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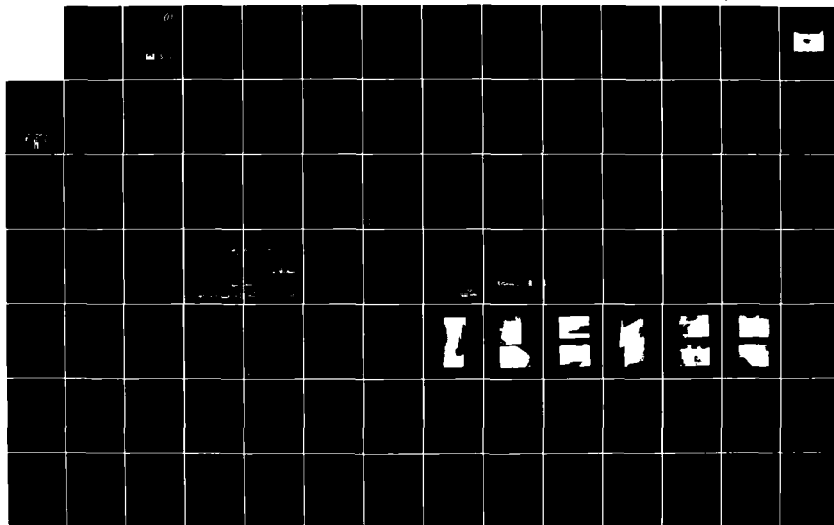
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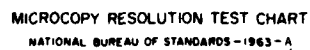
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CONNECTICUT RIVER BASIN
SOUTH BARRE, MASSACHUSETTS



POWDER MILL POND DAM
MA 00092

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

NOVEMBER 1978

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Connecticut River Basin South Barre, Massachusetts		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Powder Mill Pond Dam consists of an ungated concrete spillway approximately 125 feet long and 20 feet high, a short emergency spillway and an outlet canal with two inoperative timber gates. Powder Mill Pond Dam is currently classified as having a "high" hazard potential. Based on visual inspection, the facility is in fair to poor condition. Based on size and hazard classifications, the test flood for this dam 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

JUN 18 1970

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 Powder Mill 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 Powder Mill Pond Dam would likely be exceeded by floods greater than 37 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.

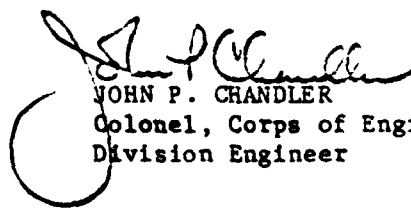
I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

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, Barre Wool Combing Company, Vernon Street, South Barre, Massachusetts 01074.

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,



JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

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CONNECTICUT RIVER BASIN
SOUTH BARRE, MASSACHUSETTS

POWDER MILL POND DAM

MA 00092

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

NOVEMBER 1978

**PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM**

Identification No.:	MA 00092
Name of Dam:	Powder Mill Pond
Town:	South Barre
County:	Worcester
State:	Massachusetts
Stream:	Ware River
Date of Site Visit:	11 May 1978

BRIEF ASSESSMENT

Powder Mill Pond Dam is located on the Ware River approximately one mile upstream of South Barre, Massachusetts. The dam, reconstructed in 1908 to generate electric power for the Barre Wool Combing Company, consists of an ungated concrete spillway approximately 125 ft. long and 20 ft. high, a short emergency spillway and an outlet canal with two inoperative timber gates. The dam was extensively modified during the 1930's.

Powder Mill Pond Dam is currently classified as having a "high" hazard potential in the Corps of Engineers National Inventory of dams.

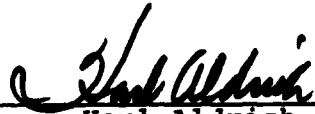
Based on a visual examination of the structure, the facility is in fair to poor condition. Nevertheless, there was no evidence of structural failure or other conditions which would warrant urgent remedial treatment.

Based on size and hazard classifications in accordance with Corps of Engineers guidelines, the test flood for this dam is the Probable Maximum Flood (PMF). The PMF outflow of 48,160 cfs would overtop the dam by 5.15 ft. With the water level at top of dam, the main and emergency spillways can pass 17,940 cfs which is 37 percent of the test flood.

The Barre Wool Combing Company, owner of the dam, should engage a registered professional engineer to determine the structural stability of the main spillway, to evaluate alternative measures for increasing the discharge capability of the dam and to inspect the spillway weir under no flow condition as outlined in Section 7.2. The results of those investigations and remedial measures, including restoration of the outlet works to operational condition, repair of concrete surfaces

and reconstruction of slope protection as outlined in Section 7.3 should be implemented by the owner within one year after receipt of this report.

HALEY & ALDRICH, INC.
by:



Harl Aldrich
President



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



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

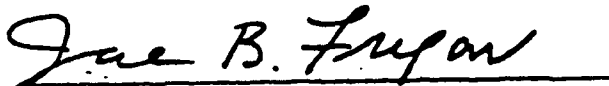


FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control 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, DC 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 Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm run-off), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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1. Overview of downstream face of dam



FILE NO. 4160 A20

DAM: Powder Mill Pond

IDENTIFICATION NO. MA 00092



LOCATION MAP
USGS QUADRANGLE
BARRE, MA.

APPROX. SCALE: 1" = 2000'

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM
POWDER MILL POND DAM
MA 00092

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.

Haley & Aldrich, 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 were issued to Haley & Aldrich, Inc. under a letter dated 26 April 1978 from Colonel Ralph T. Garver, Corps of Engineers. Contract No. DACW33-78-C-0301 has been assigned by the Corps of Engineers for this work. Camp, Dresser & McKee, Inc. was retained as consultant to Haley & Aldrich, Inc. on the structural, mechanical/electrical and hydraulic/hydrologic aspects of the investigation.

B. Purpose. The primary purposes of the National Dam Inspection Program are to:

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 PROJECT DESCRIPTION

A. Location. The Powder Mill Pond Dam is located on the Ware River, approximately one mile upstream (northeast) of South Barre, Massachusetts and the MDC's diversion to the Coldbrook intake as shown on the Location Map, page viii.

B. Dam and Appurtenances. The main portion of the dam is formed by a main spillway with flashboards and a short emergency spillway separated by a concrete pier. Right of the spillways is a rectangular concrete outlet canal. The right earth abutment is flat and contains a concrete core wall. A plan sketch of the configuration of the dam is shown in Appendix C-1.

The broad earth abutments left of the spillways and right of the outlet canal are shown in Photos No. 2 and 10, respectively. There is an approximately 90 ft. long concrete core wall, the top of which is visible, in the right abutment. The abutments are generally flat and grass-covered. Brush and small trees are growing on the upstream sides.

The concrete ogee spillways are approximately 155 ft. long and 13 ft. high. The main and emergency spillway crest elevations are 624.6 and 628.6, respectively. However, flashboards 2.7 ft. high at the main spillway bring the normal operating levels to about El. 627.3. The spillways are shown in several photos in Appendix C.

An outlet canal with two timber slide gates is located on the right side. Water formerly discharged through the canal to generate power. The outlet canal and gates are shown in Photos No. 8 and 9.

C. Size Classification. Powder Mill Pond Dam has an estimated maximum storage capacity of 336 acre-feet and the embankment has a maximum height of approximately 21 ft. According to guidelines established by the Corps of Engineers, storage capacity of less than 1000 acre-feet and height of less than 40 ft. classifies Powder Mill Pond Dam in the "small" category.

D. Hazard Classification. Powder Mill Pond Dam is currently classified as having a "high" potential in the Corps of Engineers National Inventory of Dams. A failure of the embankment would cause an increase in the water surface elevation in South Barre Mill Pond. As shown in the Phase I Investigation report for South Barre Mill Pond Dam, should

this dam fail, excessive damage to industrial, commercial and residential structures as well as loss of life would occur. The dense multi-family housing immediately downstream of the dam would bear the full brunt of a dam failure. Therefore, it is recommended that the current hazard classification of "high" be retained.

E. Ownership. The dam has been owned by the Barre Wool Combing Company since 1902. The owner's address is: Barre Wool Combing Company, Vernon Street, South Barre, MA 01074 (phone: 617/355-2921). The owner was represented by Mr. John Gould during the course of this investigation.

Prior to 1902 the dam was reportedly owned by the heirs of Nathan L. Pratt of Sudbury, MA and George Heywood of Concord, MA.

F. Operator. Mr. John Gould is assigned responsibility for operation and maintenance of the dam.

G. Purpose. The dam was reconstructed in 1908 to create a water supply for generating power. Presently the dam serves no specific purpose since the mill has been closed.

H. Design and Construction History. The details of the original dam constructed prior to 1902 are unknown. In 1908, the dam was reconstructed for the Barre Wool Combing Co. by the R.I. Contract Engineering Co. of Providence, Rhode Island. L.B. Dow of Boston, MA was the consulting engineer.

Construction plans indicate that the main spillway was constructed with a 116-ft. long weir. Electric power generating equipment was installed at the discharge end of the outlet canal. An approximately 20-ft. long abutment wall extended right of the canal. Correspondence by the City Engineer (See Appendix B-3) indicates that the dam was founded on gravel approximately 6 ft. below the river bed. There was concern about the lack of riprap on the upstream side of the abutments and the quality of backfill under the foundation of the apron. The construction plans were apparently filed well after construction was underway, and the workmanship received little construction inspection.

In 1931 the County Engineer requested that the owner replace the left wall of the outlet canal, remove

and replace other deteriorating concrete in the area, and backfill with gravel between the canal and the right end of the main spillway. This letter is included in Appendix B-6. These repairs were reportedly made in 1933 in accordance with a drawing entitled "Plan of Repairs to Canal Wall Sluiceway and Intake".

Apparently concern about the dam was expressed after the 1936 flood which resulted in a construction drawing entitled "Plan of Proposed Repairs and Changes to Powder Mill Dam", approved 14 August 1936, shown in Appendix B-7. The major changes included lengthening the spillway weir to 125 ft., adding a new 80-ft. long concrete core wall right of the outlet canal, and placing riprap downstream of the spillways.

It is not clear from the available documents exactly when the main spillway weir was increased in length to 125 ft. and if and when the other changes proposed in 1936 were actually made. In any case, an inspection report dated 26 September 1938, Appendix B-11, states the 1938 flood "washed out north (right) abutment and wing completely for 50 ft. Main concrete spillway was not damaged." A sketch of a temporary clay cofferdam built upstream of the washout at the right abutment to divert the river back over the spillway appears in an inspection report dated 6 January 1939, Appendix B-13.

A statement concerning the proposed repairs to the dam following the 1938 flood appears in Appendix B-8. The repairs included rebuilding sections of the outlet structure and adding an approximately 90-ft. long earth embankment with concrete core wall right of the outlet works. This work is shown in a plan approved 21 March 1939 in Appendix B-9. The left abutment was fortified by raising the concrete wall sections and adding backfill. Immediately downstream an approximately 72-ft. long timber cribwork was constructed to protect the left bank. This work is shown in a plan dated 15 July 1939 in Appendix B-10.

No apparent modifications are known to have been made to the dam since 1939. Fill has been placed downstream of the core wall on the right side to make the ground surface level. Prior to the 3 August 1964 inspection, the power house had been removed.

I. Normal Operational Procedures. There is no formal established routine for the operation of the dam. The gates are not operable.

1.3 PERTINENT DATA

The elevation of the spillway crest shown on all the available record drawings since 1931 is El. 630.5. Although the datum for this elevation is unknown, it appears to be 5.9 ft. below National Geodetic Vertical Datum (NGVD), since the main spillway crest elevation is reported by the U.S. Geological Survey to be 624.6 NGVD versus El. 630.5. All elevations used herein are based on NGVD.

A. Drainage Area. The drainage area of the Ware River above the dam is approximately 98.5 square miles (63,040 acres) of which 55 sq. mi. is controlled by the Corps of Engineers Barre Falls flood control dam which was constructed in 1958. The pond surface when at El. 627 comprises only about 17.9 acres (0.03 percent) of this total. The watershed's topography is rolling to mountainous. The major tributary streams are the East and West Branches of the Ware River and the Burnshirt River.

B. Discharge at Dam Site.

1. Outlet Works..... Two timber gates
(not operable)
2. Maximum known flood at
dam site..... 14,250 cfs (1938 flood)
3. Ungated spillway capacity
at top of dam..... 17,940 cfs at El. 635.6
4. Ungated spillway capacity
at test flood pool
elevation..... 48,160 cfs (the test
flood outflow) pro-
vided the top of dam
was raised 12 ft. to
El. 647.6
5. Gated spillway capacity
at normal pool elevation.... Not Applicable
6. Gated spillway capacity
at test flood pool
elevation..... Not Applicable
7. Total spillway capacity
at test flood pool
elevation..... 48,160 cfs (the test
flood outflow) pro-
vided the top of dam
was raised 12 ft. to
El. 647.6
8. Total project discharge
at test flood pool
elevation..... 48,160 cfs at El. 640.75

C. Elevation.

1. Top dam.....635.6
2. Test flood pool-design
surcharge.....640.75
3. Design surcharge - original
design.....Unknown
4. Full flood control pool....Not Applicable
5. Recreation pool.....624.6
6. Spillway crest
(with flashboards).....627.3
(without flashboards).....624.6
7. Upstream portal invert
diversion tunnel.....Not Applicable
8. Streambed at centerline
of dam.....614.6
9. Maximum tailwater.....Unknown

D. Reservoir.

1. Length of maximum pool.....1 mi. (Est.)
2. Length of recreation pool..0.87 mi. (Est.)
3. Length of flood control
pool.....Not Applicable

E. Storage (acre-feet).

1. Top of dam.....336
2. Test flood pool.....630
3. Flood control pool.....Not Applicable
4. Recreation pool.....20
5. Spillway crest.....20

F. Reservoir Surface (acres).

1. Top of dam.....51.5
2. Test flood pool.....62.4
3. Flood control pool.....Not Applicable
4. Recreation pool.....6
5. Spillway crest.....6

G. Dam Embankment. Not applicable.

H. Diversion and Regulating Facilities. Not applicable.

I. Main Spillway.

1. Type.....Concrete ogee
2. Length of weir.....125 ft.
3. Crest elevation.....624.6
4. Gates.....None (flashboards are
2.7 ft. high)
5. U/S Channel.....Unknown
6. D/S Channel.....Approximately one
percent slope
7. General.....Emergency spillway
is 30.5 ft. long

J. Regulating Outlets. Water was used from the reservoir and discharged downstream through a rectangular canal at the right side of the dam. Control of this water was by two single-stem timber gates 9 ft. wide by 5-1/2 ft. high. They were manually operated utilizing a rack and pinion device and a worm gear. The operators were manufactured by S. Morgan Smith of York, PA. The right hand gate has an operable pressure relief opening within the gate. Invert elevation of the gates is 623.0. The gates are presently inoperable and leaking. (See Photos No. 8 and 9).

Discharge from the canal is through a morning glory opening in the floor at the downstream end and a pipe in the right side wall of the channel. The pipe was blocked when the structure it passed through was demolished and the foundation filled in.

SECTION 2-ENGINEERING DATA

2.1 DESIGN RECORDS

The ten record drawings available show proposed construction, modification and repairs, and therefore are considered design records. No design calculations were located.

2.2 CONSTRUCTION RECORDS

No detailed construction records were located. Mention of construction activity was made in several prior inspection reports and subsequent correspondence. A sketch of a temporary cofferdam constructed during repairs to the dam was made in an inspection report dated 6 January 1939.

2.3 OPERATION RECORDS

No operational records other than general river level readings of a nearby gaging station are available.

2.4 EVALUATION

A. Availability. A detailed list and the location of all the engineering data mentioned in this section and available for use in this report are included in Appendix B. Selected documents from this listing are also included in Appendix B.

B. Adequacy. While the available data provide some useful information, certain important details regarding the design assumptions, construction materials and construction methods used are lacking or are incorrect. The lack of in-depth engineering data did not allow for a thorough Phase I evaluation. The evaluation of the dam is based primarily on visual examination, past performance and engineering judgement.

C. Validity. The 1908 record drawings are no longer valid, since many changes and modifications were subsequently made to the dam. However, the configuration of the dam and appurtenances shown in 1938 and 1939 record drawings is in general agreement with visual field observations. Elevations shown on these drawings are based on an unknown datum and should not be considered accurate.

SECTION 3-VISUAL EXAMINATION

3.1 FINDINGS

A. General. The Phase I visual examination of Powder Mill Pond Dam was conducted on 11 May 1978.

In general, the project was found to be in fair condition. A number of deficiencies which require correction were noted.

A visual inspection check list is included in Appendix A and selected photographs of the project are given in Appendix C.

B. Dam. The structure has no discernable earth embankment, either left of the spillways or right of the outlet canal.

A broad abutment of earth fill and waste material occurs on the left side. The top of this fill is at or above the level of the left spillway training wall, Photo No. 2. Some erosion and sloughing has occurred behind and around the downstream end of the left spillway wall, Photos No. 2 and 3.

