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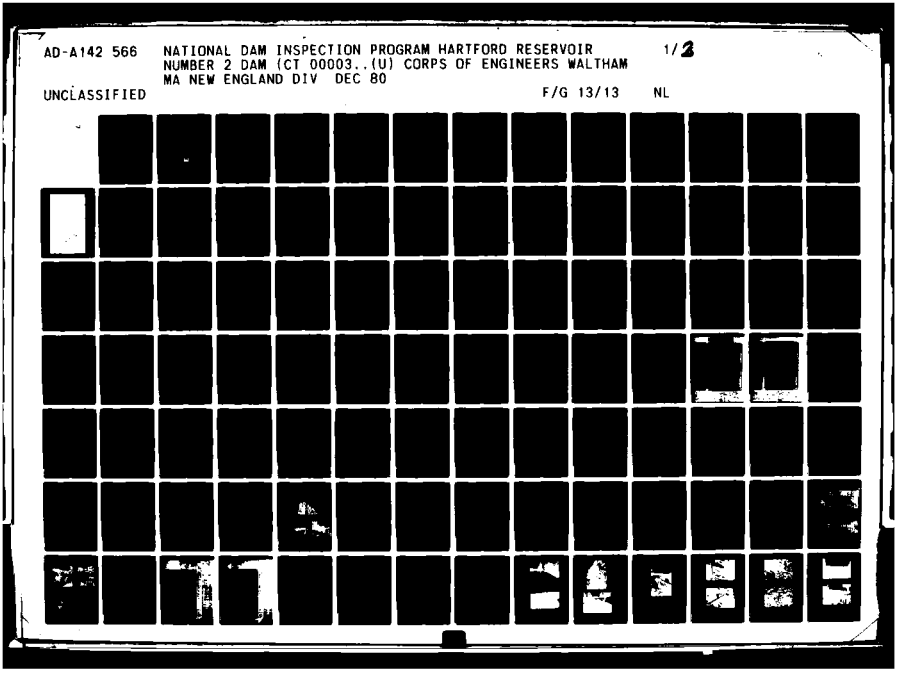

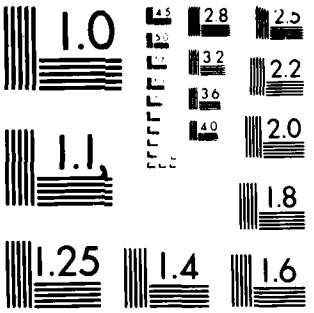

CONNECTICUT RIVER BASIN

WEST HARTFORD, CONNECTICUT

HARTFORD RESERVOIR NO.2 DAM
CT 00003

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

DECEMBER 1980

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

REPLY TO
ATTENTION OF:
NEDED

MAR 10 1981

JUL 2 1984

A

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 Hartford Reservoir No. 2 Dam (CT-00003) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, The Metropolitan District, Bernard A. Batycki, District Manager, 555 Main Street, Hartford, Connecticut 06115.

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.

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

Incl
As stated

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: CT 00003	2. GOVT ACCESSION NO.: AD-A242 566
	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): Hartford Reservoir No.2 Dam; Connecticut River Basin, West Hartford, Conn; 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: December 1980
	13. NUMBER OF PAGES: 117
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

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,
Connecticut River Basin

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

The Hartford Reservoir No.2 Dam consists of an earth embankment with a maximum height of 50 ft., a top width of 8 ft., and a total lenght of 1425 ft. including a 54 ft. long overflow spillway located at the left end of the dam. The outlet works consist of 3 cast iron pipes through the embankment, controlled by downstream gate valves. The dam impounds Hartford Reservoir No.2, a storage reservoir for public water supply owned by the Metropolitan District, Hartford, Conn. Based on the visual inspection, the dam is judged to be in fair condition.

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HARTFORD RESERVOIR NO. 2 DAM
CT 00003

CONNECTICUT RIVER BASIN
WEST HARTFORD, CONNECTICUT

A

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

49-031

12/80

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IDENTIFICATION NO: CT 00003

NAME OF DAM: Hartford Reservoir No. 2 Dam

TOWN: West Hartford

COUNTY AND STATE: Hartford County, Connecticut

STREAM: Spice Brook

DATE OF INSPECTION: November 25, 1980

BRIEF ASSESSMENT

The Hartford Reservoir No. 2 Dam consists of an earth embankment with a maximum height of 50 feet, a top width of 8 feet, and a total length of 1425 feet including a 54 foot long overflow spillway located at the left end of the dam. The outlet works consist of 3 cast iron pipes through the embankment, controlled by downstream gate valves.

The dam impounds Hartford Reservoir No. 2, a storage reservoir for public water supply owned by the Metropolitan District, Hartford, Connecticut.

Based on the visual inspection, the dam is judged to be in fair condition. Features that could affect the future integrity of the dam are downstream seepage, erosion of the slopes, the presence of trees on the slopes, and inadequate spillway capacity.

The dam is classified as "Intermediate" in size with a "High" hazard potential. A Test Flood equal to the Probable Maximum Flood (PMF) was selected in accordance with the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams. The Test Flood inflow of 2,550 cfs results in a Test Flood routed outflow of 1,970 cfs that would overtop the dam by 0.1 feet.

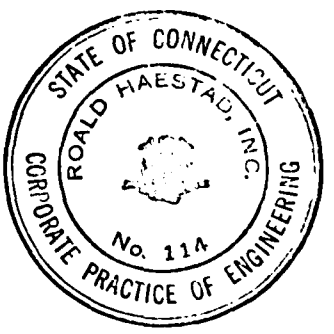
The spillway capacity is 1,540 cfs or 78 percent of the Test Flood routed outflow.

It is recommended that a qualified, registered engineer be retained to investigate the downstream seepage; the bulging of the right stone masonry training wall, and the significance of the downstream location of the outlet control valves; to oversee tree removal; and to perform a detailed hydrologic and hydraulic analysis. In addition, all animal burrows and eroded areas should be repaired, technical inspections should be made annually, an Operations and Maintenance Manual should be prepared, and the Emergency Operations Plan should be completed.

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

Ronald G. Litke, P.E.
Project Manager

Roald Haestad
President



This Phase I Inspection Report on Hartford Reservoir No. 2 Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

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

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the

condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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

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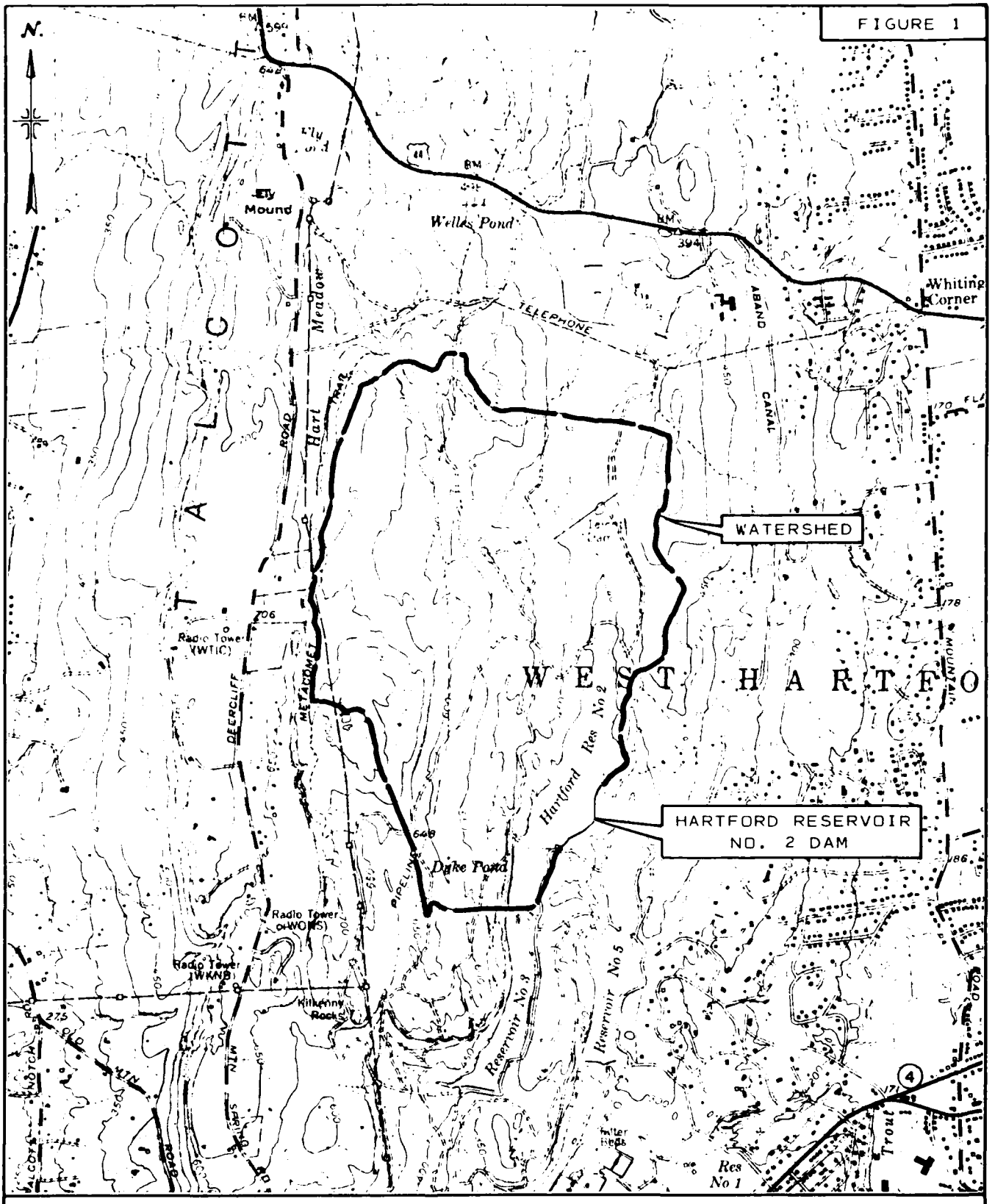
OVERVIEW PHOTO

U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM - CT 00003
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		SPICE BROOK WEST HARTFORD, CONNECTICUT 13 NOVEMBER '80



LOCATION PLAN

HARTFORD RESERVOIR NO. 2 DAM
WEST HARTFORD, CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC.

AVON QUADRANGLE 1968

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

HARTFORD RESERVOIR NO. 2 DAM

PROJECT INFORMATION
SECTION 1

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Roald Haestad, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Roald Haestad, Inc. under a letter of October 28, 1980, from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-81-C-0005 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purposes of the program are to:

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

1.2 Description of Project

a. Location

The Hartford Reservoir No. 2 Dam is located on Spice Brook in the City of West Hartford, approximately 9,000 feet south of U.S. Route 44, 5,500 feet west of Mountain Road and 3,500 feet east of the Avon - West Hartford Corporate Boundary. The dam is shown on the Avon Quadrangle having coordinates of latitude N 41°45.9' and longitude W 72° 47.1'.

b. Description of Dam and Appurtenances

The Hartford Reservoir No. 2 Dam consists of an earth embankment with a total length of 1,425 feet including a 54 foot long overflow spillway located at the left end of the dam. The earth embankment has a top width of 8 feet, and a maximum height of 50 feet. Records indicate that the upstream slope is 3 horizontal to 1 vertical; field surveys indicate that the upstream slope above the waterline is 2 horizontal to 1 vertical. The upstream slope is protected by a layer of riprap to about 2 feet above spillway level. The downstream slope varies from a minimum of about 2 horizontal to 1 vertical to a maximum of about 1 horizontal to 1 vertical. The majority of the downstream slope is covered with a combination of grass, weeds and brush. At the left end of the dam a 400 foot long section of the downstream slope is covered by a layer of riprap. Near the right end of the dam there is a stone wall along the top of the downstream slope.

The overflow spillway consists of a broad-crested weir with a height of 8 feet, a top width of 4.9 feet and a batter on the downstream face of 4 inches per vertical foot. The upstream training walls

are constructed of dry stone masonry. At the weir, the concrete training walls have been raised by the addition of a stone masonry section on top of the concrete wall. The top of the dam is 4.7 feet above the spillway level.

The outlet works consist of 3 cast iron pipes through the dam controlled by manually operated downstream gates. There is some question as to the exact size of the pipes through the dam as records are conflicting. It appears that the outlets consist of a 6-inch high leve outlet located approximately 300 feet from the right end of the dam, a 20-inch low level outlet or blowoff located approximately 650 feet from the right end of the dam, and a 16-inch intermediate level outlet located approximately 700 feet from the right end of the dam.

To the right of the dam a low causeway with a top width that varies from 4 feet to 8 feet and a length of 400 feet divides the impoundment into Hartford Reservoir No. 2 and Dike Pond (see Location Plan, page xi). There is a 20-inch cast iron pipe through the causeway.

There are two low saddle dikes which were constructed to increase the freeboard of the dam and do not impound water when the impoundment is at spillway level. One dike is located approximately 700 feet from the right end of the dam and the other is located about 400 feet from the left end of the dam. The right dike has a length of 400 feet, a maximum height of 5 feet, and a top width of 17 feet. The left dike has a length of 100 feet and a top width of 17 feet. The top of the left dike is about 5 feet above the top of the dam. There is a paved access road across each of the dikes.

c. Size Classification - "Intermediate"

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified as "Intermediate"

in size if the height is between 40 feet and 100 feet or the dam impounds between 1,000 Acre-Feet and 50,000 Acre-Feet. The dam has a maximum height of 50 feet and a maximum storage capacity of 1,140 Acre-Feet. Therefore, the dam is classified as "Intermediate" in size.

d. Hazard Classification - "High"

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification of the dam is "High". A dam failure analysis indicates that a failure of Hartford Reservoir No. 2 Dam could result in the loss of more than a few lives and extensive property damage. As a result of the calculated dam breach, the dams at Hartford Reservoirs No. 5 and 1, located downstream of Reservoir No. 2, would be overtopped by 6 feet and 2 feet respectively. The depth of flow in the area of Mountain Tree Road and Old Mill Lane would be 11 feet, flooding approximately 40 homes from 4 feet to 8 feet above sill level. See Figure 5, page D-19. Further downstream flood waters would flow through the cities of West Hartford and Hartford, causing more damage and endangering lives before discharging to the Connecticut River.

Prior to dam breach the maximum spillway discharge capacity of 1,540 cfs would be safely discharged by the spillways at Hartford Reservoirs No. 5 and 1, and would overtop Mountain Tree Road and Old Mill Lane by 1.8 feet without flooding adjacent homes.

e. Ownership

The Metropolitan District
Bernard A. Batycki, District Manager
555 Main Street
Hartford, Connecticut 06115
(203) 278-7850

f. Operator

John G. Lizzi, Deputy Manager, Plants and Maintenance
The Metropolitan District
555 Main Street
Hartford, Connecticut 06115
(203) 278-7850

g. Purpose of Dam

The dam impounds Hartford Reservoir No. 2, a storage reservoir for public water supply.

h. Design and Construction History

The dam was constructed in 1869 by Messrs. Lobdell and King, Contractors. In 1871 the embankment was raised 5 feet to increase storage capacity. In 1963 the existing concrete weir was repaired by constructing a 6 foot wide concrete weir against the downstream face of the existing weir. The freeboard was increased from 1'-8" to 4'-8" in 1964 when the saddle dikes were constructed and the crest of the dam was raised approximately 0.6 feet. The spillway repairs and the raising of the dam and dikes were designed and constructed by the Metropolitan District.

i. Normal Operating Procedures

The outlet gates are normally left closed. Gates are operated as required to release water to downstream reservoirs.

1.3 Pertinent Data

a. Drainage Area

The drainage area consists of 1.2 square miles of "rolling" wooded terrain with no development.

b. Discharge at Damsite

Discharge at the damsite is over a 54 foot long broad-crested weir. There are three outlet pipes through the embankment which discharge at the downstream toe of the dam.

1.	Outlet Works (conduits) Size:	20-inch	16-inch	6-inch
	Invert Elevation at Outlet:	340±	355.3	370.5
	Discharge Capacity: @ pool El. 390	30 cfs	30 cfs	does not operate
2.	Maximum Known Flood at Damsite:	320 cfs* - August 1955		
3.	Ungated Spillway Capacity at Top of Dam:	1,540 cfs		
	Elevation:	390		
4.	Ungated Spillway Capacity at Test Flood Elevation:	1,590 cfs		
	Elevation:	390.1		
5.	Gated Spillway Capacity at Normal Pool Elevation:	N/A		
	Elevation:			
6.	Gated Spillway Capacity at Test Flood Elevation:	N/A		
	Elevation:			
7.	Total Spillway Capacity at Test Flood Elevation:	1,590 cfs		
	Elevation:	390.1		
8.	Total Project Discharge at Top of Dam:	1,540 cfs		
	Elevation:	390		
9.	Total Project Discharge at Test Flood Elevation:	1,970 cfs		
	Elevation:	390.1		

*Reservoir was 6 feet below spillway level prior to storm.

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

1. Streambed at Toe of Dam:	340
2. Bottom of Cutoff:	Unknown
3. Maximum Tailwater:	N/A
4. Normal Pool:	385.3
5. Full Flood Control Pool:	N/A
6. Spillway Crest:	385.3
7. Design Surcharge - Original Design:	387.3 (395 cfs)
8. Top of Dam:	390
9. Test Flood Surcharge:	390.1

d. Reservoir - Length in Feet

1. Normal Pool:	3,000 feet
2. Flood Control Pool:	N/A
3. Spillway Crest Pool:	3,000 feet
4. Top of Dam:	3,300 feet
5. Test Flood Pool:	3,300 feet

e. Storage - Acre-feet

1. Normal Pool:	870 Acre-Feet
2. Flood Control Pool:	N/A
3. Spillway Crest Pool:	870 Acre-Feet
4. Top of Dam:	1,140 Acre-Feet
5. Test Flood Pool:	1,140 Acre-Feet

f. Reservoir Surface - Acres

1. Normal Pool:	53.8 Acres
2. Flood-Control Pool:	N/A
3. Spillway Crest:	53.8 Acres
4. Test Flood Pool:	59 Acres
5. Top of Dam:	59 Acres

g. Dam and Saddle Dikes

	DAM	RIGHT DIKE	LEFT DIKE
1. Type:	Earth Embankment on rock foundation with "puddle" core and cutoff.	Earth Embankment	Earth Embankment
2. Length:	1,425 feet	400 feet	1,200 feet
3. Height:	50 feet	5 feet	11 feet
4. Top Width:	8 feet	17 feet	17 feet
5. Side Slopes Upstream:	3 hor. to 1 vert. below water 2 hor. to 1 vert. above water	3 hor. to 1 vert.	2.5 hor. to 1 vert.
Downstream:	Varies from 1 to 2 hor. to 1 vert.	2 hor. to 1 vert.	1.5 hor. to 1 vert.
6. Zoning:	Earth embankment with "puddle" core	N/A	N/A
7. Impervious Core:	"Puddle" corewall	N/A	N/A
8. Cutoff:	"Puddle" cutoff trench into rock	N/A	N/A
9. Grout Curtain:	N/A	N/A	N/A
10. Other:			

h. Diversion and Regulating Tunnel - N/A

i. Spillway

1. Type:	Broad-crested weir 4.9 feet wide at the top
2. Length of Weir:	54 feet
3. Crest Elevation with Flash Boards: without Flash Boards:	 N/A 385.3
4. Gates:	N/A
5. Upstream Channel:	Stone masonry training walls with cobble and gravel floor
6. Downstream Channel:	In ledge below spillway
7. General:	Weir repaired in 1963 by placing 6 foot wide concrete weir against downstream face of existing weir.

j. Regulating Outlets

1. Invert:	20" 340± 16" 355.3 6" 370.5
2. Size:	20" low level outlet or blowoff; 16" intermediate level outlet; 6" high level outlet
3. Description:	Cast iron pipes through embankment
4. Control Mechanism:	Manually operated downstream gate valves. Two valves on 20" low level outlet or blowoff line.
5. Other:	6" high level outlet is not in working condition.

ENGINEERING DATA
SECTION 2

2.1 Design Data

There was no design data available for review on the original design of the dam. The 1869 Annual Report of the Board of Water Commissioners of the City of Hartford describes the dam as being built of earth on an irregular rock foundation with a puddle core wall and cutoff trench, and having a length of 1,300 feet, a top width of 27 feet, 5 feet of freeboard, an upstream slope of 3 horizontal to 1 vertical, a downstream slope of 2 horizontal to 1 vertical, and a maximum height of 42 feet. The original reservoir had a capacity of 229 million gallons, a surface area of 49 acres and a maximum depth of 33 feet. Two outlet pipes, one 20-inch and one 16-inch, were laid through the embankment. The 1871 Annual Report states that the dam was raised 5 feet adding about 100 million gallons to the storage capacity. The Owner questions whether it was actually the Reservoir No. 2 Dam that was raised, or the Reservoir No. 3 Dam. Available information seems to indicate that the Reservoir No. 2 Dam was raised following the initial construction. Also available for review were design calculations dated May 1962 for repairs to the spillway weir, a study of Improvements in Hydrologic Capacity for the West Hartford Reservoirs dated April 1964, and plans showing the recommended improvements, all prepared by the Water Bureau of the Metropolitan District Chief Engineer's Office.

2.2 Construction Data

The dam was constructed in 1869 by Messrs. Lobdell and King, Contractors. The 1871 Annual Report of the Board of Water Commissioners of the City of Hartford indicates that the dam was raised 5 feet in

that year. In 1963 repairs were made to the spillway weir by the Metropolitan District's own forces. A new 6 foot wide concrete weir was poured against the downstream face of the existing concrete weir. In 1964 the freeboard was increased to 4.7 feet above spillway crest by redressing the top of the dam with approximately 0.6 feet of topsoil, raising the roadway to the east of the Dike pond and to the north of the spillway with gravel fill, and raising the spillway abutments with concrete and stone masonry. These improvements were also made by Metropolitan District forces.

2.3 Operations Data

Reservoir levels are recorded on a daily basis during the normal work week. The maximum flow over the spillway occurred in August 1955 when the depth of flow over the spillway was about 1.7 feet. The water level prior to the storm was 6 feet below spillway level. In 1973 a program of technical inspections was established by the Metropolitan District. The inspections are made once every 5 years. Copies of the 1973 and 1978 reports are in Appendix B.

2.4 Evaluation of Data

a. Availability

All available information was provided by the Metropolitan District, owner of the dam.

b. Adequacy

The available information, along with the visual inspection, past performance history, and the hydrologic and hydraulic calculations made for this Report were adequate for performing a Phase I Investigation.

c. Validity

There is some question as to the size of the outlet pipes

through the dam. The 1869 Annual Report listed two pipes, 20-inches and 16-inches in diameter, while other records indicate three pipes, 6-inches, 8-inches and 16-inches in diameter. Field surveys indicate that the outlet ends of two of the pipes are 6-inches and 16-inches in diameter. The inlet and outlet ends of the third pipe were below water level and could not be observed.

VISUAL INSPECTION

SECTION 3

3.1 Findings

a. General

The visual inspection was conducted on November 25, 1980. At the time of inspection the water level was approximately 0.1 feet above spillway level.

The dam consists of an earth embankment with an overflow spillway located near the left end and outlet works consisting of 3 pipes of varying size and elevation through the embankment.

b. Dam

The crest of the dam is grass-covered, Photos 1 and 2, and appears to be fairly level and in good condition with several bare spots noted. The upstream slope is protected by a layer of riprap, Photo 3, which in most areas extends approximately 2 feet above the normal waterline and is overgrown with vegetation. The majority of the upstream slope above the riprap is grass-covered, although erosion of one area was noted where grass is missing and riprap did not extend above the waterline, Photo 4. Several large trees, up to 18-inches in diameter, were present at the waterline, Photos 1, 2 and 4.

The downstream slope is covered with a mixture of grass, weeds, and brush, Photo 5. Near the right end of the dam there are sections of low stone walls at the top of the downstream slope, Photo 5. Tree stumps and animal burrows are present on the downstream slope. Approximately 800 feet from the right end of the dam there is an erosion depression approximately 6 feet in diameter and 18 inches deep, Photo 7. There is a tree stump and a capped pipe,

approximately 1-inch in diameter, purpose unknown, at this location. At the left end of the dam approximately 400 feet of the downstream slope is covered with a layer of heavy stone riprap. Numerous trees are present on the slope and at the downstream toe in this area, Photo 6.

Near the left end of the dam there is a seep of about 1 gpm, originating approximately 40 feet downstream of the toe, Photo 8. The area around the seep was covered with rust-colored floccules, but the water appeared to be clear at the time of inspection. Another wet area is present to the left of the 16-inch intermediate level outlet, Photo 9. It could not be determined if water in this area originated from seepage through the dam or from surface water ponding in this area.

The area downstream of the dam between the 6-inch and 20-inch outlets is wet and swampy. Flow from this area discharges into a small brook which flows into the discharge channel for the 20-inch and 16-inch outlets. Flow in the small brook was estimated at 10 gpm.

c. Appurtenant Structures

The appurtenant structures consist of the overflow spillway, the outlet works and two saddle dikes constructed to increase the freeboard of the dam.

Spillway

The overflow spillway consists of a concrete weir founded on rock with concrete and stone masonry training walls, Photos 10, 11 and 12. The concrete weir and training walls appear to be in good condition with the exception of a hairline crack noted in the right training wall at the downstream face of the weir. The right upstream stone masonry training wall appears to be bulging out approximately

3 inches, Photo 11. At the upstream end of the right training wall, erosion of the embankment has taken place. The downstream embankment is also eroded to the right of the spillway, Photo 11. The channel immediately downstream of the weir is in ledge, Photo 13.

Outlet Works

The outlet works consist of 3 cast iron pipes through the embankment controlled by manually operated downstream gate valves. The low level outlet or blowoff discharges below the water surface between two ledge outcrops in the outlet channel, Photo 14. There are two gates present on the line. The end of the 16-inch intermediate level outlet is surrounded by dry stone masonry, Photo 15. The 6-inch high level outlet discharges at the downstream toe of the embankment, Photo 16. With the exception of the high level outlet, all gates are reported to be operable.

