

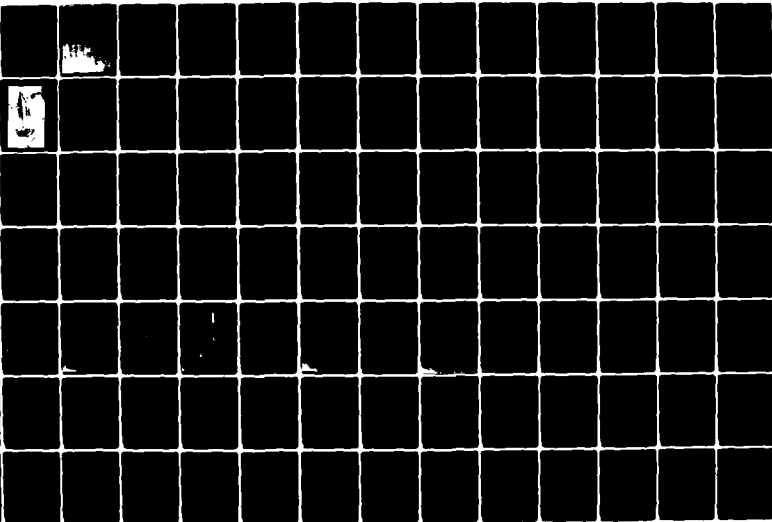
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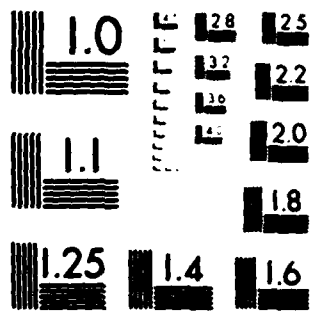
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
WOOD CREEK DAM (CT 00..(U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAR 81

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AD-A144 541

HOUSATONIC RIVER BASIN
NORFOLK, CONNECTICUT



WOOD CREEK
DAM - CT 00486
DIKE - CT 01707

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00486 CT 01707	2. GOVT ACCESSION NO. AD-A14454	3. RECIPIENT'S CATALOG NUMBER 54
4. TITLE (and Subtitle) Wood Creek DAM; DIKE NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE March 1981
		13. NUMBER OF PAGES 125
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18. SUPPLEMENTARY NOTES 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 Norfolk, Connecticut		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Wood Creek Dam and Dike form a single purpose flood control impoundment. The dam consists of a zoned earth embankment with a maximum height of 36 feet, a top width of 14 feet, an upstream slope of 3.5 horizontal to 1 vertical, and a downstream slope of 3 horizontal to 1 vertical. Based on visual inspection and a review of all available pertinent data, the condition of both the dam and dike is judged to be good. The dam and dike are classified as "Intermediate" in size with a "High" hazard potential. A test flood equal to the PMF was used to evaluate the spillway capacity.		



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

REPLY TO
ATTENTION OF:

NEDED

JUN 07 1961

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 Wood Creek Dam (CT-00486) & Wood Creek Dike (CT-01707) 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 owner and the cooperating agency for the State of Connecticut.

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
Commander and Division Engineer

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As stated

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WOOD CREEK

DAM - CT 00486
DIKE - CT 01707



HOUSATONIC RIVER BASIN
NORFOLK, CONNECTICUT

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IDENTIFICATION NO: Dam - CT 00486; Dike - CT 01707
NAME OF DAM: Wood Creek Dam and Dike
TOWN: Norfolk
COUNTY AND STATE: Litchfield County, Connecticut
STREAM: East Branch Naugatuck River
DATE OF INSPECTION: November 17, 1980; February 11, 1981

BRIEF ASSESSMENT

The Wood Creek Dam and Dike form a single purpose flood control impoundment. The dam consists of a zoned earth embankment with a maximum height of 36 feet, a top width of 14 feet, an upstream slope of 3.5 horizontal to 1 vertical, and a downstream slope of 3 horizontal to 1 vertical. The dam is 1,000 feet long and has a grass-covered 230 foot emergency spillway excavated into the left abutment. The principal spillway is of the drop inlet type and discharges through a 36-inch conduit through the center of the dam. The dam, constructed on a pervious foundation, has a central impervious core, a chimney drain within the core and a foundation drain under the downstream portion of the embankment. The dike, located 3,000 feet north of the dam, consists of a homogenous compacted earth embankment with a maximum height of 19 feet, a top width of 12 feet, and upstream and downstream slopes of 3 horizontal to 1 vertical. The dike is 1,050 feet long. As the impoundment is used for flood control, the water level remains at the invert of the principal spillway except during periods of heavy runoff. The impoundment has a maximum capacity of 1,550 Acre-Feet.

Based on the visual inspection and a review of all available pertinent data, the condition of both the dam and dike is judged to be good. The impoundment has never been substantially filled so the behavior of the structures under full hydrostatic loading conditions is unknown. The future integrity of the dam could be affected by settlement around and under the outlet conduit, the lack of anti-seep collars on the outlet conduit within the impervious core, erosion along the left upstream toe and on the upstream slope of the dam, erosion and sloughing of the left abutment, and the lack of riprap at the downstream end of the dike between the emergency spillway and the dam.

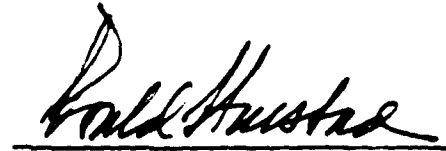
Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, both the dam and dike are classified as "Intermediate" in size with a "High" hazard potential. A Test Flood equal to the Probable Maximum Flood (PMF) was used to evaluate the spillway capacity. The Test Flood inflow of 9,400 cubic feet per second (cfs) was routed through the impoundment and produced an outflow of 5,850 cfs. The spillway capacity with the water level at the top of the dam is 7,600 cfs, 130 percent of the routed Test Flood outflow, resulting in a freeboard of 0.8 feet.

It is recommended that a qualified, registered engineer be retained to investigate the settlement around and under the outlet conduit, the need for anti-seep collars on the outlet conduit within the impervious core, the erosion channel along the left upstream toe and erosion on the upstream slope, the erosion and sloughing of the left abutment and the need for riprap at the end of the dike

between the emergency spillway and the dam. The dam and dike should be inspected by a qualified, registered engineer during each period of significant flood impoundment to assure that they function as designed. In addition, the Soil Conservation Service's Operations and Maintenance Handbook should be provided to the dam's operators, records of water levels should be kept and a downstream warning system should be developed.

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


Ronald G. Litke, P.E.
Project Engineer


Roald Haestad
President



This Phase I Inspection Report on Wood Creek Dam and Dike (CT-00486 and CT-01707) 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.



RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division



ARAMAST MAHTESIAN, MEMBER
Foundation & Materials Branch
Engineering Division



CARNEY M. TERZIAN, CHAIRMAN
Design Branch
Engineering Division

APPROVAL RECOMMENDED:



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.

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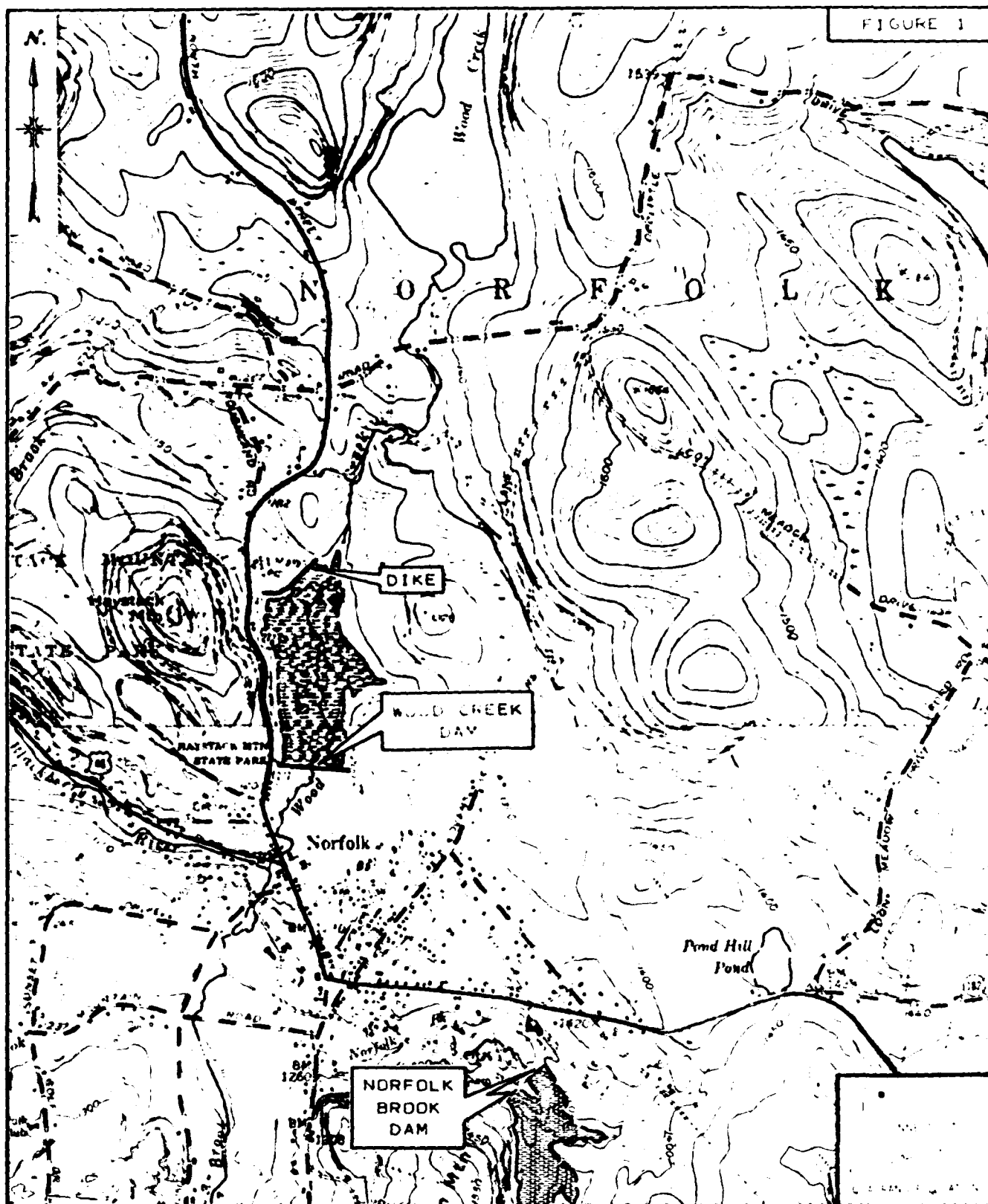
OVERVIEW PHOTO

U S ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSA CHUSETTS

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED DAMS

WALTHAM, MASSA CHUSETTS
A
1970-1971
1970-1971

FIGURE 1



LOCATION PLAN

WOOD CREEK DAM
NORFOLK, CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC.

NORFOLK QUADRANGLE 1969

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

WOOD CREEK DAM AND DIKE

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. DACW33-81-0005 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 Wood Creek Dam, also known as the Blackberry River Watershed Floodwater Retarding Dam No. 9, is located on Wood Creek, about 1,600 feet upstream of the confluence with the Blackberry River, adjacent to Connecticut Route 272, and 3,000 feet north of Norfolk Center in the Town of Norfolk, Connecticut. The dam is located but not shown on the Norfolk U.S.G.S Quadrangle map having coordinates of latitude $N41^{\circ} 59.9'$, and longitude $W73^{\circ} 12.1'$.

The Wood Creek Dike is located about 3,000 feet north of the dam and adjacent to Route 272. The dike has coordinates of latitude $N42^{\circ} 0.3'$ and longitude $W73^{\circ} 12.3'$. The dike is located but not shown on the South Sandisfield, Massachusetts - Connecticut U.S.G.S. Quadrangle map.

b. Description of Dam and Appurtenances

The Wood Creek Dam and Dike form a flood control impoundment which remains at the level of the principal spillway invert except during periods of heavy runoff. The dam consists of an earth embankment structure with the outlet works located near the center of the dam and an emergency spillway excavated into the left abutment. The dam has a maximum height of 36 feet and a total length of 1,230 feet, including the 230 foot long emergency spillway. The embankment section of the dam consists of a 1,000 foot long zoned earth fill on a pervious foundation. The embankment has a top width of 14 feet, an upstream slope of 3.5 horizontal to 1 vertical and a downstream slope of 3 horizontal to 1 vertical. Plans indicate that the dam has an impervious core and cutoff

trench and pervious upstream and downstream zones. There is a chimney drain of varying height in the center of the impervious core. The drain extends to the top of the core for a 200 foot section in the center of the dam and is 20 feet lower on either side. The drain extends under the downstream impervious core and embankment and discharges at the toe of the dam through 3 - 8 inch pipes. Approximately 23 feet below the top of the dam berms extend from both the upstream and downstream slopes. The upstream berm is approximately 45 feet wide and is constructed of rock. The downstream berm is approximately 75 feet wide and is constructed from spoil material. See page B-4 in Appendix B.

The principal spillway is a drop inlet type structure consisting of a "single stage reinforced concrete riser" discharging through a 36-inch diameter prestressed concrete steel cylinder outlet pipe to a riprapped outlet basin at the downstream toe of the dam (See page B-12). The concrete riser consists of a 6 foot x 6 foot box with a 10 inch wide longitudinal splitter wall and a 1 foot deep slot at the base of the upstream wall to discharge normal stream flows. The outlet pipe is continuously supported by a concrete cradle and has three reinforced concrete anti-seep collars under the upstream embankment. The collars appear to be upstream of the impervious core with no cutoffs shown within the core.

The emergency spillway consists of a grassed channel excavated into the left abutment. The spillway has a crest length of 230 feet at the bottom and is separated from the dam by a riprapped dike. The dike has a top width of 12 feet and side slopes of 3 horizontal to 1 vertical. The cut slope at the left abutment

is also 3 horizontal to 1 vertical. The emergency spillway has a level control section with a profile length of 30 feet and a one percent slope on the approach channel and a two percent slope on the discharge channel. The crest of the dam is 25.9 feet above the drop inlet spillway and 5.6 feet above the emergency spillway.

The Wood Creek Dike is located about 3,000 feet north of the dam. The dike consists of a homogenous compacted earth embankment with a length of 1,050 feet, a maximum height of 19 feet, a top width of 12 feet, and upstream and downstream slopes of 3 horizontal to 1 vertical. According to the plans on page B-4, in Appendix B, the dike is constructed of "poorly graded sands, silts and clay", and has a central cutoff trench. A foundation drain under the downstream portion of the embankment discharges through three 8-inch diameter pipes at various locations along the downstream toe.

c. Size Classification - "Intermediate"

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified as "Intermediate" in size if the height is between 40 feet and 100 feet or the dam impounds between 1,000 Acre-Feet and 50,000 Acre-Feet. The Wood Creek Dam has a maximum height of 36 feet and the dike has a maximum height of 19 feet. The maximum storage capacity is 1,550 Acre-Feet. Therefore both the dam and the dike are classified as "Intermediate" in size based on storage capacity.

d. Hazard Classification - "High"

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification for the dam and dike is "High". A dam failure analysis indicates that

several residential homes would be inundated by a breach of either the dam or the dike, with the possible loss of more than a few lives and extensive downstream property damage.

The dam breach would release up to 70,000 cfs into Wood Creek and would inundate about 20 residential homes up to 16 feet deep. A failure of the dike would release about 22,000 cfs into North Brook and would inundate about 7 houses from 5 to 8 feet deep. Pre-failure discharge below the dam would inundate about 6 homes up to 3 feet deep. There would be no pre-failure flow below the dike.

e. Ownership

State of Connecticut
Department of Environmental Protection
Water and Related Resources
State Office Building
Hartford, Connecticut 06115

Benjamin Warner, Director of Water Resources
(203) 566-7220

f. Operator

Anthony Cantele
P.O. Box 161
Pleasant Valley, Connecticut 06063
(203) 379-0771

g. Purpose of Dam

The dam is a single purpose structure designed to provide flood protection to the Blackberry River flood plain.

h. Design and Construction History

The dam was designed in 1967 - 1968 by the Soil Conservation Service, U.S. Department of Agriculture, for the State of Connecticut. The dam was designed to contain a Hurricane "Diane"-type storm (1955) without emergency spillway flow. The dam was

constructed in 1970 - 1971 by Arthur Hebert Construction Company under the supervision of the Soil Conservation Service. During construction the emergency spillway was reduced in length from 250 feet to 230 feet and the top of the dam was raised 0.5 feet above the original design elevation.

i. Normal Operational Procedures

The site is reportedly visited by DEP personnel during periods of heavy runoff. The DEP office in Hartford would be contacted if any problems were noted. No measurements have been taken or records kept of past impoundment depths. The impoundment has never been substantially filled.

1.3 Pertinent Data

a. Drainage Area

The drainage area consists of 4.09 square miles of essentially undeveloped wooded terrain. The watershed has very steep slopes, one significant pond, and some swampy areas.

b. Discharge at Damsite

Discharge at the damsite is through a principal spillway composed of a single stage reinforced concrete riser and a 36-inch diameter conduit of prestressed concrete steel cylinder pipe, and over a grassed emergency spillway excavated in the left abutment.

1. Outlet Works (conduits) Size: 36-inch
Invert Elevation: 1163.7
Discharge Capacity: 150 cfs @ El. 1188.0
2. Maximum Known Flood at Damsite: Unknown
3. Ungated Spillway Capacity *
at Top of Dam: 7,600 cfs
Elevation: 1193.6
4. Ungated Spillway Capacity *
at Test Flood Elevation: 5,850 cfs
Elevation: 1192.8
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: 5,850 cfs
Elevation: 1192.8
8. Total Project Discharge*
at Top of Dam: 7,600 cfs
Elevation: 1193.6
9. Total Project Discharge*
at Test Flood Elevation: 5,850 cfs
Elevation: 1192.8

*Includes Emergency Spillway Flow

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

1. Streambed at Toe of Dam:	1157.5
2. Bottom of Cutoff:	1154
3. Maximum Tailwater:	1160.3 (at 150 cfs)
4. Normal Pool:	1163.7
5. Full Flood Control Pool:	1188.0
6. Spillway Crest:	1167.7 Principal Spillway 1188.0 Emergency Spillway
7. Design Surcharge - Original Design:	1191.1
8. Top of Dam:	1193.6 Dam 1193.2 Dike
9. Test Flood Surcharge:	1192.8

d. Reservoir - Length in Feet

1. Normal Pool:	1000 feet
2. Flood Control Pool:	3,400 feet
3. Spillway Crest Pool:*	1,800 feet
4. Top of Dam:**	3,700 feet
5. Test Flood Pool:	3,600 feet

e. Storage - Acre-feet

1. Normal Pool:	7 Acre-Feet
2. Flood Control Pool:	1,057 Acre-Feet
3. Spillway Crest Pool:*	25 Acre-Feet
4. Top of Dam:**	1550 Acre-Feet
5. Test Flood Pool:	1,450 Acre-Feet

f. Reservoir Surface - Acres

1. Normal Pool:	5 acres
2. Flood-Control Pool:	87 acres
3. Spillway Crest: *	11.6 acres
4. Test Flood Pool:	97.8 acres
5. Top of Dam: **	99.4 acres

*Principal Spillway Level

**Elev. 1193.6

g.	<u>Dam</u>	<u>Dam</u>	<u>Dike</u>
1.	Type:	Zoned compacted earthfill	Homogeneous compacted earthfill
2.	Length:	1,000 feet	1,050 feet
3.	Height:	36 feet	19 feet
4.	Top Width:	14 feet	14 feet
5.	Side Slopes:	3.5 hor. to 1 ver. U.S. 3 hor. to 1 ver. D.S.	3 hor. to 1 ver.
6.	Zoning:	Impervious zone with a chimney drain & cutoff trench with silty sands, clayey sands & poorly graded sands upstream and downstream	None; silty sands, clayey sands and poorly graded sands
7.	Impervious Core:	Silts, clays	None
8.	Cutoff:	10' wide at the bottom with 1 to 2 side slopes; silts and clays	10' wide at the bottom with 1 to 1 side slopes; silty sands, clayey sands and poorly graded sands
9.	Grout Curtain:	N/A	N/A
10.	Other:	Curtain drain in center of core, connected to foundation drain under the downstream embankment.	Foundation drain under the downstream embankment

h. Diversion and Regulating Tunnel - N/A

	<u>EMERGENCY</u>	<u>PRINCIPAL</u>
i. <u>Spillway</u>		
1. Type:	Earth cut in the left abutment. Grass covered.	Reinforced concrete drop inlet; conduit through dam to rip-rapped plunge pool
2. Length of Weir:	230 feet	17 feet
3. Crest Elevation with Flashboards: N/A without Flashboards: 1166.0		N/A 1167.7
4. Gates:	N/A	N/A
5. Upstream Channel:	Grassed one percent slope	N/A
6. Downstream Channel:	Grassed two percent slope	Natural stream channel
7. General:	30 foot level control section	A 36-inch dia. pre-stressed concrete steel cylinder pipe with a hooded inlet carries the flow through the dam. Inv. El. 1163.7
j. <u>Regulating Outlets</u> - N/A		

ENGINEERING DATA

SECTION 2

2.1 Design Data

The dam was designed and constructed under the supervision of the Soil Conservation Service, U.S. Department of Agriculture. Available information which was reviewed included the design report, As-Built Plans and miscellaneous correspondence. The design report was incomplete as it did not contain a soils report or discharge capacity calculations for the revised emergency spillway. However, copies of the revised emergency spillway discharge capacity calculations were found in the Department of Environmental Protection's correspondence file. The design report did contain a geologic report, boring logs, slope stability computations, hydraulic/hydrologic computations, and structural computations for the outlet conduit cradle.

2.2 Construction data

As-Built Plans and correspondence were available and were reviewed. Contract records including change orders and soil test results are reported to be available at the Federal Archives and Record Center in Waltham, Massachusetts. Construction photographs are stored at the Soil Conservation Service Office in Storrs, Connecticut, but were not available for review. During construction the emergency spillway was reduced from 250 feet to 230 feet and the top of the dam was raised 0.5 feet from the original design. The crest of the dam is not level. The dam was constructed with an overfill of up to 1-1/2 feet at the higher portions of the dam to compensate for anticipated settlements. Field surveys indicate

essentially no settlement has taken place and that the crest is above El. 1195 except for the left end which drops down to El. 1193.5.

The dam was constructed by Arthur Hebert Construction Company in 1970 - 1971.

2.3 Operation Data

The site is visited during periods of heavy runoff, but no depth readings are made or records kept.

2.4 Evaluation of Data

a. Availability

Existing data was available at the Soil Conservation Service, U.S. Department of Agriculture, Storrs, Connecticut, at the Federal Archives and Record Center, Waltham, Massachusetts, and the Department of Environmental Protection, Hartford, Connecticut.

b. Adequacy

The information which was available, along with the visual inspection and hydraulic/hydrologic calculations made for this report, were adequate to assess the condition of the dam and the dike. It should be noted that the impoundment has never been filled and the dam has never been observed under full hydrostatic load. No comments on the performance of the dam under such loading can be made.

The Soil Conservation Service was questioned as to the design considerations behind the placement of the curtain drain within the impervious core and the lack of anti-seep collars within the upstream core. Their response was that the anti-seep collars were placed in the zone of saturation with the water level at the emergency spillway level. The chimney drain was intended to lower

the phreatic surface in the upstream core and eliminate the need for collars within the core. (See Appendix B, page B-48 and B-49.)

c. Validity

The field inspection indicated that the dam and dike were constructed substantially as shown on the As-Built Plans.

VISUAL INSPECTION

SECTION 3

3.1 Findings

a. General

The visual inspection of the dam and the dike was conducted on November 17, 1980. The dam was inspected again on February 11, 1981 during a severe rainstorm. On November 17, 1980 the water level was about 0.2 feet above the invert of the principal spillway outlet pipe. On February 11, 1981 the water was 2 feet above the invert and rising. At the times of inspection the general condition of the dam and dike was good.

The dam consists of a compacted earth embankment with a drop inlet principal spillway located near the center of the dam, discharging to a riprapped stilling basin at the downstream toe. A grass-covered emergency spillway is excavated into the left abutment.

The dike is a compacted earth embankment located about 3,000 feet north of the dam.

b. Dam

The upstream and downstream slopes of the dam are grass-covered, Photos 1 and 2. The grass is in good condition and is kept mowed. The slopes are even with no evidence of movement or sloughing. The upstream slope has numerous small erosion gullies, mostly 6-inches or less in depth with the largest approaching 12-inches. A much larger erosion channel was noted at the intersection of the upstream slope with the left abutment. The channel was up to 2 feet deep and 2 feet wide, Photo 3. The February 11 inspection

was made during a heavy downpour. The erosion channel was carrying a substantial flow of muddy water, indicating continuing erosion.

The crest of the dam has a grass surface in good condition except for tire depressions from vehicular traffic. There is a concrete foot path from the inlet structure to the crest of the dam.

The dam was built in a swampy area and wet areas are present both upstream and downstream. As the impoundment was empty, no seepage, wet or spongy areas were observed on the downstream slope.

A foundation drain under the embankment and a chimney drain within the core discharge through three 8-inch asbestos cement pipes at the downstream toe of the dam. There was no flow at the times of inspection from either outlet No. 1 or No. 3, Photos 5 and 8. There was evidence of previous flow at outlet No. 3, located immediately to the right of the principal spillway outlet pipe. Outlet No. 2 is located in a 20 foot wide notch at the downstream toe of the dam about 80 feet to the left of the principal spillway outlet pipe, Photo 6 and Overview. The notch was filled with backwater from the swamp at the times of inspection. The plans indicate this area to be a spoil disposal area with the notch being left as an outlet for the drain. A piezometer tubing well consisting of an 8-inch corrugated metal pipe with locking steel cover was located just above and to the left of the principal spillway outlet pipe, Photo 5. The cover was locked and no readings were taken.

c. Dike

The dike is grass-covered with the sod in good condition, Photos 14 and 15. The slopes are even with no indications of movement or sloughing. A foundation drain outlets through three 8-inch asbestos cement pipes at the downstream toe, Photo 16. There was no flow at the time of inspection.

d. Appurtenant Structures

The appurtenant structures consist of the principal spillway and outlet works and the emergency spillway. The ungated inlet structure is a reinforced concrete drop inlet with a galvanized steel trash rack, Photo 7, all in good condition. The inlet structure discharges through a 36-inch prestressed concrete steel cylinder pipe, only the downstream end of which was observed, to a riprapped stilling basin, Photos 5 and 13.

The outlet pipe is supported by a reinforced concrete cradle to the springline of the pipe, and the cradle is in turn supported at the downstream end by a reinforced concrete bent, Photo 5. The fill around the outlet pipe contains many large rocks. Settlement has taken place leaving voids under and around both the outlet pipe cradle and the foundation drain outlet, Photos 4, 5 and 9. No settlement of the outlet pipe was apparent.

The emergency spillway consists of a 230 foot section excavated into the left abutment, Photos 10 and 11. The spillway has a sod surface for erosion protection and is in good condition. Two drainage ditches in the spillway approach channel are 2-1/2 to 3 feet deep and have standing water in some sections. An area

of previous erosion noted at the left abutment along the top of the emergency spillway excavation has been repaired with crushed stone. Stone drains were also observed on the slope. See Overview Photo, page xii. Two berms on the left abutment contain standing water, Photo 12. Evidence of erosion and sloughing of the slope were noted. Some erosion channels have been filled with large stones. An earth dike separates the emergency spillway from the dam. The dike is riprapped on the spillway side, but not at the downstream end, Photo 2.

e. Reservoir Area

No indications of instability were observed along the edges of the reservoir in the vicinity of the dam, although there was evidence of instability in the form of erosion and sloughing in the left abutment above the emergency spillway.

f. Downstream Channel

The downstream channel is a natural streambed through a swampy area, Photo 13. The channel is clear of debris immediately below the dam, however, beavers have been active in the downstream area and have built dams across the channel in the past.

3.2 Evaluation

On the basis of the visual inspection, the dam is judged to be in good condition. The following conditions could affect the future integrity of the dam:

1. Continued erosion at the intersection of the upstream slope with the left abutment could lead to sloughing of the embankment and a breach of the dam.
2. Continued erosion of the upstream slope could lead to a breach of the dam.

3. Settlement of the fill material around the outlet conduit could eventually lead to the settlement of the conduit.

4. The continued erosion and sloughing of the left abutment could cause failure of the slope and blockage of the emergency spillway.

5. The lack of riprap at the downstream end of the dike which separates the emergency spillway from the dam may lead to erosion of the dike during periods of emergency spillway discharge.

6. It should be emphasized that the impoundment has never been substantially filled. Therefore, no observations have been made as to seepage through either the dam or the dike and their behavior under full hydrostatic loading conditions.

OPERATIONAL AND MAINTENANCE PROCEDURES

SECTION 4

4.1 Operational Procedures

a. General

The Wood Creek Dam and Dike form a single purpose flood control impoundment which remains at the principal spillway invert level except for periods of heavy runoff. The dam has no operating facilities. Both the drop inlet on the principal spillway and the emergency spillway operate without human assistance. The dam is inspected annually by representatives of the Department of Environmental Protection and the Soil Conservation Service engineers.

(See Inspection Report, page B-47 in Appendix B.)

b. Description of Any Warning System in Effect

There is no formal warning system in effect. The dam is reportedly monitored by DEP personnel during heavy runoff. Any problems noted would be reported to the Department of Environmental Protection in Hartford.

4.2 Maintenance Procedures

a. General

The grass is reportedly mowed and the brush cut at least once a year.

An Operations and Maintenance Agreement was made between the State of Connecticut and the Soil Conservation Service at the time of construction. An Operations and Maintenance Handbook prepared by the Soil Conservation Service and the Department of Environmental Protection for Connecticut watersheds is available from the Soil Conservation Service. The Handbook lists operating procedures and maintenance items to be performed.

b. Operating Facilities

The trash rack on the principal spillway is cleaned as required.

4.3 Evaluation

Present operations and maintenance procedures could be improved. Erosion channels and gullies should be filled, berms on the left abutment should be regraded to drain, and tire depressions along the crest of the dam and the dike should be filled.

Copies of the Operations and Maintenance Handbook should be provided to the operators for their implementation.

The annual inspections by representatives of the Soil Conservation Service and the Department of Environmental Protection should continue. A formal warning system should be put into effect.

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

SECTION 5

5.1 General

The outlet works at Wood Creek Dam consist of a principal spillway of the drop inlet type located at the center of the dam, and an emergency spillway excavated into the left abutment. The principal spillway is a drop inlet structure consisting of a "single stage reinforced concrete riser" discharging through a 36-inch diameter prestressed concrete steel cylinder outlet pipe with a hooded inlet. The inlet riser is a 6 foot x 6 foot box with a 10-inch wide longitudinal splitter wall and a 1 foot x 6 foot slot at the base of the upstream wall to discharge normal stream flows. The drop inlet is protected by a galvanized steel trash rack.

The grassed emergency spillway consists of a channel excavated into the left abutment. The 230 foot wide spillway has a 30 foot level control section with a one percent slope upstream and a two percent slope downstream of the control section. The spillway is separated from the dam by a riprapped earth dike. The side slopes of the dike and the cut slope at the left abutment are 3 horizontal to 1 vertical.

The capacity of the principal spillway is about 150 cfs at emergency spillway level, El. 1188.0. The emergency spillway has a capacity of 2,600 cfs at the design high water El. 1191.1 and 7,450 cfs at the top of the dam El. 1193.6. Total project discharge capacity at the top of the dam is about 7,600 cfs.

The dam has a watershed of 4.09 square miles of essentially undeveloped, wooded terrain. The watershed has very steep slopes, one pond of significant size, Wood Creek Pond, and some swampy areas. Elevations range from 1,730 at the north end of the watershed to 1,160 at the dam.

