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NATIONAL BUREAU OF STANDARDS-1963-A

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COASTAL BASIN
LYNN, MASSACHUSETTS

AD-A154 956

BREEDS POND OUTLET DAM

MA 00238

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Coastal Basin Lynn, Massachusetts Moores Brook		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) It is an earthfill structure with a concrete core that is about 1390 ft. long having a maximum height of 60 ft. The dam is fair condition, there being several motorbike trails and footpaths on the downstream slope. It is intermediate in size and has a hazard potential of high. Failure of the dam would inundate the baseball field and recreational area immediately below the dam and would pass through a thickly settled residential area. Additional investigations or major modifications are not required.		



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

REPLY TO
ATTENTION OF:

NEDED

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

Dear Governor Dukakis:


I am forwarding to you a copy of the BreedsPond Outlet Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, the City of Lynn, Department of Public Works, City Hall Square, Lynn, Massachusetts 01901. Massachusetts 01940.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

BREEDS POND OUTLET DAM

MA 00238

COASTAL BASIN
LYNN, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.: MA 00238
Name of Dam: Breeds Pond Outlet
Town: Lynn, Massachusetts
County and State: Essex County, Massachusetts
Stream: Moores Brook
Date of Inspection: July 7, 1978

BRIEF ASSESSMENT

The Breeds Pond Dam was originally constructed in 1870 and was raised in 1914. It is an earthfill structure with concrete core. It is 1,390 feet long and 60 feet high at maximum section. It has a 4-foot high by 25 feet wide ungated spillway. The reservoir is part of the City of Lynn water supply system. Breeds Pond receives water from another reservoir and pipes water to a City pumping station.


The dam is in fair condition, there being several motorbike trails and footpaths on the downstream slope.

Owing to its height and impoundment volume, the dam falls within the intermediate size classification. It is in the high hazard category and thus analyzed using the full probable maximum flood. As the spillway can discharge the full probable maximum flood inflow of 670 cfs with a foot of freeboard remaining, the dam is not in danger of overtopping.

A failure of the dam could result in a Peak Failure Outflow as high as 235,000 cfs. Such a flow would inundate the baseball field and recreational area immediately below the dam and would pass through a thickly settled residential area before flowing into the Saugus River. There would be much destruction of property and human life would be endangered.

Additional investigations or major modifications are not required. However, remedial measures that should be implemented by the owner within

12 months after receipt of the Phase I Inspection Report are described in Section 7. The motorbike trails and footpaths on the downstream should be filled and seeded and the spillway cleared of growth. Also, the owner should institute a regular program of inspection and maintenance and develop a flood warning system.



Gustav A. Diezeman, P. E.
New York State Lic. 027062

This Phase I Inspection Report on the Breeds 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.

Charles G. Tiersch

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

Fred J. Ravens, Jr.

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

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

OCT 14 1970

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.

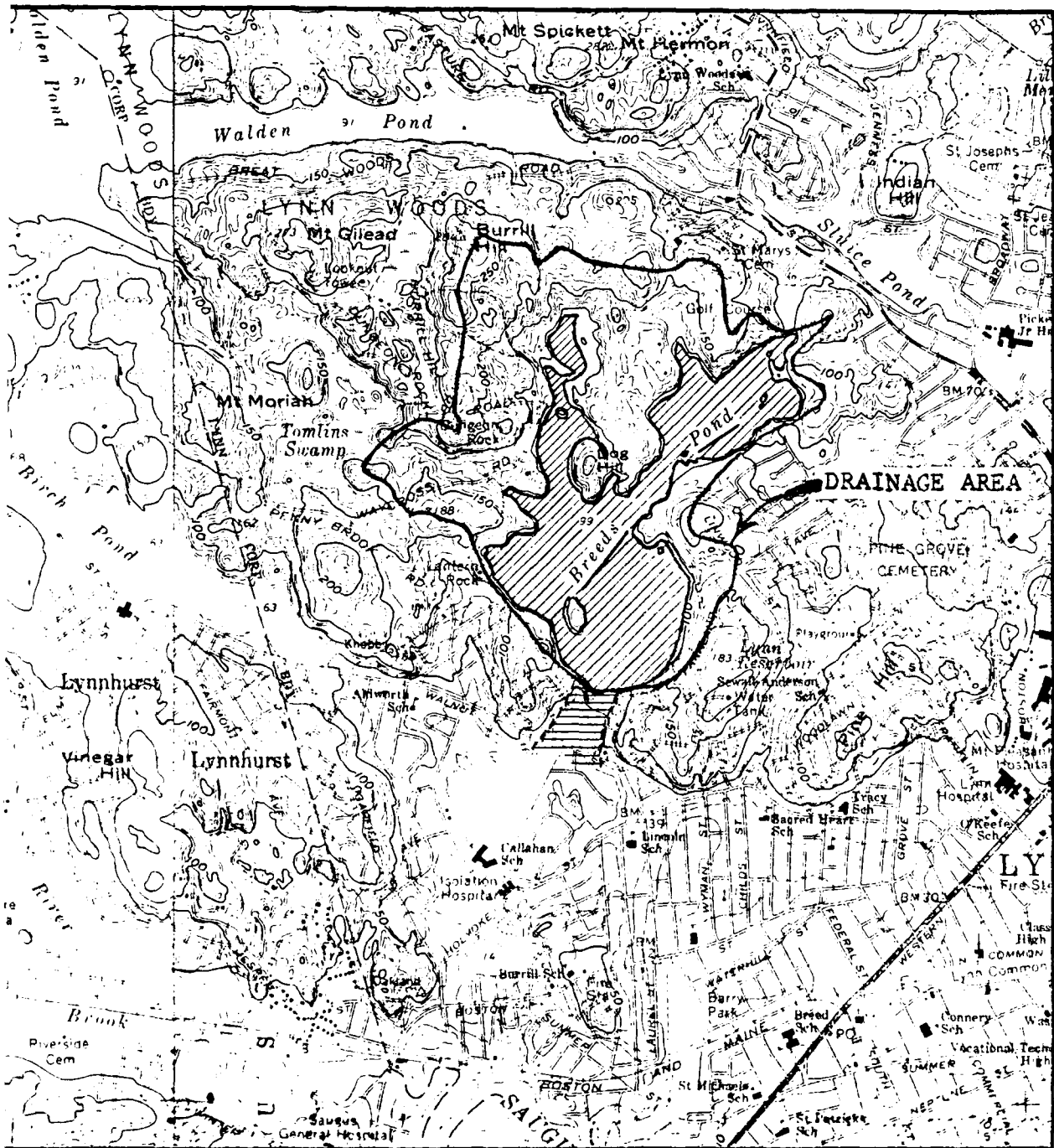
Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because 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 aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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OVERVIEW PHOTO



BREEDS POND OUTLET

LYNN, MASS.
Scale 1:24000

PHASE I INSPECTION REPORT

BREEDS POND DAM

SECTION I

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. Chas. T. Main, 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 were issued to Chas. T. Main, Inc. under a letter of May 3, 1978, from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-D328 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 prepare 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. The Breeds Pond Dam is in the City of Lynn, Essex County, Massachusetts.

b. Description of Dam and Appurtenances. The dam, built in 1870 and raised in 1914, is an earthfill rolled embankment dam with a concrete core wall, 1,390 feet long, which includes an ungated overflow spillway 25 feet wide. There are five smaller dikes around the periphery of the reservoir. Breeds Pond receives water from Walden Pond through a 36-inch line. Water is either pumped, 16.5 mgd capacity, or flows by gravity under

INSPECTION CHECK LIST

PROJECT BREEDS PONDDATE JULY 7, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<u>EMBANKMENT</u>	
crest Elevation	105
current Pool Elevation	96 96
surface Cracks	none
pavement Condition	no pavement
movement of Settlement of Crest	none
lateral Movement	none
vertical Alignment	O.K.
horizontal Alignment	O.K.
condition at Abutment and at Concrete Structures	some spalling
indications of Movement of Structural Items on Slopes	none
trespassing on Slopes	some
sloughing or Erosion of Slopes or Abutments	some sloughing of D/S slopes
rock Slope Protection - Riprap Failures	some rip rap failures
unusual Movement or Cracking at or near Toes	none
unusual Embankment or Downstream Seepage	
slipping or Boils	
foundation Drainage Features	
toe Drains	
instrumentation System	

APPENDIX A

(5) Around the clock surveillance should be provided by the owner during periods of unusually heavy precipitation.

