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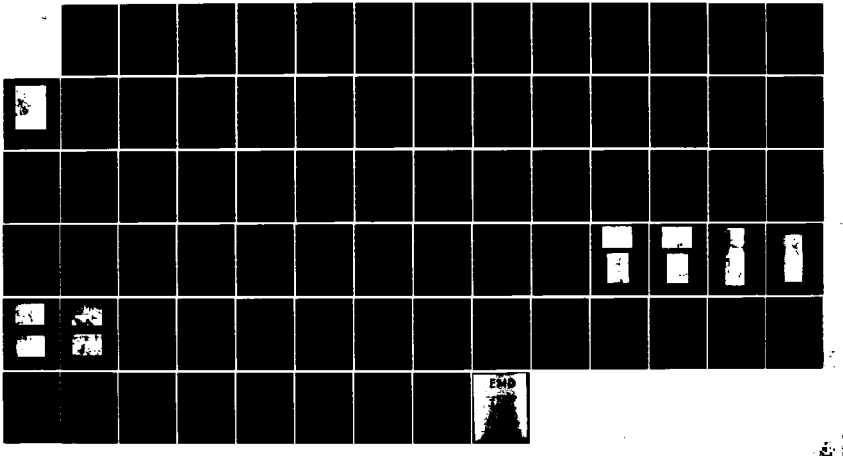
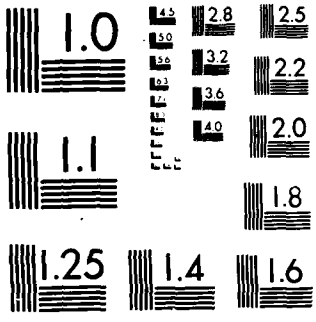
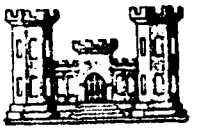




CONNECTICUT RIVER BASIN
MIDDLETOWN, CONNECTICUT

HIGHLAND POND DAM
CT 00147

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

APRIL 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

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Conn. River Basin
Middletown, Conn.
Highland Pond Dam

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

Highland Pond Dam is a 117 ft. long stone rubble and an earthfill dam which has a maximum height of 14 ft. There is a 21 ft. long broad crested weir spillway located near the middle of the dam. The width of the embankment averages 20 ft. including the dry stone masonry facing. The dam is in fair condition. Erosion was noted in the vicinity of the left abutment. Based on its small size and significant hazard classification and in accordance with the Corps Guidelins the test flood selected was ½ the probable maximum flood.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

JUL 0 1981

NEDED

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Highland Pond Dam (CT-00147) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve 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 vitally important.

Copies of this report have been forwarded to the Department of Environmental Protection, and to the owner, Dr. Eric Gordon, Bell Street, Middletown, CT 06456. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Protection for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

Incl
As stated

HIGHLAND POND DAM

CT 00147

CONNECTICUT RIVER BASIN

MIDDLETOWN, CONNECTICUT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IdentificationNo.	:	CT 00147
Name of Dam	:	Highland Pond Dam
Town	:	Middletown
County and State	:	Middlesex County, Connecticut
Stream	:	Sawmill Brook
Date of Inspection:		November 24, 1980

BRIEF ASSESSMENT

Highland Pond Dam is a 117 foot long stone rubble and earthfill dam which has a maximum height of 14 feet. There is a 21 foot long broad crested weir spillway located near the middle of the dam. The width of the embankment averages 20 feet including the dry stone masonry facing. The maximum storage capacity of the dam, with water at the top of dam, is 69 acre-feet. There are no known uses of the dam at the present time.

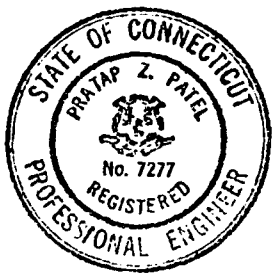
The visual inspection of Highland Pond Dam indicated that the dam is in fair condition. The inspection revealed that the crest of the dam is covered with trees and rotted stumps as seen in Photo #9. Trees were also noted growing at the downstream toe of the dam. There is no riprap on the upstream slope, and erosion was noted in the vicinity of the left abutment. On the downstream face of the dam there was one area of bulging, along with an area of seepage, and a number of voids up to 6 inches wide between stones.

Based on its small size and significant hazard classification and in accordance with the Corps Guidelines the test flood selected was 1/2 the probable maximum flood. The peak inflow at the dam is 1730 cfs which was calculated using the drainage area of 1.63 square miles and the Corps Peak Inflow Curve for rolling terrain. The peak outflow, after allowing for pond storage, is 1600 cfs. The spillway will discharge 175 cfs or 11% of the test flood with the pool level at the top of the dam. The test flood will overtop the dam by 3.2 feet.

Based on the findings of the visual inspection and hydrologic and hydraulic analysis, there is need for additional engineering analysis and design and alterations to the dam. These include monitoring the seepage

from the toe of the downstream face and inspecting the downstream face of the dam below the spillway during low reservoir flows. Trees, bushes and stumps should be removed from the crest, downstream face and within 10 feet of the downstream toe and the excavated areas backfilled with compacted soil. Riprap should be designed and placed on the upstream slope and at the eroded portion of the left abutment. The owner should engage the services of a qualified registered engineer to perform a detailed hydrologic and hydraulic analysis to assess further the need for and means to increase the project discharge capacity and the ability of the dam to withstand overtopping.

The recommendations and remedial measures are described in Section 7 and should be addressed within one year after receipt of this Phase I Inspection Report by the owner.



Pratap Z. Patel, P.E.
Project Manager

Pratap Z Patil

Philip W. Genovese & Associates, Inc.
Hamden, Connecticut

This Phase I Inspection Report on Highland Pond Dam (CT-00147) 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 judgement and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

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

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, 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 normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at

some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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

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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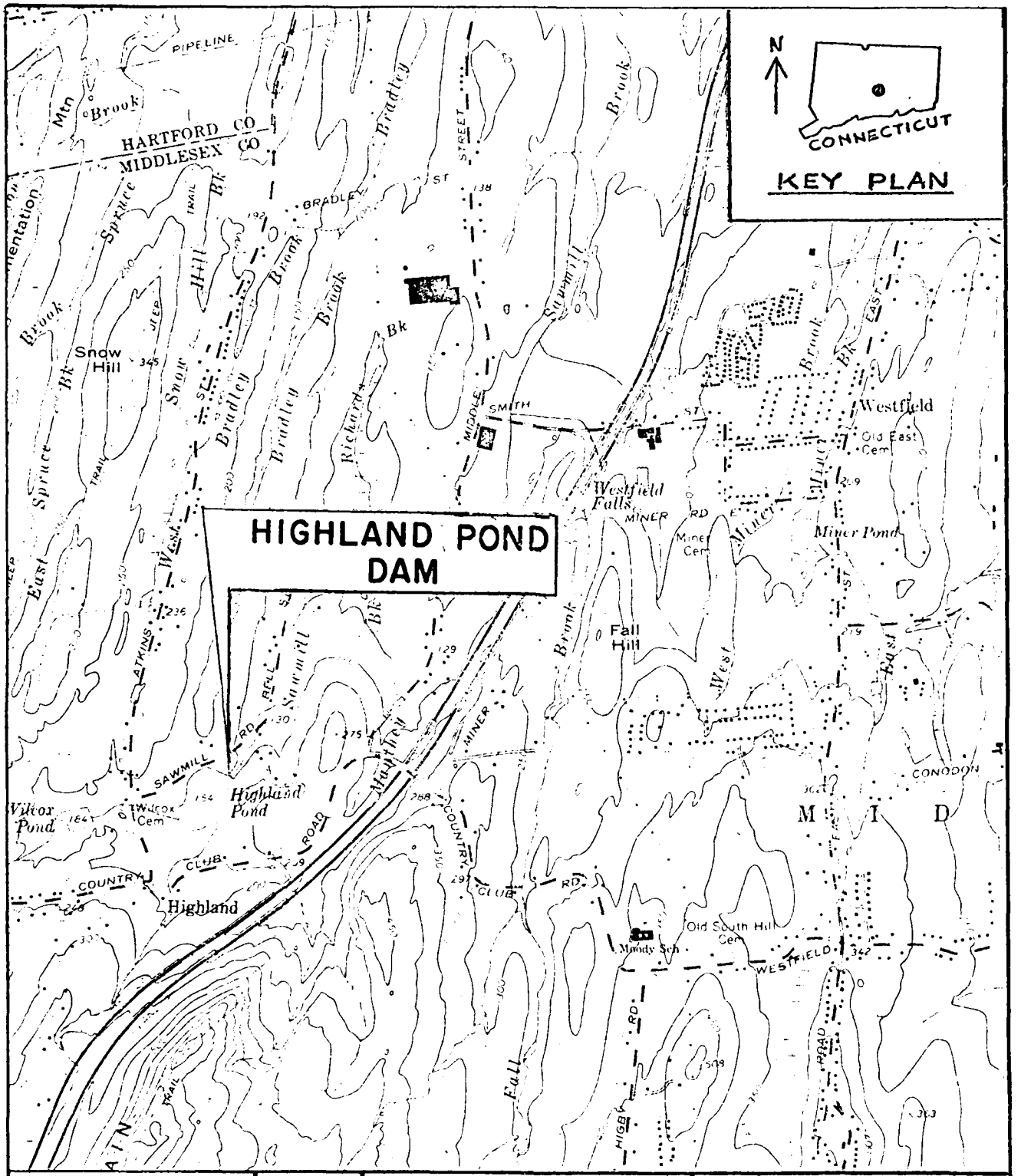
PHILIP W. GENOVESE AND ASSOCIATES, INC. ENGINEERS - HAMDEN, CT.		



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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

HIGHLAND POND DAM - CT 00147

SECTION I

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. Philip W. Genovese and Associates, Inc., has been retained by the New England Division to inspect and report on selected dams in South Central Connecticut. Authorization and notice to proceed were issued to Philip W. Genovese and Associates, Inc., under a letter of November 17, 1980 from Colonel William E. Hodgson Jr., Corps of Engineers. Contract No. DACW 33-81-C-0017 has been assigned by the Corps of Engineers for this work.

b. Purpose

1. Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

2. Encourage and prepare the states to initiate quickly effective dam safety programs for non-federal dams.

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

1.2 Description of Project

a. Location

Highland Pond Dam is located in the City of Middletown in Middlesex County, Connecticut. Highland Pond is a short distance north of Interstate 91, east of the intersection of Atkins Street and Sawmill Road. The dam impounds the waters of Sawmill Brook, and is shown on the Middletown, Connecticut Quadrangle with the approximate coordinates of North $41^{\circ}34.2'$, West $72^{\circ}44.1'$. Sawmill Brook joins the Mattabassett River approximately 2.8 miles downstream of the dam.

b. Description of Dam and Appurtenances

Highland Pond Dam is a dry rubble masonry dam with a height of 14 feet. The spillway is 21 feet in length and has a concrete floor. There is an outlet works which appears to consist of a submerged concrete headwall serving as an intake chamber, a gate valve housed in a locked vertical cast iron pipe, a conduit, and a stone box outlet at the toe of the dam. The 2.5 feet by 2.0 feet outlet is approximately at elevation 146 NGVD. Along the left bank approximately 30 feet upstream of the dam is what appears to be an old intake structure. This may have connected to a U-shaped partially collapsed outlet structure located approximately 100 feet downstream of the dam on the left bank. (See plan on Page B-1.)

A plan of the dam and the existing spillway and outlet works appears in Appendix B. Photographs of each structure are shown in Appendix C.

c. Size Classification

The dam's maximum impoundment of 69.0 acre-feet and height of 14 feet places it in the SMALL size category, using as a reference the size classification table in the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams. Table 1 of these guidelines classifies a dam with 50 to 1000 acre-feet of storage as being small in size.

d. Hazard Classification

The hazard potential classification for this dam is SIGNIFICANT, using the Corps Guidelines, because there are two residences within 4300 feet downstream of the dam which would have flood depths of 1-2 feet as a result of the dam failure. A dam breach could result in the loss of a few lives. Also the dam and stream are close to Sawmill Road and Bell Street. In addition, there are plans for construction of an office complex downstream of the dam.

e. Ownership

The dam is owned by Dr. Eric Gordon, whose address is Bell Street, Middletown, Connecticut 06457.

f. Operator

The operation of the dam is controlled by the Owner.

g. Purpose

The present purpose of the dam is unknown. Dr. Eric Gordon,

the owner, had stated the purpose as providing a sanctuary for wild life.

h. Design and Construction History

Highland Pond Dam was reportedly built in 1875, but there are no available records of the dam relating to design or construction.

i. Normal Operational Procedures

No data was disclosed for maintenance of water levels.

1.3 Pertinent Data

a. Drainage Area

The drainage area for this dam covers 1.63 square miles (1043 acres). Most of the tributary area is rolling farm land or residential land. Elevations in the basin range from 892 feet to 154 feet NGVD. There is another small pond, Wilcox Pond, approximately 1500 feet upstream of Highland Pond. Due to the small size of Wilcox Pond there is little chance of flood attenuation effects attributable to it.

b. Discharge at Damsite

1. The outlet works for the reservoir consists of a submerged concrete headwall located behind the spillway, and an 8 inch vertical cast iron pipe which reportedly houses an 8" valve which controls an outlet conduit. The conduit is inaccessible because it is submerged. It appears that the conduit leads to a 2.5 feet by 2.0 foot stone box outlet located at the base of the dam 5.5 feet left of the left edge of the spillway. It was impossible to determine the operability of this outlet. The capacity is calculated to be 7 cfs with water at the top of dam.

