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**Big Island Pond Dam**

**NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS**

**U.S. ARMY CORPS OF ENGINEERS**

**NEW ENGLAND DIVISION**

**DEPT. OF THE ARMY, CORPS OF ENGINEERS**

**NEW ENGLAND DIVISION, NEDED**

**424 TRAPELO ROAD, WALTHAM, MA. 02254**

**August 1978**

**UNCLASSIFIED**

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**Merrimack River Basin**

**Derry, New Hampshire**

**Spicket River**

**The dam is a stone masonry dam with earth abutments. The dam is 80 ft. long with a maximum height of 10 ft. The dam has an irregular configuration, having experienced various modifications and repairs. It is considered to be in the significant hazard category. The dam is assessed to be in overall fair condition. The owner should repair the gate and monitor the leaks, making repairs as required.**
Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

I am forwarding to you a copy of the Big Island Pond 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 Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, Big Island Pond Corporation, c/o Mr. Warren Krupscwotz, Conley’s Cove RFD 1, Westville, New Hampshire 03842.

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 Water Resources Board for your cooperation in carrying out this program.

Sincerely yours,

Division Engineer
BIG ISLAND POND DAM
NH 00470

MERRIMACK RIVER BASIN
DERRY, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam ______________ Big Island Pond Dam

State Located ______________ New Hampshire

County Located ______________ Rockingham

City or Town ______________ Salem

Stream ______________ Spicket River

Date of Inspection __________ 6/7/78 and 6/28/78

Brief Assessment

Big Island Pond Dam is a stone masonry and concrete dam with earth abutments, constructed in 1925. The dam is located on the Spicket River watershed on Big Island Pond in the southeast corner in the Town of Derry, New Hampshire. The dam has a maximum height of ten feet and a length of eighty feet, including dual spillways of total length twenty-nine feet. A short four foot diameter discharge conduit is located on the left abutment, controlled manually by a sluice gate with hand crank operator. No plans, specifications, computations or construction records exist of the original project.

The dam has an irregular configuration, having experienced various modifications and repairs. The dam has been well maintained, although not all maintenance and repairs have been successful. The dam is in a "significant" hazard category, there being a small crossroads community about one mile downstream. However, should failure of the dam occur during a high flood condition, the flood wave generated could destroy Wheeler Dam downstream on the Arlington Mill Reservoir, a high hazard dam.
Big Island Pond Dam is assessed to be in overall fair condition. A new gate mechanism is required along with other minor repairs. Several leaks through the dam and abutments must be monitored and/or repaired, and the flashboards must be redesigned to release reliably. Erosion protection to increase the dam's ability to withstand overtopping is needed.

The spillway capacity at maximum pool elevation is about 1,300 c.f.s. The selected test flood (equal to the probable maximum flood) has a peak inflow into the pond of about 18,000 cfs and a peak outflow at the dam of about 10,500 cfs. This peak outflow would overtop the dam by about ten feet. Overtopping of this magnitude would surely wash out the dam, although it appears capable of resisting slight overtopping.

The owner should repair the gate and monitor the leaks, making repairs as required. The owner should retain competent professional advice to redesign the flashboards, design erosion protection, and to establish a warning system in the event of failure. The owner should also begin to keep permanent records of maintenance repairs and observations. These recommendations should be carried out within one to two years.

WHITMAN & HOWARD, INC.

T.T. Chiang, PhD., P.E.

John L. Scott, P.E.
This Phase I Inspection Report on Big Island Pond 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, Chairman  
Chief, Foundation and Materials Branch  
Engineering Division

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

SAUL COOPER, Member  
Chief, Water Control Branch  
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR  
Chief, Engineering Division
PREFACE

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

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

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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

Derry, N.H.

Approx. Scale 1" = 280'
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. Whitman & Howard, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed was issued to Whitman & Howard, Inc. under a letter of May 1, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0313 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


b. Description of Dam and Appurtenances

Big Island Pond Dam consists of two adjacent stone masonry and concrete spillways connected to earth abutments. Dam height is 10 feet. The total spillway length is 29 feet and the total dam length is 80 feet. Flashboards, up to 2 feet high are usually used over the spillway aprons. A four foot diameter steel discharge conduit is situated on the left end of the spillway. The flow is controlled with a manually operated gate.

The dam is approximately 1600 feet south of the former natural outlet of Big Island Pond. Because of the dam, the level of water on the pond has been raised about 8 feet above its natural level. The discharge stream from Big Island Pond Dam flows through the small Taylor Reservoir into the Arlington Mill Reservoir. It is the farthest upstream dam of a series of dams and impoundments on the Spicket River watershed.

c. Size Classification

Although the height and mass of the dam is not great, the fairly large impoundment volume places it in the INTERMEDIATE class.

d. Hazard Classification

Significant (middle of the classes). Population in the immediate downstream area is sparse. The dam is a low structure, not likely to fail except under general flooding conditions. The floodwave produced by a dam failure would be low, though of high volume.
It must be mentioned that should a severe area-wide flood occur, and Big Island Pond Dam held a sufficient time to build an appreciable head differential and then failed, the resulting flood wave might easily destroy Wheeler Dam on Arlington Mill Reservoir, a dam in the high hazard class. Should Big Island Pond Dam fail early in this situation, the flood wave would probably not be strong enough to cause this "domino" effect.

e. **Ownership**

1977-Present  Big Island Pond Corp., an association of lakeshore property owners.

Mid-1950's -1977  Walter E. Stickney, North Salem, New Hampshire

1925-Mid-1950's  Arlington Mills, Lawrence, Mass. and its successors

f. **Operator**

Warren Krupscwetz
Conley's Cove RFD #1
Westville, NH  03892
603-893-8088

g. **Purpose of Dam**

The original purpose was to store and regulate water for Arlington Mills, an industrial complex in Lawrence, Mass. Since the mid-1950's, when the industry sold the dam and water rights, the dam has been operated for recreational purposes.

h. **Design and Construction History**

Big Island Pond Dam was built in 1925 by Arlington Mills of Lawrence, Massachusetts. Its purpose was to provide a discharge of water throughout the year to avoid dry weather shut-downs. As originally constructed the dam had 15.5 feet of concrete spillway.
In 1941 an additional 15 feet of spillway was constructed. Personnel from Arlington Mills maintained operation of the dam until the mid-1950's. The general practice was to fill the pond in the spring and then release the water downstream in the summer as needed.

