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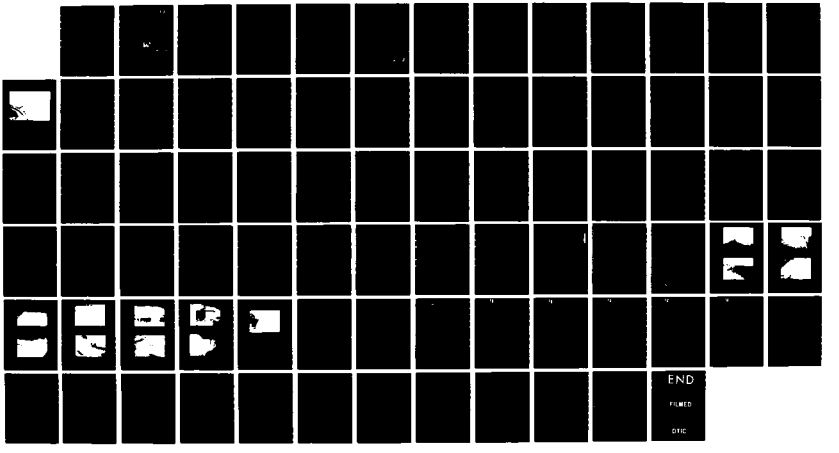

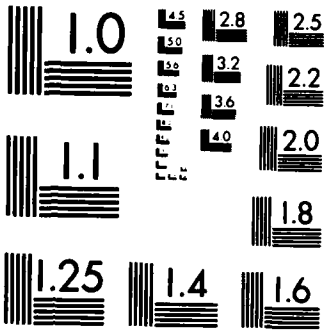

MICROCOPY RESOLUTION TEST CHART
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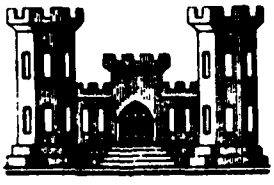
QUINNIPIAC RIVER BASIN
PROSPECT , CONNECTICUT

CHESHIRE RESERVOIR DAM
CT 00303

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

APRIL 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Cheshire Reservoir Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
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9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

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

DAMS, INSPECTION, DAM SAFETY,

Quinnipiac River Basin
Prospect Connecticut

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

Cheshire Reservoir Dam is an embankment dam 168 ft.long having a maximum height of 18 ft., with a centrally located concrete and stone fill spillway section. Based on the visual inspection, the Cheshire Reservoir Dam appears to be in fair condition. For the combination of dam size (small) and downstream hazard (high) a range in the magnitude of the test flood of ½ PMF to PMF is given.

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

REPLY TO
ATTENTION OF:
NEDED-E

10 SEP 19[illegible]

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

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

The preliminary hydrologic analysis has indicated that the spillway capacity for the Cheshire Reservoir Dam would likely be exceeded by floods greater than 1.1 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. 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 Ella T. Grasso

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, New Haven Water Company, 90 Sargent Drive, New Haven, Connecticut 06511.

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,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

CHESHIRE RESERVOIR DAM

CT 00303

QUINNIPIAC RIVER BASIN

PROSPECT, CONNECTICUT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	CT 00303
Name of Dam:	Cheshire Reservoir Dam
Town:	Prospect
County and State:	New Haven, Connecticut
Stream:	Mixville Brook
Date of Inspection:	30 October 1979

BRIEF ASSESSMENT

Cheshire Reservoir Dam is an embankment dam 168 feet long having a maximum height of 18 feet, with a centrally located concrete and stone fill spillway section. The spillway is semi-circular in plan and 74 feet long. The overflow cascades over a series of 16-inch-high steps that discharge to Mixville Brook. The spillway is flanked at each end by concrete training walls. An earth embankment section is on each side of the spillway connecting to high ground at either side. The embankment side slopes are 1 vertical on 2 horizontal. The embankments are grass covered gravel and clay. A 24"-diameter blow-off pipe passes through the dam embankment and outlets at the right spillway training wall.

The dam impounds water as a backup supply to the principal potable water system. Cheshire Reservoir Dam has a storage volume of 58 acre-feet; the size classification is thus "small".

The probable impact area from a dam breach flood includes Connecticut Route 68 and approximately seven buildings (six private dwellings and one commercial establishment). It is estimated that the commercial building and two houses would be subject to flooding of 2 to 3 feet above first floor levels with the remaining homes having flooding in the 1 foot range. With the possible loss of more than a few lives and the probability of excessive economic losses, the dam has been classified as having a "high" hazard potential.

Based on the visual inspection, the Cheshire Reservoir Dam appears to be in fair condition. The grassed slopes are well maintained. The vertical and horizontal alignment of the dam is good. Some erosion and slumping was noted adjacent to both training walls of the centrally located spillway. Several animal holes were noted on both downstream slopes (right and left of spillway). No upstream slope protection was noted along the right side of dam. A wet and spongy area was observed near the downstream toe along the left side of the dam. No piping or boils were noted. The concrete spillway is in poor condition. The surface has areas

of extensive spalling, efflorescence, and erosion. The training walls have deteriorated and aggregate is visible. The gatehouse is in good condition.

For the combination of dam size (small) and downstream hazard (high) a range in the magnitude of the test flood of 1/2 PMF to PMF is given. A test flood of 1/2 PMF was selected for this project. The maximum spillway capacity is 1086 CFS without overtopping the dam at a stage of 2.6 feet above the spillway crest (equal to the top of dam). The capacity of the spillway is inadequate to pass the 1/2 PMF test flood outflow of 2097 CFS without overtopping the dam. The test flood would overtop the dam by about 1.1 feet. The spillway is adequate to pass about 47 percent of the spillway test flood outflow without overtopping the dam.

Within one year of receipt of the Phase I inspection report the owner should retain a qualified professional engineer to accomplish the following: 1) Investigate the significance of the wet area downstream of the dam and recommend measures for monitoring the seepage; 2) design and place riprap on the upstream slopes of the embankment; 3) design and repair spillway steps and training walls; 4) design and repair collapse of the stone wall on the downstream crest of the dam and to the left of the spillway structure; 5) investigate the depressions adjacent to the spillway channel wingwalls and specify procedures for backfilling; 6) conduct more refined hydrologic and hydraulic analysis to determine the need for and methods of increasing the project discharge capacity and 7) study the advisability of raising the footbridge and eliminating the metal supports. The owner should carry out the recommendations made by the engineer.

The owner should also carry out the following operational and maintenance procedures: 1) Institute a program of periodic inspection of the dam and its appurtenances with special attention given to monitoring the seepage downstream from the toe of the dam for changes in flow and presence of any suspended solids; 2) Develop a plan for animal control on the slopes and backfill all animal burrows; 3) Establish a surveillance program for use during and immediately after heavy rainfall, and also a warning program to follow in case of emergency conditions.

S. Giavara

S. Giavara, P.E.
President

Registered CT. 7634

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

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Frye

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 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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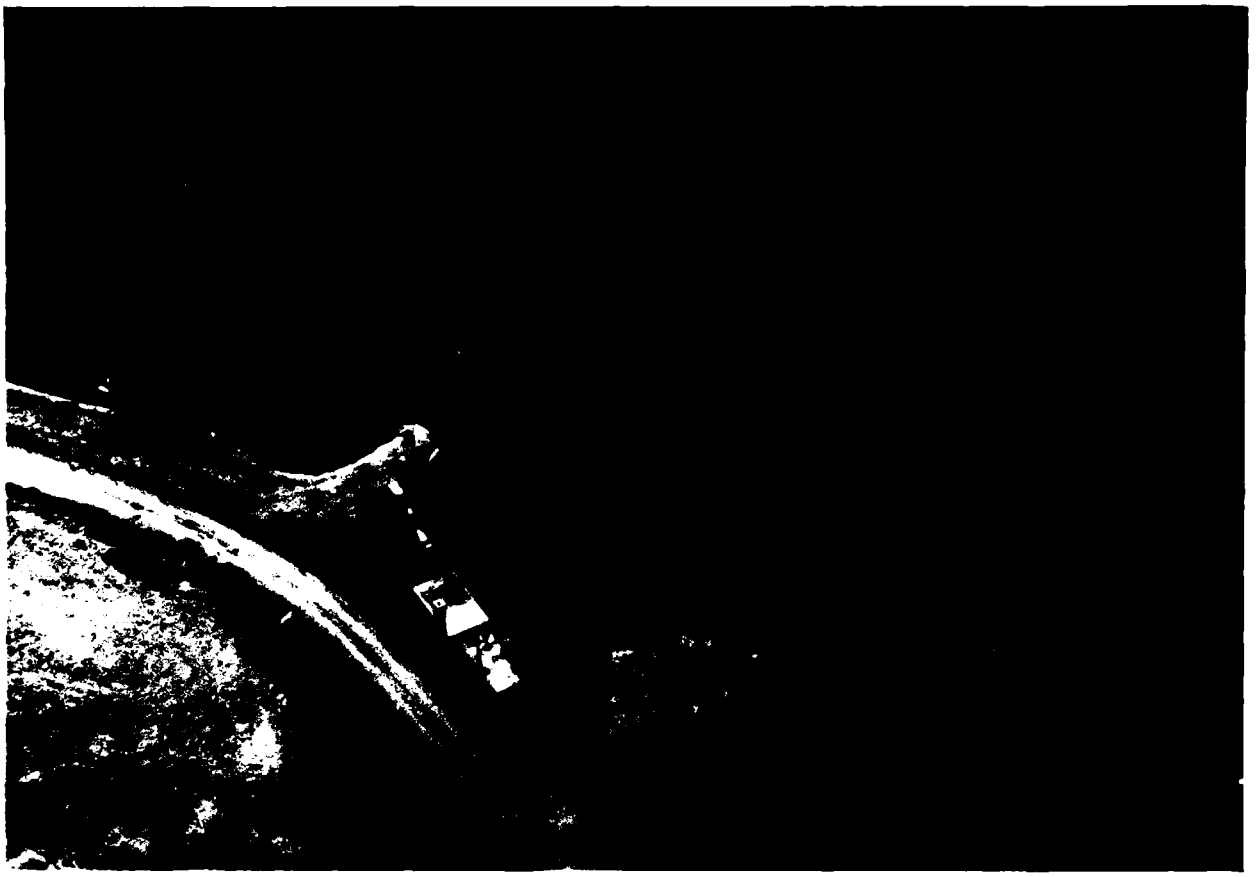
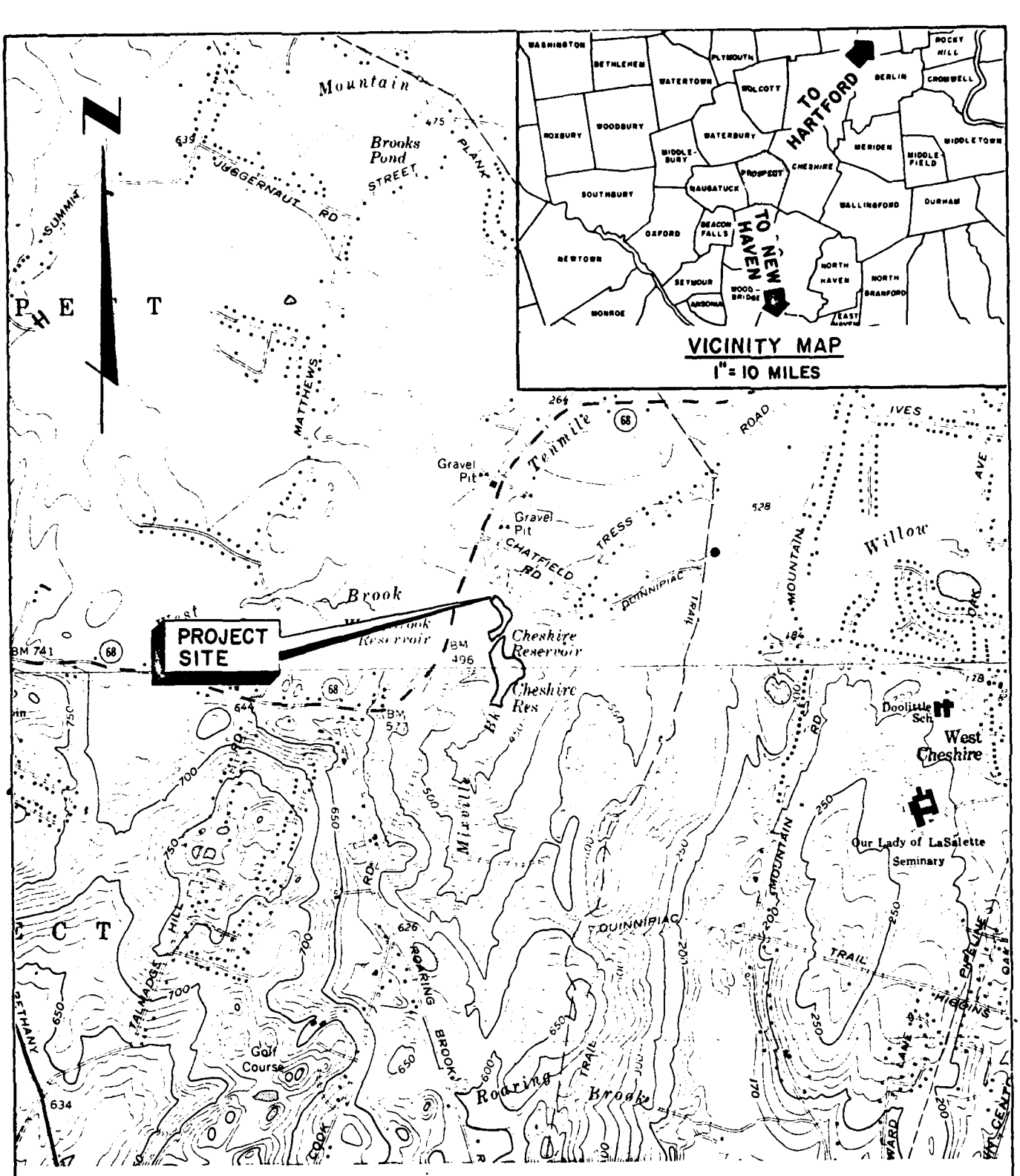
APPENDIXES



OVERVIEW PHOTO
Cheshire Reservoir Dam



VICINITY MAP
1" = 10 MILES

SCALE IN FEET
2000 1000 0 2000

CHESHIRE RESERVOIR DAM
LOCATION MAP
PROSPECT, CONNECTICUT

FLAHERTY • GIAVARA ASSOCIATES, P.C.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
CHESHIRE RESERVOIR DAM - CT 00303

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection through 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. Flaherty Giavara Associates, P.C. 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 Flaherty Giavara Associates, P.C. under a letter of 19 October 1979 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0001 has been assigned by the Corps of Engineers for this work.

b. Purpose.

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

2) Encourage and assist the States to initiate quickly effective dam safety programs for non-federal dams.

3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF THE PROJECT:

a. Location. Cheshire Reservoir Dam is located in Prospect, Connecticut on Mixville Brook. Access to the reservoir is from Roaring Brook Road and Route 68. The reservoir is located about 1½ miles east of the center of Prospect. The reservoir is shown on the U.S.G.S. Topographic Map "Southington, Connecticut" at a latitude of 41°30'10" and a longitude of 72°56'51". The Location Map on page vi shows the location of the structure.

b. Description of Dam and Appurtenances. Cheshire Reservoir Dam is an embankment dam with a centrally located concrete and stone fill spillway section. The spillway is semicircular in plan and 74 feet long. The overflow cascades over a series of 16-inch-high steps that discharge to Mixville Brook.

