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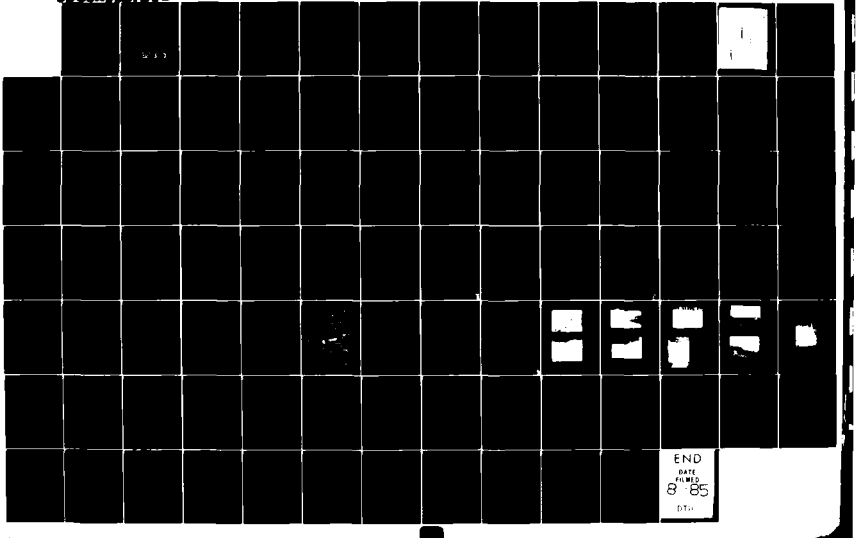

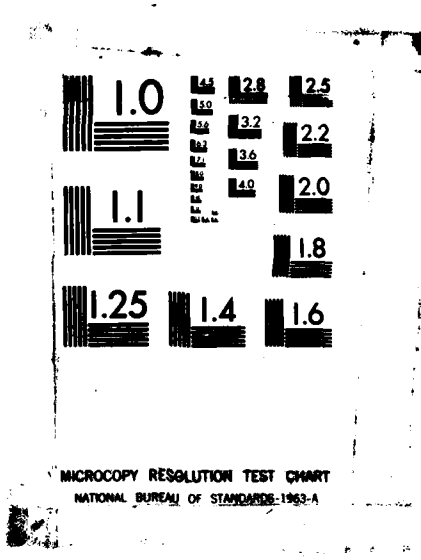
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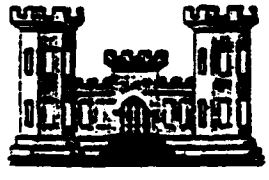
MASSACHUSETTS COASTAL AREA

WESTON, MASSACHUSETTS

SCHENCKS POND DAM
MA 00784

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154

MARCH 1980

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

DAMS, INSPECTION, DAM SAFETY,
Massachusetts Coastal Area
Weston, Massachusetts
Seaverns Brook

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

The dam is a 1200 ft. long, 22± ft. high earth embankment structure. There were no indepth engineering data provided. The dam was judged to be in generally fair condition. It is small in size and has a hazard classification of high. It is recommended that the owner engage a qualified engineer to develop means of removing trees and roots from the dam and select acceptable backfill for holes caused by root removal, as well as other remedial measures.

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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
BRIEF ASSESSMENT

Inventory No.: MA 00784

Name of Dam: Schencks Pond Dam

Town: Weston

County and State: Middlesex County, Massachusetts

Stream: Seaverns Brook

Date of Inspection: October 30, 1979

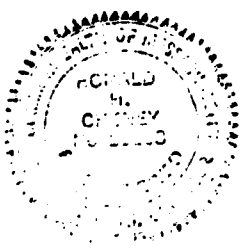
Schencks Pond Dam is a 1,200 foot long, 22± foot high, earth embankment structure containing a 35± foot long emergency spillway and a stone and concrete masonry intake structure. It impounds waters from a 28 acre natural drainage area and any overflow or released water from Norumbega Reservoir and Hultman Aqueduct (which are a part of the Commonwealth of Massachusetts Metropolitan District Commission Water Supply System). See Norumbega Reservoir Dam and Dike Report MA 00782, MA 01208, MA 01209. Schencks Pond Dam has been owned and operated by the MDC since its completion in 1940.

There were no indepth engineering data provided. Therefore, the adequacy of the dam was primarily evaluated by the visual inspection, past performance history, the available as-built drawings and sound engineering judgement. The visual inspection indicated the dam to be in generally fair condition. There was a large wet area, believed to be caused by seepage beneath the dam observed at the downstream toe area to the left of the intake structure. Excessive brush growth and trees on the downstream slope were also observed.

There are no records of the dam being overtopped by storm water runoff. The dam has a small size classification and a high hazard classification. Based upon Corps Guidelines the test flood analyzed was the full PMF. The PMF inflow is 280 cfs and the resulting outflow is 202 cfs. The spillway has a capacity of 130 cfs or 64 percent of the test flood outflow. The combined discharge capacity of the spillway and intake structure is 190 cfs or 94 percent of the outflow. The top of the dam would be overtopped by 0.1 foot.

The dam is in generally fair condition. It is recommended that the Owner engage a qualified registered professional engineer to investigate seepage at the downstream toe; develop means of removing trees and roots from the dam and select acceptable backfill for holes caused by root removal; and perform a seismic stability investigation of the dam. Remedial measures include: removal of brush growth and trees from the dam and discharge channel of the outlet works; debris and silt inside the 18 inch outlet pipe and its outlet channel should be removed; the rotted wooden access stairway at the outlet pipe should be removed and replaced; establishment of a formal downstream warning system, repointing intake structure granite block joints and yearly dam inspection including observation and documentation of seepage at both high and low reservoir levels.

These recommendations and remedial measures should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.



Ronald H. Cheney

Ronald H. Cheney, P.E.
Vice President

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

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.

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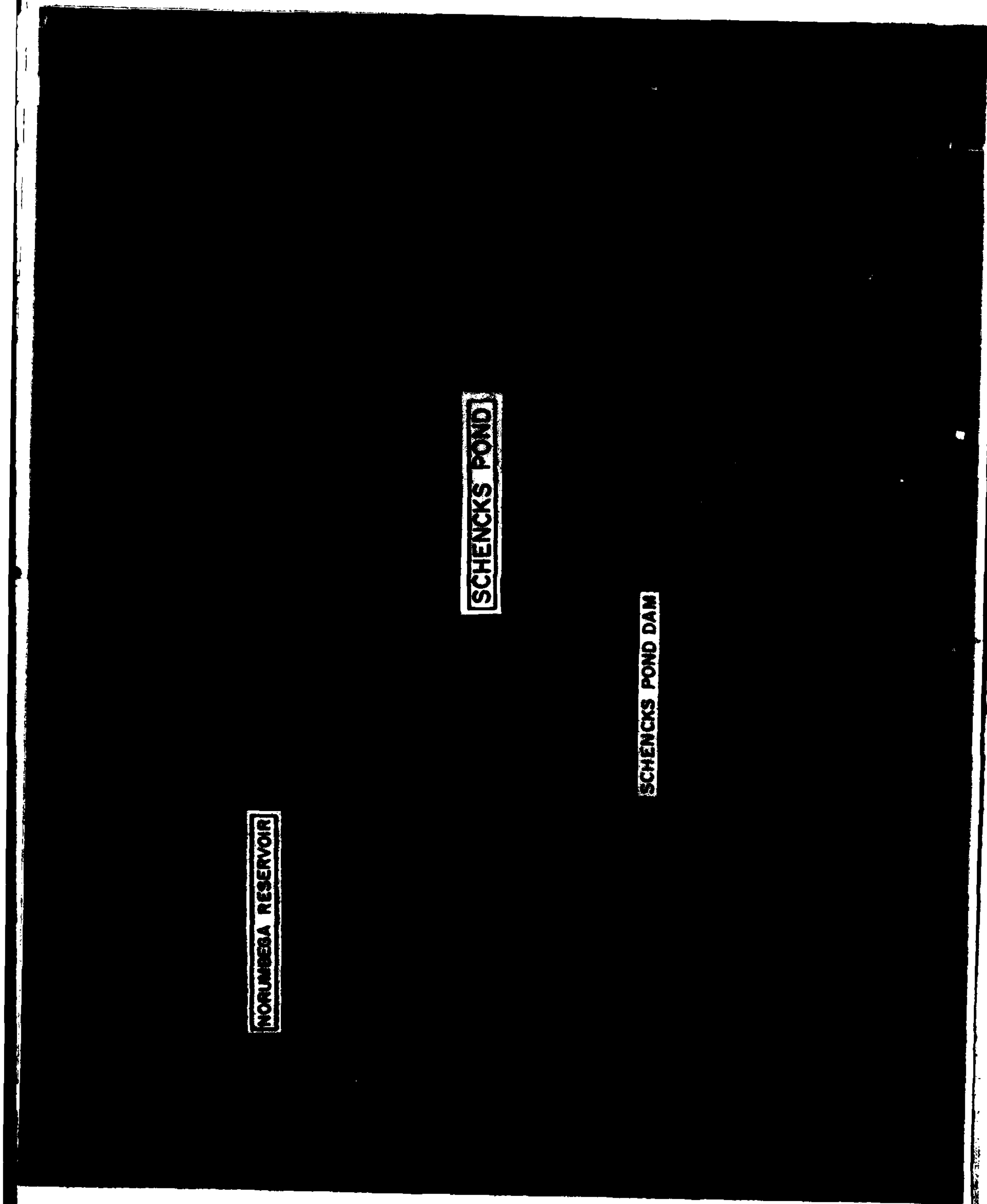
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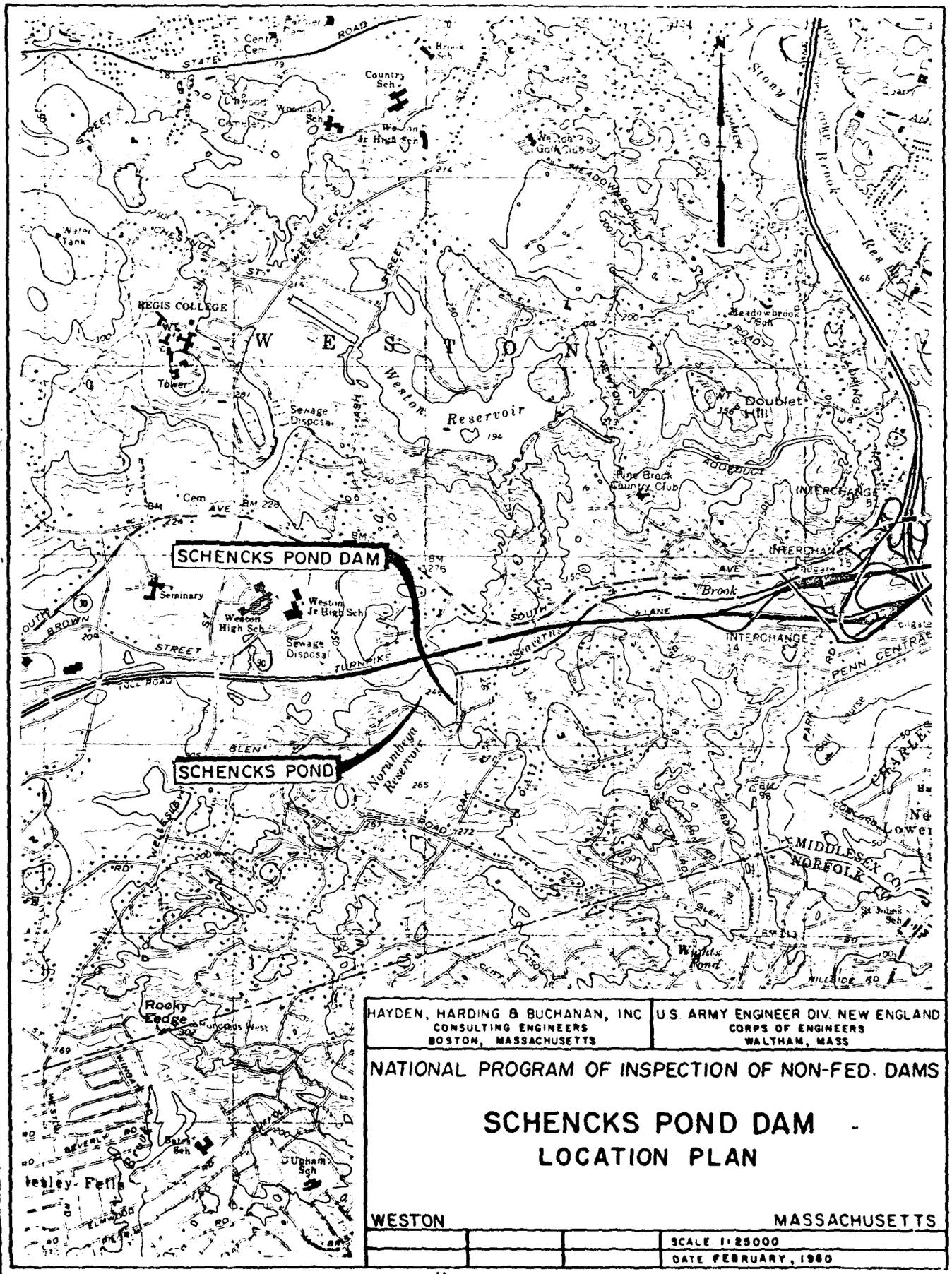
SCHENCKS POND DAM
NORUMBEGA RESERVOIR



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

SCHENCKS POND DAM
LOCATION PLAN

WESTON MASSACHUSETTS

			SCALE 1:25000
			DATE FEBRUARY, 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

Schencks Pond Dam is located in the Town of Weston in Middlesex County, Massachusetts. The dam is located off Oak Street approximately 300 feet southwest of where Oak Street crosses the Massachusetts Turnpike. Directly south of the dam is the MDC Norumbega Reservoir (MA 00782). Schencks Pond Dam is shown on the Natick, Massachusetts Quadrangle having the approximate coordinates of North 42°20'11", West 71°17'37".

b. Description of Dam and Appurtenances

Schencks Pond Dam is comprised of a 22 foot high, 1,200± foot long earth embankment, a 35± foot long emergency spillway, a stone masonry intake structure and a concrete outlet headwall. Schencks Pond is connected to the MDC Norumbega Reservoir-Hultman Aqueduct system. It is not part of the water supply system as no water is drawn from Schencks Pond by the MDC. Schencks Pond and its outlet brook (Seaverns Brook) existed prior to the construction of Norumbega Reservoir. The MDC must maintain Schencks Pond and a minimum base flow in Seaverns Brook. Schencks Pond provides a discharge area for overflow from Norumbega Reservoir and Hultman Aqueduct and also provides a reservoir used in maintaining Seaverns Brook. The MDC discharges water into Schencks Pond, from Norumbega Reservoir, to maintain the water level in the pond. Water inlets through a gated sluice at the gatehouse, and discharges into Schencks Pond through a 4 by 5 foot concrete conduit. Water from the aqueduct will also outlet into Schencks Pond when the level of the aqueduct becomes higher than the overflow weir at the Norumbega Reservoir gatehouse set at elevation 269. See drawings in Appendix B and Norumbega Reservoir Report (MA 00782).

According to plans provided by the MDC, the embankment has an impervious core, a semi-impervious transition section and a consolidated pervious shell. The upstream slope is riprapped on a 2H:1V slope and is underlaid by a 12 inch crushed stone or screened gravel layer. The downstream slope is turf lined and sloped at 2H:1V. The embankment is founded on bedrock having a concrete cut-off and grout holes, the embankment has a maximum hydraulic height of approximately 22 feet.

The intake structure is a 7 foot by 10 foot stone and concrete masonry structure as shown by photograph 1. It has an 18 inch concrete intake pipe and headwall located 30 feet upstream of the intake structure. The intake structure contains a concrete weir having a top elevation of 246. When the level of Schencks Pond exceeds this elevation, water inside the intake structure will spill over the weir. Water would then discharge through an 18 inch concrete pipe to the concrete headwall outlet structure located 45± feet downstream, photograph 9. Normally the level of Schencks Pond is below elevation 246. In order to maintain the outlet brook, water is siphoned through a 2 inch line, into the 18 inch reinforced concrete outlet pipe.

c. Size Classification

The dam is classified as small based on its maximum hydraulic height of 22 feet and storage capacity of about 66 acre-feet.

d. Hazard Classification

The dam has a high hazard potential classification due to the potential for loss of life should the dam fail. Based upon

Corps Guidelines, the assumed peak failure outflow is 13,480 cfs. Prior to failure, the total project discharge (base flow) is 180 cfs. This causes minor flooding, and possible minor damage. Dam failure flood stage varies from about 3 to 11 feet deep (including base flood stage). Twenty-five homes and four roads receive dam failure flood damage.

e. Ownership

The dam has always been owned by the MDC.

f. Operator

The dam is maintained and operated by the MDC. Mr. Charles Demeo is the designated caretaker. The address is Oak Street, Weston, Massachusetts 02193. (Telephone 617-235-2707).

g. Purpose of Dam

Schencks Pond and its outlet brook existed prior to the construction of the MDC Norumbega Reservoir. The MDC is required to maintain the pond and outlet brook. When the MDC built Norumbega Reservoir, Schencks Pond Dam was modified to provide a discharge area for overflow from Norumbega Reservoir and the Hultman Aqueduct. It also provides a reservoir for the outlet brook to draw from.

h. Design and Construction History

Design of the dam was completed in the late 1930's. Construction was completed in the early 1940's. There are no indications of post construction changes.

i. Normal Operational Procedure

Schencks Pond is maintained by the MDC to assure flow is maintained in the downstream outlet, Seaverns Brook. MDC personnel

take daily water readings of the pond. When the level of the pond drops below the operational level, water is fed into Schencks from Norumbega. When the water level of Norumbega (or the aqueduct) exceeds elevation 269, water will spill over a weir in the Norumbega Reservoir gatehouse and outlet into Schencks Pond through the 4 by 5 foot concrete culvert.

1.3 Pertinent Data

a. Drainage Area

The present drainage area 0.04 s.m. (28 acres) is wooded, undeveloped land that is owned by the MDC. The pond's surface area 16.6 acres (at top of dam), is included in that of the drainage area. The small amount of natural runoff into the pond is supplemented periodically by flow from Norumbega Reservoir. This supplemental flow assures a minimum base flow will discharge into Seaverns Brook.