The dam was purchased by Walter Stickney in the mid-1950's. In 1959, Mr. Stickney built a cofferdam at the original outlet of Big Island Pond and dredged the area between the cofferdam and the present dam as part of a development project. In 1977 the Big Island Pond Corporation, an association of landowners, purchased the dam.

i. Normal Operating Procedures

The normal yearly operational procedure is to begin drawdown on October 1st. The pond is usually lowered to elevation 200.5. The flashboards are left on year-round. In the spring run-off, the pond is allowed to fill and the gate is adjusted to regulate the flow. The pond is filled to an allowable maximum of 203.5 feet. However, the discharge may be reduced for reasons of downstream safety. After the spring runoff, the summer operation calls for a minimum discharge of 3 million gallons per day. This usually draws the pond down several feet during the summer season (in dry years it is more, in wet years less).

1.3 Pertinent Data:

a. Drainage Area - 16.7 square miles. Flat and rolling land with a few small ponds. No significant dams upstream.

b. Discharge at Damsite

Maximum known flood - Unknown

Discharge conduit capacity

- at low pool elevation - 180 cfs
- at maximum pool elevation - 200 cfs
Ungated spillway capacity - 1160 cfs
Total capacity - 1360 cfs

c. Elevation (ft. above MSL)
(1) Top Dam - 206.0
(2) Maximum pool - design surcharge -
   204.0 (Max. legal)
   203.5 (Max. normal)
(3) Full flood control pool - N/A
(4) Recreation pool - between 201 & 203
(5) Spillway crest - 201.6
(6) Upstream portal invert diversion tunnel - 195.5
(7) Streambed at centerline of dam - 195.5
(8) Maximum tailwater - unregulated

d. Reservoir
(1) Length of maximum pool - Est. 10,500 ft.
(2) Length of recreation pool - 10,400 ft.
(3) Length of flood control pool - N/A

e. Storage (acre-feet)
(1) Recreation pool - 2750 acre-ft. @ elev. 201.6
(2) Flood control pool - N/A
(3) Design surcharge - 3650 acre-ft. @ elev. 203.5
(4) Top of dam - 4950 acre-ft.
f. **Reservoir Surface (acres)**
   1. Top dam - est. 540
   2. Maximum pool - 510
   3. Flood-control pool - N/A
   4. Recreation pool - est. 480 to 500
   5. Spillway crest - est. 490

g. **Dam**
   1. Type - Concrete and stone masonry gravity dam with earth abutments
   2. Length - 80 ft.
   3. Height - 10 ft.
   4. Top width - varies
   5. Side Slopes - varies
   6. Zoning - Unknown
   7. Impervious core - Unknown
   8. Cutoff - Stone masonry core walls in embankments
   9. Grout curtain - none

h. **Spillway**
   1. Type - Broad crest, odd shape
   2. Length of weir - Total 28.8 ft.
   3. Crest elevation - 201.6 ft. msl
   4. Gates - None
   5. U/S Channel - None as such
(6) D/S Channel - Natural stream bed

(7) General - Spillway in two bays, built at different times.

i. **Regulating Outlets** - Single pipe at left abutment

(1) Invert - 195.5

(2) Size - 4 ft. diam.

(3) Description - Steel pipe thru dam

(4) Control Mechanism - Shear gate with hand crank operator

(5) Other - Permanent pond level gage (local datum). Gage indicator for gate opening.
SECTION 2 - ENGINEERING DATA

2.1 Design
There is no information on the design of the dam.

2.2 Construction
There is very little information available on the original construction of the dam. The only plan is a sketch. There is information and photographs available of the reconstruction of 1941. However, there is no data available as to the foundation preparation or embankment construction.

2.2 Operation
Records of operation of the dam are available. Water level records were kept by Arlington Mills and by the Island Pond Protective Association. The records are based on local gage elevations (known conversion to msl), and though not continuous, give a reasonable picture of normal conditions.

2.3 Evaluation
a. Availability - Poor. Very little available.
b. Adequacy - Poor. Evaluations must be based almost solely on visual observation.
c. Validity - Poor.
SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General

The findings of the inspection of the dam are presented on the visual inspection checklist. There are a few minor problems that should be monitored.

b. Dam

Minor seepage is taking place about one foot above the tailwater level at the base of the riprap along the northeast side of the downstream channel. There is a horizontal hole 2 feet long in the fill adjacent to the concrete wingwall at the southeast side of the downstream channel. There is sand and gravel on the downstream slope adjacent to the discharge conduit. Apparently, this material was recently placed on the dam as replacement for eroded material. Minor seepage was found just above the discharge conduit.

c. Appurtenant Structures

Railing slightly wobbly.

d. Reservoir Area

Island and old dam remnants 50' upstream.

c. Downstream Channel

Some overhanging trees.

3.2 Evaluation

The items noted during the inspection indicate potential problems, and should be monitored.
SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures
The operation of the dam is summarized in Section 1.2.f. of this report.

4.2 Maintenance of Dam
The dam has been continuously and conscientiously maintained and patched as required. However, no maintenance records have been kept.

4.3 Maintenance Of Operating Facilities
The gate is in poor condition. The owners have plans to install a new gate in the fall of 1978.

4.4 Warning System
There is no warning system in effect.

4.5 Evaluation
The operating procedures are adequate.
SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

No design data exists. The hydraulic criteria used by the design engineer are unknown. It is known that the dam increased the natural pond level by about 8 feet and increased the surface area from about 412 acres to about 510 acres.

b. Experience Data

No records have been kept of the dam's performance in flood situations.

c. Visual Observations

The right embankment rises fairly sharply. The left abutment rises more gradually into a dense woods. If the dam were overtopped, it is felt that the area beyond the approximately 80 foot width of the dam would not contribute much flow.