5.2 Design Data

The dam was designed by the Soil Conservation Service for the State of Connecticut. The design report and correspondence was available and was reviewed.

The dam was designed to contain a Hurricane "Diane" type storm (1955), 8.51 inches of rainfall in 14 hours, without discharging over the emergency spillway. The impoundment would store 1,057 Acre-Feet or 4.83 inches of runoff at emergency spillway level.

Design high water flood routing was based on a 15-inch rainfall in 6 hours producing 6-inches of runoff. At design high water, El. 1191.1, the dam would store 1,310 Acre-Feet.

With the water level at the design top of the dam, El. 1193.1 (design high water plus 2 feet) the storage would be 1,550 Acre-Feet or 7.13 inches of runoff.

The As-Built Plans indicate that the crest of the dam was raised 0.5 feet above the design elevation in order to maintain the required freeboard when the emergency spillway width was reduced from 250 feet to 230 feet.

5.3 Experience Data

No experience data was available. The site is visited during periods of heavy runoff but no depth measurements are taken or records kept.

The impoundment has never been substantially filled.

5.4 Test Flood Analysis

Based on the dam failure analysis, both the dam and dike are classified as "High" hazard potential. The dam and dike are classified as "Intermediate" in size based on a maximum storage capacity of 1,550 Acre-Feet. According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the Test Flood should be the Probable Maximum Flood (PMF). The Test Flood inflow was calculated for the 4.09 square miles watershed using 2,300 cubic feet per second per square mile (csm) from the Corps of Engineers' guide curve for "mountainous" terrain.

The peak inflow, calculated to be about 9,400 cfs, results in a routed outflow of 5,850 cfs. The flood routing through the reservoir was done in accordance with the Corps of Engineers' "Estimating the Effect of Surcharge Storage on Maximum Probable Discharges".

The project discharge capacity was calculated to be 7,600 cfs or 130 percent of the Test Flood routed outflow. The dam has 0.8 feet of freeboard at the Test Flood elevation.

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 peak level of the PMF.

The spillway discharge prior to dam breach was significant when compared to the dam breach flows; and therefore, it was taken into consideration in the flood routings. The spillway discharge was first routed through each reach assuming steady state flow,

and the storage volume thus obtained subtracted from the storage required for the dam breach flood routing in order to derive the usable storage within the reach.

The dam breach would release about 70,000 cfs into Wood Creek below the dam. The flood waters would overtop Route 272 by 16 feet and flood adjacent homes up to 13 feet deep. Downstream of Route 272 the flood waters would join the Blackberry River where the depth of flow would be approximately 15 feet. The flood waters would inundate low lying homes and Route 44 up to 5 feet deep.

Prior to dam failure the maximum project discharge capacity of 5,850 cfs would overtop Route 272 by approximately 6 feet, flooding several homes up to 3 feet deep, and flow at an average depth of 7.5 feet in the Blackberry River, overtopping its banks to a depth of 4 feet. Route 44 is not expected to be flooded by the spillway flow.

A failure of Wood Creek Dike would release about 22,300 cfs into the North Brook. No flood routing was performed because storage within the reaches was assumed negligible; therefore, only depths of flow were calculated for the breach flow at each section. The flood waters would travel with an average depth of 15 feet, flooding Ashpohtag Road by 6 feet and flooding homes located at the confluence of North Brook and the Blackberry River from 5 feet to 8 feet deep. There would be no pre-failure discharge at the dike.

The dam and dike were classified as "High" potential hazard because of the potential loss of more than a few lives and extensive downstream property damage should either the dam or dike fail.

EVALUATION OF STRUCTURAL STABILITY
SECTION 6

6.1 Visual Observations

The emergency spillway area, including the left abutment slope, is very wet with seepage coming from the hillside. Evidence of past repairs to eroded areas caused by this seepage and erosion and sloughing of the embankment were observed. No other indications of structural instability were seen.

6.2 Design and Construction Data

A design report and As-Built Plans were available at the Soil Conservation Service, U.S. Department of Agriculture, Storrs, Connecticut. The Soil Report recommended a 3-1/2 horizontal to 1 vertical upstream slope with a factor of safety of 1.2 because of the rapid drawdown at the site. (See Appendix B, page B-46.)

The stability analyses appear thorough and adequate.

6.3 Post-Construction Changes

In 1972, one year after completion of the dam, repairs were made to the emergency spillway. Drains were installed in the spillway and along the left abutment in an attempt to relieve the seepage problem. Erosion areas were also filled with stone.

The seepage problem is still evident as there was standing water on the slope berms and areas of erosion and sloughing were noted.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with the recommended Phase I Inspection guidelines does not warrant seismic stability analysis.

ASSESSMENT, RECOMMENDATIONS, & REMEDIAL MEASURES

SECTION 7

7.1 Dam Assessment

a. Condition

On the basis of the visual inspection and a review of the available data, the dam is judged to be in good condition. The future integrity of the dam could be affected by continued settlement around and under the outlet conduit, potential seepage due to the lack of anti-seep collars within the upstream impervious core, erosion along the left upstream toe and the upstream slope of the dam, erosion and sloughing of the left abutment, and the lack of riprap at the downstream end of the dike between the emergency spillway and the dam.

An evaluation of the hydraulic and hydrologic features of the dam determined that the spillways are capable of passing 130 percent of the routed Test Flood outflow.

b. Adequacy of Information

The information available is adequate for a Phase I Investigation.

c. Urgency

The recommendations presented in Sections 7.2 and 7.3 should be carried out within two years of receipt of this Report by the Owner.

7.2 Recommendations

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

1. The settlement around and under the outlet conduit should be investigated and repairs made to prevent additional settlement

and possible damage to the outlet conduit.

2. Investigate the need for anti-seep collars on the outlet conduit within the upstream impervious core.

3. The erosion channel along the left upstream toe of the embankment should be investigated and corrective measures designed and implemented.

4. Erosion and sloughing of the left abutment should be investigated and corrective measures designed and implemented to provide adequate drainage.

5. Investigate the need for riprap at the downstream end of the dike between the emergency spillway and the dam.

6. As the behavior of the dam and dike under full hydrostatic loading is unknown, they should be inspected by a qualified, registered engineer during each period of significant flood impoundment. Especial care should be taken in inspecting the dam and the dike when the previous maximum impoundment depth is exceeded.

7.3 Remedial Measures

a. Operations and Maintenance Procedures

1. Flood impoundment depth readings should be taken and records kept.

2. Tire depressions along the crest of the dam and dike should be filled.

3. The erosion channels on the upstream slope should be filled and a protective cover established.

4. The program of annual technical inspections by qualified, registered engineers should be continued.

5. A downstream warning system should be developed and put into effect in case of an emergency at the dam.

6. The Operations and Maintenance Handbook should be provided to the operators of the dam.

7.4 Alternatives

There are no practical alternatives to the above recommendations.

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECK LIST PARTY ORGANIZATION

PROJECT: Wood Creek Dam

DATE: 2/11/81* 11/17/80 TIME: 3:00 pm 12:00 pm WEATHER: Rain 60° Sunny 35°

W.S. ELEVATION: 1163.9 U.S. N/A DN.S

*DLS

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

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Dam Embankment</u>	<u>RH,RGL,DLS</u>	<u>Good</u>
2. <u>Dike Embankment</u>	<u>RH,RGL,DLS</u>	<u>Good</u>
3. <u>Intake Channel</u>		
3. <u>Outlet Works - & Structure</u>	<u>RH,RGL,DLS</u>	<u>Good</u>
4. <u>Outlet Works - Control Tower</u>	<u>RH,RGL,DLS</u>	<u>Good</u>
5. <u>Transition</u>		
5. <u>Outlet Works - & Conduit</u>	<u>RH,RGL,DLS</u>	<u>Not observed</u>
6. <u>Outlet Structure</u>		
6. <u>Outlet Works - & Channel</u>	<u>RH,RGL,DLS</u>	<u>Settlement around and under outlet conduit</u>
7. <u>Emer. Spillway, Appr. & Dis. Chan.</u>	<u>RH,RGL,DLS</u>	<u>Spillway and abutment wet; some erosion and sloughing.</u>
8. _____		
9. _____		
10. _____		
11. _____		
12. _____		

PERIODIC INSPECTION CHECK LIST

PROJECT: Wood Creek Dam DATE: 11/17/80
 PROJECT FEATURE: Dam Embankment NAME: RH
 DISCIPLINE: Civil Engineers NAME: RGL,DLS

AREA ELEVATION	CONDITIONS
DAM EMBANKMENT	
CREST ELEVATION	1193.6
CURRENT POOL ELEVATION	1163.9
MAXIMUM IMPOUNDMENT TO DATE	Unknown
SURFACE CRACKS	None observed
PAVEMENT CONDITION	None
MOVEMENT OR SETTLEMENT OF CREST	Tire depressions
LATERAL MOVEMENT	None observed
VERTICAL ALIGNMENT	Good
HORIZONTAL ALIGNMENT	Good
CONDITION AT ABUTMENT AND AT CONCRETE STRUCTURES	Erosion channel at left upstream toe of dam 2 feet deep
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	None observed
TRESPASSING ON SLOPES	Minor indications of motorcycle trespass
VEGETATION ON SLOPES	Good grass cover
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	Numerous erosion channels on upstream slope, 6 - 12 inches deep
ROCK SLOPE PROTECTION - RIPRAP FAILURES	Riprap along upstream toe and at stilling basin; good condition
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
UNUSUAL EMBANKMENT OR DOWNSTREAM SEEPAGE	None observed
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	Curtain drain in center of impervious core connected to downstream drain
TOE DRAINS	3 outlets at downstream toe
INSTRUMENTATION SYSTEM	4 peizometers at downstream toe

PERIODIC INSPECTION CHECK LIST

PROJECT: Wood Creek Dam DATE: 11/17/80
 PROJECT FEATURE: Dike Embankment NAME: RH
 DISCIPLINE: Civil Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	
CREST ELEVATION	1193.2
CURRENT POOL ELEVATION	Dry
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
CONDITIONS AT ABUTMENT AND AT CONCRETE STRUCTURES	Good; no concrete
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	None observed
TRESPASSING ON SLOPES	None observed
VEGETATION ON SLOPES	Good grass cover
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	None observed
ROCK SLOPE PROTECTION - RIPRAP FAILURE	N/A
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
UNUSUAL EMBANKMENT OR DOWNSTREAM SEEPAGE	None observed
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	Foundation drain under downstream embankment
TOE DRAINS	Three (3) 8-inch outlets at downstream toe
INSTRUMENTATION SYSTEM	None

PERIODIC INSPECTION CHECK LIST

PROJECT: Wood Creek Dam DATE: 11/17/80
 PROJECT FEATURE: Intake Channel
Outlet Works - & Intake Structure NAME: RH
 DISCIPLINE: Civil Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
A. APPROACH CHANNEL:	Under water; could not be observed
SLOPE CONDITIONS	
BOTTOM CONDITIONS	
ROCK SLIDES OR FALLS	
LOG BOOM	N/A
DEBRIS	None observed
CONDITION OF CONCRETE LINING	N/A
DRAINS OR WEEP HOLES	N/A
B. INTAKE STRUCTURE:	
CONDITION OF CONCRETE	Good
STOP LOGS AND SLOTS	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT: Wood Creek Dam DATE: 11/17/80
 PROJECT FEATURE: Outlet Works - Control Tower NAME: RH
 DISCIPLINE: Civil Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - CONTROL TOWER</u>	
A. <u>CONCRETE AND STRUCTURAL:</u>	
<u>GENERAL CONDITION</u>	<u>Good</u>
<u>CONDITION OF JOINTS</u>	<u>Good</u>
<u>SPALLING</u>	<u>None observed</u>
<u>VISIBLE REINFORCING</u>	<u>None observed</u>
<u>RUSTING OR STAINING OF CONCRETE</u>	<u>None observed</u>
<u>ANY SEEPAGE OR EFFLORESCENCE</u>	<u>None observed</u>
<u>JOINT ALIGNMENT</u>	<u>Good</u>
<u>UNUSUAL SEEPAGE OR LEAKS IN GATE CHAMBER</u>	<u>None observed</u>
<u>CRACKS</u>	<u>None observed</u>
<u>RUSTING OR CORROSION OF STEEL</u>	<u>Some rust; lower trash rack</u>
B. <u>MECHANICAL AND ELECTRICAL:</u>	
<u>AIR VENTS</u>	<u>N/A</u>
<u>FLOAT WELLS</u>	<u>N/A</u>
<u>CRANE HOIST</u>	<u>N/A</u>
<u>ELEVATOR</u>	<u>N/A</u>
<u>HYDRAULIC SYSTEM</u>	<u>N/A</u>
<u>SERVICE GATES</u>	<u>N/A</u>
<u>EMERGENCY GATES</u>	<u>N/A</u>
<u>LIGHTNING PROTECTION SYSTEM</u>	<u>N/A</u>
<u>EMERGENCY POWER SYSTEM</u>	<u>N/A</u>
<u>WIRING AND LIGHTING SYSTEM IN GATE CHAMBER</u>	<u>N/A</u>

PERIODIC INSPECTION CHECK LIST

PROJECT: Wood Creek Dam DATE: 11/17/80

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

DISCIPLINE: Civil Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	36-inch prestressed concrete steel cylinder pipe; only the downstream end could be observed
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: Wood Creek Dam DATE: 11/17/89
 PROJECT FEATURE: Outlet Structure & Outlet Works - Outlet Channel NAME: RH
 DISCIPLINE: Civil Engineer NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
GENERAL CONDITION OF CONCRETE	Good; concrete pipe
RUST OR STAINING	None observed
SPALLING	None observed
EROSION OR CAVITATION	None observed
VISIBLE REINFORCING	None observed
ANY SEEPAGE OR EFFLORESCENCE	None observed
CONDITION AT JOINTS	Good
DRAIN HOLES	N/A
CHANNEL	Riprapped; stilling basin to natural stream
LOOSE ROCK OR TREES OVERHANGING CHANNEL	None
CONDITION OF DISCHARGE CHANNEL	Beavers have obstructed the channel in the past; appears clear now

PERIODIC INSPECTION CHECK LIST

PROJECT: Wood Creek Dam DATE: 2/11/81 *
Emer. Spillway, Appr. 11/17/80
 PROJECT FEATURE: Outlet Works - & Discharge Channel NAME: RH
 DISCIPLINE: Civil Engineers NAME: RGL,DLS

*DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
A. APPROACH CHANNEL:	
GENERAL CONDITION	Good
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	None observed
FLOOR OF APPROACH CHANNEL	Grassed with two drainage ditches
B. EMERGENCY SPILLWAY:	
GENERAL CONDITION	Good
SURFACE	Grassed surface; area wet
DIKE	Riprap slope on spillway side; grassed slope on dam side
OTHER	Left abutment above emergency spillway very wet with some erosion and sloughing.
ANY SEEPAGE OR EFFLORESCENCE	
DRAIN HOLES	
C. DISCHARGE CHANNEL:	
GENERAL CONDITION	Good; discharges to river downstream of toe
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	None observed
FLOOR OF CHANNEL	Grassed
OTHER OBSTRUCTIONS	None

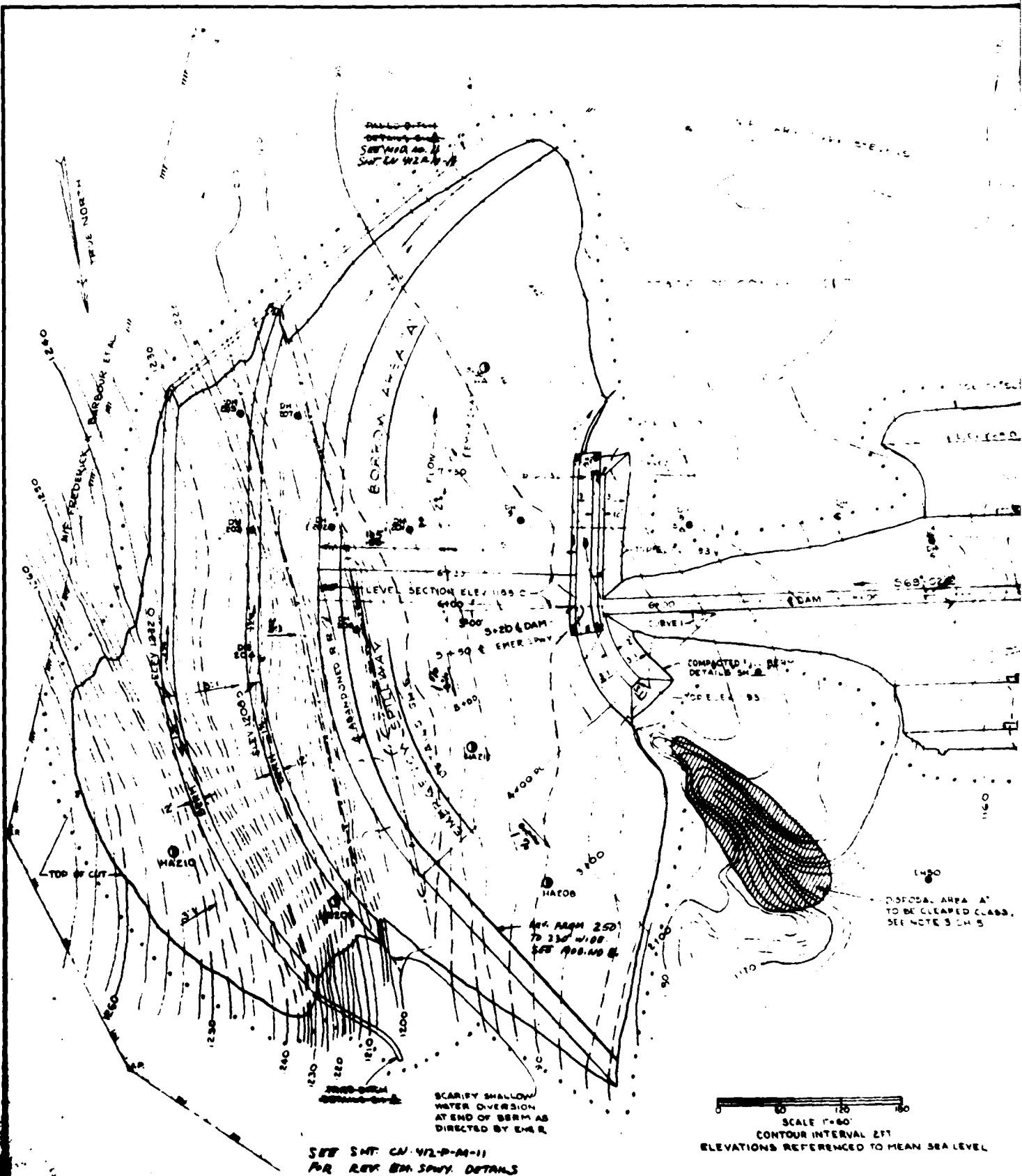
APPENDIX B

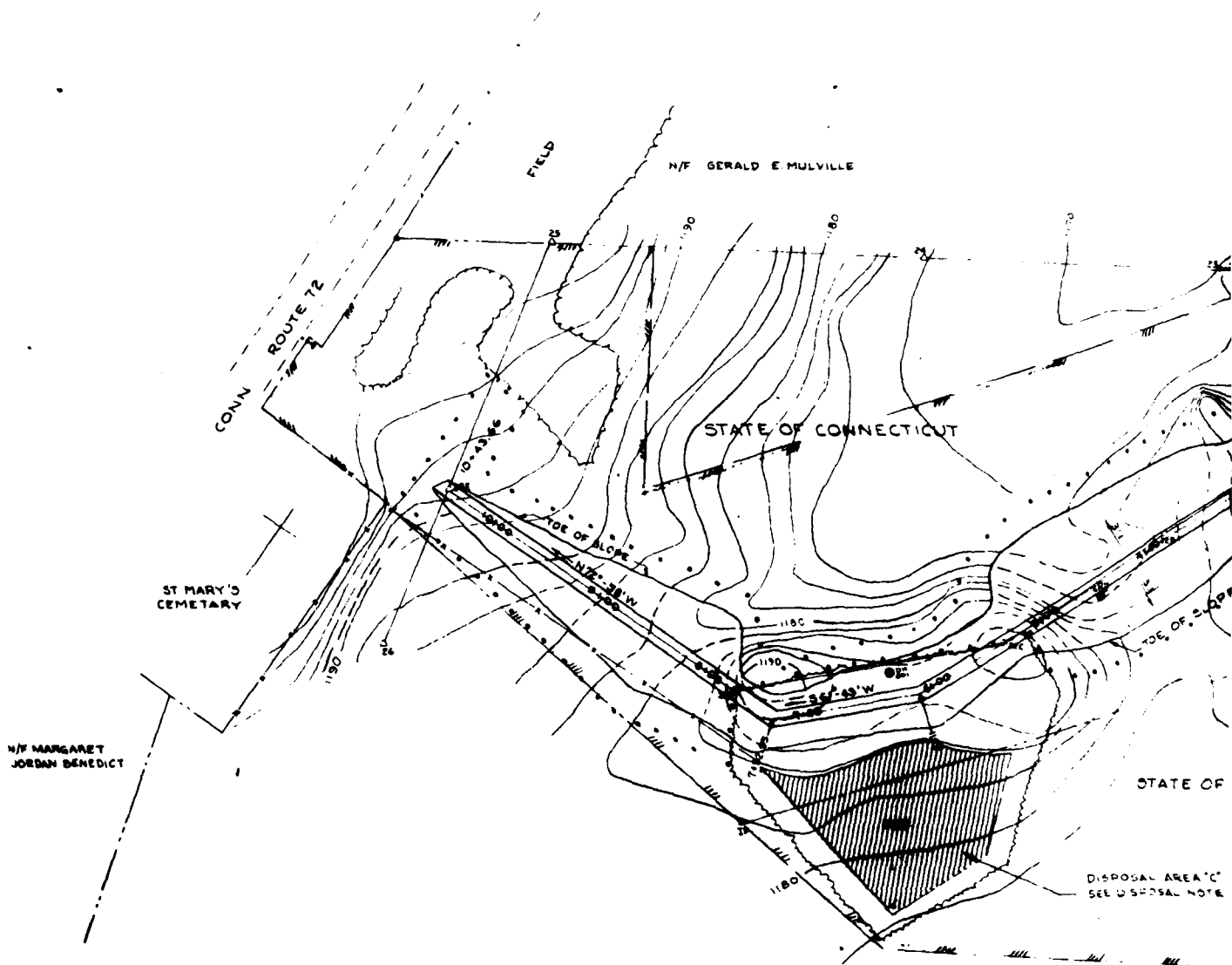
ENGINEERING DATA

LIST OF REFERENCES

Reference Nos. 1 through 3 are available at the State of Connecticut Department of Environmental Protection, Water and Related Resources Section, State Office Building, Hartford, Connecticut. Reference Nos. 4 through 8 are available from the Soil Conservation Service of the U.S. Department of Agriculture, Mansfield Professional Park, Route 44-A, Storrs, Connecticut. Reference No. 9 is located at the Federal Archives and Record Center, Waltham, Massachusetts.

1. Correspondence file on the Blackberry River Watershed Project, Floodwater Retarding Dam No. 9, Norfolk, Connecticut.
2. Letter to John Curry, Director Water Resources Commission, from Soil Conservation Service - Revised Emergency Spillway Computations, July 26, 1971.
3. State Operation and Maintenance Inspection Report, August 13, 1979.
4. Design Report, Blackberry River Watershed Site No. 9, Norfolk, Connecticut.
5. Plans for Blackberry River Watershed Project, Floodwater Retarding Site No. 9, Norfolk, Connecticut, October 1962 (Full Size).
6. "As-Built" Plans for Blackberry River Watershed Project Floodwater Retarding Site No. 9, Norfolk, Connecticut, 1968 (Half Size).
7. Construction progress photographs.
8. Connecticut Watershed Operation and Maintenance Handbook, Soil Conservation Service, September 1971.
9. Soil Test Results, Change Orders and miscellaneous data.
10. Letter from Whitney Ferguson, State Conservation Engineer, to Donald L. Smith, Vice President, Roald Haestad, Inc., February 3, 1981, concerning the design of Wood Creek Dam.

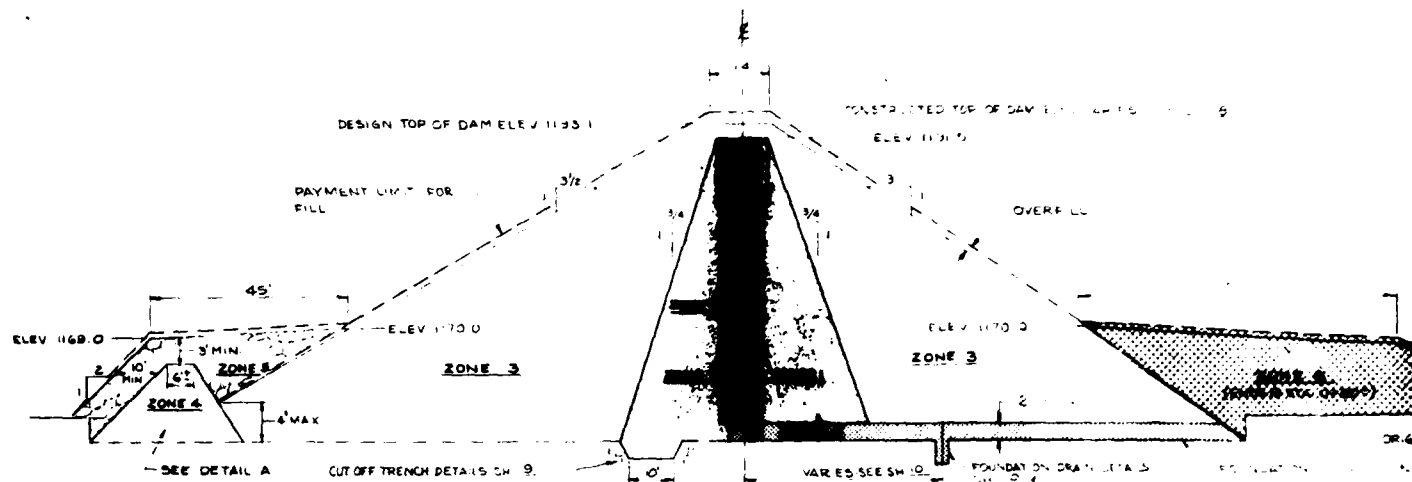




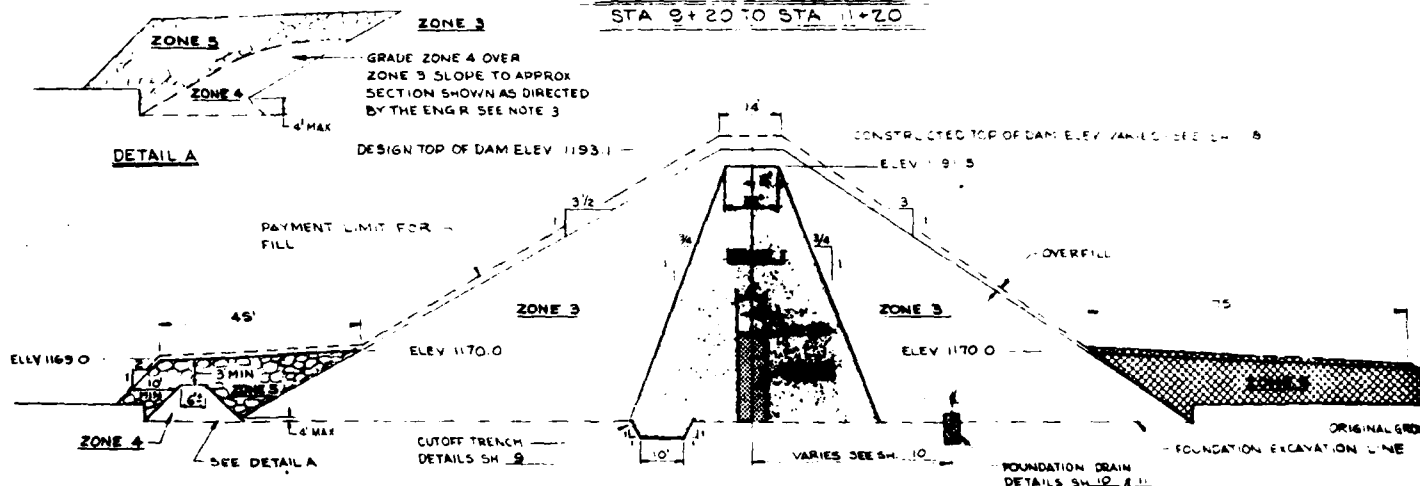
0 20 40 60 80 100 120 140 160 180 200

SCALE: 1"=60'

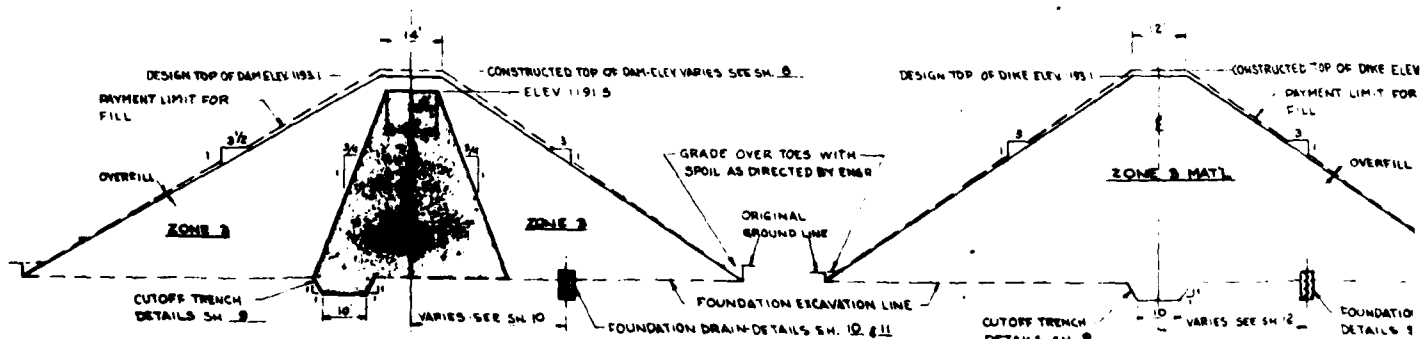
CONTOUR INTERVAL 2'
ELEVATIONS REFERRED TO MEAN SEA LEVEL



TYPICAL SECTION-DAM
STA 8+20 TO STA 11+20



TYPICAL SECTION-DAM
STA 8+50 TO STA 9+20, STA 11+20 TO STA 12+50



TYPICAL SECTION-DAM
STA 3+04.7 TO STA 6+30, STA 12+30 TO STA 15+30

TYPICAL SECTION-DIKE

CLASSES OF COMPACTION	TAMPING ROLLER		PNEUMATIC ROLLER		VIBRATING ROLLER	
	MAX LIFT THICKNESS	MAX SIZE ROCK	MAX LIFT THICKNESS	MAX SIZE ROCK	MAX LIFT THICKNESS	MAX SIZE ROCK
A-1	9"	6"	—	—	—	—
A-2	9"	6"	9"	6"	18"	12"

COMPACTION EQUIPMENT IS NOT LIMITED TO THAT LISTED ABOVE
MAX LIFT THICKNESS SHOWN IS THICKNESS BEFORE COMPACTION

OVERFILL

ELEV 1170.0

ZONE 3

ZONE 2 (CONCRETE GRADE)

ORIGINAL GROUND LINE

FOUNDATION ON DAM DETAILS

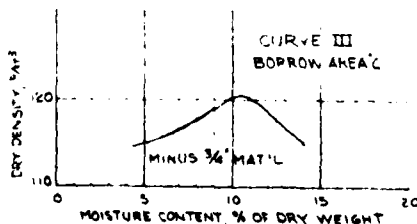
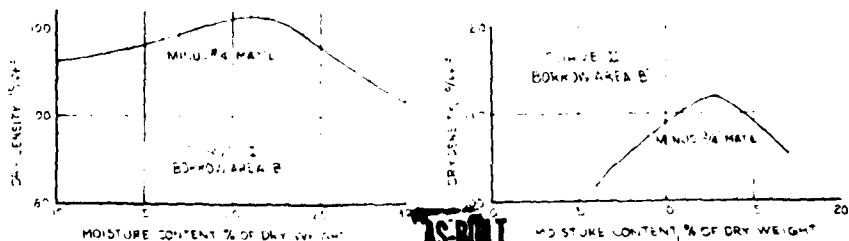
FOUNDATION ON ...