On the right side, an earth embankment approximately 20 ft. high and 90 ft. long with a 2 horizontal to one vertical upstream slope and a 3:1 downstream slope, was constructed in 1939. Since 1939, the area downstream of the embankment has been filled to a nearly level grade to the end of the canal. Only the top of the concrete core wall and some riprap, shown in Photos 10 and 11, are presently visible. Visible portions are in satisfactory condition.

C. Appurtenant Structures. The spillway weir was not observable due to the flow of water over the crest. The left side wall (abutment) was found to be in excellent to good condition. Only minor shrinkage cracks, spalls, and efflorescence were noted. The timber crib wall located downstream of the left side wall has deteriorated and is collapsing, Photo No. 4. The right abutment concrete is in good condition with deterioration only noted in the contact area of the flowing water and at the downstream end.

The emergency spillway wall located between the right

abutment of the main spillway and the outlet canal is in fair condition. The entire downstream surface exhibits staining, efflorescence and loss of the finished surface, Photo No. 7. There is definite deterioration at the cold joint between a concrete cap placed at a later date than the major portion of the wall, as well as at local spots in the wall, as shown in the photograph. Vegetation is present along the top of the wall. A concrete apron made up of concrete and cobbles is present at the base of the wall. This apron is undermined at the downstream end.

The control structure and canal vary in condition, Photos No. 8 and 9. The upstream end of the gate platform has efflorescence present and the edges of the service platform have deteriorated. Nevertheless, the condition is generally good. The channel walls have been repaired at least once in the past and probably more than once. The left wall and portions of the right wall show evidence of undermining due to deterioration of the concrete. Deterioration has taken place at old cold joints and at the juncture with concrete placed at a later date. The walls are braced by steel beams spanning between the walls, Photos No. 8 and 9. The beams are rusted but are in good condition. Considerable debris is present on the floor of the channel.

The two single-stem timber gates at the inlet to the canal are shown in Photo No. 8 and described in detail in Section 1.3J. These gates are inoperable and leak between the planks and at the edges.

D. Reservoir Area. The area around Powder Mill Pond is relatively flat and generally wooded with some open areas. There were no conditions observed which could cause a sudden increase in sediment load into the reservoir. There is no possibility of a major landslide into the pond which could result in a wave overtopping the dam.

E. Downstream Channel. The floor of the downstream channel is made up of cobbles and boulders. A steep slope is present on the left side of the channel due to the collapsed crib wall. The channel is bordered by young trees. However, the channel is generally unobstructed and in excellent to good condition.

3.2 EVALUATION

Based on visual observations during the site visit

on 11 May 1978, the general condition of the project is fair. Deficiencies which have been noted require attention and may affect the future performance and safety of the dam.

SECTION 4-OPERATIONAL PROCEDURES

4.1 PROCEDURES

In general, there are no formal procedures to assure regular maintenance and satisfactory operation of the dam.

4.2 MAINTENANCE OF DAM

There are no established procedures or manuals to assure periodic inspection and maintenance of the dam.

4.3 MAINTENANCE OF OPERATING FACILITIES

There is no plan to operate and maintain the timber gates, which are presently inoperable.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning system or emergency preparedness plan in effect for this structure.

4.5 EVALUATION

Since failure of the dam would probably cause loss of life and extensive property damage downstream, an annual inspection and maintenance program should be developed. In addition, the Owner should prepare a formal emergency preparedness plan and warning system.

SECTION 5-HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

A. Design Data. Various plans prepared for the Worcester County Engineering Department and dated from 1908 to 1939 were the basis for the construction of the dam and ensuing repairs performed during these years. However, elevations shown on the plan are not considered accurate. Consequently, field measurements of the structure made during the inspection were the basis for the calculations in Appendix D. No hydraulic or hydrologic design data were found for this dam.

The recommended test flood for the size (small) and hazard potential classification (high) of this dam is in the range of one-half probable maximum flood (1/2 PMF) to the probable maximum flood (PMF).

B. Experience Data. The PMF was determined by using the peak inflow rate of 1109 cfs per sq.mi. as determined by the New England Division, Corps of Engineers for the Barre Falls Dam which is also on the Ware River, upstream of Powder Mill Pond Dam. The PMF was determined on the basis of the 43.5 sq.mi. drainage area downstream of the Barre Falls Dam. The upstream drainage area was excluded, as the downstream drainage area will have passed its peak before the peak outflow from the Barre Falls Dam reaches this dam. Furthermore, it was assumed that the releases from the Barre Falls Dam would be diverted into the Quabbin Aqueduct at the Coldbrook intake. On the basis of these assumptions, the PMF was calculated to be 48,240 cfs. By taking advantage of surcharge storage, the PMF was decreased to 48,160 cfs. This inflow results in a pond water surface elevation of 640.75 ft. NGVD, which is approximately 5.15 ft. above the top of the dam and 16.15 ft. above the main spillway crest.

C. Visual Observations. As stated previously, field measurements of the structure were made during the visual inspection. The channel immediately downstream of the dam is approximately 100 ft. wide and covered with cobbles and small boulders. Downstream to Barre Depot Road, the channel narrows down to approximately 60 ft. and has an estimated slope of 1 percent. The embankments under the bridge are

lined with large boulders, and on the day of the inspection the water was about 2 ft. deep at this location. Downstream of Barre Depot Road the channel slope is estimated to be 0.5 percent and has similar characteristics to the upstream channel. The river eventually flows into the South Barre Mill Pond.

D. Overtopping Potential. As stated previously, the test flood for the size (small) and hazard potential (high) classifications is in the range of 1/2 PMF to PMF. However, because of the large economic losses that would be incurred by a dam failure and the potential loss of life, the test flood is designated to be the probable maximum flood (PMF). Assuming that the flashboards are removed, the total capacity of both spillways is 17,940 cfs at El. 635.6 (top of dam). Since the value of the PMF is approximately 48,160 cfs, the spillways can only pass 37 percent of the test flood. The test flood would overtop the dam by an estimated 5.15 ft.

E. Evaluation. The spillway is not capable of passing either the PMF or the 1/2 PMF. If a failure of the dam were to occur, it appears that no homes immediately adjacent to the dam would be in danger. However, the waters would be near the top of Barre Depot Road, and there is a strong possibility that the bridge will wash out since much lesser flows in the March 1936 flood caused an abutment washout.

Assuming that the pool level at South Barre Mill Pond Dam would be normal (El. 608.5) at the time, a failure of Powder Mill Pond Dam would cause the dam to be overtopped by approximately 2 ft. This would result in excessive damage to industrial, commercial and residential structures as well as loss of life. An overtopping of 2 ft. would also increase the probability that the South Barre Mill Pond Dam would itself fail.

SECTION 6-STRUCTURAL STABILITY

6.1 EVALUATION OF EMBANKMENT STRUCTURAL STABILITY

There are no discernable earth embankments at the Powder Mill Pond Dam. Both abutments have been created by earth and miscellaneous fill materials. There was no visual evidence of instability or seepage conditions which would pose a hazard to the safety of the dam.

6.2 EVALUATION OF SPILLWAY STRUCTURAL STABILITY

A. Visual Observations. There was no visual evidence that movement or distress in the spillway concrete has taken place. However, the spillway was obscured by water flowing over the weir. The emergency spillway wall located north of the main spillway does exhibit deterioration but no evidence of movement was noted.

B. Design and Construction Data. Design data in the form of sketch plans dated 14 August 1936 are available. A review of the plans indicated that they do not show sufficient detail of the spillway currently in place, but do indicate the general conditions of the outlet works and side walls. However, as noted above, they are sketch plans and do not show the details necessary to make an analysis of the stability of the spillway.

C. Operational Records. No operating records other than prior inspection reports appended to this report are known to exist for the spillway.

D. Post-Construction Changes. The dam originally constructed in 1908, is known to have undergone a number of substantial changes. Repairs and strengthening of the outlet works are shown on sketch plans dated 1932, 1934 and 1939. Changes to the abutments are shown on a sketch plan dated 14 August 1936, while the timber crib wall is shown on a plan dated 15 July 1939. It is known that the spillway is considerably different than that shown on the 1908 plans. At some time after 1908, a concrete ogee weir was apparently constructed in front of the original spillway.

E. Seismic Stability. The Powder Mill Pond Dam is located in Seismic Zone 2 and in accordance with

recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

A. Condition. The visual examination of Powder Mill Pond dam revealed that the structure was in fair condition. Although there were no obvious signs of structural failure or other conditions which would warrant urgent remedial action, several deficiencies were noted.

Based on the results of computations included in Appendix D and described in Section 5, the main and emergency spillways are not capable of passing the test flood, which for this structure is the PMF. The PMF outflow of 48,160 cfs would overtop the dam by 5.15 ft. With the water level at the top of dam, the spillway system can pass 17,940 cfs which is 37 percent of the test flood. Failure of the dam would cause additional loading on the South Barre Mill Pond dam located about one mile downstream.

B. Adequacy of Information. A review of design and construction data is a highly desirable factor in developing a thorough Phase I assessment. However, there were insufficient engineering data available for this dam to allow for such a review. The evaluation of the dam is based primarily on visual inspection, past performance and engineering judgement.

C. Urgency. The recommendations for additional investigations and remedial measures outlined in Section 7.2 and 7.3, respectively, should be undertaken by the Owner and completed within one year after receipt of this report.

D. Need for Additional Investigations. Additional investigations should be performed by the Owner as outlined in the following section.

7.2 RECOMMENDATIONS

It is recommended that the Owner engage a registered professional engineer to undertake the following investigations:

1. Perform measurements and analyses to determine the structural stability of the main spillway.
2. Perform hydrologic studies to determine what alternative measures are required to increase the discharge capability at the dam. These

alternatives include the repair and modification of the outlet works for the dam and a pre-determined operational procedure for the dam.

3. Inspect the spillway weir during no flow condition.

7.3 REMEDIAL MEASURES

A. Operation and Maintenance Procedures. The following remedial work should be undertaken by the Owner:

1. Repair the control gates to restore them to operational condition.
2. Repair the concrete surfaces of the outlet works, the wall between the outlet works and the spillway, and the downstream end of the right abutment to prevent continued deterioration of these structures. Loose, weak concrete should be removed and the surfaces restored by application of concrete mortar, shotcrete, or by other methods.
3. Remove deteriorating crib wall downstream of the left abutment and construct new work to protect the fill materials from erosion. Consideration should be given to the use of heavy stone riprap.

Due to the "high" hazard potential classification, the Owner should establish a formal operations and maintenance manual for this dam. The operating procedure should include provisions for biennial technical inspection of the dam and for surveillance of the dam during periods of heavy precipitation and high river elevations. The procedures should delineate the maintenance work to be done on the dam to ensure satisfactory operation and to minimize deterioration of the facility.

The Owner should also develop a written emergency preparedness plan and warning system to be used in the event of impending failure of the dam. The system should be developed in cooperation with local officials and downstream inhabitants.

7.4 ALTERNATIVES

The Owner should consider the alternatives of taking the dam out of service or filling and sealing the outlet canal. Removing the flashboards, opening the control gates and providing adequate openings at the downstream end of the outlet canal would decrease the hydrostatic loads on the dam and reduce required maintenance. Conversely, the filling of the outlet canal and sealing it would reduce the required maintenance of the structure.

APPENDIX A
INSPECTION ITEM ORIGINATOR AND CHECK DATE

	Page No.
<u>VISUAL INSPECTION DAMS AND STRUCTURES</u>	1
<u>VISUAL INSPECTION SINCE DATE</u>	
Dam Substructure	2
Outlet Works - Intake Structures	3
Outlet Works - Spillway Weir and Discharge Channel	3

VISUAL INSPECTION PARTY ORGANIZATION
NATIONAL DAM INSPECTION PROGRAM

Dam: Powder Mill Pond

Date: 11 May 1978

Time: 0805-1505

Weather: Clear and Warm (70's F)

Water Surface Elevation Upstream: Approximately El. 627.8
NGVD

Stream Flow: 125 MGD on 11 May 1978
(M.D.C. Records)

Inspection Party:

Harl P. Aldrich, Jr.
Haley & Aldrich, Inc.
Roger H. Wood
Camp, Dresser & McKee, Inc.

Present During Inspection:

John Gould, Barre Wood Combing Co.

VISUAL INSPECTION CHECK LIST NATIONAL DAM INSPECTION PROGRAM

DAM: Powder Mill Pond DATE: 11 May 78

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation at Earth Abutments	Approximately El. 634 (NGVD) at left abutment and El. 635 at right abutment
Current Pool Elevation	Approximately 627.8
Maximum Impoundment to Date	Not known
<u>OUTLET WORKS - INTAKE STRUCTURE</u>	
a. <u>Approach Channel</u>	None - outlet works borders reservoir
Bottom Conditions	Not visible
Log Boom	None
b. <u>Intake</u>	
Condition of Concrete	Service platform has deteriorated at edges
c. <u>Downstream Canal</u>	
Condition of Concrete	Good to fair. Vertical walls have been repaired in past which resulted in good condition of some areas and fair condition in other areas. Considerable efflorescence present. Base of wall undermined left side and local areas right side. Walls braced by steel beam struts at approximately 2/3 of height
Obstructions	Considerable debris on floor and in outlet
d. <u>Mechanical and Electrical</u>	No electrical
Gates	Two 9 ft. by 5.5 ft. timber gates - leaks between planks and at edges (see Photo No. 9)

FILE NO. 4150

VISUAL INSPECTION CHECK LIST **NATIONAL DAM INSPECTION PROGRAM**

DAM: Powder Mill Pond

DATE: 11 May 78

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY</u> <u>WEIR AND DISCHARGE CHANNELS</u>	
a. <u>Approach Channel</u>	
General Condition	No channel present - spillway is at edge of reservoir
b. <u>Weir and Training Walls</u>	
General Condition of Concrete	Weir not visible due to flow of water. Left wall good to excellent. Timber crib wall downstream left side has collapsed. Right abutment - good to fair. Emergency spillway wall between right abutment and control structure - fair.
Rust or Staining	Appreciable rust and staining downstream face of emergency spillway.
Spalling	Minor spalls at shrinkage cracks left wall. Erosion at water contact area right abutment. Downstream end of right abutment has deteriorated.
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	Slight efflorescence at cracks on left side and at spots on right side. Considerable efflorescence on face of emergency spillway.
Drain Holes	None observed
Obstructions	Logs, brush and dead animal at weir, lodged in flashboards.
c. <u>Discharge Channel</u>	
General Condition	Good, channel is the natural bed of the river
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Banks of river are wooded by young trees
Floor of Channel	Cobbles, boulders (bed of river)
Other Obstructions	None observed

FILE NO. 4160

APPENDIX B
LIST OF AVAILABLE DOCUMENTS AND
PRIOR INSPECTION REPORTS

	<u>Page No.</u>
<u>LIST OF AVAILABLE DOCUMENTS</u>	1
<u>DOCUMENTS</u>	
Letter from City Engineer to County Commissioner dated 26 August 1908	3
Letter from County Engineer to Barre Wool Combining Company dated 17 August 1931	6
"Plan of Proposed Repairs and Changes to Powder Mill Dam" approved 14 August 1936	7
Letter from Barre Wool Combining Co. to County Engineer dated 1 December 1936	8
"Plan of Powder Mill Dam Section (Emergency Flood Control)", Drawing No. 16, approved 21 March 1937	9
Plan of timber cribwork and fill constructed on the left bank immediately downstream of dam, dated 15 July 1938	10

PRIOR INSPECTION REPORTS

<u>DATE</u>	<u>BY</u>	
24 September 1938	Washington County Engineer	11
2 January 1942	Washington County Engineer	12
19 April 1944	Washington County Engineer	13

LIST OF AVAILABLE DOCUMENTS
POWDER MILL POND DAM

<u>DOCUMENT</u>	<u>CONTENTS</u>	<u>LOCATION</u>
"Plan of Dam and Elevations", L.B. Dow Consulting Engineer, Boston, MA, approved 21 July 1908	Four contract drawings for the reconstruction of the dam	Office of County Engineer, Court House, Worcester, MA
Letter from Fredk. A. McClure, City Engineer, to George W. Cook, County Commissioner, Barre, MA, dated 26 August 1908	Observations and comments on the reconstruction dam	Office of County Engineer, Court House, Worcester, MA (Appendix B-3)
Letter from Worcester County Engineer to Barre Wool Combing Co., South Barre, MA, dated 17 August 1931	Request for concrete and backfill repairs for canal right of dam	Office of County Engineer, Court House, Worcester, MA (Appendix B-6)
"Plan of Repairs to Canal Wall, Sluiceway and Intake", A.E. Burr Co., approved 10 October 1932	Plan showing proposed new canal wall and concrete work for sluiceway and intake	Office of County Engineer, Court House, Worcester, MA
"Plan of Proposed Repairs and Changes to Powder Mill Dam", Hugh Kirkpatrick, P.E., approved 14 August 1936	Plans for lengthening spillway to 125 ft., building new right abut- ment wall, backfilling and riprapping	Office of County Engineer, Court House, Worcester, MA (Appendix B-7)

<u>DOCUMENT</u>	<u>CONTENTS</u>	<u>LOCATION</u>
Letter from Barre Wool Combing Co. to Lester O. Marden, County Engineer, dated 1 December 1938	Description of proposed repairs to dam after washout north of right abutment by 1938 flood	Office of County Engineer, Court House, Worcester, MA (Appendix B-8)
Letter from County Engineer to George H. Delano, Chief Engineer, Mass. Dept. of Public Works, dated 8 December 1938	Request for urgent action after 1938 flood damage to dam	Office of County Engineer, Court House, Worcester, MA
"Plan of Powder Mill Dam Sections (Emergency Flood Control)", Cleverdon, Varney & Pike, Consulting Engineers, Boston, MA approved 21 March 1939	Drawings No. B-14 and B-15 showing new dike and gate constructed north of right abutment after 1938 flood	Office of County Engineer, Court House, Worcester, MA (Appendix B-9)
"Plan of Repair of Canal Wall and Floor", Cleverdon, Varney & Pike, Consulting Engineers, Boston, MA approved 9 May 1939	Repairs made to canal after 1938 flood	Office of County Engineer, Court House, Worcester, MA
"Plan of Dam Below Powder Mill Dam", Arthur T. Safford Consulting Engineer, 15 July 1939	Plan of timber cribwork and fill constructed on the left bank immediately downstream of dam	Office of County Engineer, Court House, Worcester, MA (Appendix B-10)

City Engineer's Office, Aug. 26, 1908.

