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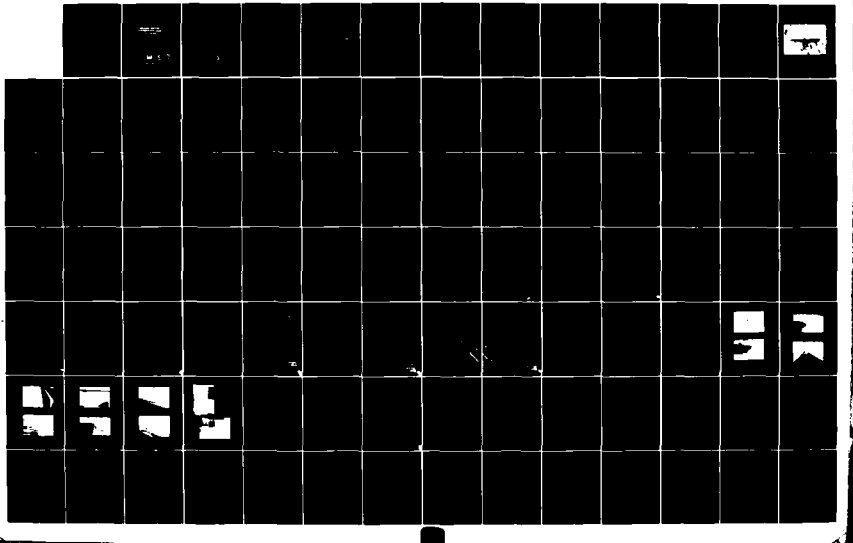

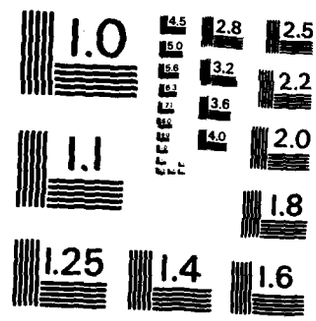

HOUSATONIC RIVER BASIN

SHELTON, CONNECTICUT

MEANS BROOK RESERVOIR DAM CT 00092

PHASE 1 INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

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

APRIL, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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

DAMS, INSPECTION, DAM SAFETY,
Housatonic River Basin
Shelton, Conn.
Means Brook Reservoir Dam

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

The dam at Means Brook Reservoir is concrete, 527 ft.long, 50 ft. high at the center of the dam, has a 100 ft. long spillway, has a top width of 10 ft., and a 2.1 high ft. wall along the top. It was originally built in 1917 with subsequent spillway and top of dam modifications in 1977. The Bridgeport Hydraulic Company presently owns and operates the dam including its waterworks facilities. The impoundment storage at the top of the dam is 373 ac.-ft. and the maximum height of the dam is 50 ft. The test flood for this dam is the PMF.

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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

MAY 05 1977

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

Dear Governor Grasso.

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

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Bridgeport Hydraulic Company, 835 Main Street, Bridgeport, Connecticut 06609.

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

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

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

HOUSATONIC RIVER BASIN

SHELTON, CONNECTICUT

MEANS BROOK RESERVOIR DAM

CT 00092

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

Identification No.:	CT 00092
Name of Dam:	Means Brook Reservoir Dam
Town:	Shelton
County and State:	Fairfield County, Connecticut
Stream:	Means Brook
Date of Inspection:	November 16, 1979

BRIEF ASSESSMENT

The dam at Means Brook Reservoir is concrete, 527 feet long, 50 feet high at the center of the dam (from the top of the crest wall to the toe of the downstream embankment), has a 100 foot long spillway, has a top width of 10 feet, and a 2.1 high foot wall along the top. It was originally built in 1917 with subsequent spillway and top of dam modifications in 1977. The Bridgeport Hydraulic Company presently owns and operates the dam including its waterworks facilities.

Based on the visual inspection and past operational performance, the dam is judged to be in FAIR condition. Significant spalling of the concrete and efflorescence was noted on the downstream face of the dam, and the edges of the top of the dam are chipped revealing reinforcement in places.

This dam is classified as INTERMEDIATE in size and a HIGH hazard potential structure in accordance with recommended guidelines established by the Corps of Engineers. The impoundment storage at the top of the dam is 373 ac.-ft. and the maximum height of the dam is 50 feet. Failure of the dam would result in the loss of more than a few lives and excessive damage to 25-30 residential homes.

The test flood for this dam is the Probable Maximum Flood (PMF). The test flood has an inflow equal to 7800 cfs and an outflow discharge of 7800 cfs, with stillwater elevation of 351.5 which will overtop the dam by 1.4 feet. The maximum outflow capacity of the spillway is 4000 cfs which is 51 percent of the test flood.

It is recommended that the following items be studied further: The upstream face of the dam, the spalled concrete on the downstream face and top of the dam, the subsurface leakage beneath the spillway, and the structural stability.

The following remedial measures should be taken; the toe at the downstream face be monitored for leakage, and the 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, P.E.
Vice-President
Connecticut P.E. No. 8012

This Phase I Inspection Report on MEANS BROOK 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. Fryar

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 by 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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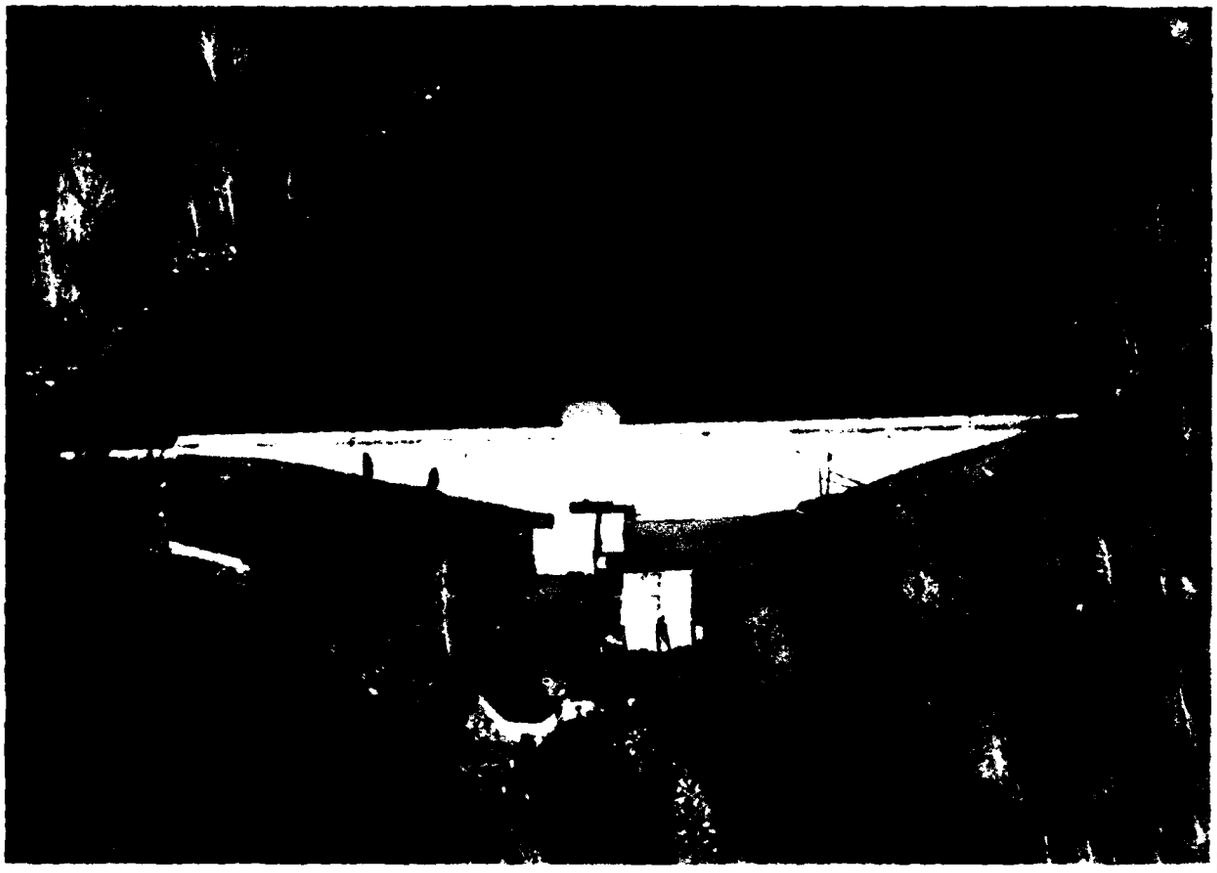
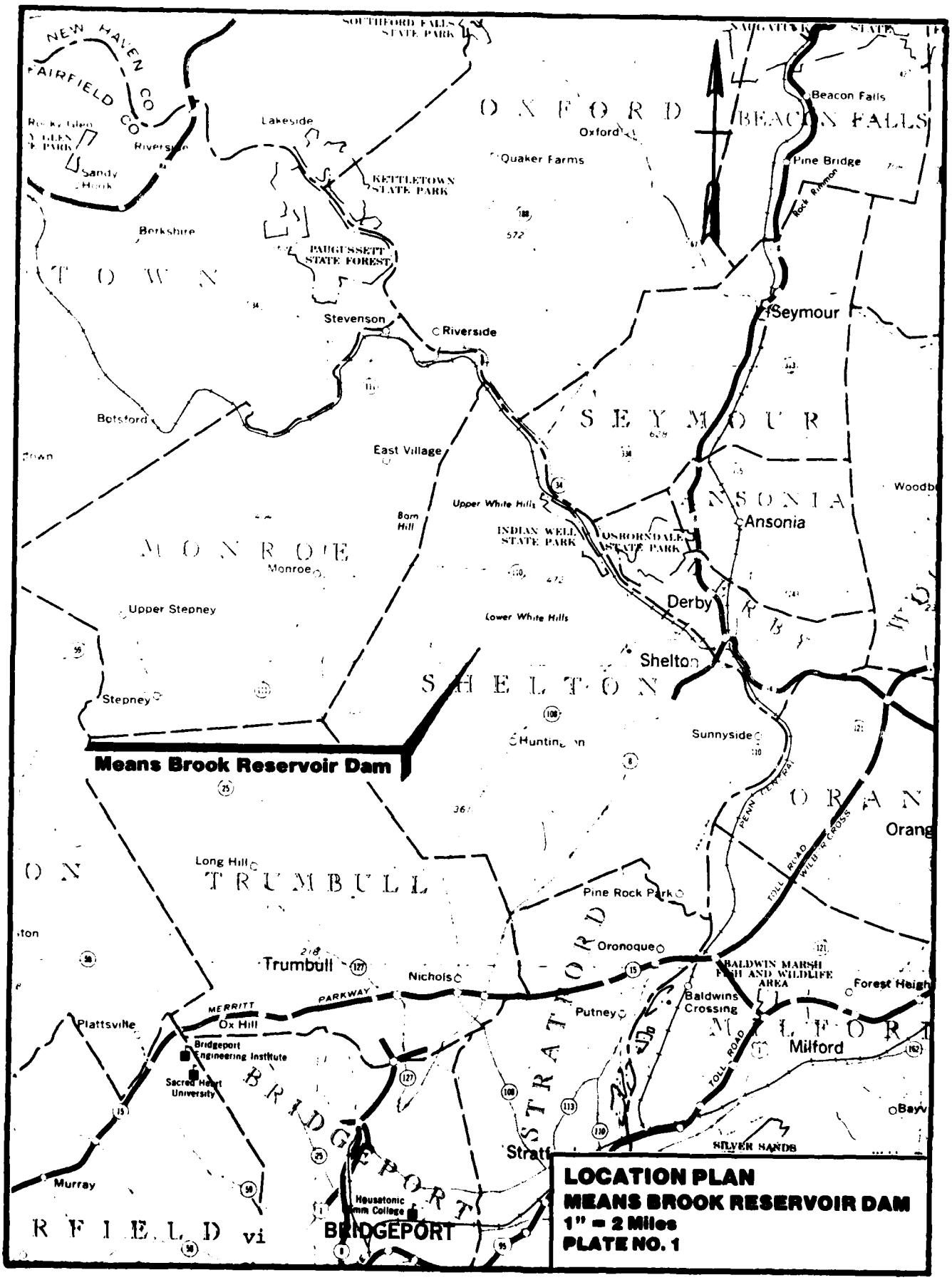
APPENDIXES



OVERVIEW PHOTO - MEANS BROOK RESERVOIR DAM


Means Brook Reservoir Dam
LOCATION PLAN
MEANS BROOK RESERVOIR DAM
1" = 2 Miles
PLATE NO. 1
NEW HAVEN CO
FAIRFIELD CO
SOUTHFORD FALLS STATE PARK
Lakeside
Riverside
Sandy Hook
KETTLETOWN STATE PARK
PAUGUSSETT STATE FOREST
Berkshire
Stevenson
Botsford
East Village
Upper White Hills
Bam Hill
INDIAN WELL STATE PARK
OSBORNDALE STATE PARK
Monroe
Upper Stepney
Lower White Hills
Stepney
Huntington
Sunnyside
Long Hill
Pine Rock Park
Oronoque
Trumbull
Nichols
Putney
Baldwins Crossing
BALDWIN MARSH FISH AND WILDLIFE AREA
Forest Heigh
Milford
Plattsville
Ox Hill
Bridgeport Engineering Institute
Sacred Heart University
Murray
Housatonic Comm College
BRIDGEPORT
Stratford
SILVER SANDS
Oxford
Quaker Farms
Beacon Falls
Pine Bridge
Rock Rimmon
Seymour
Ansonia
Derby
Shelton
Orang
Woodb
Bayv
MERRITT PARKWAY
TOLL ROAD
PENN CENTRAL
WILB CROSS

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

NAME OF DAM: MEANS BROOK RESERVOIR 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 inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. 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. DACW33-80-C-0002 has been assigned by the Corps of Engineers for this work.

b. **Purpose:**

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

2. Encourage and prepare the States to initiate quickly, effective dam safety programs for non-Federal dams.

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

1.2 Description of the Project

a. **Location:** Means Brook Reservoir Dam is located in the Town of Shelton in Fairfield County, Connecticut, approximately 1.6 miles north of the village of Huntington along Means Brook (see Plate No. 1). The dam impounds water from Means Brook and is located 11,500 feet above the confluence with Farmill River. The impoundment is situated in a northwest/southeast direction, with the dam at the southeast end. The longitude is 73° -09'-28" and the latitude is 41° -18'-57".

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

b. **Description of Dam and Appurtenances:** Means Brook Reservoir Dam is a concrete structure with abutments and foundation keyed into rock. The length at the top of the dam is 527 feet and maximum depth to the bottom of the cutoff is 59.5 feet. The spillway is a concrete ogee weir and is located at, and is keyed into rock at the west abutment at the end of the dam. It has a length of 100.0 feet and a width of 6 feet with a crest elevation of 345.0. The width of the original top of the dam is 10.0 feet and is 3 feet above the top of the spillway. A 2.1 foot high concrete wall was added to the dam's crest in 1977. The maximum width at the base of the dam is 35+/- feet. The upstream face of the dam is concrete and is vertical in a cross sectional view. The downstream face of the dam is also concrete and is battered at 0.7H: 1.0V from the toe to a distance of approximately 24.0 feet from the top of the dam. Continuing to elevation 346.5, the face of the dam, in a cross sectional view, is concave with a radius equal to 36 feet.

The upper gate house is a concrete structure located on the top of the dam approximately in the center of the dam. Water can enter the wet well via a 36 inch sluice gate with an invert at elevation 335.4 and a 16 inch sluice gate with an invert at elevation 322.0. Water flows from the upper gate house through the dam to the concrete lower gate house via the following pipes: A 30 inch service main, a 10 inch auxiliary service, and an 8 inch drain. The 10 inch auxiliary service joins the 30 inch service main in the lower gate house and a 36 inch pipe continues downstream to an outfall at Trap Falls Reservoir. Both pipes have gate valves in the lower gate house. The 8 inch drain is controlled by a gate valve in the lower gate house and drains to the blowoff pipe.

The blowoff is a 24 inch pipe with an invert on the upstream face of the dam approximately at elevation 307.0. The pipe extends through the dam to the lower gate house where discharge is controlled by a gate valve. The 24 inch pipe continues downstream, transitions to a 16 inch pipe, and outlets at an endwall 160 feet below the dam. A 12 inch blowoff from the 36 inch service main controlled by a valve in a manhole also discharges at this endwall.

c. **Size Classification:** The size classification of this dam is INTERMEDIATE 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 373 acre-feet (within the "small" range of 50 to 1000 ac.-ft.) and the maximum height of the dam is 50 feet (within the range of 40 to 100 feet). The size classification is based on the height 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 failure of the dam would result in more than a few losses of lives and extensive damage to residential areas located downstream. Twenty-five to thirty homes will be inundated by 2 to 5 feet of water.

e. **Ownership:** The Means Brook Reservoir is presently owned and maintained by the Bridgeport Hydraulic Company, 835 Main Street, Bridgeport, Connecticut 06609.

f **Operator:** The person in charge of the day-to-day operation of this dam is:

Mr. Mark L. Johnson
Superintendent of System Operations
Bridgeport Hydraulic Company
835 Main Street
Bridgeport, CT 06609
Tel. (203) 367-6621

g. **Purpose of Dam:** The Means Brook Reservoir Dam impounds water from Means Brook and is used to supply water to the distribution system of the Bridgeport Hydraulic Company.

h. **Design and Construction History:** The dam was constructed in 1917. The spillway was rehabilitated and extended 25 feet, a 2.1 foot concrete wall was added along the top of the dam, and the raceway was widened in 1977. Other minor modifications to some of the appurtenant structures also took place. Various changes in the subsurface pipe network below the dam and the addition of the high lift pump house have taken place over the years. The piping through the dam has apparently remained unchanged.

i. **Normal Operating Procedures:** Water is withdrawn via the 36 inch sluice gate and 30 inch service main, and continues to Trap Falls Reservoir via the 36 inch pipe. All other valves and pipes are normally closed.

1.3 Pertinent Data

a. **Drainage Area:** The Means Brook Reservoir drainage basin extends approximately 1.5 miles south of Route 110 and 2.3 miles north of Route 110 in the western section of Shelton and eastern section of Monroe. The basin is generally rectangular in shape having a length of 3.8 miles and an average width of 2.1 miles. The total drainage area to the dam is 7.65 square miles (see drainage basin map in Appendix D) including 1.88 square miles draining to a 5 foot high horseshoe shaped aqueduct. This aqueduct diverts water from Hurds Brook to Means Brook in the northwest portion of the watershed. The topography is generally moderate to steep terrain, with elevations ranging from a high of 650

feet to a low of 345 feet at the spillway crest. Stream slopes are flat having an average grade of 1/4 percent. Basin slopes range from 5 to 10 percent. The normal pond area is 18.4 acres which is 0.4 percent of the watershed.

b. **Discharge at Dam Site:** Daily water usage records are available from the Bridgeport Hydraulic Company. Other than this, there are no specific flood discharge records available for this dam. Listed below are calculated discharge values for the spillway and outlet works (30 inch service main and 24 inch blowoff).

1. Outlet Works: A 30 inch service main with an intake invert at elevation 322.0 and a discharge capacity of 113 cfs at elevation 345.0. A 24 inch blowoff with an invert approximately at elevation 307.0 and a discharge capacity of 42 cfs at elevation 345.0.

2. Maximum Known Discharge at Dam Site: Calculated to be 2000 cfs in October, 1955 based on a recorded flow of 4 inches over the dam. The spillway was 76.5 feet long and the wall on the top of the dam did not exist at this time.

3. Spillway Capacity at Top of Dam (Crest Wall): 4000 cfs at elevation 350.1.

4. Spillway Capacity at Test Flood Level: 5800 cfs at elevation 351.5.

5. Gated Outlet Capacity at Normal Pool Elevation: 113 cfs (30 inch main) and 42 cfs (24 inch blowoff) at elevation 345.0.

6. Gated Outlet Capacity at Test Flood Level: 128 cfs (30 inch main) and 45 cfs (24 inch blowoff) at elevation 351.5.

7. Gated Outlet Capacity at Top of Dam (Crest Wall) Elevation: 125 cfs (30 inch main) and 44 cfs (24 inch blowoff) at elevation 350.1.

8. Total Project Discharge at Top of Dam (Crest Wall) Elevation: 4170 cfs at elevation 350.1.

9. Total Project Discharge at Test Flood Elevation: 7970 cfs at elevation 351.5.

c. **Elevation (Ft. above N.G.V.D.)**

1. Stream bed at toe of dam — 305+/— (upstream)
300+/— (downstream)

2.	Bottom of cutoff	Approximately 290.6 at lowest point.
3.	Maximum tailwater	N/A
4.	Recreation pool	N/A
5.	Full flood control pool	N/A
6.	Spillway crest (Normal pool)	345.0
7.	Design surcharge (1977 Original Design)	349.1 w/1' freeboard
8.	Top of dam	350.1 (top of wall) 348.0 (top of dam)
9.	Test flood level	351.5

d. Reservoir (Length in feet)

1.	Normal pool	1600
2.	Flood control pool	N/A
3.	Spillway crest pool	1600
4.	Top of dam (crest wall)	2500
5.	Test flood pool	2500

e. Storage (acre-feet)

1.	Normal pool	268
2.	Flood control pool	N/A
3.	Spillway crest pool	268
4.	Top of dam (crest wall)	373
5.	Test flood pool	412

f.	**Reservoir Surface (acres)**	
1.	Normal pool	18.4
2.	Flood control pool	N/A
3.	Spillway crest	18.4
4.	Test flood pool	26.0
5.	Top of dam (crest wall)	24.0
g.	**Dam**	
1.	Type	Concrete
2.	Length	527 feet
3.	Height	50 feet (top of wall to downstream toe)
4.	Top width	10 feet (top of dam) 1 foot (top of wall)
5.	Side slopes	Upstream: vertical Downstream: 0.7H:1.0V and radius of 36'
6.	Zoning	Concrete
7.	Impervious core	Concrete
8.	Cutoff	Concrete keyed into bedrock
9.	Grout curtain	N/A
h.	**Diversion and Regulating Tunnel**	**N/A**
i.	**Spillway**	
1.	Type	Overflow, ogee crest, uncontrolled weir

2.	Length of weir	100 feet
3.	Crest elevation	345.0
4.	Gates	None
5.	U/S Channel	Bedrock
6.	D/S Channel	Bedrock

j. **Regulating Outlets**

Refer to Paragraph 1.2b - "Description of Dam and Appurtenances" for description of Outlet Works.

1.	Inverts	335.4 — 36 inch main intake 322.0 — 16 inch auxiliary intake 307+/— 24 inch blowoff intake
2.	Size	30 inch service main 10 inch auxiliary service 8 inch drain 24 inch blowoff
3.	Description:	Cast iron pipes
4.	Control mechanisms	Hand operated lift mechanisms in the upper gate house. Gate valves in the lower house.

SECTION 2

ENGINEERING DATA

2.1 Design

Available design data consists of the following documents and plans:

a. Bridgeport Hydraulic Co., Means Brook Development, Plan and Profile of Dam, Town of Huntington, Connecticut, May, 1915.

b. Bridgeport Hydraulic Co., Means Brook Development, Plan, Profile and Cross Section of Dam, Town of Huntington, Connecticut, February 1916.

c. Plans for Revisions to Means Brook Spillway, Designed by Seelye, Stevenson, Value and Knecht, 1977.

d. Design Report, Revisions to Means Brook Reservoir Spillway for Bridgeport Hydraulic Company by Seelye, Stevenson, Value and Knecht, Consulting Engineers, March 15, 1977.

e. Design Report, Addendum No. 1, Revisions to Means Brook Reservoir Spillway for Bridgeport Hydraulic Company, March 31, 1977.

f. Plan of Lower Gate House, Means Brook Reservoir.

g. Plan of Upper Gate House, Means Brook Reservoir.

2.2 Construction

This dam was constructed in 1917. Review of the contract plans for the 1977 revisions showed that the modifications to the dam were limited to lengthening of the spillway and spillway channel (raceway), spillway rehabilitation, extension of the pipe bridge over the widened raceway, construction of a 2.1 foot wall on the dam's crest and other minor modifications to some appurtenant structures. These revisions were implemented as the result of a 1973 inspection of the dam. A copy of this inspection report is contained in Appendix B.

2.3 Operation

The operation of the dam is for the purpose of water supply, and therefore, the water level for this dam is established on the basis of the water supply demand. However, there is no written procedure that has been established for this purpose.

2.4 Evaluation

a. **Availability:** The information noted above for this facility is available in the files of the Department of Environmental Protection, Water and Related Resources Unit, Dam Safety Engineers, State Office Building, Hartford, Connecticut, and the Bridgeport Hydraulic Company, 835 Main Street, Bridgeport, Connecticut.

b. **Adequacy:** The information that was available complemented a complete visual inspection of the dam. Since there were no signs of major distress, the information is adequate at this time.

c. **Validity:** The validity of the 1977 design data appears good. The validity of the 1915 and 1916 plans could not be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. **General:** The visual inspection of the Means Brook Reservoir Dam was conducted on November 16, 1979 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 was impounded by the dam.

2. Visual inspection of the face and crest of the dam and spillway for cracks, spalling, leakage, 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 and aerial photographs were studied and reviewed.

b. **Dam**

1. Crest: The top of the dam is concrete with no evidence of settlement or misalignment. The top is spalled (Photo C-4) and there is visible reinforcing in a few locations along the edge of the top (Photo C-5). A 2.1 foot high concrete wall was added to the upstream edge of the dam's crest in 1977 (Photo C-5).

The top of the dam has a width of 10 feet and support pipe railing (good condition) on both the upstream and downstream edges (Photo C-4).

2. Upstream face: The upstream face of the dam is concrete with a vertical face (Photo C-3). The water level at the time of the inspection was 5.6 feet below the top of the dam (wall). Spalling and efflorescence was noted.

3. Downstream face: The downstream face is concrete with a sloped face (see record drawings in Appendix B). Substantial spalling and efflorescence was noted on the downstream face (Photos C-1, C-2). Leakage at the toe in the center of the dam was reported in a 1977 inspection. However, no sign of any leakage was noted in the inspection for this report.

c. **Appurtenant Structures**

1. Spillway: The spillway is a 100 foot long and 6 foot wide concrete ogee crested weir with a drop of 3 feet to the raceway (Photos C-6, C-8). The spillway was widened and rehabilitated in 1977 and, except for leakage through a small crack (Photo C-7), and possible subsurface leakage, is in good condition. The spillway is located at the west abutment of the dam and is keyed into rock.