[illegible]

TYPICAL SECTION-DIKE

ROLLER	VIBRATING ROLLER	
MIN SIZE ROCK	MAX LIFT THICKNESS	MAX SIZE ROCK
6"	18"	12"

TO THAT LISTED ABOVE.
STRESS BEFORE COMPACTION

[illegible][illegible]

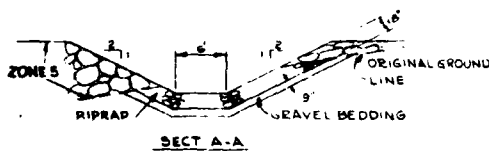
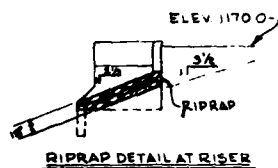
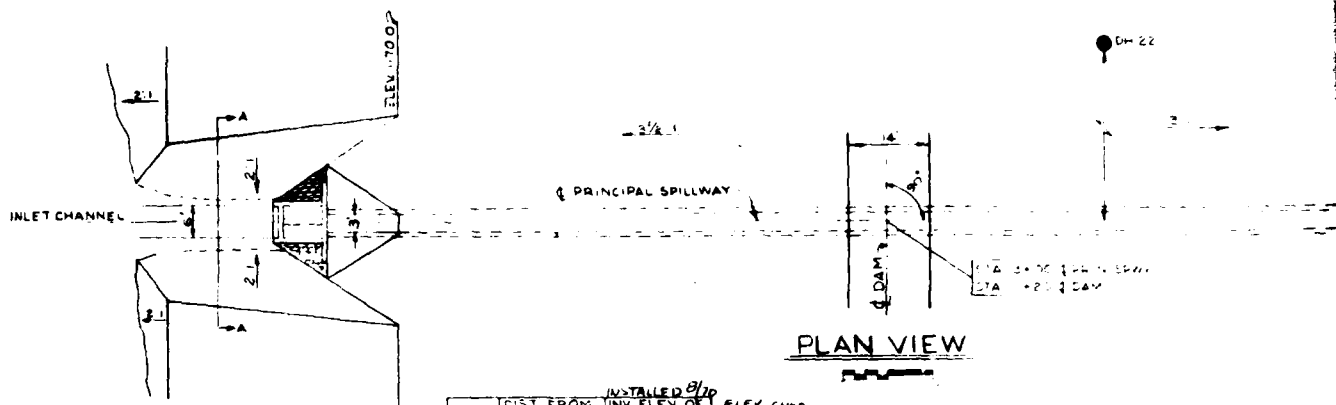
BLACKBERRY RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 9
NORFOLK, CONNECTICUT

TYPICAL EMBANKMENT SECTIONS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed <u>W.H. LESTER</u>	Date <u>2-68</u>	Approved By _____
Drawn <u>F.H. SHEPHERD</u>	Time <u>4-50</u>	Title _____
Traced _____	Sheet _____	Drawn By _____
Checked <u>D.U. SOUTHWICK</u>	4-50	CN-412-P

803-3188 (APRIL 1962)

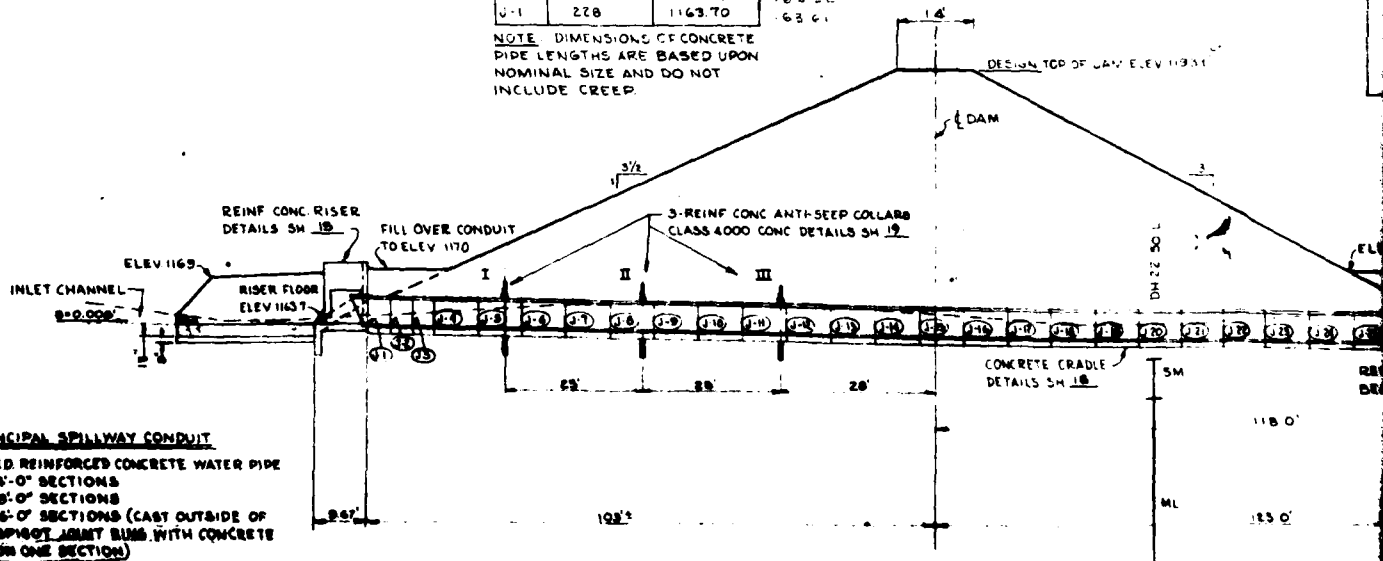


JOINT	DIST FROM OUTLET	INSTALLED 8/70	INV ELEV OF 36" ID PIPE	ELEV CHED 8/17/71
OUTLET	0	1161.50	1161.50	1161.30
J-28	16	1161.60	1161.60	1161.41
J-27	32	1161.71	1161.71	1161.50
J-26	40	1161.86	1161.86	1161.71
J-25	48	1162.02	1162.02	1161.81
J-24	56	1162.17	1162.17	1161.91
J-23	64	1162.32	1162.32	1162.07
J-22	72	1162.47	1162.47	1162.13
J-21	80	1162.63	1162.63	1162.28
J-20	88	1162.78	1162.78	1162.44
J-19	96	1162.93	1162.93	1162.59
J-18	104	1163.08	1163.08	1162.72
J-17	112	1163.24	1163.24	1162.92
J-16	120	1163.39	1163.39	1163.07
J-15	128	1163.54	1163.54	1163.10
J-14	136	1163.54	1163.54	1163.25
J-13	144	1163.55	1163.55	1163.26
J-12	152	1163.55	1163.55	1163.24
J-11	160	1163.56	1163.56	1163.24
J-10	168	1163.56	1163.56	1163.22
J-9	176	1163.57	1163.57	1163.27
J-8	184	1163.57	1163.57	1163.27
J-7	192	1163.58	1163.58	1163.31
J-6	200	1163.58	1163.58	1163.34
J-5	208	1163.59	1163.59	1163.39
J-4	216	1163.59	1163.59	1163.44
J-3	220	1163.63	1163.63	1163.47
J-2	224	1163.66	1163.66	1163.51
J-1	228	1163.70	1163.70	1163.61

COLLAR	DISTANCE FROM & DAM	INV ELEV OF 36" ID PIPE
I	76	1163.58
II	53	1163.57
III	28	1163.55

RIPRAP
FILL OVER HEAD TO BE EQUAL
2.5' MIN. RISE SHALL CONT
TOP OF THE RISE SHALL BE
5' THICK RIPRAP SHALL
BE PLACED FROM A
75.3
4.5' THICK RIPRAP SHALL

NOTE: DIMENSIONS OF CONCRETE
PIPE LENGTHS ARE BASED UPON
NOMINAL SIZE AND DO NOT
INCLUDE CREEP.



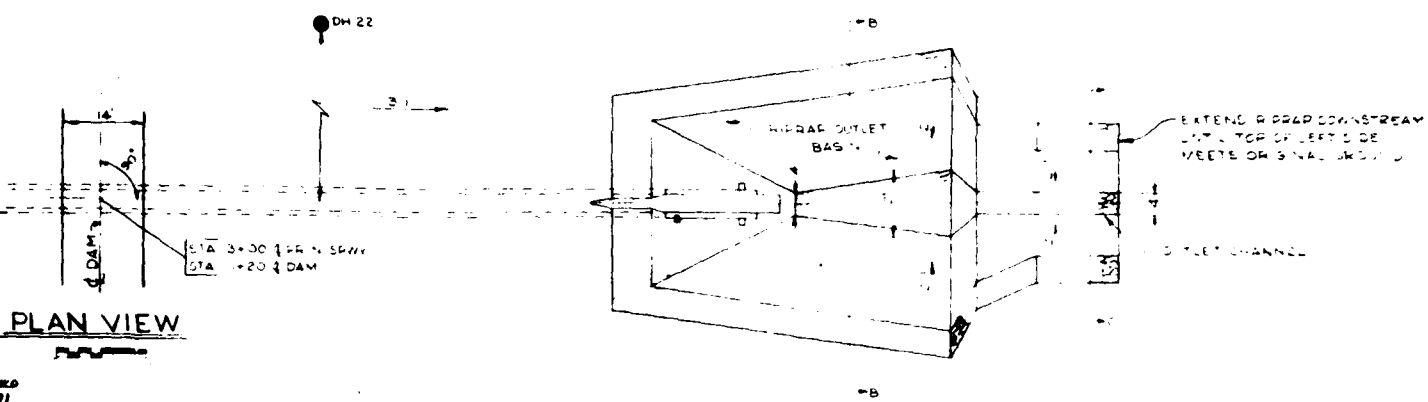
PRINCIPAL SPILLWAY CONDUIT

36" ID REINFORCED CONCRETE WATER PIPE
(1) 4'-0" SECTIONS
(2) 8'-0" SECTIONS
(3) 16'-0" SECTIONS (CAST OUTSIDE OF
SPRUE ADJUST BUILT WITH CONCRETE
ON ONE SECTION)
(4) RIBBED RING WALL PIECE FOR 10' WALL-DETAILS SH. 18
TOTAL LENGTH: 231.8'
LOAD - 25,000 LBS. PER L.F. BASED UPON O.D. OF 36"
MIN. 3-EDGE BEARING STRENGTH FOR 0.001" CRACK - 1,000 LBS.
PER L.F. FOR PRESTRESSED PIPE, AWWA C-301
MIN. 3-EDGE BEARING STRENGTH FOR 0.01" CRACK - 3,000 LBS.
FOR L.F. FOR NON-REINFORCED PIPE, AWWA C-300
WHEN THE A.B. OF THE PIPE IS GREATER THAN THE DESIGN
OF 0.01" CRACK, 3-EDGE BEARING STRENGTH SHALL
BE BASED ON THE RATIO OF THE O.D. SUPPLIED TO 36".

PROFILE ALONG & OF PRINCIPAL SPILLWAY

0 5 10
HORIZONTAL VERTICAL

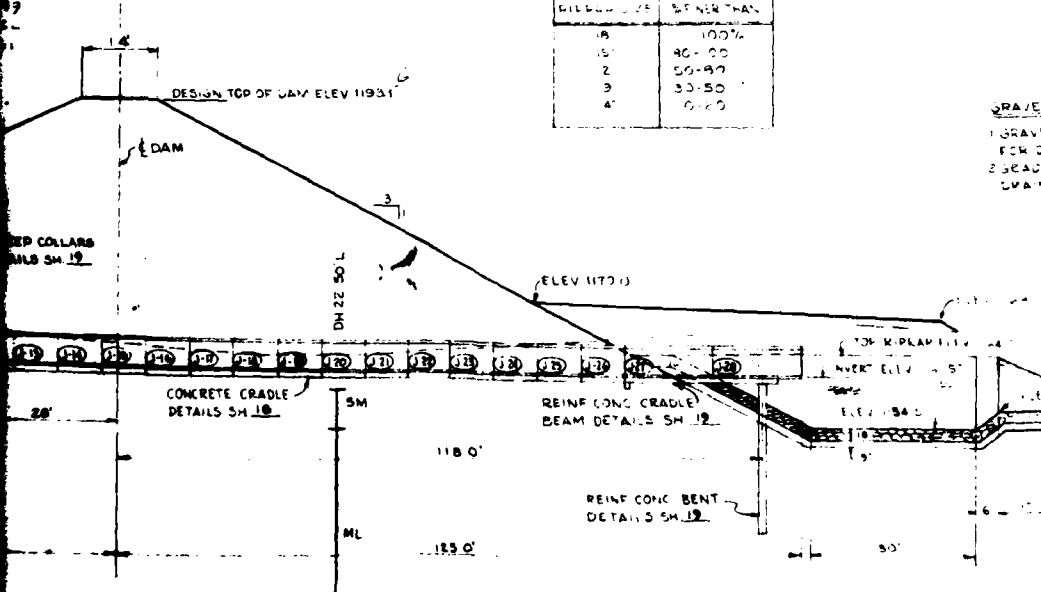
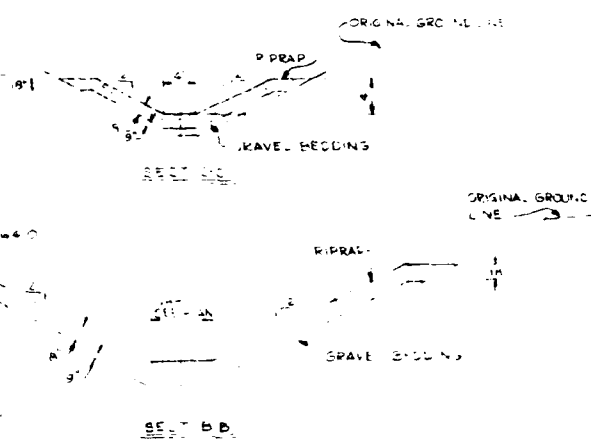
2-23-69	REVISED
11-13-68	LOWER
DATE	REV



COLLAR	DISTANCE FROM Q. DAM	HY. ELEV. OF 36" ID PIPE
I	76'	1163.58
II	53'	1163.57
III	28'	1163.55

RIPRAP
 1. ALL RIPRAP TO BE EQUIPMENT PLACED
 2. ALL RIPRAP SHALL CONTAIN NO LARGER THAN 4" R. AND NO LARGER THAN 1/2" THE LARGER Voids
 3. 1/2" THICK RIPRAP SHALL BE ONE OF THE FOLLOWING: (a) CRUSHED ROCK VARYING FROM A MAXIMUM SIZE OF 2 1/2" TO A MINIMUM SIZE OF 3/8"
 4. 1/2" THICK RIPRAP SHALL CONFORM TO THE FOLLOWING GRADATION:

SIEVE NO.	PERCENT PASSED
10	100%
15	96-100
20	90-100
30	83-100
40	75-100



GRAVEL BEDDING
 1. GRAVEL BEDDING SHALL CONFORM TO THE SPECIFICATION FOR GRAVEL MATERIAL
 2. GRAVEL BEDDING SHALL CONFORM TO THE REQUIREMENTS OF DRAINAGE AT SHEET 12

FILE ALONG C OF PRINCIPAL SPILLWAY

0 5 10
 HORIZONTAL
 0 5 10
 VERTICAL

DATE	REVISION	BY
2-23-69	REVISED COLLAR CHART	WHL
12-12-68	LOWER OUTLET BASIN 1'	WHL

NOTE
 FOR DESCRIPTION OF DH
 SEE SH. 21

BLACKBERRY RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 9
NORFOLK, CONNECTICUT
PRINCIPAL SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by: J. H. Lanning
 Drawn by: J. H. Lanning
 Traced by: J. H. Lanning
 Checked by: J. H. Lanning

Scale: 1" = 10'
 Date: 1/68
 Project No: 68-412-P

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Mansfield Professional Park, Storrs, Connecticut 06268

July 26, 1971

Mr. John J. Curry, Director
Water Resources Commission
State Office Building
Hartford, Connecticut 06115

Dear Mr. Curry:

Early in the spring a slide occurred on the cut slope of the emergency spillway between approximate center line stations 5+30 and 8+30, Blackberry River Watershed, Site 9. As construction continued into the summer, it became obvious that some additional measures would be needed, other than the filter drainage system shown on the plans, along the outside edge of the emergency spillway channel.

We are proposing three contract changes for stabilizing the slide area:

1. Reduce the emergency spillway bottom width from 250 feet to 230 feet. The spillway has already been excavated to approximately elevation 1208 MSL, and this proposal will have the effect of making the lower berm about 32 feet wide rather than the 12 feet on the plans. If further sloughing should occur, the broad berm will be able to absorb the movement as the slope stabilizes itself.
2. The grade of the inlet channel will be flattened to 1 percent to reduce the depth of excavation.
3. Install vertical drains in the emergency spillway slopes where the slide occurred, which will be tied in to the existing planned spillway drain.

We have re-routed the emergency spillway design storm to check reservoir stage and exit channel velocities. The enclosed computations and routing show that it will be necessary only to raise the height of the dam by 0.5 foot, and that the velocity changes only slightly, from 8.30 ft./sec. to 8.32 ft./sec. which is negligible.

We believe that the above will result in a more stable condition and a much better installation. The contractor is ready to proceed with the excavation and drain installation, and it is essential that his work is not delayed.

Mr. John J. Curry, Director

2

Therefore, we should like to request your concurrence as soon as possible, preferably by telephone and confirmed by letter.

Sincerely,

Whitney T. Ferguson, Jr.
State Conservation Engineer

Enclosures

cc:

W. H. O'Brien III ✓

COMPUTATION SHEET
SCS-523 REV 5-58

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE	PROJECT	DATE	JOB NO
BY P.H.C.	CHECKED BY WNL	DATE 7-22-71	210-412-F
SUBJECT EMERGENCY SILLWAY HYDRAULICS			SHEET 1 OF 2

GIVEN: $L = 230'$ $n = 0.01$ $n_s = 0.035$ $L_u = 300'$
 $z = 3$ CONTROL SECT. - 30' @ 1188.0'

FS 178 (178)			ES 178 (5,301 @ 2004)	
H_{ec}	d_c	Q_{cd}	H_f	W.S. ELEV
0.5	.33	231	1.70	1188.00
1.0	.67	720	1.6	1188.55
1.5	1.0	1320	2.20	1189.20
2.0	1.34	2051	2.70	1189.70
2.5	1.67	2790	3.30	1190.20
3.0	2.0	3720	3.90	1190.70
3.5	2.33	4200	4.10	1191.20

W.S. ELEV	$H_{f,FE}$	$H_{f,PIPE}$	z_p	z_f	$z_{f,FE}$	Q_{TOT}
1188.40	26.11	5.11	152	134	231	365
1189.55	26.75	5.17	155	135	720	895
1190.20	27.40	5.24	157	138	1320	1458
1190.70	27.90	5.28	158	139	2050	2189
1191.20	28.50	5.34	160	141	2790	3011
1191.70	29.10	5.40	162	143	3720	3933
1192.10	29.30	5.42	163	144	4200	4344

COMPUTATION SHEET
SCS-823 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SPC 1958 D-470001

STATE	PROJECT	SITE
BY	CHECKED BY	JOB NO
DATE	DATE	
SUBJECT	SHEET 2 OF 2	

DISCHARGE 247 cfs

ELEV. 1191.6

$$S_{247} = 3471 - 1421 = 2050 \text{ ft}$$

$$\frac{S_{247}}{L} = \frac{2050}{1421} = 1.448 \frac{\text{ft}}{\text{ft}}$$

TR 39 (ES-70)

1191.6 cfs

1191.6 cfs

$$Q = 1191.6 \text{ cfs}$$

$$(n = 0.035, S = 0.005)$$

REV. 1191.6

$$A = 1.70$$

$$A = [231 + 3(1.7)] 1.7 = 400 \text{ ft}^2$$

$$P = 231 + 2(1.7) = 240.76 \text{ ft}$$

$$R = \frac{A}{P} = \frac{400}{240.76} = 1.66$$

$$Q_{1.70} = 1191.6 (1.66)^{2.48} = 662 \text{ cfs}$$

$$S = \frac{Q_{1.70}^2}{K R^4} = \frac{662^2}{400 \times 1.66^4} = 8.32 \frac{\text{ft}}{\text{ft}} < 8.75 \frac{\text{ft}}{\text{ft}} \quad \text{ok!}$$

$$\text{REV. TOP OF DAM} = 1191.6 + 2.0' = 1193.6 \text{ MSL}$$

EMERGENCY SPILLWAY REVISION ACCEPTABLE

BLACKBERRY RIVER
WATERSHED

DESIGN REPORT

SITE 9 *WIRR*

NORFOLK, CONNECTICUT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

INDEX

- I - GENERAL
- II - HYDRAULIC DESIGN
- III - FOUNDATION & EMBANKMENT DESIGN
 - A - GEOLOGY REPORT
 - B - SOIL TESTING REPORT
 - C - ANALYSIS
- IV - STRUCTURAL DESIGN
- V - LAYOUT
- VI - QUANTITIES
- VII - SPECIFICATIONS

CONNECTICUT STATE OFFICE
STORRS, CONN.

U S DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

This floodwater retarding dam is located on Wood Creek in Norfolk, Connecticut. Sheet 5 of this report, together with the South Sandisfield 7.5 minute quadrangle and the Norfolk 7.5 minute quadrangle, published by the U.S. Geological Survey, may be used to locate the structure more accurately.

A summary of pertinent design information is given on sheet 2 of this report.

Criteria and procedures used in this design are given in the following Soil Conservation Service publications:

National Engineering Memorandum No. 27, Limiting Criteria for the Design of Earth Dams.
National Engineering Memorandum No. 50, Drop Inlet Spillway Standards.
National Engineering Handbook No. 4A, Hydrology
National Engineering Handbook No. 5, Hydraulics
National Engineering Handbook No. 6, Structural Design
National Engineering Handbook No. 8, Geology
Engineering Division Technical Release No. 2, Earth Spillways
Engineering Division Technical Release, No. 5, Structural Design of Underground Conduits
Engineering Division Technical Release No. 12, Procedure for Computing Sediment Requirements for Retarding Reservoirs.

Other reference publications include:

U.S. Weather Bureau Technical Paper No. 40.

This structure is one of five flood retention structures designed to reduce flood damages in the flood plain of this watershed. It will retard the runoff from a 100-yr. frequency storm without discharge occurring in the emergency spillway.

The results of hydrologic and hydraulic computations are given on sheet 3 of this report. A typical cross-section of the compacted earthfill dam is given on sheet 4.

The principal spillway is a drop inlet structure consisting of a single stage reinforced concrete riser, 36-inch diameter conduit of reinforced concrete water pipe with a hooded inlet, and a riprap outlet basin to dissipate energy at the outlet end of the conduit.

The emergency spillway is designed as an earth cut in the left abutment.

Copies of the publications referred to in this report may be obtained from Mr. N. Paul Tedrow, State Conservationist, USDA, Soil Conservation Service, Storrs, Connecticut.

R. R. Wise
State Conservation Engineer

CONNECTICUT STATE OFFICE, STORRS, CONN.

DESIGN REPORT SUMMARY

WATERSHED DATA

DRAINAGE AREA
 IMMEDIATELY ABOVE SITE 1421 AC
 SUBWATERSHEDS ABOVE SITE (Wood Creek Pond) 1/ 1197 AC
 TOTAL WATERSHED 2618 AC
 TIME OF CONCENTRATION, T_c 8.29 HR
 HYDROLOGIC CURVE NUMBER, CN
 MOISTURE CONDITION II 68
 MOISTURE CONDITION III 85

PRINCIPAL SPILLWAY

CONDUIT
 SIZE (I.D.) 36 IN
 LENGTH 231 FT.
 RISER
 SIZE (INSIDE DIMENSIONS) 6x6 FT.
 HEIGHT (FLOOR TO CREST) 4 FT.
 WEIR LENGTH 17 FT.
 ORIFICE SIZE - FT.
 POND DRAIN SIZE 72x12 IN
 TYPE OF OUTLET ENERGY DISSIPATOR riprap

EMERGENCY SPILLWAY

TYPE earth cut
 WIDTH 230 FT.
 SIDE SLOPES 3:1
 LENGTH OF LEVEL SECTION 30 FT.
 EXIT CHANNEL SLOPE 0.02 FT/FT
 VELOCITY OF FLOW AT CONTROL SECTION* 7.3 FT/SEC
 DURATION OF FLOW* 17 HR
 FREQUENCY OF USE* Once in 100 years

EMBANKMENT

DAM
 MAX HEIGHT 35 FT.
 LENGTH 1000 FT.
 VOLUME OF FILL approx. 70,000 CY
 DIKE
 MAX HEIGHT 17 FT.
 LENGTH 1000 FT.
 VOLUME OF FILL approx. 16,000 CY

* Based upon reservoir stage of design high water elevation

1/ Modifying effect of Wood Creek Pond accounted for in principal spillway hydrograph routing only.

HYDROLOGIC CRITERIA AND ROUTING RESULTS

ELEMENT OF STRUCTURE	DETERMINING FACTOR	ELEVATION FEET	WASH AREA ACRES	STORAGE		INFLOW		PEAK OUTFLOW C.F.S.
				CUBIC FEET	INCHES	VOLUME INCHES	PEAK RATE C.F.S.	
INVERT OF ORIFICE	-	-	-	-	-	-	-	-
CREST OF RISER	50-yr. sediment ^{1/} accumulation	1167.5	11	27	-	-	-	-
CREST OF EMERGENCY SPILLWAY	1955 hurricane "Diane" ^{2/} 14-hr. duration moisture condition III	1188.0	87	1057	4.83	9.88	1620	150
DESIGN HIGH WATER	15 in. rainfall ^{2/} moisture condition III	1191.1	93	1310	6.00	13.5	4235	3640
TOP OF DAM ^{3/}	Design high water ^{2/} elevation plus 2 ft.	1193.1	-	1390 ^{4/}	6.35 ^{4/}	16.62 ^{4/}	5411 ^{4/}	4950 ^{4/}

* Volume expressed in inches of runoff from controlled watershed area of 2618 acres.

^{1/} Crest of riser set higher than sediments' requirement for both hydraulic and construction purposes.

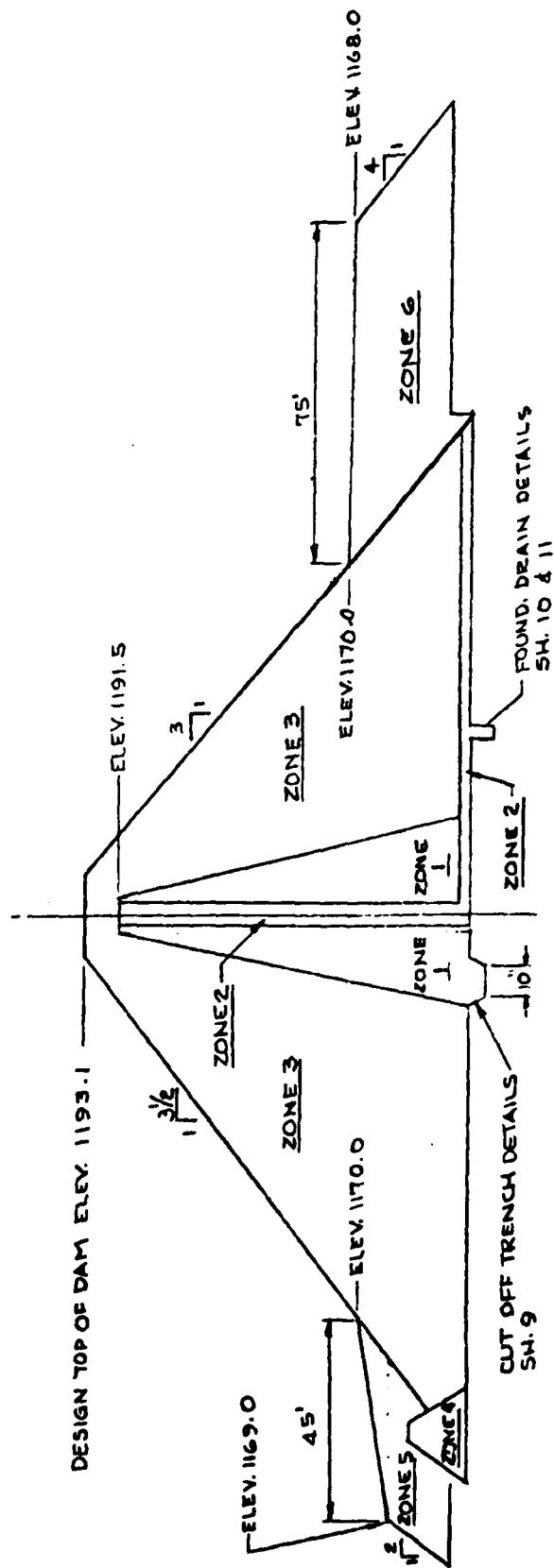
^{2/} State of Connecticut, Water Resources Criteria

^{3/} Maximum elevation as determined by (a) routing SCS Freeboard Storm

(b) design high water elevation plus 2 feet.

