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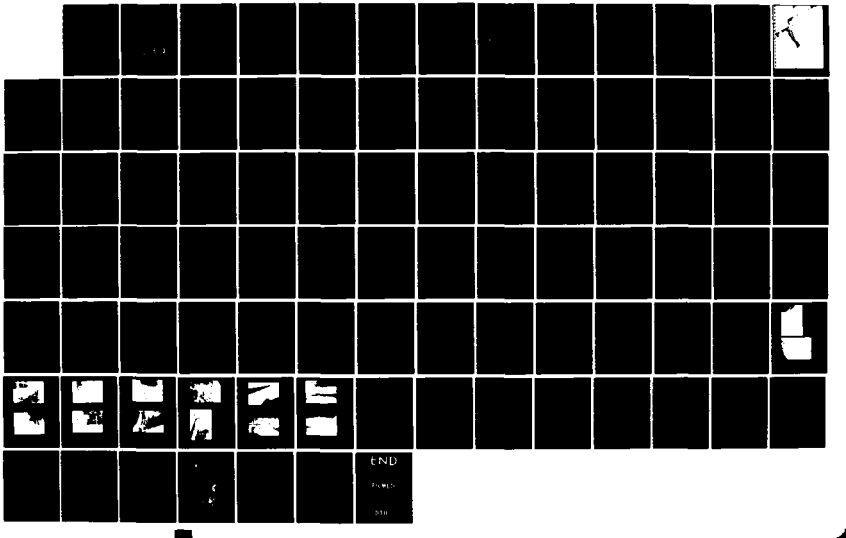

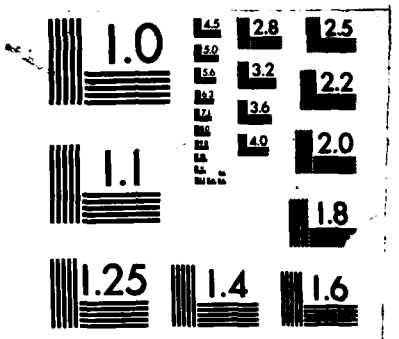

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

CONNECTICUT RIVER BASIN

NORTHAMPTON, MASSACHUSETTS

ROBERTS MEADOW RESERVOIR
(MIDDLE DAM)
MA 00761

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

AUGUST 1978

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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
Northampton, Massachusetts
Tributary of the Mill River

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

THe dam is a 403 ft. long, 42 ft. high stone masonry structure. The visual inspection of the dam did not disclose any findings that indicated an immediate unsafe condition. There is an area of standing water existing below the right abutment of the dam.

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ROBERTS MEADOW RESERVOIR
(MIDDLE DAM)

MA 00761

CONNECTICUT RIVER BASIN
NORTHAMPTON, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA. 00761

Name of Dam: Roberts Meadow Reservoir (Middle Dam)

City: Northampton

County and State: Hampshire County, Massachusetts

Stream: Tributary of Mill River

Date of Inspection: May 26, 1978

This dam is a 403 foot long, 42 foot high stone masonry structure. Minimal engineering data was available and consisted of a plan dated 1894 showing plan, elevation and typical sections of the dam and a set of construction specifications. No design calculations were available.

The visual inspection did not disclose any findings that indicated an immediate unsafe condition. The city is in the midst of a program of pressure grouting this dam to stop leaking which was extensive. At the time of the inspection, water was still leaking through the dam but at a much lesser rate than previously reported. Based on size and hazard classifications in accordance with Corps guidelines, the test flood is the Probable Maximum Flood. However, the dam's spillway will not pass either the PMF or ½ PMF without overtopping the dam, and the spillway is not considered adequate.

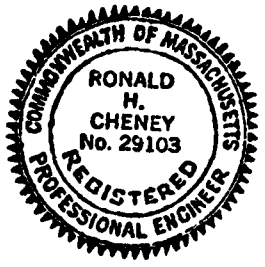
Since the structural stability calculations for this dam are not available, the owner should have a qualified consultant review the stability of the dam and determine the maximum height of flow that should be allowed over the spillway.

In conjunction with the preceding an indepth hydraulic analysis should be made to establish what surface elevation should be maintained in the reservoir to insure that this maximum height of flow is not exceeded during periods of high run-off. If high run-off is anticipated prior to implementation of the preceding, then the reservoir should be lowered to insure adequate storage so that water will not pass over the spillway with any significant height.

There is an area of standing water existing below the right abutment of the dam. This area should be cleaned and a surface drainage system installed.

The city's program of pressure grouting also entails a "dye injection" procedure for the soil above the dam and tracing to see if dye is found downstream. This procedure should be reviewed by a qualified geotechnical engineer and carried forward.

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 Roberts Meadow Reservoir (Middle 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

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 neccessarily 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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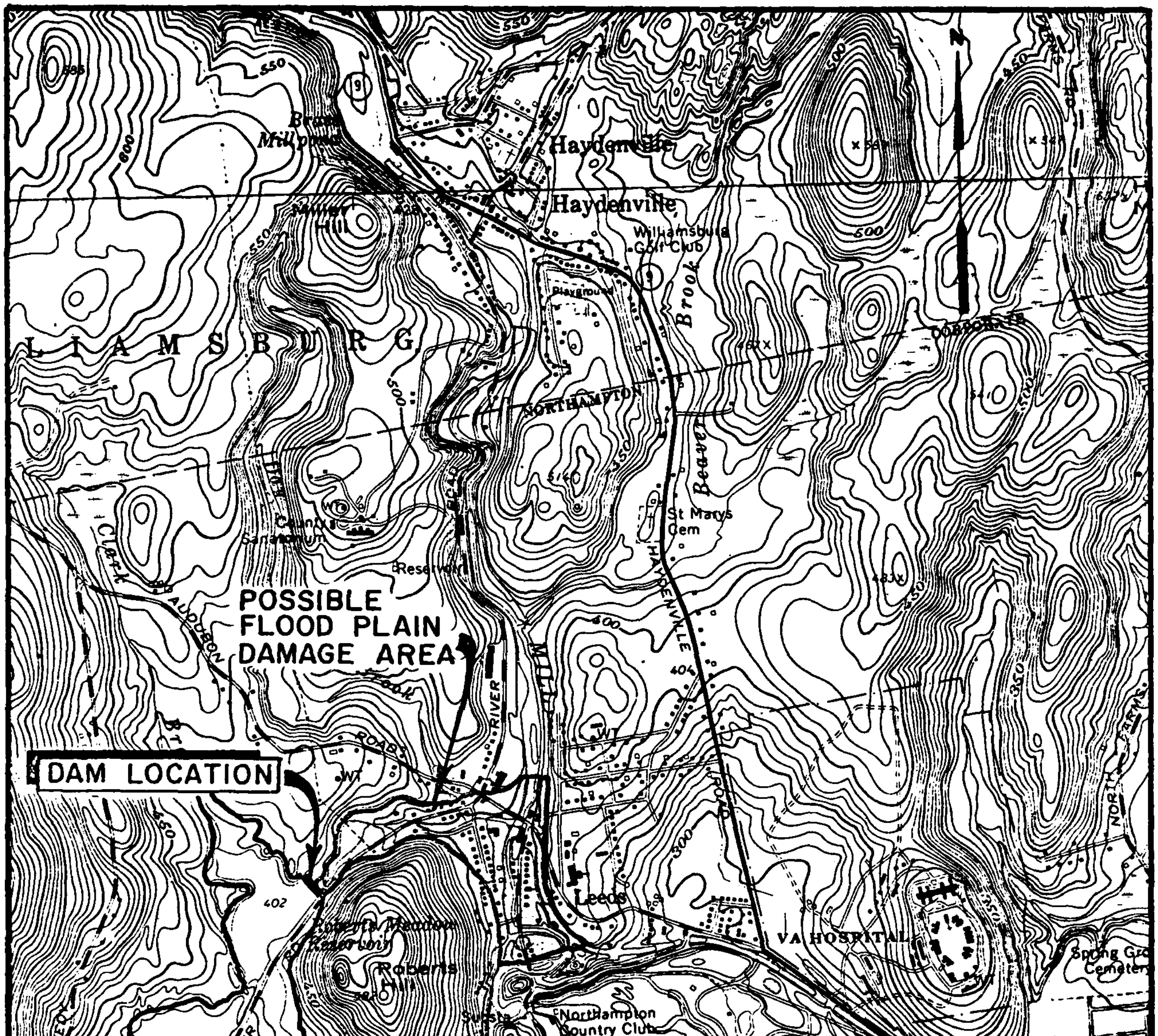


LOCATION
ROBERTS MEADOW RESERVOIR
MIDDLE DAM
IN
NORTHAMPTON, MA.
U.S.G.S. EASTHAMPTON, MA.
SCALE: 1" = 2000'

PHASE I
NATIONAL DAM INSPECTION PROGRAM
ROBERTS MEADOW RESERVOIR (MIDDLE 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.

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

Section 1.1 Continued

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

1.2 Description of Project

a. Location

Roberts Meadow Reservoir Middle Dam is located in the City of Northampton, in Hampshire County, Massachusetts.

b. Description of Dam and Appurtenances

The dam is a 403 ft long, 42 ft high, stone masonary structure. The upstream face has a batter of 1/2 inch horizontal to 1 ft vertical. The downstream face is vertical for the top 5 ft with the next 14 ft built on a 30 ft radius and the lower portion built on a 7 1/2 inch horizontal to 1 ft vertical batter. The top of the dam has a width of 7 ft. This dam has a granite block 75 ft long overflow spillway having a 1/2 inch horizontal to 1 ft vertical upstream face and an ogee shapped downstream face. Located adjacent and to the east of the spillway is a gate house described in Section 3.1c. This structure houses a 24 inch C.I. intake pipe leading to the chlorinator facility at Leeds and a 36 inch C.I. waste pipe discharging downstream of the spillway.

c. Size Classification

This dam size falls into the intermediate classification due to its hydraulic height of 33 feet and storage capacity of 410 a.f.

Section 1.2 Continued

d. Hazard Classification

The dam's potential for damage rates it as a high hazard, classification. About 65 structures could be damaged by flood water. A high probability for loss of life also exists.

e. Ownership

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

f. Operator

This dam is maintained by the City of Northampton, Board of Public Works-Water Division located at 237 Prospect Street, Northampton, Massachusetts. Mr. Leon Murray is the superintendant of the Water Division (telephone No. 413-584-1401).

g. Purpose of Dam

The purpose of this dam is water supply. Water is drawn thru the 24 inch C.I. pipe to the chlorination facility in Leeds.

h. Design and Construction History

The drawings for this dam are dated 1894 and construction was started and completed in that general time period. The stone lintle above the gate house door is dated 1894. There is no indepth design or construction data available for this site.

1.3 Pertinent Data

a. Drainage Area

Drainage areas (6922 acres - 10.8 S.M.) above the dam are meadows and forest areas with rolling hills. Five main brooks

Section 1.3 Continued

carry the major part of storm runoff. The longest drainage path (Meadow, Roberts and Brewer Brook) is about 6.4 miles long. This drainage path has a vertical drop of over 800 ft. The upper reservoir impounds the Meadow Brook 1.5 miles from Robert's Meadow Dam. The change in elevation between these dams is about 50 ft.

Several roads pass through the drainage area. Chesterfield Road parallels Meadow Brook and there are scattered houses along this road, as well as along Kennedy Road. Little other developement is found within the drainage area. The upper dam and the roads which intercept the brook will influence stream flow. Half of the main drainage path has a fairly regular change in elevation.

Below the dam, there is extensive development as the area known as Leeds is located along the water course.

b. Discharge of Dam Site

The outlet works for this dam consist of the 75 ft wide spillway, the 24 inch dia supply pipe and the 36 inch dia waste pipe. The invert of the 24 inch pipe is Elev. 376.75 and the 36 inch pipe is Elev. 373.0.

This dam was subjected to the August 1955 flood without any known damage. The actual flow at the dam site during this flood, however, is not known.

The spillway is ungated and has a maximum flow capacity of 3000.± C.F.S. (278 C.S.M.) at a pool elevation of 407.0.

Section 1.3 Continued

c. Elevation (ft. above MSL)

(1) PMF surcharge - 412.5

(2) Top Dam - 407±

(3) Water supply-402'±

(4) Spillway crest (gated)-nongated 402±

(5) Upstream portal invert diversion tunnel-no diversion tunnel

(6) Streambed at centerline of dam-380±

(7) Maximum tailwater-390±

d. Reservoir

(1) Length of water supply pool - 1500'

(2) Length of PMF pool - 5000'

e. Storage (acre-feet)

(1) Water supply-330

(2) Top of Dam - 410

(3) PMF surcharge - 962

f. Reservoir Surface (acres)

(1) Water supply pool - 20.2± at spillway crest

(2) Top dam - 23±

(3) PMF pool - 163.±

g. Dam

(1) Type -Stone Masonry-Gravity, straight

(2) Length-403'±

(3) Height-42'± (Structural Height)

(4) Top Width-7'-4"±

Section 1.3 Continued

(5) Side Slopes-u/s 1/2" per 12", d/s 7 1/2" per 12"

(6) Zoning-none

(7) Impervious Core - Stone

(8) Cutoff -8'-6" to 13'

(9) Grout curtain - None

i. Spillway

(1) Type - Stone masonry-cement crest, ogee

(2) Length of weir - 75'

(3) Crest elevation-402±

(4) Gates - None

(5) U/S Channel - None

(6) D/S Channel - No riprap in section immediately below spillway but no erosion evident.

j. Regulating Outlets

Regulating outlets consist of a 24 inch dia. C.I. supply pipe at invert Elev. 376.75 which feeds to the Chlorination facility at Leeds and a 36 inch dia. C.I. drain pipe at invert Elev. 373.0 which drains into the brook directly below the dam. Both of these pipes are controled by manually operated gate valves.