2. Water Supply Outlets: A 30 inch service main and a 10 inch auxiliary service drain water from the wet well of the upper gate house, through the dam, to the lower gate house. The 30 inch pipe is normally in use and expands to a 36 inch pipe which extends downstream to the Trap Falls Reservoir. The visible portions are rusted but appear in good condition and are reportedly operational. The 36 inch pipe can be drained to the raceway via a 12 inch blowoff.

3. 24 Inch Blowoff: A 24 inch blowoff extends from the upstream face, through the dam, to the lower gate house. Gate valves in the lower gate house control the discharge in this pipe and are reportedly operational. A cross over pipe can permit flow between the 30 inch service main and the 24 inch blowoff. The 24 inch pipe continues from the lower gate house, transitions to a 16 inch pipe, and outfalls to the raceway at an endwall 160 feet below the dam (Photo C-12).

4. Upper Gate House: The upper gate house is a concrete structure in generally good condition (Photo C-4). The lift mechanisms for the wet well intake sluice gates are located in the house and appear operational (Photo C-11).

5. Lower Gate House: The lower gate house is a concrete structure in generally good condition (Photo C-2, building at toe of dam). Controls for the various gate valves are located in the house and appear operational. Pumps are also located in the house which may be utilized to increase the flow through the 36 inch pipe to the Trap Falls Reservoir.

d. Reservoir Area

The impoundment created by the dam is a flooded portion of the natural brook bed. There are fairly gentle slopes abuting the reservoir on the west side and steeper slopes on the east side.

The natural drainage area of the reservoir has been increased by the diversion of the Hurds Brook Watershed. This watershed flows through an unregulated 5 foot by 5 foot horseshoe shaped aqueduct just south of Webb Circle Road in the northwest portion of the drainage area.

No geologic features were detected that could be expected to adversely affect the dam or its appurtenant structures.

Trespassing on the dam is prohibited and the crest is fenced and locked. Access to the dam site is limited and the access road is chained and locked.

e. Downstream Channel

The spillway channel or raceway is cut into the valley slope at the west abutment below the spillway (Photos C-6, C-9). The floor of the channel is rock with a fairly steep gradient. Water was not flowing over the spillway, however, a substantial flow was noted in the raceway below the spillway (Photo C-6).

A pipe bridge for the 36 inch service main to Trap Falls Reservoir spans the raceway just upstream of the blowoff endwall (Photo C-10).

The raceway was expanded as part of the 1977 modifications to the dam.

3.2 Evaluation

Based on the visual inspection, the Means Brook Reservoir 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:

The substantial spalling and efflorescence on the downstream face.

The subsurface flow to the raceway.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

The responsibility for the operation and maintenance of this facility is with the Bridgeport Hydraulic Company. The maintenance staff is located at the Company headquarters in Bridgeport, Connecticut. These staff personnel make daily visits to the dam facility. During storm conditions, the Means Brook Reservoir Dam is monitored around the clock. These staff personnel operate and maintain the valves and equipment necessary to maintain the flow to the Trap Falls Reservoir for distribution in the water supply system. No written procedure is available for emergency operation of the blowoff system. The blowoff valve was last opened in 1977 to drain the reservoir during alterations to the dam.

4.2 Maintenance of the Dam

The maintenance of the dam is centered around those valves and sluice gates that control the water supply to the public water distribution system. The dam is superficially inspected by the Bridgeport Hydraulic Company on an annual basis. Records of these inspections are available from the Bridgeport Hydraulic Company.

4.3 Maintenance of the Operating Facilities

The operating facilities consist of a 36 inch sluice gate for the main water service intake, a 16 inch sluice gate for the auxiliary water service intake and a gate valve for the blowoff system. All valves are manually operated from within the gate houses. No specific testing of the valves is conducted.

4.4 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.

4.5 Evaluation

The operation and maintenance of this dam could be oriented so that it more directly deals with procedures to be followed in case of an emergency situation.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The Means Brook Reservoir Dam creates an impoundment with a total storage capacity of 268 ac.-ft. at elevation 345.0, the spillway crest elevation. Each foot of depth in the reservoir above the spillway crest can accommodate approximately 20 ac.-ft. The natural drainage area has been increased by 1.88 square miles by the diversion of a portion of Hurds Brook to Means Brook. The stream bed of Means Brook above the dam is flat with an average slope of 1/4 percent. The spillway is a concrete ogee weir 100.0 feet in length and 5.1 feet below the top of the wall on the crest.

5.2 Design Data

a. The available design data is limited to final design discharges by Seelye, Stevenson, Value and Knecht, Inc., for the 1977 spillway and top of dam modifications. Refer to Appendix B for location of this data. Design calculations were unavailable.

b. The drainage area utilized in the 1977 design calculations was 5.77 square miles, which apparently did not include the 1.88 square mile watershed of Hurds Brook upstream of the diversion aqueduct. Inclusion of this watershed yields the total drainage area to the Means Brook Dam of 7.65 square miles used in this inspection report.

c. To supplement and verify the 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 was 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.

d. 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 available for this dam. The maximum discharge to date occurred in October, 1955 and was calculated to be approximately 2000 cfs, corresponding to a reported water level of 4 inches over the top of the dam. The spillway was 76.5 feet long, the wall on the dam's crest did not exist, and the top of the dam was 407 feet long at this time.

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 a HIGH hazard and INTERMEDIATE size structure. Guidelines indicate that the Probable Maximum Flood (PMF) be used as the "Test Flood": for these classifications. The watershed has a total area of 7.65 square miles. Snyder's lag was calculated to be 5.2 hours and a Snyder peaking coefficient of 0.625 was used. The 200 square mile - 24 hour Probable Maximum Precipitation (PMP) is 22 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 the PMF was calculated to be 7800 cfs, or 1020 cfs/sq. mi. (drainage area equal to 7.65 square miles). The inflow from 1/2 PMF was calculated to be 3900 cfs of 510 cfs/sq. mi. This correlates well with the 1977 calculated value of the design discharge (1/2 PMF) of 2850 cfs or 490 cfs/sq. mi. (drainage area equal to 5.77 square miles).

The spillway capacity is hydraulically inadequate to pass the "Test Flood" (PMF) and overtopping of the dam will occur. The maximum outflow capacity of the spillway without overtopping the dam is 4000 cfs. This corresponds to 51 percent of the test flood and a storage above the spillway crest of 105 ac.-ft. The maximum outflow discharge value for the test flood is 7800 cfs corresponding to a depth of flow over the top of dam of 1.4 feet and a storage above the spillway level of 144 ac.-ft. The outflow from 1/2 PMF is equal to 3900 cfs. A spillway rating curve, low level outlet rating curve and a reservoir surface area-capacity curve are included in Appendix D of this report.

At the spillway crest elevation of 345.0, the capacity of the 16 inch outlet structure is 42 cfs and approximately 113 cfs are withdrawn via the 30 inch supply main. It will require approximately 2 hours to lower the water level the first foot assuming a water surface area of 18.4 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 damage due to high velocities, impact from debris, and flooding to 25-30 residental homes and urban areas along the downstream channel.

The calculated dam failure discharge is 19600 cfs at a pool level equal to the spillway crest. This pool level was chosen instead of the top of the dam level as having the greater hazard potential because a pre-failure flow of 4000 cfs (maximum spillway capacity) would have caused evacuation and/or a warning of flood conditions downstream of the dam. Failure of the dam at normal pool level would catch the downstream area off guard and probably result in greater losses. Failure will produce a water surface level approximately 16.0 feet immediately downstream from the dam which would completely inundate the lower gate house and pump house. The failure discharge will effect downstream areas for a distance of 11500 feet from the dam where approximately 25 - 30 residential homes will be inundated by 2 - 5 feet of water. At this distance, the water surface level will be approximately 2.0 feet above normal observations as it enters the Farmill River. Beyond 11500 feet, the effects of the failure discharge will be reduced as it enters the Farmill River. Water surface elevations, due to the failure of the dam, are listed in Appendix D. Probable consequences including the prime impact areas are also listed in Appendix D.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

Since no major physical distress or movement has been noted since the construction of this dam in 1917, stability does not appear to be a problem. On the downstream face, the concrete shows signs of spalling and efflorescence. A 2.1 foot concrete wall was added to this structure and the spillway was widened in 1977. Reinforcement is visible in a few places along the edges of the crest.

6.2 Design and Construction Data

There are plans available from the 1917 construction. However, it was not until 1977 that a design analysis was available which was done in conjunction with the revisions that were made to the Means Brook Spillway. The structural analysis done by Seelye, Stevenson, Value and Knecht assumed several loading conditions to check the stability of the structure. Refer to Appendix B for location of this data. Conventional structural analysis methods were employed, however, to establish its conformity with the Corps of Engineers Recommended Guidelines for a Phase II analysis, it appears that other loading conditions will have to be studied.

Other than the contract plans there were no available construction records of the 1977 modifications to the top of the dam and the spillway.

6.3 Post-Construction Changes

Prompted by a 1973 inspection of the dam, the 1977 modifications to the top of the dam and the spillway were performed. The abutments for the pipe bridge at the bottom of the raceway were relocated and modified to increase the hydraulic capacity. Minor changes to the downstream training walls and riprap limits were performed to improve flow characteristics.

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 Means Brook Reservoir Dam and appurtenances is judged to be generally in FAIR condition. Items of concern that should be addressed as a result of this inspection are listed in Sections 7.2 and 7.3.

b. **Adequacy of Information:** The existing engineering data did not allow for a complete review. Therefore, the adequacy of the dam is also 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. An investigation as to the source and cause of the subsurface flow beneath the spillway.

b. The upstream face of the dam be visually inspected.

c. The spalling on the downstream face and the top of the dam be rehabilitated to their original condition.

d. A further analysis be conducted as to the structural stability of the dam.

7.3 Remedial Measures

a. **Operational and Maintenance Procedures**

1. The toe at the downstream face be monitored for signs of the reoccurrence of leakage.

2. Develop a downstream warning and surveillance plan, to supplement the round-the-clock monitoring during heavy precipitation.

3. Institute a program of annual periodic technical inspection.

7.4 Alternatives

None.

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT MEANS BROOK RESERVOIR DAM DATE NOVEMBER 16, 1979

TIME 9:00 - 10:30 a.m.

WEATHER Partly Cloudy

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

PARTY:

1.	R. Johnston, JPPA	6.	V. Zanillo, Bridgeport Hydraulic Company
2.	R. Lyon, JPPA	7.	J. Stone
3.	J. Chastanet, CWDD	8.	M. Johnson
4.		9.	
5.		10.	

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Hydraulics	R. Johnston	
2.	Structural	R. Lyon	
3.	Geotechnical	J. Chastanet	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

INSPECTION CHECK LIST

PROJECT MEANS BROOK RESERVOIR DAM DATE NOVEMBER 16, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT	Concrete - Wall on crest added in 1977.
Crest Elevation 348.0	Good - Minor spalling and some visible reinforcement at edges
Current Pool Elevation 344.5	3.5 feet below crest
Maximum Impoundment to Date	4 inches over crest in 1955
Surface Cracks	Substantial spalling on downstream face
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 - Spillway at west abutment
Indications of Movement of Structural Items on Slopes	N/A
Trespassing on Slopes	Not permitted
Vegetation on Slopes	Grass, two bushes on side slopes
Sloughing or Erosion of Slopes or Abutments	Substantial spalling on downstream face
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	None observed
Toe Drains	None observed
Instrumentation System	None observed

INSPECTION CHECK LIST

PROJECT MEANS BROOK RESERVOIR DAM DATE NOVEMBER 16, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Entire lake bed - underwater
b. Intake Structures	
24 Inch Blowoff Intake	A free access inlet at the base of the dam on the upstream face of the upper gate house. Last utilized in 1977 to drain the reservoir.
36 Inch Main Intake	A 36 inch sluice gate controls discharge into the well of the upper gate house. Gate controlled by a lift mechanism in the gate house and is currently in the open position. Reportedly closed in 1977.
16 Inch Auxiliary Intake	A 16 inch sluice gate also allows discharge into the well of the upper gate house. Gate controlled by a lift mechanism in the gate house. Normally closed, but reportedly operational.

INSPECTION CHECK LIST

PROJECT MEANS BROOK RESERVOIR DAM DATE NOVEMBER 16, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	Upper gate house
a. Concrete and Structural	
General Condition	Good
Condition of Joints	Good
Spalling	Minor on exterior
Visible Reinforcing	None observed
Rusting or Staining of Concrete	None observed
Any Seepage or Efflorescence	None observed
Joint Alignment	Good
Unusual Seepage or Leaks in Gate Chamber	None observed
Cracks	Minor cracks in wall above water line
Rusting or Corrosion of Steel	None observed
b. Mechanical and Electrical	
Air Vents	None observed
Float Wells	N/A
Crane Hoist	Mechanical chain hoists for screens
Elevator	N/A
Hydraulic System	N/A
Service Gates	36 inch sluice gate
Emergency Gates	16 inch auxiliary gate
Lightning Protection System	None observed
Emergency Power System	None observed
Wiring and Lighting System in Gate Chamber	Domestic lighting

INSPECTION CHECK LIST

PROJECT MEANS BROOK RESERVOIR DAM DATE NOVEMBER 16, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
30 Inch Service Main	A 30 inch cast iron pipe extends from the well in the upper gate house, through the dam, to a 30 inch valve in the lower gate house. A 36 inch cast iron pipe continues from the lower gate house to Trap Falls Reservoir, 2.8 miles south fo the dam.
10 Inch Auxiliary Service	A 10 inch cast iron pipe extends from the well in the upper gate house, through the dam, to a 10 inch valve in the lower gate house. The pipe then feeds into the 36 inch service main in the basement of the lower gate house.
24 Inch Blowoff	A 24 inch pipe extends from the inlet, through the dam, to a 24 inch valve in the lower gate house. The 24 inch pipe continues through the house reducing to a 16 inch pipe before the outlet. A 24 inch pipe and valve in the lower gate house can permit flow between the 36 inch service main and the 24 inch blowoff.
8 Inch Drain	An 8 inch pipe extends from the upper gate house, through the dam, to an 8 inch valve in the lower gate house. The 8 inch pipe then feeds into the 24 inch blowoff in the basement of the lower gate house.

INSPECTION CHECK LIST

PROJECT MEANS BROOK RESERVOIR DAM DATE NOVEMBER 16, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
36 Inch Service Main	The 36 inch pipe may be drained, to the raceway, via a 12 inch pipe to an endwall below the dam. The 36 inch pipe continues to a discharge at Trap Falls Reservoir.
24 Inch Blowoff	The 24 inch pipe reduces to a 16 inch pipe and outlets, to the raceway, at an endwall below the dam.
Outlet Channel	A short channel extends from the endwall to the raceway. The channel is overgrown with grass and brush.

INSPECTION CHECK LIST

PROJECT MEANS BROOK RESERVOIR DAM DATE NOVEMBER 16, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	Spillway widened and rebuilt in 1977.
a. Approach Channel	Entire lake bed - underwater
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir	
General Condition of Concrete	Good - Rebuilt in 1977
Rust or Staining	None observed
Spalling	None observed
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	Small leak through hairline crack.
Drain Holes	None observed
c. Discharge Channel (raceway)	
General Condition	Good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	None observed
Floor of Channel	Rock
Other Obstructions	Pipe bridge for 36 inch service main

APPENDIX B

ENGINEERING DATA

APPENDIX B-1

DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS AND LOCATION

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

Bridgeport Hydraulic Company
835 Main Street
Bridgeport, Connecticut 06609

APPENDIX B-2

COPIES OF PAST INSPECTION REPORTS

BUCK & BUCK

ENGINEERS

98 WADSWORTH STREET, HARTFORD, CONNECTICUT 06106

JAMES A. THOMPSON
ROBINSON W. BUCK
LAWRENCE F. BUCK

HENRY WOLCOTT BUCK
1931-1965
ROBINSON D. BUCK
1935-1950

COMM. 5713-74

April 24, 1973

Mr. Victor Galgowski
Supt. of Dams
Dept. of Environmental Protection
State Office Building
Hartford, CT 06106

RE: Means Brook Reservoir Dam, Shelton

Dear Vic:

We inspected the subject dam on April 12th and noted sandbags on top of same. If the sandbags were placed there to prevent overtopping of the structure, it means that the spillway capacity is inadequate. We recommend that you request an engineering report of this matter from the owner.

During our inspection we also noted a hole in the westerly embankment, 10' ± downstream from the face of the dam and 20' ± east of the east wall of the spillway. The masonry endwall of the spillway discharge channel has been partially broken away and there is evidence that flow has escaped the channel at some time in the past. The recommended engineering report should also include proposed remedial measures for the last two items mentioned.

Sincerely,
BUCK & BUCK

James A. Thompson

JAT:dlb

No. SH-19

Inventoried By WPS

Date 11 JUNE 1964

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Long 73-09.2
Lat 41-19.7

CT-92

Name of Dam or Pond MEANS BROOK RESERVOIR

Code No. H 5.7 FM 4.6 MN 2.5

Nearest Street Location SAWMILL ROAD

Town SHELTON

U.S.G.S. Quad. LONG HILL

Name of Stream MEANS BROOK

Owner BRIDGEPORT HYDRAULIC COMPANY

Address 835 MAIN STREET
BRIDGEPORT 367-6621 OR 12/18

Pond Used For WATER SUPPLY DA 7.65 SM

Dimensions of Pond: Width 500 FEET Length 1200 FEET Area ~~15~~ 22 ~~ACRES~~

Total Length of Dam ~~400~~ 500 FEET Length of Spillway ~~63~~ FEET
WIDENED TO 100' SUMMER '68

Location of Spillway WEST SIDE OF DAM

Height of Pond Above Stream Bed 35 FEET

Height of Embankment Above Spillway 5 FEET

Type of Spillway Construction CONCRETE

Type of Dike Construction CONCRETE

Downstream Conditions WOODS, ROADS

Summary of File Data

Remarks SLIGHT SPALLING OF CONCRETE NOTED ON DOWNSTREAM FACE OF DAM

Would Failure Cause Damage? YES Class B

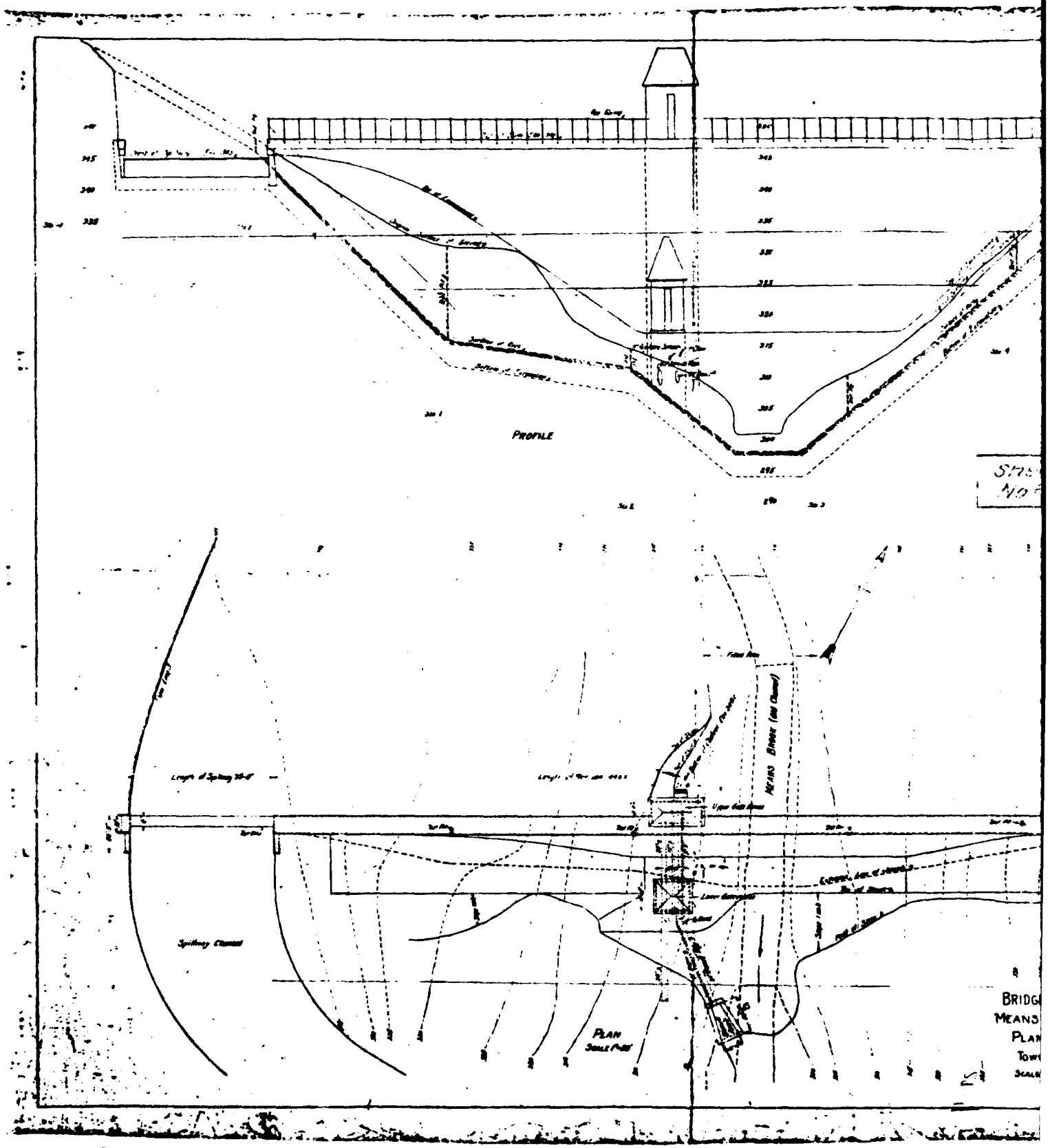
[illegible]-3-73 – 2" water over crest, [illegible]
[illegible] + loose [illegible] [illegible]

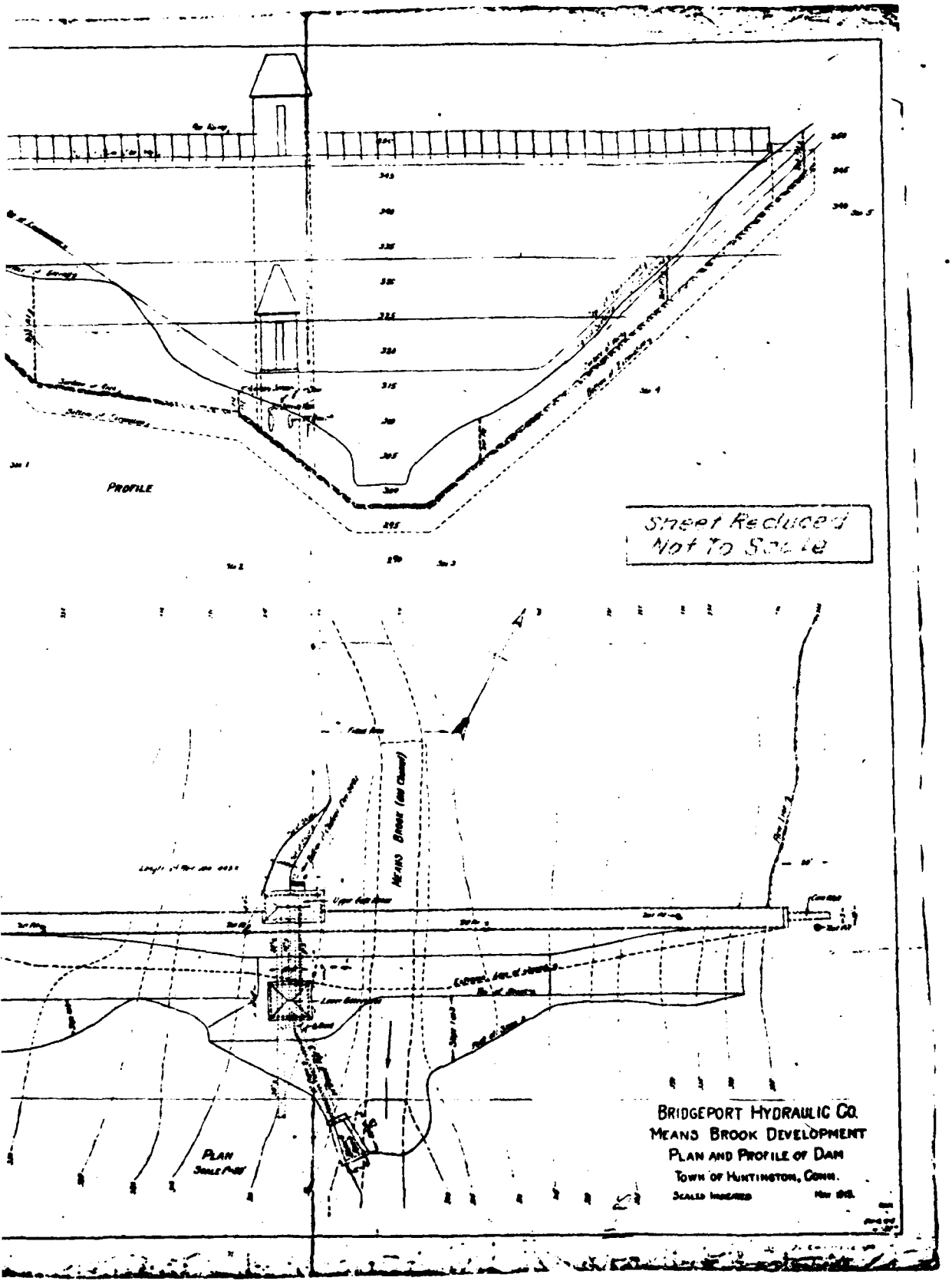
[illegible]-2-73 INSPECTED WITH JIM THOMPSON OF [illegible] [illegible] SEE [illegible]

