CONNECTICUT COASTAL BASIN

NEW CANAAN, CONNECTICUT

GRUPES RESERVOIR DAM
CT 00057

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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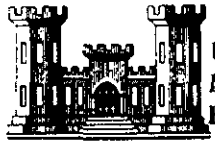

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

DECEMBER, 1979

UNCLASSIFIED

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00057	2. GOVT ACCESSION NO. AD A142086	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Conn. Coastal Basin New Canaan, Conn., Grupes Reservoir Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE December 1979 13. NUMBER OF PAGES 105
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

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

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

DAMS, INSPECTION, DAM SAFETY,

Conn. Coastal Basin
New Canaan, Conn.
Grupes Reservoir Dam

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

The dam. built in 1871, is a 225 ft. long stone and mortar masonry gravity dam used for water supply. The top is 5.7 ft. wide with a 7 ft. wide coping. The top of the coping is at elevation 298.9, which is 27± ft. above the streambed of the Silvermine River. There are two spillways; a main spillway section at the left end of the dam and an auxiliary spillway approx. 40 ft. upstream from the right end of the dam. The main spillway is a 48.9 ft. long broad-crested weir spanned by an access bridge which allows 6± ft. of clearance between the spillway crest and the low chord of the bridge. The auxiliary spillway is approx. 60 ft. long at the crest and is an unlined channel cut around the right side of the dam.

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CONNECTICUT COASTAL BASIN

NEW CANAAN, CONNECTICUT

GRUPES RESERVOIR DAM
CT 00057

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

DECEMBER, 1979

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	GRUPES RESERVOIR DAM
Inventory Number:	CT 00057
State Located:	CONNECTICUT
County Located:	FAIRFIELD
Town Located:	NEW CANAAN
Stream:	SILVERMINE RIVER
Owner:	NORWALK WATER DEPARTMENT, FIRST DISTRICT
Date of Inspection:	NOVEMBER 5, 1979
Inspection Team:	PETER M. HEYNEN, P.E.
	MIRON PETROVSKY
	HECTOR MORENO, P.E.
	JAY COSTELLO

The dam, built in 1871, is a 225 foot long stone and mortar masonry gravity dam used for water supply. The top is 5.7 feet wide with a 7 foot wide coping. The top of the coping is at elevation 298.9, which is 27± feet above the streambed of the Silvermine River. There are two spillways; a main spillway section at the left end of the dam and an auxiliary spillway approximately 40 feet upstream from the right end of the dam (See Sheet B-1). The main spillway is a 48.9 foot long broad-crested weir spanned by an access bridge which allows 6± feet of clearance between the spillway crest and the low chord of the bridge. The auxiliary spillway is approximately 60 feet long at the crest and is an unlined channel cut around the right side of the dam. The two outlets are 24 inch and 16 inch cast iron pipes. The 24 inch pipe is located at the left end of the dam and serves as a low-level outlet or a supply line. The 16 inch pipe is located at the right end of the dam and is used as an emergency supply line.

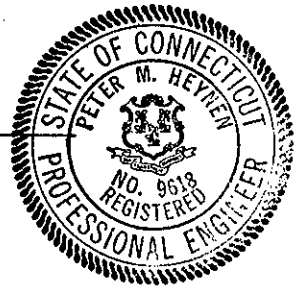
Based upon the visual inspection at the site and past performance, the dam is judged to be in fair condition. The masonry of the dam and training walls appears to be in fair condition. There are areas requiring maintenance and monitoring such as cracks in the mortar joints of the masonry in the dam and spillway walls and seepage at the right end and central portion of the dam.

In accordance with Corps of Engineers Guidelines for size (Small) and hazard (high) classication for the dam, the range of test floods to be considered is one-half the Probable Maximum Flood (½PMF) to the Probable Maximum Flood (PMF). At the PMF (test flood elevation 301.0), peak inflow to the reservoir is 16,300 cubic feet per second (cfs) and the peak outflow is 16,000 cfs with the dam overtopped 2.1 feet and flow over a low area in the service road. The spillway capacity with the reservoir level to the top of the dam is 2900 cfs, which is equivalent to 18% of the PMF outflow. The spillway capacity does not include flow over the low area in the service road.

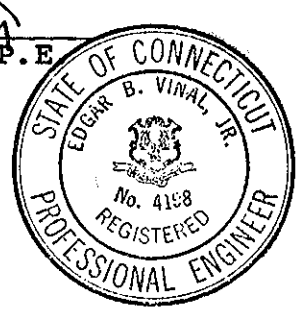
It is recommended that the owner retain the services of a registered professional engineer to perform a more detailed hydraulic/hydrologic analysis to assess the overflow section at the service road as an auxiliary spillway. Other recommendations are to repair seepage through the masonry at the right end of the dam and through the upstream valve chambers, repair masonry walls at the spillway discharge channel and to check the outlet pipes for possible seepage.

The above recommendations and further remedial measures which are discussed in Section 7, should be instituted within one (1) year of the owner's receipt of this report.

Peter M. Heynen, P.E.
Project Manager
Cahn Engineers, Inc.



Edgar B. Vinal, Jr. P.E.
Senior Vice President
Cahn Engineers, Inc.



This Phase I Inspection Report on Grupes 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 are hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL C. COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. 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 would necessarily represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will 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 there of. 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 neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> 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.