Mr. George W. Cook,
County Commissioner,
Barre, Vt.

Dear Sir:

After visiting the dam of the Barre Wool Combing Co. on Aug. 15th with you and Mr. C. L. Chamberlain, I wrote Mr. L. B. Dow of Boston, for certain information, a copy of which communication, together with Mr. Dow's reply I enclose.

As you will observe Mr. Dow's reply was an incomplete answer, and on August 21st I wrote him again, copies of which correspondence I also enclose.

You will notice in accordance with Mr. Dow's last letter that the curtain wall at the westerly end of the dam is being extended to the bank, and that Mr. Dow himself was not satisfied with the earth dike we observed at that point.

In examining the plans I fail to find any provisions for preventing the water finding its way along the back side of the easterly wing wall of the dam, except the adhesion of the earth to the concrete. The wall has a long, straight, smooth surface, and in my opinion should have buttresses or cut-offs of some description to prevent the infiltration of water at this point, if care was taken with a good clay puddle adjoining the wall perhaps this would be sufficient.

We are still left without very much information as to the

G.W.C. #2.

method of construction employed at the heel of the dam and which Mr. Dow says he criticized, further saying that the contractors used ordinary gravel for the back fill, which would indicate a lack of care and thoroughness of work at this important point. In my opinion a better water excluding material than ordinary gravel, as stated by Mr. Dow, should have been used, and especial pains taken to prevent the water finding its way under the heel of the dam. The fact that a washout occurred with a partial head of water I believe to be very good proof that further trouble of this nature may be expected.

Mr. Dow in his letter of August 24th further says that the curtain wall westerly of the gate "is carried down nearly as low as the toe of the dam" but I am in doubt if this means to include that part of the wall immediately under the gate sills, which ought to be determined with more certainty.

In answer to my inquiry as to the foundation of the apron and how it is secured from undermining, Mr. Dow's letter stated "That the foundation was filled in solid with cobble stones" and that he criticized their method of doing it, he seems to be in doubt of its stability if the dam should spring a leak. The work at this point, as it appeared to me seemed to be hardly deep enough to stand the shock of impact from falling water, in fact I failed to observe from external appearances that any particular provision had been taken to prevent its being undermined. The action of water at all such points has a tendency to create deep excavations, which if it occurs here will threaten the stability of the entire structure in

O.W.C. 43.

my opinion, as the foundations to the dam at its lower side was stated to us to be very shallow and founded on gravel.

At the easterly end of the dam care should also be taken in the founding of the earthen dike and in the material comprising its structure.

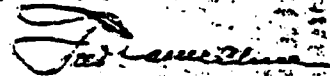
It was stated to us on the ground that no rip-rap was contemplated for this earthen embankment.

I do not know the extent of the pond, but should judge from the depth of the water at the dam that its area was sufficient to create a considerable wave motion, which will soon make serious inroads upon it unless protection is afforded.

Would it not be well while the conditions permit of further observations to satisfy yourself upon the points to which I have called special attention? The fact that the plans were not filed on attention called to this structure until it was pretty well along in its building makes it rather late in the day to secure the workmanship such structures should have.

Personally I should prefer to see improvement in other features of its design, but it appears to me that good workmanship at least should be shown in its carrying out, and which I would advise be insisted upon before the structure is subjected to use.

Very truly yours,



August 17, 1931.

Barre Wool Combing Company,
South Barre, Mass.

Gentlemen:

An inspection has been recently made of your concrete dam near the state highway to Barre according to the state law and I find that the following repairs should be made:

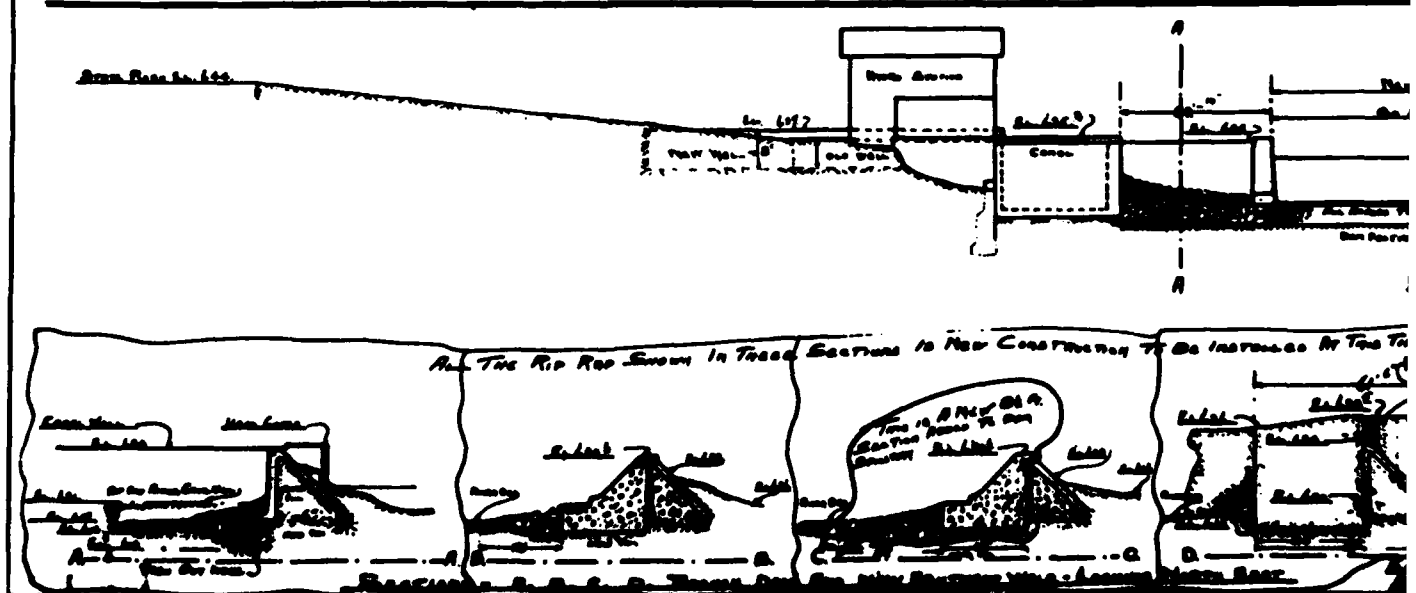
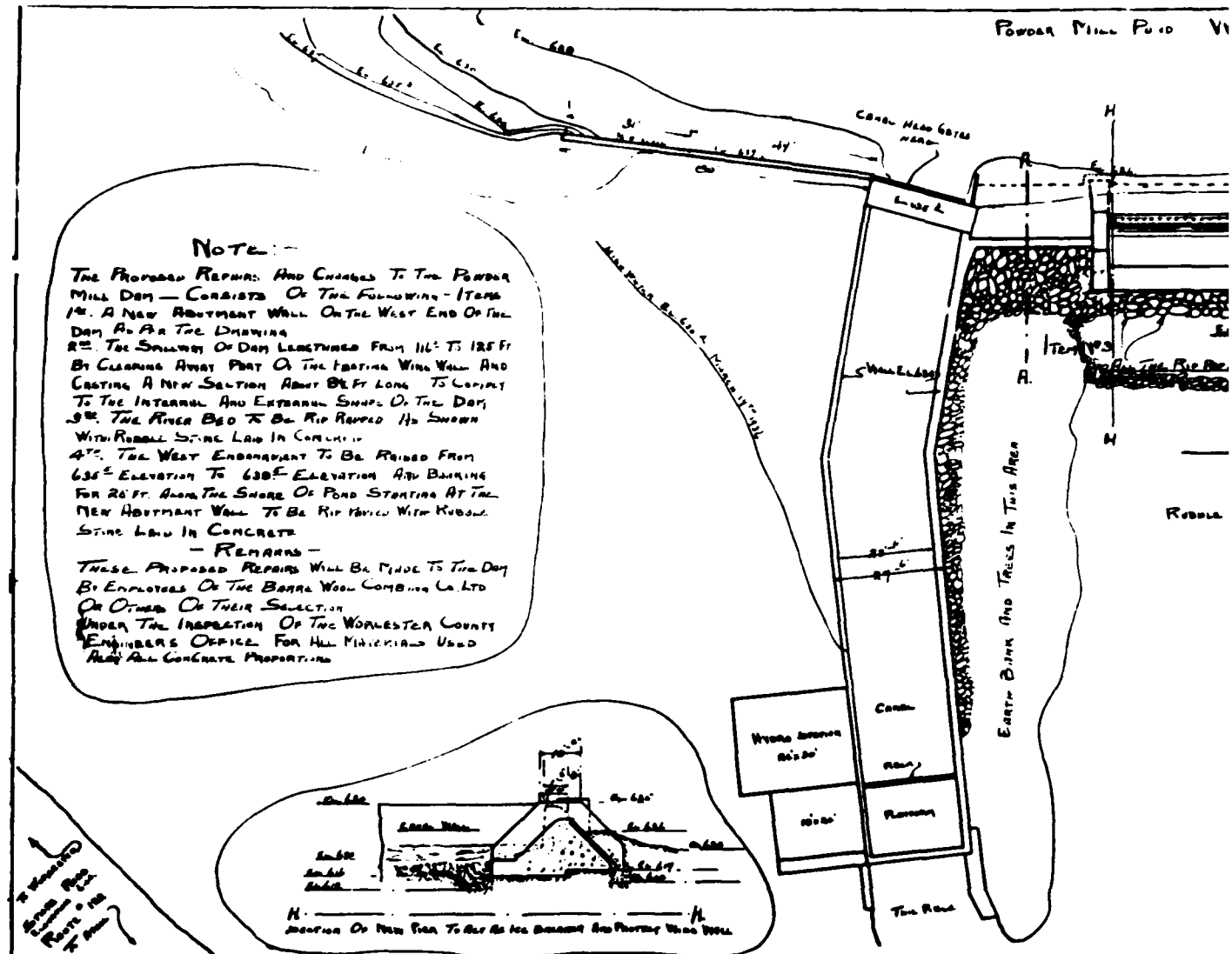
1. I notice that the structure appears to be made of very poor concrete and that it is scaling off around the flume, abutment wall to flume, and to that portion of the dam between the flume and the north abutment to the spillway; All old concrete showing disintegration should be cut out and new concrete walls properly reinforced should be constructed same.
2. A gravel backfill and concrete slope wall should be constructed similar to that at the south abutment of the spillway, between the flume and the north spillway abutment.

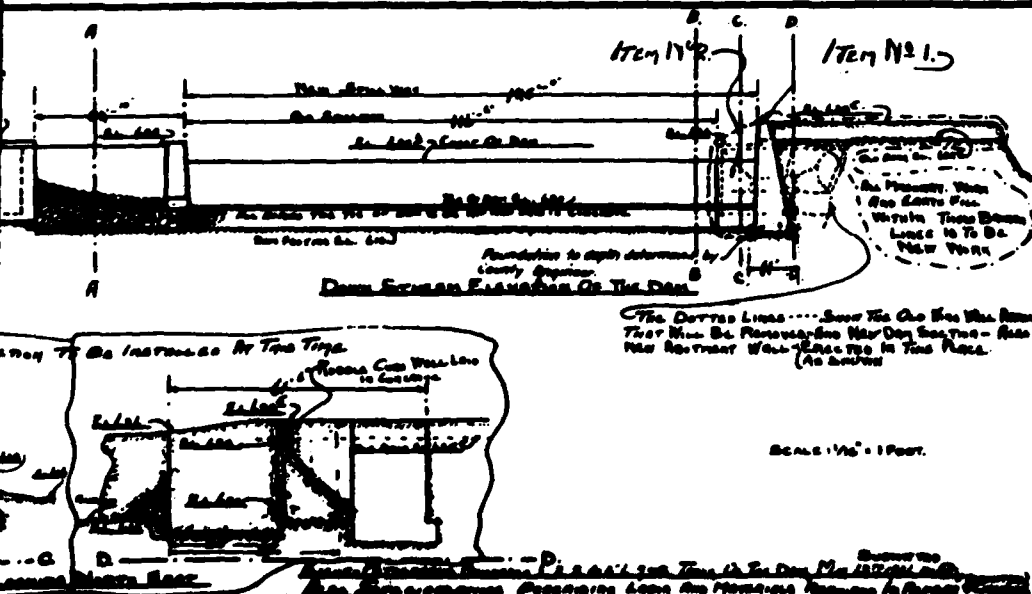
I feel that after mature consideration the changes to your structure are of enough importance to warrant your submitting a plan to the County Commissioners indicating thereon the location and method of making these alterations.

I feel that the dam is in a weakened condition at the flume and that these alterations should be made before fall.

Yours very truly,

County Engineer





**WORCESTER COUNTY COMMISSIONERS
WORCESTER COUNTY ENGINEERING DEPARTMENT
PLAN OF
PROPOSED REPAIRS AND CHANGES
TO POWDER MILL DAM
ON THE WARE RIVER
BARRE, MASS.
FOR BARRE WOOL COMBING CO., LTD.
AS FILED AND APPROVED BY THE
COUNTY COMMISSIONERS
SCALES AS NOTED**

Approved: August 16, 1954 <i>Samuel J. Jones</i> Special Agent in Charge	Approved: Aug. 13, 1954 <i>Ed. J. [illegible]</i> Chief, Bureau
DAM NO. 64-61	

THE BARRE WOOL COMBING COMPANY, LTD.

MILLS AT
SOUTH BARRE, MASS.

TREASURERS OFFICE
200 SUMNER STREET

COMMISSION WOOL COMBERS

BOSTON, MASS.



December 1, 1933

04-03

Mr. Lester O. Marden, County Engineer
Court House
Worcester, Massachusetts

Dear Mr. Marden:

Confirming telephone conversation, we understand that the Commissioner of Public Works has authorized certain work in the Ware River at South Barre.

At the Powder Mill, the river is to be diverted back into its former course by the construction of a dike from the northeast corner of our forebay, in the northerly direction, toward the state highway.

The river, both above and below the Valley Road Bridge, is to be dredged and as much of the material as possible to be left at the sides of the river as dikes.

The wing walls below our main dam are to be underpinned and the apron is to be extended further downstream and down into the river bed.

