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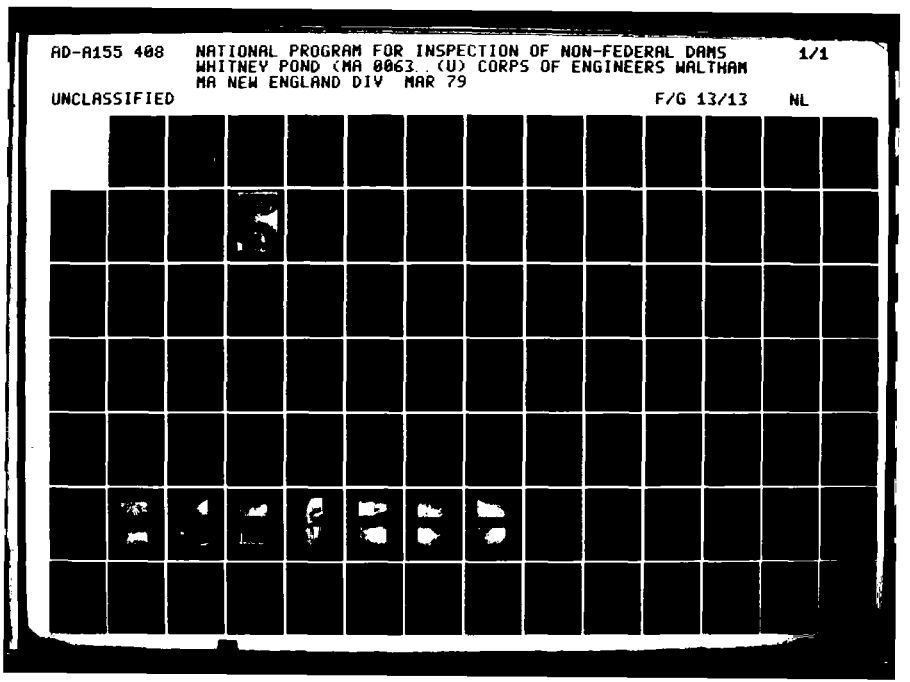

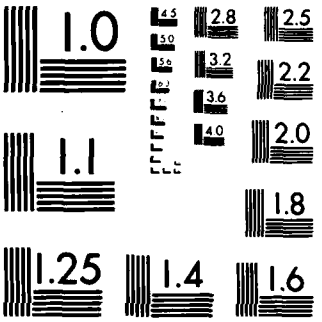

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CONNECTICUT RIVER BASIN

WINCHENDON, MASSACHUSETTS

WHITNEY POND

MA 00633

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

MARCH 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Connecticut River Basin
Winchendon, Massachusetts
Millers River

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

The dam is a 25 ft. high, 562 ft. long gravity stone masonry and earth embankment structure. The dam is generally in good condition. It has a size classification of intermediat and a hazard potential of high. It is felt that certain normal maintenance and operational procedures need attention.

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

REPLY TO
ATTENTION OF:
NEDED-E

JUL 11 1979

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

Dear Governor King:

I am forwarding for your use a copy of the Whitney Pond 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 which emphasizes the inadequacy of the project spillway under test flood conditions is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Whitney Pond Dam would likely be exceeded by floods greater than 7 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Screening criteria for initial review of spillway adequacy specifies that this class of dam, having insufficient 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 classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations there appears to be a serious deficiency in spillway capacity. This could render the dam unsafe in the event of a severe storm which would likely cause overtopping and possible failure of the dam, significantly increasing the hazard potential for loss of life downstream from the dam.

NEDED-E
Honorable Edward J. King

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.

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, Town of Winchendon, 105 Friend Street, Winchendon, Massachusetts 01475, ATTN: Mr. Peter Morneau, Superintendent, Department 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 yours,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA 00633

Name of Dam: Whitney Pond

Town: Winchendon

County and State : Worcester County, Massachusetts

Stream: Millers River

Date of Inspection: November 13, 1978

The dam is a 25± foot high, 562± long gravity stone masonry and earth embankment structure. It is comprised of an 82 foot foot long stone masonry spillway, a 450± foot earth embankment to the left of the spillway, and a 30± foot earth embankment to the right of the spillway. The left embankment is utilized for a railroad right-of-way and two railroad bridge structures are located immediately upstream of the spillway. The dam was originally built in 1880 for power generation. Modifications to the original structure were made in 1936 and 1957. The dam is now used basically for recreation. The dam is owned, operated and maintained by the Town of Winchendon.

The visual inspection of the dam indicated it to be in generally good condition.

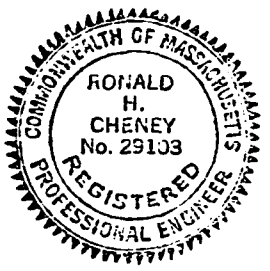
The dam has a size classification of intermediate and a hazard classification of high. According to Corps guidelines the test flood is the Probable Maximum Flood which has an inflow of 60,950 cfs. The spillway can pass 7 percent of

this flow. The dam would be overtopped by 6± feet. The resulting outflow would be 58,000 cfs. The existing spillway is partially blocked by the upstream railroad bridges. It has the potential for increased blockage by debris catching the stop log stanchions. There are normally 2 to 3 feet of stop logs in use. Indepth engineering data was not available and therefore, the adequacy of the dam was assessed primarily on visual inspection, past performance history, and engineering judgement.

The dam is in generally good condition. It is felt, however, that certain normal maintenance and operational procedures need attention. These include removal of brush and trees on the upstream and downstream slopes; development of a formal warning system and monitoring of the condition of the downstream training wall. Also repairs to the walkway over the spillway are required. Due to the dam's high hazard classification along with its overtopping potential, it is further recommended that the owner engage a competent engineer to investigate the adequacy of the spillway and design a draw down facility for the dam.

The above problems do not represent an immediate threat to the dam; however, the normal maintenance and operational procedures should be carried out by the owner over the next 2 years after receipt of this Phase I Inspection Report. The evaluation of the spillway and the design of a draw down facility

should be carried out by the owner within one year after receipt of this Phase I Inspection Report.



Ronald H. Cheney

Ronald H. Cheney, P.E
Associate

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

This Phase I Inspection Report on Whitney Pond 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 A. McElroy

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

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

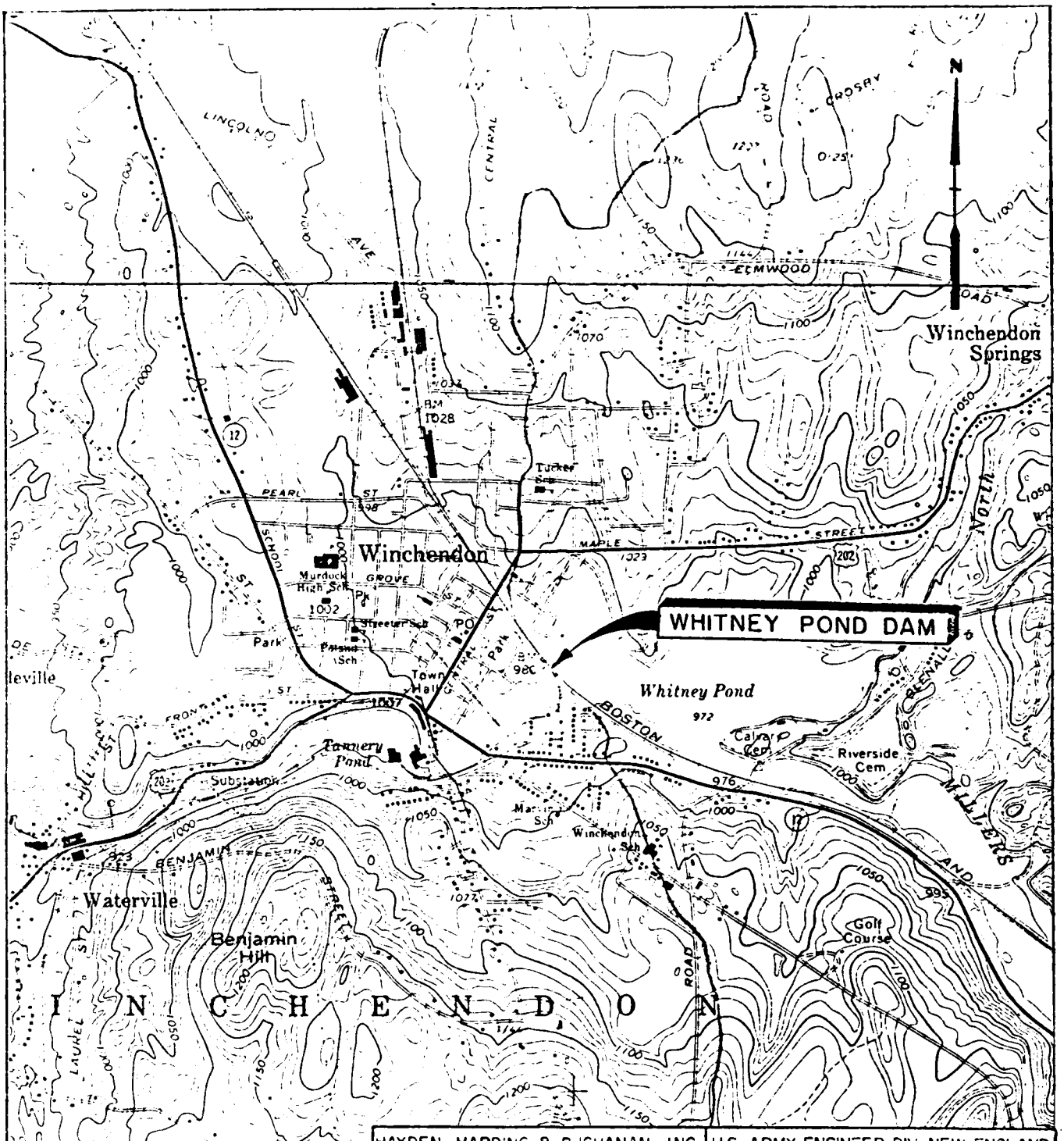
This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Inspections. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously 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 or 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.

CONTENTS



HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WHITNEY POND DAM

WINCHENDON — MASSACHUSETTS

			SCALE: 1" = 2000'
			DATE: FEBRUARY, 1979

PHASE I
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: WHITNEY POND

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. Hayden, Harding & Buchanan, Inc. 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 Hayden, Harding & Buchanan, Inc. under a letter of 28 November 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW 33-79-C-0012 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

The dam, Whitney Pond, is located in the Town of Winchendon in Worcester County, Massachusetts. Whitney Pond is formed at the intersection of the North Branch and Millers Rivers and is located east of the center of town. The dam is shown on U.S.G.S. Winchendon, Massachusetts-New Hampshire Quadrangle, with coordinates approximately at North 42° 41' 00" West 72° 02' 30".

b. Description of Dam and Appurtenances

Whitney Pond is a composite dam approximately 25 feet high consisting of an 82 foot stone masonry spillway a 450± foot earth embankment to the left of the spillway and a 30 foot long earth embankment to the right of the spillway. The overall plan length is 562± feet. The left embankment has an approximate 1½H:1V upstream slope and a downstream slope of approximately 2½H:1V. This embankment has a varying crest width and serves as the roadway for 2 converging lines of railroad tracks. The spillway is a 12' high masonry structure. During the field inspection there was approximately 2 to 3 feet of stop logs atop the masonry. There would be approximately 13' of freeboard between the top of the ungated masonry spillway and the crest of the embankment. The spillway is supported by 3 four foot thick concrete butresses. The training walls are unmortared stone masonry and serve as the abutments for the dam and the two rail-

road bridges that span the spillway. An "L" shaped concrete wall ties into the left training wall to accomodate the downstream bend in the river.

An approximate 30 foot wide section of embankment is located on the right side of the spillway. This embankment contains an impervious core and was constructed in 1957 to close down a canal which once serviced a now defunct electric power station downstream. Plans dated 1937 show provisions for approximately 7 feet of stop logs and flashboard atop the spillway. A steel framed wood planked walkway spans the structure

c. Size Classification

The dam falls into the intermediate size classification according to its maximum storage capacity of 2186 acre feet, with water to crest of dam.

d. Hazard Classification

The dam has a high hazard classification. Floodwater from dam failure would damage numerous homes and buildings in the urban area adjacent to the stream.

e. Ownership

The dam has been owned by the Town of Winchendon, Winchendon, Massachusetts since 1959. It was originally owned by the Winchendon Electric Light and Power Company until 1936 when it was taken over by New England Power Company.

f. Operator

The dam is maintained and operated by the Town of Winchendon Department of Public Works in accordance with the

Board of Selectmen. Peter Morneau is the Superintendant of the DPW and Burton E. Gould is the chairman of the Board of Selectmen. The address is 105 Friend Street Winchendon, Massachusetts 01475 for both offices and the telephone is (617) 297-0085 for both offices.

g. Purposes of Dam

Earlier usage, which has been eliminated by blockage of the old canalway, was for electric power generation and water supply for the downstream factories. The pond behind the dam is now used basically for recreation. Some control is maintained by the use of stop logs.

h. Design and Construction History

The original "Whitney Dam" was constructed in 1880. The present dam utilizes portions of the original dam along with improvements designed and instituted in 1936 by the New England Power Service Company. In 1957 the sluiceway, leading to the canal used in power generation, was blocked by an earthen embankment. Plans outlining the 1936 and 1957 improvements were made available at the Worcester County Court House. No other construction records or design calculations were available.

i. Normal Operational Procedures

No formal operational procedure is outlined for this dam. The operator maintains stop logs to assure that the water level of the pond is 2 to 3 feet above the masonry spillway for summer recreation.

