NAUGATUCK RIVER BASIN

TORRINGTON - GOSHEN, CONNECTICUT

WHIST POND DAM
CT 00102

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

DECEMBER 1980

UNCLASSIFIED

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Torrington - Goshen, Conn.
Whist Pond Dam

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

The Whist Pond Dam consists of an earth embankment with a maximum height of 9 ft. and a total length of 1,100 ft. including a 17.7 ft. long overflow spillway located at the right end of the dam. The outlet works consist of a 12 inch cast iron low level diversion outlet pipe through the dam. controlled by a downstream gate valve. The dam impounds Whist Pond, a storage reservoir for public water supply for the Torrington Water Company.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

MAR 10 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Whist Pond Dam (CT-00102) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Torrington Water Company, Richard D. Calhoun, President, 110 Prospect Street, Torrington, Connecticut 06790.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

WHIST POND DAM
CT 00102

NAUGATUCK RIVER BASIN
TORRINGTON - GOSHEN, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IDENTIFICATION NO: CT 00102

NAME OF DAM: Whist Pond Dam

TOWN: Goshen-Torrington

COUNTY AND STATE: Litchfield County, Connecticut

STREAM: Drake Pond Brook

DATE OF INSPECTION: November 17, 1980

BRIEF ASSESSMENT

The Whist Pond Dam consists of an earth embankment with a maximum height of 9 feet, and a total length of 1,100 feet including a 17.7 foot long overflow spillway located at the right end of the dam. The outlet works consist of a 12-inch cast iron low level diversion outlet pipe through the dam, controlled by a downstream gate valve.

The dam impounds Whist Pond, a storage reservoir for public water supply for the Torrington Water Company.

Based on the visual inspection and a review of all available pertinent data, the dam is judged to be in fair condition. The future integrity of the dam can be affected by continued slumping of the riprap, roots through the embankment, continued deterioration of the spillway weir and training walls, the lack of a defined spillway discharge channel, and the downstream location of the low level diversion outlet valve.

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the dam is classified as "Small" in size with a

"Significant" hazard potential. A Test Flood equal to the 100-Year Flood was selected in accordance with the Corps of Engineers' Guidelines. The calculated Test Flood inflow of 175 cfs results in a routed outflow of 65 cfs and 0.4 feet of freeboard.

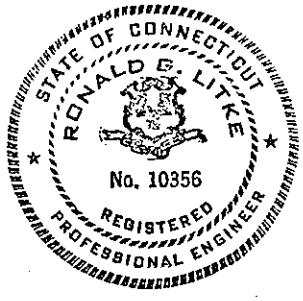
The spillway has a capacity of 100 cfs and is capable of discharging 154 percent of the Test Flood routed outflow.

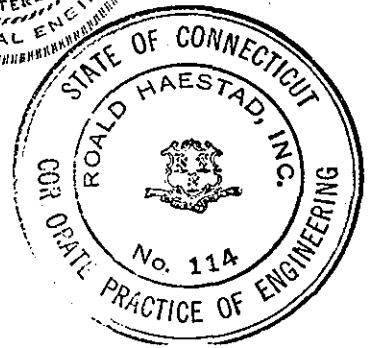
It is recommended that the owner engage the services of a qualified, registered engineer experienced in the design of dams to investigate the slumping riprap and freeboard requirements, the condition of the spillway weir and training walls, and the means to provide an upstream gate on the low level diversion outlet pipe. In addition, the following should be done: trees cleared from the area downstream of the dam, a program of annual technical inspections instituted, an Operations and Maintenance Manual prepared, and a formal warning system put into effect.

The owner should implement the recommendations as described herein and in greater detail in Section 7 within one year after receipt of this Phase I Inspection Report.

Ronald G. Litke, P.E.
Project Engineer

Roald Haestad
President





This Phase I Inspection Report on Whist Pond 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.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

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 a 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.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety of the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

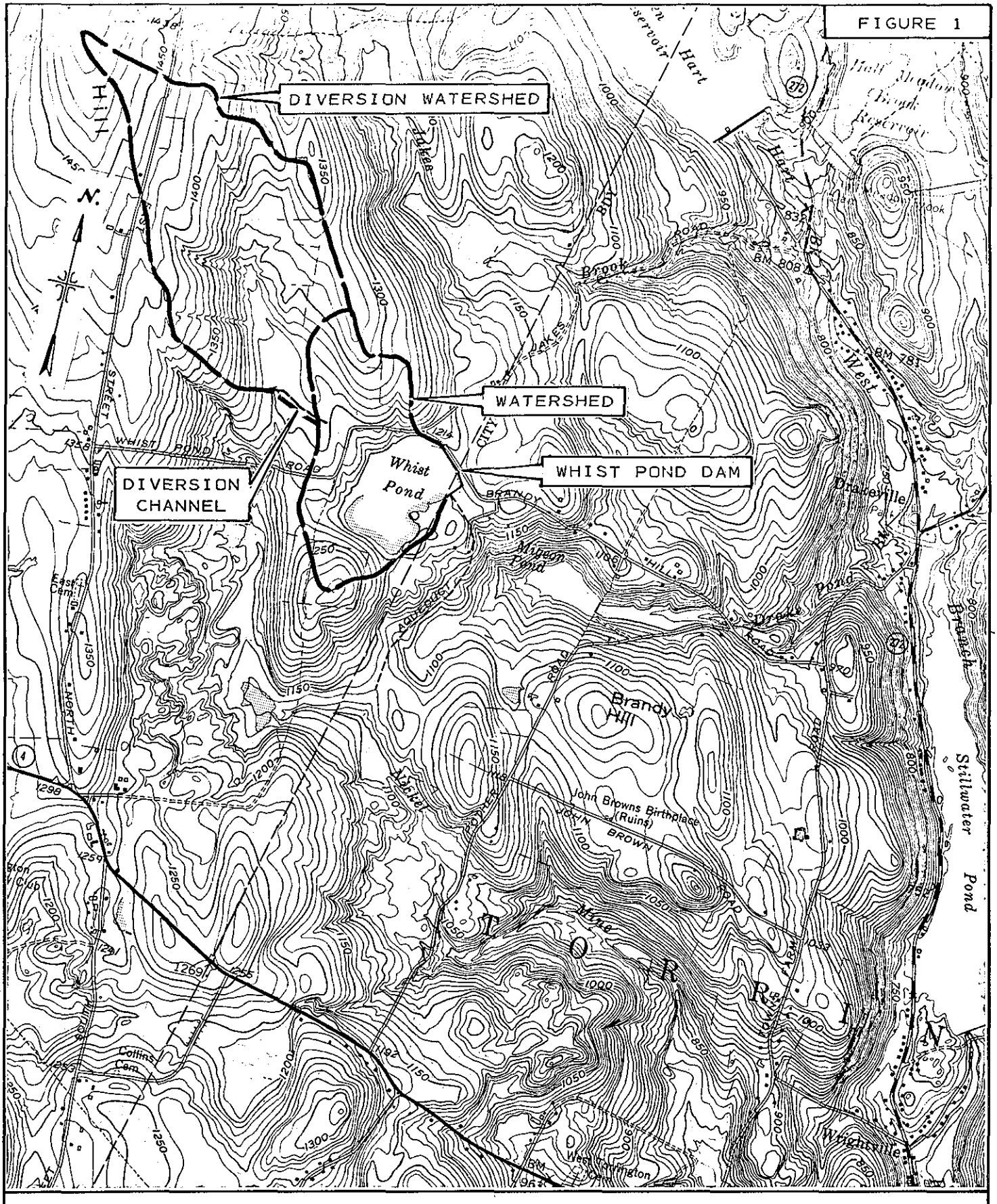
INDEX TO REPORT

INDEX TO APPENDIXES

OVERVIEW PHOTO

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	WHIST POND DAM - CT00102
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		DRAKE POND BROOK
		GOSHEN-TORRINGTON, CONNECTICUT 13 NOVEMBER '80

FIGURE 1



LOCATION PLAN

WHIST POND DAM
GOSHEN AND TORRINGTON CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC.

WEST TORRINGTON
QUADRANGLE 1969

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

WHIST POND DAM

PROJECT INFORMATION
SECTION 1

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. Roald Haestad, 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 Roald Haestad, Inc. under a letter of October 28, 1980, from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-81-C-0005 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.
2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.
3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

The Whist Pond Dam is located on Drake Pond Brook, a tributary to the West Branch of the Naugatuck River, just south of Brandy Hill Road, on the City Boundary between Torrington and Goshen, Connecticut. The dam is shown on the West Torrington Quadrangle Map having coordinates of latitude N 41°51.1' and longitude W 73°11.0'.

b. Description of Dam and Appurtenances

The dam consists of an earth embankment with a maximum height of 9 feet, upstream and downstream slopes which vary from about 2 to 3 horizontal to 1 vertical and a total length of 1,100 feet including a 17.7 foot long overflow spillway located at the right end of the dam. The dam has two sections which meet at approximately a 90° angle. The section of the dam to the right of the angle has a top width of about 8 feet, an average height of about 8 feet, and a length of 425 feet. The section to the left of the angle has a top width of about 6 feet, an average height of approximately 4 feet, and a length of 675 feet. The upstream slope of the dam is protected by a layer of riprap and the downstream slope is grassed. At the 90° angle there is an access road with stone masonry retaining walls from the downstream toe to the crest of the dam.

The spillway consists of a stone masonry overflow section with concrete training walls upstream and stone masonry training walls downstream. The top of the dam is 1.5 feet above the spillway level.

The outlet works are located near the center of the right section of the dam. The outlet works consist of a 12-inch cast iron

low level diversion outlet through the earth embankment which discharges into Nickel Mine Brook approximately 3,500 feet from the dam. The outlet is controlled by a manually operated gate located in a valve shed at the downstream toe of the dam.

c. Size Classification - "Small"

Acccording to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the dam is classified as "Small" in size if the height is between 25 feet and 40 feet or if the dam impounds between 50 Acre-Feet and 1,000 Acre-Feet. The dam has a maximum height of 9 feet and a maximum storage capacity impounded by the dam (not including natural lake storage) of 260 Acre-Feet. Therefore, the dam is classified as "Small" in size based upon a maximum storage capacity of 260 Acre-Feet.

d. Hazard Classification - "Significant"

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification of the dam is "Significant". A dam failure analysis indicates that a house trailer located at the confluence of the Drake Pond Brook and the West Branch of the Naugatuck River would be flooded to a depth of 1 to 3 feet, possibly resulting in the loss of a few lives and causing downstream property damage. Pre-failure flow is confined within the streambed.

e. Ownership

Torrington Water Company
Richard D. Calhoun, President
110 Prospect Street
Torrington, Connecticut 06790
(203) 489-4149

f. Operator

William Jones
Torrington Water Company
110 Prospect Street
Torrington, Connecticut 06710
(203) 489-4149

g. Purpose of the Dam

The Whist Pond Dam impounds Whist Pond, a storage reservoir for public water supply.

h. Design and Construction History

The dam was constructed around 1900. No information was available on the design or construction of the dam. The spillway training walls were repaired by the Torrington Water Company in 1975.

i. Normal Operational Procedures

The gate on the low level diversion outlet is normally left closed. During dry years the gate is opened to allow water to flow to downstream distribution reservoirs.

1.3 Pertinent Data

a. Drainage Area

The drainage area consists of 0.23 square miles of "rolling" wooded hills with no development. Another 0.40 square miles of similar terrain is tributary through a diversion channel with a maximum capacity of 40 cfs.

b. Discharge at Damsite

Discharge at the damsite is over a 17.7 foot long overflow spillway. A 12-inch cast iron low level diversion outlet diverts water from Whist Pond to Nickel Mine Brook when required to supplement flow during dry years.

