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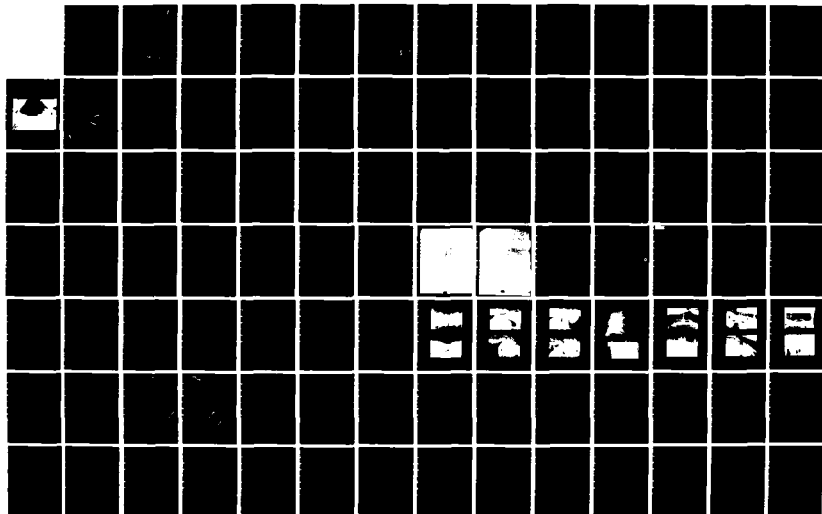
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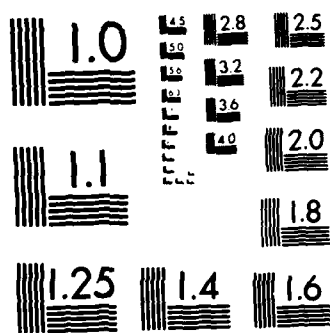
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HOUSATONIC RIVER BASIN
WOLCOTT, CONNECTICUT

CORNELIS DAM

CT 00293

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

MARCH, 1981

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Housatonic River Basin Wolcott, Connecticut		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Cornelis Dam is an earth embankment with concrete and masonry spillways. It is approximately 330 ft. long, 15.3 ft. high and has an average top width of 15 ft. Based on visual inspection and past operational performance, the dam is judged to be in FAIR condition. The dam is classified as SMALL in size and a HIGH hazard potential structure in accordance with the Recommended Guidelines for Safety Inspection of Dams, established by the Corps of Engineers.		



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

REPLY TO
ATTENTION OF:
NEDED-E

MAY 06 1981

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 Cornelis Dam (CT-00293) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Cornelis Dam would likely be exceeded by floods greater than 21 percent of the Probable Maximum Flood (PMF). Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

NEDED-E

Honorable William A. O'Neill

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

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. This report has also been furnished to the owner of the project, Scovill Manufacturing Company, Scovill Square, Waterbury, Connecticut.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for the cooperation extended in carrying out this program.

Sincerely,

A handwritten signature in dark ink, appearing to read 'C.E. Edgar, III', with a stylized flourish at the end.

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

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HOUSATONIC RIVER BASIN
WOLCOTT, CONNECTICUT

CORNELIS DAM

CT 00293

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PHASE 1 INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

Identification No.:	CT 00293
Name of Dam:	Cornelis Dam
Town:	Wolcott
Country and State:	New Haven, Connecticut
Stream:	Mad River
Date of Inspection:	November 14, 1980

BRIEF ASSESSMENT

The Cornelis Dam is an earth embankment with concrete and masonry spillways. It is approximately 330 feet long, 15.3 feet high and has an average top width of 15 feet. The Cornelis Dam was probably constructed in 1917 with subsequent improvements in 1945. The dam is presently owned by the Scovill Manufacturing Company and is operated by the Century Brass Products, Inc. The pond is presently utilized for swimming.

Based on visual inspection and past operational performance, the dam is judged to be in FAIR condition. Seepage and vegetation was noted on the downstream face of the west spillway and trees and brush are growing on the earth embankments.

The dam is classified as SMALL in size and a HIGH hazard potential structure in accordance with the Recommended Guidelines for Safety Inspection of Dams, established by the Corps of Engineers. The impoundment storage at the top of the dam is 50 ac.-ft. and the maximum height of the dam is 15.3 feet. Failure of the dam would result in the loss of more than a few lives and damage to several houses. The depth of inundation at these 6 homes would be 0 feet before and 1 to 3 feet after dam failure.

The test flood for this dam is 1/2 the Probable Maximum Flood (PMF). The test flood has an inflow equal to 6040 cfs and an outflow discharge equal to 6040 cfs with a stillwater elevation of 508.1 which will overtop the dam by 1.9 feet.

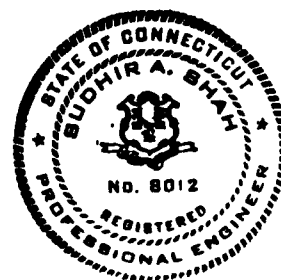
The maximum outflow capacity of the spillways with the water surface at the top of dam is 2520 cfs, which is 42 percent of the test flood outflow.

It is recommended that the following items be studied further by a qualified registered engineer: The condition of the upstream face, the inability of the spillways to pass the test flood without overtopping the dam, the removal of the trees on the embankments, the impact on the integrity of the dam of the seepage through the joints of the west spillway and abutment.

The following remedial measures should be taken by the owner: The removal of brush from the embankments and west spillway, monitoring of seepage through the west spillway and weepholes, repairing of depressions and eroded areas on the embankments, development of a downstream warning plan and an annual inspection program.

Recommendations and remedial measures that should be implemented within one year of receipt of this Phase I Inspection Report are further described in Section 7.

JAMES P. PURCELL ASSOCIATES, INC.



Sudhir A. Shah

Sudhir A. Shah, P.E.
Director of Engineering
Connecticut P.E. No. 8012

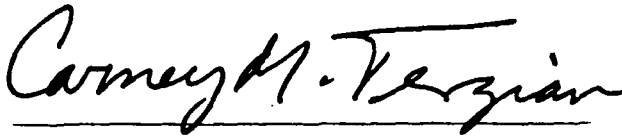
This Phase I Inspection Report on Cornelis Dam (CT-00293) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.



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

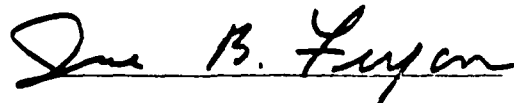


ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division



CARNEY M. TERZIAN, CHAIRMAN
Design 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 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 need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and 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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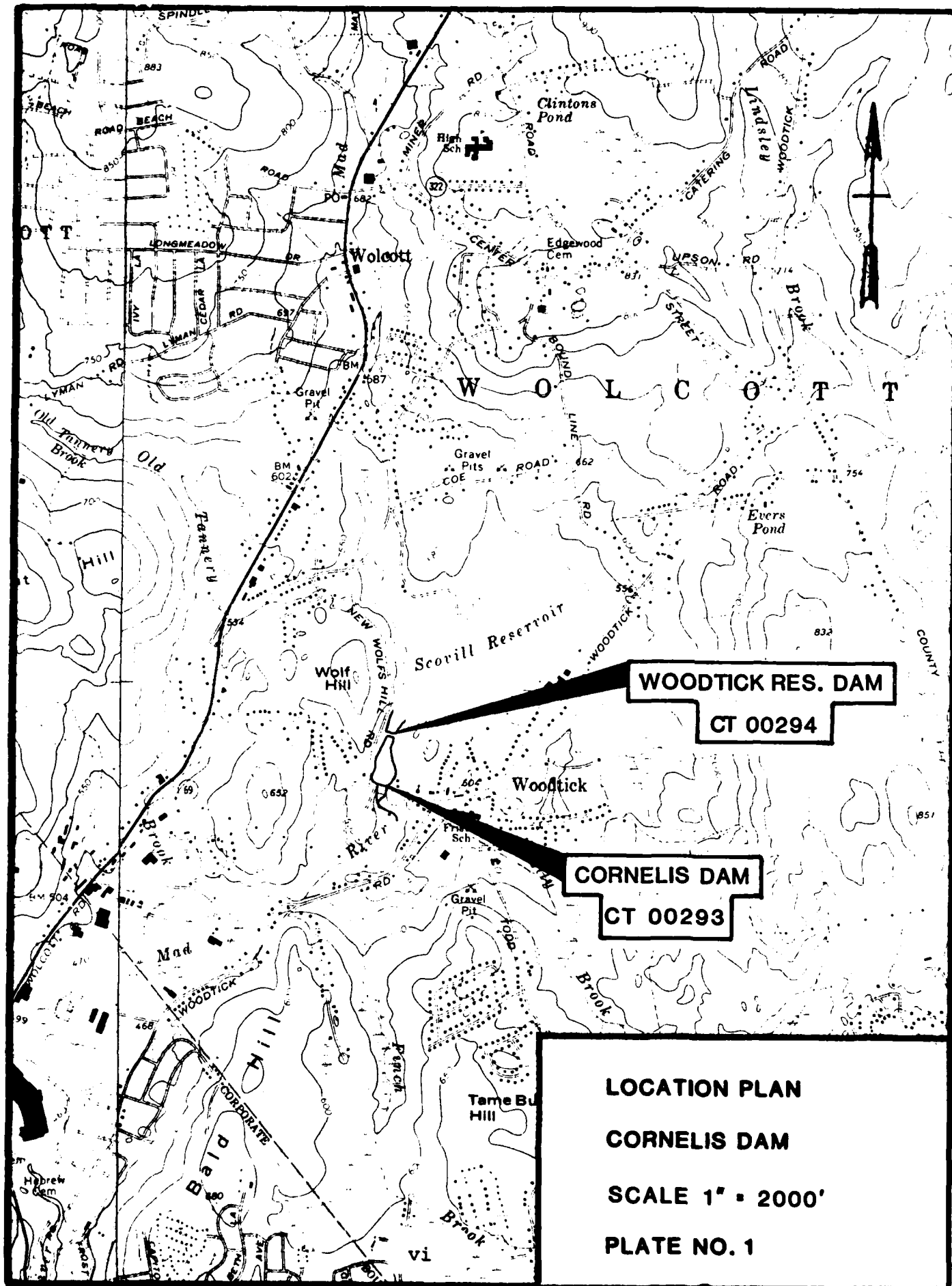
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OVERVIEW PHOTO - CORNELIS DAM

PHOTO TAKEN DECEMBER 15, 1980



NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

NAME OF DAM: CORNELIS DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority:

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspections 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. James P. Purcell Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to James P. Purcell Associates, Inc., under a letter from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-81-C-0009 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 interests.
3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project:

a. Location:

The Cornelis Dam is located in the Town of Wolcott approximately 3 miles north-east of Waterbury, Connecticut (See Plate No. 1). The dam impounds water from

the Mad River and is located approximately 6000 feet upstream of the confluence with Old Tannery Brook (also the Wolcott corporate limits).

The Woodtick Reservoir Dam (CT 294) is located 800 feet upstream of the Cornelis Dam. Cornelis Pond is situated in a north/south direction, with the dam at the south end. The dam is at latitude 41°-34'-43.1" and longitude 72°-59'-04.5".

The Cornelis Dam is also known as the Lower Scovill Reservoir Dam.

All elevations used in this report are based on the National Geodetic Vertical Datum (NGVD).

b. Description of Dam and Appurtenances:

The dam consists of two short earth embankments heavily vegetated with brush and trees on the ends of a concrete stone masonry spillway section. The embankments are approximately 6 feet high, have a top width of 15 feet and side slopes of 2H:1V. The dam is approximately 330 feet long with a 132 foot long spillway section at the eastern end. There are two spillways separated by an 8 foot wide concrete central abutment. The western spillway is a 57 foot long stone masonry structure, curved in plan, 9.6 feet high with a concrete cap which is 6 feet wide. The eastern spillway is a 75 foot long concrete weir, straight in plan, and 9.6 feet high.

The outlet works consist of a 30 inch by 30 inch square blowoff through the central abutment. Flow to the outlet is regulated by a sluice gate which is operated by a hand operated gear mechanism located on the top of the central abutment.

c. Size Classification:

The size classification of this dam is SMALL as per the criteria set forth in the Recommended Guidelines for Safety Inspection of Dams by the Corps of Engineers. The impoundment storage at the top of the dam is 50 ac.-ft. (range 50 to 1000 ac.-ft.) and the maximum height of the dam is 15.3 feet (range of 25 to 40 feet). The size classification is based on the storage criteria.

d. Hazard Classification:

The hazard classification of this dam is HIGH as per the criteria set forth in the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers. The dam is located upstream of several houses where failure discharge may cause the loss of more than a few lives. The estimated water depth due to the assumed dam failure may range from 10 feet at the dam to 1 foot, 6000 feet downstream at the confluence with Old Tannery Brook. The depth of inundation at the homes would be 0 feet before and range from 1 to 3 feet after dam failure.

e. Ownership:

Cornelis Dam is presently owned by the Scovill Manufacturing Company, Scovill Square, Waterbury, Connecticut 06720. (203)757-6061

f. Operator:

The operation of the dam is the responsibility of Century Brass Products, Inc.

The operator of the dam is:

Mr. W.M. Goss, Jr.
Century Brass Products, Inc.
Century Square
Waterbury, CT 06720
Telephone: (203) 574-7700

g. Purpose:

The dam and pond presently are utilized for recreation only, primarily swimming at a beach along the eastern shore.

h. Design and Construction History:

Cornelis Dam was probably built in 1917, with both spillways constructed of stone masonry. In 1945, the eastern concrete spillway was rebuilt including the central and eastern abutment. The blowoff in the central abutment was also added at that time.

i. Normal Operational Procedure:

All water is presently discharged over the spillways. The valve is opened as needed to lower the pond for cleaning of the beach along the eastern shore.

1.3 Pertinent Data:

a. Drainage Area:

The Cornelis Pond drainage basin is generally rectangular in shape with a length of 5 miles and an average width of 1.7 miles resulting in a total drainage area of 8.60 square miles (See drainage basin map in Appendix D). The topography is generally rolling terrain, with elevations ranging from a high of 1100 feet to a low of 502.5 feet at the spillway crest. Stream and basin slopes are moderate, 2 percent and 10 percent, respectively. The reservoir has a normal surface area of 4.5 acres which is 0.08 percent of the watershed. The upstream Woodtick Reservoir has a normal surface area of 128 acres which is 2.3 percent of the watershed. Ninety-nine percent of the watershed drains into the Woodtick Reservoir.

b. Discharge at Dam Site:

Listed below are calculated discharge values for the spillway and outlet works (30 inch square blowoff):

1. Outlet Works: A 30 inch square blowoff with an intake at elevation 492.9 and a discharge capacity of 105 cfs at elevation 506.2.
2. There are no specific discharge records available for this dam, however, the Woodtick Reservoir Dam experienced a flow of 1425 cfs during August, 1955, which was subsequently discharged through the Cornelis Dam.
3. Ungated spillway capacity at top of dam: 2520 cfs at elevation 506.2.
4. Ungated spillway capacity at test flood elevation: 4660 cfs at elevation 508.1.
5. Gated spillway capacity at normal pool elevation: N/A
6. Gated spillway capacity at test flood elevation: N/A
7. Total spillway capacity at test flood elevation: 4660 cfs at elevation 508.1.
8. Total project discharge at top of dam: 2625 at elevation 506.2.
9. Total project discharge at test flood level: 6040 cfs at elevation 508.1.

c. Elevation (Feet above NGVD):

1. Stream bed at toe of dam	490.9
2. Bottom of cutoff	N/A
3. Maximum tailwater	Unknown
4. Normal pool	502.5
5. Full flood control pool	N/A
6. Spillway crest	502.5
7. Design surcharge (Original Design)	Unknown
8. Top of dam	506.2
9. Test flood level	508.1

d. Reservoir (Length in feet)

1. Normal pool	800
2. Flood Control pool	N/A
3. Spillway crest pool	800
4. Top of dam	800
5. Test flood pool	800

e. Storage (acre-feet)

1. Normal pool	31
2. Flood control pool	N/A
3. Spillway crest pool	31
4. Top of dam	50
5. Test flood pool	61

f. Reservoir Surface (acres)

1. Normal pool	4.5
2. Flood control pool	N/A
3. Spillway crest	4.5
4. Test flood pool	6.4
5. Top of dam	5.7

g. Dam

1. Type	Stone masonry, concrete and earth
2. Length	330 feet
3. Height	15.3 feet
4. Top width	15 feet

5.	Side slopes	Upstream - 2H:1V Downstream - 2H:1V
6.	Zoning	Unknown
7.	Impervious core	Unknown
8.	Cutoff	Unknown
9.	Grout curtain	Unknown
10.	Other	---
h.	Diversion and Regulating Tunnel	N/A
i.	Spillway	
1.	Type	Broad crested overflow (west) overflow (east)
2.	Length of weir	57.0 feet (west) 75.0 feet (east)
3.	Crest elevation	502.5
4.	Gates	None
5.	U/S Channel	Natural bed
6.	D/S Channel	Overgrown gravel and rock channels. Channels join 200' downstream.
7.	General	---
j.	Regulating Outlets	
Refer to Paragraph 1.2b - "Description of Dam and Appurtenances" for description of Outlet Works.		
1.	Inverts and size	30 inch square blowoff - 492.9 feet
2.	Description	Concrete tunnel

3. Control Mechanisms

Sluice gate with a hand
operated gear mechanism on central abutment

4. Other

SECTION 2

ENGINEERING DATA

2.1 Design:

There are limited available records presenting design information for the construction of the Cornelis Dam. Three 1945 plans, cross sections, and an elevation of the dam, have been included in Appendix B of this report.

