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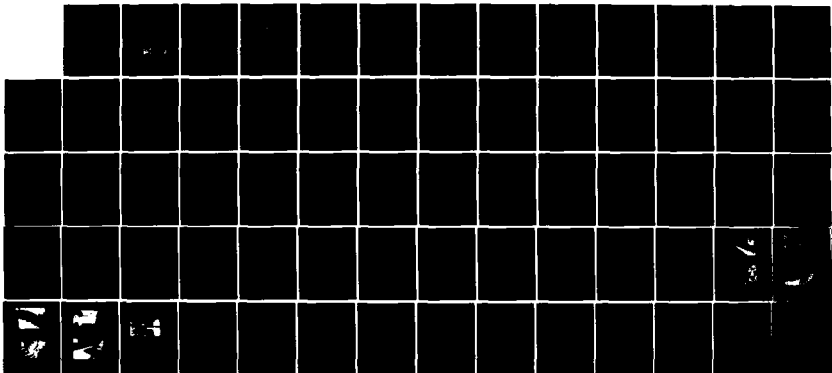
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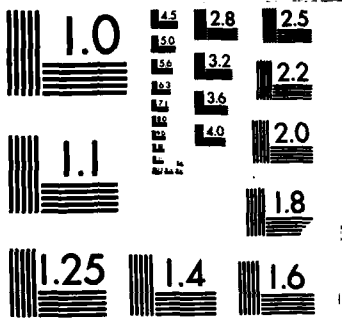
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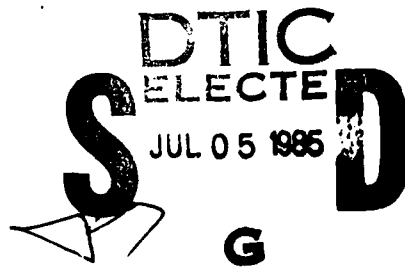
MOUSAM RIVER BASIN
SANFORD, MAINE

MILL STREET DAM
ME-00273

AD-A156 563

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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AUGUST 1981

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a concrete gravity dam with an earth embankment easterly wing wall. The concrete section of the dam is about 160 ft. long and the dam has an overall length of about 530 ft. with a maximum height of about 18 ft. The dam is assessed to be in poor condition. It is small in size with a hazard potential of high. The piping and erosion occurring in the dam embankment and west abutment present serious concerns relative to the long term safety of the dam.		

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424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

SEP 16 1981

Honorable Joseph E. Brennan
Governor of the State of Maine
State Capitol
Augusta, Maine 04330

Dear Governor Brennan:

Inclosed is a copy of the Mill Street Dam (ME-00273) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important.

Copies of this report have been forwarded to the Department of Agriculture and to the owner, Town of Sanford. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Agriculture for your cooperation in in this program.

Sincerely,

A handwritten signature in cursive script, appearing to read "C. E. Edgar, III", is written over the typed name.

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

MILL STREET DAM

ME-00273

MOUSAM RIVER BASIN

SANFORD, MAINE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

ME-00273

MILL STREET DAM

SANFORD
YORK COUNTY, MAINE

MOUSAM RIVER

September 6, 1978

BRIEF ASSESSMENT

The Mill Street Dam is a concrete gravity dam with an earth embankment easterly wing wall. The concrete section of the dam is approximately 160 feet long and the dam has an overall length of about 530 feet. It is about 18 feet high.

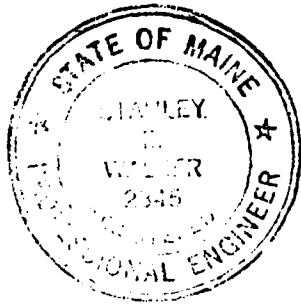
Based on the visual inspection and its performance history, the Mill Street Dam is assessed to be in poor condition. The leakage and seepage occurring beneath and through the dam is causing piping and erosion which makes the stability of the dam unpredictable and presents a serious concern regarding its long-term safety.

to 1978

Based on its small size and high hazard classification, in accordance with the Corps of Engineers' guidelines, the test flood is 14,540 cfs (PMF). The spillway capacity is only about 12 percent of this test flood and is considered inadequate.

The piping and erosion occurring in the dam embankment and west abutment present serious concerns relative to the long-term safety of the dam. It is recommended that the north-easterly earthen embankment be monitored on a monthly

basis by means of observing the development or continued widening of the sink holes and observation of the downstream channel for accumulation of additional sediments. Operation and maintenance procedures outlined in Section 7.3 and an evaluation of the hydraulics and hydrology of the dam and watershed should be made within 12 months. A plan for around-the-clock surveillance during periods of anticipated high run-off and a formal warning system should be developed and implemented.



EDWARD C. JORDAN CO., INC.

A handwritten signature in black ink, appearing to read "Stanley E. Walker".

Stanley E. Walker, P.E.
Project Manager

This Phase I Inspection Report on Mill Street Dam has been reviewed by the undersigned Review Board members. In our opinion; the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Charles G. Tiersch

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

Fred J. Ravens, Jr.

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

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

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

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

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

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

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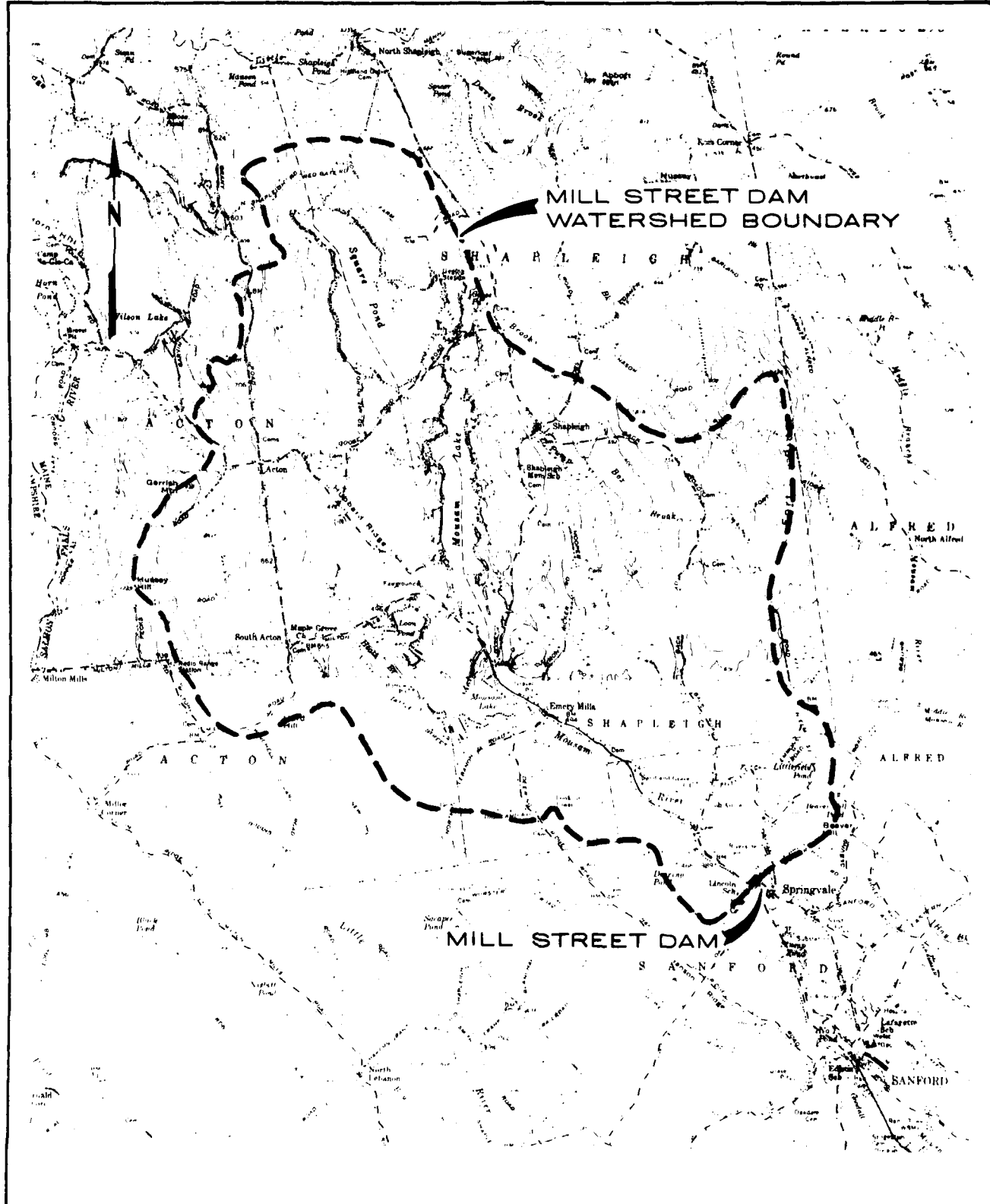
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MILL STREET DAM
WATERSHED BOUNDARY

MILL STREET DAM



EDWARD C. JORDAN CO., INC. PORTLAND, MAINE	U.S. ARMY ENGINEER DISTRICT OFFICE CORPS OF ENGINEERS BOSTON, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FEED DAMS	
MILL STREET DAM LOCATION MAP	
MOUSAM RIVER	MAINE
SCALE DATE OCTOBER 1972	

PHASE I INSPECTION REPORT

MILL STREET 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. Edward C. Jordan Co., Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Maine. Authorization and notice to proceed were issued to Edward C. Jordan Co., Inc. under a letter of June 20, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0349 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. The Mill Street Dam is located on the Mousam River in the Springvale section of the town of Sanford (N 43° 28.0', W 70° 47.9').