The dam appears capable of withstanding a small degree of overtopping, although a high level of overtopping would probably wash out the embankments, particularly the downstream face of the left embankment which in its present state is devoid of erosion protection.

d. Overtopping Potential

Reference is made to Appendix D for the hydrologic computations performed as a part of this report.

The peak inflow of the Probable Maximum Flood (PMF) is computed to be about 18,000 cfs. The PMF is defined as the largest flood there can reasonably be expected to occur on a given stream at a selected point, or the flood that may be expected from the most
severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

For dams of the size and hazard classification of Big Island Pond Dam, the "test flood" is generally selected between one-half the PMF and the full PMF. The "test flood" is that flood used to evaluate the hydraulic adequacy of a project. Due to the potential for damage to Wheeler Dam downstream, the test flood is chosen as the full PMF.

If Big Island Pond Dam does not fail, the peak outflow during the test flood would be about 10,500 cfs, the reduction from the 18,000 cfs peak inflow being accounted for by the surcharge storage "cushioning" effect of the relatively large impoundment. At the moment of peak outflow, the water surface would be about 10 feet over the top of the dam. At the same time, the tailwater would be about 1 foot below the top of the dam, creating an 11 foot hydraulic head across the crest.

The spillway capacity, including the capacity of discharge conduit, at a pool elevation just equal to the top of the dam, is about 1,300 cfs or 12% of the peak outflow during the test flood. It can therefore be seen that the overtopping potential is high.

If the test flood were chosen as one-half the PMF, the peak inflow would be about 9,000 cfs and the peak outflow would be about 4,300 cfs. Overtopping height would be about 4 feet and the spillway capacity would be 30% of the peak outflow. Overtopping potential would be judged as moderate.
a. Visual Observations. Two signs of minor instability were noted at the time of the inspection: a minor seepage at the northwest side of the downstream channel, and a horizontal hole was found in the sand-and-gravel fill at the downstream toe of the southeast embankment-section of the dam adjacent to the concrete wingwall at the southeast side of the downstream channel. These conditions should be monitored and remedial measures taken if the conditions change.

b. Design and Construction Data. There is no data available to evaluate the structural stability.

c. Operating Records. The operating records indicate that the dam is stable.

d. Post-construction Changes. Appurtenant items have been added and changed at various times with no formal record kept. The most recent change appears to be a sand-and-gravel fill placed on the downstream slope of the southeast embankment adjacent to the discharge pipe.

e. Seismic Stability. This dam is a Seismic Zone 2 and does not have to be evaluated for seismic stability, according to the COE Recommended Guidelines.
SECTION 7: ASSESSMENT, RECOMMENDATIONS
AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition - There is no evidence which would suggest that Big Island Pond Dam is unstable. The dam is in overall fair condition.

b. Adequacy of Information - The lack of substantive design and construction information means that the evaluation must be based on visual observation and peripheral information.

c. Urgency - The recommendations and remedial measures mentioned below should be carried out within one to two years.

d. Necessity for Additional Investigation - No necessity.

7.2 Recommendations

The owner should:

(1) Repair or replace the gate mechanism as planned.

(2) Retain a competent engineer to design a flashboard pin arrangement which will reliably release before overtopping.

(3) Monitor the small leaks and apparent erosion and repair as necessary.

(4) Seek professional advice on establishing a warning system or plan in case of failure of the dam.

(5) Retain a competent engineer to design erosion protection to increase the dam's ability to withstand overtopping.
7.3 Remedial Measures

a. Alternatives - N/A

b. Operation and Maintenance Procedures

The present O&M procedures are adequate.

It is recommended that the owner adopt a program of regular observation visits by a responsible individual. Visits should be at least weekly and a permanent log kept.
<table>
<thead>
<tr>
<th>Appendix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>A</td>
<td>Visual Inspection Checklist</td>
</tr>
<tr>
<td>B</td>
<td>Engineering data with Index</td>
</tr>
<tr>
<td>C</td>
<td>Inspection Photographs with Index - 14 photos</td>
</tr>
<tr>
<td>D</td>
<td>Hydrologic Computations</td>
</tr>
<tr>
<td>E</td>
<td>Information as Contained in the National Inventory of Dam</td>
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</table>
# VISUAL INSPECTION CHECK LIST

## PARTY ORGANIZATION

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>Big Island Pond Dam</th>
<th>DATE</th>
<th>June 7, 1978</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>TIME</td>
<td>1:00 A.M.</td>
</tr>
<tr>
<td>WEATHER</td>
<td>Sunny</td>
<td>W.S. ELEV.</td>
<td>203.3 U.S. 197 DN.S.</td>
</tr>
</tbody>
</table>

## PARTY:

1. T.T. Chiang, W & H
2. J. Scott, W & H
3. ____________
4. ____________
5. ____________

## PROJECT FEATURE INSPECTED

1. Entire Dam
2. ____________
3. ____________
4. ____________
5. ____________
6. ____________
7. ____________
8. ____________
9. ____________
10. ____________

## INSPECTED BY

Chiang & Scott

## REMARKS

* First visit - see next page for visit. Check list combines notes of both visits.
VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Big Island Pond Dam

DATE June 28, 1978
TIME 1:00 PM start
WEATHER sunny - hot
ALT. W.S. ELEV. 203.1 U.S. 197 DN.S.

PARTY:
1. J. Scott, Whitman & Howard
2. R. Hirschfeld, Geotechnical Engineers, Inc.
3. 
4. 
5. 

