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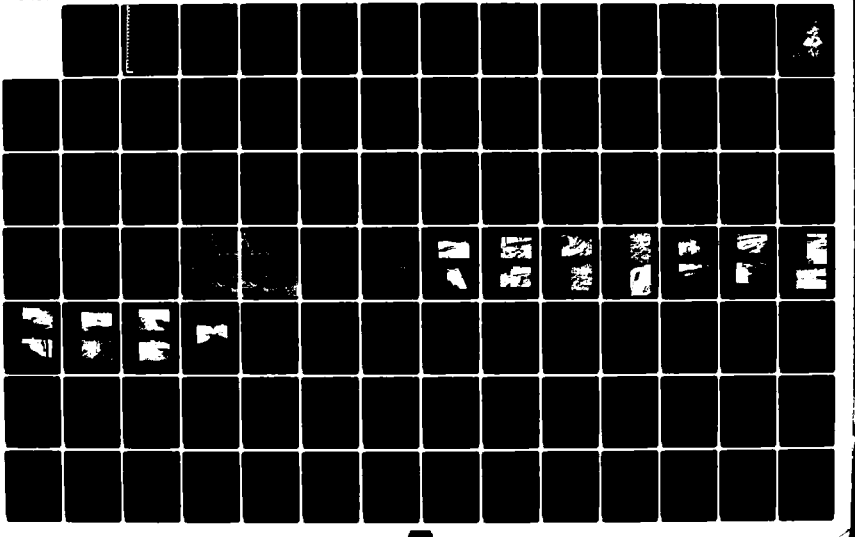

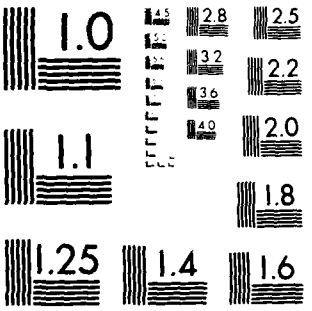

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HOUSATONIC RIVER BASIN
SALISBURY, CONNECTICUT

SOUTH POND DAM
CT 00592

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

MAY 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Housatonic River Basin
Salisbury, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

South Pond Dam is an earthen embankment dam with a vertical stone masonry wall downstream face. The embankment is approximatley 300 feet long and has a maximum height of 19 feet. The visual inspection of South Pond Dam indicated that the dam is in fair condition. Based on its intermediate size and high hazard classification the test flood is equal to the PMF.

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SOUTH POND DAM

CT 00592

HOUSATONIC RIVER BASIN

SALISBURY, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LETTER OF TRANSMITTAL

FROM THE CORPS OF ENGINEERS TO THE STATE

TO BE SUPPLIED BY THE CORPS OF ENGINEERS

A-1

NATIONAL DAM INSPECTION PROGRAM
PHASE I - INSPECTION REPORT
BRIEF ASSESSMENT

Identification No.: CT 00592

Name of Dam: South Pond Dam

Town: Salisbury

County and State: Litchfield, Connecticut

Stream: Wachocastinook Creek

Date of Inspection: April 23, 1979

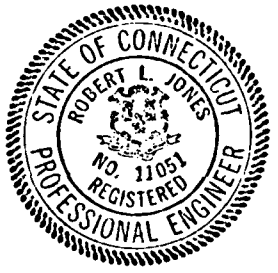
South Pond Dam is an earthen embankment dam with a vertical stone masonry wall downstream face. The embankment is approximately 300 feet long and has a maximum height of 19 feet. The dam has two spillways. An emergency spillway is located on the left abutment and the principal spillway is located in the middle portion of the embankment.

The visual inspection of South Pond Dam indicated that the dam is in fair condition. The inspection revealed that lack of adequate riprap on the upstream face has caused erosion at the splash zone of the embankment as seen in Photo 1. Tree stumps exist in the downstream slope of the embankment as shown in Photo 5. Depressions up to 3 feet in depth shown in Photo 10 were observed on the crest and downstream slope of the embankment along the right training wall and buttress wall of the center spillway. Bulges up to 3 feet offset were located in 3 areas of the vertical stone wall on the downstream face of the dam. Water with staining was observed along the downstream toe along the right side of the embankment as seen in Photos 11, 13 and 15. Erosion as shown in Photos 2, 3, 4, and 9 was found adjacent to the emergency spillway on the left abutment. Brush, trees and debris are located in the downstream channel of the left spillway. Animal burrows as seen in Photo 18 were found in the embankment.

Based on its intermediate size and high hazard classification in accordance with the Corps guidelines the test flood is equal to the Probable Maximum Flood. The spillway will pass 590 cfs or 16% of the test flood with the pool level at the top of the dam. The test flood flow of 3900 cfs will overtop the dam by 2.1 feet.

Based on the findings of the visual inspection and hydrologic and hydraulic analysis there is need for more detailed hydrologic and hydraulic analyses to determine the adequacy of the spillway capacity of South Pond Dam in conjunction with the operation of upstream Riga Lake. Recommendations and remedial measures will require engineering input, analysis and design. Provisions should be made by the owner to obtain the services of a professional engineer to investigate the apparent seepage along the downstream toe and the depressions on the crest and downstream slope of the embankment. The void under the emergency spillway should be backfilled and future erosion prevented. The upstream dam face should be repaired and riprap placed to protect the splash zone. Tree stumps, roots, and animal burrows should be removed and backfilled under the supervision of a professional engineer.

The recommendations and remedial measures are described in Section 7 and should be addressed within one year after receipt of this Phase I Inspection Report by the owner.



Robert L. Jones, P.E.
Project Manager

Philip W. Genovese & Associates, Inc.
Hamden, Connecticut

This Phase I Inspection Report on Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

THIS SHEET TO BE FURNISHED BY THE CORPS OF ENGINEERS

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. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

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. Because of the magnitude and rarity of such a storm event, a finding that spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. 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.

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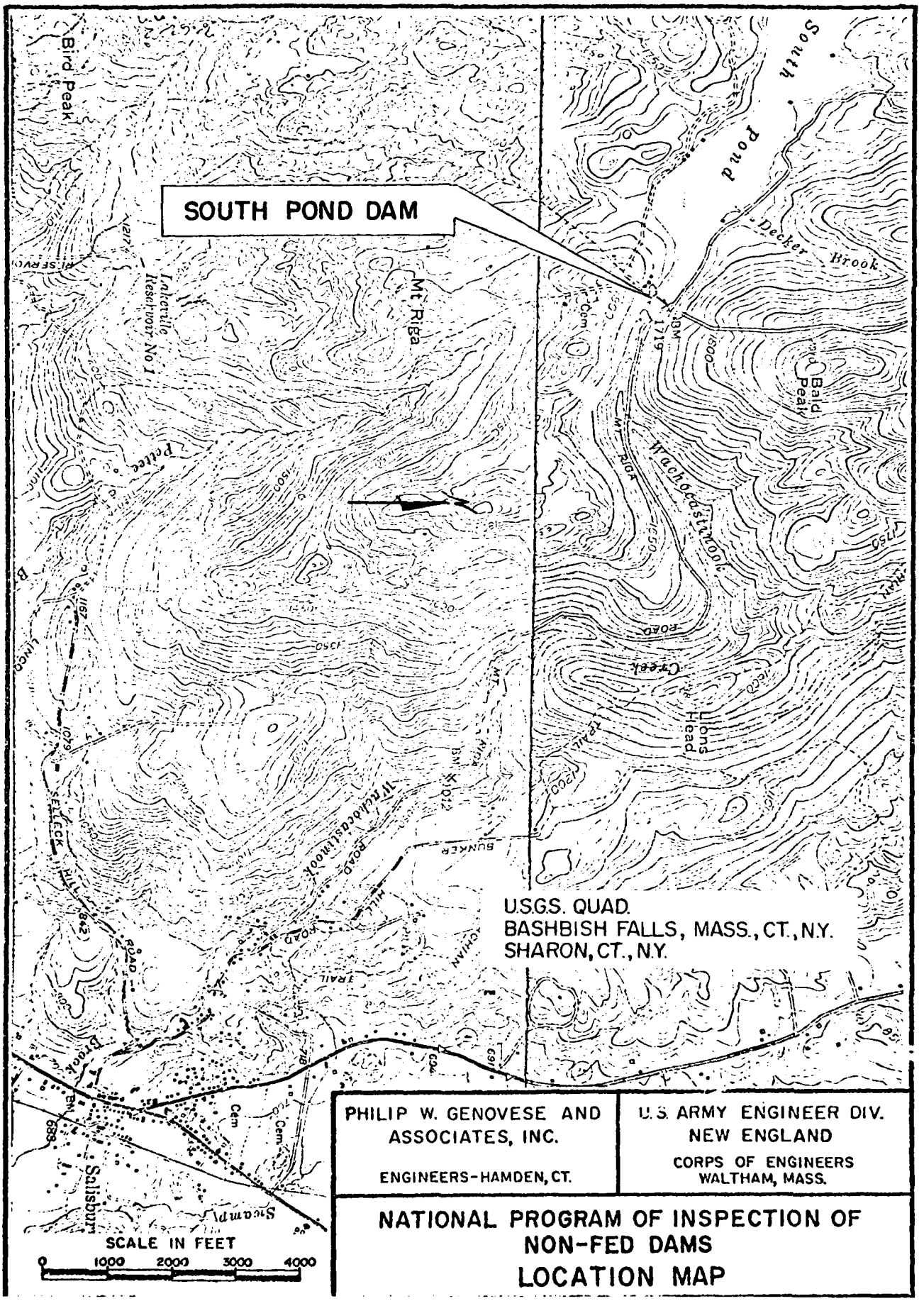
PHILIP W. GENOVESE AND ASSOCIATES, INC. ENGINEERS-HAMDEN, CT.		



PHILIP W. GENOVESE AND ASSOCIATES, INC.
ENGINEERS-HAMDEN, CT.

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
LOCATION MAP

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Philip W. Genovese and Associates, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Philip W. Genovese and Associates, Inc., under a letter of November 28, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-79-C0019 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To perform technical inspection and evaluation on non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) To encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. South Pond Dam is located on Wachocastinook Creek in the Town of Salisbury, Connecticut. The dam is approximately 3.8 miles downstream from Riga Lake. The dam is shown on U.S.G.S. quadrangle Bashbish Falls, Connecticut with coordinates approximately N 42° 0.3', W 73° 28.2', Litchfield County, Connecticut. The location of the dam is shown on the Location Map immediately preceding this page. Access to the dam is by Town owned Riga Road which is open to the public from Memorial Day to Labor Day.

b. Description of Dam and Appurtenances. South Pond Dam consists of an earthen embankment with a vertical stone wall on the downstream face. The embankment section has a total length of about 300 feet. The dam has two spillways. The maximum structural height, according to field measurement, is 19 feet.

The appurtenant structures consist of an emergency concrete spillway, principal spillway and a 30 inch diameter gated drain pipe and gate house. The principal spillway is constructed of cement rubble masonry with a concrete channel. The gate house is a wood frame structure. The emergency spillway is concrete. South Pond and Dam are almost immediately downstream of Riga Lake.

Figure 1, located in Appendix B, shows the plan of the dam and its appurtenant structures. Photographs of each structure are shown in Appendix C. Sketches of the dam and its appurtenances are in Appendix D.

c. Size Classifications. Intermediate (hydraulic height - 19 feet high, storage 1206 acre-feet) based on storage ($\geq$1,000 to 50,000 acre-feet) as given in Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. The dam's potential for damage rates is as a high hazard classification. A major breach could result in discharge into the very steep and narrow valley of Wachocastinook Creek where about 30 houses are located at an elevation that could be affected by a dam breach. The flood wave would have an average depth of approximately 12 feet and would extend to the village of Salisbury, Connecticut.

The South Pond drainage area includes Riga Lake and Dam. Failure of either dam would cause a flood wave that would extend down Wachocastinook Creek valley to Salisbury with little attenuation of velocity or flow. Structures located near the stream valley that would be in jeopardy by a breach include U.S. Route 44 which passes through Salisbury as the principal east-west access route. The impact area is shown on the Location Map.

e. Ownership. The dam is owned by

Mount Riga Corporation
c/o Frank McCabe, President
Salisbury, Connecticut
Telephone: 203-435-9201

f. Operator. This dam is owned and operated by

Mount Riga Corporation
Mr. David Brazee, Agent
Salisbury, Connecticut
Phone: 203-435-2405

g. Purpose of Dam. This dam is used for recreation.

h. Design and Construction History. The history of the dam is unknown. The owner says the dam was reported to have been built in 1803 and reconstructed in 1850. A major repair was made in 1957. See Appendix B.

i. Normal Operating Procedure. No data was disclosed for maintenance of reservoir water levels other than information provided by the operator that water levels are lowered during and after storms to prevent overtopping.

1.3 Pertinent Data

a. Drainage Area. The drainage area tributary to South Pond Dam consists of approximately 3.43 square miles of mountainous terrain. In addition to the reservoir, 10 percent of the basin is made up of lake and swamp area. Elevations in the basin range from about 1720 feet to 2500 feet MSL. The drainage area includes Riga Lake and Dam which has a drainage area of 2.36 square miles. Calculation for storage of South Pond Dam includes no consideration for storage of Riga Pond Dam. The reservoir consists of about 138 acres at the normal (top of emergency spillway) pool elevation. No dwellings are located along the reservoir shores.

b. Discharge at Dam Site

(1) The outlet works for the reservoir consists of a 30 inch diameter pipe which is located approximately 10 feet below the principal spillway. Flow through the pipe is controlled by a gate valve at the intake side of the pipe with controls located in the gate house. The gate house is constructed above the upstream portion of the principal spillway as seen in Photo 1.

(2) There are no records of maximum discharge at the dam site, however, in 1955 water was reported to be within 8 to 10 inches of the crest of the dam. This would give a discharge of approximately 350 CFS.

(3) The spillway capacity with a water surface at the top of dam (elevation 1719.4') would be approximately 590 cfs.

(4) The total project discharge at the test flood elevation of 1721.5 feet is 3900 cfs.

c. Elevation (feet above MSL)

(1) Streambed at centerline of dam - 1700.4

(2) Maximum tailwater - N/A

(3) Upstream portal invert diversion tunnel - N/A

(4) Recreation pool - N/A

(5) Full flood control pool - N/A

(6) Spillway crest (permanent spillway)- 1716.3

(7) Design surcharge - unknown

(8) Top dam - 1719.4

(9) Test flood surcharge - 1721.5

d. Reservoir (miles)

(1) Length of maximum pool - 1.5

(2) Length of recreational pool - 1.5

(3) Length of flood control pool - N/A

e. Gross Storage (acre-feet)

(1) Recreation pool - 731

(2) Flood control pool - N/A

(3) Spillway crest pool - 731

(4) Top of dam - 1206

f. Reservoir Surface (acres)

(1) Recreation pool - N/A

(2) Flood control pool - N/A

(3) Spillway crest - 138

(4) Test flood pool - 169

(5) Top dam - 158

g. Dam

(1) Type - earthen

(2) Length - 300

(3) Height - 19

(4) Top width - variable (13 - 30 feet)

(5) Side slopes - Upstream: 2:1
Downstream: 2.5:1 and vertical stone walls.

(6) Zoning - unknown

(7) Impervious core - unknown

(8) Cutoff - unknown

(9) Grout curtain - unknown

(10) Other - unknown

h. Diversion and Regulating Tunnel. 30" reservoir drain pipe with gate. Outlet is approximately at elevation 1704 feet.

i. Spillway

		Principal	Emergency
(1)	Type	open channel	broadcrested
(2)	Length of weir	6 feet	39 feet
(3)	Crest elevation	1715.7 feet	1716.3 feet
(4)	Gates	none	none

		Principal	Emergency
(5)	Upstream channel	under water	under water
(6)	Downstream channel	concrete channel & cement rubble masonry training walls.	concrete channel & training walls

j. Regulating Outlets. The reservoir can be drained by a 30 inch outlet pipe set at approximately elevation 1704 feet. This pipe is controlled by a gate valve located at the upstream side of the pipe with the control in the gate house.

SECTION 2
ENGINEERING DATA

2.1 Design

According to the owner, the dam was constructed in 1803 and reconstructed in 1850. A major repair was made in 1957. The only drawing found was for the repair and this is shown in Appendix B. No in-depth engineering data were found for this dam.

2.2 Construction

No construction records were available for use in evaluating the dam.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. Other than the drawing described above, no additional engineering data was found to be available.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Validity. The lack of engineering plans and data eliminates a judgment of validity.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of South Pond Dam was made on April 23, 1979. The inspection team consisted of personnel from Philip W. Genovese & Associates, Inc. and Geotechnical Engineers, Inc. Representative of the Mount Riga Corporation, Mr. David Brazee, was also present during portions of the inspection. Inspection checklists, completed during the visual inspection, are included in Appendix A. At the time of inspection, the water level was approximately at the emergency spillway elevation. Water was passing over the spillway. The upstream face of the dam could only be inspected above this water level.

b. Dam. The dam consists of an earthen embankment with a vertical stone wall on the downstream slope about 300 feet long. The crest is at elevation 1719.4 feet according to the field survey.

Crest. The crest of the dam is covered with grass and generally tends to slope toward the reservoir. The surface is gently undulatory. No cracks were observed along the crest of the dam at the time of the inspection.

A despression up to a maximum depth of 1.5 feet was observed on the crest parallelling the right training wall of the center spillway and the downstream masonry wall abutting this training wall. (See Photo 12). This two-to-three foot-wide depression was 13 feet along the downstream wall and 9 feet along the training wall, sloping toward the juncture of the two walls. Another 3 foot square depression, 6 to 12 inches deep, was observed on the crest at the juncture of the same center spillway training wall and the right foundation wall for the gatehouse structure.

Upstream Face. The riprap on the upstream face is sparse and in poor condition. There was no riprap protection above the reservoir surface (El 1716 MSL) along the entire length of the dam. Three to five foot-wide areas of erosion were observed at the upstream side of the crest at approximately Stations 1+50, 1+65, and 2+00.