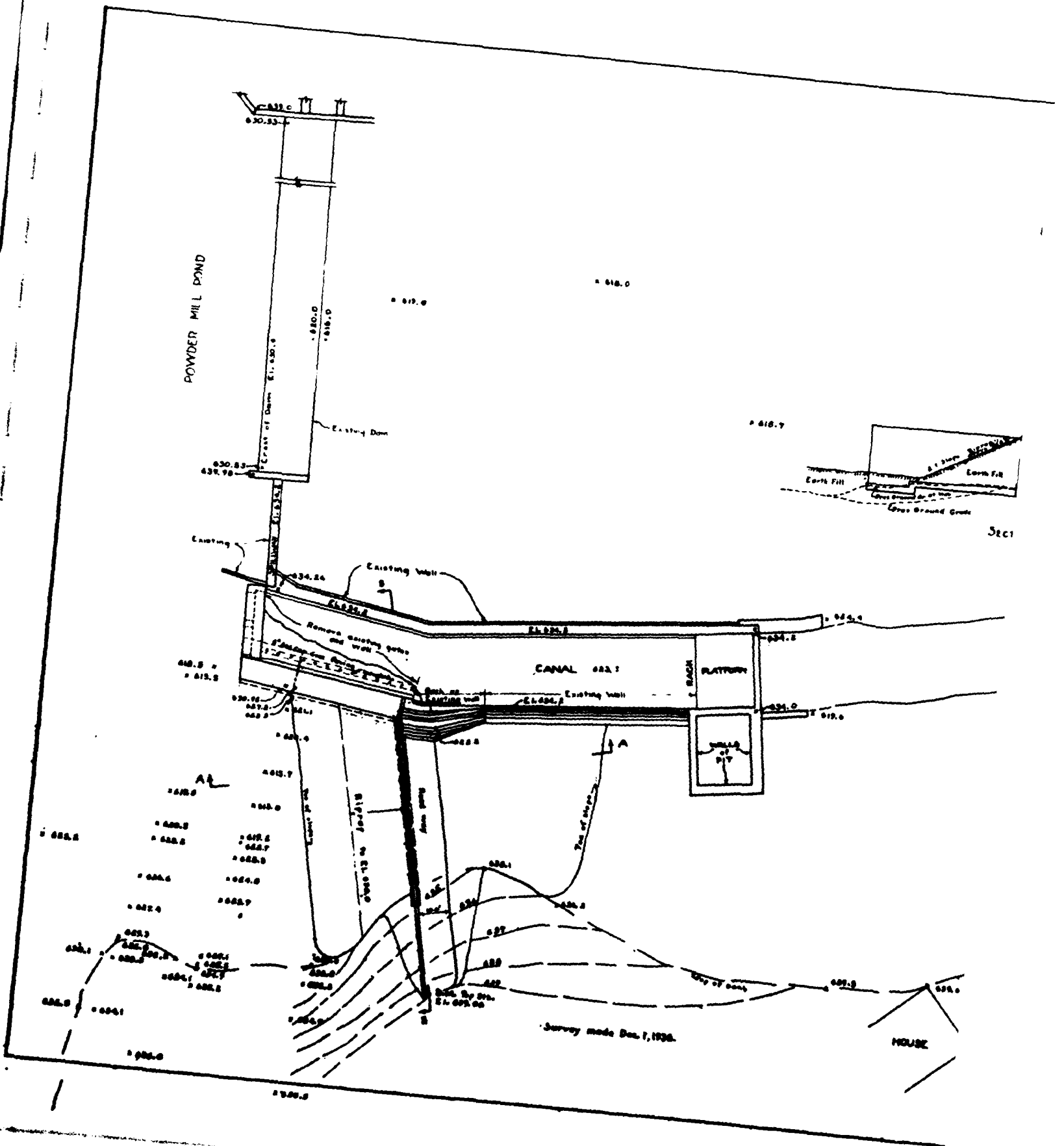
The engineers are at work there at present and we understand that the final drawings will be ready by the end of the week.

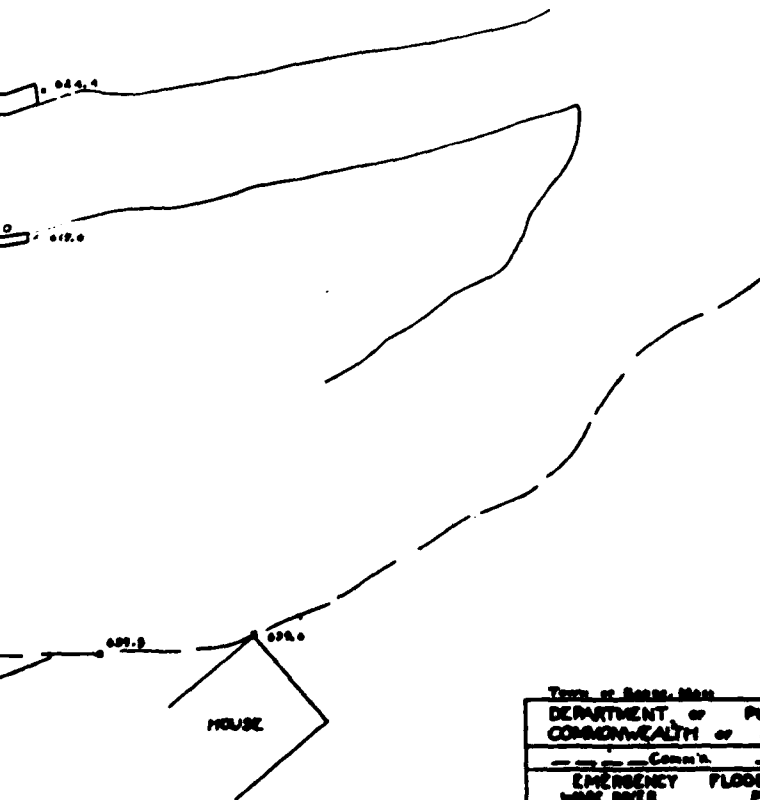
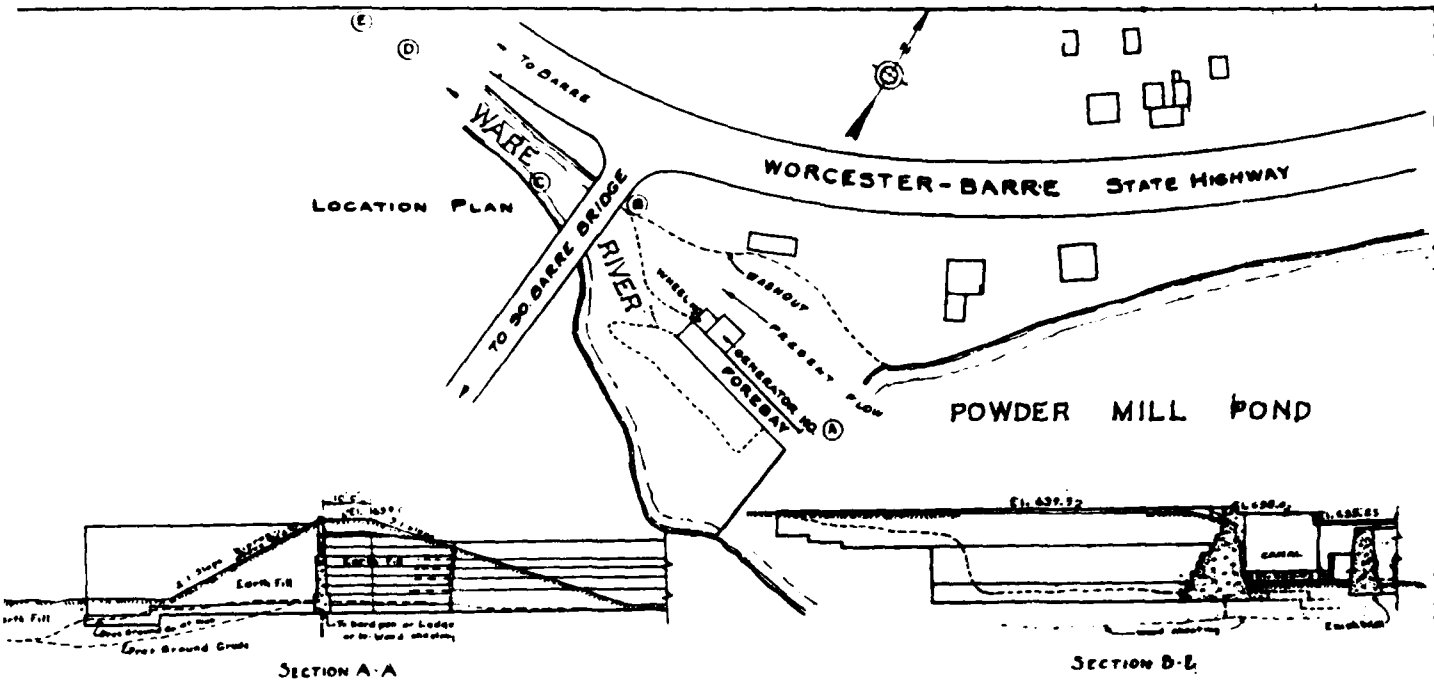
Very truly yours,

THE BARRE WOOL COMBING COMPANY, LTD.

ASN-IV

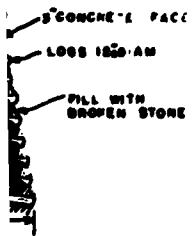
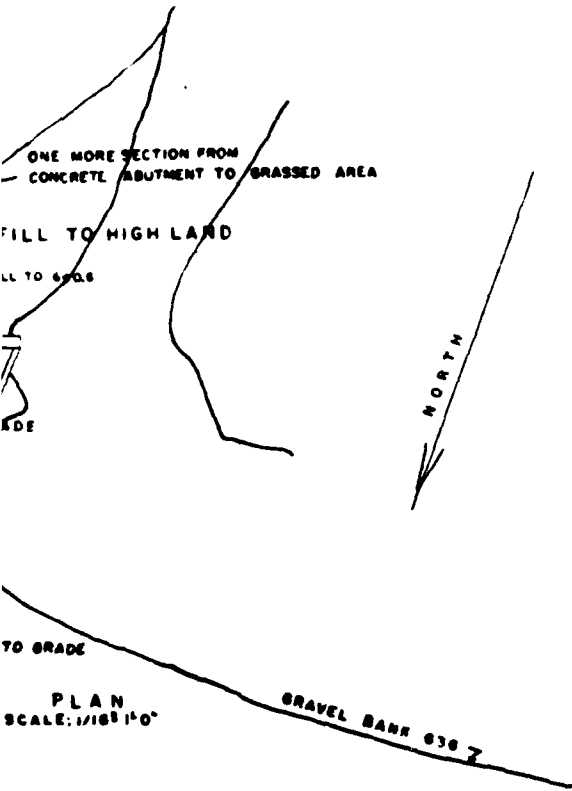
ASN
Treasurer





TOWN OF BARRE, MASS.	
DEPARTMENT OF PUBLIC WORKS	COMMONWEALTH OF MASSACHUSETTS
Commissioner	Engineer
EMERGENCY FLOOD CONTROL - POWDER MILL DAM	
WARE RIVER	Barre, Mass.
DESIGNED BY	CONSTRUCTED BY
APPROVED BY	DATE

WORCESTER COUNTY COMMISSIONERS WORCESTER COUNTY ENGINEERING DEPARTMENT PLAN OF POWDER MILL DAM & SECTIONS (EMERGENCY FLOOD CONTROL) ON THE WARE RIVER BARRE, MASS. FOR THE BARRE WOOL COMBING CO., LTD. AS FILED AND APPROVED BY THE COUNTY COMMISSIONERS REAR & ENTER	
Approved: _____ Date: _____ For: _____	Approved: _____ Date: _____ For: _____



SECTION - A
1/4"

PLAN AND SECTIONS
SHOWING SUGGESTION OF
GRIDWORK FOR WESTERLY BANK
BELOW POWDER MILL DAM
FOR
THE BARRE WOOL COMBING COMPANY LTD.
Scales As Noted. Arthur T. Safford, Consulting Engineer. JULY 15, 1939.

WORCESTER COUNTY COMMISSIONERS WORCESTER COUNTY ENGINEERING DEPARTMENT PLAN OF DAM BELOW POWDER MILL DAM FOR THE BARRE WOOL COMBING COMPANY LTD SOUTH, BARRE MASS. COUNTY COMMISSIONERS	
SCALES AS NOTED	
TRACED BY: <i>Arthur T. Safford</i>	DAM NO. 04-03
TRACING CHECKED BY: <i>Arthur T. Safford</i>	
_____ COUNTY ENGINEER	

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by M. H. Spofford Date 9-26-38 Dam No. 04-03

Town Barre Location Ware River - Powder Mill Dam

Owner Barre Woolen Co. Use

Material and Type

Dam Designed by Constructed by Year

SPILLWAY—Length Feet. Depth Feet

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

EMBANKMENT—Length overall Feet

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition (see other side)

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 of Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

Washed out north abutment and wing completely for 50 ft.
Main concrete spillway was not damaged. Flood cut around south
abutment and washed out a large hole but apparently did not
damage abutment. All four gates were closed. Approx. two feet
of flashboards were on but were mostly carried away in the flood.
Concrete flume at north end seems to be OK. From information given
by an observer the water was about five feet over the concrete
crest of the spillway or in other words a trifle over the concrete
wing at the south end.

04-03

WORCESTER COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs

Inspected by J. B. D. Date 1-6-39 Dam No. Bowling GreenTown Bowling Green Location _____
Owner _____ Use _____SPILLWAYEl. top Abutment _____ El. Crest _____ El. Apron _____ El. St. Bed _____
Width top Abut. _____ Width top Crest _____ Width bottom Sp. way _____
Width flashboards _____ Kind Flashboards _____
El. Flowline Cleanout Pipe _____ Size and Kind Pipe _____
Kind of Foundation under Spillway _____
Condition Water level 10' above crestEMBANKMENTEl. Top _____ El. Natural Ground _____ Width Top _____
Width of Bottom _____ Upstream Slope _____ Downstream Slope _____
Kind of Corewall _____ Riprap _____
Material in Embankment _____ Foundation _____
Condition After dam - 8'-10' wide at top 11' 3" max
material - clay - red shales - oneGATESLocation _____
Size _____ Kind _____ El. Flowline _____
Condition _____

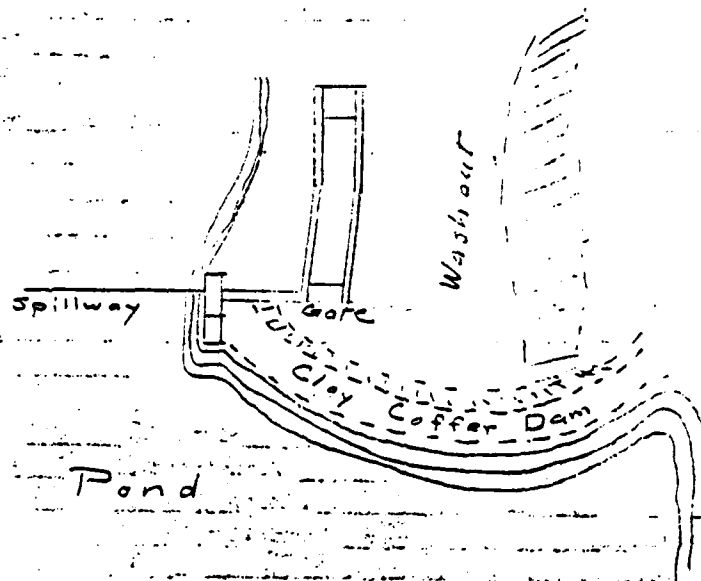
Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq. Miles _____

Discharge in Second Feet per Square Mile _____

Estimated Storage Million Cubic Feet _____



WORCESTER COUNTY ENGINEER
Inspection of Dams, Reservoir Dams, and Reservoirs

Inspected by E. M. Crockett-L.O.M. Date 4-20-1939 Dam No. 04-03

Town Barre Location Powder Mill Dam-Ware River
Owner Barre Wool Combing Co. Ltd Use _____

SPILLWAY
El. top abutment _____ El. Crest _____ El. Apron _____ El. St. Bed _____
Width top Abut. _____ Width top Crest _____ Width bottom Sp. way _____
Width flashboards _____ Kind Flashboards _____
El. Flowline Clearout Pipe _____ Size and Kind Pipe _____
Kind of Foundation under Spillway _____
Condition OK

EMBANKMENT
El. Top _____ El. Natural Ground _____ Width Top _____
Width of Borrom _____ Upstream Slope _____ Downstream Slope _____
Kind of Corewall _____ Riprap _____
Material in Embankment _____ Foundation _____
Condition New construction progressing satisfactorily

GATES _____ Location _____
Size _____ Kind _____ El. Flowline _____
Condition _____

Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq. Miles _____
Discharge in Second Feet per Square Mile _____
Estimated Storage Million Cubic Feet _____

WORCESTER COUNTY ENGINEER
Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by L. O. Marden-Smithers Date 9-12-1939 Dam No. 04-03

Town Barre Location Near River-Powder Mill Dam.

Owner Barre Wool Combing Co., Ltd. Use _____

SPILLWAY

El. top abutment _____ El. Crest _____ El. Apron _____ El. St. Bed _____

Width top Abut. _____ Width top Crest _____ Width bottom Sp. way _____

Width flashboards _____ Kind Flashboards _____

El. Flowline Cleanout Pipe _____ Size and Kind Pipe _____

Kind of Foundation under Spillway _____

Condition examine foundations west side southerly abutment down to hard pan, where the log cribbing is to be placed- found the concrete already poured in the southeasterly corner of new extension.

