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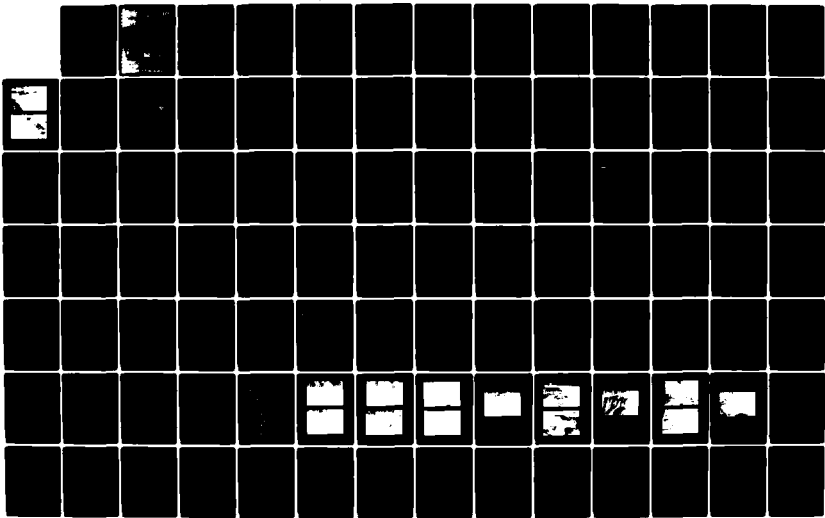
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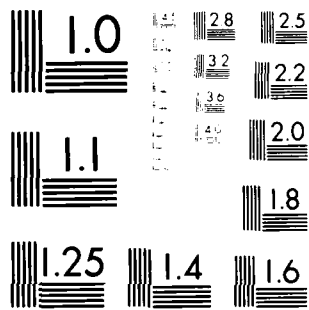
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MICROCOPY RESOLUTION TEST CHART
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HOUSATONIC RIVER BASIN
PITTSFIELD, MASSACHUSETTS

1

ONOTA LAKE DAM
MA 00016

AD-A145 194

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

NOVEMBER 1978

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		6. PERFORMING ORG. REPORT NUMBER
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9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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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, Housatonic River Basin Pittsfield, Massachusetts		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Onota Lake Dam consists of two adjoining structures: a 160+ feet long stone masonry and concrete Main Dam, which creates Onota Lake, and a 375+ feet long stone masonry, concrete and earthfill dam, which retains a small holding pond commonly referred to as the Canal. The maximum height of both dams is about 17.5 feet. The project appears to be in fair condition. Since the dam is classified as intermediate in size, with a high hazard potential, the test flood is the PMF.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDED-E

SEP 29 1979

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts

Dear Governor King:

Inclosed is a copy of the Onota Lake Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Onota Lake Dam would likely be exceeded by floods greater than 6 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty (50) percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

NEDED-E

Honorable Edward J. King

I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. This report has also been furnished to the owner of the project, the city of Pittsfield, City Hall, Allen Street, Pittsfield, Massachusetts 01201, ATTN: Mr. Gerald S. Doyle, Commissioner of Public Works.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for the cooperation extended in carrying out this program.

Sincerely,



MAX B. SCHEIDER

Colonel, Corps of Engineers
Division Engineer

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**ONOTA LAKE DAM
MA 00016**



**HOUSATONIC RIVER BASIN
PITTSFIELD, MASSACHUSETTS**

**PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Inventory No.: MA 00016
Name of Dam: ONOTA LAKE DAM
Town Located: PITTSFIELD
County Located: BERKSHIRE
State Located: COMMONWEALTH OF MASSACHUSETTS
Stream: ONOTA BROOK
Date of Inspection: 25 OCTOBER 1978

BRIEF ASSESSMENT

Onota Lake Dam consists of two adjoining structures: a 160+ feet long stone masonry and concrete Main Dam, which creates Onota Lake, and a 375+ feet long stone masonry, concrete and earthfill dam, which retains a small holding pond commonly referred to as the Canal. The maximum height of both dams is about 17.5 feet. Both dams have drop spillways which are 40 and 30 feet long, respectively, with 2.5 feet of freeboard. The Lake and Canal are interconnected by means of an uncontrolled 42 inch diameter pipe. A concrete intake structure and a 5 foot diameter steel outlet pipe are located at one end of the Canal. Discharges from the spillways and low level outlet flow into Onota Brook, a tributary of the Housatonic River.

Phase I investigation of Onota Lake Dam does not indicate conditions which would constitute an immediate hazard to human life or property. Based on engineering judgment and the performance of the dams and the outlet works, the project appears to be in fair condition. The project, however, does have inadequacies and deficiencies which, if not remedied, have the potential for developing into hazardous conditions.

Since the dam is classified as intermediate in size, with a high hazard potential, the test flood, in accordance with Corps of Engineers guidelines, is the Probable Maximum Flood. A flood hydrograph was developed for the Test Flood and resulted in an inflow peak of 15,500 cfs. The computed discharge capacity of the Main Dam spillway, with the water level at the top of the training walls, is 421 cfs. The Canal Dam spillway was not included in the analysis because the discharge capacity of the interconnecting conduit is considered

negligible in relation to the flood discharges, and was assumed inoperable. It was also assumed that the water surface was at spillway crest (El. 1079.2) at the start of the flood.

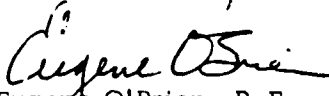
The Test Flood was routed through the lake, using a computer routing technique, and resulted in the dam being overtopped by a maximum of 5.4 feet with a peak outflow discharge of 7388 cfs. The spillway capacity is only 6% of the Test Flood outflow and is considered seriously inadequate from a hydrologic and hydraulic viewpoint.

It is recommended that the owner within 12 months after receipt of this Phase I Inspection Report retain a competent consulting engineer who should;

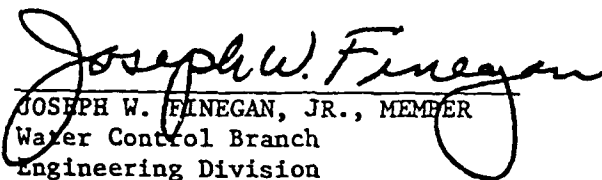
- a) conduct further detailed hydraulic and hydrologic studies to determine what measures are necessary to improve discharge capacities.
- b) conduct detailed studies to determine the causes of the leakage and seepage which were observed and to recommend measures to eliminate these conditions.

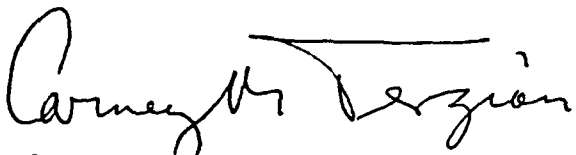
In addition, remedial measures are recommended for implementation by the owner within 24 months of receipt of this Phase I Inspection Report to improve overall conditions. These measures, in general, are as follows:

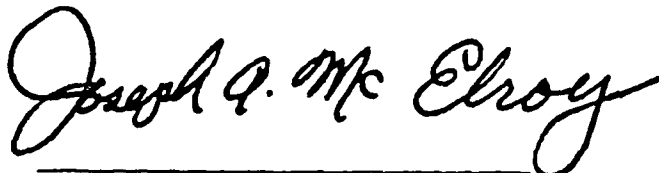
- Programs for observing and monitoring seepage
- Repairs to the dam and appurtenant structures
- Programs for operation, maintenance and inspection.


Eugene O'Brien, P.E.
New York No. 29823

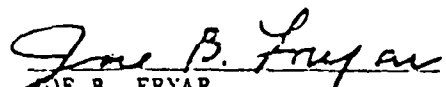
This Phase I Inspection Report on Onota Lake Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice,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


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


CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division


JOSEPH A. MCELROY, CHAIRMAN
Chief, NED Materials Testing Lab.
Foundations & Materials Branch
Engineering Division

APPROVAL RECOMMENDED:


JOE B. FRYAR
Chief, Engineering Division

PREFACE

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

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

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

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

HOUSATONIC RIVER BASIN
ONOTA LAKE DAM
INVENTORY NO. MA 0016
PHASE I INSPECTION REPORT

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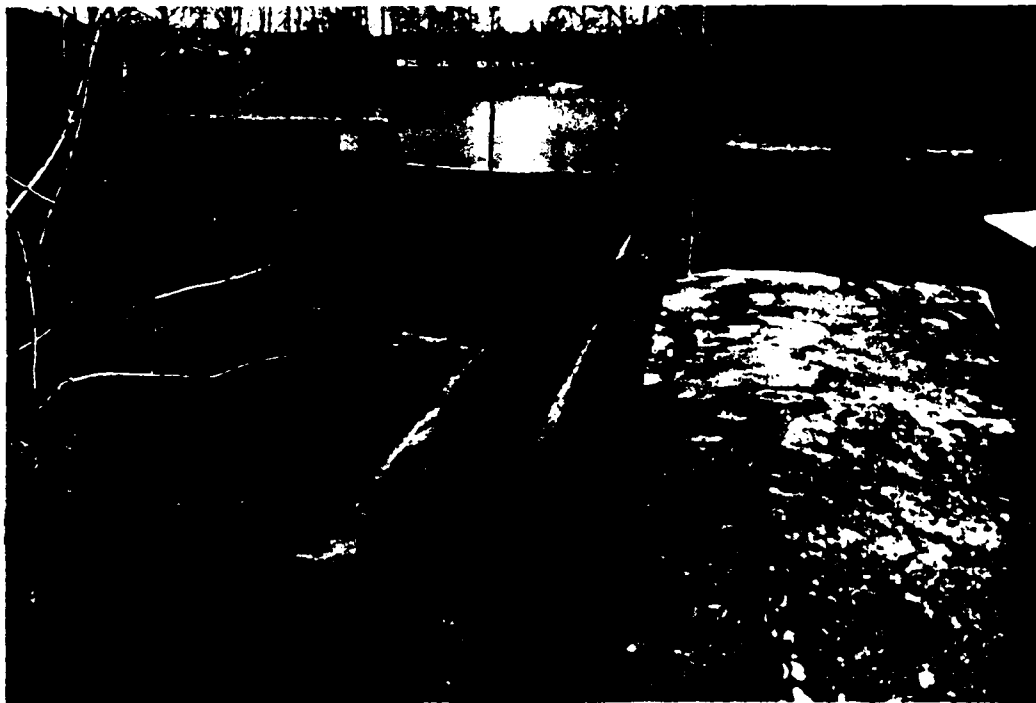
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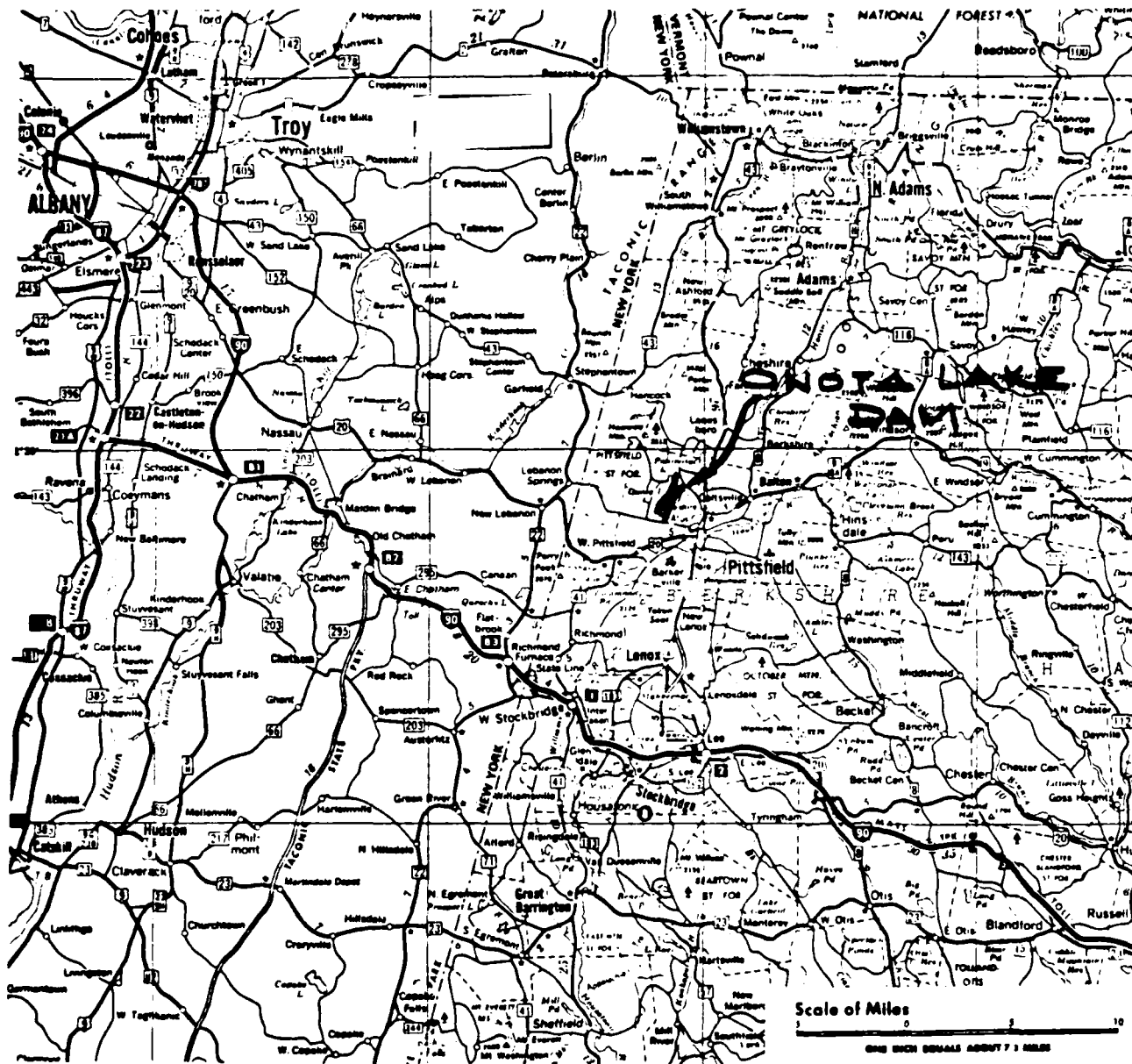


1a. MAIN DAM.



1b. CANAL DAM.

1. GENERAL OVERVIEW.



VICINITY MAP
ONOTA LAKE DAM

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
HOUSATONIC RIVER BASIN
INVENTORY NO. MA 00016
ONOTA LAKE DAM
CITY OF PITTSFIELD
BERKSHIRE COUNTY, COMMONWEALTH OF MASSACHUSETTS

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. Tippetts-Abbett-McCarthy-Stratton has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Tippetts-Abbett-McCarthy-Stratton under a letter of May 3, 1978, from Mr. Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0298 has been assigned by the Corps of Engineers for this work.

b. Purpose

- (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) Encourage and prepare the States to initiate quickly effective dam safety programs for non-Federal dams.
- (3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF THE PROJECT

a. Description of Dam and Appurtenances

Onota Lake Dam consists of adjoining structures: a stone masonry and concrete Main Dam which creates Onota Lake and a stone masonry, concrete and earthfill dam, which retains a small holding pond commonly referred to as the Canal (See Photograph No. 1). The Main Dam has a crest length of

160 feet and its maximum height is about 17.5 feet. The center drop spillway is approximately 40 feet long and has about 2.5 feet of freeboard. The spillway has a flat crest about 11 feet wide. The downstream face of the dam is nearly vertical and is covered by a 3 feet thick concrete wall facing in the area of the spillway. A stone masonry buttress, located on the downstream face near the centerline of the spillway is 6 feet wide and 8 feet long. All exposed surfaces are gunited except for a length of the stone masonry wall adjacent to the left abutment. The remnants of a gatehouse are located to the right of the spillway. Reportedly, a 42-inch diameter pipe provides uncontrolled communication between the Lake and the Canal.