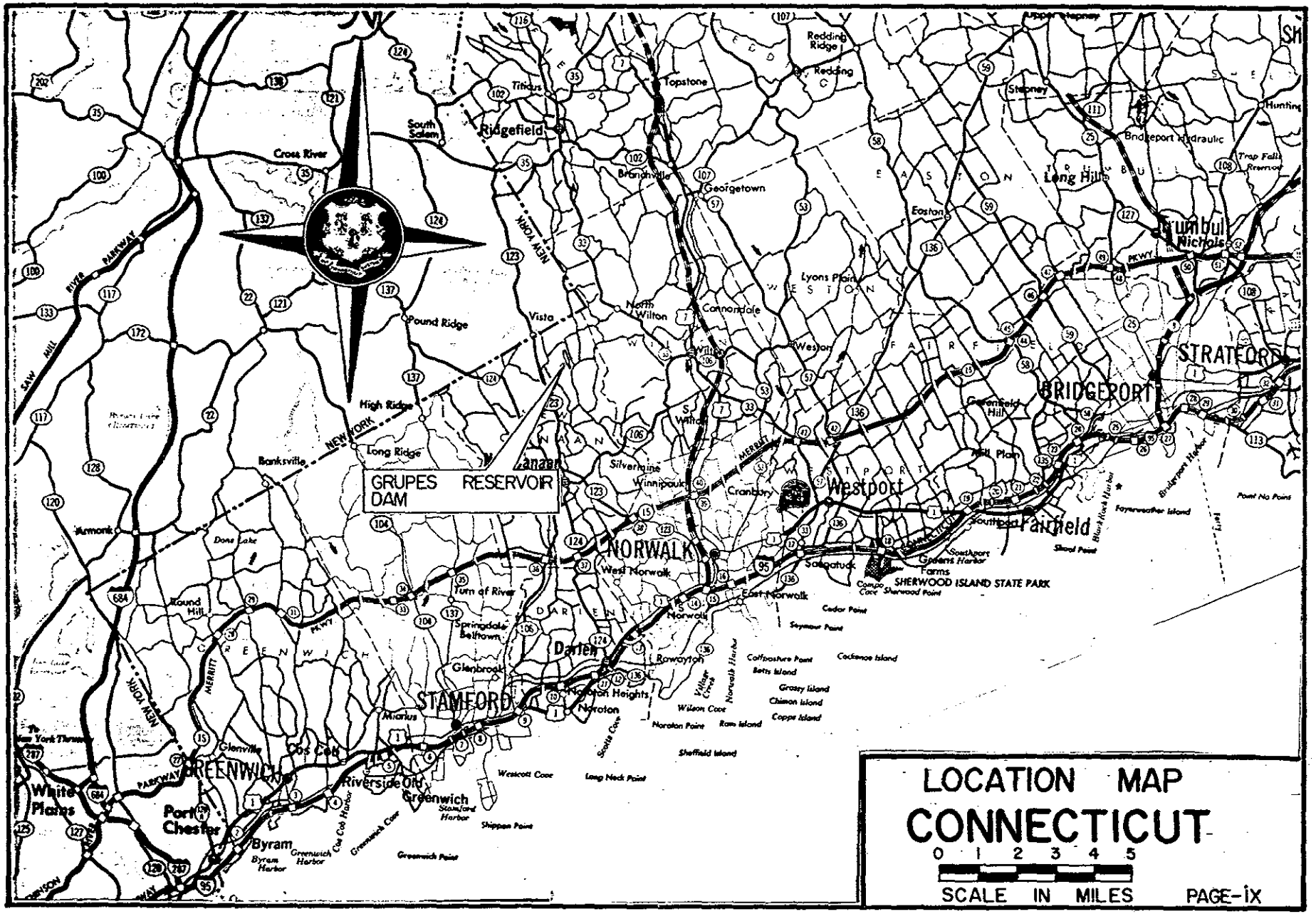
TABLE OF CONTENTS

SECTION 7: ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

APPENDICES

OVERVIEW PHOTO
(November 1979)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Grupes Reservoir Dam	New Canaan	DATE Dec '79
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED DAMS	Silvermine River	CONNECTICUT	CE #27 660 KE PAGE viii


GRUPES RESERVOIR DAM
LOCATION MAP
CONNECTICUT
0 1 2 3 4 5
SCALE IN MILES
PAGE-ix

PHASE I INSPECTION REPORT

GRUPES RESERVOIR DAM

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers, 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 were issued to Cahn Engineers, Inc. under a letter of October 15, 1979 from William E. Hodgson, Jr. Colonel, Corps of Engineers. Contract No. DACW 33-79-C-0059 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dam.

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

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report does not pass judgement on the safety or stability of the dam other than on a visual basis. The inspection is to identify those features of the dam which need corrective action and/or further study.

1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on the Silvermine River in a rural area of the town of New Canaan, County of Fairfield, State of Connecticut. The dam is shown on the Norwalk North USGS Quadrangle Map having coordinates latitude N 41° 11.3' and longitude W 73° 29.3'.

b. Description of Dam and Appurtenances - The dam is a stone and mortar masonry gravity dam, which is 225 feet long and has a typical width of 5.7 feet at the top with a 7 foot wide stone masonry coping. The upstream slope is vertical to about 5 feet below the crest. At this point there is an earth fill which slopes out from the lining at an inclination of 2.5± horizontal to 1± vertical. The downstream slope is a 20 foot high vertical stone and mortar masonry face. Both the upstream and downstream slopes are stepped, making the dam 18 feet wide at the base (See Sheet B-1). The top of the dam is at elevation 298.9, which is 27 feet above the Silvermine River and 5.2 feet above the main spillway crest.

The main spillway is a 48.9 foot long and 9.3 foot wide broad-crested masonry weir, located at the left end of the dam. A bridge across the spillway and 6 feet above the weir crest, allows access to the dam from the left abutment. There are stone and mortar masonry walls at either side of the main spillway discharge channel. The left wall is in two sections; the first is 23± feet high and 25± feet long and the second abuts the first, slants in toward the spillway channel and is 54± feet long (See Sheet B-1). The right wall is 5 feet high and 45 feet long. At the low-level gate house, this wall becomes a dry-laid stone wall outlining the downstream channel for approximately 150 feet.

The auxiliary spillway is an unlined channel that is 60± feet long at the crest and extends around the right end of the dam. There is no weir or sill at the auxiliary spillway, but the crest is approximately 1.4 feet above the main spillway crest, 3.8 feet below the top of the dam or at elevation 295.1.

There is a depression along the service road which runs parallel to the left side of the reservoir. This low area starts at the left abutment of the dam; extends 300± feet upstream and has a minimum elevation of 296.3 or 2.6 feet below the top of the dam.

The outlet works consist of a series of supply lines, a low-level outlet and an intake gate house. The intake gate house is located 65 feet upstream from the right end of the main spillway and has three 30 inch by 30 inch sluice gates. The low-level sluice gate is at centerline elevation 275.5, the mid-height sluice gate is at centerline elevation 282.0 and the upper level sluice gate is at centerline elevation 288.5. The outlet for the gatehouse is a 24 inch cast iron pipe which leads to the 30 inch upper valve chamber at the right end of the main spillway. From here the 24 inch pipe extends to the 24 inch low-level outlet valve (invert elevation 273.3) at the lower valve chamber (See Sheet B-1).

The main supply line taps the low-level outlet pipe approximately 7 feet upstream from the lower valve chamber and is a 24 inch cast iron pipe which runs parallel to and 35 feet from the downstream face of the dam (See Sheet B-1). Water through the 24 inch supply line can be diverted to either a 20 inch cast iron supply main or to a 16 inch cast iron emergency supply line. The 16 inch pipe has a 24 inch inlet valve (invert elevation 273.3±) at the right end of the dam and also connects to a 12 inch pipe which has been plugged and abandoned. There is also a 24 inch cast iron pipe from the John D. Milne Reservoir which bypasses Grupes Reservoir to the water supply system downstream..

c. Size Classification - (SMALL) - The dam impounds 310 acre-feet of water with the reservoir level at the top of the dam, which at elevation 298.9, is 27 feet above the streambed of the Silvermine River. According to the Recommended Guidelines for height and storage capacity, the dam is classified as small in size.

d. Hazard Classification - (HIGH) - If the dam were breached, there is potential for loss of life and extensive property damage to at least 5 residential structures located between 1500 and 4000 feet downstream along the Silvermine River (See Sheet D-1). There are other residential structures along the Silvermine River to the town of Norwalk which would also be in danger of flooding should the dam fail. The peak outflow before failure of the dam would be 6,300 cfs and the peak failure outflow from the dam breaching would be 24,500 cfs. A breach of the dam would result in a rise of the water level at the initial impact area from a depth of 7.3 feet before failure to a depth of 10.5 feet just after the breach, or a rise of about 3.2 feet in the water level of the stream.

