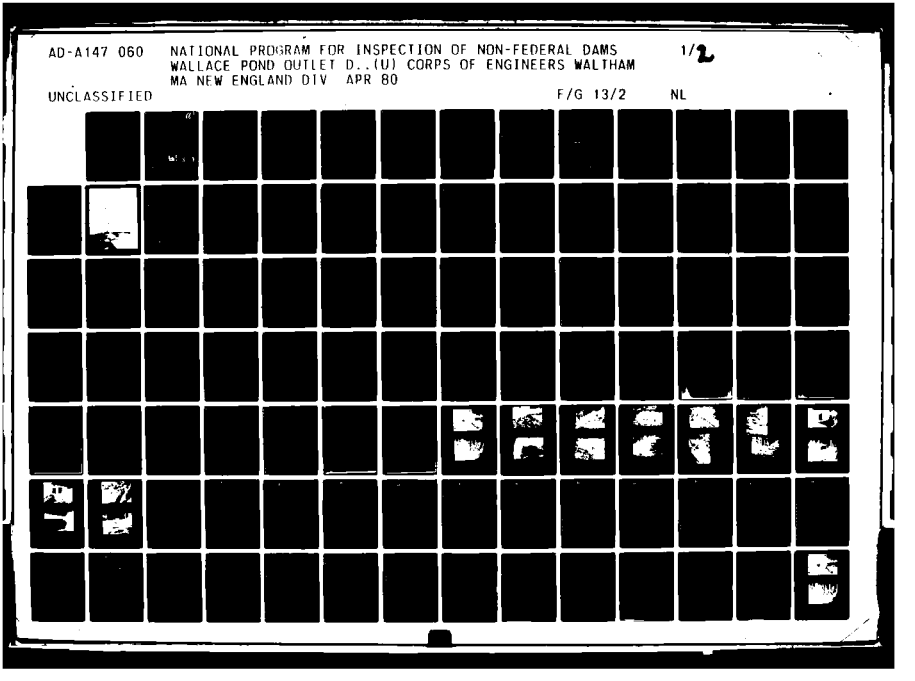
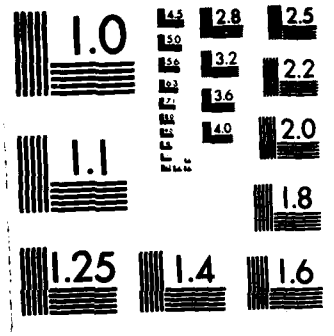
AD-A147 060 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 1/2
WALLACE POND OUTLET D..(U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV APR 80

UNCLASSIFIED F/G 13/2 NL





MASSACHUSETTS COASTAL AREA

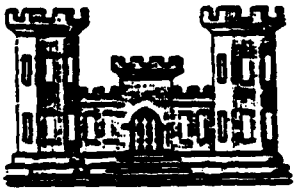
GLOUCESTER, MASSACHUSETTS

# WALLACE POND OUTLET DAM
# MA 00162



## PHASE I INSPECTION REPORT
## NATIONAL DAM INSPECTION PROGRAM







DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154



APRIL 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|---|
| 1. REPORT NUMBER<br>MA 00162 | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE (and Subtitle)<br>Wallace Pond Outlet Dam<br><br>NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS | | 5. TYPE OF REPORT & PERIOD COVERED<br>INSPECTION REPORT<br>6. PERFORMING ORG. REPORT NUMBER |
| 7. AUTHOR(s)<br>U.S. ARMY CORPS OF ENGINEERS<br>NEW ENGLAND DIVISION | | 8. CONTRACT OR GRANT NUMBER(s) |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br>DEPT. OF THE ARMY, CORPS OF ENGINEERS<br>NEW ENGLAND DIVISION, NEDED<br>424 TRAPELO ROAD, WALTHAM, MA. 02254 | | 12. REPORT DATE<br>April 1980<br>13. NUMBER OF PAGES<br>65 |
| 14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) | | 15. SECURITY CLASS. (of this report)<br>UNCLASSIFIED<br>15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

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

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Mass. Coastal Area,
Gloucester, Mass.

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

Wallace Pond Outlet Dam, is a 220 feet long earth embankment dam with a hydraulic height of approximately 22 feet. It contains a 15 foot long by 1.6 foot high stone masonry spillway near the left abutment. The dam is in fair condition. THe dam has a size classification of small and a hazard potential of high. The test flood chosen would be ½ the PMF.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED-E

JUN 19 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts

Dear Governor King:

Inclosed is a copy of the Wallace Pond Outlet Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Wallace Pond Outlet Dam would likely be exceeded by floods greater than 17 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

NEDED-E
Honorable Edward J. King

I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. This report has also been furnished to the owner of the project, the city of Gloucester, Massachusetts.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, 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 the cooperation extended in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

NATIONAL DAM INSPECTION PROGRAM
PHASE I INVESTIGATION REPORT
BRIEF ASSESSMENT

Identification No.: MA 00162

Name of Dam: Wallace Pond Outlet Dam

City: Gloucester

County and State: Essex County, Massachusetts

Stream: Off Stream Tributary of Little River

Date of Inspection: November 1, 1979

Wallace Pond Outlet Dam is a 220± feet long earth embankment dam with a hydraulic height of approximately 22 feet. It contains a 15 foot long by 1.6 foot high stone masonry spillway near the left abutment. The dam was probably built during the mid 1800's, but the exact date is unknown. The dam has always been owned and operated by the City of Gloucester, as part of their water supply system.

The visual inspection generally indicates the dam to be in fair condition. Seepage was observed at the downstream toe area when the level of the pond was high. Trees were observed growing on the downstream side slope, the toe area and the spillway discharge channel. Debris was observed at the spillway approach channel and at the stone culvert which channels the spillway flow underneath a downstream railroad embankment.

Since there was no indepth engineering data available, the condition of the dam was primarily evaluated by visual inspection, past performance history and sound engineering judgement.

The dam has a size classification of small and a hazard potential of high. Based upon Corps Guidelines, the test flood would be in the 1/2 to full PMF range. The test flood chosen was the 1/2 PMF, which would produce an inflow of 390 cfs from the 0.26 s.m. drainage area.

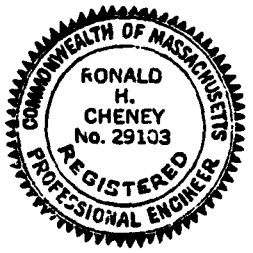
Considering the initial pool level to be at elevation 58.4, spillway crest, the routed test flood outflow of 255 cfs would overtop the dam embankment by 0.3 foot, to elevation 60.3 (NGVD). The spillway discharge would be about 85 cfs, or 33 percent of the routed test flood outflow.

It is recommended that the Owner engage a qualified registered professional engineer to investigate the following: 1) perform a detailed hydraulic hydrologic study to determine the potential for overtopping the dam, the need for increasing spillway capacity and providing an adequate outlet channel; 2) investigate the seepage at the downstream toe of the dam; 3) determine procedures for removing trees growing at the dam embankment and downstream toe area and selection of suitable backfill for resulting holes; 4) perform a seismic stability investigation of the dam.

Furthermore, the Owner should institute remedial measures including clearing of brush and on the slopes, toe area and spillway channel; removal of debris at the spillway approach and at the stone culvert located downstream at the railroad embankment; repair of the collapsed portion of the right spillway training wall; reset and point the stone masonry spillway; repair of erosion on the slopes of the screen structure embankment;

install a gate valve on the 16 inch water supply intake pipe upstream of the dam; institute a program of annual technical inspection and establishment of a formal warning system for alerting downstream residents in case of emergency.

The above recommendations and remedial measures should be instituted by the Owner within one year of receipt of this Phase I Inspection Report.




Ronald H. Cheney

Ronald H. Cheney, P.E.
Vice President

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

This Phase I Inspection Report on Wallace Pond Outlet 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.

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, MEMBER
Foundation & Materials Branch
Engineering Division

CARNEY M. TERZIAN, CHAIRMAN
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

## PREFACE

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

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

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

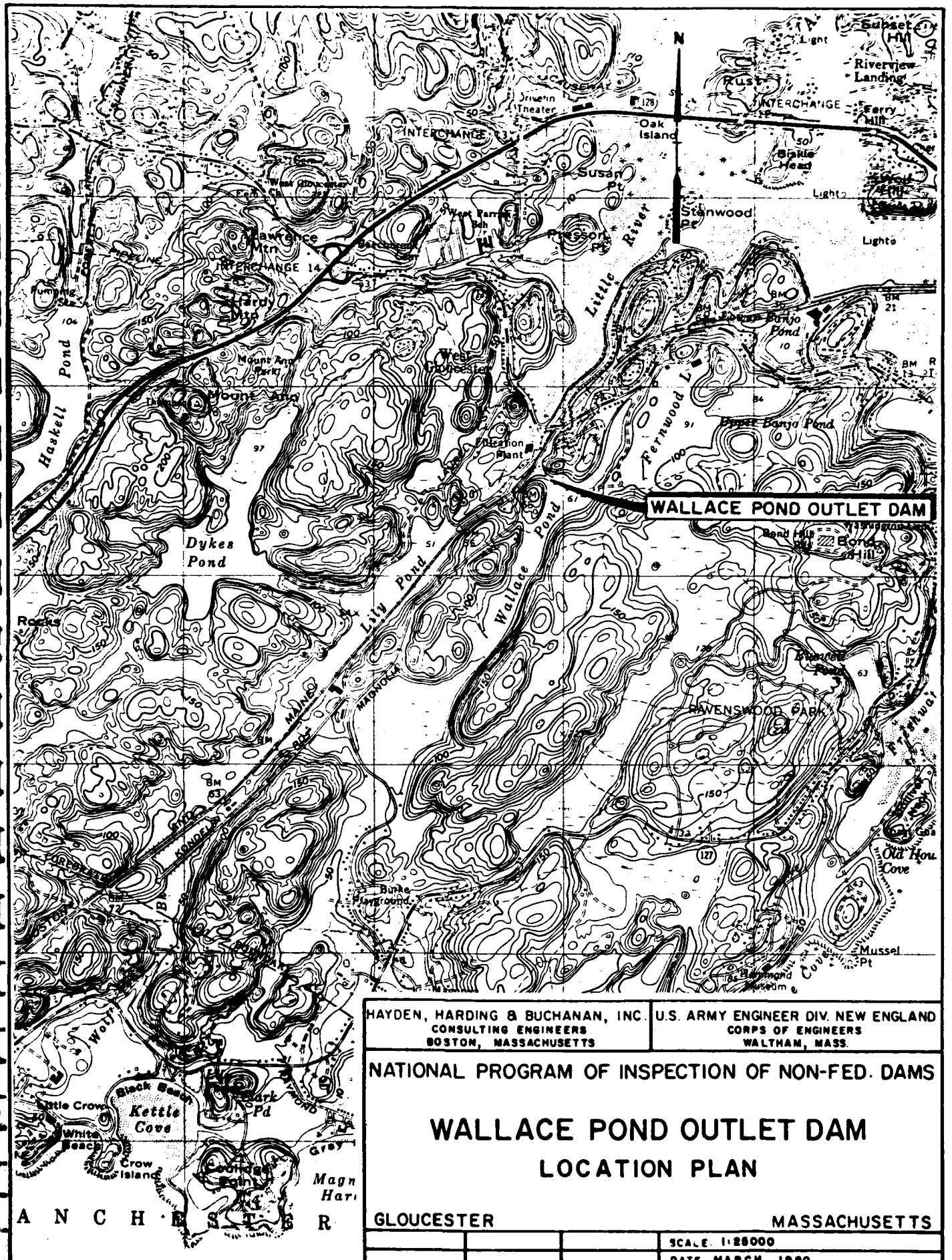
assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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

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

## TABLE OF CONTENTS

## APPENDIXES




| | |
|---|---|
| HAYDEN, HARDING & BUCHANAN, INC.<br>CONSULTING ENGINEERS<br>BOSTON, MASSACHUSETTS | U.S. ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASS. |

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

# WALLACE POND OUTLET DAM

## LOCATION PLAN

GLOUCESTER MASSACHUSETTS

| | | | |
|---|---|---|---|
| | | | SCALE 1:25000 |
| | | | DATE MARCH, 1980 |

PHASE I
NATIONAL DAM INSPECTION PROGRAM

## 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 Hayden, Harding & Buchanan, Inc. under a letter of 24 October 1979 from William E. Hodgson Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0006 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.

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

## 1.2 Description of Project

### a. Location

Wallace Pond Outlet Dam is located in the City of Gloucester, in Essex County, Massachusetts. The pond is located to the south of the Magnolia Avenue - State Route 133 intersection. The dam is shown on the Gloucester, Massachusetts U.S.G.S. Quadrangle, having the approximate coordinates of North 42°36'29", West 70°42'26".

### b. Description of Dam and Appurtenances

Wallace Pond Outlet Dam is a 22 foot high, 220 foot long earth embankment structure with an approximate 15 foot long masonry spillway, and a concrete screen structure for housing the screens used in water supply. See plans in Appendix B.

The earth embankment dam has a 20+ foot wide crest, at approximately elevation 60. The upstream side slopes are inclined at an approximate 2H:1V slope. The downstream side slopes are inclined at about 2H:1V. The screen house is located approximately 50 feet downstream of the crest. It is a 17 by 13 foot concrete structure approximately 40 feet high. The lower 32+ foot portion of this well type structure is located below an earth fill embankment, photograph 11. The top of this embankment is at elevation 62 and the side slopes are inclined at approximately 2H:1V. A 16 inch ductile iron intake pipe is located approximately 60 feet upstream of the crest. This line traverses below the dam embankment into the screen house, and then connects to the City's water supply system at Magnolia Avenue. There is a gate valve located approximately 5 feet upstream of the screen

structure on the 16 inch water supply pipe. According to plans dated 1977 the screen structure also contains a manually operated butterfly valve for controlling the 16 inch line.

There is also a 16 inch water transmission line from Bond Hill Reservoir which traverses under the dam to the right side of the screen house. Flow through this line is controlled by a series of gates at upstream Bond Hill Reservoir and at the treatment plant.

An area of high ground located at the southern end of Wallace Pond prevents any discharge to a large swampy area beyond it. The top of this natural "dike" is at elevation 60±.

c. Size Classification

Size classification is based upon hydraulic height and storage capacity. The Corps Guidelines range for a small size classification are between 50 to 1000 a-f of storage capacity and a hydraulic height of between 6 to 40 feet. The dam has a small size classification based on its storage capacity of 136 acre feet and its height of 22 feet.

d. Hazard Classification

The hazard potential is classified as high due to the potential for loss of more than a few lifes and excessive property damage from dam failure flooding. Based on Corps Guidelines, the outflow from the dam failure is 9,025+ cfs. The impact area along the brook adjacent to Magnolia Avenue contains several residential structures and a filtration plant, that could be inundated by flood stages of 1 to 5 feet deep. Several homes,

the filtration plant, several roads and a line of the B&M Railroad are located in the impact area.

e. Ownership

The dam is owned by the City of Gloucester, Massachusetts 01930.

f. Operator

The dam is maintained and operatored by the City of Gloucester, Department of Public Works Water Division. Mr. Robert Martinack is the present Director of the Water Division. The address is City of Gloucester, DPW, City Hall, Gloucester, Massachusetts 01930. Telephone (617) 283-5940.

g. Purpose of Dam

The purpose of this dam has always been for public water supply.

h. Design and Construction History

Information pertaining to the original design and construction of the dam could not be found. A screen structure and pipeline was constructed at the dam in 1978. This pipeline replaced an existing line from the dam to the City's water supply system. The engineering for this project was performed by Metcalf and Eddy, Inc., Boston, Massachusetts.

i. Normal Operational Procedures

The 16 inch intake line into the screen structure is kept open when Gloucester Water Supply System is drawing from Wallace Pond. Otherwise the valve located upstream of the screen structure is closed. The reservoir's water level normally varies between elevations 54 to 58.

## 1.3 Pertinent Data

### a. Drainage Area

Wallace Pond, which is used as a water supply reservoir, has a drainage area of 0.26 s.m. (166 acres). It is located in a narrow valley surrounded by steeply sided hills to the north, east, and west, and a large swampy area to the south. The area is basically rock outcropping with a thin soil cover. The swampy area to the south is separated from the pond by a ridge between the surrounding hills and drains away from the pond into a small stream beyond Magnolia Avenue. There are several houses on one road within the northern limit of the drainage area. See drainage area map in Appendix D.

### b. Discharge at Damsite

#### 1. Outlet Works

Discharge to the town water supply is through a 16 inch D.I. pipe. The invert of this pipe at the screen house is at elevation 37.7. Flow within the pipeline can be controlled by a gate valve located approximately 5 feet upstream of the screen house, a controlling valve indicated on the 1977 plans to be within the screen house, and valves inside a bypass structure located on the pipeline about 180 feet downstream of the screen house. Gravity flow through this pipe (with all valves open) could reach a maximum of 35 cfs.

#### 2. Maximum Known Flood

There is no data available concerning the maximum known flood at the Wallace Pond Outlet Dam. U.S. Weather Bureau records indicate that between September 17 to 22, 1938, and between August 17 to 20, 1955, about 6 inches and 8 inches, respectively, of rainfall occured near the project location.

3. Ungated Spillway Capacity at Top of Dam

The spillway capacity with the resevoir level at the top of dam, elevation 60, is 85 cfs.

4. Ungated Spillway Capacity at Test Flood Elevation

The spillway capacity at the routed test flood elevation of 60.3 is 85 cfs or 33 percent of test flood outflow.

5. Total Project Discharge at Test Flood Elevation

The total routed project discharge at the test flood elevation of 60.3 is 255 cfs.

c. Elevation (feet above NGVD - approximate only)

(1) Streambed at toe of dam ---------- 38±

(2) Bottom of cutoff ---------- Unknown

(3) Maximum tailwater ----------Unknown

(4) Normal pool ---------- 57.0±

(5) Full flood control pool ---------- N/A

(6) Spillway crest ---------- 58.4

(7) Design surcharge (Original Design) -------- Unknown

(8) Top of dam ---------- 60

(9) Test flood surcharge ---------- 60.3

d. Reservoir (Length in feet)

(1) Normal pool ---------- 3600± (elevation 57±)

(2) Spillway crest pool ---------- 3600±

(3) Top of dam ---------- 3900±

(4) Test flood pool ---------- 3900±

(5) Flood control pool ---------- N/A

e. Storage (acre-feet)

(1) Normal pool ---------- 78

(2) Spillway crest pool ---------- 95+

(3) Top of dam ---------- 136±

(4) Test flood pool ---------- 143±

(5) Flood control pool ---------- N/A

f. Reservoir Surface (acres)

(1) Normal pool ---------- 22±

(2) Spillway crest ---------- 23+

(3) Test flood pool ---------- 26±

(4) Top of dam ---------- 26±

(5) Flood-control pool ---------- N/A

g. Dam

(1) Type ---------- gravity, earth embankment

(2) Length ---------- 220'±

(3) Height ---------- 22'

(4) Top Width ---------- 20'

(5) Side Slopes -------- U.S. approx. 2H:1V; D.S. 2H:1V
screen house embankment 2H:1V

(6) Zoning ---------- Unknown

(7) Impervious Core ---------- Unknown

(8) Cutoff ---------- Unknown

(9) Grout curtain ---------- Unknown

h. Diversion and Regulating Tunnel ---------- None

i. Spillway

(1) Type ---------- broad crested weir

(2) Length of weir ---------- 15'

(3) Crest elevation ---------- without flashboards 58.4

(4) Gates ---------- None

(5) U/S Channel ---------- opens directly to pond

(6) D/S Channel -------- discharges into partially rock lined D/S face of dam; riprap placed on bottom 4 feet of slope for screen house embankment

j. Regulating Outlets

The regulating outlet for the Wallace Pond Dam consists of a 16 inch D.I. pipe connected to the City's water supply system. The 16 inch water supply pipe has an invert elevation of 37.7 at the screen house. Flow through the pipe to a transferpump station near the filtration plant can be controlled by gate valves located upstream of and within the screen structure; at the bypass structure about 180 feet downstream of the screen house; and just upstream of screen structure. This pipe could be used as a drain for the pond. See the engineering drawings in Appendix B.