The Canal Dam is a combination of a stone masonry and concrete dam and an earthfill embankment. The stone masonry and concrete portion of the dam is connected almost at right angles to the Main Dam near the right abutment. Its crest is 60 feet long and its maximum height is 17.5 feet. A drop spillway having a length of 30 feet is located at the left end of the dam. The spillway crest is flat, 8 feet wide and has a freeboard of 2.5 feet. The downstream face is nearly vertical and covered with a concrete wall; all exposed surfaces are gunited.

The earthfill embankment portion of the dam is 315 feet long. In plan it has a broad based "U" - shape. The average crest width is about 7 feet and the slopes average about 1V on 2H. The crest and slope are covered by vegetation (See Photograph No. 2). A low level concrete intake structure, about 15 feet wide and 18.5 feet high, is located at the south end of the embankment. Flanking the intake structure are two stone masonry and concrete training walls. The intake opening is 10 feet wide and 16.5 feet high and is protected by a trash rack of 1/4 inch thick steel plates separated about one inch on center (See Photograph No. 5). Water is controlled by a functioning manually operated, center screw rising type sluice gate and is conducted underground by a 5 feet diameter, 50 feet long riveted steel outlet pipe. The outfall terminus of the pipe is set in an 8 feet wide, 7 feet high reinforced concrete headwall with an attached 6 feet wide, 7 feet high concrete reinforced wing-wall (See Photograph No. 6).

The flows from both spillways and the low level outlet are into Onota Brook which passes under Valentine Road through 30 inch and 60 inch diameter reinforced concrete conduits. At the entrance to the conduits the road embankment is protected by riprap and a concrete headwall. Immediately downstream of the conduits the channel is riprapped for a short distance (See Photograph No. 9). Water discharged from the lake, runs under the old Berkshire Woolen Co. mill in an 84-inch steel pipe, then outfalls into the main channel of Onota Brook.

b. Location

Onota Lake Dam is located in the northwest section of the City of Pittsfield between Valentine Road and Lakeway Drive and west of Peck's Road.

c. Ownership

The dam is owned by the City of Pittsfield. The day-to-day operation and maintenance is provided by the Department of Public Works, City of Pittsfield.

d. Purpose of Dam

The impoundment provided by the dam is for recreational purposes.

e. Design and Construction History

Original design and construction records are not available. It is reported that the dam was built for the Berkshire Woolen Company in about 1864. The City of Pittsfield acquired ownership of the dam in 1965.

According to the available 1932 drawings, a "concrete facing wall" was added to the downstream face of the Main Dam in the vicinity of the spillway. The drawings also indicate the existence of a spring to the left of and at the base of the concrete wall proposed for construction in 1932.

It is reported that additional repairs were carried out in 1969 by Penetryn Corp. which consisted of guniting the upstream and downstream faces of the dam. The Department of Public Works repaired the upstream face of the Canal Dam in 1976 by constructing a concrete lining at the base of the dam in an area where several leaks had been occurring. In addition, the gatehouse, the two sluiceways and sluice gates, which provided the interconnection between the Canal pond and the Lake, were reportedly removed and replaced with a single uncontrolled 42-inch diameter pipe.

f. Normal Operating Procedures

There are no normal operating procedures for the project. The lake is allowed to establish its own level.

g. Size Classification

The dam is less than 40 feet high but has a maximum storage capacity of more than 1000 acre-feet, but less than 50,000 acre-feet. It is, therefore, classified as an "intermediate" size dam.

h. Hazard Classification

The dam is in a "high" hazard potential category because there are, about 7 houses and one very large industrial complex immediately downstream from the dam. In the event of a dam failure, the resulting flood wave would cause loss of life and substantial property damage.

For details on selection of the hazard potential category see Section 5.1d.

i. Operator

The individual responsible for the day-to-day operation of the dam is:

Mr. Gerald S. Doyle
Commissioner of Public Works
City Hall
Allen Street
Pittsfield, Mass.
Telephone No. (Office) 413-499-1100 Ext. 24
(Home) 413-442-7603

1.3 PERTINENT DATA

a. Drainage Area

The drainage area contributing to Onota Lake is about 10 square miles, rectangular in shape with a length to width ratio of about 1.6. The average basin length is about 3.25 miles with a mean basin slope of 6.5%. The lake is about 2 miles wide and stretches across the base of the basin, its surface area at El 1079.2 (spillway crest) is 700 acres (1.09 square miles) or 10.7% of the total drainage area. The basin is located on the eastern slopes of the Taconic Range in the Housatonic River basin, and is drained by at least seven brooks entering the lake at five different points. Most of the drainage area is covered by forests with about 20% urban development, parks, pastures, etc.

b. Discharge at Damsite

Discharges at the damsite are over two uncontrolled spillways and a low level outlet pipe.

The spillways are 30 and 40 feet long, 17.5 feet high and have

about 2.5 feet of freeboard. The computed maximum discharge capacities, with the lake level at the top of the dam, El 1081.7, are, respectively, 413 and 421 cfs. Flow into the Canal Dam is controlled by the 42-inch diameter connecting conduit - this conduit with a maximum differential head of 2.5 feet would have a discharge of about 90 cfs. The computed maximum spillway discharge of the Canal Dam could only be attained if the Main Dam overtops.

The low level outlet pipe is 5 feet in diameter. The maximum discharge, computed with a head equivalent to the spillway crest, and the top of Canal Dam is 45 cfs \pm and 200 cfs \pm respectively.

From data supplied by the City Engineers Office, Pittsfield, the highest recorded lake level since 1927, was on March 19, 1977, which is equivalent to a head of 1.55 feet above the spillway crest. The computed discharge for this peak stage is 205 cfs over the main spillway.

c. Elevation (feet above MSL)

Top of dam	1081.7
Maximum pool-design surcharge	Unknown
Maximum pool-test flood surcharge	1087.10
Full flood control pool	Not Applicable
Recreation pool	1079.2
Spillway crest (gated)	Not Applicable
Streambed at centerline of dam	1066 \pm
Maximum Tailwater	Unknown

d. Reservoir (miles)

Length of maximum pool	0.68
Length of recreation pool	0.66
Length of flood control pool	Not Applicable

e. Storage (acre-feet)

Recreation pool	3296
Flood control pool	Not Applicable
Design surcharge	Unknown
Test flood surcharge (NET)	6229
Top of dam	5130

f. Reservoir Surface (acres)

Top of dam	762
Test flood pool	848
Flood control pool	Not Applicable
Recreation pool	700
Spillway crest	700

g. Dam

Type	<u>Main Dam</u>	<u>Canal Dam</u>	
	Stone masonry & concrete	<u>Masonry</u> Stone masonry, concrete, earthfill	<u>Earth</u>
Length (feet)	160±		375±
Height (feet)	17.5±		17.5±
Top Width (feet)	11±	8+	7+
Side Slopes - U/S	Unknown	Unknown	1V on 2H
D/S	Nearly vertical	Nearly vertical	1V on 2H
Zoning	None		Unknown
Impervious core	Not Applicable		Unknown
Cutoff	None		Unknown
Grout curtain	None		Unknown

h. Diversion and Regulating Tunnel

Type	Not Applicable
Length	Not Applicable
Closure	Not Applicable
Access	Not Applicable
Regulating Facilities	Not Applicable

i. Spillway

Type	Broadcrested	Broadcrested
Length of weir (feet)	40	30
Crest elevation (feet)	1079.2	1079.2
Gates	None	None
U/S channel	None	None
D/S channel	Natural Brook	Natural Brook

j. Regulating Outlets

The regulating outlets consist of two uncontrolled spillways and a low level outlet.

The uncontrolled spillways are about 30 and 40 feet long, about 17.5 feet high, with about 2.5 feet of freeboard.

The low level outlet consists of a concrete intake structure with a manually operated sluice gate and a 5 feet diameter, about 50 feet long pipe. The sluice gate is reportedly operable.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

There are no design data, drawings or specific memoranda available to evaluate the original dam construction, any subsequent changes or repairs to the dam. Two drawings dated October 1932, which are included in the Appendix, show a plan and elevation of the Main Dam and a portion of the Canal Dam. The purpose of the drawing was to obtain a permit for construction of a concrete wall on the downstream face of the Main Dam. During the Phase I inspection some approximate field measurements were made. On the basis of these measurements a sketch was prepared showing the approximate relationship of the dams (See Appendix).

There is no available information on subsurface conditions except for the reference on the 1932 drawing which indicates that the dam is founded on ledge rock.

2.2 CONSTRUCTION RECORDS

There are no construction records available.

2.3 OPERATION RECORDS

A record of flood reservoir levels is kept at the Office of the Department of Public Works.

2.4 EVALUATION OF DATA

a. Availability

Existing information was made available by City Engineers Office, Department of Public Works, City of Pittsfield, Mass.; County Engineers Office, Berkshire County, Pittsfield, Mass.; Department of Environmental Quality Engineers, Division of Waterways, Boston, Mass.; and Soil Conservation Service, U.S. Department of Interior, Amherst, Mass.

b. Adequacy

The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Validity

In general, the information obtained from the available drawings, the past inspection reports, and the personal interviews is consistent with observations made during the inspection and therefore considered reliable.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The visual inspection of Onota Lake Dam was performed on 25 October 1978. The weather was sunny, temperature 60° to 70°F. The last rainfall reportedly occurred two days prior to the inspection. At the time of the inspection the lake level was about 1.5 inches above the spillway crest.

b. Dam and Spillway

1) Main Dam

At the time of the inspection, water was flowing over the spillway, therefore it was impossible to observe any seepage. However, it is reported that there are a few pressure leaks on the dam face below the spillway crest. The condition of the spillway sill is good with no apparent erosion or spalling of the gunite surface and there was no debris. The gunite surfacing of the upstream and downstream faces and the crest of the dam is in fair condition with only a few cracks. The gunite as well as the underlying concrete is heavily spalled at several locations on the crest, especially adjacent to both sides of the spillway. (See Photograph No. 1b). The gunite on the face of the buttress is spalled, and the gunite concrete at the base of the buttress is eroded exposing the underlying stone masonry. (See Photograph Nos. 10 and 11). The upstream face of the north portion of the dam is in good condition with only a few stones and mortar missing. The downstream face, in the area of the gunite, is in generally good condition with only a few minor cracks. Some minor seepage occurs at these locations evidenced by the presence of lime deposits and algal growth. The stone masonry portion of the dam is in fair condition with no mortar present and a few stones missing. Two leaks are evident; about 8 feet and 5 feet below the crest and 12 feet and 37 feet north of the spillway, respectively. The leak closest to the spillway is flowing at an estimated quantity of 10 gpm and the other about 3 gpm. (See Photograph No. 12). The faster flowing leak is in the same general area as the spring noted in the 1932 drawing which is included in the Appendix. A rock outcrop at the base of the dam below the spillway can be seen and appears to be either moderately jointed or separated along bedding planes which strike about 45° relative to the face of the dam.

2) Canal Dam

The stone masonry and concrete portion of the Canal Dam is in fair condition. The gunite surface on the crest is missing in a few areas and the underlying concrete is heavily spalled in places. The spillway crest

is in good condition. Some minor debris in the form of collected leaves was observed on the spillway crest. The downstream concrete face and gunited surfaces are in good condition with only minor spalling. (See Photograph No. 1a.). A leakage area was observed at the end of the downstream concrete facing wall about 13 feet below the crest and 18 feet east of the spillway. It appears that the leakage is coming from three or four locations and the total quantity of flow is estimated at 10 gpm. The water appears to be clean with no fines. (See Photograph No. 13). This area of leakage has been observed by others for several years and has been described in correspondence and previous inspection reports. Repairs as recently as 1976 had been undertaken to alleviate this problem, with little apparent success.

The earthfill embankment portion of the Canal Dam appears to be in fair condition. The vertical and horizontal alignment appears to be generally good. The crest of the dam exhibits only minimal erosion due to trespassing, however, the grassed surface is uncut and a few saplings were noted. (See Photograph No. 3). The upstream slope appears in generally good condition with no observable erosion, sloughing or trespassing. However, the same condition of vegetal growth exists as noted above for the crest. (See Photograph No. 2). The downstream slope is in poor condition with heavy vegetation including large trees, shrubs, saplings, thick underbrush and fallen trees. In addition, several areas along the top of the slope are steeper than the average and as a result sloughing has taken place. (See Photograph No. 4). Trespassing and runoff has caused erosion at the contact between the masonry portion of the dam and the earthfill. A damp zone was observed in this same location at the toe of the embankment and a seep within the area was observed to have an estimated flow of 3 gpm. Several other zones of dampness were observed along the toe of the embankment, with no measurable flow.

c. Appurtenant Structure

The concrete intake structure appears to be in generally good condition. The trash rack was clean except for a minor collection of leaves. Many of the steel plates which make up the rack have been bent but do not seem to affect the function. (See Photograph No. 5). The operating stand for the low level gate is in good condition, greased and reported operable. A short steel rod was observed above the top of the structure. It appears to be a valve stem, however, its function could not be ascertained. The approach walls to the intake structure are in generally good condition with only a few stones and some mortar pointing missing. The concrete portions of the walls are in good condition. A leak was observed in the stone masonry of the north approach wall about three feet from the top of the wall. The flow was extremely small.

The low level outlet pipe is rusty, but in good condition. The sluice gate also appears to be in good condition, but there is a slight leakage around the seal. The concrete of the headwall and wingwall is in good condition, but the foundation of the wingwall is completely eroded away leaving the wingwall as a cantilever projecting from the headwall. (See Photograph No. 6). The area around the outfall for a distance of about 20 feet is riprapped with large sound stone.

d. Abutments

There are no signs of seepage or other unusual conditions at the abutments.

e. Downstream Channel

The downstream channel is part of Onota Brook. The channel directly below the spillways is a natural brook with some minor debris consisting of trees, tires, remnants of the old stone and concrete gatehouse and gunited stones. The areas adjacent to both sides of the channel are flat, however, the right bank, after a short distance, intersects the downstream toe of the Canal Dam embankment. The left slope is flat. Some trees are adjacent to the brook, but only a few overhang the channel. (See Photograph Nos. 7 and 8). The channel widens in the vicinity of the low level outfall before passing under Valentine Road. The concrete conduit headwalls, the two conduits and the riprap are in good condition. (See Photograph No. 9a). The channel at the terminus of the conduits is clear and the riprapped slopes are in good condition. (See Photograph No. 9b).

f. Reservoir Area

In the vicinity of the dams, there is no evidence of potentially unstable slopes or other unusual conditions which would adversely affect the dams.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the inspection revealed several deficiencies which at present do not adversely affect the adequacy of the dam. However, these deficiencies do require attention and should be corrected before further deterioration leads to a hazardous condition. Recommended measures to improve these conditions are given in Section 7.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

There are no operating procedures for the project.