2.2 Construction:

There are no available records of the original construction of this dam.

2.3 Operation:

No formal records of operation are kept for this dam.

2.4 Evaluation:

a. Availability:

The information noted above for this facility is available in the files of the Department of Environmental Protection, Water Resources Unit, Dam Safety Engineers, State Office Building, Hartford, Connecticut, and the Century Brass Products, Inc., Waterbury, Connecticut.

b. Adequacy:

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

c. Validity:

The validity of the limited information available could not be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

a. General:

The visual inspection of the Cornelis Dam was conducted on November 14, 1980 and a copy of the visual inspection check list is contained in Appendix A of this report.

The following procedure was used:

1. Inspection of the upstream area of the reservoir which is impounded by the dam.
2. Visual inspection of the face and top of the dam and spillways for cracks, loose stones, seepage, etc.
3. Inspection of the outlet works and other appurtenances as to their existence, location, and operability.
4. Review of procedures that could be utilized in the event of an emergency situation.
5. A check of the downstream area for seepage, piping, boils or other indications of abnormal conditions. The downstream hazard potential in the event of dam failure was investigated.
6. Photographs of the general area of the dam and of specific items of note were taken and are included in Appendix C of this report.

Before the inspection, the available existing data was studied and reviewed.

b. Dam:

1. Crest: The top of the dam to the west of the spillways is approximately 15 feet wide and extends for approximately 140 feet (Photo C-10). It is heavily vegetated with brush and trees and extends around a corner in a northerly direction. To the east of the spillways, the top of the dam extends approximately 60 feet and is covered with brush.
2. Upstream Face: The upstream face of the western dam is heavily vegetated with trees and brush (Photo C-5). There are two large trees at the upstream end of the eastern abutment (Photo C-6).

3. **Downstream Face:** The downstream face to the west of the spillways is clear of trees and brush. There are signs of minor erosion at the corner and a hole (2 feet diameter by 18 inches deep) exists at this point near the crest. The eastern embankment is vegetated with brush and there are two small depressions (1 foot diameter by 6 inches deep) near the east abutment. There were no signs of seepage observed on the embankments.

c. Appurtenant Structures:

1. **Western Spillway:** This spillway is constructed of stone masonry and is a 57 foot long by 6 foot wide broad crested weir. (Photos C-3 and C-4.) Mortar is missing from many of the joints and there is clear seepage (approximately 1 to 2 gallons per minute) through the stone joints near the west abutment (Photo C-7). There is also clear seepage at the bottom of the spillway and west abutment. The quantity of this seepage was approximately 1 gallon per minute. Grass and moss is growing from many joints on the spillway and abutment. The west abutment is also stone masonry with many open joints and missing stones (Photo C-3). The weir is capped with concrete which is cracked and spalled. There are two small trees and brush growing between the spillway and the road.
2. **Eastern Spillway:** This spillway is a 75 foot long concrete weir (Photo C-5 and C-6). The face is cracked and spalled near the central abutment (Photo C-8). The entire spillway was flowing on the day of the inspection. The east abutment is concrete and is generally in good condition. There are two weepholes in the abutment below the spillway which were seeping. The concrete around the weepholes and further downstream to the road is spalled and chipped (Photos C-6 and C-11). There is a tree growing between the spillway and road (Photo C-11).
3. **Central Abutment:** The concrete central abutment contains three minor cracks (1/16 inch) which extend from one side, across the top, and down the other side. These cracks correspond to the efflorescence noted on both sides (Photos C-4 and C-5). Other than these cracks, the structure is in good condition.
4. **Blowoff:** A 30 inch square blowoff extends from a sluice gate at the upstream end of the central abutment to an outlet on the east side just below the spillway (Photo C-5). There is a 5 foot by 4 foot wooden cover over an opening in the top of the abutment above the sluice gate. The lift mechanism for the sluice gate is in the center of the abutment (Photos C-5 and C-9). This sluice gate is usually closed with all flow being discharged over the spillways. The gate was last opened a few years ago and is reportedly operational.

d. Reservoir Area:

The pond is formed by the flooding of a portion of the Mad River Valley. The sides of the forested valley have gentle slopes bordering the pond. No unusual geologic features were noted that could be expected to adversely affect the dam or its appurtenant structures.

Trespassing on the dam is not permitted.

The Woodtick Reservoir Dam is located approximately 800 feet upstream of the dam and failure of this upstream dam would create a potential hazard at the Cornelis Dam (Photo C-2).

e. Downstream Channel::

The two downstream channels are meandering streams which join approximately 200 feet downstream (Photos C-13 and C-14). Nichols Road crosses both channels approximately 30 feet downstream of the spillways. Each opening is 21 feet wide by 7 feet high (Photos C-11 and C-12).

3.2 Evaluation:

Based on the visual inspection, the Cornelis Dam appears to be in fair condition overall, and there were no major areas of distress noted. Specific areas of concern that were noted are:

- a. The presence of seepage and grass and moss on the downstream face of the west spillway and abutment.
- b. The missing mortar and voids between stones on the downstream face of the west spillway.
- c. The missing mortar and stones on the west abutment.
- d. The minor cracking of the central abutment.
- e. The brush and trees on the embankments.
- f. The depressions on the downstream face of the embankments.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures:

a. General:

The pond is presently used solely for recreation and all flow is discharged over the spillways.

b. Description of Any Warning System in effect:

No formal emergency or contingency plan is in effect to reduce or minimize downstream damage in emergency situations.

4.2 Maintenance Procedures:

a. General:

There is no regular maintenance schedule for this dam.

b. Operating Facilities:

No regular maintenance of the gate valve was reported.

4.3 Evaluation:

To insure the safety of the residents downstream, a regular inspection and maintenance program and a formal downstream warning plan should be developed and implemented.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General:

The Cornelis Dam creates an impoundment with a total storage capacity of 31 ac.-ft. at elevation 502.5, the spillway crest elevation. Each foot of depth in the reservoir above the spillway crest can accommodate approximately 4.5 ac.-ft. The west spillway is a 57 foot long by 6 foot wide broad crested uncontrolled weir. The east spillway is a 75 foot long, uncontrolled weir. Ninety-nine percent of the drainage area drains to the upstream Woodtick Reservoir. Stream and basin slopes are moderate, 2 percent and 10 percent, respectively.

5.2 Design Data:

- a. No specific design data is available for this watershed or the structures of the Cornelis Dam. In lieu of existing design information, USGS topographic maps (scale 1"=2000') were utilized to develop hydrologic parameters such as drainage area, basin length, time of concentration, and other runoff characteristics. Elevation-storage relations for the reservoir were approximated. Reservoir surface area and surcharge storage were computed using the USGS maps. Some of the pertinent hydraulic design data was obtained and/or confirmed by actual field measurements at the time of the visual inspection.
- b. Outflow values (routing procedures) and dam overtopping analyses were computed in accordance with the guidelines developed by the Corps of Engineers. Judgment was used in calculating final values outlined in this report, which are quite approximate and should not be considered a substitute for actual detailed analysis.

5.3 Experience Data:

Historical data for recorded discharges is not available for this dam. However, the maximum discharge to date at the upstream Woodtick Reservoir Dam, experienced during August 1955, was 1425 cfs. This flow was subsequently discharged by the Cornelis Dam.

5.4 Test Flood Analysis:

Recommended guidelines for the Safety Inspection of Dams by the Corps of Engineers were used for the selection of the "Test Flood". This dam is classified as HIGH hazard and SMALL size structure. Guidelines indicate that a range of the 1/2 times the Probable Maximum Flood (PMF) to the PMF be used as the "Test Flood" for these classifications. A test flood of 1/2 PMF was chosen due to the small size of the dam. The watershed of the upstream Woodtick Reservoir Dam has an area of 8.6 square miles.

The watershed of the Cornelis Dam alone is 0.02 square miles. The total watershed area of the Cornelis Dam is 8.6 square miles. Snyder's lag was calculated to be 4.4 hours and a Snyder peaking coefficient of 0.625 was used. The 200 square mile - 24 hour Probable Maximum Precipitation (PMP) is 21.5 inches. The flood hydrograph package, HEC-1 computer program developed by the Corps of Engineers was utilized to develop the inflow hydrograph, route the flood through the reservoir, and for the dam overtopping analysis. A test flood inflow equal to 1/2 PMF was calculated to be 6040 cfs (700 CSM).

This test flood analysis assumes that the outlet works are closed. The inflow hydrograph has been routed through the Woodtick Reservoir, which has been assumed to be full at the beginning of inflow. Hydraulic calculations are included in Appendix D.

The spillway capacity is hydraulically inadequate to pass the test flood (1/2 PMF) and overtopping of the dam will occur. The maximum outflow capacity of the spillways without overtopping the dam is 2520 cfs. This corresponds to approximately 42 percent of the test flood outflow and a storage above the spillway level of 19 ac.-ft. The maximum outflow discharge value for the test flood is 6040 cfs corresponding to a depth of flow over the top of the dam of 1.9 feet and a storage above the spillway level of 30 ac.-ft. A spillway rating curve, an outlet rating curve, and a reservoir stage-capacity curve, are included in Appendix D of this report.

At the spillway elevation of 502.5, the capacity of the 30 inch outlet structure is 30 cfs. It will require approximately 3/4 hour to lower the water level the first foot assuming a water surface area of 4.5 acres, normal inflow conditions, and use of the outlet works to regulate the water level for expected inflows.

5.5 Dam Failure Analysis:

This dam is classified as a HIGH hazard structure. Failure discharge can cause the loss of more than a few lives, damage due to high velocities, impact from debris, and flooding to 6 homes, a building and one road along the downstream channel.

The calculated dam failure discharge is 3650 cfs due to an assumed breach width of 55 feet and a pre-failure pool level equal to the spillway crest. This pre-failure condition was chosen because the increase in flooding due to dam failure with the pool at the top of the dam, from the full spillway discharge flooding, is less than 1.4 feet

Failure will produce a water depth of 10.5 feet immediately downstream of the dam due to the Nichols Road embankment. This roadway may washout due to water and debris impact. The depth of inundation at the 6 houses and 1 building would be 0 feet before and 1 to 3 feet after dam failure.

The failure discharge will effect downstream areas for a distance of 6000 feet from the dam. At this distance, the water surface will be approximately 1 foot above normal observations as it enters a flat swampy area approximately 4000 feet from the dam.

Beyond 6000 feet, the affects of the failure discharge will be reduced by storage in the swampy area. Additional damage is possible in Waterbury until the Mad River enters the Naugatuck River. Water surface elevations due to the failure of the dam are listed on Page D-25. Probable consequences including the prime impact areas are listed on Page D-33.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation:

The visual inspection revealed no signs of major physical distress in the structure. However, seepage was noted through the joints on the downstream face of the west spillway and abutment. The upstream face of the spillway could not be inspected due to the pond level. The seepage may be occurring or enhanced due to defects in the upstream face of the spillway.

6.2 Design and Construction Data:

There is insufficient design and construction data to permit a formal evaluation of stability.

6.3 Post-Construction Changes:

In 1945, the eastern spillway, central abutment and east abutment were rebuilt and the blowoff was added.

6.4 Seismic Stability:

The dam is in Seismic Zone 1 and hence does not require evaluation for seismic stability according to the Corps of Engineers Recommended Guidelines.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment:

a. Condition:

Based on the visual inspection, past performance and hydraulic/hydrologic evaluation, the Cornelis Dam and appurtenances are judged to be generally in FAIR condition. Items of concern that should be addressed as a result of this inspection are listed in Section 7.2 and 7.3.

b. Adequacy of Information:

The limited engineering data did not allow for a definitive review. Therefore, the adequacy of the dam is based on visual inspection, past performance history, and engineering judgment.

c. Urgency:

The recommendations and remedial measures described below should be implemented by the owner within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations:

It is recommended that the owner engage a qualified registered engineer to carry out the following actions and that his recommendations be implemented.

- a. A detailed hydrologic/hydraulic investigation to determine the need for and means of increasing the discharge capacity of the project.
- b. The removal of the trees and their respective root systems on the embankments, below the spillways to the road, and at the upstream end of the east abutment; and the backfilling with suitable compact material.
- c. The upstream face be visually inspected.
- d. The vegetation should be removed from the joints and the joints repointed on the downstream face of the west spillway.
- e. The missing stones replaced and the joints repointed at the west abutment.

- f. The seepage on the downstream face of the west spillway and abutment should be investigated to determine its potential impact on the integrity of the dam and repairs designed as necessary.

7.3 Remedial Measures:

a. Operational and Maintenance Procedures:

1. Brush should be cleared from the embankments and between the spillways and road.
2. Fill and repair the depressions and eroded areas on the embankments.
3. Monitor the seepage through the weepholes to note any change from the existing conditions.
4. Develop a surveillance and downstream warning plan, including round-the-clock monitoring during heavy precipitation.
5. Institute a program of annual periodic technical inspection including insuring the operability of the outlet works.

7.4 Alternatives:

There are no practical alternatives to the above stated recommendations.

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Cornelis Dam

DATE November 14, 1980

TIME 9:00 - 12:00 A.M.

WEATHER Overcast

W.S. ELEV. _____ U.S. _____ DN.S.

PARTY:

- | | |
|---|-----------------------------|
| 1. <u>R. Johnston, JPPA</u> | 6. <u>J. Abele, Scovill</u> |
| 2. <u>J. Hewes, JPPA</u> | 7. <u>Manufacturing Co.</u> |
| 3. <u>J. Walsh, Baystate</u> | 8. _____ |
| 4. <u>Environmental Consultants, Inc.</u> | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Hydraulics</u>	<u>R. Johnston</u>	
2. <u>Structural</u>	<u>J. Hewes</u>	
3. <u>Geotechnical</u>	<u>J. Walsh</u>	
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

INSPECTION CHECK LIST

PROJECT Cornelis DamDATE November 14, 1980

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation 506.2	Good
Current Pool Elevation 502.5	Crest of Spillways
Maximum Impoundment to Date	2.55 Feet over Spillways in August, 1955.
Surface Cracks	N/A
Pavement Condition	N/A
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None Observed
Trespassing on Slopes	None
Vegetation on Slopes	Yes - Brush and Trees
Sloughing or Erosion of Slopes or Abutments	Several Depressions on Downstream Faces.
Rock Slope Protection - Riprap Failures	N/A
Unusual Movement or Cracking at or near Toes	None Observed
Unusual Embankment or Downstream Seepage	None Observed
Piping or Boils	None Observed
Foundation Drainage Features	Weepholes in Eastern Abutment below Spillways.
Toe Drains	None Observed
Instrumentation System	None Observed

INSPECTION CHECK LIST

PROJECT Cornelis Dam

DATE November 14, 1980

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	Central Abutment
a. Concrete and Structural	
General Condition	Good - Loose Timber Cover over wetwell.
Condition of Joints	N/A
Spalling	None Observed
Visible Reinforcing	None Observed
Rusting or Staining of Concrete	Minor due to valve stem.
Any Seepage or Efflorescence	Efflorescence at cracks
Joint Alignment	N/A
Unusual Seepage or Leaks in Gate Chamber	None observed - water at pond level
Cracks	Three across top
Rusting or Corrosion of Steel	None Observed
b. Mechanical and Electrical	
Air Vents	None observed
Float Wells	None Observed
Crane Hoist	None Observed
Elevator	None Observed
Hydraulic System	None Observed
Service Gates	Underwater - not visible
Emergency Gates	None Observed
Lightning Protection System	None Observed
Emergency Power System	None Observed
Wiring and Lighting System in Gate Chamber	None Observed

INSPECTION CHECK LIST

PROJECT Cornelis Dam

DATE November 14, 1980

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS</u> a. Approach Channel b. Intake Structure c. Transition and conduit d. Outlet Structure and Outlet Channel.	30 inch square blowoff in central abutment Entire lake bed - underwater Upstream end of central abutment A 30 inch sluice gate controls discharge into blowoff. Formed 30 inch square conduit extends through central abutment to a free outlet on the east side below the spillways. Conduit outlets to eastern spillway discharge channel.

INSPECTION CHECK LIST

PROJECT Cornelis Dam DATE November 14, 1980
 PROJECT FEATURE _____ NAME _____
 DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNFLS</u>	Eastern Spillway
a. Approach Channel	Pond Bed - Underwater
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	Good - Concrete
Rust or Staining	None Observed
Spalling	Yes on Downstream Face
Any Visible Reinforcing	None Observed
Any Seepage or Efflorescence	Spillway Flowing
Drain Holes	None Observed
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None Observed
Trees Overhanging Channel	Yes
Floor of Channel	Rock and Stones
Other Obstructions	Bridge with 7 foot high by 21 foot wide opening approximately 40 feet downstream of spillway.

INSPECTION CHECK LIST

PROJECT Cornelis DamDATE November 14, 1980

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNFLS</u>	Western Spillway
a. Approach Channel	Pond Bed - Underwater
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Masonry	Fair - Masonry
Rust or Staining	None Observed
Spalling	N/A
Any Visible Reinforcing	None Observed
Any Seepage or Efflorescence	Seepage at west abutment and along toe
Drain Holes	None Observed
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None Observed
Trees Overhanging Channel	Brush
Floor of Channel	Concrete Floor immediately below spillway, stone and gravel beyond.
Other Obstructions	Bridge with 7 foot high by 21 foot wide opening approximately 30 feet downstream of spillway

APPENDIX B

ENGINEERING DATA

APPENDIX B-1

DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS

Location

Items

Mr. Victor J. Galgowski
Dam Safety Engineer
Water Resources Unit
Department of Environmental Protection
State of Connecticut
State Office Building
Hartford, Connecticut 06115

- 1. State Inspection Reports
- 2. Plan Showing Dam and Cross-Section
- 3. Plan Showing 1945 Modifications
- 4. Various coorespondence

Century Brass Products, Inc.
Century Square
Waterbury, Connecticut 06720

- 1. Plan Showing Central Abutment

• Indicates material contained in this Phase I Inspection Report.

