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NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
TILTON TOWN DAM (NH 0... (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUL 79

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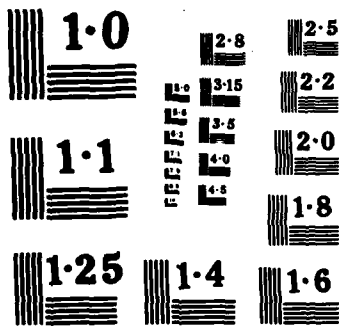
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MERRIMACK RIVER BASIN
TILTON, NEW HAMPSHIRE

TILTON TOWN DAM
NH 00151

STATE NO 237.02

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NH 00151	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Tilton Town Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE July 1979
		13. NUMBER OF PAGES 35
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Merrimack River Basin Tilton, new Hampshire Winnepesaukee River		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is 192 ft. long with a hydraulic height of 13 ft. The dam is in poor condition. Major concern is the poor condition of the timber frame spillway and wooden decking. It is small in size with a significant hazard potential.		

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: NH00151
 Name of Dam: Tilton Town Dam
 Town: Tilton
 County and State: Belknap, New Hampshire
 River: Winnepesaukee River
 Date of Inspection: April 6, 1979 and April 24, 1979

BRIEF ASSESSMENT

Tilton Town Dam has a hydraulic height of 13 feet and a total length of 192 feet. It is a low, run-of-the-river dam and consists of a timber frame spillway with wooden upstream decking placed between two concrete sluiceways each controlled by a timber gate. The dam spans a reach of the Winnepesaukee River and is located in south central New Hampshire. The drainage area to the site consists of 473 square miles and includes the 363 square mile Lake Winnepesaukee drainage area. Maximum storage capacity is about 50 acre-feet. Tilton Town Dam is used to provide pondage for process water and water for an auxiliary fire pump. The pond at spillway crest is 1450 feet in length with a surface area of about 4 acres.

The dam is in poor condition. Major concern is the poor condition of the timber frame spillway and wooden decking.

Based on small size and significant hazard classification in accordance with Corps guidelines, the test flood is $\frac{1}{2}$ the Probable Maximum Flood (PMF). A test flood discharge of 7,570 cfs (16 csm) would overtop the dam by about 2.6 feet (5.6 feet over spillway crest) assuming both gates closed. The spillway will pass 2200 cfs or about 29 percent of the test flood. A major breach at top of dam would probably result in the loss of a few lives and could cause appreciable property damage.

The owner, the Town of Tilton, should implement the results of the recommendation and remedial measures given in Sections 7.2 and 7.3 or alternative in Section 7.4 within one year after receipt of this Phase I inspection report.

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Warren A. Guinan
 Warren A. Guinan
 Project Manager
 N.H. P.E. 2339



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.

TABLE OF CONTENTS

Title	Page
LETTER OF TRANSMITTAL.....	
BRIEF ASSESSMENT.....	
REVIEW BOARD PAGE.....	
PREFACE.....	iv
TABLE OF CONTENTS.....	v
OVERVIEW PHOTO.....	vi
LOCATION MAP.....	vii

REPORT

Section

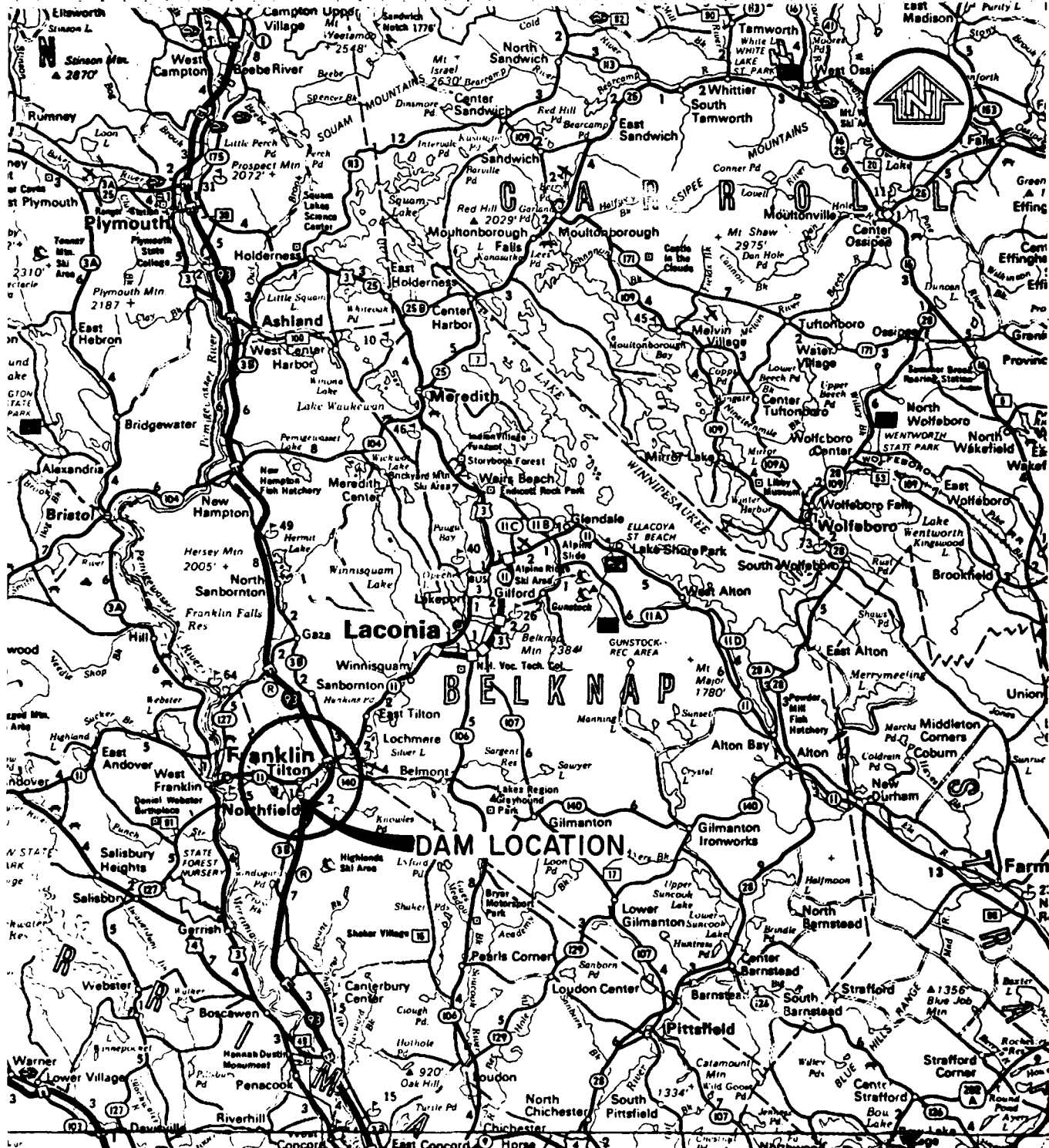
1	PROJECT INFORMATION.....	1-1
	1.1 General.....	1-1
	1.2 Description of Project.....	1-1
	1.3 Pertinent Data.....	1-3
2	ENGINEERING DATA.....	2-1
	2.1 Design.....	2-1
	2.2 Construction.....	2-1
	2.3 Operation.....	2-1
	2.4 Evaluation.....	2-1
3	VISUAL INSPECTION.....	3-1
	3.1 Findings.....	3-1
	3.2 Evaluation.....	3-3
4	OPERATIONAL PROCEDURES.....	4-1
	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.....	4-1
5	HYDROLOGIC/HYDRAULIC.....	5-1
	5.1 Evaluation of Features.....	5-1
6	STRUCTURAL STABILITY.....	6-1
	6.1 Evaluation of Structural Stability.....	6-1
7	ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES.....	7-1
	7.1 Dam Assessment.....	7-1
	7.2 Recommendations.....	7-1
	7.3 Remedial Measures.....	7-1
	7.4 Alternatives.....	7-1

APPENDICES

	Designation
VISUAL INSPECTION CHECKLIST.....	A
ENGINEERING DATA.....	B
PHOTOGRAPHS.....	C
HYDROLOGIC AND HYDRAULIC COMPUTATIONS.....	D
INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS..	E



APRIL 1979
Figure 1 - Overview of Tilton Town Dam.



Map prepared by permission of the Department of Resources and Economic Development, Concord, N.H. 03301, and the copyright owners, The National Survey, Chester, VT. 05143. 5/18/79

SCALE 1" = MILES



MAP BASED ON STATE OF NEW HAMPSHIRE OFFICIAL HIGHWAY MAP.

Anderson-Nichols & Co, Inc.		U.S. ARMY ENGINEER DIV. NEW ENGLAND	
CONCORD NEW HAMPSHIRE		CORPS OF ENGINEERS	
		WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
TILTON TOWN DAM			
LOCATION MAP			
WINNIPESAUKEE RIVER		NEW HAMPSHIRE	
		SCALE: SEE BAR SCALE	
		DATE: JULY 1979	

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
TILTON TOWN DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Anderson-Nichols & Company, 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 were issued to Anderson-Nichols under a letter of November 20, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-79-C-0009 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 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. Tilton Town Dam is located in the Towns of Tilton and Northfield, New Hampshire. The dam is a run-of-the-river dam spanning the Winnepesaukee River approximately 5.3 miles above its confluence with the Pemigewasset River. The centerline of the river serves as the boundary between Tilton and Northfield. The Merrimack River originates at the confluence of the Winnepesaukee and Pemigewasset Rivers in Franklin, New Hampshire. Tilton Town Dam is shown on U.S.G.S. Quadrangle, Penacook, New Hampshire with coordinates approximately at N 43° 26' 33", W 71° 35' 43". Tilton is located in Belknap County; Northfield is located in Merrimack County. (See Location Map, page vii.)

b. Description of Dam and Appurtenances. Tilton Town Dam is a low, run-of-the-river dam totaling 192 feet in length and having a hydraulic height of 13 feet. The north abutment of the dam is located in Tilton and consists of a concrete sluiceway with discharge controlled by a timber gate. The timber gate is 6'H x 6'W and has an invert 3.5 feet below the spillway crest. The maximum gate opening is 11.6' above the sluiceway invert. It is operated by means of a mechanical lifting device (chain hoist). A 10-inch intake is located on the upstream side of the wingwall of this gate structure. This intake provides water for use in the Arthur S. Brown Manufacturing Company plant building which is located just adjacent to the north abutment. The spillway consists of a timber frame structure about 124 feet in length. The spillway crest is 9.6 feet above the downstream toe of the dam. The south abutment of the dam is located in Northfield and consists of a concrete sluiceway with discharge also controlled by a timber gate. The timber gate is 8.3'H x 10'W and has an invert 6 feet below the spillway crest. The maximum gate opening is 11.7' above the sluiceway invert. This gate is now raised mechanically by an external available power source (bucket loader) but could be raised by a chain hoist. A concrete box inlet structure is constructed on the stream side of the south sluiceway wingwall. There is a 10-inch pipe inlet from this structure supplying an auxiliary fire pump for the Surette Storage Battery Company, a factory on the south side of the river immediately downstream of the dam.

c. Size Classification. Small (hydraulic height - 13 feet; storage - 50 acre-feet) based on height and storage (< 40 feet and ≥ 50 to $< 1,000$ acre-feet) as given in Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant Hazard. A major breach at top of dam would probably result in the possible loss of a few lives and could cause appreciable property damage. (See Section 5.1 f.)

e. Ownership. Tilton Town Dam was constructed prior to 1886. The earliest ownership recorded appeared on a New Hampshire Water Resources Board (NHWRB) inspection report dated 8/30/34. This report states that the Tilton (north) side of the dam is owned by the Public Service Company of New Hampshire and the Northfield (south) side by the Elm Mills Woolen Company. This ownership apparently remained unchanged until the Town of Tilton purchased the dam and property March 8, 1968.

f. Operator. The current owner and operator of the Tilton Town Dam is the Town of Tilton, Town Hall, 145 Main Street, Tilton, New Hampshire 03276. Phone: (603) 286-4425.

g. Purpose of Dam. The purpose of the original construction of the dam is not known. Sometime prior to 1934 the dam was utilized for power generation to both of its co-owners, Public Service Company of New Hampshire and Elm Mills Woolen Company. A NHWRB inspection report of December 17, 1934 states that the

Tilton side of the dam (Public Service Company) was not operating. The pondage behind the dam is presently used to supply several plants with industrial process water. A NHWRB memo of October 15, 1976 reflects this pondage was also used to dilute sewage from a few lines which discharge into the pond above the dam. An article which appeared in the Concord Monitor, Monday, April 30, 1979, reflects that this dam is currently being considered as a future source of hydroelectric power. (See Appendix B.)

h. Design and Construction History. Tilton Town Dam was constructed sometime prior to 1886. No information was disclosed regarding the original design and construction of the dam. A NHWRB inspection report dated 6/25/36 reported the center portion of the dam was damaged in the flood of March 1936 but was repaired immediately. A NHWRB sketch dated 9/18/39 reflects a 107-foot long spillway, two adjacent gate structures forming the south abutment, and one wood flume forming the north abutment. Further information was obtained from a study done by Fenton G. Keyes Associates, Hydraulic Calculations for the Winnepesaukee River from Lake Winnepesaukee to the Merrimack River, prepared for the New England Division, U.S. Army Corps of Engineers, January, 1957. The above report reflects two gates exist, one 8.6-foot wide gate on the north end and one 8.2-foot wide gate on the south end. The spillway in this report was noted to be 124.5 feet in length. Therefore, structural modifications occurred between the years of 1939 and 1957. Additional structural changes in the gate sluiceways have occurred after 1957. The structure as seen on the visual inspection consisted of a sluiceway with a 5.6'H x 6'W gate on the north side which was reported to have been constructed in 1969 and a sluiceway with a 8.3'H x 10'W gate on the south side which was reported to have been constructed in 1974. These two dates were obtained orally from the owner.

i. Normal Operating Procedures. No written operating procedures were disclosed. The gates are normally opened in the spring and closed in mid July. The water level is watched by a staff member of the Arthur S. Brown Manufacturing Company plant and conditions are relayed to the town. The Town of Tilton Road Agent operates the gates as deemed necessary.

1.3 Pertinent Data

a. Drainage Area. The drainage area consists of 473 square miles (302,720 acres) of varied terrain and includes the 363 square mile Lake Winnepesaukee drainage area. The Winnepesaukee River originates at Lake Winnepesaukee and flows in a southwesterly direction through Paugus Bay, Opechee Bay, Winnisquam Lake, Silver Lake and the communities of Laconia, Belmont, Tilton, Northfield and Franklin. Three dams affect flood control on the Winnepesaukee River. The Lakeport Dam, located between Paugus Bay and Opechee Lake, regulates the elevation of Paugus Bay and Lake Winnepesaukee. The drainage area to Lakeport Dam is 363 square miles. Avery Dam, located between Opechee Lake and Lake Winnisquam, has a drainage

area of 374 square miles. Lochmere Dam, which regulates the water surface of Lake Winnisquam, carries a drainage area of 1 square miles. Tilton Town Dam is located downstream of these three flood control dams on the Winnepesaukee River.

b. Discharge at Damsite

(1) Outlet works (sluices) - 5.6' H x 6'W timber gate invert elevation of 436.9' MSL. 8.3'H x 10'W timber gate @ invert elevation 434.4' MSL. Combined capacity at top of dam - 10 cfs @ 443.4' MSL.

(2) The maximum discharge at damsite - A U.S.G.S. gaging station, having a drainage area of 471 square miles, is located 0.4 miles upstream of the dam and has a record since January 1937. The maximum recorded discharge at the gage is 3,810 cfs which occurred during the September 1938 flood. Therefore, the discharge at the dam during the 1938 flood was probably in excess of 3,810 cfs. However, a greater discharge may have occurred during the 1936 flood which is the largest of historical record on the Winnepesaukee River, evidenced by high water marks. Also recorded are discharges of 3,720 cfs and 3,700 cfs which occurred in 1953 and 1954, respectively.

(3) Ungated spillway capacity @ top of dam elevation - 200 cfs @ 443.4' MSL.

(4) Ungated spillway capacity @ test flood elevation - 505 cfs @ 446' MSL

(5) Gated spillway capacity @ top of dam elevation - not applicable

(6) Gated spillway capacity @ test flood elevation - not applicable

(7) Total spillway capacity @ test flood elevation - 505 cfs @ 446' MSL

(8) Total project discharge @ test flood elevation - 7,570 cfs @ 446' MSL (with gates closed); 7,570 cfs @ 444.3' MSL (with gates open)

c. Elevation (ft. above MSL)

(1) Streambed at centerline of dam - 430.8 (at downstream end)

(2) Maximum tailwater - During the September 1938 flood with a discharge of 3,810 cfs maximum tailwater is estimated to have been at 433.5' MSL.

SECTION 7
ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

Dam Assessment

a. Condition. The visual inspection and the comments made previous dam inspection reports, memos, and letters which are available in the N.H. Water Resources Board files indicate that Town Dam is in poor condition. The principal concern with respect to the integrity of the dam is the poor condition of the masonry frame structure and wooden decking of the overflow section of the dam. The gate on the south side must be raised by an external mechanical force such as a bucket loader, crane, etc. and therefore, cannot be removed quickly and easily.

b. Adequacy of Information. The information available is inadequate to assess the condition of the dam. The conclusions regarding the condition of the dam are based primarily on the results of the visual inspection.

c. Urgency. The recommendation, remedial measures, or alternative in 7.2, 7.3, or 7.4 respectively, should be implemented by the owner within one year after receipt of this Phase I report.

d. Need for Additional Information. No additional information is needed to assess the condition of this dam.

Recommendation

The owner should engage a registered professional engineer to design and supervise appropriate repairs to the sinkhole over the masonry pipe in south abutment and to the existing structure such as masonry frame, decks, gates, lift mechanisms, etc. Attention should also be paid to the possibility that the silt collected behind the dam may contain pollutants which could affect the downstream reaches of the river.

Remedial Measures

a. Operating and Maintenance Procedures. Establish a maintenance program for use during and immediately following periods of heavy rainfall, and also a warning program to follow in the case of emergency conditions. Institute a program of annual periodic inspection after dam is repaired or replaced.

Alternative

The owner should engage a registered professional engineer to design and supervise construction of a suitable replacement dam.

May 5, 1976 note to WRB file -
Whirlpool upstream of the timber dam. It appeared
that perhaps a section of planking had broken and
was letting water through the underside of the dam.

Oct. 15, 1976 WRB internal memo -
Evidence of...large whirlpool.... The main dam is
in poor condition; the entire decking as well as
all the support framing should be replaced. Water
was going through the decking in several locations
and the crest of the dam sags at the location
where the repairs were made some time ago indi-
cating that their (sic) has been a structural
failure of the support timbers.... It is my
opinion that the structure could fail at any time.

d. Post-Construction Changes. See 1.2 h.

e. Seismic Stability. The dam is located in Seismic Zone 2
and in accordance with the recommended Phase I guidelines does not
warrant seismic analysis.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The timber decking on the upstream face of the dam is in very poor condition. Large quantities of water are leaking through holes in the decking at many locations. Near the south abutment there is a hole several feet in diameter in the decking and there is a whirlpool several feet in diameter over the hole. The timber frame of the dam is also in poor condition.

Several planks near the bottom of the south sluiceway gate were damaged by a beaver. The planking near the bottom of the north sluiceway gate is in poor condition. Several of the planks are bowed downstream and one of the planks is broken. A small sink-hole in the fill above the intake pipe from the reservoir to the industrial plant was observed.

b. Design and Construction Data. A sketch dated 9/18/39 shows a cross section of the dam with vertical 8" x 10" posts on the downstream side, an upstream decking consisting of a double thickness of 2-inch planks and inclined at about 4H:1V, and 8" x 10" horizontal ties in both the longitudinal and transverse directions. This sketch indicates that the timber frame is founded on "ledge". It appears that this sketch shows the condition of the dam as it existed at the time of an inspection of the same date. However, there is an apparent discrepancy because the written inspection report indicates that the dam is founded on hardpan.