- b. Description of Dam and Appurtenances. Starting from the west abutment, the dam consists of a concrete gravity section approximately 160 feet long. East of this section is an embankment section with concrete retaining walls approximately 120 feet in length, and east of this section is an old gate which closes a penstock which is no longer used. East of the penstock area is a concrete wing wall which extends approximately 250 feet northeast. The dam is approximately 18 feet high. There are two outflow channels at the dam. The river channel conducts flows from the spillways and gate, and the other channel, an abandoned canal at the outlet of the penstock, is currently not used.
- c. Size Classification. Based on a storage capacity of 209 acre-feet at full spillway and a height of about 18 feet, the Mill Street Dam is classified as a small dam (storage less than 1000 acre-feet).
- d. Hazard Classification. In the event of failure of the dam, there would be damage to factory buildings downstream of the dam, and there would be the associated chance of loss of many lives in the factories. Thus, the Mill Street Dam is classified as having a high hazard potential.
- e. Ownership. The dam is owned by the Town of Sanford. It was previously owned by Goodall-Worsted Co. Due to the closeness of the operator's residence to the structure, this dam is considered to be a manned project.
- f. Operator. Mr. Roy Moses
Town of Sanford
Town Hall
Sanford, Maine
Telephone 207-324-5561
- g. Purpose of Dam. The dam is presently used for recreation.
- h. Design and Construction History. No information was found to be available regarding the design of the dam. Based on available information the dam appears to have been constructed around 1910. No details regarding construction of the dam were disclosed in the investigation.

- i. Normal Operating Procedures. The outlet gate at the dam is operated only as necessary to drain the pond for maintenance. The normal operation is to allow water to overflow the spillway crest and the water level is governed by the flow in the river. The penstock gate is inoperable and the power generating equipment has been removed.

1.3 PERTINENT DATA

- a. Drainage Areas. The drainage area above the Mill Street Dam is approximately 37.8 square miles and lies in portions of Shapleigh, Acton and Sanford. About 8 percent of the entire drainage area is storage at Mousam Lake, Square Pond, Loon Pond, Goose Pond, Littlefield Pond, and other small unnamed ponds. The watershed has a relatively flat topography with a few hills varying in elevation from about 470 feet to 1300 feet.
- b. Discharge at Damsite. There is one vertical lift gate which is 6 feet in diameter. The invert elevation (MSL) is approximately 333. The following are pertinent discharges.
- (1) Maximum flood at damsite is unknown.
 - (2) Ungated spillway capacity at the top of the dam is about 1030 cfs at elevation 349.5.
 - (3) Ungated spillway capacity (total spillway capacity) at test flood (PMF) elevation is about 13,400 cfs at elevation 353.6.
 - (4) Gated spillway capacity is not applicable.
 - (5) Total project discharge at adjusted test flood (PMF) elevation is 14,540 cfs at elevation 353.6.
- c. Elevation. Survey data collected at the Mill Street Dam was referenced to a temporary bench mark. The following elevations were later referenced to USGS data found in USGS Water Supply Paper No. 1671.

ITEM	ELEVATION ABOVE MSL
Streambed at Centerline of Dam	332
Maximum Tailwater	Unknown
Upstream Invert Diversion Tunnel	N/A
Recreation Pool	348
Full Flood Control Pool	349.5
Spillway Crest	348
Design Surcharge	Unknown
Top of Dam	349.5
Test Flood (PMF) Design Surcharge	353.6

d. Reservoir. The lengths of the maximum/flood control pool (elevation 349.5) and the recreation pool were estimated from USGS maps. The lengths are shown below.

ITEM	LENGTH (feet)
Maximum/Flood Control Pool	3700
Recreation Pool	3500

e. Storage.

ITEM	STORAGE (acre-feet)
Recreation Pool	150
Flood Control/Top of Dam	209
Test Flood (PMF) Pool	454

f. Reservoir Surface. The following are estimates of the surface area of No. 3 Pond.

ITEM	SURFACE AREA (acres)
Top of Dam/Maximum Pool	40.3
Recreation Pool	29.6

g. Dam.

Type - The Mill Street Dam is a concrete gravity structure with an earth embankment easterly wing wall. The dam has an overall length of approximately 530 feet. The spillway section of the dam is approximately 150 feet in length.

Height - The spillway crest is approximately 16 feet above the streambed.

Top Width - See cross-sections in Appendix B.

Side Slopes - See cross-sections.

Zoning - Not applicable.

Impervious Core - None.

Cut-off - The concrete portion of the dam and the concrete retaining walls in and around the earth embankment form a cut-off wall in the dam.

Grout Curtain - None.

Other - Not applicable.

h. Division and Regulating Tunnel. Not applicable.

i. Spillway.

Type - There are two spillways on this dam, located side by side. The elevations of the spillways are the same. One spillway has flashboards; the other does not.

Length - The spillways are 110 feet and 40 feet in length.

Crest Elevation - The crest elevations are 348 feet above MSL.

Gates - Not applicable.

Upstream Channel - Small cove about 200 feet wide leading from the impoundment. See photograph 1.

Downstream Channel - The dam discharges into a large bedrock channel which reduces to approximately 30 feet in width above the Mill Street bridge located approximately 250 feet downstream. See photographs 3, 5, 7 and 8. The old penstock, located east of the spillways discharged into a canal which runs parallel to the spillway channel. The Mill Street Bridge is made up of two box sections, one to pass the river flow and one to pass the canal flow. These discharge channels meet below the Mill Street Bridge to form a single river channel.

j. Regulating Outlet.

Invert - 333 (feet above MSL).

Size - 6 feet in diameter.

Description - The outlet sluiceway consists of a riveted steel pipe embedded in the concrete spillway section of the dam.

Control Mechanism - The control gate is a timber vertical lift gate which is operated by a vertical rack and gear and reducing gear system which is manually operated. See photograph 5.

Other - Not applicable.

SECTION 2
ENGINEERING DATA

2.1 DESIGN

This investigation disclosed no available design data.

2.2 CONSTRUCTION

No information was found to be available regarding the original construction of the Mill Street Dam.

2.3 OPERATION

The controlled outlet gate is operated only as necessary to drain the pond for maintenance of the dam. The normal operation of the dam is to allow water to overtop the spillway and the water level is controlled by flow in the river.

2.4 EVALUATION

- a. Availability. No data is available regarding design or construction of the facilities.
- b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review of the project. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, performance history and engineering judgment.
- c. Validity. Not applicable.

SECTION 3

VISUAL INSPECTION

3.1 FINDINGS

- a. General. The Mill Street Dam is located in a shallow but very broad valley. The westerly portion of the dam is founded on bedrock. The easterly section of the dam appears to be founded on soil. The embankment portion of the dam shows significant signs of erosion and distress. The concrete gravity section of the dam, however, appears to be in good condition.
- b. Dam.
- (1) Structural - The spillway portion of the dam is constructed of concrete. The east wing wall of the dam is constructed of earth embankment with concrete retaining walls. See plan, profile, and cross-sections in Appendix B for the general configuration of the structure. The concrete gravity section of the dam appears to be in good structural condition. The earth embankment portion appears to be in poor condition. See photograph 2. See Appendix A for detailed inspection findings. The visual inspection resulted in the following major findings:
- (a) Leakage is occurring through the west abutment of the dam. A hole was observed approximately 20 feet upstream of the spillway crest on the westerly end and a spring was observed below the westerly abutment and was flowing at an estimated rate of approximately 30 gpm. It was noted that the hole upstream and the spring were interconnected.
- (b) Leakage was observed from beneath the westerly portion of the spillway section of the dam. Several holes were noted upstream of the spillway crest. These

areas were as big as 3 feet in diameter and up to 1-foot in depth. Substantial flow was occurring into these areas. The underdrain or drainpipe which outlets in the downstream face of the spillway was estimated to be flowing at about 200 gpm. See photograph 4.

(c) The concrete wall upstream of the easterly embankment section of the dam was observed to have settled at least 6 inches and was severely cracked in several locations. See photograph 2. Substantial leakage was occurring through this wall and several holes were observed in the embankment fill downstream of the wall. Seepage was also observed flowing through the bottom of some of the holes. Downstream of this embankment, seepage was occurring from the toe of the embankment and the erosion of the fines from the embankment was noted.

(d) Spalling and cracking of the concrete in the training walls adjacent to the easterly portion of the spillway section of the dam was observed. See photograph 4. Some leakage was occurring through the westerly training wall.

(2) Hydraulics - At the time of the visual inspection, the lake level was at about elevation 348.5. Discharge was over the spillways into the downstream channel.

c. Appurtenant Structures. The controlled outlet gate works of the dam consists of a vertical lift timber gate. The gate and its operating equipment was observed to be in good condition, however, this equipment lacked the benefit of routine maintenance, particularly lubrication. See photograph 6. Located in the easterly portion of the dam is a gate which closed the penstock to an old powerhouse. The powerhouse is no longer used and the power equipment has been removed. The gate is inoperable and soil fill has been placed above the gate and above the trash rack immediately upstream of the gate. See photograph 9.

d. Reservoir Area. The reservoir slopes are gently sloping and are generally covered with trees and brush. Some development has occurred around the reservoir. Little sedimentation was observed at the dam site.

e. Downstream Channel. The bottom of the channel downstream is lined with gravel, boulders and bedrock.

