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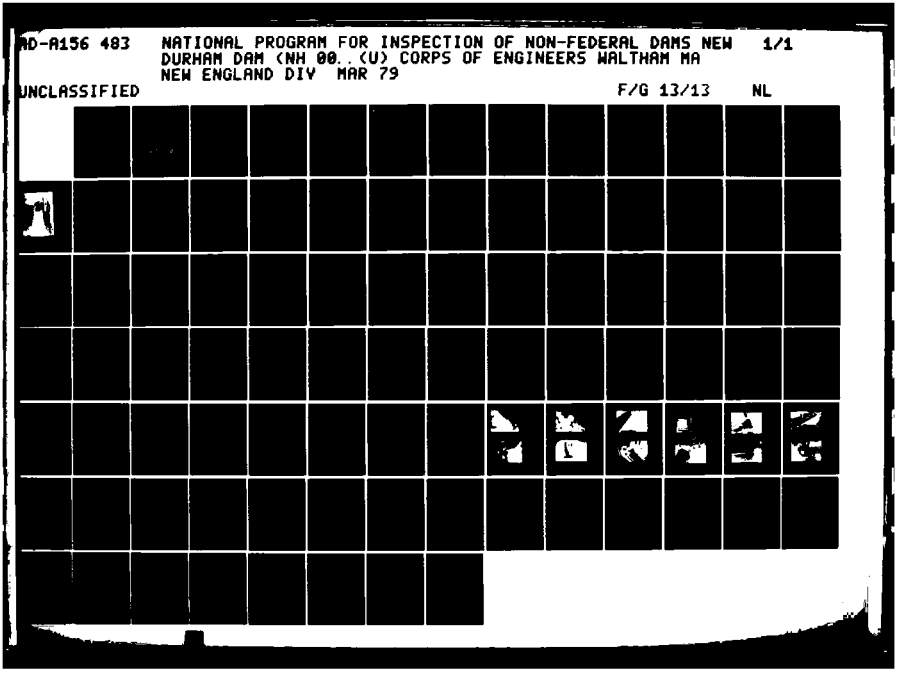

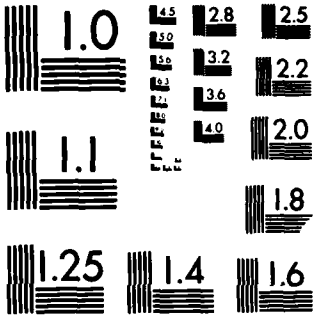

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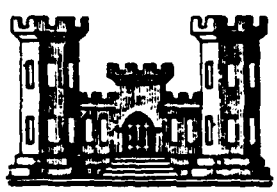
MERRIMACK RIVER BASIN
NEW DURHAM, NEW HAMPSHIRE

NEW DURHAM DAM
NH - 00345

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

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Merrimack Raver Basin
New Durham, New Hampshire
Merrymeeting River

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

The dam is a concrete gravity dam with embankment dikes constructed across a narrow channel in a moderately broad section of the Merrymeeting River Valley. The dam is about 50 ft. long and 21 ft. high. The dam is judged to be in fair condition. It is small in size with a high hazard potential. The earth embankment at the east end of the dam would be susceptible to erosion during overtopoing.

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MERRIMACK RIVER BASIN

NEW DURHAM, NEW HAMPSHIRE

NEW DURHAM DAM

NH-00345

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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REPLY TO
ATTENTION OF:
NEDED

SEP 29 1979

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 New Durham 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, New Hampshire Fish & Game Department, Concord, New Hampshire 03301.

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,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

This Phase I Inspection Report on New Durham 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 judgement and practice, and is hereby submitted for approval.

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

CARNEY M. TERZIAN, CHAIRMAN
Chief, Structural Section
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

NH-00345

NEW DURHAM DAM

NEW DURHAM
STRAFFORD COUNTY, NEW HAMPSHIRE

MERRYMEETING RIVER

November 16, 1978 (Field Inspection)

BRIEF ASSESSMENT

The New Durham Dam (also known as Jones Pond Dam) is a concrete gravity dam with embankment dikes constructed across a narrow channel in a moderately broad section of the Merrymeeting River valley. The main concrete structure is about 103 feet long, the embankment is about 50 feet long, and the dam is about 21 feet high. A 70-foot long concrete dike is located adjacent to the Powder Mill Road about 200-feet west of the main dam.

Based on the visual inspection and past operational performance, the New Durham Dam is judged to be in fair condition. Major concerns regarding long-term safety of the structure include deterioration of the controlled outlet works and structural cracking through the west end of the dam.

The dam is classified as a small dam having a high hazard potential. The test flood is the Probable Maximum Flood (PMF). The total design spillway capacity of 2,050 cfs is about 15 percent of the routed test flood outflow of 13,900 cfs. The test flood would overtop the west end of the main dam by 4.0 feet and the east end by 3.7 feet. The dike at Powder Mills Road would be overtopped by about 5.2 feet. The earth embankment section at the east end of the dam would be susceptible to erosion during overtopping.

The recommendations and items of remedial maintenance and operation presented in Section 7 should be implemented within 12 months of receipt of this report by the owner. A registered professional engineer should be retained to evaluate the need for additional spillway capacity, and to design the following: 1) required spillway modifications; 2) rehabilitation of the controlled outlet works; and 3) rehabilitation of the cracked section at the west end of the

dam. Remedial maintenance includes repair of concrete surfaces, and removal of trees and brush from the embankment section. Operating procedures should include monitoring seepage at the toe of the embankment near the east abutment of the spillway, around the clock surveillance of the dam during periods of anticipated high runoff, and a formal warning system for emergency use.

EDWARD C. JORDAN CO., INC.

Stanley E. Walker, P.E.
Project Officer

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 conditions 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 Recommended Guidelines for Safety Inspection of Dams, 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.

TABLE OF CONTENTS

		PAGE
LETTER OF TRANSMITTAL		
BRIEF ASSESSMENT		i
REVIEW BOARD SIGNATURE SHEET		iii
PREFACE		iv
TABLE OF CONTENTS		vi
OVERVIEW PHOTOGRAPH		viii
LOCATION AND DRAINAGE AREA MAP		ix
SECTION 1 - PROJECT INFORMATION		
1.1	GENERAL	1-1
1.2	DESCRIPTION OF PROJECT	1-2
1.3	PERTINENT DATA	1-4
SECTION 2 - ENGINEERING DATA		
2.1	DESIGN	2-1
2.2	CONSTRUCTION	2-1
2.3	OPERATION	2-1
2.4	EVALUATION	2-1
SECTION 3 - VISUAL INSPECTION		
3.1	FINDINGS	3-1
3.2	EVALUATION	3-3
SECTION 4 - OPERATING PROCEDURES		
4.1	PROCEDURES	4-1
4.2	MAINTENANCE OF DAM	4-1
4.3	MAINTENANCE OF OPERATING FACILITIES	4-1
4.4	DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT	4-1
4.5	EVALUATION	4-2
SECTION 5 - HYDRAULIC/HYDROLOGIC		
5.1	EVALUATION OF FEATURES	5-1

TABLE OF CONTENTS (Continued)

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY..... 6-1

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT..... 7-1
7.2 RECOMMENDATIONS..... 7-2
7.3 REMEDIAL MEASURES..... 7-2

APPENDICES

A FIELD INSPECTION NOTES

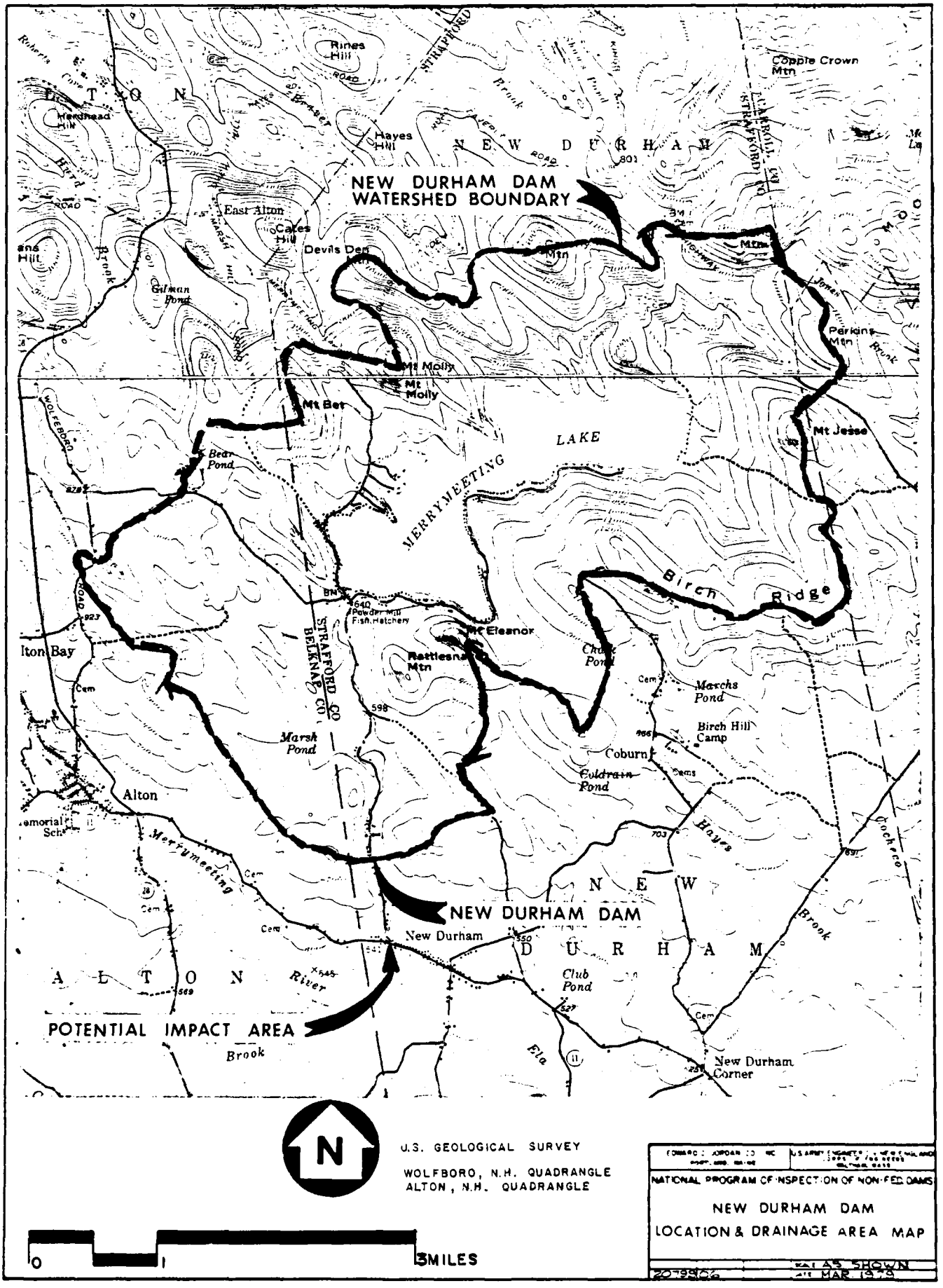
B ENGINEERING DATA

C PHOTOGRAPHS

D HYDROLOGIC AND HYDRAULIC COMPUTATIONS

E INVENTORY FORMS

OVERVIEW



U.S. GEOLOGICAL SURVEY

WOLFBORO, N.H. QUADRANGLE
ALTON, N.H. QUADRANGLE

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

NEW DURHAM DAM
LOCATION & DRAINAGE AREA MAP

AS SHOWN
MAR 1979

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

NEW DURHAM DAM

SECTION 1
PROJECT INFORMATION

1.1 GENERAL

a. Authority. Public Law 92367, 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. Edward C. Jordan Co., Inc. has been retained by the New England Division to inspect and report on selected dams in the states of Maine and New Hampshire. Authorization and notice to proceed were issued to Edward C. Jordan Company, Inc. under a letter of December 1, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW3379C0017 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To 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) To encourage and prepare the states to initiate 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 New Durham Dam is located on the Merrymeeting River in the town of New Durham, New Hampshire. N 43°-26.8', W 71°-10.7'.

b. Description of Dam and Appurtenances. The New Durham Dam is a concrete gravity structure constructed across a narrow stream channel in a moderately broad valley. This concrete structure is about 103 feet long and 21 feet high. At the east end of the dam is an earth embankment about 50 feet long. The main dam consists of a 66-foot long free overfall spillway with flashboards, a 5-foot by 6-foot stop log spillway, and 48-inch diameter gated outlet. A 70-foot long concrete dike is located about 200 feet west of the main dam adjacent to Powder Mills Road.

Descriptive sketches of the dam are presented in Appendix B of this report and photographs taken during the inspection are presented in Appendix C.

c. Size Classification. The New Durham Dam is classified as a small-sized dam based on both storage capacity (375 acre-feet) and height (21 feet). According to the Corps of Engineers "Recommended Guidelines for Safety Inspection of Dams," a dam having a capacity of less than 1000 acre-feet and a height of less than 40 feet is classified as a small sized dam.

d. Hazard Classification. The New Durham Dam has a high hazard potential. Failure of the dam would cause significant damage in the town of New Durham located approximately 0.8 miles below the dam. River stages near the town of New Durham would range from 7 to 9 feet resulting in flood depths of 1 to 3 feet in the town. Property damage would occur to approximately 15 residential and commercial buildings. There would be a possibility for loss of life in the flooded area.

e. Ownership.

Current Owner: New Hampshire Fish & Game Department
Attention: Steven Virgin
Bridge Street
Concord, New Hampshire 03301

Previous Owners:

Name	Approximate Dates of Ownership
Charles M. Bartlett	May 1951 - October 1958
Public Service Company of New Hampshire	January 1946 - May 1951
George H. Jones	Prior to 1946

f. Operator.

Frank Alden
Powder Mills Fish Hatchery
Merrymeeting Road
New Durham, New Hampshire 03855
Tel: 1-603-859-2041

g. Purpose of Dam. The New Durham Dam was formerly utilized to store water for hydroelectric power generation. It is currently used to maintain the level of Jones Pond for recreation.

h. Design and Construction History. No information was available pertaining to original design and construction or any post-construction modifications prior to 1963. In 1963, the dam underwent a major reconstruction, including replacement of the former stop log spillway with a concrete free-overfall spillway with flashboards. According to the design drawing for the reconstruction of the dam (see Appendix B) flashboards are designed to fail when the reservoir water surface elevation reaches 587.0 feet (3 feet above spillway crest). New wingwalls and a new gate and gate house were constructed. In addition, a new 5 foot by 6 foot stop log spillway section was constructed adjacent to the free overall spillway. No further reconstruction has apparently occurred since that time.

i. Normal Operating Procedure. There are apparently no formal operating procedures for the dam. The operator reportedly checks the facility periodically and adjusts stop logs as necessary during high

runoff conditions. The New Hampshire Fish and Game Department owns and operates a dam at Merrymeeting Lake located upstream of this dam. The operator reportedly coordinates the removal of stop logs at the New Durham Dam with the operation of the upstream facility.