APPENDIX B-2

COPIES OF PAST INSPECTION REPORTS

MOZZOCHI ASSOCIATES**CIVIL ENGINEERS**GLASTONBURY, CONN. 06033
217 HEBRON AVENUE
PHONE 633-9401PROVIDENCE, R. I. 02903
169 WEYBOSSETT STREET
PHONE 421-0420**PARTNERS**JOHN LUCHS, JR.
STUART J. BECKERMAN

February 23, 1972

REPLY TO: Glastonbury

William H. O'Brien, III - Civil Engineer
Department of Environmental Protection
Water & Related Resources
State Office Building
Hartford, Connecticut 06115**WATER & RELATED
RESOURCES
RECEIVED**

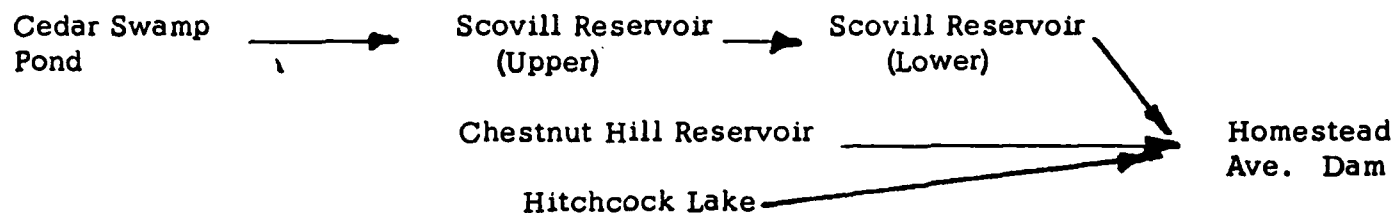
FEB 23 1972

ANSWERED _____
REFERRED _____
FILED _____Re: Homestead Ave. Dam
(John Errichetti Assoc.)
Waterbury
Our File No. 57-73-94

Dear Mr. O'Brien:

As authorized in your letter of January 27, 1972, we have inspected and evaluated the spillway capacity allowing for the storage of four large reservoirs in the up-stream drainage area.

The total watershed area for this structure is 17.4[±] sq. miles, with four (4) major reservoirs upstream. The storages and releases from these independent structures, will affect the inflow of the subject dam. It was therefore necessary to determine the routed discharges from the upstream reservoirs to evaluate the inflow hydrograph. The flow pattern is as follows:



	<u>Drainage Area</u>		<u>Water Surface Area</u>	
Cedar Swamp Pond	0.9	Sq. Miles	130 [±]	Acres
Scovill Reservoir (Upper)	7.4	Sq. Miles	115 [±]	Acres
Scovill Reservoir (Lower)	0.0	Sq. Miles	5 [±]	Acres
Chestnut Hill Reservoir	1.7	Sq. Miles	65 [±]	Acres
Hitchcock Lake	0.3	Sq. Miles	100 [±]	Acres
Homestead Ave. Dam	7.1	Sq. Miles	6 [±]	Acres
Total	17.4	Sq. Miles		

Flood routing studies for the reservoirs were carried out for design floods of 7.5" and 5.1" / 6 hr storm and the results tabulated below:

Reservoir	FLOOD ROUTING STUDY						
	<u>SPILLWAY</u>		<u>MAX. WATER SURFACE</u>		<u>FREEBOARD</u>		MAX. OUTFLOW Q CFS
	width ft.	depth of crest from top	p=7'5"	p=5'1"	p=7'5"	p=5'1"	
Cedar Swamp Reservoir	13'-0" ⁺	2'-9"	1'-1"	0'-7"	1'-8"	2'-2"	45
Scovill Reservoir (upper)	100' & 39'6"	3'-6"	3'-6"	1'-10"	----	1'-8"	3000
Scovill Reservoir (lower)	57' & 79'	3'-10"	3'-4"	1'-10"	0'-6"	2'-0"	2900
Chestnut Hill Lake	28'	4'-8"	2'-9"	1'-5"	1'-11"	3'-3"	450
Hitchcock Lake	26' ⁺	2' ⁺	0'-5"	0'-3"	1'-7"	1'-9"	25
Homestead Ave. Dam (40" Sluice gate)	60' &	6'-0"	6'-0"	4'-0"	-----	2'-0"	3300
							1680

STATE BOARD FOR THE SUPERVISION OF DAMS
INVENTORY DATA

CT-293

NAME OF DAM OR POND Lower Scovill Res.

CODE NO. N18.0 M6.6

LOCATION OF STRUCTURE:

Town Wolcott

Name of Stream Mad River

U.S.G.S. Quad. Southington Long. 72-59.1 Lat. 41-38.6

OWNER: Scovill Manufacturing Company

Address Waterbury

Telephone _____

Pond Used For: Recreation

DA 8.725M

Dimensions of Pond: Width _____ Length _____ Area 10 A ±

Depth of Water below Spillway Level (Downstream) 11"

Total Length of Dam 300' Length of Spillway (27-100' each) 71'-5'

Height of Abutments above Spillway 4

Type of Spillway Construction Stone and concrete.

Type of Dike Construction Earth.

Downstream Conditions Crosses road 20' below, then through woods.

Summary of File Data _____

Remarks Board Member

ROGER C. BROWN
FRANK RABAIN
JAMES C. SEASH

TELEPHONE 6-7681
P. O. BOX 226

CLARENCE BLAIR ASSOCIATES
INCORPORATED
CONSULTING ENGINEERS
100 CROWN STREET, NEW HAVEN 2, CONN.

WATER SUPPLY AND SEWERAGE
INDUSTRIAL WASTES
INVESTIGATIONS AND REPORTS
VALUATIONS AND RATES
SURVEYS AND MAPS
PROPERTY LINES

October 18, 1944

Re: Cornelis Dam of
Scovill Manufac-
turing Company

Mr. V. B. Clarke, Member
State Board of Supervision of Dams

Dear Mr. Clarke;

At a conference in Waterbury on October 13, attended by representatives of the Scovill Manufacturing Company, the Lane Construction Company and myself, it was decided to proceed at once with the reconstruction of the dam along the lines suggested in my report to them. They are not interested in retaining any of the stone for appearance so all of the new construction will be of concrete throughout.

Mr. Sperry would like to have some sort of flashboards on the spillway, arranged so that they would collapse in times of high flow. He is anxious to get an extra foot of depth in the pond. I told him that it would be necessary to get your permission for such an installation.

For your benefit I am including in this letter that portion of my report that has to do with spillway capacity.

Quote from Report on Cornelis Dam, by Clarence Blair Associates to Scovill Manufacturing Company dated October 9, 1944:

"Sometime between September 7, the date of Mr. V. B. Clarke's letter to you, and our conference with you on September 28, you abandoned the plan of raising the spillway level 2'. We believe that was a wise decision for two reasons; first, a 2' raise would necessitate quite extensive dikes or embankments at the east and west ends of the dam, and secondly, neither of the existing dams is substantial enough to support an additional two feet of height.

It is our opinion that the spillway level should be at the same elevation as the present top of the westerly spillway. The reconstruction work on the easterly dam should be such as to bring its new spillway up to the level of the westerly side.

When Mr. Blair visited the dam in 1938 he found the spillway area inadequate for freshet flows that might be expected. One of the reasons for this was the poor condition of the westerly embankment. The top of that embankment was so low in places that it only

afforded a freeboard of 2.2' according to Mr. Blair's figures. By repairing this embankment and bringing it up to a point slightly above the elevation of the westerly abutment wall, the available freeboard of the spillway will become 3.7' which would double the capacity of the spillway, per foot of length.

By doing away with the section of wall which runs easterly from the center abutment for 12', the length of the easterly spillway would be increased to 70'.

This would give a total spillway of $56' + 70' = 126'$ in length and about 3.7' in depth. According to our formulas this spillway would pass a flow of 340 cubic feet per second per square mile. This figure is based on a watershed area of 8.8 square miles. While this capacity is not quite equal to the combined capacity of the two spillways on your Woodtick Dam it is 40% greater than the figure of 240 cubic feet per second per square mile that Mr. Blair recommended to Mrs. Cornelis in 1938."

We would like to have you study this matter of flashboards and report to us your decision because it will affect the design of the details.

I will be glad to meet with you and discuss the matter if you wish.

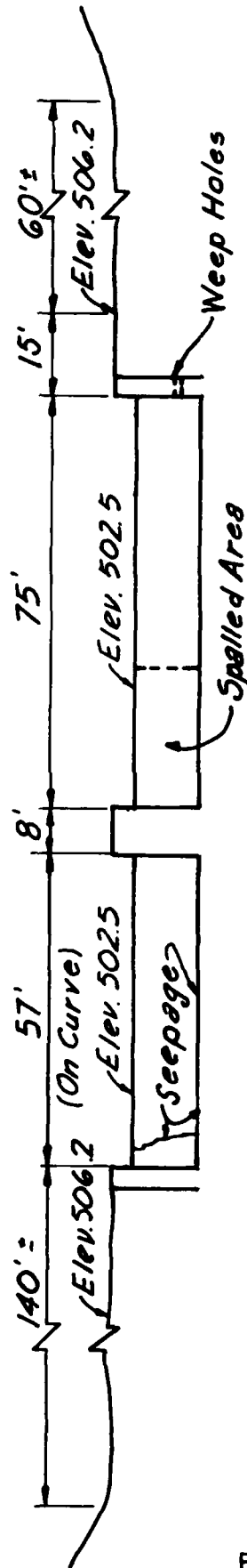
Very truly yours,

Roger C Brown

RCB:BFS

APPENDIX B-3

RECORD DRAWINGS AND SKETCHES



B-11

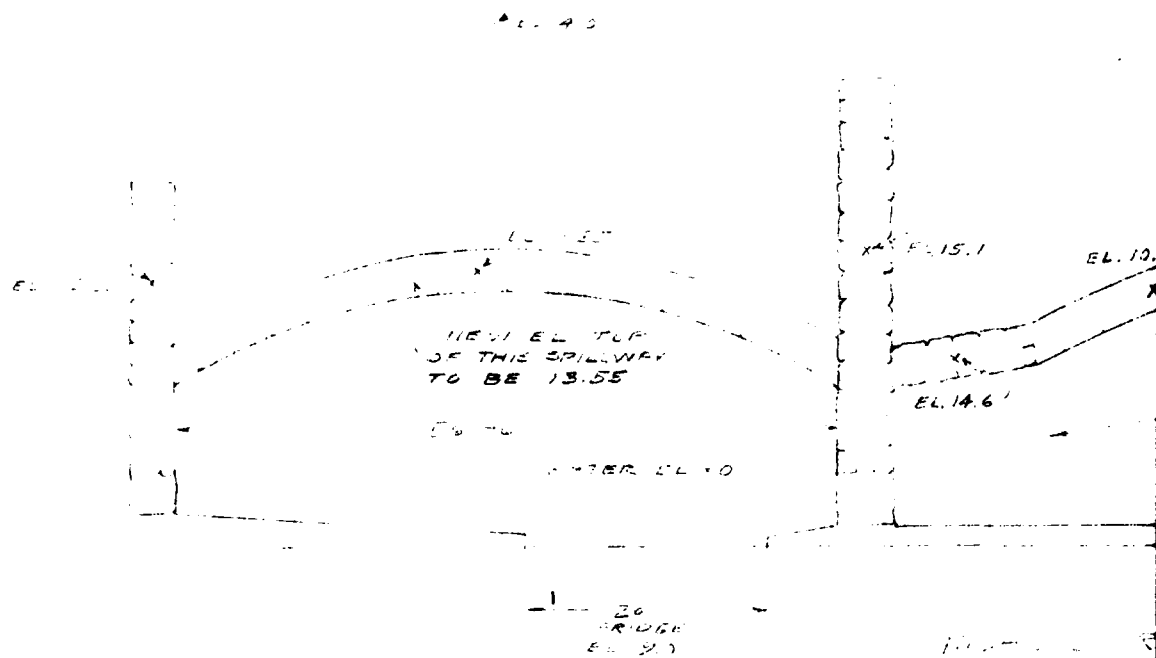
ELEVATION OF DAM - LOOKING UPSTREAM

SCALE 1" = 30'

CORNELIS DAM



JAMES P. PURCELL ASSOCIATES, INC.
ENGINEERS • ARCHITECTS • PLANNERS



THIS SPILLWAY IS TO BE
 REBUILT HEIGHT 13.55
 NEW OUTLINE SHOWN IN DASH

NEW EL. 13.55

EL. 6.2

EL. 14.0

EL. 15.1

EL. 10.62

EL. 14.7

EL. 14.6

STUPE OUT OF PLACE
IN THIS SECTION OF
SPILLWAY

SPILLWAY

EL. 2.5

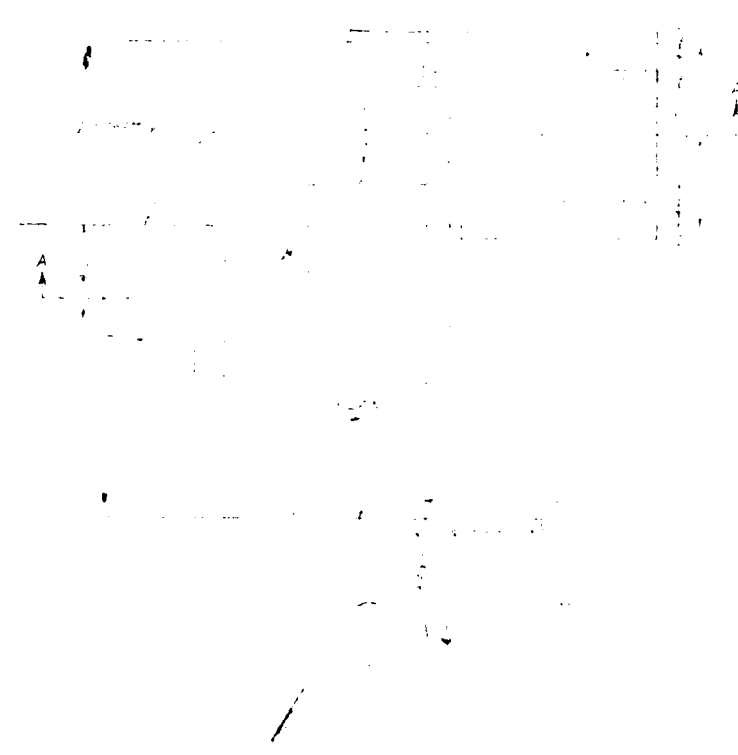
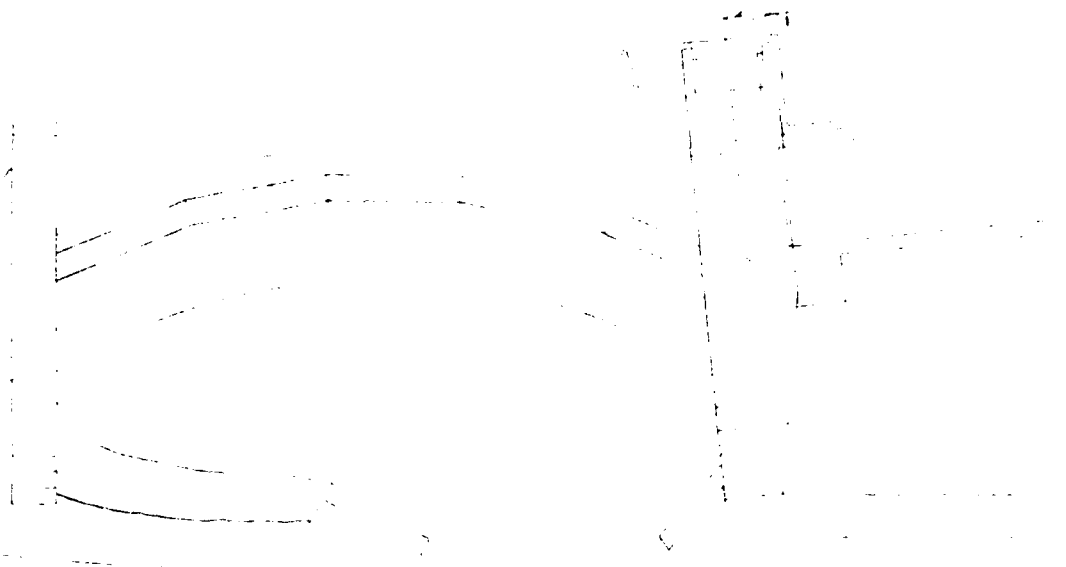
WATER ROAD