2. There are no records of maximum discharge at the dam site.

3. The ungated spillway capacity with a water surface at the top of the dam elevation (156.0) is approximately 175 cfs.

4. The ungated spillway capacity at test flood elevation 159.1 is 1605 cfs.

5. The gated spillway capacity at normal pool elevation of 154.0 is N/A.

6. The gated spillway capacity at test flood elevation of 159.1 is N/A.

7. The total spillway capacity at test flood elevation of 159.1 is 1605 cfs.

8. The total project discharge at top of dam elevation of 155.9 is 180 cfs.

9. The total project discharge at test flood elevation of 159.1 is 1610 cfs.

c. Elevation (Feet above NGVD)

1. Streambed at toe of dam	142.0
2. Bottom of cutoff	Unknown
3. Maximum Tailwater	Unknown
4. Normal Pool	154.0
5. Full Flood Control Pool	N/A
6. Spillway Crest	154.0
7. Design Surcharge	N/A
8. Top of Dam	156.0
9. Test Flood Surcharge	159.1

d. Reservoir (Length in feet)

1. Maximum Pool	1300
2. Normal Pool	1000
3. Flood Control	N/A
4. Top of Dam	1100
5. Spillway Crest Pool	1000

e. Storage (Acre-feet)

1. Normal Pool	47
2. Spillway Crest Pool	47
3. Flood Control Pool	N/A
4. Top of Dam	69
5. Test Flood Pool	122

f. Reservoir Surface (Acres)

1. Normal Pool	11.8
2. Flood Control Pool	N/A
3. Spillway Crest Pool	11.8
4. Test Flood Pool	17.7
5. Top of Dam	15.0

g. Dam

1. Type	Earth fill with rubble masonry facing on down stream face
2. Length	117.0 feet
3. Height	14 feet
4. Top Width	20.0 feet
5. Side Slopes - Upstream	1 Vertical : 3 Horizontal
Downstream	1 Horizontal : 2 Vertical
6. Zoning	Unknown
7. Impervious Core	Unknown
8. Cutoff	Unknown
9. Grout Curtain	Unknown

h. Diversion and Regulating Tunnel

None

i. Spillway

1. Type	Broad crested weir with a concrete floor
2. Length of Weir	21 feet
3. Crest elevation	154.0
4. Gates	None
5. Upstream channel	Underwater
6. Downstream channel	Stilling basin followed by rocky natural channel.

j. Regulating Outlets

1. Invert	150.0
2. Size	An 8-inch conduit which passes through the dam

3. Description
(A description of this outlet and control mechanism may be found in a letter from Eric Gordon, M.D. to the Water and Resources Division of the State Department of Environmental Protection under date of September 13, 1972. See Appendix B-5 and B-6).

4. Control Mechanism	8-inch gate valve housed in an 8-inch vertical cast iron pipe located about 30 feet upstream of the spillway

SECTION 2
ENGINEERING DATA

2.1 Design Data

This dam was reportedly constructed in 1875. No plans or in-depth engineering data were found.

2.2 Construction Data

No construction records were available for use in evaluating the dam.

2.3 Operation Data

No engineering operational data were disclosed.

2.4 Evaluation of Data

a. Availability

No engineering data was found to be available for this dam.

b. Adequacy

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

c. Validity

Since there are no available engineering plans or construction data, it is impossible to comment on their validity.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General

The field inspection of Highland Pond Dam was made on November 24, 1980. The inspection team consisted of personnel from Philip W. Genovese and Associates, Inc. and Geotechnical Engineers, Inc. Inspection checklists, completed during the visual inspection are included in Appendix A. At the time of inspection, the water level was approximately 0.1 feet above the permanent spillway elevation. Water was passing over the spillway. The upstream face of the dam could only be inspected above this water level.

b. Dam

The dam is an earthfill dam with a dry stone masonry downstream face. It is 117 feet long, 14 feet high and 21 feet long at the crest. A stationing system was developed for the visual inspection. The junction of the crest of the dam and the left abutment corresponds to Sta 0+00, and the station numbers increase to the right of this point. A 21-foot wide straight-drop spillway with a dry stone masonry downstream face is located between Sta 0+50 and Sta 0+71. The control tower for the low-level outlet is located on the upstream slope across from Sta 0+60, about 30 feet upstream from the crest of the spillway. The 2.5 foot wide and 2 foot high outlet emerges at the bottom of the downstream face of the dam at Sta 0+45. The outlet is operable according to the owner (See Pages B-5, B-6).

The crest of the dam is covered with trees up to 11-inch diameter and rotted stumps up to 12-inch diameter (Photo No. 9). Trees up to 4-inch diameter grow from the top of the downstream face of the dam left of the spillway (Photo No. 11), and trees up to 14-inch diameter grow at the toe of the downstream face (Photos No. 5 and 8). The upstream slope is covered with brush and has no riprap protection (Photo No. 1). Wave action has eroded a 1-foot vertical scarp in the upstream slope above the water level, and trespassing and wave action has eroded the upstream slope in the vicinity of the left abutment. The crest of the dam is very irregular, and local settlement was observed at Sta 0+25 forming a 14-inch deep and 2-foot wide depression about 3 feet upstream from the downstream face. (See Page B-1 for location).

A 5 foot long and 3 foot high portion of the dry stone masonry wall comprising the upper portion of the downstream face of the dam was observed to have moved differentially 6 to 8 inches in the downstream direction about 5 feet below the crest at Sta 0+30. Several stones have fallen from the top of the wall above the bulge at Sta 0+30, forming a local depression in the top of the wall 5 feet long and 2 feet deep (Photo No. 7).

Many voids up to 6-inches wide were observed between stones in the downstream face (Photos No. 5, 6, and 7). Seepage was observed to flow from one of these voids at the base of the downstream wall at Sta 0 + 25 (Photos No. 3 and 4). At the time of inspection a rust-colored stain was observed at the bottom of ponded water at the outlet of the seep, but the seep appeared to be flowing clear and free of suspended fines.

c. Appurtenant Structures

The spillway consists of a dry stone masonry wall with a mortared stone masonry crest as shown in Photos No. 5 and 6. At the time of inspection water was flowing over the spillway, and a portion of the downstream face could not be inspected for evidence of seepage. The mortared stone masonry left training wall of the spillway is in good condition (Photo No. 11) and appears to have been re-pointed recently. The right side (abutment) of the spillway does not have a vertical training wall but consists of a sloping stone masonry surface recently covered with a thin veneer of concrete. An energy dissipating stilling basin is located immediately downstream from the spillway face (Photo No. 2). Some riprap protection was observed at the edge of the stilling basin. The outlet works consist of an 8-inch cast iron intake conduit controlled by an 8-inch gate valve with extended stem, and a 2 x 2.5 foot stone box outlet.

d. Reservoir Area

There are no indications of instability along the banks of the reservoir in the vicinity of the dam.

e. Downstream Channel

The downstream channel serves the low-level outlet at Sta 0+45 and the spillway. The floor of the downstream channel is a natural stream bed with cobbles and boulders (Photo No. 10). The banks of the channel are forested, and a few trees grow in the channel downstream from the stilling basin. Some fallen trees were observed to obstruct a portion of the channel.

3.2 Evaluation

On the basis of the visual inspection, Highland Pond Dam is judged to be in fair condition. The following features could affect the long term performance of the dam:

1. Potential local instability of the downstream dry stone masonry face of the dam from Sta 0 + 25 to Sta 0 + 30.

2. Seepage at the downstream toe of the wall at Sta 0 + 25.

3. Growth of trees at the crest and downstream toe of the dam, and growth of brush on the upstream slope.

4. Lack of riprap protection on the upstream slope and erosion at the left abutment.

5. The working condition of the outlet works.

It could not be determined whether seepage is occurring through the downstream face of the spillway. The spillway should be inspected when the reservoir level is below the spillway crest.

SECTION 4
OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General

The dam creates an impoundment of the water which is used primarily for recreational purposes. No operational records pertinent to the structural stability of the dam were available.

b. Description of any Warning System in Effect

There are no downstream warning systems in effect at this facility.

4.2 Maintenance Procedures

a. General

We could not find any record of maintenance for this dam.

b. Operating Facilities

Maintenance of the operating facilities is done as required.

4.3 Evaluation

At present the operating procedures and maintenance procedures in effect at this dam are inadequate. An Operating and Maintenance Manual should be prepared for the dam and operating facilities, and a program of annual technical inspections by qualified registered engineers should be instituted. A formal downstream warning system should be developed and put into effect in case of an emergency at the dam.

SECTION 5
EVALUATION OF HYDROLOGIC AND HYDRAULIC FEATURES

5.1 General

Highland Pond Dam consists of a 117 foot long earthfill and dry stone masonry dam including a 21 foot long broad crested weir spillway. The maximum structural height of the dam is 14 feet. Appurtenant structures other than the spillway include the spillway channel and the outlet works. The spillway weir is located at elevation 154.0 NGVD. The outlet works consists of an inlet, a gated conduit and a stone box outlet at elevation 146.0 NGVD. The gate valve stem for the outlet is housed in an 8-inch vertical cast iron pipe located 30 feet upstream of the spillway. (See correspondence in Appendix B).

Highland Pond is classified as being small in size having a maximum storage of 69.0 acre-feet.

One small pond, Wilcox Pond, is located in the drainage area of Highland Pond and would likely have only a slight attenuating effect on storm flows.

5.2 Design Data

No hydrologic or hydraulic design data were disclosed for this dam.

5.3 Experience Data

The maximum discharge at this dam site is unknown. The only possible evidence of damage from overtopping is the bulge which appears in the downstream face of the dam at Sta 0 + 30. At that point the displacement is 6 to 8 inches in the downstream direction (Photo No. 2).

5.4 Test Flood Analysis

As no detailed design and operational information are available, hydrologic evaluation was performed using dam information gathered by field inspection, watershed size and an estimated test flood equal to 1/2 the Probable Maximum Flood (PMF) as determined by guide curves issued by the Corps of Engineers. For this size dam a range of test flood from a 100 year storm to a 1/2 PMF is recommended by the Corps guidelines.

The latter, higher figure was chosen in light of the start of construction of the Aetna office complex 1.5 miles downstream of the dam. Based on a drainage area of 1.6 square miles and using a peak inflow value of 1062 cfs/sq. mi. from the "rolling terrain" curve the test flood peak inflow is estimated to be 1730 cfs. Following the guidance for Estimating Effect of Surcharge Storage on Maximum Probable Discharges results in a test flood discharge of 1600 cfs. The maximum spillway capacity with the reservoir at the top of the dam is 175 cfs or 11% of the test flood discharge. The test flood would overtop the dam by 3.2 feet.

5.5 Dam Failure Analysis

The impact of failure of the dam at maximum pool (top of dam) was assessed using the "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers. A dam breach width of 23 feet, including the spillway, was used. The post-failure discharge was 2010 cfs compared with the pre-failure flow of 175 cfs.

A major breach of dam would result in discharge into Sawmill Brook which flows approximately three miles through a low density rural area of Middletown, Connecticut before entering Mattabessett River. Between 2400 and 4300 feet downstream of the dam are 2 residences that would have floooding of 1-2 feet of water as a result of the dam breach. The hazard potential classification is significant, since there could be loss of a few lives under breach conditions.

SECTION 6
EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation

Several conditions observed during the site visit are indicative of problems which could affect the long-term structural performance of the dam.

The visual inspection disclosed possible local instability between Sta 0+25 and Sta 0+30 on the downstream face of the dam. Movement of the downstream face of the dam may be responsible for the downstream bulge, local collapse of the top of the wall, and the settlement depression behind the wall in the earthfill crest. The downstream face of the dam left of the spillway should be monitored to determine if this movement is progressing or has ceased. Erosion of earthfill within the dam may result from seepage through the dam and further reduce the stability of the downstream face at Sta 0+25. This seepage should be monitored periodically to detect changes in rate of flow or turbidity.

6.2 Design and Construction Data

Due to the lack of design and construction data for this dam, the assessment of safety is based on the results of the visual inspection and engineering judgement.

6.3 Post-Construction Changes

There are no records of post-construction changes. However, it appears that the left training wall and right abutment of the spillway recently have been re-pointed with mortar and covered with a protective veneer of concrete.

6.4 Seismic Stability

The dam is located in Seismic Zone 1, and in accordance with Corps Guidelines, does not warrant further seismic analysis at this time.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

On the basis of the visual inspection Highland Pond Dam is judged to be in fair condition.

b. Adequacy of Information

Due to lack of in-depth design and construction data for the dam, the assessment of safety is based on the results of the visual inspection.

c. Urgency

The recommendations presented in Sections 7.2 and 7.3 should be implemented by the Owner within one year after receipt of the Phase I report.

7.2 Recommendations

The Owner should retain the services of a registered professional engineer qualified in the design and inspection of dams to accomplish the following:

1. Monitor movement of the downstream face of the dam left of the spillway and settlement of the crest behind the wall. If any movement is detected, design and oversee construction of remedial measures, as required.

2. Monitor seepage from the toe of the downstream face particularly at Sta 0 + 25 to detect significant changes in flow and turbidity with time and at high reservoir levels.

3. Inspect the downstream face of the spillway for seepage when the reservoir level is below the crest of the spillway.

4. Remove trees growing on the crest, on the downstream face and within 10 feet of the downstream toe and backfill root depressions with appropriate compacted soil.

5. Design and supervise placement of riprap protection on the upstream slope and at the eroded portion of the left abutment.

6. Conduct a detailed hydrologic and hydraulic study to assess further the potential of overtopping the dam and the means to increase project discharge capacity.

7. Inspect and analyze the capacity of the outlet works and supervise any necessary changes and modifications.

8. Make the low-level outlet accessible and operable.

9. Repair the downstream masonry wall by replacing missing stones.

10. Fill the depressions on the crest with proper compacted fill.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Maintain upstream slope and crest clear of brush.

2. Visually inspect the dam once each month.

3. Engage a professional engineer qualified in the design and construction of dams to make a comprehensive technical inspection of the dam once every year.

4. Establish a surveillance program for use during and immediately after heavy rainfall and also a downstream warning program to follow in case of emergency.

5. Remove fallen trees from downstream spillway channel.

6. Prepare an Operating and Maintenance Manual for the dam and operating facilities.

7. Establish a protective cover over all bare spots on the crest.

7.4 Alternatives

There are no practical alternatives to the recommendations of Sections 7.2 and 7.3. Since the dam has little use at present, consideration might be given to removing it.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Highland Pond Dam

DATE: November 24, 1980

TIME 8:45 A. M.

WEATHER Cloudy 40°F

W.S. ELEV. Spillway Crest U.S. ____ DN.S.