1.3 PERTINENT DATA

a. Drainage Area. The drainage area above the New Durham Dam is approximately 16.3 square miles (10,400 acres). The flow of the Merrymeeting River is regulated by the Merrymeeting Lake Dam located 2.8 miles upstream. The drainage area above Merrymeeting Lake Dam is approximately 11.1 square miles. Merrymeeting Lake has a surface area of approximately 1,100 acres and a storage capacity of 19,500 acre-feet at spillway crest. The New Durham Dam watershed is primarily forested with elevations ranging from 1,490 feet at Caverly Mountain to about 567 feet at the streambed at New Durham Dam.

b. Discharge at Dam Site. Discharges from the New Durham Dam occur at both the free overfall spillway and the stop log spillway. The gated outlet also provides discharge capability, however, it needs maintenance. The 66-foot long free overfall spillway is provided with flashboards. As stated in Section 1.2.h., the flashboards are designed to fail when reservoir water surface elevation reaches 587.0 feet. There is an unlined saddle spillway about 20 feet wide on the east side of the dam with a crest elevation of about 585.2 (MSL). On the west side of the dam there is a 70-foot long dike with a crest elevation of about 586.8 (MSL). Water overflowing the dike would be discharged to the Powder Mills Road. The following discharges were estimated assuming water surface at top of dam (elev. = 588.0 ft) unless otherwise noted.

(1) Outlet Works - 48-inch diameter outlet - 275 cfs.

(2) Stop log spillway (with all stop logs removed) - 300 cfs.

(3) Uncontrolled free overfall spillway (without flashboards) - 1,750 cfs.

(4) Saddle spillway east of dam plus dike west of dam - 420 cfs.

(5) Maximum past flood discharge at damsite is unknown.

(6) Test Flood Discharge - 13,900 cfs at elevation of 592.0 ft MSL.

(7) Discharge at 1/2 PMF - 5,300 cfs at elevation of 589.6 ft MSL.

c. Elevation (Feet Above MSL). Survey datum elevations were referenced to a water level gauge at the dam and subsequently converted to mean sea level elevations using a February, 1959 drawing prepared by the New Hampshire Fish and Game Department when the spillway was reconstructed (see Appendix B).

ITEM	ELEVATION ABOVE MSL
Free overfall spillway crest	584.0
Streambed at centerline of dam	566.8 ±
Top of dam at west abutment	588.0
east abutment	588.3
Top of earth embankment (east of spillway)	Varies from 585.2 to 588.3
Top of concrete dike wall west of dam	586.8
Stop log spillway crest	581.1
Top of stop logs (at time of inspection)	585.7
Invert of controlled outlet	571.0 ±
Normal water surface elevation (top of flashboards)	585.9
Maximum tailwater	Unknown
PMF pool	592.0
1/2 PMF pool	589.9

d. Reservoir.

ITEM	LENGTH (MILES)
Spillway crest	1.1
Normal water surface pool	1.2
Top of dam (elev. 588.0)	1.3

e. Storage.

ITEM	STORAGE (ACRE-FEET)
Spillway crest	200
Normal water surface pool	280
Top of dam	375
PMF pool	640
1/2 PMF pool	465

f. Reservoir Surface Area.

ITEM	SURFACE AREA (ACRES)
Spillway crest	40
Normal water surface pool	60
Top of dam	80

g. Dam.

Type - Concrete gravity structure with earth embankment section at east end.

Length - The concrete structure is about 103 feet long; the earth embankment is approximately 50 feet long.

Height - Approximately 21 feet (top of abutment to downstream bed).

Top Width - See plan and cross-section sketches in Appendix B-1.

Side Slopes - See Plan and cross-section sketches in Appendix B-1.

Zoning - Unknown.

Impervious Core - Unknown.

Cutoff - Concrete poured to bedrock for portions of dam. Cutoff for remaining portions is unknown.

Grout Curtain - Unknown.

h. Diversion and Regulating Tunnel. Not applicable.

i. Spillway.

There are two spillway sections as follows:

(1) Type : Free overfall spillway with flashboards.
Length : 66 Feet
Crest Eelvation : 585.9 feet with flashboards
584.0 feet without flashboards
Gates ; No mechanically or electrically operated gates.

(2) Type : Stop log spillway
Length : 5 feet
Crest Elevation : 585.7 feet (time of inspection)
581.1 stop logs removed
Gates : No mechanically or electrically operated gates.

Upstream Channel - The reservoir has a forested shoreline with flat to moderate slopes above high water line. No evidence of slope failure above the reservoir was noted during the visual inspection. Because of pond level, the amount of silting could not be determined. The approach channel to the spillway was clear and unobstructed.

Downstream Channel - The streambed is composed primarily of cobble to boulder sized bed material. The channel is about 25 feet in width. The overbank areas are heavily forested with many trees overhanging the banks. The streambed had scoured suf-

ficiently to form a plunge pool, however, the scour did not appear to be excessive.

j. Regulating Outlets.

Invert - Gated outlet: 571.0 feet

Size - Gated outlet: 4 ft. diameter

The controlled outlet is located west of the spillway section of the dam. It consists of a gatehouse containing a steel-lined wood stave conduit. This conduit comprises the remnants of a penstock which formerly carried water to a power house located downstream. The outlet is controlled by a timber vertical lift gate.

Control Mechanism - The mechanism which regulates the controlled outlet is operated manually. The equipment appeared to need lubrication and has reportedly not been operated for several years.

SECTION 2

ENGINEERING DATA

2.1 DESIGN

No design data relative to original construction of the New Durham Dam are available. The only available design data for the dam are drawings prepared by the New Hampshire Fish and Game Department for reconstruction of the dam in about 1963. These drawings are referenced in Appendix B.

2.2 CONSTRUCTION

No engineering data regarding the original construction or reconstruction of the dam are available.

2.3 OPERATION

No engineering data pertinent to operation of the dam are available.

2.4 EVALUATION

a. Availability. Drawings of the damsite and the 1963 renovations are available. However, detailed design drawings and backup data are not available.

b. Adequacy. Although some drawings are available, they are inadequate for an in-depth review of the design and construction of the New Durham Dam. The assessment is therefore based primarily on visual inspection, performance history, and engineering judgment.

c. Validity. Because of the limited design data available, no assessment can be made of its validity.

SECTION 3

VISUAL INSPECTION

3.1 FINDINGS

a. General. The New Durham Dam is a 103-foot long concrete gravity structure with an earth embankment section about 50 feet long at its east end. It closes a narrow stream channel in a moderately broad valley. The dam appears to be founded partially on bedrock and partially on soil. A small earth embankment and concrete dike closes a saddle located adjacent to Powder Mills Road west of the dam.

b. Dam.

(1) Structural - The dam appears to be in generally good condition except in the area of the controlled outlet. See Appendix A for detailed inspection notes and Appendix C for photographs. The inspection resulted in the following major findings:

(a) In the section west of the gated outlet there are two major structural cracks through the concrete dam. These cracks extend through the dam to the downstream face. Another crack was observed above the outlet conduit in the downstream face of the dam (see photograph 1).

(b) The downstream face of the controlled outlet section is spalled and eroded to a depth of 2 to 3 feet near the toe. Reinforcing steel is exposed. See Photograph 3.

(c) The upstream face of the outlet section is spalled and cracked at and below normal pond level (see Photograph 5). Heavy leakage (on the order of 250 gpm) is occurring through this deteriorated area into the vertical passage from the gatehouse down to the outlet conduit. See Photographs 4 through 7.

(d) The junction between the east abutment and embankment section appears to be in fair condition but some seepage is occurring at the toe of the dam in this area. Some erosion has also occurred at this junction on the upstream face. See Photograph 8.

(e) Seepage is occurring through the bedrock west of the west abutment.

(f) The embankment slopes are tree and brush covered with only limited erosion resistant ground cover vegetation.

(2) Hydraulics - Hydraulic control of the reservoir's water surface is provided by a stop log spillway at the west end of the dam and the flashboards of the free overfall spillway. A concrete dike located west of the main dam keeps water from flowing out on to the Powder Mills Road when the water surface elevation is less than about 586.8 ft. The low level controlled outlet has a timber gate with a manually operated lift mechanism. Although considered operable, the outlet works control mechanism is in need of lubrication and maintenance. At the time of inspection, there was approximately one foot of freeboard at the concrete dike adjacent to the Powder Mills Road. During high flow conditions the the unlined saddle spillway east of the dam would be overtopped prior to failure of the designed-to-fail flashboards of the free overfall spillway. Failure of the flashboards would occur at approximately the same time as overflow of the dike on Powder Mills Road.

c. Appurtenant Structures. Not applicable.

d. Reservoir Area. The reservoir shoreline is primarily forested with flat to moderate slopes above high water line. No evidence of slope failure above the reservoir was observed during the inspection. The Powder Mills Road runs along the west shore of the reservoir. At points the road is only 2 to 3 feet above normal water surface of the reservoir.

Several cabins are located in the vicinity of the reservoir.

e. Downstream Channel. The channel of the Merrymeeting River below the New Durham Dam is composed of cobble to boulder sized bed material and averages about 25 feet wide. The overbank areas are heavily forested with many trees overhanging the stream.

3.2 EVALUATION

Based on the visual inspection findings, the dam appears to be in fair condition. It appears that major rehabilitation of the controlled outlet structure and the cracked section at the westerly end of the dam is necessary to assure its long-term safety. Other elements of the dam appear to be in generally good condition. The seepage occurring at the downstream toe of the easterly abutment should be monitored, however, and the unlined saddle spillway in the east embankment should be raised to top of dam elevation.

SECTION 4

OPERATING PROCEDURES

4.1 PROCEDURES

No written operating procedures for the New Durham Dam are available. The dam is operated to maintain the level of Jones Pond at or near normal pool elevation. The operator of the dam is the superintendent of the Powder Mills Fish Hatchery, which is located about two miles upstream of the dam. He reportedly checks the dam periodically and manually removes stop logs at the structure in anticipation of high flows. The New Hampshire Fish and Game Department owns and operates the Merrymeeting Lake Dam which is located about 2.8 miles upstream. No operating records are available.

4.2 MAINTENANCE OF DAM

Maintenance of the dam is apparently on an as-needed basis. The spillway portion of the dam and the stop log section are apparently maintained in good condition. The gated outlet structure is in need of extensive maintenance and repair and should not be used for discharge until the repairs are made. The embankment section at the east end of the dam also needs maintenance. No maintenance records are available.

4.3 MAINTENANCE OF OPERATING FACILITIES

The controlled outlet gate lift mechanism appears to need cleaning and lubrication. The gate was not operated during inspection and reportedly had not been operated for several years. Due to lack of use and proper maintenance, the gated outlet may not operate as designed at the present time. Stop logs and flashboards were observed to be in good repair.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No formal warning system is known to be in effect at the New Durham Dam.

4.5 EVALUATION

The New Durham Dam appears to need a more thorough maintenance program. Rehabilitative maintenance is particularly needed for the controlled outlet works. Maintenance or operating records are apparently not kept. There is no formal warning system in effect for this dam.

SECTION 5

HYDROLOGIC/HYDRAULIC

5.1 EVALUATION OF FEATURES

a. General. The New Durham Dam is a concrete gravity dam with a free overfall spillway. About 66 feet of the spillway is furnished with flashboards and about 5 feet consists of a stop log bay. The dam was originally used to impound water for power generation and a gated outlet works located at the west end of the dam regulated discharge to a wood stave penstock. The penstock has been removed and the headworks now forms the low level controlled outlet. The dam is currently used to maintain the normal pool elevation of the reservoir which is used for recreation. The New Hampshire Fish and Game Department is the current owner and operator of the dam. Flashboards are used to maintain water surface at approximate elevation of 586.0 feet (2 feet above spillway crest).

The flow of the Merrymeeting River is regulated by Merrymeeting Lake Dam located about 2.8 miles upstream of the New Durham Dam. Merrymeeting Lake Dam is also owned and operated by the New Hampshire Fish and Game Department.

During high flow conditions, the dike adjacent to Powder Mills Road and the unlined saddle spillway east of the dam would be overtopped prior to the reservoir water surface reaching the crest of the dam.

b. Design Data. No original hydrologic or hydraulic design data were available. The February, 1959 design drawing for the reconstruction of the dam (see Appendix B) indicates that the spillway crest was to be raised 4 feet and that designed-to-fail flashboards were to be provided along the reconstructed free overfall spillway.

c. Experience Data. No information regarding past overtopping or other notable hydrologic events was available. The present spillway was constructed in 1963 to replace a stop log spillway.

d. Visual Observations. The water level at the New Durham Dam can be controlled by either the stop log spillway or the free overfall spillway. The free overfall spillway is provided with 2 feet of designed-to-fail flashboards. A gated outlet located at the west end of the dam is considered operable but requires substantial maintenance. No evidence of damage caused by overtopping of the dam was observed during the field inspection. The following conditions describing the hydraulic characteristics of the dam were noted: (1) the downstream face and crest of concrete spillway were in good condition; (2) at normal water surface (586.0) less than one foot of freeboard exists at the concrete dike located near Powder Mills Road west of the dam; and (3) no significant scour was noted in the downstream channel, except at the plunge pool.

e. Test Flood Analysis. The New Durham Dam is classified as having a high hazard potential. Based on Corps of Engineers "Recommended Guidelines for Safety Inspection of Dams," the spillway test flood is the probable maximum flood (PMF). The drainage area above the New Durham Dam consists of about 16.3 square miles of rolling to mountainous terrain. The drainage area above the Merrymeeting Lake Dam is 11.1 square miles. The PMF flow above Merrymeeting Lake was estimated to be 18,300 cfs. This PMF flow was routed through Merrymeeting Lake and added to the PMF flow from the remaining drainage area (5.2 sq. mi.) above New Durham Dam to yield the PMF inflow to New Durham Dam. The very limited surcharge storage capacity of the New Durham Dam has no significant effect on the PMF peak inflow. The PMF outflow at the New Durham Dam was estimated to be 13,900 cfs. The 1/2 PMF outflow from New Durham Dam was estimated to be 5,300 cfs. The total spillway capacity (stop log outlet plus free overfall) is about 15% of the PMF peak flow. During the PMF event, the dam would be overtopped by about 4.0 feet at the west abutment and gate house and about 3.7 feet at the earth embankment east of the dam. The dike by Powder Mills Road would be overtopped by about 5.2 feet.

f. Dam Failure Analysis. To determine the hazard classification of the New Durham Dam, the potential impact of failure of the dam at maximum pool was assessed. The failure analysis relied upon the rule of thumb guidance outlined in an attachment to ETL 1100-2-234. Peak discharge rates which might occur downstream from the dam from a breach of the earth embankment east of the spillway section of the dam has been estimated.