## SECTION 2

## ENGINEERING DATA

### 2.1 Design Data

Design calculations were not located and no information was found indicating who designed the dam. A screen house and new pipeline were completed at the dam in 1979. Design plans and specifications, dated October, 1977, by Metcalf and Eddy, Inc., Boston, Massachusetts, the engineering consultants for this work, were obtained from the office of the City Engineer.

### 2.2 Construction Data

No construction data was located pertaining to the dam. Between late 1978 and 1979, a screen house and pipeline were built at the project as noted above.

### 2.3 Operation Data

No operational manual exists for this dam.

### 2.4 Evaluation of Data

a. Availability

Plans and specifications by Metcalf and Eddy for the screen house and pipeline were obtained from the office of City Engineer for Gloucester. No additional engineering data was located regarding the Wallace Pond Outlet Dam. No County or `State Inspection Reports were available for this dam.

b. Adequacy

No indepth engineering data was made available. This, therefore, does not permit a structual and hydraulic assessment of the dam from the standpoint of review of design calculations but must be based primarily on the visual inspection, past performance history, and sound engineering judgement.

c. Validity

The visual inspection of this facility showed no reason to question the validity of the information as shown on the plans obtained from the City.

## SECTION 3

## VISUAL INSPECTION

### 3.1 Findings

#### a. General

At the time of the original inspection on November 1, 1979, the water level in the reservoir was about 8 feet below the spillway crest. A subsequent visit was made on December 15, 1979, at which time the reservoir level was about 1 foot below the spillway crest.

#### b. Dam

The dam is an earth embankment with a stone masonry spillway at the left abutment. A screen structure is located in an earth embankment abutting the downstream side of the dam embankment in approximately the center of the dam. The screen structure houses outlet works for a water supply line. Bedrock outcrops are at the left abutment of the dam.

##### Upstream Slope

The upstream slope of the dam is protected by riprap up to about 3-4 feet below the crest, as shown in photograph 3. The riprap is in generally good condition; however, occasional windows were observed in the riprap, as can be seen in photograph 3. The upper 3-4 feet of the upstream slope above the riprap is overgrown with brush.

##### Crest

The crest of the dam is covered with grass which is in good condition, as shown in photograph 4. No evidence of cracking or misalignment was observed.

Downstream Slope

The downstream slope of the dam to the left of the screen structure embankment is overgrown with brush and a few small trees as shown in photograph 6. Several trees are also growing at the downstream toe. The downstream slope to the right of the screen structure embankment is covered with light brush and numerous stones, as shown in photograph 7.

Seepage was observed at the downstream toe of the dam to the left of the screen structure embankment, photograph 5. The seepage area appears to be in the spillway discharge channel, which is poorly defined in this area. No flowing water was observed at the time of the original inspection when the reservoir level was low; however, seepage flow was observed during the subsequent visit when the reservoir level was near the spillway crest. The seepage was clear, with no visible evidence of suspended soil particles.

Seepage flow was also observed from a seep located at the junction of the downstream toe of the dam and the left side of the screen structure embankment, photographs 10 and 11. Seepage was not observed at this location during the original inspection, but was noted during the subsequent visit when the reservoir level was higher. The seepage at this location also appeared to be clear.

Standing water was observed on the right side of the access roadway near the right abutment, as shown in photograph 8. It is not known whether this water is from seepage or from local runoff.

c. Appurtenant Structures

Spillway

The spillway section is located at the left abutment, as shown in photograph 1. The floor of the spillway channel is bare soil with no lining to protect against erosion; however, the soil in the floor of the channel does not appear to be highly susceptible to erosion. There is a stone masonry weir at the spillway crest, as shown in photograph 9. The spillway originally contained provisions for flashboards. However, the deteriorated condition of the metal pins at the crest now restricts their usage. The floor of the spillway approach channel is strewn with several large pieces of driftwood, as is visible in the photographs.

The right spillway training wall is constructed of mortared stone masonry. The upstream end of the right spillway training wall is collapsed. A bedrock outcrop at the left abutment forms the left wall of the spillway, as shown in photograph 1. The bedrock is jointed and blocky, and appears to have eroded back about 20 feet into the abutment at the centerline of the dam. The apparent erosion is above the crest elevation. No loose rock that might fall and block the spillway was observed.

Several trees are growing in the spillway outlet channel which could obstruct the spillway discharge.

Screen Structure

A screen structure housing an outlet for water supply is located in an earth embankment abutting the downstream side of the dam embankment in approximately the center of the dam. The

screen structure was added subsequent to the original construction of the dam, and construction specifications and drawings for the structure are available. All control valves for the 16 inch water supply pipe are reported operable. There is no indication of a control valve for this pipe at the upstream intake. The screen structure was observed to be in good condition.

The downstream spillway channel passes close to the toe of the screen structure embankment on the left side of the screen structure. The toe of the embankment is protected with riprap in this area. The remainder of the embankment slopes are bare soil, and numerous erosion gullies have formed on the unprotected slopes.

d. Reservoir Area

There are no indications of instability along the banks of the reservoir in the vicinity of the dam.

e. Downstream Channel

The downstream spillway channel is shown in photograph 2. The channel is irregular and is poorly defined in the area immediately downstream from the dam. Several trees are growing in the channel in the vicinity of the downstream toe of the dam.

Approximately 300 feet downstream from the dam the channel empties into a stone outlet which passes underneath a railroad embankment. The entrance to the stone outlet is choked with debris as shown in photograph 17. After passing below the railroad embankment, the channel enters a concrete pipe and passes underneath Magnolia Avenue to the Little River.

## 3.2 Evaluation

The visual inspection indicates the dam to be in generally fair condition.

The water observed at the downstream toe of the dam may be the result of seepage conditions which, if not controlled, could lead to failure of the dam.

The trees growing on the downstream slope and at the downstream toe of the dam could cause seepage or erosion problems if a tree blows over and pulls out its roots or if a tree dies and rotting roots provide pathways for seepage which could lead to internal erosion of the embankment.

The large driftwood in the spillway intake channel and the trees growing in the spillway discharge channel could impair the functioning of the spillway during large flows.

Collapse of the upstream end of the right spillway training wall could lead to erosion of the embankment during high flows. Debris blocking the stone oulet which channels the spillway flow underneath a railroad embankment downstream from the dam could cause backwater erosion at the toe of the embankment.

The spillway, approach and discharge channel are in need of repair. The stone masonry spillway needs resetting and pointing. The channels should be cleared and reshaped and lined to prevent possible erosion.

There is no indication of an upstream control valve for the 16 inch water supply pipe. Should this pipe break, while under pressure, subsequent piping failure of the dam could ensue. Means should be provided for shutting this pipe off upstream of the embankment.

## SECTION 4

## OPERATIONAL AND MAINTENANCE PROCEDURES

### 4.1 Operational Procedures

#### a. General

The Wallace Pond Outlet Dam is owned by the City of Gloucester. The gate valve upstream of screen structure is opened when the City water supply system is drawing from Wallace Pond. Otherwise the valve is closed.

#### b. Description of Warning Systems

There are no warning systems at this dam.

### 4.2 Maintenance Procedures

#### a. General

The City of Gloucester is responsible for the maintenance of this dam. The dam and its appurtenant structures are checked by employees of the City.

#### b. Operating Facilities

There is no formal maintenance procedure for this structure. As the dam is used for water supply purposes, any deficiencies in the operational facilities should be detected during normal operation.

### 4.3 Evaluation

There are no formal written operational or maintenance procedures. The spillway, approach and discharge channels need repairs. Brush and tree growth should be removed. The owner should institute a program of annual technical inspection.

## SECTION 5

## EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

### 5.1 General

Wallace Pond Outlet Dam is located in the southwestern section of the City of Gloucester, Massachusetts, near the water treatment plant. The structure is used to impound runoff from the surrounding hills for water supply purposes. At the top of dam, elevation of 60, it has a storage capacity of 136 acre-feet and a surface area of approximately 26 acres.

The pond has a drainage area of 0.26 square miles (166 acres). This area is composed of undeveloped hills which drain to the pond. A large swamp is located directly southwest of the pond. However outflow from the pond to the swamp is prevented by natural high ground at the southern end of the dam. This area has a minimum elevation of approximately 60.

The outlet works and dam are located on the western side at the northern end of the pond. A 16 inch ductile iron water pipe runs under the dam, through a screen house, and to a transfer pumping station on Magnolia Avenue. Flow through the pipe can be controlled by gate valves. A small 15 foot long by 1.6 foot high spillway is located on the southern end (left abutment) of the dam. The spillway discharges into an unlined channel which flows through a small culvert under a railroad line and Magnolia Avenue and into a brook behind the water filtration plant. A map of the drainage area along with plans and sketches of the structure and

the spillway is contained in Appendix B and D. Additional information on the drainage area and reservoir can be found in Sections 1.2 and 1.3. Photographs of the project are shown in Appendix C.

## 5.2 Design Data

No design data were located for the original facility. Design plans for the screen structure and pipeline were obtained from the City Engineer.

## 5.3 Experience Data

Records pertaining to past flood events and possible overtopping of the dam could not be found. Information from the U.S. Weather Bureau indicates that, in the area near Wallace Pond, 6 inches of rainfall fell during September 17 to 22, 1938, and 8 inches occurred from August 17 to 20, 1955.

## 5.4 Test Flood Analysis

The dam has a small size classification and a high hazard potential. Based upon Corps Guidelines, the test flood would be in the 1/2 to full PMF range. The test flood inflow using 1/2 PMF was determined to be 390 cfs. Runoff from the small 0.26 square mile drainage area is beyond the 2.0 square mile lower limit of the Corps Guidelines chart for runoff. For these small drainage areas, test flood runoff rates are based upon 3000 cfs per square mile. There are several structures within the dam failure impact area, thus the 1/2 PMF test flood was used.

The only outlet for the test flood is the stone masonry spillway at the southern end of the dam. There are no provisions for stoplogs and the pins for installing flashboards on the

spillway were found to be mostly rusted away during the field inspection. The spillway has a maximum capacity of 85± cfs before the dam, crest elevation of 60, would be overtopped. Photographs 1 and 12 in Appendix C show various aspects of this structure. Hydraulic calculations for the spillway are contained in Appendix D.

With an initial reservoir water level at the spillway crest, elevation 58.4, the test flood inflow of 390 cfs would surcharge Wallace Pond by 1.9 feet to elevation 60.3. This would overtop the dam by about 0.3 feet. The routed test flood outflow is approximately 255 cfs. The spillway could handle about 33 percent of this routed outflow.

About 70 cfs of the routed test flood outflow would overtop the natural high ground at the southern end of the pond. This discharge would be retained in a swamp below this area. The remaining test flood outflow would be over the crest of the dam. The pond would provide storage for 2.9 inches or 143 acre-feet of runoff.

5.5 Dam Failure Analysis

The failure analysis was performed assuming an initial reservoir water elevation of 60, top of dam. The dam has a hydraulic height of 22 feet and a maximum storage capacity of 135 acre-feet. Immediately prior to dam failure, the spillway would be releasing approximately 85 cfs. This discharge would not produce significant flooding (depth less than 1 foot deep) or damage to downstream areas.

Approximately 380 feet downstream of the dam, a 14± foot high railroad embankment crosses the potential impact area. The embankment has a 10.5 foot high by 15.5 foot wide opening for the access road to the dam. The top of this embankment is approximately 12 feet below the top of the dam. In the event of failure of Wallace Pond Outlet Dam, the railroad embankment could act as a secondary dam and both reduce and retard the failure outflow from Wallace Pond. The structural integrity of this embankment is not known, and its failure, as a result of the failure flood could occur.

Based on Corps "rule of thumb" guidance, the failure of the dam would result in a peak outflow of 9,025 cfs. If the railroad embankment did not fail (but acted as a "dam" with a 10.5 by 15.5 foot outlet), this failure outflow could be reduced to 2,235 cfs. In our analysis we assumed the embankment has failed, thus creating an unrestricted failure discharge condition. A home and a barn located between the dam and railroad would be inundated by about 13 feet of water. Beyond the railroad line, portions of the filtration plant and one home would be flooded by 3 feet of water, about 5 additional homes (along Magnolia Avenue) would be inundated by 1 to 3 feet, and Magnolia Avenue and Essex Avenue would be overtopped by about 3 feet of water. Failure flooding depth includes initial fllod depth from the 85 cfs spillway discharge. Loss of more than a few lifes and excessive property damages could occur as a result of the failure of this dam thereby providing for a high hazard classification.

## SECTION 6

## EVALUATION OF STRUCTURAL STABILITY

### 6.1 Visual Observations

The visual inspection indicates the following potential structural problems:

a. The presence of seepage at the downstream toe of the embankment adjacent to the spillway channel may, if not controlled, lead to failure of the dam by piping.

b. Collapse of the right training wall of the spillway could result in erosion of the embankment during periods of high water.

c. Trees growing on the toe of the embankment could cause seepage or erosion problems if a tree is blown over and pulls out its roots or if a tree dies and its roots rot.

d. The 16 inch water supply pipe is not controlled through an upstream valve. Should this pipe break, while under pressure, subsequent piping failure of the dam could ensue.

### 6.2 Design and Construction Data

No original design and construction data are available for the dam.

### 6.3 Post-Construction Changes

Design drawings and construction specifications are available for the screen structure which was added subsequent to the original construction of the dam. The specifications contain the log of a single boring located at the downstream toe of the dam

embankment approximately in the center of the dam. The boring log shows dense widely-graded silty sand and gravel with cobbles and boulders, underlain by granite bedrock at a depth of 20.5 feet. The drawings and specifications were prepared by Metcalf and Eddy Engineers and are dated October 1977.

6.4 Seismic Stability

The dam is located in Seismic Zone 3 and, in accordance with the recommended Phase I guidelines, warrants seismic investigation. No record of seismic investigations were available.

## SECTION 7

## ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

### 7.1 Dam Assessment

a. Condition

Based on a visual inspection, the dam is judged to be in generally fair condition.

b. Adequacy

The available information, along with the visual inspection is adequate for a Phase I level investigation.

c. Urgency

The recommendations and remedial measures presented below should be implemented by the Owner within one year after receipt of this Phase I inspection report.

### 7.2 Recommendations

The Owner should engage a qualified registered professional engineer to implement the following:

a. Investigate the seepage occurring at the downstream toe of the dam and design remedial measures if needed.

b. Determine procedures for removal of trees growing on the dam embankment and within 10 feet of the downstream toe and to assist in the selection of suitable fill materials for backfilling of the voids left in the embankment after removal of the tree root systems.

c. Perform a seismic stability investigation of the dam.

d. Perform a detailed hydraulic/hydrologic study to determine the potential for overtopping the dam and need for

increasing spillway capacity. Also to provide an adequate outlet channel from the spillway and under the downstream railroad embankment, extending to the Little River.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Brush should be cleared from the slopes of the dam and from the area within 10 feet of the downstream toe.

2. The large driftwood in the spillway intake area should be removed.

3. The collapsed portion at the upstream end of the right spillway training wall should be repaired. Reset and point the stone masonry spillway.

4. Trees and brush growing in the downstream spillway channel should be cut.

5. The debris blocking the stone outlet structure at the railroad embankment downstream from the dam should be removed.

6. The erosion on the slopes of the screen structure embankment should be repaired, and grass should be planted where unprotected soil is exposed.

7. The owner should institute a program of annual technical inspection.

8. A formal warning system should be developed to alert downstream residents in case of emergency.

9. The Owner should prepare a formal operational procedure and maintenance program for the dam.

10. A shut-off valve for the intake pipe should be provided on the upstream side of the dam.

7.4 Alternatives

There are no practical alternatives for these recommendations.

# APPENDIX A

# INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT WALLACE POND OUTLET DAM

DATE Nov. 1, 1979*

TIME 11 am

WEATHER Cool (~50°), Sunny

W.S. ELEV. 52+ U.S. ____ DN.S.

PARTY:

1. R. Cheney, HHB
2. D. Vine, HHB
3. D. LaGatta, GEI
4. D. Shields, GEI
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____

| | PROJECT FEATURE | INSPECTED BY | REMARKS |
|---|---|---|---|
| 1. | Dam Embankment | D. LaGatta, D. Shields | |
| 2. | Screen Structure | All | |
| 3. | Spillway | All | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |

*A further inspection was performed on December 15, 1979.