The spillway is flanked at each end by concrete training walls. An earth embankment section is on each side of the spillway connecting to high ground at either side. The embankment side slopes are 1 vertical on 2 horizontal. The embankments are grass covered gravel and clay. A 24" diameter blow-off pipe passes through the dam embankment and outlets at the next spillway training wall. A 16-inch diameter blow-off was observed adjacent to the 24-inch diameter pipe.

c. Size Classification. Cheshire Reservoir Dam has a storage volume of 58.3 acre-feet and a maximum height of 18 feet. Storage of less than 1,000 acre-feet and a height of less than 40 feet classify this structure in the "small" category according to guidelines established by the Corps of Engineers.

d. Hazard Classification. The dam is classified as having a "high" hazard potential. The probable impact area includes Connecticut Route 68 and approximately seven buildings (six private dwellings and one commercial establishment). It is estimated that the commercial building and two houses would be subject to flooding of 2 to 3 feet above first floor levels with the remaining homes having flooding in the 1 foot range. With the possibility of the loss of more than a few lives and the probability of excessive economic losses, the dam has been classified as having a "high" hazard potential.

e. Ownership. The Cheshire Reservoir Dam is owned by the New Haven Water Company, 90 Sargent Drive, New Haven, Connecticut 06511.

f. Operator. The person responsible for the operation of the dam is Mr. Jack Reynolds, New Haven Water Company, Telephone: (203) 624-6671.

g. Purpose of Dam. The purpose of the dam is to impound the reservoir for use as a public water supply. Presently the reservoir is used as a back-up supply to the principal potable water system.

h. Design and Construction History. It is unknown when the dam was originally constructed. The designer of the original dam is also unknown. Modifications to the spillway structure were constructed in 1934. The designer of these modifications was Blair and Marchant, Inc., Civil Engineers and Surveyors, New Haven, Connecticut.

i. Normal Operating Procedures. The outlet works are not operated at the present time, therefore the reservoir level is controlled by the spillway.

1.3 PERTINENT DATA:

a. Drainage Area. The drainage area consists of 2.1 square miles of rolling upland terrain which is heavily wooded and sparsely developed.

b. Discharge at Damsite.

1) The outlet works consist of 16-inch and 24-inch C.I.P. blow-off conduits. The inlet invert elevations of these pipes are estimated to be at El. 410±. The total discharge capacity is estimated to be 35 CFS.

2) There are no known records of past floods or flood stage heights at the dam.

3) The ungated spillway capacity at the top of dam - 1090 CFS @ El. 427.6.

4) The ungated spillway capacity at test flood elevation - 1840 CFS @ El. 428.7.

5) The gated spillway capacity at normal pool elevation is not applicable at this dam.

6) The gated spillway capacity at test flood elevation is not applicable at this dam.

7) The total spillway capacity at test flood elevation - 1840 CFS @ El. 428.7.

8) The total project discharge at the top of dam elevation - 1090 CFS @ El. 427.6.

9) The total project discharge at test flood elevation - 2100 CFS @ El. 428.7.

c. Elevation. (NGVD)

1) Streambed at toe of dam.....410±

2) Bottom of cut-off.....Unknown

3) Maximum tailwater.....N/A

4) Recreation pool.....N/A

5) Full flood control pool.....N/A

6) Spillway crest.....425±

7) Design surcharge (Original Design).....Unknown

8) Top of dam.....427.6±

9) Test flood design surcharge.....428.7

d. Reservoir. (Length in feet)

1) Normal pool (spillway crest).....1,500±

2) Flood control pool.....N/A

3) Spillway crest pool.....1,500±

4) Top of dam.....1,700±

5) Test flood pool.....1,800±

e. Storage. (acre-feet)

1) Normal pool (spillway crest).....30

2) Flood control pool.....N/A

3) Spillway crest pool.....30

4) Top of dam.....58

5) Test flood pool.....70

f. Reservoir Surface. (acres)

1) Normal pool (spillway crest).....10

2) Flood control pool.....N/A

3) Spillway crest.....10

4) Test flood pool.....15

5) Top of dam.....14

g. Dam.

1)	Type:	Earth embankment with concrete and stone faced spillway
2)	Length:	168 feet
3)	Height:	18 feet
4)	Top Width:	10 feet
5)	Side Slopes:	2 horizontal to 1 vertical

6)	Zoning:	New embankment - gravel and clay over layer of sand and gravel, and layer of clay
7)	Impervious Core:	None
8)	Cut-off:	None
9)	Grout Curtain:	None

h. Diversion and Regulating Tunnel.

1)	Type:	N/A
2)	Length:	N/A
3)	Closure:	N/A
4)	Access:	N/A
5)	Regulating Facilities:	N/A

i. Spillway.

1)	Type:	Stone masonry and concrete - stepped D/S face
2)	Length of weir:	74 feet
3)	Crest Elevation:	425 feet
4)	Gates:	None
5)	U/S Channel:	Reservoir
6)	D/S Channel:	Natural channel - gravel and cobble bed

j. Regulating Outlets.

1)	Invert:	El. 410± (EST.)
2)	Size:	16 and 24 inch
3)	Description:	24 inch blow-off 16 inch watermain
4)	Control Mechanism:	Gatehouse

SECTION 2 - ENGINEERING DATA

2.1 DESIGN:

Plans are available and contain the principal information regarding the dam and its appurtenances. The plans that were reviewed in the preparation of this report include:

a. Spillway and Spillway Channel. Prospect Lake - New Haven Water Co. Revised: December 1934 to show same as constructed - Drawing by Blair and Marchant Inc., New Haven, Ct. (see Appendix B).

b. Borings. At Prospect Reservoir - by Blair and Marchant Inc., New Haven, Ct. (see Appendix B).

c. Plan for Dam. Prospect, Ct., New Haven Water Co., Cheshire Water Works, Albert B. Hill, Consulting Engineer.

2.2 CONSTRUCTION:

Information relative to construction is shown on the plan for Dam by Albert B. Hill. The following specification was provided for modification to an old masonry dam existing at the site.

> "...The overflow timber on top of the old masonry dam removed, the surface of the stones thoroughly cleaned and a concrete rollway, four feet in thickness built on top of the old masonry to elevation 415; or 2½ ft. above level of the old rollway. The spillway flanked on each end by concrete abutments as shown on plans. An earth embankment built on each end of the spillway connecting it with the high ground on either side, and with side slopes not steeper than 1 on 2. The embankments made of gravel and clay, well mixed, and thoroughly rammed. Where the blow-off pipe passes through the embankment a cut-off of concrete is constructed around the pipe at one of the joints to prevent water from flowing along the pipe. All concrete made of one part of Portland cement, two and one-half parts of sand and five parts of broken stone or gravel. All mud and vegetable matter removed from the top of the old earth embankment for a distance of fifty feet back from the face of the dam and replaced with a layer of clay, two feet in thickness, thoroughly rammed; this covered with sand and gravel; and a strip, eight feet in width, back of the concrete overflow paved with cobbles. The face of the masonry reinforced with a heavy riprap wall extending from the bed of the stream up to the top of the old stone dam."

Evidently concrete spillway steps were constructed in 1934 as shown on spillway and spillway channel plan. During the field inspection direct field measurements of the existing dam were made.

2.3 OPERATION:

Operation of the dam is by the New Haven Water Company. No formal records of operation are maintained.

2.4 EVALUATION:

a. Availability. The information noted above is available in the files of the New Haven Water Company.

b. Adequacy. The lack of in-depth 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, but is based primarily on the visual inspection, the dam's past performance, and sound engineering judgement.

c. Validity. In general there is no reason to question the validity of the available data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS:

a. General. Based on the visual inspection, the Cheshire Reservoir Dam appears to be in fair condition. The grassed slopes are well maintained. The vertical and horizontal alignment of the dam is good. Some erosion and slumping was noted adjacent to both training walls of the centrally located spillway. Several animal holes were noted on both downstream slopes (right and left of spillway). No upstream slope protection was noted along the right side of dam. A wet and spongy area was observed about 55 feet downstream from the toe along the left side of the dam. No piping or boils were noted. The concrete spillway is in poor condition. The surface has areas of extensive spalling, efflorescence, and erosion. The training walls have deteriorated and aggregate is visible. The gatehouse is in good condition, however toe valves and operating equipment could not be inspected during the site visit.

b. Dam.

1) Upstream Slope - The upstream face of the earth embankment on either side of the spillway was covered with grass, as indicated in Photo No. 2. Evidence of minor sloughing and erosion was visible at several locations on the slope. No riprap was present above the water surface.

2) Crest - The crest of the dam appears fairly constant in elevation. Very slight wear on the grassed surface was noted (Photo No. 1).

3) Downstream Slope - The downstream slopes of the embankment sections were generally grass-covered and well-maintained (Photos No. 1, No. 5 and No. 6). A small section of the 2-ft.-high stone wall has collapsed near the crest of the dam to the left of the spillway. Small animal burrows, approximately 2 to 3 in. in diameter, were noted at numerous locations just below the surface of the downstream slopes.

Erosion has occurred at several locations adjacent to the spillway wingwall along the downstream slopes and downstream from the toe. The erosion depressions are up to 18 in. deep and some of the soil may have been carried through the cracks and joints in the spillway training wall. An example of one of the erosion features can be noted in Photo No. 7.

A wet and spongy area, approximately 3 to 4 ft. in diameter, was located about 55 ft. downstream from the toe of the dam (see Photo No. 10). This area is located approximately 10 ft. to the left of the end of the left spillway training wall. No water was flowing from this area at the time of the field inspection.

4) Spillway - The concrete spillway has rounded crest that discharges through the dam on a series of concrete steps (Photos No. 1, No. 3 and No. 4). The concrete surface has areas of extensive erosion, as indicated in Photo No. 4. Concrete spalling was noted on both the left and right training walls (Photo No. 8). Efflorescence was also observed. The spillway discharges into a concrete apron that in turn discharges into a stone lined channel. The concrete apron is in generally good condition. Grass and weeds are growing through the voids in the stone lined channel.

c. Appurtenant Structures. The exterior of the brick gatehouse is in good condition as indicated in Photo No. 11 (the interior was not inspected). The outlets of the 16 inch C.I.P. and 24 inch C.I.P. blow off pipes were located (Photo No. 9) and both pipe ends were in good condition and free of debris. The conduits have control valves located in the upper gatehouse.

d. Reservoir Area. The perimeter of the reservoir is composed of wooded slopes on the west and south, and a grass hillside on the east. All slopes appeared stable. There were no visible sediment deposits in the reservoir. A roadway embankment separates the reservoir into two parts (see Photo No. 13). The embankment section is approximately 25 feet wide and 5 feet above the reservoir level.

e. Downstream Channel. The natural channel is eight to ten feet wide and has a gravel and cobble bed (Photo No. 12). The banks are well vegetated and stable. An uprooted tree overlies the channel (Photo No. 12). There is no evidence of degradation or aggradation.

f. Footbridge. The wooden footbridge over the spillway is painted and in good condition (Photo No. 1, No. 2 and No. 3).

3.2 EVALUATION:

The absence of riprap on the upstream face will allow continued erosion and slumping of the slopes. The partial collapse of the stone wall along the crest of the dam to the left of the spillway could lead to erosion of the crest of the dam which could eventually result in failure of the dam.

Erosion has developed adjacent to the spillway wingwalls on both sides of the spillway channel. This condition could lead to piping and internal erosion of the dam if not corrected.

The wet area below the downstream toe on the left side of the dam should be periodically observed to determine whether it is related to dam seepage, groundwater and/or surface runoff. The outlet works (valves, conduit, and operating equipment) could not be inspected.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES:

a. General. The Cheshire Reservoir is a surface water supply storage facility for the New Haven Water Company. Located in the upper reaches of the watersheds that serves the water system, it is operated as a reserve or supplemental supply. Except when used for supply no regulation of the pool level occurs. There are no records available indicating releases for downstream low flow augmentation.

b. Description of any Warning System in Effect. There is no formal warning system in effect in the event of failure or partial failure of the structure.

4.2 MAINTENANCE PROCEDURES:

a. General. The dam and associated structures are generally well maintained with a regular program of grass mowing and general maintenance in effect. However, the concrete spillway and training walls have deteriorated and require maintenance. Water company personnel visit the site on a routine basis (1 to 2 weeks). Yearly inspections are carried out by New Haven Water Company staff.

b. Operating Facilities. The operating facilities are well maintained. A formal maintenance program, including valve exercising, is followed by the New Haven Water Company. The reservoir foreman maintains the Cheshire Reservoir, and ensures that the spillway is free of brush and debris.

4.3 EVALUATION:

The Cheshire Reservoir Dam, is well maintained. The blow-off was not operated during the site inspection, therefore comments on the serviceability cannot be made. The valves are tested on a periodic basis to ensure that they could be operated if required.

An emergency action plan should be prepared to prevent or minimize the impact of failure. This plan should list the expedient action to be taken and authorities to be contacted in emergency situations.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL DATA:

The Cheshire Reservoir Dam is owned by the New Haven Water Company and was formerly used for water supply. A 74-foot long, centrally located, stone masonry and concrete spillway section discharges flow over the dam.

The spillway discharges over a rounded concrete crest, and water then cascades down a series of 16" high steps. The plans show the steps to be courses of cut stone, although the present exposed surface is concrete (possibly a gunite treatment). A wood footbridge over the spillway allows only two feet of clearance between the crest of the spillway and the bottom on the footbridge support beam. The low clearance and metal supports could be a restriction during floods, particularly if obstructed with debris.

The spillway discharges onto a concrete and stone paved apron, located between low retaining walls at the toe of the dam. A stable natural channel extends downstream from the apron.

The watershed consists of 2.1 square miles of rolling upland, and is heavily wooded with little development.

5.2 DESIGN DATA:

No specific data is available for this watershed or the structures at Cheshire Reservoir Dam. In lieu of existing design information. U.S.G.S. Topographic Maps (Scale 1"-2,000') were utilized to develop hydrologic parameters. Some of the pertinent hydraulic design data was obtained and/or confirmed by actual field measurements at the time of the visual field inspection.

5.3 EXPERIENCE DATA:

Historical data for recorded discharges is not available for this dam.

5.4 TEST FLOOD ANALYSIS:

The test flood for determining the spillway adequacy is based upon Corps of Engineers guidelines. The size classification of the dam is "SMALL" based upon a height of 18 feet and storage volume of 58.3 acre feet. The hazard potential is "HIGH" due to the land use downstream of the dam. The test flood required by Corps of Engineers guidelines for this size dam and hazard potential can range from the one-half probable maximum flood to the probable maximum flood (PMF).

The test flood selected for this project is the one-half PMF, due to the possibility of some loss of life and the probability of appreciable economic loss due to dam failure. The relative size of the dam and reservoir area was also taken into account when selecting the test flood.

The magnitude of the PMF (and one-half PMF test flood) is based upon "Preliminary Guidance for Estimating PMF Discharges" by the New England Division, Corps of Engineers, dated December, 1977. The watershed is rolling, and has little floodwater storage areas in natural wetlands. The flood magnitude was based on the "rolling" watershed curve. The one-half PMF (test flood) is 2200 CFS.

The maximum spillway capacity is 1086 CFS, without overtopping the dam (a stage of 2.6 above the spillway crest El. 425.0 N.G.V.D.). The spillway evaluation assumes that the footbridge does not obstruct flow.

The spillway flood was formed into a triangular hydrograph with a peak inflow of 2200 CFS and a duration of 10 hours. The duration was selected so that the triangular hydrograph would contain the same volume of water as the estimated storm runoff.