1.3 Pertinent Data

a. Drainage Area

The drainage area (33,920 acres - 53 s.m.) is comprised of wooded, rolling hills, containing several drainage paths and a number of lakes and ponds. The two major drainage paths are the Millers River and North Branch Millers River. Millers River receives outflow directly from Sunset and Lower Naukeag Lakes, and indirectly from several lakes and ponds above these two lakes. During its course of about 7.3 miles from Lower Naukeag Lake to the Whitney Pond Dam, the river falls nearly 100 feet in elevation. North Branch Millers River serves as an outlet to Lake Monomonac, which is fed by several smaller lakes, ponds, amd streams to the north and east. The river drops approximately 70 feet over the course of 2.7 miles from Lake Monomonac to Whitney Pond Dam.

Development throughout the drainage area is generally sparse except near downtown Winchendon, around the lakes used for recreational purposes, and at Winchendon Springs, Rindge and East Ridge. The Boston and Maine Railroad, several State highways, and a number of improved roads service the area.

For a reach of about 2000 feet downstream of the dam the downtown area of Winchendon is adjacent to the Millers River. A number of structures are located within 400 feet of the River, including residential and manufacturing buildings

and two road bridges. Several manufacturing and a number of residential buildings are located within 400 feet of the river at Waterville, about 1.5 miles downstream of the dam. A sewage treatment plant and U.S.G.S. gaging stations are located just over 3 miles below the dam. Beyond this point there is little or no development close to Millers River for several miles downstream.

b. Discharge at Dam Site

This dam has no outlet works other than existing overflow spillway. An old sluiceway at the northwestern end of the dam was closed off and filled in during 1957 to 1958.

The dam was constructed in 1880, and underwent extensive improvements in 1936. Discharge records of the U.S.G.S. gaging station No. 1-1620, located approximately 3.3 miles downstream of the dam, are available from 1916 to the present. Flows are recorded for an 83 square mile area of the Millers River. The flood of record at this gage occurred on September 22, 1938 with a peak discharge of 8,500 cfs and elevation of 848.2±.

The spillway is ungated, with provisions for stop logs and flashboards. It has an approximate capacity of 9700 cfs at an elevation of 978.8± without stop logs. Considering three feet of stop logs the capacity is 6,400 cfs. Due to the existance of the railroad bridge, the spillway capacity is reduced to 4,000 cfs since the bridge blocks 3± feet of the spillway. The test flood (inflow 60,950 cfs) would overtop the embankment to elevation 985.1. The outflow would be 58,000 cfs. If the spillway were blocked with debris, the outflow would overtop the embankment to elevation 985.25±.

c. Elevation (ft. above MSL)

(1) Streambed at centerline of dam ---------- 948
(average 954)

(2) Maximum tailwater ---------- 962±

(3) Upstream portal invert diversion tunnel ----- none

(4) Recreation pool ---------- 969±

(5) Full flood control pool ---------- N/A

(6) Spillway crest- with stop logs 968.8
without stop logs 965.8

(7) Design surcharge (Original Design)----------unknown

(8) Top Dam ---------- 978.5

(9) Test flood design surcharge ---------- 985.1
(985.25 spillway blocked)

d. Reservoir

(1) Length of maximum pool---------- 11,000'

(2) Length of recreation pool---------- 4,000'

(3) Length of flood control pool ---------- N/A

e. Storage (acre feet)

(1) Spillway crest pool----elevation 965.8--------258

(2) Recreation pool--------elevation 968.8------- 410

(3) Flood control pool----------N/A

(4) Top of dam---------- 1450

(5) Test flood pool----------3750

f. Reservoir Surface (acres)

(1) Spillway crest ---------- 44±

(2) Recreation pool (with flashboards of 3')-- 56

(3) Top dam ----------248

(4) Flood control pool----------N/A

(5) Test flood pool ----------331

g. Dam

(1) Type --------Gravity type, stone masonry, earth embankment

(2) Length----------562' total including spillway

(3) Height----------25'

(4) Top Width----------25' at embankment

(5) Side Slopes---- 1½:1 U.S., 2.5:1± D.S. at left embankment
1½:1 U.S. & D.S. at right embankment

(6) Zoning ---------- unknown

(7) Impervious Core ---------- unknown

(8) Cutoff---------- unknown

(9) Grout curtain---------- unknown

(10) Other

h. Diversion Regulating Tunnel ---------- none

Type

Length

Closure

Access

Regulating Facilities

i. Spillway

(1) Type---------- broad crested

(2) Length of weir----------82'

(3) Crest elevation----------965.8

(4) Gates---------- none-stop logs & flashboards only

(5) U/S Channel---------- riverbed

(6) D/S Channel---------- riverbed

(7) General---------- provisions for stoplogs

j. Regulating Outlets

The regulating outlet for this dam consists of the overflow spillway with provisions for stop logs and flashboards. As previously described, the spillway is made up of stone masonry betweeen concrete buttresses. Total crest length is 82' and crest elevation is 965.8'. Up to 7 feet of stop logs and flashboards can be used to control discharge through the dam. These stop logs can be removed manually or by releasing the needle beams holding them in place if manual removal is not possible.

SECTION 2
ENGINEERING DATA

2.1 Design

Plans showing 1936 and 1957 improvements were located at the Worcester County Court House - Engineering Department. E.P. Moseley is the Engineer indicated on the 1957 plans; there is no positive confirmation as to who prepared the 1936 plans. A County fact sheet and County Inspection Reports prior to 1971 are also available at that Department. A 1971 State Inspection Report was also found at the State Department of Environmental Quality Engineering Division of Waterways Office. No indepth design calculations were located.

2.2 Construction

No construction data was encountered regarding Whitney Pond.

2.3 Operation

No operational manual exists for the dam.

2.4 Evaluation

a. Availability

Plans showing 1936 and 1957 dam improvements, a County fact sheet, County Inspection Reports and limited County correspondence, were found at the Worcester County Court House - Engineering Department. The 1971 State

Inspection Report was located at the State Department of Environmental Quality Engineering Division of Waterways Office. The 1936 and 1957 Improvement Plans were also found at the Town of Winchendon Department of Public Works Office.

b. Adequacy

The lack of indepth engineering data does not allow for a definitive review. Therefore the adequacy of this dam, structurally and hydraulically, can not be assessed from the standpoint of review of design calculations, but must be based primarily on the visual inspection, past performance history, and engineering judgement.

c. Validity

The field investigation indicates that the external features substantially agree with those shown on the furnished data.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General

The Whitney Pond Dam was inspected on November 13, 1978. At that time, approximately 1 to 3 inches of water was passing over the spillway and some leakage through the stop logs was also observed. The upstream face of the dam could only be inspected above this water surface.

b. Dam

The dam consists of a masonry spillway section about 82 feet long abutted by a 30± foot earth embankment on the right and a 450± foot earth embankment on the left. The left training wall of the spillway section forms a retaining wall abutment for the left embankment section. The embankment serves as a multiple track railroad right-of-way, as shown in photo 1. The definition of the dam embankment is complicated by its use as a railroad fill. Based on this inspection, the left embankment dam section is defined as 450+ feet long. Total dam length is 562± feet.

Visual inspection of the dam indicated it is in good condition.

Left Embankment Section

Upstream Slope

The upstream face of the embankment is sloped at about 1.5H:1V. The upper 10 feet of the embankment was visible above the water surface. Riprap slope protection extending about 1 foot above the waterline and over most of the embankment

length, consists of a small-sized broken rock. Adjacent to the left training wall of the spillway and extending for a distance of about 75 feet, large-sized riprap has been placed. Both sizes of riprap may be seen in photo 12. Dense brush has grown on the upstream slope above the riprap. This condition is shown in photos 2 and 12.

Crest

The crest of the dam, which serves as a railroad bed is shown in photo 1. Track maintenance would obscure any visible misalignment due to embankment movements. The crest is 25 feet wide at its narrowest point near the spillway structure.

Downstream Slope

The downstream face is on a slope of about 2.5H:1V. Photo 10 is a view of the downstream slope from the crest looking toward the left abutment area. The lower one third of the slope and the area immediately downstream of the toe is overgrown with brush and small trees. Photos 3 and 11 are views along the toe of the slope looking toward the left abutment. The entire downstream toe area was traversed, and no seepage or wet areas which could be attributed to seepage were observed. Some surface drainage collects at the toe of the slope. Adjacent to the left training wall of the spillway, an area of the downstream slope has been covered with large-sized rock. This area is shown in Photo 9. This rock was placed in repair of a slide in the embankment which damaged the toe of the training wall and a wing wall extend-

ing along the toe of the embankment.

Right Embankment Section

When originally constructed in 1880, this project included a power canal through the right abutment. In 1957 this canal was plugged by construction of a zoned earth embankment about 14 feet high and 30 feet long. This embankment consists of an impervious core with random fill upstream and downstream shells. Upstream and downstream embankment slopes were constructed on 1.5H:1V. The crest width is 6 feet.

c. Appurtenant Structures

The training walls of the spillway act as embankment retaining walls. The left training wall which retains the main embankment is shown in photo 13. The toe of the wall, which has been damaged by an embankment slide, has been replaced with a concrete section. The wall was in good condition at the time of inspection. The right training wall is shown in photo 5. This photo, which is of the extreme downstream end of the training wall, shows a portion of the wall downstream of the embankment which has fallen. The condition of the wall may be a result of demloition of an old structure which occupied this area. The condition of the wall presents no hazard at this time. Continued observation of this wall should be made. The spillway consists of the masonry abutments and three concrete buttresses infilled with stone masonry. The spillway and training walls are true, plum and appear to be in no distress. Water is

leaking out between the joints in the stone at the middle two sections of the spillway at about 1/3 the distance up from the base. The three concrete buttresses located at the spillway appear to be in good condition with some minor spalling. Large stones, which appear to have been hand placed, are located in front of the two middle bays of the spillway (photo 14). The purpose of placing these stones is unclear as the alignment of the spillway appears to be good.

The metal framed wood decked walkway over the spillway was weathered but basically in good condition. Approximately 5 lengths of handrail and one floorboard were missing. The walkway does not appear to have been painted or the wood oiled in some time.

d. Reservoir Area

The general area surrounding the reservoir is a wooded rural area as shown by photo 4. A more detailed description of the drainage area is included in Section 1.3 of this report. The amount of siltation within the reservoir is unknown.

e. Downstream Channel

The downstream channel is the natural riverbed shown by photo 6. It is broad and level with many trees located along the shoreline and upon several small downstream "islands". Some stones, old tires, and other debris are located within the downstream pond, however, these objects pose no major problem to continued flow. An "L" shaped concrete wingwall

located on the left side and the old masonry training wall on the right side define the immediate downstream channel.

3.2 Evaluation

Visual inspection indicated the embankment is in good condition.

No seepage was observed along the downstream toe of the embankment.

Dense brush growing on the downstream slope should be eradicated as part of an improved maintenance program.

The condition of the downstream section portion of the right training wall should be monitored to assure that eventual undermining of the right abutment does not occur.

There is no rapid draw down facility for this dam.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedure

No formal operational procedures were disclosed for Whitney Pond Dam. Discussion with the Town of Winchendon Department of Public Works indicate that they attempt to maintain 2 to 3 feet of stoplogs in place for summer pond recreation. They are also responsible for periodic general maintenance to the dam.

4.2 Maintenance of Dam

The dam, Whitney Pond, is maintained by the Town of Winchendon, Massachusetts. No known recent repairs were performed on the dam .

4.3 Maintenance of Operating Facility

There are no operational facilities for this dam other then provisions for flashboards. At the time of our inspection there was approximately 3 feet of flashboard in place. The apparatus used for regulating the flashing system appears to be in working order. The flashboard-stoplog system can be released by removing pins in the stanchion support system at the walkway level.

4.4 Description of Any Warning System in Effect

There are no warning systems associated with this dam.