1.	Outlet Works (conduits) Size:	12-inch
	Invert Elevation:	Approximately 1182.5
	Discharge Capacity:	2 cfs @ Pool El. 1196.5
2.	Maximum Known Flood at Damsite:	Unknown
3.	Ungated Spillway Capacity at Top of Dam:	100 cfs
	Elevation:	1196.5
4.	Ungated Spillway Capacity at Test Flood Elevation:	65 cfs
	Elevation:	1196.1
5.	Gated Spillway Capacity at Normal Pool Elevation:	N/A
	Elevation:	
6.	Gated Spillway Capacity at Test Flood Elevation:	N/A
	Elevation:	
7.	Total Spillway Capacity at Test Flood Elevation:	65 cfs
	Elevation:	1196.1
8.	Total Project Discharge at Top of Dam:	100 cfs
	Elevation:	1196.5
9.	Total Project Discharge at Test Flood Elevation:	65 cfs
	Elevation:	1196.1

c. Elevation - Feet Above Mean Sea Level (NGVD)

1. Streambed at Toe of Dam:	1187
2. Bottom of Cutoff:	Unknown
3. Maximum Tailwater:	N/A
4. Normal Pool:	1195.0
5. Full Flood Control Pool:	N/A
6. Spillway Crest:	1195.0
7. Design Surcharge - Original Design:	Unknown
8. Top of Dam:	1196.5
9. Test Flood Surcharge:	1196.1

d. Reservoir - Length in Feet

1. Normal Pool:	1800 feet
2. Flood Control Pool:	N/A
3. Spillway Crest Pool:	1800 feet
4. Top of Dam:	2000 feet
5. Test Flood Pool:	1900 feet

e. Storage - Acre-feet

1. Normal Pool:	400 Acre-Feet*
2. Flood Control Pool:	N/A
3. Spillway Crest Pool:	400 Acre-Feet*
4. Top of Dam:	460 Acre-Feet*
5. Test Flood Pool:	445 Acre-Feet*

f. Reservoir Surface - Acres

1. Normal Pool:	39.5 acres
2. Flood-Control Pool:	N/A
3. Spillway Crest:	39.5 acres
4. Test Flood Pool:	40.9 acres
5. Top of Dam:	45.9 acres

*Including estimated 200 Acre-Feet, natural lake storage.

g. Dam

1.	Type:	Earth Embankment
2.	Length:	1100 feet
3.	Height:	Maximum 9 feet
4.	Top Width:	8 feet right section; 6 feet left section
5.	Side Slopes:	Vary from 2 - 3 horizontal to 1 vertical
6.	Zoning:	Unknown
7.	Impervious Core:	Unknown
8.	Cutoff:	Unknown
9.	Grout Curtain:	Unknown
10.	Other:	

h. Diversion and Regulating Tunnel - N/A

i. Spillway

1.	Type:	Stone Masonry Overflow
2.	Length of Weir:	17.7 feet
3.	Crest Elevation with Flash Boards: without Flash Boards:	 N/A 1195
4.	Gates:	N/A
5.	Upstream Channel:	Lined with cobbles and gravel
6.	Downstream Channel:	Unlined - Overgrown with brush and trees
7.	General:	No defined dowstream channel

j. Regulating Outlets

1.	Invert:	Approximately 1182.5
2.	Size:	12-inch
3.	Description:	Cast iron low level diversion outlet
4.	Control Mechanism:	Manually operated downstream gate valve
5.	Other:	Outlet discharges to Nickel Mine Brook approximately 3,500 feet from dam. Capacity reported to be approximately 2 cfs.

2.1 Design Data

There was no design data available for review.

2.2 Construction Data

There was no construction data available for review. It was reported that the dam was constructed around 1900 to increase the storage capacity of an existing natural lake. Repairs were made to the upstream training walls in 1975 by the Torrington Water Company. It was reported that new concrete walls were poured against and over the existing walls.

2.3 Operation Data

Water levels have been recorded at least weekly since 1973. Information concerning maximum water levels was not available.

2.4 Evaluation of Data

a. Availability

Design or construction data was not available from the State of Connecticut Department of Environmental Protection or the Torrington Water Company, the owner of the dam.

b. Adequacy

As no design or construction information was available, the assessment of the condition of the dam was based on the visual inspection, past performance history, and hydrologic and hydraulic calculations performed for this Report.

VISUAL INSPECTION

SECTION 3

3.1 Findings

a. General

The visual inspection of the dam was conducted on November 17, 1980. At the time of inspection the water level was approximately 11 feet below the top of the dam, and approximately 3 feet below the upstream toe of the dam.

Whist Pond Dam consists of an "L" shaped earth embankment with an overflow spillway located at the right end of the dam, and outlet works located near the center of the right portion of the dam, Photo 1.

The general condition of the dam at the time of inspection was fair.

b. Dam

The upstream slope of the dam is protected by a layer of 4 to 12 inch riprap, Photo 2. In several areas the riprap appears to have slumped approximately 12 inches, Photo 3, possibly due to the lack of filter or bedding material between the riprap and the embankment. The slumping is most pronounced near the left end of the dam, Photo 4, where the slumping has cut into the crest.

The crest of the dam is generally level and covered with grass, Photos 1 and 4. There is a foot path at approximately the center line of the crest along the entire length of the dam. Tree roots were observed at several locations along the crest of the dam, Photo 5, and appear to originate from trees located downstream of the embankment, Photo 4.

The downstream slope of the dam is grass-covered, Photos 1 and 4. Several ruts due to mowing equipment were observed on the downstream slope.

The areas downstream of the left portion of the dam were slightly wet as the result of ponding water in this area and not from water seeping through the dam. Downstream of the right portion of the dam there was a small wet area and evidence of previous ponding in the surrounding area.

c. Appurtenant Structures

The appurtenant structures consist of the overflow spillway and the outlet works.

Overflow Spillway

The overflow spillway consists of a stone masonry weir with concrete training walls upstream and stone masonry training walls downstream, Photos 6 and 7. The right training wall is cracked and displaced approximately 5/8 inch at the top of the wall, Photo 8. The left concrete training wall appeared to be in good condition. The concrete training walls appeared to have been poured over existing stone masonry training walls. The downstream stone masonry training walls show some signs of deterioration, Photo 7.

The overflow weir is constructed of a dry stone masonry wall with 4.5 foot wide cap stones. There are voids between the stonework and under the cap stones of the wall, Photo 9.

Outlet Works

The outlet works consist of a 12-inch diameter cast iron low level diversion outlet through the dam controlled by a manually operated downstream gate that is reported to be operable. The gate is housed in a wooden building at the downstream toe. The building has

been practically demolished by vandals with the floor covered with pieces of riprap, Photo 10.

d. Reservoir Area

There are no indications of instability along the edges of the reservoir in the vicinity of the dam.

e. Downstream Channel

The spillway discharge channel is not very well-defined and is heavily overgrown with brush and trees.

3.2 Evaluation

Based on the visual observations, the dam appears to be in fair condition. The following features could affect the future integrity of the dam:

1. Slumping of the riprap could cause futher erosion of the crest resulting in a breach of the dam.
2. Roots through the embankment could provide seepage paths for internal erosion.
3. Continued deterioration of the spillway weir and training walls could lead to failure of the spillway.
4. The lack of a defined spillway discharge channel could cause flooding and erosion of the downstream toe of the embankment.
5. The location of the low level diversion outlet valve at the downstream toe permits full water pressure to exist in the outlet pipe through the dam. In the event of a leak in the outlet pipe, seepage and high pore pressure near the downstream toe or base of the dam could cause sliding failure or piping failure of the embankment.

OPERATIONAL AND MAINTENANCE PROCEDURES

SECTION 4

4.1 Operational Procedures

a. General

The gate on the low level diversion outlet is normally left closed. During dry years the gate is opened to allow water to flow through a diversion pipeline to Nickel Mine Brook and into downstream distribution reservoirs. Prior to this year (1980) the last time water was drawn from the impoundment was in 1974.

b. Description of Any Warning System in Effect

There is no formal warning system in effect for the dam.

4.2 Maintenance Procedures

a. General

The downstream slopes and crest of the dam are cleared annually. Repairs, such as the repairs to the concrete training walls, are made occasionally.

b. Operating Facilities

There are no maintenance procedures for the operating facilities.

4.3 Evaluation

The present operational and maintenance procedures should be improved upon. An Operations and Maintenance Manual should be prepared for the dam and operating facilities, a program of annual technical inspections by qualified, registered engineers should be instituted, and a formal warning system should be put into effect.

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

SECTION 5

5.1 General

Whist Pond is impounded by a low earth dam approximately 1,100 feet long with a maximum height of 9 feet. The dam has two sections which meet at approximately a 90° angle. An access road from the downstream toe to the dam crest also meets the dam at this corner. The spillway consists of a 17.7 foot long stone masonry overflow section with concrete training walls upstream and stone masonry training walls downstream of the weir. The spillway is located at the right end of the dam. The top of the dam is 1.5 feet above the spillway level. The normal freeboard of only 1.5 feet could lead to overtopping due to wave action.

The dam has a watershed of 0.23 square miles directly tributary to the pond and another 0.4 square miles tributary via a diversion channel. The diversion has a capacity of about 40 cfs, and is controlled by flashboards at an upstream intake structure, Photos 11 and 12. Flows exceeding the diversion capacity continue down the natural channel. The terrain is "rolling" wooded hills with no development. Elevations range from 1320 feet at the north end of the watershed to 1195 feet at the spillway. The diversion watershed has a maximum elevation of about 1500 feet.

Piping consists of a single 12-inch cast iron low level diversion outlet pipe through the dam controlled by a downstream gate. The pipe discharges to another watershed 3,500 feet from the dam.

5.2 Design Data

No design data or computations were available for the dam.

5.3 Experience Data

The dam did not overtop in the August 1955 Flood. Records of peak flows have not been maintained, although the pond level has been read on a weekly basis since 1973.

5.4 Test Flood Analysis

Based on the dam failure analysis, the dam is classified as "Significant" hazard potential. The dam is classified as "Small" in size based on a storage capacity impounded by the dam (not including natural lake storage) of 260 Acre-Feet. According to the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers, the Test Flood should be in the range of the 100-Year Flood to one-half the Probable Maximum Flood (1/2 PMF).

A Test Flood equal to the 100-Year Flood was selected because of the limited downstream development and the low hydraulic height of the dam.

An inflow flood peak of 135 cfs was calculated for the 0.23 square mile watershed of Whist Pond using the "Weiss Formula" as developed by the U.S.G.S. (United States Geological Survey) and described in Flood Control Formulas for Connecticut by the Connecticut Department of Environmental Protection.

Including the 40 cfs from the diversion, the 100 Year peak inflow was calculated to be 175 cfs. The Test Flood was routed through the impoundment in accordance with "Estimating Effect of Surcharge Storage on Probable Maximum Discharges" provided by the Corps of Engineers. The Test Flood routed outflow was calculated to be about 65 cfs. The spillway has a capacity of 100 cfs and is capable of discharging almost 154 percent of the Test Flood routed outflow.

5.5 Dam Failure Analysis

A dam failure analysis was made using the Corps of Engineers' "Rule of Thumb" Guidance. Failure was assumed when the water level reached the top of the dam, producing a maximum head of 9 feet. For purposes of the dam failure analysis the dam was assumed to be

divided at the access road into two sections. Should they fail, each section would flood a different stream valley. The right section is up to 9 feet high and 425 feet long including the spillway. The left section is up to 5 feet high and 675 feet long. Flood routing was performed for the right section only, as this would produce greater flood flows, and there was no development in the stream valley downstream of the left section.

The calculated dam breach, 9 feet high by 154 feet long, would release about 7,000 cfs into the stream below the dam. Spillway discharge was assumed negligible in comparison to the dam breach flow and was not included in the flood routing. The flood waters would flow downstream in a well-defined channel before overtopping Brandy Hill Road by approximately 4-1/2 feet. The flood waters would continue downstream in a steep, narrow gorge for approximately 2,500 feet before reaching the West Branch of the Naugatuck River. Here the flood flows would have to make a 90° bend. A trailer park is located at the confluence of the stream and the West Branch of the Naugatuck River. One house trailer is located very close to the confluence and would be subject to flooding from a failure of Whist Pond Dam. The dam breach flow in the area of this trailer would be about 4,000 cfs and would cause flooding to a depth of 1 to 3 feet depending on the opposing flows of the two streams and the 90° bend the flood flows would have to make. The bridge at Route 272 can pass the dam breach flows. Beyond Route 272 the flood flows would be dissipated in Stillwater Pond.

Pre-failure flow is confined within the streambed.

The dam is classified as "Significant" potential hazard because of the possible loss of a few lives should the dam fail.

