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NATIONAL BUREAU OF STANDARDS 1963-A

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COASTAL BASIN
SAUGUS, MASSACHUSETTS

AD-A154 702

HAWKES POND OUTLET DAM

MA 00245

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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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is an earthfill structure with a core of rock set in mortar. It is 1270 feet long and 30 feet high at a maximum section. The dam is heavily overgrown and is in fair condition. It is small in size and has a hazard classification of high. The chance of failure of this dam by overtopping is considered small.		

HAWKES POND OUTLET DAM

MA 00245

COASTAL BASIN
SAUGUS, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.: MA 00245
Name of Dam: Hawkes Pond Outlet
Town: Saugus, Massachusetts
County and State: Essex County, Massachusetts
Stream: Hawkes Brook
Date of Inspection: July 6, 1978

BRIEF ASSESSMENT

The Hawkes Pond Dam is an earthfill structure with a core of rock set in mortar. It was constructed in 1895 and is 1,270 feet long and 30 feet high at maximum section. The granite block spillway, 25 feet wide and 4 feet high, is ungated. The reservoir is used as part of the Lynn water supply system. Water is pumped from Hawkes Pond to nearby Walden Pond. The dam has a drainage area of 1.75 square miles and impounds a reservoir of 950 acre feet.


The dam is heavily overgrown and in fair condition. The spillway is overgrown to the extent that its capability of discharging water is seriously impaired.

Owing to its height and storage, Hawkes Pond Outlet falls within the small size classification. It is in the high hazard potential category and thus hydraulically analyzed using the full probable maximum flood.

Reservoir storage will reduce the maximum probable discharge of 1,400 cfs to a test flood of 1,300 cfs. Although the spillway can discharge only 600 cf at maximum pool, the test flood would overtop the embankment section by only a few inches. The chance of failure of this dam by overtopping is considered small.

A failure of the dam could produce a flow over 100,000 cfs. A flow of this magnitude, as well as flows of considerably less magnitude, would pose a hazard to life and property in the half mile reach below the dam.

Additional investigations or major modifications are not required. However, remedial measures that should be implemented by the owner within 12 months after receipt of this Phase I Inspection Report are described in Section 7. The owner should clear the spillway of all growth, and repair the spillway lining as required. The owner should also implement regular inspection and maintenance procedures, make repairs where necessary, reactivate the outlet works, and develop a flood warning system.



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

This Phase I Inspection Report on the Hawkes 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 10 1968

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.

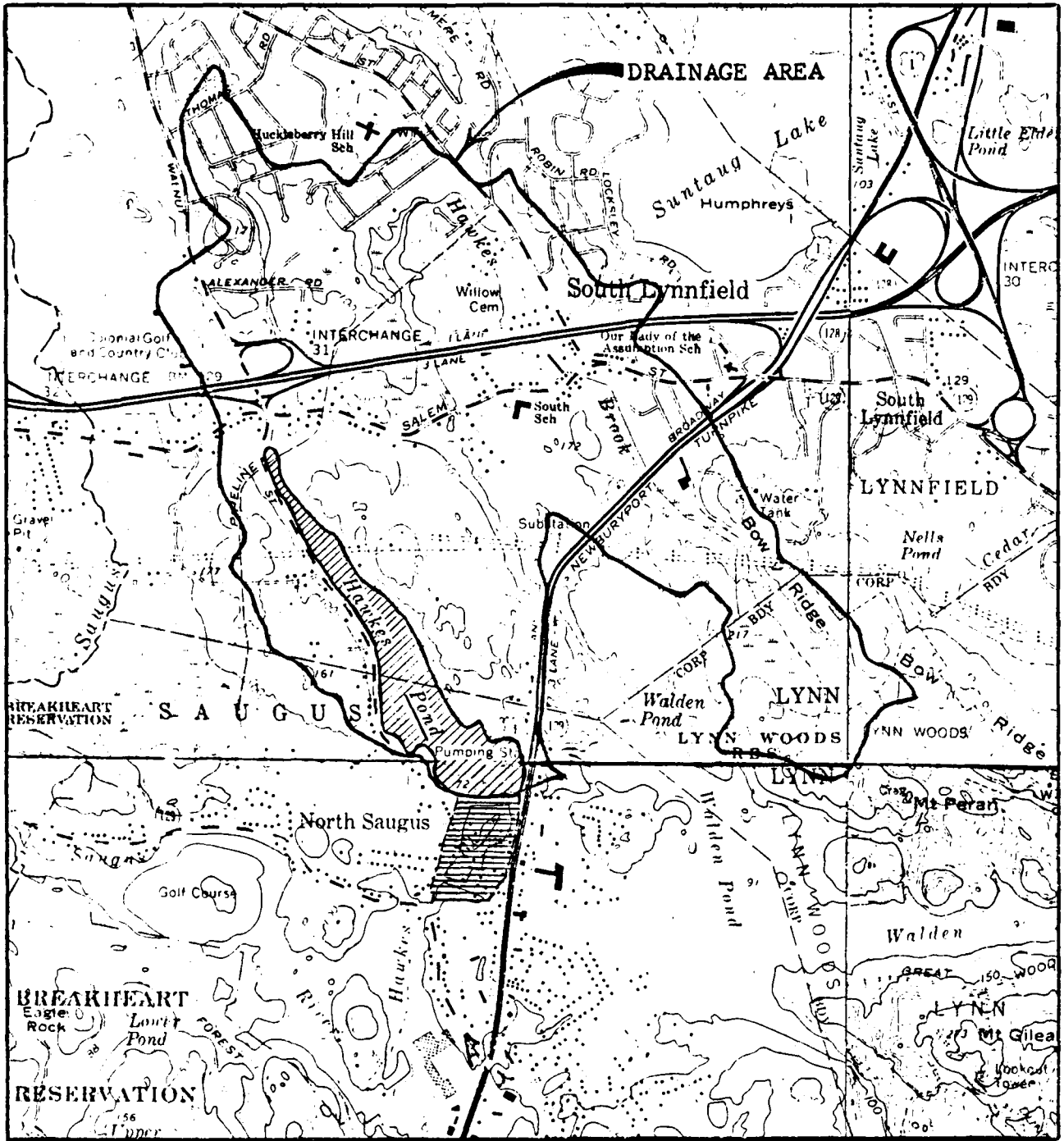
Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because 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



HAWKES POND

READING and
 BOSTON NORTH, MASS.
 Scale 1:24000

PHASE I INSPECTION REPORT

HAWKES POND OUTLET

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 Hawkes Pond Outlet, on Hawkes Brook, is located in Essex County in the Town of Saugus, Massachusetts. Hawkes Brook flows into the Saugus River about half a mile below the dam.

b. Description of Dam and Appurtenances. The dam consists of an embankment section 1,270 feet long. The crest width is 20 feet; the maximum height of the dam is 26 feet. The embankment has a core of rock set in mortar. The dam was built in 1895. There is a 25-foot long by 4-foot high ungated spillway. The outlet works are permanently closed and

inoperable. Remote from the dam is a 20 mgd pumping station to Walden Pond.

c. Size Classification. Owing to its height of 30 feet and its storage volume of about 900 acre feet, the dam falls within the small size classification.

d. Hazard Classification. As there are several houses downstream of the dam which may 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. Nothing is known of the design and construction history of the dam.

i. Normal Operating Procedures. As the outlet works are inoperable, only overflow discharges through the spillway. Water is pumped into Hawkes Pond from the Ipswich River. Hawkes Pond is fed by gravity from the Saugus River. From Hawkes Pond, water is pumped to Walden Pond.