^{4/} Value obtained from SCS freeboard hydrograph routing

5-day drawdown elevation 1168.0



TYPICAL-SECTION-DAM

5-27-23

HYDROGRAPH COMPUTATION

WATERSHED OR PROJECT Elk River, Miss. STATE Conn.STRUCTURE SITE OR SUBAREA 51.7DR AREA 4.2 SQ MI T 9.29 HRRUNOFF CONDITION NO. IIIRUNOFF CURVE NO. 05 STORM DISTRIB CURVE B HYDROGRAPH FAMILY NO. 1STORM DURATION 1 HR RAINFALL 1.5 IN POINT 15 INQ 13.5 IN 13.5 COMPUTED T, 5.80 HR T, 5.69 HR(T + T_r) COMPUTED 0.98 USED 1 REVISED T, 1.67 $q_r = \frac{484 A}{REV. T_r} = \frac{484 \times 4.2}{1.67} = 345$ CFSQq = 47.5 CFS(COLUMN) = (T/T_r) REV. T_rq(COLUMN) = (a q_r) Qq

LINE NO	T HOURS	q CFS	LINE NO	T HOURS	q CFS	LINE NO	T HOURS	q CFS
1	0	0	21	5.81	5	41		
2	1.51	136	22	33.4	0	42		
3	3.12	715	23			43		
4	4.77	2210	24			44		
5	6.36	3700	25			45		
6	7.95	4235	26			46		
7	9.54	3547	27	(4.124)		47		
8	11.13	2670	28	645 A		48		
9	12.72	1529	29	47.154		49		
10	14.31	1212	30	32.22 405		50		
11	15.90	813	31			51		
12	17.49	541	32	32.22		52		
13	19.08	367	33	15.1		53		
14	20.67	242	34			54		
15	22.26	122	35			55		
16	23.85	113	36			56		
17	25.44	75	37			57		
18	27.03	42	38			58		
19	28.62	24	39			59		
20	30.22	9	40			60		

HYDROGRAPH COMPUTATION

Furukawa Hydrograph

WATERSHED OR PROJECT Butte County, Calif. STATE Calif.STRUCTURE SITE OR SUBAREA Life CreekDR. AREA 4.05 SQ. MI. T. 8.29 HR. RUNOFF CONDITION NO. 1RUNOFF CURVE NO. 65 STORM DISTRIB. CURVE 3 HYDROGRAPH FAMILY NO. 1STORM DURATION 6 HR. RAINFALL: POINT 1.5 IN. AREAL 1.5 IN.Q 16.63 IN. COMPUTED T. 8.29 HR. T. 8.29 HR.(T₀ + T_p): COMPUTED 8.29 USED 8.29 REVISED T. 8.29

$$q_p = \frac{484 A}{REV T_p} = \frac{484 \times 4.05}{8.29} = 237.9 \text{ CFS}$$

$$Qq = 4.05 \times 237.9 = 963.6 \text{ CFS}$$

$$q(\text{COLUMN}) = (t/T_p) REV T_p$$

$$q(\text{COLUMN}) = (q_p / Qq) Qq$$

LINE NO	t HOURS	q CFS	LINE NO	t HOURS	q CFS	LINE NO	t HOURS	q CFS
1	0	0	21	3.15	151	41		
2	5	152	22	3.42	142	42		
3	3.51	1362	23			43		
4	4.51	2535	24			44		
5	6.03	4313	25			45		
6	7.53	5911	26	4.71	1151	46		
7	8.54	4768	27	4.98	1045	47		
8	10.54	2863	28			48		
9	12.56	2282	29	6.15	823	49		
10	12.56	1571	30			50		
11	15.06	1015	31	6.42	745	51		
12	16.57	621	32			52		
13	18.08	477	33			53		
14	19.58	315	34			54		
15	21.09	206	35			55		
16	22.60	141	36			56		
17	24.10	92	37			57		
18	25.61	55	38			58		
19	27.12	24	39			59		
20	28.62	12	40			60		

GEOLOGY REPORT

CN-62
JAN. 1959

BLACKBERRY RIVER WATERSHED
LITCHFIELD COUNTY, CONNECTICUT
WOOD CREEK - SITE NO. 9

REPORT NO. CN-412-G

Geologist, E&WP Unit, SCS

Prepared by: William M. Brown
Geologist, SCS, Storrs, Conn.

Concurred by: T. R. Wire
State Conservation Engineer

I. Introduction A. General

State: Connecticut Location: Litchfield County
Watershed: Blackberry River Funds: WP-2-2
Site: Wood Creek - Site No. 9 Hazard: High
Explored by: W. M. Brown, Geologist Date: January-June, 1961
Equipment Used: Acker Drills (2)
Site Data:
Drainage area: 5.96 sq. miles 3814.4 acres
Type of structure: Compacted Earth Purpose: Flood Prevention
Height of fill: 37 feet; Length of fill: 1180 feet
Volume of compacted fill required: 140,000 yards
Location of emergency spillway: Left Abutment

REFERENCE:

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DRAWING NO.

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JAN. 1966

STORAGE ALLOCATION

	Depth at dam (feet)	Surface area (acres)	Volume (ac. ft.)
Sediment :	6	3.5	12
Floodwater :	32	1190	1250

B. Surface Geology and Physiography

Wood Creek - Site No. 9 is located in the foothills of the Berkshire Highlands of Northwestern Connecticut. Set in a region of generally moderate to steep relief, Site #9 has gentle sloping abutments. No bedrock is exposed at the site but the underlying bedrock is a gneissic complex associated with the highland regions and contains all gradations from highly micaceous schists to quartzitic gneisses. The surficial deposits are a complex of glacial lacustrine deposits in the floodplain overlying tills to well developed sand terraces common to the left abutment. Elsewhere, the site is overlain by heterogeneous boulder till. No adverse structural conditions such as faulting or fracture zones are apparent at the site. Seepage, because of local shallow groundwater conditions is common to both abutments. Channel and streambank conditions are stable and no erosion problems are anticipated at the site.

II Subsurface Geology

A. Centerline of the Dam

Nine holes were drilled along the proposed centerline of the dam to evaluate foundation conditions in the abutments and valley bottom. A total of 19 undisturbed samples (Stationary Pistol) were taken for

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foundation analysis. These samples were taken at various depths from holes 22U, 23U, and 24U as shown on SCS 35B. Of these samples, two were rejected because of poor recovery and one because the sampler settled under the weight of the rods. The undisturbed samples were obtained under the contracted supervision of Moran, Procter, Musser and Rutledge and as a result, eight of the sixteen samples were supplied to them for their analysis to develop final design criteria. The remaining eight samples were supplied to the Service and represent comparable sampling horizons. These samples are to be analyzed by Lincoln, Nebraska to determine if, after a comparison of results, a disturbance on shipped samples to Lincoln occurs thereby altering or distorting final results.

All of the centerline holes penetrated gray, micaceous silt which attained a maximum depth of approximately 70 feet in hole #8. Tentatively classified as an ML, the silt possesses a "livery" quality, is frequently varved, and contains varying amounts of clay and very fine grained sandy lenses. The undisturbed piston samples were taken of this ML for foundation analysis and one bulk sample taken for embankment stability and compaction criteria. The ML attains its greatest thickness on the left or east side of the valley - east of the existing stream channel. The silt lenses out on both sides of the valley revealing a fairly deep pre-glacial valley. Emerging from the silt, a zone of till is entered which extends approximately 10 feet before refusal is obtained on the sampler and/or casing. This zone of refusal is very uniform for the holes in the valley bottom. The zones of refusal are as follows: hole #22U - 100 blows on the split spoon for 6 inches at 47'6"; hole #24U - 57 blows on the split spoon for 6 inches at 48'6" and 500 blows on the casing for 5 inches at 49'5"; hole #303 - 410 blows on the casing for 1 foot at 49.0 feet.

Artesian conditions were prevalent in holes drilled in the valley bottom. The artesian zone was common to both the lower silt zone and throughout the whole till zone. The following summarizes the artesian conditions as they were encountered during drilling.

A. Hole #22AU

1. 4 inch casing at 25.0 feet - water rose 5.4 feet or elevation 1164.5 feet MSL.
2. 4 inch casing at 29.0 feet - water rose 2.9 feet or elevation 1163.0 feet MSL.

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3. 4 inch casing at 34.5 feet - water rose 3.0 feet or elevation 1162.1 feet MSL.
4. 4 inch casing at 40.0 feet - water rose 6.8 feet or elevation 1165.9 feet MSL.
5. General artesian conditions from 40.0 to 47.0 feet.

B. Hole 24U

1. 4 inch casing at 33.0 feet - water rose 4.0 feet or elevation 1162.0 feet MSL.
2. General artesian conditions exist from 33.0 to 39.0 feet.

Both abutments contain seep areas as a result of either extremely poorly drained subsoils or very shallow groundwater tables. Both these conditions are found jointly throughout the abutment areas. The abutment materials themselves being primarily a ML are quite impermeable as evidenced by the lack of sands and the mottling which occurs at shallow depth.

As a possibility of relocating the centerline of the dam, hole #50 was drilled about 330 feet upstream from the proposed centerline. The hole penetrated the same type silt with refusal being obtained on the spoon at a depth of 53'2".

B. Centerline of Outlet Structure

Only two of the planned five holes along the conduit were drilled. Hole 303 also served as a centerline hole for the proposed centerline of the dam. The same low volume-weight silts were encountered in the holes which were identified and described in the foregoing paragraphs covering centerline exploration. Refusal to the casing was met at 49.0 feet where 410 blows were obtained without advancement. The undisturbed samples taken in hole #24U will satisfy the laboratory needs for developing rates of consolidation beneath the conduit regardless to where it is placed in the valley bottom since the materials encountered in all of the holes are similar.

C. Emergency Spillway

Seven holes were drilled in the emergency spillway area to evaluate subsurface conditions. All holes went at least 15 feet below the approximate grade elevation (1191.0) without encountering bedrock. The subsurface materials consist

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primarily of fine grained micaceous sands with associated gravels, cobbles, and some boulders. Hole 201 was drilled to a depth of 42.0 feet and is located along the centerline of the dam at the approximate top elevation. From 2.5 to 13.5 feet, the ML of the other centerline holes was encountered. This marked the near eastern limit of the valley ML's where it starts to lense out quite rapidly.

All of the emergency spillway holes encountered a very shallow local groundwater table. Depths to groundwater are as follows: 201 - 7.0 feet; 202 - 3.0 feet; 203 - 7.0 feet; 204 - 8.0 feet; 205 - 2.0 feet; 206 - 3.0 feet; and 207 - 3.0 feet. Also common throughout the whole emergency area are seepage zones and general wet conditions. The material at the base of the excavation will be a silty sand of an estimated medium to very dense relative density.

D. Dike Area

Approximately 3,000 feet north of the dam a dike is proposed. The maximum height of the fill will be approximately 28 feet and its length about 1,000 feet. Five holes were drilled along the centerline to evaluate foundation conditions. All of the holes penetrated bedrock which was an unweathered granite biotite gneiss. The bedrock was hit at shallow depth and was in good condition. No jointing or fracture pattern was identified. The following summarizes the drilling information along the dike centerline.

<u>Hole</u>	<u>Earth Boring (feet)</u>	<u>Rock Coring (feet)</u>	<u>Total Depth</u>
601	-	20	20'
602	5'	20	25'
603	2' 1/4"	12	14' 1/4"
604	-	10	10'
605	8'	8	16'

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E. Borrow Areas

No formal investigation was undertaken to determine or delineate borrow source areas. It is tentatively planned that the bulk of the fill will be fines (ML) from the flood-pool with a shell of coarser material from outside the flood-pool area. The embankment design criteria is to be supplied by Moran, Proctor, Mueser, and Rutledge.

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DRILLING PROGRAM

	<u>Number of Holes</u>		<u>Undisturbed</u>	<u>Disturbed</u>	
	<u>Exploration</u>	<u>Sampling</u>	<u>Piston</u>	<u>Large</u>	<u>Small</u>
1. Centerline of Dam	8	3	16	-	-
2. Principal Spillway	2	-	-	-	-
3. Emergency Spillway	7	-	-	-	-
4. Centerline of Dike	5	-	-	-	-
5. Borrow	-	-	-	2	-

SUMMARY OF FINDINGS

1. Centerline of Dam: - Drilling revealed extensive low volume - weight materials tentatively classified as ML. The ML which underlies the entire foundation attains its greatest thickness under the east abutment as evidenced in hole #8. Underlying the silt is approximately 10 feet of till before a zone of refusal is met. Artesian conditions are found at various depths from 25.0 to 47.0 feet in holes drilled in the valley bottom. Both abutments contain seep areas and have locally high groundwater levels.
2. Principal Spillway: - Two holes were drilled along the proposed axis. The same silts were encountered. Refusal was encountered in hole 303 at 49.0 feet. This zone of refusal is constant at the near same depth as evidenced in holes 22 and 24.
3. Emergency Spillway: - All holes drilled extended to depths at least 15 feet below the anticipated grade elevations. No bedrock was encountered. Shallow groundwater levels were found in all of the holes. The material is primarily silty, poorly graded sand with gravel, cobbles and some boulders.
4. Centerline of Dike: - All holes drilled penetrated fine grained quartzitic biotite gneiss at shallow depth - greatest depth being 8.0 feet in hole #605.
5. Borrow: - No formal investigations were undertaken to delineate or evaluate borrow areas. The embankment design criteria is to be furnished by Moran, Proctor, Mueser and Rutledge. It is tentatively planned however that the bulk of the fill will be fines (ML) from the floodpool and a shell of coarser material being supplied from an area outside the floodpool.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Litchfield County

State Connecticut

Blackberry River

Sub-watershed Wood Creek

Site No 9

Bored by W. M. Brown

Date February 14, 1961

Project W-1

WEP: X

Tab 4B

Drilling Equipment Acker Drill

Location of Holes Centerline - Left Abutment

Hole No	Station and Surface Elev.	Hole Depth		Description of Materials	Unit Soil Class Synth	BPF	Samples			
		From	To				No	Type	From	To
		ft.	ft.						ft.	ft.
6	7+04 1170.8	0	9.0	Sand, very fine grained, poorly graded, brown, micaceous, silty, some 1/4 inch brown clay seams from 4 to 6 feet. Wet after 5 feet. Very loose to loose relative density.	SM-ML	2	1	SS	0	2.0
							2	SS	2.0	4.0
							3	SS	4.0	6.0
							4	SS	6.0	8.0
							5	SS	8.0	10.0
		9.0	10.0	Sand, very fine grained, poorly graded, brown, micaceous, SP trace silt, wet, no coarse fraction, very loose.	SP	6	6	SS	6.0	8.0
							4	SS	8.0	10.0
		10.0	11.5	Sand, very fine grained, silty, poorly graded, micaceous, SM-very loose, ML fraction.	SM-ML	4	6	SS	10.0	12.0
							7	SS	15.0	17.0
		11.5	13.0	Silt, gray, micaceous, soft to very soft, traces of clay and occasionally very fine grained sand.	ML	3	8	SS	20.0	22.0
							9	SS	25.0	27.0
		13.0	15.0	Sand, very fine to fine grained, poorly graded, micaceous, SM-wet, loose, gray.	SM-ML	2	10	SS	30.0	32.0
							11	SS	35.0	37.0
		15.0	17.0	Sand, fine grained, poorly graded, micaceous, fragmental quartzitic rock.	SM	6	12	SS	40.0	42.0
							13	SS	45.0	47.0
							14	SS	50.0	52.0
							15	SS	55.0	57.0
							16	SS	60.0	62.0
							17	SS	65.0	67.0

* Blows per foot (2nd and 3rd six inch increment)

* Disturbed undisturbed rock core
 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140, 145, 150, 155, 160, 165, 170, 175, 180, 185, 190, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 265, 270, 275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325, 330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380, 385, 390, 395, 400, 405, 410, 415, 420, 425, 430, 435, 440, 445, 450, 455, 460, 465, 470, 475, 480, 485, 490, 495, 500, 505, 510, 515, 520, 525, 530, 535, 540, 545, 550, 555, 560, 565, 570, 575, 580, 585, 590, 595, 600, 605, 610, 615, 620, 625, 630, 635, 640, 645, 650, 655, 660, 665, 670, 675, 680, 685, 690, 695, 700, 705, 710, 715, 720, 725, 730, 735, 740, 745, 750, 755, 760, 765, 770, 775, 780, 785, 790, 795, 800, 805, 810, 815, 820, 825, 830, 835, 840, 845, 850, 855, 860, 865, 870, 875, 880, 885, 890, 895, 900, 905, 910, 915, 920, 925, 930, 935, 940, 945, 950, 955, 960, 965, 970, 975, 980, 985, 990, 995, 1000, 1005, 1010, 1015, 1020, 1025, 1030, 1035, 1040, 1045, 1050, 1055, 1060, 1065, 1070, 1075, 1080, 1085, 1090, 1095, 1100, 1105, 1110, 1115, 1120, 1125, 1130, 1135, 1140, 1145, 1150, 1155, 1160, 1165, 1170, 1175, 1180, 1185, 1190, 1195, 1200, 1205, 1210, 1215, 1220, 1225, 1230, 1235, 1240, 1245, 1250, 1255, 1260, 1265, 1270, 1275, 1280, 1285, 1290, 1295, 1300, 1305, 1310, 1315, 1320, 1325, 1330, 1335, 1340, 1345, 1350, 1355, 1360, 1365, 1370, 1375, 1380, 1385, 1390, 1395, 1400, 1405, 1410, 1415, 1420, 1425, 1430, 1435, 1440, 1445, 1450, 1455, 1460, 1465, 1470, 1475, 1480, 1485, 1490, 1495, 1500, 1505, 1510, 1515, 1520, 1525, 1530, 1535, 1540, 1545, 1550, 1555, 1560, 1565, 1570, 1575, 1580, 1585, 1590, 1595, 1600, 1605, 1610, 1615, 1620, 1625, 1630, 1635, 1640, 1645, 1650, 1655, 1660, 1665, 1670, 1675, 1680, 1685, 1690, 1695, 1700, 1705, 1710, 1715, 1720, 1725, 1730, 1735, 1740, 1745, 1750, 1755, 1760, 1765, 1770, 1775, 1780, 1785, 1790, 1795, 1800, 1805, 1810, 1815, 1820, 1825, 1830, 1835, 1840, 1845, 1850, 1855, 1860, 1865, 1870, 1875, 1880, 1885, 1890, 1895, 1900, 1905, 1910, 1915, 1920, 1925, 1930, 1935, 1940, 1945, 1950, 1955, 1960, 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015, 2020, 2025, 2030, 2035, 2040, 2045, 2050, 2055, 2060, 2065, 2070, 2075, 2080, 2085, 2090, 2095, 2100, 2105, 2110, 2115, 2120, 2125, 2130, 2135, 2140, 2145, 2150, 2155, 2160, 2165, 2170, 2175, 2180, 2185, 2190, 2195, 2200, 2205, 2210, 2215, 2220, 2225, 2230, 2235, 2240, 2245, 2250, 2255, 2260, 2265, 2270, 2275, 2280, 2285, 2290, 2295, 2300, 2305, 2310, 2315, 2320, 2325, 2330, 2335, 2340, 2345, 2350, 2355, 2360, 2365, 2370, 2375, 2380, 2385, 2390, 2395, 2400, 2405, 2410, 2415, 2420, 2425, 2430, 2435, 2440, 2445, 2450, 2455, 2460, 2465, 2470, 2475, 2480, 2485, 2490, 2495, 2500, 2505, 2510, 2515, 2520, 2525, 2530, 2535, 2540, 2545, 2550, 2555, 2560, 2565, 2570, 2575, 2580, 2585, 2590, 2595, 2600, 2605, 2610, 2615, 2620, 2625, 2630, 2635, 2640, 2645, 2650, 2655, 2660, 2665, 2670, 2675, 2680, 2685, 2690, 2695, 2700, 2705, 2710, 2715, 2720, 2725, 2730, 2735, 2740, 2745, 2750, 2755, 2760, 2765, 2770, 2775, 2780, 2785, 2790, 2795, 2800, 2805, 2810, 2815, 2820, 2825, 2830, 2835, 2840, 2845, 2850, 2855, 2860, 2865, 2870, 2875, 2880, 2885, 2890, 2895, 2900, 2905, 2910, 2915, 2920, 2925, 2930, 2935, 2940, 2945, 2950, 2955, 2960, 2965, 2970, 2975, 2980, 2985, 2990, 2995, 3000, 3005, 3010, 3015, 3020, 3025, 3030, 3035, 3040, 3045, 3050, 3055, 3060, 3065, 3070, 3075, 3080, 3085, 3090, 3095, 3100, 3105, 3110, 3115, 3120, 3125, 3130, 3135, 3140, 3145, 3150, 3155, 3160, 3165, 3170, 3175, 3180, 3185, 3190, 3195, 3200, 3205, 3210, 3215, 3220, 3225, 3230, 3235, 3240, 3245, 3250, 3255, 3260, 3265, 3270, 3275, 3280, 3285, 3290, 3295, 3300, 3305, 3310, 3315, 3320, 3325, 3330, 3335, 3340, 3345, 3350, 3355, 3360, 3365, 3370, 3375, 3380, 3385, 3390, 3395, 3400, 3405, 3410, 3415, 3420, 3425, 3430, 3435, 3440, 3445, 3450, 3455, 3460, 3465, 3470, 3475, 3480, 3485, 3490, 3495, 3500, 3505, 3510, 3515, 3520, 3525, 3530, 3535, 3540, 3545, 3550, 3555, 3560, 3565, 3570, 3575, 3580, 3585, 3590, 3595, 3600, 3605, 3610, 3615, 3620, 3625, 3630, 3635, 3640, 3645, 3650, 3655, 3660, 3665, 3670, 3675, 3680, 3685, 3690, 3695, 3700, 3705, 3710, 3715, 3720, 3725, 3730, 3735, 3740, 3745, 3750, 3755, 3760, 3765, 3770, 3775, 3780, 3785, 3790, 3795, 3800, 3805, 3810, 3815, 3820, 3825, 3830, 3835, 3840, 3845, 3850, 3855, 3860, 3865, 3870, 3875, 3880, 3885, 3890, 3895, 3900, 3905, 3910, 3915, 3920, 3925, 3930, 3935, 3940, 3945, 3950, 3955, 3960, 3965, 3970, 3975, 3980, 3985, 3990, 3995, 4000, 4005, 4010, 4015, 4020, 4025, 4030, 4035, 4040, 4045, 4050, 4055, 4060, 4065, 4070, 4075, 4080, 4085, 4090, 4095, 4100, 4105, 4110, 4115, 4120, 4125, 4130, 4135, 4140, 4145, 4150, 4155, 4160, 4165, 4170, 4175, 4180, 4185, 4190, 4195, 4200, 4205, 4210, 4215, 4220, 4225, 4230, 4235, 4240, 4245, 4250, 4255, 4260, 4265, 4270, 4275, 4280, 4285, 4290, 4295, 4300, 4305, 4310, 4315, 4320, 4325, 4330, 4335, 4340, 4345, 4350, 4355, 4360, 4365, 4370, 4375, 4380, 4385, 4390, 4395, 4400, 4405, 4410, 4415, 4420, 4425, 4430, 4435, 4440, 4445, 4450, 4455, 4460, 4465, 4470, 4475, 4480, 4485, 4490, 4495, 4500, 4505, 4510, 4515, 4520, 4525, 4530, 4535, 4540, 4545, 4550, 4555, 4560, 4565, 4570, 4575, 4580, 4585, 4590, 4595, 4600, 4605, 4610, 4615, 4620, 4625, 4630, 4635, 4640, 4645, 4650, 4655, 4660, 4665, 4670, 4675, 4680, 4685, 4690, 4695, 4700, 4705, 4710, 4715, 4720, 4725, 4730, 4735, 4740, 4745, 4750, 4755, 4760, 4765, 4770, 4775, 4780, 4785, 4790, 4795, 4800, 4805, 4810, 4815, 4820, 4825, 4830, 4835, 4840, 4845, 4850, 4855, 4860, 4865, 4870, 4875, 4880, 4885, 4890, 4895, 4900, 4905, 4910, 4915, 4920, 4925, 4930, 4935, 4940, 4945, 4950, 4955, 4960, 4965, 4970, 4975, 4980, 4985, 4990, 4995, 5000, 5005, 5010, 5015, 5020, 5025, 5030, 5035, 5040, 5045, 5050, 5055, 5060, 5065, 5070, 5075, 5080, 5085, 5090, 5095, 5100, 5105, 5110, 5115, 5120, 5125, 5130, 5135, 5140, 5145, 5150, 5155, 5160, 5165, 5170, 5175, 5180, 5185, 5190, 5195, 5200, 5205, 5210, 5215, 5220, 5225, 5230, 5235, 5240, 5245, 5250, 5255, 5260, 5265, 5270, 5275, 5280, 5285, 5290, 5295, 5300, 5305, 5310, 5315, 5320, 5325, 5330, 5335, 5340, 5345, 5350, 5355, 5360, 5365, 5370, 5375, 5380, 5385, 5390, 5395, 5400, 5405, 5410, 5415, 5420, 5425, 5430, 5435, 5440, 5445, 5450, 5455, 5460, 5465, 5470, 5475, 5480, 5485, 5490, 5495, 5500, 5505, 5510, 5515, 5520, 5525, 5530, 5535, 5540, 5545, 5550, 5555, 5560, 5565, 5570, 5575, 5580, 5585, 5590, 5595, 5600, 5605, 5610, 5615, 5620, 5625, 5630, 5635, 5640, 5645, 5650, 5655, 5660, 5665, 5670, 5675, 5680, 5685, 5690, 5695, 5700, 5705, 5710, 5715, 5720, 5725, 5730, 5735, 5740, 5745, 5750, 5755, 5760, 5765, 5770, 5775, 5780, 5785, 5790, 5795, 5800, 5805, 5810, 5815, 5820, 5825, 5830, 5835, 5840, 5845, 5850, 5855, 5860, 5865, 5870, 5875, 5880, 5885, 5890, 5895, 5900, 5905, 5910, 5915, 5920, 5925, 5930, 5935, 5940, 5945, 5950, 5955, 5960, 5965, 5970, 5975, 5980, 5985, 5990, 5995, 6000, 6005, 6010, 6015, 6020, 6025, 6030, 6035, 6040, 6045, 6050, 6055, 6060, 6065, 6070, 6075, 6080, 6085, 6090, 6095, 6100, 6105, 6110, 6115, 6120, 6125, 6130, 6135, 6140, 6145, 6150, 6155, 6160, 6165, 6170, 6175, 6180, 6185, 6190, 6195, 6200, 6205, 6210, 6215, 6220, 6225, 6230, 6235, 6240, 6245, 6250, 6255, 6260, 6265, 6270, 6275, 6280, 6285, 6290, 6295, 6300, 6305, 6310, 6315, 6320, 6325, 6330, 6335, 6340, 6345, 6350, 6355, 6360, 6365, 6370, 6375, 6380, 6385, 6390, 6395, 6400, 6405, 6410, 6415, 6420, 6425, 6430, 6435, 6440, 6445, 6450, 6455, 6460, 6465, 6470, 6475, 6480, 6485, 6490, 6495, 6500, 6505, 6510, 6515, 6520, 6525, 6530, 6535, 6540, 6545, 6550, 6555, 6560, 6565, 6570, 6575, 6580, 6585, 6590, 6595, 6600, 6605, 6610, 6615, 6620, 6625, 6630, 6635, 6640, 6645, 6650, 6655, 6660, 6665, 6670, 6675, 6680, 6685, 6690, 6695, 6700, 6705, 6710, 6715, 6720, 6725, 6730, 6735, 6740, 6745, 6750, 6755, 6760, 6765, 6770, 6775, 6780, 6785, 6790, 6795, 6800, 6805, 6810, 6815, 6820, 6825, 6830, 6835, 6840, 6845, 6850, 6855, 6860, 6865, 6870, 6875, 6880, 6885, 6890, 6895, 6900, 6905, 6910, 6915, 6920, 6925, 6930, 6935, 6940, 6945, 6950, 6955, 6960, 6965, 6970, 6975, 6980, 6985, 6990, 6995, 7000, 7005, 7010, 7015, 7020, 7025, 7030, 7035, 7040, 7045, 7050, 7055, 7060, 7065, 7070, 7075, 7080, 7085, 7090, 7095, 7100, 7105, 7110, 7115, 7120, 7125, 7130, 7135, 7140, 7145, 7150, 7155, 7160, 7165, 7170, 7175, 7180, 7185, 7190, 7195, 7200, 7205, 7210, 7215, 7220, 7225, 7230, 7235, 7240, 7245, 7250, 7255, 7260, 7265, 7270, 7275, 7280, 7285, 7290, 7295, 7300, 7305, 7310, 7315, 7320, 7325, 7330, 7335, 7340, 7345, 7350, 7355, 7360, 7365, 7370, 7375, 7380, 7385, 7390, 7395, 7400, 7405, 7410, 7415, 7420, 7425, 7430, 7435, 7440, 7445, 7450, 7455, 7460, 7465, 7470, 7475, 7480, 7485, 7490, 7495, 7500, 7505, 7510, 7515, 7520, 7525, 7530, 7535, 7540, 7545, 7550, 7555, 7560, 7565, 7570, 7575, 7580, 7585, 7590, 7595, 7600, 7605, 7610, 7615, 7620, 7625, 7630, 7635, 7640, 7645, 7650, 7655, 7660, 7665, 7670, 7675, 7680, 7685, 7690, 7695, 7700, 7705, 7710, 7715, 7720, 7725, 7730, 7735, 7740, 7745, 7750, 7755, 7760, 7765, 7770, 7775, 7780, 7785, 7790, 7795, 7800, 7805, 7810, 7815, 7820, 7825, 7830, 7835, 7840, 7845, 7850, 7855, 7860, 7865, 7870, 7875, 7880, 7885, 7890, 7895, 7900, 7905, 7910, 7915, 7920, 7925, 7930, 7935, 7940, 7945, 7950, 7955, 7960, 7965, 7970, 7975, 7980, 7985, 7990, 7995, 8000, 8005, 8010, 8015, 8020, 8025, 8030, 8035, 8040,

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location **Litchfield County**
Watershed **Blackberry River**
Owned by **W. M. Brown**
Drilling Equipment **Acker Drill**

State **Connecticut**

Site No **9**

Sub-watershed **Wood Creek**

Date **February 19 61** Project WP1
WP2 **I** FP

Pub. 46

Centerline - Left Abutment

Location of Holes

Hole No	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class Symb	BPF XXXX	Samples			
		From Ft.	To Ft.				No	Type	From Ft.	To Ft.
7	6+11 1176.2:	0	4.0	Sand, very fine grained, mottled, clayey with trace of silt. Slightly micaceous.	SC-	2	1	SS	0	2.0
				Some pebbles at 2.0 feet.	CL	4	2	SS	2.0	4.0
					ML	9	3	SS	4.0	6.0
				Silt, gray, clay, medium relative density, some mica.	SM		5	SS	10.0	12.0
				Sand, very fine grained, micaceous, dark gray, medium relative density, silty.						
	13.053.0	13.053.0	53.0	Silt, micaceous, wet, high % clay except from 33.0 to 43.0 feet where very fine grained sand is more common.	ML	7	6	SS	15.0	17.0
				High % clay from 43.0 to 53.0.			7	SS	20.0	22.0
							8	SS	25.0	27.0
				Sand, very fine, grained, poorly graded, wet, some angular rock fragments.	SM-	6	9	SS	30.0	32.0
					ML	5	10	SS	35.0	37.0
	58.0	67.0		Sand, very fine to fine grained, poorly graded, micaceous to 63 feet. Sand becoming fine to medium grained with pebbles and angular rock fragments. Medium density.	SP	4	11	SS	40.0	42.0
						6	12	SS	45.0	47.0
						6	13	SS	50.0	52.0
						26	14	SS	55.0	57.0
						20	15	SS	60.0	62.0
						18	16	SS	65.0	67.0

* Disturbed undisturbed rock core
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other as directed by State Conservationist

Station 9 29 feet

CN-412-6

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County State Connecticut
 Watershed Blackberry River
 Logged by W. M. Brown Date February 19 61 Project WP1 Site No. 9
 Drilling Equipment Acker Drill Location of Holes Centerline - Left Abutment Pub. 46

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symb.	BPT	Samples			
		From	To				No.	Type	From	To
		FL	FL						FL	FL
8	4+66	0	13.0	Sand, very fine grained, clayey with trace of silt, oxidation bands, soft to medium relative density.	SC	2	1	SS	0	2.0
	1182.7			Groundwater at 2.0 feet.	CL	4	2	SS	2.0	4.0
						4	3	SS	4.0	6.0
						6	4	SS	10.0	12.0
	4+66	13.0	23.0	Silt, micaceous, gray, medium relative density. Very soft from 20.5 feet.	ML	6	5	SS	15.0	17.0
	1182.7					2	6	SS	20.0	22.0
		23.0	33.0	Sand, very fine grained, poorly graded, very micaceous, gray, very loose.	SM-ML	3	7	SS	25.0	27.0
		33.0	69.0	Silt, gray, micaceous, soft to medium relative density. 1/8" lenses of poorly graded sands with pebbles from 45 feet.	ML	6	8	SS	30.0	32.0
						4	9	SS	35.0	37.0
						4	10	SS	40.0	42.0
	69.0	72.0		Sand, coarse sand, poorly graded subround rock fragments, medium dense relative density.	SM-ML	8	11	SS	45.0	47.0
						14	12	SS	50.0	52.0
						10	13	SS	55.0	57.0
						10	14	SS	60.0	62.0
						14	15	SS	65.0	67.0
						27	16	SS	70.0	72.0

* Disturbed-undisturbed rock core. † Percent sample recovery.
 1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
 Oliver Co. as directed by State Conservationist.