EVALUATION OF STRUCTURAL STABILITY

SECTION 6

6.1 Visual Observations

The visual observations did not disclose any evidence of present or past structural instability. The future stability of the dam could be affected by:

1. Continued slumping of riprap slope protection;
2. Roots through the embankment;
3. Continued deterioration of the spillway weir and training walls;
4. Brush and heavy tree growth in the spillway discharge channel; and
5. The location of low level diversion outlet control valve at the downstream toe.

6.2 Design and Construction Data

No design or construction data for the dam was available for review.

6.3 Post-Construction Changes

No known post-construction changes have been made that would jeopardize the integrity of the dam.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers, does not warrant seismic stability analysis.

7.1 Dam Assessment

a. Condition

Based on the visual inspection, the dam appears to be in good condition. The following features could affect the future integrity of the dam:

1. Slumping of the riprap slope protection;
2. Roots through the embankment;
3. Continued deterioration of the spillway weir and training walls;
4. Lack of defined spillway discharge channel;
5. Location of the low level diversion outlet valve at the downstream toe; and
6. Inadequate freeboard.

An evaluation of the hydraulic and hydrologic features of the dam indicates that the spillway is capable of passing 154 percent of the Test Flood routed outflow (100-Year Flood).

b. Adequacy of Information

As no design or construction data were available for review, the assessment of the condition of the dam was based on the visual inspection, past performance history, and hydraulic and hydrologic calculations made for this Report.

c. Urgency

The recommendations described in Sections 7.2 and 7.3 should be carried out by the owner within one year after receipt of this Report.

7.2 Recommendations

The following items should be carried out under the direction of a qualified, registered engineer:

1. Investigate the slumping of the riprap slope protection, and design remedial measures as required.
2. Investigate the condition of the spillway weir and training walls, and design required repairs.
3. Clear trees from the area downstream of the dam to within 20 feet of the toe.
4. Design an upstream gate for the low level diversion outlet in order to relieve full reservoir water pressure in the pipe under the dam.
5. Inspect the dam for seepage when the impoundment is full.
6. Investigate freeboard requirements for the dam.

The owner should implement all recommendations made by the engineer based on the above investigations.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Remove trees and brush along and in the spillway discharge channel for a distance of 100 feet below the dam.
2. Institute a program of annual technical inspections by qualified, registered engineers.
3. Prepare an Operations and Maintenance Manual for the dam and operating facilities.
4. Develop a downstream warning system in case of an emergency at the dam.

7.4 Alternatives

There are no practical alternatives to the recommendations described herein.

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT: Whist Pond Dam

DATE: 11/17/80 TIME: 3:00 p.m. WEATHER: Cloudy 35°

W.S. ELEVATION: 1185.5 U.S. N/A DN.S
(11' ± below top of dam)

	PARTY	DISCIPLINE
1.	Roald Haestad, P.E. - Roald Haestad, Inc.	Civil/Geotechnical
2.	Donald L. Smith, P.E. - Roald Haestad, Inc.	Civil/Hydrologic
3.	Ronald G. Litke, P.E. - Roald Haestad, Inc.	Civil/Structural
4.		
5.		
6.		

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	RH,DLS,RGL	Fair condition; slumping of riprap.
2.	Outlet Works - Intake Channel & Intake Structure	RH,DLS,RGL	Intake channel at bottom of pond; no structure observed.
3.	Outlet Works - Control Tower	RH,DLS,RGL	Valve shed in poor condition
4.	Outlet Works - Transition & Conduit	RH,DLS,RGL	12-inch cast iron pipe
5.	Outlet Works - Outlet Structure & Outlet Channel	RH,DLS, RGL	No structure or channel
6.	Outlet Works - Spillway Weir, Appr. & Disch. Channel	RH,DLS,RGL	Training wall cracked; stone masonry weir deteriorated; channel overgrown.
7.			
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT: Whist Pond Dam DATE: 11/17/80

PROJECT FEATURE: Dam Embankment NAME: RH,DLS

DISCIPLINE: Civil/Geotechnical Engineers NAME: RGL

AREA ELEVATION	CONDITIONS
DAM EMBANKMENT	
CREST ELEVATION	1196.5
CURRENT POOL ELEVATION	1185.5
MAXIMUM IMPOUNDMENT TO DATE	Unknown
SURFACE CRACKS	None observed
PAVEMENT CONDITION	N/A
MOVEMENT OR SETTLEMENT OF CREST	None observed
LATERAL MOVEMENT	None observed
VERTICAL ALIGNMENT	Good
HORIZONTAL ALIGNMENT	Good
CONDITION AT ABUTMENT AND AT CONCRETE STRUCTURES	Good
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	None observed
TRESPASSING ON SLOPES	No evidence of trespassing
VEGETATION ON SLOPES	Grass cover. Roots from downstream trees are present at the crest of the dam.
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	Riprap on upstream slope appears to be settling or slumping.
ROCK SLOPE PROTECTION - RIPRAP FAILURES	Riprap appears to be settling, possibly due to lack of filter.
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
EMBANKMENT OR DOWNSTREAM SEEPAGE	N/A - Water level below upstream toe of dam at time of inspection.
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	None observed
TOE DRAINS	None observed
INSTRUMENTATION SYSTEM	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT: Whist Pond Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - Intake Channel and Intake Structure NAME: RH

DISCIPLINE: Civil/Geotechnical Engineers NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
A. APPROACH CHANNEL:	
SLOPE CONDITIONS	Good
BOTTOM CONDITIONS	Could not be observed
ROCK SLIDES OR FALLS	None observed
LOG BOOM	N/A
DEBRIS	N/A
CONDITION OF CONCRETE LINING	N/A
DRAINS OR WEEP HOLES	N/A
B. INTAKE STRUCTURE:	No intake structure observed
CONDITION OF CONCRETE	
STOP LOGS AND SLOTS	

PERIODIC INSPECTION CHECK LIST

PROJECT: Whist Pond Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - Control Tower NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	No control tower - gate housed in shed at toe of downstream slope
A. CONCRETE AND STRUCTURAL:	
GENERAL CONDITION	Poor
CONDITION OF JOINTS	N/A
SPALLING	N/A
VISIBLE REINFORCING	N/A
RUSTING OR STAINING OF CONCRETE	N/A
ANY SEEPAGE OR EFFLORESCENCE	N/A
JOINT ALIGNMENT	N/A
UNUSUAL SEEPAGE OR LEAKS IN GATE CHAMBER	N/A
CRACKS	N/A
RUSTING OR CORROSION OF STEEL	N/A
B. MECHANICAL AND ELECTRICAL:	N/A
AIR VENTS	N/A
FLOAT WELLS	N/A
CRANE HOIST	N/A
ELEVATOR	N/A
HYDRAULIC SYSTEM	N/A
SERVICE GATES	Manually operated downstream gate reported to be operable.
EMERGENCY GATES	N/A
LIGHTNING PROTECTION SYSTEM	N/A
EMERGENCY POWER SYSTEM	N/A
WIRING AND LIGHTING SYSTEM IN GATE CHAMBER	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT: Whist Pond Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - Transition and Conduit NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	Conduit consists of a 12-inch cast iron pipe.
GENERAL CONDITION OF CONCRETE	
RUST OR STAINING ON CONCRETE	
SPALLING	
EROSION OR CAVITATION	
CRACKING	
ALIGNMENT OF MONOLITHS	
ALIGNMENT OF JOINTS	
NUMBERING OF MONOLITHS	

PERIODIC INSPECTION CHECK LIST

PROJECT: Whist Pond Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - Outlet Structure and Outlet Channel NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	No outlet structure or channel. Conduit discharges approximately 3,500 feet from dam.
GENERAL CONDITION OF CONCRETE	
RUST OR STAINING	
SPALLING	
EROSION OR CAVITATION	
VISIBLE REINFORCING	
ANY SEEPAGE OR EFFLORESCENCE	
CONDITION AT JOINTS	
DRAIN HOLES	
CHANNEL	
LOOSE ROCK OR TREES OVERHANGING CHANNEL	
CONDITION OF DISCHARGE CHANNEL	

PERIODIC INSPECTION CHECK LIST

PROJECT: Whist Pond Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - Spillway Weir, Approach & Discharge Channel NAME: RH

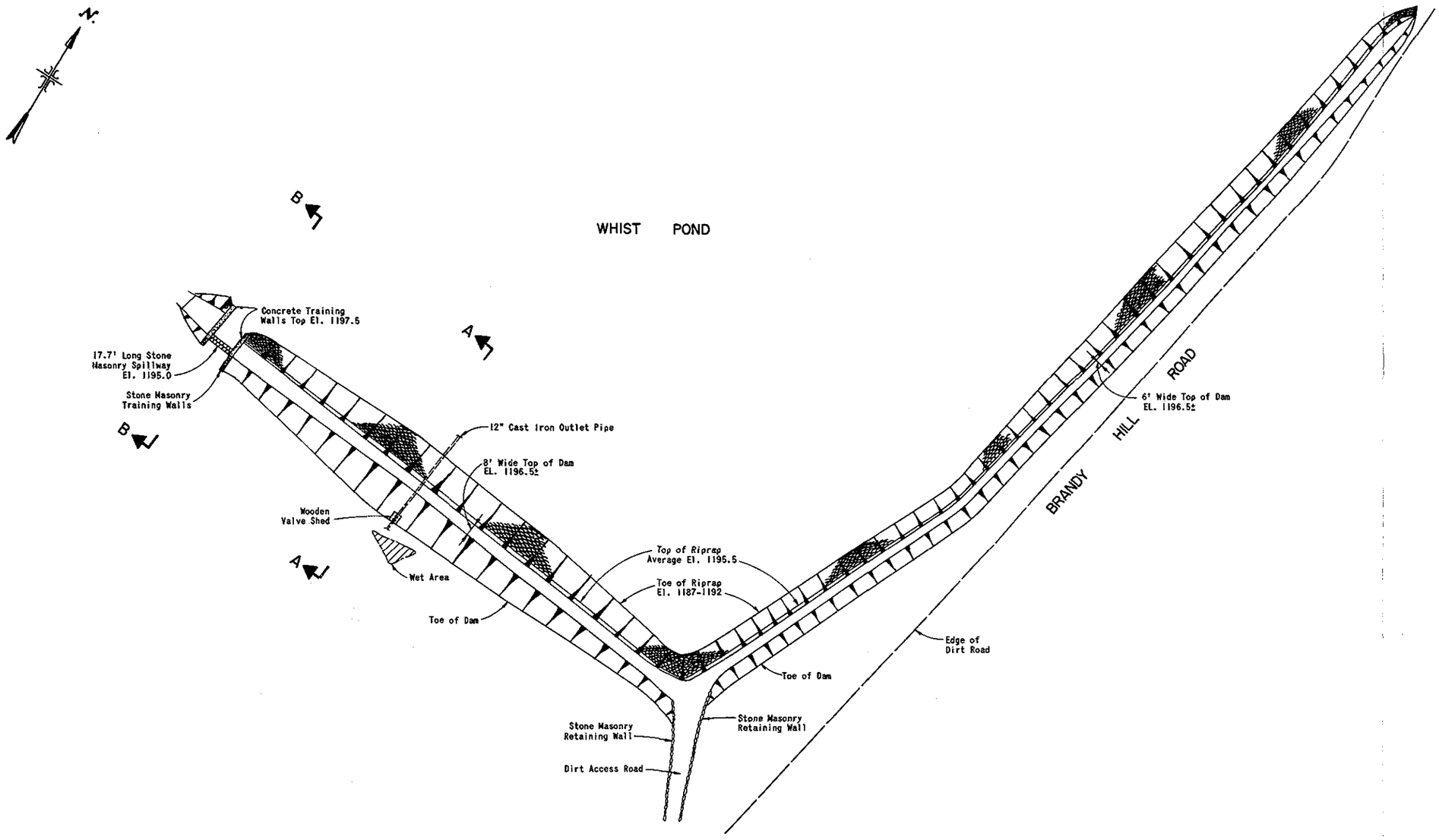
DISCIPLINE: Civil/Geotechnical Engineers NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
A. APPROACH CHANNEL:	
GENERAL CONDITION:	Good
LOOSE ROCK OVERHANGING CHANNEL	None
TREES OVERHANGING CHANNEL	None
FLOOR OF APPROACH CHANNEL	Cobbles and Gravel
B. WEIR AND TRAINING WALLS:	Weir stone masonry; training walls concrete upstream, stone masonry downstream.
GENERAL CONDITION OF CONCRETE	Right training wall cracked and displaced 5/8" at top. Downstream walls and weir need work - deteriorated.
RUST OR STAINING	N/A
SPALLING	None observed
ANY VISIBLE REINFORCING	None observed
ANY SEEPAGE OR EFFLORESCENCE	No seepage. Water level below spillway.
DRAIN HOLES	None
C. DISCHARGE CHANNEL:	
GENERAL CONDITION	Overgrown, not very well-defined.
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	Brush and small trees in channel
FLOOR OF CHANNEL	Cobbles and Gravel
OTHER OBSTRUCTIONS	

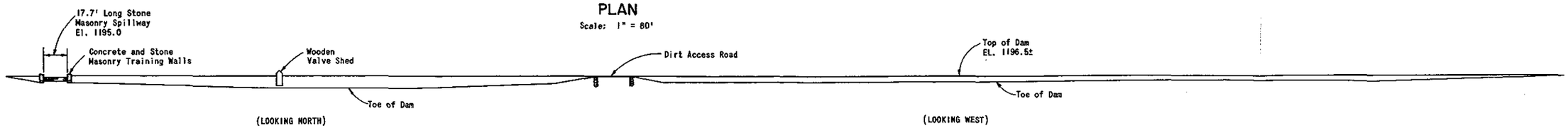
APPENDIX B

ENGINEERING DATA

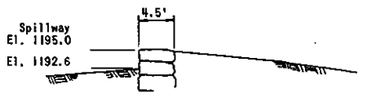
FIGURE 2



PLAN
Scale: 1" = 80'



ELEVATION
Scale: 1" = 80'
Hor. & Vert.