SECTION 2
ENGINEERING DATA

2.1 Design

A plan dated 1894 showing plan, elevation and typical sections along with a set of specifications are the only design information found. These were located at the Northampton Water Department. In depth engineering calculations are non-existant.

2.2 Construction

A construction proposal submitted by Main, Lewis and Hodge of New York City submitted to the City of Northampton Dated April 3, 1894 is the only construction data discovered.

2.3 Operation

No operational manual for the 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 firm searched for additional data to no avail.

b. Adequacy

The lack of indepth engineering data does not allow for a definitive review. Therefore the adequacy of this dam, structurally and hydraulically, can not be assessed from the standpoint of review of design calculations, but must be based

Section 2.4 Continued

primarily on the visual inspection, past performance history, and hydrologic and hydraulic assumptions.

c. Validity

The field investigation indicates that the external features substantially agree with those shown on the furnished plan.

SECTION 3:
VISUAL INSPECTION

3.1 Findings

a. General

The Roberts Meadow dam was inspected on May 26, 1978. At that time water was passing over the spillway approximately 2 inches deep. The upstream face of the dam could only be inspected above this water surface.

b. Dam

The dam is a masonry gravity dam with an earth embankment forming the extreme left section of the dam. The abutments of the dam are natural glacial till slopes.

Visual inspection of the earth embankment and the abutments showed no signs of immediate distress.

Seepage water was found on the downstream slope of the embankment on the left side of the dam. The water is in the immediate vicinity of the masonry wall. The extent of the seepage area can be seen in Photos 1 and 2*. Craig Nehring of the Northampton Water Division has performed maintenance at the site and stated that the area described above is wet at all times of the year. While the exact elevation of the seep could not be located, it appears that the seep begins at a point 70 ft south of the end of the masonry wall on the left abutment and about 30 ft downstream of the face of the dam at about elevation 395. The seep area was about 10 ft wide and 20 ft long. No

*See Appendix C for these and all subsequent photos.

Section 3.1 Continued

siltation was visible at the time of inspection and the seepage water flows down the abutment into the undergrowth above the spillway channel.

The left abutment was traversed from the dam face to the end of the spillway channel and two additional wet areas were noted at approximately the same elevation as the seep mentioned above. The second area, about 15 ft downstream of the first area, was damp but no surface water was visible. The third area was about 65 ft downstream of the dam face. This third area was very small with no surface water visible.

There is an area of standing water on the right abutment beginning about 17 ft below the dam and extending to a point about 75 ft below the dam to the location of a drop inlet to a drain pipe leading to the spillway channel. Photo 6 shows the water leaving this drain. Photo 4 is a view of this seepage area from a point on the roadway 50 ft downstream of the dam.

Photo 5 is a view of a spring on the right abutment which feeds the seepage area shown in Photo 4. Debris was removed from the spring and clear water was observed trickling from the back of the spring. No siltation was observed that would indicate erosion of the abutment. This seepage condition has occurred for an undetermined long time. The drop inlet and drain pipe mentioned above was constructed after the dam had been built.

The seepage on the left and right abutment do not pose an immediate hazard to the dam.

This dam was showing some leakage thru the mortar joints at the time of inspection. The dam has experienced heavy leakage in recent years and currently the City is attempting to have this leakage stopped. Section 4 of this report addresses in more detail the remedial action the city is undertaking.

c. Appurtenant Structures

The gate house was inspected to the water surface. The house has a granite masonry substructure with a brick wall and wood roof superstructure. A concrete waste well attached to the rear of the gate house was added in 1933. A crack exists in the left rear corner of this waste well approximately 1/4 inch wide and extends down into the water. Some Spalling exist on the slab of this waste well. The east wall of the brick superstructure shows some cracking of the brick.

None of these items affects the safety of the dam.

The spillway outlet channel is in good condition.

d. Reservoir Area

The general area surrounding this reservoir is wooded with rolling slopes. A more detailed description of the drainage area is included in Section 1.3 of this report. Amount of siltation within the reservoir is unknown.

e. Downstream Channel

The downstream channel is free and clean. No riprap covers the floor of the channel immediately below the spillway but erosion appears to be no problem. Some trees are along side the channel but pose no problem to continued free flow. The channel outlets into a recreation pool approximately 500 ft downstream. This pool is created by a small earth embankment dam located approximately 1000 ft downstream from the Roberts Meadow Dam.

3.2 Evaluation

The visual examination itself indicated no immediate safety problem.

The leakage thru the mortar joints could become a concern if left unchecked. The city however is in the midst of remedial measures and the leakage is much less now than previously reported.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedure

The retained reservoir of this dam is used for water supply by the City of Northampton. The normal operating procedure is with the intake gate in the waste well which feeds the 36" dia. waste pipe closed and the gate on the 24" dia. intake supply pipe open. Flow through the intake supply is controlled by a float valve at the leeds chlorination facility.

4.2 Maintenance of Dam

This dam has had a history of heavy leakage through the mortar joints in recent years. This has been reported in the States inspection reports of 1973 and 1976. In September of 1976 the City of Northampton submitted to the State Department of Environmental Quality Engineering Division of Waterways an application for Authorization to repair this dam. This application shows the Engineering firm of Whitman and Howard of Wellesley, Ma. to be the City's Consultant for this repair.

During the fall of 1977 this dam was pressure grouted with neat cement and the exposed mortar joints repointed with mortar by "Penetryn Systems, Inc. of Latham, N. Y."

The visual inspection of this dam indicated that leakage is still occuring though according to the Superintendent of the Water Division and the Caretaker of the facility at a much lesser degree.

Section 4.2 Continued

The Superintendent indicated that Penetryn was to return to the Site for further remedial work. This was subsequently confirmed by Whitman and Howard, with the Penetryn firm expected back at the dam site between the middle to end of July, 1978.

4.3 Maintenance of Operating Facilities

The gate valves which operate the intake and waste pipes are normally operated once a year by the City.

4.4 Description of Warning Systems

There are no warning systems in effect at this facility.

4.5 Evaluation

Other than operating the gates on the outlet pipes annually and cutting trees and shrubs growing close to the face of the dam, there appears to be no formal operational procedure for this dam. As noted in 4.2 above, the City is now in the midst of an indepth repair program. A dam of this size should be inspected annually by qualified personnel who can identify conditions 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

This dam was subjected to the floods of Nov. 1927, March 1936, Sept. 1938 and August and October 1955. However the actual maximum discharge is unknown.

c. Visual Observations

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

d. Overtopping Potential

This dam carries an intermediate classification for size with a high hazard potential. As such it must be capable of passing a Probable Maximum Flood. This test flood was computed by determining the watershed drainage area from USGS maps in combination with Corps discharge guide curves.

Storm runoff from the 10.8 sq. mi. drainage area will result in an approximate discharge of 17,600 cfs (1600 csm) passing the dam. This PMF discharge will result in the dam being overtopped by about 5.5 ft. (El. 412.5±). With the reservoir level at 407, the spillway discharge is only 3000 cfs.

Section 5.1 Continued

Using the "rule of thumb" method, the effects of overtopping damage were determined, assuming failure of the dam.

Approximately 1000 ft. downstream is the "lower dam". This is a low, earthen dam which forms a pond several acres in size. This dam would be overtopped due to a failure of the middle dam. This lower dam washed-out in the August 1955 flood. A power line crosses the lower dam site. The support towers are within the flood plain and might sustain damage.

Between the lower dam and the Mill River is the western section of the City of Northampton know as Leeds. About 65 structures (homes, schools, factories) are within the flood plain and would be damaged. Storm runoff from the Mill River would compound storm damage. Because of this, an even greater number of structures would probably be damaged throughout this "low area".

Several bridges and roads would also be damaged or completely washed-out.

Due to the number of dwellings within the flood plain, there is a high potential for loss of life caused by Flood waters and dam failure.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The visual inspection did not disclose any apparent stability problems with the earth dike or abutments of the masonry dam. There was no visible evidence of movement, settlement or misalignment of the dam.

b. Design and Construction Data

Design drawings and construction specifications exist and indicate that the dam is of masonry construction. It cannot be determined with certainty what portion of the dam rests on soil or rock. The space between the masonry walls is filled with "Rubble." The specifications indicate that the "Rubble" consists of broken stone bedded in mortar. No stability analysis calculations were available.

c. Operating Records

No operating records were made available.

d. Post-construction Changes

The surface water drainage facility, namely the drop inlet and drain pipe below the dam on the right abutment was installed after initial construction. Also a concrete waste well was added to the gate house in 1933.

In 1976, the City of Northampton engaged Penetryn System, Inc. of Latham, N. Y. to inject grout into the dam to seal the many leaks that had appeared in the masonry since construction of the dam. In addition, Penetryn was to test,

by dye injection, "the soil above the dam" if directed to do so by the City. The tests are to be performed at 15-foot intervals along the upstream face. If dye is found downstream, the foundation will be grouted. This dye testing had not been performed at the time of inspection.

It is recommended that the City implement this testing program and that it be reviewed by a qualified geotechnical engineer.

e. Seismic Stability

The dam is located in Seismic Zone 2 according to USCE guidelines and does not require special analysis for seismic stability.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Conditions

The visual inspection did not disclose any findings that indicate an immediate unsafe condition. This dam was designed and constructed in the late 1800's. The state of the art for the design of such structures at that time was not the same as today. Uplift water pressure acting beneath the foundation was not normally considered. This uplift pressure is a requirement by today's standards unless means of relief are provided. It is therefore prudent that the recommendations in Section 7.2 be implemented.

b. Adequacy of Information

The information available is such that a Phase I level investigation can be performed adequately.

c. Urgency

The recommendations presented in Sections 7.2a and b and the remedial measures in Sections 7.3b.2 and 4 should be implemented by the owner within six months to one year. The water should not be allowed to exceed the spillway crest elevation until recommendations 7.2a and b are addrsed. The remaining remedial measures in Section 7.3 should be addressed within two to four years.

Section 7.1 Continued

d. Necessity of Additional Investigation

The findings of the visual inspection do not warrant additional investigation.

7.2 Recommendations

In view of the lack of engineering backup data, it is recommended that the following measures be undertaken by the owner.

a. The owner should engage a qualified engineering consultant to review the structural stability of this dam and determine the maximum height that water should be allowed to run over the spillway.

b. An indepth hydraulic analysis should be made. This analysis should determine what surface elevation should be maintained within the reservoir such that at periods of high run-off water will not pass the spillway at a depth greater than that determined in a. above.

7.3 Remedial Measures

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

a. Alternatives

Although the dam is apparently more than 75 years old and has survived the 1927, 1936, 1938 and 1955 floods without serious damage, the spillway capacity is not considered adequate. Further hydraulic studies by competent consulting

engineers are necessary to determine what alternative measures are necessary such as:

(1) Improved spillway discharge capabilities.

(2) Operation of reservoir at a lower level to insure proper storage during periods of unusually heavy precipitation.

b. Operation and Maintenance Procedures

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

(2) The owner should have the foundation dye test program referred to in Section 6.1d of this report performed. The owner should engage a qualified geotechnical consultant to review and monitor this program.

(3) The area of standing water below the right abutment of the dam should be cleaned and surface drainage system installed that would contain the water to a confined channel leading to the existing drop inlet.

(4) Because of the location of the dam upstream of a populated area, 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.

It is assumed that the grouting program referred to in Section 4.2 will continue forthwith until all leaking has been stopped.

APPENDIX A

VISUAL INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Roberts Meadow Middle Dam DATE May 26, 1978

TIME 08:30

WEATHER Sunny 67°F

W.S. ELEV. 402.1 U.S. ____ DN.S.

PARTY:

1. Ron Cheney
2. Dan LaGatta
3. Craig Nehring
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Masonry Dam Abutments	Dan LaGatta	
2.	Masonry Dam	Ron Cheney	
3.	Intake Structure & Control Tower	Ron Cheney	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT Robert Meadow DATE May 26, 1978

PROJECT FEATURE Middle Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	Masonry Dam
Crest Elevation	407.0±
Current Pool Elevation	402.1±
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	Motorbike path on left abutment slope
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection - Riprap Failures	None observed
Unusual Movement or Cracking at or near Toes	None observed
Unusual Embankment or Downstream Seepage	See detail comments in Section 31
Piping or Boils	None observed
Foundation Drainage Features	None observed
Toe Drains	None
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT Roberts Meadow — DATE May 26, 1978

PROJECT FEATURE Middle Dam — NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer — NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	Dike on left abutment
Crest Elevation	407.0±
Current Pool Elevation	407.1±
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	Motorbike path on left abutment slope
Sloughing or Erosion of Slopes or Abutment	None observed
Rock Slope Protection - Riprap Failures	None observed
Unusual Movement or Cracking at or Near Toes	None observed
Unusual Embankment or Downstream Seepage	See detail comments in Section 3.1
Piping or Boils	None observed
Foundation Drainage Features	None observed
Toe Drains	None
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT Roberts Meadow — DATE May 26, 1978

PROJECT FEATURE Middle Dam — NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer — NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	This facility has no approach channel.
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	Granite masonry gate house with a concrete waste well added in 1933. Large crack in waste well wall at left rear corner extending down into water (¼" wide). Concrete slab of waste well is spalled in areas.
Condition of Concrete	
Stop Logs and Slots	There is no superstructure over waste well. A brick superstructure with wood roof covers gate house. There is some cracking in brick on west wall.

PERIODIC INSPECTION CHECK LIST

PROJECT Roberts Meadow DATE May 26, 1978

PROJECT FEATURE Middle Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer.