PERIODIC INSPECTION CHECKLIST

PROJECT WALLACE POND OUTLET DAM DATE Nov. 1, 1979

PROJECT FEATURE Embankment Dam NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney
Structural Engineer

| AREA EVALUATED | CONDITION |
|---|---|
| DAM EMBANKMENT | |
| Crest Elevation | 60± |
| Current Pool Elevation | 52± (59± - Dec. 15, 1979) |
| Maximum Impoundment to Date | Unknown |
| Surface Cracks | None observed. |
| Pavement Condition | No pavement, grass covered. |
| 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. |
| Trespassing on Slopes | No indications observed. |
| Sloughing or Erosion of Slopes or Abutments | Bedrock at left abutment appears to have eroded back approx. 20 ft at centerline of dam; the apparent erosion is above crest elevation. |
| Rock Slope Protection - Riprap Failures | Riprap in generally good condition, occasional windows observed. |
| Unusual Movement or Cracking at or Near Toe | None observed. |
| Unusual Embankment or Downstream Seepage | Seepage observed at the downstream toe to the left of the screen structure. |
| Piping or Boils | None observed. |
| Foundation Drainage Features | None observed. |
| Toe Drains | None observed. |
| Instrumentation System | None. |
| Vegetation | Brush on slopes. Trees growing on downstream slope and at downstream toe to the left of the screen structure. |

PERIODIC INSPECTION CHECKLIST

PROJECT WALLACE POND OUTLET DAM DATE Nov. 1, 1979

PROJECT FEATURE Intake Structure NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

| AREA EVALUATED | CONDITION |
|---|---|
| OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE | Intake not visible, under water. |
| 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 | The concrete screen structure located downstream of the embankment crest is essentially the inlet-outlet control structure. It is of recent construction in good condition. |
| Condition of Concrete | |
| Stop Logs and Slots | |

PERIODIC INSPECTION CHECKLIST

PROJECT WALLACE POND OUTLET DAM DATE Nov. 1, 1979

PROJECT FEATURE Control Tower NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

| AREA EVALUATED | CONDITION |
|---|---|
| OUTLET WORKS - CONTROL TOWER | |
| a. Concrete and Structural | There is no control tower. |
| 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 | |
| b. Mechanical and Electrical | |
| Air Vents | |
| Float Wells | |
| Crane Hoist | |
| Elevator | |
| Hydraulic System | |
| Service Gates | |
| Emergency Gates | |
| Lightning Protection System | |
| Emergency Power System | |
| Wiring and Lighting System | |

PERIODIC INSPECTION CHECKLIST

PROJECT WALLACE POND OUTLET DAM DATE Nov. 1, 1979

PROJECT FEATURE Transition & Conduit NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

| AREA EVALUATED | CONDITION |
|---|---|
| OUTLET WORKS - TRANSITION AND CONDUIT | There is no transition or conduit. |
| General Condition of Concrete | |
| Rust or Staining on Concrete | |
| Spalling | |
| Erosion or Cavitation | |
| Cracking | |
| Alignment of Monoliths | |
| Alignment of Joints | |
| Numbering of Monoliths | |

PERIODIC INSPECTION CHECKLIST

PROJECT WALLACE POND OUTLET DAM DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

| AREA EVALUATED | CONDITION |
|---|---|
| OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL | Water outlets through a water supply pipeline. The concrete screen structure is described on Page A-4. |
| General Condition of Concrete | |
| Rust or Staining | |
| Spalling | |
| Erosion or Cavitation | |
| Visible Reinforcing | |
| Any Seepage or Efflorescence | |
| Condition at Joints | |
| Drain holes | N/A |
| Channel | N/A |
| Loose Rock or Trees Overhanging Channel | N/A |
| Condition of Discharge Channel | N/A |

PERIODIC INSPECTION CHECKLIST

PROJECT WALLACE POND OUTLET DAM DATE Nov. 1, 1979

PROJECT FEATURE Spillway NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

| AREA EVALUATED | CONDITION |
|---|---|
| OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS | |
| a. Approach Channel | |
| General Condition | Fair. Some blockage by driftwood. |
| Loose Rock Overhanging Channel | None observed. |
| Trees Overhanging Channel | None. |
| Floor of Approach Channel | Soil floor - no erosion protection. Floor of approach channel strewn with large driftwood. |
| b. Weir and Training Walls | |
| General Condition of Concrete | The masonry spillway is in fair to poor condition. Portions of the right training wall has collapsed. The metal pins on the weir are rusted and are not capable of being used to support stoplogs. |
| Rust or Staining | |
| Spalling | |
| Any Visible Reinforcing | |
| Any Seepage or Efflorescence | |
| Drain Holes | None. |
| c. Discharge Channel | |
| General Condition | Poor. |
| Loose Rock Overhanging Channel | None. |
| Trees Overhanging Channel | Trees growing in discharge channel, could impair spillway flow. |
| Floor of Channel | Soil floor - no erosion protection. |
| Other Obstructions | Stone outlet at railroad embankment approx. 300 ft downstream from dam is blocked with debris. |

PERIODIC INSPECTION CHECKLIST

PROJECT WALLACE POND OUTLET DAM DATE Nov. 1, 1979

PROJECT FEATURE Service Bridge NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

| AREA EVALUATED | CONDITION |
|---|---|
| OUTLET WORKS - SERVICE BRIDGE | |
| a. Super Structure | There is no service bridge. |
| Bearings | |
| Anchor Bolts | |
| Bridge Seat | |
| Longitudinal Members | |
| Underside of Deck | |
| Secondary Bracing | |
| Deck | |
| Drainage System | |
| Railings | |
| Expansion Joints | |
| Paint | |
| b. Abutment & Piers | |
| General Condition of Concrete | |
| Alignment of Abutment | |
| Approach to Bridge | |
| Condition of Seat & Backwall | |

# APPENDIX B

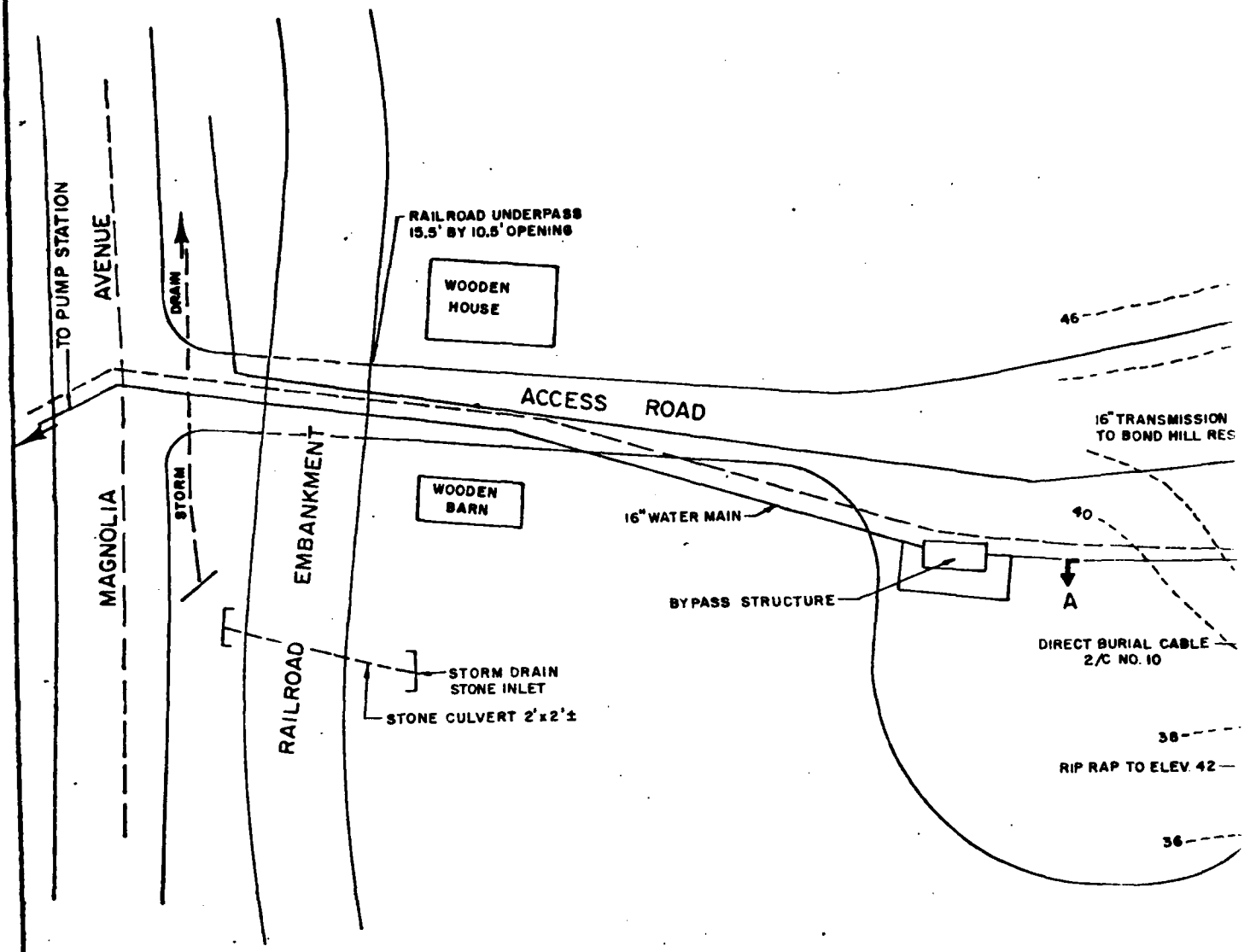
# ENGINEERING DATA

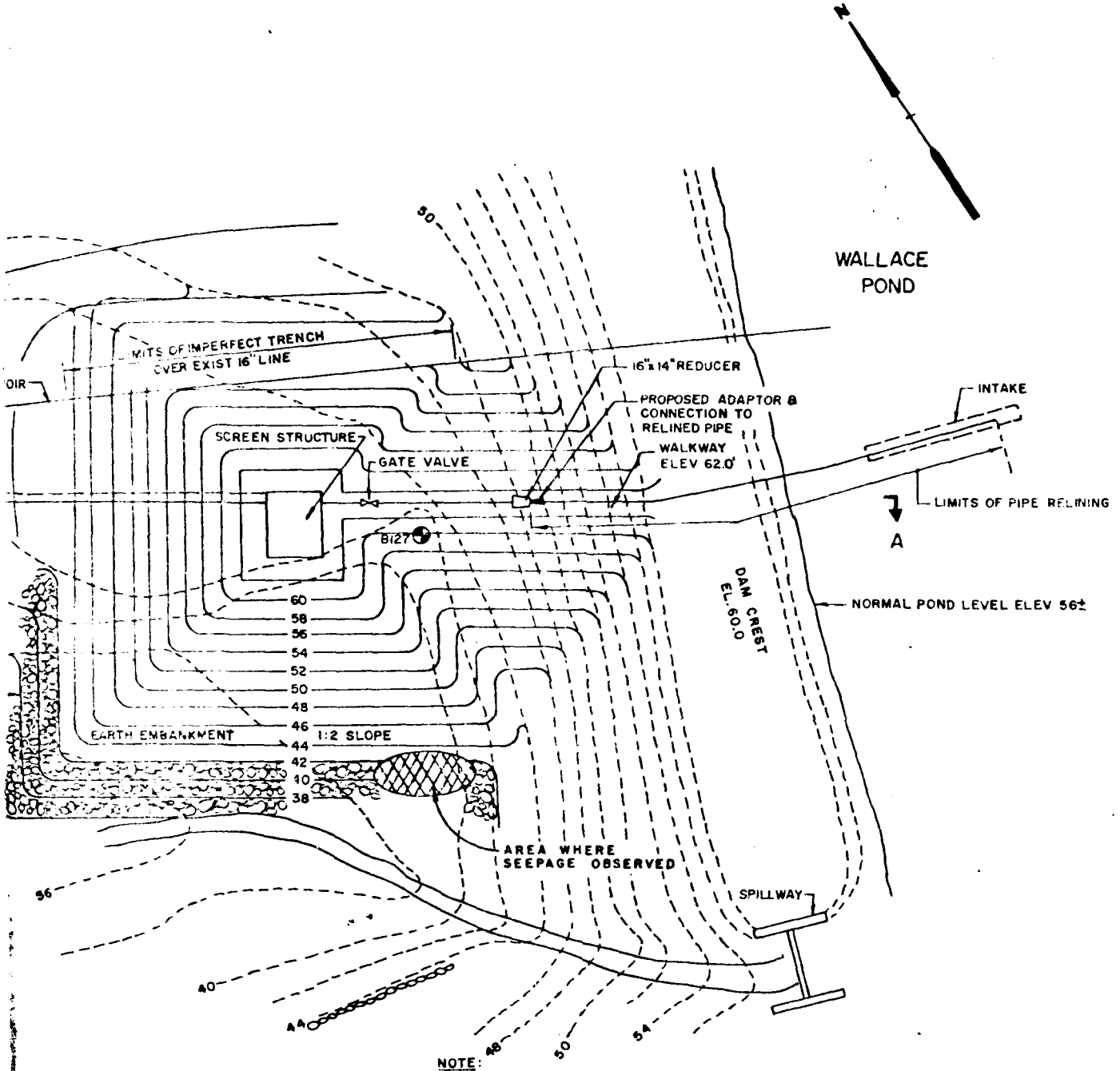
## LIST OF ENGINEERING DATA

1. Topographic maps and plot plans of the area around the dam and pond are available at the City of Gloucester Department of Engineering, City Hall, Gloucester, Massachusetts 01930.

2. Design Plans for Wallace Pond screen structure and pipeline and Project Specifications (including some boring data) are available at the City of Gloucester Department of Engineering.

3. A State Inspection Report for March 1971 is available from the Department of Environmental Quality, Waterways Division, 100 Nashua Street, Boston, Massachusetts.


TO PUMP STATION
AVENUE
MAGNOLIA
DRAIN
STORM
EMBANKMENT
RAILROAD
RAILROAD UNDERPASS
15.5' BY 10.5' OPENING
WOODEN
HOUSE
WOODEN
BARN
ACCESS ROAD
16" WATER MAIN
BYPASS STRUCTURE
STORM DRAIN
STONE INLET
STONE CULVERT 2'x2'±
16" TRANSMISSION
TO BOND HILL RES
DIRECT BURIAL CABLE
2/C NO. 10
RIP RAP TO ELEV. 42
A
46
40
38
36




NOTE:
TAKEN FROM PLANS BY METCALF & EDDY, DATED OCT 1977
ELEVATIONS SHOWN ARE NGVD

FOR SECTION A-A SEE SHEET B-4

| HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS | U.S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS |
|---|---|

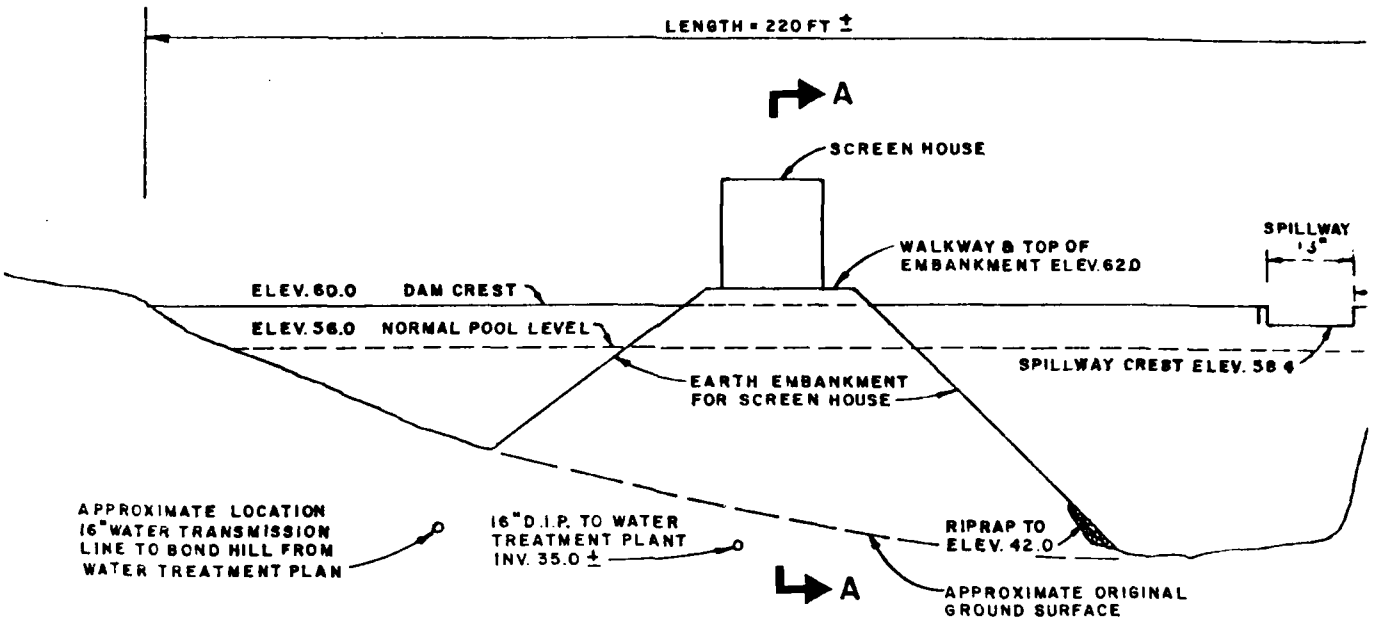
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

# WALLACE POND OUTLET DAM
## PLAN

GLOUCESTER MASSACHUSETTS

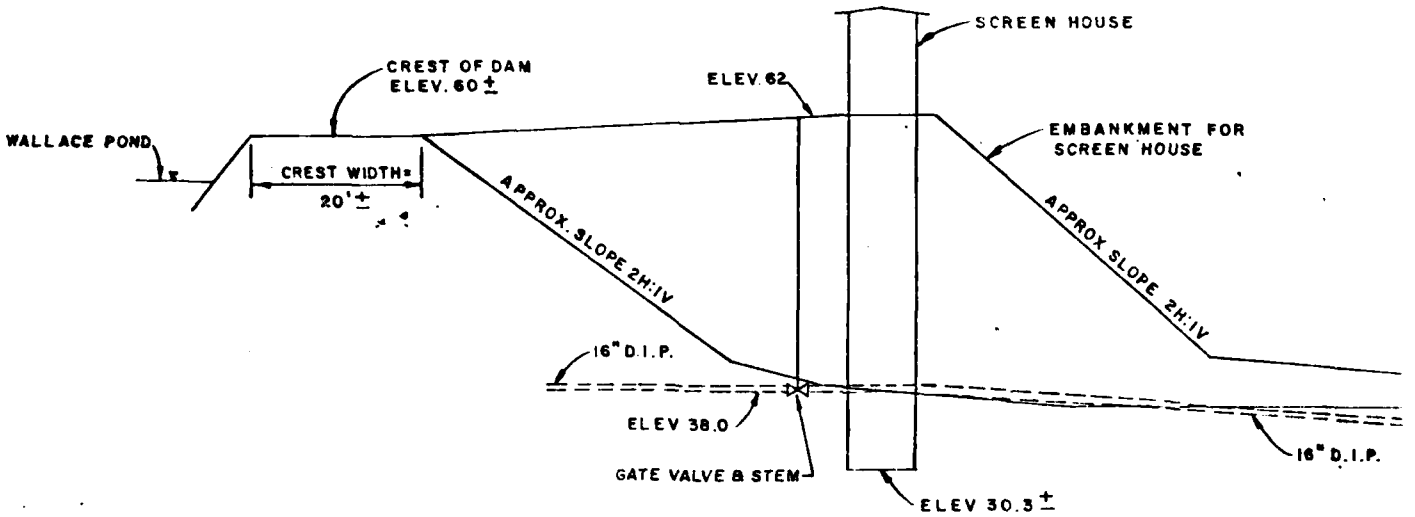
| | | | |
|---|---|---|---|
| | | | SCALE NOT TO SCALE |
| | | | DATE MAR 1980 |

2



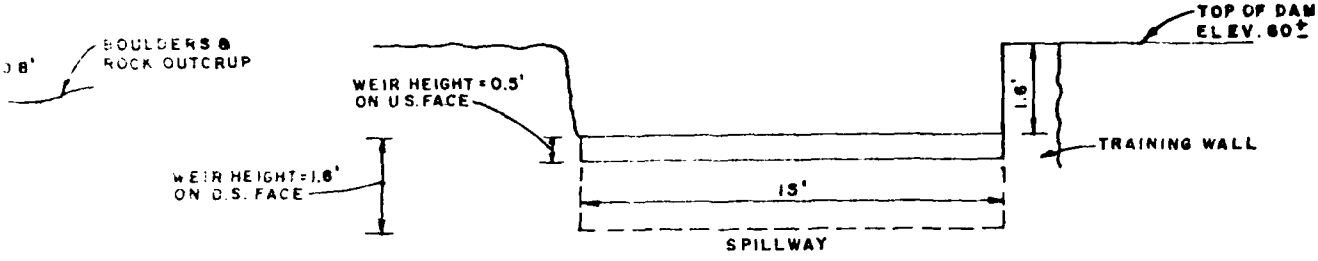

## ELEVATION

NOTE:
TAKEN FROM PLANS BY METCAL
DATED OCTOBER, 1977




## SECTION A-A

NOTE:
TAKEN FROM PLANS BY METCAL
DATED OCTOBER, 1977
ELEVATIONS SHOWN ARE NGVD




## SPILLWAY DETAIL

NOTE:
PLAN DEVELOPED FROM ON-SITE INSPECTION

EDDY

EXISTING GROUND

EDDY

| HAYDEN, HARDING & BUCHANAN, INC<br>CONSULTING ENGINEERS<br>BOSTON, MASSACHUSETTS | U.S. ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASS |
|---|---|

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

# WALLACE POND OUTLET DAM

## ELEVATION, SECTION & SPILLWAY DETAIL

GLOUCESTER — MASSACHUSETTS

| | | | |
|---|---|---|---|
| | | | SCALE: NOT TO SCALE |
| | | | DATE: MARCH 1980 |

GLOUCESTER
5-5-107-6

L. E. WILKINSON MARCH 18, 1971

ON WALLACE POND. 14,500 L.F. EAST OF ESSEX TOWN LINE VIA ROUTE 13 (ESSEX AVE.). DAM IS 500 L.F. EAST OF MAGNOLIA AVE., AT A POIN 400 L.F. SOUTHWEST OF ROUTE 133 VIA MAGNOLIA AVE.