Saddle Dikes

There are two saddle dikes which were constructed in 1964 to increase the freeboard for the dam. There is a paved access road across the crest of both dikes. Trees are present on the slopes of the left dike.

d. Reservoir Area

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

e. Downstream Channel

The spillway discharge channel is in ledge immediately downstream of the spillway, Photo 13. Farther downstream, erosion of the channel banks has taken place and there are trees overhanging the channel.

The discharge channel for the outlet works is in ledge, Photo 14.

3.2 Evaluation

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

1. Seepage downstream of the dam may cause internal erosion, leading to piping failure of the embankment;
2. Continued erosion of the upstream and downstream slopes could lead to reduction of the crest width;
3. Trees on the embankment and in the immediate downstream area of the dam and left dike could be overturned during a storm, damaging the embankment. Root systems could provide seepage paths, leading to internal erosion and piping failure of the embankment.
4. The location of the outlet gates at the downstream toe permits full water pressure to exist in the outlet pipes through the dam. In the event of a leak in an outlet pipe, seepage and high pore pressure near the downstream toe or base of the dam could cause sliding failure or piping failure of the embankment.

OPERATIONAL AND MAINTENANCE PROCEDURES

SECTION 4

4.1 Operational Procedures

a. General

At the present time Hartford Reservoir No. 2 is generally not used for water supply. The outlet gates are normally left closed but are operated once a year to insure their working condition. The 6-inch outlet gate is inoperable. A program of technical inspections to be made every 5 years was instituted in 1973 by the Metropolitan District.

b. Description of Any Warning System in Effect

The Metropolitan District is currently preparing a formal warning system for the dam. At the present time the reservoir is reportedly drawn down prior to large storms, and the dam is monitored during storms.

4.2 Maintenance Procedures

a. General

The crest of the dam is mowed about twice a year and the downstream slopes cleared of brush annually. Fertilizer and lime were last applied about 12 years ago.

b. Operating Facilities

The outlet gates are operated once a year to insure their working condition. The 6-inch outlet gate is inoperable.

4.3 Evaluation

Present Operational and Maintenance procedures should be improved upon. An Operations and Maintenance Manual should be prepared for the dam and operating facilities. The technical inspection should be made annually instead of every 5 years.

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

SECTION 5

5.1 General

The spillway at Hartford Reservoir No. 2 Dam consists of a 54 foot long concrete broad-crested weir located at the left end of the dam. The spillway is 4.9 feet wide at the top with a batter on the downstream face of 4 inches per vertical foot. The top of the dam is 4.7 feet above the spillway level and the dam crest is approximately 1,425 feet long.

The dam has a tributuary watershed of 1.2 square miles. The terrain is "rolling" wooded hills with no development. Elevations vary from 800 feet in the west to 385 at the spillway. Talcott Dam, a flood control structure, is located in the northeastern corner of the watershed. The dam has two separate emergency spillways, one of which discharges into the Hartford Reservoir No. 2 watershed. For computational purposes, 0.5 square miles of the total 1.4 square mile watershed for Talcott Dam was assumed to be tributary to the Hartford Reservoir No. 2 watershed. The flood control dam would reduce the inflow to Hartford Reservoir No. 2 for smaller floods but was not considered to be effective in reducing the peak for the Probable Maximum Flood (PMF).

The outlet works consist of 3 pipes through the embankment discharging at the downstream toe of the dam. The outlets are controlled by downstream gate valves. The size of the outlet pipes is not entirely clear as records are conflicting. The oldest records (1869) indicate that a 16-inch and a 20-inch pipe were installed through the embankment. More recent records indicate that there are two 16-inch pipes, one of which reduces to a 12-inch at the outlet, and one 6-inch

pipe. One 16-inch pipe and the 6-inch pipe were confirmed in the field. The other pipe discharges below water and was not observed. The two larger pipes are rated at 30 cfs each by the Metropolitan District. The 6-inch outlet is inoperative.

5.2 Design Data

Design data on the reconstruction of the spillway in 1963 and some sketches for the construction of the saddle dikes and raising of the dam in 1964 were available and reviewed. Computations indicated that the spillway was designed for 395 cfs with 2 feet of flow over the weir.

5.3 Experience Data

In August 1955 the depth of flow over the spillway was 1.7 feet. Prior to the storm the water level was 6 feet below spillway level.

5.4 Test Flood Analysis

Based on the dam failure analysis, the dam is classified as "High" hazard potential. The dam is classified as "Intermediate" in size based on a height of 50 feet and a storage capacity of 1,140 Acre-Feet. According to the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers, the Test Flood should be the Probable Maximum Flood (PMF). The Test Flood was calculated using a peak flow of 2,125 cubic feet per second per square mile (csm), from the minimum 2 square mile drainage area shown on the guide curves supplied by the Corps of Engineers, and 1.2 square mile watershed of Hartford Reservoir No. 2. The peak inflow calculated to be 2,550 cfs results in a routed outflow of 1,970 cfs that would overtop the dam by 0.1 feet. The flood routing through the reservoir was done in accordance with "Estimating Effect of Surcharge Storage on Maximum Probable Discharges" provided by the Corps of Engineers.

The spillway capacity was calculated to be 1,540 cfs or 78 percent of the Test Flood routed outflow. For comparison purposes, the 1/2 PMF was calculated and routed through the impoundment. The spillway can discharge 179 percent of the 1/2 PMF routed outflow of 860 cfs.

5.5 Dam Failure Analysis

A dam failure analysis was made using the Corps of Engineers' "Rule of Thumb" guidance. Failure was assumed with the water level at the top of the dam, producing a maximum head of 50 feet.

The calculated dam breach of 50 feet high by 132 feet wide would release about 78,000 cfs into the stream below the dam. Spillway discharge capacity is small in comparison to the breach flow and was not included in the flood routing. Directly downstream of the dam, Hartford Reservoir No. 5 Dam and the service road would be overtopped by approximately 6 feet. At this point the flood waters would divide, with approximately 19,000 cfs discharging over the service road and the remainder continuing downstream to Hartford Reservoir No. 1. Hartford Reservoir No. 1 Dam would be overtopped by approximately 2 feet.

The dams at Hartford Reservoirs No. 1 and No. 5 consist of earth embankments and are susceptible to failure when overtopped. The failure of Hartford Reservoir No. 2 Dam could start a chain reaction resulting in the failures of the dams at Hartford Reservoirs No. 5 and No. 1 as well. For flood routing computations the dams were assumed not to fail.

The flood waters would rejoin at the intersection of Mountain Tree Road and Old Mill Lane, overtopping the roads by approximately 11 feet. Approximately 40 homes within the area would be inundated from 4 to 8 feet above sill level. Downstream the flood waters would flow through the cities of West Hartford and Hartford, inundating structures and endangering lives, before discharging to the Connecticut River.

The maximum spillway discharge capacity of 1,540 cfs would be safely discharged by the spillway at Hartford Reservoirs No. 5 and No. 1, and would overtop Mountain Tree Road and Old Mill Lane by 1.8 feet without flooding the adjacent homes.

The area downstream of the Hartford Reservoir system is highly developed and the failure of Hartford Reservoir No. 2 Dam could result in the loss of more than a few lives and extensive property damage. Therefore, the dam is classified as "High" hazard potential.

EVALUATION OF STRUCTURAL STABILITY
SECTION 6

6.1 Visual Observations

The visual observations did not disclose any evidence of present or past structural instability, with the exception of the bulging of the right stone masonry training wall. The future stability of the dam could be affected by:

1. Downstream seepage;
2. Erosion of the upstream and downstream slopes;
3. Trees on the upstream and downstream slopes and in the area immediately downstream of the dam;
4. The downstream location of the outlet works control valves.

6.2 Design and Construction Data

There was no design or construction data available for the original dam. Design calculations were available and reviewed for the repairs to the spillway weir. The calculations were made in accordance with conventional methods and appear adequate.

6.3 Post-Construction Changes

Since the original construction of the dam in 1869, the following changes have been made:

1. The dam was raised 5 feet in 1871;
2. Spillway weir repaired in 1963;
3. The dam was raised 0.6 feet and the saddle dikes constructed in 1964, increasing the design freeboard from 1'-8" to 4'-8".

6.4 Seismic Stability

The dam is located in Seismic Zone I and in accordance to the recommended Phase I Guidelines does not warrant seismic stability analysis.

ASSESSMENT, RECOMMENDATIONS, & REMEDIAL MEASURES
SECTION 7

7.1 Assessment

a. Condition

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

1. Seepage downstream of the dam;
2. Erosion of the slopes;
3. Trees and stumps on the embankment and left dike;
4. The bulging of the right stone masonry training wall;
5. The downstream location of the outlet control valves.

An evaluation of the hydraulic and hydrologic features of the dam determined that the spillway is capable of passing 78 percent of the Test Flood routed outflow.

b. Adequacy of Information

The information that was available along with the visual inspection, past performance history, and the hydraulic and hydrologic calculations made for this Report were sufficient for performing a Phase I Investigation.

c. Urgency

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

7.2 Recommendations

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

1. Investigate the seepage downstream of the dam and recommend measures for monitoring the seepage and/or preventing piping of the embankment soils.

2. Remove trees, stumps, and root systems from the slopes of the embankments of the dam and left dike and in the area within 20 feet of the downstream toe and backfill with proper material.

3. Investigate the bulging of the right stone masonry training wall.

4. Design upstream shut-offs for the outlet pipes in order to relieve full reservoir water pressure in the pipes through the dam.

5. Perform a detailed hydraulic and hydrologic analysis in order to determine the need for and means to provide additional project discharge capacity.

6. Investigate the need for additional slope protection and design remedial measures as required.

7. Investigate the capped pipe to determine its purpose and need.

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

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Backfill animal burrows and repair erosion areas on the upstream and downstream slopes.

2. Technical inspections currently made every 5 years should be made annually.

3. An operations and maintenance manual should be prepared for the dam and operating facilities.

4. Develop a downstream warning system in case of an emergency at the dam.

7.4 Alternatives

There are no practical alternatives to the above recommendations.

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT: Hartford Reservoir No. 2 Dam

DATE: 11/25/80 TIME: 2:00 p.m. WEATHER: Cloudy - Cold

W.S. ELEVATION: 385.4 U.S. N/A DN.S
(0.1' above spillway)

	PARTY	DISCIPLINE
1.	Roald Haestad, P.E. - Roald Haestad, Inc.	Civil/Geotechnical
2.	Donald L. Smith, P.E. - Roald Haestad, Inc.	Civil/Hydrologic
3.	Ronald G. Litke, P.E. - Roald Haestad, Inc.	Civil/Structural
4.	Robert F. Young, L.S. - Roald Haestad, Inc.	Land Surveyor
5.	Richard Doty - Roald Haestad, Inc.	Civil Technician
6.	David Layman - Metropolitan District	Project Engineer
7.	Rudy Wegscheidr - Metropolitan District	Foreman

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	RH,DLS,RGL	Trees on slopes; some downstream seepage
2.	Dike Embankment	RH,DLS,RGL	Low dikes to increase freeboard
3.	Outlet Works - Intake Channel & Intake Structure	RH,DLS,RGL	No structure or channel observed
4.	Outlet Works - Control Tower	RH,DLS,RGL	Manually operated buried valves (6") not operable
5.	Outlet Works - Transition & Conduit	RH,DLS,RGL	Cast iron pipes through dam
6.	Outlet Works - Outlet Structure & Outlet Chan.	RH,DLS,RGL	Channels in ledge
7.	Outlet Works - Spillway Weir, Appr. & Discharge Channels	RH,DLS,RGL	Weir in good condition; right training wall concrete cracked and stone masonry building
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT: Hartford Reservoir No. 2 Dam DATE: 11/25/80

PROJECT FEATURE: Dam Embankment NAME: RH

DISCIPLINE: Civil/Geotechnical Engineers NAME: RGL,DLS

AREA ELEVATION	CONDITIONS
DAM EMBANKMENT	
CREST ELEVATION	390
CURRENT POOL ELEVATION	385.3
MAXIMUM IMPOUNDMENT TO DATE	1.7' above spillway (August 1955)
SURFACE CRACKS	None observed
PAVEMENT CONDITION	N/A
MOVEMENT OR SETTLEMENT OF CREST	None observed
LATERAL MOVEMENT	None observed
VERTICAL ALIGNMENT	Good
HORIZONTAL ALIGNMENT	Good
CONDITION AT ABUTMENT AND AT CONCRETE STRUCTURES	Some erosion at right spillway training wall
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	None observed
TRESSPASSING ON SLOPES	Animal burrows present
VEGETATION ON SLOPES	Portions of slope covered with brush and weeds. Some trees up to 18" in diameter and rotted tree stumps.
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	Some erosion at right spillway training wall, isolated areas of upstream and downstream slopes.
ROCK SLOPE PROTECTION - RIPRAP FAILURES	Minor slumping of riprap above waterline.
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
EMBANKMENT OR DOWNSTREAM SEEPAGE	Seepage near left end; wet area near 16" outlet; large swamp downstream of right end, flow in brook approximately 10 gpm
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	None observed
TOE DRAINS	None observed
INSTRUMENTATION SYSTEM	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT: Hartford Reservoir No. 2 Dam DATE: 11/25/80

PROJECT FEATURE: Dike Embankment NAME: RH

DISCIPLINE: Civil/Geotechnical Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS	
DIKE EMBANKMENT	RIGHT DIKE	LEFT DIKE
CREST ELEVATION	390.3	394.8
CURRENT POOL ELEVATION	385.3	
MAXIMUM IMPOUNDMENT TO DATE	1.7 above spillway	
SURFACE CRACKS	None observed	Longitudinal cracking
PAVEMENT CONDITION	Good	Longitudinal cracking
MOVEMENT OR SETTLEMENT OF CREST	None observed	None observed
LATERAL MOVEMENT	None observed	None observed
VERTICAL ALIGNMENT	Good	Good
HORIZONTAL ALIGNMENT	Good	Good
CONDITIONS AT ABUTMENT AND AT CONCRETE STRUCTURES	N/A	N/A
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	None observed	None observed
TRESPASSING ON SLOPES	None observed	None observed
VEGETATION ON SLOPES	N/A	Trees
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	None observed	None observed
ROCK SLOPE PROTECTION - RIPRAP FAILURE	No riprap slope protection	No riprap slope protection
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed	None observed
UNUSUAL EMBANKMENT OR DOWNSTREAM SEEPAGE	None observed	None observed
PIPING OR BOILS	None observed	None observed
FOUNDATION DRAINAGE FEATURES	None observed	None observed
TOE DRAINS	None observed	None observed
INSTRUMENTATION SYSTEM	None observed	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT: Hartford Reservoir No. 2 Dam DATE: 11/25/80

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

DISCIPLINE: Civil/Geotechnical NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	There were no intake channels or structures observed
A. APPROACH CHANNEL:	
SLOPE CONDITIONS	
BOTTOM CONDITIONS	
ROCK SLIDES OR FALLS	
LOG BOOM	
DEBRIS	
CONDITION OF CONCRETE LINING	
DRAINS OR WEEP HOLES	
B. INTAKE STRUCTURE:	
CONDITION OF CONCRETE	
STOP LOGS AND SLOTS	

PERIODIC INSPECTION CHECK LIST

PROJECT: Hartford Reservoir No. 2 Dam DATE: 11/25/80

PROJECT FEATURE: Outlet Works - Control Tower NAME: RH

DISCIPLINE: Civil Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	There was no control tower; outlets controlled by manually operated buried gates at downstream toe.
A. CONCRETE AND STRUCTURAL:	
GENERAL CONDITION	N/A
CONDITION OF JOINTS	N/A
SPALLING	N/A
VISIBLE REINFORCING	N/A
RUSTING OR STAINING OF CONCRETE	N/A
ANY SEEPAGE OR EFFLORESCENCE	N/A
JOINT ALIGNMENT	N/A
UNUSUAL SEEPAGE OR LEAKS IN GATE CHAMBER	N/A
CRACKS	N/A
RUSTING OR CORROSION OF STEEL	N/A
B. MECHANICAL AND ELECTRICAL:	
AIR VENTS	N/A
FLOAT WELLS	N/A
CRANE HOIST	N/A
ELEVATOR	N/A
HYDRAULIC SYSTEM	N/A
SERVICE GATES	All gates reported to be in working order except for 6" outlet
EMERGENCY GATES	N/A
LIGHTNING PROTECTION SYSTEM	N/A
EMERGENCY POWER SYSTEM	N/A
WIRING AND LIGHTING SYSTEM IN GATE CHAMBER	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT: Hartford Reservoir No. 2 Dam DATE: 11/25/80

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

DISCIPLINE: Civil Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	Conduits are cast iron pipes through the dam.
GENERAL CONDITION OF CONCRETE	
RUST OR STAINING ON CONCRETE	
SPALLING	
EROSION OR CAVITATION	
CRACKING	
ALIGNMENT OF MONOLITHS	
ALIGNMENT OF JOINTS	
NUMBERING OF MONOLITHS	

PERIODIC INSPECTION CHECK LIST

PROJECT: Hartford Reservoir No. 2 Dam DATE: 11/25/80

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

DISCIPLINE: Civil Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL GENERAL CONDITION OF CONCRETE	The outlet structures consist of riprap placed at the discharge ends of two of the outlet pipes and a stone masonry well at the third.
RUST OR STAINING	N/A
SPALLING	N/A
EROSION OR CAVITATION	N/A
VISIBLE REINFORCING	N/A
ANY SEEPAGE OR EFFLORESCENCE	Wet area to left of 16" outlet
CONDITION AT JOINTS	N/A
DRAIN HOLES	N/A
CHANNEL	16" and 20" in ledge; 6" discharges at downstream toe
LOOSE ROCK OR TREES OVERHANGING CHANNEL	None observed
CONDITION OF DISCHARGE CHANNEL	16" and 20" in ledge

PERIODIC INSPECTION CHECK LIST

PROJECT: Hartford Reservoir No. 2 Dam DATE: 11/25/80

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

DISCIPLINE: Civil/Geotechnical Engineers NAME: RGL,DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
A. APPROACH CHANNEL:	
GENERAL CONDITION	Good
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	None observed
FLOOR OF APPROACH CHANNEL	Cobbles and gravel
B. WEIR AND TRAINING WALLS:	
GENERAL CONDITION OF CONCRETE	Weir is good; crack in right training wall at downstream face of weir; downstream right stone training wall bulging.
RUST OR STAINING	None observed
SPALLING	None observed
ANY VISIBLE REINFORCING	N/A
ANY SEEPAGE OR EFFLORESCENCE	Efflorescence present at construction joints of weir
DRAIN HOLES	None observed
C. DISCHARGE CHANNEL:	
GENERAL CONDITION	Good - some erosion at banks downstream
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	Some trees overhanging downstream channel.
FLOOR OF CHANNEL	In vicinity of dam channel is in ledge
OTHER OBSTRUCTIONS	

APPENDIX B

ENGINEERING DATA

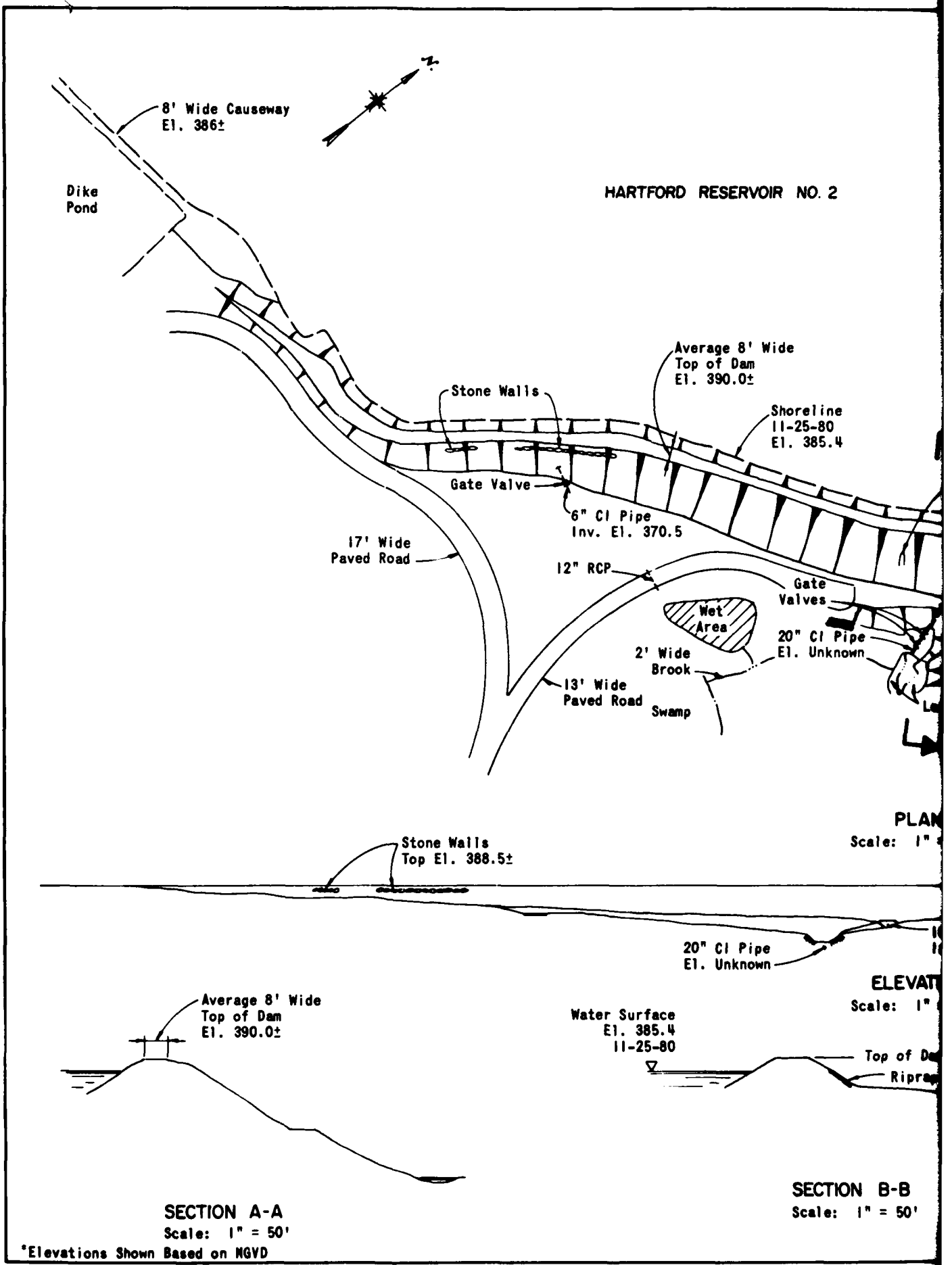
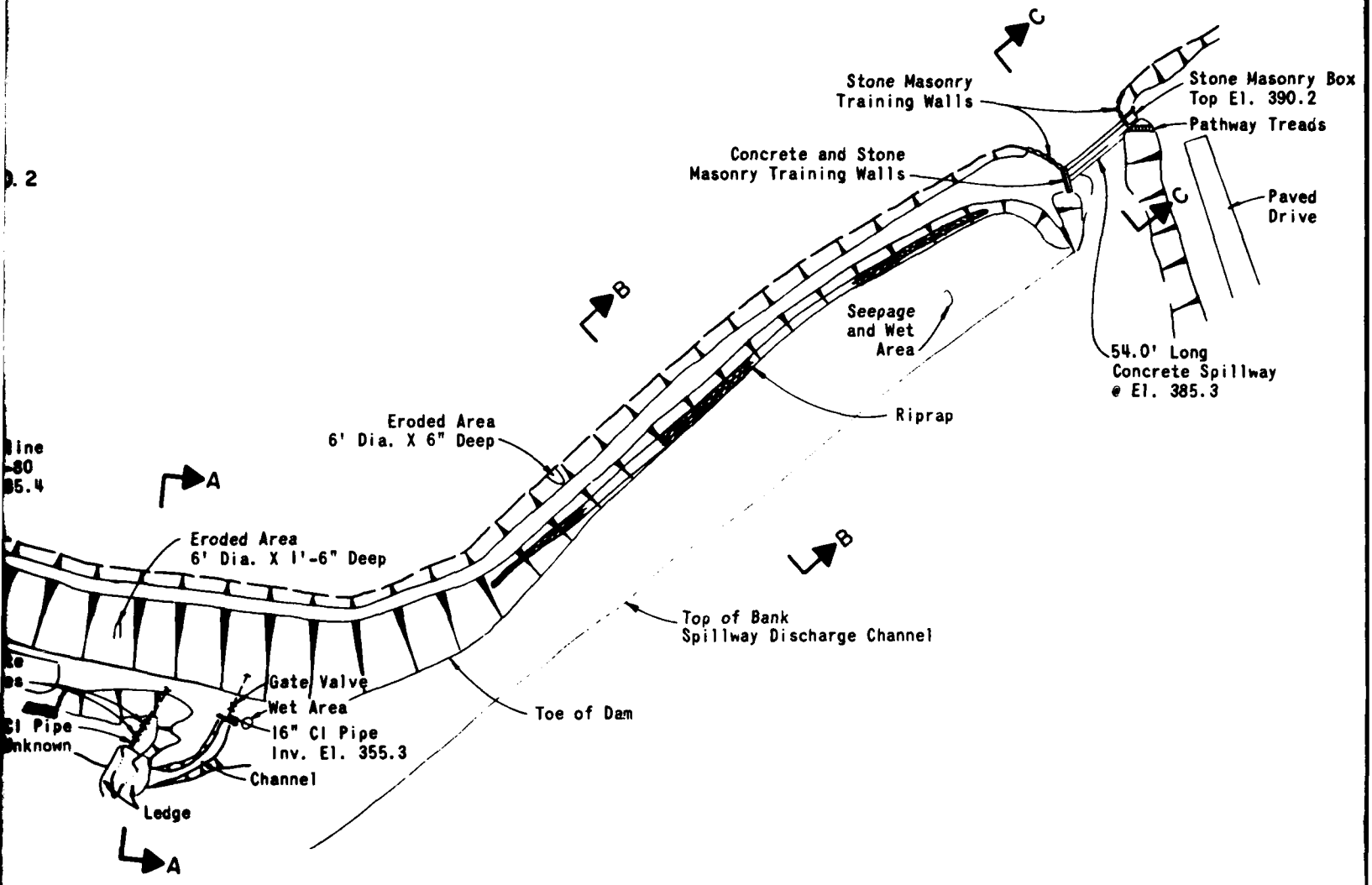
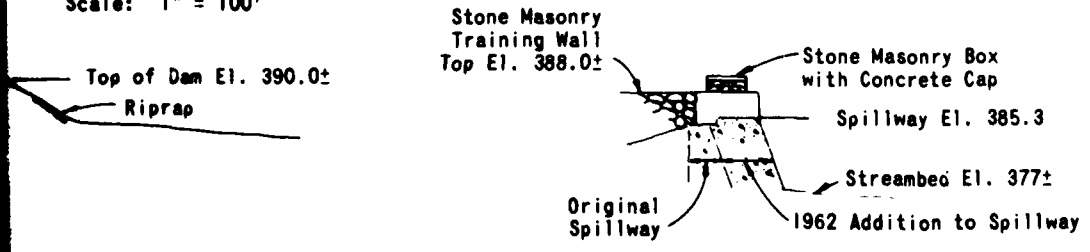

HARTFORD RESERVOIR NO. 2
8' Wide Causeway
El. 386±
Dike
Pond
Average 8' Wide
Top of Dam
El. 390.0±
Stone Walls
Shoreline
11-25-80
El. 385.4
Gate Valve
6" CI Pipe
Inv. El. 370.5
17' Wide
Paved Road
12" RCP
Gate
Valves
Wet
Area
20" CI Pipe
El. Unknown
2' Wide
Brook
13' Wide
Paved Road
Swamp
PLAN
Scale: 1"
Stone Walls
Top El. 388.5±
20" CI Pipe
El. Unknown
ELEVAT
Scale: 1"
Average 8' Wide
Top of Dam
El. 390.0±
Water Surface
El. 385.4
11-25-80
Top of D
Ripra
SECTION A-A
Scale: 1" = 50'
SECTION B-B
Scale: 1" = 50'
*Elevations Shown Based on NGVD

FIGURE 2



PLAN
Scale: 1" = 100'

ELEVATION
Scale: 1" = 100'



CTION B-B
le: 1" = 50'

SECTION C-C
Scale: 1" = 20'

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

HARTFORD RESERVOIR NO. 2 DAM

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

LIST OF REFERENCES

The following references are located at the Metropolitan District, 555 Main Street, Hartford, Connecticut 06115.

