

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
NORTHAMPTON RESERVOIR.. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV AUG 78

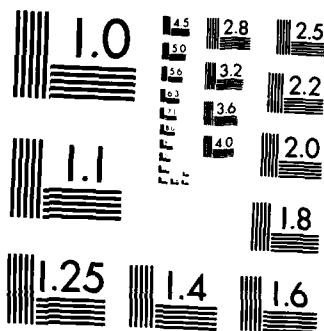
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FIGURE 1



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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CONNECTICUT RIVER BASIN
WHATELY, MASSACHUSETTS

NORTHAMPTON RESERVOIR
(LOWER DAM)
MA 00520

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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REPLY TO
ATTENTION OF

NEDED

Honorable Michael S. Dukakis
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

NOV 17 1976

Dear Governor Dukakis:

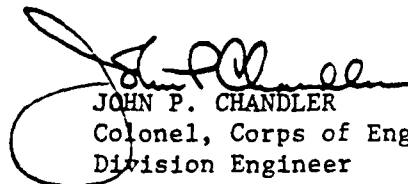
I am forwarding to you a copy of the Northampton Reservoir (Lower Dam) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief 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 Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, the City of Northampton, Board of Public Works, 237 Prospect Street, Northampton, Massachusetts 01060.

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 Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

NORTHAMPTON RESERVOIR
(LOWER DAM)

MA 00520

CONNECTICUT RIVER BASIN
WHATELY, MASSACHUSETTS

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA. 00520
Name of Dam: Northampton Reservoir (Lower Dam)
Town: Whately
County and State: Franklin County, Massachusetts
Stream: West Brook
Date of Inspection: May 25, 1978

This dam is a 1200' long, 23' high earth embankment dam. Minimal engineering data is available consisting only of a drawing dated 1901 showing plan, elevations and typical dam and spillway sections. No construction records or design calculations are available. Construction was completed in 1903.

The visual inspection of the dam did not disclose any immediate stability problems. There is a large area of standing water at the downstream toe of the dam which indicates substantial leakage through or beneath the dam. Areas of the spillway outlet channel, which is concrete and stone paved, are spalled and eroded.

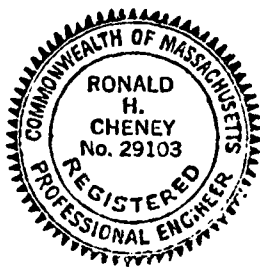
Based on size and hazard classifications in accordance with Corps guidelines, the test flood is $\frac{1}{2}$ Probable Maximum Flood. The spillway is not capable of passing this test flood, without overtopping the dam, when discharge from the upper dam at this two dam complex is considered.

It is recommended that the seepage condition below the toe

Northampton Lower Dam

of the dam be investigated and an adequate collection and monitoring system be designed. The spalled, eroded areas of the spillway outlet channel should be repaired. The rotted wood and loose hand rail on the service bridge need repairing and the small trees should be removed from between the joints of the granite blocks at the gate house and the joints mortared. Since the spillway will not pass the required flow of $\frac{1}{2}$ PMF (significant hazard classification) an indepth hydraulic analysis should be made for this two dam complex. A plan of operation for the complex can then be implemented such as operating the upper and/or lower dam at less than spillway crest level to allow for proper storage during periods of peak runoff. Increased spillway capacity should also be considered. If weather bureau forecasts give potential for flood conditions prior to the implementation of the preceding then this reservoir should be lowered to allow for increased storage.

The urgency of these recommendations varies and is given in Section 7.1c of this report.



Ronald H. Cheney

Ronald H. Cheney, P.E.
Associate

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

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

Charles G. Tiersch

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

Fred J. Ravens, Jr.

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

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

SEP 14 1978

PREFACE

This report is prepared under guidance contained in Department of the Army, Office of the Chief of Engineers, Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. 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.

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Section 3.1 Continued

d. Reservoir Area

The general area of the reservoir consists of wooded hills with rolling slopes. The Northampton Reservoir Upper Dam is located immediately above the upstream end of this reservoir's reach. A detailed description of the drainage area is given in Section 1.3a of this report. Siltation within the reservoir is unknown.

e. Downstream Channel

The downstream channel is a natural stream bed, surrounded by wooded area. The stream is flowing freely. The area immediately below the spillway crest is stone and concrete paved. Much of this area is spalled and eroded away. This condition has been reported in past State Inspection Reports. Due to the water flow over the spillway area, it was difficult to determine the underlying material at these locations, and the degree of erosion seriousness at the time of this inspection. Subsequently this area was reinspected on July 6, 1978. At this time no water was passing the spillway. The channel immediately below the spillway is constructed of hand placed boulders which at some date were grouted in place. At many locations the concrete has eroded and spalled away. This has allowed water to dislodge some of the hand placed boulders. This condition however does not pose a serious problem to the safety of the dam at this time. The training walls which serve

Section 3.1 Continued

dammed, runs through the area of seepage. The original course of Nash Brook passes through the seepage area and intersected West Brook within the seepage area.

The extent of the seepage from this dam is large, the fact that the seepage has existed for over thirty years with no visible effect on the dam indicates that the dam is not likely to be an immediate safety hazard. However, present day design standards would not allow such an uncontrolled seepage condition to exist below the dam. It is recommended that the owner engage a qualified consulting engineer to investigate the cause of the seepage and to design a proper collection system downstream of the dam that would allow periodic measurement of the quantity and turbidity of the seepage water.

An effort has been made in the past to collect the surface water below the dam and channel it to an inlet into the reservoir drain pipe. This design was not adequate.

c. Appurtenant Structures

The gate house was inspected to the water surface. This structure is of granite stone masonry construction with a wood floor, brick superstructure and wood roof. Small trees are growing from some of the joints between the masonry where mortar is missing.

The service bridge is of wood deck, steel stringer construction. The wood is badly weathered and rotted and the steel hand rail is loose and unsafe.

Section 3.1 Continued

Crest

The crest of the dam has no pavement. No evidence of erosion or cracking of the embankment was observed.

Downstream Slope

The face of the downstream slope was traversed along two lines, (1) along the crest; (2) along the toe.

The slope is in good condition with a good turf and grass cover. There are small bushes up to 3 feet high growing on the slope which should be removed as part of normal dam maintenance. The owner normally cuts the grass and cleans the slope each spring; our inspection was performed before this routine maintenance had been performed.

There is a large area immediately downstream of the dam which has standing water due to seepage from the dam or its foundation. The extent of this area can be seen in Photo 5. The area extends about 200 ft. along the toe and proceeds downstream to the Williamsburg Road in an approximately triangular pattern with the base of the triangle at the dam toe.

This seepage area has been noted in early reports dating to 1970. Mr. Leon Murray of the Northampton Board of Public Works has indicated that this seepage condition has existed since he joined the Board in the 1940's.

An old drawing, on file at the Northampton Water Division indicates that the channel of West Brook, which was

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General

The Northampton Reservoir Lower Dam was inspected on May 25, 1978. At that time, water was passing over the spillway one inch deep. Therefore, the upstream slope and appurtenant structures were inspected above the water surface.

b. Dam

Visual inspection of the embankment showed no signs of distress. There is a large area of standing water at the downstream toe of the dam which indicates that there is substantial leakage through or beneath the dam. This condition has been reported in previous inspection reports dating back to 1970. Mr. Leon Murray of the Northampton Board of Public Works has indicated that this seepage condition has existed since he joined the Board in the 1940's.

Upstream Slope

Only the upper 5 feet of the upstream slope was visible at the time of inspections. Photos 1 and 2* show the entire upstream slope above approximate elevation 596.

The riprap protection has been infilled with soil and grass but is in place. No surface erosion was noted on the upstream slope.

*See Appendix C for these and all subsequent photos.

Section 2.4 Continued

c. Validity

The visual inspection of the dam site shows that the external features substantially agree with those shown on the furnished plan.

SECTION 2 ENGINEERING DATA

2.1 Design

A drawing dated 1901 showing plan, elevation and typical dam and spillway sections, located at the Northampton Water Department, was the only engineering data found.

In-depth engineering calculations for the dam and spillway design and hydraulic consideration are non-existent.

2.2 Construction

Construction records of the dam are non-existent.

2.3 Operation

No operational manual for this dam exists.

2.4 Evaluation

a. Availability

This dam was designed by Davis Engineering, now known as Almer Huntley Assoc. of Northampton. The Water Divisions Superintendent has had the records of this engineering company searched for additional data. No additional data has been found.

b. Adequacy

The lack of in-depth engineering data does not allow for a definitive review of such data. Therefore, the adequacy of this dam structurally and hydraulically cannot be assessed from the review of design calculations but must be based primarily on the visual inspection, past performance history and hydrologic and hydraulic assumptions.

Section 1.3 Continued

j. Regulating Outlets

Regulating outlets are a 30" cast iron drain and a 20" cast iron water supply pipe. Both are controlled with manual gate valves. The inverts of both pipes are unknown.

Section 1.3 Continued

e. Storage (acre-feet)

- (1) Water Supply pool - 42±
- (2) Top of dam - 99±
- (3) $\frac{1}{2}$ PMF surcharge - 121±

f. Reservoir Surface (acres)

- (1) Water supply pool - varies, no records (10±)
- (2) Top dam - 12±
- (3) $\frac{1}{2}$ PMF pool - 12±

g. Dam

- (1) Type - gravity, earth embankment
- (2) Length - 1200'
- (3) Height - 31' (structural incl. 8' cutoff)
- (4) Top Width - 12'
- (5) Side Slopes - $1\frac{1}{2}$:1 D.S., 2:1 U.S.
- (6) Zoning - not indicated or known
- (7) Impervious Core - Concrete
- (8) Cutoff - 8' concrete
- (9) Grout curtain - Not known

i. Spillway

- (1) Type - Stone Masonry
- (2) Length of weir - 50'
- (3) Crest elevation - 596.00
- (4) Gates - None
- (5) U/S Channel - Concrete apron, 3:1 slope
- (6) D/S Channel - Stone masonry in concrete, slope varies
- (7) General - Bridge over spillway - could cause restriction.

Section 1.3 Continued

part of the reservoir is bounded by a new dam built in 1970 which intercepts runoff from 2897 acres (4.52 s.m.) of land.

The areas contributing storm runoff to the dam are wooded with rolling slopes. One swamp area (10 to 20 acres) is within the drainage area. The longest watercourse is the Henhawk Brook. It has a length of about two miles with a change in elevation of 500 feet. The brook passes through the swamp for a distance of about 1500 feet.

b. Discharge at Dam Site

This dam was not damaged during the August 1955 flood and adequately handled runoff from the entire 4077 acre (6.37s.m.) drainage area. The actual maximum flow, however, is unknown. The spillway is ungated and has a capacity of 2000± cfs (314 csm) at a pool elevation of 601±.

c. Elevation (ft. above MSL)

- (1) ½ PMF surcharge - 603±
- (2) Top Dam - 601.00
- (3) Water supply pool - varies 596 or less
- (4) Spillway crest (gated) - not gated 596
- (5) Upstream portal invert diversion tunnel - None
- (6) Streambed at centerline of dam - 581.00±
- (7) Maximum tailwater - 593±

d. Reservoir

- (1) Length of water supply pool - 1600'±
- (2) Length of ½ PMF pool - 1800'±

Section 1.2 Continued

d. Hazard Classification

This dam falls into a significant hazard classification for potential damage. Approximately five habitable structures could be damaged by flood waters.

e. Ownership

The dam is owned by the City of Northampton and has always been part of their water supply system.

f. Operator

The dam is maintained and operated by the Board of Public Works - Water Division, located at 237 Prospect Street, Northampton, MA. Mr. Leon Murray is the Superintendent of the Water Division. Telephone - (413) 584-1401.

g. Purpose of Dam

The purpose of this dam is water supply. Water is drawn from this reservoir through the 20" dia. C.I. pipe to feed the Mountain Street Reservoir some 2.5 miles away.

h. Design & Construction History

The drawings for the dam were made in 1901 and construction completed in 1903. There is no in-depth design or construction data available for this site.

1.3 Pertinent Data

a. Drainage Area

The main drainage area is about 1180 acres (1.82 S.M.) and extends to the westerly side of the dam. The northerly

Section 1.1 Continued

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

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

1.2 Description of Project

a. Location

Northampton Reservoir Lower Dam is located in the Town of Whately in Franklin County, Massachusetts.

b. Dam and Appurtenances

The dam is a 1200' long, 23' high earth embankment dam with a 2:1 riprap upstream slope and a 1½:1 turfed downstream slope. A Concrete Core wall is provided at midsection. The Spillway has a center core wall of stone masonry with a 3:1 approach slope and a stone paved 5:1 exiting channel. The training walls are stone masonry and serve as abutments for a roadway truss bridge which spans the spillway.

A gate structure described in Section 3.1c is located at the approximate 1/3rd point along the length of the dam. This structure contains a 20" dia. C.I. pipe which feeds the water supply system, and a 30" dia. C.I. waste pipe.

c. Size Classification

This dam falls into the small size classification due to its hydraulic height and storage capacity of 23 feet and 99 a.f. respectively.