CITY OF GLOUCESTER (WATER WORKS)

WATER SUPPLY

20.5 FT.

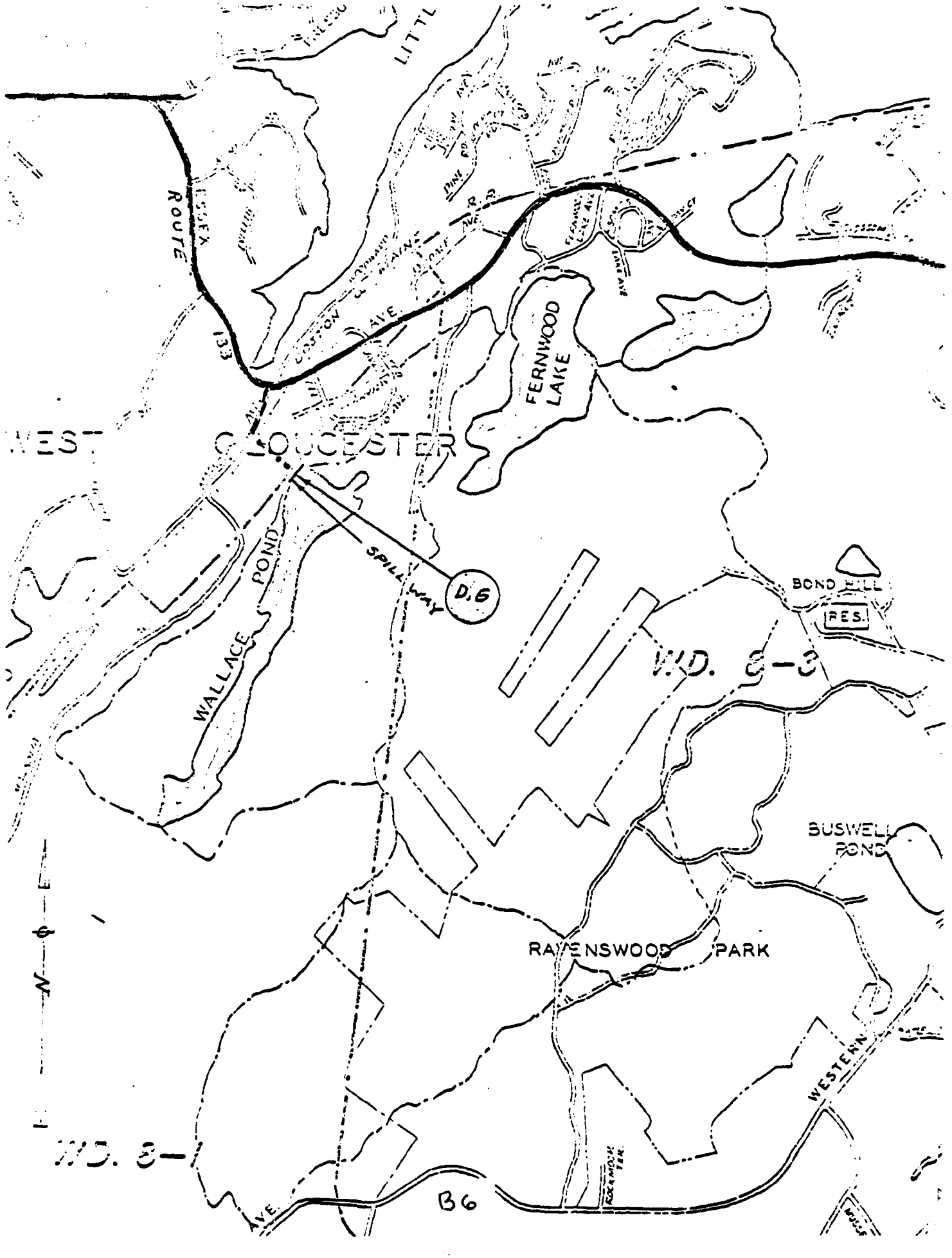
220 L.F. ± 19. FT. 24 ACRES

63,000,000.

164.0

15.0 FEET WIDE AND 18 INCHES BELOW TOP OF DAM. MORTARED STONE MASONRY. NO PROVISION FOR FLASH BOARDS. WATER LEVEL OF POND 1.0 FOOT BELOW TOP OF SPILLWAY TO-DAY.

CLUSTER OF TREES IN OUTLET CHANNEL OF SPILLWAY, ONLY SIX FEET FROM WALL, SHOULD BE CUT DOWN AN LARGE DRIFTWOOD REMOVED FROM BOTH SIDES OF SPILLWAY WALL. TWO TREES TOP OF DAM NORTHERLY END SHOULD BE CUT AND BRUSH ACROSS ENTIRE DAM REMOVED. (IF TREES WERE UPROOTED IN A STORM, CRITICAL HOLES WOULD BE GOUGED IN DAM AND/OR SPILLWAY.)


LITTLE
ROUTE 133
ESSEX
DUSTON AVE
FERNWOOD LAKE
WEST GLOUCESTER
SPILLWAY
D.6
WALLACE POND
BOND HILL RES.
W.D. 8-3
BUSWELL POND
RAVENSWOOD PARK
WESTERN
W.D. 8
B6
AVE

CLARENCE WELTI ASSOC., INC.
986 NEW LONDON TURNPIKE
GLASTONBURY, CONN. 06033

# "BORING LOG"

PROJ. GLOUCESTER, MASS.

CLIENT METCALF & EDDY

BORING NO. 127

LINE & STA.

OFFSET

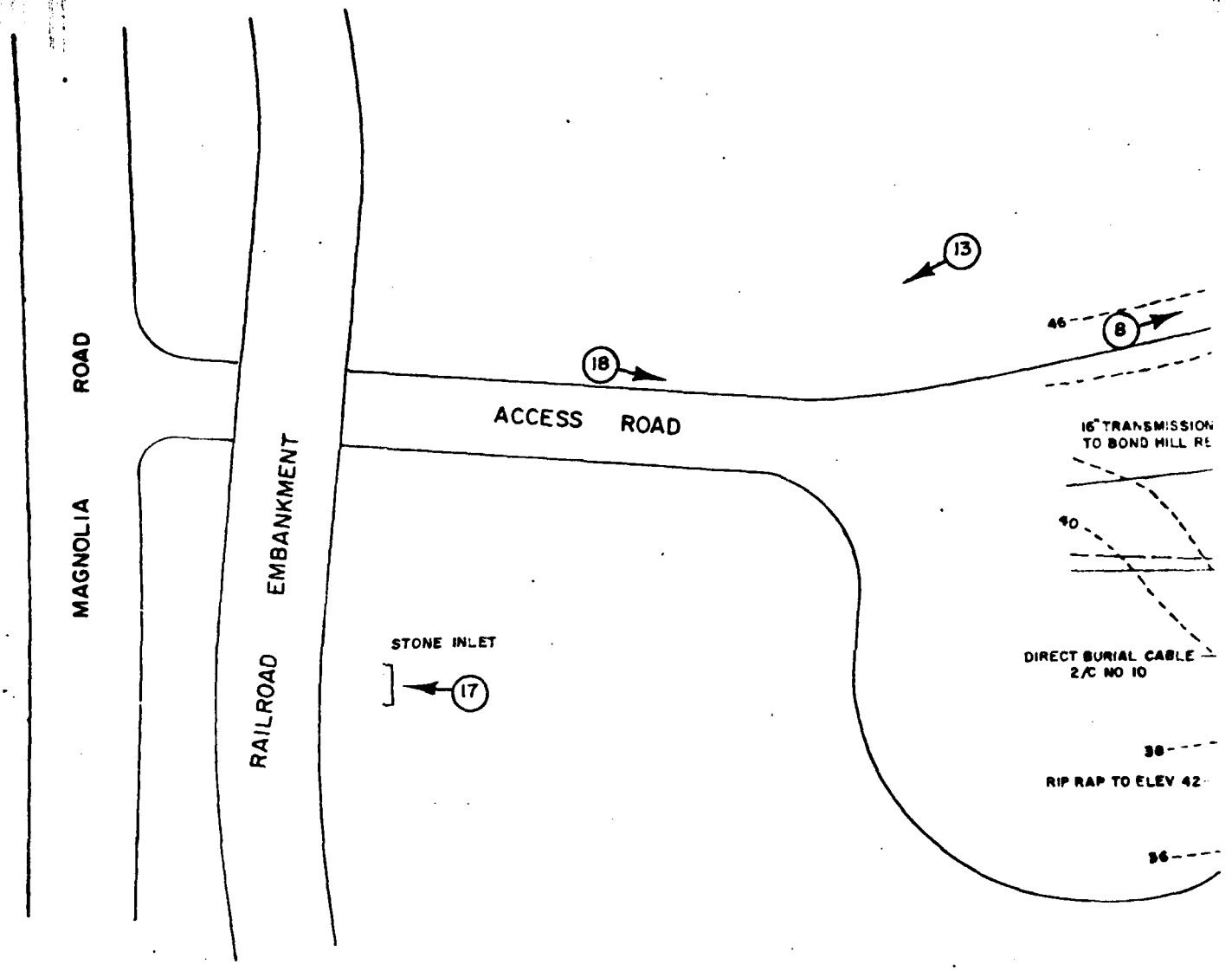
GR. ELEV.

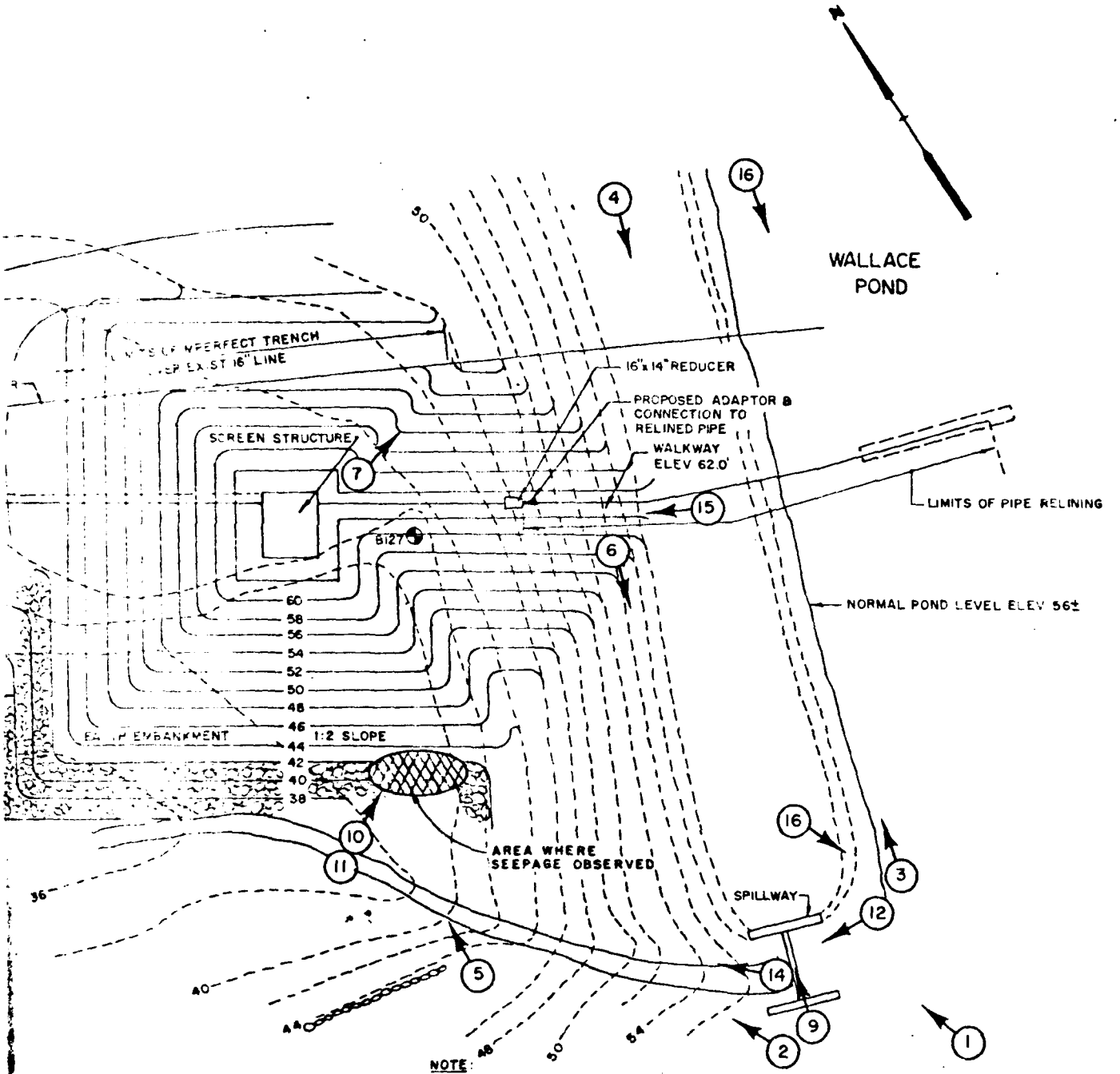
| A | STRATUM DESCRIPTION | BLOWS PER 6" | B |
|---|---|---|---|
| 1.0 | ** | 1-1-4-5 | |
| | *** | | |
| 4.0 | ~~GR/BR.FINE-CRS.~~ SAND & GRAVEL, SOME COBBLES & SMALL BOULDERS, LITTLE SILT ~~DRILLED 15-20'~~ REC.14" BOULDERS | ~~48-50~~ 15-25-21 | |
| | | 72/6" | |
| 20.5 | | 88/6" | |
| | PINK GRANITE W/ DECOMPOSED SEAMS RUN #1 20.5-25.5 REC.43" | | |
| | RUN #2 25.5-28.5 REC.33" | | |
| ~~28.5~~ | | | |
| | **BLK.SILT & BOULDERS | | |
| | ***YELLOW/BR.FINE SAND, ~~FINE-CRS.GRAVEL,COBBLES~~ & BOULDERS, SOME SILT | | |
| | BOTTOM OF BORING | 28.5 | |
| | ~~WATER AT SURFACE~~ | ~~0 0 HRS.~~ | |
| | DATE: 8/12-15/77 | | |
| | DRILLER: BROMLEY | | |

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

# APPENDIX C

# PHOTOGRAPHS


MAGNOLIA ROAD
RAILROAD EMBANKMENT
ACCESS ROAD
13
18
8
46
16" TRANSMISSION
TO BOND HILL RE
40
STONE INLET
17
DIRECT BURIAL CABLE
2/C NO 10
38
RIP RAP TO ELEV 42
36




NOTE:
TAKEN FROM PLANS BY METCALF & EDDY, DATED OCT. 1977
ELEVATIONS SHOWN ARE NGVD

| HAYDEN, HARDING & BUCHANAN, INC<br>CONSULTING ENGINEERS<br>BOSTON, MASSACHUSETTS | U.S. ARMY ENGINEER DIV NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASS |
|---|---|

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

# WALLACE POND OUTLET DAM
## PHOTO LOCATIONS

GLOUCESTER MASSACHUSETTS

| | | | |
|---|---|---|---|
| | | | SCALE NOT TO SCALE |
| | | | DATE MARCH, 1980 |

PHOTO NO. 1 - Spillway intake at the left abutment.

PHOTO NO. 2 - Downstream spillway channel, viewed from the spillway crest.

PHOTO NO. 3 - Upstream slope of the Dam, viewed from the left abutment.

PHOTO NO. 4 - Crest of the Dam, viewed from the right abutment.

PHOTO NO. 5 - Wet area at the downstream toe of the Dam in the downstream spillway channel. The standing water extends over an area about 20 feet by 30 feet in size.

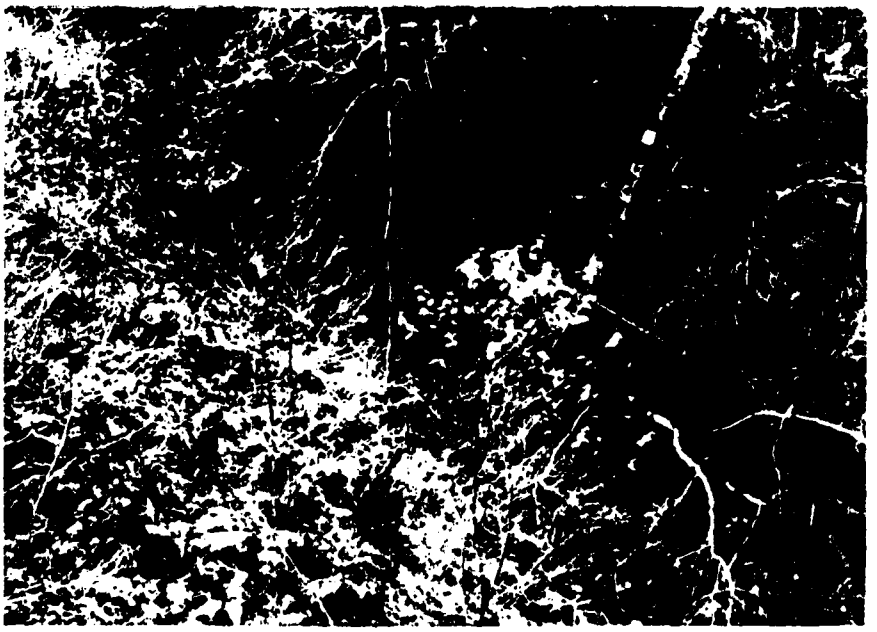


PHOTO NO. 6 - Downstream slope of the Dam, looking toward the left abutment from the Screen House.

PHOTO NO. 7 - Downstream slope of the Dam, looking toward the right abutment from the Screen House.

PHOTO NO. 8 - Standing water on the right side of the access roadway, approximately 100 feet downstream from the right abutment.

PHOTO NO. 9 - Spillway at the left abutment.

PHOTO NO. 10 - Close-up of seep at the junction of the downstream toe of the Dam and the left side of the screen structure embankment.

PHOTO NO. 11 - Seepage at the junction of the downstream toe of the Dam and the left side of the screen structur embankment, looking towards the right.

PHOTO NO. 12 - View of spillway taken from upstream embankment looking toward crest.

PHOTO NO. 13 - View of opening in railroad embankment for access road to Dam. The opening is 10.5 feet high by 15.5 feet wide. Most of the outflow from the test flood and at least 25% of that from a possible Dam failure could be discharged through this opening. The building showing in the opening is the water treatment plant, across Magnolia Street.

PHOTO NO. 14 - Looking at overflow area on downstream face of Dam from spillway. There is no defined downstream outlet channel from the spillway. Note logs, branches and other debris on downstream face. The riprap protecting the toe of the embankment for the Screen House is shown in the upper middle right portion of the Photo.