1.3 Pertinent Data

a. Drainage Area. The Hawkes Pond dam has a drainage area of 1.75 square miles of semi-wooded, rural land.

b. Discharge at Damsite.

- (1) The outlet works are inoperable and abandoned.
- (2) The maximum known flood at the damsite is unknown.
- (3) The ungated spillway capacity at maximum pool is 600 cfs at El. 76.
- (4) There is no gated spillway capacity.
- (5) There is no gated spillway capacity.
- (6) The total spillway capacity at maximum pool is 600 cfs at El. 76.

INSPECTION CHECK LIST

PROJECT HAWKES POND

DATE JULY 6, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	
Crest Elevation	76
Current Pool Elevation	72
Surface Cracks	none
Pavement Condition	no pavement
Movement or Settlement of Crest	none
Lateral Movement	none
Vertical Alignment	OK,
Horizontal Alignment	O.K.
Condition at Abutment and at Concrete Structures	fair
Indications of Movement of Structural Items on Slopes	none
Trespassing on Slopes	none
Sloughing or Erosion of Slopes or Abutments	-
Rock Slope Protection - Riprap Failures	-
Unusual Movement or Cracking at or near Toes	-
Unusual Embankment or Downstream Seepage	Excessive trees and vegetation on crest of dam and slopes
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instruments on System	

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT HAWKES POND

DATE JULY 6, 1978

TIME 9:00 AM

WEATHER WARM & SUNNY

W.S. ELEV. 72 U.S. _____ DN.S _____

PARTY:

1. J. GOODRICH
2. D. FISCHER
3. _____
4. _____
5. _____

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

APPENDIX A

(4) The watercourse below the spillway should be cleared of major growth for not less than 250 feet below the dam. A width of 50 feet would be suitable.

(5) The outlet works should be reactivated so that the reservoir can be drained without breaching the dam or its abutments. This would include repair and painting of the access bridge and the rehabilitation of the gate house and gates.

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

(7) 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. Owing mainly to the fact that the spillway is very overgrown and the outlet works are inoperable, this dam must be classed in only 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 owner of the dam should develop and implement procedures which would include annual inspection of the dam and the initiation of repairs, as required.

(2) The spillway should be cleared completely of all growth.

(3) The sides and especially the bottom of the spillway will undoubtedly require repairs. The exact nature of the repairs to the bottom is not known as the bottom is completely overgrown and no drawings of the spillway exist.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. Nothing was noted which would indicate that the dam was 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. This 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.

in the first few thousand feet below the dam would be inundated and several industrial buildings would be affected before the flow dissipated in the marshy stretch of the Saugus River into which it would discharge.

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

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. The spillway is heavily overgrown, as is downstream channel. Any major spill must have taken place years ago, if at all.

A Probable Maximum Flood (PMF) of 1,400 cfs was determined. Although this dam is in the small size classification and owing to the fact that there are several dwellings and other structures in the watercourse below the dam, the full PMF was used in the determination of the Peak Outflow (or test flood) of 1,300 cfs. This would cause an overtopping of the embankment section of only a few inches. Such an overtopping should have no noticeable effect on the safety of dam.

The application of "rule of thumb" procedures for the estimation of the downstream dam failure hydrograph - with the assumption of a maximum breach width of 30 percent of the dam - results in a Peak Failure Outflow in excess of 107,000 cfs. While the reservoir storage could support such a flow for something less than 10 minutes, or the flow could be mitigated by assuming a lesser breach width, inspection of calculations and the location map shows that any flow exceeding 5,000 cfs or so could greatly endanger human life as well as property. Several homes

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures

Hawkes Pond receives water from the Ipswich River by means of pumping, and from the Saugus River by means of gravity flow. Water level is maintained by pumping to Walden Pond.

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 pumped outflows to Walden Pond are maintained on a yearly basis, according to the owner. The gates at the outlet works are inoperable.

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.

3.2 Evaluation

The visual inspection during site examination indicates that the Hawkes Pond Dam and appurtenances, except for the pump house have been neglected with respect to maintenance. The dam itself, while overgrown, can be considered in fair condition. The abandoned outlet works and the neglected spillway, however, must be considered in poor condition. The reservoir itself is not a factor in evaluating the dam. The water-course below the dam is inhabited to the extent that property and life could be in jeopardy if the dam failed.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Phase I visual inspection of the Hawkes Pond Dam was conducted on July 6, 1978. The dam is located in a broad, low valley to the west of U.S. Route 1, in Saugus, Massachusetts. Although constructed 83 years ago, the dam can be considered in fair condition. Maintenance is poor and deficiencies requiring attention were noted.

b. Dam. The earthfill dam lies to the right of the spillway section. There is dense vegetation on the crest and upstream and downstream slope of the dam. The vegetation made close inspection impossible, however there appear to be no serious horizontal or vertical misalignments of the dam nor is there evidence of significant seepage through the dam. The dam can be considered to be in fair condition.

c. Appurtenant Structures. The spillway is almost entirely blocked with trees and vegetation. The masonry block walls of the spillway are in fair condition but require some pointing up and general maintenance. The growth is so dense that the nature of the spillway bottom cannot be determined.

The outlet works are inoperable and in generally poor condition. The stone-faced gate house structure appears to be sound, although much of the roof is missing. The door is missing and there is no decking on the service bridge. It was not possible to observe the gates.

The structure which houses the pumps which transfer water to Walden Pond appears to be in good condition. According to the owner, the pumps are maintained regularly.

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

e. Downstream Channel. The spillway, itself, is almost completely overgrown. The watercourse immediately below the dam is heavily wooded. Below that the watercourse passes through residential and semi-industrialized areas before discharging into a broad swamp. Flow ultimately reaches the Saugus River.

SECTION 2
ENGINEERING DATA

2.1 Design

There is a drawing showing the dam cross section which is included in this report. The original of this drawing is available at the Town of Lynn City Hall - Room 401. Other than this drawing, there are no design data or records available.