PARTY:

1. P. Patel - Genovese
2. W. Gancarz - Genovese
3. R. Murdock - GEI
4. R. Stetkar - GEI
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Geotechnical	R. Murdock / R. Stetkar	
2.	Structural	P. Patel	
3.	Hydraulics	W. Gancarz	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT Highland Pond Dam DATE November 24, 1980

PROJECT FEATURE Dam Embankment NAME

DISCIPLINE Geotechnical/Hydraulic NAME Murdock/Stetkar/Gancarz

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	154.0
Current Pool Elevation	154.1
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	4.5-foot-wide concrete surface pavement adjacent to left spillway training wall is satisfactory.
Movement or Settlement of Crest	Depression in crest 14 inches deep and 2 feet wide adjacent to downstream face, Sta 0+25. Crest surface generally irregular.
Lateral Movement	Bulge in downstream face at Sta 0+30, displacement about 6 to 8 inches.
Vertical Alignment	No misalignment observed other than bulge in downstream wall at Sta 0+30.
Horizontal Alignment	No misalignment observed other than bulge in downstream wall at Sta 0+30.
Condition at Abutment and at Concrete Structures	No riprap protection at abutments, heavy vegetation on left abutment.
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	Free access to crest and upstream slope.
Sloughing or Erosion of Slopes or Abutments	Erosion scarp extending 1 foot above water level on upstream slope. Erosion 5 feet into upstream slope at left abutment.

PERIODIC INSPECTION CHECKLIST

PROJECT Highland Pond Dam DATE November 24, 1980

PROJECT FEATURE Dam Embankment NAME

DISCIPLINE Geotechnical/Hydraulic NAME Murdock/Stetkar/Gancarz

AREA EVALUATED	CONDITION
Rock Slope Protection - Riprap Failures	No riprap protection.
Unusual Movement or Cracking at or Near Toe	None Observed.
Unusual Embankment or Downstream Seepage	Small seep flowing clear through bottom of downstream face at Sta 0+25.
Piping or Boils	None observed
Foundation Drainage Features	None observed
Toe Drains	None observed
Instrumentation System	None observed
Vegetation	Upstream slope, crest and downstream toe forested with trees up to 12 inches in diameter. Rotten stumps on crest up to 12 inches in diameter.

PERIODIC INSPECTION CHECK LIST

PROJECT Highland Pond Dam — DATE November 24, 1980

PROJECT FEATURE Dike Embankment — NAME

DISCIPLINE Geotechnical — NAME Murdock/Stetkar

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	
Crest Elevation	No dike embankment
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PERIODIC INSPECTION CHECK LIST

PROJECT Highland Pond Dam — DATE November 24, 1980

PROJECT FEATURE Intake Channel/Structure — NAME

DISCIPLINE Geotechnical — NAME Murdock/Stetkar

Civil/Hydraulic — Patel/Gancarz

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Approach channel under water and not observable.
a. Approach Chan[illegible]	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECK LIST

PROJECT Highland Pond Dam — DATE November 24, 1980

PROJECT FEATURE Control Tower — NAME

DISCIPLINE Hydraulic/Civil — NAME Gancarz/Patel

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	Control Tower consists of an 8 inch vertical cast iron pipe which is locked and reportedly contains the gate valve which controls the outlet works. The pipe is set out in the pond and thus the control works were inaccessible during the inspection.
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	N/A
Float Wells	N/A
Crane Hoist	N/A
Elevator	N/A
Hydraulic System	N/A
Service Gates	Not observable
Emergency Gates	N/A
Lightning Protection System	N/A
Emergency Power System	N/A
Wiring and Lighting System	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT Highland Pond Dam

DATE November 24, 1980

PROJECT FEATURE Conduit

NAME

DISCIPLINE Hydraulic/Structural

NAME Gancarz/Patel

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	Conduit was not visible
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT Highland Pond Dam — DATE November 24, 1980

PROJECT FEATURE Outlet Channel — NAME

DISCIPLINE Structural/Hydraulics — NAME Patel/Gancarz

Geotechnical — Murdock/Stetkar

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	A 2.5 foot by 2 foot outlet emerges at the bottom of the downstream face at Sta 0+45.
General Condition of Concrete	N/A
Rust or Staining	N/A
Spalling	N/A
Erosion or Cavitation	N/A
Visible Reinforcing	N/A
Any Seepage or Efflorescence	N/A
Condition at Joints	Some misalignment
Drain holes	N/A
Channel	Natural stream bed.
Loose Rock or Trees Overhanging Channel	Channel is forested with many overhanging trees.
Condition of Discharge Channel	Satisfactory.

PERIODIC INSPECTION CHECK LIST

PROJECT Highland Pond Dam — DATE November 24, 1980

PROJECT FEATURE Spillway Weir — NAME

DISCIPLINE Geotechnical — NAME Murdock/Stetkar

Structural/Hydraulics — Patel/Gancarz

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Satisfactory
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Some trees overhang right side
Floor of Approach Channel	Concrete - Good condition
b. Weir and Training Walls	
General Condition of Concrete	Good
Rust or Staining	None
Spalling	None
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None
Drain Holes	N/A
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Many trees overhanging channel
Floor of Channel	Energy dissipating plunge pool downstream from weir has some observable riprap protection. Natural stream channel downstream from plunge pool covered with loose stones.
Other Obstructions	Some fallen trees in channel.

PERIODIC INSPECTION CHECK LIST

PROJECT Highland Pond Dam — DATE November 24, 1980

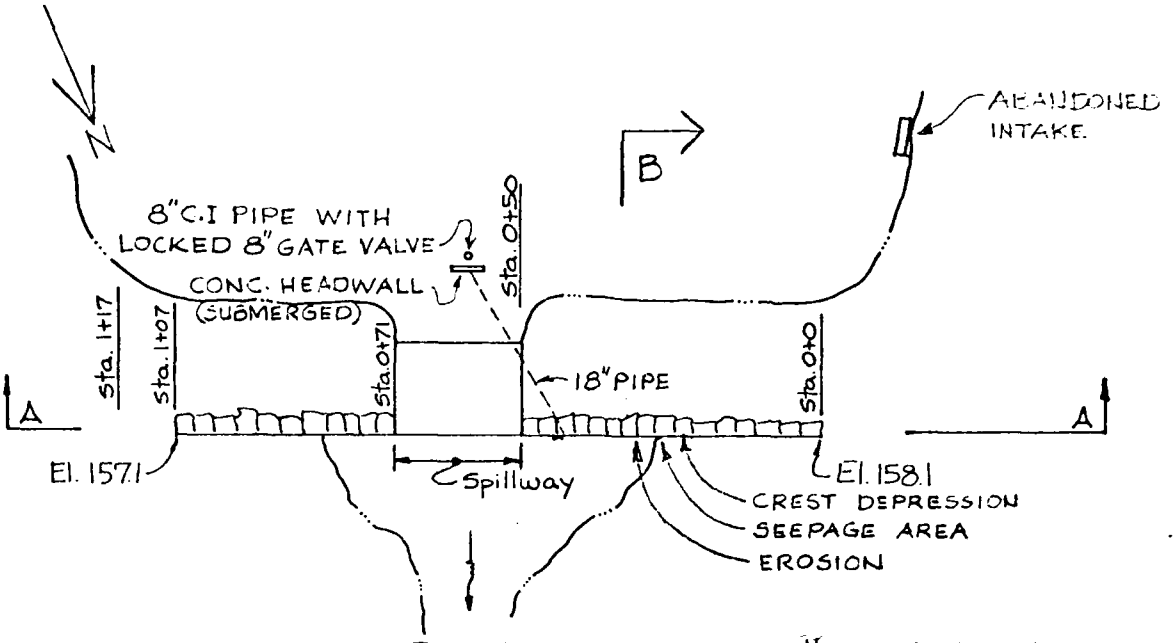
PROJECT FEATURE Service Bridge — NAME

DISCIPLINE Structural — NAME Patel

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	None exists
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

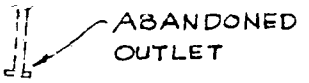
APPENDIX B

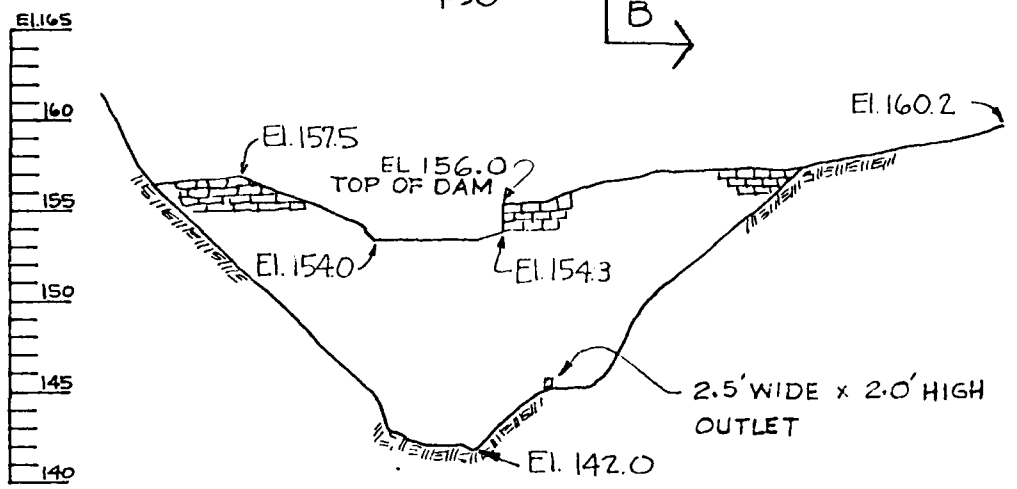
ENGINEERING DATA



PLAN

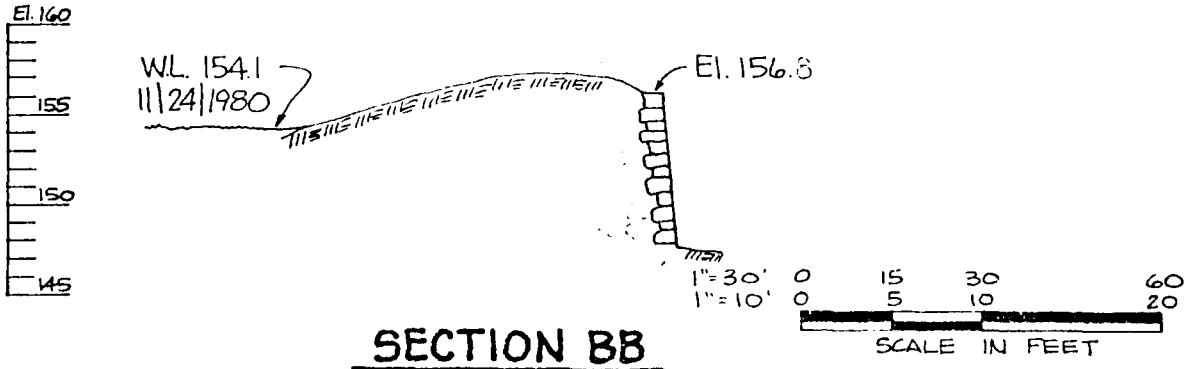
1"=30'





SECTION AA

SCALE: HOR. 1"=30' VERT. 1"=10'



SECTION BB

SCALE: HOR. 1"=10' VERT. 1"=10'

PHILIP W. GENOVESE & ASSOCIATES, INC. ENGINEERS HAMDEN, CONNECTICUT	HIGHLAND POND DAM (CT00147)

Stephen C. Thomson — Water and Related Resources — September 5, 1972

Director

Victor F. Galgowski — Water and Related Resources

Supt. of Dam Maintenance

Highland Pond, Middletown

On Monday evening, August 28, 1972 I received a phone call from a Mr. Ray Everett stating that the portion of Saw Mill Brook that flowed by his property in Middletown was dry. He further stated Highland Pond, located upstream, had recently been drained to facilitate repairs to the dam and now the gate had been closed to fill the pond. He requested our assistance in forcing the owner of the pond to release water. He thought the dam belonged to Dr. Eric Gordon, City Health Officer in Middletown.

A phone call to Dr. Gordon the following morning established he was the owner of the pond and had recently installed a new slide gate at considerable expense ($1,000.00). When told that State Statute required a Construction Permit from our unit for repairs to a dam, he stated it was not necessary in his case since he had the city engineer plan the work done. Finally convinced him we had jurisdiction over such repairs and he agreed to send us plans of the work performed.

When I told him that from an environmental viewpoint we would stress that water be released into the brook, his comment was he had to fill his pond first. I informed him that we had no authority to force him to open the gate, but people downstream having "riparian rights" could legally bring suit against him. He replied they could take him to the Supreme Court as far as he was concerned.

A field trip to the area on Tuesday afternoon confirmed the stream was dry with the exception of scattered small pools. Numerous dead fish were observed and one small pool entrapped approximately 100 blue gills that appeared to be dying. A very disagreeable odor of decaying plants and animals was evident.

Wednesday morning I stopped to take a few pictures of the area. A surveyor working in the area stated that in May he had observed the brook running full. While I was there a few cars stopped to view the condition of the stream.

After a Wednesday evening meeting held by the Regional Planning Group to explain Public Act 155 to a group of town officials, I again talked to Dr. Gordon. In reply to my plea he released some water through the gate and he said people would have to wait until water flowed over the spillway. When I told him this might take a few weeks in the absence of heavy rains, he quickly stated I should pray for rain. To my inquiry how he, as a health officer, could condone conditions created downstream, he said that it was no concern of his.

In talking to people who live along the stream; namely Everett, Kramer, and Giannetti, I have advised them to secure legal counsel as to what procedure they should take to restore water flow in the brook.

On Thursday morning Mayor Sobona called to enlist our aid in solving the problem. I reviewed my conversation with Dr. Gordon and also informed him that we could not force him to open the gate. I suggested that Statute 7-146 pertaining to clearing of waterways might empower him to order the flow of water restored.

Supt. of Dam Maintenance

VFG:ljg

September 11, 1972

Eric Gordon, M.D.
Sulton Towers
Washington Street
Middletown, CT

Re: Highland Pond, Middletown

Dear Dr. Gordon:

To date we have not received a copy of the engineering plans you agreed to mail this office.

As you were informed over the telephone on August 29, 1972, we are concerned with safety of dams. Section 130 of Public Act No. 872, a copy of which is enclosed, places your dam under the jurisdiction of this department.

The plans should be prepared by a engineer registered in the State of Connecticut. They should present, in detail, repairs made to the drawdown gate at Highland Pond.

Since the repairs have been completed, it is most important that we review these plans to ascertain if the structure is safe.

