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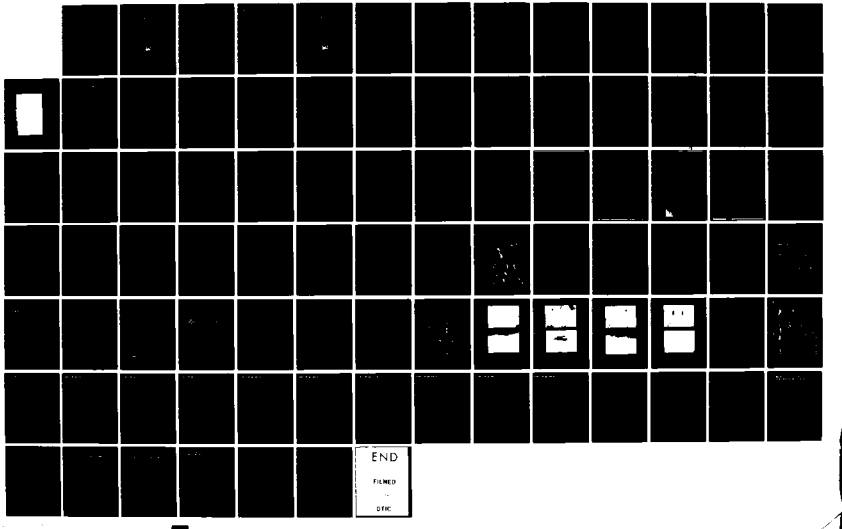

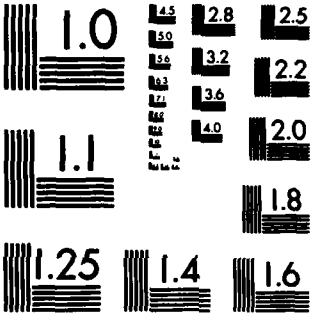

MICROCOPY RESOLUTION TEST CHART
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THAMES RIVER BASIN
STAFFORD, CONNECTICUT

SHENIPSIT DAM
CT 00482

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

SEPTEMBER, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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4. TITLE (and Subtitle) Shenipsit Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE September 1980 13. NUMBER OF PAGES 75
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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,
Thames River Basin
Stafford, Connecticut

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

The project is an earth embankment approximately 390 feet in length with an emergency spillway at its left end. In accordance with the U.S. Army Corps of Engineers guidelines, Shenipsit Dam is classified as a high hazard, small size dam. The test flood is equivalent to the ½ PMF. Based upon the visual inspection and past performance, the dam is judged to be in good condition.

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

REPLY TO
ATTENTION OF:
NEDED

MAY 26 1981

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

Dear Governor O'Neill:

Inclosed is a copy of the Shenipsit Dam (CT-00482) 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 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
Division Engineer

Incl
As stated

THAMES RIVER BASIN
STAFFORD, CONNECTICUT

SHENIPSIT DAM
CT 00482

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

SEPTEMBER, 1980

BRIEF ASSESSMENT

PHASE 1 INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	SHENIPSIT DAM
Inventory Number:	CT 00482
State:	CONNECTICUT
County:	TOLLAND
Town:	STAFFORD
Stream:	TRIBUTARY TO MIDDLE RIVER
Owner:	STATE OF CONNECTICUT
Date of Inspection:	AUGUST 21, 1980
Inspection Team:	PETER HEYNEN, P.E.
	HECTOR MORENO, P.E.
	ERIC TEALE, P.E.
	THEODORE STEVENS
	ANTHONY BELLA

The project, completed in 1961, is an earth embankment approximately 390 feet in length with an emergency spillway at its left end. It is a flood control project approximately 28.5 feet in height and capable of impounding approximately 520 acre-feet of water. The principal spillway is a drop inlet type structure consisting of a reinforced concrete riser with a 24 inch diameter reinforced concrete outlet pipe through the dam. The grass-bottomed emergency spillway channel is cut into natural ground at the left end of the dam and has a crest length of 125 feet. The top and slopes of the dam are grass covered, with a filter drain at the toe of the downstream slope.

In accordance with the U.S. Army Corps of Engineers guidelines, Shenipsit Dam is classified as a high hazard, small size dam. The test flood for the Shenipsit Dam is equivalent to the ½ PMF. Peak inflow to the pond at test flood is 1150 cubic feet per second (cfs); peak outflow is 350 cfs with the dam maintaining a freeboard of 4.0 feet. The spillway capacity with the pond level to the top of the dam is 4700 cfs, which is equivalent to 1300% of the routed test flood outflow.

Based upon the visual inspection and past performance, the dam is judged to be in good condition. No evidence of instability was observed in the project. There are some remedial measures, such as filling of large holes in the "waste areas" adjacent to the dam, re-establishment of grassy vegetation in the vehicle tracks on the top of the dam, and institution of a biennial inspection program, which require attention.

The remedial and maintenance measures presented in Section 7.3 should be instituted within two years of the owner's receipt of this report.

Peter M. Heynen, P.E.
Project Manager - Geotechnical
Cahn Engineers, Inc.

STATE OF CONNECTICUT
PETER M. HEYNEN
No. 9318
REGISTERED
PROFESSIONAL ENGINEER

C. Michael Horton, P.E.
Chief Engineer
Cahn Engineers, Inc.

STATE OF CONNECTICUT
CLARENCE M. HORTON
No. 8433
REGISTERED
PROFESSIONAL ENGINEER

This Phase I Inspection Report on Shenipsit Dam (CT-00482) 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.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRIAR
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 inspection. 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 would necessarily 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 will 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 there of. 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 neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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 to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

The information contained in this report is based on the limited investigation described above and is not warranted to indicate the actual condition of the dam. The integrity of the dam can only be determined by a means of a monitoring program and/or a detailed physical investigation. The accuracy of available data is assumed where not in obvious conflict with facts observable during the visual inspection.

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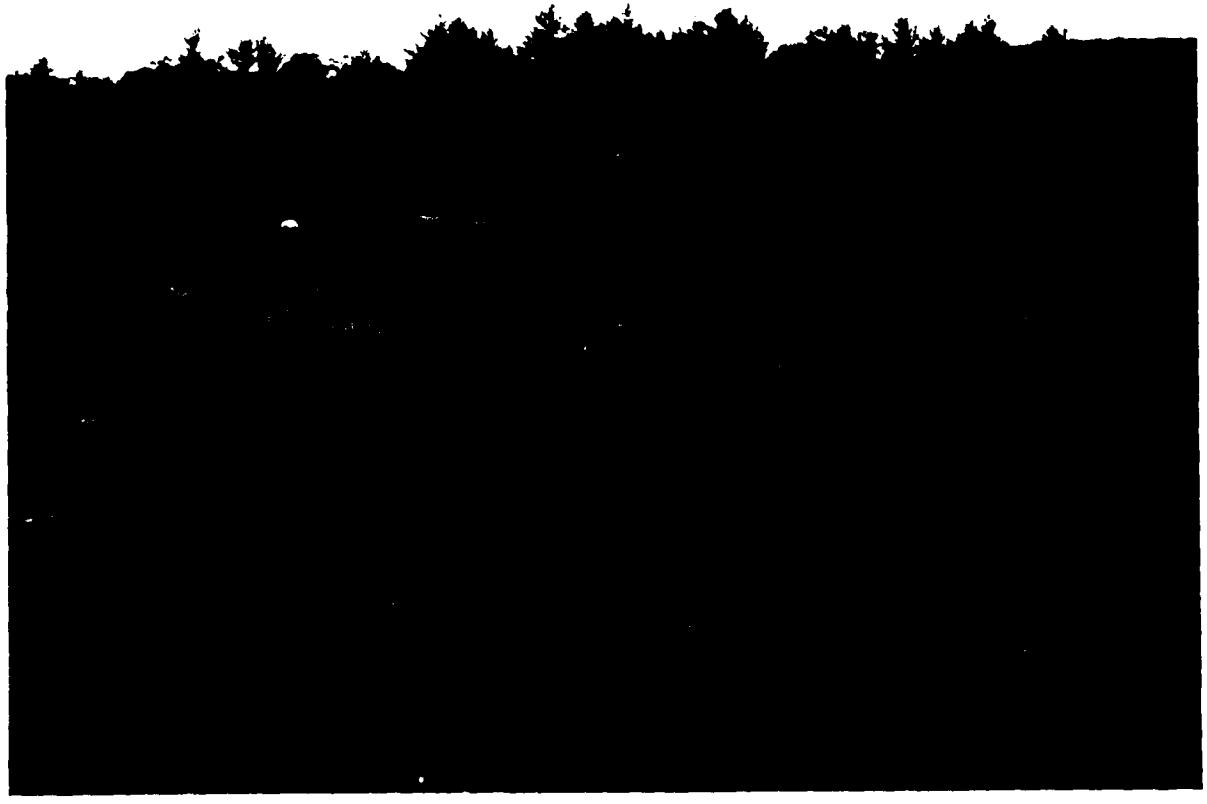
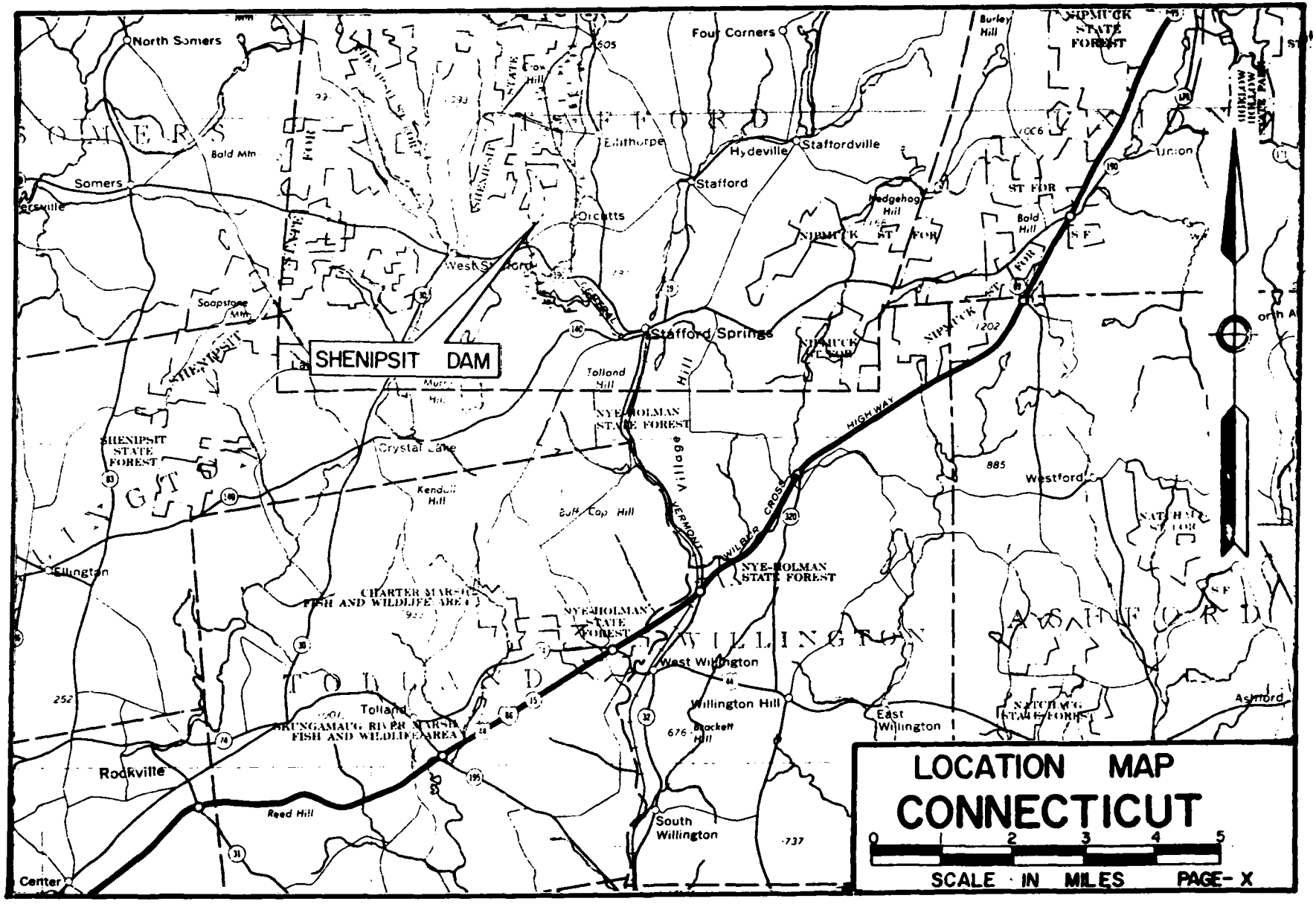
APPENDICES



OVERVIEW PHOTO
(August, 1980)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Shenipsit Dam	Stafford	DATE Sept. '80
CAHN ENGINEERS INC. WALLINGFORD, CONN ENGINEER	INSPECTION OF NON-FED DAMS	Tr - Middle River	CONNECTICUT	CE # 27 785 KC PAGE ix


SHENIPSIT DAM
North Somers
Four Corners
Burley Hill
Bald Mtn
Somers
Edithorpe
Hydeville
Staffordville
Stafford
Orcutts
Hedgehog Hill
Bald Hill
Union
West Stafford
Soapstone Mtn
Stafford Springs
Tolland Hill
Hill
SHENIPSIT STATE FOREST
Crystal Lake
Kendall Hill
Cuff Cap Hill
NYE-HOLMAN STATE FOREST
HIGHWAY
885
Westford
Ellington
CHARTER STARR FISH AND WILDLIFE AREA
NYE-HOLMAN STATE FOREST
West Willington
Willington Hill
East Willington
Ashford
Tolland
676
Blackett Hill
Rockville
Reed Hill
South Willington
737
Center
LOCATION MAP
CONNECTICUT
0 1 2 3 4 5
SCALE IN MILES
PAGE- X

PHASE I INSPECTION REPORT

SHENIPSIT DAM

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers, 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 Cahn Engineers, Inc. under a letter of April 14, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0052 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - 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 interests.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dam.

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

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report passes judgment only on those factors of safety and stability which can be determined by a visual surface examination. The inspection is to identify those visually apparent features of the dam which evidence the need for corrective action and/or further study and investigation.

1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on an unnamed tributary to the Middle River of the Thames River Basin in a rural area of the Town of Stafford, County of Tolland, State of Connecticut. The project is shown on the Stafford Spring USGS Quadrangle Map, having coordinates latitude N41°58.6' and longitude W72°20.1'.

b. Description of Dam and Appurtenances - As shown on Sheets B-1 and B-2, the dam is an earth embankment approximately 390 feet long and 28.5 feet high. The dam has a top elevation of 556.2 and a top width of 12 feet. The upstream slope is covered with grass and Chemung Crown Vetch and is inclined at 3 horizontal to 1 vertical. The downstream slope, also vegetated with grass and Chemung Crown Vetch is inclined at 2 horizontal to 1 vertical and contains a toe drain.

The principal spillway is a concrete drop inlet structure located near the center of the dam at the toe of the upstream slope. The spillway crest, at elevation 537.0, has a total length of 12 feet and is protected by a galvanized steel trash rack. The upstream end of a 24 inch reinforced concrete pipe, at invert elevation 532.0, joins the bottom of the drop inlet shaft. The pipe outlets at the downstream toe of the dam, at invert elevation 530.0. The low level intake, at invert elevation 532.0, is a 12 inch diameter opening in the upstream face of the intake structure, however the sluice gate for this intake has been removed.

The emergency spillway is cut into natural ground at the left end of the dam. The approach channel, control section, and discharge channel are grass covered, with a high natural embankment to the left and a low earthfill embankment to the right. The control section, or crest, at elevation 551.4, is 125 feet long and 30 feet wide with an approach channel slope of 2% and a discharge channel slope of 2.84%.

c. Size Classification - (SMALL) - The dam is 28.5 feet high and, with the reservoir level to the top of the dam, impounds approximately 520 acre-feet of water. According to recommended guidelines, a dam of this height and storage capacity is classified as small in size.

d. Hazard Classification - (HIGH) - If the dam were breached, there is potential for loss of more than a few lives at two residences and three commercial structures approximately 2000 feet downstream of the dam at the intersection of Route 190 and Orcutt-ville Road.

e. Ownership - State of Connecticut
Department of Environmental Protection
Division of Conservation and Preservation
Region 3 Headquarters
Marlborough, Ct. 06420
(203) 295-9523
Mr. John Spencer
Mr. Charles Phillips

The dam has been under the ownership of the State of Connecticut since its construction in 1960.

f. Operator - Mr. Lawrence Lucay
Maintenance Supervisor
Shenipsit State Forest Headquarters
West Stafford, Ct. 06075
(203) 684-3430

g. Purpose of Dam - Flood Control. The dam is part of the Furnace Brook - Middle River flood prevention project and reduces peak flows into the Middle River.

h. Design and Construction History - The dam was designed by the Soil Conservation Service in 1959 and constructed by the State of Connecticut in 1960.

i. Normal Operational Procedures - There are no operating facilities at the dam; therefore there are no operational procedures.

1.3 PERTINENT DATA

a. Drainage Area - The drainage area is 1.0 square mile of undeveloped, wooded, rolling terrain.

b. Discharge at Damsite - Discharge is through the 12 inch low-level outlet, over the principal spillway and over the emergency spillway.

1. Outlet Works (Conduits) 12 inch low-level outlet @ invert el. 532.0:	10± cfs (pond level to test flood el. 552.2)
2. Maximum flood at damsite:	Not known
3. Principal spillway capacity @ top of dam el. 556.2:	60 cfs
4. Emergency spillway capacity @ top of dam el. 556.2:	4640 cfs
5. Principal spillway capacity @ test flood el. 552.2:	60 cfs
6. Emergency spillway capacity @ test flood el. 552.2:	290 cfs
7. Gated spillway capacity @ normal pool:	N/A
8. Gated spillway capacity @ test flood:	N/A

9. Total spillway capacity @ test flood el. 552.2: 350 cfs

10. Total project discharge @ top of dam el. 556.2: 4700 cfs

11. Total project discharge @ test flood el. 552.2: 350 cfs

c. Elevations - Elevations are on National Geodetic Vertical Datum (NGVD), as shown on existing drawings.

1. Streambed at toe of dam: 529.0

2. Bottom of cutoff: Not known

3. Maximum tailwater: Not known

4. Normal pool: N/A

5. Full flood control pool: 551.4

6. Spillway crest (ungated)

Principal spillway: 537.0
Emergency spillway: 551.4

7. Design surcharge (original design): 554.4

8. Top of dam: 556.2 to 557.5

9. Test flood surcharge: 552.2

d. Reservoir Length

1. Normal pool: N/A

2. Flood control pool: 3,900± ft.

3. Spillway crest pool

Principal spillway: 1,500± ft.
Emergency spillway: 3,900± ft.

