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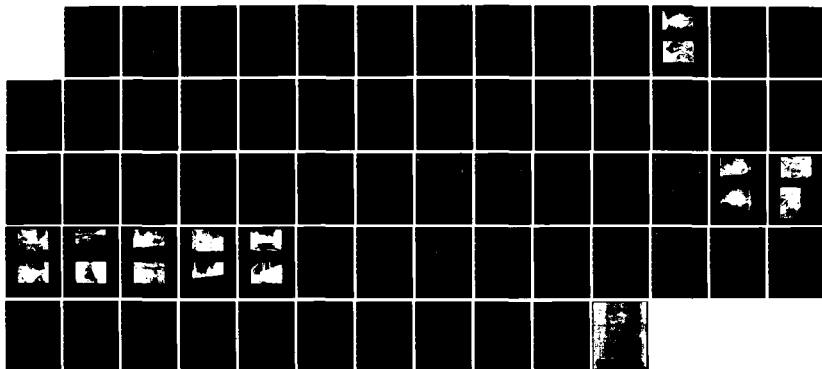
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CASE POND UPPER DAM (U) CORPS OF ENGINEERS WALTHAM
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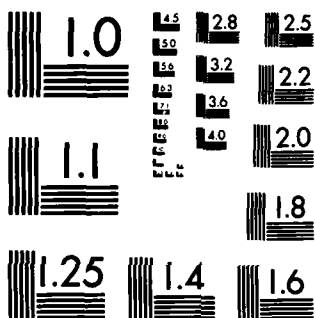
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HOCKANUM RIVER BASIN
MANCHESTER, CONNECTICUT

CASE POND UPPER DAM
CT 00560

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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AUG 20 1984

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

MAY 1980

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Case Pond Upper Dam is a 110-year old earth embankment, with an approximate length of 300 feet and a maximum height of 16 feet. The spillway is 87 feet long with a crest elevation about 2 feet below the top of the dam. The dam appears to be in poor condition. The maximum storage capacity of 52 acre-feet along with the maximum height of 16 feet place the dam in the "Small" size category. The dam is classified as "Significant" hazard potential. The recommended test flood ranges from the 100-year flood to one-half of the PMF.		

CASE POND UPPER DAM

CT 00560

HOCKANUM RIVER BASIN
MANCHESTER, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT



Identification No.: CT 00560
Name of Dam: Case Pond Upper Dam
City: Manchester
County and State: Hartford County, Connecticut
Stream: Birch Mountain Brook
Date of Inspection: November 14, 1979

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BRIEF ASSESSMENT

Case Pond Upper Dam is a 110-year old earth embankment, used to impound water of the Birch Mountain Brook for recreational purposes. The dam is irregularly shaped in plan and section with an approximate length of 300 feet and a maximum height of 16 feet. The spillway is 87 feet long with a crest elevation about 2 feet below the top of the dam.

The drainage area for Case Pond Upper Dam is approximately 1.6 square miles. The maximum storage capacity of 52 acre-feet along with the maximum height of 16 feet place the dam in the "Small" size category. A breach of the dam could cause appreciable damage to a highway bridge located approximately 600 feet downstream of the dam, but it is unlikely that any lives would be lost. Therefore, the dam is classified in the "Significant" hazard potential category. The recommended test flood for a "Small" size, "Significant" hazard dam ranges from the 100-year flood to one-half of the Probable Maximum Flood (PMF). The selected test flood for this structure is one-half of the PMF.

The peak test flood inflow for Case Pond Upper Dam is 1,470 cfs. The routed test flood outflow of 1,460 cfs overtops the dam by 0.5 feet. The spillway is capable of discharging 810 cfs, or about 56 percent of the routed test flood outflow, prior to overtopping of the dam. A breach of the dam would result in a 3.1-foot depth (contained within the channel banks) of flow at the first residential area (an apartment complex), located about 4,400 feet downstream of the dam.

The dam appears to be in poor condition. Many trees, with trunks up to 3 feet in diameter, are growing on both the upstream and downstream faces of the dam as well as on the crest. No erosion protection is provided on the upstream face. Seepage (about 2 gpm) was observed during the inspection about 10 feet downstream of the dam. No emergency low level outlet exists for drawing down the impoundment.

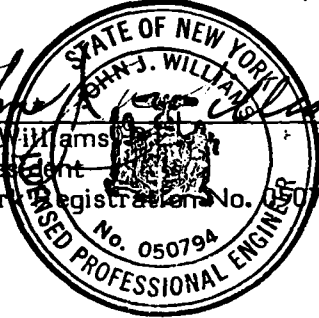
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Within one year after receipt of this Phase I Inspection Report, the Owners should retain the services of a qualified, registered professional engineer, experienced in the design and construction of dams to: 1) investigate the cause of the seepage located in the vicinity of the downstream toe of the embankment and assess the need for remedial action; 2) direct the removal of trees and root systems from the dam and within a 20-foot wide area surrounding the dam; 3) design a low level outlet for emergency drawdown of the pond; and 4) investigate the abandoned 12-inch diameter pipe to insure that the pipe is not under pressure through the embankment.

In addition, the Owners should perform the following operation and maintenance work: 1) install riprap or other means of protecting the upstream face of the dam; 2) repair all deteriorated concrete and masonry surfaces; 3) repair the cracks between the spillway wall and the rock foundation; 4) develop and implement an ongoing operation and maintenance program; 5) initiate a program of annual technical inspection; and 6) develop a flood warning plan so that downstream residents will be notified in the event of possible overtopping and/or failure of the dam.

O'BRIEN & GERE ENGINEERS, INC.


John J. Williams
Vice President
New York Registration No. 050794



Date 16 May 1980

PREFACE

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

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

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

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

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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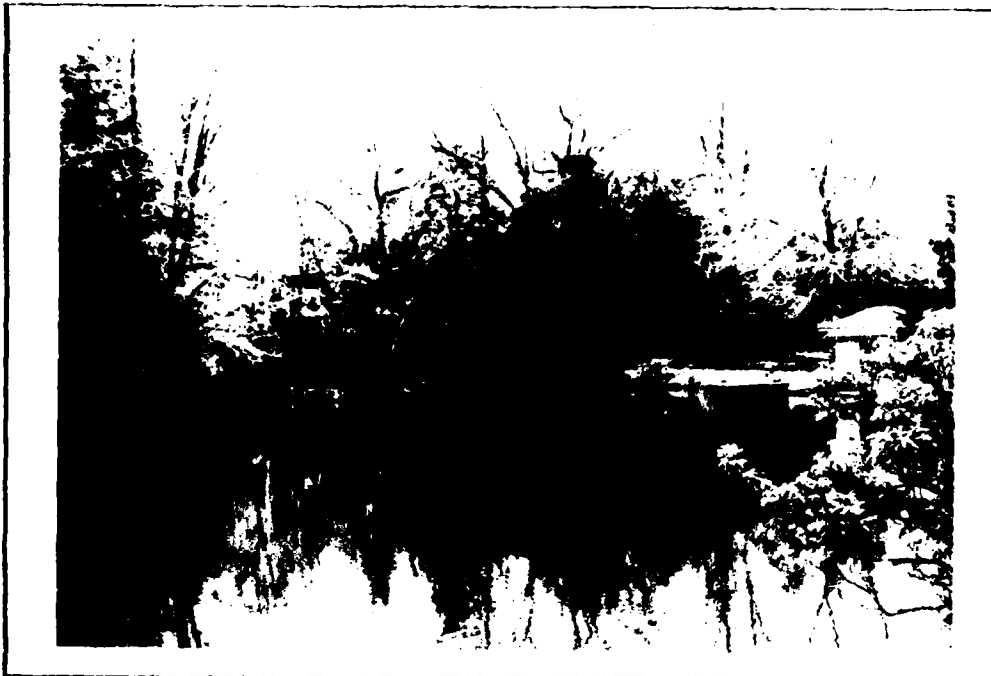
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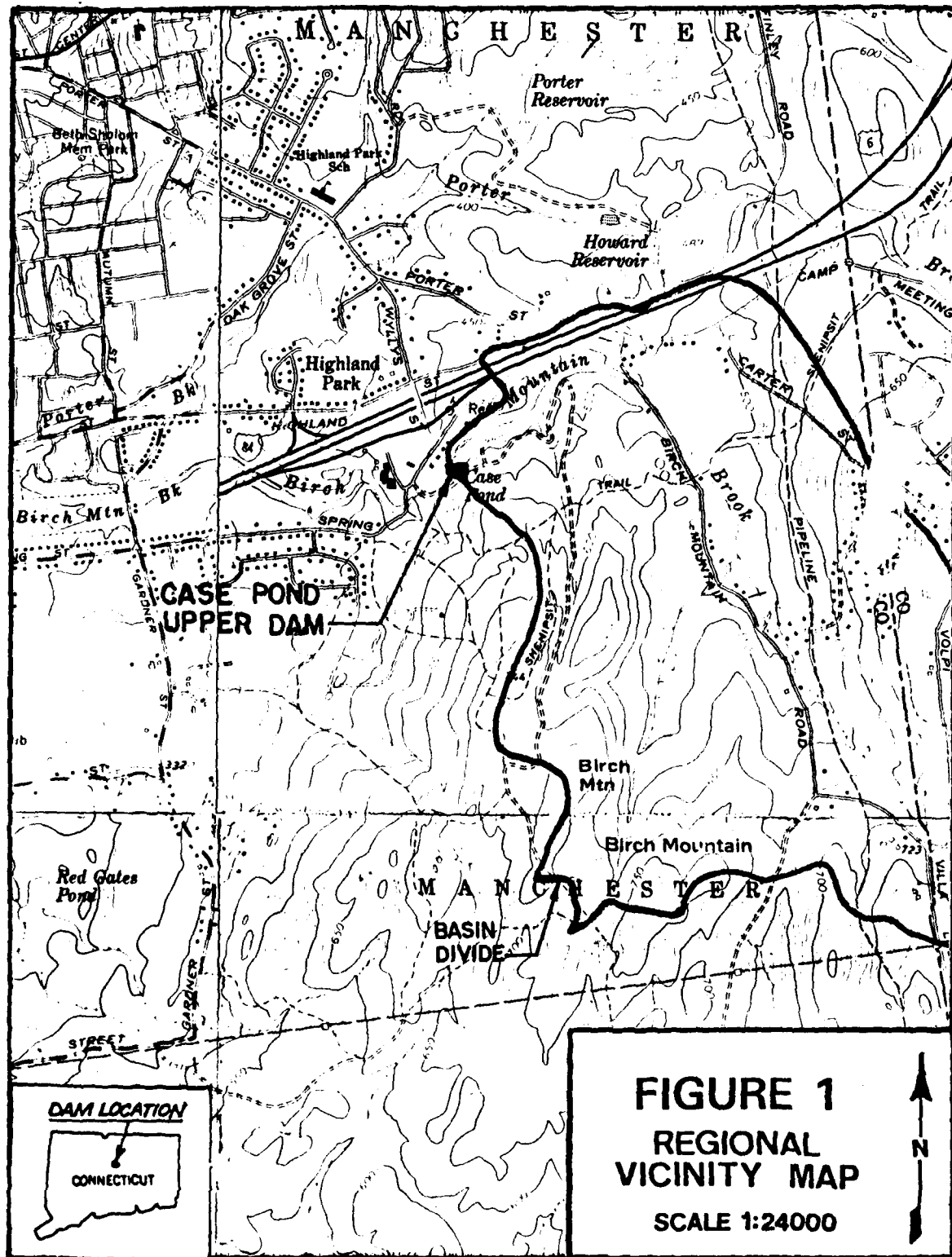
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UPSTREAM OVERVIEW OF THE DAM WITH THE TREE COVERED EMBANKMENT TO THE LEFT. (11/14/79)



DOWNSTREAM OVERVIEW AS OBSERVED FROM THE RIGHT ABUTMENT. (11/14/79)



NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
CASE POND UPPER DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The National Dam Inspection Act (Public Law 92-367) was passed by Congress on August 8, 1972. Under this Act, the Secretary of the Army was authorized to initiate, through the Corps of Engineers, the National Program for Inspection of Dams throughout the United States. Responsibility for supervising inspection of dams in the New England Region has been assigned to the New England Division of the Corps of Engineers.