PHASE I
INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NORTHAMPTON RESERVOIR (LOWER DAM)

SECTION 1
PROJECT INFORMATION

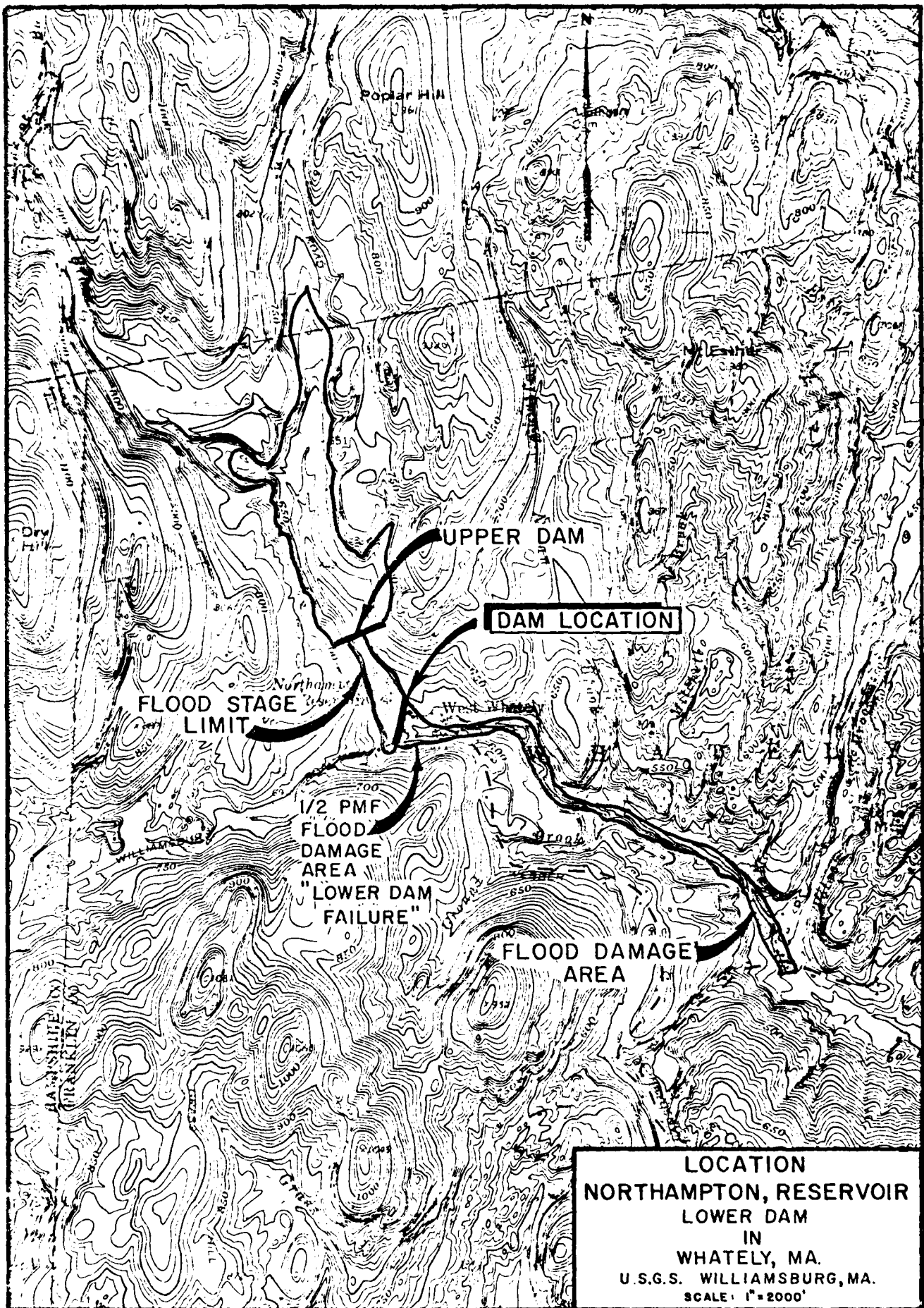
1.1 General

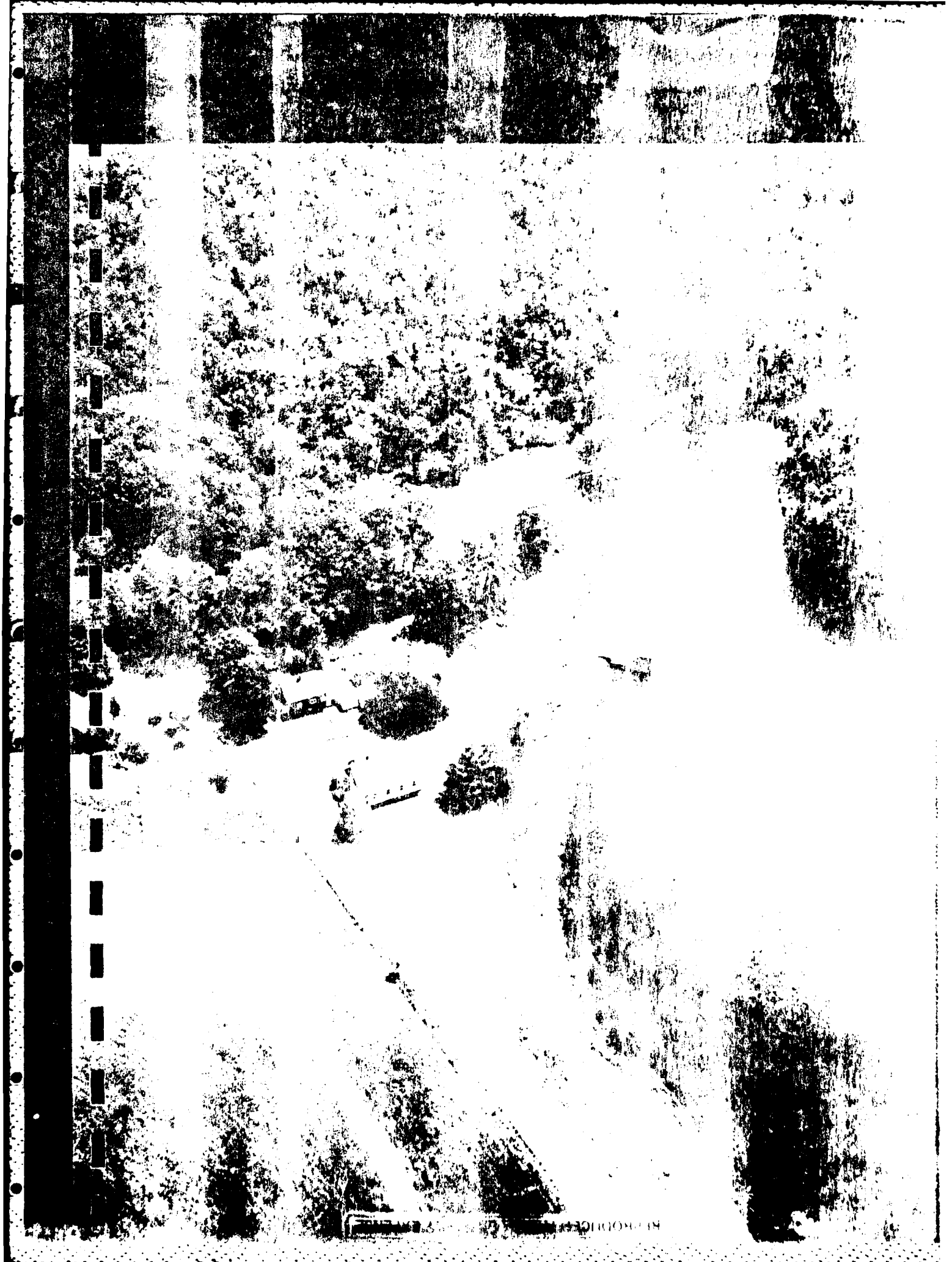
a. Authority.

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Hayden, Harding & Buchanan, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Hayden, Harding & Buchanan, Inc. under a letter of May 3, 1978, from Mr. Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0307 has been assigned by the Corps of Engineers for this work.

b. Purpose

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





Section 3.1 Continued

as abutments for the roadway truss bridge are true and plumb and in generally good condition.

3.2 Evaluation

Visual examination indicates no immediate safety problem, however, the cause of extensive seepage downstream of the toe should be investigated and a seepage collection system designed. Also the spalled area of the spillway outlet channel along with the rotted wood and loose hand rail on the service bridge should be repaired.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures

The reservoir retained by this dam is used to supply water to the City of Northampton. Normally, the gate on the 20" dia. supply line is open, thereby feeding water to the system. The 30" dia. waste pipe is normally closed.

4.2 Maintenance of Dam

The downstream slope of this dam is cut annually by the City. Animal burrows are also looked for and repaired as required at this time.

4.3 Maintenance of Operating Facilities

The operating gates which control flow to the 20" dia. supply line and the 30" dia. waste line are operated annually by the City.

4.4 Description of Warning Systems

There are no warning systems in effect for this dam.

4.5 Evaluation

The basic maintenance procedures of cutting turf, fixing burrow holes and operating the control gates appears adequate for this facility. However, the dam should be inspected annually by qualified personnel who can identify areas of concern which, if left unchecked, could jeopardize the safety of the dam.

SECTION 5
HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

There are no hydraulic design calculations available for this site.

b. Experience Data

The Superintendent of the Water Division reported that there was no damage evident to this dam during the August 1955 flood. The actual flow at the spillway during this flood, however, was not monitored and is therefore unknown. This dam was also subjected to the floods of Nov. 1927, March 1936, Sept. 1938 and October 1955.

c. Visual Observations

Visual observations of the drainage area and general vicinity show it to be generally as indicated on the U.S.G.S. Map. This is described in Section 1.3 of this report.

d. Overtopping Potential

This dam carries a small dam classification with a significant hazard potential. As such, it should be capable of passing maximum flow of $\frac{1}{2}$ PMF. The test flood was computed by determining the watershed drainage area from USGS maps in combination with Corps discharge guide curves. This flow also

Section 5.1 Continued

includes the $\frac{1}{2}$ PMF input to this site by the spillway of the dam immediately north of this location. (Upper Reservoir, MA. 00521).

Considering the storm runoff from the 1180 acre (1.85 s.m.) drainage area and the upper dam input, a total of 6182 cfs (970 csm) will pass through the Lower Dam. This $\frac{1}{2}$ PMF will overtop the lower dam to an approximate depth of 2 feet (El. 603 $\pm$). As previously mentioned, the spillway has a discharge capacity of 2000 cfs (314 csm) at elevation 601 $\pm$.

Using the "rule-of-thumb" method, the effects of overtopping damage were determined, assuming failure of this dam. When the dam is overtopped, the automobile bridge at the spillway will be washed out (this bridge presents a possible blockage point, for trees, at lesser flood flows). Within 1000 feet of the dam, 5 inhabited structures would be struck by the water's wave. Significant damage to these structures is indicated by using U.S.G.S. elevations.

No structures are close to the stream again until 6000 to 8000 feet downstream near the Haydenville road. Along this length, 6 structures could be damaged by flood water. Damage might be significant here since these structures are close to the stream bed.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The visual inspection did not disclose any immediate stability problems.

b. Design and Construction Data

The drawing in Appendix B summarizes the available information about the design of the dam. No specifications are available.

c. Operating Records

No operating records were made available.

d. Post-construction Changes

A gravel-filled trench drain and a drop inlet leading to the dam drain were constructed to collect the excessive seepage which occurred at this site.

This collection system has not been adequate to prevent significant uncontrolled seepage downstream.

e. Seismic Stability

The dam is located in Seismic Zone 2 according to U.S. Corps of Engineer guidelines and does not require a special analysis for seismic stability. Since the dam has an old concrete or masonry core wall, earthquake shaking could cause cracking of the wall. This possibility supports the need for designing a seepage collection system downstream of the dam.

SECTION 7
ASSESSMENT, RECOMMENDATIONS -
REMEDIAL MEASURES

7.1 Dam Assessment

a. Conditions

The visual inspection did not disclose any findings that indicate an immediate unsafe condition.

b. Adequacy of Information

The information available is such that the assessment of the safety of the dam must be based primarily on the visual inspection and the past performance of the structure.

c. Urgency

The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented by the owner within two to four years. The exception is the remedial measure 7.3b(4) which should be implemented within six months to one year.

d. Necessity of Additional Investigations

The findings of the visual inspection do not warrant additional investigation; however, the owner should engage a qualified consultant to evaluate the seepage condition at the downstream toe in sufficient detail to permit the design of a seepage collection and monitoring system.

7.2 Recommendations

a. The wood walkway on the gate house service bridge should have all rotted wood replaced and the steel handrail should be securely fastened in place.

Section 7.2 Continued

b. The small trees growing from between the granite block joints of the gate house should be removed. All joints should be mortared as required.

7.3 Remedial Measures

Although this dam is in generally good condition it is considered important that the following items be accomplished.

a. Alternatives

This dam's spillway does not have the capacity to pass the $\frac{1}{2}$ PMF when flow from the upper dam's spillway at $\frac{1}{2}$ PMF is added to the drainage area inflow. The spillway is adequate when only the drainage area of 1.84 square miles for this dam is considered. Further hydraulic studies by competent consulting engineers are necessary to determine what alternative measures are necessary to improve spillway discharge capabilities.

This study could possibly lead to the following conclusions:

- 1) Operate upper dam at less than full capacity to provide increased storage at peak runoff times.
- 2) Increase spillway capacity of this dam.
- 3) Operate this dam at less than full capacity to provide increased storage.
- 4) Combination of the above.

Section 7.3 Continued

b. Operation and Maintenance Procedures

1) The owner should have a qualified consultant investigate the seepage condition below the toe of the dam and design an adequate collection and monitoring system.

2) The area of the downstream channel immediately below the spillway as outlined in Section 3.1e of this report should be repaired. This repair should consist of replacing in kind the dislodged hand placed boulders or filling the voids with concrete.

3) This dam should be inspected annually by qualified personnel who can identify areas of concern which, if left unchecked could jeopardize the safety of the dam.

4) Because of the relationship of the upper and lower dams, around the clock surveillance should be provided during periods of unusually heavy precipitation. In addition the owner should develop a formal system for warning downstream residents in case of emergency.