3.2 EVALUATION

Based on the visual inspection the dam appears to be in poor structural condition. Substantial seepage and leakage is occurring through and beneath the dam and erosion of the embankment material is occurring, as evidenced by fines accumulating in the old canal downstream of the penstock area. As outlined in Section 7, remedial measures are necessary to assure a long-term safety of the structure.

SECTION 4

OPERATING PROCEDURES

4.1 PROCEDURES

The outlet gate at the dam is operated only to facilitate maintenance on the structure. The dam is normally operated to allow water to overflow the spillway and waterlevels are controlled by the flow in the river. The outlet gate is secured with a padlock between operations. The gate above the old penstock and powerhouse is inoperable.

4.2 MAINTENANCE OF THE DAM

No record of maintenance was found to be available for the Mill Street Dam. No major repairs were reported to have been made, however, visual inspection indicated that the spillway surfaces of the structure had been repaired with gunite sometime in the past. It was also noted that holes in the embankment in the easterly portion of the dam had been filled and refilled in the past.

4.3 MAINTENANCE OF OPERATING FACILITIES

No record of maintenance of the operating facilities of the dam was found to be available. It was observed during the inspection that although the gate hoisting equipment was in reasonably good condition, it lacked lubrication and was apparently not routinely maintained.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

None in effect.

4.5 EVALUATION

No regular maintenance program is apparently in effect for the Mill Street Dam. As outlined in Section 7, remedial measures are necessary to assure a long-term safety of the structure. No warning system for either high water or structural distress is in effect at the dam.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

- a. General. The Mill Street Dam is a concrete gravity structure with an easterly concrete wing wall supported by an earth embankment. The Mill Street Dam is about a mile from the town of Sanford and impounds Number 3 Pond. Normal pond elevation is 348 feet above MSL and 1.5 feet of surcharge storage is available at the damsite.
- b. Design Data. Design data was not available for the Mill Street Dam.
- c. Experience Data. Published hydrologic and hydraulic data appears to be almost entirely lacking for the Mill Street Dam. There is a USGS gage on the Mousam River near West Kennebunk (drainage area 105 square miles), but the gage is too far from the Mill Street Dam (drainage area 37.8 square miles) to be of use in estimating flood flows and frequencies. USGS Paper No. 1671 published estimated flood flows for the Emery Mills Dam and the River Street Dam. These two structures are located on the Mousam River above and below the Mill Street Dam, respectively. Flood flows for Mill Street Dam were interpolated from these data on a drainage area basis. These flood flows are shown in the following table.

<u>RECURRENCE INTERVAL (years)</u>	<u>FLOW, (cfs)</u>
10	1410
20	1850
50	2720
100	3410

No record of lake levels could be located. The water surface elevation and discharge of the maximum flood are unknown.

SECTION 6

STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations. Based on the visual observations the dam appeared to be in poor condition. Substantial seepage and leakage was observed at the westerly abutment, beneath the spillway section of the dam, and through the easterly embankment of the dam. Erosion of the embankment materials was observed to be occurring. The leakage, seepage and erosion observed present serious concern regarding the long-term structural stability of the dam.
- b. Design and Construction Data. No data concerning the original design or construction of the Mill Street Dam was disclosed in this investigation.
- c. Operating Records. None available.
- d. Post Construction Changes. No major alterations are known to have been made to the dam since its original construction. The power generating equipment which was located in the easterly portion of the dam, has been removed. It was observed during the visual inspection that the spillway section of the dam has been repaired using gunite. It was noted during inspection that substantial settlement of the easterly wing wall of the dam has occurred and that several holes have developed in the earthfill section of the northeasterly wing wall.
- e. Seismic Stability. The dam is located in Seismic Zone No. 2 and in accordance with Recommended Phase I guidelines it does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Condition. Based on the visual inspection and performance history of the Mill Street Dam, it is assessed to be in poor condition. The spillway of the dam will pass approximately a 20-year flood. The adjusted probable maximum flood (PMF) peak flow at the dam has been calculated to be 14,540 cfs. To pass this flow the structure would be overtopped by about 4.1 feet. The spillway capacity is about 12 percent of the adjusted PMF.

The inspection of the facility resulted in the following major concerns: 1) the leakage occurring through the dam and the west abutment is resulting in erosion and piping of the soil materials from the dam structure as evidenced by a fines accumulation in the unused penstock canal, and 2) the inadequacy of the spillway capacity.

- b. Adequacy of Information. The information available is such that the assessment of the condition of the dam must be based primarily on visual inspection, the past operation performance of the dam, and engineering judgment.
- c. Urgency. The recommendations outlined in 7.2 below and the remedial maintenance of the facilities outlined in 7.3 should be implemented within 12 months.
- d. Need for Additional Investigation. Additional investigation is not considered necessary for the current assessment.

7.2 RECOMMENDATIONS

The leakage and related erosion make the stability of the structure unpredictable, therefore, the leakage should be curtailed by a properly designed and implemented system. The condition

of the northeasterly earthen embankment should be monitored on a monthly basis by means of observing the development or continued widening of the sink holes and observation of the downstream channel for accumulation of additional sediments.

Since the spillway capacity is considered inadequate, a qualified engineer should make a further evaluation of the hydrology and hydraulics of the watershed and dam and design additional spillway capacity as may be warranted.

7.3 REMEDIAL MEASURES

a. Operating and Maintenance Procedures. The dam and operating facilities lack the benefit of routine maintenance. A program of regular inspection and maintenance should be implemented and a record of activities should be kept. The following specific operating and maintenance procedures should be implemented within 12 months after receipt of this report by the owner:

1. Cut all brush on the embankment portions of the dam.
2. Repair all spalled or cracked concrete surfaces.
3. Repair the old gate above the penstock or suitably close this area to stop leakage or seepage.
4. Provide around-the-clock surveillance during periods of anticipated high run-off.
5. Develop a formal warning system and implement its use in the event of an emergency.
6. Have inspections of the dam made by qualified engineers once every two years.
7. Replace flashboards with those designed to fail at a specified head.
8. Provide safety railing on control gate platform.

7.4 ALTERNATIVES

Breach and remove the dam.

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Mill Street Dam

DATE 9/6/78

TIME A.M.

WEATHER Sunny, cool

W.S. ELEV. 348.5 U.S. 333+ DN.S.

PARTY:

- | | | | |
|----|----------------------|-----|---------|
| 1. | <u>Brian Bisson</u> | 6. | <u></u> |
| 2. | <u>Stephen Cole</u> | 7. | <u></u> |
| 3. | <u>Ernest Jurick</u> | 8. | <u></u> |
| 4. | <u>John Kimble</u> | 9. | <u></u> |
| 5. | <u>Henry Oatley</u> | 10. | <u></u> |

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	<u>Hydraulics/Hydrology</u>	<u>Bisson</u>	
2.	<u>Geotechnical</u>	<u>Cole</u>	
3.	<u>Structural</u>	<u>Cole, Oatley</u>	
4.	<u>Photography</u>	<u>Jurick</u>	
5.	<u>Survey</u>	<u>Kimble</u>	
6.	<u></u>		
7.	<u></u>		
8.	<u></u>		
9.	<u></u>		
10.	<u></u>		

NOTE: See Supplementary Inspection Notes Following Checklist

INSPECTION CHECKLIST

PROJECT Mill Street Dam DATE 9/6/78
 PROJECT FEATURE Embankment NAME Stephen Cole
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITIONS
----------------	------------

DAM EMBANKMENT

Crest Elevation	349+
Current Pool Elevation	348+
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	Turf, brush
Movement or Settlement of Crest	Many localized depressions, some general settlement
Lateral Movement	None apparent
Vertical Alignment	Poor - depressions
Horizontal Alignment	Okay
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	None
Sloughing or Erosion of Slopes or Abutments	Some erosion of embankment at canal below old tailrace
Vegetation	Grass and brush

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT (cont.)</u>	
Rock Slope Protection - Riprap Failures	At tailrace noted above, also along east side of spillway channel
Unusual Movement or Cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	See Supplementary Inspection Notes, Section 2.c.
Piping or Boils	See Supplement Inspection Notes, 2.c.
Foundation Drainage Features	None observed
Toe Drains	None
Instrumentation System	None

INSPECTION CHECKLIST

PROJECT Mill Street Dam DATE 9/6/78
 PROJECT FEATURE Intake Channel/Structure NAME Stephen Cole
 DISCIPLINE Geotechnical, Structural NAME Henry Oatley
Hydrology/Hydraulics Brian Bisson

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

OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE

- | | |
|------------------------------|---------------------------------|
| a. Approach Channel | Clear - cove of impoundment |
| Slope Conditions | Flat - okay |
| Bottom Conditions | Clear - no obstructions |
| Rock Slides or Falls | None |
| Log Boom | None |
| Debris | None |
| Condition of Concrete Lining | N/A |
| Drains or Weep Holes | N/A |
| b. Intake Structure | |
| Condition of Concrete | Good |
| Stop Logs and Slots | None |
| | <u>NOTE</u> |
| | No trash rack upstream of gate. |

INSPECTION CHECKLIST

PROJECT Mill Street Dam DATE 9/6/78
 PROJECT FEATURE Control Tower NAME Stephen Cole
 DISCIPLINE Geotechnical, Structural NAME Oatley, Bisson
Hydrology/Hydraulics