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	Control tower and intake structure are one and the same.
a. Concrete and Structural	
General Condition	See comments preceding under Intake Structure.
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	
b. Mechanical and Electrical	All gates are manually operated.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	24" C.I. always open
Emergency Gates	36" C.I. Drain. working
Lightning Protection System	Used to lower reservoir in 1977.
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST

PROJECT Roberts Meadow DATE May 26, 1978

PROJECT FEATURE Middle Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	There is no transition and conduit.
General Condition of Concrete	24" and 36" outlet pipes only.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT Roberts Meadow DATE May 26, 1978

PROJECT FEATURE Middle Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer.

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	No outlet structure.
General Condition of Concrete	36" waste pipe empties into stream through a concrete retaining wall on right side of outlet channel. There are 8 vertical cracks spaced at random along this wall. One crack has some spalling and moss growth. These cracks show no misalignment. The wall has some heavy erosion on its face for the last 10'±. Wall shows no evidence of lean or structural distress. Cracks appear to be shrinkage or temperature induced.
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	
Channel	Good
Loose Rock or Trees Overhanging Channel	There are trees along channel, but they are not a safety hazard.
Condition of Discharge Channel	Good. No riprap in upper part of channel, but erosion does not appear to be a problem.

PERIODIC INSPECTION CHECK LIST

PROJECT Roberts Meadow DATE May 26, 1978

PROJECT FEATURE Middle Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	This facility has no approach channel.
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	Granite masonry spillway with granite masonry walls. Water flowing over spillway (1½") at time of inspection.
General Condition of Concrete	
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
c. Discharge Channel	Same as outlet channel.
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Channel	
Other Obstructions	

PERIODIC INSPECTION CHECK LIST

PROJECT Roberts Meadow

DATE May 26, 1978

PROJECT FEATURE Middle Dam

NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer

NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	There is no service bridge.
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
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	

APPENDIX B

1. LIST OF DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS

2. PAST INSPECTION REPORTS

3. PLANS AND DETAILS

LIST OF AVAILABLE ENGINEERING DATA

1) Plan dated 1894 showing plan, elevations and typical dam and spillway sections.

2) Set of Construction Specifications with Contract Proposal.

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

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

City/Town Northampton. County Hampshire. Dam No. 2-8-214-14.

Name of Dam Roberts Meadow Reservoir-Middle.

Mass. Rect.

Topo Sheet No. 11 C. Coordinates: N 494,800, E 272,700.

Inspected by: Harold T. Shumway, On Sept. 22,1976. Date Last Inspection 9-23-74.

2. OWNER/S: As of Sept. 22, 1976

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

1. City of Northampton
Board of Public Works-Water Division, 237 Prospect St., Northampton, Mass.

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.

3. 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 St., Northampton, Mass.

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

4. DATA:

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

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

1. Minor ____.
2. Moderate ____.
3. Severe ____.
4. Disastrous X.

Comments: Approx. 75 million gallons impoundment-would overtop "Lower" Dam No. 2-8-214-16-Flood plain below heavily developed.

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

OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: 105' from southerly end of dam-75' W. X 5' H. masonry ogee overflow spillway with a drop of 28½' to toe.

Controls None, TYPE: _____.

Automatic ____. Manual ____. Operative Yes ____, No ____.

Comments: Crest and ogee dropwall face is grouted stone masonry. Several areas of grout missing.

No. 2 Location and Type: In gate house-24" diameter water main.

Controls Yes, Type: Gate valves and hand stands.

Automatic ____. Manual X. Operative Yes ____, No Unk..

Comments: Last operated 17 years ago.

No. 3 Location and Type: In gate house-36" diameter waste pipe.

Controls Yes, Type: Gate valve and hand stand.

Automatic ____. Manual X. Operative Yes ____, No Unk..

Comments: Considerable leakage of water at outlet end of pipe controls not used for several years.

Drawdown present Yes X, No ____. Operative Yes ____, No Unk..

Comments: See No. 3 above.

DAM UPSTREAM FACE: Slope Batter ½":1, Depth Water at Dam 20'±.

Material: Turf ____. Brush & Trees ____. Rock fill ____. Masonry X (Ashlar stone). Wood ____.

Other _____.

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

2. Minor Repairs ____. 4. Urgent Repairs ____.

Comments: Open joints in stone masonry of dam walls and in gate well structure.

DAM DOWNSTREAM FACE: Slope Top 5' vertical; Next 14' concave-30'R. spillway face ogee. Bottom of walls on 7½" to 1' Batt.

Material: Turf ____. Brush & Trees ____. Rock Fill ____. Masonry X (Coursed Ashlar stone). Wood ____.

Other _____.

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

2. Minor Repairs ____. 4. Urgent Repairs ____.

Comments: Brush growth in stone masonry crevices-minor to severe leakage through masonry joints-heavy seepage in many areas.

9. EMERGENCY SPILLWAY: Available Yes . Needed ____.

Height Above Normal Water 5 Ft.

Width 275 Ft. Height 2 Ft. Material Stone masonry top of dam.

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

2. Minor Repairs X . 4. Urgent Repairs ____.

Comments: Entire top of dam would be overflow spillway in extreme high water, many masonry joints need pointing up.

10. WATER LEVEL AT TIME OF INSPECTION: 1/6 Ft. Above X . Below ____.

Top Dam ____ F.L. Principal Spillway X .

Other ____

Normal Freeboard 5 Ft.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Brush growth in masonry crevices.

Animal Burrows and Washouts Earth-fill slope at downstream face of notherly end of dam wall washed away by leakage.

Damage to Slopes or Top of Dam Yes-see above.

Cracked or Damaged Masonry Numerous open joints-movement of some blocks noted.

Evidence of Seepage General seepage through dam walls and at toe of dam.

Evidence of Piping None found

Leaks Many areas of leakage-some quite severe-through masonry joints.

Erosion Yes-Southerly conc. ret. wall below spillway heavily undercut.

Trash and/or Debris Impeding Flow None found

Clogged or Blocked Spillway None found

Other ____

12. OVERALL CONDITION:

1. Safe _____.
2. Minor repairs needed _____.
3. Conditionally safe - major repairs needed X
4. Unsafe _____.
5. Reservoir impoundment no longer exists (explain)

Recommend removal from inspection list _____.

13. REMARKS AND RECOMMENDATIONS: (Fully Explain)

Conditions at this dam are the same, or, in some instances worse, than what was
ıd on last inspection of 9-23-74. Mr. Leon Murray, Supt. of the Northampton Water
ision, stated in a telephone conversation with him on Sept. 15, 1976, that the city
going to repair this dam. Mr. Murray also stated that preliminary plans for repairs
been processed up to the point of contract advertising. Per Mr. Murray during a
ıe conversation with our District office on Sept. 29, 1976 an application for
ıorization to construct or alter a reservoir, Reservoir Dam, or Mill Dam was filed
ı your office on Sept. 7, 1976. Due to the continuing deterioration of the overall
dition of this dam it would seem advisable for the owners to expedite their repair
gram as rapidly as possible.

/at

October 9, 1974

Honorable Sean M. Dunphy, Mayor
City Hall
Northampton, Massachusetts 01060

RE: Inspection-Dams #2-8-214-14, 15 & 16
Northampton
Roberts Meadow Middle, Upper &
Lower Dams

Dear Mayor Dunphy:

On September 23, 1974, an engineer from the Massachusetts Department of Public Works made a visual inspection of the above dams, owned by the City of Northampton.

The inspections were made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970 (Dams-Safety Act).

The results of the inspections are as follows:

Roberts Meadow Reservoir Middle-Dam #2-8-214-14

The results of the inspection indicate that repairs are needed. The following conditions were noted that require attention:

1. This dam leaks extensively, particularly in the area southeasterly of the overflow spillway. At that area water is leaking from horizontal joints about one foot below the crest. There were a series of pressure leaks through the joints. In this same area, the fill against the lower portion of the wall and adjacent to the spillway sidewall has been washed away to what appears to be the original ground level for a distance of about 60 feet.

2. There appears to be a slight bulge outward of the stones in the sixth course from the cap stones of the face of the wall northwesterly of the spillway. One stone in the next lower course protrudes by about 9 inches. It appears reasonable to assume that the original construction included mortar joints of which only traces remain. There is considerable seepage over the face of the wall below this area. In some places a broomstick could be pushed into the open joints by two feet.

3. There is a concrete wall, not shown on the original construction plans along the westerly side of the brook for about 150 feet downstream.

There are some soft areas in the turfed overfill behind this wall. About 60 feet downstream there is a flow from the hillside about 50 feet back of the wall. This indicates the possibility of underground flow.

4. Much of the mortar in the stone masonry of the ogee overflow spillway is missing and there is a noticeable leak under the capstone near the westerly sidewall. Several of the stones on the easterly sidewall have moved and it was possible to look completely through several of the joints in the lower portion of the wall.

5. There was a noticeable flow from the 36" waste pipe outlet below the dam through the westerly concrete wall. This pipe is supposed to be connected to the waste well on the upstream side of the gate house.

Roberts Meadow Upper (Hoxie Reservoir)-Dam #2-8-214-15

The condition of this dam is about the same as the "middle"dam. Repairs are needed. Little or no maintenance has been conducted for a long period of time. The following conditions were noted:

1. Leakage through the masonry joints is quite general with much of the mortar missing. Weeds are growing out of some of the joints.

2. On the northerly end of the spillway wall there is a considerable amount of water leaking through the base of the abutment, apparently along the joints between the ledge foundation and the stone masonry.

3. At the base of the ledge wall, against the downstream face of the spillway there is a large block of stone (10' x 8'+) which has become loose.

4. At the southerly end of the arched spillway the gate house structure is badly deteriorated.

5. In the southerly abutment downstream wingwall about 14 feet down and 4 feet from the abutment face, there is a large pressure leak. There is a sinkhole and an animal borrow hole in earth embankment above this area.

Roberts Meadow Reservoir Low-Dam #2-8-214-16

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

1. There are some areas of erosion due to wave and ice action and one other area of surface erosion on the downstream slope.

2. The wood decking of the service walkway for the 20" drawdown gate has many missing planks and is quite rotted in places.

Due to the interdependency of these structures and the extreme risks to downstream lives and properties you are hereby directed to draw down the middle and upper reservoirs to a safe level and maintain that level until they are considered safe. It is also strongly recommended that you obtain the services of a Registered Professional Civil Engineer experienced in the design, construction and maintenance of dams. An in-depth inspection is recommended, followed by prompt remedial action.

If we may be of assistance please do not hesitate to contact us.

Very truly yours,

NLD
LRA:jmp
cc: Leon Murry, Supt.
F J Hoey
R Salls

MALCOLM E. GRAF, P.E.
Associate Commissioner

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

City/~~Town~~ Northampton. County Hampshire. Dam No. 2-8-214-14.

Name of Dam Roberts Meadow Reservoir Middle.

Topo Sheet No. 11 C. Mass. Rect. Coordinates: N 494,800, E 272,700.

Inspected by: R.C. Salls, P.E., On 9-23-74. Date Last Inspection 1970.

2. OWNER/S: As of Nov. 9, 1972

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

1. City of Northampton, B.P.W. - Water Division - 237 Prospect St., Northampton, Mass.

Name	St. & No.	City/Town	State	Tel. No.
2.				
3.				

3. 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 St., Northampton, Mass.

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

4. DATA:

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

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

1. Minor ____.
2. Moderate ____.
3. Severe ____.
4. Disastrous X.

Comments: Would overtop "Lower" Dam. Flood plain below heavily developed.

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

OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: 105' from s'ly. end dam, ogee overflow spillway, 75' W X 5'H with a drop of 28'-6" to toe plus 2' ± drop to brook bed.

Controls None, TYPE: _____.

Automatic____. Manual____. Operative Yes____, No____.

Comments: The crest and ogee spillway face is grouted stone masonry.

No. 2 Location and Type: In gatehouse - 24" diam. water main to system.

Controls Yes, Type: Gate valve.

Automatic____. Manual X. Operative ~~X~~ Unk, No____.

Comments: Operative per Water Dept. personnel 15 years ago.

No. 3 Location and Type: In gatehouse - 36" dia. waste pipe.

Controls Yes, Type: Gate valve.

Automatic____. Manual X. Operative Yes____, No____. Unk.

Comments: Considerable leakage of water noted at outlet end of pipe. Per Water Dept. personnel operated 15 years ago.

Drawdown present Yes X, No____. Operative Yes____, No____.

Comments: See Item #3 above.

DAM UPSTREAM FACE: Slope Batter ½" to 1', Depth Water at Dam 20' ± Ashler stone

Material: Turf____. Brush & Trees____. Rock fill____. Masonry X. Wood____.

Other _____.

Condition: 1. Good____. 3. Major Repairs X.

2. Minor Repairs____. 4. Urgent Repairs____.

Comments: Open joints in stone masonry of dam walls and in gate well structure.

DAM DOWNSTREAM FACE: Slope Top 5' vertical; Next 14' concave - 30' R.; Bottom of walls on ½" to 1' batter. Spillway face ogee. Coursed Ashler stone

Material: Turf X. Brush & Trees____. Rock Fill____. Masonry X. Wood____.

Other _____.

Condition: 1. Good____. 3. Major Repairs____.

2. Minor Repairs____. 4. Urgent Repairs X.

Comments: Many areas of seepage. Numerous leaks and heavy flows of water thru masonry joints about 3' below spillway crest elevation on left wall of dam.

EMERGENCY SPILLWAY: Available X. Needed ____.

Height Above Normal Water 5 Ft.

Width 275 Ft. Height 2 Ft. Material Stone masonry top of dam.