O'Brien & Gere Engineers, Inc. has been retained by the New England Division to inspect and report on selected non-federal dams in the State of Connecticut. Authorization and Notice to Proceed were issued to O'Brien & Gere by a letter dated November 6, 1979 and signed by Col. William E. Hodgson, Jr. Contract No. DACW33-80-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose. The purpose of inspecting and evaluating non-federal dams is to:

1. Identify conditions which threaten public safety and make the Owner aware of any deficiencies so that he may correct them in a timely manner.

2. Encourage and prepare the states to initiate an effective dam safety program for non-federal dams as soon as possible.

3. Update, verify and complete the National Inventory of Dams.

1.2 Description of Project (information with regard to this dam was obtained from Mr. Robert C. Dennison, co-Owner of Case Pond Upper Dam)

a. Location. Case Pond Upper Dam is located on Birch Mountain Brook in the southeastern corner of the City of Manchester, Connecticut. The dam is shown on the USGS Quadrangle entitled "Manchester, Conn." at coordinates N41°45.7; W72°29.3'. A regional location plan of Case Pond Upper Dam is enclosed as Figure 1 on page vi.

Birch Mountain Brook merges with Porter Brook to form Hop Brook about 1.5 miles west of the damsite. Hop Brook continues westward for approximately four miles where it joins the Hockanum River at Laurel Lake.

The potential damage area is the highway bridge located about 600 feet downstream of Case Pond Upper Dam. The initial residential area is an apartment complex located approximately 4,400 feet downstream of the dam.

b. Description of Dam and Appurtenances. Case Pond Upper Dam is an irregular earth embankment with an approximate length of 300 feet and a maximum height of about 16 feet with a variable crest width ranging from 15 feet to 65 feet. The unprotected upstream face of the dam is on a slope of about 1H:1V. The downstream face of the dam is partially retained by a vertical stone masonry wall about 100 feet long and 16 feet high. The remainder of the downstream face of the dam is on a slope which averages 2H:1V.

The concrete spillway located between the embankment and right abutment is 87 feet long. The downstream face of the spillway which extends a maximum of three feet above the irregular bedrock foundation, is vertical. The spillway is supported by four small concrete buttresses on the downstream side of the spillway. The spillway section has been integrated into three pre-existing stone masonry piers which supported a pedestrian bridge removed years ago.

c. Size Classification. Case Pond Upper Dam has a maximum height of approximately 16 feet and a maximum storage capacity of 52 acre-feet. The criteria for the "Small" size category includes dams which have less than 1,000 acre-feet of storage capacity and are less than 40 feet high. Therefore, Case Pond Upper Dam is classified as a "Small" size structure.

d. Hazard Classification. The potential damage area is considered to be a highway bridge (Spring St.) located approximately 600 feet downstream of the dam. Breach flows would travel through Case Pond Lower Dam then down a steep incline to the Spring Street Bridge. The first residential area is an apartment complex located about 4,400 feet downstream of the dam. The failure analysis indicated that breach floodwaters would be contained within the channel banks at this location. A failure of the dam could result in appreciable damage to the highway bridge, but it is unlikely that lives would be lost at any downstream location. Therefore, Case Pond Upper Dam is classified in the "Significant" hazard potential category.

e. Ownership. The co-Owners for Case Pond Upper Dam are:

Mr. Robert C. Dennison
700 Spring Street
Manchester, Connecticut 06040
Telephone: 203-643-4986

Mr. Andrew Ansaldi
81 Battista Road
Manchester, Connecticut 06040
Telephone: 203-649-5249

f. Operator. The dam is not equipped with any operating facilities other than an inoperable valve on an abandoned 12-inch diameter pipe which was used to provide water for a nearby mill. The Owners would perform any operations associated with the dam.

g. Purpose of Dam. The dam currently impounds water for recreational purposes.

h. Design and Construction History. The dam was originally built about 1870. Since that time, the spillway has been revised three times; in 1880, the masonry portion of the spillway wall was built; in 1890, the present spillway was constructed; and in 1962, the spillway was repaired.

i. Normal Operating Procedures. There are no operating procedures for this site.

1.3 Pertinent Data

a. Drainage Area. A 1.6 square mile watershed, ranging from Elevation 785 at Birch Mountain to Elevation 448 at normal pool, drains to Case Pond Upper Dam. The area is primarily forested with some upstream residential development.

b. Discharge at Damsite.

1. Outlet Works. The only known outlet is an abandoned 12-inch diameter valve and pipe which used to provide water for a nearby mill. According to Mr. Dennison, the valve has been inoperable for at least 10 years.

2. Maximum Known Flood. According to Mr. Dennison, the embankment was overtopped in September, 1938, but he does not recall the depth of overtopping. Details associated with this event, as it related to Case Pond Upper Dam, are not recorded.

3. Ungated Spillway Capacity at Top of Dam. The capacity of the spillway at the top of dam Elevation 450.0, is approximately 812 cfs.

4. Ungated Spillway Capacity at Test Flood Elevation. At the test flood Elevation 450.5, the spillway capacity is 1,134 cfs.

5. Gated Spillway Capacity at Top of Dam. Not Applicable.

6. Gated Spillway Capacity at Test Flood Elevation. Not Applicable.

7. Total Spillway Capacity at Test Flood Elevation. (See 4 above)

8. Total Project Discharge at Top of Dam. The total project discharge, with the pool elevation at the top of dam Elevation 450.0, is estimated to be 812 cfs.

9. Total Project Discharge at Test Flood Elevation. The total project discharge at the test flood Elevation 450.5 is estimated to be 1,458 cfs.

c. Elevation. (NGVD)

1. Streambed at Toe of Dam	434 ⁺
2. Bottom of Cutoff	Unknown
3. Maximum Tailwater	Unknown
4. Recreation Pool	448
5. Full Flood Control Pool	N/A
6. Spillway Crest (Ungated)	448
7. Design Surge (Original Design)	Unknown
8. Top of Dam	450
9. Test Flood Surge	450.5

d. Reservoir Length. (Feet)

1. Normal Pool	1,800
2. Flood Control Pool	N/A
3. Spillway Crest Pool	1,800
4. Top of Dam Pool	3,100
5. Test Flood Pool	3,200

e. Storage. (Acre-Feet)

1. Normal Pool	30
2. Flood Control Pool	N/A
3. Spillway Crest Pool	30
4. Top of Dam Pool	52
5. Test Flood Pool	61

f. Reservoir Surface Area. (Acres)

1. Normal Pool	6.0
2. Flood Control Pool	N/A
3. Spillway Crest Pool	6.0
4. Top of Dam Pool	17.5
5. Test Flood Pool	19.0

g. Dam Data.

1. Type	Earth Embankment
2. Length	300 feet
3. Height	16 feet
4. Top Width	Variable, 15 feet to 65 feet
5. Side Slopes (Upstream)	1H:1V
(Downstream)	2H:1V
6. Zoning	Unknown
7. Impervious Core	Unknown
8. Cutoff	Unknown
9. Grout Curtain	Unknown

h. Diversion and Regulating Tunnel.

Not Applicable

i. Spillway.

1. Type	Concrete Overflow
2. Length of Weir	87 feet
3. Crest Elevation	448
4. Gates	None
5. Upstream channel	Case Pond Upper
6. Downstream Channel	Case Pond Lower and steep rock gorge

j. Regulating Outlet.

1. Invert Elevation
2. Size
3. Description
4. Control Mechanism
5. Other

435⁺
12-inch diameter
Cast Iron Pipe
Gate Valve (Inoperable)
Abandoned Outlet

SECTION 2

ENGINEERING DATA

2.1 Design

According to the co-Owners, there is no design information available.

2.2 Construction

No construction information exists except for knowledge of approximate construction dates. The dam was originally constructed in about 1870 and since that time, modifications have been made to the spillway (see Section 1.2-h).

2.3 Operation

Other than the abandoned 12-inch diameter outlet, which was used to convey water to a nearby mill, there are no operating facilities at this site.

2.4 Evaluation

a. Availability. There is no information available with respect to the design and construction of the Case Pond Upper Dam.

b. Adequacy. Although no drawings or engineering information with respect to Case Pond Upper Dam is available, it is believed that sufficient information has been obtained during the field inspection and through conversations with the Owners, to conduct a Phase I dam evaluation.

c. Validity. There is no reason to question the validity of the information obtained from the Owners.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. Case Pond Upper Dam was inspected on November 14, 1979. At the time of inspection, the pool elevation was approximately at the spillway crest (Elevation 488.0). Underwater areas were not inspected.

A checklist of observations and comments made during the inspection is included as Appendix A.

b. Dam. The dam is an earth embankment partially retained on the downstream slope by a vertical stone masonry wall in the vicinity of the left abutment. It is irregular in plan and section and is almost completely obscured by large trees and brush growing on the dam. The following conditions were observed during the field inspection:

1. The unprotected upstream face of the embankment is on a slope of 1H:1V and there is evidence of some erosion at several locations.

2. The dam crest to the left of the spillway is almost completely overgrown with large trees and brush. A few of the trees have trunk diameters of at least three feet. The larger trees range up to 50 feet in height. No evidence of settlement, cracks, or other indication of surface deficiency, was observed.

3. About 100 feet of the downstream face of the dam, towards the left abutment, is retained by a vertical 16-foot high stone masonry wall. The wall appears to be in fair condition with some loss of mortar, but no evidence of leakage through the wall or vertical or horizontal misalignments were observed. Rust-colored seepage, with a flow estimated to be about two gallons per minute, was observed in the old streambed about 10 feet downstream of the retaining wall (Page C-4). The soil in the area of the seepage is very soft. According to Mr. Dennison, this condition has remained unchanged for many years.

4. The downstream face of the dam, between the retaining wall and spillway, is on a slope which averages about 2H:1V with some portions as steep as 1H:1V. The surface is heavily overgrown with brush and large trees. The seepage described above has created minor sloughing and erosion of the slope in the vicinity of the toe.

Several photos of the conditions described above are included in Appendix C.

c. Appurtenant Structures. The spillway consists of a concrete wall, approximately three feet high and 87 feet long. The concrete generally appears to be in fair condition except for some spalling along the downstream face of the wall. In addition, some leakage was observed at the base of the wall near the right abutment.

The valve house is in fair condition. The valve on the 12-inch diameter outlet pipe has not been operable for at least 10 years. The 12-inch diameter outlet pipe also has not been used for at least 10 years.

d. Reservoir Area. The area bordering the pond is well vegetated but indications of erosion were observed on the banks. According to the Owners, the pond has appreciable sediment accumulation. They do not believe that the water is any more than 6 feet deep at any point in the impoundment.

e. Downstream Channel. The channel immediately downstream of the spillway is formed by an outcropping of bedrock. Water flowing over the spillway discharges down the bedrock and into Case Pond Lower. The dam for Case Pond Lower is a stone masonry structure with a stone masonry bridge built on its crest. The gradient of Birch Mountain Brook for about 4,000 feet downstream of Case Pond Lower Dam is relatively steep. The stream channel drops about 170 feet in this reach. The stream channel is overgrown with trees and brush but, due to the slope, the flow of water is not significantly impeded.