2.2 Construction

The Hawkes Pond dam was built in 1895. 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. Other than the drawing mentioned above, 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 rock core
(2) Length	1,270 ± feet
(3) Height	30 ± feet
(4) Top Width	20 ± feet
(5) Side slope	2:1 upstream and downstream
(6) Zoning	Unknown
(7) Impervious core	Unknown
(8) Cutoff	Unknown
(9) Grout curtain	Unknown
(10) Other	N/A

h. Spillway

(1) Type	Broadcrested weir
(2) Length of weir	25 feet
(3) Crest elevation	El. 72 ±
(4) Gates	None
(5) U/S Channel	N/A
(6) D/S Channel	Streambed
(7) General	N/A

i. Regulating Outlets. The outlet works at the dam are inoperable. There is a 20 m.g.d. pumping station which pumps water from Hawkes Pond to Walden Pond through a 520-foot long, 30-inch diameter pipe.

c. Elevation (Feet Above MSL)

(1)	Top of dam	El. 76 ±
(2)	Maximum design surcharge	El. 76 ±
(3)	Full flood control pool	N/A
(4)	Recreation pool	N/A
(5)	Spillway crest (gated)	El. 72 ± (ungated)
(6)	Upstream portal invert diversion tunnel	N/A
(7)	Streambed at centerline of dam	El. 46 ±
(8)	Maximum tailwater	Unable to ascertain accurately

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	950 ± (at spillway crest)
(2)	Flood control pool	N/A
(3)	Design surcharge	1250 ±
(4)	Top of dam	1250 ±

f. Reservoir Surface (Acres)

(1)	Top of dam	79
(2)	Maximum pool	79
(3)	Flood control pool	N/A
(4)	Recreation pool	N/A
(5)	Spillway crest	72 ±

INSPECTION CHECK LIST

PROJECT HAWKES POND

DATE JULY 6, 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 HAWKES POND

DATE JULY 6, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE

a. Approach Channel

- Slope Conditions
- Bottom Conditions
- Rock Slides or Falls
- Log Boom
- Debris
- Condition of Concrete Lining
- Drains or Weep Holes

b. Intake Structure

- Condition of Concrete
- Stop Logs and Slots

*NOT
APPLICABLE*

INSPECTION CHECK LIST

PROJECT HAWKES POND

DATE JULY 6, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - TRANSITION AND CONDUIT</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining on Concrete</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Cracking</p> <p>Alignment of Monoliths</p> <p>Alignment of Joints</p> <p>Numbering of Monoliths</p>	<p><i>NOT</i></p> <p><i>APPLICABLE</i></p> <p><i>5</i></p>

INSPECTION CHECK LIST

PROJECT HAWKES POND

DATE JULY 6, 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 spalling</i></p> <p><i>NONE</i></p> <p><i>NO</i></p> <p><i>NONE</i></p> <p><i>} heavily overgrown with trees and vegetation</i></p> <p style="text-align: right;">6</p>

INSPECTION CHECK LIST

PROJECT HAWKES POND

DATE JULY 6, 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 HAWKES POND

DATE JULY 6, 1978

PROJECT FEATURE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - OUTLET STRUCTURE AND</u> <u>OUTLET CHANNEL (Gate House)</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Condition at Joints</p> <p>Drain holes</p> <p>Channel</p> <p>Loose Rock or Trees Overhanging Channel</p> <p>Condition of Discharge Channel</p>	<p>POOR</p> <p>SOME</p> <p>SOME</p> <p>-</p> <p>NONE</p> <p>NONE</p> <p>O.K.</p> <p>NONE</p> <p>N/A</p> <p>N/A</p> <p>ROOFING DESTROYED</p> <p>8</p>

INSPECTION CHECK LIST

PROJECT HAWKES PONDDATE JULY 6, 1978

PROJECT FEATURE _____

NAME _____

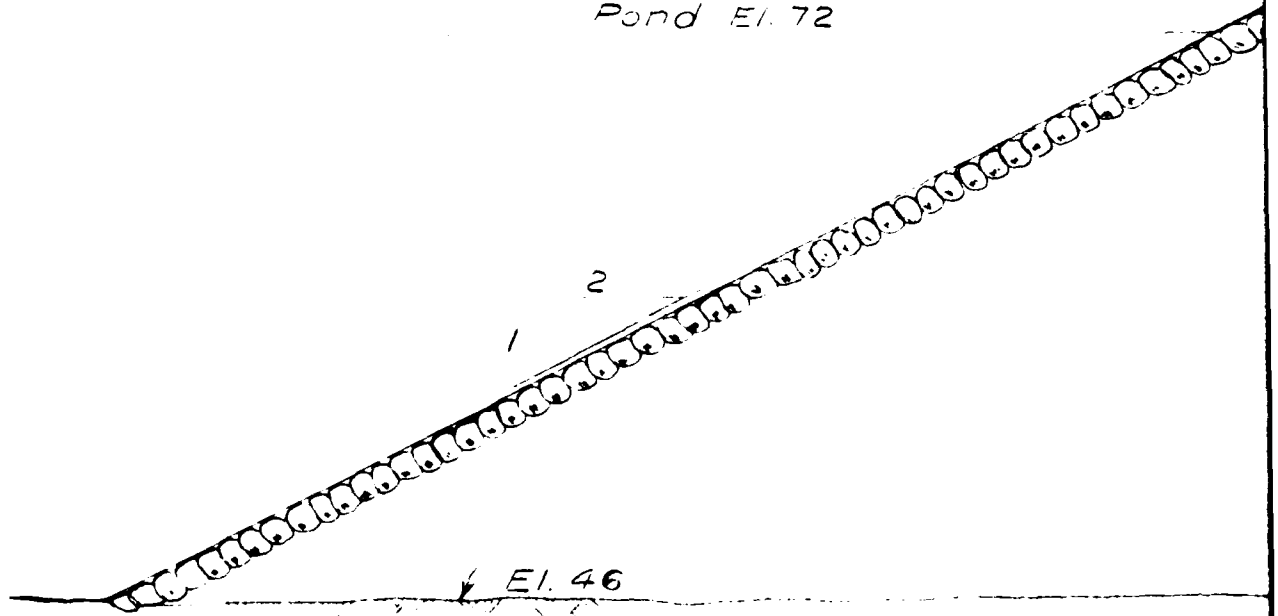
AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	
a. Super Structure	
Bearings	O.K.
Anchor Bolts	O.K.
Bridge Seat	O.K.
Longitudinal Members	O.K.
Under Side of Deck	-
Secondary Bracing	NONE
Deck	NONE
Drainage System	-
Railings	NONE
Expansion Joints	-
Paint	IN NEED OF PAINT
b. Abutment & Piers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