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

OUTLET WORKS - CONTROL TOWER

- | | |
|--|--------------------------|
| a. Concrete and Structural | |
| General Condition | Fair to Good |
| Condition of Joints | Good |
| Spalling | None |
| Visible Reinforcing | None |
| Rusting or Staining of Concrete | None |
| Any Seepage or Efflorescence | None |
| Joint Alignment | Okay |
| Unusual Seepage or Leaks in Gate Chamber | None |
| Cracks | None |
| Rusting or Corrosion of Steel | Minor |
| b. Mechanical and Electrical | |
| Air Vents | N/A |
| Float Wells | N/A |
| Gate Hoist | Okay - needs lubrication |
| Elevator | N/A |

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - CONTROL TOWER (cont.)</u>	
Hydraulic System	N/A
Service Gates	Gate appears okay, riser stems corroded
Emergency Gates	N/A
Lightning Protection System	N/A
Emergency Power System	N/A
Wiring and Lighting System	N/A

INSPECTION CHECKLIST

PROJECT Mill Street Dam DATE 9/6/78
 PROJECT FEATURE Transition & Conduit NAME Stephen Cole
 DISCIPLINE Geotechnical, Structural NAME Brian Bisson
Hydrology/Hydraulics

AREA EVALUATED

CONDITION

OUTLET WORKS - TRANSITION AND CONDUIT

General Condition	Steel lined conduit
Rust or Staining of Conduit	Very minor rusting
Spalling	N/A
Erosion or Cavitation	None
Cracking	None
Alignment of Monoliths	N/A
Alignment of Joints	N/A
Numbering of Monoliths	N/A

PERIODIC INSPECTION CHECKLIST

PROJECT Mill Street Dam DATE 9/6/78
 PROJECT FEATURE Outlet Structure/Channel NAME Stephen Cole
 DISCIPLINE Geotechnical, Structural NAME Oatley, Bisson
Hydrology/Hydraulics

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	Fair
Rust or Staining	Training walls stained
Spalling	Training walls badly spalled
Erosion or Cavitation	None
Visible Reinforcing	In training walls
Any Seepage or Efflorescence	Minor through west training wall
Condition at Joints	Okay
Drain holes	None
Channel	Bedrock & boulders - good
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	Clear - unobstructed
	Bridge 250+ ft. downstream

INSPECTION CHECKLIST

PROJECT Mill Street Dam DATE 9/6/78
 PROJECT FEATURE Spillway NAME Stephen Cole
 DISCIPLINE Geotechnical, Structural NAME Oatley, Bisson
Hydrology/Hydraulics

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

OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS

- | | |
|--------------------------------|------------------------------------|
| a. Approach Channel | Cove of impoundment |
| General Condition | Clear |
| Loose Rock Overhanging Channel | None |
| Trees Overhanging Channel | None |
| Floor of Approach Channel | Appears clear |
| b. Weir and Training Walls | |
| General Condition of Concrete | Fair |
| Rust or Staining | Stain of training walls, some rust |
| Spalling | Spalling of training walls |
| Any Visible Reinforcing | In west training wall |
| Any Seepage or Efflorescence | Seepage in west training wall |
| Drain Holes | 4", downstream face flowing full |
| c. Discharge Channel | |
| General Condition | Okay - generally bedrock |
| Loose Rock Overhanging Channel | None |
| Trees Overhanging Channel | None |
| Floor of Channel | Bedrock & boulders, no scour |
| Other Obstructions | None |

INSPECTION CHECKLIST

PROJECT <u>Mill Street Dam</u>	DATE <u>9/6/78</u>
PROJECT FEATURE <u>Service Bridge</u>	NAME <u>Stephen Cole</u>
DISCIPLINE <u>Structural</u>	NAME <u>Henry Oatley</u>

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

OUTLET WORKS - SERVICE BRIDGE

a. Super Structure

Bearings	Okay
Anchor Bolts	Okay
Bridge Seat	Good
Longitudinal Members	Good
Under Side of Deck	Okay
Secondary Bracing	Okay
Deck	Plank - okay - one missing
Drainage System	None
Railings	None
Expansion Joints	None
Paint	None

b. Abutment & Piers

General Condition of Concrete	Some spall
Alignment of Abutment	Good
Approach to Bridge	From north only - good
Condition of Seat & Backwall	Okay

SUPPLEMENTARY INSPECTION NOTES

1. CONSTRUCTION STRUCTURES IN GENERAL

- a. Concrete Surfaces - The concrete surface of the spillway portions of the dam are in fair to good condition. These areas appear to have been repaired with gunite at some time in the past. The surface presently shows little indication of spalling. The training walls adjacent to the east flashboarded spillway show severe spalling and exposed reinforcing steel in some portions. See photograph 4. The east wing wall of the dam shows signs of spalling and cracking. See photograph 2.
- b. Structural Cracking - Structural cracking was noted in the concrete which makes up the westerly wing wall of the dam adjacent to the warehouse which is situated at the west abutment of the dam. Structural cracking was also noted in the easterly wing wall in several areas. The cracks in both walls appear to be related to structural distress caused by settlement of these segments of the dam. Surficial cracking was also observed in the lower portion of the west end of the spillway near the abutment and also in the surfaces of the training wall near the east spillway section. These cracks do not, however, appear to be related to structural distress.
- c. Movement - The wing wall at the west abutment of the dam shows indication of some settlement related to the cracking discussed in Item b. above. The easterly wing wall of the dam has settled as much as 6 inches at one point but no horizontal movement is evident. The spillway section of the dam shows no indication of either horizontal or vertical movement.
- d. Junctions - The junctions of the dam from the west abutment to the spillway and from the spillway to the easterly embankment show no evidence of movement or distress.

- e. Drains - A 4-inch diameter drain line was observed in the downstream face of the spillway. This drain line was observed to be flowing full and discharging at an estimated rate of at least 200 gpm. No other formal drainage systems were observed in the dam structure. The flow from the drain line in the face of the spillway was found to be clear and no evidence of erosion was noted.
- f. Water Passages - The spillway sections of the dam were found to be in good condition. No erosion or significant structural cracking was observed in these surfaces.
- g. Seepage or Leakage - Seepage was observed to be entering through the west wing wall of the dam and outletting in a spring below the west abutment. This connection was ascertained by the passage of a relatively large native crayfish from the upstream face to the downstream spring. Seepage was noted through the westerly training wall between the two spillway sections of the dam and through the cracked portions of the wall which makes up the easterly wing of the wall. Seepage was also noted to be coming from beneath the face of the westerly portion of the spillway between the concrete and the bedrock surface. See plan for location of the areas of seepage.
- h. Monolith Joints - Joints could not be observed in the spillway portion of the dam, since the surfaces have been covered with gunite some time in the past. An open construction joint was observed, however, in the wing wall of the dam which makes up the westerly abutment. An open joint was also observed in the easterly wing wall of the dam approximately 16 feet east of the spillway.
- i. Foundation - The spillway portion of the dam is founded directly on bedrock. It was observed that a portion of the spillway section of the dam have been undermined by erosion of the bedrock. The undermining was found to be of minor extent and no foundation distress was observed. It appears that the easterly wing wall of the dam is founded on soil and this area has undergone settlement indicating foundation distress.

j. Abutments - The westerly abutment of the dam consists of a wall beneath an adjacent warehouse. Seepage was observed to be occurring through this abutment and a spring was observed downstream of this abutment. The easterly abutment of the dam is not well defined. The easterly wing wall extends several hundred feet from the spillway of the dam and ends in what appears to be natural high ground.

2. EMBANKMENT STRUCTURES

The easterly wing wall of the dam consists of a section made up of two concrete walls and a contained earthen embankment. The embankment appears to consist of sands and gravel.

a. Settlement - The embankment portion of the dam has undergone general settlement as well as several areas of localized settlement. Several deep depressions or holes were observed in this embankment. There is also evidence of areas filled apparently related to previous depressions. Several depression holes were also observed upstream of the dam. See plan for locations.

b. Slope Stability - The higher areas of the embankment portion of the dam are retained in concrete walls. No instability of the embankments related to slopes was observed.

c. Seepage - A substantial amount of seepage was observed to be coming through the embankment portion of the dam. Seepage could be observed in the bottom of several holes in the north embankment. Seepage coming from the toe of this embankment was estimated to be in excess of 50 gpm and it was observed that silt and sand has accumulated beneath or downstream of these areas of seepage indicating piping or erosion from the embankment section. Some tree and brush growth has occurred on the embankment section. However, this growth does not appear to effect the stability of the embankment. No animal burrows were observed.

d. Drainage Systems - No formal drainage is known to exist in the embankment portion of the dam and none was observed.

e. Slope Protection - The upstream face of the embankment portion of the dam is protected by a concrete wall. The downstream slope is covered with grass and low brush. No erosion of the surface was apparent. The section of the embankment which abuts the tailrace or canal from the old generator room, see plan, is protected from erosion by a dry laid stone masonry wall. Portions of this wall have collapsed with subsequent erosion of embankment materials. See photographs 7 and 8.

3. SPILLWAY STRUCTURES

The spillway of the dam consists of two sections. A westerly section, which is a broad crested concrete weir, and an easterly section, which is a sharp crested weir with flashboards.

a. Control Gates and Operating Machinery - The spillway of the dam is not gated. The flashboards in the easterly spillway section appear to be of a non-failing type.

b. Unlined Saddle Spillway - Not applicable.

c. Approach and Outlet Channel - The approach channel appeared to be clear and unobstructed. The outlet channel flows through a bridge section a short distance downstream. The box sections of this bridge is traversed by a 6-inch diameter sewer line which would obstruct high water flows.

d. Stilling Basin - The stilling basin below the spillway consists of a bedrock channel. No serious erosion or scouring of the channel was noted.