EMBANKMENT

El. Top _____ El. Natural Ground _____ Width Top _____

Width of Borrom _____ Upstream Slope _____ Downstream Slope _____

Kind of Corewall _____ Riprap _____

Material in Embankment _____ Foundation _____

Condition _____

GATES

Location _____

Size _____ Kind _____ El. Flowline _____

Condition _____

Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq. Miles _____

Discharge in Second Feet per Square Mile _____

Estimated Storage Million Cubic Feet _____

TOWN Barnes DAM NO. 2-123
LOCATION South of Barnes 2-123 STREAM North River
at White Valley

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

Owned by Barnes and Barnes 2-123 Place Barnes Use House Pond
Inspected by 1-12-52 Date 1-12-52
Type of Dam Concrete Condition Good

SPILLWAY

Flashboards in Place 1-12-52 Recent Repairs None
Condition Good
Repairs Needed Some work on concrete spillway. The concrete spillway
center of the main spillway is badly cracked.

EMBANKMENT

Recent Repairs The old concrete dam has been removed. The new dam
Condition Good
Repairs Needed None

GATES

Recent Repairs Some work could be done on the seal at the gates
Condition The concrete is beginning to crack. Some work could
Repairs Needed The existing concrete in the water's gate is good.
These gates should be tested. The concrete should be replaced in places.

LEAKS

How Serious The concrete gate is good.

DATE: 1-12-52 County Engineer

INSPECTION REPORT & DATA FOR DAMS

Owner: Barre Wool Combining Co
 His Address: Vernon Avenue, Barre
 Function of Dam: Industrial

Location & Access: Intersection of Rte 122 + New Britain Pk
Rd.
 USGS Quad. Barre Lat. 42°23'40" Long. 72°54'40"
 Drain. Ar. 57.7 Sq. Mi.; Ponds: ac.; Res. @ dam:
 Character of D.A.:

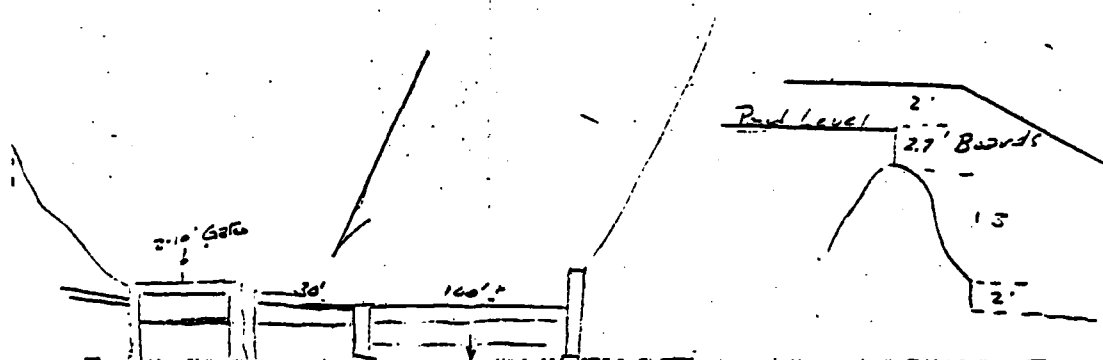
Dam No. 21-03
 Town: Barre
 Stream: Wisc River
 Pond: Powder Mill Pond
 Date: 3-1-72
 By: 1256m - Canu
 CONDITION RATING
 Structural: Fair
 Hydraulic: 1.30 x 2
 General: Fair
 PRIORITY: *

Estimated
 Discharge:
 Capacity:

General Description of Dam and Discharge Control:

Concrete dam & Spillway with 2.7' of boards in place. No provision
for more 2-10 gates are probably inoperable and should be fixed.

Sketch (Not to Scale):



Remarks and Recommendations:

* concrete badly eroded & should be repaired
Gates are not operable

Date 3-1-72

By Eaton +
Canu Comment

Dam No. 3-17-21-03

APPENDIX C
SELECTED PHOTOGRAPHS OF PROJECT

Page No.

LOCATION PLAN

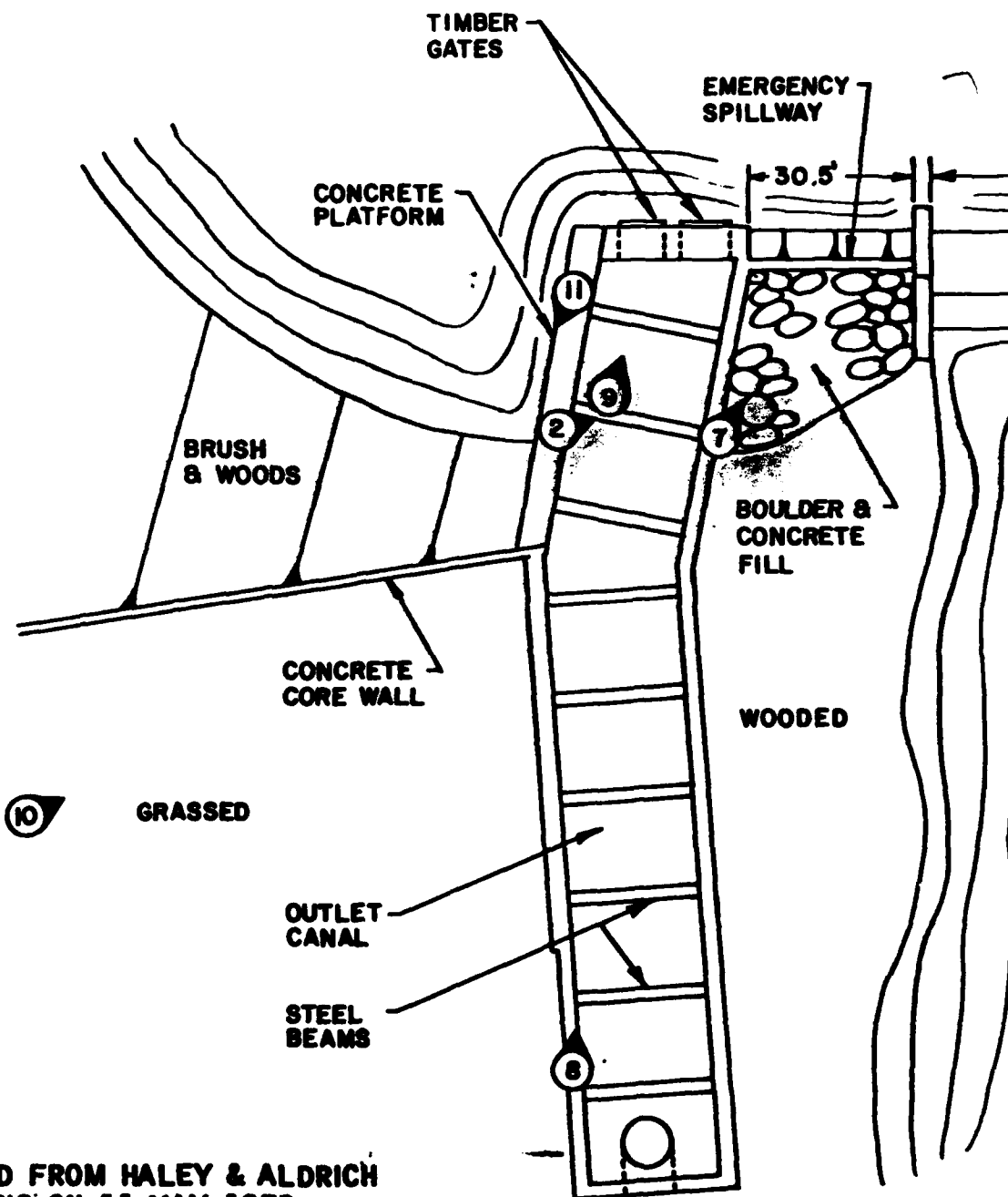
Site Plan Sketch

1

PHOTOGRAPHS

<u>No.</u>	<u>Title</u>	<u>Roll</u>	<u>Frame</u>	<u>Page No.</u>
1.	Overview of downstream face of dam	65	8	vii
2.	Overview of main spillway and left abutment	5	16, 17	2
3.	Training wall at left abutment	5	4	3
4.	Deteriorating rock work wall downstream of left abutment	5	5	3
5.	Main spillway showing flow at right and end emergency spillway beyond	5	1	4
6.	Overview of right abutment and canal walls	5	6	4
7.	Downstream face of emergency spillway	5	16, 18	5
8.	Canal walls, downstream view	5	12	5
9.	Downstream view of canal walls and gate	5	13	5
10.	Right abutment, downstream view	5	14	5
11.	Spillway face at downstream end	5	15	5

POWDER MIL



NOTE:

SKETCH DEVELOPED FROM HALEY & ALDRICH
FIELD OBSERVATIONS ON 11 MAY 1978.

LEGEND

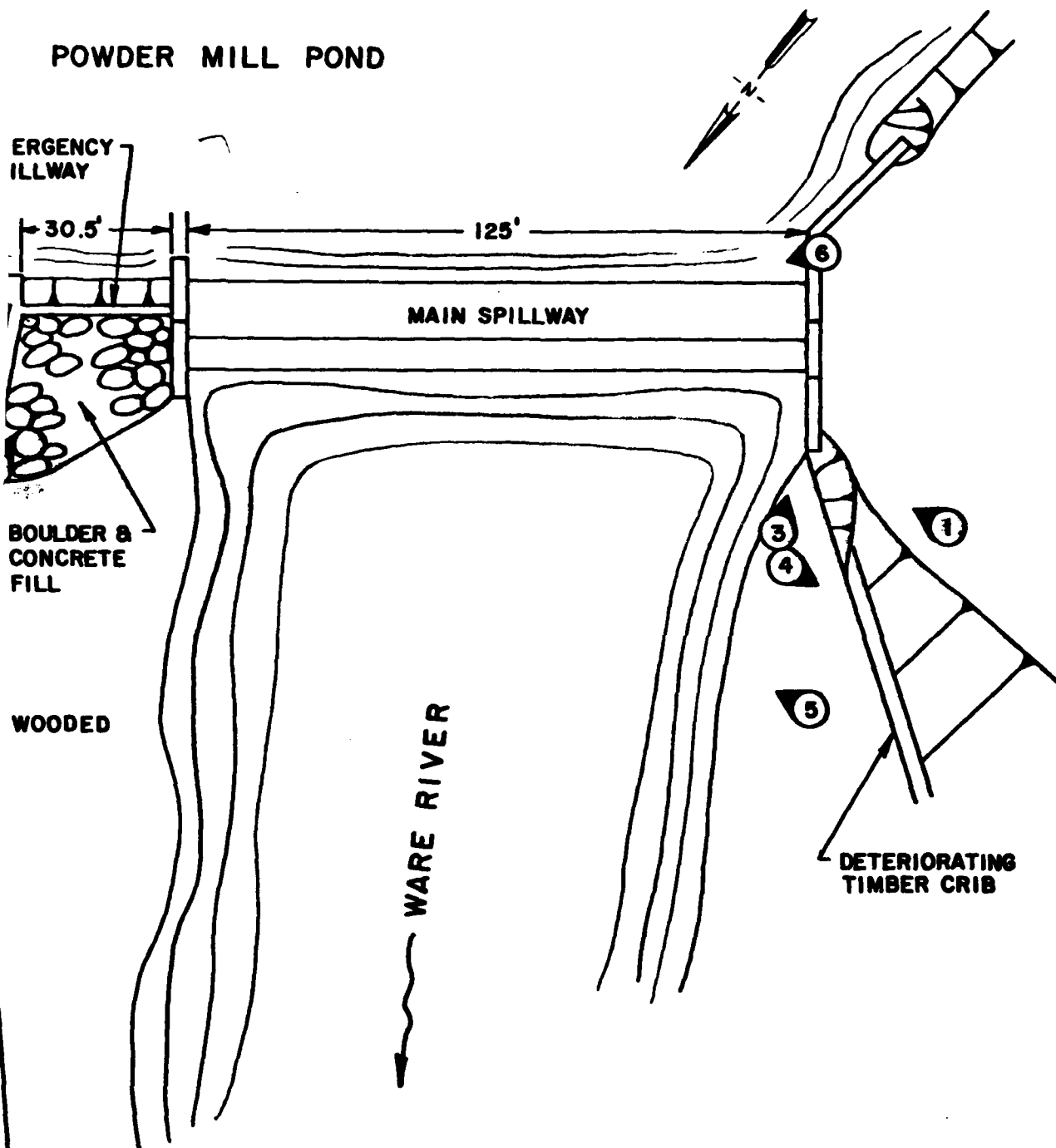


PHOTO NUMBER AND DIRECTION OF VIEW

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

FILE NO. 4160 850

POWDER MILL POND

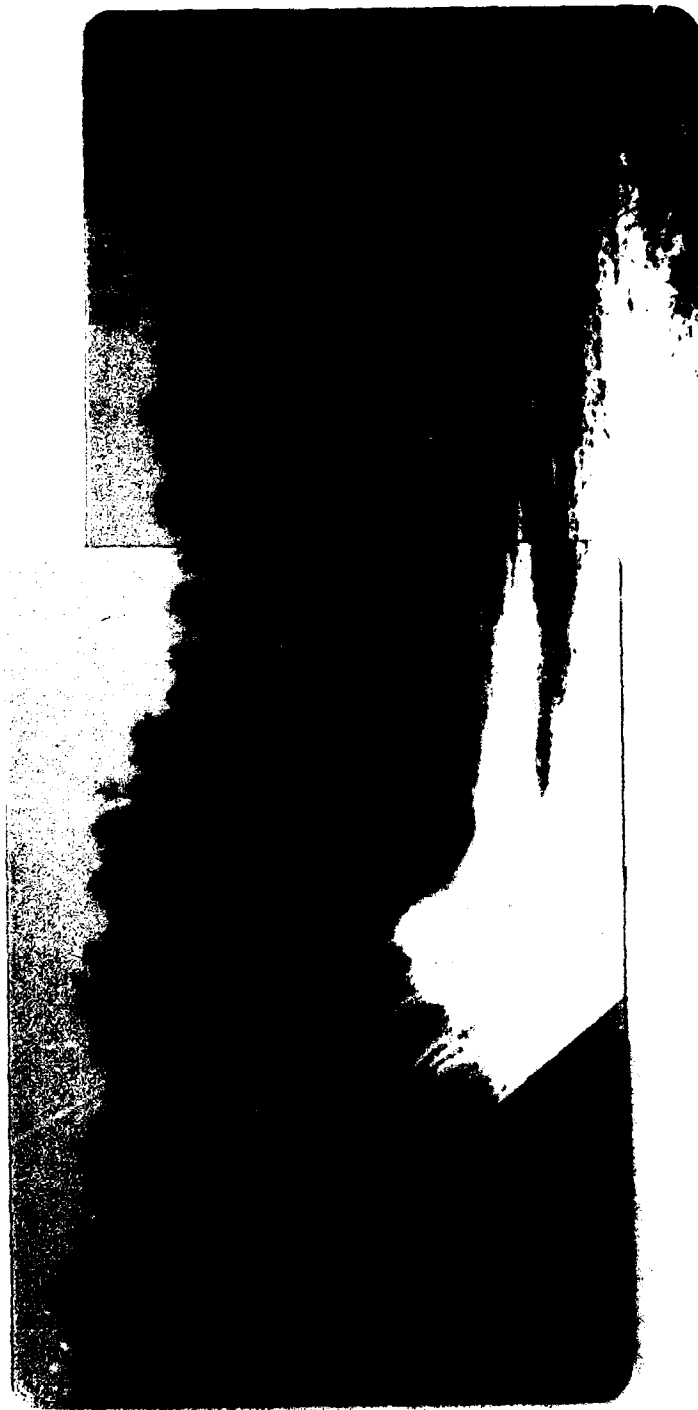


Powder Mill Pond Dam
South Barre, MA

SITE PLAN SKETCH

Approx. scale: 1"=30' Nov. 1978

2 C-1



2. Overview of main spillway and left abutment



3. Training wall
at left abutment



4. Deteriorating rock crib wall downstream of
left abutment



5. Main spillway showing pier at right end and emergency spillway beyond



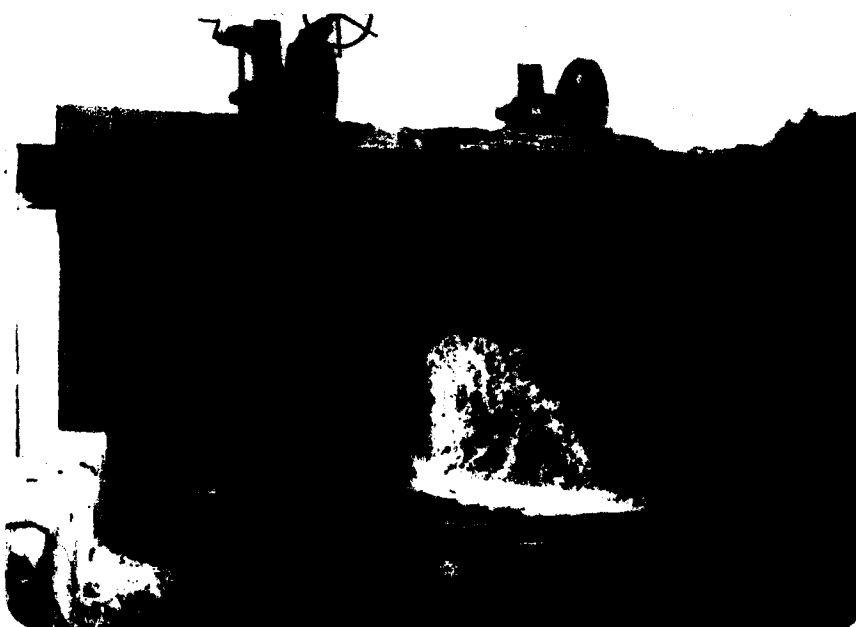
6. Overview of right abutment and canal walls



7. Downstream face of emergency spillway



8. Outlet canal, looking upstream



9. Downstream side of outlet works and gates



10. Right abutment showing top of concrete core wall



11. Upstream side of right abutment

APPENDIX D
OUTLINE OF DRAINAGE AREA AND
HYDRAULIC COMPUTATIONS

Page No.