Sheet 10 of 29 sheets

CN-4-6

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County

State Connecticut

Watershed Blackberry River

Sub-watershed

Logged by W. M. Brown

Date February 19 61 Project WP1

Site No 9

Pub 46

Drilling Equipment Acker Drill

Location of Holes Centerline - Left Abutment

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symb.	No.	Samples			Rec. %
		From	To				Type	From	To	
		Ft.	Ft.					Ft.	Ft.	
9	3+02 1191.2	0	4.0	Sand, very fine grained, poorly graded, micaceous, trace clay. Groundwater level at 8.0 feet.	SM-ML	1	SS	0	2.0	67
						2	SS	2.0	4.0	50
						3	SS	4.0	6.0	58
						4	SS	6.0	8.0	58
						5	SS	10.0	12.0	67
						6	SS	15.0	17.0	67
						7	SS	20.0	22.0	67
						8	SS	25.0	27.0	62
						9	SS	30.0	32.0	67
						10	SS	35.0	37.0	67

Sheet 11 of 29 holes

* Disturbed - undisturbed rock core. † Percent sample recovery.
1 copy to F and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other as directed by State Conservationist.

CN-112-G

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County State Connecticut
Watershed Blackberry River Sub-watershed Wood Creek Site No. 9
Leased by N. M. Brown Date July 1961 Project: WP1 WP2 X FP
Drilling Equipment Acifer Drill Location of Holes Centerline - Right Abutment

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unit Soil Class Symb.	No. of Samples	From To			Type	To Rec	
		From	To				Ft.	Ft.	Ft.		Ft.	%
20	10+38	0	4.0	Sand, very fine grained, poorly graded, gray, micaceous, silty. Mottled from 1.5 to 3.0 feet. Some gravels and clay at 4.0 feet.	SM	7		0	1.5	SS		89
	1169.8					7		1.5	3.0	SS		89
						9		3.0	4.5	SS		89
		4.0	31.0	Beyond 4.0 feet, silt with clay fraction. Silt micaceous, gray, very soft to soft relative density.	ML	11		4.5	6.0	SS		89
		31.0	44.4	Dense till. Sand, fine to medium grained, silty, micaceous, some gravels, gray. Very dense at 44.0 feet. Casing 500 blows for 6 inches; 200 blows on sampler for 5 inches.	SM	5		6.0	7.5	SS		0
						5		7.5	9.0	SS		0
						4		12.0	13.5	SS		67
						4		17.0	18.5	SS		89
				Water level elevation 1163.8		3		22.0	23.5	SS		67
						4		26.0	27.5	SS		89
						39		32.0	33.5	SS		33
						30		37.0	38.5	SS		0
21	11+85	0	5.0	Sand, very fine grained, micaceous, mottled, gray, some pebbles from 4.0 to 5.0 feet.	SM	12		0	1.5	SS		67
	1180.3					10		1.5	3.0	SS		67
		5.0	13.0	Silt, high percentage of clay, gray, slightly micaceous.	ML	4		4.0	5.5	SS		89
						4		7.0	8.5	SS		56
						200+		44.0	44.4	SS		60

* Disturbed undisturbed rock core.
† Percent sample recovery
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other as directed by State Conservationist

Sheet 1 of 2

CN-410-6

Form SCS 543
Rev. Dec. 56

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location **Litchfield County**
Watershed **Blackberry River**

Owner **E. R. Stevens**
Sub-watershed **Wood Creek**

State **Connecticut**

Logged by **H. M. Brown**

Site No. **9**
Pub. 46

Drilling Equipment **Acme Drill**

Date **July** 19 **61** Project: WPI WP2 **I**
Location of Holes **Centerline Right Abutment**

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symb.	BPT	Samples			
		From Ft.	To Ft.				No.	Type	From Ft.	To Ft.
21	11485	13.0	29.8	Sand, fine to coarse grained, silty, gray, micaceous. Less silt from 20.0 to 21.5 ft. No gravels at 29.0 feet. Refusal on sampler at 29.8 ft. with 100 blows for 3 inches.	SM	10		SS	10.0	11.5
	11480.3							SS	12.0	13.5
22U				Ground water elevation at 1175.6 No samples taken - Hit roots at 5.0 feet. Hole offset (22 AU) 3.0 feet to N.W.		100+	5	SS	14.0	15.5
							6	SS	20.0	21.5
							7	SS	25.0	26.5
							8	SS	29.0	29.8
22AU	9 + 14	0	4.5	Sand, very fine grained, poorly graded, gray, micaceous, silty, trace of clay.	SM	4	1	SS	3.0	4.5
	1159.1	4.5	17.0				2	SS	5.0	6.5
				Silt, associated clay fraction, traces of very fine grained gray micaceous sand throughout.	ML		3A	US	7.0	9.0
							3B	US	11.0	13.0

* Disturbed undisturbed-rock core. 1 Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other () as directed by State Conservationist.

Sheet 13 of 129 sheets

CN-412-5

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location **Litchfield County**
Watershed **Blackberry River Watershed**
Owner **E.R. Stevens**
Sub-watershed **Wood Creek**

State **Connecticut**

Site No. **9**

Designed by **M. M. Brown**

Date **July** 1961 Project: WP1

Pub. 46

Drilling Equipment **Acker Drill**

Location of Holes **Centerline - Right Abutment**

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unit, Soil Class, Symb.	BPT	Samples			
		From Ft.	To Ft.				No.	Type	From Ft.	To Rec. Ft. %
22AU	9 + 14 1159.1			Artesian conditions as follows:	ML		4A	U.S.	16.0	18.0 100
				1. With 4" casing at 25.0' - water rose 5.4' (1164.5' MSL)			4B	U.S.	18.0	20.0 100
				2. With 4" casing at 29.0' - water rose 2.9' (1163.0' MSL)			5	SS	21.0	22.5 89
				3. With 4" casing at 34.5' - water rose 3.0' (1162.1' MSL)			6A	U.S.	23.0	25.0 100
				4. With 4" casing at 40.0' - water rose 6.8' (1165.9' MSL)			6B	U.S.	25.0	27.0 100
				5. General artesian conditions from 40.0 to 47.0 feet.			7	SS	32.0	33.5 89
							3	HS	34.0	36.0 0
							28	SS	36.0	37.5 89
				37.0 - 47.6 Sand, fine to coarse grained, micaceous, gray, silty, trace of clay, some gravel. Fill zone starts at 37.0 feet. Used 2 1/2" casing below 40.0 feet. Spoon grouted in at 47.0 feet with 2 1/2" casing.	SM		48	SS	40.0	41.5 33
				Ground Water elevation at 1152.5 feet.			136	SS	46.0	47.5 56

* Disturbed - undisturbed rock core. † Percent sample recovery
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other c as directed by State Conservationist

Sheet 14 of 29 sheets

CN-412-G

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County State Connecticut
 Watershed Blackberry River Sub-watershed Wood Creek Site No. 9
 Logged by W. M. Brown Date July 1961 Project: WP1 WP2 X FP --- Pub. 45
 Drilling Equipment Acker Drill Location of Holes Centerline - Right Abutment

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symb.	BPF ~~xxx~~	Samples					
		From Ft.	To Ft.				No.	Type	From Ft.	To Ft.	Rec. %	
230		0	4.5	Sand, fine to coarse grained sand, very silty, mottled, trace of clay, some gravel fraction.	SM LL		1	SS	4.0	5.5	89	
		4.5	5.5	Silt, some fine grained sand, brown, mottled, micaceous, some pebbles. Hole bottomed due to inability of removing gravels prior to undisturbed sampling. Off-set hole 2.5 feet west.	ML							
231U	10+70	0	4.5	Sand, fine to medium grained, micaceous, mottled. Sample obtained by using 140# hammer on 3" Shelby tube to remove gravels up to 4.5 feet prior to undisturbed sampling.	SM		1	SS	3.0	4.5	67	
	117.7						2A	U.S.	5.0	7.0	92	
							2B	U.S.	7.0	9.0	100	
		4.5	24.5	Silt, some traces of sand and clay, somewhat micaceous. Some lenses of gray sand from 12.0 - 13.5 feet grading into silt with clay.	ML	6	SS	12.0	13.5	89		
							4A	U.S.	14.0	16.0	100	
							4B	U.S.	16.0	18.0	100	

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Sheet 1527 Sheets

* Disturbed-undisturbed-rock core. † Percent sample recovery.
 1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
 Other as directed by State Conservationist.

CN-412-G

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Witchfield County
Blackberry River

Owner E. R. Stevens
Wood Creek

State Connecticut

Watershed Blackberry River

Sub-watershed Wood Creek

Logged by M. M. Brown

Date July

19 61 Project: WP1

WP2 I

Site No. 9

Drilling Equipment Acker Drill

Centerline - Right Abutment

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symb.	BPT	Samples			
		From Ft.	To Ft.				Type	No.	From Ft.	To Ft.
23AU	10+70			Reduced to 2 1/2" casing below 23.0 feet.	ML	6	SS	5	18.0	19.5
	1171.7	24.5	39.5	Entering till at 24.5 feet. Sand, fine to coarse grained, trace silt, some gravels. Some decomposed micaceous rock fragments from 33.0 feet.			US	6A	20.0	22.0
				Refusal of casing at 39'6" with 300 blows for 5".	SP/SH	53	SS	6B	22.0	24.0
							SS		25.0	26.5
							SS	7	27.0	28.5
							SS	8	33.0	33.7
							SS	9	37.0	38.5
24U	8+32	0	41.5	No samples taken from 0 to 28.0 feet			US	1A	28.0	30.0
	1158.7			Top of 1A fine to coarse grained sand with clay and silt. ML			US	2*	30.0	32.0
				Bottom of 1A - Silt, gray, micaceous, trace of sand and clay. Very fine grained sand becoming more common beyond 35.0 feet.			US	3*	33.0	35.0
							US	4*	37.0	39.0
				* Rejected			SS	49	42.0	43.5
				** Sampler settled 1.0 foot under weight of rods.			SS	6	47.0	48.5

† Disturbed undisturbed rock core. ‡ Percent sample recovery.
§ 1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

Sheet 1 of 1

CN-1-G

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County State Connecticut
 Watershed Blackberry River Sub-watershed Wood Creek Site No. 9
 Logged by W. M. Brown Date July 19 61 Project: WP1 X WP2 X FP Pub 46
 Drilling Equipment Acker Drill Location of Holes Centerline - Right Abutment

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symb	BPT XXXX XXXX XXXX	Samples						
		From Ft.	To Ft.				No.	Type	From		To		
									Ft.	%	Ft.	%	
240	8+32	41.5	49.5	Entering till at 41.5 feet.	SM								
	1158.7		Sand, fine to medium grained, poorly graded, some gravels from 47.0 feet, micaceous.										
244U	8+36			Artesian conditions between 33.0 and 39.0 feet. 4" casing at 33.0 feet; water rose to 1162.0 feet.									
244U	8+36	0	7.0	No samples taken. Washed through 4" casing to 7.0 feet.	ML		1B	US	7.0	9.0	9.0	100	
	1159.1		ML material encountered at 2.5 feet.										
		7.0	6.0	Silt, gray, micaceous, trace clay, some wash (coarse sand and gravel at 7.0 feet).			2A	US	12.0	14.0	14.0	100	
							2B	US	14.0	16.0	16.0	100	

* Disturbed-undisturbed-rock c. † Percent sample recovery.
 1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
 Other is as directed by State Conservationist

Sheet 17 of 29 sheets

CN-412-G

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location
**Litchfield County
Blackberry River**

Owner
Wood Creek

State
Connecticut

Water shed

Sub watershed

Date

Project

WP2

FP

Site No.

Pub 46

Invested by
W. M. Brown

Drilling Equipment
Acker Drill

Location of Holes

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unit Soil Class Symb	HPF	Samples									
		From	To				No.	Type	From Ft.	To Ft.	Rec %					
50		0	2.0	Ice and water												
		2.0	5.0	Sand, fine grained, poorly graded, brown to gray, very loose, micaceous, wet. Profile change at 5.0 feet.	SM-ML	3	1	SS	2.0	4.0	75					
		5.0	8.0	Sand, poorly graded, dark gray, very micaceous, very loose and wet. From 6-8 feet: fine to medium grained, organic traces and pebbles.	SP	3	2	SS	4.0	6.0	75					
							3	SS	6.0	8.0	75					
							4	SS	8.0	10.0	75					
							5	SS	10.0	12.0	67					
		8.0	17.0	Silt, gray, micaceous, wet. Pebbles and rock fragments from 15 to 17 feet. Very soft to 27 feet. From 25 to 26 feet sampler advanced by wgt. of hammer. Soft to medium density from 27 to 51 feet.	ML	3	6	SS	15.0	17.0	75					
							7	SS	20.0	22.0	75					
							8	SS	25.0	27.0	75					
							9	SS	30.0	32.0	75					
		51.0	53.2*	Sand, gray, well graded, very dense, gravel fragments. 65 HPF on casing w/300# hammer at 53 feet w/no advancement. ARTESIAN conditions at 53 feet for 24 hour period.	SM	5	10	SS	45.0	37.0	75					
							11	SS	40.0	42.0	75					
							12	SS	45.0	47.0	75					
						72	SS	50.0	51.5	0						
							oe*	51.5	53.2*							

* Open end sampler

* Open end sampler

* Disturbed undisturbed rock core
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other as directed by State Conservationist

Sheet 18 of 25

CN-412 0

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County
Blackberry River

Owner Wood Creek

State Connecticut

Site No 9

Logged by W. M. Brown

Date February 19 61 Project: WP1 WP2 X FP

Pub 46

Drilling Equipment Acker Drill

Location of Holes Emergency Spillway

Hole No	Station and Surface Elev	Hole Depth		Description of Materials	Unif Soil Class Synh	BPF XXXX	Samples			
		From Ft.	To Ft.				No	Type	From Ft.	To Rec %
201	1493	0	2.5	Sand, poorly graded, micaceous, angular quartzitic fragments from cobbles and/or gravels. Profile change at 2.5 feet.	SM	10	1	SS	0	2.0 67
	1195.3						2	SS	2.0	4.0 58
							3	SS	4.0	6.0 58
		2.5	13.5	Silt, low plasticity, some fine grained sand, micaceous, no coarse fraction below 6 feet. Profile change at 13.6". Soft to medium density. Groundwater at 7 feet.	ML	4	4	SS	6.0	8.0 67
							5	SS	8.0	10.0 67
							6	SS	10.0	12.0 67
		13.5	28.0	Sand, very fine grained, poorly graded, some rock fragments from gravels and/or cobbles, some decomposed biotite schist, trace of clay.	SM-	10	7	SS	15.0	17.0 50
							8	SS	20.0	22.0 33
							9	SS	25.0	27.0 58
		28.0	42.0	Sand, fine grained with some angular coarse grained sand. Dense to very dense. Some mica and decomposed fine grained gneiss.	SM	27	10	SS	30.0	32.0 58
							11	SS	35.0	37.0 67
							12	SS	40.0	42.0 62

* Disturbed undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other as directed by State Conservationist

Sheet 19 of 29 Sheets

CN-412-G

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County State Connecticut
Watershed Blackberry River Sub-watershed Wood Creek
Logged by W. M. Brown Date Feb. 19 61 Project WP1 WP2 X FP
Drilling Equipment Acton Drill Location of Holes Emergency Spillway Site No. 9 Pub. 46

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unit, Soil Class Symb.	BPF	Samples				
		From Ft.	To Ft.				No.	Type	From Ft.	To Rec %	
202	1205.3	0	31.5	Sand, very fine grained, poorly graded, decomposed gneissic fragments. Coarser fraction from 10.0 to 21.5 feet. Fine grained from 21.5 ft. to hole bottom. Groundwater level at 3.0 feet. Medium relative density.	SM	26	1	SS	5.0	6.5	50
							2	SS	10.0	11.5	58
							3	SS	15.0	16.5	67
							4	SS	20.0	21.5	67
203	1221.7	0	46.5	Sand, fine grained, poorly graded, micaceous, pebbles and rock fragments. Groundwater at level of 7.0 ft. Somewhat better grading of sand w/ a higher % of fines from 25.0 to 30.0 feet. Dense to 40.0 feet; thereafter very dense.	SM	26	1	SS	5.0	6.5	50
							2	SS	10.0	11.5	58
							3	SS	15.0	16.5	42
							4	SS	20.0	21.5	50
						36	5	SS	25.0	26.5	42
						33	6	SS	30.0	31.5	50
						35	7	SS	35.0	36.5	42
						54	8	SS	40.0	41.5	42
						54	9	SS	45.0	46.5	50

* Disturbed-undisturbed rock core. 1 Percent sample recovery
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copy as directed by State Conservationist.

Sheet 20 of 27 Sheets

ON-4120

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County State Connecticut
Watershed Blankberry River Sub-watershed Wood Creek Site No. 9
Logged by W. M. Brown Date February 1961 Project WP1 WP2 X FP --- Pub 46
Drilling Equipment Acker Drill Location of Holes Emergency Spillway

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symb.	BPF	Samples			
		From	To				No.	Type	From	To
		Ft.	Ft.						Ft.	Ft.
204	1221.7	0	33.0	Sand, fine to medium grained, poorly graded, micaceous, some subangular quartz fragments. Groundwater level at 8.0 ft. Coarser sand from decomposed rock from 13.0 to 17.0 feet. Boulder from 25.0 to 26.5 w/no recovery	SM	21	1	SS	5.0	6.5
							2	SS	10.0	11.5
							3	SS	15.0	15.5
							4	SS	20.0	21.5
							Boulder		25.0	26.5
205	1214.9	0	46.5	Same as above without fines, coarser fraction. Same as previous SM's w/white quartzite fragments from 45.0 to 46.5 feet. Groundwater level at 2.0 feet. Sand, fine grained, poorly graded, micaceous, gray, some pebbles and gravel fragments. From 2.0 to 13.0 ft., sand fine to medium grained and without gravel fraction. Medium to dense to 40.0 feet.	SP	62	5	SS	30.0	31.5
							6	SS	35.0	36.5
							7	SS	40.0	41.5
							8	SS	45.0	46.5
205	1214.9	0	46.5	Groundwater level at 2.0 feet. Sand, fine grained, poorly graded, micaceous, gray, some pebbles and gravel fragments. From 2.0 to 13.0 ft., sand fine to medium grained and without gravel fraction. Medium to dense to 40.0 feet.	SM	13	1	SS	5.0	6.5
							2	SS	10.0	11.5
							3	SS	15.0	16.5
							4	SS	20.0	21.5
							5	SS	25.0	26.5
							6	SS	30.0	31.5
							7	SS	35.0	36.5
							8	SS	40.0	41.5

* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copy as directed by State Conservationist.

CW-414 G

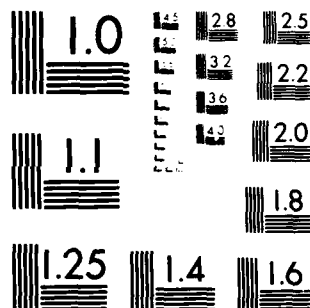
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
WOOD CREEK DAM (CT 00..U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAR 81

22

F/G 13/13 NI

END
DATE
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9 84
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County

Owner

Sub watershed Wood Creek

State Connecticut

Watershed Blackberry River

Date February 19 61

Site No 9

Logged by W. M. Brown

Project WP1

FP

Pub. 46

Drilling Equipment Acker Drill

Location of Holes Emergency Spillway

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symh	BPF	Samples				
		From	To				No.	Type	From	To	Rec %
		Ft.	Ft.						Ft.	Ft.	
205	1214.9				SM	54	9	SS	45.0	46.5	42
206	1204.7	0	31.5	Groundwater level at 3.0 feet. Sand, fine grained, poorly graded, gray, micaceous, fragmental rock from gravels and/or cobbles. Medium relative density.	SM	39	1	SS	5.0	6.5	67
						13	2	SS	10.0	11.5	67
						14	3	SS	15.0	16.5	67
						15	4	SS	20.0	21.5	58
						12	5	SS	25.0	26.5	67
						16	6	SS	30.0	31.5	67
207	1206.4	0	31.5	Groundwater level at 3.0 feet. Sand, fine to medium grained, poorly graded, pebble and rock fragments, micaceous. Medium density to 13.8 ft., then very dense.	SM	26	1	SS	5.0	6.5	67
						38		SS	10.0	11.5	0
								Boulder	13.8	15.8	79
						58	2	SS	20.0	21.5	67
						56	3	SS	25.0	26.5	67
						79	4	SS	30.0	31.5	67

Sheet 22 of 27 sheets

* Disturbed-undisturbed rock core. † Percent sample recovery
1 copy to E and WP Unit. 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist.

CN-412-G

LOG OF TEST HOLES

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County

Owner

State Connecticut

Watershed Blackberry River

Sub watershed

Site No. 9

Logged by W. M. Brown

Date February 19 61 Project WP1 WP2 X FP

Pub. 46

Drilling Equipment Acher Drill

Location of Holes Principal Spillway

Hole No	Station and Surface Elev.	Hole Depth		Description of Materials	Unit, Soil Class. Symb.	BPF	Samples			
		From	To				No.	Type	From To	Rec
		Ft.	Ft.						Ft.	%
303	8+29	0	3.0	Ice and water			1	SS	4.0	6.0
		3.0	6.0	Silt, organic, wet, micaceous, some clay, gray, very soft to soft.	OL		2	SS	6.0	8.0
							3	SS	8.0	10.0
1162	6+0	6.0	10.0	Silt, gray, very fine grained, micaceous, soft to medium, relative density.	ML		4	SS	10.0	12.0
							5	SS	15.0	17.0
							6	SS	20.0	22.0
				Refusal on casing at 49.0 feet, 410 blows with no advancement.			7	SS	25.0	27.0
							8	SS	30.0	32.0
							9	SS	35.0	37.0
							10	SS	40.0	42.0
							11	SS	45.0	47.0

Sheet 23 of 28 Sheets

* Disturbed undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit. 1 copy Soil Mechanics Laboratory with samples
Other as directed by State Conservationist.

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County State Connecticut
Watershed Blackberry River Sub-watershed Wood Creek Site No. 9
Logged by W. M. Brown Date February 1961 Project WP1 WP2 X FP Pub 46
Drilling Equipment Acker Drill Location of Holes Principal Spillway

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unit, Soil Class Symb.	BPF	Samples			
		From	To				No	Type	From	To
		Ft.	Ft.						Ft.	Ft.
305	1142	0	6.3	Ice and water		2	1	SS	8.0	10.0
		6.3	9.0	Sand, well graded, dark gray, pebbles, micaceous, very soft.	SM-	2	2	SS	10.0	12.0
		9.0	16.0	Silt, gray, micaceous, wet, very soft, some clays.	ML	2	3	SS	15.0	17.0
		16.0	17.0	Sand, silty, fine grained, poorly graded, micaceous, ML fraction, medium density.	ML	3	4	SS	20.0	22.0
		17.0	50.0	Sand, fine grained, poorly graded, gray, micaceous	SM-	4	5	SS	25.0	27.0
					ML	4	6	SS	30.0	32.0
					SP	4	7	SS	35.0	37.0
						4	8	SS	40.0	42.0
						5	9	SS	45.0	47.0
						34	10	SS	48.0	50.0
				gravel sized up to 1", medium to dense relative density.						

* Disturbed-undisturbed rock core.
1 copy to E and WP Unit. 1 copy Soil Mechanics Laboratory with samples
Other as directed by State Conservationist.

Sheet 24 of 28 sheets

CN-4125

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location - **Litchfield County**

Owner

Watershed

Sub-watershed

State

Connecticut

Logged by **W. M. Brown**

Date

June

Project

WP2

FP

Site No

9

Pub 46

Drilling Equipment **Acme Drill**

Location of Holes **North Dike**

Hole No.	Station and Surface Elev.	Hole Depth		Description of Materials	Unit Soil Class. Symb.	BPF	No	Type	Samples		Rec %
		From Ft.	To Ft.						From Ft.	To Ft.	
601	1185.2	0	20.0	Bedrock - fine grained quartzitic biotite gneiss				RC	0	20.0	85
602	1175.2	0	5.0	Sand, fine to coarse grained, generally poorly graded, brown, some gravels and decomposed gneissic rock.	SM	9	1	SS	0	2.0	100
				Refusal at 5.0 feet with 190 blows on casing with no advancement.		63	2	SS	2.0	4.0	54
						75*	3	SS	4.0	5.0	91
		5.0	25.0	Bedrock - very fine grained quartzitic biotite gneiss				RC	5.0	10.0	86
								RC	10.0	15.0	94
								RC	15.0	20.0	84
								RC	20.0	25.0	76
603	1161.7	0	2.3	Sand, fine to medium grained, brown, poorly graded, some gravels. Refusal at 2.3 feet.	SM	5	1	SS	0	2.0	79
		2.3	14.3	Bedrock, fine grained quartzitic biotite gneiss. Almost a schist from 2.3 to 10.3 ft.		ref.	2	SS	2.0	2.3	0
								RC	2.3	4.3	30
								RC	4.3	10.3	38
								RC	10.3	14.3	96

Sheet **25** of **28** sheets

* Disturbed undisturbed rock core.
† Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

CN-412-G

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County State Connecticut
 Watershed Blackberry River Sub-watershed Wood Creek Site No 9
 Logged by M. M. Brown Date June 19 61 Project: WPI WP? X FP Pub 46
 Drilling Equipment Acker Drill Location of Holes North Dike

Hole No	Station and Surface Elev.	Hole Depth		Description of Materials	Unif. Soil Class. Symb	Type	From		To	Ft.	Rec. %
		From	To				Ft.	FL			
604	1173.1	0	10.0	Bedrock - fine grained quartzitic biotite gneiss		RC	0	10.0	88		
605	1184.2	0	4.0	Sand, brown, poorly graded, some mica	SM	SS	0	2.0	58		
		4.0	8.0	Boulders		SS	2.0	4.0	50		
		8.0	16.0	Bedrock - fine grained quartzitic gneiss		RC	8.0	12.0	100		
						RC	12.0	16.0	100		

* Disturbed, undisturbed rock core. † Percent sample recovery.
 1 copy to E and WP Unit. 1 copy Soil Mechanics Laboratory with samples
 Other as directed by State Conservationist.

Sheet 26 of 29 sheets

CN-412-G

GEOLOGY REPORT

CN - 60
JAN. 1959

INTERPRETATIONS AND CONCLUSIONS "For in Service Use Only"

1. The silt (ML) which underlies the whole foundation ^{is} probably a glaciolacustrine deposit. The varves and sand lenses reflect different phases of cyclic deposition. The silt occupies a rather broad and deep preglacial valley. The silt is underlain by a till which gives way to a zone of refusal. This refusal is probably bedrock. The silt attained its greatest thickness under the left abutment indicating that the major axis of the valley was left or east of the existing stream. The ML exhibits a "livery" quality when subjected to any agitation making it generally difficult to work with under its present moisture condition.
2. Artesian conditions are found at varying depths from 25.0 to 47.0 feet as determined by holes drilled in the valley bottom. This artesian zone exists in the lower portion of the ML and is found throughout the underlying till. Relief wells probably will not be required however since the artesian zone is well contained by the overlying, relatively impermeable silt.
3. Consolidation rates will have to be determined for settlement beneath the principal conduit and riser. There seems to be no particular advantage in placing the conduit at the sides of the floodplain as opposed to locating it in the center of the valley. The silt possesses enough similarity and uniformity that the consolidation rates will probably be about the same.
4. Hole #50 was drilled about 300 feet upstream to determine if a possible centerline relocation would be feasible. The same foundation conditions exist upstream thereby making any relocation inadvisable.
5. No rock excavation will be required in the emergency spillway area. The excavated sands will probably be suitable for use as shell material in the embankment. Drainage however will be required as a very high water table exists as evidenced in all of the holes drilled in the spillway section. Surface seep areas are also common. Tranching during excavation if the material is to be used for borrow will be necessary to drain the soil and hold down the moisture content. The use of interceptor drains should be anticipated in construction to provide side slope drainage and reduce the degree of erosion on the side slope soils.
6. The abutments likewise have a high groundwater table. This is due primarily to the generally high impermeability of the subsoil. Heavy construction equipment will have to be discriminately used to avoid turning the dam site into a quagmire.

REFERENCE:

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DRAWING NO.
CN-112-G

SHEET 1 OF 2
DATE August 1961

GEOLOGY REPORT

CN - 60
JAN. 1959

INTERPRETATIONS AND CONCLUSIONS "For in Service Use Only"

7. Use of the silts as embankment fill will have to be closely watched since moisture content control will probably be a critical factor. Moisture contents generally run from 36 to 45% and the silt will presumably have to be drier in order to obtain 90-95% compaction.
8. The foundation conditions under the dike are stable since all holes penetrated an unweathered fine grained quartzitic gneiss. The bed-rock may be encountered anywhere from ground surface to a depth of 8 feet.
9. After the site investigation was completed, a tentative relocation of the principal spillway was planned as shown on SCS 35A. Other than a somewhat lesser thickness of ML material no variance in foundation conditions are anticipated.

REFERENCE:

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DRAWING NO.

CN-412-G

SHEET 2 OF 2

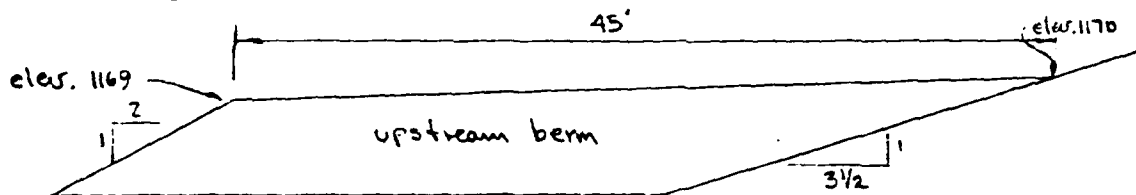
DATE Aug. 1961

STATE Conn. PROJECT Blackberry River - Site 9
BY WHL DATE 11-27-67 CHECKED BY DATE JOB NO. CN-412 E
SUBJECT Drawdown Stability SHEET 50 OF 68

For upstream slope - use $3\frac{1}{2}:1$ slope as recommended by M.P.M. & R. The factor of safety of 1.2 is probably acceptable for this condition because some drainage will undoubtedly occur & ϕ is probably greater than 32° for a typical sample (total) of $<6'$ mat'l. Also, if mat'l is not free draining, the presence of fines may be indicative of some cohesive strength. However, the placement of the berm not only increases drawdown stability but tends to reduce differential settlement between the riser and the conduit.

construct berm to elev. 1170 - carry to 150' from & dam (same as downstream berm) - will provide essentially same FS @ end of construction for upstream slope as for downstream slope. (150' distance may be reduced depending upon quantity available)

use following berm dimensions:



WATER RESOURCES UNIT - D.C.P.

OPERATION AND MAINTENANCE INSPECTION REPORT

PROJECT: Norfolk - Wood Creek Site 9

DATE: August 13, 1979

INSPECTION PARTY: A. Cross, Soil Conservation Service; and A. Roberts,
V. Galgowski, Department of Environmental Protection

ITEM	CONDITION S or U*	MAINTENANCE OR REPAIRS REQUIRED	DATE COMPLETED
I. Embankments			
A. Vegetation	S		
B. Rip rap	S		
C. Drains	S		
II. Principal Spillway			
A. Trash rack	S		
B. Gates	N/A		
C. Stilling Basin	S		
D. Conduit	S		
III. Emergency Spillway			
A. Vegetation	S		
B. Obstructions	S		
IV. Outlet Channels			
A. Slope protection	S		
B. Drains	S		
V. Reservoir Area			
A. Debris	S		
B. Stop logs	N/A		
VI. Miscellaneous			
A. Access road	S		
B. Fences	S		

Remarks: Project in good condition.