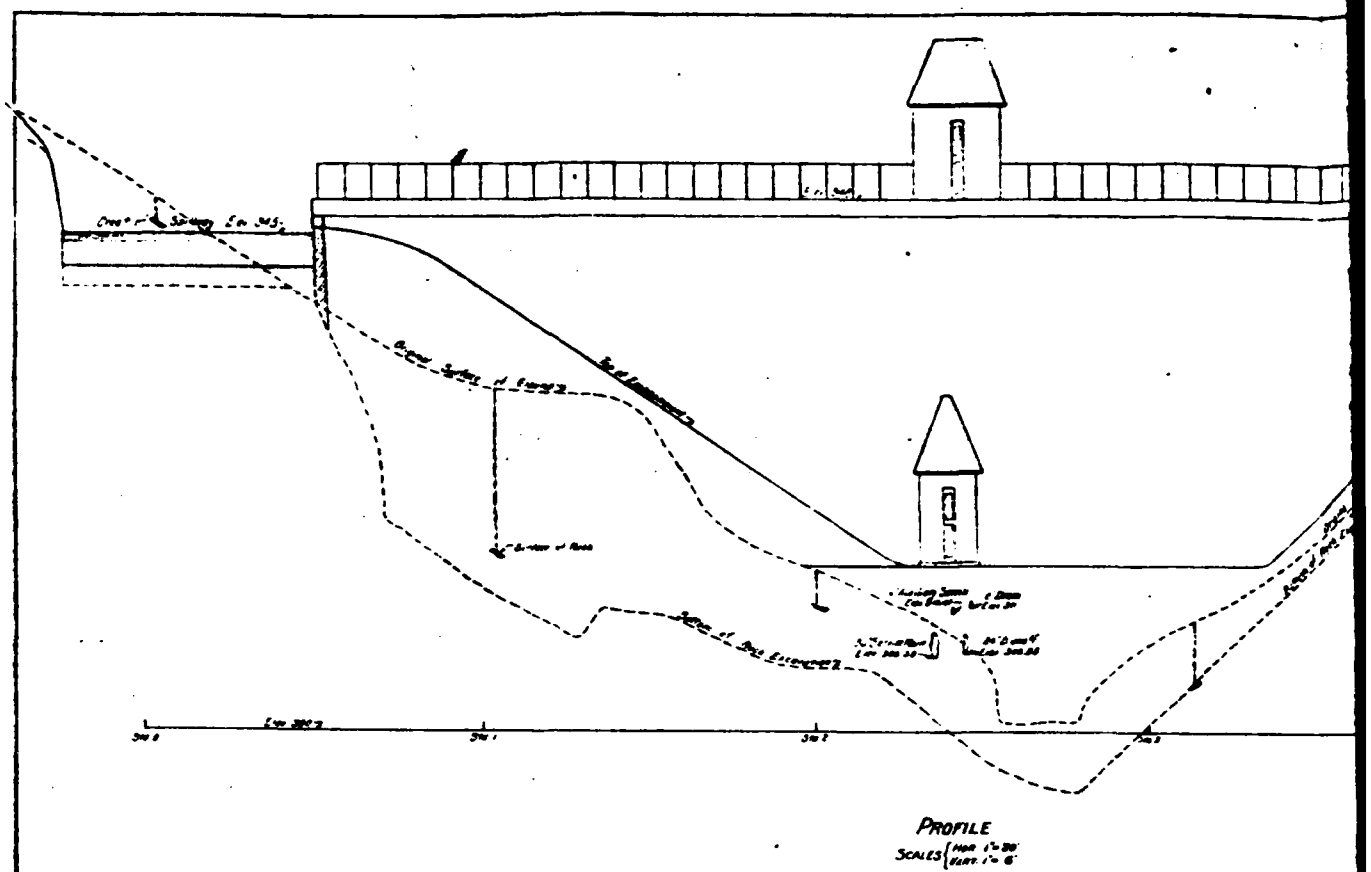
3-14-77 Seepage along toe about center of dam, should be monitored. [illegible] is preparing plans to provide more spillway cap. [illegible]

APPENDIX B-3

RECORD DRAWINGS AND SKETCHES

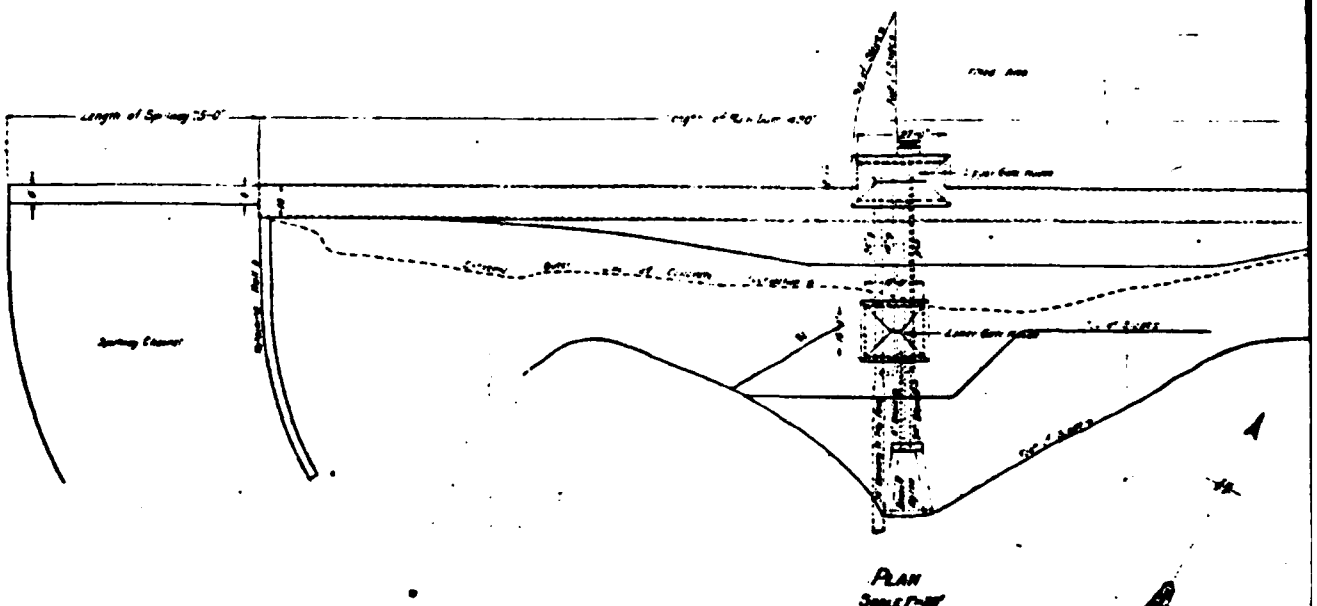

PROFILE
PLAN
Spillway Channel
MEANS BROOK (Old Channel)


PROFILE
Sheet Reduced
Not To Scale
MEANS BROOK (Old Channel)
PLAN
BRIDGEPORT HYDRAULIC CO.
MEANS BROOK DEVELOPMENT
PLAN AND PROFILE OF DAM
TOWN OF HUNTINGTON, CONN.



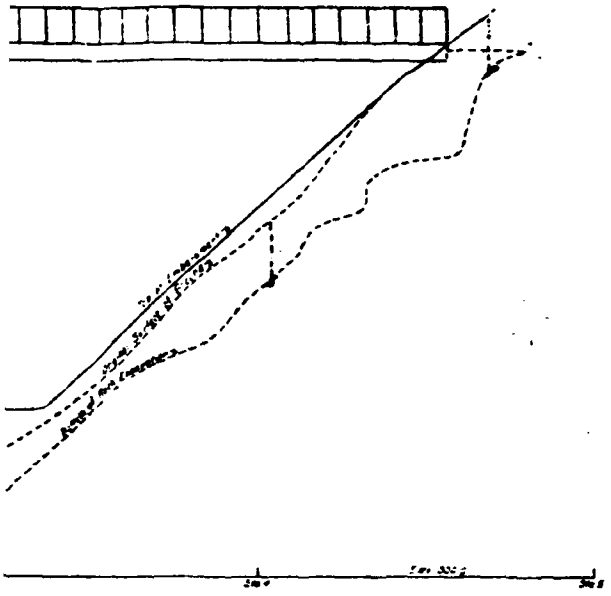
PROFILE

SCALES { HOR. 1"=20'
VERT. 1"=6'



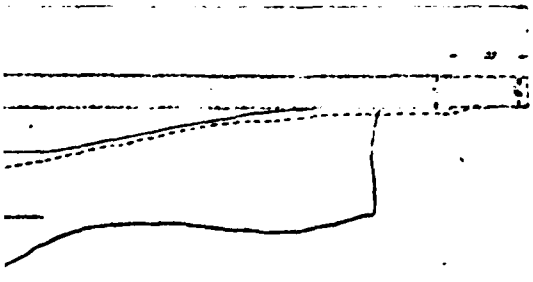
PLAN

SCALE 1"=10'



CROSS SECTION OF SPILLWAY
SCALE 1"=4'

MAXIMUM CROSS SECTION OF DAM
SCALE 1"=4'



BRIDGEPORT HYDRAULIC CO.
MEANS BROOK DEVELOPMENT
PLAN, PROFILE AND CROSS SECTION OF DAM
TOWN OF HUNTINGTON, CONN.
SCALES INDICATED FEBRUARY, 1910

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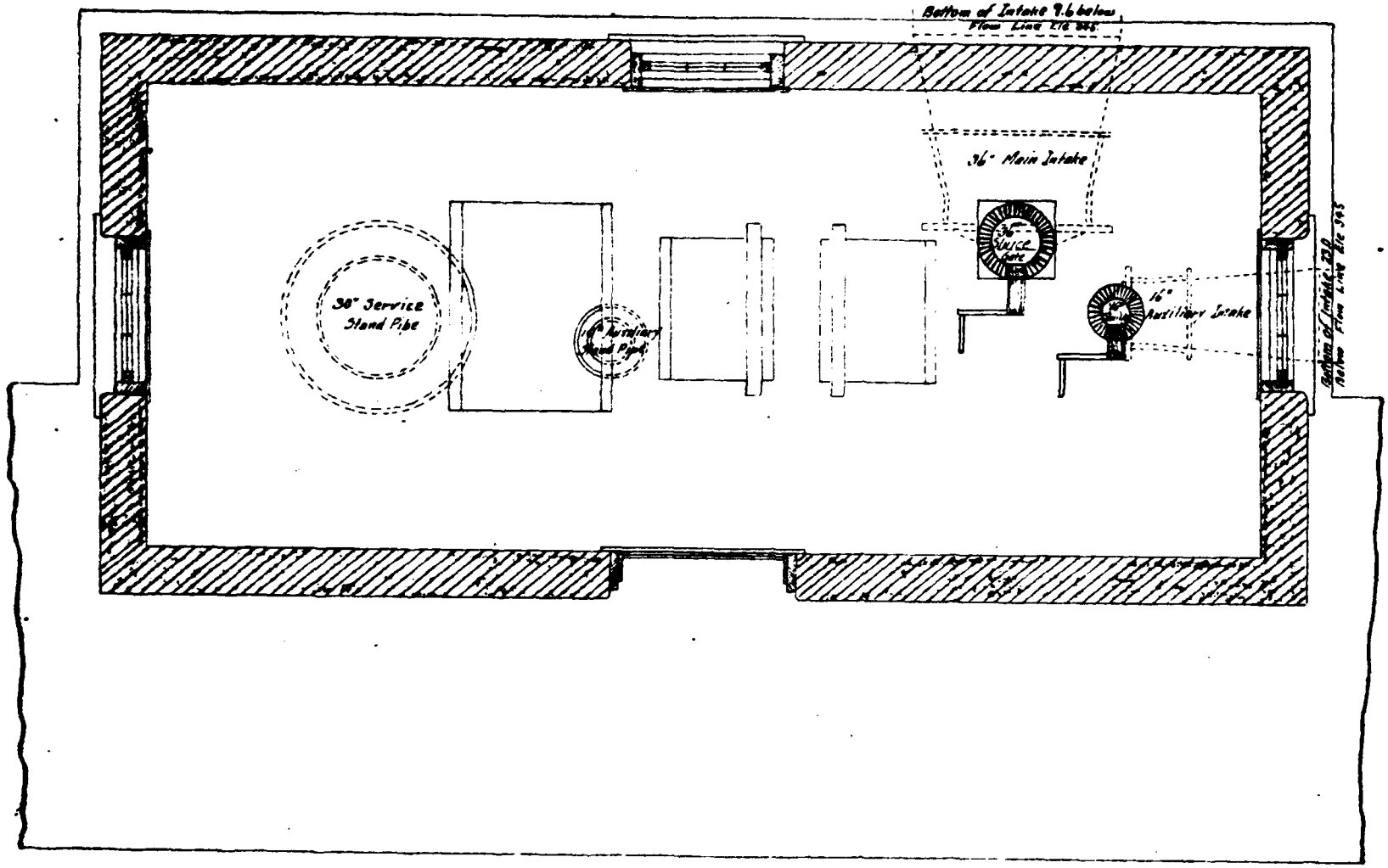
Not To Scale



SECTIONAL PLAN OF UPPER GATE HOUSE

MEANS BROOK RESERVOIR

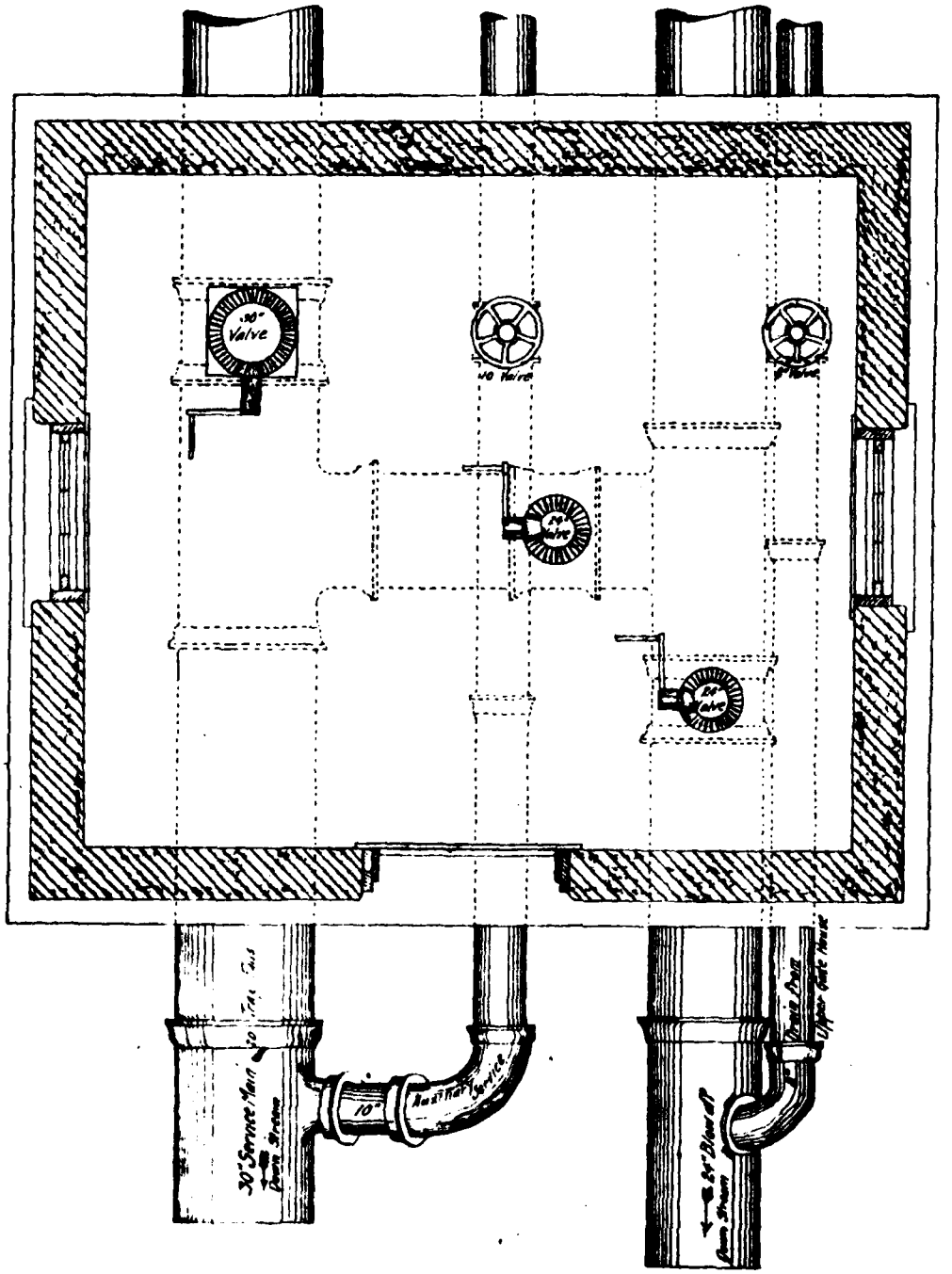
E 14

Sheet Reduced
Not To Scale

Scale 1" = 1 Foot

M-17

B-9



SECTIONAL PLAN OF LOWER GATE HOUSE

MEANS BROOK RESERVOIR

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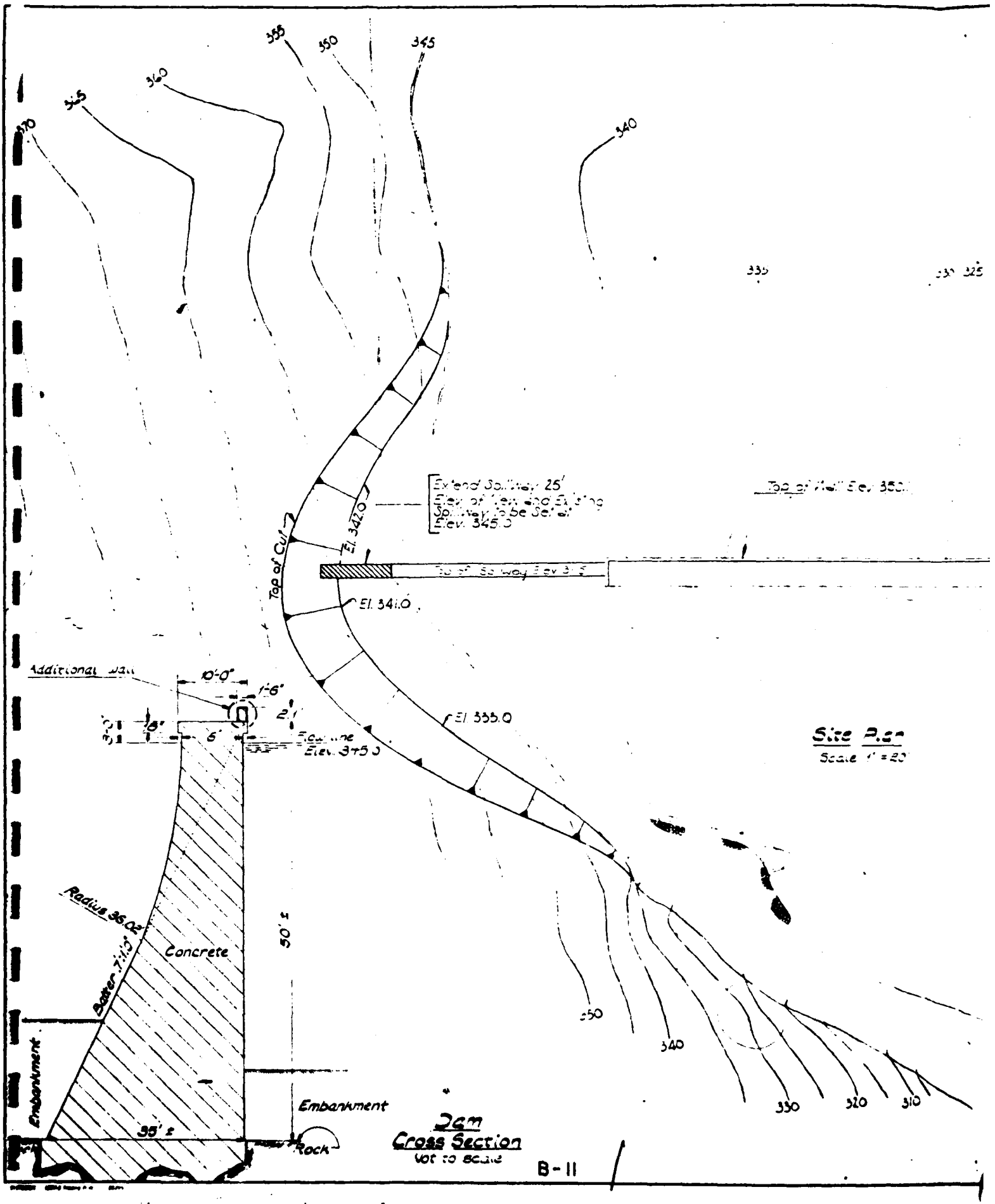
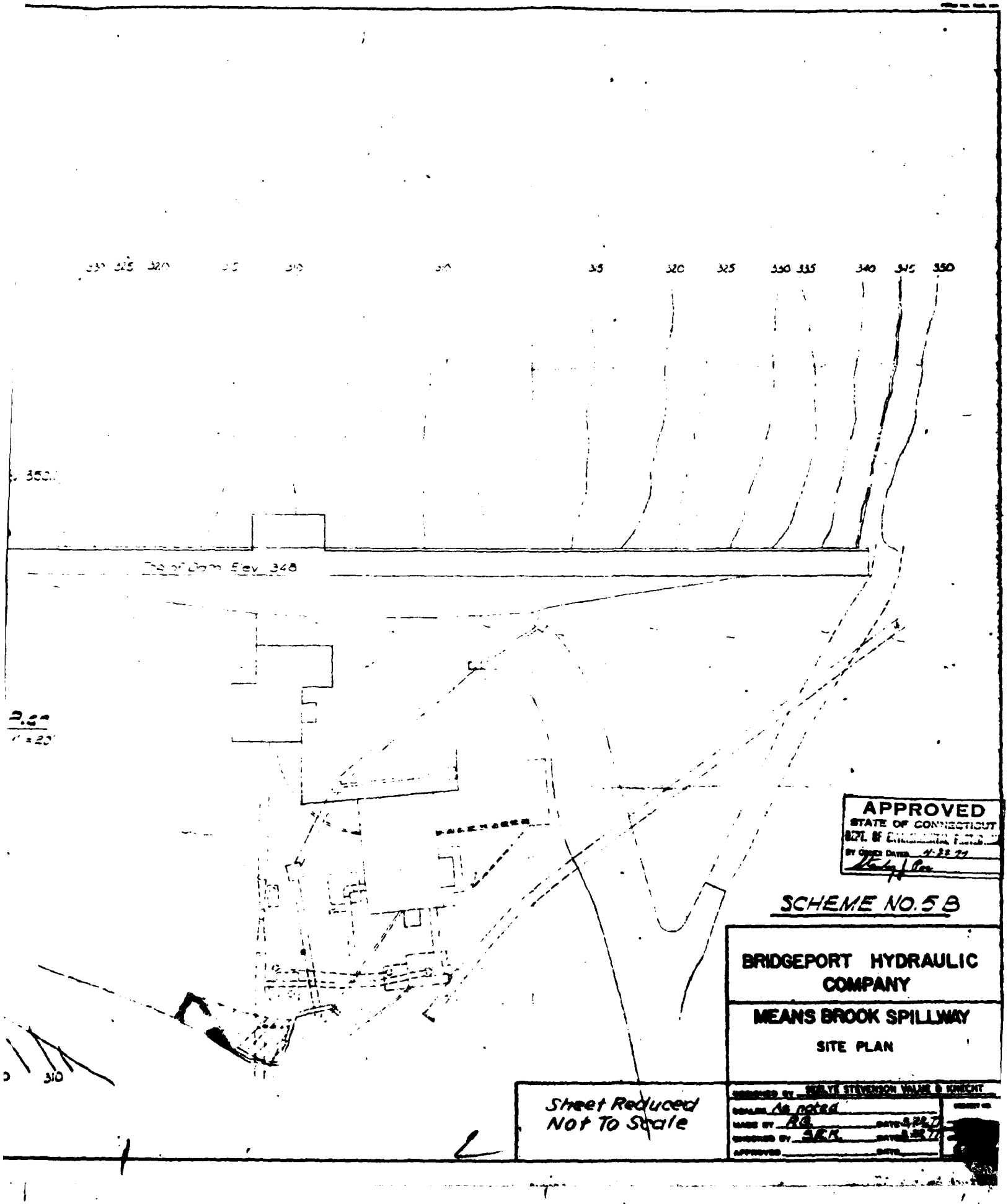
Not To Scale

Scale 1"=1 Foot

MICROFILMED DATE


355
350
345
360
365
370
340
335
330
325
Extend Spillway 25'
Elev. of New end of Existing Spillway to be Determined
Elev. 345.0
Top of Wall Elev. 350.
Top of Spillway Elev. 345
Top of Cut
El. 342.0
El. 341.0
El. 335.0
Additional wall
10'-0"
1'-6"
2'
6'
Elev. 345.0
Site Plan
Scale 1" = 20'
Radius 35.02
Batter 1:1.0
Concrete
50' ±
Embankment
35' ±
Embankment
Rock
Dam
Cross Section
Not to Scale
B-11
350
340
330
320
310