APPENDIX A

VISUAL INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Northampton Watery Complex
Lower Dam

DATE May 25, 1978

TIME 3:15

WEATHER Partly sunny 70°

W.S. ELEV. 596.1 U.S. _____ DN.S. _____

PARTY:

- | | |
|-------------------------|-----------|
| 1. <u>Ron Cheney</u> | 6. _____ |
| 2. <u>Dan LaGatta</u> | 7. _____ |
| 3. <u>Craig Nehring</u> | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Embankment Dam</u>	<u>D.P. LaGatta</u>	
2. <u>Intake Structure & Control Structure</u>	<u>Ron Cheney</u>	
3. <u>Spillway</u>	<u>Ron Cheney</u>	
4. <u>Service Bridge</u>	<u>Ron Cheney</u>	
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery Complex DATE May 25, 1978
 PROJECT FEATURE Lower Dam NAME D. P. LaGatta
 DISCIPLINE Geotechnical Engineer NAME R.H. Cheney
Structural Engineer

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	601.0
Current Pool Elevation	596.1
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed.
Pavement Condition	No pavement.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	No misalignment observed.
Horizontal Alignment	No misalignment observed.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	None observed.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	No riprap.
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	See detailed description in Section 3.1 of report.
Piping or Boils	No boils observed.
Foundation Drainage Features	Unknown.
Toe Drains	Unknown.
Instrumentation System	None.

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery Complex DATE May 25, 1978
 PROJECT FEATURE Lower Dam NAME D. P. LaGatta
 DISCIPLINE Geotechnical Engineer NAME R. H. Cheney
Structural Engineer

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	This facility has no approach channel.
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	Granite stone masonry structure with wood floor, brick super-structure, and wood roof.
Condition of Concrete	
Stop Logs and Slots	Small trees are growing from joints between granite blocks.

PERIODIC INSPECTION CHECK LIST

OBJECT Northampton Watery Complex DATE May 25, 1978
 OBJECT FEATURE Lower Dam NAME D. P. LaGatta
 DISCIPLINE Geotechnical Engineer NAME R. H. Cheney
Structural Engineer

AREA EVALUATED	CONDITIONS
<u>LET WORKS - CONTROL TOWER</u>	
Concrete and Structural	Control tower and intake structure are one and the same. See comments preceding for intake structure.
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
Mechanical and Electrical	All gates are manually operated. City checks gates for operational ability once a year. 20" C.I. Supply open. 30" C.I. Waste closed.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST

SUBJECT Northampton Wately Complex

DATE May 25, 1978

OBJECT FEATURE Lower Dam

NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer

NAME: R. H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
ET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	There is no transition and Conduit
Rust or Staining on Concrete	20" dia C.I. Supply and
Spalling	30" dia C.I. Waste pipe only.
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

- 4 -

LL CONDITION:

Safe _____.

Minor repairs needed X _____.

Conditionally safe - major repairs needed _____.

Unsafe _____.

Reservoir impoundment no longer exists (explain)

Recommend removal from inspection list _____.

FINDINGS AND RECOMMENDATIONS: (Fully Explain)

grade and alignment of earthen dam appeared good. The upstream slope was riprapped with turfed surface at top 5 feet of slope, all of which appeared stable. The downstream slope is well turfed over but considerable wetness of dike was noted at toe of slope on northeasterly part of dike. There is a drainage ditch and catch basin drain at lower end of this area to carry off water. This condition has existed for some years according to Northampton Water Department employee and it appears to be stabilized.

Emergency spillway at westerly end of dam is in poor condition. Some brush and considerable silt is partially blocking upstream entrance. The crest of spillway is made of cut stone blocks and is sound. Immediately below crest is a section of badly spalled concrete paved floor. At start of spillway drop (see sketch) there are several areas of broken floor pavement with eroding areas beneath. The entire length of the rest of stone and concrete paved floor spillway is deteriorating badly.

District believes this condition should be corrected to prevent eventual weakening of crest wall and then dam itself.

/sd

ent

EMERGENCY SPILLWAY: Available X . Needed .

Height Above Normal Water 3 Ft. at time of inspection.

Width 50 Ft. Height 5 Ft. Material Cut stone crest;
concrete apron upstream;
conc. & stone paving down-
Condition: 1. Good . 3. Major Repairs X . stream

2. Minor Repairs . 4. Urgent Repairs .

Comments: Several areas of downstream spillway floor broken up, large spalled
area of floor at crest - downstream side.

WATER LEVEL AT TIME OF INSPECTION: 3 Ft. Above . Below X .

Top Dam F.L. Principal Spillway .

Other Flow line of emergency spillway.

Normal Freeboard 8 $\frac{1}{2}$ Ft. to top dike.

SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Yes. Minor brush growth in spillway
intake.

Animal Burrows and Washouts None found

Damage to Slopes or Top of Dam None found

Cracked or Damaged Masonry See notes on spillway floor

Evidence of Seepage Considerable wetness noted at toe of slope on
downstream side of dike.

Evidence of Piping None found

Leaks Flow of water noted along side of waste pipe at outlet end -
source unknown.

Erosion Erosion of spillway channel noted

Trash and/or Debris Impeding Flow None found

Clogged or Blocked Spillway None found

Other

3: OUTLET CONTROLS AND DRAWDOWN

50 ft. wide - 5 ft. high overflow spillway.

1 Location and Type: Stone and concrete paved floor.

Controls No, TYPE: _____.

Automatic _____. Manual _____. Operative Yes _____, No X _____.

Comments: Floor of spillway badly deteriorated - several areas of broken pavement.

2 Location and Type: 30" I.D., C.I. drawdown - conduit from gatehouse to brook
South of Williamsburg Road.

Controls Yes, Type: Gate

Automatic _____. Manual X _____. Operative Yes X _____, No _____.

Comments: Operated in 1970 - Leakage of water along pipe line evident

3 Location and Type: 20" C.I. Intake Main - from gatehouse intake well

Controls Yes, Type: Gate valve - screw lift

Automatic _____. Manual X _____. Operative Yes X _____, No _____.

Comments: Verified by employee of Water Department

drawdown present Yes X _____, No _____, Operative Yes X _____, No _____.
Comments: See No. 2 Above

UPSTREAM FACE: Slope 2:1 riprapped, Depth Water at Dam 6½'

Material: Turf X _____. Brush & Trees _____. Rock fill _____. Masonry _____. Wood _____.
or Stone riprap.

Condition: 1. Good X _____. 3. Major Repairs _____.
2. Minor Repairs _____. 4. Urgent Repairs _____.

Comments: Stone riprap appeared stable - turf on top 5' of slope good.

DOWNSTREAM FACE: Slope 1½:1

Material: Turf X _____. Brush & Trees _____. Rock Fill _____. Masonry _____. Wood _____.
or _____.

Condition: 1. Good X _____. 3. Major Repairs _____.
2. Minor Repairs _____. 4. Urgent Repairs _____.

Comments: Turf on slopes good - considerable wetness at toe of northeasterly
half of dike noted.

INSPECTION REPORT - DAMS AND RESERVOIRS

LOCATION:

~~City~~/Town Whately County Franklin Dam No. 2-6-337-2

Name of Dam Northampton's West Whately Reservoir, Lower
Mass. Rect.

Topo Sheet No. 11A Coordinates: N 526,000, E 280,300

Inspected by: Harold T. Shumway, On Nov. 29, 1973 Date
Last Inspection 1970

OWNER/S: As of November, 1942

per: Assessors X, Reg. of Deeds _____, Prev. Insp. _____, Per. Contact X

City of Northampton,

1. Board of Public Works, Water Division, 237 Prospect Street, Northampton, Ma. 01060
Name St. & No. City/Town State Tel. No.

2. _____
Name St. & No. City/Town State Tel. No.

3. _____
Name St. & No. City/Town State Tel. No.

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
absentee owner, appointed by multi owners.

Mr. Leon Murray,
Superintendent of Water Division, 237 Prospect Street, Northampton, Ma. 01060
Name St. & No. City/Town State Tel. No.

DATA:

No. of Pictures Taken None Sketches See description of Dam.
Plans, Where In Northampton Water Department Office

DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor _____ 3. Severe X

2. Moderate _____ 4. Disastrous _____

Comments: At least ten homes could be affected plus several bridges

*This rating may change as land use changes (future development).

OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X_____.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list_____.

REMARKS AND RECOMMENDATIONS: (Fully Explain)

r. Craig Nehring, work crew foreman of the Northampton Water Division, was present during inspection. While the seepage flows were considerable this seems to be a normal condition for this dam from past inspections. The condition of the floor of the overflow spillway channel has deteriorated further since last inspection.

As noted in item #9, comments, the worst area is only 9'+ downstream from crest of spillway. A continuous break-up of floor in this area could rapidly spread back to base of spillway crest section which would be structurally weakened by such action. The District therefore considers this continuous deterioration of spillway channel floor a hazard to safety of dam and recommends that owners be requested to make proper repairs.

At time of inspection the main dam structure appears to be safe.

10. EMERGENCY SPILLWAY: Available Yes. Needed _____.

Height Above Normal Water: 0 Ft. varies according to water usage
Cut stone crest-conc. apron paving downstream.

Width 50 Ft. Height 5 Ft. Material _____.

Condition: 1. Good _____.

3. Major Repairs _____.

2. Minor Repairs X.

4. Urgent Repairs _____.

Comments: A hole 1' to 1½' deep, 10' ± long and 5'± wide in spillway channel floor, 9'± downstream from spillway crest on westerly side of channel.
other areas cracking and breaking up in floor.

11. WATER LEVEL AT TIME OF INSPECTION: 1/6 Ft. Above X. Below _____.

Top Dam _____ F.L. Principal Spillway X.

Other _____.

Normal Freeboard 5 Ft. to top dike.

12. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Minor brush growth on downstream slope.

Animal Burrows and Washouts None found.

Damage to Slopes or Top of Dam None found.

Cracked or Damaged Masonry Yes - overflow side channel spillway outlet floor badly cracked and broken up.

Evidence of Seepage Yes, a considerable seepage flow was noted in seepage drains.

Evidence of Piping None found.

Leaks None found.

Erosion None found.

Trash and/or Debris Impeding Flow None found.

Clogged or Blocked Spillway None found.

Other _____.

OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: Westerly end of dam - 50' w x 5' h overflow spillway
with stone and conc. paved floor.

Controls None, TYPE: _____

Automatic _____. Manual _____. Operative Yes _____, No _____.

Comments: Several areas of spillway floor badly cracked and broken up.

No. 2 Location and Type: At gate house - 30" dia. C.I. drawdown conduit.

Controls Yes, Type: Gate Valve

Automatic _____. Manual X. Operative Yes X, No _____.

Comments: Valve works per water division personnel - minor brush growth in crevices of gatehouse foundation.

No. 3 Location and Type: At gate house intake well - 20" dia. C.I. intake main.

Controls Yes, Type: Gate valve - screw lift.

Automatic _____. Manual X. Operative Yes X, No _____.

Comments: Operable per water division personnel

Drawdown present Yes X, No _____. Operative Yes X, No _____.

Comments: See No. 2 above

7. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 10'+.

Material: Turf X. Brush & Trees _____. Rock fill _____. Masonry _____. Wood _____.

Other Stone riprapped

Condition: 1. Good X. 3. Major Repairs _____.

2. Minor Repairs _____. 4. Urgent Repairs _____.

Comments: Stone riprap paving appears stable - turf cover on upper portion of slope and along top of dam is good.

8. DAM DOWNSTREAM FACE: Slope 1½:1.

Material: Turf X. Brush & Trees _____. Rock Fill _____. Masonry _____. Wood _____.

Other _____.

Condition: 1. Good _____. 3. Major Repairs _____.

2. Minor Repairs X. 4. Urgent Repairs _____.

Comments: Considerable seepage noted along toe of slope - some standing water noted on top of ground - minor brush growth.

INSPECTION REPORT - DAMS AND RESERVOIRS

LOCATION:

~~City~~/Town WHATELY County Franklin Dam No. 2-6-337-2

Name of Dam Northampton's West Whately Reservoir - Lower

Topo Sheet No. 11A Mass. Rect. Coordinates: N 526,000, E 280,300

Inspected by: Harold T. Shumway, On May 26, 1976 Date Last Inspection 11/29/73

OWNER/S: As of May 26, 1976

per: Assessors _____, Reg. of Deeds _____, Prev. Insp. X, Per. Contact X

1. City of Northampton, Bd. of Public Works-Water Div. 237 Prospect St. Northampton
Name St. & No. City/Town State Tel. No.

2. _____
Name St. & No. City/Town State Tel. No.

3. _____
Name St. & No. City/Town State Tel. No.

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
absentee owner, appointed by multi owners.
Mr. Leon Murray
Supt. of Water Division 237 Prospect Street, Northampton, Mass.

Name St. & No. City/Town State Tel. No.

DATA:

No. of Pictures Taken None Sketches See description of Dam.
Plans, Where In office files of Northampton B.P.W. - Water Div.

DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor _____ 3. Severe X

2. Moderate _____ 4. Disastrous _____

Approx. 24 million gallons impoundment - several homes and highway

Comments: bridges downstream could be affected.

*This rating may change as land use changes (future development).



The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

City of Northampton
Board of Public Works
Water Division
237 Prospect Street
Northampton, Massachusetts

100 Nashua Street, Boston 02111

February 25, 1977

Re: Insp. Dam #2-6-337-2
Northampton's West Whatley
Reservoir Lower Dam

Attention: Mr. Leon Murry

Dear Sir:

Cn 5-26-76, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be City of Northampton. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 705 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention: The condition of the floor of the overflow spillway channel has deteriorated further since last inspection. As noted in item #9, comments, the worst area is only 9+ downstream from crest of spillway. A continuous break-up of floor in this area could rapidly spread back to base of spillway crest section which would be structurally weakened by such action. The Division therefore considers this continuous deterioration of spillway channel floor a hazard to safety of dam and recommends that owners be requested to make proper repairs.