4.2 MAINTENANCE OF DAM

There is no formal maintenance manual for the project. The last reported maintenance of the dam were the repairs made in 1976.

There is no scheduled program of inspections of the dam by the City of Pittsfield. There is, however, a statewide program of inspection established several years ago by the Department of Environmental Quality Engineering, Division of Waterways, and prior to this program, the County of Berkshire conducted inspections. Copies of several of the latest inspection reports, dated August 22, 1978, September 20, 1976, December 14, 1972, and October 31, 1968, are included in the Appendix.

4.3 MAINTENANCE OF OPERATING FACILITIES

There is no established maintenance program for the operating facilities. Maintenance is carried out as needed.

4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect other than telephone communication between the City Engineers Office and the Office of the Mayor and the City's Civil Defense Organization.

4.5 EVALUATION

The maintenance and operating procedures for the dams and appurtenant structures are considered inadequate. Measures to improve these deficiencies are given in Section 7.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Design data for the Onota Lake Dams are not available.

The drainage area contributing to Onota Lake is about 10.23 square miles, rectangular in shape with a length to width ratio of about 1.6. The average basin length is about 3.25 miles with a mean basin slope of 6.5%. The lake is about 2 miles wide and stretches across the base of the basin, its surface area at El 1079.2 (spillway crest) is 700 acres (1.09 square miles) or 10.7% of the total drainage area. The basin is located on the eastern slopes of the Taconic Range in the Housatonic River basin, and is drained by at least seven brooks entering the lake at five different points. The multiple basins and steep slopes are indicative of a type which produce flash floods with very high peak discharges. Most of the drainage area is covered by forests with about 20% urban development, parks, pastures, etc.

b. Experience Data

It is reported by persons interviewed that to their knowledge since 1938 the major floods have caused little to no damage to the dams. However, extensive damage was sustained by property adjacent to the downstream channel.

c. Visual Inspection

At the time of the inspection, the lake level was about 1.5 inches above the spillway crests. The spillways and training walls are in generally good condition. The downstream channel is a natural brook filled with only minor debris. The low level intake structure and outlet pipe appear to be in generally good condition. For further details see Section 3.1c.

d. Overtopping Potential

The potential for overtopping the dam was investigated on the basis of the adequacy of the spillway and the available surcharge storage to meet a potential emergency inflow. The dam, with a maximum storage capacity of 5130 acre-feet¹/* is classified as intermediate in size. In order to estimate the downstream hazard potential in the event of a dam failure, the U.S. Corps of Engineers' "Rule of Thumb" guidance was used. The estimate assumes (a) the reservoir surface is at the top of the dam at the time of the breach, (b) a breach of 40% of

* See References at the end of this Section.

the dam length occurs (64.0 ft.) and (c) the channel has an average roughness coefficient (n) of 0.07. The estimated flood wave heights are as follows:

Distance below dam (feet)	Peak Elevation	Depth	Discharge (cfs)
400	1072.3	13.3	6877
1500	1061.2	7.2	6804
2300	1054.8	2.8	6714
3800	1023.8	4.8	6674

The visual inspection corroborates the information shown on USGS Quadrangle Sheet for Pittsfield West-Mass, which indicates about seven houses and an industrial complex (Old Mill) at or about El. 1070, would be damaged or destroyed by the estimated flood wave. The dam is therefore classified as a high hazard dam.

Based on the size and potential hazard classification the Probable Maximum Flood was selected as the Test Flood^{2/}. A triangular unit hydrograph^{3/} was developed to represent unit runoff from the land area and subsequently used to compute the Probable Maximum flood. The runoff resulting from the excess rainfall on the water area and the adjacent (unchannelized) land area was added to the computed flood hydrograph to form the Test Flood with an inflow peak of 15,500 cfs.

The computed discharge capacity of the Main Dam spillway, with the water level at the top of the training walls, is 421 cfs. The Canal Dam spillway was not included in this analysis as the discharge capacity of the interconnecting conduit is negligible in relation to the flood discharges, and was assumed inoperable. It was also assumed that the water surface was at the spillway crest (El. 1079.2) at the start of the flood.

5.2 EVALUATION OF THE ANALYSIS

The Test Flood, was routed through the lake, using a computer routing technique, and resulted in the dam being overtopped by a maximum of 5.4 feet. The peak outflow discharge is 7388 cfs. The spillway capacity is only 6% of the Test Flood outflow and is considered seriously inadequate from a hydrologic and hydraulic viewpoint.

References

- 1/ National Program of Inspection of Dams, Volume
U. S. Corps of Engineers
- 2/ Recommend Guidelines for Safety Inspection of Dams, Appendix D,
U. S. Corps of Engineers
- 3/ Flood-Hydrograph Analyses and Computation, EM 1110-2-1405, U.S.
Corps of Engineers, August 1959

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations did not indicate any serious structural problems with respect to the dam. The observed deficiencies described in Section 3 require attention; measures to correct these deficiencies are given in Section 7.

b. Design and Construction Data

No design computations or other data pertaining to the structural stability of the dam have been located. On the basis of the structures, the visual inspection, as well as engineering judgment, the dam appears to be structurally adequate at the present time.

c. Operating Records

There are no operating records. There are no records or reports of any operational problems which would affect the stability of the dam.

d. Post-Construction Changes

It is reported that the dam was built about 1864. There are no records of any modifications to the dam until 1932. In that year, according to an available drawing, a concrete wall facing was added to the downstream face of the Main Dam. It is reported that in 1969 the surfaces of both dams were gunited to prevent leakage which had been observed through the spillways. In 1976 additional repairs were carried out to alleviate leaks which had been observed at the base of the Canal Dam. A concrete wall was constructed on the upstream face of the dam, keyed into the rock foundation. In addition, impervious material was placed over the concrete.

e. Seismic Stability

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

SECTION 7 - ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition

Phase I investigation of Onota Lake Dam does not indicate conditions which would constitute an immediate hazard to human life or property. Based on engineering judgment and the performance of the dams and the outlet works, the project appears to be in fair condition. The project, however, does have inadequacies and deficiencies which, if not remedied, have the potential for developing into hazardous conditions.

Since the dam is classified as intermediate in size, with a high hazard potential, the test flood, in accordance with Corps of Engineers guidelines, is the Probable Maximum Flood. A triangular unit hydrograph was developed to represent unit runoff from the land area and subsequently used to compute the Probable Maximum flood. The runoff resulting from the excess rainfall on the water area and the adjacent (unchannelized) land area was added to the computed flood hydrograph to form the Test Flood with an inflow peak of 15,500 cfs.

The computed discharge capacity of the Main Dam spillway, with the water level at the top of the training walls, is 421 cfs. The Canal Dam spillway was not included in this analysis as the discharge capacity of the interconnecting conduit is negligible in relation to the flood discharges, and was assumed inoperable. It was also assumed that the water surface was at the spillway crest (El. 1079.2) at the start of the flood.

The Test Flood was routed through the lake, using a computer routing technique and resulted in the dam being overtopped by a maximum of 5.4 feet. The peak outflow discharge is 7388 cfs. The spillway capacity is only 6% of the Test Flood outflow and is considered seriously inadequate from a hydrologic and hydraulic viewpoint.

b. Adequacy of Information

The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of these dams could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Urgency

The recommendations and remedial measures described in subsequent paragraphs should be undertaken by the owner within 12 and 24 months respectively, after receipt of this Phase I Inspection Report.

d. Need for Additional Investigations

Additional investigations to assess the adequacy of the dam and appurtenant structures do appear necessary and are enumerated in the following paragraph.

7.2 RECOMMENDATIONS

It is recommended that the owner within 12 months after receipt of this Phase I Inspection Report retain a competent consulting engineer who should;

a) conduct further detailed hydraulic and hydrologic studies to determine what measures are necessary to improve discharge capacities.

b) conduct detailed studies to determine the causes of the seepage observed along the toe of the embankment and to recommend measures to eliminate these conditions.

7.3 REMEDIAL MEASURES

a. Alternatives

The results of the additional investigations recommended above may indicate alternatives which will be needed to provide discharge adequacy under flood conditions and to eliminate the leakage and seepage conditions. These alternatives can only be determined after completion and evaluation of the additional investigations.

b. Operating and Maintenance Procedures

It is recommended that the following measures be undertaken by the owner within 24 months after receipt of this Phase I Inspection Report.

1. Establish a formal program of operation and maintenance to include periodic inspections on a biennial basis.
2. Provide round-the-clock surveillance during periods of unusually heavy precipitation.

3. Develop a formal warning system with local officials for alerting downstream residents in case of emergency.
4. Replace missing stones and repoint all joints in the masonry portion of the dams.
5. Repair all gunited and concrete surfaces.
6. Keep vegetation in a close cut condition on the crest and slopes of the earthfill portion of the Canal Dam and the area adjacent to the downstream toe.
7. Refill and compact with a suitable material and reseed the areas of erosion and sloughing on the earthfill portion of the Canal Dam.
8. Remove and haul away debris from the downstream channel.
9. Rebuild the foundation of the low level outlet pipe wing wall.
10. Determine the function of what seems to be a second valve stem on the low level intake structure.
11. All brush, shrubs and young saplings should be removed from all locations on the Canal Dam embankment, and the area adjacent to the downstream toe. Large conifers, but no deciduous hardwoods, should be removed. The remaining trees should be inventoried and their condition monitored. If a tree dies, the area around the tree should be closely monitored for seepage.
12. Inspect dams for leakage when the lake level is low.
13. Establish a systematic program of observation and monitoring of the leakage and seepage occurring at both masonry dams.

VISUAL INSPECTION CHECKLIST

APPENDIX A

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT ONOTA LAKE DAM

DATE 10-25 78

TIME 11.00 AM

WEATHER Sunny, 60°-70° F.

W.S. ELEV. _____ U.S.

PARTY:

- | | |
|------------------------------|-----------|
| 1. <u>Harvey S. Feldman</u> | 6. _____ |
| 2. <u>Jyotindra H. Patel</u> | 7. _____ |
| 3. _____ | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>All project features inspected by party members</u>		
2. _____		
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECK LIST

PROJECT ONOTA LAKE DAM DATE 10-25-78

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

DAM ~~XXXXXXXXXX~~ MAIN DAM - STONE MASONRY, CONCRETE & GUNITE.

Crest Elevation _____

Current Pool Elevation _____

Maximum Impoundment to Date _____

Surface Cracks _____

Pavement Condition No pavement

Movement or Settlement of Crest None observed

Lateral Movement None observed

Vertical Alignment good

Horizontal Alignment good

Condition at Abutment and at Concrete Structures At abutment generally good

Indications of Movement of Structural Items on Slopes _____

Trespassing on Slopes Downstream slope almost vertical -- no trespassing

Sloughing or Erosion of ~~Slopes~~ Abutments None at abutments

Rock Slope Protection - Riprap Failures _____

Unusual Movement or Cracking at or near Toes _____

Unusual ~~Abutment~~ Downstream Seepage Reported few minor leaks on the dam face; minor seepage at north concrete-grout joint of dam; and two leaks in the stone masonry section of dam. (see misc. comments)

Piping or Boils None

Foundation Drainage Features None

Toe Drains None

Instrumentation System None

Miscellaneous. 1) Two leaks at the North portion of the dam (Stone Masonry) are located about 8 feet and 5 feet below the crest and 12 feet and 37 feet north of the spillway, respectively. The leak closest to the spillway is flowing about 10 gpm and the other about 3 gpm.

2) The grout surfacing of the upstream and downstream faces and the crest of the dam is in fair condition with few cracks. The grout and the underlying concrete is heavily spalled at several locations on the crest especially adjacent to both sides of the spillway.

3) The grout on the face of the buttress is spalled and the grout and concrete at the base of the buttress is eroded exposing the underlying stone masonry.

PERIODIC INSPECTION CHECK LIST

PROJECT ONOTA LAKE DAM DATE 10-25-78
PROJECT FEATURE _____ NAME _____
DISCIPLINE _____ NAME _____

OUTLET WORKS - SPILLWAY WEIR, APPROACH MAIN DAM
AND DISCHARGE CHANNELS

- a. Approach Channel is Onota lake
General Condition Generally good
Loose Rock Overhanging Channel None
Trees Overhanging Channel None
Floor of Approach Channel unable to observe because
reservoir was full
- b. Weir and Training Walls
General Condition of Concrete, Stone Masonry and Granite
Rust or Staining None
Spalling Concrete and granite on crest is heavily chipped
Any Visible Reinforcing None
Any Seepage or Efflorescence Pressure leaks on the spillway
Weir, below the spillway crest
Drain Holes None
- c. Discharge Channel is Onota Brook
General Condition Generally in good condition
Loose Rock Overhanging Channel None
Trees Overhanging Channel Few trees overhang
the channel

Floor of Channel is natural bed.

Other Obstructions minor debris consisting of
trees, tires, remnants of the old stone and
concrete gatehouse and gunited stones. Channel
passes under the roadway through 30" and
60" RCC tubes, then in a riprapped channel
and then into a 84" ϕ steel pipe which is
underground.

PERIODIC INSPECTION CHECK LIST

PROJECT ONOTA LAKE DAM DATE 10-25-78

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

DAM EMBANKMENT - CANAL DAM

Crest Elevation _____

Current Pool Elevation _____

Maximum Impoundment to Date _____

Surface Cracks None observed

Pavement Condition No pavement; Crest exhibits minimal erosion due to trespassing and grass surfaces uncut and a few saplings are growing

Movement or Settlement of Crest None observed

Lateral Movement Generally good

Vertical Alignment Generally good

Horizontal Alignment Generally good

Condition at Abutment and at Concrete Structures Generally good at abutment and at concrete structures

Indications of Movement of Structural Items on Slopes None

Trespassing on Slopes None at upstream slope; downstream slope at contact between the masonry and earthfill, there is sign of trespassing.

Sloughing or Erosion of Slopes or Abutments None at upstream slope; downstream slope at contact between the masonry and earthfill, there is sign of erosion. (see misc. comments)

Rock Slope Protection - Riprap Failures None at upstream slope. see downstream slope.

Unusual Movement or Cracking at or near Toes None

Unusual Embankment or Downstream Seepage At contact between earthfill and masonry dam, a damp zone was observed and a seep within the zone was observed to have low estimated flow of 3 gpm. Several other zones of dampness were observed along the toe of the embankment with no measurable flow.

Piping or Boils None observed

Foundation Drainage Features None

Toe Drains None

Instrumentation System None

Miscellaneous: 1. The downstream slope is in poor condition with heavy vegetation including large trees, shrubs, saplings, thick underbrush and fallen trees.

2. Several areas along the top of the slope are steeper than the average and as a result sloughing has taken place.

3. Upstream slope grassed surface is eroded and a few saplings are growing.

PERIODIC INSPECTION CHECK LIST

PROJECT ONOTA LAKE DAM DATE 10-25-78
 PROJECT FEATURE _____ NAME _____
 DISCIPLINE _____ NAME _____

OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE

Concrete intake structure is located at south end of the embankment intake channel in the canal pond.

a. Approach Channel

~~Structure~~ ^{Framing walls} Conditions Generally good except a few stones and some pointing missing. (See Misc. comments)
 Bottom Conditions Canal pond full therefore unable to determine the condition
 Rock Slides or Falls None
 Log Boom None
 Debris Minor debris with minor collection of leaves
 Condition of Concrete Lining No concrete lining See Misc. comments.
 Drains or Weep Holes None

b. Intake Structure

Condition of Concrete generally good
 Stop Logs and Slots No stop logs and slots. The trash rack in fair condition. (See Misc. comments)

Miscellaneous: A leak observed in the stone masonry of the north abutment wall about three feet from top of wall. The flow was unmeasurable. Many of the steel piles of trash rack have been bent.