The original Schencks Pond was at this same location. Its surface area was about 8 acres. Its original drainage area, prior to the construction of Norumbega Reservoir, was about 91 acres in size. See Appendixes B, C and D for drawings, photographs and hydraulic calculations.

b. Discharge at Damsite

1. Outlet Works

The outlet works consist of a concrete intake structure with an overflow weir. The inlet and two outlets are 18 inch diameter concrete pipes. The inlet pipe invert is at elevation 228.75. It is connected to the weir chamber where the outlet pipe, at elevation 228.6±, is kept closed with a manually operated sluice gate. Water must rise inside this chamber to overflow a weir before entering the outlet side of the chamber

and then discharge into the outlet pipe. The two 18 inch outlet pipes combine into one 18 inch pipe which outlets approximately 45 feet downstream of the intake structure. The weir and outlet pipe have a maximum capacity of 60 cfs with water at elevation 250.5, top of dam.

2. Maximum Known Flood at Damsite

There are no available records of maximum flooding conditions at the damsite. According to MDC personnel the dam has not been overtopped. Past records of daily reservoir readings are filed at the MDC Sudbury office. The U.S. Weather Bureau records indicate that between 10 to 12 inches of rainfall occurred near the project location from August 17 to 20, 1955.

3. Ungated Spillway Capacity at Top of Dam

The spillway has no provisions for gates, flashboards or stoplogs. Its crest and top of dam elevation are 249.0 and 250.5, respectively. Its capacity with water to elevation 250.5 is 125± cfs.

4. Ungated Spillway Capacity at Test Flood Elevation

At the test flood elevation of 250.6 the spillway capacity is 130± cfs.

5. Total Project Discharge at Top of Dam

With the water level at elevation 250.5, top of dam, the total project discharge is 180± cfs.

6. Total Project Discharge at Test Flood Elevation

At the test flood elevation of 250.6, the total project discharge is 202± cfs.

7. Project Discharge at Normal Pool Elevation

The normal pool elevation is about 246. There is no spillway discharge, as its crest elevation is 249. The weir at the intake structure, with stoplogs, is at elevation 248, thus it has no discharge. A small 2 inch diameter siphon pipe provides a minimal base flow into Seaverns Brook.

c. Elevation (ft. above NGVD - approximate only)

(1) Streambed at toe of dam ---------- 228.5

(2) Bottom of cutoff ---------- 219±

(3) Maximum tailwater --------- less than 1 foot deep

(4) Normal Pool ---------- 246±

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

(6) Spillway crest ---------- 249.0

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

(8) Top of dam ---------- 250.5

(9) Test flood surcharge ---------- 250.6

d. Reservoir (Length in Feet)

(1) Normal pool ---------- 900±

(2) Spillway crest pool ---------- 905±

(3) Top of dam ---------- 910±

(4) Test flood pool ---------- 910±

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

e. Storage (acre-feet)

(1) Normal pool ---------- 66

(2) Spillway crest pool ---------- 111

(3) Top of dam ---------- 133

(4) Test flood pool ---------- 133

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

f. Reservoir Surface (acres)

(1) Normal pool ---------- 13

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

(3) Spillway crest ---------- 15.4

(4) Test flood pool ---------- 16.6

(5) Top of dam ---------- 16.6

g. Dam

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

(2) Length ---------- 1200'±

(3) Height ---------- 22'± (hydraulic)

(4) Top width ---------- 12'

(5) Side slopes ---------- 2H:1V u.s. & d.s.

(6) Zoning - consolidated pervious, rolled semi-impervious and rolled impervious embankment

(7) Impervious core -- rolled impervious embankment

(8) Cutoff ---------- concrete to rock

(9) Grout curtain ---------- shallow grout holes

h. Diversion and Regulation Tunnel

None at this project.

i. Spillway

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

(2) Length of weir ---------- 35'±

(3) Crest elevation (no flashboards) -------- 249.0

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

(5) U/S Channel -- opens directly into Schencks Pond

(6) D/S Channel ----- stone paving on d.s. slope of embankment then open earth channel

j. Regulating Outlets

Regulating outlets are in the weir chamber. Here, the 18 inch pipe has a manually operated sluice gate, at elevation 228.6. The weir, at elevation 246, has provisions for two feet of stoplogs, to reach elevation 248.

SECTION 2

ENGINEERING DATA

2.1 Design Data

The dam was designed in the late 1930's. No design calculations were located.

2.2 Construction Data

Construction of the dam was completed in the early 1940's. As-built plans dated 1945 were made available by the MDC.

2.3 Operation Data

The dam is maintained and operated by the MDC. Flow in the aqueduct is regulated by the upstream Southborough station based on periodic monitoring of the water level at Norumbega Reservoir. Daily water level readings of Schencks Pond are taken to assure that flow in the outlet channel is maintained. No formal operations manual for this project was made available.

2.4 Evaluation of Data

a. Availability

As-built plans were made available at the MDC Water Division Office at 20 Somerset Street, Boston, Massachusetts. A State Inspection Report dated 1974, was made available at the Department of Environmental Quality Engineering, Division of Waterways, Boston Office.

b. Adequacy

Indepth engineering data was not provided and does not allow for a definitive review. Therefore, the adequacy of this dam, structurally and hydraulically, cannot be assessed from the

standpoint of review of design calculations, but must be based primarily on the visual inspection, past performance history, the available as-built drawings, and sound engineering judgement.

c. Validity

The visual inspection of this facility showed no reason to question the validity of the information supplied by the M.D.C.

The January 14, 1974, inspection report from the State indicates no risk to life or property in the event of dam failure. Our field investigation and subsequent analysis indicate a high hazard potential due to dam failure and a high potential for loss of life.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General

At the time of inspection, the water in the reservoir was about 5 feet below the top of the dam.

b. Dam

The dam is a zoned earth embankment about 1200± feet in length and about 22 feet in height with an emergency spillway and an intake structure.

The upstream slope is covered with riprap which is in good condition. In several locations small brush has grown through the riprap near the waterline, photograph 2.

The crest of the dam is about 10 feet wide and is grass covered. The grass has been worn due to maintenance traffic, photographs 3 and 4. No evidence of cracking or misalignment of the crest that could be attributed to embankment movement was observed.

The downstream slope is covered with brush and trees, which in most areas are very dense, photograph 4 and 5. A large wet area, believed to be caused by seepage from beneath the dam, was observed downstream of the toe of the dam starting near the outlet works and extending about 170 feet left of the outlet works. A seep was observed from around a boulder and tree root located about 160 feet left of the outlet works and about 85 feet from the crest of

the dam, photograph 6. The water emerging from the seep was clear and no silt or fine sand was found deposited around the seep. A ½ inch diameter stick could be pushed 18 inches into the ground in the wet area about 35 feet left of the outlet works.

Several large rock outcrops were observed on the upstream and downstream slopes of the dam.

c. Appurtenant Strctures

The spillway of the dam is excavated into bedrock and is in good condition, photograph 7. The discharge channel of the spillway, shown in photograph 8, has a floor consisting of rock, concrete, and mortared stone.

The visible portion of the intake structure is in generally good condition as shown in photograph 1. The mortar joints of the granite blocks need repointing.

The visible portion of the outlet structure on the downstream side of the dam is shown in photograph 9. The discharge channel of the outlet structure is heavily vegetated and lined with trees. The stoplogs and sluice gate are reportedly in operable condition. The wood access stairway from the dam crest to the outlet pipes' headwall was rotted and unsafe.

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 channel is Seaverns Brook. No significant obstructions were observed in the channel, however, it is thickly vegetated. The outlet channel and pipes need to be cleaned.

3.2 Evaluation

Visual inspection indicates the dam is in generally fair condition.

A large wet area, believed to be caused by seepage beneath the dam, was observed downstream of the downstream toe of the dam left of the outlet works. Seepage was observed exiting from the base of a tree root located about 85 feet downstream of the crest of the dam. This condition if left unattended could lead to instability of the dam.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General

Schencks Pond Dam is a component of the high level storage facility used to compensate flow through the MDC Hultman Aqueduct. Water is fed from Norumbega Reservoir into Schencks Pond when the level of Schencks is too low to maintain flow in the outlet channel or when the level of Norumbega Reservoir exceeds elevation 269. Periodic water level readings are taken at Norumbega Reservoir and Schencks Pond.

b. Description of Warning System

There is no warning system to notify the impact area in the event of an emergency. However, the upstream Norumbega Reservoir gatehouse is manned 24 hours per day.

4.2 Maintenance Procedures

a. General

The MDC is responsible for the maintenance of the facility. There is no formal maintenance schedule. MDC personnel at the Norumbega gatehouse perform periodic maintenance as required.

b. Operating Facilities

The gatehouse at Norumbega Reservoir is manned 24 hours per day. MDC personnel can assess the condition of the intake structure during the daily water readings. The direct outlet from Norumbega Reservoir into Schencks Pond is used when the caretaker determines it is necessary.

4.3 Evaluation

Maintenance of the facility is periodically performed by the MDC. Brush growth and trees should be cut as part of routine maintenance. Trees and their root systems should be removed and the resulting holes backfilled with a filter material.

The project should be inspected every year by a qualified registered professional engineer who can identify conditions of concern which if left unchecked could jeopardize the safety of the dam.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Schencks Pond is located in the Town of Weston, Massachusetts, about 200 feet south of the Massachusetts Turnpike. The pond is controlled by the MDC.

The pond was reconstructed, at its original location as a part of the Norumbega-Hultman Aqueduct project, in the early 1940's. It presently has a surface area of 16.6 acres. A small drainage area of 11.4 acres, surrounds the pond. Water is occassionally released from Norumbega Reservoir to maintain the pond's water level, and a minimal base flow in Seaverns Brook.

5.2 Design Data

The existing Schencks Pond and Dam were designed in the late 1930's as a part of the MDC Norumbega Reservoir-Hultman Aqueduct project. Original design data was not located for inclusion in this report. Original construction plans were obtained from the MDC. Schencks Pond is not part of the MDC water supply system.

5.3 Experience Data

There are no available records at the gatehouse of the dam ever being overtopped or past flooding experience. According to MDC personnel the dam has never been overtopped. Past records of daily reservoir readings are kept at the MDC Sudbury office. The small size of the pond's drainage area would limit the amount of runoff even from the largest storms.

U.S. Weather Bureau records indicate that from August 17 to 20, 1955, about 10 to 12 inches of rainfall occurred near the project location.

5.4 Test Flood Analysis

Schencks Pond has a small size classification and a high hazard potential. Based upon Corps Guidelines, the test flood would be in the ½ PMF to full PMF range. The full PMF was used for the test flood due to the amount of residential structures within the dam failure impact area. The test flood inflow from the 0.04 s.m. drainage area is 130 cfs. The spillway discharge from Norumbega Reservoir, 150 cfs, was added to the drainage area inflow of 130 cfs to arrive at a peak inflow of 280 cfs at Schencks Pond.

Assuming that the initial water level were at elevation 249, spillway crest, the test flood inflow would surcharge the pond to elevation 250.6. The resulting test flood outflow is 202 cfs. The combined spillway and weir chamber discharge would be 190 cfs or 94 percent of the test flood outflow. Since the top of the dam is at elevation 250.5, the test flood overtops the dam by 0.1 foot. The total discharge capacity with water at elevation 250.5, top of dam, is 180 cfs, or 89 percent of the 202 cfs test flood outflow.

With the initial water level at elevation 246, normal pool level the test flood outflow would be 145 cfs at elevation 250.4, 0.1 foot below the top of dam. The test flood analysis indicated that for normal operating conditions, the total project storage and discharge capacity is adequate and the dam is not overtopped. Further hydrologic/hydraulic analysis should not be necessary.

5.5 Dam Failure Analysis

Dam failure analysis was performed assuming the initial water level was at the top of dam, elevation 250.5. The dam has a maximum hydraulic height of 22 feet. Forty percent of a 190 foot long

section was assumed to have failed. The peak failure discharge is 13,480 cfs. Just prior to failure, the spillway and weir chamber would be discharging a base flow of 180 cfs.

The base flow will cause minor flooding damage along Seaverns Brook. The base flow and failure flow were combined, 13,660 cfs, and routed to determine failure flood stage and damage.

The first impact area is between stations 5+00 to 12+00. Dam failure flood stage (including base flow stage) is about three to four feet. Nine homes and one road are flooded.

At station 15+00 dam failure flood stage increases to about nine feet. One house is damaged by about nine feet of water and another by two feet of water. Another road is also flooded at this area.

The Massachusetts Turnpike, station 21+00, is flooded by four feet of water. Flood stage is about eleven feet deep. The flood stage increases to allow water to overflow the highway embankment.

From station 26+00 to 49+00 dam failure flood stage is about four to five feet deep. Nine houses and two roads receive about four to five feet of flood water damage. Five other homes receive about two feet of flood water damage.

Beyond station 49+00, additional damage could occur as the remaining 4,528 cfs continues to flow towards the Massachusetts Turnpike, Route 128 and the Charles River.

The potential for loss of life due to the failure of Schencks Pond Dam is high.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation

The visual observations disclosed a large wet area at the toe of the dam and seepage exiting from the base of a tree root about 85 ft from the centerline of the dam. If left unattended this seepage could lead to instability of the dam in the future.

6.2 Design and Construction Data

Design drawings by the Commonwealth of Massachusetts Metropolitan District Water Supply Commission dated 1944 were reviewed. The dam was constructed around 1940.

The following geotechnical information was obtained from a drawing of typical cross sections through the dam:

a. The upstream and downstream slopes are 2H:1V

b. The dam is zoned embankment with a core consisting of "rolled impervious" soil.

c. The dam is founded on earth with the exception of the core which is founded on bedrock.

d. The rock beneath the core was grouted through shallow drill holes.

The plan drawings indicate numerous bedrock outcrops along the centerline of the dam.

6.3 Post Construction Changes

No significant post construction changes to the dam are known.

6.4 Seismic Stability

The dam is located near the boundary of Seismic Zones 2 and 3 and considering its height, a seismic stability investigation should be conducted as recommended in Section 7.

SECTION 7

ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

On the basis of the visual inspection and available records, the dam is judged to be in fair condition.

b. Adequacy of Information

The information made available and the visual inspection are adequate for a Phase I level of investigation.

c. Urgency

The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented within one year after receipt of this Phase I report by the owner.

7.2 Recommendations

The Owner should engage a qualified registered professional engineer to investigate and design required remedial measures for:

a. Means of removing trees and roots from the dam and selecting acceptable backfill for holes caused by root removal.

b. The seismic stability of the dam in accordance with recommended Phase I Guidelines.

3. The source of seepage found at the downstream toe of the dam.

7.3 Remedial Measures

a. Operating and Maintenance Procedures

1. Brush growth on the upstream and downstream slopes and trees on the downstream slope should be cut as part of routine annual maintenance.

2. Brush growth in the discharge channel of the outlet works should be cut as a part of routine maintenance. Debris and silt inside the 18 inch outlet pipe and its outlet channel should be removed.

3. The rotted wooden access stairway located on the downstream slope near the outlet pipe should be removed, and a new, durable stairway constructed to facilitate maintenance.

4. The dam should be inspected every year by qualified registered professional engineers who can identify areas of concern which, if left unchecked, could jeopardize the safety of the dam. This inspection should include observation and documentation of seepage so that significant changes in flow can be detected. This inspection should be performed at both high and low reservoir level.

5. The mortar joints of the granite blocks at the intake structure should be repointed.

6. The Owner should establish a formal warning system to notify downstream areas in the event of an emergency.

7.4 Alternatives

There are no practical alternatives for these recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT SCHENCKS POND DAM

DATE October 30, 1980

TIME 10:30 A.M.

WEATHER 40°F, Sunny

W.S. ELEV. 245+ U.S. ____ DN.S.

PARTY:

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

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT SCHENCKS POND DAM DATE 10/30/79

PROJECT FEATURE Embankment Dam NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	250.5±
Current Pool Elevation	245±
Maximum Impoundment to Date	Unknown
Surface Cracks	None of significance
Pavement Condition	No pavement
Movement or Settlement of Crest	None of significance
Lateral Movement	None of significance
Vertical Alignment	No vertical misalignment observed
Horizontal Alignment	No horizontal misalignment observed
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	None of significance
Sloughing or Erosion of Slopes or Abutments	None of significance
Rock Slope Protection - Riprap Failures	Riprap in good condition
Unusual Movement or Cracking at or Near Toe	None observed
Unusual Embankment or Downstream Seepage	Wet area downstream of dam between left abutment and outlet structure (See text)
Piping or Boils	None observed
Foundation Drainage Features	None observed
Toe Drains	None
Instrumentation System	None
Vegetation	Brush and trees (Up to 12" dia) on downstream slope; slight vegetation on upstream slope.