APPROVED
STATE OF CONNECTICUT
DEPT. OF ENVIRONMENTAL PROTECTION
BY ORDER DATED 4-28-77

SCHEME NO. 5 B

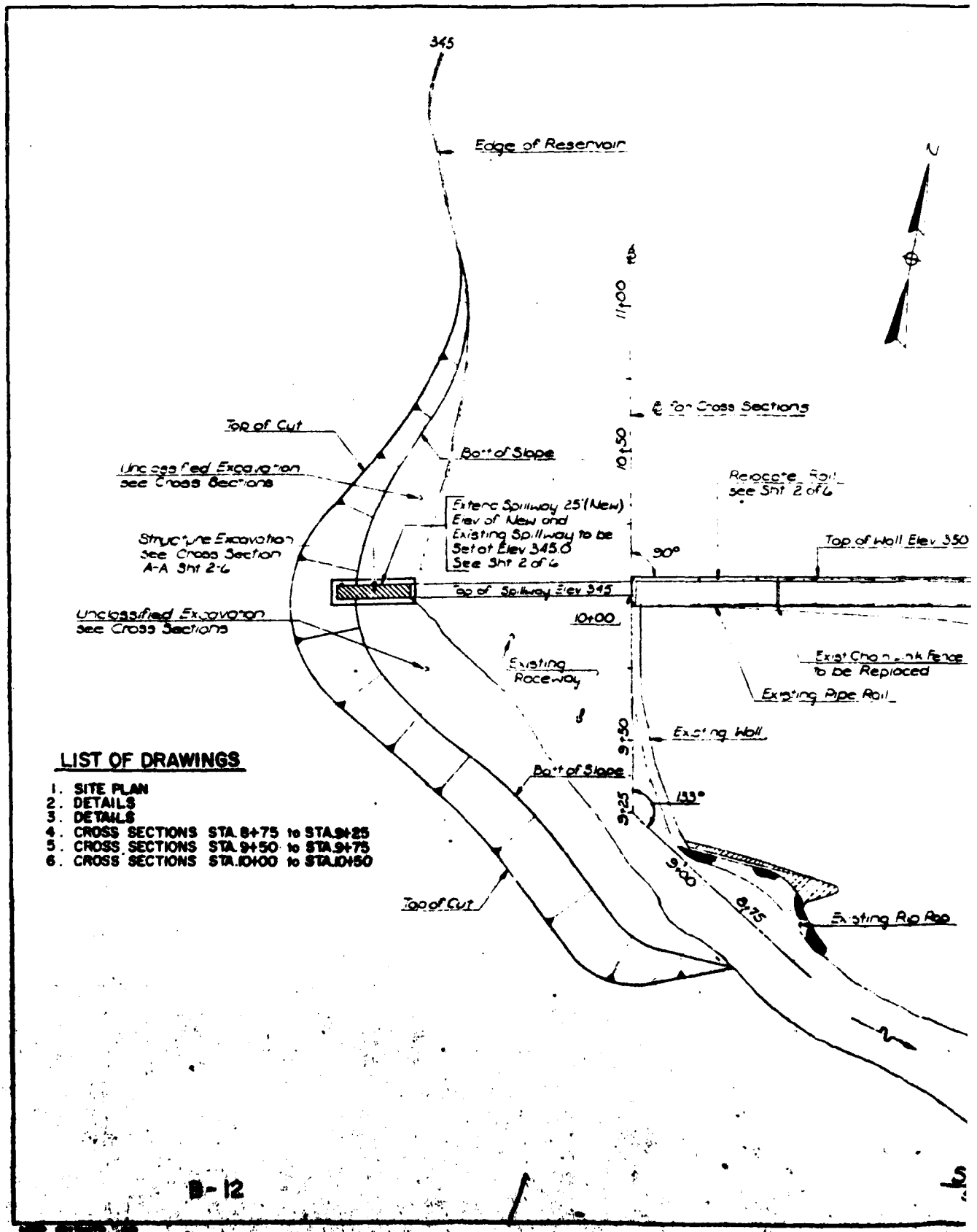
BRIDGEPORT HYDRAULIC COMPANY

MEANS BROOK SPILLWAY

SITE PLAN

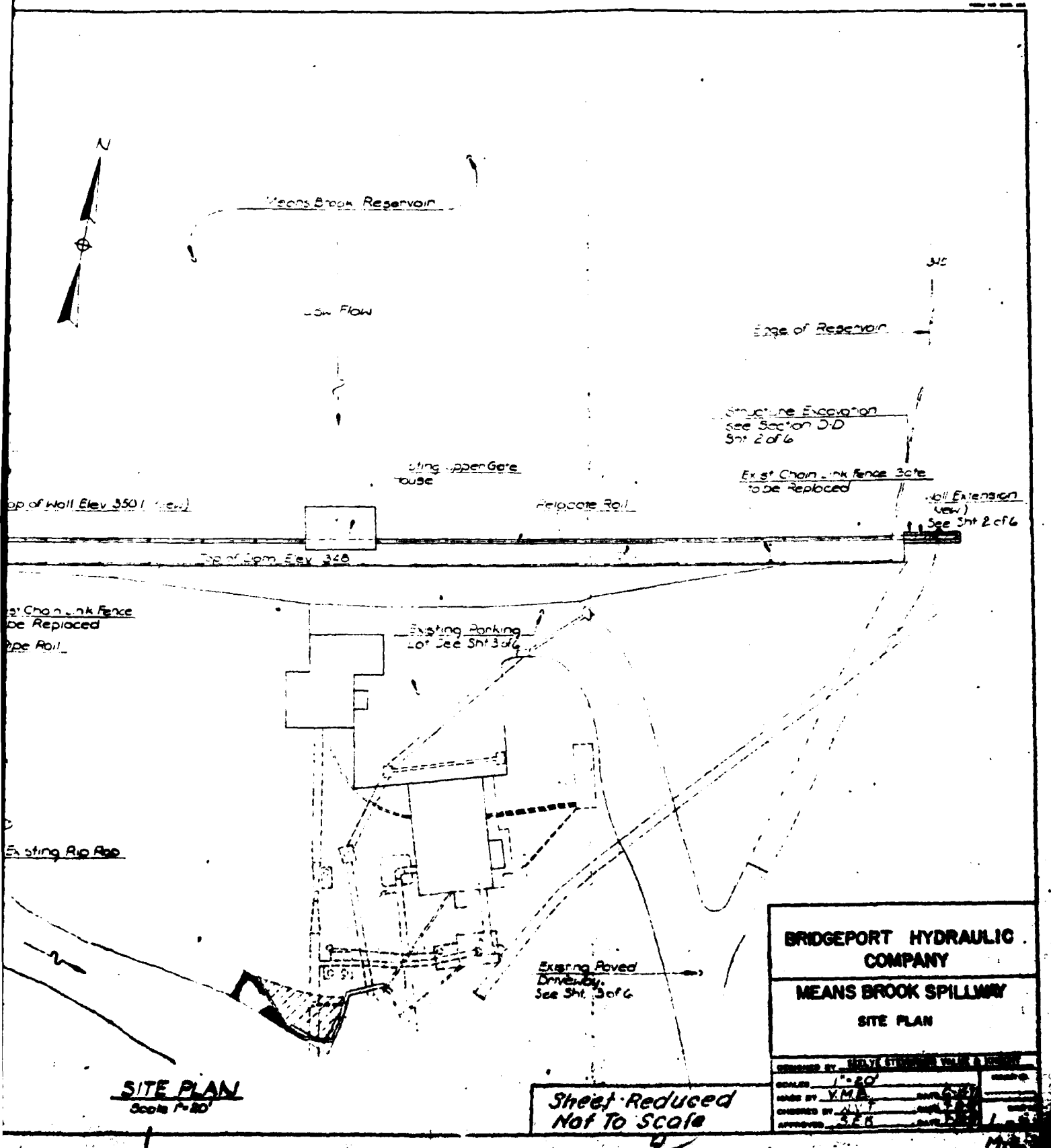
Sheet Reduced
Not To Scale

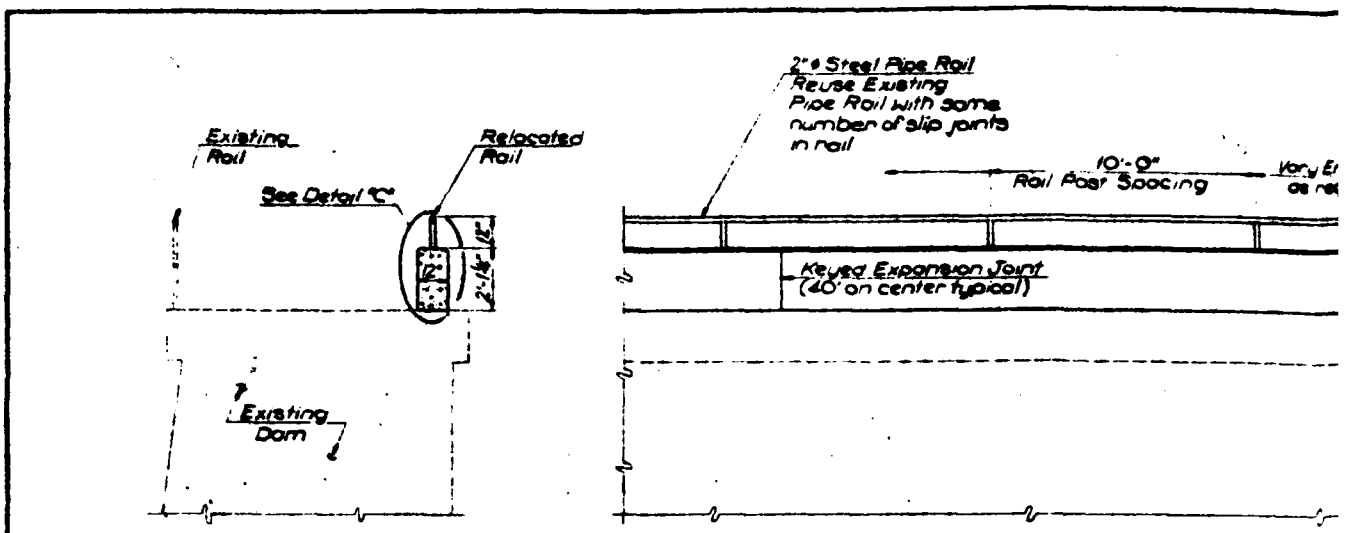
DESIGNED BY STEVENSON VALVE & KNIGHT
DRAWN BY AS noted
TRACED BY RG DATE 3-24-77
CHECKED BY SEK DATE 3-25-77
APPROVED DATE



LIST OF DRAWINGS

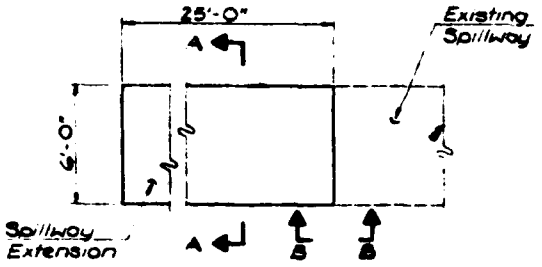
1. SITE PLAN
2. DETAILS
3. DETAILS
4. CROSS SECTIONS STA. 8+75 to STA.9+25
5. CROSS SECTIONS STA. 9+50 to STA.9+75
6. CROSS SECTIONS STA.10+00 to STA.10+50


N
Means Brook Reservoir
Low Flow
345
Edge of Reservoir
Existing Upper Gate House
Existing Chain Link Fence to be Replaced
Relocate Rail
See Sht 2 of 6
Top of Wall Elev 350 (New)
Top of Dam Elev 348
Existing Parking Lot See Sht 3 of 6
Existing Rip Rap
Existing Paved Driveway See Sht 3 of 6
SITE PLAN
Scale 1"=20'
Sheet Reduced Not To Scale
BRIDGEPORT HYDRAULIC COMPANY
MEANS BROOK SPILLWAY
SITE PLAN
SCALE 1"=20'
DRAWN BY V.M.B.
CHECKED BY A.V.T.
APPROVED S.E.R.

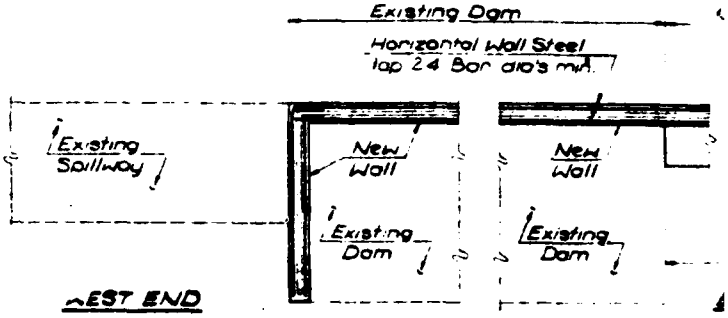


PART SECTION
Scale: N.T.S.

PART ELEVATION
Scale: N.T.S.

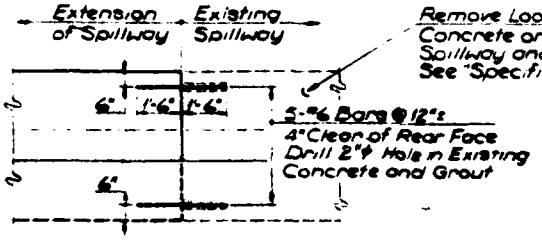


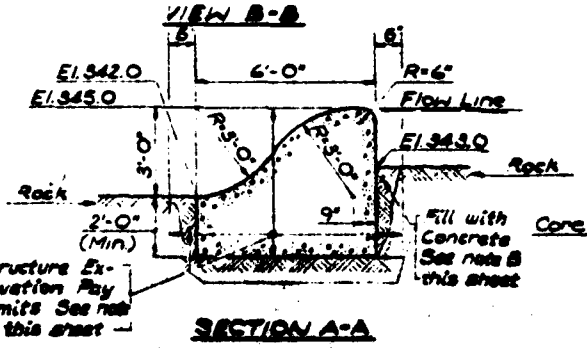
PLAN



EST END

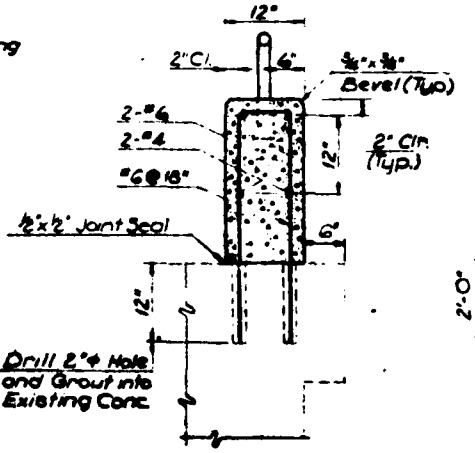
PART PLAN
Scale: N.T.S.



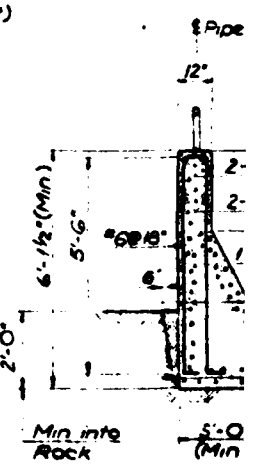


SECTION A-A

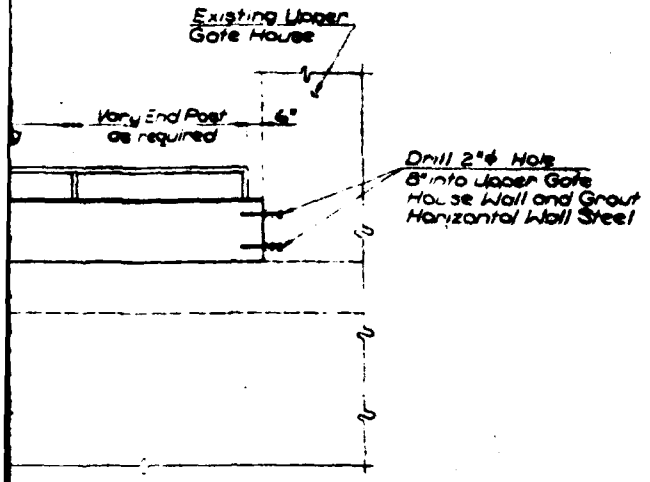
EXTENSION OF EXISTING SPILLWAY
Scale: N.T.S.

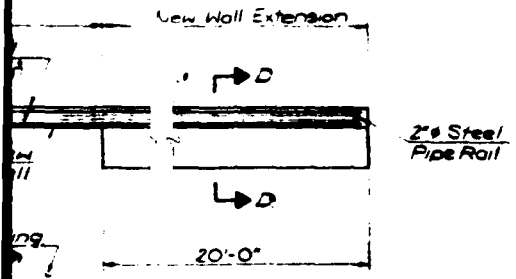


DETAIL "C"
Scale: N.T.S.

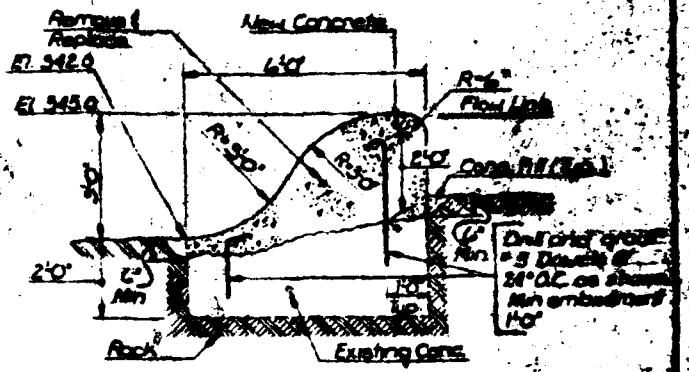


SECTI
Scale





EAST ELEV.



SPILLWAY REHABILITATION

Scale 1/2"=1'-0"

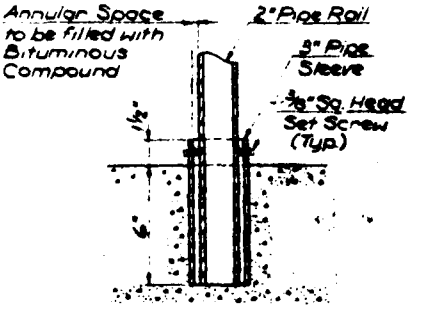
Note A

Structure Excavation Pay Limits

Pay Limits shall be vertical 2' outside the neat limits of the structure and from the bottom of the footing to Elev 345.0. For Section A-A and from the bottom of the footing to original Ground for Section D-D

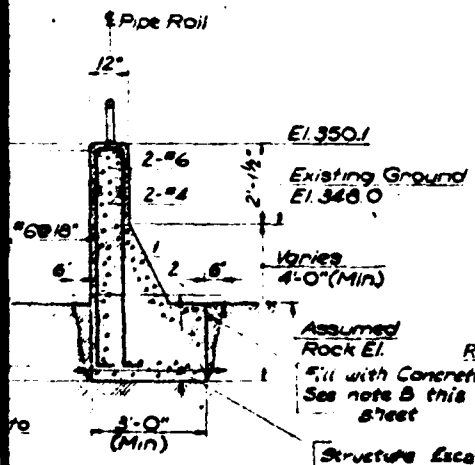
Note B

The excavation shall be completely filled with concrete to the top of adjacent rock surfaces. Structure excavation is to be made as close to the neat lines of the structure as possible. Excavation beyond the payment limits shall not be paid. Excavation more than 2' outside the pay limits shall be backfilled with 3,000 lb. concrete to the pay limits, at the Excavation Contractor's expense.



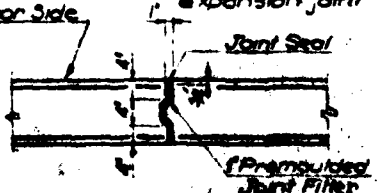
RAIL ANCHOR DETAIL

Scale: N.T.S.



SECTION "D-D"

Scale: ½"=1'-0"



KEYED EXPANSION JOINT DETAIL

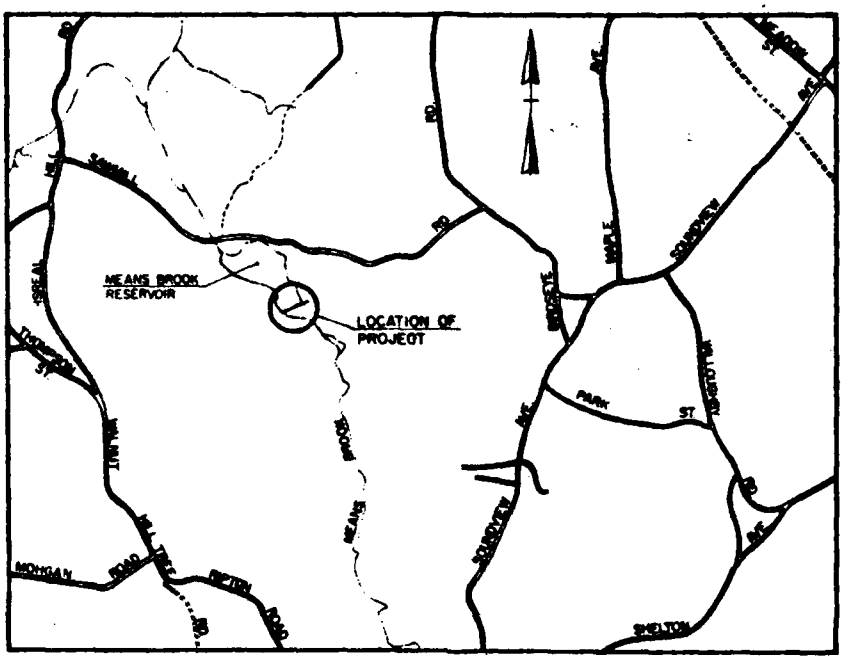
Scale: N.T.S.

Sheet Reduced Not To Scale

BRIDGEPORT HYDRAULIC COMPANY

MEANS BROOK SPILLWAY

DETAILS

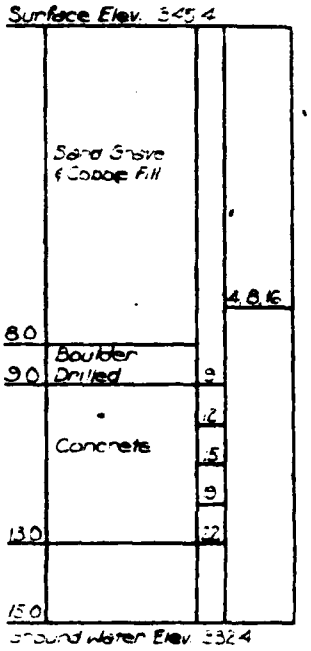


2000 1000 0 2000 4000 6000

SCALE IN FEET

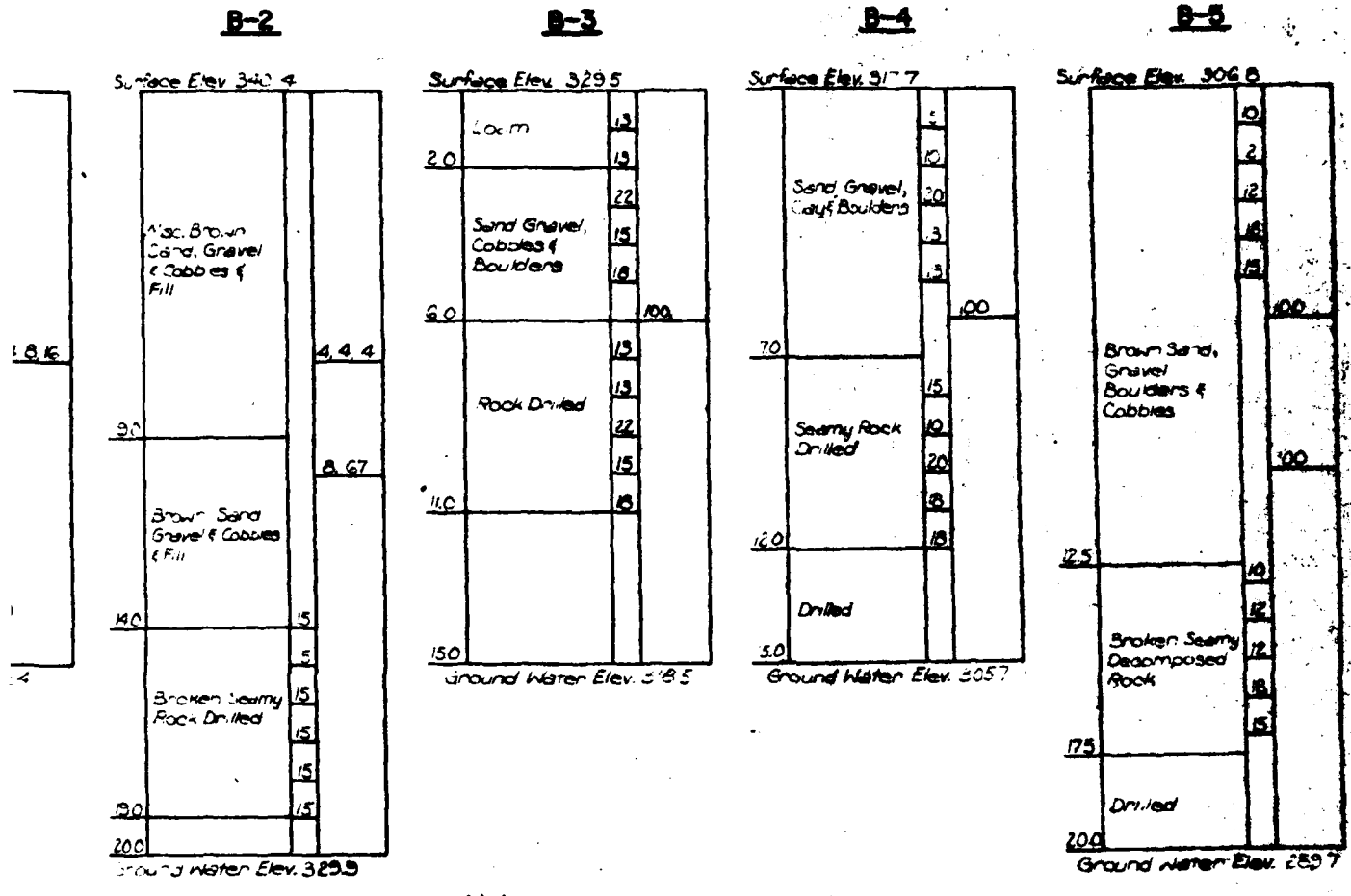
LOCATION PLAN

B-1



LIST OF DRAWINGS

1. LOCATION PLAN AND BORINGS
2. SITE PLAN
3. PIPE BRIDGE
4. DETAILS
5. ALTERATION NORTH ABUTMENT
6. SOUTH ABUTMENT
7. WALL DETAILS
8. CROSS SECTION STA 9+00 TO STA 9+50
9. CROSS SECTION STA 10+00 TO STA 10+25
10. CROSS SECTION STA 10+50 TO STA 11+75
11. CROSS SECTION STA 12+00 TO STA 12+25
12. CROSS SECTION STA 12+50 TO STA 13+00



Note:

Figures at left indicate depth Below ground surface of strata change.

Figures at center indicate Coring Time Per Ft (Min).