Downstream Face. The downstream face is a combination vertical stone wall and earth embankment. The masonry wall runs the length of the dam and varies in height from 1 to 7 feet measured down from the crest. The masonry wall is two tiered for about 20 feet to the left of the center spillway with the lower tier about 6

feet in height (see Photo 8). An earth embankment extends from the masonry wall on approximately a 1 (V) on 2.5 (H) slope to the toe of the dam. The depth to which the masonry wall extends below the surface of the earth embankment could not be determined during this inspection.

Three downstream bulges were observed in the vertical stone wall at approximately Stations 1+25, 2+25, and 2+60. These bulges appeared to have a maximum offset of approximately 2 to 3 feet from the probable general constructed arch of the dam.

A depression up to 3 feet deep was observed in the downstream embankment along the right training wall of the principal spillway. The depression is about 6 feet wide measured from the training wall and extends from the vertical stone wall of the dam to the downstream end of the training wall.

The downstream earth embankment is generally grassed. Brush growing on the face has been cut recently. Several 12 inch diameter tree stumps were observed at approximately Stations 0+70 and 1+60 near the bottom of the masonry wall. Erosion was observed at Station 0+56 just downstream of the left spillway right training wall. An 8 inch diameter animal hole was seen at Station 2+50 at the bottom of the masonry wall. Approximately 20% of the downstream earth embankment was snow covered at the time of inspection.

Standing water and rust staining were observed along the toe of the downstream embankment to the right of the center spillway. Slight water flow was observed, but the flow may be a result of the runoff associated with the melting snow cover. Possible seepage was also observed at the downstream toe at approximately Station 1+00, but this may also have been due to runoff from the melting snow.

Left Abutment. The emergency spillway is located at the left abutment. Some erosion was observed at the upstream end of the left concrete spillway training wall. A cavity extending back about 1 and 1/2 feet beneath the left spillway apron was observed at the right side of the left spillway (see Photos 3 and 4).

c. Appurtenant Structures. Visual inspection of the cement rubble masonry principal spillway, concrete emergency spillway, spillway channels and drain did not reveal any evidence of stability problems. The concrete channel surfaces and cement rubble masonry walls appeared to be in good condition.

The principal spillway structure shown in Photo 16 consists of a concrete channel with cement rubble masonry walls that appear to be in good condition. The emergency spillway structure shown in

Photos 1, 3, 4, 12 and 21 consists of a concrete channel and training walls that are in good condition.

The outlet works consists of a 30 inch pipe drain with a gate valve on the upstream side which is reported to be in operable condition. This conduit is located below the principal spillway and outlets at approximately elevation 1704 feet. The drain pipe and gate valve were below water and could not be inspected. A wood frame gatehouse, located above the 30 inch gate valve on the outlet pipe, is in good condition. See sketch in Appendix D, page 7.

The emergency spillway discharge channel is covered with brush, trees and debris. The principal spillway channel is clear of obstructions.

d. Reservoir Area. The reservoir area has mountainous terrain, partially wood covered. A more detailed description of the drainage area is included in Section 1.3 of this report. There was no development observed along the shoreline other than seasonally occupied cottages.

e. Downstream Channel. The downstream channels for the left and center spillway are irregular stream beds with cobbles and boulders. The channels join about 100 feet downstream from the downstream crest of the dam. Brush, trees, and debris were observed in the emergency spillway channel, while the principal channel is relatively clear of obstructions.

3.2 Evaluation

Based on visual inspection, the dam appears to be in fair condition. The following features could adversely affect the long term performance of the dam in the future.

a. The lack of adequate riprap on the upstream face at the splash zone will lead to further erosion of the embankment on the upstream face.

b. The tree roots remaining from the cut trees on the downstream slope can provide seepage paths for water from the reservoir if they extend back into the saturated zone of the dam.

c. The depressions on the crest and downstream slope along the right training wall and buttress wall of the center spillway may be due to erosion through the masonry walls or to piping action in the embankment.

d. The causes of bulging in the downstream masonry walls are not apparent. Bulges in the same areas were evident in the 1957 drawing.

e. The loss of foundation support beneath the concrete apron of the left spillway could lead to cracking of the apron and result in erosion of the embankment.

f. Animal burrows in the embankment could extend into the saturated zone allowing seepage.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedure

The dam creates an impoundment of the water which is used primarily for recreational purposes.

4.2 Maintenance of Dam

This dam is visited on a frequent basis by personnel of the Mount Riga Corporation. These visits are primarily for surveillance.

4.3 Maintenance of Operating Facilities

Maintenance on the operating facilities is done on an as required basis.

4.4 Description of Warning Systems

There are no warning systems in effect at this facility.

4.5 Evaluation

There is no current operating and maintenance procedure for the dam except for the practice of lowering the water level during and after storms to prevent overtopping of the dam. Maintenance and operational procedures are inadequate.

SECTION 5
HYDROLOGY AND HYDRAULIC ANALYSIS

5.1 Evaluation of Features

General. South Pond Dam consists of a 300 foot long earthen embankment with a concrete emergency spillway that is 39 feet long and a principal spillway of concrete and cement rubble masonry that is 6 feet long. The pool can be drained by a 30 inch gated pipe located below the principal spillway with an outlet at 1704 feet.

The principal spillway is located in the center portion of the embankment and the emergency spillway is located on the left abutment. The downstream channels from the spillways are joined approximately 100 feet downstream of the dam crest.

The drainage area of South Pond includes the drainage area of Riga Lake and Dam. Riga Lake drainage area is 2.36 square miles and South Pond drainage area is 1.07 square miles making the total drainage of South Pond 3.43 square miles.

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

b. Experience Data. The maximum discharge at this dam site is unknown. The maximum observed condition was reported to be 8 to 10 inches below the dam crest in 1955.

c. Visual Observations. No evidence of damage to any portion of the project from overtopping was visible at the time of the inspection.

d. Test Flood Analysis. As no detailed design and operational information is available, hydrologic evaluation was performed using dam information gathered by field inspection, watershed size and an estimated test flood equal to Probable Maximum Flood (PMF) as determined by guide curves issued by the Corps of Engineers. Based on a drainage area of 3.43 square miles, it was estimated that the test flood inflow at this dam would be 5145 cfs. Following the guidance for Estimating Effect of Surcharge Storage on Maximum Probable Discharges results in a test flood discharge of 3900 cfs. As the maximum spillway capacity at the top of the dam is 590 cfs, the spillway will not pass the PMF without overtopping the dam by 2.1 feet. Storage capability of Riga Lake Dam has not been considered in this test flood analysis.

The storage of Riga Lake Dam appears to be in the order of 500 acre-feet which is considered to be insignificant as far as attenuating capacity is concerned.

e. Dam Failure Analysis. The impact of failure of the dam at maximum pool (top of dam) was assessed using the "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers.

A major breach of dam would result in a flood wave approximately of an average height of 12 feet down Wachocastinook Creek to the village of Salisbury, Connecticut about 20,000 feet downstream. There are about thirty houses within the long, very steep and narrow valley downstream of the dam.

A summary of the flood wave routing is as follows:

Point	Distance D/S of Dam (ft)	Breaching Discharge (cfs)	Flood Elev. (MSL)	Depth (ft)	Velocity (fps)
Dam	--	13914	1713	13±	--
A - A	1300	13533	16701	10.1	12.3
B - B	4300	12881	1543.6	12.6	16
C - C	11300	11785	1022.2	12.2	21
D - D	15700	10861	855.9	7.9	14.1

The peak flow at section D - D is 78% of the breaching discharge volume at the dam and still has a very high velocity.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The visual observations did not disclose any immediate stability problems. In the absence of design drawings or documentation, it is not possible to determine whether the dam crest was constructed with an upstream slope and bulges in the downstream masonry wall, or whether these features are the result of post construction movements. It is also not apparent whether the depressions noted along the right side of the principal spillway are due to erosion, piping or poor placement of fill material.

b. Design and Construction Data. There is no design and construction data available relating to the stability of the embankment.

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

d. Post Construction Changes. The application for a construction permit submitted to the Connecticut State Board of Supervision of Dams on May 18, 1957, by the owner Mount Riga Inc. indicated that measures were to be undertaken to reinforce the then existing structure. It appears that fill was placed in front of the vertical stone wall to form the right side downstream embankment. In addition, a vertical stone buttress retaining wall was built along the right side of the center discharge channel to contain this fill. The application also called for filling of fissures on the crest with grout and the placing of impervious fill on the crest. It appears from the construction permit application that the fissures had formed at the location of bulges in the downstream masonry wall. Two of these bulges seem to coincide with the two bulges observed on the right side of the dam during this inspection. It is also possible that compacted fill was placed on the upstream face of the embankment to the right of the principal spillway as noted in the application plan. However, no plans were available which documented the post construction changes.

e. Seismic Stability. The dam is located in Seismic Zone 1, and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination indicates that the dam is in fair condition. The inspection revealed:

(1) Depressions up to 3 feet in depth on the downstream face and up to 1.5 feet in depth on the crest of the embankment.

(2) Erosion of the entire upstream face of the dam above the normal pool elevation and areas along the crest and adjacent to the emergency spillway training walls and under the channel floor.

(3) Bulges in the vertical stone wall on the downstream face of the embankment.

(4) Tree stumps and animal burrows on the downstream face of the embankment.

(5) Stained water at the toe of the downstream embankment that could be seepage.

(6) Brush, trees and debris in the emergency downstream spillway channel.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Urgency. This dam is in fair condition. The recommendations and remedial measures described in Sections 7.2 and 7.3 should be accomplished within one year after receipt of this Phase I Inspection Report by the owner.

d. Need for Additional Investigation. The findings of this inspection indicate that there is need for additional engineering analyses, input, and design.

7.2 Recommendations

The findings of the visual inspection and hydrologic and hydraulic analysis indicate that the owner should engage the services of a professional engineer to:

a. Investigate the apparent seepage along the toe of the downstream embankment to determine what type of seepage controls are required, if any.

b. Investigate the depressions on the crest and on the downstream embankment adjacent to the right training and buttress wall of the principal spillway to determine the cause of these depressions and what corrective actions are required.

c. Investigate the reason for the cavity formation beneath the concrete apron of the left spillway and supervise proper backfilling to provide support for the concrete apron.

d. Design measures to prevent erosion on the upstream face and supervise repair.

e. Supervise removal of tree stumps and roots on the embankment.

f. Conduct further hydrological and hydraulic studies (the spillway only passes 60% of the design flood).

7.3 Remedial Measures

a. Areas of erosion adjacent to the spillway training walls and along the crest should be backfilled and grassed.

b. The spillway channels should be cleared of trees and debris and protected against erosion.

c. The owner should maintain the proper vegetation on the downstream slope of the embankment.

d. The embankment should be inspected on a regular basis for animal burrows which should be properly backfilled.

e. An operational procedure and formal warning system for emergency conditions should be established. A surveillance program should be initiated during periods of unusually heavy rainfall.

f. An annual technical inspection program should be developed.

7.4 Alternatives

There are no practical alternatives to the recommendations in Sections 7.2 and 7.3.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT South Pond Dam

DATE April 23, 1979

TIME A.M.

WEATHER Fair - 60°F

W.S. ELEV. _____ U.S. ____ DN.S.

PARTY

1. Bob Jones Party Chief
2. Joe Engels Geotechnical
3. Richard Murdock "
4. Don Ballou Hydraulics/Hydrology

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

PROJECT FEATURE Dam Embankment NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	DAM EMBANKMENT	
	Crest Elevation Current Pool Elevation Maximum Impoundment to Date	
GEI	Surface Cracks	None observed
GEI	Pavement Condition	No pavement on crest
GEI	Movement or Settlement of Crest	Crest rather undulating tending to slope to upstream side.
GEI	Lateral Movement	Bulge downstream @ Sta 1+00 to 1+50, evident in downstream masonry wall. 2 ft. may offset bulge downstream @ 2+00 to 2+30 & 2+60 to 2+85.
GEI	Vertical Alignment	Good
GEI	Horizontal Alignment	Good
GEI	Condition at Abutment and at Concrete Structures	1.5 foot deep depressions on crest along the right center spillway training wall. Depression to 3 feet deep along right training wall of center spillway. 1-1/2 foot deep cavity beneath right side of left spillway concrete apron.
GEI	Indications of Movement of Structural Items on Slopes	None observed
GEI	Trespassing on Slopes	Minimal
GEI	Sloughing or Erosion of Slopes or Abutments	Erosion on upstream edge of crest at Sta. 0+00, 1+50, 1+65 and 2+00 and on downstream slope at 0+65.
GEI	Rock Slope Protection-Riprap Failures	Large animal hole at 2+50 on downstream slope at base of masonry wall. Riprap missing at many locations
GEI	Unusual Movement or Cracking at or Near Toe	None observed.

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

PROJECT FEATURE Dam Embankment NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	DAM EMBANKMENT - Continued	
GEI	Unusual Embankment or Downstream Seepage	Seep @ downstream toe @ contact Sta. 1+75 to 2+75, rust staining & wet, very slight to no flow observed. Seep @ downstream toe @ 1+00 very slight flow, may be snow melt.
GEI	Piping or Boils	None observed
GEI	Foundation Drainage Features	None observed
GEI	Toe Drains	None observed
GEI	Instrumentation System	None
GEI	Vegetation	Brush & trees have been recently cut, stumps to 12" diameter on downstream slope. Trees to 12" round @ downstream toe Sta. 0+00 to 1+75.

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

PROJECT FEATURE Other Embankment NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	DIKE EMBANKMENT	No dike present
	Crest Elevation	
	Current Pool Elevation	
	Maximum Impoundment to Date	
GEI	Surface Cracks	
GEI	Pavement Condition	
GEI	Movement or Settlement of Crest	
GEI	Lateral Movement	
GEI	Vertical Alignment	
GEI	Horizontal Alignment	
GEI	Condition at Abutment and at Concrete Structures	
GEI	Indications of Movement of Structural Items on Slopes	
GEI	Trespassing on Slopes	
GEI	Sloughing or Erosion of Slopes or Abutments	
GEI	Rock Slope Protection- Riprap Failures	
GEI	Unusual Movement or Cracking at or Near Toes	
GEI	Unusual Embankment or Downstream Seepage	
GEI	Piping or Boils	
GEI	Foundation Drainage Features	
GEI	Toe Drains	
GEI	Instrumentation System	
GEI	Vegetation	

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

PROJECT FEATURE Outlet Works-Intake NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
	a. Approach Channel	
GEI	Slope Conditions	Underwater, not observed
GEI	Bottom Conditions	
GEI	Rock Slides or Falls	
	Log Boom	
	Debris	
	Condition of Concrete Lining	
GEI	Drains or Weep Holes	
	b. Intake Structure	
	Condition of Concrete	
	Stop Logs and Slots	

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

PROJECT FEATURE Outlet Works - Control Tower NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	N/A
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

PROJECT FEATURE Outlet Works - Transition NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	N/A
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

PROJECT FEATURE Outlet Works- Channel NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	OUTLET WORKS -OUTLET STRUCTURE AND OUTLET CHANNEL	
	General Condition of Concrete	
	Rust or Staining	
	Spalling	
	Erosion or Cavitation	
	Visible Reinforcing	
	Any Seepage or Efflorescence	
	Condition at Joints	
GEI	Drain Holes	None
GEI	Channel	Irregular Shape Brook
GEI	Loose Rock or Trees Overhanging Channel	Brush & Trees up to 12" diameter overhanging channels.
GEI	Condition of Discharge Channel	Fair Condition

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

PROJECT FEATURE Outlet Works - Spillway NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
	a. Approach Channel	
GEI	General Condition	Underwater, not observed.
GEI	Loose Rock Overhanging Channel	None observed
GEI	Trees Overhanging Channel	None observed
GEI	Floor of Approach Channel	Underwater, not observed
	b. Weir and Training Walls	
	General Condition of Concrete	
	Rust or Staining	
	Spalling	
	Any Visible Reinforcing	
	Any Seepage or Efflorescence	
GEI	Drain Holes	None observed
	c. Discharge Channel	
GEI	General Condition	Fair, irregular shape brook
GEI	Loose Rock Overhanging Channel	None
GEI	Trees Overhanging Channel	Trees & brush up to 12" diameter overhanging channel.
GEI	Floor of Channel	
GEI	Other Obstructions	Fallen trees and growing brush to 8" diameter.