PERIODIC INSPECTION CHECK LIST

PROJECT ONOTA LAKE DAM DATE 11-25-78

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

OUTLET WORKS - CONTROL TOWER

operating stand is located on the top of intake structure. The stand is not protected and easily accessible.

a. Concrete and Structural

General Condition _____

Condition of Joints _____

Spalling _____

Visible Reinforcing _____

Rusting or Staining of Concrete _____

Any Seepage or Efflorescence _____

Joint Alignment _____

Unusual Seepage or Leaks in Gate Chamber _____

Cracks _____

Rusting or Corrosion of Steel _____

b. Mechanical and Electrical

Air Vents _____

Float Wells _____

Crane Hoist _____

Elevator _____

Hydraulic System None

Service Gates 15 Sluice gate which is operated manually and reported in good condition.

Emergency Gates None

Lightning Protection System None

Emergency Power System None

Wiring and Lighting System None

Miscellaneous 1. The operating stand for the low level gate is in good condition and reported operable.

2. A short steel rod was observed above the top of the structure. It appears to be a valve stem, however, its function could not be ascertained.

3. There is slight leakage around the seal of the sluice gate.

PERIODIC INSPECTION CHECK LIST

PROJECT ONOTA LAKE DAM DATE 10-25-78
PROJECT FEATURE _____ NAME _____
DISCIPLINE _____ NAME _____

OUTLET WORKS - TRANSITION AND CONDUIT 5 feet dia steel pipe

General Condition of ~~Concrete~~ Steel pipe is in good condition
except it is rusty.

Rust or Staining of Concrete See comments above

Spalling Not Applicable

Erosion or Cavitation None observed

Cracking None

Alignment of Monoliths good

Alignment of Joints good

Numbering of Monoliths None

Miscellaneous

At the outlet, the concrete headwall and wingwall are in good condition. The foundation of the wingwall is completely eroded away leaving the wingwall as a cantilever of the headwall.

Riprap at the area around the outfall is in good condition.

PERIODIC INSPECTION CHECK LIST

PROJECT ONOTA LAKE DAM DATE 10-25-78

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL No outlet structure; and outlet channel is Onota Brook

General Condition of Concrete _____

Rust or Staining _____

Spalling _____

Erosion or Cavitation _____

Visible Reinforcing _____

Any Seepage or Efflorescence _____

Condition at Joints _____

Drain Holes _____

Channel is Onota Brook

Loose Rock or Trees Overhanging Channel None

Condition of Discharge Channel generally good

See Misc. Comments OUTLET WORKS - TRANSITION AND CONDUIT

PERIODIC INSPECTION CHECK LIST

PROJECT ONOTA LAKE DAM DATE 10-25-78
 PROJECT FEATURE _____ NAME _____
 DISCIPLINE _____ NAME _____

OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS CANAL DAM STONE MASONRY SPILLWAY

a. Approach Channel is Canal
 General Condition is generally good
 Loose Rock Overhanging Channel None
 Trees Overhanging Channel None
 Floor of Approach Channel Unable to observe because Canal was full.

b. Weir and Training Walls
 General Condition of Concrete stone masonry and Gunitite. Fair condition. (See misc. comments)
 Rust or Staining None
 Spalling Gunitite surface on the crest is missing in a few areas and the underlying concrete is heavily spalled in places. (See misc. comments)
 Any Visible Reinforcing None
 Any Seepage or Efflorescence None from this dam. Weir surface
 Drain Holes None

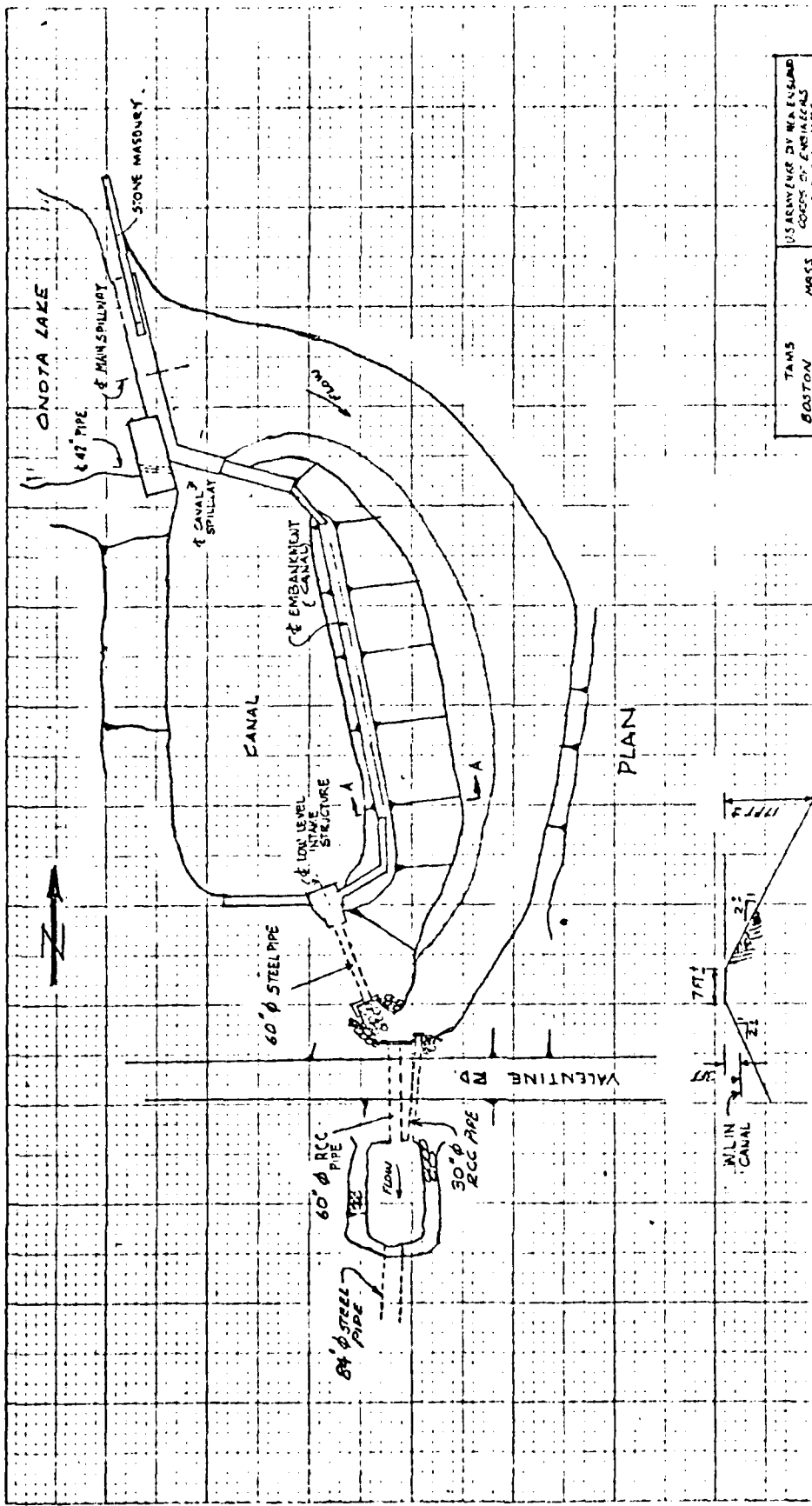
c. Discharge Channel is Onota Brook
 General Condition Generally in good condition
 Loose Rock Overhanging Channel None
 Trees Overhanging Channel Few trees overhang the channel.

Floor of Channel is natural bed.

Other Obstructions Minus debris consisting of trees,
trees, remnants of the old stone and concrete
gatehouse and gunited stones Channel
passes under the roadway through
30" and 60" R.C.C pipes, then in a
re-rapped channel and then into 84" ϕ Steel
pipe which is underground.

DRAWINGS AND INSPECTION REPORTS

APPENDIX B



TAMS
 BOSTON MASS
 U.S. ARMY ENGINEER REGIMENT
 CORPS OF ENGINEERS
 DISTRICT NO. 1
 NATIONAL PROGRAM OF INSPECTION OF LOW-LEVEL DAMS
ONOTA LAKE DAM
 PLAN AND SECTION
 HOUSATONIC RIVER BASIN MASS
 SCALE NTS
 DATE NOV 1975

SECTION A-A
EARTH EMBANKMENT
(CANAL)

NOTE: DRAWING BASED ON
 ROUGH MEASUREMENTS
 MADE DURING VISUAL INSPECTION



The Commonwealth of Massachusetts

Executive Office of Transportation and Construction

Department of Public Works

DISTRICT #1 OFFICE
VETERAN'S MEMORIAL HIGHWAY, LENOX
P. O. BOX 1151, PITTSFIELD 01201

September 22, 1978

SUBJECT WATERWAYS - District One
Onota Lake Dam 1-2-236-6
Cheshire Reservoir Dam 1-2-58-2

Mr. Harvey Feldman
Tibbit, Abbott, McCarthy, Stratton
345 Park Avenue
New York City 10022

Dear Sir

We have enclosed a copy of the latest District One Inspection Report for the subject dams.

Although the report for Cheshire Reservoir shows the structure to be in satisfactory condition, a problem developed in March 1978 and at the request of the Civil Defense Agency this office conducted a visual inspection on March 27, 1978. Several pressure leaks were noted in the face of the dam and the left abutment. We recommended the immediate lowering of the pond and advised the owners to retain the services of an engineering consultant to conduct an indepth investigation. The firm of Robert G. Brown & Associates was awarded a contract to perform this work.

Mr. Brown has not completed his study, but he has a considerable amount of information relative to the structure.

Mr. Brown can be reached at the following address should you desire to contact him: Robert G. Brown & Associates, Berkshire Common, South Street, Pittsfield, MA 01201, telephone: (413) 499-1560.

If we can be of any further assistance, please contact this office.

Very truly yours

Dean P. Amidon, P. E.
District Highway Engineer

RDJdic
Enclosures
cc SurLen

L-168

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town PITTSFIELD Dam No. 1-2-236-6

Name of Dam Onota Lake Inspected by RDJordan - Rspaniol

Date of Inspection 8-22-78

Previous Inspection 9-20-76

2. Owner/s per: Assessors _____
Reg. of Deeds _____ Personal Contact _____

1. City of Pittsfield Pittsfield, MA
Name _____ St. & No. _____ City/Town/State _____ Tel. No. _____

2. _____
Name _____ St. & No. _____ City/Town/State _____ Tel. No. _____

3. Caretaker (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

_____ Name _____ St. & No. _____ City/Town/State _____ Tel. No. _____

4. No. of Pictures taken 1

5. Degree of Hazard: (If dam should fail completely)*

1. Minor _____ 2. Moderate X

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual X

Operative X Yes _____ No _____

Comments: _____

7. Upstream Face of Dam:

Condition: 1. Good X 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

L-168-A

DAM NO. 1-2-236-6

8. Downstream Face of Dam:

Condition: 1. Good 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

9. Emergency Spillway

Condition: 1. Good _____ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

10. Water level at time of inspection 0.1' above _____ below

top of dam _____

principal spillway

other _____

11. Summary of Deficiencies Noted:

Growth (Trees & Brush) on Embankment _____

_____ Animal Burrows and Washouts _____

_____ Damage to slopes or top of dam _____

_____ Cracked or damaged masonry _____

Evidence of seepage _____

_____ Evidence of piping _____

_____ Erosion _____

Leaks _____

_____ Trash and/or debris impeding flow _____

_____ Clogged or blocked spillway _____

_____ Other _____

L-168B

DAM NO. 1-2-236-6

- 3 -

12. Remarks & Recommendations; (Fully Explain)

This is the first regular inspection since the City completed repairs in 1976. Although much work was done on this canal dam, the leaking persists. It is of little concern as the structure is built on ledge and there is no danger of failure.

The top of the canal embankment and upstream face has been cleared of brush and trees, and has been substantially reinforced with earth. There is approximately 3' of free board.

The draw down mechanism is in good shape but the erosion at the wing wall of the drawdown outlet has not been repaired.

Some brush and trees are on the downstream face of the canal dike. The brush should be removed to provide easier access for inspection.

Except for these minor deficiencies noted, the structure appears to be safe.

For location see Topo Sheet 2-B.

13. Overall Condition:

1. Safe _____
2. Minor repairs needed _____
- _____ 3. Conditionally safe - major repairs needed _____
- _____ 4. Unsafe _____
- _____ 5. Reservoir impoundment no longer exists (explain)
- Recommend removal from inspection list _____



13
DEPARTMENT OF
ENVIRONMENTAL QUALITY ENGINEERING
DIVISION OF WATERWAYS

RECEIVED APR 25 1977

Referred to: FHM

DEPARTMENT OF PUBLIC WORKS
CITY OF PITTSFIELD
MASSACHUSETTS
01201

April 20, 1977

GERALD S. DOYLE
COMMISSIONER

John H. Hannon, P.E.
Chief Engineer
Division of Waterways
100 Nashua Street
Boston, Ma.

Dear Mr. Hannon:

This letter is to serve two purposes. One, to inform you that the work requested on the Onota Lake Dam (Inspection #1-2-236-6) in your letter of October 15, 1976, has been completed. You will in the very near future, receive a letter with photos, showing and explaining the work that has been done.

The second reason for this letter is about the serious flooding the City experienced in March, in most cases along the west branch of the Housatonic River, which originates at the Onota and Pontoosuc Lake Dams. The inspection held after the flooding, shows conditions that still exist here and were noted to require immediate repair by your Division.

There is serious eroding of the slope all along the west branch, from Pontoosuc Lake Dam into Wahconah Park. The most serious were at 1347 North Street and 1229 North Street.

At 1347 North Street, a stone retaining wall has been carried down river, and the banks to the rear of the homes, eroded to a point where high water could possibly start to endanger the structures.

The other is at 1229 North Street (A & W Root Beer) where high water caused erosion under the banks, causing a cave-in in the blacktop parking lot, used by A & W, and if this were to happen again, it would not only endanger the structure there, but also the homes just southerly. There is also erosion from the Onota Lake Dam, along the five properties just before where the river crosses under Valentine Road.

We would expect that your division would investigate these conditions, and make whatever repairs you would think necessary. Any loss of property down stream, I would expect would make the Commonwealth liable.

1-2-236-C



DEPARTMENT OF PUBLIC WORKS
CITY OF PITTSFIELD

MASSACHUSETTS DEPARTMENT OF
ENVIRONMENTAL QUALITY ENGINEERING
DIVISION OF WATERWAYS

GERALD S. DOYLE
COMMISSIONER

May 12, 1977

RECEIVED MAY 16 1977

Referred to _____
Report No. _____
File _____

EHM/AM

Commissioner David Stanley
Department of Environmental Quality Engineering
Division of Waterways
100 Nashua Street
Boston, MA 02114

Attn: John J. Hannon P.E.