4.5 Evaluation

Although the dam appears to be in adequate condition the current operation and maintenance procedures are not

formally written and therefore can not insure the successful treatment of all potential problems within a reasonable period of time. The dam should be inspected every two years by qualified personnel who can identify any areas of concern which could in time lead to serious deficiencies. A formal system for warning downstream residents during flood-flow conditions or imminent dam failure should be developed.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General

The dam was built in 1880 for power production. The spillway is basically a run-of-the-river type. It has a low surcharge storage capacity and a high spillage rate. The spillway is constructed of stone masonry with newer improvements being constructed of concrete. The remainder of the dam is an earth embankment which also serves as a railroad right-of-way.

The spillway has provisions for stop logs, several levels of which are normally used. The stop logs and their supports could cause blockages (allowing debris to build up) thus backing up water behind the dam.

Immediately upstream of the spillway are two railroad bridges. These structures could interfere with flood flow and cause a back-up of water.

b. Design Data

Deisgn data is not available for this project. Improvements and modifications have been made at various times by the owners of the dam.

c. Experience Data

During the flood of August 19, 1955, about 850 cfs passed the dam, with no significant problems occurring at the dam. This flow appears to have been contained within the spillway. No records of dam overtopping are known.

d. Visual Observations

Visual observations indicate that roads, bridges, dam and railroad lines above and below the dam would restrict flow and cause backwater condition.

e. Overtopping Potential

The test flood, full PMF, will produce an inflow of 60,950 cfs. The existing spillway can pass only 4,000 cfs, (7 percent of inflow) due to a partial blockage by the railroad bridge and assuming 3 feet of stop logs in place. Its capacity can be further reduced by debris caught on the stop log stanchions. The PMF will overtop the embankment area to elevation 985.1, 6.6 feet above the crest of the dam. The resulting outflow is 58,000 cfs. If the spillway were totally blocked the overtopping would reach elevation 985.25±.

f. Dam Failure Analysis

With water assumed to the crest of the earth embankment, an analysis produced an outflow of 22,000 cfs. Just below the dam is Tannery Pond and parts of the Town of Winchendon. Flood stage would be at depths of 5 to 10 feet above base flow levels. About 24 homes, businesses and factories would be damaged by about 3± feet of flood-water. Two roads would be under 8± feet of water. The small dam above Tannery Pond would be under about 8 feet of water. Loss of life could be expected.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stabiltiy

a. Visual Examination

The visual examination did not disclose any immediate stability problems.

b. Design and Construction Data

Plans showing the 1936 and 1957 modifications were made available at the Worcester County Court House. No construction records or design calculations were available. No drawings are available for the main embankment portion of the dam or the original construction of the spillway.

c. Operating Records

No operational manual exists for the dam.

d. Post-Construction Changes

The 1936 modifications included the provisions for 4'-8" of stop logs topped with 2'-0" of flashboards, the downstream concrete buttresses and the service walkway.

An embankment closure section was built in about 1957 in the original canal which passed through the right abutment.

A small slide on the downstream face adjacent to the left training wall of the spillway damaged a portion of the masonry wall which was rebuilt as a concrete section. The slide area was filled with large-sized rock. Both of the changes can be seen in photo 9.

e. Seismic Stability

This dam is in Seismic Zone 2, and according to USCE guidelines, it is assumed that there is no hazard from earthquake loading.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

The visual inspection indicates the dam is in good condition. Hydraulic and hydrologic analysis indicates the spillway to be inadequate to pass the test flood without overtopping.

b. Adequacy of Information

The information available is such that the condition of the dam must be evaluated from visual observations, past performance history and engineering judgement.

c. Urgency

The problems associated with the remedial measures of Section 7.3 should be carried out by the owner within two years of receipt of this Phase I Inspection Report. The recommendations of Section 7.2 should be carried out by the owner within one year of receipt of this Phase I Inspection Report.

d. Need for Additional Investigation

No additional investigation is needed to complete the Phase I Inspection.

7.2 Recommendations

The dam has a high hazard potential. The spillway can not pass the PMF test flood as per Section 5.1.e and the dam would be overtopped by over 6 feet. The owner, therefore

should engage a competent consulting engineer to evaluate further the potential for overtopping and the adequacy of the spillway. A draw down facility should also be added to the structure to insure the potential for rapid lowering of the pond under emergency conditions.

7.3 Remedial Measures

a. Operating and Maintenance Procedures

1. The owner should eradicate the brush and trees on the upstream and downstream slopes.
2. The owner should replace the missing sections of the handrails and floorboards on the walkway over the spillway.
3. Although the condition of the downstream right side training wall presents no hazard at this time, the condition of the wall should be monitored. If further deterioration of the wall back towards the spillway is observed over and above that shown in photo 5, the wall should be repaired to insure that eventual undermining of the spillway abutment does not occur.
4. The owner should develop a formal warning system to warn the downstream area in case of an emergency during periods of high stream flow.
5. The dam should be inspected every two years by qualified personnel who can identify areas of concern which, if left unchecked could jeopardize the safety of the dam.

7.4 Alternatives

Not applicable to this dam.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Whitney Pond

DATE Nov. 13, 1978

TIME 9:45

WEATHER sunny

W.S. ELEV. 969± U.S. ____ DN.S.

PARTY:

1. Ron H. Cheney HHB
2. David Vine HHB
3. Daniel P.LaGatta GEI
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Embankment	Daniel P. LaGatta	
2.	Spillway	Ron H. Cheney	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT Whitney Pond — DATE November 13, 1978

PROJECT FEATURE Embankment Dam — NAME Daniel P. LaGatta

DISCIPLINE Geotechnical Engineer — NAME Ron H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	The dam is an integral part of a railroad embankment 980.5±
Current Pool Elevation	969±
Maximum Impoundment to Date	unknown
Surface Cracks	None observed.
Pavement Condition	No pavement. Railroad on crest.
Movement or Settlement of Crest	None observed.
Lateral Movement	No misalignment was observed.
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Repair to slide on embankment adjacent to left training wall is evident.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	None observed.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	Except in vicinity of spillway there is no riprap on upstream face.
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.
Foundation Drainage Features	None.
Toe Drains	None.
Instrumentation System	None
Vegetation	Dense brush on upstream face. High grass and brush on downstream face.

PERIODIC INSPECTION CHECKLIST

PROJECT Whitney Pond DATE November 13, 1978

PROJECT FEATURE Embankment Dam NAME Daniel P. LaGatta

DISCIPLINE Geotechnical Engineer NAME Ron H. Cheney

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	There is no gate controlled outlet structure. River flow maintained over spillway.
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	None.
Debris	None.
Condition of Concrete Lining	Good.
Drains or Weep Holes	
b. Intake Structure	None.
Condition of Concrete	
Stop Logs and Slots	

PROJECT Whitney Pond DATE November 13, 1978

PROJECT FEATURE Embankment Dam NAME Daniel P. LaGatta

DISCIPLINE Geotechnical Engineer NAME Ron H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	None.
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	None.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST

PROJECT Whitney Pond DATE November 13, 1978

PROJECT FEATURE Embankment Dam NAME Daniel P. LaGatta

DISCIPLINE Geotechnical Engineer NAME Ron H. Cheney

Structrual Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	None.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECKLIST

PROJECT Whitney Pond Dam DATE Nov. 13, 1978

PROJECT FEATURE Embankment Dam NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer NAME Ron H. Cheney

Structural Engineer

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	None.
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECKLIST

PROJECT Whitnay Pond DATE November 13, 1978

PROJECT FEATURE Embankment Dam NAME Daniel P. LaGatta

DISCIPLINE Geotechnical Engineer NAME Ron H. Cheney

Structural Engineer

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Approach Channel	Free and Clear (below water)
b. Weir and Training Walls	
General Condition of Concrete	Concrete and masonry abutments of railroad bridges form the training walls for channel. These walls are in generally good condition. Spillway is stone masonry between concrete buttresses. No mortar in stone joints. Some spalling of concrete. No exposed or rusting reinf. bars.
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
c. Discharge Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Channel	Large stones in some places. Does not however effect flow.
Other Obstructions	Island in downstream channel.

PROJECT Whitney Pond DATE November 13, 1978

PROJECT FEATURE Service Bridge NAME Daniel P. LaGatta

DISCIPLINE Geotechnical Engineer NAME Ron H. Cheney
Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	
Bearings	There is a bridge across crest of the spillway which originally was used to service flashboards. Bridge consists of steel beams spanning between concrete buttresses with a wood plank deck and steel handrails. Five sections of horizontal rail are missing and one wood plank. Wood is weathered and appears not to have been painted or oiled in some time. Bridge is reasonably sound at this time.
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment and Piers	
General Condition of Concrete	Good.
Alignment of Abutment	Good..
Approach to Bridge	Good.
Condition of Seat and Backwall	Good.

APPENDIX B

ENGINEERING DATA

LIST OF ENGINEERING DATA

1. Plans showing 1936 modifications
2. Plans showing 1957 modifications

Location: Worcester County Court House
Engineering Department
Worcester, Massachusetts 01009

No indepth design calculations were located.

TOWN OR CITY Winchendon DECREE NO. PLAN NO. DAM NO. 05

LOCATION At plant of Baxter D. Whitney & Son. Notebook 9-P. 25 C. C. DOCKET NO.

DESCRIPTION OF DAM

Type Concrete & Cut Granite.
Length 115.0
Height 20'0
Thickness top 5.0
" " bottom - Couldn't determine
Downstream Slope Vertical.
Upstream " " — ?
Length of Spillway 82.0
Size of Gates 82.0 wide.
Location of Gates In Spillway
Flashboards used Yes.
Width Flashboards or Gates 7'0 high - 2" thick.
Dam designed by El. Top flashboards 972 8
" constructed by
Year constructed 1880. - "Whitney Dam."

GENERAL REMARKS

Owned by Winchendon El. L. & P. Co.
Inspected Dec. 14, 1927 - L.O. Marden.
" Oct. 13, 1929 - 10-14-29
13-2"
" July 5, 1934 - " "
" April 6, 1935 - " "
" May 22, 1936 - " ", Nason
" " 8, 1936 - "Young
" : Mar. 20, 1936 W.O.L., M.F.H.

DESCRIPTION OF RESERVOIR & WATERSHED

Name of Main Stream Millers River.
" " any other Streams
Length of Watershed (Traced and Approved
Width " " 5-4-40 E.C. Concord
Is Watershed Cultivated Appr. - L.O. Marde
Percent in Forests N. E. Power Co. 441 Stuart
Steepness of Slope St. Boston.
Kind of Soil
No of Acres in Watershed 53. Sq Miles = 33920 A
" " " " Reservoir 110. A.
Length of Reservoir
Width " " 1936 Flood El. 977.4
Max Flow Cu. Ft per Sec.
Head on Flashboards Low Water 1938 - Town of Winchendon
" " " high " 19'. Head used

GENERAL REMARKS

1936 - N.E. Power Construction Co. Stuart St. Boston
Second Inspection - 3-29-26 - L.O. Marden
New Plans & Specs approved 8-11-36 by C.C.
Inspected July 24, 1938 - L.O.M.
Inspected: Nov. 3 1937 - L.O.M.
Measured - See Sketch Oct. 14, 1938 - M.F. Hunt
Hunt Bk #1 Page 46:
Inspected : Dec. 6, 1938 - E.D. Strayer
" : Nov. 15 1938 - L.O. Marden
(over)

INSPECTION REPORT & DATA FOR DAMS

Dam No. 60-05
Town: Winchendon
Stream: Millers River
Pond: Whitney Pond
Date: 12/27/71
By: EAC

Owner: Town of Winchendon
His Address: Board of Selectmen, Front St., Winchendon
Function of Dam: Storage