PROJECT FEATURES
All features

INSPECTED BY
Scott & Hirschfeld

REMARKS

*Second visit - see previous page for first visit.
Check List combines notes of both visits.
### PERIODIC INSPECTION CHECK LIST

**PROJECT**  |  Big Island Pond Dam  | **DATE**  |  6/7/78 and 6/28/78  
**PROJECT FEATURE**  |  Main Structure  | **NAME**  |  Entire party  
**DISCIPLINE**  |  | **NAME**  |  

<table>
<thead>
<tr>
<th>AREA EVALUATED</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DAM EMBANKMENT</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Crest Elevation**

**Current Pool Elevation**

**Maximum Impoundment to Date**

**Surface Cracks**

**Pavement Condition**

**Movement or Settlement of Crest**

**Lateral Movement**

**Vertical Alignment**

**Horizontal Alignment**

**Condition at Abutment and at Concrete Structures**

**Indication of Movement of Structural Items on Slopes**

**Trespassing on Slopes**

**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**

**Piping or Boils**

**Foundation Drainage Features**

**Toe Drains**

**Instrumentation System**

---

- Crest Elevation
- Current Pool Elevation: 203.3 on 6/7; 203.1 on 6/28
- Maximum Impoundment to Date: Reportedly 204.8
- Surface Cracks: None
- Pavement Condition: No pavement
- Movement or Settlement of Crest: None
- Lateral Movement: None
- Vertical Alignment: Ok
- Horizontal Alignment: Ok
- Condition at Abutment and at Concrete Structures: Stone masonry needs repointing
- Indication of Movement of Structural Items on Slopes: None
- Trespassing on Slopes: Roadways come to dam from both sides, bare ground
- Sloughing or Erosion of Slopes or Abutments: None, but upstream and downstream slopes of southeast embankment are bare. Two-foot horizontal hole in fill at toe of slope adjacent to wingwall beside discharge pipe.
- Rock Slope Protection-Riprap Failures: None
- Unusual Movement or Cracking at or near Toes: None
- Unusual Embankment or Downstream Seepage: Minor seepage at downstream end of masonry wingwall on northwest side.
- Piping or Boils: None
- Foundation Drainage Features: None
- Toe Drains: None
- Instrumentation System: None
PERIODIC INSPECTION CHECK LIST

PROJECT  Big Island Pond Dam  DATE  6/7/78 and 6/28/78

PROJECT FEATURE  NAME

DISCIPLINE  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

   N/A

b. Intake Structure
   Condition of Concrete
   Stop Logs and Slots

   Stone masonry joint leaking from intake side thru pier wall to spillway apron.
   Existing gate scheduled for replacement in fall of '78.
PERIODIC INSPECTION CHECK LIST

PROJECT  Big Island Pond Dam  DATE  6/7/78 and 6/28/78
PROJECT FEATURE  ---  NAME  ---
DISCIPLINE  ---  NAME  ---

<table>
<thead>
<tr>
<th>AREA EVALUATED</th>
<th>CONDITION</th>
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</thead>
<tbody>
<tr>
<td>OUTLET WORKS-TRANSITION AND CONDUIT</td>
<td></td>
</tr>
<tr>
<td>General Condition of Concrete</td>
<td>Stone masonry wing walls at pipe outlet.</td>
</tr>
<tr>
<td></td>
<td>Leak just above top of discharge pipe.</td>
</tr>
<tr>
<td>Rust or Staining on Concrete</td>
<td>None.</td>
</tr>
<tr>
<td>Spalling</td>
<td>None.</td>
</tr>
<tr>
<td>Erosion or Cavitation</td>
<td>None.</td>
</tr>
<tr>
<td>Cracking</td>
<td>None.</td>
</tr>
<tr>
<td>Alignment of Monoliths</td>
<td>N/A</td>
</tr>
<tr>
<td>Alignments of Joints</td>
<td>N/A</td>
</tr>
<tr>
<td>Numbering of Monoliths</td>
<td>N/A</td>
</tr>
</tbody>
</table>
PERIODIC INSPECTION CHECK LIST

PROJECT Big Island Pond Dam

DATE 6/7/78 and 6/28/78

PROJECT FEATURE__________________________ NAME__________________________

DISCIPLINE__________________________ NAME__________________________

AREA EVALUATED | CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL

General Condition of Concrete | No outlet channel as such - natural stream bed.
Rust or Staining
Spalling
Erosion or Cavitation
Visible Reinforcing
Any Seepage or Efflorescence
Condition at Joints
Drain Holes
Channel
Loose Rock or Trees Overhanging Channel | Trees overhanging channel downstream of dam, but it is fairly open and wide.
Condition of Discharge Channel
PERIODIC INSPECTION CHECK LIST

PROJECT Big Island Pond Dam	DATE 6/7/78 and 6/28/78
PROJECT FEATURE __________________	NAME __________________________
DISCIPLINE __________________	NAME __________________

<table>
<thead>
<tr>
<th>AREA EVALUATED</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTLET WORKS—SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</td>
<td></td>
</tr>
<tr>
<td>a. Approach Channel</td>
<td>Concrete apron recently added at right spillway. Good</td>
</tr>
<tr>
<td>General Condition</td>
<td>None</td>
</tr>
<tr>
<td>Loose Rock Overhanging Channel</td>
<td>None</td>
</tr>
<tr>
<td>Trees Overhanging Channel</td>
<td>Some small shrubs</td>
</tr>
<tr>
<td>Floor of Approach Channel</td>
<td>Main channel leads to discharge pipe. Island 50' upstream, with old dam remnants.</td>
</tr>
<tr>
<td>b. Weir and Training Walls</td>
<td>Fair to good - repoint masonry.</td>
</tr>
<tr>
<td>General Condition of Concrete</td>
<td>None</td>
</tr>
<tr>
<td>Rust or Staining</td>
<td>Very little</td>
</tr>
<tr>
<td>Spalling</td>
<td>No</td>
</tr>
<tr>
<td>Any Visible Reinforcing</td>
<td></td>
</tr>
<tr>
<td>Any Seepage or Efflorescence</td>
<td>Some seepage - would be fixed by repointing masonry.</td>
</tr>
<tr>
<td>Drain Holes</td>
<td>None</td>
</tr>
<tr>
<td>c. Discharge Channel</td>
<td></td>
</tr>
<tr>
<td>General Condition</td>
<td>Surface of spillway aprons show normal erosion - not bad.</td>
</tr>
<tr>
<td>Loose Rock Overhanging Channel</td>
<td></td>
</tr>
<tr>
<td>Trees Overhanging Channel</td>
<td>Some - not bad.</td>
</tr>
<tr>
<td>Floor of Channel</td>
<td>Natural stream bed.</td>
</tr>
<tr>
<td>Other Obstructions</td>
<td>None</td>
</tr>
</tbody>
</table>
## PERIODIC INSPECTION CHECK LIST