OUTLINE OF DRAINAGE AREA

Drainage Area Map

1

COMPUTATIONS

Size and Hazard Classification 2
FHW Computations; Hydraulic Data From Corps 3
Reservoir Surface Area Graph 4
Dam and Spillway Cross Section 5
Dam and Spillway Plan View 6
Spillway Rating Curve 7
Final FHW Computations 13
Dam Failure Analysis 14



CAMP DRESSER & McKEE INC.
Consulting Engineers
Boston, Massachusetts



POWDERMILL POND DAM
DRAINAGE AREA
Scale: 1:250,000

CAMP ORESSER & MCKEE
Environmental Engineers
Boston, Mass.

CLIENT M. J. and Aldrich
PROJECT National Park Area
DETAIL Powdermill Pond Dam

JOB NO. 541-B-ET
DATE CHECKED 8-19-78
CHECKED BY Miller

PAGE 2 of 17
DATE 9/12/78
COMPUTED BY ASD

Size and Hazard Classification

Size Classification

Top of Dam: 635.0'

Elevation of Stream Bed: 619.0

Height of Dam = 21 feet

$$\text{Storage} = \frac{1}{3} \times 6^2 \times 10 \text{ ft} + \left(\frac{6 + 56.5}{2} \right) 11.0$$

$$= 330 \text{ Acre-feet}$$

Hazard Classification

- COE has designated this dam to be of high hazard. If dam breached, it would cause higher water surface elevations at the South Bore Mill Pond Dam. The South Bore Mill Pond Dam has already been designated as a high hazard.

- Therefore, initially assume Powdermill Pond Dam will be classified as "high" in hazard potential.

Spillway Design Floods

Hazard = High, Size = Small $\rightarrow$ $\frac{1}{2}$ PMF to PMF

Since the risk of loss of life downstream of South Bore Mill Pond Dam is quite high due to the presence of downstream housing, the probable maximum flood will be used as the SDE.

Historical Floods

1936 $\rightarrow$ ~6690 cfs. at Elev. 629.9' msl. at crest

1938 $\rightarrow$ ~14250 cfs.

Note: Bore Mills Dam had not been constructed yet. These flows are routed (using direct drainage area correction) from flows gauged at the U.S.G.S. gauging station (01173000) at Cold Brook, N.Y.

CAMP DRESSER & MCKEE
Environmental Engineers
Boston, Mass.

CLIENT WMA and City of JOB NO. 501-2-PT
PROJECT WMA and City of DATE CHECKED 2-12-78
DETAIL WMA and City of CHECKED BY CEH

PAGE 2 of 17
DATE 9/7/78
COMPUTED BY CEH

Spillway Design Flood

Total Drainage Area = 98.5 mi^2

Drainage Area to Barris Falls Dam = 55 mi^2

- Since the peak outflow from the Barris Falls Dam will occur after the peak of the regional drainage area (13.5 mi^2) at Powdermill Pond Dam; and it is assumed that the releases from the Barris Falls Dam will be diverted at the Coldbrook intake, the effective drainage area that will be used to determine the PMF is 43.5 mi^2 .

Use $1109 \text{ cfs}/\text{mi}^2$ (same value used for South Barris Hill Pond Dam)

$$1109 \text{ cfs}/\text{mi}^2 \times 43.5 \text{ mi}^2 = 48242 \text{ cfs}$$

say 48200 cfs

$$\therefore \text{P.M.F.} = 48240 \text{ cfs}$$

$$1/2 \text{ P.M.F.} = 24120 \text{ cfs}$$

Hydrologic Data from Corps: Sept. 1959 Report

Sept. 1938 Flood Peaks

At site of Barris Falls Dam: 8000 cfs to 7800 cfs
routed to Coldbrook

At Coldbrook ----- 4200 cfs

18000 cfs

$$\frac{18250}{18000} = 1.01785$$

Had Barris Falls Dam been in

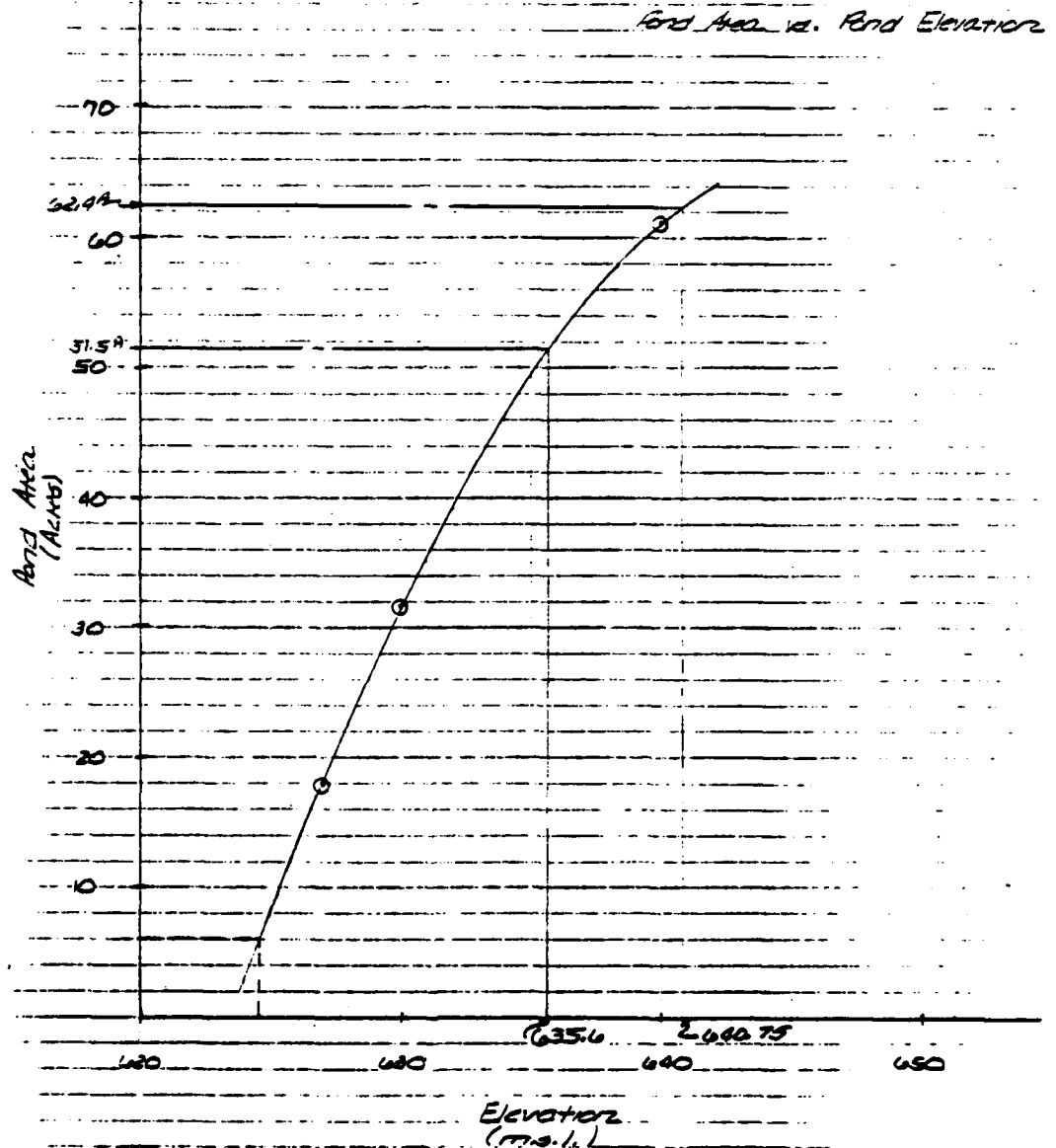
$$4200 \times 1.01785 = 4275 \text{ cfs}$$

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Environmental Engineers
Boston, Mass.

CLIENT Wahki and Aldrich
PROJECT Landfill Gas Project
DETAIL Landfill Gas Model

JOB NO. 91-1-2-97
CHECKED BY J.P.M.
COMPUTED BY J.P.M.

PAGE 6 of 17
DATE 3/1/98

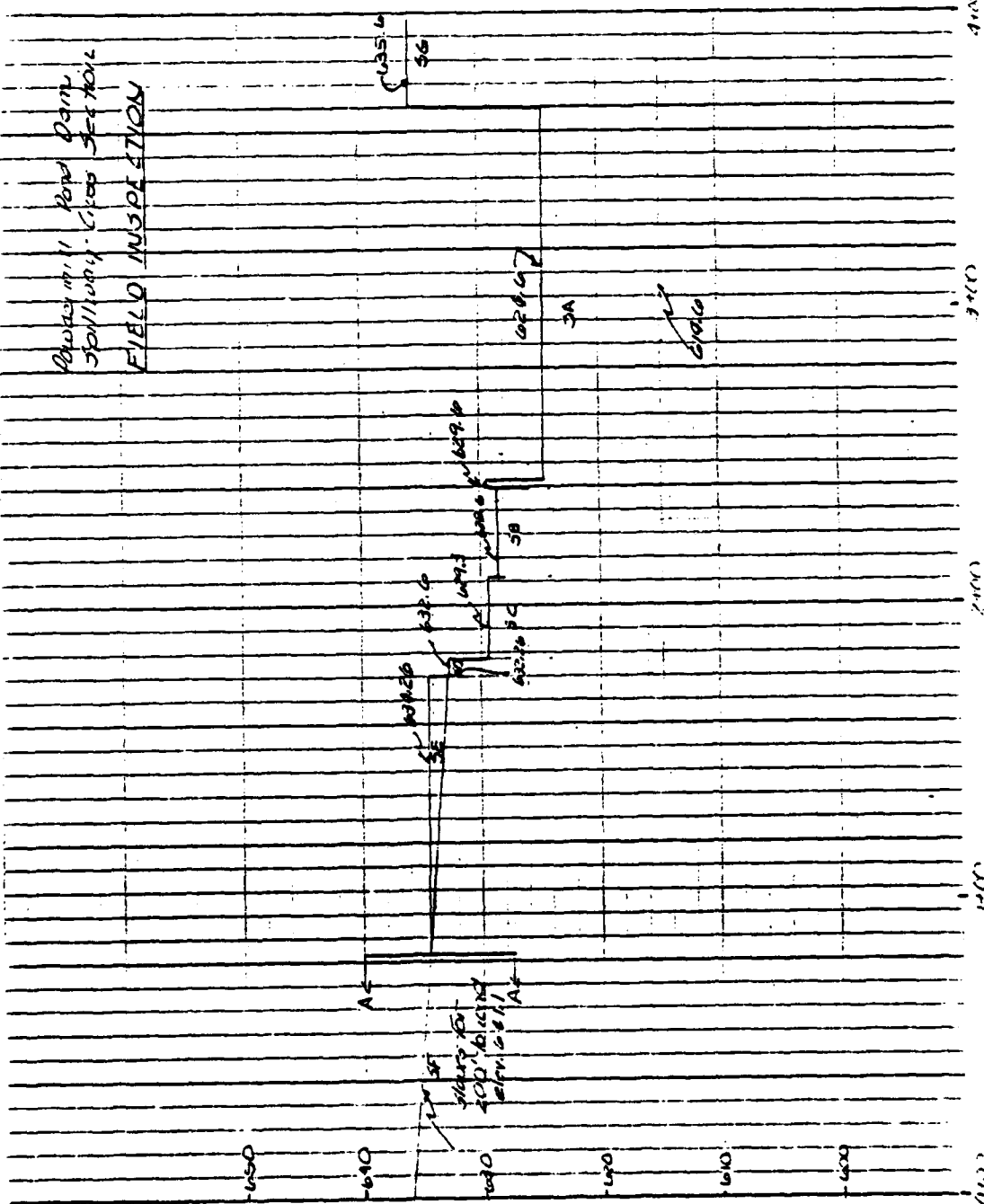


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CLIENT Long and Plimpton
PROJECT Lowell Dam, USA
DETAIL Reservoir Area Plan

JOB NO. SL-2-PT
DATE CHECKED 2/12/72
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PAGE 5 OF 17
DATE 2/13/72
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DATE 120/70
COMPUTED BY _____



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Boston, Mass.

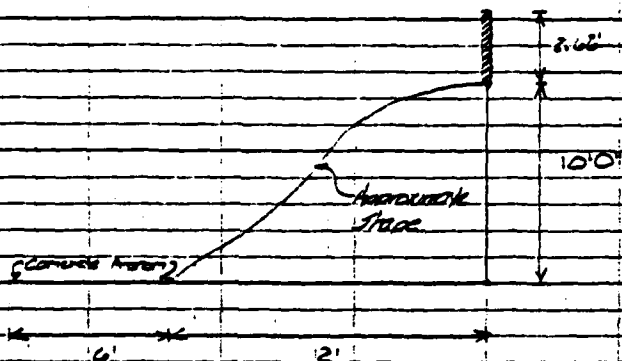
CLIENT W. H. and Aldrich
PROJECT Natural Dam 1990
DETAIL Burroughs Pond Dam

JOB NO. 5649-RT
DATE CHECKED 8/27/90
CHECKED BY BDH

PAGE 7 of 17
DATE 9/7/90
COMPUTED BY BDH

Spillway Outlet Curve

- Cross Section of Spillway



From King and Brater, Handbook of Hydraulics
C Values taken from Figure 5-16 for spillways

Spillway System Outline

Spillway Designation	Length (feet)	Elev. (ft. m.s.l.)
1A	12.5'	628.6
1B	30.5'	628.6
1C	25.4'	629.3
1D	16'	632.0
1E	23.6'	634.26
overload { 1F	varies	104.5 ft 635.26
1G	varies	635.0

Note: $C = 2.50$ for any overload F.

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Environmental Engineers
Boston, Mass.

CLIENT Walden Aldrich
PROJECT Internal Migration
DETAIL Walden Pond No.

JOB NO. 561-A-PT
DATE CHECKED 8-18-72
CHECKED BY Miller

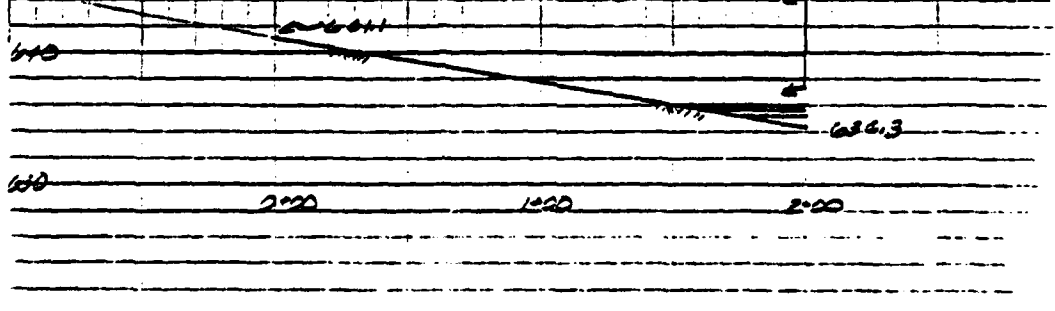
PAGE 9 of 17
DATE 9/13/72
COMPUTED BY J. J. J.