Heavy seepage noted.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,

John J. Hannon, P.E.
Chief Engineer

AMC:

cc: Francis J. Hoey
Russell Salls

LIST OF AVAILABLE ENGINEERING DATA

- 1) A plan showing plan and typical sections of dam and spillway was the only engineering data found.

Location: City of Northampton, Board of Public Works,
Water division. 237 Prospect Street, Northampton,
Massachusetts.

Northampton Lower Dam

APPENDIX B

1. LIST OF DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS
2. PAST INSPECTION REPORTS
3. PLANS AND DETAILS

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery Complex DATE May 25, 1978
 PROJECT FEATURE Lower Dam NAME D. P. LaGatta
 DISCIPLINE Geotechnical Engineer NAME R. H. Cheney
Structural Engineer

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - SERVICE BRIDGE</u>	
a. Super Structure	
Bearings	Service bridge consists of three (3) seven (7) inch steel beams with wood decking. Wood Blocking is fastened to the inside web faces of the beams and wood Bracing Spans between this blocking
Anchor Bolts	
Bridge Seat	The wood is badly weathered and rotted.
Longitudinal Members	A double horizontal steel rail is provided on each side. The rail is fastened to the wood deck with pipe flanges and screws.
Under Side of Deck	
Secondary Bracing	Due to the rotted wood and missing screws, these rails are loose and unsafe
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment and Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat and Backwall	

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery Complex DATE May 25, 1978
 PROJECT FEATURE Lower Dam NAME D. P. LaGatta
 DISCIPLINE Geotechnical Engineer NAME R. H. Cheney
Structural Engineer

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	This facility has no approach channel.
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	Spillway consists of a cut stone crest, a 6 foot upstream concrete apron and a concrete and stone pavement down stream.
Rust or Staining	
Spalling	Training walls are granite block with some joints mortared. Walls serve as abutments for a roadway truss bridge. Walls are true and plumb.
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
c. Discharge Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None observed.
Trees Overhanging Channel	Yes, but not significant.
Floor of Channel	Boulder strewn.
Other Obstructions	None.

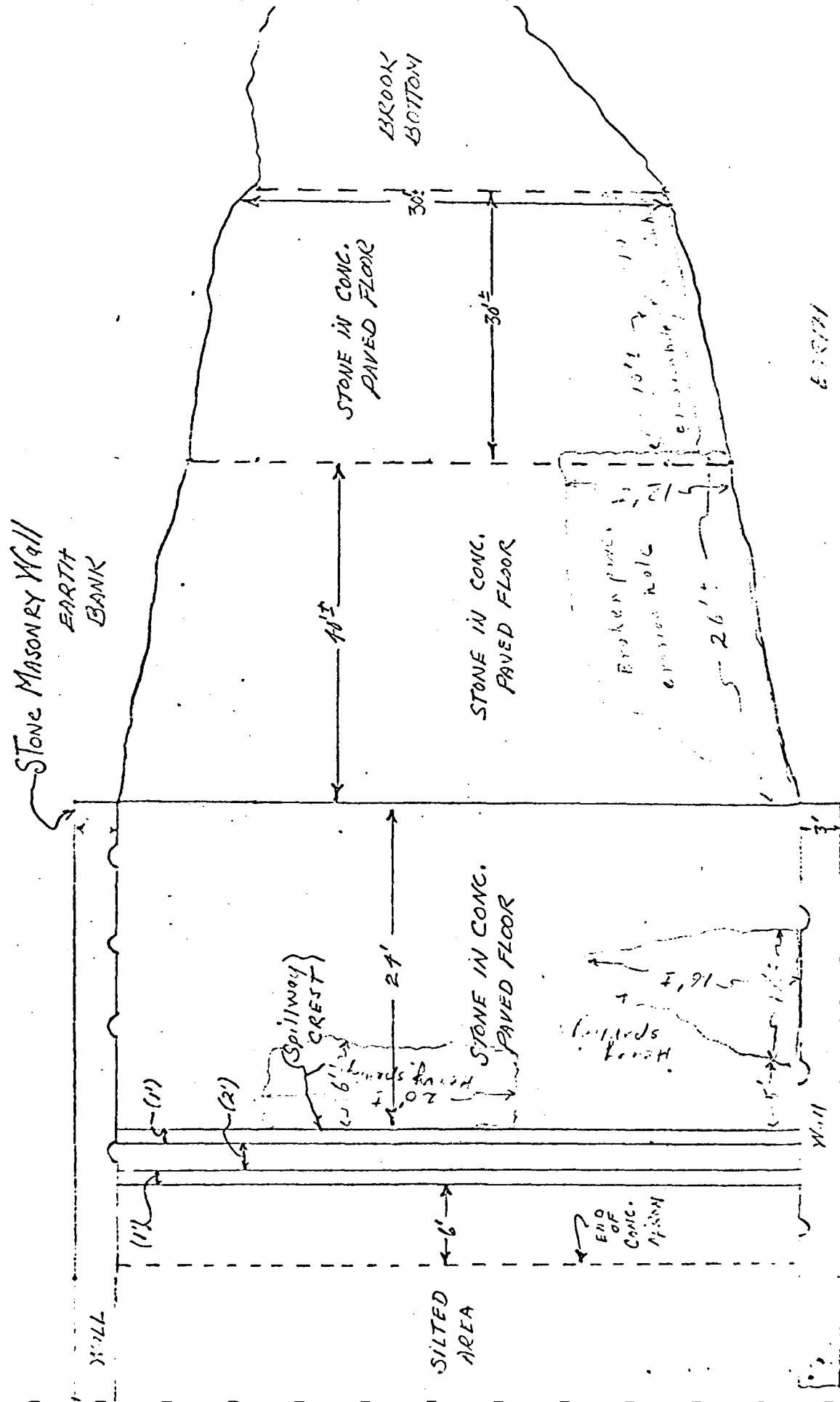
PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery Complex DATE May 25, 1978
 PROJECT FEATURE Lower Dam NAME D. P. LaGatta
 DISCIPLINE Geotechnical Engineer NAME R. H. Cheney
Structural Engineer

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	No outlet structure.
Rust or Staining	Waste pipe empties directly into brook beyond Williamsburg Road located down stream of Dam.
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	
Channel	
Loose Rock or Trees Overhanging Channel	None.
Condition of Discharge Channel	Good.

Whiteley, Mass. _____

ATTACHMENT To



January 18, 1970

Leon Murray, Superintendent
Board of Public Works
Water Division
237 Prospect Street
Northampton, Massachusetts 01060

Re: Inspection-Dam # 2-6-337-2
Whately
West Whately Lower Reservoir Dam

Dear Mr. Murray,

An engineer from the Massachusetts Department of Public Works has inspected the above dam, owned by the City of Northampton.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

The results of the inspection indicate that this dam is safe; however, the emergency spillway at the westerly end of the dam is in poor condition. Some brush and silt is partially blocking the upstream entrance. Below the spillway crest a large section of the concrete floor is spalled. Several other floor areas have broken pavement with eroded holes beneath. The entire length of the stone and concrete floor is deteriorated. This spillway area should be repaired to prevent the weakening of the crest wall and the dam itself.

We call these conditions to your attention now, before they become serious and more expensive to correct.

Very truly yours,

F. C. Schuelm

FRED. C. SCHUELM, P.E.
Deputy Chief Engineer

LJM
LPA:mej
cc: P.J. Hony
E. Salls

Number 230

2-6-337-2

TOWN WHATELY

Name Northampton Reservoir ^{#/}

Inspection Date 1970

Owner City of Northampton

Location just west of West Hawley

Type of Pond made

Acreage about 10 acres

Drainage Area

Comments

Type of Dam earth, with a ^rstone masonry core wall

Length 20 feet

Height 15 feet

Head of Water

Comments

Type of Spillway stone masonry on ledge, bridge over spillway

Width

Height

Comments

Condition, Previous Report, Dated 1968 This dam is safe

Present Condition

DISTRICT II.Submitted by Harold T. Shumway Dam No. 2-6-337-2Date November 29, 1973 ~~City~~/Town WhatelyName of Dam Northampton's West Whately
Reservoir - Lower

1. Location: Topo Sheet No. 11A Mass. Rect. Coordinates N 526,000 E 280,300

Provide $8\frac{1}{2}$ " x 11" in clear copy of topo map with location of
Dam clearly indicated.

On West Brook in West Whately about 100 feet north of intersection of

Conway Road and Williamsburg Road.

2. Year built 1902 - 1903 Year/s of subsequent repairs In 1930's
Reservoir cleaned

3. Purpose of Dam: Water Supply X Recreational _____
Flood Control _____ Irrigation _____ Other _____

4. Drainage Area: 8 $\frac{1}{2}$ sq. mi. _____ acres.
Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban _____ Rural, Farm _____
Wood & Scrub Land X Slope: Steep 50% Med. 50% Slight _____

5. Normal Ponding Area: 6 Acres; Ave. Depth 12' to 13'
Impoundment: 24 Million gals.; 75 $\pm$ acre ft.
Silted in: Yes X No _____ Approx. Amount Storage Area 15 $\pm$

6. No. and type of dwellings located adjacent to pond or reservoir _____
i.e. summer homes etc. None

7. Dimensions of Dam: Length 1200' $\pm$ Max. Height 23' $\frac{1}{2}$
Embankment 1125' long Freeboard 5'
Slopes: Upstream Face 2:1 riprapped
Downstream Face 1 $\frac{1}{2}$ to 1 loamed
Width across top 8' to 12'

Dam No. 2-8-337-2

Classification of Dam by Material:

Earth X Conc. Masonry _____ Stone Masonry _____
Timber _____ Rockfill _____ Other Stone paved slope upstream
of dike

Dam Type: Gravity X Straight X Curved, Arched _____ Other Curved nor-
Overflow _____ Non-overflow _____ easterly e:

A. Description of present land usage downstream of dam:

100 % rural; _____ % urban

B. Is there a storage area or flood plain downstream of dam which
could accommodate the impoundment in the event of a complete
dam failure? Yes _____ No X

C. Character Downstream Valley: Narrow X Wide _____ Developed Rural homes
Rural 100% Urban _____

Risk to life and property in event of complete failure.