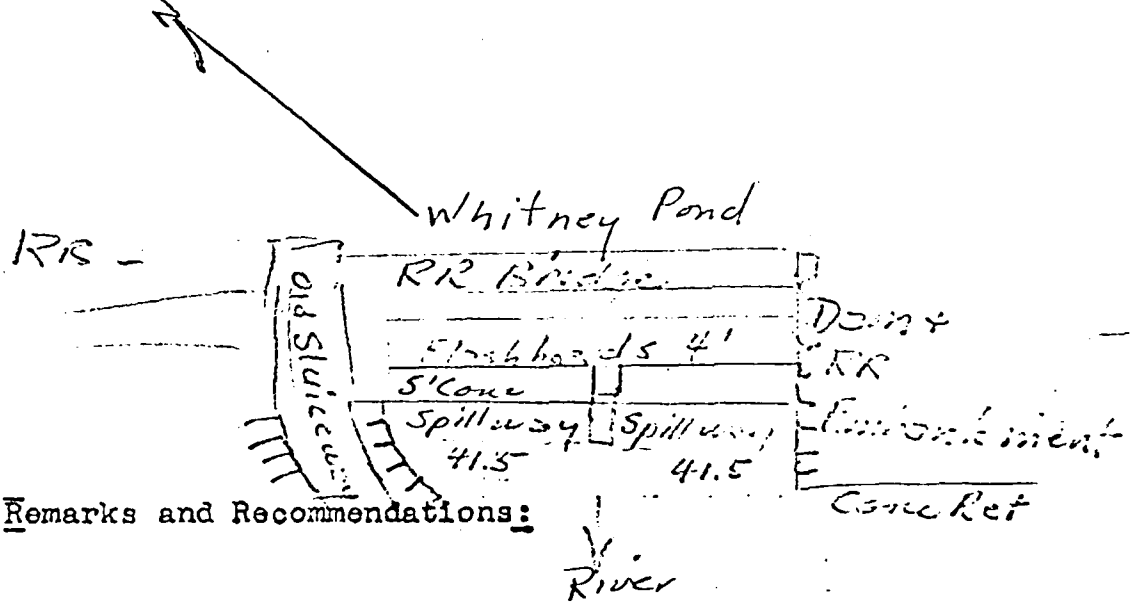
Location & Access: B&M RR Trestle behind Skating Rink
USGS Quad. Winchendon Lat. 42°41'20" Long. 72°02'30"
Drain.Ar.: 53.67 Sq.Mi.; Ponds: 110 ac.; Res.Cdam:
Character of D.A.:

CONDITION RATING
Structural: Good
Hydraulic:
General: Good
PRIORITY:

Estimated
Discharge
Capacity:

General Description of Dam and Discharge Control:

Sketch (Not to Scale):



Remarks and Recommendations:

Date 12/27/71 By EAC Comment

Dam No. 3-14-343-05

Inspected: Nov. 21, 1938 - L.O.M., Crockett, Jones, Harry Nelson - N.E. Power Co.
Patrol " Jan. 6, 1939 - E.S. Grover
" " Mar. 16, 1939 - " " "
Inspected: Sept. 26, 1940 - L.O.M. - Harry Nelson
" Feb. 26, 1944 - M.F.H.
" Oct. 17, 1946 - L.O.M.
" July 8, 1948 - LOM

1936 Repairs: New conc. piers, New flashboards, New Bridge

TOWN Northbridge DAM NO. 60-05

LOCATION Whitins Pond STREAM Millers River

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

Owned by _____ Place _____ Use _____

Inspected by M.F. Hunt Date Sept 9 1947

Type of Dam _____ Condition O.K.

SPILLWAY

Flashboards in Place Part - on Recent Repairs _____

Condition Being watched by Dewdney

Repairs Needed _____

[illegible]

[illegible]

[illegible]

[illegible]

GATES

Recent Repairs _____

Condition _____

Repairs Needed _____

[illegible]

[illegible]

[illegible]

County [illegible]

Whitinsville Pond

NAME Whitinsville DAM NO. 60-05

LOCATION _____ STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

Owned by _____ Place _____ Use _____

Inspected by T.C.M - M.B.R. Date 3-6-69

Type of Dam _____ Condition _____

SPILLWAY

Flashboards in Place — some in place - holding back 1' of water ± Recent Repairs _____

Condition _____

Repairs Needed _____

GATES -- closed - but water level has been lowered

Recent Repairs Reinspection 3-11-69 Some conditions same

Condition _____

Repairs Needed _____

TOWN Westborough DAM NO. 60-05

LOCATION Whitney Pond STREAM Mallard River

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

Owned by _____ Place _____ Use _____

Inspected by [illegible] Date Nov 11 [illegible]

Type of Dam _____ Condition [illegible]

SPILLWAY

Flashboards in Place [illegible] Recent Repairs _____

Condition [illegible]

Repairs Needed _____

[illegible]

Recent Repairs _____

Condition [illegible]

Repairs Needed _____

GATES

Recent Repairs _____

Condition _____

Repairs Needed _____

TOWN Winchendon DAM NO. 10-05

LOCATION Above Mt. Center STREAM Millers River
at the B. & M. Railroad "Whitney Pond"

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Owned by Town of Winchendon Place Selectmen Use Storage Pond

Inspected by W.O.L. Date Nov. 29, 1967.

Type of Dam Earth, stone and wood. Condition Good.

SPILLWAY

Flashboards in Place 6' of 4" thick boards Recent Repairs

Condition The automatic trips are ok. The steel work should

Repairs Needed be painted

[illegible]

[illegible]

Needed

GATES

Recent Repairs

Condition Concrete lined

Repairs Needed

[illegible]

[illegible]

DAM NO. [illegible] 62-35

LOCATION [illegible] STREAM Millers River

"Whitney Pond"

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

Owned by Town of Winchendon Place Selectmen Use Recreation Street Pond

Inspected by WCh Date Nov 6, 1954

Type of Dam Earth-stone-concrete Condition Good

SPILLWAY

Flashboards in Place 11 6" boards = 5'(4) Recent Repairs

Condition Good condition. The boards have leaks in case removed-

Repairs Needed [illegible]

GATES

Recent Repairs

Condition

Repairs Needed

Winchendon DAM NO. 60-05

TION East Winchendon Etc. STREAM Millers River

"Whitney Pond."

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Owned by Town of Winchendon Place Selectmen Use Storage

Inspected by WOC Date July 27, 1960

Type of Dam Stone - Concrete. Condition Good.

SPILLWAY

Flashboards in Place 9 boards Recent Repairs

Condition Good

Repairs Needed

Condition Good

Repairs Needed

Recent Repairs

Condition No gate is visible.

Repairs Needed

Original with Signature

TOWN Winchendon DAM NO. 60-05

LOCATION E. of Winchendon Ctr. STREAM Millers River

"Whitney Pond."

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

Owned by Town of Winchendon Place Selectmen Use Storage Pond

Inspected by W.O.L. Date May 27, 1959

Type of Dam Earth and Stone Condition Good

SPILLWAY

Flashboards in Place 5' of boards Recent Repairs

Condition Trip beams for releasing boards. Plank walkway upstream

Needs Needs Metal protection of beams etc. - Good condition

Condition Good condition.

Repairs Needed (Pond is full - with 1" of water over boards.)

GATES

Recent Repairs

Condition Provide 4 boards for gate.

Repairs Needed

Owner of Winchendon will be notified to have boards
put in.

DAM NO. [illegible]

STREAM [illegible]

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Owned by [illegible] Place Worcester Use None

Inspected by E. F. Leach - Lcm Date July 11, 1958
Edward Martin - Mc. Donald

Type of Dam [illegible] Condition Satisfactory

SPILLWAY

Flashboards in Place None Recent Repairs Filling in upstream with approval

Condition Wall at rt in place on top at Stoplogs

Repairs Needed Point of [illegible] and rip rap Replaced

[illegible]

Needed

Repairs [illegible] is satisfactory

Needed [illegible] some patchwork needed

None

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.
Harry Nelson-New England Power
Inspected by L.O.Warden-Com.Jones & Crockett 11-21-38 Dam No. 60-05

Town Winchendon Location Whitney Pond.

Owner Winchendon Power & Lt Co. Use power.

Material and Type

Dam Designed by Constructed by Year

SPILLWAY

El. top Abutment El. Crest El. Apron El. Streambed

Width top Abutment Width top Crest Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition examine condition of dam after 1938 Flood-Mr. Crockett wants catwalk from shore to canal wall, so as to reach trips of needle beams during high water-

EMBANKMENT

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition It is agreed to replace riprap and reslope downstream embankment

GATES Location

Size Kind El. Flowline

Condition

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure

Recent Repairs and Date

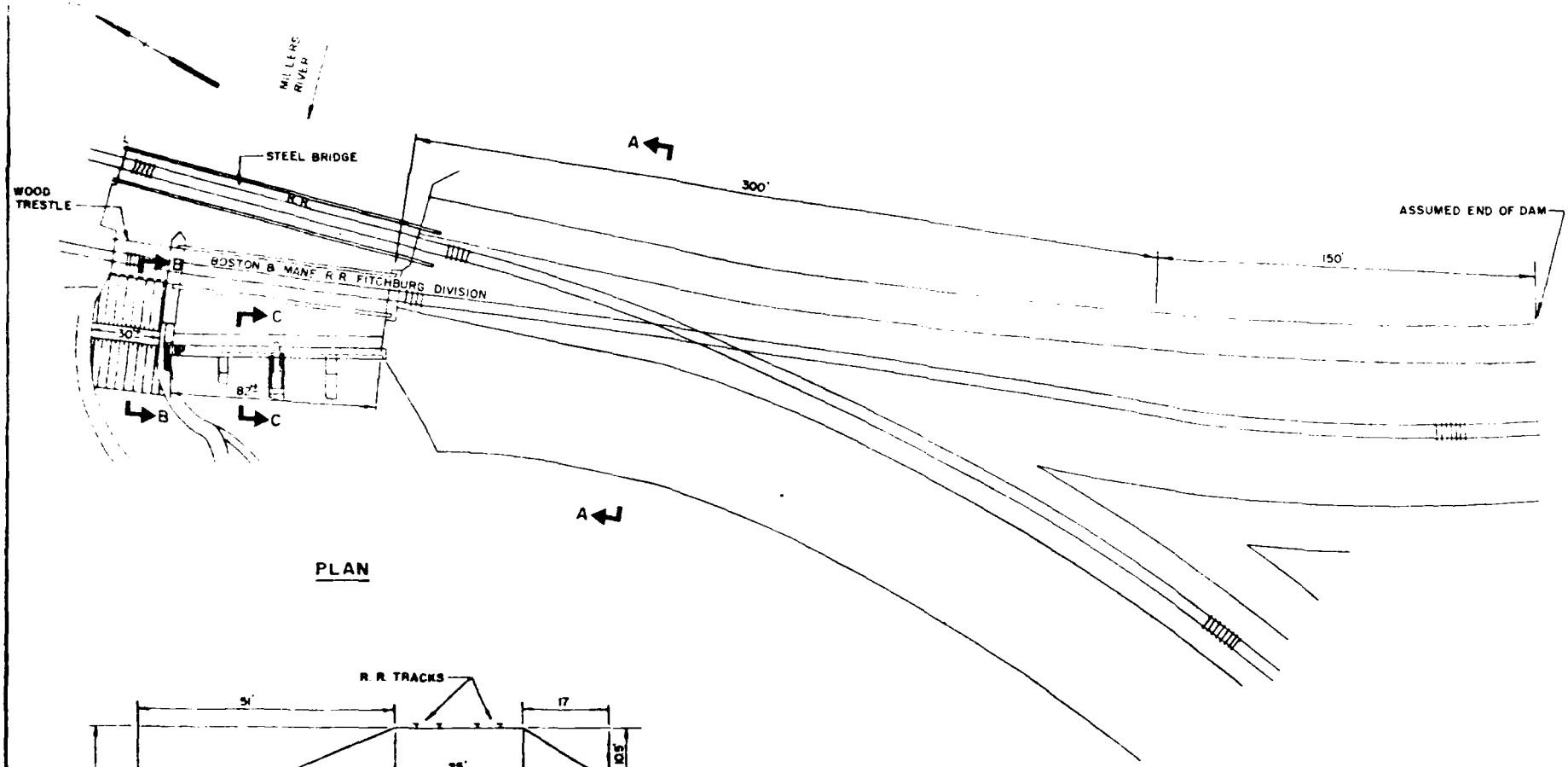
Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet



INFORMATION SHOWN TAKEN FROM PLANS DATED 1936 & 1957 AND FROM FIELD MEASUREMENTS

HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

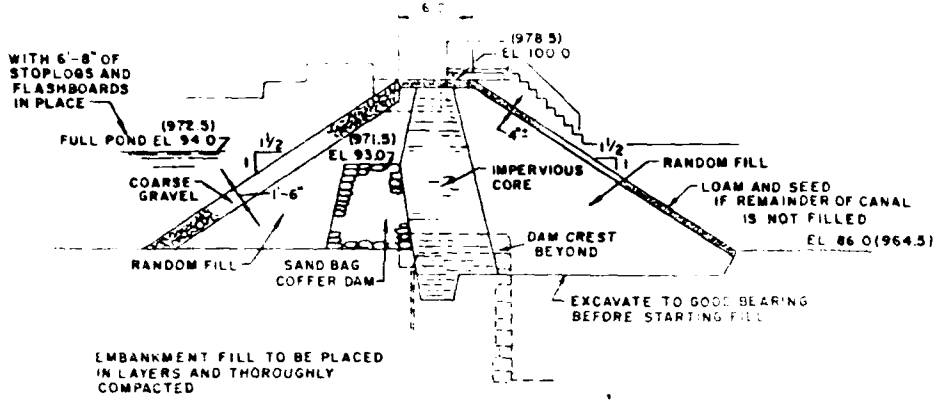
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WHITNEY POND