The flood peak at the dam from failure was computed to be about 7,400 cfs which would result in a flood wave of 12 to 14 feet just below the dam. Flow just prior to failure would be about 2,500 cfs with a tail water depth of about 5 to 6 feet. It would take the reservoir approximately 75 minutes to empty. At the town of New Durham (about 4,000 feet below the dam), the peak flow would be reduced to approximately 5,000 cfs resulting in a river stage of about 7 to 9 feet. Some flooding in the town of New Durham would be expected. Approximately 15 residential and commercial buildings located on and near N.H. Route 11 could experience flooding to a depth of 1 to 3 feet. There would be a chance for the loss of life in this area.

The earth embankment section at the east end of the dam and the dike by Powder Mill Road would be susceptible to erosion during overtopping conditions.

SECTION 6

STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations. Based on the visual observations, the New Durham Dam appears to be in fair condition. The concrete has deteriorated in the controlled outlet structure and the section at the westerly end of the dam is cracked. Structural cracking, spalling, and erosion are evident in the westerly portion of the dam. Heavy leakage is occurring through the upstream face into the vertical passage from the gatehouse to the outlet conduit. Some seepage is occurring through the easterly abutment at the junction between the concrete abutment and embankment. In general, the other elements of the dam appear to be in good condition.

b. Design and Construction Data. No data concerning original design or construction was available.

c. Operating Records. None available.

d. Post-Construction Changes. Major rehabilitative construction was performed on the structure in 1963. At that time, according to the 1959 reconstruction design drawing (see Appendix B), the original stop log spillway was removed and the concrete spillway crest was raised four feet. The new spillway section consists of a 66-foot free overfall section with designed-to-fail flashboards and a 5-foot stop log bay. At that time the penstock which previously carried water to a downstream powerhouse was removed. The penstock side works then became a controlled outlet facility discharging at the downstream face of the dam.

e. Seismic Stability. The dam is located in Seismic Zone No. 2 and in accordance with recommended Phase I Guidelines, does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition. The New Durham Dam is judged to be in fair condition based on the visual inspection. The major concerns relative to the dam's physical condition are as follows:

(1) there is significant deterioration of the controlled outlet works section of the dam and the outlet conduit.

(2) there are cracks through the dam west of the outlet works.

(3) high spillway discharges could cause extensive scour at the downstream toe because of the lack of control of energy dissipation.

(4) low (unlined saddle) area adjacent to the easterly embankment section would be susceptible to erosion if overtopped.

(5) there is seepage at the toe of the earth embankment at the junction with the east abutment.

(6) there is a lack of erosion protection on dike by Powder Mill Road.

(7) spillway capacity is insufficient.

b. Adequacy of Information. The information available is such that the assessment of the condition of the dam must be based primarily on the visual inspection, the past operational performance of the dam, and engineering judgment.

c. Urgency. The recommendations and remedial measures outlined below should be implemented within 12 months of receipt of this report by the owner.

d. Need for Additional Investigation. Additional investigation is not considered necessary for the current assessment.

7.2 RECOMMENDATIONS

The following should be evaluated by a registered professional engineer and mitigating measures inplemented as found necessary.

(1) The need for additional spillway capacity.

(2) The need for energy dissipator at base of spillway.

(3) The rehabilitation of the controlled outlet.

(4) Repair or reconstruction of the cracked section of the dam west of the outlet structure.

(5) Provision for erosion control on the downstream side of the dike by Powder Mill Road.

7.3 REMEDIAL MEASURES

a. Operating and Maintenance Procedures. A program of regular inspection and maintenance of the dam should be implemented and a record of these activities should be kept. The following specific maintenance and operating procedures should be implemented:

(1) Clear trees and bushes from the embankment.

(2) Repair eroded area on upstream face of embankment adjacent to east abutment.

(3) Raise the easterly embankment to a uniform grade, level the top of the east abutment, closing the unlined saddle spillway and establish and maintain an erosion resistant surface.

(4) Re-establish the serviceability of controlled outlet gateworks.

(5) Monitor the seepage occurring at the toe of the embankment adjacent to the east abutment and take appropriate mitigating measures should an increase in flow or erosion occur.

(6) Provide around-the-clock surveillance during periods of anticipated high runoff.

(7) Develop a formal warning system and implement it in the event of an emergency.

(8) Have inspections of the dam made by a registered professional engineer once every year.

7.4 ALTERNATIVES

An alternative to implementing the recommendations and remedial measures outlined above would be the removal of the dam.

APPENDIX A

VISUAL INSPECTION CHECK LIST

AND

SUPPLEMENTARY INSPECTION NOTES

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT New Durham Dam DATE 11/16/78

TIME A.M.

WEATHER Sunny, cool

W.S. ELEV. U.S. DN.S.

PARTY:

1. Stephen Cole
2. John Devine
3. David Nyman
4. T. Noonan
5. D. Lane
6.
7.
8.
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Geotechnical	Cole	
2.	Structural	Cole, Devine, Nyman	
3.	Civil	Nyman	
4.	Hydraulics/Hydrology	Devine	
5.	Photography	Nyman, Devine	
6.	Survey	Noonan, Lane	
	Review (11/30/78)	Walker, Horstmann	

There were 5 to 6 inches of snow on the ground and ice on the pond, 11/30/78. No significant differences in the condition of the dam were observed.

NOTE: See Supplementary Inspection Notes Following Checklist

INSPECTION CHECKLIST

PROJECT New Durham Dam DATE 11/16/78

PROJECT FEATURE Embankment NAME Cole

DISCIPLINE Geotechnical NAME

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	588 down to 586 ± (MSL)
Current Pool Elevation	586 ± (MSL)
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	Turf, brush, trees
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Some erosion and seepage at toe of east abutment
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	None
Sloughing or Erosion of Slopes or Abutments	Minor erosion near east abutment
Vegetation	Trees, brush

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT (cont.)	
Rock Slope Protection - Riprap Failures	None
Unusual Embankment or Downstream Seepage	Seepage at dike toe near east training wall
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

INSPECTION CHECKLIST

PROJECT New Durham Dam DATE 11/16/78

PROJECT FEATURE Intake Structure/Channel NAME Cole, Nyman

DISCIPLINE Structural, Geotechnical Hydraulics/Hydrology NAME Devine

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Flat, shore of reservoir
Bottom Conditions	Some silt, unobstructed
Rock Slides or Falls	None
Log Boom	None
Debris	None
Condition of Concrete Lining	N/A
Drains or Weep Holes	N/A
b. Intake Structure	
Condition of Concrete	Concrete spalled 2 to 6 inches deep
Stop Logs and Slots	None

INSPECTION CHECKLIST

PROJECT New Durham Dam DATE 11/16/78

PROJECT FEATURE Control Tower NAME Cole, Nyman

DISCIPLINE Structural, Geotechnical Hydraulics/Hydrology NAME Devine

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Masonry and Structural	
General Condition	Poor
Condition of Joints	Poor
Spalling	Severe, many areas
Visible Reinforcing	On downstream face, near toe
Rusting or Staining of Concrete	Some lime stain
Any Seepage or Efflorescence	Heavy leakage into observation port, some efflorescence at joints and cracks
Joint Alignment	Okay
Unusual Seepage or Leaks in Gate Chamber	Gate appears tight, leakage into upstream face of chamber
Cracks	Two major cracks through section
Rusting or Corrosion of Steel	Gate guides and exposed steel rusted
b. Mechanical and Electrical	
Air Vents	None
Float Wells	None
Gate Hoist	Gate hoist appears okay, needs lubrication
Elevator	N/A

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER (cont.)	
Hydraulic System	N/A
Service Gates	Gate appears sound
Emergency Gates	"
Lightning Protection System	N/A
Emergency Power System	N/A
Wiring and Lighting System	None

INSPECTION CHECKLIST

PROJECT New Durham Dam DATE 11/16/78

PROJECT FEATURE Transition & Conduit NAME Cole, Nyman

DISCIPLINE Structural, Geotechnical Hydraulics/Hydrology NAME Devine

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	Wood stave steel lined conduit (former penstock to downstream power station) badly rusted
General Condition of Concrete	N/A
Rust or Staining on Concrete	N/A
Spalling	N/A
Erosion or Cavitation	None
Cracking	None
Alignment of Monoliths	N/A
Alignment of Joints	N/A
Numbering of Monoliths	N/A

PERIODIC INSPECTION CHECKLIST

PROJECT New Durham Dam DATE 11/16/78

PROJECT FEATURE Outlet Structure/Channel NAME Cole, Nyman

DISCIPLINE Structural, Geotechnical NAME Devine
Hydraulics/Hydrology

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Poor
Rust or Staining	Some lime stain
Spalling	Severe spalling near conduit outlet, 2 to 3 feet deep near toe of structure
Erosion or Cavitation	Erosion of spall
Visible Reinforcing	Near outlet of conduit
Any Seepage or Efflorescence	Some seepage around conduit
Condition at Joints	Okay, some efflorescence
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	Trees in channel
Condition of Discharge Channel	Appears okay, no major scour

INSPECTION CHECKLIST

PROJECT New Durham Dam DATE 11/16/78

PROJECT FEATURE Spillway NAME Cole, Nyman

DISCIPLINE Structural, Geotechnical Hydraulics/Hydrology NAME Devine

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good, unobstructed
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Some silt, unobstructed
b. Weir and Training Walls	
General Condition of Concrete	East wall good, west wall fair
Rust or Staining	Some efflorescence
Spalling	Minor
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None
Drain Holes	None
c. Discharge Channel	
General Condition	Good, no scour
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Trees in channel
Floor of Channel	Bedrock, cobbles, boulders
Other Obstructions	Some debris downstream

INSPECTION CHECKLIST

PROJECT New Durham Dam DATE 11/16/78

PROJECT FEATURE Service Bridge NAME Cole, Nyman

DISCIPLINE Structural NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Superstructure	NOT APPLICABLE
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

SUPPLEMENTARY INSPECTION NOTES

NEW DURHAM DAM
NEW DURHAM, NEW HAMPSHIRE

APPENDIX A

1. CONCRETE STRUCTURES IN GENERAL

a. Concrete Surfaces. Generally the concrete surfaces of the New Durham Dam are in good condition showing evidence of little or no erosion or spalling. Some areas however, particularly around the gated outlet, are severely weathered and spalled and large voids exist.

b. Structural Cracking. In the section west of the gated outlet there are two major structural cracks through the concrete dam. These cracks extend through the dam to the downstream face. Another crack was observed above the outlet conduit in the downstream face of the dam.

c. Movement - Horizontal and Vertical Alignment. No evidence of movement of the structure was observed. The horizontal and vertical alignment appears true to line and grade.

d. Junctions. The junction between the east abutment of the dam and the earth embankment to the east has undergone some erosion along the upstream edge of the embankment. Some minor seepage is occurring at the downstream toe of the embankment, adjacent to the east training wall. The junction between the spillway and the gated outlet section of the dam appears to be sound. The junction between the westerly abutment and the earth or bedrock to the west appears to be good; however, some seepage is occurring.

e. Drains. No drains were observed in any portion of the structure.

f. Water Passages. The spillway section of the dam was found to be in good condition with little or no erosion apparent.

g. Seepage or Leakage. Some minor seepage (estimated to be 1 to 2 gpm) was observed to be occurring at the downstream toe of the east abutment training wall. Some minor erosion has occurred at the toe of this training wall apparently due to this seepage. No seepage was observed along the toe of the spillway. A large amount of leakage is occurring through the dam into the vertical passage which runs from the gatehouse to the outlet conduit. This leakage appears to be coming through a structural crack from the upstream face of the dam. Leakage was estimated to be in excess of 250 gpm in this area. Seepage was also observed along the westerly abutment of the concrete-rock interface. Substantial seepage was also occurring through the bedrock west of the westerly abutment of the dam.

h. Monolith Joints and Construction Joints. All construction joints observed in the structure appeared to be tight and no movement or distress was observed. However, some efflorescence has developed at several of the joints in the gated control structure. The concrete to bedrock joint at the west end of the dam is open on the downstream face about one to two inches. Minor seepage is occurring at this joint, and the opening is likely due to weathering.

i. Foundation. The easterly and westerly abutments of the dam appear to be founded on bedrock. The middle portion of the dam may or may not be founded directly on bedrock. Based on visual observations no foundation distress is apparent.

j. Abutments. Some erosion has occurred at the easterly abutment and seepage is occurring at the toe of the dam in this area. The westerly abutment of the dam is founded directly on bedrock. The bedrock appears to be significantly fractured and substantial seepage is occurring through it.

2. EMBANKMENT STRUCTURES

The only embankment portion of the dam is on the easterly end of the dam. It is about 50 feet in length.

a. Settlement. No settlement or evidence of localized depressions was observed.

b. Slope Stability. The downstream face of the embankment slope is tree and brush covered and appears stable. The upstream slope is also tree and brush covered. Some erosion has occurred at the edge of the pond. The earth embankment appears stable.

c. Seepage. No seepage was observed downstream of the earth embankment except at the junction with the concrete abutment at the east end of the spillway.

d. Drainage Systems. None.

e. Slope Protection. No rip-rap exists on the upstream slope of the embankment portion of the dam. No serious erosion has occurred, however.

3. SPILLWAY STRUCTURES

The spillway consists of a concrete free overfall wier with flashboards, and a section with stop logs.

a. Control Gates and Operating Machinery. There are no spillway control gates. A stop log outlet exists at the west end of the spillway.

b. Unlined Saddle Spillways. There is very little freeboard at the dam and an unlined saddle spillway exists east of the embankment section of the dam. No erosion in this area is evident, however. A saddle spillway also exists west of the dam near the Powder Mills Road. This saddle has a concrete dike wall and although it appears that it has been overtopped, no serious erosion has occurred. There is some seepage through the west dike.

c. Approach and Outlet Channel. The approach channel to the spillway appears to be clear and unobstructed. The outlet channel has many trees and some debris in it.

d. Stilling Basin. The stilling basin is a combination of a plunge pool which has developed over the life of the structure and a horizontal apron. No serious scour or erosion was observed.

4. OUTLET WORKS

The outlet of the dam consists of a gated 4-foot diameter conduit. The conduit is a wood stave pipe with a steel lining. This outlet comprises the remnants of a former penstock to a downstream power generating station.

a. Intake Structure. The intake structure could not be examined due to the depth of headwater. It appeared that this area was clear and unobstructed. There is a trash rack upstream of the inlet. Little or no debris had accummulated on the trash rack.

b. Operating and Emergency Control Gates. The operating equipment for the gated outlet appeared to be in fair condition. It was reported that the equipment has not been used in several years. It was noted that the equipment is not lubricated and it appears that it would be difficult to operate the gate.

c. Conduits, Sluiceways and Water Passages. The steel lined wood stave pipe which makes up the outlet conduit was found to be in very poor condition. The interior surface of the pipe was badly corroded and the wood stave portion of the pipe has deteriorated.

d. Stilling Basin. The stilling basin consists of the channel downstream of the dam. No serious erosion or scour was observed.

e. Approach and Outlet Channels. The approach and outlet channels to the outlet works are the reservoir and the downstream channel, respectively. These are discussed in Sections 6 and 7 below.

f. Drawdown Facilities. During low to normal flow conditions, the gated outlet works can be used to drawdown the water surface of the reservoir. However, considerable maintenance to the outlet works is required before they can be used in normal operating procedures. The stop log spillway can be used to drawdown the water surface elevation below the free overfall spillway to allow maintenance of the spillway crest.