Sailway Rating Curve (continued)

(No Flashboards in place, Not including gates)

Elevation	3A	3B	3C	3D	3E	3F	3G
624.4	0	0	0	0	0	0	0
625	105						
626	716						
627	1585						
628	2735						
628.6	3500	0					
629	4038	26					
629.3	4658	60	0				
630	5490	174	50				
631	7084	387	194				
632	8807	467	388				
632.6	9900	854	530	8			
633	10651	995	633	5			
634	12409	1340	906	34			
634.26	13135	1437	982	44	8	8	
635	14673	1728	1210	71	203	13	
635.6	15961	1977	1400	108	501	52	8
636	16840	2149	1542	131	739	98	7
638	21860	3077	2281	244	2363	673	623
640	26480	4109	3112	423	4525	2021	2355
642	31754	5236	4024	605	7054	4230	5295
644	37384	6851	5010	808	9958	7477	3392
646	43311	7748	6067	1030	13178		

Profile West Bank

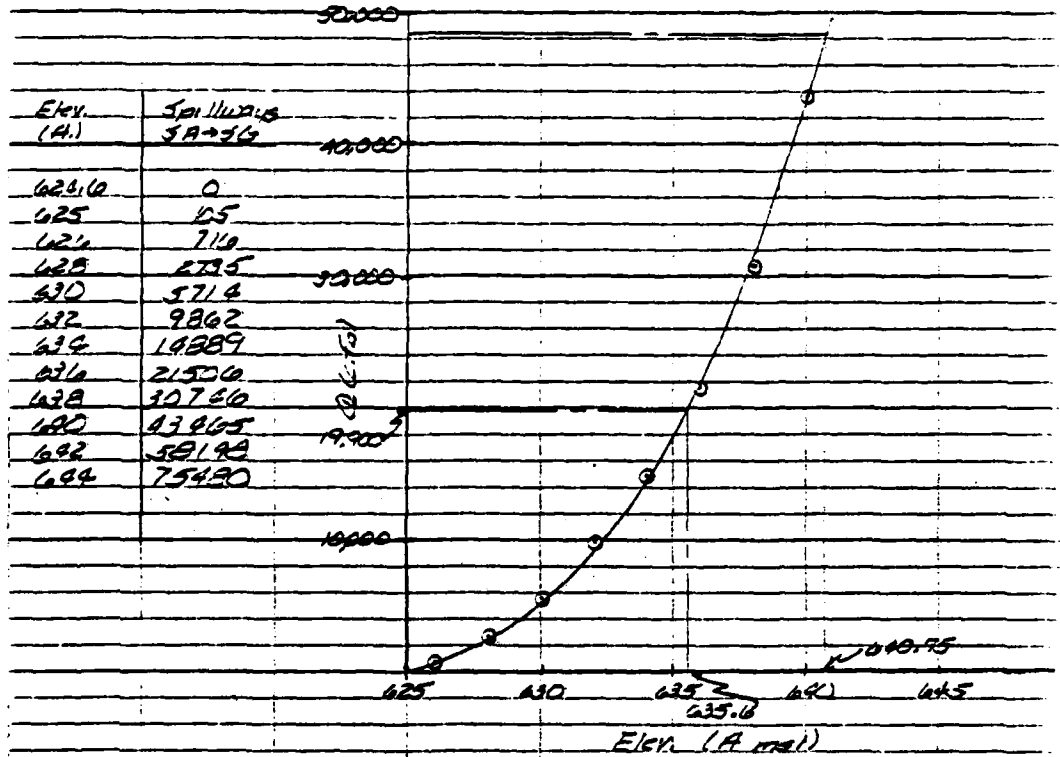


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CLIENT City of Boston
PROJECT Watermain Dam
DETAIL Spillway and Dam

JOB NO. 57-10-PT
DATE CHECKED 5-18-78
CHECKED BY CEM

PAGE 2 of 17
DATE 5-18-78
COMPUTED BY CEM



Spillway Rating Curve

No Flashboards, Gates Closed

Flows w/ Flashboards in Place - Elev. crest = 622.27' + 2.47'

Elevation	SA w/ 36-36	Total	
627.27	0	0	
628	266	0	266
630	1980	224	2104
632	4500	1053	5553
634	7438	2280	9718
636	11285	4060	15345
638	15377	9286	24663
640	19271	17025	36296
642	22733	26888	51177
644	29938	38096	68034

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Environmental Engineers
Boston, Mass.

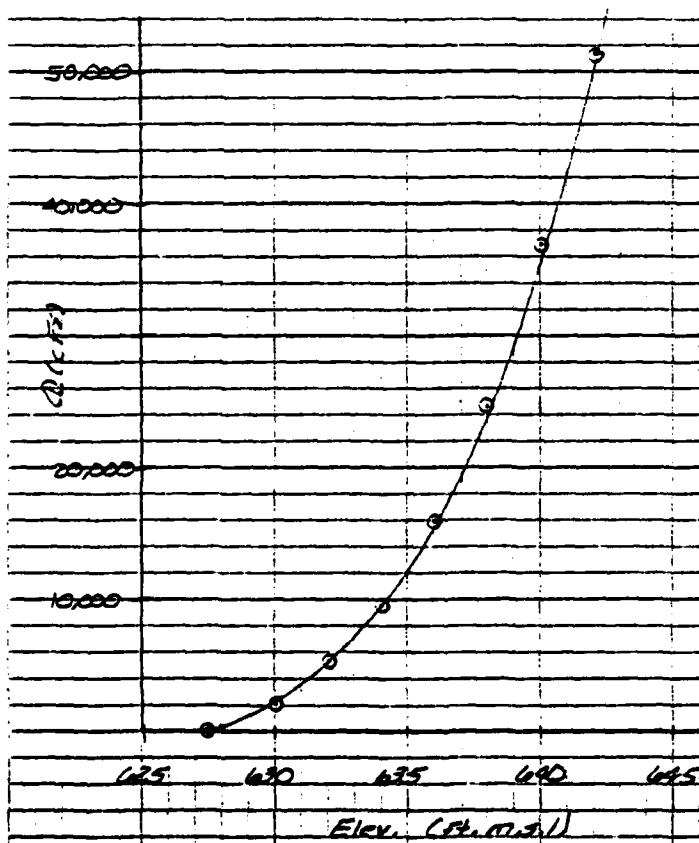
CLIENT Worcester County
PROJECT Worcester County
DETAIL Worcester County

JOB NO. W-10-10
DATE CHECKED 8-18-78
CHECKED BY Miller

PAGE 10 of 17
DATE 8-18-78
COMPUTED BY ---

Inflow Rating Curve

Flashboards in place, Gates closed



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Environmental Engineers
Boston, Mass.

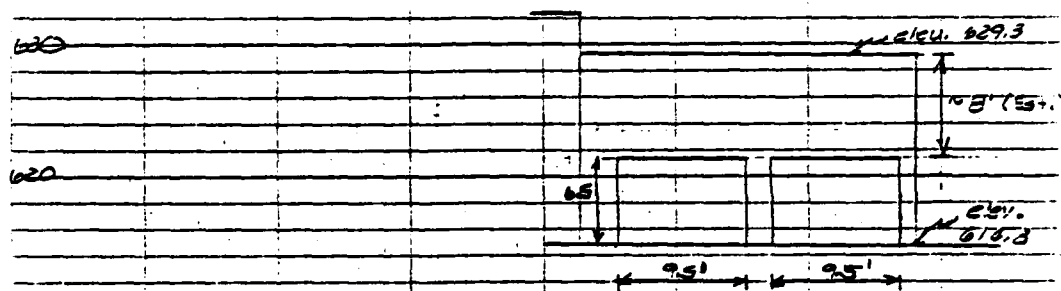
CLIENT Holston and Lippitt JOB NO. 541-2-PT
PROJECT Industrial Canal Head DATE CHECKED 2-18-78
DETAIL Bridge Mill Road Dam CHECKED BY Miller

PAGE 12517
DATE 2/12/78
COMPUTED BY 1-20

Spillway Rating Curves

Include the effects of opening the ^{head} gates

Head
Gate Section 25, Gates (from location 8129178)



0.150 0.190 0.230 0.270 0.310 0.350

King and Brater, Handbook of Hydraulics Table 4-7

Coefficients of Discharge for Submerged Gates

Gates Flowing Full

$$C_d = 1.920 \cdot P^{0.5} \cdot A$$

$$P = 0.175 \cdot 1.9296875$$

$$52.0001 \cdot A = 0.175 \cdot 2 \cdot 0.15$$

CAMP DRESSER & MCKEE
Environmental Engineers
Boston, Mass.

CLIENT Holmes and Narish
PROJECT Internal Drainage
DETAIL Roundabout Flood Gage

JOB NO. 71-2-PT
DATE CHECKED 9-8-79
CHECKED BY Becker

PAGE 12 of 17
DATE 5-3-79
COMPUTED BY Becker

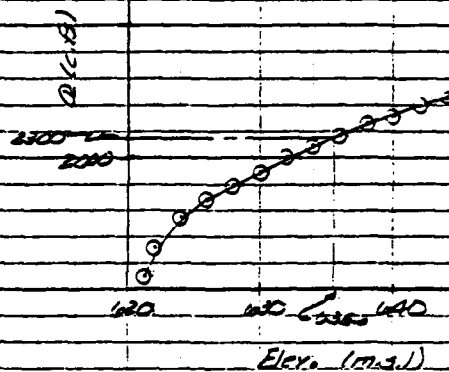
$$Q_{F11} = 2 \times 1.495 (1.929 \times 2.5)^{3/2} (1.000)^{1/2} \times 101.75$$

$$.015$$

$$Q_{F11} = 190 \text{ CFS}$$

Elevation	Head on Gate	Q (for one gate) 8000
621.3	0	95
622	0.7	311
624	2.7	529
626	4.7	677
628	6.7	795
630	8.7	906
632	10.7	1005
636	12.7	1095
638	14.7	1178
638	14.7	1250
640	16.7	1329
642	20.7	1398
644	22.7	1464

Gates Rating Curve
(for both gates)



$$Q = CA \sqrt{2gh}$$

* Add capacity of gates to spillway capacities for total structure capacity.

* However, gates should be considered as closed for the purpose of this analysis.

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Boston, Mass.

CLIENT Holy and Bishop
PROJECT Internal Drainage
DETAIL Regional Flood Map

JOB NO. 561-2-RT

DATE CHECKED 5-18-79

CHECKED BY CDP

PAGE 3 of 17

DATE 5-12-79

COMPUTED BY CDP

Estimation Effect of Surge Storage

1. $Q_p = 53290 \text{ CFS}$

a. all Fishbarrs, gates closed / water = 640.75'

b. Volume Surge = $6 \text{ Acres} \times 16.15$
 $43.5 \text{ sq. mi.} \times 53.3$

= 0.04 inches of runoff

c. $Q_p = 53290 \times \left(1 - \frac{0.04}{23}\right) = 48156 \text{ CFS}$

3 a. Ht. surge = 640.70

Volume surge = $6 \text{ Acres} \times 16.1 \text{ feet}$
 $43.5 \text{ sq. mi.} \times 53.3$

Volume = 0.04 inches of runoff

b. $Q_p = 48156 \text{ CFS}$

CAMP DRESSER & MCKEE
Environmental Engineers
Boston, Mass.

CLIENT Massachusetts Dept. of Transportation
PROJECT Lowell Dam No. 1
DETAIL Estimate of Downstream Dam Failure Hydrographs

JOB NO. 7-1-78
DATE CHECKED 8-18-78
CHECKED BY Miller

PAGE 4 of 17
DATE 8-18-78
COMPUTED BY Miller

Estimate of Downstream Dam Failure Hydrographs

1. Reservoir Storage, S, at time of failure = 936 Rcu.

2. Basin width = $0.40 \times 125 = 50$ ft.

$$y_0 = 21'$$

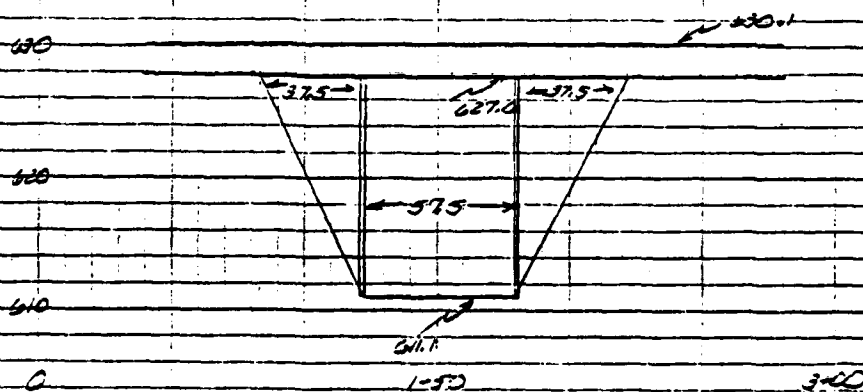
$$Q_p = \frac{2}{27} \times 50' \times 132.2 \times 21'^{3/2}$$

$$Q_p = 8090 \text{ cfs.}$$

3. Downstream of Powdermill Pond Dam.
- Borie Creek Road

Stream slope = 18" for first 50'
24" for rest of distance (~330')

$$\text{Weighted slope} = \frac{42''}{380'} = 3.5' = .0092105 \text{ ft/ft}$$



$$Q = 1.486 R^{2/3} S^{1/2} A$$

$$R = 0.30, Q = 9,754 \text{ cfs } A$$

at 1/4 mile out, but effect of 1/4 mile distance with 50 ft. width

CAMP ORESSER & MCKEE
Environmental Engineers
Boston, Mass.

CLIENT Hill and Aldrich
PROJECT Vertical Curve Insp
DETAIL Bridgeway, Ford Dam

JOB NO. 561-B-PT
DATE CHECKED 5-8-82
CHECKED BY PRR

PAGE 5 OF 17
DATE 9/13/82
COMPUTED BY dad

Slope-Discharge Rating Curve for Bridge Section

Elevation	Head	A	WD	P	S	Q
611.1	0	0			0.09205	0
612	0.9	53.55	61.89	0.865		231
614	2.9	189.15	70.23	2.000		1654
616	4.9	320.95	79.77	4.023		3862
618	6.9	493.35	90.52	5.950		7248
620	8.9	671.95	97.66	6.881		11563
622	10.9	877.95	108.90	8.095		16829
624	12.9	1102.95	119.16	9.256		23192
626	14.9	1378.25	133.58	10.318		31078
627.4	16.5	1547.5	139.44	11.241		37425
Pressure → 630.1 Flow	19.0	1567.5				

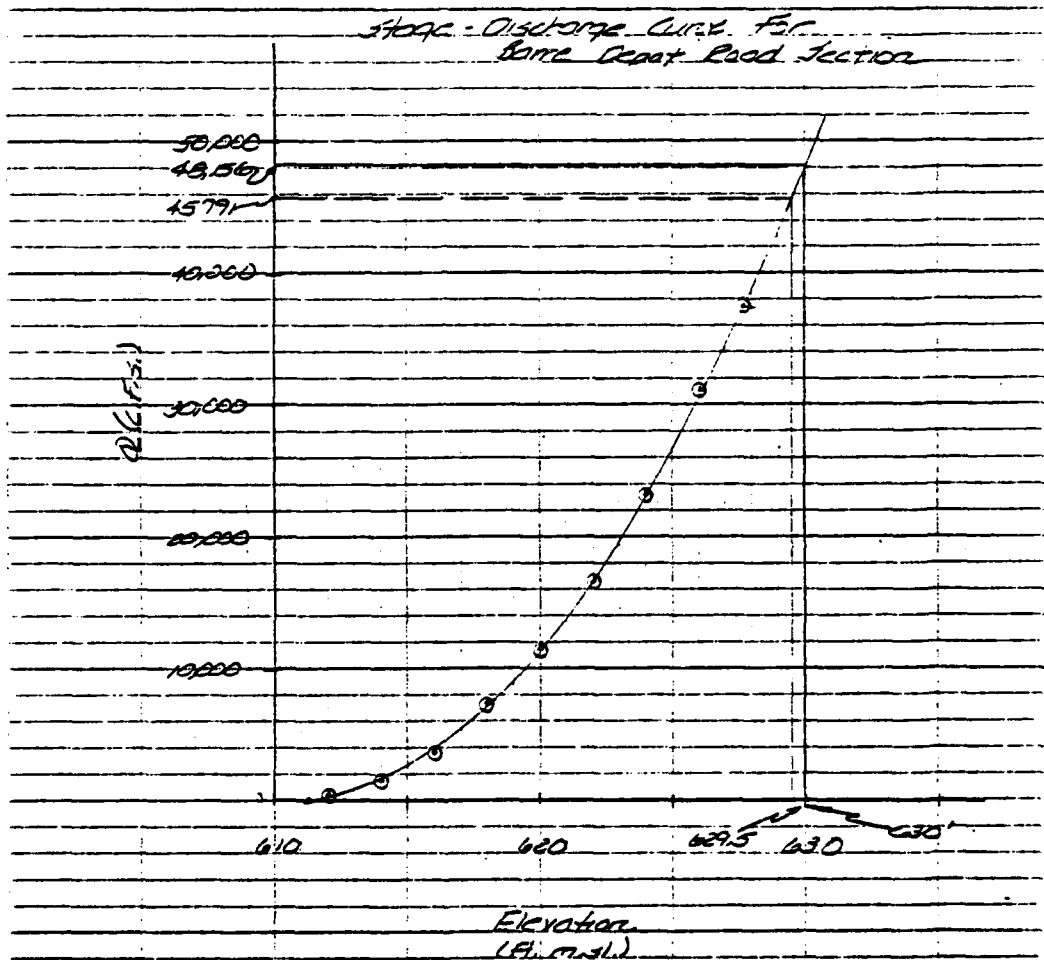
P. Flow

Q = 1.4129 ft³/s, C = 0.429

CAMP DRESSER & MCKEE
Environmental Engineers
Boston, Mass.

