of Dams," and additional guidance and criteria provided by the Philadelphia District Corps of Engineers. The Probable Maximum Precipitation (PMP) was calculated using Hydrometeorological Report No. 33 and the Hop Brook reduction factor of 0.80 for misalignment of the storm.

The Probable Maximum Flood (PMF) was calculated using the Corps' computer program HEC-1, Dam Break Version. In computing the PMF the Corps requested that

the SCS triangular unit hydrograph with curvilinear transformation be used. The computer program was used to calculate this unit hydrograph from the basin lag. A lag time of 0.2 hours was calculated for the basin and used in the program.

An initial infiltration loss of 0.5 inch and a constant infiltration loss rate of 0.05 inch per hour were used in the HEC-1 program to give the rainfall excess. These values were selected because the reservoir represents a large percentage of the basin area and slopes into the reservoir are relatively constant and steep. Using the excess rainfall and the unit hydrograph, the program computed the peak inflows of the 25 percent, 50 percent, 75 percent, and 100 percent PMF. These inflows are approximately 670 cfs, 1330 cfs, 1990 cfs, and 2660 cfs, respectively.

At the time of the field inspection, Great Notch Dam spillway had flashboards in place. The presence of these flashboards could have a significant impact on the ability of the spillway to pass the SDF. Thus, two hydraulics/hydrology analyses of the dam were made, one, assuming no flashboards on the spillway and, the other, assuming the flashboards are in place. The analysis that assumes no flashboards is presented first.

Hydraulic & Hydrologic Analysis - No Flashboards

The various percentages of the PMF inflow hydrograph were routed through the reservoir using the Modified Puls Method by the HEC-1 program. The peak outflow of the 25 percent, 50 percent, 75 percent and 100 percent PMF were calculated to be approximately 200 cfs, 450 cfs, 770 cfs, and 1500 cfs, respectively. The flood routings indicated that all floods greater

than about 65 percent of the PMF will overtop the dam. A plot of percent PMF versus peak outflow discharge is presented as Plate D-2 in Appendix D.

The spillway and overtop stage-discharge rating curve used in the flood routings was calculated using the weir equation and assuming free overflow across the entire length of the dam and spillway. The spillway is a modified broad-crested weir with a cyclone fence just downstream. A discharge coefficient of 2.6 was used for this weir because the first flood flows would pass through the spillway and these flows would carry the majority of reservoir debris which would collect on the cyclone fence. The dam crest is a broad-crested weir with a discharge coefficient of 3.1. The reservoir stage-storage curve was determined from U. S. Geological Survey 7.5 - minute topographic maps and data obtained from the owners. This stage-storage curve was extended above the top of dam to include surcharge storage during peak flood discharges. In the reservoir routing computations, possible discharges through the outlet works were excluded because their capacity is small compared to the PMF. The stage-storage and the spillway and overtop stage-discharge curves are presented in Appendix D as Plates D-3 and D-4, respectively.

Hydraulic & Hydrologic Analysis - With Flashboards

The spillway can accommodate 15 inches of flashboards and the flashboards were in place at the time of inspection. Consequently, this second analysis of the dam was made assuming 15 inches of flashboards are in place during the PMF. The assumptions used in this analysis were the same as those in the analysis without flashboards, except the weir coefficient of the

spillway was increased to 2.9 to better approximate the flow characteristics of the flashboards.

The analysis without flashboards indicated that the spillway with flashboards probably cannot pass one-half the PMF. Consequently, the various percentages of the PMF, assuming the dam would not breach and assuming the dam would breach, were routed 0.4 miles downstream through three successive reaches to Highway 46. A high hazard would exist at Highway 46 due to flooding. For the routing calculations, estimates of channel shapes, slopes and roughnesses were made based on conditions observed in the field and U.S.G.S. topographic maps. The locations of the cross-sections used in these routings are shown on page D-5, Appendix D.

The breach parameters used in the HEC-1 analysis are: the breach is triangular in shape, has 60-degree side slopes, will extend to the approximate original reservoir floor elevation (370'), will begin breaching when the dam is first overtopped, and will develop to its maximum size in 1.0 hours.

The peak outflow for the 25 percent, 50 percent, 75 percent and 100 percent PMF, assuming the dam does not breach, were calculated to be 200 cfs, 620 cfs, 1330 cfs, and 1940 cfs, respectively. These routings indicate that with flashboards the spillway can pass only 35 percent of the PMF without overtopping. The peak overflow for the 25 percent, 50 percent, 75 percent and 100 percent PMF, assuming the dam does breach, were calculated to be approximately 200 cfs, 13700 cfs, 14300 cfs, and 14000 cfs, respectively.

Three floods were compared in assessing the downstream hazard: (1) the PMF assuming the dam is breached; (2) the PMF assuming the dam is not breached; and (3) the

flood that is approximately equal to the existing capacity of the spillway with flashboards (25% PMF). The flood depth, width and mean flow velocity of these three floods at Highway 46 are summarized in the following tabulation. The hazard potential of flooding is discussed in Section 1.2d.

Flooding Characteristics
at Highway 46

	<u>25% PMF Without Breaching</u>	<u>PMF Without Breaching</u>	<u>PMF With Breaching</u>
Peak Discharge, cfs	200	1900	13800
Peak Flood Depth, ft.	1.8	4.5	9.4
Peak Flood Top Width, ft.	70	210	470
Peak Flow Velocity, fps	3.2	4.4	6.6

The dam owner has indicated that there is no way of draining the reservoir other than to stop pumping water into the reservoir and using reservoir storage to supply the distribution system. Water use out of the distribution system is reported to average about 7.7 acre-feet per day. Assuming this average rate for draining the reservoir, it is estimated that the reservoir can be drained, from a spillway level full condition, in approximately 2.5 months.

b. Experience Data

Records of lake levels are maintained for this site. The reservoir is operated to maintain water levels above elevation 422 feet in order to provide adequate pressures through the service area. There are no reports or evidence that the dam has ever been overtopped, although it is reported there is occasional flow over the spillway.

c. Visual Observations

There is no defined spillway channel downstream of

the embankment. No dwellings were observed immediately downstream. The flood plain below the dam contains a fairly dense stand of medium and small trees with significant undergrowth.

Just downstream of the spillway crest is a cyclone fence that would collect debris during floods. If the fence collects sufficient quantities of debris, it could significantly reduce the spillway capacity (Photo 8).

d. Overtopping Potential

As indicated in Section 5.1-a, without flashboards, Great Notch Dam spillway can pass about 65 percent of the PMP. During the PMF the dam would be overtopped about 0.6 feet. Without flashboards the spillway is classified, in accordance with the Corps' guidelines, as Inadequate.

With 15-inches of flashboards in place, all floods greater than about 35 percent of the PMF, when routed through the reservoir, will overtop the dam. The PMF will overtop the dam for about 4.0 hours and have a maximum stage about 1.0 foot above the top of dam. One-half the PMF will overtop the dam for about 1.3 hours and will have a maximum stage about 0.3 feet above the dam crest. These overtopping heights assume the dam remains in its current condition. A dam breach analysis was made to determine if the existing spillway is Seriously Inadequate because (1) the Spillway Design Flood is the PMF; (2) the spillway is not capable of passing one-half the PMF; and (3) there is a high downstream hazard to loss of life. The results of this analysis are presented in Section 5.1-a. One of the

Corps' criteria for classifying a spillway as Seriously Inadequate is, "Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure."

The data tabulated in Section 5.1-a were used to assess the degree of significance that overtopping failure would increase the downstream hazard. Assuming the dam does not breach during the PMF, the discharge at Highway 46 will be about 1900 cfs as compared to a breach peak discharge of about 13,800 cfs. The flow depth, top width and velocity will be much greater during the breach peak discharge and result in a significantly higher downstream hazard. For this comparison, the spillway is classified, in accordance with the Corps' guidelines, as Seriously Inadequate.

Currently the spillway is classified as Seriously Inadequate; however, if the flashboards were removed, the spillway would be reclassified to Inadequate.

embankment. There has been no recent survey of the dam. There are no records of maintenance or inspections.

d. Post-Construction Changes

The only major post-construction change was the raising of the spillway crest and the addition of flashboards in recent years. This change indirectly affects the structural stability of the dam by lowering the hydraulic capability of the spillway and thus increasing the probability of overtopping of the dam.

e. Seismic Stability

The dam is located in Seismic Zone I in which it may be generally assumed that there is no hazard from earthquake, provided static stability conditions are satisfactory and conventional safety margins exist. Although the dam appears to have adequate static stability, a stability analysis would be required to verify this.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

The spillway of the dam, without flashboards in place, is inadequate and is capable of passing 65 percent of the Probable Maximum Flood (PMF). With flashboards in place, as they presently are, the spillway can pass only about 35 percent of the PMF and is seriously inadequate.

Structurally, the dam appears to be adequate. The slopes and crest are without any major discontinuities or evidence of distress. Although nothing is known of the embankment materials, it is known that the dam has a concrete core wall that extends into bedrock. However, the core wall should not be expected to provide structural stability if overtopping should result in removal of embankment materials.

Most of the valves have not been operated in many years and are thus in questionable operating condition.

b. Adequacy of Information

Data are insufficient to evaluate the stability of the dam, since nothing is known of the design, construction or as-built properties of the embankment materials. Little is known of the core wall, other than its configuration. The mode of operation of the gates of the intake structure is imprecisely known. The dam has not been surveyed in many years, thus information on elevations and slopes may be inexact.

c. Urgency

The spillway flashboards and downstream security fence should be removed very soon. Other measures as itemized below are of a less urgent nature and should be implemented in the near future.

d. Necessity for Additional Data/Evaluation

Seepage and stability analyses should be on record for all dams in the high hazard category. Great Notch Dam is so classified; however, based on the visual inspection and satisfactory performance of the dam, the structural stability and seepage characteristics appear to be satisfactory. Even so, it is considered that seepage and stability analyses are desirable, and should be done after a boring program, by soils engineers.

It is recommended that the dam be surveyed to verify the existing crest elevation and side slopes. This could become the basis for periodic monitoring surveys in the future.

More detailed and sophisticated hydraulic and hydrologic studies to more accurately determine the spillway capacity should be undertaken by the owner within 6 months. Remedial action, as a result of these studies, should be initiated within one year.

7.2 Remedial Measures

a. Remedial Action

It is recommended that the owner perform the following remedial measures:

1. Remove the flashboards from the spillway and relocate the chain-link fence at the spillway to a location where it will not create a debris buildup hazard.

2. Determine the source of seepage below the spillway and take remedial action as necessary.
3. Investigate alternative methods of draining the reservoir, including installation of an emergency drain.

b. Operation and Maintenance Procedures

The following operation and maintenance procedures are recommended:

1. Regularly operate all valves at the intake structure and outlet works.
2. Remove all trees and brush from the face and crest of the dam and from the spillway channel.
3. Replace dislodged rock facing on the downstream embankment.
4. Regularly inspect the dam and keep records of all maintenance work.
5. Install survey monuments on the crest and downstream embankment and periodically make settlement surveys.
6. A contingency plan and an emergency warning system should be established to provide adequate warning to downstream residents. Also, surveillance of the dam should be provided during periods of heavy precipitation.

PLATES



1000 0 1000 2000 3000 4000

SCALE IN FEET



AREA LOCATION

VICINITY MAP

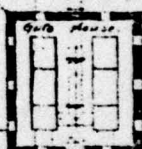
JENNY-LEEDSHILL

JANUARY 1979

ON 100' V
ON 100' V
ON 100' V

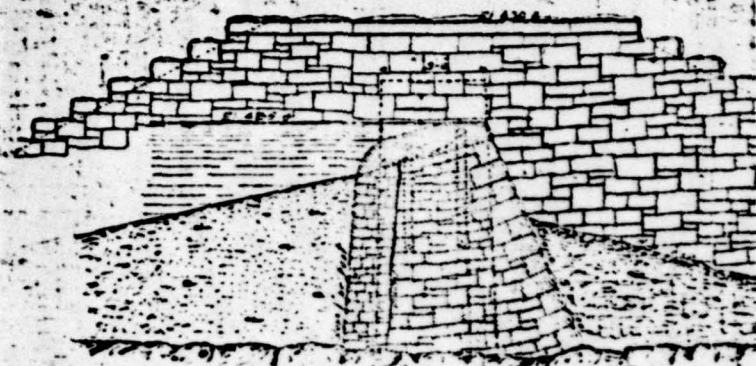
160 Berms

120 Berms



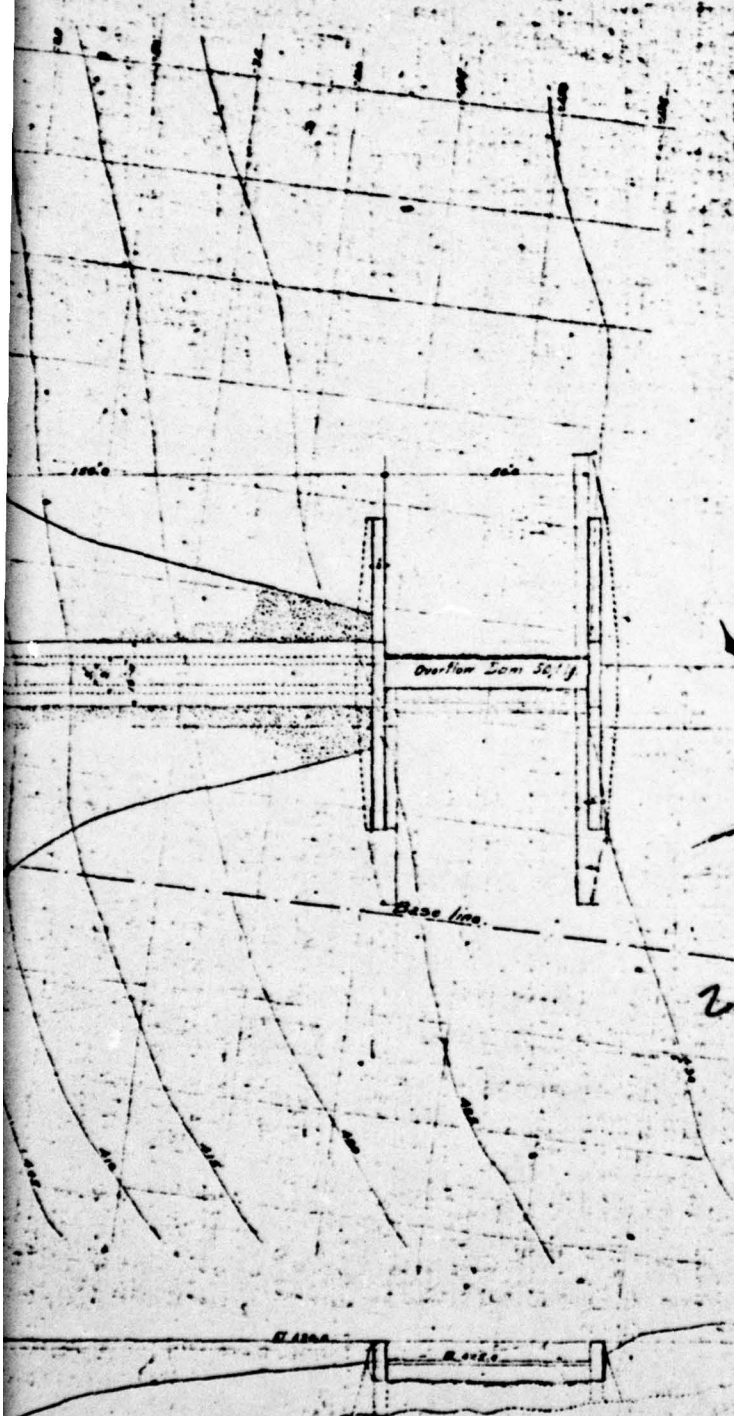
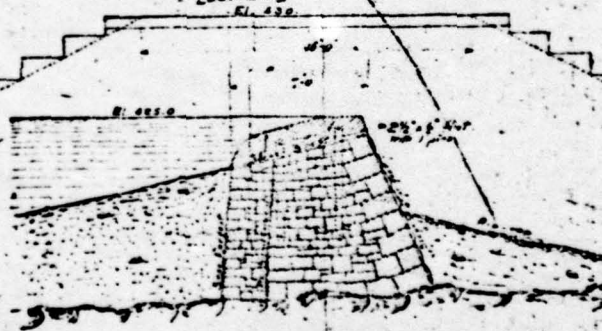
Section of Overflow Dam.

[West End]



Section of Overflow Dam.

East End



PACIFIC VALLEY WATER COMMISSION
CITY HALL ANNEX
127-141 ELLISON STREET, PATTERSON, N.J.

The East Jersey Water Company

Contour Plan of Dam Site for

Great Notch Reservoir

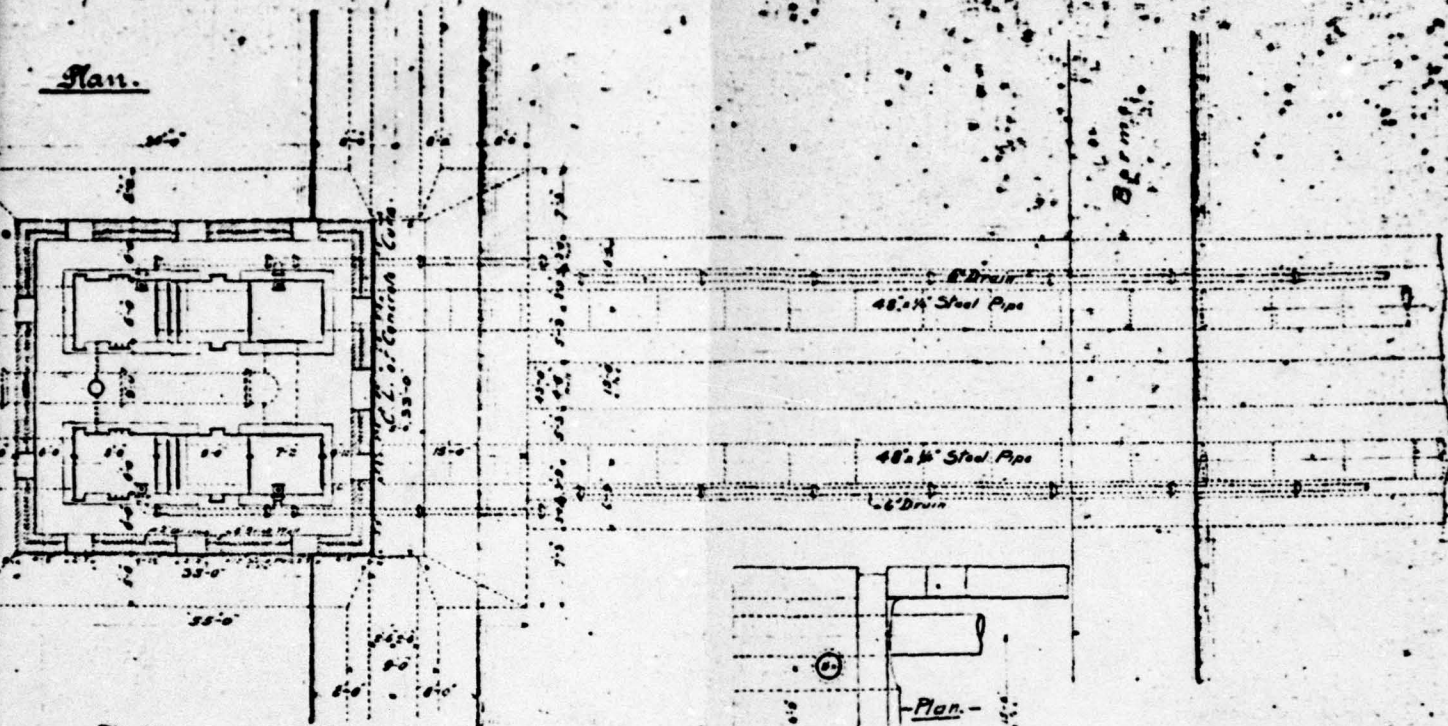
April 1899.

PA. A. T.
C. A. B. N. E.
S. H. E. E. T
C. O. M. P. A. N. Y.