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

2. Minor Repairs X. 4. Urgent Repairs ____.

Comments: Stone masonry joints need pointing up. This emergency spillway is top of dam.

WATER LEVEL AT TIME OF INSPECTION: 2/10 Ft. Above X. Below ____.

Top Dam ____ F.L. Principal Spillway X.

Other ____.

Normal Freeboard 5 Ft.

SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment None found.

Animal Burrows and Washouts Yes - earth-fill slope at downstream face of left wall adjacent to spillway washed away by leakage.

Damage to Slopes or Top of Dam Yes - see above.

Cracked or Damaged Masonry Yes - numerous open joints - indication of movement of one masonry block.

Evidence of Seepage Yes - general seepage thru dam walls and along toe of right wall.

Evidence of Piping None found.

Leaks Yes - numerous leaks, some with very heavy flows of water thru joints of stone masonry.

Erosion Yes - see washouts item above.

Trash and/or Debris Impeding Flow None evident.

Clogged or Blocked Spillway None.

Other Concrete wall on right side brook downstream of dam and fill behind wall added after dam built. Some soft spots in this turf covered fill could indicate existence of seepage through rock seam under dam.

(12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed_____.
3. Conditionally safe - major repairs needed X .
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

(13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

This stone masonry dam was observed to be leaking extensively, especially in the area to the left of the overflow spillway. Here water is leaking from horizontal joints about 1 foot below the crest and somewhat below and to the left of this area there were a series of leaks through the joints where the water is leaking under pressure. In this area, the fill against the lower portion of the wall and adjacent to the spillway side wall has been washed away to the approximate old ground level for a distance of about 60 feet. Because of the water flowing from the above described leaks, it was not possible to determine if there were leaks lower down.

The face of the wall to the right of the spillway could be examined more closely. There appeared to be a slight bulging outward of the stones in the sixth course down from the cap stones, and one stone in the seventh course was protruding from the face of the wall 9 inches. As the exposed upper face of this stone had mortar traces, it can be assumed that this stone has been displaced by the elements. There was considerable seepage over the face of the wall below the sixth course below the cap stones. In some places a broomstick could be pushed into the open joints two feet. Only traces of mortar remain in almost all of the joints examined

A concrete wall which was not shown on the original plans and was evidently built since the dam's construction is along the west or right side of the brook for about 150 feet downstream. This wall is 6 foot high and about 3 to 4 foot wide on top. There are some soft spots in the turfed over fill behind this wall indicating possible underground seepage flow. Also about 60 feet downstream there is a flow from the hillside about 50 feet back of the wall which flows into a catch basin at the toe of the slope and then through a 10" C.I. pipe to the brook.

Many of the joints in the stone masonry face of the ogee overflow spillway were devoid of mortar and there was a visible leak from under the cap stone about a foot from the right spillway side wall. Several of the stones in the left spillway side wall have moved and it was possible to see completely through several of the vertical joints in the lower part of this wall.

On the upstream side of the dam, many of the exposed joints in the masonry wall had no visible mortar. Where the stone masonry base of the brick gate house joins the main wall of the dam, the joint between the cap stones of the dam and those on the base have opened up as have the joints below. There are hairline cracks in the brick gate house walls above this area. This could indicate slight settlement of the gate house structure. Also, the concrete waste gate well behind the gate house has a vertical crack in its outside face. Except for the open joints at the junction of the gate house base and the main dam most of the cap stone joints have been repointed and are sealed against the elements.

There is a 36" waste pipe outlet below the dam through the concrete wall on the west or right bank of the brook. At the time of the inspection there was a noticeable stream of water flowing from this pipe. This pipe is supposed to be connected directly into the concrete waste well on the upstream side of the gate house with a gate valve on the pipe in the gate house. Flow into the waste well is controlled by a 24 inch gate valve. According to Water Department personnel, this waste pipe was last operated fifteen years ago. Also passing through the gate house is a 24 inch intake water main leading to the chlorinator in Leeds village. This main is controlled by a check valve near the chlorinator which operates whenever pressure from the Mountain Street Reservoir in Williamsburg drops below a certain point. Water from Roberts Meadow has not been used for several years.

Because of the leakage through various parts of the dam itself, the disintegration of the mortar in most of the exposed joints and the small indication of possible underground seepage, it is apparent that the stability of this dam is questionable. Since a failure of this structure would be disastrous and because of the possibility of a major overtopping with a failure of the Roberts Meadow Reservoir "Upper" Dam No. 2-8-214-15, which also appears to be in very poor condition, an investigation of the stability of this structure appears to be required.

RCS/vk

DISTRICT 2.

Submitted by R. C. Salls, P.E. Dam No. 2-8-214-14

Date September 23, 1974 City/~~Town~~ Northampton

Name of Dam Roberts Meadow Reservoir - Middle

1. Location: Topo Sheet No. 11 C Mass. Rect. Coordinates N 494,800 E 272,700

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

On Roberts Meadow Brook upstream of Lower Reservoir, No. 2-8-214-16, just N. of Reservoir Rd. about 1/2 mile from Audubon Rd. in Leeds.

2. Year built Plan Dated 1894 Year/s of subsequent repairs 1933

3. Purpose of Dam: Water Supply X Recreational _____

Flood Control _____ Irrigation _____ Other _____

Now used as auxiliary water supply.

4. Drainage Area: 10.6 sq. mi. _____ acres.

Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban _____ Rural, Farm 2(

Wood & Scrub Land 80% Slope: Steep 60% Med. 40% Slight _____

5. Normal Ponding Area: 23± Acres; Ave. Depth 10'±

Impoundment: 75 million gals.; 230 acre ft.

Silted in: Yes X No _____ Approx. Amount Storage Area 20%

5. No. and type of dwellings located adjacent to pond or reservoir _____

i.e. summer homes etc. None

7. Dimensions of Dam: Length 403' Max. Height 29½' to crest spillway

Freeboard 5'

Slopes: Upstream Face Batter 1/2" per ft.

Downstream Face Vertical to 7½" per ft.

Spillway section has ogee curve on downstream face.

Width across top 7'-4"

Dam No. 2-8-214-14

Classification of Dam by Material:

Earth _____ Conc. Masonry _____ Cemented Stone Masonry X

Timber _____ Rockfill _____ Other _____

Dam Type: Gravity X Straight X Curved, Arched _____ Other Wall

Overflow X Non-overflow _____

A. Description of present land usage downstream of dam:

80 % rural; 20 % developed

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 - Not before Mill River

C. Character Downstream Valley: Narrow 25% Wide 75% Developed 18%

Rural 82% Urban _____

Roberts Meadow Reservoir Dam "Lower" No. 2-8-214-16 would be overtopped.

9. Risk to life and property in event of complete failure. * See note below.

No. of people 3 to 5

No. of homes 3 to 5

No. of businesses Post Office

No. of industries 1 Type General manufacturing building

No. of utilities 4 Type Telephone and electric transmission lin water and sewer mains.

Railroads 0

Other dams 1 - Roberts Meadow Reservoir Dam "Lower" No. 2-8-214-16.

Other 1 - Town highways and bridges.

11. Attach Sketch of dam to this form showing section and plan on 8½" x 11" sheet.

RCS/vk
Attachments
Locus Plan
Sketches

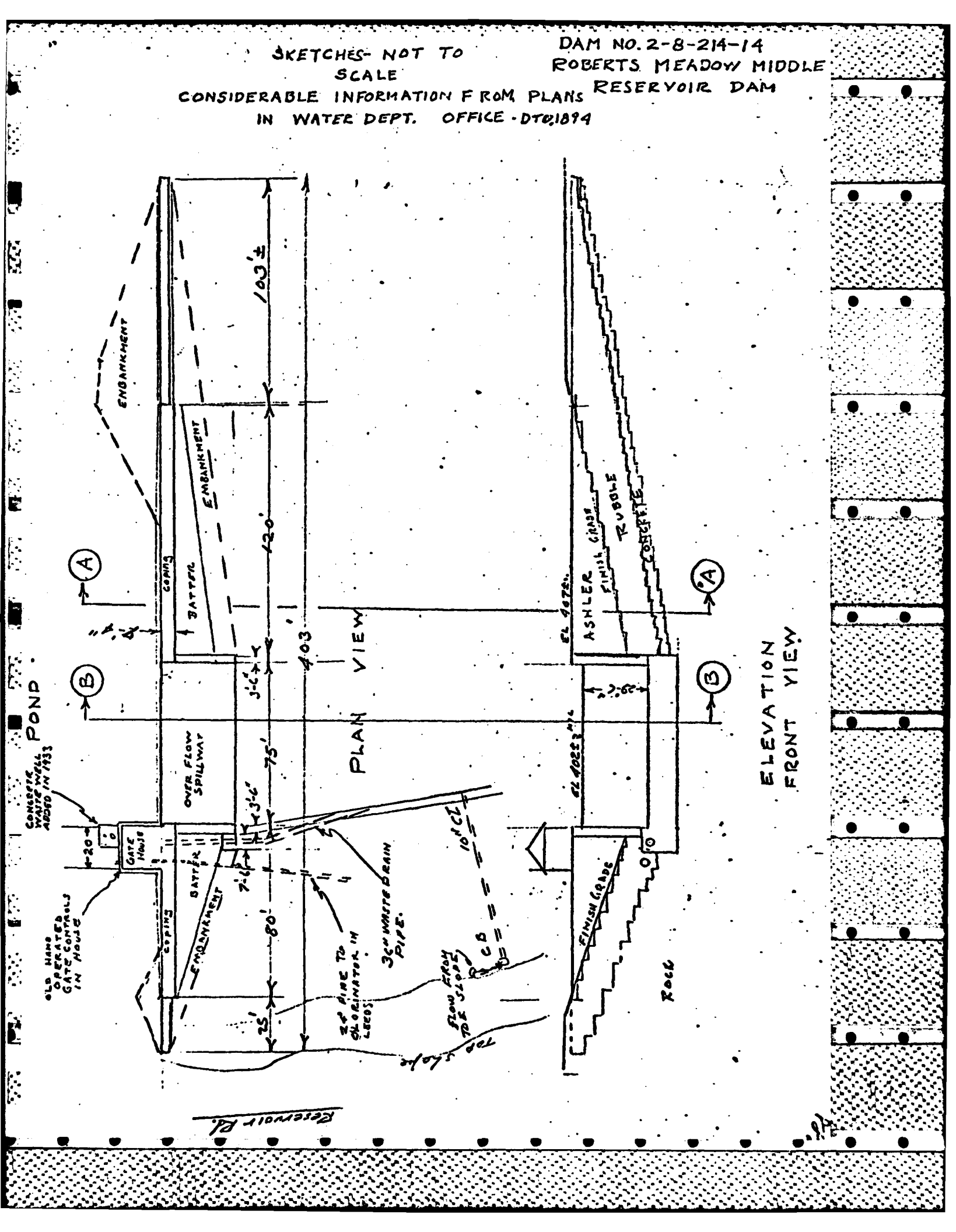
* NOTE: Information given under Item #10 pertains only to conditions up to Mill River and Roberts Meadow Brook confluence.