WINCHENDON MASSACHUSETTS

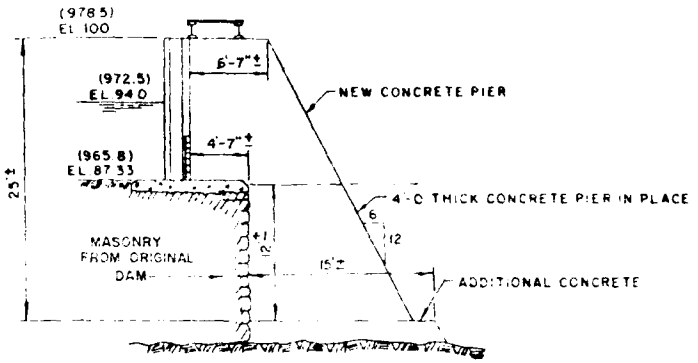
SCALE NOT TO SCALE

DATE FEBRUARY, 1979

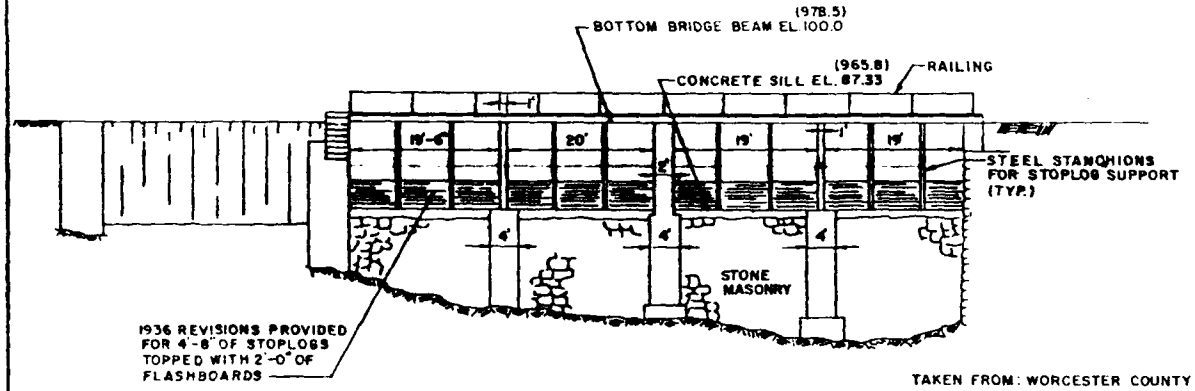


SECTION B-B

THIS EMBANKMENT CONSTRUCTED IN 1957



SECTION C-C



ELEVATION
LOOKING UPSTREAM

TAKEN FROM: WORCESTER COUNTY COMMISSIONERS, WORCESTER COUNTY ENGINEERING DEPT., DRAWING NUMBER: H-5880-O DATED 1936

DATUM:
U.S.C&G BENCH MARK Y-7, 1933
UNADJUSTED ELEVATION 979.612'=101.15'(AS SHOWN)

ELEVATIONS SHOWN THUS (965.5) ARE CONVERTED TO U.S.G.S. DATUM.

HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

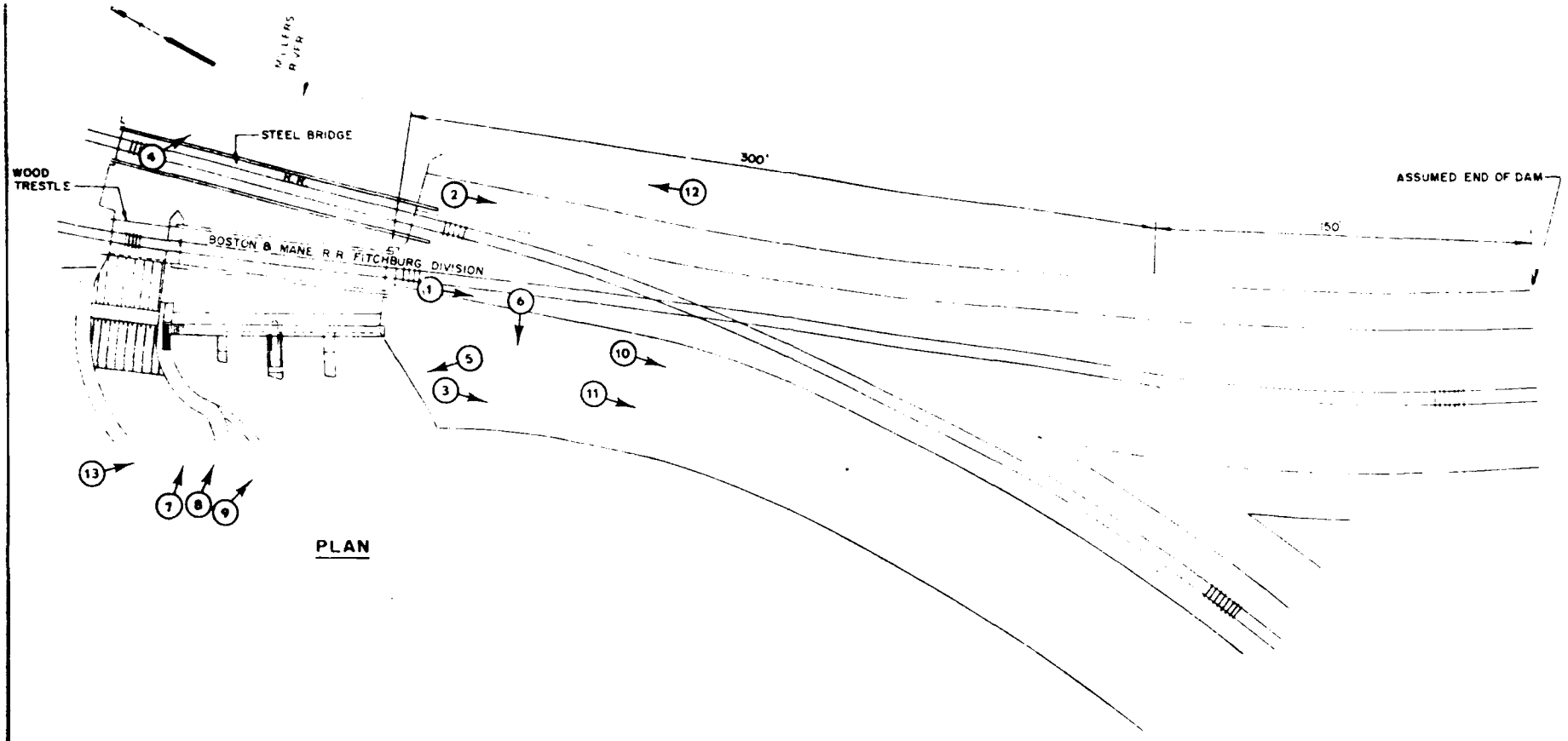
WHITNEY POND

WINCHENDON MASSACHUSETTS

SCALE NOT TO SCALE
DATE FEBRUARY, 1979

APPENDIX C

PHOTOGRAPHS



PLAN

HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION OF PHOTOGRAPHS
WHITNEY POND

WINCHENDON — MASSACHUSETTS

SCALE NOT TO SCALE
DATE FEBRUARY, 1979

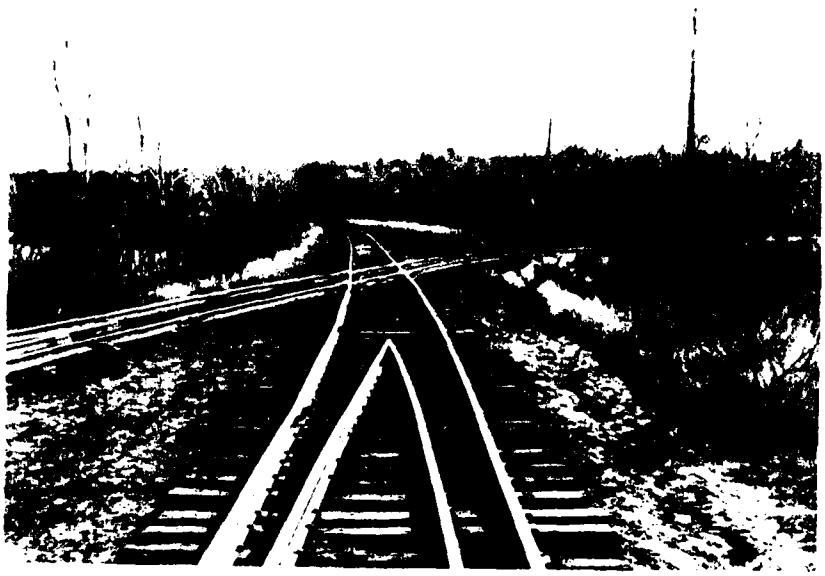


PHOTO NO. 1 - Crest of dam viewed from left abutment of railroad bridge.

PHOTO NO. 2 - General view of upstream face of dam viewed from the crest near the spillway training wall.

PHOTO NO. 3 - Downstream face of dam viewed from left wall of spillway towards left abutment.

PHOTO NO. 4 - Upstream view from railroad structure.

PHOTO NO. 5 - Right training wall of spillway.

PHOTO NO. 6 - Downstream view from dam.

PHOTOS NO. 7 & 8 - Panarama of spillway.

PHOTO NO. 9 - Toe of left training wall showing rebuilt section of wall and boulder fill on embankment.

PHOTO NO. 10 - Area at downstream toe viewed from crest about 100 feet left of spillway.

PHOTO NO. 11 - Downstream toe area viewed from vicinity of spillway training wall looking toward left abutment.

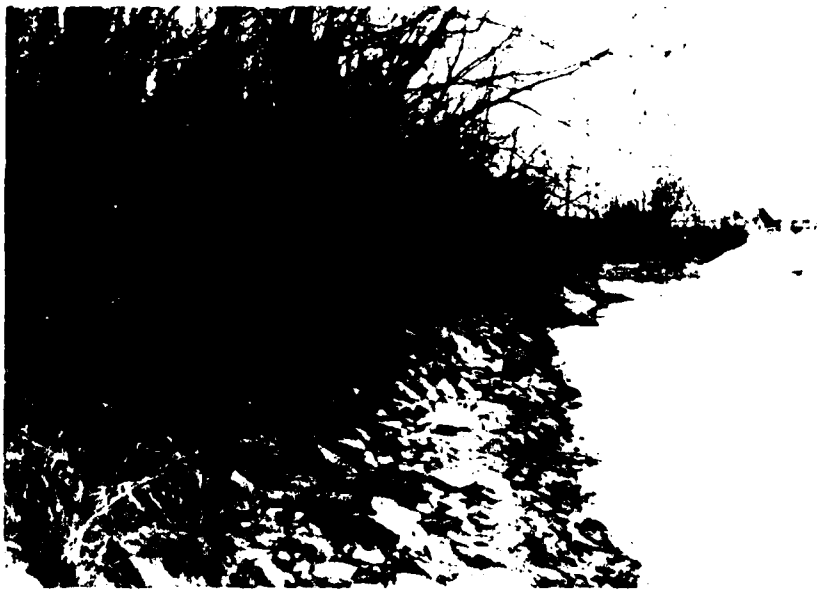


PHOTO NO. 12 - Upstream face of dam looking toward spillway.

PHOTO NO. 13 - Left training wall of spillway.

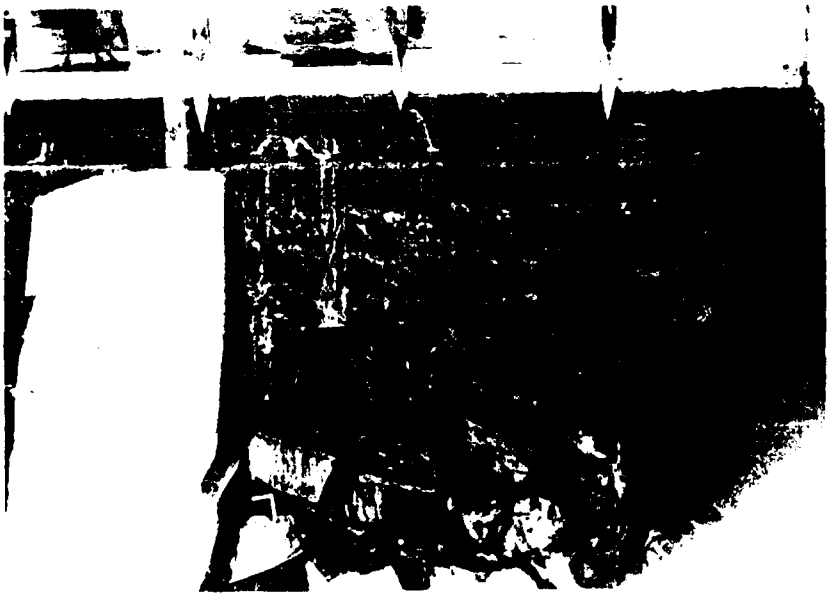


PHOTO NO. 14 - Stones piled in front of spillway.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Spillway Design

Hydraulic Data

Use COE Inventory of Dams in the U.S. & State Inspection

Spillway width = 82'
Impoundment capacity
Normal 510 acre-ft
Max = 1450 acre-ft

Structural Height = 25'
Hydraulic Height

Hydraulic Head on Spillway

Spillway Length = 82 ft.