4. Top of dam pool: 4,800± ft.

5. Test flood pool: 4,000± ft.

e. Reservoir Storage

1. Normal pool: N/A

2. Flood control pool: 340± acre-feet

3. Spillway crest pool

Principal spillway: 40+ acre-feet
Emergency spillway: 340± acre-feet

4. Top of dam pool: 520± acre-feet

5. Test flood pool:	370± acre-feet
f. Reservoir Surface	
1. Normal pool:	N/A
2. Flood control pool:	29± acres
3. Spillway crest pool	
Principal spillway:	12± acres
Emergency spillway:	29± acres
4. Top of dam pool:	48± acres
5. Test flood pool:	32± acres
g. Dam	
1. Type:	Earth embankment
2. Length:	390 ft.
3. Height:	28.5 ft.
4. Top width:	12 ft.
5. Side slopes:	3H to 1V upstream 2H to 1V downstream
6. Zoning:	N/A
7. Impervious core:	N/A
8. Cutoff:	N/A
9. Grout curtain:	N/A
10. Other:	Toe drain
h. Diversion and Regulating Tunnel	N/A
i. Spillways	
Principal Spillway	
1. Type:	Concrete drop inlet to 24" outlet pipe
2. Length of weir:	12.0 ft.
3. Crest elevation:	537.0
4. Gates:	N/A

5. Upstream channel:	5 feet wide at bottom with 2H to 1V side slopes
6. Downstream channel:	8 feet wide at bottom, with 2H to 1V side slopes
7. General:	Galvanized steel pipe trash rack

Emergency Spillway

1. Type	Channel cut into natural ground
2. Length of weir (control section):	125 ft.
3. Crest Elevation:	551.4
4. Gates:	N/A
5. Upstream channel:	Grassed, 2% slope
6. Downstream channel:	Grassed, 2.84% slope
7. General:	30 ft. wide trapezoidal control section

j. Regulating Outlets

Low-level inlet to principal spillway

1. Invert:	532.0
2. Size:	12 in. dia.
3. Description:	orifice in upstream face of spillway structure
4. Control mechanism:	None
5. Other:	N/A

SECTION 2: ENGINEERING DATA

2.1 DESIGN DATA

The available design data consists of design drawings, Work Plan for Watershed Protection & Flood Prevention: Furnace Brook - Middle River Watershed, and "Information Storage and Retrieval - Dams Planned and Constructed by SCS" from the Soil Conservation Service, and correspondence concerning design of the project. (See Appendix B).

2.2 CONSTRUCTION DATA

The available construction data consists of construction specifications and construction inspection reports. Some minor revisions are shown on the design drawings, which have been marked "as-built".

2.3 OPERATIONS

No formal operations records are known to exist.

2.4 EVALUATION OF DATA

a. Availability - Available data was provided by the State of Connecticut and the Soil Conservation Service. The owner made the project available for visual inspection.

b. Adequacy - Since detailed as-built drawings are available, the assessment of the project may be based on a review of these drawings, visual inspection, performance history, hydraulic computations of spillway capacity, and hydrologic estimates.

c. Validity - A comparison of record data and visual observations reveals no significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The project is in good condition. The inspection indicated that the project is in need of little maintenance beyond that which is normally performed. At the time of inspection, the upstream water level was at elevation 532.2±; i.e. 0.2 feet above the invert of the low-level intake pipe.

b. Dam

Top of Dam - The top of the dam is in good condition (Photo 1). Grass cover is good, except for the vehicle tracks which run the length of the dam. It was noted that the top of the dam slopes slightly from elevation 557.5±, near its center, to elevation 556.2± near its left end (See Appendix D-2).

Upstream slope - The upstream slope is in good condition (Photo 2). Vegetative cover is good and there were no signs of erosion or sloughing.

Downstream Slope - The downstream slope is in good condition with good vegetative cover (Overview Photo). There were no signs of erosion or sloughing, but one animal burrow was observed approximately 2 feet below the top of the dam and 20 feet to the left of the spillway conduit.

The toe drain outlets are clear of debris and appear to be in good condition. A flow of approximately 0.1 gallon per minute was observed at the right outlet pipe (Photo 3) and a smaller flow was observed at the left outlet pipe. All discharges are clear of sediments, though rust staining was observed.

Spillways - The principal spillway intake structure is in good condition (Photo 4). Trash racks are in good condition and clear of debris. Very minor spalling of the intake structure was noted. Observed from its downstream end, the 24 inch spillway discharge conduit appears to be in good condition (Photo 5).

The emergency spillway is in good condition, with good grass cover on the channel bottom and side embankments (Photo 6).

c. Appurtenant Structures - There are no appurtenant structures. The sluice gate for the 12 inch low-level outlet pipe has been removed and the normal streamflow is accommodated by this pipe (Photo 7).

Soils which were excavated for the dam foundation and emergency spillway were deposited in spoil piles to either side of the downstream channel. The native soil in the area is a hetergeneous glacial till containing many large boulders. It appears that settlement of the finer grained constituents of the till has occured, probably due to voids between boulders present

during placement of waste materials. This has resulted in several holes of up to 4 feet in diameter and greater than 6 feet in depth (Photo 8). While this condition does not affect the performance of the dam, it could be very hazardous to anyone walking in the area.

d. Reservoir Area - The area where the flood control pool would be impounded is cleared and contains many large boulders. The area surrounding the flood control impoundment is densely wooded.

e. Downstream Channel - The downstream channel is the natural streambed which passes through a wooded, swampy area to the initial impact area.

3.2 EVALUATION

Based upon the visual inspection, the project is assessed as being in good condition. The manner in which the features identified in Section 3.1 could affect the future condition and/or stability of the project is as follows.

1. Further vehicular traffic across the dam could kill more grass, making the top of the dam suceptible to surface erosion.

2. Animal burrows could provide seepage paths through the dam which could cause internal erosion of the dam.

3. The holes in the waste areas downstream of the dam pose a hazard to persons walking in the area.

SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

a. General - There are no operating facilities at the project, thus there are no operational procedures.

b. Description of Any Warning System in Effect - No warning system is in effect.

4.2 MAINTENANCE PROCEDURES

a. General - The operator inspects the dam site periodically and performs regular maintenance. He checks for and destroys any burrowing animals in the embankment and clears debris out of the spillway intake structure and toe drain outlets. Brush and saplings on the embankment are removed yearly. The grass and vetch on the dam is fertilized, usually once a year, but is not normally mowed.

b. Operating Facilities - There are no operating facilities.

4.3 EVALUATION

The maintenance procedures are good and there is no need for any operational procedures. The maintenance procedures should be formalized, including documentation to provide records for future reference. Remedial maintenance procedures are presented in Section 7.3.

SECTION 5: EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

The Shenipsit Dam watershed is 1.0 square mile of rolling wooded terrain. The dam is presently used as a flood control reservoir and is normally kept empty.

The dam is an earth embankment with a principal conduit spillway and an adjacent depressed earth section which serves as an emergency spillway. It is basically a high surcharge storage - low spillage type project. The available storage reduces the outflow from a Probable Maximum Flood (PMF) of 2300 cubic feet per second (cfs) to 1400 cfs and the ½ PMF outflow from 1150 cfs to 350 cfs.

5.2 DESIGN DATA

The design storm for the project was the storm of August 18-19, 1955 (B-4, B-5). It appears that the dam was designed to retain 2 feet of freeboard with the water level to the design surcharge (B-11, B-13). However, no computations could be found for the original design of the dam. The "as built" copy of the original construction drawings prepared in 1959 by the U.S. Department of Agriculture, Soil Conservation Service, is available for this project.

5.3 EXPERIENCE DATA

The operator reports that the highest upstream water level that he has observed is to about the top of the spillway intake structure.

5.4 VISUAL OBSERVATIONS

It was observed that while the height of the dam is listed as 26 feet on the construction drawings, the actual height to the streambed downstream from the dam is approximately 28.5 feet.

5.5 TEST FLOOD ANALYSIS

Based upon the U.S. Army Corps of Engineers "Preliminary Guidance for Estimating Maximum Probable Discharges" dated March, 1978; the watershed classification (Rolling), and the watershed area of 1.0 square mile, a PMF of 2300 cfs or 2300 cfs per square mile is estimated at the damsite. In accordance with the size (small) and hazard (high) classification, the range of test floods to be considered is from the ½ PMF to the PMF. Based on the degree of hazard associated with a breach of the dam, the test flood for Shenipsit Dam is equivalent to the ½ PMF. The reservoir at the start of the test flood is considered to be empty, at low-level inlet invert elevation 532.0. The peak outflow for the test flood is estimated at 350 cfs and this flow will be accomodated by the principal and emergency spillways with 4.0 feet of freeboard to the top of the dam. Based on hydraulics computations, the spillway capacity to the top of the dam is 4700 cfs which is equivalent to 1300% of the routed test flood outflow (Appendix D-6).

5.6 DAM FAILURE ANALYSIS

The dam failure analysis is based on the April, 1978 Army Corps of Engineers "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs". With the reservoir level at the test flood surcharge elevation, peak outflow before failure of the dam would be about 350 cfs and the peak failure outflow from the dam breaching would total about 21,000 cfs. A breach of the dam would result in a rise in the water level of the stream at the initial impact area, from a depth of 1.9 feet just before the breach to a depth of about 8 feet shortly after the breach. This rapid, 6.1 foot increase in water level will inundate two houses and two other structures by up to 2 feet, causing the loss of more than a few lives as well as substantial economic loss (Appendix D-7). Based on the dam failure analysis, Shenipsit Dam is classified as a high hazard dam (Appendix D-9).

SECTION 6: EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATIONS

The visual inspection verified that the set of as-built drawings is substantially correct. No indications of stability problems were detected during the inspection.

6.2 DESIGN AND CONSTRUCTION DATA

The design drawings of the project depict the embankment as having a top width of 12 feet, a maximum base width of approximately 130 feet, a 3 horizontal to 1 vertical upstream slope and a 2 horizontal to 1 vertical downstream slope.

The foundation conditions of the embankment are not clearly depicted on the design drawings. The original ground surface of the valley which the dam now occupies is shown, as is soil information obtained from test pits dug in January and February of 1959. The soil information indicates that 1 to 3 feet of organic soil was present at the surface of the stream valley. Typically, silty sands were found underlying the organics and a clay layer was observed in one test pit. The test pit logs indicate that the sediments typically grade to gravelly sands at depths of 5 to 7 feet, and that groundwater was encountered at depths of 2 to 7 feet. Although the depth and limit of the foundation excavation is not specified, prior to construction the volume of the excavation was estimated, for bidding purposes, as 3071 cubic yards. The area at the base of the dam is approximately 11,000 square feet, so the average depth of excavation is approximately 7.5 feet. However, since the depth of excavation on the side slopes of the valley is probably much less than 7.5 feet, the depth of excavation near the bottom of the valley is probably in excess of 7.5 feet, which is adequate to remove the unsuitable soils encountered in that area. In addition, the dam toe drain trench is shown to be dug to elevation 521, which appears to be adequate to effectively drain groundwater from the dam foundation.

6.3 POST-CONSTRUCTION CHANGES

The only known post-construction change to the project is the removal of the low-level sluice gate. The gate was removed because it had been repeatedly vandalized and there was no need for a permanent pool. The removal of the gate does not affect the stability of the project.

6.4 SEISMIC STABILITY

The dam is in Seismic Zone 1, and according to U.S. Army Corps of Engineers' Recommended Guidelines, need not be evaluated for seismic stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition - Based upon the visual inspection and past performance, the project is in good condition. No evidence of instability was observed in the project.

Based upon the U.S. Army Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharges" dated March, 1978, the watershed area and classification, and hydraulic/hydrologic computations, peak inflow to the reservoir at test flood is 1150 cfs; peak outflow is 350 cfs, with the dam maintaining a freeboard of 4.0 feet. Based upon hydraulics computations, the spillway capacity to the top of the dam is 4,700 cfs, which is equivalent to 1300% of the routed test flood outflow and more than adequate to handle any conceivable peak flows without overtopping of the dam.

b. Adequacy of Information - The information available is such that an assessment of the condition and stability of the project must be based on a review of existing engineering data, visual inspection, past performance and sound engineering judgement.

c. Urgency - It is recommended that the measures presented in Section 7.2 and 7.3 be implemented within two years of the owner's receipt of this report.

7.2 RECOMMENDATIONS

There are no recommendations.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures - The following measures should be undertaken by the owner within the length of time indicated in Section 7.1.c, and continued on a regular basis:

1. Round-the-clock surveillance should be provided during periods of heavy precipitation or high project discharge. A formal downstream warning system should be developed, to be used in case of emergencies at the dam.

2. A formal program of maintenance procedures should be instituted and fully documented to provide accurate records for future reference.

3. A comprehensive program of inspection by a registered professional engineer qualified in dam inspection should be instituted on a biennial basis.

4. The large holes in the waste areas should be filled with granular soils and compacted.

5. Grassy vegetation should be re-established in the vehicle tracks on the top of the dam.

6. Extermination of burrowing animals and removal of brush from the dam should be continued as part of the routine maintenance procedures at the dam.

7.4 ALTERNATIVES

This study has identified no practical alternatives to the above remedial measures.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Shenipsit Dam

DATE: Aug. 21, 1980

TIME: 9:00 am

WEATHER: Overcast 55°

W.S. ELEV. 532.2 U.S. 528.0 DN.S

PARTY:	INITIALS:	DISCIPLINE:
1. Peter Heynen	PH	Geotechnical
2. Theodore Stevens	TS	Geotechnical
3. Eric Teale	ET	Geotechnical
4. Hector Moreno	HM	Hydraulics
5. Anthony Bella	AB	Hydraulics
6.		

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	All	Good Condition
2.	Principal Spillway	All	Good Condition
3.	Emergency Spillway	All	Good Condition
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT Shenipsit Dam DATE 8/21/80

PROJECT FEATURE Dam Embankment BY PH, TS, ET, HM, AB

AREA EVALUATED		CONDITION
DAM EMBANKMENT		
Crest Elevation		556.2±
Current Pool Elevation		N/A
Maximum Impoundment to Date		538±
Surface Cracks		None observed
Pavement Condition		N/A
Movement or Settlement of Crest		None observed
Lateral Movement		None observed
Vertical Alignment		Appears good
Horizontal Alignment		Appears good
Condition at Abutment and at Concrete Structures		Appears good
Indications of Movement of Structural Items on Slopes		None observed
Trespassing on Slopes		Vehicle tracks on crest
Sloughing or Erosion of Slopes or Abutments		Minor erosion from vehicle tracks
Rock Slope Protection-Riprap Failures		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		Probable high groundwater condition drained by filter drain – Appears to be functioning properly
Toe Drains		
Instrumentation System		

PERIODIC INSPECTION CHECK LIST

PROJECT Shenipsit Dam DATE 8/21/80

PROJECT FEATURE Principal Spillway BY PH, TS, ET, HM, AB

AREA EVALUATED		CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS		
a) Approach Channel		
General Condition		Good
Loose Rock Overhanging Channel		No
Trees Overhanging Channel		No
Floor of Approach Channel		Silty, grassy
b) Weir and Training Walls		
General Condition of Concrete		Good
Rust or Staining		None observed
Spalling		Very minor
Any Visible Reinforcing		No
Any Seepage or Efflorescence		No
Drain Holes		N/A
c) Discharge Channel		
General Condition		Good
Loose Rock Overhanging Channel		No
Trees Overhanging Channel		No
Floor of Channel		Gravel
Other Obstructions		None