It was reported that the north sluiceway was constructed in 1969 and the south sluiceway in 1974.

c. Operating Records. Several references in the available records reflect that the timber-structure of the dam has been in poor condition at various times in the past:

Dec. 17, 1934 dam inspection report -
Dam, timber A frame, condition poor, should be repaired.

June 25, 1936 dam inspection report -
Condition poor. Center portion of dam damaged in flood of Mar. 1936. Repaired immediately.

Sept. 18, 1939 dam inspection report -
Condition poor.

June 18, 1951 dam inspection report -
Timber frame...is rotting and will go in a few years.

on the Winnepesaukee River were determined at Lakeport Dam, Avery Dam, and Lochmere Dam using various hydrologic methods. The peak discharge at the Tilton gage during a 500-year storm was determined to be 7,570 cfs. This gage is located 0.4 miles upstream of Tilton Town Dam. This 500-year flood flow, being approximately the test flood, was utilized in determining the overtopping potential of Tilton Town Dam. The discharge at Lakeport Dam during a flooding event of this magnitude was determined to be 4,300 cfs.

The overtopping analyses indicates that the dam would be overtopped by 2.6 feet (5.6 feet over spillway crest) during the test flood, assuming both gates closed. The maximum spillway capacity at top of dam is 2200 cfs which is 29 percent of the test flood discharge, assuming the dam stayed intact during a flooding event of this magnitude. Assuming both gates closed, a test flood discharge of 7,570 cfs would overtop the dam by 0.9 foot (3.9 feet over spillway crest).

f. Dam Failure Analysis. A major breach at top of dam would result in a discharge of about 4,315 cfs. This flow is similar to the 4,475 cfs used in Reference 5 (see 5.1 b.). Therefore, the profile developed with this discharge could be utilized to estimate the level of probable damages caused by dam failure at top of dam. Included on this profile are elevations of key damage points. From the profile, the only damage caused by a breach would be the Arthur S. Brown Mfg. Company building which is located adjacent to the north abutment of the dam. A portion of this plant is located in the channel and is the working area for two people. The maintenance garage located at the south abutment at times is occupied. Therefore, loss of life is possible. Property damage could be appreciable. Plants which utilize the pondage for process water would be without water. Loss of water could cause substantial damage to the boilers in the Arthur S. Brown Mfg. Company plant. The pondage also supplies water to an auxiliary fire pump. Therefore, Tilton Town Dam was classified Significant Hazard.

References 3 and 4: HEC-2 step-backwater computations reflect that with a discharge of 7,570 cfs an elevation of 445.4' msl could be reached. The hydraulic input of this study was reviewed and evaluated. In order to reflect existing conditions, backup from the 1978 ANCO study (Reference 5) was utilized in developing stage-discharge relationship for Tilton Town Dam. The rating curve developed in the FIS studies, References 3 and 4, ranges .6 to 1.0 foot lower than the rating curve developed for this inspection study.

Reference 5: The recommendation of this study was to replace the dam with a weir having a crest elevation at least 1.5 feet lower than the existing spillway. From trial HEC-2 runs through this area, it was determined that lowering the spillway would reduce flooding upstream of the dam to the Route 38 bridge crossing. Several companies utilize the pondage for process water. Breaching the dam would create a hardship, therefore, this was not recommended as an alternative.

c. Experience Data. In a NHWRB report of 6/25/36 it was reported that the center portion of the dam was damaged in the flood of March 1936 but was repaired immediately. No recorded discharge was disclosed for this flooding event. The U.S.G.S. gage in Tilton, N.H. came into operation January 1937 and remains in current use. The maximum recorded discharge occurred during the September 1938 flood and was recorded to be 3,810 cfs. No records were found that reported any sustained damages to the dam. The 1936 flood, however, is reported to be the largest of historical record on the Winnepesaukee River as demonstrated by high water marks in the area of the dam. The 1938 profile along with the 1936 high water marks are shown on the Winnepesaukee River Plan and Profile, Sheet 1, U.S. Engineer Office, February 1939. Recorded discharges of 3,720 cfs and 3,700 cfs which occurred in 1953 and 1954, respectively, were also obtained.

d. Visual Observations. The dam is in poor condition. The timber spillway has an uneven crest caused by some local support failures. The timber decking on the upstream face is in very poor condition.

e. Test Flood Analysis. Tilton Town Dam is classified as being small in size having a hydraulic height of 13 feet and a maximum storage capacity of 50 acre-feet; the dam was determined to have a Significant Hazard Classification. Using the Recommended Guidelines for Safety Inspection of Dams, the test flood was determined to be $\frac{1}{2}$ Probable Maximum Flood (PMF).

The test flood inflow cannot simply be determined by use of the PMF guide curves due to the complexity of the hydrologic and hydraulic conditions which comprise the Winnepesaukee River drainage basin. Flooding on the Winnepesaukee River and its associated bays and lakes is to a large extent controlled by Cochmere Dam on Lake Winnisquam, Avery Dam on the Winnepesaukee River, and Lakeport Dam between Opechee Lake and Paugus Bay. Referring to the Northfield Flood Insurance Study, peak discharges

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. General. Tilton Town Dam is a low, run-of-the-river dam which impounds a reservoir of small size. The dam has a timber frame spillway with a wooden upstream decking placed between concrete abutments. If this structure were breached, the failed portion of the timber structure could become lodged in a number of other dams and bridges downstream of the dam. Two dams and six bridges are located in the reach on the Winnepesaukee River between Tilton Town Dam and its confluence with the Pemigewasset River, a distance of 5.3 miles.

b. Design Data. The available data pertinent to the Tilton Town Dam comes from five primary sources:

(1) The New Hampshire Water Resources Board (NHWRB) files on the dam;

(2) Hydraulic Calculations for the Winnepesaukee River from Lake Winnepesaukee to the Merrimack River, prepared by Fenton G. Keyes Associates for the Corps of Engineers, New England Division, in 1957;

(3 and 4) The back up files for the Flood Insurance Studies of Tilton and Northfield, New Hampshire, prepared for the Federal Insurance Administration by Hamilton Engineering Associates, Inc. of Nashua, N.H. and Anderson-Nichols & Company, Inc. (ANCo.) of Concord, New Hampshire, respectively.

(5) Hydraulic Engineering Analysis for Evaluating Flood Stage Reduction on the Winnepesaukee River, New Hampshire, prepared by ANCo for the Corps of Engineers, New England Division, December 1978.

The following is a summation of data pertinent to Tilton Town Dam found in each of the above references:

Reference 1: It is the opinion of the NHWRB that this structure has been in poor condition since 1934; NHWRB feels that this dam could fail at any time and should be removed. (See Appendix B and Section 6.1 c.)

Reference 2: The final recommendations of this study with reference to Tilton Town Dam was that the spillway section of the dam be lowered 3.50' and this section be replaced with flashboards or crest gates which can easily be removed or dropped during high flows.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No written operational procedures were obtained for Tilton Town Dam. Flow conditions are watched by a staff member of the Arthur S. Brown Mfg. Company and relayed to the town. The gates are normally open in the spring and closed in mid July. A hand winch is used to open the north gate. Because of the friction caused by hydrostatic pressure the gate on the south side must be raised by an external source of power (bucket loader or crane).

4.2 Maintenance of Dam

The Town of Tilton is responsible for the maintenance of the dam.

4.3 Maintenance of Operating Facilities

No formal maintenance is performed.

4.4 Description of Any Warning System in Effect

No written warning system was revealed.

4.5 Evaluation

The present operational and maintenance procedures are not adequate to ensure proper operation of the gates during high flows. The maintenance procedures are inadequate to ensure that all problems encountered can be remedied within a reasonable period of time. The owner should establish a written operation and maintenance procedure as well as establishing a warning system to follow in event of emergency conditions.

d. Reservoir Area. The watershed above the reservoir is rolling and partially wooded. Numerous structures are built close to the edge of the reservoir immediately upstream of the dam in the Town of Tilton. The Winnepesaukee River, spanned by the Tilton Town Dam is the outlet for Lake Winnepesaukee and flows through Winnisquam Lake and Silver Lake a few miles upstream from Tilton Town Dam. The Arthur S. Brown Manufacturing Company building is located immediately upstream of the dam on the north approach channel. (See Appendix C - Figure 12.)

e. Downstream Channel. The downstream channel is broad, unobstructed by trees and brush, with a boulder and rugged exposed bedrock bottom. (See Appendix C - Figure 13.) A mill building is located on the north side of the channel immediately downstream of the dam. There are also two dams and six bridges spanning the river between Tilton Town Dam and its confluence with the Pemigewasset River about 5.3 miles downstream.

3.2 Evaluation

Based on the visual inspection, Tilton Town Dam appears to be in poor condition. The timber frame dam is so badly deteriorated that it may collapse, particularly during seasonal high water flows. If there are pollutants in the silt behind the dam they could cause significant environmental problems downstream if the dam failed or was breached. The deteriorated condition of the wooden gates could cause loss of water in the reservoir which would also cause the loss of process water to the Arthur S. Brown Manufacturing Company and loss of fire protection water to the manufacturing facility on the south side of the dam.

one cross section shows the timber structure as being founded on "ledge", and one written record indicates that the foundation of the dam is "hardpan". On the basis of a visual inspection from the shoreline downstream of the dam it appears that most of the timber framing of the dam rests on bedrock and that parts of it rests on large boulders.

No evidence of seepage or other problems were observed at the south abutment. A mill building is located at the north abutment. An inspection of the basement of that building did not reveal any signs of seepage or other problems.

c. Appurtenant Structures. Two concrete sluiceways pass through the dam, one at each abutment. (See Appendix C - Figures 8, 9 and 10.) The north sluiceway was reported to have been constructed in 1969; the south sluiceway in 1974.

The sluiceway on the north side is 6 feet wide and the invert of the channel is 3.5 feet below the dam crest. The sluiceway on the south side is 10 feet wide and 3.3 feet below the dam crest at the inlet and 6 feet below crest at the timber gate. Each sluiceway has steel gate slots, cast into the side approximately 12 feet from the upstream end.

Both timber gates were raised at the time of inspection and were observed to be in a deteriorated condition. Several planks near the bottom of the south sluiceway gate were damaged by a beaver. The planking at the bottom of the north sluiceway gate is in deteriorated condition. Several of the planks are bowed downstream and one of the planks is broken. The steel gate slots were observed to have surface rust but were otherwise in good condition.

The concrete walls of the sluiceways were observed to be in good condition except for some minor erosion at the inlet end.

A concrete box inlet structure is constructed on the upstream side of the south sluiceway wingwall. There is a 10-inch pipe inlet from this structure supplying an auxiliary fire pump in a building immediately downstream of the dam. (See Appendix C - Figure 9.) The concrete box appears to have been constructed at the same time as the sluiceway.

A sand fill has been placed between the north abutment and the sluiceway structure at the north end of the dam. A sinkhole, about 18 inches in diameter, was observed at the downstream side of this fill. (See Appendix C - Figure 11.) According to the maintenance manager of the Arthur S. Brown Mfg. Co., the sand fill was placed on top of a wood decking which, in turn, is above the water intake pipe to the mill. Collapse of the decking may have caused the sinkhole.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. Tilton Town Dam is a low, run-of-the-river dam which impounds a reservoir of small size on the Winnepesaukee River located immediately downstream of Tilton Village. The watershed above the reservoir is rolling and partially wooded. The Winnepesaukee River is the outlet for Lake Winnepesaukee and flows through Winnisquam Lake and Silver Lake a few miles upstream of Tilton Town Dam. The dam is 5.3 miles upstream from the confluence of the Winnepesaukee and Pemigewasset Rivers. There are two dams and six bridges downstream of Tilton Town Dam on the Winnepesaukee River.

b. Dam. Tilton Town Dam consists of a timber-frame spillway with a wooden upstream decking placed between two concrete gated outlet structures. (See Appendix C - Figures 2 and 3). The dam totals 192 feet in length and has a hydraulic height of 13 feet.

During the initial inspection performed April 6, 1979, about one foot of water was flowing over the crest of the spillway. It was noted that the level of the water flowing over the crest was not uniform along the length of the spillway. (See Appendix C - Figure 4.) From this observation it was inferred that local failures have occurred along the length of the structure. A subsequent inspection was performed April 24, 1979, in conjunction with representatives of the New Hampshire Water Resources Board (NHWRB) and the owner, the Town of Tilton. The NHWRB restricted discharge at Lakeport Dam, reducing flow in the Winnepesaukee River. The Town of Tilton opened both gates at Tilton Town Dam and the impoundment behind the dam was lowered so that little water was discharging over the crest of the dam. This enabled a more thorough inspection on the structural condition of the dam.

The timber frame of the dam is, in part, in poor condition and badly deteriorated. Confirmation of some local support failures was made. (See Appendix C - Figure 5.) The timber decking over the upstream face is in very poor condition. (See Appendix C - Figure 6.) Major quantities of water are pouring through large holes in the decking and lesser quantities through leaks along the entire length of the spillway. (See Appendix C - Figure 5.) Near the south abutment is a hole several feet in diameter in the decking and a whirlpool several feet in diameter was observed over this hole. (See Appendix C - Figure 7.)

Extensive outcrops of bedrock were observed on the south bank of the reservoir immediately upstream of the dam. No outcrops of rock were observed on the north bank. In the available records,

SECTION 2
ENGINEERING DATA

2.1 Design

No original design data were obtained for Tilton Town Dam.

2.2 Construction Records

No written construction records were disclosed. The owner stated that the north sluiceway was constructed in 1969 and the south sluiceway was constructed in 1974.

2.3 Operation

No engineering operational data were obtained.

2.4 Evaluation

a. Availability. A search of the files of the NHWRB and direct contact with the owner revealed only a limited amount of recorded information.

b. Adequacy. Because of the limited amount of detailed data available, the final assessments and recommendations of this investigation are based on the hydrologic and hydraulic calculations and the visual inspection.

c. Validity. No original engineering data were obtained. Hydrologic and hydraulic studies done on the Winnepesaukee River (discussed in Section 5.1 b.) were reviewed and validated.

The south abutment also consists of a concrete gate structure with an 8.3'H x 10'W timber gate and head frame. This gate is now raised mechanically by a movable power source (bucket loader). It has a maximum opening of 11.7 feet above the sluiceway invert. On the upstream face of the structure is a 10" intake pipe. This intake supplies water to an auxiliary fire pump for the Surette Storage Battery Co., a factory on the south bank of the river immediately downstream of the dam.

- (3) Height - 13' (structural height)
- (4) Topwidth - varied
- (5) Side slopes - U/S spillway 4H:1V - U/S abutments vertical; D/S spillway and abutments vertical.
- (6) Zoning - none
- (7) Impervious core - none
- (8) Cutoff - none
- (9) Grout curtain - none

h. Diversion and Regulating Tunnel - not applicable (See j. below.)

i. Spillway

- (1) Type - timber frame with wooden decking
- (2) Length of weir - 124'
- (3) Crest elevation - 440.4' MSL
- (4) Gates - none

(5) U/S Channel - the upstream channel consists of the Winnepesaukee River. A Boston & Maine Railroad bridge and the Route #38 bridge are located 580 feet and 660 feet upstream of the dam, respectively. The Arthur S. Brown Mfg. Co. plant is located on the north side of the approach channel.

(6) D/S Channel - the downstream channel immediately below the dam is wide and has a boulder strewn and rugged exposed bedrock bottom. No trees, brush or man-made structures obstruct the immediate channel below the dam. The J.P. Stevens Company plant is located downstream on the south side of the channel. Two dams and six bridges have been constructed in the downstream reach of the Winnepesaukee River between Tilton Town Dam and its confluence with the Pemigewasset River in Franklin, New Hampshire, a distance of 5.3 miles.

j. Regulating Outlets. The north abutment of the dam consists of a concrete gate structure with a 5.6'H x 6'W timber gate and head frame. This gate is mechanically operated by a chain hoist and it has a maximum opening of 11.6' above the sluiceway invert. On the upstream side of this structure is a 10-inch process water intake which supplies process water to the Arthur S. Brown Mfg. plant.

- (3) Upstream invert north abutment sluiceway - 436.9
Upstream invert south abutment sluiceway - 434.4
- (4) Recreation pool - not applicable
- (5) Full flood control pool - not applicable
- (6) Spillway crest - 440.4
- (7) Design surcharge (Original Design) - unknown
- (8) Top of dam - 443.4
- (9) Test flood pool - 446

d. Reservoir (feet)

- (1) Length of maximum pool - 2700
- (2) Length of spillway crest pool - 1450
- (3) Length of flood control pool - not applicable

e. Storage (acre-feet)

- (1) Recreation pool - not applicable
- (2) Flood control pool - not applicable
- (3) Spillway crest pool - 16 (approximate)
- (4) Top of dam - 50 (approximate)
- (5) Test flood pool - 80 (approximate)

f. Reservoir Surface (acres)

- (1) Recreation pool - not applicable
- (2) Flood control pool - not applicable
- (3) Spillway crest - 4 (approximate)
- (4) Test flood pool - 13 (approximate)
- (5) Top of dam - 9 (approximate)

g. Dam

- (1) Type - timber frame spillway and wooden upstream deck with concrete sluiceways and abutments at either end.
- (2) Length - 192'

APPENDIX A
VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Tilton Town Dam, N.H.

DATE April 6, 1979

TIME 10:00 A.M.

WEATHER Cold, cloudy

W.S. ELEV.	U.S.	DN.S.
	<u>441</u>	<u>433.9</u>

PARTY:

- | | |
|---------------------------------------|-----------|
| 1. <u>Warren Guinan (4/24/79)</u> | 6. _____ |
| 2. <u>Stephen Gilman (4/24/79)</u> | 7. _____ |
| 3. <u>Leslie Williams</u> | 8. _____ |
| 4. <u>Ronald Hirschfeld (4/24/79)</u> | 9. _____ |
| 5. <u>Pattu Kesavan</u> | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Hydrology/Hydraulics</u>	<u>W. Guinan/L. Williams</u>	
2. <u>Structural Stability</u>	<u>S. Gilman</u>	
3. <u>Soils & Geology</u>	<u>R. Hirschfeld</u>	
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECKLIST

PROJECT Tilton Town Dam, N.H. DATE April 6 & 24, 1979

PROJECT FEATURE Intake Structure & Channel NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u></p> <p>a. Approach Channel</p> <p>Slope Conditions</p> <p>Bottom Conditions</p> <p>Rock Slides or Falls</p> <p>Log Boom</p> <p>Debris</p> <p>Condition of Concrete Lining</p> <p>Drains or Weep Holes</p> <p>b. Intake Structure</p> <p>Condition of Concrete</p> <p>Stoplogs and Slots</p> <p>Stoplogs</p>	<p>Good</p> <p>Not visible beneath water surface</p> <p>None</p> <p>None</p> <p>Some observed on upstream face below water surface</p> <p>Good</p> <p>None apparent</p> <p>Good, only surface laitance eroded away</p> <p>Fair, embedded steel surface rusted - no paint</p> <p>3" wood weathered - several planks deteriorated and bowed. One plank on north side broken</p>

PERIODIC INSPECTION CHECKLIST

PROJECT Tilton Town Dam DATE April 6 & 24, 1979
 PROJECT FEATURE Outlet Structure & Channel NAME _____
 DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	Concrete Sluiceways
General Condition of Concrete	Good
Rust or Staining	Only at embedded steel items
Spalling	None
Erosion or Cavitation	Only surface laitance eroded where in contact with water
Visible Reinforcing	None
Any Seepage or Efflorescence	None observed
Condition at Joints	Good
Drain holes	None apparent
Channel	
Loose Rock or Trees Overhanging Channel	Small trees overhanging north side, but channel is wide and unobstructed.
Condition of Discharge Channel	Good

PERIODIC INSPECTION CHECKLIST

PROJECT Tilton Town Dam, N.H. DATE April 6 & 24, 1979

PROJECT FEATURE Spillway Weir NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u></p>	
<p>a. Approach Channel</p> <p>General Condition</p> <p>Loose Rock Overhanging Channel</p> <p>Trees Overhanging Channel</p> <p>Floor of Approach Channel</p>	<p>Timber frame spillway with decking on upstream face</p> <p>Good</p> <p>None</p> <p>None</p> <p>Not visible beneath water surface</p>
<p>b. Weir and Training Walls</p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Any Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Drain Holes</p>	<p>Wood frame-badly deteriorated, one large hole in deck, many small ones. Crest of dam is irregular and sagged.</p> <p>Only at tie holes and embedded steel supports</p> <p>None visible</p> <p>None</p> <p>None</p> <p>None</p>
<p>c. Discharge Channel</p> <p>General Condition</p> <p>Loose Rock Overhanging Channel</p> <p>Trees Overhanging Channel</p> <p>Floor of Channel</p> <p>Other Obstructions</p>	<p>Good</p> <p>None</p> <p>Small trees overhanging north side, but channel is wide</p> <p>Not visible beneath water surface</p> <p>None</p>

PERIODIC INSPECTION CHECKLIST

PROJECT Tilton Town Dam, N.H. DATE April 6 & 24, 1979

PROJECT FEATURE Service Bridge NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	
a. Super Structure	
Bearings	Not applicable
Anchor Bolts	Not applicable
Bridge Seat	Not applicable
Longitudinal Members	Not applicable
Underside of Deck	Not applicable
Secondary Bracing	Not applicable
Deck	Wood plank 3" thick untreated in weathered condition
Drainage System	Not applicable
Railings	Not applicable
Expansion Joints	Not applicable
Paint	Not applicable
b. Abutment & Piers	
General Condition of Concrete	See Outlet Structure - Outlet Works
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

PROJECT Tilton Town Dam, N.H.