May we be notified within two weeks your intentions in regard to submitting the required plans.

Very truly yours,

Stephen C. Thomson, Director
Water and Related Resources

SCT:VFG:ljg

Enclosure

ERIC GORDON,M.D.,FACPM.
P.O.Box 467
MIDDLETOWN,Conn.06457

September 13,1972

Mr.Stephen C. Thomson,Director
Water and Related Resources
Dept. of Environmwntal Protection
State Office Building
Hartford,Conn. 06115

Dear Mr.Thomson:

I am in receipt of your letter dated September 11,1972.This is to inform you that immediately upon notification by telephone of the requirement for filing plans for repairs to the draw-down gate of our dam I so contacted Mr.Chaffee of the Water and Sewer Department of the City of Middletown.Mr.Chaffee a most competent engineer in charge of all similar installations owned by the City of Middletown was kind enough to inspect our property on Bell Street,jointly owned by Mrs.Gordon and myself,and suggested the type of repair work eventually executed by Hubert E. Butler Construction Co. of Middletown, a most reliable and competent firm doing similar work for the City of Middletown.The new Valve and all cast iron piping was supplied by the Middletown Water and Sewer Department which was fully compensated for all material.Todate Mr.Chaffee who is a very busy gentleman has not submitted to us the promised plans.This is the one and only reason I have been unable to forward them to you sofar.However,in the following I shall attempt to give you a detailed description of the repair work and hope this will satisfy your department until such time as we are able to carry out to the letter your most urgent request. As you know Highland Pond has been in existence for many a decade and the drain at the bottom of the dam was plugged on the upstream side by a most primitive woodden drawdown gate which primarily was held in place by sheer water pressure.Early summer an unautho-rized person or persons whose identity unfortunately is unkown to us drew our gate and released all the water in Highland Pond with all its contents.We made every conceivable effort to halt the flow of the onrushing water by placing additional boards at the bottom of the pulled gate.I personally dove to the bottom of the dam to investigate and was almost sucked in by the strong undertow which of course would have solved the problem at least temporarily.However, I was able to extricate myself

and after all the water had rained off and literally millions of fish,eels etc. were lost to us forever by being swept down stream to die we had H.E.Butler install a new 8" valve to front which and rear a 6' length of 8" cast iron pipe had been attached. The rear end of this system was inserted into the pre-existing drain pipe and made tight with water proof concrete.The front end at a distance of approximately 5' was surrounded by boulders so as the prevent fouling of the valve.An 8' length of cast iron pipe was attached to the valve assembly vertically. When the pond will have reached its maximum level of overflow this vertical pipe will protrude about one foot above water level.A lide with a weatherproof lock controls access to the valve 8' below operated by a key.I have personally opened and closed this system and can attest that it works very satisfactorilly.If your department so wishes I will supply you with your own key so you or any official so designated by you may have access to this installation any time.We naturally expect the courtesy to be notified in advance whenever such on site inspection of our homestead by your depaertment is contemplated. The installation of the valve assembly not to speak of the irreperable loss of wild life incurred by us was connected with great expense which we were willing to bear because we believe the valve constitutes a signal improvement over the previous arrangement and above all because we both are ecologists by profession and avocation.Moreover,we are presently building our permanent homestead on our land which we intend to preserve in its natural state.It will afford a protected sanctuary for all wildlife in 9 acres of pond,11 acres of swampy wetland owned by us and 9 acres of swampy wetland owned by our good neighbors the Andersons.We allow absolutely no fishing,hunting or trap setting by outsiders or ourselves which is in sharp contrast to the conditions encountered by us on June 9,1971 when we became owners of this land.

I hope this lengthy and detailed expose will satisfy you at least temporarily until such time when we will be able to prevail on Mr.Chaffee to submit the requested drawings so we may comply to the letter with every and all rules and regualtions as Mrs.Gordon and I have done all our life and which enviable record we intend to maintain.Should any additional information be desired or if you or any of your staff members wish to inspect or visit our homestead,please,be kind enough to give us enough advance notice.I assure you we shall cooperate in every possible manner to make our homestead property safe and a shining example of sound ecological management.Parenthetically I wish to mention that during the first Spring of our ownership we have planted approximately 600 trees and shrubs supplied by the State Nurseries in Voluntown.

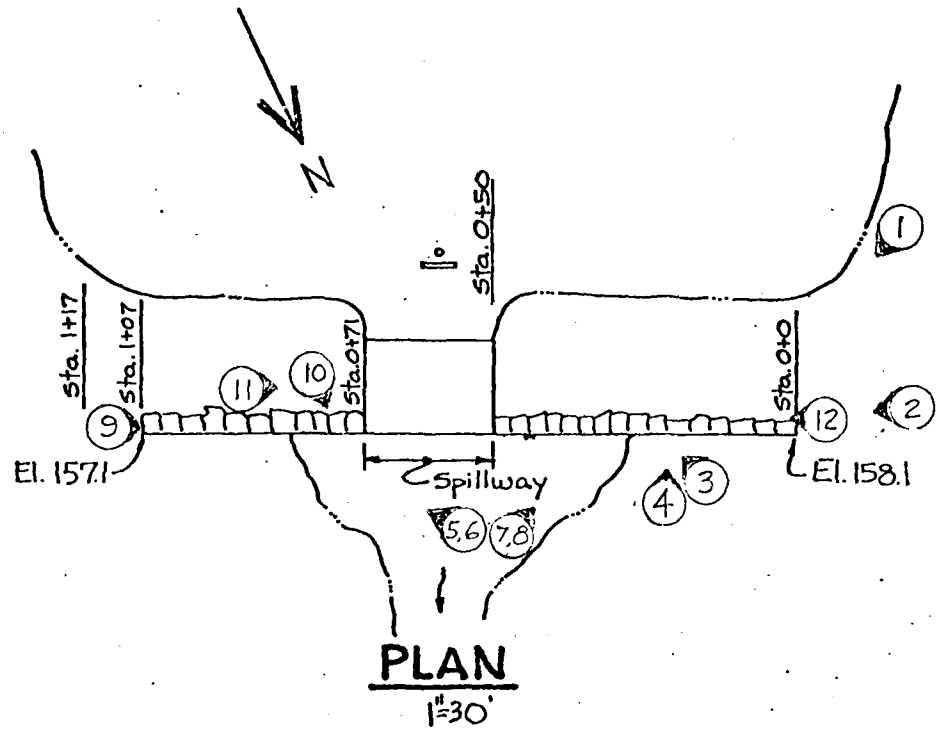
Sincerely yours

Eric Gordon,M.D.,FACPM.

EG:eeg
cc:Hon.Dan Lufkin

APPENDIX C

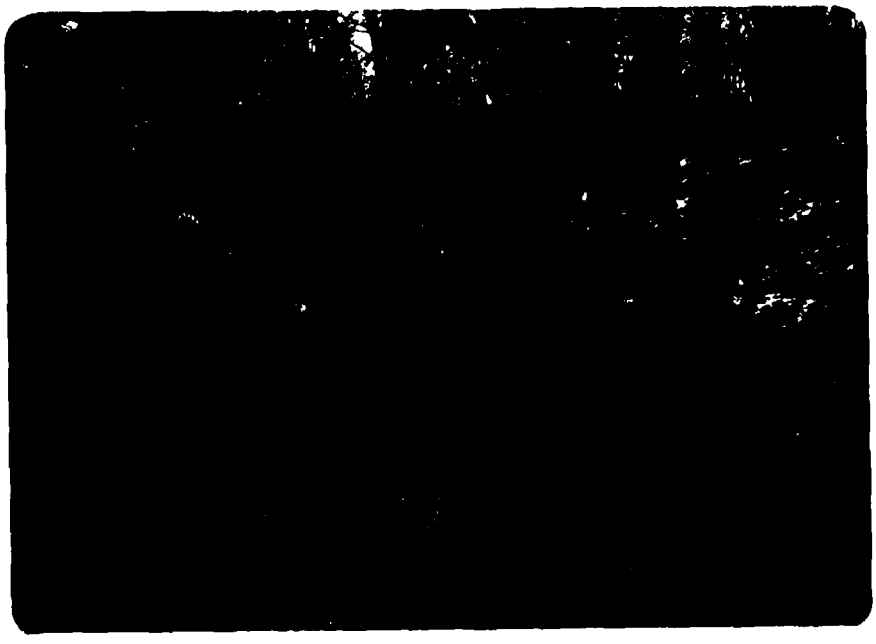
PHOTOGRAPHS



PLAN
1"=30'

3 REFERS TO PHOTO NUMBER, LOCATION AND DIRECTION

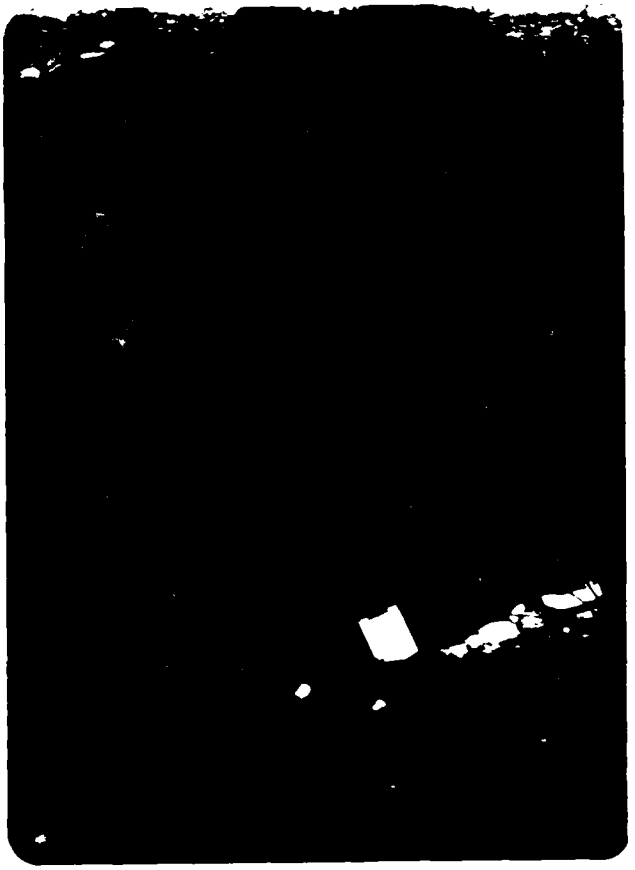
U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	PHOTO LOCATION PLAN
PHILIP W. GENOVESE AND ASSOCIATES, INC. ENGINEERS - HAMDEN, CT.		HIGHLAND POND DAM SAW MILL BROOK MIDDLETOWN, CONNECTICUT



1. Upstream slope of dam from left abutment across from Station 0+00. Note lack of riprap slope protection.

2. Downstream face of dam viewed from left abutment across from Station 0+00. Note bulge in downstream face above head of person standing in photo at Station 0+30. Displacement is 6 to 8 inches in the downstream direction.

3. Close-up view of small seep through 6 inch wide void between stones at the toe of the downstream face at Station 0+25. Seep flows clear at about 1 gpm. Note rust-colored stain at outlet of seep.



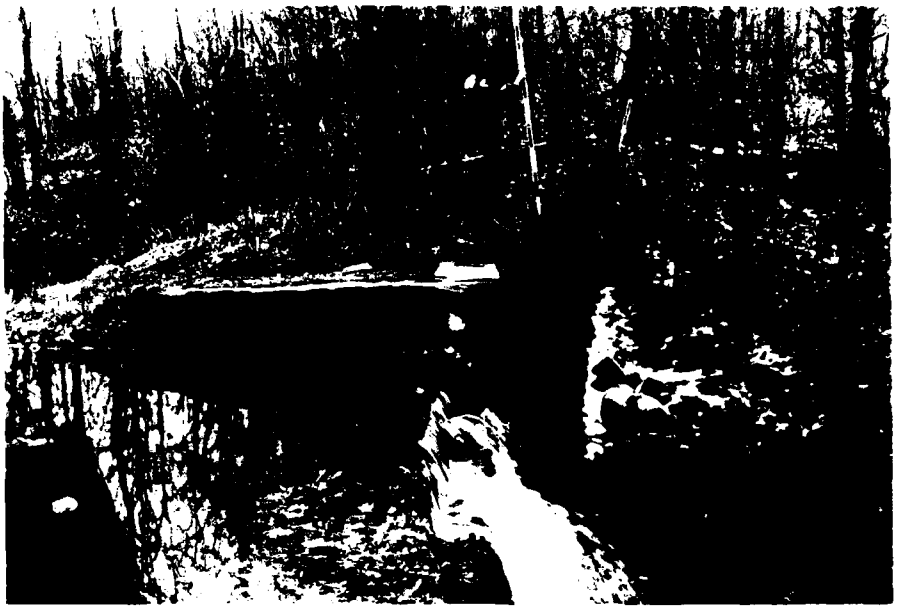
4. Downstream face of dam. Seep in Photo No. 4 is 1 foot left of clipboard in photo; bulge in wall is in upper left of photo.

Photo 5, 6. Panoramic view of downstream face of dam from left to right viewed from about 20 feet downstream from dam. (Continued on Photo 8 and 7).

Photo 7,8. Panoramic view continued from Photo 6 and 7. Note low-level outlet bottom left of Photo 8, and stones missing from top of face at Station 0+30 in center of Photo 8.

4. Crest and downstream face of dam from right abutment. Note trees on crest and at downstream toe up to 10 inches diameter in foreground.