**PROJECT** Big Island Pond Dam  
**DATE** 6/7/78 and 6/28/78

**PROJECT FEATURE**  
**NAME**

**DISCIPLINE**  
**NAME**

<table>
<thead>
<tr>
<th>AREA EVALUATED</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OUTLET WORKS-SERVICE BRIDGE</strong></td>
<td></td>
</tr>
<tr>
<td>a. Super Structure</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bearings</strong></td>
<td>Concrete plank with steel angle sides.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Anchor Bolts</strong></td>
<td>Direct bearing on piers - small, no fancy structural connections needed</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bridge Seat</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Longitudinal Members</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Under Side of Deck</strong></td>
<td>Ok</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Secondary Bracing</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Deck</strong></td>
<td>Concrete surface ok</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drainage System</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Railings</strong></td>
<td>Rusty, a little wobbly.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Expansion Joints</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Paint</strong></td>
<td>Railing and other metal parts could use a coat of paint.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Abutment &amp; Piers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General Condition of Concrete</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Alignment of Abutment</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Approach to Bridge</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Condition of Seat &amp; Backwall</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>
APPENDIX B
BIG ISLAND POND DAM
INDEX TO ENGINEERING DATA

Sketch of Plan and Section
N.H. Water Resources Board memorandum, 10/10/74

N.H. Water Resources Board Dam Safety Inspection Report Form, 2/27/74

Letter indicating correlation between local gate and msl elevations, 9/19/58

Construction photographs of 1941 expansion of spillway
MEMORANDUM

DATE: October 10, 1974
FROM: Zoes Dimos, Civil Engineer
SUBJECT: Walter Stickney Dam - Derry - #63.09
TO: Vernon A. Knowlton, Chief Water Resources Engineer

On October 9, 1974, I inspected the dam at the outlet of Big Island Pond. The pond was drawn down to 3.2 feet on the gauge.

The spillway (15' wide) on the right side has one inch diameter solid pins with a pin spacing of 1'7" center to center and three chains bolted to the catwalk. The flashboards in their present state are non-failing.

The left spillway (14' wide) has 1" solid pins spaced at 1'3" center to center with 3 chains bolted to the catwalk. The flashboards on this spillway are also non-failing. The flashboards should be replaced with failing flashboards which fail at an elevation of approximately one foot below the top of the dam.

The abutments are constructed of cut stone and are in rather poor condition. (see photos). I recommend that all the abutments be capped with reinforced concrete.

Due to the water by the gate section, I could not inspect the gate; however, it did seem to be in operable condition. The stone wall on the left side of the gate should be rebuilt, or a concrete wall constructed.

The concrete apron seemed to be in fair condition with signs of erosion at the downstream toe. I recommend that this be repaired, and cutoffs be constructed (if none are present), since the dam seems to be built on a gravel foundation. At the time of inspection, there was ± 3' of tailwater.

The dikes seemed to be in fair condition, with a concrete core wall; however, all trees on the dike should be removed and fill be placed on the dike where erosion is evident.

zd/js
### DAM SAFETY INSPECTION REPORT FORM

**Town:**  
**Dam Number:**

**Inspected by:**  
**Date:** 2.17.19

**Local name of dam or water body:**

**Owner:**  
**Address:**

Owner was not interviewed during inspection.

**Drainage Area:** sq. mi.  
**Stream:**

**Pond Area:** Acre, Storage Ac-Ft.  
**Max. Head** Ft.

**Foundation:** Type  
Seepage present at toe—Yes/No,

**Spillway:** Type  
Freeboard over perm. crest: c.f.s.,

Width ' 14', Flashboard height _c.f.s.,

Max. Capacity ____________ c.f.s.

**Embankment:** Type  
Cover Width

Upstream slope to 1; Downstream slope to 1

**Abutments:** Type  
Condition: Good/Fair/Poor

**Gates or Pond Drain:** Size Capacity Type

Lifting apparatus -> Operational condition

Changes since construction or last inspection:

---

Downstream development:

This dam would not be a menace if it failed.

Suggested reinspection date:

**Remarks:**

---

**Discharge:** Flow calculated by field survey:

D.A. = 1700 cfs 300 (2-10-75)
September 19, 1958

Mr. Walter Z. Stickney
Haverhill Road
North Salem, New Hampshire

Dear Mr. Stickney:

The elevation of the top of masonry east of gate section at Island Pond Dam, Derry, is 206.00', M.S.L., or 10.53' on the gauge. The mud sill ahead of the new fish screen is 0.00' on the gauge.

These are the questions unanswered after your recent call at the office.

Sincerely,

Francis C. Moore
Civil Engineer

\[
\begin{align*}
\text{gage Datum} & = 206.00' - 10.53' \\
& = 195.47'
\end{align*}
\]
Constr. photos during dam expansion in 194
### APPENDIX C