SIZE CLASSIFICATION

Size Category

Height → Small
Impoundment → Intermediate

Use Intermediate Size Class

HAZARD POTENTIAL CLASSIFICATION

Use High Hazard Potential Classification

Test flood = PMF

Drainage area to Dam

delineated on USGS Quad Sheet & planimetered

A = 53 sq. mi. (33920 a) (Check: Rev. input Data
A = 53.7 sq. mi.)

Peak Flow

Use COE Flow Control Chart Tully & Brook Hill Dam
- Fall between Flat-Country and Rolling on
MPF Peak Flow Rates Chart

Use Rolling Terrain

PMF 1150 cfs/sq. mi. x 53 sq. mi. = 60,950 cfs.

Use PMF

Check Figure

PMF q = 47.50 cfs
(Corrected Peak Discharge) = 946 cfm

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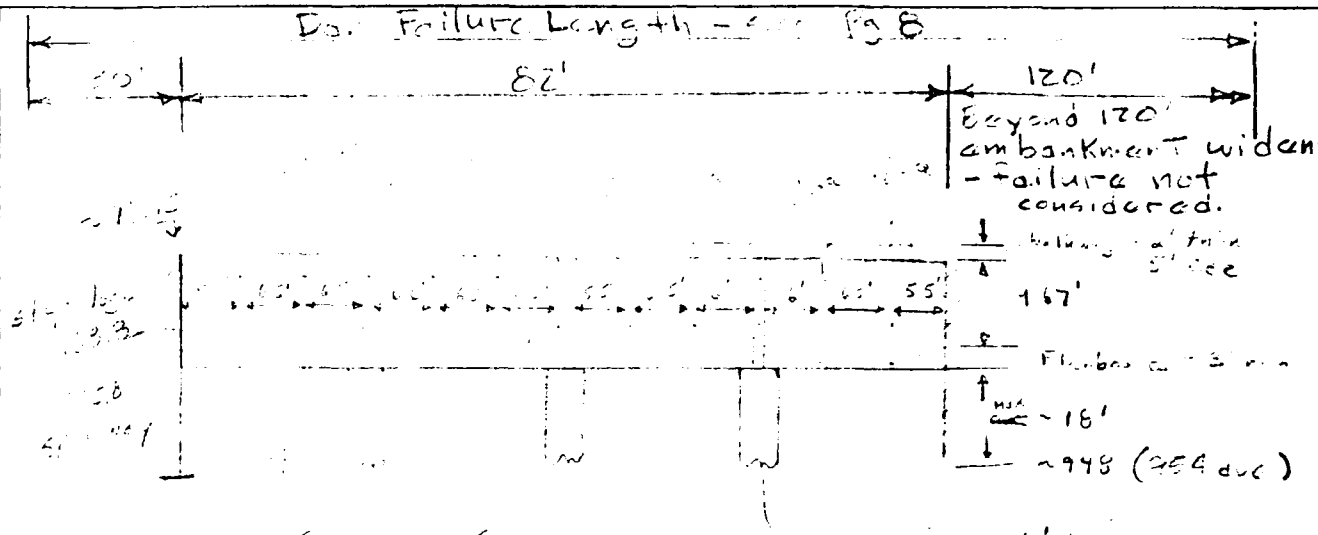
SHEET NO
JOB
SUBJECT
CLIENT COE

BY 12/27

Dr. Failure Length - [illegible] fig 8



[illegible] 4' thick

Open [illegible]: 9.47x ([illegible] see Tables 6.1, 6.2, 6.3)
9.67 [illegible] 715 LF ≈ 711 S.F.

[illegible] Flashboards removed in place to be

[illegible]

All [illegible] Bridge structure remains intact during Flood

[illegible] for Opened Conduit Culvert Blockages

[illegible] to obtain discharge.

Q = C L H^{3/2}

[illegible] L = 715 [illegible] length of spillway opening per tables)
H [illegible]
C [illegible] to be obtained from King's Handbook of Hydraulics

Use width of opening = 5 ft

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SHEET NO. 41
JOB Dam Safety Inspection
SUBJECT Hydraulics of Dam
CLIENT [illegible]

BY [illegible] 2/27

Spillway Capacity - No Blockage (See page 16)

H ft	H/L	C (Kings Handbook)	L ft	Q cfs	Elevation
0	-	-	-	-	968.8
0.5	0.35	2.60	73.5	65 ~ 70	969.3
1.0	1.0	2.69	"	197 ~ 200	969.8
2.0	2.83	2.65	"	551 ~ 550	970.8
3.0	5.20	2.66	"	1015.7 ~ 1020	971.8
4.0	8.0	2.70	"	1587.6 ~ 1590	972.8
5.0	11.13	2.77	"	2293 ~ 2290	973.8
6.0	14.70	2.91*	"	3133 ~ 3130	974.8
7.0	19.0		"	3945 ~ 3950	975.8
8.0	23.63		"	4963 ~ 4960	976.8
9.0	28.6		"	5725 ~ 5720	977.8
10.0	30.27		"	6410	978.5
10.5	3.6		"	6740	978.8
11.0	39.93		"	6495 ~ 9500	979.3
12.0	41.5		"	896	980.8
13.0	6[illegible]		"	14,971 14550	981.8
13.5	6[illegible]		"	14977 14550	982.6

* C value for H/L = 2.8 should be 2.9 (Corrected, see Engineer IV)

Estimate elev 975.8 & 976.5 Rail Road Bridge Blocks
flow to Spillway

[illegible] Dam & Railroad Embankment

[illegible] located in W.B.C. Guard shed

[illegible] = A/H

A = [illegible] H(10H+4)

A = 4H + 100 H²

L' = [illegible] + 10H

[illegible] 45' to 50' [illegible]

Spillway blocked - Flow Over RF Embankment

[illegible] CL Dam

[illegible] Crest Elev. Max. Reservoir Elev. 15'

Overflow Length From USGS Map

H	$H^{3/2}$	C	L'	Q	F. Freeb.
0	0		780'		979
0.5	0.35	[illegible]	[illegible]	7[illegible]	979.5
1.0	1.0	[illegible]	[illegible]	[illegible]	980
1.5	1.84	[illegible]	[illegible]	4,5[illegible]	.5
2.0	2.8	[illegible]	[illegible]	7,2[illegible]	981
2.5	3.95	[illegible]	[illegible]	[illegible]	.5
[illegible]	5.20	[illegible]	[illegible]	[illegible]	982
[illegible]	6.55	[illegible]	1130	[illegible]	.5
[illegible]	[illegible]	[illegible]	1150	24,[illegible]	983
[illegible]	9.55	[illegible]	1200	[illegible]	.5
[illegible]	11.1[illegible]	[illegible]	1230	31,640	984
[illegible]	12.[illegible]	[illegible]	1320	46,120	.5
[illegible]	14.7[illegible]	[illegible]	1350	53,350	985
[illegible]	16.[illegible]	[illegible]	1430	62,300	.5

Inflow

Spillway 4000 cfs
Embankment +57000 cfs
61000

Inflow = 61000 cfs
Elev 985.25±

Spillway 0
Embankment 61000
Elev 985.5±

If assume no spillway discharge (i.e. spillway blocked by debris) flow records significant by RR bridge upstream of dam spillway, clay native PMF [illegible] over top of embankment, [illegible] this would increase pool level by about 0.25, to elev. 985.25±.

JOB NO 7-246.
DATE 3/13/75
BY
CH'D BY

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SHEET NO 6
JOB Dam
SUBJECT
CLIENT

Outflow

Q_{P_1} = 60950 cfs El_{cu_1} = 985.25 (57000)

$Stor_1$ = 3800 - 264 = 3536 a-f at 1.25'

$Q_{P_2} = 60950\left(1 - \frac{1.25}{19}\right) = 56930.$ (57000)

El_2 = 985.0 $Stor_2$ = 3720 - 264 = 3456

$Stor_{ave} = \frac{3456 + 3536}{2} = 3496.$

$Q_{1/2}$ = 58,000± cfs El_2 = 985.1

Outflow = 58,000± cfs El_{cu} = 985.1

Spillway Flow 4000 cfs
Embankment Flow 54000. cfs

To 985.1 - 978.5 = 6.6'

Dam Storage at time of failure = 220 ac-ft.
at elev. 950.5

II Determine Peak Failure Outflow - Q_{pf}

$$Q_{pf} = 8/27\, W_b \sqrt{g}\, Y_o^{3/2}$$

W_b = Breach Width – includes part of embankment
$W_b = .4(\text{est. } 120) = 93'$ (See Pg 3)

Y_o = Total Height From River Bed to Pool level at Failure

Top of dam = Elev. 959 (assume)

$Y_o = 959.5 - 952 = 27' \pm$

$Q_{pf} = \frac{8}{27} \times 93 \times \frac{5.674}{32.2} \times (27)^{1.5} \approx 22{,}000$ cfs.

$Q_{pf} = 22{,}000$ cfs at dam failure.

III How do "rough" routing of Failure Outflow downstream

Cross section 1 approx 1000' downstream of Whiting Pond Dam

$S_o = 0.0036$ ft/ft

n = .03

use Manning eqtn:

@ H = 16'

Elev. 950 $A = \frac{1}{2}(16 \times 350 + 16 \times 350) = 5200$ sf

$P = 350.4 + 300.4 = 650.8$

$R = 7.990$

$Q = \frac{1.49}{.03} \times (7.990)^{\frac{2}{3}} \times (.003)^{\frac{1}{2}} \times 52.00 = 2.93 \times 3.997 \times 5200 =$

$Q = 61,363$ cfs > reqd

@ H = 10' Elev. = 154

$A = \frac{1}{2} \times 10 \times (218.4 + 197.5) = 5 \times 406.3$

$A = 2031.5$ sf

$P = 218.4 + 197.5 = 406.3$

$R = 4.9981$

$Q = 2.93 \times 4.998 \times 2031.5 = 17,335$ cfs Reqd

@ H = 13.1 Elev. = 957.1

$A = \frac{1}{2} \times 13.1 \times [13 \times 21.5 + 13 \times 21.5] = 3436.26$

$P = 245.17 + 286.93 = 532.10$

$R = 6.5920$

$Q = 2.93 \times (6.592)^{\frac{2}{3}} \times .054^{\frac{1}{2}} = 3657$ cfs. > Reqd.

See Sht 11 re: 5 & 8

At [illegible] Elev 957.1

Probable [illegible] Rte 12 Bridge

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Compute Volume of Storage in Reach

V_1 = Acre Length = $\frac{2500'}{43560}(100) = 5.7$

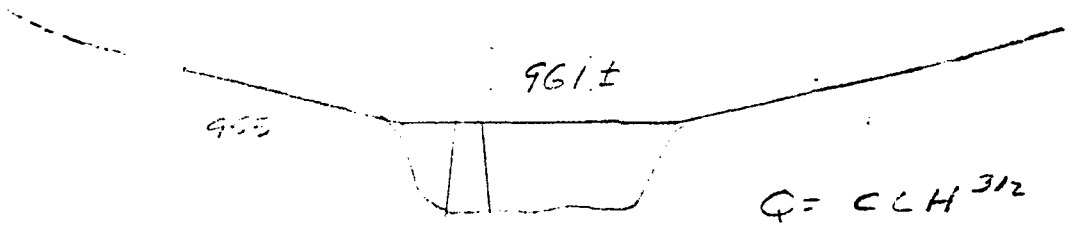
Total Q_{in} = $Q_{in}\left(1 - \frac{V_1}{5}\right)$ = 22^K (.977) = 21500. cfs