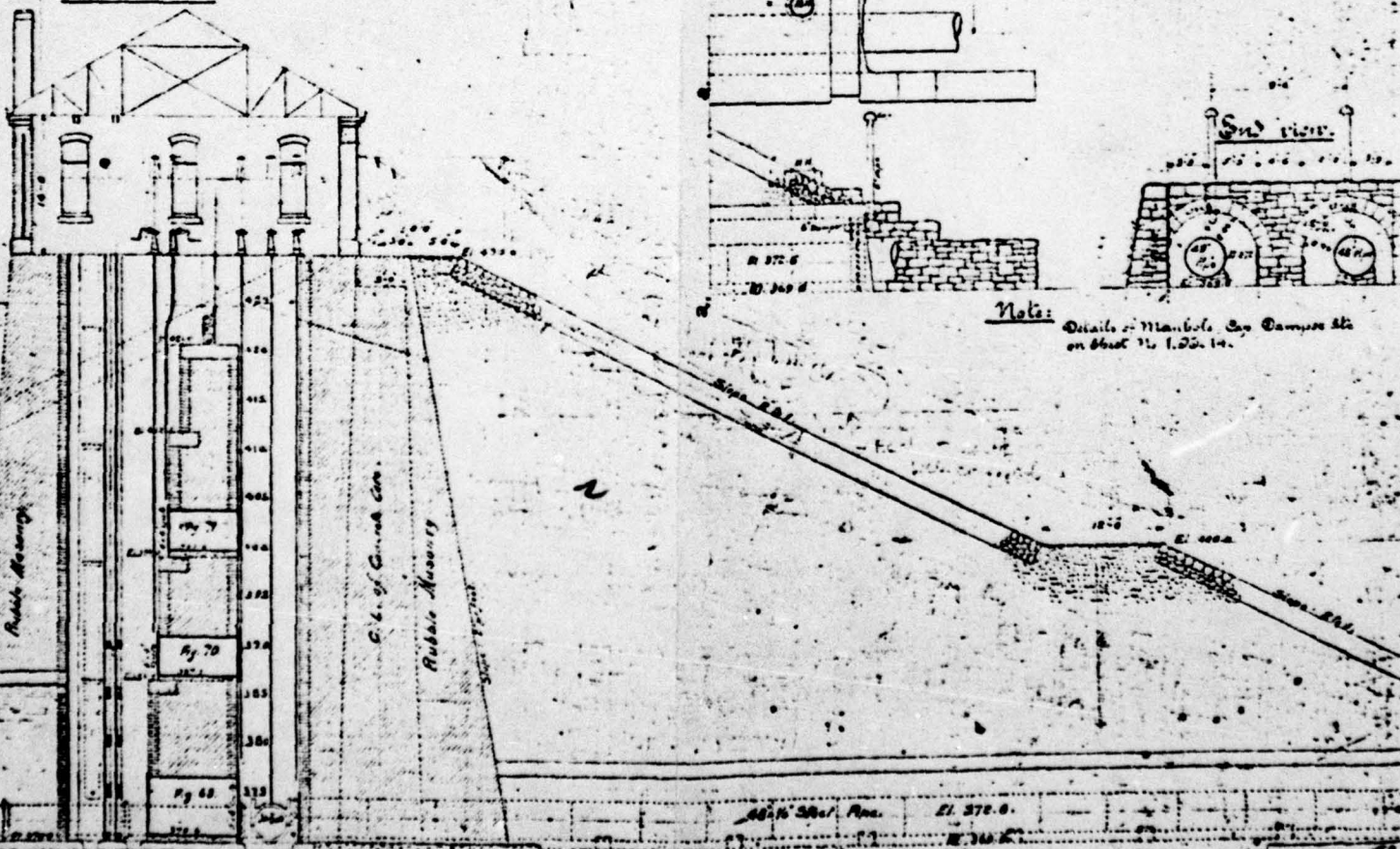
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F. 5

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Plan.



Section.



Notes:

Details of Manhole See Chapter 14 on Sheet No. 1, 2, 3, 4.

SAULTIN
CABINET NO
DRAWER NO
SHEET NO
COMP NO

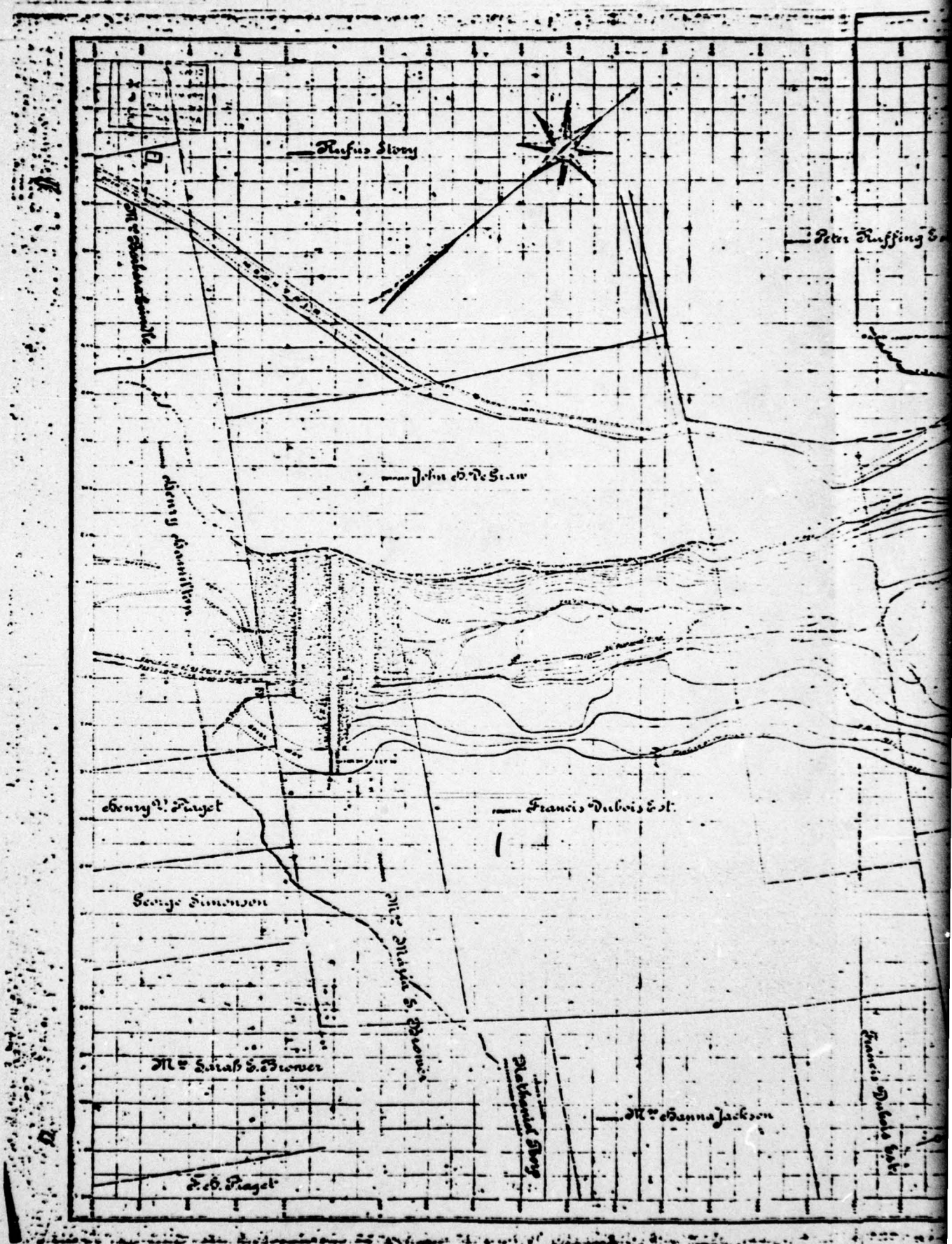


PLATE 4

Peter Schuriger

Henry Davis

Frank Seiler

Frank Seiler

Refuge Store

(Area Plotted 20.5 Acres)

Martin Macman Est.

The East Jersey Water Company

Contour Map

Garret Mountain Reservoir

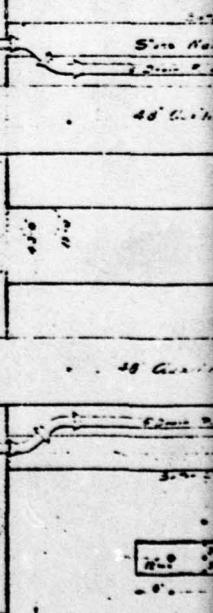
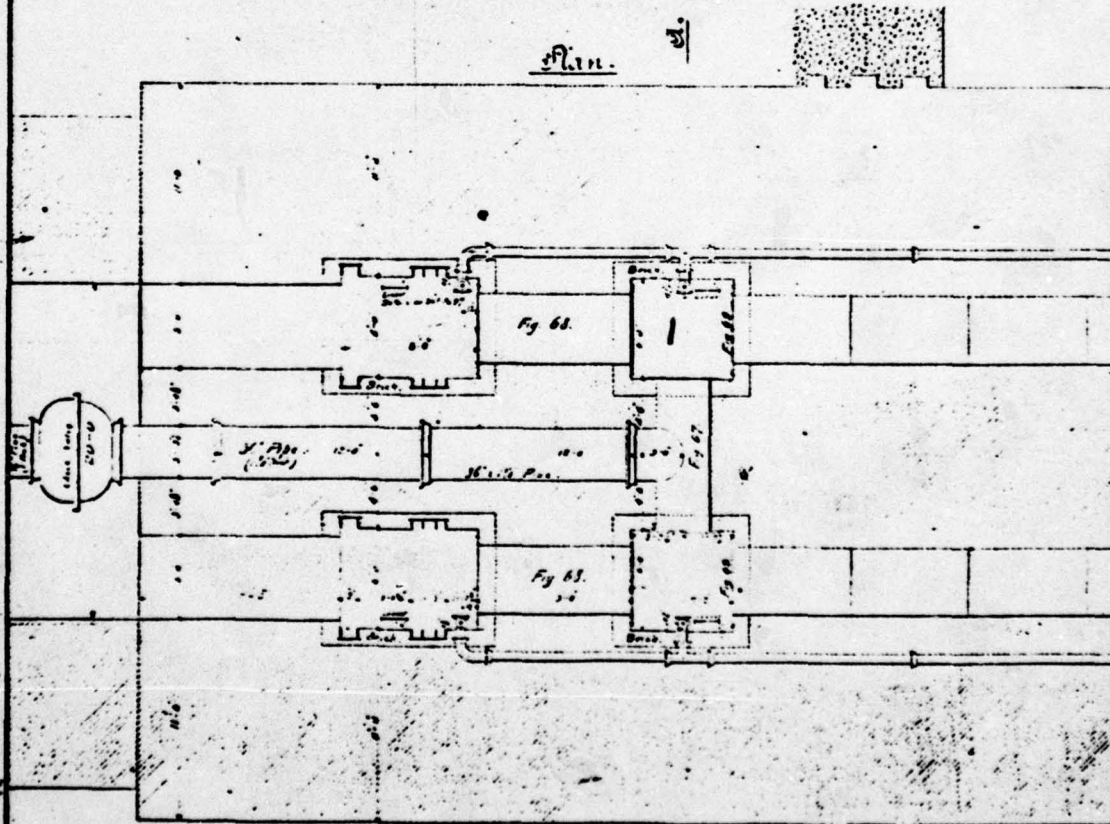
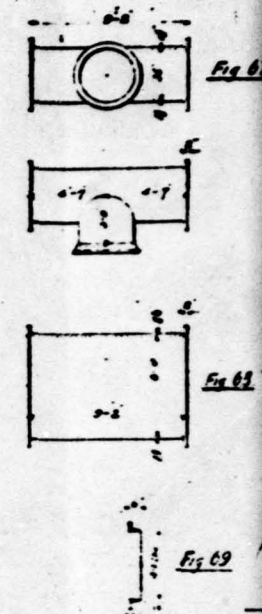
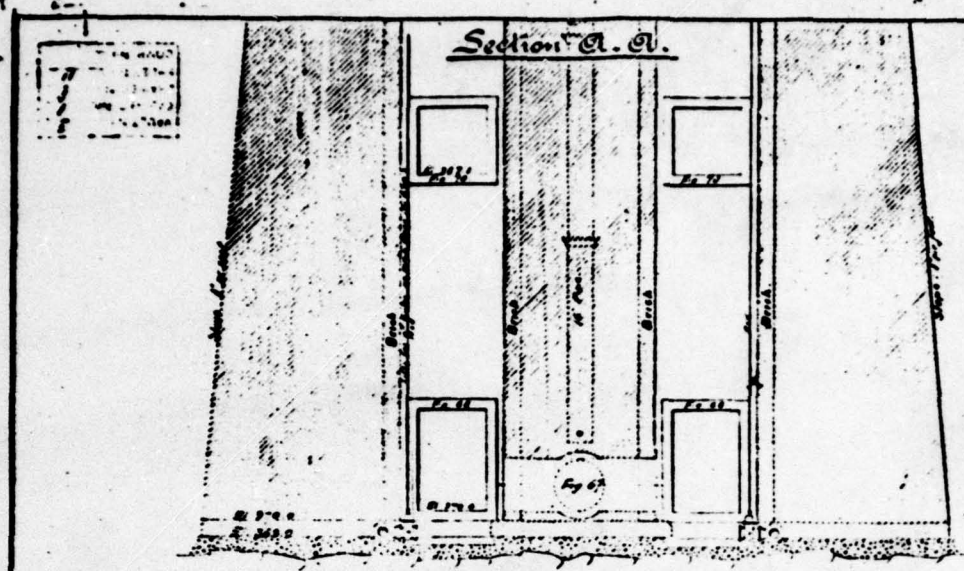
December 1899

Scale

Feet 100 200 300 400 500 600 700 800 900 1000 Feet

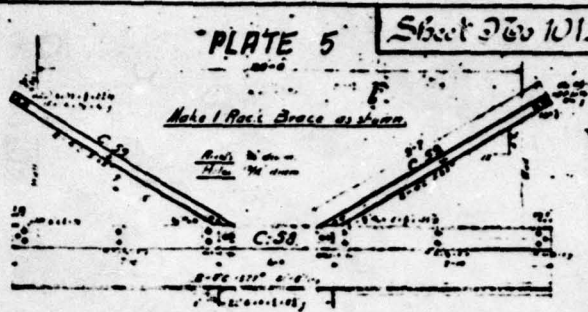
Note: All clearing and excavating of Reservoir Site was completed previous to Cross Sectioning.

71.7

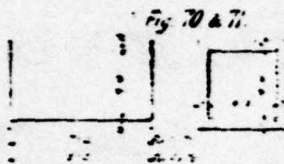


Bill of Materials

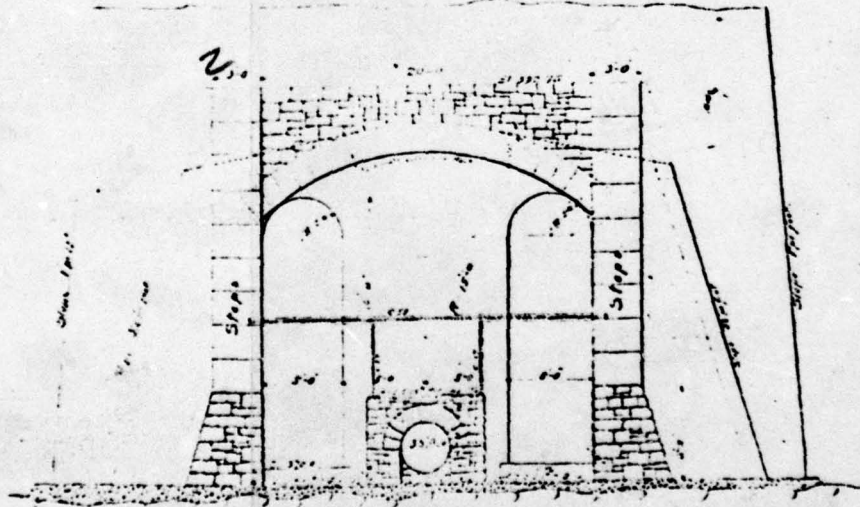
No. of pcs.	Description	Mark	Length
1	36" x 36" x 10' R.F. & B	Fig. 67	9'-0"
2	40" x 70" x 10' R.F. & B	68	9'-0"
2	40" x 70" x 10' R.F. & B	69	9'-0"
2	40" x 70" x 10' R.F. & B	70	9'-0"
2	40" x 70" x 10' R.F. & B	71	9'-0"
2	40" x 70" x 10' R.F. & B	72	9'-0"
2	40" x 70" x 10' R.F. & B	73	9'-0"
2	40" x 70" x 10' R.F. & B	74	9'-0"
2	40" x 70" x 10' R.F. & B	75	9'-0"
2	40" x 70" x 10' R.F. & B	76	9'-0"
2	40" x 70" x 10' R.F. & B	77	9'-0"
2	40" x 70" x 10' R.F. & B	78	9'-0"
2	40" x 70" x 10' R.F. & B	79	9'-0"
2	40" x 70" x 10' R.F. & B	80	9'-0"
2	40" x 70" x 10' R.F. & B	81	9'-0"
2	40" x 70" x 10' R.F. & B	82	9'-0"
2	40" x 70" x 10' R.F. & B	83	9'-0"
2	40" x 70" x 10' R.F. & B	84	9'-0"
2	40" x 70" x 10' R.F. & B	85	9'-0"
2	40" x 70" x 10' R.F. & B	86	9'-0"
2	40" x 70" x 10' R.F. & B	87	9'-0"
2	40" x 70" x 10' R.F. & B	88	9'-0"
2	40" x 70" x 10' R.F. & B	89	9'-0"
2	40" x 70" x 10' R.F. & B	90	9'-0"
2	40" x 70" x 10' R.F. & B	91	9'-0"
2	40" x 70" x 10' R.F. & B	92	9'-0"
2	40" x 70" x 10' R.F. & B	93	9'-0"
2	40" x 70" x 10' R.F. & B	94	9'-0"
2	40" x 70" x 10' R.F. & B	95	9'-0"
2	40" x 70" x 10' R.F. & B	96	9'-0"
2	40" x 70" x 10' R.F. & B	97	9'-0"
2	40" x 70" x 10' R.F. & B	98	9'-0"
2	40" x 70" x 10' R.F. & B	99	9'-0"
2	40" x 70" x 10' R.F. & B	100	9'-0"



Rock Brace



Foundation



The East Jersey Water Company.

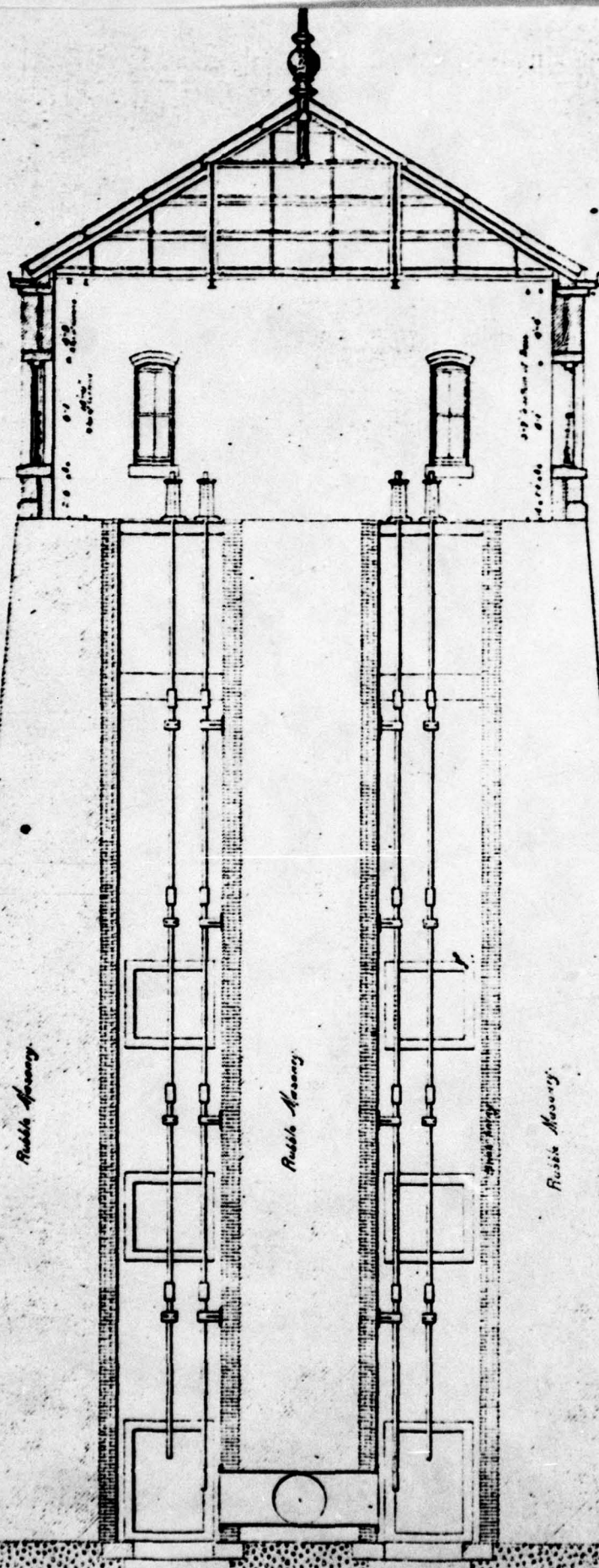
Plan of Gate House & Location of Main & Drain Pipes

Great Nock Reservoir

May 1892.

PAUL N.
CABINET NO.
DRAWER NO.
SHEET NO.
COMP. NO.

101.



See Section

Rubble Masonry

Rubble Masonry

Rubble Masonry

See Section

See Section

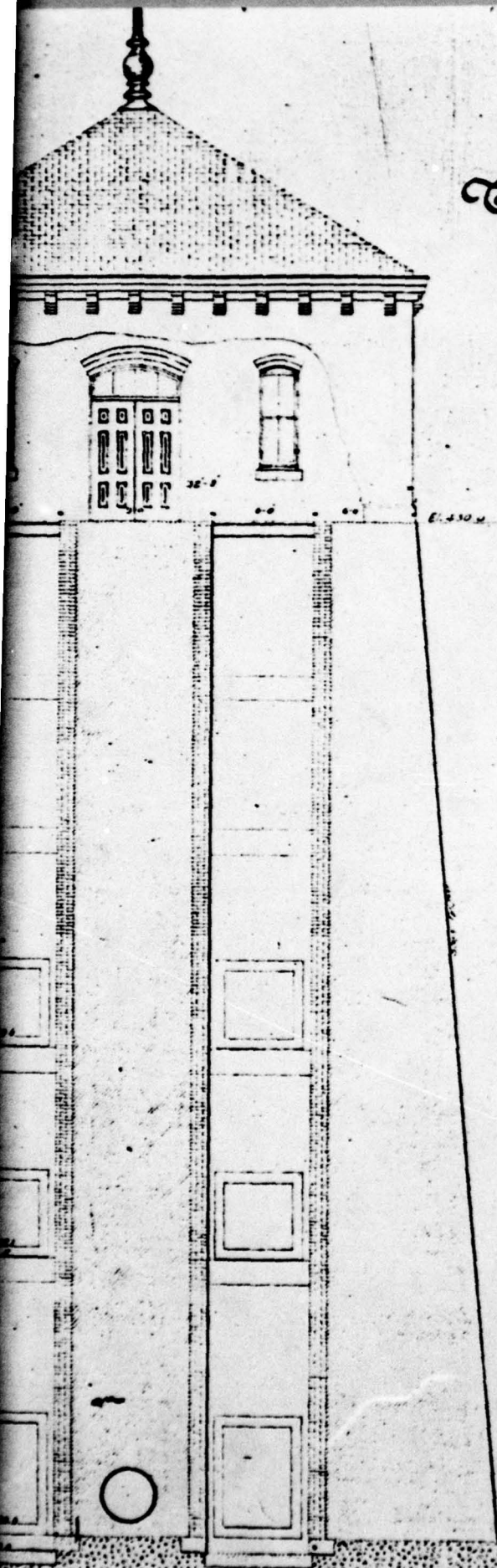


The East Jersey Water Company.