1. 1869 Annual Report of the Board of Water Commissioners of the City of Hartford, Connecticut.
2. 1871 Annual Report of the Board of Water Commissioners of the City of Hartford, Connecticut.
3. West Hartford Reservoir No. 2, Spillway Weir Repairs, Design Calculations, The Water Bureau of the Metropolitan District, Chief Engineer's Office, May 1962.
4. West Hartford Reservoirs - Study of Improvements in Hydrologic Capacity, The Water Bureau of the Metropolitan District, Chief Engineer's Office, June 1963.
5. West Hartford Reservoir Capacities, The Water Bureau of the Metropolitan District, Office of the Manager, August 31, 1956.
6. Summary of Major Component of System Reservoirs and Dams.
7. Dam Inspection, 1973, Metropolitan District.
8. Dam Inspections, 1978, Metropolitan District.
9. Miscellaneous information on outlets.
10. Phase I Inspection Report, Hartford Reservoir No. 1 Dam, CT 00001, O'Brien and Gere, Engineers, Inc., April 1980.
11. Phase I Inspection Report, Hartford Reservoir No. 5 Dam, CT 00004, O'Brien and Gere, Engineers, Inc., April 1980.

"431"

P9

Annual Report 1871

385

The Commissioners were obliged to raise the wages of the laborers twice during the season in order to keep any of them.

On account of this difficulty and the excessive rains during some months the Dam was not brought to its present condition as early in the season as it otherwise would have been and the expense has been much larger than it would have been under ordinary circumstances.

The damages caused by the rupture of the Dam have been settled in accordance with votes passed by the Hon. Court of Common Council with the exception of a portion to the Town of West Hartford which the Commissioners have withheld for the reason that the Stone Arch Bridge over which the Main Pipe was laid has not been completed.

As soon as that is completed the balance will be paid.

Reservoir No. 2.

The embankment or dam of the upper Reservoir, or Reservoir No. 2, is built of earth on a rock foundation, very irregular in its formation; the length is about thirteen hundred feet; the width on top twenty-seven feet, and five feet above top water line in the Reservoir.

The inside slope is three and the outside two horizontal to one perpendicular; the inside is covered with a heavy rip-rap wall.

The extreme height from the bed of the brook is forty-two feet.

A puddle wall is built in the embankment starting in a trench cut in the solid rock; the dimensions, &c., about the same as that in the lower Reservoir.

The capacity of this Reservoir is 229,000,000 gallons, covering a water surface of forty-nine acres. The greatest depth of water is thirty-three feet.

Through this Dam is laid two pipes, one of twenty and one of sixteen inches in diameter.

The Dam was built by Messrs. Lobdell and King, contractors, and in a manner very satisfactory to the Commissioners.

Their contract was closed by mutual agreement about the first of November, a little short of what they would have been required to do and nearly their whole force of men and teams put to work upon the lower Reservoir, as it was feared that the force there employed was not sufficient to complete the Dam as far as it was desirable before winter set in.

capacity; for the Commissioners feel that it is quite important to have the pumping works kept in good repair and ready for use in case of an emergency.

During the time the pumps were run, some of the higher portions of the city were deprived of water, as the distributing reservoir is not high enough to furnish it.

At the present time, Reservoir No. 1 is full, and No 2 is above the old top water line, and a large quantity is now being run to waste.

As soon as the impurity of the water, before alluded to, was discovered, an examination was made at the reservoir where the water is drawn into the pipes, and here no bad taste or odor, which was so offensive in some parts of the city, could be discovered, neither was it discoverable as drawn from the main pipe near the reservoir. These examinations were repeated several times subsequently with the same result.

During the time that the water drawn from the pipes was so offensive to the taste and smell in a large portion of the city, in some localities there was no appearance of anything wrong, nor has there been during the entire season.

THE WORKS AT WEST HARTFORD.

During the Fall months the embankment to Reservoir Dam No. 2 was raised five feet, and at the same time a considerable portion of the basin of the reservoir was grubbed and cleaned of all perishable matter, thus adding to the storage capacity about 100,000,000 gallons.

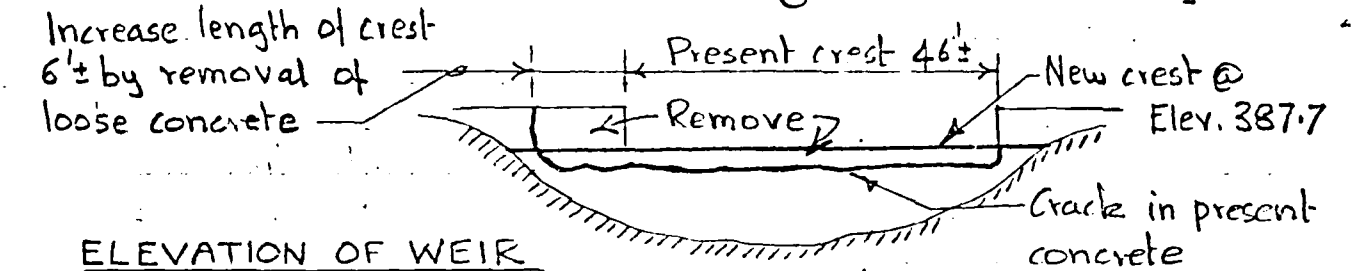
The entire works are now considered in good condition.

Connected with the West Hartford Works there is 352 acres of land owned by the city, and embraced in this is a site for another storage reservoir.

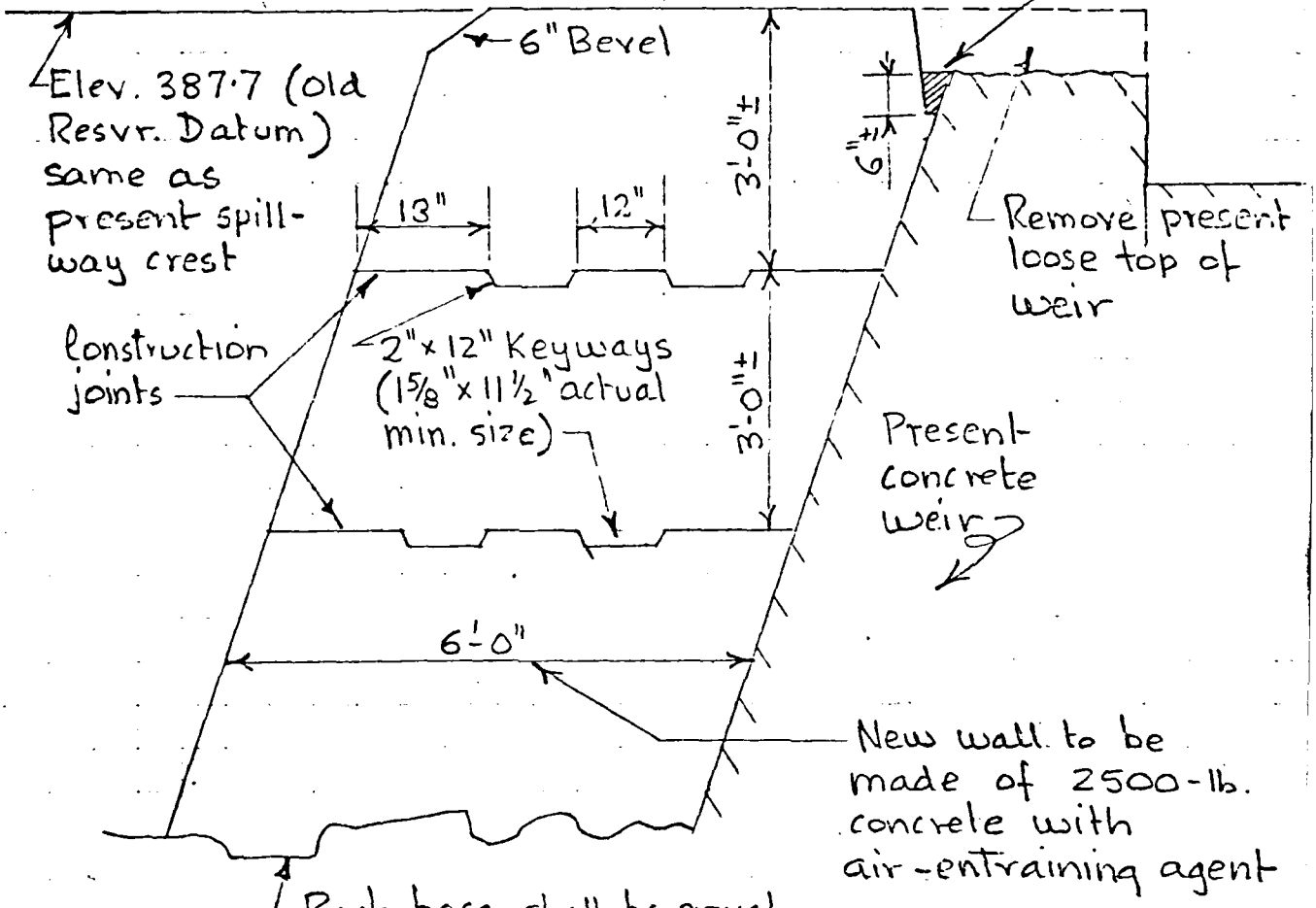
During the year the Commissioners have sent to your Honorable Body two plans for increasing the storage at West Hartford and improving the principal distribution, and the estimated cost of each.

One was to build a large distributing reservoir on Vanderbilt Hill and lay an additional main from there to the city; the other, to build another storage reservoir at West Hartford and lay an additional main the whole distance.

THE METROPOLITAN DISTRICT WATER BUREAU OF CHIEF ENGINEER'S OFFICE	SUBJECT West Hartford Reservoir # 2 – Spillway Weir Repairs	FILE NO.
		ACC. NO. H-3403 A
	COMPUTER P.J.R. CHECKED BY PPS	DATE May 20, 1962



ELEVATION OF WEIR
(No scale)



SECTION THROUGH WEIR
(Scale: 1" = 2'-0")

FORM 3-B THE WATER BUREAU OF THE METROPOLITAN DISTRICT CHIEF ENGINEER'S OFFICE	SUBJECT WEST HARTFORD RESERVOIRS - Study of Improvements in Hydrologic Capacity	PAGE 1 OF 6
		FILE NO.
		ACC. NO. H-3546.1
	COMPUTER fpg / CHECKED BY	DATE 6/18/63

PRESENT CAPACITIES

Refer to Acc. H-2771.8 and related computations made in 1956, following the 1955 storms.

Present spillway capacities range from 200 to 530 cubic feet per second per square mile of watershed which is equivalent to 0.2 to 0.8 inches per hour.

Present freeboard is:

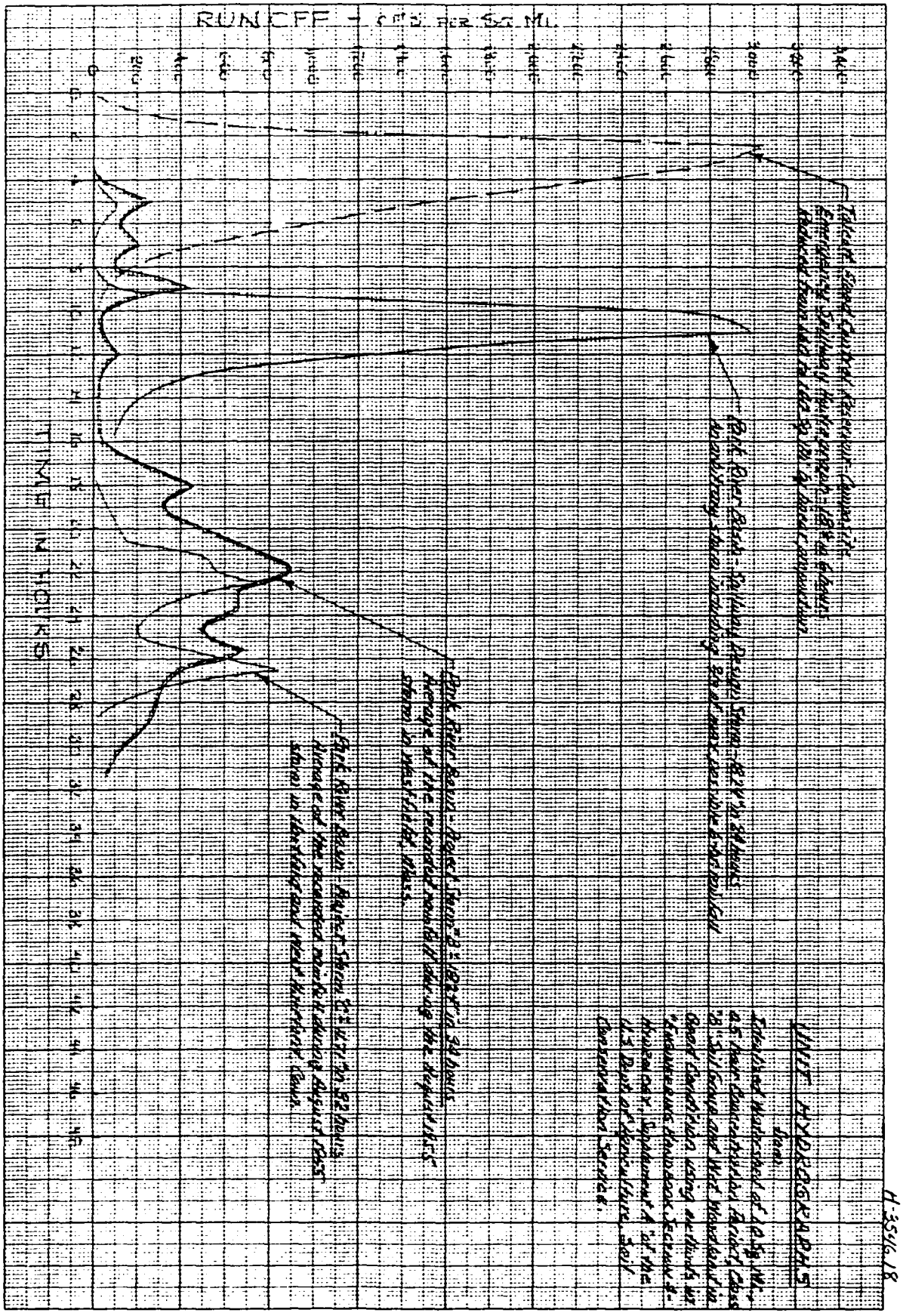
5'-0" ± on Res. No. 1, of which 3'-0" was utilized in August 1955. (was empty)

1'-8" ± on Res. No. 2, ALL of which " " " " " (was down 6')

2'-2" ± on Res. No. 3, ALL of which " " " " " (was down 5')

3'-1" ± on Res. No. 5, of which 2'-0" ± " " " " " (was down 4')

4'-5" ± on Res. No. 6, of which 2'-6" ± " " " " " (was down 1½')


RUNOFF - C.F.S. PER SQ. MI.
TIME IN HOURS
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48

H-3546-18

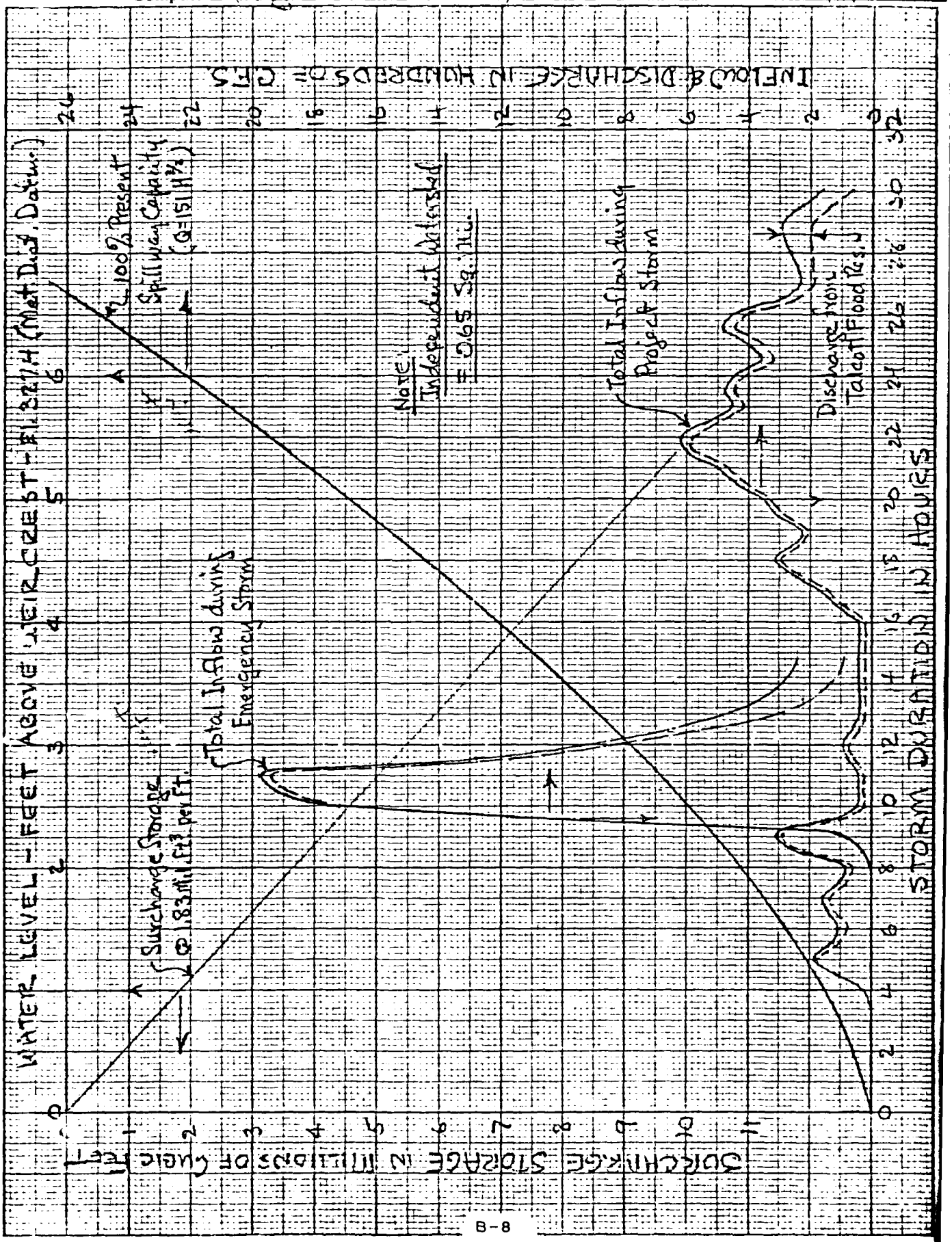
FORM B-1M-2-57

THE WATER BUREAU OF
THE METROPOLITAN DISTRICT

Subject Reservoir No. 2 Statistics
For Flood Routing Computations

Computer PPG Checked by

File No. PAGE 3 OF
Acc. No. II-3546.41
Date 3/11/64



Discussion –

The present weir was built in 1963 and is of course in good condition. Further improvements would have little effect on the height to which the dikes must be raised (a reduction of 0.7 ft. for 50% increase in capacity). Raising the dikes, etc. is the obvious solution.

Recommendations –

Leave weir as is and confine the pond to Elev. 392.0, or 4.6' above El. 387.4 crest, by

a) Redressing the top of the dam, ±0.6' max., with topsoil and seed same.
b) Raise the roadway east of Dyke Pond with general fill and gravel – 16'± top width, 1 on 2½ side slopes seeded and mulched.
c) Raise the dike north of weir with general fill – 6'± top width, 1 on 2½ side slopes, all seeded and mulched.
d) Raise weir abutments from Elev. 390.6 to 392.0 with concrete or masonry.

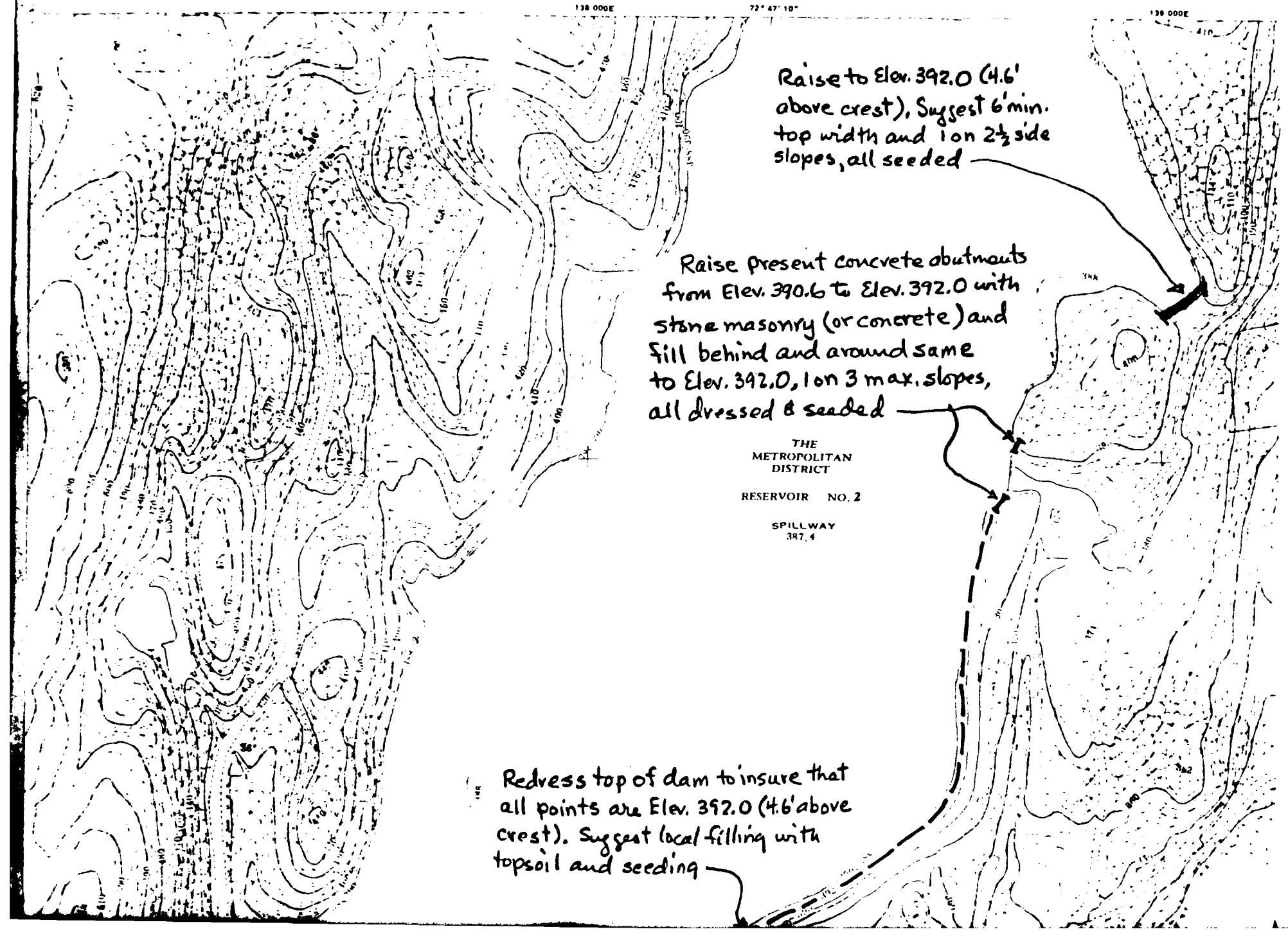
Question of Emergency Spillway –

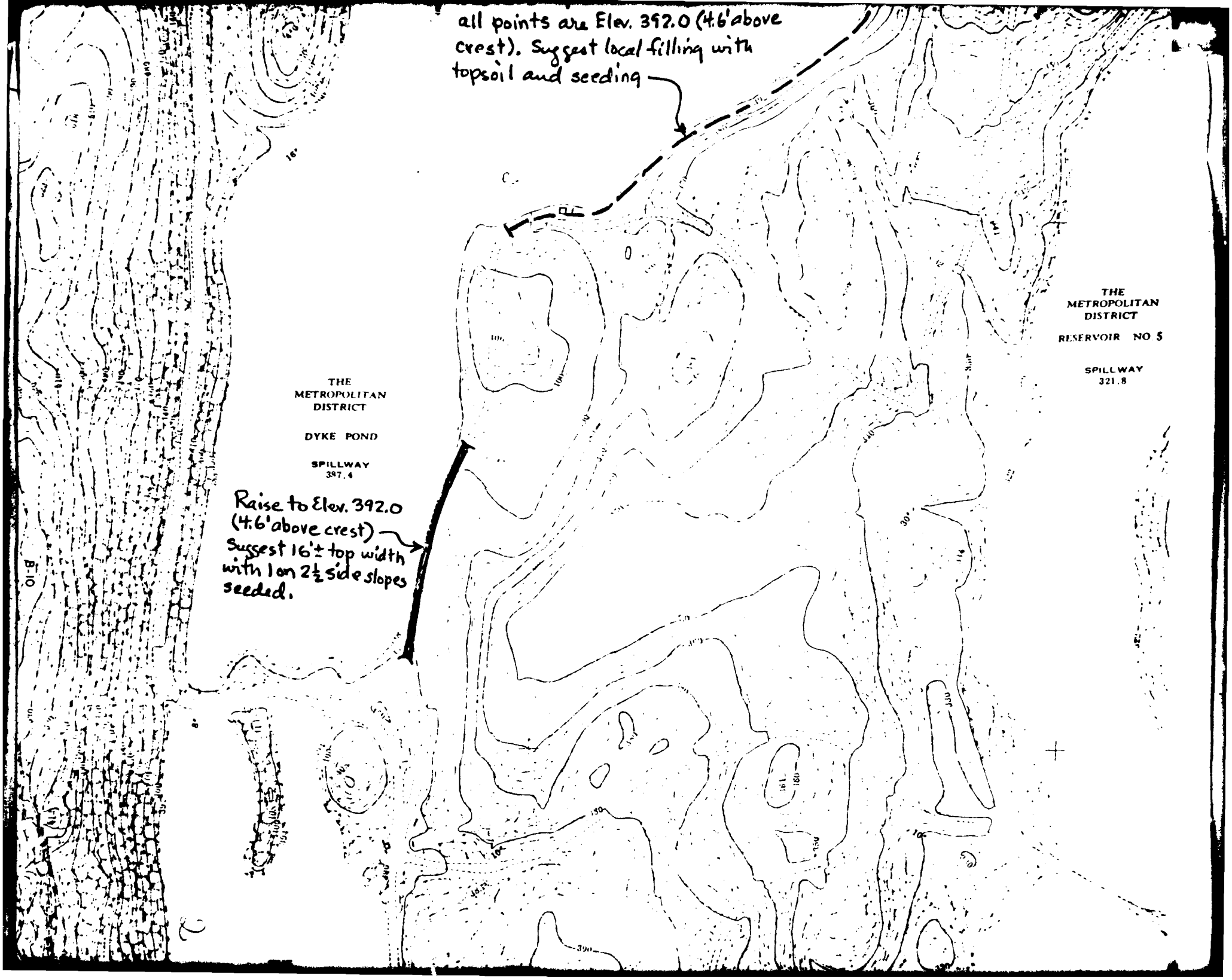
It should be mentioned that the possibility of an emergency spillway has not been overlooked. The saddle north of the weir would be the logical location. It would probably be left at Elev. 391.0 or 12" below the dam, dikes, etc.