The hydrograph was routed through the reservoir using a computer program based on stage-storage and stage-discharge data. The reservoir stage was assumed to be level with the spillway crest prior to the test flood. It was assumed that the roadway embankment and associated culverts, did not restrict the inflow hydrograph. The results of the flood routing computations indicate that the spillway test flood peak inflow rate of 2200 CFS is reduced to a peak outflow rate of 2100 CFS by the storage characteristics of the reservoir.

The peak flood stage at the spillway is about 1.1 feet above the crest of the dam. The duration of the overflow is estimated to be five hours. The spillway can pass 47 percent of the test flood outflow.

5.5 DAM FAILURE ANALYSIS:

The downstream impact of a dam failure was analyzed using the Corps of Engineers "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs" dated April 1978.

Based upon an assumed breach width of 67 feet, which is equal to 40 percent of the dam's estimated width at mid-height, the peak flood flow due to failure would be 6670 CFS with an initial depth of 6 feet just downstream of the dam. The total flow (base flow plus failure outflow) is 7756 CFS.

Using U.S.G.S. topographic maps, the evaluation indicates that the dam failure floodwave would move rapidly down the steep valley of Ten Mile Brook with an average depth of 6 to 7 feet above the streambed and then spread out laterally into the Mixville Pond area. The failure floodwave is generally 3 feet above the base flow (1086 CFS) stage.

The probable impact area includes Connecticut Route 68, and approximately seven buildings, six private dwellings and one commercial establishment - club).

It is estimated that the commercial building and two houses would be subject to flooding of 2 to 3 feet above first floor levels, with the remaining homes having flooding in the 1 foot range. With the possibility of the loss of more than a few lives and the probability of excessive economic losses, the dam has been classified as having a high hazard potential.

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATION:

The visual inspection did not disclose any indications of present structural instability. The long-term performance of this dam can be affected by erosion adjacent to the spillway wingwalls if remedial measures are not undertaken.

6.2 DESIGN AND CONSTRUCTION DATA:

The design and construction data consists of plans showing a plan and cross section of the dam. No information is presented on the type of soil in the earth embankment and the foundation conditions. Thus, the evaluation of stability is based solely on the visual inspection.

6.3 POST-CONSTRUCTION CHANGES:

Information is available on the 1934 modification to the dam (see Appendix B).

6.4 SEISMIC STABILITY:

The dam is located in Seismic Zone 1 and, in accordance with the recommended Phase I inspection guidelines, does not warrant seismic stability analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT:

a. Condition. On the basis of the visual inspection and a review of available data, the dam is judged to be in fair condition. The long-term performance of the dam could be affected by further deterioration of the spillway steps and channel retaining walls and possibly by seepage in the wet area downstream of the left side of the dam.

b. Adequacy of Information. The engineering information available was limited and this assessment of the condition of the dam was based primarily on the results of the visual inspection, past operational performance of the structure and sound engineering judgement.

c. Urgency. The recommendations and remedial measures presented in Section 7.2 and 7.3 should be implemented by the owner within one year of receipt of this Phase I inspection report.

7.2 RECOMMENDATIONS:

The owner should retain a qualified registered engineer to accomplish the following:

1) Investigate the significance of the wet area downstream of the dam and recommend measures for monitoring the seepage.

2) Design and place riprap on the upstream slopes of the embankment.

3) Design and repair spillway steps and training walls.

4) Design and repair collapse of the stone wall on the downstream crest of the dam to the left of the spillway structure.

5) Investigate the depressions adjacent to the spillway channel wingwalls and specify procedures for backfilling.

6) Conduct more refined hydrologic and hydraulic analysis to determine the need for and methods of increasing the project discharge capacity.

7) Study the advisability of raising the footbridge and eliminating the metal supports.

The owner should implement the engineers recommendations.

7.3 REMEDIAL MEASURES:

a. Operating and Maintenance Procedures. The owner should:

1) Institute a program of annual inspection of the dam

and its appurtenances with special attention given to monitoring the seepage downstream from the toe of the dam for changes in flow and presence of any suspended solids.

2) Develop a plan for animal control on the slopes and backfill all animal burrows.

3) Establish a surveillance program at the site during and immediately after heavy rainfall, and also a warning program to follow in case of emergency conditions.

7.4 ALTERNATIVES:

There are no practical alternatives to the recommendations contained in Sections 7.2 and 7.3.

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT CHESHIRE RESERVOIR DAM **DATE** Oct. 30, 1979

TIME 1400

WEATHER Clear 50°F

W.S. ELEV. ____ **U.S.** ____ **DN.S.**

PARTY:

1. R. Smith, FGA, Project Manager
2. J. MacBroom, FGA, Hydraulics/Hydrology
3. R. Jackson, FGA, Survey
4. R. Murdock, GEI, Geotechnical
5. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: CHESHIRE RESERVOIR DAM DATE: Oct. 30, 1979

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	None.
Pavement Condition	None.
Movement or Settlement of Crest	None.
Lateral Movement	None.
Vertical Alignment	Good.
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Erosion and slumping adjacent to both stepped spillway wingwalls.
Indications of Movement of Structural Items on Slopes	None.
Trespassing on Slopes	Minor
Sloughing or Erosion of Slopes or Abutments	Considerable small animal holes just below ground surface on both slopes.
Rock Slope Protection - Riprap Failures	No riprap on upstream along right side of dam.
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	Wet and spongy area near the downstream toe along left side of dam.
Piping or Boils	None.
Foundation Drainage Features	None observed.
Toe Drains	None observed.
Instrumentation System	None.
Vegetation	Well maintained grass slopes.

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: CHESHIRE RESERVOIR DATE: Oct. 30, 1979

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	
Crest Elevation	Not applicable.
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
NATIONAL DAM INSPECTION PROGRAM

DAM: CHESHIRE RESERVOIR DAM DATE: Oct. 30, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Not applicable.
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
NATIONAL DAM INSPECTION PROGRAM

DAM: CHESHIRE RESERVOIR DAM DATE: Oct. 30, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	The control tower is in good condition.
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	Could not be inspected.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: CHESHIRE RESERVOIR DAM DATE: Oct. 30, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Conduit outlets are in good condition and free of debris. The conduit could not be entered for detailed inspection.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: CHESHIRE RESERVOIR DAM DATE: Oct. 30, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Poor condition, showing deterioration, spalling and general disrepair.
Rust or Staining	
Spalling	Major spalling.
Erosion or Cavitation	No.
Visible Reinforcing	None.
Any Seepage or Efflorescence	Seepage and efflorescence noted.
Condition at Joints	
Drain Holes	None observed.
Channel	
Loose Rock or Trees Overhanging Channel	No
Condition of Discharge Channel	Generally good condition.

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: CHESHIRE RESERVOIR DAM **DATE:** Oct. 30, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Underwater, face of the dam.
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	Stone masonry, in good condition.
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	One drain hole on both sides of spillway channel. Both appear to be operating .
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Yes, both sides of channel.
Floor of Channel	Natural gravel bottom.
Other Obstructions	Fallen trees and brush present.

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: CHESHIRE RESERVOIR DAM DATE: Oct. 30, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	
a. Superstructure	Bridge is in generally good condition.
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	Wooden decking - good condition.
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat and Backwall	

APPENDIX B

ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Cheshire Reservoir Dam

I.D. NO. CT 00303

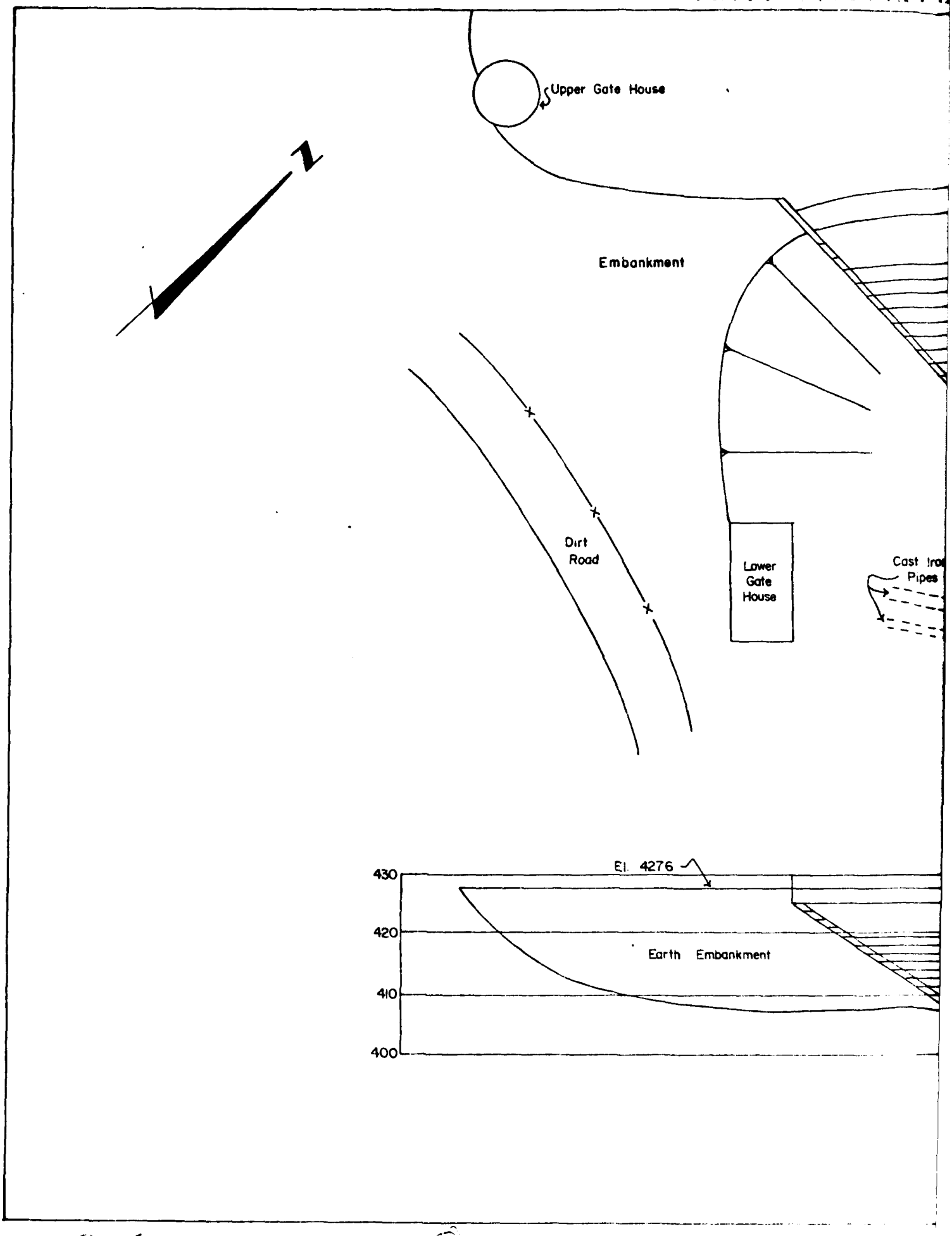
ITEM	REMARKS
AS-BUILT DRAWINGS	Construction plans - New Haven Water Company files
REGIONAL VICINITY MAP	Available from U.S.G.S.
CONSTRUCTION HISTORY	Limited Data - Water Company files
TYPICAL SECTIONS OF DAM	From plans
OUTLETS - Plan	From plans, field measurements
- Details	From plans
- Constraints	Unknown
- Discharge Ratings	None available
RAINFALL/RESERVOIR RECORDS	Unavailable
DESIGN REPORTS	None
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS	None
HYDROLOGY & HYDRAULICS	None
DAM STABILITY	None
SEEPAGE STUDIES	
MATERIALS INVESTIGATIONS	Plan of borings showing top of rock elevations
BORINGS RECORDS	None
LABORATORY	None
FIELD	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Cheshire Reservoir Dam

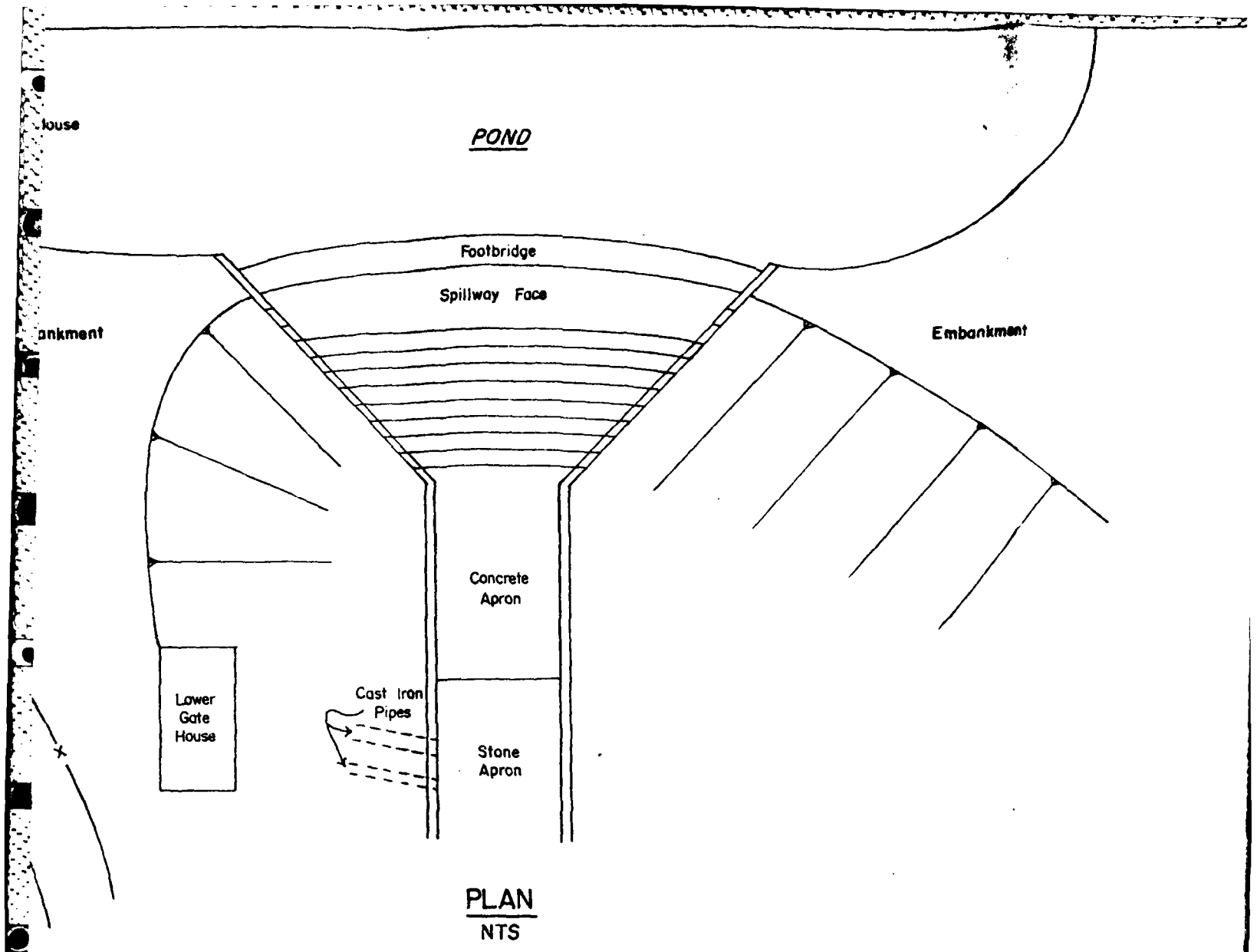
I.D. NO. CT 00303

ITEM	REMARKS
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	Unknown
MONITORING SYSTEMS	Unknown
MODIFICATIONS	Modifications constructed 1933 (plans available)
HIGH POOL RECORDS	None
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown
MAINTENANCE OPERATION RECORDS	Unavailable
SPILLWAY PLAN	
SECTIONS	From plans
DETAILS	From plans
OPERATING EQUIPMENT PLANS & DETAILS	From plans