PERIODIC INSPECTION CHECKLIST

PROJECT: South Pond Dam DATE April 23, 1979

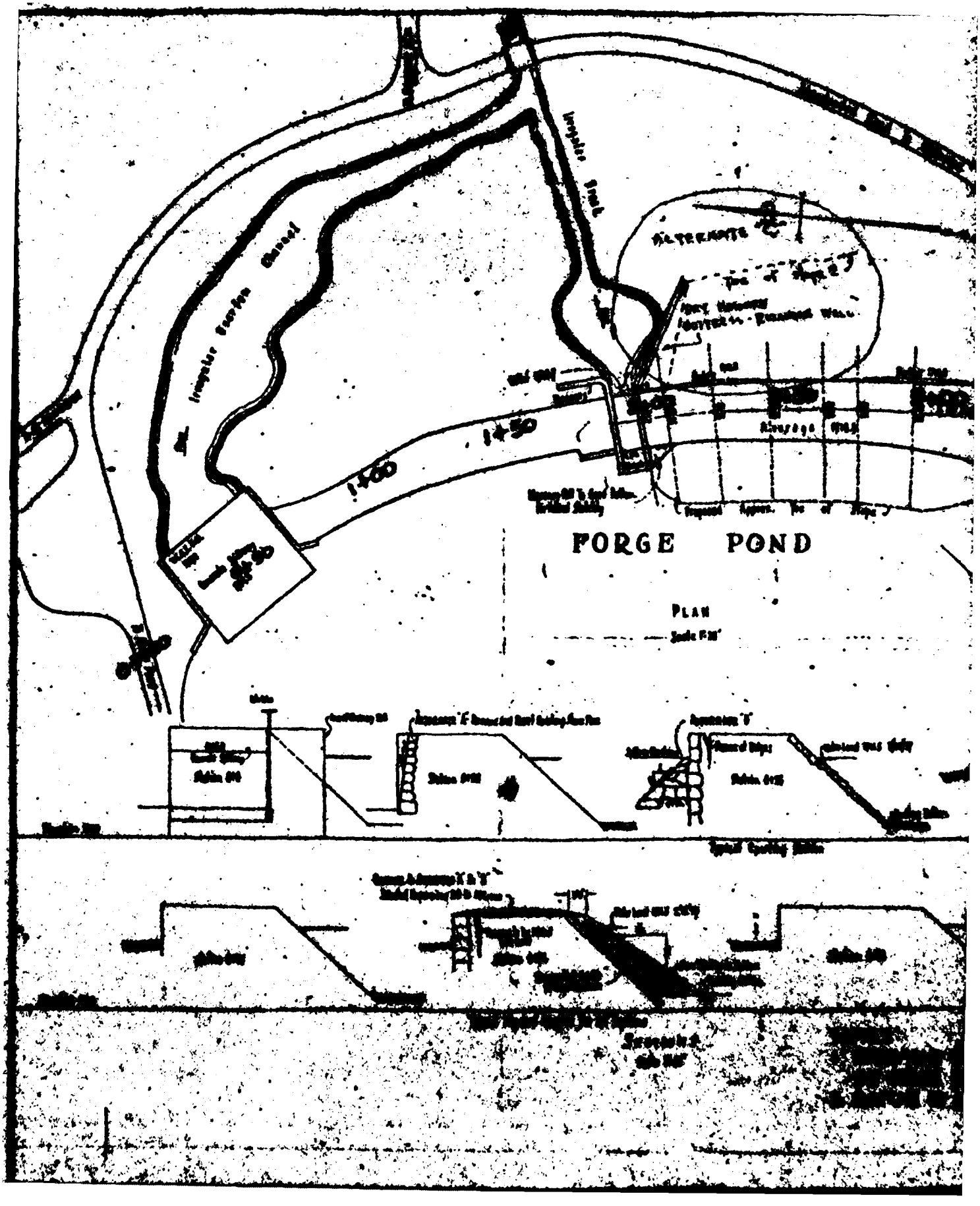
PROJECT FEATURE Outlet Works- Service Bridge NAME

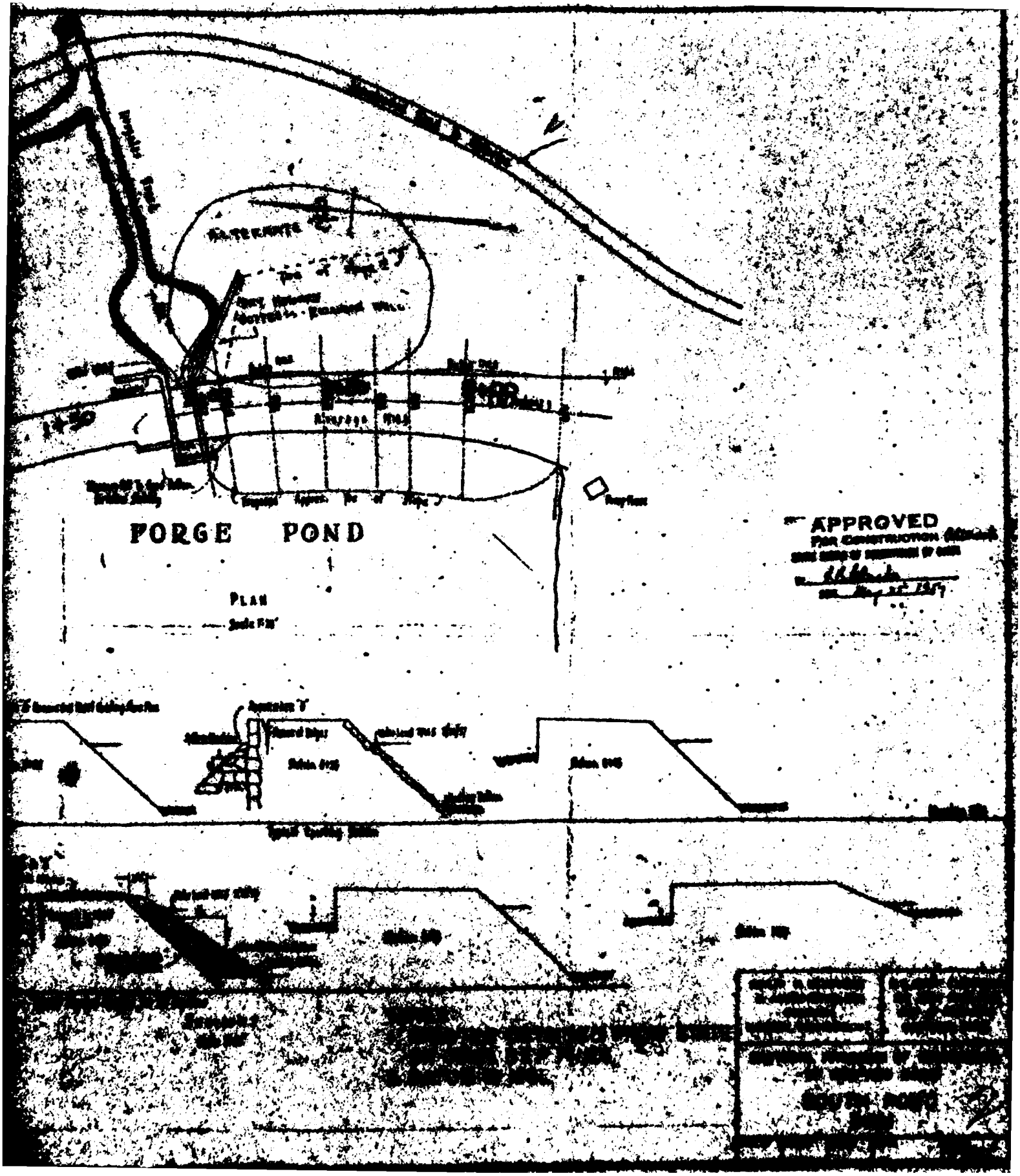
DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS-SERVICE BRIDGE	
a.Super Structure	N/A
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b.Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

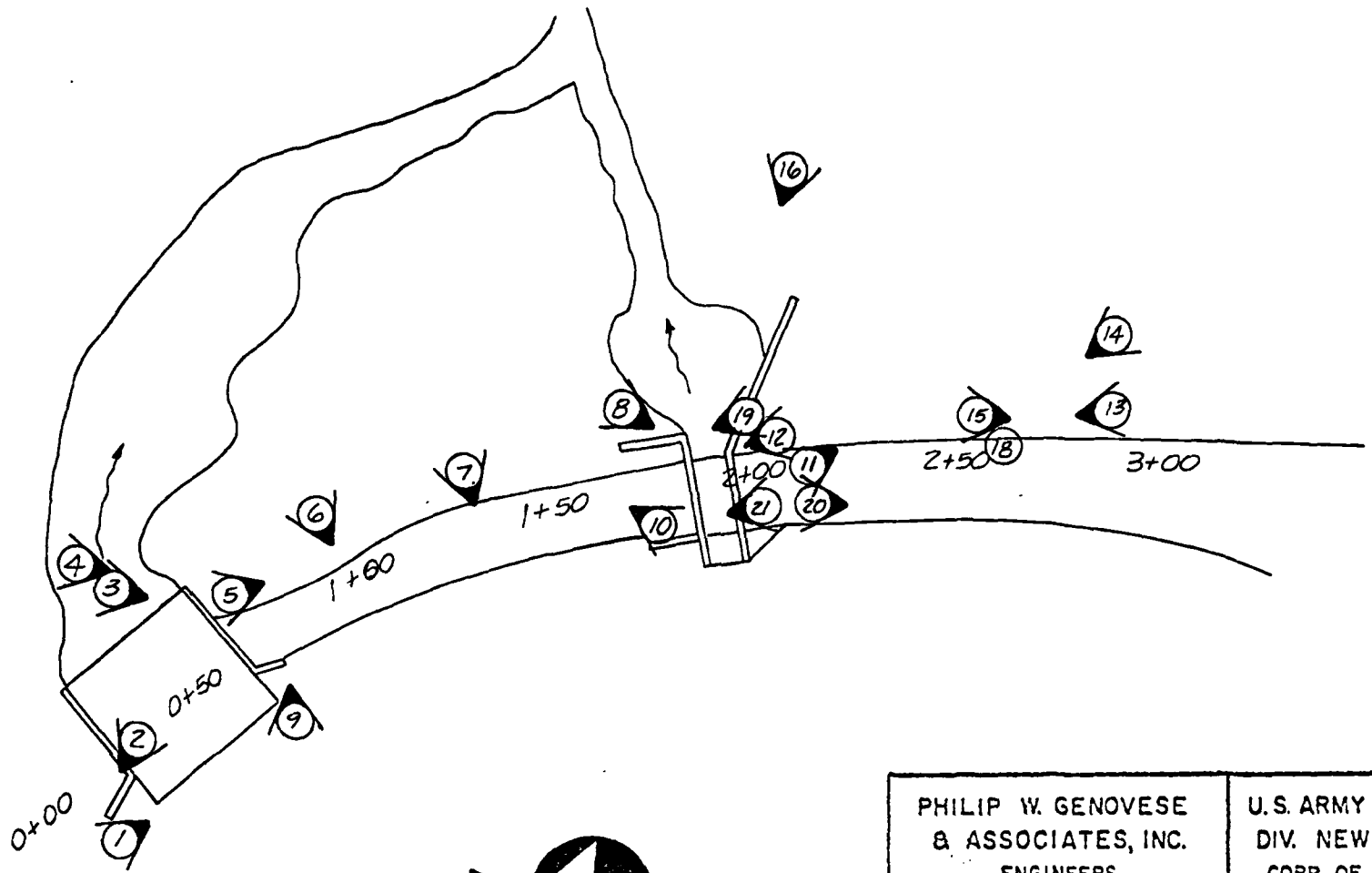
ENGINEERING DATA


FORGE POND
PLAN


FORGE POND
APPROVED
PLAN

APPENDIX C

PHOTOGRAPHS



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NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

SOUTH POND DAM

DWN BY	CKD BY	APP BY	DATE	SCALE
MJS	NRS	RLJ	2/21/79	N.T.S.

LEGEND

④ NUMBER REFERS TO CAPTION. ARROW INDICATES DIRECTION OF PHOTOGRAPH.

PHOTO NO. 1 - From left training wall adjacent to left abutment looking toward right side of dam. Note erosion of upstream face.

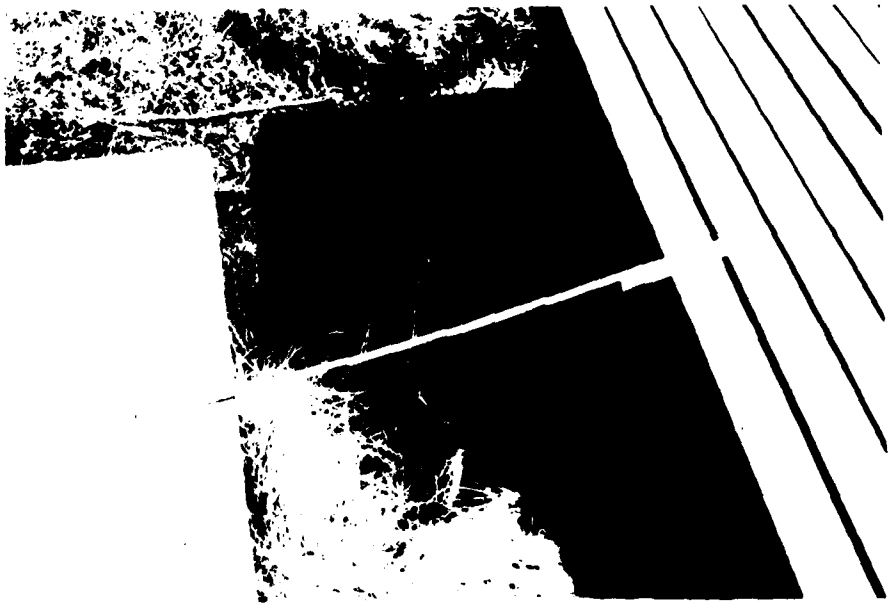


PHOTO NO. 2 - Station 0+00, erosion along the upstream face of dam adjacent to the left training wall of the left spillway. Wood structure (right) is portable dock.

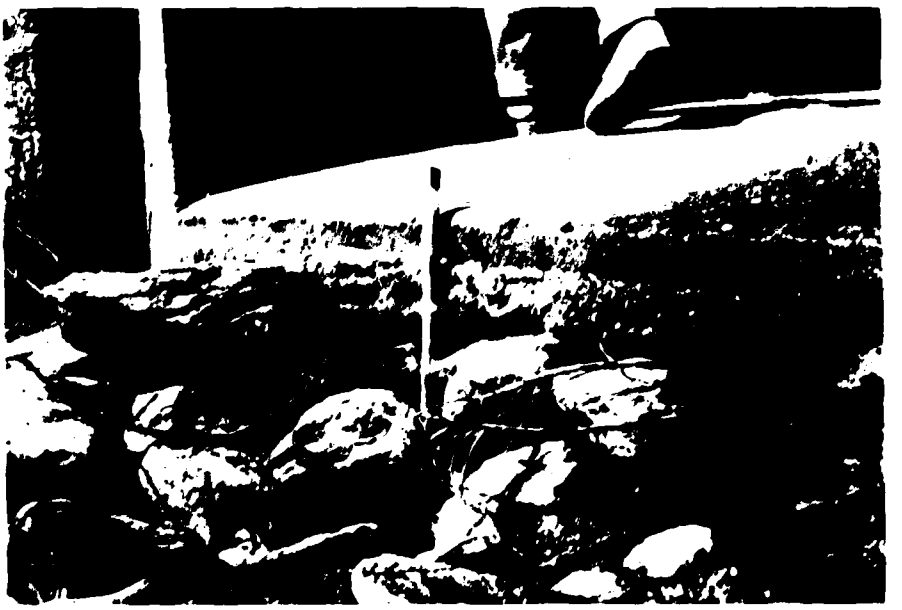


PHOTO NO. 3 - Station 0+56, erosion just downstream of the left spillway adjacent to the right training wall.

PHOTO NO. 4 - Station 0+56, erosion just downstream of the left spillway adjacent to the right training wall.

PHOTO NO. 5
Station 0+70
12" diameter
stump at the
base of the
vertical stone
masonry wall.

PHOTO NO. 6
Station 1+00, close up
of downstream stone
masonry wall, rule
extended six feet.

PHOTO NO. 7
Station 1+50, closeup of downstream stone masonry, rule extended 6 feet.

PHOTO NO. 8
Station 1+85, closeup of two tier vertical stone masonry wall adjacent to the left side of the center spillway.

PHOTO NO. 9 - Station 0+70, erosion along the upstream face adjacent to the right wing wall of the left spillway.

PHOTO NO. 10 - Station 1+90, depression feature along the crest adjacent to the downstream vertical stone wall, approximately 6 feet long and up to 1.5 feet deep.

PHOTO NO. 11 - Station 2+00, looking downstream at the toe along the right hand side of dam, note rust colored seepage.

PHOTO NO. 12 - Station 2+00, the upstream crest looking toward the upstream gate-house, depression just behind vertical stone wall in the foreground of the photo is up to 2 feet deep.

PHOTO NO. 13
Station 2+70 at downstream toe looking along the seepage zone toward the left side of the dam.

PHOTO NO. 14- Station 2+70 from toe of dam looking upstream at the downstream slope. Roof of gatehouse can be seen in the upper left corner.

PHOTO NO. 15- Station 2+50, from toe of dam looking toward right abutment, note rust colored seepage in the foreground.

PHOTO NO. 16- Station 2+00, taken upstream along center spillway channel.

PHOTO NO. 17 - From position along right abutment looking toward left side of dam.

PHOTO NO. 18 - Station 2+50, animal burrow, approximately 8" diameter, 2.5 feet deep just below the crest of the dam.

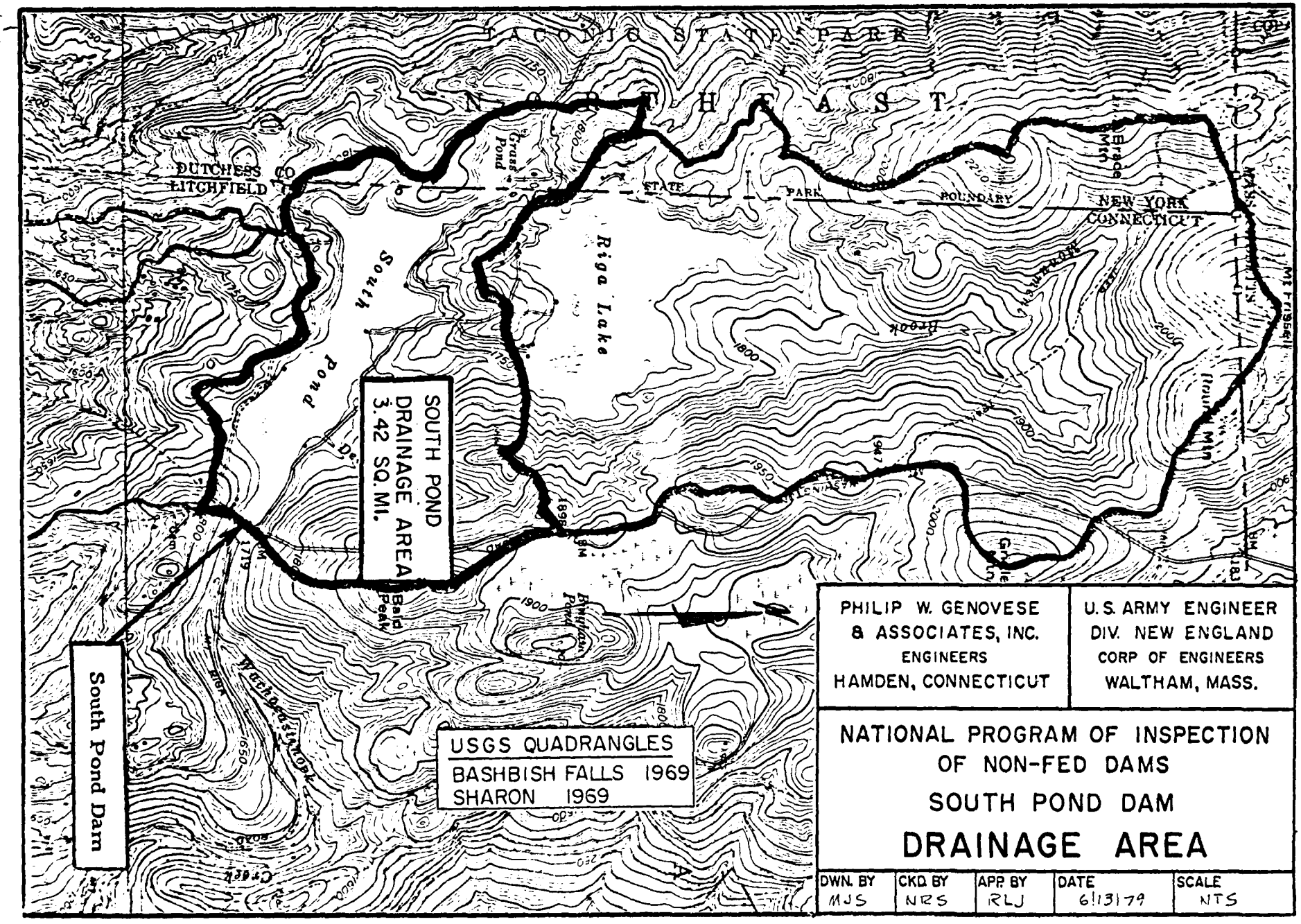
PHOTO NO. 19- Station 2+00, taken from position just below the crest looking along the downstream slope toward the left side of the dam, note vertical stone masonry wall.