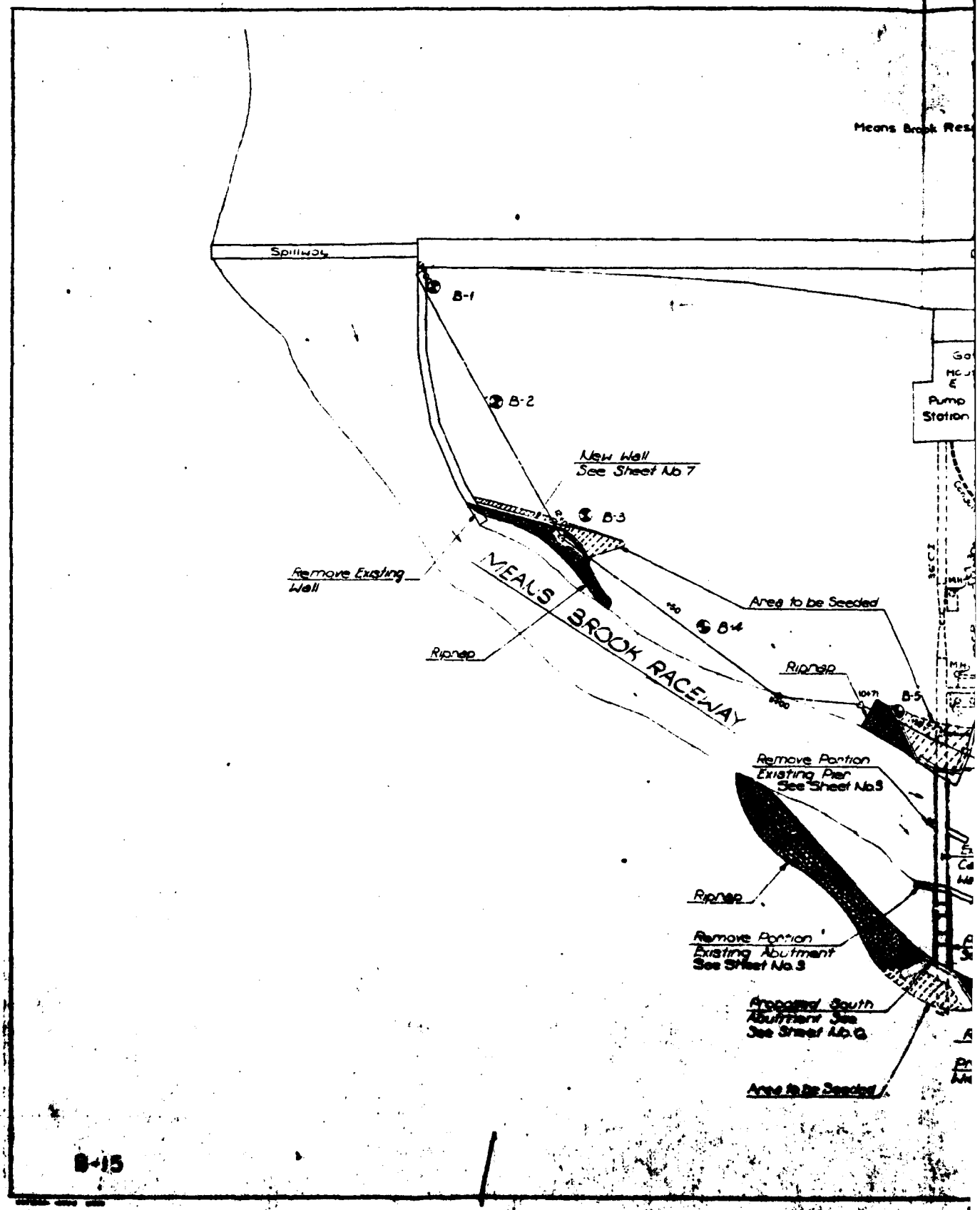
Figures at Right indicate numbers of Blows required to drive 1 3/8" o.d. Sampler 6" using 140 lb hammer dropping 30".

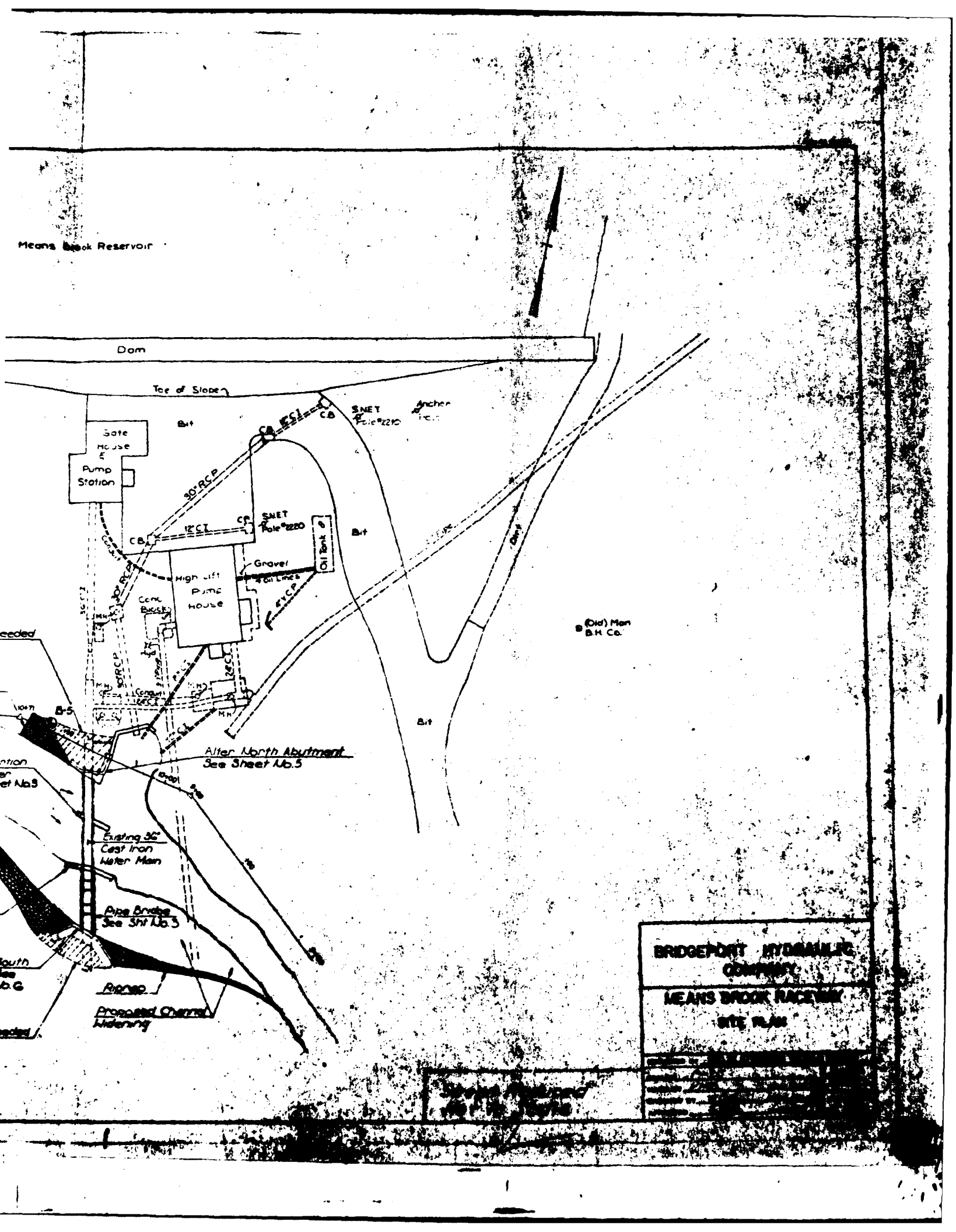
BRIDGEPORT HYDRAULIC COMPANY

MEANS BROOK RESERVOIR

LOCATION PLAN AND BORINGS

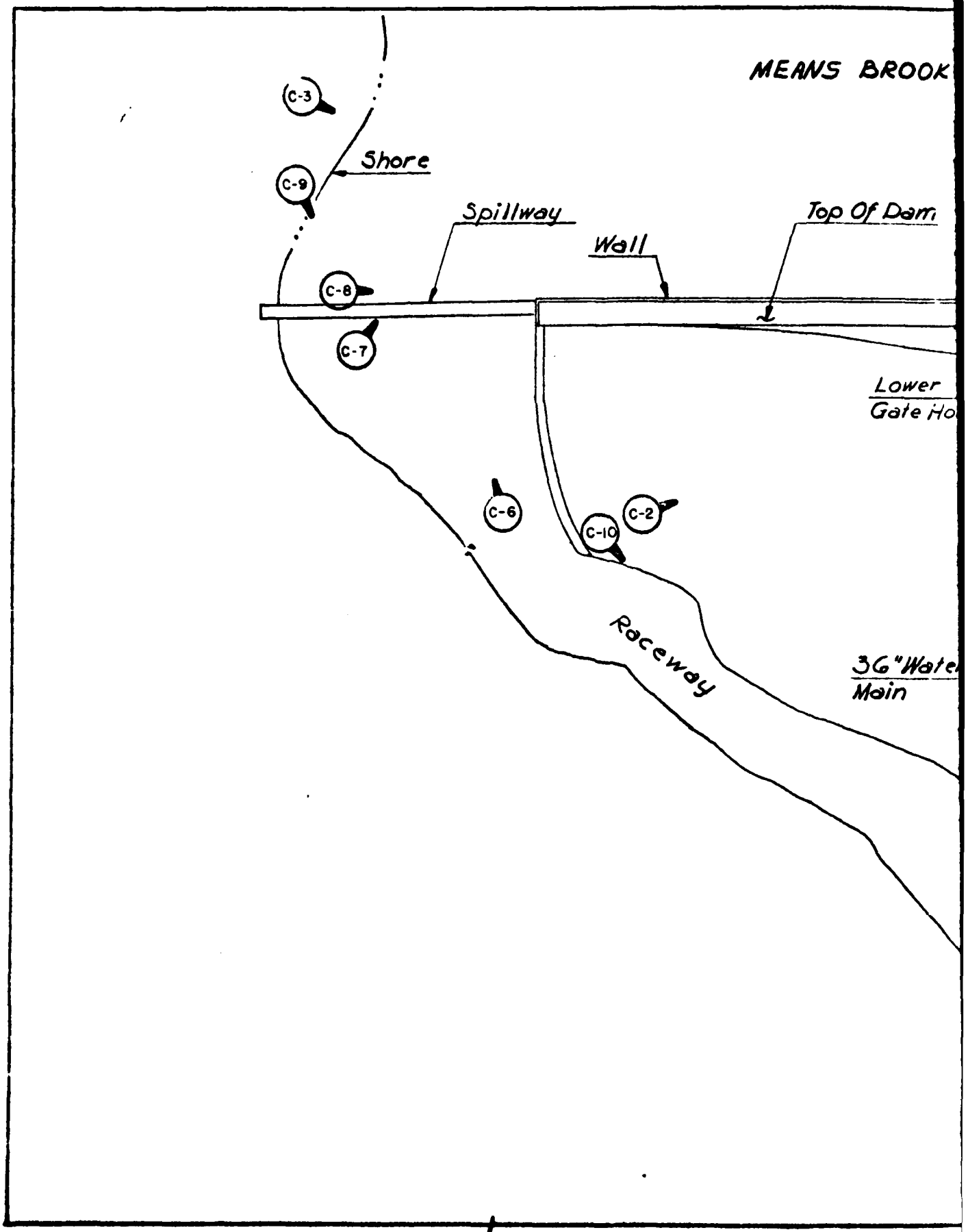
Sheet Reduced Not to Scale


Means Brook Res
Spillway
B-1
B-2
Pump Station
New Wall
See Sheet No 7
B-3
Remove Existing Wall
MEANS BROOK RACEWAY
Area to be Seeded
B-4
Riprap
Riprap
B-5
Remove Portion
Existing Pier
See Sheet No 3
Riprap
Remove Portion
Existing Abutment
See Sheet No 3
Proposed South
Abutment See
See Sheet No 6
Area to be Seeded
B-15

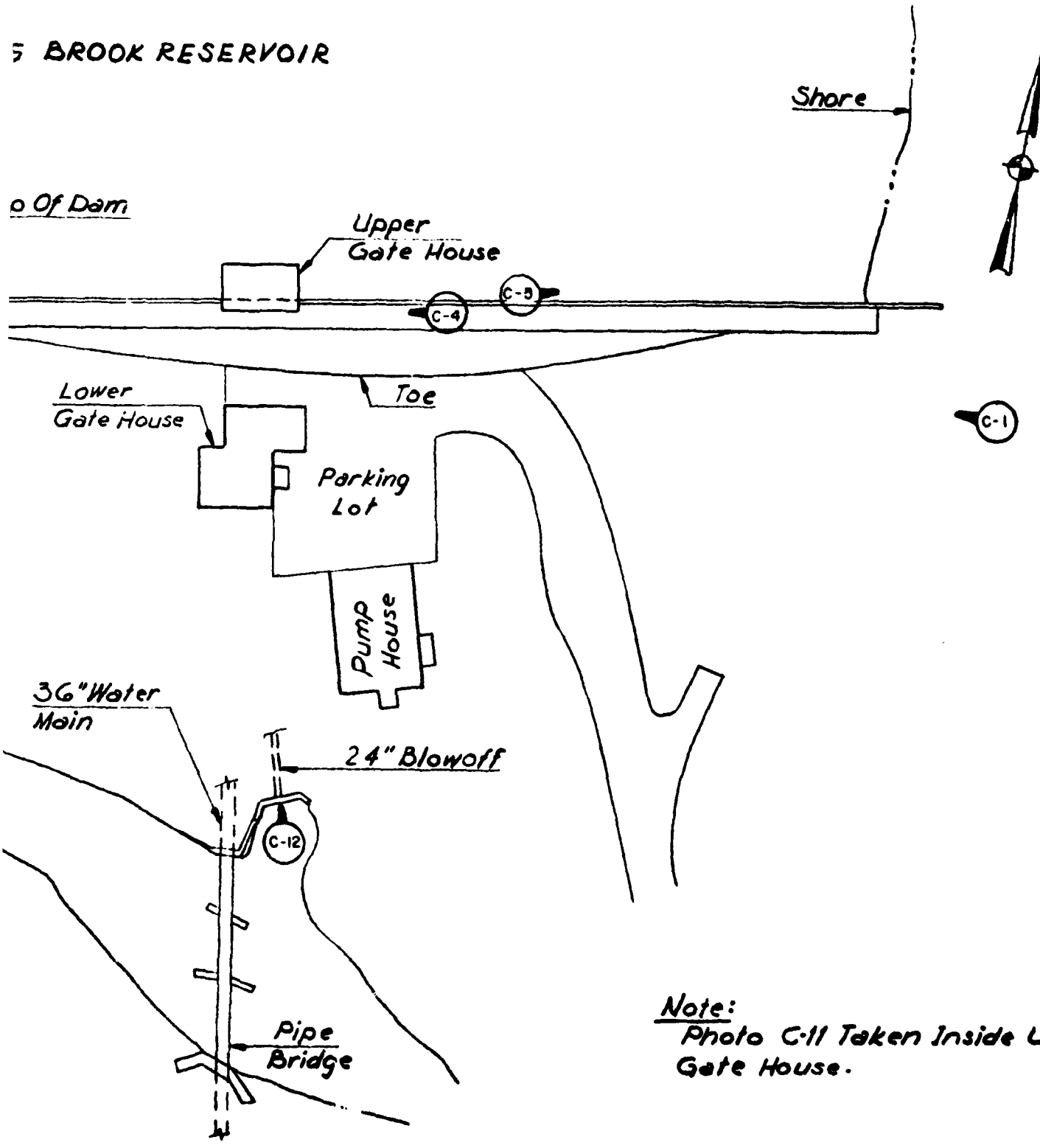

Means Brook Reservoir
Dam
Toe of Slope
Bit
Gate House
Pump Station
30" RCP
CB
SNET Pole #2210
Archer
SNET Pole #2220
12" CI
High Lift Pump House
Gravel
Oil Tank
Oil Lines
RCP
Conc. Blocks
(Old) Main B.H. Co.
Creek
Alter North Abutment See Sheet No.5
B-5
Existing 36" Cast Iron Water Main
Pipe Bridge See Sht No.5
Riprap
Proposed Channel Widening
BRIDGEPORT HYDRAULIC COMPANY
MEANS BROOK RACEWAY
SITE PLAN

APPENDIX C

PHOTOGRAPHS

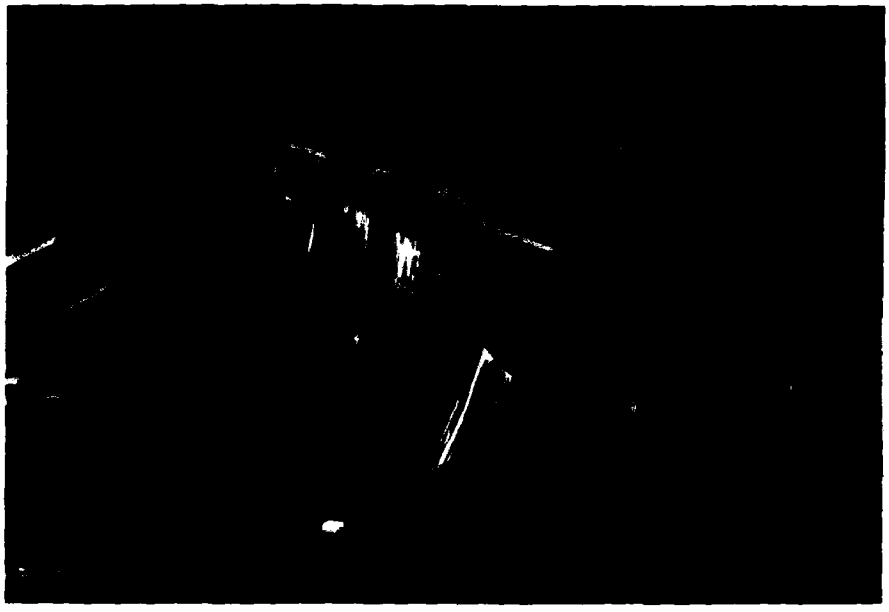

MEANS BROOK
C-3
Shore
C-9
Spillway
Wall
Top Of Dam
C-8
C-7
Lower
Gate Ho
C-6
C-10
C-2
Raceway
36" Wate
Main

5 BROOK RESERVOIR

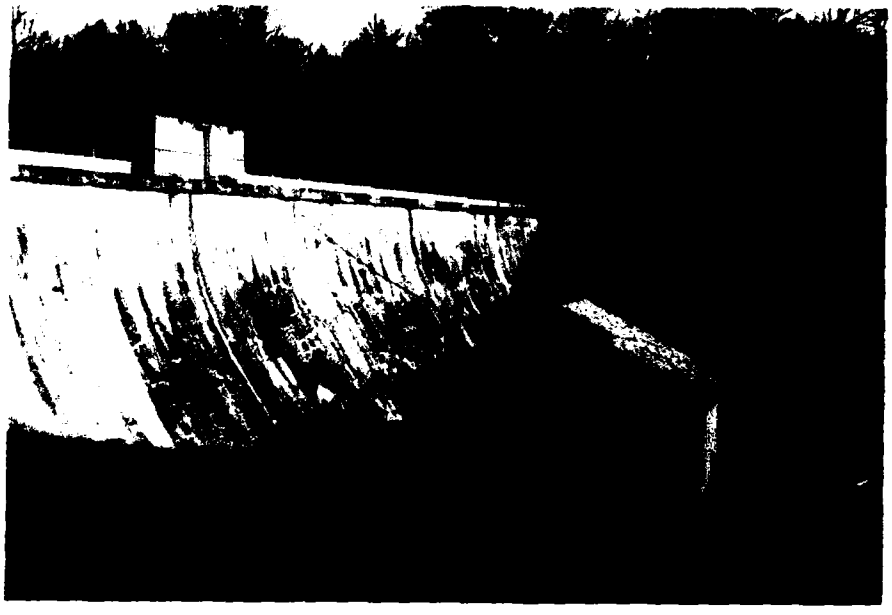


Note:
Photo C-11 Taken Inside Upper Gate House.