Consider, however, the Emergency Storm results plotted on H-3546.45. The overflow would start at about Hour 10:55, last for about 2 hours and reach an overflow depth of 0.8' max. At 100' length and 2.4 coef., the emergency flow would be some 170 cfs, compared with 1,300 cfs over the weir.

If, however, this Emergency Storm were exceeded and an overflow of 170 cfs was experienced, this flow spread over the 1,700' length of dam, dikes and spillway, would average below 1½", which would be preferable by far to a concentrated overflow with a higher chance of scour.

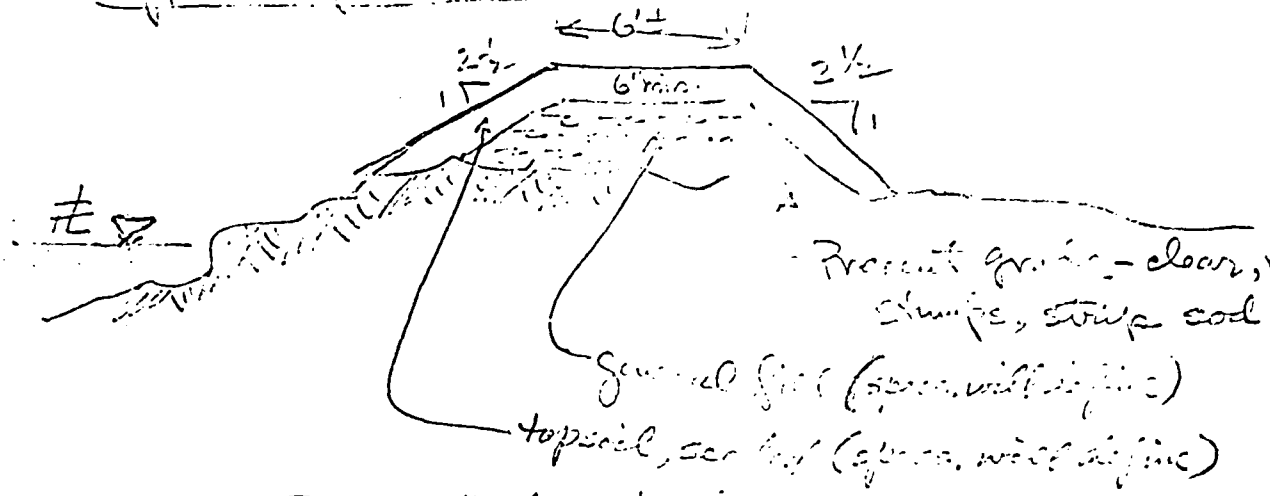
This reservoir is also one of a chain, so that any discharge adds to the load on downstream reservoirs. Uncontrolled flow over an emergency spillway is a dangerous situation in such a chain of reservoirs.


138 000E
72° 47' 10"
139 000E
Raise to Elev. 392.0 (4.6' above crest), Suggest 6' min. top width and 1 on 2½ side slopes, all seeded
Raise present concrete abutments from Elev. 390.6 to Elev. 392.0 with stone masonry (or concrete) and fill behind and around same to Elev. 392.0, 1 on 3 max. slopes, all dressed & seeded
THE METROPOLITAN DISTRICT
RESERVOIR NO. 2
SPILLWAY
387.4
Redress top of dam to insure that all points are Elev. 392.0 (4.6' above crest). Suggest local filling with topsoil and seeding


all points are Elev. 392.0 (4.6' above crest). Suggest local filling with topsoil and seeding
THE METROPOLITAN DISTRICT
DYKE POND
SPILLWAY 397.4
Raise to Elev. 392.0 (4.6' above crest) Suggest 16'± top width with 1 on 2½ side slopes seeded.
THE METROPOLITAN DISTRICT
RESERVOIR NO 5
SPILLWAY 321.8
B-10

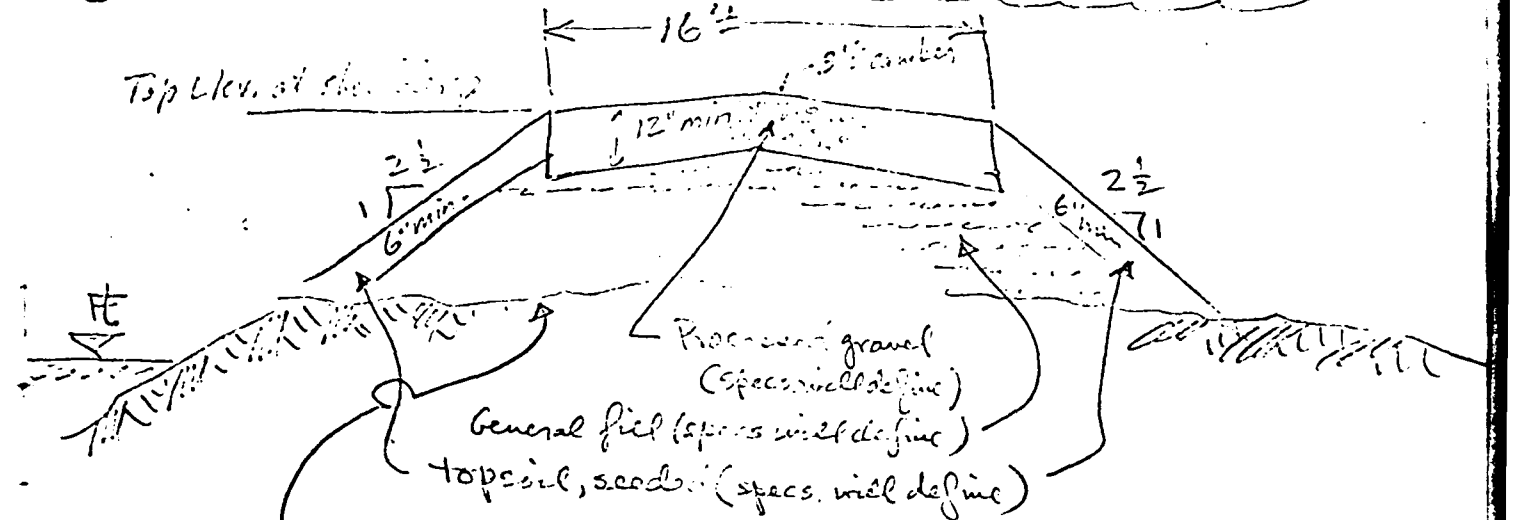
Work Item

Typical Dike Profiles (Where ample top width is available)



Dam & Dike Height

(Without Service Road)



Dam & Dike Height

(With Service Road)

Form 145 - 5000 DEC 1958

THE WATER BUREAU
THE METROPOLITAN DISTRICT
OFFICE OF THE MANAGER

Subject West Hartford Reservoirs - Capacities

File No.
Acc. No. H-231
Date August 5, 1965

Computer D.H.E. Checked by E.P.J.

Note:- All elevations are referred to Old Reservoir Datum.
All data listed below copied from photostat in Mr. Dorenbaum's personal notebook.

Reservoir No.1		Reservoir No.2		Reservoir No.3		Reservoir No.5		Reservoir No.6	
Ele.	Capacity (M.G.)	Elev.	Capacity (M.G.)	Elev.	Capacity (M.G.)	Elev.	Capacity (M.G.)	Elev.	Capacity (M.G.)
260.0	146.0	*387.7	355.7	*375.7	145.5	*322.2	83.0	*401.0	809.1
*259.0	137.3	386.7	270.1	392.7	137.8	321.2	75.1	400.0	765.1
258.0	128.7	385.7	256.4	391.7	130.1	320.2	67.2	399.0	721.6
257.0	120.1	384.7	242.8	390.7	122.5	319.2	59.2	398.0	678.1
256.0	111.4	383.7	229.2	389.7	114.8	318.2	51.3	397.0	634.6
255.0	102.8	382.7	215.5	388.7	107.1	317.2	43.4	396.0	591.1
254.0	95.8	381.7	203.7	387.7	100.7	316.2	38.2	395.0	547.6
253.0	88.8	380.7	191.9	386.7	94.4	315.2	32.7	394.0	509.7
252.0	81.8	379.7	180.1	385.7	88.0	314.2	27.6	393.0	471.7
251.0	74.7	378.7	168.2	384.7	81.6	313.2	22.4	392.0	433.8
250.0	67.7	377.7	156.4	383.7	75.3	312.2	17.1	391.0	395.9
249.0	62.4	376.7	146.6	382.7	70.1	311.2	14.1	390.0	357.9
248.0	57.1	375.7	136.8	381.7	65.0	310.2	11.0	389.0	326.9
247.0	51.8	374.7	127.0	380.7	59.8	309.2	7.9	388.0	295.8
246.0	46.6	373.7	117.2	379.7	54.7	308.2	4.8	387.0	264.8
245.0	41.3	372.7	107.4	378.7	49.5	307.2	1.8	386.0	233.7
244.0	37.4	371.7	99.7	377.7	45.2	306.2	0.6	385.0	202.7
243.0	33.5	370.7	91.9	376.7	41.0	305.2	0.1	384.0	177.6
242.0	29.6	369.7	84.2	375.7	36.7	*304.2	0.01	383.0	156.6
241.0	25.7	368.7	76.5	374.7	32.4			382.0	135.5
240.0	21.8	367.7	68.7	373.7	28.1			381.0	110.5
239.0	19.6	366.7	62.9	372.7	24.6			380.0	87.5
238.0	17.4	365.7	57.0	371.7	21.0			379.0	72.6
237.0	15.1	364.7	51.2	370.7	17.5			378.0	57.8
236.0	12.9	363.7	45.3	369.7	13.9			377.0	42.9
235.0	10.7	362.7	39.5	368.7	10.3			376.0	28.1
234.0	7.4	361.7	34.9	367.7	8.5			375.0	13.3
233.0	3.1	360.7	29.4	366.7	6.7			*374.0	6.6
232.0	6.6	359.7	25.8	365.7	4.9				
231.0	5.4	358.7	21.3	364.7	3.1				
230.0	4.1	357.7	16.8	363.7	1.3				
229.0	3.8	356.7	14.1	362.7	1.1				
228.0	3.5	355.7	11.4	361.7	0.9				
*227.0	3.1	354.7	8.7	360.7	0.4				
		353.7	6.0	359.7	0.1				
		352.7	3.3	*358.7	0.02				
		351.7	2.7						
		350.7	2.0						
		349.7	1.3						
		348.7	0.7						
		*347.7	0.01						

* Present crest elevation (*6 has 12" flash boards)
= Approximately 1 foot above lowest effluent pipe.

SUMMARY OF MAJOR COMPONENTS OF SYSTEM

Reservoirs and Dams

RESERVOIR	NO. 1 WH	NO. 2 WH	NO. 3 WH	
OTAF #	03-05	03-05	03-05	
Use	Hydropower	Reserve	Reserve Supply	
Watershed sq. mi.	(a)	(a)	(a)	
Total Capacity Bil. Gals.	0.146	0.284	0.146	
Operating Capacity Bil. Gals.	0.13	0.28	0.096	
Flowline Elevation (MDC)	259.6	387.4	393.3	
Min. oper. Elevation	-	-	387 (supply via No. 5)	
Average Yield m.g.d.	(a)	(a)	(a)	
95% dry yr. yield m.g.d.	(a)	(a)	(a)	
1960's drought yield m.g.d.	(a)	(a)	(a)	
Level gauge	-	-	-	
DAM	**NO. 1**	**NO. 2**	**SOUTH**	**EAST**
OTAF #	04-07	04-08	04-09	04-09
Length ft.	650	1,200	400	200
Height ft.	43	32	35	10
Type	Earth	Earth	Earth	Earth
Spillway length ft.	45	54	23	-
Spillway design head ft.	-	-	-	-
Total freeboard ft.	7.8	4.6	5.2	-
Spillway design flow c.f.s.	(b)	(b)	(b)	-
Blowoff capacity c.f.s.	55	30	40 to Res. 1	30 to Res.
Outgoing mains	2 @ 20"	-	-	-
Main capacity m.g.d.	-	-	-	-
Metering	-	-	-	-
Power System	-	-	-	-
Standby power	-	-	-	-
Remote signals	-	-	-	-
Telephone	-	-	-	-

NOTE: Dash (-) indicates None or Not Available.
(a) See OTAF No. 02-01, page 8 for areas, reservoir interconnections, and yiel
(b) See separate data sheets for flows. Res. 1, 2, 3, 5 & 6 redesigned in 1960± to handle greater Hartford Flood Commission criteria.

SUMMARY OF MAJOR COMPONENTS OF SYSTEM

Reservoirs and Dams

RESERVOIR	NO. 5 WH		NO. 6 WH & BLOOMFIELD		
OTAF #	03-05		03-06		
Use	Balancing		Water supply and balancing		
Watershed sq. mi.	(a)		2.0		
Total Capacity Bil. Gals.	0.083		0.796		
Operating Capacity Bil. Gals.	0.068		0.28± for Resv. 6 Plant (b)		
Flowline Elevation	321.8		400.6 (c) (MDC datum)		
Min. oper. Elevation	312		393± for Resv. 6 Plant		
Average Yield m.g.d.	(a)		~~See page 8~~ (a)		
95% dry yr. yield m.g.d.	(a)		~~See page 8~~ (a)		
1960's drought yield m.g.d.	(a)		~~See page 8~~ (a)		
Level gauge (recording or indicating)	Remote @ WH Plant		Remote at Resv. 6 Plant		
DAM	SOUTH	EAST	SOUTH	SOUTHEAST	EAST
OTAF #	04-10	04-10	04-11	04-11	04-11
Length ft.	450	300	400	600	3,500
Height ft.	20	10	14	10	35
Type	Earth	Earth	Earth	Earth	Earth
Spillway length ft.	50	-	-	-	50
Spillway design head ft.	-	-	-	-	3.7
Total freeboard ft.	5.2	-	7.0	7.0	7.0
Spillway design flow c.f.s.	(5) f	-	-	-	1,100
Blowoff capacity c.f.s.	~~34~~ 24	-	-	-	25
Outgoing mains	1 @ 48"	-	-	1 @ 20"	2 @ 66"
Main capacity m.g.d.	50	-	-	20	300+
Metering	-	-	-	(d)	(e)
Power System	WH Plant	-	-	-	From Resv.
Standby power	~~Power~~	-	-	-	6 Plant
Remote signals	Water Level	-	-	-	Water Level
Telephone	-	-	-	Plant Intercom	Plant Intercom

NOTE: Dash (-) indicates None or Not Available.
(a) See OTAF No. 02-01, page 8 for areas, reservoir interconnections, and yie
(b) Almost all water available to main at Southeast Dam.
(c) Includes 12" weir board on stone sill.
(d) Meter on 30" Canal Road Main.
(e) Meter at Resv. 6 Plant.
(f) See Note (b) on Page 5.

METROPOLITAN DISTRICT
HARTFORD COUNTY, CONNECTICUT

5/ReC/mm

From: H. A. Phillips, Deputy Manager for Engineering and Administration
Date: Feb. 28, 1974

To: A. J. Minkus, Deputy District Manager and Deputy Manager for Supply & Purification
Copy to: HAP, PJR, ReC, R.Al

SUBJECT: Dam Inspections - 1973
File:

During the Fall of 1973 R. Allen of the Supply and Purification Department and R. Conopask of the Designing Division inspected the various dams and dikes on our reservoirs. Reports of these inspections, together with photographs, are on file in the Designing Division and are available for reference. Copies have also been sent to the West Hartford Filters Headquarters.

No major deficiences were found in any of the dams or appurtenant structures; however minor deficiences that need improvement (high priority items marked with an asterisk; other items should be remedied in not-to-distant future) are listed below under each dam or dike heading:

Saville Dam - Barkhamsted Reservoir

1. Point and/or caulk joints in parapet walls.
2. Remove grass from downstream face drainage ditches and clear catch basins on east side covered with pine branches and needles.
3. Thin brush on downstream face at east end.
4. Place plantings on upstream face and upper slope of downstream face to eliminate hazardous mowing conditions.
5. Fill woodchuck holes on downstream face.
6. Heat/dehumidify stairwell of Upper Gate House.
7. Stop leaks in roof of Lower Gate House, paint ceiling and replace partially rotted entrance door sill.
8. Paint walk gratings and railings in conduit between gate houses: possibly replace with aluminum grates and rails.
9. Clear brush from Diversion Works and culverts at east end of Dam.

Nepaug Dam - Nepaug Reservoir

1. Exterior of dam in poor shape - rennovation planning now in progress by Designing Division.
2. Lime deposits should be cleaned from weep holes and drainage gutters in Inspection Gallery.
3. Floor boards on walkway to Nepaug River Weir should be replaced and painted.

Phelps Brook Dam

1. Trim brush and branches overhanging downstream toe at north end of dam.
2. Patch spalled stringers on downstream face steps.
*3. Replace nuts and bolts on all valves and all nuts and bolts on flanged joints in piping in Lower Gate House. See paragraph following listings of improvements.
4. Paint ladder and structural steel in Lower Gate House.
*5. Clean accumulated sludge, wood, small piping etc. from floor of Lower Gate House and the conduit between gate houses.

Reservoir #2 Dam - West Hartford

1. Remove brush and selected small trees and trim branches overhanging toe of downstream face, especially at south end.
2. Replace blow-off gate box covers.

Reservoir #3 East Dam - West Hartford

1. Mow upstream and downstream faces.
2. Clear small rockfall from inlet channel and large fallen tree from outlet channel.

Reservoir #3 South Dam - West Hartford

1. Improve drainage facilities from road at west end (present drainage ditch is eroding).
2. Remove brush and cut grass on upstream and downstream faces and trim branches overhanging downstream toe.
3. Clear brush and remove minor obstructions from blow-off channels.

Reservoir #3 Dike at North End - West Hartford

1. Repair wire rope railings.
2. Cut brush and grass on both faces.
3. Clean blow-off inlet and outlet.

Reservoir #5 East Dam - West Hartford

1. Cut grass and brush and remove previously cut brush, trees, etc. from downstream face.
2. Clear fallen concrete slabs and rocks from channel of 16" C. I. line outfall.

Reservoir #5 South Dam - West Hartford

1. Mow downstream face.
2. Replace 2 gate box covers.
3. Replace wood floor in Upper Gate House with aluminum grating.
4. Resurface deck of bridge over spillway channel.

Reservoir #6 Long East Dike - West Hartford and Bloomfield

1. Cut brush in area of Middle Gate on downstream face.

Reservoir #6 South Dam - West Hartford

1. Replace missing rip-rap.
2. Fill woodchuck holes.
3. Clean culvert under Reservoir #6 Access Road.
4. Cut brush and trim branches overhanging toe of downstream face.

Cold Brook Dam - Glastonbury

1. Paint chain link fence.
2. Paint intake and gate houses where necessary.
3. Fill eroded area behind end of east wing wall.
4. Lubricate hoists in intake house.

Collinsville Dam - New Hartford (Nepaug Reservoir)

1. Mow upstream and downstream faces.

Detailed inspection and replacement of deteriorated nuts and bolts at Phelps Brook Dam and Reservoir #1 Dam [redacted] Powerhouse Gate House should be initiated as soon as possible. Bolts and nuts of all sizes appear to be in short supply at this time. The Designing Division will assist in purchasing the necessary materials and investigate the possibility of using stainless steel nuts and bolts to eliminate future replacement. We strongly recommend that Gate Personnel from the Distribution Department be utilized to effect the bolt replacement on all gate valves (associated gate maintenance could be made concurrently if this recommendation is followed).

While most of the above listed work can be accomplished by normal maintenance procedures, bolt replacement, fence installation, floor grating purchasing, etc. may require that specifications and contracts be written. The Designing Division will assist as requested by Supply and Purification personnel.

Henry A. Phillips

The Metropolitan District
Hartford County, Connecticut
Water Bureau
Designing Division

Des. Div. Ref. No. S- 1408
Date 10-24-73

INSPECTION OF DAMS AND SPILLWAYS

NAME OF DAM Reservoir #2 Dam

LOCATION (Town, River, Reservoir) West Hartford

INSPECTORS	Name	Title	Div./Dept.
	Dick Allen	Asst. Engineer	S & P
	Dick Conopask	Sr. Engineer	Design

In filling out this form, please enter full information on conditions, and on location of any defects.

A. GENERAL

1) Were any photographs taken of the dam during this inspection Yes

2) Reservoir level, Elev. MDC Datum = 40.80

3) Weather (including comment on humidity) Warm, dry, sunny (Beautiful fall day)

B. EARTH DAMS

1) Note any depressions in crest None

2) Slides and/or erosion, upstream face None

3) Slides and/or erosion, downsteam face Minor raveling of placed stone (See Picture #1); worn foot path from cul-de-sac to crest.

4) Cracks in embankment None

5) Surfacing on crest and condition Grass, generally good but poor in spots (See Picture #2).

6) Condition of parapet walls, if any None

7) Seepage on downstream face, especially at toe, (location and quantity) None

8) Soft ground at toe (locate) None

9) Signs of settlement at gate house and/or gate house bridge Not applicable.

10) Downstream drainage system (clear or blocked, etc.) None

11) Type and condition of downstream face planting Natural grass and brush overgrown* (See Picture #2).

12) Is planting and/or debris etc. a fire hazard? No

13) Do plantings obscure toe of dam and other points where monitoring inspection is necessary? At southend

14) Damage or vandalism (to lights, plaques, etc.) Usual littering.

15) Other All blow-off gate box tops are missing. Stuffing box leak at downstream gate of lower blow-off.

C. CONCRETE DAMS

1) Any signs of motion

* Brush at south end of dam should be removed and pine trees trimmed of branches to 6' above ground. From cul-de-sac north brush and selected small trees should be removed.

Electrical gear _____

Other _____

_____

6) Do all electric lights work _____

7) Condition of stop logs in storage well _____

_____

8) Operating personnel comments on functional condition of all equipment (valves, hoists, selector gates, trash racks, screens, etc.) _____

_____

_____

_____

9) Other comments _____

_____

_____

_____

iii) Conduit between gate houses

1) Concrete condition _____

2) Leakage _____

3) Condition of metal work and piping _____

_____

4) Other comments _____

_____

_____

E. PRINCIPLE SPILLWAY

(If spillway is part of dam, enter information in C only).