DATE April 6, 1979

PROJECT FEATURE Reservoir

NAME L. Williams

AREA EVALUATED	REMARKS
Stability of Shoreline	Good
Sedimentation	None observed
Changes in Watershed Runoff Potential	None significant
Upstream Hazards	Route 38 and Boston & Maine Railroad Bridge
Downstream Hazards	Part of Arthur S. Brown Mfg. Co. plant
Alert Facilities	None posted
Hydrometeorological Gages	U.S.G.S. gage 0.4 miles upstream of dam in Tilton
Operational & Maintenance Regulations	None posted

APPENDIX B
ENGINEERING DATA

Tilton Dam May Create Energy Again

By ANDREW MEANS
Monitor Staff Writer

TILTON — The selectmen will soon have to decide the future of the town-owned dam across the Winnepesaukee River, and one option may be to restore it as a source of hydroelectricity.

Three of the operators of the Sulloway Mill hydroelectric plant in Franklin have approached the Tilton selectmen to find out if the town is interested in selling them the dam to generate electricity.

The three, Ted Larter of Dunstable, Mass., Tony Turgeon of Tilton and John Clement of Franklin, have been asked by selectmen to provide more details of any restoration plan they may have for the dam.

The N.H. Water Resources Board has been concerned about the condition of the dam for some time. The U.S. Army Corps of Engineers is inspecting the dam this

week, said Water Resources Engineer Vernon Knowlton.

"After we receive their report we will order the town to either repair it or remove it," said Knowlton, adding that "any interest from anyone wanting to generate hydroelectricity would be helpful."

The dam is over 100 years old, he said, but has not been used to generate power since the ownership was transferred from Public Service Co. of N.H. to the town of Tilton over 10 years ago.

It is currently used to provide water, mainly for processing and emergency firefighting purposes, in two factories, Arthur S. Brown Co. and Surrette Batteries.

If the dam is restored, said Larter, it could generate 800 to 1,000 kilowatts an hour. This could be sold to a power company such as Public Service or, conceivably, used as an emergency standby system for the town.

But Larter stressed that the feasibility is still being studied.

"As a matter of a fact it may not be big enough to make it worthwhile," he said. "All we want to know is whether the town would be willing to convey it over to us for us to start work on it."

Larter said restoration would be a private operation. In the unlikely event that the selectmen decided to keep the dam and repair it, he said, he would be just as happy to buy the water rights alone. "We have just so much money to spend," he said. "There's a lot of liability that goes along with (the dam)."

Besides the Franklin plant, Larter also owns an operation at Goodrich-Falls in Bartlett, N.H. Electric Cooperative buys power from this source, and Public Service buys from the Sulloway Mill plant.

The viability of such plants depends largely on energy policy in general, he said.

State of New Hampshire

WATER RESOURCES BOARD

CONCORD 03301

October 15, 1976

Re. Dam #237.02

Board of Selectmen
Town Office
Tilton, N. H. 03276

Gentlemen:

In answer to telephone requests from the town of Tilton for assistance in lowering the water in the Winnepesaukee River so that the Town could make repairs to their dam located adjacent to the Brown Manufacturing Company, an engineer of this office did a preliminary inspection of that dam on October 14th with Mr. Manning, the Road Agent of the Town.

Mr. Manning explained that for sometime the Town has been trying to repair a hole in the decking and with the gates on the dam have not been able to control the flow of water which is at present at 280 cfs. We explained to Mr. Manning and to members of the Board of Selectmen that with our dam at Lochmere being under reconstruction, it is impossible for us to restrict the flow of water from Lake Winnisquam.

During the inspection our engineer, Mr. D. Rapoza, discovered that in addition to the deck which is in extremely poor condition, many of the upright braces supporting the A-frames and the connecting timbers between the A-frames are in a state of decay. One section of the dam's crest is already sagging indicating a structural failure in that section of the timber dam. In our review of the inspection report and our file on this dam, it is our opinion that a loss of the supporting timbers could cause a failure of a portion of this dam "at any time". The uncertainty of when such a failure could occur creates a problem at which the Town is left with a decision to be made, we feel, in the near future.

This Dam #237.02 in the files of the Water Resources Board is classified as a menace structure. This classification indicates that due to its height, storage, and location, failure of the dam could jeopardize the lives and safety of the public. This office has reviewed this classification and feel that a major liability connected with this dam would be following the failure portion of the timber structure could become lodged in a number of bridges and other dams downstream of Tilton perhaps causing structural damage to these facilities.

Board of Selectmen
Town of Tilton

-2-

October
Re. Dam #237.02

In reviewing our files and discussing this matter with members of the Board of Selectmen, the Water Resources Board has been on record in the past indicating that if this dam is not serving a useful purpose it would benefit the public if it was removed or lowered substantially since the present dam maintains a high water level throughout the town which reduces the ability to pass flood waters down the Winnepesaukee River. It is our present understanding that the existing dam helps to improve a sewer condition in the town and provides a reservoir for process water for local industry. During the immediate future if the town reconsiders reconstructing this dam, perhaps they should consider reconstructing the dam at a lower height or supplying the water needs to their industry from a different source.

This office wishes to cooperate with the town of Tilton in any way in this matter; and our staff will be available to meet with the town's engineers to discuss this problem at your convenience.

Due to the nature of the condition of this dam, the New Hampshire Water Resources Board requests the town of Tilton to notify us within the next few weeks of its plans to take corrective action regarding the situation that presently exists. Except for what nature might create, the flows in the Winnepesaukee River will not be increased by the operations of Lake Winnepesaukee until the middle of December at which time the flow will be increased to approximately 1,000 cfs which would make repairs to this dam extremely expensive.

Sincerely,

George M. McGee, Sr.
Chairman

GMM/VAK:L

M E M O

E: October 15, 1976

Vernon A. Knowlton, Chief Water Resources Engineer

M: Donald M. Rapoza, Civil Engineer

SUBJECT: Dam repairs on Town owned structure (Dam #237.02)

On October 14, 1976 I met with Mr. Raymond Manning, Road Agent for Town of Tilton, regarding the repairs he wish to make on the town owned dam (#237.02) on the Winnepesaukee River in Tilton.

Some time ago, the town repaired a hole in the wooden deck planking with a weighted (manhole cover or frame) sheet of plywood. With the passage of time, the plywood repairs have not solved the problem, as evidenced by the large whirlpool at the location of the plywood.

Mr. Manning has opened both gates at the structure in order to lower the pool elevation and with the present flow the pool has only dropped approximately 2 to 3 feet below the crest of the spillway. Mr. Manning wanted to know if we could reduce the flow in the Winnepesaukee River so that the town can make the repairs in relatively shallow water.

I also spoke with Mr. Frank Ponton, Maintenance Supervisor for the Arthur S. Brown Manufacturing Company, and he informed me that the company is not pleased with our attitude, relative to maintaining a dam at the site. He mentioned that the company is dependent on a pondage which is quite concerned in having the dam properly maintained. They have expended \$5,000.00 within the last six months to buy a pump for use of excess water at the site. He stated that the town is responsible and has an obligation to keep and maintain the dam for water uses as well as for discharging a few sewage lines which discharge into the pondage.

As for the dam the abutments and gates are in good condition, but the main dam is in poor condition; the entire decking as well as all the support framing should be replaced. Water was going through the decking at several locations and the crest of the dam sags at the location where repairs were made some time ago indicating that there has been a structural failure of the support timbers.

The Town should be made aware of the present condition of the structure as it is my opinion that the structure could fail at any time.

/kn

May 5, 1976

Mr. Mundy, Selectman, Town of Tilton, called regarding the development of a whirlpool upstream of the timber dam owned by the Town downstream of the bridge in the village.

They inquired whether a permit was required to lower the water to make necessary repairs.

After discussing the issue with Mr. Mundy it was my recommendation that they lower the water as soon as possible to make sure no damage was being done to the foundation. It appeared that perhaps a section of planking had broken and was letting water through the underside of the dam.

He will contact us if he feels they need assistance.

V.A.Knowlton:L

THE STATE OF NEW HAMPSHIRE

Bellows ss.

June 24 1969

STATEMENT OF INTENT TO CONSTRUCT OR
RECONSTRUCT A DAM AT Tilton

RECEIVED

JUN 25 1969

NEW HAMPSHIRE
WATER RESOURCES BOARD

WATER RESOURCES BOARD:

In compliance with the provisions of RSA 482:3.

The selectmen of the Town of Tilton, N.H.
state name of person/or persons, partnership, association, corporation,

I state our intent to the Water Resources Board to construct, to reconstruct,
repairs to, a dam along, or (cross out portion not applicable) across:

Winnepesaukee River
state name of stream or body of water)

Adjacent to Tilton Tanning Corp.
(Here give location, by distance from mouth of stream, county or

state boundary)

in (s) of Tilton, N.H.

In accordance with PRELIMINARY PLANS, and SPECIFICATIONS FILED WITH THIS STATEMENT
AS PART HEREOF.

Understand that more detailed plans and specifications may be requested
and in conformance with RSA 482:4 and that, if such plans are requested,
construction will not commence until such plans have been filed with and approved
by the Board.

Tilton #2

I-3898

Winnepesaukee River, Tilton & Northfield, Tilton side, 1/2 dam owned by the Public Service Company of New Hampshire, about 10' head, Northfield side 1/2 dam owned by the Elm Mills Woolen Company about 10½ head. Power dam, on basis of 75% - 80%, time - efficiency, 355 H.P., 2533000 Kw-hr. per year; on basis of 90% - 80%, time efficiency, 316 H.P. , 2077000 Kw-hrs. per year. As developed, Tilton side not operating. Dam, timber A frame, condition poor, should be repaired, inspected 8-30-34, no record of any previous inspection found, for additional information see I-3898.

Flood study not made. The following information was given me as coming from Mr. Harry Daniell Lakeport Dam. His recollection of maximum discharge at the Lake occurred 10 or 12 years ago and reached 1800 cu. ft. over spillway and through gates. The spillway capacity of this dam is greater than 1800 cu. ft.

S. J. Lord

December 17, 1934

NEW HAMPSHIRE WATER RESOURCES BOARD

INVENTORY OF DAMS AND WATER POWER DEVELOPMENTS

NO. 2 - 1934 - I-3895 425 USGS / VRS
 MILES FROM MOUTH 4.18 (4.76) D.A.SQ.MI.
 OWNER Elm Mills & Public Service Co of N.H.
 NAME OF DAM Upper Dam
 DATE prior to 1886 DESCRIPTION "A" Frame - Timber on Hardpan
(Wood crib AE)

WIDTH-ACRES 16 (19.25) DRAUGHT-FT. 16 POINT CAPACITY-ACRE FT. 4 (2.73 AC)
 HEIGHT-TOP TO BED OF STREAM-FT. 170 MAX. FLOOD HEIGHT ABOVE CREST-FT. None
 SMALL LENGTH OF DAM-FT. 50 and 57 LOCAL GAGE
 PERMANENT CREST ELEV. U.S.G.S. 441.92 LOCAL GAGE
 ELEV. U.S.G.S. 441.92 LOCAL GAGE
 FREEBOARD-FT. 4 (2.73 AC)
 SLASHBOARDS-TYPE, HEIGHT ABOVE CREST None
 GATE NO. 1 WIDTH MAX. OPENING 10.5 DEPTH STILL BELOW CREST 7.51

REMARKS Condition Poor. Center portion of dam damaged in flood of Mar. 1936. Repaired immediately

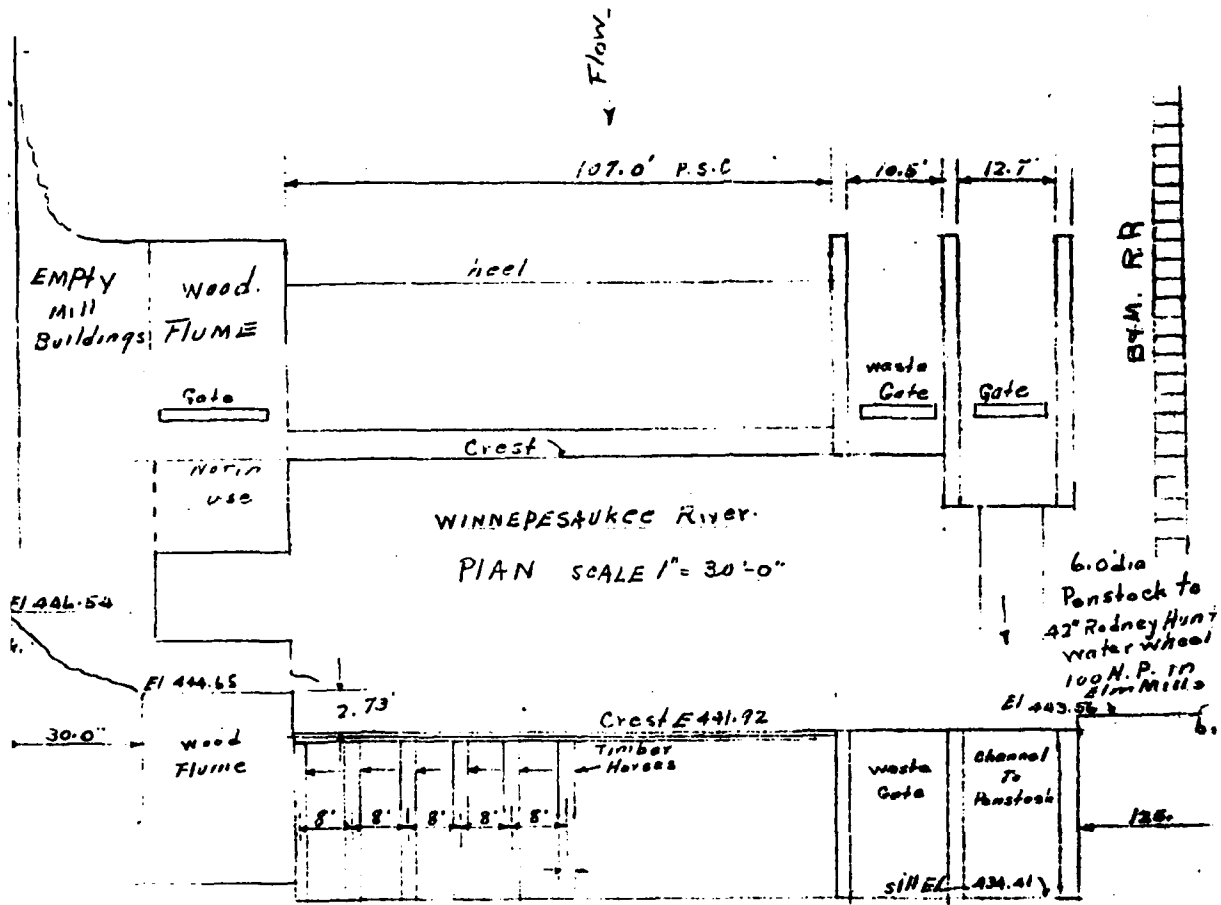
Coordinates from AE.
 43° 25' + 4400ft
 71° 35' + 2900ft.

POWER DEVELOPMENT	RATED	HEAD	C.F.S.	KW	MAKE
NO.	HP	FEET	FULL GATE		
<u>1</u>	<u>100</u>	<u>11</u>			<u>45" Redney Unit</u>
<u>1</u>	<u>200</u>	<u>10</u>	<u>USGS list</u>	<u>30</u>	<u>125V 8-1/2 D.C.</u>

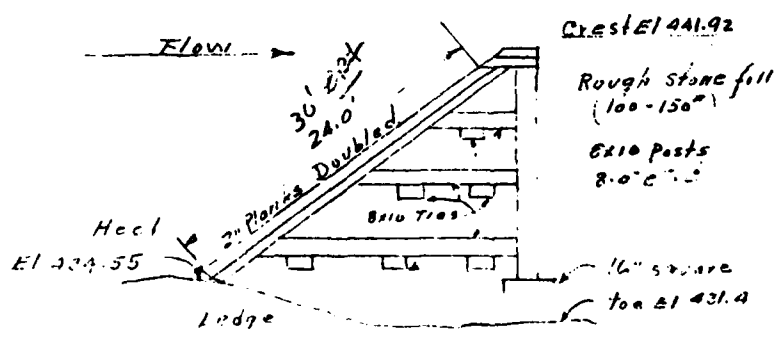
REMARKS Mill closed. Head 125 ft on Tilden 5002. Menace to get information from Wm Henderson, Chief Mechanic Elm Mills.

DATE 6/25/36 AE
8/30/34

PROJECT: WINNEPESAUKEE R. TILTON
 SUBJECT: WINNEPESAUKEE R. TILTON
 FILE: 237.02
 DATE: 9/14/39
 COMPUTER: G.S.W. CHECKER: R.L.I.
 CONT. FROM ACC. CONT. ON ACC. SUMMARY ON ACC.



ELEVATION



SECTION

B-18

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON WATER POWER DEVELOPMENTS IN NEW HAMPSHIRE

LOCATION AT DAM NO. 237.02
Town Tilton: County Belknap
Stream Winnepesaukee R.
Basin-Primary Merrimack R.: Secondary Winnepesaukee R.
Local Name Upper Dam

GENERAL DATA
Head-Max. ft.: Min. ft.: Ave. ft.
Date of Construction: Use of Power Industrial & Public Utility
Pondage ac. ft.: Storage ac. ft.