SKETCHES- NOT TO SCALE

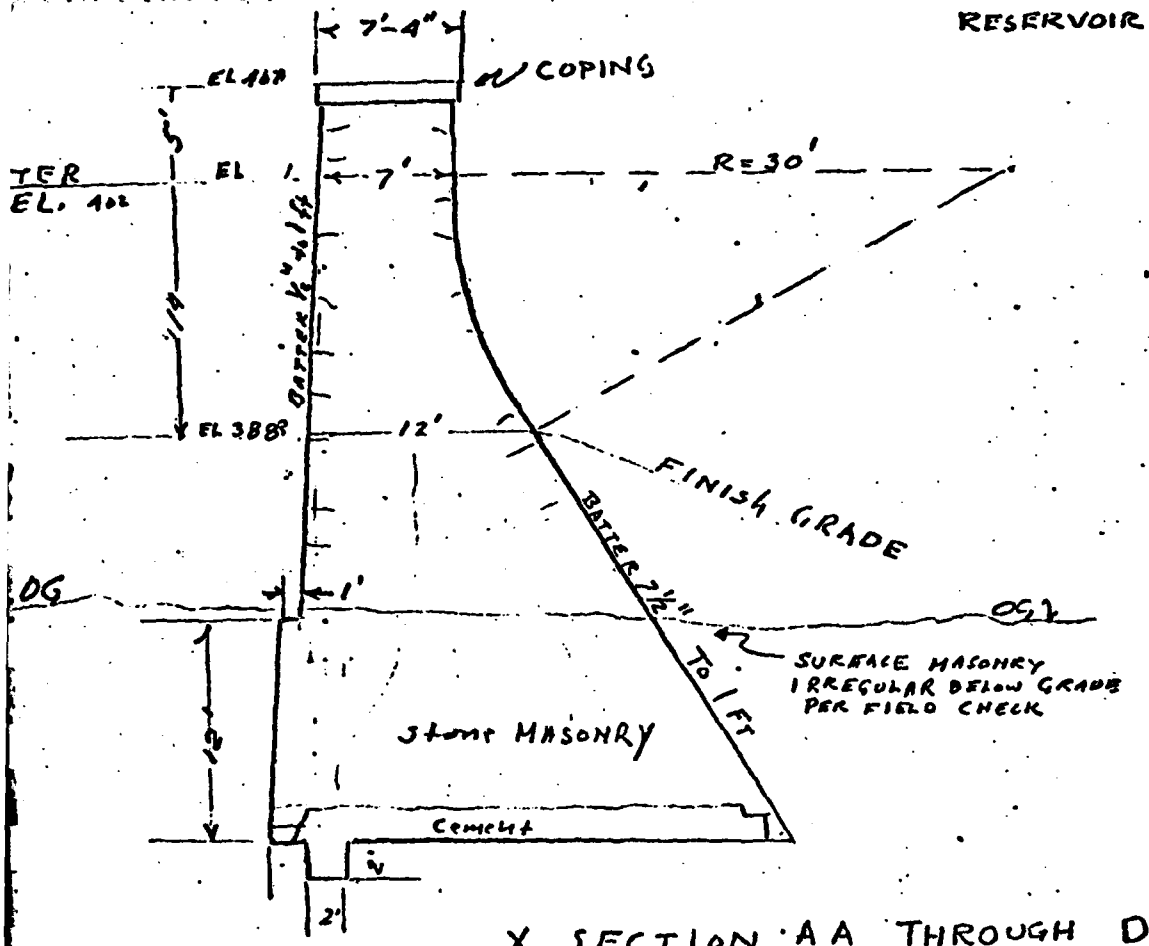
CONSIDERABLE INFORMATION FROM PLANS IN WATER DEPT. OFFICE - DTD 1894

DAM NO. 2-8-214-14

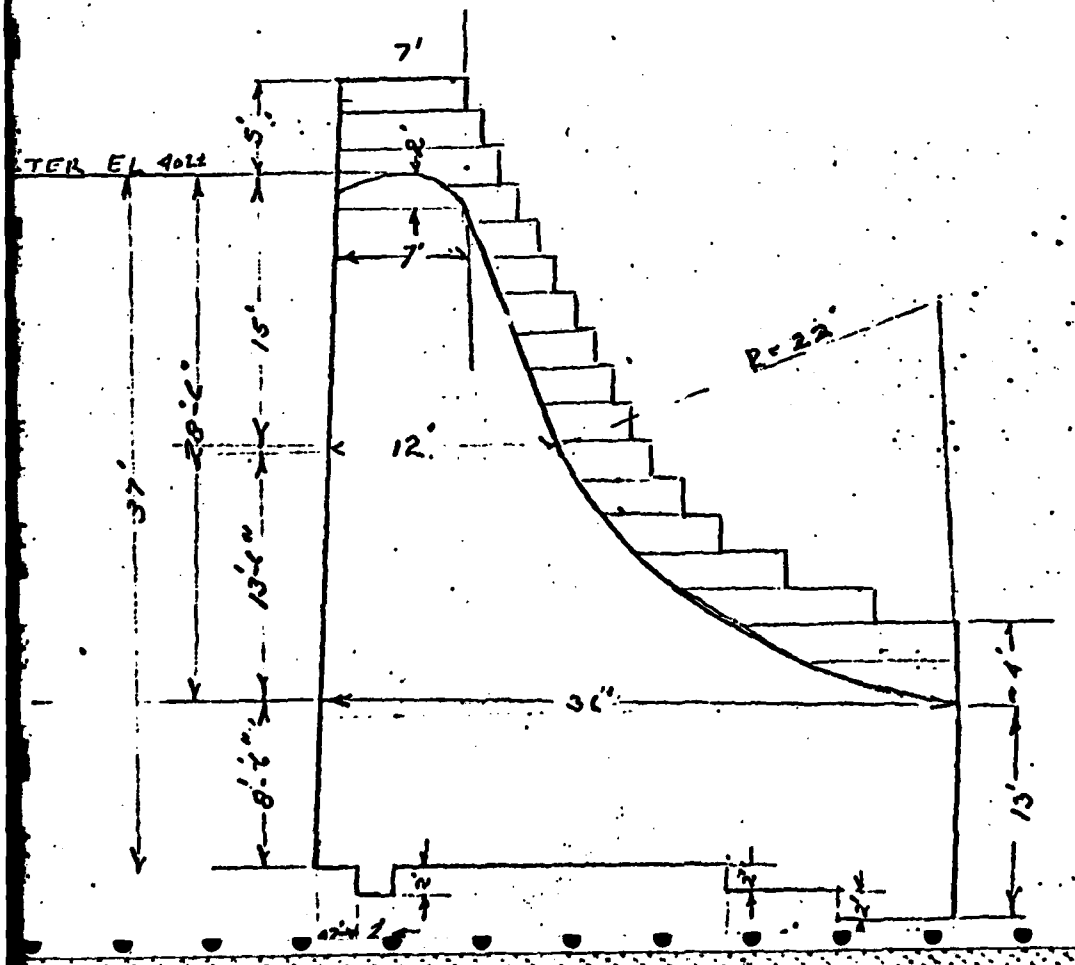
ROBERTS MEADOW MIDDLE RESERVOIR DAM



RESERVOIR DAM

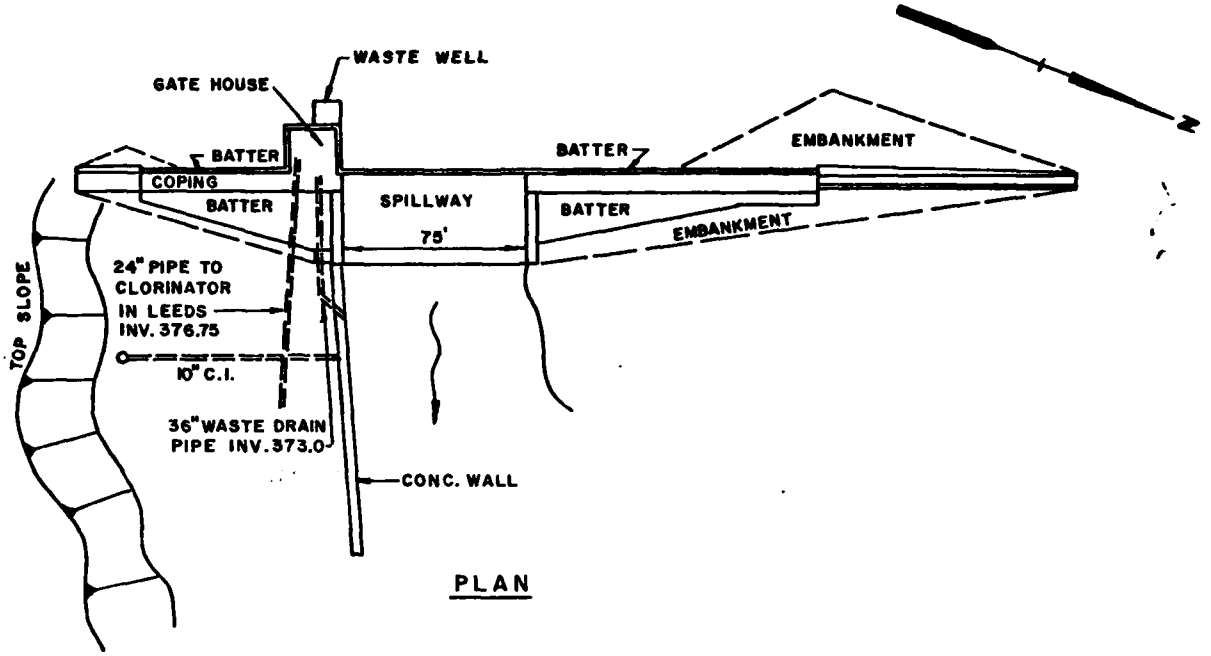


X SECTION AA THROUGH DAM

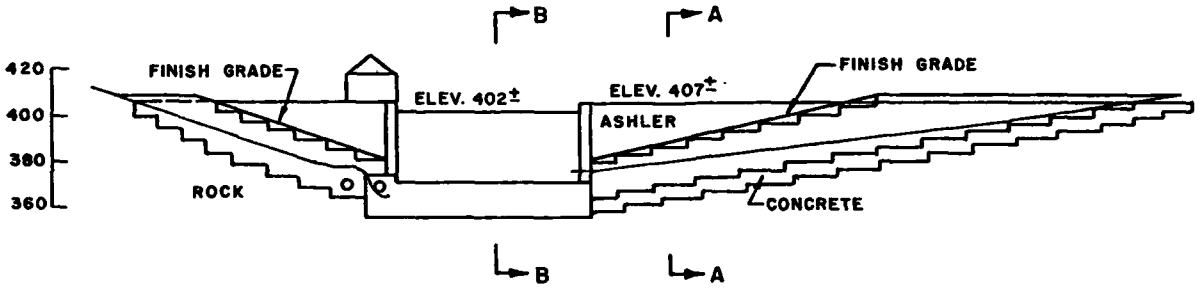


X SECTION BB THROUGH SPILLW

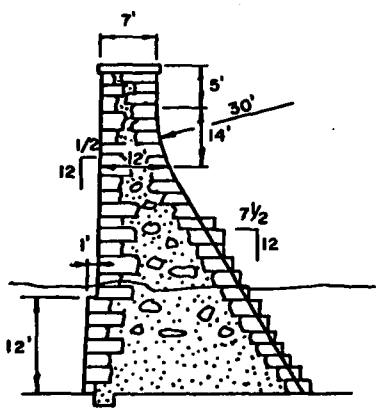

LOCUS PLAN
WILLIAMSBURG
DAM No 2-8-214-14
Golf Club
NORTHAMPTON
County Sanatorium
Reservoir
St Marys Cem
AUDUBON
Brook
ROAD
MILL RIVER
Leeds
VA HOSPITAL
Roberts Meadow Reservoir
Roberts Hill
Northampton Country Club
LOOK MEMORIAL PARK
RIVER
KENNEDY ROAD
RESERVOIR
Marble
Upper Reservoir
CHESTERFIELD
Gravel Pit
Roberts Meadow
TELEPHONE
Sawmill Hills
Florence Pond
STREET
Gravel Pit
Mineral Hills
Gravel Pit



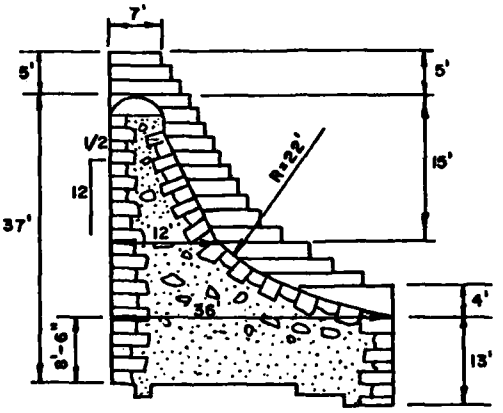
PLAN



ELEVATION



SECTION A-A

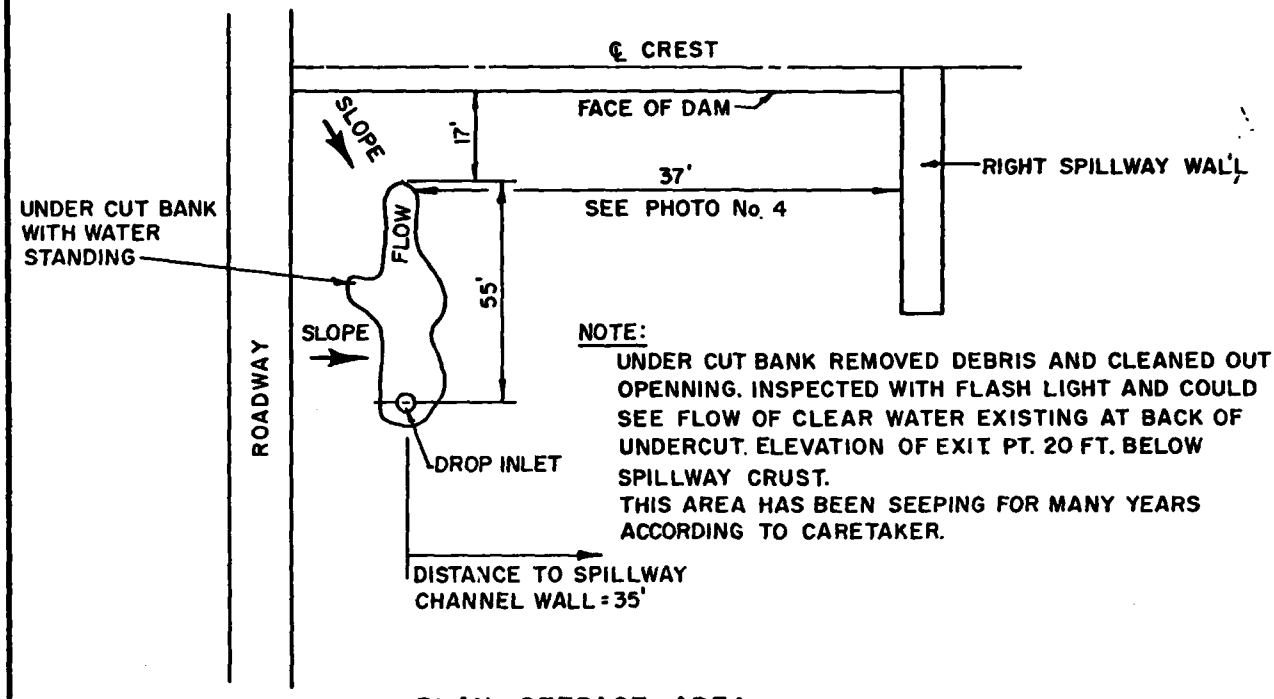


SECTION B-B

ROBERTS MEADOW RESERVOIR
MIDDLE DAM
IN
NORTHAMPTON, MA.