No. of people 10

No. of homes 10

No. of businesses None

No. of industries None Type _____

No. of utilities 3 Type Water, telephone and electric
transmission lines

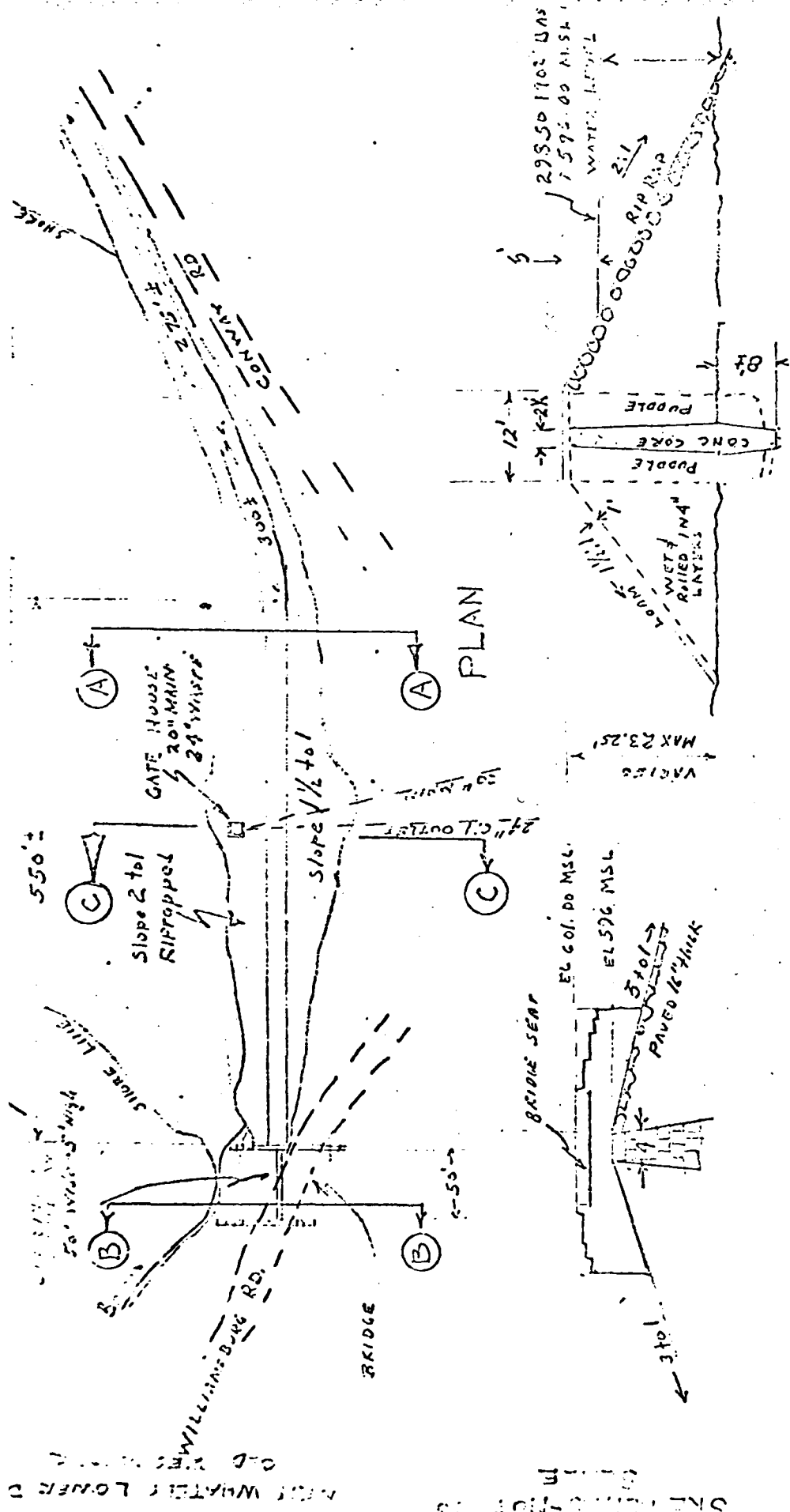
Railroads None

E. S. Crafts Dam, Number 2-6-337-1, plus remains of four dams
Other dams now breached.

Other Five Town Highway Bridges and three Town Highways

1. Attach Sketch of dam to this form showing section and plan on $8\frac{1}{2}$ " x 11" sheet.

CS/vk /sd
Attachments
Locus Plan
Sketches

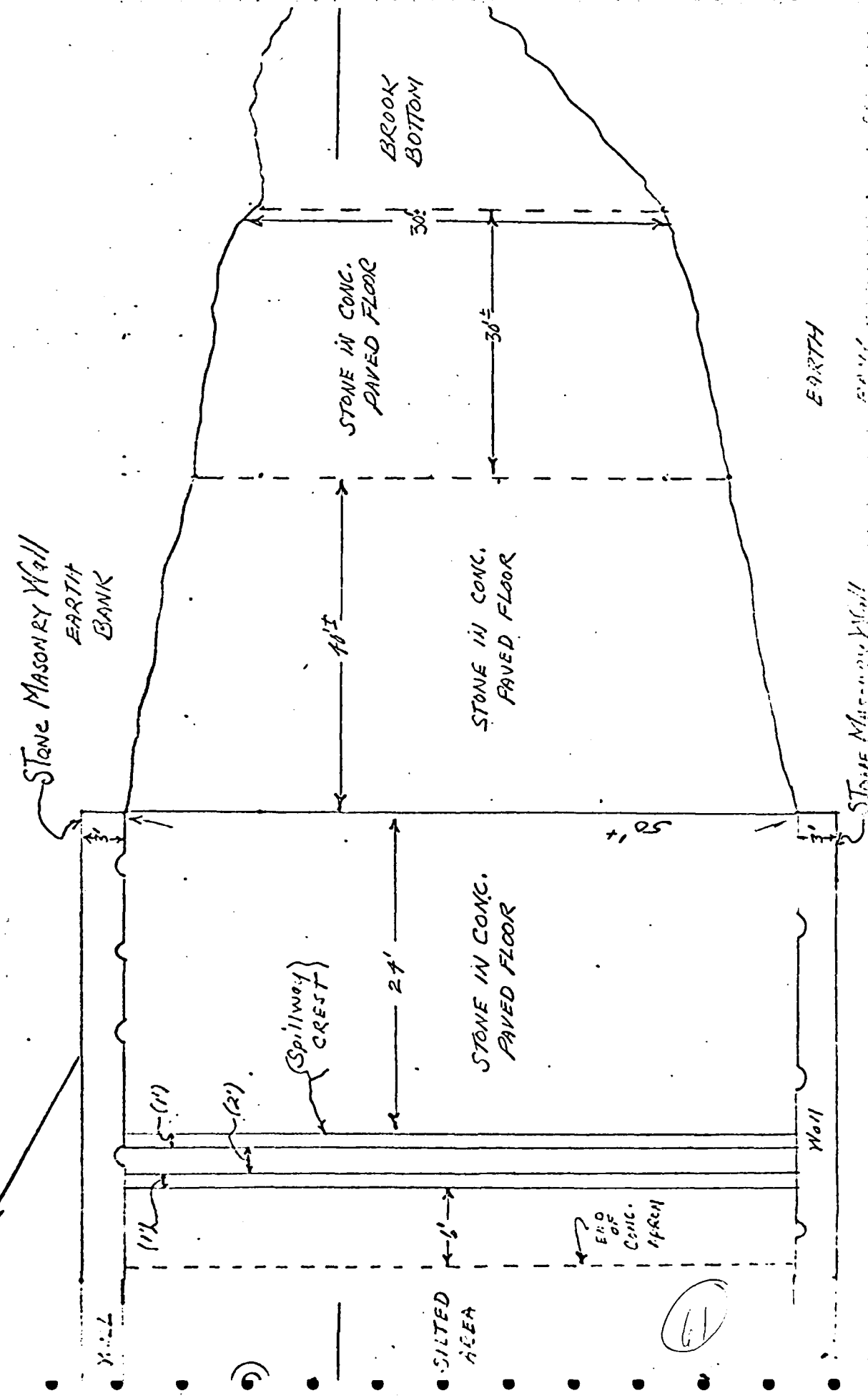


XX SECTION "BB"

XX SECTION "AA"

Sheet Lot 17 Sheets

DETAIL PLAN OVERFLOW SPILLWAY
AT WEST END DAM - FIELD CHECK



END OF CONC. FLOOR

NEW SPILLWAY WALL

24'

12'

24'

30'

151'

1:1

CONCRETE APRON

CONCRETE PAVED APRON

WATER LEVEL IN

1 FOOT DEE,

ENTERING FROM

NORTH WEST.

CUTSTONE

SPILLWAY CREST

0.5'

24'

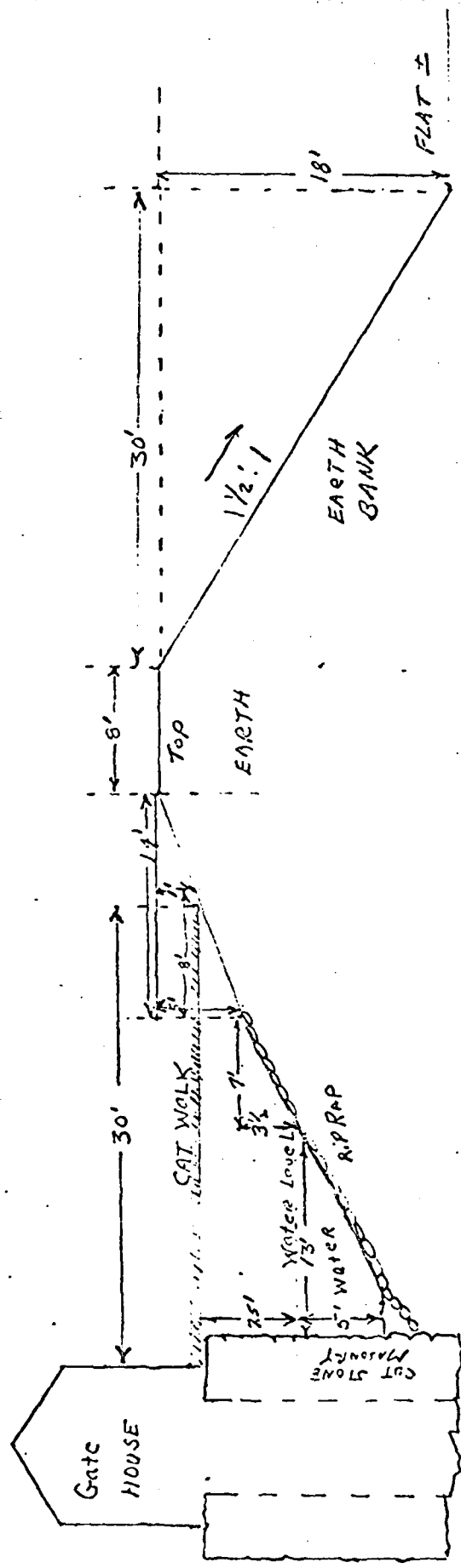
94'

105'

30'

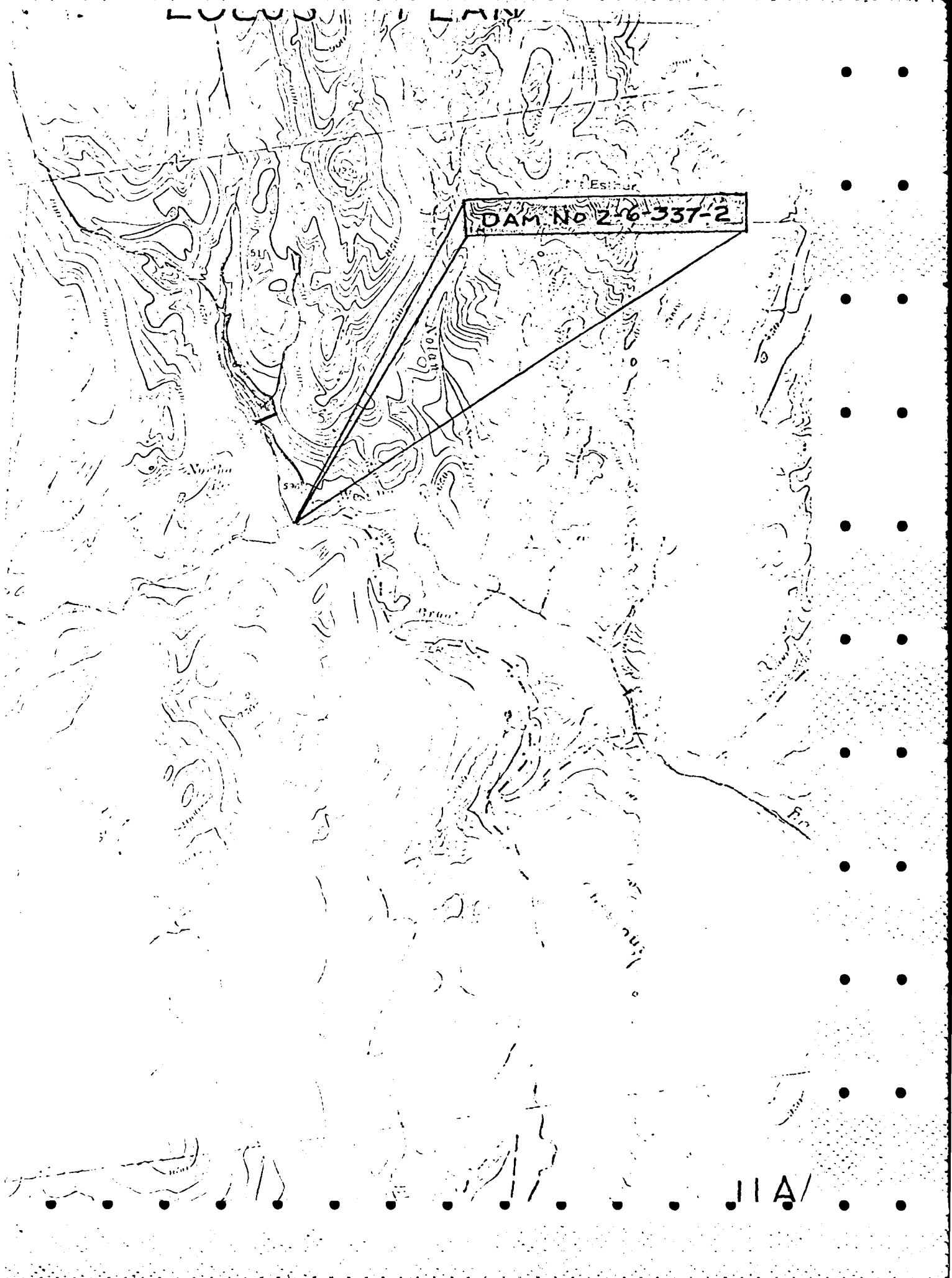
151'