(6) The owner should develop a formal warning system with local officials for alerting downstream residents in case of emergency.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The Breeds Pond Dam is in fair condition.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and engineering judgment.

c. Urgency. The required repair and maintenance work should be accomplished within one to two years of the receipt of this report by the owner.

d. Need for Additional Investigation. There is no need for additional investigation.

7.2 Recommendations

Additional engineering investigations or major modifications to the dam are not required.

7.3 Remedial Measures

a. Alternatives. Not applicable.

b. Operating and Maintenance Procedures

(1) The spillway should be cleared of growth and debris.

(2) The motorbike trails and footpaths should be filled and seeded and motorbiking on the dam should be stopped.

(3) Sloughed riprap on the upstream face should be replaced.

(4) The owner of the dam should develop and implement procedures which would include annual inspection of the dam and the initiation of repairs such as repair of all spalled concrete and the repair and painting of the service bridge.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

- a. Visual Observations. Nothing was noted which would indicate that the dam is unstable.
- b. Design and Construction Data. No design nor construction data are available.
- c. Operating Records. Not applicable.
- d. Post Construction Changes. No data concerning any post construction changes are available.
- e. Seismic Stability. The dam is located in Seismic Zone 3. Because of its configuration and condition and the low head of water retained, a seismic analysis is not considered warranted.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data. The hydraulic/hydrologic analysis was made in accordance with "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations", "Estimating Effect of Surcharge Storage on Maximum Probable Discharges", and "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs" as furnished by the New England Division, Corps of Engineers and "Recommended Guidelines for Safety Inspection of Dams" as issued by the Department of the Army, Office of the Chief of Engineers.

U.S.G.S. Quadrangle maps were used to determine reservoir and drainage areas. Where practicable, spillway dimensions were obtained by direct measurement. Hydraulic coefficients were assigned on the basis of experience and engineering judgment.

b. Experience Data. No specific experience data with respect to the hydraulic/hydrological characteristics of the project are known to exist.

c. Visual Observations. Except for rocks at upstream lip, spillway has reasonably smooth invert. Chute converges to a drain at bottom. Discharge is not a threat to dam.

d. Overtopping Potential. A Probable Maximum Flood (PMF) inflow of about 670 cfs was determined. The spillway is capable of discharging this flow with one foot of freeboard. Thus, the dam is not in danger of overtopping. It is noted that Breeds Pond has a large water surface area with respect to drainage area and the pond can store most flood runoff in surcharge storage, minimizing spillway requirements. One inch of runoff is equivalent to about 4 inches of rise in pond level.

Assuming a 300 foot breach of the dam, a Peak Failure Flood of approximately 235,000 cfs was determined. Such a discharge would put up to 10 feet of water on the recreational area immediately below the dam. The flood would pass through a thickly settled residential area, including a school and hospital, before ultimately flowing into the Saugus River about a mile from the dam.

The areas of impact immediately downstream of the dam are shown on the location map.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

Breeds Pond receives water from Walden Pond by means of either pumped or gravity flow depending upon the relative elevations of both. Water level is maintained by gravity feed to the Walnut Street pumping station.

4.2 Maintenance of Dam

There appear to be no definite maintenance procedures of the dam in effect.

4.3 Maintenance of Operating Facilities

The gates controlling the outflows are maintained on a yearly basis, according to the owner.

4.4 Warning System

There is no warning system.

4.5 Evaluation

Apart from the daily operation to meet the water supply demands, the operational procedures are minimal. Maintenance of the dam and spillway could be improved. Recommendations for improving this situation are given in Section 7.3.

the motorbike trails on the downstream slope can lead to a hazardous condition unless arrested. The reservoir itself is not a factor in evaluating the dam. The area below the dam is urban and property and life would be in jeopardy if the dam failed.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Phase I visual inspection of the Breeds Pond Outlet Dam was conducted on July 7, 1978. The project is part of the City of Lynn water supply and is about 108 years old. The project is unprotected and obviously misused by the public.

b. Dam. The dam is an earthfill structure with a concrete core and riprap on the upstream face. Some of this riprap has been displaced over the years and there is considerable growth and vegetation on both the upstream and downstream slopes. In several areas there is severe erosion on the downstream slope caused by motorbiking. There appear to be no vertical or horizontal misalignments. The dam can be considered in fair condition.

c. Appurtenant Structures. The concrete and brick gate house structure which discharges water to the Walnut Street pumping station is obviously operable and in apparent good condition. The steel service bridge, other than requiring painting, is also in good condition.

The concrete spillway structure is a long flat weir which discharges into a concrete chute at the bottom of which is a drain. This structure is in relatively poor condition, there being considerable spalling and growth and gravel and other debris in the channel.

d. Reservoir Area. The banks surrounding the reservoir are hilly and wooded. There are no houses along the perimeter of the reservoir. There appears to be little possibility of landslides into the reservoir or conditions which might result in a sudden increase of sediment load in the reservoir.

e. Downstream Channel. Below the dam there is no defined watercourse. Immediately below the dam is a large recreational area including a ball field. Flows resulting from a failure of the dam would pass through this area and through thickly settled residential areas before reaching the Saugus River.

3.2 Evaluation

The visual inspection during site examination reveals that the Breeds Pond Outlet Dam and its spillway have been neglected with respect to maintenance. The dam can be considered in fair condition, however

SECTION 2
ENGINEERING DATA

2.1 Design

There are no known existing design data.

2.2 Construction

The Breeds Pond dam was built in 1870 and raised in 1914. There are no detailed construction records available.

2.3 Operation

Some flow data are kept but are not relevant to this investigation.