5. Upstream channel of spillway viewed from crest of dam at right side of spillway.

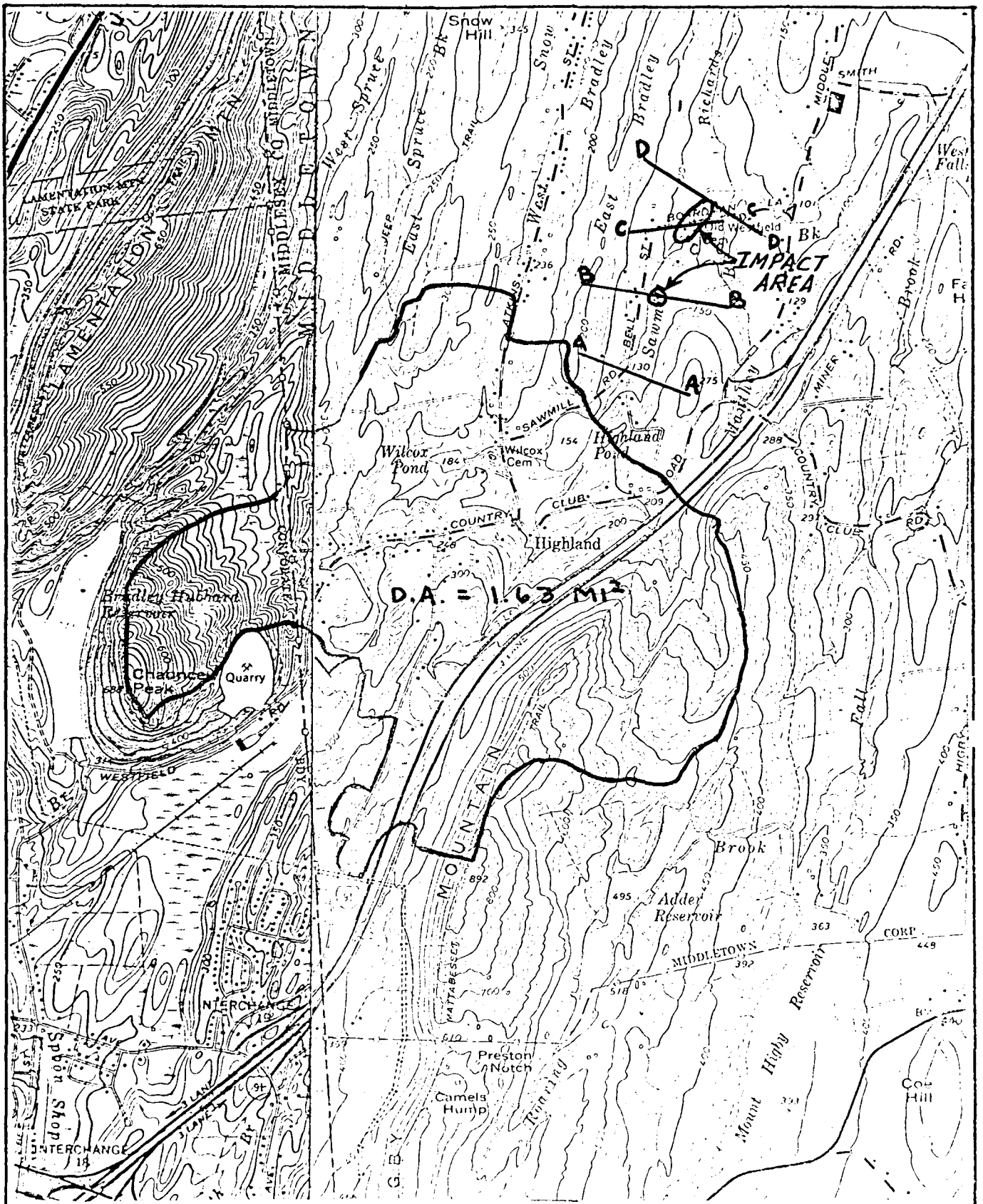


11. Crest of dam and spillway from Station 0+88 looking toward left abutment.

12. Top of downstream wall of dam viewed from crest at Station 0+00. Note growth of trees at top of wall left of people in photo.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



DRAINAGE & IMPACT AREA

MIDDLETOWN QUAD

DRAINAGE AREA 1.63 SQ.M

PHILIP W. GENOVESE & ASSOCIATES, INC. ENGINEERS HAMDEN, CONNECTICUT	HIGHLAND POND DAM (CT00147)

PROJ. NO. 904105
DESCRIPTION Hi[illegible] Pond Dam
[illegible]town, Conn.

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D1 OF 16
BY [illegible] DATE 12/11/[illegible]
CHKD. BY ______ DATE ______

Hydrologic/Hydraulic Computations
[illegible] [illegible] DAM

Size Classification –

Storage = 11.8 AC OF SURFACE AREA
= 12.0 FT OF HEIGHT

$$S = \frac{1}{3} \times b \times h_1 + b \times h_2$$

$$= \frac{1}{3}(11.8)\cdot(12.0) + 11.8 \times 1.85$$

$$S = 69.0 \text{ AC-FT}$$

Height = 14.0 FT

∴ Size of dam is [illegible] and Spillway Design Flood is 100 yr to ½ PMF, based upon a significant hazard [illegible]. This is [illegible] [illegible] approximately 3 [illegible] [illegible] [illegible] in the [illegible] 3900' d/s of the dam including 1 [illegible] at [illegible]. In [illegible], it is reported that [illegible] Insurance Co. has plans to construct a large complex involving 300 employees downstream of the dam. Because of this latter [illegible] [illegible] flood of ½ PMF.

In [illegible] the PMF in cfs/mi² for a drainage area of 1.63 mi² is 2125 (the chart has a min. drainage area of 2 mi²). Therefore the test flood will be:

SDF = ½ PMF = ½ (2125)(1.63)

SDF = 1732 CFS

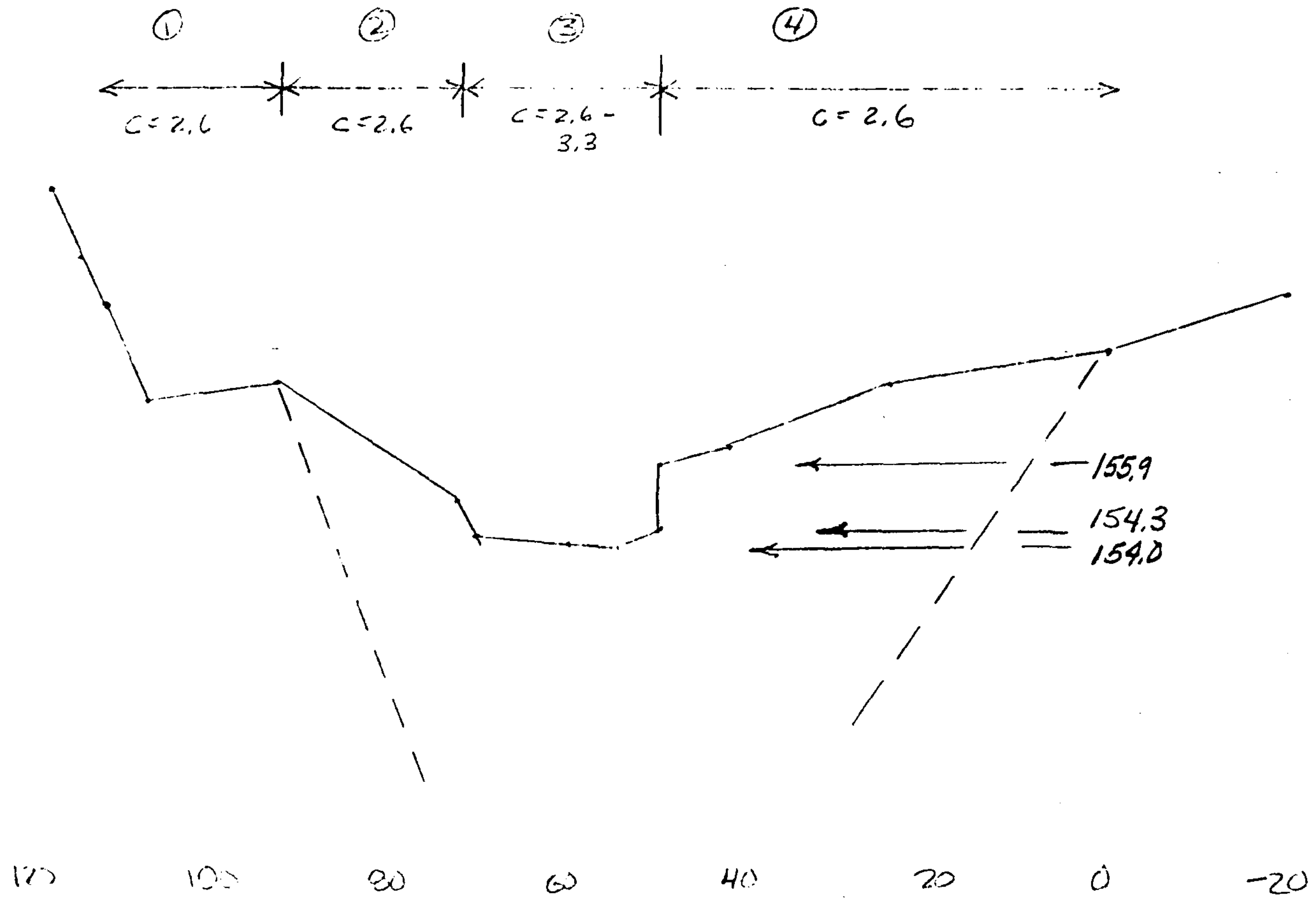
Volume of test flood = 53.3 $\frac{\text{AC-FT}}{\text{in}}$ / mi² × 1.63 mi² $\left(\frac{19}{2}\right)$"

V.T = 825 AC-FT

PROJ. NO. 804105
DESCRIPTION Haveland Pond Dam
Middletown, Conn.

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D2 OF 16
BY WJG DATE 12-11-80
CHKD. BY ______ DATE ______



SPILLWAY RATING CURVE COMPUTATION

ELEV	H_1	H_2	H_3	H_4	Q_1	Q_2	Q_3	Q_4	Q_{TOT}
154.0	—	—	—	—	—	—	—	—	0
154.25	—	—	0.25	—	—	—	12.4	—	12.4
[illegible]	—	0.2	1.35	—	—	0.7	99.2	—	99.9
[illegible]	—	0.7	2.35	0.65	—	15.2	[illegible]	2.9	266.7
[illegible]	—	1.2	[illegible]	[illegible]	—	61.5	[illegible]	37.2	564.1
[illegible]	1	2.2	[illegible]	[illegible]	36.4	169.7	642.8	[illegible]	[illegible]
[illegible]	1.75	3.2	[illegible]	2.25	114.4	[illegible]	[illegible]	[illegible]	1795.7
[illegible]	[illegible]	4.2	[illegible]	[illegible]	219.4	[illegible]	[illegible]	[illegible]	[illegible]

PROJ. NO. 80410T
DESCRIPTION Hubbard Park Dam
Middletown, Conn

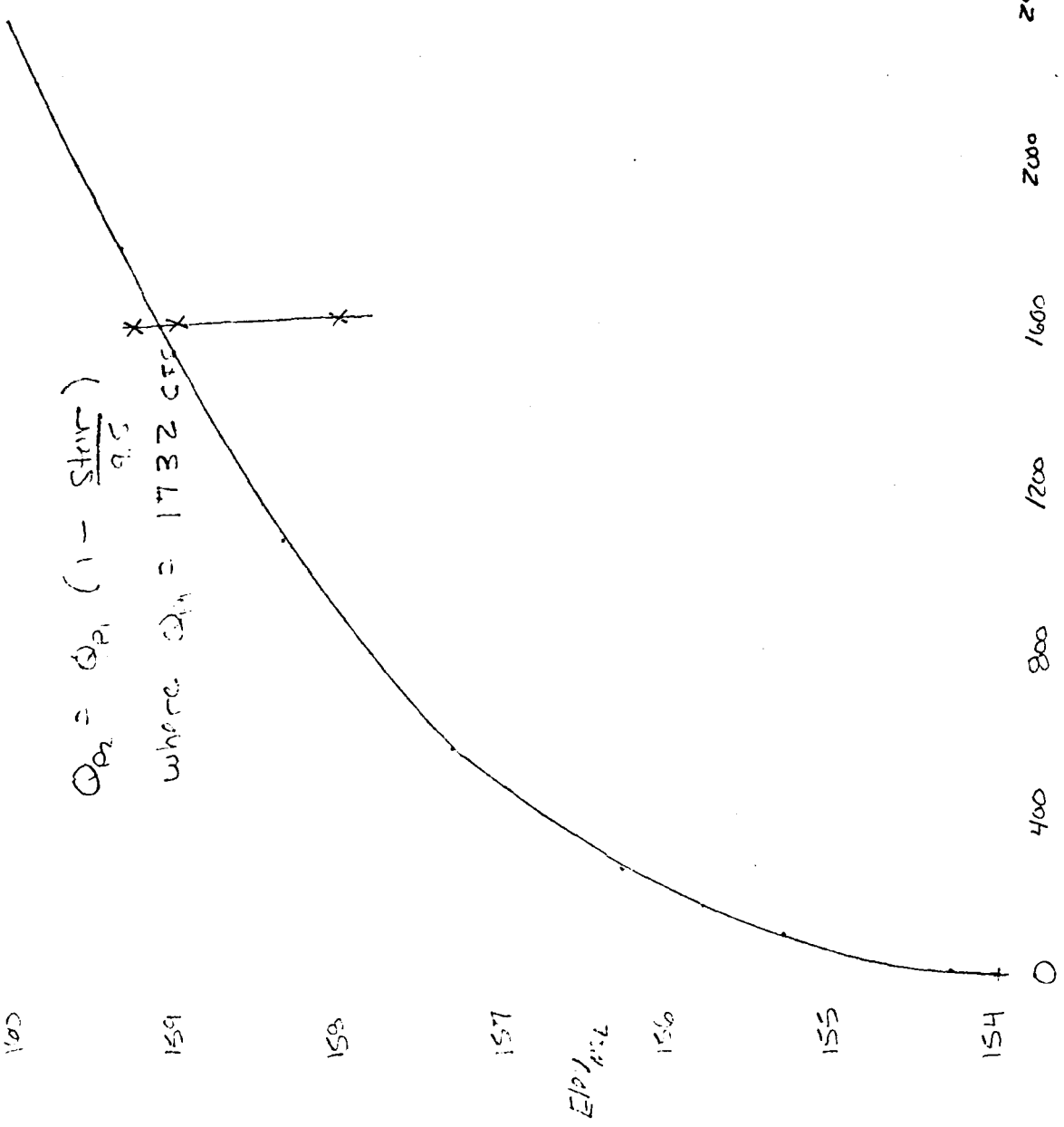
GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D3 OF 16
BY WJG DATE 12-11-92
CHKD. BY _____ DATE _____