An estimated 1.5 miles downstream of Case Pond Upper Dam, Birch Mountain Brook joins Porter Brook to form Hop Brook. Hop Brook continues westward for approximately 4 miles where it joins the Hockanum River at Laurel Lake. Beyond the initial 4,000 feet downstream of Case Pond Upper Dam, the stream channel is on an estimated gradient of 0.4 percent with few obstructions aside from numerous bridges.

3.2 Evaluation

The dam is considered to be in poor condition. All of the trees and brush, especially the large trees, should be removed from the embankment crest and both the upstream and downstream faces. Erosion protection should be provided for the upstream face of the dam. The seepage condition and the necessity for a low-level outlet should be investigated.

SECTION 4

OPERATION AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. Since there are no operating facilities currently in use at the site, there is no designated operator. However, co-Owner Mr. Dennison, lives close to the dam and is familiar with past operation of the abandoned outlet, which used to furnish water to a nearby mill. According to Mr. Dennison, the outlet has been inoperable for at least 10 years.

b. Description of Any Warning System in Effect. According to Mr. Dennison, there is no formal warning system which would alert downstream property owners of an impending dam failure.

4.2 Maintenance Procedures

a. General. According to Mr. Dennison, no maintenance has been performed on the dam for several years.

b. Operating Facilities. According to Mr. Dennison, the 12-inch diameter outlet has been inoperable for at least 10 years.

4.3 Evaluation

The lack of an operation and maintenance program is reflected by conditions observed at the dam. A program should be established which would include periodic removal of vegetation from the dam, and repair of structural and operational elements of the dam.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The 1.6 square-mile area draining to Case Pond Upper Dam consists primarily of steep, forested terrain with some residential development. Topography within the watershed ranges from Elevation 785 at Birch Mountain to Elevation 448 at normal pool.

5.2 Design Data

Hydraulic and hydrologic data used for the design of Case Pond Upper Dam are not available, according to the Owners.

5.3 Experience Data

According to Mr. Dennison, the embankment was overtopped in September 1938, but he does not recall the depth of the overtopping. Details associated with this event, as it relates to Case Pond Upper Dam, are not recorded.

5.4 Test Flood Analysis

The recommended test flood range for a "Small" size, "Significant" hazard dam is from the 100-year flood to one-half of the Probable Maximum Flood (PMF). Based upon the potential for appreciable damage to the downstream highway bridge, one-half of the PMF has been selected as the test flood.

Hydraulic and hydrologic calculations were performed with the assistance of the HEC-1-DB computer program. The flood hydrographs were constructed from Snyder unit hydrographs using average coefficients, an initial infiltration of zero, and a constant loss rate of 0.05 inches per hour. The Hop Brook Adjustment Factor was used to reduce the Probable Maximum Precipitation (PMP) based on the drainage area.

Stage vs. discharge and stage vs. storage relationships were developed for Case Pond Upper Dam for routing of the test flood through the pond and to the downstream flood impact area. The water surface elevation for Case Pond Upper was assumed to be at the spillway crest elevation at the beginning of the hypothetical storm event.

The test flood peak inflow to Case Pond Upper Dam was computed as 1,470 cfs. The routed test flood outflow of 1,460 cfs corresponds to a stage elevation of approximately 450.5 or 0.5 feet above the top of the dam. The spillway is capable of discharging 810 cfs or about 56 percent of the routed test flood outflow prior to overtopping of the dam.

5.5 Dam Failure Analysis

Failure of Case Pond Upper Dam was simulated through the use of the HEC-1-DB computer program. It was assumed that a 75-foot wide by 15-foot deep breach with vertical side slopes would develop over a two-hour period. Furthermore, failure was assumed to occur with the pool elevation at the top of the dam.

The maximum breach discharge of 812 cfs was routed to the initial residential area which consists of an apartment complex located about 4,400 feet downstream of the dam. The analysis indicates that the depth of flow in the stream channel would increase from about 0.5 feet to 3.1 feet and would remain within the channel banks.

However, the breach outflow could cause appreciable damage to a highway bridge (Spring St.) located across the channel approximately 600 feet downstream of the dam. Since no residential areas would be endangered by a breach flood, the highway bridge is considered to be the flood impact area.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The roots of large trees growing on the embankment may be providing seepage paths through the dam and could be dislodging joint material from the downstream masonry retaining wall. High winds could uproot the trees causing removal of significant volumes of embankment material. The rust-colored seepage in the vicinity of the downstream toe of the embankment indicates that seepage paths may have developed through the embankment or foundation. Although the condition has remained constant for many years, according to Mr. Dennison, the potential remains for piping of fine-grained soil from the embankment.

6.2 Design and Construction Data

No design and construction data are available according to Mr. Dennison.

6.3 Post Construction Changes

Since the original construction of the dam around 1870, the spillway has been revised three times; in 1880, the masonry portion of the spillway wall was built, in 1890, the present spillway was constructed; and in 1962, the spillway was repaired.

6.4 Seismic Stability

Case Pond Upper Dam is located in Seismic Zone 1 on the "Seismic Zone Map of Contiguous States". Therefore, according to the Recommended Guidelines for Phase I dam inspections, the dam need not be evaluated for seismic stability.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The dam is considered to be in poor condition. The following observations help to substantiate this assessment:

1. A significant amount of seepage (about 2 gpm) was observed in the vicinity of the downstream toe of the embankment about 10 feet from the downstream embankment retaining wall.

2. The dam is almost completely overgrown with large trees (up to 3 feet in diameter and 50 feet high) and brush.

3. No means of protecting the upstream face of the dam has been provided.

4. The impoundment cannot be lowered because of the lack of a low level outlet.

5. Leakage is occurring under the spillway wall near the right abutment.

6. Mortar between stones in the retaining wall is cracked or missing.

7. The concrete spillway wall and buttresses are spalled.

b. Adequacy of Information. Sufficient information has been obtained through field observations and through discussions with the Owners to conduct a Phase I dam evaluation.

c. Urgency. The recommendations and remedial measures presented in this Section should be implemented within one year of receipt of this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the Owners retain the services of a qualified, registered professional engineer, experienced in the design and construction of dams, to perform the following services:

1. Investigate the causes of the seepage located in the vicinity of the downstream toe of the embankment (about 10 feet downstream of the retaining wall) and at the base of the spillway wall and assess the need for remedial action at each location.

2. Direct the removal of trees and root systems from the dam and within a 20-foot wide area surrounding the dam. Voids left in the embankment as a result of such removal should be backfilled with suitable thoroughly compacted material.

3. Design a low level outlet for emergency drawdown of the pond.

4. Investigate the abandoned 12-inch diameter pipe to insure that the pipe is not under pressure through the embankment. If the pipe is under pressure, then it should be plugged.

7.3 Remedial Measures

a. Operation and Maintenance Procedures. The Owners should also implement the following operation and maintenance procedures:

1. Riprap or other means of protecting the upstream slope of the dam should be provided.

2. All deteriorated concrete and masonry surfaces should be repaired.

3. Cracks between the spillway wall and the rock foundation should be repaired.

4. An ongoing operation and maintenance program should be developed and implemented.

5. A program of annual technical inspection should be instituted.

6. A flood warning plan should be developed so that downstream residents will be notified in the event of possible overtopping and/or failure of the dam.

7.4 Alternatives

As an alternative to the above recommendations and remedial measures, the pond could be drained and the dam removed.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
INSPECTION TEAM ORGANIZATION

Project: Case Pond Upper Dam
National I.D. #: CT 00560
Location: Manchester, Connecticut
Type of Dam: Earth Embankment/ Masonry
Inspection Date(s): November 14, 1979
Weather: Overcast, 40's
Pool Elevation: 448 ± MSL

Inspection Team

Leonard Beck	O'Brien & Gere	Structures
Steven Snider	O'Brien & Gere	Foundations & Materials
Alan Hanscom	O'Brien & Gere	Structures
Rodney Georges	Bryant & Associates	Hydrology/Hydraulics

*Mr. John J. Williams, Vice-President, O'Brien & Gere has visited the site but not necessarily in conjunction with the inspection team.

Owner's Representative

Mr. Robert C. Dennison and Mr. Andrew Ansaldi, Co-owners.

VISUAL INSPECTION CHECK LIST

Project: Case Pond Upper Dam

National I.D. #: CT 00560

Date(s): November 14, 1979

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	450 NGVD
Current Pool Elevation	448 NGVD
Maximum Impoundment to Date	52 Acre-feet
Surface Cracks	None Observed
Pavement Condition	N/A
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	No misalignment observed
Horizontal Alignment	No misalignment observed
Condition at Abutment and at Concrete Structures	Slight erosion at spillway abutments
Indications of Movements of Structural Items on Slopes	None Observed
Trespassing on Slopes	Not significant
Vegetation on Slopes	Erosion on u/s face Trees, brush over entire dam
Sloughing or Erosion of Slopes or Abutments	Sloughing on u/s and d/s slopes of eastern portion of embankment
Rock Slope Protection - Riprap Failures	No riprap observed
	A-2

VISUAL INSPECTION CHECK LIST

Project: Case Pond Upper Dam

National I.D. #: CT 00560

Date(s): November 14, 1979

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT (Con't)</u>	
Unusual Movement or Cracking at or near Toes	None Observed
Unusual Embankment or Downstream Seepage	~1 gpm deep orange - colored seepage ~20 feet d/s of retaining wall
Piping or Boils	Seepage is "boiling"
Foundation Drainage Features	Unknown
Toe Drains	Unknown
Instrumentation System	None
	A-3

VISUAL INSPECTION CHECK LIST

Project: Case Pond Upper Dam

National I.D. #: CT 00560

Date(s): November 14, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None Observed
Trees Overhanging Channel	None Observed
Floor of Approach Channel	Much sediment - several feet per Mr. Dennison
b. Weir and Training Walls	
General Condition of Concrete	Good
Rust or Staining	None Observed
Spalling	d/s side - scattered
Any Visible Reinforcing	None Observed
Any Seepage or Efflorescence	At base of weir wall near western abutment
Drain Holes	None Observed
c. Discharge Channel	
General Condition	Rock ledge - good slope. Not likely to submerge weir.