PERIODIC INSPECTION CHECKLIST

PROJECT SCHENCKS POND DAM DATE 10/30/79

PROJECT FEATURE Intake Structure NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structual Engineer

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Approach channel is reservoir
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	The stone masonry intake structure is in generally good condition.
Condition of Concrete	The joints in the granite blocks need repointing.
Stop Logs and Slots	

PERIODIC INSPECTION CHECKLIST

PROJECT SCHENCKS POND DAM DATE 10/30/79

PROJECT FEATURE Control Tower NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structual Engineer

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER.	
a. Concrete and Structural	
General Condition	There is no control tower.
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 SCHENCKS POND DAM DATE 10.30.79

PROJECT FEATURE Outlet Works NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structual Engineer

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

PERIODIC INSPECTION CHECKLIST

PROJECT SCHENCKS POND DAM DATE 10/30/79

PROJECT FEATURE Outlet Structure NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney
Structural Engineer

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	The general condition of the concrete headwall is good.
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	None observed
Channel	
Loose Rock or Trees Overhanging Channel	Trees line channel sides
Condition of Discharge Channel	Fair - much vegetation

PERIODIC INSPECTION CHECKLIST

PROJECT SCHENCKS POND DAM DATE 10/30/79

PROJECT FEATURE Spillway NAME D. LaGatta

DISCIPLINE Geotechnical Engineer / Structural Engineer NAME R. Cheney

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Combination bedrock and mortared stone.
b. Weir and Training Walls	There is no concrete weir or training wall.
General Condition of Concrete	
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	None observed
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None of significance
Floor of Channel	Combination bedrock and mortared stone
Other Obstructions	None

PERIODIC INSPECTION CHECKLIST

PROJECT SCHENCKS POND DAM DATE 10/30/79

PROJECT FEATURE Service Bridge NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

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	

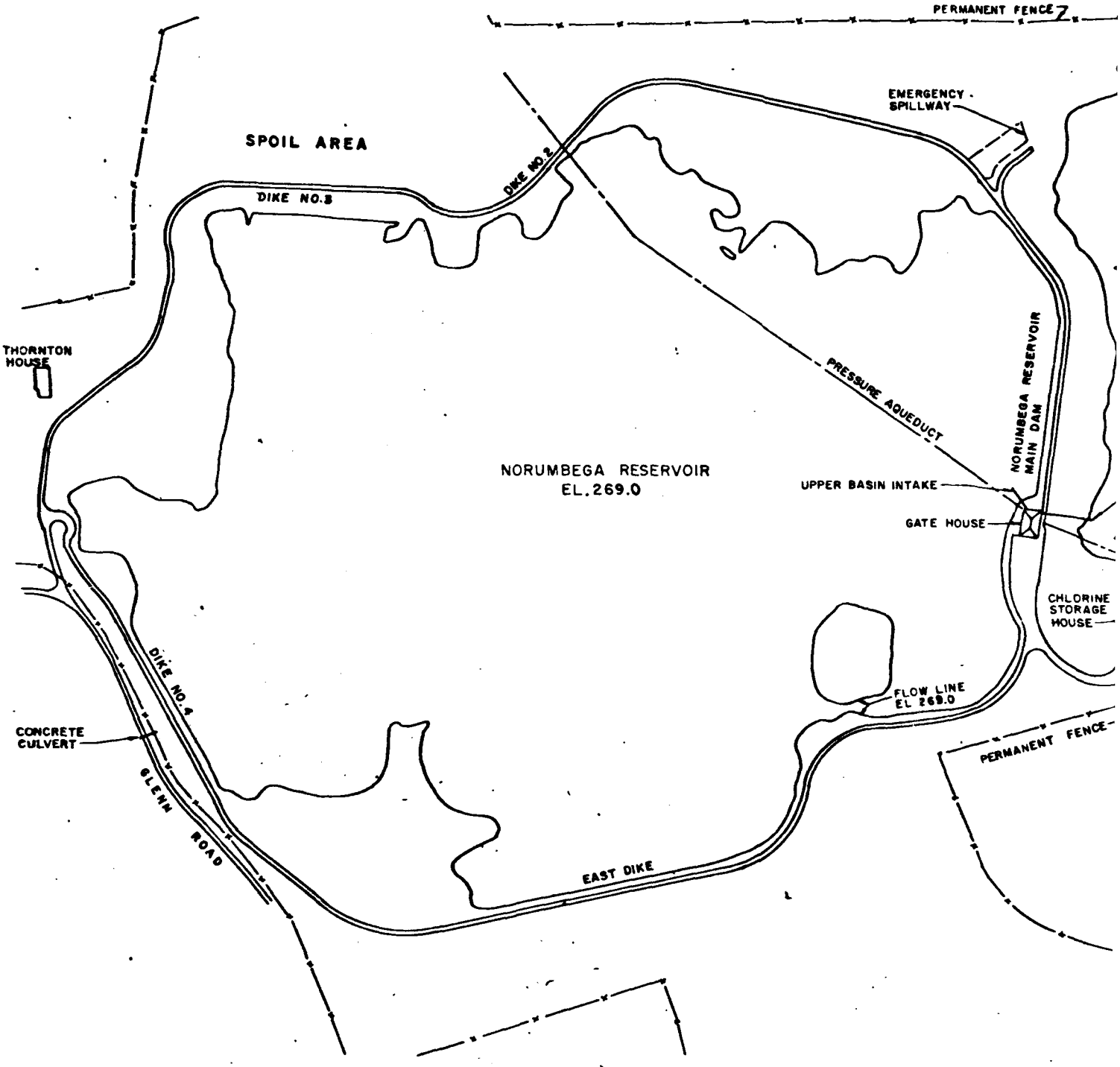
APPENDIX B

ENGINEERING DATA

LIST OF ENGINEERING DATA

1. As-built plans dated 1944 were made available at the MDC Water Division Office at 20 Somerset Street, Boston, Massachusetts.

2. A State Inspection Report dated 1974, was made available at the Department of Environmental Quality Engineering, Division of Waterways, Boston Office.



NOTE:

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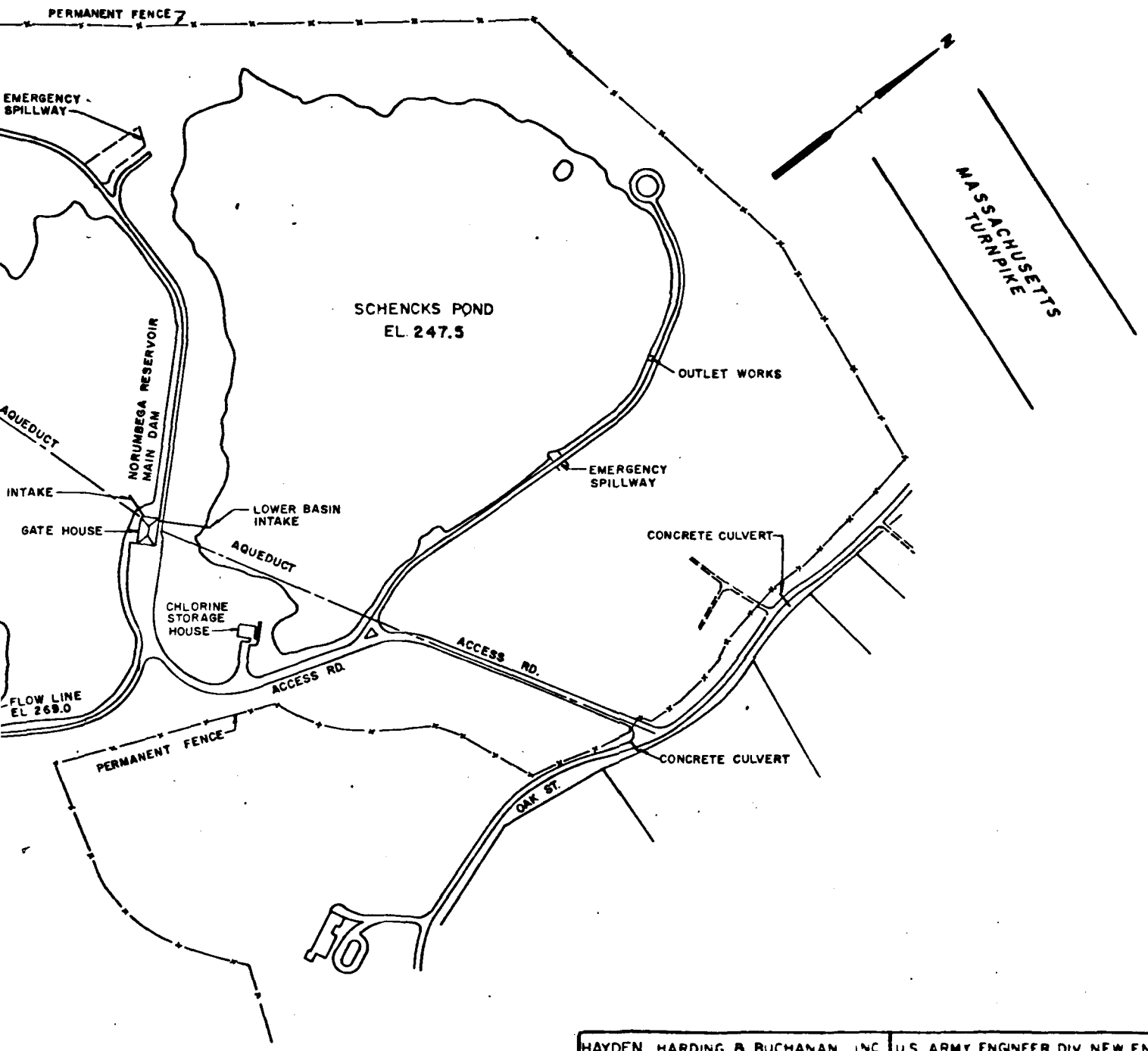
ELEVATION SHOWN ARE NGVD



PLY COMM DWG. DATED MAY 13, 1941

HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON MASSACHUSETTS	US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

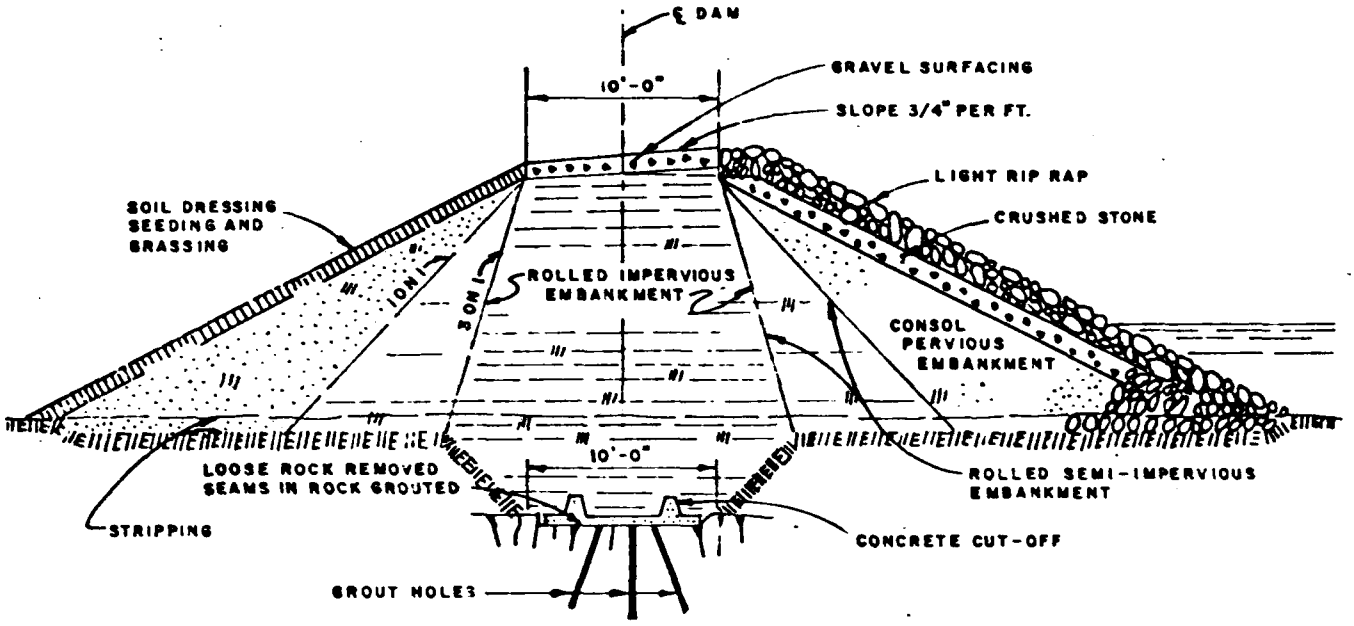
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SCHENCKS POND DAM
PLAN

WESTON MASSACHUSETTS

SCALE NOT TO SCALE

DATE FEBRUARY 1980



NOTE:
TAKEN FROM METR. DISTR. WATER SUPPLY COMM. DWG DATED FEB. 1, 1944
ELEVATION SHOWN ARE BOSTON CITY BASE

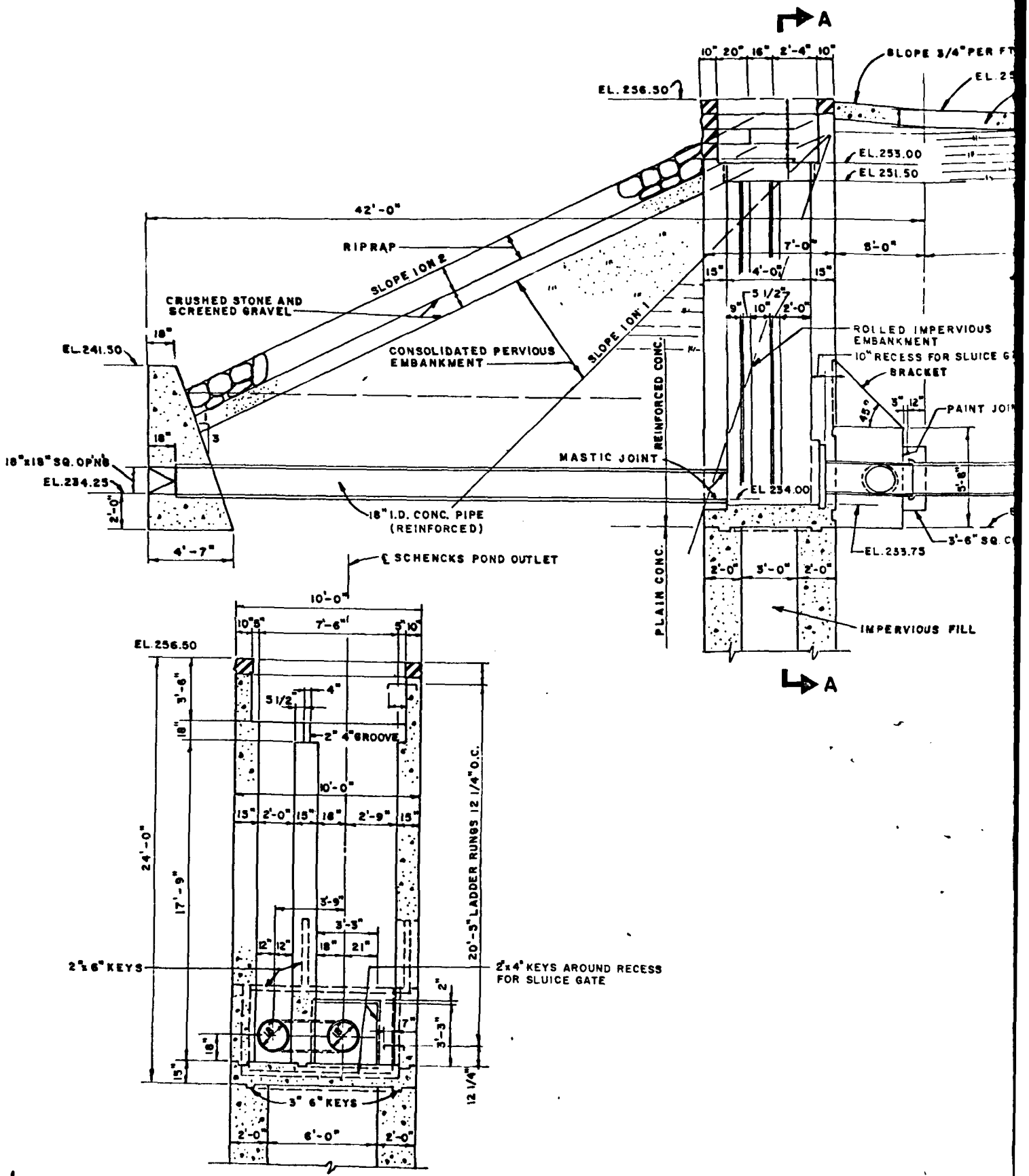
HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