$Q_p = 1605$ cfs
$El_{WS_p} = 159.1$

$Q_{02} = Q_{p1}\left(1 - \frac{Storage}{Q_{p1}}\right)$

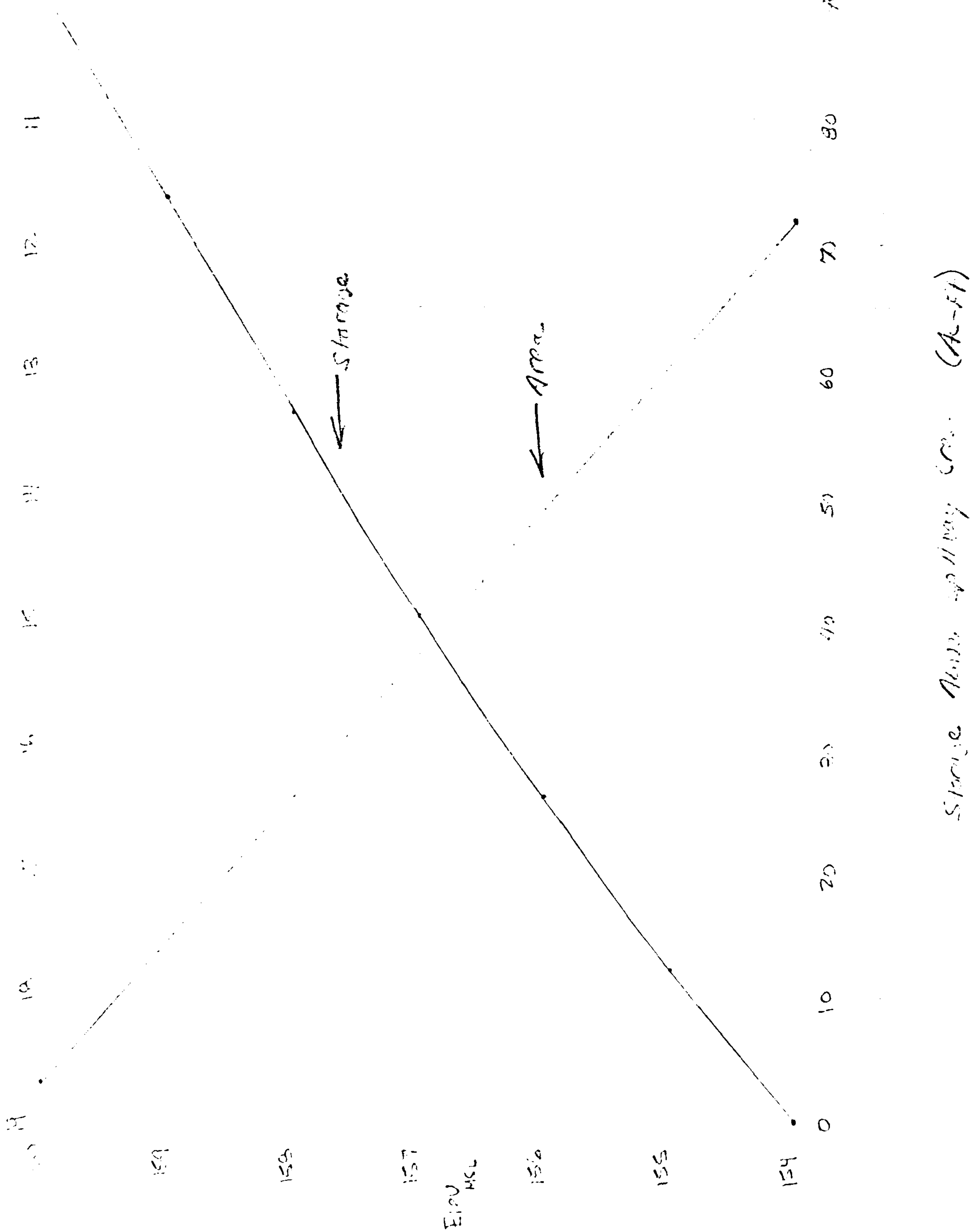
where $Q_{p1} = 1732$ cfs



PROJ. NO. 804105
DESCRIPTION Highland Pond Dam, Middletown, Conn.

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D4 OF 16
BY WJS DATE
CHKD. BY DATE



Perform dam breaching analysis -

$$Q_{P_1} = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$$

$$= \frac{8}{27} (0.4)(58)(\sqrt{32.2})(13.85)^{3/2}$$

Q_{P_1} = 2010 CFS Stor = 69.0 AC-FT

$d \approx 9.23'$

$Q_o = 175$ cfs

A-A (640' d/s of dam)

Q_{P_1} = 2010 cfs which is within A-A results in elevation 139.1, and a cross sectional area of 425.0 FT². The volume of water stored in this reach is $Q_o = 175$ cfs, $El_{V_o} = 137.1$, Area = 120

$$V = \frac{640' (425 - 120)}{43{,}560 \text{ FT}^2/\text{AC}} = 4.5 \text{ AC-FT}$$

$$Q_{P_2} = Q_{P_1}\left(1 - \frac{V}{S}\right)$$

$$= 2010\left(1 - \frac{4.5}{69.0}\right)$$

Q_{P_2} = 1879 CFS

Using this figure we recompute Q_{P_2}

El/V = 138.9, area = 405, Vol = 4.2 AC-FT

$$Q_{P_2} = Q_{P_2}\left(1 - \frac{(4.5 + 4.2)/2}{69.0}\right)$$

Q_{P_2} = 1883 CFS

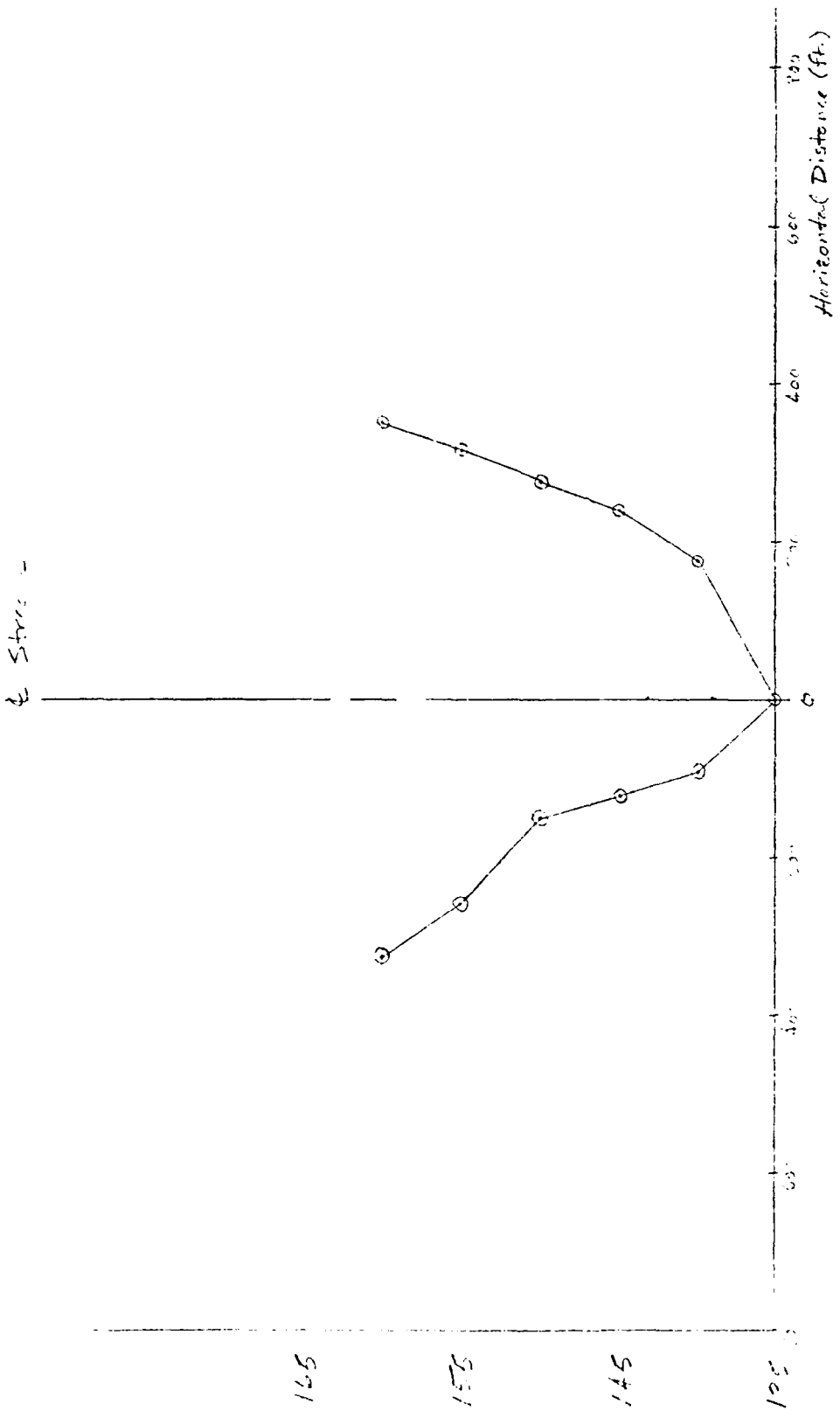
El/V. = 138.9

Move d/s to next section and repeat this process using Q_{P_2} = 1883 CFS and S = 69.0 - 4.35 = 64.65 AC-FT

PROJ. NO. [illegible]
DESCRIPTION [illegible]

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D6 OF 16
BY TEG DATE [illegible]
CHKD. BY WJS DATE 2/11/82



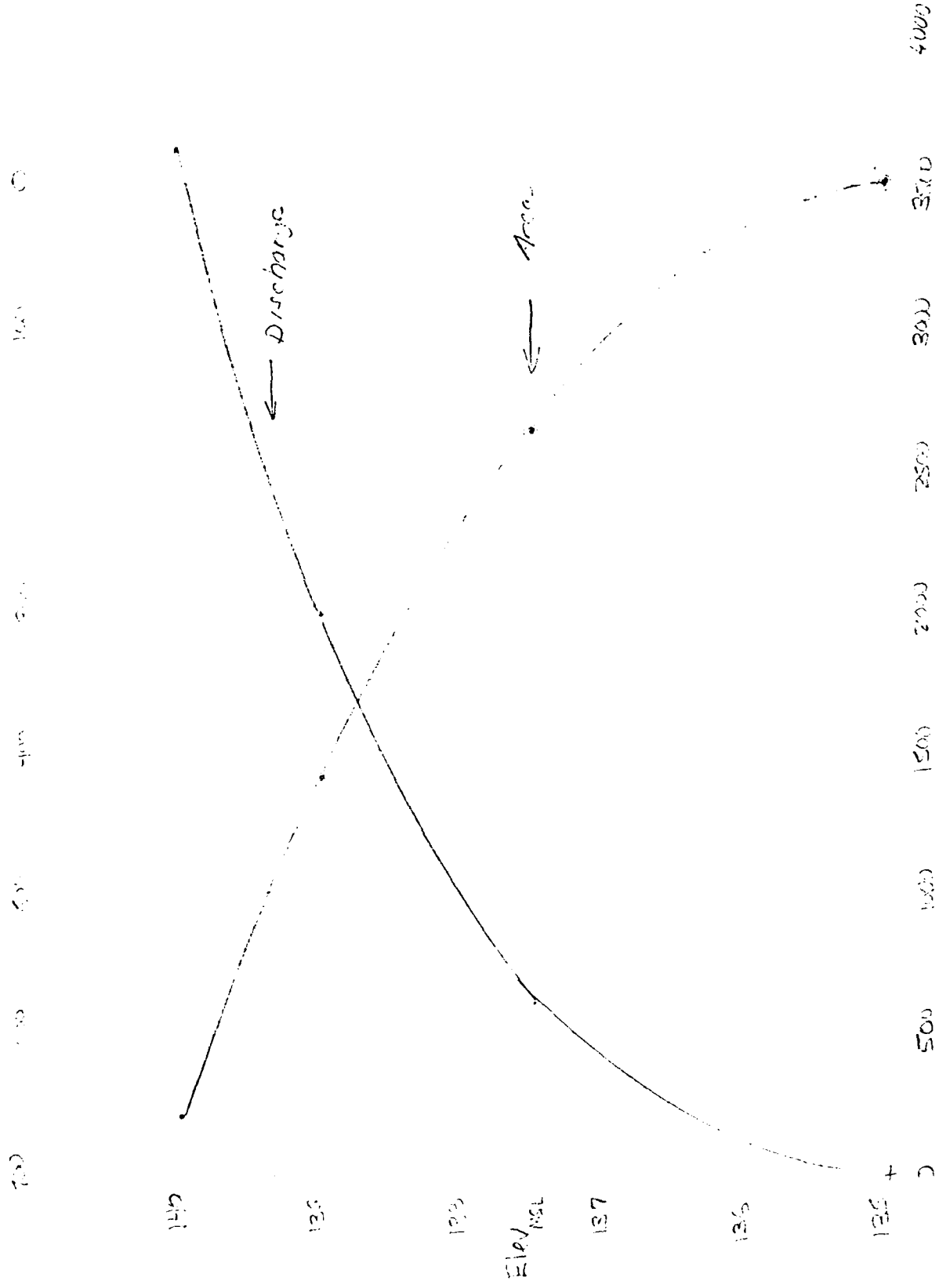
LOCKING - DOWNSTREAM
SECTION A-A

60± feet downstream of Highland Pond Dam

PROJ. NO. 8041105
DESCRIPTION Highland Park Dam
Middletown Conn

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D7 OF 16
BY VCS DATE 2/11/80
CHKD. BY ____ DATE ____



B-B

$Q_0 = 175$ cfs
Elev = 111.3
Area = 65 FT²

$Q = 1883$ CFS $\longrightarrow$ elev = 114.15
area 480 FT²

$$Q_{P_3} = 1883 \left(1 - \frac{(480-65)(1775)}{\frac{43,560}{64.65}} \right) \qquad Vol_1 = 16.9 \text{ AC-FT}$$

$Q_{P3} = 1390$ CFS
elev = 113.6, area = 385 FT², $Vol_2 = 13.0$ AC-FT

$$Q_{P3} = Q_{P_1} \left(1 - \frac{V_1 + V_2}{2} / S \right)$$

$$Q_{P_3} = 1883 \left(1 - \frac{(16.9+13.0)}{(2)64.65} \right) = 1447 \text{ CFS}$$

elev = 113.65, area = 395 FT², Vol = 14.95

Move on to section C-C with a new
$Q = \underline{1447}$ CFS, $S = 64.65 - 14.95 = \underline{49.7}$ Ac-Ft