El_2 = 10.5 $Stor_2$ = $\frac{2250}{1}\left(\frac{1}{43.56}\right) \simeq 52$

$Stor_{ave}$ = 54.5 ac-ft

Q_{in_2} = $22^K\left(1 - \frac{54}{5}\right)$ = 21520

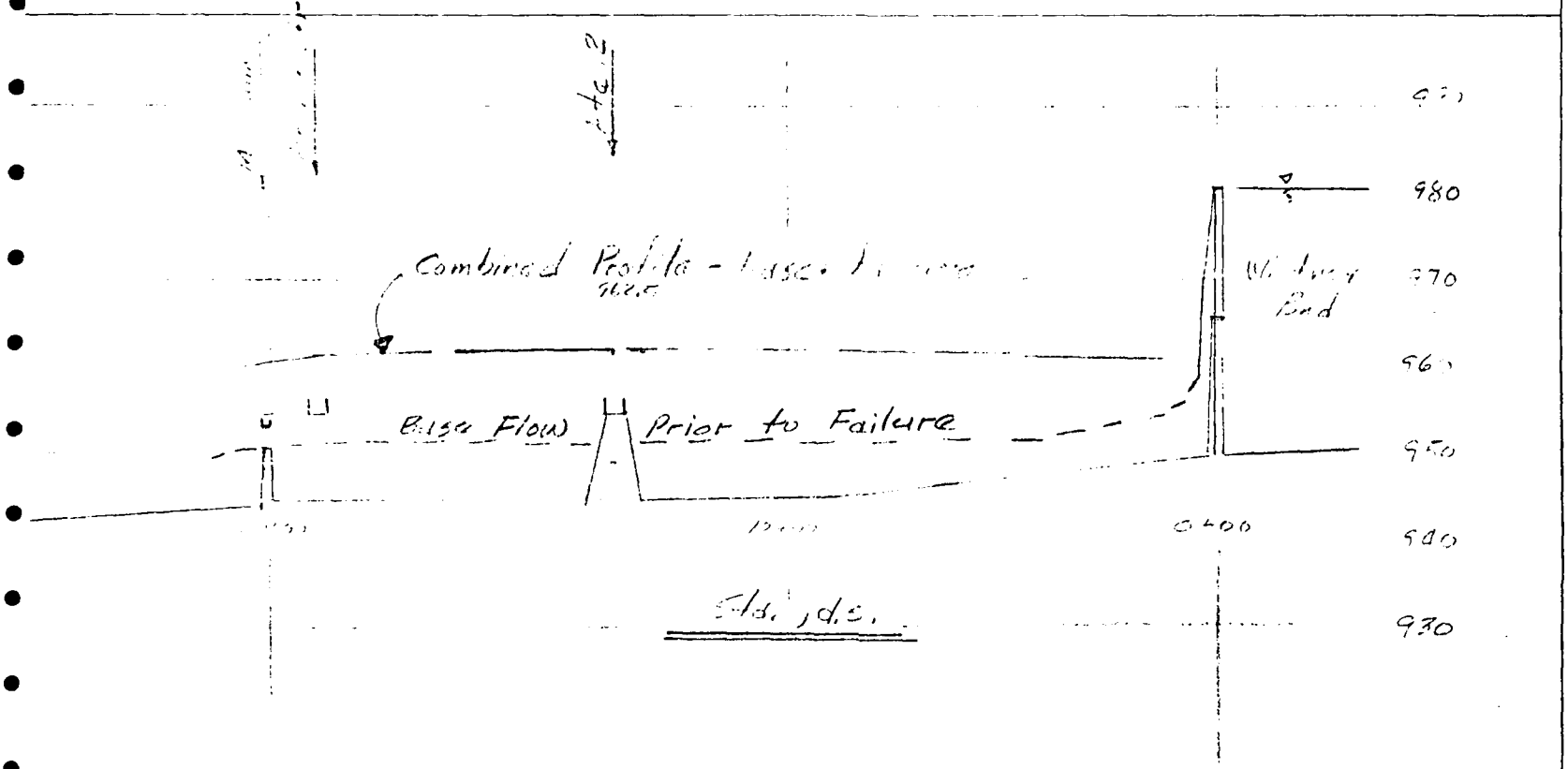
At ± 14+ (Pt. 12)



$Q = CLH^{3/2}$

D	C	L	$H^{3/2}$	Q
2	2.62	35	7.82	2600 ±
5	2.63	50	11.18	14700 ±
7	"	570	18.52	27,164 ±
6	"	540	19.7	20,873 ±
8	"	600	22.62	35700.

Elev ≃ 961±
≃ 21500 ok



Dam Assessment

14 houses 1' to 3' water damage
10 bldgs over 3' water damage
2 Roads 8" water damage

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BOSTON MASSACHUSETTS

JOB Dams
SUBJECT Failure Analysis
CLIENT Corps

SHEET NO 10

DRG NO 7
DATE 1/22/79
BY
CHKD BY

JOB NO
DATE
BY
CH'D BY

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BOSTON MASSACHUSETTS

SHEET NO 11
JOB
SUBJECT
CLIENT

Area to [illegible] Pond Dam

Drainage area covers 4 Quad Sheets

(1) Peterborough, N.H. Scale 1" = 1 mi = 5280'

$R_1 = 3.67$ $R_2 = 3.75$ $R_3 = 3.72$ $R_{Av} = 3.71$

$A = 3.71$ sq mi

(2) Marlborough, N.H. Scale 1" = 1 mi

$R_1 = .60$ $R_2 = 0.59$ $R_{Av} = 0.59$

$A = 0.57$ sq mi

(3) Fitzburg, Mass. - N.H. Scale 1" = 2000 ft.

$S_{(part)} = [illegible] \times 37,400 = 26.17$ sq. mi

SA: $R_1 = 2.72$ $R_2 = 2581$ $R_3 = 2575$ $R_{Av} = 2576$
$A = 3.70$ sq. mi

A- $R_1 = 7.43$ $R_2 = 7.44$ $R_3 = 7.52$ $R_{Av} = 7.48$
$A = 1.07$ sq. mi

[illegible] $R_1 = [illegible]$ $R_2 = 49$ $R_3 = 1944$ $R_{Av} = 1944$
[illegible]

JOB NO 7[illegible]
DATE [illegible]
BY [illegible]
CH'D BY MF

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SHEET NO. 1
JOB DAMS
SUBJECT Winchendon
CLIENT Corps

(3) Winchendon Mass. - N.H. Scale 1" = 3000 ft.

SA1 $R_1 = 37.09$ $R_2 = 37.65$ $R_3 = 37.73$ $R_{avg} = 37.69$
$A = 5.41$ sq. mi.

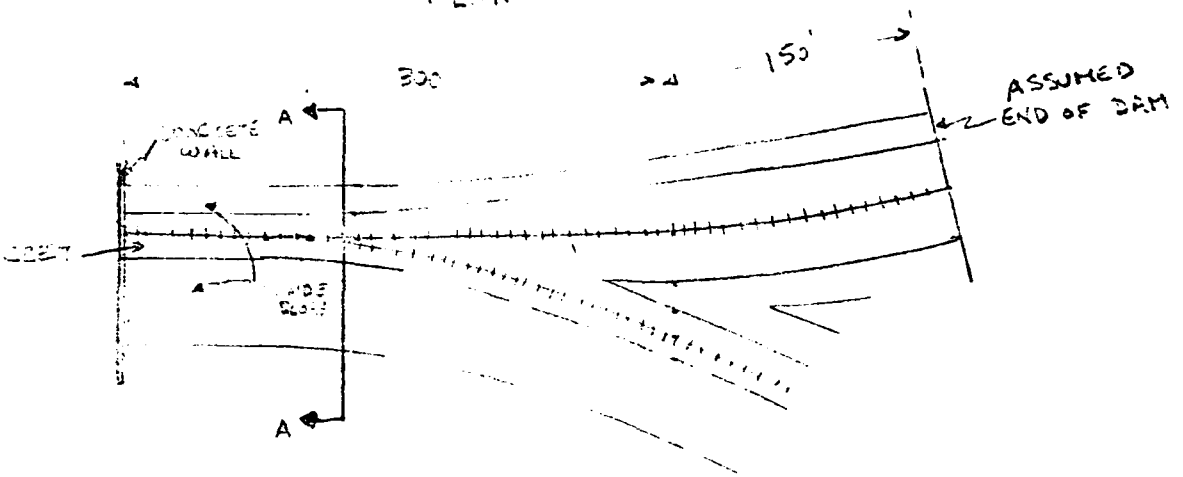
SA2 $R_1 = 50.52$ $R_2 = 50.41$ $R_3 = 50.36$ $R_{avg} = 50.45$
$A = 7.24$ sq. mi.

	A	Total A	ΣA
(1)	3.71	3.71	3.71
(2)	0.29	0.29	4.30
(3)	3.73 + 1.[illegible] + 29.17	35.73	40.03
(4)	5.41 + 7.24	12.65	52.68

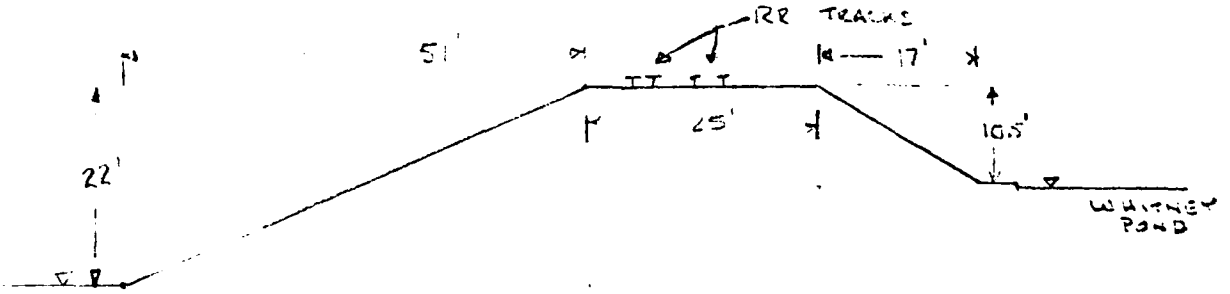
Total area = 53 sq. mi.

(W)HITNEY POND

PLAN



1" = 100'
(APPROX.)



SECTION A-A

1" = 20'
(APPROX.)

FROM 11-12-73
R.H.C FIELD NOTE

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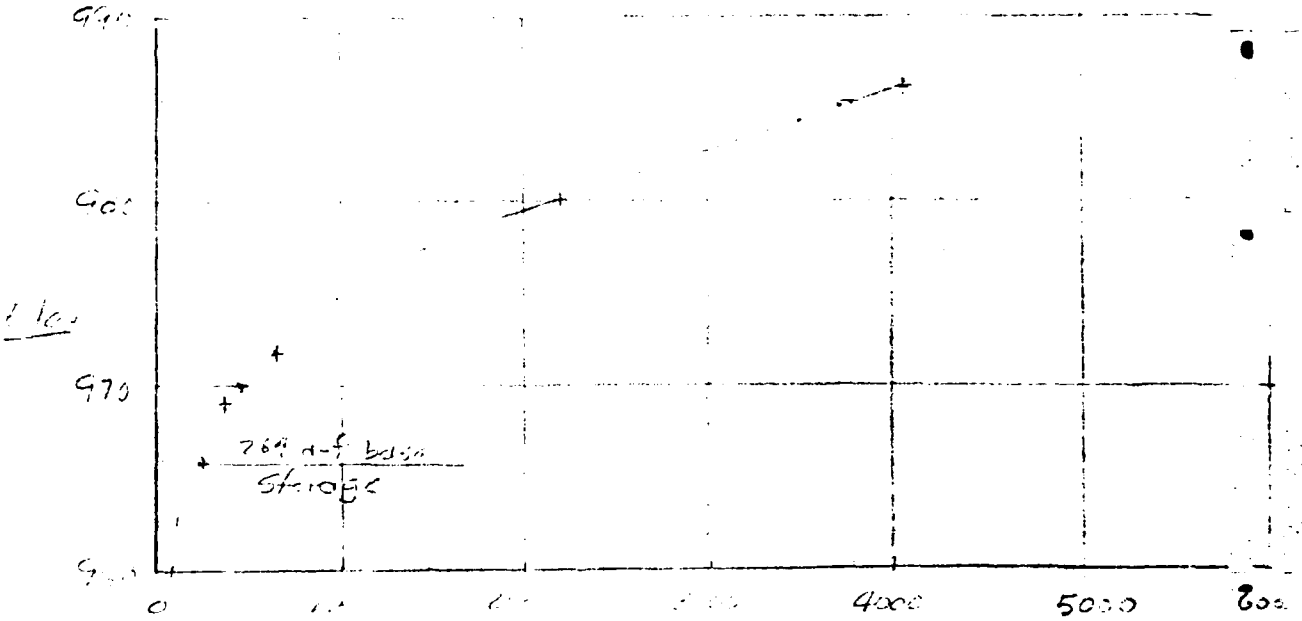
BOSTON MASSACHUSETTS