e. Ownership - First District Water Department
3 Belden Avenue
Norwalk, Connecticut
Mr. Richard Kelly (203) 847-9114

f. Operator - William Lahey (Superintendent) (203) 966-1473

g. Purpose of Dam - Water Supply

h. Design and Construction History - The following information is believed to be accurate based on the plans and correspondence available. The dam was built in 1871. In 1901, a 3 foot thick concrete lining was added on the upstream face and in 1905 an auxiliary spillway was added at the right end of the dam. In 1933 the original gate houses were removed and a larger gate house and chlorination facilities were designed by Buck, Seifert and Jost, Inc. and constructed at the dam. In 1962, an attempt was made to grout the dam through holes drilled into the downstream face of the stone masonry. Test borings were also made in consideration of installing a cut-off wall at the dam but according to the operator, the project was never completed. Earth fill was added to the upstream side of the dam, the date of which is unknown.

i. Normal Operation Procedures - The mid-level gate at the intake gate house is normally open and the upper and lower gates are kept closed. Water is drawn from this gate through the 24 inch line to the supply lines. The 24 inch low-level outlet, is kept closed at all times. According to the operator, the valves for the 24 inch low-level outlet and the 16 inch supply line have not been operated since his employment at the water company in the 1950's. The water level is usually maintained at the spillway crest, elevation 293.7.

1.3 PERTINENT DATA

a. Drainage area - 10.2 square miles of rolling and relatively undeveloped wooded terrain. The Grupes Reservoir is the furthest downstream of a series of four reservoirs regulating the Silvermine River for water supply purposes. The other watersheds include 1.9 square miles to Scott's Reservoir, 7.4 square miles to Brown's Reservoir and 9.3 square miles to John D. Milne Lake.

b. Discharge at Damsite - Discharge is over the main spillway, over the auxiliary spillway, over a low area in the service road at the left side of the reservoir (if the water surface gets above elevation 296.3), and through the 24 inch low-level outlet and 16 inch supply line.

1. Outlet Works (conduits):	
24 inch low-level outlet at invert el. 273.3	65 cfs (head to top of dam)
16 inch emergency supply	N/A
2. Maximum reported flood at damsite:	Dam overtopped 6" in October 1955
3. Ungated spillway capacity @ top of dam el. 298.9:	2900 cfs (total)
main spillway	1730 cfs
auxiliary spillway	1170 cfs
4. Ungated spillway capacity @ test flood el. 301.0:	4900 cfs (total)
main spillway	2600 cfs
auxiliary spillway	2300 cfs
5. Gated spillway capacity @ top of dam:	N/A
6. Gated spillway capacity @ test flood:	N/A

7. Total spillway capacity @ test flood el. 301.0:	4,900 cfs
8. Discharge through low area in service road	
At top of dam el. 298.9:	3,400 cfs
At test flood el. 301.0:	9,400 cfs
9. Total project discharge @	
top of dam el. 298.9:	6300 cfs
test flood el. 301.0:	16,000 cfs

c. Elevations (National Geodetic Vertical Datum)

1. Streambed @ centerline of dam:	272±
2. Maximum tailwater:	Unknown
3. Upstream portal invert diversion tunnel:	N/A
4. Recreation pool:	N/A
5. Full flood control pool:	N/A
6. Spillway crest (ungated):	
Main spillway:	293.7
Auxiliary spillway:	295.1
7. Low area at service road:	296.3±
8. Design surcharge (original design):	Unknown
9. Top of dam:	298.9
10. Test flood surcharge	
with service road overflow:	301.0
no service road overflow:	302.2

d. Reservoir

1. Length of maximum pool:	3500 ft.
2. Length of recreation pool:	N/A
3. Length of flood control pool:	N/A

e. Storage

1. Recreation pool:	N/A
2. Flood control pool:	N/A
3. Spillway crest pool:	171 acre-ft.
4. Top of dam:	311 acre-ft.
5. Test flood Pool:	370 acre-ft.

f. Reservoir Surface

1. Recreation pool:	N/A
2. Flood control pool:	N/A
3. Spillway crest pool:	23 acres
4. Top of dam pool:	25 acres
5. Test flood pool:	30 acres

g. Dam

1. Type:	Stone masonry gravity
2. Length:	225 ft.
3. Height:	27 ft.
4. Top width:	5.7 ft. (7 foot wide coping)
5. Side slopes:	vertical
6. Zoning:	N/A
7. Impervious Core:	N/A
8. Cutoff:	N/A
9. Grout curtain:	N/A
10. Other:	Concrete lining upstream

h. Diversion and Regulatory Tunnel - N/A

i. Spillway

Main Spillway

1. Type:	Broad-crested masonry
2. Length of weir:	48.9 feet

3. Crest elevation:	293.7
4. Gates:	N/A
5. Upstream channel:	N/A
6. Downstream channel:	bedrock and gravel streambed
7. General:	6 foot clearance to low chord of access bridge from spillway crest

Auxiliary Spillway

1. Type:	unlined overflow channel
2. Length of crest:	60 feet
3. Crest elevation:	295.1
4. Gates:	N/A
5. Upstream channel:	N/A
6. Downstream channel:	sloping, weed covered overflow channel to Silvermine River
7. General:	N/A

j. Low Area at Service Road

1. Length:	300± ft.
2. Elevation:	296.3 (minimum elevation)
3. Description:	unlined swale
4. Other:	See Appendix D-5

k. Regulating Outlets

Low-level outlet

1. Invert:	273.3 (downstream)
2. Size:	24 inch
3. Description:	cast iron
4. Control mechanism:	Hand operated 30" valve at upper valve chamber Hand operated 24" valve at lower valve chamber
5. Other:	24" cast iron emergency inlet valve for 16" supply line at invert el. 273.3±.

SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Available Data - The available data consists of a set of plans for the gate house and chlorinator installation, 3 miscellaneous drawings of the dam, correspondence and boring logs. The plans for the gate house and chlorinator is a set of 4 sheets including plan, sections, details and chlorinator layout, and was prepared by Nicholas S. Hill in 1933. The miscellaneous plans include a plan of the dam with boring locations, plan and profile of the auxiliary spillway by C. N. Wood in 1905, and an elevation of the dam with a cross section. The correspondence consists of letters from the Connecticut Water Resources Commission; The First District Water Company; Buck, Seifert and Jost Consulting Engineers; and Mr. Roald Haestad. This correspondence contains information on inspections at the dam, borings done at the dam site in 1962 and a letter from Dr. R. L. Kroll expressing his concern about the bedrock geology and that the dam foundation may contain some calc-silicate gneiss which may present stability problems for the dam.

b. Design Features - The drawings indicate the design features stated previously in this report.

c. Design Data - There were no engineering values, assumptions, test results or calculations available for the original construction or subsequent addition of an upstream gatehouse, chlorine house, and earth fill at the upstream side of the dam.