5. RESERVOIR

a. Shoreline. No active or inactive landslide areas were observed. Chance of slope failure above high water appeared minimal. Powder Mills Road along the west shore has only about 1 to 1-1/2 feet of freeboard in some places.

b. Sedimentation. The extent of sedimentation could not be definitively determined during the field inspection. However, the sediment accumulation does not impede flow to the spillway sections.

c. Potential Upstream Hazard Area. The small amount of freeboard existing between the normal water surface elevation (586.0 ft) and the Powder Mills Road creates a potential for flooding along the road.

d. Watershed Runoff Potential. No significant changes in watershed runoff potential are expected to occur in the near future.

6. DOWNSTREAM CHANNEL

The channel of the Merrymeeting River below the New Durham Dam is composed of cobble to boulder sized bed material and averages about 25 feet wide. The overbank areas are heavily forested with many trees overhanging the stream.

7. OPERATING AND MAINTENANCE FEATURES

a. Reservoir Regulation Plan. Although no formal plan was disclosed, an attempt is made to keep the reservoir water surface elevation close to normal pool (elev. 586 ft) by adjusting stop log height.

b. Maintenance. The concrete in the area of the controlled outlet has deteriorated seriously and lacks maintenance. The gate works also appear to lack maintenance.

APPENDIX B

ENGINEERING DATA

This appendix lists the engineering data collected from project records and other sources of data developed as a result of the visual inspection. The contents of this appendix are listed below.

Appendix	Description
B-1	General Project Data
B-2	Past Inspection Reports

APPENDIX B-1

GENERAL PROJECT DATA

I. The following material relative to the New Durham Dam is on file at the New Hampshire Fish and Game Department offices in Concord, New Hampshire.

   A. Site Plans: Showing right-of-way for former penstock through Bickford land and Jones land.

   B. Drawing No. E-49-A "Reconstruction-Jones Dam" Fish and Game Department (February 1959).

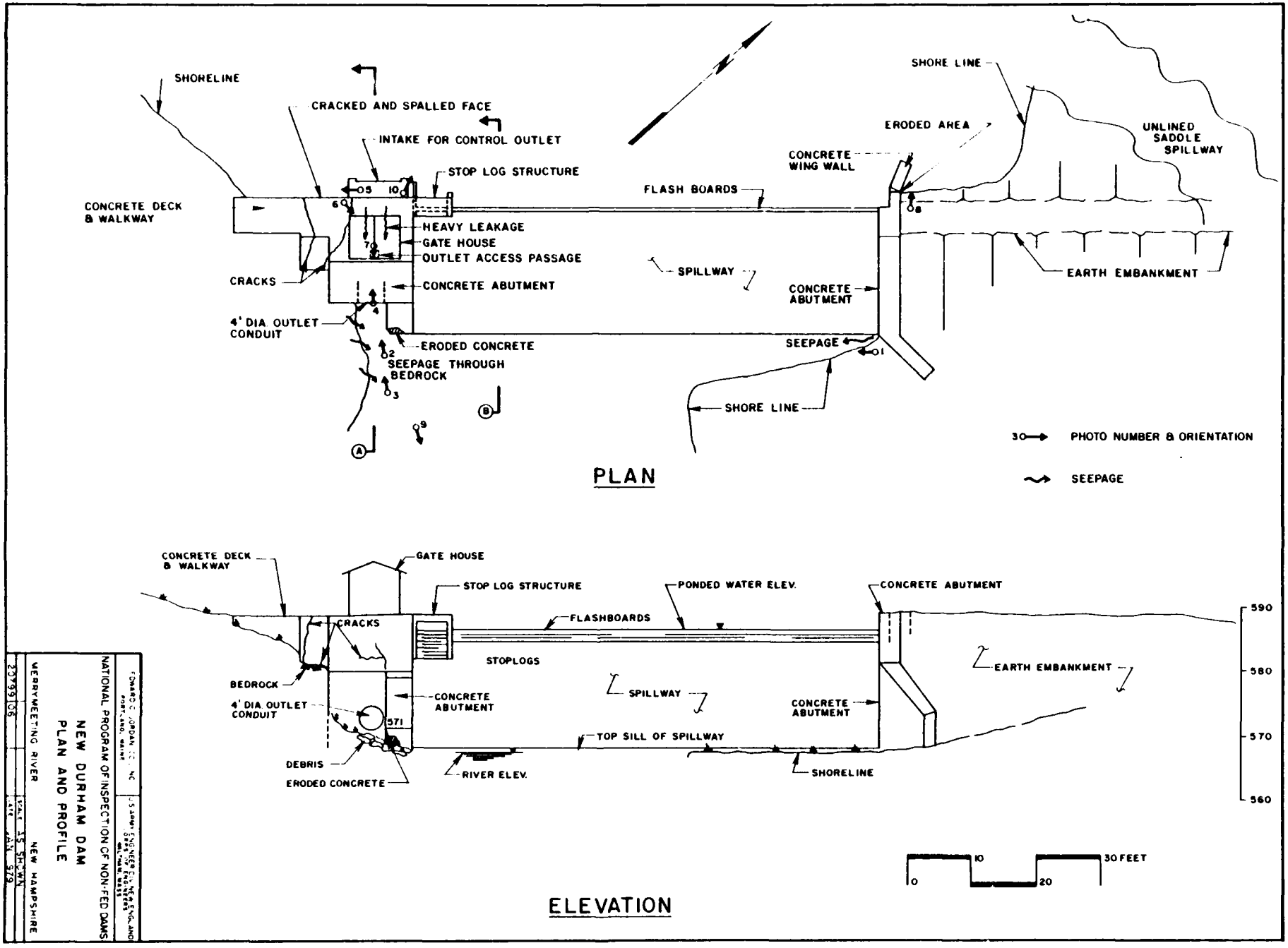
II. The following material is available at the office of the New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire:

   A. Periodic inspection reports, copies of which are attached as Appendix B-2 of this report.

   B. Photographs taken of dam at various times during the period 1934 to present.

   C. Miscellaneous correspondence and survey data.

III. The following plan, profile and cross-section sketches of the dam were developed from a limited stadia survey performed during visual inspection, field notes taken by inspection team members, and photographs taken during the visual inspection.


SHORELINE
CRACKED AND SPALLED FACE
INTAKE FOR CONTROL OUTLET
STOP LOG STRUCTURE
CONCRETE DECK & WALKWAY
HEAVY LEAKAGE
GATE HOUSE
OUTLET ACCESS PASSAGE
CRACKS
CONCRETE ABUTMENT
4' DIA. OUTLET CONDUIT
ERODED CONCRETE
SEEPAGE THROUGH BEDROCK
FLASH BOARDS
SPILLWAY
CONCRETE WING WALL
ERODED AREA
SHORE LINE
UNLINED SADDLE SPILLWAY
CONCRETE ABUTMENT
EARTH EMBANKMENT
SEEPAGE
SHORE LINE
30 PHOTO NUMBER & ORIENTATION
SEEPAGE
PLAN
CONCRETE DECK & WALKWAY
GATE HOUSE
STOP LOG STRUCTURE
PONDED WATER ELEV.
CONCRETE ABUTMENT
CRACKS
FLASHBOARDS
STOPLOGS
BEDROCK
4' DIA OUTLET CONDUIT
CONCRETE ABUTMENT
SPILLWAY
CONCRETE ABUTMENT
EARTH EMBANKMENT
TOP SILL OF SPILLWAY
DEBRIS
ERODED CONCRETE
RIVER ELEV.
SHORELINE
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580
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30 FEET
ELEVATION
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
NEW DURHAM DAM
PLAN AND PROFILE
MERRYMEETING RIVER
NEW HAMPSHIRE
EDWARD C. JORDAN CO., INC.
PORTLAND, MAINE
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
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DATE
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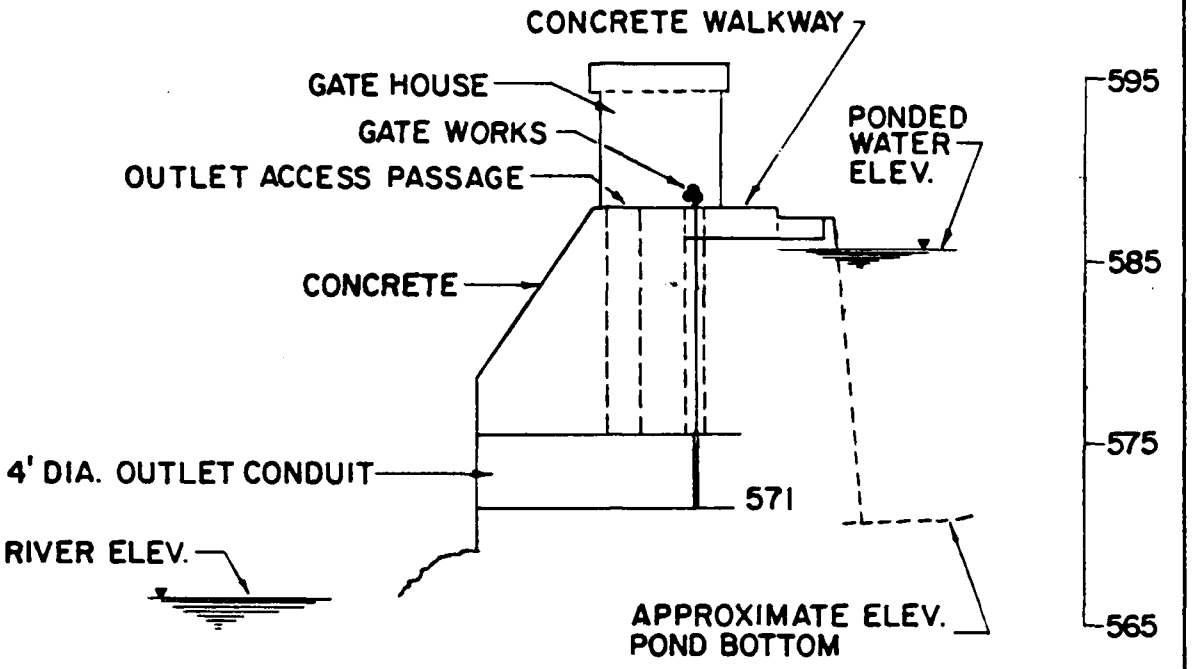
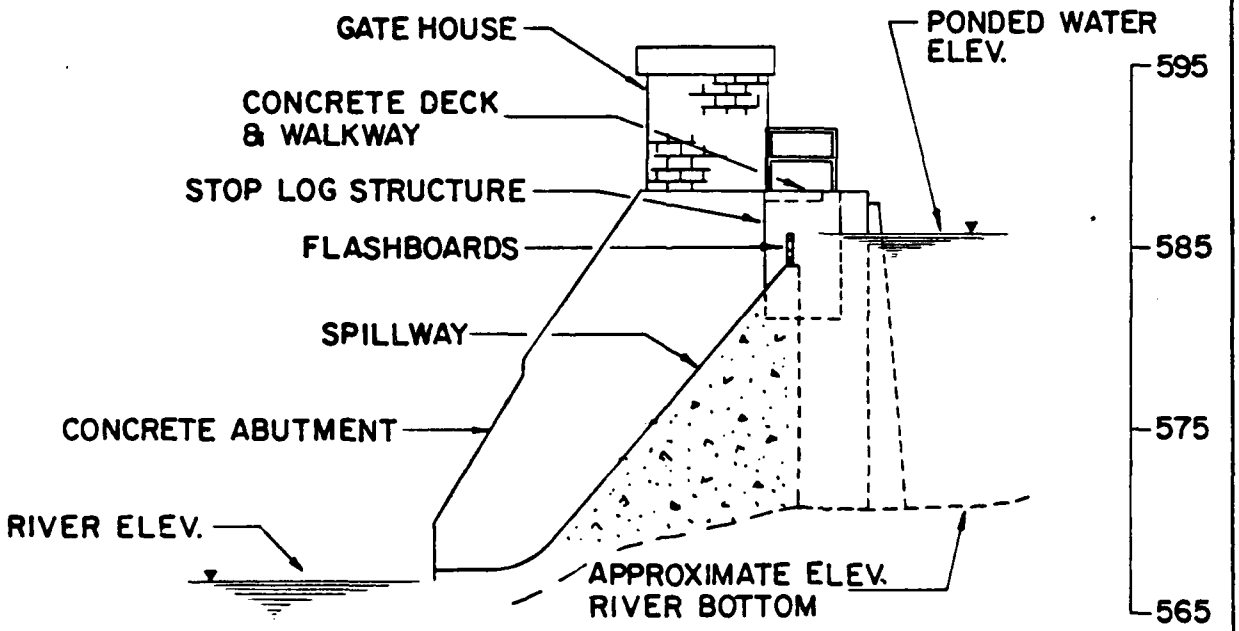
SCS 66-C2



SECTION A



SECTION B

5 0 5 10 FEET

EDWARD C. JORDAN CO., INC. PORTLAND, MAINE

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

NEW DURHAM DAM

CROSS SECTION

20799-05

SCALE AS SHOWN

DATE FEB 1979

APPENDIX B-2

PAST INSPECTION REPORTS

Attached are copies of inspection reports pertaining to the New Durham Dam on file with the New Hampshire Water Resources Board in Concord, N.H.

PUBLIC SERVICE COMMISSION OF NEW HAMPSHIRE—DAM RECORD I-4517

TOWN	New Durham	TOWN NO. 2	STATE NO. 170.12
RIVER STREAM	Merrymeeting River (New Durham Dam)		
DRAINAGE AREA		POND AREA	
DAM TYPE	Gravity	FOUNDATION NATURE OF	Earth-ledge one end
MATERIALS OF CONSTRUCTION	Concrete		
PURPOSE OF DAM	POWER—CONSERVATION—DOMESTIC—RECREATION—TRANSPORTION—PUBLIC UTILITY		
HEIGHTS TOP OF DAM TO BED OF STREAM	27'	TOP OF DAM TO SPILLWAY CRESTS	8'
SPILLWAYS, LENGTHS DEPTHS BELOW TOP OF DAM	76'	LENGTH OF DAM	208' Approx.
FLASHBOARDS TYPE, HEIGHT ABOVE CREST	Removable stop planks 6'		
OPERATING HEAD CREST TO N. T. W.	52'	TOP OF FLASHBOARDS TO N. T. W.	
WHEELS, NUMBER KINDS & H. P.	1-Lefell vertical turbine 18" - 240 HP.		
GENERATORS, NUMBER KINDS & K. W.	1-G.E.A.C Direct Connected 600 R.P.M. 4000V - 32.5A	.8 P.F. 180 KW. 3 phase	#4019450
H. P. 90 P. C. TIME 100 P. C. EFF.		H. P. 75 P. C. TIME 100 P. C. EFF.	
REFERENCES, CASES, PLANS, INSPECTIONS.	File under New Durham		

REMARKS

OWNER- George H. Jones

CONDITION- Good

MENACE- Yes. Will be subject to periodic inspection.