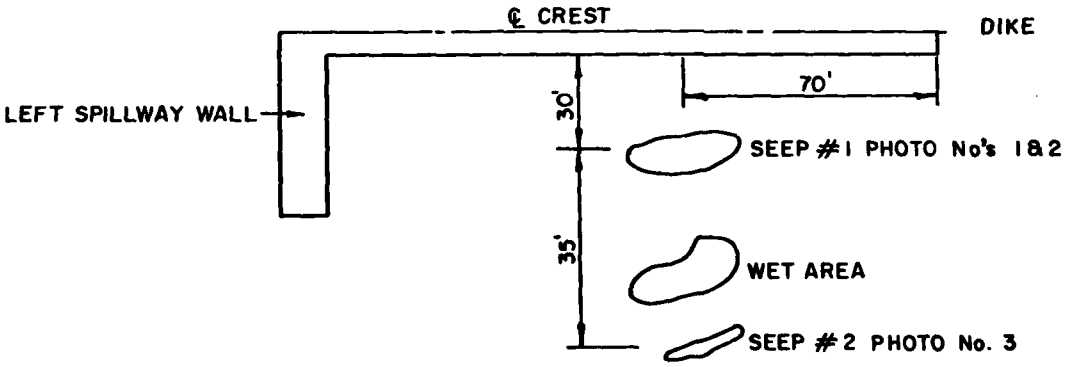
INFORMATION SHOWN COPIED
FROM PLAN DATED 1894

NOT TO SCALE JULY 1978



NOTE:
UNDER CUT BANK REMOVED DEBRIS AND CLEANED OUT OPENNING. INSPECTED WITH FLASH LIGHT AND COULD SEE FLOW OF CLEAR WATER EXISTING AT BACK OF UNDERCUT. ELEVATION OF EXIT PT. 20 FT. BELOW SPILLWAY CRUST.
THIS AREA HAS BEEN SEEPING FOR MANY YEARS ACCORDING TO CARETAKER.

PLAN SEEPAGE AREA
RIGHT ABUT.



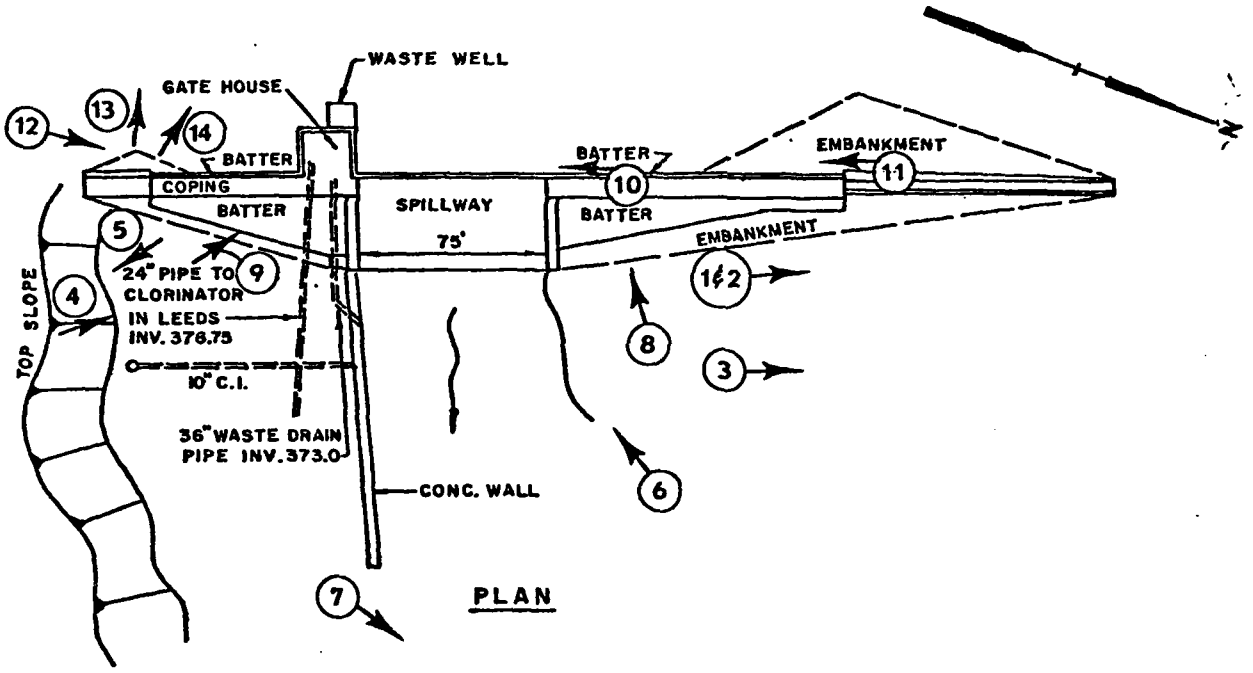
PLAN SEEPAGE AREA
LEFT ABUT

ROBERTS MEADOW RESERVOIR
MIDDLE DAM
IN
NORTHAMPTON, MA.

NOT TO SCALE JULY 1978

APPENDIX C

PHOTOGRAPHS



LOCATION OF PHOTOGRAPHS
ROBERTS MEADOW RESERVOIR
MIDDLE DAM
IN
NORTHAMPTON, MA.

NOT TO SCALE JULY 1978

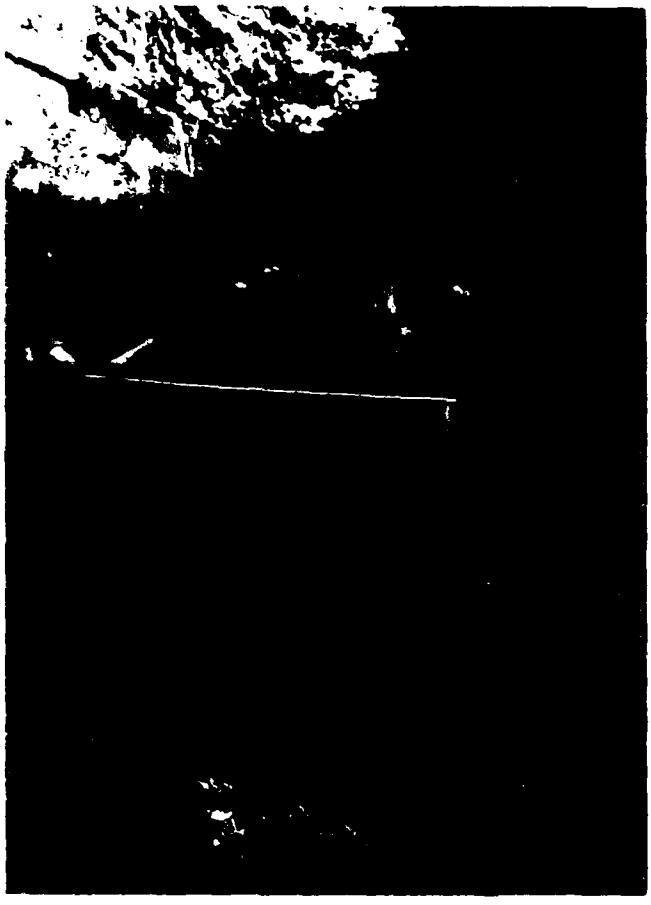


PHOTO NO. 1 - Close-up of seep area #1 on left abutment. Note crest of dam in upper left corner. Rule equals 6 ft.

PHOTO NO. 2 - General view of seep area # 1 on left abutment. Photo taken from crest of dam at left wall of spillway section.

PHOTO NO. 3 - General view of seep area #2 on left abutment.

PHOTO NO. 4 - General view of water flowing from seep area d.s. of right abutment. Photo taken from roadway about 50 ft. d.s. of dam.

PHOTO NO. 5 - Spring on right abutment about 40 ft. d.s. of dam.

PHOTO NO. 6 - General view of outlet channel and spillway.

PHOTO NO. 7 - Outlet channel and lower reservoir beyond. Note Earth Dam in background.

PHOTO NO. 8 - General view of water seeping through left face of dam.

PHOTO NO. 9 - Close up of water seeping through right face of dam. Note water exiting from grout pipes.

PHOTO NO. 10 - General view of spillway crest.

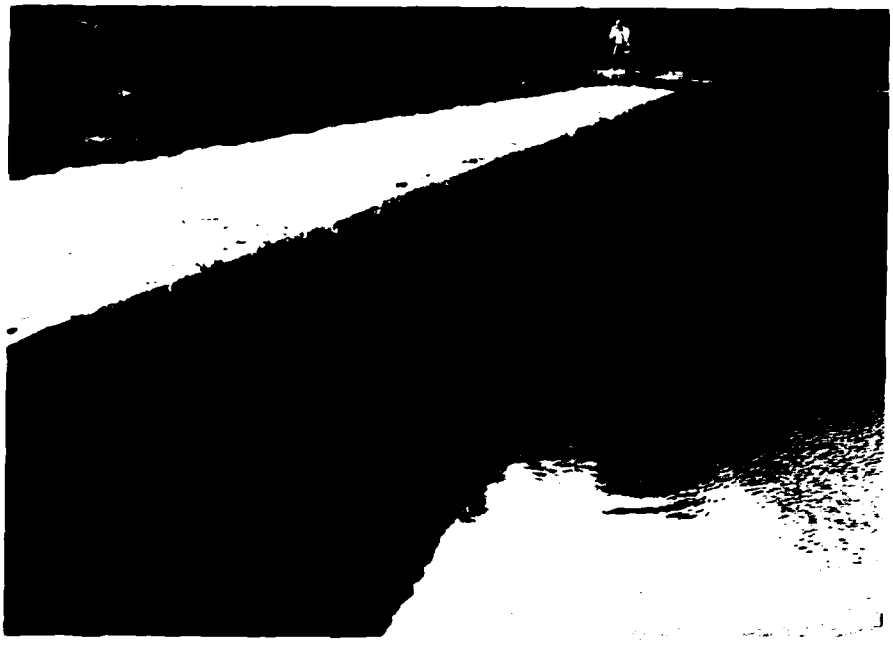


PHOTO NO. 11 - General view of upstream face left side of dam.

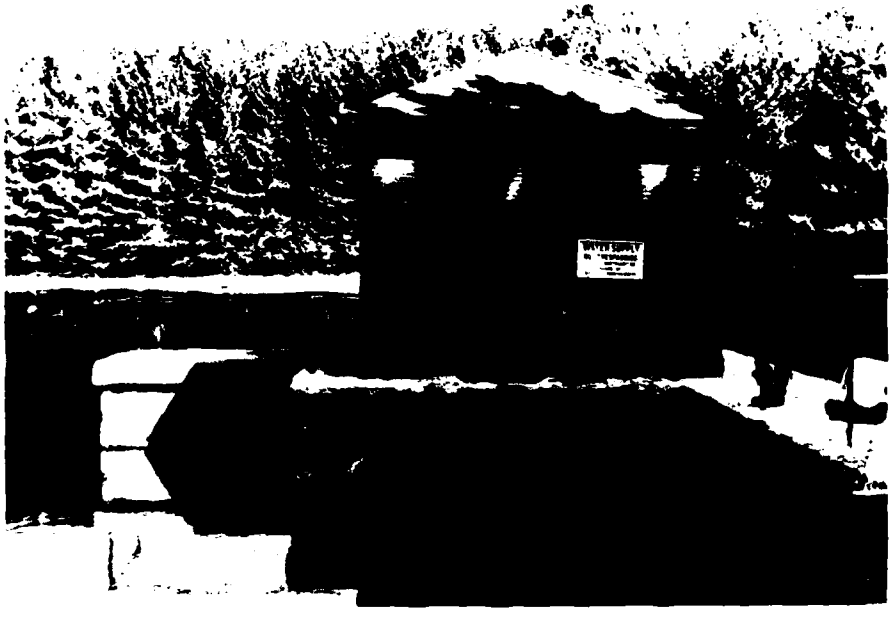


PHOTO NO. 12 - General view of Gate House.

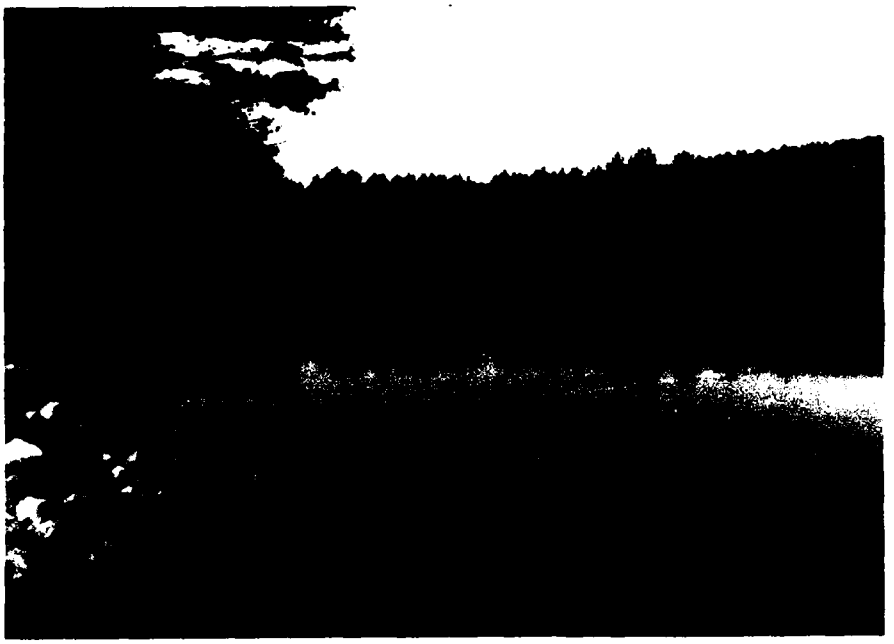


PHOTO NO. 13 - General view of reservoir from right abut. (left).

PHOTO NO. 14 - General view of reservoir from right abut. (right).