2.4 Evaluation

a. Availability. There are no engineering data available.

b. Adequacy. The lack of in-depth engineering data 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, and sound hydrologic and hydraulic engineering judgment.

c. Validity. N/A

g. Dam

(1)	Type	Earthfill with concrete core
(2)	Length	1,390 feet
(3)	Height	60 feet
(4)	Top Width	20 feet
(5)	Side slope	Unknown
(6)	Zoning	Unknown
(7)	Impervious core	Unknown
(8)	Cutoff	Unknown
(9)	Grout curtain	Unknown
(10)	Other	N/A

h. Spillway

(1)	Type	Ungated weir
(2)	Length of weir	25 feet
(3)	Crest elevation	E1. 99 ±
(4)	Gates	None
(5)	U/S Channel	N/A
(6)	D/S Channel	Chute
(7)	General	N/A

c. Elevation (Feet Above MSL)

(1)	Top of dam	El. 104 ±
(2)	Maximum design surcharge	El. 103 ±
(3)	Full flood control pool	N/A
(4)	Recreation pool	N/A
(5)	Spillway crest (gated)	El. 99 ± (ungated)
(6)	Upstream portal invert diversion tunnel	N/A
(7)	Streambed at centerline of dam	El. 48 ±
(8)	Maximum tailwater	N/A

d. Reservoir (Feet)

(1)	Length of maximum pool	5,500 ±
(2)	Length of recreation pool	N/A
(3)	Length of flood control pool	N/A

e. Storage (Acre-Feet)

(1)	Recreation pool	5,200 ± (at spillway crest)
(2)	Flood control pool	N/A
(3)	Design surcharge	6,000 ±
(4)	Top of dam	6,200 ±

f. Reservoir Surface (Acres)

(1)	Top of dam	236 ±
(2)	Maximum pool	227 ±
(3)	Flood control pool	N/A
(4)	Recreation pool	N/A
(5)	Spillway crest	191 ±

suitable head conditions. Water is released from Breeds Pond by gravity through 20 and 36 inch diameter lines to the City's Walnut Street pumping station.

c. Size Classification. Owing to its height of 60 feet and its impoundment of approximately 5,200 acre feet below the crest, the dam falls within the intermediate category.

d. Hazard Classification. As there are many houses downstream of the dam which would be endangered if the dam failed, the dam is considered to have a high hazard potential.

e. Ownership. The dam is owned by the City of Lynn.

f. Operator. Mr. Patrick McGrath, Superintendent of Water, Department of Public Works, Lynn, Massachusetts, (617) 592-7900, Ext. 242.

g. Purpose of Dam. The reservoir impounded by the dam is part of the City of Lynn's water supply system.

h. Design and Construction History. Other than a drawing, excerpts from which are part of this report, nothing is known of the design and construction history of this project.

i. Normal Operating Procedures. The water level is normally kept below the spillway level by means of releases to the City's Walnut Street pumping station. Inflows exceeding outflow and storage capabilities would discharge through the spillway.

1.3 Pertinent Data

a. Drainage Area. The Breeds Pond Reservoir has a drainage area of approximately 0.75 square miles of semi-wooded, hilly land.

b. Discharge at Damsite.

(1) The outlet structure houses gates controlling 20 and 36-inch lines to the Walnut Street pumping station.

(2) The maximum known flood at the damsite is unknown.

(3) The ungated spillway capacity exceeds the test flood of approximately 670 cfs.

(4) There is no gated spillway capacity.

(5) There is no gated spillway capacity.

(6) The total spillway capacity exceeds the test flood of approximately 670 cfs.

INSPECTION CHECK LIST

PROJECT BREEDS POND

DATE JULY 7, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>CONCRETE DAM</u></p> <p>Concrete Surfaces</p> <p>Structural Cracking</p> <p>Movement -- Horizontal & Vertical Alignment</p> <p>Junctions</p> <p>Drains -- Foundation, Joint, Face</p> <p>Water Passages</p> <p>Seepage or Leakage</p> <p>Monolith Joints -- Construction Joints</p> <p>Foundation</p>	<p style="text-align: center;"><i>NOT APPLICABLE</i></p> <p style="text-align: right;">3</p>

INSPECTION CHECK LIST

PROJECT BREEDS POND

DATE JULY 7, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u></p> <p>a. Approach Channel</p> <p style="padding-left: 40px;">Slope Conditions</p> <p style="padding-left: 40px;">Bottom Conditions</p> <p style="padding-left: 40px;">Rock Slides or Falls</p> <p style="padding-left: 40px;">Log Boom</p> <p style="padding-left: 40px;">Debris</p> <p style="padding-left: 40px;">Condition of Concrete Lining</p> <p style="padding-left: 40px;">Drains or Weep Holes</p> <p>b. Intake Structure</p> <p style="padding-left: 40px;">Condition of Concrete</p> <p style="padding-left: 40px;">Stop Logs and Slots</p>	<p style="text-align: center; font-size: 2em;"><i>NOT APPLICABLE</i></p> <p style="text-align: right; font-size: 2em;">4</p>

INSPECTION CHECK LIST

PROJECT BREEDS POND

DATE JULY 7, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED

CONDITION

OUTLET WORKS - TRANSITION AND CONDUIT

General Condition of Concrete

Rust or Staining on Concrete

Spalling

Erosion or Cavitation

Cracking

Alignment of Monoliths

Alignment of Joints

Numbering of Monoliths

*NOT
APPLICABLE*

INSPECTION CHECK LIST

PROJECT BREEDS POND

DATE JULY 7, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u></p>	
<p>a. Approach Channel</p> <p> General Condition</p> <p> Loose Rock Overhanging Channel</p> <p> Trees Overhanging Channel</p> <p> Floor of Approach Channel</p>	
<p>b. Weir and Training Walls</p> <p> General Condition of Concrete</p> <p> Rust or Staining</p> <p> Spalling</p> <p> Any Visible Reinforcing</p> <p> Any Seepage or Efflorescence</p> <p> Drain Holes</p>	
<p>c. Discharge Channel</p> <p> General Condition</p> <p> Loose Rock Overhanging Channel</p> <p> Trees Overhanging Channel</p> <p> Floor of Channel</p> <p> Other Obstructions</p>	<p>} <i>some vegetation in channel</i></p>

INSPECTION CHECK LIST

PROJECT BREEDS POND

DATE JULY 7, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - CONTROL TOWER</u></p> <p>a. Concrete and Structural</p> <p> General Condition</p> <p> Condition of Joints</p> <p> Spalling</p> <p> Visible Reinforcing</p> <p> Rusting or Staining of Concrete</p> <p> Any Seepage or Efflorescence</p> <p> Joint Alignment</p> <p> Unusual Seepage or Leaks in Gate Chamber</p> <p> Cracks</p> <p> Rusting or Corrosion of Steel</p> <p>b. Mechanical and Electrical</p> <p> Air Vents</p> <p> Float Wells</p> <p> Crane Hoist</p> <p> Elevator</p> <p> Hydraulic System</p> <p> Service Gates</p> <p> Emergency Gates</p> <p> Lightning Protection System</p> <p> Emergency Power System</p> <p> Wiring and Lighting System</p>	<p style="text-align: center;"><i>NOT APPLICABLE</i></p>

INSPECTION CHECK LIST

PROJECT BREEDS PONDDATE JULY 7, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL (GATE HOUSE)</u>	
General Condition of Concrete	FAIR
Rust or Staining	SOME
Spalling	SOME
Erosion or Cavitation	-
Visible Reinforcing	NONE
Any Seepage or Efflorescence	NONE
Condition at Joints	O.K.
Drain holes	NONE
Channel	N/A
Loose Rock or Trees Overhanging Channel	N/A
Condition of Discharge Channel	