**BIG ISLAND POND DAM**

INDEX TO INSPECTION PHOTOGRAPHS

<table>
<thead>
<tr>
<th>Photo No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>View of dam from northwest side of approach channel showing southeast abutment and embankment section, discharge conduit operating mechanism, approaches to both spillway sections, and footbridge.</td>
</tr>
<tr>
<td>2</td>
<td>View from downstream slope of northwest embankment section showing: downstream aprons of northwest (left) and central (center) overflow spillways, and discharge conduit outlet (behind left-hand tree).</td>
</tr>
<tr>
<td>3 - 5</td>
<td>Sequence of 3 photos taken clockwise from northwest edge of downstream channel showing: downstream side of northwest overflow spillway and pond in background (3); downstream side of central overflow spillway with service bridge at top of photo (4) and low-level outlet and southeast embankment section (5).</td>
</tr>
<tr>
<td>6</td>
<td>View from top of southeast embankment showing cutoff wall, gate mechanism and footbridge.</td>
</tr>
<tr>
<td>7</td>
<td>Shoreline upstream from southeast abutment. Enclosure is for recording equipment (not used).</td>
</tr>
<tr>
<td>8</td>
<td>View looking northwest along crest of dam, showing small tree and brush (to left of hand-railing on service bridge) growing at northwest edge of wingwall on the northwest side of the northwest overflow spillway section.</td>
</tr>
<tr>
<td>Photo No.</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>9</td>
<td>Location of hole shown in photo 10. View is looking upstream toward downstream slope of embankment between outlet (to left of photo) and southeast abutment (to right of photo). Metal clipboard is lying in same spot as in 10 and hole is at edge of concrete wingwall.</td>
</tr>
<tr>
<td>10</td>
<td>Closeup of small hole extending into sand-and-gravel fill. (See 9 for location.) Hole is below clipboard and to the right. Six-foot rule is inserted straight into hole for 2 feet.</td>
</tr>
<tr>
<td>11</td>
<td>Discharge end outlet showing minor leakage from masonry joints (dark area just above water surface below center of photo and dark area at vertical boundary between sunlit and shadowed areas right of center of photo).</td>
</tr>
<tr>
<td>12</td>
<td>Island near center of upstream approach channel looking upstream from low-level outlet. Old mill dam is reported to have been located here - since destroyed, except for a few remnants.</td>
</tr>
<tr>
<td>13</td>
<td>Discharge apron of central section of overflow spillway showing concrete-and-masonry training wall on northwest side.</td>
</tr>
<tr>
<td>14</td>
<td>Minor seepage about one foot above tailwater level at base of riprap along northwest side of downstream channel immediately downstream of northwest overflow spillway. Seepage is below metal clipboard at left-center of photo.</td>
</tr>
</tbody>
</table>
APPENDIX D

BIG ISLAND POND DAM

HYDROLOGIC COMPUTATIONS
APPENDIX D

Big Island Pond

I. Hydrology & Hydraulic Data

a) Drainage Area: At dam site is 16.7 sq. miles, including Ballard Pond and Wash Pond.

b) Basin Slope: Main stream slope $= \frac{480-285}{2195-0} = 0.208$
   
   Side Drainage Area slope $= \frac{360-285}{215-0} = 0.0147$
   (Wash Pond side)
   
   Side Drainage Area slope $= \frac{570-285}{1795-0} = 0.0204$
   (Ballard Pond side)

Conclusion: It should be classified as a flat-rolling land type of drainage basin due to the presence of some small wet-land and ponds in the basin.

c) Water Surface Area: (excluding Ballard Pond & Wash Pond) The water surface area for Big Island Pond is 510 acres.
   
   At Elev. 203.47 and 412 acres at $31.9547$

b) Storage Capacity: Because Big Island Pond is a natural pond, its total storage is unknown but from its gaging height (0' to 8', i.e., 195.47 to 203.47) its capacity is as follows:

<table>
<thead>
<tr>
<th>Elev.</th>
<th>Gage Height (ft)</th>
<th>Volume (A-F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>195.47</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>197.47</td>
<td>2</td>
<td>700</td>
</tr>
<tr>
<td>199.47</td>
<td>4</td>
<td>1800</td>
</tr>
<tr>
<td>201.47</td>
<td>6</td>
<td>3750</td>
</tr>
<tr>
<td>203.47</td>
<td>8</td>
<td>3550</td>
</tr>
</tbody>
</table>

Therefore, the size of Big Island Pond is classified as Intermediate.

Tailwater elevation is about 196 ft.
Spillway El. 201.6 ft, Top of Dam 206.0

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45 WILLIAM STREET, WELLESLEY, MASS.
Engineers and Architects
e) Probable Max. Flood Flow

PMF: 650 cfs/50 yr. for flat area
     1405 cfs/50 yr. for rolling land
Average = 1073 cfs/50 yr. mile

PMF for Big Island Post = 1073 x 15.7 = 17,919 cfs
Say 18,000

f) Estimating Effect of Surcharge Storage on PMF, Using Spillway

The present spillway is 29' in length with embankment of 3.2'. There is a 4' diameter steel pipe with gate.

With an average head of 8', the capacity of the pipe would be about

\[ Q_p = \left(\frac{\sqrt{2} \times 2.03 \times 4 \times 13.14}{2}\right) = 1.79 \times 100.8 \]

\[ = 180.5 \text{ cfs} \]

- say max. at 200 cfs during peak flood flow.

Therefore, \( Q_p \) is reduced to 17,720 cfs

\[ Q = C H^{3/2} = 3.2 H^{3/2} \times 29 \]

\[ H = \left(\frac{17,720}{3.2 \times 29}\right) = 33.17 \text{ ft} \]

overtopping at 5.4'

STOR1 = 33.17 \times 510 \times 12 / 10691 = 18.99 \text{ inch}

STOR2 = \left(\frac{17.7^{0.667}}{3.2 \times 29}\right) \times 12 \times 510 / 10691 \ ( = 16.7 \times 10^{3/4.552})

\[ = 0.19 \text{ inch} \]

\[ \text{STOR1 + STOR2} = \frac{18.99 + 0.19}{2} = 9.59 \text{ inch} \]

\[ Q_{P2} = Q_P \times \left(1 - \frac{9.59}{19}\right) = 17,720 \times 1 - 0.999 = 17.7 \text{ cfs} \]

\[ H = \left(\frac{17.7^{0.667}}{3.2 \times 29}\right) \times 20.76\] Overtopping

\[ \text{STOR3} = 17,720 \times \left(1 - \frac{9.59}{19}\right) = 17,720 \times 1 - 0.999 = 8776 \text{ cfs} \]

\[ H = \left(\frac{8776^{0.667}}{3.2 \times 29}\right) \text{ Overtopping} \]
9) Improvement:

Convert the whole length of dam into an overflow type dam.

Total length = 20' with $C = 3.6$ average

then for $QPI$ surcharge height

$$STOR_1 = \frac{15.59 \times 12 \times 12}{10691} = 8.92''$$

$$QPI = QPI \left(1 - \frac{8.92}{12}\right) = 17720 \times 0.81 = 9409 \text{ cfs}$$

Surcharge Height = \(\frac{9409 \times 0.667}{36150}\) = 10.22 ft

$$STOR_2 = \frac{10.22 \times 12 \times 570}{10691} = 5.85 \text{ inch}$$

$$\frac{STOR_1 + STOR_2}{2} = 7.39 \text{ inch}$$

$$QPI = QPI \left(1 - \frac{7.39}{12}\right) = 17720 \times 0.81 = 10827 \text{ cfs}$$

Surcharge Height = \(\frac{10827 \times 0.667}{36150}\) = 11.2 ft

1) Conclusion:

i) The possible collapse section is about 80 ft in length.