PERIODIC INSPECTION CHECK LIST

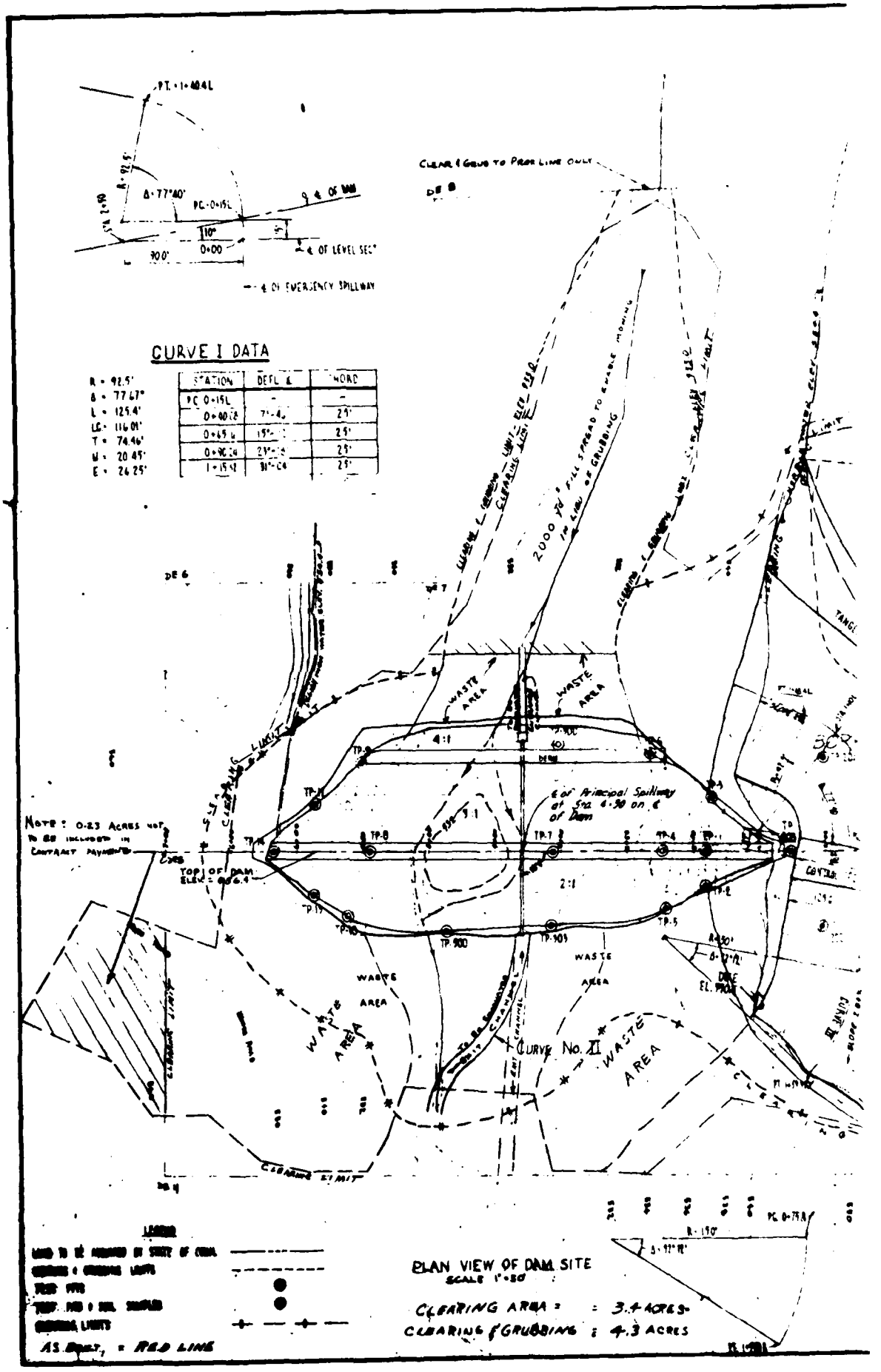
PROJECT Shenipsit Dam DATE 8/21/80

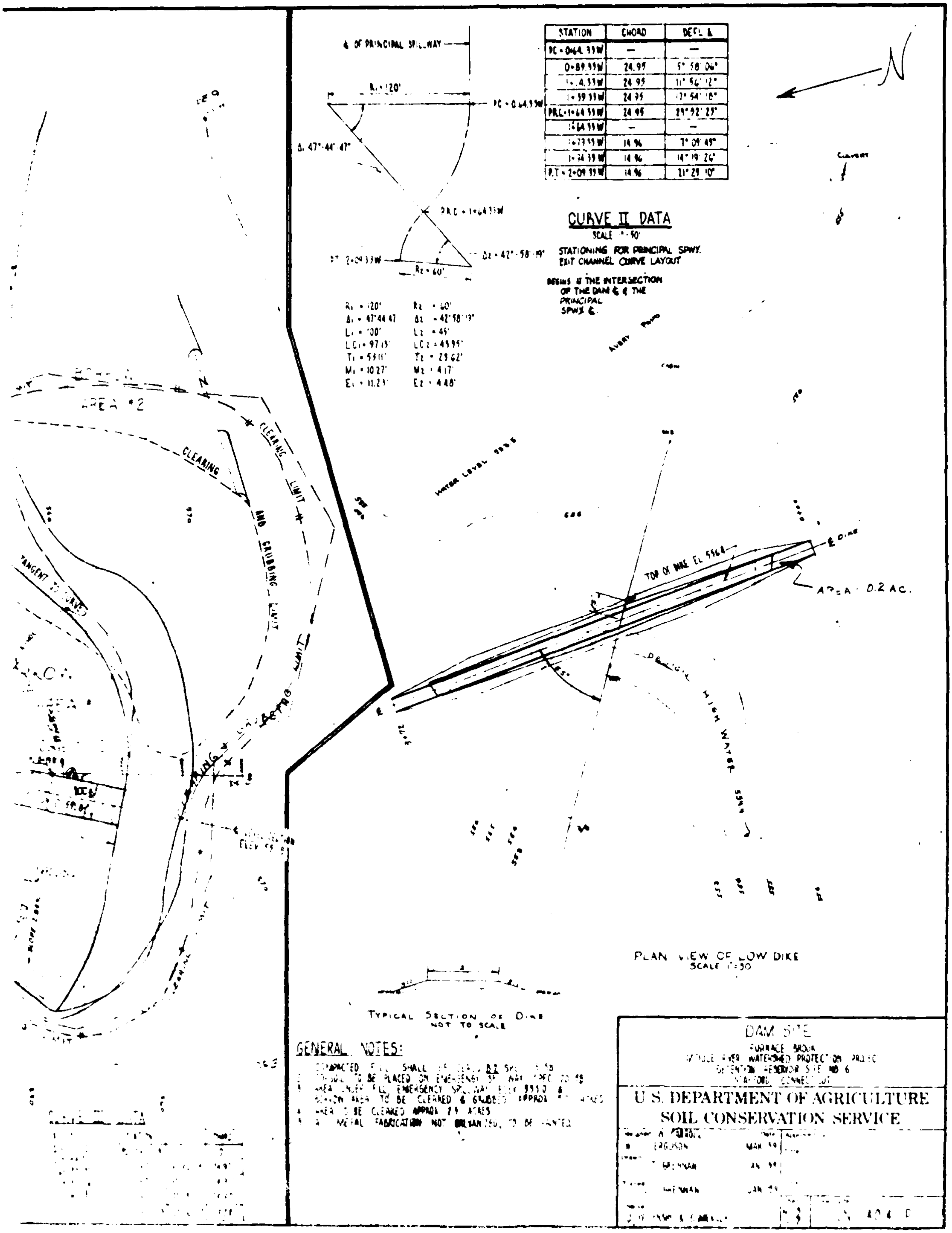
PROJECT FEATURE Emergency Spillway BY ~~EH, TS, ET, HM, AB~~

AREA EVALUATED		CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS		
a) Approach Channel		
General Condition		Good
Loose Rock Overhanging Channel		No
Trees Overhanging Channel		No
Floor of Approach Channel		Grassed
~~b) Weir and Training Walls~~		
~~General Condition of Concrete~~		Spillway channel defined by natural slope to left and low berm to right, which are grassed and in good condition
~~Rust or Staining~~		
~~Spalling~~		
~~Any Visible Reinforcing~~		
~~Any Seepage or Efflorescence~~		
~~Drain Holes~~		
c) Discharge Channel		
General Condition		Good
Loose Rock Overhanging Channel		No
Trees Overhanging Channel		No, but discharges to wooded area
Floor of Channel		Grassed
Other Obstructions		No

APPENDIX B

ENGINEERING DATA AND CORRESPONDENCE


PT. 1+48.4 L
Δ = 77°40'
PC 0+15 L
℄ OF DAM
10'
5'
0+00
90.0'
℄ OF LEVEL SEC.
℄ OF EMERGENCY SPILLWAY
CLEAR & GRUB TO PROP. LINE ONLY
DE 8
DE 6
DE 7
2000 SF FILL STAND TO ENABLE MOVING IN LIEU OF GRUBBING
WASTE AREA
4:1
3:1
2:1
℄ of Principal Spillway Sta 4+50 on ℄ of Dam
TP-8
TP-9
TP-7
TP-6
TP-5
TP-4
TP-3
TP-2
TP-1
TP-10
TP-900
TP-901
TOP OF DAM ELEV. = 866.4
Note : 0.23 Acres not to be included in Contract Payment
Curve No. II
CLEARING LIMIT
TANGENT
R=150'
Δ=12°11'
PC 0+78.8
CURVE I DATA
R = 92.5'
Δ = 77.67°
L = 125.4'
LC = 116.01'
T = 74.46'
M = 20.45'
E = 24.25'
STATION
DEFL Δ
CHORD
PC 0+15L
0+60.28
0+69.4
0+90.24
1+15.4
2.5'
LEGEND
AS BUILT = RED LINE
PLAN VIEW OF DAM SITE
SCALE 1"=50'
CLEARING AREA = 3.4 ACRES
CLEARING & GRUBBING = 4.3 ACRES



STATION	CHORD	DEFL ∠
PC = 0+64.55W	—	—
0+89.55W	24.95	5° 58' 06"
1+14.55W	24.95	11° 56' 12"
1+39.55W	24.95	17° 54' 18"
PRC = 1+64.55W	24.95	23° 52' 23"
1+64.55W	—	—
1+79.55W	14.96	7° 09' 49"
1+94.55W	14.96	14° 19' 26"
P.T = 2+09.55W	14.96	21° 29' 10"

CURVE II DATA

SCALE 1"=50'

STATIONING FOR PRINCIPAL SPWY. EXIT CHANNEL CURVE LAYOUT

BEGINS @ THE INTERSECTION OF THE DAM ℄ & THE PRINCIPAL SPWY ℄.

GENERAL NOTES:

1. COMPACTED FILL SHALL BE CLASS B2 SPEC. [illegible]
2. TOPSOIL TO BE PLACED ON EMERGENCY SPILLWAY SPEC. 20-58
3. AREA UNDER FILL, EMERGENCY SPILLWAY ELEV 555.0 & BORROW AREA TO BE CLEARED & GRUBBED APPROX. [illegible] ACRES
4. AREA TO BE CLEARED APPROX. 2.9 ACRES
5. ALL METAL FABRICATION NOT GALVANIZED TO BE PAINTED

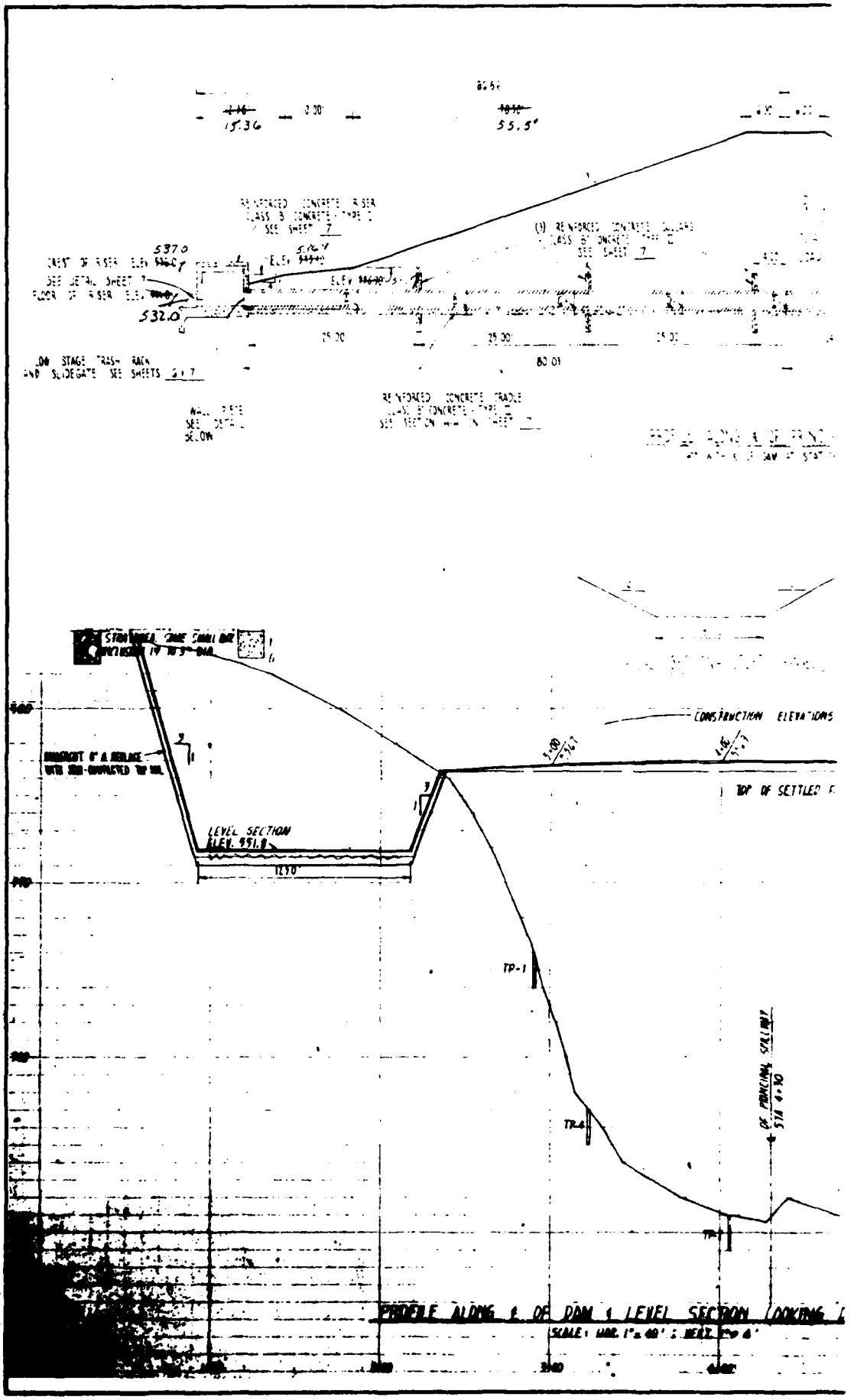
DAM SITE
FURNACE BROOK
[illegible] RIVER WATERSHED PROTECTION PROJECT
DETENTION RESERVOIR SITE NO. 6
STAFFORD, CONNECTICUT

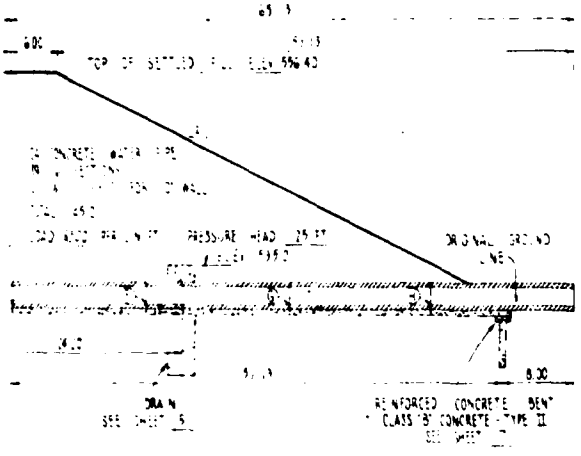
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed A. [illegible]	Date	
ERGUSON	MAR 59	
Drawn [illegible] BRENNAN	JAN 59	
Traced BRENNAN	JAN 59	
[illegible]		[illegible] 404 [illegible]

Sheet B-1

2

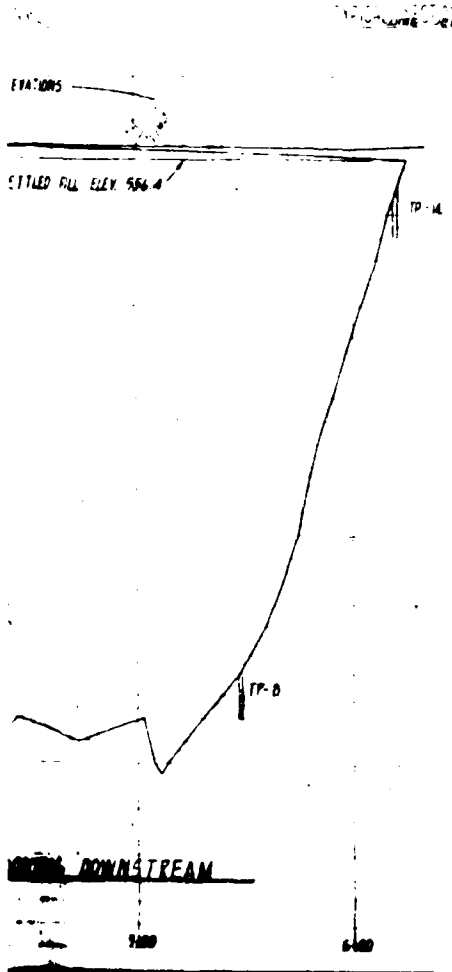

15.36
55.5'
REINFORCED CONCRETE RISER
CLASS B CONCRETE TYPE II
SEE SHEET 7
5370
CREST OF RISER ELEV
SEE DETAIL SHEET 7
FLOOR OF RISER ELEV
532.0
ELEV
25.00
25.00
25.00
80.00
LOW STAGE TRASH RACK
AND SLIDEGATE SEE SHEETS 6 & 7
REINFORCED CONCRETE TRADLE
SEE SECTION
BELOW
CONSTRUCTION ELEVATIONS
TOP OF SETTLED F
LEVEL SECTION
ELEV. 951.0
TP-1
TP-4
TP-7
OF PRINCIPAL SPILLWAY
STA 4+10
PROFILE ALONG ℄ OF DAM & LEVEL SECTION LOOKING
SCALE: HOR. 1"= 40' ; VERT.

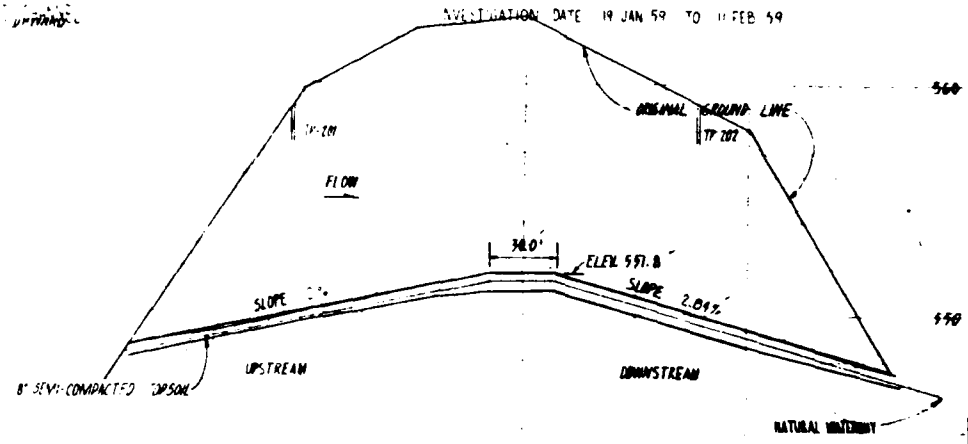


POINT	DISTANCE FROM DISCHARGE END OF 24" PIPE IN FEET	INVERT ELEVATION OF 24" PIPE WITH CAMBER	ADJUSTED ELEV. INVERT 24	AS BUILT ELEV
RISER	145.7	~~531.00~~ 532.0	532.00	532.00
A	128.00	530.99	531.94	531.92
B	112.00	530.99	531.88	531.90
C	96.00	530.98	531.82	531.82
D	80.30	530.97	531.76	531.80
E	64.00 ✓	530.97	531.70	531.73
F	48.00	530.96	531.53	531.97
G	32.00	530.74	531.35	531.41
H	16.00	530.62	531.18	531.11
J	9.33	530.99	531.91	
K	24.33	530.98	531.82	
L	69.33	530.97	531.72	

NOTE ABOVE DIMENSIONS OF LENGTH OF PIPE ARE BASED ON NOMINAL LENGTHS AND DO NOT INCLUDE CREEP

MAXIMUM CAMBER = 0.25' AT POINT E





PROFILE ALONG ℄ OF EMERGENCY SPILLWAY

SCALE : HOR. 1" = 40'
VERT. 1" = 4'

2+00 L 1+00 L 0+00 1+00 R

5+00 6+00 7+00

PROFILES
FURNACE BROOK
MIDDLE RIVER WATERSHED PROTECTION PROJECT
DETENTION RESERVOIR NO. 6
STAFFORD, CONNECTICUT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed W.T. FERGUSON	Date	Approved by	
W.J. CARROLL	MAR. 59	Title	
Drawn			
W.M. MORGAN	MAR. 59		
Traced			
Checked J. WITTMAN & G. MORSE		Sheet No. 4 of	Drawing No. CN-606 P. 4

Sheet B-2

2

SHENIPSIT DAM

EXISTING PLANS

Furnace Brook - Middle River
Watershed Protection Project
Detention Reservoir Site No. 6
Stafford, Connecticut

Designed By:
U.S. Department of Agriculture
Soil Conservation Service

Sheet 1	Cover Sheet
Sheet 2	Dam Site & Pond Area
Sheet 3	Dam Site
Sheet 4	Profiles & Soil Information
Sheet 5	Details of Drain
Sheet 6	Profile Along Center Line of Principal Spillway
Sheet 7	Steel Details

SUMMARY OF DATA AND CORRESPONDENCE

WATERSHED WORK PLAN

FURNACE BROOK - MIDDLE RIVER WATERSHED

Tolland County, Connecticut

Hampden County, Massachusetts

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act. (Public Law 566, 83rd. Congress; 68 Stat. 666 as amended by Public Law 1018, 84th. Congress; 70 Stat. 1088)

Prepared by: Commissioner of Agriculture
State of Connecticut
and the
Hampden County Soil Conservation District
State of Massachusetts

With assistance by:

U.S. Department of Agriculture, Soil Conservation Service

U.S. Department of Agriculture, Forest Service

U.S. Department of Interior, Fish and Wildlife Service

February 1958

SECTION II

WATERSHED WORK PLAN

FURNACE BROOK - MIDDLE RIVER WATERSHED

TOLLAND COUNTY, CONNECTICUT

HAMPDEN COUNTY, MASSACHUSETTS

FEBRUARY 1958

INVESTIGATIONS AND ANALYSES

Hydraulic

Engineering surveys were made to collect information on stream reaches including stream profiles, valley cross sections, channel capacities and other hydraulic characteristics required to route selected storms for present conditions and after structural installations have been completed.