PHOTO NO. 15 - View of Screen House and embankment taken from Dam embankment.

PHOTO NO. 16 - View of Wallace Pond looking eastward from crest of Dam. On the day this photo was taken, the Pond water level was about 11 feet below the crest of the Dam.

PHOTO NO. 17 - View of the upstream inlet of the culvert under the downstream railroad embankment. The 2.7 feet by 4 feet stone masonry structure is mostly blocked by debris. The culvert exits the other side of the railroad embankment and flow then goes under Magnolia Avenue through a 30 inch R.C.P.

PHOTO NO. 18 - View of downstream side of Dam taken from access road. Note lack of grass for slope protection and erosion on Screen House embankment. The spillway for the Dam is located to the right of the Screen House in Photo. The Dam embankment is shown to the left of the Screen House.

# APPENDIX D

# HYDROLOGIC AND HYDRAULIC COMPUTATIONS

JOB NO. 79.206.1
DATE 1/8/80
BY FDD
CH'D BY WAK 2-1-80

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO D2
JOB Dams
SUBJECT Wallace Pond Outlet
CLIENT Corps

Wallace Pond Outlet Dam: exact date of construction not known; est. 1860's ±

Height of Dam: 22'± (hydraulic)

Outlets: 16" D.I. pipe to Town water supply system

Spillway = 15'± by 66'

"Land of southern end of pond could possibly be overtopped & water flow into swampy area below pond. Assume at same elevation as top of dam (60±' MSVD)

Dam is earth embankment structure with newly renovated or reconstructed screen house and stone-masonry spillway. Project is used for water supply.

Storage Capacity: 136 ac-ft

Size Class: Small [Corps Guidelines, pg D-8 height: ~~to~~ 40 to 25 to 40' Storage: 50 to 1000 a.f]

Drainage Area: 0.26 s.m. (166 ac.)

Hazard Potential: High

Test Flood: 1/2 PMF to Full PMF; use 1/2 PMF.

[Corps Guidelines Drainage Areas 2 s.m. or less use 3000. c.s.m.]

Inflow = 3000 x .26 sm x 1/2 = 390 ± cfs
Outflow = 255 cfs.

Dam overtopped by 0.3'± (4"±)

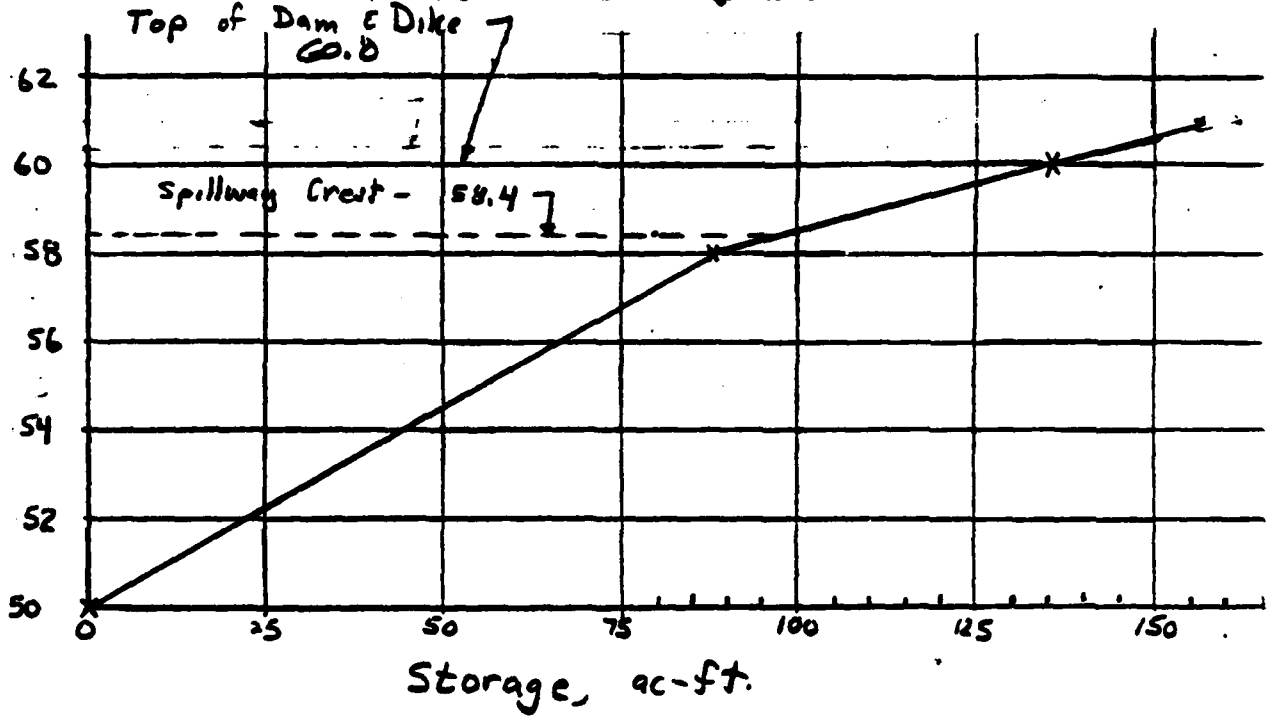
HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD



# Storage Capacity - Wallace Pond

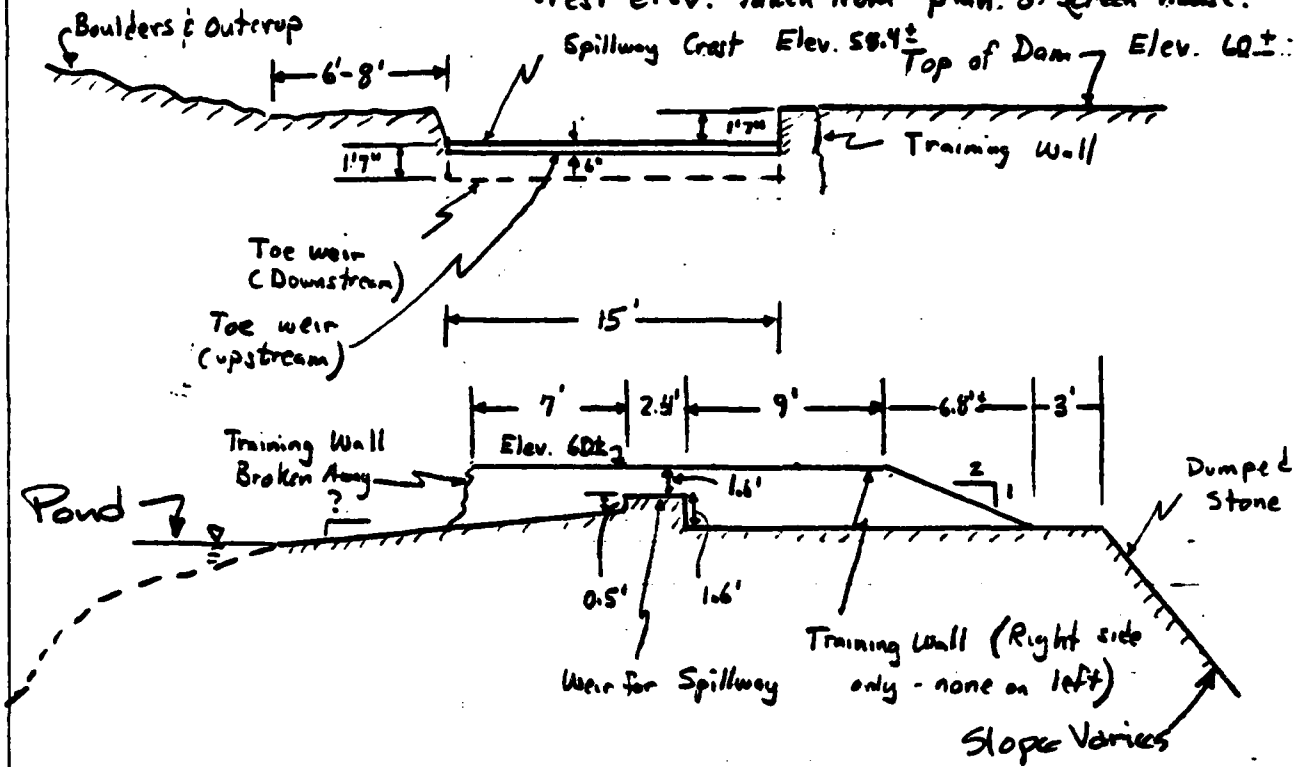
| Elev.* NGVD | Area ac. | Ave. Area ac. | D ft | Stor ac-ft | Cum Stor ac-ft | |
|---|---|---|---|---|---|---|
| 50± | 0 | — | — | — | — | |
| 58 | 22 | 11 | 8 | 88 ✓ | 88± | Water Surface (USGS) |
| 60.0 | 26± | 24 | 2 | 48 ✓ | 136± ✓ | Top Dam & Dike |
| 61 | 26± | 26 | 1 | 26 | 162± ✓ | |

## Stage - Storage Curve




*Elevations taken from plans for Screen House by M&E used in conjunction with USGS Quad Sheet

Spillway - dimensions taken from field sketch
Crest elev. taken from plan of screen house.




Spillway Discharge See Page D5A for Discharge Curves.

$Q = CLH^{3/2}$

| H ft | $H^{3/2}$ | C | L ft | Q cfs | Elev. NGVD |
|---|---|---|---|---|---|
| 0.5 | 0.35 | 2.60 | 15' | 13.7 | 58.9 |
| 1.0 | 1.0 ✓ | 2.64 | " | 39.6 ✓ | 59.4 |
| 1.6 | 2.02 ✓ | 2.77 | " | 84.1 ✓ | 60. |

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD



Above Elevation 60± get flow over top of dam & high land at south end of pond - this area is referred to as a "dike", but it is not!

Assume weir lengths 175' @ dam
150' @ "dike"

Discharge $Q = CL H^{3/2}$ $C = 2.6$

| | | | Dam | | "Dike" | | Combined* | |
|---|---|---|---|---|---|---|---|---|
| H | $H^{3/2}$ | C | L ft | Q cfs | L ft | Q cfs | Q cfs | Elev |
| 0.5 | 0.35 | 2.6 | 175 | 160 | 150 | 135 | 295± | 60.5 |
| 1.0 | 1.0 | " | " | 455 ✓ | 150 | 390 ✓ | 845± | 61.0 |
| 1.5 | 1.84 | " | " | 835 ✓ | " | 718 ✓ | 1553± | 61.5 |

* Combined Q includes discharge from Spillway.

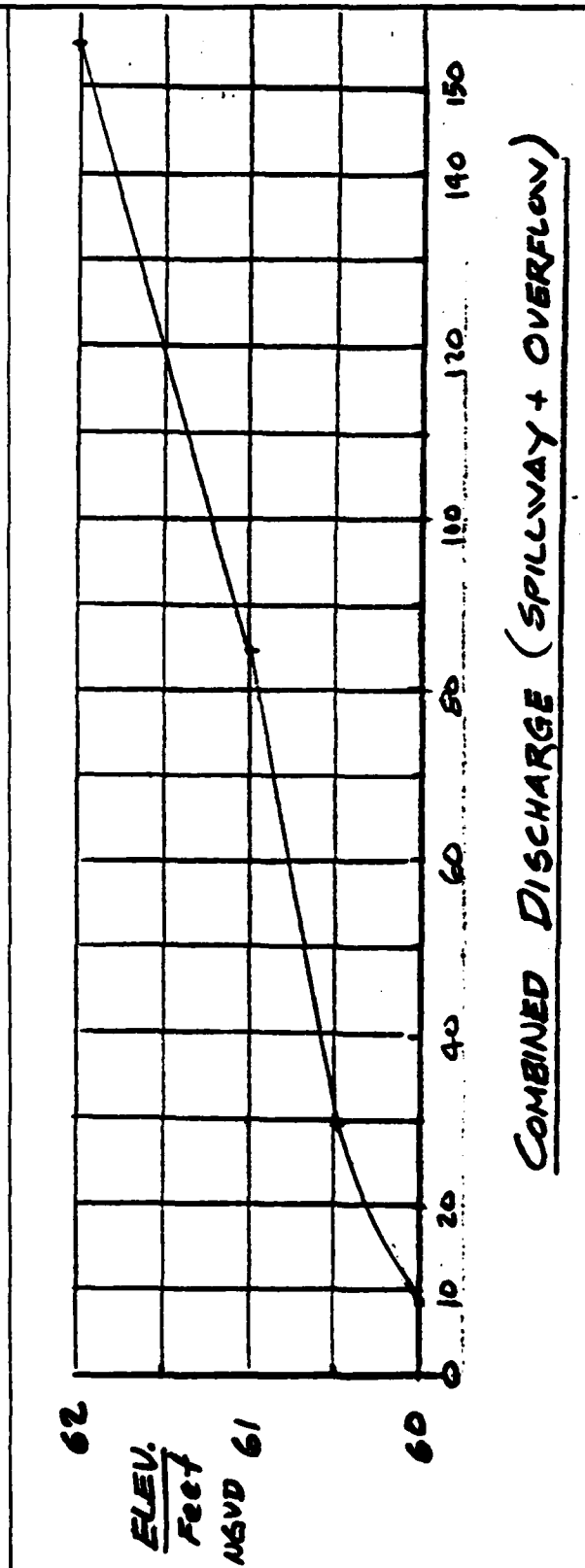
See Next Page For Discharge Curves.

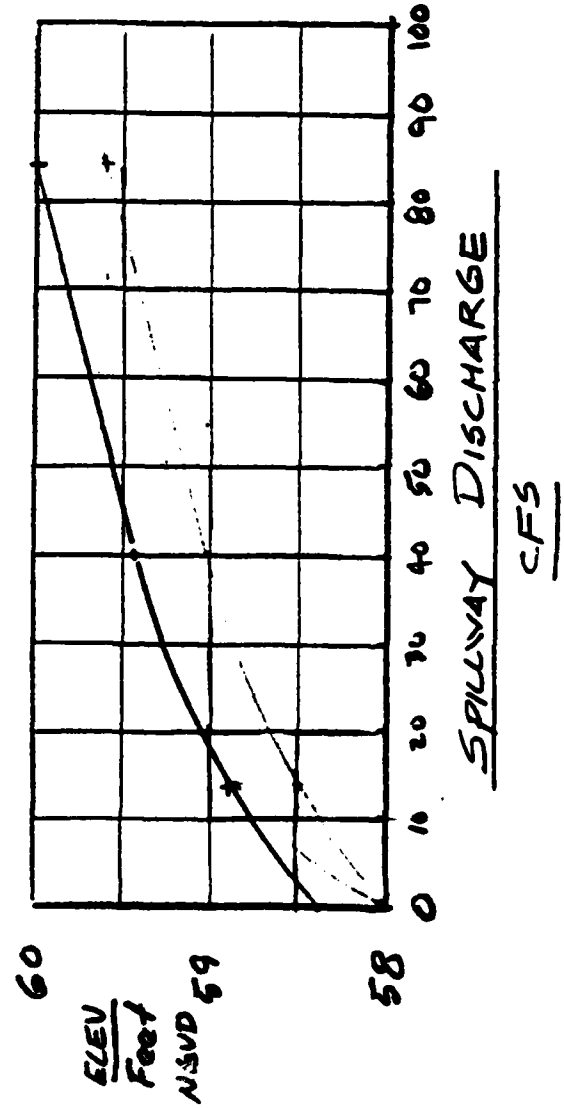
JOB NO. 79.206.1
DATE 9-20-80
BY MA
CH'D BY PDD

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

JOB Dams SHEET NO. D5A
SUBJECT Wallace Pond
CLIENT COE

# STAGE DISCHARGE



HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD



# Test Flood Storage Routing

Test Flood = ½ PMF

$Q = 3000 \times .26 \times \frac{1}{2} = 390$ cfs.

$Vol = 19 \times 166 \times \frac{1}{12} \times \frac{1}{2} = 131 \pm$ ac-ft

Normal Pool Level for pond is elev 57± varies considerably.

Normal Storage = 78 ac-ft

Spillway crest @ elev 58.4±

Storage @ Spillway crest = 97 ac-ft

Assume Pond level initially @ spillway crest, 58.4

Using Corps Guide lines

$Q_{P_1} = 390$ cfs $\quad d_1 = 2.1'$ (60.5)

$Stor_1 = \frac{99}{166} \times 12 = 3.54$ in.

$Q_{P_2} = 390\left(1 - \frac{3.54}{9.5}\right) = 245$ cfs. $\quad d_2 = 1.9'$ (60.3)

$Stor_2 = \frac{42}{166} \times 12 = 3.04$

$Stor_{ave} = \frac{3.04 + 3.54}{2} = 3.29$

$Q_{P_3} = 390\left(1 - \frac{3.29}{9.5}\right) = 255$ cfs. $\quad d_3 = 1.95'$ (60.3±

$Q_{out} = 256$ cfs.± $\quad Elev. = 60.3'\pm$

Dam overtopped by 0.3'± (4 in±)

Discharge from each outlet is as follows:

Spillway: 85 cfs ±

Over Dam: 100 cfs ±

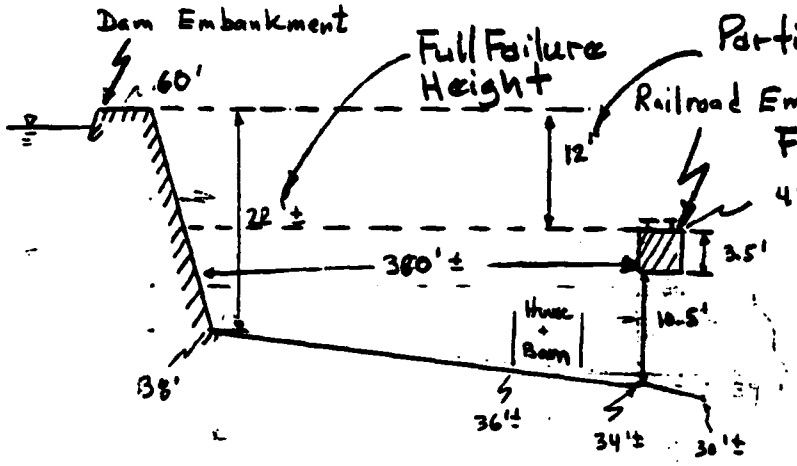
Over "Dike": 70 cfs ±

## Dam Failure Flood Routing

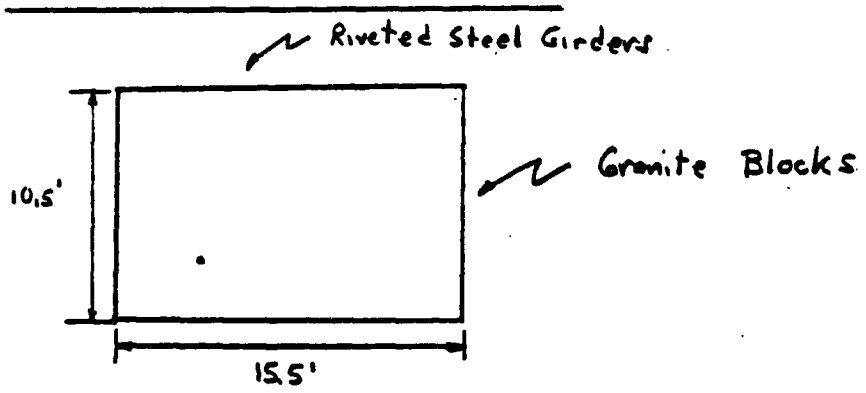
Have 14'± high RR embankment, about 380' below dam, with 15.5' by 10.5' opening. Composition & structural stability of embankment under force of water from dam failure unknown. IF RR embankment fails, will not significantly reduce flood. If embankment holds, it would act as dam to reduce flood wave downstream. Worst condition is failure of both dam and RR embankment, and will use in flood routing.