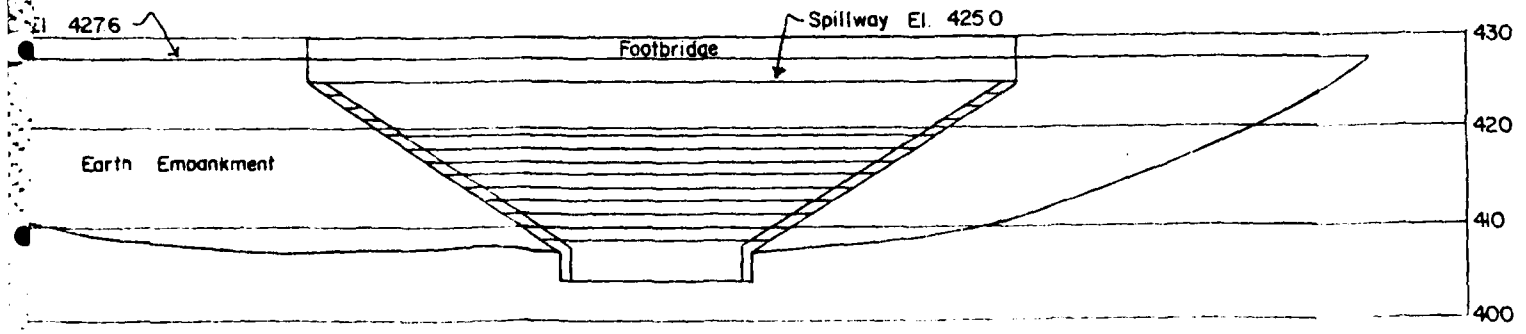

Upper Gate House
Embankment
Dirt
Road
Lower
Gate
House
Cast Iron
Pipes
El. 4276
430
420
410
400
Earth Embankment

B-3

① of 3

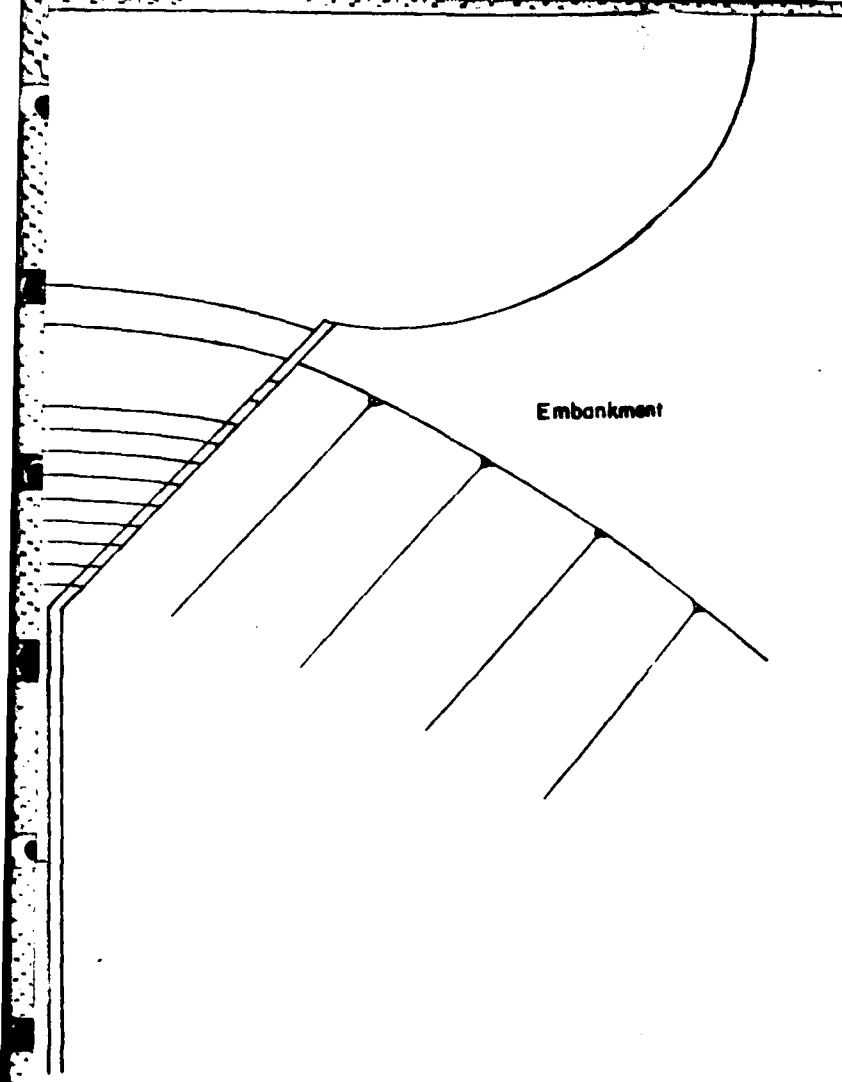


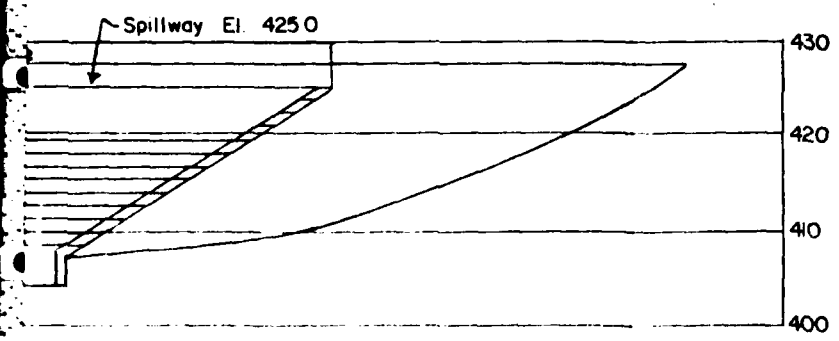
PLAN
NTS



PROFILE
NTS

CHESHIRE





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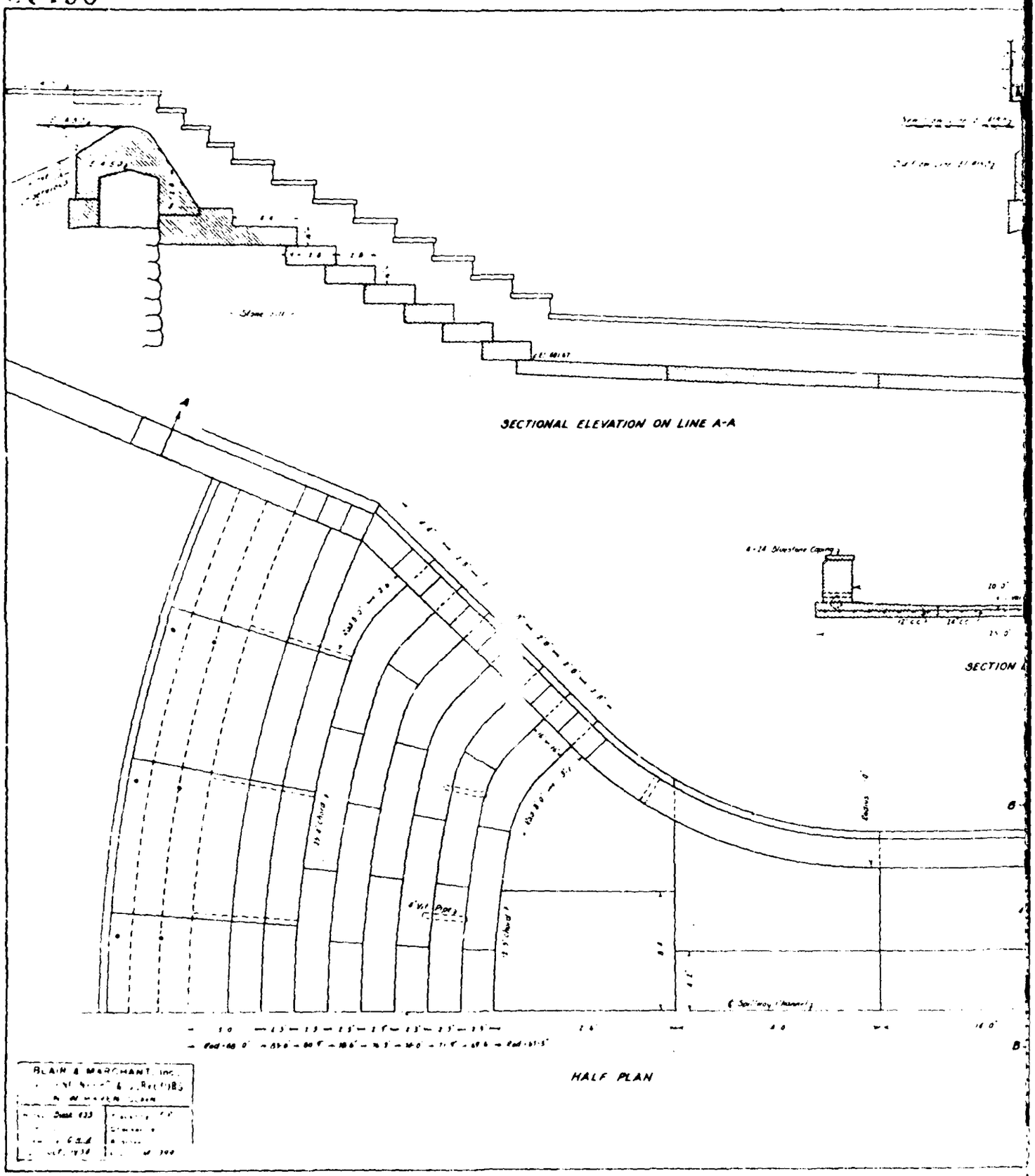
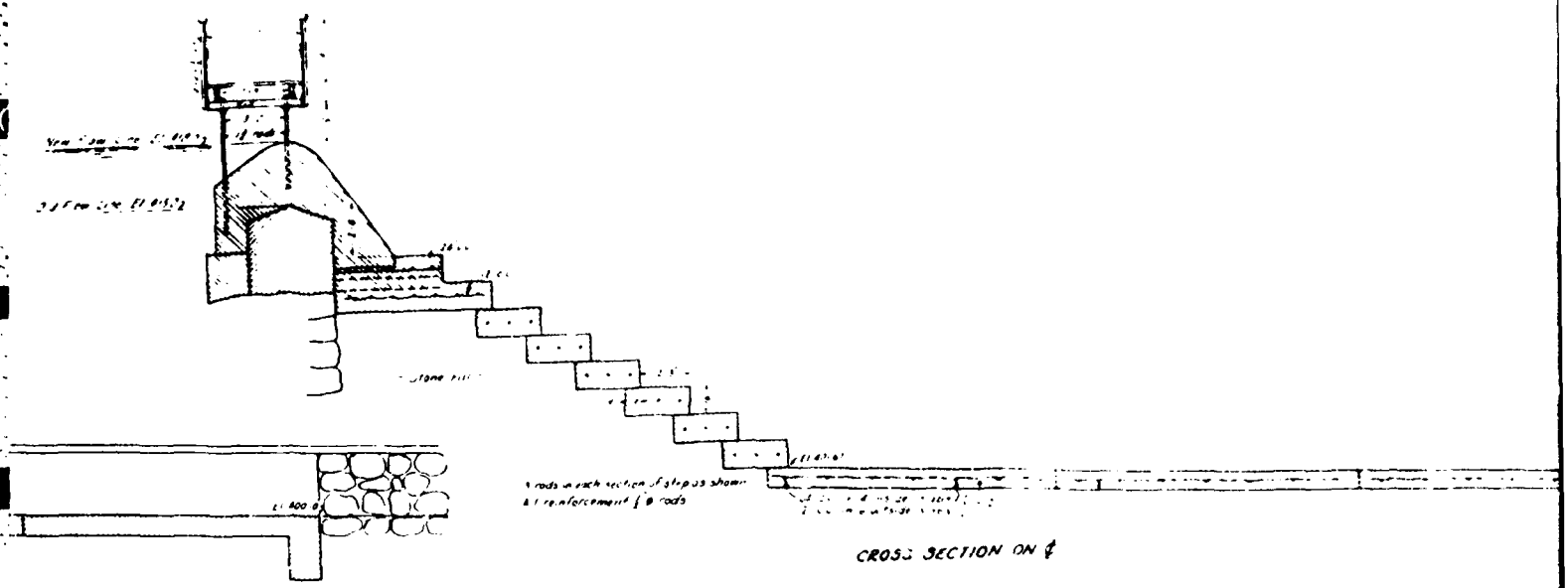
CHESHIRE RESERVOIR DAM

(3) of (3)