EL. 14.0
EL. 14.0
EL. 14.0

WATER ROAD
WATER INCREASED
SHOWN IN 1935

NEW EL. 12.69

N95363



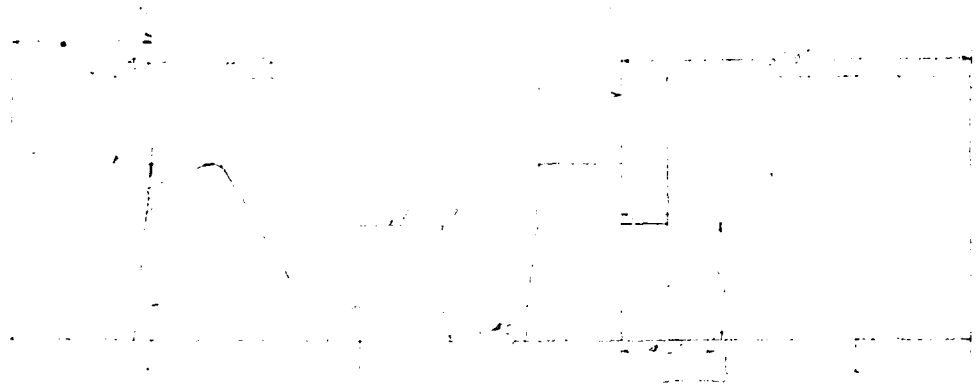
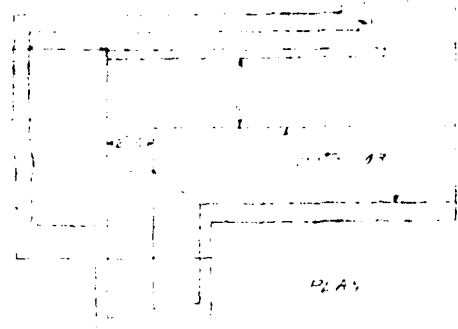
SPENCE BLAIR ASSOCIATES
ARCHITECTS
HARTFORD, CONNECTICUT
HARTFORD, CONN

1

12-0

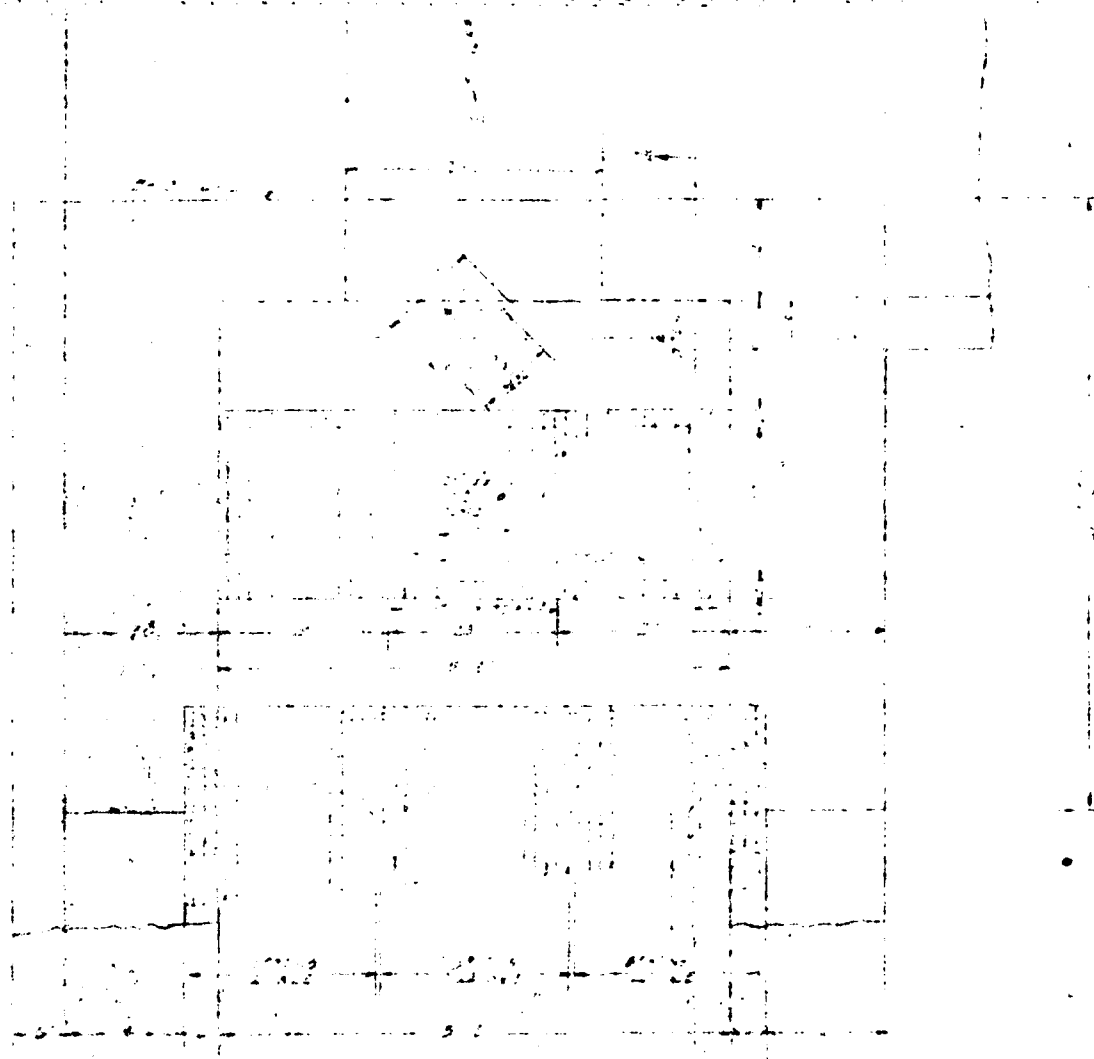
and other
information

Handwritten notes in the top left corner, including "Top 2" and "Handwritten notes".



Handwritten text "Y2" with an arrow pointing to a specific part of the drawing.

Handwritten number "2" inside a circle.



①

22

1000

Cat's paw

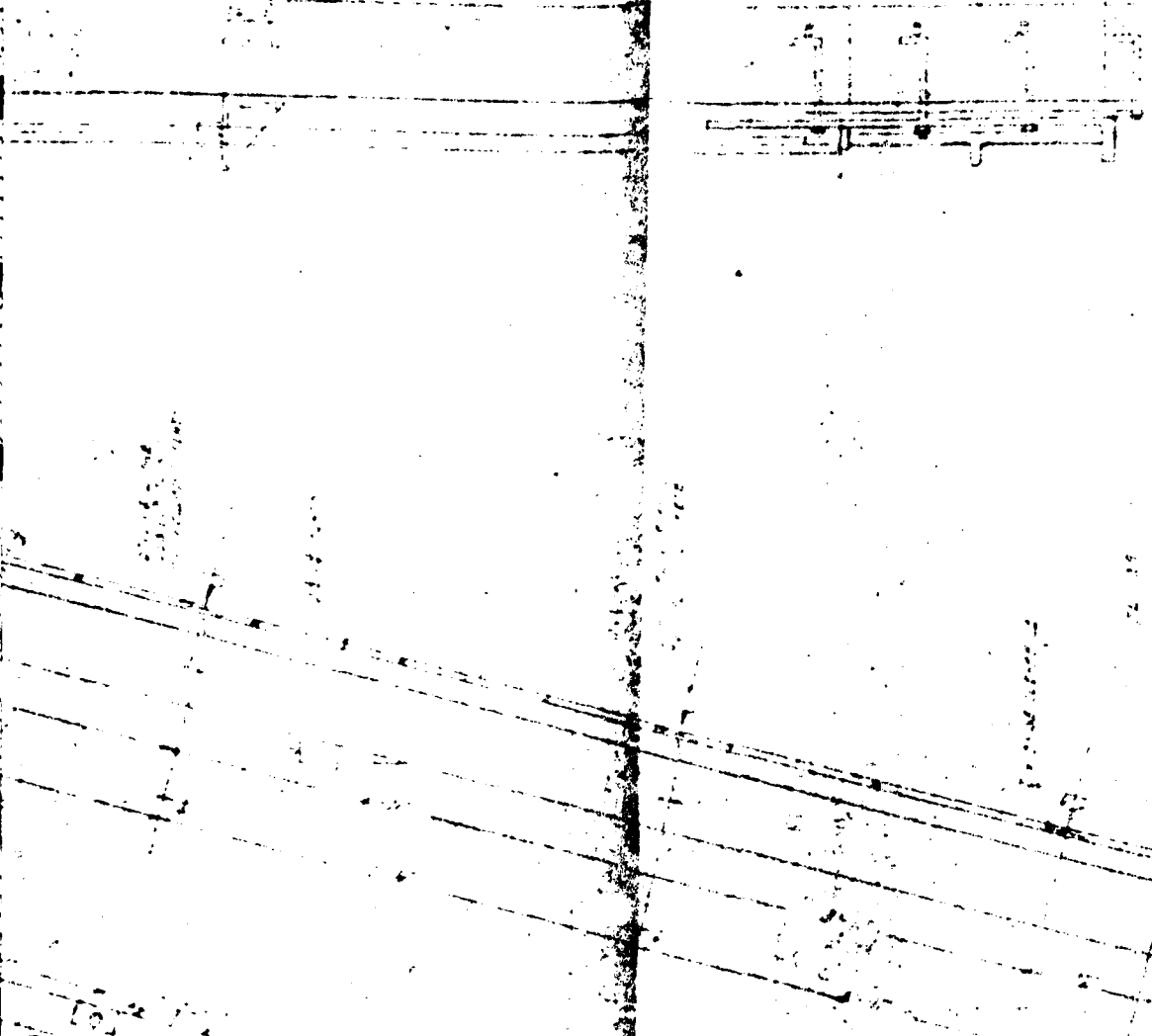
55

10

1. *Chlorophyll a* (Chl *a*)
 2. *Chlorophyll b* (Chl *b*)
 3. *Chlorophyll c* (Chl *c*)
 4. *Chlorophyll d* (Chl *d*)
 5. *Chlorophyll e* (Chl *e*)
 6. *Chlorophyll f* (Chl *f*)
 7. *Chlorophyll g* (Chl *g*)
 8. *Chlorophyll h* (Chl *h*)
 9. *Chlorophyll i* (Chl *i*)
 10. *Chlorophyll j* (Chl *j*)
 11. *Chlorophyll k* (Chl *k*)
 12. *Chlorophyll l* (Chl *l*)
 13. *Chlorophyll m* (Chl *m*)
 14. *Chlorophyll n* (Chl *n*)
 15. *Chlorophyll o* (Chl *o*)
 16. *Chlorophyll p* (Chl *p*)
 17. *Chlorophyll q* (Chl *q*)
 18. *Chlorophyll r* (Chl *r*)
 19. *Chlorophyll s* (Chl *s*)
 20. *Chlorophyll t* (Chl *t*)
 21. *Chlorophyll u* (Chl *u*)
 22. *Chlorophyll v* (Chl *v*)
 23. *Chlorophyll w* (Chl *w*)
 24. *Chlorophyll x* (Chl *x*)
 25. *Chlorophyll y* (Chl *y*)
 26. *Chlorophyll z* (Chl *z*)
 27. *Chlorophyll aa* (Chl *aa*)
 28. *Chlorophyll ab* (Chl *ab*)
 29. *Chlorophyll ac* (Chl *ac*)
 30. *Chlorophyll ad* (Chl *ad*)
 31. *Chlorophyll ae* (Chl *ae*)
 32. *Chlorophyll af* (Chl *af*)
 33. *Chlorophyll ag* (Chl *ag*)
 34. *Chlorophyll ah* (Chl *ah*)
 35. *Chlorophyll ai* (Chl *ai*)
 36. *Chlorophyll aj* (Chl *aj*)
 37. *Chlorophyll ak* (Chl *ak*)
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 39. *Chlorophyll am* (Chl *am*)
 40. *Chlorophyll an* (Chl *an*)
 41. *Chlorophyll ao* (Chl *ao*)
 42. *Chlorophyll ap* (Chl *ap*)
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 44. *Chlorophyll ar* (Chl *ar*)
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 48. *Chlorophyll av* (Chl *av*)
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 50. *Chlorophyll ax* (Chl *ax*)
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 55. *Chlorophyll acz* (Chl *acz*)
 56. *Chlorophyll adz* (Chl *adz*)
 57. *Chlorophyll aez* (Chl *aez*)
 58. *Chlorophyll afz* (Chl *afz*)
 59. *Chlorophyll agz* (Chl *agz*)
 60. *Chlorophyll ahz* (Chl *ahz*)
 61. *Chlorophyll aiz* (Chl *aiz*)
 62. *Chlorophyll ajz* (Chl *ajz*)
 63. *Chlorophyll akz* (Chl *akz*)
 64. *Chlorophyll alz* (Chl *alz*)
 65. *Chlorophyll amz* (Chl *amz*)
 66. *Chlorophyll anz* (Chl *anz*)
 67. *Chlorophyll aoz* (Chl *aoz*)
 68. *Chlorophyll apz* (Chl *apz*)
 69. *Chlorophyll aqz* (Chl *aqz*)
 70. *Chlorophyll arz* (Chl *arz*)
 71. *Chlorophyll asz* (Chl *asz*)
 72. *Chlorophyll atz* (Chl *atz*)
 73. *Chlorophyll auz* (Chl *auz*)
 74. *Chlorophyll avz* (Chl *avz*)
 75. *Chlorophyll awz* (Chl *awz*)
 76. *Chlorophyll axz* (Chl *axz*)
 77. *Chlorophyll ayz* (Chl *ayz*)
 78. *Chlorophyll ayz* (Chl *ayz*)
 79. *Chlorophyll azz* (Chl *azz*)
 80. *Chlorophyll azaa* (Chl *aza*)
 81. *Chlorophyll abz* (Chl *abz*)
 82. *Chlorophyll acz* (Chl *acz*)
 83. *Chlorophyll adz* (Chl *adz*)
 84. *Chlorophyll aez* (Chl *aez*)
 85. *Chlorophyll afz* (Chl *afz*)
 86. *Chlorophyll agz* (Chl *agz*)
 87. *Chlorophyll ahz* (Chl *ahz*)
 88. *Chlorophyll aiz* (Chl *aiz*)
 89. *Chlorophyll ajz* (Chl *ajz*)
 90. *Chlorophyll akz* (Chl *akz*)
 91. *Chlorophyll alz* (Chl *alz*)
 92. *Chlorophyll amz* (Chl *amz*)
 93. *Chlorophyll anz* (Chl *anz*)
 94. *Chlorophyll aoz* (Chl *aoz*)
 95. *Chlorophyll apz* (Chl *apz*)
 96. *Chlorophyll aqz* (Chl *aqz*)
 97. *Chlorophyll arz* (Chl *arz*)
 98. *Chlorophyll asz* (Chl *asz*)
 99. *Chlorophyll atz* (Chl *atz*)
 100. *Chlorophyll auz* (Chl *auz*)
 101. *Chlorophyll avz* (Chl *avz*)
 102. *Chlorophyll awz* (Chl *awz*)
 103. *Chlorophyll axz* (Chl *axz*)
 104. *Chlorophyll ayz* (Chl *ayz*)
 105. *Chlorophyll ayz* (Chl *ayz*)
 106. *Chlorophyll azz* (Chl *azz*)
 107. *Chlorophyll azaa* (Chl *aza*)
 108. *Chlorophyll abz* (Chl *abz*)
 109. *Chlorophyll acz* (Chl *acz*)
 110. *Chlorophyll adz* (Chl *adz*)
 111. *Chlorophyll aez* (Chl *aez*)
 112. *Chlorophyll afz* (Chl *afz*)
 113. *Chlorophyll agz* (Chl *agz*)
 114. *Chlorophyll ahz* (Chl *ahz*)
 115. *Chlorophyll aiz* (Chl *aiz*)
 116. *Chlorophyll ajz* (Chl *ajz*)
 117. *Chlorophyll akz* (Chl *akz*)
 118. *Chlorophyll alz* (Chl *alz*)
 119. *Chlorophyll amz* (Chl *amz*)
 120. *Chlorophyll anz* (Chl *anz*)
 121. *Chlorophyll aoz* (Chl *aoz*)
 122. *Chlorophyll apz* (Chl *apz*)
 123. *Chlorophyll aqz* (Chl *aqz*)
 124. *Chlorophyll arz* (Chl *arz*)
 125. *Chlorophyll asz* (Chl *asz*)
 126. *Chlorophyll atz* (Chl *atz*)
 127. *Chlorophyll auz* (Chl *auz*)
 128. *Chlorophyll avz* (Chl *avz*)
 129. *Chlorophyll awz* (Chl *awz*)
 130. *Chlorophyll axz* (Chl *axz*)
 131. *Chlorophyll ayz* (Chl *ayz*)
 132. *Chlorophyll ayz* (Chl *ayz*)
 133.