4. OUTLET WORKS

The outlet works consist of a gated, 6-foot diameter riveted steel pipe. A gated penstock exists in the easterly portion of the dam. This outlet is not functional, however. Therefore the only flow in the canal downstream of this penstock is due to seepage through the dam.

- a. Intake Structure - The intake structure consists of a channel formed by concrete training walls. The inlet area is clear of both silt and accumulated debris. There is no trash rack upstream of the gated outlet.
- b. Operating and Emergency Control Gates - The gate is a timber vertical lift gate which is operated manually by means of reducing gears in a vertical rack and gear. The gate was operated during the inspection. It was noted that the operating equipment lacked lubrication and that the riser stems on the gates were heavily corroded, however, the stems appeared serviceable.
- c. Conduits - The 6-foot diameter conduit from the gate through the dam is riveted steel. It appeared to be in good condition with very little corrosion.
- d. Stilling Basin - The stilling basin consists of a concrete apron which extends approximately 10 feet downstream from outlet of the sluiceway. This apron was found to be in good condition with no signs of erosion. The edge of the apron was inspected and no erosion was noted.
- e. Approach and Outlet Channel - Both the approach and outlet channels of the outlet works were found to be clear and unobstructed. There has been some erosion of the easterly earth bank just downstream of the spillway training wall.
- f. Drawdown Facilities - A 6-foot diameter gated outlet is available to effectively empty the reservoir.

5. SAFETY AND PERFORMANCE INSTRUMENTATION

None at the dam.

6. RESERVOIR

- a. Shoreline - No major active or inactive landslide areas on No. 3 Pond were observed.

- b. Sedimentation - The watershed has remained in its present condition for a number of years. No new sources of sediment were located.
- c. Potential Upstream Hazard Areas - A few residences are located around the pond. These would be affected by Probable Maximum Flood elevations, but not by maximum water storage pool elevations.
- d. Watershed Runoff Potential - This watershed is of a rural nature with a significant portion of its area as lakes and ponds. This would tend to reduce peak flows and allow for water storage (surcharge) within the drainage basin.

7. DOWNSTREAM CHANNEL

With high flood flows or breach of the dam, extensive damage would be anticipated at industrial locations downstream of the dam. Breach of the dam would most likely occur in a non-discharge portion of the dam, thus flows could deviate from the normal channel.

8. OPERATION AND MAINTENANCE FEATURES

- a. Reservoir Regulation Plan - No formal plan is available.
- b. Maintenance - Based on the visual inspection it appears that maintenance is done on the dam and operating facilities on an as-needed basis. No routine maintenance is apparently accomplished.

APPENDIX B
ENGINEERING DATA

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

<u>Appendix</u>	<u>Description</u>
B-1	Inspection History
B-2	Plan, Profile and Cross-Sections

APPENDIX B-1

INSPECTION HISTORY

On January 5, 1978 an inspection of the Mill Street Dam was made by Maine Department of Transportation personnel. A copy of their report is attached.

B-1.1

INSPECTION REPORT
FOR THE MILL STREET DAM, SANFORD (SPRINGVALE)

COPY

On January 5, 1978, Everett Barnard, MDOT Assistant Bridge Maintenance Engineer; Charles Norburg, MDOT Geologist and Philip Libby, MDOT Project Design Engineer assigned to Dam Inspection met Tony Hayes, Engineer for the Town of Sanford and arranged to meet the Selectmen at 1:30 p.m. to be followed by inspection of the Mill Street Dam located in the Springvale section and is upstream from the urban area of Springvale and Sanford.

An examination of the watershed discloses that a small land area drains into Mousam Lake and Square Pond, relatively large lakes, which feed the Mousam River. This relationship eliminates the danger of excessive increase of head on any retaining structure. The water level of Mousam Lake is controlled by a dam (Emery's Mill), which is also owned by Town of Sanford. This dam is about 5 miles upstream and controls flow to Mill Street Dam.

At the meeting with the Selectmen, John Hall, Chairman and Mr. Lemieux, expressed approval of the plan for inspection of dams. It was explained that this inspection would only note extreme conditions, as ice, snow and water flowage would prevent any detailed examination, and that the agency designated to continue the inspections of conditions, had not finally been determined. Both Selectmen pledged support for the program and asked for monetary assistance.

Jerry Hayes took us to the site where we met John Bird, Director, and Claudette Lemieux, Resource Research Clerk, for York County Civil Emergency Preparedness.

The inspection of the site showed that the original use for the dam was to control and increase the height of water used for water power at a mill that was on the east end of the dam. The water power is no longer used and the gates were closed and the machine room abandoned. The tailwater channel showed very little flow from seepage coming thru the dam. There are no plans for the construction, but there seemed to be two concrete walls with a varying width of earth fill between them. The spillway section was shallow in depth and flowed onto ledge. There was also a head control gate in the middle section of the dam that was operative to control water levels at the site.

The inspection showed that there was no apparent weakness in the dam structure. A more detailed structural inspection would be warranted when more favorable conditions exist, due to the property downstream from the site.

The flow control of the river basin lessens any danger of extreme flooding along the river. There are a number of dams along the river in the urban area, which help guard against disasters in the river basin.

COPY

Reported by _____
Philip J. Libby

DAM INSPECTION #4
BEDROCK REPORT

1/5/78

COPY

NAME: Mill Street Dam

TOWN: Sanford COUNTY: York

RIVER: Mousam

TYPE OF DAM: Gravity

PURPOSE: Maintain Head for Water Power

HEIGHT(FT.): 14

CAPACITY(ACRE FT.): 306

UNDERLYING BEDROCK: Gray biotite and muscovite gneiss and schist (Rindgemere Fm.)

SITUATION: This dam is one of four on the Mousam River between Mousam Lake and Sanford proper and is the second below the lake. It is a large concrete structure with possibly an earthen or rock-filled core. The southwestern end is visibly on bedrock with the remainder assumed to be, at depth. The ledge dips to the northeast below the stream bed and was not seen to outcrop again in this area within 500 feet of the northeast bank. No faults have been noted in the dam proximity. This area is in seismic risk zone 2 (Moderate damage, Modified Mercalli intensity VII, Maximum) but is 25 to 30 miles from a zone 3 which surrounds the Boston area (Major damage, Modified Mercalli Intensity VIII and larger). Therefore, as far as earthquake risk is concerned, this structure is the most potentially susceptible of all the Class I dams in the state. The earthquake of October 1925 was apparently centered about 17 miles north of the dam site. This quake is classified as having an intensity of VI M.M. and was felt over an area of 39,000 sq. km. (15,000 sq. mi.). No damage was recorded at the dam site.

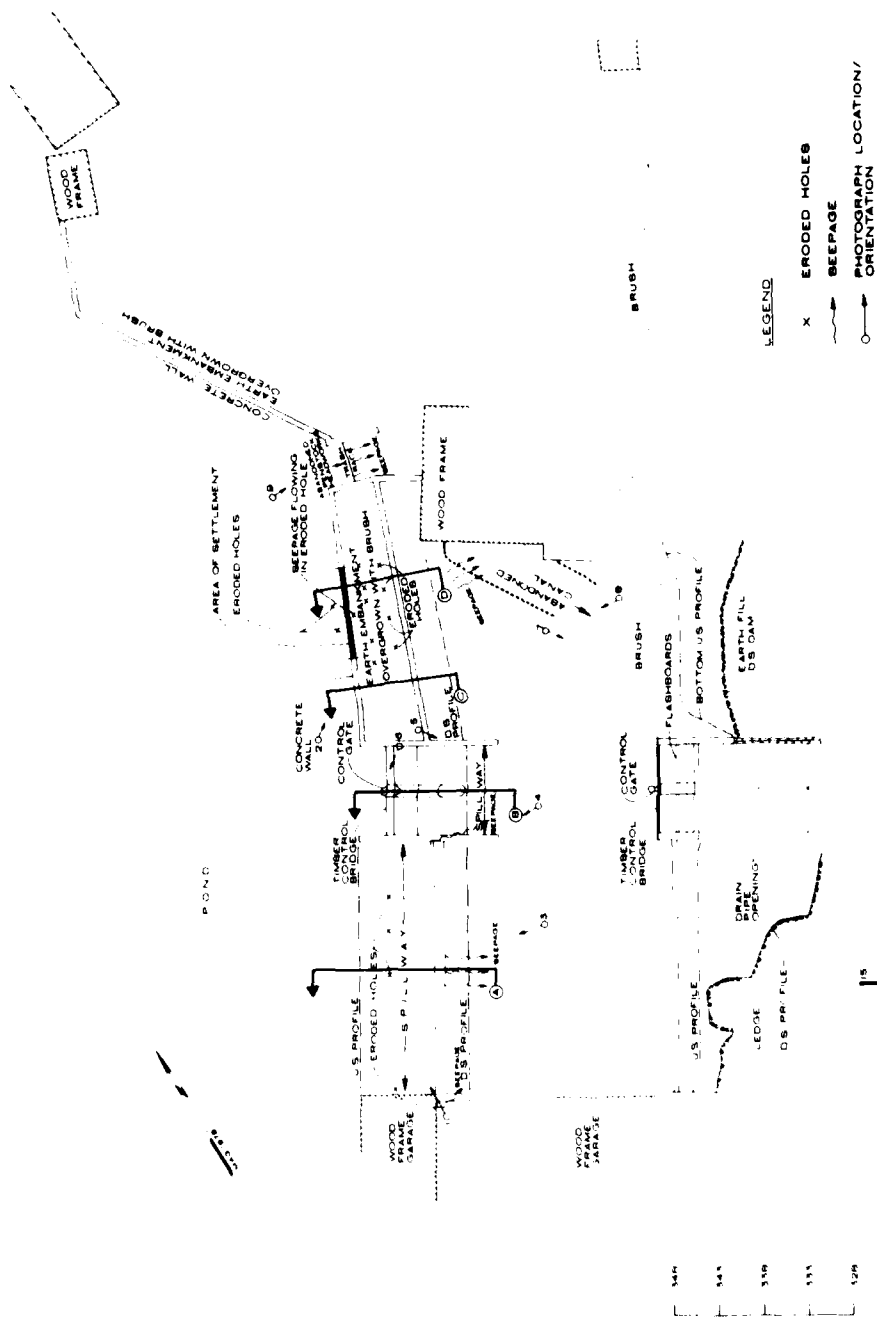
CONDITION: Seepage was noted by Town officials prior to our inspection. We found some cracks and minor seepage, but nothing that could be considered of any great import at this time. The dam, as a whole, appears sound. A reinspection after the snow leaves would be in order.