SECTION B-B
Scale: 1" =20'

SECTION A-A
Scale: 1" = 20'

ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

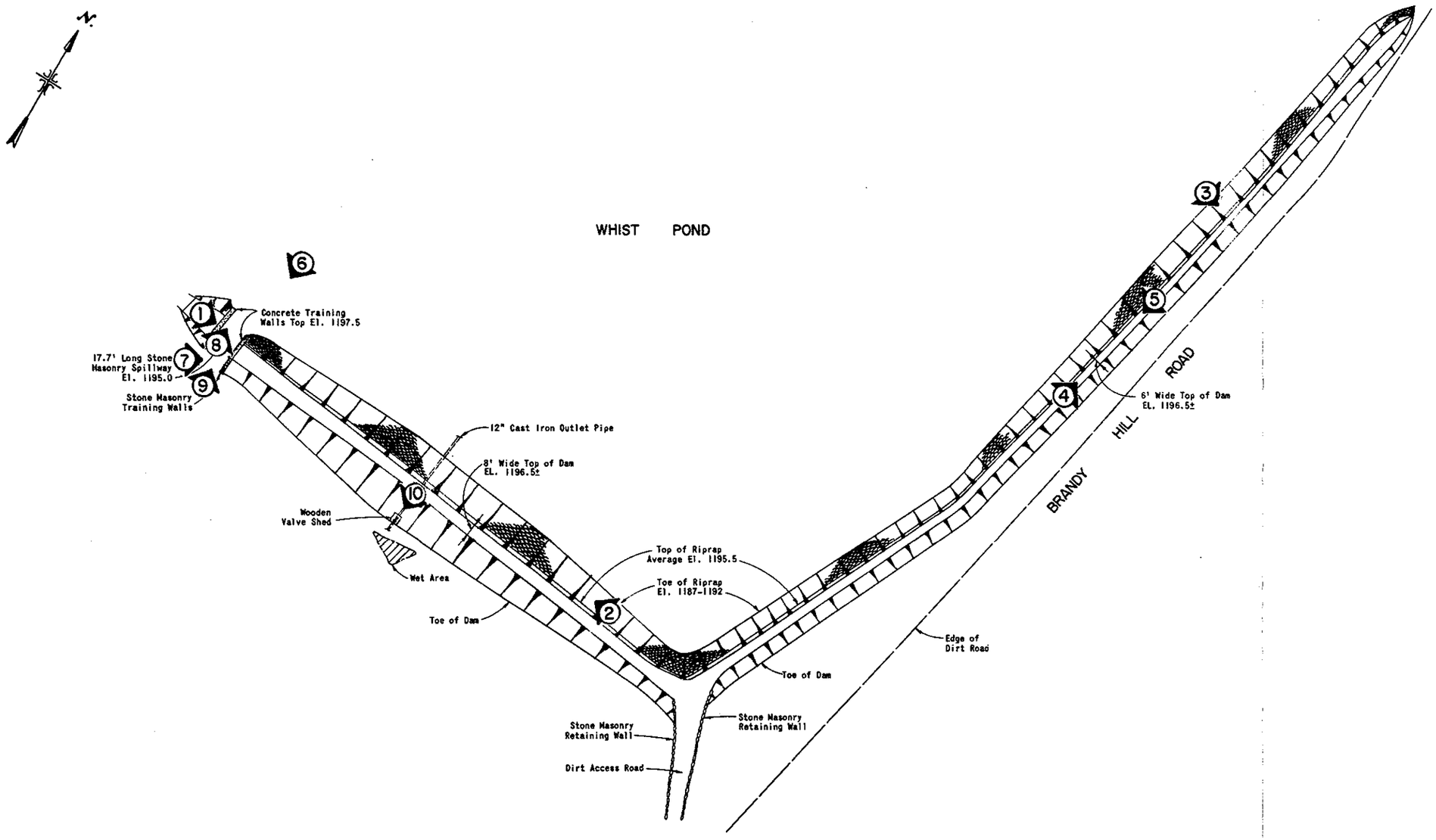
WHIST POND DAM

DRAWN	CHECKED	APPROVED	SCALES AS NOTED	
JRS	RGL	RH	DATE DEC. 1980	PAGE 8-1

APPENDIX C

PHOTOGRAPHS

FIGURE 3



Denotes photo number and direction in which photo was taken.

ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PHOTO LOCATION PLAN
WHIST POND DAM
GOSHEN AND TORRINGTON, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES 1"=80'
JRS	RGL	RH	DATE 12/80 PAGE C-1

PHOTO NO. 1

VIEW OF DAM FROM
RIGHT END OF SPILLWAY

PHOTO NO. 2

RIPRAP ON UPSTREAM SLOPE

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	WHIST POND DAM DRAKE POND BROOK GOSHEN-TORRINGTON, CT CT 00102 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 3

SLUMPING RIPRAP. RULE EXTENDED 18 INCHES.
NOTE TREES DOWNSTREAM.

PHOTO NO. 4

LEFT SECTION OF DAM. NOTE SLUMPING
RIPRAP CUTTING INTO CREST.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	WHIST POND DAM DRAKE POND BROOK GOSHEN-TORRINGTON, CT CT 00102 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 5

ROOTS AT CREST
OF EMBANKMENT.

PHOTO NO. 6

SPILLWAY FROM
UPSTREAM.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	WHIST POND DAM DRAKE POND BROOK GOSHEN-TORRINGTON, CT CT 00102 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 7

SPILLWAY WEIR AND DOWNSTREAM TRAINING WALL. NOTE BRUSH IN SPILLWAY DISCHARGE CHANNEL.

PHOTO NO. 8

CONCRETE TRAINING WALL. NOTE CRACK AND 5/8 INCH DISPLACEMENT AT TOP OF WALL.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	WHIST POND DAM DRAKE POND BROOK GOSHEN-TORRINGTON, CT CT 00102 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 9

STONE MASONRY WEIR. NOTE VOIDS UNDER CAPSTONES.

PHOTO NO. 10

VALVE SHED AT DOWNSTREAM TOE.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	WHIST POND DAM DRAKE POND BROOK GOSHEN-TORRINGTON, CT CT 00102 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 11

DIVERSION STRUCTURE. FLASHBOARDS IN BACKGROUND DIVERT WATER FROM NATURAL STREAM TO WHIST POND.

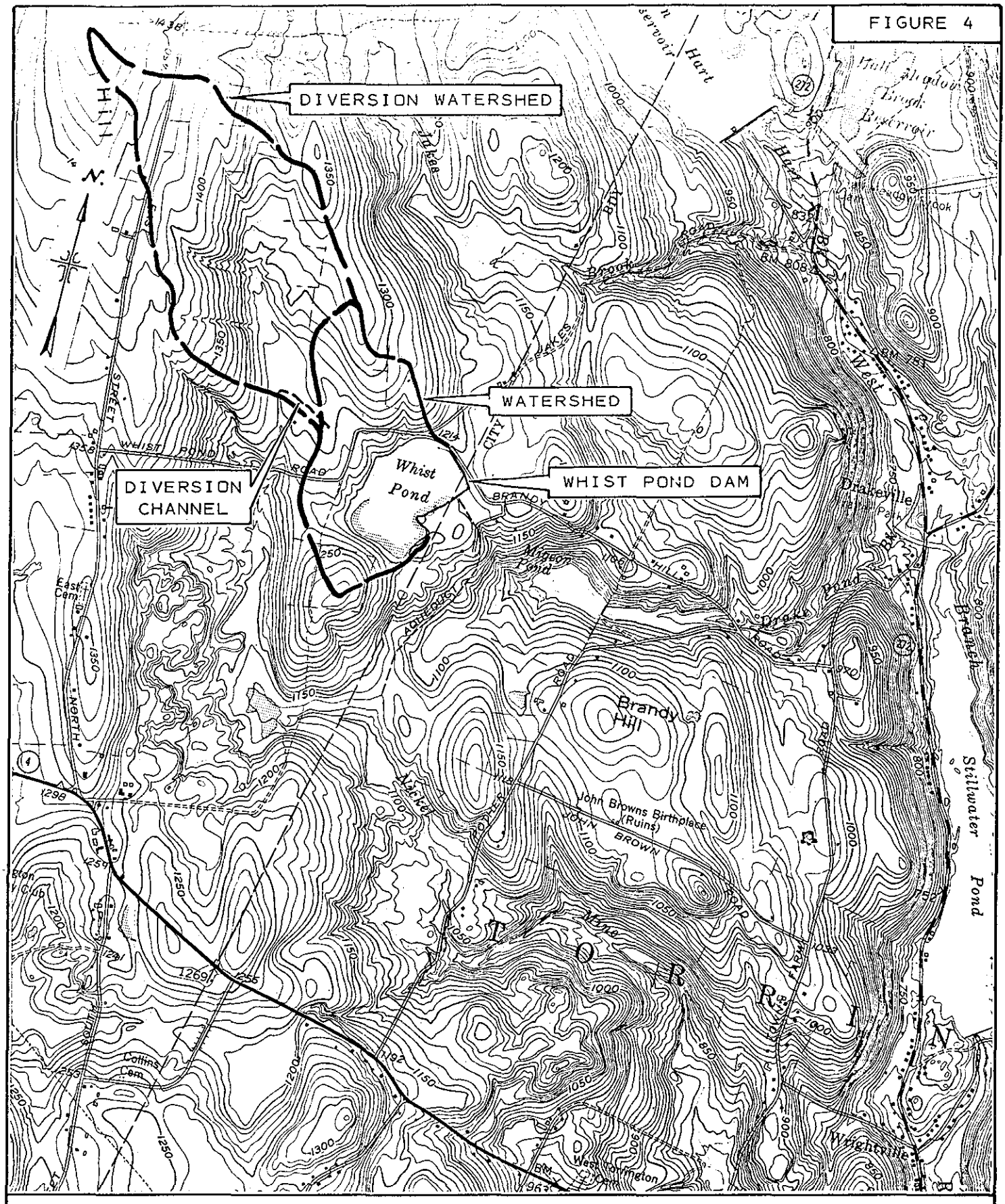
PHOTO NO. 12

DIVERSION STRUCTURE. LOOKING DOWN CHANNEL TOWARD WHIST POND.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

FIGURE 4



WATERSHED MAP

WHIST POND DAM
GOSHEN AND TORRINGTON, CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC.