1945-1946

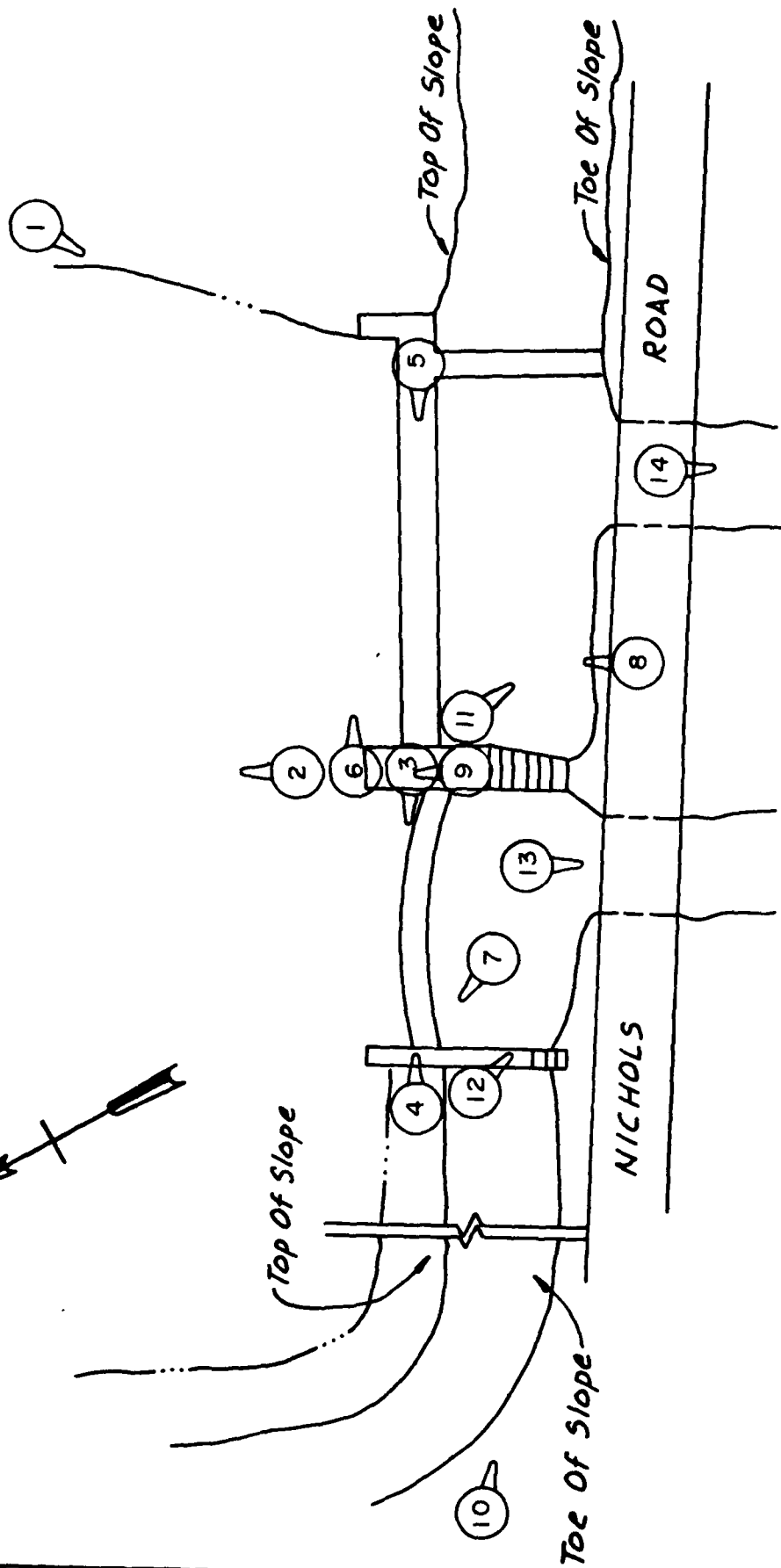
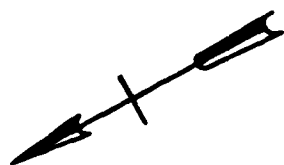
SECTION 22



APPENDIX C

PHOTOGRAPHS

Cornelis Pond



CORNELIS DAM
PHOTO INDEX



C-1 SPILLWAY - LOOKING SOUTH



C-2 WOODTICK RESERVOIR DAM (CT 294) -
LOOKING NORTH



C-3 WEST END OF WEST SPILLWAY - LOOKING
FROM CENTER ABUTMENT



C-4 EAST END OF WEST SPILLWAY - LOOKING
EAST



C-5 WEST END OF EAST SPILLWAY - LOOKING
WEST



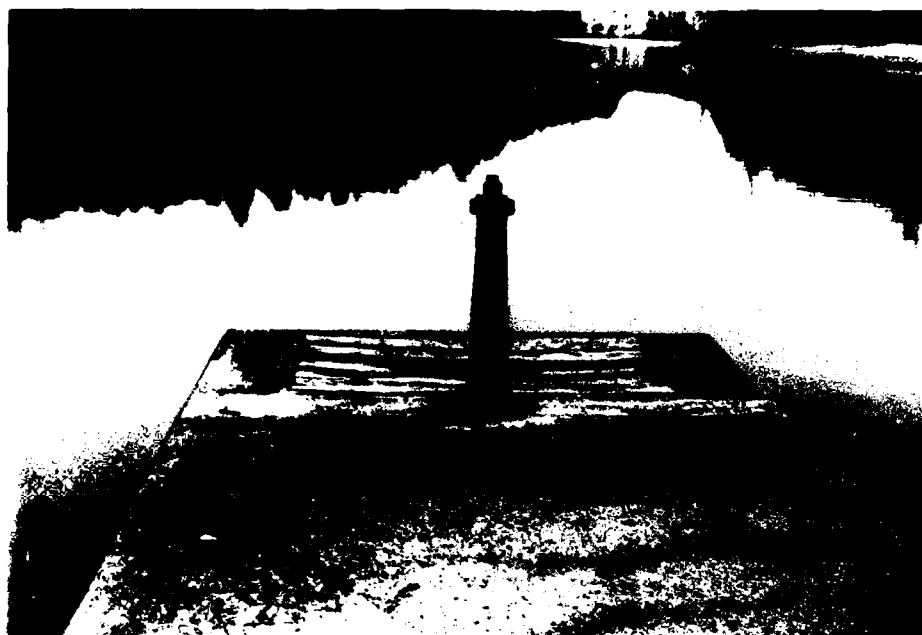
C-6 EAST END OF EAST SPILLWAY - LOOKING
FROM CENTER ABUTMENT



C-7 SEEPAGE AT WEST END
OF WEST SPILLWAY



C-8 SPALLING ON DOWNSTREAM FACE OF EAST SPILLWAY



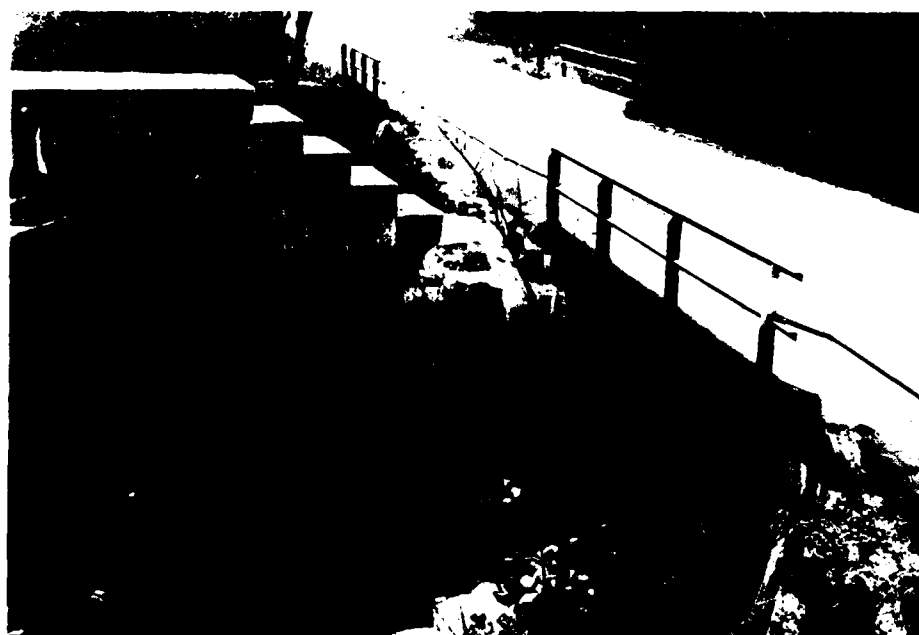
C-9 VALVE STEM FOR OUTLET WORKS



C-10 DOWNSTREAM FACE OF EARTH EMBANKMENT
TO WEST OF SPILLWAYS - LOOKING EAST



C-11 BRIDGE BELOW EAST SPILLWAY



C-12 BRIDGE BELOW WEST SPILLWAY



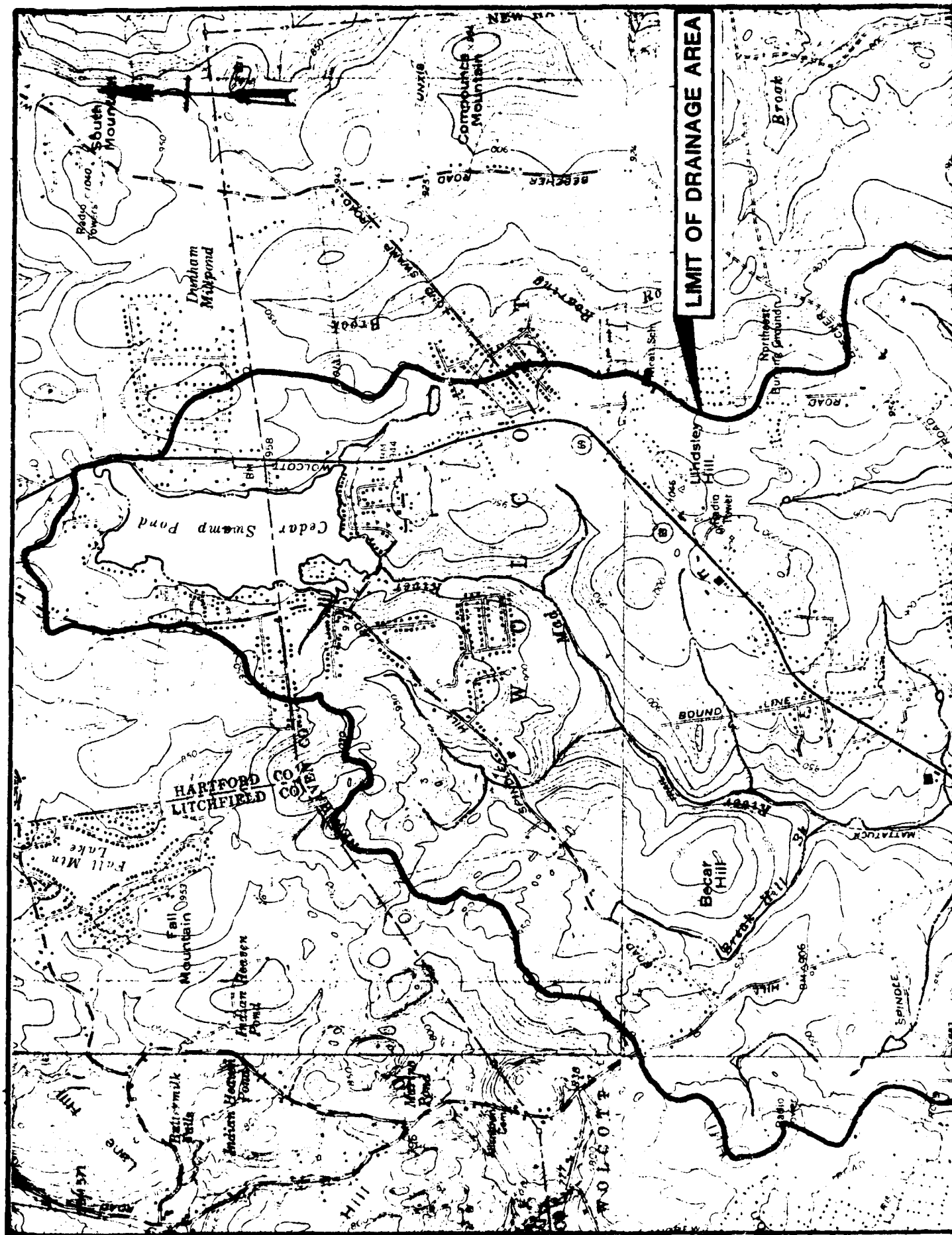
C-13 DOWNSTREAM CHANNEL BELOW WEST
SPILLWAY

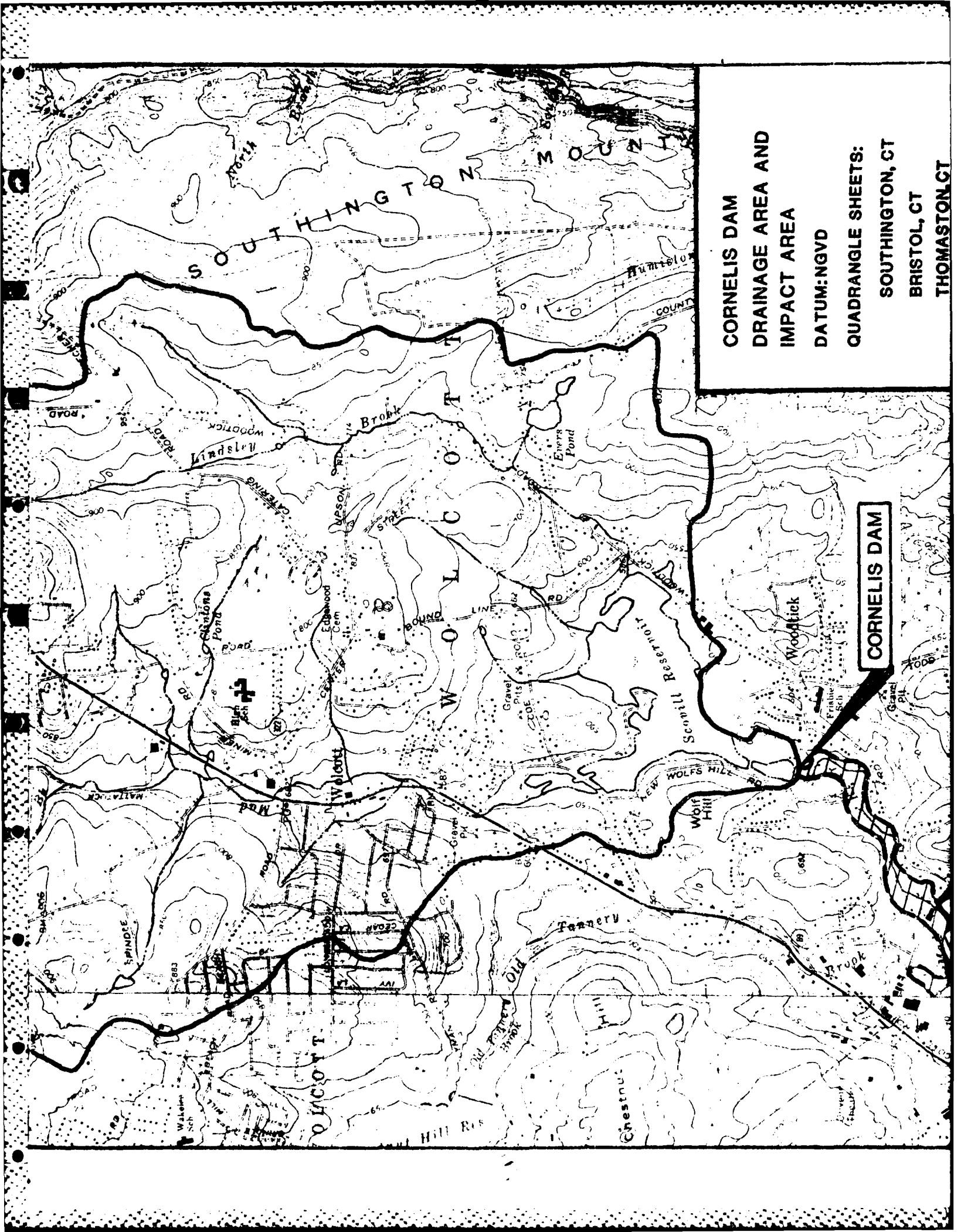


C-14 DOWNSTREAM CHANNEL BELOW EAST
SPILLWAY

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS





CORNELIS DAM
DRAINAGE AREA AND
IMPACT AREA
DATUM: NGVD
QUADRANGLE SHEETS:
SOUTHINGTON, CT
BRISTOL, CT
THOMASTON, CT

CORNELIS DAM

**CORNELIS DAM
DRAINAGE AREA AND
IMPACT AREA**

DATUM: NGVD

QUADRANGLE SHEETS:

SOUTHINGTON, CT

BRISTOL, CT

THOMASTON, CT

WATERBURY, CT

SCALE: 1:24000

PLATE NO. D-1



HYDROLOGIC AND HYDRAULIC ANALYSIS
SUMMARY SHEET

Dam CORNELIS DAM

Test Flood 1/2 PMF

INFLOW HYDROGRAPH DEVELOPMENT

Drainage Area 8.60 sq. mi.

Probable Maximum Precipitation
24 hour - 200 square mile PMP 21.5 inches

Initial Rainfall Loss 0 Inch
Uniform Rainfall Loss .1 Inch

Snyder's Lag 4.40 hours
Snyder's Peaking Coefficient .625

Test Flood Inflow 6040 CFS

PMF Inflow 12,180 CFS

RESERVOIR ROUTING AND DAM OVERTOPPING

Test Flood Outflow 6040 CFS

Spillway Capacity at Top of Dam	<u>2520</u>	CFS
	<u>42</u>	% of Test Flood

Flow Over Spillway at Test Flood	<u>4660</u>	CFS
----------------------------------	-------------	-----

Spillway Crest Elevation	<u>502.50</u>	Feet
Top of Dam Elevation	<u>506.23</u>	Feet
Test Flood Elevation	<u>508.12</u>	Feet

100

[illegible]

1105 = 52 = 1.00

[illegible]

ADDRESSES OF THE FOLLOWING INDIVIDUALS

ISTAU	ICOMP	IFCOP	ITAPE	JPLI	JPRT	INAMF	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

	EXPB6	LUMS	TAVE4	SNAP	INSDA	INSPC	RATIO	ISNOW	ISQF	LOCAL
	1	1	8.60	0.00	8.60	0.00	0.000	0	1	0

CASE	PAGE	OFFICE DATA		
0.00	21.70	116.00	174.00	133.50
				142.60
				0.00
				0.00

[illegible]

```
UNIT HYDROGRAPH DATA
ID= 4.40 CP= .53 N1= 0
```

[illegible][illegible]

STATISTICS

(a) $MOL = 43.4935$, $W = 1.0741$, $U = 0.0741$

[illegible]

[illegible]

1

0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	9000.	0.	10.	20.	30.	40.	50.	60.	70.	80.	90.	0.
1.00	11																			
2.00	21																			
3.00	31																			
4.00	41																			
5.00	51																			
6.00	61																			
7.00	71																			
8.00	81																			
9.00	91																			
0.00	101																			
1.00	111																			
2.00	121																			
3.00	131																			
4.00	141																			
5.00	151																			
6.00	1601																			
7.00	1701																			
8.00	1801																			
9.00	19.01																			
0.00	20.01																			
1.00	21.01																			
2.00	22.1																			
3.00	23.10																			
4.00	24.10																			
5.00	25.1																			
6.00	26.1																			
7.00	27.1																			
8.00	2810																			
9.00	2910																			
0.00	3010																			
1.00	3110																			
2.00	32.1																			
3.00	33.1																			
4.00	34.01																			
5.00	35.01																			
6.00	36.01																			
7.00	37.01																			
8.00	38.01																			
9.00	39.01																			
0.00	40.01																			
1.00	41.																			
2.00	42.																			
3.00	43.																			
4.00	44.																			
5.00	45.																			
6.00	46.																			
7.00	47.																			
8.00	48.																			
9.00	49.																			
0.00	50.																			
1.00	51.																			
2.00	52.																			
3.00	53.																			
4.00	54.																			
5.00	55.																			
6.00	56.																			
7.00	57.																			