PHOTO NO. 20 - Station 2+00, taken from position just below the crest looking along the downstream slope toward the right side of the dam.

PHOTO NO. 21 - Station 2+00, crest of dam at centerline looking toward left side.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



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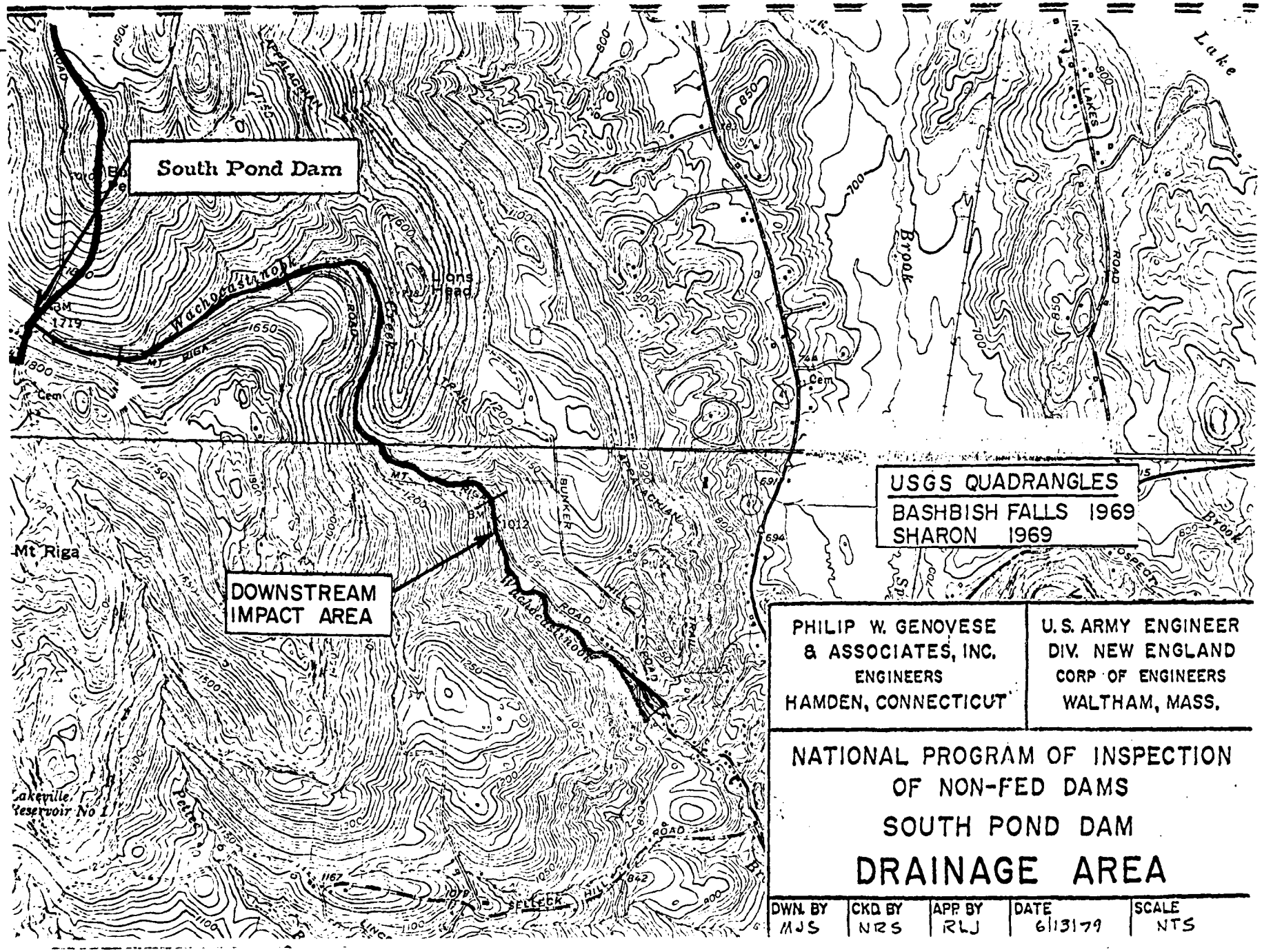
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

SOUTH POND DAM

DRAINAGE AREA

DWN. BY	CKD BY	APP. BY	DATE	SCALE
MJS	NRS	RLJ	6/13/79	NTS



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NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

SOUTH POND DAM

DRAINAGE AREA

DWN. BY	CKD BY	APP BY	DATE	SCALE
MJS	NRS	RLJ	6/13/79	NTS

Name	South Pond Dam
Location	Salisbury, Conn.
Drainage Area	3.43 sq-miles / 2195 acres
Spillway Crest	Elev 1716.3
Top of Dam	Elev 1719.4
Dam Height	19 Feet
Spillway Storage	475 Ac-Ft (No Freeboard)
Total Storage	1206 Ac-Ft (No Freeboard)
Size & Hazard	Intermediate & High
Test Flood (TF)	PMF
TF Runoff	19 inches
TF Peak Inflow	5,145 cfs
TF Volume	3,474 Ac-Ft
TF Peak Outflow	3,900 cfs
Peak Stage of TF Outflow	Elev 1721.5
Spillway Type	Broadcrested - concrete
Breaching Discharge	13,914 cfs
Reach Outflow	10,861 cfs (15,700' downstream)
Reach Outflow Flood Stage	Elev 855.9 (8' depth)

South Pond Dam
Salisbury, Conn

June 1979
D. T. Ballou

Evaluate the size and hazard classification of the dam in order to select the spillway Design Storm to be utilized as the "Test Flood"

Tables 1, 2 & 3 of the Nov 1976 OCE D.O.A. Guidelines will be utilized in arriving @ the required size & hazard classifications.

Size Classification

Top of Dam = Elev 1719.4 (USGS)
Low Point = Elev 1700.4
Dam Height = 19.0 feet

Reservoir area @ the spillway crest Elev of 1716.3 = 138 acres; ∴ the estimated volume below the spillway crest = $\frac{1}{3}bh = \frac{1}{3} \times 138 \times 15.9 =$ 731 Ac-Ft

Volume between the spwy crest & the top of dam = 475 Ac-Ft

Total storage = 1206 Ac-Ft

From table #1 of O.C.E. guides the storage governs & the size classification required is Intermediate

South Pond Dam

June 1979
D.T Ballou

Determin Hazard classification

The dam, located in the northwest corner of Salisbury, Conn., is serviced by a watershed area of 3.43 sq-miles. The drainage area is composed of two sections; Riga Lake with a drainage area of 2.36 sq-miles & South Pond with 1.07 sq-miles.

The Village of Salisbury is about 20,000 feet downstream of the dam, connected to the dam via Wachocastinook Creek and Mt Riga Road and Bunker Road. There is an elevation difference of about 1000 feet.

There are about thirty houses within the long, very steep, and very narrow valley that leads up to South Pond dam; with signs of continuing development.

As pointed out above there are two reservoirs & two dams, with Riga Lake D.A. being the largest. A failure of either dam would send a flood wave down the long, steep, narrow valley of Wachocastinook Creek that would carry right thru to the village of Salisbury due to the lack of storage capability of the valley.

Select a hazard classification of High

South Pond Dam

Test Flood

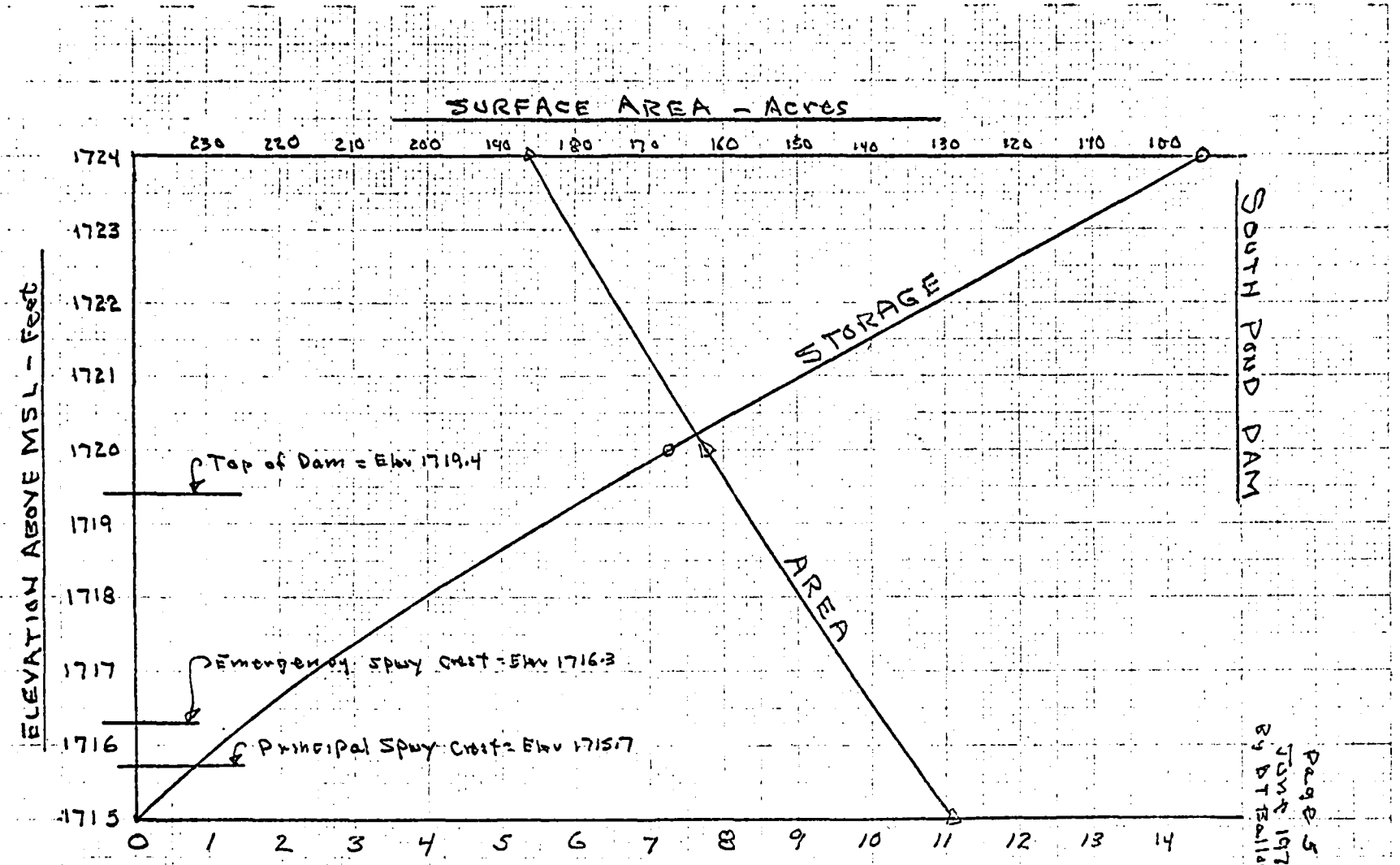
From table #3 of C.C.E. guides using a size classification of "Intermediate" and a hazard classification of "High" we find that "Spillway Design Flood" (SDF) the magnitude of the PMF is required.

The watershed area = 3.43 sq-miles
= 2,195 acres

Utilizing data furnished by the Comp. N.E.D. a unit test flood of 1500 cfs/sq-mile was selected

The Test Flood = 1500 cfs/mi x 3.43 mi = 5,145 cfs

Volume of Flood = 53.3 x 3.43 x 19" = 3474 AC-Ft
note that available spwy storage, with no freeboard = 475 AC-Ft



Note: Subtract 150 AC-Ft to obtain storage above Elev 1716.3 (This adjustment due to low flow capability of principal spwy)

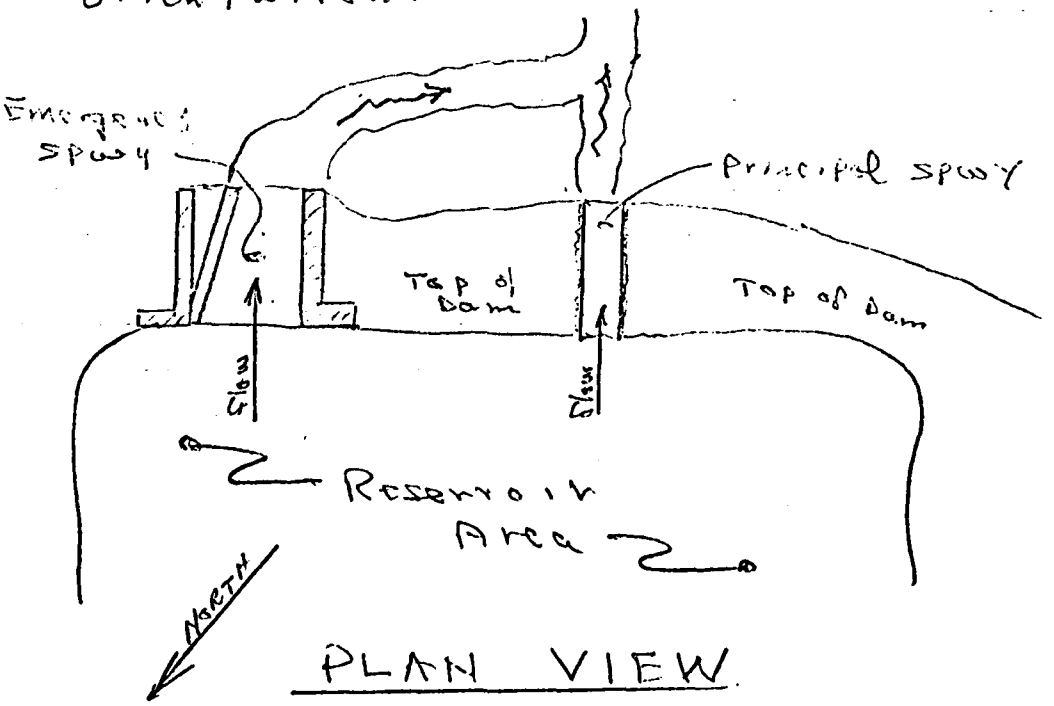
Page 5
June 1979
By BT Ballou

South Pond Dam

June 1979
D T Ballou

SERVICE SPILLWAYS

There are two overflow spillways, a 6' wide x 4'± high rectangular spwy located near the ℄ of the dam, and a 39' wide x 3'± high, altered rectangular spwy located adjacent to the left abutment of the dam. See following sketches for delineative dimensions. The larger spillway has a crest elevation about 6" higher than the smaller spwy ∴ therefore will be referred to as the Emergency spwy while the smaller spwy will be referred to as the principal spwy. See attached field sketches in rear of appendix D for orientation.



PLAN VIEW

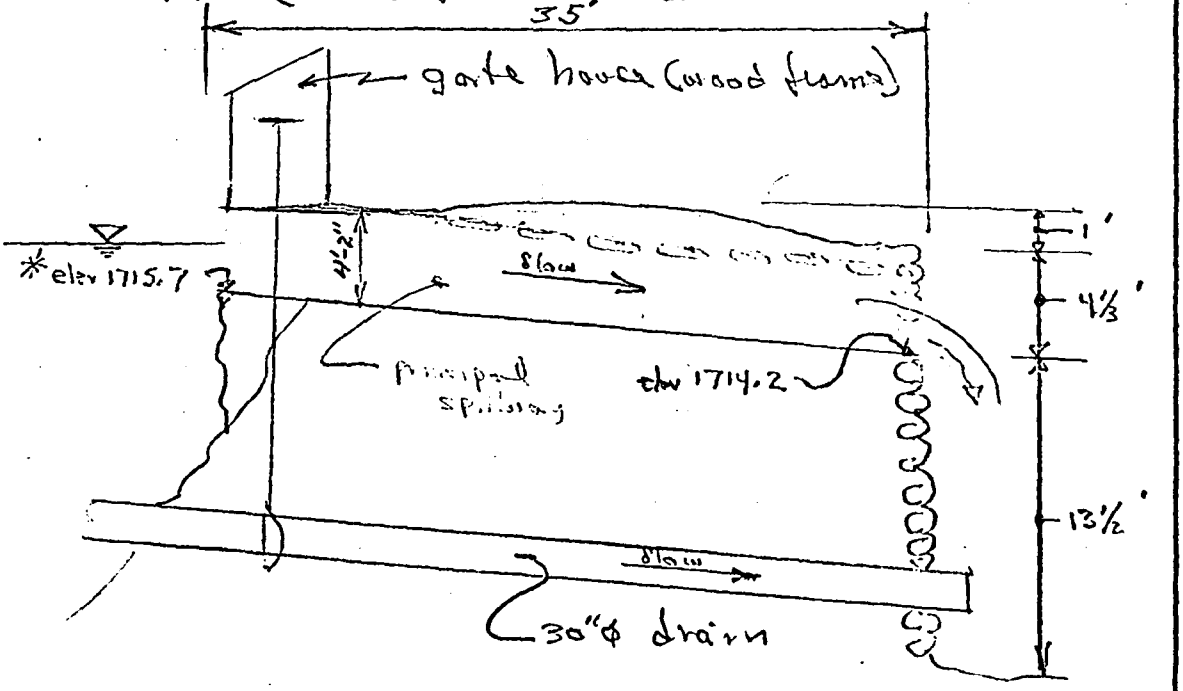
South Pond Dam

Service Spillways Continued
Principal Sp ~~ws~~.

