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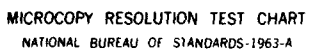
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
BRIERLY POND DAM (MA..(U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV OCT 78

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BLACKSTONE RIVER BASIN
MILLBURY, MASSACHUSETTS

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BRIERLY POND DAM
MA 00143

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

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

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00143	2. GOVT ACCESSION NO. AD-A146161	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Brierly Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE October 1978
		13. NUMBER OF PAGES 55
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		18a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Blackstone River Basin Millbury, Mass.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Brierly Pond Dam consists of an earthfill dam which is part of West Main St. in Willbury Mass. The main dam is about 260 feet long, with a maximum height of 10 feet. The dike is about 225 feet long and 5 feet high. Brierly Pond Dam and Dike are considered to be in fair condition. An outflow test flood of 2,560 cfs will overtop the dam by about 2.4 feet.		



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

REPLY TO
ATTENTION OF:

NEDED

JAN 30 1979

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

I am forwarding to you a copy of the Brierly Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Windle Industries, Inc., 65 Canal Street, Millbury, Massachusetts 02537.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be 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 your cooperation in carrying out this program.

Sincerely yours,


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

BRIERLY POND DAM

MA 00143

BLACKSTONE RIVER BASIN
MILLBURY, MASSACHUSETTS

PHASE I - INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM



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NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA00143

Name of Dam: Brierly Pond

Town: Millbury

County and State: Worcester County, Massachusetts

Stream: Singletary Brook - Tributary of the Blackstone
River

Date of Inspection: August 23, 1978

Brierly Pond Dam consists of an earthfill dam which is part of West Main Street, Millbury, Massachusetts. An earthfill dike section is located at the northeast end of the pond 600 feet from the main dam. The age of the structures is unknown. The main dam is about 260 feet long, with a maximum height of 10 feet. The dike is about 225 feet long and 5 feet high.

There are two regulating outlets at the pond. One is a U-shaped concrete structure extending from the upstream toe of the dam. This outlet has a submerged 4-foot-square wooden slide gate with an invert at elevation (El) 511.9. The second outlet is located at the dike, and consists of a 4-foot-wide wooden slide gate and stone outlet channel. The invert of the outlet is at El 512.5. When the gate is open, water flows directly into the outlet channel. When the pond level exceeds El 516.3, and the gate is closed, the top of the gate serves as an overflow weir leading to the outlet channel. Overflow can also be controlled by flashboards on this gate. There is no other spillway at this site other than flow over the wooden slide gate.

The dam and dike at Brierly Pond were neither designed nor constructed according to current approved state-of-the-art procedures. Based upon the visual inspection at the site, the lack of engineering data,

BRIERLY POND DAM

and little evidence of operational or maintenance procedures, it was concluded that there are deficiencies that must be corrected to assure their continued performance. Generally, Brierly Pond dam and dike are considered to be in fair condition. Because of the potential danger to a few lives and the limited property development in the area, the dam has been placed in the "significant" hazard category.

The following visible signs of distress were noted at the site: erosion and insufficient riprap on the upstream face of the dam; the lack of permanently-installed equipment for opening the gate at the low-level intake; leakage around the closed gate; seepage in the tailrace downstream of the dam; and overgrowth of vegetation on the dam, the dike, and over the outlet channel.

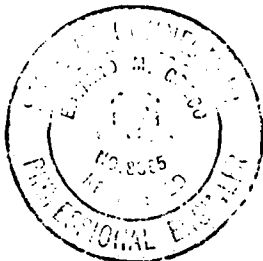
Hydraulic analyses indicate that the opened outlet at the dike can discharge a flow of 180 cubic feet per second (cfs) when the water surface is at El 519.0, which is the lowest point on the dike. If the dike outlet gate is not opened, the discharge is 48 cfs at pond El 519.

An outflow test flood of 2,560 cfs (derived from one-half the probable maximum flood) will overtop the dam by about 2.4 feet. The outlet even when fully opened is inadequate as a spillway because it can discharge only 7 percent of the test flood. In the event of overtopping, complete failure of the main dam is unlikely, although local breaching and severe flooding is a possibility. Complete failure of the dike is possible during overtopping.

It is recommended that the Owner employ a qualified consultant to conduct a more detailed hydraulic and hydrologic investigation to design an adequate spillway. It is also recommended that the Owner construct a permanent mechanical operator for opening the gate at the outlet at the dam; repair the riprap on the upstream face of the dam; repair the stone masonry on the approach channel to the spillway; and clear the trees and brush from all structures. The Owner should also implement a systematic program of maintenance inspections.

BRIERLY POND DAM

The above recommendations and remedial measures should be implemented by the Owner within a period of 2 years after receipt of this Phase I Inspection Report. An alternative to these recommendations would be draining the pond and breaching or removing the dike or dam.



Edward M. Greco

Edward M. Greco, P.E.
Project Manager
Metcalf & Eddy, Inc.

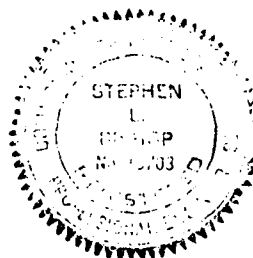
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Approved by:

Stephen L. Bishop

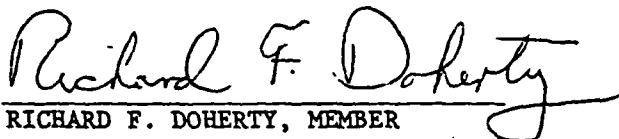
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Vice President
Metcalf & Eddy, Inc.

Massachusetts Registration
No. 19703

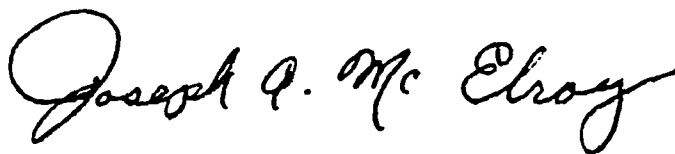


BRIERLY POND DAM

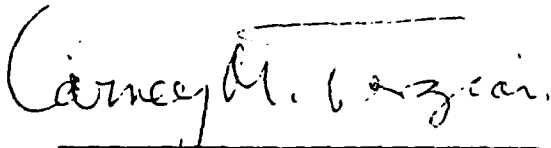
This Phase I Inspection Report on Brierly Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice,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



RICHARD F. DOHERTY, MEMBER
Water Control Branch
Engineering Division

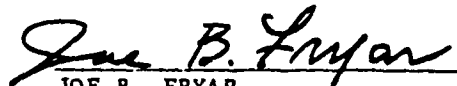


JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division



CARNEY M. TERZIAN, CHAIRMAN
Chief, Structural Section
Design Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

PREFACE

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

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

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

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

BRIERLY POND DAM

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TABLE OF CONTENTS

	<u>Page</u>
BRIEF ASSESSMENT	
PREFACE	
OVERVIEW PHOTO	111
LOCATION MAP	iv
REPORT	
SECTION 1 - PROJECT INFORMATION	1
1.1 General	1
1.2 Description of Project	2
1.3 Pertinent Data	6
SECTION 2 - ENGINEERING DATA	11
2.1 General	11
2.2 Construction Records	11
2.3 Operation Records	11
2.4 Evaluation of Data	11
SECTION 3 - VISUAL INSPECTION	13
3.1 Findings	13
3.2 Evaluation	15
SECTION 4 - OPERATING PROCEDURES	16
4.1 Procedures	16
4.2 Maintenance of Dam	16
4.3 Maintenance of Operating Facilities	16
4.4 Description of Any Warning System in Effect	16
4.5 Evaluation	16
SECTION 5 - HYDRAULIC/HYDROLOGIC	17
5.1 Evaluation of Features	17

BRIERLY POND DAM

TABLE OF CONTENTS (Continued)

	<u>Page</u>
SECTION 6 - STRUCTURAL STABILITY	19
6.1 Evaluation of Structural Stability	19
SECTION 7 - ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES	20
7.1 Dam Assessment	20
7.2 Recommendations	21
7.3 Remedial Measures	21
7.4 Alternatives	22
APPENDIXES	
APPENDIX A - PERIODIC INSPECTION CHECKLIST	
APPENDIX B - PLAN OF DAM AND PREVIOUS INSPECTION REPORTS	
APPENDIX C - PHOTOGRAPHS	
APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS	
APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS	