2.2 CONSTRUCTION

a. Available Data - There is no as-built drawings or construction inspection reports available for the dam.

b. Construction Considerations - No information is available for problems or special considerations for the dam construction.

2.3 OPERATIONS

Lake level readings are taken weekly and recorded. According to the operator and existing available data, there was 6 inches of water over the dam in October 1955. No formal operations records are known to exist at this time.

2.4 EVALUATION

a. Availability - Existing data was provided by the Connecticut Department of Environmental Protection, The First District Water Company and Buck, Seifert and Jost, Consulting Engineers. The owner made the project available for visual inspection.

b. Adequacy - The limited amount of detailed engineering data available was generally inadequate to perform an in-depth assessment of the dam, therefore, the assessment of this dam must be based on visual inspection, performance history, hydraulic computations of spillway capacity and approximate hydrologic judgements.

c. Validity - A comparison of record data and visual observations reveals no significant discripancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The general condition of the project is fair. The inspection did reveal several areas requiring maintenance and monitoring. At the time of the inspection the reservoir level was at elevation 293.8, i.e. 5.1 feet below the crest of the dam, with water flowing over the main spillway.

b. Dam

Crest - The crest of the dam is in good condition. No signs of misalignment, spalling or visible cracks were observed (Photo 2).

Upstream Slope - There are cracks in the mortar joints of the masonry, with considerable cracking noted at the right side of the slope in the area of the emergency inlet valve chamber (Photo 1). The top of the concrete lining appears to be in sound condition.

Downstream Slope - No misalignment or signs of movement were observed on this slope. Efflorescence was noted along the mortar joints of this slope (Photo 3). There are several seepage areas on the right side and central portion of the downstream slope (Photos 11 and 12). In this area of the slope, seepage emanated through the numerous cracks in the joints of the stone masonry. In some places, the mortar is completely washed out from between the stones. There are several metal pipes protruding from the downstream slope and are reported to have been used for pressure grouting of the masonry in the 1960's (Photo 12).

There is a 12 inch tile drain pipe which runs from a dry well, which is reported to be located to the right of the chlorine house, to the downstream river channel. (See Sheet B-1). Discharge from this pipe was approximately 10 gpm (Photo 4). A two inch thick deposit of siltation was observed on the bottom of the pipe outlet. The ground in the vicinity of the dry well is wet and according to the dam operator there is water in this area all year long (Photo 10).

Main Spillway - The spillway section of the dam was overflowing with about 2 inches of water and portions of the downstream wall were not visible (Photo 5 through 7). There is a dry-laid stone wall along the left side of the reservoir for several hundred feet upstream from the left spillway wall. This stone wall is showing signs of deterioration near the spillway with some of the stone falling into the spillway approach channel (Photo 5). The downstream spillway walls are stone and mortar masonry. There is considerable deterioration of the left wall immediately downstream of the spillway with cracking of the mortar joints (Photo 6). According to the operator, there are wet areas on the middle and lower sections of the downstream face of the spillway, which are visible when the spillway is dry. The floor of the spillway channel is an outcrop of natural rock with several loose boulders and some brush (Photos 6 and 7). There is a 200 foot long dry-laid stone wall along the right side of the spillway discharge channel.

Auxiliary spillway - The auxiliary spillway is at the right side of the reservoir (Photo 9). It has a grass, brush and stone cover with the remains of a stone wall on both sides of the crest.

c. Appurtenant Structures - The intake gatehouse is in good condition (Photo 2). No cracks or spalling was observed on the external or internal surfaces of the concrete chamber.

The upper 30 inch valve chamber is on the left end of the upstream side of the dam. The inspection of this chamber revealed some leakage through the right upstream corner.

The 24 inch emergency inlet valve chamber on the right end of the upstream side of the dam also had a leak at the right upstream corner of the chamber. Water level in the chamber was approximately even with the water level in the reservoir. The upstream wall of the chamber has many cracks in the mortar joints of the masonry.

The 24 inch low-level outlet chamber is a masonry structure with some signs of cracking and weathering (Photo 7). The other structures at the right downstream toe of the dam, such as the chlorine house, diffuser, venturi and 24 inch valve house are in good condition.

d. Reservoir Area - The area surrounding the reservoir is generally wooded. There is a service road at the left side of the reservoir with a stone wall extending 300 feet along the shore and parallel to the road. The condition of this stone wall is fair. A substantial depression zone in the area of the service road was observed. This low area is located from the left of the dam to 300 feet upstream of the dam and is 2.6± feet below the crest of the dam.

e. Downstream Channel - The downstream channel runs in the natural bed of the Silvermine River. It is mostly undeveloped, steep-sided and wooded to the initial impact area.

3.2 EVALUATION

Based upon the visual inspection, the project is assessed as being generally in fair condition. The following features which could influence the future condition and/or stability of the project were identified.

1. Seepage through the right portion of the dam and through the body of the spillway could deteriorate the mortar joints and increase the uplift pressure with a subsequent reduction in the stability of the structure.

2. The leaks in the upper 30 inch and 24 inch valve chambers and the cracked mortar joints on the right end of the upstream side of the dam could lead to additional saturation, leaking and deterioration of the masonry of the dam.

3. Damaged mortar joints of the left spillway wall and damage to the stone wall along the right side of the spillway discharge channel could result in erosion problems should these walls become unstable and fail.

4. The 24 inch low-level outlet has not been operated in several years. The condition of this pipe and valve are unknown and could present a problem should there be a need to draw down the reservoir.

5. The pipes through the dam are over 100 years old and the condition of these pipes should be checked.

SECTION 4: OPERATIONAL PROCEDURES

4.1 REGULATING PROCEDURES

Flows are regulated from the filter plant which is located downstream from the dam. Only the mid-level sluice gate at the intake gate house is open for water supply through the 24 inch line. The 16 inch emergency supply line and 24 inch low-level outlet are not operated. The reservoir can be completely eliminated from the water supply system by using the 24 inch bypass from the John. D. Milne Lake.

4.2 MAINTENANCE OF DAM

The grass and brush is cut once a month when the weather permits. All painting and general repair to appurtenant structures is done during the summer months as required.

4.3 MAINTENANCE OF OPERATING FACILITIES

The gates at the intake gate house are cleaned and serviced once a year. Screens for these gates are checked and cleaned on a weekly schedule.

4.4 DESCRIPTION OF ANY FORMAL WARNING SYSTEM IN EFFECT

No formal warning system is in effect, but the operator does notify the Civil Defense if the water level at the main spillway rises to 1.8 feet below the top of the dam.