Section & Elevation of Gate House for Great Notch & 7

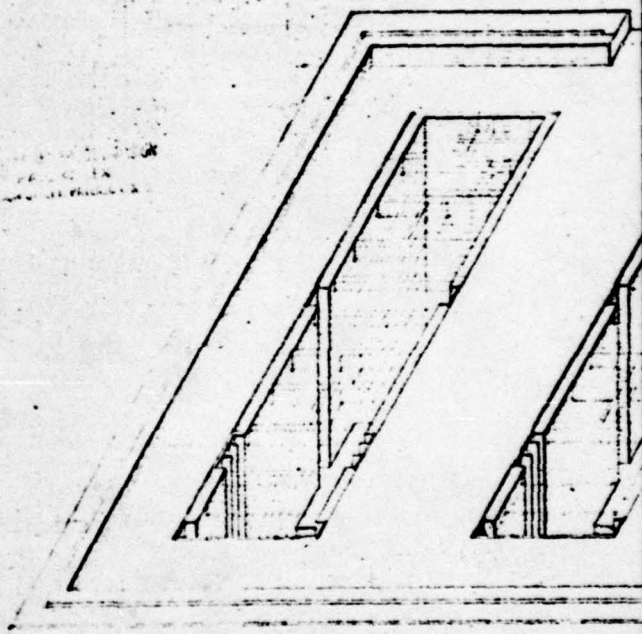
Garrett Mountain Reservoir.

October 1899.



NOTES: 1. The gate house is to be built of brick with a concrete foundation. 2. The gate is to be of iron and is to be operated by a system of pulleys and ropes. 3. The gate is to be 10 feet high and 12 feet wide. 4. The gate is to be 10 feet high and 12 feet wide.

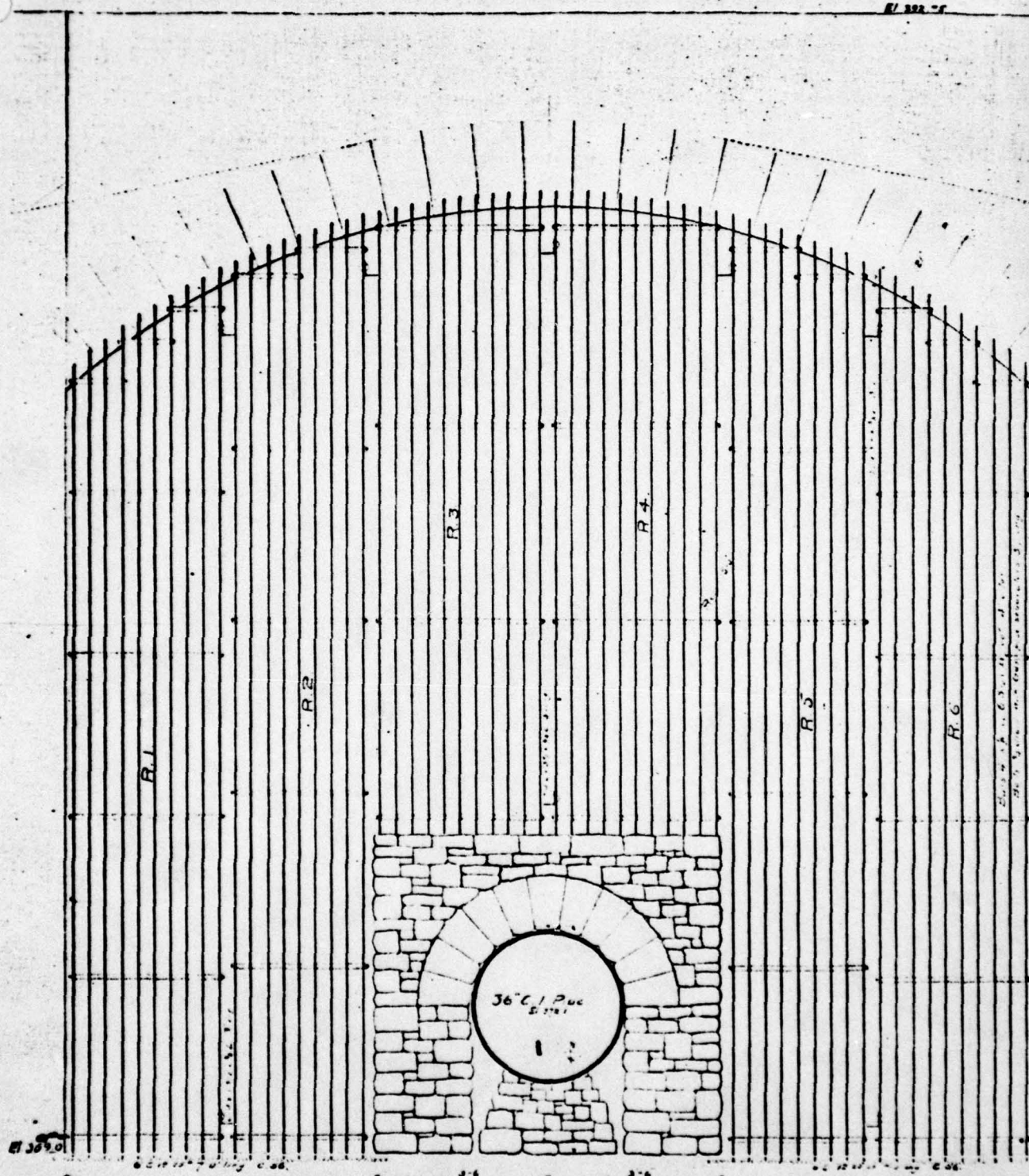
2



PAID TO THE
JANUARY 1900
DRAWN BY
J. H. 22
COMP. NO.

1
H. 22

146



36" = 1600'

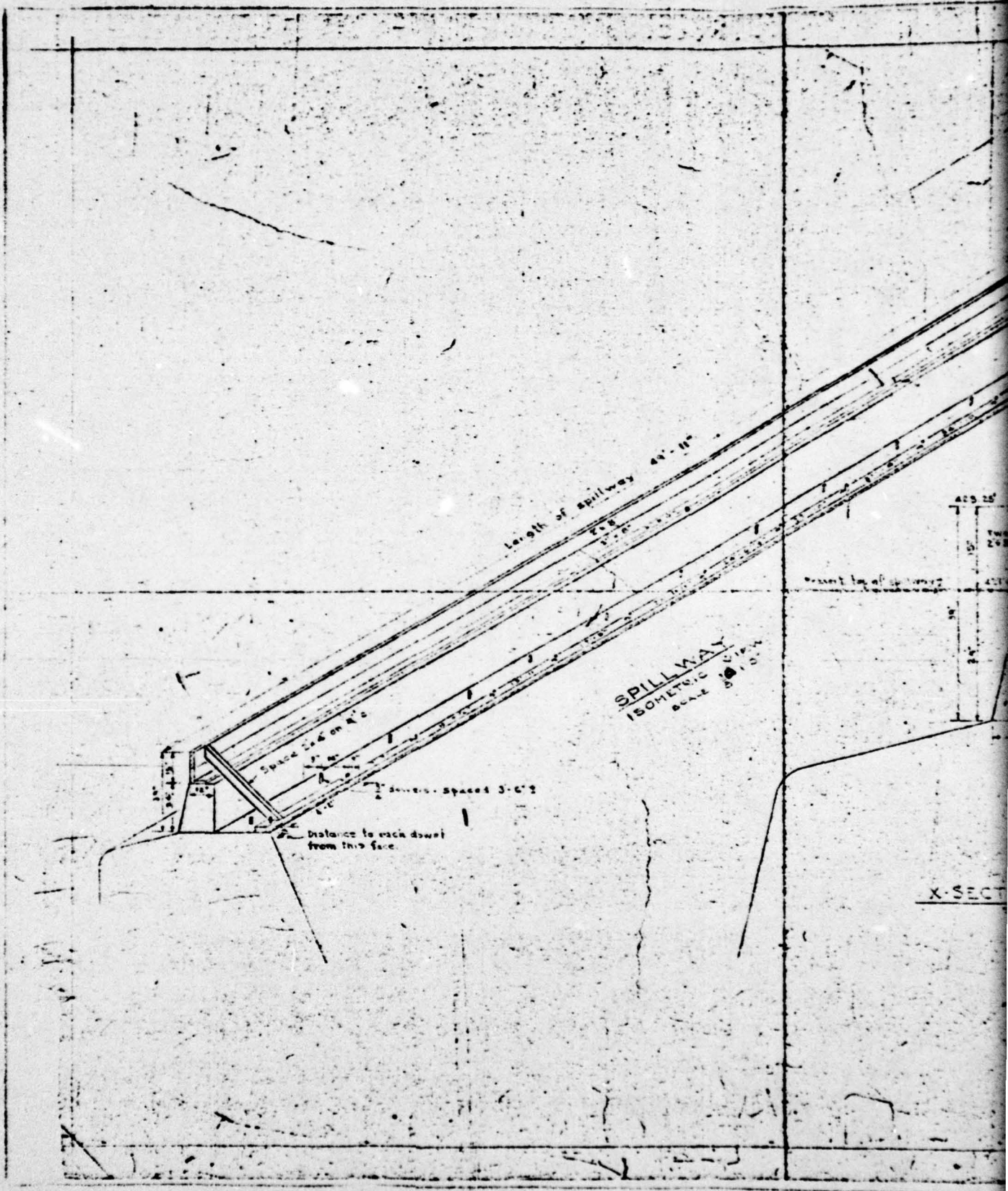
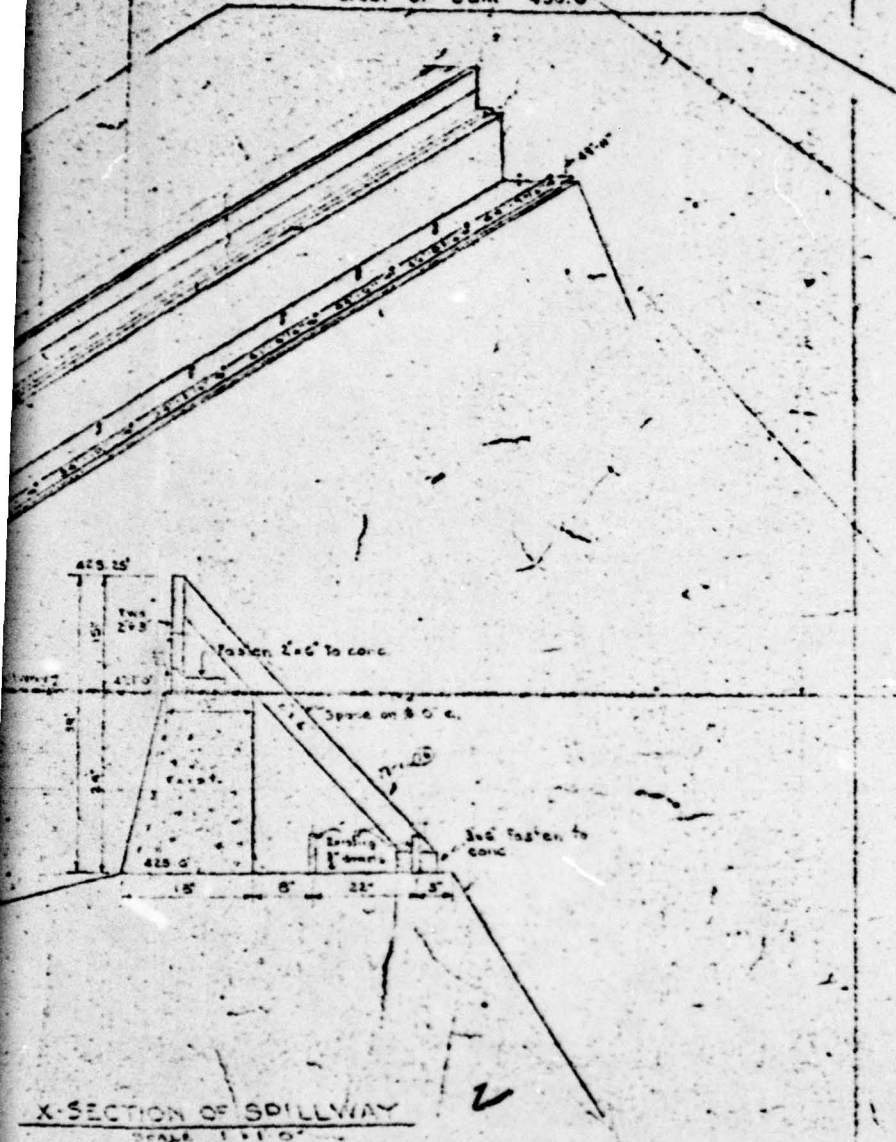


PLATE 8

Crest of Dam 430.0



RABBIT VALLEY WATER COMMISSION
ENGINEERING DEPT. CLIFTON, N.J.

PLAN OF PROPOSED CONSTRUCTION OF FLASH DITCHES
TO RAISE ELEVATION OF GREAT NOTCH SEEBAND
FROM 422 FT. TO 425.25 FT.

SEAL (AS NOTED)

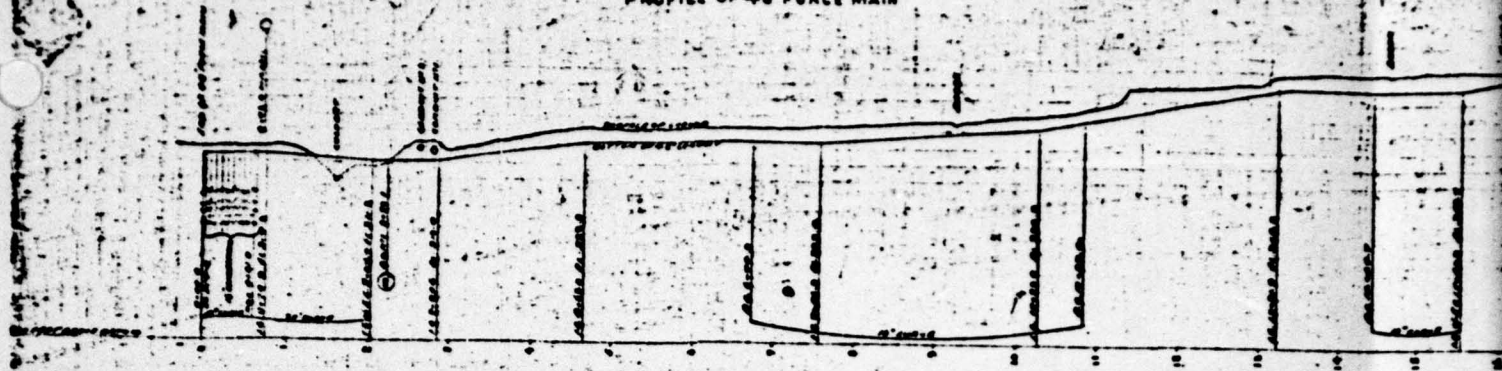
30 MAR 54 1762

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24-30

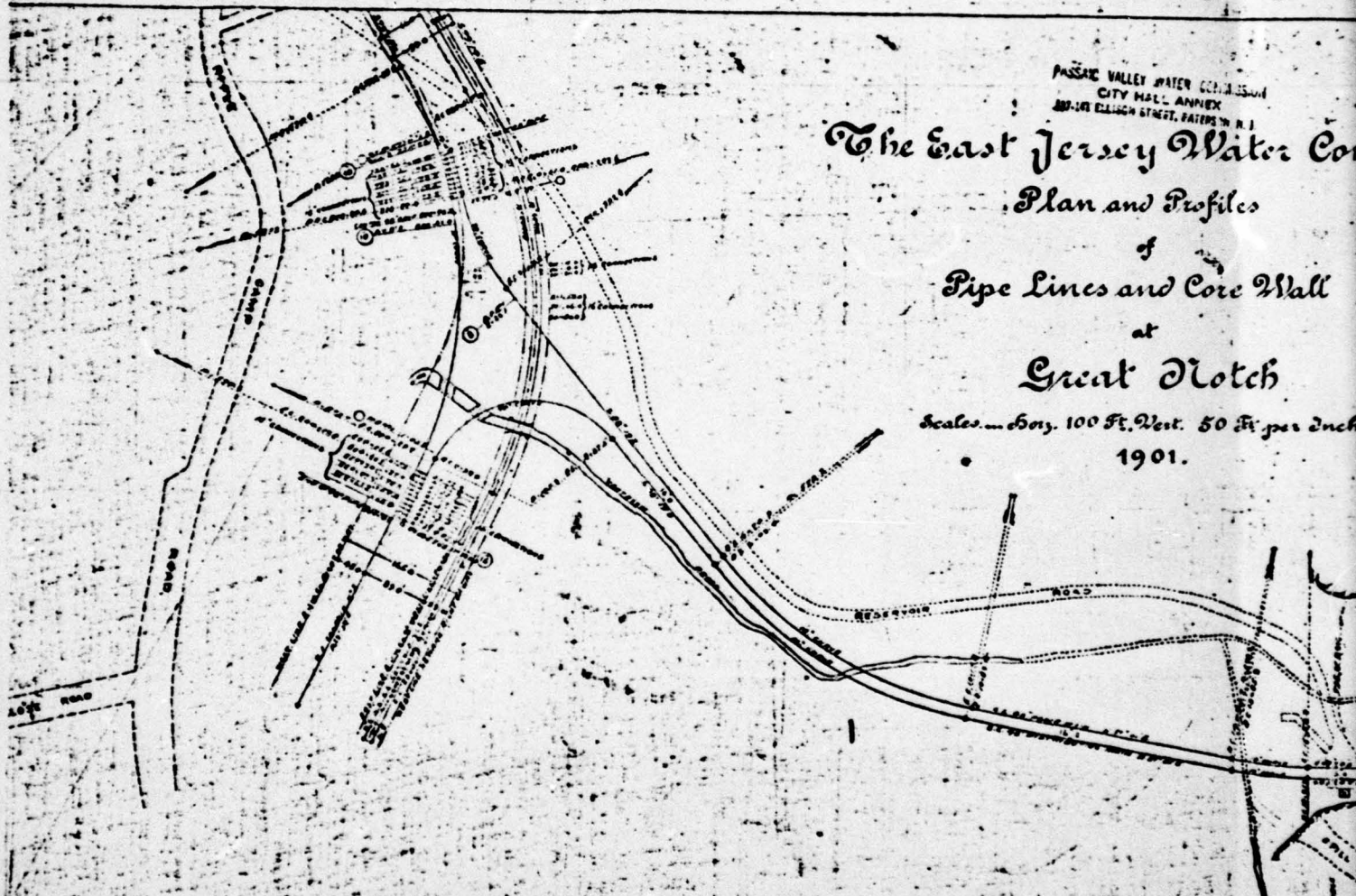
PROFILE OF 48" FORCE MAIN



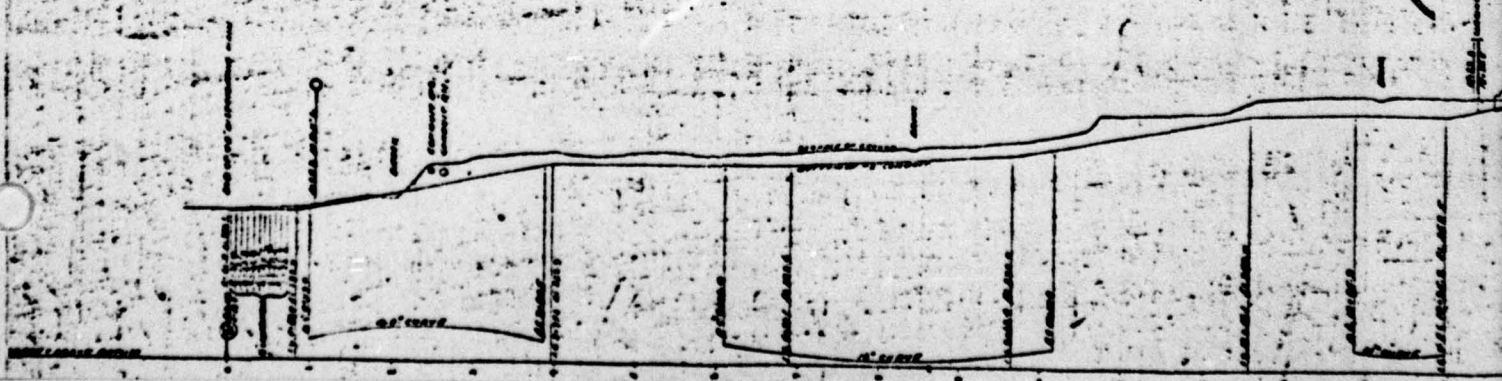
PASSAIC VALLEY WATER COMMISSION
CITY HALL ANNEX
200-202 ELIZABETH STREET, PATTERSON, N. J.

The East Jersey Water Company Plan and Profiles of Pipe Lines and Core Wall at Great Notch

Scales.—Hory. 100 Ft. Vert. 50 Ft. per Inch
1901.