A-4

VISUAL INSPECTION CHECK LIST

Project: Case Pond Upper Dam

National I.D. #: CT 00560

Date(s): November 14, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS (Con't)	
Loose Rock Overhanging Channel	Not significant
Trees Overhanging Channel	Several in Channel
Floor of Channel	Very rough, ledge and loose stones
Other Obstructions	Trees

APPENDIX B
ENGINEERING DATA

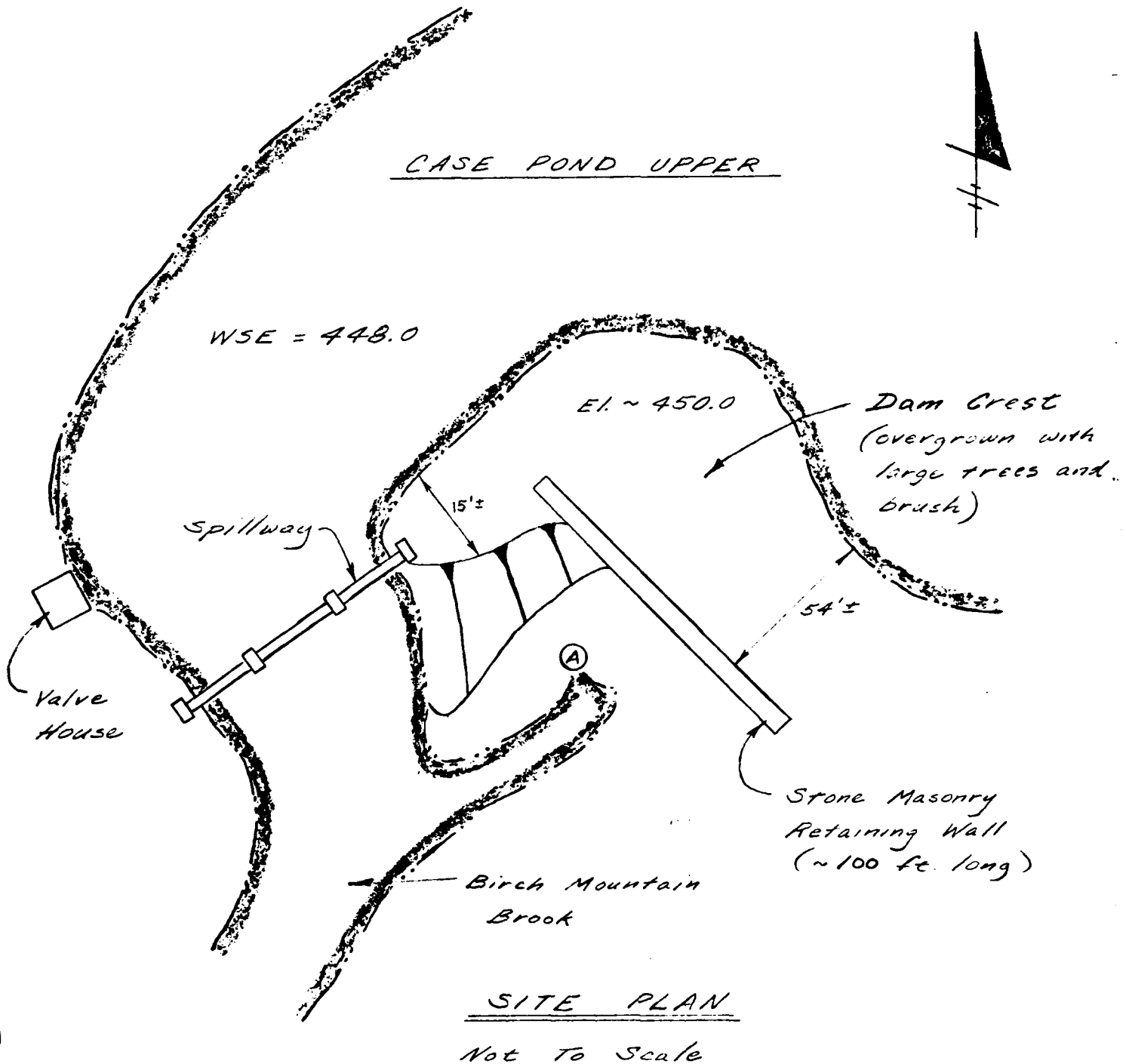
APPENDIX B
ENGINEERING DATA*

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	<u>Page</u>
SITE PLAN	B-1
SPILLWAY PLAN & SECTION	B-2

*Note: All elevations refer to National Geodetic Vertical Datum (NGVD).

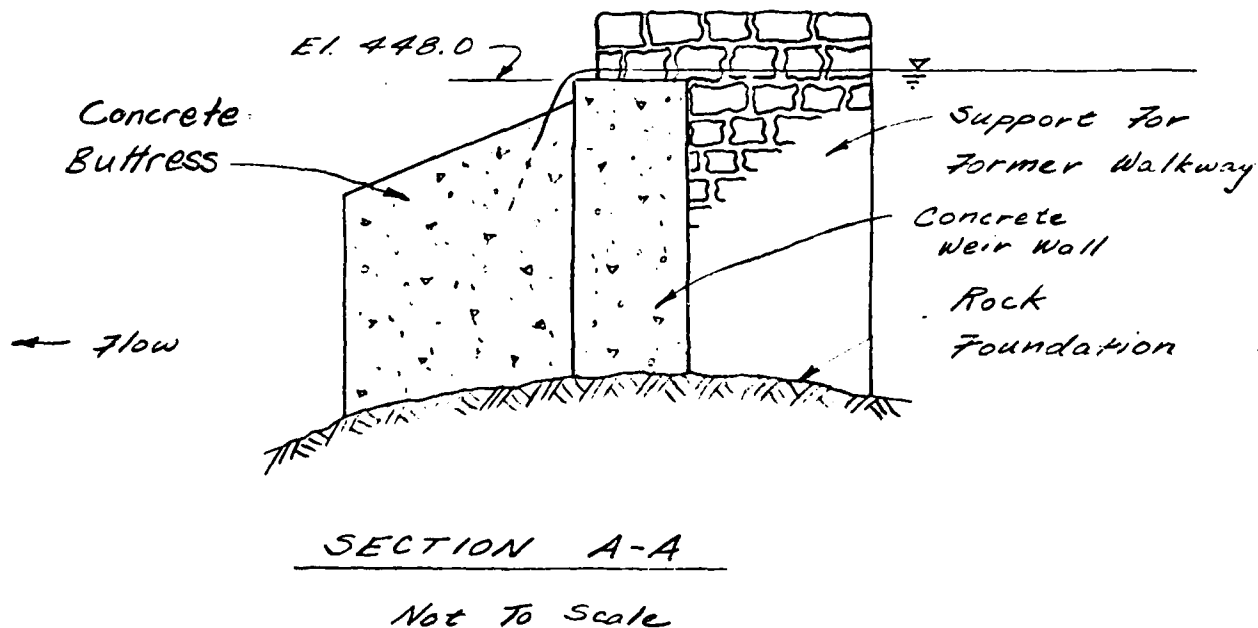
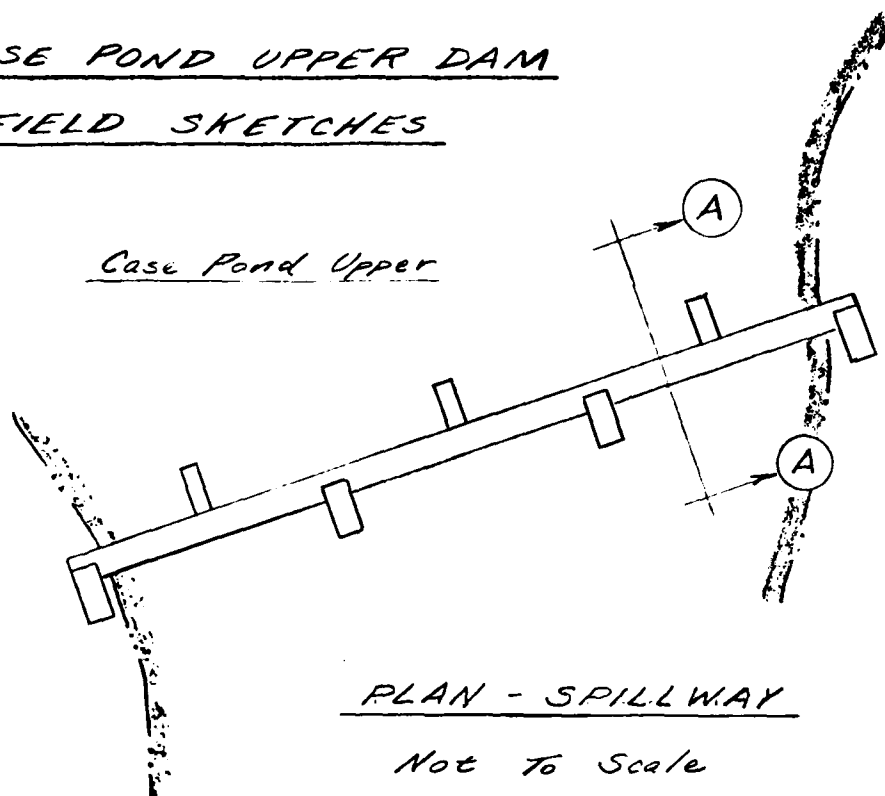
SUBJECT	SHEET	BY	DATE	JOB NO.
Case Pond Upper Dam	B-1	A. H.	3/80	2060-001



(A) Approximate location of "boiling" seepage.

SUBJECT	SHEET	BY	DATE	JOB NO
Case Pond Upper Dam	B-2	A. H.	3/80	2060-001

CASE POND UPPER DAM
FIELD SKETCHES



APPENDIX C

PHOTOGRAPHS

APPENDIX C
SELECTED PHOTOGRAPHS OF PROJECT

LOCATION PLAN

Page
No.

Site Plan Sketch

A

PHOTOGRAPHS

No.

Page
No.

- | | | |
|-----|---|---|
| 1. | Dense tree cover on the downstream face of the dam. | 1 |
| 2. | Dense tree cover on the top of the dam looking towards the left abutment. | 1 |
| 3. | Vertical downstream masonry wall near the left abutment. | 2 |
| 4. | View along the spillway crest looking towards the right abutment. | 2 |
| 5. | Seepage through the spillway wall. | 3 |
| 6. | Discharge immediately downstream of the spillway. | 3 |
| 7. | Seepage which begins about 10 feet downstream of the vertical downstream masonry wall of the dam. | 4 |
| 8. | Seepage flow as viewed from the crest of the downstream vertical masonry wall of the dam. | 4 |
| 9. | Masonry bridge built over the Case Lower Pond Dam approximately 600 feet downstream of the Case Upper Pond Dam. | 5 |
| 10. | Discharge over the Case Lower Pond Dam. | 5 |
| 11. | Region approximately 100 feet upstream of the spillway where water has overtopped the right bank of the pond in the past. | 6 |
| 12. | Region to the right of the Case Lower Pond Dam where discharge would be concentrated during periods of excessive flow. | 6 |
| 13. | Factory complex about 900 feet downstream of Case Upper Pond Dam. | 7 |
| 14. | Apartment complex about one mile downstream of Case Upper Pond Dam. | 7 |

SUBJECT

Case Pond Upper Dam

SHEET

A

BY

A.H.

DATE

4/80

JOB NO

2060-001

CASE POND UPPER

WSE = 448.0 ±

EI. ~ 450.0

Dam Crest
(overgrown with
large trees and
brush)

Spillway

Valve
House

LOCATION OF
SEEPAGE AT TOE

Approximate Location
of Boiling Seepage

Stone Masonry
Retaining Wall
(~100 ft. long)

Birch Mountain
Brook

SITE PLAN

Not To Scale

LEGEND



LOCATION & DIRECTION IN WHICH EACH PHOTO WAS
TAKEN & THE NUMBER OF THE PHOTO





1. DENSE TREE COVER ON THE DOWNSTREAM FACE OF THE DAM. (11/14/79)



2. DENSE TREE COVER ON THE TOP OF THE DAM LOOKING TOWARDS THE LEFT ABUTMENT. (11/14/79)



3. VERTICAL DOWNSTREAM MASONRY WALL NEAR THE LEFT ABUTMENT.
(11/14/79)



4. VIEW ALONG THE SPILLWAY
CREST LOOKING TOWARDS THE
RIGHT ABUTMENT. (11/14/79)



5. SEEPAGE THROUGH THE SPILLWAY WALL. (11/14/79)



6. DISCHARGE IMMEDIATELY DOWNSTREAM OF THE SPILLWAY. (11/14/79)



7. SEEPAGE WHICH BEGINS ABOUT 10 FEET DOWNSTREAM OF THE VERTICAL DOWNSTREAM MASONRY WALL OF THE DAM. (11/14/79)



8. SEEPAGE FLOW AS VIEWED FROM THE CREST OF THE DOWNSTREAM VERTICAL MASONRY WALL OF THE DAM. (11/14/79)



9. MASONRY BRIDGE BUILT OVER THE CASE POND LOWER DAM APPROXIMATELY 600 FEET DOWNSTREAM OF THE CASE POND UPPER DAM. (11/14/79)