BRIERLY POND DAM

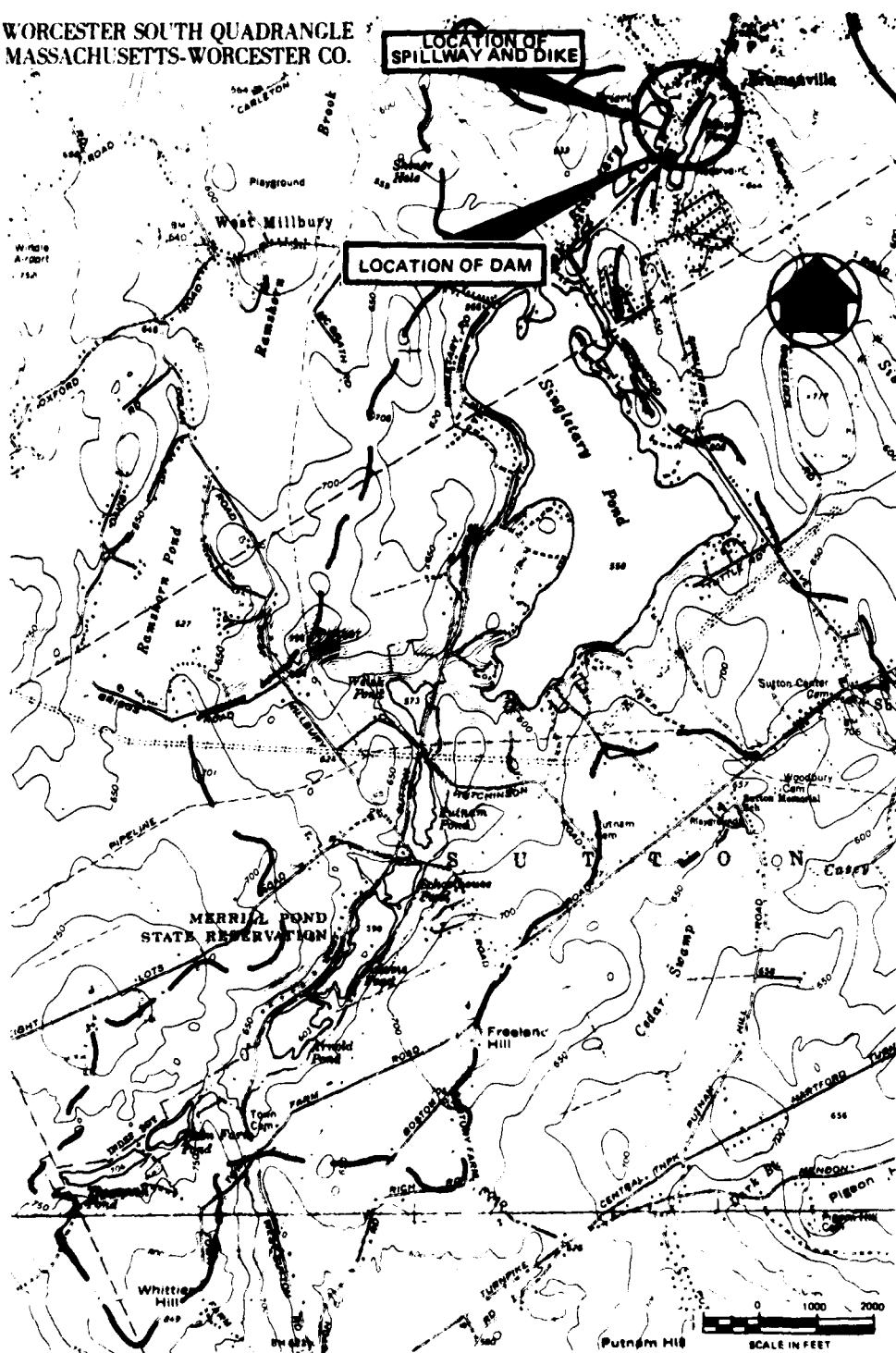
**OVERVIEW
BRIERLY POND DAM
MILLBURY, MASSACHUSETTS**



UPSTREAM VIEW OF MAIN DAM

**Location and Direction of Photographs
Shown on Figure in Appendix B**

WORCESTER SOUTH QUADRANGLE
MASSACHUSETTS-WORCESTER CO.



LOCATION MAP - BRIERLY POND DAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIERLY POND

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Metcalf & Eddy, Inc. under a letter of July 28, 1978, from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0306 has been assigned by the Corps of Engineers for this work.

b. Purpose

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

BRIERLY POND DAM

1.2 Description of Project

- a. Location. The dam is located on Singletary Brook, a tributary of the Blackstone River, in the Town of Millbury, Worcester County, Massachusetts (see location plan).
- b. Description of Dam and Appurtenances. There are two impoundment structures on Brierly Pond: an earthfill dam on the east side that forms part of West Main Street; and an earthfill dike at the northeast end of the pond, about 200 feet west of West Main Street (see location map, and plan of dam, and dike Figures B-1 and B-2). The dam is about 260 feet long with a maximum height of 10 feet. The crest of the dam, which is the paved road, is generally about 33 feet wide but increases to 100 feet wide at the south abutment, where Sutton Road forks to the south from West Main Street. The elevation (El) of the crest varies from 518.9 to 520.7. On the upstream slope of the dam there was originally a vertical stone wall two to three feet high. The wall has collapsed in many areas, and is overgrown with weeds. There is a small sandy beach near the south abutment, and beyond that an area of the pond has been filled for parking. The downstream slope of the dam (the east side of West Main Street) is a vertical concrete wall, and immediately beyond that is a three-story brick building, formerly the mill that used the water from the pond.

A low level outlet (outlet "B" on Figure B-1) is located at the dam about 100 feet south of the north abutment. The structure consists of a U-shaped concrete headwall with a 4-foot square submerged wooden slide gate. The invert of the gate is at El 511.9. This outlet is inoperative because there is no permanent mechanical operator at the gate. The outlet pipe reportedly enters the mill at the downstream face of the dam.

BRIERLY POND DAM

In addition to the low level outlet, there is a high-level service intake located about 30 feet offshore from the outlet ("C" on Figure B-1). The structure is a 6-foot-square concrete box, and the intake provided water to run the wheel at the mill. There is no access walk to the intake. Since the penstock has reportedly been filled in with concrete, this intake is inoperative.

The dike at Brierly Pond is about 225 feet long and about 5 feet high (see Figure B-2, Plan of Dike and Outlet). The crest of the dike is generally 13 feet wide north of the spillway. The elevation of the grass-covered crest varies from 519.5 to 521.2. The upstream slope is approximately 2:1 (horizontal to vertical) and covered with riprap. The downstream slope varies from 3:1 at the northern section of the dike to almost 6:1 at the southern section. The downstream face is covered with grass, and slopes into the backyards of two abutting residences.

There is no spillway at the dam other than a second low-level outlet (Outlet "A") located near the south end of the dike. The structure consists of an approach channel bounded by 2-foot thick mortared stone masonry and concrete sidewalls; a 4-foot-wide wooden slide gate operated by a rack and pinion mechanism, and a dry stone masonry outlet channel. The gate stem is accessible by a wooden walkway built across the outlet channel. The invert of the outlet is at El 512.5. When the gate is closed, water can flow directly into the outlet channel. When the gate is lowered, water above El 516.3 can flow over the top of the gate and enter the same channel. Flashboards can be added above the gate to increase the storage capacity of the pond.

The outlet channel is 190 feet long and decreases in height and width from 5.3 by 4 feet at the gate to 3.7 by 3.2 feet at the stone box culvert under West Main Road. The channel is straight, and has vertical sidewalls for most of its length. The slope of the channel is approximately 5.5 percent. The

outlet end of the culvert is located east of West Main Street and is 3 feet wide and 2.8 feet high.

- c. Size Classification. Brierly Pond Dam is classified in the "small category since it has a maximum height of 10 feet and a maximum storage capacity of 135 acre-feet.
- d. Hazard Classification. The mill building that formerly used the pond is now used for storage and light industry, and is located immediately downstream of the dam. Failure of the dam could cause considerable damage to West Main Street and the building, before the flood water entered the former Mayo Pond basin. Failure of the dike could result in extensive property damage and possible loss of life in about five homes abutting the downstream toe of the dike. The height of the flood wave due to dike failure would be on the order of 2 to 3 feet. In both cases, it is likely that the dry Mayo Pond basin would reduce the impact of a dam or dike failure on Bramanville, located less than 1,500 feet downstream of the dike. For this reason, the dike and dam at Brierly Pond has been classified in the "significant" category.
- e. Ownership. The dam and dike are presently owned by Windle Industries, Inc., 65 Canal Street, Millbury, Massachusetts, 02537 (telephone 617-865-4461). A representative of the company granted permission to enter the property and inspect the dam.
- f. Operator. Windle Industries currently operates the flashboards at the spillway, and the outlet gate (B) at the dam.
- g. Purpose of the Dam. The dam and dike were constructed sometime prior to 1924 (the first recorded inspection date) by the West End Thread Company Mill No. 1. The dam was used to store water for mill processes - including dye works and power for the water wheel. In 1944 the dam became the property of the Linen Thread Company, Inc., in Millbury. The thread company sold the dam to the Winfred W. Windle Company (wool processing) in 1948, but

BRIERLY POND DAM

apparently they retained the water rights and the right to enter and repair the dam. In 1955 W.W. Windle granted water rights to the Worcester Brass and Electroplating Corporation, who contracted for 50,000 gallons per day to their mill. The mill on West Main Street is no longer in operation and the intakes (B and C) are closed or blocked. The pond is presently used for recreation by the few abutting residents near the dike, and there is a small beach near the south abutment of the dam.

- h. Design and Construction History. There are no plans available for the original dam or for any subsequent repairs. The present owner provided no information on the design and construction history of the dam. Early inspection reports on file at the Worcester County Commissioner's office and interviews with local residents provided some background information for both the dam and the dike.

In the early history of the dam, most of the area on West Main Street from north of the mill to south of the fork at Sutton Road was reported to be swamp land that had been filled in.

In 1925 the concrete wall at the downstream side of the dam was new, the conduit to the mill was a 48-inch diameter pipe, and the water wheel, a size 6, was rated at 60 horsepower. The 1939 report states that the spillway (i.e., the outlet A) was in good condition, and describes the concrete intake structure for the mill. According to the sketch, the gate was 58 inches square, and water flowed through the gate and down into a 65-inch diameter stone culvert under the roadway. The gate was operated by a rack and pinion mechanism. In 1940 the spillway was rated in fair condition, and there were no flashboards at the time of the inspection (December). The inspector reported that the spillway was too small and that the gate should be kept open to keep the pond at a lower level.