Dear Sir:

Work has been completed on the Onota Lake Dam, or we would much prefer to say, the wall of the old holding pond for the former Berkshire Mill which runs parallel to the bank. When inspected by Mr. Jordan, seepage was noticed at the bottom of the concrete wall. The area was cleaned to the ledge on which that wall is set. The enclosed pictures will confirm this.

Another wall was poured and keyed into the ledge at the bottom of the existing wall. This area was then built up approximately five feet and rip-rap was placed along the bank which is now under water, and the earth side was cleared, raised and seeded.

When the gates were closed, and the water was allowed into the holding pond, the same leak occurred in the same place. As was our original contention, this leakage is in the ledge, following a seam. The two wet spots noticed on the bottom of the earth embankment remain wet when the pond is dry. As this is a swampy area, and some years ago, the natural bed of the river, it would be safe to assume that the wet spots appearing there are from ground water some 15 feet away from the present location of the river. Mr. Jordan and Mr. Amidon were made aware of this condition, and both have viewed the same during repair.

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town PITTSFIELD Dam No. 1-2-236-6
 Name of Dam Onota Lake Inspected by: RD Jordan
 Date of Inspection 9-20-76

2. Owner/s: per: Assessors _____ Prev. Inspection X
 Reg. of Deeds _____ Pers. Contact _____

1. City of Pittsfield - Pittsfield 499-1100
 Name St. & No. City/Town State Tel. No.

2. _____
 Name St. & No. City/Town State Tel. No.

3. _____
 Name St. & No. City/Town State Tel. No.

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

_____ Name St. & No. City/Town State Tel. No.

4. No. of Pictures taken 8

5. Degree of Hazard: [if dam should fail completely]*

1. Minor _____ 2. Moderate X

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes [future development]

6. Outlet Control: Automatic _____ Manual X
 Operative X yes: _____ no.

Comments: _____

upstream face of Dam: Condition:

1. Good _____ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: See report.

Downstream Face of Dam: Condition: 1. Good _____ 2. Minor Repairs _____
3. Major Repairs x 4. Urgent Repairs _____

Comments: _____

9. Emergency Spillway: Condition: 1. Good _____ 2. Minor Repairs x _____
3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

10. Water level @ time of inspection: 0.3' ft. above x below _____
top of dam _____
principal spillway x _____
other _____

11. Summary of Deficiencies Noted:

- Growth [Trees and Brush] on Embankment x _____
- Animal Burrows and Washouts _____
- Damage to slopes or top of dam _____ x _____
- Cracked or Damaged Masonry _____ x _____
- Evidence of Seepage _____ x _____
- Evidence of Piping _____
- Erosion _____ x _____
- Leaks _____ x _____
- Trash and/or debris impeding flow _____
- Clogged or blocked spillway _____
- Other _____

12. Remarks & Recommendations: [Fully Explain] PREVIOUS INSPECTION DATE: February 28, 1974

No repairs have been made since 1974. The earth embankment has little freeboard and is eroding in several areas along the upstream face. The top and slopes are covered with many trees and heavy brush. Much seepage is visible along the toe of the embankment.

The concrete headwall at the outlet end of the drawdown pipe is in danger of failing due to severe erosion at the wing section. Unless repairs are made in the near future, the wing and possibly the headwall will be destroyed.

No change was noted in the leak located 35' north of the pond spillway.

The leak easterly of the canal spillway appears to have increased in volume, water is bubbling out at the base of the wall at an estimated rate of 5 gal. per minute. It was noted that some fines were being displaced by this flow,

This leak was not reported in the counties 1968 report, nor was it mentioned in the repair contract of 1970. The County Engineer cannot recall a leak existing in this location.

Construction plans of the pond dam show it to be built on ledge. No plans were available of the canal spillway and wall, but I assume it is also built on ledge.

Failure of the structure could cause heavy damage to downstream areas. Also, the Berkshires would lose a very popular and beautiful recreational area.

It is the opinion of this office that the owners (City of Pittsfield) should be directed to retain the services of a consultant engineering firm to conduct an in-depth investigation of the structure to determine the extent of repairs.

For location see Topo 2-B.

13. Overall Condition:

1. Safe _____
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed X
4. Unsafe _____
5. Reservoir impoundment no longer exists [explain]
 Recommend removal from inspection list _____

12. Remarks & Recommendations: [Fully Explain] SUPPLEMENTARY REPORT Onota Lake Dam

Monday, November 29, 1976. City crews have begun repairs. The channel was completely drained and the gate from the pond to the channel was temporarily blocked with steel plates. The material adjacent to the channel side of the wall was excavated to bed rock. The wall was found to be constructed of stone blocks with mortared joints. The leak, previously reported, was found to flow between the ledge and stone wall. The City has excavated a section approximately 20' along the wall down to the ledge. A concrete wall will be poured against the wall to seal the leak. In addition, impervious material will be placed over the new concrete and excess material will be utilized to repair eroded areas in the earth dike.

All brush and trees have been removed from the upstream face and top of the dike. The upstream face of the drawdown structure has been mortared. Some clearing has been done on the downstream slopes.

December 6, 1976: Inspected site with Mr. A. McCallum of DEQE. Repairs, although not complete, have progressed satisfactorily. Inspection of completed job will be conducted at a later date.

13.

Overall Condition:

1. Safe _____
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed _____
4. Unsafe _____
5. Reservoir impoundment no longer exists [explain]
Recommend removal from inspection list _____

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

October 15, 1976

G. S. Doyle, Commissioner
Pittsfield Public Works
City Hall
Pittsfield, Massachusetts

RE: Inspection Dam #1-2-236-6
Onota Lake Dam
Pittsfield

Dear Mr. Doyle:

On September 20, 1976, an engineer from the Massachusetts Department of Public Works inspected the above dam owned by the City of Pittsfield.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws as amended by Chapter 706 of the Acts of 1975 (Dams Safety Act).

The results of the inspection indicate that the dam is conditionally safe but that major repairs are needed. There has been no attention to previously noted deficiencies.

During the September inspection, the following conditions were noted and require immediate repair:

1. Earth embankment has little freeboard and is eroding in several areas along the upstream face.
2. Remove the growth of brush and small trees from the embankment of the dam and establish a good growth of turf.
3. Investigate and correct the seepage visible along the toe of the embankment.
4. Repair the concrete headwall at the outlet end of the drawdown pipe. This is in immediate danger of failing due to the severe erosion at the wing section.

Dam #1-2-236-6
Onota Lake Dam, Pittsfield

-2-

October 15, 1976

5. No change from the last inspection (letter March 14, 1974) was noted in the leak located 35' north of the pond spillway. This should be corrected.
6. The large leak in the canal spillway reported to you on March 14, 1974, has increased in volume and is bubbling out at the base of the wall at an estimated rate of 5 gallons per minute. Additionally, some fines were being displaced by the flow. Investigation and corrective action should be taken immediately.


Unless the City takes action to correct the above deficiencies within a reasonable time and with the guidance of a Registered Professional Civil Engineer having experience in dam design and construction, I will have no recourse but to order Lake Onota drawn down until the necessary repairs are made.

The failure of this dam would cause heavy damage to downstream areas for which the City would be liable and a very popular and beautiful recreational resource would be lost.

Please indicate by November 15, 1976, in a letter to this office, which Consulting Engineering firm has been selected by the City to recommend and oversee the corrective actions needed to make this dam safe.

Additionally, please indicate the above referenced dam number on all correspondence.

Very truly yours,


John J. Hannon, P.E.
Chief Engineer

EHM

EHM:alb
cc:Dean Amidon
Robert Jordan
Hon. Evan S. Dobbelle, Mayor

COUNTY OF BERKSHIRE, MASS.

INSPECTION OF DAMS

1-2-236-6

City or Town of Pittsfield Date October 31, 1968

Name of Dam Onota Lake Inspector William A. Heaphy

Owner Berkshire Woolen Address 343 Peck's Road Tel. 3-6495

Caretaker William Doyle Address 53 Brombach Street Tel. 2-8251

Location Onota Lake at Peck's Road and Lakeway Drive

Type and Dimensions Stone masonry-- 160' long

Spillway, type and size Stone masonry--40' long, 15' high, 8' wide- 2'6" freeboard

Outlets, type and size Gate open to canal-- Gate to mill closed

Flashboards, type and height None

Date Built 1864 Condition Fair to Good

When last repaired 1959 By whose orders Owners

Nature of Repairs Guniting on upstream face - masonry repointed

Purpose of Dam Originally manufacturing

Approximate storage of water about 1,200,000 cu. ft.

Approximate area of water shed -----

Possible damage due to failure of dam To houses and highway below.

Remarks Water 28" below spillway level. Gatehouse removed. Concrete deteriorating at spillway and sidewalls of canal. Leaks observed through spillway

Recommendations Concrete should be repaired and leaks sealed before they become worse.

1-169

DESCRIPTION OF DAM

DISTRICT ONE

Submitted by R D Jordan

Dam No. 1-2-236-6

Date December 14, 1972

City/Town Pittsfield

Name of Dam Onota Lake

1. Location: Topo Sheet No. 2-B

Provide 8-1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year built: 1864 Year/s of subsequent repairs 1970

3. Purpose of Dam: Water Supply _____ Recreational X
Irrigation _____ Other _____

4. Drainage Area: _____ sq. mi. _____ acres.

5. Normal Ponding Area: 650 Acres; Avg. Depth _____
Impoundment: 125' gals; _____ acre ft.

6. No. and type of dwellings located adjacent to pond or reservoir _____
i.e. summer homes etc. _____

7. Dimensions of Dam: Length 125' Max. Height 15.5'
Slopes: Upstream Face stone masonry
Downstream Face conc. masonry
Width across top 6'

8. Classification of Dam by Material:
Earth X Conc. Masonry X Stone Masonry X
Timber _____ Rockfill _____ Other _____

9. A. Description of present land usage downstream of dam: _____
General; 100% urban.

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure
Yes _____ No X

L-169 A

DAM NO. 1-2-236-6.

10. Risk to life and property in event of complete failure.

Damage could occur to mills and buildings on Peck's Road and Wahconah Street.

No. of people _____.

No. of homes _____.

No. of Businesses _____.

No. of Industries _____.

Type _____.

No. of Utilities _____.

Type _____.

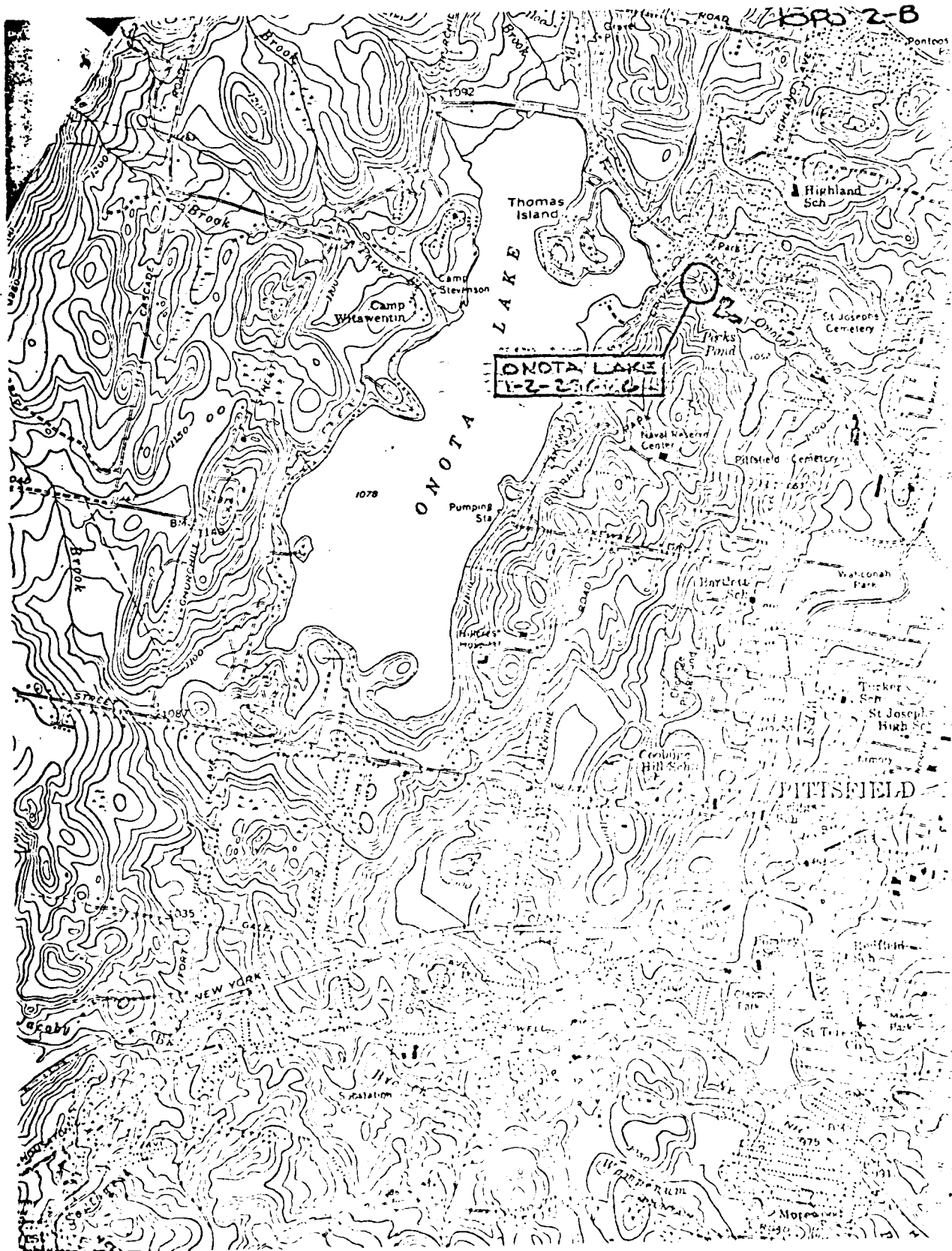
Railroads _____.

Other dams _____.

Other _____.

11.

Attach sketch of dam to this form showing section and plan on 8-1/2" x 11" sheet.



HARRY W. HEAPHY

CIVIL AND CONSTRUCTION
ENGINEER

LEE, MASSACHUSETTS

October 10. 1932

Berkshire Woolen Co.
Pittsfield, Mass.

Gentlemen:-

I am enclosing herewith plan showing changes and repairs made to the dam owned by your company at Unota Lake in Pittsfield, Mass.

You will note by the plan that some alterations were made differing from the recommendations made in the letter to you of Aug. 25

The concrete facing wall on the dam was made 3 feet in thickness at the bottom and 2 feet in thickness at the top, and also was reinforced with $\frac{1}{2}$ " bars placed 12" on centers both ways.

It was also found that the concrete around the bottom portion of the buttress at the dam was none too good. This poor concrete was removed and replaced with a new concrete wall on three sides of the buttress, this wall being 3 feet thick at the bottom and about 16" thick at the top, being reinforced with $\frac{3}{4}$ " and $\frac{5}{8}$ " rods placed approximately 24" on centers both ways.

At the end of each day's pouring of concrete on the facing wall of the dam, steel plates 12" wide were imbedded 6" in the wall the remaining 6" above the wall to bond into the next pouring and so prevent leakage through a horizontal joint at the end of a day's run.