PROFILE OF 48" DISTRIBUTING MAIN



APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION,
MAINTENANCE DATA

Check List
Visual Inspection
Phase 1

Name Dam Great Notch County Passaic State New Jersey Coordinator NJDEP
Coordinates: Lat. 40° 52' 48"N
Long. 74° 11' 37"W

Date(s) Inspection Dec. 2, 1978 Weather Overcast Temperature 42°F

Pool Elevation at Time of Inspection 425' M.S.L. Tailwater at Time of Inspection N.A. M.S.L.

Inspection Personnel:
(December 2, 1978)
R.C. Gaffin

(December 20, 1978)
R.J. Jenny

(December 20, 1978)
A.L. Slaughter

A.L. Slaughter

D.J. Lachel

P.L. Wagner

F.L. Panuzio

P. L. Wagner Recorder

Owner Representatives:
(December 2, 1978)
Anthony Seeman

(December 7, 1978)
Leo Calligaro

George Bednarz

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	Not Applicable	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Not Applicable	
DRAINS	Not Applicable	
WATER PASSAGES	Not Applicable	
FOUNDATION	Not Applicable	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Not Applicable	
STRUCTURAL CRACKING	Not Applicable	
VERTICAL AND HORIZONTAL ALIGNMENT	Not Applicable	
MONOLITH JOINTS	Not Applicable	
CONSTRUCTION JOINTS	Not Applicable	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete sill with wood flashboards 1-ft. height in place.	
APPROACH CHANNEL	Stone masonry wing walls.	
DISCHARGE CHANNEL	Steep-sided natural channel, heavily wooded. Drains to area behind rock outcrop at base of left abutment and thus is well separated from face of dam. Possible seepage noted just downstream of spillway weir.	Chain link fence immediately downstream of spillway could trap debris and impede flow through spillway.
BRIDGE AND PIERS	None	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed. Downstream face of dam is surfaced with 12-in. to 16-in. sub-rounded boulders. Generally even surface. Above bench the rock surfacing appears to be hand-placed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None.	A surface drain has been excavated at toe on right side of the embankment.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Apparent slide of downstream rock facing near right abutment; 20 ft. wide by 50 ft. downslope, where larger surface rocks have slid downslope. Small trees have grown in this area. Other slopes of facing material are fairly even except for minor swales.	Trees should be cut and rock facing replaced in denuded area.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No discernable misalignment.	
RIPRAP FAILURES	None. Upstream riprap appears to be in good condition above waterline.	

EMBANKMENT

VISUAL EXAMINATION OF VEGETATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	Small (2-in. dia.) birch trees at scattered locations on downstream embankment, but heavy growth along embankment bench.	Trees should be removed.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Lower left abutment is large outcrop of quartzite separating spillway channel from downstream face of dam.	
ANY NOTICEABLE SEEPAGE	Possible seepage at base of spillway.	
STAFF GAGE AND RECORDER	Staff gage and float gage in gate house with records at Little Falls pump station.	Continuous records kept by owner.
DAMS	None.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Steel outlet pipe coated with 3-inch concrete. No cracks or spalling observed.	
INTAKE STRUCTURE	6 sluice gates operated individually. Gates seldom operated. Pumped water flows through 48-in. steel pipe in right tunnel below gate house.	Owner is reluctant to change operation of sluice gates because of their age.
OUTLET STRUCTURE	Releases flow through 48-in. pipe in left tunnel below gate house. Tunnels are about 9 ft. diameter with concrete arches and masonry walls. Minor seepage through arch of outlet tunnel. Also minor seepage on outside wall of tunnel facing.	Valve controlling 48-inch outlet pipe should be regularly operated.
OUTLET CHANNEL	Not applicable	
EMERGENCY GATE	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not Applicable	
APPROACH CHANNEL	Not Applicable	
DISCHARGE CHANNEL	Not Applicable	
BRIDGE AND PIERS	Not Applicable	
GATES AND OPERATION EQUIPMENT	Not Applicable	

INSTRUMENTATION

VISUAL EXAMINATION MONUMENTATION/SURVEYS	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	Survey monuments reported but not observed.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	Continuous recording of water levels from float gage in gate house.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Vertical rock slopes on right side of reservoir. Moderate slopes, wooded parkland area on left. Some debris potential.	
SEDIMENTATION	Very clean (treated water).	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Generally wooded area. No well defined stream channel.	
SLOPES	Abutments at base of dam are hard, slabby, very steep sandstone. Below dam the slopes are moderate and not contained within a well defined valley.	
APPROXIMATE NO. OF HOMES AND POPULATION	Major highway about 1/3 mile downstream. Major population centers further downstream, portions of which would be within flood area.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	"Contour Plan of Dam Site for Great Notch Reservoir", April 1899, Scale: 1" = 20' (See Plate 2).
REGIONAL VICINITY MAP	U.S. Geological Survey topographic maps (See Plate 1).
CONSTRUCTION HISTORY	Some history available from correspondence on file with the State Dep, plus plans obtained from owner.
TYPICAL SECTIONS OF DAM	"Plan and Section of Gate House and Main Dam, Great Notch Reservoir", August 1899, Scale: 1/8" = 1'0" (See Plate 9). "Pipe Lines and Core Wall at Great Notch", 1901, Scales: 1" = 100' Horiz., 1" = 50' Vert. (See Plate 4).
HYDROLOGIC/HYDRAULIC DATA	Reservoir contours and elevation capacity chart on "Contour Map of Garrett Mountain Reservoir", December 1899, Scale: 1" = 100' (See Plate 4).
OUTLETS - PLAN - DETAILS -CONSTRAINTS -DISCHARGE RATINGS	"Details of Rack for Culvert, Great Notch Reservoir", June 1899, Scale: 3/4" = 1'0" (Trash rack at base of gate house) (See Plate 7). "Plan of Gate House and Location of Main and Drain Pipes, Great Notch Reservoir", May 1899, Scale: 1/4" = 1'0" (See Plate 5).
RAINFALL/RESERVOIR RECORDS	Continuous records of reservoir levels available from owner.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available. Depth to rock indicated on Plate 9.
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	No records available. Plans indicate some or all of borrow material was from reservoir excavation (See Plate 4).

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
SPILLWAY-PLAN -SECTIONS -DETAILS	"Plan of Proposed Construction of Flash Boards to Raise Elevation of Great Notch Reservoir from 427 ft. to 428.25 ft.", March 26, 1962, Scales: 3/8" = 1'0" and 1" = 1'0" (See Plate 8).
OPERATING EQUIPMENT PLANS & DETAILS	See Sheet 1, "Outlets".
MONITORING SYSTEMS	Have float gage and recorder. Reportedly have survey monuments on dam.
MODIFICATIONS	See remarks above on Spillway. Also have "Plan of Reinforcement 48" Steel Conduits in Pipe Tunnels below Dam, Great Notch Reservoir", March 1951.
HIGH POOL RECORDS	Records available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Limited data available in State files.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM

REMARKS

MAINTENANCE
OPERATION
RECORDS

None available

APPENDIX B
PHOTOGRAPHS



Photo 1 - Rock riprap extends to the crest of the embankment. (12-2-78)



Photo 2 - Hand-placed rock facing above the downstream embankment bench. (12-2-78)



Photo 3 - Dumped rock fill facing below the downstream embankment bench. (12-2-78)



Photo 4 - Rock facing denuded by a slide on lower right side of downstream embankment. (12-2-78)



Photo 5 - Heavy growth of trees along downstream embankment bench. (12-2-78)



Photo 6 - Rock ledge on lower left abutment separating dam embankment (left) from the spillway channel (to right of photo). (12-2-78)

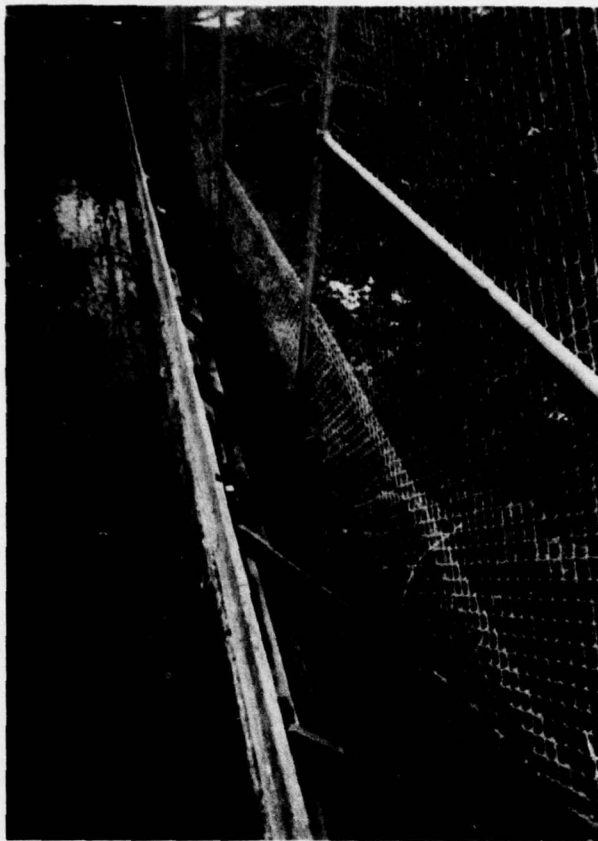


Photo 7 - Spillway
crest and installed
flashboards.
(12-2-78)



Photo 8 - Spillway, looking toward left abutment. Note
close proximity of downstream chain-link fence. (12-2-78)



Photo 9 - Inside of gate house, showing gate controls, staff gage and float gage. (12-2-78)



Photo 10 - Entrance of tunnels housing force main (left) and distribution main (right). (12-2-78)



Photo 11 - Right bank of reservoir looking northwest
from the dam. (12-2-78)



Photo 12 - Left bank of reservoir looking northeast
from the dam. (12-2-78)

APPENDIX C

REGIONAL GEOLOGY - PIEDMONT LOWLANDS

REGIONAL GEOLOGY - PIEDMONT LOWLANDS

Physiography

The Piedmont Lowlands Province of New Jersey lies northwest of a line approximately between Trenton and Perth Amboy and southeast of an approximate line between Milford on the Delaware River and Mahwah near the New York State border. Physiographically, the province is situated between the predominantly Precambrian age New Jersey Highlands Province to the northwest and the typically unconsolidated Cretaceous age and younger sediments of the Coastal Plain Province to the southeast. (See Figure C-1).

Bedrock

The Piedmont Lowlands, encompassing about one-fifth of the state, is characterized by northwestward dipping bedrock composed of interbedded red shales, siltstones and sandstones of Triassic and Jurassic age and igneous basalt extrusions (lava flows) and diabase intrusions of Jurassic age. The sedimentary rocks have been eroded to a broad southeastward sloping piedmont plain. The northwest border of the province is a northeast-southwest trending fault zone (Ramapo Fault) which truncates the sedimentary beds. Total vertical displacement on the fault may reach 10,000 feet.

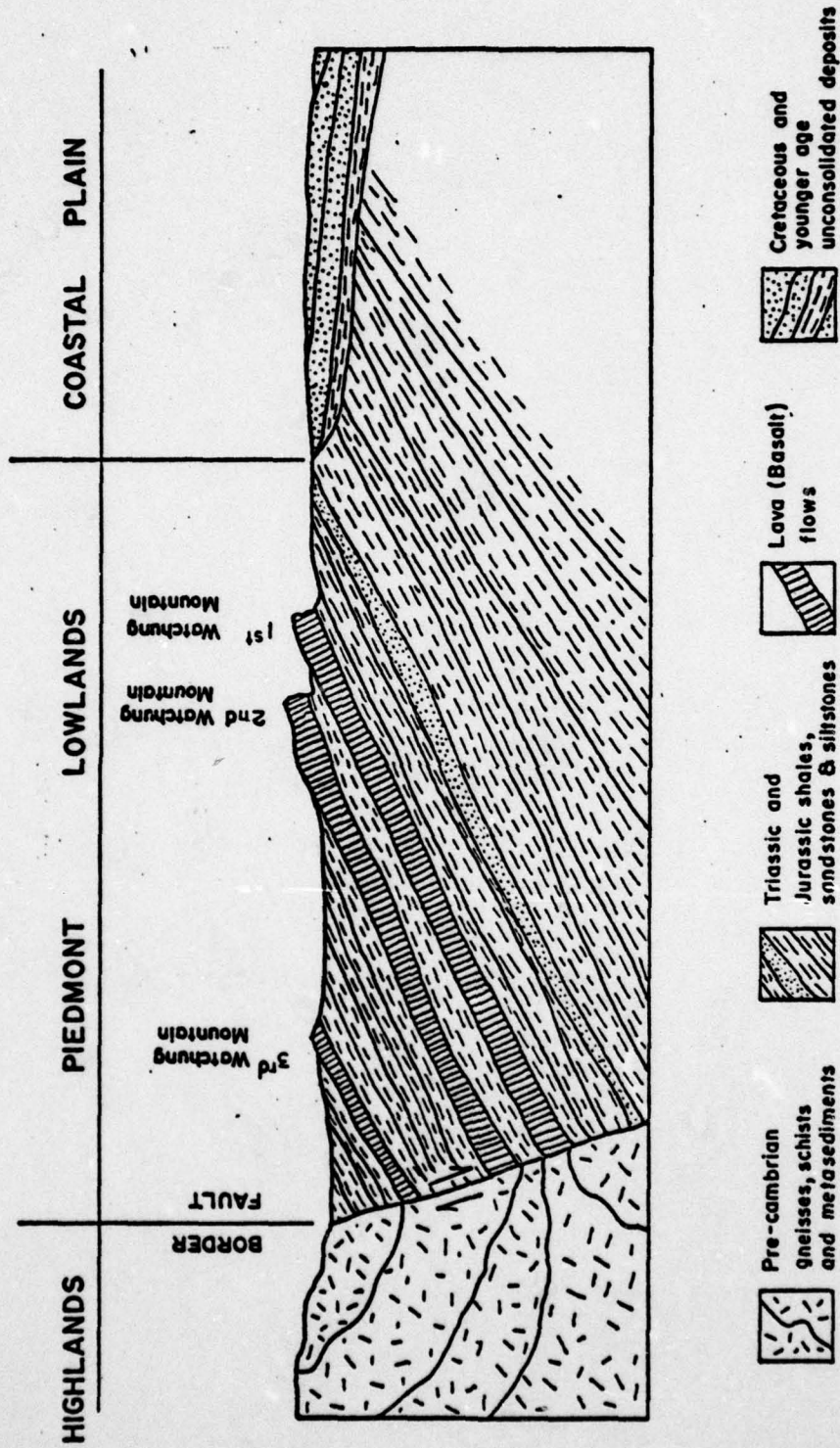
The gently rolling lowland topography of the piedmont lowlands is pierced by long asymmetric ridges of hard

and resistant igneous rocks which were intruded into or on top of the sedimentary sequences. With the subsequent erosion of the softer sedimentary rocks, these igneous formations have been left standing, often in bold relief, up to 400 ft. above the surrounding plains. The igneous bodies composed of diabase and basalt form the Palisades along the Hudson River and the three Watchung Mountain ridges of the central Piedmont. The ridges are all steeper on the southeast with gentle dip slopes to the northwest.

Overburden

The Pleistocene Age Wisconsin continental glacier has smoothed and filled approximately the northern half of the province. The terminal moraine of the glacier extends from Perth Amboy to Summit then northward to Morris Plains. North of the morainal line the soils characteristically consist of glacial tills overlying the bedrock with scattered overlying stratified outwash deposits. At least three large glacial lakes occupied portions of the area north of the moraine at different periods, resulting in a relatively flat topography composed predominantly of silts and clays.

South of the terminal moraine, most of the overburden consists of alluvial deposits overlying a more highly developed weathered transition zone on top of the bedrock. Some highly weathered tills of pre-Wisconsin glaciation can be found on the top of intervalley ridges. Much of the alluvium is glacial outwash.



SCHEMATIC CROSS-SECTION OF
NEW JERSEY PIEDMONT LOWLANDS
PHYSIOGRAPHIC PROVINCE

JENNY / LEEDSHILL
JANUARY 1979

FIGURE C-1

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.3 SQ. MI.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 428.25 Ft WITH FLASHBOARDS (SBOAF)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N/A

ELEVATION MAXIMUM DESIGN POOL: 428.25 Ft

ELEVATION TOP DAM: 430 Ft

CREST: SPILLWAY

- a. Elevation 428.25 ET (WITH FLASHBOARDS)
- b. Type SILLER CRESTED
- c. Width —
- d. Length 50'
- e. Location Spillover LEFT ABUTMENT (LOOKING DOWNSTREAM)
- f. Number and Type of Gates 1.25' FLASHBOARDS / CREST ELEV. 428.25

OUTLET WORKS: —

- a. Type 1-36" C.I. BLOW-OFF AND 1-48" FORCE MAIN
- b. Location —
- c. Entrance inverts —
- d. Exit inverts —
- e. Emergency draindown facilities —

HYDROMETEOROLOGICAL GAGES: NONE

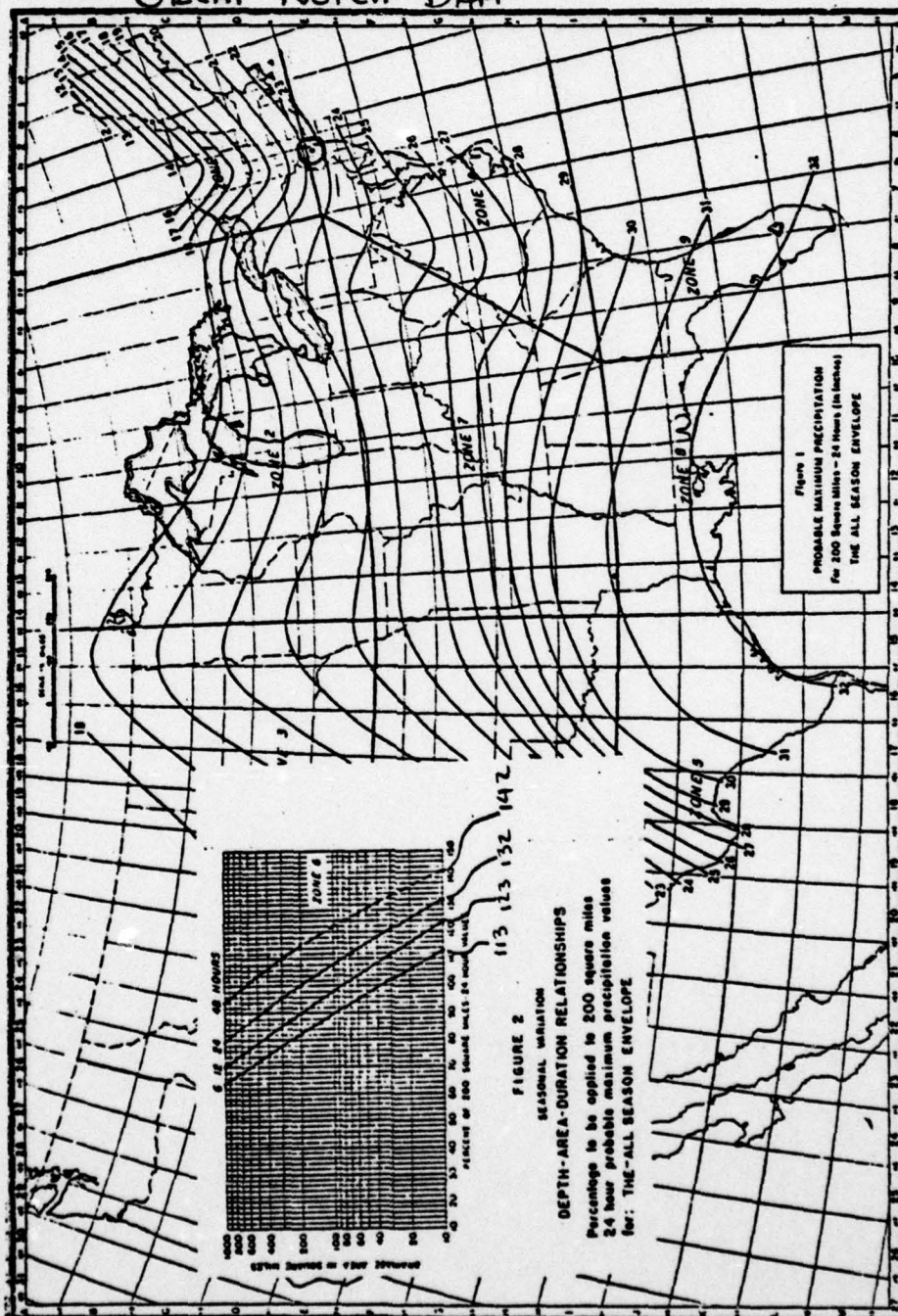
- a. Type —
- b. Location —
- c. Records —