STATION HOPEW PLN 1. RATIO 2

NUMBER OF PEAK FOR HYDROLOGICAL CALCULATES

INFLOW		OUTFLOW		STORAGE	
0.	0.	0.	0.	1.	1.
173.	173.	173.	173.	4.	4.
144.	144.	144.	144.	83.	83.
1706.	1706.	1706.	1706.	97.	97.
5925.	5925.	5925.	5925.	958.	958.
4823.	4823.	4823.	4823.	416.	416.
557.	557.	557.	557.	74.	74.
48.	48.	48.	48.	13.	13.

STAGE		STAGE		STAGE	
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0

STAGE		STAGE		STAGE	
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0
525.0	525.0	525.0	525.0	525.0	525.0

PEAK OUTFLOW IS 1217.5 LPM 45.00 HOURS

PEAK		PEAK		PEAK	
1217.5	1217.5	1217.5	1217.5	1217.5	1217.5
45.00	45.00	45.00	45.00	45.00	45.00
19.85	19.85	19.85	19.85	19.85	19.85
504.21	504.21	504.21	504.21	504.21	504.21
9100.	9100.	9100.	9100.	9100.	9100.
11245.	11245.	11245.	11245.	11245.	11245.

TOTAL VOLUME 116750.

3306.

21.05

534.60

9649.

11902.

	0.	2,000.	4,000.	6,000.	8,000.	10,000.	12,000.	14,000.	0.	0.	0.	0.	0.	0.
1.00	11	.	.	.	.	.	.	.	.	.	.	.	.	.
2.00	21	.	.	.	.	.	.	.	.	.	.	.	.	.
3.00	31	.	.	.	.	.	.	.	.	.	.	.	.	.
4.00	41	.	.	.	.	.	.	.	.	.	.	.	.	.
5.00	51	.	.	.	.	.	.	.	.	.	.	.	.	.
6.00	61	.	.	.	.	.	.	.	.	.	.	.	.	.
7.00	71	.	.	.	.	.	.	.	.	.	.	.	.	.
8.00	81	.	.	.	.	.	.	.	.	.	.	.	.	.
9.00	91	.	.	.	.	.	.	.	.	.	.	.	.	.
10.00	101	.	.	.	.	.	.	.	.	.	.	.	.	.
11.00	111	.	.	.	.	.	.	.	.	.	.	.	.	.
12.00	121	.	.	.	.	.	.	.	.	.	.	.	.	.
13.00	131	.	.	.	.	.	.	.	.	.	.	.	.	.
14.00	141	.	.	.	.	.	.	.	.	.	.	.	.	.
15.00	151	.	.	.	.	.	.	.	.	.	.	.	.	.
16.00	1601	.	.	.	.	.	.	.	.	.	.	.	.	.
17.00	1701	.	.	.	.	.	.	.	.	.	.	.	.	.
18.00	1801	.	.	.	.	.	.	.	.	.	.	.	.	.
19.00	1901	.	.	.	.	.	.	.	.	.	.	.	.	.
20.00	2001	.	.	.	.	.	.	.	.	.	.	.	.	.
21.00	2101	.	.	.	.	.	.	.	.	.	.	.	.	.
22.00	2201	.	.	.	.	.	.	.	.	.	.	.	.	.
23.00	2310	.	.	.	.	.	.	.	.	.	.	.	.	.
24.00	2410	.	.	.	.	.	.	.	.	.	.	.	.	.
25.00	2501	.	.	.	.	.	.	.	.	.	.	.	.	.
26.00	2601	.	.	.	.	.	.	.	.	.	.	.	.	.
27.00	2701	.	.	.	.	.	.	.	.	.	.	.	.	.
28.00	2810	.	.	.	.	.	.	.	.	.	.	.	.	.
29.00	2910	.	.	.	.	.	.	.	.	.	.	.	.	.
30.00	3010	.	.	.	.	.	.	.	.	.	.	.	.	.
31.00	3110	.	.	.	.	.	.	.	.	.	.	.	.	.
32.00	3201	.	.	.	.	.	.	.	.	.	.	.	.	.
33.00	3301	.	.	.	.	.	.	.	.	.	.	.	.	.
34.00	3401	.	.	.	.	.	.	.	.	.	.	.	.	.
35.00	3501	.	.	.	.	.	.	.	.	.	.	.	.	.
36.00	3601	.	.	.	.	.	.	.	.	.	.	.	.	.
37.00	3701	.	.	.	.	.	.	.	.	.	.	.	.	.
38.00	3801	.	.	.	.	.	.	.	.	.	.	.	.	.
39.00	3901	.	.	.	.	.	.	.	.	.	.	.	.	.
40.00	4001	.	.	.	.	.	.	.	.	.	.	.	.	.
41.00	4101	.	.	.	.	.	.	.	.	.	.	.	.	.
42.00	4201	.	.	.	.	.	.	.	.	.	.	.	.	.
43.00	4301	.	.	.	.	.	.	.	.	.	.	.	.	.
44.00	4401	.	.	.	.	.	.	.	.	.	.	.	.	.
45.00	4501	.	.	.	.	.	.	.	.	.	.	.	.	.
46.00	4601	.	.	.	.	.	.	.	.	.	.	.	.	.
47.00	4701	.	.	.	.	.	.	.	.	.	.	.	.	.
48.00	4801	.	.	.	.	.	.	.	.	.	.	.	.	.
49.00	4901	.	.	.	.	.	.	.	.	.	.	.	.	.
50.00	5001	.	.	.	.	.	.	.	.	.	.	.	.	.
51.00	5101	.	.	.	.	.	.	.	.	.	.	.	.	.
52.00	5201	.	.	.	.	.	.	.	.	.	.	.	.	.
53.00	5301	.	.	.	.	.	.	.	.	.	.	.	.	.
54.00	5401	.	.	.	.	.	.	.	.	.	.	.	.	.
55.00	5501	.	.	.	.	.	.	.	.	.	.	.	.	.
56.00	5601	.	.	.	.	.	.	.	.	.	.	.	.	.
57.00	5701	.	.	.	.	.	.	.	.	.	.	.	.	.

4.00 62.10
5.00 63.1
16.00 64.10
17.00 65.10
14.00 66.10
19.00 67.10
20.00 68.1
21.00 69.1
22.00 70.1
23.00 71.1
0.00 72.1
1.00 73.1
2.00 74.1
3.00 75.1

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ROUTING OUTFLOW HYDROGRAPH FROM LOWER RESERVOIR - OVERTOPPING ANALYSIS

CLASS	CLASS	AVG	INCS	ISAME	IOPI	IPMP	LSTR
0.6	0.000	0.00	1	1	0	0	0

SURFACE AREA=	5.	0.	7.
CAPACITY=	0.	13.	43.

ELEVATION=	500.	510.							
	CMEL	SPWLD	COOW	FXPW	ELFVL	COOL	CAREA	EXPL	
	502.5	132.0	2.7	1.5	0.0	0.0	0.0	0.0	

NAME DATA		
TOTAL	CURR	EXPR
506.02	2.07	1.05
		200.

STATION LOWER PLAN 1, RATIO 1

END-OF-TRIOD HYDROGRAPH ORDINATES

[illegible][illegible]

	STAGE			
502.5	502.5	502.5	502.5	502.5
502.6	502.5	502.5	502.6	502.8
502.7	502.5	502.5	502.6	502.9
502.8	502.5	502.5	502.6	502.9

PEAK	5-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
105	5107.	2247.	510.	5816.
106	145.	65.	73.	1651.
107	5552	9590	1051	1051.
108	140.32	251.37	267.03	267.03
AC-1	2533.	4537.	4614.	4819.
TRANS-10-4	3124.	5590.	5745.	5945.

Tulus, L. A.

STATION LOWF4

[illegible]

STATION LOADS, PLAN 1, RATIO 2

OUTLET-TO-INTAKE HYDROGRAPH COORDINATES

OUTFLOW									
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
331.	361.	392.	421.	451.	481.	511.	541.	571.	601.
110.	187.	132.	203.	234.	264.	294.	324.	354.	384.
474.	771.	1074.	1213.	1214.	1034.	814.	597.	381.	164.
394.	327.	254.	203.	157.	114.	74.	34.	0.	0.
460.	373.	300.	240.	187.	142.	107.	82.	63.	50.
41.	37.	27.	23.	19.	15.	11.	8.	6.	5.

STORAGE									
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4.	5.	5.	4.	4.	4.	3.	3.	3.	2.
27.	35.	42.	48.	46.	41.	38.	34.	30.	27.
24.	22.	19.	17.	14.	12.	10.	9.	8.	7.
6.	5.	4.	4.	3.	3.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

STAGE									
502.5	502.5	502.5	502.5	502.5	502.5	502.5	502.5	502.5	502.5
502.6	502.6	502.6	502.6	502.6	502.6	502.6	502.6	502.6	502.6
502.7	502.7	502.7	502.7	502.7	502.7	502.7	502.7	502.7	502.7
503.0	503.0	503.0	503.0	503.0	503.0	503.0	503.0	503.0	503.0
507.5	504.8	504.8	510.4	510.4	509.4	508.7	508.1	507.6	507.6
507.2	506.7	506.3	505.3	505.0	504.6	504.3	504.1	503.9	503.9
503.7	503.5	503.4	503.3	503.2	503.0	502.9	502.8	502.8	502.8
502.7	502.7	502.7	502.7	502.6	502.6	502.6	502.6	502.6	502.6

PEAK OUTFLOW IS 1721.4 AT TIME 45.00 HOURS

TOTAL VOLUME				
CFR	1721.4	6-HOUR	72-HOUR	11674.1
C/S	346.	24-HOUR	4544.	1671.
INCHES				
MM				
AC-FI				
THOUS CU FT				

TABLE I. $\omega_{\text{eff}}(z)$, $\omega_{\text{eff}}(z)$ AND $\omega_{\text{eff}}(z)$

[illegible]

HEAD RISE AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS TO COMPLETION PER SECOND (CUBIC METERS PER SECOND)
 AREA 1 SQUARE MILES (SQUARE KILOMETERS)

OPERATION STATION AREA PLAN RATIO 1 RATIO 2
 .50 1.00

HYDROGRAPH AT	1	0.60	1	0.50	1.00	1.00
	(	22.27)	(	178.68)	(	357.36)
ROUTED TO	0.60	1	0.50	1.00	1.00	1.00
	(	22.27)	(	170.64)	(	344.83)
ROUTED TO	0.60	1	0.50	1.00	1.00	1.00
	(	22.27)	(	171.20)	(	345.87)

PLAN 1

ELEVATION
AT DAM
OUTFLOW

INITIAL VALUE
525.00
0.
0.

SPILLWAY CREST
525.00
0.
0.

TOP OF DAM
529.50
540.
507.4

WOODSTICK RESERVOIR DAM

RATIO OF PPE	MAXIMUM WATER ELEV OVER DAM	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.50	529.94	4.4	642.	603.	3.00	45.00	0.00
1.00	532.28	2.78	954.	1217.	8.00	45.00	0.00

PLAN 1

ELEVATION
STORAGE
OUTFLOW

INITIAL VALUE
507.50
1.
0.

SPILLWAY CHEST
507.50
0.
0.

TOP OF DAM
506.23
10.
2520.

UNIONVILLE RESERVOIR UPPER DAM

RATIO OF
MAXIMUM
STORAGE
MAXIMUM
DEPTH
OVER DAM
MAXIMUM
OUTFLOW
(FS)
DURATION
OVER TOP
HOURS
TIME OF
MAX OUTFLOW
HOURS
TIME OF
FAILURE
HOURS

0.5
1.00
504.12
510.34
1.49
4.15
30.
46.
60.6.
1221+.
9.00
14.00
45.00
45.00
0.00
0.00

CORNELIS DAM

Dam Failure Analysis

1. Failure discharge with pool at spillway (elev. 502.5) = 3650 CFS
2. Depth of water in reservoir at time of failure = 11.6 ft.
3. Maximum depth of flow downstream of dam = 10.5 ft.
4. Water surface elevation just downstream)
of dam at time of failure) = 500.5

The failure discharge of 3650 CFS will enter and flow downstream 6000 feet until the brook enters a large swampy area. Valley storage in this 6000 feet length of brook is significant in reducing the discharge. Also due to roughness characteristics, obstructions and frictional losses, it is very likely that the unsteady dam failure flow will dissipate its wave and kinetic energy and thus convert to steady and uniform flow obeying Manning's formulae 6000 feet downstream. The failure profile will have the following hydraulic characteristics:

DISTANCE FROM THE DAM	WATER SURFACE ELEVATION	DEPTH (ft.)	REMARKS
40	500.5	10.5	Nichols Road Swampy area confluence with old Tannery Brook
1000	482.7	2.7	
2500	470.0	5.0	
3300	465.4	3.4	
4000	460.6	0.6	
6000	456.4	0.4	

NOTES:

AD-A144 080

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
CORNELIS DAM (CT 0029. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAR 81

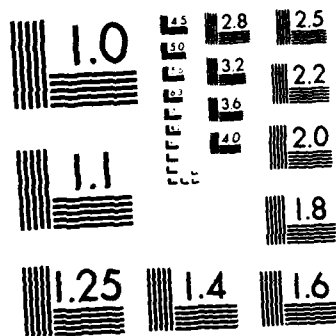
2/2

UNCLASSIFIED

F/G 13/13

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

"Rule of Thumb" Guidance for Estimating
Downstream Dam Failure Analysis

DATA

Name of Dam CORNELIS DAM
Location WOLCOTT, CONNECTICUT
Drainage Area 8.6 sq. mi., Top of Dam 506.23
Spillway Type broad, Crest of Spillway 502.50
Surface Area @ Crest Elev. 4.5 Acres = 0.007 sq. mi.
Pool Bottom Near Dam = 490.93
Assumed Side Slopes of Embankments = 2:1
Depth of Pool at Dam (Y_o) = 11.6 Feet
Mid-Height Elev. 496.72
Length of Dam at Crest = 136 Feet
Length of Dam at Mid-Height = 136 Feet
40% of Dam Length at Mid-Height = W_b = 55 Feet

Step 1

Storage (S) at time of failure 30 Ac-FT

Step 2

Peak Failure Discharge
 $Q_{pl} = 8/27 W_b \sqrt{g} Y_o^{3/2}$

$$= (1.68) (W_b) (Y_o)^{3/2} = \underline{3650} \text{ cfs}$$

Failure is assumed to coincide with pool elevation at spillway

NOTES: Failure with pool at top of dam would result in flow of 5500 CFS. Full spillway flow would be 2520 CFS. The increase in flooding due to dam failure with pool at top of dam would not be as significant as dam failure with pool at spillway crest.