APPENDIX D

1. HYDROLOGIC COMPUTATION
2. DRAINAGE AREA

78.117
26-7
A
FDD

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

SHEET NO. 1-9
JOB Dam Insp.
SUBJECT Roberts Mead.
CLIENT corps

Roberts Meadow Middle Dam

Phase I

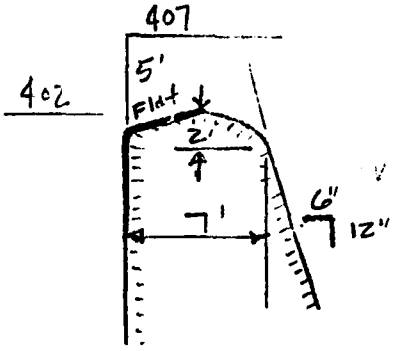
Size — Small
Hazard — Significant
Design — PMF ✓

Height — 29'-6" hyd @ spillway
34'-6" str

Storage — Normal — 340 a-f ✓
Max — 340 a-f ?

Drainage Area — 10.81 sq mi — 6922 acres

Spillway — 75' long 7' wide 5' high "ogee"
ashlar stone cement jnts



Rolling Terrain PMF = 1625 $\frac{cfs}{s.m.}$

PMF = 17,566 cfs
½ PMF = 8,783 cfs
these flows will overtop this dam

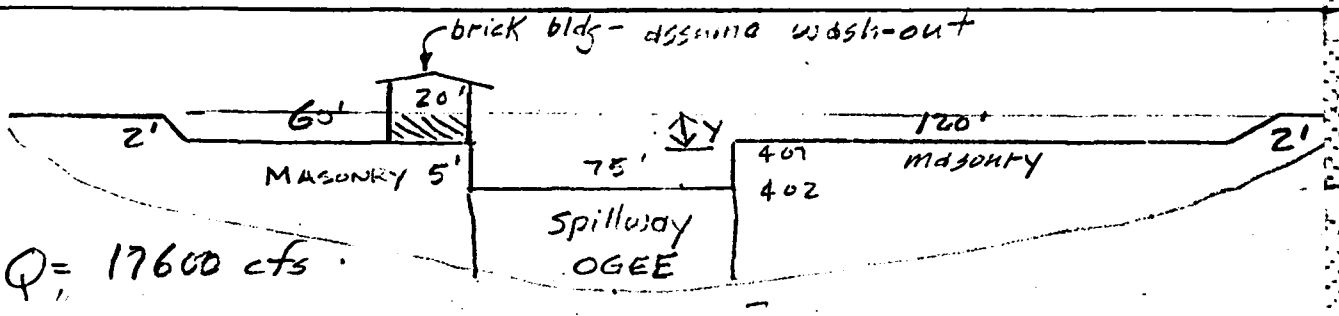
Whitman-Howard Report
Cited max flood as
3200 cfs
(Kinnison - Colby Major Flood)

USE : PMF

78.117
6/26 78
A
FEE

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

SHEET NO. 2-9
JOB Dam Insp.
SUBJECT Rob. Mead.
CLIENT Corps



$Q = 17600$ cfs.

$Q = CLH^{3/2}$ Let $C \simeq 3.60$ (King)

$Q = 3.60\ (75)\ (5)^{3/2} \simeq 3000$ cfs (11.18)

El. 409 let $Y = 2'$

$A = 2'\ (60 + 20 + 120 + 75) = 550$ (275)

$wp = 210'\pm$

$R = 2.62 \quad 1.91$

$V = \frac{1.486}{.017}\ (1.91)(.001)^{1/2} = (87.412)(1.91)(.0316) = 5.27$ fps (5.11)

$Q = 550 \times 5.27 \simeq 2900$ cfs $+ 3000 = 5900, < 17600$ NG

El. 410.5 $Y = 8'$

$wp = 250 + 210 = 460'$.

$A = 550 + 65(1 \times 40) = 3150$ sf.

$R = 6.85$

$V = 87.412\ (3.63)(.0316) = 10$

$Q = 31{,}500$ cfs $+ 3000 > 17600$

$Q = 3.3\ (75)\ (1)^{3/2} = 248$ cfs

$= 3.42$ " $(2) = 725$ "

$= 3.49$ " $(3) = 1360$ "

$Q = 3.95$ " $(4) = 2070$ "

Spillway Crest 407: 0.25 s.m. 22.96 a

402: 0.22 s.m. 20.2 a

Storage	a	a.f.
480	10	0
402	20.	330 (330)
407	23.	108 (438)
410	117	210
412	163	280 (648)
412.5	163	82 (928)
		± 82 (1010)
		1010 a-f total

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CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

Elev 412. $y = 5'$

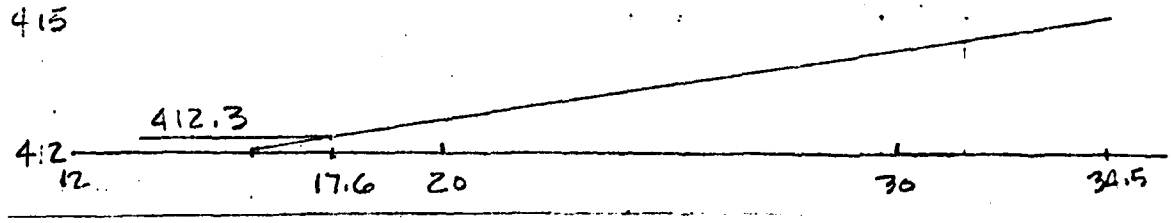
$WP = 210 + 175 = 385.$

$A = 3150 - 12(120\,sf) = 1710\ sf$

$R = 4.44$

$V = 87.412(2.72)(.0316) \simeq 7.5$

$Q = 12826\ cfs + 3000 \simeq 15826 < 17600$



1. 412 163 a

2. 410 117 a.

$Q_{P1} = 17600$ Elev 412.5

$Stor_1$ (402-412.5) $= \left(\frac{20.2 + 163}{2}\right) 10.5 = 962\ a\text{-}f$

$962 \times 12 \div 6922 = 1.67\ in$

$Q_{P2} = 17600\left(1 - \frac{1.67}{19}\right) \simeq 16{,}000.\ cfs$

Elev 412.25

$Stor_2 = 939\ af\ (12) \div 6922 = 1.63\ in$

$(1.63 + 1.67) \div 2 = 1.65$

$Q_{P3} = 17600\left(1 - \frac{1.65}{19}\right) = 16{,}100.\ cfs$

78.11?
6/76
MA
FBF

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BOSTON, MASSACHUSETTS

SHEET NO. 4-9
JOB Dam Insp.
SUBJECT Rob. Mead
CLIENT Corps

Since dam is over-topped, try failure analysis Rule-of-Thumb method.

Storage ≈ 960 a-f

$$Q_p = \frac{8}{27}(84)\sqrt{32.2}\,(35)^{3/2} = \underline{\underline{29,221.\ cfs}}$$

(5.67) (207)

$W_b = 210(.4) = 84$

$$Storage = \left(\frac{10+20}{2}\right)22 + 962 \approx 1292\ a\text{-}f$$

(330)

$Vol_{h152 \to 4..2} = 330\ a\text{-}f$

10+00 (Lower Dam ±)

380

n = .07 flood plain light brush trees, "developed area"

wp = 380'
A = 41(10) + 17(40) + 15(10) = 410 + 680 + 600 = 1690'
R = 4.45' 2.72

$$V = \frac{1.486}{.07}(2.72)(.01)^{1/2} = 5.77\ fps$$

Q = 9,751. < 29.2 NG

(Power Line Str. w/in flood area)

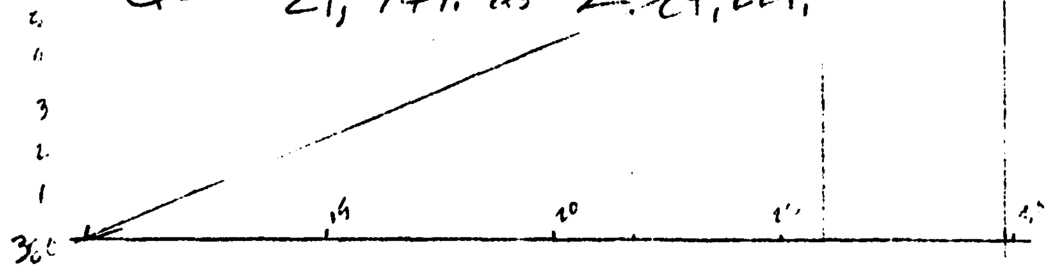
elev 385

wp = 380 + 120 = 500
A = 1690 + 34(40) = 3050
R = 6.1

$$V = \frac{1.486}{.07}(3.36)(.1) = 7.13$$

Q = 21,747. cfs < 29,221.

388.5



78.117
-26

Elev 388.5

6.43 a.

65.73 − 65.66 = .07

65.73 − 65.71 = .02

388.5 − 375.0 = 13.5

top old dam (lower) 1.83 a

Storage = $\left(\frac{1.83 + 6.43}{2}\right)(13.5) = 56^{\pm}$ a-f < 129 ok

Q_{P2} = 29,220 cfs

25+00

$\frac{10}{8}$ s = 1.25

elev 355
wp = 800'
A = 24 (40) = 960 sf (5) = 4800
R = 6 3.32
V = $\frac{1.486}{.10}(3.32)(.0125)^{1/2}$ = 5.58
Q = 26,784 < 29,220

(13 structures w/in flood plain)

elev 350
wp = 175
A = 16 (40)(5) = 3200 sf = + 1600 sf ✓
R = 9.14
V = 14.86 (9.4)(.112) = 7.3
Q = 11,727

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CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 6-9
JOB Dam Inv.
SUBJECT Back Bay
CLIENT Corps

14+00

S = 2.5

elev 365
WP = 310'
A = 8 (40)(5) = 1600 sf
R = 5.16 3.
V = $\frac{1.486}{.10}$ (3)(.158) = 7.
Q = 11,278 cfs < 29220

elev 368
WP = 410'
A = 1600 + 3(315) = 2545
R = 6.2 3.4
V = 14.86 (3.4)(.158) = 8.
Q = 20,305

elev 370
WP = 450
A = 2545 + 2(430) = 3405
R = 7.57 3.9
V = 9.1
Q = 31,021 > 29,2 OK

(3 structures - homes - w/in floodplain)

elev 369.5 ±

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

JOB NO. 78__
DATE ____
BY ____
CHK'D BY ____

SHEET NO. 7-9
JOB ____
SUBJECT ____
CLIENT Comp

27+00 ≥
28+00 elev ≃ 335± to River

Slope 3.3%

elev = 345
wp = 630'
A = 12.5(40)(5) = 2500
R = 3.97. 2.52.
V = 14.86 (2.52) (.182) = 6.8.
Q = 17,000. < 29,2.

elev = 347
wp: 480
A: 2500 + 2(650) = 3800
R = 8 4.
V = 10.8.
Q = 41,105

Elev 346±.

25 → 27+00 27 → River
13 structures 26± structures

(does include east river bank which would also be flooded impact of river would increase dam.)

NO. 79-17

D BY FDB

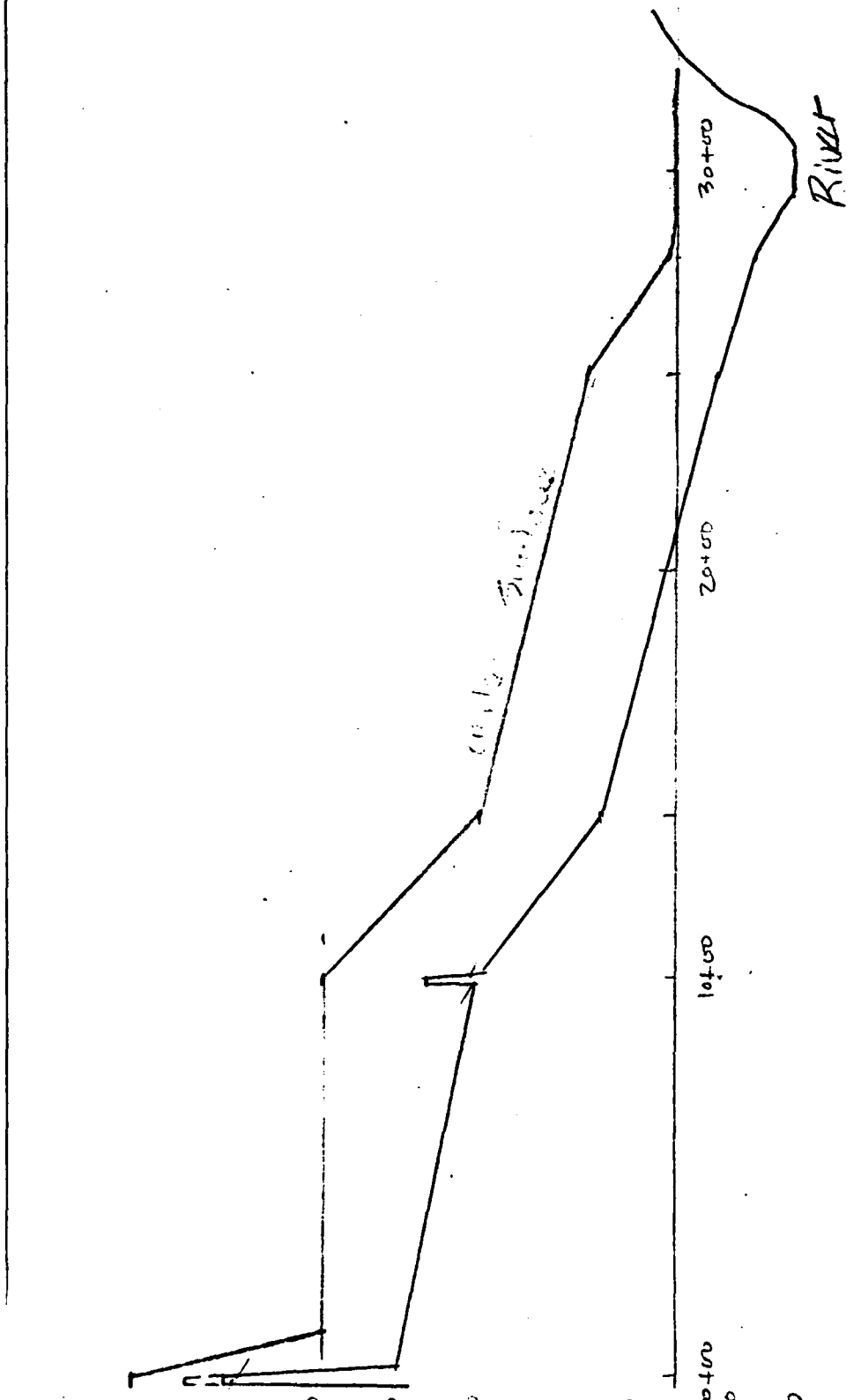
HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 8 of 9