A 1963 inspection report describes a diversion channel located about 100 feet below the slide gate at outlet A. This channel has about

a 3- by 5-foot opening and is used to divert some of the outlet flow to a community cesspool. Small leaks were reported at the spillway, and three large leaks at the diversion channel outlet. At the main dam it was recommended that the wood timbers on the gate be renewed, and the amount of freeboard for the dam be increased.

Through interviews with local residents it was learned that repairs were made to the outlet conduit walls and gate timbers in 1970. Also, the penstock in the waterwheel intake (C) was filled in with concrete about 3 years ago.

1. Normal Operational Procedures. There are no operational procedures at this dam. The gate at Outlet B has not been operated in a number of years. The Owner removes the flashboards from the slide gate at the dike in the late summer, apparently to provide extra storage in the pond in the event of flooding from seasonal storms.

1.3 Pertinent Data

- a. Drainage Area. The approximately 2,844-acre drainage area (4.4 square miles) above Briely Pond includes seven ponds in the Merrill Pond State Forest and several other mill ponds. Singletary Pond is the largest and comprises 12 percent of the drainage area. Singletary Pond Dam is also owned by Windle Industries. The drainage area is generally sparsely developed and consists of forest and farmland. The most heavily populated areas are the lake front properties along Singletary Pond. Two high-tension lines and a buried pipeline cross the drainage area south of Singletary Pond.
- b. Discharge at the Dam Site. Water discharges at the dike into the stone-lined channel that discharges east of West Main Street. There the flow joins a tributary of Singletary Brook which flows through the former Mayo Pond. Mayo Pond was a mill pond, and although the mill and dam are still standing, the pond has been drained. Singletary Brook flows north under Burbank Street through two 6- by 6-foot box culverts and into low, open land until it flows

BRIERLY POND DAM

under Route 140. The brook flows on the edge of a more heavily populated area of Millbury for the remaining 1,200 feet to the Blackstone River.

Water flowing through outlet B at the dam enters the mill, then apparently discharges into an earth tailrace below the building, and into Singletary Brook, also at Mayo Pond.

Hydraulic analyses indicate that, when opened, the outlet works (A) at the dike can discharge 180 cfs when the water surface is at El 519, which is the lowest point on the dam.

An outflow test flood of 2,560 cfs (one-half the probable maximum flood) will overtop the dam by 2.4 feet. The outlet, when fully opened, has the capacity to discharge only 7 percent of this flow, and with the gate closed the discharge is negligible, meaning that almost the entire flow will be over the crests of the dam and dike.

The maximum flood which has occurred at the dam site is unknown, although residents recall that flooding on Beach Street (north of the dike) has occurred in the past.

There is no longer any flow through Outlet B at the dam.

- c. Elevation (feet above MSL (Mean Sea Level)).
A benchmark elevation of 517.0 at the water surface was estimated from a United States Geological Survey (USGS) topographic map.

- (1) Top dam: Main Dam: 519.0 to 520.7
Dike: 519.5 to 521.2
- (2) Test flood pool: 521.4
- (3) Design surcharge (original design):
unknown
- (4) Full flood control pool: Not Applicable
(N/A)
- (5) Recreation pool: 516.3, top of slide gate

BRIERLY POND DAM

- (6) Spillway crest (top of slide gate): 516.3
- (7) Upstream portal invert diversion tunnel:
N/A
- (8) Stream bed at dike (outlet channel):
512.3
- (9) Maximum tailwater: None

d. Reservoir

- (1) Length of maximum pool: 1,800 feet
- (2) Length of recreation pool: 1,800 feet
- (3) Length of flood control pool: N/A

e. Storage (acre-feet)

- (1) Test flood surcharge: 50 at El 521.4
- (2) Top of dam: 135
- (3) Flood control pool: N/A
- (4) Recreation pool: 85 (approximate)
- (5) Spillway Crest: 85

f. Reservoir Surface (acres)

- *(1) Top dam: 17
- *(2) Maximum pool: 17
- (3) Flood-control pool: N/A
- (4) Recreation pool: 17
- (5) Spillway crest: 17

*Based on the assumption that the surface area will not significantly increase with changes in reservoir elevation from 516.3 to 519.0.

g. Dam

- (1) Type: Main dam: earthfill
Dike: earthfill
- (2) Length: Main dam: 260 feet
Dike: 225 feet
- (3) Height: Main dam: 10 feet - maximum
Dike: 5 foot - maximum
- (4) Top width: Main dam: 33 feet
Dike: 13 feet
- (5) Side slopes: Main dam - Upstream:
Unknown
Downstream:
Vertical
Dike - Upstream: 2:1
Downstream: 3:1
- (6) Zoning: Unknown
- (7) Impervious core: Unknown
- (8) Cutoff: Unknown
- (9) Grout curtain: Unknown

i. Spillway. (No spillway at this site other than Outlet A)

- (1) Type: sharp-crested weir - flashboards
over outlet gate
- (2) Length of weir: 5.45 feet
- (3) Crest elevation: 516.3 (top of gate)
- (4) Gates: one 48-inch square wooden slide
gate
- (5) Upstream Channel: Stone masonry and con-
crete walls on approach
channel

BRIERLY POND DAM

(6) Downstream Channel: Stone masonry channel with vertical walls, 4 feet wide, 5.3 feet deep at gate, to 3.2 feet wide, 3.7 feet deep. Open channel is 191 feet long, then stone culvert under road. Outlet is 3 feet wide and 2.8 feet high.

- j. Regulating Outlets. There are two regulating outlets at Brierly Pond. One is the slide gate (Outlet A) at the dike which when opened will allow flow down to El 512.5. There are keyways for 5.5-foot flashboards above the gate in the spillway. Shortly before the inspection two 6- or 7-inch boards were removed by the Owner. Water is presently flowing over the gate.

The second outlet, B, is located on the main dam. This gate is closed, and there is no permanent mechanism for opening it. According to a local resident, the gate was last opened with the aid of a pulley system mounted on a tripod on top of the intake structure.

SECTION 2
ENGINEERING DATA

- 2.1 General. There are no plans, specifications, or computations available from the Owner, State, or County offices relative to the design and construction of this dam. The only data available for this evaluation were visual observations made during inspection, review of previous inspection reports, and conversations with local residents, and State and County agencies.

We acknowledge the assistance and cooperation of personnel of the Massachusetts Department of Public Works: Messrs. Willis Regan and Raymond Rochford, and of the Massachusetts Department of Environmental Quality Engineering, Division of Waterways: Messrs. John J. Hannon and Joseph Iagallo.

Also, we acknowledge the cooperation and assistance of personnel from the Worcester County Engineer's Office: Messrs. John O'Toole, Joseph Brazauskas, and Mr. Wallace Lindquist - recently retired from county service.

Mr. Larry Stockwell, and Mr. William Grout, longtime residents of the Brierly Pond area, provided background history on the pond and mills.

- 2.2 Construction Records. There are no construction records available.
- 2.3 Operating Records. No operating records are available, and there is no daily record kept of the elevation of the pool or rainfall at the dam site.
- 2.4 Evaluation
- a. Availability. Due to the age of this dam, there is no engineering data available.
 - b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based

BRIERLY POND DAM

primarily on visual inspection, past performance history and engineering judgment.

- c. Validity. The limited engineering data available is valid.

BRIERLY POND DAM

SECTION 3
VISUAL INSPECTION

3.1 Findings

- a. General. The Phase I Inspection of the dam and dike at Brierly Pond was performed on August 23, 1978. A copy of the inspection check list is in Appendix A. Previous inspections of this dam have been made by others since 1924. A partial listing of these inspections is in Appendix B. Copies of the 1972 inspection reports by the Massachusetts Department of Public Works for both the dam and the dike are also included in Appendix B.
- b. Dam. The earthfill dam, which forms part of West Main Street, is in generally good condition. The paved crest is level with no cracks or depressions on the surface. The upstream slope is covered with weeds and only partially protected by scattered riprap 1.5 to 2.5 feet in size. Apparently there was once a short vertical stone wall at the top of the slope but the wall has deteriorated in places to a pile of rubble at the toe. The three-story brick building situated on the downstream slope of the dam is separated from the road by a 4-foot-wide, 10-foot-deep concrete channel. This channel is partially filled with water.

The earth dike, which is located about 600 feet from the main dam, is in good condition. The crest and the downstream face are covered with grass. Since the downstream slope serves as a back yard for two residences, the area is very well maintained. There are trees and shrubs growing on the upstream side of the crest, partially hiding the low stone wall on the shore.

- c. Appurtenant Structures. Outlet A, at the dike, is in fair condition. There are patches of mortar and concrete missing from the training walls, and a few large diameter (1 to 2 foot) trees adjacent to the approach. The floor of the approach and discharge channel is submerged, but appear to be paved with stone.

BRIERLY POND DAM

There is minor spalling and erosion of concrete in the vicinity of the gate, but the gate appears to be in good condition. It is operable by a rack and pinion mechanism hung between timbers. The mechanism is accessible by means of a wooden walkway which crosses the outlet channel. The railing on the walkway is very loose. There is a keyway for flashboards to be added above the gate, but the flashboards had been removed that week by the Owner.