INSPECTION CHECK LIST

PROJECT BREEDS PONDDATE JULY 7, 1978

PROJECT FEATURE _____

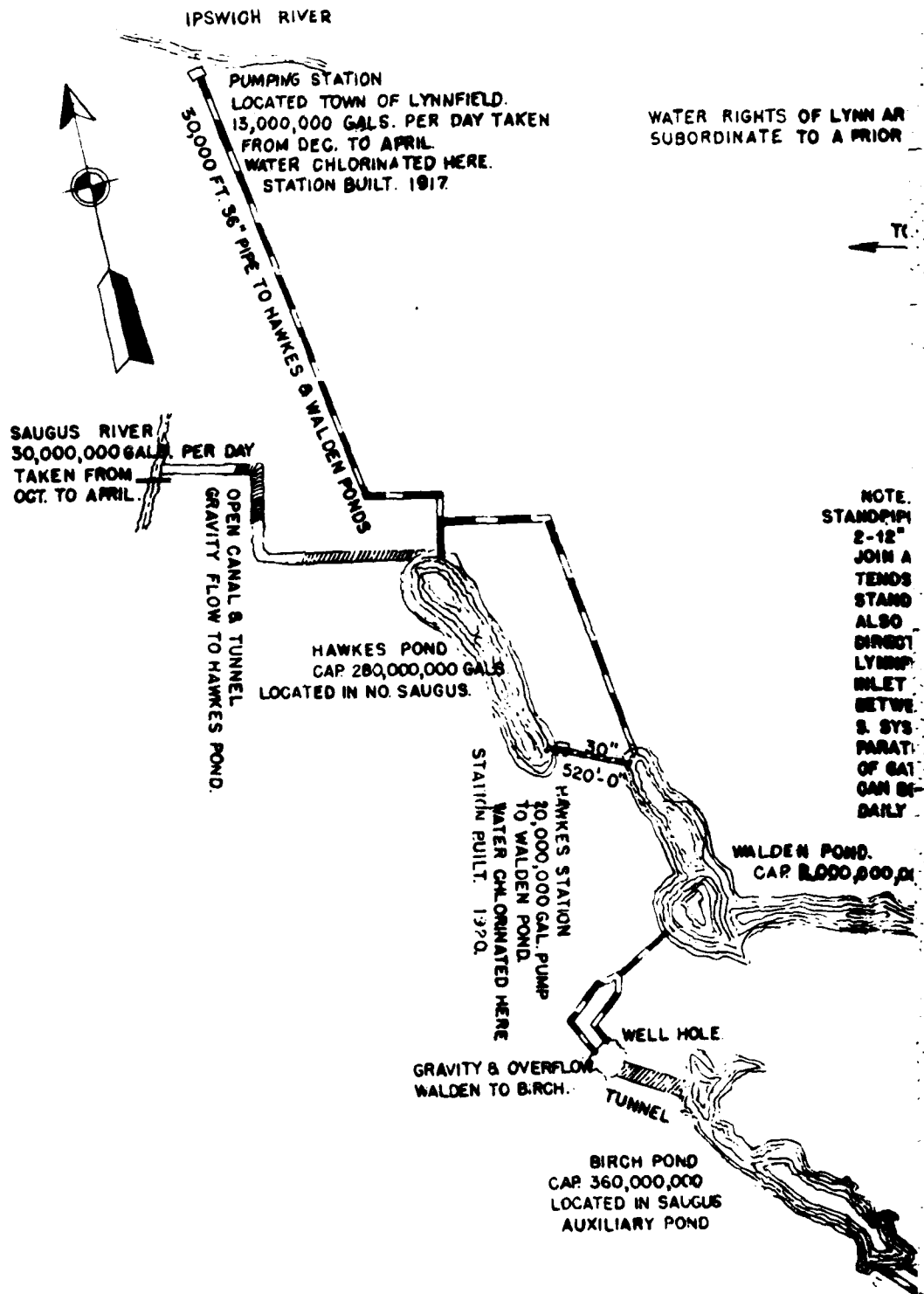
NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	
a. Super Structure	
Bearings	O.K.
Anchor Bolts	O.K.
Bridge Seat	O.K.
Longitudinal Members	—
Under Side of Deck	—
Secondary Bracing	O.K.
Deck	O.K.
Drainage System	
Railings	NONE
Expansion Joints	
Paint	IN NEED OF PAINT
b. Abutment & Piers	
General Condition of Concrete	FAIR
Alignment of Abutment	O.K.
Approach to Bridge	
Condition of Seat & Backwall	O.K.

APPENDIX B

Only a few drawings were available.

Excerpts from these drawings follow.



DEPARTMENT OF WATER SUPPLY
CITY OF LYNN

THOMAS W. HEATH, COMMISSIONER.

OPERATION OF SUPPLY SYSTEM
1940

1 of 2

LYNN ARE
A PRIOR MILL RIGHT TO 10,000,000 GALS. PER DAY.

TO SOUTH LYNNFIELD.
LYNNFIELD ST.
10"

LYNNFIELD ST. STANDPIPE.
CAP 1,250,000 GALS. 80'x30' ELL. 259'
FEEDS LYNNFIELD, WYOMA, & INTER-
CONNECTED WITH PINE HILL STANDPIPE
& HIGH SERVICE GRIDIRON.

NOTE.
STANDPIPES.
2-12" LINES FROM THE PUMPING STATION
JOIN A 16" LINE FROM WHICH A 12" LINE EX-
TENDS TO THE INLET OF THE PINE-HILL
STANDPIPE. IT HAS A 12" OUTLET &
ALSO 12" BY-PASS FOR PUMPING AROUND
DIRECT TO DISTRIBUTION
LYNNFIELD STREET. STANDPIPE HAS 12"
INLET & OUTLET & ACTS AS A BALANCE
BETWEEN THE TWO STANDPIPES & THEN
S. SYSTEM. THE H.S. SYSTEM IS SE-
PARATED FROM L.S. SYSTEM BY A SERIES
OF GATES BUT BY THEIR OPERATION H.S.
CAN BE FED BY L.S. AT REDUCED PRESSURE.
DAILY H.S. CONSUMPTION. 900,000 GALS.

12"
TO HIGH SERVICE GRIDIRON DISTRIBUTION

RESERVOIR
CAP 20,000,000 GALS.
ELL. 269'
PINE HILL STANDPIPE.
CAP 500,000 GALS. ELL. 269'
HIGH SERVICE. FEEDS
PINE HILL & HIGHLANDS.
12"

TO LYNN L.S. GRIDIRON.
WALNUT ST.

POND.
1,000,000,000 GALS.

GLEN LEWIS STATION PUMPS 16,500,000 GALS. PER
DAY TO BREEDS POND.

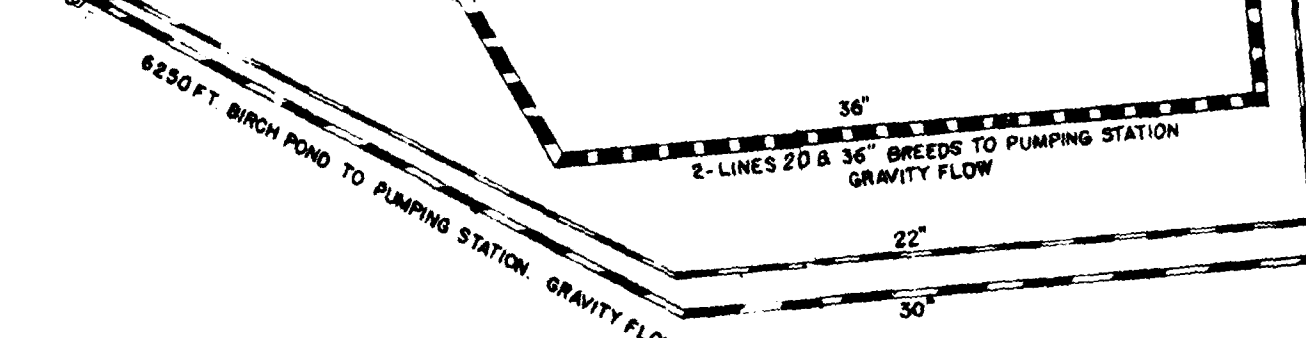
36" PUMP LINE TO BREEDS POND
GRAVITY LINE IF BREEDS LOWERED 7FT.