1) Weir Excellent (See Picture #3). _____

_____

2) Channel Good

3) Outlet of channel Good

4) Note any obstructions to flow None

5) Bridge None

6) Is water spilling No

7) Other comments

F. EMERGENCY SPILLWAY

1) Channel

2) Obstructions

3) Other comments

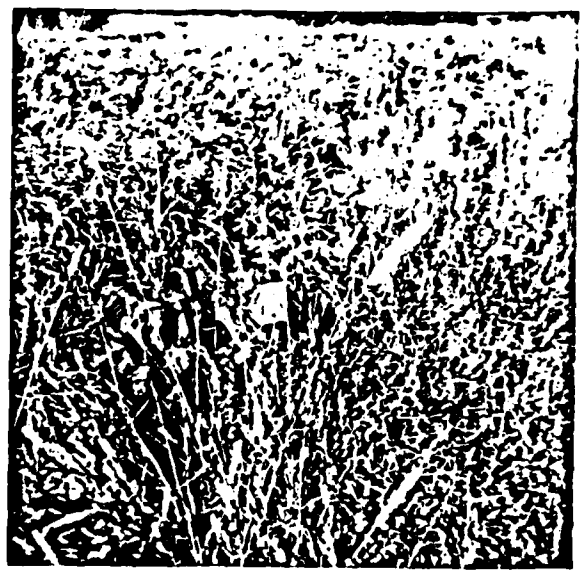
G. APPURTENANT STRUCTURES

List structure (such as stilling pools, discharge weir structures, stream diversion works, etc. and give conditions.

H. OVERALL ASSESSMENTS

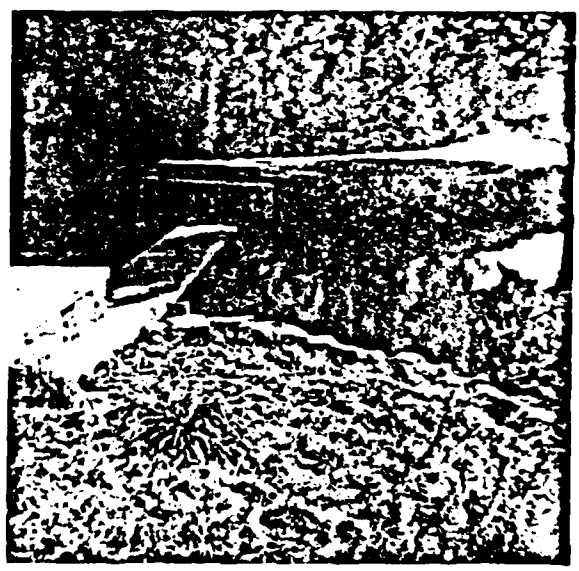
Is this dam with its appurtenances maintained in a condition satisfactorily to the Inspectors? Yes, but brushing would facilitate future inspections.

RESERVOIR #2 DAM



#1. Minor ravelling of downstream face.

#2. Grass crest in generally good condition. Downstream face overgrown.



#3. Spillway in excellent shape. Some stones missing on approaches.

FORM 38

METROPOLITAN DISTRICT
HARTFORD COUNTY, CONNECTICUT

From: R. E. Conopask, Senior Engineer — Date: March 23, 1979

To: P. J. Revill, Chief Design Engineer - Water — Copy to: PJR, REC, DCL

SUBJECT: DAM INSPECTIONS -- 1978 — File:

During the Fall of 1978, D. Layman and R. Conopask of the Design Division - Water inspected the District's dams and dikes. Reports of these inspections together with photographs, are on file in the Design Division.

No major deficiencies affecting operating safety were found in any of the dams or appurtenant structures; however, conditions that need improvement or phenomena that need monitoring (priority items marked with asterisk) are listed below:

SAVILLE DAM - BARKHAMSTED RESERVOIR

1. Fill woodchuck holes on downstream face.

*2. Parapet walls and road entrance buttresses need pointing and caulking. The mortar in many places is crumbling and some stones are loose. As reported in the paper "Saville Dam - Masonry" by P. J. Revill 3/5/79 the repair of the parapet is considered urgent.

3. C. B. #13 (Catch Basin No. 13) has water coming from upstream pipe - flow is 4" wide in bottom of pipe - per operating personnel this comes from a "spring" above Upper Gate House - source should be investigated and flow monitored.

*4. Drainage ditch west of C. B. #2 needs repair; 1st berm up from toe - 1 C. B. has solid cover, replace w/grate - remove piles of sand from drainage ditch - remove growing grass from drainage ditch; 2nd berm up from toe - 3 C. B.'s have solid covers, replace w/grates - replant and grass where excavations made - remove growing grass from drainage ditch - East side drainage ditch overgrown with junipers and grass, remove these growths.

5. The present temporary access road to the 1st and 2nd berms located on the eastern end of the dam should be made permanent to allow for regular cleaning of the berm catch basins and drainage ditches.

6. Remove grass from downstream face drainage ditches.

7. Repair west stairway at the Lower Gate House.

8. Resurface the upper slope to eliminate unsightly weed growth and a hazardous mowing condition.

9. Replace/repair locks on exterior doors of both gate houses.

10. The electrical system needs replacing per Corps of Engineers report by Matthews Association. This is covered in P. J. Revill's paper "Saville Dam - Electrical System" of 3/5/79.

GOODWIN DAM - HOGBACK RESERVOIR

*1. Seal cracks in roadway on crest to prevent further deterioration.

*2. Remove solid covers on Manholes #10 and 16 and replace with grates.

3. Remove grass from stone paved ditches.

4. Replace rail on fence above stream flow tunnel end wall.

5. Refinish door to Gate House.

*6. Improve electrical system in accord with Corps of Engineers report by Matthews Associates.

7. Inspect balcony in Streamflow Tunnel and paint.

*8. Repair gate at Outlet Conduit anti-personnel grating.

*9. Grout paving joints in Stream flow channel.

RICHARD'S CORNER DAM - COMPENSATING RESERVOIR

*1. Locate outlet of downstream face drainage system and clear if necessary.

2. Repair spalled concrete on west retaining wall and paint railing.

3. Paint door of Upper Gate House.

*4. Replace electrical system per Corps of Engineers report by Matthews Assoc.

*5. Replace Discharge Conduit endwall ladder.

*6. Install 6' chain link fence along west wall of Spillway channel from weir southerly to south end of vertical channel wall.

7. Repair washout at end of west wingwall of Discharge Tunnel.

RESERVOIR #1 DAM - WEST HARTFORD

1. Paint exterior walls of Upper Gate House.

*2. Replace rotted back door of Upper Gate House.

3. Clean black sludge from floor of Lower Gate House.

4. Repair walls in Outlet Channel where they have fallen in.

RESERVOIR #2 DAM - WEST HARTFORD

*1. Repair spillway south wall - repoint joints and fill depression and erosion.

2. Clean gate boxes and replace box tops on center blow-off.

3. Ascertain if leakage causing swamp behind dam is caused by leaky gate valves on blow-offs.

4. Support walkway approach slab at spillway.

RESERVOIR #3 SOUTH DAM - WEST HARTFORD

1. Fill woodchuck holes on downstream face.

*2. Ascertain exact location of running water see (item B.7 in 1978 report) to determine if flow can be stopped.

3. Seed downstream face, particularly where brush has been removed, to obtain better grass cover.

4. Clear all blow-off channels of brush and fallen rocks, particularly the high level blow-off.

RESERVOIR #3 EAST DAM - WEST HARTFORD

1. Remove brush from lower ½ of downstream face.

2. Mow both up and downstream faces.

RESERVOIR #3 DIKE AT NORTH END - WEST HARTFORD

1. Remove severely overgrown brush from both faces of dike.

RESERVOIR #5 SOUTH DAM - WEST HARTFORD

1. Seed east half of crest to obtain better grass cover.

*2. Clear outfalls of internal drains at center and west end of dam.

*3. Clear blow-off channel and ascertain quantity and reason for flow from 6"+ pipe in blow-off end wall.

4. Repair broken windows in Gate House.

5. Replace wooden floor in Gate House with grating.

6. Clear outlet channel of fallen trees.

7. Repair erosion damage to outlet channel bank at right hand bend below bridge.

8. Replace surfacing on channel bridge.

RESERVOIR #5 EAST DAM - WEST HARTFORD

*1. Repair eroded areas and seed entire upstream face to obtain grass cover. Paved leakoffs should be installed to contain road drainage and prevent erosion.

2. Mow grass on both faces and remove brush from downstream face.

RESERVOIR #6 SOUTH DAM - WEST HARTFORD

1. Replace missing rip-rap on upstream face.
2. Fill woodchuck holes on downstream face.
3. Clear ends of drainage culvert under access road.
4. Remove cedars and brush from downstream face.

RESERVOIR #6 SMALL EAST DIKE - WEST HARTFORD

1. Clear outlet channel of culvert under access road.

RESERVOIR #6 LONG EAST DIKE - BLOOMFIELD AND WEST HARTFORD

1. Remove brush and trees from downstream face.

*2. Replace supports for small piping in wells of Intake House.

*3. Thoroughly inspect and replace, if necessary, the aluminum ladders in the intake wells.

*4. Repair broken stem, etc. of 84" sluice gate - procedure now being investigated by Water Design.

5. Repair erosion at channel end of North Talcott Tunnel.

COLDBROOK DAM - GLASTONBURY

1. Repair crack in east spillway retaining wall and fill depression behind wall.
2. Repair erosion damage on upstream face.

*3. Mow grass on east end and remove brush from both faces before it becomes overgrown.

*4. Recaulk all windows, replace exterior doors and rotten boards in wood trim and paint all exterior wood on Intake House.

5. Paint soffits and facias on Outlet House.
6. Inspect reservoir draining valve in spillway to ascertain working condition.

COLLINSVILLE DAM - NEW HARTFORD

1. Mow slopes more often to prevent brush growth.

Most of the work listed above can be accomplished by normal maintenance procedures. Water Design will assist as requested in the preparation of any plans and specifications required for the work.

Richard E. Conopask,
Senior Engineer

The Metropolitan District
Hartford County, Connecticut
Water Bureau
Designing Division

Des. Div. Ref. No. S- 1408
Date 11/1/78

INSPECTION OF DAMS AND SPILLWAYS

NAME OF DAM Reservoir #2 Dam

LOCATION (Town, River, Reservoir) West Hartford

INSPECTORS	Name	Title	Div./Dept.
	Dave Layman	Ass't Engineer	Design
	Dick Conopask	Sr. Engineer	Design

In filling out this form, please enter full information on conditions, and on location of any defects.

A. GENERAL

1) Were any photographs taken of the dam during this inspection Yes

2) Reservoir level, Elev. Depth above effluent pipe - 40.87'

3) Weather (including comment on humidity) cool, dry, breezy, sunny beautiful Fall day

B. EARTH DAMS

1) Note any depressions in crest None

2) Slides and/or erosion, upstream face None; however minor erosion at end of south spillway retaining wall, see picture #2

3) Slides and/or erosion, downsteam face None except for occasional footpath

4) Cracks in embankment None

5) Surfacing on crest and condition Grass - generally good but poor in spots

6) Condition of parapet walls, if any None

7) Seepage on downstream face, especially at toe, (location and quantity) Extensive swamp @ south end east of cul-de-sac road *

8) Soft ground at toe (locate) 10'± north of upper blow-off, see picture #6

9) Signs of settlement at gate house and/or gate house bridge —

10) Downstream drainage system (clear or blocked, etc.) None

11) Type and condition of downstream face planting Native grass and placed stone fair - some areas need regrassing

12) Is planting and/or debris etc. a fire hazard? No

13) Do plantings obscure toe of dam and other points where monitoring inspection is necessary? No

14) Damage or vandalism (to lights, plaques, etc.) Usual littering

15) Other Upper (north most) blow-off - O.K.
Lower (center) blow-off - both gate box tops missing, boxes full of debris

C. CONCRETE DAMS

1) Any signs of motion

* See picture #7 for local flow running to main swamp and picture #8 for swamp

Electrical gear _____

Other _____

_____

6) Do all electric lights work _____

7) Condition of stop logs in storage well _____

_____

8) Operating personnel comments on functional condition of all equipment (valves, hoists, selector gates, trash racks, screens, etc.) _____

_____

_____

_____

9) Other comments _____

_____

_____

_____

iii) Conduit between gate houses

1) Concrete condition _____

2) Leakage _____

3) Condition of metal work and piping _____

_____

4) Other comments _____

_____

_____

E. PRINCIPLE SPILLWAY

(If spillway is part of dam, enter information in C only).

1) Weir Excellent, see picture #4

_____

2) Channel Good

3) Outlet of channel Good

4) Note any obstructions to flow None

5) Bridge No

6) Is water spilling No

7) Other comments Walkway approach slab is undermined and should be back-filled before it collapses - see picture #3; south retaining wall has erosion at back face, see picture #1

F. EMERGENCY SPILLWAY

1) Channel

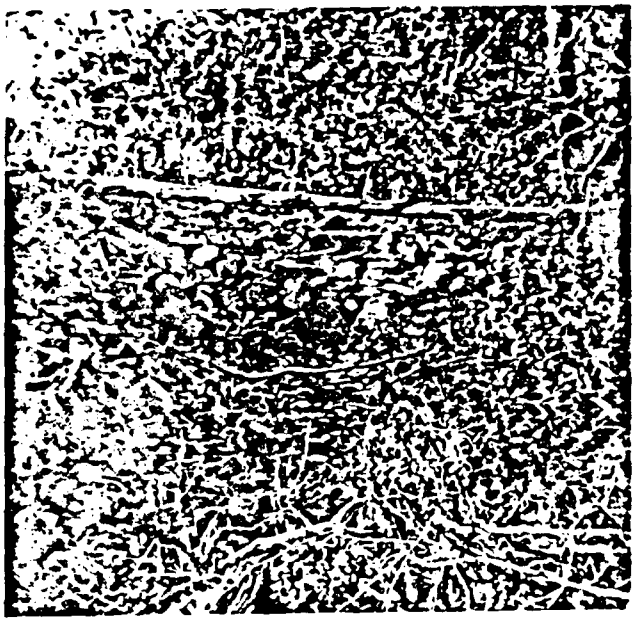
2) Obstructions

3) Other comments

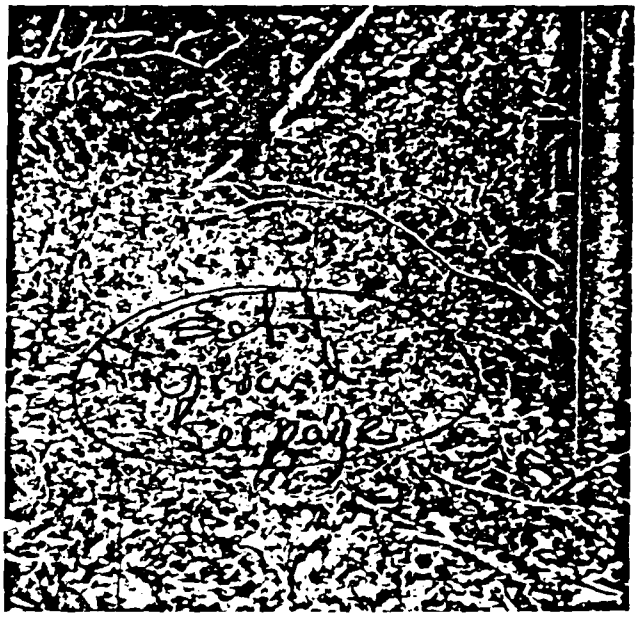
G. APPURTENANT STRUCTURES

List structure (such as stilling pools, discharge weir structures, stream diversion works, etc. and give conditions.

RESERVOIR #2 DAM
1978

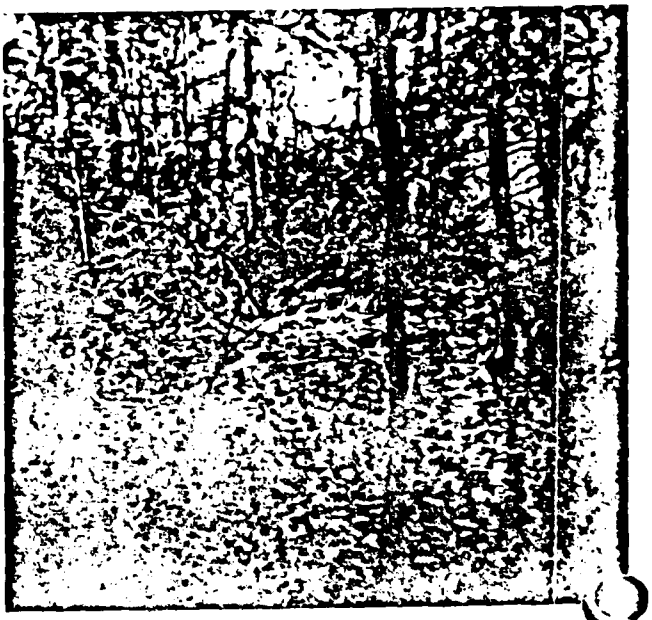


#5 16" Blow-off and end wall



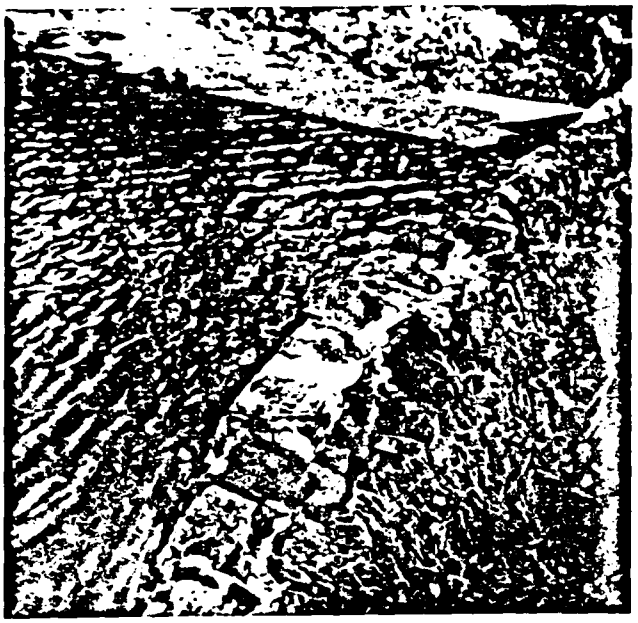
#6 Soft ground and seepage 10'± north of north-most blow-off (8")

#7 Running water at South end of dam east of cul-de-sac



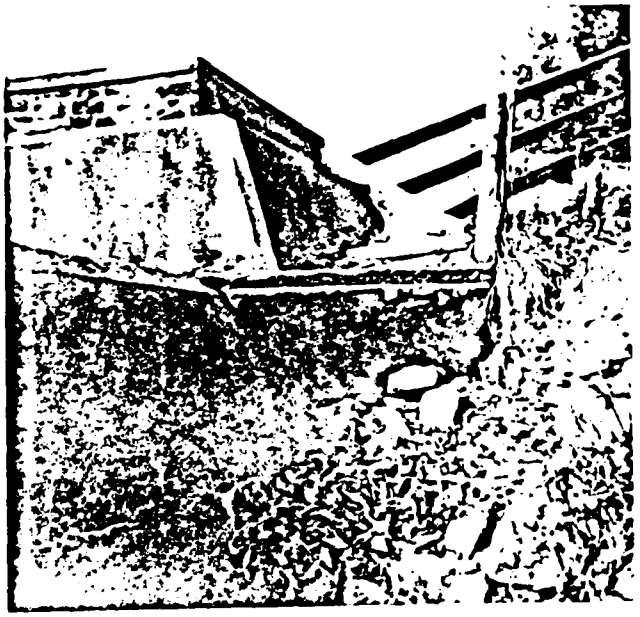
#8 Large area of standing water east of south end of dam

RESERVOIR #2 DAM
1978

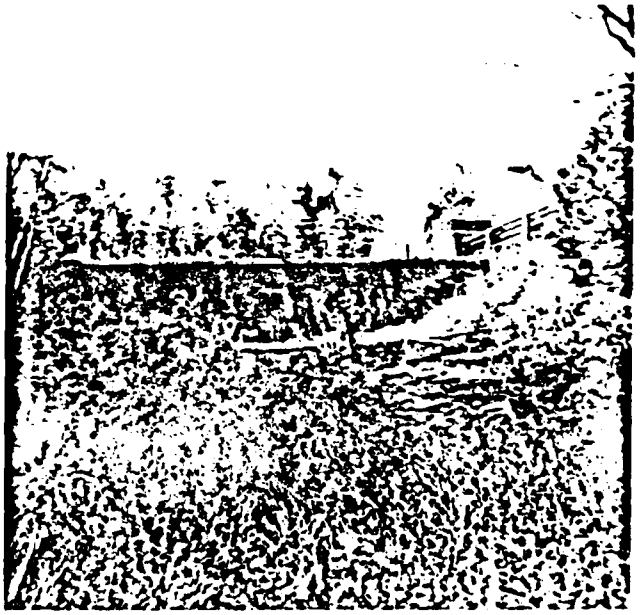


#1 South wall of spillway approach - depressions should be filled and wall joints repointed

#2 Erosion at end of south wall - joints should be repointed



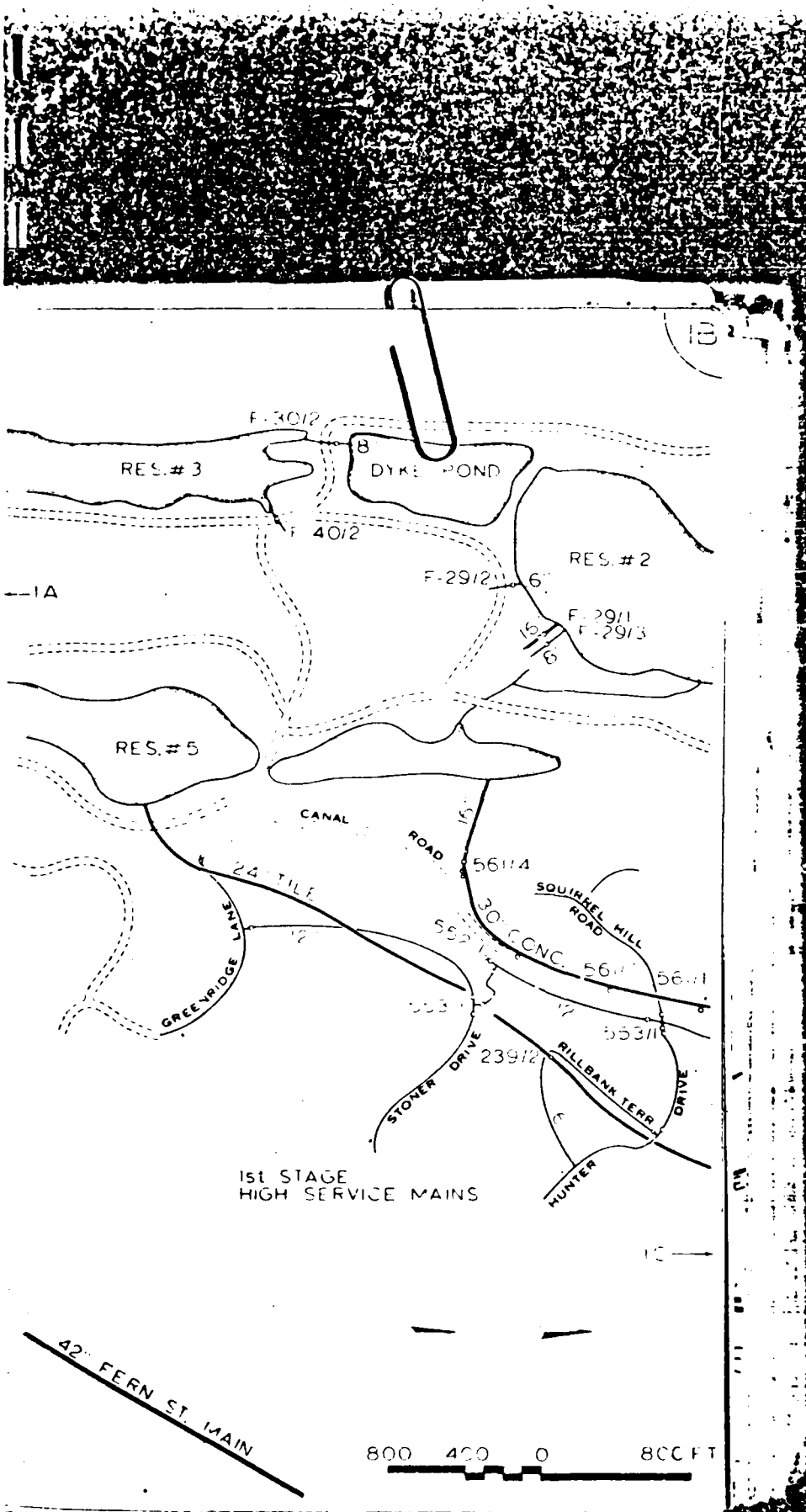
#3 Walkway slab at spillway is undermined



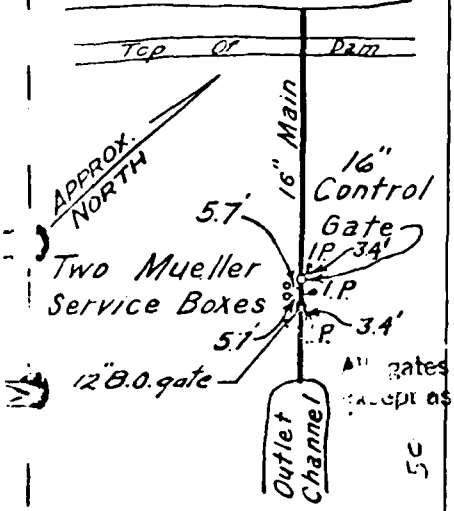
#4 Downstream face of spillway in excellent condition

H. OVERALL ASSESSMENTS

Is this dam with its appurtenances maintained in a condition satisfactorily to the Inspectors? Yes

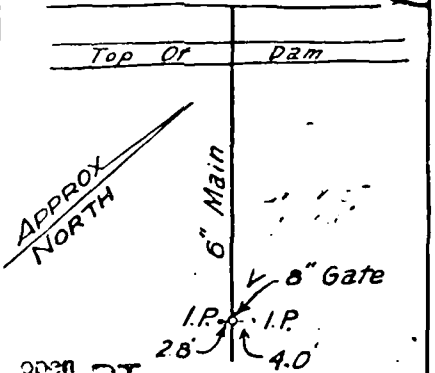

RES. # 3
DYKE POND
RES. # 2
RES. # 5
CANAL
ROAD
SQUIRREL HILL ROAD
GREENRIDGE LANE
STONER DRIVE
RILLBANK TERR.
DRIVE
HUNTER
24" TILE
42" FERN ST. MAIN
1st STAGE
HIGH SERVICE MAINS
800 400 0 800 FT