4.5 EVALUATION

The operation and maintenance procedures are generally good, however there are some areas requiring improvement. A more formal program of operation and maintenance procedures should be implemented, including schedules, periodic inspections and documentation to provide complete records for future reference. Remedial operation and maintenance recommendations are presented in Section 7.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. General - The watershed is 10.2 square miles of rolling and relatively undeveloped wooded terrain. The Grupes Reservoir is the furthest downstream of a series of four reservoirs regulating the Silvermine River for water supply purposes. The other watersheds include 1.9 square miles to Scott's Reservoir, 7.4 square miles to Brown's Reservoir and 9.3 square miles to John D. Milne Lake. The dam is a masonry structure with a main spillway incorporated into the left end of the dam and an auxiliary spillway consisting of an unlined channel at the right side of the reservoir. A low area exists at the service road to the left of the dam. This area extends 300± feet upstream from the dam and has a minimum elevation of 296.3. The dam is basically a low surcharge storage - high spillage project which does not develop sufficient storage to generate a significant reduction in either the Probable Maximum Flood (PMF) or the 1/2 PMF.

b. Design Data - No computations could be found for the original dam construction.

c. Experience Data - No information on serious problem situations arising at the dam was found. There was 6 inches of water over the dam in October 1955 according to the operator.

d. Visual Observations - The dam and appurtenant structures appear to be well maintained. There is an access bridge which extends across the main spillway approximately 6 feet above the spillway crest. Several low hanging branches were noted at the auxiliary spillway and water flowing over this spillway will be channeled around the right end of the dam to the Silvermine River approximately 250 feet downstream from the dam. Flows over the service road will go around the left end of the dam and back to the Silvermine River several hundred feet downstream.

e. Test Flood Analysis - Based upon the Army Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March 1978, the watershed classification (rolling) and area (10.2 square miles), a Probable Maximum flood (PMF) of 16,300, or 2000 cfs per square mile, is expected at the dam site. In accordance with the size (small) and hazard (high) classification, the test flood range to be considered is from the ½ PMF to the PMF. Peak inflow to the reservoir at the PMF is 16,300 cfs (Appendix D-2) and peak outflow is 16,000 cfs. Peak inflow to the reservoir at the ½ PMF is 8150 cfs and peak outflow is 7900 cfs. The test flood for Grupes reservoir Dam is considered to be equivalent to the PMF.

Assuming the low area at the service road is not raised to the elevation of the dam, the dam will be overtopped 2.1 feet (elevation 301.0), the spillway capacities will be 2600 cfs (main) and 2300 cfs (auxiliary), and the overflow at the service road will be 9400 cfs. If the low area at the service road is raised to the elevation of the dam, the dam will be overtopped to a depth of 3.3 feet, or to elevation 302.2.

If the service road overflow is not considered as spillway outflow, the capacity of the spillways just before the dam is overtopped is 2900 cfs or 18% of the routed test flood outflow. If the service road outflow is considered as spillway outflow, the spillway capacity just before the dam is overtopped is 6300 cfs or 39% of the routed test flood outflow.

f. Dam Failure Analysis - Utilizing the Army Corps of Engineers' April, 1978 "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak outflow before failure would be 6300 cfs (including low area) and the peak failure outflow from the dam breaching would be 24,500 cfs. A breach of the dam would result in a rise of about 3.2 feet in the water level of the stream at the initial impact area, which corresponds to an increase in the water level from a depth of 7.3 feet just before the breach to a depth of 10.5 feet just after the breach. The rapid 3.2 foot increase in the water level at the initial and secondary impact areas would inundate at least 3 houses located approximately 1400 to 3500 feet downstream to a depth of about 3 feet. There are several other houses located close to the streambed along the Silvermine River between the secondary impact area and the town of Norwalk. These houses would also be in danger of flooding if the dam were breached.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - The visual inspection did not reveal any indications of immediate stability problems. However, there is seepage through the body of the dam which could jeopardize the stability of the dam if left uncontrolled. A boring program implemented at the dam in 1962 and visual observations by Dr. Richard Kroll (Section 6.1.c), indicate that the bedrock foundation may be fractured and contain weak layers. Due to the above considerations, and the present geometry and age of the structure, a more detailed investigation of the dam and existing data should be performed to determine the necessity of a stability analysis.

b. Design and Construction Data - The drawings and data available and listed in Appendix B were not sufficient to perform an in-depth stability analysis of the dam. No engineering assumptions, data or calculations could be found for the original design of the dam.

c. Operating Records - The boring program implemented in December 1962 and January 1963 at the downstream toe of the dam, indicated that the rock foundation was highly fractured and contained bands of soft material. Also, in a letter to Dr. Joe Webb Peoples on June 27, 1972, Dr. Richard Kroll expressed his concern about possible solution of calcite layers in the bedrock foundation of the dam. Evidently this was not considered a stability problem at this time, as no follow-up correspondence could be found to indicate any concern over this situation.

d. Post Construction Changes - The post-construction changes of the project include the following data:

1. Construction of a new auxiliary spillway at the right end of the dam in 1905.

2. Addition of a 3 foot lining on the upstream slope.

3. Construction of a new concrete and brick intake gate house and removal of the original structures in 1933.

4. Improvement of the existing chlorine house and venturi valve at the downstream toe in 1933.

5. Addition of earth fill at the upstream side of the dam.

e. Seismic Stability - The project is in Seismic Zone I and according to the Recommended Guidelines, need not to be evaluated for seismic stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 PROJECT ASSESSMENT

a. Condition - Based upon the visual inspection of the site and past performance, the project appears to be in fair condition. The masonry is generally in fair condition with areas of some concern which require maintenance and monitoring.

Based upon the Army Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March, 1978, and hydraulic/hydrologic computations, the peak inflow to the reservoir at the test flood is 16,300 cubic feet per second (cfs) and the peak outflow is 16,000 cfs, with the dam overtopped 2.1 feet (elevation 301.0) and flow over the low area in the service road. Based upon our hydraulic computations, the spillway capacity with the reservoir level to the top of the dam is 2,900 cfs (not including service road overflow), which is equivalent to approximately 18% of the routed test flood outflow.

b. Adequacy of Information - The information available is such that an assessment of the condition and stability of the project must be based solely on visual inspection, past performance and sound engineering judgement.

c. Urgency - It is recommended that the measures presented in Section 7.2 and 7.3 be implemented within 1 year of the owner's receipt of this report.

7.2 RECOMMENDATIONS

It is recommended that further studies be made by a registered professional engineer qualified in dam design and inspection pertaining to the following:

1. A detailed hydraulic/hydrologic analysis to assess the overflow section at the service road as an auxiliary spillway. Recommendations should be made by the engineer and implemented by the owner.