10. DISCHARGE OVER THE CASE POND LOWER DAM SPILLWAY. (11/14/79)



11. REGION APPROXIMATELY 100 FEET UPSTREAM OF THE SPILLWAY WHERE WATER HAS IN THE PAST OVERTOPPED THE RIGHT BANK OF THE POND. (11/14/79)



12. REGION TO THE RIGHT OF THE CASE POND LOWER DAM WHERE DISCHARGE WOULD BE CONCENTRATED DURING PERIODS OF EXCESSIVE FLOW. (11/14/79)



13. FACTORY COMPLEX ABOUT 900 FEET DOWNSTREAM OF CASE POND
UPPER DAM. (11/14/79)



14. APARTMENT COMPLEX ABOUT ONE MILE DOWNSTREAM OF CASE POND
UPPER DAM. (11/14/79)

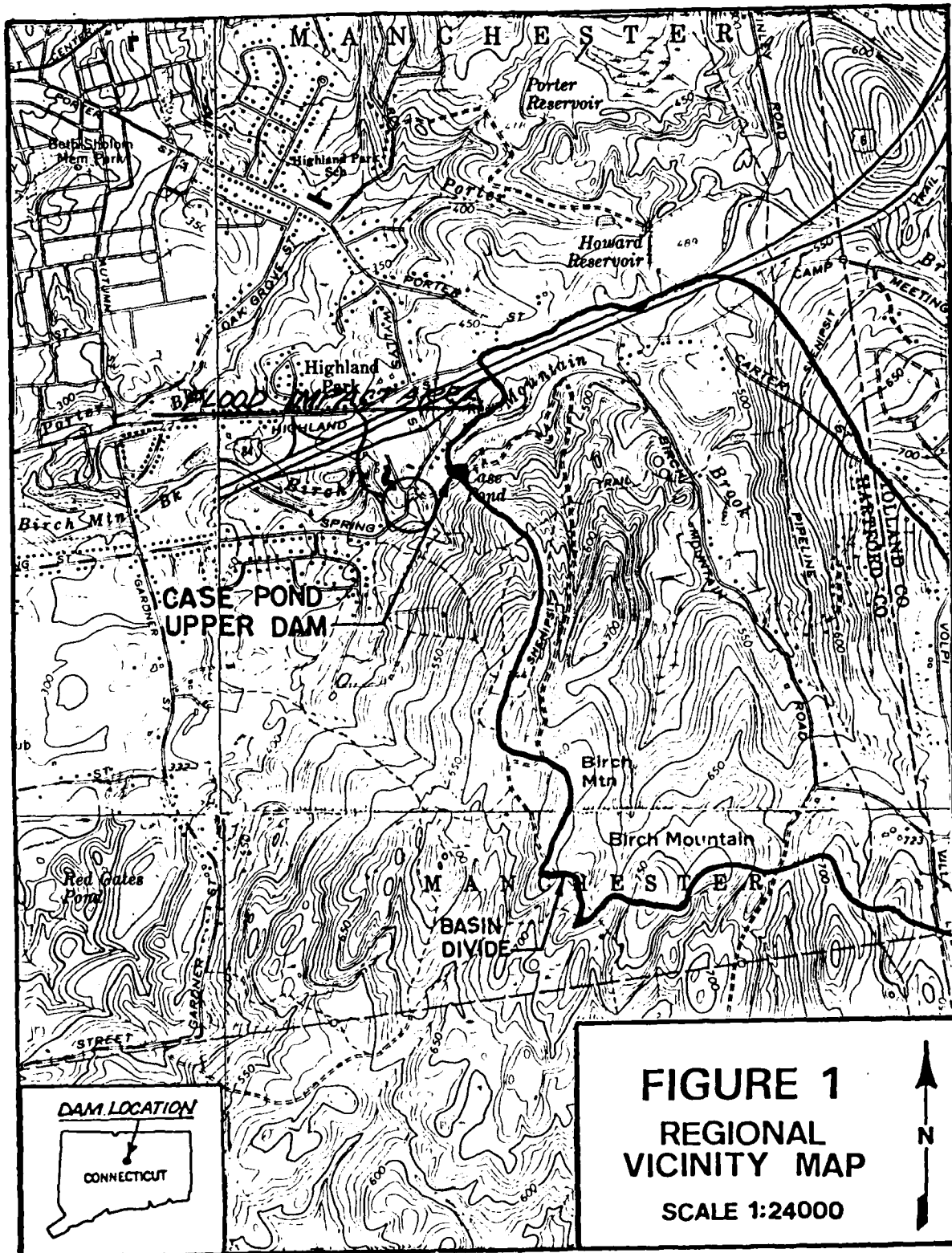
APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

CASE POND UPPER DAM

APPENDIX D HYDROLOGIC & HYDRAULIC COMPUTATIONS TABLE OF CONTENTS

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REGIONAL VICINITY MAP SHOWING FLOOD IMPACT AREA	D-1
DRAINAGE AREA CHARACTERISTICS, T_p COMPUTATIONS, PMP DATA & DAM ELEV., LENGTH & SPWY. DIMENSIONS SKETCH	D-2
STAGE-DISCHARGE & STAGE-STORAGE DATA, CASE PD. UPPER DAM	D-3
STAGE-DISCHARGE & STAGE-STORAGE DATA, CASE PD. LOWER DAM	D-4
DOWNSTREAM CROSS SECTIONS FOR BREACH ROUTING	D-5
STAGE-DISCHARGE & STAGE-STORAGE CURVES, CASE PD. UPPER DAM	D-6
HEC-1 DAM SAFETY VERSION, COMPUTER OUTPUT W/D BREACH	D-7 to D-10
HEC-1 DAM SAFETY VERSION, COMPUTER OUTPUT WITH BREACH	D-11 to D-16



BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB 2060-001
SHEET NO. D-2
CALCULATED BY R.G.
CHECKED BY R.R.B.
OF
DATE 1/80
DATE 3/80
SCALE

CASE POND UPPER DAM - H & H

1/3

DRAINAGE AREA

= 1.59 sq. Mi.

SNYDER HYDROGRAPH COEFFICIENTS

$C_t = 2.0$

$C_p = 0.5$

T_p COMPUTATIONS

$L = 2.0$ MILES

$L_{ca} = 1.1$ MILES

$$T_p = C_t \cdot (L \times L_{ca})^{.3}$$

$$T_p = 2 \times (2.0 \times 1.1)^{.3} \approx \underline{\underline{2.50 \text{ HOURS}}}$$

PMP DATA

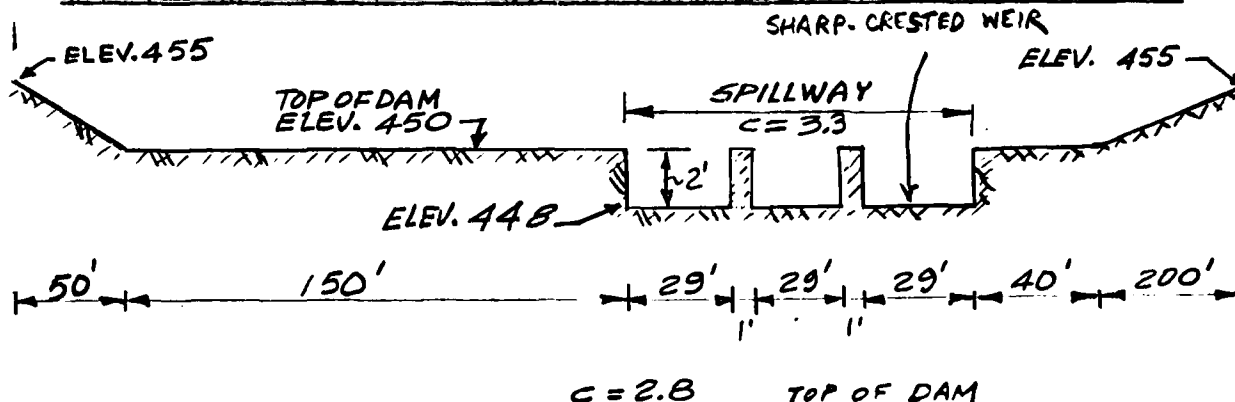
FROM HMS #33 THE 24 HOUR 200 sq. Mi INDEX RAINFALL IS 21.5

6hr. % OF INDEX FOR THIS BASIN = 111

12hr. % " " " " " = 124

24hr. % " " " " " = 133

DAM ELEVATION & LENGTH and SPILLWAY DIMENSIONS SKETCH



BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB 2060.001
SHEET NO. D-3 OF
CALCULATED BY R.G. DATE 1/80
CHECKED BY R.R.B. DATE 3/80
SCALE

CASE POND UPPER DAM H&H Cont'd.

2/4

STAGE DISCHARGE

H=0 @ CORRESPONDING CREST

$$Q = CLH^{1.5}$$

SPILLWAY CREST ELEV. = 448 (NGVD)

Q_1

C = 3.3

TOP OF DAM ELEV. = 450 (NGVD)

Q_2

C = 2.8

ELEVATION (NGVD)	H Ft.	Q_1 CFS.	H Ft.	Q_2 CFS.	ΣQ CFS.
448	0	0			0
449	1	287			287
450	2	812	0	0	812
451	3	1,492	1	553	2,045
452	4	2,297	2	1,638	3,935
453	5	3,210	3	3,154	6,364
454	6	4,219	4	5,086	9,305
455	7	5,317	5	7,437	12,754

STAGE STORAGE

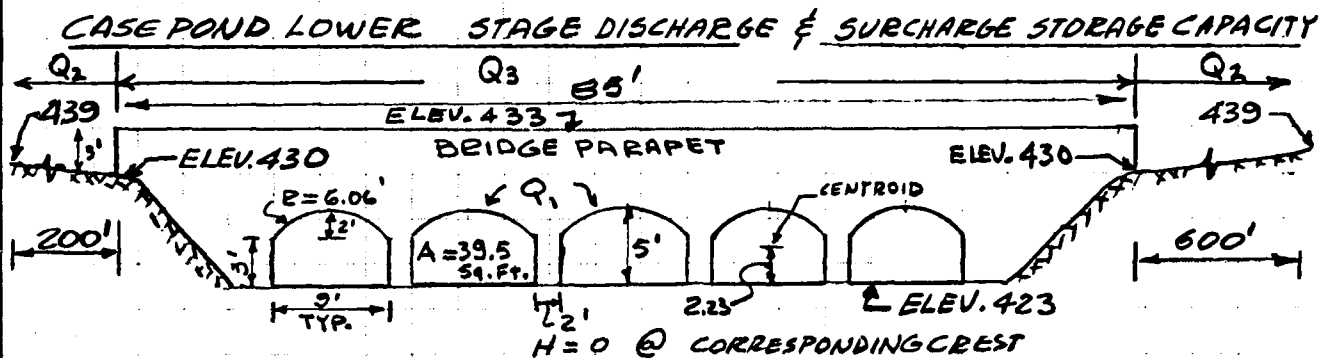
ELEVATION (NGVD)	AREA (AC.)	STORAGE (AC. FT.) (COMP. BY HEC-1 PROGRAM)
433	0	
SPILLWAY CREST 448	5.9	
TOP OF DAM 450	17.5	
460	35.0	

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB 2060-001
SHEET NO. D-4 OF
CALCULATED BY R.G. DATE 1/80
CHECKED BY R.R.B. DATE 3/80
SCALE

CASE POND UPPER H & H CONT'D.