COPY

To the Public Service Commission:

The foregoing memorandum on the above dam is submitted covering inspection made July 29, 1935 according to notification to owner dated July 24, 1935, and bill for same is enclosed.

Samuel J. Lord
Hyd. Eng.

Sept. 12, 1935
Copy to Owner

NEW HAMPSHIRE WATER CONTROL COMMISSION

REPORT ON DAM INSPECTION

TOWN New Durham DAM NO. 170.02 STREAM Merrymeeting River

OWNER Public Service Co. of N.H. ADDRESS Manchester, N.H.

In accordance with Section 20 of Chapter 133, Laws of 1937, the above dam was inspected by me on Aug. 2, 1950 accompanied by _____

NOTES ON PHYSICAL CONDITION

Abutments Fair - extensive scaling on left abutment & cracking at junction of spillway & abutments. - Not dangerous as yet.

Spillway Fair - Extensive scaling which has just progressed sufficiently to be dangerous

Gates Operable

Other

COPY

CHANGES SINCE LAST INSPECTION deterioration

FUTURE INSPECTIONS Yes

This dam (is) ~~(is not)~~ a menace because at least and perhaps 2nd property downstream.

REMARKS Pond within 28" to 30" of top of abutments, possible leaks some but have had new dams just in recently.

Copy to Owner	Date

Francis C. Wyse
INSPECTOR

(Additional Notes Over)

N. H. WATER RESOURCES BOARD
Concord, N. H. 03301

DAM SAFETY INSPECTION REPORT FORM

Town: New Durham Dam Number: 120.02

Inspected by: S Burritt Date: 6 Aug 1975

Local name of dam or water body: Jones dam

Owner: NH F&G Address: Concord

Owner was/was not interviewed during inspection.

Drainage Area: 15.6 sq. mi. Stream: Merry meeting

Pond Area: 300 ~~E~~ I Acre, Storage _____ Ac-Ft. Max. Head 19 Ft.

Foundation: Type _____, Seepage present at toe - Yes/(No) yes on D.

Spillway: Type Overflow, Freeboard over perm. crest: 2',

Width 76, Flashboard height 2',

Max. Capacity _____ c.f.s.

Embankment: Type Earth Dike, Cover Grass Width 5',

Upstream slope 0 to 1; Downstream slope 3 to 1

Abutments: Type Concrete, Condition: Good, Fair, Poor

Gates or Pond Drain: Size 6"? Capacity _____ Type Bankstock end

Lifting apparatus _____ Operational condition good

Changes since construction or last inspection: _____

Downstream development: _____

This dam would/would not be a menace if it failed.

Suggested reinspection date: _____

Remarks: _____

COPY

NEW HAMPSHIRE
WATER RESOURCES BOARD

SITE EVALUATION DATA

OWNER: NH F & G Dept TELEPHONE NO. _____

MAILING ADDRESS: Bridge St Concord

SITE LOCATION (TOWN OR CITY) New Durham

NAME OF STREAM OR WATERBODY: Merrymeeting

QUADRANGLE: Alton LOCATION RT 3.92 Dn 3.78

HEIGHT OF (PROPOSED, EXISTING) DAM 19 LENGTH 200 ±

TYPE OF (PROPOSED, EXISTING) STRUCTURE _____

DRAINAGE AREA 15.6 SM POND AREA 300 A

AVAILABLE ARTIFICIAL STORAGE: PERMANENT: _____ TEMPORARY: _____ TOTAL 1000 AF

EXISTING DEVELOPMENT DOWNSTREAM OF (PROPOSED, EXISTING) STRUCTURE _____

COPY

POTENTIAL DEVELOPMENT DOWNSTREAM OF (PROPOSED, EXISTING) STRUCTURE _____

POTENTIAL DAMAGE DOWNSTREAM OF STRUCTURE (EXPLAIN IN DETAIL AND INCLUDE ANY POTENTIAL LOSS OF LIFE ESTIMATE) _____

OTHER COMMENTS: _____

CLASS OF STRUCTURE -- NON MENACE: MENACE A B C DAM # 177.02

DATE OF INSPECTION: 6 Aug 75

SIGNED J Burritt

SIGNATURE

DATE:

APPENDIX C

PHOTOGRAPHS

The following are photographs referenced in this report. See Plan in Appendix B-1 for photograph locations and orientations.

1

WEST ABUTMENT & GATED OUTLET;
NOTE CRACKING

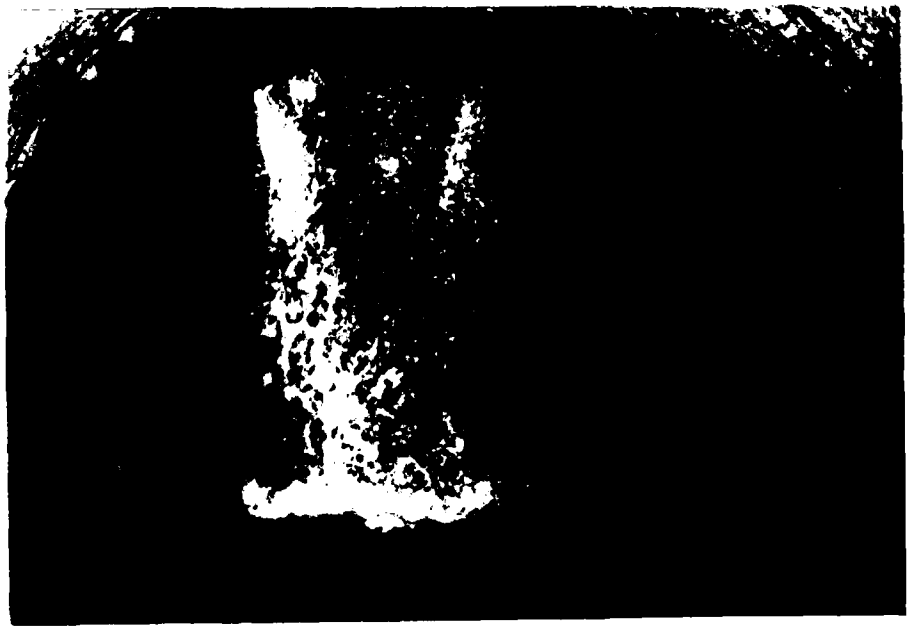
2

SPILLWAY, VIEW TOWARD WEST ABUTMENT

3

VIEW OF WEST ABUTMENT AND GATED OUTLET

SHOWING EROSION OF CONCRETE AT TOE.



4

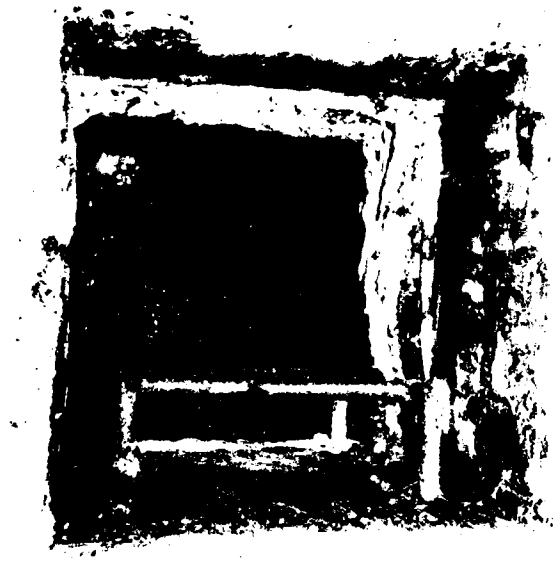
GATED OUTLET CONDUIT.

5

WEST END OF DAM - UPSTREAM SIDE;
NOTE EROSION OF CONCRETE.

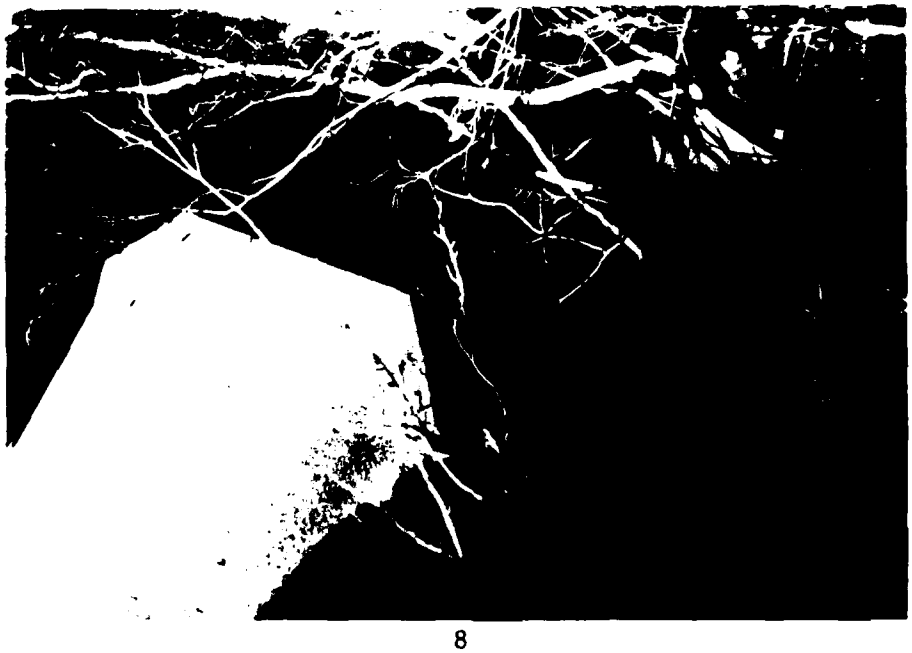
6

CONTROLLED OUTLET GATEHOUSE INTERIOR.
NOTE EROSION OF CONCRETE BELOW HOIST MECHANISM.
ACCESS HATCH TO OUTLET CONDUIT IS SEEN AT RIGHT BACKGROUND



7

CONTROLLED OUTLET GATE
VIEW DOWN ACCESS
HATCH SHOWING
SPALLING OF CONCRETE
AND MAJOR LEAK
THROUGH STRUCTURE

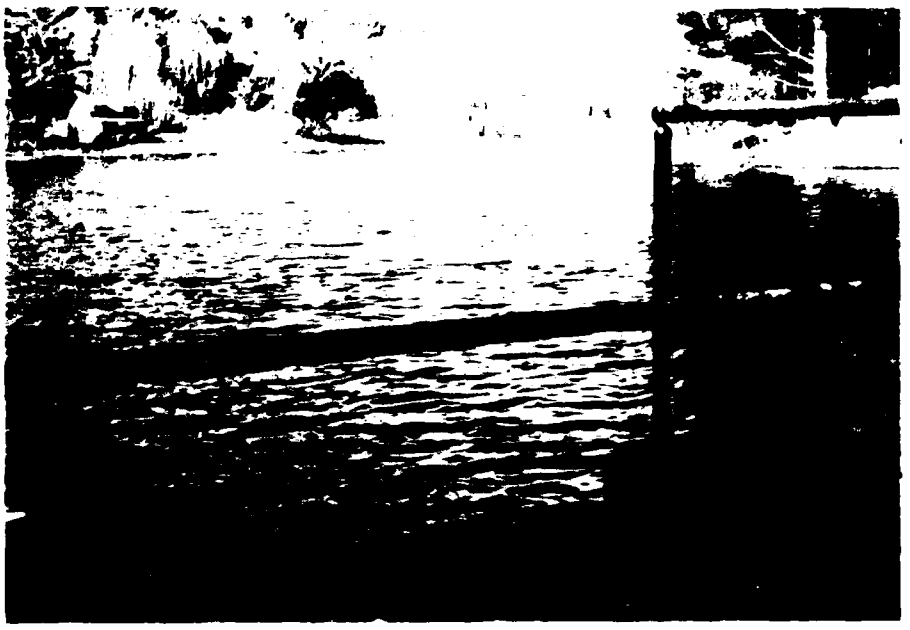


8

EAST ABUTMENT, UPSTREAM SIDE.
NOTE EROSION BEHIND ABUTMENT.