THE RESERVOIR ACTS AS A
EQUALIZER FOR THE L.S.
INLET & OUTLET AT THE WESTERN
END BEING THRU 1-20" & 1-30"
BOTH OF WHICH CONNECT AT THE
PUMPING STATION WITH SUPPLY
LINES TO THE DISTRIBUTING
SYSTEM. A 80" WHICH IS CONN-
ECTED BY A 20" BY-PASS FROM
THE WESTERN LINES LEAVES
THE EASTERN END OF THE RES.
TO THE L.S. GRIDIRON.

BREEDS POND
CAP 1,600,000,000 DAILY L.S. CONSUMPTION
7,500,000 GALS.

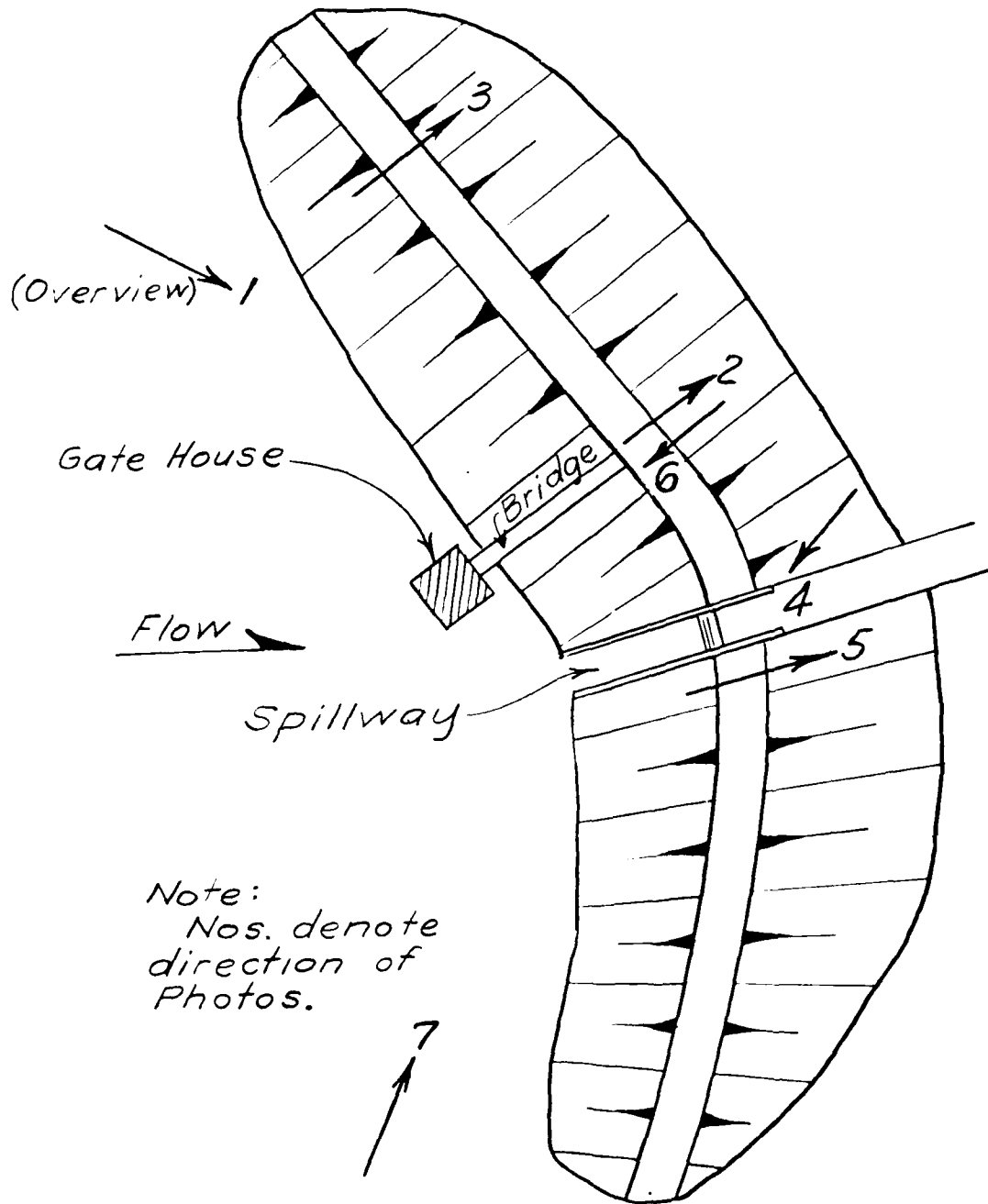
STEAM
TURBINE
L.S. GAS & ELEC
LORETZ
WALNUT ST. STATION

TO SAUGUS & L.S. GRIDIRON.
WALNUT ST.



2082

APPENDIX C



Note:
Nos. denote
direction of
Photos.

PLAN
BREEDS POND



2

Playground Area At Downstream
Toe of Dam



3

Downstream Portion of Embankment

BREEDS POND



4

Entrance to Spillway



5

Downstream Portion of Spillway

BREEDS POND



6

Bridge to Gatehouse



7

View from Hill above Right Abutment

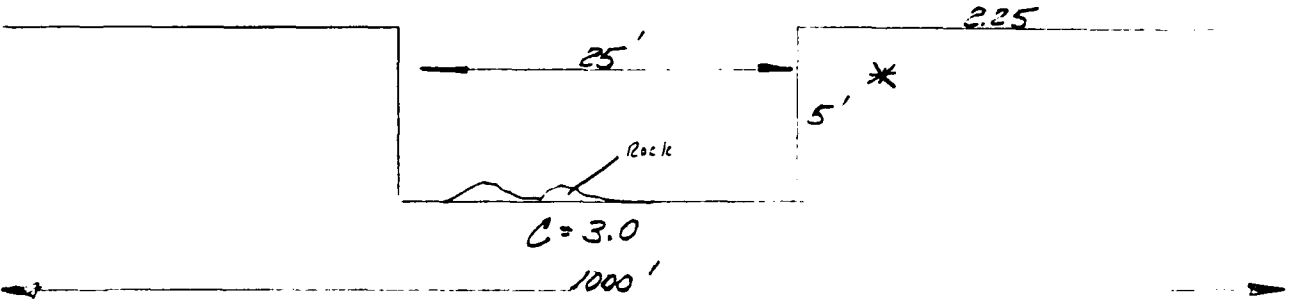
BREEDS POND

APPENDIX D

DMF : 664 CFS
 RES. A : 191 AC
 DR. A : .75 mi² = 480 AC

L_{dam} = 1000' SPILLWAY: CONCRETE & NATURAL ROCK OUTCROP FORMING SPILLWAY
 to CATCH BASIN w/ DRAIN

SPILLING CAPACITY



H ₂₀₀	Q = CLH ^{1.5}	Q _{TOT.}
1	75	75
3	390	390
5	840	840
6	1100 + 2195	3295
8	1700 + 11,400	13,100

* SPILLWAY MEASURED @ 5'
 REFERENCE SHOWS SPILLWAY TO BE 6', EITHER 5 OR 6' - CONTAINED.