Inspected by: Victor F. Galgowski Title Supt. of Dam Maintenance

* S = Satisfactory
U = Unsatisfactory
NA = Not applicable



United States
Department of
Agriculture

Soil
Conservation
Service

Mansfield Professional Park
Storrs, Connecticut 06268

February 3, 1981

Donald L. Smith
Vice-president
Roald Haestad, Inc.
37 Brookside Road
Waterbury, CT 06708

RECEIVED
FEB 5 1981
ROALD HAESTAD, INC.
37 BROOKSIDE ROAD
WATERBURY, CT. 06708

Dear Mr. Smith:

I am forwarding some material relative to the Blackberry River Sites No. 9 and No. 15, for your information. The wing walls at Site 15 were excavated by hand down to the original drainage material, then additional clean gravel was placed as recommended.

I reviewed the soils engineering data in the design report for Blackberry River Site No. 9, to clarify the reason for the chimney drain and core material in the center zone of the dam.

As you know, the foundation and embankment materials were analyzed for consolidation after completion to determine the amount of additional fill to allow for settlement. The materials used for the core were fine-grained silts or clays, but generally of low plasticity. The material was to be placed at or slightly above optimum moisture content. Anticipating that this material would gradually drain and could become somewhat brittle, subject to tensile strains and possible cracking, the chimney drain was designed as a precaution against movement of seepage water into the downstream shell and a possible piping condition.

The dam is a so-called "dry dam" subject to only short periods of time at full reservoir stage under design storm conditions. As the outer shell and the core are fine-grained soils of fairly low permeability, it is unlikely that the full phreatic surface of saturated material would develop, but the chimney drain would permit drainage.

I am enclosing a copy of the piezometer readings taken as the fill height increased.

The question of the top elevation of the dike is difficult to answer with any certainty. Final cross-section notes showed the top elevation to be 1194.0 over part of the dike with about 1193.2 toward one end of the profile. I should point out, also, that the Water Resources Commission at that time required the top of dam to be 2 feet above the emergency



The Soil Conservation Service
is an agency of the
Department of Agriculture

SCS-AS-1
10-79

Mr. Donald L. Smith, February 3, 1981

2

spillway design high water or the maximum elevation of the routed Freeboard storm, whichever was higher. As was true in most instances, the two foot dimension governed. The SCS Freeboard storm is 25" of precipitation in 6 hours, fairly close to the PMP.

If I can be of further assistance, please let me know.

Sincerely,

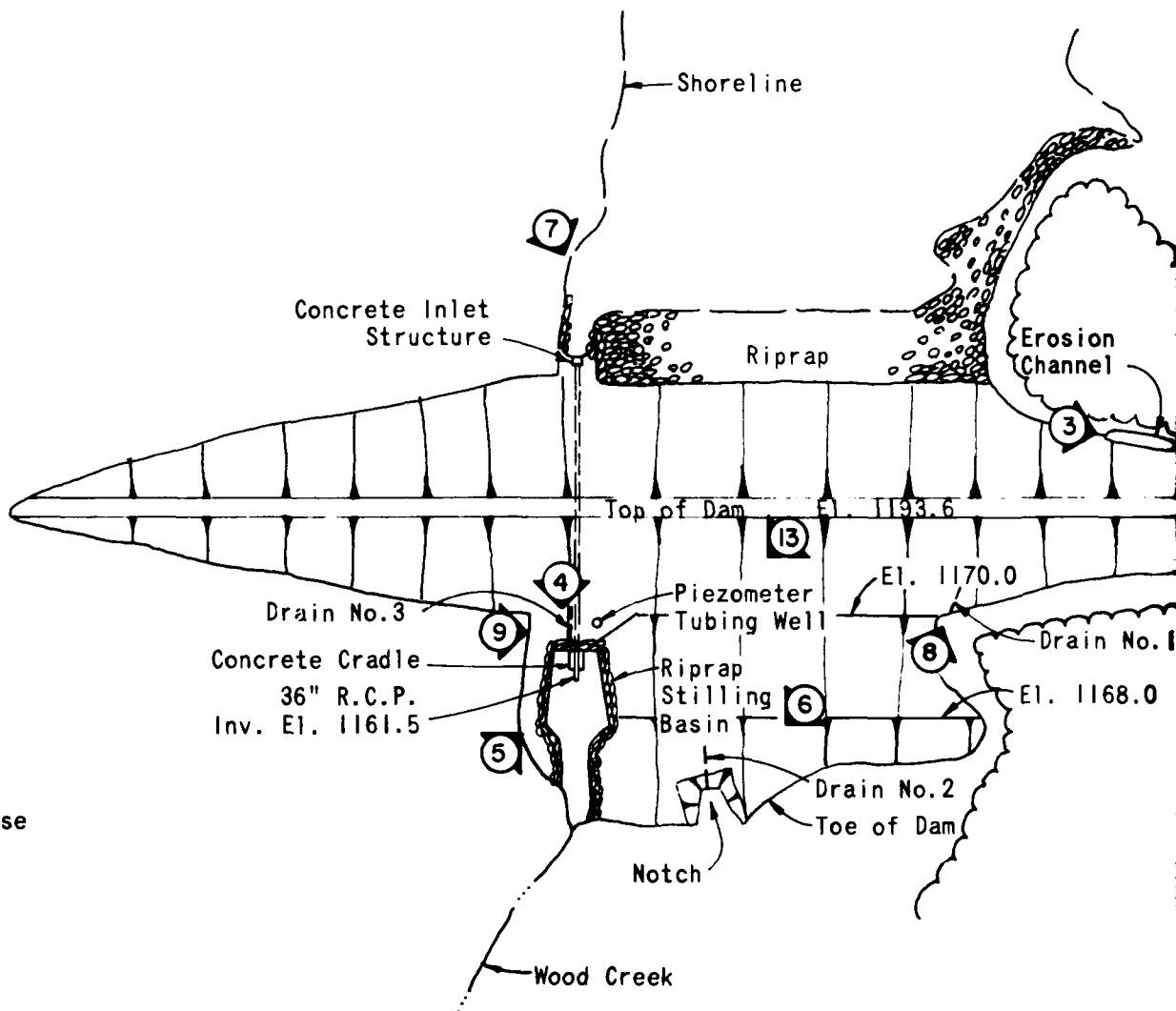

Whitney T. Ferguson
State Conservation Engineer

APPENDIX C

PHOTOGRAPHS

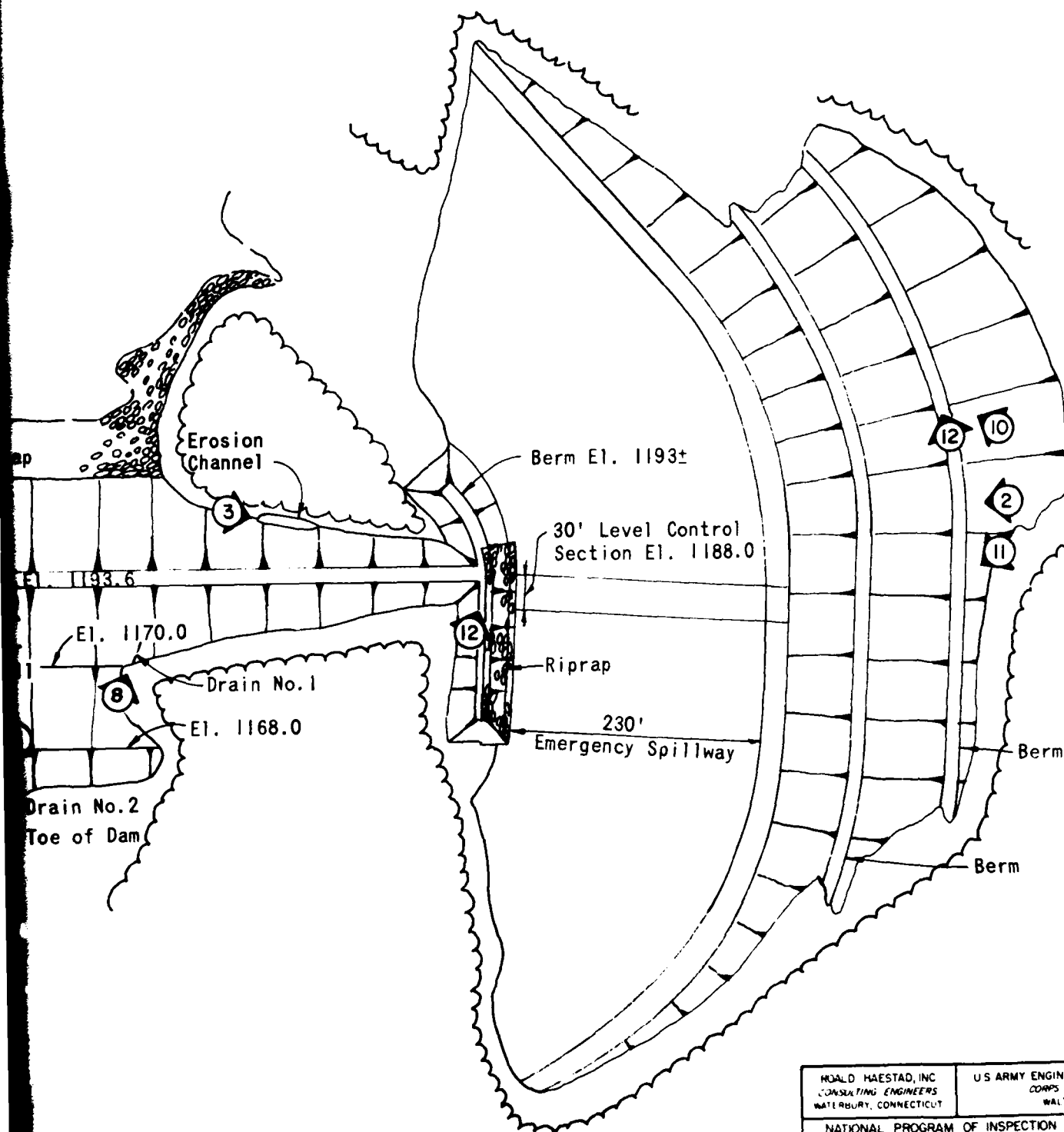


North Street Conn. Rte. 272



Denotes photo number and direction in which photo was taken.

FIGURE 2



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
WOOD CREEK DAM
NORFOLK, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALE 1" = 120'
IRS	DLS	RH	DATE 2/8/11

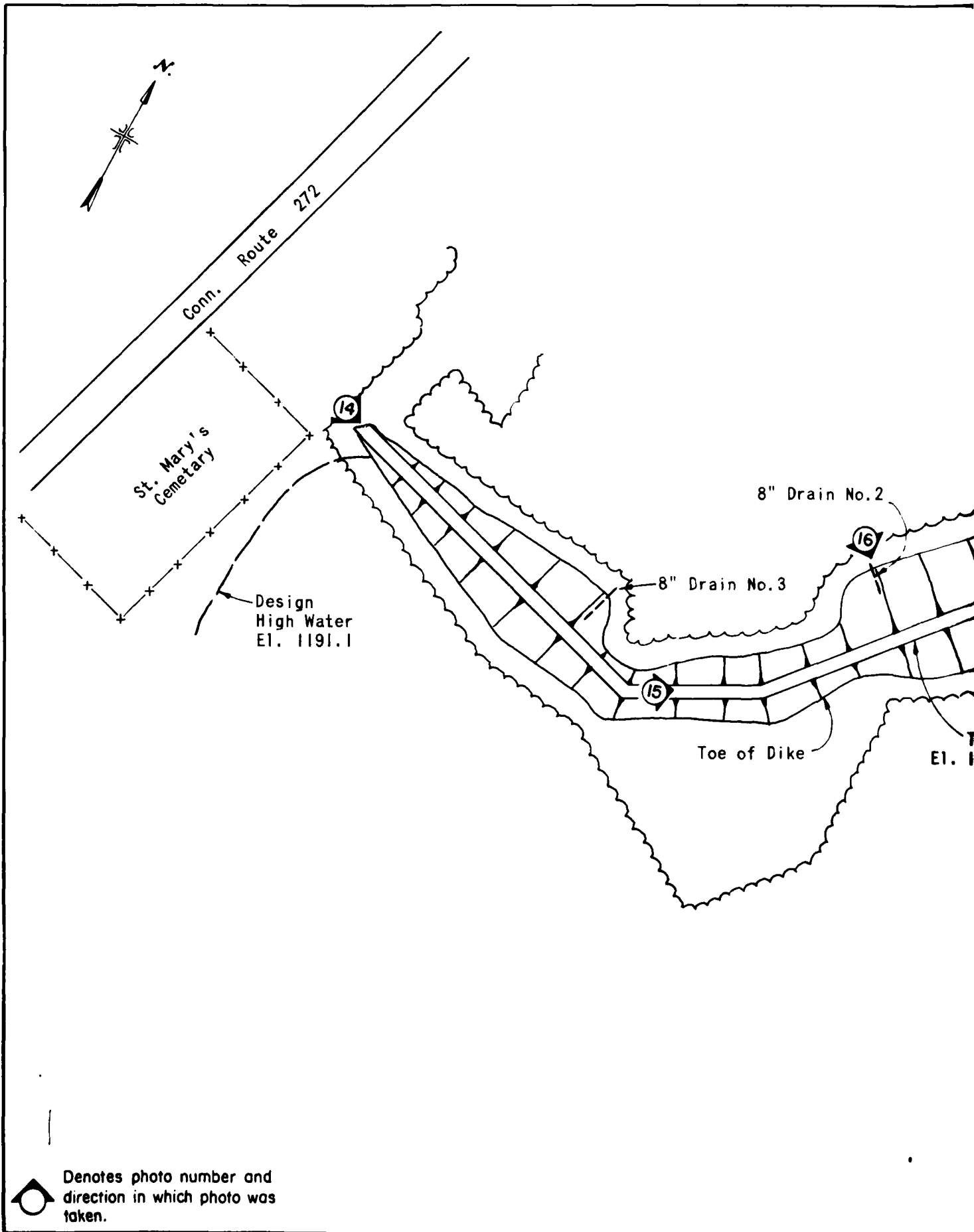
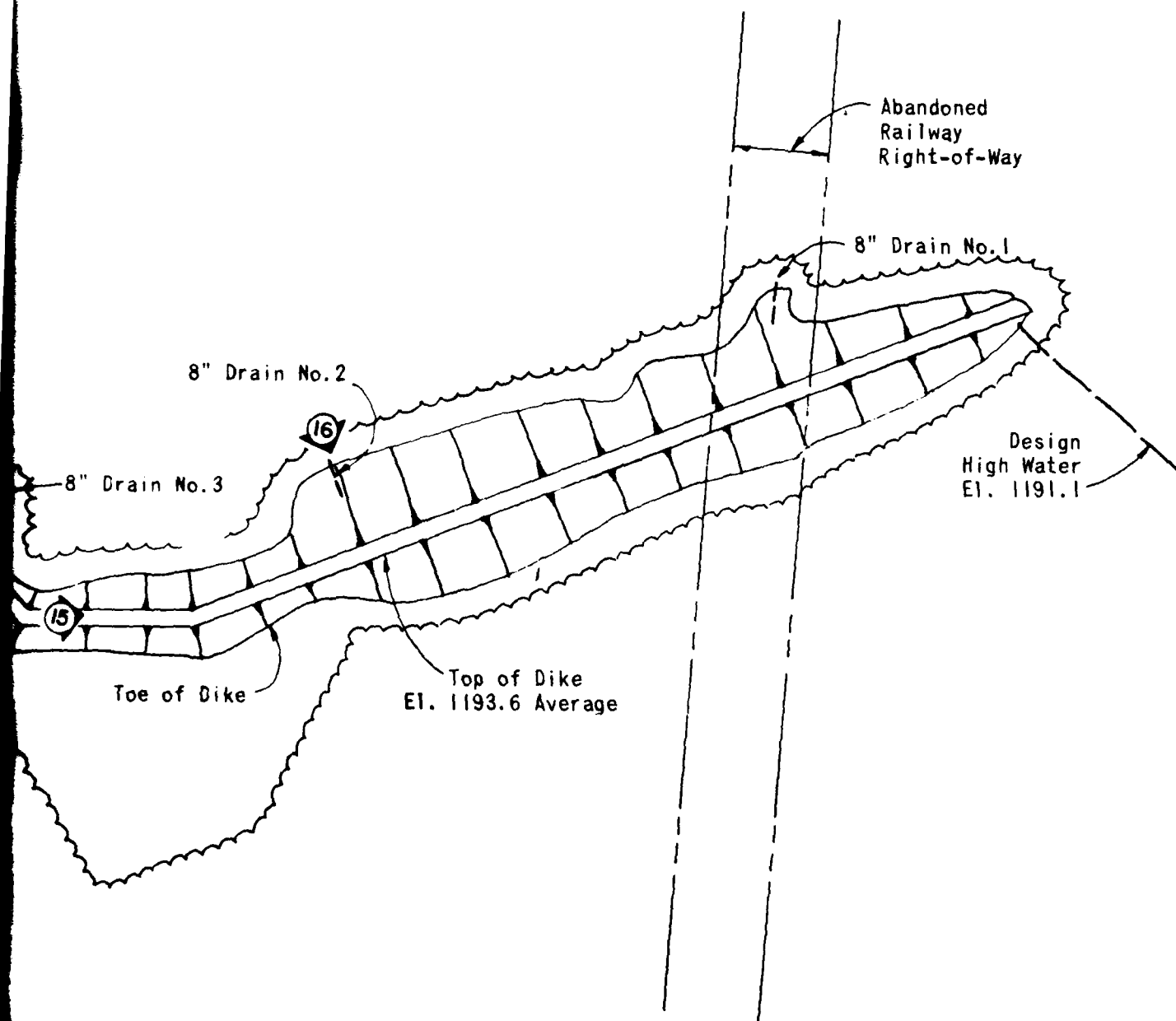


FIGURE 3



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 WOOD CREEK DIKE NORFOLK, CONNECTICUT			
DRAWN	CHECKED	APPROVED	SCALE 1" = 100'
TRS	DLB	RH	DATE 2/81 PAGE 1-1



PHOTO NO. 1

DAM EMBANKMENT FROM RIGHT ABUTMENT.



PHOTO NO. 2

DAM EMBANKMENT FROM LEFT ABUTMENT. NOTE
EMERGENCY SPILLWAY IN FOREGROUND.

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

ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

WOOD CREEK DAM
WOOD CREEK
NORFOLK, CONNECTICUT
CT 00486
17 NOVEMBER '80



PHOTO NO. 3*

EROSION CHANNEL ALONG THE
TOE OF THE UPSTREAM SLOPE AT
THE LEFT ABUTMENT. FLOW IS
MUDDY INDICATING
CONTINUING EROSION.



PHOTO NO. 4

EROSION AND SETTLEMENT
AROUND OUTLET PIPE AND
FOUNDATION DRAIN.

*11 FEBRUARY '81

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

ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

WOOD CREEK DAM

WOOD CREEK

NORFOLK, CONNECTICUT

CT 00486

17 NOVEMBER '80



PHOTO NO. 5

PRINCIPAL SPILLWAY OUTLET. NOTE: CONCRETE CRADLE AND
CONCRETE SUPPORT, FOUNDATION DRAIN OUTLET NO. 3,
AND FIVE WATER TUBES WELLS.



PHOTO NO. 6

WATER FILLED NOTCH AT DOWNSTREAM TOE.
PLANS INDICATE FOUNDATION DRAIN OUTLETS HERE.

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

ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

WOOD CREEK DAM
WOOD CREEK
NORFOLK, CONNECTICUT
CT 06486
17 NOVEMBER 1980

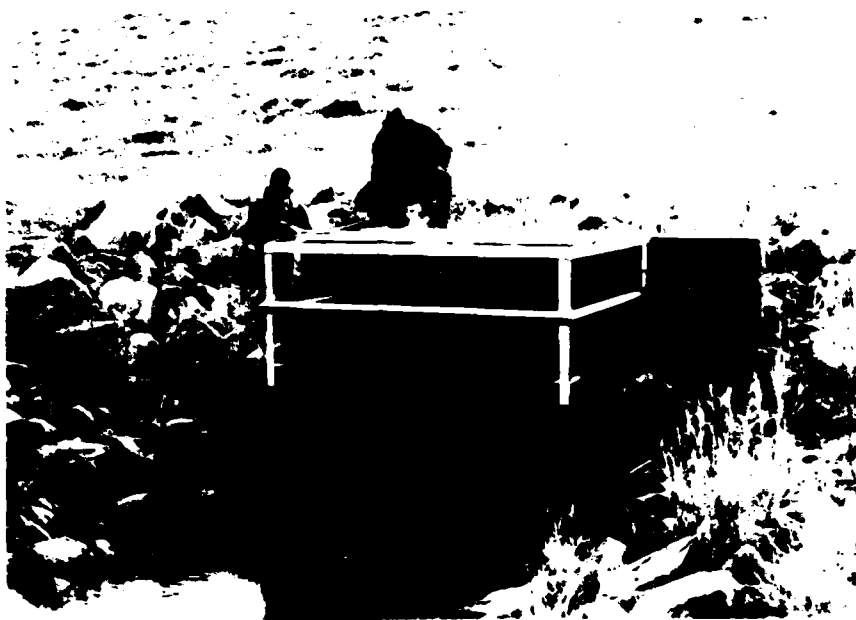


PHOTO NO. 7

DROP INLET WITH GALVANIZED STEEL TRASH RACK.



PHOTO NO. 8

FOUNDATION DRAIN OUTLET NO. 1. NO FLOW
AT TIME OF INSPECTION.

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

ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

WOOD CREEK DAM
WOOD CREEK
NORFOLK, CONNECTICUT
CT 00486
17 NOVEMBER 1965



PHOTO NO. 9

EROSION AND SETTLEMENT AROUND AND
UNDER OUTLET PIPE CRADLE.



PHOTO NO. 10

EMERGENCY SPILLWAY INTAKE CHANNEL. NOTE DRAINAGE
DITCHES AND RIPRAPPED DIKE.

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

ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

WOOD CREEK DAM
WOOD CREEK
NORFOLK, CONNECTICUT
CT 00486
177 N. V. 1000 E. 1000



PHOTO NO. 9

EROSION AND SETTLEMENT AROUND AND
UNDER OUTLET PIPE CRADLE.



PHOTO NO. 10

EMERGENCY SPILLWAY INTAKE CHANNEL. NOTE DRAINAGE
DITCHES AND RIPRAPPED DIKE.

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

ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

WOOD CREEK DAM
WOOD CREEK
NORFOLK, CONNECTICUT
CT 00486
17 NOVEMBER 1961



PHOTO NO. 11

EMERGENCY SPILLWAY DISCHARGE CHANNEL.



PHOTO NO. 12*

STANDING WATER ON BERMS OF LEFT ABUTMENT.

*11 FEBRUARY '81

U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	WOOD CREEK DAM
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		WOOD CREEK
		NORFOLK, CONNECTICUT
		CT 00486
		17 NOVEMBER '80



PHOTO NO. 13

DOWNSTREAM CHANNEL AND RIPRAPPED STILLING BASIN.



PHOTO NO. 14

DIKE FROM LEFT ABUTMENT.

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

ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

WOOD CREEK DAM

WOOD CREEK

NORFOLK, CONNECTICUT

CT 00486

17 NOVEMBER '80



PHOTO NO. 15

DIKE LOOKING TOWARD RIGHT ABUTMENT.



PHOTO NO. 16

8-INCH DRAIN AT TOE OF DIKE.

US ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

WOOD CREEK DAM

WOOD CREEK

NORFOLK, CONNECTICUT

CT 00486

17 NOVEMBER '80

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

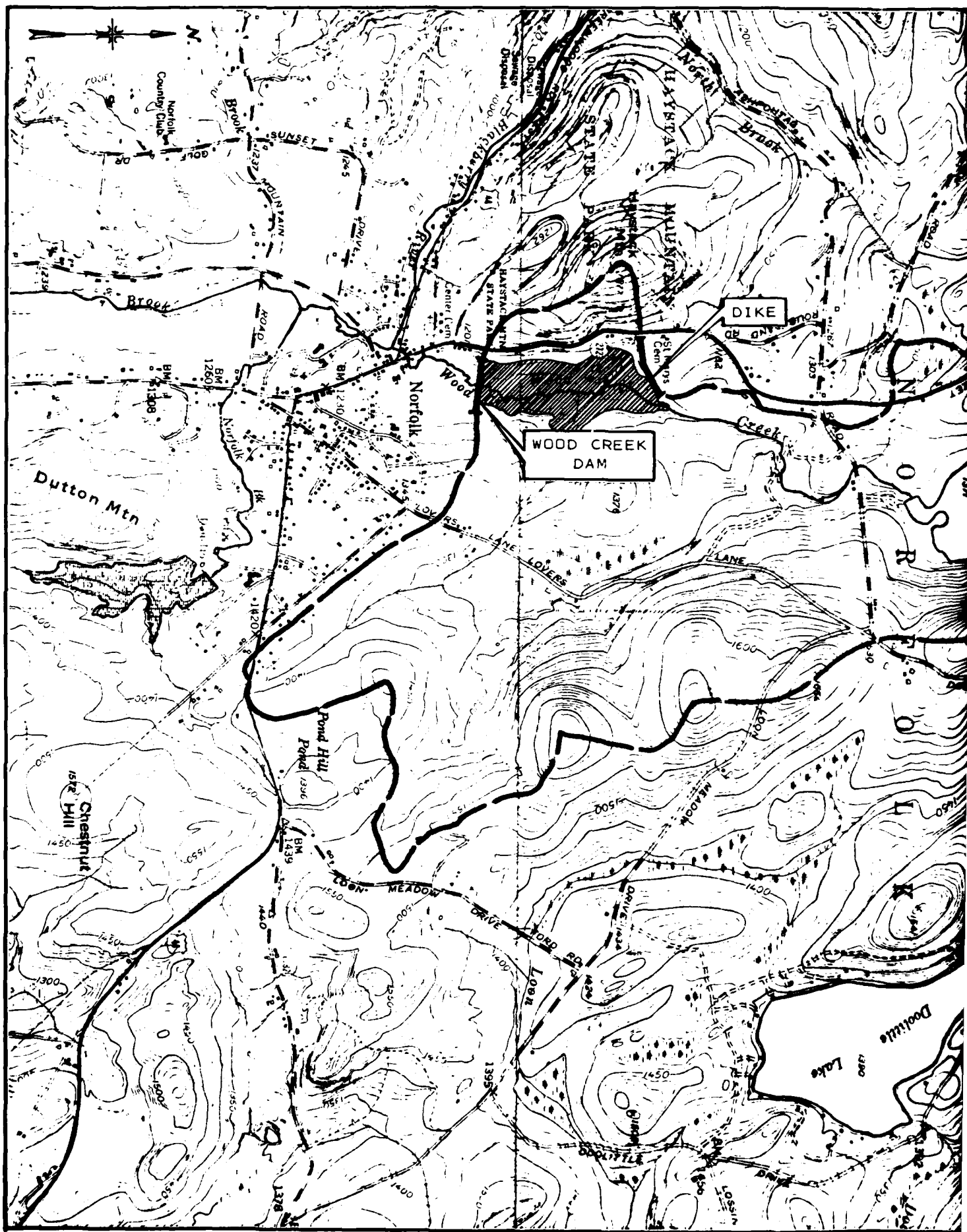
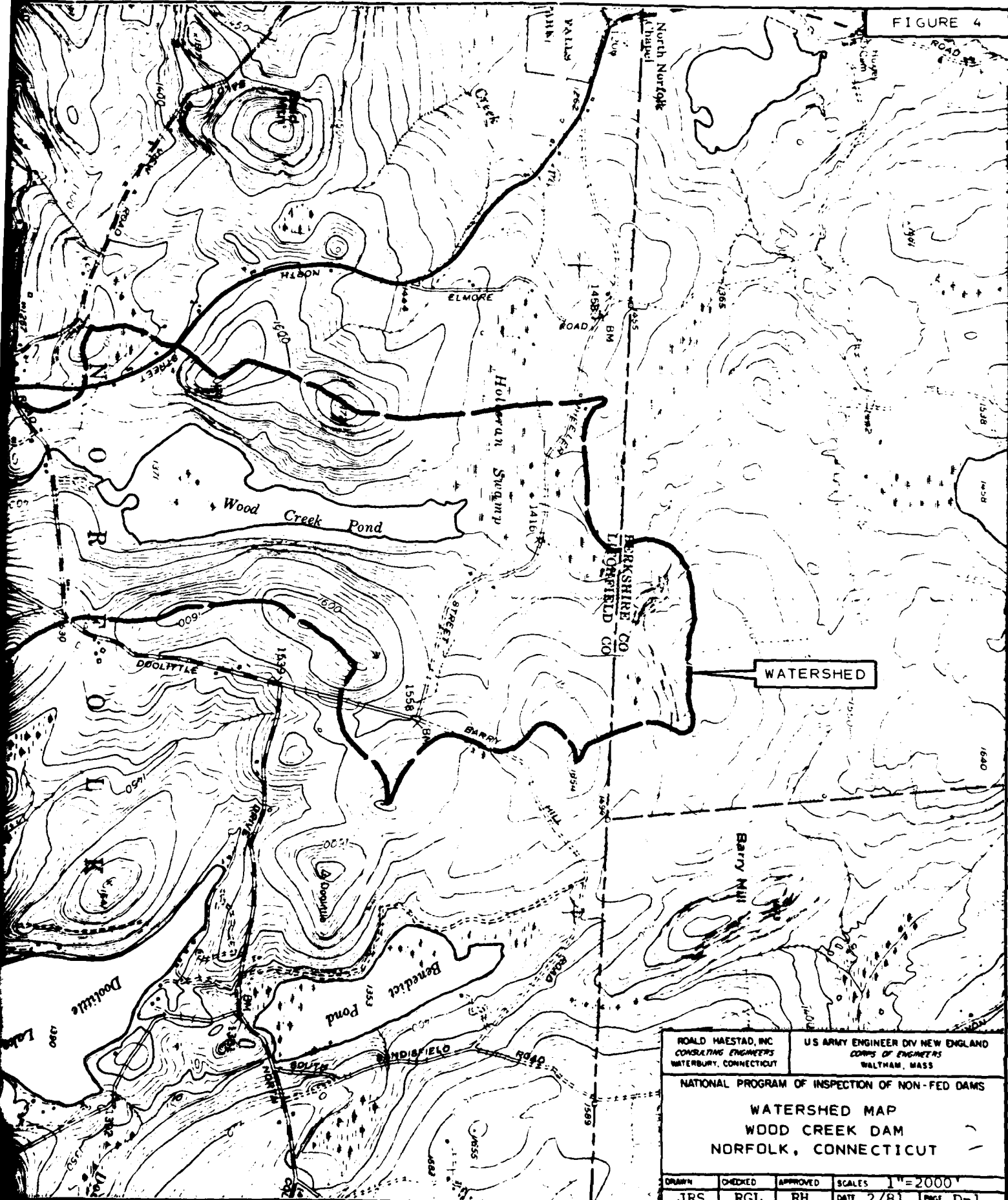


FIGURE 4



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			
WATERSHED MAP WOOD CREEK DAM NORFOLK, CONNECTICUT			
DRAWN	CHECKED	APPROVED	SCALE 1"=2000'
JRS	RGL	RH	DATE 2/81 PAGE D-1

STATE	Conn	PROJECT	BR Site 9
BY	WHL	CHECKED BY	D.S.
DATE	5-25-67	DATE	6/9/67
SUBJECT	Principal Spillway Hydraulics		JOB NO. CN-412-H
			SHEET 15 OF 26