Evaluate the principal spillway @ the approximate center of dam

The spillway is open-channel, 6 feet wide & has an average height of 4'-2". The sides are pargeted masonry rubble, the bottom appears to be concrete.

The 30"ϕ pipe that lies in the embankment below the spillway will not be evaluated hydraulically as it is a reservoir drain.



SECTION THRU SPILLWAY

* about 6 inches lower than emergency spillway that is located @ the left abutment.

South Pond Dam

June 1979

By DTBallou

Service Spillways Continued

Principal spwy Continued

Check for flow control:

Slope of spwy = (1715.7 − 1714.2)/35 = 0.043

Critical slope:

$S_c = 14.56\, n^2 / D_m^{1/3}$

$= 14.56\,(0.015)^2 / (6 \times 4/6)^{1/3} = 0.0021$ for $n = 0.015$

and $= 0.0082$ for $n = 0.030$

note: with depth = 1' the critical slope = 0.0033 (for n=0.015)
= 0.0131 (for n=0.030)

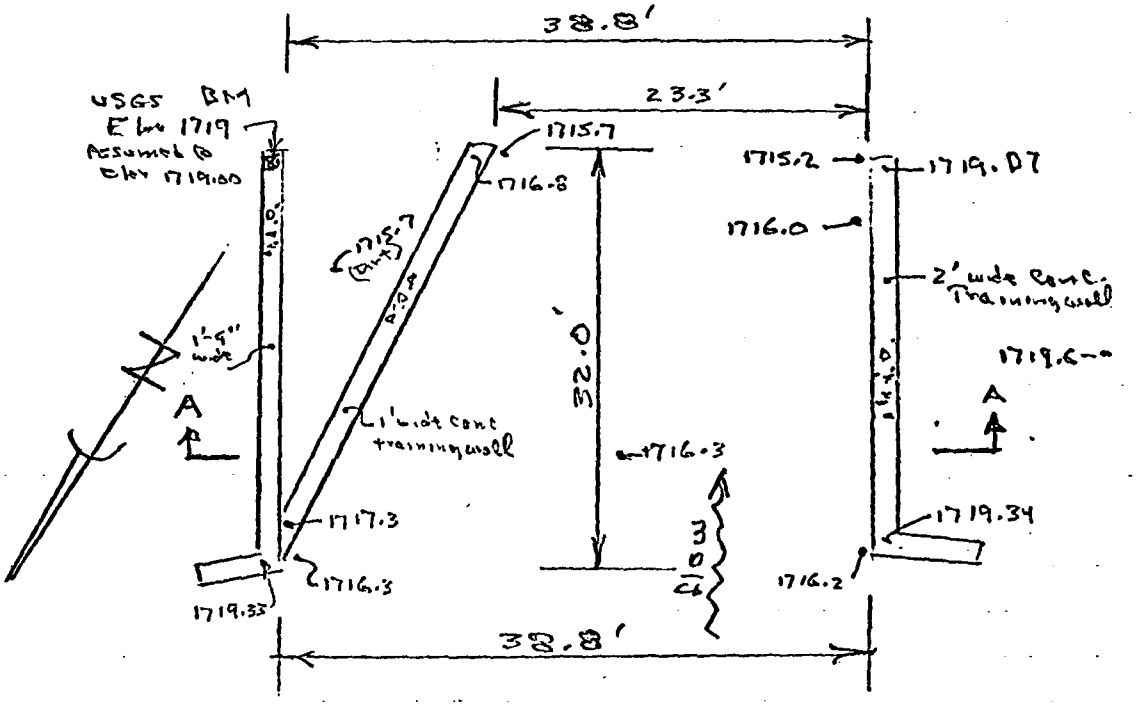
∴ control is @ inlet — treat as a broad crested weir, & use

$Q_p = C L H^{3/2}$ where $C = 2.7$, $L = 6$

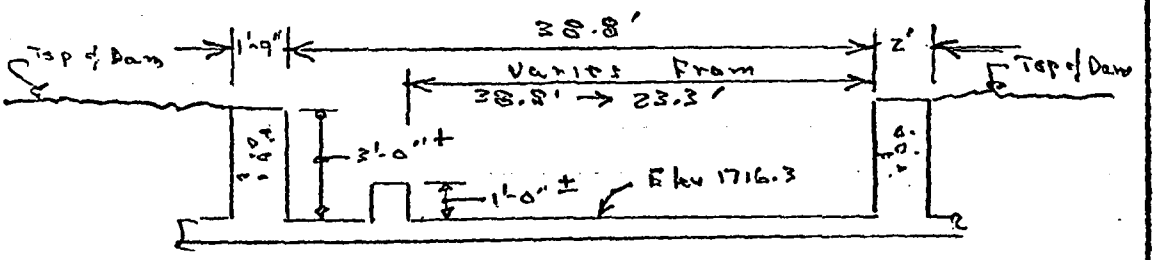
$Q_p = 2.7 \times 6 \times H^{3/2} = 16.2\, H^{3/2}$

South Pond Dam

Service Spillways Continued
Flashboard Spillway



PLAN VIEW



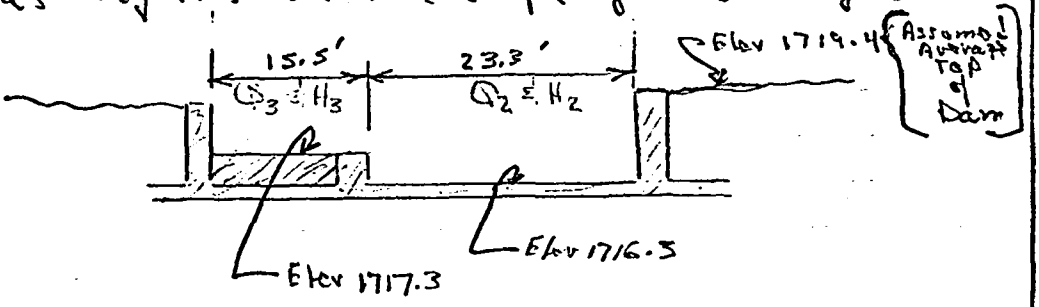
SECTION A-A
Looking Downstream

South Pond Dam

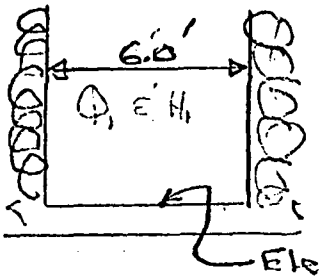
June 1979
D.T. Ballou

work up rating data ~~for~~ discharge via the principal spwy, emergency spwy & flow over the top of dam

Discharge thru the emergency spwy shall be treated in the following manner as regards to the scope of this analysis.



ELEVATION @ EMERGENCY SPWY
LOOKING DOWNSTREAM



ELEVATION @ PRINCIPAL SPWY
LOOKING DOWNSTREAM

Average Top of Dam will be taken @ Elevation 1719.4 & will yield Q_4 & H_4

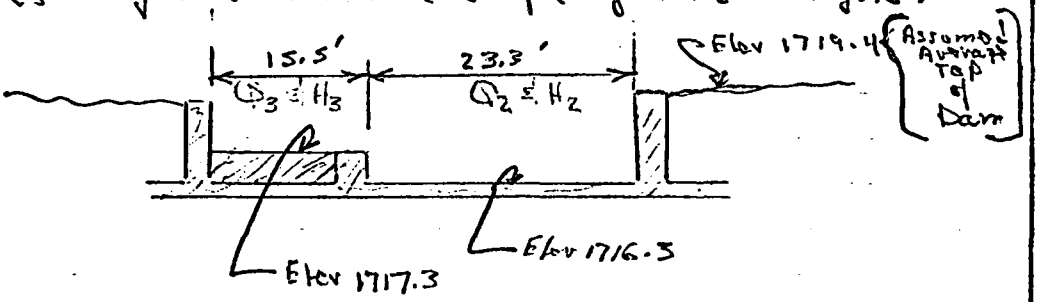
See calculations next page

South Pond Dam

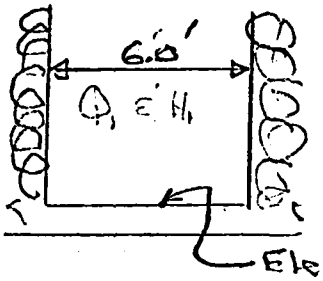
June 1979
D.T. Ballou

Work up rating data ~~for~~ discharge via the principal spwy, emergency spwy & flow over the top of dam

Discharge thru the emergency spwy shall be treated in the following manner as regards to the scope of this analysis.



ELEVATION @ EMERGENCY SPWY
Looking Downstream



ELEVATION @ PRINCIPAL SPWY
LOOKING DOWNSTREAM

Average Top of Dam will be taken @ Elevation 1719.4 & will yield $Q_4 \in H_4$

See calculations next page

South Pond Dam

Principal Spillway Discharge

$Q_1 = 2.7 \times 6 \times H_1^{3/2} = 16.2\, H_1^{3/2}$ (Ref elev = 1715.7)

Emergency Spillway Discharge

$Q_2 = 2.7 \times 23.0 \times H_2^{3/2} = 62.9\, H_2^{3/2}$ (Ref elev = 1716.3)

$Q_3 = 2.7 \times 15.5 \times H_3^{3/2} = 41.9\, H_3^{3/2}$ (Ref elev = 1717.3)

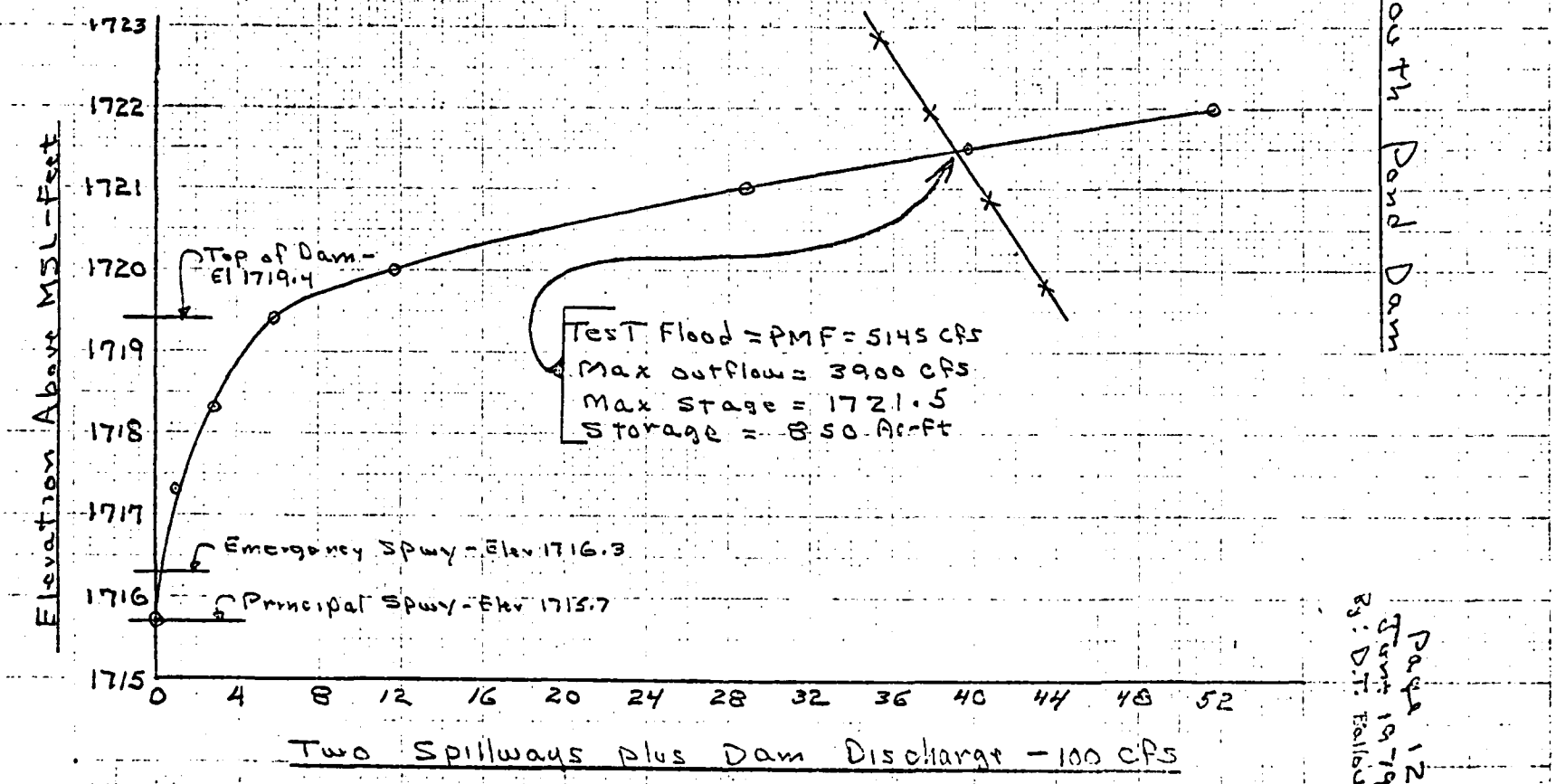
Flow over the Dam

$Q_4 = 2.7 \times 320 \times H_4^{3/2} = 864\, H^{3/2}$ (Ref elev = 1719.4)

Elev (ft)	See preceding page(s) for location of Discharge Heads				See preceding page(s) for Discharge Locations				ΣQ
	H_1 ft	H_2 ft	H_3 ft	H_4 ft	Q_1 cfs	Q_2 cfs	Q_3 cfs	Q_4 cfs	cfs
1715.7	—	—	—	—	—	—	—	—	—
1716.3	0.6	—	—	—	8	—	—	—	8
1717.3	1.6	1.0	—	—	33	63	—	—	96
1718.3	2.6	2.0	1.0	—	68	178	42	—	288
1719.4	3.7	3.1	2.1	—	115	343	128	—	586
1720.0	4.3	3.7	2.7	0.6	144	448	186	402	1,180
1721.0	5.3	4.7	3.7	1.6	198	641	298	1749	2,886
1721.5	5.8	5.2	4.2	2.1	226	746	361	2629	3,962
1722.0	6.3	5.7	4.7	2.6	256	856	427	3622	5,161

For evaluation of dam in terms of Volumes & routings the spillway crest will be taken as 1716.3

See next page for discharge curve



Page 12
Sheet 19-19
By: D.T. Ballou

South Pond Dam

June 1979
D T Ballou

Short-cut routing of Test Flood (PMF = 5,145 cfs)

1. Select surcharge storage associated with Q = 5,145 cfs which is Q_{P_1}
2. From stage-discharge curve, page 12, for Q_{P_1} = 5,145 cfs we obtain Elev 1721.95
3. From the stage-storage curve, page 5, we obtain 1080 − 150 = 930 Ac-Ft for elev 1721.95 (do not forget to subtract 150 Ac-Ft from curve reading, & do not forget to add back in to Column ③ below)

$$\frac{930 \text{ Ac-Ft}}{2195 \text{ Acres}} \times 12 \text{ "/ft} = 5.08 \text{ inches of R.O.} = \text{Stor}(i)$$

$$Q_{P_i} = Q_{P_1}\left(1 - \frac{\text{Stor}(i)}{19"}\right)$$

(Stor(i): inches; 19": R.O. from P.M.F.)