COPY

APPENDIX B-2

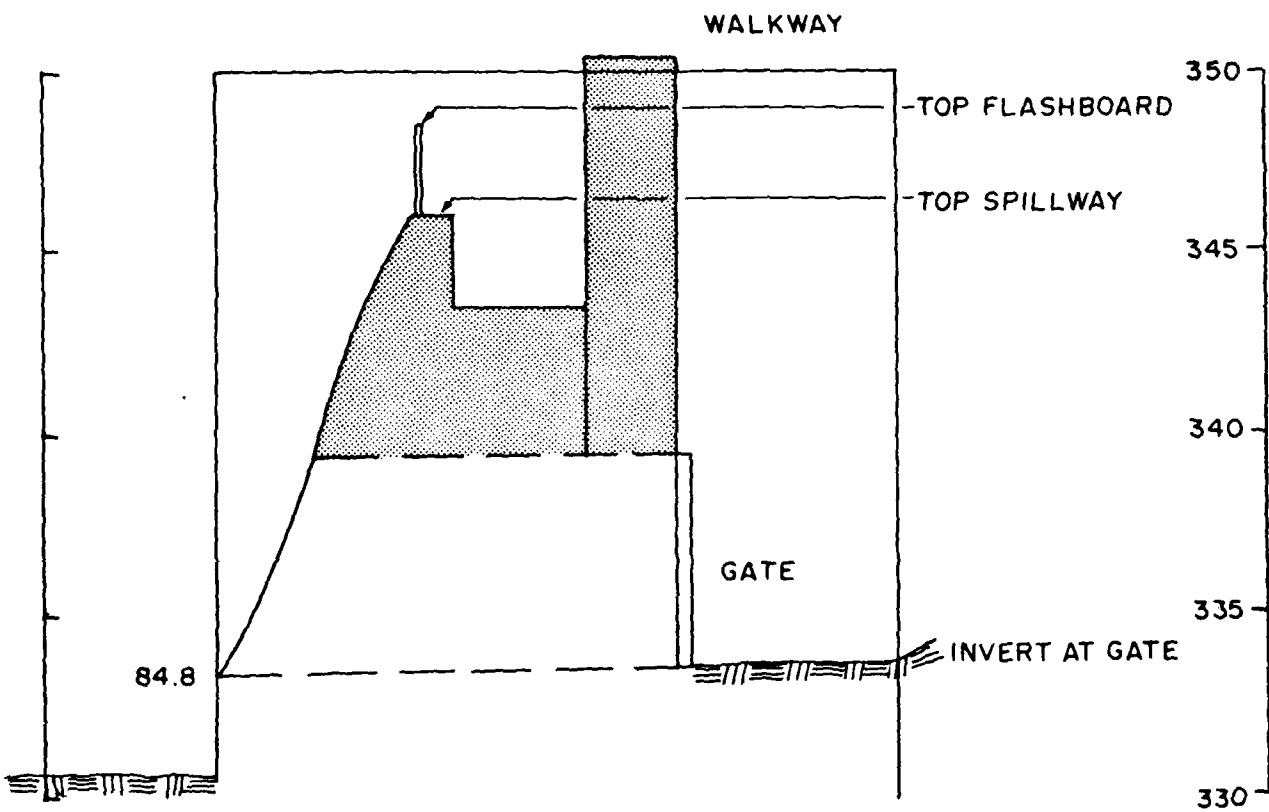
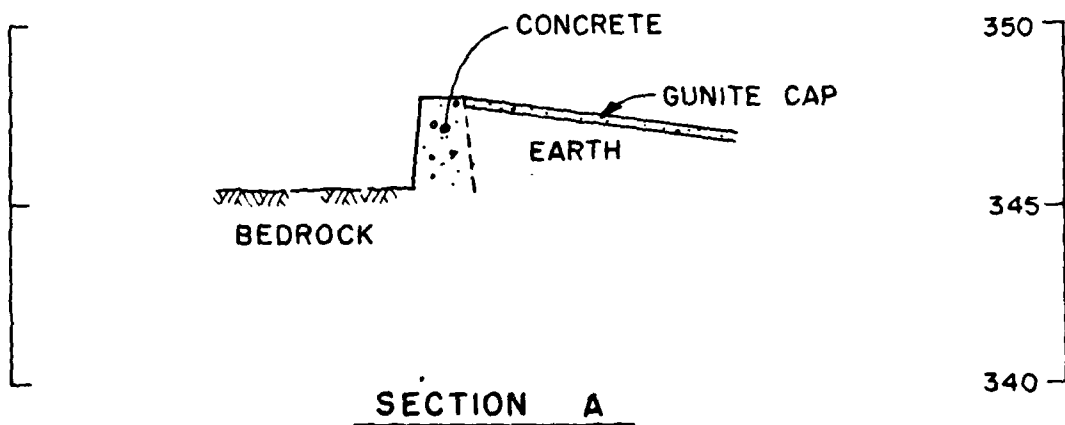
PLAN, PROFILE AND CROSS-SECTIONS

A plan, profile and cross-sections with limited detail were developed based on the data obtained during the visual inspection. Copies of these drawings are attached.



B-2.1

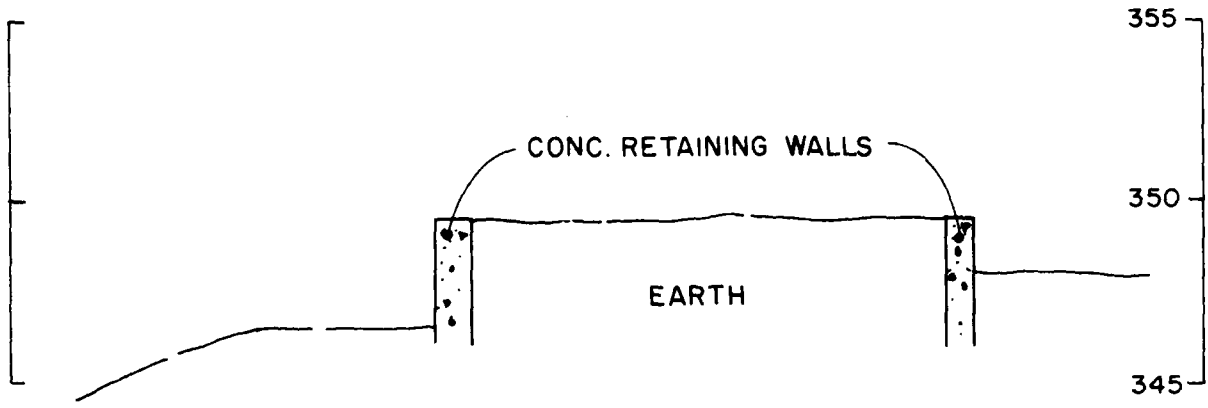
EDWARD C. JORDAN CO., INC. PORTLAND, MAINE	U.S. ARMY ENGINEER DISTRICT OFFICE PORTLAND, MAINE
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	
MILL STREET DAM	
PLAN & PROFILE	
MOUSAM RIVER	MAINE
DATE: OCTOBER 1975	



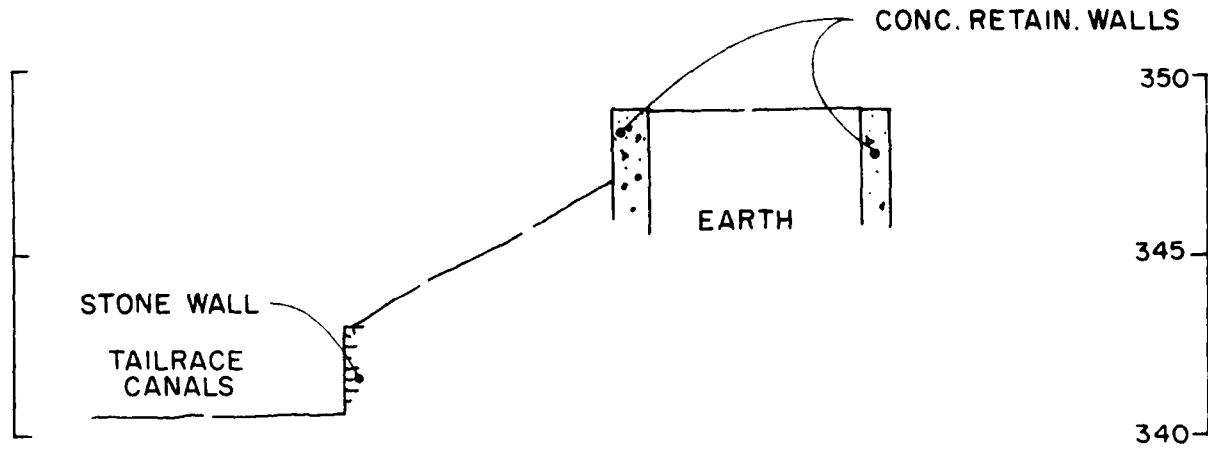
SECTION B

B-2.2

DESIGNED BY	DATE
CHECKED BY	DATE
NATIONAL PROGRAM OF INSPECTION OF NON-FEED DAMS	
MILL STREET DAM	
X-SECTION	
MOUSAM RIVER	MAINE
OCTOBER 1978	



SECTION C



SECTION D

B-2.3

EDWARD C. JORDAN CC MC	U.S. ARMY
POSTLAND, MA 021	ENGINEER
NATIONAL PROGRAM OF INSPECTION OF NON-FED BRAMS	
MILL STREET DAM	
X-SECTIONS	
MOUSAM RIVER	MAINE

APPENDIX C

PHOTOGRAPHS

The following are photographs referenced in this report.
See Sheet B-2.1 for photographs, locations and orientations.