BY ERJ DATE 11/12/80 SUBJECT DAM INSPECTION STUDY

SHEET NO. 1 OF 6

CHKD. BY JK DATE 12/5/80

DAM FAILURE ANALYSIS

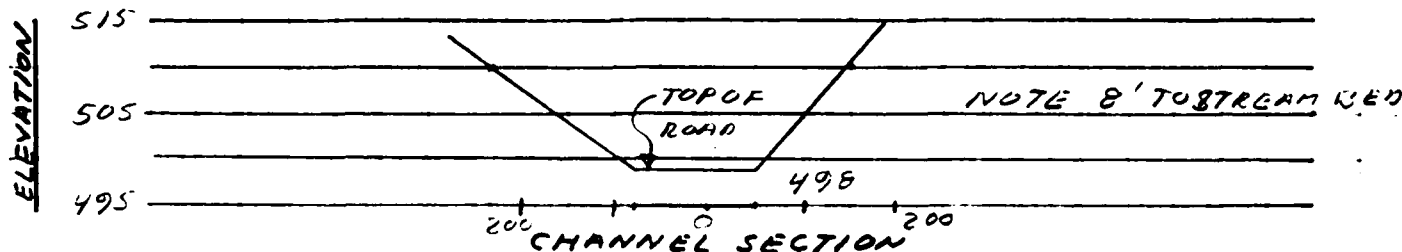
JOB NO. 80-100/04

PURCELL ASSOCIATES
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DAM CORNELIS DAM

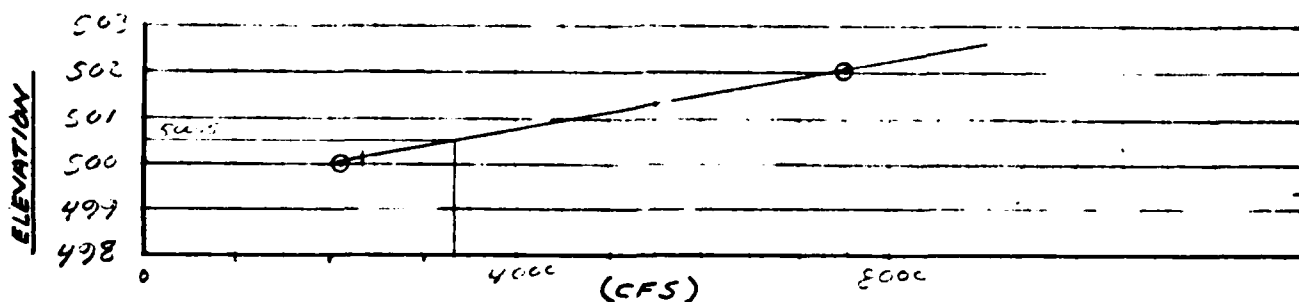
SECTION 40' FROM DAM (ROAD) ASSUME OPENINGS BLOCKED
WITH DELTAS

USING $Q = \frac{1.486}{n} A R^{2/3} S_L^{1/2}$ $n = \underline{.03}$ SLOPE (S_L) = .01



$Q_p = \underline{3650}$ CFS FULL SPILLWAY $Q_s = \underline{0}$ CFS
TOTAL STORAGE (S) = 30 AC-FT

ELEV	AREA	WP	R	Q	DEPTH
505	1421	270	5.2	21,000	7
500	296	160	19	2215	2
502	672	200	34	7487	4



$$V_1 = \left(\frac{7}{2} \right) \left(\frac{7}{2} \right) \left(\frac{1}{43560} \right) \left(\frac{1}{2} \right) = \underline{\hspace{2cm}} \text{ AC-FT}$$

$$Q_{P2} = Q_p (1 - V_1/S) = \underline{\hspace{2cm}} \text{ CFS} \quad V_{AVG} = \underline{\hspace{2cm}}$$

$$V_2 = \left(\frac{7}{2} \right) \left(\frac{7}{2} \right) = \underline{\hspace{2cm}} \text{ AC-FT}$$

$$Q_{P2} = Q_p (1 - V_{AVG}/S) = \underline{3650} \text{ CFS} \quad \text{ELEV} = \underline{500.5}$$

DEPTH = 2.5
OVER ROAD

FULL SPILLWAY & DEPTH = 0

INCREASE DUE TO DAM FAILURE = 2.5
OVER ROAD

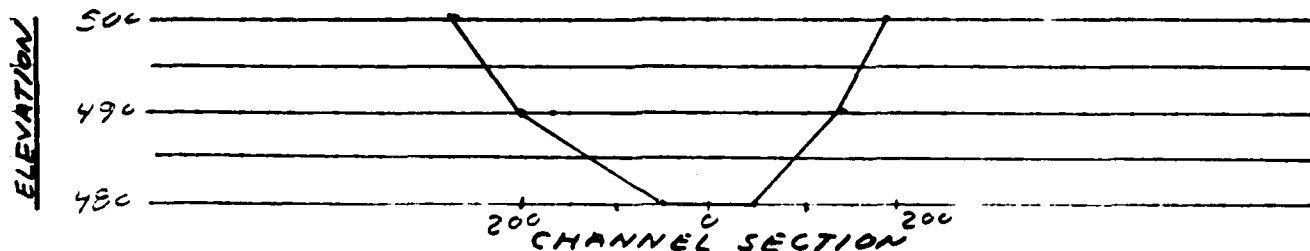
BY BRJ DATE 11/19/80 SUBJECT DAM INSPECTION STUDY
 CHKD. BY JR DATE 12/5/80
DAM FAILURE ANALYSIS

SHEET NO. 2 OF 6
 JOB NO. 80-100/04
 PURCELL ASSOCIATES
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DAM CORNELIS DAM

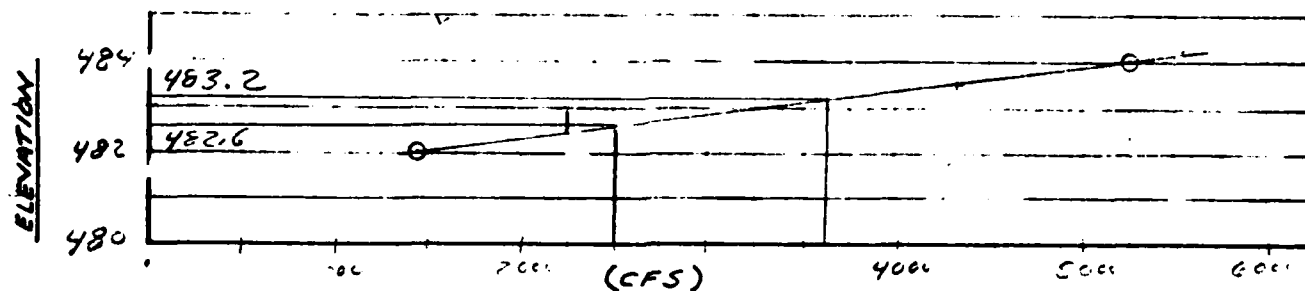
SECTION 1000' DOWNSTREAM

USING $Q = \frac{1.486}{n} A R^{2/3} S_L^{1/2}$ $n = \underline{.05}$ SLOPE (S_L) = .02



$Q_P = \underline{3650}$ CFS FULL SPILLWAY $Q_s = \underline{0}$ CFS
 TOTAL STORAGE (S) = 30 AC-FT

ELEV	AREA	WP	R	Q	DEPTH
485	813	225	3.6	8068	5
482	230	130	2.8	1400	2
484	601	200	2.2	5260	7



$$V_1 = \left(\frac{2.5 + 3.2}{2} \right) \left(\frac{180+140}{2} + \frac{180+100}{2} \right) \left(\frac{960}{43560} \right) \left(\frac{1}{2} \right) = \underline{9.4} \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_1/S) = \underline{2500} \text{ CFS} \quad V_{AVE} = \underline{8.9}$$

$$V_2 = \left(\frac{2.5 + 2.6}{2} \right) (3.3) = \underline{8.4} \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_{AVE}/S) = \underline{2600} \text{ CFS} \quad \text{ELEV} = \underline{482.7}$$

$$\text{DEPTH} = \underline{2.7}$$

FULL SPILLWAY DEPTH = 0

INCREASE DUE TO DAM FAILURE = 2.7

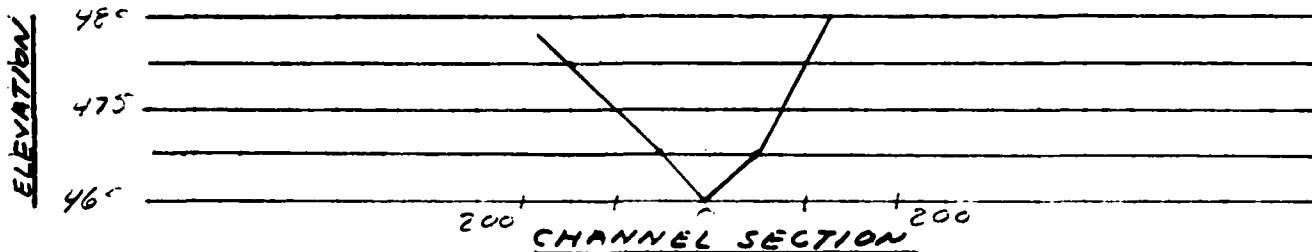
BY EDJ DATE 11/19/86 SUBJECT DAM INSPECTION STUDY
 CHKD. BY JR DATE 12/5/86
DAM FAILURE ANALYSIS

SHEET NO. 3 OF 6
 JOB NO. 80-100/04
 PURCELL ASSOCIATES
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DAM CORNELIS DAM

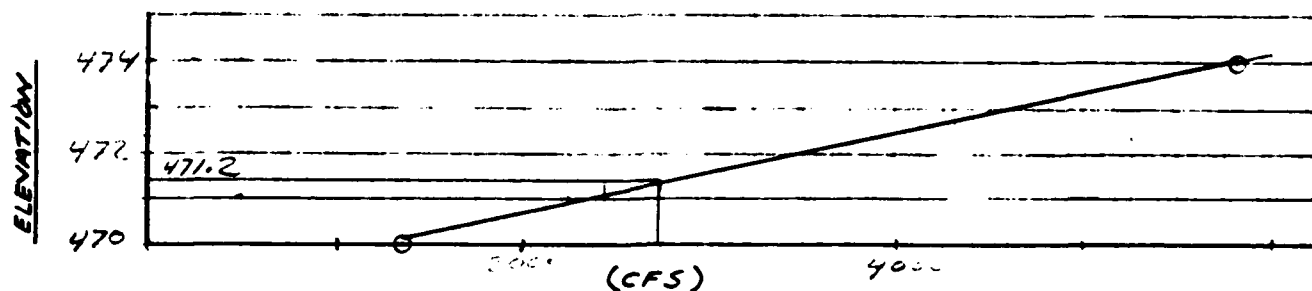
SECTION 2500' FROM DAM

USING $Q = \frac{1.486}{n} A R^{2/3} S_L^{1/2}$ $n = \underline{.05}$ SLOPE (S_L) = .01



$Q_P = \underline{2600}$ CFS FULL SPILLWAY $Q_S = \underline{0}$ CFS
 TOTAL STORAGE (S) = 30 AC-FT

ELEV	AREA	WP	R	Q	DEPTH
475	1000	180	5.6	9300	10
470	250	100	2.5	1372	5
474	720	160	4.5	5800	9



$$V_1 = \left(\frac{2.6 + 6.2}{2} \right) \left(\frac{180 + 100}{2} + \frac{120 + 0}{2} \right) \left(\frac{1500}{43560} \right) \left(\frac{1}{2} \right) = \underline{15.2} \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_1/S) = \underline{1300} \text{ CFS} \quad V_{AVG} = \underline{14.2}$$

$$V_2 = \left(\frac{2.6 + 5.0}{2} \right) (3.4) = \underline{13.1} \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_{AVG}/S) = \underline{1400} \text{ CFS} \quad \text{ELEV} = \underline{470.0}$$

DEPTH = 5.0

FULL SPILLWAY DEPTH = 0

INCREASE DUE TO DAM FAILURE = 5.0

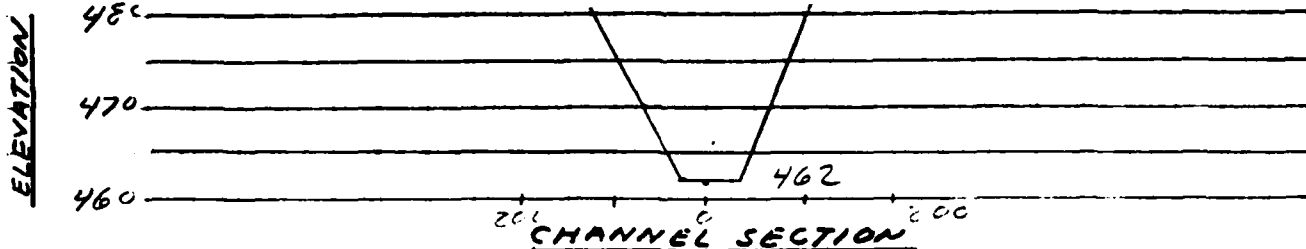
BY EDJ DATE 11/19/80 SUBJECT DAM INSPECTION STUDY
 CHKD. BY JR DATE 12/5/80
DAM FAILURE ANALYSIS

SHEET NO. 4 OF 6
 JOB NO. 80-100/04
 PURCELL ASSOCIATES
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DAM CORNELIS DAM

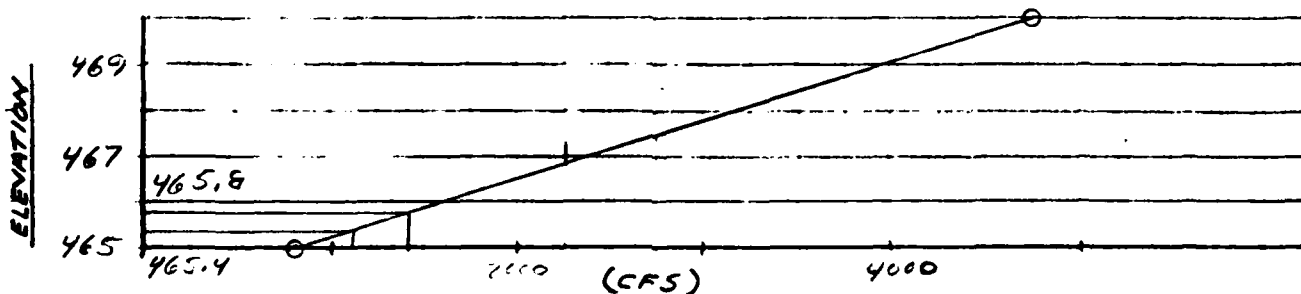
SECTION 3300' FROM DAM

USING $Q = \frac{1.486}{n} A R^{2/3} S_L^{1/2}$ $n = .05$ SLOPE (S_L) = .003



$Q_P = 1400$ CFS FULL SPILLWAY $Q_S = 0$ CFS
 TOTAL STORAGE (S) = 30 AC-FT

ELEV	AREA	WP	R	Q	DEPTH
470	860	140	6.1	4700	8
465	249	90	2.8	800	3



$$V_1 = \left(\frac{5.0 + 3.8}{2} \right) \left(\frac{1200}{2} + \frac{100+60}{2} \right) \left(\frac{800}{43560} \right) \left(\frac{1}{2} \right) = 5.7 \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_1/S) = 1100 \text{ CFS} \quad V_{AVG} = 5.6$$

$$V_2 = \left(\frac{5.0 + 3.4}{2} \right) (1.3) = 5.5 \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_{AVG}/S) = 1100 \text{ CFS} \quad \text{ELEV} = 465.4$$

$$\text{DEPTH} = 3.4$$

FULL SPILLWAY DEPTH = 0
 INCREASE DUE TO DAM FAILURE = 3.4

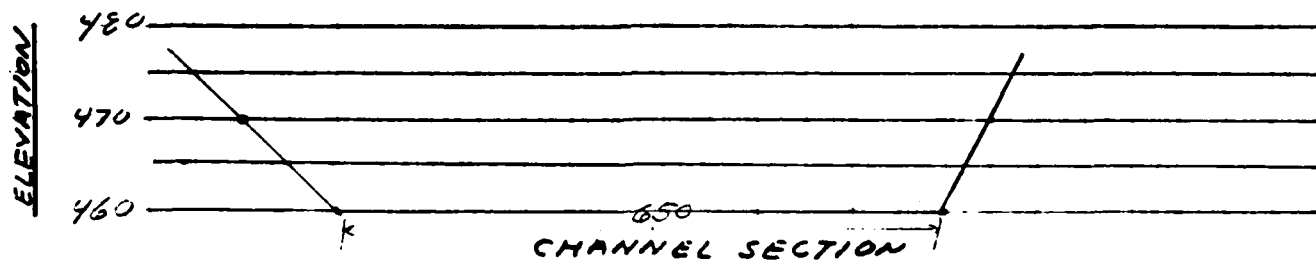
BY EDJ DATE 11/19/80 SUBJECT DAM INSPECTION STUDY
 CHKD. BY JP DATE 12/5/80
DAM FAILURE ANALYSIS

SHEET NO. 5 OF 6
 JOB NO. 80-100/04
FURCELL ASSOCIATES
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DAM CORNELIS DAM

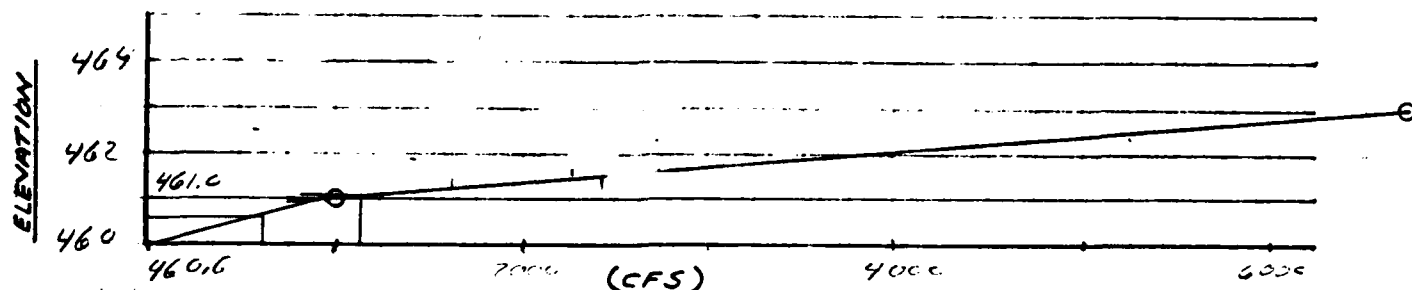
SECTION 4000' FROM DAM

USING $Q = \frac{1.486}{n} A R^{2/3} S_L^{1/2}$ $n = \underline{.05}$ SLOPE (S_L) = .003



$Q_P = \underline{1100}$ CFS FULL SPILLWAY $Q_S = \underline{0}$ CFS
 TOTAL STORAGE (S) = 30 AC-FT