DESCRIPTION Timber on hard pan
Racks
Size of Rack Opening
Size of Bar: Material
Area: Gross Sq. Ft.: Net sq. ft.
Head Gates
Type
Number: Size ft. high x ft. wide
Elevation of Invert: Total Area sq. ft.
Hoist
Penstock
Number 2: Material 1, wooden 1, steel
Size: Length
Turbines

Dam No. 237.02

rth side of Dam, Tilton side owned by Public Service. Mill closed. 10.5 head feet.
uth Side - 6.0' dia penstock, 11 head feet. 48" Rodney Hunt Northern 125 V 240A. D.C.
orthfield Side. 100H.P. (ABANDONED)

19.....
19.....: 19.....
19.....: 19.....
OWNER Elm Mills 1/2 Public Service of N.H. 1/2

B-17

Tabulation By RLT Date 9/18/39

**NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON DAMS IN NEW HAMPSHIRE**

LOCATION STATE NO. 237.02
 Town Tilton : County Belknap
 Stream Winnepesaukee R.
 Basin-Primary Merrimack : Secondary Winnepesaukee R.
 Local Name Unner Dam
 Coordinates—Lat. 43° 35' 4" - 9500 : Long. 71° 35' 4" - 29900

GENERAL DATA
 Drainage area: Controlled.....Sq. Mi.: Uncontrolled Sq. Mi.: Total.....Sq. Mi.
 Overall length of dam 170 ft.: Date of Construction Prior to 1886
 Height: Stream bed to highest elev. 16 ft.: Max. Structure 12 ft.
 Cost—Dam: Reservoir

DESCRIPTION Timber on hard pan "A" Frame ✓
Waste Gates
 Type
 Number 1 : Size ft. high x 10.5 ft. wide
 Elevation Invert: Total Area sq. ft.
 Hoist

Waste Gates Conduit
 Number: Materials
 Size ft.: Length.....ft.: Area sq. ft.

Embankment
 Type
 Height—Max. ft.: Min. ft.
 Top—Width: Elev. ft.
 Slopes—Upstream on.....: Downstream on.....
 Length—Right of Spillway: Left of Spillway

Spillway
 Materials of Construction Timber
 Length—Total 50 and 57' ft.: Net 107 ft.
 Height of permanent section—Max. 12 ft.: Min. 12 ft.
 Flashboards—Type None : Height ft.
 Elevation—Permanent Crest 441.92 : Top of Flashboard
 Flood Capacity cfs.: cfs/sq. mi.

Abutments
 Materials:
 Freeboard: Max. 4 ft.: Min. 2.5 ft.

Headworks to Power Devel.—(See "Data on Power Development")
 OWNER Elm Mills 1/2 Public Ser. Co. 1/2

MARKS Condition poor. B-16

Publication By RLT Date 9/18/39

Elm Mills
 OWNER Public Service Co. of N.H. ADDRESS CASE NO.
 Contractor Address

Construction Record

Date		Office-Routine	Inspection During Construction		
Date	Inspector	Memo	Date	Inspector	Memo
.....
.....
.....
.....
.....
.....

Application Received
 Board Approval
 Authorization Sent
 Final Plans Rec'd
 Final Approval-Board
 Final Approval-Sent
 Case Closed

Is Dam a Menace
 Why

Dam Inspection Record

Date	Inspector	Comments	Memo	Memo Sent
10/15/41	R.S.B.&J.H.S.	Fair condition - Penstock intake in poor condition - Elm Mills	Prepared	To Owner

Form No. E61A

6442

NEW HAMPSHIRE WATER CONTROL COMMISSION RECORD OF DAM NO. 237.02

Town Filton County Merrimack Local Name

Function of Dam Paper Type Timber - A. Frame

Primary Basin Merrimack Sec. Basin Winnepesaukee River Local Stream Winnepesaukee River

Drainage Area, Total 476 sq. mi. Controlled sq. mi. Net Uncontrolled sq. mi.

Reservoir Area, Full Pond acres At Max. Drawdown acres

Reservoir Capacity mcf. ac. ft. in net D. A. in Total D. A.

Overall Length of Dam 170 ft. Max. Depth Water at Dam ft.

Net Spillway Length 107 ft. Minimum Freeboard 2.75 ft.

Spillway Capacity cfs. per sq. mi.

Highest Flood Flow of Record cfs. per sq. mi. Date

Estimated Maximum Probable Flood cfs.

REMARKS

Card Prepared by J.H.S. Checked by Approved for File Date 10/21/41

NEW HAMPSHIRE WATER CONTROL COMMISSION

REPORT ON DAM INSPECTION

TOWN Tilton DAM NO. 237.02 STREAM Winhepsoides River
 M. S. Stevens Northfield Franklin, N.H.
 OWNER Tilton Lumber Co. - Tilton ADDRESS Tilton N.H.

In accordance with Section 20 of Chapter 133, Laws of 1937, the above dam was inspected by me on 6/18/51 accompanied by _____

NOTES ON PHYSICAL CONDITION

Abutments Fair

Spillway Fair

Gates South side gate in poor condition. Timber frame to gate structure is rotting and will go in a few years - with little damage downstream. Tilton side -> riverside gate operable landside gate closed & inoperable.

Other _____

CHANGES SINCE LAST INSPECTION _____

FUTURE INSPECTIONS Yes

This dam (is) (~~is not~~) a morace because of lack of development downstream at rivers edge

REMARKS About 6" over spillway.

Copy to Owner	Date

Thomas C. J.
INSPECTOR



July 7, 1967

JUL 10 1967

NEW HAMPSHIRE
WATER RESOURCES BOARD

Mr. George M. McGee, Chairman
N. H. Water Resources Board
State House Annex
Concord, New Hampshire

Dear Mr. McGee:

We own a dam in the Town of Tilton on the Winnepesaukee River located directly behind the Tilton Leather Company. This dam does not have any use to the Public Service Company of New Hampshire and we have reviewed the use to the industries in the area. We have also discussed the ownership of the dam with the Towns of Tilton and Northfield.

To leave the dam in the river would require a sizeable sum of money for maintenance; therefore, we propose to remove the dam this fall working out with the industries that are involved a connection to the river so that they can take water for processing purposes.

If you have any questions as to the planned action, we will be pleased to hear from you.

Very truly yours,

A handwritten signature in cursive script, appearing to read 'Eliot Priest', written in dark ink.

Eliot Priest
Vice President

EP:p
c.c. D. E. Sinville
W. A. Adams, Jr.
L. O. Wilson

July 17, 1967

Mr. Eliot Priest, Vice President
Public Service Company of New Hampshire
Manchester, New Hampshire

Dear Mr. Priest:

In reply to your letter of July 7, 1967, this Board has no objection to removal of your dam directly behind Tilton Leather Company. In fact, this removal will substantially lower the flood crests through the compact area of Tilton.

Very truly yours,

George M. McGee, Sr.
Chairman

gmcg:c
cc: U.S.G.S.

September 25, 1967

Mr. Elliot Priest, Vice President
Public Service Company of New Hampshire
Manchester, New Hampshire

Dear Mr. Priest:

Regarding your letter of August 31, 1967 relating to the dam in the towns of Tilton and Northfield directly behind the Tilton Leather Company on the Winnepesaukee River, we understand that the Town of Tilton wishes to take title to the dam and related property.

We have discussed the town retaining this dam with both Mr. Prescott, Chairman of the Board of Selectmen and Mr. Wadleigh, Chairman of the Planning Commission. We were informed that the town's interest at present is to eliminate possible health and unsanitary conditions that would be caused if this dam was removed at this time. We also understand that water users adjacent to the dam would have to provide a more costly way of utilizing water from the stream should this dam be removed.

The Water Resources Board is of the opinion that this dam should be removed in the future if these other problems are eliminated. Its removal would provide for greater discharge capacity through this section of the Winnepesaukee River which, in the past during high flood flows caused damage to property owners along the river upstream of the dam.

Very truly yours,

George H. McGee, Sr.
Chairman

gacg:c
cc: Mrs. Prescott
Mr. Wadleigh

September 25, 1968

Board of Selectmen
Tilton
New Hampshire 03276

Gentlemen:

Some time ago, personnel from this Board talked with you concerning repairs to the gate section in the former Elm Mills dam across Winnepesaukee River after the Town of Tilton acquired it from Public Service Company of New Hampshire. This Board expected you would notify this Board of the nature of the repairs to be undertaken. As yet, no plans have been received and the Town of Tilton now has title to this dam.

This work should be completed before the fall rains raise the river and before the spring freshets arrive. The present condition of the gate section is such that heavy flows could cause a serious failure, flooding downstream establishments for which you could be liable.

I await your plans to repair this gate section in a manner to prevent failure and insure the safety of the structure. In case you should desire it, you could arrange for Water Resources Engineer, Vernon A. Knowlton, to discuss this matter with you at Concord.

Very truly yours,

George M. McGee, Sr.
Chairman

GMM/FCM/m

RECEIVED

OCT 21 1968
NEW HAMPSHIRE
WATER RESOURCES BOARD

Town of Tilton

New Hampshire 03276

OFFICE OF SELECTMEN

RECEIVED

OCT 21 1968
NEW HAMPSHIRE
WATER RESOURCES BOARD

October 21, 1968

Water Resources Board
State House Annex
Concord N. H.

Dear Sir:

We are requesting permission to open the gate on the Northfield side of the former Public Service Dam which the Town of Tilton now owns. We wish to lower the river for one day (next Saturday) so Mr. Dick Persons of "Person's Concrete" can estimate the cost of erecting a ten foot concrete wall. It is our intention to have this wall built to stop the flow through the gate on the Tilton side and to remove this gate after the wall is completed. At this time we only wish to try to lower the river with this one gate. It is possible later on other ways of lowering the river may have to be undertaken when the footings and wall are to be poured. We are hoping that the raising of the Northfield gate will serve our purpose at these particular times. The gate will be closed on Sunday to allow the river to return to its natural flow by Monday. Your urgent answer is requested. Thank you.

Donald B. Joscelyn
Chairman Board of Selectmen
Tilton N. H.

The purpose of the proposed construction is

To repair the dam's gate by bypassing it with a cement wall
(Here briefly state use to which stored water/is to be put)

gate by bypassing it with a cement wall
which stored water/is to be put)

The construction will consist of

(Here give brief description of work contemplated including height of dam)

work contemplated including height of dam)

Cement wall construction (Details forwarded to Water Resources Board)

All land to be flowed is not owned by applicant.
is

Raymond W. Stokely
Board of Selectmen
Town of Tilton, N.H.
Address 67 School Lane
Tilton, N.H.

Note: This statement together with plans, specifications and information and data filed in connection herewith will remain on file in the office of the Water Resources Board. This statement is to be filed in duplicate.

7949

TOWN NO. 1 TOWN Tilton, N. H. NO. 103b PAGE NO. 6

NAME OF COMPANY Elm Mills Woolen Company

HOME ADDRESS Tilton, N. H.

DRAINAGE AREA 418 SQ. MI. HEAD 14 FT.

RIVER Winnepesaukee RATE SEC. FT. PER SQ. MI. 90% TIME .7

RESOURCES

FOR CENTRAL STATIONS		FOR ISOLATED INDUSTRIAL PLANTS	
WHEEL CAP. H. P.	PRIMARY H. P. 90% TIME	WHEEL CAP. H. P.	PRIMARY H. P. 90% TIME
		300	186.18

USES

FOR CENTRAL STATIONS		FOR ISOLATED INDUSTRIAL PLANTS		
K. V. A. CAPACITY	ANNUAL KW. H. OUTPUT	K. V. A. CAPACITY	ANNUAL KW. H. PROD. AND CONS. ELECT.	ANNUAL KW. H. PROD. AND CONS. MECH.

PUBLIC SERVICE COMMISSION OF NEW HAMPSHIRE—DAM RECORD

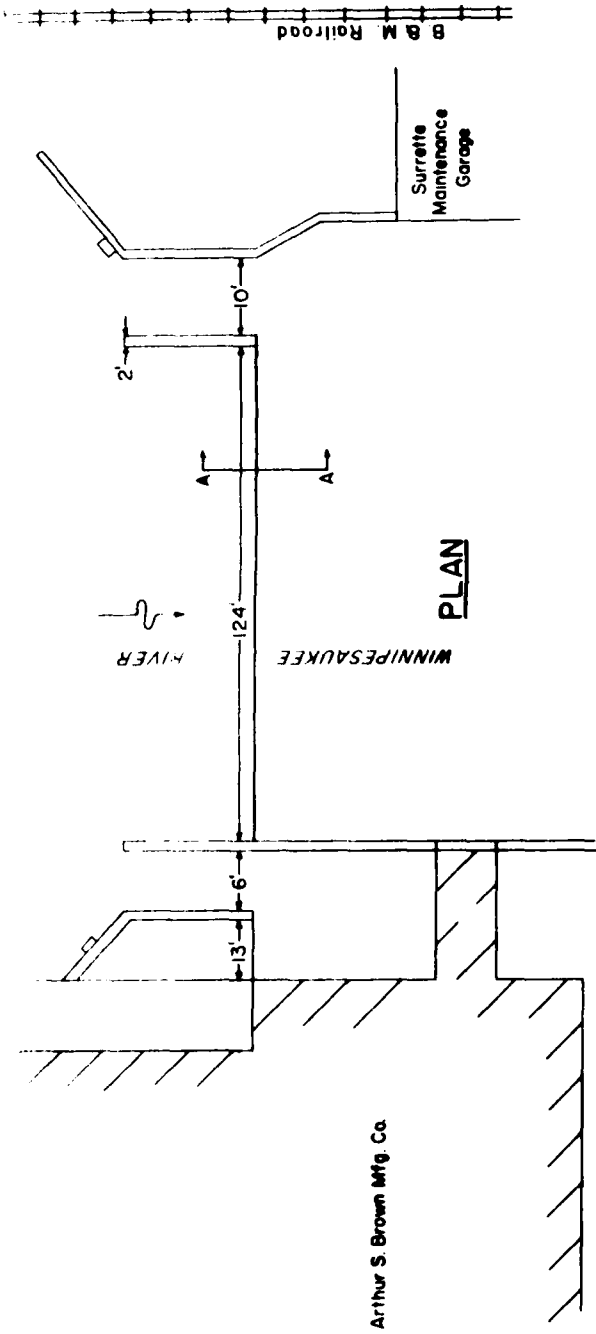
1-3578

TOWN	TILTON	TOWN NO.	2	STATE NO.	
RIVER	MINNEPESAUKEE RIVER				
STREAM	4185 & A.M.I.				
DRAINAGE AREA	4185 & A.M.I.				
DAM TYPE	"A" FRAME				
MATERIALS OF CONSTRUCTION	TIMBER				
PURPOSE OF DAM	POWER—CONSERVATION—DOMESTIC—RECREATION—TRANSPORTATION—PUBLIC UTILITY $\frac{1}{2}$				
HEIGHTS, TOP OF DAM TO BED OF STREAM	16'	TOP OF DAM TO SPILLWAY CRESTS	4'	LENGTH OF DAM	170'
SPILLWAYS, LENGTHS	50' - 57'				
DEPTHS BELOW TOP OF DAM					
FLASHBOARDS	NONE				
TYPE, HEIGHT ABOVE CREST					
OPERATING HEAD	11'	TOP OF FLASHBOARDS TO N. T. W.	11'		
CREST TO N. T. W.	11'				
WHEELS, NUMBER	1 - Rodney Hunt 45" 100HP				
KINDS & H. P.					
GENERATORS, NUMBER	Northern D.C 30KW				
KINDS & K. W.	24DA - 125V				
H. P. 90 P. C. TIME					
100 P. C. EFF.					

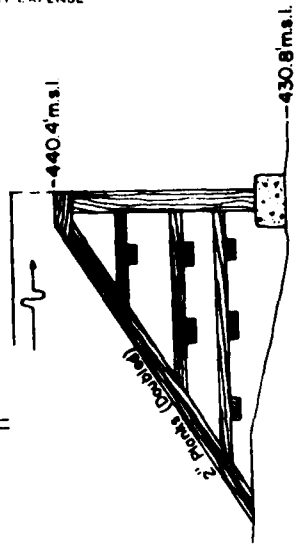
REFERENCES, CASES, PLANS, INSPECTIONS.