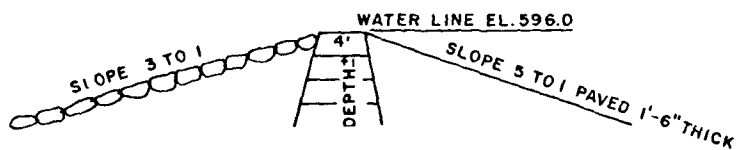
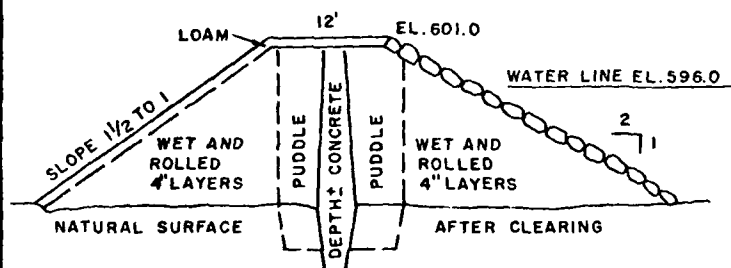
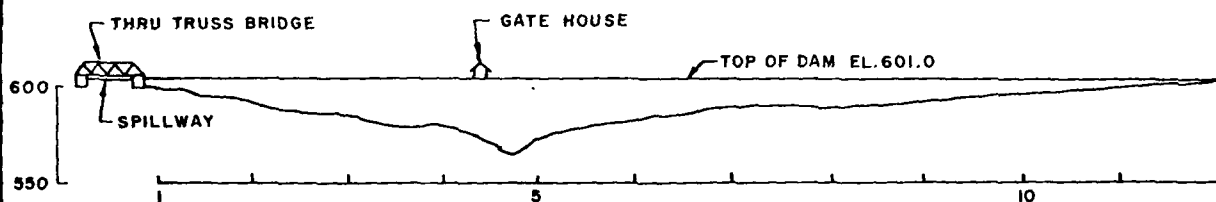
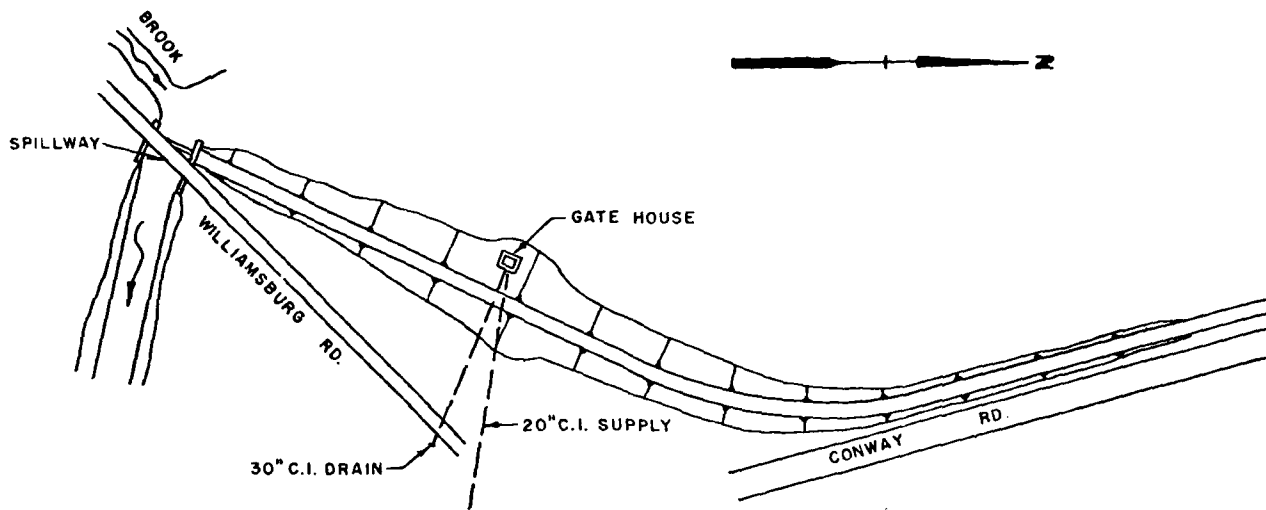
X SECTION DD
X SECTION THROUGH OVERFLOW SPILLWAY-FROM
FIELD CHECK NOV. 29, 1973



X SECTION "CC"
 X SECTION THROUGH ENBANKMENT
 AT GATE HOUSE - FROM FIELD
 CHECK 11/29/73

201.52





INFORMATION SHOWN COPIES
FROM PLAN DATED 1901

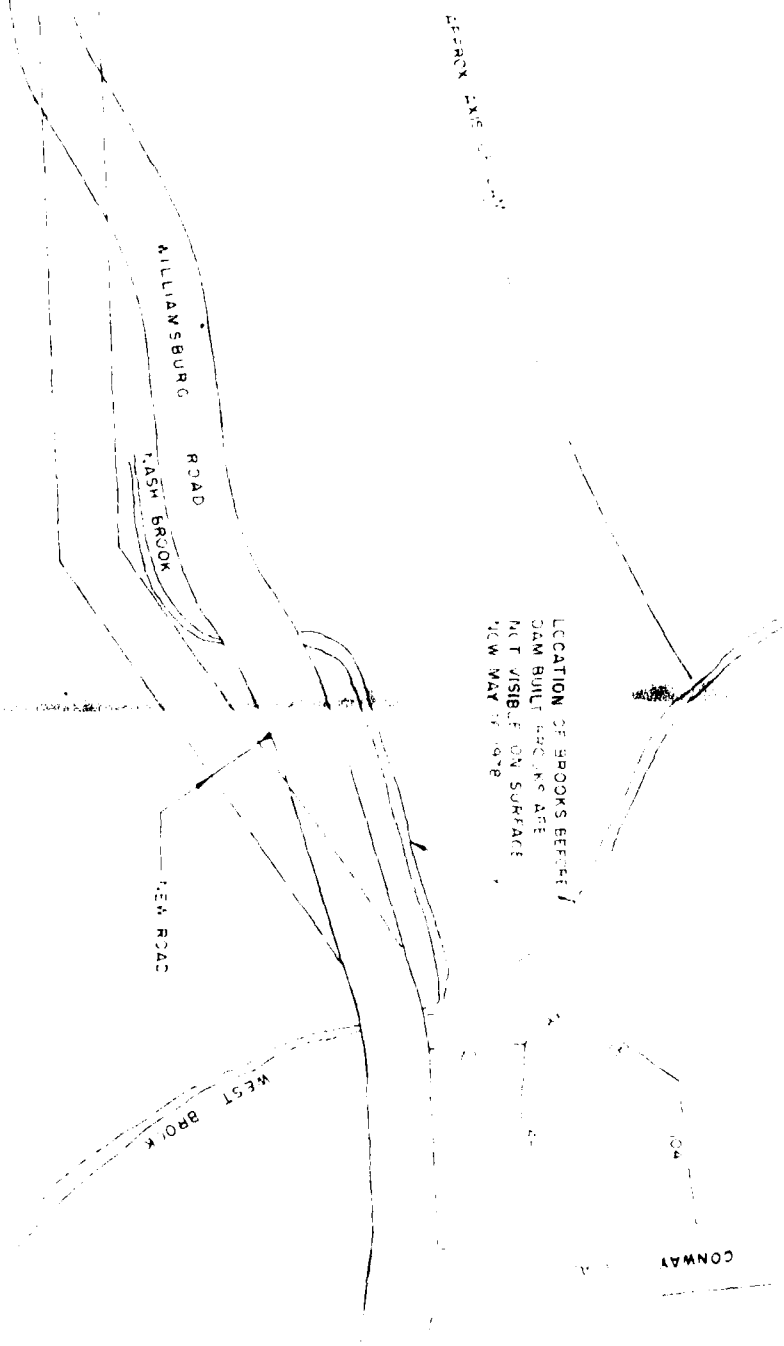
NORTHAMPTON RESERVOIR LOWER DAM IN WHATELY MA.

NOT TO SCALE

JULY 1978

NOTE
SKETCH DRAFTED FROM NORTHAMPTON
WATER OFFICE DRAWING WHATELY
COMPLEX LOWER DAM A-4-A

AREA PLAN OF
FORMER BROOKS



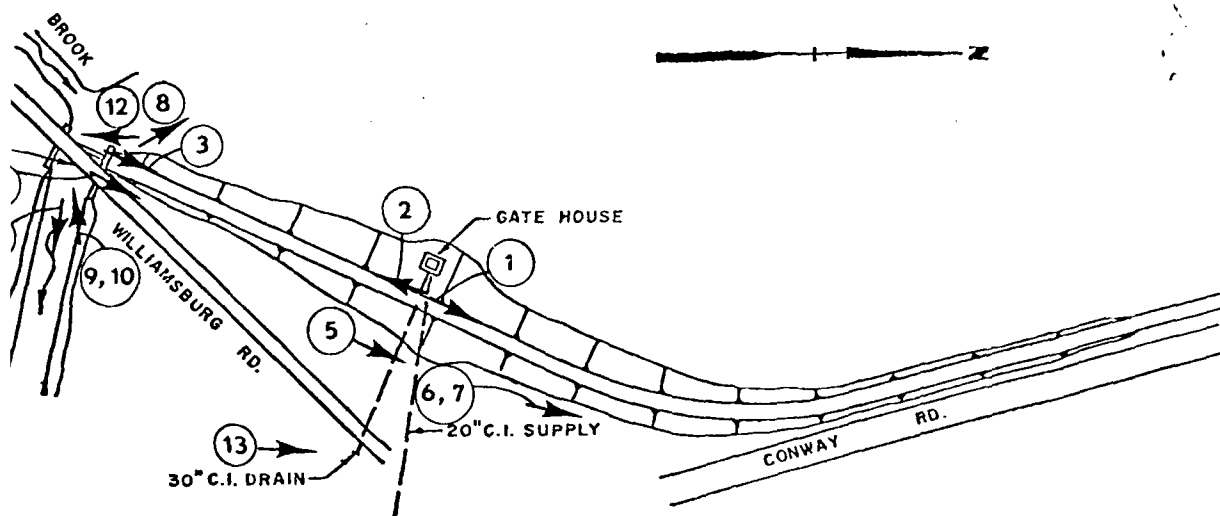
NORTHAMPTON RESERVOIR

LOWER DAM

WHATELY WA

APPENDIX C

PHOTOGRAPHS



PLAN

LOCATION OF PHOTOGRAPHS
NORTHAMPTON RESERVOIR
UPPER DAM
IN
WHATELY MA.

NOT TO SCALE JULY 1978



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BOSTON, MASSACHUSETTS

SHEET NO. 6

JOB Design of
SUBJECT Normal
CLIENT Comp

$$\begin{aligned} \text{Elev } 590 & \quad \text{at } 0.078 \\ w_p &= 350' \\ A &= 35(100) = 3500 \text{ sf} \\ R &= 10' \quad 4.67' \\ V &= 12.78(4.67)(0.181) = 10.5' \\ Q &= 36759 \text{ cfs} < 44352 \end{aligned}$$

7593

$$\begin{aligned} \text{Elev } 592 & \\ w_p &= 380 \\ A &= 35 + 2(37)(10) = 4280 \\ R &= 11.26' \quad 5.06' \\ V &= 11.33' \\ Q &= 43518 > 44352 \end{aligned}$$

4173

$$\text{Elev } \approx 591.25 \pm$$



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SHEET NO. 5-

JOB 1-22-54
SUBJECT 12-1-54
CLIENT

Q = 67,200 cfs

3-1

2-10 595 5 = 5 .05 1/4

Wp = 140 - 160 = 300

A = 14.5(100) + $\frac{390}{2} \times 15 = 2550 + 1450 = 4000$

R = 13.33 5.67

V = 12.38 (5.67) (.223) = 15.65 fms

Q = 62,632 < 67.2 NG

N = 0.12 flood plain
trees, weeds,
not developed

A = 1(320) = 320 + 4000 = 4320

Q = 4320 (15.65) = 67608 OK

else 596

2-10 590

Wp = 290

A = 4000 - 18(50) = 3100

R = 10.68 4.89

V = 13.5

Q = 41859

else 591

A = 3300

V = 14

Q = 43,200

straw bed 580
church, 2 bld



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SHEET NO. 4

JOB 12-111 - 1
SUBJECT 12-111 - 1 - 1
CLIENT 12-111 - 1

Water will flow over dam about
2' deep. Dam is "low" width
& stone construction - does not
seem likely to fail due to
this Flood.

Dam width at mid height $\approx 800'$
mid height elev ≈ 595

$$Q_{p1} = 6182 \text{ cfs}$$

$$S_{m1} = 77.28 \text{ af} \times 12 \div 1180 + 2897 = 0.23 \text{ in.}$$

$$Q_{p2} = 6182 \times \left(1 - \frac{1012 \times 2.75}{19}\right) = 6108; \text{ cfs}$$

$$S_{m2} = 76.2 \text{ af}$$

$$\text{ave } S_m = (77.28 + 76.2) \div 2 = 76.74 \text{ af}$$

$$Q_{p3} \approx 6,148; \text{ cfs}$$

$$Q_{pF} = \frac{8}{27} (3.0)^3 \sqrt[3]{\frac{5.67}{32.2}} \left(\frac{125}{25} \right)^{3/2} = 67,200; \text{ cfs}$$

$$\text{ELIV } 562 \pm$$

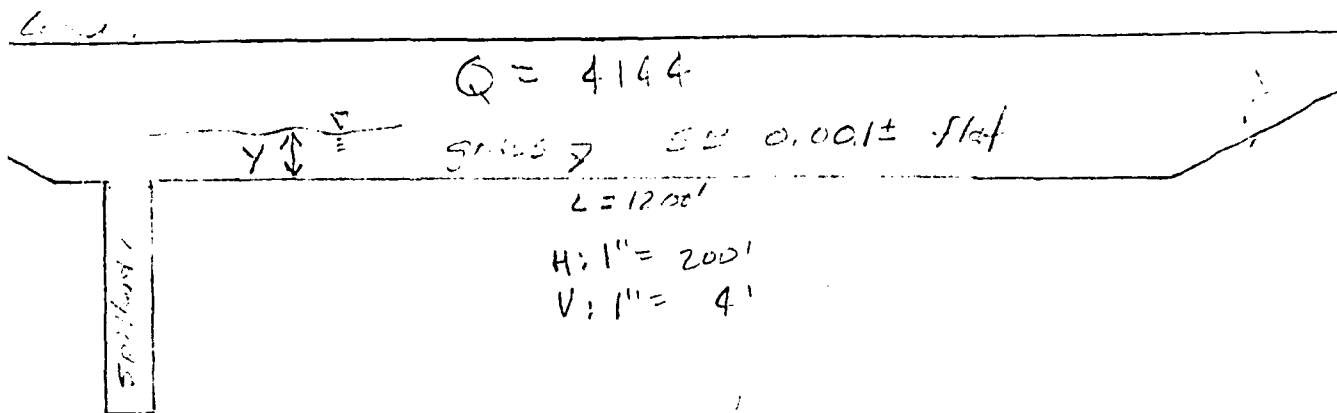
117
3-78



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SHEET NO. 3

JOB 111 T. SP
SUBJECT Dam
CLIENT C. J. S.