WEST TORRINGTON
QUADRANGLE 1969

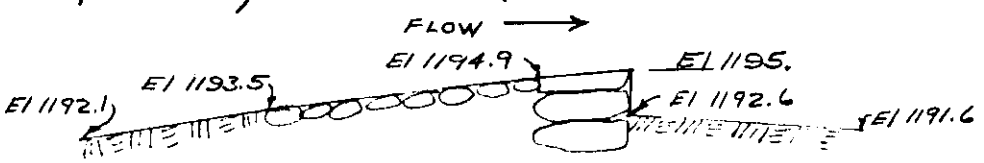
BY SAL DATE 11/21/80 **ROALD HAESTAD, INC.** SHEET NO 1 OF 23

CONSULTING ENGINEERS

CKD BY DLS DATE 11/24/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-032

SUBJECT WHIST POND DAM - Project discharge Capacity

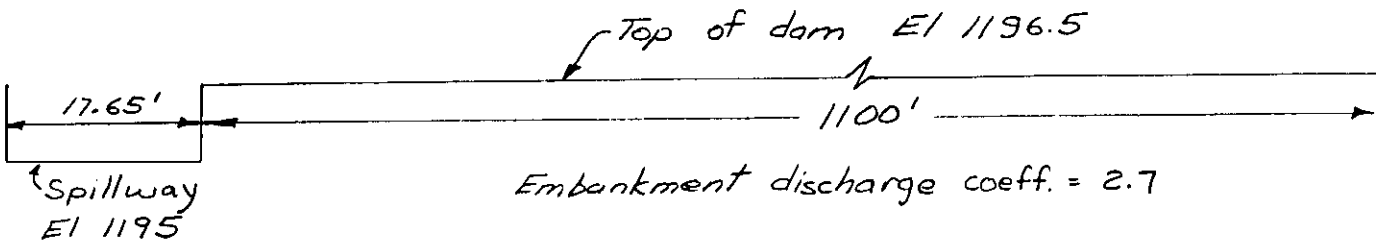
Spillway Section: (Scale 1" = 10' V&H)



L = 17.65'
C = 3.1

FORMULA:
$Q = CLH^{3/2}$

Dam Profile: (Not to Scale)



Embankment discharge coeff. = 2.7

Elevation (feet)	Spillway Discharge Capacity (cfs)	Dam Discharge Capacity (cfs)	Total Discharge Capacity (cfs)
1195	0	0	0
1196	55	0	55
1196.5	100	0	100
1197	155	1,050	1205
1198	284	5,456	5740
1199	438	11,740	12,178

BY SAL DATE 11/24/80 **ROALD HAESTAD, INC.** SHEET NO 2 OF 23

CKD BY DJS DATE 12/2/80 CONSULTING ENGINEERS 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-032

SUBJECT WHIST POND DAM - Project discharge capacity curve

BY SAL DATE 11/20/80 **ROALD HAESTAD, INC.** SHEET NO 3 OF 23

CONSULTING ENGINEERS

CKD BY DLS DATE 11/24/80. 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-032

SUBJECT WHIST POND DAM - Surcharge storage capacity

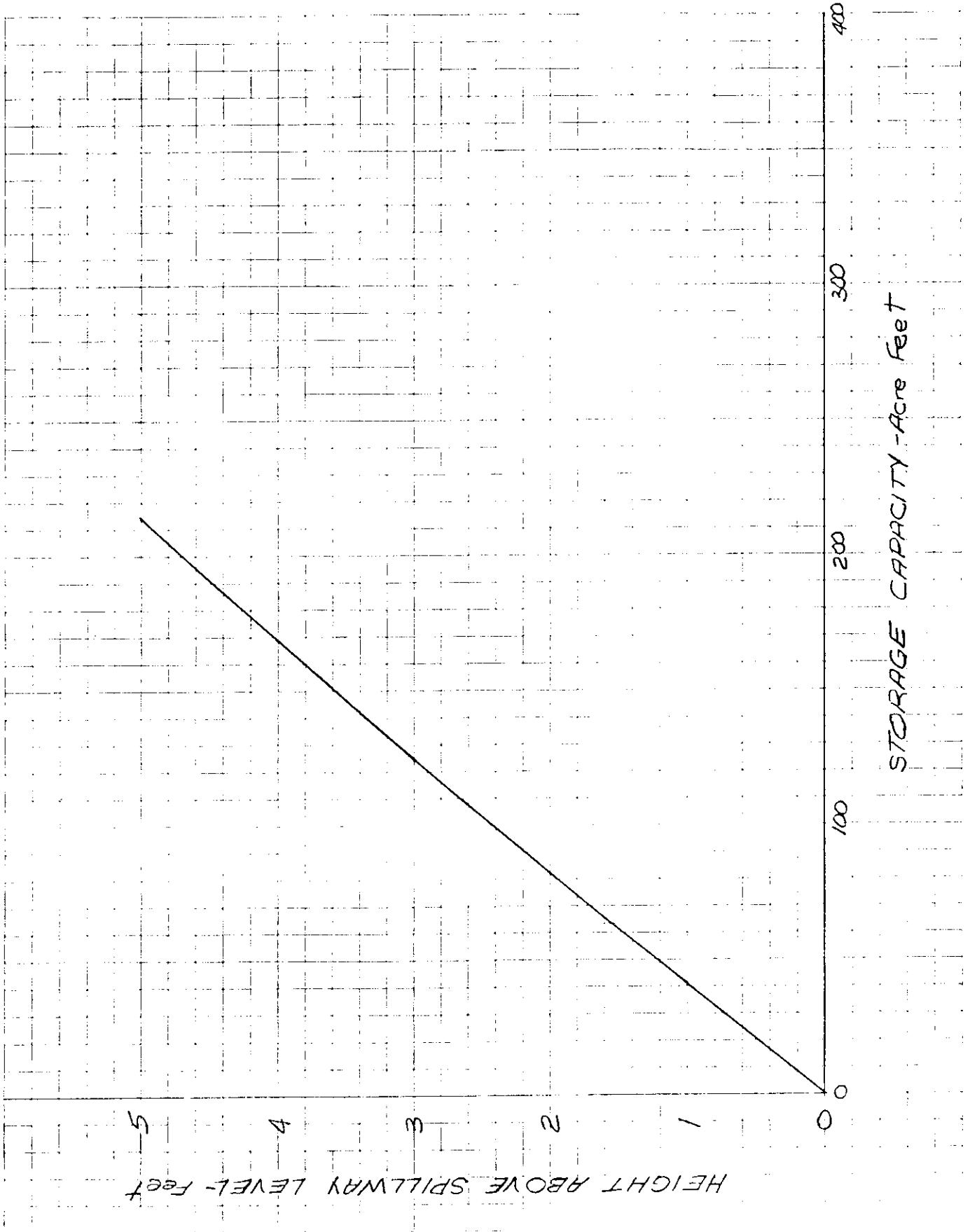
Elevation (feet)	Surface Area (Acres)	Average Surface Area (Acres)	Storage Capacity (Acre-Feet)
1195	39.5		0
		40.15	
1196	40.8		40.2
		41.45	
1197	42.1		81.6
		42.7	
1198	43.3		124.3
		43.95	
1199	44.6		168.3
		45.25	
1200	45.9		213.5

BY SAL DATE 11/20/80 **ROALD HAESTAD, INC.** SHEET NO 4 OF 23

CONSULTING ENGINEERS

CKD BY DLS DATE 11/24/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-032

SUBJECT WHIST POND DAM - Surcharge storage capacity curve



Diversion Channel:

Control Section is a stone masonry wall with provisions for the use of flashboards to divert the flow.

Data: 1) 44" high
2) 4' wide
3) $H_{w\,max}$ of channel upstream is 2 feet
4) channel slope estimated at 1%.
5) Mannings coefficient $n = 0.03$

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

$$V = \frac{1.486}{0.03}\left(\frac{8\,ft^2}{8\,ft}\right)^{2/3}(0.01)^{1/2} = 4.95 \text{ use } 5 \text{ fps}$$

$$Q = VA = 5(8) = 40 \text{ cfs}$$

Note: Flow greater than 40 cfs would overtop the diversion channel banks and flow down the natural stream.

Test Flood = 100 yr

Drainage Area = 146 Acres = 0.23 sq mi (direct watershed)

$$Q_{100} = \frac{15.0\, A^{0.99} R_{24,100}^{1.15}}{(L/\sqrt{S})^{0.26}}$$ (WEISS FORMULA)

A = drainage area (sq mi) = 0.23
R = rainfall (inches) = 11.5"/24 hr
L = main channel length (mi) = 0.57
S = main channel slope (ft/mi) = 219

$$Q_{100} = \frac{15\,(0.23)^{0.99}\,(11.5)^{1.15}}{(0.57/\sqrt{219})^{0.26}} = 135 \text{ cfs}$$

Q_{P1} = Total inflow = Direct watershed + Diversion watershed

$$Q_{P1} = 135 \text{ cfs} + 40 \text{ cfs} = 175 \text{ cfs}$$

Note a) For diversion watershed inflow see computation sheet 5 of 23.
b) The Weiss Formula comes from "Flood Flow Formulas for Connecticut" by Conn. Department of Environmental Protection - Natural Resources Center. Oct 1, 1977.
c) Rainfall value (R) is obtained from USGS "Aeral Rainfall Distribution Map", 24 hour - 100 yr
d) Inches of runoff for the 100 yr flood is assumed to equal 6 inches.

Continued:

$Q_{P1} = 175$ cfs

$H_1 =$ 1.55' above spillway, from Discharge Curve

$STOR_1 =$ 64 ac-ft, from Storage Capacity Curve

= 5.2 inches of runoff from 0.23 sq mi

$Q_{P2} = Q_{P1}(1 - STOR_1/6) = 175 \text{ cfs}(1 - 5.2/6) = 23$ cfs

$H_2 = 0.5$ ft $\qquad STOR_2 = 20$ ac-ft

$STOR_{AVE1} = (STOR_1 + STOR_2)/2 = (64+20)/2 = 42$ ac-ft
= 3.4 " of runoff

$Q_{P3} = Q_{P1}(1 - STOR_{AVE1}/6) = 175\text{cfs}(1 - 3.4/6) = 76$ cfs

$H_3 = 1.2$ ft $\qquad STOR_3 = 50$ ac-ft

$STOR_{AVE2} = (STOR_{AVE1} + STOR_3)/2 = (42+50)/2 = 46$ ac-ft
= 3.75" of runoff

$Q_{P4} = Q_{P1}(1 - STOR_{AVE2}/6) = 175\text{cfs}(1 - 3.75/6) = 66$ use 65 cfs

$H_4 = 1.1$ ft

Spillway Capacity (Top of dam) $= CLH^{3/2}$

$= 3.1(17.65)(1.5)^{1.5}$

$= 100.5$ use 100 cfs

% of 100 yr flood $= (100/65) \times 100 = 154\%$ of the 100yr flood.

S = Storage at time of failure with water level at top of dam

S = Storage at spillway level + Surcharge storage

S = (Surface area × Average depth) + Surcharge storage

S = (39.5 Ac. × 5 ft) + 62 Ac-Ft

S = 197.5 Ac-Ft + 62 Ac-Ft = 259.5 use 260 Ac-Ft

Note: Whist pond is a natural pond. Storage capacity was increased by construction of a 9 foot high dam. In the flood routing, the storage capacity of the natural pond was not included because it was assumed that the water would not be released in the event of a dam failure.

Q_{pl} = Peak Failure Outflow = $8/27\ W_b \sqrt{g}\ Y_o^{3/2}$

W_b = Breach width - 40% of dam length at mid-height - 0.4(385) = 154 feet

Y_o = Total height from river bed to pool level at time of failure = 9 feet

$Q_{pl} = 8/27\ (154)\sqrt{32.2}\ (9)^{3/2}$

= 6,990.9 use 6,990 cfs.

Note: 1) In calculating the peak failure outflow it was assumed that either the main dam or the dike would fail but not both of them together. In this case the main dam was assumed to fail.

2) Spillway discharge was assumed negligible in comparison to the dam breach flow and was not included in the flood routing.