① Stor(i) inches	② $\left(1 - \frac{\text{Stor}(i)}{19"}\right)$	③ Stor(i) Ac-Ft ① x Area	④ Q_{R_i} cfs ② x 5,145 cfs	⑤ Elev. From Page 5 for Col. ③ Plus 150 Ac-Ft
5.08	0.732	930 (1080)*	3,768	1721.95
6.00	0.684	1098 (1248)*	3,520	1722.87
4.00	0.790	732 (882)*	4,062	1720.85
3.00	0.842	549 (699)*	4,333	1719.82

* col ③ + 150 Ac-Ft = 732 + 150 = 882 Ac-ft for use in col ⑤

Plots of Columns ④ & ⑤ are found on page 12

Note that Test flood overtopped dam by 2.1 feet

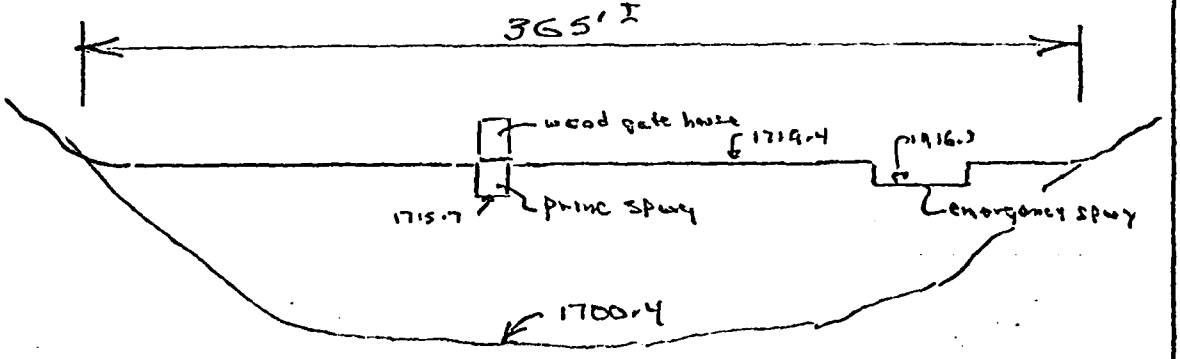
$$\frac{\text{Spwy Q @ El 1719.4}}{\text{Test Flood}} = \frac{586}{5145} = 11.4\%$$

$$\frac{\text{Spwy Q @ 1721.5}}{\text{Test Flood}} = \frac{1333}{5145} = 25.9\%$$

South Pond Dam

June 1979
D.T. Ballou

Estimate Dam Breaching Discharge



VERTICAL SECTION @ ℄ DAM
Looking upstream

Dam width @ midheight ≅ 250'
Failure width = 40% × 250 = 100' = W_b
Y_o = Elev 1719.4 − 1700.4 = 19'

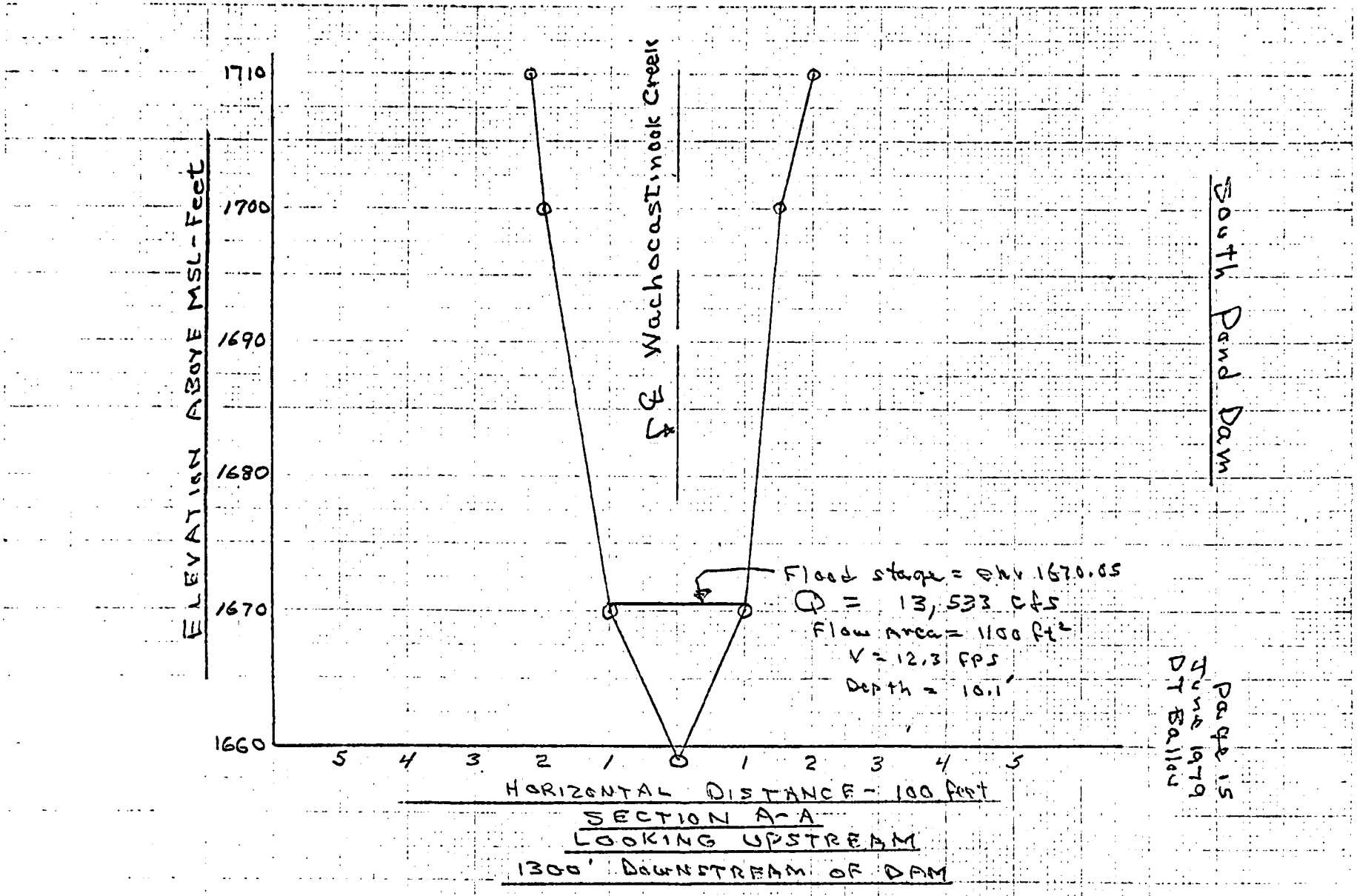
Peak Failure Outflow = $\frac{8}{27} \times W_b \times g^{1/2} \times Y_o^{3/2} = Q_{p_1}$

$Q_{p_1} = 8/27 \times 100 \times 32.2^{1/2} \times 19^{3/2}$
(32.2^{1/2} ∠ 5.67; 19^{3/2} ∠ 82.8)

$= 13{,}914$ cfs

Failure wave @ dam has height ≅ $\frac{2}{3} Y_o \cong 12'$.

Perform downstream Routing of wave & storage behind dam of 1,206 Ac-ft



SECTION A-A
LOOKING UPSTREAM
1300' DOWNSTREAM OF DAM

Page 15
4 Jun 1979
DT Ballou

South Pond Dam

June 1979
D T Ballou

Work up rating curve for Section A-A which is 1300' downstream of dam

Use $Q = A \frac{1.49}{n} R^{2/3} S^{1/2}$

where $n = 0.060$

$S = (1700 - 1660)/1300' = 0.031$

$S^{1/2} = 0.175$

and

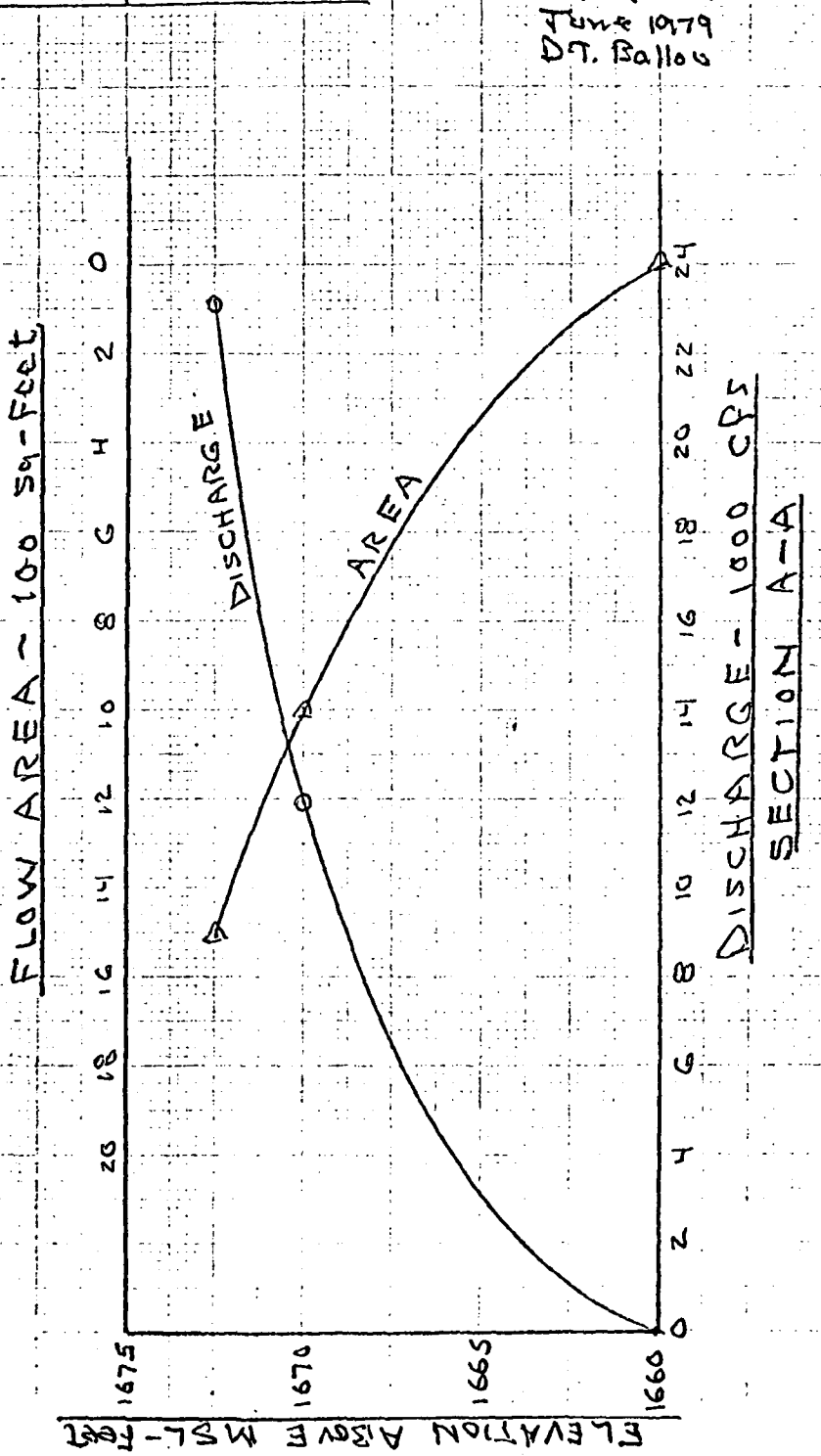
$Q = A \frac{1.49}{0.060} R^{2/3} \times .175 = 4.36 AR^{2/3}$

Elev	Area ft^2	Wp ft	R ft	$R^{2/3}$	Q cfs
1660	—	—	—	—	—
1670	1000	220	4.55	2.74	11,962
1672.5	1513	230	6.58	3.51	23,156

See plots next page

SOUTH POND DAM

Page 17
June 1979
DT. Ballou



South Pond Dam

June 1979
By D.T. Ballou

Routing of flood wave by short-cut method from dam → Section A-A which is 1300' downstream of the dam

From page 14, Q_{p_1} = 13,914 cfs
Storage @ time of breach = 1206 Ac-Ft

From page 17 for Q_{p_1} we obtain elev 1670.07 E', 1120 ft² of flow area

Reach length = 1300', ∴ V_1 in the reach = 1300 × 1120 / 43560 = 33 Ac-Ft

Trial $Q_{p_2} = Q_{p_1}\left(1 - \frac{V_1}{S}\right) = 13{,}914\left(1 - \frac{33}{1206}\right)$ = 13,533 cfs

Using Q_{p_2} E' → back to page 17 we obtain elev 1670.05 E', 1100 ft² flow area
∴ V_2 = 1300 × 1100 / 43560 = 33 Ac-ft

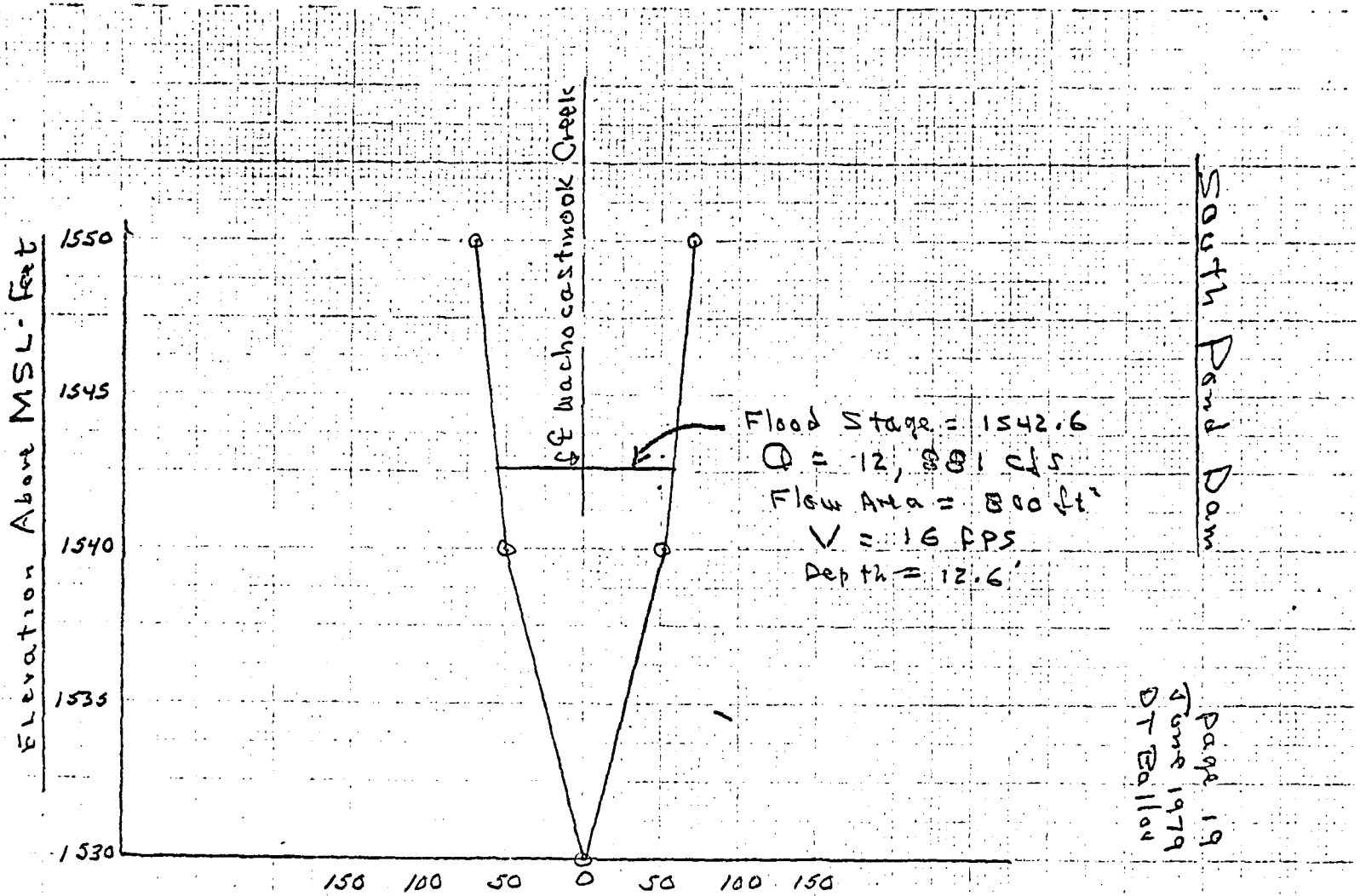
Recomputed $Q_{p_2} = 13{,}914\left(1 - \frac{(33+33)/2}{1206}\right]$ = 13,533 cfs which is the same as Trial Q_{p_2} — This is so because of lack of storage affect from valley that flood is passing thru

Finally:

use Q_{p_2} = 13,533 cfs
flood stage = 1670.05
for data @ Section — A-A

Storage Remaining = 1206 − 33 = 1173 Ac-Ft

Take another section downstream E' use a much longer reach.



Section B-B
Looking Upstream
4300' downstream of dam

South Pond Dam

June 1979
D.T. Ballou

Work up rating curve for Section B-B which is 4300' downstream of dam E, 3000' downstream of Section A-A

$$Q = A \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$n = 0.060$$

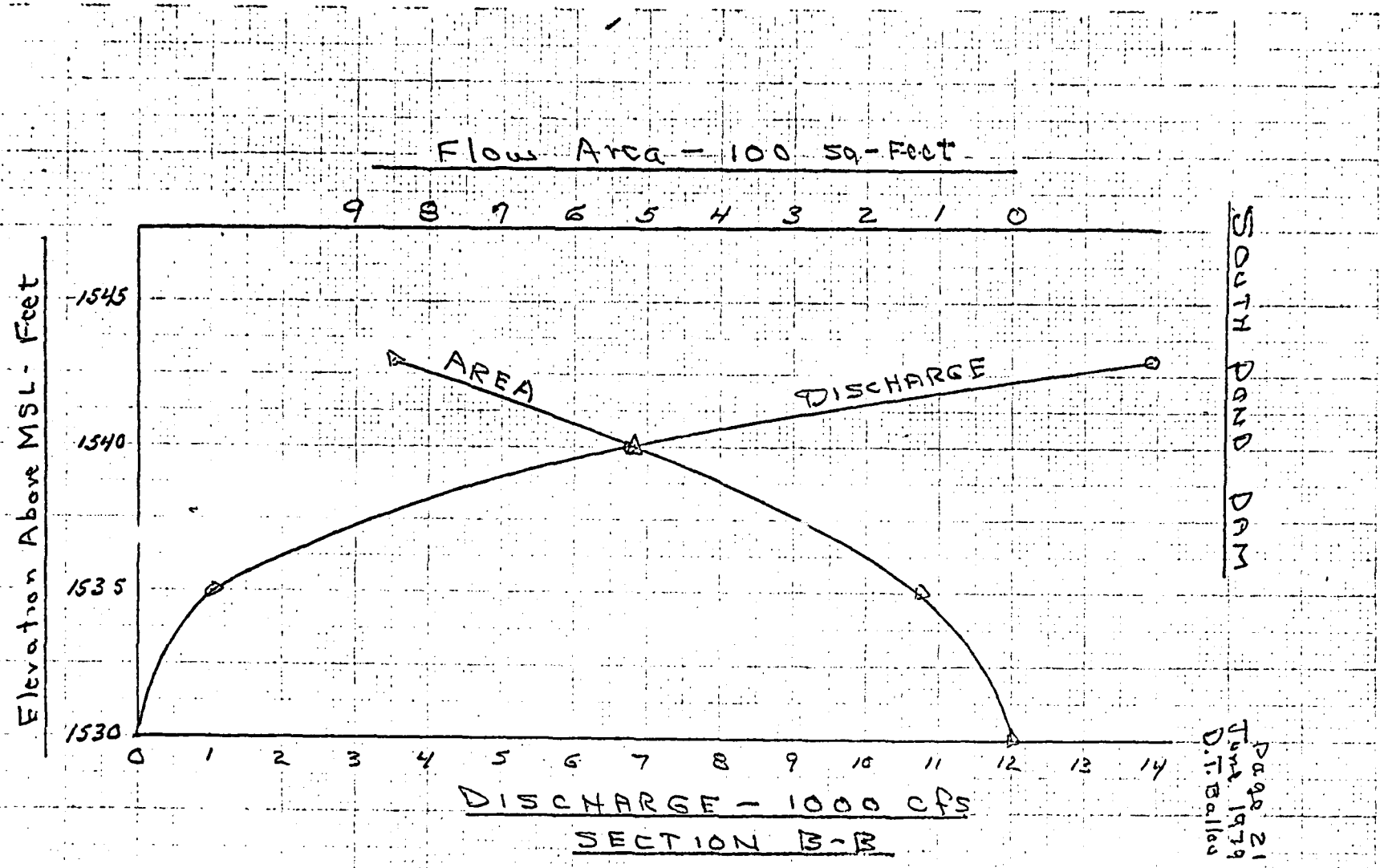
$$S = (1660 - 1530)/3000' = 0.040$$

$$S^{1/2} = 0.200$$

$$Q = A \frac{1.49}{0.060} R^{2/3} 0.20 = 4.97 A R^{2/3}$$

Elev	Area ft^2	WP ft	R ft	$R^{2/3}$	Q cfs
1530	—	—	—	—	—
1535	125	60	2.08	1.63	1,013
1540	520	124	4.19	2.60	6,720
1542	736	134	5.49	3.11	11,386
1543	848	141	6.01	3.31	13,936

see plots next page


Flow Area - 100 sq-Feet
9 8 7 6 5 4 3 2 1 0
Elevation Above MSL - Feet
1545
1540
1535
1530
AREA
DISCHARGE
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
DISCHARGE - 1000 cfs
SECTION B-B
SOUTH POND DAM
Page 21
Feb 1979
D.T. Ballou

South Pond Dam

June 1979
D.T. Ballou

Continue routing of flood wave by short-cut method from Section A-A → Section B-B which is 3000' downstream from A-A.