ELEV	AREA	WP	R	Q	DEPTH
465	3450	730	4.7	16000	5
463	2025	700	2.9	6712	3
461	650	650	1.0	1060	1



$$V_1 = \left(\frac{3.4 + 1.0}{2} \right) \left(\frac{10060}{2} + \frac{650 \times 650}{2} \right) \left(\frac{700}{43560} \right) \left(\frac{1}{2} \right) = \underline{13.0} \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_1/S) = \underline{600} \text{ CFS} \quad V_{AVG} = \underline{12.4}$$

$$V_2 = \left(\frac{3.4 + 0.6}{2} \right) (5.9) = \underline{11.8} \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_{AVG}/S) = \underline{650} \text{ CFS} \quad \text{ELEV} = \underline{460.6}$$

$$\text{DEPTH} = \underline{0.6}$$

FULL SPILLWAY & DEPTH = 0

INCREASE DUE TO DAM FAILURE = 0.6

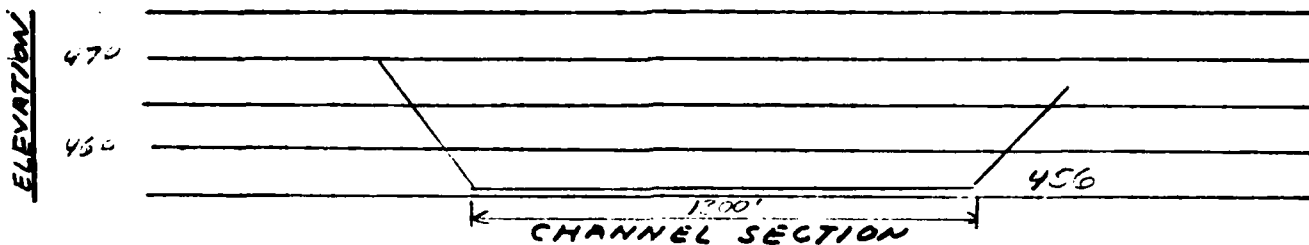
BY HR DATE 11/19/80 SUBJECT DAM INSPECTION STUDY
 CHKD. BY JR DATE 12/5/80
DAM FAILURE ANALYSIS

SHEET NO. 6 OF 6
 JOB NO. 80-100/04
 PURCELL ASSOCIATES
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DAM CORNELIS DAM

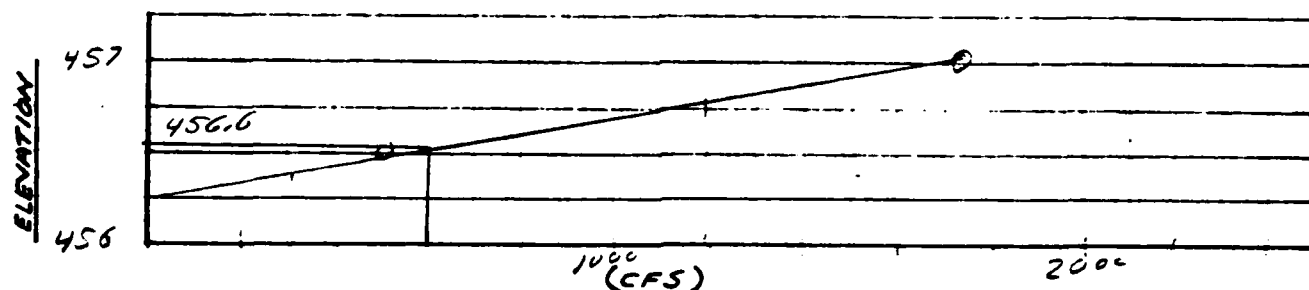
SECTION 6000 1 1 1 7 FLOW UNIT

USING $Q = \frac{1.486}{n} A R^{2/3} S_L^{1/2}$ $n = .05$ SLOPE (S_L) = .002



$Q_P = 650$ CFS FULL SPILLWAY $Q_S = 0$ CFS
 TOTAL STORAGE (S) = 30 AC-FT

ELEV	AREA	WP	R	Q	DEPTH
457	1300	1300	1	1732	1
456.5	650	1300	.5	545	.5



$$V_1 = \left(\frac{0.6 + 0.6}{2} \right) \left(\frac{650 + 650}{2} + \frac{1300 + 1300}{2} \right) \left(\frac{2000}{43560} \right) \left(\frac{1}{2} \right) = 26.8 \text{ AC-FT}$$

OVER 1/2, BUT USE OVER TO GET DEPTH OF FLOW

$$Q_{P2} = Q_P (1 - V_1/S) = 100 \text{ CFS} \quad V_{AVG} = 22.3$$

$$V_2 = \left(\frac{0.6 + 0.2}{2} \right) (44.7) = 17.9 \text{ AC-FT}$$

$$Q_{P2} = Q_P (1 - V_{AVG}/S) = 200 \text{ CFS} \quad \text{ELEV} = 456.4$$

DEPTH = 0.4

FULL SPILLWAY DEPTH = -

INCREASE DUE TO DAM FAILURE = 0.4

CORNELIS DAM

A. Size Classification

Height of dam = 15.3 ft.; hence small

Storage capacity at top of dam (elev. 506.23) = 50 AC-FT.; hence small

Adopted size classification: small

B.i) Hazard Potential

Failure of the dam can cause damage to many homes and
buildings between the dam and Old Tannery Brook. Dwellings
in Waterbury may also be damaged.

Adopted hazard classification: High

ii) Impact of Failure of Dam with pool at spillway crest

It is estimated from the "rule of thumb" failure hydrograph, that the following adverse impacts are a possibility by the failure of this dam.

- a) Loss of homes 6+ ;
- b) Loss of buildings 2+ ;
- c) Loss of highways or roads 2+ ;
- d) Loss of bridges 1+ ;

The failure profile can affect a distance of 6000 feet from the dam.

C. Hazard Potential Classifications

<u>HAZARD</u>	<u>SIZE</u>	<u>TEST FLOOD RANGE</u>
<u>High</u>	<u>Small</u>	<u>1/2 PMF to PMF</u>
Adopted Test Flood = <u>1/2 PMF</u> = <u>700</u> CSM		
= <u>6040</u> CFS		

D. Overtopping Potential

Drainage Area -- = 8.60 sq. miles

Spillway crest elevation = 502.50

Top of Dam Elevation = 506.23

Maximum spillway discharge

Capacity without overtopping of dam = 2520 CFS
 "test flood" inflow discharge = 6040 CFS
 "test flood" outflow discharge = 6040 CFS

RATING CURVE DEVELOPMENT

CORNELIS DAM

Spillway

$$Q = CLH^{3/2}$$

$$C = 2.65$$

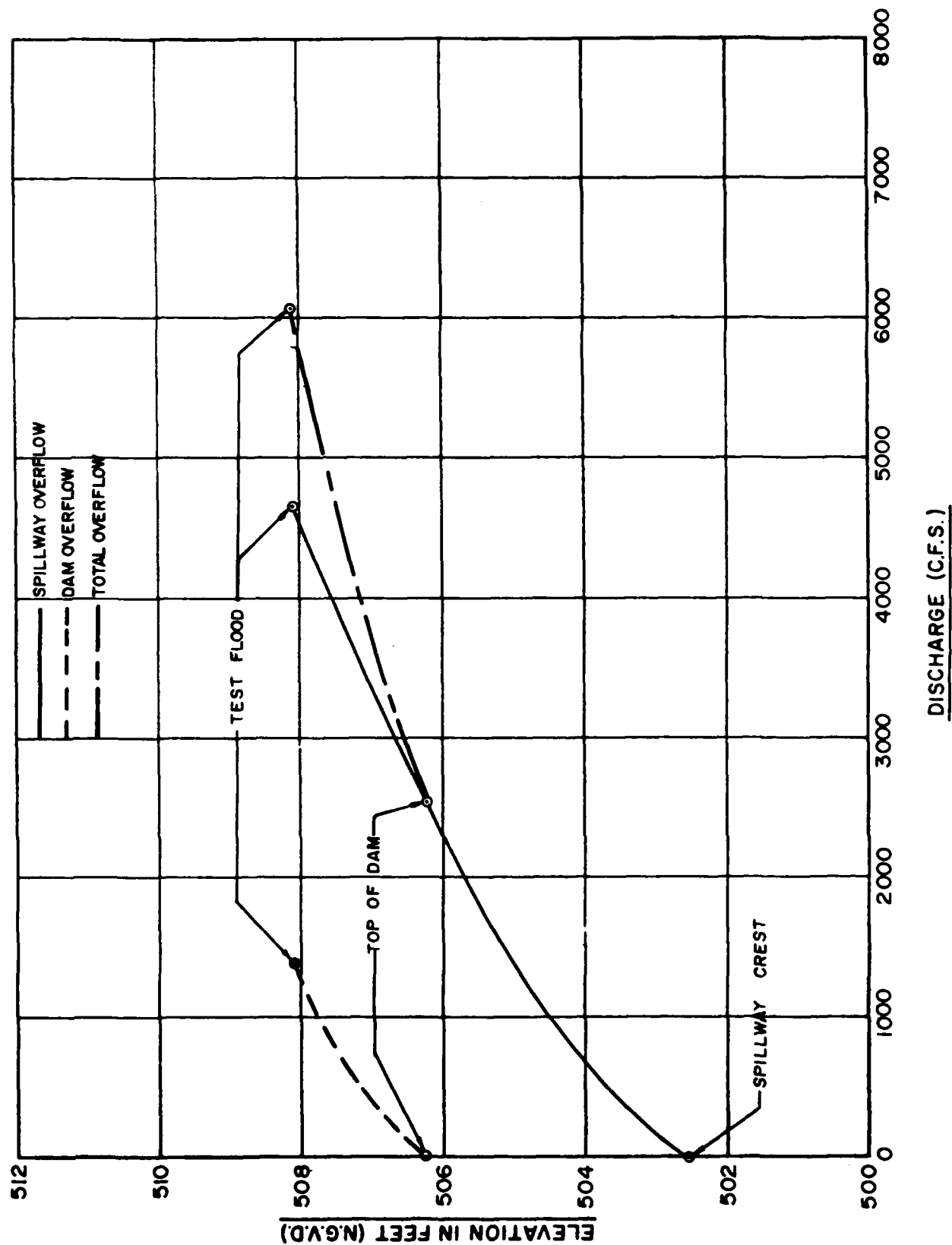
$$L = 132 \text{ Feet}$$

30 Inch Blowoff

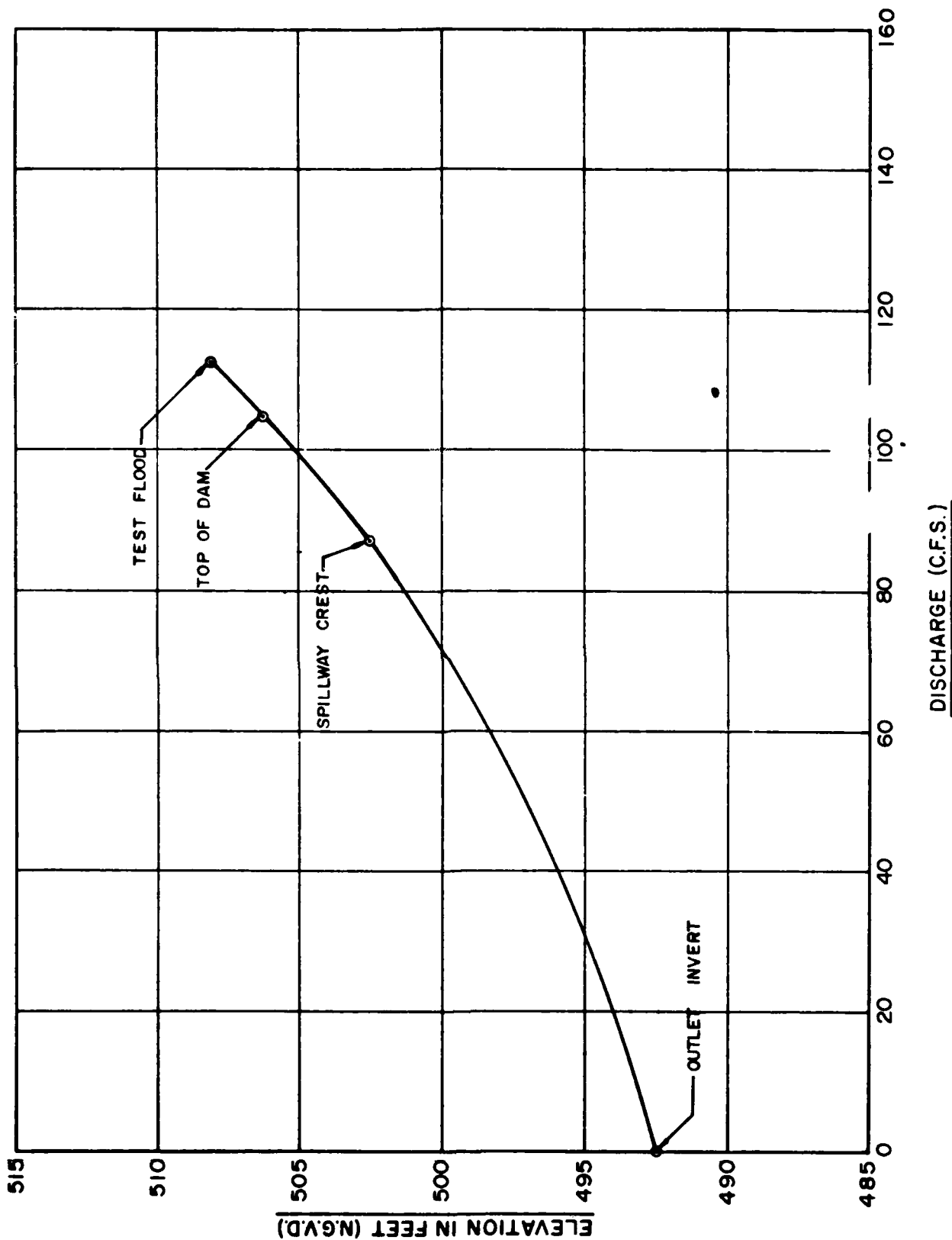
$$Q = (c) (a) (2gh)^{1/2}$$

$$C = 0.60$$

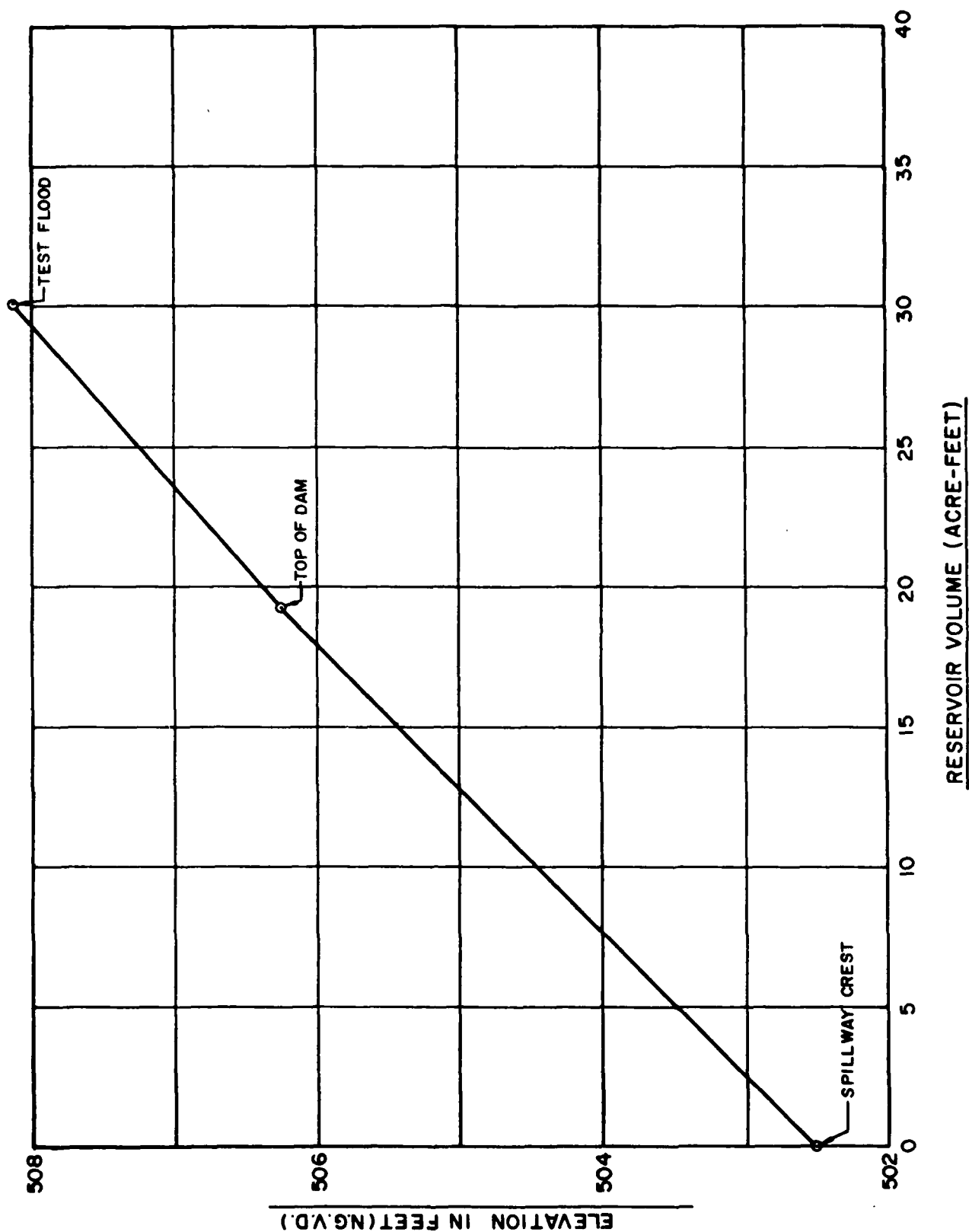
$$a = 6.25 \text{ square feet}$$



CORNELIS DAM
SPILLWAY RATING CURVE



CORNELIS DAM
30 INCH SQUARE BLOWOFF
OUTLET WORKS RATING CURVE



CORNELIS DAM
D-37 RESERVOIR STAGE-CAPACITY CURVE

APPENDIX E

**INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS**

NOT AVAILABLE AT THIS TIME

UNCLASSIFIED

FILMED

DTIC