SUBJECT WHIST POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 1

MIGEON POND
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	8.17	7.9
2.0	8.73	16.3
3.0	9.30	25.3
4.0	9.87	34.9
5.0	10.43	45.1
6.0	11.00	55.8
7.0	11.46	67.0
8.0	11.92	78.7
9.0	12.38	90.9
10.0	12.84	103.5

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SUBJECT WHIST POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 1

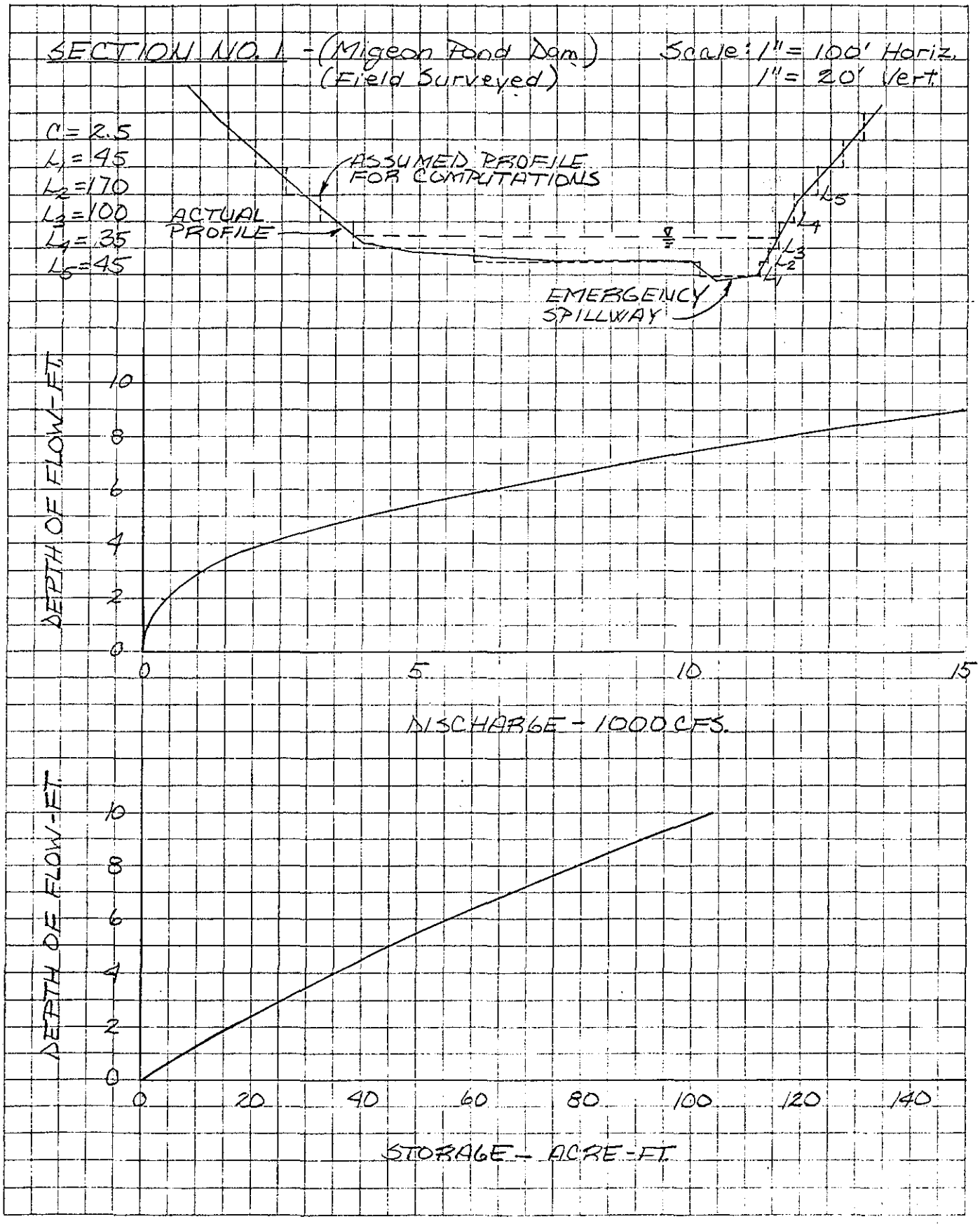
MIGEON POND

HEIGHT ABOVE SPILLWAY LEVEL (FEET)	SPILLWAY DISCHARGE CAPACITY (CFS)
1.0	122
2.0	344
3.0	1090
4.0	2270
5.0	4013
6.0	6221
7.0	8785
8.0	11655
9.0	14887
10.0	18444

STORAGE AT TIME OF FAILURE=S=	260	AC. FT.
LENGTH OF REACH=L=	1100	FT
INFLOW INTO REACH=QP1=	6990	CFS
HEIGHT ABOVE SPILLWAY LEVEL=H1=	6.3	FT.
STORAGE IN REACH=V1=	59.2	AC. FT.
TRIAL REACH OUTFLOW=QP(TRIAL)=	5399	CFS
TRIAL HEIGHT ABOVE SPILLWAY LEVEL=H(TRIAL)=	5.6	FT.
TRIAL STORAGE IN REACH=V(TRIAL)=	51.8	AC. FT.
REACH OUTFLOW=QP2=	5498	CFS
HEIGHT ABOVE SPILLWAY LEVEL=H2=	5.7	FT.

SUBJECT WHIST POND DAM - FLOOD ROUTING

SECTION NO. 1 - (Migeon Pond Dam) (Field Surveyed) Scale: 1" = 100' Horiz. 1" = 20' Vert.



SUBJECT WHIST POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 2A

MAIN CHANNEL

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
1.0	24	20	0.86	0.0133	3.11	63
2.0	28	45	1.64	0.0133	4.77	216
3.0	32	74	2.33	0.0133	6.02	443
4.0	32	104	3.28	0.0133	7.57	783
5.0	32	134	4.23	0.0133	8.96	1197
6.0	32	164	5.18	0.0133	10.26	1678
7.0	32	194	6.13	0.0133	11.48	2222
8.0	32	224	7.08	0.0133	12.64	2825
9.0	32	254	8.03	0.0133	13.75	3485
10.0	32	284	8.98	0.0133	14.81	4200
11.0	32	314	9.93	0.0133	15.84	4967
12.0	32	344	10.89	0.0133	16.83	5784
13.0	32	374	11.84	0.0133	17.80	6650
14.0	32	404	12.79	0.0133	18.74	7565
15.0	32	434	13.74	0.0133	19.66	8526

MANNING COEFFICIENT=N=0.0500

SECTION NUMBER 2B

LEFT OVERBANK

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
4.0	23	11	0.50	0.0133	1.08	12
5.0	46	46	1.00	0.0133	1.71	78
6.0	69	103	1.50	0.0133	2.24	231
7.0	92	183	2.00	0.0133	2.72	497
8.0	114	286	2.50	0.0133	3.15	901
9.0	137	411	3.00	0.0133	3.56	1466
10.0	160	560	3.50	0.0133	3.95	2211
11.0	165	723	4.37	0.0133	4.58	3311
12.0	170	890	5.22	0.0133	5.16	4593
13.0	175	1063	6.06	0.0133	5.69	6050
14.0	181	1240	6.87	0.0133	6.19	7679
15.0	186	1423	7.66	0.0133	6.66	9475

MANNING COEFFICIENT=N=0.1000

SECTION NUMBER 2C

RIGHT OVERBANK

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
4.0	19	10	0.50	0.0133	1.08	10
5.0	39	39	1.00	0.0133	1.71	66
6.0	58	87	1.50	0.0133	2.24	195
7.0	77	154	2.00	0.0133	2.72	419
8.0	97	241	2.50	0.0133	3.15	760
9.0	116	347	3.00	0.0133	3.56	1236
10.0	135	473	3.50	0.0133	3.95	1865
11.0	138	609	4.42	0.0133	4.61	2808
12.0	141	748	5.32	0.0133	5.22	3903
13.0	143	889	6.20	0.0133	5.79	5143
14.0	146	1033	7.07	0.0133	6.32	6521
15.0	149	1179	7.93	0.0133	6.82	8034

MANNING COEFFICIENT=N=0.1000

SUBJECT WHIST POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 2

TOTAL SECTION

	AREA (SQ.FT.)				DISCHARGE (CFS)			
H	A	B	C	TOTAL	A	B	C	TOTAL
1.0	20	0	0	20	63	0	0	63
2.0	45	0	0	45	216	0	0	216
3.0	74	0	0	74	443	0	0	443
4.0	104	11	10	125	783	12	10	806
5.0	134	46	39	218	1197	78	66	1341
6.0	164	103	87	353	1678	231	195	2103
7.0	194	183	154	531	2222	497	419	3138
8.0	224	286	241	750	2825	901	760	4487
9.0	254	411	347	1012	3485	1466	1236	6188
10.0	284	560	473	1316	4200	2211	1865	8276
11.0	314	723	609	1645	4967	3311	2808	11085
12.0	344	890	748	1981	5784	4593	3903	14280
13.0	374	1063	889	2325	6650	6050	5143	17843
14.0	404	1240	1033	2676	7565	7679	6521	21764
15.0	434	1423	1179	3035	8526	9475	8034	26035

STORAGE AT TIME OF FAILURE=S= 260 AC. FT.
LENGTH OF REACH=L= 2000 FT

INFLOW INTO REACH=QP1= 5498 CFS
DEPTH OF FLOW=H1= 8.6 FT.
CROSS SECTIONAL AREA=A1= 906 SQ.FT.
STORAGE IN REACH=V1= 41.6 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 4619 CFS
TRIAL DEPTH OF FLOW=H(TRIAL)= 8.1 FT.
TRIAL CROSS SECTIONAL AREA=A(TRIAL)= 771 SQ.FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 35.4 AC. FT.

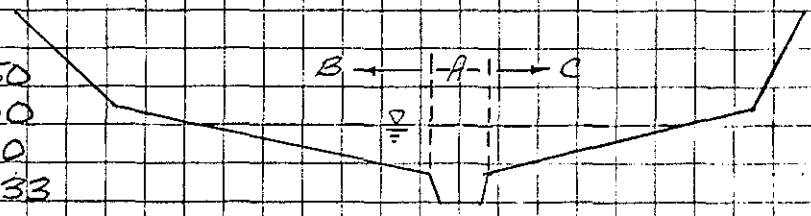
REACH OUTFLOW=QP2= 4684 CFS
DEPTH OF FLOW=H2= 8.1 FT.