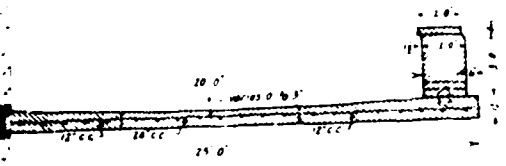


C-4

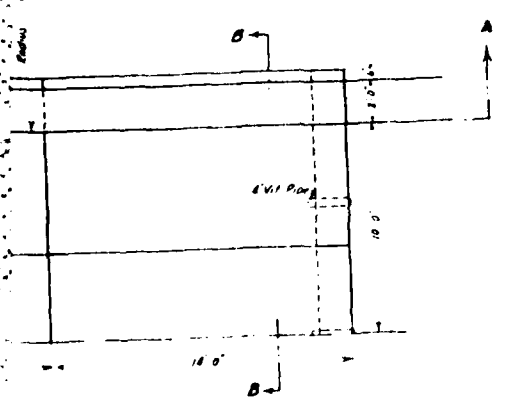
1 of 3

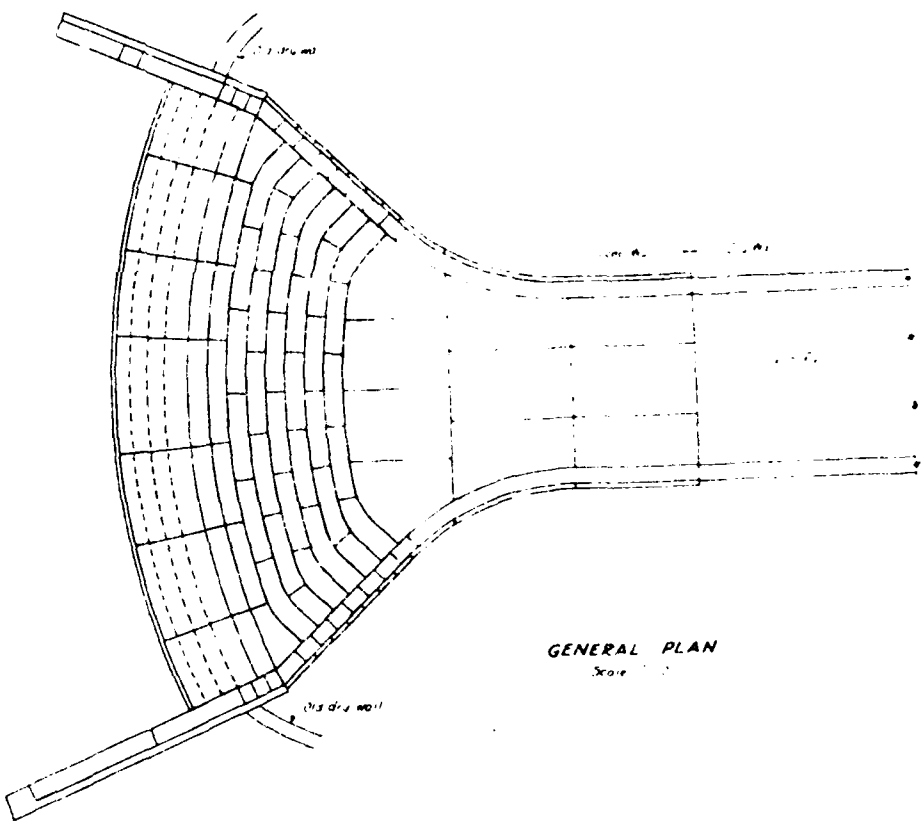


CROSS SECTION ON ℄



SECTION B-B



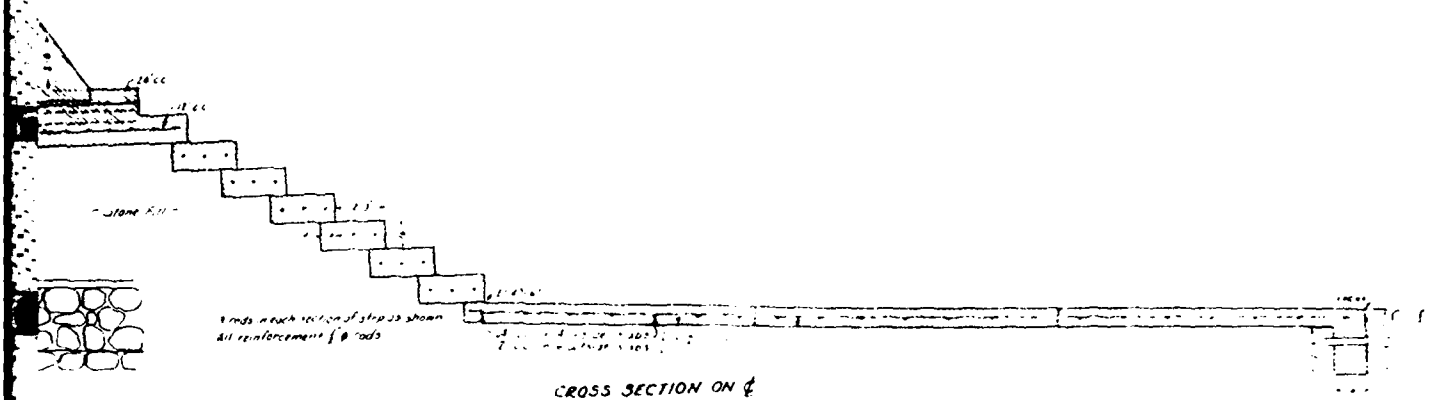


GENERAL PLAN

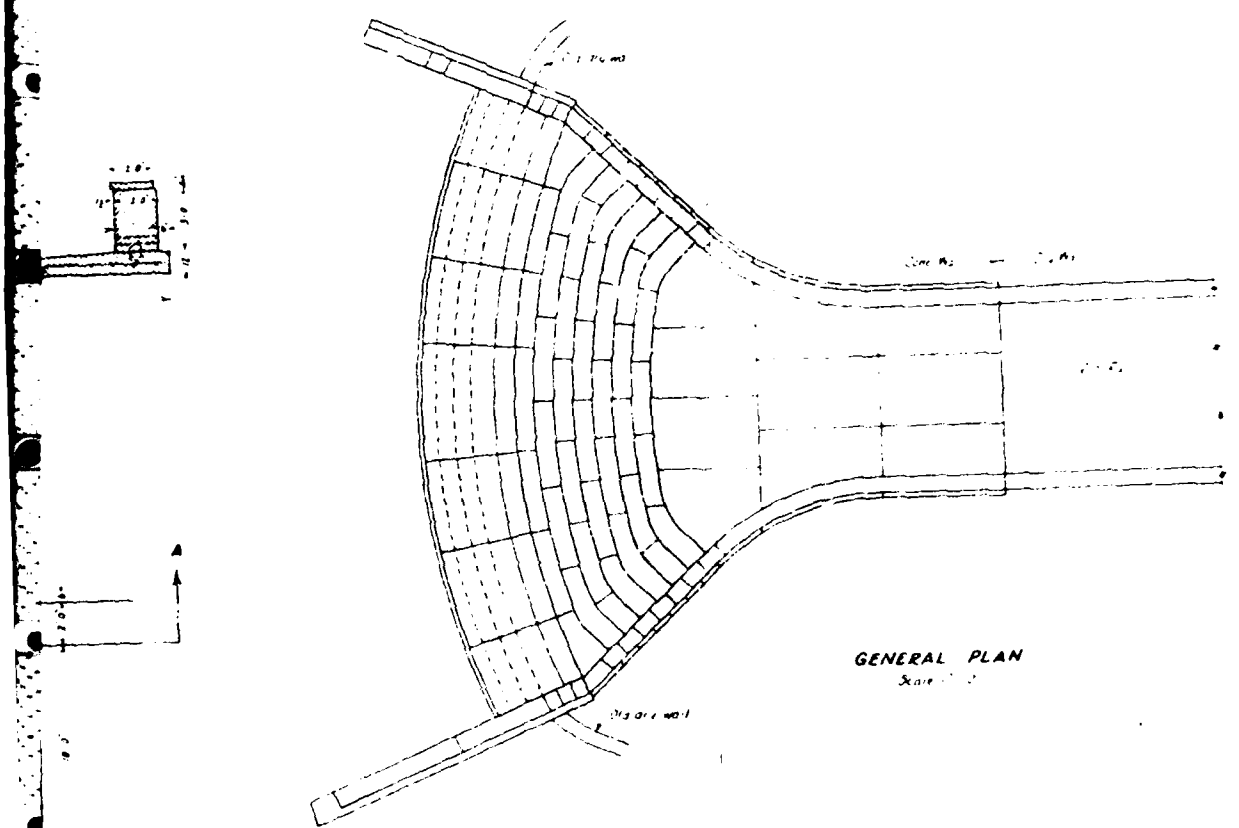
NEW HAVEN WATER C

PROSPECT LAKE

SPILLWAY AND SPILLWAY CH

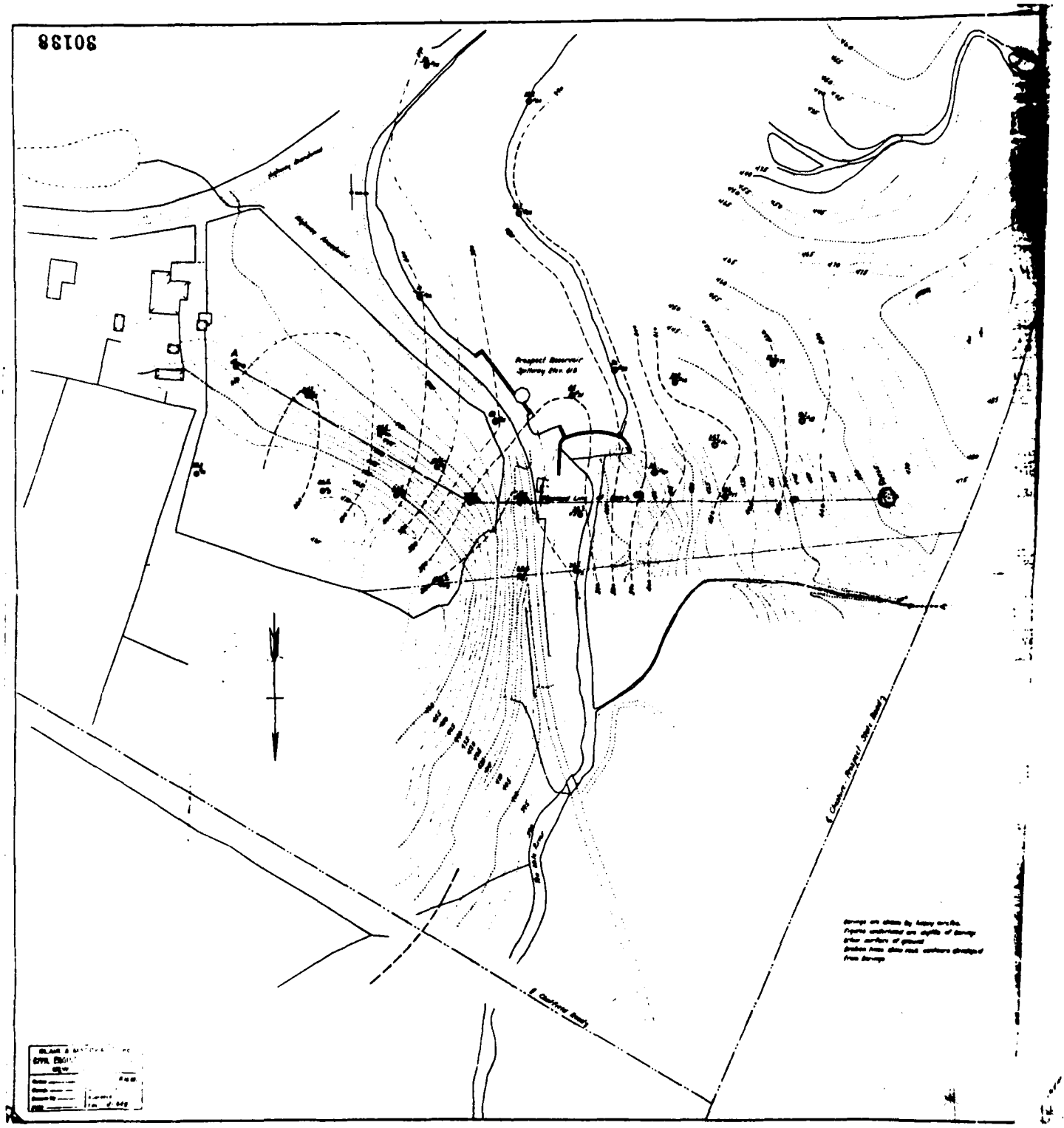


CROSS SECTION ON ℄



GENERAL PLAN

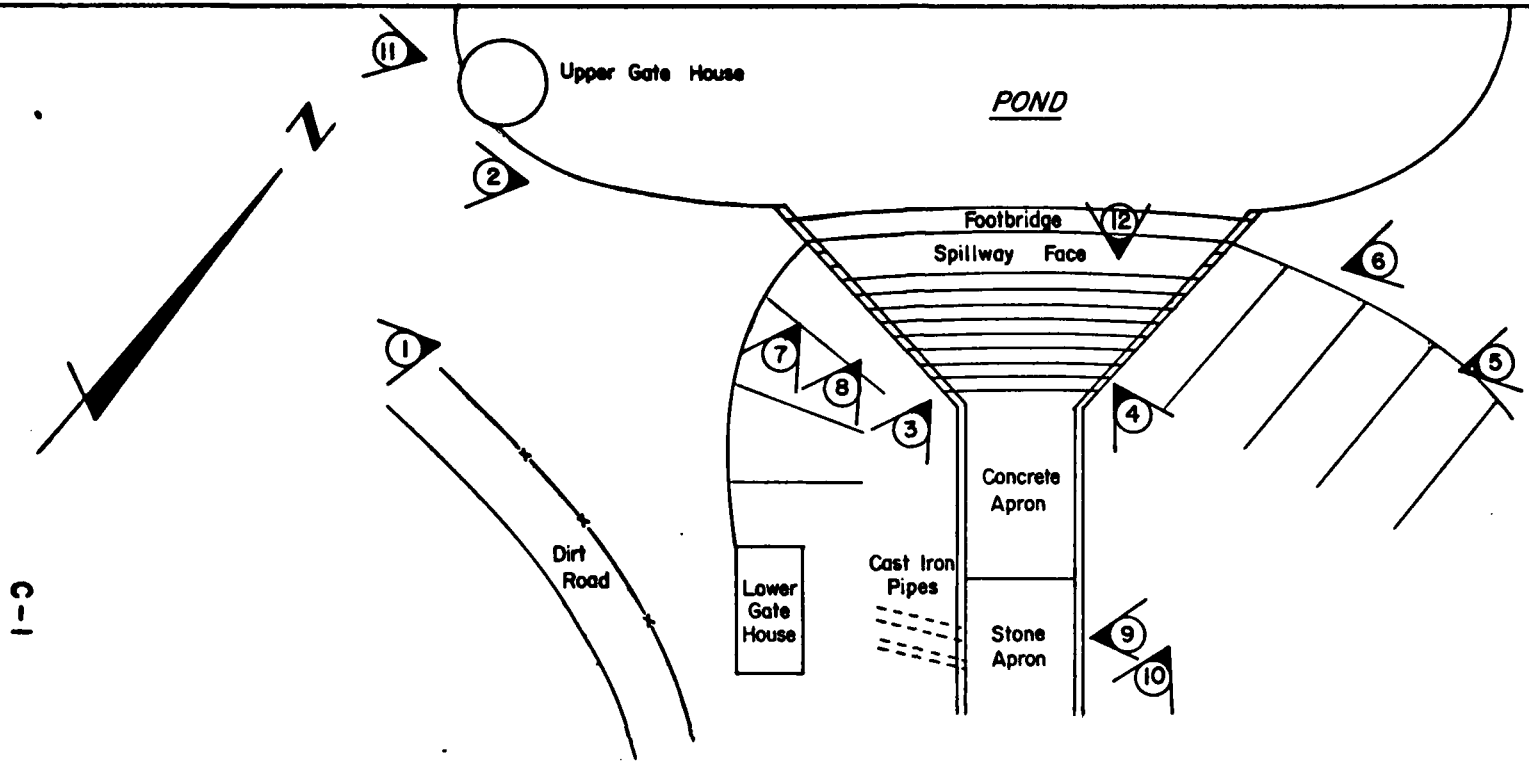
NEW HAVEN WATER CO.
PROSPECT LAKE
SPILLWAY AND SPILLWAY CHANNEL



B-5

APPENDIX C

PHOTOGRAPHS



C-1

LEGEND

(5) Number refers to caption. Arrow indicates direction of photograph.

CHESHIRE RESERVOIR DAM
PHOTO LOCATION MAP

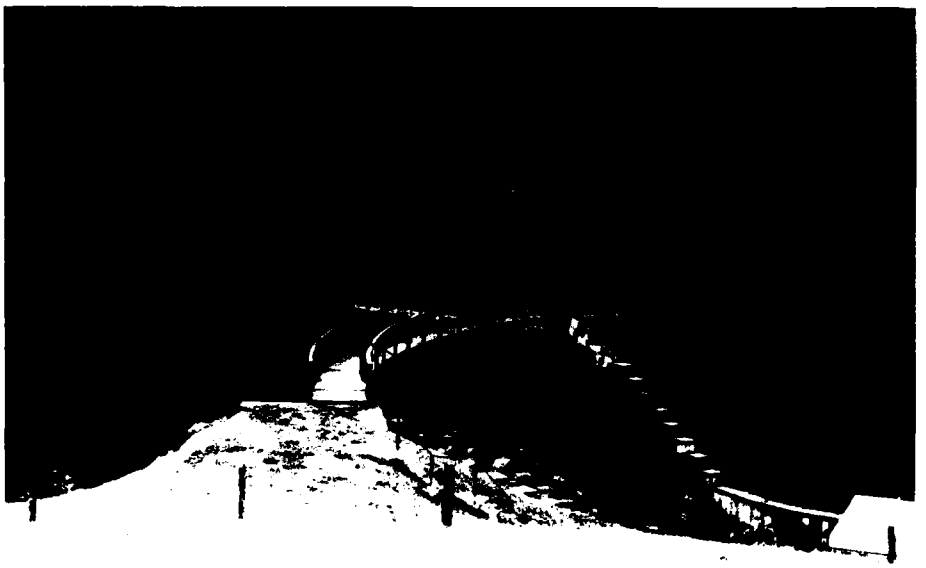


PHOTO #1: Overview, from right abutment.