Let $Y=1$

$$A = 1(1200) = 1200 \text{ sf}$$

$$WP = 1200 + 50 = 1250'$$

$$R = 0.96 \quad R^2 = .973$$

$$V = \frac{1.486}{.04} (1.973)(.0316) = 1.14 \text{ fps}$$

$$Q = VA = 1370 \text{ cfs} < 4144$$

Let $Y=2'$

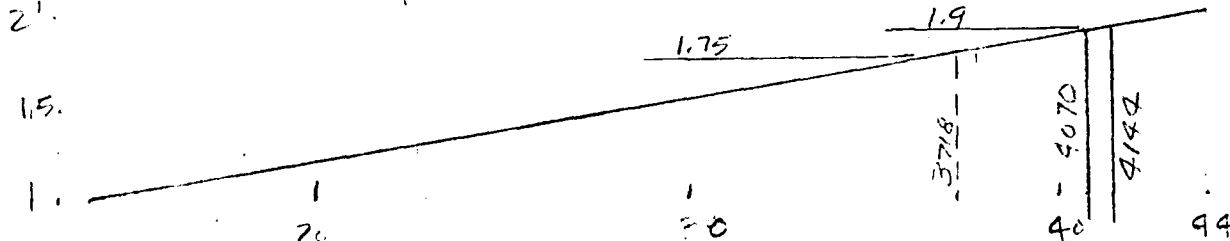
$$A = 2(1200) = 2400$$

$$WP = 1300$$

$$R = 1.53 \quad R^2 = 1.53$$

$$V = 37.15 (1.53)(.0316) = 1.794 \text{ fps}$$

$$Q = 2400 (1.794) = 4397 \text{ cfs}$$



At 1.9' Elev. 602.9' ± ± 603
bridge over dam would
be "backed-out"

"reduction of upper flow from 425 to 3715
does not cause significant change - leave
as is"



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BOSTON, MASSACHUSETTS

SHEET NO. 2-

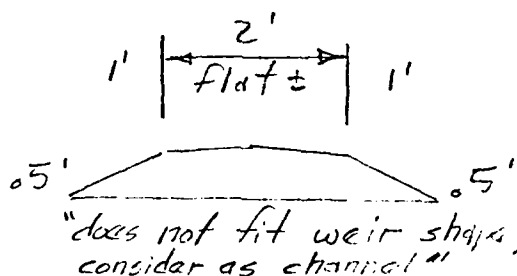
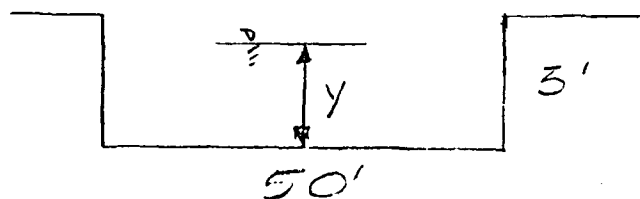
JOB Dam Fe.
SUBJECT Levee, Farm Lane
CLIENT Co. ps

$$At \frac{1}{2} PMF = 1050 \text{ cfs/sm}$$

$$Q_{11} = 1050(1.84) + 4250 = 1932 + 4250 = 6182 \text{ cfs}$$

4250. from upper dam discharge

Spillway does not approach "weir" type outlet - consider as channel



$$Q = VA$$

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

$$n = 0.015 \text{ (corr. ashl.)}$$

$$S \approx \text{flat} \approx 0.001 \pm$$

$$Let \ y = 5' \quad A = 250 \quad WP = 60 \quad R = 4.17 \quad R^{2/3} = 2.602$$

$$V = \frac{1.486}{0.015} (2.602)(.0316) = 8.15 \text{ fps}$$

$$Q = 250(8.15) = 2038 \text{ cfs} < 6182 \text{ NG}$$

Flow over dam crest. and across road

$$Q_{over} = 6182 - 2038 = 4144 \text{ cfs.}$$

the way could handle runoff from lower area only if upper dam were low enough to contain entire $\frac{1}{2}$ PMF runoff.

7



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SHEET NO. 1

JOB _____
SUBJECT _____
CLIENT _____

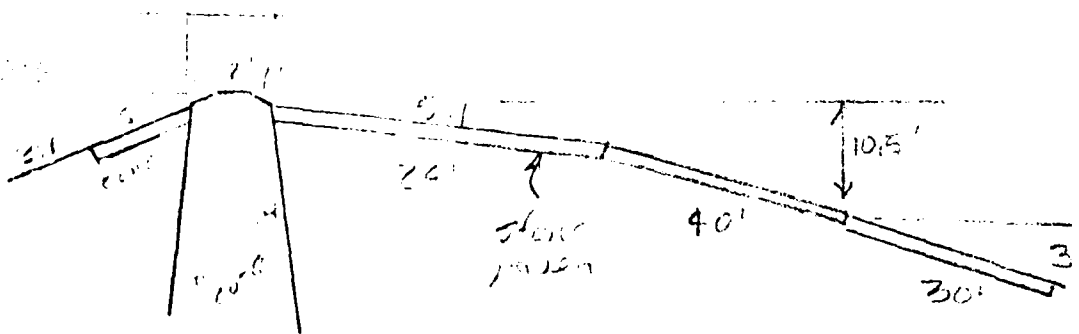
Phase I

Height - 31' str.
23' hyd
Storage 130± ac-ft

Size - small built 1902
Hazard - Significant

Design chK 1/2 PMF to Full PMF

Drainage Area 1180 ac, 1.84 sq mi.
wooded, rolling terrain PMF = 215 cfs
511



APPENDIX D

1. HYDROLOGIC COMPUTATION
2. DRAINAGE AREA



PHOTO NO. 13 - Outlet pipe below dam across
Williamsburg Rd.



PHOTO NO. 11 - General view of outlet channel
looking downstream.



PHOTO NO. 12 - General
view of Spilling



PHOTO NO. 9 - Spillway outlet channel.



PHOTO NO. 10 - Spillway outlet and bridge abutment.

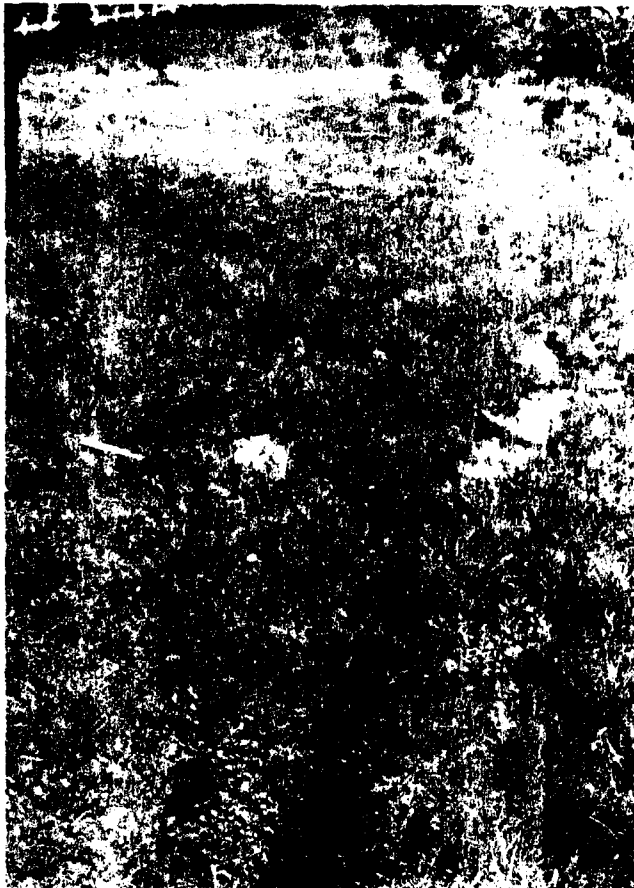


PHOTO NO. 7 - Close-up
of scarp face shown in
PHOTO 6 .



PHOTO NO. 8 - General view of reservoir from right
abutment.

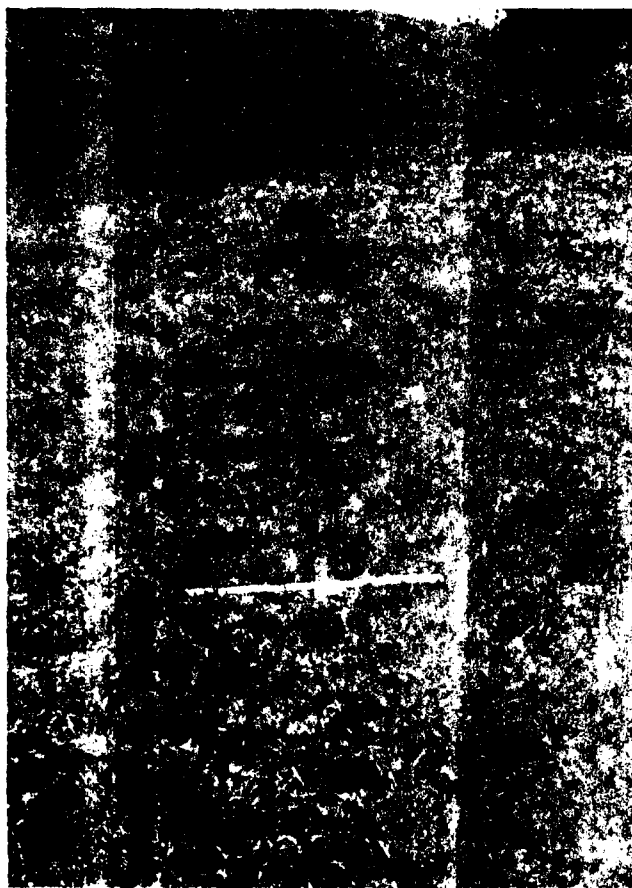


PHOTO NO. 5 - General view of seepage area at d.s. toe. Pipe in upper part of photo is opposite gate house in the center of the dam.



PHOTO NO. 6 - Seepage area near left abutment not visible in PHOTO 5.



PHOTO 10.3 - Downstream view of
large tree in front of dam.



PHOTO 10.4 - Downstream view showing proximity of
large tree to toe of dam. The nearest
tree is 10 ft. from toe of dam.



PHOTO NO. 1 - Upstream face from gate house to left abutment.



PHOTO NO. 2 - Upstream face from gate house to right abutment.

NO. 10
 DATE 6-15
 BY FOD

HH & B HAYDEN, HARDING & BUCHANAN, INC.
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 BOSTON, MASSACHUSETTS

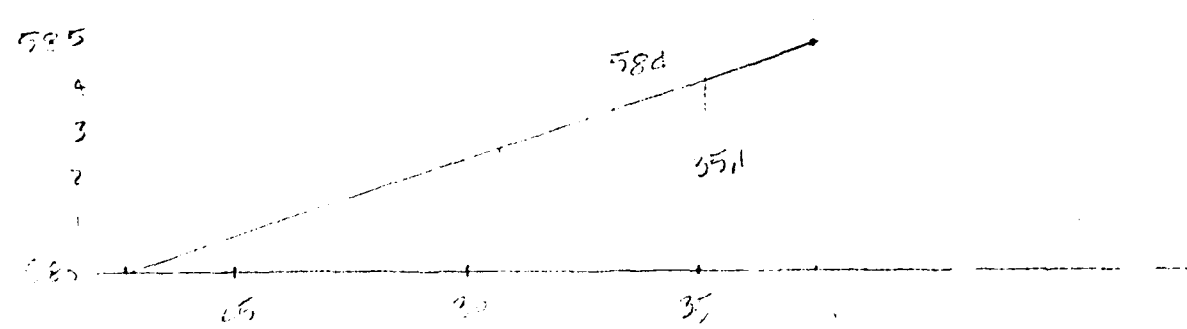
SHEET NO. 7-
 JOB 100-100
 SUBJECT 100-100
 CLIENT Comp

Pool 35K
div 580 4th Str. 560
 $S = .05''$

$WP = 150$
 $A = 1650$
 $R = 11.5$
 $V = \frac{1483}{112} (4.98)(.224) = 13.79$
 $Q = 22,747$

div 585
 $WP = 150 + 30 = 180'$
 $A = 1650 + 15(50) = 2400$
 $R = 13.33 \quad 5.67'$
 $V = 15.65 \text{ fps}$
 $Q = 37,579 \text{ cfs}$
 (2 structures)

no structure in next 6000'
 from 8 @ 6000' to 8000' along
 stream bed approx 4-5'
 could have major damage
 possible loss of life
 house on w/in 50' of stream
 channel is not deep here.



7-11-17

6/25

MEL

FED



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SHEET NO. 8

JOB Dams

SUBJECT Northampton Dam

CLIENT Corps

Storage at failure 121 a-f

$$Q_{P_1} = 67,200 \text{ cfs in}$$

$$A_1 = 8' \times \left(\frac{880 + 1200}{2} \right) = 8400$$

$$A_2 = 4000$$

$$\text{Sta } 3+00 \text{ Elev } 593.75'$$

$$Vol = \frac{300(6200)}{43560} = 43 \text{ a-f}$$

$$Q_{P_2} = 67,200 \left(1 - \frac{.046 \cdot 9.3}{121} \right) = 43,344 \text{ cfs}$$

$$\text{Elev } 590.5' \quad A \approx 3200 \text{ sf}$$

$$Vol = 300 \left(\frac{880 + 3200}{2} \right) \div 43560 = 41 \text{ a-f}$$

$$Q_{P_2} = 67,200 \left(1 - \frac{.66 \cdot 41}{121} \right) = 44,352 \text{ cfs out}$$

$$\text{Sta } 6+00 \text{ Elev. } 591.25' \quad A = 4000$$

$$Q_{P_2} = 44,352 \left(1 - \frac{.795 \cdot 25}{121} \right) = 35,260 \text{ cfs}$$

$$Vol = 300 \left(\frac{4000 + 3200}{2} \right) \div 43560 = 25 \text{ a-f}$$

$$\text{Elev } 589.5' \quad A \approx 3360$$

$$V = \frac{3360 + 4000}{2} \times \frac{300}{43560} = 25.34$$

$$Q_{P_2} = 44,352 \left(1 - \frac{.792 \cdot 25.17}{121} \right) = 35,127 \text{ cfs out}$$

JO NO. 78 117
DATE 6/75
BY J.F.
CH BY F.D.