2. A Further investigation and inspection of the project and make any necessary recommendations. Items of particular importance are as follows:

    a. Evaluation of the need for a dam stability analysis at test flood conditions. This analysis could require implementation of a boring program, piezometer installation and material testing.

    b. The condition of the dry well on the right side of the dam toe and the development of measures to control drainage at the wet area surrounding this well. Also the origin and significance of seepage flow from the 12 inch tile drain pipe.

c. Condition of the main spillway when it is not overflowing.

d. Condition of the dam upstream face and the concrete lining.

e. The cracking and leakage through the mortar joints in the upstream walls of the upper 30 inch and the emergency intake valve chambers.

f. Condition of the 16 and 24 inch pipes through the dam. These pipes could be deteriorated and produce additional seepage flow through the dam.

g. Monitoring of seepage through the dam, the upper valve chambers and through the 12 inch tile drain pipe to measure any changes in seepage quantities Any acceptable repair measures to reduce or stop seepage through the dam and spillway should be implemented.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures - The following measures should be undertaken and continued on a regular basis.

1. Round-the-clock surveillance should be provided by the owner during periods of heavy precipitation or high project discharge at the dam. The owner should develop and implement a downstream warning system to be used in case of emergencies at the dam.

2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future references.

3. A comprehensive program of inspection by a registered professional engineer qualified in dam inspection should be instituted on an annual basis.

4. Cracked masonry joints on the upstream slope of the dam and the upper 24 inch and emergency intake valve chambers should be sealed to prevent masonry deterioration and water penetration to the dam.

5. Deteriorated areas of the masonry and stone spillway training walls and the stone wall along the left shore of the reservoir should be repaired to prevent erosion of the banks and to increase the stability of these walls.

6. The cutting of grass and brush on the toe and abutments of the dam, as well as at the auxiliary spillway should be continued as part of the routine maintenance procedure.

7.4 ALTERNATIVES

This study has identified no practical alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT GRUPES RESERVOIR DAM DATE: NOVEMBER 5, 1979

TIME: 10:00 - 12:00 PM

WEATHER: SUNNY, 50°F

W.S. ELEV. 2938 U.S. ____ DN.S

PARTY:	INITIALS:	DISCIPLINE:
1. PETER M. HEYNEN	PMH	Geotechnical
2. MIRON PETROVSKY	MP	Geotechnical
3. JAY COSTELLO	JC	Geotechnical
4. HECTOR MORENO	HM	Hydraulic/Hydrologic
5. WILLIAM LAHEY	W.L.	Owner Representative
6. FRANK SEGALINE	F.S.	Survey

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	MASONRY DAM	PMH, MP, JC, F.S.	
2.	INTAKE GATEHOUSE	PMH, MP, JC,	
3.	UPPER VALVE CHAMBERS	MP, JC	
4.	LOW-LEVEL VALVE CHAMBER	PMH, MP, JC,	
5.	LOWER VALVE CHAMBER	MP, JC	
6.	PRINCIPAL SPILLWAY	PMH, MP, JC, F.S.	
7.	AUXILIARY SPILLWAY	PMH, MP, JC, FS	
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT GRUPES RESERVOIR DAM DATE Nov. 5, 1979

PROJECT FEATURE MASONRY DAM BY PMH, MP, JC, FS

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	298.9
Current Pool Elevation	293.8
Maximum Impoundment to Date	UNKNOWN
Surface Cracks	SOME, ON U/S SLOPE
Pavement Condition	N/A
Movement or Settlement of Crest	NONE OBSERVED
Lateral Movement	
Vertical Alignment	APPEARS GOOD
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	GOOD
Indications of Movement of Structural Items on Slopes	NONE OBSERVED
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection-Riprap Failures	N/A
Unusual Movement or Cracking at or Near Toes	NONE OBSERVED
Unusual Embankment or Downstream Seepage	SEEPS ON D/S SLOPE & WET AREA AT TOE
Piping or Boils	NONE OBSERVED
Foundation Drainage Features	UNKNOWN
Toe Drains	HORIZONTAL TOE DRAIN WITH FLOW OF 10± gpm
Instrumentation System	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT GRUPES RESERVOIR DAM DATE NOV. 5, 1979

PROJECT FEATURE INTAKE GATEHOUSE BY PMH, MP, JC.

AREA EVALUATED	CONDITION
OUTLET WORKS-CONTROL TOWER	
a) Concrete and Structural	
General Condition	GOOD
Condition of Joints	NOT OBSERVED
Spalling	NONE OBSERVED
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	NOT OBSERVED
Unusual Seepage or Leaks in Gate Chamber	NONE OBSERVED
Cracks	
Rusting or Corrosion of Steel	
b) Mechanical and Electrical	
Air Vents	N/A
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	3 SLUICES GATES OF 30"×30", OPERABLE
Emergency Gates	N/A
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	GOOD

PERIODIC INSPECTION CHECK LIST

PROJECT GRUPES RESERVOIR DAM DATE NOV. 5, 1979

PROJECT FEATURE UPPER SERVICE VALVE CHAMBER BY MP, JC

AREA EVALUATED	CONDITION
OUTLET WORKS-CONTROL TOWER	MASONRY STRUCTURE WITH CONCRETE LINING ON U/S SLOPE
a) Concrete and Structural	
General Condition	FAIR
Condition of Joints	N/A
Spalling	NONE OBSERVED
Visible Reinforcing	N/A
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	SOME EFFLORENSCENCE
Joint Alignment	N/A
Unusual Seepage or Leaks in Gate Chamber	SEEP ON RIGHT CORNER
Cracks	SOME, U/S SLOPE
Rusting or Corrosion of Steel	N/A
b) Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	N/A
Elevator	
Hydraulic System	
Service Gates	24" GATE VALVE, OPERABLE
Emergency Gates	
Lightning Protection System	N/A
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

PROJECT GRUPES RESERVOIR DAM DATE Nov. 5, 1979

PROJECT FEATURE UPPER EMERGENCY VALVE CHAMBER BY MP, JC

AREA EVALUATED	CONDITION
OUTLET WORKS-CONTROL TOWER	MASONRY STRUCTURE WITH CONCRETE LINING ON U/S SLOPE
a) Concrete and Structural	
General Condition	FAIR
Condition of Joints	N/A
Spalling	SOME, MASONRY U/S SLOPE
Visible Reinforcing	N/A
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	SOME EFFLORESCENCE
Joint Alignment	N/A
Unusual Seepage or Leaks in Gate Chamber	SEEP ON RIGHT CORNER
Cracks	CRACKS OF 1/8" - 1/4" WIDE ON U/S SLOPE
Rusting or Corrosion of Steel	N/A
b) Mechanical and Electrical	
Air Vents	N/A
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	16" GATE VALVE, OPERABLE
Lightning Protection System	N/A
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

PROJECT GRUPES RESERVOIR DAM DATE Nov. 5, 1979

PROJECT FEATURE LOW-LEVEL VALVE CHAMBER BY PMH, MP, JC.