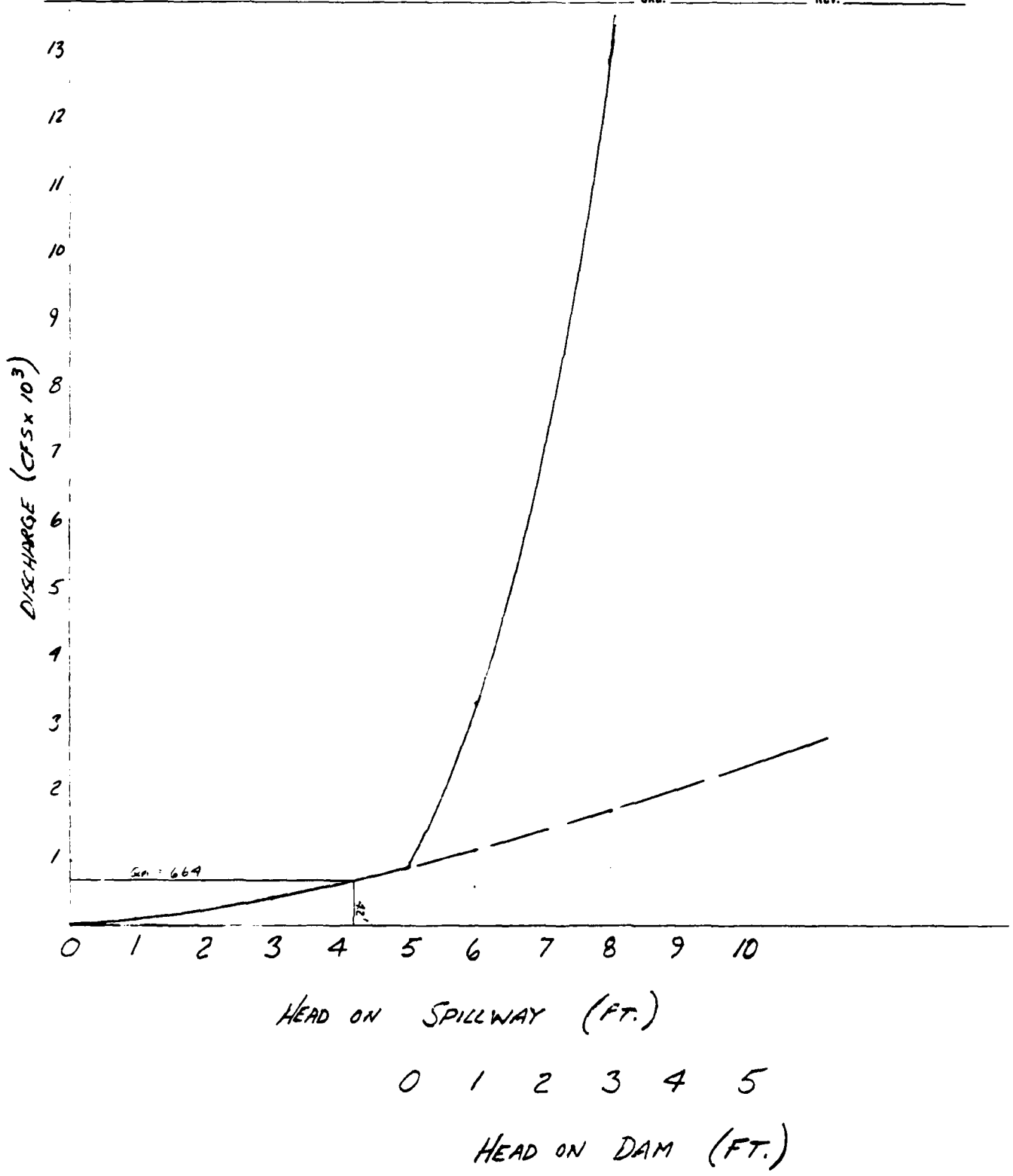
Client CCEE

Job No. 1345-065 Sheet 2 of 7

Subject - SPILLWAY POND -

By J. VEITCH Date 9 AUG. 1973

Ckd. _____ Rev. _____



Client Cof E

Job No. 1345-065 Sheet 3 of 7

Subject BREEDS POND

By J. VEITCH Date 9 AUG 1973

Ckd. _____ Rev. _____

TEST FLOOD - HANDLED BY SPILLWAY - DRAIN WOULD NOT HANDLE FLOW BUT IS LOCATED ON LARGE FLAT FIELD THUS TAKING 664 CFS WITH LITTLE EFFECT