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD






Opening in Railroad Embankment




Determine Failure outflow for 2 cases

① Railroad Embankment fails, $h = 22'$ [Assumes Full Failure Height is Developed]

$$Q_p = \frac{8}{27}(0.4 \times 130)\sqrt{32.2}\,(22)^{1.5} = 9{,}025 \pm \text{cfs}.$$

(10%)

② Railroad Embankment does not fail, $h = 12'$ [Assumes R.R. Embankment Prevents Development of Full Failure Height.]

$$Q_f = \frac{8}{27}(0.4 \times 80)\sqrt{32.2}\,(12)^{1.5} = 2235 \text{ CFS}$$

(41.5%)

USE Case (1) For Failure Analysis

# Failure Flood Routing

$Qp_1 = 9025 \text{ cfs} + 85 \text{ cfs} \approx 9100 \text{ cfs}$

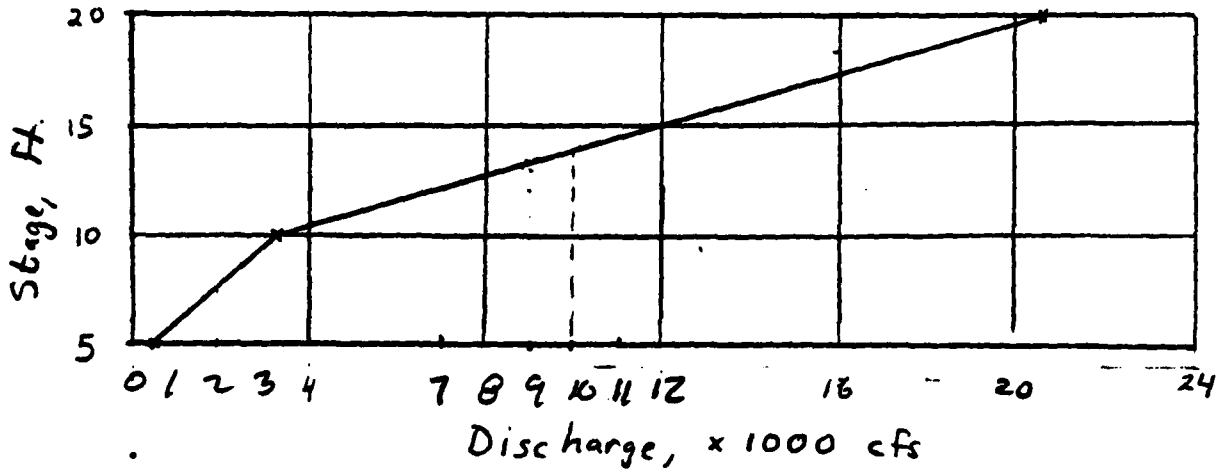
Sta. 1+00

$S = \frac{5}{350} = .0143'/'$ ✓ $\quad n = 0.06$

$V = f' R^{2/3} \quad f' = \frac{1.486}{0.06} (.0143)^{1/2} = 2.97$ ✓

$V = 2.97 R^{2/3}$

| D ft | WP ft | A sf | $R^{2/3}$ | f' | V fps | Q cfs. | Elev MSL |
|---|---|---|---|---|---|---|---|
| 20 | 150 | 1500 | 4.64 | 2.97 | 13.78 | 20,670. | 60 |
| 10 | 75 | 375 | 2.93 ✓ | " | 8.70 ✓ | 3263 ✓ | 50 |
| 5 | 37.5 | 93.8 | 1.84 ✓ | " | 5.46 ✓ | 512 ✓ | 45 |




$Qp_1 = 9100$ cfs. $\quad Elev_1 = 13.9'\pm$

Area of flooding section.

$Stor_1 = \frac{725 \times 100}{43,560} = 1.66$ ac-ft

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD



$$Q_{P_2} = 9100\left(1 - \frac{1.66}{136}\right) = 8988 \text{ cfs} \quad Elev_2 = 13.9\pm$$

$$Stor_2 = \frac{79.1 \times 100}{43,560} = 1.81 \text{ ac-ft.} \quad Stor_{ave} = 1.74 \text{ ac-ft}$$

$$Q_{P_3} = 9100\left(1 - \frac{1.74}{136}\right) = 8983 \text{ cfs.} \quad Elev_3 = 13.9\pm$$

$$Q_{out} = 8983 \text{ cfs.} \quad Elev = 53.9' \text{ NGVD}$$

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD



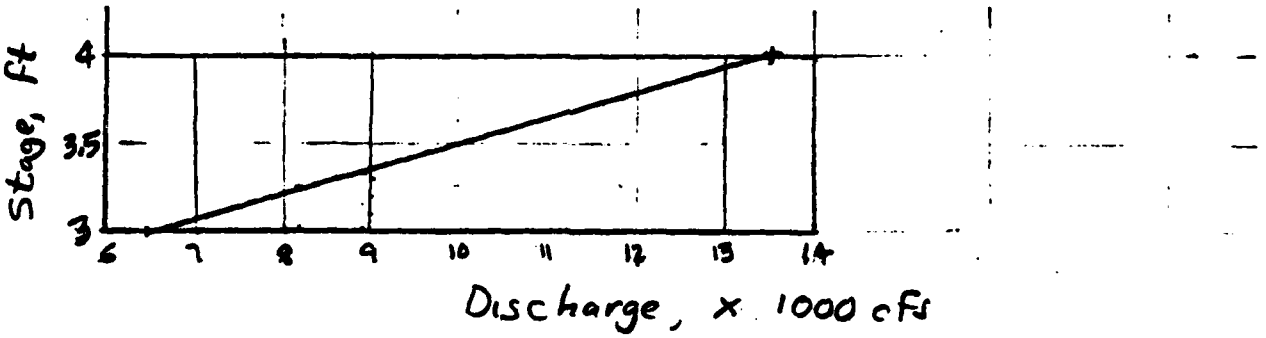
# Failure Flood Routing

## Sta 5+00

$S = \frac{10}{100.} = 0.01'$ $\quad n = 0.06$

$V = f' R^{2/3} \qquad f' = \frac{1.49}{0.06}(.01)^{1/2} = 2.47$

| D Ft | wP Ft | A sF | $R^{2/3}$ | f' | V fps. | Q cfs | Elev. MSL |
|---|---|---|---|---|---|---|---|
| 3 | 650 | 1500 | 2.75 | 2.47 | 4.33 | 6488 | 23 |
| 4 | 700 | 2400 | 2.28 | " | 5.6 | 13534 | 24 |
| 2 | 600 | 7100 | 1.5 | 2.47 | 3.7 | 4078 | 22 |




$Qp_1 = 8983$ cfs $\qquad Elev_1 = 3.35$

Average flood section area $\quad Stor_1 = \frac{791 + 1815}{2} \times \frac{400}{43560} = 12 \pm$ a.f

$Qp_2 = 8983\left(1 - \frac{12}{136}\right) = 8190. \quad El_2 = 3.35 \pm$

$Stor_2 = \frac{791 + 1815}{2} \times \frac{400}{43560} = 12$ ac-ft $\quad Stor_{ave} = 12$

$Qp_3 = 8983\left(1 - \frac{12}{136}\right) = 8190 \quad El = 23.35.$

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD



# Failure Flood Routing

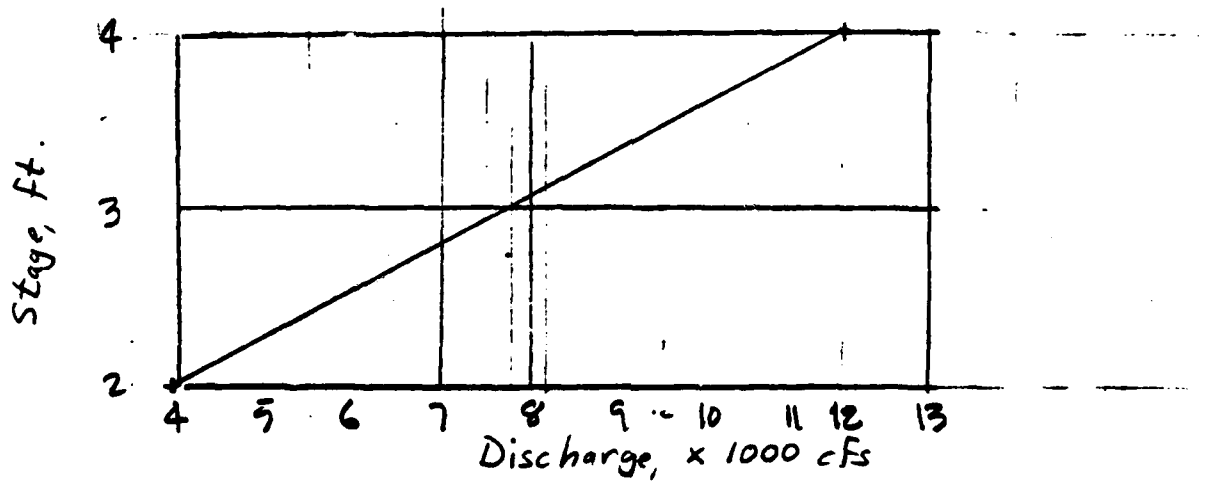
## Sta 7+00

$S = \frac{10}{100} = 0.01$ $\quad n = 0.06$

$V = f' R^{2/3}$ $\quad f' = \frac{1.486}{0.06}(.001)^{1/2} = 2.47$

$V = 0.79 R^{2/3}$

| D Ft | WP Ft | A sf | $R^{2/3}$ | F' | V fps | Q cfs | Elev MSL |
|---|---|---|---|---|---|---|---|
| 4 | 530 | 2000 | 2.43 | 2.47 | 6.01 | 12,027 | 24 |
| 5 | 537.5 | 2593.8 | 2.87 | " | 7.09 | 18,382 | 25 |
| 2 | 545 | 1015 | 1.58 | " | 3.89 | 3950 | 22 |




$Q_{p_1} = 8190.$ cfs $\quad Elev_1 = 3.1$

$Stor_1 = \frac{640 + 1815}{2} \times \frac{200}{43560} = 7.93$ ac-ft

$\bar{Q}_{P_2} = 8190\left(1 - \frac{7.93}{136}\right) = 7712$ El = 3'±

$Str_2 = \frac{1510 + 1815}{2}\left(\frac{200}{43560}\right) = 7.63$

$Str_{ave} = 7.78$

$Q_{P3} = 8190\left(1 - \frac{7.78}{136}\right) = 7721$ El = 23'±

Base Flood: Q = 85 cfs ±; Results in stages ≤ 1'± @ X-section
no real impact area beyond RR embankment

Impact Area - Failure Flood Routing

Sta 0+00 to 4+00 — 1 House + 1 Barn Flooded by 10-12'
RR Embankment possibly overtopped or fails

Sta 4+00 Foreward — 2 houses south of plant flooded by 1-2'
Filtration plant + 1 house near Rte 133,
& Route 133 & Magnolia Ave flooded by 3' water
3 houses along Magnolia Ave - Flooded by 2-3

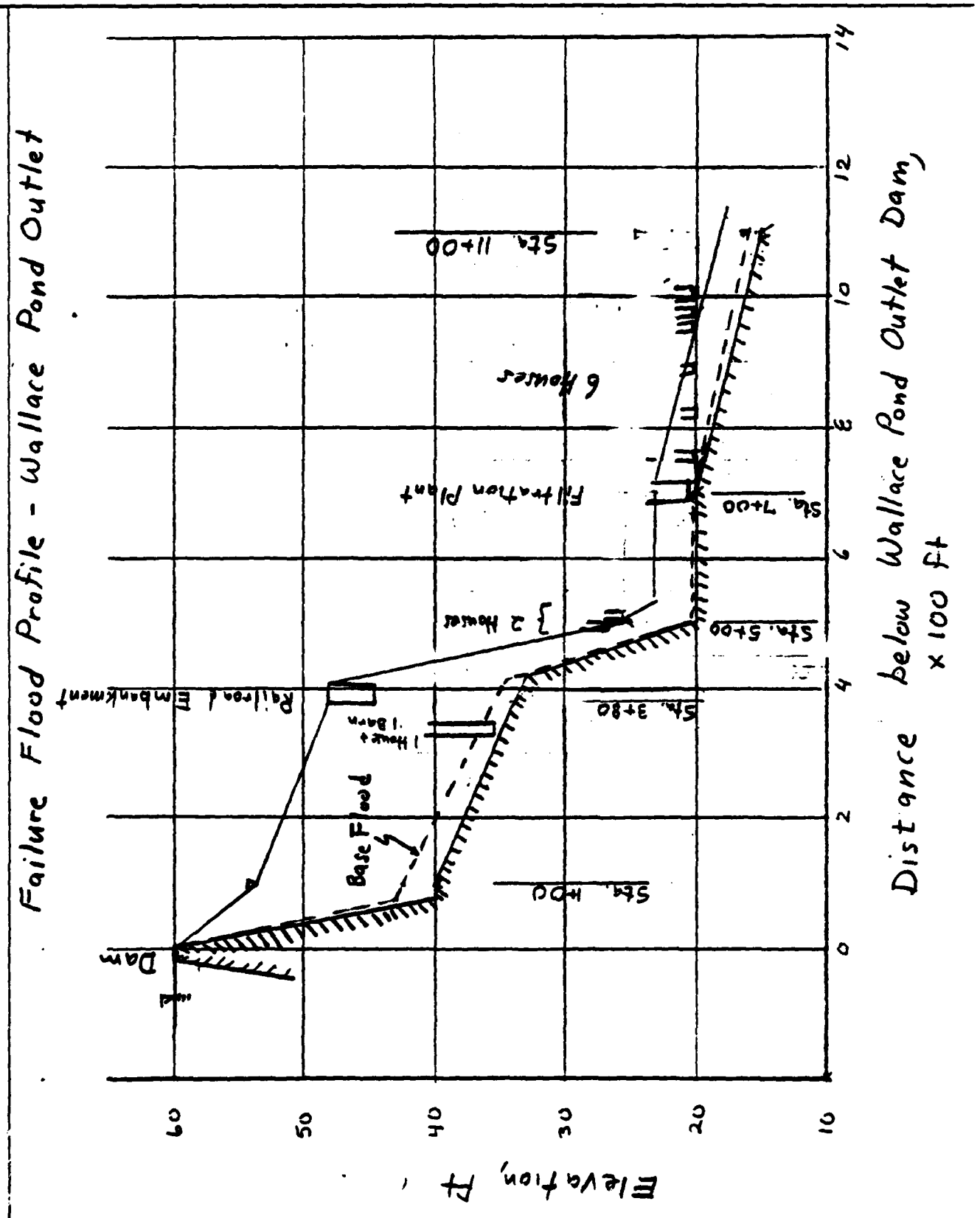
Failure Flood Stage Summary:

| Station | Elevation (MSL) |
|---|---|
| 0+00 (Dam) | 60.0' |
| 1+00 | 53.9' |
| 3+80 | 48.0'± |
| 5+00 | 23.4' |
| 7+00 | 23.0 |

No. 79.206.1
1/14/80
FDD
BY WVS

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D14
JOB Dams
SUBJECT Wallace Pond Outlet
CLIENT Sappi



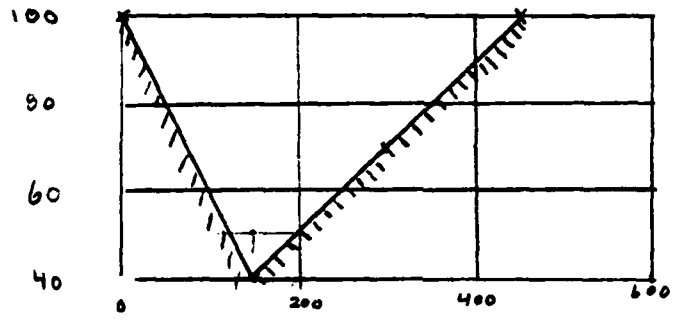
JOB NO. 79.206.1
DATE 1/9/80
BY FDD
CH'D BY MR

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO D 15
JOB Dams
SUBJECT Wallace Pond Outlet
CLIENT Corps

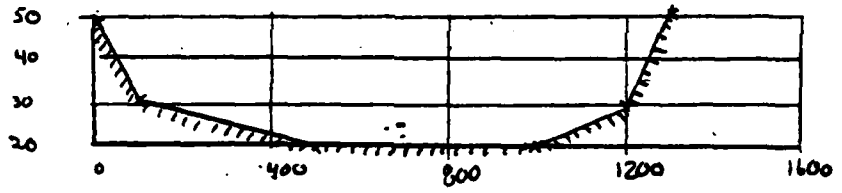
# Cross Sections
taken looking upstream

## Sta 1+00



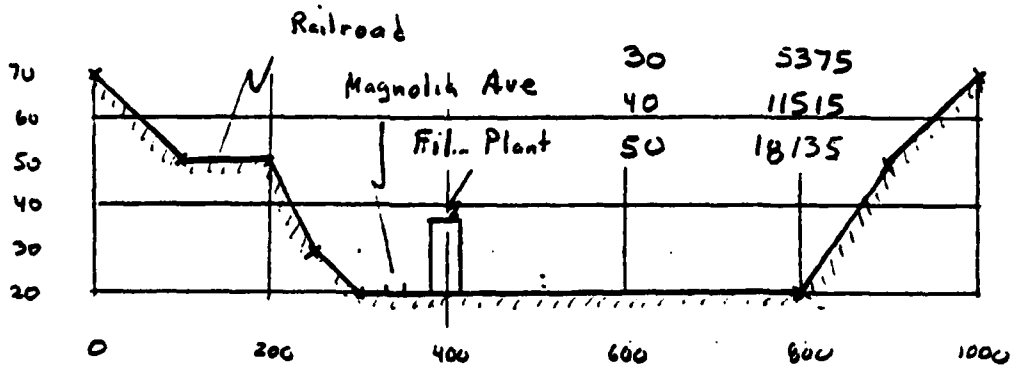

| Elev. | Area, sf |
|---|---|
| 50 | 188. |
| 60 | 1500 |
| 70 | 3375 |
| 80 | 6000 |