MAXIMUM NON-DAMAGING DISCHARGE: 335 CFS WITH FLASHBOARDS

790118

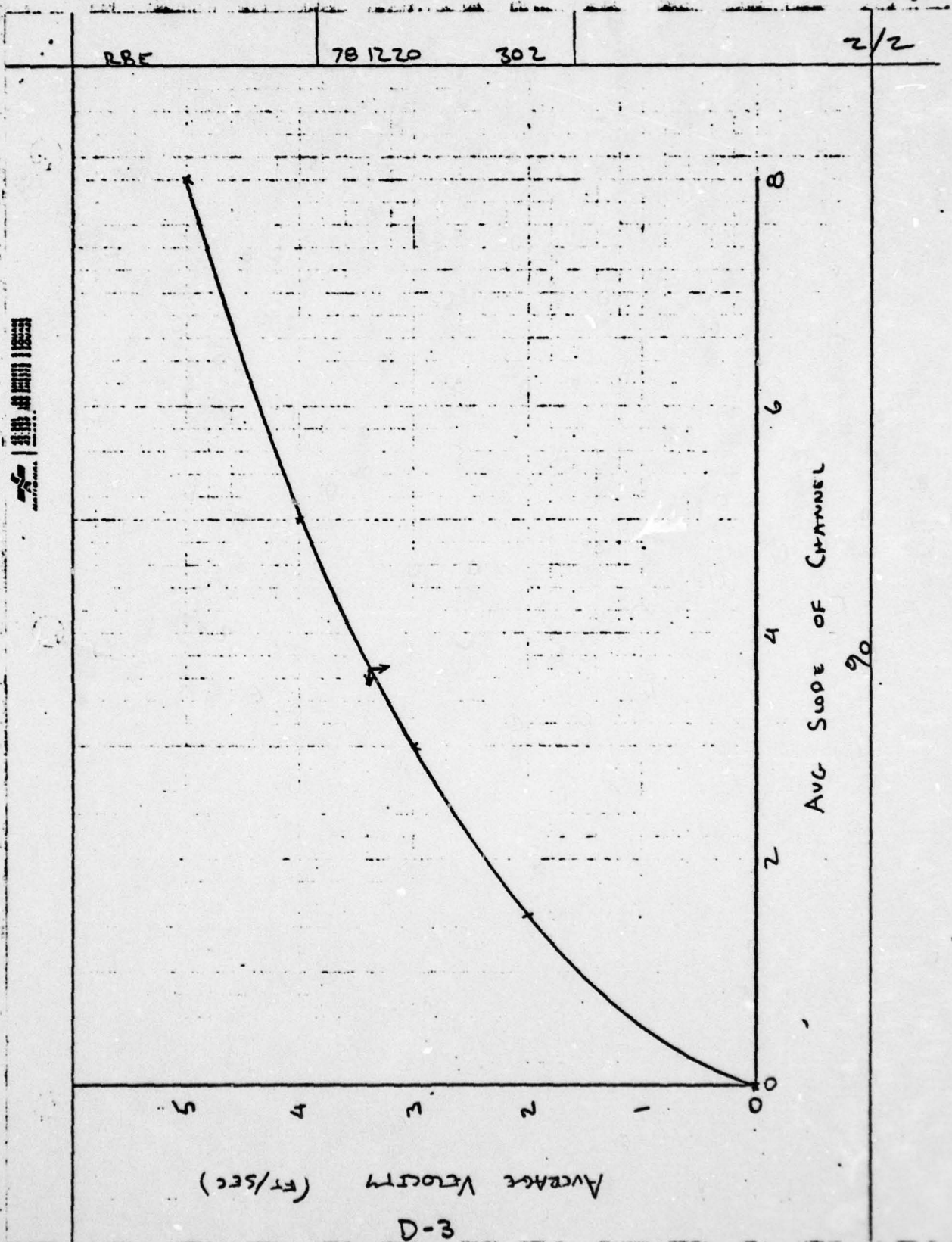
302-07

GREAT NOTCH DAM



BY PBE DATE 7/22/20 CLIENT N.J.SHEET NO. 1 OF 2CHKD _____ DATE _____ JOB TIME OF CONCENTRATIONJOB NO. 302

1	2	3	4	5	6	7	8	9
1	DATA	GREAT NOTCH						
2		L = STREAM LENGTH FROM WATERSHED						
3		OUTLET TO THE MOST DISTANT RIDGE						
4								
5		L _{CA} = STREAM LENGTH FROM BASIN CENTROID						
6								
7		H = DIFF BETWEEN ELEV AT OUTLET AND						
8		ELEV AT MOST DISTANT POINT						
9								
10		T _C = TIME OF CONCENTRATION OR TIME FOR						
11		WATER TO FLOW FROM THE MOST DISTANT						
12		POINT IN THE WATERSHED TO THE WATERSHED						
13		OUTLET						
14								
15		T _L = LAG TIME FROM CENTER OF EXCESS						
16		RAINFALL TO TIME OF PEAK						
17								
18	METHOD 1	T _C = $\frac{L^{1.15}}{7700 H^{0.38}}$						
19								
20								
21		T _L = $\frac{0.6 L^{1.15}}{7700 H^{0.38}}$						
22								
23								
24								
25	METHOD 2	T _C = $\left(\frac{11.913}{H}\right)^{0.385}$						
26								
27								
28		T _L = $0.6 \left(\frac{11.913}{H}\right)^{0.385}$						
29								
30								
31								
32	METHOD 3	T _C = C _T $\left(\frac{L L_c}{S^{1/2}}\right)^{0.38}$						
33								
34								
35		T _C = C _T $\left(\frac{L L_c}{(H/L)^{1/2}}\right)^{0.38}$						
36								
37								
38								
39								
40	METHOD 4	T _C = L / V						
41								
42		T _L = 0.6 L / V						
43								
44								
45	Dam							
46								
47								
48								
49								
50								



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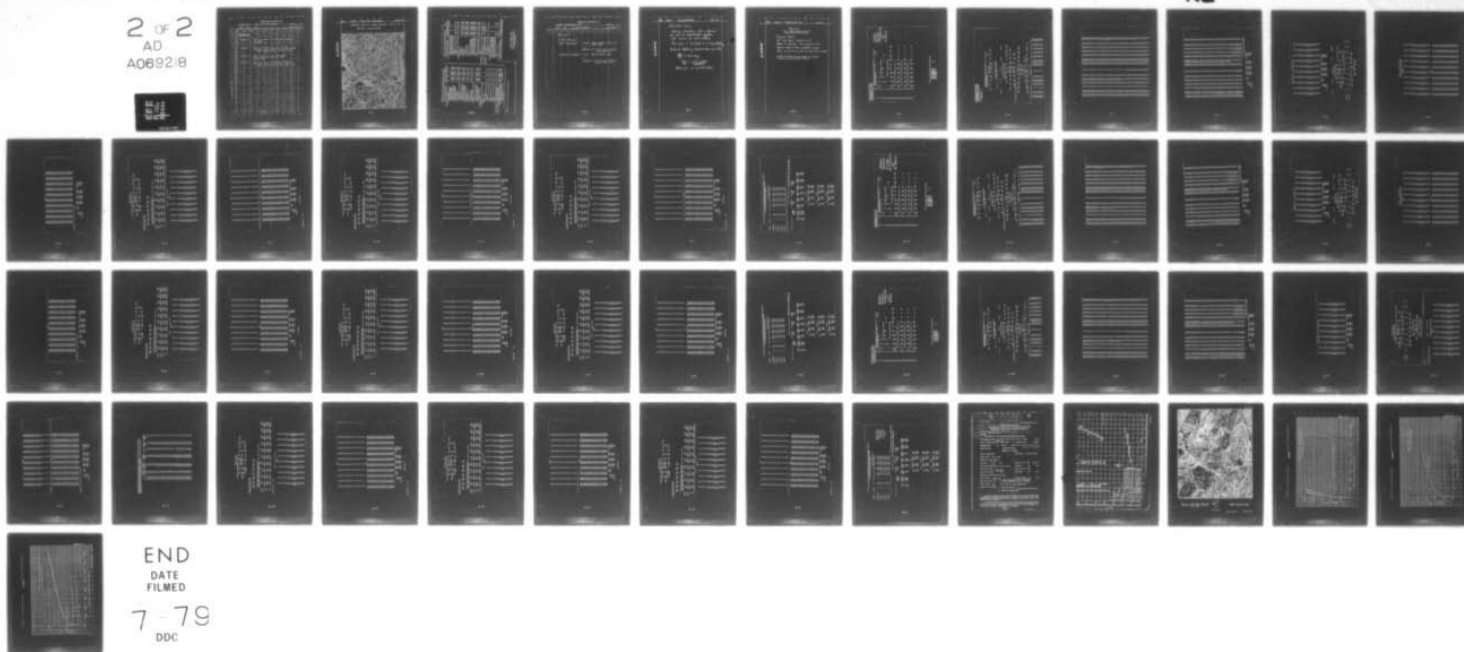
NEW JERSEY STATE DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/6 13/2
NATIONAL DAM SAFETY PROGRAM. GREAT NOTCH RESERVOIR (NJ 00244). --ETC(U)
APR 79 R J JENNY

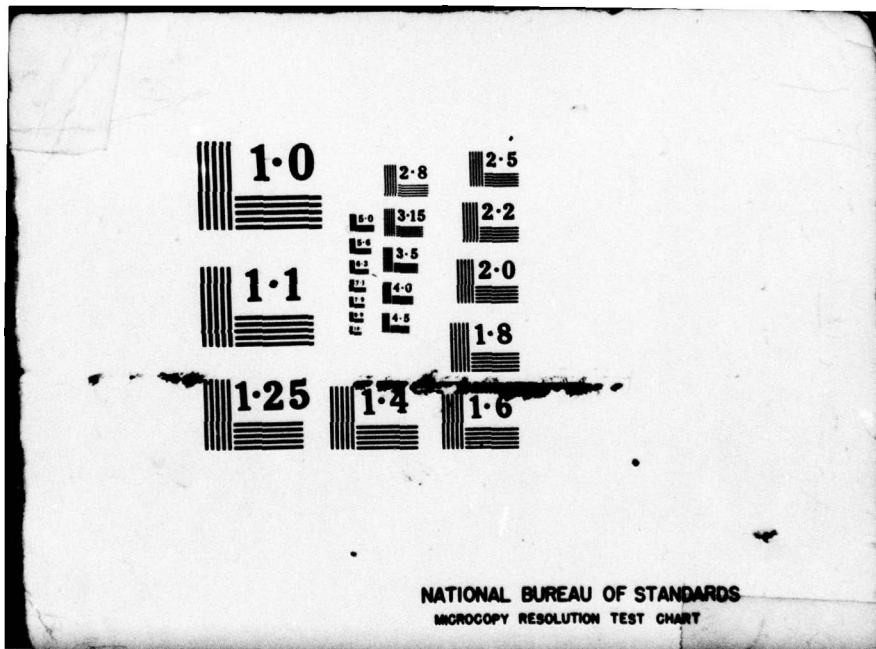
DACW61-78-C-0124

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UNCLASSIFIED

2 OF 2
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LEEDS, HILL AND JEWETT, INC.

BY RBE DATE CLIENT N.J. DAM SAFETY

SHEET NO. OF

CHKD DATE JOB

JOB NO. 302-03

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REFERENCES

METHOD 1 - FROM "HANDBOOK OF APPLIED HYDROLOGY"
BY CHOW
MCGRAW HILL PP 21-10, 11

METHOD 2 - FROM CALIFORNIA CULVERTS PRACTICE, CALIF
HIGHWAYS AND PUBLIC WORKS, SEPT 1942
SEE USBR DESIGN OF SMALL DAMS
PG. 71

METHOD 3 - FROM HYDROLOGY FOR ENGINEERS
LINSLEY/KOHLER/PAULIUS 1975
PP 247-248

METHOD 4 - FROM U.S. NAVY - TECHNICAL PUBLICATION
NAVDOKS TP-PW-5 TABLE 8B, MARCH 1953
SEE USBR DESIGN OF SMALL DAMS PG. 70

RBE

796707

GREAT NOTCH RESERVOIR

307-03

LOCATION MAP OF CROSS-SECTIONS USED IN
ROUTING CALCULATIONS



D-5

TABLE 5-4. VALUES OF THE RESISTANCE COEFFICIENT n (continued)

Type of channel and description	Minimum	Normal	Maximum
C. Excavated or Ditches			
a. Earth, straight and uniform			
1. Clean, recently completed	0.016	0.018	0.020
2. Clean, after weathering	0.018	0.022	0.025
3. Gravel, uniform section, clean	0.022	0.025	0.030
4. With short grass, few weeds	0.022	0.027	0.033
b. Earth, winding and sluggish			
1. No vegetation	0.023	0.025	0.030
2. Grass, some weeds	0.025	0.030	0.033
3. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. Earth bottom and rubble sides	0.028	0.030	0.035
5. Stony bottom and weedy banks	0.025	0.035	0.040
6. Cobble bottom and clean sides	0.030	0.040	0.050
a. Dragline-excavated or dredged			
1. No vegetation	0.025	0.028	0.033
2. Light brush on banks	0.035	0.050	0.060
d. Rock cuts			
1. Smooth and uniform	0.025	0.035	0.040
2. Jagged and irregular	0.035	0.040	0.050
c. Channels not maintained, weeds and brush uncut			
1. Dense weeds, high as flow depth	0.050	0.080	0.120
2. Clean bottom, brush on sides	0.040	0.050	0.080
3. Same, highest stage of flow	0.045	0.070	0.110
4. Dense brush, high stage	0.080	0.100	0.140
D. NATURAL STREAMS			
D-1. Minor streams (top width at flood stage <100 ft)			
a. Streams on plain			
1. Clean, straight, full stage, no rills or deep pools	0.025	0.030	0.033
2. Same as above, but more stones and weeds	0.030	0.035	0.040
3. Clean, winding, some pools and shoals	0.033	0.040	0.048
4. Same as above, but some weeds and stones	0.035	0.045	0.050
5. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
6. Same as 4, but more stones	0.045	0.050	0.060
7. Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
8. Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150

MAIN CHANNEL

STATION 3 & 4

→

FOR STATION 5 $n = 0.05$ (MAIN CHANNEL)

TABLE 5-4. VALUES OF THE RESISTANCE COEFFICIENT n (continued)

Type of channel and description	Minimum	Normal	Maximum
b. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages			
1. Bottom: gravel, cobbles, and few boulders	0.030	0.040	0.060
2. Bottom: cobbles with large boulders	0.040	0.060	0.070
D-2. Flood plains			
a. Pasture, no brush	0.025	0.030	0.035
1. Short grass	0.030	0.035	0.050
2. High grass	0.030	0.030	0.040
b. Cultivated areas			
1. No crop	0.025	0.035	0.045
2. Mature row crops	0.030	0.040	0.050
3. Mature field crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. Dense willows, summer, straight	0.110	0.150	0.200
2. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050
3. Same as above, but with heavy growth of sprouts	0.050	0.060	0.080
4. Heavy stand of timber, a few down trees, little undergrowth, flood stage below branches	0.080	0.100	0.120
5. Same as above, but with flood stage reaching branches	0.100	0.120	0.160
D-3. Major streams (top width at flood stage >100 ft). The n value is less than that for minor streams of similar description, because banks offer less effective resistance.			
a. Regular section with no boulders or brush	0.025		0.060
b. Irregular and rough section	0.035		0.100

OVERBANK

STATION 3, 4 & 5

→

OPEN-CHANNEL HYDRAULICS

VEN TE CHOW, Ph.D.
Professor of Hydraulic Engineering
University of Illinois

LEEDS, HILL AND JEWETT, INC.

BY RBE DATE 7/9/107 CLIENT N.J.

SHEET NO. OF

CHKD DATE JOB GREAT NOTCH

JOB NO. 302-07

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$$Q = CLH^{1.5}$$

C FOR SPILLWAY

WITH FLASHBOARDS

$$C = 3.3$$

SHARP CRESTED WEIR AND
FROM DATA



REDUCED TO $C = 2.9$ DUE TO FENCE
ACROSS SPILLWAY

WITHOUT FLASHBOARDS

$$C = 3.1$$

BROAD CRESTED WEIR



REDUCED TO $C = 2.6$ DUE TO FENCE
ACROSS SPILLWAY

D-6

The Mill

Great Notch.

302-03

Drawdown time:

Average drawdown rate = Average
use out of distribution system
(No means to waste water)

This rate is 2.5 MGD $\approx$ 7.7 acre-feet/day

Storage at Spillway Crest $\approx$ 580 acre-feet

$$\frac{580}{7.7} = 75.3 \text{ days}$$

$$\frac{75.3}{30} = \underline{\underline{2.5 \text{ months}}}$$

Assumes no runoff inflow

Thu 790214

Great Notch Dam

302-03

Assumed
Dam Breach Parameters^{1/}

Triangular Breach

60° side slopes (0.58 h : 1 v)

Breach to elevation 370' (reservoir floor)

Breach begins when overtopping begins

Time to develop maximum breach ≈ 1.0 hrs.

^{1/} Assumed parameters are based on previous studies of actual dam failures

 FLOOD HYDROGRAPH PACKAGE (HYC-1)
 SAN SAFETY VERSION JULY 1979
 LAST MODIFICATION 25 SEP 79

RUN DATE 01/06/79
 TIME 09:17:30.

NEW JERSEY SAN SAFETY - GREAT MICHAM RESERVOIR DAM I.D. NO. C0244
 HYDRAULIC-HYDROLOGIC ANALYSIS 102-03
 PROBABLE MAXIMUM FLOOD

-00E-

JOB SPECIFICATION									
NO	MIN	MIN	DAY	IM	MIN	MEIC	IPAT	IPPT	NETAN
100	0	5	0	0	0	0	0	0	0
			JOP1	MUT	LOOT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSIS TO BE PERFORMED

RTIME- .25 .50 .75 1.00
 MPALAN- 1 MILLION- 1 LATION- 1

 SUB-AREA RUNOFF COMPUTATION
 INFLOW HYDROGRAPH TO RESERVOIR

ISTAQ	ICOMP	ITECH	ITAPE	IPAT	IPAT	IMAGE	ISTAGE	ISAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INWQ	INWQ	INWQ	INWQ	INWQ	INWQ	INWQ	INWQ	INWQ	INWQ
1	1	1	1	1	1	1	1	1	1

LOSS DATA
 LOSS DATA
 LOSS DATA

LOSS	LOSS	LOSS	LOSS	LOSS	LOSS	LOSS	LOSS	LOSS	LOSS
1	1	1	1	1	1	1	1	1	1

UNIT HYDROGRAPH DATA

UNIT	UNIT	UNIT	UNIT	UNIT	UNIT	UNIT	UNIT	UNIT	UNIT
1	1	1	1	1	1	1	1	1	1

RECESSION DATA

RECESSION	RECESSION	RECESSION	RECESSION	RECESSION	RECESSION	RECESSION	RECESSION	RECESSION	RECESSION
1	1	1	1	1	1	1	1	1	1

UNIT HYDROGRAPH 14 END OF PERIOD ORIGINATES, TC- 6.00 HOURS, LAB- .20 HRS- 1.00 10.

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END-OF-PERIOD FLOW

END-OF-PERIOD	END-OF-PERIOD	END-OF-PERIOD	END-OF-PERIOD	END-OF-PERIOD	END-OF-PERIOD	END-OF-PERIOD	END-OF-PERIOD	END-OF-PERIOD	END-OF-PERIOD
1	1	1	1	1	1	1	1	1	1