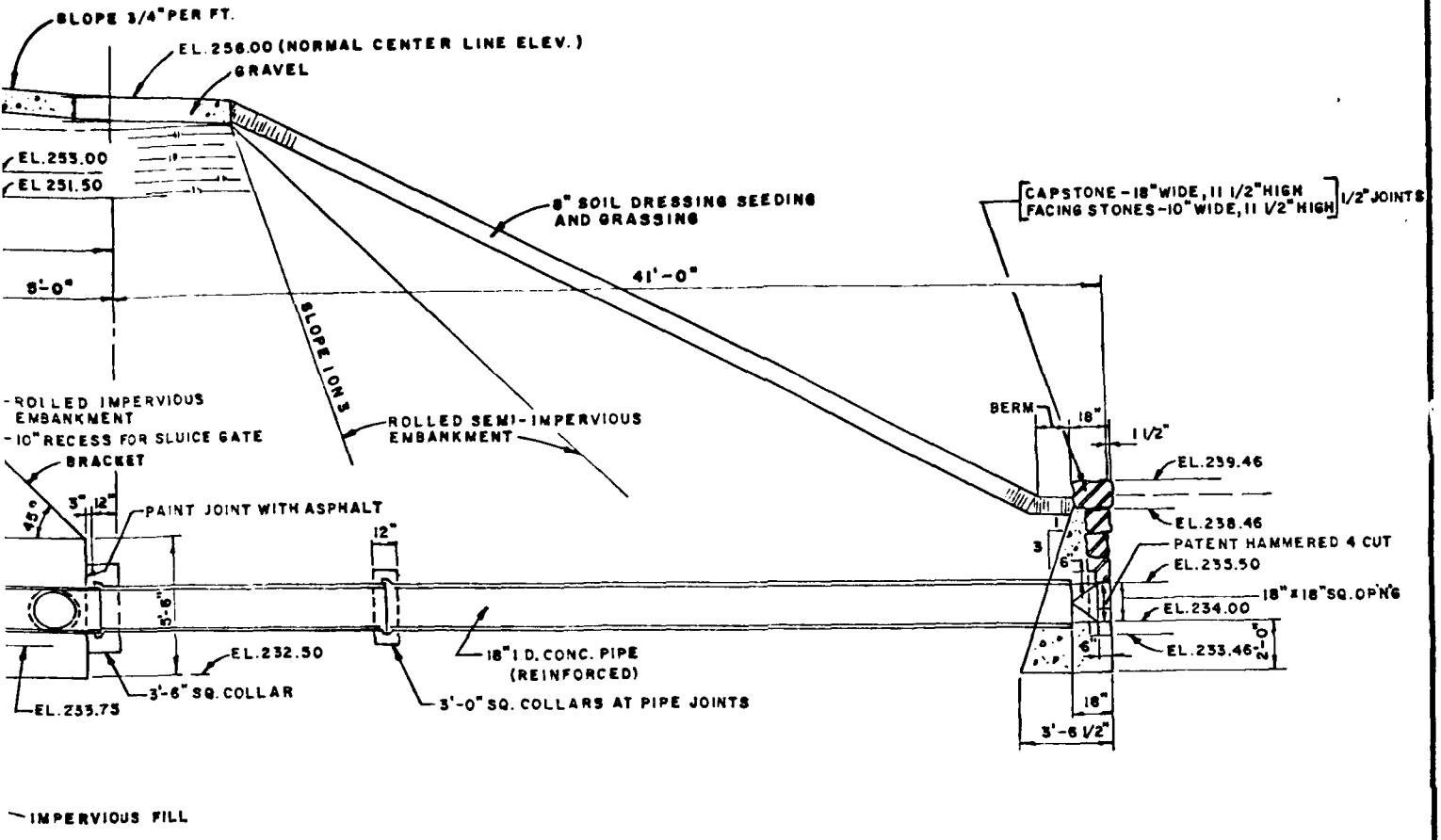
SCHENCKS POND DAM
TYPICAL CROSS SECTION

WESTON MASSACHUSETTS

SCALE: NOT TO SCALE
DATE FEBRUARY 1980



B-5 SECTION A-A



NOTE:
TAKEN FROM METR. DISTR. WATER SUPPLY COMM. DWG. DATED FEB. 1, 1944
ELEVATION SHOWN ARE BOSTON CITY BASE

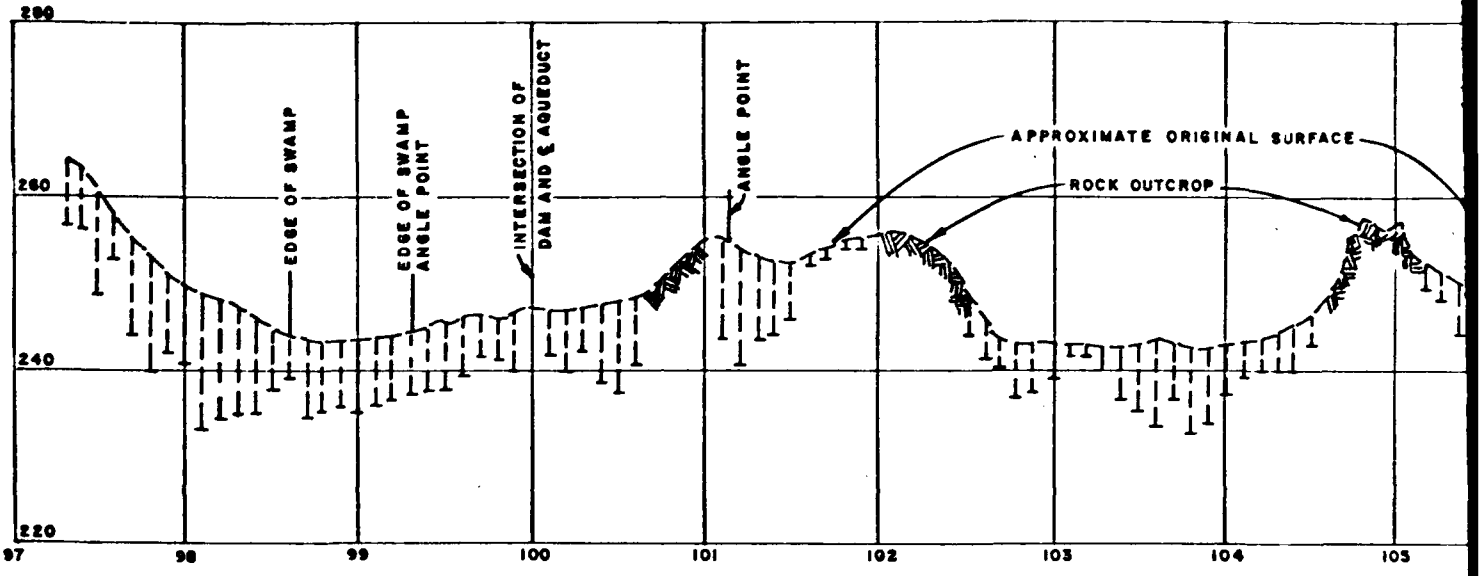
HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SCHENCKS POND DAM
SECTION AT OUTLET CHAMBER

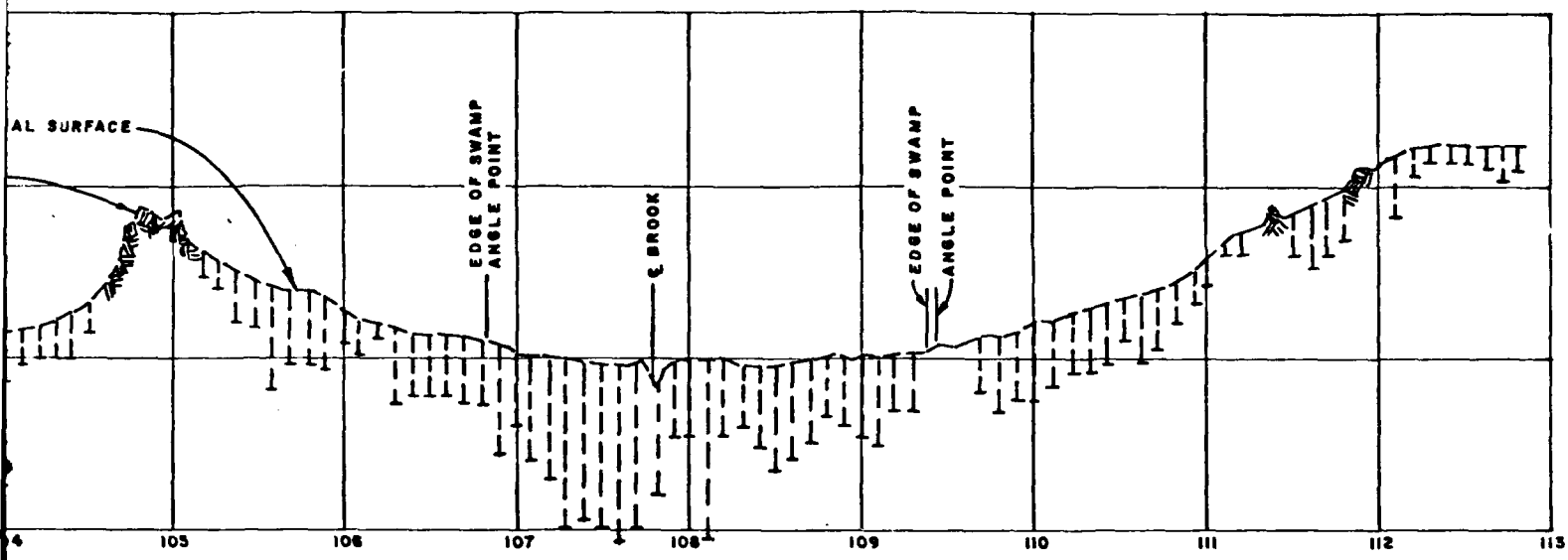
WESTON MASSACHUSETTS

SCALE NOT TO SCALE
DATE FEBRUARY 1980



PROFILE ON CENTER L

NOTE:
TAKEN FROM METR. DISTR. WATER SUPPLY CO
ELEV. SHOWN ARE BOSTON CITY BASE



E ON CENTER LINE

WATER SUPPLY COMM. DWG. DATED FEB. 1, 1944
N CITY BASE

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

SCHENCKS POND DAM
PROFILE

WESTON MASSACHUSETTS

SCALE NOT TO SCALE

DATE FEBRUARY 1980

OK FILE

DESCRIPTION OF DAM
DISTRICT_____

Submitted by: D. Kilpatrick
Date: JAN. 14, 1974

Dam No. 4-9-333-3
Town Worcester
Name of Dam MAHUNDECA A.E.S. POND DAM

1.
Location: Topo Sheet No. 26D
Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

2.
Year built: 1940 Year/s of subsequent repairs_____

3.
Purpose of Dam: Water Supply_____. Recreational ✓
Irrigation_____. Other_____

4.
Drainage Area: .135 Sq. mi. 96.5 acres.

5
Normal Ponding Area: 13.8 acres; Ave Depth 10 Ft.
Impoundment: 4.6 Mil. gals: 138 acre ft.

6
No. and type of dwellings located adjacent to pond or reservoir_____
i.e. summer homes etc. 1-M.D.C. Pump House; 1-M.D.C. Chlorine Storage House

7.
Dimensions of Dam: Length 950'± Max. Height 25'±
Slopes: Upstream Face 2:1
Downstream Face 2:1
Width across top 15 Ft.

9.
Classification of Dam by Materials:
Earth ✓. Conc Masonary_____. Stone Masonary_____
Timber_____. Rockfill_____. Other_____

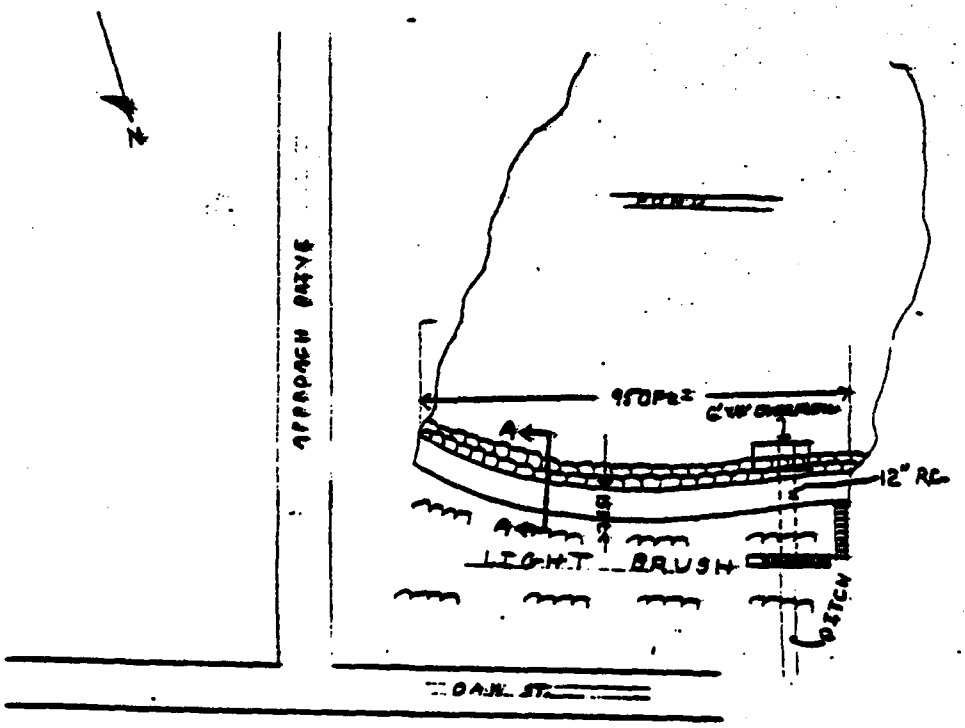
J.
A. Description of present land usage downstream of dam: 90 % rural; 10 % urban
B. Is there a storage area or flood plain downstream of dam: which could accommodate the impoundment in the event of a complete dam failure no ✓. yes_____.

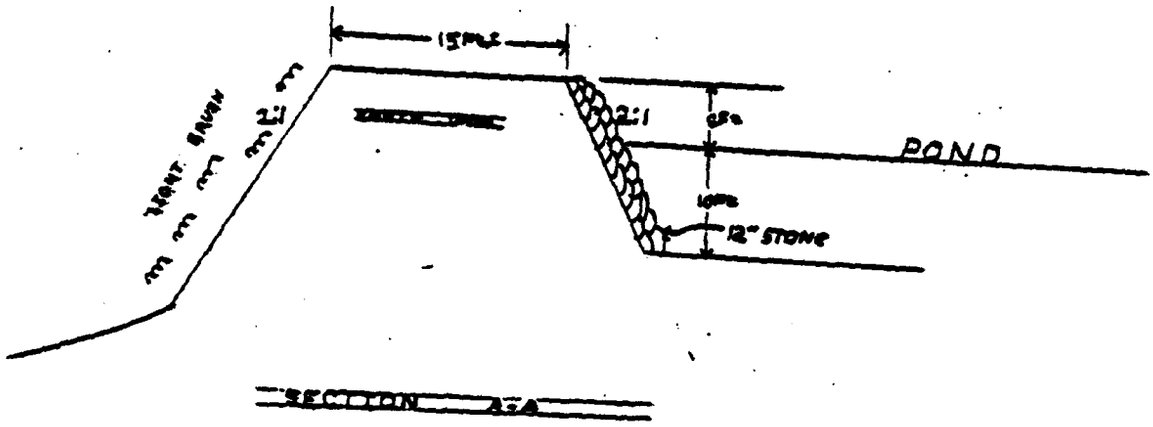
DAM NO. 4-9-337-3

10.
Risk to life and property in event of complete failure.

No. of people	0		
No. of homes	0		
No. of businesses	0		
No. of Industries	0		Type
No. of utilities	0		Type
Railroads	0		
Other dams	0		
Other			

11.
Attach sketch of dam to M x form showing section and plan 8½" x 11" Sheet.





SECTION A-A

INSPECTION REPORT - DAMS AND RESERVOIRS

(1.) Location: City/Town Weston. Dam No. 4-9-333-3

Name of Dam: Merrimaspa Reservoir Flood Dam Inspected by: D. Kilpatrick

Date of Inspection JAN. 14 1974

(2.) Owner/s: per: Assessors _____. Prev. Inspection _____

Reg. of Deeds _____. Para. Contact ✓

1. M.D.C. 133 HOLLIS ST, Framingham MASS 872-4749
Name St. & no. City/Town State Tel. no. -01701

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.

Francis Birmingham OAK ST. Weston - Foreman
Name St. & no. City/Town State Tel. no.

(4.) No. of Pictures taken None.

(5.) Degree of Hazard: (if dam should fail completely)*

1. Minor ✓. 2. Moderate _____.

3. Severe _____. 4. Disastrous _____.

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

(6.) Outlet Control: Automatic ✓. Manual _____.

Operative ✓ yes ; _____ No.

Comments: Overflow spillway through 12" RC Pipe To drainage ditch in adjacent field

(7.) Upstream Face of Dam: Condition:

1. Good ✓. 2. Minor Repairs _____

3. Major Repairs _____. 4. Urgent Repairs _____

Comments: _____

DAM NO. 4-9-333-3

(8) Downstream Face of Dam: Condition: 1. Good ✓ 2 Minor Repairs____

3. Major Repairs____ Urgent Repairs__

Comments:_____

(9) Emergency Spillway: Condition: 1. Good____ 2. Minor Repairs____

3. Major Repairs____ 4. Urgent Repairs____

Comments:_____

(10) Water Level @ time of Inspection 6 ft. above____ below ✓

top of dam ✓ Principal spillway____

other____

(11) Summary of Deficiencies Noted:

Growth (Trees and Brush) on Embankment Minor

Animal Burrows and Washouts____

Damage to slopes or top of dam____

Cracked or Damaged Masonry____

Evidence of Seepage____

Evidence of Piping____

Erosion____

Leaks____

Trash and/or debris impeding flow____

Clogged or blocked spillway____

Other____

Date No. 4-9-111-3

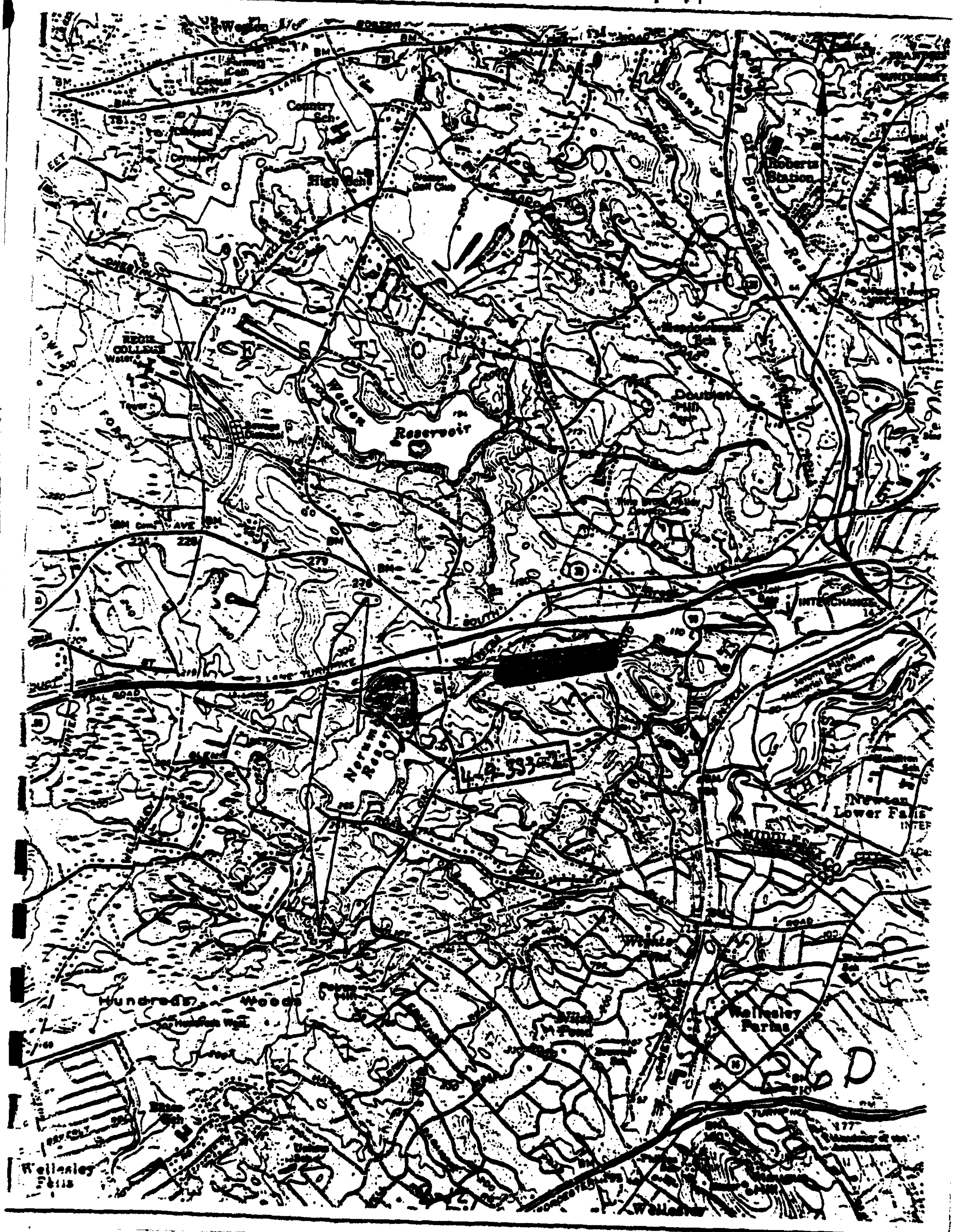
(12.) Remarks / Recommendations: (Utility Equipment)

DAM IN C-000 CONDITION.