Stage-discharge relations were developed at each valley cross section by use of Mannings formula. The roughness coefficient values "n" used in the computations were determined by the method outlined in NEH-5, Supplement B. Slope "S" values were obtained by using the stream gradient for channel computations and the valley gradient for out of bank flow.

Hydrologic

No weather bureau precipitation stations or gaging stations are found within the watershed. Precipitation data for the watershed dating back to 1923 was compiled from records recorded in U. S. Weather Bureau Climatological Data for seven official rainfall stations that surround and are within 2 to 15 miles of the watershed. Isohyetal maps were developed using the above data to obtain watershed area rainfall for storms selected. Direct runoff estimates were made for annual storm series, taking into account such factors as topography, climate, and soils for present land use and for future land use conditions.

Synthetic hydrographs were developed by the method outlined in the Soil Conservation Service Hydrology Guide. Three one day storms and the August 18 and 19, 1955 multi-day storm were flood routed through the watershed using the storage-indication method of flood routing to determine the runoff-peak discharge relationship for the watershed. Peak stages and time of peak obtained by routing the August 18-19, 1955 multi-day storm checked closely with the reported observations of local residents.

Frequency curves were developed for each damage reach for present and future land conditions.

The planning designs of the proposed retarding structures have been made according to Soil Conservation Service procedures. All preliminary designs were based on field surveys and investigations.

All structures have been planned to retard floodwater runoff of the design storm (August 18-19, 1955) below the emergency spillway height. The storm produced from 6 to 9 inches of runoff from the watershed.

The proposed floodwater retarding structures were individually flood routed for future land use conditions. All structures were then routed as a unit.

Economics

Field investigations made before the actual damage appraisal was begun, revealed that: (1) only scattered and moderate erosion and sediment problems exist at present; (2) no major municipal, industrial, water supply, irrigation or drainage problems exist; (3) floodwater damage from Furnace Brook and Middle River to the Borough of Stafford Springs is the main problem of the watershed and of most concern to the local people; (4) agricultural damage is minor. Agriculture is not a major enterprise in the area; therefore a full scale analysis for damage evaluation on agricultural land was not warranted.

The method used in analyzing average annual damages was the frequency method. The "key" flood used in appraising damages was the storm which occurred August 18-19, 1955. Damage schedules were obtained for all inundated properties and represent only those damages which were estimated to recur. All damages were computed on a 1955 price base and converted to long term projected prices.

Reaches for both economic and hydrologic evaluation were selected for the damaged areas. The method used to evaluate average annual damages and benefits is as found in the Interim Economic Guide.

Indirect damages are estimated to be 25 percent of direct. Factors used in estimating these indirect damages are as follows: (1) travel and shipment of goods and services along the Central Vermont Railroad were suspended for one month. Regular movements of goods and services along the line were not resumed for a three month period; (2) traffic was not allowed through the business section of Stafford Springs for three days followed by a two week period of limited traffic; (3) approximately 1½ years were required to restore two heavily traveled bridges destroyed by floodwater; (4) residents of Stafford Springs were without electrical power for approximately three days.

Land Treatment Measures

Land treatment measures to be applied were based on total needs data obtained at the Soil Conservation Service Work Unit Office for the Tolland County Soil Conservation District. The total needs data were tempered to realistically represent what land treatment measures and quantities could be applied within the installation period of the project. Present land use

for the watershed was obtained from available aerial photos, topographic maps and Land Use Capability Maps. Expected future land use was derived by projecting county trends to the watershed area with revision made by local knowledge of the watershed. Recommended land treatment measures for the forest land were estimated by the U. S. Forest Service in cooperation with the State Forestry Agencies, as shown on pages 8 and 9 in Section I of this plan.

The effects of land treatment measures were evaluated hydrologically for their effect in reducing runoff and hence flood flows. The effects of land treatment measures were estimated before the structure program was evaluated.

Geologic

Of the six (6) proposed floodwater retarding structures, all but Ellithorpe are basically similar in character. All structure sites are located in areas of glacial till or deposits of outwash material. The components of the till range in size from medium sized sands to cobbles and some small boulders. The till and/or outwash material is usually fairly well compacted although the sands of both may often be friable. Occasionally, some deposits of gravel may be seen in the proximity of the sites. There should be no problem in obtaining suitable and adequate fill for any of the structures. Likewise, no problems should arise with regard to satisfactory foundations. Inasmuch as these are not storage reservoirs, the borrow material will be adequate for the construction of detention structures.

The Ellithorpe structure site as proposed on Middle River traverses a broad swamp approximately 3500 feet in width. An intermediate topographic high having a north-south axis provides a medial abutment for the intended structure. The high is approximately 15 to 20 feet above the surrounding swamp area, and has a well sorted, slightly stratified sand extending from the surface to a depth of about 4 to 6 feet. This sand is underlain by coarser sands with some cobbles. The east leg of dam site is immediately north of and closely parallels Diamond Ledge Road. The first 500 feet of the east leg crosses a slope of heterogeneous glacial debris that ranges in size from sand to cobbles. The remaining 600 feet of the east side of the proposed structure site crosses a swamp having an organic zone which averages 2.5 feet in thickness. The centerline of the proposed structure meets and crosses in a southwesterly direction, the topographic high previously mentioned and described. Coming off the high and continuing west another swamp is entered. This swamp has a hemlock cover with numerous boulders scattered on the surface, and contains no appreciable areas of muck. Some isolated areas of muck do exist, but these are not in excess of 3 or 4 feet in depth and should present no problems in construction. The underlying material could not be reliably evaluated because of the abundance of boulders; however it is probably near the surface and should be acceptable. Presumably, the base sediment which will be the foundation for the structure is a fairly well compacted glacial till. The proposed site should prove adequate both for foundation and fill material and no construction problems are immediately forseen.

Preliminary site investigations for Structure No. 5 (Ellithorpe) were in an area approximately 500 feet north of the currently proposed structure. Field investigations of the swamp area to the east and west of the topographic high previously described, revealed extensive deposits of swamp muck; some of which were noticeable peaty in character. Thicknesses of muck up to 20 feet and 23 feet to the east and west respectively were not uncommon. The muck had sufficient lateral continuity to make dam relocation desirable for economic and construction reasons.

The remaining structure sites in the watershed are mainly located in areas overlain by ground moraine. Not uncommon however, are outwash deposits of sand and/or gravel laid down by glacial meltwaters. The structures are located in valleys of gentle to moderate relief. At the Shenipsit Site(Structure No. 6), boulder material is common and associated with intervening shallow pockets of muck. Again, this recurrence of muck is not of sizeable proportions to constitute any problem or obstacle to construction.

At the Bradway Pond Site (Structure No. 4), two structures are contemplated. One, a dike, is at the southern tip of the Devils Hopyard Swamp. The intended dike will cross a shallow, narrow section of swamp where the muck zone is not in excess of three feet. Should, for any reason, the location of the dike be altered, it is recommended that it be moved south, away from the swamp, and not north. Moving north towards the swamps interior, would undoubtedly result in deeper, more extensive zones of muck. The other proposed structure is to the north beyond the Devils Hopyard Swamp at Bradway Pond. The site is at the head of a narrow, moderately steep-sided stream valley, a portion of which is visibly underlain by bedrock. Although not visible at the site, the anticipated depth to bedrock is only a few feet. The bedrock is fractured in a direction peralleling the stream channel.

STRUCTURE INVESTIGATIONS

Middle River and Tributaries

The key to the flood protection program for the Middle River - Furnace Brook Watershed is Middle River which drains about 22,000 acres or two thirds of the watershed. The river valley being relatively broad and swampy, provides considerable natural storage.

The elevation of the crests of the several emergency spillways were determined by routing the hydrograph of the August 1955 storm through the structures.

The sizes of the emergency spillways were planned by routing a design storm of 1.5 times the 6 hour point rainfall using Moisture Condition III through the structures. This size determination for Class "a" and "b" structures is in excess of the minimum criteria as set forth in the Soil Conservation Service Engineering Memorandum No. 3, revised.

The crests of the principal spillways have been planned at the elevation of the maximum required sediment pools. The draw down rates range from 23 csm to 43 csm, producing a dewatering time of from 5 to 9 days.

Determination of the required sediment pool, for a 50 year period, was calculated by the Soil Loss Formula (0.1 ton/ac/yr. yield).

The designed height of the structures will provide storage for a 50 year sediment accumulation, detention storage for a storm equivalent in magnitude to the August 1955 storm, and the required freeboard in excess of the height of design flow through the emergency spillway.

Structure No. 4 (Bradway) - The proposed dam and dike at Bradway Pond are about 2 miles southeast of West Stafford and about 1 mile east of Crystal Lake respectively. Draining 768 acres, the structures will provide 513 acre-feet of detention storage or 3.0 inches of runoff per acre of watershed. There is at present, a 100 acre-foot recreational pond at this site that must be maintained. This pond will provide the required 13 acre-foot sediment pool.

Structure No. 5 (Ellithorpe) - The proposed floodwater retarding structure across Middle River is approximately 3½ miles north of Stafford Springs and has a drainage area of 6,570 acres. The structure will provide 3853 acre-feet of detention storage or 7.0 inches of runoff per acre of watershed.

The major problem at the site of this dam and reservoir is the Central Vermont Railroad which is located in the river valley. Some 13,000 feet of track and at least one bridge will be affected by the reservoir area. Three alternatives were investigated and cost estimates prepared with the assistance of the railroad engineers.

The railroad will be relocated around the reservoir and at an elevation that would clear the dam and storage area. This will require some 15,000 feet of relocation including new rights-of-way and has been estimated at a cost of $338,407 exclusive of dam and appurtenances.

Furnace Brook

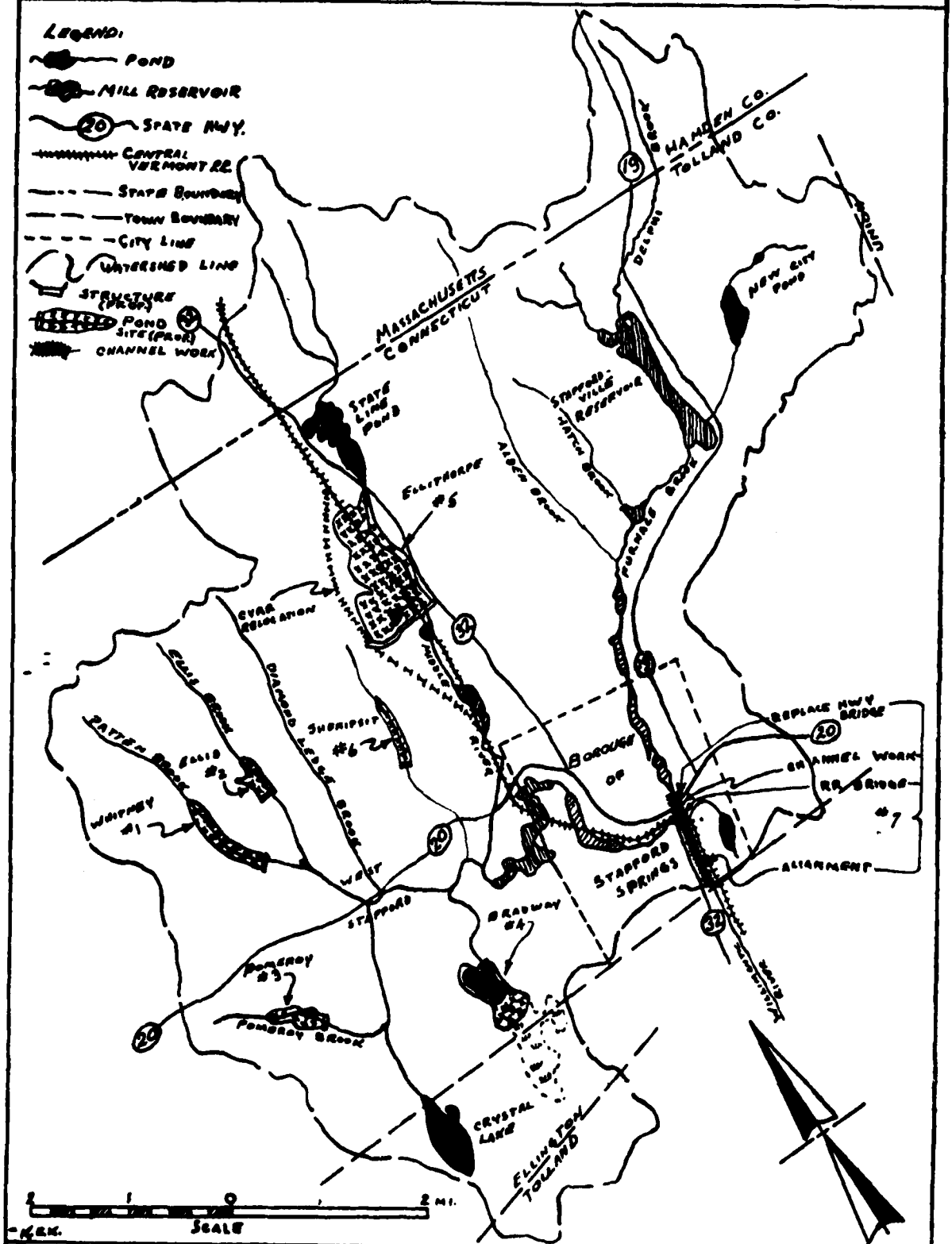
The channel improvement work on Furnace Brook consists of four phases of construction. These are as follows: widening the channel through the Borough of Stafford Springs from the Cyril Johnson Woolen Mill Dam down to the Central Vermont Railroad Bridge; replacement of the Main Street Stone-Arch Bridge; replacement of the main line of the railroad bridge at the B. P. Cooley Mill; and the widening and realignment of the channel from the railroad bridge to a point some 300 feet below the junction of the Brook with Middle River.

Unfeasible Sites

In addition to the six recommended dam sites, 7 sites on Furnace Brook and its tributaries, 3 on Middle River, and 4 on tributaries of Middle River were investigated in varying degrees of detail. These

sites were found unfeasible because they lacked economic justification and/or physical limitations. Through the damage centers, diking and raising the existing stone walls that now line the brook were also considered but deemed impractical.

STRUCTURE LOCATION MAP
MIDDLE RIVER–FURNACE BROOK WATERSHED



REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE	FIGURE NO. 2
U.S.G.S. QUAD. MAPS	SOIL CONSERVATION SERVICE	WATERSHED CN.2
	D.A. WILLIAMS - ADMINISTRATOR	DATE 2-15-58

TABLE 3 - STRUCTURE DATA
FLOODWATER RETARDING STRUCTURES
FURNACE BROOK - MIDDLE RIVER WATERSHED
Tolland County, Connecticut
Hampden County, Massachusetts

ITEM	UNIT	STRUCTURE NUMBER						TOTAL
		1	2	3	4	5	6	
Drainage Area	sq. mi.	2.89	1.52	1.46	1.2	10.3	1.02	18.39
Storage Capacity								
Sediment	ac. ft.	27.0	13.5	13.0	13.0	40.0	4.0	110.50
Flood detention	ac. ft.	1140.0	640.0	498.0	513.0	3853.0	366.0	7010.0
Total	ac. ft.	1167.0	653.5	511.0	526.0	3893.0	370.0	7120.5
Surface Area								
Sediment Storage	ac.	8.97	4.2	3.9	4.0	36.5	3.2	62.77
Floodwater detention storage	ac.	87.3	49.5	43.0	106.1	367.0	44.7	697.6
Maximum Height of Dam	ft.	47	38	36	29	27	25	
Volume of Fill	cu. yds.	76,572	35,665	34,189	13,056	159,560	17,077	336,119
Emergency Spillway								
Type		vegetative	vegetative	vegetative	vegetative	vegetative	vegetative	
Frequency of use	years	100	100	100	100	100	100	
Design storm rainfall								
Duration	hours	6	6	6	6	6	6	
Total (1.5 x Pmod.)	inches	13.8	14.2	14.3	14.2	13.2	14.3	
Bottom width	ft.	200	200	200	200	2-200*	200	
Design depth	ft.	2.6	2.0	2.0	1.2	2.5	1.7	
Design capacity	c.f.s.	2243	1510	1510	702	4222	313	
Freeboard	ft.	2.4	2.0	2.0	3.8	1.5	2.3	
Total capacity	c.f.s.	5970	4272	4272	5970	8544	4272	
Principal Spillway Capacity	c.f.s.	121.5	33.7	30.3	44.9	306.0	39.4	
Capacity Equivalents								
Sediment Volume	inches	0.175	0.166	0.166	0.203	0.072	0.072	
Detention Volume	inches/ac	7.4	7.9	6.4	8.0	7.0	6.7	
Spillway Storage	inches	3.22	2.65	2.47	10.81	2.8	3.63	
Class of Structure **		b	a	a	a	c	a	

* Two spillways of the same size are planned.
** All structures meet class "c" criteria (see page 20)

February 1956

FORM D-4

STATE OF CONNECTICUT
WATER RESOURCES COMMISSION
Room 317, State Office Building
Hartford, Connecticut

APPLICATION FOR CONSTRUCTION PERMIT FOR DAM

Owner State of Connecticut Date July 20, 1959

P. O. Address State Dept. of Agriculture
State Office Bldg., Htfd., Conn. Tel. No. JA 7-6341 Ext. 435

Location of Structure:

Town Stafford, Conn. Shown on USGS Quadrangle Stafford Springs, Conn.
Thompson, Massachusetts

Name of Stream Shenipsit Brook-Site #6 at _____ inches south / north of Lat. _____
and _____ inches east / west of Long. _____

Directions for reaching site from nearest village or route intersection:
(see sketch on reverse side)

Orcuttville - Becker Road - Stafford

This is an application for: X (New Construction) (Alteration) (Repair) (Removal)
(check one or more of above)

This pond is to be used for: Flood Control

Dimensions of Pond: width _____ length _____ area _____

Maximum depth of water immediately above dam: _____

Total length of dam: _____

Length of spillway: SEE PLANS

Height of abutments above spillway: _____

Type of spillway construction: _____

Type of dike construction: _____

Spillway section will be set on: (Bedrock) (Gravel) (Clay) (Till)
(check one of above)

Remarks: _____

Signed: Joseph N. Gill
Joseph N. Gill, Commissioner, Dept. of Agriculture

Name of Engineer, if any s/ U.S. U.S.D.A.