From page 18, Q_{p_1} = 13,533 cfs & remaining storage = 1173 Ac-Ft.

From page 21 for Q_{p_1} we obtain Elev 1542.8 & 840 ft² of flow area

Reach length = 3000', ∴ $V_1 = 3000 \times 840 / 43{,}560 =$ 58 Ac-Ft

Trial $Q_{p_2} = Q_{p_1}(1 - V_1/5) = 13{,}533(1 - \frac{58}{1173}) = 12{,}864$ cfs

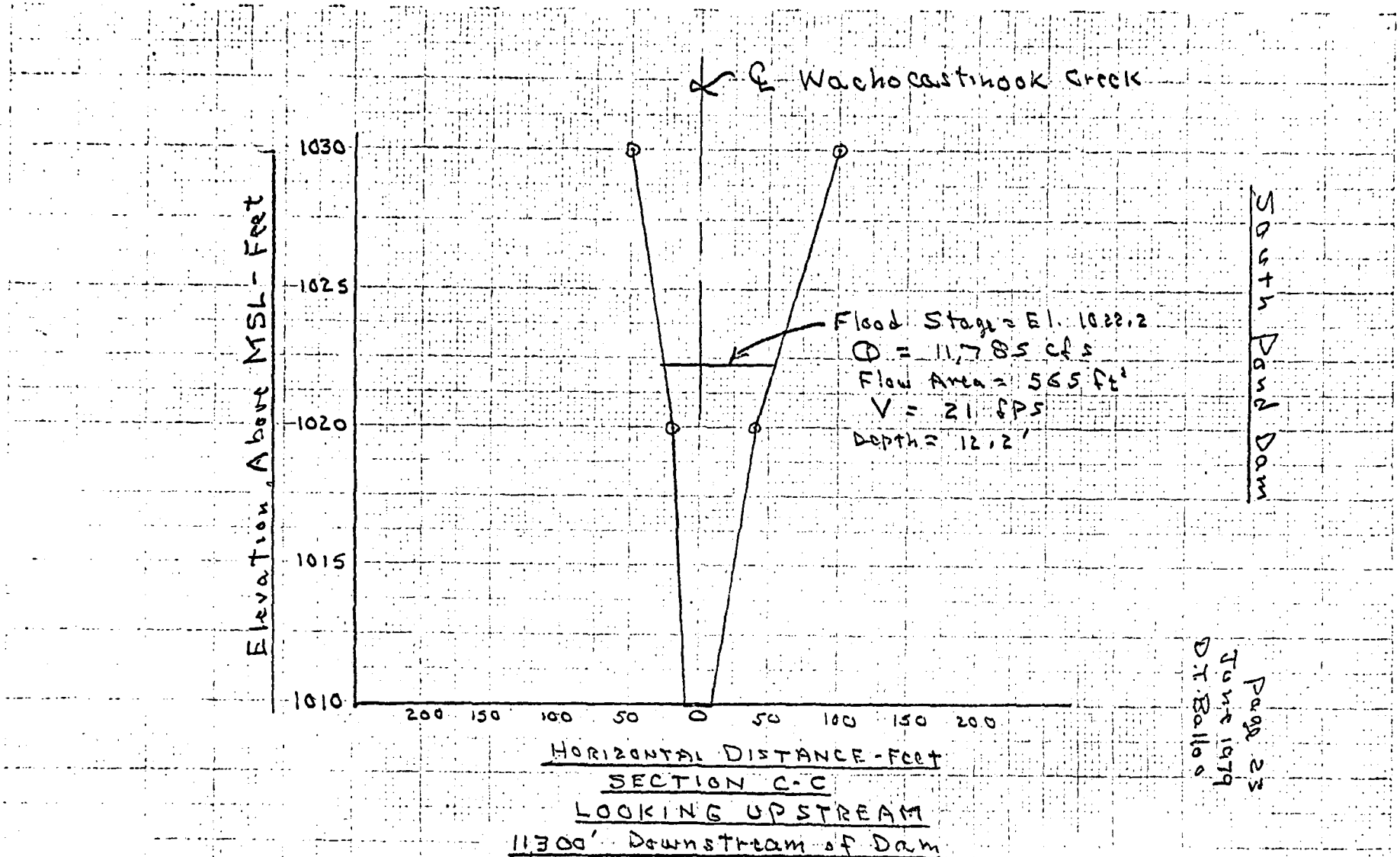
Using Q_{p_2} & going back → page 21 we obtain elev 1542.6 & 800 ft² — 0%
$V_2 = 3000 \times 800 / 43560 = 55$ Ac-Ft

Recomputed $Q_{p_2} = 13533\left(1 - \frac{(55+58)/2}{1173}\right] = 12{,}881$ cfs

Finally:

Q_p = 12,881 cfs
Stage = 1542.6
Remaining Storage = 1173 − 57 = 1116 Ac-Ft

Take another Section



SECTION C-C
LOOKING UPSTREAM
11300' Downstream of Dam

Page 25
June 1979
D.T. Ballo

South Pond Dam

Page 24
June 1979
D.T. Ballou

Work up rating curve for Section C-C which = 11,300' downstream of dam & 7000' downstream of Section B-B

$$Q = A \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$n = 0.060$$

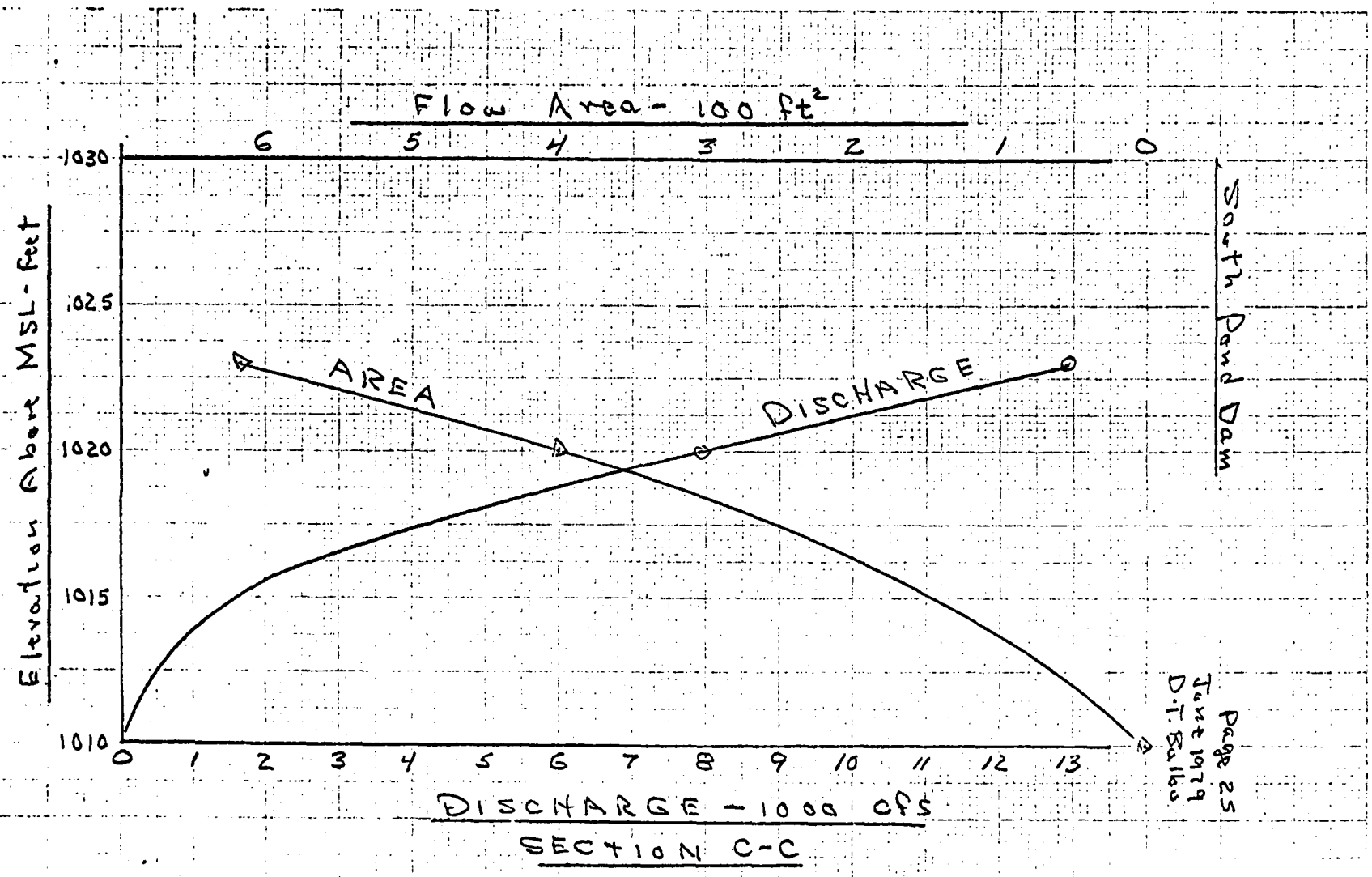
$$S = (1330 - 1010)/7000 = 0.074$$

$$S^{1/2} = 0.273$$

$$Q = A \frac{1.49}{0.060} R^{2/3} \times 0.273 = 6.78 A R^{2/3}$$

Elev	Area ft^2	WP ft	R ft	$R^{2/3}$	Q cfs
1010	—	—	—	—	—
1020	400	80	5.00	2.92	7,929
1022.5	575	97	5.93	3.28	12,769
1023.0	618	114	5.42	3.09	12,928

See plots next page


Flow Area - 100 ft²
6
5
4
3
2
1
0
1030
1025
1020
1015
1010
Elevation Above MSL - Feet
AREA
DISCHARGE
0
1
2
3
4
5
6
7
8
9
10
11
12
13
DISCHARGE - 1000 CFS
SECTION C-C
South Pond Dam
Page 25
June 1979
D.T. Bulbo

South Pond Dam

Continue routing flood wave from Section B-B to Section C-C which is 7000' downstream of B-B.

From page 22, Q_{p_1} = 12,881 cfs
Remaining Storage = 1116 Ac-ft

From page 25 for Q_{p_1} = 12,881 cfs we obtain Elev 1022.8 E', 615 ft² of flow area

Reach length = 7000', ∴ V_1 = 7000 × 615/43560 = 99 Ac-Ft

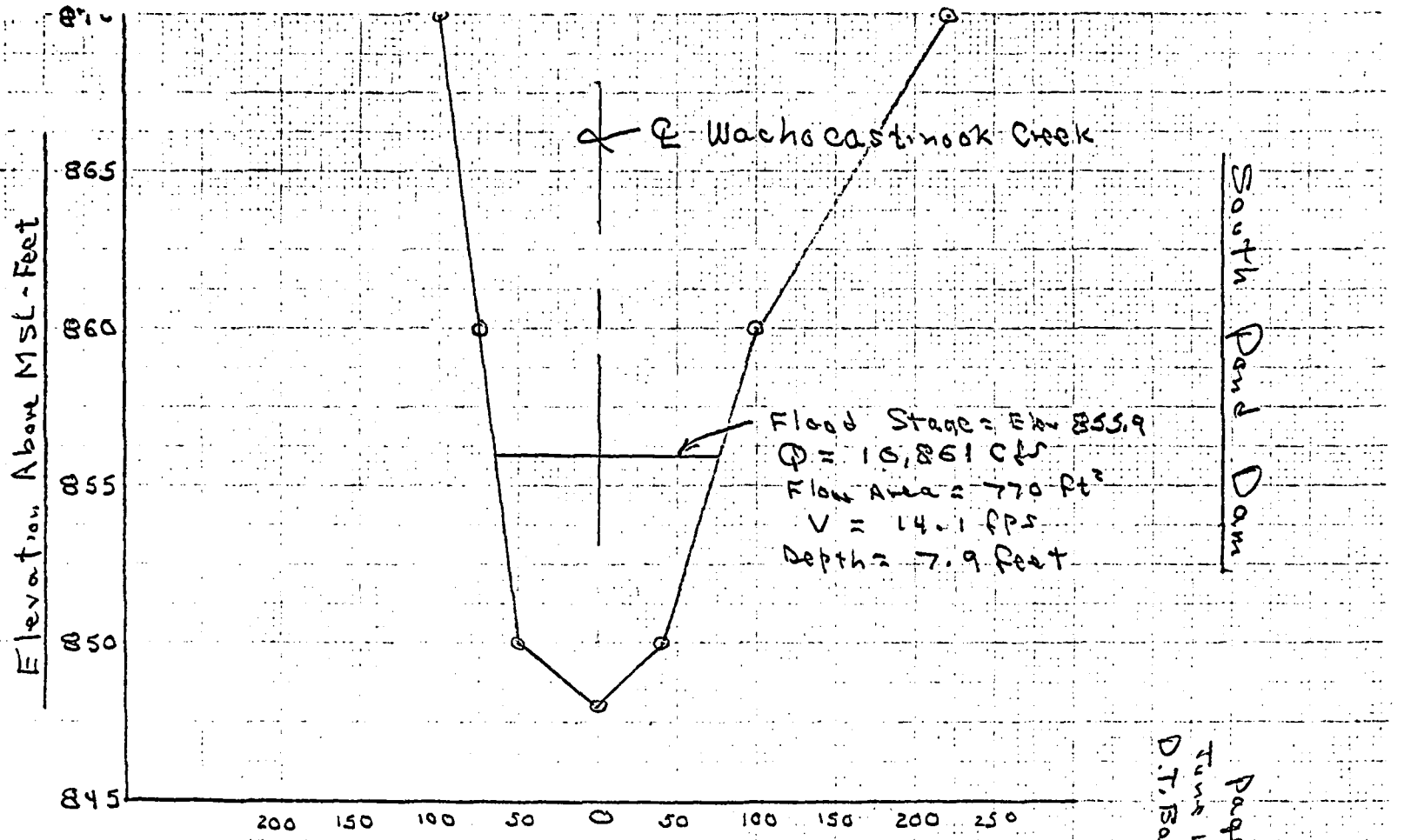
Trial $Q_{p_2} = Q_{p_1}(1 - V_1/S) = 12{,}881\left(1 - \frac{99}{1116}\right)$ = 11,738 cfs

Using Trial Q_{p_2} & re-entering page 25 we obtain Elev 1022.25 E', 565 ft² ∴
V_2 = 7000 × 565/43560 = 91 Ac-ft

Recomputed $Q_{p_2} = 12881\left(1 - \frac{(91+99)/2}{1116}\right)$ = 11,785 cfs

finally:

Q_{p_2} = 11,785 cfs
Flood Stage = El 1022.25
Flow Area = 565 ft²
Remaining Storage = 1116 - 95 = 1021 Ac-ft