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DATE	TIME	6-HOUR	24-HOUR	72-HOUR	TOTAL	WOLFE
1.23	47	46	46	1.31	1.43	237
1.24	48	46	46	1.31	1.50	238
1.25	49	46	46	1.31	1.55	239
1.26	50	46	46	1.31	2.00	240
1.27	51	46	46	1.31	2.05	241
1.28	52	46	46	1.31	2.10	242
1.29	53	46	46	1.31	2.15	243
1.30	54	46	46	1.31	2.20	244
1.31	55	46	46	1.31	2.25	245
1.32	56	46	46	1.31	2.30	246
1.33	57	46	46	1.31	2.35	247
1.34	58	46	46	1.31	2.40	248
1.35	59	46	46	1.31	2.45	249
1.36	60	46	46	1.31	2.50	250
1.37	61	46	46	1.31	2.55	251
1.38	62	46	46	1.31	2.55	252
1.39	63	46	46	1.31	2.55	253
1.40	64	46	46	1.31	2.55	254
1.41	65	46	46	1.31	2.55	255
1.42	66	46	46	1.31	2.55	256
1.43	67	46	46	1.31	2.55	257
1.44	68	46	46	1.31	2.55	258
1.45	69	46	46	1.31	2.55	259
1.46	70	46	46	1.31	2.55	260
1.47	71	46	46	1.31	2.55	261
1.48	72	46	46	1.31	2.55	262
1.49	73	46	46	1.31	2.55	263
1.50	74	46	46	1.31	2.55	264
1.51	75	46	46	1.31	2.55	265
1.52	76	46	46	1.31	2.55	266
1.53	77	46	46	1.31	2.55	267
1.54	78	46	46	1.31	2.55	268
1.55	79	46	46	1.31	2.55	269
1.56	80	46	46	1.31	2.55	270
1.57	81	46	46	1.31	2.55	271
1.58	82	46	46	1.31	2.55	272
1.59	83	46	46	1.31	2.55	273
1.60	84	46	46	1.31	2.55	274
1.61	85	46	46	1.31	2.55	275
1.62	86	46	46	1.31	2.55	276
1.63	87	46	46	1.31	2.55	277
1.64	88	46	46	1.31	2.55	278
1.65	89	46	46	1.31	2.55	279
1.66	90	46	46	1.31	2.55	280
1.67	91	46	46	1.31	2.55	281
1.68	92	46	46	1.31	2.55	282
1.69	93	46	46	1.31	2.55	283
1.70	94	46	46	1.31	2.55	284
1.71	95	46	46	1.31	2.55	285
1.72	96	46	46	1.31	2.55	286
1.73	97	46	46	1.31	2.55	287
1.74	98	46	46	1.31	2.55	288
1.75	99	46	46	1.31	2.55	289
1.76	100	46	46	1.31	2.55	290
1.77	101	46	46	1.31	2.55	291
1.78	102	46	46	1.31	2.55	292
1.79	103	46	46	1.31	2.55	293
1.80	104	46	46	1.31	2.55	294
1.81	105	46	46	1.31	2.55	295
1.82	106	46	46	1.31	2.55	296
1.83	107	46	46	1.31	2.55	297
1.84	108	46	46	1.31	2.55	298
1.85	109	46	46	1.31	2.55	299
1.86	110	46	46	1.31	2.55	300
1.87	111	46	46	1.31	2.55	301
1.88	112	46	46	1.31	2.55	302
1.89	113	46	46	1.31	2.55	303
1.90	114	46	46	1.31	2.55	304
1.91	115	46	46	1.31	2.55	305
1.92	116	46	46	1.31	2.55	306
1.93	117	46	46	1.31	2.55	307
1.94	118	46	46	1.31	2.55	308
1.95	119	46	46	1.31	2.55	309
1.96	120	46	46	1.31	2.55	310
1.97	121	46	46	1.31	2.55	311
1.98	122	46	46	1.31	2.55	312
1.99	123	46	46	1.31	2.55	313
2.00	124	46	46	1.31	2.55	314
2.01	125	46	46	1.31	2.55	315
2.02	126	46	46	1.31	2.55	316
2.03	127	46	46	1.31	2.55	317
2.04	128	46	46	1.31	2.55	318
2.05	129	46	46	1.31	2.55	319
2.06	130	46	46	1.31	2.55	320
2.07	131	46	46	1.31	2.55	321
2.08	132	46	46	1.31	2.55	322
2.09	133	46	46	1.31	2.55	323
2.10	134	46	46	1.31	2.55	324
2.11	135	46	46	1.31	2.55	325
2.12	136	46	46	1.31	2.55	326
2.13	137	46	46	1.31	2.55	327
2.14	138	46	46	1.31	2.55	328
2.15	139	46	46	1.31	2.55	329
2.16	140	46	46	1.31	2.55	330
2.17	141	46	46	1.31	2.55	331
2.18	142	46	46	1.31	2.55	332
2.19	143	46	46	1.31	2.55	333
2.20	144	46	46	1.31	2.55	334
2.21	145	46	46	1.31	2.55	335
2.22	146	46	46	1.31	2.55	336
2.23	147	46	46	1.31	2.55	337
2.24	148	46	46	1.31	2.55	338
2.25	149	46	46	1.31	2.55	339
2.26	150	46	46	1.31	2.55	340
2.27	151	46	46	1.31	2.55	341
2.28	152	46	46	1.31	2.55	342
2.29	153	46	46	1.31	2.55	343
2.30	154	46	46	1.31	2.55	344
2.31	155	46	46	1.31	2.55	345
2.32	156	46	46	1.31	2.55	346
2.33	157	46	46	1.31	2.55	347
2.34	158	46	46	1.31	2.55	348
2.35	159	46	46	1.31	2.55	349
2.36	160	46	46	1.31	2.55	350
2.37	161	46	46	1.31	2.55	351
2.38	162	46	46	1.31	2.55	352
2.39	163	46	46	1.31	2.55	353
2.40	164	46	46	1.31	2.55	354
2.41	165	46	46	1.31	2.55	355
2.42	166	46	46	1.31	2.55	356
2.43	167	46	46	1.31	2.55	357
2.44	168	46	46	1.31	2.55	358
2.45	169	46	46	1.31	2.55	359
2.46	170	46	46	1.31	2.55	360
2.47	171	46	46	1.31	2.55	361
2.48	172	46	46	1.31	2.55	362
2.49	173	46	46	1.31	2.55	363
2.50	174	46	46	1.31	2.55	364
2.51	175	46	46	1.31	2.55	365
2.52	176	46	46	1.31	2.55	366
2.53	177	46	46	1.31	2.55	367
2.54	178	46	46	1.31	2.55	368
2.55	179	46	46	1.31	2.55	369
2.56	180	46	46	1.31	2.55	370
2.57	181	46	46	1.31	2.55	371
2.58	182	46	46	1.31	2.55	372
2.59	183	46	46	1.31	2.55	373
2.60	184	46	46	1.31	2.55	374
2.61	185	46	46	1.31	2.55	375
2.62	186	46	46	1.31	2.55	376
2.63	187	46	46	1.31	2.55	377
2.64	188	46	46	1.31	2.55	378
2.65	189	46	46	1.31	2.55	379
2.66	190	46	46	1.31	2.55	380
2.67	191	46	46	1.31	2.55	381
2.68	192	46	46	1.31	2.55	382
2.69	193	46	46	1.31	2.55	383
2.70	194	46	46	1.31	2.55	384
2.71	195	46	46	1.31	2.55	385
2.72	196	46	46	1.31	2.55	386
2.73	197	46	46	1.31	2.55	387
2.74	198	46	46	1.31	2.55	388
2.75	199	46	46	1.31	2.55	389
2.76	200	46	46	1.31	2.55	390
2.77	201	46	46	1.31	2.55	391
2.78	202	46	46	1.31	2.55	392
2.79	203	46	46	1.31	2.55	393
2.80	204	46	46	1.31	2.55	394
2.81	205	46	46	1.31	2.55	395
2.82	206	46	46	1.31	2.55	396
2.83	207	46	46	1.31	2.55	397
2.84	208	46	46	1.31	2.55	398
2.85	209	46	46	1.31	2.55	399
2.86	210	46	46	1.31	2.55	400
2.87	211	46	46	1.31	2.55	401
2.88	212	46	46	1.31	2.55	402
2.89	213	46	46	1.31	2.55	403
2.90	214	46	46	1.31	2.55	404
2.91	215	46	46	1.31	2.55	405
2.92	216	46	46	1.31	2.55	406
2.93	217	46	46	1.31	2.55	407
2.94	218	46	46	1.31	2.55	408
2.95	219	46	46	1.31	2.55	409
2.96	220	46	46	1.31	2.55	410
2.97	221	46	46	1.31	2.55	411
2.98	222	46	46	1.31	2.55	412
2.99	223	46	46	1.31	2.55	413
3.00	224	46	46	1.31	2.55	414
3.01	225	46	46	1.31	2.55	415
3.02	226	46	46	1.31	2.55	416
3.03	227	46	46	1.31	2.55	417
3.04	228	46	46	1.31	2.55	418
3.05	229	46	46	1.31	2.55	419
3.06	230	46	46	1.31	2.55	420
3.07	231	46	46	1.31	2.55	421
3.08	232	46	46	1.31	2.55	422
3.09	233	46	46	1.31	2.55	423
3.10	234	46	46	1.31	2.55	424
3.11	235	46	46	1.31	2.55	425
3.12	236	46	46	1.31	2.55	426
3.13	237	46	46	1.31	2.55	427
3.14	238	46	46	1.31	2.55	428
3.15	239	46	46	1.31	2.55	429
3.16	240	46	46	1.31	2.55	430
3.17	241	46	46	1.31	2.55	431
3.18	242	46	46	1.31	2.55	432
3.19	243	46	46	1.31	2.55	433
3.20	244	46	46	1.31	2.55	434
3.21	245	46	46	1.31	2.55	435
3.22	246	46	46	1.31	2.55	436
3.23	247	46	46	1.31	2.55	437
3.24	248	46	46	1.31	2.55	438
3.25	249	46	46	1.31	2.55	439</

D-13

[illegible]

[illegible][illegible]

MY00069AP-4 ROUTING

CHANNEL CONTINUED - MODIFIED PULS- STATION 2 TO 3

	TSTAD	ICOMP	SECON	TRAPE	JPLT	JPRAT	IMAGE	ESTAGE	ZAUTR
.0055	CLOSIS	A6C	INCS	ISSAME	IOPF	IPRP			
.049	G.WCC	O.OO		1					
	MSPTE	HSTOL	LAS	ANSLK	X	TKL	STORA	ISPRTV	
	BLOCKSCN	N	O	-1.00	E-000		C.		

WATER DEPTH CHANNEL ROUTING

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Avg
1971	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1972	25	26	27	28	29	30	31	32	33	34	35	36	37	38
1973	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1974	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1975	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1976	81	82	83	84	85	86	87	88	89	90	91	92	93	94
1977	95	96	97	98	99	100	101	102	103	104	105	106	107	108
1978	109	110	111	112	113	114	115	116	117	118	119	120	121	122
1979	123	124	125	126	127	128	129	130	131	132	133	134	135	136
1980	137	138	139	140	141	142	143	144	145	146	147	148	149	150
1981	151	152	153	154	155	156	157	158	159	160	161	162	163	164
1982	165	166	167	168	169	170	171	172	173	174	175	176	177	178
1983	179	180	181	182	183	184	185	186	187	188	189	190	191	192
1984	193	194	195	196	197	198	199	200	201	202	203	204	205	206
1985	207	208	209	210	211	212	213	214	215	216	217	218	219	220
1986	221	222	223	224	225	226	227	228	229	230	231	232	233	234
1987	235	236	237	238	239	240	241	242	243	244	245	246	247	248
1988	249	250	251	252	253	254	255	256	257	258	259	260	261	262
1989	263	264	265	266	267	268	269	270	271	272	273	274	275	276
1990	277	278	279	280	281	282	283	284	285	286	287	288	289	290
1991	291	292	293	294	295	296	297	298	299	300	301	302	303	304
1992	305	306	307	308	309	310	311	312	313	314	315	316	317	318
1993	319	320	321	322	323	324	325	326	327	328	329	330	331	332
1994	333	334	335	336	337	338	339	340	341	342	343	344	345	346
1995	347	348	349	350	351	352	353	354	355	356	357	358	359	360
1996	361	362	363	364	365	366	367	368	369	370	371	372	373	374
1997	375	376	377	378	379	380	381	382	383	384	385	386	387	388
1998	389	390	391	392	393	394	395	396	397	398	399	400	401	402
1999	403	404	405	406	407									

[illegible]

STAGE	6.00	11.00	16.00	21.00	26.00	31.00	36.00	41.00	46.00	51.00	56.00	61.00	66.00	71.00	76.00	81.00	86.00	91.00	96.00	101.00	106.00	111.00	116.00	121.00	126.00	131.00	136.00	141.00	146.00	151.00	156.00	161.00	166.00	171.00	176.00	181.00	186.00	191.00	196.00	201.00	206.00	211.00	216.00	221.00	226.00	231.00	236.00	241.00	246.00	251.00	256.00	261.00	266.00	271.00	276.00	281.00	286.00	291.00	296.00	301.00	306.00	311.00	316.00	321.00	326.00	331.00	336.00	341.00	346.00	351.00	356.00	361.00	366.00	371.00	376.00	381.00	386.00	391.00	396.00	401.00	406.00	411.00	416.00	421.00	426.00	431.00	436.00	441.00	446.00	451.00	456.00	461.00	466.00	471.00	476.00	481.00	486.00	491.00	496.00	501.00	506.00	511.00	516.00	521.00	526.00	531.00	536.00	541.00	546.00	551.00	556.00	561.00	566.00	571.00	576.00	581.00	586.00	591.00	596.00	601.00	606.00	611.00	616.00	621.00	626.00	631.00	636.00	641.00	646.00	651.00	656.00	661.00	666.00	671.00	676.00	681.00	686.00	691.00	696.00	701.00	706.00	711.00	716.00	721.00	726.00	731.00	736.00	741.00	746.00	751.00	756.00	761.00	766.00	771.00	776.00	781.00	786.00	791.00	796.00	801.00	806.00	811.00	816.00	821.00	826.00	831.00	836.00	841.00	846.00	851.00	856.00	861.00	866.00	871.00	876.00	881.00	886.00	891.00	896.00	901.00	906.00	911.00	916.00	921.00	926.00	931.00	936.00	941.00	946.00	951.00	956.00	961.00	966.00	971.00	976.00	981.00	986.00	991.00	996.00	1001.00	1006.00	1011.00	1016.00	1021.00	1026.00	1031.00	1036.00	1041.00	1046.00	1051.00	1056.00	1061.00	1066.00	1071.00	1076.00	1081.00	1086.00	1091.00	1096.00	1101.00	1106.00	1111.00	1116.00	1121.00	1126.00	1131.00	1136.00	1141.00	1146.00	1151.00	1156.00	1161.00	1166.00	1171.00	1176.00	1181.00	1186.00	1191.00	1196.00	1201.00	1206.00	1211.00	1216.00	1221.00	1226.00	1231.00	1236.00	1241.00	1246.00	1251.00	1256.00	1261.00	1266.00	1271.00	1276.00	1281.00	1286.00	1291.00	1296.00	1301.00	1306.00	1311.00	1316.00	1321.00	1326.00	1331.00	1336.00	1341.00	1346.00	1351.00	1356.00	1361.00	1366.00	1371.00	1376.00	1381.00	1386.00	1391.00	1396.00	1401.00	1406.00	1411.00	1416.00	1421.00	1426.00	1431.00	1436.00	1441.00	1446.00	1451.00	1456.00	1461.00	1466.00	1471.00	1476.00	1481.00	1486.00	1491.00	1496.00	1501.00	1506.00	1511.00	1516.00	1521.00	1526.00	1531.00	1536.00	1541.00	1546.00	1551.00	1556.00	1561.00	1566.00	1571.00	1576.00	1581.00	1586.00	1591.00	1596.00	1601.00	1606.00	1611.00	1616.00	1621.00	1626.00	1631.00	1636.00	1641.00	1646.00	1651.00	1656.00	1661.00	1666.00	1671.00	1676.00	1681.00	1686.00	1691.00	1696.00	1701.00	1706.00	1711.00	1716.00	1721.00	1726.00	1731.00	1736.00	1741.00	1746.00	1751.00	1756.00	1761.00	1766.00	1771.00	1776.00	1781.00	1786.00	1791.00
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STATION 3. PLAIN 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 8

[illegible]

31 DAYS 101.2

• IDENTIFICATION •

	PLAN	4-MON	24-MON	72-MON	TOTAL
CE 1	57.	17.	17.	166.	560.
CE 2	152.	58.	179.	106.	596.
CE 3	63.	17.	5.	5.	142.
CE 4	182.	17.27	21.02	21.60	23.69
CE 5	467.74	59.02	59.02	59.02	59.92
AC-PT	276.	361.	361.	367.	367.
THOUS. \$	331.	423.	423.	423.	410.

[illegible]

[illegible]

MAXIMUM STORAGE • 7.

MAXIMUM STAGE IS 303.9

MAXIMUM STORAGE • 7.

PLAN FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO SCHEMATIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN RATIO 1	RATIO 2	RATIOS APPLIED TO FLOWS		
					RATIO 3	RATIO 4	
HYDROGRAPH AT	1	.30	1	.045	.25	.75	1.00
	1	.781	1	10.0216	1329.	199.	2659.
ROUTED TO	2	.30	1	.045	.25	.75	1.00
	1	.781	1	10.0216	1329.	199.	2659.
ROUTED TO	3	.30	1	.045	.25	.75	1.00
	1	.781	1	10.0216	1329.	199.	2659.
ROUTED TO	4	.30	1	.045	.25	.75	1.00
	1	.781	1	10.0216	1329.	199.	2659.
ROUTED TO	5	.30	1	.045	.25	.75	1.00
	1	.781	1	10.0216	1329.	199.	2659.

SUMMARY OF DAM SAFETY ANALYSIS - No Flashboards, No Breach.

PLAN 1	STATION	ELEVATION STORAGE TUTFLOW	INITIAL VALUE 510.	SPILLWAY CREST 540.	TOP OF DAM 540.	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
PLAN 1	STATION 1	425.31	0.00	502.	195.	0.00	0.00
	STATION 2	425.31	0.00	502.	195.	0.00	0.00
	STATION 3	425.31	0.00	502.	195.	0.00	0.00
	STATION 4	425.31	0.00	502.	195.	0.00	0.00
PLAN 2	STATION 1	425.31	0.00	502.	195.	0.00	0.00
	STATION 2	425.31	0.00	502.	195.	0.00	0.00
	STATION 3	425.31	0.00	502.	195.	0.00	0.00
	STATION 4	425.31	0.00	502.	195.	0.00	0.00

Analysis
Assuming
15-Inches
of Flushboard
and
No Branch.

REVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

6UMOS #	*YBQZGCHAP AT
POJIE	*VHANG-APM TO
BUMJE	*VHANG-APM TU
BOJIE	*VHQBZGCHAP TO
BOJIE	*VHQBZGCHAP TO
IMJ OF	*ETWQAK

STATION 2, PLAIN 1, BAY 13 4

STORAGE

D-29

CHANNEL ROUTING -MODIFIED PULS- STATION 2 TO 3

[illegible]

WORLDWIDE CHANNEL PARTNERS

CM(1)	CM(2)	CM(3)	FLNVT	FLQD	BLNTH	SEL
1000	.0303	.1003	36C.0	100.0	600.	.07000

CROSS SECTION COMPARISON--STA. 615+50--ETC

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2
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31 39075 UNITED STATES OF AMERICA 163.6

MAXIMUM STRESS • 2.

STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572																																																																																																																																																																																																																																																																																																																																																																																																																																												

CHANNEL ROUTING - MODIFIED PULS- STATION 3 TO 4

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0.0
550.70

MSIPS	MSIOL	L46	AMSOL	X	YSK	STOMA	ISPPAT
01020800		0	0.000	0.000	0.030	0.	0

PERSONAL DEPTH CHARTS ADVICE

NAME	OW(1)	OW(2)	FLAVI	ELMAX	ALMIN	SEL
11	3991	1030	900.0	330.0	1400.	.64160

013--A333'VIS'A333'VIS--SALVIMUOCU MU1A335 55082

	0.36	312.00	150.40	310.70	240.00	303.00	240.00	300.00	265.00	300.00
0.36	312.00	150.40	310.70	240.00	303.00	240.00	300.00	265.00	300.00	300.00

[illegible]

STATION 6, PLAN 10, 21104

Country	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357</
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CHANNEL CABLES - MODIFIED PULS - STATION 4 TO 5

[illegible]

09529°	0°00'	0°01'	0°02'	6031'	0°31'	0031'
135	MIN	XXV13	LAU13	66100	12100	11100

CROSS SECTION COMPARISON--STA. 616.51A, 616.51C
0.00 313.00 300.30 300.00 295.00 291.00 289.00 286.00

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
STORAGE	4.53	20.75	3.78	1.03	3.44	3.61	0.10	11.32	13.26	19.20	33.41							
	24.59		10.12	41.02	97.23	39.09	60.00	64.10	75.67									
DISFLOW	0.00	60.06	244.64	64.43	1452.20	2781.12	4379.89	7015.68	10256.20	14053.15								
	10662.61	2467.43	3167.00	30330.44	47021.04	37467.16	47064.04	70664.96	101973.73	108506.02								
STAGE	280.00	701.05	205.11	203.16	204.21	209.20	206.32	207.37	206.62	206.67								
	569.53	302.63	302.63	204.74	109.70	109.70	109.70	206.62	206.62	210.60								
FLW	20.23	60.94	24.46	60.43	1492.20	2781.12	4379.89	7415.64	10130.10	14633.18								
	10662.61	2467.43	3167.00	30330.44	47021.04	37467.16	47064.04	70664.96	101973.73	108506.02								

STATION 3. PLAN 1. 0110 4

[illegible]

ST PAULS MINISTERS 206.9

MAXIMUM STORAGE :

[illegible]

**FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)**

Flashboard, No Breach

PLAN 1

PLAN : 3
STATION : 3

PLAN 1 STATION 4

PLAN 1 STATION 3

TIME	STAGES	PERCENTS	STAGES	TIME
10.13	201.0	145	10.13	10.13
10.17	203.0	411	10.17	10.17
10.17	202.0	1200	10.17	10.17
10.18	204.5	1000	10.18	10.18

Analysis Assuming Flashboards and Breach.

RESULTS OF SEQUENCE OF STEAL NETWORK CALCULATIONS

	1	2	3	4	5
ROUTES HYDROGRAPH AT					
ROUTE HYDROGRAPH TO					
ROUTE HYDROGRAPH IN					
ROUTE HYDROGRAPH TO					
ROUTE HYDROGRAPH TO					
END OF NETWORK					

-000-

MULTI-PLAN ANALYSES TO BE PERFORMED	
PLANE	1 MATIO- 4 LATIO- 1
PLANE 1	.25 1.00
PLANE 2	.25 1.00
PLANE 3	.25 1.00
PLANE 4	.25 1.00
PLANE 5	.25 1.00
PLANE 6	.25 1.00
PLANE 7	.25 1.00
PLANE 8	.25 1.00
PLANE 9	.25 1.00
PLANE 10	.25 1.00
PLANE 11	.25 1.00
PLANE 12	.25 1.00
PLANE 13	.25 1.00
PLANE 14	.25 1.00
PLANE 15	.25 1.00
PLANE 16	.25 1.00
PLANE 17	.25 1.00
PLANE 18	.25 1.00
PLANE 19	.25 1.00
PLANE 20	.25 1.00
PLANE 21	.25 1.00
PLANE 22	.25 1.00
PLANE 23	.25 1.00
PLANE 24	.25 1.00
PLANE 25	.25 1.00
PLANE 26	.25 1.00
PLANE 27	.25 1.00
PLANE 28	.25 1.00
PLANE 29	.25 1.00
PLANE 30	.25 1.00
PLANE 31	.25 1.00
PLANE 32	.25 1.00
PLANE 33	.25 1.00
PLANE 34	.25 1.00
PLANE 35	.25 1.00
PLANE 36	.25 1.00
PLANE 37	.25 1.00
PLANE 38	.25 1.00
PLANE 39	.25 1.00
PLANE 40	.25 1.00
PLANE 41	.25 1.00
PLANE 42	.25 1.00
PLANE 43	.25 1.00
PLANE 44	.25 1.00
PLANE 45	.25 1.00
PLANE 46	.25 1.00
PLANE 47	.25 1.00
PLANE 48	.25 1.00
PLANE 49	.25 1.00
PLANE 50	.25 1.00
PLANE 51	.25 1.00
PLANE 52	.25 1.00
PLANE 53	.25 1.00
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PLANE 55	.25 1.00
PLANE 56	.25 1.00
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PLANE 60	.25 1.00
PLANE 61	.25 1.00
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PLANE 72	.25 1.00
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PLANE 79	.25 1.00
PLANE 80	.25 1.00
PLANE 81	.25 1.00
PLANE 82	.25 1.00
PLANE 83	.25 1.00
PLANE 84	.25 1.00
PLANE 85	.25 1.00
PLANE 86	.25 1.00
PLANE 87	.25 1.00
PLANE 88	.25 1.00
PLANE 89	.25 1.00
PLANE 90	.25 1.00
PLANE 91	.25 1.00
PLANE 92	.25 1.00
PLANE 93	.25 1.00
PLANE 94	.25 1.00
PLANE 95	.25 1.00
PLANE 96	.25 1.00
PLANE 97	.25 1.00
PLANE 98	.25 1.00
PLANE 99	.25 1.00
PLANE 100	.25 1.00

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SUB-AREA SUMOFF COMPUTATION

INFLUENCE OF THE ENVIRONMENT ON THE DEVELOPMENT OF THE CHILD

STATUS	ICOMP	ISCON	ISAPE	JPLY	JORT	INAME	ISVAGE	IAUTO
1	0	0	0	1	0	1	0	0

NAME	TIME	TABE	SHIP	HYDROGRAPH DATA			ISNO	ISAN	LOCAL
		CT.	NO.	TASD	TASPC				
1	2	73.	906	.80	3.60	0.00	3	1	0

3000
 0.00
 22.00
 22.00

[illegible]

UNIT HYDROGRAPH DATA
IC- 6.60 LAG- .20

STATUS	-1.00	RECESSION DATA	00CS	-0.05	AYTOR	2.60
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UNIT HYDROGRAPH 14 TWO OF PREVIOUS ORIGINATES, TC= 0.00 HOURS, LAS= .20 VOL= 1.00
446. 497. 590. 470. 200. 193. 87. 29. 10.