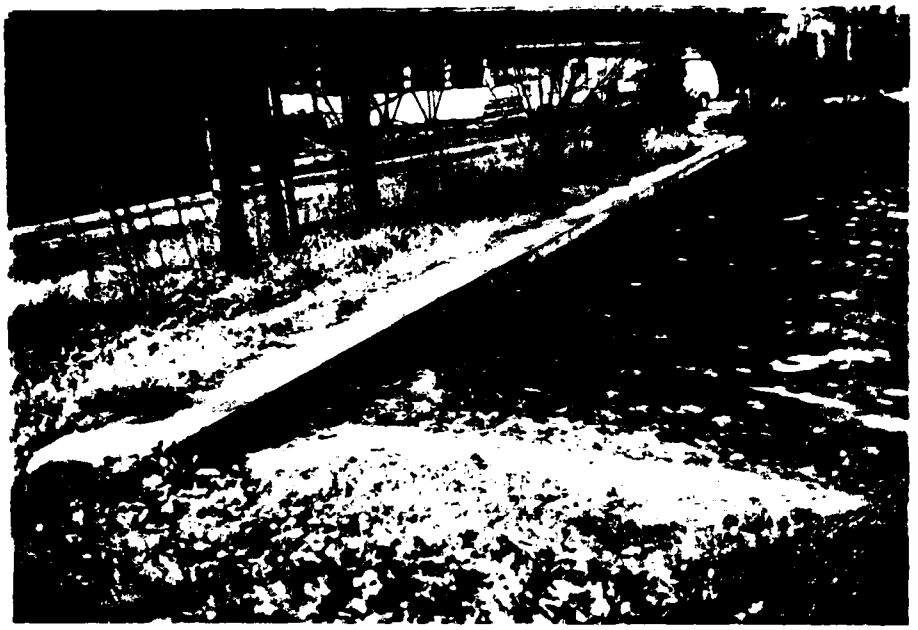
9

CHANNEL DOWNSTREAM OF DAM



10

VIEW UPSTREAM FROM GATEHOUSE



11

DIKE WITH CONCRETE WALL AT ROADSIDE
ABOUT 200 FEET WEST OF NEW DURHAM DAM

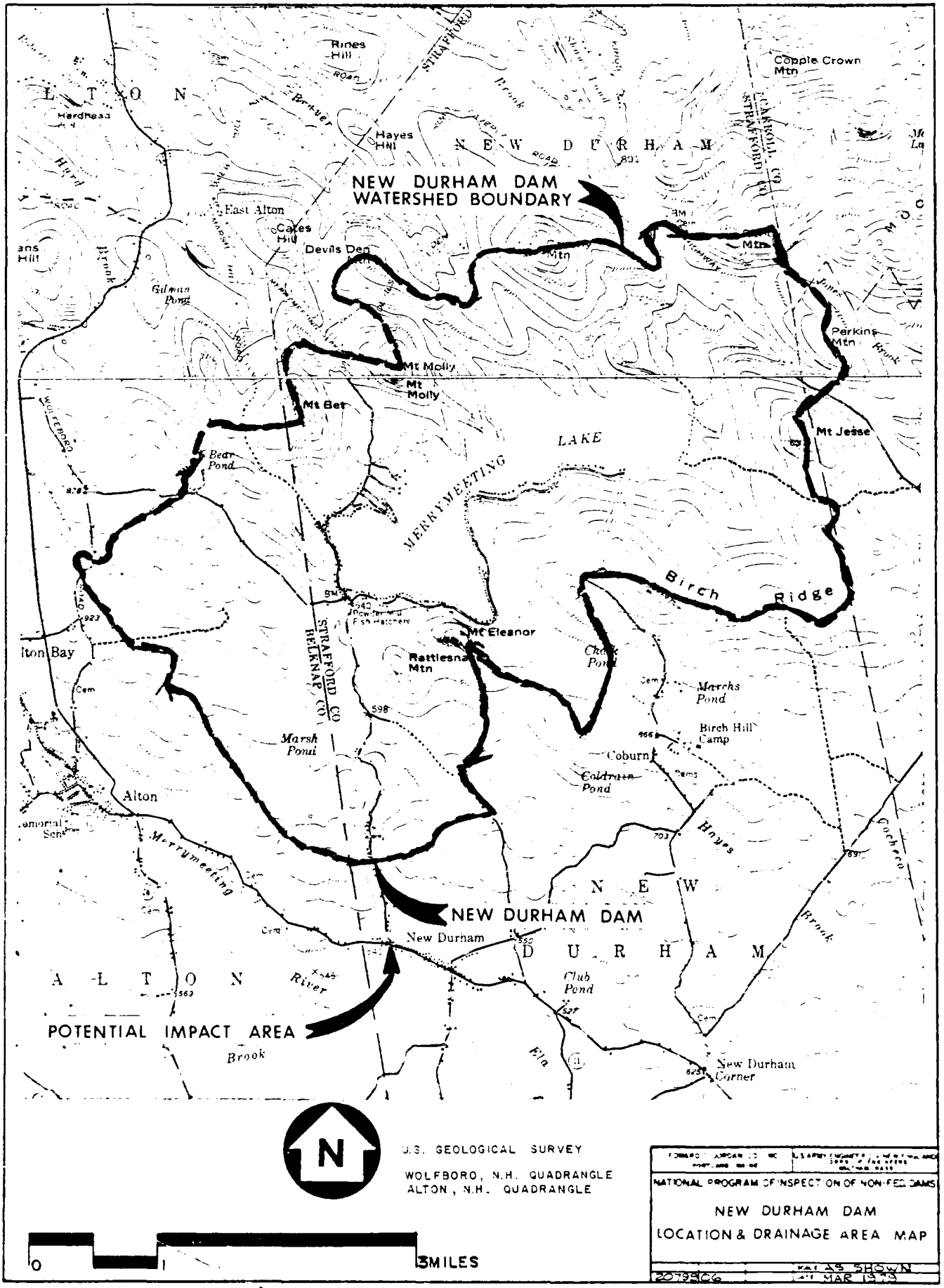
12

DOWNSTREAM VIEW OF BRIDGE 0.7 MILES DOWNSTREAM
FROM NEW DURHAM DAM

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Hydrologic computations pertinent to this investigation are attached. The following figure shows the Merrymeeting River watershed at the New Durham Dam.



U.S. GEOLOGICAL SURVEY

WOLFBORO, N.H. QUADRANGLE
ALTON, N.H. QUADRANGLE

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

NEW DURHAM DAM
LOCATION & DRAINAGE AREA MAP

SCALE AS SHOWN
DATE MAR 1978

20739C6

PROJECT	COMP BY	JOB NO.
C.O.E. DAM INSPECTION PROGRAM	JJD	20799
New Durham Dam	CHK BY BTB	DATE 1-9-79

Test Flood Analysis

Flow at the New Durham Dam is affected by the existence of Merrymeeting Lake. The drainage area above the New Durham Dam is 16.3 square miles. The drainage area above Merrymeeting Lake Dam is 11.1 square miles. Intervening drainage is 5.2 square miles. Merrymeeting Lake has a surface area of 1,120 acres which represents 11 % of the entire drainage area above New Durham Dam.

The MPF and ½ MPF at New Durham Dam will be determined as follows:

1. Determine a MPF and ½ MPF discharge rates for the 16.3 square mile drainage using guide curves
2. Using guidelines, rout (11.1/16.3) × (PMF discharge) through Merrymeeting Lake (same with ½ PMF).
3. Compare routed PMF with remaining portion of PMF to determine if both are significant
4. If both are significant, add routed PMF (½ PMF) with 80% of the unrouted PMF (½ PMF) to obtain PMF (½ MPF) at New Durham Reservoir
5. Rout PMF (½ PMF) through New Durham Reservoir

Note: The 80% in (4.) above is an attempt to account for the resulting lack of syncronization of the peaks due to the routing through Merrymeeting Lake

The drainage area above Merrymeeting Lake is to be referred to as D-1, the remaining drainage area as D-2.

1. PMF and ½ PMF discharge rates
   - using a curve mid-way between rolling and mountainous:
     PMF = 1,650 csm

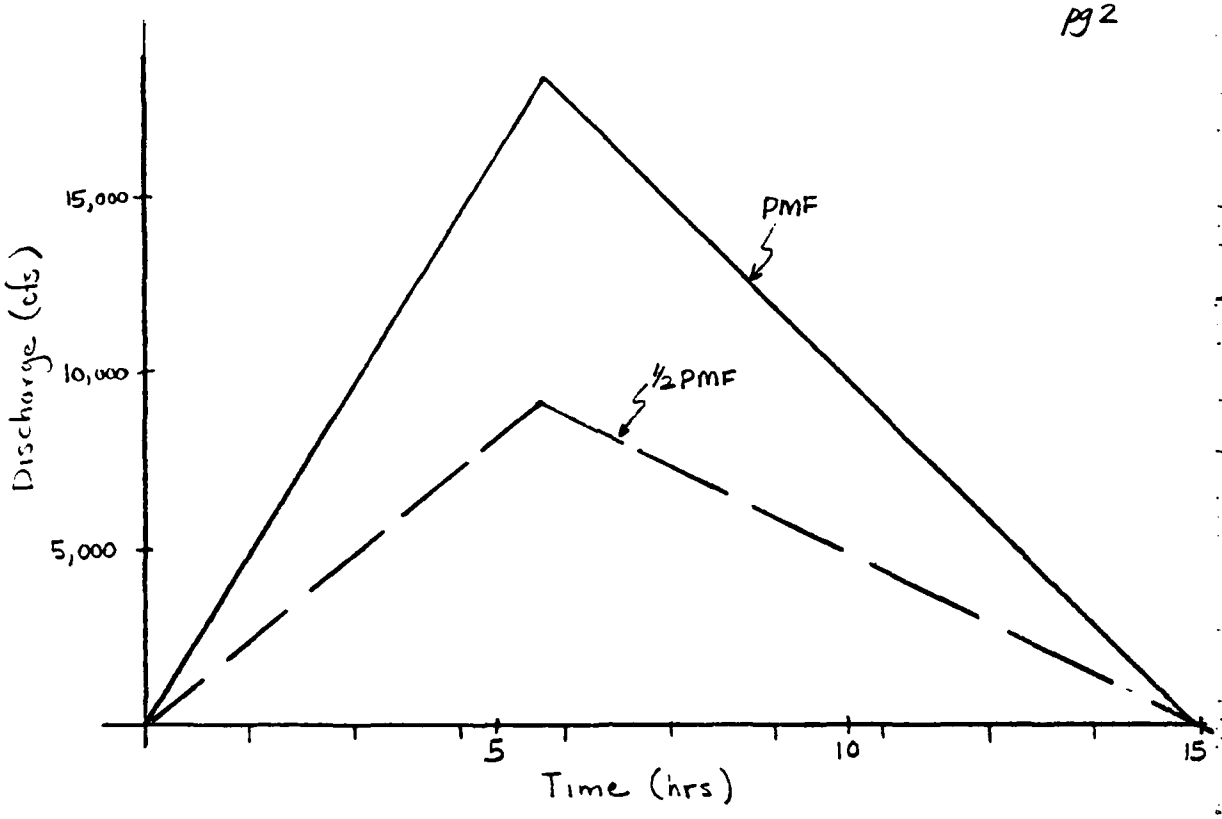
2. Storage Routing through Merrymeeting Lake
   a) Inflow hydrograph
      PMF peak = 1,650 csm × 11.1 mi² = 18,315 cfs
      Time to peak:
      19" of runoff from 11.1 mi² = 11,248 ac.-ft. (total area under hydrograph)

$$11,248 = \frac{1}{2}(18,315) \times B$$

$$B = 14.9 \text{ hours (total time of runoff)}$$

Time to peak = 14.9 ÷ 2.67 = 5.6 hours

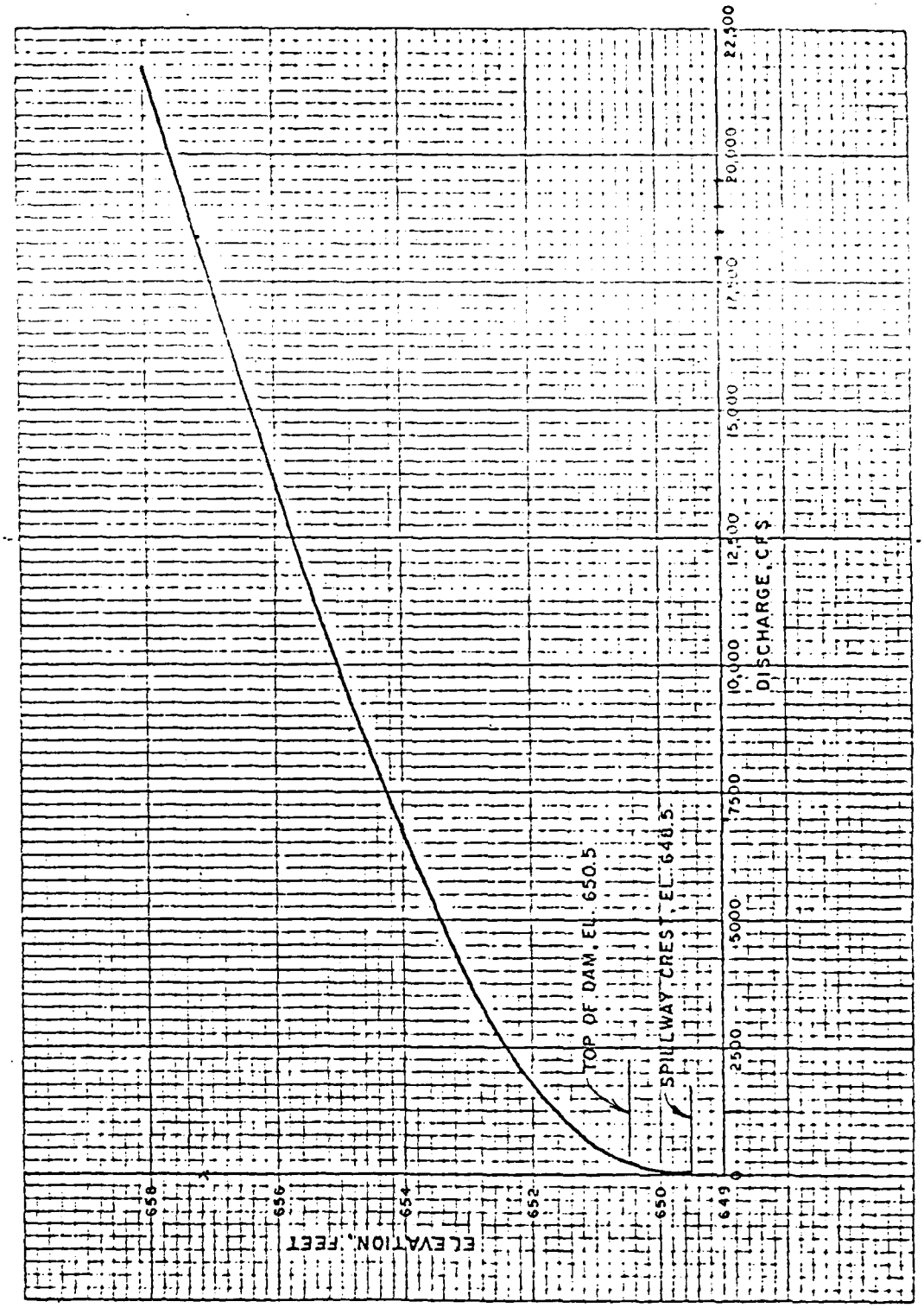
PROJECT	COMP BY	JOB NO.
	CHK BY BTB	DATE



b) Storage - Discharge Relationship - Merrymeeting Lake

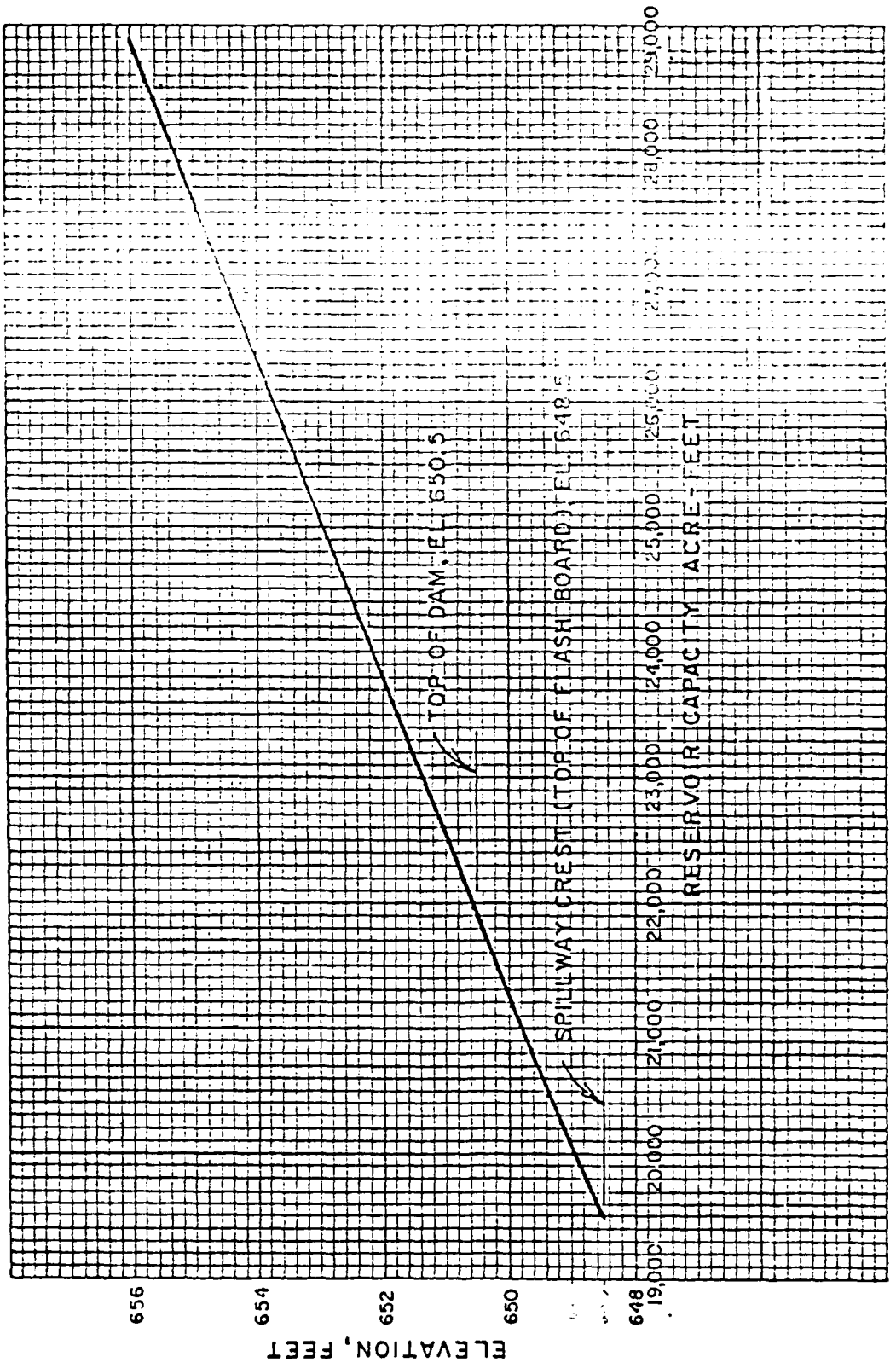
Data on Merrymeeting Lake:

Merrymeeting Lake is presently operated by the New Hampshire Fish and Game Dept. for recreational purposes. The primary purpose of the dam is for lake level control. The Lake also supplies water to the Powder Mills Fish Hatchery.



MERRYMEETING LAKE DAM
SPILLWAY AND OVERTOP
RATING CURVE

GRAPH FROM PHASE I INSPECTION REPORT, MERRYMEETING LAKE DAM, APPENDIX D, 1978



MERRYMEETING LAKE DAM
RESERVOIR CAPACITY CURVE

GRAPH FROM PHASE I INSPECTION REPORT, MERRY-MEETING LAKE DAM, APPENDIX D. 1979

PROJECT	COMP BY	JOB NO.
NEW DURHAM DAM	JJD	20799-06
ROUTING OF PMF & ½ PMF THRU MERRYMEETING	CHK BY BTB	DATE 2/5/79

ROUTING OF PMF THROUGH MERRYMEETING LAKE

(1) PEAK INFLOW (PMF), Q_{p1} = 18,315 CFS

(2) a. SURCHARGE HEIGHT TO PASS Q_{p1}

SURCHARGE HEIGHT = 657.2 FEET

b. VOLUME OF SURCHARGE IN INCHES OF RUNOFF ($STOR_1$)

$$\text{VOL} = 30,400 - 19,500 = 10,900 \text{ AC.-FT.}$$
$$= 10,900 \text{ A-F} \times \frac{1}{7,104} \times \frac{12}{1} = 18.4 \text{ INCHES}$$

c. $$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR_1}{19}\right)$$
$$= 18,315\left(1 - \frac{18.4}{19}\right) = 578 \text{ CFS}$$

(3) a. SURCHARGE HEIGHT TO PASS Q_{p2} = 651.0 FT

b. $STOR_2 = 22,700 - 19,500 = 3,200$ A-F
$= 5.4$ INCHES OF RUNOFF

c. $(STOR_1 + STOR_2)/2 = 11.9$ IN. $= STOR_{AVE1}$

$$Q_{p3} = 18315\left(1 - \frac{11.9}{19}\right) = 6,844 \text{ CFS}$$

(4) a. HEIGHT TO PASS Q_{p3} = 654.0 FT

b. $STOR_3 = 26,350 - 19,500 = 6,850$ A-F
$= 11.6$ IN.

c. $(STOR_3 + STOR_{AVE})/2 = 11.75 = STOR_{AVE2}$

$$Q_{p4} = 18315\left(1 - \frac{11.75}{19}\right) = 6,988 \text{ CFS}$$

(5) a. HEIGHT TO PASS Q_{p4} = 654.1 FT

PROJECT	COMP BY	JOB NO.
NEW DURHAM DAM ROUTING OF ½ PMF THRU MERRYMEETING LAKE	JJD	2079-06
	CHK BY BTB	DATE 2-5-79

ROUTING OF ½ PMF THRU MERRYMEETING LAKE

(1) PEAK INFLOW (½ PMF), Q_{p1} = 9,158 CFS

(2) a. SURCHARGE HEIGHT TO PASS Q_{p1} = 654.8 FT

b. $STOR_1$ = 27,350 − 19,500 = 7,850 A-F
= 13.3 INCHES OF RUNOFF

c. $Q_{p2} = 9158\left(1 - \frac{13.3}{9.5}\right) < 0$, ∴ Q_{p2} = 0 CFS

(3) a. SURCHARGE HEIGHT TO PASS Q_{p2} = 648.5 FT

b. $STOR_2$ = 0 A-F = 0 INCHES

c. $(STOR_1 + STOR_2)/2$ = 6.7 INCHES = $STOR_{AVG1}$

$$Q_{p3} = 9158\left(1 - \frac{6.7}{9.5}\right) = 2,700 \text{ CFS}$$

(4.) a SURCHARGE HEIGHT TO PASS Q_{p3} = 652.5 FT

b. $STOR_3$ = 24,500 − 19,500 = 5,000 A-F
= 8.45 INCHES

c. $(STOR_3 + STOR_{AVE1})/2$ = 7.6 INCHES

$$Q_{p4} = 9158\left(1 - \frac{7.6}{9.5}\right) = 1,832 \text{ CFS}$$

(5) a. HEIGHT TO PASS Q_{p4} = 652.1 FT

b. $STOR_4$ = 24,000 − 19,000 = 4,500 A-F
= 7.6 INCHES

∴ Q = 1,832 CFS @ 652.1 FT

EDWARD C. JORDAN CO., INC.

PROJECT	COMP BY JJD	JOB NO. 20799-06
	CHK BY BTB	DATE 2-5-79

TOTAL PMF INFLOW TO NEW DURHAM DAM:

$$PMF = 7{,}000 \text{ CFS} + .8(5.2)(1{,}650)$$

- 7,000 CFS: MERRYMEETING LAKE OUTFLOW
- .8: FACTOR FOR LACK OF SYNCHRONIZATION OF PEAKS DUE TO ROUTING
- 5.2: REMAINING D.A.
- 1,650: C.S.M RATE FOR PMF

$$PMF = 13{,}860 \text{ CFS} \cong 13{,}900 \text{ CFS}$$

$$1/2 \text{ PMF} = 1{,}832 \text{ CFS} + (.8)(5.2)(1650)(.5)$$

$$= 5{,}264 \text{ CFS}$$

PROJECT	COMP BY JJD	JOB NO. 6 20799-08
	CHK BY BTB	DATE 1-9-79

Spillway Capacity of New Durham Dam

The spillway of New Durham Dam has two distinct sections. One is a stop-log section with invert at 581.1 ft. with dimensions of 5' wide by 6' high. The other is a free overfall section 66 feet wide. Free overfall spillway crest elevation is 584.0 ft. Top of dam is at elevation 588.0 ft. There was two feet of flash board placed on top of the spillway at the time of inspection. The flashboard is supported by designed-to-fail flashrods.

A. Capacity of gated spillway section

	Elev (ft)	H (ft)	C[1]	L (ft)	Q (ft³/sec)
	580				
	580.5				
	581.0				
	581.5	0.4	2.58	5.0	3.3
	582.0	0.9	2.62	"	11.2
	582.5	1.4	2.64	"	22
	583.0	1.9	2.70	"	35
SPILLWAY CREST	584.0	2.9	2.89	"	71
	585.0	3.9	3.05	"	117
	586.0	4.9	3.32	"	180
	587.0	5.9	3.32	"	238
TOP OF DAM	588.0	6.9	3.32	"	301
	589.0	7.9	"	"	369
	590.0	8.9	"	"	441
	591.0	9.9	3.32	5.0	517
	592.0	10.9	"	"	597
	593.0	11.9	"	"	681
	594.0	12.9	"	"	769
	595.0	13.9	"	"	860
	596.0	14.9	"	"	955
	597.0	15.9	"	"	1,053
	598.0	16.9	"	"	1,153
	599.0	17.9	"	"	1,257
	600.0	18.9	"	"	1,364

[1] King & Brater, "Handbook of Hydraulics", Sixth Edition, Table 5-3, pg 5-40

PROJECT	COMP BY	JOB NO.
	CHK BY BTB	DATE

B. Capacity of Free overfall spillway

	Elev. (Ft)	H (ft)	C [1]	L (ft)	Q Ft³/sec
	584.0	0			0
	585.0	1.0	2.64	66	174
	586.0	2.0	2.76	"	515
	587.0	3.0	3.05	"	1,046
TOP OF DAM	588.0	4.0	3.32	"	1,742
	589.0	5.0	"	"	2,435
	590.0	6.0	"	"	3,201
	591.0	7.0	"	"	4,034
	592.0	8.0	"	"	4,928
	593.0	9.0	"	"	5,881
	594.0	10.0	"	"	6,887
	595.0	11.0	"	"	7,946
	596.0	12.0	"	"	9,054
	597.0	13.0	"	"	10,209
	598.0	14.0	"	"	11,409
	599.0	15.0	"	"	12,653
	600.0	16.0	"	"	13,939

[1] King & Brater, "Handbook of Hydraulics", Table 5-3, pg 5-40, Sixth Edition

The gated outlet works to the 4'ϕ outlet sleeve is considered operable but requires considerable maintenance to ensure its safe operation. Its maximum discharge capability is ~300 CFS AT PMF ELEVATION AND IS CONSIDERED INSIGNIFICANT.

C. The 20 foot section of top of dam on west side of dam - will act as a broad-crested weir with a 10' section having a breadth of 5.5 ft and a 10' section having a breadth of 10'

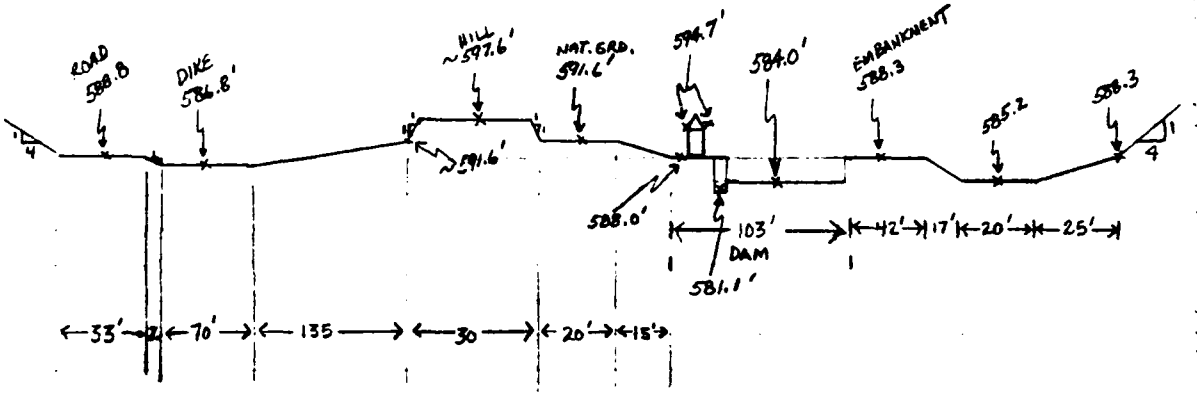
Elev (ft)	H (ft)	C_1 [1] (see above)	C_2 [1] (see above)	C_{AVG}	L	Q
589.0	1.0	2.68	2.68	2.68	20	54
590.0	2.0	2.65	2.64	2.65	"	150
592.0	4.0	2.70	2.64	2.67	"	427
594.0	6.0	2.79	2.64	2.72	"	800
596.0	8.0	"	"	"	"	1,231
598.0	10.0	"	"	"	"	1,720
600.0	12.0	"	"	"	"	2,261

PROJECT	COMP BY	JOB NO.
Item - spillway discharge New Durham Dam	JJD	20799-06
	CHK BY BTB	DATE 1-15-79

D.) Discharge over dam through non-spillway sections (Overland Flow)

The New Durham Dam is constructed in a narrow valley section of the Merrymeeting River. The elevation at top of dam is 588.0 ft. A 70 foot long dike is located west of the dam near the highway leading to Merrymeeting Lake. The top of the dike is at elev 586.8 ft (1.2 feet lower than top of dam). The highway is estimated to be at elev. 588.8 at the dike (or 2 feet higher than the dike). The cross-section across the top of dam shown below was derived from field inspection notes and USGS quads

Looking Upstream
NOT TO SCALE



Assume flow over non-spillway sections is governed by Mannings equation: $Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$

For slope, use average valley slope in vicinity of dam (from USGS quads) = .012
(From contour 560 ft to 540 ft = 1,690 ft.)