Note: Show details of construction on reverse side.

JOHN J. MOZZOCHI AND ASSOCIATES
CONSULTING ENGINEERS

JOHN J. MOZZOCHI
ASSOCIATES
OWEN J. WHITE
JOHN LUCHS, JR.

217 HEBRON AVENUE
GLASTONBURY, CONN.
PHONE MEDFORD 3-9401

August 10, 1959

William S. Wise - Director
State Water Resources Commission
State Office Building
Hartford 15, Connecticut

CODE No. W 25.3 M 2.0 S 0.8

Re: Our File 57-73-19-6
Stafford Springs
Detention Reservoirs
Site No6-Shenipsit

Dear Mr. Wise:

In accordance with your authorization dated August 28, 1958, I have reviewed the design of the referenced project submitted for approval by The State Department of Agriculture.

Design criteria established in letter dated April 30, 1959 from Charles J. Pelletier, Hydraulic Engineer, are tabulated herewith for comparison with actual design data.

	Design Data	Criteria
Drainage Area	1.02 sq. mi	
Design Storm	15" in 6 hrs.	15" in 6 hrs.
Total Retention	1.5"	1.5"
Net Run-off	13.5"	13.5"
Design Peak	2210 cfs	
Per sq. mile	2185 cfs.	
Drawdown Time	4.0 days	0-5 days
Earth Spillway Discharge	1210 cfs	
Earth Spillway Width	125'	
Dc at Control Section	1.43'	
Vc at Control Section	6.8 fps	9 fps
Velocity in Exit Channel	7.3 fps	9 fps
Freeboard	2.0'	2.0 min

All of the design data computations have been checked and we find them to be substantially correct. As shown in the above listing the design meets the criteria established in all instances.

We have discussed with the S.C.S. engineers the need of revising the emergency spillway design to eliminate objectional constrictions at both the inlet and outlet ends. They have agreed to make these revisions on their plans prior to releasing them for contract bidding.

I therefore recommend that a construction permit be issued for this project with the proviso, (1) that the curved inlet to the emergency spillway be straigntened to provide a more direct entrance and (2) the outlet of the emergency spillway be constructed with a continuing uniform width of 125 feet to a point where the direction of flow at the grade point is at right angles to the contour lines.

We are retaining the copy of the design report, plans and specifications for future reference.

Very truly yours,

John J. Mozzochi and Associates
Consulting Engineers

JJM:hk

STATE OF CONNECTICUT
WATER RESOURCES COMMISSION
Room 317, State Office Building
Hartford, Connecticut

CONSTRUCTION PERMIT FOR DAM

Date: September 18, 1959

To: State of Connecticut
Department of Agriculture
State Office Building
Hartford, Connecticut

Gentlemen: Attention: Mr. Joseph N. Gill, Commissioner

Your application for Construction Permit dated July 20, 1959 for the construction of an earth dam on Shenipsit Brook in the Town of Stafford in accordance with plans and specifications marked CT404 and prepared by the Soil Conservation Service, U. S. Department of Agriculture,

copy of which is attached hereto, has been considered and the construction described therein is hereby approved only under the following conditions:

1. The Commission shall be notified

   A) When construction is started
   B) When foundation is excavated
   C) When the dam is completed and before water is impounded
   D) When project is completed and ready for final inspection

2. That the curved inlet to the emergency spillway be straightened to provide a more direct entrance.

3. That the outlet of the emergency spillway be constructed with a continuing uniform width of 125 feet to a point where the direction of flow at the grade point is at right angles to the contour lines.

This permit, with the attached application form and other enclosures, must be kept at the site of the work and made available to the Commission at any time during the construction. This permit covers the construction as described in the attached documents. If any changes are contemplated the Commission must be notified and supplementary approval obtained.

-1-
CONTINUED

If the construction authorized by this construction permit is not started within two years of the date of this permit and completed within four years of the same date this permit must be renewed.

Your attention is directed to Section 25-115 of the 1958 Revision to the General Statutes - Liability of owner or operator. Nothing in this chapter, and no order, approval or advice of the commission or a member thereof, shall relieve any owner or opertor of such a structure from his legal duties, obligations and liabilities resulting from such ownership or operation. No action for damages sustained through the partial or total failure of any structure or its maintenance shall be brought or maintained against the state, a member of the commission or the commission, or its employees or agents, by reason of supervision of such structure exercised by the commission under this chapter.

The Commission cannot convey or waive any property right in any lands of the state, nor is this permit to be construed as giving any property rights in real estate or material or any exclusive privileges, nor does it authorize any injury to private property or the invasion of private rights or any infringement of federal, state or local laws or regulations.

Your attention is also directed to Section 26-134 of the 1958 Revision to the General Statutes - Obstructing streams. No person shall, unless authorized by the director, prevent the passing of fish in any stream or through the outlet or inlet of any pond or stream by means of any rack, screen, weir or other obstruction or fail, within ten days after service upon him of a copy of an order issued by the director, to remove such obstruct, - - - - -The address of the State Board of Fisheries and Game is 2 Wethersfield Avenue, Hartford 15, Connecticut.

Very truly yours,

By:_____
William S. Wise
Director

WSW/jt
Enclosures
cc: Mr. Renato A. Pellizari, Town Clerk in Stafford
Mr. Sam Smith, Soil Conservation Service
Mr. John J. Mossochi, Consulting Engineer

JOHN J. MOZZOCHI AND ASSOCIATES
CIVIL ENGINEERS

GLASTONBURY, CONN.
317 HEBRON AVENUE
PHONE MEDFORD 3-9401

PROVIDENCE 3, R. I.
200 DYER STREET
PHONE GASPEE 1-0420

JOHN J. MOZZOCHI
ASSOCIATES
OWEN J. WHITE
JOHN LUCHS, JR.
ECTOR L. GIOVANNINI

September 2, 1960

REPLY TO:
Our File 57-73-19

William S. Wise - Director
Water Resources Commission
State Office Building
Hartford 15, Connecticut

Re: Stafford Spring Detention Reservoirs
Sites No. 2 & No. 6

Dear Mr. Wise:

On Thursday August 25th, a final inspection was made of site No. 2, Ellis, and Site No. 6, Shenipsit, detention reservoirs in Stafford Springs.

Both of the sites are completed except for the seeding operations which I understand are to be performed by State Highway Department forces.

Except for minor hand work in fine grading the loam in the emergency spillway at Site No. 6, I found both sites acceptable in all details.

I recommend that the final permit be withheld until a good stand of grass is obtained on each site in conformance with the usual requirements of the Board.

Very truly yours,

John J. Mozzochi J.J.

John J. Mozzochi and Associates
Consulting Engineers

JJM;hk

JOHN J. MOZZOCHI AND ASSOCIATES
CIVIL ENGINEERS

GLASTONBURY, CONN.
317 NEBRON AVENUE
PHONE MEDford 3-8401

PROVIDENCE 3, R. I.
800 DYER STREET
PHONE GAspee 1-0420

JOHN J. MOZZOCHI
ASSOCIATES
OWEN J. WHITE
JOHN LUCIBI, JR.
ECTOR L. GIOVANNINI

REPLY TO: Glastonbury

October 23, 1961

William S Wise-Director
Water Resources Commission
State Office Building
Hartford 15, Connecticut

Re: Our File No. 57-73-19
Stafford Springs
Flood Detention Reservoirs

Dear Mr. Wise:

On October 20th, I made a final inspection of the four completed flood detention reservoirs which have been constructed by the Department of Agriculture and Natural Resources in Stafford Springs and for which semi-final approval has already been given. This final inspection was to see the results of the seeding operations which had not been accomplished at the time the semi-final approvals had been given.

The four structures are:

Site No. 2 -- Ellis, Semi-Final Approval September 2, 1960.
Site No. 3 -- Pomeroy, Semi-Final Approval November 7, 1960.
Site No. 4 -- Bradway, Semi-Final Approval July 3, 1961.
Site No. 6 -- Shenipsit, Semi-Final Approval September 2, 1960.

In all four locations the grass cover was found acceptable.

I recommend that Final Permits be issued for these structures.

Approved 11-6-61

Very truly yours,

John J. Mozzochi

John J. Mozzochi and Associates
Civil Engineers

JJM:hk

FORM D-7

STATE OF CONNECTICUT
WATER RESOURCES COMMISSION
Room 317, State Office Building
Hartford, Connecticut

CERTIFICATE OF APPROVAL

Date November 9, 1961

To: State of Connecticut
Department of Agriculture and
Natural Resources
State Office Building
Hartford, Connecticut

ATTENTION: MR. JOSEPH M. GILL,
COMMISSIONER

NAME OF STRUCTURE: Shenipsit Brook Dam, Site #6

This is to certify that the following construction work:
the construction of an earth dam in accordance with plans and specifications marked CT-404 and prepared by the Soil Conservation Service, U. S. Department of Agriculture

on your property on Shenipsit Brook

in the Town (s) of Stafford

for which construction permit was issued September 13, 1959, has been completed to the satisfaction of this Commission and that such structure is approved as of date of this Certificate.

cc:Soil Conservation
Service

WATER RESOURCES COMMISSION

BY: William S. Wise
William S. Wise, Director

Note: The owner is required by law to record this Certificate in the land records of the town or towns in which the dam, dike or similar structure is located.

NETSC TEMPORARY FORM
6-13-75

INFORMATION STORAGE AND RETRIEVAL - DAMS PLANNED AND CONSTRUCTED BY SCS

CT-6
SITE ID NO.

IDENTIFICATION AND LOCATION

1. FBMR - 6
STRUCTURE DESIGNATION (NAME OR NUMBER)
2. Willimantic - Thames
RIVER BASIN (NAME)
3. Furnace Brook - Middle River
WATERSHED (NAME OR UNNAMED)
4. Connecticut
STATE (NAME)
5. Tolland
COUNTY (NAME)
6. — STAFFORD
TOWNSHIP (NAME)
7. 2
CONGRESSIONAL DISTRICT (NUMBER)
8. Eastern Highlands
PHYSIOGRAPHIC AREA 1/ (NAME)
9. WP
AUTHORIZATION (WP, FP, RC&D, CO-OP, PILOT)
10. 41° 58' 38"
LATITUDE (DEGREES, MINUTES, SECONDS)
11. 72° 20' 05"
LONGITUDE (DEGREES, MINUTES, SECONDS)
12. 556.4
ELEVATION OF TOP OF DAM (SETTLED FILL-FEET MSL)
13. DATE PLAN APPROVED 1958
14. DATE OF MOST RECENT SUPPLEMENT ---1965
(LEAVE BLANK IF NOT SUPPLEMENTED)
15. DATE CONSTRUCTION COMPLETED 1960
(LEAVE BLANK IF NOT COMPLETED)
16. TYPE OF DAM (CIRCLE APPLICABLE) -
(EARTH) ROCK, CONCRETE, OTHER
17. PLANNED PURPOSES (CIRCLE ALL APPLICABLE) -
(FLOOD PREVENTION) RECREATION, FISH & WILDLIFE, MUNICIPAL AND INDUSTRIAL WATER SUPPLY, IRRIGATION, NAVIGATION, HYDRO-ELECTRIC, SEDIMENT CONTROL, LOW FLOW AUGMENTATION, OTHER
18. HAZARD CLASS (A, B, OR C) C
19. EARTHQUAKE ZONE 2/ (0, 1, 2, 3, or 4) 1

SIZE AND CAPACITY

20. DRAINAGE AREA UNCONTROLLED 653 AC.
(UPSTREAM FROM STRUCTURE)
21. DRAINAGE AREA CONTROLLED 0 AC.
(UPSTREAM FROM STRUCTURE)
22. MAXIMUM FILL HEIGHT 26 FT.
(FROM LOW POINT ON CENTERLINE, BEFORE EXCAVATING, TO TOP OF SETTLED FILL.)
23. CREST LENGTH OF DAM (ALONG CENTERLINE) 400 FT.
24. VOLUME OF FILL 23,642 CU. YD.
25. SUBMERGED SEDIMENT STORAGE ~~0~~ 0.9 AC. FT.
26. AERATED SEDIMENT STORAGE 0.1 AC. FT.
27. MUNICIPAL AND INDUSTRIAL WATER STORAGE ---- AC. FT.
28. RECREATION WATER STORAGE ---- AC. FT.
29. FISH AND WILDLIFE STORAGE ---- AC. FT.
30. IRRIGATION STORAGE ---- AC. FT.
31. OTHER BENEFICIAL STORAGE ---- AC. FT.
32. TOTAL FLOOD STORAGE 343 AC. FT.
33. TEMPORARY EMERGENCY SPILLWAY STORAGE (BETWEEN CREST OF LOWEST EMERGENCY SPILLWAY AND TOP OF SETTLED FILL)
197 AC. FT.
34. SURFACE AREA OF NORMAL POOL --- AC.
35. LENGTH OF SHORE LINE OF NORMAL POOL --- MILES
36. MAXIMUM DEPTH OF NORMAL POOL --- FT.

PRINCIPAL SPILLWAY FEATURES

37. PRINCIPAL SPILLWAY TYPE (CIRCLE APPLICABLE) -
(PIPE) MONOLITHIC, OPEN CONCRETE STRUCTURE, OTHER
38. IS THERE COLD WATER RELEASE FACILITY? No
39. NUMBER OF STAGES 1 (1 or 2)
40. LOW STAGE CAPACITY 0 CFS
(AT HIGH STAGE PRINCIPAL SPILLWAY CREST)
41. PRINCIPAL SPILLWAY CAPACITY 40 CFS
(AT LOWEST EMERGENCY SPILLWAY CREST)

PRINCIPAL SPILLWAY CONDUIT FEATURES

42. MAJOR PORTION OF CONDUIT IS ON (CIRCLE APPLICABLE) -
ROCK OR (EARTH)
43. TYPE OF ENERGY DISSIPATOR (CIRCLE APPLICABLE) -
IMPACT BASIN, SAF, PLUNGE POOL, (NONE) OTHER
44. CONDUIT SIZE 2.0
(LARGEST CONDUIT THROUGH DAM) (DIAM. IN FT. IF ROUND) (HEIGHT AND WIDTH IN FT. IF MONOLITHIC) ALSO SHOW NUMBER OF BARRELS IF MULTI-BARREL
45. INLET TYPE (CIRCLE APPLICABLE) - (CONCRETE) OPEN TOP, (COVERED TOP) HOOD INLET, METAL-OPEN TOP, OTHER
46. HEIGHT OF RISER 6.5 FT.
(FROM TOP OF FLOOR TO TOP OF ANTI-VORTEX)

EMERGENCY SPILLWAY FEATURES

47. PRIMARY EMERGENCY SPILLWAY TYPE (CIRCLE APPLICABLE)
CLOSED CONDUIT, OPEN CONCRETE STRUCTURE, EARTH, (VEGETATED) SOFT ROCK, HARD ROCK 3/
48. PRIMARY EMERGENCY SPILLWAY WIDTH 125 FT.
(CREST LENGTH FOR CONCRETE)
49. 1 %
PERCENT CHANCE OF USE OF PRIMARY EMERGENCY SPILLWAY

1/ N. M. Fenneman, 1938, Physiography of Eastern United States, McGraw Hill Book Co., New York, N. Y.

2/ See TSC Technical Note - Engineering UD-22.

3/ Soft Rock - Rock that will erode when subjected to flowing water.
Hard Rock - Rock that is resistant to erosion due to flowing water.

EMERGENCY SPILLWAY FEATURES (CONT'D.)

50. 4,300 CFS
CAPACITY OF PRIMARY EMERGENCY SPILLWAY (WHEN POOL IS AT TOP OF DAM)

51. 4.6 FT.
DIFFERENCE IN ELEVATION BETWEEN CREST OF PRIMARY EMERGENCY SPILLWAY AND TOP OF DAM

52. SECONDARY EMERGENCY SPILLWAY IS (CIRCLE APPLICABLE)
(NONE) EARTH, VEGETATED, SOFT ROCK, HARD ROCK 3/

53. WIDTH OF SECONDARY EMERGENCY SPILLWAY --- FT.

54. CAPACITY OF SECONDARY EMERGENCY SPILLWAY (WHEN POOL IS AT TOP OF DAM) --- CFS

55. --- FT.
DIFFERENCE IN ELEVATION BETWEEN CREST OF SECONDARY EMERGENCY SPILLWAY AND TOP OF DAM

OMIT ITEMS 56-59 IF DRAINAGE AREA IS LESS THAN 10 SQUARE MILES

56. BULK LENGTH OF SOFT ROCK 3/ EARTH OR VEGETATED SPILLWAY (SEE TR-52 FOR DEFINITION) --- FT.

57. ---
PI OF SURFACE MATERIAL IN EARTH OR VEGETATED SPILLWAY (PREDOMINANT MATERIAL AT OR NEAR SURFACE BEFORE TOP SOILING)

58. ---
USCS CLASSIFICATION OF ABOVE MATERIAL

59. ---- AC. FT.
VOLUME OF OUTFLOW THROUGH VEGETATED OR EARTH SPILLWAY (DURING PASSAGE OF FREEBOARD HYDROGRAPH)

COST DATA

WORK PLAN

60. LAND RIGHTS COST $ 1,588

61. FEDERAL SHARE OF LAND RIGHTS COST $ ----

62. CONSTRUCTION COST $ 29,271
(DOES NOT INCLUDE LAND RIGHTS, ENGINEERING AND PROJECT ADMINISTRATION)

63. FEDERAL SHARE OF CONSTRUCTION COST IN PERCENT 100 %

COMPLETED STRUCTURE

64. FINAL CONSTRUCTION COST $ 35,614

ADDITIONAL DATA REQUIRED FOR U.S. REGISTER OF DAMS (LEAVE BLANK FOR DAMS LESS THAN 33 FT. IN HEIGHT) 26' Hgt.

65. Shenipsit
POPULAR NAME OF DAM

66. ---
NAME OF RESERVOIR

67. NEAREST CITY OR TOWN Stafford Springs

68. TYPE OF DAM IF CONCRETE (CIRCLE APPLICABLE)
BUTTRESS, ARCH, MULTI-ARCH

69. IS DISCHARGE THROUGH PRINCIPAL SPILLWAY CONTROLLED BY GATES? No

70. ESTIMATED COMPLETION DATE --- (IF UNDER CONSTRUCTION)

71. OWNER State of Connecticut

72. ENGINEERING BY SCS

73. CONSTRUCTION BY Frank Shields (CONSTRUCTION CONTRACTOR)

74. ABOVE DATA FURNISHED BY J. E. Polulech (NAME)

75. DATE DATA FURNISHED 10/75

76. REMARKS

3/ Soft Rock - Rock that will erode when subjected to flowing water.
Hard Rock - Rock that is resistant to erosion due to flowing water.