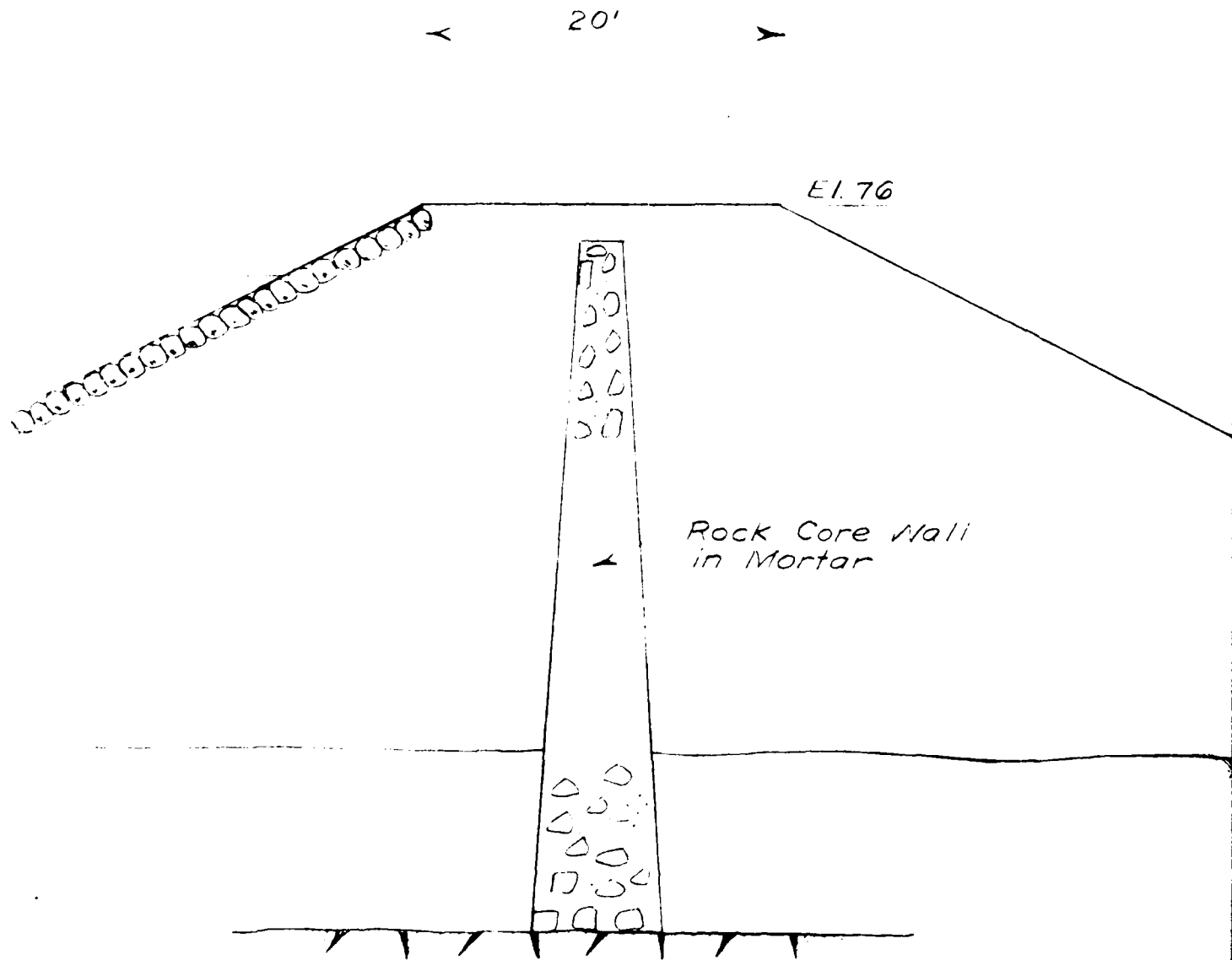
Pond El. 72



SE

1 of 3

11

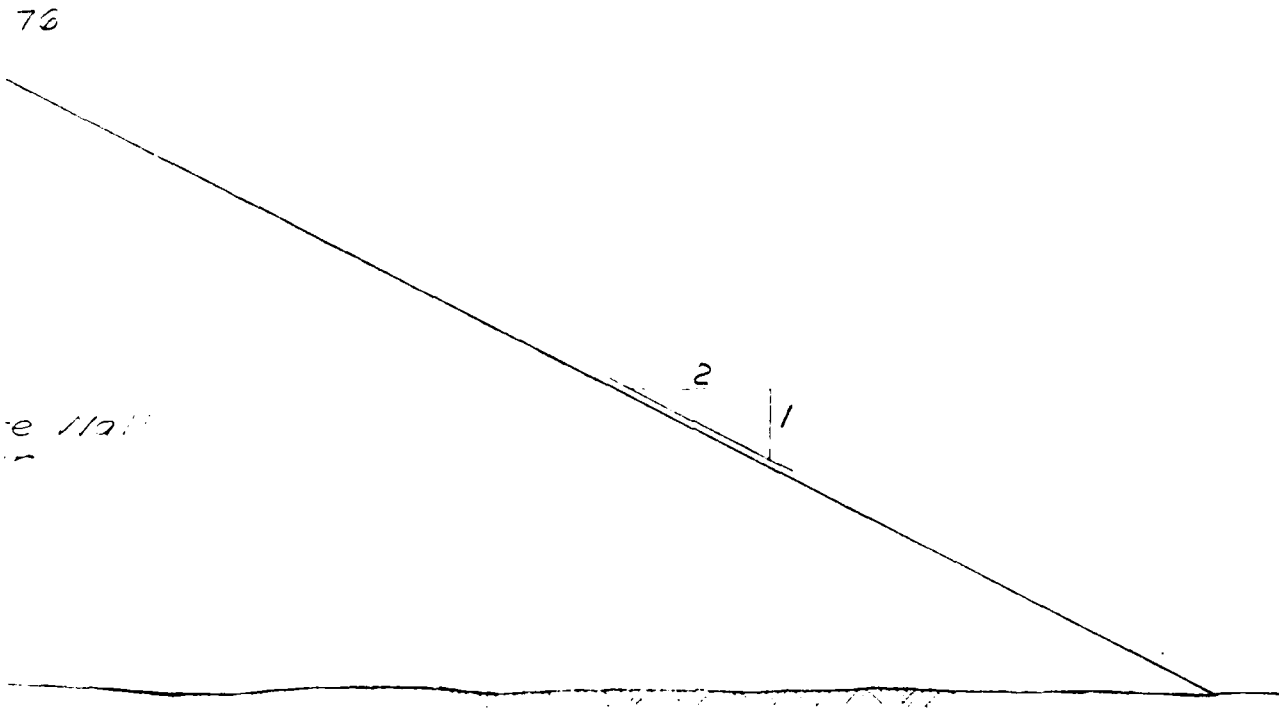


SECTION THRU EMBANKMENT



SCALE: $\frac{1}{8}'' = 1'-0''$

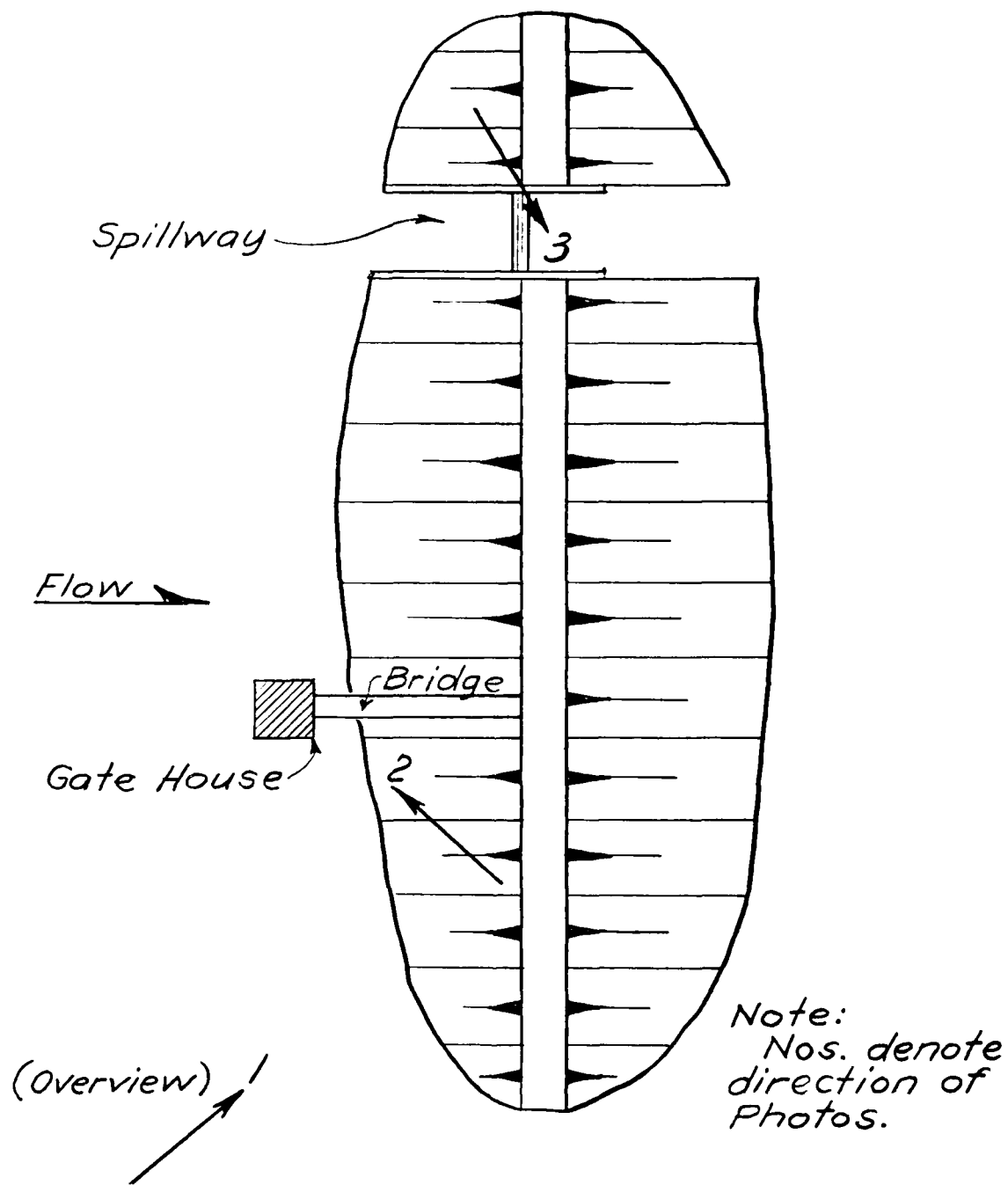
2 of 3



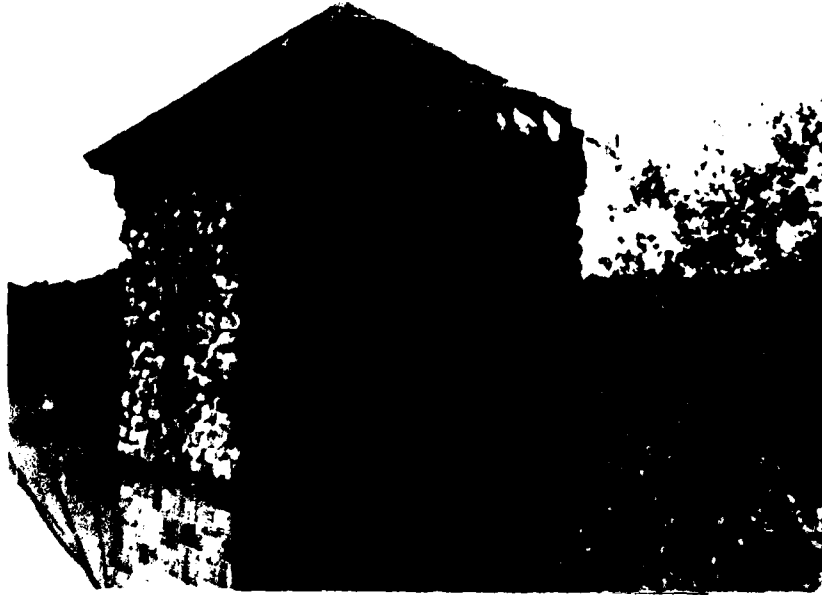
NT

HAWKES POND DAM

APPENDIX C

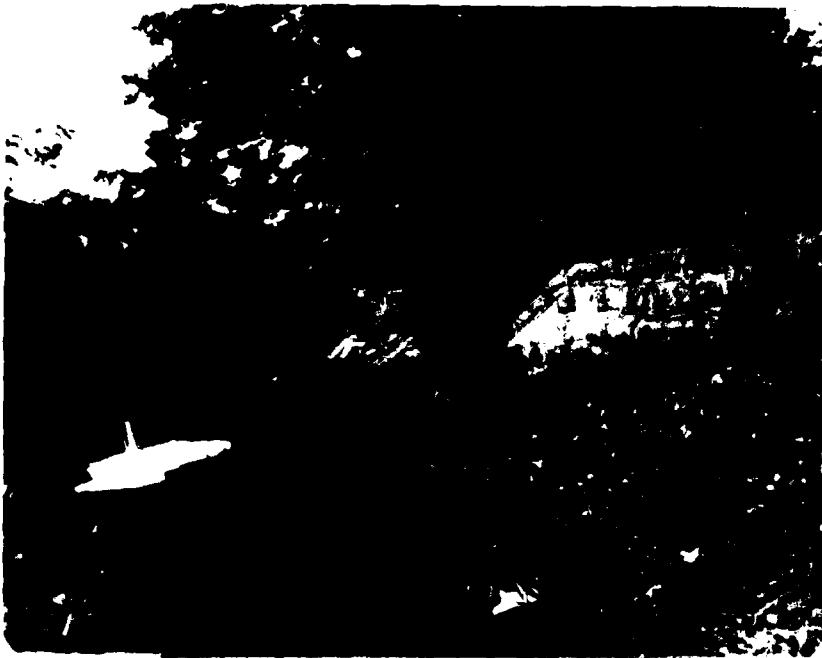