REMARKS
 Old Ponds 2
 11' 4" height
 24DA - 125V
 any improvement
 11/10/51

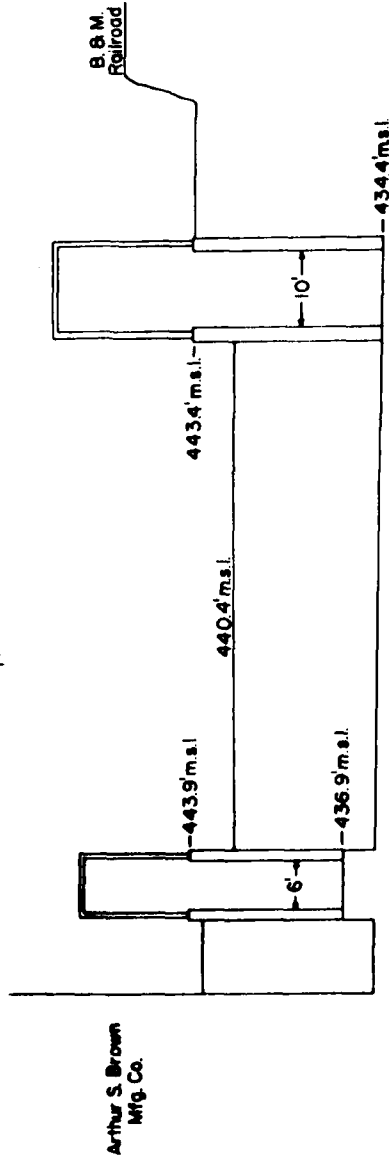
2151



PLAN



SECTION A-A

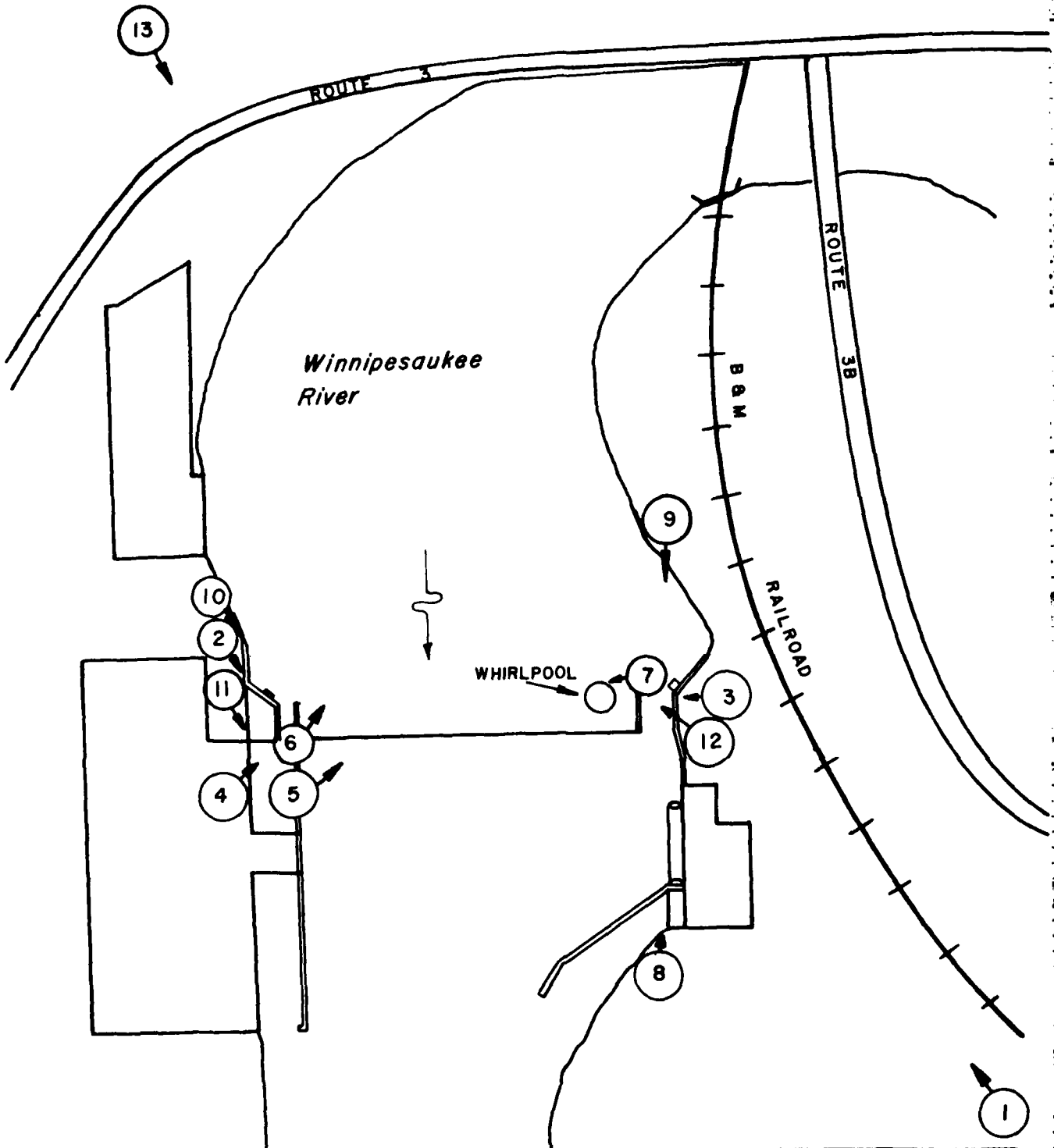


ELEVATION

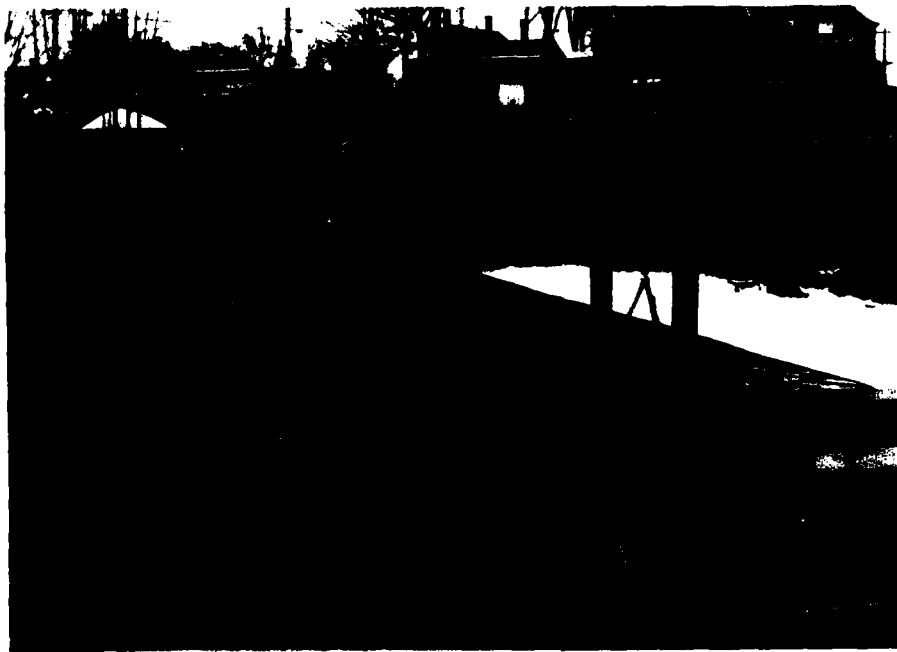
Anderson-Michels & Co., Inc. CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIVISION CONCORD NEW HAMPSHIRE
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	
WINNEPESAUKEE RIVER	NEW HAMPSHIRE
SCALE: NOT TO SCALE	DATE: JULY 1978

TILTON TOWN DAM

APPENDIX C
PHOTOGRAPHS



Anderson-Nichols & Co., Inc.		U.S. ARMY ENGINEER DIV. NEW ENGLAND	
CONCORD		CORPS OF ENGINEERS	
NEW HAMPSHIRE		WALTHAM, MA.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
TILTON TOWN DAM			
PHOTO INDEX			
WINNIPESAUKEE RIVER		NEW HAMPSHIRE	
		SCALE: NOT TO SCALE	
		DATE: JULY, 1979	



April 6, 1979

Figure 2 - Looking south across the upstream face of the dam from the north abutment.



April 6, 1979

Figure 3 - Looking north across the upstream face of the dam from the south abutment.



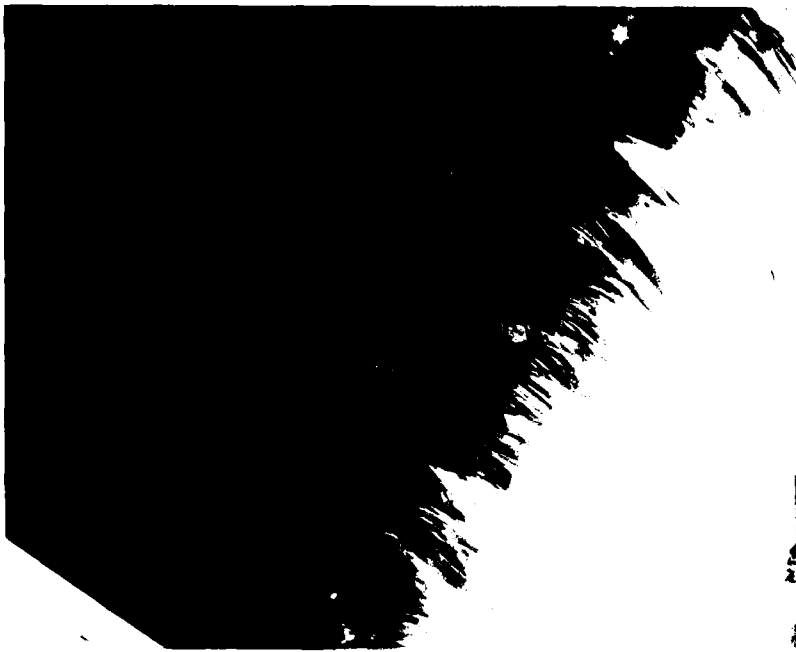
April 6, 1979

Figure 4 - View of the spillway. Note the uneven level of the water.



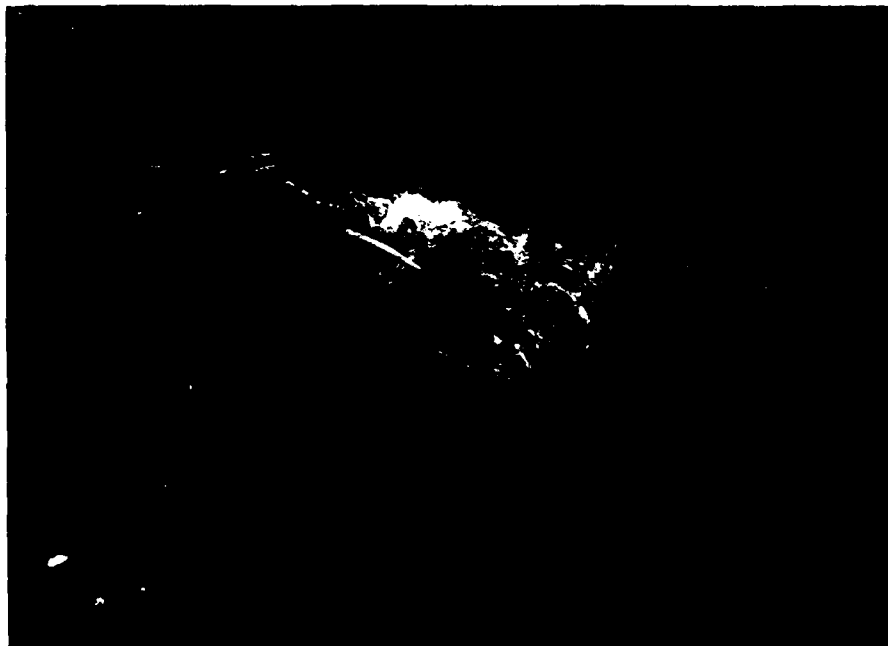
April 24, 1979

Figure 5 - Looking at the spillway where local support failures have occurred. Note the water discharging through the spillway through holes in planking.



April 24, 1979

Figure 6 - Closeup of the deteriorated planking on the upstream side of the spillway.



April 24, 1979

Figure 7 - View of the whirlpool located over a hole in the planking.



April 6, 1979

Figure 8 - View of the downstream face of the south abutment.



April 6, 1979

Figure 9 - View of the upstream face of the south abutment. Note the concrete box inlet structure.



April 6, 1979

Figure 10 - Looking at the upstream face of the north abutment.

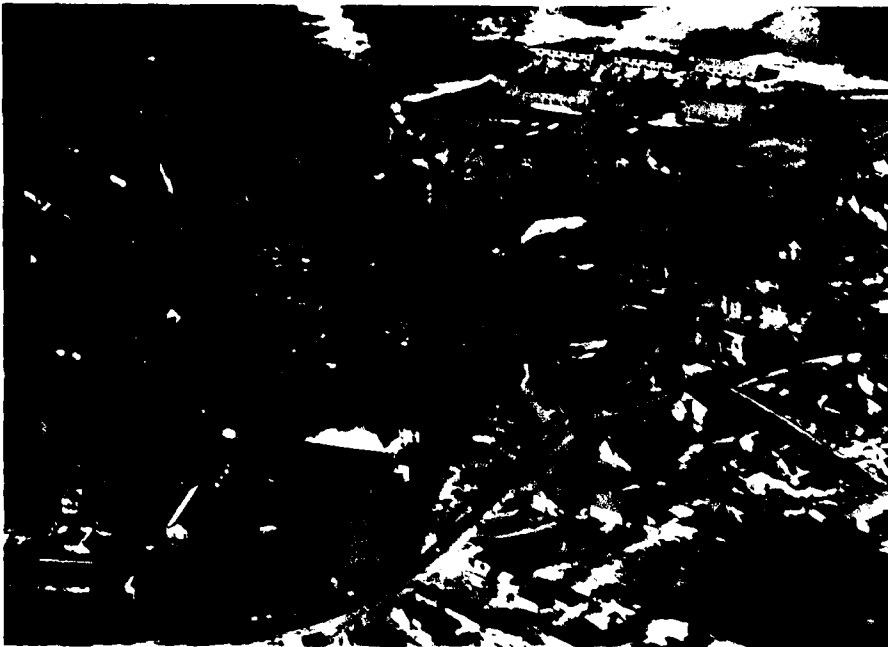


April 6, 1979

Figure 11 - View of the sinkhole observed in the fill at the north abutment.

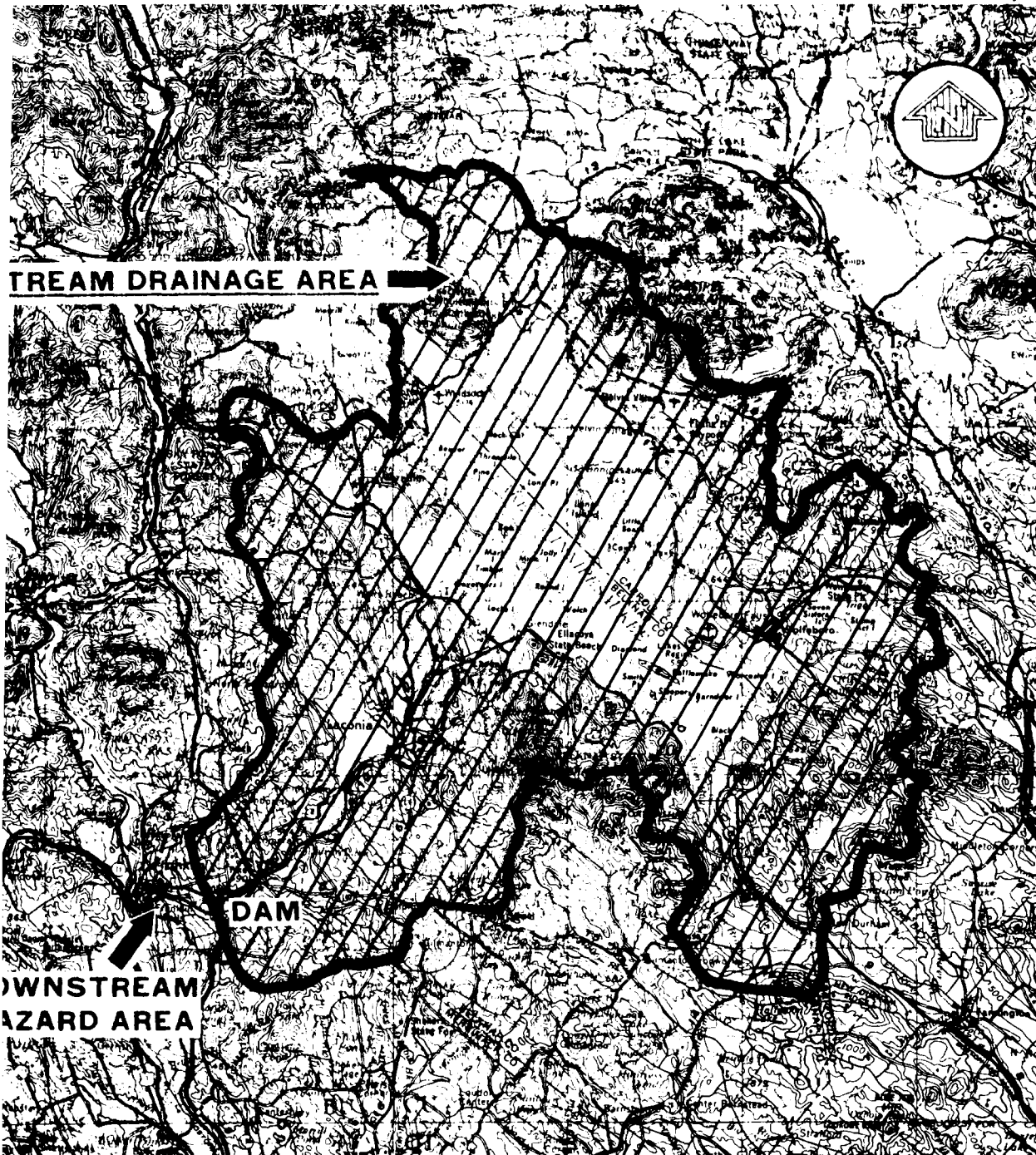


April 6, 1979
Figure 12 - Looking upstream at the north approach
channel from the south abutment.



April 1979
Figure 13 - Overview of the downstream channel.

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS



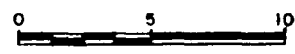
**NATIONAL PROGRAM OF INSPECTION
OF NON-FED DAMS
TILTON TOWN DAM
TILTON, NEW HAMPSHIRE
REGIONAL VICINITY MAP**

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

N-NICHOLS & CO., INC.

CONCORD, NH

SCALE IN MILES



MAP BASED ON U.S.G.S. 1:250,000 SERIES
TOPOGRAPHIC MAPPING. NK-19-1 PORTLAND
ME, NH 1956, REVISED 1972.

TILTON TOWN DAM HYDROLOGIC / HYDRAULIC ANALYSIS

Page 1 of 5
L. Williams
4/20/79

Area = 473 mi²

Dam Classification = Small

Hazard Classification = Significant

Design Flood = $\frac{1}{4}$ PMF to $\frac{1}{2}$ PMF

Design test flood = $\frac{1}{2}$ PMF

The flood inflow cannot simply be determined by use of the PMF guidelines due to the complexity of hydrologic and hydraulic conditions which comprise the Winnepesaukee River drainage basin. Flooding on the Winnepesaukee River and its associated streams and lakes is to a large extent controlled by Lochmere Dam on Lake Umbagog, Avery Dam on the Winnepesaukee River, and Lakeport Dam between Opechee Lake and Pouquebec Bay. Referring to the Northfield and Tilton Flood Insurance Studies, peak discharges on the Winnepesaukee River were determined at Lakeport Dam, Avery Dam, and Lochmere Dam using various hydrologic methods. (Note: Northfield Study done by ANCO, received backup from Tilton Engineering who performed the Northfield FIS Study, September 1977.) The peak discharge at the Tilton gage during a 500-year storm was determined to be 7,570 cfs. This gage is located 0.4 miles upstream of Tilton Town Dam. The peak discharge at Lakeport Dam during a flooding of this magnitude was determined to be 4,300 cfs.

SECNO	XLCH	ELTRK	ELLC	CWSEL	XLBEL	ELMIN	FBEL	VCH	B	RLDB	RICH	ORUB
* 27595.000	1050.00	0.0	0.0	427.74	434.50	420.80	434.20	12.51	7000.00	0.0	7000.00	0.0
* 27595.000	1050.00	0.0	0.0	427.74	434.50	420.80	434.20	13.47	9000.00	0.0	9000.00	0.0
* 27595.000	1050.00	0.0	0.0	427.74	434.50	420.80	434.20	13.47	9000.00	0.0	9000.00	0.0
* 27910.000	315.00	0.0	0.0	428.07	444.20	425.80	442.90	5.17	1000.00	0.0	1000.00	0.0
* 27910.000	315.00	0.0	0.0	429.52	444.20	425.80	442.90	7.36	3000.00	0.0	3000.00	0.0
* 27910.000	315.00	0.0	0.0	430.34	444.20	425.80	442.90	8.35	4475.00	0.0	4475.00	0.0
* 27910.000	315.00	0.0	0.0	431.06	444.20	425.80	442.90	9.04	5875.00	0.0	5875.00	0.0
* 27910.000	315.00	0.0	0.0	431.60	444.20	425.80	442.90	9.48	7000.00	0.0	7000.00	0.0
* 27910.000	315.00	0.0	0.0	432.08	444.20	425.80	442.90	9.80	8000.00	0.0	8000.00	0.0
* 27910.000	315.00	0.0	0.0	432.53	444.20	425.80	442.90	10.10	9000.00	0.0	9000.00	0.0
* 28010.000	100.00	0.0	0.0	431.92	443.60	430.80	443.20	6.05	1000.00	0.0	1000.00	0.0
* 28010.000	100.00	0.0	0.0	433.13	443.60	430.80	443.20	8.70	3000.00	0.0	3000.00	0.0
* 28010.000	100.00	0.0	0.0	433.85	443.60	430.80	443.20	9.94	4475.00	0.0	4475.00	0.0
* 28010.000	100.00	0.0	0.0	434.45	443.60	430.80	443.20	10.90	5875.00	0.0	5875.00	0.0
* 28010.000	100.00	0.0	0.0	434.90	443.60	430.80	443.20	11.55	7000.00	0.0	7000.00	0.0
* 28010.000	100.00	0.0	0.0	435.30	443.60	430.80	443.20	12.04	8000.00	0.0	8000.00	0.0
* 28010.000	100.00	0.0	0.0	435.66	443.60	430.80	443.20	12.53	9000.00	0.0	9000.00	0.0
* 28015.000	5.00	440.40	434.40	440.99	443.40	434.40	443.90	6.11	1000.00	0.0	992.92	7.07
* 28015.000	5.00	440.40	434.40	442.29	443.40	434.40	443.90	8.52	3000.00	0.0	2941.63	58.37
* 28015.000	5.00	440.40	434.40	443.00	443.40	434.40	443.90	9.80	4475.00	0.0	4356.69	118.31
* 28015.000	5.00	440.40	434.40	443.59	443.40	434.40	443.90	10.76	5875.00	0.0	5683.52	191.12
* 28015.000	5.00	440.40	434.40	444.15	443.40	434.40	443.90	11.05	7000.00	0.0	6713.12	274.15
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* 28027.000	12.00	0.0	0.0	441.66	452.00	435.10	447.60	2.03	1000.00	0.0	1000.00	0.0
* 28027.000	12.00	0.0	0.0	443.43	452.00	435.10	447.60	4.07	3000.00	0.0	3000.00	0.0
* 28027.000	12.00	0.0	0.0	444.40	452.00	435.10	447.60	5.10	4475.00	0.0	4475.00	0.0
* 28027.000	12.00	0.0	0.0	445.20	452.00	435.10	447.60	5.92	5875.00	0.0	5875.00	0.0
* 28027.000	12.00	0.0	0.0	446.70	452.00	435.10	447.60	6.57	7000.00	0.0	7000.00	0.0
* 28027.000	12.00	0.0	0.0	446.13	452.00	435.10	447.60	7.08	8000.00	0.0	8000.00	0.0
* 28027.000	12.00	0.0	0.0	446.47	452.00	435.10	447.60	7.63	9000.00	0.0	9000.00	0.0
* 28071.000	44.00	0.0	0.0	441.73	449.00	432.10	444.60	1.08	1000.00	0.0	1000.00	0.0
* 28071.000	44.00	0.0	0.0	443.66	449.00	432.10	444.60	2.48	3000.00	0.0	3000.00	0.0
* 28071.000	44.00	0.0	0.0	444.75	449.00	432.10	444.60	3.25	4475.00	0.0	4475.00	0.00
* 28071.000	44.00	0.0	0.0	445.64	449.00	432.10	444.60	3.87	5875.00	0.0	5875.00	0.00
* 28071.000	44.00	0.0	0.0	446.24	449.00	432.10	444.60	4.34	7000.00	0.0	7000.00	0.00
* 28071.000	44.00	0.0	0.0	446.74	449.00	432.10	444.60	4.73	8000.00	0.0	8000.00	0.00
* 28071.000	44.00	0.0	0.0	447.17	449.00	432.10	444.60	5.11	9000.00	0.0	8999.99	0.01
* 28525.000	454.00	0.0	0.0	441.77	443.20	433.90	445.00	1.59	1000.00	0.02	999.98	0.0
* 28525.000	454.00	0.0	0.0	443.80	443.20	433.90	445.00	3.40	3000.00	21.85	2978.15	0.0
* 28525.000	454.00	0.0	0.0	444.94	443.20	433.90	445.00	4.31	4475.00	71.94	4403.05	0.0
* 28525.000	454.00	0.0	0.0	445.87	443.20	433.90	445.00	5.03	5875.00	136.07	5737.52	1.40
* 28525.000	454.00	0.0	0.0	446.50	443.20	433.90	445.00	5.57	7000.00	193.56	6800.14	6.30
* 28525.000	454.00	0.0	0.0	447.03	443.20	433.90	445.00	6.00	8000.00	249.93	7734.07	16.00
* 28525.000	454.00	0.0	0.0	447.48	443.20	433.90	445.00	6.43	9000.00	307.57	8664.00	28.42