(13.) Overall Condition:

1. Safe ✓
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed _____
4. Unsafe _____
5. Restricted transmission to larger units (explain)

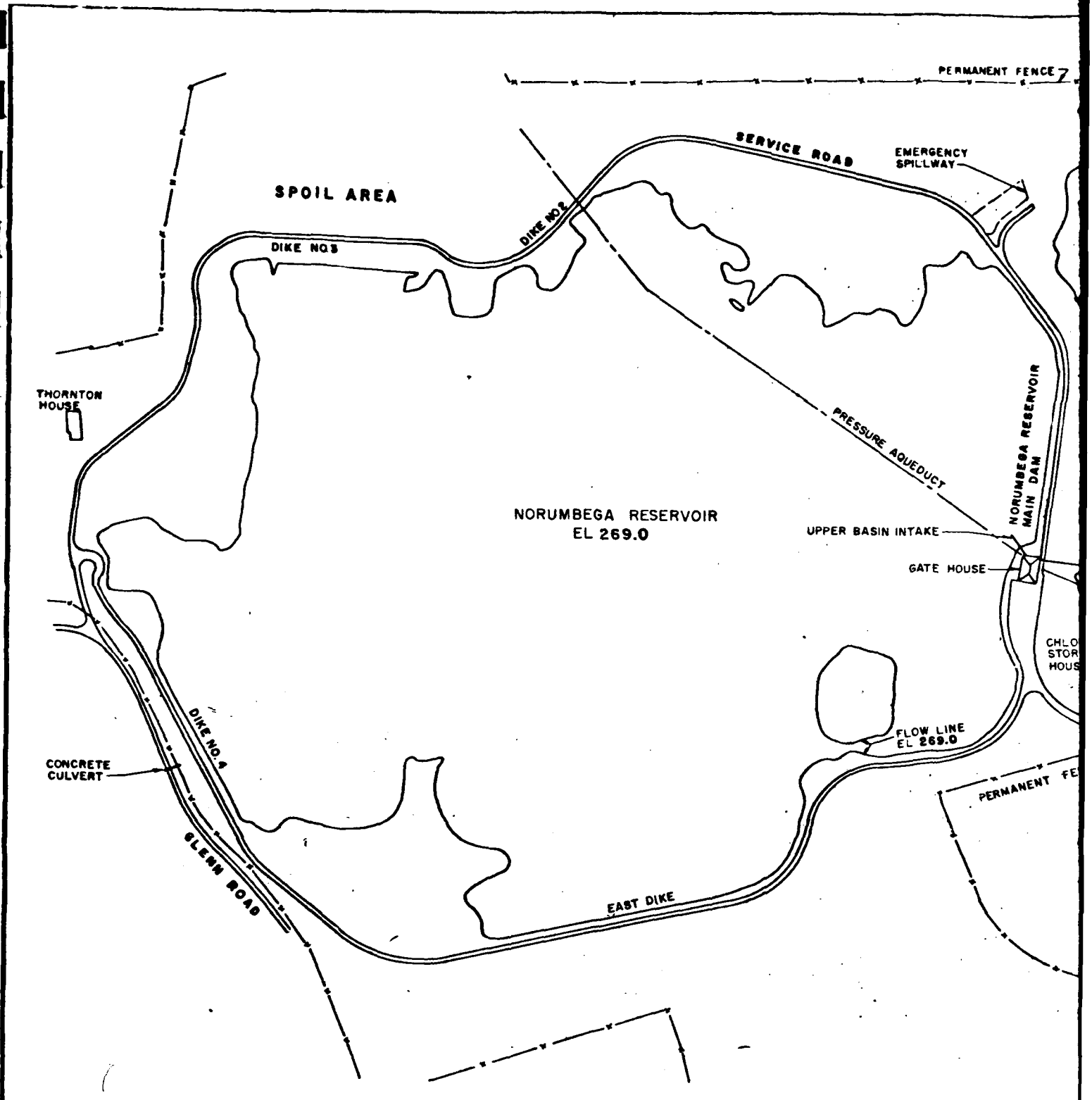
Recommend removal from inspection list _____



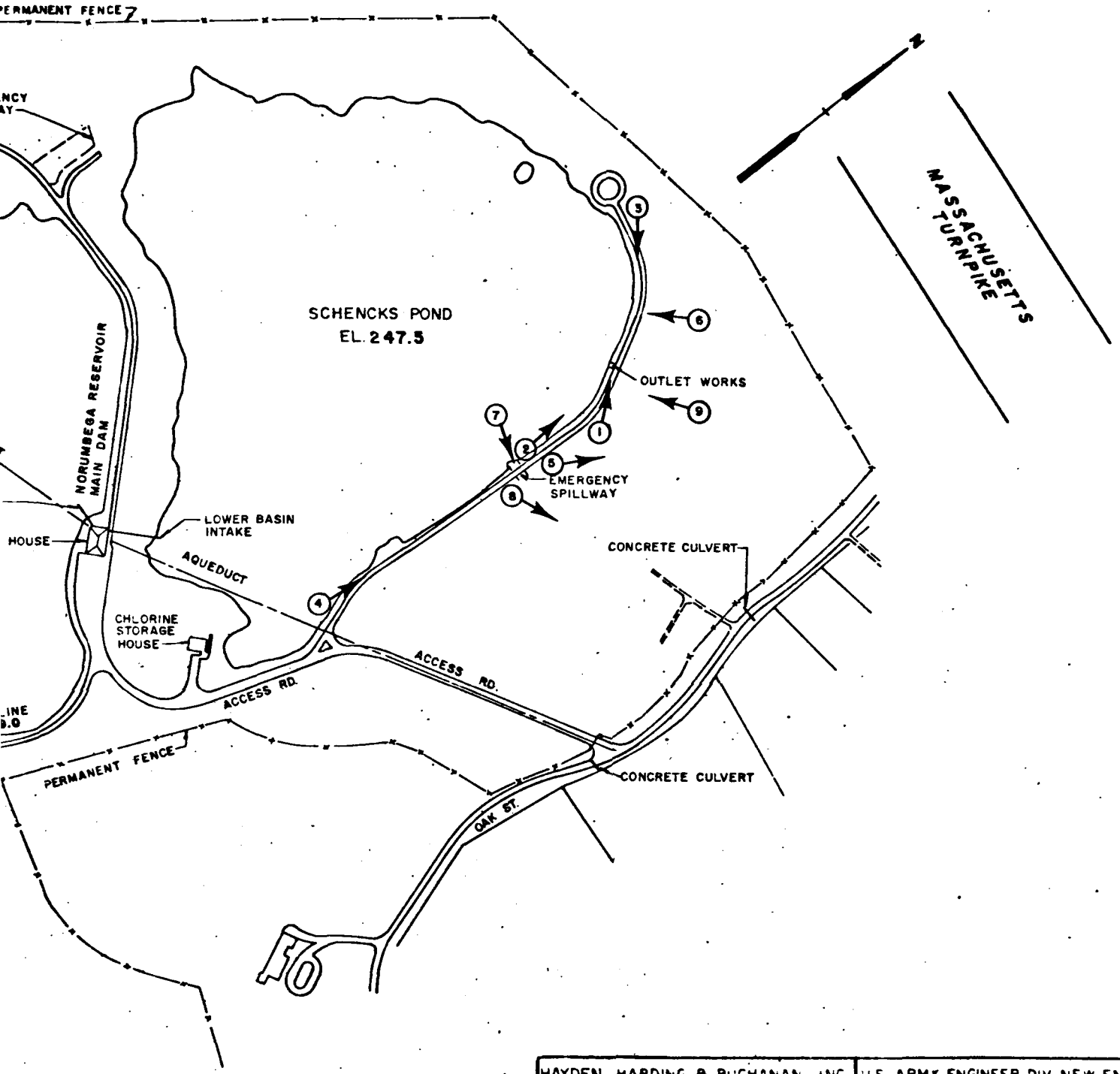
Country Sch
High Sch
Weston Golf Club
Roberts Station
Stony Brook
REGIS COLLEGE
Weston Reservoir
Doublet Hill
INTERCHANGE
Newton Lower Falls
Hundreds Woods
Wellesley Farms
Wellesley Falls

APPENDIX C

PHOTOGRAPHS



NOTE:
TAKEN FROM METR. DISTR. WATER SUPPLY COMM. DWG. DATED
ELEVATIONS SHOWN ARE NGVD



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

SCHENCKS POND DAM
PHOTO LOCATIONS

WESTON MASSACHUSETTS

SCALE NOT TO SCALE

DATE FEBRUARY 1980

COMM. DWG. DATED MAY 13, 1941

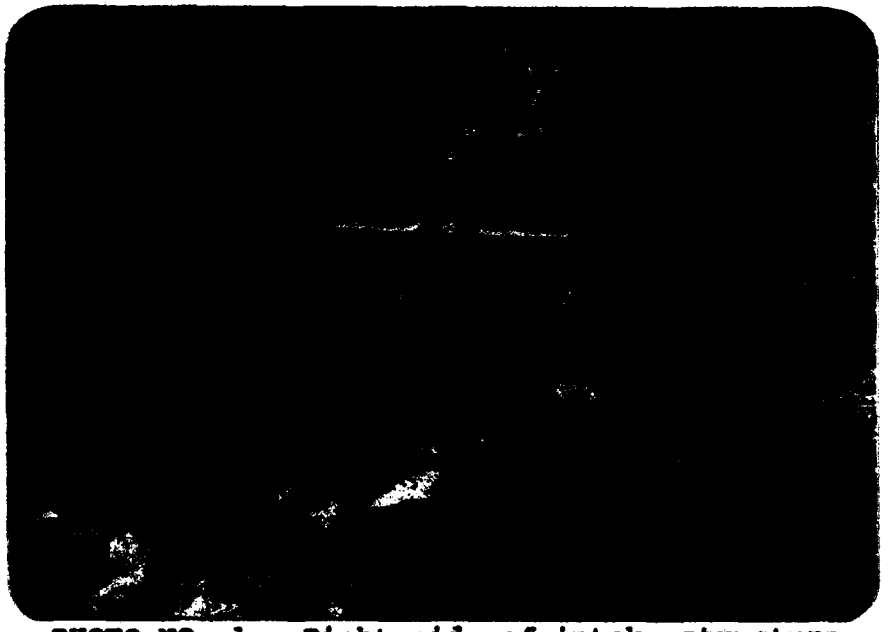


PHOTO NO. 1 - Right side of intake structure.

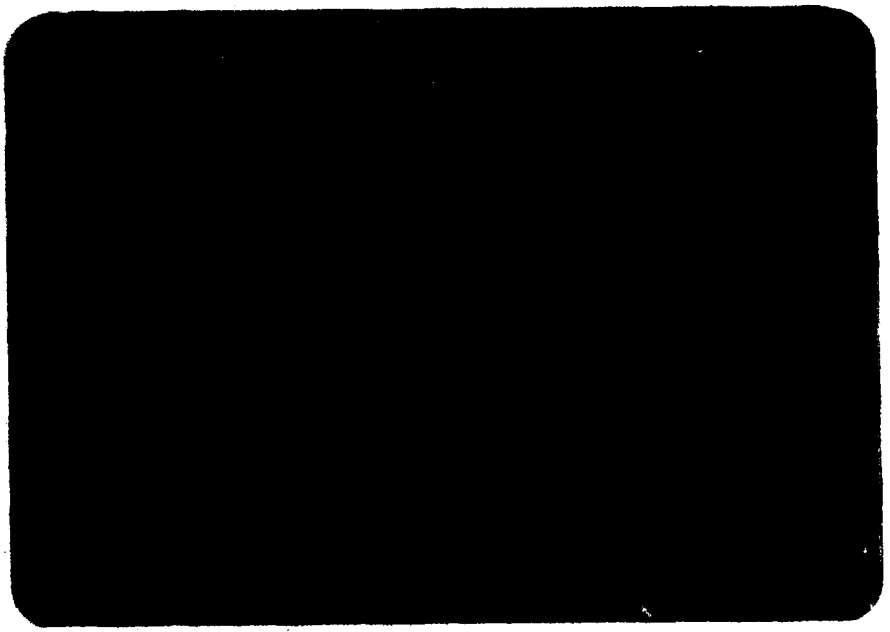


PHOTO NO. 2 - Upstream slope between the spillway and intake structure.

PHOTO NO. 3 - Crest of Dam as viewed from left abutment area.

PHOTO NO. 4 - Crest of Dam as viewed from right abutment area.

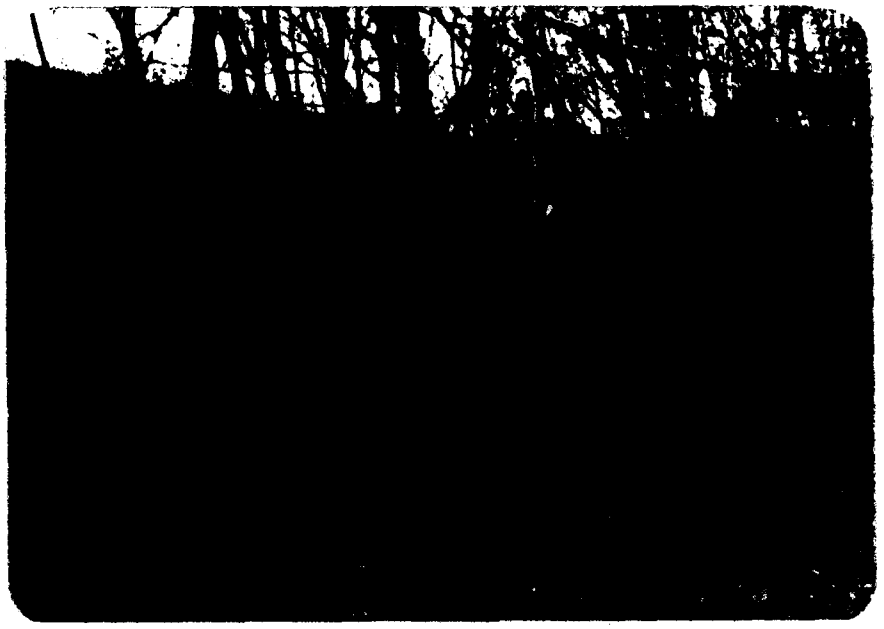


PHOTO NO. 5 - Downstream slope on the left side of the spillway showing trees and brush.

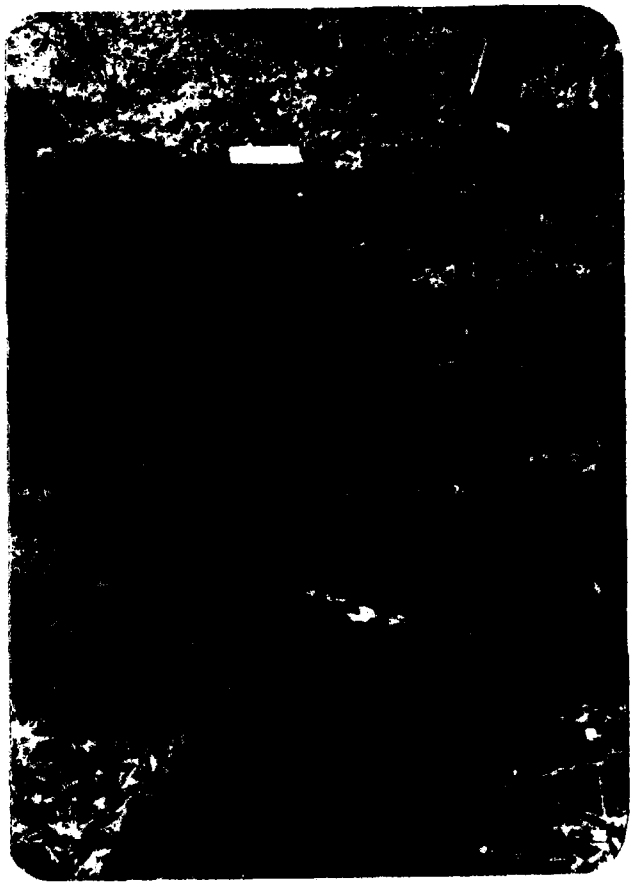


PHOTO NO. 6 - Wet area downstream of Dam about 160 feet left of outlet works and 85 feet from centerline of crest. Seep was observed exiting from around boulder and tree root at location of clipboard.

PHOTO NO. 7 - Spillway floor as viewed from a point near the reservoir water line.

PHOTO NO. 8 - Spillway discharge channel as viewed from the spillway floor.