PHOTO #2: Upstream face, from right side.

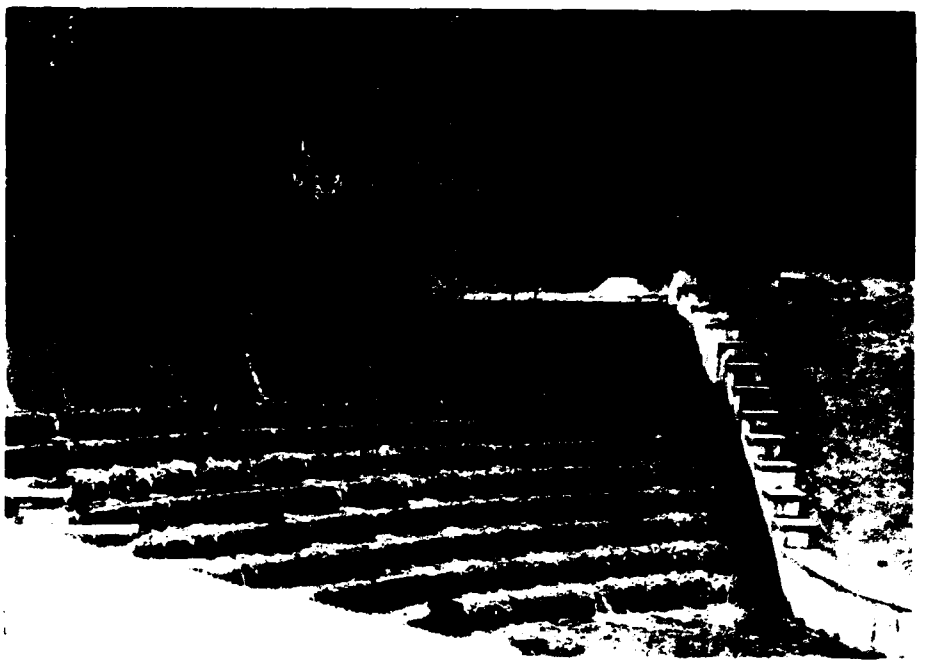


PHOTO #3: Spillway.

PHOTO #4: Spillway steps (detail).

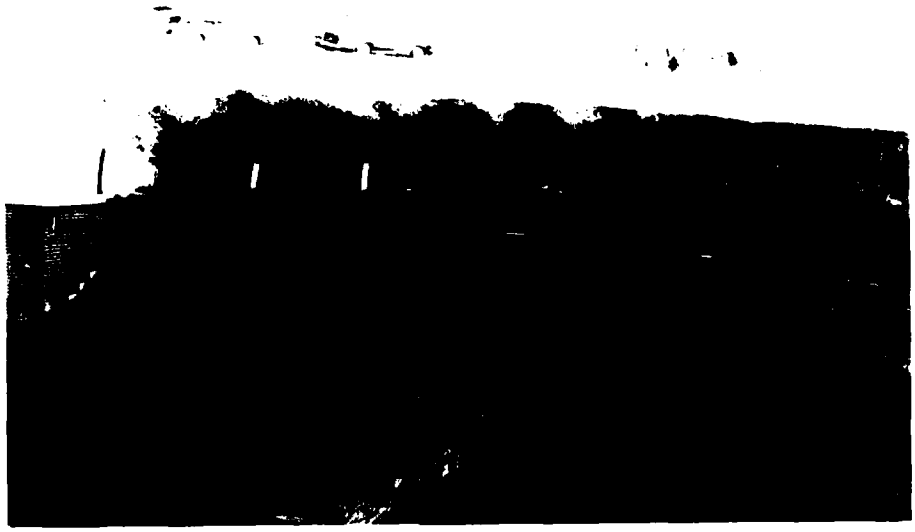


PHOTO #5: Right abutment.

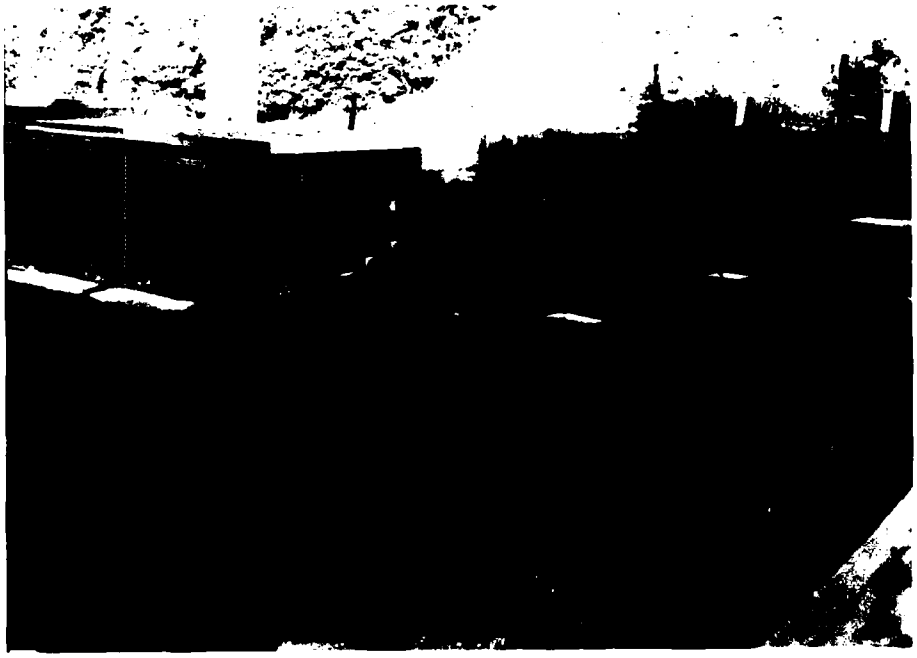


PHOTO #6: Downstream slope on right side of spillway.

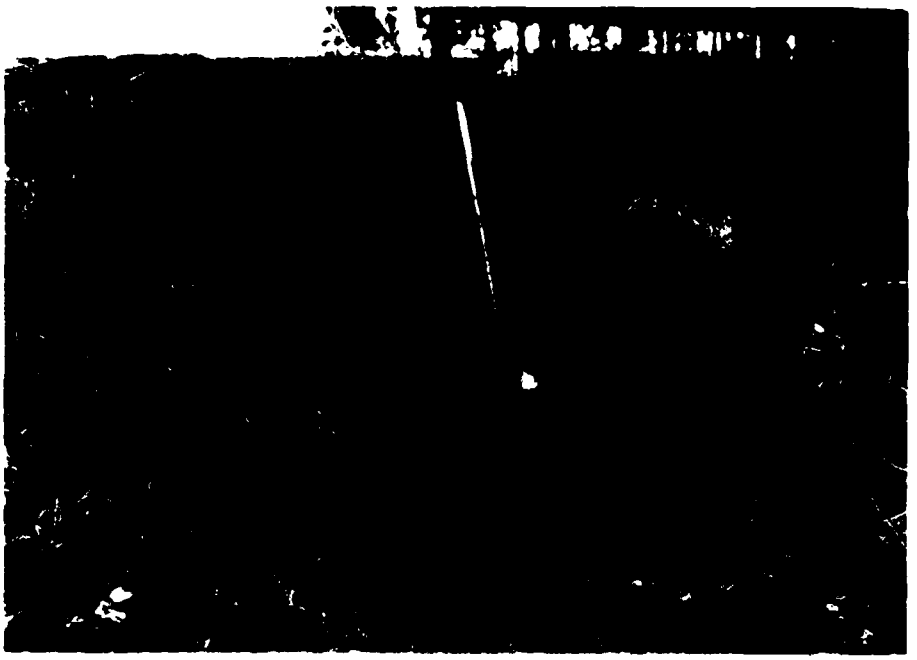


PHOTO #7: Erosion adjacent to right spillway training wall.

PHOTO #8: Right spillway training wall (detail).

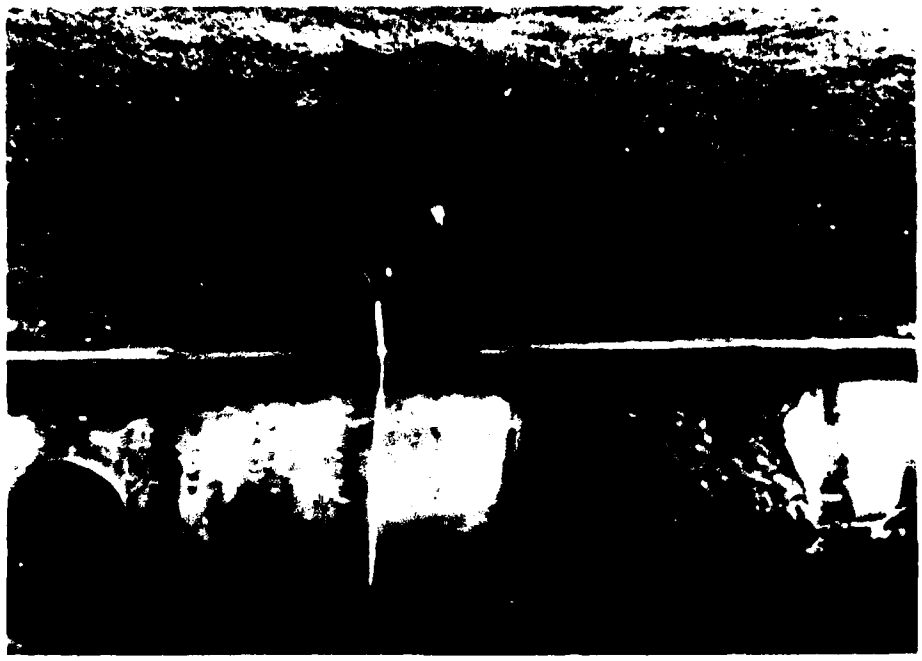


PHOTO #9: Blowoff outlets.

PHOTO #10: Wet area, downstream of toe at left side of dam.

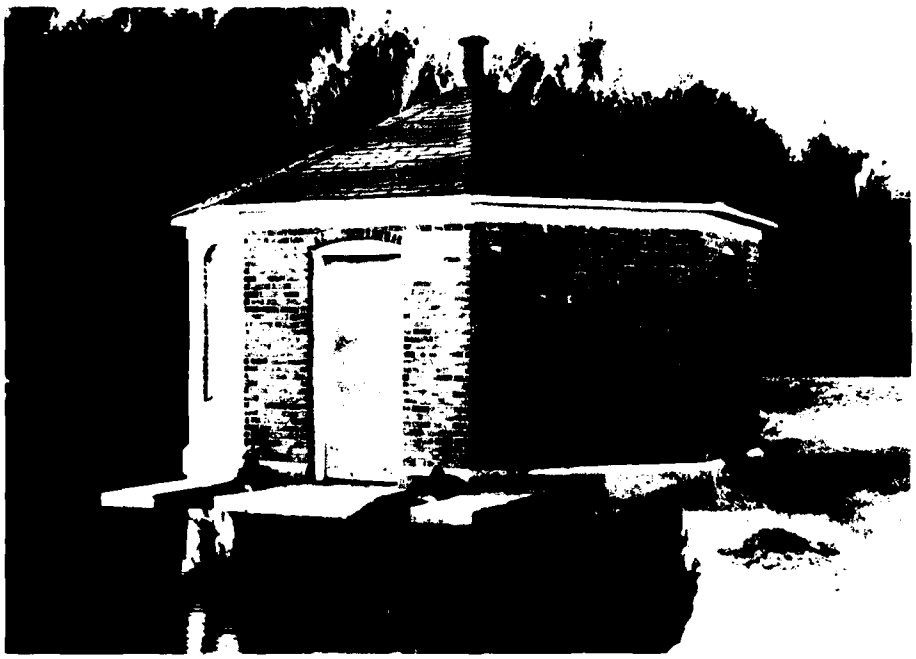


PHOTO #11: Gatehouse.

PHOTO #12: Downstream channel.

PHOTO #13: Reservoir area.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

PROJECT 79010
CHESHIRE RES DAM
SOUTHINGTON CONN

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 1 OF
BY RAC DATE 3-4-80
CHK'D. BY JGM DATE 3/7/80

DETERMINATION OF SPILLWAY TEST FLOOD*

A. SIZE CLASSIFICATION

Storage Volume (Ac.-Ft.) 58.3

Height of Dam (Ft.) 18

Size Classification SMALL

B. HAZARD POTENTIAL CLASSIFICATION

Category	Loss of Life	Economic Loss
Low	None expected	Minimal
Significant	Few	Appreciable
(High)	(More than few)	Excessive

Hazard Classification HIGH

C. HYDROLOGIC EVALUATION GUIDELINES

Hazard	Size	Spillway Test Flood
Low	Small	50 to 100-Year Frequency
	Intermediate	100-Year Frequency to 1/2 PMF
	Large	1/2 PMF to PMF
Significant	Small	100-Year Frequency to 1/2 PMF
	Intermediate	1/2 PMF to PMF
	Large	PMF
(High)	(Small)	(1/2 PMF) to PMF
	Intermediate	PMF
	Large	PMF

Spillway Test Flood 1/2 PMF

*Based upon "Recommended Guidelines for Safety Inspection of Dams" Department of the Army, Office of the Chief of Engineers, November 1976.

PROJECT 7990 10
CHESHIRE RES DAM
SOUTHINGTON CONN

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. 2 OF
BY RAC DATE 3-4-80
CHK'D. BY JBM DATE 3/7/80

DETERMINATION OF THE MAXIMUM PROBABLE FLOOD (MPF)

A. Drainage Area in Square Miles 2.1

B. Watershed Characteristic: Flat & Coastal

(Rolling)

Moutainous

C. M.P.F. in CFS/Square Mile,* 2100

M.P.F. = (CFS/Square Mile) x (Area in Square Miles)

2100 x 2.1 = 4410 CFS

½ PMF = 4410 (½) = 2205 CFS

*Based upon the figure "Maximum Probable Flood Peak Flow Rates" U.S. Army Corps of Engineers, December 1977.

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THE PMP RAINFALL IS 29.0 INCHES FOR A 6 HR DURATION, 24 HR STORM. USING A 20% FACTOR FOR IMPERFECT FIT, THE EFFECTIVE RAINFALL IS 19.2 INCHES (SEE FIG 15, DESIGN OF SMALL DAMS).

VOLUME OF RUNOFF

BASED ON AN ASSUMED CN VALUE OF 80 (FOR GLACIAL TILL SOILS), RUNOFF FOR THE PMP IS 16.5 INCHES (FIG A-4, - DESIGN OF SMALL DAMS).