TILTOW
DPA
D-16

SECNO	KLCH	ELTRD	ELLC	CMSEL	XLBEL	ELMIN	RBEL	VCH	G	QLOR	QCH	OROR
16245.000	1455.00	0.0	0.0	411.82	402.00	394.30	402.00	2.76	9000.00	1159.11	6812.57	1028.32
18030.000	1785.00	0.0	0.0	403.14	404.00	399.60	404.00	3.70	1000.00	0.0	1000.00	0.0
18030.000	1785.00	0.0	0.0	406.54	404.00	399.60	404.00	4.84	3000.00	30.28	2948.82	20.89
18030.000	1785.00	0.0	0.0	408.32	404.00	399.60	404.00	5.49	4475.00	92.38	4315.66	66.96
18030.000	1785.00	0.0	0.0	409.80	404.00	399.60	404.00	5.97	5875.00	170.11	5577.41	127.48
18030.000	1785.00	0.0	0.0	410.84	404.00	399.60	404.00	6.31	7000.00	247.77	6561.96	190.27
18030.000	1785.00	0.0	0.0	411.69	404.00	399.60	404.00	6.60	8000.00	328.97	7416.08	254.95
18030.000	1785.00	0.0	0.0	412.50	404.00	399.60	404.00	6.84	9000.00	423.96	8247.28	328.76
18620.000	590.00	0.0	0.0	404.64	409.00	400.00	409.00	4.09	1000.00	0.0	1000.00	0.0
18620.000	590.00	0.0	0.0	407.52	409.00	400.00	409.00	4.63	3000.00	0.0	3000.00	0.0
18620.000	590.00	0.0	0.0	409.23	409.00	400.00	409.00	4.60	4475.00	0.0	4474.97	0.00
18620.000	590.00	0.0	0.0	410.64	409.00	400.00	409.00	4.63	5875.00	4.48	5863.09	7.43
18620.000	590.00	0.0	0.0	411.71	409.00	400.00	409.00	4.70	7000.00	15.50	6952.74	31.76
18620.000	590.00	0.0	0.0	412.57	409.00	400.00	409.00	4.77	8000.00	32.57	7903.73	63.70
18620.000	590.00	0.0	0.0	413.39	409.00	400.00	409.00	4.85	9000.00	52.65	8844.77	102.58
20515.000	1895.00	0.0	0.0	405.51	411.00	400.80	411.00	1.32	1000.00	0.0	1000.00	0.0
20515.000	1895.00	0.0	0.0	408.46	411.00	400.80	411.00	1.97	3000.00	0.0	3000.00	0.0
20515.000	1895.00	0.0	0.0	410.12	411.00	400.80	411.00	2.23	4475.00	0.01	4474.98	0.0
20515.000	1895.00	0.0	0.0	411.50	411.00	400.80	411.00	2.40	5875.00	16.86	5858.14	0.00
20515.000	1895.00	0.0	0.0	412.50	411.00	400.80	411.00	2.50	7000.00	108.62	6891.23	0.15
20515.000	1895.00	0.0	0.0	413.33	411.00	400.80	411.00	2.56	8000.00	280.23	7719.11	0.66
20515.000	1895.00	0.0	0.0	414.12	411.00	400.80	411.00	2.59	9000.00	518.85	8479.54	1.60
21425.000	910.00	0.0	0.0	405.79	407.60	400.40	407.00	2.50	1000.00	0.0	1000.00	0.0
21425.000	910.00	0.0	0.0	408.71	407.60	400.40	407.00	3.82	3000.00	0.12	2996.22	3.66
21425.000	910.00	0.0	0.0	410.34	407.60	400.40	407.00	4.40	4475.00	1.28	4424.37	49.35
21425.000	910.00	0.0	0.0	411.68	407.60	400.40	407.00	4.83	5875.00	3.64	5738.75	132.61
21425.000	910.00	0.0	0.0	412.66	407.60	400.40	407.00	5.12	7000.00	10.33	6761.70	227.97
21425.000	910.00	0.0	0.0	413.46	407.60	400.40	407.00	5.32	8000.00	40.98	7616.26	342.76
21425.000	910.00	0.0	0.0	414.24	407.60	400.40	407.00	5.46	9000.00	126.82	8395.26	477.92
21965.000	540.00	0.0	0.0	406.09	413.60	401.20	413.70	2.61	1000.00	0.0	1000.00	0.0
21965.000	540.00	0.0	0.0	409.04	413.60	401.20	413.70	3.92	3000.00	0.0	3000.00	0.0
21965.000	540.00	0.0	0.0	410.65	413.60	401.20	413.70	4.52	4475.00	0.0	4475.00	0.0
21965.000	540.00	0.0	0.0	411.99	413.60	401.20	413.70	4.96	5875.00	0.0	5875.00	0.0
21965.000	540.00	0.0	0.0	412.95	413.60	401.20	413.70	5.26	7000.00	0.0	7000.00	0.0
21965.000	540.00	0.0	0.0	413.74	413.60	401.20	413.70	5.51	8000.00	0.01	7999.99	0.00
21965.000	540.00	0.0	0.0	414.50	413.60	401.20	413.70	5.74	9000.00	1.07	8998.87	0.06
23220.000	1255.00	0.0	0.0	406.77	415.60	401.00	414.00	1.89	1000.00	0.0	1000.00	0.0
23220.000	1255.00	0.0	0.0	409.83	415.60	401.00	414.00	2.82	3000.00	0.0	3000.00	0.0
23220.000	1255.00	0.0	0.0	411.50	415.60	401.00	414.00	3.25	4475.00	0.0	4475.00	0.0
23220.000	1255.00	0.0	0.0	412.88	415.60	401.00	414.00	3.57	5875.00	0.0	5875.00	0.0
23220.000	1255.00	0.0	0.0	413.87	415.60	401.00	414.00	3.80	7000.00	0.0	6999.14	0.86
23220.000	1255.00	0.0	0.0	414.68	415.60	401.00	414.00	3.97	8000.00	0.0	7985.40	14.59
23220.000	1255.00	0.0	0.0	415.45	415.60	401.00	414.00	4.10	9000.00	0.0	8898.31	101.70
25615.000	2395.00	0.0	0.0	409.15	410.00	404.80	410.30	3.56	1000.00	0.0	1000.00	0.0
25615.000	2395.00	0.0	0.0	412.04	410.00	404.80	410.30	5.14	3000.00	0.0	2986.49	12.29
25615.000	2395.00	0.0	0.0	413.55	410.00	404.80	410.30	5.84	4475.00	5.23	4342.39	127.40
25615.000	2395.00	0.0	0.0	414.77	410.00	404.80	410.30	6.31	5875.00	11.09	5491.60	372.31
25615.000	2395.00	0.0	0.0	415.67	410.00	404.80	410.30	6.60	7000.00	17.14	6371.37	611.49
25615.000	2395.00	0.0	0.0	416.41	410.00	404.80	410.30	6.84	8000.00	23.36	7134.20	842.44
25615.000	2395.00	0.0	0.0	417.10	410.00	404.80	410.30	7.06	9000.00	30.31	7884.79	1084.90
26545.000	930.00	0.0	0.0	411.90	412.90	408.20	413.40	4.28	1000.00	0.0	1000.00	0.0

X1 28010.000 13.000 1048.000 1196.000 85.000 150.000 100.000 0.0 0.0 0.0 1048.100 430.800 1048.100
 GR 453.300 980.000 452.400 1000.000 444.400 1010.000 443.600 0.0 0.0 0.0 1048.100 430.800 1048.100
 GR 430.800 1195.900 443.200 1196.000 444.100 1208.000 446.500 0.0 0.0 0.0 1208.100 442.900 1216.000
 GR 439.800 1216.100 439.400 1228.000 450.000 1228.100 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 SB 0.900 10.000 3.000 0.0 0.100 0.010 0.010 0.0 0.0 0.0 434.400 430.800 430.800

X1 28015.000 17.000 932.000 1076.100 5.000 5.000 5.000 0.0 0.0 0.0 0.0 0.0 0.0
 X2 0.0 0.0 1.000 434.400 440.400 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 RT 17.000 864.000 453.300 0.0 884.000 452.400 0.0 894.000 444.400 0.0 444.400 0.0 0.0
 RT 932.000 443.400 0.0 932.100 434.400 0.0 942.000 942.100 0.0 942.100 0.0 942.100
 RT 443.400 0.0 944.000 443.400 0.0 944.100 440.400 0.0 1068.000 440.400 0.0 440.400
 RT 0.0 1068.100 443.900 0.0 1070.000 443.900 0.0 1070.100 436.900 0.0 436.900 0.0 0.0
 RT 1076.000 436.900 0.0 1076.100 443.900 0.0 1108.000 440.000 0.0 1108.100 0.0 1108.100
 RT 450.000 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 GR 453.300 864.000 452.400 884.000 444.400 894.000 443.400 894.000 434.400 932.000 434.400 932.100
 GR 434.400 942.000 443.400 942.100 443.400 944.000 440.400 944.100 440.400 944.100 440.400 1068.000
 GR 443.900 1068.100 443.900 1070.000 436.900 1070.100 436.900 1076.000 443.900 1076.100 443.900 1076.100
 GR 440.000 1108.000 450.000 1108.100 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 NC 0.0 0.0 0.0 0.300 0.500 0.0 0.0 0.0 0.0 0.0 0.0 0.0

X1 28027.000 17.000 1006.000 1173.000 12.000 12.000 12.000 0.0 0.0 0.0 0.0 3.000 0.0
 GR 453.100 965.000 452.200 984.000 449.600 1000.000 449.000 1006.000 442.100 1025.000 442.100 1025.000
 GR 440.800 1027.000 437.300 1035.000 436.800 1063.000 433.800 1063.000 434.800 1103.000 434.800 1103.000
 GR 432.100 1126.000 435.300 1148.000 434.800 1164.000 437.700 1167.000 444.600 1173.000 444.600 1173.000
 GR 447.400 1173.100 448.100 1190.000 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 X1 28071.000 0.0 0.0 0.0 60.000 70.000 44.000 0.0 0.0 0.0 0.0 -3.000 0.0
 NC 0.080 0.0 0.035 0.300 0.500 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

X1 28525.000 25.000 1051.000 1179.000 360.000 520.000 454.000 0.0 0.0 0.0 0.0 0.0 0.0
 GR 465.900 521.000 463.700 587.000 462.800 619.000 461.500 666.000 460.600 678.000 460.600 678.000
 GR 455.800 815.000 451.700 858.000 451.400 967.000 451.800 982.000 451.100 1000.000 451.100 1000.000
 GR 450.600 1003.000 441.800 1018.000 441.600 1025.000 443.000 1033.000 443.200 1051.000 443.200 1051.000
 GR 440.900 1063.000 438.800 1070.000 433.900 1094.000 436.200 1112.000 434.900 1140.000 434.900 1140.000
 GR 435.900 1164.000 440.900 1174.000 445.000 1179.000 446.600 1200.000 448.800 1206.000 448.800 1206.000
 EJ 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

7 1 1713/1 un
 SUMMARY PRINTOUT

SECNO	XLCH	ELTRD	ELLC	CWSEL	XLBEL	ELMIN	RBEL	VCH	Q	GLDB	QCH	GRDB
14790.000	220.00	0.0	0.0	400.97	405.20	394.50	405.10	1.94	1000.00	0.0	1000.00	0.0
14790.000	220.00	0.0	0.0	405.16	405.20	394.50	405.10	2.74	3000.00	0.0	3000.00	0.00
14790.000	220.00	0.0	0.0	407.03	405.20	394.50	405.10	3.22	4475.00	3.57	4468.82	2.61
14790.000	220.00	0.0	0.0	408.57	405.20	394.50	405.10	3.57	5875.00	31.26	5831.25	12.48
14790.000	220.00	0.0	0.0	409.65	405.20	394.50	405.10	3.80	7000.00	101.72	6872.66	25.61
14790.000	220.00	0.0	0.0	410.51	405.20	394.50	405.10	3.99	8000.00	193.78	7765.47	40.74
14790.000	220.00	0.0	0.0	411.35	405.20	394.50	405.10	4.15	9000.00	314.35	8624.16	61.50
16245.000	1455.00	0.0	0.0	401.32	402.00	394.30	402.00	1.43	1000.00	0.0	1000.00	0.0
16245.000	1455.00	0.0	0.0	405.51	402.00	394.30	402.00	1.96	3000.00	150.74	2753.25	96.01

MC	0.110	0.110	0.030	0.300	0.500	0.0	0.0	0.0	0.0
X1	20515.000	33.000	9638.000	9958.000	1720.000	1840.000	1895.000	0.0	0.0
GR	420.900	8497.000	419.300	8536.000	413.900	8545.000	412.500	413.800	8746.000
GR	411.600	8885.000	414.900	8894.000	416.100	8921.000	415.600	410.700	9051.000
GR	411.000	9086.000	412.500	9103.000	410.000	9176.000	411.000	411.400	9307.000
GR	411.900	9403.000	412.100	9461.000	411.800	9513.000	412.300	411.000	9638.000
GR	405.300	9681.000	403.100	9699.000	402.700	9716.000	403.900	403.500	9741.000
GR	402.000	9788.000	400.800	9822.000	401.300	9864.000	402.000	405.300	9921.000
GR	408.400	9935.000	411.400	9958.000	423.100	9987.000	0.0	0.0	0.0
X1	21425.000	38.000	9864.000	10000.000	700.000	1680.000	910.000	0.0	0.0
GR	420.300	8700.000	417.400	8712.000	413.400	8727.000	414.600	415.300	8853.000
GR	413.300	8872.000	413.200	8945.000	411.900	8965.000	413.000	417.700	9131.000
GR	417.700	9267.000	417.900	9363.000	416.700	9450.000	416.400	414.600	9610.000
GR	413.200	9643.000	414.900	9738.000	415.100	9833.000	413.200	407.600	9864.000
GR	405.600	9876.000	401.800	9889.000	400.400	9913.000	401.100	402.700	9949.000
GR	402.900	9962.000	405.600	9996.000	407.000	10000.000	408.700	408.800	10025.000
GR	408.000	10032.000	412.200	10111.000	412.700	10160.000	416.100	414.200	10275.000
GR	418.000	10357.000	419.000	10365.000	423.000	10375.000	0.0	0.0	0.0
X1	21965.000	21.000	848.000	1002.000	250.000	440.000	540.000	0.0	0.0
GR	419.700	375.000	417.300	450.000	415.200	483.000	416.000	416.100	593.000
GR	415.800	645.000	417.500	704.000	416.200	813.000	413.600	411.200	853.000
GR	406.000	866.000	404.000	875.000	404.600	888.000	403.800	401.200	934.000
GR	401.200	960.000	402.400	973.000	406.000	988.000	411.800	413.700	1002.000
GR	424.600	1015.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MC	0.100	0.110	0.035	0.300	0.500	0.0	0.0	0.0	0.0
X1	23220.000	20.000	783.000	990.000	1000.000	880.000	1235.000	0.0	0.0
GR	419.800	776.000	415.600	783.000	408.100	796.000	407.000	404.700	819.000
GR	403.500	847.000	401.000	876.000	402.600	904.000	403.600	404.900	951.000
GR	407.000	966.000	414.000	990.000	414.400	1000.000	414.500	414.400	1183.000
GR	414.500	1265.000	417.400	1335.000	415.200	1438.000	413.200	419.800	1555.000
X1	25615.000	19.000	884.000	990.000	2600.000	720.000	2395.000	0.0	0.0
GR	420.900	871.000	410.000	884.000	408.700	887.000	407.200	404.800	907.000
GR	405.100	917.000	404.800	935.000	405.800	950.000	407.300	408.700	975.000
GR	410.300	990.000	411.200	1000.000	413.200	1035.000	413.200	411.500	1105.000
GR	413.100	1159.000	415.700	1167.000	419.900	1185.000	420.900	0.0	0.0
MC	0.085	0.110	0.040	0.300	0.500	0.0	0.0	0.0	0.0
X1	26545.000	31.000	886.000	992.000	600.000	480.000	930.000	0.0	0.0
GR	434.700	752.000	415.400	788.000	415.400	811.000	414.200	414.600	869.000
GR	412.900	886.000	411.300	889.000	408.200	900.000	408.800	409.800	933.000
GR	409.700	957.000	409.700	965.000	410.500	987.000	412.100	413.400	992.000
GR	416.800	995.000	417.100	1000.000	419.000	1032.000	418.600	417.500	1093.000
GR	416.900	1116.000	420.100	1144.000	422.900	1201.000	421.600	423.200	1283.000
GR	423.200	1291.000	420.400	1395.000	420.500	1531.000	419.900	418.400	1656.000
GR	424.800	1683.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MC	0.0	0.085	0.0	0.300	0.500	0.0	0.0	0.0	0.0
X1	27595.000	14.000	855.000	1000.000	800.000	1320.000	1050.000	0.0	0.0
GR	440.600	816.000	440.200	848.000	434.500	855.000	423.500	421.300	890.000
GR	421.100	899.000	420.800	918.000	421.700	946.000	421.600	423.000	971.000
GR	423.500	974.000	434.200	1000.000	437.400	1114.000	443.400	423.000	971.000

Test File
Both Gates Open

T1 CORP OF ENGINEERS NEW ENGLAND DIVISION-TILTON TOWN DAM
 T2 ANDERSON-NICHOLS & CO. INC.
 T3 WINNIFESAUNEE RIVER RATING CURVE DATA