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BOSTON MASSACHUSETTS

SHEET NO. 9
JOB Dams
SUBJECT Northampton - L
CLIENT Corps

5-1/2 8+00

$$G_{12} = 35,127 \quad \text{also } 584 \pm \quad A = 2250$$

$$V = 200 \left(\frac{2250 + 4200}{2} \right) \div 43560 = 14.8 \text{ cfs}$$

$$Q_{12} = 35127 \left(1 - \frac{14.8}{121} \right) = 30,841 \text{ cfs}$$

$$\text{also } 582.75 \quad A = 2100$$

$$V = 200 \left(\frac{2100 + 4200}{2} \right) \div 43560 = 14.5 \text{ cfs}$$

$$V_a = 14.65 \text{ cfs}$$

$$Q_{12} = 35127 \left(1 - \frac{14.65}{121} \right) = 30,876 \text{ cfs } \underline{\text{out}}$$

73.117
 6-2-5
 No. 4

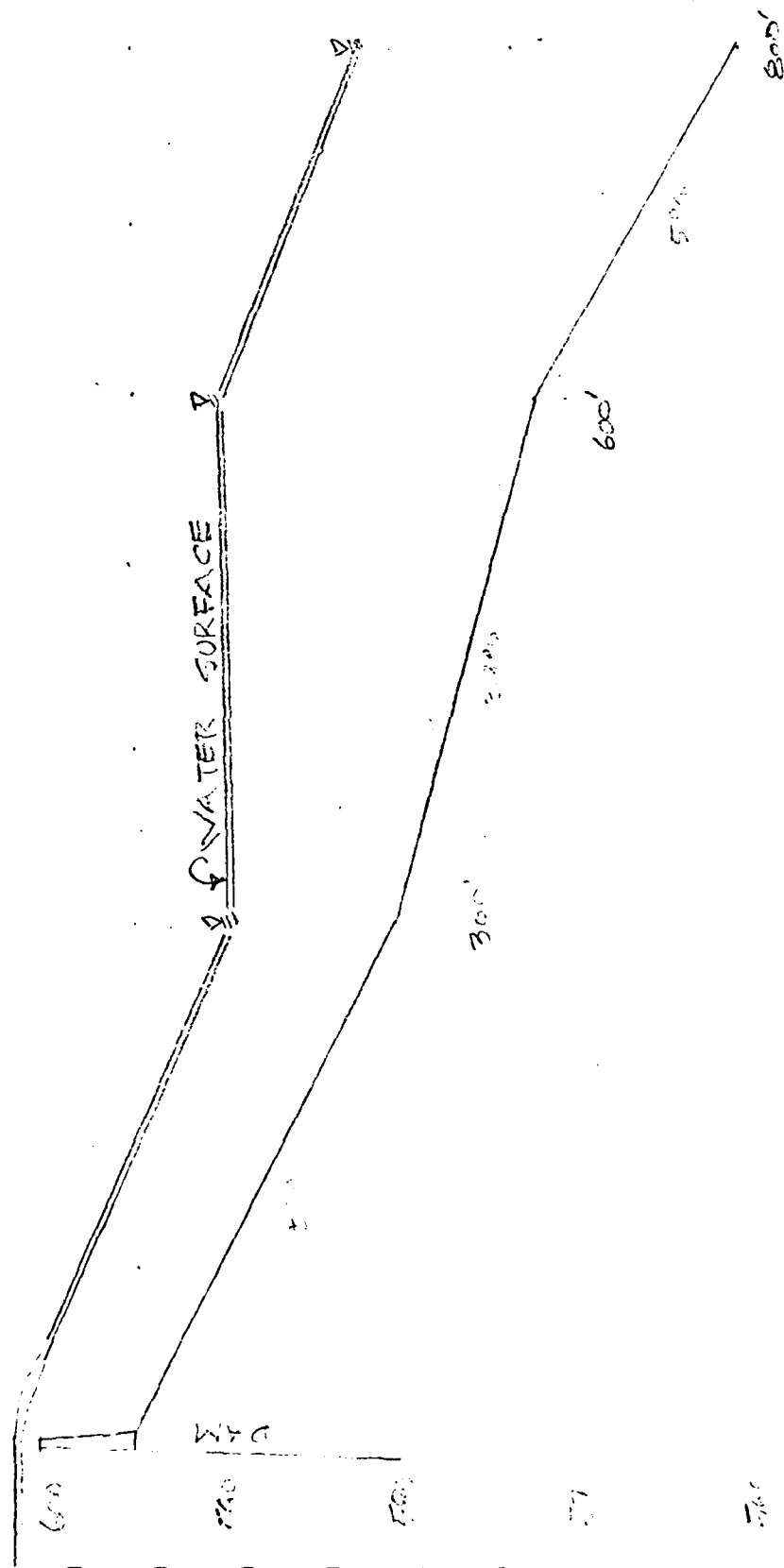


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SHEET NO. 12

JOB Dam Design
 SUBJECT Northampton Canal
 CLIENT Camp

110



28 1-7
 3-1-1
 1-1-1
 FCB



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 BOSTON MASSACHUSETTS

SHEET NO. 11

JOB Wash. Ins.
 SUBJECT Northampton - Conn.
 CLIENT Corys

<u>Flow</u>	<u>Sq. in.</u>	<u>Q</u>	<u>Q_{ave}</u>	<u>Depth</u>	<u>A-F</u>	<u>A-F_{corrected}</u>
57	.04	3.7	—	—	—	—
58	.11	10.2	7	6	42	42
60	.13	12.1	11.1	4	44.4	86.4
60.1		12.2	12.1	1	12.2	98.6
62.8		12.53	12.37	1.8	22.3	120.9
64		13	12.77	1.2	15.32	136.2
65		12.2	13.1	1.5	19.7	155.9
66	.15	12.9	13.55	4.5	61	216.9

4557

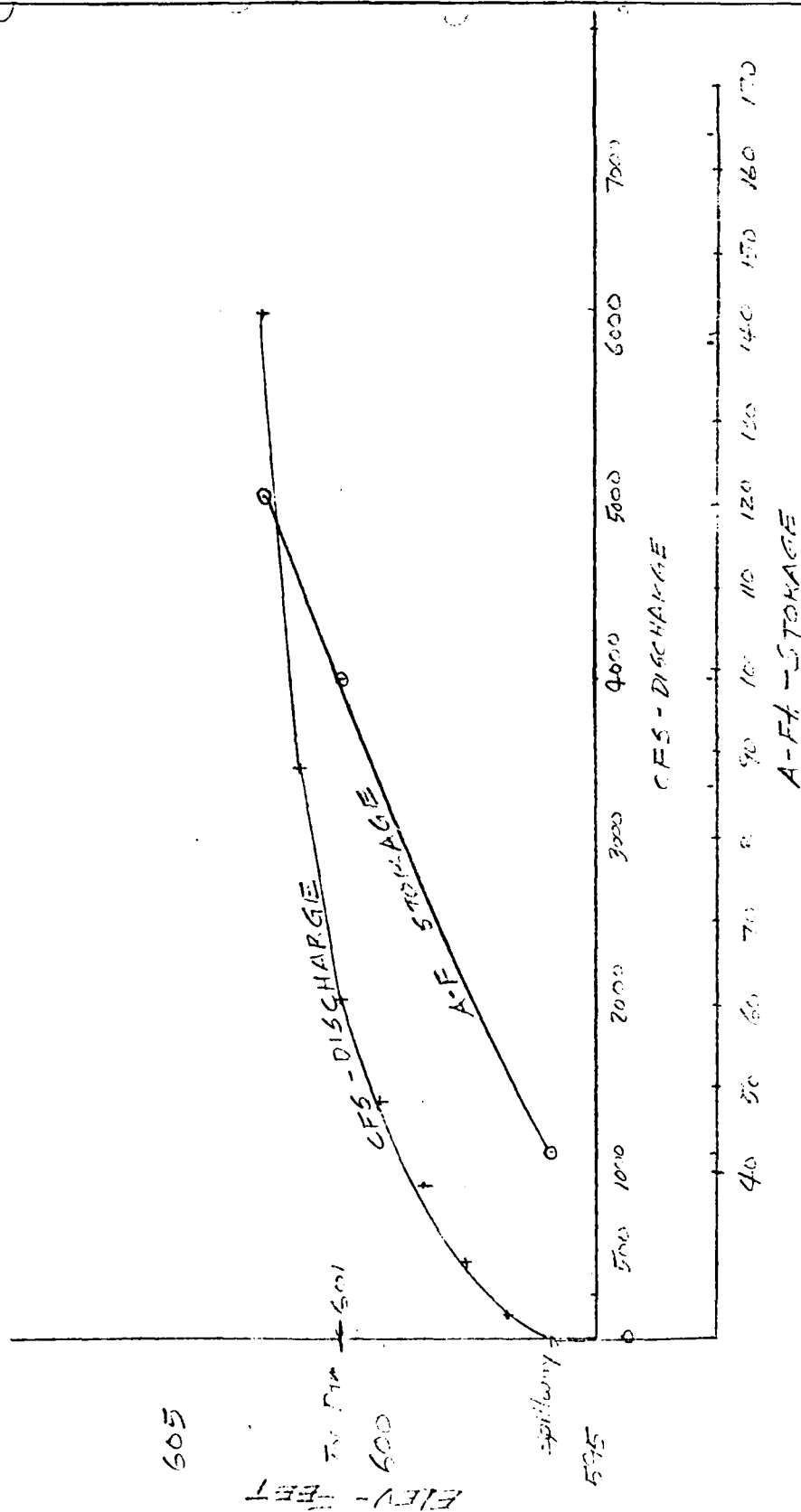


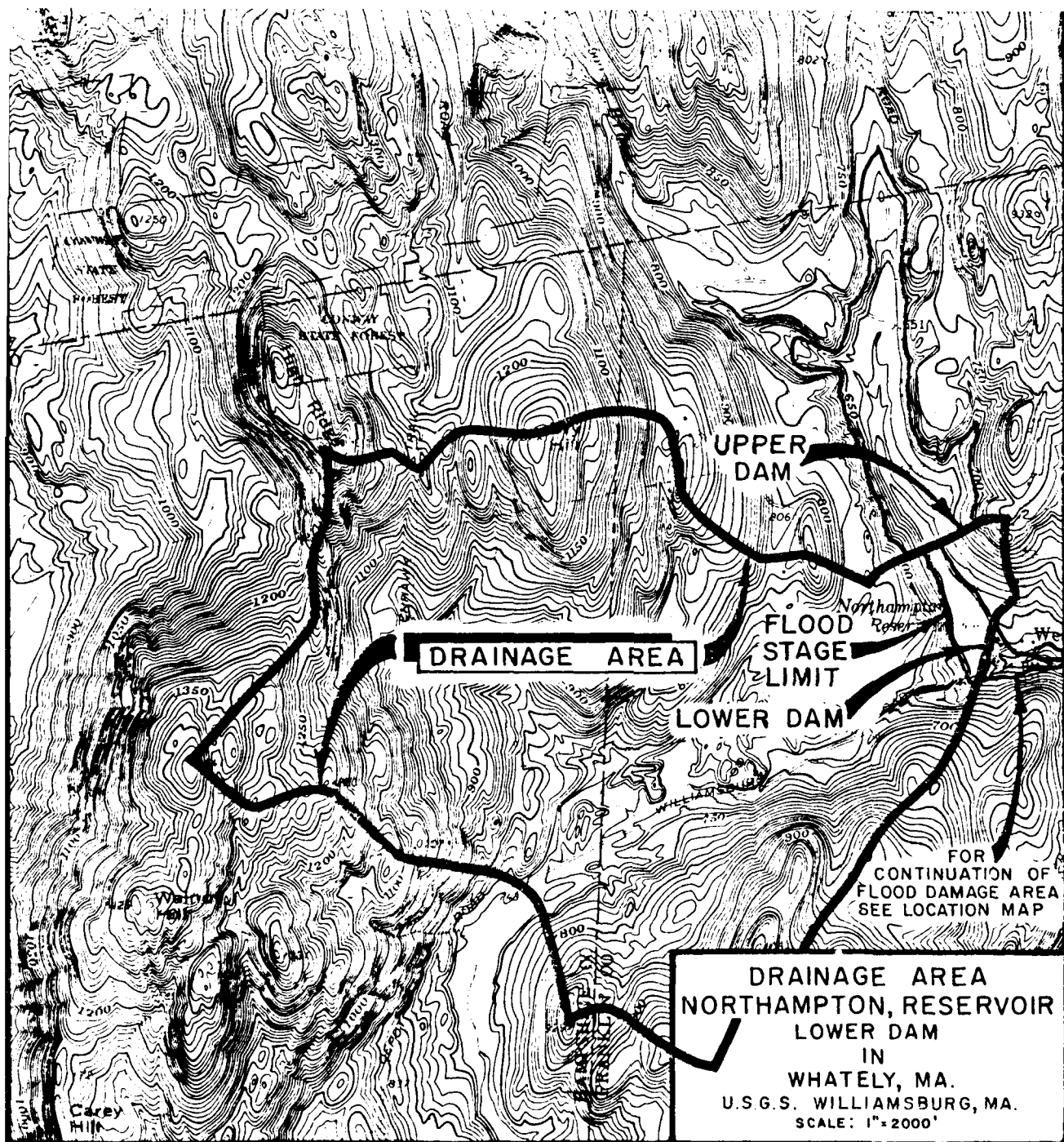
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CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 1

JOB Dam Project
SUBJECT Design of Dam
CLIENT Co. Inc.

Stage Discharge / Storage Curves





APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

END

FILMED

7-85

DTIC