If it were constructed as an overflow dam, then even with the peak flow, the dam will not collapse and the storage capacity will still be available. Therefore, the damage will be limited to upstream flooding and downstream flooding due to the peak discharges of 10827 cfs. There will be no dam-break flood wave problem.

ii) Based on Spicket River flood report, the river itself do not have the capacity to carry this type of flow. Therefore flooding problem will exist.
The Big Island Pond Dam is a low dam, but due to its large water surface area, the volume stored at the top 4 ft is large, preventing the failure of the dam is important.

II. Supplemental Information for rating curves:

a) Assume dam does not fail; but overtopping occurs.

Estimated downstream channel capacity by assuming hydraulic gradient line parallel to channel side = 0.013. Use Manning n of 0.05, the control section of the stream is about 1000 ft upstream from Cowbell Corner. For Depth = 8 ft, Top Width of channel = 100 ft.

Depth = 18 ft, Top Width of Channel = 370 ft.

Assume 30 ft bottom width.

\[
V = \frac{1.49}{0.05} \left( \frac{0.013}{2} \right) \left[ \frac{(100+30)\times 8}{(72+30)} \right]^{2/3}
\]

\[
= 29.8 \times 0.114 \times 2.96 = 10.06 \text{ ft/sec.}
\]

\[
Q = AV = 10.06 \times 520 = 5233 \text{ cfs}
\]

D=10' \[
V = 3.397 \times \left[ \frac{(100+30+2127)\times 10}{(62.3 + 30 + 128)} \right]^{2/3}
\]

\[
= 3.397 \times 3.27 = 11.11 \text{ ft/sec.}
\]

\[
Q = 11.11 \times 920 = 10,219 \text{ cfs}
\]

D=12' \[
V = 3.397 \times \left[ (720 \times \frac{12}{10} + 27\times 12) /210 \right]^{2/3}
\]

\[
= 3.397 \times 3.589 = 12.2 \text{ cfs}
\]

\[
Q = 12.2 \times 920 = 17,412 \text{ cfs}
\]

Great elevation is 10 ft, about 7 ft from bottom of channel.
Top of dam is only about 12 ft from bottom of channel.
Water supply will be submerged, but dam can be assumed unsubmerged. Use El. 195 as bottom of downstream channel.
Spillway Max. Capacity = \( 3.2 \times 31 \times 2\frac{3}{4} + 3.2 \times 17.4 \times 29 \times 180 \)
= 432 + 1868 + 180 = 2460 cfs

Estimated Silt gate outlet pipe capacity = 180 cfs

Neglecting submerged effect, we consider spillway pipe capacity of 1200 cfs. Use C=3.0 for overtopping condition.

Water Surface 2' above top of Dam (at El. 208)

\[ Q = 3.0 \times 51 \times 2\frac{3}{4} + 3.2 \times 17.4 \times 29 + 180 \]

= 432 + 1868 + 180 = 2460 cfs

Water Surface 4' above top of Dam (at El. 210)

\[ Q = 432 \left(\frac{4}{3}\right)^{\frac{3}{2}} + 1868 \left(\frac{13.4}{7.4}\right)^{\frac{3}{2}} + 180 \]

= 1222 + 2674 + 180 = 4076 cfs

Water Surface 8' above top of Dam (at El. 214)

\[ Q = 1222 \left(2\right)^{\frac{15}{5}} + 1868 \left(\frac{13.4}{7.4}\right)^{\frac{15}{5}} + 180 \]

= 3456 + 4552 + 180 = 8136 cfs

Water Surface 12' above top of Dam (at El. 218)

\[ Q = 3456 \left(\frac{14}{8}\right)^{\frac{15}{5}} + 1868 \left(\frac{13.4}{7.4}\right)^{\frac{15}{5}} + 180 \]

= 8000 + 7929 + 180 = 16,109 cfs

Water Surface 16' above top of Dam (at El. 218)

\[ Q = 8000 \left(\frac{12}{8}\right)^{\frac{15}{5}} + 7929 \left(\frac{13.4}{7.4}\right)^{\frac{15}{5}} + 180 \]

= 9774 + 9186 + 180 = 19,140 cfs

+ Water at that level, the actual width of water surface may be much more than 80 ft, but most additional flow will be overland flow, therefore, we neglect its quantity.

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Engineers and Architects
b) Assume dam overtopping and failure. Project dynamic action:

If the dam fails when overtopping 4 ft, then flow through the channel is about 400 ft wide and 14 ft deep with velocity at least 20 ft/sec, it will discharge a flow of:

\[ Q = 20 \times 40 \times 14 = 11,200 \text{ cfs} \]

Also, the spillway would discharge another:

\[ Q = 3.1416 \times 9.4 \times 9.4 \times 20 = 2674 \text{ cfs} \]

The flood flow would be 14,000 cfs which is higher than the dam overtopping but not failure.

* The velocity is estimated; due to the Big Island Ford Dam is small and low, there probably only 4-6 feet hydraulic head difference, to dissipate this 4-6 ft head in short distance, it would generate a velocity over 20 ft per sec.

c) Rating Curve: The plotted rating curve can be used to provide a design curve for various uses. This is an estimated curve for rough routing. It can be used for estimating purposes only.

d) Conclusions:

No earth fill dam shall be designed with overtopping, even with concrete core wall, since the core wall does not provide strength of the dam but serves as seepage loss control. Therefore, converting the dam into a gravity overflow type of dam is recommended, but due to its downstream channel capacity, the failure of it may not create a high hazard, if the flood wave builds out.

If dam failure is due to overtopping when water surface elevation in reservoir is higher than the estimated at the flood flow would be much higher. It may even create a flood flow higher than PMF peak flow records.