1 OF 25

Weir Flow weir elev. 1167.5 $L_w = 17.0'$

$$Q_w = 3.1 L_w H_w^{3/2} = (3.1)(17) H_w^{3/2} = 52.7 H_w^{3/2}$$

Pipe Flow outlet inv. elev. = 1161.3 36" ID pipe
outlet elev. = 1162.8

$$Q_p = C_p H_p^{1/2} \quad C_p = A_p \left(\frac{2g}{1 + K_r + K_p L_p} \right)^{1/2}$$

$$A_p = 7.07' \quad K_r = 1 \quad K_p = 0.0016 (n = 0.012)$$

L_p may vary from
220' to 300'
depending upon
results soils
analysis
try $L_p = 260'$

$$C_p = 7.07 \left(\frac{64.4}{2 + 260(0.0016)} \right)^{1/2} = 29.9 \text{ say } 30.0$$

$$\therefore Q_p = 30 H_p^{1/2}$$

outlet = 1162.8

H.W. Elev.	Weir Flow			Pipe Flow			Total Q cfs
	H_w	$H_w^{3/2}$	Q_w	H_p	$H_p^{1/2}$	Q_p	
1167.5	0		0				0
1167.8	0.3	0.164	8.6				8.6
1168.0	0.5	0.354	18.7				18.7
1168.3	0.8	0.716	37.8				37.8
1168.6	1.1	1.154	60.9	5.8	2.40	72.1	60.9
1169.0	1.5	1.837	96.5	6.2	2.49	74.5	74.5
1172.0				9.2	3.03	90.8	90.8
1175.0				12.2	3.49	104.8	104.8
1178.0				15.2	3.90	117	117
1181.0				18.2	4.26	127.9	127.9
1184.0				21.2	4.60	138	138
1187.0				24.2	4.91	147.1	147.1
1190.0				27.2	5.21	156.1	156.1
1191.1				28.3	5.32	159.6	159.6
1193.1				30.3	5.50	165.1	165.1

primes

STATE <u>CONN</u>		PROJECT <u>BR</u>		SITE <u>9</u>	
BY <u>PRR</u>	DATE <u>7-21-71</u>	CHECKED BY <u>WAL</u>	DATE <u>7-22-71</u>	JOB NO. <u>C10-412-H</u>	
SUBJECT <u>EMERGENCY SPILLWAY HYDRAULICS</u>				SHEET <u>1</u> OF <u>2</u>	

2 OF 25

GIVEN: $L = 230'$ $S_0 = 0.01$ $n = 0.035$ $L_c = 300'$
 $Z = 3$ CONTROL SECT. - $30'$ @ $1188.0'$

ES 175 ($Z=3$)			ES 171 ($S_0=0.01$ $n=0.04$)	
H_{ec}	d_c	Q_{cd}	H_p	W.S. ELEV
0.5	.33	231	0.70	1187.70
1.0	.67	720	1.55	1189.55
1.5	1.0	1320	2.20	1190.20
2.0	1.34	2050	2.70	1190.70
2.5	1.67	2870	3.30	1191.30
3.0	2.02	3790	3.90	1191.90
3.2	2.15	4200	4.10	1192.10

W.S. ELEV	H_{PIPE}	$H_{PIPE}^{1/2}$	Q_p	$Q_{p1} = 18.7$	Q_{sum}	Q_{TOT}
1188.90	26.10	5.11	153	134	231	365
1189.55	26.75	5.17	155	135	720	855
1190.20	27.40	5.24	157	138	1320	1758
1190.70	27.90	5.28	158	139	2050	2189
1191.30	28.50	5.34	160	141	2870	3011
1191.90	29.10	5.40	162	143	3790	3933
1192.10	29.30	5.42	163	144	4200	4344

STATE	CONN.	PROJECT	PLACHERRY	SITE	9
BY	PRP	DATE	7-21-71	CHECKED BY	WHL
		DATE	7-22-71	JOB NO.	CN-412-H
SUBJECT	EMERGENCY SPILLWAY HYDRAULICS				SHEET 2 OF 2

30F25

DISCHARGE = 3470 cfs

ELEV = 1191.6'

$$Q_{\text{dam}} = 3470 - 1420 = 3328 \text{ cfs}$$

$$\frac{Q_{\text{dam}}}{b} = \frac{3328}{2.30} = 14.48 \frac{\text{cfs}}{\text{ft}}$$

TR 39 (ES-170)

$$v_c = 7.82 \text{ fps}$$

$$v_p = 8.35 \text{ fps}$$

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

$$(n = 0.025, S = 0.0155)$$

$$AR^{2/3} = 562$$

$$\alpha = 1.70$$

$$R = \frac{[230 + 3(1.7)]}{1.7} = 400'$$

$$D = 230 \cdot 2 (3.38) = 240.76'$$

$$R = \frac{400}{240.76} = 1.4$$

$$AR^{2/3} = 400 (1.4) = 560 \approx 562$$

$$v_c = \frac{3328}{400} = 8.32 \text{ fps} < 8.75 \text{ fps} \quad \text{OK!}$$

$$\text{REV. TOP OF DAM} = 1191.6' + 2.0' = 1193.6 \text{ MSL}$$

EMERGENCY SPILLWAY REVISION ACCEPTABLE

BY SAL DATE 1-12-81

ROALD HAESTAD, INC.

SHEET NO. 4 OF 25

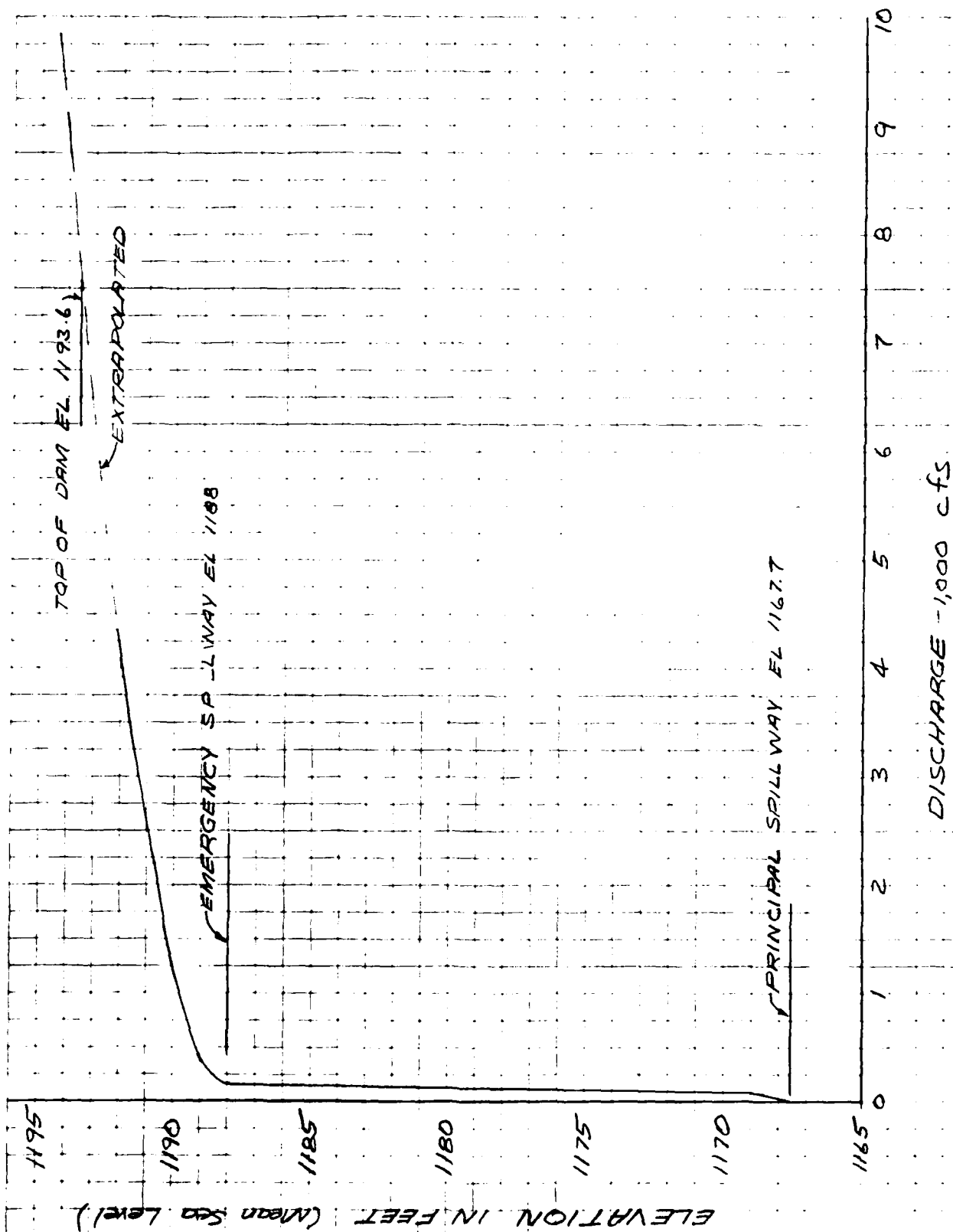
CONSULTING ENGINEERS

CKD BY DIC DATE 1/17/81

37 Brookside Road - Waterbury, Conn. 06708

JOB NO. 49-037

SUBJECT WOOD CREEK DAM - Project Discharge Capacity Curve



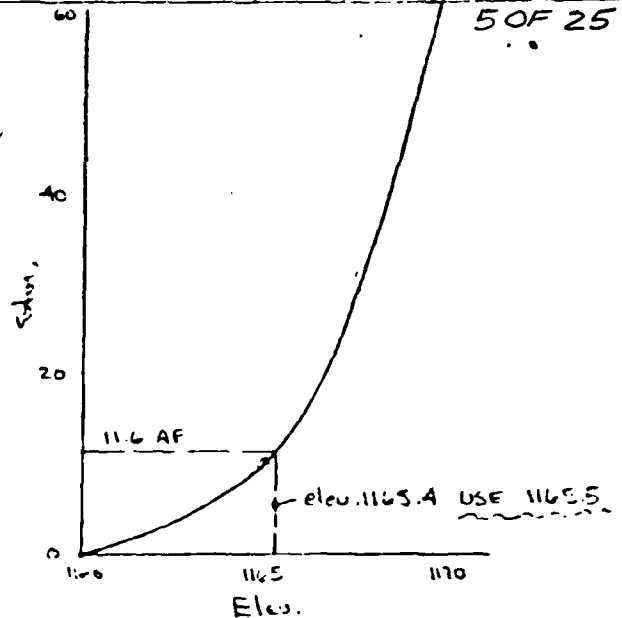
STATE	Conn	PROJECT	BR #9
BY	WHL	DATE	5-9-67
CHECKED BY	D.S.	DATE	5/31/67
JOB NO.	CN-412-H		
SUBJECT	Stage Storage Computations		SHEET 10 OF 26

elev.	area	Vol.	Σ Vol.
1160	0 ac.	1.95 AS 9.75	9.8 AF
1165	3.90	11.07 AS 53.10	64.9
1170	18.14		

reg'd. sediment stor. = 11.6 AF

from 1165 to 1170 $\Delta Area = \frac{18.14 - 3.9}{5} = 2.85 \frac{Ac}{ft}$

∴ @ 1165.5, Area = $3.9 + 0.5(2.85) = 5.42 \frac{Ac}{ft}$



Elev.	Area	Avg. Area	Δ Elev	Vol.	Σ Avail. Vol.
1165.5	5.43 ac	11.79 ac.	4.5'	53 AF	0
1170	18.14	28.94	5'	144.7	53 (50)
1175	39.75	50.43	"	252	198 (177)
1180	61.2	70.75	"	354	450 (427)
1185	80.3	85.8	"	429	804 (780)
1190	91.3	96.9	"	484	1233 (1212)
1195	102.5				1717

BY SAL DATE 1-7-81

ROALD HAESTAD, INC.

SHEET NO 6 OF 25

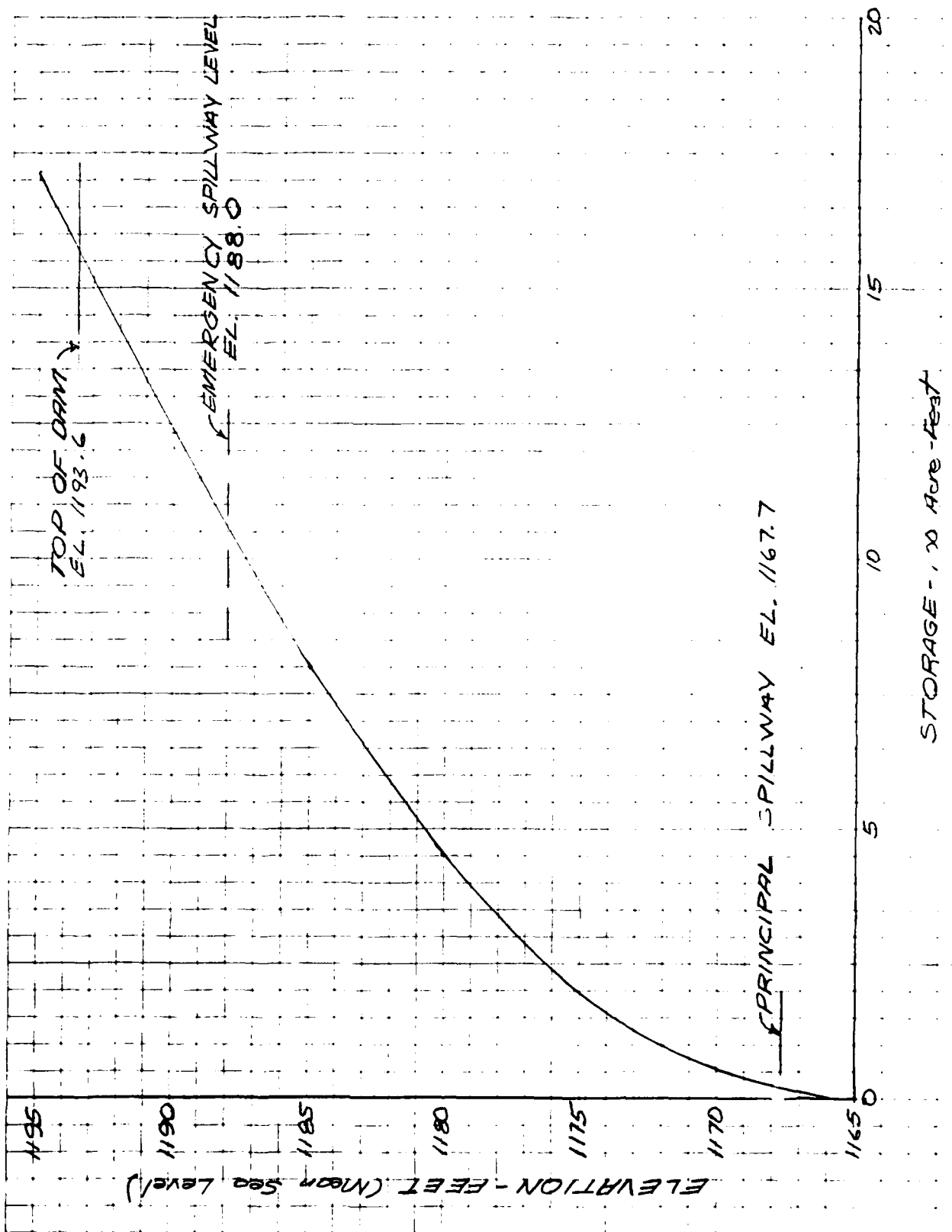
CONSULTING ENGINEERS

CKD BY DL DATE 11/27/81

37 Brookside Road - Waterbury, Conn. 06708

JOB NO 49-037

SUBJECT WOOD CREEK DAM - Surge storage capacity curve



BY SAL DATE 1-7-81

ROALD HAESTAD, INC.

SHEET NO. 7 OF 25

CKD BY DL DATE 1/27/81

CONSULTING ENGINEERS

37 Brookside Road - Waterbury, Conn. 06708

JOB NO. 49-037

SUBJECT WOOD CREEK DAM - Test Flood

TEST FLOOD = PMF

Drainage Area = 2618 Acres = 4.09 sq mi

From Corps of Eng. chart for "Mountainous" Terrain

MPF = 2,300 cfs/sq mi

PMF = 2,300 cfs/sq mi $\times$ 4.09 sq mi = 9,407 Use 9,400 cfs

$Q_{p1} = 9,400$ cfs

$H_1 = 26.5$ feet above principal spill, from discharge curve

STOR₁ = 1,620 Acre-Feet from Storage Capacity Curve
= 7.43" of runoff from 4.09 sq mi

$Q_{p2} = Q_{p1} (1 - \text{STOR}_1/19) = 9,400 \text{ cfs} (1 - 7.43/19) = 5,724$ cfs

$H_2 = 25.1'$ STOR₂ = 1,500 Ac-Ft

STOR_{AVE} = $(\text{STOR}_1 + \text{STOR}_2)/2 = (1620 + 1500)/2 = 1560$ Ac-Ft
= 7.15" of runoff

$Q_{p3} = Q_{p1} (1 - \text{STOR}_{AVE}/19) = 9,400 \text{ cfs} (1 - 7.15/19) = 5,843$ cfs
Use 5,850 cfs

$H_3 = 25.1'$, EL 1192.8

Project Discharge Capacity = 7,600 cfs (from discharge capacity curve)
(EL 1193.6)

% of Test Flood = $(7,600/5850) \times 100 = 130\%$ of PMF

BY SAL DATE 1-8-81 **ROALD HAESTAD, INC.** SHEET NO. 8 OF 25
 CKD BY DLS DATE 2/6/81 CONSULTING ENGINEERS
 37 Brookside Road - Waterbury, Conn. 06708 JOB NO. 49-037
 SUBJECT WOOD CREEK DAM - Dam breach calculations

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

S = Surcharge Storage Capacity

S = 1,555 Acre-Feet (Surcharge Storage capacity curve)

$$Q_{p1} = \text{Peak Failure Outflow} = 8/27 W_b \sqrt{g} Y_0^{3/2}$$

W_b = Breach width - 40% of dam length across river at mid height = $0.4(550) = 180$ ft

Y_0 = Total height from river bed to pool level at time of failure = 35 ft.

$$Q_{p1} = 8/27 (200) \sqrt{32.2} (35)^{3/2}$$

$$= 69,630 \text{ use } 69,600 \text{ cfs}$$

WOOD CREEK DIKE FAILURE

W_b = Breach width - 40% of dam length across river at mid height = $0.4(400) = 160$ ft

Y_0 = Total height from river bed to pool level at time of failure = 19 ft.

$$Q_{p1} = 8/27 (160) \sqrt{32.2} (19)^{3/2}$$

$$= 22,279 \text{ use } 22,300 \text{ cfs}$$

BY SAL DATE 1/16/81

RIGOLD HAESTAD, INC.

SHEET 9 OF 25CHKD BY DLS DATE 2/18/81

CONSULTING ENGINEERS

JOB NO. 000-117SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATIONSECTION NUMBER 1ROUTE-272
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	1.82	1.3
2.0	2.79	3.6
3.0	3.76	6.9
4.0	4.72	11.1
5.0	5.69	16.4
6.0	6.66	22.5
7.0	7.69	29.7
8.0	8.73	37.9
9.0	9.76	47.2
10.0	10.79	57.4
11.0	11.83	68.7
12.0	12.86	81.1
13.0	13.89	94.5
14.0	14.92	108.9
15.0	15.96	124.3
16.0	16.99	140.8
17.0	19.03	158.8
18.0	21.08	178.6
19.0	23.12	200.9
20.0	25.16	225.1

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

BY SAL DATE 1/16/81

FOR H. H. HALL, INC.

SHEET NO. 10 OF 25

CRD BY DLS DATE 2/18/81

CONSULTING ENGINEERS

JOB NO. 044 037

SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 1

ROUTE-272

HEIGHT ABOVE
SPILLWAY LEVEL
(FEET)

SPILLWAY
DISCHARGE CAPACITY
(CFS)

1.0	350
2.0	990
3.0	1819
4.0	2800
5.0	4688
6.0	7336
7.0	10509
8.0	14120
9.0	18352
10.0	23130
11.0	28356
12.0	33985
13.0	40248
14.0	47075
15.0	54370
16.0	62090
17.0	70481
18.0	79472
19.0	88965
20.0	98917

STORAGE AT TIME OF FAILURE=S= 1555 AC. FT.
LENGTH OF REACH=L= 1500 FT

INFLOW INTO REACH=QP1= 69600 CFS
HEIGHT ABOVE SPILLWAY LEVEL=H1= 16.9 FT.
STORAGE IN REACH=V1= 137.8 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 63431 CFS
TRIAL HEIGHT ABOVE SPILLWAY LEVEL=H(TRIAL)= 16.2 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 124.6 AC. FT.

REACH OUTFLOW=QP2= 63727 CFS
HEIGHT ABOVE SPILLWAY LEVEL=H2= 16.2 FT.

BY 1.E.C. DATE 12-31

ROALD HAESTAD, INC.

SHEET NO. 11 OF 25

CONSULTING ENGINEERS

CKD BY SAL DATE 1-16-81

37 Brookside Road - Waterbury, Conn. 06708

JOB NO. 49-037

SUBJECT WOOD CREEK DAM - FLOOD ROUTING

SECTION NO. 1 (ROUTE 272)

SCALE: 1" = 200' HORIZ

1" = 40' VERT.

$C = 2.5$

$L_1 = 140$

$L_2 = 310$

$L_3 = 95$

$L_4 = 105$

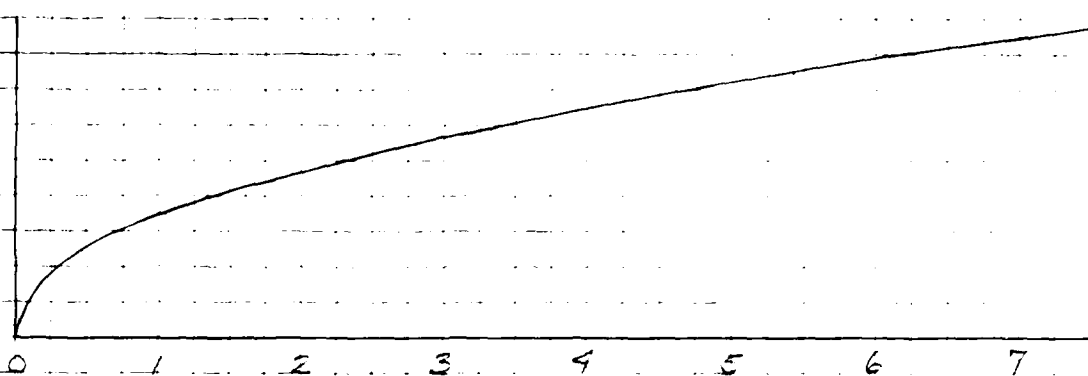
$L_5 = 110$

$L_6 = 130$

$L_7 = 150$

DEPTH OF FLOW - FT.

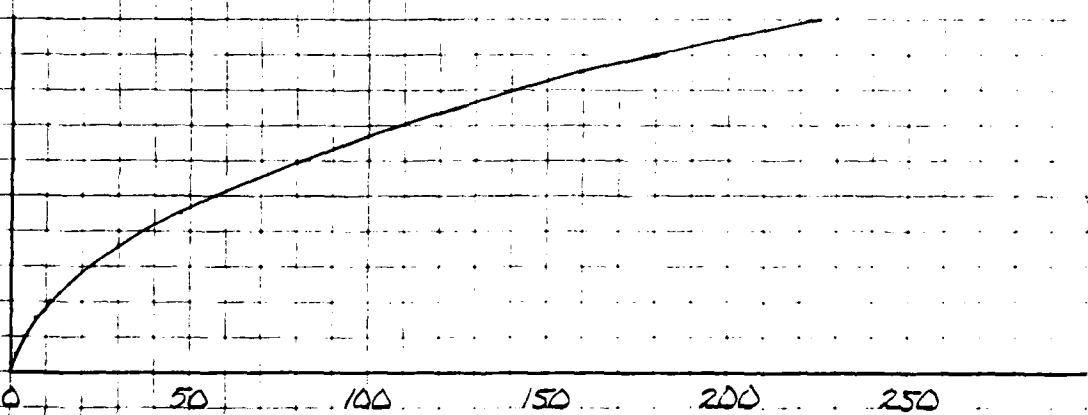
18
16
14
12
10
8
6
4
2
0



DISCHARGE - 10,000 CFS.

DEPTH OF FLOW - FT.

20
18
16
14
12
10
8
6
4
2
0



STORAGE - ACRE FEET

BY SAL DATE 1/16/81

ROAD DRAINAGE, INC.

SHEET NO 12 OF 25CRD BY DLS DATE 2/18/81

CONSULTING ENGINEERS

JOB NO. 049-03SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATIONSECTION NUMBER 2A

MAIN CHANNEL

<u>H</u> <u>(FT)</u>	<u>W</u> <u>(FT)</u>	<u>A</u> <u>(SQ-FT)</u>	<u>R</u> <u>(FT)</u>	<u>S</u> <u>(FT/FT)</u>	<u>V</u> <u>(FT/SEC)</u>	<u>Q</u> <u>(CFS)</u>
1.0	26	13	0.50	0.0375	4.52	59
2.0	34	43	1.26	0.0375	8.40	358
3.0	41	79	1.92	0.0375	11.10	883
4.0	49	124	2.51	0.0375	13.30	1645
5.0	57	175	3.08	0.0375	15.22	2560
6.0	63	233	3.70	0.0375	17.22	4012
7.0	69	297	4.30	0.0375	19.03	5652
8.0	75	367	4.89	0.0375	20.72	7604
9.0	81	443	5.46	0.0375	22.30	9879
10.0	87	525	6.02	0.0375	23.80	12494
11.0	92	613	6.63	0.0375	25.39	15554
12.0	97	705	7.23	0.0375	26.91	18971
13.0	97	800	8.21	0.0375	29.28	23421
14.0	97	895	9.18	0.0375	31.55	28237
15.0	97	990	10.16	0.0375	33.74	33408
16.0	97	1085	11.13	0.0375	35.87	38920
17.0	97	1180	12.11	0.0375	37.93	44764
18.0	97	1275	13.08	0.0375	39.94	50930
19.0	97	1370	14.06	0.0375	41.90	57411
20.0	97	1465	15.03	0.0375	43.82	64199

MANNING COEFFICIENT=N=0.0400

BY SAL DATE 1/16/81

LEWIS HASTED INC.

SHEET NO 13 OF 25

CRD BY DLS DATE 2/18/81

CONSULTING ENGINEERS

JOB NO. 049 637

SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 2B

LEFT OVERTHANK

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
			0.50	0.0375	2.27	34
13.0	30	15	1.28	0.0375	4.23	208
14.0	39	49	1.95	0.0375	5.61	517
15.0	47	92	2.57	0.0375	6.75	969
16.0	56	144	3.15	0.0375	7.74	1575
17.0	65	204	3.72	0.0375	8.64	2350
18.0	73	272	4.27	0.0375	9.47	3307
19.0	82	349	4.81	0.0375	10.25	4459
20.0	90	435				

MANNING COEFFICIENT=N=0.0800

BY SAL DATE 1/16/81

ROBERT ROESTAD, INC.

SHEET NO. 14 OF 25

DESIGNED BY DLS DATE 2/10/81

CONSULTING ENGINEERS

JOB NO. 095-031

SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 2C

RIGHT OVERBANK

<u>H</u> <u>(FT)</u>	<u>W</u> <u>(FT)</u>	<u>A</u> <u>(SQ-FT)</u>	<u>R</u> <u>(FT)</u>	<u>S</u> <u>(FT/FT)</u>	<u>V</u> <u>(FT/SEC)</u>	<u>Q</u> <u>(CFS)</u>
6.0	37	19	0.50	0.0375	1.81	39
7.0	74	74	1.00	0.0375	2.88	212
8.0	111	167	1.50	0.0375	3.77	628
9.0	148	296	2.00	0.0375	4.57	1357
10.0	185	463	2.50	0.0375	5.30	2451
11.0	188	649	3.46	0.0375	6.58	4267
12.0	190	838	4.40	0.0375	7.72	6469
13.0	193	1029	5.33	0.0375	8.78	9029
14.0	196	1223	6.24	0.0375	9.76	11921
15.0	199	1419	7.15	0.0375	10.68	15147
16.0	201	1618	8.04	0.0375	11.55	18678
17.0	204	1819	8.92	0.0375	12.38	22509
18.0	207	2023	9.79	0.0375	13.17	26653
19.0	209	2229	10.65	0.0375	13.93	31043
20.0	212	2438	11.50	0.0375	14.66	35703

MANNING COEFFICIENT = 0.1000

BY SAL DATE 1/16/61

PROJECT DAFSTAD, IOWA

SHEET NO 15 OF 25

CD BY DLS DATE 2/18/61

CONSULTING ENGINEERS

JOB NO. 95-1-431

SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 2

TOTAL SECTION

A R E A (SQ.FT.)					D I S C H A R G E (CFS)			
H	A	B	C	TOTAL	A	B	C	TOTAL
1.0	13	0	0	13	59	0	0	59
2.0	43	0	0	43	358	0	0	358
3.0	79	0	0	79	883	0	0	883
4.0	124	0	0	124	1645	0	0	1645
5.0	175	0	0	175	2664	0	0	2664
6.0	233	0	19	252	4012	0	34	4045
7.0	297	0	74	371	5653	0	213	5866
8.0	367	0	167	534	7604	0	628	8232
9.0	443	0	296	739	9879	0	1352	11231
10.0	525	0	463	988	12494	0	2451	14945
11.0	613	0	649	1261	15554	0	4267	19821
12.0	705	0	838	1543	18971	0	6469	25440
13.0	800	15	1029	1844	23421	34	9029	32484
14.0	895	49	1223	2167	28237	208	11927	40373
15.0	990	92	1419	2501	33408	517	15147	49072
16.0	1085	144	1618	2846	38920	969	18678	58566
17.0	1180	204	1819	3202	44764	1575	22509	68848
18.0	1275	272	2023	3570	50930	2350	26633	79914
19.0	1370	349	2229	3948	57411	3307	31043	91761
20.0	1465	435	2438	4338	64199	4459	35733	104391

STORAGE AT TIME OF FAILURE=S= 1555 AC. FT.
LENGTH OF REACH=L= 4000 FT

INFLOW INTO REACH=QP1= 63727 CFS
DEPTH OF FLOW=H1= 16.5 FT.
CROSS SECTIONAL AREA=A1= 3025 SQ.FT.
STORAGE IN REACH=V1= 243.8 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 53736 CFS
TRIAL DEPTH OF FLOW=H(TRIAL)= 15.5 FT.
TRIAL CROSS SECTIONAL AREA=A(TRIAL)= 2670 SQ.FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 211.3 AC. FT.

REACH OUTFLOW=QP2= 54402 CFS
DEPTH OF FLOW=H2= 15.6 FT.

BY SG DATE 1-12-81

ROALD HAESTAD, INC.