C-C

$Q_0 = 175$ CFS
Elev = 98.75 Area = 80 FT²

$Q = 1447$ CFS
$S = 49.7$ AC-FT
$\Longrightarrow$ elev = 100.6, area = 520

$$V = \frac{1490 \times (520-80)}{43,560} = 15.0 \text{ AC-FT}$$

$$Q_{P_4} = 1447 \left(1 - \frac{15.0}{49.7} \right) = 1010 \text{ CFS}$$

elev = 100.2, area = 400 FT², V = 10.9 AC-FT

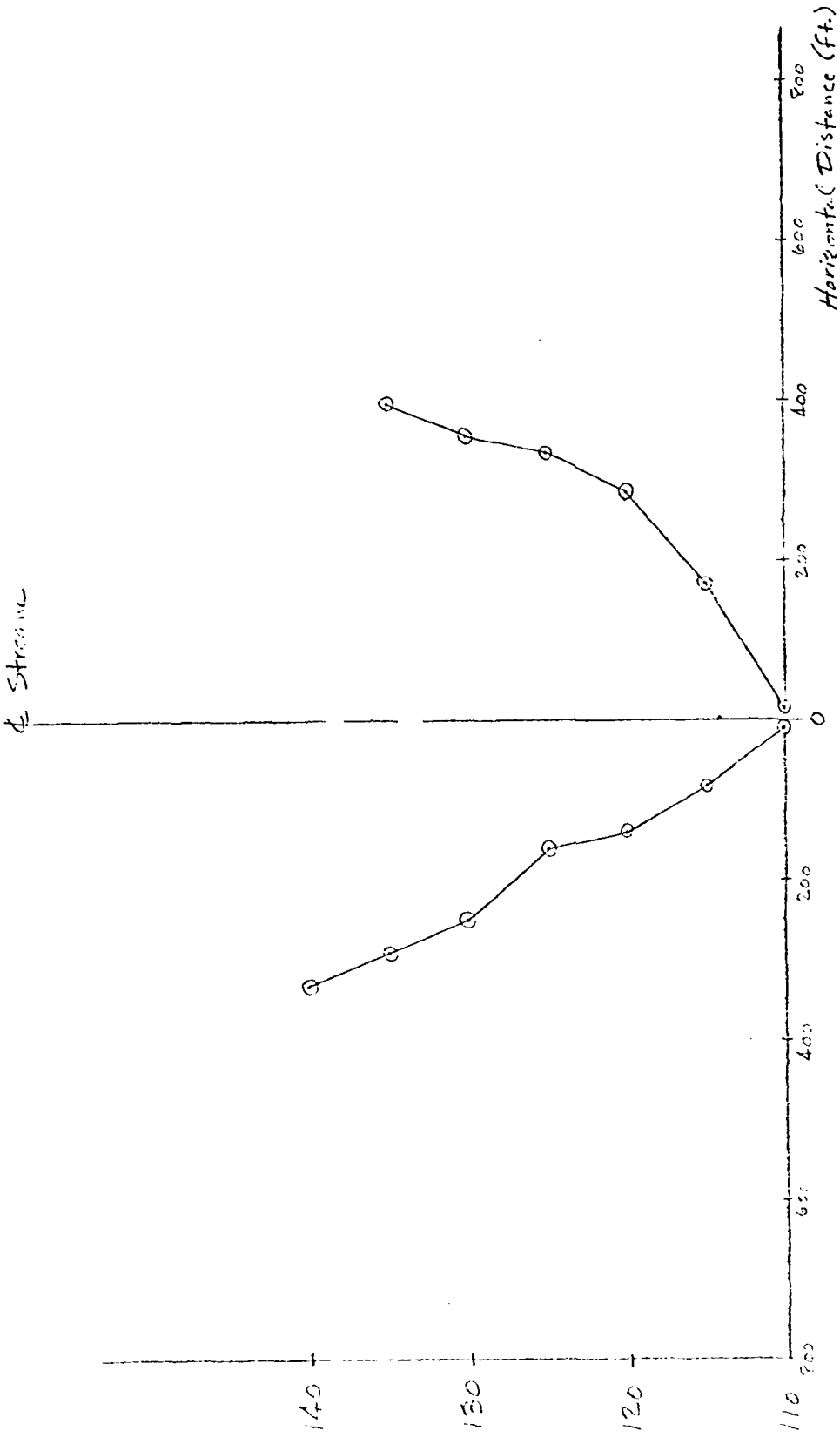
$$Q_{P_4} = 1447 \left(1 - \frac{\frac{15.0 + 10.9}{2}}{49.7} \right)$$

elev = 100.25
$Q_{P4} = 1070$ CFS $\Longrightarrow$ area = 420 FT²
S = 49.7 - 14.4 = 35.3

PROJ. NO. 804105
DESCRIPTION HIGHLAND POND DAM
MIDDLETOWN, CT.

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. 29 OF 16
BY TKC DATE 12/13/82
CHKD. BY _____ DATE _____



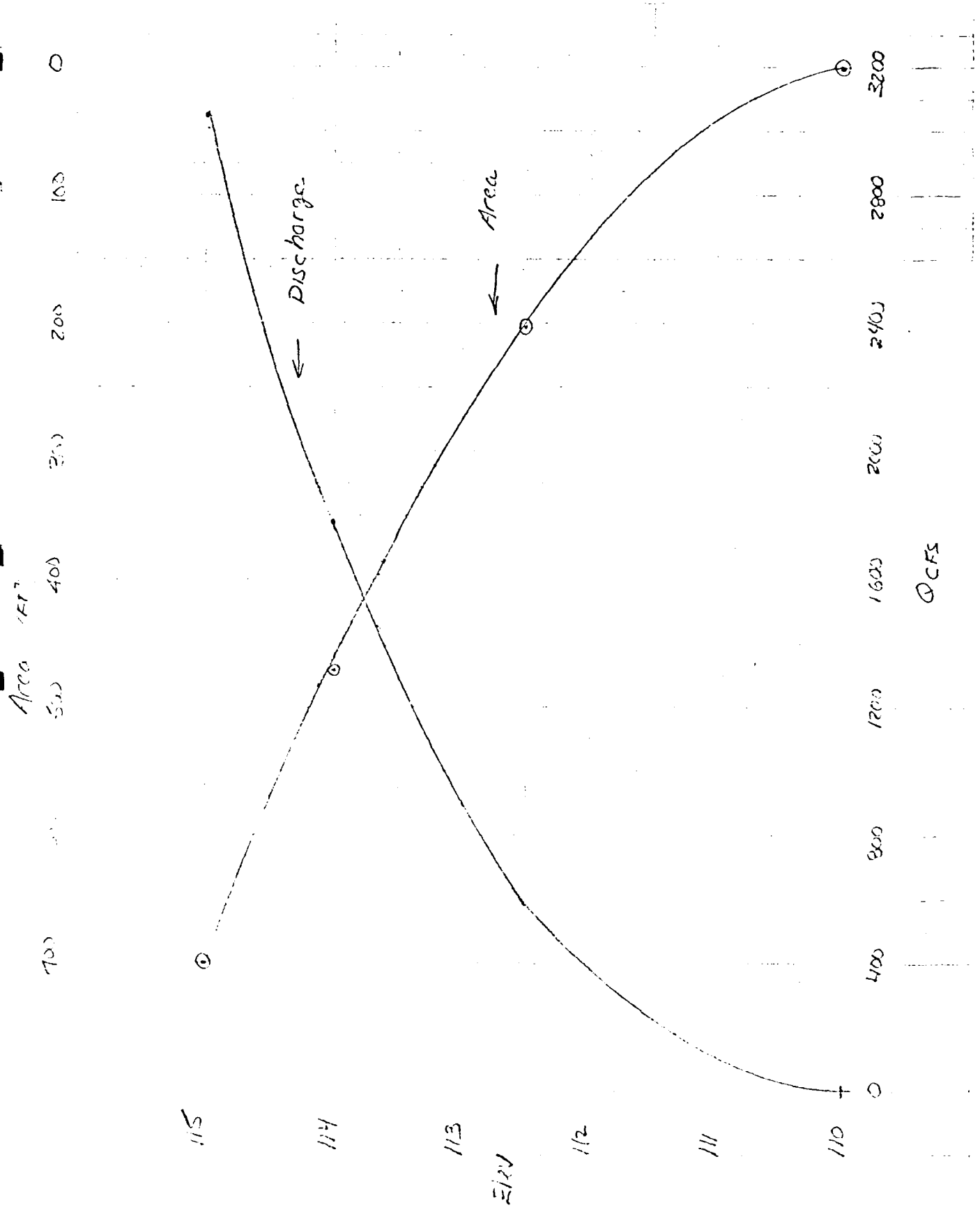
LOOKING DOWNSTREAM
SECTION E-E

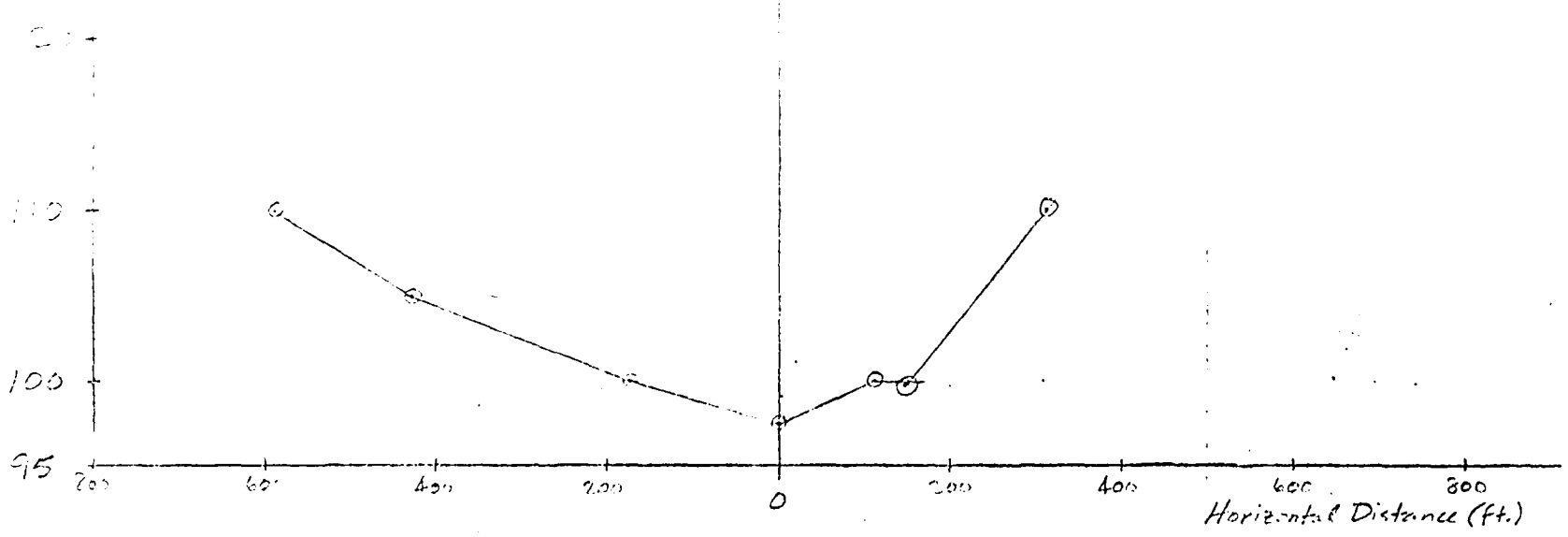
1775 feet downstream of section A-A
2415 feet downstream of Highland Pond Dam

PROJ. NO. 804105
DESCRIPTION Hickory Pond Dam
Middletown, Conn.

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D10 OF 16
BY NJG DATE 12-11-95
CHKD. BY _____ DATE _____





LOCKING DOWNSTREAM
SECTION C-C

1490 feet downstream of section B-B
3905 feet downstream of Highland Pond Dam

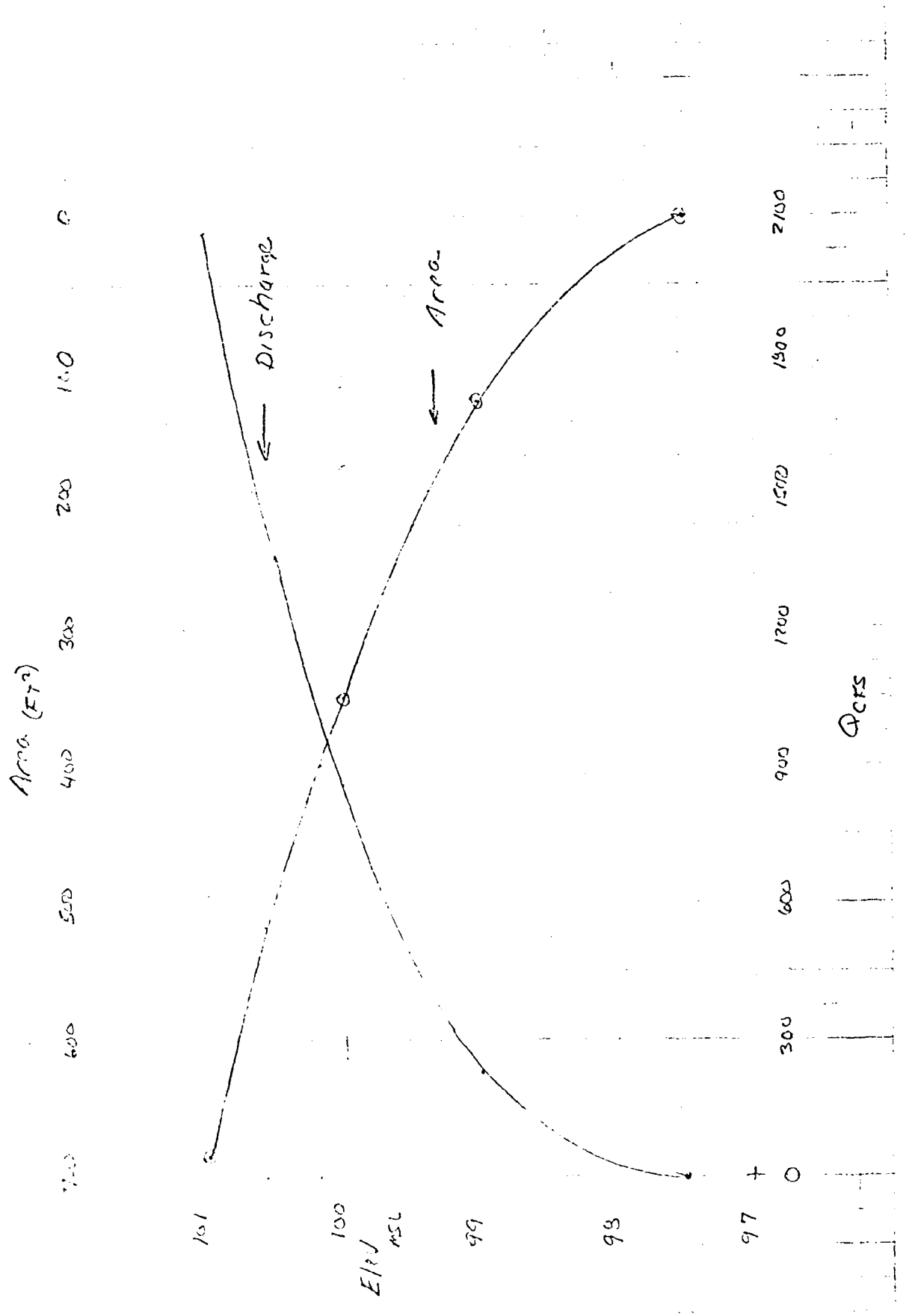
GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. 11 OF 12
BY TJC DATE 12/[illegible]
CHKD. BY _____ DATE _____

PROJ. NO. 6711.05
DESCRIPTION High St. Bridge
Middletown, Conn.