3/4



Q₁) FOR 0 < H < 5
FOR H > 7
Q₂)
Q₃)

$Q_1 = C \times 5 \times L \times H^{1.5}$ $C = 3.0$
 $Q_1 = 5 \times 6.5 \times A \times \sqrt{2g} \times (H - 2.23)^{1/2}$
 $Q_2 = CLH^{1.5}$ $C = 2.8$
 $Q_3 = CLH^{1.5}$ $C = 3.0$

ELEVATION (NGVD)	H ₁ FT	Q ₁ CFS.	H ₂ FT.	Q ₂ CFS	H ₃ FT.	Q ₃ CFS	ΣQ CFS
423	0	0					0
425	2	382					382
426	3	701					701
428	5	1,715					1,509
430	7	2,250	0	0			2,250
433	10	2,872	3	908	0	0	3,780
436	13	3,381	6	5,136	3	1,325	9,842
439	16	3,823	9	15,126	6	3,748	23,297

SURCHARGE STORAGE

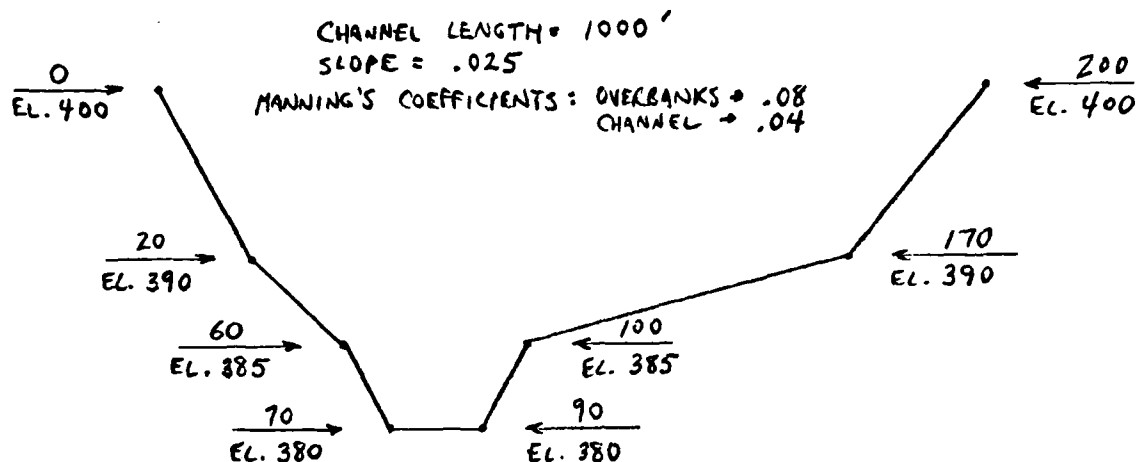
ELEVATION (NGVD)	AREA (AC.)	SURCHARGE STORAGE (AC.FT.)
NORMAL POOL 423	0.5	
430	1.0	
440	3.6	

SUBJECT	SHEET	BY	DATE	JOB NO.
CASE POND UPPER DAM	D-5	RRR	3/80	2060-001

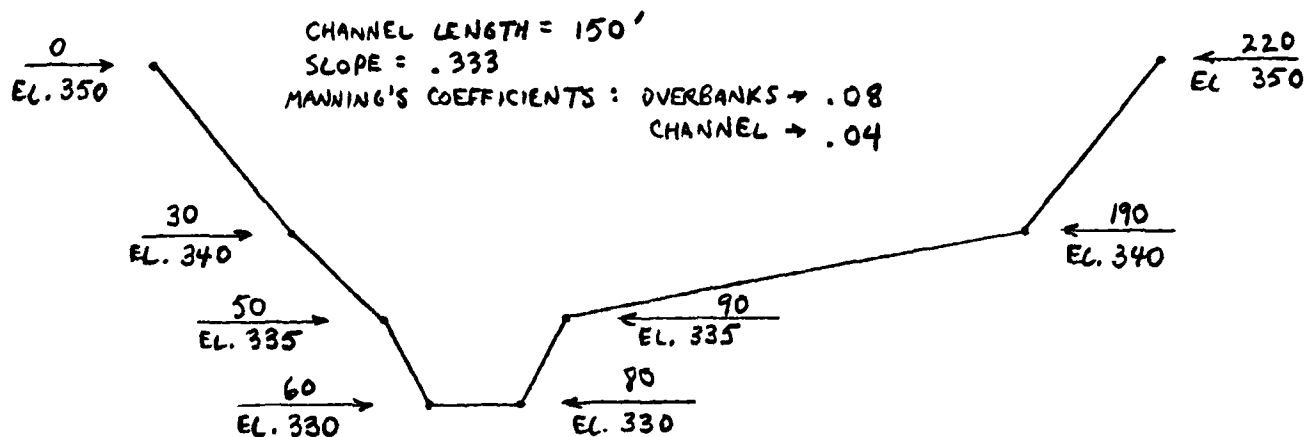
4/4

DOWNSTREAM CROSS-SECTIONS FOR BREACH ROUTING

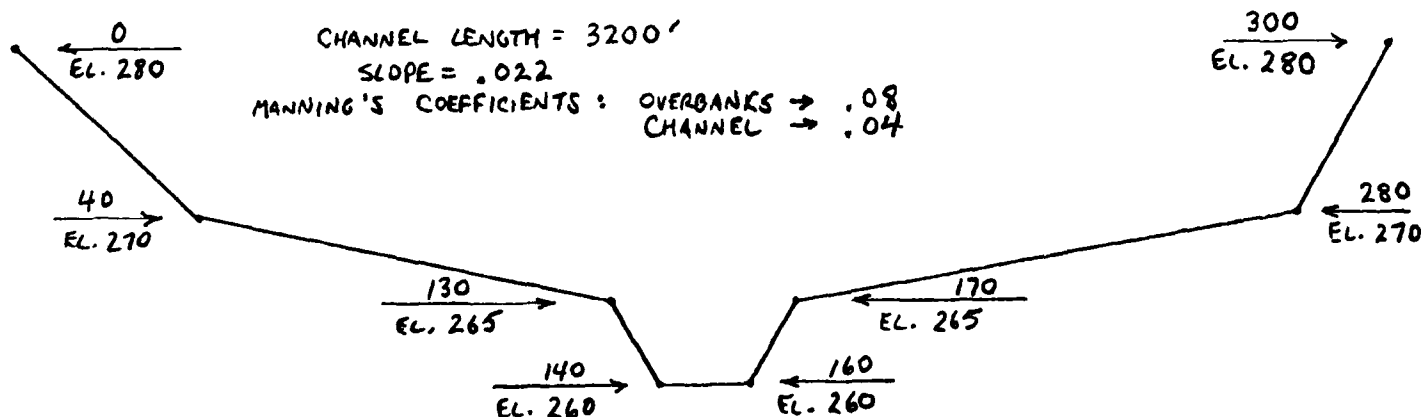
CROSS-SECTION AT TOP OF WATERFALL



CROSS-SECTION AT BOTTOM OF WATERFALL



CROSS-SECTION AT HAZARD AREA





O'BRIEN & GERE
ENGINEERS, INC.

SUBJECT

CASE POND UPPER DAM

SHEET

D-6

BY

SHS

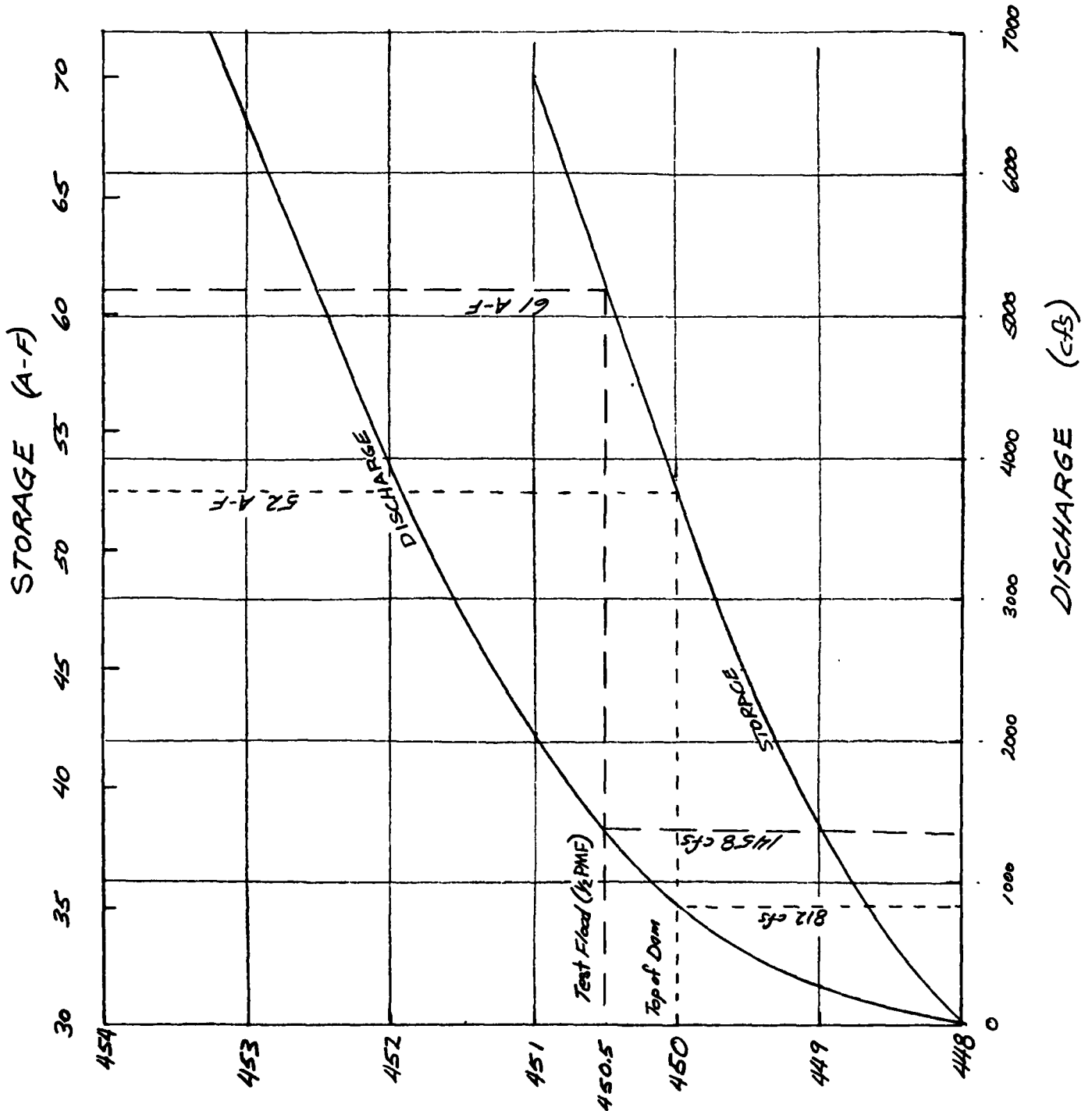
DATE

3/80

JOB NO

2060-001

STAGE vs. STORAGE
STAGE vs. DISCHARGE



FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26-FEB-79

RUN DATED 03/17/80
TIME 15:21.00

HYDROLOGIC ANALYSIS OF CASE POND UPPER DAM
NATIONAL DAM INSPECTION PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

NO NHH NMN IDAY IMH IMIN METRC IPLT IPRT NSTAN
300 0 15 0 0 0 0 0 0 -4 0
JOPER NAT LUOPT ITRAGE
5 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLANE 1 NRTIO= 9 LRTIO= 1

Percentages of PMF

0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00

INLEWY HYDROGRAPH DEVELOPMENT FOR CASE UPPER POND

SUB AREA RUNOFF COMPUTATION

INFLOW TO CASE POND UPPER DAM

ISTAQ ICUMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUO
CAS-U 0 0 0 0 0 0 1 0 0

HYDROGRAPH DATA

IHYDG IUNG TAREA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL
1 1.59 0.00 0.00 1.59 0.00 0.00 0.000 0 1 0

PRECIP DATA

SMFE PMS H6 H12 H24 R48 R72 R96
0.00 21.50 111.00 124.00 133.00 0.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS .000

LOSS DATA

LPOPI STRKH ULTKM HTIUL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIMP
0 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.05 0.00 0.00

UNIT HYDROGRAPH DATA

TP= 2.50 CP= .50 NTA= 0

RECESSION DATA

STAFN= 1.70 QHESM= .10 RTIOM= 2.00

UNIT HYDROGRAPH 78 END-OF-PERIOD ORIGINATES, LAG= 2.52 HOURS, CP= .50 VOL= 1.00

207.	195.	181.	169.	157.	145.	135.	126.	117.	108.	209.
101.	94.	81.	70.	65.	60.	56.	52.	27.	25.	13.
23.	21.	20.	19.	17.	16.	15.	14.	7.	3.	3.