PLAN
HAWKES POND



2

Abandoned Valve House



3

Overgrown Spillway Channel

HAWKES POND

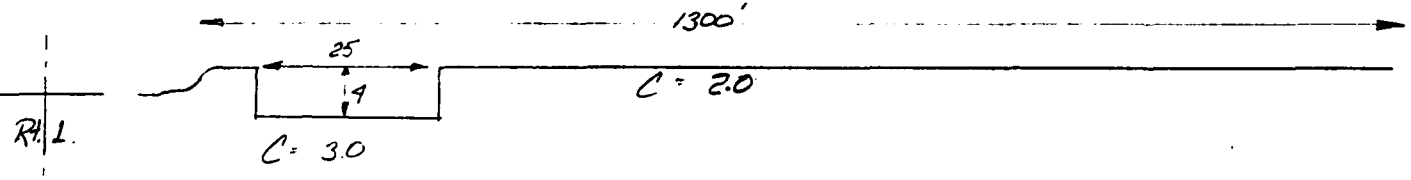
APPENDIX D

PMF - PREVIOUS CALC.: $806.4 \frac{cfs}{mi^2}$, USING $1.75 mi^2$ DRAINAGE BASIN, by eq $q = 858.32 - 92.786 \ln x$, (x = D.A.) taken from PMF ESTIMATION CURVES
 $1.75(806.4) = 1411 cfs = PMF.$