[illegible]

1.01	1.05	13	0.01	0.00	0.01	0.01	1.01	11.15	143	20	20	03	497.
1.01	1.10	14	0.01	0.00	0.01	0.01	1.01	11.45	144	20	20	03	498.
1.01	1.15	15	0.01	0.00	0.01	0.01	1.01	11.45	145	20	20	03	499.
1.01	1.20	16	0.01	0.00	0.01	0.01	1.01	11.50	146	20	20	03	500.
1.01	1.25	17	0.01	0.00	0.01	0.01	1.01	11.55	147	20	20	03	501.
1.01	1.30	18	0.01	0.00	0.01	0.01	1.01	12.00	148	20	20	03	502.
1.01	1.35	19	0.01	0.00	0.01	0.01	1.01	12.05	149	20	20	03	503.
1.01	1.40	20	0.01	0.00	0.01	0.01	1.01	12.10	150	20	20	03	504.
1.01	1.45	21	0.01	0.00	0.01	0.01	1.01	12.15	151	20	20	03	505.
1.01	1.50	22	0.01	0.00	0.01	0.01	1.01	12.20	152	20	20	03	506.
1.01	1.55	23	0.01	0.00	0.01	0.01	1.01	12.25	153	20	20	03	507.
1.01	1.59	24	0.01	0.00	0.01	0.01	1.01	12.30	154	20	20	03	508.
1.01	2.00	25	0.01	0.00	0.01	0.01	1.01	12.35	155	20	20	03	509.
1.01	2.05	26	0.01	0.00	0.01	0.01	1.01	12.40	156	20	20	03	510.
1.01	2.10	27	0.01	0.00	0.01	0.01	1.01	12.45	157	20	20	03	511.
1.01	2.15	28	0.01	0.00	0.01	0.01	1.01	12.50	158	20	20	03	512.
1.01	2.20	29	0.01	0.00	0.01	0.01	1.01	12.55	159	20	20	03	513.
1.01	2.25	30	0.01	0.00	0.01	0.01	1.01	13.00	160	20	20	03	514.
1.01	2.30	31	0.01	0.00	0.01	0.01	1.01	13.05	161	20	20	03	515.
1.01	2.35	32	0.01	0.00	0.01	0.01	1.01	13.10	162	20	20	03	516.
1.01	2.40	33	0.01	0.00	0.01	0.01	1.01	13.15	163	20	20	03	517.
1.01	2.45	34	0.01	0.00	0.01	0.01	1.01	13.20	164	20	20	03	518.
1.01	2.50	35	0.01	0.00	0.01	0.01	1.01	13.25	165	20	20	03	519.
1.01	2.55	36	0.01	0.00	0.01	0.01	1.01	13.30	166	20	20	03	520.
1.01	3.00	37	0.01	0.00	0.01	0.01	1.01	13.35	167	20	20	03	521.
1.01	3.05	38	0.01	0.00	0.01	0.01	1.01	13.40	168	20	20	03	522.
1.01	3.10	39	0.01	0.00	0.01	0.01	1.01	13.45	169	20	20	03	523.
1.01	3.15	40	0.01	0.00	0.01	0.01	1.01	13.50	170	20	20	03	524.
1.01	3.20	41	0.01	0.00	0.01	0.01	1.01	13.55	171	20	20	03	525.
1.01	3.25	42	0.01	0.00	0.01	0.01	1.01	14.00	172	20	20	03	526.
1.01	3.30	43	0.01	0.00	0.01	0.01	1.01	14.05	173	20	20	03	527.
1.01	3.35	44	0.01	0.00	0.01	0.01	1.01	14.10	174	20	20	03	528.
1.01	3.40	45	0.01	0.00	0.01	0.01	1.01	14.15	175	20	20	03	529.
1.01	3.45	46	0.01	0.00	0.01	0.01	1.01	14.20	176	20	20	03	530.
1.01	3.50	47	0.01	0.00	0.01	0.01	1.01	14.25	177	20	20	03	531.
1.01	3.55	48	0.01	0.00	0.01	0.01	1.01	14.30	178	20	20	03	532.
1.01	4.00	49	0.01	0.00	0.01	0.01	1.01	14.35	179	20	20	03	533.
1.01	4.05	50	0.01	0.00	0.01	0.01	1.01	14.40	180	20	20	03	534.
1.01	4.10	51	0.01	0.00	0.01	0.01	1.01	14.45	181	20	20	03	535.
1.01	4.15	52	0.01	0.00	0.01	0.01	1.01	14.50	182	20	20	03	536.
1.01	4.20	53	0.01	0.00	0.01	0.01	1.01	14.55	183	20	20	03	537.
1.01	4.25	54	0.01	0.00	0.01	0.01	1.01	15.00	184	20	20	03	538.
1.01	4.30	55	0.01	0.00	0.01	0.01	1.01	15.05	185	20	20	03	539.
1.01	4.35	56	0.01	0.00	0.01	0.01	1.01	15.10	186	20	20	03	540.
1.01	4.40	57	0.01	0.00	0.01	0.01	1.01	15.15	187	20	20	03	541.
1.01	4.45	58	0.01	0.00	0.01	0.01	1.01	15.20	188	20	20	03	542.
1.01	4.50	59	0.01	0.00	0.01	0.01	1.01	15.25	189	20	20	03	543.
1.01	4.55	60	0.01	0.00	0.01	0.01	1.01	15.30	190	20	20	03	544.
1.01	4.60	61	0.01	0.00	0.01	0.01	1.01	15.35	191	20	20	03	545.
1.01	4.65	62	0.01	0.00	0.01	0.01	1.01	15.40	192	20	20	03	546.
1.01	4.70	63	0.01	0.00	0.01	0.01	1.01	15.45	193	20	20	03	547.
1.01	4.75	64	0.01	0.00	0.01	0.01	1.01	15.50	194	20	20	03	548.
1.01	4.80	65	0.01	0.00	0.01	0.01	1.01	15.55	195	20	20	03	549.
1.01	4.85	66	0.01	0.00	0.01	0.01	1.01	16.00	196	20	20	03	550.
1.01	4.90	67	0.01	0.00	0.01	0.01	1.01	16.05	197	20	20	03	551.
1.01	4.95	68	0.01	0.00	0.01	0.01	1.01	16.10	198	20	20	03	552.
1.01	5.00	69	0.01	0.00	0.01	0.01	1.01	16.15	199	20	20	03	553.
1.01	5.05	70	0.01	0.00	0.01	0.01	1.01	16.20	200	20	20	03	554.
1.01	5.10	71	0.01	0.00	0.01	0.01	1.01	16.25	201	20	20	03	555.
1.01	5.15	72	0.01	0.00	0.01	0.01	1.01	16.30	202	20	20	03	556.
1.01	5.20	73	0.01	0.00	0.01	0.01	1.01	16.35	203	20	20	03	557.
1.01	5.25	74	0.01	0.00	0.01	0.01	1.01	16.40	204	20	20	03	558.
1.01	5.30	75	0.01	0.00	0.01	0.01	1.01	16.45	205	20	20	03	559.
1.01	5.35	76	0.01	0.00	0.01	0.01	1.01	16.50	206	20	20	03	560.
1.01	5.40	77	0.01	0.00	0.01	0.01	1.01	16.55	207	20	20	03	561.
1.01	5.45	78	0.01	0.00	0.01	0.01	1.01	17.00	208	20	20	03	562.
1.01	5.50	79	0.01	0.00	0.01	0.01	1.01	17.05	209	20	20	03	563.
1.01	5.55	80	0.01	0.00	0.01	0.01	1.01	17.10	210	20	20	03	564.
1.01	5.60	81	0.01	0.00	0.01	0.01	1.01	17.15	211	20	20	03	565.
1.01	5.65	82	0.01	0.00	0.01	0.01	1.01	17.20	212	20	20	03	566.
1.01	5.70	83	0.01	0.00	0.01	0.01	1.01	17.25	213	20	20	03	567.
1.01	5.75	84	0.01	0.00	0.01	0.01	1.01	17.30	214	20	20	03	568.
1.01	5.80	85	0.01	0.00	0.01	0.01	1.01	17.35	215	20	20	03	569.
1.01	5.85	86	0.01	0.00	0.01	0.01	1.01	17.40	216	20	20	03	570.
1.01	5.90	87	0.01	0.00	0.01	0.01	1.01	17.45	217	20	20	03	571.
1.01	5.95	88	0.01	0.00	0.01	0.01	1.01	17.50	218	20	20	03	572.
1.01	6.00	89	0.01	0.00	0.01	0.01	1.01	17.55	219	20	20	03	573.
1.01	6.05	90	0.01	0.00	0.01	0.01	1.01	18.00	220	20	20	03	574.
1.01	6.10	91	0.01	0.00	0.01	0.01	1.01	18.05	221	20	20	03	575.
1.01	6.15	92	0.01	0.00	0.01	0.01	1.01	18.10	222	20	20	03	576.
1.01	6.20	93	0.01	0.00	0.01	0.01	1.01	18.15	223	20	20	03	577.
1.01	6.25	94	0.01	0.00	0.01	0.01	1.01	18.20	224	20	20	03	578.
1.01	6.30	95	0.01	0.00	0.01	0.01	1.01	18.25	225	20	20	03	579.
1.01	6.35	96	0.01	0.00	0.01	0.01	1.01	18.30	226	20	20	03	580.
1.01	6.40	97	0.01	0.00	0.01	0.01	1.01	18.35	227	20	20	03	581.
1.01	6.45	98	0.01	0.00	0.01	0.01	1.01	18.40	228	20	20	03	582.
1.01	6.50	99	0.01	0.00	0.01	0.01	1.01	18.45	229	20	20	03	583.
1.01	6.55	100	0.01	0.00	0.01	0.01	1.01	18.50	230	20	20	03	584.
1.01	6.60	101	0.01	0.00	0.01	0.01	1.01	18.55	231	20	20	03	585.
1.01	6.65	102	0.01	0.00	0.01	0.01	1.01	19.00	232	20	20	03	586.
1.01	6.70	103	0.01	0.00	0.01	0.01	1.01	19.05	233	20	20	03	587.
1.01	6.75	104	0.01	0.00	0.01	0.01	1.01	19.10	234	20	20	03	588.
1.01	6.80	105	0.01	0.00	0.01	0.01	1.01	19.15	235	20	20	03	589.
1.01	6.85	106	0.01	0.00	0.01	0.01	1.01	19.20	236	20	20	03	590.
1.01	6.90	107	0.01	0.00	0.01	0.01	1.01	19.25	237	20	20	03	591.
1.01	6.95	108	0.01	0.00	0.01	0.01	1.01	19.30	238	20	20	03	592.
1.01	7.00	109	0.01	0.00	0.01	0.01	1.01	19.35	239	20	20	03	593.
1.01	7.05	110	0.01	0.00	0.01	0.01	1.01	19.40	240	20	20	03	594.
1.01	7.10	111	0.01	0.00	0.01	0.01	1.01	19.45	241	20	20	03	595.
1.01	7.15	112	0.01	0.00	0.01	0.01	1.01	19.50	242	20	20	03	596.
1.01	7.20	113	0.01	0.00	0.01	0.01	1.01	19.55	243	20	20	03	597.
1.01													

1.01	7.05	95	02	00	40	1.01	10.35	235	01	00	47
1.01	7.14	96	02	00	40	1.01	10.40	236	01	00	48
1.01	7.15	97	02	00	40	1.01	10.45	237	01	00	49
1.01	7.25	98	02	00	40	1.01	10.50	238	01	00	50
1.01	7.25	99	02	00	40	1.01	10.55	239	01	00	51
1.01	7.35	91	02	00	40	1.01	11.00	240	01	00	52
1.01	7.45	92	02	00	40	1.01	11.05	241	01	00	53
1.01	7.55	93	02	00	40	1.01	11.10	242	01	00	54
1.01	7.55	94	02	00	40	1.01	11.15	243	01	00	55
1.01	8.00	95	02	00	40	1.01	11.20	244	01	00	56
1.01	8.05	96	02	00	40	1.01	11.25	245	01	00	57
1.01	8.10	97	02	00	40	1.01	11.30	246	01	00	58
1.01	8.15	98	02	00	40	1.01	11.35	247	01	00	59
1.01	8.20	99	02	00	40	1.01	11.40	248	01	00	60
1.01	8.25	101	02	00	40	1.01	11.45	249	01	00	61
1.01	8.30	102	02	00	40	1.01	11.50	250	01	00	62
1.01	8.35	103	02	00	40	1.01	11.55	251	01	00	63
1.01	8.40	104	02	00	40	1.01	12.00	252	01	00	64
1.01	8.45	105	02	00	40	1.01	12.05	253	01	00	65
1.01	8.50	106	02	00	40	1.01	12.10	254	01	00	66
1.01	8.55	107	02	00	40	1.01	12.15	255	01	00	67
1.01	9.00	108	02	00	40	1.01	12.20	256	01	00	68
1.01	9.05	109	02	00	40	1.01	12.25	257	01	00	69
1.01	9.10	110	02	00	40	1.01	12.30	258	01	00	70
1.01	9.15	111	02	00	40	1.01	12.35	259	01	00	71
1.01	9.20	112	02	00	40	1.01	12.40	260	01	00	72
1.01	9.25	113	02	00	40	1.01	12.45	261	01	00	73
1.01	9.30	114	02	00	40	1.01	12.50	262	01	00	74
1.01	9.35	115	02	00	40	1.01	12.55	263	01	00	75
1.01	9.40	116	02	00	40	1.01	13.00	264	01	00	76
1.01	9.45	117	02	00	40	1.01	13.05	265	01	00	77
1.01	9.50	118	02	00	40	1.01	13.10	266	01	00	78
1.01	9.55	119	02	00	40	1.01	13.15	267	01	00	79
1.01	10.00	120	02	00	40	1.01	13.20	268	01	00	80
1.01	10.05	121	02	00	40	1.01	13.25	269	01	00	81
1.01	10.10	122	02	00	40	1.01	13.30	270	01	00	82
1.01	10.15	123	02	00	40	1.01	13.35	271	01	00	83
1.01	10.20	124	02	00	40	1.01	13.40	272	01	00	84
1.01	10.25	125	02	00	40	1.01	13.45	273	01	00	85
1.01	10.30	126	02	00	40	1.01	13.50	274	01	00	86
1.01	10.35	127	02	00	40	1.01	13.55	275	01	00	87
1.01	10.40	128	02	00	40	1.01	14.00	276	01	00	88
1.01	10.45	129	02	00	40	1.01	14.05	277	01	00	89
1.01	10.50	130	02	00	40	1.01	14.10	278	01	00	90
1.01	10.55	131	02	00	40	1.01	14.15	279	01	00	91
1.01	11.00	132	02	00	40	1.01	14.20	280	01	00	92
1.01	11.05	133	02	00	40	1.01	14.25	281	01	00	93
1.01	11.10	134	02	00	40	1.01	14.30	282	01	00	94
1.01	11.15	135	02	00	40	1.01	14.35	283	01	00	95
1.01	11.20	136	02	00	40	1.01	14.40	284	01	00	96
1.01	11.25	137	02	00	40	1.01	14.45	285	01	00	97
1.01	11.30	138	02	00	40	1.01	14.50	286	01	00	98
1.01	11.35	139	02	00	40	1.01	14.55	287	01	00	99
1.01	11.40	140	02	00	40	1.01	15.00	288	01	00	100
1.01	11.45	141	02	00	40	1.01	15.05	289	01	00	101
1.01	11.50	142	02	00	40	1.01	15.10	290	01	00	102
1.01	11.55	143	02	00	40	1.01	15.15	291	01	00	103
1.01	12.00	144	02	00	40	1.01	15.20	292	01	00	104
1.01	12.05	145	02	00	40	1.01	15.25	293	01	00	105
1.01	12.10	146	02	00	40	1.01	15.30	294	01	00	106
1.01	12.15	147	02	00	40	1.01	15.35	295	01	00	107
1.01	12.20	148	02	00	40	1.01	15.40	296	01	00	108
1.01	12.25	149	02	00	40	1.01	15.45	297	01	00	109
1.01	12.30	150	02	00	40	1.01	15.50	298	01	00	110
1.01	12.35	151	02	00	40	1.01	15.55	299	01	00	111
1.01	12.40	152	02	00	40	1.01	16.00	300	01	00	112

SUM 23.05 25.19 1.57 23.05
 (601.11 500.11 37.31 1400.79)

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
2650.	334.	102.	175.	52376.
75.	16.	5.	5.	1476.
	10.72	22.60	22.60	22.60
	500.01	574.02	574.02	574.02
	315.	361.	361.	361.
	389.	440.	440.	440.