UNITED COMPUTING SYSTEMS, INC.

END-OF-PERIOD FLOW
MU.DA MM.MN PERIOD RAIN EXCS LUSS COMP Q MD.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q

SUM 22.MA 21.68 1.20 89102.
(941.1) (-441.1) (-36.1) (2525.35)

..... HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM CASE POND UPPER

ISTAQ	ICOMP	IECUN	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
CAS-U	1	0	0	0	0	1	0	0
ROUTING DATA								
QLOSS	CLOSS	AVG	ITRES	ISAME	IORT	IPMP	LSTR	
0.0	0.000	0.00	1	1	0	0	0	
NSTPS NSTDL LAG ANSKK X TSK STORA ISPRAT								
1	0	0	0.000	0.000	0.000	-448.	-1	

STAGE 448.00 449.00 450.00 451.00 452.00 453.00 454.00 455.00 } Stage - Discharge Data

FLOW 0.00 207.00 012.00 2045.00 2035.00 6344.00 9305.00 12754.00 } for Case Upper Pond

SURFACE AREA= 0. 6. 18. 35. } Stage - Storage Data

CAPACITY= 0. 30. 52. 309. 460.

ELEVATIONS= 433. 448. 450. 460.

CREL SPWID COOW EXPW ELEV COOL CAREA EXPL

449.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

TOPEL E000 EXPW DAMWID

450.0 0.0 0.0 0.

0.2 PMF

PEAK OUTFLOW IS 570. AT TIME 10.50 HOURS

0.3 PMF

PEAK OUTFLOW IS 874. AT TIME 10.50 HOURS

0.4 PMF

PEAK OUTFLOW IS 1166. AT TIME 10.50 HOURS

0.5 PMF

PEAK OUTFLOW IS 1450. AT TIME 10.50 HOURS

0.6 PMF

PEAK OUTFLOW IS 1740. AT TIME 10.50 HOURS

0.7 PMF

PEAK OUTFLOW IS 2040. AT TIME 10.50 HOURS

UNITED COMPUTING SYSTEMS, INC.

0.8 PMF

PEAK OUTFLOW IS 2340. AT TIME 10.25 HOURS

0.9 PMF

PEAK OUTFLOW IS 2632. AT TIME 10.25 HOURS

PMF

PEAK OUTFLOW IS 2924. AT TIME 10.25 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO-EGRAPHIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS									
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9	RATIO 10
Test Flood Peak Inflow													
HYDROGRAPH AT	CAS-U	(	1.59 4.12)	1	587. (16.61)	880. (24.92)	1173. (33.23)	1467. (41.54)	1760. (49.84)	2054. (58.15)	2347. (66.46)	2640. (74.77)	2934. (83.07)
ROUTED TO	CAS-U	(	1.59 4.12)	1	578. (16.37)	874. (24.75)	1166. (33.02)	1458. (41.28)	1749. (49.52)	2040. (57.77)	2340. (66.26)	2632. (74.54)	2924. (82.81)

↓ Routed Test Flood Outflow

TEST FLOOD RESULTS AT CASE POND UPPER DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM	
ELEVATION		448.00		448.00		450.00	
STORAGE		30.		30.		52.	
OUTFLOW		0.		0.		842.	
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION		TIME OF FAILURE
					OVER TOP HOURS	MAX OUTFLOW HOURS	
.20	449.55	0.00	45.	578.	0.00	18.50	0.00
.30	450.05	.05	53.	874.	1.50	18.50	0.00
.40	451.29	.29	57.	1166.	3.75	18.50	0.00
.50	452.52	.52	61.	1458.	5.00	18.50	0.00
.60	453.76	.76	66.	1749.	6.00	18.50	0.00
.70	454.99	1.00	70.	2040.	6.75	18.50	0.00
.80	451.16	1.16	73.	2340.	7.75	18.25	0.00
.90	451.31	1.31	76.	2632.	8.50	18.25	0.00
1.00	451.47	1.47	79.	2924.	9.25	18.25	0.00

Test Flood Routed Outflow

D-10

CASE UPPER POND DAM BEACH TO PRIMARY HAZARD AREA

HYDROLOGIC ANALYSIS OF CASE POND UPPER DAM
NATIONAL DAM INSPECTION PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

LIST OF CASES

~~NATIONAL DAM INSPECTION PROGRAM~~
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

0

Page 1000

POND UPPER
1

452

3935

1

450

~~1-CASE-POND~~

3

0522

SECRET

?

400

60

[illegible]

WINTERFALL

350

220
50

0301 0000

1
1-3046-0414 24

200

130
300

MAC

1

100

1

1
 2
 3
 4
 5

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

RUN DATE=02-17-80
TIME=15.00.44.

HYDROLOGIC ANALYSIS OF CASE POND UPPER DAM
NATIONAL DAM INSPECTION PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

JOB SPECIFICATION
NQ NHR NHIN IDAY IMR IMIN METC IPLT IPRT NSTAN
300 0 5 0 0 0 0 0 0 0 0 0
JOWER NWT LBORT IRACE
5 0 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN=1 NRTIO=1 LRTIO=1

NO INFLOW → RTIOS=0.00

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM CASE POND UPPER

ISTAQ ICOMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO
CAS-U 1 0 0 0 0 0 1 0 0

ROUTING DATA

QLOSS CLOSS AVG IRES ISAME IUPT IPMP LSTR
0.0 0.000 0.00 1 1 0 0 0

NSTPS NSTDL LAG A4SKK X TSK STORA ISPRAT
1 0 0 0.000 0.000 0.000 -450. -1

STAGE 449.00 449.00 450.00 451.00 452.00 453.00 454.00
FLOW 0.00 207.00 412.00 2045.00 3035.00 4364.00 9305.00

455.00 } Stage - Discharge Data
12754.00 }

SURFACE AREA 0. 6. 18. 35.

CAPACITY 0. 30. 52. 309.

ELEVATION 433. 449. 450. 460.

Stage - Storage Data

Spillway Crest Elevation → 449.0
CREL SPWID CUOW EXPW ELEV COOL CANEA EXPL
449.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Top of Dam Elevation → 450.0
TOPEL CUOW EXPD DAMWID
450.0 0.0 0.0 0.

DAM DATA

BRWTD Z DAM-BREACH DATA WSEL FAILEL

Breach Data

75. .01 435.00 2.00 450.00 450.00

BEGIN DAM FAILURE AT 0.00 HOURS

PEAK OUTFLOW IS 412. AT TIME 0.00 HOURS

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BREACH FLOOD ROUTING THROUGH CASE POND LOWER

HYDROGRAPH ROUTING

RESERVOIR ROUTING THROUGH CASE POND LOWER

ISTAO	ICOMP	IECON	ITYPE	JPLT	JPRI	INAME	ISTAGE	IAUTO
CAS-L	1	0	0	0	0	1	0	0
ROUTING DATA								
QLOSS	CLOSS	AVG	IRIS	ISAME	IOPT	IPMP	LSTR	
0.0	0.000	0.00	1	1	0	0	0	
NSTPS NSTUL LAG AWSKK X TSK STORA ISPRAT								
1	0	0	0.000	0.000	0.000	-423.	-1	

STAGE	423.00	425.00	426.00	428.00	430.00	433.00	436.00	439.00
FLOW	0.00	362.00	701.00	1509.00	2250.00	3780.00	9842.00	23297.00

SURFACE AREA= 1. 1. 4.

CAPACITY= 0. 5. 27.

ELEVATION= 423. 430. 440.

CREL	SPWID	COBW	EXPW	ELEV	COOL	CAREA	EXPL
423.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOPEL COBD EXPD DAMWID
436.0 0.0 0.0 0.

PEAK OUTFLOW IS 805. AT TIME .00 HOURS

HYDROGRAPH ROUTING

CHANNEL ROUTING TO TOP OF WATERFALL

ISTAO	ICOMP	IECON	ITYPE	JPLT	JPRI	INAME	ISTAGE	IAUTO
NS-1	1	0	0	0	0	1	0	0
ROUTING DATA								
QLOSS	CLOSS	AVG	IRIS	ISAME	IOPT	IPMP	LSTR	
0.0	0.000	0.00	1	1	0	0	0	
NSTPS NSTUL LAG AWSKK X TSK STORA ISPRAT								
1	0	0	0.000	0.000	0.000	-1.	0	

NORMAL DEPTH CHANNEL ROUTING

QNI(1) QNI(2) QNI(3) ELMVT ELMAX RLNTH SEL
 0000 0000 0000 300.0 400.0 1000 02500

CROSS SECTION COORDINATES--STA+ELEV+STA+ELEV--ETC
 0.00 400.00 20.00 300.00 60.00 385.00 70.00 380.00 90.00 380.00
 100.00 385.00 170.00 390.00 200.00 400.00