## Sta 5+00

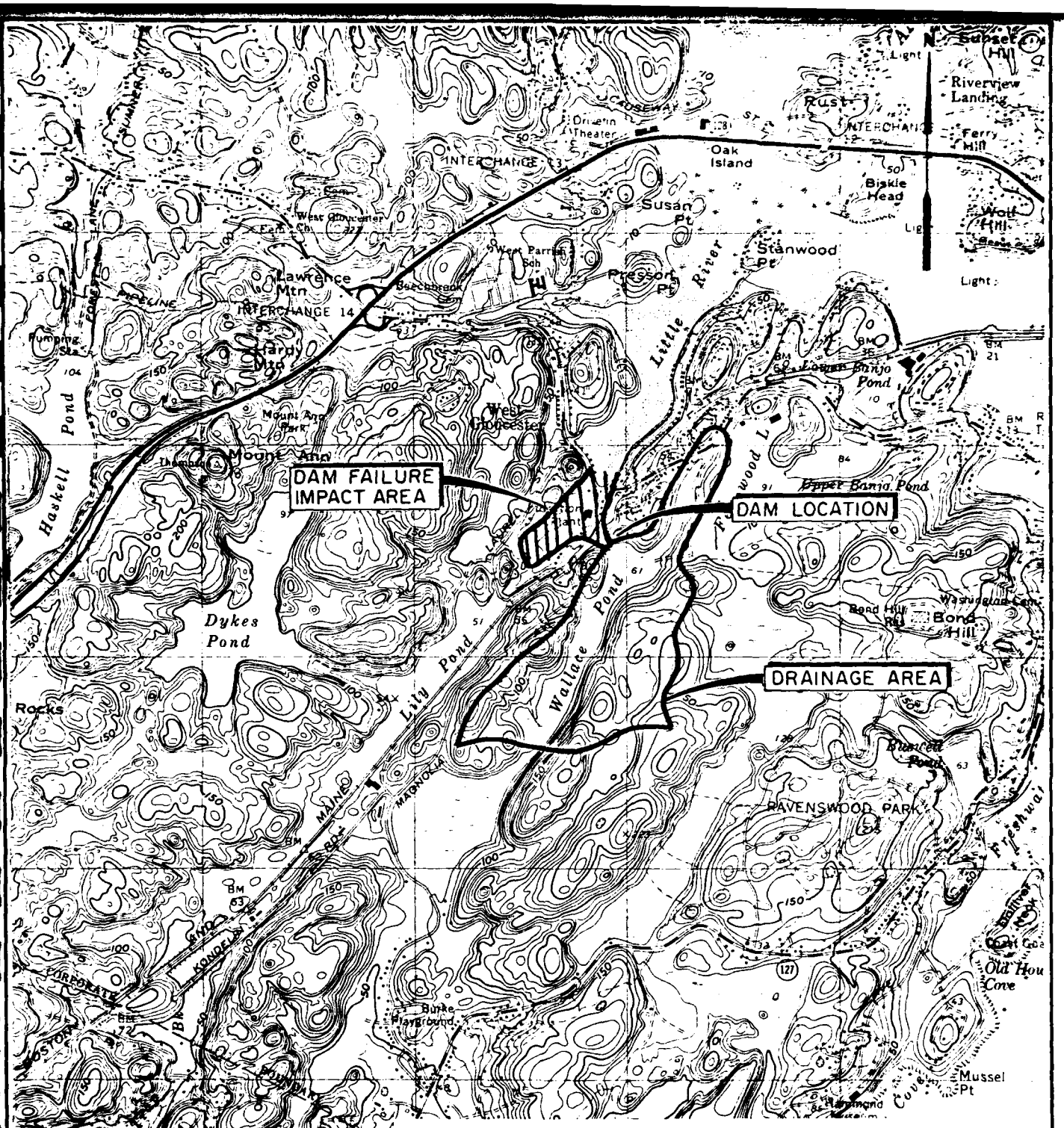



| Elev | Area sf |
|---|---|
| 30 | 8000 |
| 40 | 19500 |

## Sta. 7+00




| Elev. | Area, sf |
|---|---|
| 30 | 5375 |
| 40 | 11515 |
| 50 | 18135 |




| HAYDEN, HARDING & BUCHANAN, INC<br>CONSULTING ENGINEERS<br>BOSTON, MASSACHUSETTS | U.S. ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASS |
|---|---|

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

# WALLACE POND OUTLET
## DAM FAILURE IMPACT & DRAINAGE AREAS

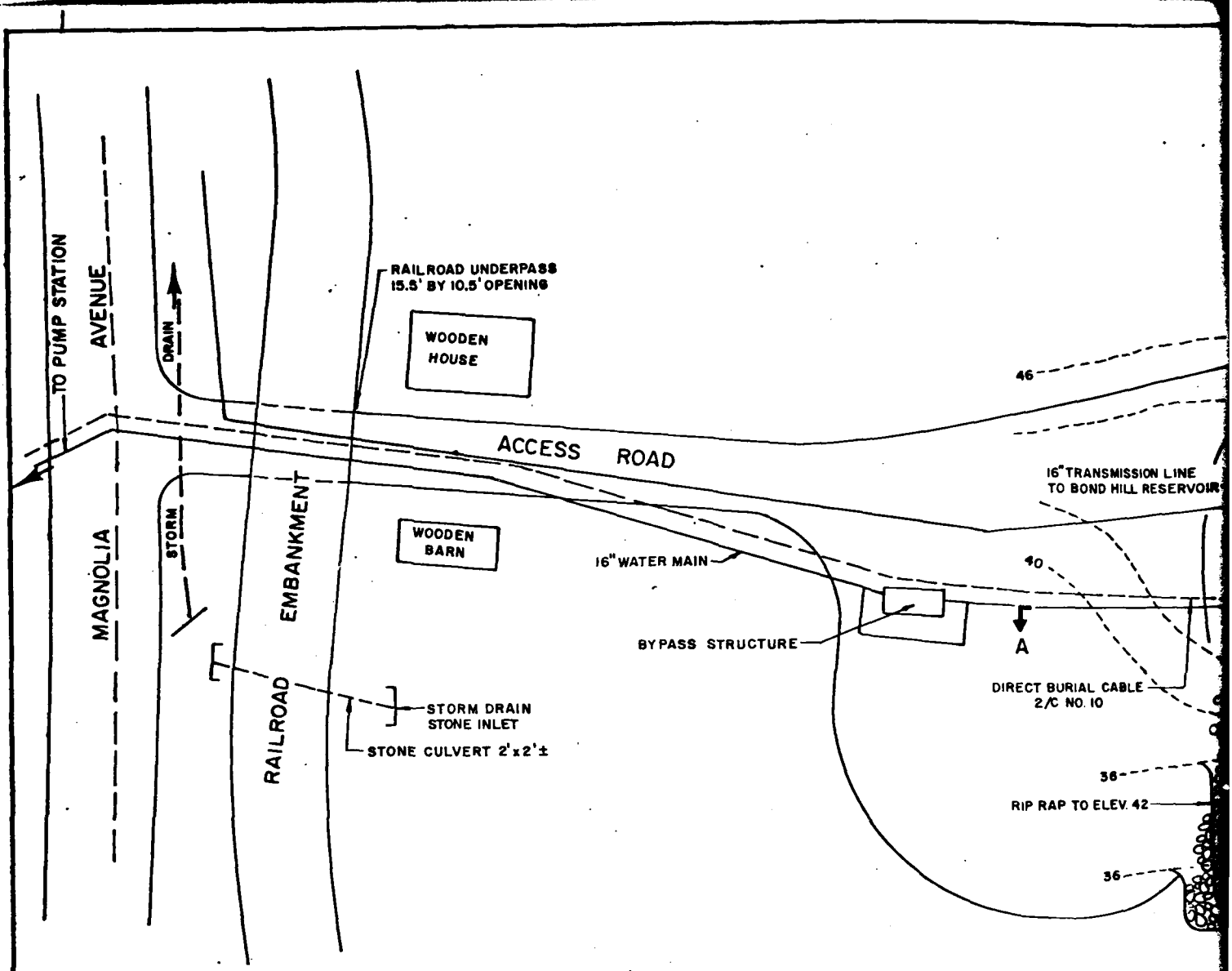
GLOUCESTER MASSACHUSETTS

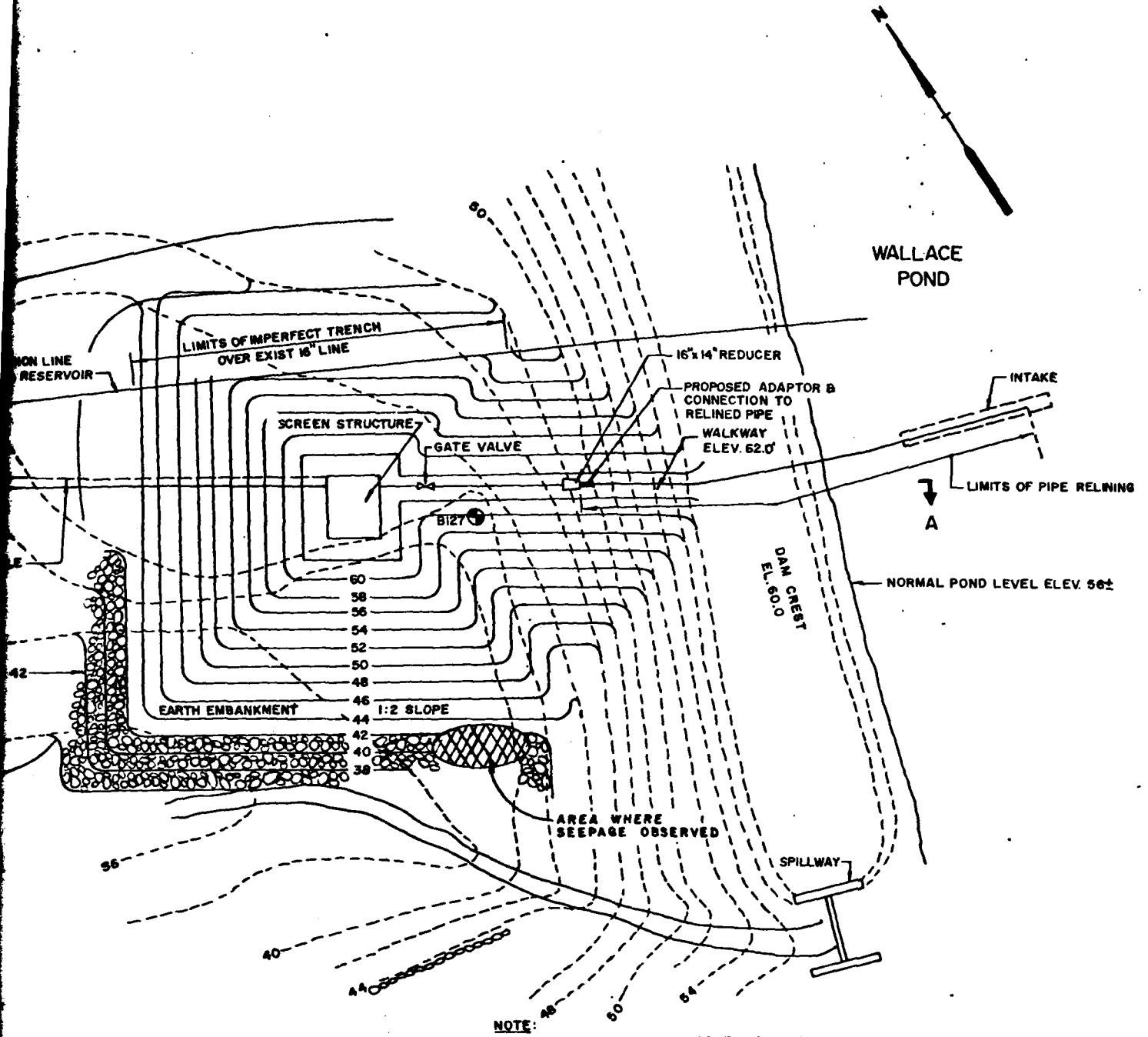
| | | | |
|---|---|---|---|
| | | | SCALE: 1" = 2500' |
| | | | DATE MARCH 1980 |

# APPENDIX E

## INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME


TO PUMP STATION
MAGNOLIA AVENUE
DRAIN
STORM
RAILROAD EMBANKMENT
RAILROAD UNDERPASS
15.5' BY 10.5' OPENING
WOODEN HOUSE
WOODEN BARN
ACCESS ROAD
16" WATER MAIN
BYPASS STRUCTURE
A
STORM DRAIN
STONE INLET
STONE CULVERT 2'x2'±
16" TRANSMISSION LINE
TO BOND HILL RESERVOIR
DIRECT BURIAL CABLE
2/C NO. 10
RIP RAP TO ELEV. 42
46
40
38
36




NOTE:
TAKEN FROM PLANS BY METCALF & EDDY, DATED OCT. 1977
ELEVATIONS SHOWN ARE NGVD

FOR SECTION A-A SEE SHEET B-4

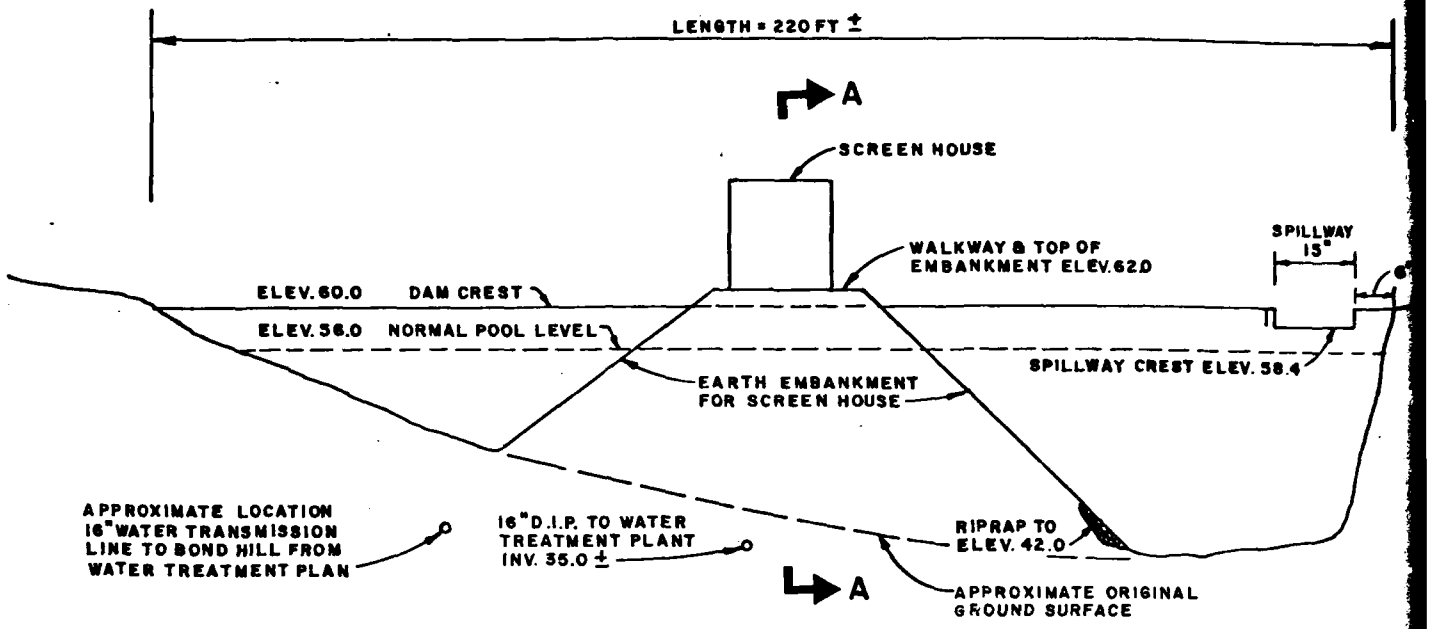
| HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS | U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS. |
|---|---|

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

# WALLACE POND OUTLET DAM
## PLAN

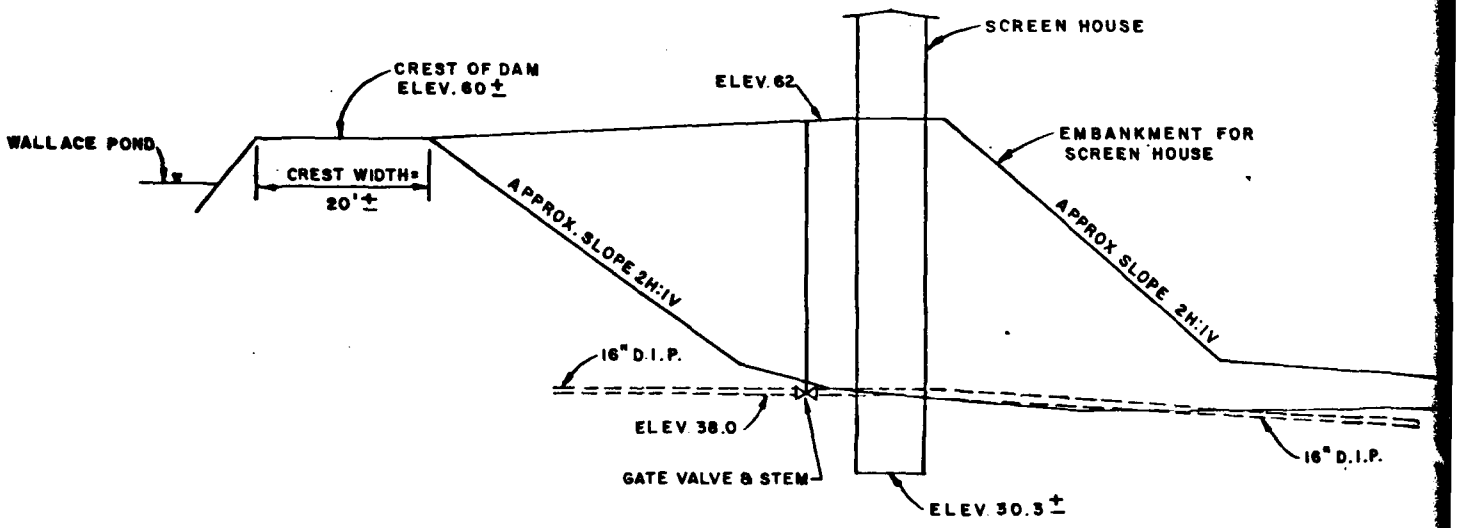
GLOUCESTER MASSACHUSETTS

| | | | |
|---|---|---|---|
| | | | SCALE: NOT TO SCALE |
| | | | DATE: MAR. 1980 |




## ELEVATION

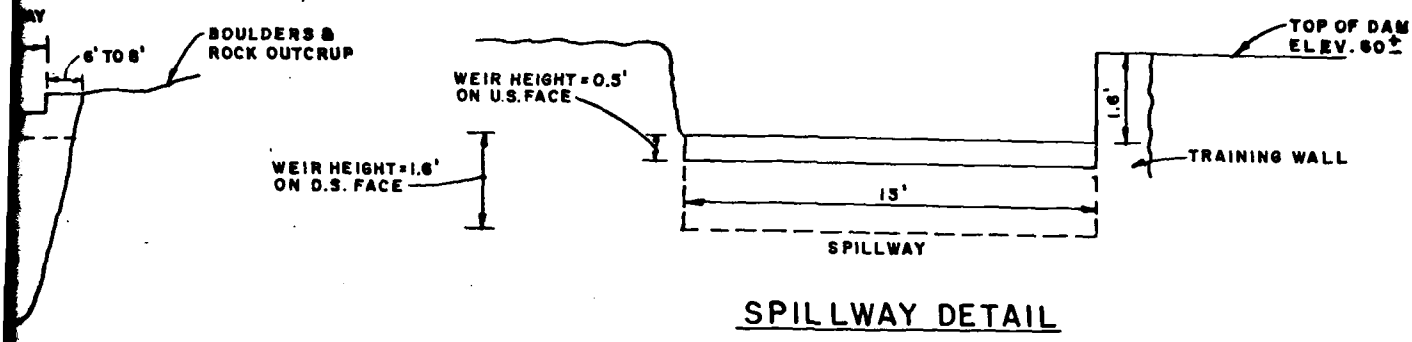
NOTE:
TAKEN FROM PLANS BY METCALF
DATED OCTOBER, 1977