J1 ICHECK IND MINV IDIR STRT METRIC HVINS B WSEL FD
 -1. 2. 0. 0. 0.000320 0.0 0.0 0. 404.000 0.0
 J2 NPROF IPLOT PRFUS XSECV XSECH FN ALLDC IBW CHNIM ITRACE
 1.000 0.0 -1.000 0.0 0.0 0.0 0.0 0.0 0.0 0.0

J3 VARIABLE CODES FOR SUMMARY PRINTOUT
 38.000 39.000 40.000 41.000 1.000 23.000 42.000 24.000 26.000 43.000
 13.000 14.000 15.000 0.0 38.000 1.000 50.000 61.000 51.000 53.000
 21.000 4.000 22.000 54.000 49.000 34.000 17.000 0.0 0.0 0.0

J6 IHLED IDCFY

GT 7.000 1000.000 3000.000 4475.000 5875.000 7000.000 8000.000 9000.000 0.0 0.0
 MC 0.090 0.090 0.035 0.300 0.500 0.0 0.0 0.0 0.0 0.0

X1 14790.000 18.000 841.000 1000.000 150.000 250.000 220.000 0.0 0.0 0.0
 GR 421.500 501.000 420.200 617.000 411.800 620.000 407.900 761.000 407.800 821.000
 GR 485.200 841.000 401.500 857.000 397.500 868.000 396.400 889.000 394.500 910.000
 GR 396.100 929.000 396.700 952.000 398.400 973.000 401.500 981.000 405.100 1000.000
 GR 411.000 1029.000 416.700 1041.000 421.500 1049.000 0.0 0.0 0.0 0.0

X1 16245.000 23.000 9812.000 9981.000 1320.000 1520.000 1455.000 0.0 0.0 0.0
 GR 422.600 9078.000 418.400 9093.000 414.800 9193.000 412.600 9428.000 412.600 9428.000
 GR 410.800 9489.000 407.900 9553.000 408.400 9686.000 407.000 9695.000 402.300 9712.000
 GR 482.100 9730.000 402.000 9812.000 398.300 9849.000 396.800 9882.000 395.000 9910.000
 GR 394.300 9934.000 396.400 9964.000 402.000 9981.000 403.700 10022.000 403.700 10075.000
 GR 405.100 10142.000 410.000 10168.000 420.200 10183.000 0.0 0.0 0.0 0.0

X1 18030.000 15.000 950.000 1050.000 1600.000 2240.000 1785.000 0.0 0.0 0.0
 GR 425.000 750.000 420.000 780.000 415.000 830.000 410.000 915.000 405.000 935.000
 GR 404.000 950.000 401.000 955.000 399.600 1000.000 400.700 1045.000 404.000 1050.000
 GR 405.000 1060.000 410.000 1080.000 415.000 1130.000 420.000 1155.000 425.000 1265.000

X1 18620.000 14.000 795.000 1000.000 560.000 520.000 590.000 0.0 0.0 0.0
 GR 421.300 727.000 417.200 743.000 414.300 772.000 411.600 777.000 409.000 795.000

SECNO	XLCH	ELTRD	ELLC	CMSEL	XLREL	ELMIN	KBEL	VCH	Q	QUDR	QCH	QRDR
* 27595.000	1050.00	0.0	0.0	426.26	434.50	420.80	434.20	11.00	7000.00	0.0	7000.00	0.0
* 27595.000	1050.00	0.0	0.0	426.83	434.50	420.80	434.20	12.51	7000.00	0.0	7000.00	0.0
* 27595.000	1050.00	0.0	0.0	427.29	434.50	420.80	434.20	13.02	8000.00	0.0	8000.00	0.0
* 27595.000	1050.00	0.0	0.0	427.74	434.50	420.80	434.20	13.47	9000.00	0.0	9000.00	0.0
* 27910.000	315.00	0.0	0.0	428.07	444.20	425.80	442.90	5.17	1000.00	0.0	1000.00	0.0
* 27910.000	315.00	0.0	0.0	429.52	444.20	425.80	442.90	7.36	3000.00	0.0	3000.00	0.0
* 27910.000	315.00	0.0	0.0	430.34	444.20	425.80	442.90	8.35	4475.00	0.0	4475.00	0.0
* 27910.000	315.00	0.0	0.0	431.06	444.20	425.80	442.90	9.04	5875.00	0.0	5875.00	0.0
* 27910.000	315.00	0.0	0.0	431.60	444.20	425.80	442.90	9.48	7000.00	0.0	7000.00	0.0
* 27910.000	315.00	0.0	0.0	432.08	444.20	425.80	442.90	9.80	8000.00	0.0	8000.00	0.0
* 27910.000	315.00	0.0	0.0	432.53	444.20	425.80	442.90	10.10	9000.00	0.0	9000.00	0.0
* 28010.000	100.00	0.0	0.0	431.92	443.60	430.80	443.20	6.05	1000.00	0.0	1000.00	0.0
* 28010.000	100.00	0.0	0.0	433.13	443.60	430.80	443.20	8.70	3000.00	0.0	3000.00	0.0
* 28010.000	100.00	0.0	0.0	433.85	443.60	430.80	443.20	9.94	4475.00	0.0	4475.00	0.0
* 28010.000	100.00	0.0	0.0	434.45	443.60	430.80	443.20	10.90	5875.00	0.0	5875.00	0.0
* 28010.000	100.00	0.0	0.0	434.90	443.60	430.80	443.20	11.55	7000.00	0.0	7000.00	0.0
* 28010.000	100.00	0.0	0.0	435.30	443.60	430.80	443.20	12.04	8000.00	0.0	8000.00	0.0
* 28010.000	100.00	0.0	0.0	435.66	443.60	430.80	443.20	12.53	9000.00	0.0	9000.00	0.0
* 28015.000	5.00	440.40	434.40	442.10	443.40	434.40	443.90	3.08	1000.00	0.0	982.34	17.66
* 28015.000	5.00	440.40	434.40	443.45	443.40	434.40	443.90	5.40	3000.00	0.0	2900.30	99.32
* 28015.000	5.00	440.40	434.40	444.30	443.40	434.40	443.90	6.78	4475.00	0.0	4277.59	184.60
* 28015.000	5.00	440.40	434.40	444.83	443.40	434.40	443.90	7.84	5875.00	0.0	5546.42	277.58
* 28015.000	5.00	440.40	434.40	445.21	443.40	434.40	443.90	8.59	7000.00	0.0	6499.54	356.05
* 28015.000	5.00	440.40	434.40	445.58	443.40	434.40	443.90	9.13	8000.00	0.0	7426.55	430.22
* 28015.000	5.00	440.40	434.40	445.86	443.40	434.40	443.90	9.73	9000.00	0.0	8306.23	502.37
* 28027.000	12.00	0.0	0.0	442.24	452.00	435.10	447.60	1.75	1000.00	0.0	1000.00	0.0
* 28027.000	12.00	0.0	0.0	443.76	452.00	435.10	447.60	3.68	3000.00	0.0	3000.00	0.0
* 28027.000	12.00	0.0	0.0	444.76	452.00	435.10	447.60	4.82	4475.00	0.0	4475.00	0.0
* 28027.000	12.00	0.0	0.0	445.38	452.00	435.10	447.60	5.76	5875.00	0.0	5875.00	0.0
* 28027.000	12.00	0.0	0.0	445.82	452.00	435.10	447.60	6.45	7000.00	0.0	7000.00	0.0
* 28027.000	12.00	0.0	0.0	446.21	452.00	435.10	447.60	6.99	8000.00	0.0	8000.00	0.0
* 28027.000	12.00	0.0	0.0	446.54	452.00	435.10	447.60	7.55	9000.00	0.0	9000.00	0.0
* 28071.000	44.00	0.0	0.0	442.28	449.00	432.10	444.60	0.99	1000.00	0.0	1000.00	0.0
* 28071.000	44.00	0.0	0.0	444.14	449.00	432.10	444.60	2.34	3000.00	0.0	3000.00	0.0
* 28071.000	44.00	0.0	0.0	445.05	449.00	432.10	444.60	3.14	4475.00	0.0	4475.00	0.00
* 28071.000	44.00	0.0	0.0	445.79	449.00	432.10	444.60	3.81	5875.00	0.0	5875.00	0.00
* 28071.000	44.00	0.0	0.0	446.33	449.00	432.10	444.60	4.30	7000.00	0.0	7000.00	0.00
* 28071.000	44.00	0.0	0.0	446.80	449.00	432.10	444.60	4.70	8000.00	0.0	8000.00	0.00
* 28071.000	44.00	0.0	0.0	447.22	449.00	432.10	444.60	5.08	9000.00	0.0	8999.99	0.01
* 28525.000	454.00	0.0	0.0	442.31	443.20	433.90	445.00	1.44	1000.00	0.78	999.22	0.0
* 28525.000	454.00	0.0	0.0	444.26	443.20	433.90	445.00	3.18	3000.00	32.19	2967.81	0.0
* 28525.000	454.00	0.0	0.0	445.22	443.20	433.90	445.00	4.15	4475.00	81.82	4393.14	0.03
* 28525.000	454.00	0.0	0.0	446.01	443.20	433.90	445.00	4.95	5875.00	142.08	5730.89	2.03
* 28525.000	454.00	0.0	0.0	446.58	443.20	433.90	445.00	5.51	7000.00	197.77	6795.02	7.21
* 28525.000	454.00	0.0	0.0	447.08	443.20	433.90	445.00	5.94	8000.00	252.86	7730.07	17.07
* 28525.000	454.00	0.0	0.0	447.53	443.20	433.90	445.00	6.40	9000.00	310.27	8660.15	29.58

TILTON TOWN
DAM

IPES...
7

SECNO	XLCH	ELTRD	ELLC	CMSEL	XLREL	ELMTN	RBEL	VCH	D	QLDB	QCH	DRDB
18620.000	590.00	0.0	0.0	404.64	409.00	400.00	409.20	4.09	1000.00	0.0	1000.00	0.0
18620.000	590.00	0.0	0.0	407.52	409.00	400.00	409.20	4.63	3000.00	0.0	3000.00	0.0
18620.000	590.00	0.0	0.0	409.23	409.00	400.00	409.20	4.60	4475.00	0.03	4474.97	0.00
18620.000	590.00	0.0	0.0	410.66	409.00	400.00	409.20	4.63	5875.00	4.48	5863.09	7.43
18620.000	590.00	0.0	0.0	411.71	409.00	400.00	409.20	4.70	7000.00	15.50	6952.74	31.76
18620.000	590.00	0.0	0.0	412.57	409.00	400.00	409.20	4.77	9000.00	32.57	7903.73	63.70
18620.000	590.00	0.0	0.0	413.39	409.00	400.00	409.20	4.85	9000.00	52.65	8844.77	102.58
20515.000	1895.00	0.0	0.0	405.51	411.00	400.80	411.40	1.32	1000.00	0.0	1000.00	0.0
20515.000	1895.00	0.0	0.0	408.46	411.00	400.80	411.40	1.97	3000.00	0.0	3000.00	0.0
20515.000	1895.00	0.0	0.0	410.17	411.00	400.80	411.40	2.23	4475.00	0.01	4474.98	0.0
20515.000	1895.00	0.0	0.0	411.50	411.00	400.80	411.40	2.40	5875.00	16.86	5858.14	0.00
20515.000	1895.00	0.0	0.0	412.50	411.00	400.80	411.40	2.50	7000.00	108.62	6891.23	0.15
20515.000	1895.00	0.0	0.0	413.33	411.00	400.80	411.40	2.56	9000.00	280.23	7719.11	0.66
20515.000	1895.00	0.0	0.0	414.12	411.00	400.80	411.40	2.59	9000.00	518.85	8479.54	1.60
21425.000	910.00	0.0	0.0	405.79	407.60	400.40	407.00	2.50	1000.00	0.0	1000.00	0.0
21425.000	910.00	0.0	0.0	408.71	407.60	400.40	407.00	3.82	3000.00	0.12	2996.22	3.66
21425.000	910.00	0.0	0.0	410.34	407.60	400.40	407.00	4.40	4475.00	1.28	4424.37	49.35
21425.000	910.00	0.0	0.0	411.68	407.60	400.40	407.00	4.83	5875.00	3.64	5738.75	132.61
21425.000	910.00	0.0	0.0	412.66	407.60	400.40	407.00	5.12	7000.00	10.33	6761.70	227.97
21425.000	910.00	0.0	0.0	413.46	407.60	400.40	407.00	5.32	9000.00	40.98	7616.26	342.76
21425.000	910.00	0.0	0.0	414.24	407.60	400.40	407.00	5.46	9000.00	126.82	8395.26	477.92
21965.000	540.00	0.0	0.0	406.09	413.60	401.20	413.70	2.61	1000.00	0.0	1000.00	0.0
21965.000	540.00	0.0	0.0	409.04	413.60	401.20	413.70	3.92	3000.00	0.0	3000.00	0.0
21965.000	540.00	0.0	0.0	410.65	413.60	401.20	413.70	4.52	4475.00	0.0	4475.00	0.0
21965.000	540.00	0.0	0.0	411.99	413.60	401.20	413.70	4.96	5875.00	0.0	5875.00	0.0
21965.000	540.00	0.0	0.0	412.95	413.60	401.20	413.70	5.26	7000.00	0.0	7000.00	0.0
21965.000	540.00	0.0	0.0	413.74	413.60	401.20	413.70	5.51	9000.00	0.01	7999.99	0.00
21965.000	540.00	0.0	0.0	414.50	413.60	401.20	413.70	5.74	9000.00	1.07	8998.87	0.06
23220.000	1255.00	0.0	0.0	406.77	415.60	401.00	414.00	1.89	1000.00	0.0	1000.00	0.0
23220.000	1255.00	0.0	0.0	409.83	415.60	401.00	414.00	2.82	3000.00	0.0	3000.00	0.0
23220.000	1255.00	0.0	0.0	411.50	415.60	401.00	414.00	3.25	4475.00	0.0	4475.00	0.0
23220.000	1255.00	0.0	0.0	412.88	415.60	401.00	414.00	3.57	5875.00	0.0	5875.00	0.0
23220.000	1255.00	0.0	0.0	413.87	415.60	401.00	414.00	3.80	7000.00	0.0	6999.14	0.86
23220.000	1255.00	0.0	0.0	414.68	415.60	401.00	414.00	3.97	9000.00	0.0	7985.40	14.59
23220.000	1255.00	0.0	0.0	415.45	415.60	401.00	414.00	4.10	9000.00	0.0	8898.31	101.70
25615.000	2395.00	0.0	0.0	409.15	410.00	404.80	410.30	3.56	1000.00	0.0	1000.00	0.0
25615.000	2395.00	0.0	0.0	412.04	410.00	404.80	410.30	5.14	3000.00	1.23	2986.49	12.29
25615.000	2395.00	0.0	0.0	413.55	410.00	404.80	410.30	5.86	4475.00	5.21	4342.39	127.40
25615.000	2395.00	0.0	0.0	414.77	410.00	404.80	410.30	6.31	5875.00	11.09	5491.60	372.31
25615.000	2395.00	0.0	0.0	415.67	410.00	404.80	410.30	6.60	7000.00	17.14	6371.37	611.49
25615.000	2395.00	0.0	0.0	416.41	410.00	404.80	410.30	6.84	9000.00	23.36	7134.20	842.44
25615.000	2395.00	0.0	0.0	417.10	410.00	404.80	410.30	7.06	9000.00	30.31	7884.79	1084.90
26545.000	930.00	0.0	0.0	411.90	412.90	408.20	413.40	4.28	1000.00	0.0	1000.00	0.0
26545.000	930.00	0.0	0.0	414.35	412.90	408.20	413.40	6.11	3000.00	9.16	2990.70	0.15
26545.000	930.00	0.0	0.0	415.65	412.90	408.20	413.40	6.94	4475.00	123.76	4349.81	1.43
26545.000	930.00	0.0	0.0	416.69	412.90	408.20	413.40	7.51	5875.00	341.56	5529.61	3.83
26545.000	930.00	0.0	0.0	417.46	412.90	408.20	413.40	7.86	7000.00	555.05	6432.73	12.22
26545.000	930.00	0.0	0.0	418.10	412.90	408.20	413.40	8.12	9000.00	759.47	7196.70	43.83
26545.000	930.00	0.0	0.0	418.71	412.90	408.20	413.40	8.33	9000.00	971.74	7925.23	103.03
27595.000	1050.00	0.0	0.0	423.10	434.50	420.80	434.20	6.56	1000.00	0.0	1000.00	0.0
27595.000	1050.00	0.0	0.0	424.61	434.50	420.80	434.20	9.66	3000.00	0.0	3000.00	0.0
27595.000	1050.00	0.0	0.0	425.50	434.50	420.80	434.20	10.95	4475.00	0.0	4475.00	0.0

GR	453.100	980.000	452.400	1000.000	444.400	1070.000	443.600	1048.000	430.800	1048.100	430.800
GR	430.800	1192.900	443.200	1196.000	444.100	1208.000	446.500	1208.100	442.900	1216.000	442.900
GR	439.800	1216.100	439.400	1228.000	450.000	1228.100	0.0	0.0	0.0	0.0	0.0
SB	0.900	10.000	3.000	0.0	0.100	0.010	0.010	0.0	0.0	430.800	430.800
X1	28015.000	17.000	932.000	1076.100	5.000	5.000	5.000	0.0	0.0	0.0	0.0
AC	0.0	0.0	1.000	434.400	440.400	0.0	0.0	0.0	0.0	0.0	0.0
BT	17.000	864.000	453.300	0.0	884.000	452.400	0.0	894.000	444.400	0.0	0.0
BT	932.000	443.400	0.0	932.100	442.900	434.500	942.000	442.900	434.500	942.100	942.100
BT	443.400	0.0	944.000	443.400	0.0	944.100	440.400	0.0	1068.000	440.400	440.400
BT	0.0	1068.100	443.900	0.0	1070.000	443.900	0.0	1070.100	442.400	437.000	437.000
BT	1076.000	442.400	437.000	1076.100	443.900	0.0	1108.000	440.000	0.0	1108.100	1108.100
BT	450.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GR	453.300	864.000	452.400	884.000	444.400	894.000	443.400	932.000	434.400	932.100	932.100
GR	434.400	942.000	443.400	942.100	443.400	944.000	440.400	944.100	440.400	1068.000	1068.000
GR	443.900	1068.100	443.900	1070.000	436.900	1070.100	436.900	1076.100	443.900	1076.100	1076.100
GR	440.000	1108.000	450.000	1108.100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.0	0.0	0.0	0.300	0.500	0.0	0.0	0.0	0.0	0.0	0.0
X1	28027.000	17.000	1006.000	1173.000	12.000	12.000	12.000	0.0	0.0	0.0	0.0
GR	453.100	965.000	452.200	984.000	449.600	1000.000	449.000	1006.000	442.100	1025.000	1025.000
GR	440.800	1027.000	437.300	1035.000	436.800	1063.000	433.800	1086.000	434.800	1103.000	1103.000
GR	432.100	1126.000	435.300	1148.000	434.800	1164.000	437.700	1167.000	444.600	1173.000	1173.000
GR	447.400	1173.100	448.100	1190.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	28071.000	0.0	0.0	0.0	60.000	70.000	44.000	0.0	-3.000	0.0	0.0
NC	0.080	0.0	0.035	0.300	0.500	0.0	0.0	0.0	0.0	0.0	0.0
X1	28525.000	25.000	1051.000	1179.000	360.000	520.000	454.000	0.0	0.0	0.0	0.0
GR	465.900	521.000	463.700	587.000	462.800	619.000	461.500	666.000	460.600	676.000	676.000
GR	455.800	815.000	451.700	858.000	451.400	967.000	451.800	982.000	451.100	1000.000	1000.000
GR	450.600	1003.000	441.800	1018.000	441.600	1025.000	443.000	1033.000	443.200	1051.000	1051.000
GR	440.900	1063.000	438.800	1070.000	433.900	1094.000	436.200	1112.000	434.900	1140.000	1140.000
GR	435.900	1164.000	440.900	1174.000	445.000	1179.000	446.600	1200.000	448.800	1206.000	1206.000
EJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TILTON TOWN DAM