The bleeder or drainage pipe to take care of seepage worked quite well and the completed wall shows only one damp spot where water apparently seeped thru, which I consider very good when we take into

HARRY W. HEAPHY

CIVIL AND CONSTRUCTION
ENGINEER

LEE, MASSACHUSETTS

account the amount of seepage and the very poor condition of the old concrete which we had to contend with.

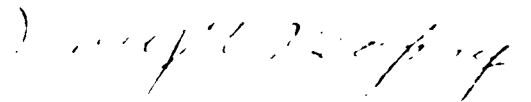
There is a spring or a leak thru the seamy ledge on the right hand side of the new facing wall. This is very small and should never give any trouble.

The leak under the head wall of the canal is quite large and requires repairing and attention. The only way this can be stopped is to drain the canal and dig down on the inner face of the headwall and make repairs either by pointing up the masonry or by a facing wall of concrete.

I wish to express my appreciation of the cooperation given me by Mr. Harry Hill in carrying out my suggestions and in endeavoring to obtain a good job.

I shall be pleased to be of service to you at any time.

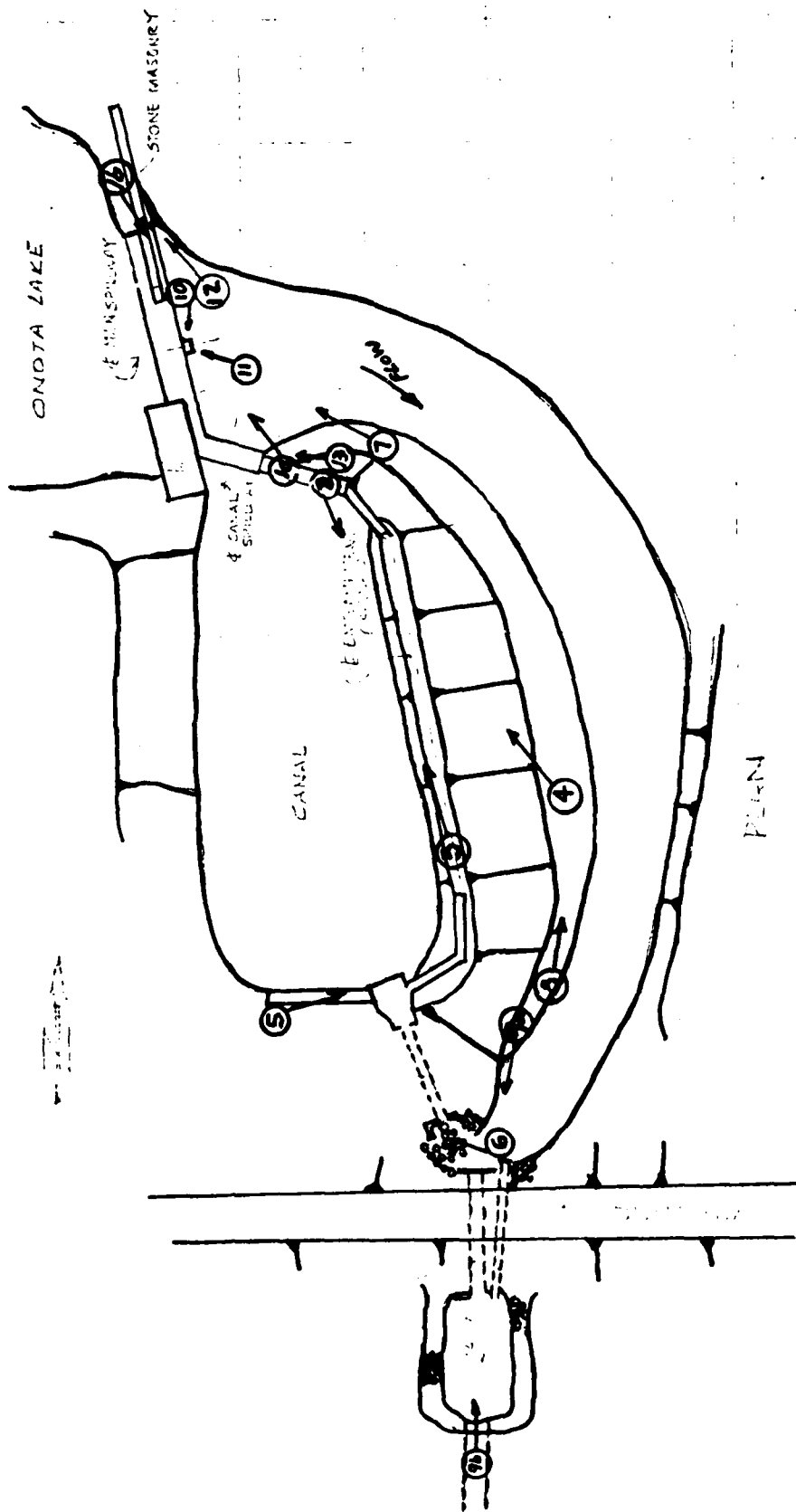
very truly yours,



Copy to County Commissioners

PHOTOGRAPHS

APPENDIX C



TITLE	ONOTA LAKE DAM
DATE	NOV 1915
BY	U.S. GEOLOGICAL SURVEY
FOR	U.S. GEOLOGICAL SURVEY
PROJECT	PHOTOGRAPH LOCATION PLAN
SCALE	AS SHOWN
DATE	NOV 1915



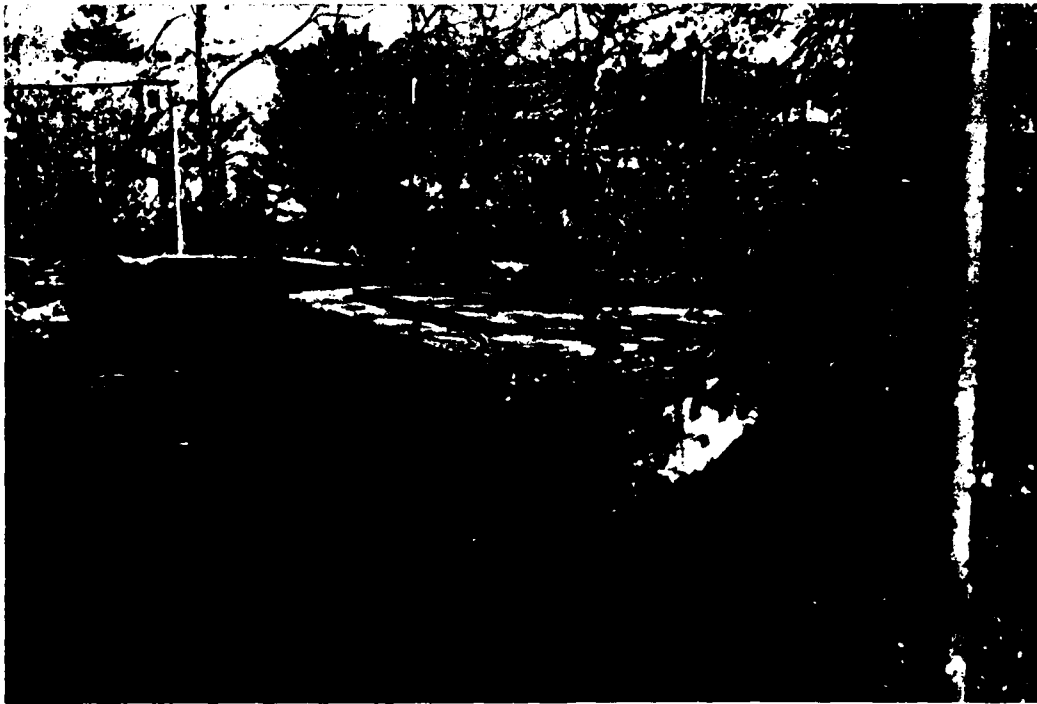
2. VIEW OF UPSTREAM SLOPE - CANAL EARTHFILL EMBANKMENT.



3. VIEW OF CREST-CANAL EARTHFILL EMBANKMENT.
NOTE HEAVY VEGETATION.



4. VIEW OF DOWNSTREAM SLOPE - CANAL EARTHFILL EMBANKMENT. NOTE HEAVY VEGETATION AND TREES.



5. VIEW OF LOW LEVEL INTAKE STRUCTURE WITH OPERATING STAND AND TRASH RACK.



6. VIEW OF LOW LEVEL OUTLET PIPE. NOTE UNDERCUTTING OF CONCRETE WINGWALL.



7. VIEW OF DOWNSTREAM CHANNEL LOOKING UPSTREAM. NOTE BOULDERS AND DEBRIS IN CHANNEL.



3. VIEW OF DOWNSTREAM CHANNEL, LOOKING DOWNSTREAM.
NOTE PROXIMITY OF HOUSES TO CHANNEL.



9a. AT INLET. NOTE RIPRAP SLOPE.



9b. AT OUTLET. NOTE INTAKE STEEL PIPE CONTINUATION OF
 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

9c. AT OUTLET. NOTE INTAKE STEEL PIPE CONTINUATION OF



16. VIEW OF SPALLED CONCRETE ON MAIN DAM BUTTRESS.



11. VIEW OF ERODED GUNITE AT BASE OF MAIN DAM BUTTRESS.



12. VIEW OF DAM AND MAIN DAM BUTTRESS FROM MAIN DAM.



14. THICK OF MARSHY AREA, WITH A FEW
TALLER TREES IN THE DISTANCE.

HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX I

LANESBOROUGH



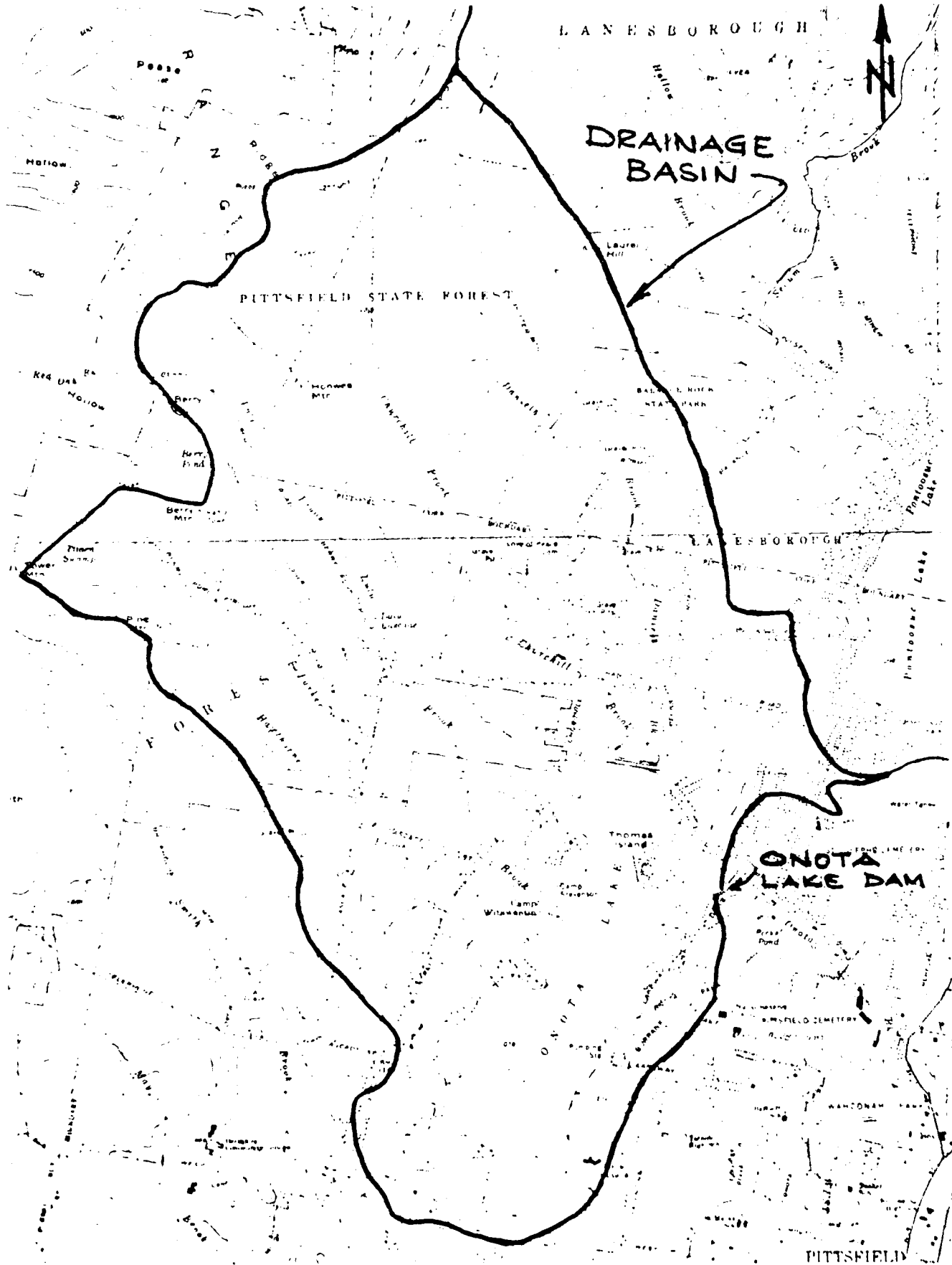
**DRAINAGE
BASIN**

PITTSFIELD STATE FOREST

LANESBOROUGH

**ONOTA
LAKE DAM**

PITTSFIELD



TAMS

Job No. 1297-13 Sheet 1 of
 Project Onata Reservoir Date Dec. 20 1955
 Subject _____ By EW
 _____ Ch'k. by _____

| Sub-basin | Area
mi ² | L
mi | LA
mi ² | LxA | LA x A |
|-----------|-------------------------|---------|-----------------------|--------|--------|
| I | 3.309 | 3.4 | 11.251 | 11.251 | 49.64 |
| II | 1.514 | 3.2 | 4.845 | 4.845 | 22.71 |
| III | 3.226 | 3.3 | 10.646 | 10.646 | 51.02 |
| Σ | 8.049 | | 26.742 | 26.742 | 123.37 |
| | | | required | 3322 | 123.37 |

$$t_p = C_r (L L A)^{0.3}$$

$$= 2 / (3322 \times 1000)^{0.3}$$

$$= 3.26 \text{ hrs.}$$

$$t_r = 70/55 = 1.27 \text{ hrs} = 23 \text{ mins. use } 30 \text{ mins.}$$

$$t_e = 0.5$$

$$t_{pk} = t_p + 0.25(t_r - t_e)$$

$$= 3.26 + 0.25(1.27 - 0.5)$$

$$= 3.24 \text{ hrs use } 3.25 \text{ hrs.}$$

$$\text{Time to peak} = 3.25 + 0.25 = 3.50 \text{ hrs}$$

$$q_{pe} = 600 C_D / t_{pk} = 123.08$$

$$Q_{pe} = 123.08 \times 8.049 = 991 \text{ cfs.}$$

TAMS

Job No. 1497-13
 Project INSPECTION ONOTA LAKE
 Subject _____

Sheet 4 of _____
 Date Nov 2 1978
 By DLC
 Ch'k. by EH

| EL | AREA | MEAN AREA (Ac) | Δ VOL | Surcharge STORAGE (Ac Ft) |
|--------|------|----------------|-------|---------------------------|
| 1078 | 634 | 667 | 800.4 | 0 |
| 1079.2 | 700 | 714 | 714 | 800 |
| 1080.2 | 728 | 740.5 | 740.5 | 1514 |
| 1081.2 | 753 | 757.5 | 375.8 | 2255 |
| 1081.7 | 762 | 767.5 | 383.8 | 2634 |
| 1082.2 | 773 | 791.5 | 1583 | 3018 |
| 1084.2 | 810 | 827 | 1654 | 4600 |
| 1086.2 | 844 | 860 | 1720 | 6254 |
| 1088.2 | 876 | | | 7974 |