Manning's "n" values:
road = .016 (King & Brater, "Handbook of Hydraulics", for 'concrete-lined channel' pg 7-
other = .100 ("Design of Small Dams", Bureau of Reclamation, USDI, pg 577)
(badly obstructed by small trees)

elev	1.486/n	A	P	R	$R^{2/3}$	S	$S^{1/2}$	Q
588.0	14.9	214	164	1.305	1.194	.012	.1095	417
589.0	16.2 [1]	433	278	1.558	1.343	.012	.1095	1,035
590.0	18.0 [1]	731	319	2.292	1.738	.012	.1095	2,504
591.0	19.5 [1]	1,073	359	2.989	2.073	.012	.1095	4,759
592.0	20.6 [1]	1,466	411	3.567	2.333	.012	.1095	7,707
593.0	21.2 [1]	1,868	422	4.427	2.693	.012	.1095	11,653
594.0	21.5 [1]	2,291	433	5.291	3.033	.012	.1095	16,370
595.0								
596.0								

@587', A = 73
P = 121,
Q = 85 cfs

[1] "n"-weighted average with respect to "n". In calculation, a "Q" was determined for each section with a different "n" value

PROJECT	COMP BY	JOB NO.
	CHK BY BTB	DATE

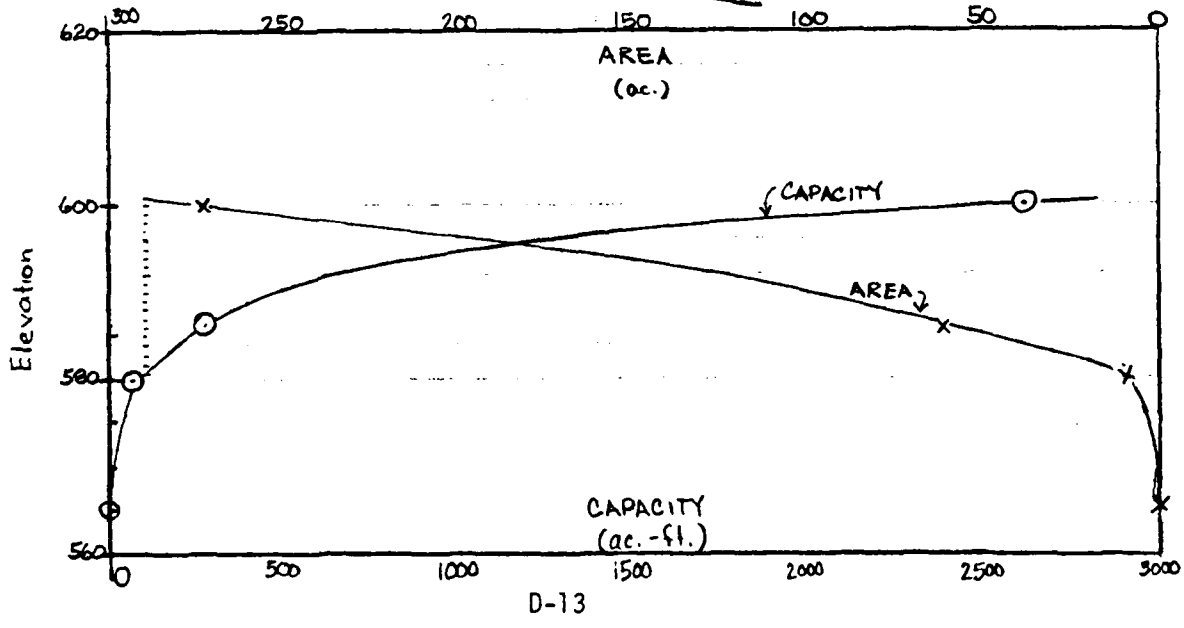
New Durham Dam – Area/Capacity Curves

1. Area assumptions
   assume area on USGS map corresponds to elevation 586.0 ft. which is the top of stop logs of the old dam (USGS map dated 1957, construction changes to dam began in 1959).

Elev (ft)	Area (ft^2)	
565.0	0	from reconstruction drawing NHFG
580.0	9.3 ac	From USGS map
586.0	61 ac	" " "
600.0	273 ac.	" " "

2. Capacities of New Durham Dam

Elev (ft.)	Area (ac)	Avg. Area (ac)	Depth (ft)	Δ Vol (acre-feet	Volume (ac.-ft.)
565.0	0				0
		4.65	15	69.8	
580.0	9.3				69.8
		35.2	6	211.2	
586.0	61				281
		167	14	2338	
600.0	273				2619



EDWARD C. JORDAN CO., INC.

PROJECT	COMP BY	JOB NO.
New Durham Dam HYDRAULICS	JJD	20799-06
	CHK BY BTD	DATE 1-15-79

Storage - Discharge Relationships

- stop log spillway crest at elev = 581.1 , capacity = 110 A-F

Elev (ft)	Surcharge Storage (ac.-ft.)	Overland Flow (cfs)	Spillway 1/ Discharge (cfs)	Total Discharge (cfs)
581.0	0		0	0
582.0	20		11	11
583.0	50		35	35
584.0	90		71	71
585.0	120		291	291
586.0	160	25	695	720
587.0	190	85	1,284	1,369
588.0	260	417	2,043	2,460
589.0	300	1,035	2,858	3,893
590.0	360	2,504	3,792	6,296
591.0	430	4,759	4,840	9,599
592.0	530	7,707	5,952	13,659
593.0	650	11,653	7,176	18,829
594.0	790	16,370	8,456	24,826
595.0	940			
596.0	1,140			
597.0	1,340			
598.0	1,610			
599.0	2,040			
600.0	2,510			

1/ INCLUDES FLOW OVER WEST SECTION OF TOP OF DAM.

EDWARD C. JORDAN CO., INC.

PROJECT	COMP BY	JOB NO.
NEW DURHAM DAM	JJD	20799-06
OVERTOPPING POTENTIAL	CHK BY BTB	DATE 1-29-79

. SURCHARGE HEIGHT TO PASS PMF FLOW OF 13,900 CFS = 592.0'

.. $STOR_1$ = 530 A-F = $\frac{530}{10,432} \times 12$ = .61 IN

.. $Q_{p2} = 13900\left(1 - \frac{.61}{19}\right)$ = 13,450 CFS

.. SURCHARGE HEIGHT TO PASS Q_{p2} = 591.9 FT

$STOR_2$ = 520 A-F = .60 IN

∴ Q_{p3} = 13,460 CFS

∴ EFFECT OF SURCHARGE STORAGE INSIGNIFICANT (ONLY 3% CHANGE)

PMF = 13,900 CFS @ ELEV 592.0 FT MSL
HEIGHT OF OVERTOPPING OF WEST PART OF DAM (ELEV 588.0) = 592.0 - 588.0 = 4.0 FT, HEIGHT OF OVERTOPPING OF EAST EARTH EMBANKMENT = 592.0 - 588.3 = 3.7 FT

½ PMF = 5,264 CFS @ ELEV 589.6
HEIGHT OF OVERTOPPING OF WEST PART OF DAM = 1.6 FT
" " " " EAST EARTH EMBANKMENT = 1.3 FT.

PROJECT	COMP BY	JOB NO.
NEW DURHAM DAM	JJD	20799-06
DAM FAILURE ANALYSIS	CHK BY BTB	DATE 1-29-79

DAM FAILURE ANALYSIS

(1) STORAGE AT TIME OF FAILURE = 375 AC.-FT.

(2) PEAK FAILURE OUTFLOW, Q_{pl}

$$Q_{pl} = \frac{8}{27} W_b \sqrt{G}\, Y_o^{3/2}, \quad W_b = 30\text{FT}$$

$$= \frac{8}{27}(30)(32.2^{1/2})(20.9)^{3/2}$$

$$= 4{,}820 \text{ CFS}$$

ASSUMING A FAILURE OF THE EAST WINGWALL EARTH EMBANKMENT. FROM THE ABUTMENT TO A DISTANCE OF 30 FT EAST OF THE ABUTMENT, THE EARTH EMBANKMENT HAS A RELATIVELY NARROW BREADTH. FURTHER EAST ALONG THE EMBANKMENT, THE BREADTH WIDENS CONSIDERABLY.

$Y_o = 588.3 - 567.4 = 20.9'$

(3) FLOW AT TIME OF FAILURE WITH STOPLOGS OF GATED SPILLWAY IN PLACE (WAT. SUR @ 588.3)

Q (OVERLAND + DAM OVERFLOW UNGATED SPILLWAY)	= 2,565 CFS
Q (FAILURE)	= 4,820 CFS
Q (TOTAL)	= 7,385 CFS

(4) FLOW AT MAX. CAPACITY OF DAM

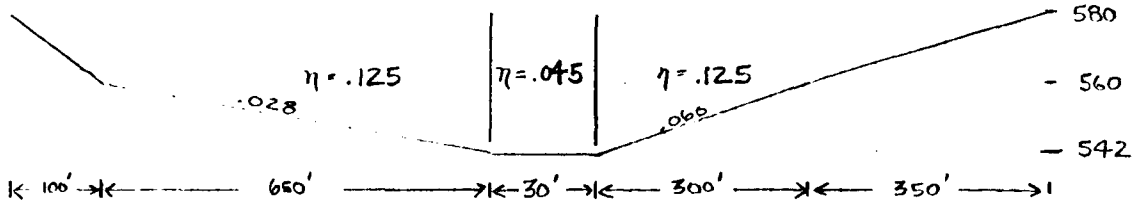
Q (DAM)	= 2,890 CFS
Q (FAIL.)	= 4,820 CFS
Q (TOTAL)	= 7,710 CFS

(5) TIME FOR RESERVOIR TO EMPTY, T

$$T = \frac{12.1\,S}{\frac{1}{2} Q_p} = \frac{12.1\,(375)}{\frac{1}{2}(7385)} = 1.23 \text{ HRS} \cong 74 \text{ MIN}$$

CROSS - SECTION #1
(LOCATED 1,400 FT BELOW RESERVOIR JUST ABOVE POND)
(ELEVS ESTIMATED FROM USGS QUAD)
LOOKING UPSTREAM

SLOPE = 20/1450 = .0138



STREAM

ELEV	1.486/n	A	P	R	S	Q
545	33.0	90	30	3.00	.0138	726
550	"	240	30	8.00	"	3,716
551	"	270	30	9.00	"	4,522
548	"	180	30	6.00	"	2,277
549	"	210	30	7.00	"	2,978

OVERBANK

ELEV	1.486/n	A	P	R	S	Q
545	11.9	236	157	1.503	.0138	432
550	11.9	1,676	419	4.000	"	5,898
549	11.9	1,283	367	3.496	"	4,128
548	"	943	314	3.003		2,744

TOTAL

ELEV	A	Q	ELEV	A	Q	ELEV	A	Q
545	326	1,158	549	1,493	7,106			
548	1,123	5,021	550	1,916	9,614			

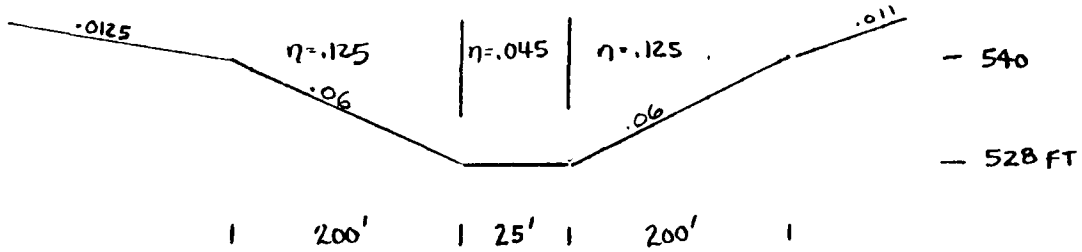
PROJECT

COMP BY JJD
CHK BY BTB
JOB NO. 20799-06
DATE 1-29-79

EDWARD C. JORDAN CO., INC.

CROSS-SECTION #2
(LOCATED ABOUT 4,000 FT BELOW NEW DURHAM DAM AT THE TOWN OF NEW DURHAM)

SLOPE = 20/3800 = .0052



STREAM

ELEV	1.486 n	A	P	R	S	Q
530	33.0	50	25	2 -	.0052	189
535	"	175	25	7 -	"	1,524
540	"	300	25	12 -	"	3,736
545	"	425	25	17 -	"	6,674

OVERBANK

ELEV	1.486 n	A	P	R	S	Q
530	11.9	80	80	1.00	.0052	69
535	"	817	234	3.49	"	1,612
540	"	2,400	401	5.99	"	6,780
545	"					

TOTAL

ELEV	A	Q
530	130	258
535	992	3,136

ELEV	A	Q
540	2,700	10,516

PROJECT

CHK BY BTB | COMP BY

DATE | JOB NO.

EDWARD C. JORDAN CO., INC.

PROJECT	COMP BY JJD	JOB NO. 20799-06
	CHK BY BTB	DATE 1-29-79

CROSS-SECTION #1 (1,400 FT. BELOW DAM)

$S = 375$ AC-FT
$q_1 = 7{,}385$ CFS TRIAL STAGE = 549.1 FT OR 7.1 FT

$$V_1 = \frac{1535 \times 1400}{43{,}560} = 49 \text{ AC-FT}$$

$$q_2 = 7385\left(1 - \frac{49}{375}\right) = 6{,}413 \text{ CFS}$$

$$V_2 = \frac{1370 \times 1400}{43{,}560} = 44 \text{ AC-FT}$$

$V_{AVE} = 46.5$ AC-FT

$$Q_1 = 7385\left(1 - \frac{46.5}{375}\right) = 6{,}470 \text{ CFS}$$

STAGE = 6.7 FT

CROSS-SECTION #2 (~4,000 FT BELOW DAM)

$S = 375$ AC-Ft
$q_1 = 6{,}470$ CFS

$$V_1 = \left(\frac{1{,}764 + 1{,}380}{2}\right) \times \frac{2{,}600}{43{,}560} = 94 \text{ AC-FT}$$

$$q_2 = 6470\left(1 - \frac{94}{375}\right) = 4{,}848 \text{ CFS}$$

$$V_2 = \left(\frac{1388 + 1100}{2}\right) \times \frac{2600}{43{,}560} = 74 \text{ AC-FT.}$$

$V_{AVE} = 84$ AC-FT

$$Q_2 = 6470\left(1 - \frac{84}{375}\right) = 5{,}021 \text{ CFS}$$

STAGE = 536.3 - 528.0 = 8.3 FT

APPENDIX E

Information as Contained in the National Inventory of Dams

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY	MO	YR
NH	345	NED	NH	017	01				NEW DURHAM DAM	4326.8	7010.7	24	JUL	79

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
JONES POND DAM	JONES POND

(16) REGION	(17) BASIN	(18) RIVER OR STREAM	(19) NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	(20) DIST FROM DAM (MI.)	(21) POPULATION
01	05	MERRYMEETING RIVER	NEW DURHAM	0	600

(22) TYPE OF DAM	(23) YEAR COMPLETED	(24) PURPOSES	(25) STRUCTURAL HEIGHT (FT.)	(26) HYDRAULIC HEIGHT (FT.)	(27) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
PGRE	1924	R	23	21	375	280	NED	N	N	N	N	24JUL79

(28) REMARKS
21-CONCRETE W/ EARTH EMBANKMENTS

(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) TYPE	(32) WIDTH (F.T.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	(38) LENGTH (F.T.)	(39) WIDTH (F.T.)	(40) LENGTH (F.T.)	(41) WIDTH (F.T.)	(42) LENGTH (F.T.)	(43) WIDTH (F.T.)	(44) LENGTH (F.T.)	(45) WIDTH (F.T.)
1	153	C	71	2470												

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
NH FISH AND GAME DEPT		

(49) REGULATORY AGENCY DESIGN	(50) CONSTRUCTION	(51) OPERATION	(52) MAINTENANCE
NONE	NONE	NONE	NHWRB

(53) INSPECTION BY	(54) INSPECTION DATE DAY | MO | YR	(55) AUTHORITY FOR INSPECTION
EDWARD C JORDAN CO INC	16NOV78	PUBLIC LAW 92-367 8AUG1972

(56) REMARKS
31-UNCONTROLLED 2170CFS CONTROLLED 300CFS

END

FILMED

8-85

DTIC