The stone masonry of the narrow outlet channel is in good to fair condition; some of the mortar and a few stones are missing at the base of the sidewalls. There are numerous trees growing on the banks of the channel, and in some places it is completely hidden by brush. The open channel ends at West Main Street and the inlet to the stone box culvert is obscured by vegetation. The outlet downstream of the street is in a stone masonry retaining wall. This area near the road is completely overgrown with trees.

Outlet B at the main dam is in fair condition. The concrete is spalling, especially at the water line. The slide gate is closed, and there is no permanent gate-opening mechanism in place. Water can be heard running inside the structure, suggesting that the gate leaks.

The tailrace downstream of the mill building is filled with brush and debris, and there is evidence of seepage.

The offshore service intake C is reportedly blocked with concrete and inoperable. There is no approach bridge to this structure.

- d. Reservoir Area. At the present time light residential and commercial development is limited to the north and east sides of Briery Pond. In addition, a small land-clearing operation is in progress on the northwest side of the pond, opposite the dike. The remainder of the area west of the pond is hilly farm and woodland.

BRIERLY POND DAM

e. Downstream Channel. Discharge from the tail-race downstream from the mill, as well as from the stone box culvert below outlet A, enters Singletary Brook in the former basin for Mayo Pond. The mill building and dam at Mayo Pond are still standing, although in a deteriorating state, and the outlet and penstock are open. Below the mill Singletary Brook continues in a natural channel to the Blackstone River, about 4,500 feet downstream, and just south of Millbury center.

3.2 Evaluation. Although the dam and dike appear to be in good condition, the condition of the upstream slope of the dam and the leaking intake are signs of neglect. It is evident that these structures are not adequately maintained. Recommended measures to improve these conditions are stated in Section 7.3.

SECTION 4

OPERATING PROCEDURES

- 4.1 Procedures. There are no regular operating procedures at this dam. It is reported that the Owner regulates the storage in the pond seasonally by adjusting the number of flashboards at the outlet gate.
- 4.2 Maintenance of Dam. The crest of the main dam is a paved town road and is maintained by highway department personnel. The upstream slope of the dam has deteriorated, judging by the condition of the stone wall on the upstream face and the accumulation of debris and vegetation. The dike crest and downstream slope appear to be maintained by the residents of the abutting property, but the upstream face is overgrown with brush.
- 4.3 Maintenance of Operating Facilities. The service intake structure C at the main dam was blocked with concrete by the Owner. The gate on the low-level outlet B appears to be leaking. Apparently the Owner has not used it for about 3 years, as there is no permanent operating mechanism. There is no known maintenance procedure for Outlet A.
- 4.4 Description of Any Warning System in Effect. There are no warning systems in effect at this dam.
- 4.5 Evaluation. There are no regular operational or warning systems in effect at Brierly Pond Dam, and the maintenance is inadequate. This is extremely undesirable, considering the dam is in the "significant" hazard category. A program of operation and maintenance for this dam should be implemented as recommended in Section 7.3.

BRIERLY POND DAM

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

- a. Design Data. The probable maximum flood (PMF) rate was determined to be 1,200 cfs per square mile. This calculation is based on an average drainage area slope of 3 percent, the pond-plus-swamp area to drainage area ratio of 19 percent, and the U.S. Army Corps of Engineers' Flow Rates (dated December 1977). Applying one-half the PMF to the 4.44 square miles of drainage area results in a calculated peak flood flow of 2,664 cfs as the inflow test flood. By adjusting the inflow test flood for surcharge storage, the maximum discharge rate was established as 2,560 cfs (577 cfs per square mile) with the water surface at El. 521.4.

For the peak outflow flood, the depth of flow over the crest at a minimum elevation of 519+ is calculated to be 2.4 feet with a unit flow of 9.9 cfs per foot of width. Where flow becomes critical, a critical depth of 1.5 feet will occur with a critical velocity of 6.8 feet per second. Hydraulic analyses indicate that outlet A at the dike, when fully opened, can discharge a flow of 180 cfs with the surface of the water at El. 519.0, which is the low point on the dam. This outlet, which also serves as a spillway, is inadequate since it can only discharge 7 percent of the test flood. Flood flow will also occur in a low, broad swale at the northern end of the pond. The swale is roughly 100 feet wide and about a foot higher than the normal pond level. During large storm flows this area would act as an emergency spillway, conducting discharge down Beach Street into Bramanville.

- b. Experience Data. Hydraulic records are not available for this dam, however, residents recall some local flooding over the road at

BRIERY POND DAM

the south abutment of the dam during the 1938 storm, and also in the natural swale during the 1955 floods.

- c. Visual Observations. At the time of the inspection the flashboards had been removed from Outlet A but the gate was closed and water was flowing over the top into the outlet channel. The gate and channel are inadequately sized considering that presently it is the only operable outlet at the pond and there is no spillway. Outlet B at the dam, although closed, is leaking. With no permanent mechanism for operating the gate the structure is useless for emergencies.
- d. Overtopping Potential. As noted previously, overtopping of the dam and dike is expected under the test flood. In addition, hydraulic computations show that the dike would be overtopped even with a 45 percent reduction in test flood outflows as a result of available storage at Singletary Pond. Failure of the dike would produce a flood flow of 570 cfs, with a resulting flood wave height of 2 to 3 feet. Failure of the dam during a peak flood would produce initial outflow on the order of 2,780 cfs. The volume from Brierly Pond could add 8 feet of water to the Mayo Pond basin.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

- a. Visual Observations. The evaluation of the stability of Brierly Pond Dam is based on the visual inspection conducted on August 23, 1978. As discussed in Section 3, Visual Inspection, the embankments of the dam and dike are generally in good condition, and not considered a hazard. However, the small size of the outlet at the dike, and the lack of a permanent operating mechanism at Outlet B at the dam indicate a possibly hazardous situation.
- b. Design and Construction Data. There are no plans, specifications or computations available on the design, construction or repair of this dam from the Owner, County, or State offices. Furthermore, information does not appear to exist on the type, shear strength, and permeability of the soil and/or rock materials of the embankment. The West Main Street highway embankment is probably of local sand and gravel fill without any type of core or cut-off wall.
- c. Operating Records. There is no evidence that instrumentation of any type was ever installed in Brierly Pond Dam. The performance of this dam under prior loading can only be inferred by physical evidence at the site.
- d. Post-Construction Changes. There are no as-built drawings available for Brierly Pond Dam. There is no information available on the type of conduit or the location of the outlets to the mill.
- e. Seismic Stability. The dam is located in Seismic Zone No. 2 and in accordance with Phase I "Recommended Guidelines" does not warrant seismic analyses.

BRIERLY POND DAM

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

- a. Condition. Brierly Pond Dam was neither designed nor constructed according to current state-of-the-art procedures. Based upon the visual inspection of the site, the lack of engineering data, operational or maintenance information, there are deficiencies which must be corrected to assure the continued performance of this dam. Generally, the dam is considered to be in fair condition. There is no spillway at the site other than overflow at outlet gate A at the dike. There is no permanent mechanism to operate the gate at outlet B at the dam. There were several problem areas observed at the site: erosion along the slopes of the dam, irregular and displaced riprap, and the collapsed wall on the upstream face of the dam; leakage around the closed gate of outlet B; seepage in the tailrace downstream of the dam; and overgrowth of vegetation on the dam, the dike, and over the discharge channel from the spillway.

Hydraulic analyses indicate that the outlet structure at the dike, which serves as a spillway can discharge a flow of 180 cfs when the gate is fully opened and the water surface is at El 519 (the low point on the dam). This means that the outlet is adequate for only 7 percent of the test outflow of 2,650 cfs.

- b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented

BRIERLY POND DAM

by the Owner within 2 years after receipt of this Phase I Inspection Report.

- d. Need for Additional Investigations. Additional investigations to further assess the adequacy of the dam are outlined below in Section 7.2. Recommendations.

7.2 Recommendations. In view of the concerns over the continued performance of the dam, dike, and outlet works it is recommended that the Owner employ a qualified consultant to:

- a. Conduct a more detailed hydrologic and hydraulic investigation to design an adequate spillway.

The recommendations on repairs and maintenance procedures are outlined below under Section 7.3, Remedial Measures.

7.3 Remedial Measures

- a. Operating and Maintenance Procedures. The dam and appurtenance structures are not adequately maintained. It is recommended that the Owner accomplish the following:
 - (1) construct a permanent operating mechanism for opening the gate on the low-level outlet at the dam (Outlet B).
 - (2) repair the leak through the gate, and the spalled concrete at Outlet B.
 - (3) repair the riprap and erosion on the upstream face of the dam and clear the vegetation.
 - (4) repair the stone walls in the approach channel, and the railing on the walkway at Outlet A.
 - (5) clear the trees and vegetation on the dike and along the outlet channel.
 - (6) implement a systematic program of maintenance inspections. As a minimum, the program should consist of a monthly inspection of the dam and appurtenances,

BRIERLY POND DAM

supplemented by additional inspections during and after severe storms. All repairs and maintenance should be undertaken in accordance with all applicable State regulations.

(7) institute a definite plan for surveillance and a warning system during periods of unusually heavy rains and/or runoff.

(8) Technical inspections of this dam should be conducted on an annual basis.

7.4 Alternatives. An alternative to implementing the recommendations and maintenance procedures listed above would be to drain the pond and breach or remove the dam.