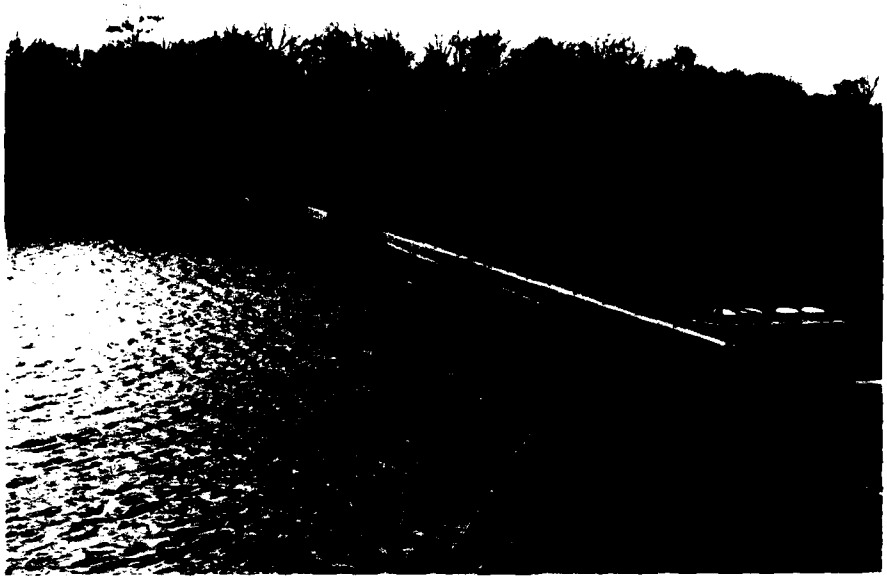
MEANS BROOK RESERVOIR DAM
PHOTO INDEX



C-1 DOWNSTREAM FACE OF DAM - LOOKING AT WEST ABUTMENT

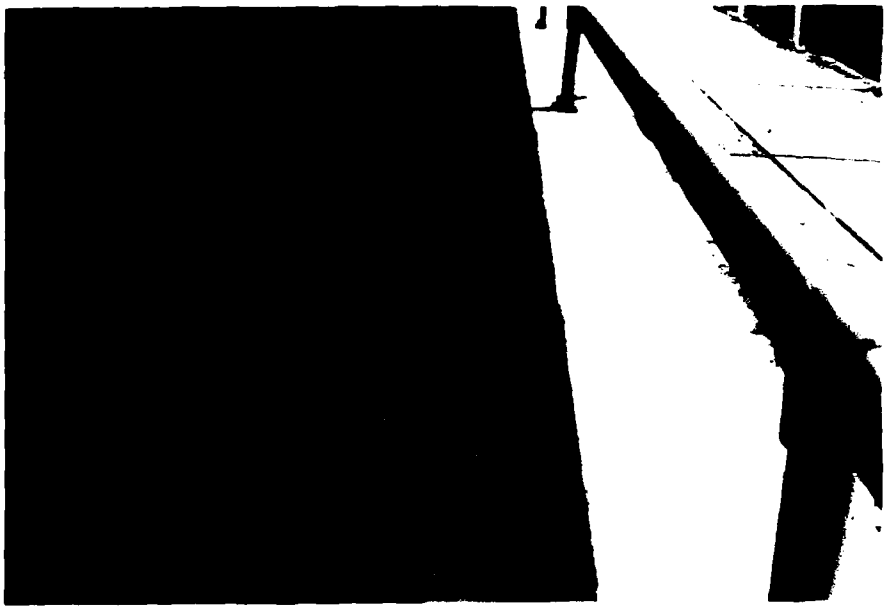


C-2 DOWNSTREAM FACE OF DAM - LOOKING AT EAST ABUTMENT



C-3 UPSTREAM FACE OF DAM - LOOKING EAST

C-4 TOP OF DAM SHOWING UPPER GATE HOUSE AND 1977 WALL ADDITION

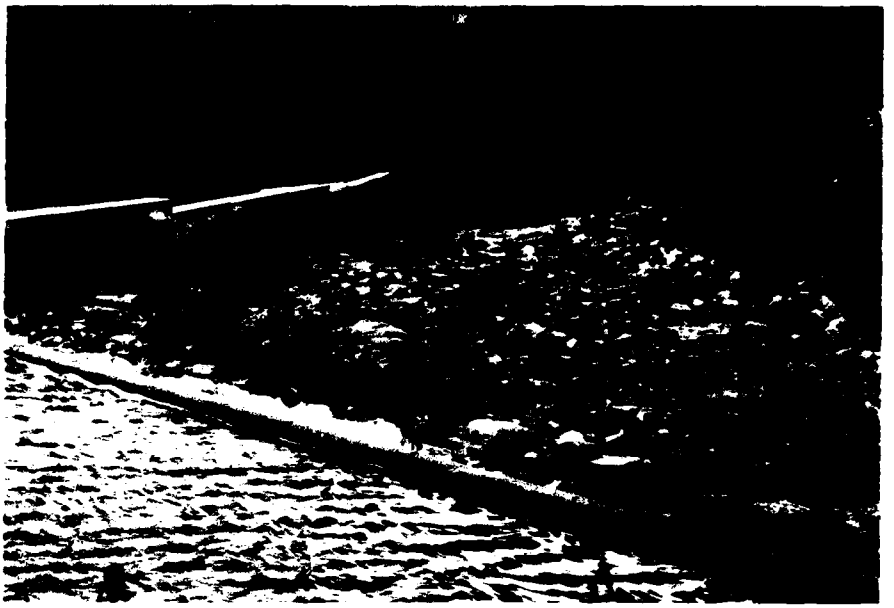


C-5 1977 WALL ADDITION AND EXPOSED REINFORCING STEEL IN EXISTING TOP OF DAM

C-6 SPILLWAY - LOOKING FROM RACEWAY

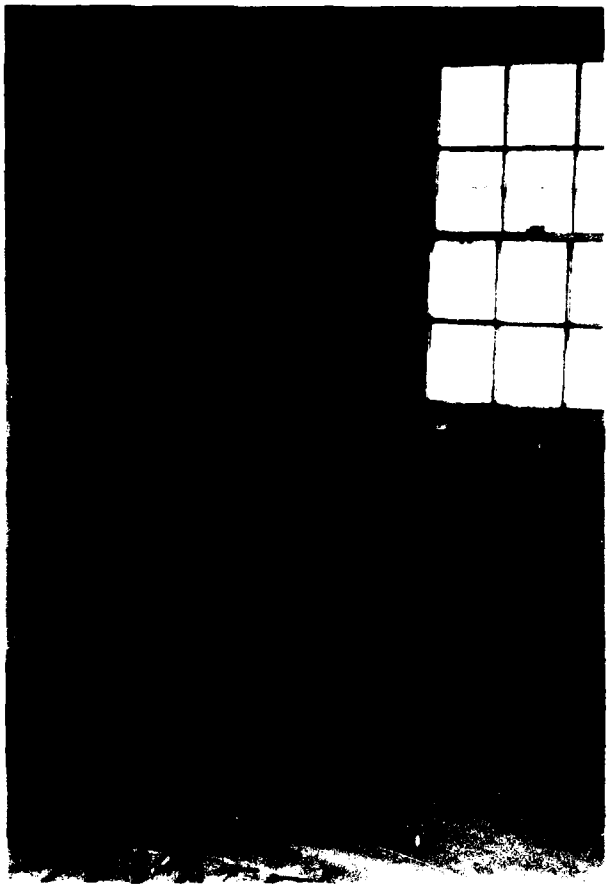
C-7 LEAKAGE THROUGH SPILLWAY JOINT

C-8 SPILLWAY - LOOKING EAST

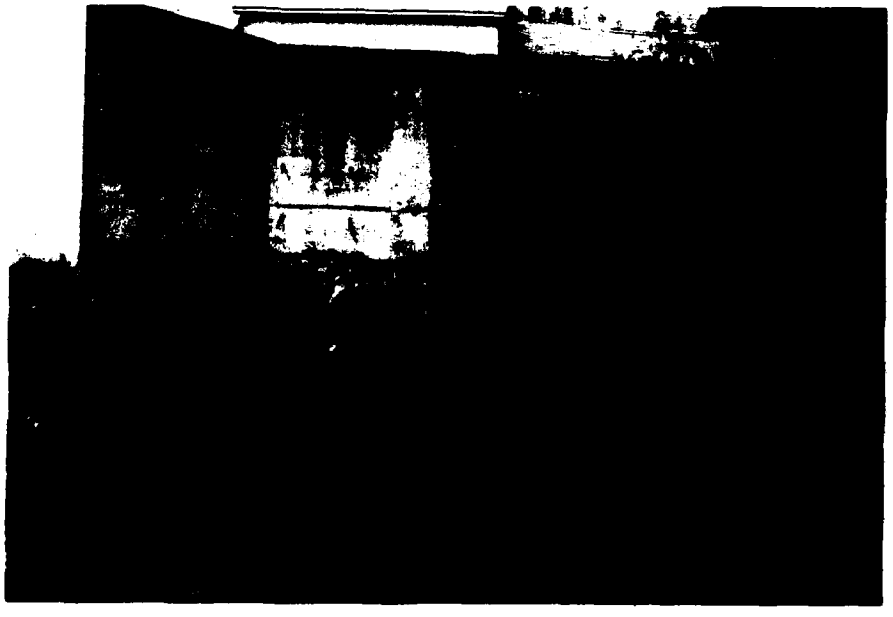


C-9 RACEWAY - LOOKING SOUTH

C-10 RACEWAY AND PIPE BRIDGE FOR 36 INCH WATER MAIN



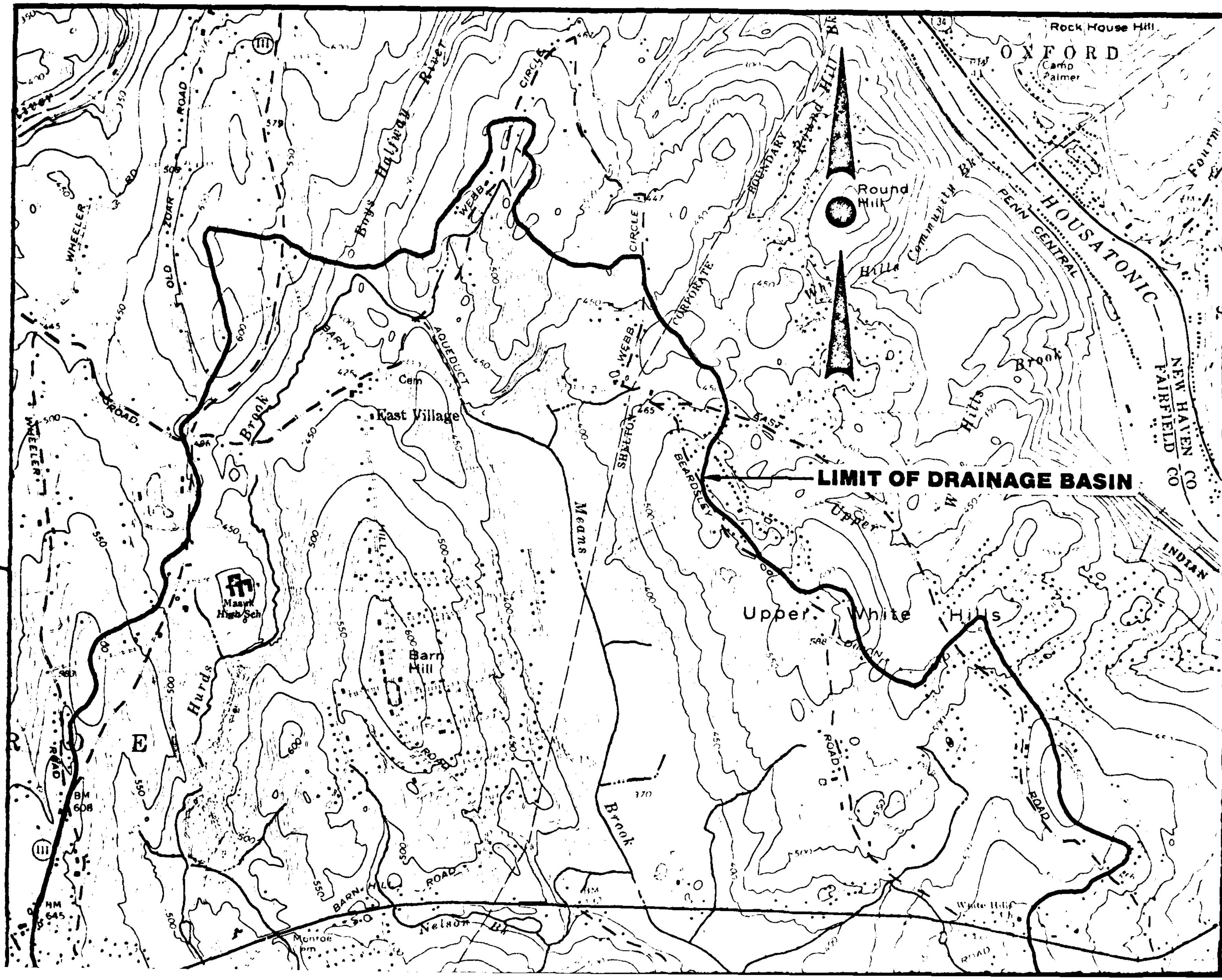
C-11 LIFT MECHANISMS INSIDE UPPER GATE HOUSE

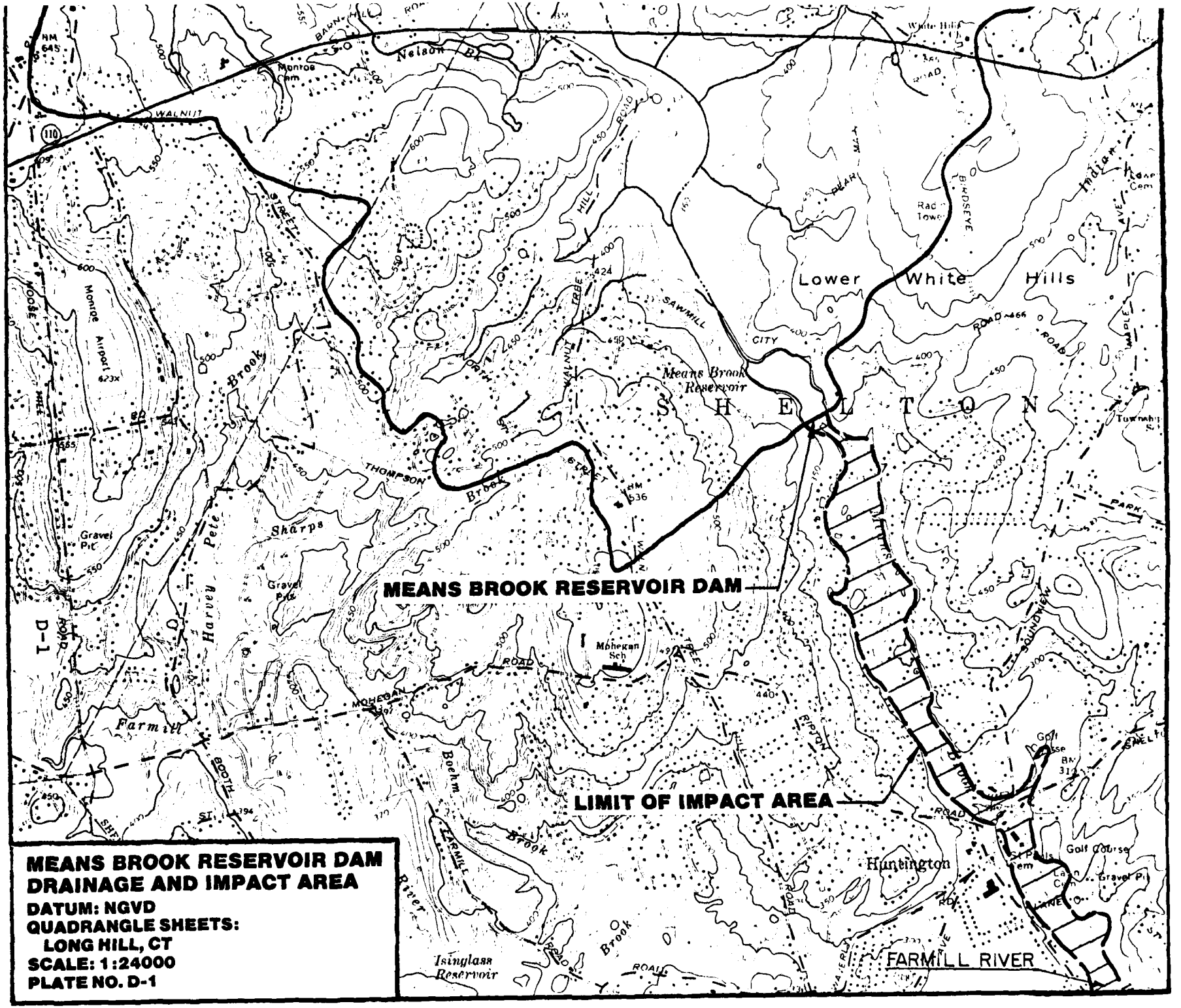


C-12 ENDWALL BELOW DAM SHOWING (FROM LEFT TO RIGHT) 12 INCH BLOWOFF FROM 36 INCH MAIN, 16 INCH OUTLET FOR 24 INCH BLOW-OFF, 30 INCH STORM DRAIN, 8 INCH DRAIN FROM PUMP HOUSE.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS


LIMIT OF DRAINAGE BASIN
Round Hill
Rock House Hill
OXFORD
Camp Palmer
HOUSATONIC
PENN CENTRAL
NEW HAVEN CO
FAIRFIELD CO
INDIAN
Community Bk
Round Hill Bk
BOUNDARY
CORPORATE
Upper White Hills
East Village
Barn Hill
Masuk High Sch
Means Brook
Hurds Brook
Halfway River
AQUEDUCT
WEBB
CIRCLE
SHELTON
BEARDSLEY
BARN HILL ROAD
OLD ZOAR ROAD
WHEELER
Nelson Br
Monroe
BM 608



MEANS BROOK RESERVOIR DAM
DRAINAGE AND IMPACT AREA
DATUM: NGVD
QUADRANGLE SHEETS:
LONG HILL, CT
SCALE: 1:24000
PLATE NO. D-1

HYDROLOGIC AND HYDRAULIC ANALYSIS
SUMMARY SHEET

Dam Means Brook Reservoir Dam

Test Flood PMF

INFLOW HYDROGRAPH DEVELOPMENT

Drainage Area 7.65 **sq. mi.**

Probable Maximum Precipation
24 hour - 200 square mile PMP 22 **inches**

Initial Railfall Loss 0 **Inch**
Uniform Railfall loss .1 **Inch**

Snyder's Lag 5.2 **hours**
Snyder's Peaking Coefficient .625

Test Flood Inflow 7800 **CFS**

PMF Inflow 7800 **CFS**

RESERVOIR ROUTING AND DAM OVERTOPPING

Test Flood Outflow 7800 **CFS**

Spillway Capacity at Top of Dam 4000 **CFS**
51 **% of Test Flood**

Flow Over Spillway at Test Flood 5800 **CFS**

Spillway Crest Elevation	345.0	**Feet**
Top of Dam Elevation	350.1	**Feet**
Test Flood Elevation	351.3	**Feet**

```
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
*************************************
    1               A1       DAM SAFETY ANALYSIS-JOB NO. 79-905/07 EHJ
    2               A2       MEANS BROOK RESERVOIR DAM- SHELTON-CONN.
    3               A3       1-29-80
    4               B     75       1       0       0       0       0       0       2       0       0
    5               B1     5
    6               J      1       2       1
    7               J1    .5      1.      0.      0.      0.      0.      0.      0.      0.
    8               K      0       1       0       0       0       0       1       0
    9               K1       COMPUTATION OF PMF- DEVELOPMENT OF INFLOW HYDROGRAPH
   10               M      1       1     5.8       0     5.8       0       0       0       1
   11               P      0      22     110     124     133     142
   12               T      0       0       0       0       0       0       0      .1
   13               W    5.2    .625
   14               X    1.9     .05     2.0
   15               K      1       1       0       0       0       0       1
   16               K1       ROUTING INFLOW HYDROGRAPH THRU LAKE - OVERTOPPING ANALYSIS
   17               Y      0       0       0       1       1
   18               Y1     1       0       0       0       0       0      -1
   19               $A  18.4    21.0    24.0
   20               $E   345     347   350.1
   21               $$ 345.0   100.0     3.5     1.5
   22               $D 350.1     2.7     1.5     427
   23               K     99
```

DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 01/29/80.
TIME= 14.20.18.

DAM SAFETY ANALYSIS-JOB NO. 79-905/07 ERJ
MEANS BROOK RESERVOIR DAM- SHELTON-CONN.
1-29-80

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
75	1	0	0	0	0	0	2	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1

RTIOS= .50 1.00

****

SUB-AREA RUNOFF COMPUTATION

COMPUTATION OF PMF- DEVELOPMENT OF INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	5.80	0.00	5.80	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	110.00	124.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.10	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 5.20 CP= .63 NTA= 0

RECESSION DATA
STRTQ= 1.90 QRCSN= .05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.13 AND R= 4.64 INTERVALS

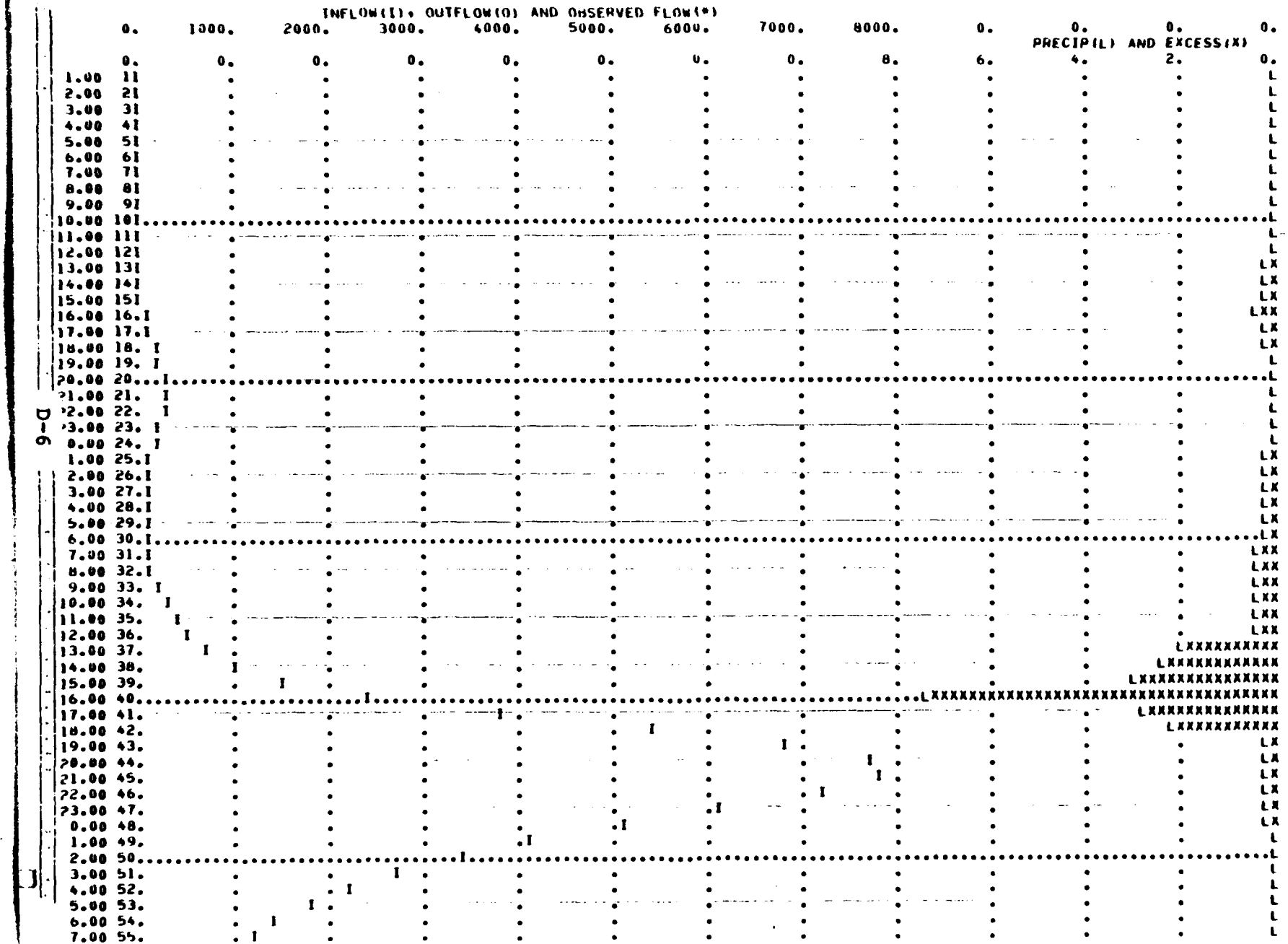
UNIT HYDROGRAPH 28 END-OF-PERIOD ORDINATES, LAG= 5.19 HOURS, CP= .63 VOL= 1.00

34.	123.	242.	357.	435.	454.	406.	329.	265.	213.
172.	138.	111.	90.	72.	58.	47.	38.	30.	25.
20.	16.	13.	10.	8.	7.	5.	4.		

0 END-OF-PERIOD FLOW

1.01	4.00	4	.01	0.00	.01	1.	1.02	17.00	41	2.71	2.61	.10	3833.
1.01	5.00	5	.01	0.00	.01	1.	1.02	18.00	42	2.13	2.03	.10	5427.
1.01	6.00	6	.01	0.00	.01	1.	1.02	19.00	43	.16	.06	.10	6837.
1.01	7.00	7	.03	0.00	.03	1.	1.02	20.00	44	.16	.06	.10	7677.
1.01	8.00	8	.03	0.00	.03	1.	1.02	21.00	45	.16	.06	.10	7782.
1.01	9.00	9	.03	0.00	.03	1.	1.02	22.00	46	.16	.06	.10	7161.
1.01	10.00	10	.03	0.00	.03	1.	1.02	23.00	47	.16	.06	.10	6129.
1.01	11.00	11	.03	0.00	.03	1.	1.03	0.00	48	.16	.06	.10	5063.
1.01	12.00	12	.03	0.00	.03	1.	1.03	1.00	49	0.00	0.00	0.00	4122.
1.01	13.00	13	.13	.03	.10	2.	1.03	2.00	50	0.00	0.00	0.00	3355.
1.01	14.00	14	.16	.06	.10	6.	1.03	3.00	51	0.00	0.00	0.00	2729.
1.01	15.00	15	.20	.10	.10	19.	1.03	4.00	52	0.00	0.00	0.00	2215.
1.01	16.00	16	.50	.40	.10	51.	1.03	5.00	53	0.00	0.00	0.00	1793.
1.01	17.00	17	.18	.08	.10	110.	1.03	6.00	54	0.00	0.00	0.00	1447.
1.01	18.00	18	.14	.04	.10	182.	1.03	7.00	55	0.00	0.00	0.00	1165.
1.01	19.00	19	.01	0.00	.01	249.	1.03	8.00	56	0.00	0.00	0.00	939.
1.01	20.00	20	.01	0.00	.01	291.	1.03	9.00	57	0.00	0.00	0.00	756.
1.01	21.00	21	.01	0.00	.01	299.	1.03	10.00	58	0.00	0.00	0.00	609.
1.01	22.00	22	.01	0.00	.01	273.	1.03	11.00	59	0.00	0.00	0.00	489.
1.01	23.00	23	.01	0.00	.01	228.	1.03	12.00	60	0.00	0.00	0.00	393.
1.02	0.00	24	.01	0.00	.01	186.	1.03	13.00	61	0.00	0.00	0.00	316.
1.02	1.00	25	.11	.01	.10	150.	1.03	14.00	62	0.00	0.00	0.00	253.
1.02	2.00	26	.11	.01	.10	121.	1.03	15.00	63	0.00	0.00	0.00	203.
1.02	3.00	27	.11	.01	.10	99.	1.03	16.00	64	0.00	0.00	0.00	162.
1.02	4.00	28	.11	.01	.10	83.	1.03	17.00	65	0.00	0.00	0.00	124.
1.02	5.00	29	.11	.01	.10	70.	1.03	18.00	66	0.00	0.00	0.00	92.
1.02	6.00	30	.11	.01	.10	60.	1.03	19.00	67	0.00	0.00	0.00	65.
1.02	7.00	31	.41	.31	.10	63.	1.03	20.00	68	0.00	0.00	0.00	27.
1.02	8.00	32	.41	.31	.10	94.	1.03	21.00	69	0.00	0.00	0.00	12.
1.02	9.00	33	.41	.31	.10	163.	1.03	22.00	70	0.00	0.00	0.00	3.
1.02	10.00	34	.41	.31	.10	268.	1.03	23.00	71	0.00	0.00	0.00	2.
1.02	11.00	35	.41	.31	.10	398.	1.04	0.00	72	0.00	0.00	0.00	1.
1.02	12.00	36	.41	.31	.10	534.	1.04	1.00	73	0.00	0.00	0.00	1.
1.02	13.00	37	1.94	1.84	.10	707.	1.04	2.00	74	0.00	0.00	0.00	1.
							1.04	3.00	75	0.00	0.00	0.00	0.
									SUM	24.99	21.72	3.27	80882.
										(635.)	(552.)	(83.)	(2290.32)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7782.	6805.	3154.	1123.	80882.
CMS	220.	193.	89.	32.	2290.
INCHES		10.91	20.24	21.62	21.62
MM		277.24	513.99	549.15	549.16
AC-FT		3375.	6256.	6684.	6684.
THOUS CU M		4162.	7717.	8245.	8245.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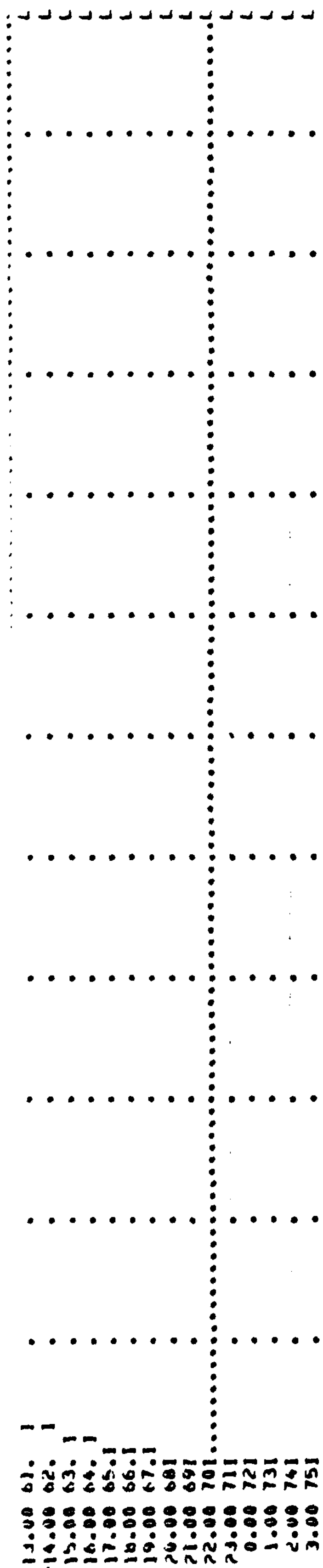


13.00 61.
14.00 62.
15.00 63.
16.00 64.
17.00 65.
18.00 66.
19.00 67.
20.00 68
21.00 69
22.00 70
23.00 71
0.00 72
1.00 73
2.00 74
3.00 75

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
0.	0.	1.	3.	9.	25.	55.	91.	124.	146.
150.	136.	114.	93.	75.	61.	50.	41.	35.	30.
31.	47.	82.	134.	199.	267.	354.	504.	761.	1224.
1917.	2713.	3419.	3839.	3891.	3580.	3065.	2532.	2061.	1677.
1364.	1108.	896.	723.	583.	469.	378.	304.	245.	197.
158.	127.	101.	81.	62.	46.	32.	13.	6.	1.
1.	1.	0.	0.	0.					

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3891.	3403.	1577.	562.	40441.
CMS	110.	96.	45.	16.	1145.
INCHES		5.46	10.12	10.81	10.81
MM		138.62	257.00	274.58	274.58
AC-FT		1687.	3128.	3342.	3342.
THOUS CU M		2081.	3859.	4123.	4123.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

2.	2.	2.	1.	1.	1.	1.	1.	1.	1.
1.	1.	2.	6.	19.	51.	110.	182.	249.	291.
299.	273.	228.	186.	150.	121.	99.	83.	70.	60.
63.	94.	163.	268.	398.	534.	707.	1007.	1523.	2448.
3833.	5427.	6837.	7677.	7782.	7161.	6129.	5063.	4122.	3355.
2729.	2215.	1793.	1447.	1165.	939.	756.	609.	489.	393.
316.	253.	203.	162.	124.	92.	65.	27.	12.	3.
2.	1.	1.	1.	0.					

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7782.	6805.	3154.	1123.	80882.
CMS	220.	193.	89.	32.	2290.
INCHES		10.91	20.24	21.62	21.62
MM		277.24	513.99	549.15	549.16
AC-FT		3375.	6256.	6684.	6684.
THOUS CU M		4162.	7717.	8245.	8245.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING INFLOW HYDROGRAPH THRU LAKE - OVERTOPPING ANALYSIS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

SURFACE AREA=	18.	21.	24.
CAPACITY=	0.	39.	109.