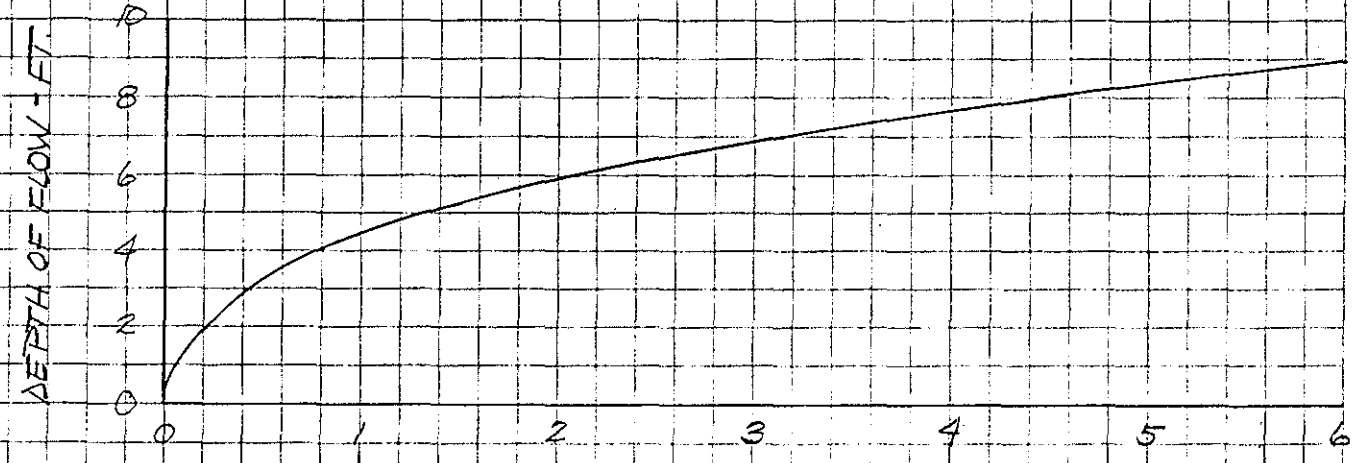
SUBJECT WHIST POND DAM - FLOOD ROUTING

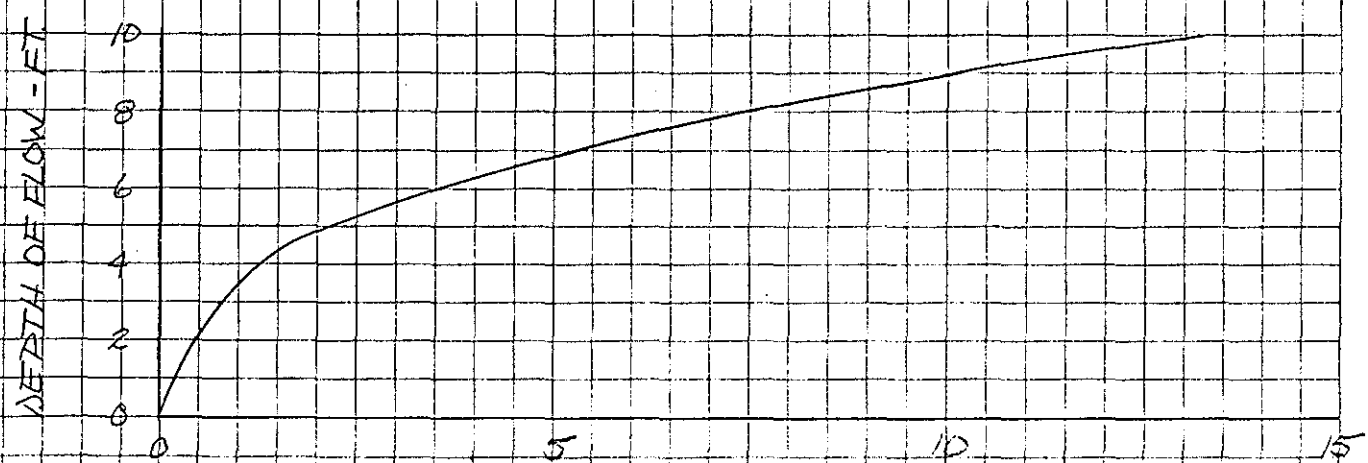
SECTION NO. 2

Scale: 1" = 100' Horiz
1" = 20' Vert.

L = 2000'
NA = 0.050
NB = 0.100
NC = 0.100
S = 0.0133







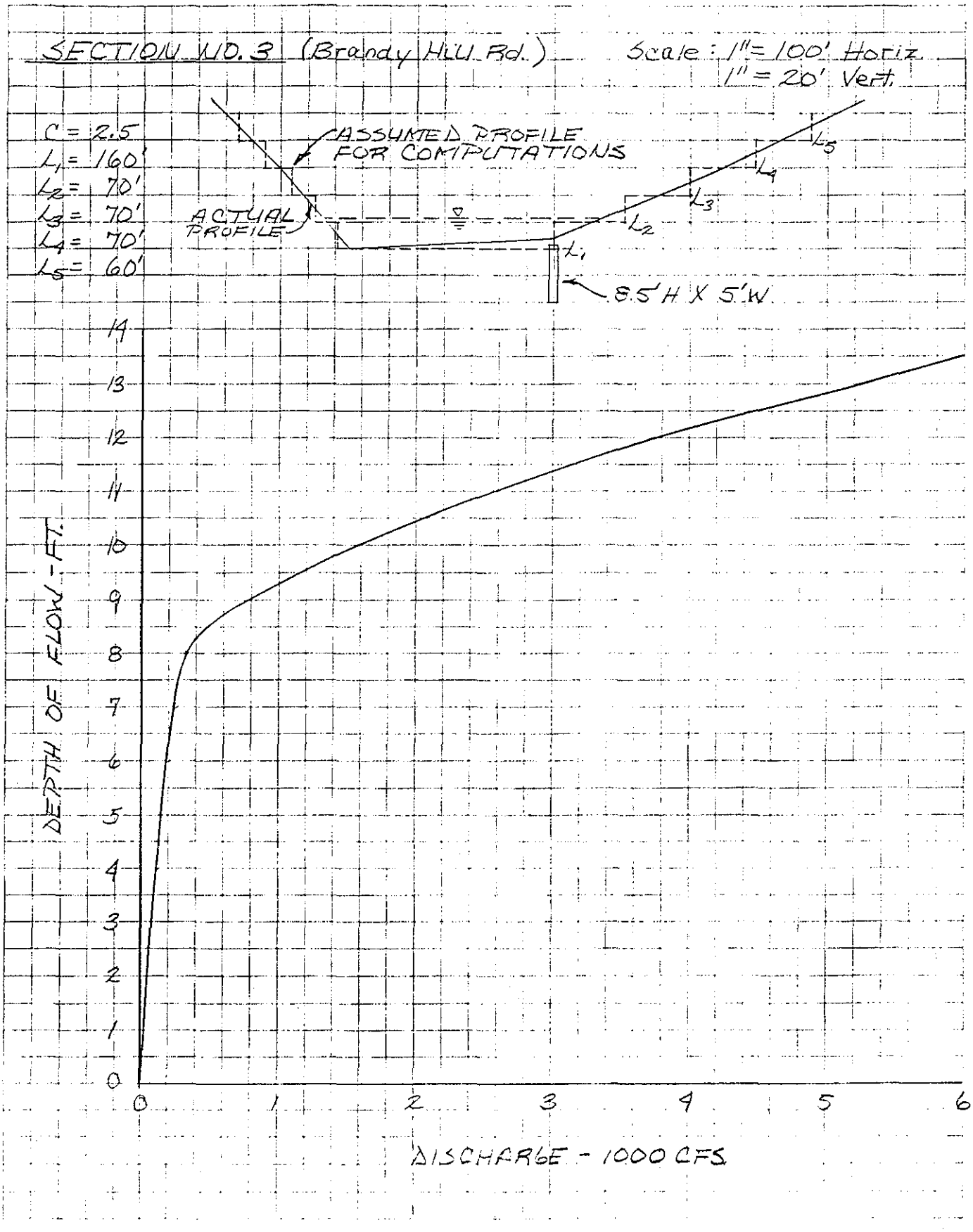
SECTION NUMBER 3

BRANDY HILL ROAD

HEIGHT ABOVE INVERT (FEET)	D I S C H A R G E C A P A C I T Y CONDUIT (CFS)	SPILLWAY (CFS)	TOTAL (CFS)
1.0	23	0	23
2.0	45	0	45
3.0	82	0	82
4.0	120	0	120
5.0	173	0	173
6.0	225	0	225
7.0	280	0	280
8.0	335	0	335
9.0	393	400	792
10.0	450	1131	1581
11.0	495	2078	2573
12.0	540	3200	3740
13.0	582	4647	5230
14.0	625	6374	6999
15.0	657	8317	8975
16.0	690	10451	11141
17.0	725	12932	13657
18.0	760	15716	16476
19.0	792	18744	19536
20.0	825	21987	22812

REACH OUTFLOW=QP2= 4684 CFS

HEIGHT ABOVE CONDUIT INVERT=H2= 12.6 FT.


SECTION NO. 3 (Brandy Hill Rd.)
Scale: 1" = 100' Horiz.
1" = 20' Vert.
C = 2.5
L1 = 160'
L2 = 70'
L3 = 70'
L4 = 70'
L5 = 60'
ASSUMED PROFILE FOR COMPUTATIONS
ACTUAL PROFILE
8.5' H X 5' W
DEPTH OF FLOW - FT.
DISCHARGE - 1000 CFS

SUBJECT WHIST POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 4

TOTAL SECTION

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
1.0	24	20	0.86	0.0667	3.48	71
2.0	28	45	1.64	0.0667	5.34	241
3.0	32	74	2.33	0.0667	6.74	496
4.0	40	108	2.67	0.0667	7.39	796
5.0	49	151	3.06	0.0667	8.09	1219
6.0	58	202	3.48	0.0667	8.82	1783
7.0	67	262	3.92	0.0667	9.55	2502
8.0	76	331	4.37	0.0667	10.26	3394
9.0	84	408	4.83	0.0667	10.97	4472
10.0	93	493	5.29	0.0667	11.66	5753
11.0	112	593	5.30	0.0667	11.66	6913
12.0	131	710	5.44	0.0667	11.87	8436
13.0	149	847	5.67	0.0667	12.21	10338
14.0	168	1001	5.96	0.0667	12.62	12641
15.0	187	1175	6.30	0.0667	13.09	15372

MANNING COEFFICIENT=N=0.1000
STORAGE AT TIME OF FAILURE=S= 260 AC. FT.
LENGTH OF REACH=L= 3000 FT

INFLOW INTO REACH=QP1= 4684 CFS
DEPTH OF FLOW=H1= 9.2 FT.
CROSS SECTIONAL AREA=A1= 422 SQ.FT.
STORAGE IN REACH=V1= 29.1 AC. FT.

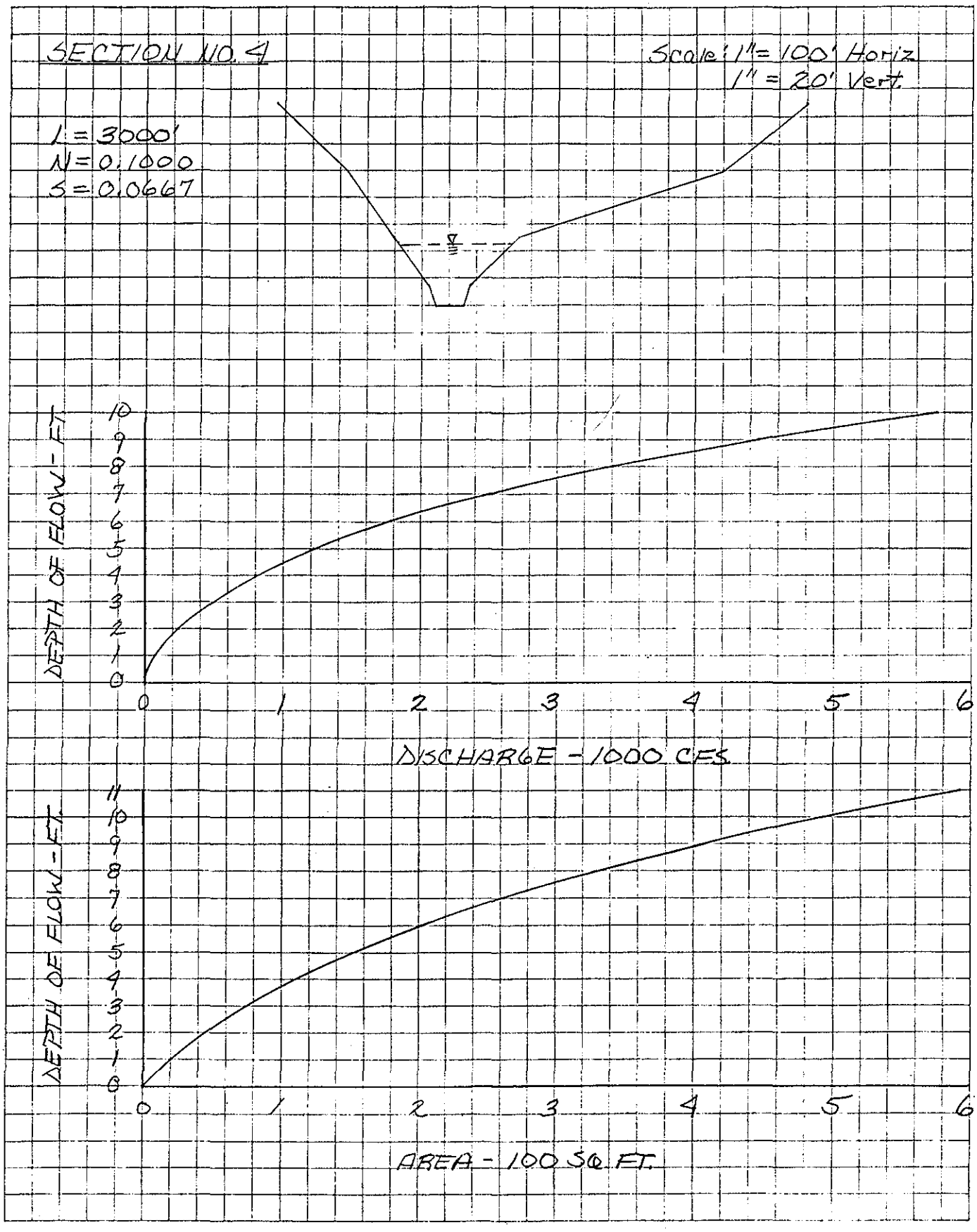
TRIAL REACH OUTFLOW=QP(TRIAL)= 4161 CFS
TRIAL DEPTH OF FLOW=H(TRIAL)= 8.7 FT.
TRIAL CROSS SECTIONAL AREA=A(TRIAL)= 385 SQ.FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 26.5 AC. FT.