APPENDIX A
PERIODIC INSPECTION CHECKLIST

BRIERLY POND DAM

PERIODIC INSPECTION

PARTY ORGANIZATION

PROJECT Brierly Pond Dam

DATE 8-23-78

TIME 1:30 to 5:00 pm

WEATHER sunny, 80° F

W.S. ELEV. 517.0 U.S. - DN...

PARTY:

- | | |
|-------------------------|-------------------------|
| 1. <u>Ed Greco</u> | 6. <u>Frank Sviokla</u> |
| 2. <u>Lyle Branagan</u> | 7. <u>Henry Lord</u> |
| 3. <u>Sue Pierce</u> | 8. _____ |
| 4. <u>Carol Sweet</u> | 9. _____ |
| 5. <u>David Cole</u> | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Dam / Dike</u>	<u>Ed Greco / Sue Pierce</u>	
2. <u>Spillway</u>	<u>Ed Greco / Lyle Branagan</u>	
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____

PERIODIC INSPECTION CHECK LIST

PROJECT Brierly Pond DATE 8-23-78
 PROJECT FEATURE Dam NAME E. Greco
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	top of dam is West Main Road
Crest Elevation	
Current Pool Elevation	517.0
Maximum Impoundment to Date	unknown
Surface Cracks	none
Pavement Condition	pavement on West Main Road
Movement or Settlement of Crest	none
Lateral Movement	none - downstream face is concrete wall and industrial building
Vertical Alignment	flat road grade
Horizontal Alignment	straight, except at intersection
Condition at Abutment and at Concrete Structures	dam ties into natural ground at abutments
Indications of Movement of Structural Items on Slopes	no movement
Trespassing on Slopes	telephone pole, power line, 4-inch high chainlink fence at upstream face
Sloughing or Erosion of Slopes or Abutments	stonework slumped on upstream face
Rock Slope Protection - Riprap Failures	random stones on upstream face
Unusual Movement or Cracking at or near Toes	downstream toe not visible, building not inspected inside
Unusual Embankment or Downstream Seepage	seepage in tailrace, behind mill building
Piping or Boils	none visible
Foundation Drainage Features	none visible
Toe Drains	none visible
Instrumentation System	none

PERIODIC INSPECTION CHECK LIST

PROJECT Brierly Pond DATE 8-23-78
 PROJECT FEATURE Dike embankment NAME E. Greco
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	4 to 5 feet high, located at east end of pond
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	unknown
Surface Cracks	none visible
Pavement Condition	footpath - earth
Movement or Settlement of Crest	none apparent
Lateral Movement	none
Vertical Alignment	relatively flat
Horizontal Alignment	relatively straight
Condition at Abutment and at Concrete Structures	cabana at east abutment natural ground at west abutment
Indications of Movement of Structural Items on Slopes	none
Trespassing on Slopes	footpath on crest
Sloughing or Erosion of Slopes or Abutments	grass on slopes and crest minor erosion
Rock Slope Protection - Riprap Failures	stone wall on upstream face near spillway, then riprap
Unusual Movement or Cracking at or near Toes	none
Unusual Embankment or Downstream Seepage	none visible
Piping or Boils	none apparent
Foundation Drainage Features	none
Toe Drains	none
Instrumentation System	none

PERIODIC INSPECTION CHECK LIST

PROJECT Brierly Pond DATE 8-23-78
 PROJECT FEATURE Outlet works NAME E. Greco
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	Concrete and stone masonry
a. Approach Channel	submerged
Slope Conditions	/
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure *	concrete U-shaped headwall
Condition of Concrete	fair - erosion and spalling
Stop Logs and Slots	wooden slide gate with eyebolt no control mechanism rotten wood in keyway sound of running water indicates that gate is leaking Outlet pipe enters downstream mill building, discharges into downstream tailrace. Inside of building not inspected.

- * An abandoned intake structure for waterwheel is located 30 ft. from upstream face, perpendicular to outlet gate intake. Penstock is filled in with concrete.

PERIODIC INSPECTION CHECK LIST

PROJECT Brierly Pond DATE 8-23-78
 PROJECT FEATURE Spillway NAME E. Greco
 DISCIPLINE Hydraulic NAME L. Branagan

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	mortared stone masonry and concrete walls
General Condition	good to fair: mortar and concrete missing in some areas
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	1-12" and 1-24" tree adjacent to approach
Floor of Approach Channel	submerged
b. Weir and Training Walls *	concrete walls
General Condition of Concrete	fair: some erosion and deterioration
Rust or Staining	none
Spalling	minor
Any Visible Reinforcing	none
Any Seepage or Efflorescence	none
Drain Holes	none
c. Discharge Channel	
General Condition	good to fair
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	numerous trees and bushes
Floor of Channel	possibly lined with stones
Other Obstructions	stone walkway downstream, also partial diversion to community cesspool

* Slide gate mechanism operated by rack and pinion
 Keyway for flashboards above slide gate.
 wooden walkway over channel

APPENDIX B
PLAN OF DAM AND PREVIOUS
INSPECTION REPORTS

	<u>Page</u>
Figure B-1. Plan of Dam and Section	B-1
Figure B-2. Plan of Dike and Outlet	B-2
Previous Inspections (Partial Listing)	B-3
Inspection Reports by Massachusetts Department of Public Works, January, 1972	B-5

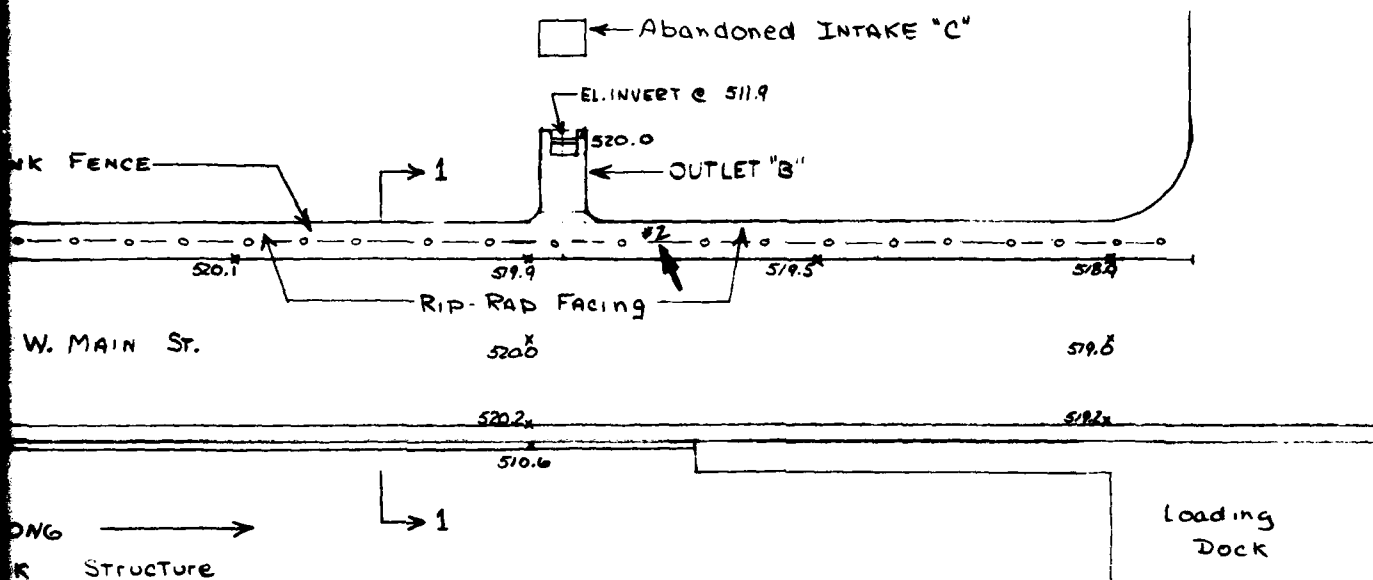
A hand-drawn site plan of the Brierly Pond area. The plan shows a 'Beach' area at the top left, a 'House' represented by a rectangle, and a 'Loading Dock' area. A '4.0' Chain Link Fence' runs along the right side. A 'W. MAIN' road is shown horizontally. A 'MILL 330' LONG 3 STORY BRICK STRUCT' is indicated with an arrow pointing left. A 'BLDG - 3 STORY' is shown with a height of '550±'. A 'Section 1-1' is drawn showing a cross-section of a structure with dimensions '38.2' and '520.37', and elevations '520.1' and '510.0'. Various elevation points are marked throughout the plan, including '519.7', '519.8', '520.0', '520.1', '520.2', '520.4', '510.9', and '519.8'. A scale bar at the bottom right indicates 'Scale in Feet' with markings for 30, 20, 10, 0, and 15.

Metcalf & Eddy, Inc.