	STORAGE	OUTFLOW	STAGE	FLW	MAXIMUM STAGE IS
	0.00	0.00	380.00	0.00	
	16.10	131.67	381.05	131.67	
	19.93	130.53	381.50	130.53	
	23.01	130.00	382.11	130.00	
	27.01	129.62	382.63	129.62	
	31.95	129.21	383.16	129.21	
	36.21	128.74	383.69	128.74	
	40.60	128.21	384.21	128.21	
	45.11	127.61	384.72	127.61	
	49.75	126.96	385.26	126.96	
	54.52	126.26	385.79	126.26	
	59.41	125.51	386.32	125.51	
	64.38	124.72	386.84	124.72	
	69.45	123.88	387.37	123.88	
	74.56	122.99	387.89	122.99	
	79.75	122.06	388.42	122.06	
	85.00	121.08	388.95	121.08	
	90.30	120.06	389.47	120.06	
	95.75	119.00	390.00	119.00	
	101.25	117.91	390.53	117.91	
	106.80	116.78	391.05	116.78	
	112.40	115.61	391.58	115.61	
	118.05	114.40	392.11	114.40	
	123.75	113.16	392.63	113.16	
	129.50	111.89	393.16	111.89	
	135.30	110.58	393.69	110.58	
	141.15	109.23	394.21	109.23	
	147.05	107.84	394.72	107.84	
	153.00	106.41	395.26	106.41	
	159.00	104.96	395.79	104.96	
	165.05	103.48	396.32	103.48	
	171.15	101.96	396.84	101.96	
	177.30	100.41	397.37	100.41	
	183.50	98.83	397.89	98.83	
	189.75	97.21	398.42	97.21	
	196.05	95.56	398.95	95.56	
	202.40	93.88	399.47	93.88	
	208.80	92.16	400.00	92.16	
	215.25	90.41	400.53	90.41	
	221.75	88.63	401.05	88.63	
	228.30	86.82	401.58	86.82	
	234.90	84.98	402.11	84.98	
	241.55	83.11	402.63	83.11	
	248.25	81.21	403.16	81.21	
	255.00	79.28	403.69	79.28	
	261.80	77.32	404.21	77.32	
	268.65	75.33	404.72	75.33	
	275.55	73.31	405.26	73.31	
	282.50	71.26	405.79	71.26	
	289.50	69.18	406.32	69.18	
	296.55	67.08	406.84	67.08	
	303.65	64.96	407.37	64.96	
	310.80	62.81	407.89	62.81	
	318.00	60.63	408.42	60.63	
	325.25	58.42	408.95	58.42	
	332.55	56.19	409.47	56.19	
	340.00	53.93	410.00	53.93	
	347.50	51.64	410.53	51.64	
	355.05	49.32	411.05	49.32	
	362.65	46.98	411.58	46.98	
	370.30	44.61	412.11	44.61	
	378.00	42.21	412.63	42.21	
	385.75	39.78	413.16	39.78	
	393.55	37.32	413.69	37.32	
	401.40	34.83	414.21	34.83	
	409.30	32.31	414.72	32.31	
	417.25	29.76	415.26	29.76	
	425.25	27.18	415.79	27.18	
	433.30	24.58	416.32	24.58	
	441.40	21.96	416.84	21.96	
	449.55	19.32	417.37	19.32	
	457.75	16.66	417.89	16.66	
	466.00	14.00	418.42	14.00	
	474.30	11.32	418.95	11.32	
	482.65	8.63	419.47	8.63	
	491.05	5.93	420.00	5.93	
	499.50	3.21	420.53	3.21	
	508.00	0.48	421.05	0.48	
	516.55	-0.28	421.58	-0.28	
	525.15	-1.00	422.11	-1.00	
	533.80	-1.69	422.63	-1.69	
	542.50	-2.35	423.16	-2.35	
	551.25	-3.00	423.69	-3.00	
	560.05	-3.63	424.21	-3.63	
	568.90	-4.24	424.72	-4.24	
	577.80	-4.83	425.26	-4.83	
	586.75	-5.40	425.79	-5.40	
	595.75	-5.95	426.32	-5.95	
	604.80	-6.48	426.84	-6.48	
	613.90	-6.99	427.37	-6.99	
	623.05	-7.48	427.89	-7.48	
	632.25	-7.95	428.42	-7.95	
	641.50	-8.40	428.95	-8.40	
	650.80	-8.83	429.47	-8.83	
	660.15	-9.24	430.00	-9.24	
	669.55	-9.63	430.53	-9.63	
	679.00	-10.00	431.05	-10.00	
	688.50	-10.35	431.58	-10.35	
	698.05	-10.68	432.11	-10.68	
	707.65	-10.99	432.63	-10.99	
	717.30	-11.28	433.16	-11.28	
	727.00	-11.55	433.69	-11.55	
	736.75	-11.80	434.21	-11.80	
	746.55	-12.03	434.72	-12.03	
	756.40	-12.24	435.26	-12.24	
	766.30	-12.43	435.79	-12.43	
	776.25	-12.60	436.32	-12.60	
	786.25	-12.75	436.84	-12.75	
	796.30	-12.88	437.37	-12.88	
	806.40	-12.99	437.89	-12.99	
	816.55	-13.08	438.42	-13.08	
	826.75	-13.15	438.95	-13.15	
	837.00	-13.20	439.47	-13.20	
	847.30	-13.23	440.00	-13.23	
	857.65	-13.24	440.53	-13.24	
	868.05	-13.23	441.05	-13.23	
	878.50	-13.20	441.58	-13.20	
	889.00	-13.15	442.11	-13.15	
	899.55	-13.08	442.63	-13.08	
	910.15	-12.99	443.16	-12.99	
	920.80	-12.88	443.69	-12.88	
	931.50	-12.75	444.21	-12.75	
	942.25	-12.60	444.72	-12.60	
	953.05	-12.43	445.26	-12.43	
	963.90	-12.24	445.79	-12.24	
	974.80	-12.03	446.32	-12.03	
	985.75	-11.80	446.84	-11.80	
	996.75	-11.55	447.37	-11.55	
	1007.80	-11.28	447.89	-11.28	
	1018.90	-11.00	448.42	-11.00	
	1030.05	-10.70	448.95	-10.70	
	1041.25	-10.39	449.47	-10.39	
	1052.50	-10.06	450.00	-10.06	
	1063.80	-9.71	450.53	-9.71	
	1075.15	-9.34	451.05	-9.34	
	1086.55	-8.95	451.58	-8.95	
	1098.00	-8.54	452.11	-8.54	
	1109.50	-8.11	452.63	-8.11	
	1121.05	-7.66	453.16	-7.66	
	1132.65	-7.19	453.69	-7.19	
	1144.30	-6.70	454.21	-6.70	
	1156.00	-6.19	454.72	-6.19	
	1167.75	-5.66	455.26	-5.66	
	1179.55	-5.11	455.79	-5.11	
	1191.40	-4.54	456.32	-4.54	
	1203.30	-3.95	456.84	-3.95	
	1215.25	-3.34	457.37	-3.34	
	1227.25	-2.71	457.89	-2.71	
	1239.30	-2.06	458.42	-2.06	
	1251.40	-1.39	458.95	-1.39	
	1263.55	-0.70	459.47	-0.70	
	1275.75	-0.00	460.00	-0.00	
	1288.00	0.71	460.53	0.71	
	1300.30	1.41	461.05	1.41	
	1312.65	2.10	461.58	2.10	
	1325.05	2.78	462.11	2.78	
	1337.50	3.45	462.63	3.45	
	1350.00	4.11	463.16	4.11	
	1362.55	4.76	463.69	4.76	
	1375.15	5.40	464.21	5.40	
	1387.80	6.03	464.72	6.03	
	1400.50	6.65	465.26	6.65	
	1413.25	7.26	465.79	7.26	
	1426.05	7.86	466.32	7.86	
	1438.90	8.45	466.84	8.45	
	1451.80	9.03	467.37	9.03	
	1464.75	9.60	467.89	9.60	
	1477.75	10.16	468.42	10.16	
	1490.80	10.71	468.95	10.71	
	1503.90	11.25	469.47	11.25	
	1517.05	11.78	470.00	11.78	
	1530.25	12.30	470.53	12.30	
	1543.50	12.81	471.05	12.81	
	1556.80	13.31	471.58	13.31	
	1570.15	13.80	472.11	13.80	
	1583.55	14.28	472.63	14.28	
	1597.00	14.75	473.16	14.75	
	1610.50	15.21	473.69	15.21	
	1624.05	15.66	474.21	15.66	
	1637.65	16.10	474.72	16.10	
	1651.30	16.53	475.26	16.53	
	1665.00	16.95	475.79	16.95	
	1678.75	17.36	476.32	17.36	
	1692.55	17.76	476.84	17.76	
	1706.40	18.15	477.37	18.15	
	1720.30	18.53	477.89	18.53	
	1734.25	18.90	478.42	18.90	
	1748.25	19.26	478.95	19.26	
	1762.30	19.61	479.47	19.61	
	1776.40	19.95	480.00	19.95	

NORMAL DEPTH CHANNEL ROUTING

QNT(1) QNT(2) QNT(3) ELNVT ELMAX RLNTH SEL
.0800 .0400 .0800 330.0 350.0 150. .33300

CROSS SECTION COORDINATES--STA.ELEV.STA.ELEV--ETC
0.00 350.00 30.00 340.00 50.00 335.00 60.00 330.00 00.00 330.00
90.00 335.00 190.00 340.00 220.00 350.00

STORAGE 0.00 2.53 3.13 3.76 4.41 5.08 5.77 6.49
1.07 1.47 1.96
7.23 7.99 8.78

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OUTFLOW 0.00 480.56 1580.59 3233.54 5447.50 8389.50 12533.91 17744.91 24219.00 32125.03
41913.63 53578.41 66744.50 81372.06 97435.83 114920.09 133815.75 154118.51 175827.66 198945.29

STAGE 330.00 331.05 332.11 333.16 334.21 335.26 336.32 337.37 338.42 339.47
340.53 341.58 342.63 343.68 344.74 345.79 346.84 347.89 348.95 350.00

FLOW 0.00 480.56 1580.59 3233.54 5447.50 8389.50 12533.91 17744.91 24219.00 32125.03
41913.63 53578.41 66744.50 81372.06 97435.83 114920.09 133815.75 154118.51 175827.66 198945.29

MAXIMUM STAGE IS 331.4

BREACH FLOW ROUTING TO HAZARD AREA

HYDROGRAPH ROUTING

CHANNEL ROUTING TO HAZARD AREA

ROUTING DATA
ISTAQ ICOMP AVG IMFS ISAME IOPT IPMP LSTR
0.0 0.000 0.000 1.000 1.000 1.000 1.000 1.000 1.000
NSTPS NSTDL LAG AMSKK X TSK STORA ISPRAT
1.0 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

NORMAL DEPTH CHANNEL ROUTING

QNT(1) QNT(2) QNT(3) ELNVT ELMAX RLNTH SEL
0.000 0.400 0.800 260.0 280.0 320.0 .02200

CROSS SECTION COORDINATES--STA.ELEV.STA.ELEV--ETC
0.00 280.00 40.00 270.00 130.00 265.00 140.00 260.00 160.00 260.00
170.00 265.00 280.00 270.00 300.00 280.00

STORAGE 0.00 1.71 3.74 6.10 8.79 11.89 17.43
71.78 90.93 110.37 130.39 150.90 171.90 193.39

OUTFLOW 0.00 123.52 406.26 831.13 1400.19 2156.78 3250.69
12178.38 16078.53 20512.44 25477.66 30948.96 36913.80 43362.85

STAGE 260.00 261.05 262.11 263.16 264.21 265.26 266.32
270.93 271.94 272.63 273.68 274.74 275.79 276.84

FLOW 0.00 123.52 406.26 831.13 1400.19 2156.78 3250.69
12178.38 16078.53 20512.44 25477.66 30948.96 36913.80 43362.85

MAXIMUM STAGE IS 261.1

Elevation of Breach Floodwaters at Damage Center

Channel Characteristics at Downstream Hazard Center

Streambed Elevation at Hazard Area

26.22 38.27 53.57
215.37 237.84 260.79

4700.34 6596.49 9016.70
50289.12 57687.42 65553.92

267.37 268.42 269.47
277.89 278.95 280.00

4700.34 6596.49 9016.70
50289.12 57687.42 65553.92

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 *****

ELEVATION		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
STORAGE	450.00	450.00	450.00	450.00
OUTFLOW	52.	30.	52.	52.
		0.	0.	0.

RATIO OF PMF	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	449.84	0.00	52.	0.00	0.00	0.00

CASE UPPER POND BREACH FLOOD RESULTS

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 *****

ELEVATION		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
STORAGE	423.00	423.00	423.00	430.00
OUTFLOW	0.	0.	0.	5.
		0.	0.	2250.

RATIO OF PMF	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	426.26	0.00	2.	0.00	0.00	0.00

PLAN 1 STATION DS-1

RATIO	MAXIMUM FLOW-CFS	MAXIMUM STAGE-FT	TIME HOURS
0.00	805.	383.0	0.00

PLAN 1 STATION DS-2

RATIO	MAXIMUM FLOW-CFS	MAXIMUM STAGE-FT	TIME HOURS
0.00	805.	331.4	0.00

PLAN 1 STATION DS-3

RATIO	MAXIMUM FLOW-CFS	MAXIMUM STAGE-FT	TIME HOURS
0.00	805.	263.1	0.00

Peak Breach Flow at Damage Center

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APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

The above statement means that Appendix E is
not available per Mr. Tim Hayes, Army Corps
of Engineers, New England Division

END

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DTIC