PHOTO NO. 9 - Headwall of Outlet Pipe located at downstream toe. The 18 inch discharge pipe and outlet channel are filled with water and silt.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

JOB NO. 79.206.1
DATE 12/7/79
BY FDD
CH'D BY mp

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

SHEET NO. D2
JOB Dams
SUBJECT Schencks Pond
CLIENT Corps

Schencks Pond Dam - built 1940-1941

Height of Main Dam: 22'± hydraulic

Discharge into Schencks Pond controlled by inflow allowed from Norumbega. Pond not used for significant water supply storage, & level is generally allowed to remain fairly constant. Pond maintained to fulfill agreement (when Norumbega Res. built) to provide some flow to Seaverns Brook. Draw down for Pond located at outlet structure - 18" RCP

Storage Capacity: 133 acre-ft (Top of Dam)

Size Class: Small (by Storage & Height)

Drainage Area: 0.043 s.m. = 28± acres

Hazard Potential: High

Test Flood: For Small Size & High Hazard ½ to 1 x PMF
Use full PMF

Inflow = 3000 csm × 0.043 sm × 1.0 = 130± cfs

Outlet Structure & emergency spillway could pass entire PMF with water level below top of dam (elev 250.5±)
Elevs = USGS (NGVD) not BCB

Storage Capacity

Elev. Ft USGS	Area acres	Ave Area acres	D Ft	Storage ac-ft	Accum Storage ac-ft
240	9.2	—	—	—	—
246	12.9	11.05	6	66.3	66.3
250.5	16.6	14.75	4.5	66.4	132.7

Note: USGS = BCB − 5.5± ft

Test Flood - Full PMF

Have high hazard and small size
Test Flood Range = ½ to Full PMF
Number of homes downstream Dam so will use Full PMF

$Q_{PMF} = 3000 csm \times 0.043 sm \times 1 = 130 \pm cfs$

$Vol_{PMF} = 19 in \times \frac{1 ft}{12 in} \times 27.5 ac. \cong 44 \pm ac\text{-}ft.$

Also will get inflow from Norumbega Reservoir (from spillway); From Norumbega calcs for PMF inflow get outflow of 150 cfs ±

Total Inflow = 130 + 150 = 280 cfs

Now determine discharge capacity of outlets & Test Flood Storage Routing

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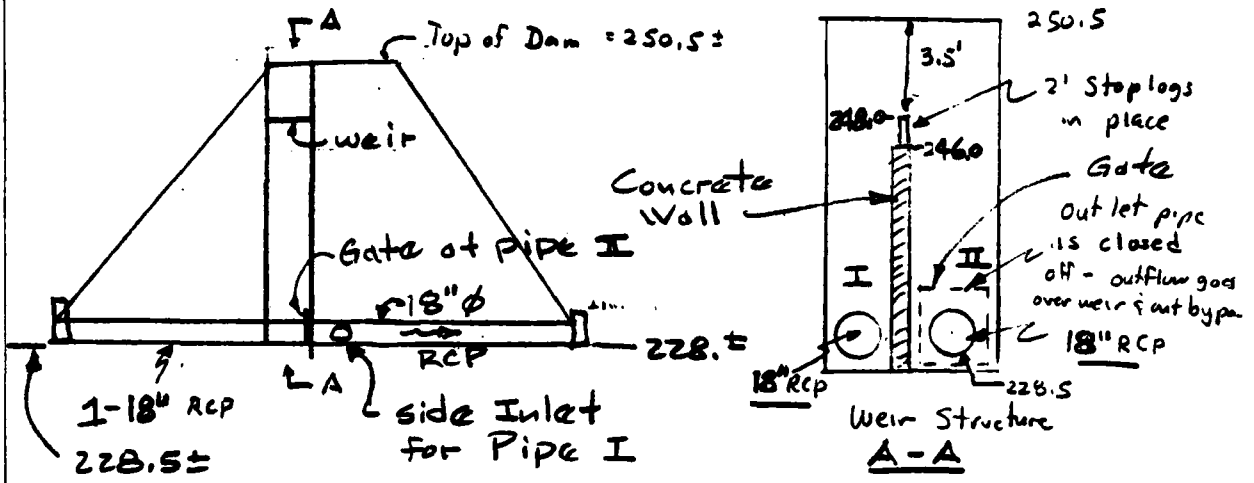
SHEET NO. D7
JOB Lake
SUBJECT Schenks
CLIENT CORPS

Outlet Structure - see photos # 17, 18, 19



Assume spillway weir - broad crested, 15" (1.25') wide with 2' stop logs in place

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

H Ft.	$H^{3/2}$	C	L Ft.	Q cfs.	Elev
1.0	1.0	2.82	4.5	13	249
2.0	2.83	3.12	4.5	40	250
2.5	3.95	3.30	4.5	59	250.5

Outflow: 18" R.C. outlet pipe ① Assume Inlet Control use HEC-5 Chart #2

H Ft	HW/D	Q cfs	H Ft	HW/D	Q cfs
1.5	1.0	6	7.5	5.0	23
3.0	2.0	13	9.0	6.0	26
4.5	3.0	16	15.0	10.0	40 ±
6.0	4.0	20	22.5	15.0	55 ±
			23.0	15.3	56 ±

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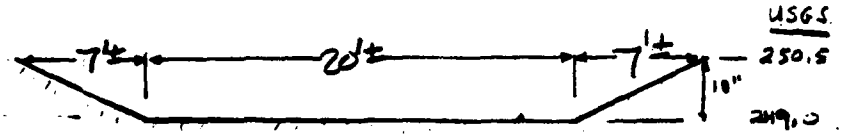
SHEET NO. D4
JOB Dams
SUBJECT Schenchs Pond
CLIENT Corps

Flow through structure controlled by weir (with 2' stop logs in place), as weir flow < pipe capacity up to elev. 150.5, @ top of dam where weir flow ≅ pipe capacity

Emergency Spillway - see photo #15



▼246 Normal Wtr Level

Assume "Broad crested" weir with C = 2.63

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

H ft	$H^{3/2}$	C	L (ave) ft	Q cfs.	Elev. (USGS)
0.5	0.35	2.63	22	20	249.5
1.0	1.0	"	24	63	250.0
1.5	1.84	"	26	125	250.5
2.0	2.83	"	26±	193	251.0

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SHEET NO D.5
JOB Dams
SUBJECT Schenckis
CLIENT Corps

Flow over top of dam - assume $L = 200'$ & $C = 2.63$

Elev.	H, Ft	$H^{3/2}$	L, Ft.	C	Q, cfs.	$Q_{Total} = Q_{top} + Q_{spillway} + Q_{outlet}$
251.0	0.5	0.35 ✓	200	2.63	186 ✓	435 cfs.
250.7	0.2	0.09	"	"	47	254 cfs.
250.8	0.3	0.16	"	"	86	306 cfs.

PMF Storage Routing: Assume initial reservoir elev. = 249.0 (Sheet 5A bottom)

Wt. Ave. Runoff Volume = $Vol_{Schenckis} + Vol_{Nonamesset} = \frac{(Area_S \times Runoff_S) + (Area_N \times Runoff_N)}{Combined\ Area}$

$= \frac{(63 \times 9.47\ in) + (28 \times 19\ in)}{63+28} = 12.4$ in. ✓
91

$Q_{P_1} = 280$ cfs. $Elev_1 = 250.8$ ✓

$Stor = 138 - 110 = 28$ ac-ft or 3.7 in (91 acres)

$Q_{P_2} = 280\left(1 - \frac{3.7}{12.4}\right) = 196$ cfs. ✓ $Elev_2 = 250.55$

$Stor_2 = 134 - 110 = 24$ ac-ft or 3.2 in ✓

$Storage = \frac{3.7+3.2}{2} = 3.45$ ✓

$Q_{P_3} = 280\left(1 - \frac{3.45}{12.4}\right) = 202$ cfs ✓ $Elev_3 = 250.6$

$Q_{out} = 202$ cfs. ± $Elev = 250.6' \pm$

Dam overtopped by 0.1 ft ±

Outlet + Spillway can handle 90% PMF outflow

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SHEET NO. D5A
JOB Dams
SUBJECT Schenciks Res
CLIENT Corps

Check Storage Routing for 1/2 PMF

$Q_{IN} = 1/2 \times 130 + 65$ (From Norumberga)

$Q_{in} = 65 + 65 = 130$ cfs.

Wt. Ave Runoff Vol. $= \frac{(63 \times 4.07) + (28 \times 9.5)}{91} = 5.74$ in ✓

$Q_{P_1} = 130$ cfs $\quad Elev_1 = 150.2$ ✓

$Stor_1 = 129. - 110. = 19$ ac-ft or 2.5 in ✓

$Q_{P_2} = 130\left(1 - \frac{2.5}{5.74}\right) = 73$ cfs. ✓ $\quad Elev_2 = 49.7'$ ✓

$Stor_2 = 122 - 110 = 12$ ac-ft $= 1.6"$

$Stor_{ave} = \frac{2.5 + 1.6}{2} = 2.1"$

$Q_{P_3} = 130\left(1 - \frac{2.1}{5.74}\right) = 83^{\pm}$ cfs.

$Q_{out} = 83$ cfs. $\quad Elev = 249.8$ ft

PMF Test Flood Analysis with initial pool level at elev. 246. (See 5) "normal pool elev."

$Q_{P_1} = 280$ cfs · $El_1 = 250.8$ · $Str = 138 - 65 = 73$ a-f on 9.6"

$Q_{P_2} = 280\left(1 - \frac{9.6}{19}\right) = 138$ cfs $\quad El_2 = 250.4$

$Str_2 = 131 - 65 = 66$ a-f on 8.7"

$Str_{ave} = \frac{9.6 + 8.7}{2} = 9.15"$

$Q_{P_3} = 280\left(1 - \frac{9.15}{19}\right) = 145$ cfs $\quad El_3 = 250.4$.

no over topping

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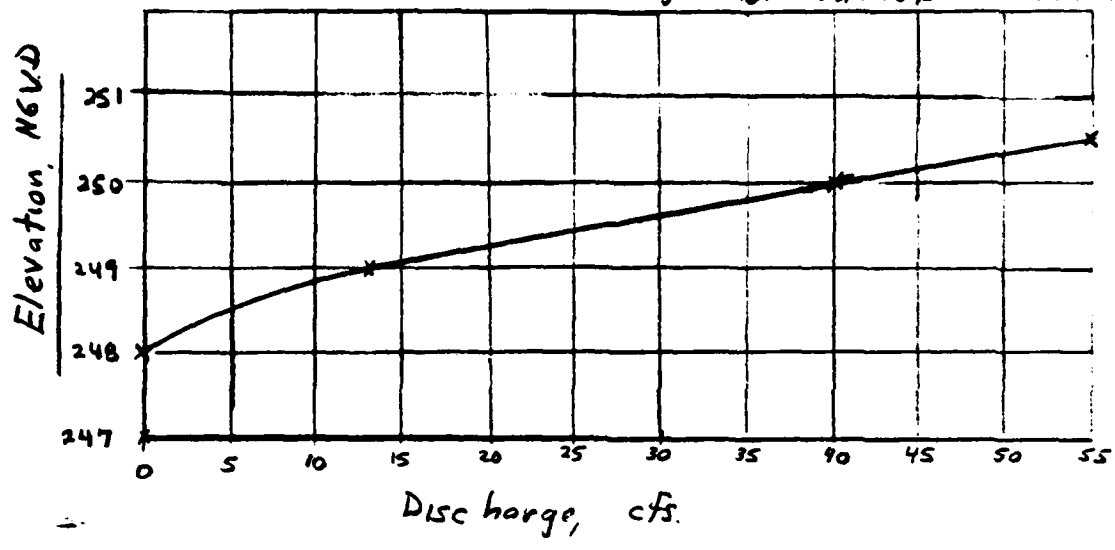
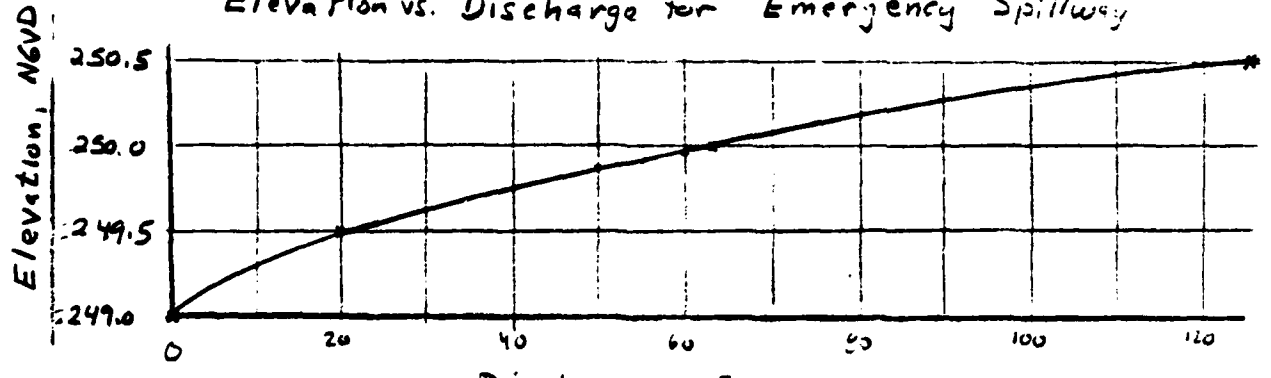
SHEET NO D6
JOB Dam
SUBJECT Schenecki Reservoir
CLIENT Corps

Elevation vs Discharge for Outlet Structure



Elevation vs. Discharge for Emergency Spillway



Top of Dam Elevation = 250.5±
Invert Emergency Spillway = 249.0 ±
Top of weir inlet to 1 "RCP = 249 ±
Invert 18" RCP = 229 ±.

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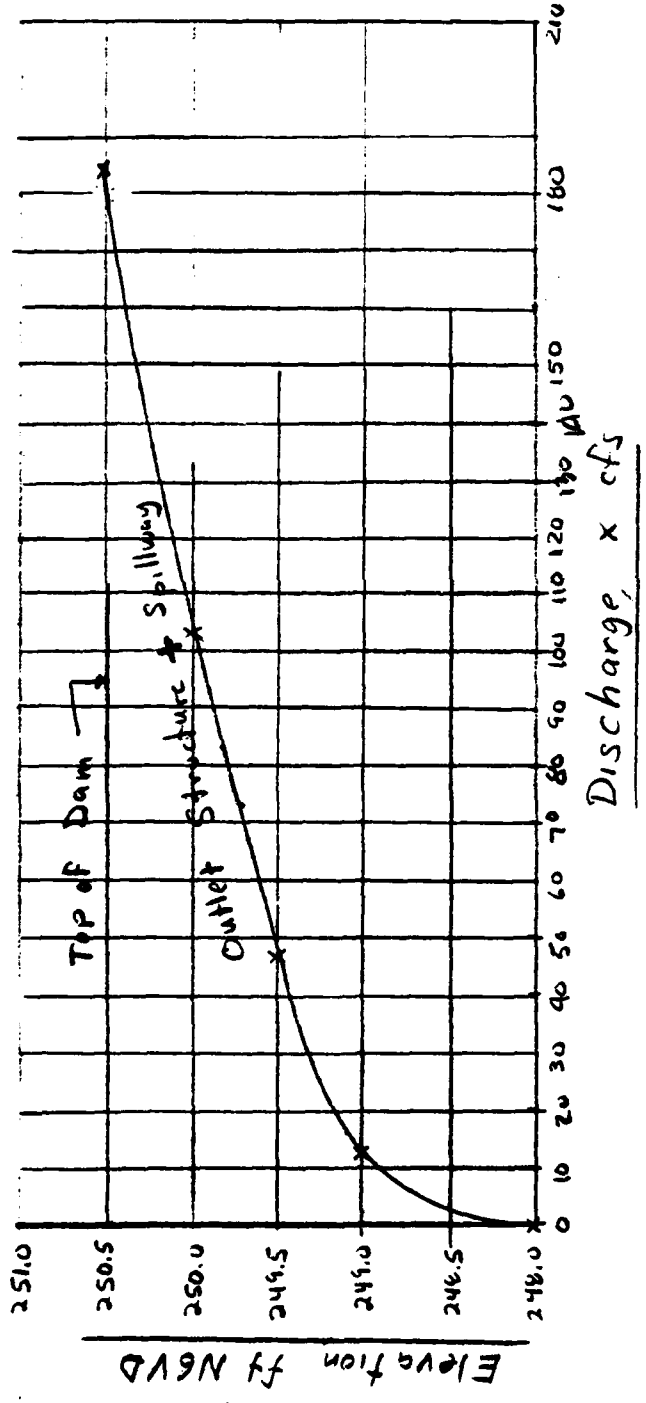
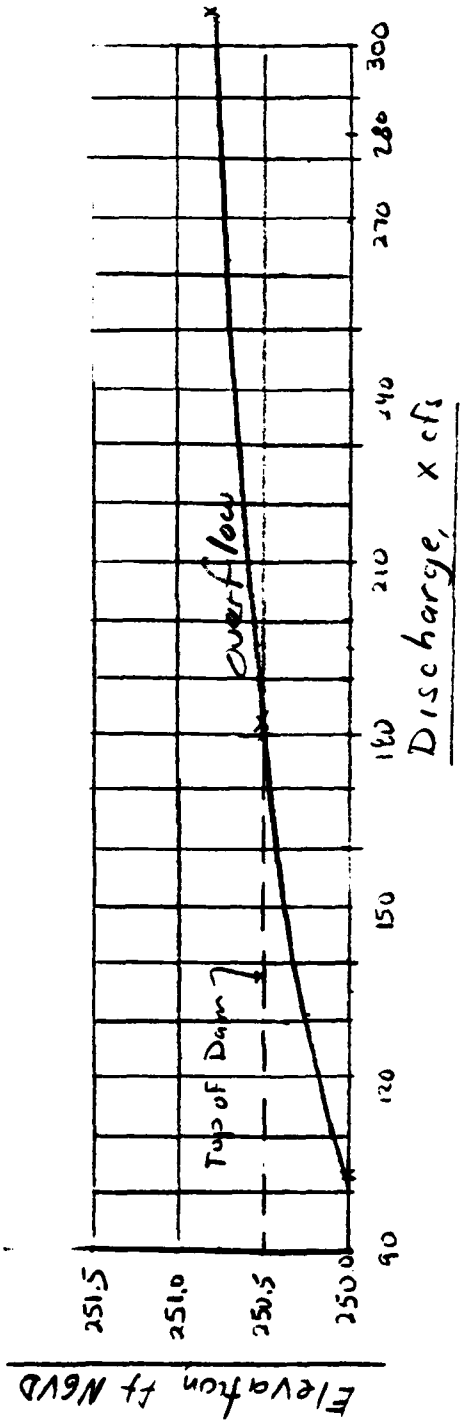
SHEET NO D6a
JOB Dams
SUBJECT Schenckes Rel
CLIENT Corps

Combined Rating Curves
Elevation vs. Discharge





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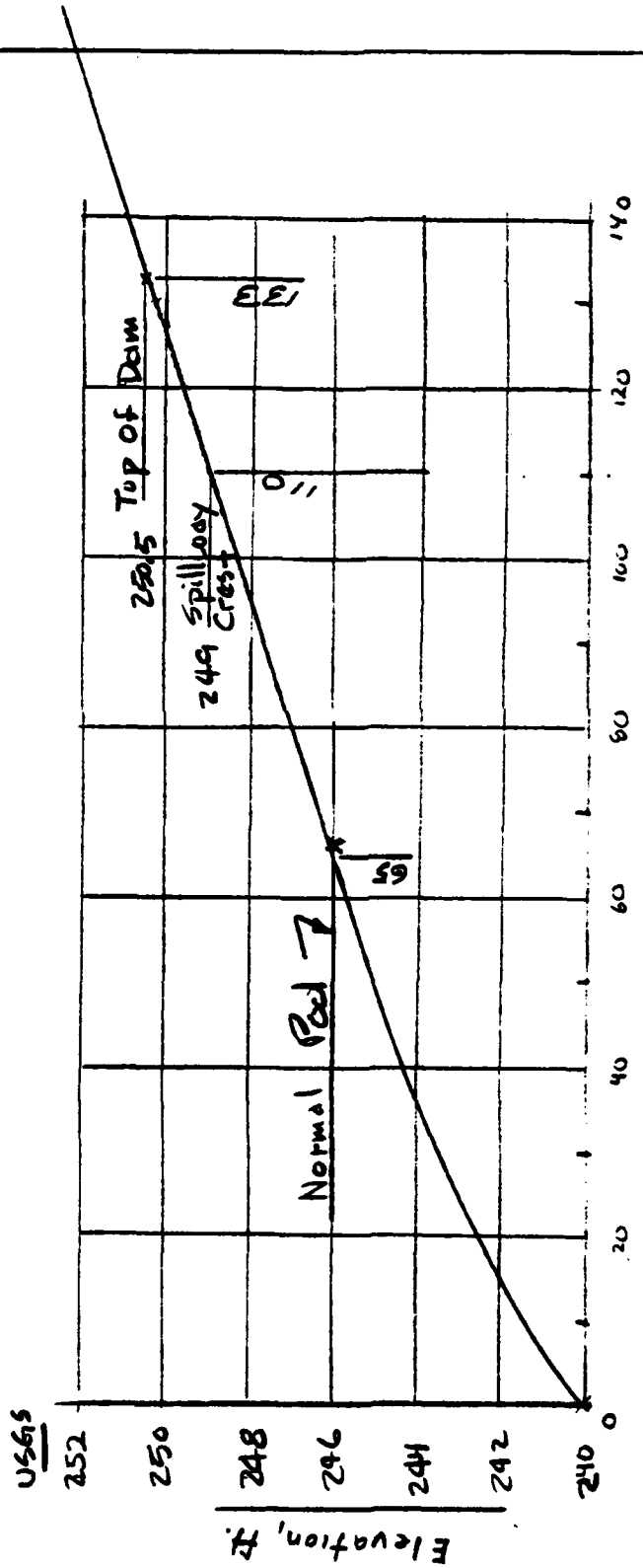
SHEET NO. D6b
JOB Dams
SUBJECT Screacles Rei.
CLIENT Corps

Stage - Storage



Note USGS = BCB + 5.5' ±

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BOSTON, MASSACHUSETTS

SHEET NO. D7
JOB Dams
SUBJECT Schencks Res
CLIENT Corps

Failure Discharge

$$Q_p = \frac{8}{27} \times (0.4 \times 190)(\sqrt{32.2})(22)^{3/2}$$

$Q_p = 13,480^{\pm}$ cfs. ✓

190' section is at natural stream location
Assume Dam fails with water @ top of embankment.