Brierly Pond
517.0



Overview



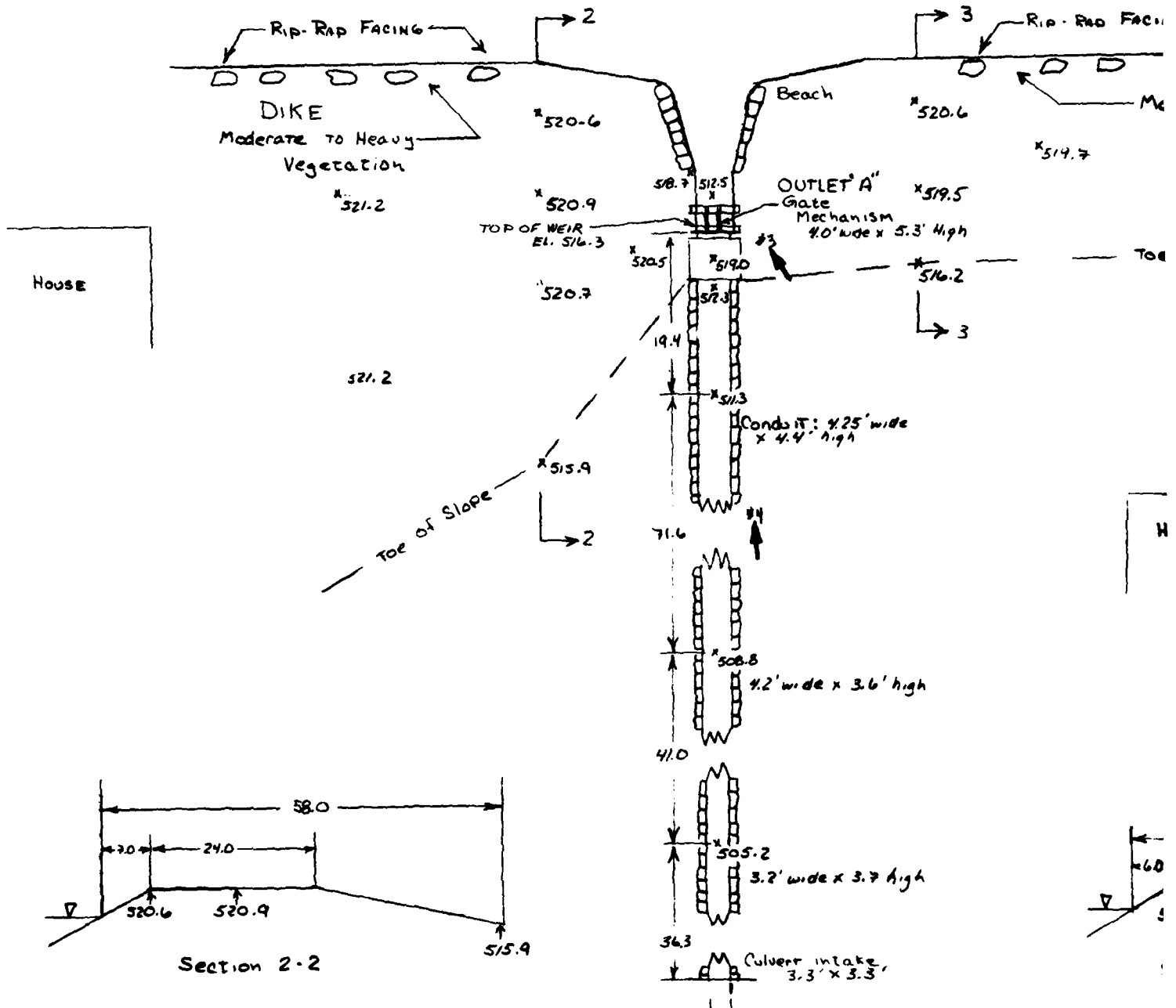
Notes:

1. Elevations Based ON ASSUMED Water level, 517.0 (MSL)
2. Details Shown Based ON field Survey of Aug. 23, 1978
3. 2. Denotes Direction of View of photographs.
4. Building locations approximate.

NETTLE & FORD, INC.	U.S. ARMY ENGINEER DIV. NEW ORLEANS
PROVIDENCE, R.I.	CORPS OF ENGINEERS
BOSTON, MA	BALTIMORE, MD
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	
BRIERLY POND DAM	
FIGURE D-1 PLAN OF DAM	
TRIBUTARY BLACKSTONE RIVER	MASSACHUSETTS
SCALE: 1" = 30'	DATE: OCTOBER, 1978

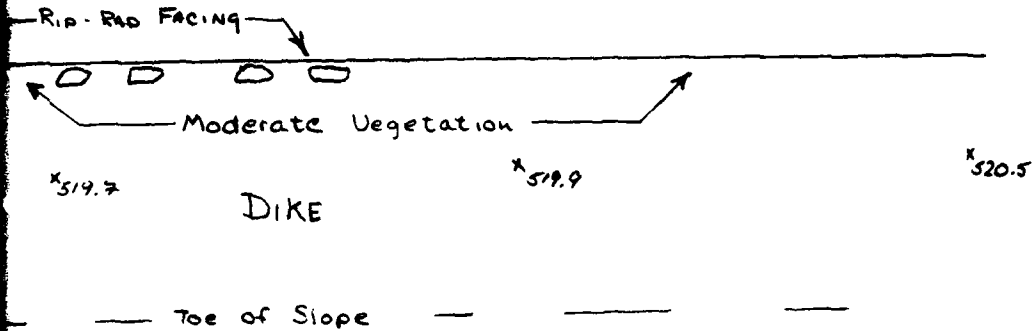
BRIERLY POND

WS 517.0



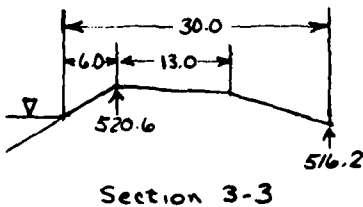
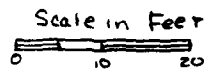
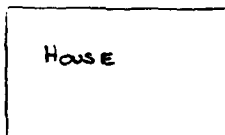
W. MAIN ST. Crown El. 507.8

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NOTES:

1. Elevations shown are referenced to assumed water level 517.0 (MSL)
2. Details shown from field survey Aug 23, 1978
3. ————— #2 Shows direction of view of photographs
4. Building locations approximate



NETCALF & EDDY, INC. ENGINEERS BOSTON, MA.	U.S. ARMY ENGINEER DIV. NEW ENGLAND COMPS OF ENGINEERS BOSTON, MA.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
BRIERLY POND DAM	
FIGURE B-2 PLAN OF DIKE AND OUTLET WORKS	
TRIBUTARY BLACKSTONE RIVER	MASSACHUSETTS
SCALE: 1" = 20'	DATE: OCTOBER, 1978

[illegible]

PREVIOUS INSPECTIONS (PARTIAL LISTING)
COPY OF INSPECTION CARD ON FILE AT THE MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS, DISTRICT OFFICE, WORCESTER.

TOWN OR CITY	Millbury	BLIERLY Pond DECREE NO. MILL Pond	1936 PLAN NO. Flood	DAM NO. 30	14
LOCATION	Bramanville	500' BELOW MILLS		C.C. DOCKET NO.	

DESCRIPTION OF DAM		DESCRIPTION OF RESERVOIR & WATERSHED	
Type	Earth - Hy Emb - Conc. Downstream Wall - 100'	Name of Main Stream	Jingletery Brook
Length		Length of Watershed	
Height		Width	
Thickness top	abt 16" crest emb	Is Watershed Cultivated	
" bottom	spill	Percent in Forests	
Downstream Slope		Steepness of Slope	
Upstream		Kind of Soil	Rocky
Length of Spillway	El. crest 100'	No. of Acres in Watershed	452.56 M
Size of Gates	to Mill - 48"	" " " Reservoir	
Location of Gates	3' of B. & O. S. 1212	Length of Reservoir	
Flashboards used	El. 105.5 5'-6" wide Yes	Width	
Width Flashboards or Gates		Max Flow Cu. Ft. per Sec.	
Dam designed by		Head or Flashboards - Low Water	
" constructed by		" " " High	
Year constructed		GENERAL REMARKS	

GENERAL REMARKS	
West End Thread Co. Mill #1 ✓	Measured: April 27, 1939 - L.H. Sarty - M.F. Hunt.
Inspected: Sept. 19, 1924, L.O. Marten.	Feb. 1944 - Linen Thread Co. Inc. Millbury.
" July 17, 1925 "	Now - W.W. Windle Co.
" Sept. 9, 1927 "	65 Canal St., Millbury -
" Nov. 15, 1928 "	
" Sept. 29, 1932 "	
" " 23, 1935 "	
" May 13, 1937 K.M. Finlayson	
" Oct. 14, 1938 "	

INSPECTION REPORT & DATA FOR DAMS

Owner: W. W. WINDLE COMPANY
His Address: 15 CANAL ST, MILLBURY
Function of Dam: MILL & STORAGE POND

Location & Access: JUST SUTTON RD & W. MAIN ST
ACROSS FROM MILL

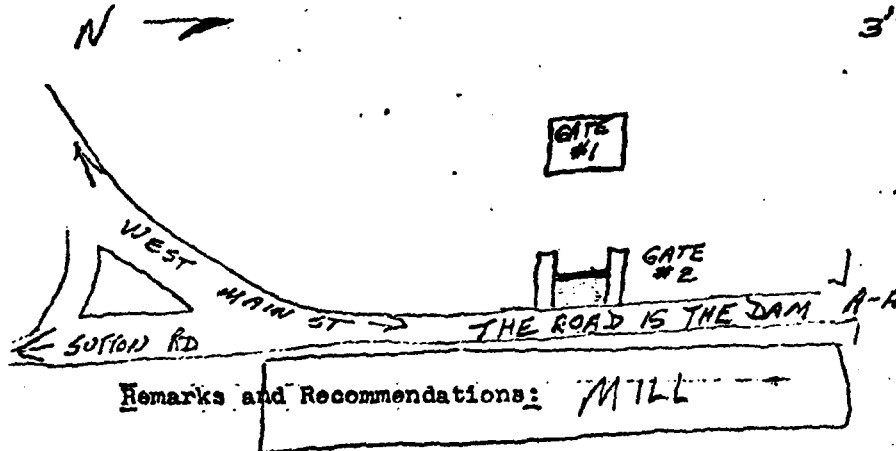
USGS Quad. Warc. South Lat. 42°10'32" Long. 71°46'30"
Drain. Ar.: Sq. Mi. Ponds: ac. Res. @ dam:
Character of D.A.:

Estimated
Discharge:
Capacity:

General Description of Dam and Discharge Control:

WEST MAIN ST IS THE DAM. GATE #1 IS LOCATED UNDER
WATER & IS SEALED UP. GATE #2. NO CONTROLS & IS
SEALED ALSO.