1

UPSTREAM VIEW OF DAM



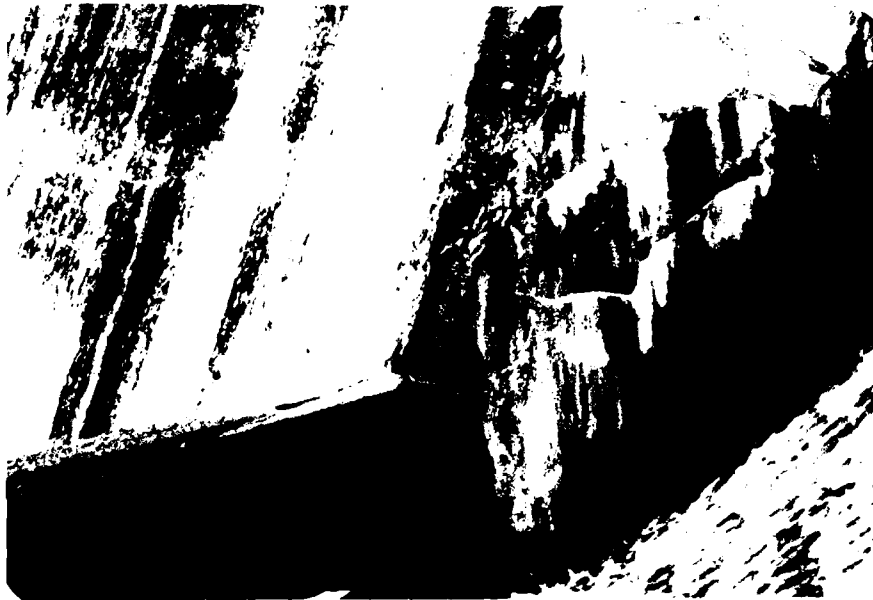
2

VIEW OF SAG IN UPSTREAM CONCRETE WALL OF EASTERLY EMBANKMENT



3

DOWNSTREAM VIEW OF WESTERLY SPILLWAY



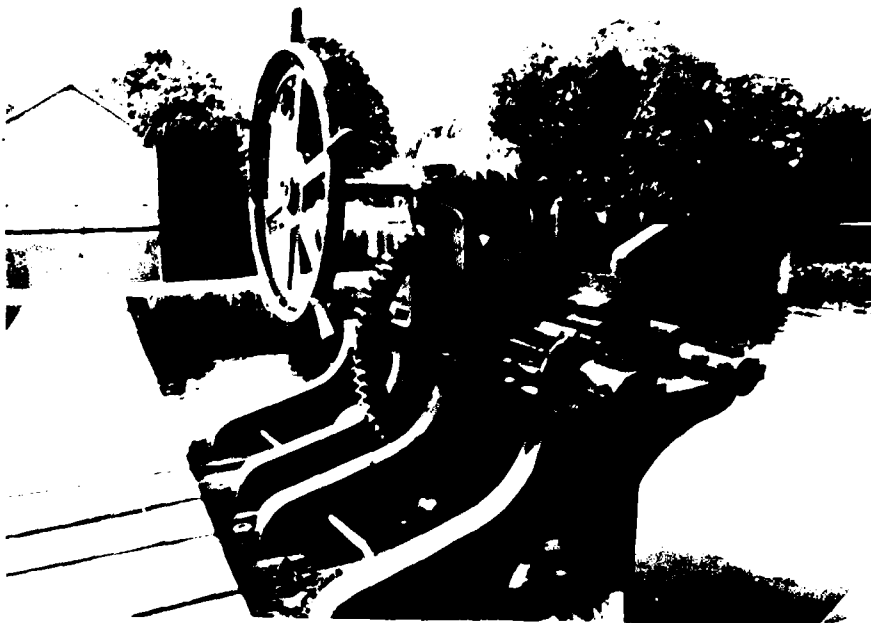
4

VIEW OF TRAINING WALL BETWEEN SPILLWAYS AND DRAIN PIPE DISCHARGE



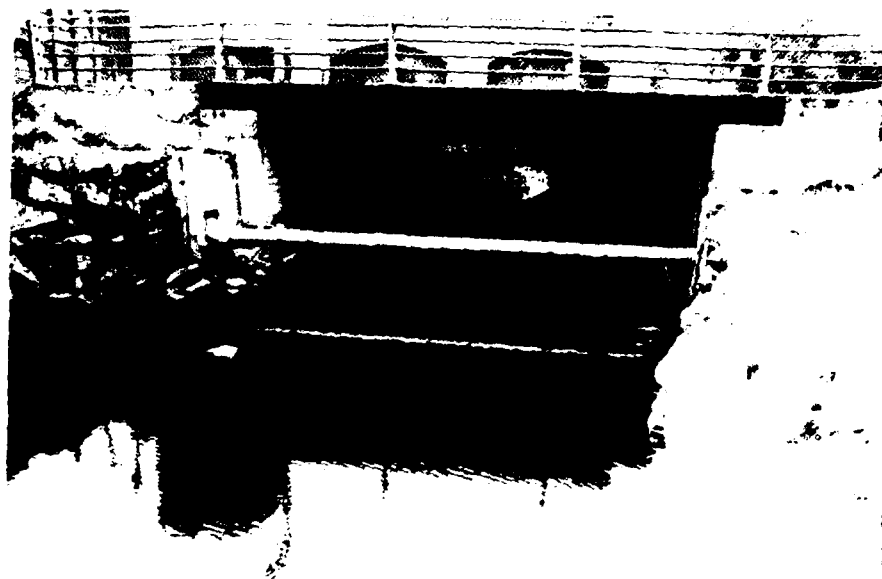
5

V I E W O F D O W N S T R E A M C H A N N E L F R O M D A M



6

C O N T R O L G A T E M E C H A N I S M



7

ABANDONED CANAL DOWNSTREAM OF DAM



8

DOWNSTREAM VIEW OF DAM SHOWING
ABANDONED CANAL AND RIVER CHANNEL



9

ABANDONED PENSTOCK HEADWORKS

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Attached to this section are the hydrologic and hydraulic computations for the Mill Street Dam.

PROJECT Dam Safety Inspection - Mill Street Hydraulic/Hydrologic Analysis	COMP BY JHF	JOB NO. 205309
	CHK BY JTB	DATE 10/6/78

GENERAL INFORMATION

Concrete Earth Construction
18' high
Capacity - 150 acre-feet
gate utilized only for repairs
-16' Drawdown available

built - 1910
last repair - 1961
Normal Pond elevation @ flashboards
Seismic zone # 2
Spillway elevation 3'12" above MSL

Hydraulics - flow through gate structure
Survey datum - 0.0 @ flashboards, & Gate @ 12.2' below flashboards

$$Q = CA\sqrt{2gh} \quad C = 0.7 \quad A = 28.3 \text{ ft}^2$$

Survey Datum	Elevation	Q	Survey Datum	Elevation	Q
-6.0	342.0	396	6.5	354.5	688
-5.5	342.5	412	7.0	355.0	697
-5.0	343.0	427	7.5	355.5	706
-4.5	343.5	441	8.0	356.0	715
-4.0	344.0	455	8.5	356.5	723
-3.5	344.5	469	9.0	357.0	732
-3.0	345.0	482	9.5	357.5	741
-2.5	345.5	495	10.0	358.0	751
-2.0	346.0	508	10.5	358.5	757
-1.5	346.5	520	11.0	359.0	766
-1.0	347.0	532	11.5	359.5	771
-0.5	347.5	544	12.0	360.0	782
0.0	348.0	555	12.5	360.5	790
0.5	348.5	567	13.0	361.0	798
1.0	349.0	578	13.5	361.5	806
1.5	349.5	588	14.0	362.0	814
2.0	350.0	599	14.5	362.5	822
2.5	350.5	610	15.0	363.0	829
3.0	351.0	620	15.5	363.5	837
3.5	351.5	630	16.0	364.0	844
4.0	352.0	640	16.5	364.5	852
4.5	352.5	650	17.0	365.0	859
5.0	353.0	659	17.5	365.5	866
5.5	353.5	669	18.0	366.0	874
6.0	354.0	678	18.5	366.5	881

PROJECT Lane - 15471 Mill Street Lane	COMP BY JNT	JOB NO. 7200-1-11
	CHK BY JNT	DATE 10/9/73