## SECTION A-A

NOTE:
TAKEN FROM PLANS BY METCALF
DATED OCTOBER, 1977
ELEVATIONS SHOWN ARE NGVD

2




## SPILLWAY DETAIL

NOTE:
PLAN DEVELOPED FROM ON-SITE INSPECTION

CALF & EDDY

EXISTING GROUND

CALF & EDDY

| | |
|---|---|
| HAYDEN, HARDING & BUCHANAN, INC<br>CONSULTING ENGINEERS<br>BOSTON, MASSACHUSETTS | U.S. ARMY ENGINEER DIV NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASS |

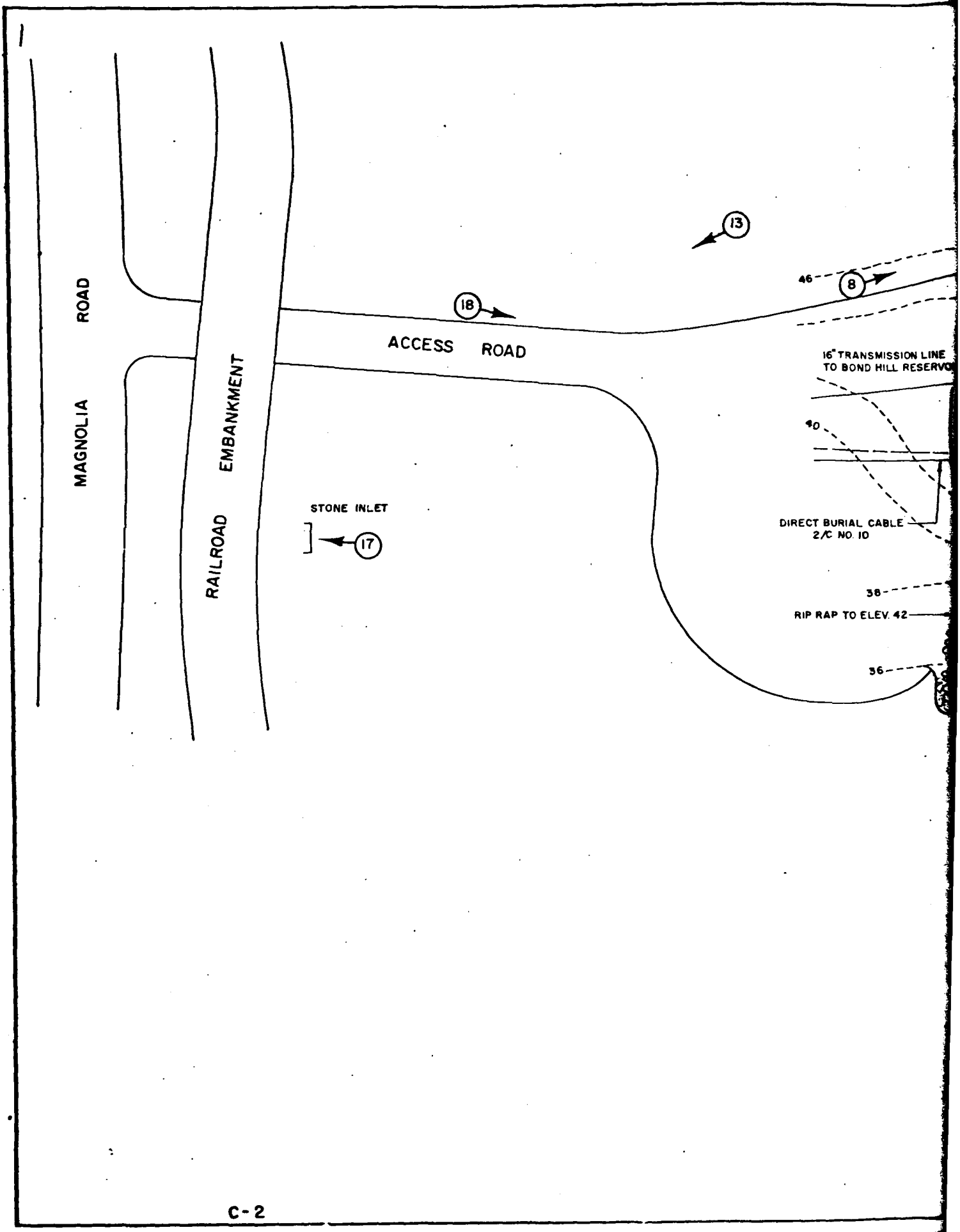
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

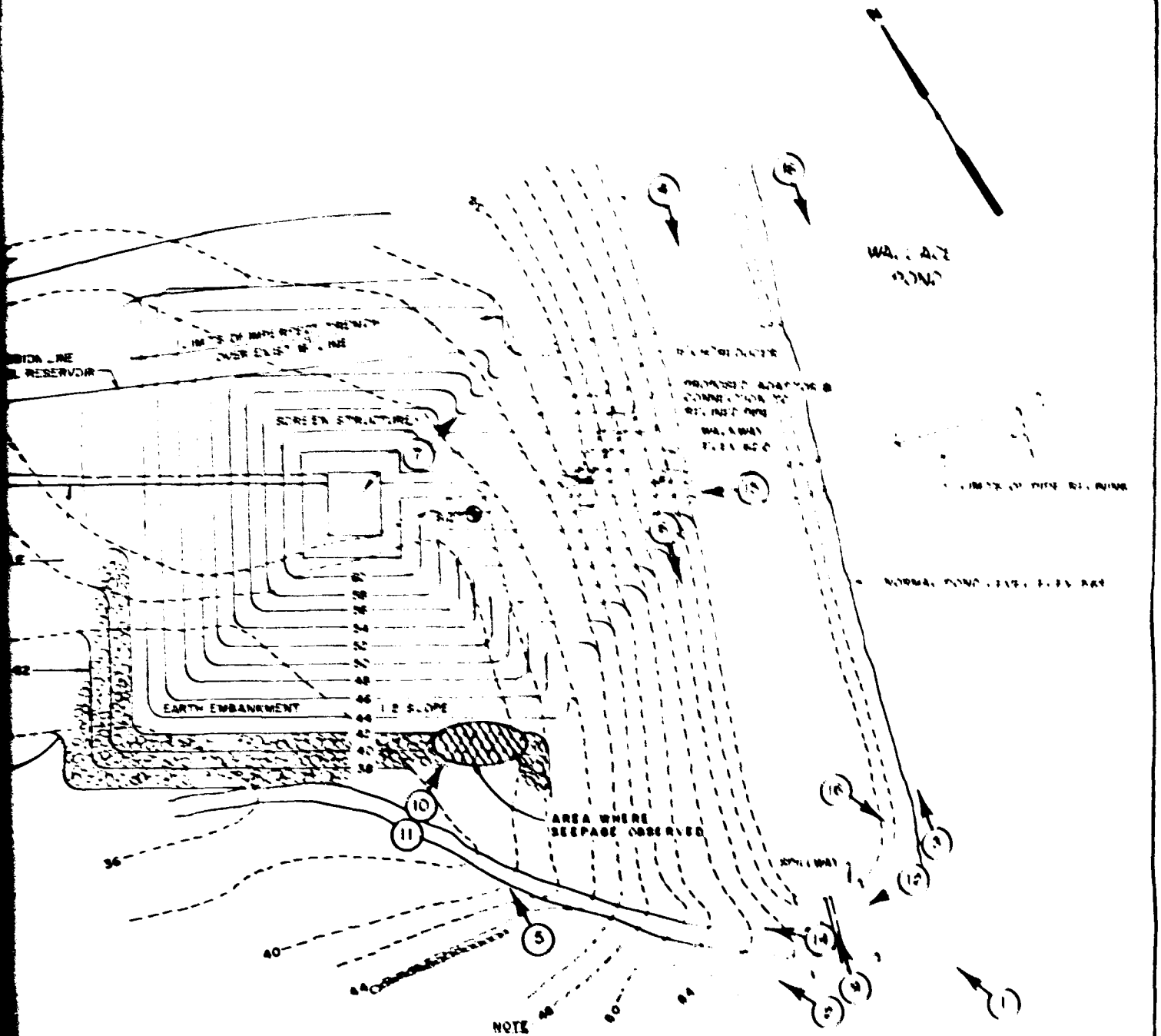
# WALLACE POND OUTLET DAM

## ELEVATION, SECTION & SPILLWAY DETAIL

GLOUCESTER MASSACHUSETTS

| | | | |
|---|---|---|---|
| | | | SCALE NOT TO SCALE |
| | | | DATE MARCH 1980 |


MAGNOLIA ROAD
RAILROAD EMBANKMENT
ACCESS ROAD
STONE INLET
13
18
17
8
46
40
38
36
16" TRANSMISSION LINE
TO BOND HILL RESERVO
DIRECT BURIAL CABLE
2/C NO. 10
RIP RAP TO ELEV. 42




| | |
|---|---|
| HAYDEN, HARDING & BUCHANAN, INC<br>CONSULTING ENGINEERS<br>BOSTON, MASSACHUSETTS | U.S. ARMY ENGINEER DIV. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASS. |

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

# WALLACE POND OUTLET DAM
## PHOTO LOCATIONS

GLOUCESTER — MASSACHUSETTS

SCALE NOT TO SCALE
DATE MARCH, 1980

PHOTO NO. 1 - Spillway intake at the left abutment.

PHOTO NO. 2 - Downstream spillway channel, viewed from the spillway crest.

AD-A147 060 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS WALLACE POND OUTLET D..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV APR 80 2/2

UNCLASSIFIED F/G 13/2 NL

END
DATE FILMED
12-84
DTIC

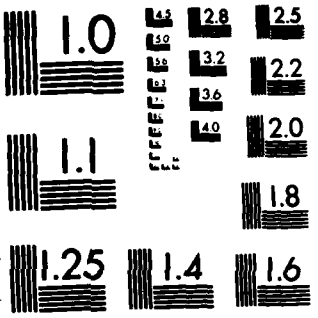


PHOTO NO. 3 - Upstream slope of the Dam, viewed from the left abutment.

PHOTO NO. 4 - Crest of the Dam, viewed from the right abutment.

PHOTO NO. 5 - Wet area at the downstream toe of the Dam in the downstream spillway channel. The standing water extends over an area about 20 feet by 30 feet in size.

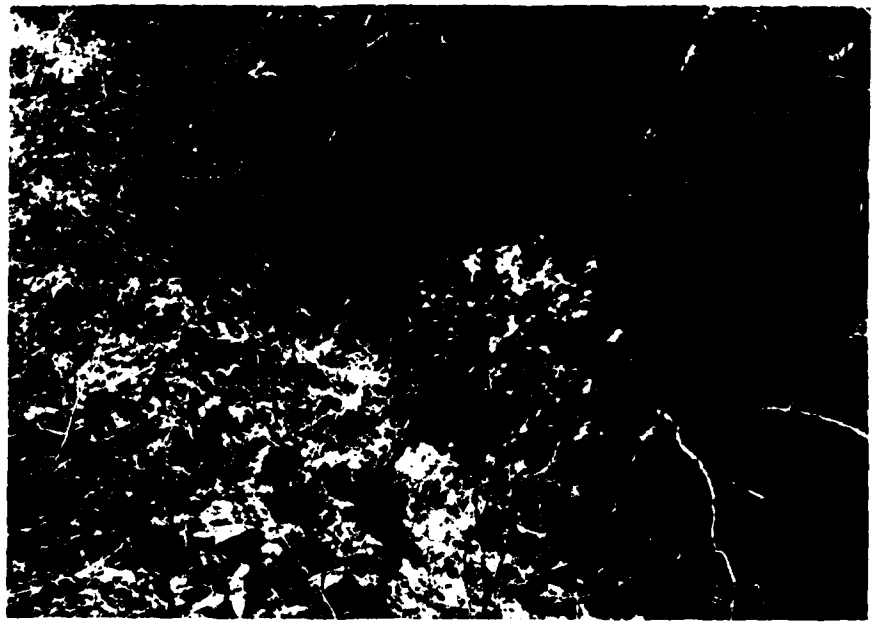


PHOTO NO. 6 - Downstream slope of the Dam, looking toward the left abutment from the Screen House.

PHOTO NO. 7 - Downstream slope of the Dam, looking toward the right abutment from the Screen House.

PHOTO NO. 8 - Standing water on the right side of the access roadway, approximately 100 feet downstream from the right abutment.

PHOTO NO. 9 - Spillway at the left abutment.

PHOTO NO. 10 - Close-up of seep at the junction of the downstream toe of the Dam and the left side of the screen structure embankment.

PHOTO NO. 11 - Seepage at the junction of the downstream toe of the Dam and the left side of the screen structur embankment, looking towards the right.

PHOTO NO. 12 - View of spillway taken from upstream embankment looking toward crest.

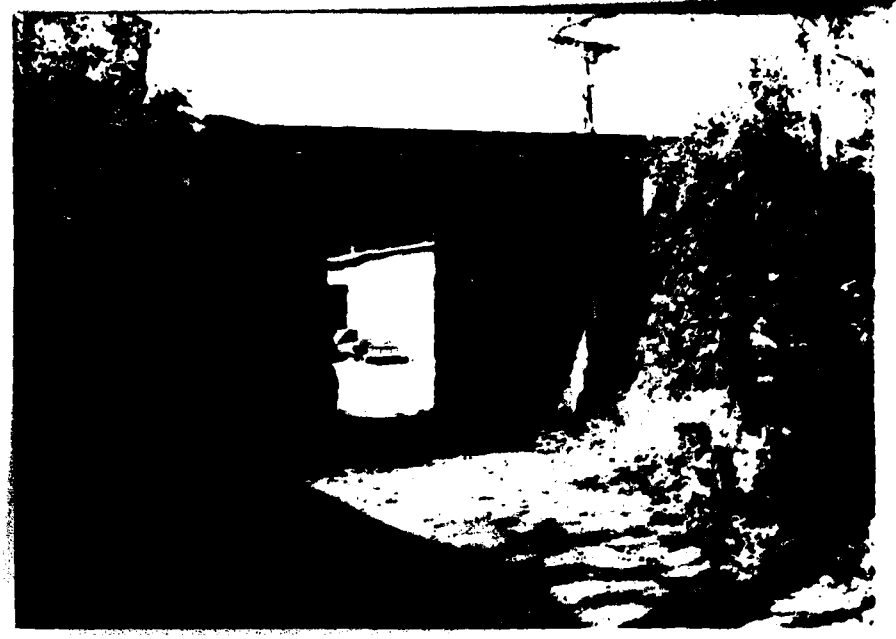


PHOTO NO. 13 - View of opening in railroad embankment for access road to Dam. The opening is 10.5 feet high by 15.5 feet wide. Most of the outflow from the test flood and at least 25% of that from a possible Dam failure could be discharged through this opening. The building showing in the opening is the water treatment plant, across Magnolia Street.

PHOTO NO. 14 - Looking at overflow area on downstream face of Dam from spillway. There is no defined downstream outlet channel from the spillway. Note logs, branches and other debris on downstream face. The riprap protecting the toe of the embankment for the Screen House is shown in the upper middle right portion of the Photo.

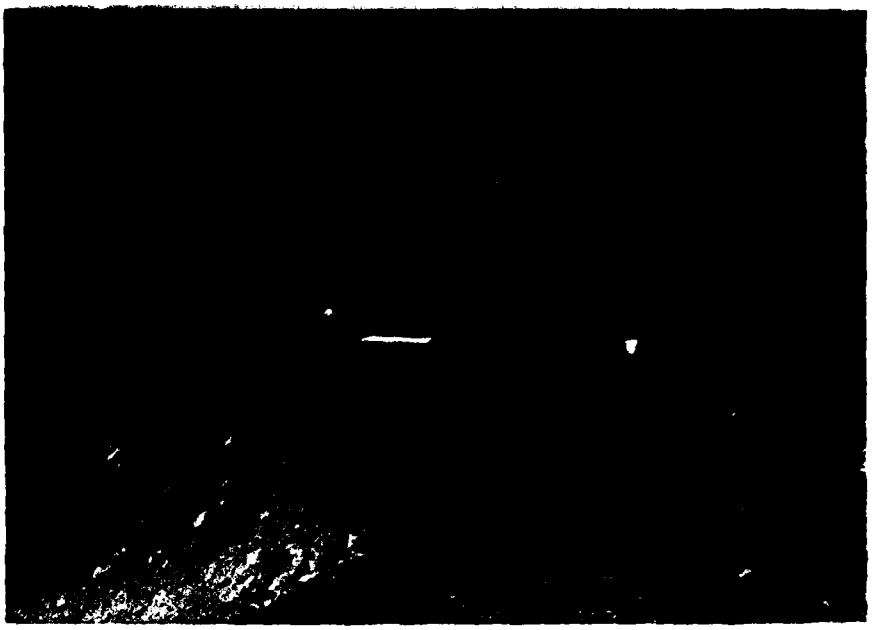


PHOTO NO. 15 - View of Screen House and embankment taken from Dam embankment.

PHOTO NO. 16 - View of Wallace Pond looking eastward from crest of Dam. On the day this photo was taken, the Pond water level was about 11 feet below the crest of the Dam.

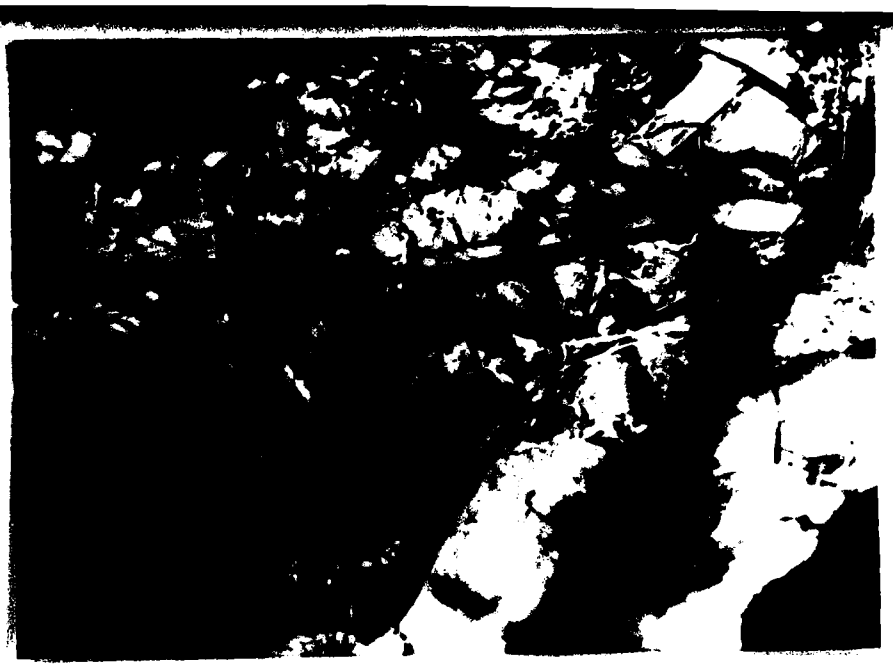


PHOTO NO. 17 - View of the upstream inlet of the culvert under the downstream railroad embankment. The 2.7 feet by 4 feet stone masonry structure is mostly blocked by debris. The culvert exits the other side of the railroad embankment and flow then goes under Magnolia Avenue through a 30 inch R.C.P.

PHOTO NO. 18 - View of downstream side of Dam taken from access road. Note lack of grass for slope protection and erosion on Screen House embankment. The spillway for the Dam is located to the right of the Screen House in Photo. The Dam embankment is shown to the left of the Screen House.


F
2