Section D-D

Looking Upstream

15,700 feet Downstream of Dam

Page 27

June 1979

D.T. Ballou

South Pond Dam

June 1979
D. T. Ballou

Work Up Rating Curve for Section D-D, which is 4400' downstream of section C-C

$$Q = A \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$n = 0.060$$

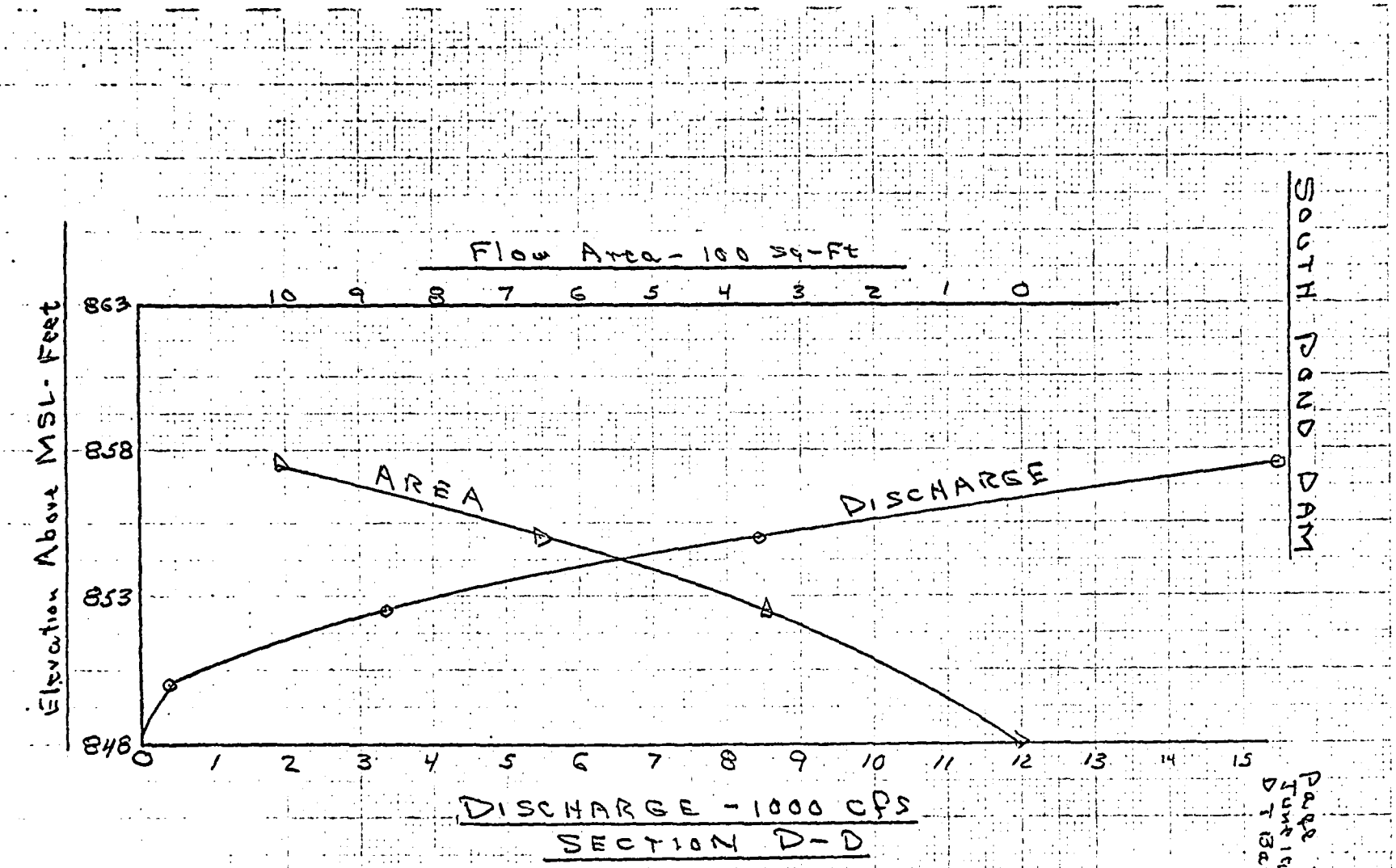
$$S = (1010 - 848)/4400 = 0.037$$

$$S^{1/2} = 0.192$$

$$Q = A \frac{1.49}{0.060} R^{2/3} \times 0.194 = 4.77 A R^{2/3}$$

Elev	Area ft^2	WP ft	R ft	$R^{2/3}$	Q cfs
848	—	—	—	—	—
850	90	94	0.96	0.97	417
852.5	348	121	2.88	2.02	3,356
855	653	147	4.44	2.70	8,417
857.5	1008	174	5.79	3.23	15,508

See plots next page


SOUTH POND DAM
Flow Area - 100 Sq-Ft
10 9 8 7 6 5 4 3 2 1 0
Elevation Above MSL - Feet
863
858
853
848
AREA
DISCHARGE
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
DISCHARGE - 1000 CFS
SECTION D-D
Page 29
June 1979
D. T. Ballou

South Pond Dam

June 1979
D T Ballou

Continue routing of flood wave from Section CC → Section D-D which is 4400' downstream of C-C

From page 26, Q_{p_1} = 11,785 cfs
Remaining storage = 1,021 Ac-Ft

From page 29 for Q_{p_1}, we obtain Elev 856.2 & 820 ft² of flow area

Reach length = 4400', ∴ Volume in reach, V_1 = 4400 × 820 / 43560 = 83 Ac-Ft

Trial $Q_{p_2} = 11785\left(1 - \frac{83}{1021}\right) = 10{,}826$ cfs

using trial Q_{p_2} &, re-entering page 29 we obtain elev 855.8 & 765 ft²
∴ V_2 = 4400 × 765 / 43560 = 77 Ac-Ft

Recomputed $Q_{p_2} = 11785\left(1 - \frac{(83+77)/2}{1021}\right] = 10{,}861$ cfs

Finally:

Q_{p_2} = 10,861 cfs
Flood Stage = Elev 855.9
Flow Area = 770 ft²
Remaining Storage = 1021 − 80 = 941 Ac-Ft

941 / 1206 = 78% of storage left

10,861 / 13914 = 78% of initial flood peak

Discontinue routing, see comments on following page

South Pond Dam

June 1979
D T Balbu

Summary of routing down Wachaseeftonk Creek

Point	Distance Below Dam ft	Discharge cfs	Flood Elev. (USGS)	Depth (ft)	Vel. fps
Dam	—	*13,914	1713'	13'	
A-A	1,300	13,533	1670.1	10.1	12.3
B-B	4,300	12,881	1542.6	12.6	16
C-C	11,300	11,785	1022.2	12.2	21
D-D	15,700	10,861	855.9	7.9	14.1

* Breaching Discharge

Comments

There would appear to be no reason to change the hazard classification from the selected one of "High". (See page 3) Please note that the flood wave averages over 12' in depth, has very high velocities, and more important, still has @ least 78% of volume remaining after traveling 15,700'. The peak flow @ section D-D is also, 78% of breaching discharge.

Also note that Route 44, a main east-west state highway passes thru the village of Salisbury C', could very well be destroyed by the wave.

A more delineating routing of the breaching wave + H.C. H studies is suggested.

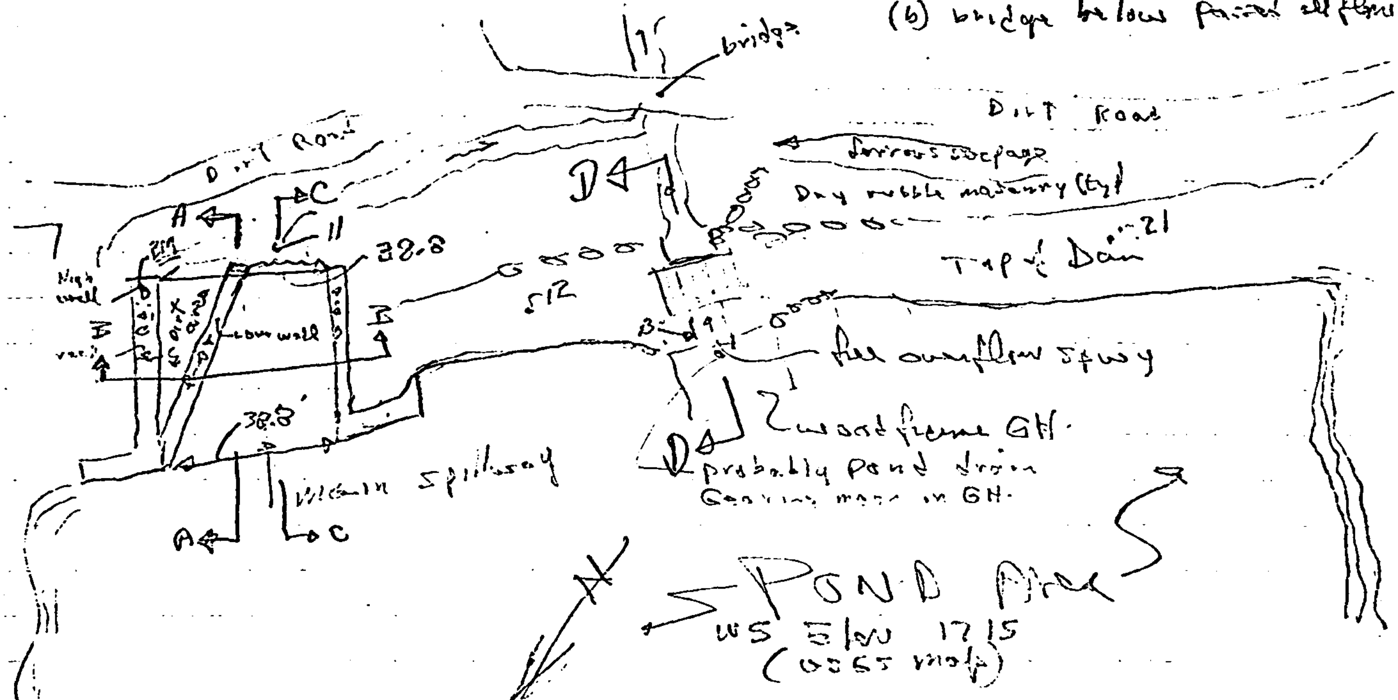
April 23 197?
By D.T. Ballou

Field Inspection of South Pond Dam

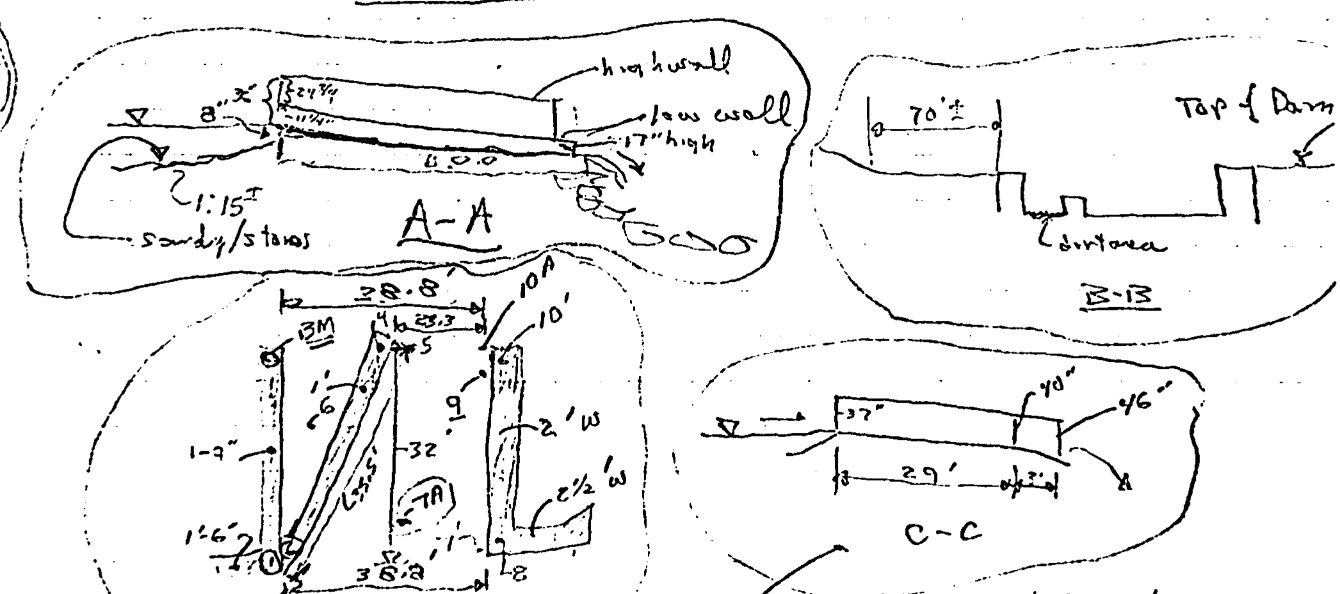
Salisbury Conn

Murdock, Engle, Jones, Ballou

Dave Brazet (rep)
(a) 1955 – 8"–10" over top
(b) bridge below passed all flow



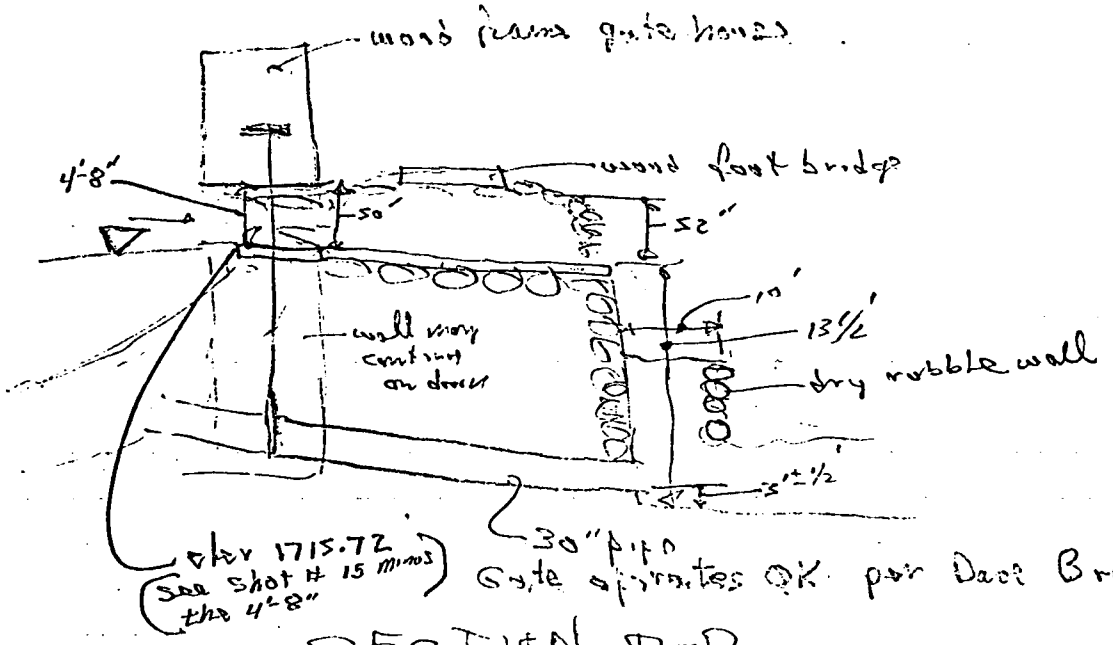
PLAN VIEW



profile should have been drawn right → left but data is still valid!!!

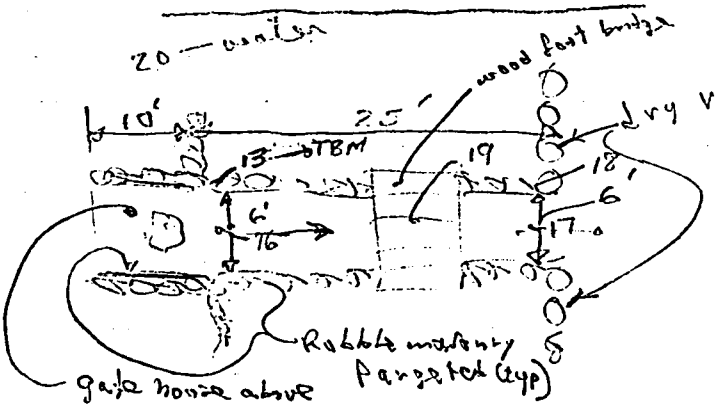
April 23 1929
D I Fallon

South Pond



Gate elevations OK per Dave Bragee

SECTION D-D



PLAN of D-D

4/23/79

D. T. Ballou

South Pond Dam
Salisbury, Conn

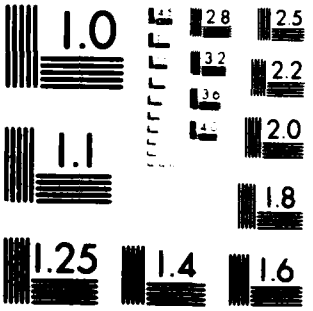
1724.15 − 4.75 = 1719.40

1719.40 + 5.22 = 1724.62

Point	BS	FS	Elev	
	HI = 1724.15			
BM	5.15		1719.00	-AB (1942)
1		4.82	1719.33	
2		6.85	1717.3	
3		7.84	1716.31	- spwy invert - inlet
4		7.31	1716.84	
5		8.49	1715.66	- spwy invert - outlet
6		8.42	1715.73	
7A		7.85	1716.3	- spwy invert
7		7.94	1716.21	- " " - inlet
8		4.81	1719.34	
9		8.11	1716.04	- spwy invert - outlet
10A		8.92	1715.23	
10		5.08	1719.07	
11		~~—~~	~~—~~	
12		4.58	1719.57	1+25 (Top of Dam)
13 TBM	Top of wall HI = 1724.62	4.75	1719.40	
13 TPN	5.22		1719.40	
15		4.23	1720.39	wood floor inside gate house
16		9.21	1715.41	channel Inv @ gate house
17		10.41	1714.21	
18		6.15	1718.47	
19		5.04	1719.58	[illegible]
20		8.20	1716.32	water surface
21		5.50	1719.12	3+00 (Top of Dam)

AD-A144 422 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS SOUTH POND DAM (CT 00..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV MAY 79 2/2

UNCLASSIFIED F/G 13/13 NL

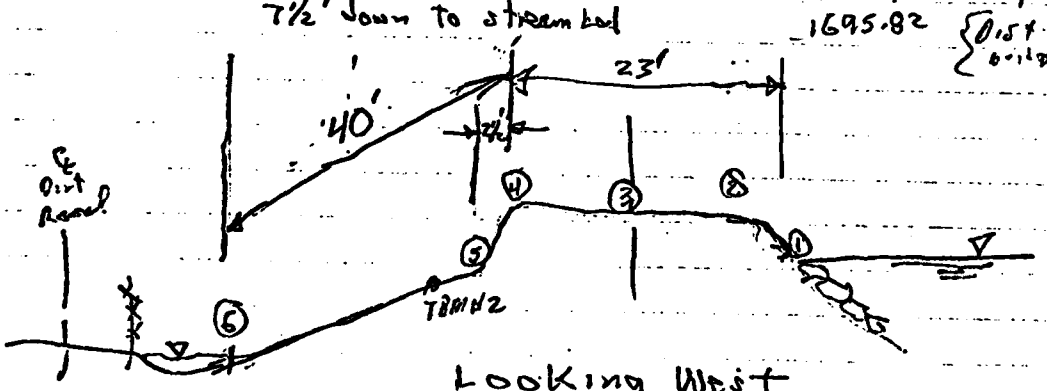

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6

4/23/79

D. T. Balbo

South Pond Dam
Salisbury Conn

Point	BS	FS	Elev	
	HI = 1724.62 (See preceding page)			
①		8.29	1716.33	water
②		7.14	1717.48	T.O.S.
③		5.59	1719.03	℄ Dam
④		5.22	1719.4	T.O.S.
⑤		8.84	1715.78	
TBM #2		10.16	1714.52	
TBM #2	HI = 1715.97 1.45		1714.52	
⑥		12.34	1703.63	T.O.S. @ water
		12.65	1703.32	Top of Bridge @ Dam
			1695.82	8.5' ↓ to bed of stream (Bridge = 1' thick)



Looking West
Station 2+50
Dam Section

APPENDIX E

INFORMATION AS CONTAINED IN THE INVENTORY OF DAMS


DATE
ILME