APPENDIX C

DETAIL PHOTOGRAPHS

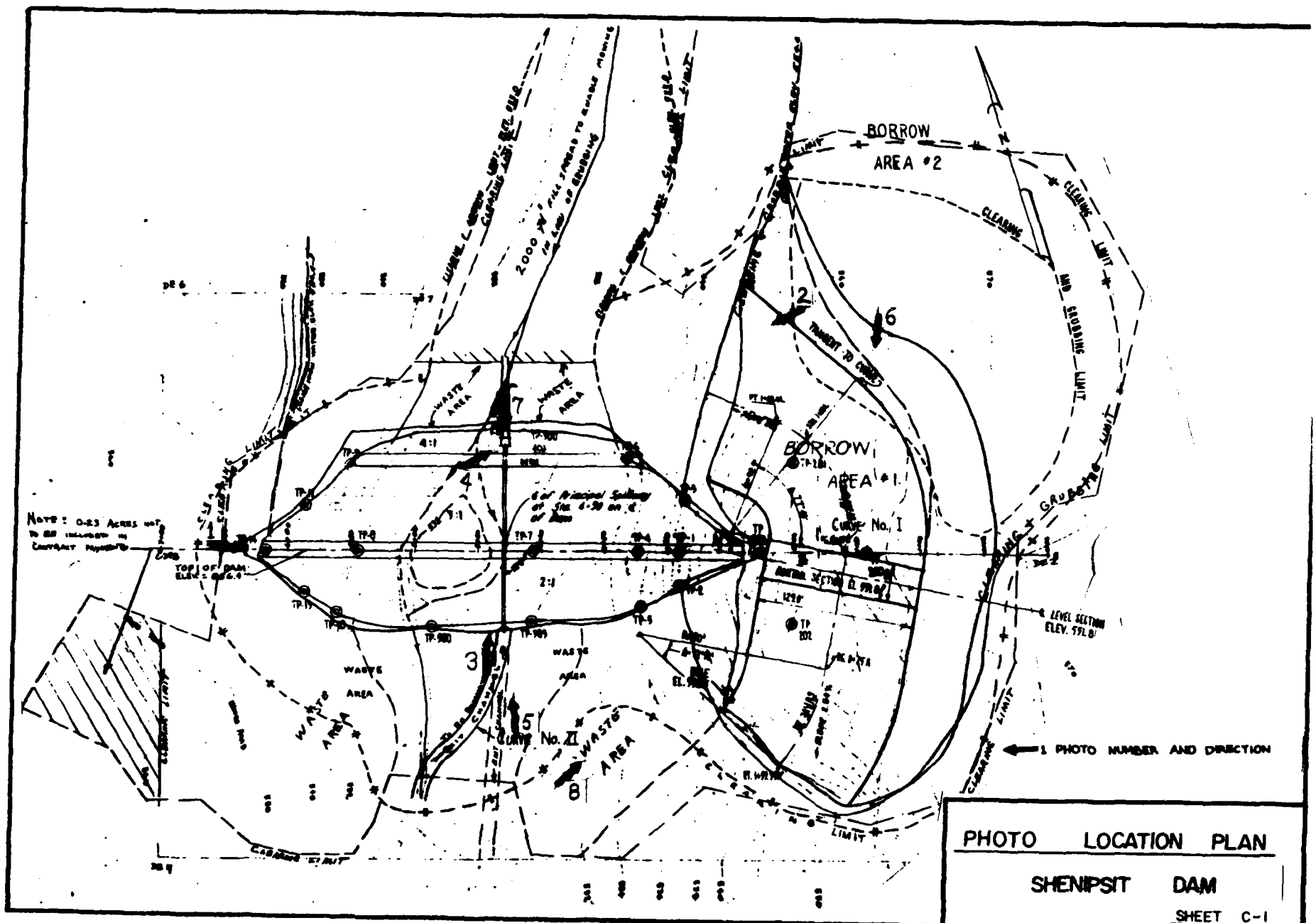

BORROW
AREA #2
BORROW
AREA #1
WASTE
AREA
WASTE
AREA
WASTE
AREA
WASTE
AREA
Curve No. I
Curve No. II
TOP OF DAM
ELEV. 599.0
1 PHOTO NUMBER AND DIRECTION
PHOTO LOCATION PLAN
SHENIPSIT DAM
SHEET C-1

Photo 1 - Top of dam viewed from right end. Truck is parked in emergency spillway approach channel (8/21/80).

Photo 2 - Upstream slope of dam (8/21/80).

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	NATIONAL PROGRAM OF	Shenipsit Dam Tr - Middle River Stafford, CT
CAHN ENGINEERS INC. WALLINGFORD, CONN ENGINEER	INSPECTION OF NON-FED. DAMS	CE# 27 785 KC DATE Sept. '80 PAGE C-1

Photo 3 - Right toe drain discharge pipe (8/21/80).

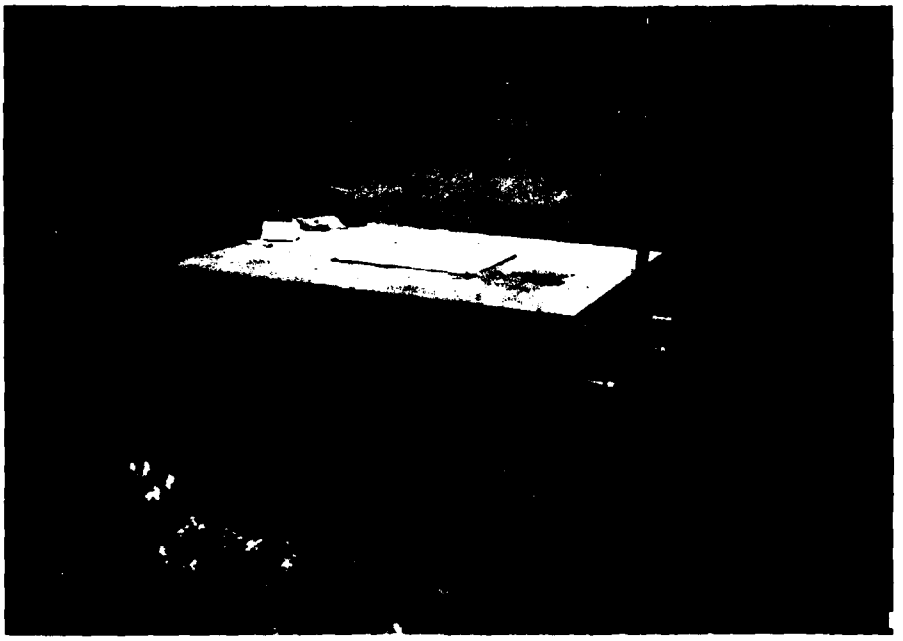


Photo 4 - Principal spillway intake structure (8/21/80).

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	NATIONAL PROGRAM OF	Shenipsit Dam Tr - Middle River Stafford, CT
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	CE # 27 785 KC DATE Sept. '80 PAGE C-2

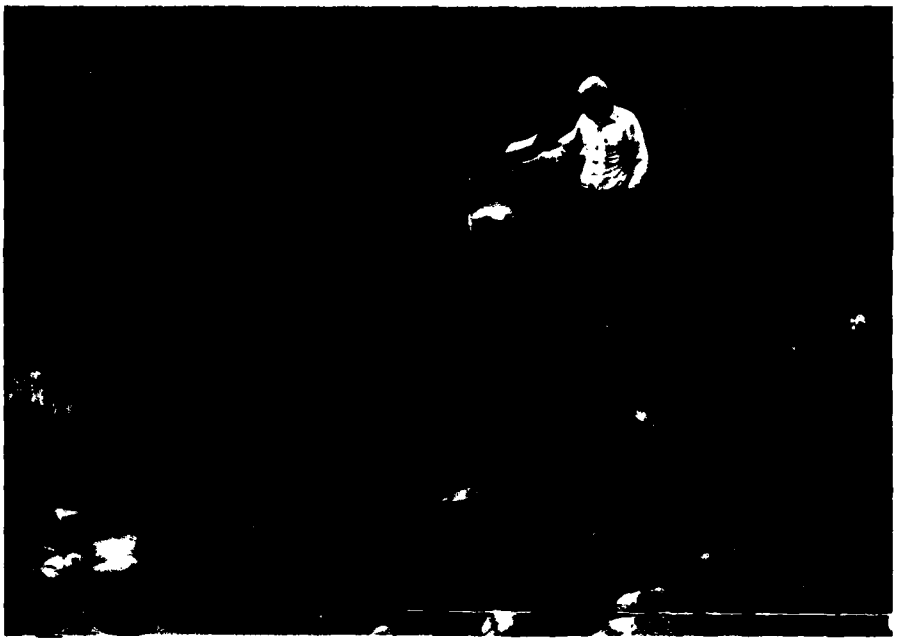


Photo 5 - 24" RCP principal spillway conduit and toe drain outlets to either side (8/21/80).

Photo 6 - Emergency spillway channel, looking downstream (8/21/80).

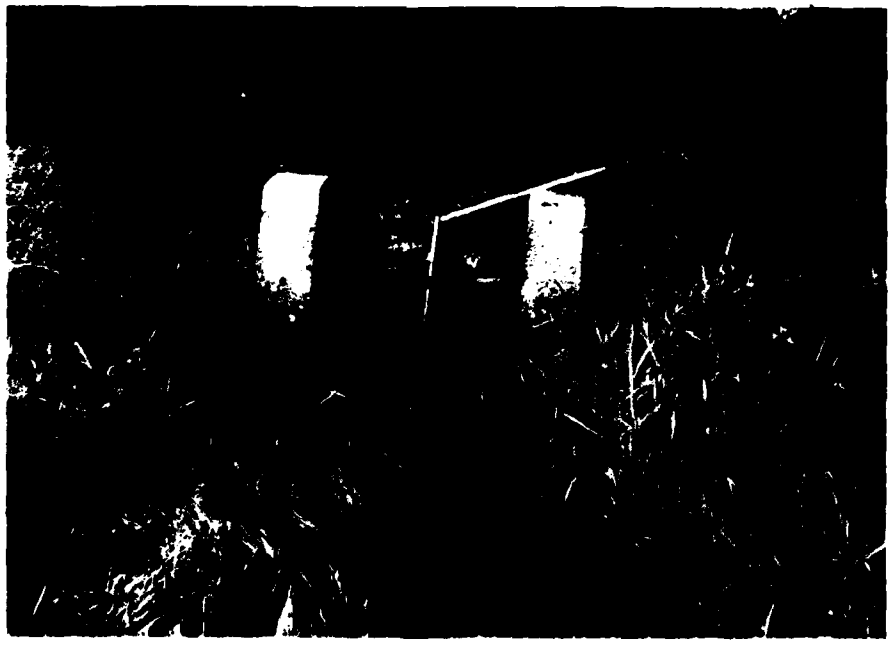
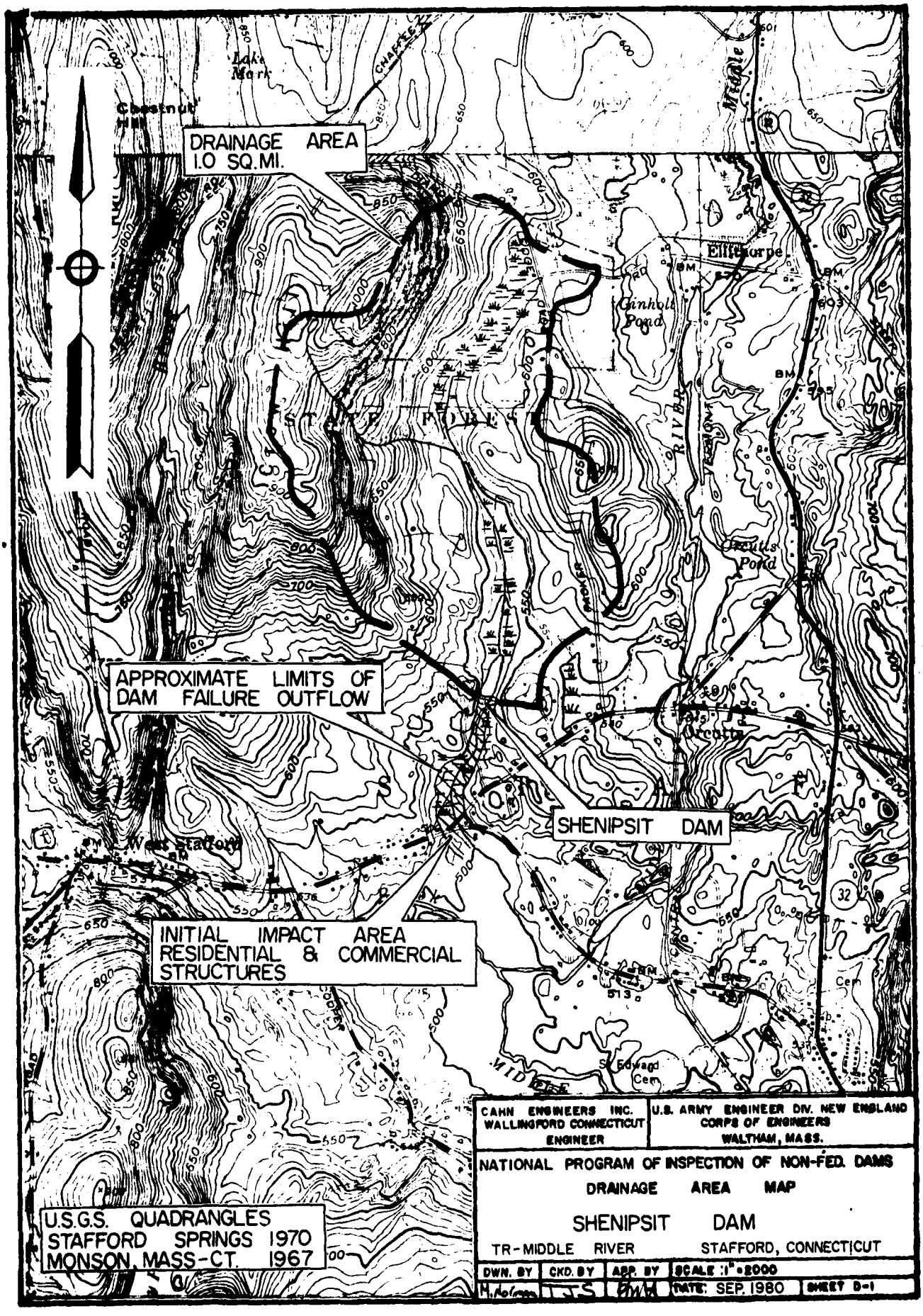


Photo 7 - 12" opening in upstream face of principal spillway intake structure (8/21/80).

Photo 8 - Large hole in surface of "waste area" (8/21/80).

APPENDIX D

HYDRAULICS/HYDROLOGIC COMPUTATIONS


DRAINAGE AREA
1.0 SQ.MI.
APPROXIMATE LIMITS OF
DAM FAILURE OUTFLOW
SHENIPSIT DAM
INITIAL IMPACT AREA
RESIDENTIAL & COMMERCIAL
STRUCTURES
U.S.G.S. QUADRANGLES
STAFFORD SPRINGS 1970
MONSON, MASS-CT. 1967
Lake Mark
Chestnut Hill
Ellithorpe
Ganholt Pond
Orcutts Pond
West Stafford
St Edward Cem
CAHN ENGINEERS INC.
WALLINGFORD CONNECTICUT
ENGINEER
U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
DRAINAGE AREA MAP
SHENIPSIT DAM
TR-MIDDLE RIVER
STAFFORD, CONNECTICUT
DWN. BY
CKD. BY
APP. BY
SCALE 1" = 2000
DATE: SEP. 1980
SHEET D-1

HYDROLOGIC / HYDRAULIC INSPECTION

SHENIPSIT DAM, STAFFORD, CT.

I) PERFORMANCE AT PEAK FLOOD CONDITIONS:

1) PROBABLE MAXIMUM FLOOD (PMF)

a) WATERSHED CLASSIFIED AS "ROLLING"

b) WATERSHED AREA: D.A. $\simeq$ 1.0 sq mi

NOTE: D.A. FROM SCS "AS BUILT" DRAWINGS NO. CN-404 P, SHEET N°1 OF 7 (DA = 653 AC.). CONN. DEP BULLETIN N°1, 1972 (GAZETTEER OF NATURAL DRAINAGE AREAS) P.3 GIVE D.A. = 0.87 sq mi. - USE SCS VALUE: DA $\simeq$ 1.0 sq mi

c) PEAK FLOODS (FROM NED-ACE GUIDELINES - GUIDE CURVES FOR PMF):

i) FROM GUIDE CURVES BY EXTRAPOLATION TO D.A. < 2 sq mi

CSM = 2300 cfs/sq mi

ii) PMF $\simeq$ 1.0 x 2300 = 2300 cfs

iii) ½ PMF $\simeq$ 1150 cfs

2) SURCHARGE AT PEAK INFLOWS (PMF AND ½ PMF)

a) OUTFLOW RATING CURVE

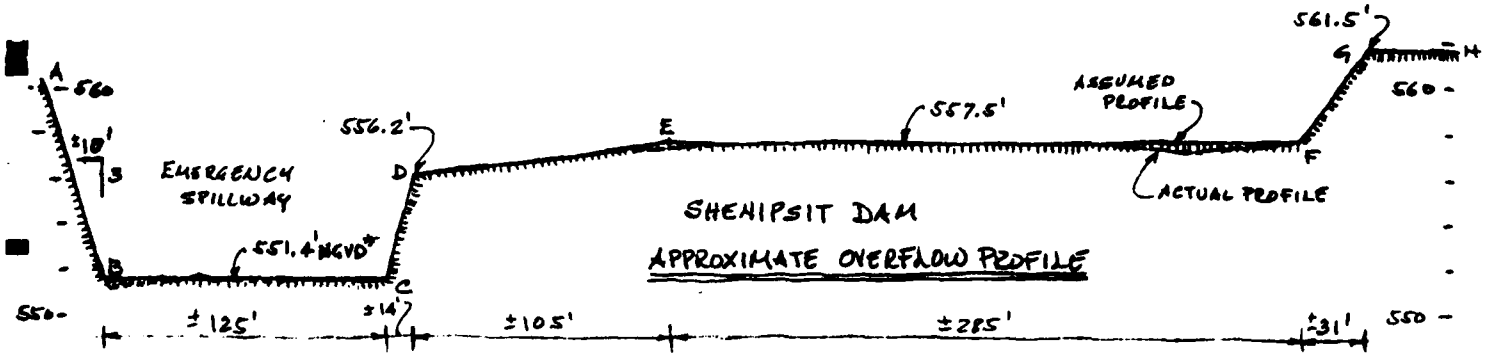
i) SPILLWAYS AND OVERFLOW PROFILE OF DAM:

SHENIPSIT DAM HAS TWO SPILLWAYS: THE PRINCIPAL (CONDUIT) SPILLWAY WITH WEIR CREST AT ELEV. 537.0 'NGVD* AND TOTAL LENGTH OF L = 12',* (TOP OF THE LONG SIDES OF THE 6' x 2' RISER). THE RISER HAS A TOP SLAB

*SEE NOTE P. D-2

COVER WITH SOFFIT ELEV. (±) 537.8 'NGVD.* THE RISER (±) 5' HIGH HAS ACSD, A 12"ϕ ORIFICE INLET AT THE BOTTOM (INV. ELEV. 532 'NGVD) AND DISCHARGES THRU A 24"ϕ PIPE, (±) 145' LONG WITH OUTLET INVERT ELEV. (±) 530.7 'NGVD. THE EMERGENCY SPILLWAY IS AN EARTH CHANNEL TO THE LEFT OF THE DAM WITH CONTROL SECTION AT (±) ELEV. 551.4 'NGVD. THE CONTROL SECTION (EARTH, GRASED) OF THIS SPILLWAY IS TRAPEZOIDAL (±) L=125' AND (±) 30' WIDE WITH SIDE SLOPES (±) 3" TO 1". THE RESERVOIR IS NORMALLY EMPTY WITH NO RECREATION POOL (FLOOD CONTROL)

THE TOP OF THE DAM, EMERGENCY SPILLWAY AND ADJACENT TERRAIN FORM AN OVERFLOW SECTION, MOSTLY GRASED, WHICH IS APPROXIMATELY AS SHOWN IN THE FOLLOWING SKETCH:



THEREFORE, ASSUME C=3.2 FOR BOTH, THE PRINCIPAL SPILLWAY (FREE DISCH) AND EMERGENCY SPILLWAY AND C=3.0 FOR THE DAM AND ADJACENT TERRAIN OVERFLOWS.