REACH OUTFLOW=QP2= 4183 CFS
DEPTH OF FLOW=H2= 8.7 FT.

SECTION NO. 4

Scale: 1" = 100' Horiz.
1" = 20' Vert.

L = 3000'
N = 0.1000
S = 0.0667



SUBJECT WHIST POND DAM-DEPTH OF FLOW

SECTION NUMBER 5

ROUTE-272 BRIDGE

HEIGHT ABOVE INVERT (FEET)	D I S C H A R G E C A P A C I T Y CONDUIT (CFS)	SPILLWAY (CFS)	TOTAL (CFS)
1.0	374	0	374
2.0	748	0	748
3.0	1430	0	1430
4.0	2112	0	2112
5.0	2992	0	2992
6.0	3872	0	3872
7.0	4796	0	4796
8.0	5720	0	5720
9.0	6600	0	6600
10.0	7480	0	7480
11.0	8140	0	8140
12.0	8800	0	8800

REACH OUTFLOW=QP2= 4183 CFS

HEIGHT ABOVE CONDUIT INVERT=H2= 6.3 FT.

SUBJECT WHIST POND DAM - DEPTH OF FLOW

SECTION NO. 5 (Route 272 Bridge) Scale: 1" = 50' Horiz
(Field Measurements) 1" = 10' Vert.

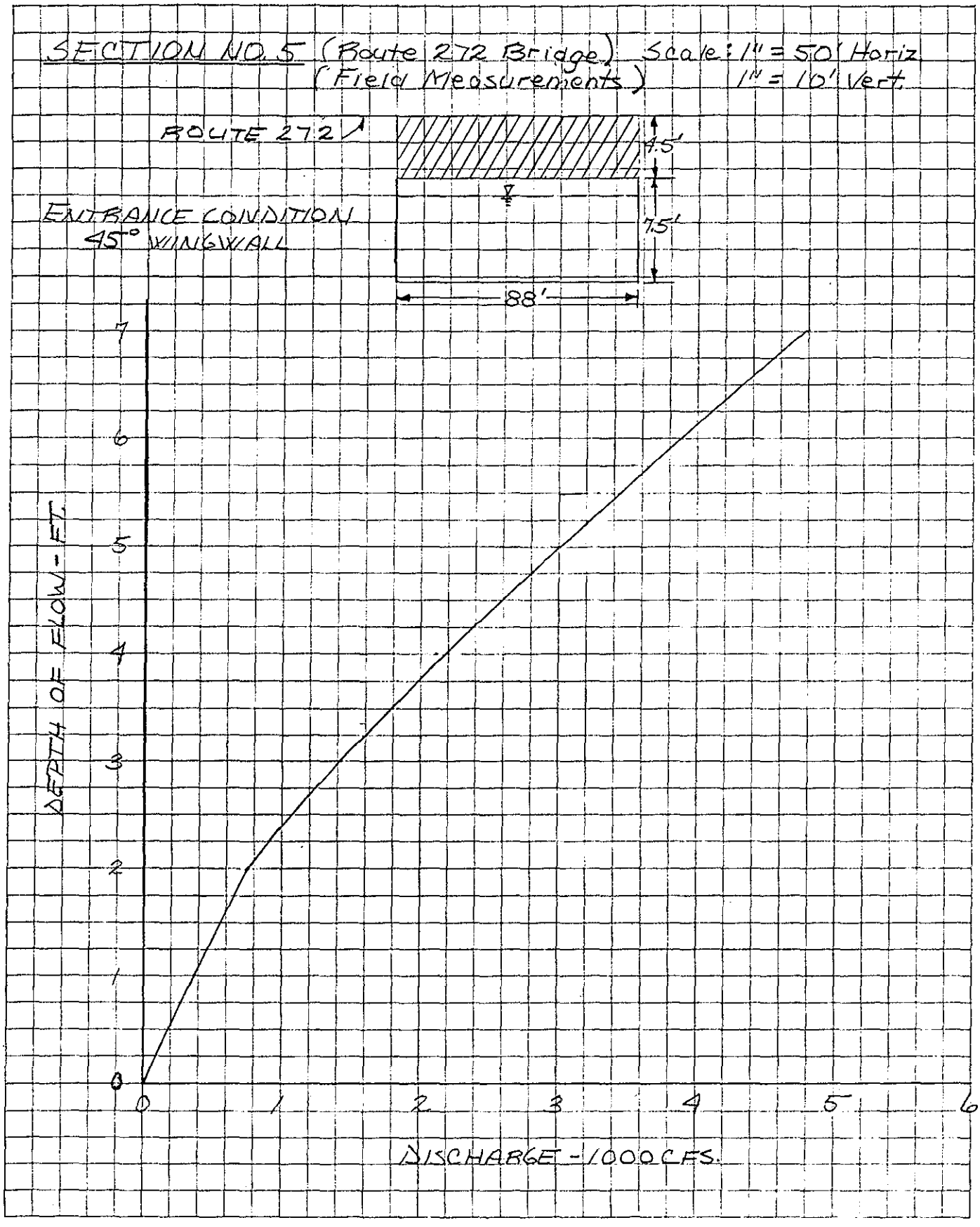
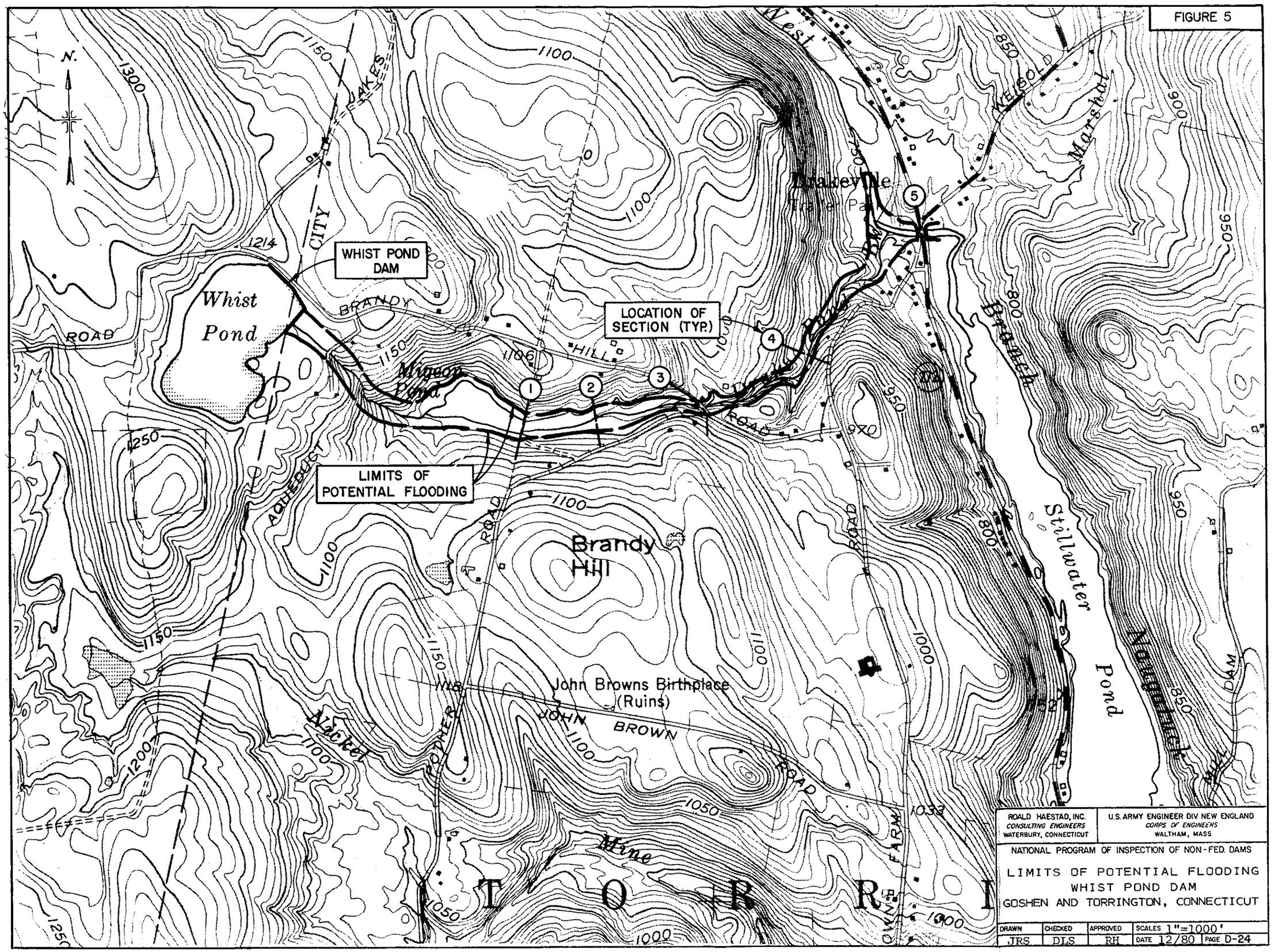


FIGURE 5



ROALD HAESTAD, INC. *CONSULTING ENGINEERS* WATERBURY, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LIMITS OF POTENTIAL FLOODING
WHIST POND DAM
GOSHEN AND TORRINGTON, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES 1"=1000'
JRS	DLS	RH	DATE 12/80 PAGE D-24

SUBJECT WHIST POND DAM - SURFACE AREAS

PLANIMETER NO. 60272

PLANIMETER READING
(Scale: 1" = 2000')

WATER SURFACE	THIRD	23.60 SQ. IN.	.48	= 39.5 ACRES
	FIRST	22.73 SQ. IN.	.42	
	START	22.31 SQ. IN		
WATERSHED	THIRD	8.38 SQ. IN	1.59	= 0.23 SQ. MI.
	FIRST	5.19 SQ. IN	1.59	
	START	3.60 SQ. IN		
DIVERSION WATERSHED	THIRD	25.45 SQ. IN.	2.8	= 0.40 SQ. MI.
	FIRST	19.85 SQ. IN.	2.8	
	START	17.05 SQ. IN		
CONTOUR 1200	THIRD	15.05 SQ. IN.	.50	= 45.9 ACRES
	FIRST	14.05 SQ. IN.	.49	
	START	13.56 SQ. IN.		

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY | MO | YR
CT	102	NED	CT	005	06				WHIST POND DAM	4151.1	7311.0	16DEC80

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
	WHIST POND

(16) REGION	(17) BASIN	(18) RIVER OR STREAM	(19) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(20) DIST FROM DAM (MI.)	(21) POPULATION
01	10	DRAKE POND BROOK	DRAKEVILLE	1	2000

(22) TYPE OF DAM	(23) YEAR COMPLETED	(24) PURPOSES	(25) STRUCTURAL HEIGHT (FT.)	(26) HYDRAULIC HEIGHT (FT.)	(27) IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE–FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
RE	1900	S	9	9	460	400	NED	N	N	N	N	

(28) REMARKS
20 ESTIMATE 26+27 INCLUDES 185 ACRE FT OF NATURAL LAKE STORAGE

(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
2	1100	U	18	100	5000											

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
TORRINGTON WATER CO	UNKNOWN	UNKNOWN

(49) REGULATORY AGENCY DESIGN	(50) CONSTRUCTION	(51) OPERATION	(52) MAINTENANCE
NONE	NONE	CT DEP	CT DEP

(53) INSPECTION BY	(54) INSPECTION DATE DAY | MO | YR	(55) AUTHORITY FOR INSPECTION
RUALD HAESTAD INC	17NOV80	PL 92-367

(56) REMARKS