Total Storage (before failure) = 140 ac-ft. ✓

Base outflow just prior to failure = $180^{\pm}$ cfs ✓

Total Combined flow = $13,660^{\pm}$ cfs

Sta. 5+00 below Schencks Reservoir (Oak St.)

Assume culverts through Oak St. embankment blocked (or are small 15"± - typical)

$S = 0.025'/'$ $\quad n = 0.10$

$V = f' R^{2/3}$ $\quad f' = \frac{1.486}{0.10}(.025)^{1/2} = 2.35$ ✓

D (ft)	WP (ft)	A (sf)	$R^{2/3}$	f'	V (fps)	Q (cfs)	Elev. (MSL)
10	1150	7550	3.53 ✓	2.35	9.29 ✓	62,600 ✓	240
5	775	2938	2.44 ✓	"	5.74 ✓	16,857 ✓	235
3	625	1538	1.83	"	4.30	6,608	233

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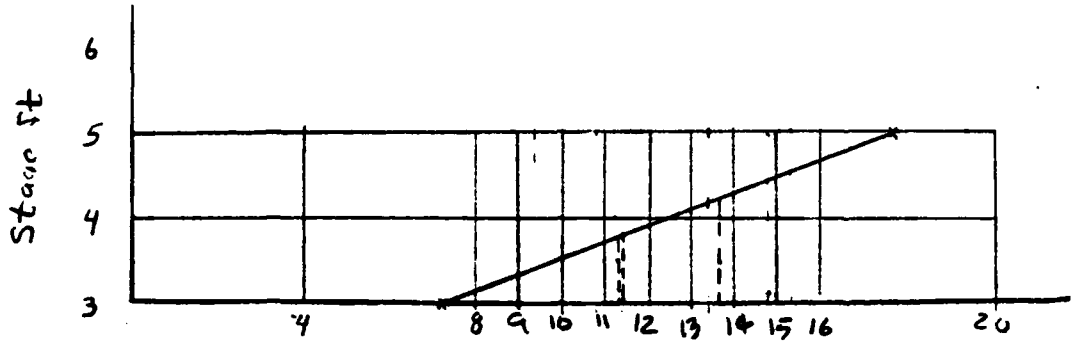
SHEET NO. D8
JOB Dams
SUBJECT Schencks Res
CLIENT Corps

Sta 5+00 cont.



Q_{P_1} = 13,660 cfs d_1 = 4.2' ± ✓

Vol. = $\frac{1920+2342}{2} \times \frac{500}{43,560}$ = 24.5 ac-ft ✓

Q_{P_2} = $13,660\left(1 - \frac{24.5}{140}\right)$ = 11,273 cfs ✓ d_2 = 3.8' ±

Vol_2 = $\frac{1920+2062}{2} \times \frac{500}{43,560}$ = 22.9 ac-ft

Volave = 23.7 ac-ft

Q_{P_2} = $13,660\left(1 - \frac{23.7}{140}\right)$ = 11,348 cfs ✓ d_2 = 3.82' ± ok

Q_{out} = 11,348 cfs. Elev = 233.8' ±

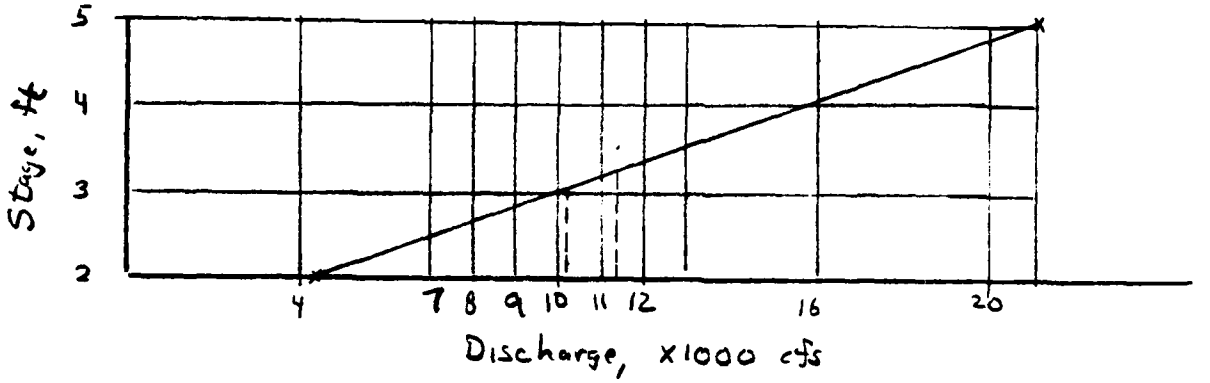
Sta 9+00 below Schencks Reservoir

S = 0.075% n = 0.06

$V = F' R^{2/3}$ $F' = \frac{1.486}{0.06}(0.075)^{1/2}$ = 6.78 ✓

D ft	WP ft	A sf	$R^{2/3}$	F'	V fps	Q cfs	Elev. MSL
5	262.5	1156.3	2.70 ✓	6.78	18.31 ✓	21,172 ✓	205
2	225	425	1.53	"	10.38	4412	202

Sta 9+00 cont



$Qp_1 = 11,348$ cfs $d_1 = 3.2' \pm$

$Vol_1 = \frac{2200+768}{2} \times \frac{400}{43,560} = 13.6$ ac-ft

$Qp_2 = 11,348\left(1 - \frac{13.6}{140}\right) = 10,243$ cfs $d_2 = 3.0' \pm$

$Vol_2 = \frac{2200+713}{2} \times \frac{400}{43,560} = 13.4$ ac-ft

$Vol_{ave} = \frac{13.6+13.4}{2} = 13.5$ ac-ft

$Qp_2 = 11,348\left(1 - \frac{13.5}{140}\right) = 10,254$ cfs. $d_2 = 3.0' \pm$

$Q_{out} = 10,254$ cfs Elev. = 203' ±

Sta 15+00 below Schenks Reservoir

$S = 0.0167'/'$ $n = 0.08$

$V = F' R^{2/3}$ $F' = \frac{1.486}{0.08}(0.0167)^{1/2} = 2.40$

D ft	WP ft	A sF	$R^{2/3}$	F'	V fps	Q cfs	Elev (MSL)
8	250	1000	2.53	2.40	6.08	6,076	190
11	295	1818	3.38	"	8.11	14,753	193

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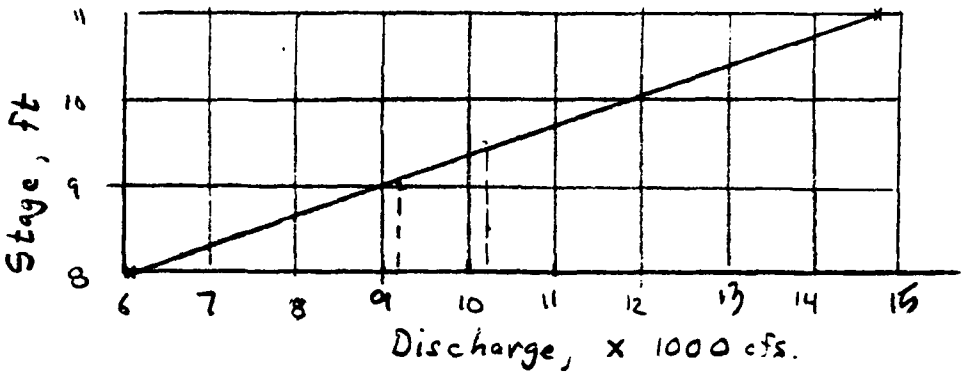
SHEET NO. D 10
JOB Dams
SUBJECT Schencks Res
CLIENT Corps

Sta 15+50 Cont



Q_{P_1} = 10,254 cfs d_1 = 9.4'

$Vol_1 = \frac{740 + 1365}{2} \times \frac{600}{43,560}$ = 14.50 ac-ft

$Q_{P_2} = 10,254\left(1 - \frac{14.5}{140}\right)$ = 9,192 cfs d_2 = 9.1' ±

$Vol_2 = \frac{740 + 1284}{2} \times \frac{600}{43,560}$ = 13.9 ac-ft $Vol_{ave} = \frac{14.5 + 13.9}{2}$ = 14.2

$Q_{P_2} = 10,254\left(1 - \frac{14.2}{140}\right)$ = 9,214 cfs. d_2 = 9.1'

Q_{out} = 9,214 cfs Elev = 191.1 ±

Sta. 21+00 below Schencks Reservoir (Mass Pike)

Assume any culverts through Mass Pike embankment blocked or are small

Have weir flow over roadway: $Q = cLH^{3/2}$

H ft	$H^{3/2}$	C	L ft	Q cfs
3	5.2	2.63	400	5,466
5	11.18	2.63	400	11,762

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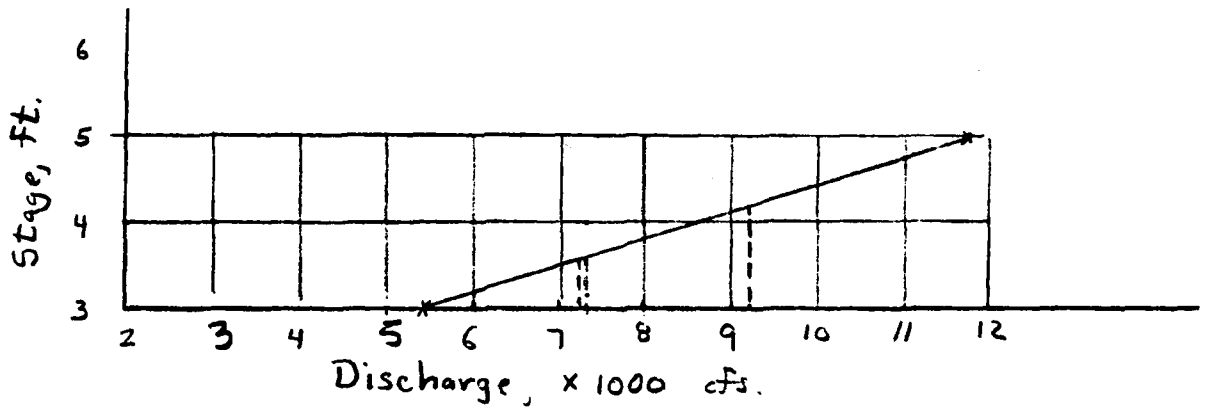
SHEET NO. D11
JOB Dams
SUBJECT Schencks Res.
CLIENT Corps

Sta 21+00 Cont



$Q_{P_1} = 9,214$ cfs. $d_1 = 4.2'$

$Vol_1 = \frac{1325 + 3090}{2} \times \frac{600}{43,560} = 30.3$ ac-ft

$Q_{P_2} = 9,214\left(1 - \frac{30.3}{140}\right) = 7,217$ cfs. $d_2 = 3.6'$

$Vol_2 = \frac{1325 + 2640}{2} \times \frac{600}{43,560} = 28.7$ ac-ft

$Vol_{ave} = \frac{30.3 + 28.7}{2} = 29.0$ ac-ft

$Q_{P_2} = 9,214\left(1 - \frac{29.0}{140}\right) = 7305\pm$ cfs. $d_2 = 3.6'$

$Q_{out} = 7305$ cfs Elev = 183.6 ±

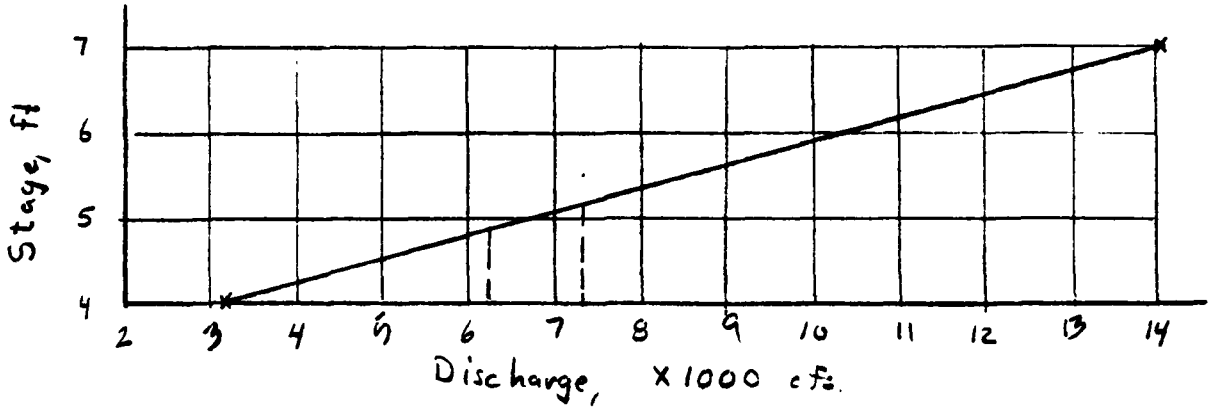
Sta. 26+00 below Schencks Reservoir

$S = 0.04'/'$ $n = 0.06$

$V = f' R^{2/3}$ $f' = \frac{1.486}{0.06}(0.04)^{1/2} = 4.95$

D in	WP ft	A sf	$R^{2/3}$	f'	V fps	Q cfs.	Elev. (MSL)
7	350	1225	2.31	4.95	11.46	14037	160
4	200	400	1.59	"	7.88	3150	157

Sta 26+00 Cont



Q_{P_1} = 7,305 cfs. d_1 = 5.15'

$Vol_1 = \frac{2960+663}{2} \times \frac{500}{43560}$ = 20.8 ac-ft

$Q_{P_2} = 7305\left(1 - \frac{20.8}{140}\right)$ = 6220 cfs d_2 = 4.85'

$Vol_2 = \frac{2960+588}{2} \times \frac{500}{43560}$ = 20.4 ac-ft. $Vol_{ave} = \frac{20.8+20.4}{2}$ = 20.6

$Q_{P_2} = 7305\left(1 - \frac{20.6}{140}\right)$ = 6230 cfs. d_2 = 4.9'

Q_{out} = 6230 cfs Elev = 157.9' ±

Sta. 33+00 below Schencks Reservoir

S = 0.047', n = 0.06

$V = f' R^{2/3}$ $f' = \frac{1.486}{0.06}(0.047)^{1/2}$ = 5.38

D ft	WP ft	A sf	$R^{2/3}$	f'	V fps	Q cfs	Elev. (MSL)
5	350	875	1.85	5.38	9.94	8698	125
3	210	315	1.31	"	7.06	2224	123

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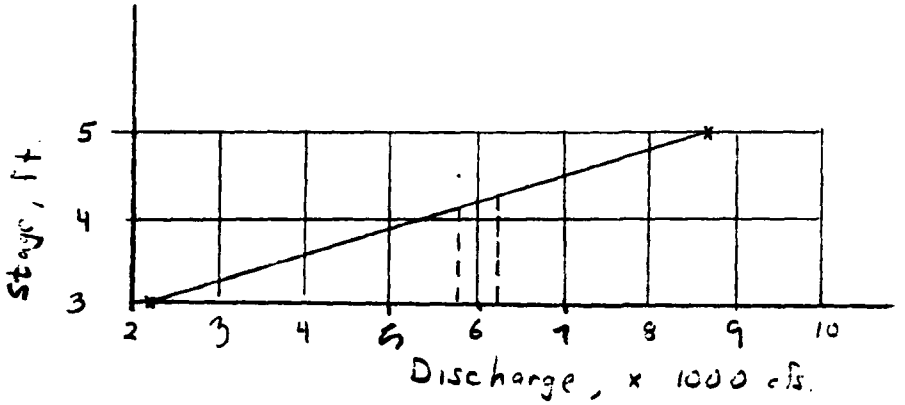
SHEET NO. D13
JOB Dam
SUBJECT Schencks Res
CLIENT Corps

Sta 33+00 Cont



Q_{P_1} = 6,230 cfs d_1 = 4.25'

$Vol_1 = \frac{625+632}{2} \times \frac{700}{43,560}$ = 10.1 ac-ft

$Q_{P_2} = 6,230\left(1 - \frac{10.1}{140}\right)$ = 5,781 cfs d_2 = 4.1'

$Vol_2 = \frac{625+588}{2} \times \frac{700}{43,560}$ = 9.75 ac-ft

$Vol_{ave} = \frac{10.1+9.75}{2}$ = 9.93 ac-ft

$Q_{P_2} = 6,230\left(1 - \frac{9.93}{140}\right)$ = 5,788 cfs d_2 = 4.1'

Q_{out} = 5,788 cfs Elev = 124.1'

Sta. 49+00 below Schencks Reservoir

S = 0.00938 ft/ft n = 0.06

$V = F' R^{2/3}$ $F' = \frac{1.486}{0.06} \times (0.00938)^{1/2}$ = 2.40

D ft	WP ft	A sf	$R^{2/3}$	F'	V fps	Q cfs	Elev (MSL)
5	450	1625	2.36	2.40	5.67	9219	110
3	350	825	1.75	"	4.26	3517	108