TAMS

Job No. 1497-13

Sheet 6 of

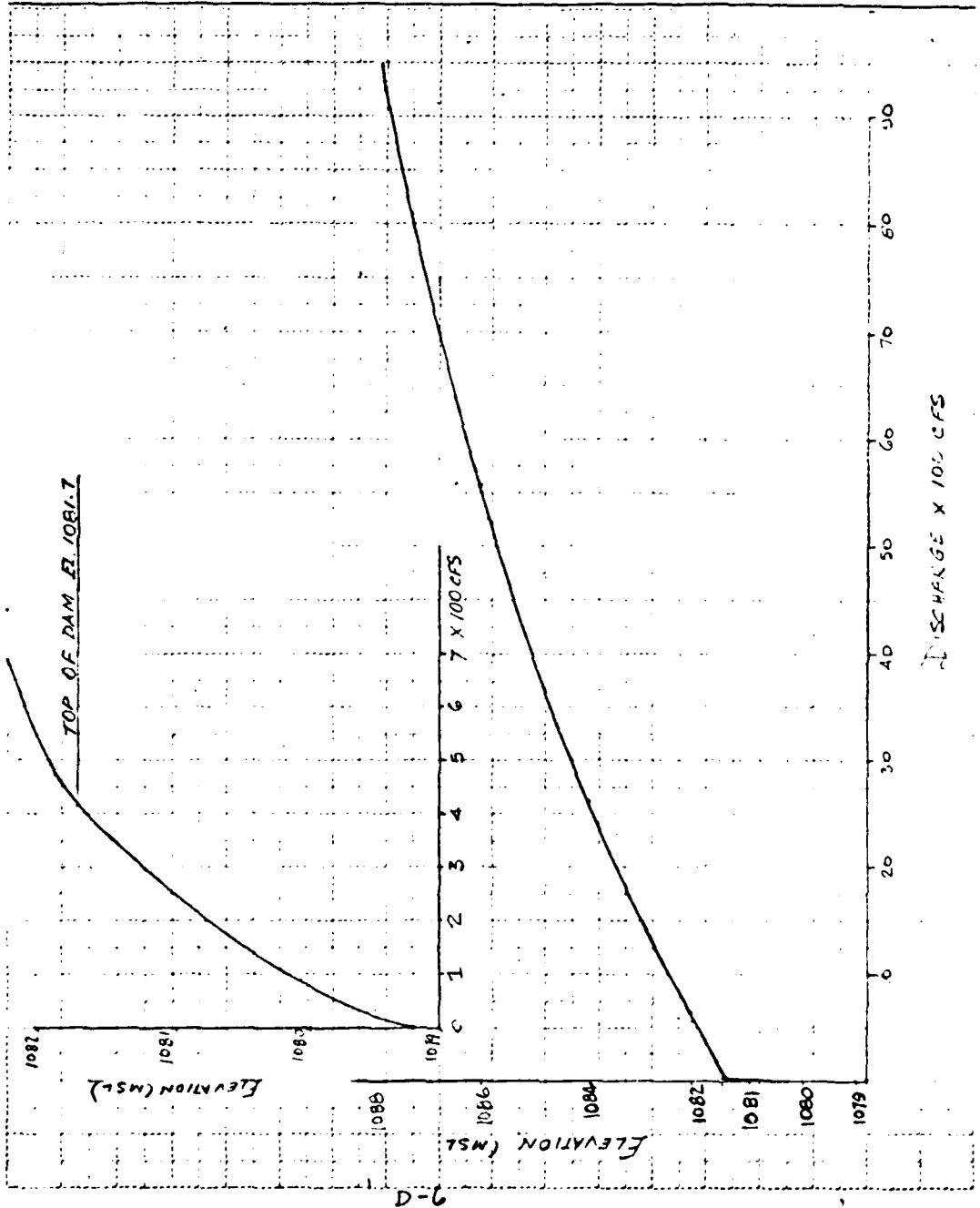
Project INSPECTION ONOTA LAKE

Date OCT 30 1978

Subject Min Spillway RATING CURVE

By DLC

Ch'k. by



TAMS

Job No. 1497-13 Sheet 7 of
 Project ONOTA LAKE SAFETY INSPECTION. Date Nov 6, 78
 Subject Spillway head/discharge rating By D.L.C.
for canal Spillway Ch'k. by

$L = 30.0$ feet

Assume spillway as
broadcrested weir
(* Kings' Handbook of Hydraulics.)

| H(ft) | C ^x | Q = CLH ^{3/2} (cfs) | |
|-------|----------------|------------------------------|----------------------|
| 0 | 0 | 0 | |
| 1 | 2.68 | 80 | |
| 2 | 2.64 | 224 | |
| 3 | 2.65 | 413 | Top of training wall |

OXOTA LAKE SAFETY INSPECTION
 FLOOD ROUTING - TAMS
 JOB NO. 1497-13 OCTOBER 31 1978

RES. SER. DAVINEX FLOOD

INPUT PARAMETERS

| STARTING ELEV. (FT.) | TIME INTERVAL (HOURS) | STARTING TIME (HOURS) | ENDING TIME (HOURS) | PRINT INTERVAL (HOURS) | GATE OPTION | PLOT OPTION | STORAGE COEFF. | OUTFLOW COEFF. | INFLOW COEFF. | TIPE COEF. | BREAK TYPE |
|----------------------|-----------------------|-----------------------|---------------------|------------------------|-------------|-------------|----------------|----------------|---------------|------------|------------|
| 55.00 | 0.10 | 0.00 | 12.00 | 1 | NO | YES | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 |

| D | T | Op | RESERVOIR | | RESERVOIR | |
|---|---|----|-------------|----------------|-------------|----------------|
| | | | ELEV. (FT.) | STORAGE (ACFT) | ELEV. (FT.) | STORAGE (ACFT) |
| | | | 79.20 | 500.0001 | 0.00 | 0.00 |
| | | | 81.20 | 1114.0002 | 107.00 | 107.00 |
| | | | 81.70 | 2555.0004 | 269.00 | 269.00 |
| | | | 82.20 | 3634.0004 | 421.00 | 421.00 |
| | | | 82.20 | 3619.0004 | 652.00 | 652.00 |
| | | | 84.20 | 4600.0009 | 2667.00 | 2667.00 |
| | | | 86.20 | 6254.0009 | 5670.00 | 5670.00 |
| | | | 88.20 | 7974.0009 | 9474.00 | 9474.00 |

| TIME (HRS) | INFLOW (CFS) | OUTFLOW (CFS) | STORAGE (ACFT) | ELEVATION (FT.) |
|------------|--------------|---------------|----------------|-----------------|
| 0.00 | 0.00 | | 800.0001 | 79.20 |
| 0.10 | 627.11 | 0.32 | 802.1838 | 79.20 |
| 0.20 | 846.22 | 1.30 | 804.7318 | 79.21 |
| 0.30 | 1266.23 | 2.04 | 810.6372 | 79.22 |
| 0.40 | 1592.44 | 5.22 | 834.8934 | 79.24 |
| 0.50 | 1957.62 | 7.88 | 852.6666 | 79.27 |
| 0.60 | 1927.92 | 10.64 | 871.0456 | 79.29 |
| 0.70 | 1967.46 | 13.50 | 890.0567 | 79.32 |
| 0.80 | 1653.41 | 16.45 | 909.7778 | 79.35 |
| 0.90 | 2347.52 | 19.67 | 921.2695 | 79.38 |
| 1.00 | 3123.64 | 27.33 | 955.7227 | 79.41 |
| 1.10 | 3724.75 | 27.44 | 983.1229 | 79.45 |
| 1.20 | 3117.97 | 31.90 | 1013.4652 | 79.49 |
| 1.30 | 3717.70 | 27.23 | 1048.4558 | 79.54 |
| 1.40 | 4233.82 | 42.60 | 1099.4549 | 79.60 |
| 1.50 | 4344.26 | 50.21 | 1137.0091 | 79.67 |
| 1.60 | 3572.20 | 59.55 | 1190.7428 | 79.74 |
| 1.70 | 4312.09 | 67.93 | 1263.7698 | 79.83 |
| 1.80 | 3819.00 | 79.04 | 1322.4233 | 79.93 |
| 1.90 | 3971.60 | 91.90 | 1411.2148 | 80.05 |
| 2.00 | 1854.50 | 102.47 | 1510.5219 | 80.19 |
| 2.10 | 3129.55 | 132.07 | 1614.0815 | 80.33 |
| 2.20 | 3727.70 | 169.01 | 1718.5500 | 80.47 |
| 2.30 | 3341.65 | 187.33 | 1824.0444 | 80.61 |
| 2.40 | 3952.20 | 214.00 | 1920.4418 | 80.74 |
| 2.50 | 3997.90 | 242.59 | 2037.7425 | 80.90 |
| 2.60 | 3116.00 | 270.29 | 2144.1975 | 81.05 |
| 2.70 | 3146.59 | 257.98 | 2251.0664 | 81.19 |
| 2.80 | 3729.20 | 322.12 | 2357.6146 | 81.33 |
| 2.90 | 1731.02 | 366.56 | 2464.9821 | 81.47 |
| 3.00 | 3121.55 | 401.10 | 2572.1816 | 81.61 |
| 3.10 | 3724.47 | 452.09 | 2679.7548 | 81.75 |
| 3.20 | 1711.50 | 505.19 | 2787.2998 | 81.89 |
| 3.30 | 3127.50 | 589.43 | 2895.6503 | 82.03 |
| 3.40 | 3127.50 | 672.02 | 3001.3305 | 82.18 |
| 3.50 | 3127.50 | 759.77 | 3111.8408 | 82.31 |
| 3.60 | 3127.50 | 835.79 | 3220.2705 | 82.45 |
| 3.70 | 3127.50 | 1174.32 | 3370.6440 | 82.59 |
| 3.80 | 3127.50 | 1215.54 | 3445.2143 | 82.74 |
| 3.90 | 3127.50 | 1379.54 | 3563.8081 | 82.89 |
| 4.00 | 3127.50 | 1520.64 | 3686.4126 | 83.04 |
| 4.10 | 3127.50 | 1679.30 | 3812.0312 | 83.20 |
| 4.20 | 3127.50 | 1835.40 | 3936.6760 | 83.36 |
| 4.30 | 3127.50 | 1971.14 | 4060.3315 | 83.52 |
| 4.40 | 3127.50 | 2146.30 | 4200.9419 | 83.69 |
| 4.50 | 3127.50 | 2331.94 | 4332.9458 | 83.86 |
| 4.60 | 3127.50 | 2664.05 | 4463.7627 | 84.02 |
| 4.70 | 3127.50 | 2813.67 | 4503.3672 | 84.19 |
| 4.80 | 3127.50 | 2877.51 | 4721.4640 | 84.34 |