THE PRINCIPAL SPILLWAY CONDUIT (RISER/PIPE) FLOWS FULL AND SUBMERGES THE OVERFLOW WEIR APPROXIMATELY THE SAME HEAD AT WHICH THIS WEIR STARTS WORKING AS AN ORIFICE (BECAUSE OF THE TOP SLAB COVER).

* NOTE: DIMENSIONS/ELEVATIONS FROM S.C.S. DWGS NO. CN-404P, SHEETS 1 TO 7, "DETENTION RESERVOIR NO. 6," DATED MAR. 1959 AND/OR C.E. FIELD MEASURE ON 8/20/80 BY GAB. NATIONAL GEODETIC VERTICAL DATUM (NGVD) ELEVATIONS ASSUMED TO BE EQUIVALENT TO THE MSL ELEVS. ON THE S.C.S. "AS BUILT" DWGS. (CN-404P).

BOTH THE FREE AND SUBMERGED WEIR FLOW RANGES ARE NEGLIGEABLE. THE OUTFLOW THROUGH THE BOTTOM ORIFICE BEFORE THE SPILLWAY (WEIR) OPERATES IS ESTIMATED AT (±)MAX. $Q_o = 9$ CFS (NEGLIGEABLE). AND THE MAX. COMBINED BOTTOM ORIFICE/FREE-SUBMERGED WEIR FLOW IS ESTIMATED AT (±)30 CFS. THEREFORE, ASSUMING AN ORIFICE DISCHARGE COEFFICIENT C_E 0.7 FOR BOTH, "SPILLWAY" AND BOTTOM ORIFICES AND TOTAL ENTRANCE/OUTLET LOSSES OF $1.0h_v$ AND $1.5h_v$ FOR THE RISER/PIPE CONDUIT SECTIONS, AND $n = 0.015$ FOR THE OUTLET PIPE, THE PRINCIPAL SPILLWAY FLOW FLOWING FULL ($(\pm)H \geq 5.8'$ ABOVE THE ASSUMED NORMAL POOL ELEVATION 532' NGVD - RESERVOIR EMPTY - SEE p.D-2) CAN BE APPROXIMATED BY THE EQUATION:

$$Q_{PS} = \underline{12.4(H+0.3)^{1/2}} \quad (\text{¢ OF CONDUIT OUTL.(±) ELEV. } 531.7' \text{ NGVD})$$

(NOTE: FOR $H = 19.8'$; $Q_{PS} \cong 55^{CFS}$ VS. $Q_{PS} = 40^{CFS}$ GIVEN FOR THE SAME HEAD ON "INFORMATION STORAGE AND RETRIEVAL - DAMS PLANNED AND CONSTRUCTED BY SCS" DATA SHEET FOR SITE ID Nº CT-6)

ii) THE OVERFLOW RATING CURVE FOR THE RANGE OF FLOWS/SURCHARGES CONSIDERED CAN BE APPROXIMATED AS FOLLOWS (SEE PLOTKE p.D-2):

1') EMERGENCY SPILLWAY.

SECTION AB: $^{*}Q_{AB} = 0.4 \times {}^{10}/_{3} \times 3.2(H-19.4)^{1/2} = \underline{4.27(H-19.4)^{1/2}}$

SECTION BC: $Q_{BC} = 3.2 \times 125(H-19.4)^{1/2} = \underline{400(H-19.4)^{3/2}}$

SECTION CD: $(Q_{CD})_1 = 0.4 \times {}^{14}/_{4.8} \times 3.2(H-19.4)^{1/2} = \underline{3.73(H-19.4)^{1/2}}$; $H \leq 24.2'$

$(Q_{CD})_2 = 3.73\left[(H-19.4)^{1/2} - (H-24.2)^{1/2}\right]$; $H > 24.2'$

*NOTE: FLOW OVER SLOPED SECTIONS, BY APPLICATION OF FORMULA GIVEN BY THE USGS ON "MEASUREMENT OF PEAK DISCHARGES AT DAMS BY INDIRECT METHODS" BY H. HUGGINS (APPLICATIONS OF HYDR.)

$Q = \frac{2Cb}{5(h_b - h_a)}\left[h_b^{5/2} - h_a^{5/2}\right]$ WHERE Q = DISCH.; C = COEFF.; b = LENGTH; $h_a \cong h_b$ = STATIC HEAD REFERED TO HIGH & LOW ENDS OF WEIR, RESPECTIVELY.

2') TOP OF DAM AND ADJACENT TERRAIN:

SECTION DE: $(Q_{DE})_1 = 0.4 \times {}^{105}/_{1.3} \times 3\,(H-24.2)^{5/2} = \underline{96.9\,(H-24.2)^{5/2}}$; $H \leq 25.5'$

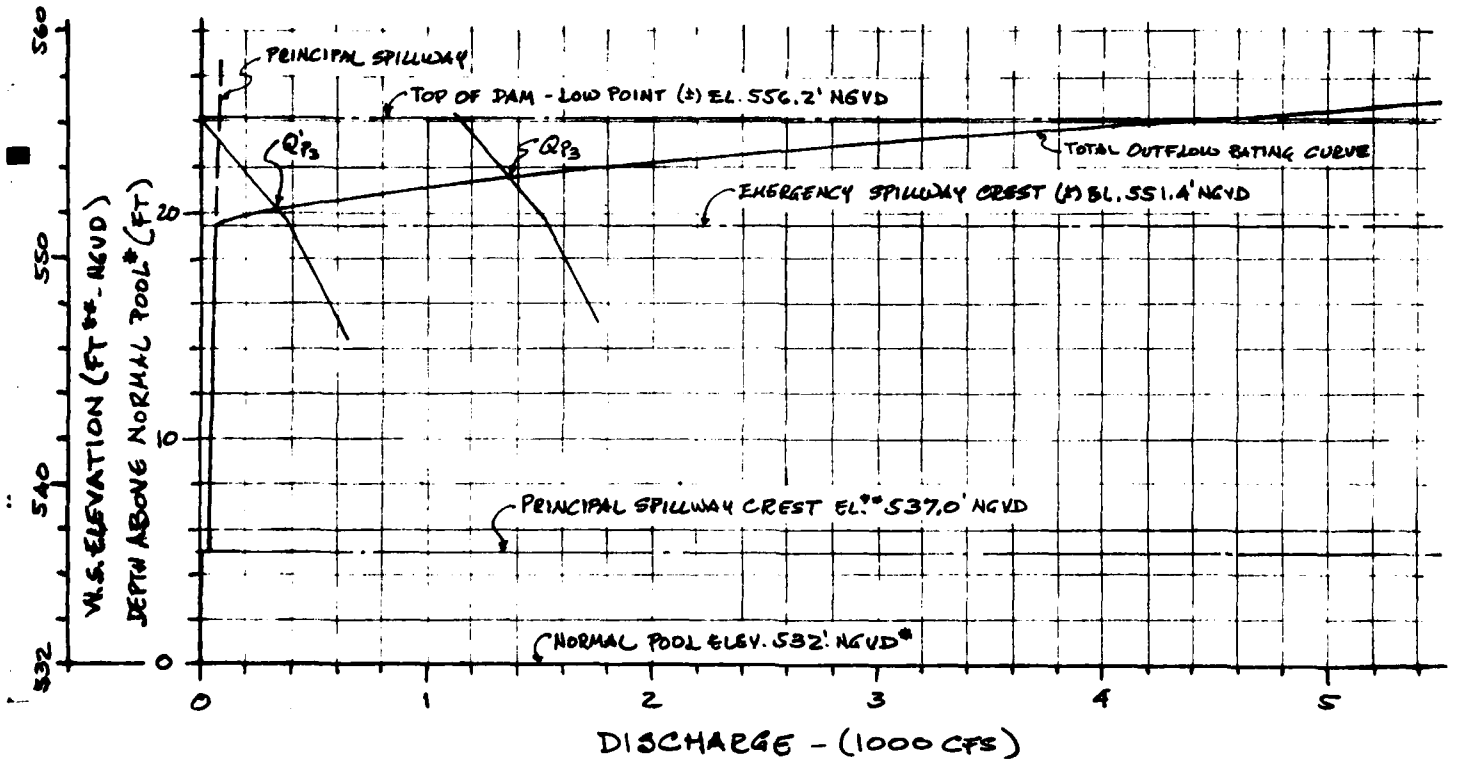
$(Q_{DE})_2 = \underline{96.9\left[(H-24.2)^{5/2} - (H-25.5)^{5/2}\right]}$; $H > 25.5'$

SECTION EF: $Q_{EF} = 3 \times 285\,(H-25.5)^{3/2} = \underline{855\,(H-25.5)^{3/2}}$

SECTION FG: $Q_{FG} = 0.4 \times {}^{3}/_{4} \times 3\,(H-25.5)^{5/2} = \underline{9.3\,(H-25.5)^{5/2}}$

THE TOTAL OUTFLOW IS APPROXIMATED BY THE SUM OF THE APPLICABLE FORMULAE ON ITEMS (1') AND (2') AND THE FLOW THRU THE PRINCIPAL SPILLWAY (p. D-3)

iii) SHENIPSIT DAM - OUTFLOW RATING CURVE



*NORMAL POOL AT BOTTOM OF IMPOUNDMENT - OULET INV. ELEV. 532' NGVD

**SEE NOTE - p. D-2

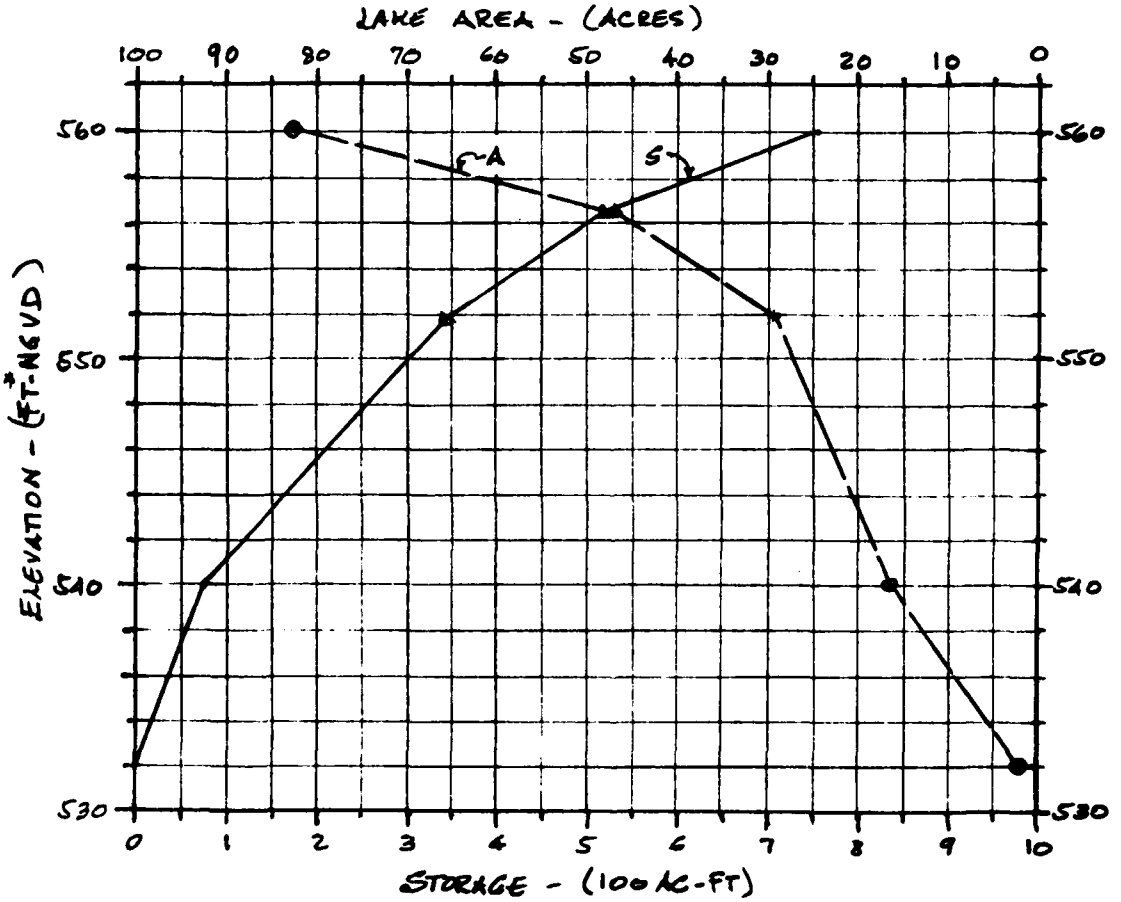
b) SURCHARGE HEIGHTS TO PASS PEAK INFLOWS (O_{p_1} & O'_{p_1})

i) @ $O_{p_1} \approx$ PMF = 2300 CFS $H_1 \approx$ 22.4' (FROM NORMAL POOL-RES. EMPTY)

ii) @ $O'_{p_1} \approx \frac{1}{2}$ PMF = 1150 CFS $H'_1 \approx$ 21.3'

c) EFFECT OF SURCHARGE - PEAK OUTFLOWS

i) LAKE AREA/STORAGE CURVES - SHENIPSIT DAM.



Δ - DATA FROM S.C.S. DWG Nº CN-404P SHEET Nº 1 OF 7

① - AREAS MEASSURED ON USGS STAFFORD SPRINGS, CT. QUADRANGLE SHEET (REV. 1970)

* SEE NOTE p. D-2

ii) WATERSHED D.A. $\doteq$ 1.0 SQ MI (SEE P. D-1)

iii) PEAK OUTFLOWS (Q_{P_3} & Q'_{P_3})

(DETERMINED ON THE OUTFLOW RATING CURVE (P. D-4), BY USING THE APPROX. ROUTING NED-ACE GUIDELINES "SURCHARGE STORAGE ROUTING" ALTERNATE METHOD AND 19" MAX. PROBABLE P.O. IN NEW ENGLAND).

$Q_{P_3} \doteq 1400$ CFS $\quad H_3 \doteq 21.6'$ (ELEV. 553.6 'NGVD)

$Q'_{P_3} \doteq 350$ CFS $\quad H'_3 \doteq 20.2'$ (ELEV. 552.2 'NGVD)

3) SPILLWAY CAPACITY RATIO TO PEAK OUTFLOWS:

SPILLWAY CAPACITY TO:	SURCH.* H (FT)	W.S. ELEV. (FT. NGVD)	SPILLWAY CAPACITY (CFS)**	SPILLWAY CAPACITY AS % OF PEAK OUTFLOWS	
				Q_{P_3} (1400 CFS)	Q'_{P_3} (350 CFS)
EM. SPWY. CREST	19.4	551.4	◉55	3.9	16
½ PMF	20.2	552.2	350	—	100
PMF	21.6	553.6	1400	100	—
TOP OF DAM+	24.2	556.2	◉4700	340	1300

*SURCHARGE ABOVE NORMAL POOL (RESERVOIR EMPTY - ELEV. 532 'NGVD)
**COMBINED CAPACITY OF PRINCIPAL AND EMERGENCY SPILLWAYS
+LOW POINT AT LEFT END, ADJACENT TO EMERGENCY SPILLWAY (SEE PROFILE P. D-2)
◉PRINCIPAL AND EMERGENCY SPILLWAY CAPACITIES GIVEN ON "INFORMATION STORAGE AND RETRIEVAL - DAMS PLANNED AND CONSTRUCTED BY SCS" DATA SHEET FOR SITE CT-6 ARE Q_{PS} = 40 CFS AND Q_{ES} = 4300 CFS, FOR SURCHARGE AT EMERGENCY SPILLWAY CREST AND TOP OF DAM, RESPECTIVELY.

SHENIPSIT DAM

II) DOWNSTREAM FAILURE HAZARD

1) POTENTIAL IMPACT AREA

SHENIPSIT DAM IS LOCATED ON AN UNNAMED STREAM, (±)2000' S/S FROM RTE 190 BETWEEN ORCUTSVILLE AND WEST STAFFORD. TWO HOUSES ON RTE 190, WITH FIRST FLOOR ELEVS. OF (±)6.1' AND 7.5' ABOVE THE STREAM, AND THREE INDUSTRIAL/COMERCIAL STRUCTURES WITH FIRST FLOOR ELEVATIONS BETWEEN 6' AND 8.8' ABOVE THE STREAM, CONSTITUTE THE POTENTIAL IMPACT AREA IN CASE OF FAILURE OF SHENIPSIT DAM.