HAZARD CLASS: HIGH HAZARD, SMALL : USE $\frac{1}{2}$ - 1.0 PMF
 USE TOTAL PMF, CONSERVATIVELY COVER SLIGHT DISCREPANCY IN D.A

RES. AREA: 72 AC
 DRAINAGE AREA: $1.75 mi^2 = 1120 AC.$

SPILLWAY: TOTAL DAM LENGTH $\approx 1300'$ heavily overgrown

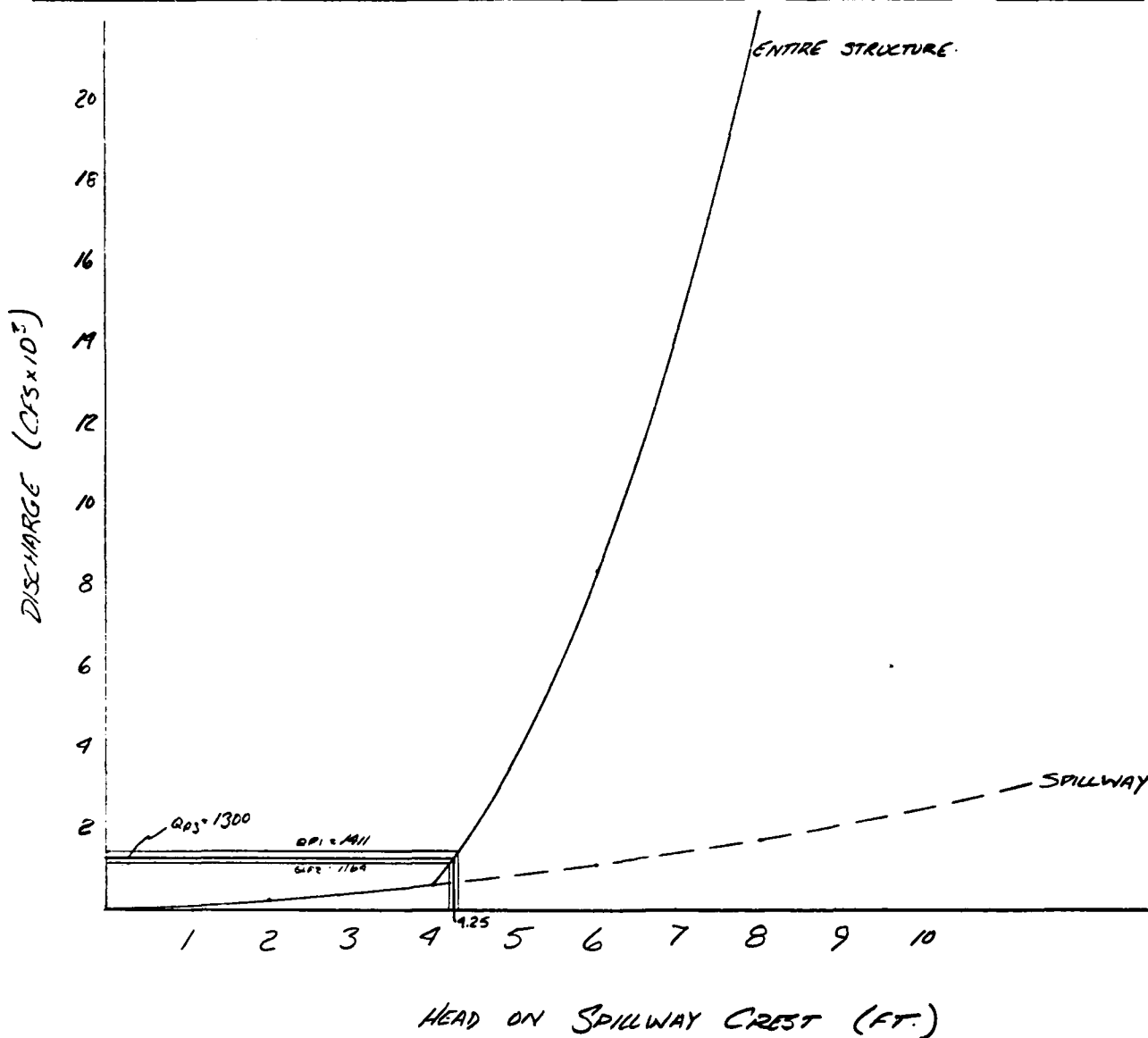


H	Q
2	212
4	600
6	1100 7212
8	1700 20400

Client C of E
 Subject HAWKES POND

Job No. 1345-065 Sheet 2 of 6
 By J. VEITCH Date 11 AUG 1978

Ckd. _____ Rev. _____



$Q_{P1} = 1411 \text{ cfs.}$

$S = 4.3'$

$STOR_1 = \frac{(4.3)(12)(72)}{1120} = 3.32''$

$Q_{P2} = 1411 \left(1 - \frac{3.32}{19}\right) = 1164 \text{ cfs.} \Rightarrow S = 4.2' \quad STOR_2 = \frac{4.2(12)(72)}{1120} = 3.24''$

$STOR_{AVE.} = 3.28'' \quad S_{AVE} = \frac{(3.28)(1120)}{12(72)} = 4.25' \quad Q_{P3} = 1300 \text{ cfs.}$