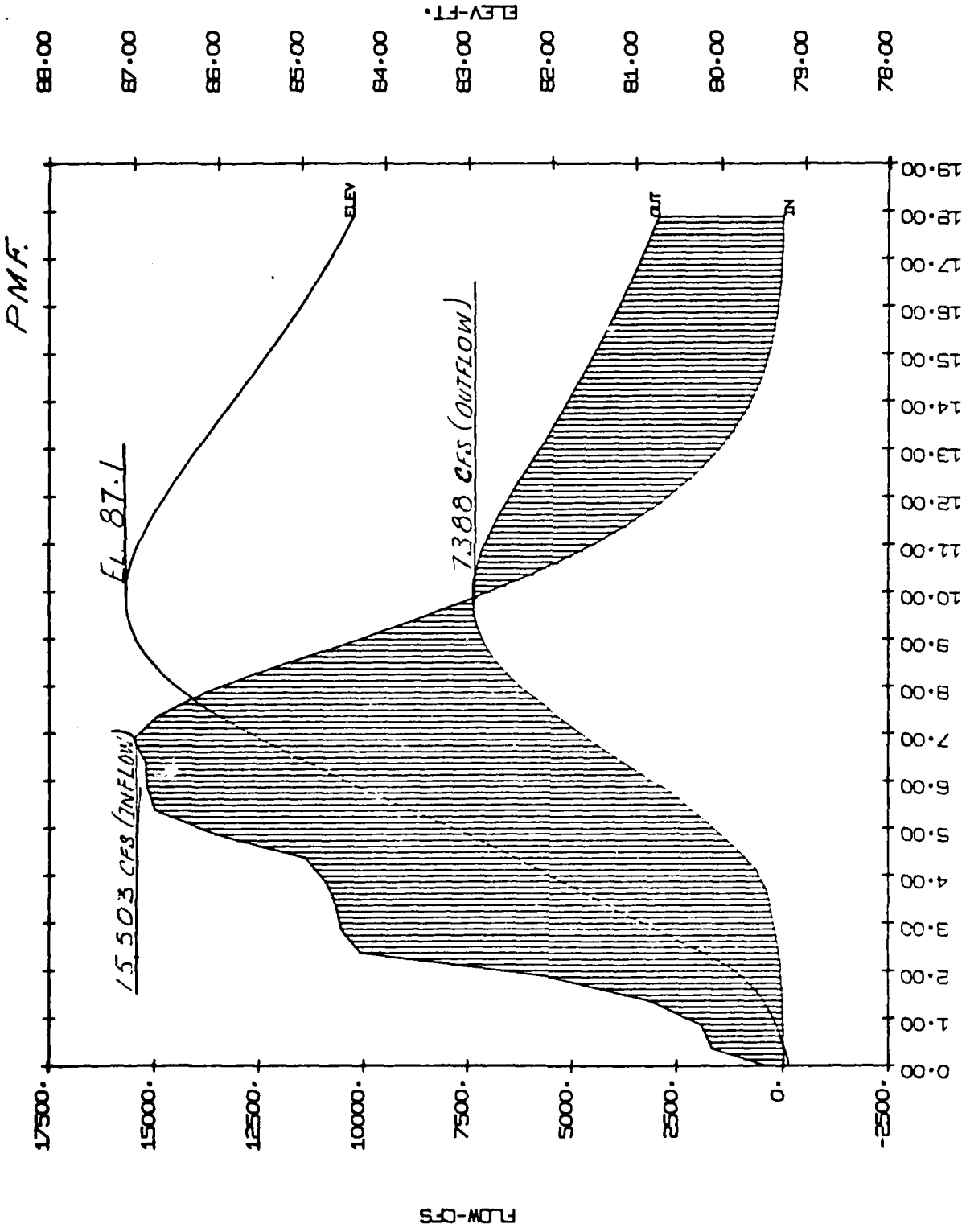
0-9

| TIME (HRS) | INFLOW (CFS) | OUTFLOW (CFS) | STORAGE (ACFT) | ELEVATION (FT.) |
|------------|--------------|---------------|----------------|-----------------|
| 6.13 | 1502.50 | 3116.27 | 4847.4531 | 84.49 |
| 6.25 | 1509.80 | 740.91 | 4071.1936 | 84.64 |
| 6.37 | 1517.00 | 561.52 | 5092.6504 | 84.79 |
| 6.50 | 1524.40 | 1775.16 | 5212.6176 | 84.94 |
| 6.62 | 1532.15 | 361.50 | 5226.5146 | 85.08 |
| 6.74 | 1540.00 | 422.116 | 5445.3459 | 85.22 |
| 6.87 | 1548.05 | 4410.21 | 5560.1147 | 85.36 |
| 7.00 | 1556.40 | 4615.69 | 5673.3066 | 85.49 |
| 7.12 | 1565.17 | 4816.59 | 5787.8480 | 85.63 |
| 7.25 | 1574.35 | 5022.660 | 5902.6680 | 85.76 |
| 7.37 | 1584.00 | 5234.671 | 6028.4071 | 85.88 |
| 7.50 | 1594.20 | 5452.42 | 6164.5107 | 86.00 |
| 7.62 | 1604.95 | 5675.62 | 6310.4541 | 86.12 |
| 7.75 | 1616.26 | 5913.83 | 6466.7487 | 86.24 |
| 7.87 | 1628.14 | 6166.56 | 6633.1396 | 86.33 |
| 8.00 | 1640.60 | 6434.42 | 6809.2763 | 86.42 |
| 8.12 | 1653.65 | 6717.52 | 6995.6205 | 86.51 |
| 8.25 | 1667.30 | 7016.51 | 7191.6166 | 86.59 |
| 8.37 | 1681.55 | 7331.29 | 7397.8345 | 86.67 |
| 8.50 | 1696.40 | 7662.62 | 7624.6470 | 86.74 |
| 8.62 | 1711.85 | 8019.52 | 7871.3964 | 86.80 |
| 8.75 | 1727.90 | 8392.59 | 8222.5697 | 86.86 |
| 8.87 | 1744.55 | 8782.35 | 8585.1288 | 86.91 |
| 9.00 | 1761.80 | 9188.22 | 8958.3908 | 86.96 |
| 9.12 | 1779.65 | 9610.77 | 9341.6552 | 87.00 |
| 9.25 | 1798.10 | 10049.52 | 9734.5629 | 87.04 |
| 9.37 | 1817.15 | 10504.27 | 10147.7059 | 87.08 |
| 9.50 | 1836.80 | 10975.54 | 10580.6409 | 87.10 |
| 9.62 | 1857.05 | 11463.01 | 11034.0741 | 87.10 |
| 9.75 | 1877.90 | 11967.24 | 11507.1604 | 87.10 |
| 9.87 | 1899.35 | 12487.72 | 12000.2724 | 87.10 |
| 10.00 | 1921.40 | 13024.09 | 12522.7755 | 87.10 |
| 10.12 | 1944.05 | 13576.53 | 13075.1212 | 87.10 |
| 10.25 | 1967.30 | 14145.42 | 13647.5175 | 87.10 |
| 10.37 | 1991.15 | 14731.25 | 14240.0088 | 87.10 |
| 10.50 | 2015.60 | 15334.51 | 14852.5122 | 87.10 |
| 10.62 | 2040.65 | 15955.80 | 15485.4293 | 87.10 |
| 10.75 | 2066.30 | 16594.75 | 16138.5517 | 87.10 |
| 10.87 | 2092.55 | 17251.07 | 16811.8779 | 86.97 |
| 11.00 | 2119.40 | 17924.57 | 17505.4795 | 86.94 |
| 11.12 | 2146.85 | 18614.99 | 18219.2509 | 86.91 |
| 11.25 | 2174.90 | 19322.08 | 18953.0293 | 86.88 |
| 11.37 | 2203.55 | 20045.55 | 19706.5764 | 86.84 |
| 11.50 | 2232.80 | 20785.07 | 20480.0107 | 86.80 |
| 11.62 | 2262.65 | 21540.26 | 21283.2607 | 86.74 |
| 11.75 | 2293.10 | 22311.76 | 22116.3777 | 86.72 |
| 11.87 | 2324.15 | 23100.05 | 22979.2728 | 86.67 |
| 12.00 | 2355.80 | 23905.58 | 23862.0296 | 86.63 |
| 12.12 | 2388.05 | 24728.72 | 24774.4464 | 86.58 |

| TIME (HRS) | INFLOW (CFES) | OUTFLOW (CFES) | STORAGE (ACFT) | ELEVATION (FT.) |
|-------------|---------------|----------------|----------------|-----------------|
| 12.34 | 2775.51 | 6219.08 | 6547.3339 | 86.54 |
| 12.35 | 2704.00 | 7278.07 | 6504.1804 | 86.69 |
| 12.36 | 2653.50 | 6155.50 | 6464.3730 | 86.44 |
| 12.37 | 1926.40 | 7141.95 | 6422.0937 | 86.30 |
| 12.38 | 1777.92 | 5667.37 | 6379.3535 | 86.34 |
| 12.39 | 1466.19 | 5651.00 | 6336.1021 | 86.29 |
| 12.40 | 1857.13 | 7755.75 | 6292.6660 | 86.24 |
| 12.41 | 1495.07 | 5477.93 | 6249.0058 | 86.16 |
| 12.42 | 1313.00 | 5851.18 | 6205.0910 | 86.14 |
| 12.43 | 1203.94 | 5510.83 | 6160.8252 | 86.08 |
| 12.44 | 1117.46 | 5420.11 | 6116.3711 | 86.03 |
| 12.45 | 1063.95 | 7336.28 | 6071.8466 | 85.97 |
| 12.46 | 577.43 | 5257.31 | 6027.2539 | 85.92 |
| 12.47 | 724.58 | 5177.23 | 5982.7947 | 85.87 |
| 12.48 | 317.28 | 5166.23 | 5937.9785 | 85.81 |
| 12.49 | 581.09 | 7015.46 | 5893.5117 | 85.74 |
| 12.50 | 553.55 | 4835.03 | 5849.1923 | 85.74 |
| 12.51 | 237.30 | 4854.82 | 5805.0175 | 85.65 |
| 12.52 | 429.05 | 4175.04 | 5761.0771 | 85.60 |
| 12.53 | 449.05 | 4465.25 | 5717.4588 | 85.55 |
| 12.54 | 440.00 | 7117.37 | 5674.1552 | 85.49 |
| 12.55 | 317.55 | 4599.18 | 5631.1079 | 85.44 |
| 12.56 | 357.77 | 4461.92 | 5587.5666 | 85.39 |
| 12.57 | 324.69 | 4345.26 | 5544.3916 | 85.34 |
| 12.58 | 291.21 | 4306.50 | 5504.6640 | 85.29 |
| 12.59 | 277.83 | 4274.57 | 5463.2762 | 85.24 |
| 12.59 | 241.76 | 4160.73 | 5422.5322 | 85.19 |
| 12.59 | 274.49 | 417.15 | 5382.1972 | 85.14 |
| 12.58 | 151.92 | 4114.50 | 5342.3705 | 85.09 |
| 12.58 | 177.56 | 3647.33 | 5302.9824 | 85.05 |
| 12.57 | 123.19 | 3872.78 | 5264.1269 | 85.00 |
| 12.57 | 102.51 | 3737.22 | 5225.1115 | 84.95 |
| 12.57 | 75.55 | 3744.62 | 5185.0273 | 84.91 |
| 12.57 | 64.62 | 3666.26 | 5150.7666 | 84.84 |
| 12.56 | 61.62 | 3610.31 | 5116.0556 | 84.82 |
| 12.56 | 57.01 | 3544.77 | 5077.9345 | 84.77 |
| 12.56 | 57.01 | 3470.20 | 5042.7999 | 84.73 |
| 12.56 | 47.73 | 3477.69 | 5007.4101 | 84.69 |
| 12.55 | 41.99 | 3444.22 | 4973.0939 | 84.65 |
| 12.55 | 34.26 | 3322.10 | 4938.1777 | 84.61 |
| 12.55 | 30.52 | 3222.42 | 4903.0218 | 84.56 |
| 12.55 | 24.75 | 3173.06 | 4871.2246 | 84.53 |
| 12.54 | 21.71 | 3144.72 | 4841.0908 | 84.49 |
| 12.54 | 19.65 | 3147.40 | 4809.5224 | 84.45 |
| 12.53 | 15.58 | 3091.69 | 4777.5058 | 84.41 |
| 12.53 | 13.53 | 2955.77 | 4745.0600 | 84.37 |
| MAX. VALUES | | | | 87.10 |
| MIN. VALUES | | | | 79.20 |

D-11

//



Outflow

TIME

FLOW-CFS

ELEV-FT.

PMF

EL. 87.1

15,503 CFS (INFLOW)

7,388 CFS (OUTFLOW)

```

// FOR
*LIST ALL
*ONE WORD INTEGERS
SURROUTINE AREAD(QP1,ELEV,AMIN,VOL,X,Y,SLOPE,AN,DELTE)
COMMON MP,AL
DIMENSION X(1),Y(1)
SET START ELEV TO MINIMUM
ELEV=AMIN
DO 500 ITRY=1,200
  WP=0.
  AREA=0.
  ICODE=1
  DO 200 I=2,NP
    IF((ELEV-Y(I))*(ELEV-Y(I-1)).GT.0.) GO TO (200,50),ICODE
  ICODE=2
  DIST=ABS(ELEV-Y(I-1))/ABS(Y(I)-Y(I-1))*(X(I)-X(I-1))
  DIS=ABS(Y(I)-Y(I-1))/(Y(I)-Y(I-1))
  YOLD=X(I-1)+DIST
  XOLD=ELEV
  IF(DIP.GT.0.) GO TO 100
  AREA=AREA+.5*(X(I)-XOLD)*(ELEV-Y(I)+ELEV-YOLD)
  WP=WP+SORT((X(I)-XOLD)**2+(Y(I)-YOLD)**2)
  GO TO 150
100  ARFA=AREA+.5*(XOLD-X(I-1))*(ELEV-Y(I-1)+ELEV-YOLD)
  WP=WP+SORT((XOLD-X(I-1))**2+(YOLD-Y(I-1))**2)
  GO TO 210
150  XOLD=X(I)
  YOLD=Y(I)
200  CONTINUE
210  O=1.4926/AN*(AREA/WP)**.667*SLOPE**5*AREA
  IF(O.GT.0P1) GO TO 300
  ELEV=ELEV
  GOLD=0
  AREA=AREA
  ELEV=ELEV+DELTE
  GO TO 500
300  FAC=(ELEV-ELEV0)*(QP1-GOLD)/(O-GOLD)
  ELEV=ELEV0+(ELEV-ELEV0)*FAC
  AREA=AREA0+(AREA-AREA0)*FAC
  VOL=AREA/43560.*AL
  GO TO 610
500  CONTINUE
  WRITE(5,25)
25  STOP('PROGRAM WOULD NOT CONVERGE')
  CALL EXIT
600  RETURN
  END
// DUP
*DELETE
*STORE MS UA AREAD 0107 0107
// JOB 0107
// FOR
*LIST ALL
*ONE WORD INTEGERS
  DIMENSION X(50),Y(50)

```

AD-A145 194

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
ONOTA LAKE DAM (MA 00...) (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV NOV 78

22

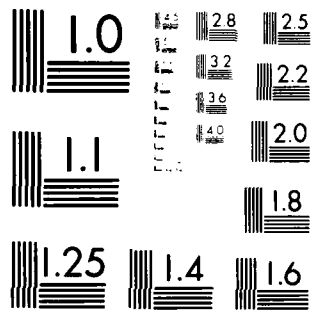
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NL



END
DATE
FILMED
9-84
DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A


```
QP1=QP1*(1.-(VOL*VOL2)/2./RESTO)
CALL AREAD(QP1,ELEV,AMIN,VOL,X,Y,SLOPE,AN,DELIE)
DEPTH=ELEV-AMIN
WRITE(10,80) IR,AL,AN,QP1,ELEV,VOL,DEPTH
IF(VOL,GT,RESIO/2.) GO TO 500
80  FORMAT(3X,13.5X,18.0,2X,18.3,2X,18.0,2X,3(F8.1,2X))
    GO TO 1000
500  WRITE(10,800) VOL,IR
600  FORMAT(2X,VOLUME = ,F10.2, FOR REACH ,I2)
4000 CALL EXIT
END

// DUP
*DELETE
*STORE MS UA DAMFA 0107 010Z
```

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

APPENDIX E



INVENTORY OF DAMS IN THE UNITED STATES

| | | | | | | | |
|-----------------------|-------|--------|--------------|----------------|------------------|------------------|-------------|
| FEDERAL AGENCY NUMBER | STATE | COUNTY | LOCAL COUNTY | NAME | LATITUDE (NORTH) | LONGITUDE (WEST) | REPORT DATE |
| 43-14-5ED | IA | 003 | 01 | ONOTA LAKE DAM | 4228.6 | 7316.0 | 00NOV78 |

| | | | | |
|--------------|---------------------|--------------------------------------|---------------------|------------|
| POPULAR NAME | NAME OF IMPROVEMENT | | | |
| | ONOTA LAKE | | | |
| REGION BASIN | RIVER OR STREAM | NEAREST DOWNSTREAM CITY-TOWN-VILLAGE | DIST FROM DAM (MI.) | POPULATION |
| 01 07 79 | ONOTA RRDM | PITTSFIELD | 1 | 57000 |

| | | | | | | | | | | |
|-------------|----------------|----------|---------------------|----------------------------|------------------------------|----------|-------|---------|-------|----------|
| TYPE OF DAM | YEAR COMPLETED | PURPOSES | STATUS HEIGHT (FT.) | IMPROVING CAPACITIES | | DIST OWN | FED R | PRV/FED | SCS A | VER/DATE |
| | | | | STAYING MAXIMUM (ACRE-FT.) | HYDRAULIC MAXIMUM (ACRE-FT.) | | | | | |
| OFF-CYDQ | 1974 | R | 18 | 18 | 5130 | 3296 | | | | |

| | | | | | | | | | | | |
|---------|--|--|--|--|--|--|--|--|--|--|--|
| REMARKS | | | | | | | | | | | |
| | | | | | | | | | | | |
| REMARKS | | | | | | | | | | | |
| | | | | | | | | | | | |

| | | | | | | | | | | | |
|---------|----------|-------------------------|-----------------------|---------|---------------------|----------|--------------|--------------|-------------|--------------|-------------------------|
| DISEASE | SPILLWAY | MAXIMUM DISCHARGE (CFS) | VOLUME OF DAM (CU FT) | INSTALL | POWER CAPACITY (MW) | PROPOSED | NO. OF LOCKS | LENGTH (FT.) | WIDTH (FT.) | HEIGHT (FT.) | LENGTH WITH PIERS (FT.) |
| | | | | | | | | | | | |

| | | | | | |
|----------------------------------|--|-------------------|--|--------------------------|--|
| OWNER | | ENGINEERING BY | | CONSTRUCTION BY | |
| CITY OF PITTSFIELD | | | | | |
| DESIGN | | REGULATORY AGENCY | | OPERATION | |
| NONE | | NONE | | NONE | |
| INSPECTION BY | | INSPECTION DATE | | AUTHORITY FOR INSPECTION | |
| TIPPETS-ABRETT-MCCARTHY-STRATTON | | 22AUG78 | | PL-92-367 | |
| REMARKS | | | | | |
| | | | | | |