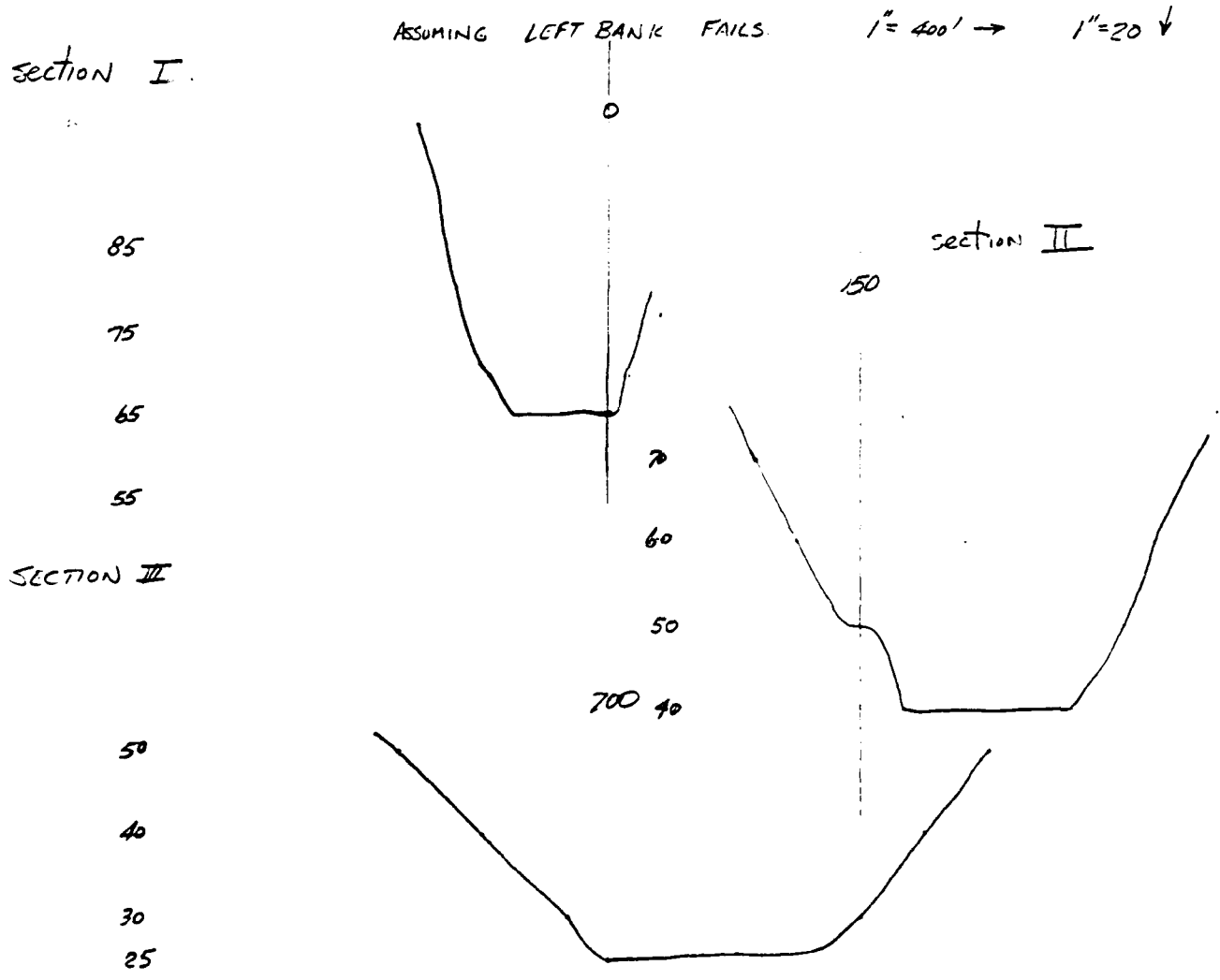
PEAK FAILURE FLOW CRITICAL

$$Q_{PI} = \frac{8}{27} W_b \sqrt{g} Y_o^{1.5} + SP. CAP. \quad W_b = 1000(.3) = 300'$$

$$Y_o = 60$$

$$= 234,425 \text{ cfs.} + 664 = 235,089 \text{ cfs.}$$

$$S = (191) 60(.5) = 5730 \text{ ac ft.}$$



Client C of E

Job No. 1345-065 Sheet 4 of 7

Subject BREEDS POND -

By J. VEITCH Date 9 AUG. 1978

Ckd. _____ Rev. _____

Reach #1 Sect I A EA WP.

$S = .1$	65	-	-	250
$n = .028$	70	1400	1400	320
	75	1800	3200	400

Reach #2

Sect II

$S = .027$	45	2250	2250	500
	50	2750	5000	600
$n = .028$	55	3550	8550	770
	60	4050	12600	850
	65	4475	17075	940
	70	4975	22050	1050

Sect. III

	30	2875	2875	700
	35	3938	6813	875
	40	4813	11626	1050
	45	5725	17351	1290
	50	6600	23951	1400

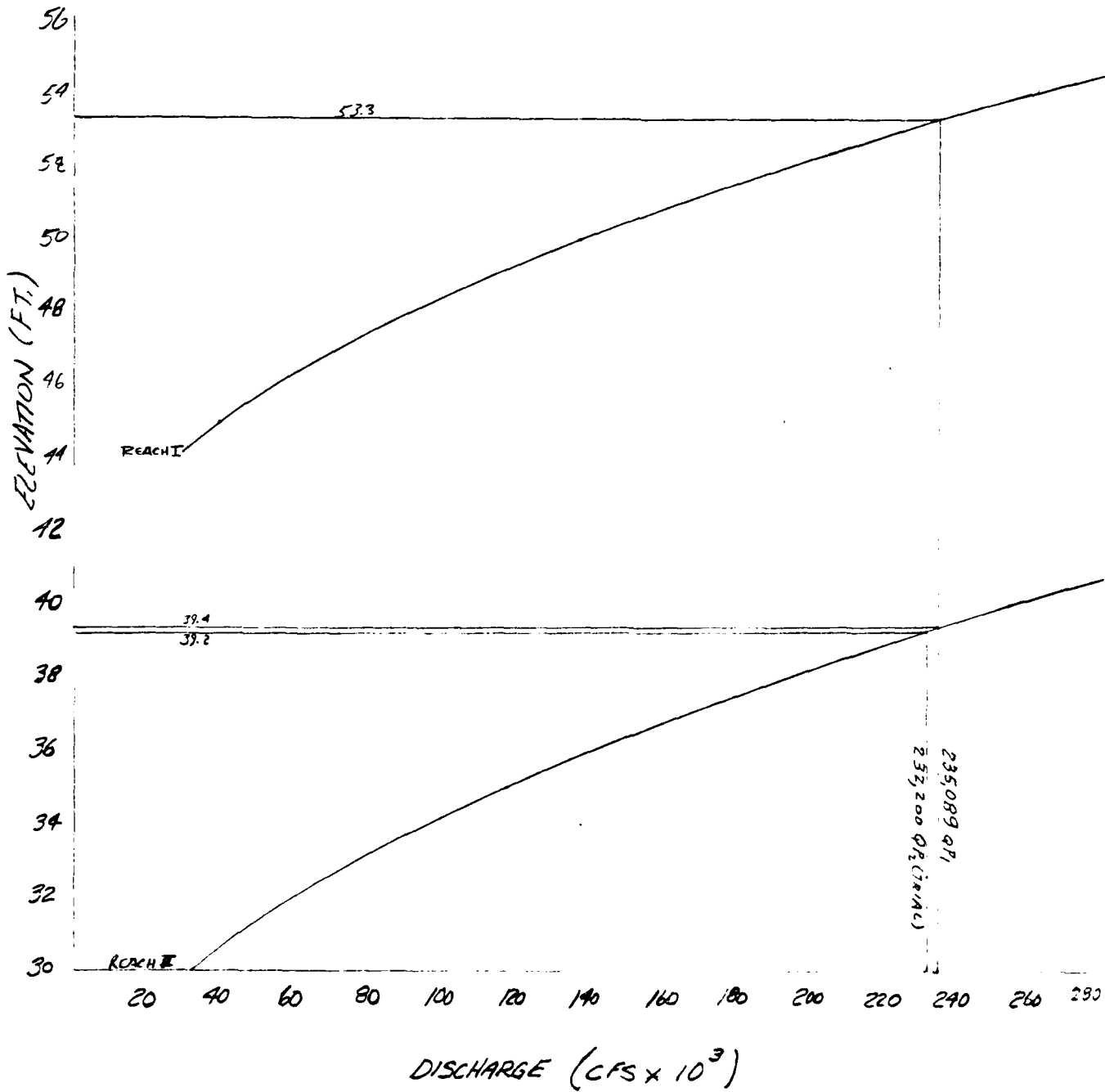
Reach #1

$$Q = \frac{149}{n} (A_{avg} (R_{avg}))^{3/2} S^{1/2}$$

50	$= 53.2 (2500) \left(\frac{2520}{425} \right)^{1.5} \sqrt{.1} = 137,865$
60	$= 53.2 (6300) \left(\frac{6300}{550} \right)^{1.5} \sqrt{.1} = 542,960$
65	$= 53.2 (8538) \left(\frac{8538}{595} \right)^{1.5} \sqrt{.1} =$
55	$= 53.2 (4275) \left(\frac{4275}{370} \right)^{1.5} \sqrt{.1} = 298,885$
45	$= 53.2 (1125) \left(\frac{1125}{375} \right)^{1.5} \sqrt{.1} = 39,515$

Client C O F E
Subject BREEDS POND

Job No. 1345-065 Sheet 5 of 7
By J VEITEN Date 10 AUG. 1978
Ckd. _____ Rev. _____



Client C of EJob No. 1345-065 Sheet 6 of 7Subject BREEDS POND -By J. VEITCH Date 10 AUG. 1978

Ckd. _____

Rev. _____

$$Q_{D1} = 235,089 \text{ cfs EL } 53.3$$

$$V_1 = \frac{13.3}{15} (8550) \frac{150}{43560} = 26 \text{ AC FT.}$$

$$Q_{D2} (\text{TRIAL}) = 235,089 \left(1 - \frac{26}{5730}\right) = 234,022 \text{ cfs}$$