2) FAILURE AT SHENIPSIT DAM:

ASSUME SURCHARGE TO TEST FLOOD ELEVATION (½ PMF - SEE p. D-9)
(ELEV. 553.6' NGVD)

a) HEIGHT OF DAM *: $H = 28.5'$ (TOP OF DAM EL. 557.5' NGVD; STREAMBED EL. 529.0' NGVD)

b) MID-HEIGHT LENGTH *: $\ell \approx 275'$

c) BREACH WIDTH (SEE NED-ACE P/L DAM FAILURE GUIDELINES)

$W = 0.4 \times 275 \approx 110'$ ∴ ASSUME $W_b = \underline{110'}$

d) ASSUMED WATER DEPTH AT TIME OF FAILURE: $Y_o = \underline{23.2'}$

e) SPILLWAY DISCHARGE AT TIME OF FAILURE: $Q_s = 350$ CFS (SEE p. D-6)

f) BREACH OUTFLOW (SEE NED-ACE GUIDELINES):

$$Q_b = \frac{8}{27} W_b \sqrt{g}\, Y_o^{3/2} \approx 20700 \text{ CFS}$$

* FROM C.E. FIELD MEASUREMENTS ON 8/20/80 BY HLL & AB

g) PEAK FAILURE OUTFLOW (Q_{P_1}) TO STREAM:

$Q_{P_1} = Q_s + Q_b = 21050^{CFS}$ SAY, $Q_{P_1} = \underline{21000}^{CFS}$

3) FLOOD DEPTH* IMMEDIATELY D/S FROM DAM:

$Y = 0.44\, Y_o \cong \underline{10.2'}$

*(FROM RETREATING WAVE THEORY APPLIED TO DAM FAILURE)

4) ESTIMATE OF D/S FAILURE CONDITIONS AT POTENTIAL IMPACT AREA:

(SEE NED-ACE GUIDELINES FOR ESTIMATING D/S FAILURE HYDROGRAPHS)

a) THE CHANNEL D/S FROM SHENIPSIT DAM IS APPROXIMATELY V-SHAPED WITH (±) 25" AND 30" TO 1' SIDE SLOPES AND A REACH SLOPE OF (±) 1.4%. (ASSUME $n = 0.050$ FOR THE REACH AT FLOOD STAGE)

b) RESERVOIR STORAGE AT TIME OF FAILURE:

$S_{\frac{1}{2}PMF} \cong 360^{AC\,FT}$ (SEE P. D-5) $S/2 \cong 180^{AC\,FT}$

c) APPROXIMATE STAGE AT POTENTIAL IMPACT AREA AFTER FAILURE:

$Q_{P_1} = 21000^{CFS}$ $\therefore Y_1^* \cong 8.9'$; $V_1 = 101^{AC\,FT} < \frac{S}{2}$ (REACH $L = 2000'$; $n \cong 0.050$)

$\therefore Q_{P_2} \cong 15100^{CFS}$ $\therefore Y_2 = 7.90'$; $V_2 = 78.8^{AC\,FT}$; $\bar{V} \cong 89.9^{AC\,FT}$ $\therefore Q_G = 15800^{CFS}$; $Y_3 \cong 8.0'$

$\therefore$ REACH OUTFLOW: $Q_{P_3} \cong \underline{15800}^{CFS}$; $Y_3 = \underline{8.0'}$

d) APPROXIMATE STAGE BEFORE FAILURE: $Q_s = \underline{350}^{CFS}$ $Y_s \cong \underline{1.9'}$

e) RISE IN STAGE AT IMPACT AREA: $\Delta Y \cong \underline{6.1'}$

III) SELECTION OF TEST FLOOD:

1) CLASSIFICATION OF DAM ACCORDING TO NED-ACE GUIDELINES:

a) SIZE: *STORAGE (MAX) ≈ 520 $^{AC-FT}$ ($50 < S < 1000^{AC-FT}$)
*HEIGHT ≈ 28.5' ($25 < H < 40^{FT}$)

*STORAGE: SEE p. D-5.

*HEIGHT: SEE p. D-7; TAKEN FOR CLASSIFICATION PURPOSES, TO ELEV. 557.5' NGVD WHICH IS THE TOP ELEV. OF MOST OF THE EMBANKMENT.

∴ SIZE CLASSIFICATION: SMALL

b) HAZARD POTENTIAL: AS A RESULT OF THE ~~DF~~ FAILURE ANALYSIS AND IN VIEW OF THE IMPACT THAT FAILURE OF SWENPSIT DAM MAY HAVE ON THE INITIAL IMPACT AREA (P. D-7), THE DAM IS CLASSIFIED AS HAVING

HAZARD CLASSIFICATION: HIGH

2) TEST FLOOD: ½ PMF = 1150 ^{CFS}

THIS SELECTION IS BASED ON THE RESULTS OF THE PREVIOUS ANALYSIS AND CLASSIFICATION.

SHENIPSIT DAM

IV) SUMMARY

1) TEST FLOOD = ½ PMF ≅ 1150 CFS
(PARALLEL COMPUTATIONS HAVE BEEN MADE FOR PMF ≅ 2300 CFS AND ARE ALSO SUMMARIZED BELOW)

2) PERFORMANCE AT PEAK FLOOD CONDITIONS:
a) PEAK INFLOWS: Q_{P_1} = PMF ≅ 2300 CFS Q'_{P_1} = ½ PMF ≅ 1150 CFS
b) PEAK OUTFLOWS: Q_{P_2} ≅ 1400 CFS Q'_{P_2} ≅ 350 CFS
c) SPILLWAY CAPACITY: (SEE TABLE p. D-6)
d) PERFORMANCE:
i) AT TEST FLOOD: FREEBOARD (±) 4.0' (W.S. ELEV. 552.2' NGVD)
ii) AT PMF: FREEBOARD (±) 2.6' (W.S. ELEV. 553.6' NGVD)

3) DOWNSTREAM FAILURE CONDITIONS:
a) PEAK FAILURE OUTFLOW: Q_{P_1} = 21000 CFS
b) FLOOD DEPTH IMMEDIATELY D/S FROM DAM: Y_0 ≅ 10.2'
c) CONDITIONS AT INITIAL IMPACT AREA:
STAGE BEFORE FAILURE: Y_S = 1.9' (Q_S ≅ 350 CFS)
STAGE AFTER FAILURE: Y_3 ≅ 8.0' (Q_{P_3} = 15800 CFS)
RAISE IN STAGE AFTER FAILURE: ΔY ≅ 6.1'

PRELIMINARY GUIDANCE

FOR ESTIMATING

MAXIMUM PROBABLE DISCHARGES

IN

PHASE I DAM SAFETY

INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

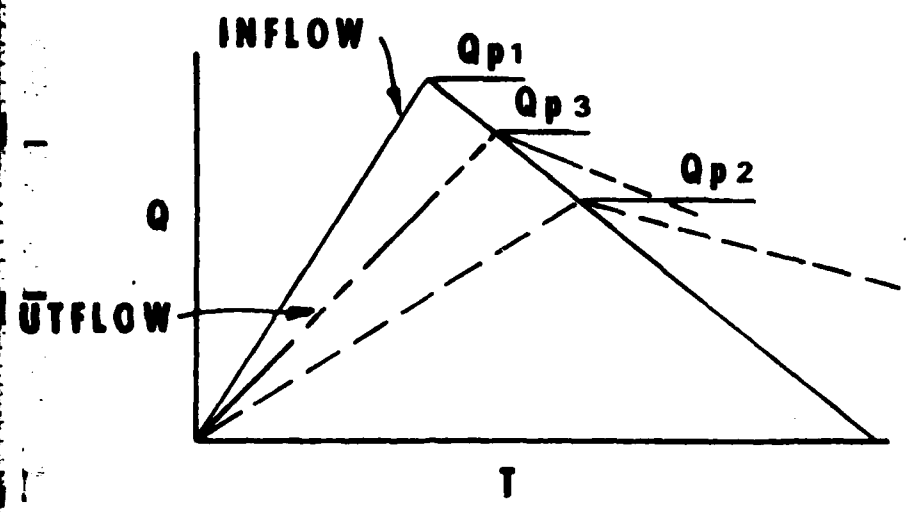
MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
3.	Thomaston	158,000	97.2	1,625
4.	Northfield Brook	9,000	5.7	1,580
5.	Black Rock	35,000	20.4	1,715
6.	Hancock Brook	20,700	12.0	1,725
7.	Hop Brook	26,400	16.4	1,610
8.	Tully	47,000	50.0	940
9.	Barre Falls	61,000	55.0	1,109
10.	Conant Brook	11,900	7.8	1,525
11.	Knightville	160,000	162.0	987
12.	Littleville	98,000	52.3	1,870
13.	Colebrook River	165,000	118.0	1,400
14.	Mad River	30,000	18.2	1,650
15.	Sucker Brook	6,500	3.43	1,895
16.	Union Village	110,000	126.0	873
17.	North Hartland	199,000	220.0	904
18.	North Springfield	157,000	158.0	994
19.	Ball Mountain	190,000	172.0	1,105
20.	Townshend	228,000	106.0(278 total)	820
21.	Surry Mountain	63,000	100.0	630
22.	Otter Brook	45,000	47.0	957
23.	Birch Hill	88,500	175.0	505
24.	East Brimfield	73,900	67.5	1,095
25.	Westville	38,400	99.5(32 net)	1,200
26.	West Thompson	85,000	173.5(74 net)	1,150
27.	Hodges Village	35,600	31.1	1,145
28.	Buffumville	36,500	26.5	1,377
29.	Mansfield Hollow	125,000	159.0	786
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS BASED ON TWICE THE STANDARD PROJECT FLOOD (Flat and Coastal Areas)

River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1. Pawtuxet River	19,000	200	190
2. Mill River (R.I.)	8,500	34	500
3. Peters River (R.I.)	3,200	13	490
4. Kettle Brook	8,000	30	530
5. Sudbury River.	11,700	86	270
6. Indian Brook (Hopk.)	1,000	5.9	340
7. Charles River.	6,000	184	65
8. Blackstone River.	43,000	416	200
9. Quinebaug River	55,000	331	330

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Qp_1) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Qp_1".

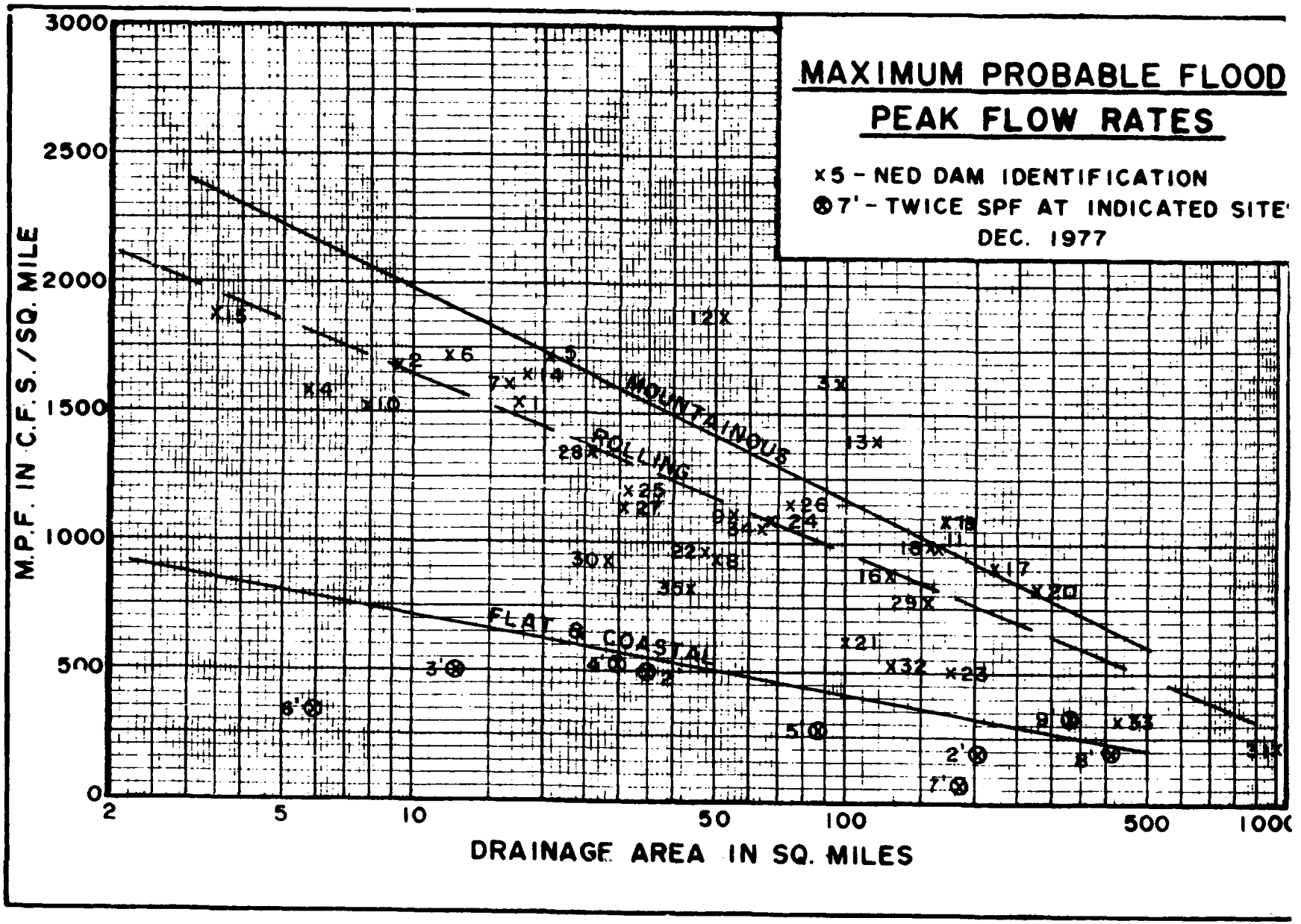
b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Qp_2 = Qp_1 \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Average "$STOR_1$" and "$STOR_2$" and Determine Average Surcharge and Resulting Peak Outflow "Qp_3".


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITE
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
DRAINAGE AREA IN SQ. MILES
3000
2500
2000
1500
1000
500
0
2
5
10
50
100
500
1000
MOUNTAINOUS
ROLLING
FLAT & COASTAL

SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Avg "$STOR_1$" and "$STOR_2$" and Compute "Qp_3".

c. If Surcharge Height for Qp_3 and "$STOR_{AVG}$" agree O.K. If Not:

STEP 4: a. Determine Surcharge Height and "$STOR_3$" To Pass "Qp_3"

b. Avg. "Old $STOR_{AVG}$" and "$STOR_3$" and Compute "Qp_4"

c. Surcharge Height for Qp_4 and "New $STOR_{Avg}$" should Agree closely

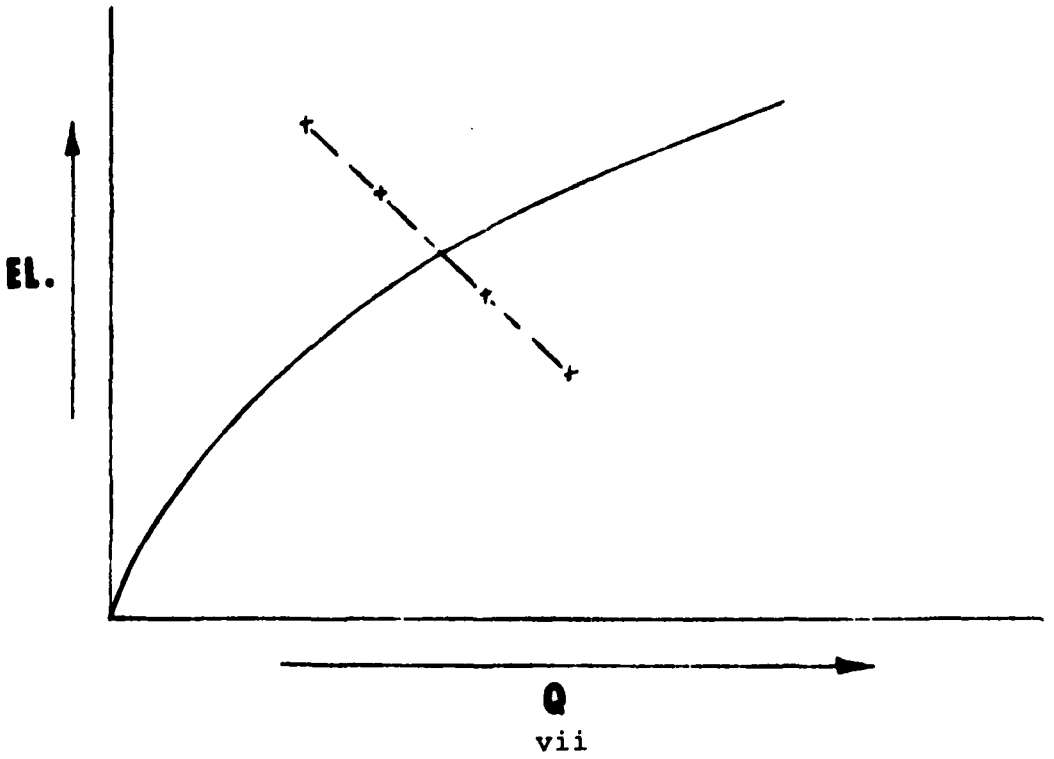
SURCHARGE STORAGE ROUTING ALTERNATE

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR}{19}\right)$$

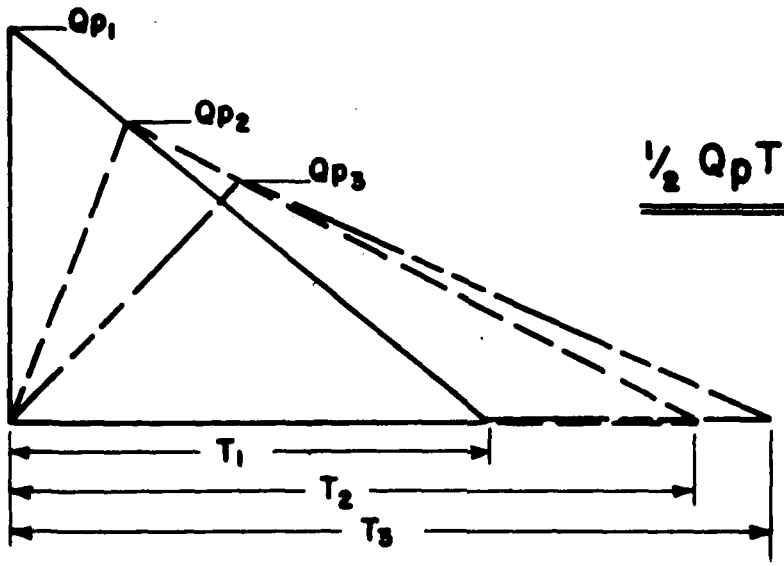
$$Q_{p2} = Q_{p1} - Q_{p1}\left(\frac{STOR}{19}\right)$$

FOR KNOWN Q_{p1} AND 19" R.O.

Q_{p2} STOR EL.



"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$$\tfrac{1}{2} Q_p T = 12 S$$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Qp_1 = \tfrac{8}{27} W_b \sqrt{g} Y_o^{\frac{3}{2}}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Qp_2(\text{TRIAL}) = Qp_1 \left(1 - \tfrac{V_1}{S}\right)$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Qp_2 = Qp_1 \left(1 - \tfrac{V_{ave}}{S}\right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

FROM C.E. FIELD MEASUREMENTS ON 8/20/80 BY HLL & AB

END

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