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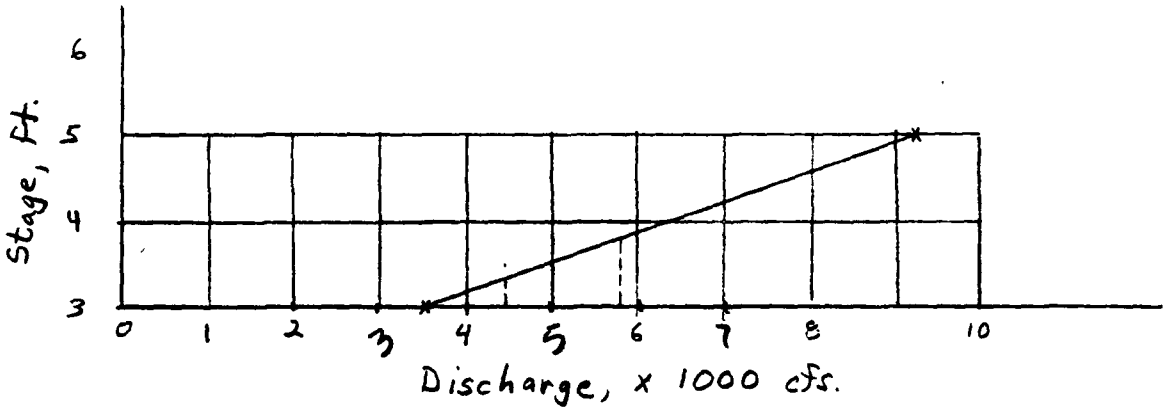
SHEET NO. D14
JOB Dams
SUBJECT Schenck's Pond
CLIENT Cooper

Sta 49+00 Continued



$Q_{P_1} = 5{,}788$ cfs. $d_1 = 3.5'$

$Vol_1 = \frac{610 + 1121}{2} \times \frac{1600}{43560} = 31.8$ ac-ft

$Q_{P_2} = 5788\left(1 - \frac{31.8}{140}\right) = 4474$ cfs. $d_2 = 3.35'$

$Vol_2 = \frac{610 + 951}{2} \times \frac{1600}{43560} = 28.7$ ac-ft

$Vol_{ave} = \frac{31.8 + 28.7}{2} = 30.25$ ac-ft

$Q_{P_2} = 5788\left(1 - \frac{30.25}{140}\right) = 4528$ cfs $d_2 = 3.4'$

$Q_{out} = 4528$ cfs ± Elev. = 108.4' ±

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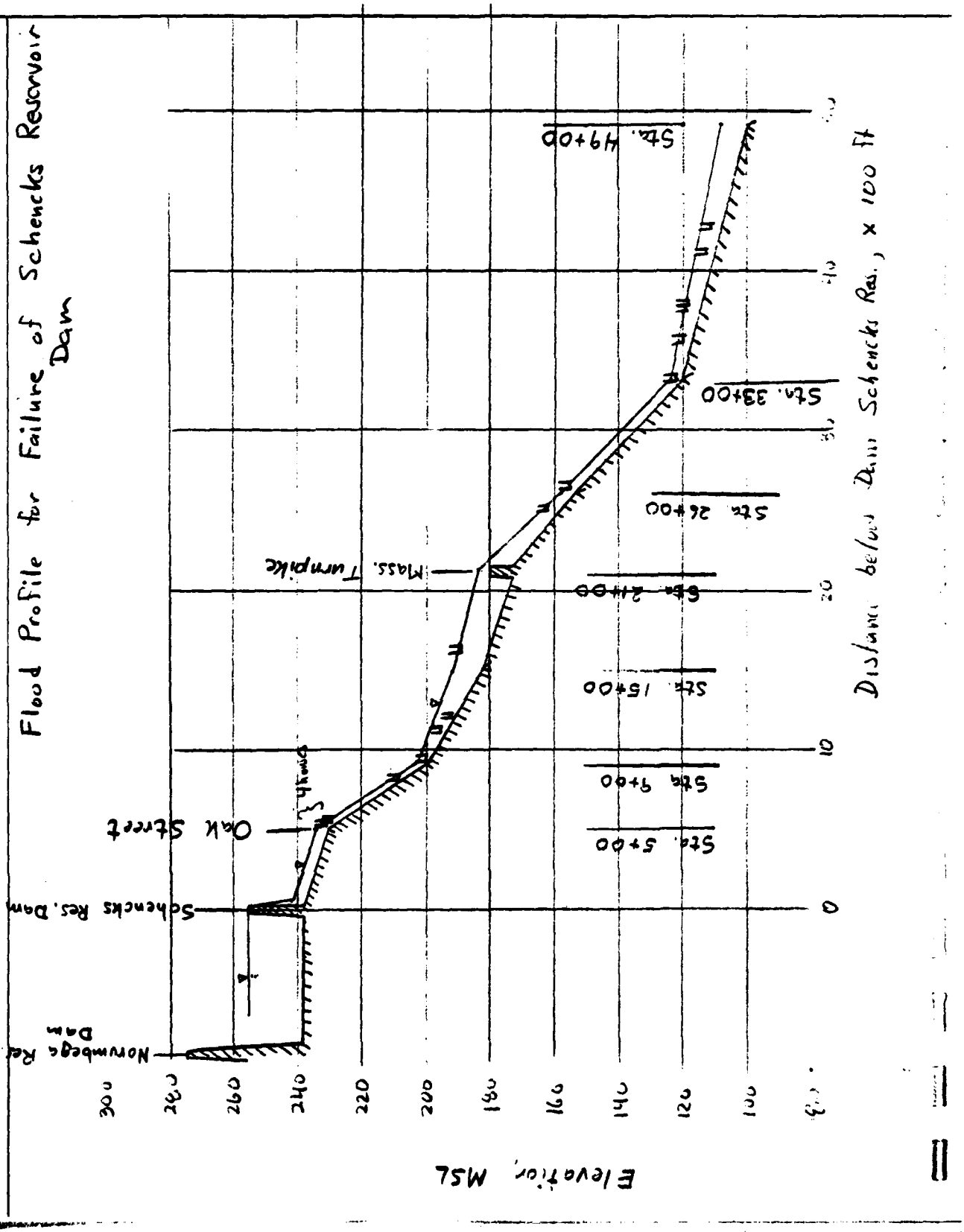
SHEET NO. D15
JOB Dams
SUBJECT Schencks Res
CLIENT Corps



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

SHEET NO. D16
JOB Dams
SUBJECT Tehencks
CLIENT COE

Sta	Elev	Base Elev.	Failure Elev	Failure Damage
0+00	250.5	250.5	250.5	Dam
5+00	230	231	234	Road 4'
				3 houses 4'
				1 " 1'
9+00	200	201	203	1 " 3'
				1 " 8'
				2 " 4'
				1 " 9'
15+00	182	183	191	1 " 21
21+00	173	181	184	1 Road 4'
Pike	180±			
26+00	153	154	158	2 house 5'
				road
33+00	120	121	124	4 house 4'
				road
49+00	105	106	109	5 houses 2'
				3 " 4'

JOB NO. 79.206.1
DATE 12/11/79
BY FDD
CH'D BY

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

SHEET NO. D17
JOB Dams
SUBJECT Schenckes Res
CLIENT Corps

Cross Sections - Failure of Main Dam

Cross Sections looking upstream

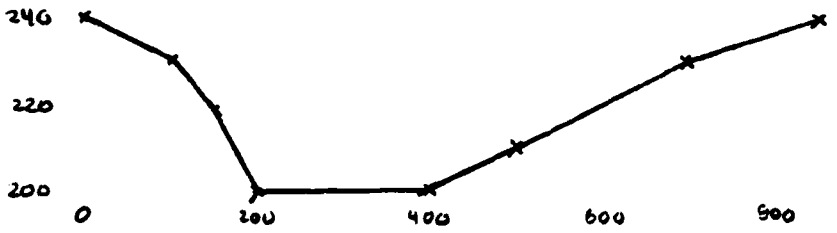
Sta. 5+00 below Schenckes Reservoir
(Taken along Oak St.)

Elev. (MSL)	Area sf
240	7750
250	24500

Channel Slope = $\frac{10}{400}$ = 0.025 %

n = 0.10 (heavy brush & trees)

Sta. 9+00 below Schenckes Reservoir



Elev. MSL)	Area sf
210	2,625
220	6,500
230	11,750
240	19,000

Channel Slope = $\frac{30}{400}$ = 0.075 %

n = 0.06

JOB NO. 79.206.1
DATE 12/11/79
BY FDD
CH'D BY

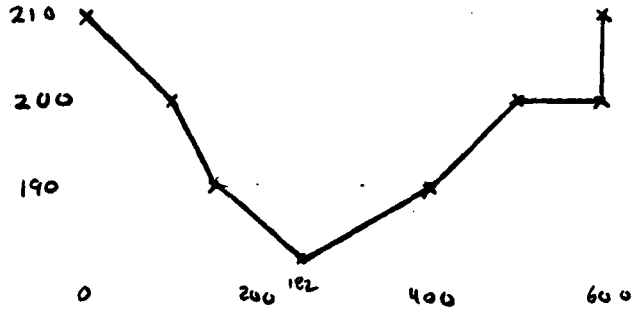
HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. D18
JOB Dam
SUBJECT Schencks Res.
CLIENT Corps

Cross Sections - Failure of Main Dam

Cross Sections looking Upstream

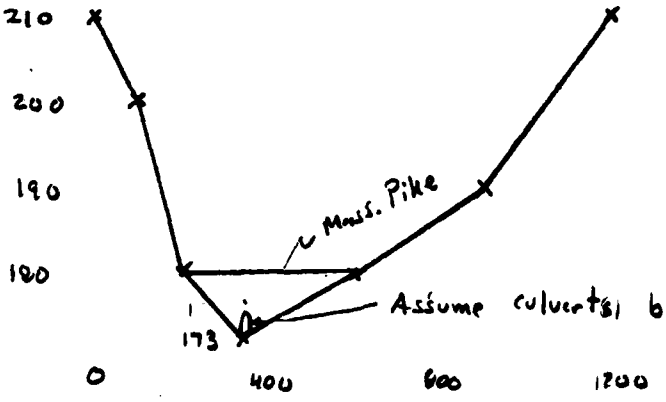
Sta. 15+00 below Schencks Reservoir



Elev. (MSL)	Area sf
190	1000
200	4250
210	9750

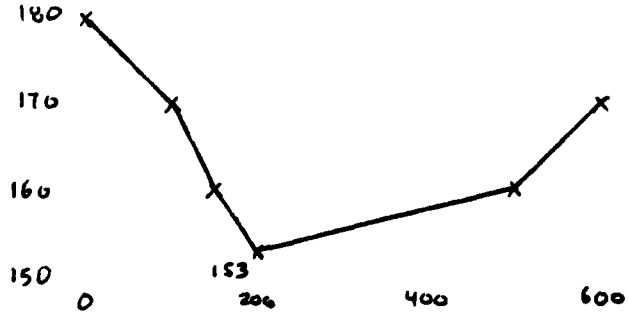
channel slope = $\frac{60}{600}$ = 0.0167; n = 0.08

Sta. 21+00 below Schencks Reservoir (Mass. Pike)



Elev. (MSL)	Area sf
180	1,400
190	7,150
200	15,900

Sta. 26+00 below Schencks Reservoir



Elev. (MSL)	Area sf
160	1225
170	5475

channel slope = $\frac{20}{500}$ = 0.040

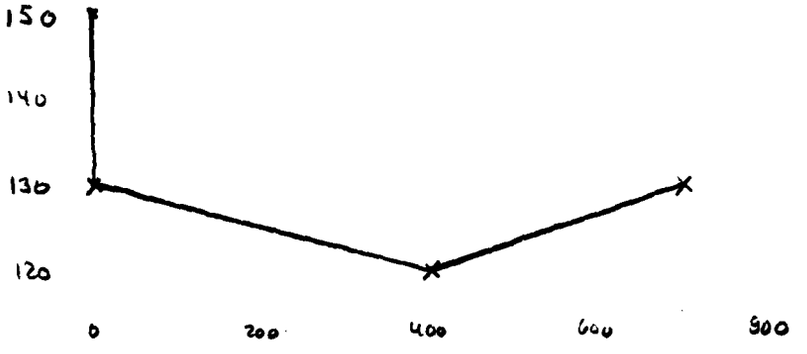
n = 0.06

JOB NO. 79 206.1
DATE 12/4/79
BY FDD
CH'D BY MF

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

SHEET NO. D19
JOB Dam
SUBJECT Schencks Res
CLIENT Corps

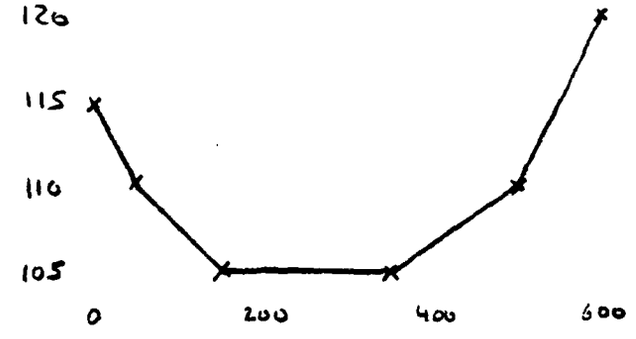
Sta. 33+00 below Schencks Reservoir



Elev. (MSL)	Area sf
130	3500

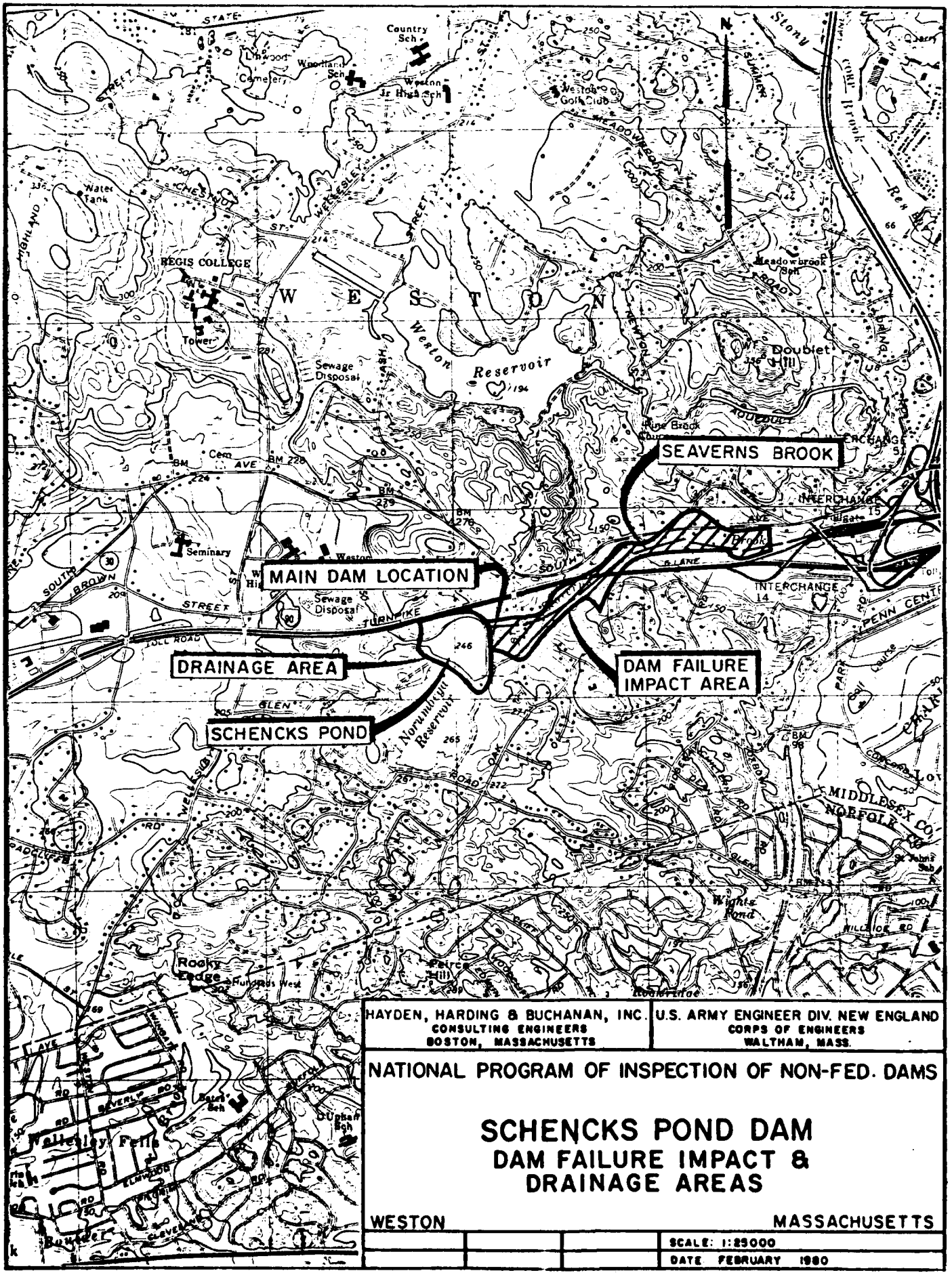
channel slope = $\frac{33}{700}$ = 0.047 n = 0.06

Sta 49+00 below Schencks Reservoir



Elev. (MSL)	Area sf
110	1625
115	4125

channel slope = $\frac{15}{1600}$ = 0.00939 n = 0.06



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

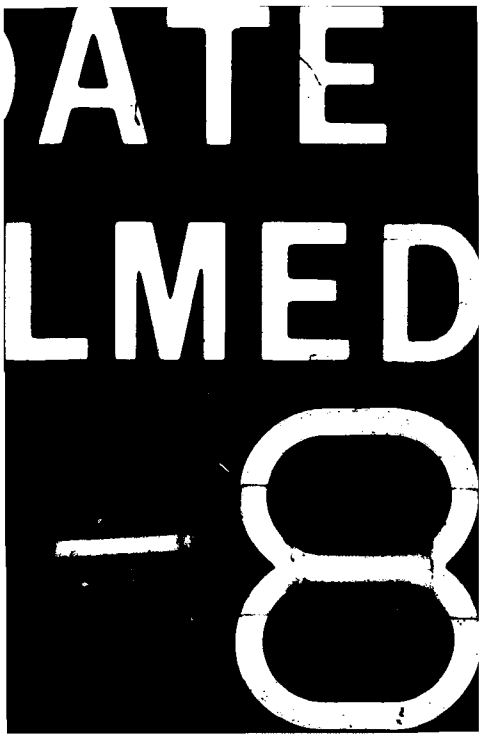
SCHENCKS POND DAM
DAM FAILURE IMPACT & DRAINAGE AREAS

WESTON MASSACHUSETTS

			SCALE: 1:25000
			DATE FEBRUARY 1980

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS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