RESERVOIR NO. 2



12" B.O. gate

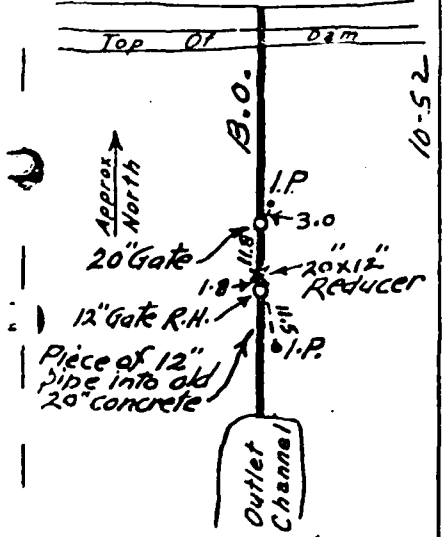
RESERVOIR NO. 2 29



Gate Used To Draw Off Upper Portion Of Reservoir

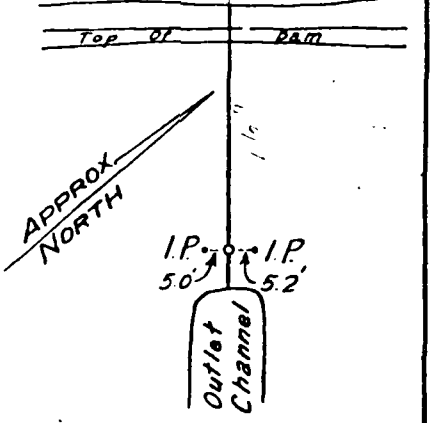
1 2
4 3

RESERVOIR NO3



B. O. 100' South Of Top Of Dam

RESERVOIR NO. 2



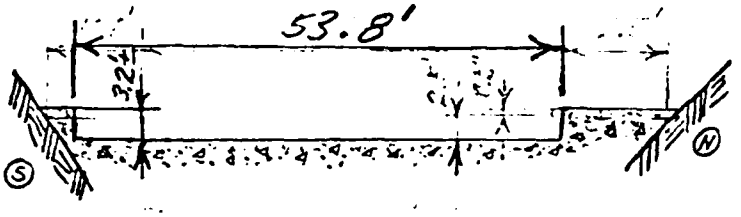
Gate Used To Draw Off Middle Portion Of Reservoir

Form 5-E 7-1938
The Water Bureau of
The Metropolitan District
Office of the Manager

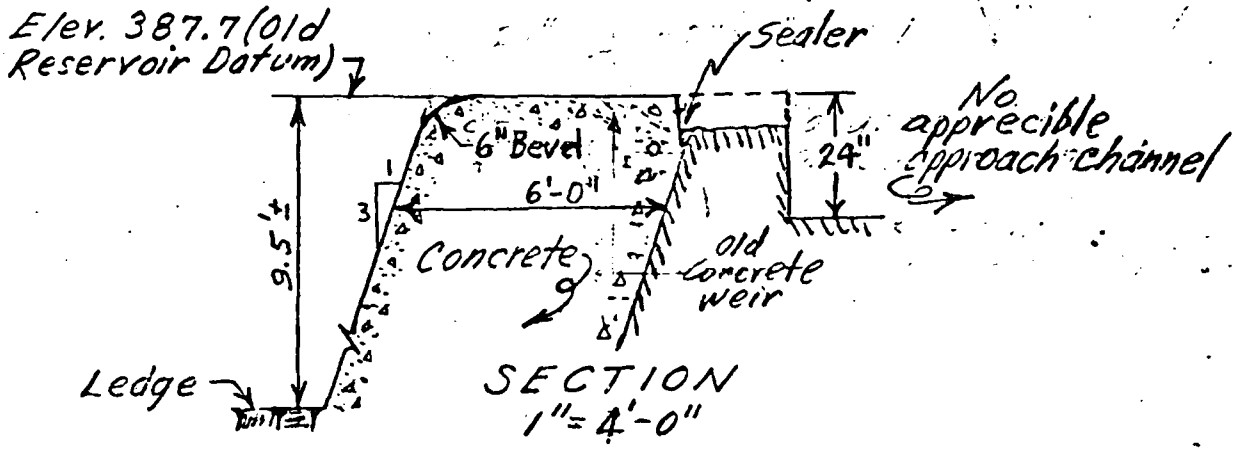
Subject WEST HARTFORD RESERVOIRS - Reservoir #2

File No.
Acc. No. H-2771
Date June 195

Computer T.E.M. Checked by



ELEVATION
1" = 20'



SECTION
1" = 4'-0"

WEIR DETAILS

DAM DATA:

Present minimum freeboard is 1.7' on Dyke Pond and 2.3' on dam proper
Maximum height of dam is 50'± (based on downstream toe)
Top width is 15'±
Downstream slope is 1 on 2.5±
Earth dam with "puddle" core down to rock

BLOW-OFF DATA (based on approx. computation and reservoir at Elev. 387.7)

#29/1-16" to 12" Pipe will discharge 30± c.f.s. (by Brook into Res. #5)
#29/3 - 16" " " " 30± c.f.s. (" " " " ")

SUBMITTED BY William Doienbaum
Chief Designing Engineer B-37

APPROVED
Deputy Manager and Chief Engineer

Joseph Merritt & Co.

APPENDIX C

PHOTOGRAPHS

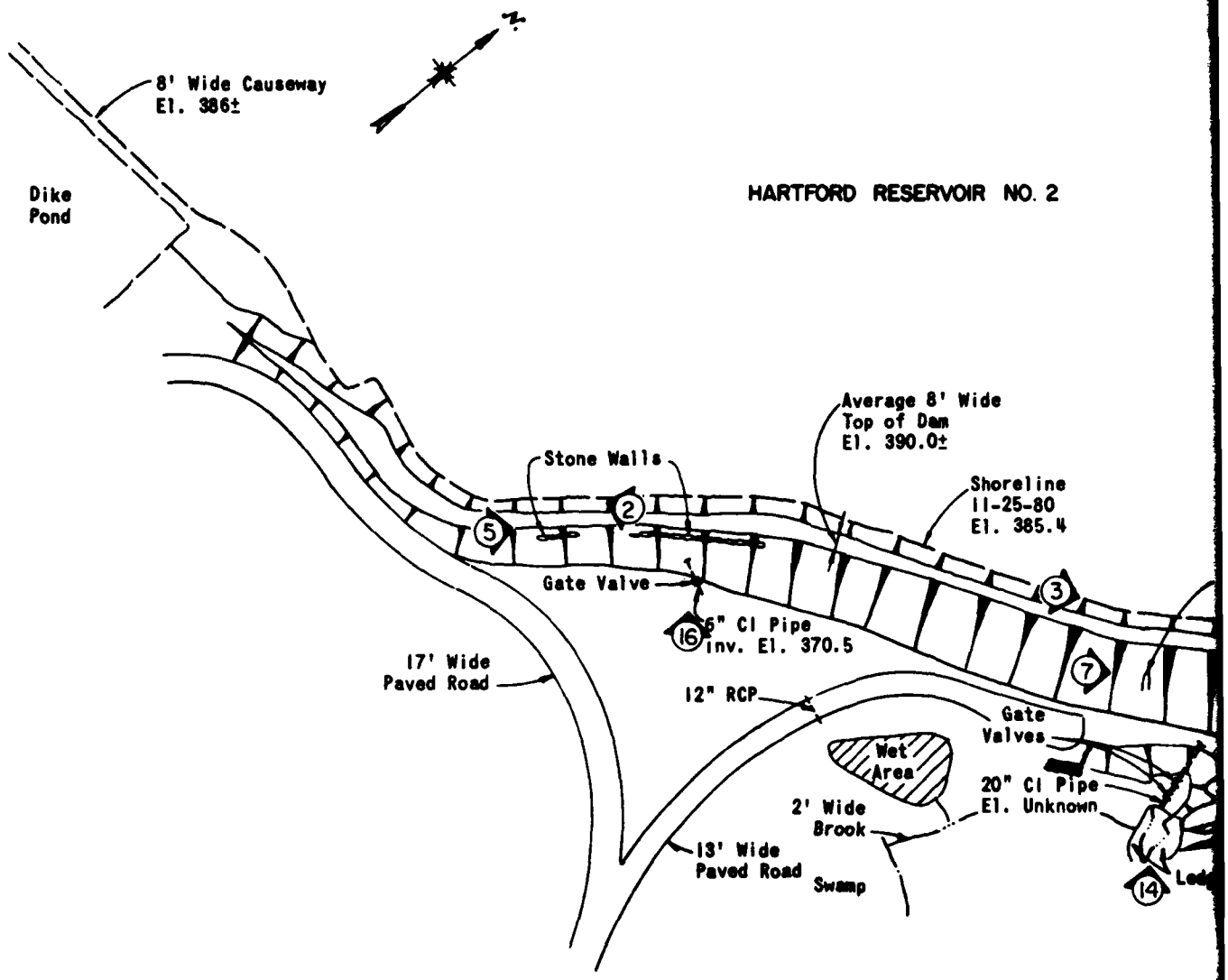
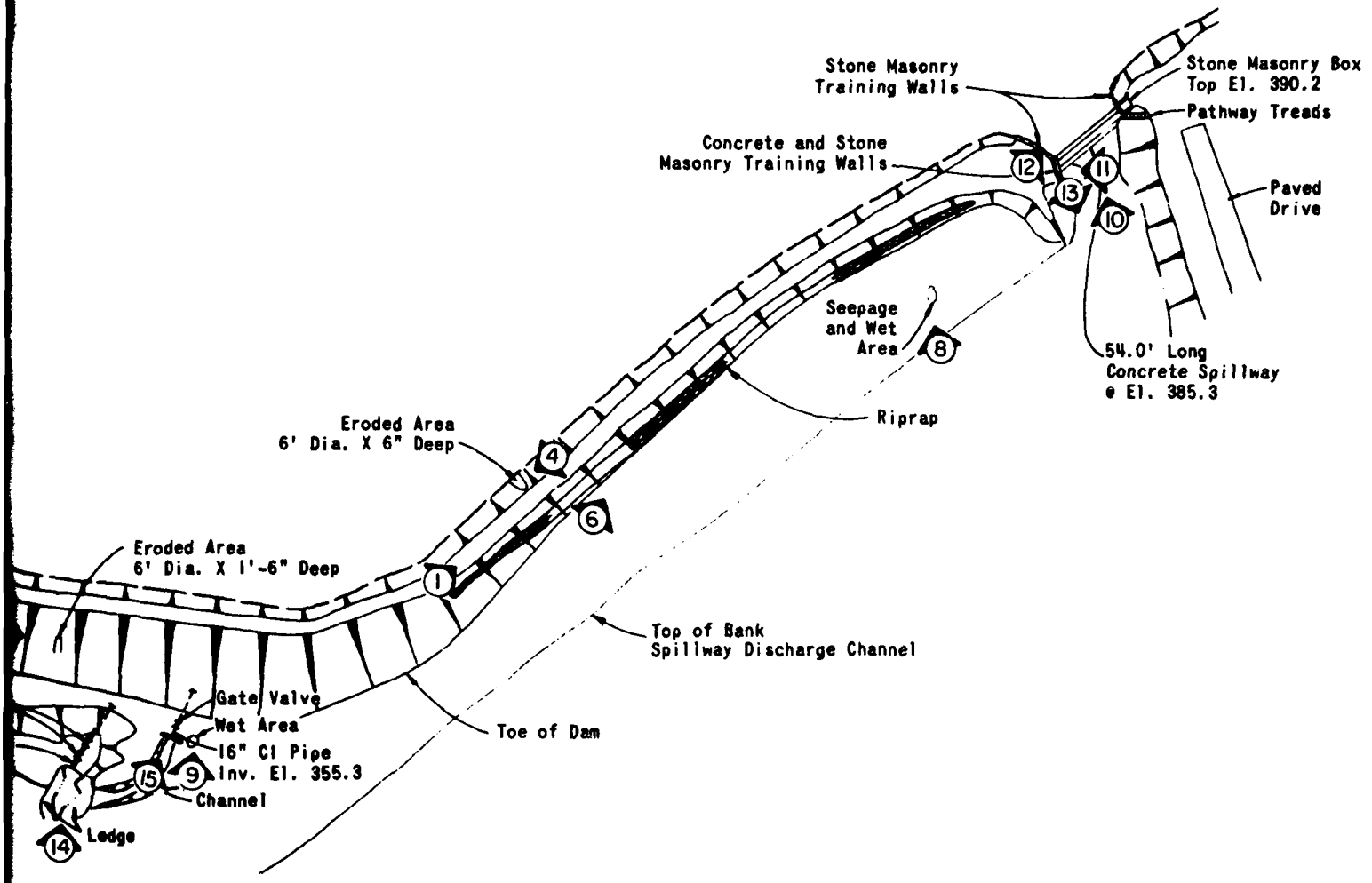

HARTFORD RESERVOIR NO. 2
8' Wide Causeway
El. 386±
Dike
Pond
Average 8' Wide
Top of Dam
El. 390.0±
Stone Walls
Shoreline
11-25-80
El. 385.4
Gate Valve
6" CI Pipe
Inv. El. 370.5
17' Wide
Paved Road
12" RCP
Gate
Valves
Wet
Area
20" CI Pipe
El. Unknown
2' Wide
Brook
13' Wide
Paved Road
Swamp
Denotes photo number and
direction in which photo was taken

FIGURE 3



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

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PHOTO LOCATION PLAN
HARTFORD RESERVOIR NO. 2 DAM
WEST HARTFORD, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES 1"=100'
JRS	RGL	RH	DATE 12/80 PAGE C-1

PHOTO NO. 1

DAM CREST

PHOTO NO. 2

DAM CREST AND UPSTREAM SLOPE
LOOKING TOWARDS RIGHT ABUTMENT

U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM SPICE BROOK WEST HARTFORD, CT CT 00003 25 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 3

UPSTREAM SLOPE
AT WATERLINE.

PHOTO NO. 4

EROSION ON
UPSTREAM SLOPE.

U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM
		SPICE BROOK
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		WEST HARTFORD, CT
		CT 00003
		25 NOVEMBER '80

PHOTO NO. 5

DOWNSTREAM SLOPE NEAR RIGHT END OF DAM. NOTE STONE WALL AT THE TOP OF SLOPE IN FOREGROUND.

U.S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM SPICE BROOK WEST HARTFORD, CT CT 00003 25 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 6

DOWNSTREAM SLOPE AT LEFT END OF DAM.
NOTE RIPRAP ON SLOPE AND TREES ON SLOPE AND AT TOE.

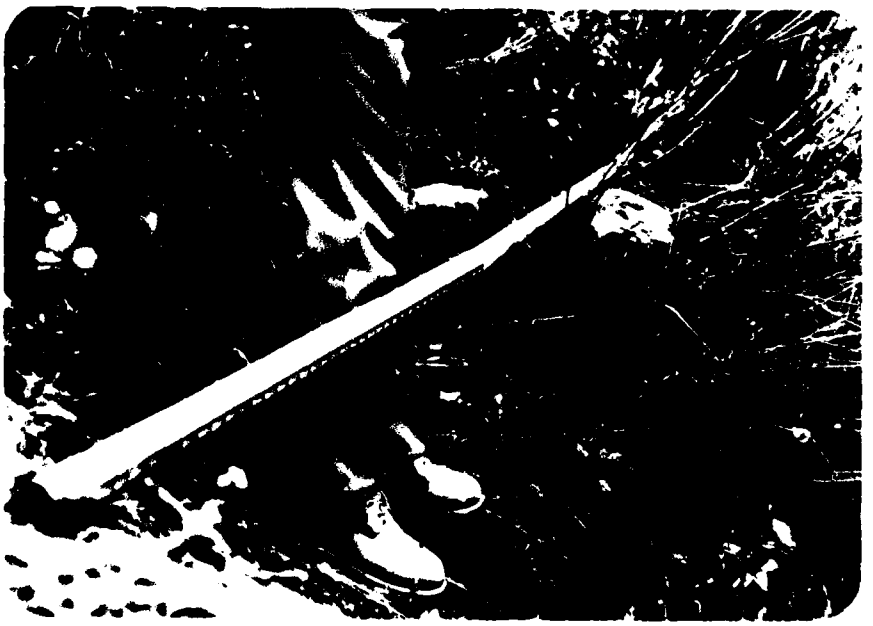


PHOTO NO. 7

DEPRESSION ON DOWNSTREAM SLOPE.
NOTE TREE STUMP AT RIGHT.

U.S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM SPICE BROOK WEST HARTFORD, CT CT 00003 25 NOVEMBER '80
ROALL HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 8

SEEPAGE AREA AT LEFT
END OF DAM.

PHOTO NO. 9

SEEPAGE NEAR 16-INCH OUTLET.

US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM SPICE BROOK WEST HARTFORD, CT CT 00003 25 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 10

SPILLWAY FROM DOWNSTREAM.

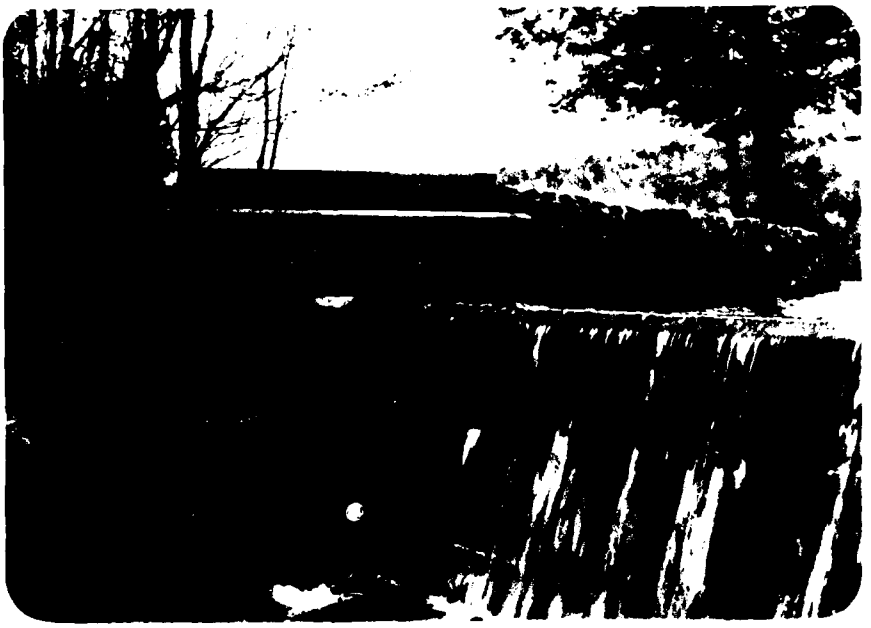


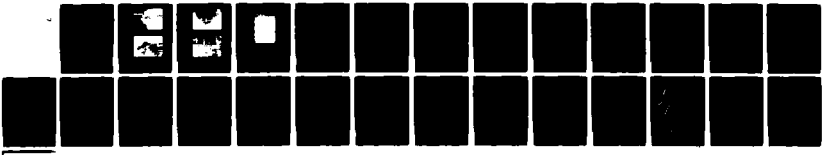
PHOTO NO. 11

RIGHT TRAINING WALL AND SPILLWAY WEIR.
NOTE EFFLORESCENCE PRESENT ON WEIR, BULDGING OF
UPSTREAM TRAINING WALL, AND EROSION OF DOWNSTREAM EMBANKMENT.

U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM SPICE BROOK WEST HARTFORD, CT CT 00003 25 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

AD-A142 566 NATIONAL DAM INSPECTION PROGRAM HARTFORD RESERVOIR NUMBER 2 DAM (CT 00003..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV DEC 80 2/2

UNCLASSIFIED F/G 13/13 NL



END
DATE FILMED
8-84
DTIC

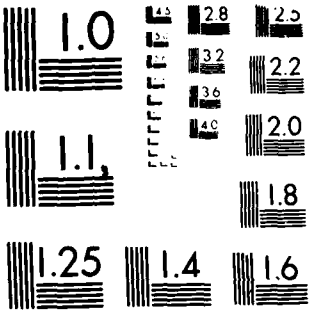


PHOTO NO. 12

LEFT TRAINING WALL

PHOTO NO. 13

DOWNSTREAM CHANNEL

U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM SPICE BROOK WEST HARTFORD, CT CT 00003 25 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 14

LOW LEVEL OUTLET

PHOTO NO. 15

16-INCH OUTLET

U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM SPICE BROOK WEST HARTFORD, CT CT 00003 25 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 16

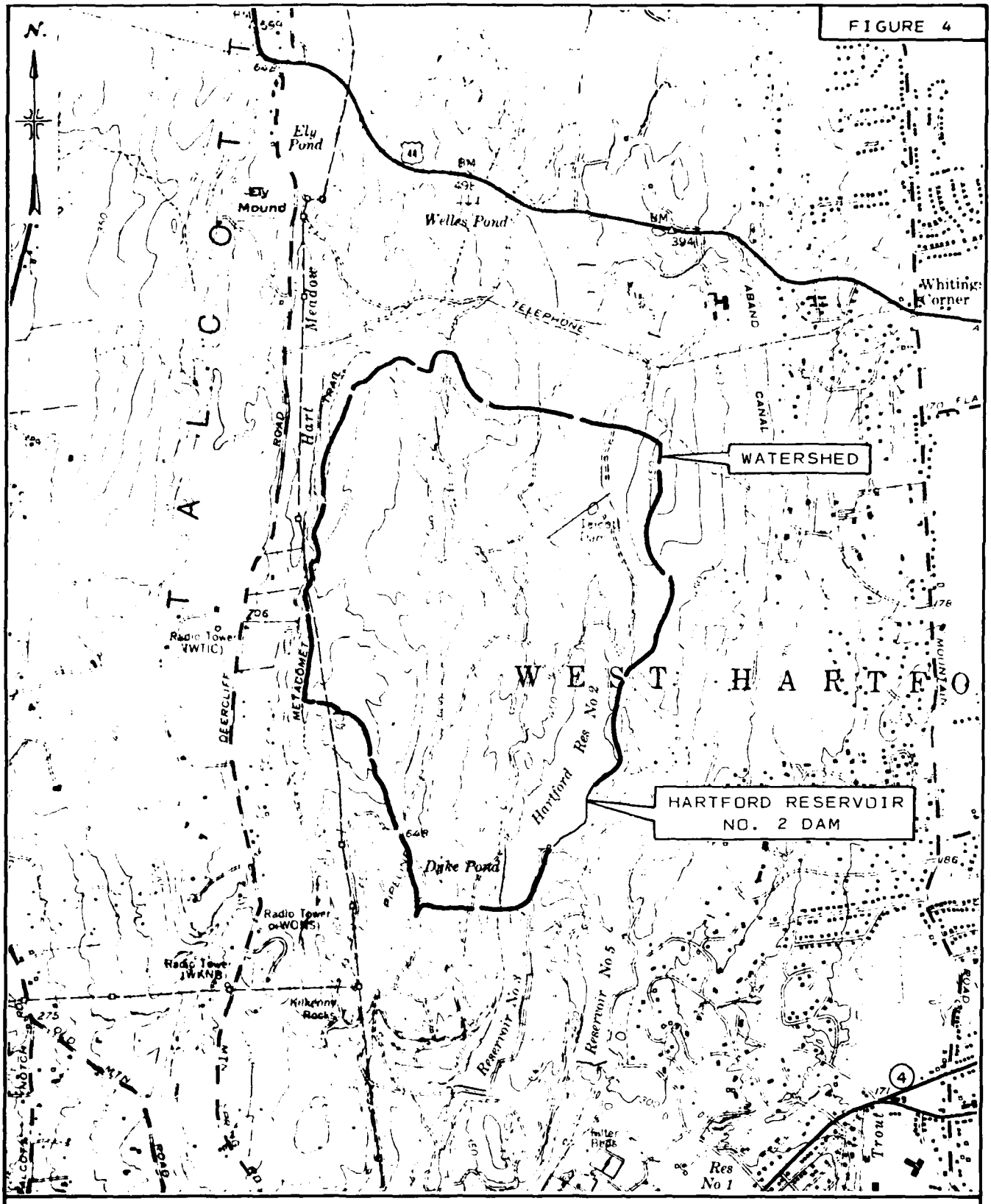
6-INCH HIGH LEVEL OUTLET

U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HARTFORD RES. NO. 2 DAM SPICE BROOK WEST HARTFORD, CT CT 00003 25 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

FIGURE 4



WATERSHED MAP

HARTFORD RESERVOIR NO. 2 DAM
WEST HARTFORD, CONNECTICUT
SCALE: 1" = 2000'

ROALD HAESTAD, INC. AVON QUADRANGLE 1968

BY SAL DATE 12/2/80 **ROALD HAESTAD, INC.** SHEET NO 1 OF 17

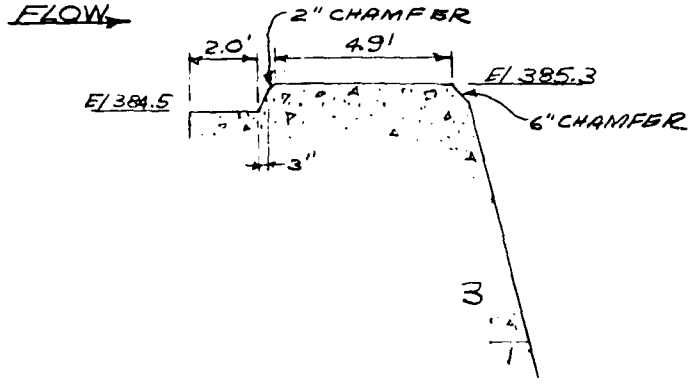
CONSULTING ENGINEERS

CKD BY DLS DATE 12/5/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-031

SUBJECT HARTFORD RES. #2 - Project discharge capacity

Spillway Cross Section:

Scale 1"=5' V&H



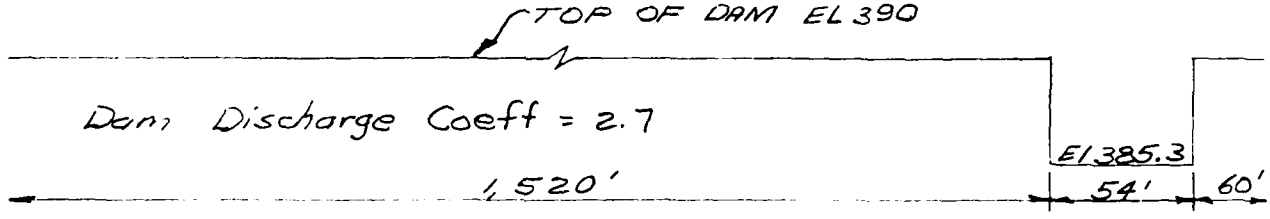
Spillway Length = 54 ft

Discharge Coeff = 2.8

Formula:

$Q = C L H^{3/2}$

Dam Profile: (Not to Scale)



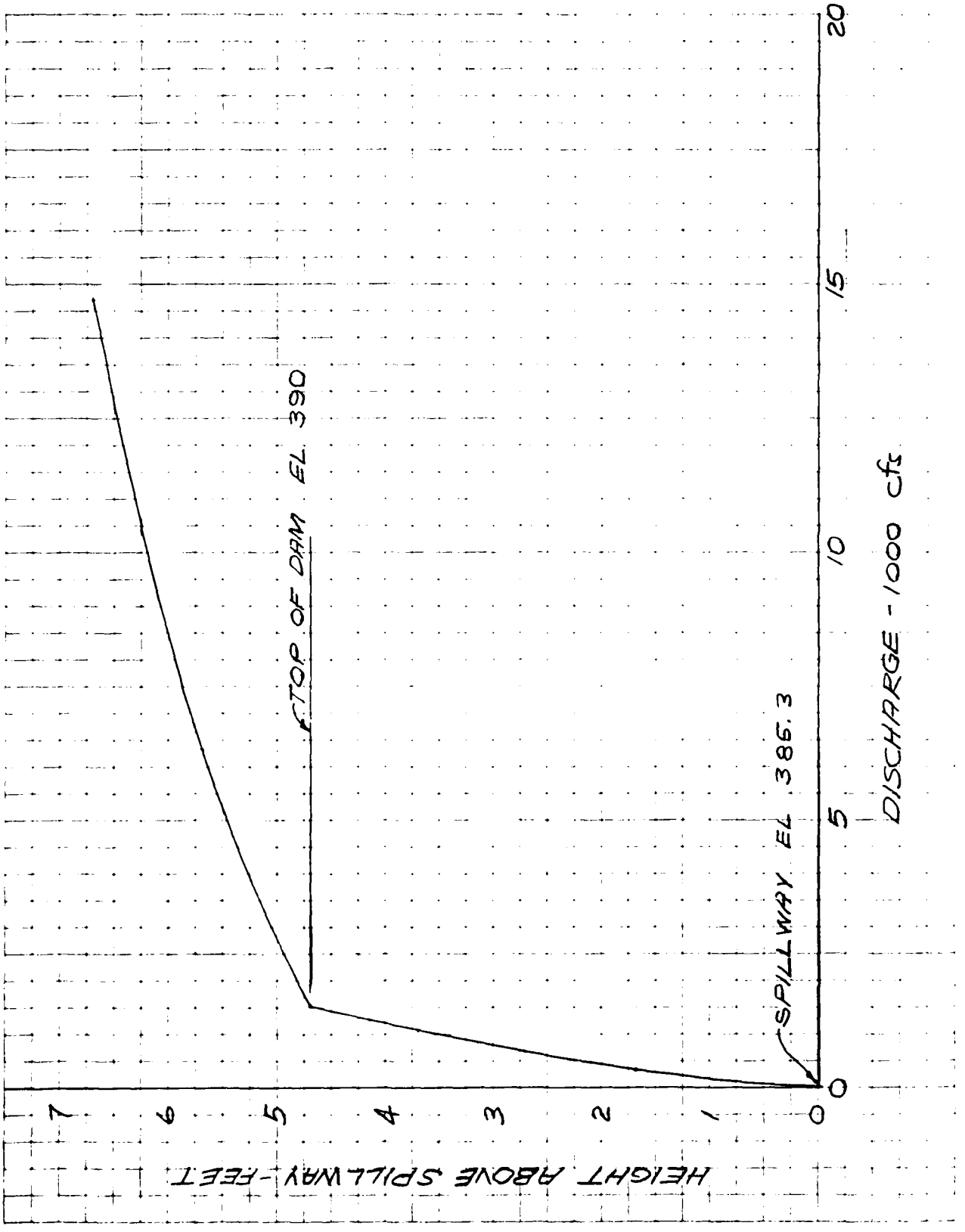
Elevation (feet)	Spillway Disch. Cap. (cfs)	Dam Discharge Capacity (cfs)	Total Project Disch. Capacity (cfs)
385.3	0	0	0
387	335	0	335
388	671	0	671
389	1,076	0	1,076
390	1,540	0	1,540
391	2,058	4,266	6,324
392	2,622	12,066	14,688
393	3,231	22,167	25,398

BY SAL DATE 12-5-80 **ROALD HAESTAD, INC.** SHEET NO 2 OF 17

CONSULTING ENGINEERS

CKD BY DLS DATE 12/5/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-031

SUBJECT HARTFORD RES. #2 - Project discharge capacity curve



BY SAL DATE 12-4-80 **ROALD HAESTAD, INC.** SHEET NO 3 OF 17

CONSULTING ENGINEERS

CKD BY DLS DATE 12/5/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-031

SUBJECT HARTFORD RES. #2 - Surcharge storage capacity

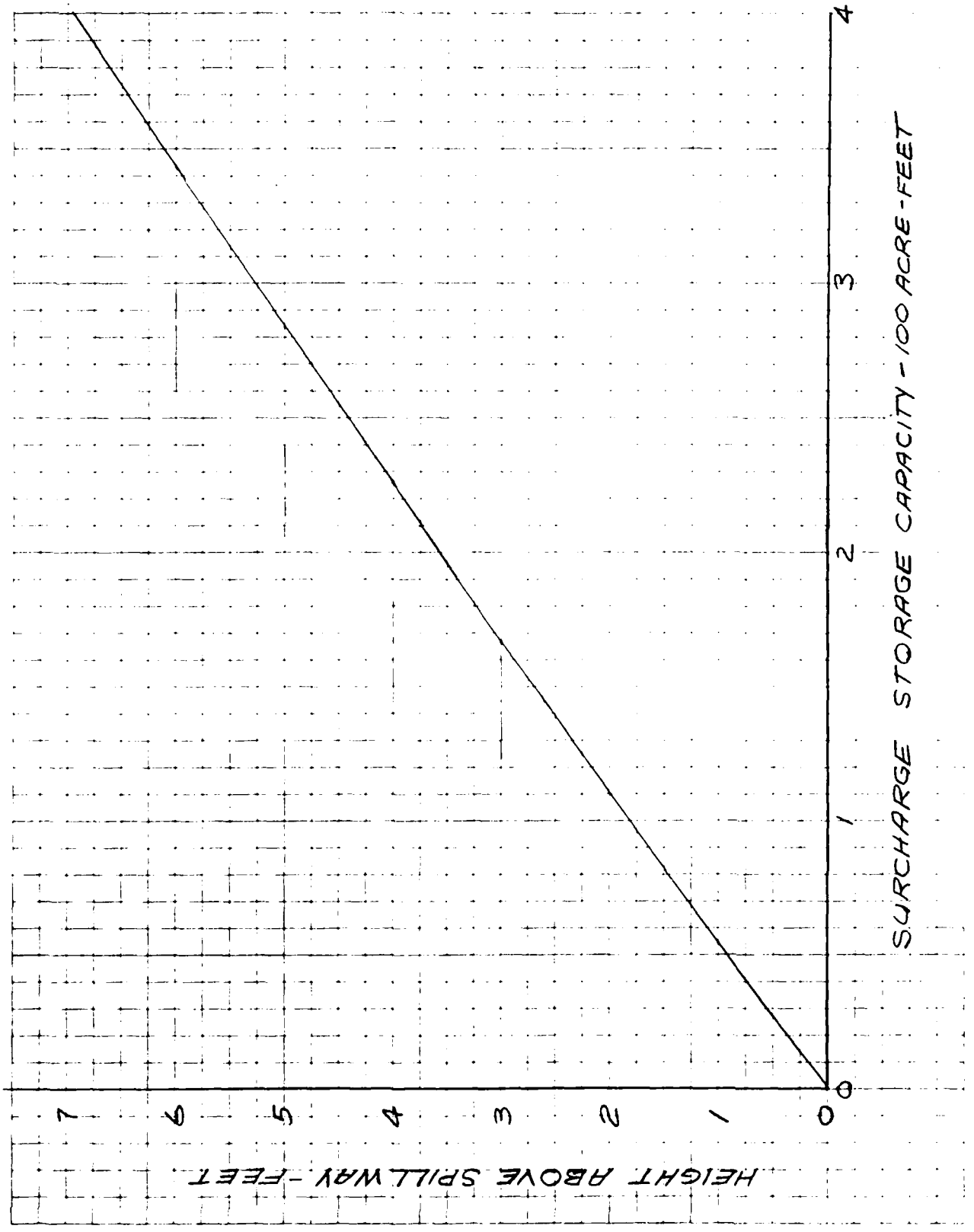
Height Above Spillway (feet)	Surface Area (Acres)	Average Surface Area (Acres)	Storage Capacity (Acre-Feet)
(EL 385.3) 0	53.8		0
		54.40	
1	55.0		54.4
		55.65	
2	56.3		110.1
		56.65	
(EL 387.9) 2.6	57.0		144.1
		57.20	
3	57.4		166.9
		57.85	
4	58.3		224.8
		58.80	
5	59.3		283.6
		59.75	
6	60.2		343.3
		60.65	
7	61.1		404.0
		61.55	
8	62.0		465.5
		62.30	
(EL 393.9) 8.6	62.6		527.8

BY SAL DATE 12-5-80 **ROALD HAESTAD, INC.** SHEET NO 4 OF 17

CONSULTING ENGINEERS

CKD BY DLS DATE 12/5/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-031

SUBJECT HARTFORD RES. #2 - Surcharge storage capacity curve



BY SAL DATE 12-5-80 **ROALD HAESTAD, INC.** SHEET NO 5 OF 17

CONSULTING ENGINEERS

CKD BY DLS DATE 12/5/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-031

SUBJECT HARTFORD RES. #2 - Test Flood

Test Flood = PMF

Drainage area = 776 acres = 1.2 square miles

From Corps of Engineers chart for "Rolling" Terrain

MPF = 2,125 cfs/sq.mi. (2.0 sq.mi. minimum)

PMF = 2,125 cfs/sq.mi. × 1.2 sq mi = 2,550 cfs

Q_{P1} = 2,550 cfs

H_1 = 5.0 ft above spillway, from Discharge Curve

$STOR_1$ = 284 ac-ft, from Storage Capacity Curve

= 4.4" runoff from 1.2 sq mi

MPF runoff in New England equals approximately 19".

$Q_{P2} = Q_{P1}(1 - STOR_1/19) = 2,550 \text{ cfs}\ (1 - 4.4/19) = 1,960 \text{ cfs}$

H_2 = 4.8 ft $STOR_2$ = 272 ac-ft

$STOR_{AVE} = (STOR_1 + STOR_2)/2 = (284 + 272)/2 = 278$ ac-ft

= 4.3" runoff

$Q_{P3} = Q_{P1}(1 - STOR_{AVE}/19) = 2,550 \text{ cfs}\ (1 - 4.3/19) = 1,970 \text{ cfs}$

H_3 = 4.8 ft

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

$= 2.8(54)(4.7)^{3/2} = 1,540$ cfs

% of PMF = (1,540/1,970) × 100 = 78% of the PMF

BY SAL DATE 1-23-81 **ROALD HAESTAD, INC.** SHEET NO 5A OF 17

CONSULTING ENGINEERS

CKD BY DLS DATE 1/23/81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-031

SUBJECT HARTFORD RES. #2 - 1/2 PMF

Note: The spillway cannot safely discharge the PMF therefore the 1/2 PMF was flood routed and the results compared.

PMF = 2,550 cfs (See Computation Sheet 5 of 17)

1/2 PMF = 1/2 (2,550 cfs) = 1,275 cfs

Q_{P1} = 1,275 cfs

H_1 = 4.15 ft above spillway, from Discharge Curve

$STOR_1$ = 235 Ac-Ft, from Storage Capacity Curve

= 3.7" runoff from 1.2 sq mi

MPF runoff in New England equals approximately 19", therefore 1/2 PMF runoff is approximately 1/2 (19) = 9.5".

$Q_{P2} = Q_{P1} (1 - STOR_1/9.5) = 1,275 (1 - 3.7/9.5) = 778$ cfs

H_2 = 3 ft $STOR_2$ = 165 Ac-Ft

$STOR_{AVE} = (STOR_1 + STOR_2)/2 = (235+165)/2 = 200$ Ac. Ft.
= 3.1" runoff

$Q_{P3} = Q_{P1} (1 - STOR_{AVE}/9.5) = 1,275$ cfs $(1 - 3.1/9.5) = 860$ cfs

H_3 = 3.15 ft

Spillway Capacity = 1,540 cfs
(Top of dam)

% of 1/2 PMF = (1,540/860) x 100 = 179 % of the Test Flood.

SUBJECT HARTFORD RES. #2 - Dam breach calculations

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

S = Storage at spillway level + Surcharge storage

$$S = \left[283.7 \times 10^6 \text{ gal} \times \frac{1 \text{ acre-ft}}{325,851 \text{ gal}}\right] + 268 \text{ acre-feet}$$

$S = 870.6$ acre-ft + 268 acre-feet

$S = 1138.6$ use 1,140 acre-feet

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

W_b = Breach width - 40% of dam length across river at mid-height = $0.4(330) = 132'$

Y_o = Total height from river bed to pool level at time of failure = 50'

$$Q_{pl} = 8/27\ (132)\sqrt{32.2}\ (50)^{3/2}$$

$= 78,466.3$ use 78,450 cfs

Note: Spillway discharge was assummed negligible in comparison to the dam breach flow and was not included in the flood routing.

BY SAL DATE 12-10-80 ROALD HAESTAD, INC. SHEET NO 7 OF 17

CKD BY DLS DATE 12/12/80 CONSULTING ENGINEERS JOB NO. 049 031

SUBJECT HARTFORD RESERVOIR NO. 2 DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 1

HARTFORD RES. #5
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	26.17	25.6
2.0	27.33	52.3
3.0	28.50	80.2
4.0	29.66	109.3
5.0	30.83	139.6
6.0	31.99	171.0
7.0	33.16	203.5
8.0	34.32	237.3
9.0	35.49	272.2
10.0	36.65	308.3
11.0	37.82	345.5
12.0	41.41	385.1
13.0	41.41	426.5
14.0	41.41	467.9

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SUBJECT HARTFORD RESERVOIR NO. 2 DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 1

HARTFORD Rl... #5

HEIGHT ABOVE SPILLWAY LEVEL (FEET)	SPILLWAY DISCHARGE CAPACITY (CFS)
1.0	192
2.0	544
3.0	999
4.0	1538
5.0	2149
6.0	4912
7.0	10605
8.0	18148
9.0	27236
10.0	37773
11.0	49673
12.0	62820
13.0	77142
14.0	92507

STORAGE AT TIME OF FAILURE=S= 1140 AC. FT.
LENGTH OF REACH=L= 3000 FT

INFLOW INTO REACH=QP1= 78450 CFS
HEIGHT ABOVE SPILLWAY LEVEL=H1= 13.1 FT.
STORAGE IN REACH=V1= 430.0 AC. FT.

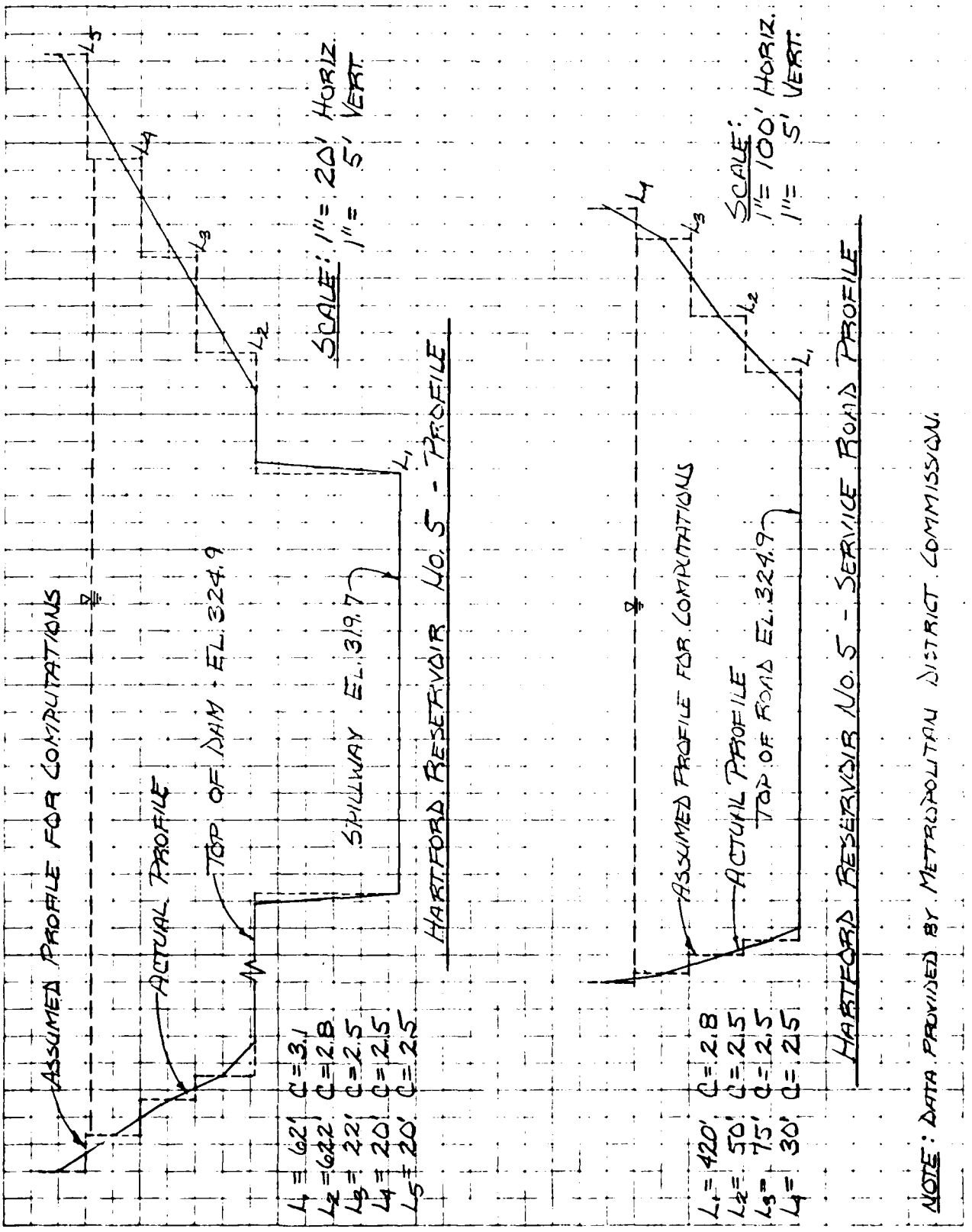
TRIAL REACH OUTFLOW=QP(TRIAL)= 48857 CFS
TRIAL HEIGHT ABOVE SPILLWAY LEVEL=H(TRIAL)= 10.9 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 342.9 AC. FT.

REACH OUTFLOW=QP2= 51854 CFS
HEIGHT ABOVE SPILLWAY LEVEL=H2= 11.2 FT.

BY LBG DATE 12-8-80 **ROALD HAESTAD, INC.** SHEET NO 9 OF 17

CKD BY SAL DATE 12-9-80 CONSULTING ENGINEERS 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-031

SUBJECT HARTFORD RESERVOIR NO. 2 - FLOOD ROUTING



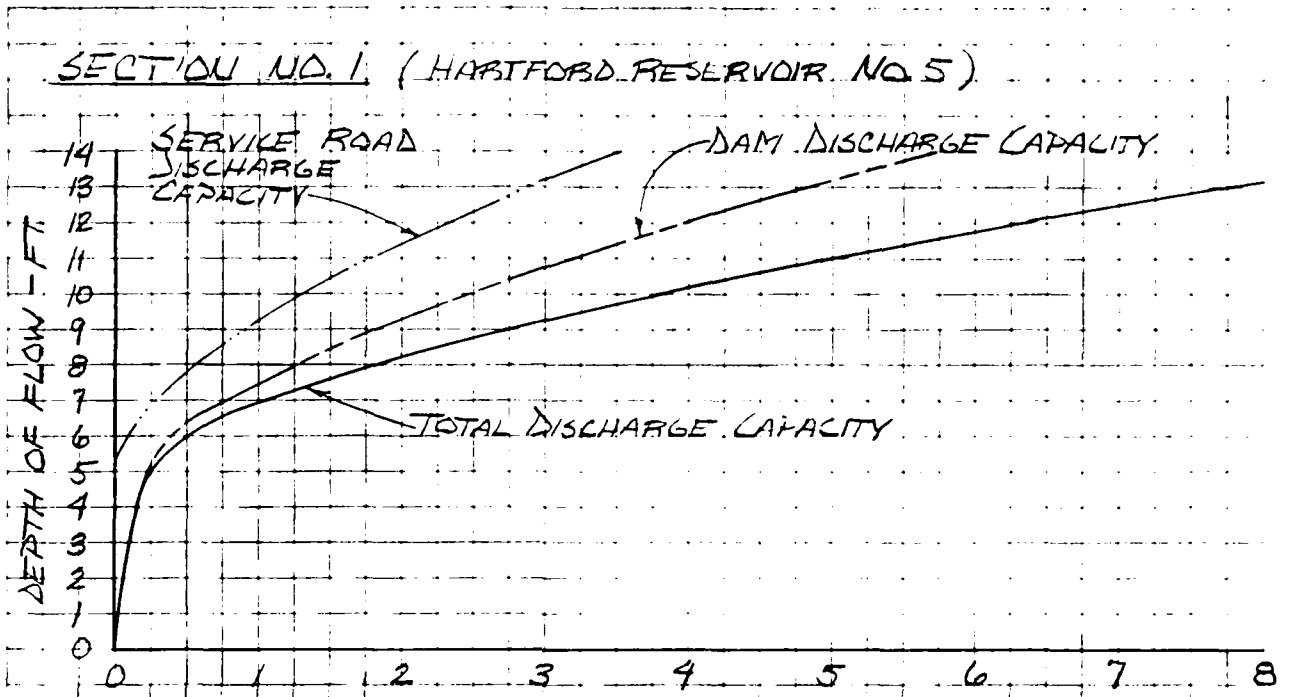
BY EG DATE 12-8-80 **ROALD HAESTAD, INC.** SHEET NO 10 OF 17

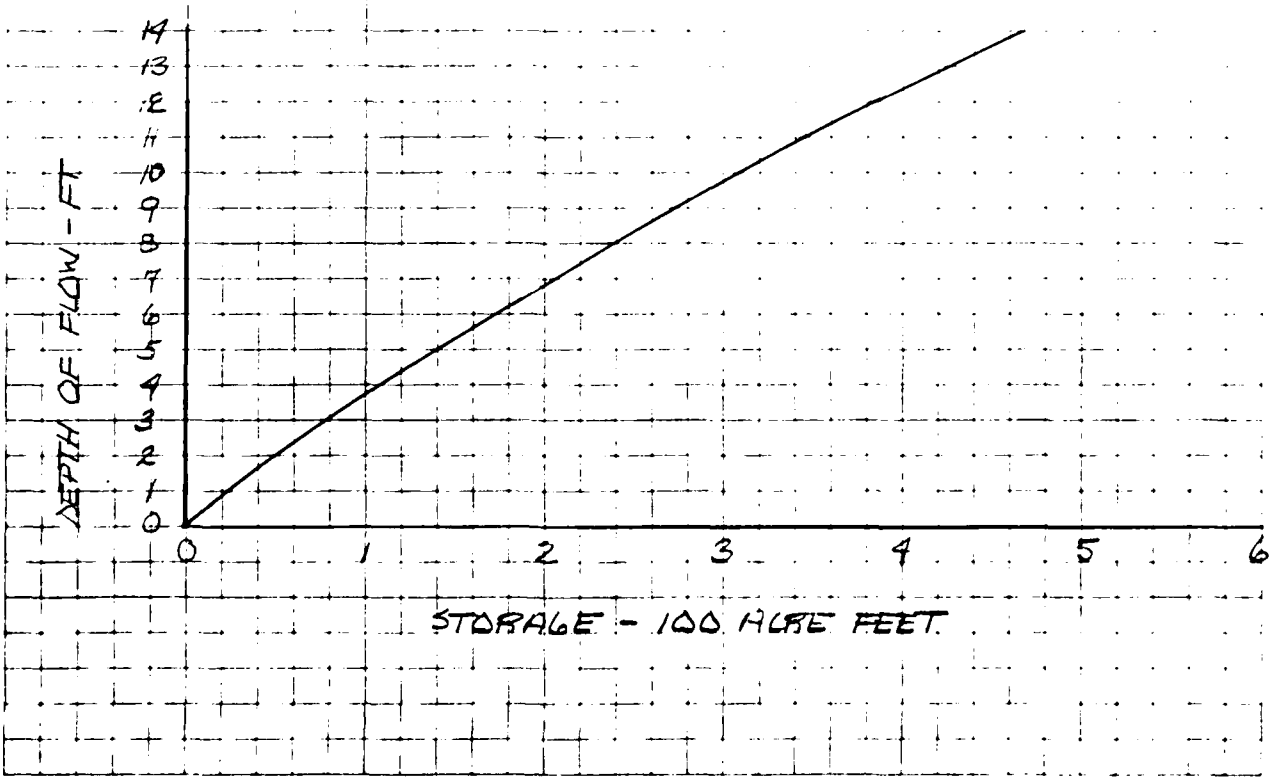
CONSULTING ENGINEERS

CKD BY SAL DATE 12-9-80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 79-CE1

SUBJECT HARTFORD RESERVOIR NO. 2 DAM - FLOOD ROUTING

SECTION NO. 1 (HARTFORD RESERVOIR NO. 5)





SUBJECT HARTFORD RESERVOIR NO. 2 DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 2

HARTFORD RES. #1
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	30.43	28.7
2.0	33.86	60.9
3.0	37.29	96.4
4.0	40.71	135.4
5.0	43.81	177.7
6.0	46.91	223.1
7.0	50.01	271.5
8.0	53.11	323.1
9.0	56.21	377.7
10.0	59.31	435.5
11.0	62.41	496.4
12.0	65.51	560.3
13.0	68.61	627.4
14.0	71.71	697.6
15.0	75.01	770.9

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SUBJECT HARTFORD RESERVOIR NO. 2 DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 2

HARTFORD RES. #1

HEIGHT ABOVE SPILLWAY LEVEL (FEET)	SPILLWAY DISCHARGE CAPACITY (CFS)
1.0	140
2.0	396
3.0	727
4.0	1148
5.0	1714
6.0	2513
7.0	3713
8.0	5210
9.0	7252
10.0	11947
11.0	18390
12.0	26229
13.0	35507
14.0	45936
15.0	57377

STORAGE AT TIME OF FAILURE=S= 1140 AC. FT.
LENGTH OF REACH=L= 4000 FT

INFLOW INTO REACH=QP1= 33040 CFS
HEIGHT ABOVE SPILLWAY LEVEL=H1= 12.7 FT.
STORAGE IN REACH=V1= 609.6 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 15373 CFS
TRIAL HEIGHT ABOVE SPILLWAY LEVEL=H(TRIAL)= 10.5 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 467.9 AC. FT.