SHEET NO. 16 OF 25

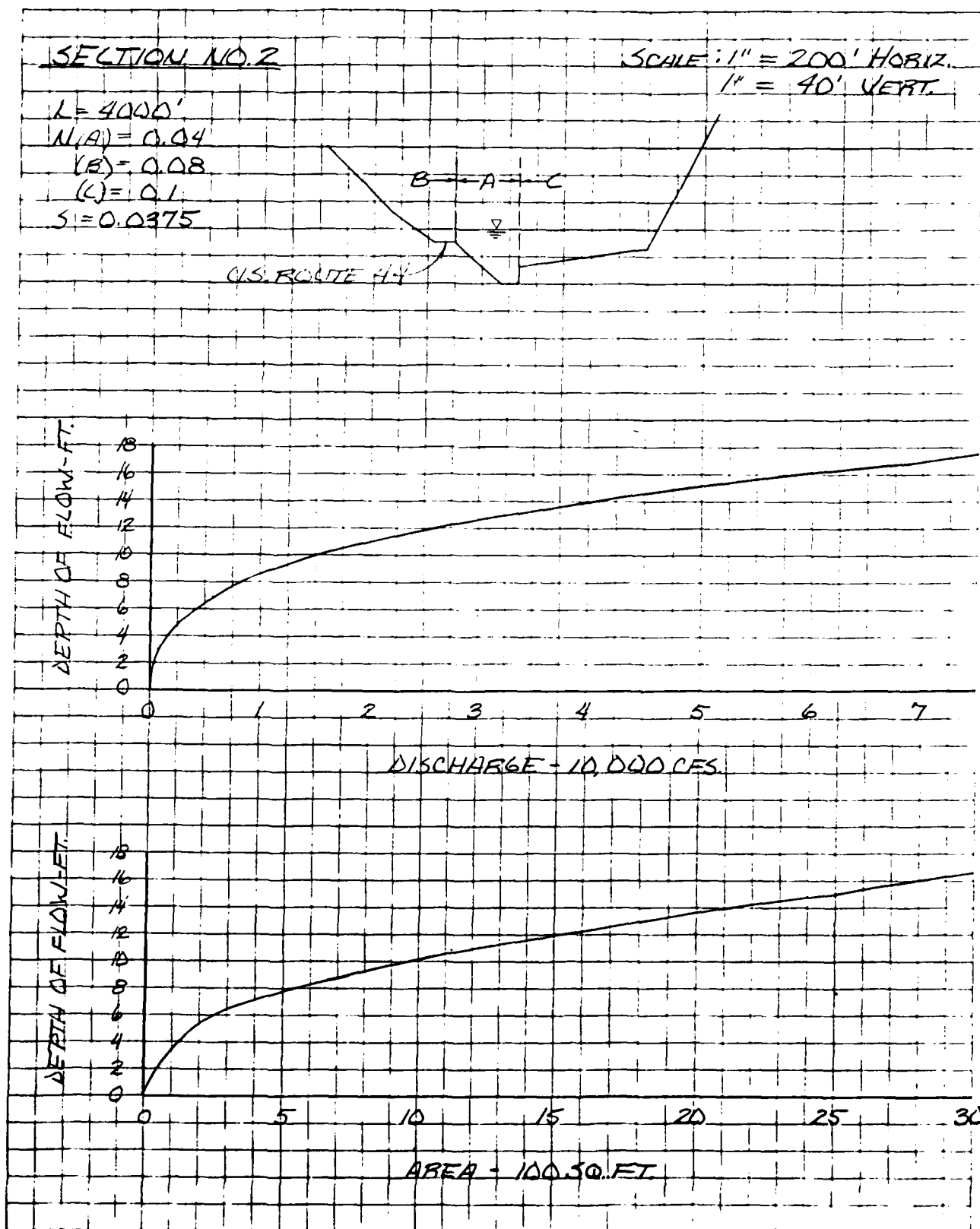
CONSULTING ENGINEERS

CKD BY SAL DATE 1-16-81

37 Brookside Road - Waterbury, Conn. 06708

JOB NO. 49-037

SUBJECT WOOD CREEK DAM - FLOOD ROUTING



BY SAL DATE 1/16/81

ROALD HAESTAD, INC.

SHEET NO 17 OF 25

CHK BY DLS DATE 2/12/81

CONSULTING ENGINEERS

JOB NO. 049 037

SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 3A

MAIN CHANNEL

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
1.0	22	11	0.50	0.0250	4.22	46
2.0	34	39	1.14	0.0250	7.32	284
3.0	46	78	1.70	0.0250	9.56	749
4.0	48	125	2.59	0.0250	12.67	1577
5.0	48	172	3.57	0.0250	15.68	2690
6.0	48	219	4.55	0.0250	18.43	4028
7.0	48	266	5.53	0.0250	20.99	5573
8.0	48	313	6.51	0.0250	23.40	7312
9.0	48	360	7.49	0.0250	25.69	9236
10.0	48	407	8.47	0.0250	27.88	11335
11.0	48	454	9.44	0.0250	29.99	13602
12.0	48	501	10.42	0.0250	32.03	16032
13.0	48	548	11.40	0.0250	34.01	18619
14.0	48	595	12.38	0.0250	35.93	21359
15.0	48	642	13.36	0.0250	37.80	24247
16.0	48	689	14.34	0.0250	39.62	27280
17.0	48	736	15.32	0.0250	41.40	30454
18.0	48	783	16.30	0.0250	43.15	33767
19.0	48	830	17.27	0.0250	44.86	37214
20.0	48	877	18.25	0.0250	46.54	40795

MANNING COEFFICIENT=N=0.0350

BY SAL DATE 1/16/81

ROADSIDE HASTAD INC

SHEET NO 18 OF 25

CHKD BY DLS DATE 2/18/81

CONSULTING ENGINEERS

JOB NO. 040 037

SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 3B

LEFT OVBANK

<u>H</u> <u>(FT)</u>	<u>W</u> <u>(FT)</u>	<u>A</u> <u>(SQ-FT)</u>	<u>R</u> <u>(FT)</u>	<u>S</u> <u>(FT/FT)</u>	<u>V</u> <u>(FT/SEC)</u>	<u>Q</u> <u>(CFS)</u>
4.0	33	16	0.50	0.0250	2.11	35
5.0	66	66	1.00	0.0250	3.36	221
6.0	99	148	1.50	0.0250	4.40	650
7.0	131	263	2.00	0.0250	5.33	1400
8.0	164	411	2.50	0.0250	6.18	2539
9.0	197	591	3.00	0.0250	6.98	4128
10.0	230	805	3.50	0.0250	7.74	6227
11.0	248	1044	4.20	0.0250	8.74	9127
12.0	267	1302	4.88	0.0250	9.65	12567
13.0	285	1578	5.53	0.0250	10.50	16561
14.0	315	1878	5.96	0.0250	11.03	20708
15.0	334	2202	6.59	0.0250	11.79	25968
16.0	354	2546	7.20	0.0250	12.52	31862
17.0	373	2909	7.80	0.0250	13.20	38409
18.0	392	3291	8.40	0.0250	13.87	45628
19.0	411	3692	8.98	0.0250	14.50	53539
20.0	430	4113	9.56	0.0250	15.12	62161

MANNING COEFFICIENT=N=0.0700

BY SAL DATE 1/16/81 ROAD HASTAD, INC. SHEET NO 19 OF 25
 CKD BY DLS DATE 2/18/81 CONSULTING ENGINEERS JOB NO. 049-137
 SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 3C

RIGHT OVERBANK

<u>H</u> <u>(FT)</u>	<u>W</u> <u>(FT)</u>	<u>A</u> <u>(SQ-FT)</u>	<u>R</u> <u>(FT)</u>	<u>S</u> <u>(FT/FT)</u>	<u>V</u> <u>(FT/SEC)</u>	<u>Q</u> <u>(CFS)</u>
5.0	8	4	0.50	0.0250	1.47	6
6.0	15	15	0.99	0.0250	2.34	35
7.0	23	34	1.49	0.0250	3.06	103
8.0	30	60	1.98	0.0250	3.71	222
9.0	38	94	2.48	0.0250	4.30	403
10.0	45	135	2.97	0.0250	4.86	656
11.0	48	181	3.75	0.0250	5.67	1029
12.0	51	231	4.50	0.0250	6.40	1476
13.0	54	282	5.21	0.0250	7.06	1995
14.0	57	337	5.90	0.0250	7.67	2586
15.0	60	394	6.57	0.0250	8.24	3251
16.0	63	455	7.22	0.0250	8.78	3989
17.0	66	517	7.85	0.0250	9.28	4803
18.0	69	583	8.47	0.0250	9.77	5693
19.0	72	651	9.08	0.0250	10.23	6662
20.0	75	723	9.68	0.0250	10.67	7709

MANNING COEFFICIENT=N=0.1000

BY SAL DATE 1/16/81

ROALD HALSTAD, INC.

SHEET NO 20 OF 25CHKD BY DLS DATE 2/18/81

CONSULTING ENGINEERS

JOB NO. 049 037SUBJECT WOOD CREEK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 3

TOTAL SECTION

A R E A (SQ.FT.)					D I S C H A R G E (CFS)			
H	A	B	C	TOTAL	A	B	C	TOTAL
1.0	11	0	0	11	46	0	0	46
2.0	39	0	0	39	284	0	0	284
3.0	78	0	0	78	749	0	0	749
4.0	125	16	0	141	1577	35	0	1612
5.0	172	66	4	241	2690	221	6	2916
6.0	219	148	15	381	4028	650	35	4713
7.0	266	263	34	562	5573	1400	103	7076
8.0	313	411	60	783	7312	2539	222	10073
9.0	360	591	94	1045	9236	4128	403	13767
10.0	407	805	135	1347	11335	6227	656	18218
11.0	454	1044	181	1679	13602	9127	1029	23759
12.0	501	1302	231	2033	16032	12567	1476	30075
13.0	548	1578	282	2407	18619	16561	1995	37175
14.0	595	1878	337	2809	21359	20708	2586	44653
15.0	642	2202	394	3238	24247	25968	3251	53466
16.0	689	2546	455	3689	27280	31862	3989	63132
17.0	736	2909	517	4162	30454	39409	4803	73667
18.0	783	3291	593	4656	33767	45628	5693	85088
19.0	830	3692	651	5173	37214	53539	6662	97415
20.0	877	4113	723	5712	40795	62161	7709	110666

STORAGE AT TIME OF FAILURE=S= 1555 AC. FT.
 LENGTH OF REACH=L= 4000 FT

INFLOW INTO REACH=QP1= 54402 CFS
 DEPTH OF FLOW=H1= 15.1 FT.
 CROSS SECTIONAL AREA=A1= 3282 SQ.FT.
 STORAGE IN REACH=V1= 258.3 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 45364 CFS
 TRIAL DEPTH OF FLOW=H(TRIAL)= 14.1 FT.
 TRIAL CROSS SECTIONAL AREA=A(TRIAL)= 2844 SQ.FT.
 TRIAL STORAGE IN REACH=V(TRIAL)= 218.1 AC. FT.

REACH OUTFLOW=QP2= 46068 CFS
 DEPTH OF FLOW=H2= 14.2 FT.

BY L.E.G. DATE 1-12-81

ROALD HAESTAD, INC.

SHEET NO. 21 OF 25

CONSULTING ENGINEERS

CKD BY SAL DATE 1-16-81

37 Brookside Road - Waterbury, Conn. 06708

JOB NO. 49-037

SUBJECT WOOD CREEK DAM - FLOOD ROUTING

SECTION NO. 3

SCALE: 1" = 200' HORIZ.

1" = 40' VERT.

$L = 4000'$

$N(A) = 0.035$

$(B) = 0.07$

$(C) = 0.1$

$S = 0.025$

U.S. ROUTE 44

B-L-A-C

DEPTH OF FLOW - FT.

18
16
14
12
10
8
6
4
2
0

0 1 2 3 4 5 6 7

DISCHARGE - 10,000 CFS.

DEPTH OF FLOW - FT.

20
18
16
14
12
10
8
6
4
2
0

0 1 2 3 4 5 6

AREA - 1000 SQ. FT.

1 SAL DATE 1/16/81

ROAD H&H STAD. INC.

SHEET NO. 22 OF 25

CHKD BY DLS DATE 2/16/81

CONSULTING ENGINEERS

JOB NO. 842-007

SUBJECT WOOD CREEK DIKE-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 1

TOTAL SECTION

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
1.0	30	15	0.50	0.0222	1.39	21
2.0	60	60	1.00	0.0222	2.21	134
3.0	90	135	1.50	0.0222	2.90	391
4.0	120	240	2.00	0.0222	3.51	802
5.0	150	375	2.49	0.0222	4.07	1527
6.0	180	540	2.99	0.0222	4.60	2487
7.0	211	735	3.49	0.0222	5.10	3745
8.0	241	960	3.99	0.0222	5.57	5307
9.0	271	1215	4.49	0.0222	6.02	7320
10.0	301	1500	4.99	0.0222	6.46	9695
11.0	313	1806	5.76	0.0222	7.12	12855
12.0	326	2125	6.52	0.0222	7.72	16415
13.0	339	2456	7.25	0.0222	8.29	20374
14.0	351	2800	7.97	0.0222	8.83	24731
15.0	364	3156	9.67	0.0222	9.34	29591
16.0	377	3525	9.36	0.0222	9.83	34655
17.0	389	3906	10.03	0.0222	10.30	40228
18.0	402	4300	10.69	0.0222	10.75	46214
19.0	415	4706	11.35	0.0222	11.18	52618
20.0	427	5125	11.99	0.0222	11.60	59447

MANNING COEFFICIENT=N=0.1000

REACH OUTFLOW=QP2= 22300 CFS
DEPTH OF FLOW=H2= 13.4 FT.

BY EC DATE 2-23-81

ROALD HAESTAD, INC.
CONSULTING ENGINEERS

SHEET NO. 23 OF 25

CKD BY SAL DATE 2-23-81

37 Brookside Road - Waterbury, Conn. 06708

JOB NO. 44-651

SUBJECT WOOD CREEK Dike - Flood Routing

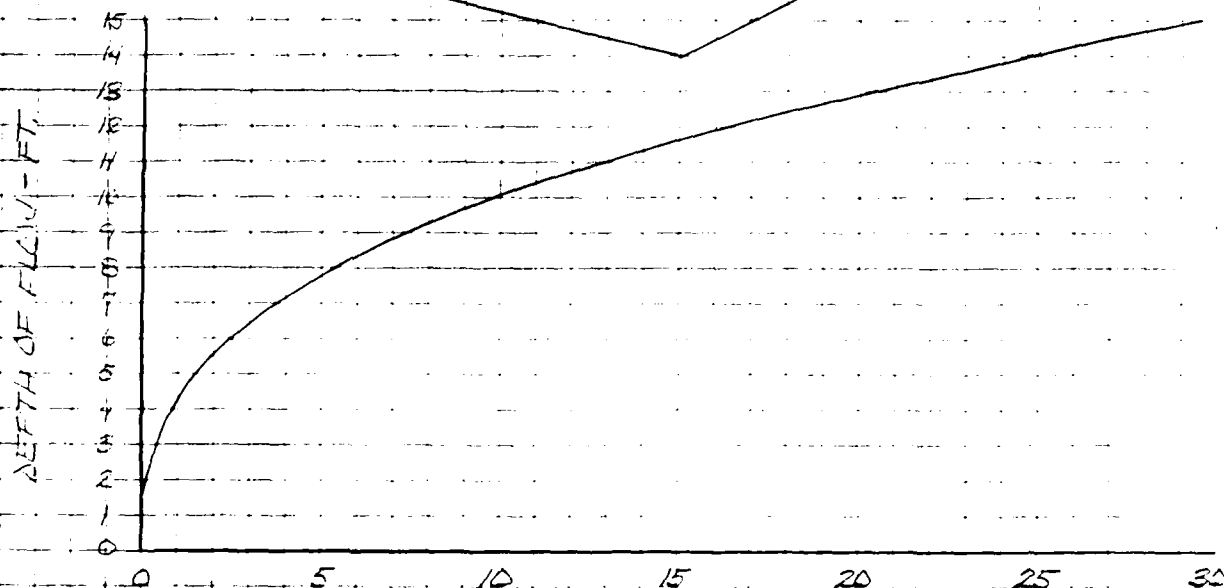
SECTION NO. 1

SCALE: 1" = 100' HORIZ.
1" = 20' VERT.

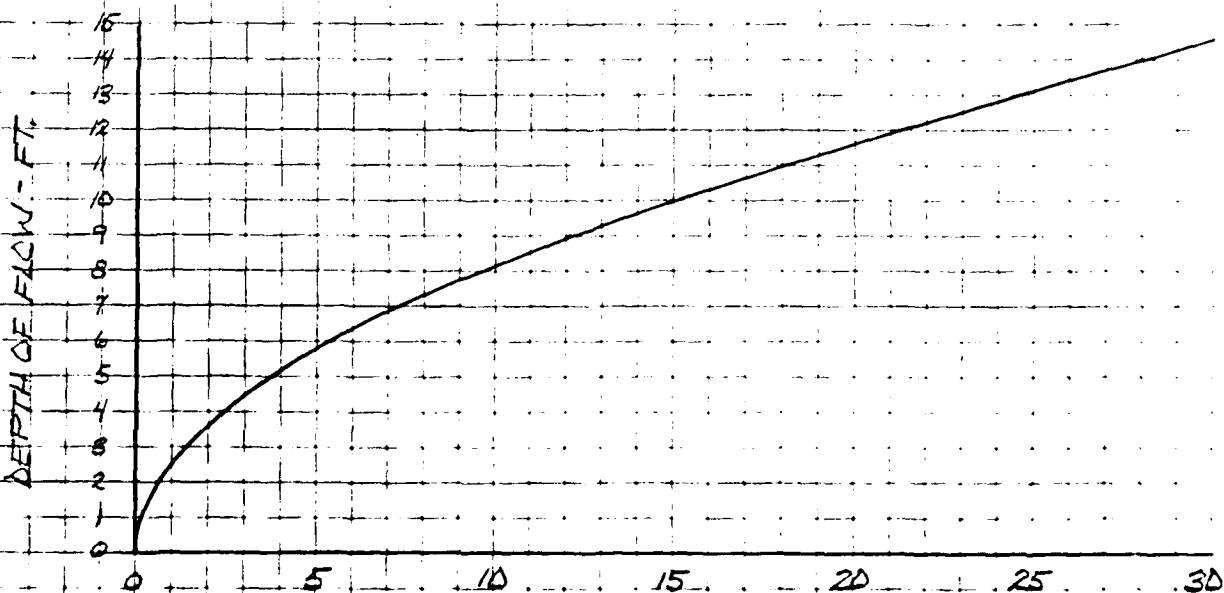
L = 4500'

N = 0.1

S = 0.0222



DISCHARGE = 1000 CFS.



AREA = 100 SQ. FT.

BY SAL DATE 1/16/81

ROAD MAPS & CO., INC.

SHEET NO 24 OF 25CHKD BY DLS DATE 2/16/81

CONSULTING ENGINEERS

JOB NO. PMF-81SUBJECT WOOD CREEK DIKE-FLOOD ROUTING AT PMF ELEVATIONSECTION NUMBER 2

TOTAL SECTION

<u>H</u> <u>(FT)</u>	<u>W</u> <u>(FT)</u>	<u>A</u> <u>(SQ-FT)</u>	<u>R</u> <u>(FT)</u>	<u>S</u> <u>(FT/FT)</u>	<u>V</u> <u>(FT/SEC)</u>	<u>Q</u> <u>(CFS)</u>
1.0	10	5	0.49	0.0571	2.21	11
2.0	20	20	0.98	0.0571	3.50	70
3.0	31	45	1.47	0.0571	4.59	207
4.0	41	80	1.96	0.0571	5.56	445
5.0	51	125	2.45	0.0571	6.46	807
6.0	61	180	2.94	0.0571	7.29	1312
7.0	71	245	3.43	0.0571	8.08	1975
8.0	82	320	3.92	0.0571	8.83	2826
9.0	92	405	4.41	0.0571	9.55	3869
10.0	102	500	4.90	0.0571	10.25	5124
11.0	120	609	5.09	0.0571	10.51	6395
12.0	137	735	5.35	0.0571	10.87	7988
13.0	155	879	5.67	0.0571	11.29	9925
14.0	173	1040	6.03	0.0571	11.76	12231
15.0	190	1219	6.41	0.0571	12.25	14931
16.0	208	1415	6.81	0.0571	12.76	18058
17.0	225	1629	7.22	0.0571	13.27	21613
18.0	243	1860	7.65	0.0571	13.79	25696
19.0	261	2109	8.09	0.0571	14.31	30171
20.0	278	2375	8.53	0.0571	14.83	35212

MANNING COEFFICIENT=N=0.1000

REACH OUTFLOW=Q_{P2}= 22300 CFS
 DEPTH OF FLOW=H₂= 17.2 FT.

BY S.S. DATE 2-23-81

ROALD HAESTAD, INC.

SHEET NO 25 OF 25

CONSULTING ENGINEERS

CKD BY SAL DATE 2-23-81

37 Brookside Road - Waterbury, Conn. 06708

JOB NO 47-137

SUBJECT WOOD CREEK DIKE - FLOOD FLOWING

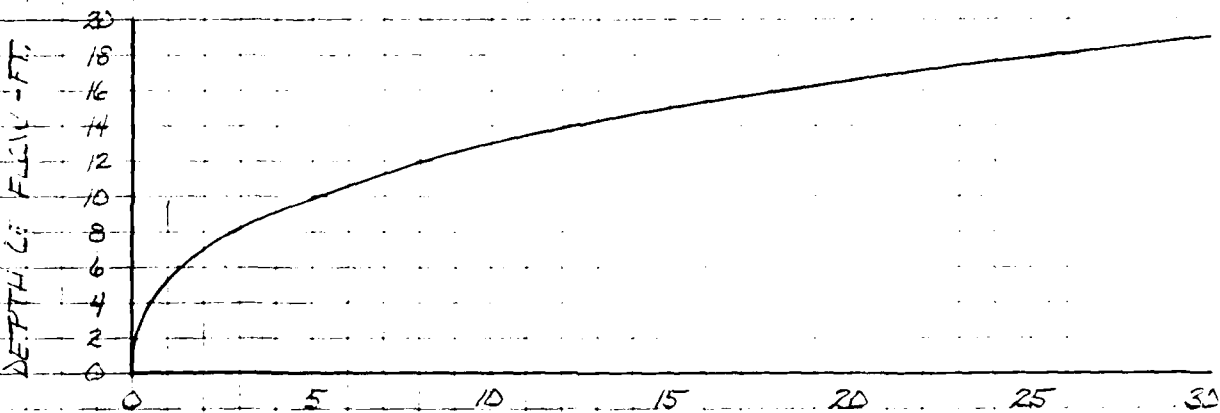
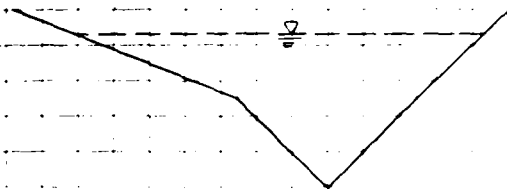
SECTION NO. 2

SCALE: 1" = 100' H.C.F. &
1" = 20' VERT.

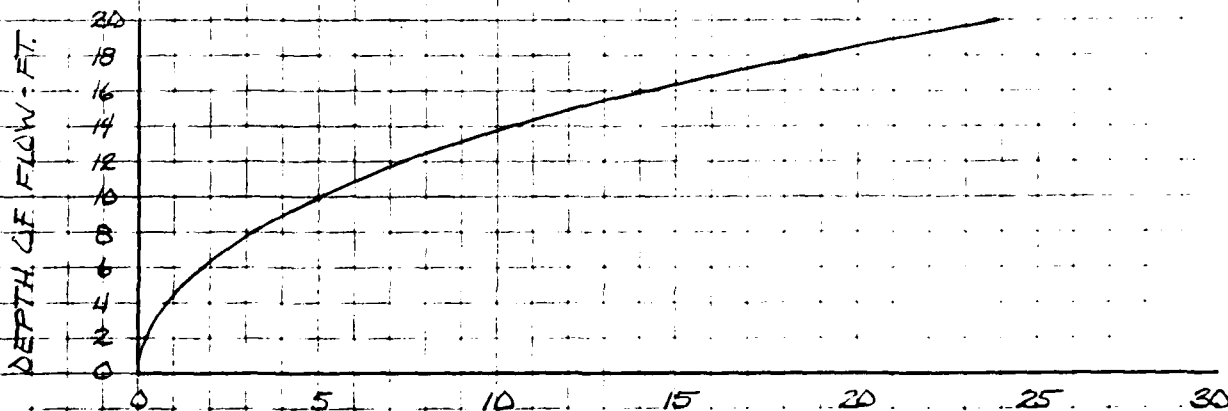
L = 4500'

N = 0.1

S = 0.0571



DISCHARGE - 1000 CFS.



AREA - 100 SQ. FT.

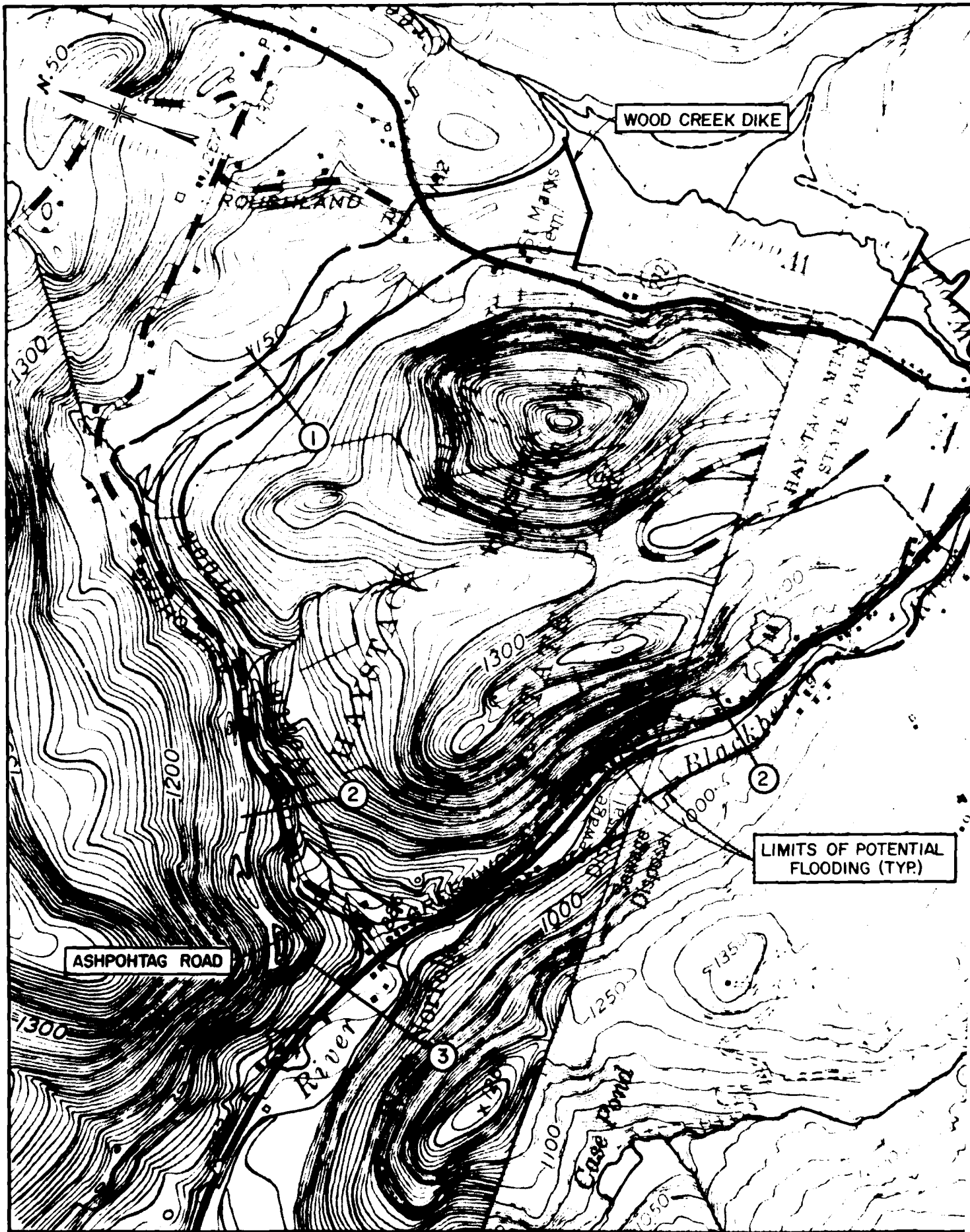
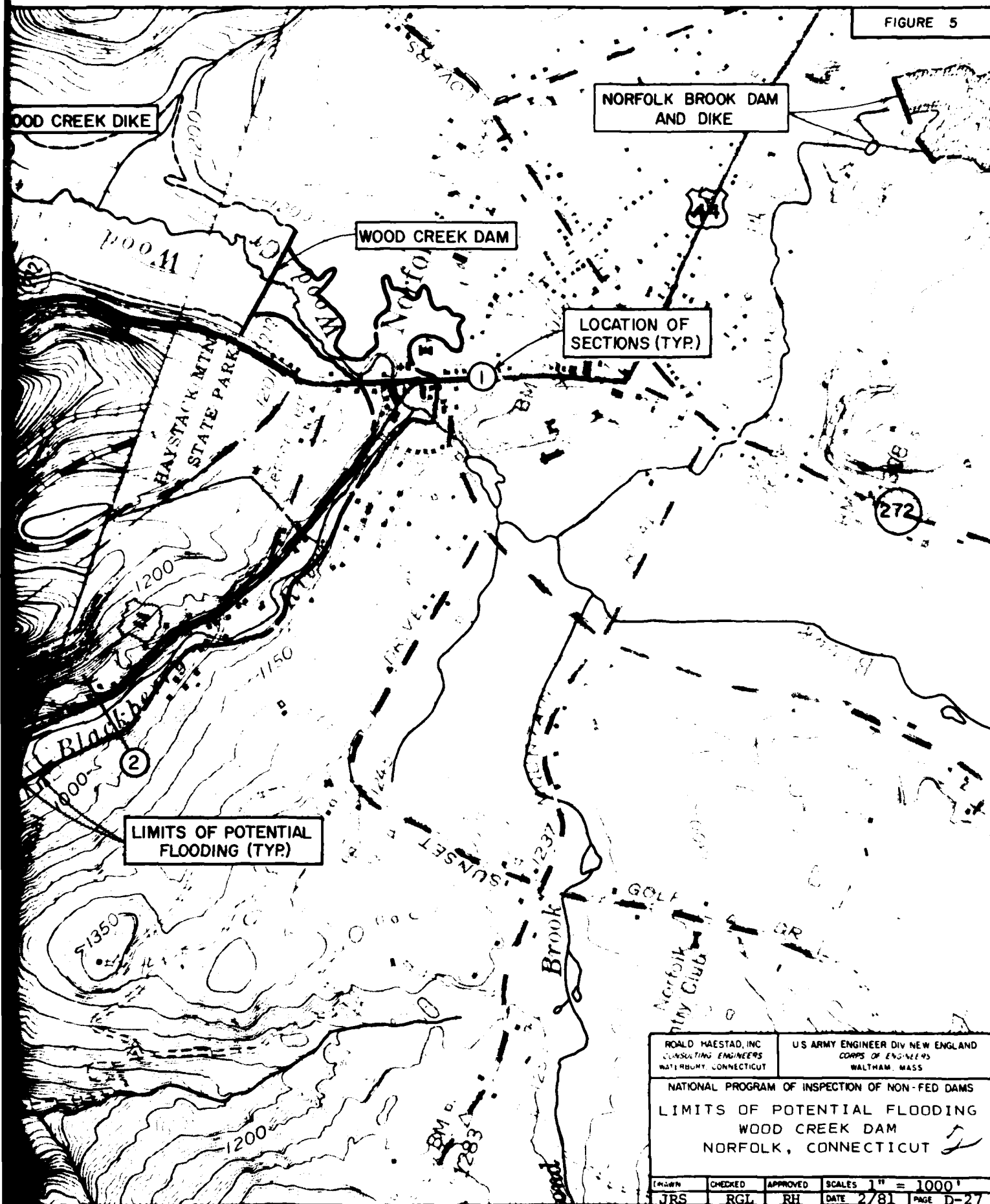


FIGURE 5



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 WOOD CREEK DAM NORFOLK, CONNECTICUT			
DESIGNED JRS	CHECKED RGL	APPROVED RH	SCALE 1" = 1000' DATE 2/81 PAGE D-27

APPENDIX E

INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

EE
ED