CLIENT W. J. and A. Blawie JOB NO. 51-12-57
PROJECT 1-7-57 Camp Dresser DATE CHECKED 2-18-58
DETAIL Engineering Data CORRECTED BY Becker

PAGE 1-35
DATE 3-3-58
COMPUTED BY 5-58



6. For Q_p , stage = 630.0 (18.9' deep)

$$Area = 15,475 + 2.4 \times 137.5 = 1897.5 \text{ ft}^2$$

$$Volume = 1897.5 \text{ ft}^2 \times 380 \text{ ft} = 721,050 \text{ ft}^3 = 16.6 \text{ Acres-ft}$$

$$16.6 \approx 16.8$$

1/15 50.004

CAMP DRESSER & MCKEE
Environmental Engineers
Boston, Mass.

CLIENT WATER RESOURCES DIVISION JOB NO. 51-1-B-27
PROJECT NATURAL DAM FSD DATE CHECKED 8-18-78
DETAIL Boulder Mill Pond Dam CHECKED BY DEWILK

PAGE 17
DATE 3-19-78
COMPUTED BY WILSON

4. (continued)

$$Q_{P2} = 48,156 \left(1 - \frac{16.6}{330}\right) = 45,777 \text{ cfs}$$

$$V_2 = (1567.5 \text{ ft} + 1.9 \times 137.5) 330 = 694925 \text{ ft}^3$$
$$= 15.95 \text{ ACR-ft}$$

$$\frac{V_1 + V_2}{2} = \frac{16.6 + 15.95}{2} = 16.275 \text{ ACR-ft}$$

$$Q_{P2} = 48,156 \left(1 - \frac{16.275}{330}\right) = 45,823 \text{ cfs}$$

$$\text{Elevation water} = 629.6$$

Flood waters would enter South Base Hill Pond Dam, increasing the water surface elevation of the pond. An analysis of the South Base Hill Pond Dam has already demonstrated a high hazard potential exists. Therefore, the classification of Boulder Mill Pond Dam should remain high in the hazard category.

REPORT OF
INVESTIGATION OF THE
FEDERAL BUREAU OF INVESTIGATION

INVENTORY OF DAMS IN THE UNITED STATES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
STATE	COUNTY	CITY	NAME	LATITUDE	LONGITUDE	REPORT DATE													
MA	02	08	POWDER HILL POND DAM	4223.4	7204.4	15 NOV 78													

POPULAR NAME		NAME OF DAM	
		POWDER HILL POND (SHAR RIVER)	
NEAREST DAM	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	POPULATION
01 08	WARE RIVER	SOUTH DARE	3983

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STORAGE CAPACITY		DIST	OWN	FED	R	PHV	FED	SCS	A	VER	DATE
			MAXIMUM	MINIMUM										
RFC1PG	1908	R	21	13	336	20	MED	N	N	N	N	N	N	N

REMARKS

D/S HAS	SPILLWAY	TYPE	WIDTH	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY	INSTALLED	PROPOSED	MO	LENGTH	WIDTH	HEIGHT	DIST	OWN	FED	R	PHV	FED	SCS	A	VER	DATE	
1	200	C	155	17940																			

OWNER	ENGINEERING BY	CONSTRUCTION BY
BARNE WOOD COMBING CO.	L. B. DOW	R. L. CONTRACT INC. CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPH

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
HALEY + ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

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



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

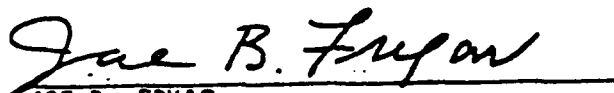


FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

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Engineering Division

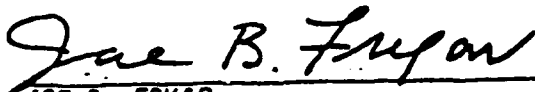


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Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



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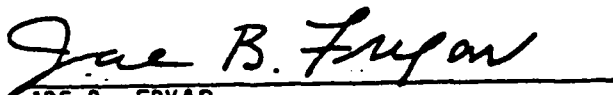


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Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



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Chief, Engineering Division

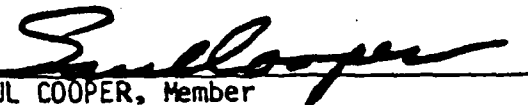
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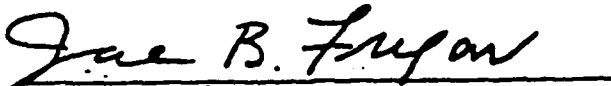


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Engineering Division



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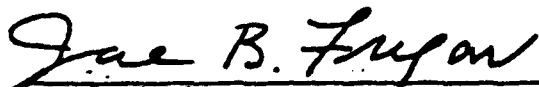


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Engineering Division



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Engineering Division

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Engineering Division

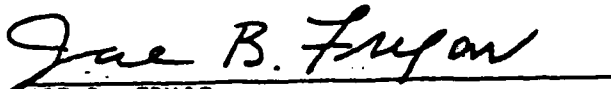


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Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
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Engineering Division

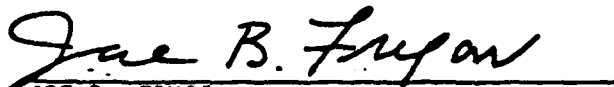


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Chief, Design Branch
Engineering Division



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Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



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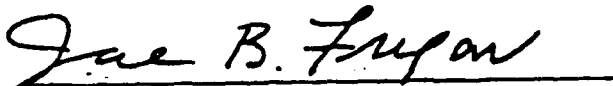


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Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



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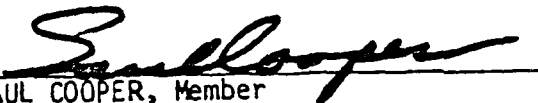
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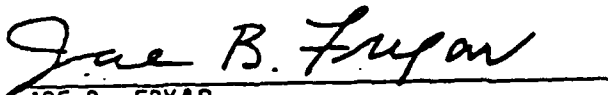


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Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

AD-A145 343

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
POWDER MILL POND DAM (..(U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV NOV 78

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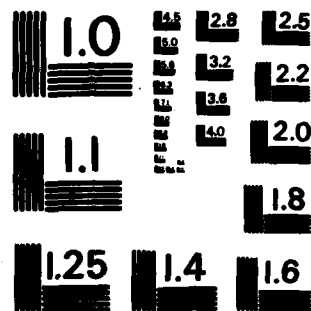
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Chief, Foundation and Materials Branch
Engineering Division

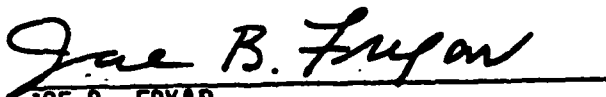


FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

INVENTORY OF DAMS IN THE UNITED STATES

STATE	COUNTY	TOWNSHIP	SECTION	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
MA	WINDHAM	02	02	POWDER MILL POND DAM	4223.4	7204.4	15 NOV 78

POPULAR NAME	NAME OF IMPROVEMENT
	POWDER MILL POND (MAHE RIVER)

REGION	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	POPULATION
0100	MAHE RIVER	SOUTH BARNES	3983

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC POWER CAPACITY (KW)	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE
RECTPG	1900	R	21	336

DIST 04N FED R PHV/FED SCS A VER/DATE

REMARKS

DAM NO.	SPILLWAY TYPE	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY (KW)	INSTALLED POWER (KW)	NAVIGATION LOCKS
1	200 C 155	17900				

OWNER	ENGINEERING BY	CONSTRUCTION BY
BORNE MOOL CUMMING CO.	L. A. DOW	R. I. CONTRA CT ENG. CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPH

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
MALEY + ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	COUNTY	CITY	NAME	REPORT DATE
MA	WINDHAM	WINDHAM	POWDER MILL POND DAM	15 NOV 78

POPULAR NAME	NAME OF IMPROVEMENT
	POWDER MILL POND (MAINE RIVER)

RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	POPULATION
MAINE RIVER	SOUTH BAHNE	1983

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC CAPACITY	IMPOUNDING CAPACITIES
RECIPRO	1900	R	21	336

REMARKS

DS HAS LENGTH	SPILLWAY TYPE	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CU YD)	POWER CAPACITY INSTALLED (KW)	PROPOSED (KW)	NAVIGATION LOCKS
1 200	C	155	17940			

OWNER	ENGINEERING BY	CONSTRUCTION BY
BADHE MOOL CUMMING CO.	L. B. DOW	R. I. CONTRACT ENG. CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPM

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
HALEY + ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

DIST 04N FED R PHY/FED SCS A VER/DATE

INVENTORY OF DAMS IN THE UNITED STATES

DATE	STATE	COUNTY	CITY	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE (DAY MO YR)
7-1-78	MA	02	02	POWDER MILL POND DAM	42°23'4"	72°04'N	15 NOV 78

POPULAR NAME	NAME OF IMPROVEMENT
	POWDER MILL POND (MAHE RIVER)
RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE
MAHE RIVER	SOUTH RANNE
POPULATION	
3983	

TYPE OF DAM	YEAR COMPLETED	PURPOSES	IMPOUNDING CAPACITIES (ACFT)
RFCIPG	1900	R	21 13 336

DIST OWN FED R PRV/FED SCS A VER/DATE

N N N N

REMARKS

OVERSIGHT	SPELLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CU)	POWER CAPACITY (KW)	NAVIGATION LOCKS
1	240 C 155	17940			

OWNER	ENGINEERING BY	CONSTRUCTION BY
BARRE MOOL COMBING CO.	L. B. DOW	P. J. CONTRACT ENG. CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPM

INSPECTION BY	INSPECTION DATE (DAY MO YR)	AUTHORITY FOR INSPECTION
MALEY + ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	COUNTY	CITY	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE (DAY MO YR)
MA	WINDHAM	WINDHAM	POWDER MILL POND DAM	4223.4	7204.4	15 NOV 78

POPULAR NAME	NAME OF MONUMENT
	POWDER MILL POND (MAINE RIVER)

NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
SOUTH BAHRE	1	3983

TYPE OF DAM	YEAR COMPLETED	PURPOSES	TRAVEL HOURS	IMPOUNDING CAPACITIES
RFC1PG	190R	R	21	336

DIST ON N FED R PRV/FED SCS A VER/DATE

REMARKS

OWNER	ENGINEERING BY	CONSTRUCTION BY
BARRE WOOL CUMBER CO.	L. B. DOW	R. I. CONTRACT ENG. CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPM

INSPECTION BY	INSPECTION DATE (DAY MO YR)	AUTHORITY FOR INSPECTION
MALEY & ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	COUNTY	CITY	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
MA	WIND	MA 021 02	POUNDER HILL POND DAM	4223.4	7204.4	15 NOV 78

POPULAR NAME	NAME OF IMPOUNDMENT
	POUNDER HILL POND (MAINE RIVER)
NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	POPULATION
SOUTH BARRIE	3903

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC HEIGHT	MAXIMUM CAPACITY
RECIPRO	1900 R		21	336

REMARKS

OR HAS	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CFT)	POWER CAPACITY	INSTALLED	PROPOSED	NAVIGATION LOCKS
1	200 C 155	17900					NO

OWNER	ENGINEERING BY	CONSTRUCTION BY
BARRIE WOOD CUPPING CO.	L. B. DOW	R. I. CONTRACT ENG. CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPH

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
MALEY + ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

DIST OWN FED R PRV/FED SCS A VER/DATE

11-77

INVENTORY OF DAMS IN THE UNITED STATES

STATE	COUNTY	TOWNSHIP	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
MA	01	00	POWDER MILL POND DAM	4223.4	7204.4	15 NOV 78

POPULAR NAME	NAME OF IMPONUMENT
	POWDER MILL POND (WARE RIVER)

REGION	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	POPULATION
01 00	WARE RIVER	SOUTH RAKE	3983

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC CAPACITY	IMPOUNDING CAPACITIES
RFCIPG	1900	R	21	336

DIST 04N FED R PRV/FED SCS A VER/DATE

REMARKS

OR HAS	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CFT)	POWER CAPACITY (KW)	NAVIGATION LOCKS
1	200	155	17940	13	NO

OWNER	ENGINEERING BY	CONSTRUCTION BY
BARNE WOOD CUMMING CO.	L. B. DDM	P. L. CONTRACT ENU. CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPH

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
HALEY + ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

MA

INVENTORY OF DAMS IN THE UNITED STATES

STATE	MA	COUNTY	MA	NAME	POWDER MILL POND DAM	LATITUDE NORTH	4223.4	LONGITUDE WEST	7204.4	REPORT DATE DAY	15	MONTH	NOV	YEAR	78
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POPULAR NAME	POWDER MILL POND (MAINE RIVER)
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NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	SOUTH DAKOTA	POPULATION	3983
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TYPE OF DAM	190A R	YEAR COMPLETED	190A	PURPOSES	HYDRO-ELECTRICITY	IMPOUNDING CAPACITIES	MAXIMUM	MAINE
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REMARKS	
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OWNER	MAINE MOOL CUMMING CO.	ENGINEERING BY	R. L. CONTRACT ENG. CO.	CONSTRUCTION BY	
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DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
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INSPECTION BY	INSPECTION DATE DAY	MONTH	YEAR	AUTHORITY FOR INSPECTION
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HALEY & ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367
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REMARKS	
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DIST U4N FED R PRV/FED SCS A VER/DATE

N N N

(a)	POPULAR NAME	NAME OF IMPONUMENT	
			BOWDED MTL POND (KAHE RIVER)

(a)	(b)	(c)	(d)	(e)	(f)
REGION	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM OAM (MI.)	POPULATION	1981

[illegible]

REF ID: A66588	908	0	REMARKS
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[illegible]

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
										OWNER										ENGINEERING BY										CONSTRUCTION BY																																																																					
																														R. L. CONTRACT ENG. CO.																																																																					

REGULATORY AGENCY		OPERATION	MAINTENANCE
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONF	NONF	NONF	MA DPM

NONE	NONE	(5)	(6)	(7)
INSPECTION BY		INSPECTION DATE		
		DAY	MO	YR
INSPECTION ADDRESS		AUTHORITY FOR INSPECTION		
		PUBLIC LAW 92-367		

MALEY & ALCOHOL, INC.	9	REMARKS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	COUNTY	CITY	NAME	REPORT DATE
MA	WINDHAM		POWDER MILL POND DAM	15 NOV 78

POPULAR NAME	NAME OF IMPROVEMENT
	POWDER MILL POND (MAINE RIVER)

NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
		3983

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC POWER CAPACITY (KW)	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
RFCIPG	1900	R	21	13	336	20

REMARKS

OWNER	ENGINEERING BY	CONSTRUCTION BY
BARRE WOOD COMBING CO.	L. B. DOW	P. L. CONTRACTING CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPM

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
HALEY & ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

SCS A VER/DATE

INVENTORY OF DAMS IN THE UNITED STATES

IDENTITY NUMBER	STATE	COUNTY	CURR. DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
92 NED	MA	02	02	POWDER MILL POND DAM	4223.4	7204.8	15 NOV 78

POPULAR NAME	NAME OF IMPOUNDMENT
	POWDER MILL POND (WARE RIVER)

REGION	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DATE OF CONSTRUCTION (YR.)	POPULATION
01 0A	WARE RIVER	SOUTH BARRE	1	3983

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STATUS: HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES (ACRE-FT.)	NORMAL (ACRE-FT.)
RFC1PG	1908	R	21	13	336

DIST 04N FED R PRY/FED SCS A VER/DATE N N N

REMARKS

DESIGN LENGTH	SPILLWAY TYPE	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CU)	POWER CAPACITY INSTALLED (KW)	PROPOSED (KW)	NO. OF LOCKS	NAVIGATION LOCKS
1 200	C	155	17940				

OWNER	ENGINEERING BY	CONSTRUCTION BY
BARRE MOUL COMBING CO.	L. B. DDW	P. L. CONTRACT ENG. CO.

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPM

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
MALEY & ALDRICH, INC.	11 MAY 78	PUBLIC LAW 92-367

REMARKS

REFERENCE OR OFFICE SYMBOL

NEDED-E

SUBJECT

Dam Inspection Final Report

TO

Chief, Design Branch
Chief, F & M Branch
Chief, Water Control Branch

FROM

Chairman,
Dam Safety Review Board

DATE 26 Dec 1978 CMT 1

OK J. Fay

1. Attached is a single copy of the final report for

Powder Mill Dam, Identity No. MR00022

2. Please ascertain that the report is acceptable in accordance with your Branch comments or instructions given to the Architect-Engineer at the Review Board Meeting.

3. If acceptable, retain the copy for your files and be prepared to sign the (master) approval sheet on 5 Jan 1979.

4. If the report requires further work or correction, notify the undersigned as soon as the determination is made.

5. The cost code for this review is ABA02 0700000000.

Incl
as

Mc Elroy
MC ELROY

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