PICK FAILURE OUTFLOW

$$Q_p = \frac{8}{27} (390) \sqrt{32.2} (30)^{1.5}$$

$$= 107,745 \text{ cfs.} + \text{SPILLWAY CAP.}$$

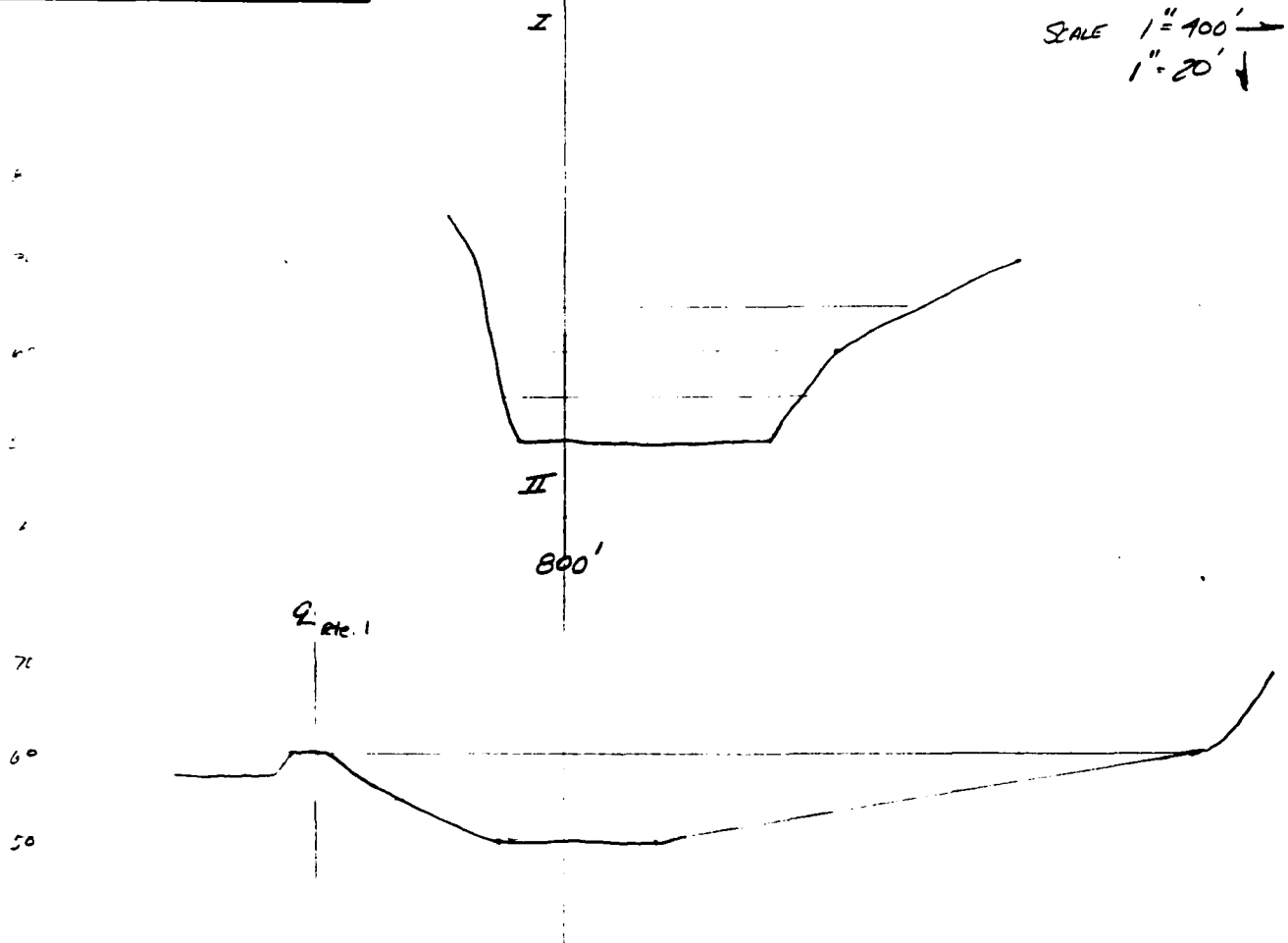
$$= 108,345 \text{ cfs.}$$

$$y_0 = 30$$

$$W_b = .3(1300) = 390'$$

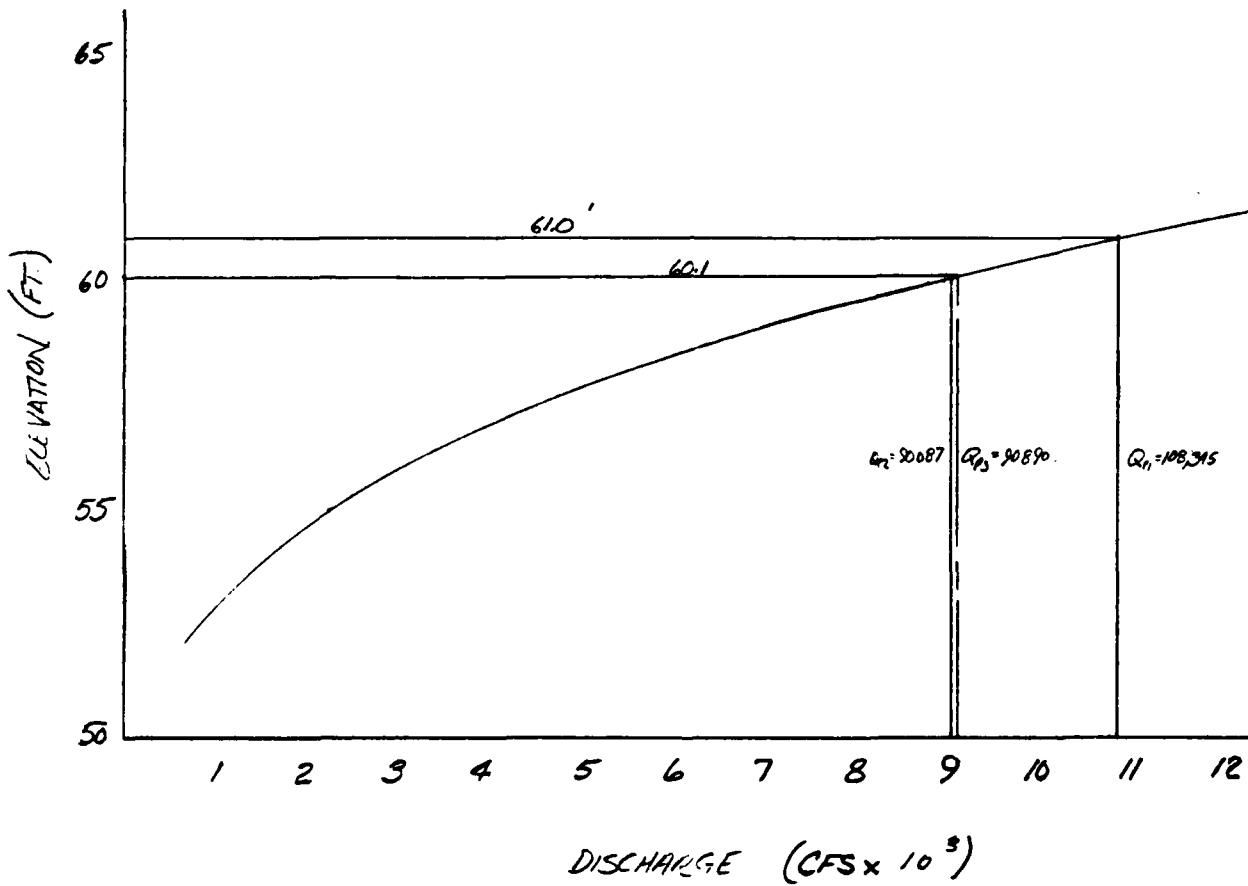
$$S = 72(30).5 = 1080 \text{ AC FT}$$

PICK FAILURE CRITICAL.