Sketch (Not to Scale):



Date
1/27/72

By
VFP
RSL

Comment

Dam No. 3-14-156-14A

INSPECTION REPORT & DATA FOR DAMS

(L 7011)

3-14-186-14
 Dam No. 30-14
 Town: MILLBURY
 Stream: SINGLEBERRY BROOK
 Pond: BRIERLY POND
 Date: 1/27/72
 By: _____
 CONDITION RATING
 Structural: GOOD
 Hydraulic: 5'x3'
 General: GOOD
 PRIORITY: NONE

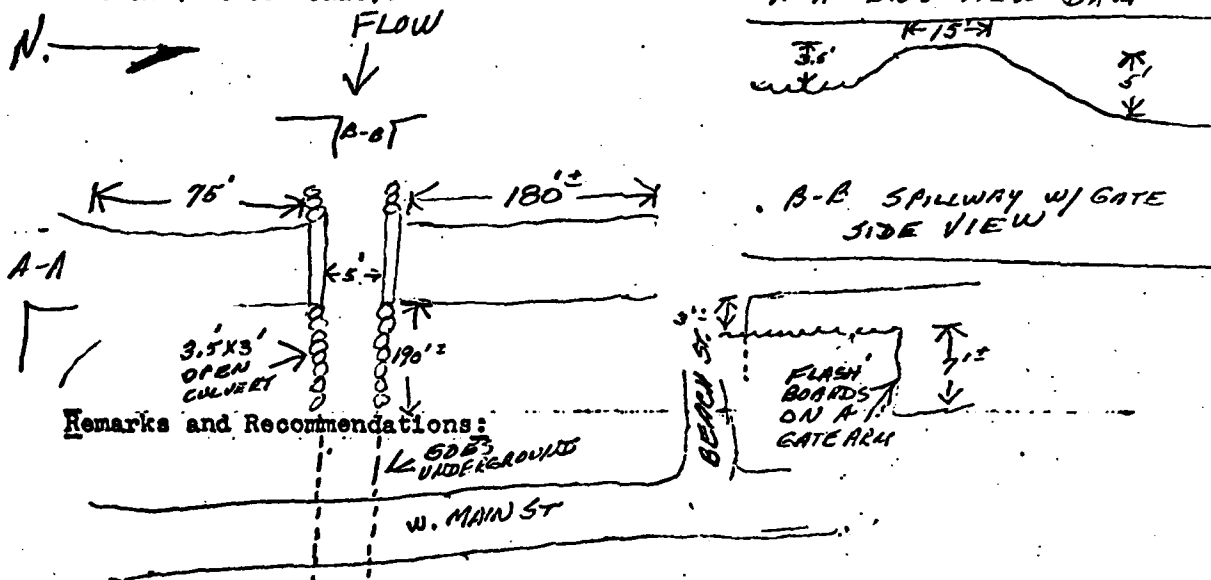
Owner: W. W. WINDLE COMPANY
 His Address: 65 CANAL ST, MILLBURY, MASS.
 Function of Dam: MILL POND
 Location & Access: 200' W. THROUGH FIELD AT
JCT OF W. MAIN & BEACH STREETS
 USGS Quad. Worc. South Lat. 42°10'38" Long. 71°46'30"
 Drain. Ar.: 7.52 Sq. Mi. Ponds: 20. Res. @ dam: _____
 Character of D.A.: _____

Estimated
 Discharge: _____
 Capacity: _____

General Description of Dam and Discharge Control:

EARTHEN DAM W/ A 5' DISCHARGE GATE WHICH IS
IN GOOD CONDITION. NUMEROUS 3"-18" TREES ON
FACE OF DAM.

Sketch (Not to Scale):



Date

1/27/72

To 3-14-186-13

By WEP
KA

Comment

Dam No. 3-14-186-14

APPENDIX C
PHOTOGRAPHS

BRIERLY POND DAM



NO. 1 CREST OF DAM



NO. 2 OUTLETS B AND C AT DAM



NO. 3 SLIDE GATE MECHANISM AND SOUTH END OF DIKE



NO. 4 OUTLET CHANNEL (OUTLET A)

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

BRIERLY POND DAM

Project Nat. Review of Non Fed. Dams Acct No. 6036 Page 1 of 5
 Subject Worcester Mass. Area Comptd. By LEB Date 8/1/78
 Detail BRIERLY POND DAM Ckd. By E. M. S. Date 10/9/76

I Test Flood, 100 year storm & Storage Functions

1- Total Drainage Area - 4.44 mi²

2- Ponds & Swamps - Total Ponds = 0.702
 Total Swamps = 0.138
0.840

$$\% \text{ Ponds \& Swamps} = \frac{0.840}{4.44} = 19\% \checkmark$$

3- $\frac{849 - 517}{26000} = 1.277\%$ } Say Ave Slope = 3%
 & Many Shorter Runs

4- Using C. of E. Curves for Peak Flow Rates & above guide values the Peak Flow Rate was estimated to be considerably lower than "Rolling"; and taken at 1200 c.f.s./mi²

Due to low dam height use 1/2 MPF

5- Test Flood Inflow = $\frac{1}{2}(1200) 4.44 = 2664 \text{ c.f.s.}$

6- Storage:

Brierly Pond has an area of 0.027 mi²
 Singletary Pond has an area of 0.552 mi²

Storage per foot rise in Brierly = 17.3 acre feet
 " " " " Singletary = 353.3 acre feet

(Assume Pond areas remain constant)

7- Storage Functions are based on $Q_{out} = Q_{in} [1 - \frac{S_{out}}{R}]$

S_{out} = Storage Vol. in Reservoir related to final Q_{out}
 in terms of inches of rain over the drainage area

$$S(\text{in Inches}) = 12 D \left(\frac{0.027}{4.44} \right) = 0.073 D; R = 6 \text{ hr rain duration}$$

D = Storage Depth (2000 spillway) on reservoir in inches

8- Storage Functions: (F_T) ; $D = 0$ @ Pond El. = 577'

$$F_{TF} = 2664 - 280 S = 2664 - 20.4 D$$

Project Nat. Review of Unfed. Dams Acct. No. 6036 Page 2 of 5
 Subject Worcester Mass. Area Comptd By LEB Date 7/13/78
 Detail BRIERLY POND DAM Ckd By EMG Date 10/9/78

II Singletary Peak Discharge - D.A. = 4 mi²

- 1- All discharge over top of small outlet structure - 50' wide and swale - with similar level - 100' wide

Use $q_c = 2.55 H^{1.5} \therefore Q_c = 382.5 H^{1.5}$

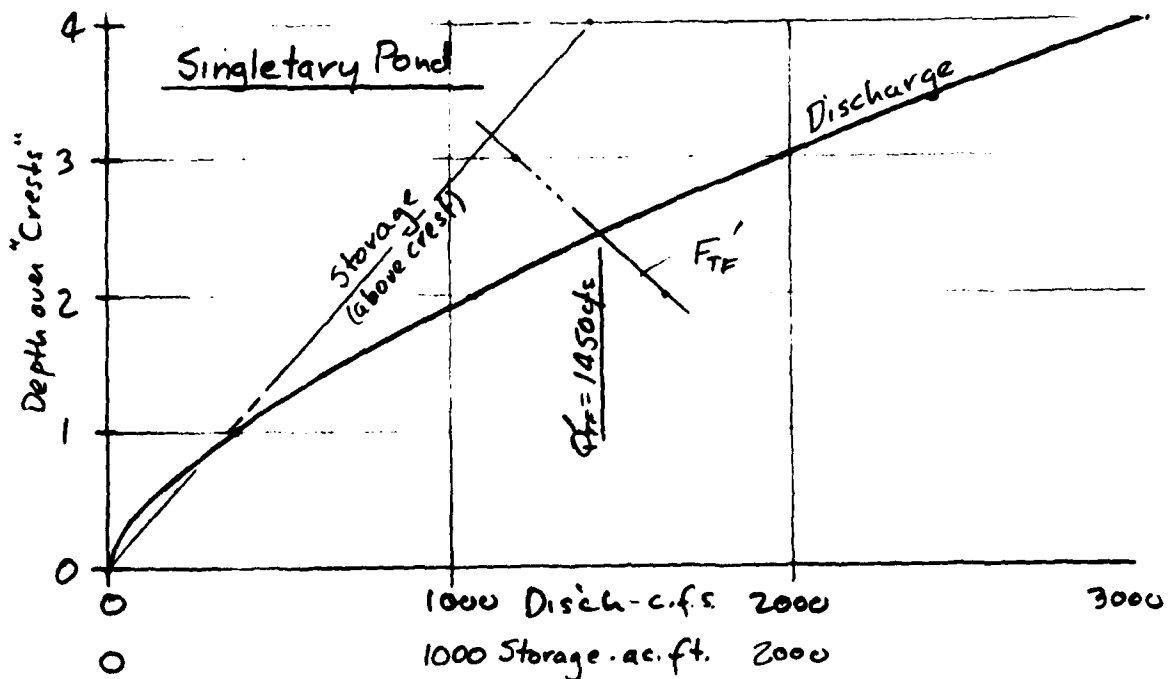
- 2- Use P.F.R. slightly higher than Brierty - due to reduced D.A.