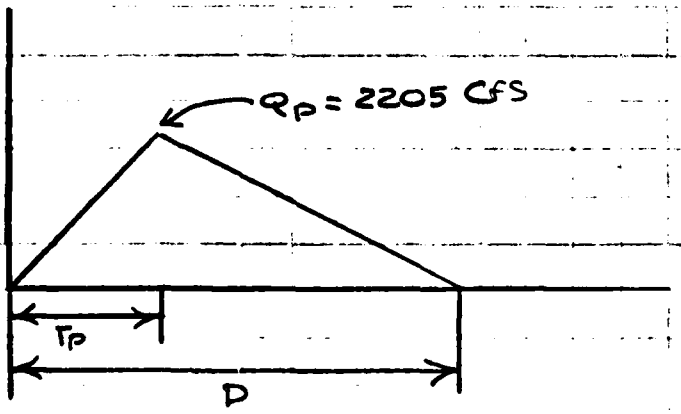
SPILLWAY TEST FLOOD RUNOFF = $\frac{1}{2}(16.5) = 8.25''$

VOLUMN OF RUNOFF

$$\left(\frac{8.25''}{12''/FT}\right)\left(2.1\,M^2\right)\left(\frac{640\,AC}{M^2}\right) = 924\ AC\text{-}FT$$

TEST FLOOD HYDROGRAPH

A TRIANGULAR HYDROGRAPH IS TO BE USED FOR THE ROUTING OF THE TEST FLOOD THROUGH THE RESERVOIR, PEAK FLOW EQUALS 2205 CFS, SET DURATION OF RUNOFF SO AS TO CONTAIN VOLUMN OF RUNOFF, AND RECEEDING LIMB EQUALS TWICE THE RISING LIMB.



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HYDROGRAPH VOL $= \frac{1}{2} Q_p D = 924$ AC-F

$924 = (.5)(2205) D$

$$D = \frac{(924 \text{ AC-FT})(43560 \text{ FT}^3/\text{AC-FT})}{(.5)(2205 \text{ CFS})(60 \text{ S/M})(60 \text{ M/HR})} = 10.2 \text{ HOURS}$$

SAY 10 HOURS

HYDROGRAPH FORMATION

D = 10 HOURS $T_p = 3.3$ $Q_p = 2205$ CFS

TIME (HOURS)	INFLOW (CFS)
0	0
1	668
2	1336
3	2005
3.3	2205
4	1975
5	1646
6	1317
7	988
8	659
9	329
10	0

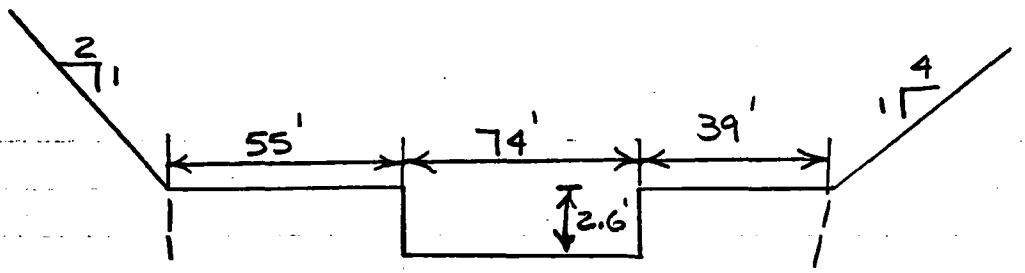
PROJECT 79010
CHESIRE RES. DAM
SOUTHINGTON CONN

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. 5 OF
BY RAC DATE 3-4-80
CHK'D. BY JGM DATE 3/8/80

SPILLWAY AND OVERFLOW SECTION DATA

N.T.S.



SEGMENT	ITEM	"C"	LENGTH	ELEV USGS
1	GRASS EMBANKMENT	2.5	55	427.6
2	CONC. OGEE SPILLWAY	3.5	74'	425.0
3	GRASS EMBANKMENT	2.5	39'	427.6

IE = 425
I.V = 0.0
E = 425 A = 10.0
E = 450 A = 41.3

ASSUMED BREACH WIDTH = 67'

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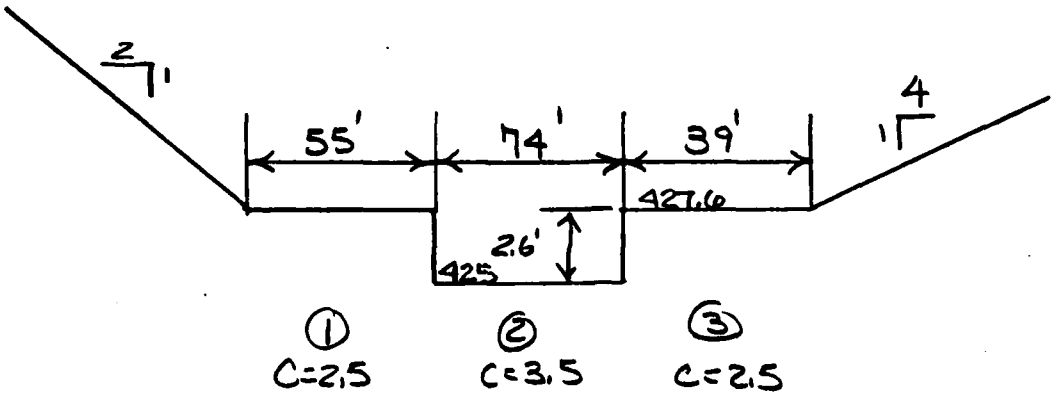
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

STAGE DISCHARGE DATA N.T.S.



ELEV	426	427	427.6	428	429	430
$Q_1 = C_1 L_1 H^{3/2}$ $Q_1 = (2.5)(55) H^{3/2}$	—	—	—	35	228	511
$Q_2 = C_2 L_2 H^{3/2}$ $Q_2 = (3.5)(74) H^{3/2}$	259	733	1086	1346	2072	2896
$Q_3 = C_3 L_3 H^{3/2}$ $Q_3 = (2.5)(39) H^{3/2}$	—	—	—	25	162	363
TOTAL CAPACITY	259	733	1086	1406	2462	3770

THESE VALUES WOULD BE REDUCED IF THE FLOW AT THE SPILLWAY WERE LIMITED TO AN ORIFICE CONDITION BY THE FOOTBRIDGE

PROJECT 799010
CHESHIRE RES DAM
SOUTHINGTON CONN

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. 7 OF
BY RAC DATE 3-5-9
CHK'D. BY DATE

HSE	WATER ELEV	HSE ELEV	WATER DEPTH
1	293	270	23.0'
2	293	270	23.0'
3	272.6	255	17.6'
4	272.6	255	17.6'
5	261.2	245	16.2'
6	261.2	253	8.2'

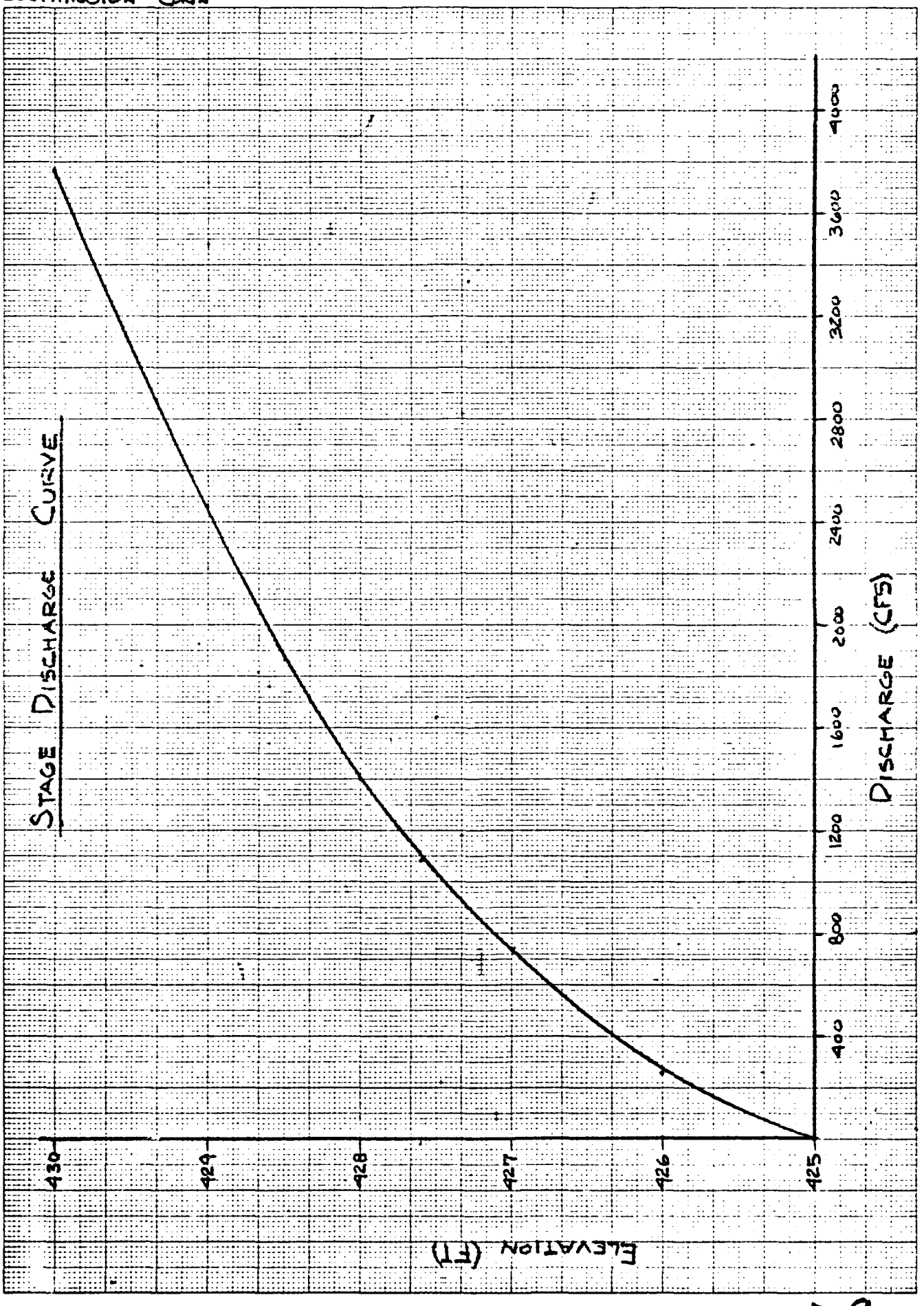
CHESHIRE RES. DAM 799010 FLOOD ROUTING RAC MARCH 5, 19

INPUT DATA: UNSUBMERGED WEIR
SEGMENT 1 DISCHARGE COEFFICIENT = 2.5 LENGTH OF WEIR = 55 ELEVATION OF WEIR = 427.6
SEGMENT 2 DISCHARGE COEFFICIENT = 3.5 LENGTH OF WEIR = 74 ELEVATION OF WEIR = 425
SEGMENT 3 DISCHARGE COEFFICIENT = 2.5 LENGTH OF WEIR = 39 ELEVATION OF WEIR = 427.6
IE=425.0 IV= 0.0 E=425.0 A= 10.00 E=450.0 A= 41.30

HOUR	INFLOW	MASS INFLOW	WATER EL.	TAIL WATER	OUTFLOW	MASS OUTFLOW	STORAGE(R)	STORAGE(A)
0.00	0CFS	0.00AC-F	425.00FT	.00FT	0CFS	0.00AC-F	0.00AC-F	0.00AC-F
1.00	668CFS	27.60AC-F	426.22FT	0.00FT	349CFS	14.45AC-F	13.15AC-F	13.15AC-F
2.00	1,336CFS	110.41AC-F	427.74FT	0.00FT	1,193CFS	78.20AC-F	32.20AC-F	32.20AC-F
3.00	2,005CFS	248.47AC-F	428.49FT	0.00FT	1,895CFS	205.82AC-F	42.64AC-F	42.64AC-F
3.30	2,205CFS	300.66AC-F	428.68FT	0.00FT	2,097CFS	255.31AC-F	45.34AC-F	45.34AC-F
4.00	1,975CFS	421.57AC-F	428.67FT	0.00FT	2,087CFS	376.35AC-F	45.21AC-F	45.21AC-F
5.00	1,646CFS	571.19AC-F	428.28FT	0.00FT	1,670CFS	531.65AC-F	39.54AC-F	39.54AC-F
6.00	1,317CFS	693.63AC-F	427.98FT	0.00FT	1,391CFS	658.21AC-F	35.42AC-F	35.42AC-F
7.00	988CFS	788.88AC-F	427.55FT	0.00FT	1,054CFS	759.30AC-F	29.57AC-F	29.57AC-F
8.00	659CFS	856.94AC-F	427.03FT	0.00FT	752CFS	833.98AC-F	22.95AC-F	22.9 AC-F
9.00	329CFS	897.76AC-F	426.39FT	0.00FT	425CFS	882.64AC-F	15.12AC-F	15.12AC-F
10.00	0CFS	911.36AC-F	425.59FT	0.00FT	119CFS	905.15AC-F	6.20AC-F	6.20AC-F

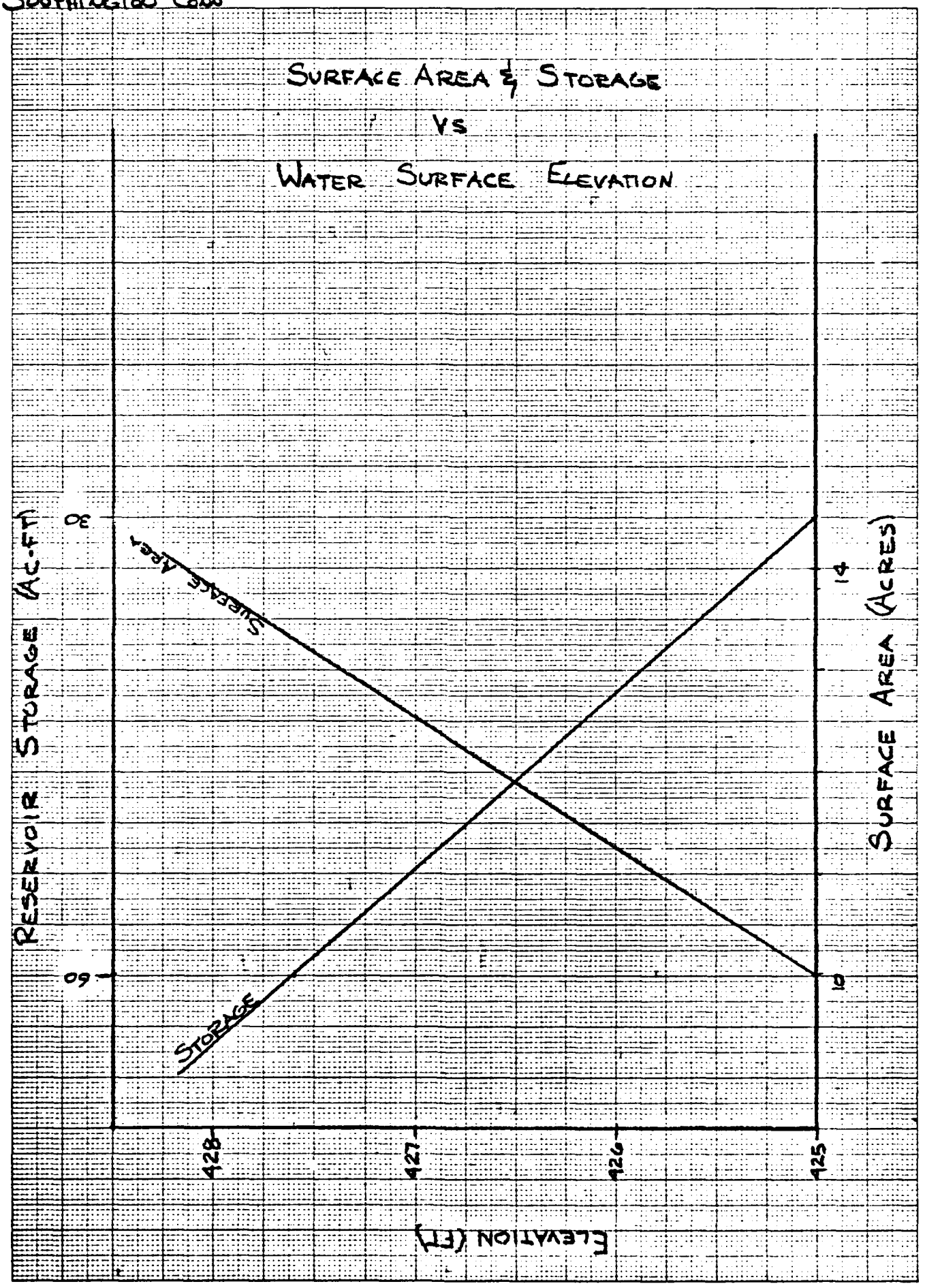
799010
CHESIRE RES. DAM
SOUTHINGTON CONN

RAC 3-10-80



79010
CHESIRE RES. DAM
SOUTHINGTON CONN

RAC 3-4-80



D-10

FGA FLOOD WAVE ROUTING

APPROXIMATE FLOOD WAVE ROUTING BASED UPON U.S. ARMY CORPS OF ENGINEERS' "RULE OF THUMB GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS" DATED APRIL, 1978.