DAM DATA

TOPEL	COOD	EXPD	DAMWID
350.1	2.7	1.5	427.

STATION 1. PLAN 1. RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
0.	0.	1.	1.	2.	9.	28.	61.	99.	131.
146.	143.	127.	106.	87.	71.	59.	49.	41.	35.
32.	37.	57.	99.	160.	230.	311.	435.	654.	1049.
1689.	2489.	3245.	3755.	3902.	3680.	3205.	2670.	2186.	1783.
1456.	1187.	965.	783.	634.	513.	416.	337.	273.	221.
179.	145.	117.	95.	75.	58.	44.	29.	17.	9.
5.	4.	3.	2.	1.					

STORAGE

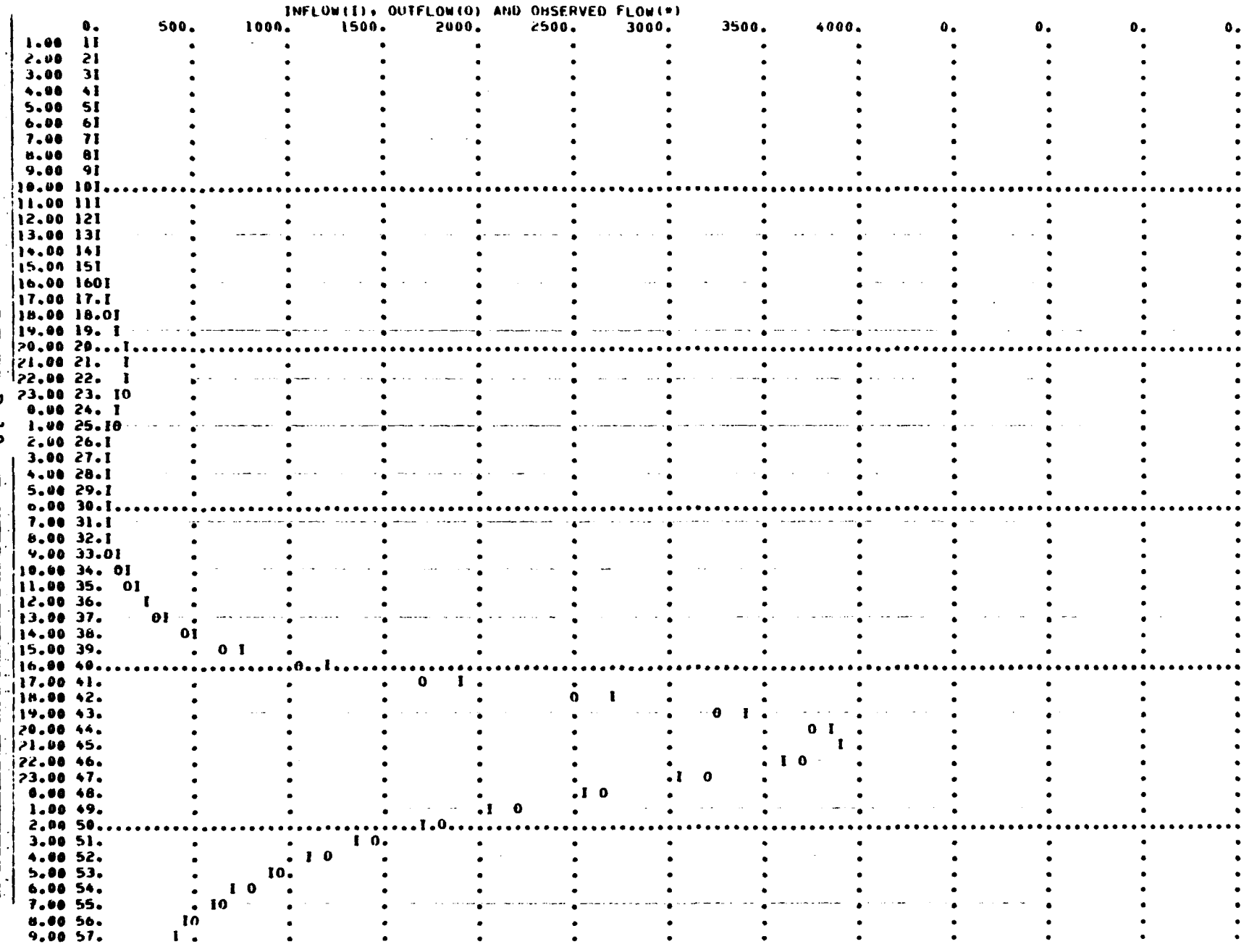
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	2.	3.	6.	8.	10.
10.	10.	10.	8.	7.	6.	6.	5.	4.	4.
4.	4.	6.	8.	11.	14.	18.	22.	29.	41.
58.	76.	93.	103.	106.	102.	92.	80.	70.	60.
52.	45.	39.	33.	29.	25.	21.	19.	16.	14.
12.	10.	9.	8.	7.	6.	5.	4.	2.	2.
1.	1.	1.	1.	0.					

STAGE

345.0	345.0	345.0	345.0	345.0	345.0	345.0	345.0	345.0	345.0
345.0	345.0	345.0	345.0	345.0	345.1	345.2	345.3	345.4	345.5
345.6	345.6	345.5	345.5	345.4	345.3	345.3	345.3	345.2	345.2
345.2	345.2	345.3	345.4	345.6	345.8	345.9	346.2	346.5	347.1
347.9	348.7	349.4	349.9	350.0	349.8	349.4	348.9	348.4	348.0
347.6	347.3	347.0	346.7	346.5	346.3	346.1	346.0	345.8	345.7
345.6	345.6	345.5	345.4	345.4	345.3	345.3	345.2	345.1	345.1
345.1	345.0	345.0	345.0	345.0					