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

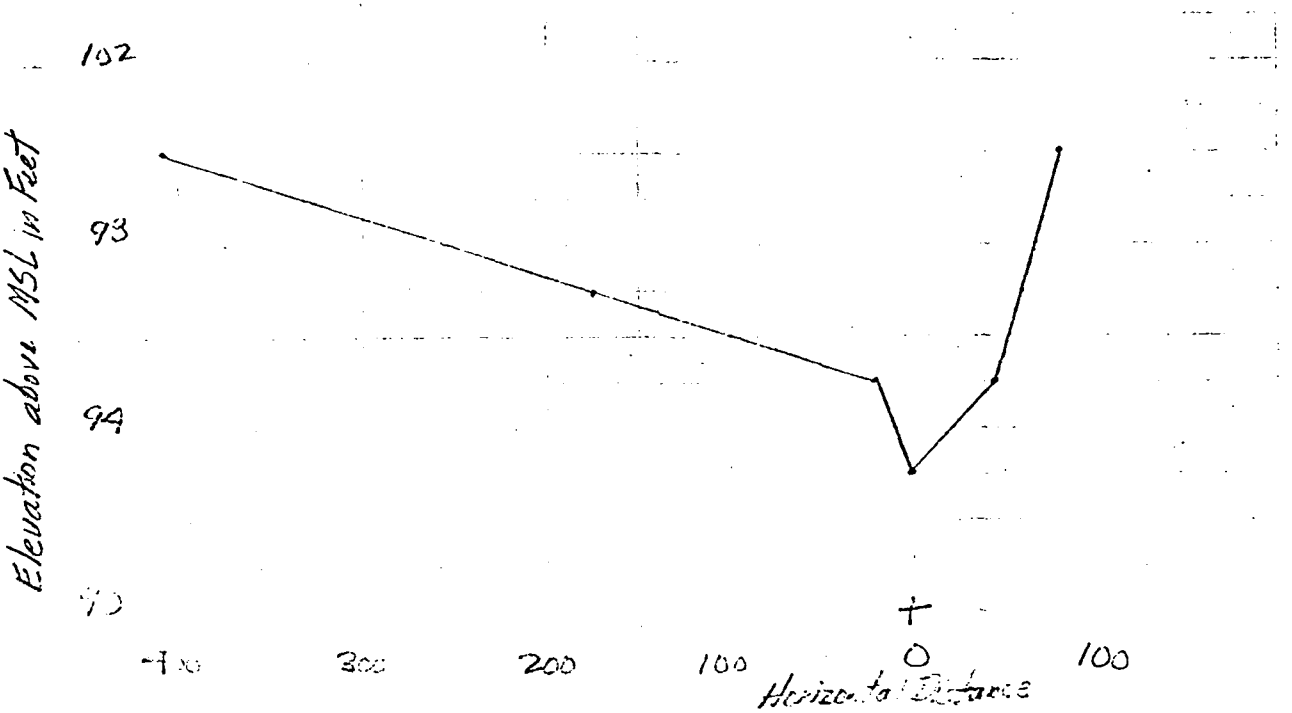
SHEET NO. D12 OF 16
BY WSS DATE 12-11-90
CHKD. BY _____ DATE _____



PROJ. NO. 804105
DESCRIPTION Highland Pond Dam
Middletown, Conn.

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D13 OF 16
BY [illegible] DATE 12-11-80
CHKD. BY _____ DATE _____



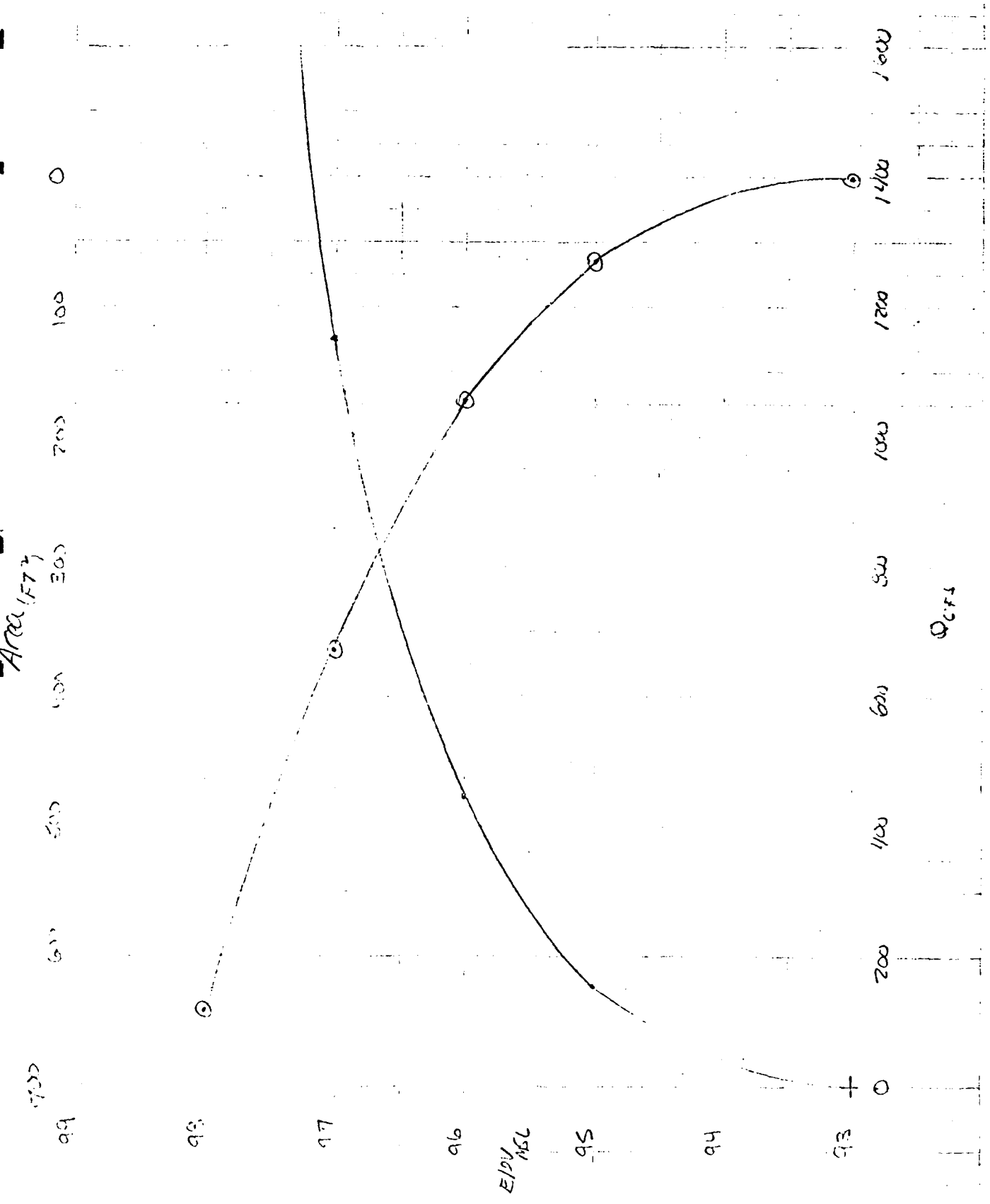
D – D
Looking Downstream

390' DS of C-C
4295' DS of Highland Pond Dam

PROJ. NO. 8041.05
DESCRIPTION Area and Rating Curves
Middletown, Conn.

GENOVESE AND ASSOCIATES
CONSULTING ENGINEERS
HAMDEN, CONN.

SHEET NO. D14 OF 16
BY WJG DATE 12-11-80
CHKD. BY _____ DATE _____



D-D

$Q = 1070$ CFS
$S = 35.3$ AC-FT
$\Rightarrow$ elev = 96.9
area = 345 FT²

$$V = \frac{(345 - 75) \times 390}{42,560} = 2.4 \text{ AC-FT}$$

$$Q_{ps} = 1070 \left(1 - \frac{2.4}{35.3}\right) = 997 \text{ CFS}$$

elev = 96.85 area = 330 FT² V = 2.95

$$Q_{ps} = 1070 \left(1 - \frac{(2.4 + 2.95)/2}{35.3}\right)$$

$Q_{ps} = 989$ CFS

$S_{res} = 32.6$ AC-FT

Elev = 96.9

After this section (D-D) the stream enters a large pasture - wetlands type area. It is reasonable to assume at this point that 1) much of the flood wave will go into storage in this area and 2) with the present height of water of only 3.9' at section D-D there is little further chance of loss of life or major economic damage.

SUMMARY OF BREACH ANALYSIS

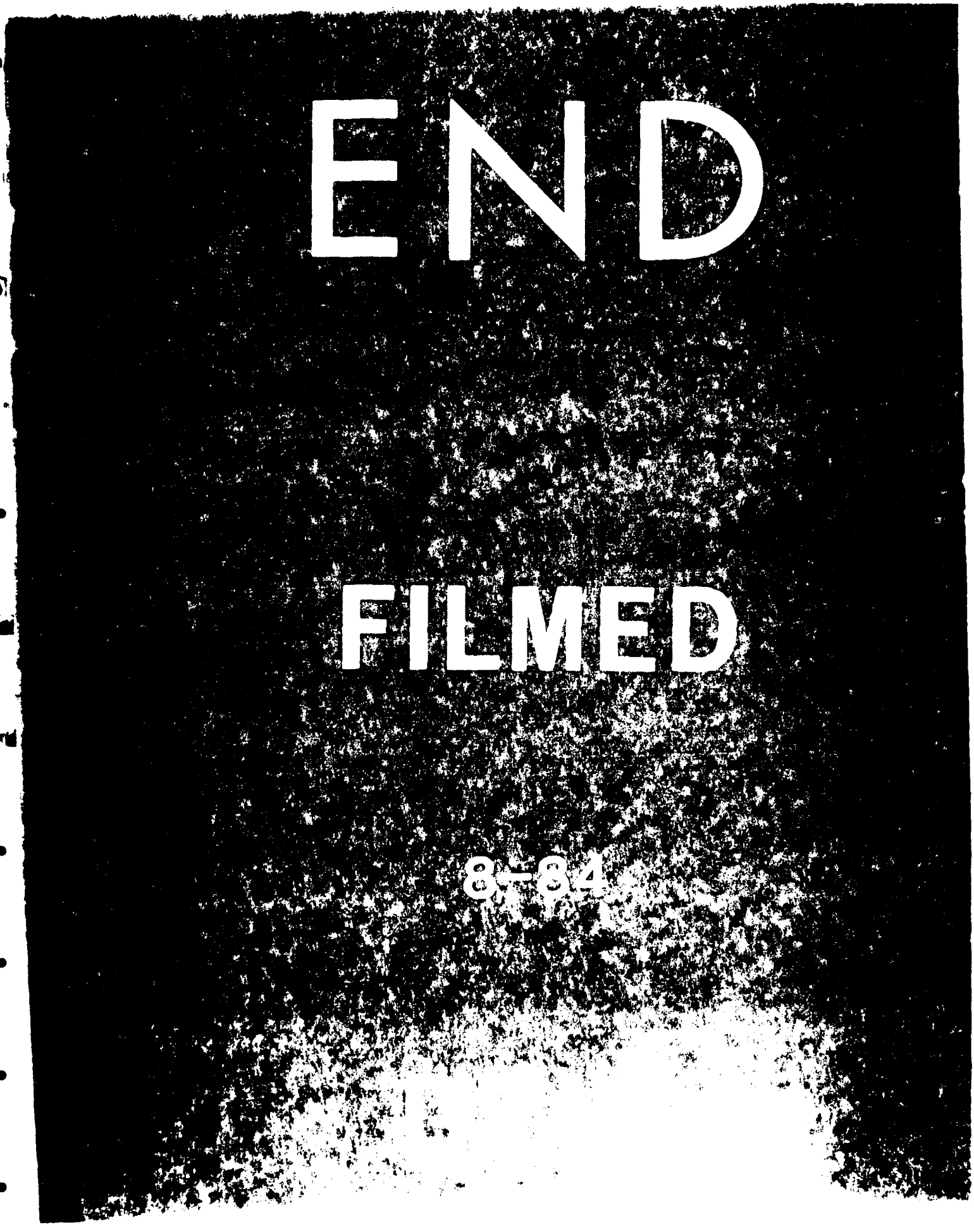
STATION	Q	ELEV	DEPTH
Dam	2010	155.85	7.8' *
6+40	1883	138.9	3.9
24+15	1447	113.65	3.65
39+05	1070	100.25	2.75
42+95	989	96.9	3.9

$D_{DAM} = \frac{2}{3} Y_0$ where $Y_0 = 11.65'$

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME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8-84