INITIAL STATION = 0 +0
INITIAL BASE FLOW = 1,086 CFS
INITIAL WAVE HEIGHT = 18.0 FT
ASSUMED BREACH WIDTH = 52.0 FT
INITIAL RESERVOIR STORAGE = 58 ACRE-FT
COMPUTED FLOOD WAVE PEAK FLOW = 6,672 CFS
TOTAL FLOOD WAVE PEAK FLOW = 7,758CFS

STATION 0+90

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-250.0 FT	460.0 FT	-200.0 FT	450.0 FT	-150.0 FT	430.0 FT
-20.0 FT	410.0 FT	-10.0 FT	410.0 FT		
		N = 0.040			
-10.0 FT	410.0 FT	-5.0 FT	407.0 FT	5.0 FT	407.0 FT
10.0 FT	410.0 FT				
		N = 0.080			
10.0 FT	410.0 FT	50.0 FT	410.0 FT	80.0 FT	420.0 FT
180.0 FT	430.0 FT	270.0 FT	440.0 FT	290.0 FT	450.0 FT
400.0 FT	460.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
64.5 SF	30.8 FT	0.050	18.4 FPS	1,190CFS
108.5 SF	21.6 FT	0.040	41.2 FPS	4,480CFS
142.2 SF	50.0 FT	0.080	14.1 FPS	2,011CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
407.0 FT	6.1 FT	413.1 FT	315 SF	24.3 FPS	7,681 CFS	0.1440

BASE FLOW = 1,086 CFS BASE STAGE = 410.0 FT.

STATION 9+90

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-700.0 FT	420.0 FT	-625.0 FT	410.0 FT	-350.0 FT	420.0 FT
-200.0 FT	420.0 FT	-150.0 FT	410.0 FT	-100.0 FT	400.0 FT
-25.0 FT	370.0 FT	-10.0 FT	370.0 FT		
		N = 0.040			
-10.0 FT	370.0 FT	-5.0 FT	367.0 FT	5.0 FT	367.0 FT
10.0 FT	370.0 FT				
		N = 0.080			
10.0 FT	370.0 FT	90.0 FT	370.0 FT	200.0 FT	380.0 FT
400.0 FT	380.0 FT	620.0 FT	400.0 FT	860.0 FT	420.0 FT

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
68.3 SF	24.4 FT	0.080	7.7 FPS	527CFS
115.4 SF	21.6 FT	0.040	23.7 FPS	2,743CFS
349.8 SF	118.8 FT	0.080	8.0 FPS	2,799CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
367.0 FT	6.5 FT	373.5 FT	533 SF	11.3 FPS	6,070 CFS	0.0440

BASE FLOW = 1,086 CFS BASE STAGE = 370.6 FT.

STATION 23 +0

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-300.0 FT	340.0 FT	-200.0 FT	330.0 FT	-125.0 FT	320.0 FT
-25.0 FT	310.0 FT	-10.0 FT	310.0 FT		
		N = 0.040			
-10.0 FT	310.0 FT	-5.0 FT	307.0 FT	5.0 FT	307.0 FT
10.0 FT	310.0 FT				
		N = 0.080			
10.0 FT	310.0 FT	25.0 FT	320.0 FT	175.0 FT	330.0 FT
200.0 FT	340.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
167.1 SF	59.9 FT	0.080	7.8 FPS	1,316CFS
134.4 SF	21.6 FT	0.040	26.8 FPS	3,610CFS
15.0 SF	8.0 FT	0.080	6.0 FPS	90CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
307.0 FT	7.4 FT	314.4 FT	316 SF	15.8 FPS	5,016 CFS	0.0458

BASE FLOW = 1,086 CFS BASE STAGE = 310.9 FT.

STATION 29 +0

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.080			
-300.0 FT	300.0 FT	-200.0 FT	290.0 FT	-100.0 FT	280.0 FT
-25.0 FT	270.0 FT	-10.0 FT	270.0 FT		
		N = 0.040			
-10.0 FT	270.0 FT	-5.0 FT	267.0 FT	5.0 FT	267.0 FT
10.0 FT	270.0 FT				
		N = 0.080			
10.0 FT	270.0 FT	25.0 FT	270.0 FT	100.0 FT	280.0 FT
200.0 FT	290.0 FT	250.0 FT	300.0 FT		

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
90.0 SF	39.9 FT	0.080	8.2 FPS	743CFS
110.8 SF	21.6 FT	0.040	28.4 FPS	3,159CFS
90.0 SF	39.9 FT	0.080	8.2 FPS	743CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
267.0 FT	6.2 FT	273.2 FT	291 SF	15.9 FPS	4,646 CFS	0.0667

BASE FLOW = 1,086 CFS BASE STAGE = 270.5 FT.

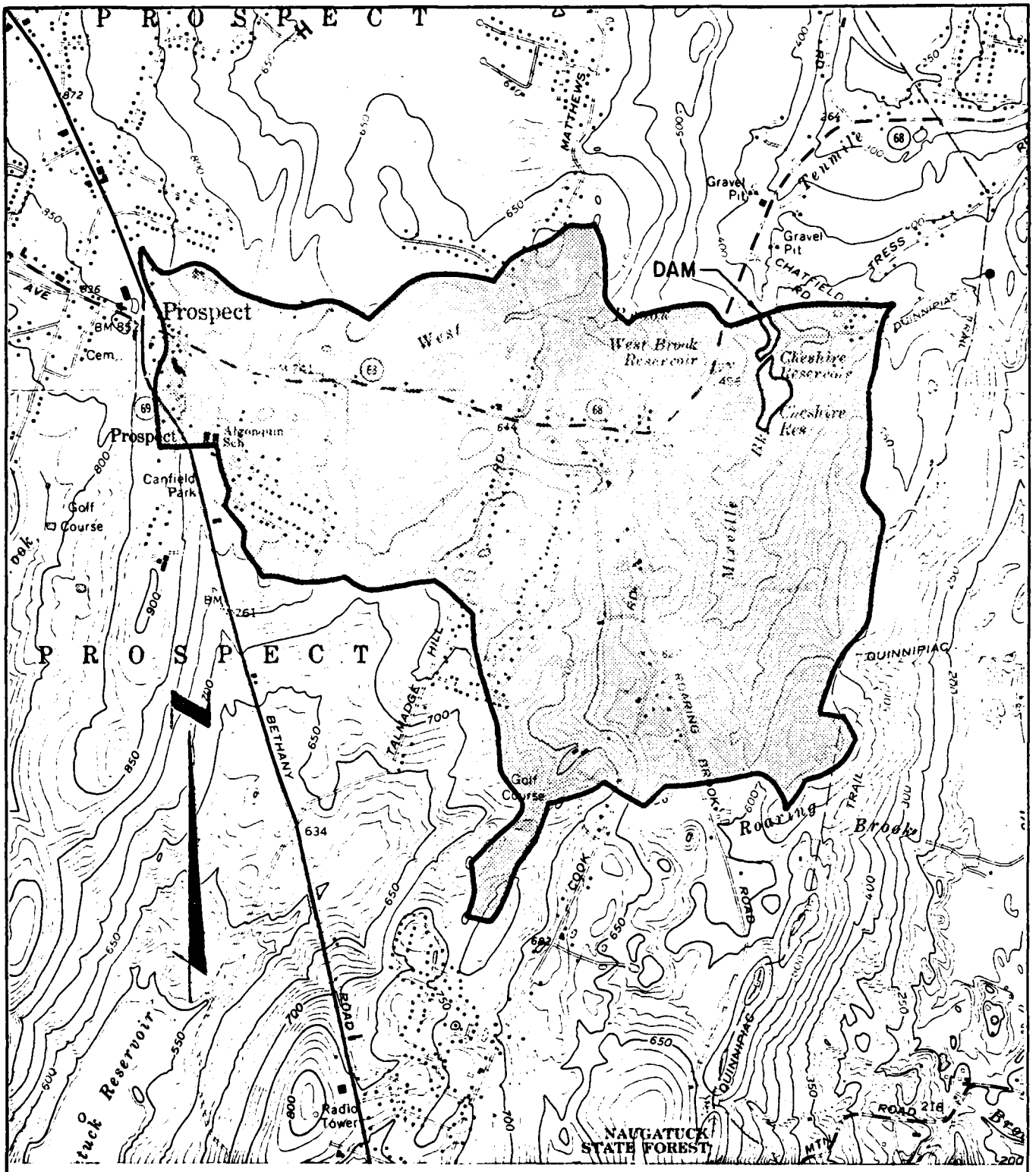
STATION 40+60

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-800.0 FT	250.0 FT	-360.0 FT	250.0 FT	-180.0 FT	240.0 FT
-10.0 FT	240.0 FT				
		N = 0.040			
-10.0 FT	240.0 FT	-5.0 FT	237.0 FT	5.0 FT	237.0 FT
10.0 FT	240.0 FT				
		N = 0.080			
10.0 FT	240.0 FT	600.0 FT	240.0 FT	750.0 FT	250.0 FT
950.0 FT	300.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
155.2 SF	185.7 FT	0.050	4.2 FPS	655CFS
62.4 SF	21.6 FT	0.040	12.0 FPS	752CFS
520.7 SF	603.1 FT	0.080	2.6 FPS	1,403CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
237.0 FT	3.8 FT	240.8 FT	738 SF	3.8 FPS	2,810 CFS	0.0256

BASE FLOW = 1,086 CFS BASE STAGE = 240.3 FT.



SCALE IN FEET

2000 1000 0 2000

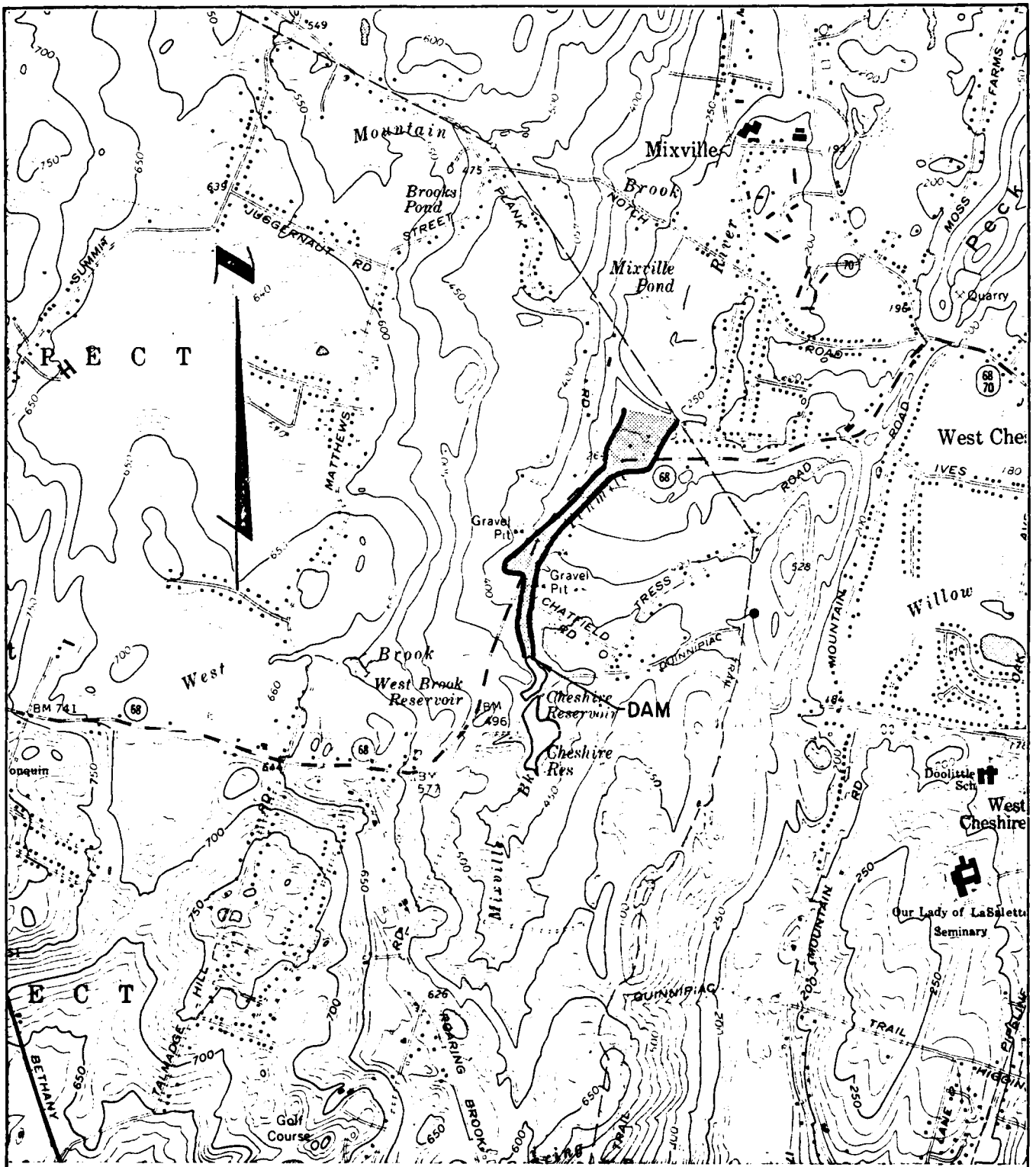
CHESHIRE RESERVOIR DAM

DRAINAGE MAP

PROSPECT, CONNECTICUT

FLAHERTY • GIAVARA ASSOCIATES, P.C.

D-16



CHESHIRE RESERVOIR DAM
DAM FAILURE ANALYSIS
IMPACT AREAS
PROSPECT, CONNECTICUT

FLAHERTY • GIAVARA ASSOCIATES, P.C.

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY	MO	YR
CT	603	NED	CT	009	05				CHESHIRE RESERVOIR DAM	4130.2	7256.9	01	APR	80

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
	CHESHIRE RESERVOIR

(15) REGION	(16) BASIN	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	10	MIXVILLE BROOK	MIXVILLE	1	3000

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	(27) IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)
ERTHRG	1900M	S	18	15	50	30

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

(28) REMARKS
P/S-ESTIMATE 23-BACK-UP

(29) O/S HAS	(30) SPILLWAY CREST LENGTH	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
1	160	U	74	1086												

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
NEW HAVEN WATER CO		

(49) REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
CONN DEP	CONN DEP	CONN DEP	CONN DEP

(50) INSPECTION BY	(51) INSPECTION DATE DAY	MO	YR	(52) AUTHORITY FOR INSPECTION
FLAHERTY GIAVARA ASSOCIATES	30	OCT	79	P.L. 92-367

(53) REMARKS

END

FILMED

3-85

DTIC