CM5
 CM4
 INC-MS
 MS
 AC-ET
 IMPUS RU W

THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .021 HOURS DURING SPIGACH FORMATION. POSTSTREAM CALCULATIONS WERE USED A TIME INTERVAL OF .003 HOURS. THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH. INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	COMPUTED BREACH HYDROGRAPH (CFS)	ERROR (CFS)	ACCUMULATED ERROR (AC-FI)
14.500	6.000	341.	341.	0.	0.
14.521	6.021	341.	341.	0.	0.
14.542	6.042	341.	341.	0.	0.
14.563	6.063	341.	341.	0.	0.
14.584	6.084	341.	341.	0.	0.
14.605	6.105	341.	341.	0.	0.
14.626	6.126	341.	341.	0.	0.
14.647	6.147	341.	341.	0.	0.
14.668	6.168	341.	341.	0.	0.
14.689	6.189	341.	341.	0.	0.
14.710	6.210	341.	341.	0.	0.
14.731	6.231	341.	341.	0.	0.
14.752	6.252	341.	341.	0.	0.
14.773	6.273	341.	341.	0.	0.
14.794	6.294	341.	341.	0.	0.
14.815	6.315	341.	341.	0.	0.
14.836	6.336	341.	341.	0.	0.
14.857	6.357	341.	341.	0.	0.
14.878	6.378	341.	341.	0.	0.
14.899	6.399	341.	341.	0.	0.
14.920	6.420	341.	341.	0.	0.
14.941	6.441	341.	341.	0.	0.
14.962	6.462	341.	341.	0.	0.
14.983	6.483	341.	341.	0.	0.
15.004	6.504	341.	341.	0.	0.
15.025	6.525	341.	341.	0.	0.
15.046	6.546	341.	341.	0.	0.
15.067	6.567	341.	341.	0.	0.
15.088	6.588	341.	341.	0.	0.
15.109	6.609	341.	341.	0.	0.
15.130	6.630	341.	341.	0.	0.
15.151	6.651	341.	341.	0.	0.
15.172	6.672	341.	341.	0.	0.
15.193	6.693	341.	341.	0.	0.
15.214	6.714	341.	341.	0.	0.
15.235	6.735	341.	341.	0.	0.
15.256	6.756	341.	341.	0.	0.
15.277	6.777	341.	341.	0.	0.
15.298	6.798	341.	341.	0.	0.
15.319	6.819	341.	341.	0.	0.
15.340	6.840	341.	341.	0.	0.
15.361	6.861	341.	341.	0.	0.
15.382	6.882	341.	341.	0.	0.
15.403	6.903	341.	341.	0.	0.
15.424	6.924	341.	341.	0.	0.
15.445	6.945	341.	341.	0.	0.
15.466	6.966	341.	341.	0.	0.
15.487	6.987	341.	341.	0.	0.
15.508	7.008	341.	341.	0.	0.
15.529	7.029	341.	341.	0.	0.
15.550	7.050	341.	341.	0.	0.
15.571	7.071	341.	341.	0.	0.
15.592	7.092	341.	341.	0.	0.
15.613	7.113	341.	341.	0.	0.
15.634	7.134	341.	341.	0.	0.
15.655	7.155	341.	341.	0.	0.
15.676	7.176	341.	341.	0.	0.
15.697	7.197	341.	341.	0.	0.
15.718	7.218	341.	341.	0.	0.
15.739	7.239	341.	341.	0.	0.
15.760	7.260	341.	341.	0.	0.
15.781	7.281	341.	341.	0.	0.
15.802	7.302	341.	341.	0.	0.
15.823	7.323	341.	341.	0.	0.
15.844	7.344	341.	341.	0.	0.
15.865	7.365	341.	341.	0.	0.
15.886	7.386	341.	341.	0.	0.
15.907	7.407	341.	341.	0.	0.
15.928	7.428	341.	341.	0.	0.
15.949	7.449	341.	341.	0.	0.
15.970	7.470	341.	341.	0.	0.
15.991	7.491	341.	341.	0.	0.
16.012	7.512	341.	341.	0.	0.
16.033	7.533	341.	341.	0.	0.
16.054	7.554	341.	341.	0.	0.
16.075	7.575	341.	341.	0.	0.
16.096	7.596	341.	341.	0.	0.
16.117	7.617	341.	341.	0.	0.
16.138	7.638	341.	341.	0.	0.
16.159	7.659	341.	341.	0.	0.
16.180	7.680	341.	341.	0.	0.
16.201	7.701	341.	341.	0.	0.
16.222	7.722	341.	341.	0.	0.
16.243	7.743	341.	341.	0.	0.
16.264	7.764	341.	341.	0.	0.
16.285	7.785	341.	341.	0.	0.
16.306	7.806	341.	341.	0.	0.
16.327	7.827	341.	341.	0.	0.
16.348	7.848	341.	341.	0.	0.
16.369	7.869	341.	341.	0.	0.
16.390	7.890	341.	341.	0.	0.
16.411	7.911	341.	341.	0.	0.
16.432	7.932	341.	341.	0.	0.
16.453	7.953	341.	341.	0.	0.
16.474	7.974	341.	341.	0.	0.
16.495	7.995	341.	341.	0.	0.
16.516	8.016	341.	341.	0.	0.
16.537	8.037	341.	341.	0.	0.
16.558	8.058	341.	341.	0.	0.
16.579	8.079	341.	341.	0.	0.
16.600	8.100	341.	341.	0.	0.
16.621	8.121	341.	341.	0.	0.
16.642	8.142	341.	341.	0.	0.
16.663	8.163	341.	341.	0.	0.
16.684	8.184	341.	341.	0.	0.
16.705	8.205	341.	341.	0.	0.
16.726	8.226	341.	341.	0.	0.
16.747	8.247	341.	341.	0.	0.
16.768	8.268	341.	341.	0.	0.
16.789	8.289	341.	341.	0.	0.
16.810	8.310	341.	341.	0.	0.
16.831	8.331	341.	341.	0.	0.
16.852	8.352	341.	341.	0.	0.
16.873	8.373	341.	341.	0.	0.
16.894	8.394	341.	341.	0.	0.
16.915	8.415	341.	341.	0.	0.
16.936	8.436	341.	341.	0.	0.
16.957	8.457	341.	341.	0.	0.
16.978	8.478	341.	341.	0.	0.
16.999	8.499	341.	341.	0.	0.
17.020	8.520	341.	341.	0.	0.
17.041	8.541	341.	341.	0.	0.
17.062	8.562	341.	341.	0.	0.
17.083	8.583	341.	341.	0.	0.
17.104	8.604	341.	341.	0.	0.
17.125	8.625	341.	341.	0.	0.
17.146	8.646	341.	341.	0.	0.
17.167	8.667	341.	341.	0.	0.
17.188	8.688	341.	341.	0.	0.
17.209	8.709	341.	341.	0.	0.
17.230	8.730	341.	341.	0.	0.
17.251	8.751	341.	341.	0.	0.
17.272	8.772	341.	341.	0.	0.
17.293	8.793	341.	341.	0.	0.
17.314	8.814	341.	341.	0.	0.
17.335	8.835	341.	341.	0.	0.
17.356	8.856	341.	341.	0.	0.
17.377	8.877	341.	341.	0.	0.
17.398	8.898	341.	341.	0.	0.
17.419	8.919	341.	341.	0.	0.
17.440	8.940	341.	341.	0.	0.
17.461	8.961	341.	341.	0.	0.
17.482	8.982	341.	341.	0.	0.
17.503	9.003	341.	341.	0.	0.
17.524	9.024	341.	341.	0.	0.
17.545	9.045	341.	341.	0.	0.
17.566	9.066	341.	341.	0.	0.
17.587	9.087	341.	341.	0.	0.
17.608	9.108	341.	341.	0.	0.
17.629	9.129	341.	341.	0.	0.
17.650	9.150	341.	341.	0.	0.
17.671	9.171	341.	341.	0.	0.
17.692	9.192	341.	341.	0.	0.
17.713	9.213	341.	341.	0.	0.
17.734	9.234	341.	341.	0.	0.
17.755	9.255	341.	341.	0.	0.
17.776	9.276	341.	341.	0.	0.
17.797	9.297	341.	341.	0.	0.
17.818	9.318	341.	341.	0.	0.
17.839	9.339	341.	341.	0.	0.
17.860	9.360	341.	341.	0.	0.
17.881	9.381	341.	341.	0.	0.
17.902	9.402	341.	341.	0.	0.
17.923	9.423	341.	341.	0.	0.
17.944	9.444	341.	341.	0.	0.
17.965	9.465	341.	341.	0.	0.
17.986	9.486	341.	341.	0.	0.
18.007	9.507	341.	341.	0.	0.
18.028	9.528	341.	341.	0.	0.
18.049	9.549	341.	341.	0.	0.
18.070	9.570	341.	341.	0.	0.
18.091	9.591	341.	341.	0.	0.
18.112	9.612	341.	341.	0.	0.
18.133	9.633	341.	341.	0.	0.
18.154	9.654	341.	341.	0.	0.
18.175	9.675	341.	341.	0.	0.
18.196	9.696	341.	341.	0.	0.
18.217	9.717	341.	341.	0.	0.
18.238	9.738	341.	341.	0.	0.
18.259	9.759	341.	341.	0.	0.
18.280	9.780	341.	341.	0.	0.
18.301	9.801	341.	341.	0.	0.
18.322	9.822	341.	341.	0.	0.
18.343	9.843	341.	341.	0.	0.
18.364	9.864	341.	341.	0.	0.
18.385	9.885	341.	341.	0.	0.
18.406	9.906	341.	341.	0.	0.
18.427	9.927	341.	341.	0.	0.
18.448	9.948	341.	341.	0.	0.
18.469	9.969	341.	341.	0.	0.
18.490	9.990	341.	341.	0.	0.
18.511	10.011	341.	341.	0.	0.
18.532	10.032	341.	341.	0.	0.
18.553	10.053	341.	341.	0.	0.
18.574	10.074	341.	341.	0.	0.
18.595	10.095	341.	341.	0.	0.
18.616	10.116	341.	341.	0.	0.
18.637	10.137	341.	341.	0.	0.
18.658	10.158	341.	341.	0.	0.
18.679	10.179	341.	341.	0.	0.
18.700	10.200	341.	341.	0.	0.
18.721	10.221	341.	341.	0.	0.
18.742	10.242	341.	341.	0.	0.
18.763	10.263	341.	341.	0.	0.
18.784	10.284	341.	341.	0.	0.
18.805	10.305	341.	341.	0.	0.
18.826	10.326	341.	341.	0.	0.
18.847	10.347	341.	341.	0.	0.
18.868	10.368	341.	341.	0.	0.
18.889	10.389	341.	341.	0.	0.
18.910	10.410	341.	341.	0.	0.
18.931	10.431	341.	341.	0.	0.
18.952	10.452	341.	341.	0.	0.
18.973	10.473	341.	341.	0.	0.
18.994	10.494	341.	341.	0.	0.
19.015	10.515	341.	341.	0.	0.
19.036	10.536	341.	341.	0.	0.
19.057	10.557	341.	341.	0.	0.
19.078	10.578	341.	341.	0.	0.
19.099	10.599	341.	341.	0.	0.
19.120	10.620	341.	341.	0.	0.
19.141	10.641	341.	341.	0.	0.
19.162	10.662	341.	341.	0.	0.
19.183	10.683	341.	341		

HYDROGRAPH ROUTING

CHANNEL ROUTING --MODIFIED PULS-- STATION 2 TO 3

STAGE	ICOMP	SECUM	STAGE	JPLI	JPRF	STAGE	EMWID
0.00	1	0	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0

WATER DEPTH CHANNEL ROUTING

STAGE	ICOMP	SECUM	STAGE	JPLI	JPRF	STAGE	EMWID
0.00	1	0	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0

CROSS SECTION COORDINATES--STATION 2 TO 3--ETC

STAGE	ICOMP	SECUM	STAGE	JPLI	JPRF	STAGE	EMWID
0.00	1	0	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0

MAXIMUM STAGE IS 300.0

STATION 3, PLAN 1, STAGE 4

STAGE	ICOMP	SECUM	STAGE	JPLI	JPRF	STAGE	EMWID
0.00	1	0	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0
0.00	0.00	0.00	ROUTING DATA	0	0	1	0

D-5

EXAMPLE GIVING -MODIFIED PULS- STATION 3 TO 4

[illegible]

Case	Q121	Q131	ELNVT	ELMAX	OLNTH	SFL
1-1326	.1034	.1000	360.0	320.0	1466.	.64303

0698E 0704 0701 0656 0610 0609
0904Z 0905 0601 0500
01B--A170V15-A78V15--S1V06003 M01235 ST07

[illegible]

4. PLAN 1, 2, 2110 &

NOTES

[illegible]

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO SCHEMATIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CFS) ARE SHOWN IN PARENTHESES
AREA IN SQUARE FEET (SQ. FT.) ARE SHOWN IN PARENTHESES

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIOS APPLIED TO FLOWS
				.25	.50	.75	1.00	
HYDROGRAPH AT	1	.30	1	.465	1320.	1000.	700.	
		.701		10.0211	37.0411	50.4011	75.2011	
ROUTED TO	2	.30	1	.404	1332.	1012.	700.	
		.701		5.5511	303.1011	405.0011	302.4011	
ROUTED TO	3	.30	1	.404	1335.	1012.	700.	
		.701		5.5511	303.6011	405.0011	302.4011	
ROUTED TO	4	.30	1	.404	1335.	1012.	700.	
		.701		5.5511	303.6011	405.0011	302.4011	
ROUTED TO	5	.30	1	.404	1335.	1012.	700.	
		.701		5.5511	303.6011	405.0011	302.4011	

Reservoir + Flood
Volume = 12,500 ft³
∴ Q_p (w/Res.)
≈ 19,000 cfs
Calc. = 19,982 cfs
Good!

SUMMARY OF DAM SAFETY ANALYSIS - Flashboards, Breach.

PLAN 1	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	428.25	429.25	430.00
	500.	500.	500.
	0.	0.	336.

RATIO	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE	MAXIMUM FLOW	DURATION OVER TOP	TIME OF MAX OUTFLOW	TIME OF FAILURE
.25	0.00	422.	100.	0.00	16.25	0.00
.50	.25	445.	137.7	.35	16.43	16.43
.75	.35	452.	143.2	.40	16.46	16.46
1.00	.40	457.	143.7	.40	16.48	16.48

PLAN 1	STATION 3	MAXIMUM FLOW	MAXIMUM STAGE	TIME
		100.	301.0	16.25
		137.7	309.0	16.43
		143.2	309.0	16.46
		143.7	309.0	16.48

PLAN 1	STATION 4	MAXIMUM FLOW	MAXIMUM STAGE	TIME
		100.	301.0	16.25
		137.7	309.0	16.43
		143.2	309.0	16.46
		143.7	309.0	16.48

PLAN 1	STATION 5	MAXIMUM FLOW	MAXIMUM STAGE	TIME
		100.	301.0	16.25
		137.7	309.0	16.43
		143.2	309.0	16.46
		143.7	309.0	16.48

State of New Jersey
Department of Conservation and Development
REPORT ON DAM APPLICATION

To the Board of Conservation and Development,
 State of New Jersey.

Gentlemen:

The application of The Passaic Consolidated Water Company
 filed September 14, 1929 for approval of plans and for a permit to raise a dam
 known as Great Notch, ^{Reservoir} near Great Notch on Yankee River tributary
 to Passaic River in Passaic County, New Jersey, has been examined by
John T. Brooks Hydraulic Engineer. D-52 21-0 26-5

PRINCIPAL FEATURES

Location	26.2.5.7.2	Site inspected	October 3, 1929.
Purpose of dam	Water supply		
Drainage area	0.3 sq. mi.		
Area of lake	33 acres.	Capacity of lake	270 Mill. gals.
Type of dam	Earth fill, concrete core wall	Top width	15 feet.
Upstream slope	2:1	Downstream slope	2:1
Length of dam	130 ^{460 FROM SCALING} feet.	Max. height	70 feet.
Foundation material	Ledge rock. Trap		
Type of spillway	Concrete o.g.	Length of spillway	14 feet.
Max. head on spillway	2' ^h feet. with flashboards on end 1' freeboard		
Spillway capacity	1350 sec. ft. per sq. mi. with flashboards on		
Outlets other than spillway	1 - 36" C.I. blow-off) 1 - 18" Steel supply main)	Gate valves in gate house.	

It has been found that the site for the dam is suitable and the plans adequate to insure 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.

Company

Reservoir

Genl. Brewer Est.



~~~~~

800 900 1000 feet

old previous to Cross Sectioning.



CONTENTS		
ELEVATION	MILL GALL.	ACR.
370.00	0.0	
375.00	0.2	0.4
380.00	1.6	4.9
385.00	3.6	11.7
390.00	7.5	23.0
395.00	12.0	36.5
400.00	18.8	57.7
405.00	28.8	89.4
410.00	45.0	141
415.00	73.4	225.3
420.00	108.7	334
425.00	151.7	465.6

427
 VAULT NO. 537
 CABINET NO. 7
 DRAWER NO. 5
 SHEET NO. 26

BLOOMFIELD N. J. MAY 21 1910



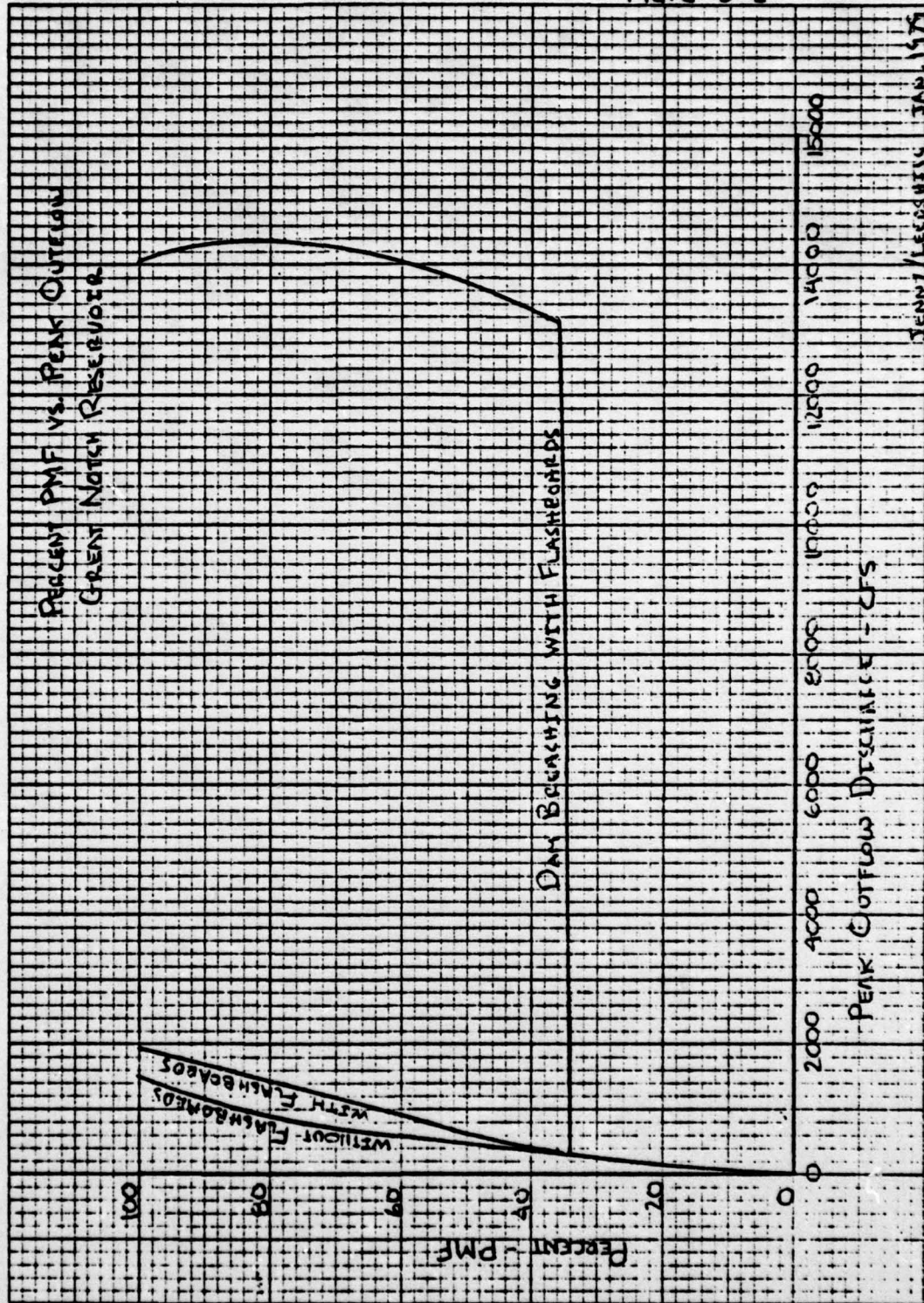
AREA LOCATION

GREAT NOTCH DAM

JENNY-LEEDSHILL

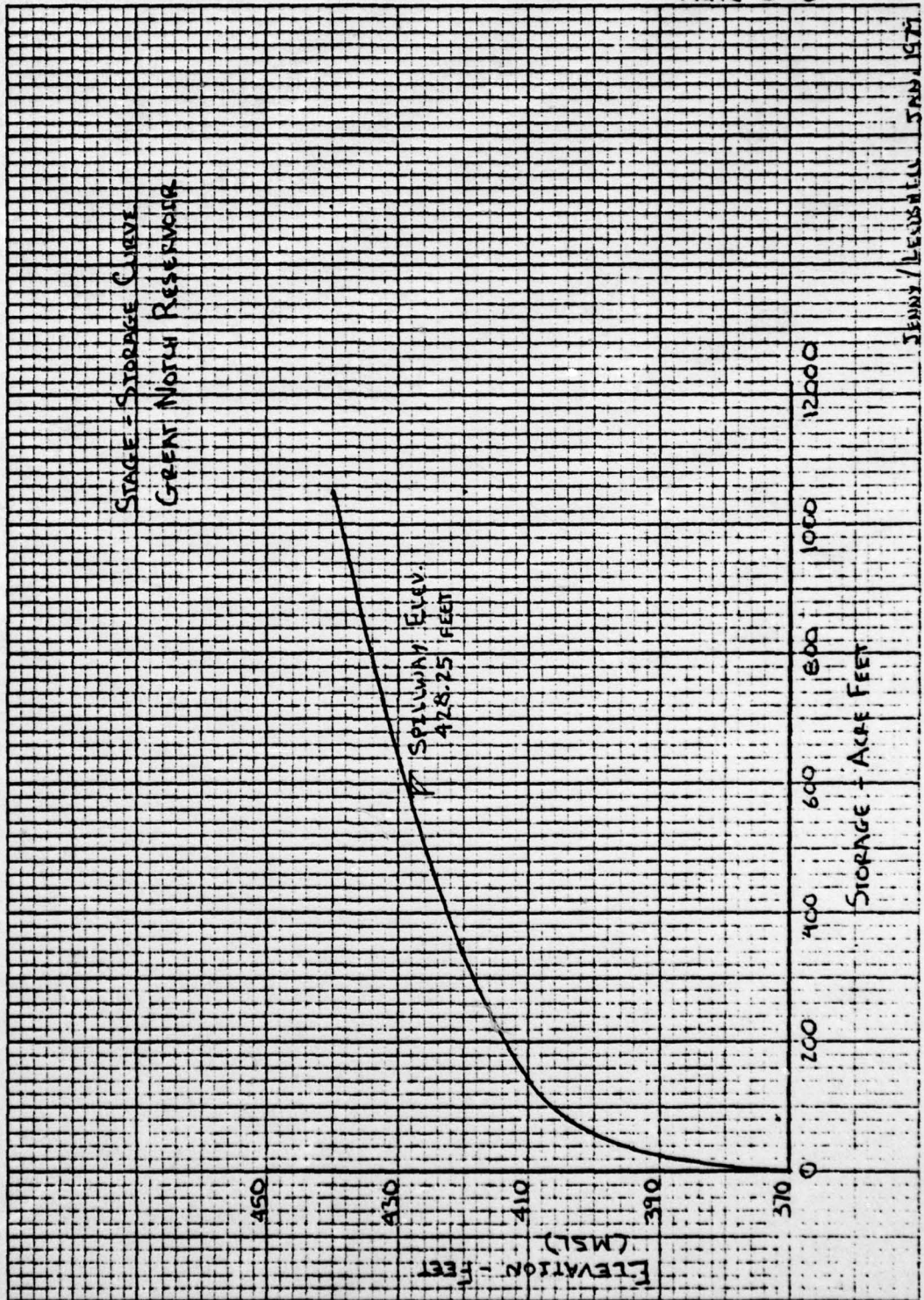
JANUARY 1979

Plate D-2



CLEARPRINT QUALITY

Plate D-3



CLEARPRINT

Plate D-4