JOB Dam Insp

SUBJECT Rom. Flood

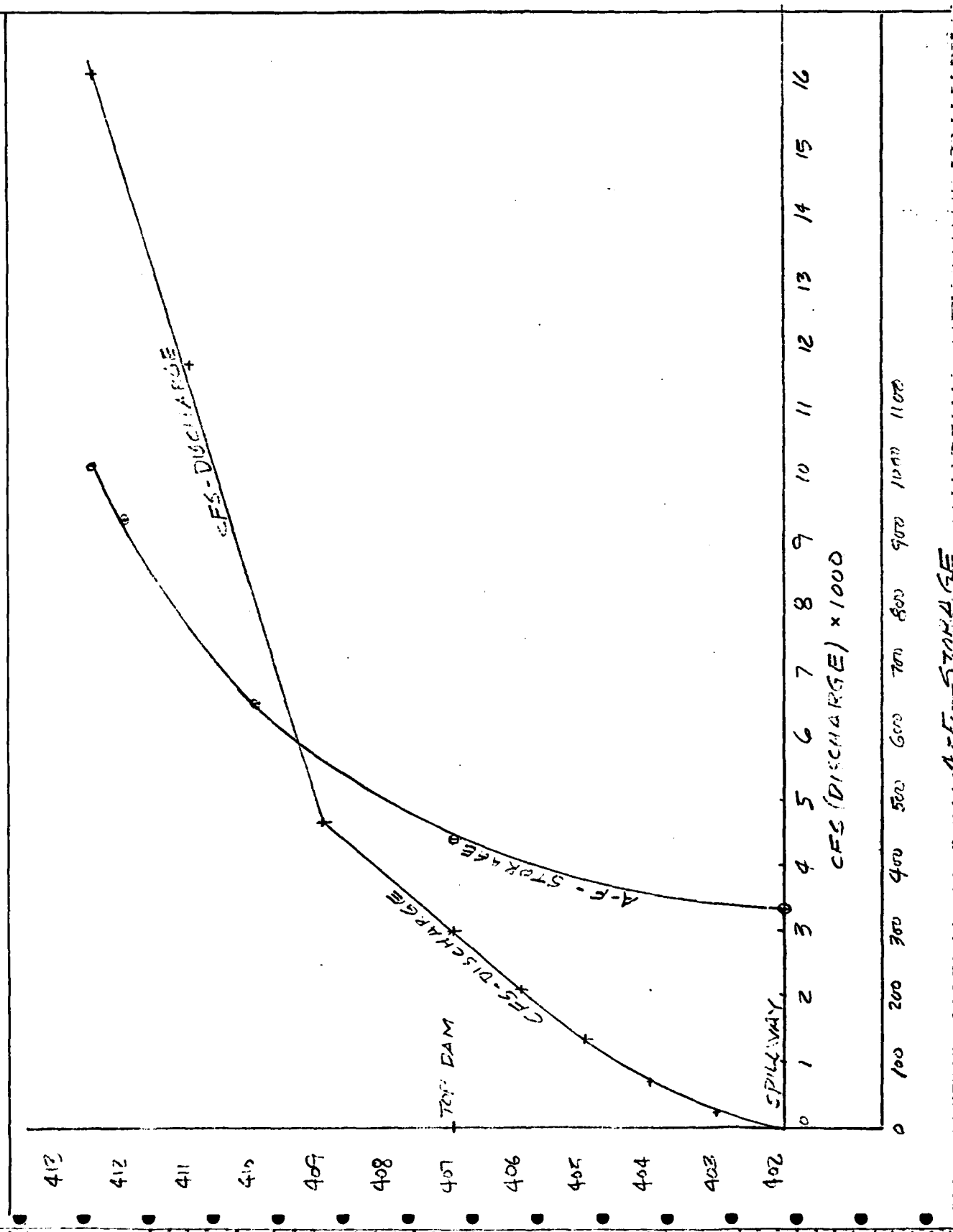
CLIENT Corps

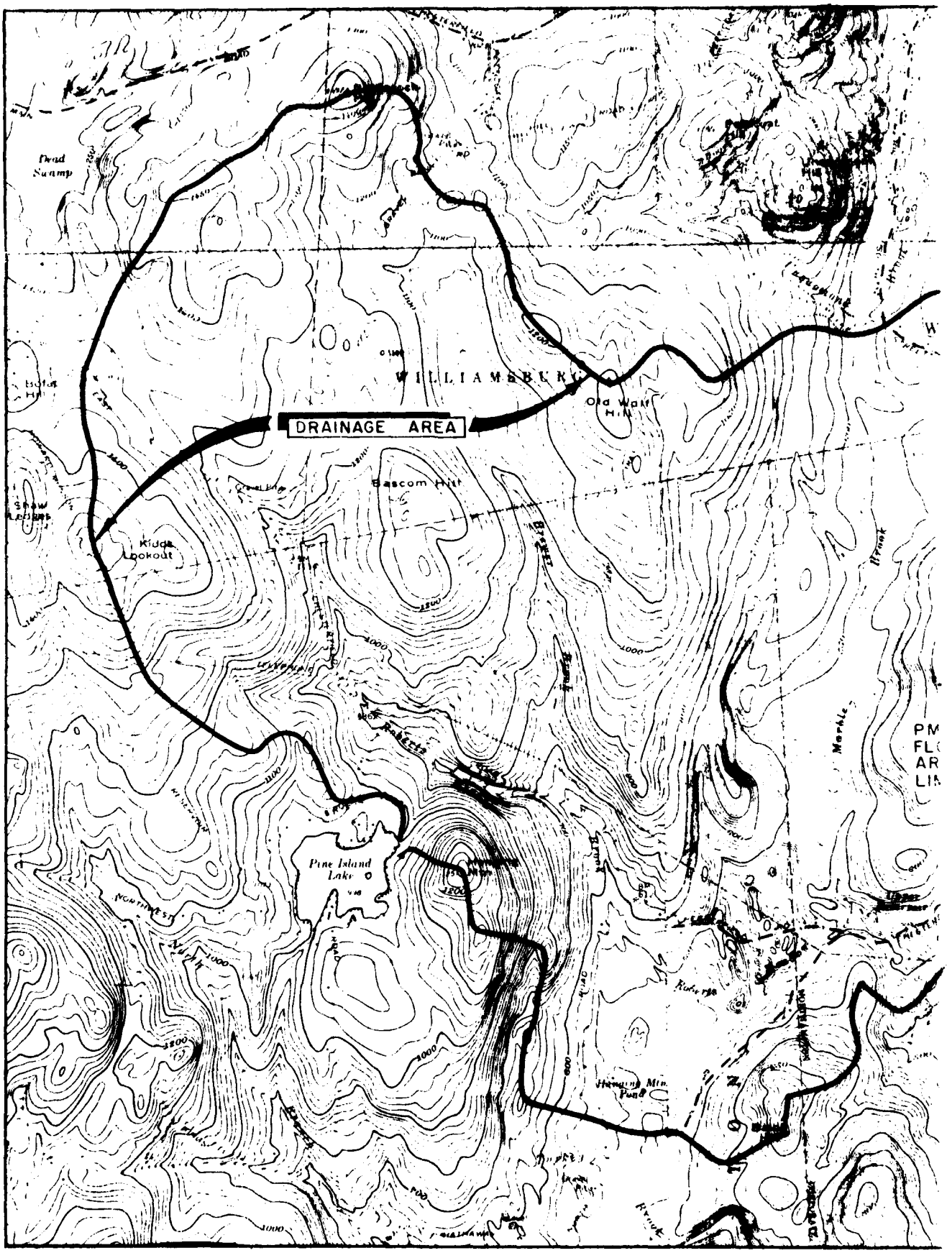


28.11
6-78
MA
BY

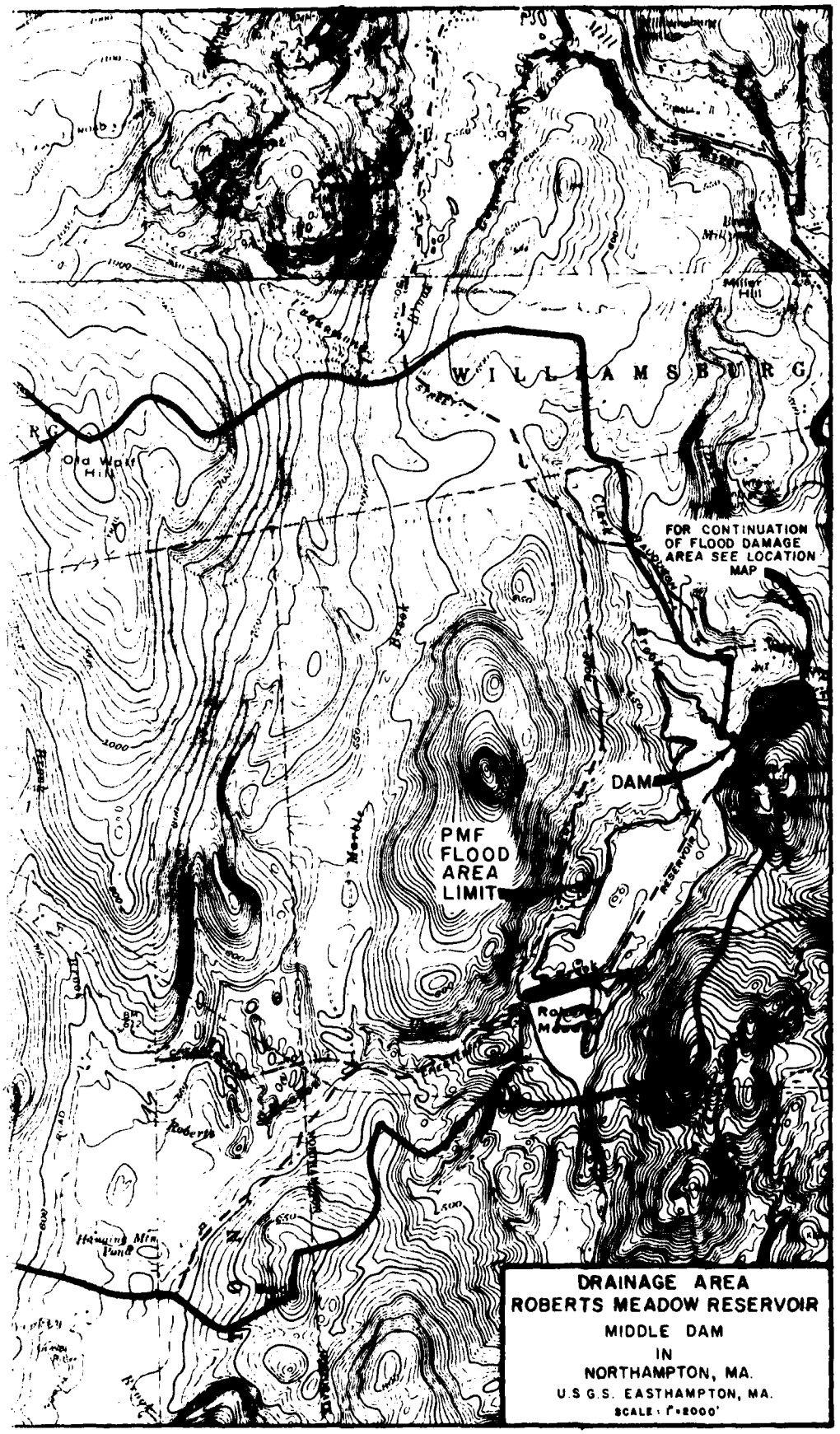
HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 9-9
JOB Dam Insp.
SUBJECT Rob. Morrow
CLIENT Corps





14 12



24 1

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
MA	761	NED	MA	015	01				ROBERTS MEADOW RESERVOIR MIDDLE DAM	4221.1	7242.6	07JUL78

POPULAR NAME	NAME OF IMPOUNDMENT
	ROBERTS MEADOW RESERVOIR MIDDLE

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	08	TR MILL RIVER	NORTHAMPTON	0	26664

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE–FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REGNPGRA	1894	S	44	42	410	330	NED	N	N	N	N	24JUL78

REMARKS

D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	403	U	75	3000	9400											

OWNER	ENGINEERING BY	CONSTRUCTION BY
CITY OF NORTHAMPTON	DAVIS ENGINEERS	MAIN LEWIS AND HODGE

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
HAYDEN, HARDING & BUCHANAN, INC	26MAY78	PL 92-367

REMARKS

END

FILMED

8-85

DTIC