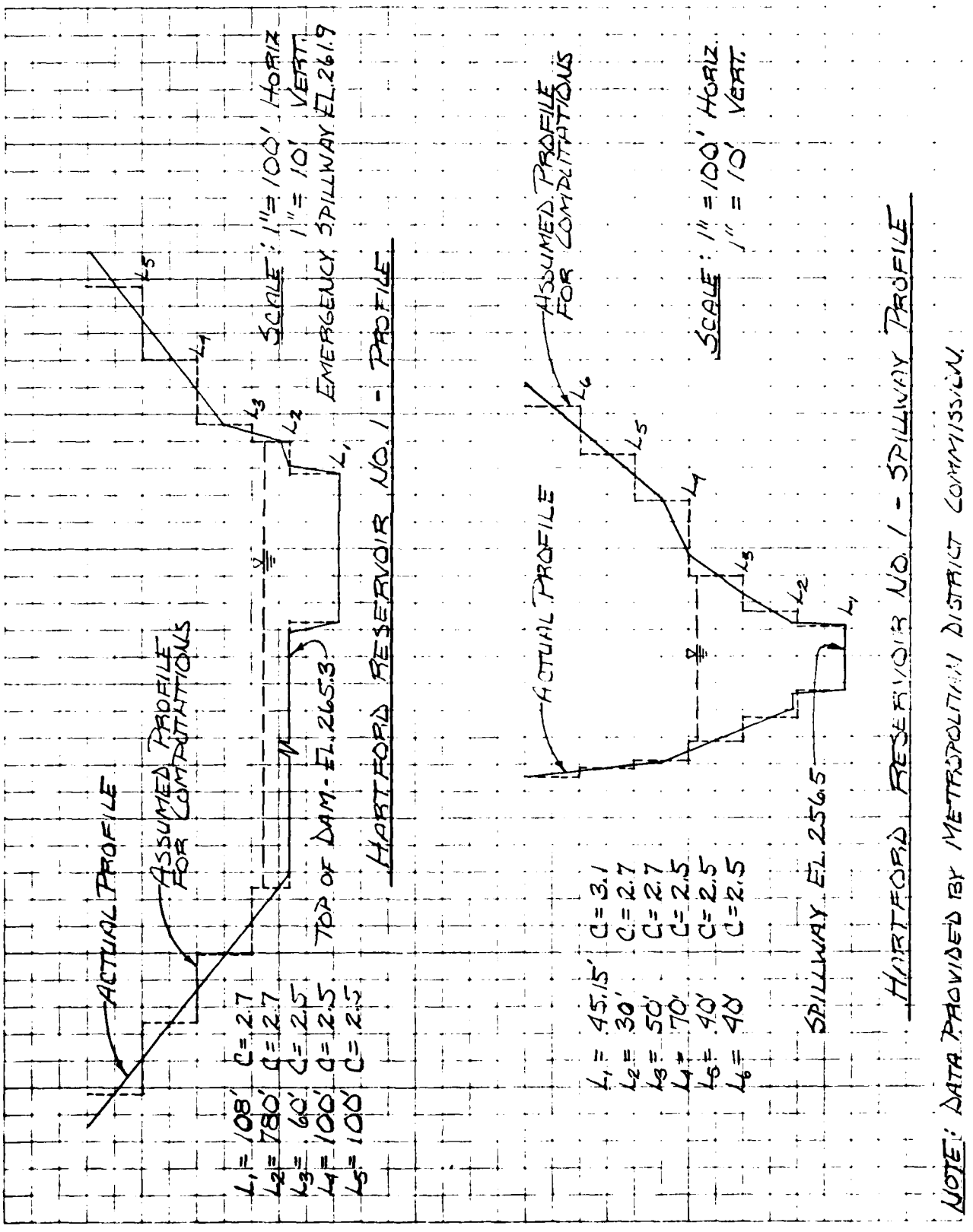
REACH OUTFLOW=QP2= 17426 CFS
HEIGHT ABOVE SPILLWAY LEVEL=H2= 10.9 FT.

BY ..BG..... DATE ..12-8-80 **ROALD HAESTAD, INC.** SHEET NO ..13.. OF ..17.....

CONSULTING ENGINEERS

CKD BY SAL DATE 12-9-80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO ..19-081.....

SUBJECT ..HARTFORD RESERVOIR No. 2 - FLOOD ROUTING.....



NOTE: DATA PROVIDED BY METROPOLITAN DISTRICT COMMISSION.

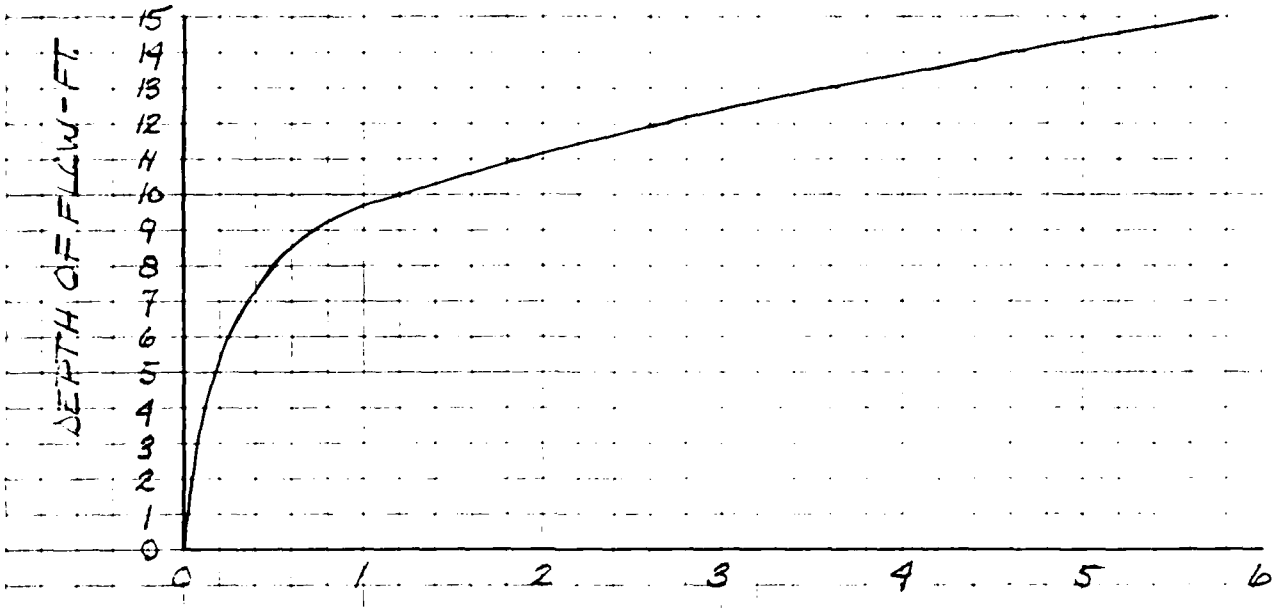
BY ... DATE 12-8-80 **ROALD HAESTAD, INC.** SHEET NO. 14 OF 17

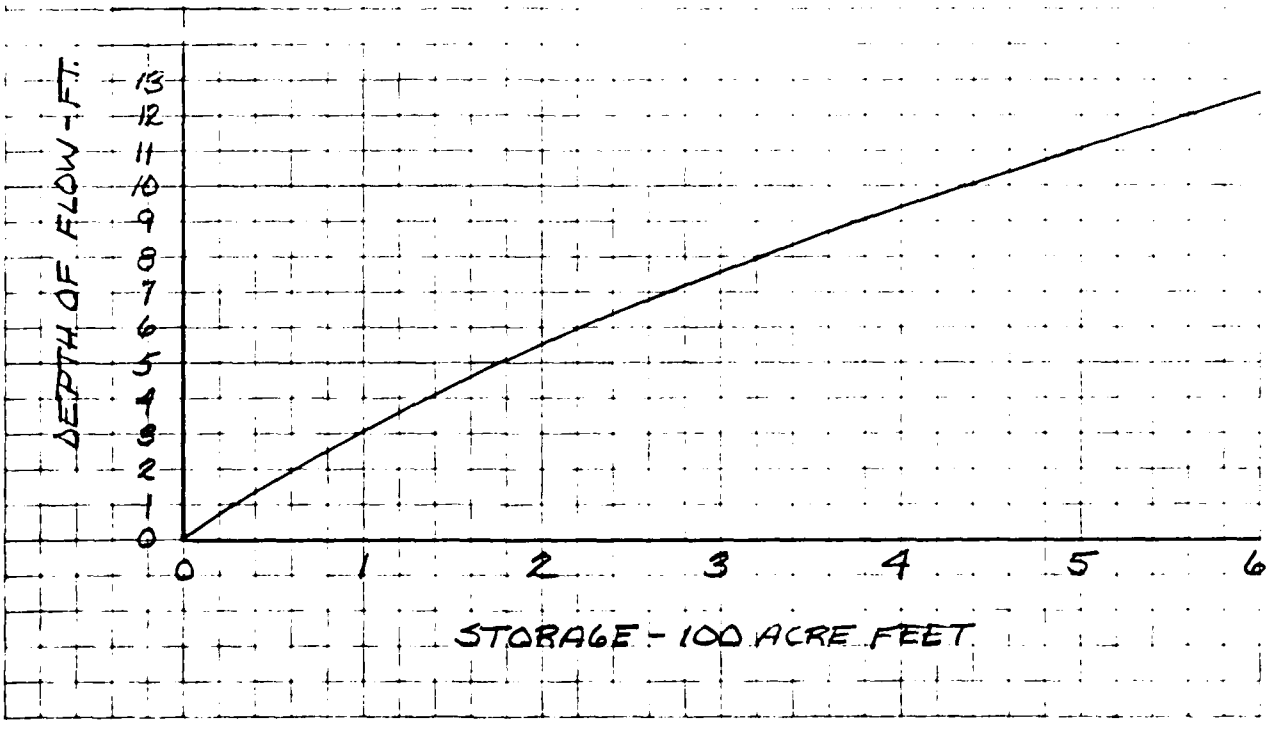
CONSULTING ENGINEERS

CKD BY SAL DATE 12-8-80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO. 79-351

SUBJECT HARTFORD RESERVOIR NO. 2 DAM - FLOOD ROUTING

SECTION NO. 2 (HARTFORD RESERVOIR NO. 1.)





BY SAL DATE 12-10-80 ROALD HAESTAD, INC. SHEET NO 15 OF 17

CKD BY DLS DATE 12/12/80 CONSULTING ENGINEERS JOB NO. 049 031

SUBJECT HARTFORD RESERVOIR NO. 2 DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 3

MOUNTAIN TREE ROAD

HEIGHT ABOVE SPILLWAY LEVEL (FEET)	SPILLWAY DISCHARGE CAPACITY (CFS)
1.0	625
2.0	1768
3.0	3473
4.0	5636
5.0	8382
6.0	11622
7.0	15422
8.0	19709
9.0	24577
10.0	29957
11.0	35920
12.0	42400
13.0	49424
14.0	56939

REACH OUTFLOW=QP2= 36240 CFS
HEIGHT ABOVE SPILLWAY LEVEL=H2= 11.0 FT.

Note: The flow of 36,240 cfs is equal to 18,814 cfs from the Service Road and 17,426 cfs from Hartford Reservoir No. 1. The storage within the reach was assumed negligible. The depth of flow was taken from the discharge capacity curve on page D-17.

BY LBG DATE 12-11-80 **ROALD HAESTAD, INC.** SHEET NO 16 OF 17

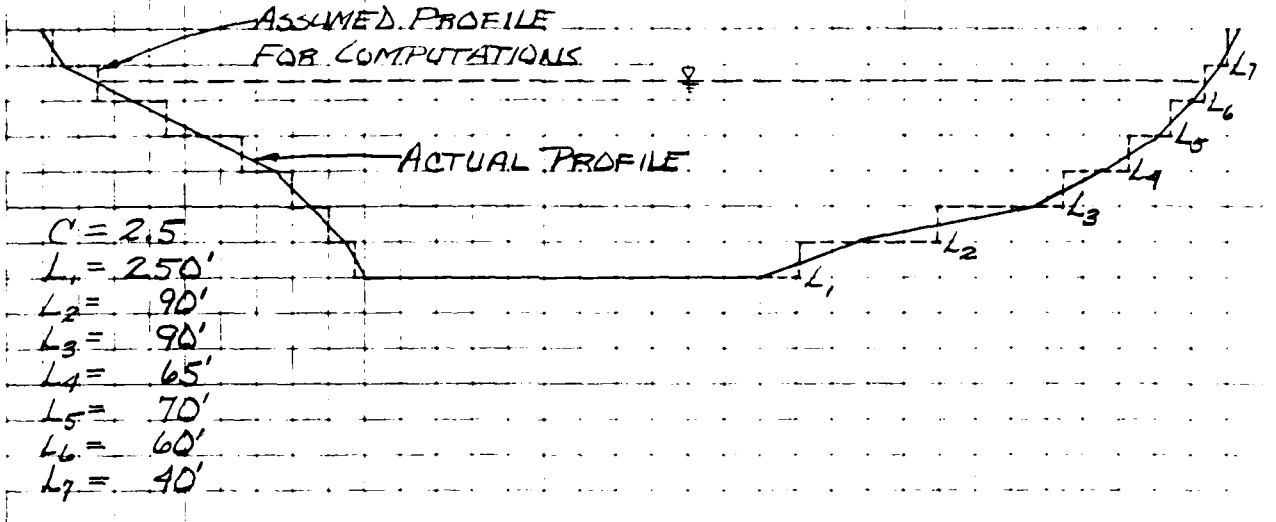
CONSULTING ENGINEERS

CKD BY SAL DATE 12-12-80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-031

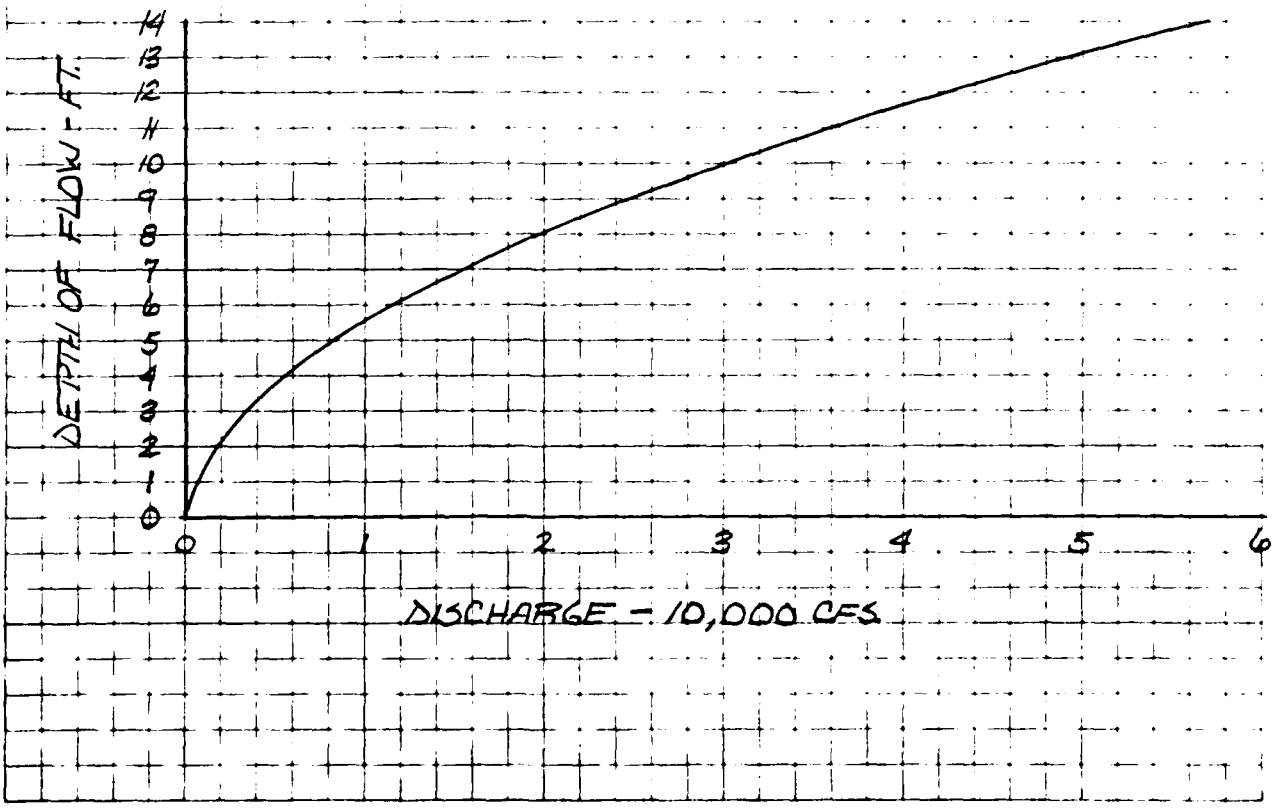
SUBJECT HARTFORD RESERVOIR NO. 2 - DEPTH OF FLOW

SECTION NO. 3 (MOUNTAIN TREE RD. & OLD MILL LANE)

SCALE: 1" = 100' HORIZ.
1" = 10' VERT.



C = 2.5
L_1 = 250'
L_2 = 90'
L_3 = 90'
L_4 = 65'
L_5 = 70'
L_6 = 60'
L_7 = 40'



BY L.E.S. DATE 12-1-80 **ROALD HAESTAD, INC.** SHEET NO. 17 OF 17

CONSULTING ENGINEERS

CKD BY S.A.H. DATE 12-5-80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO. 79-03

SUBJECT HARTFORD RESERVOIR NO. 6 - SURFACE AREAS

PLANIMETER NO. 70203

PLANIMETER READINGS: (FROM M.D.C. MAPPING (Scale 1" = 200') M.D.C. DATUM - 2.08 = N.G.V.D DATUM)

WATER SURFACE (1A): (EL. 387.4)	THIRD	35.80	11 x 4 = 44 SQ. IN. =	
	FIRST	13.78	11	40.4 ACRES
	START	2.77		
WATER SURFACE (1B):	THIRD	12.79	3.64 x 4 = 14.56 SQ. IN. =	
	FIRST	5.50	3.64	13.4 ACRES
	START	1.86		

TOTAL WATER SURFACE = 1A + 1B = 11 + 3.64 = 14.64

14.64 x 4 = 58.6 SQ. IN. = 53.8 ACRES

CONTOUR 390 (1A)	THIRD	40.50	11.5 x 4 = 46 SQ. IN.	
	FIRST	17.45	11.5	42.2 ACRES
	START	5.95		
CONTOUR 390 (1B)	THIRD	15.65	4.0 x 4 = 16 SQ. IN	
	FIRST	7.63	4.0	14.7 ACRES
	START	3.62		

TOTAL FOR CONTOUR 390 = 1A + 1B = 11.5 + 4 = 15.5

15.5 x 4 = 62 SQ IN = 57 ACRES

CONTOUR 396 (1A):	THIRD	39.04	12.3 x 4 = 49.2 =	
	FIRST	14.42	12.3	45 ACRES
	START	2.12		
CONTOUR 396 (1B):	THIRD	28.79	4.74 x 4 = 18.96 SQ. IN.	
	FIRST	19.31	4.74	17.4 ACRES
	START	14.57		

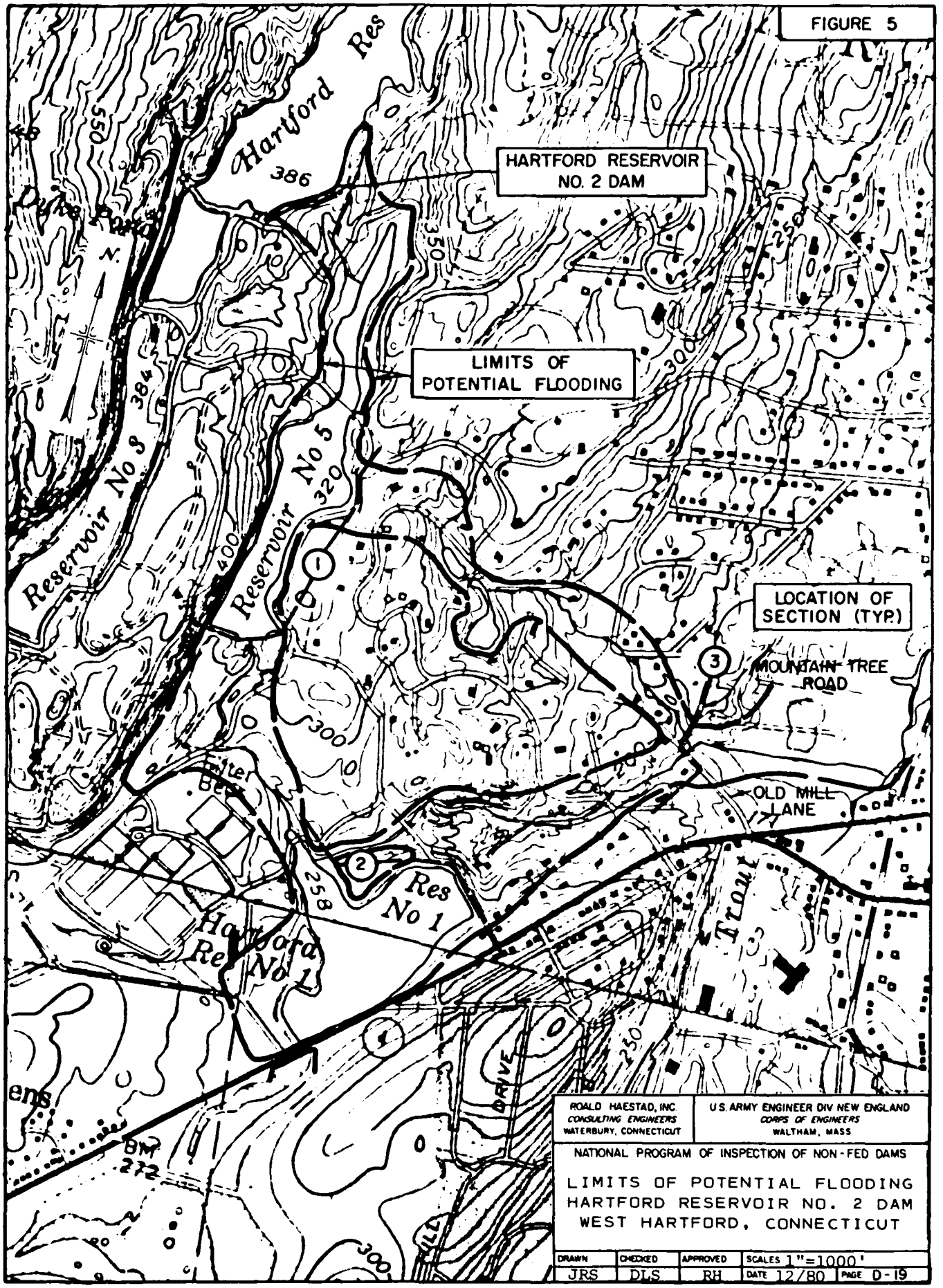
TOTAL FOR CONTOUR 396 = 1A + 1B = 17.04

17.04 x 4 = 68.16 SQ IN = 62.6 ACRES

WATERSHED: (PLANIMETERING FROM U.S.G.S. MAPPING.)
(SCALE 1" = 2000')

THIRD:	28.63 SQ. IN	8.45 = 776 ACRES =	
FIRST:	11.76 SQ. IN	8.48	1.2 SQ. MI.
START:	3.28 SQ. IN.		

FIGURE 5



ROALD HAESTAD, INC.
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

LIMITS OF POTENTIAL FLOODING
HARTFORD RESERVOIR NO. 2 DAM
WEST HARTFORD, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES 1"=1000'	
JRS	DLS	RH	DATE 12/80	PAGE D-19

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST	STATE	COUNTY	CONGR DIST	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
CT	5	NE1	CT	003	01				HARTFORD RESERVOIR NO 2 DAM	4145.9	7247.1	16	DEC	[illegible]

POPULAR NAME	NAME OF IMPOUNDMENT
	HARTFORD RESERVOIR NO 2

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	[illegible]	SPICE BROOK	WEST HARTFORD	1	6820

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	DAM	FED W	FED/REG	SCS A	DATE
[illegible]	1869	S	50	50	1140	870	NED	N		N		

REMARKS

D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (KW)	POWER CAPACITY PROPOSED (KW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	1925	U	54	1540	54000												

OWNER	ENGINEERING BY	CONSTRUCTION BY
[illegible] METROPOLITAN DISTRICT	[illegible] OKONOGAN	[illegible] OKONOGAN

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
[illegible] E	NONE	CT DEP	CT DEP

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
HOALD HAESTAD INC	25	[illegible]	80	PL 92-367

REMARKS


DAT
ILM