AREA EVALUATED	CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	GOOD
Rust or Staining	NONE OBSERVED
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	N/A
Drain Holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST

PROJECT GRUPES RESERVOIR DAM DATE NOV. 5, 1979

PROJECT FEATURE LOWER VALVE CHAMBER BY MP, JC

AREA EVALUATED	CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	GOOD
Rust or Staining	NONE OBSERVED
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	N/A
Drain Holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST

PROJECT GRUPES RESERVOIR DAM DATE Nov. 5, 1979

PROJECT FEATURE PRINCIPAL SPILLWAY BY PMH, MP, JC, HM, FS

AREA EVALUATED	CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	MASONRY STRUCTURE
a) Approach Channel	
General Condition	GOOD
Loose Rock Overhanging Channel	NONE OBSERVED
Trees Overhanging Channel	
Floor of Approach Channel	NOT OBSERVED
b) Weir and Training Walls	
General Condition of Concrete	FAIR
Rust or Staining	N/A
Spalling	DAMAGED TRAIN. WALL NEAR WEIR
Any Visible Reinforcing	N/A
Any Seepage of Efflorescence	SOME
Drain Holes	N/A
c) Discharge Channel	
General Condition	GOOD
Loose Rock Overhanging Channel	NONE OBSERVED
Trees Overhanging Channel	
Floor of Channel	BEDROCK
Other Obstructions	BOULDERS & BRUSH

PERIODIC INSPECTION CHECK LIST

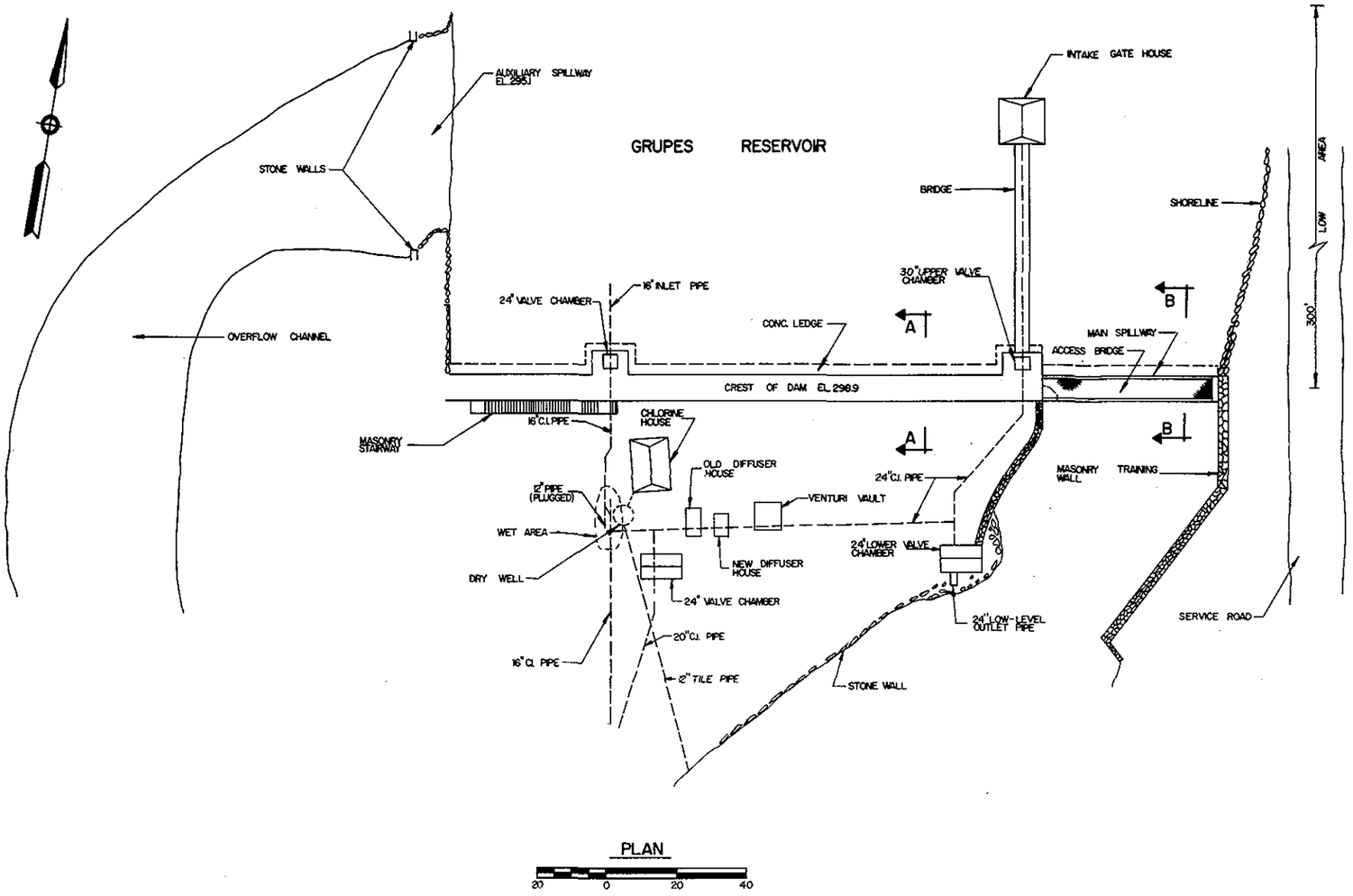
PROJECT GRUPES RESERVOIR DAM DATE Nov. 5, 1979

PROJECT FEATURE AUXILIARY SPILLWAY BY PMH, MP, JC, HM, ES

AREA EVALUATED		CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS		
a) Approach Channel		
General Condition		FAIR
Loose Rock Overhanging Channel		NONE OBSERVED
Trees Overhanging Channel		SOME
Floor of Approach Channel		NATURAL GROUND
b) Weir and Training Walls		
General Condition of Concrete		FAIR
Rust or Staining		N/A
Spalling		SOME, STONE WALLS
Any Visible Reinforcing		N/A
Any Seepage of Efflorescence		NONE OBSERVED
Drain Holes		N/A
c) Discharge Channel		
General Condition		FAIR
Loose Rock Overhanging Channel		NONE OBSERVED
Trees Overhanging Channel		SOME
Floor of Channel		NATURAL GROUND
Other Obstructions		BOULDERS & BRUSH