PEAK OUTFLOW IS 3902. AT TIME 45.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3902.	3395.	1577.	562.	40437.
CMS	110.	96.	45.	16.	1145.
INCHES		5.44	10.12	10.81	10.81
MM		138.29	256.94	274.55	274.55
AC-FT		1683.	3128.	3342.	3342.
THOUS CU M		2076.	3858.	4122.	4122.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16.00 64. I
17.00 65.10
18.00 66.I
19.00 67.I
20.00 6810
21.00 69I
22.00 70I
23.00 71I
 0.00 72I
 1.00 73I
 2.00 74I
 3.00 75I
```

STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	6.	22.	64.	134.	211.	270.
296.	286.	250.	208.	170.	138.	113.	94.	79.	68.
63.	76.	121.	210.	334.	475.	637.	891.	1340.	2151.
3445.	5195.	6743.	7609.	7812.	7237.	6246.	5178.	4252.	3545.
2880.	2349.	1907.	1546.	1250.	1011.	818.	662.	535.	432.
349.	282.	228.	184.	146.	112.	83.	53.	29.	15.
8.	5.	4.	3.	2.					

STORAGE

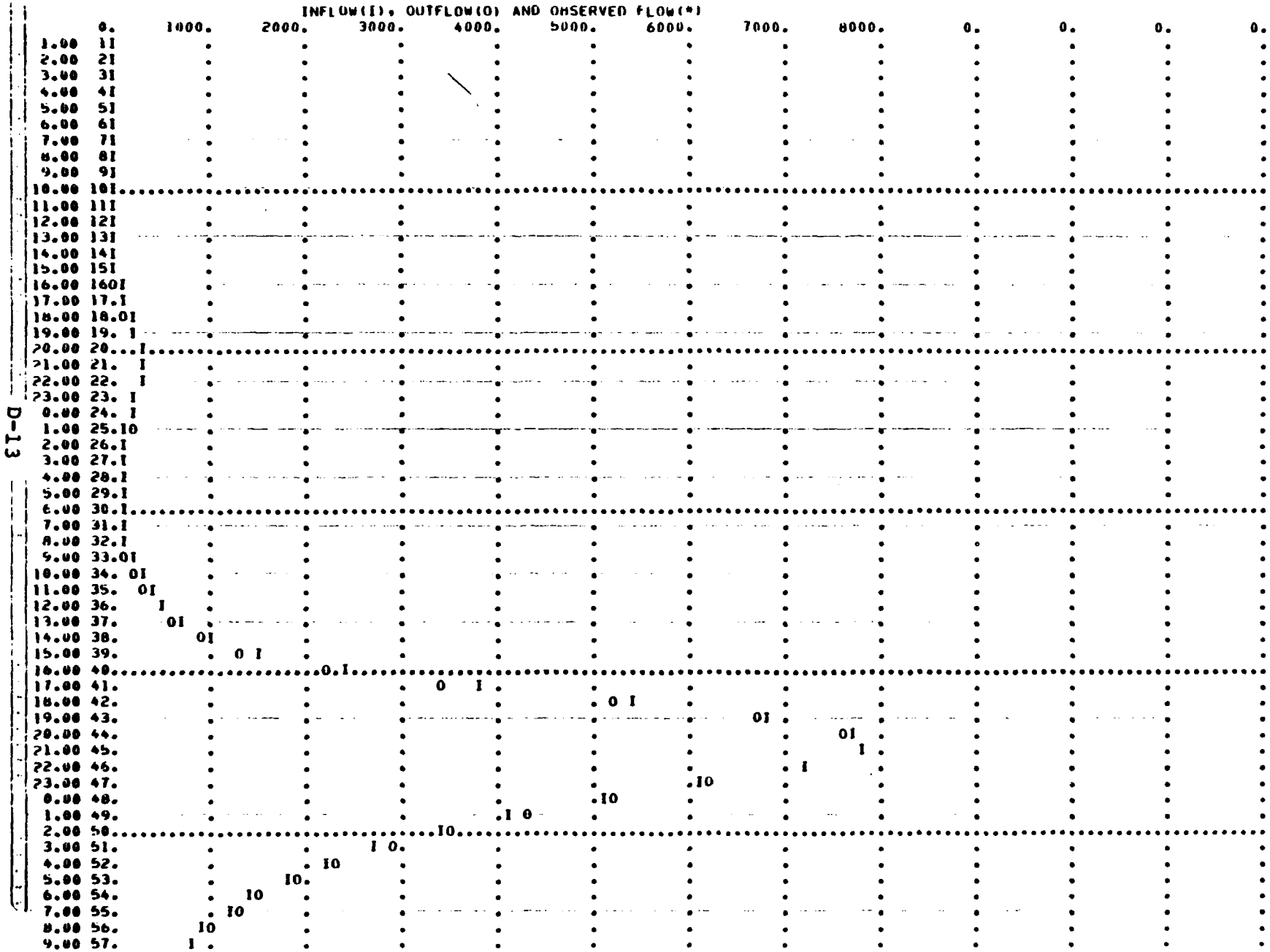
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	3.	6.	10.	13.	16.
17.	17.	15.	13.	12.	10.	9.	8.	7.	6.
6.	7.	9.	13.	18.	24.	29.	37.	49.	69.
97.	123.	136.	143.	144.	140.	132.	122.	112.	99.
85.	73.	63.	54.	47.	40.	34.	30.	26.	22.
19.	16.	14.	12.	10.	9.	7.	5.	4.	2.
2.	1.	1.	1.	1.					

STAGE

345.0	345.0	345.0	345.0	345.0	345.0	345.0	345.0	345.0	345.0
345.0	345.0	345.0	345.0	345.1	345.2	345.3	345.5	345.7	345.8
345.9	345.9	345.8	345.7	345.6	345.5	345.5	345.4	345.4	345.3
345.3	345.4	345.5	345.7	346.0	346.2	346.5	346.9	347.4	348.4
349.6	350.7	351.2	351.5	351.5	351.4	351.0	350.7	350.2	349.7
349.1	348.6	348.1	347.7	347.3	347.0	346.8	346.5	346.3	346.2
346.0	345.9	345.8	345.7	345.6	345.5	345.4	345.3	345.2	345.1
345.1	345.1	345.0	345.0	345.0					

PEAK OUTFLOW IS 7812. AT TIME 45.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7812.	6806.	3154.	1123.	80877.
CMS	221.	193.	89.	32.	2290.
INCHES		10.92	20.23	21.62	21.62
MM		277.24	513.94	549.12	549.12
AC-FT		3375.	6256.	6684.	6684.
THOUS CU M		4163.	7716.	8245.	8245.


INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
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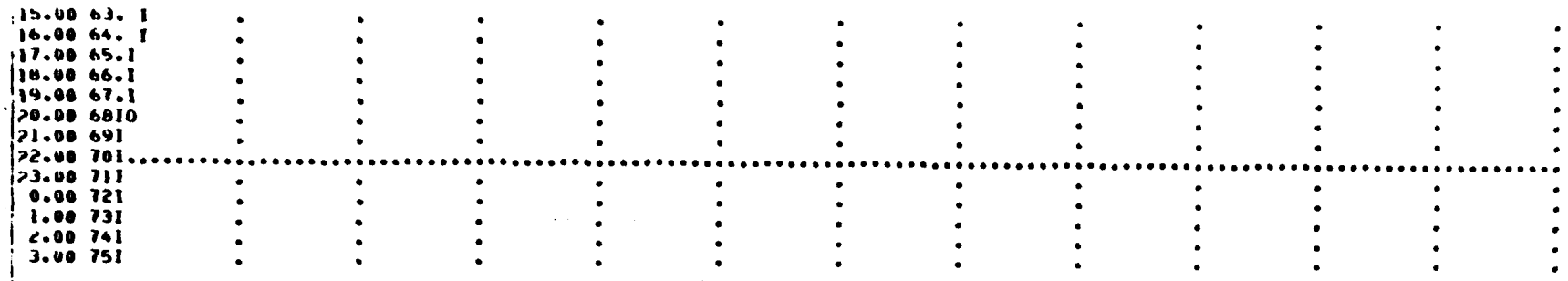
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17.00 65.I
18.00 66.I
19.00 67.I
20.00 68I0
21.00 69I
22.00 70I
23.00 7II
0.00 72I
1.00 73I
2.00 74I
3.00 75I

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50	 RATIO 2 1.00
HYDROGRAPH AT	1	5.80	1	3891.	7782.
		(15.02)		(110.19)(	220.38)(
ROUTED TO	1	5.80	1	3902.	7812.
		(15.02)		(110.49)(	221.22)(

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	345.00	345.00	350.10
STORAGE	0.	0.	109.
OUTFLOW	0.	0.	4031.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	349.99	0.00	106.	3902.	0.00	45.00	0.00
1.00	351.53	1.43	144.	7812.	8.00	45.00	0.00

A. Size Classification

Height of dam = 50 ft.; hence intermediate

Storage capacity at top ofwall (elev. 350.1)= 373 AC-FT.; hence small

Adopted size classification intermediate

B.i) Hazard Potential

Failure would result in the loss of more than a few lives, many homes and damage to the village of Huntington.

ii) Impact of Failure of Dam at Normal Pool (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 25-30 ;
b) Loss of buildings 6± ;
c) Loss of highways or roads 2-3 ;
d) Loss of bridges 1-2 ;

The failure profile can affect a distance of 11500 feet from the dam.

C. Hazard Potential Classifications

HAZARD	SIZE	TEST FLOOD RANGE
High	Intermediate	PMF

Adopted Test Flood = PMF = 1020 CSM

= 7800 CFS

D. Overtopping Potential

Drainage Area 3519 acres = 7.65 sq. miles

Spillway crest elevation = 345.0 NGVD

Top of Dam Elevation = 348.0 (350.1 - top of wall) NGVD

Maximum spillway discharge

Capacity without overtopping of dam = 4000 CFS
"test flood" inflow discharge = 7800 CFS
"test flood" outflow discharge = 7800 CFS

MEANS BROOK RESERVOIR DAM

Dam Failure Analysis

1. Failure discharge with pool at spillway (elev. 345.0) = 19600 CFS
2. Depth of water in reservoir at time of failure = 30 ft.
3. Maximum depth of flow downstream of dam = 16 ft.
4. Water surface elevation just downstream of dam at time of failure) = 316 NGVD

The failure discharge of 19600 CFS will enter and flow downstream 11500 feet until the brook enters the Farhill River. Valley storage in this 11500 feet length of brook is substantial 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 11500 feet downstream. The failure profile will have the following hydraulic characteristics:

DISTANCE FROM THE DAM	WATER SURFACE ELEVATION NGVD	REMARKS
0	345.0	Upstream of dam
100	316.0	
1000	304.6	
4000	302.2	
8000	252.0	Huntington
10500	232.0	
11500	232.0	Farhill River

Beyond 11500 feet _____ failure discharge will flow in the below given channel characteristics:

Q = 4700 CFS; S = .005

n = .05; b = 20; d = 2

Side slopes = 1V on 5H.

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

DATA

Name of Dam Means Brook Reservoir Dam

Location Town of Shelton

Drainage Area 7.65 sq. mi., Top of Dam 348.0 NGVD

Spillway Type Overflow - ogee, Crest of Spillway 345.0 NGVD

Surface Area @ Crest Elev. 24 Acres = .04 sq. mi.

Pool Bottom Near Dam = 315 NGVD*

Assumed Side Slopes of Embankments = 2:1

Depth of Pool at Dam (Yo) = 30 Feet*

Mid-Height Elev. 332 NGVD

Length of Dam at Crest = 430 Feet

Length of Dam at Mid-Height = 285 Feet

25% of Dam Length at Mid-Height = W_b = 71 Feet

Step 1

Storage (S) at time of failure 268 Ac-FT
(Equal to spillway crest)

Step 2

Peak Failure Discharge

$$Q_{pl} = 8/27\ W_b\ \sqrt{g}\ Yo^{3/2}$$

$$= 1.68\ W_b\ Yo^{3/2} = 19600 \text{ cfs}$$

Failure is assumed to coincide with pool elevation at top of dam.

* Referring to toe of dam on the downstream face.

The Farhill River is located 11500 feet downstream of Means Brook Reservoir dam. There is a 70 foot drop into the Farhill River which will cause the dissipation of wave and kinetic energy of the failure discharge. Approximately, the water surface elevations between the Means Brook Reservoir dam and the Farhill River will be as given on Dam Failure Analysis. The increase of depth in the Farhill River due to failure of Means Brook Res. dam is estimated to be 2 feet.

BY FLC DATE 1/22/79 SUBJECT DAM INSPECTION STUDIES SHEET NO 1 OF 5
CHKD. BY BDA DATE 1-21-80 JOB NO 79-905/07

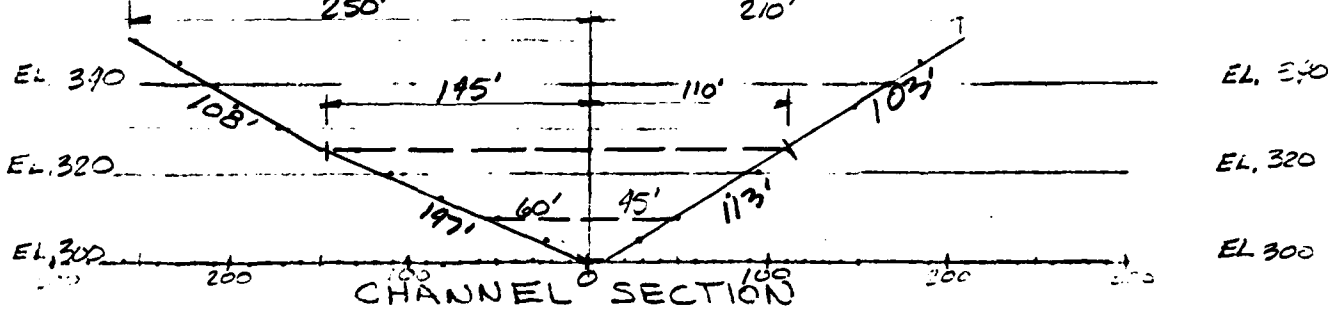
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: Mesa View Reservoir

SECTION LOCATION: 100' DOWNSTREAM OF DAM

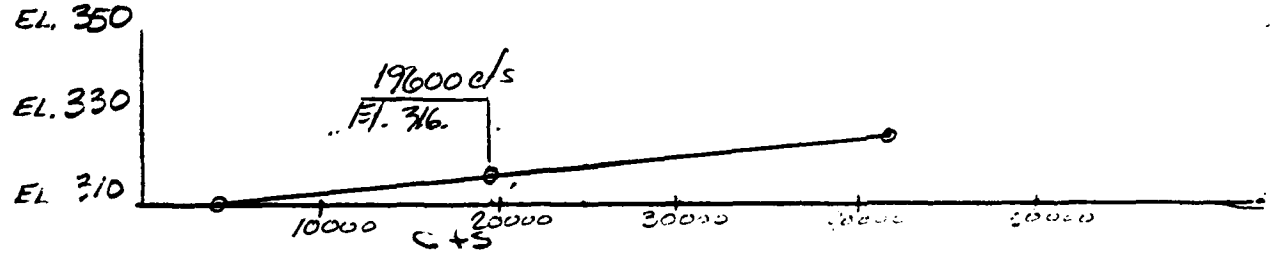
USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

WHERE: n = 0.05 S = SLOPE = .0067'/ft



Q_{F_0} = 19600 cfs STORAGE (S) 268 Ac-ft

ELEV	AREA	W.P.	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
325	3313#	270'	12.3	5.33	.08	29.72	4193	25'
350	12251	481	25.5	8.67	.03	29.72	25250	50'
310	575	105	5.48	3.11	.03	29.72	4252	10'



V_1 = ($\frac{}{2}$ × ÷43,560) 1/2 = _____ Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V_1/S)$ = _____ cfs

V_2 = _____ Ac-ft V_{AVE} = _____ Ac-ft.

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S)$ = _____ cfs

STAGE DISCHARGE = 19600 cfs ELEV = 316 OR A D 16 T

NEXT DOWNSTREAM SECTION 1000 ft.

PURCELL ASSOCIATES

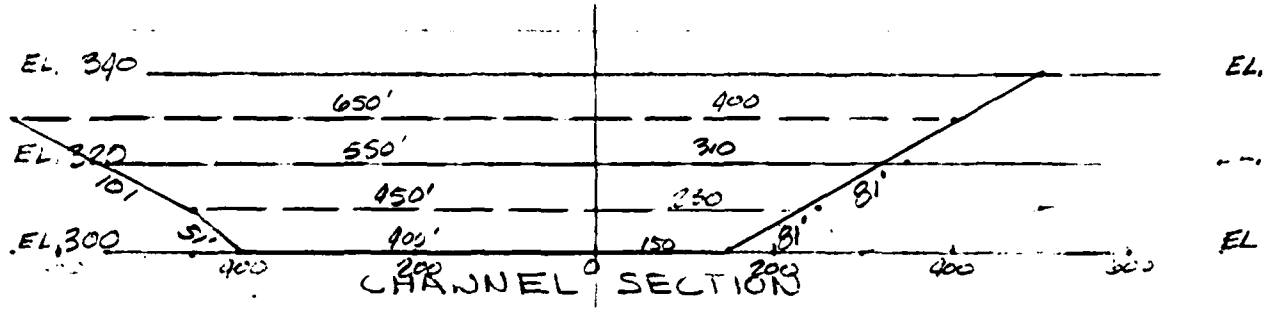
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: Mesa Knox Reservoir

SECTION LOCATION: 1000' DOWNSTREAM OF DAM

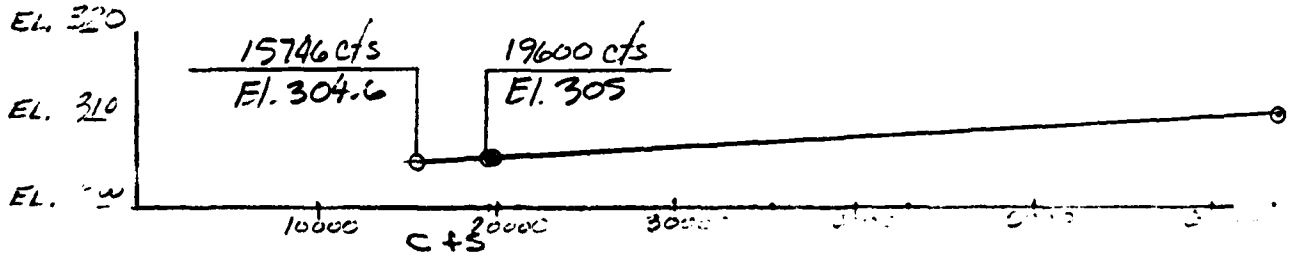
USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

WHERE: n = 0.05 S = SLOPE = .0067'/FT



Q_{F_1} = 19600 cfs STORAGE (S) 268 Ac-ft

ELEV	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
310	6150	682	9.02	4.33	.09	29.72	63314	10'
320	13850	864	16.03	6.36	.03	29.72	209433	20'
305	2912	616	4.73	2.82	.09	29.72	19524	5'



$V_1 = \frac{16.0+5.0}{2} \times \left(\frac{175+600}{2} \times 1000 \div 43{,}560\right) 1/2$ = 52.2 Ac-ft

$Q_{P2} = Q_{P1}(1 - V_1/S)$ = 15746 cfs

$V_2 = \frac{18.1+5.2}{2} \times 8.90 \times 1/2$ = 51.8 Ac-ft V_{AVE} 52.3 Ac-ft

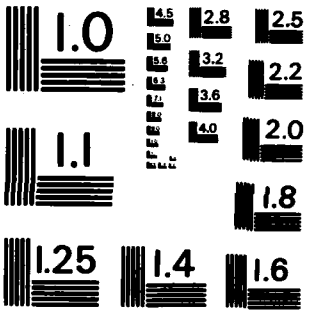
$Q_{P2} = Q_{P1}(1 - V_{AVE}/S)$ = 15779 cfs

STAGE DISCHARGE: 15779 cfs ELEV = 304.6 OR A D = 4.6 ft

NEXT DOWNSTREAM SECTION 3000 ft.

AD-A142 859 . HOUSATONIC RIVER BASIN SHELTON CONNECTICUT MEANS BROOK RESERVOIR DAM (CT..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV APR 80 2/2

UNCLASSIFIED F/G 13/13 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A

BY FCG DATE 1/22/79 SUBJECT DAM INSPECTION STUDIES SHEET NO 3 OF 5
CHKD. BY GDA DATE 1-21-80 JOB NO 79-905/07

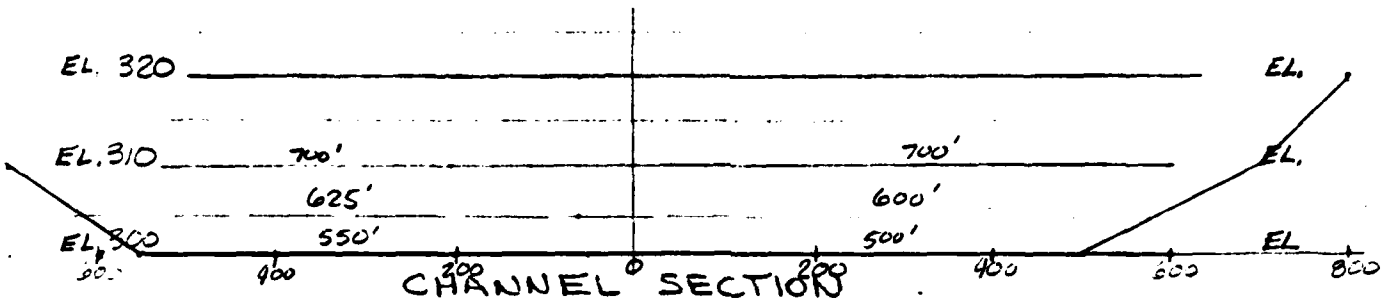
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: Means Brook Reservoir

SECTION LOCATION: 4000' DOWNSTREAM OF DAM

USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

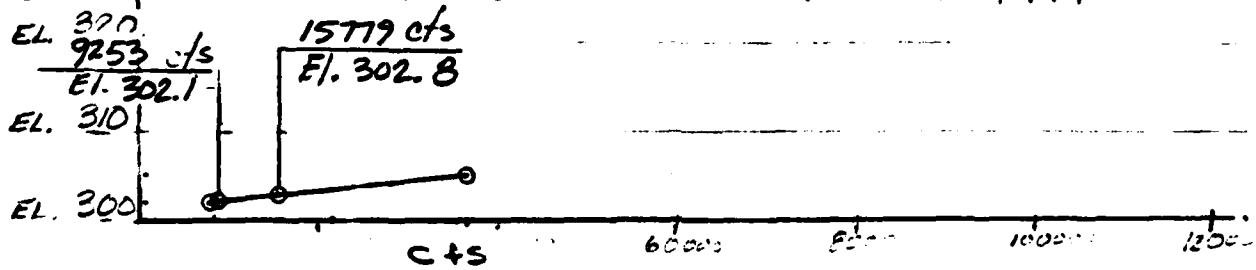
WHERE: n = 0.05 S = SLOPE = .0067'/ft



CHANNEL SECTION

Q_{P_1} = 15779 cfs STORAGE (S) 268 Ac-ft

ELEV	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
305	5683	1275	4.46	2.71	.08	29.72	36649	5'
310	12250	1400	8.75	4.25	.08	29.72	126794	10'
302	2150	1100	1.95	1.56	.08	29.72	7974	2



V_1 $\frac{4.6+2.8}{2} \times \left(\frac{600+1140}{2} \times 3000 \div 43{,}560\right) 1/2$ = 111 Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V_1/S)$ = 9253 cfs

V_2 $\frac{4.6+2.1}{2} \times \left(\frac{600+1120}{2} \times 3000 \div 43{,}560\right) 1/2$ = 99 Ac-ft V_{AVE} 105 Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S)$ = 9591 cfs

STAGE DISCHARGE 9591 cfs ELEV = 302.2 OR Δ 2.2 ft

NEXT DOWNSTREAM SECTION 4000 ft.

PURCELL ASSOCIATES

BY FLE DATE 1/22/79 SUBJECT DAM INSPECTION SHEET NO 4 OF 5
CHKD. BY BCA DATE 1-21-80 STUDIES JOB NO 79-905/07

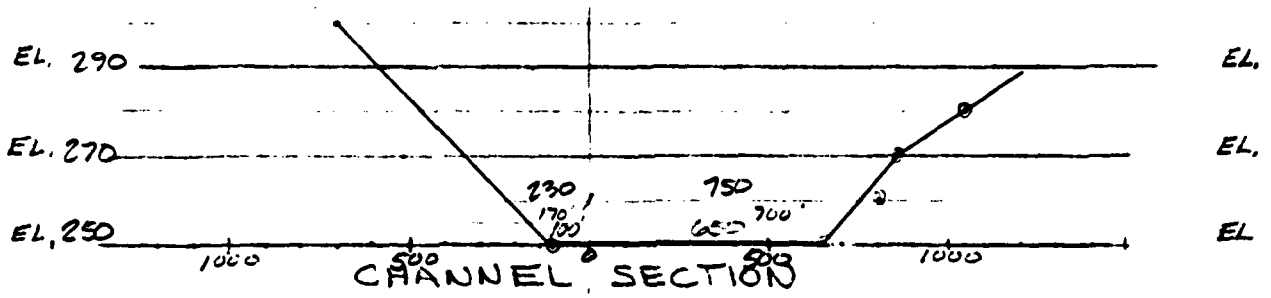
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: Mesa Rock Reservoir

SECTION LOCATION: 8000' DOWNSTREAM OF DAM

USING: $Q = 1.486/n\ A\ R^{2/3}\ S^{1/2}$

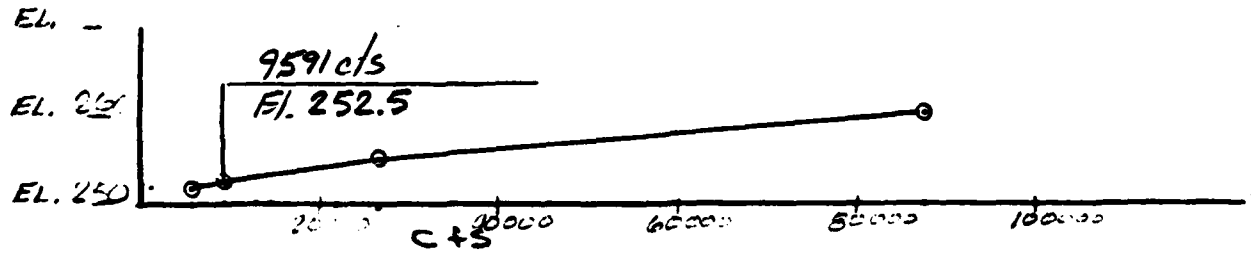
WHERE: n = 0.05 S = SLOPE = .0067'/ft



CHANNEL SECTION

Q_{P_1} = 9591 cfs STORAGE (S) 268 Ac-ft

ELEV	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
255	4050	870	4.66	2.79	.03	29.72	26[illegible]	5'
260	8650	930	8.33	4.27	.03	29.72	37[illegible]	10'
252	1560	810	1.93	1.55	.03	29.72	5[illegible]	2'



$V_1 = \frac{2.2+2.5}{2} \times (\frac{1120+900}{2} \times 4000 \div 43{,}560)\ 1/2$ = 109 Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V_1/S)$ = 5691 cfs, El. 252

$V_2 = \frac{2.6+2.0}{2} \times 92.75 \times 1/2$ = 107 Ac-ft V_{AVE} 108 Ac-ft.

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S)$ = 5732 cfs

STAGE DISCHARGE 5732 cfs ELEV = 252.0 OR A D = 2.0 ft

NEXT DOWNSTREAM SECTION 2500 ft.

PURCELL ASSOCIATES

BY F.G.B. DATE 1/22/79 SUBJECT DAM INSPECTION STUDIES SHEET NO 5 OF 5
CHKD. BY EOA DATE 1-21-80 JOB NO 79-905/07

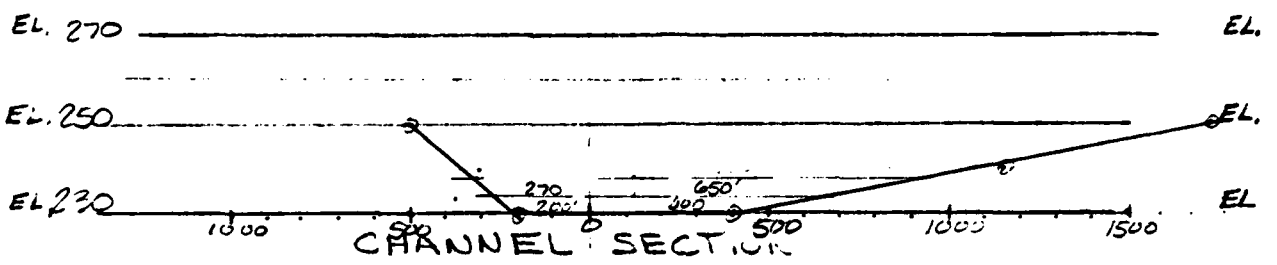
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: Mears Brox Pond

SECTION LOCATION: 10500' DOWNSTREAM OF DAM

USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

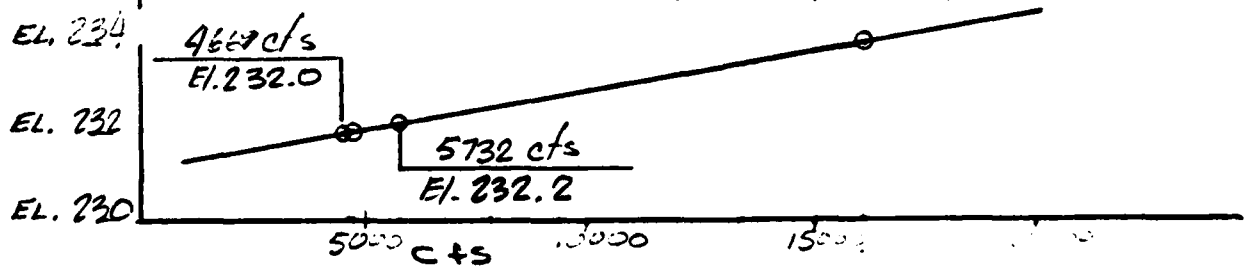
WHERE: n = 0.05 S = SLOPE = .0067'/ft



CHANNEL SECTION

Q_{P1} = 5732 cfs STORAGE (S) 268 Ac-ft

ELEV	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
232	1360	760	1.79	1.47	.08	29.72	4753	2
234	3040	920	3.30	2.22	.09	29.72	16046	4
						29.72		



$V_1 = \frac{2.0+2.2}{2} \times \left(\frac{900+750}{2} \times 2500 \div 43,560\right) 1/2$ = 49.7 Ac-ft

$Q_{P2} = Q_{P1}(1 - V_1/S)$ = 4669 cfs

V_2: 2.0 X 47.3 X 1/2 = 47.3 Ac-ft V_{AVE} 48.5 Ac-ft.

$Q_{P2} = Q_{P1}(1 - V_{AVE}/S)$ = 4695 cfs

STAGE DISCHARGE = 4695 cfs ELEV = 232.0 OR A D 2.0 FT

NEXT DOWNSTREAM SECTION 1000 ft.

CONFLUENCE W/ FALMICE RIVER

PURCELL ASSOCIATES

RATING CURVE DEVELOPMENT

Means Brook Reservoir Dam

Spillway

$Q = C\ L\ H^{3/2}$

$C = 3.5$

$L = 100$ feet

30 Inch Pipe

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

$c = .6$

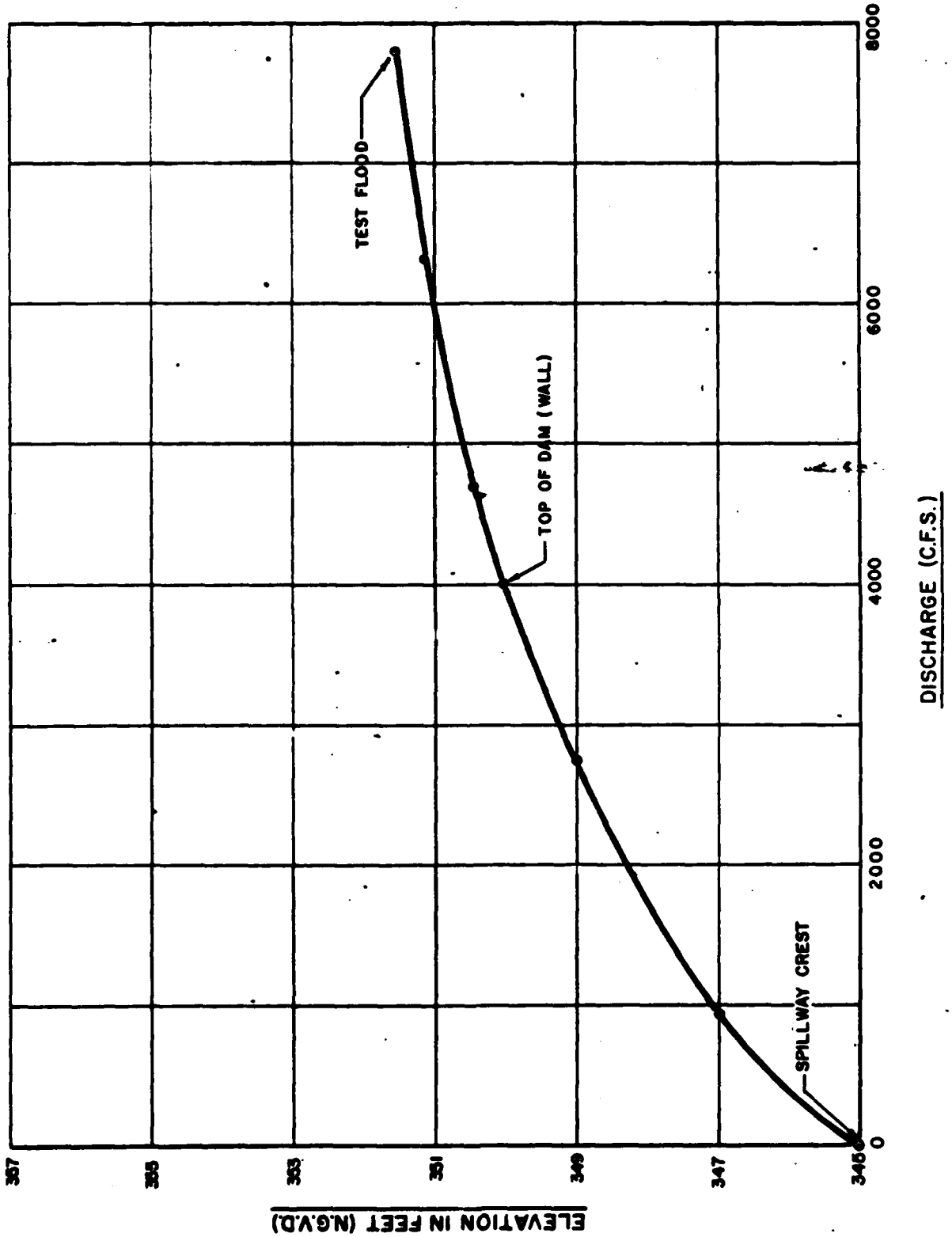
$a = 4.9$ square feet

24 Inch Blowoff

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

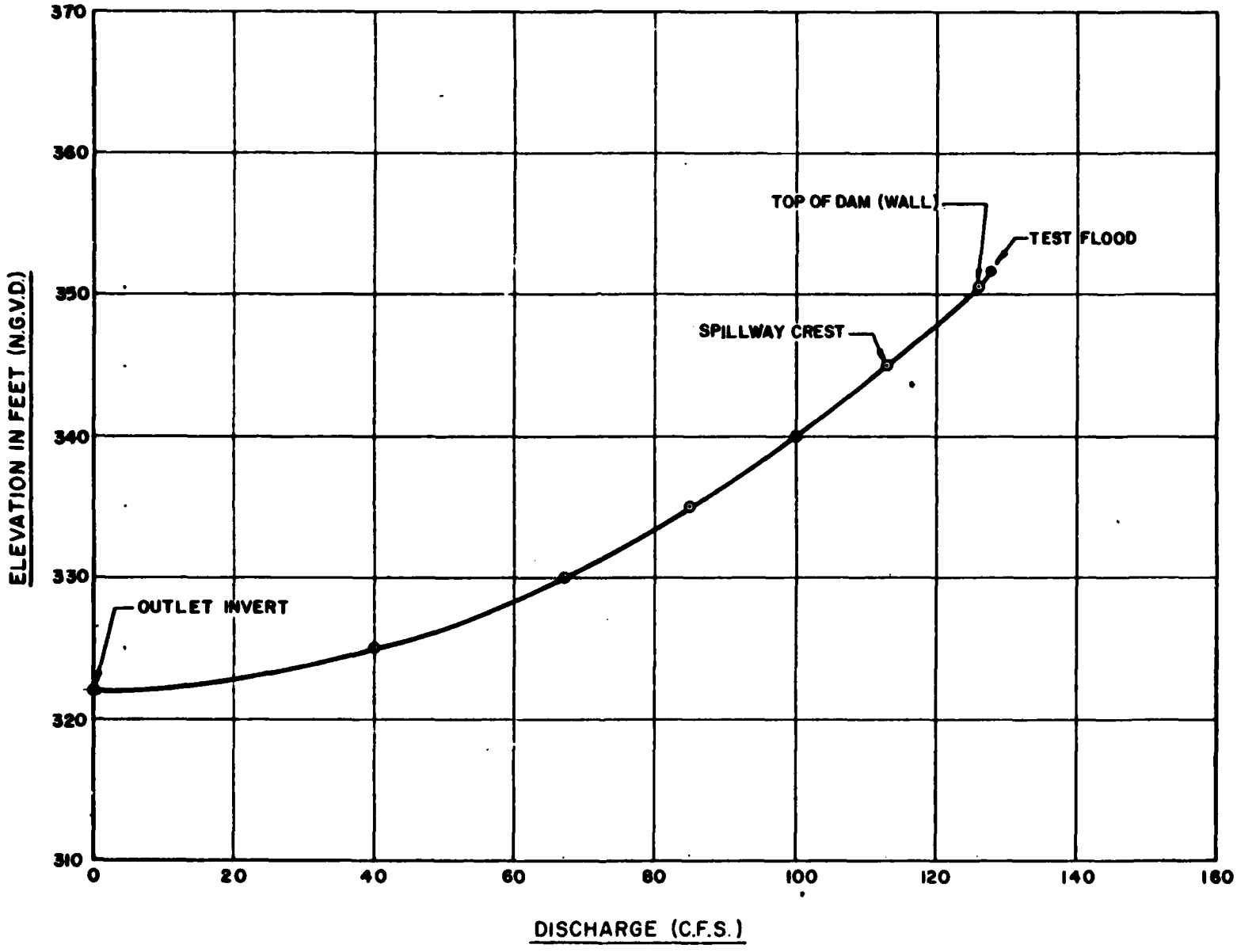
$c = .6$

$a = 1.4$ square feet (16 inch pipe at outlet)

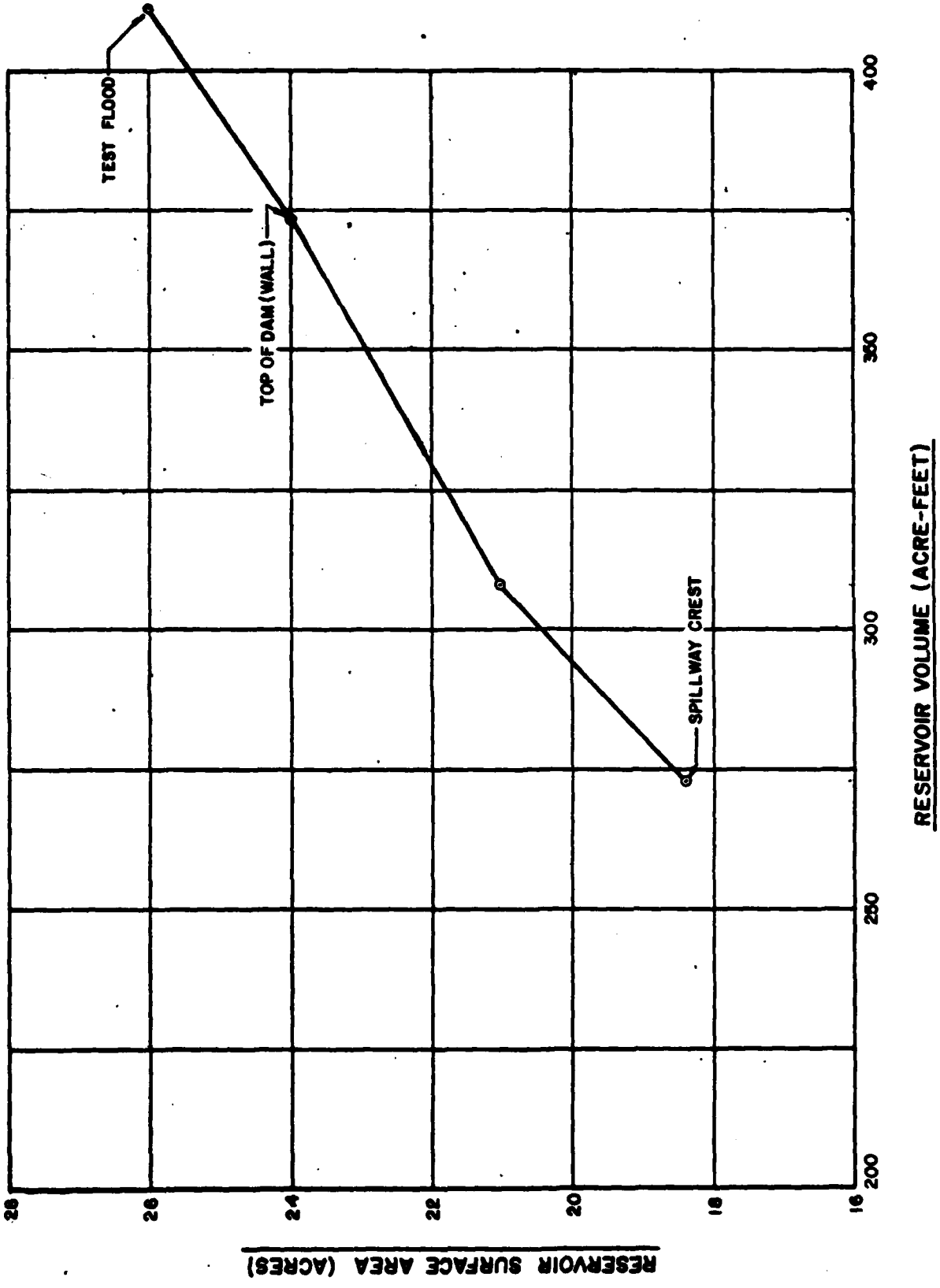


MEANS BROOK RESERVIOR DAM

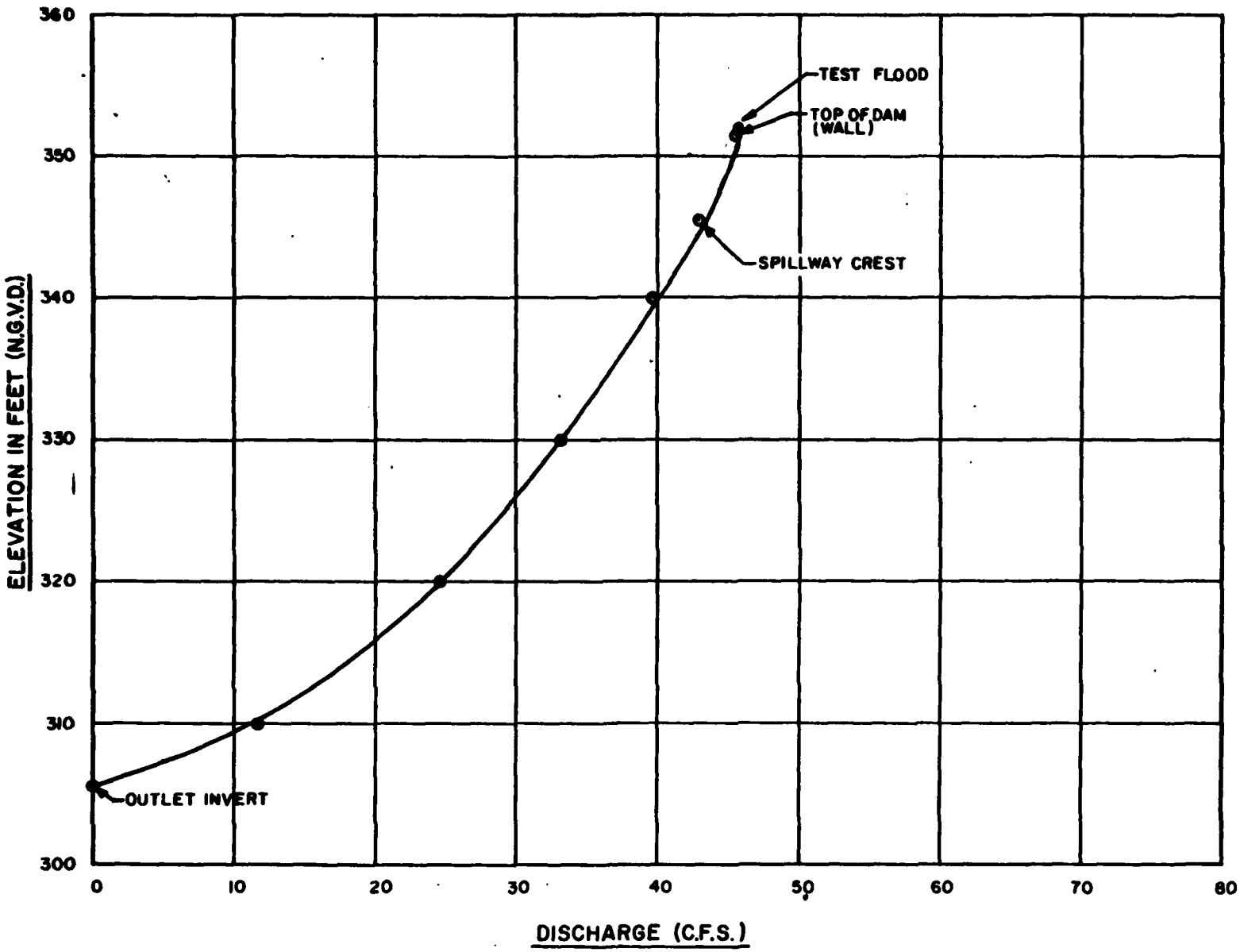
SPILLWAY RATING CURVE



MEANS BROOK RESERVOIR DAM
30 INCH SERVICE MAIN
OUTLET WORKS RATING CURVE



MEANS BROOK RESERVOIR DAM
RESERVOIR AREA-CAPACITY CURVE



MEANS BROOK RESERVOIR DAM
24 INCH BLOWOFF

D-30 OUTLET WORKS RATING CURVE

APPENDIX E

INFORMATION AS CONTAINED IN THE

NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

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DATE
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