		SECTION I		
		A	E A	WP.
<u>REXH #1</u> $S = \frac{2}{800} = .0025$ EL.	50	-	-	550
	55	3050	3050	670
	60	3600	6650	770
		SECTION II		
	50	-	-	350
	55	3725	3725	1140
	60	7675	11400	1930

REACH #	RATIO	EL.	Q
1			
$S = .003$		50	-
$R = .03$		55	$\frac{1.49}{.03} (3388) \left(\frac{3388}{905}\right)^{.67} \sqrt{.003} = 22,320$
		60	$\frac{1.49}{.03} (9025) \left(\frac{9025}{1350}\right)^{.67} \sqrt{.003} = 87,680$
		65	



$Q_{P1} = 108345$ EL. = 61.0

$V_1 = \frac{11}{10} \frac{(9025)(800)}{43560} = 182 \text{ AC FT.}$

$Q_{P2} \text{ (TRIAL)} = 108345 \left(1 - \frac{182}{1080}\right) = 90,087 \text{ cfs.}$

$V_2 = \frac{9025(800)}{43560} = 166 \text{ AC FT}$

$V_{AVE.} = 174 \text{ AC FT}$

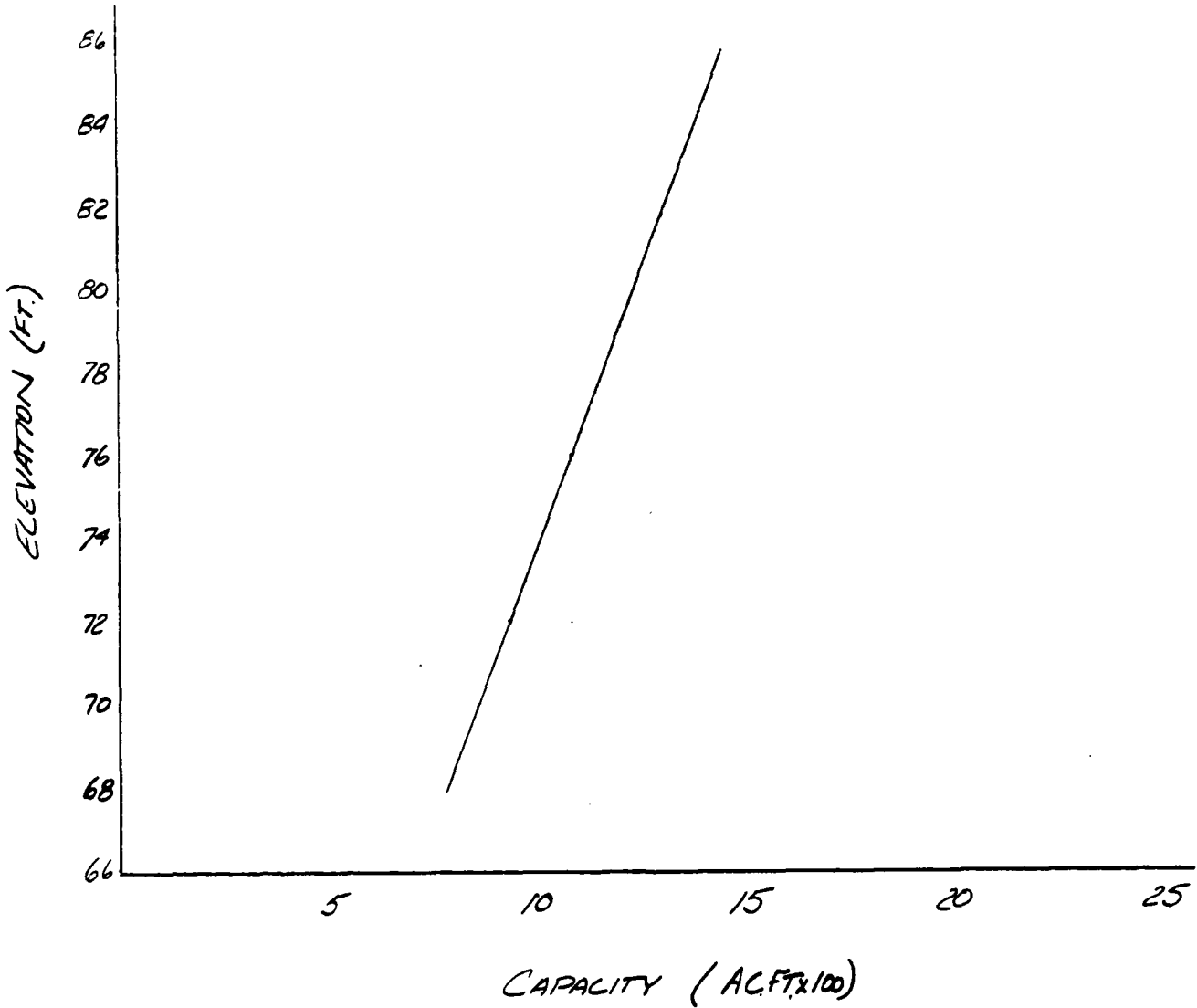
$Q_{P2} = 108345 \left(1 - \frac{174}{1080}\right) = 90,890 \text{ cfs.}$ EL 60.1

THROUGH REACH #1 ARE MANY HOMES BELOW DAM. IN THE CASE OF FAILURE THE HAZARD TO LIFE IS GREAT WITH A LARGE POTENTIAL FOR PROPERTY DAMAGE JUST WITH REACH I, HENCE THE NEED FOR FURTHER STUDY IN PHASE II. DOWN STREAM OF REACH I THE CHANNEL WIDENS LESSENING THE POSSIBLE HAZARD TO LIFE BUT THE POTENTIAL FOR PROPERTY DAMAGE INCREASES, Rte 1 WOULD ALSO BE SUFFERING FLOODING.

TEST FLOOD $Q_{P3} = 1300 \text{ cfs.}$

TEST FLOOD MAGNITUDE OF 1.2% OF PFO WOULD CREATE LITTLE HARM TO LIFE OR PROPERTY. MINOR FLOODING TO SOME LOWLYING RESIDENCES.

Client C of E Job No. 1345-065 Sheet 6 of 6
Subject HAWKES POND By J. VEITEN Date 25 AUG. 1978
CAPACITY CURVE Ckd. _____ Rev. _____



APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS



INVENTORY OF DAMS IN THE UNITED STATES

STATE	DIVISION	COUNTY	CONSTR. COUNTY	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
MA	009	07		HAWKES POND OUTLET DAM	4230.0	7101.0	08SEP78

POPULAR NAME	NAME OF IMPOUNDMENT
HAWKES POND	HAWKES POND
REGION BASIN	RIVER OR STREAM
01 06	HAWKES BROOK
	SAUGUS
	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE
	0
	DIST FROM DAM (MI.)
	POPULATION
	26100

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES (ACRE-FT.)	DIST URM	PRV/PFD	SCS A	VER/DATE
HEMPG	1895	S	30	1080	N	N	N	30AUG78

REMARKS

D/S HAS ACCESS	SPILLWAY TYPE	MAXIMUM DISCHARGE (CF)	VOLUME OF DAM (CY)	POWER CAPACITY (KW)	INSTALLED	PROPOSED	NO. OF LOCKS	LENGTH (FT.)	WIDTH (FT.)	HEIGHT (FT.)
1	1270 U	25	600	58000						

OWNER	ENGINEERING BY
CITY OF LYNN	
	CONSTRUCTION BY

DESIGN	REGULATORY AGENCY
NONE	
CONSTRUCTION	OPERATION
NONE	NONE
	MAINTENANCE
	NONE

INSPECTION BY	INSPECTION DATE
CHAS. F. MAIN, INC.	06JUL78
	06JUL78
	P. L. 92-367

REMARKS

END

FILMED

7-85

DTIC