NEGLECT Vol.

$$Q_{P1} \Rightarrow \text{REACH 2} = 235,089 \text{ cfs.}$$

REACH 2	EL	Q
	30	$= 53.2 (1938) \left(\frac{1938}{750}\right)^{.67} \sqrt{.027} = 32,400$
	35	$= 53.2 (3907) \left(\frac{3907}{935}\right)^{.67} \sqrt{.027} = 117,725$
	40	$= 53.2 (5813) \left(\frac{5813}{525}\right)^{.67} \sqrt{.027} = 254,970$
	45	$= 53.2 (9800) \left(\frac{9800}{870}\right)^{.67} \sqrt{.027} = 433,975$

$$EL_{AP1} = 39.4$$

$$V_1 = \frac{14.4}{15.0} (5813) \frac{550}{43560} = 70.5 \text{ AC FT}$$

$$Q_{D2} (\text{TRIAL}) = (235,089) \left(1 - \frac{70.5}{5730}\right) = 232,200 \text{ cfs.}$$

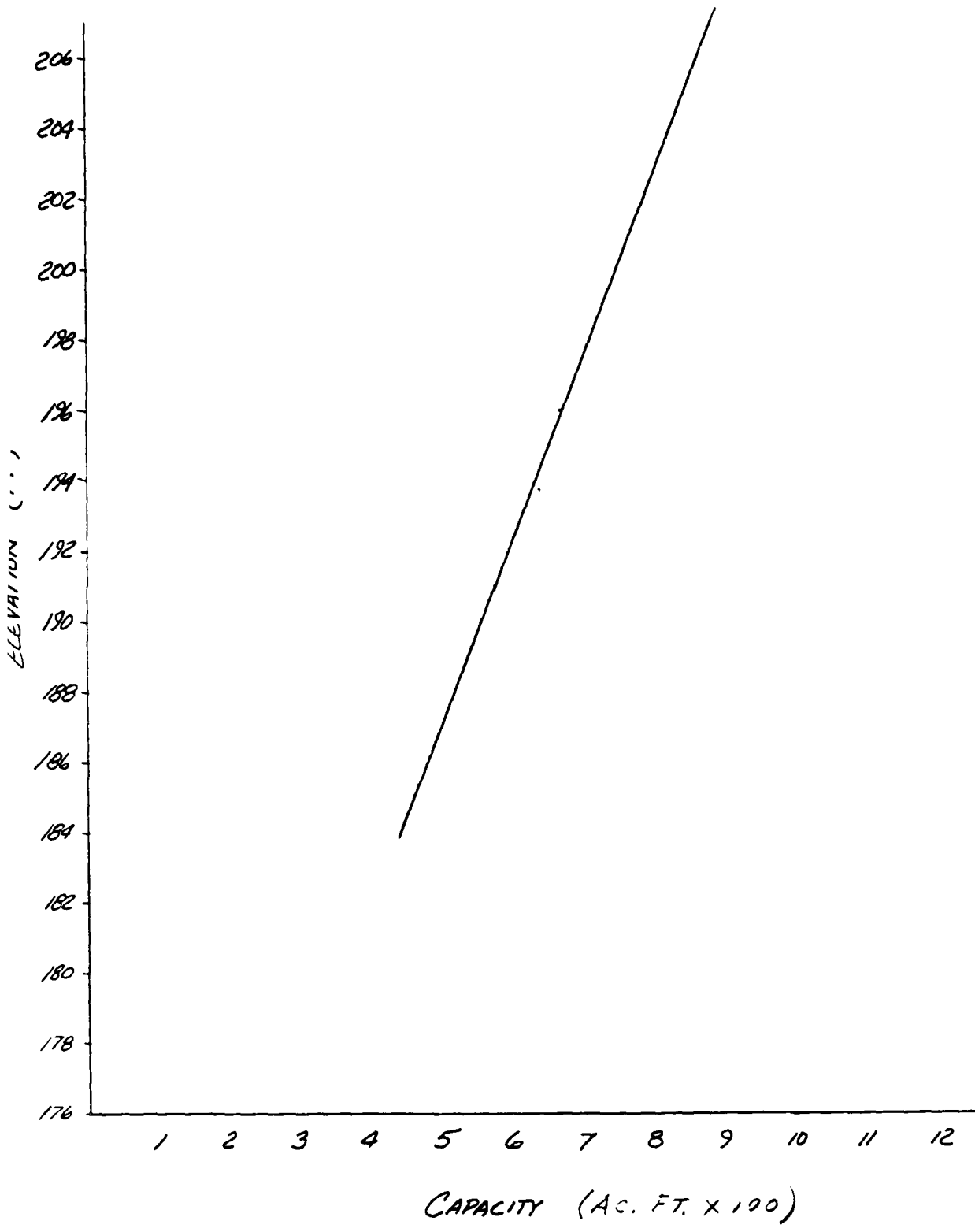
$$V_2 = \frac{14.2}{14.9} (70.5) = 69.5 \text{ AC FT}$$

$$Q_{P3} = 235,089 \left(1 - \frac{70}{5730}\right) = 232,217 \text{ cfs.}$$

ASSUMING THE 300' breach (very conservative) flooding is found to be extensive through both reaches computed it is felt that there is little need to investigate further in this phase. Flood water will be approx. 9'-10' deep across lower field below DAM. Heavily populated extensively used (recreation) AREA creates high potential for HAZARD to lives.

Client COF E
Subject BREEDS POND -
CAPACITY

Job No. 1345-065 Sheet 7 of 7
By J VEITCH Date 23 AUG 1978
Ckd. _____ Rev. _____



APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

STATE	DIVISION	COUNTY	CONTRACT	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
MA	238	MA 009	06	BREEDS POND OUTLET DAM	4228.5	7656.6	08SEP78

POPULAR NAME	NAME OF IMPONDMENT			
BREEDS POND	BREEDS POND			
REGION BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 06	MOUNES BROOK TH-SAUGUS RIVER	LYNN	0	90000

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCT. HEIGHT (FT.)	HYDRAU. HEIGHT (FT.)	IMPONDING CAPACITIES		DIST ONN	FED	R	PHV	P	SCS	A	VER	DATE
					MAXIMUM (ACRE-FT.)	NORMAL (ACRE-FT.)									
WECLPG	1914	S	65	600	57500	5730	N	N	N	N	N	N	N	N	30AUG78

REMARKS

DIS. HAS	SPILLWAY CREST LENGTH	TYPE	WIDTH (FT.)	VOLUME OF DAM (CY)	MAXIMUM DISCHARGE (FT.)	POWER CAPACITY (MW)	INSTALLED PROPOSED (MW)	NAVIGATION LOCKS	
								LENGTH (FT.)	WIDTH (FT.)
1	1000	U	25	181000	840				

OWNER: CITY OF LYNN

ENGINEERING BY: []

CONSTRUCTION BY: []

REGULATORY AGENCY: []

DESIGN: []

CONSTRUCTION: []

OPERATION: []

MAINTENANCE: []

INSPECTION BY: CHAS. T. MAIN, INC.

INSPECTION DATE: 07 JUL 78

AUTHORITY FOR INSPECTION: P. L. 92-367

REMARKS

END

FILMED

7-85

DTIC