7 1 1242/1 un
SUMMARY PRINTOUT

SECNO	XLCH	ELTRD	ELLC	CHSEL	XLBEL	ELMIN	RBEL	VCH	Q	QLOB	QCH	QROB
14790.000	220.00	0.0	0.0	400.97	405.20	394.50	405.10	1.94	1000.00	0.0	1000.00	0.0
14790.000	220.00	0.0	0.0	405.16	405.20	394.50	405.10	2.74	3000.00	0.0	3000.00	0.00
14790.000	220.00	0.0	0.0	407.03	405.20	394.50	405.10	3.22	4475.00	0.0	4468.82	2.61
14790.000	220.00	0.0	0.0	408.57	405.20	394.50	405.10	3.57	5875.00	31.26	5831.25	12.48
14790.000	220.00	0.0	0.0	409.65	405.20	394.50	405.10	3.80	7000.00	101.72	6872.66	25.61
14790.000	220.00	0.0	0.0	410.51	405.20	394.50	405.10	3.99	8000.00	193.78	7765.47	40.76
14790.000	220.00	0.0	0.0	411.35	405.20	394.50	405.10	4.15	9000.00	314.35	8624.16	61.50
16245.000	1455.00	0.0	0.0	401.32	402.00	394.30	402.00	1.43	1000.00	0.0	1000.00	0.0
16245.000	1455.00	0.0	0.0	405.51	402.00	394.30	402.00	1.96	3000.00	150.74	2753.25	96.01
16245.000	1455.00	0.0	0.0	407.41	402.00	394.30	402.00	2.24	4475.00	320.29	3866.92	287.79
16245.000	1455.00	0.0	0.0	408.99	402.00	394.30	402.00	2.44	5875.00	518.24	4850.07	506.69
16245.000	1455.00	0.0	0.0	410.08	402.00	394.30	402.00	2.57	7000.00	725.22	5585.07	689.72
16245.000	1455.00	0.0	0.0	410.97	402.00	394.30	402.00	2.67	8000.00	931.60	6210.62	857.79
16245.000	1455.00	0.0	0.0	411.82	402.00	394.30	402.00	2.76	9000.00	1159.11	6812.57	1028.32
18030.000	1785.00	0.0	0.0	403.14	404.00	399.60	404.00	3.70	1000.00	0.0	1000.00	0.0
18030.000	1785.00	0.0	0.0	406.54	404.00	399.60	404.00	4.84	3000.00	30.28	2948.82	20.89
18030.000	1785.00	0.0	0.0	408.32	404.00	399.60	404.00	5.49	4475.00	92.38	4315.66	66.96
18030.000	1785.00	0.0	0.0	409.80	404.00	399.60	404.00	5.97	5875.00	170.11	5577.41	127.48

GR	408.400	9935.000	411.400	9958.000	423.100	9987.000	0.0	0.0	0.0
X1	21425.000	38.000	9864.000	10000.000	700.000	1480.000	910.000	0.0	0.0
GR	420.300	8700.000	417.400	8712.000	413.400	8727.000	414.600	415.300	8853.000
GR	413.300	8872.000	413.200	8945.000	411.900	8965.000	413.000	9043.000	9131.000
GR	417.700	9267.000	417.900	9363.000	416.700	9450.000	416.400	9523.000	9610.000
GR	413.200	9643.000	414.900	9738.000	415.100	9833.000	413.200	9858.000	9864.000
GR	405.600	9876.000	401.800	9889.000	403.400	9913.000	401.100	9931.000	9949.000
GR	402.900	9942.000	405.600	9996.000	407.000	10000.000	408.700	10010.000	10025.000
GR	408.000	10032.000	412.200	10111.000	412.700	10160.000	416.100	10263.000	10275.000
GR	408.000	10357.000	419.000	10365.000	423.000	10375.000	416.000	10375.000	0.0

X1	21965.000	21.000	848.000	1002.000	250.000	440.000	540.000	0.0	0.0
GR	419.700	375.000	417.300	450.000	415.200	483.000	416.000	416.100	593.000
GR	415.800	645.000	417.500	704.000	416.200	813.000	413.600	848.000	853.000
GR	406.000	866.000	404.000	875.000	404.600	888.000	403.800	401.200	934.000
GR	401.200	960.000	402.400	973.000	406.000	988.000	411.800	413.700	1002.000
GR	424.600	1015.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.100	0.110	0.035	0.300	0.500	0.0	0.0	0.0	0.0

X1	23220.000	20.000	783.000	990.000	1000.000	880.000	1255.000	0.0	0.0
GR	419.800	776.000	415.600	783.000	408.100	796.000	407.000	404.700	819.000
GR	403.500	847.000	401.000	876.000	402.600	904.000	403.600	404.900	951.000
GR	407.000	966.000	414.000	990.000	414.400	1000.000	414.500	1084.000	1183.000
GR	414.500	1265.000	417.400	1335.000	415.200	1438.000	413.200	1468.000	1555.000

X1	25615.000	19.000	884.000	990.000	2600.000	720.000	2395.000	0.0	0.0
GR	420.900	871.000	410.000	884.000	408.700	887.000	407.200	404.800	907.000
GR	405.100	917.000	404.800	935.000	405.800	950.000	407.300	967.000	975.000
GR	410.300	990.000	411.200	1000.000	413.200	1055.000	413.200	1092.000	1105.000
GR	413.100	1159.000	415.700	1167.000	419.900	1185.000	420.900	1197.000	0.0
NC	0.085	0.110	0.040	0.300	0.500	0.0	0.0	0.0	0.0

X1	26545.000	31.000	886.000	992.000	600.000	480.000	930.000	0.0	0.0
GR	434.700	752.000	415.400	788.000	415.400	811.000	414.200	414.600	869.000
GR	412.900	886.000	411.300	889.000	408.200	900.000	408.800	409.800	933.000
GR	409.700	957.000	409.700	965.000	410.500	987.000	412.100	988.000	992.000
GR	416.800	995.000	417.100	1000.000	419.000	1052.000	418.600	1066.000	1093.000
GR	416.900	1116.000	420.100	1144.000	422.900	1201.000	421.600	1243.000	1283.000
GR	423.200	1291.000	420.400	1395.000	420.500	1531.000	419.900	1643.000	1654.000
GR	424.800	1683.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.0	0.085	0.0	0.300	0.500	0.0	0.0	0.0	0.0

X1	27595.000	14.000	855.000	1000.000	800.000	1320.000	1050.000	0.0	0.0
GR	440.600	816.000	440.200	848.000	434.500	855.000	423.500	421.300	890.000
GR	421.100	899.000	420.800	918.000	421.700	946.000	421.600	958.000	971.000
GR	423.500	974.000	434.200	1000.000	437.400	1114.000	443.400	1166.000	0.0

X1	27910.000	19.000	1000.000	1218.000	265.000	350.000	315.000	0.0	0.0
GR	449.200	868.000	447.600	872.000	445.700	934.000	444.200	432.000	1020.000
GR	428.500	1032.000	427.200	1042.000	427.200	1051.000	427.800	1072.000	1085.000
GR	426.300	1095.000	425.800	1131.000	426.500	1167.000	428.700	1181.000	1190.000
GR	439.000	1209.000	442.900	1218.000	443.100	1233.000	449.200	1248.000	0.0
NC	0.0	0.0	0.0	0.300	0.500	0.0	0.0	0.0	0.0

X1	28010.000	13.000	1048.000	1196.000	85.000	130.000	100.000	0.0	0.0
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Tilton Town Dam
 Test File
 Both gates closed

T1 CORPS OF ENGINEERS NEW ENGLAND DIVISION-TILTON TOWN DAM
 T2 ANDERSON-NICHOLS & CO. INC.
 T3 MINNESAPUKEE RIVER RATING CURVE DATA

J1 ICHECK INQ INU INV IDIR STRY METRIC HVINS Q MSEL FQ
 -1. 2. 0. 0. 0.000320 0.0 0.0 0. 404.000 0.0
 J2 NPROF IPLOT PRFUS XSECV XSECH XSECH FN ALLDC IBW CHNIM ITRACE
 1.000 0.0 -1.000 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

J3 VARIABLE CODES FOR SUMMARY PRINTOUT
 38.000 39.000 40.000 41.000 42.000 43.000 44.000 45.000 46.000 47.000 48.000 49.000 50.000 51.000 52.000 53.000
 13.000 14.000 15.000 16.000 17.000 18.000 19.000 20.000 21.000 22.000 23.000 24.000 25.000 26.000 27.000 28.000
 21.000 4.000 22.000 54.000 49.000 34.000 34.000 17.000 17.000 0.0 0.0 0.0 0.0 0.0 0.0 0.0

J6 IHLEQ ICDPY
 1.000 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

Q1 7.000 1000.000 3000.000 4475.000 5875.000 7000.000 8000.000 9000.000 0.0 0.0
 NC 0.090 0.035 0.300 0.500 0.0 0.0 0.0 0.0 0.0 0.0

D-7

X1 14790.000 18.000 841.000 1000.000 150.000 250.000 220.000 0.0 0.0 0.0
 GR 421.500 501.000 420.200 617.000 411.800 620.000 407.900 761.000 407.800 821.000
 GR 403.200 841.000 401.500 857.000 397.500 868.000 396.400 889.000 394.500 910.000
 GR 396.100 929.000 396.700 932.000 398.400 973.000 401.500 981.000 403.100 1000.000
 GR 411.000 1029.000 416.700 1041.000 421.500 1049.000 0.0 0.0 0.0 0.0

X1 16245.000 23.000 9812.000 9981.000 1320.000 1520.000 1455.000 0.0 0.0 0.0
 GR 422.600 9078.000 418.400 9093.000 414.800 9193.000 415.100 9273.000 412.600 9428.000
 GR 410.800 9489.000 407.900 9555.000 408.400 9686.000 407.000 9895.000 402.300 9712.000
 GR 402.100 9730.000 402.000 9812.000 398.300 9882.000 396.800 9882.000 395.000 9710.000
 GR 394.300 9934.000 396.400 9964.000 402.000 9981.000 403.100 10022.000 403.700 10075.000
 GR 405.100 10142.000 410.000 10168.000 420.200 10183.000 0.0 0.0 0.0 0.0

X1 18030.000 15.000 950.000 1050.000 1600.000 2240.000 1785.000 0.0 0.0 0.0
 GR 425.000 750.000 420.000 780.000 415.000 830.000 410.000 915.000 405.000 935.000
 GR 404.000 950.000 401.000 955.000 399.600 1000.000 400.700 1045.000 404.000 1050.000
 GR 405.000 1060.000 410.000 1080.000 415.000 1130.000 420.000 1155.000 425.000 1265.000

X1 18420.000 14.000 795.000 1000.000 560.000 520.000 590.000 0.0 0.0 0.0
 GR 421.300 727.000 417.200 743.000 414.300 772.000 411.600 777.000 409.000 795.000
 GR 404.600 862.000 403.400 883.000 401.700 910.000 400.000 937.000 402.700 954.000
 GR 404.600 970.000 409.200 1000.000 411.000 1029.000 421.100 1100.000 0.0 0.0
 MC 0.110 0.110 0.030 0.300 0.500 0.0 0.0 0.0 0.0 0.0

X1 20515.000 33.000 9638.000 9958.000 1720.000 1840.000 1895.000 0.0 0.0 0.0
 GR 420.900 8497.000 419.300 8536.000 413.900 8565.000 412.500 8639.000 413.800 8746.000
 GR 411.600 8885.000 414.900 8996.000 416.100 8992.000 415.600 9021.000 410.700 9051.000
 GR 411.000 9086.000 412.500 9103.000 410.000 9176.000 411.000 9213.000 411.400 9307.000
 GR 411.900 9403.000 412.100 9461.000 411.800 9513.000 412.300 9542.000 411.000 9638.000

BREACH ANALYSIS - TILTON TOWN DAM

Determine downstream hazard if breach were to occur @ top of dam - 443.4' MSL pg. 5/5

$$Q_{p1} = \frac{8}{27} W_b \sqrt{g} y_0^{3/2} \text{ where: } W_b = \text{breach width}$$

$g = 32.2 \text{ ft/sec}^2$
 $y_0 = \text{pool elev} - \text{ups river bed}$

$$W_b = 172 \times 0.40 = 69 \text{ feet}$$

$$y_0 = 443.4 - 434 = 9.4 \text{ feet}$$

$$Q_{p1} = 3343 \text{ cfs}$$

$$Q_{p2} = Q \text{ going over dam other than at breach}$$
$$Q = CLH^{3/2}$$
$$= 3.4 \cdot 55 \cdot 3^{3/2}$$
$$= 972 \text{ cfs}$$

Assume gates closed.

$$Q_{p3} = \text{total breach} = \underline{4315 \text{ cfs}}$$

This flow is similar to the 4475 cfs used in Reference 5 (1978 ANCO study). Therefore, this profile could be utilized to estimate the level of probable damages due to dam failure under the above conditions. Elevations of potential damage points were obtained for use in the ANCO study. Looking at this profile it can be seen that the only damage caused by a breach of Tilton Town Dam would be to the Arthur S. Brown Mfg. Co. building. A portion of this building is located in the channel immediately downstream of the dam and is the working area for 2 people. Loss of life is possible. Several plants which utilize the pondage for process water would be without. Property damage could be appreciable. The pondage also supplies water to an auxiliary fire pump. Therefore, Tilton Town Dam was classified - SIGNIFICANT HAZARD. D-6

4/5

Test Flood = 7,570 cfs

With gates closed \Rightarrow 446' MSL
 Top of dam \Rightarrow 443.4' MSL

\therefore Test Flood would overtop the dam by 2.6 feet. Spillway capacity @ top of dam is 2200 cfs or 29 percent of test flood with gates closed.

With gates open \Rightarrow 444.3' MSL
 Top of dam \Rightarrow 443.4' MSL

\therefore Dam would be overtopped by 0.9 foot. Spillway capacity including both gates open is 5300 cfs or 70 percent of test flood. Therefore, the combined capacity of both gates \Rightarrow 3100 cfs.

Spillway Capacity @ test flood elevation of 446' MSL

$$Q = CLH^{3/2}$$

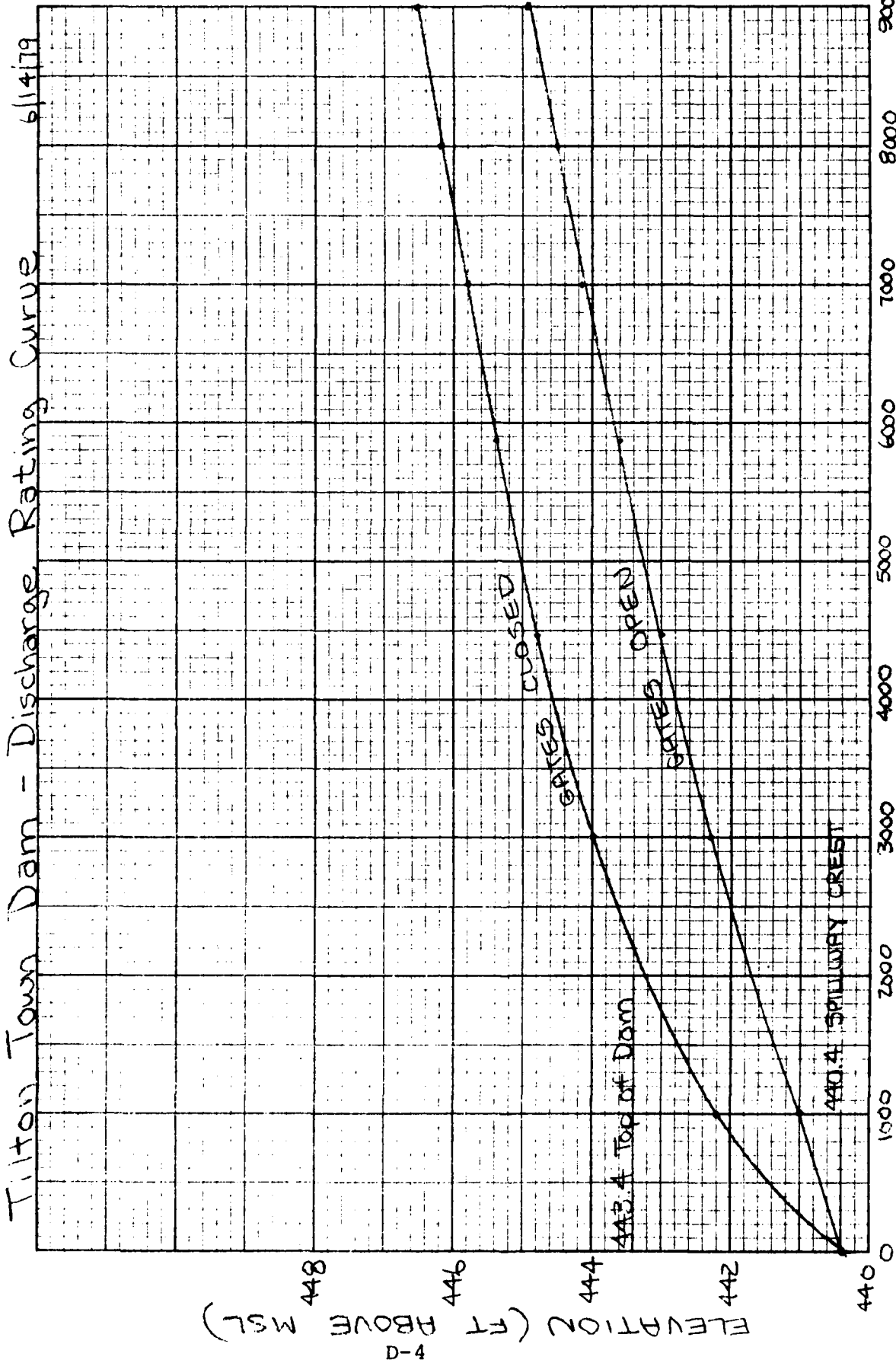
$$2200 \text{ cfs} = C \cdot 124 \cdot 3.0^{3/2} \text{ (From HEC-2 run)}$$

$$3.41 = C$$

$$Q = 3.41 \cdot 124 \cdot 5.6^{3/2}$$

$$= 5603.5 \text{ cfs} \approx \underline{5605 \text{ cfs}}$$

Following is the HEC-2 input and summary list for a test file run under conditions of closed gates and open gates. (See pages D-7 \Rightarrow D-16.)



Tilton Town Dam - Discharge Rating Curve

6/14/79

ELEVATION (FT ABOVE MSL)

DISCHARGE IN CFS

D-4

Water Surface elevations were computed through the use of the Corps of Engineers HEC-2 step-backwater computer program. A subsequent study was performed by ANCO in December 1978, entitled Hydraulic Engineering Analysis for Evaluating Flood Stage Reduction on the Winnepesaukee River, New Hampshire. This study utilized HEC-2 modeling and because this study is more recent and reflects existing conditions on the Winnepesaukee River, this hydraulic model was used in developing a rating curve for Tilton Town Dam. A test file covering the study area was taken from this model and various discharges ranging from 1000 cfs to 9000 cfs were analyzed. From this analysis the following rating curve points were established, assuming both gates closed:

Discharge (cfs)	Elevation (ft. above MSL)
0	440.4
1000	442.24
3000	443.96
4475	444.76
5875	445.38
7000	445.82
8000	446.21
9000	446.54

Using these points a rating curve can be drawn. See page 3.

Another HEC-2 run was made, assuming both gates are fully opened. This curve is also plotted on page 3.

APPENDIX E
INFORMATION AS
CONTAINED IN THE NATIONAL
INVENTORY OF DAMS

END

FILMED

8-85

DTIC