Test Flood Peak = $\frac{1}{2} (1250 \text{ cfs/mi}^2) 4 \text{ mi}^2 = 2500 \text{ cfs}$

- 3- Storage Functions: $S = 12 D \left(\frac{1.55}{4.0} \right) = 1.65 D$

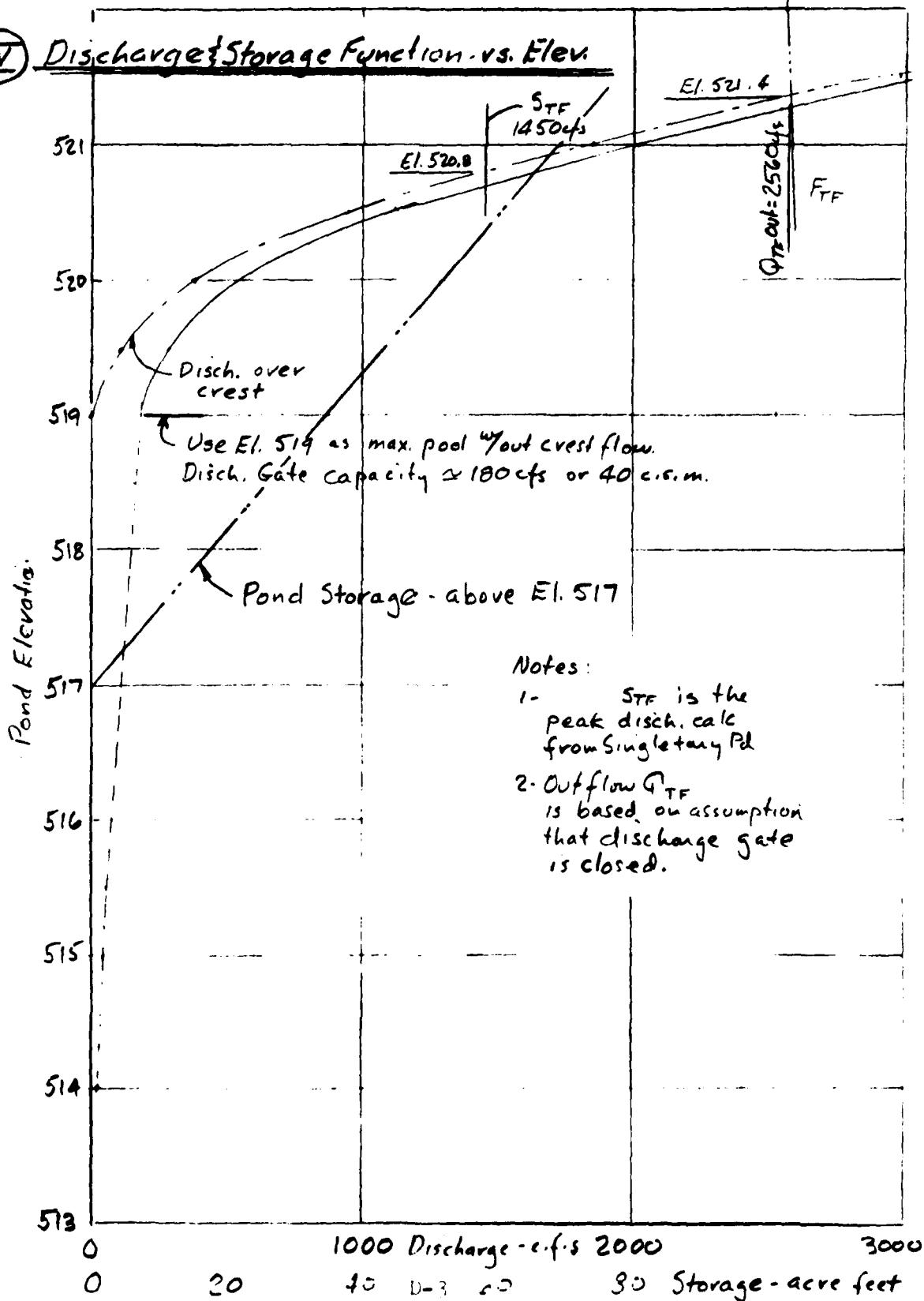
$F_{TF} = 2500 - 2635 = 2500 - 434 D$ D meas. from top swale

4- H(m D) =	1'	2'	3'	4'
Q_c	382	1082	1988	3060
F_{TF}	2066	1632	1198	764



Project Nat. Review of Non-Fed Dams Acct No 6030 Page 3 of 3
 Subject Worcester Mass. Area Comptd By LEE Date 9/13/78
 Detail BRIERLY POND DAM Chkd By SM Date 10/4/78

(TV) Discharge & Storage Function - vs. Elev.



METCALF & EDDY, ENGINEERS

Project Nat. Rev. of Non Fed. Dams Acct. No. 6036 Page 7 of 2
 Subject Worcester Mass. Area Comptd By LEB Date 9/15/78
 Detail BRIERLY POND DAM Ck'd. By EMG Date 10/9/78

⑤ Failure of Dam - with Pond @ El. 519 ± - Top of Crest

Location 1 - 170' of "dam" parallel to factory and under Sutton Road. Base of dam taken as elev. 510.6

$$Q_p = 1.68 (.4) 170 (8.4)^{1.5} = 2780 \text{ cfs.}$$

$$\text{Time to Drain: } \left[\frac{1}{3} (.027) (5280)^2 (10.4) \right] + \left[\frac{2780}{2} \right] 3600 = 0.5 \text{ hr or } 31 \text{ min}$$

Location 2 - 180' of "dam" adjacent to discharge gate
 Base of dam taken as elev. 516.2

$$Q_p = 1.68 (.4) 180 (2.8)^{1.5} = 570 \text{ cfs.}$$

Failure at either location would discharge flow into the former Mayo Pond basin. Mayo Pond is dry and its "dam" was the base of a factory, but the control gate appears to have been rebuilt to minimize ponding. The dry Mayo Pond would reduce the impact of a Briery Pond Dam failure on Bramanville.

⑥ Crest Flow Vel.

$$\text{Test Flood: El. 521.4 - Max } q_{\text{crest}} = 2.67 (521.4 - 519)^{1.5} = 9.93 \text{ cfs/ft.}$$

$$\text{As Critical Flow: } y_c = 1.5', V_c = 6.8 \text{ fps}$$

⑦ Drawdown Rate

If Disch. Gate was operable, its max. disch. before overtopping the crest is ±180 c.f.s. or 40 c.s.m. or 77% of Test Flood outflow

Time to draw pond down to elev. 512.5 (Gate sill) is

$$\frac{.027 (5280)^2 (519 - 512.5)}{\frac{1}{2} (180) 3600} = 15 \text{ hours}$$

A - Discharge Gate & Chute

Assume Effective width $= 4' - 0.5' = 3.5'$

$$Q = 3.5 \sqrt{g} (y_c)^{1.5} = 20 \text{ } y_c^{1.5}$$

yc	1'	2'	3'	4'
Q	20	56	104	160
Pondel.	514,0	515,5	517,0	518,5

B. Crest & Swale Dischargers

1 - Near Factory 100' @ El. 519 north of fact. & 100' @ El. 520 south of fact.

El. 520.62' El. 520.5-180'

3 - "Inner" descent controlled on Beach St. - \$1,519.5 - 100' wide

Use $\alpha = 2.67 \text{ H}^{-1/2}$ [Ref. V.T. Chow - "Open Chan Hydr" pg 53]

Pond E1.	519.5	5200	520.5	521.0	521.5
1 Loc. 1 North ⁵¹⁹	94	267	490	755	1055
" 1 South ⁵²⁰	—	—	94	267	490
" 2 E1. 519-9'	8	24	44	68	95
" 2 E1. 519.5-3'	—	3	8	15	23
" 2 E1. 520-50'	—	—	47	133	245
" 2 E1. 520.5-118'	—	—	—	111	315
" 3 E1. 519.5-100	—	94	267	490	755
Totals	102	388	950	1839	2978

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

BRIERLY POND DAM



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	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
STATE	IDENTITY NUMBER	OWNER	TYPE	DATE	CONTRACT	COUNTY	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE	DAY	MO	YR																																																																																						
MA	143	NED		HA	027	03	BRIENLY POND DAM	4210.6	7146.5	200CT78																																																																																									

POPULAR NAME	NAME OF IMPONDMENT
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NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	POPULATION
MILLBURY	12100

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STATUS	HYDRAULIC HEIGHT	IMPONDING CAPACITIES	DIST OWN	FED R	PRV/FED	SCS A	VER/DATE
RECTPG	1980	R	10	10	135	85	N	N	N	40EC78

REMARKS

SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CU FT)	POWER CAPACITY	NAVIGATION LOCKS
2	260	6	48	3370

OWNER	ENGINEERING BY	CONSTRUCTION BY
MIDDLE INDUSTRIES INC	UNKNOWN	UNKNOWN

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
METCALF + EDDY, INC.	31AUG78	PUBLIC LAW 92-367

REMARKS

ATE
LME