Witman & Howard, Inc.
45 William Street, Wellesley, Mass.
Engineers and Architects
III. Flood Routing

- Rough routing with assumption that dam will not fail, then it can be classified as significant hazard.

\[ Q_{PI} = \frac{1}{3} P_{HF} = 9000 \text{ cfs} \]

From rating curve, surcharge to elev. 214.6

\[ \text{STORE} = (214.6 - 201.6) \times 510 \times 12 / 1091 = 7.44 \text{ inch} \]

\[ Q_{P2} = Q_{PI} \left(1 - \frac{7.44}{9.5}\right) = 1950 \text{ cfs} \]

\[ \text{STORE} = (207.2 - 201.6) \times 510 \times 12 / 1091 = 3.21 \text{ inch} \]

\[ \text{STORE} = \frac{3.21 + 7.44}{2} = 5.33 \text{ inch} \]

\[ Q_{P3} = 9000 \left(1 - \frac{5.33}{9.5}\right) = 3955 \text{ cfs} \]

On rating curve \( H = 210 - 201.6 = 8.4 \text{ ft} \)

\[ \text{STORE} = 8.4 \times 510 \times 12 / 1091 = 4.91 \text{ inch} \leq 5.33 \]

\[ Q_{P4} = 9000 \left(1 - \frac{4.91}{9.5}\right) = 4443 \]

\[ \text{STORE} = (210.5 - 201.6) \times 510 \times 12 / 1091 = 5.09 \text{ inch} \]

\[ \text{STORE} = \frac{5.09 + 4.91}{2} = 4.95 \text{ inch} \]

\[ Q_{P5} = 9000 \left(1 - \frac{4.95}{9.5}\right) = 4308 \text{ cfs} \]

From Rating Curve \( H = 210.2 - 201.6 = 8.6 \text{ ft} \)

which very close to 8.4 ft surcharge on QP3.

IV. Surcharge Capacity Curve

Due to lack of survey data and storage capacity data, the curve computed theoretically based on the known water surface area and U.S. G.S. map estimates. Therefore, it should be only considered as a rough estimate.
I Surcharge Effect on PMF: Assume Dam Not Faulty

\[ QP1 = 18,000 \text{ cfs} \]
\[ H_1 = 221.5 - 201.6 = 19.9 \text{ ft} \]
\[ STOR1 = 13.9 \times 510 \times 12/10691 = 11.39 \text{ inch} \]
\[ QP2 = 18,000 \left(1 - \frac{11.39}{19.9}\right) = 7208 \text{ cfs} \]
\[ H_2 = 213.1 - 201.6 = 11.5 \text{ ft} \]
\[ STOR2 = 11.5 \times 510 \times 12/10691 = 6.58 \text{ inch} \]
\[ STOR_{ave} = \frac{6.58 + 11.39}{2} = 8.99 \text{ inch} \]
\[ QP3 = 18,000 \left(1 - \frac{8.99}{14}\right) = 9486 \text{ cfs} \]
\[ H_3 = 215.1 - 201.6 = 13.5 \text{ ft} \]
\[ STOR3 = 13.5 \times 510 \times 12/10691 = 7.73 \text{ inch} \]
\[ QP4 = 18,000 \left(1 - \frac{7.73}{14}\right) = 10,678 \text{ cfs} \]
\[ H_4 = 216 - 201.6 = 14.4 \text{ ft} \]
\[ STOR4 = 14.4 \times 510 \times 12/10691 = 8.24 \text{ inch} \]
\[ STOR_{ave} = \frac{8.24 + 7.73}{2} = 7.99 \text{ inch} \]
\[ QP5 = 18,000 \left(1 - \frac{7.99}{14}\right) = 10,434 \text{ cfs} \]

Say 10,500 cfs — Peak outflow rate, if dam does not fail under about 14 ft of water above its spilling crest.

WHITMAN & HOWARD, INC.
45 WILLIAM STREET, WELLESLEY, MASS.
Engineers and Architects
WATERSHED AREA

BIG ISLAND POND DAM

SCALE 1: 62500
APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS
### INVENTORY OF DAMS IN THE UNITED STATES

<table>
<thead>
<tr>
<th>STATE</th>
<th>IDENTITY NUMBER</th>
<th>DIVISION</th>
<th>STATE (COUNTY)</th>
<th>CITY-TOWN-VILLAGE</th>
<th>POPULAR NAME</th>
<th>NAME OF IMPOUNDMENT</th>
<th>REGION/BASIN</th>
<th>RIVER OR STREAM</th>
<th>NEAREST DOWNSTREAM CITY-TOWN-VILLAGE</th>
<th>DIST FROM DAM (M)</th>
<th>POPULATION</th>
<th>TYPE OF DAM</th>
<th>YEAR COMPLETED</th>
<th>PURPOSES</th>
<th>SPILLWAY</th>
<th>MAXIMUM DISCHARGE (CF/S)</th>
<th>VOLUME OF DAM (ACR)</th>
<th>POWER CAPACITY (MW)</th>
<th>NAVIGATION LOCKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH</td>
<td>470</td>
<td>NED</td>
<td>NH 015 02</td>
<td>BIG ISLAND POND</td>
<td>N/A</td>
<td>BIG ISLAND POND</td>
<td>01 04</td>
<td>SPICEK RIVER</td>
<td>NORTH SALEM</td>
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<td>400</td>
<td>O</td>
<td>1925</td>
<td>)=='</td>
<td>C/L</td>
<td>120</td>
<td>29</td>
<td>720</td>
<td>450</td>
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</tbody>
</table>

**Remarks**

- **Owner:** BIG ISLAND POND CORP
- **Engineering By:**
- **Construction By:**
- **Regulatory Agency:**
  - **Design:**
  - **Construction:**
  - **Operation:**
  - **Maintenance:**
    - **NH WATER RES BD:**
    - **NH WATER RES BD:**
    - **NH WATER RES BD:**
    - **NH WATER RES BD:**

**Inspection By:**

- **Inspection Date:**
  - **Day:** July 7th
  - **Month:**
  - **Year:**
- **Authority For Inspection:**
  - WHITMAN, & MORAND, INC

**Remarks:**