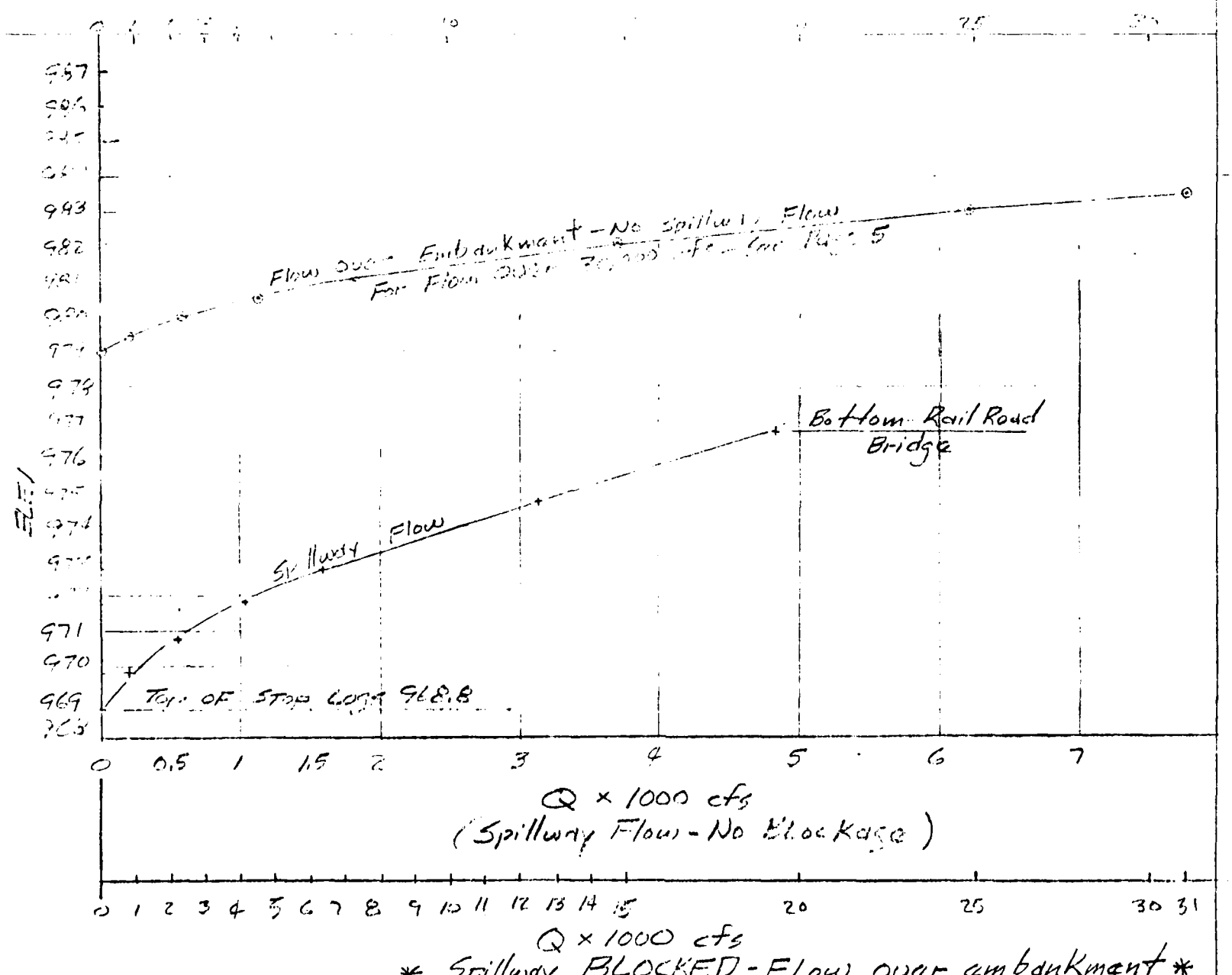
SHEET NO 1

Stor

Elev	L	Area	Ave Area	Stor	Accum S (+)
959	—	5	—	—	—
960	6	20	12	72	72
966	6	44	32	192	264
969	3	56	50	150	414
970	1	60	58	58	472
972	2	108	84	168	640
978	6	282	194	1552	2192
980	6	342	312	1860	4052
979	4	379			



Flood



JOB NO
DATE
BY
CHKD BY

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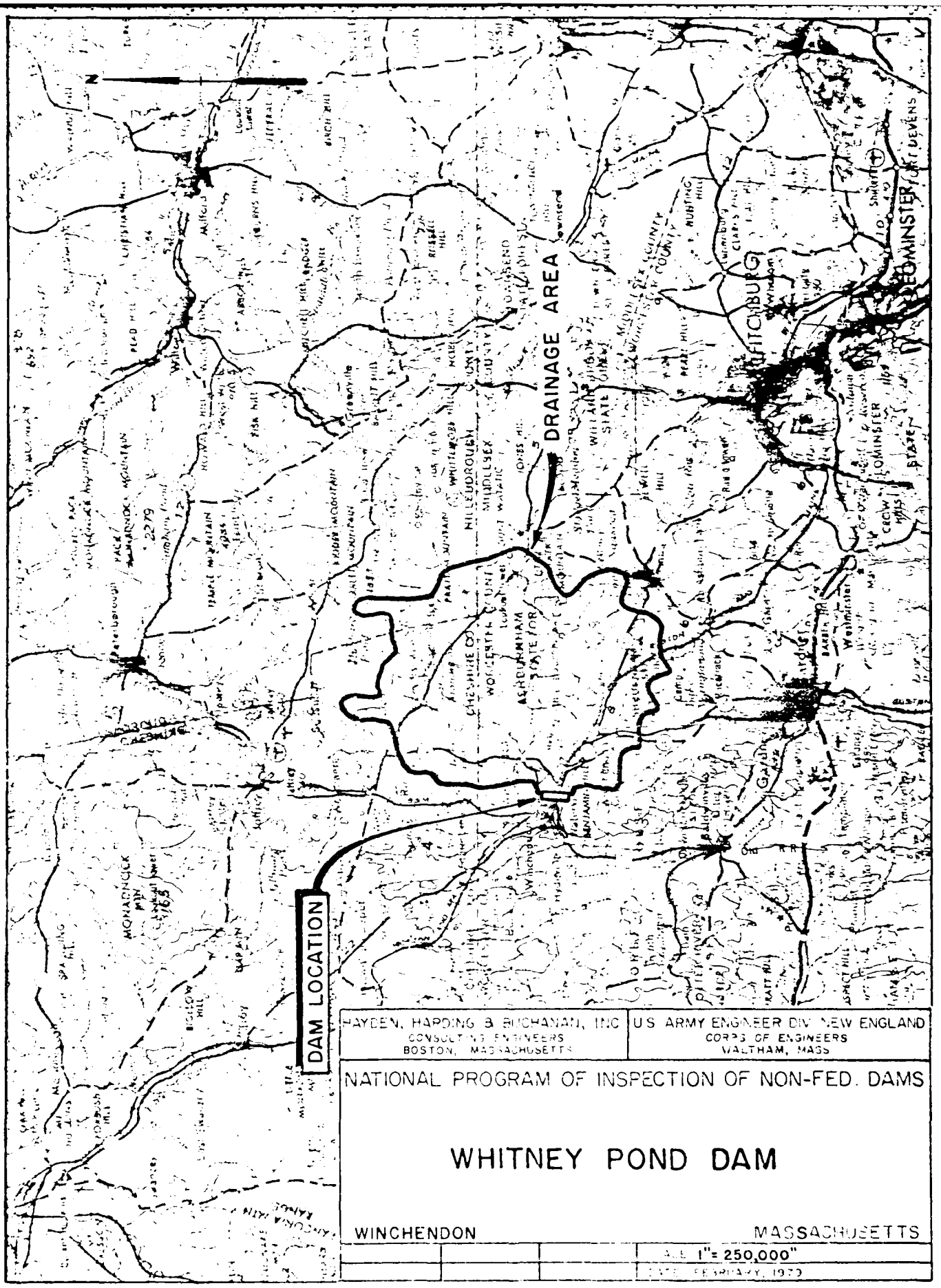
BOSTON MASSACHUSETTS

JOB
SUBJECT
CLIENT

SHEET NO 15



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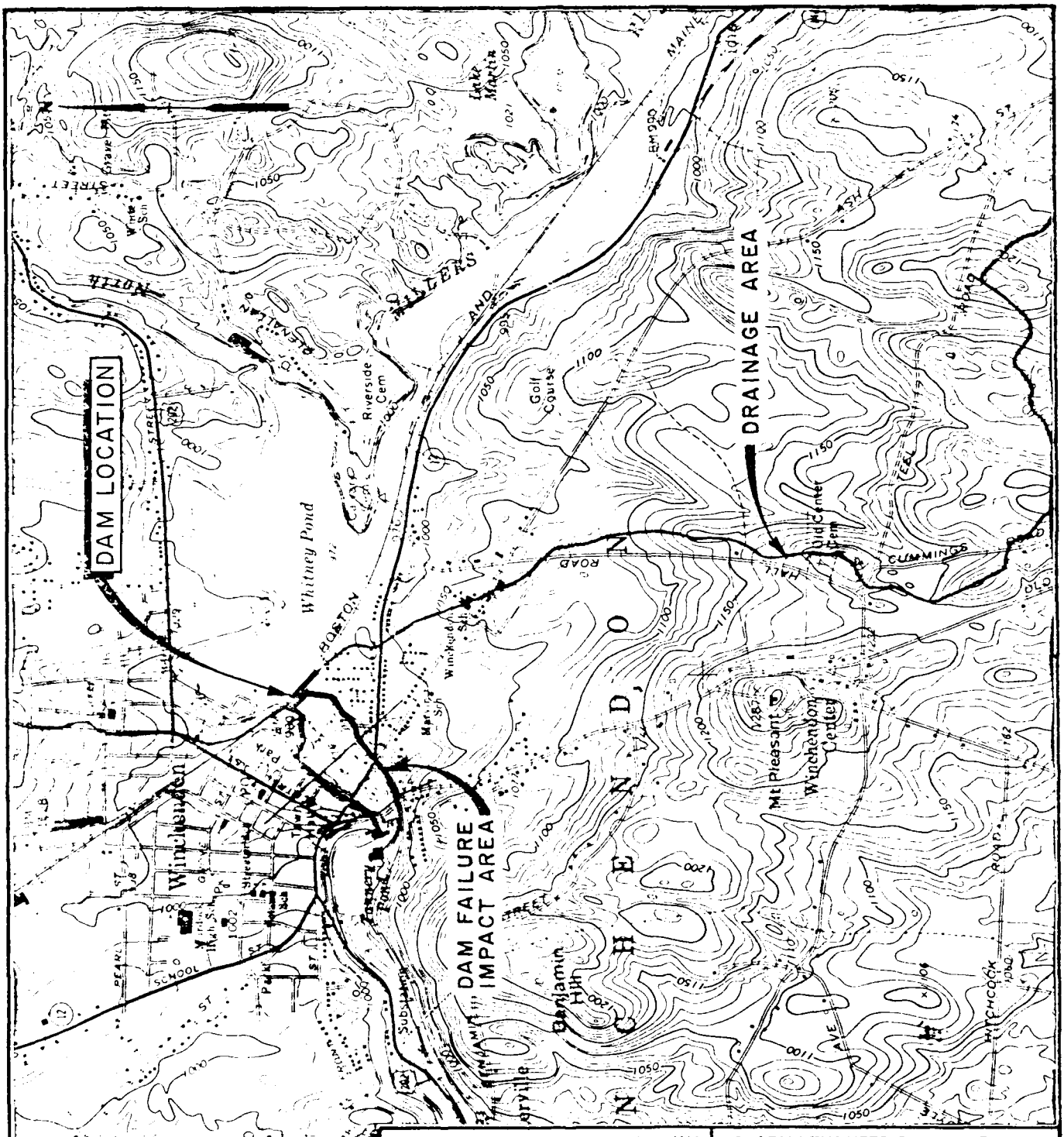
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WHITNEY POND DAM

WINCHENDON MASSACHUSETTS

			SCALE 1"= 250,000'
			DATE FEBRUARY, 1979



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NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WHITNEY POND DAM

WINCHENDON MASSACHUSETTS

			SCALE 1" = 2000'
			DATE FEBRUARY, 1979

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR. DIST.	STATE	COUNTY	CONGR. DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
MA	[illegible]	NED	MA	027	02				WHITNEY POND	4241.0	7202.5	23	FEB	79

POPULAR NAME	NAME OF IMPOUNDMENT
	WHITNEY POND

RIVER BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
[illegible]	MILLERS RIVER	WINCHENDON	0	6635

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	INSPECTION DIST	OWNER	FED REGULATORY	PRV/FED	SCS ACTIVITY	VERIFICATION/UPDATE DATE
[illegible]	1[illegible]	CR	25	21	2186	410	NED	N	N	N	N	07MAR79

REMARKS

TYPE	WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
[illegible]	42	8500												

OWNER	ENGINEERING BY	CONSTRUCTION BY
[illegible] WINCHENDON		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
[illegible]	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
HAYDEN HARDING + BUCHANAN, INC	13	NOV	78	PUBLIC LAW 92-367

REMARKS

31 PROVISIONS FOR 7 FT FLASHBOARDS