Weir #2

$$C_e = 3.22 + 0.40 \frac{H}{P}$$

H = Head
P = height of weir

Survey Datum	Elevation	P	H	C _e
0.0	348.0	2.5	0.0	-
0.5	348.5	2.5	0.5	3.30
1.0	349.0		1.0	3.38
1.5	349.5		1.5	3.46
2.0	350.0		2.0	3.54
2.5	350.5		2.5	3.62
3.0	351.0		3.0	3.70
3.5	351.5		3.5	3.78
4.0	352.0		4.0	3.86
4.5	352.5		4.5	3.94
5.0	353.0		5.0	4.02
5.5	353.5		5.5	4.10
6.0	354.0		6.0	4.18
6.5	354.5		6.5	4.26
7.0	355.0		7.0	4.34
7.5	355.5		7.5	4.42
8.0	356.0		8.0	4.50
8.5	356.5		8.5	4.58

PROJECT Dam Inspection - Mill Street Low	COMP BY JAF	JOB NO. 2004-009
	CHK BY LJS	DATE 10/9/03

Elevation above MSL	Survey Datum	Weir #1 L=112.4' w=5' Cr=0.0		Weir #2 L=40' w=15' Cr=0.0		Weir #3 L=140' w=15' Cr=1.75		Weir #4 L=130' w=15' Cr=1.25		Weir #5 L=40' w=15' Cr=1.5	
		C	Q	C	Q	C	Q	C	Q	C	Q
348.0	0.0	-	-	-	-	-	-	-	-	-	-
348.5	0.5	3.28	130	3.30	47	-	-	-	-	-	-
349.0	1.0	3.50	393	3.38	135	-	-	-	-	-	-
349.5	1.5	3.54	731	3.46	254	-	-	2.68	44	-	-
350.0	2.0	3.52	1119	3.54	401	2.68	47	2.67	225	2.70	38
350.5	2.5	3.36	1493	3.62	572	2.67	243	2.64	480	2.63	105
351.0	3.0	3.31	1933	3.70	769	2.64	517	2.63	792	-	193
351.5	3.5	3.30	2429	3.78	990	2.63	852	-	1154	-	298
352.0	4.0	↙	2967	3.86	1235	↙	1243	↙	1559	↙	416
352.5	4.5	↙	3541	3.94	1504	↙	1674	↙	2003	↙	547
353.0	5.0	↙	4147	4.02	1798	↙	2157	↙	2483	↙	689
353.5	5.5	↙	4784	4.10	2115	↙	2674	↙	2996	↙	842

⊕ Cross-Section fig. 5-21 pp. 5-27 Brater & King

● Sharp Crested Weir, C values from equation 5-37 pp. 5-10 Brater & King

Survey Datum	Elevation above MSL	Total Discharge cfs
0.0	348.0	555
1.0	349.0	1106
2.0	350.0	2429
3.0	351.0	4824
4.0	352.0	8060
5.0	353.0	11933
5.5	353.5	14080
6.0	354.0	16356

PROJECT Lum Inspection - Mill Street	COMP BY JNF	JOB NO. 201201
	CHK BY BTE	DATE 12/1/88

Elevation	Surge return	Surface Area	Surcharge Storage (Ac-ft)	Surcharge (cf)
348.0	0.0	29.6	0.0	555
349.0	1.0	36.7	36.7	1106
350.0	2.0	43.8	80.5	2129
351.0	3.0	51.0	131.5	4824
352.0	4.0	58.1	189.6	8660
353.0	5.0	65.2	251.8	11932
353.5	5.5	68.8	289.2	14082
354.0	6.0	72.3	361.5	16356

Q_{p1} = routed flow from Energy Mills Dam + lift for added T_{in} = 14660 cfs

Elevation to pass Q_{p1} = 353.63'

Storage @ 353.63' = 298.6 acre-feet

DA tributary to Mill St. Dam = $37.8 \text{ in.}^2 \times 640 \text{ ac.} / \text{mi}^2 = 24190 \text{ ac.}$

$$STOR_1 = \frac{298.6}{24190} \times \frac{12}{1} = 0.15''$$

$$Q_{p2} = 14660 \left(1 - \frac{0.15}{19}\right) = 14540 \text{ cfs}$$

Elevation to pass Q_{p2} = 353.60'

Storage @ 353.60' = 296.7 acre-ft.

$$STOR_2 = \frac{296.7}{24190} \times \frac{12}{1} = 0.15''$$

$$\text{Avg.} = 0.15''$$

$\therefore Q = 14540 \text{ cfs}$
Elev. = 353.6

5.6 feet over spillway

PROJECT Dam Inspection Mill Creek	COMP BY JNF	JOB NO. 2000-1
	CHK BY JNF	DATE 12/9/83

Q_p , determination w/ breach @ full spillway - elev. 349.5'

$$Q_p = \left(\frac{8}{27}\right) W_b \sqrt{g} Y_0^{3/2}$$

$$W_b = 2.4(115) = 46 \text{ ft.}$$

$$Y_0 = 16.5 \text{ ft.}$$

$$Q_p = \left(\frac{8}{27}\right)(46)(\sqrt{32.2})(16.5)^{3/2}$$

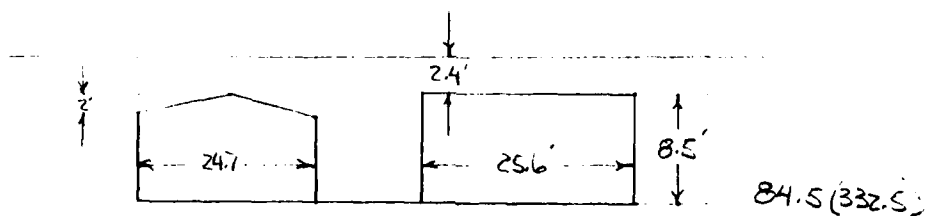
$$= 5180 \text{ cfs.}$$

Storage @ spillway crest = 150 acre-ft.

Storage @ full spillway = 2086 acre-ft.

$$T_i = \frac{(12.1)(2086)}{(1/2)(5180)} = 1.6 \text{ hrs.}$$

PROJECT Rose & 1101 1/2 Street Bridge 20' from 11th Street	COMP BY JKP	JOB NO. 100-1001
	CHK BY ---	DATE 11/10/70



$$S = \frac{S}{250} = 0.02 \quad n = 0.014$$

@ Elevation 86.5 (334.5)

$$Q = \frac{1.49}{0.014} \left((2 \times 24.7) + (2 \times 25.6) \right) \left(\frac{58.3}{58.3} \right)^{2/3} (0.02)^{2/3}$$

$$Q = 2179 \text{ cfs.}$$

@ Elevation 88.5 (336.5)

$$Q = \frac{1.49}{0.014} \left((4 \times 24.7) + (4 \times 25.6) \right) \left(\frac{66.3}{66.3} \right)^{2/3} (0.02)^{2/3}$$

$$Q = 6350 \text{ cfs.}$$

$$Q_{p1} = 5180 \text{ cfs}$$

$$\text{Stage} = 335.94'$$

$$V_1 = \frac{(3+3.5)(30)(250)}{43560} = 0.56 \text{ acre-ft.}$$

$$Q_{p2}(\text{trial}) = 5180 \left(1 - \frac{0.56}{208.6} \right) = 5170 \text{ cfs.}$$

$$\text{Stage} = 335.93'$$

$$\therefore V_1 \approx V_2$$

$$\therefore Q_{p2} = 5170 \text{ cfs.}$$

$$V = Q/A \quad \therefore V = \frac{5170}{172.5} \approx 30 \text{ fps}$$

use critical equation

PROJECT Cross-section #1 @ Mill Street Bridge	COMP BY JNF	JOB NO. 20033001
	CHK BY JNF	DATE 1/1/01

$$Q = C A V \quad C = 0.7$$

$$Q = (0.7)(50.3)(2.5)(\sqrt{64.4(1)})$$

$$= 2400 \text{ cfs.} \quad V \sim 5.8 \text{ fps.}$$

\therefore Bridge would be overtopped, i.e. flow over road and damage to structures below Bridge.

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

11-11-78

INVENTORY OF DAMS IN THE UNITED STATES

STATE	DIVISION	CONTRACTOR	COUNTY	DISTRICT	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
ME	031	01			MILL STREET DAM	4328.0	7047.9	200CT78

POPULAR NAME	NAME OF IMPOUNDMENT
NUMBER 3 POND	
REGION/BASIN	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE
01 04 MOUSAM RIVER	SANFORD
TYPE OF DAM	PURPOSES
REC.TPG	1910 R
YEAR COMPLETED	18
HYDRAULIC HEAD (FT.)	16
STRUCTURAL HEAD (FT.)	16
MAXIMUM CAPACITY (CY)	200
NORMAL CAPACITY (CY)	150
POPULATION	16000
DIST FROM DAM (MI.)	2

DIST OWN	FED R	PRV/FED	SCS A	VER/DATE
N	N	N	N	200CT78

REMARKS

D/S HAS	SPILLWAY LENGTH	TYPE	WIDTH	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (KW)	PROPOSED	NAVIGATION LOCKS
1	530	U	150	1030	6000			

OWNER	ENGINEERING BY
TOWN OF SANFORD	
	CONSTRUCTION BY

DESIGN	REGULATORY AGENCY
NONE	
CONSTRUCTION	OPERATION
NONE	NONE
	MAINTENANCE

INSPECTION BY	INSPECTION DATE
EDWARD C. JORDAN CO., INC.	06SEP78
	PL 92-367

REMARKS

END

FILMED

8-85

DTIC