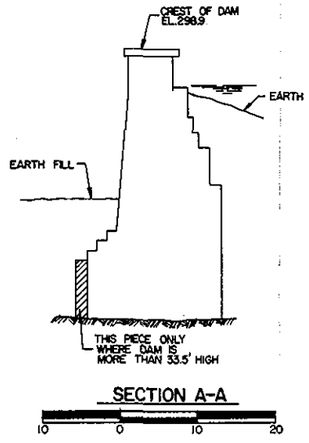
APPENDIX B

ENGINEERING DATA AND CORRESPONDENCE



PLAN

20 0 20 40



SECTION A-A

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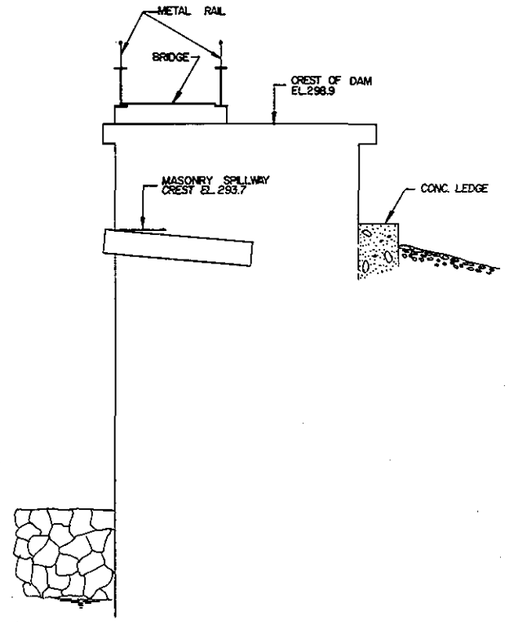
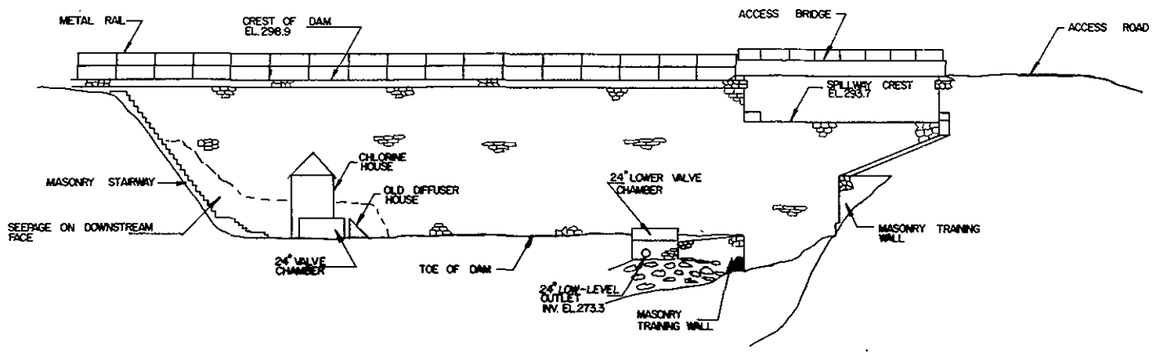


SECTION B-B

4 0 4 8



PROFILE

HORIZONTAL 20 0 20 40

VERTICAL 10 0 10 20

NOTES:

1. THIS PLAN WAS COMPILED FROM EXISTING PLANS DRAWN IN 1933 AND 1962 AND OBTAINED FROM THE NORWALK FIRST DISTRICT WATER DEPARTMENT. NOT ALL TOPOGRAPHIC AND/OR STRUCTURAL FEATURES ARE NECESSARILY IDENTIFIED.
2. ALL ELEVATIONS ARE ASSUMED N.G.V.D. TAKEN FROM EXISTING PLANS.

CAHN ENGINEERS INC. WALLINGFORD, CONNECTICUT ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PLAN, ELEVATION & SECTIONS

GRUPES RESERVOIR DAM

SILVERMINE RIVER NEW CANAAN, CONNECTICUT

DRAWN BY	CHECKED BY	APPROVED BY	SCALE: AS NOTED	
M.N.	JAC	[illegible]	DATE: NOV. 1979	SHEET 8-1

EXISTING DATA

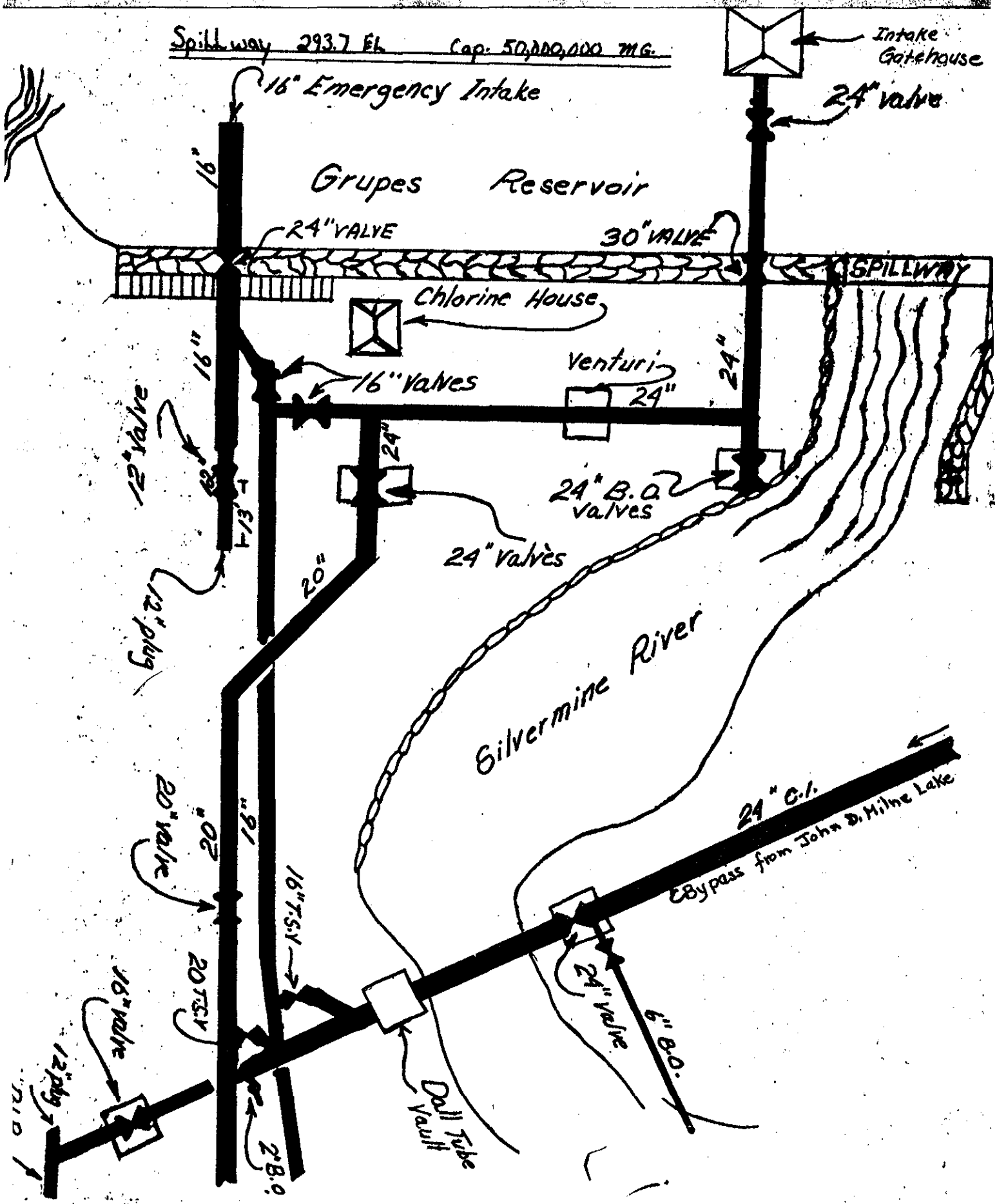
"Grupe Dam Survey"
No Date

Elevation View of Dam with Cross Section
No Date

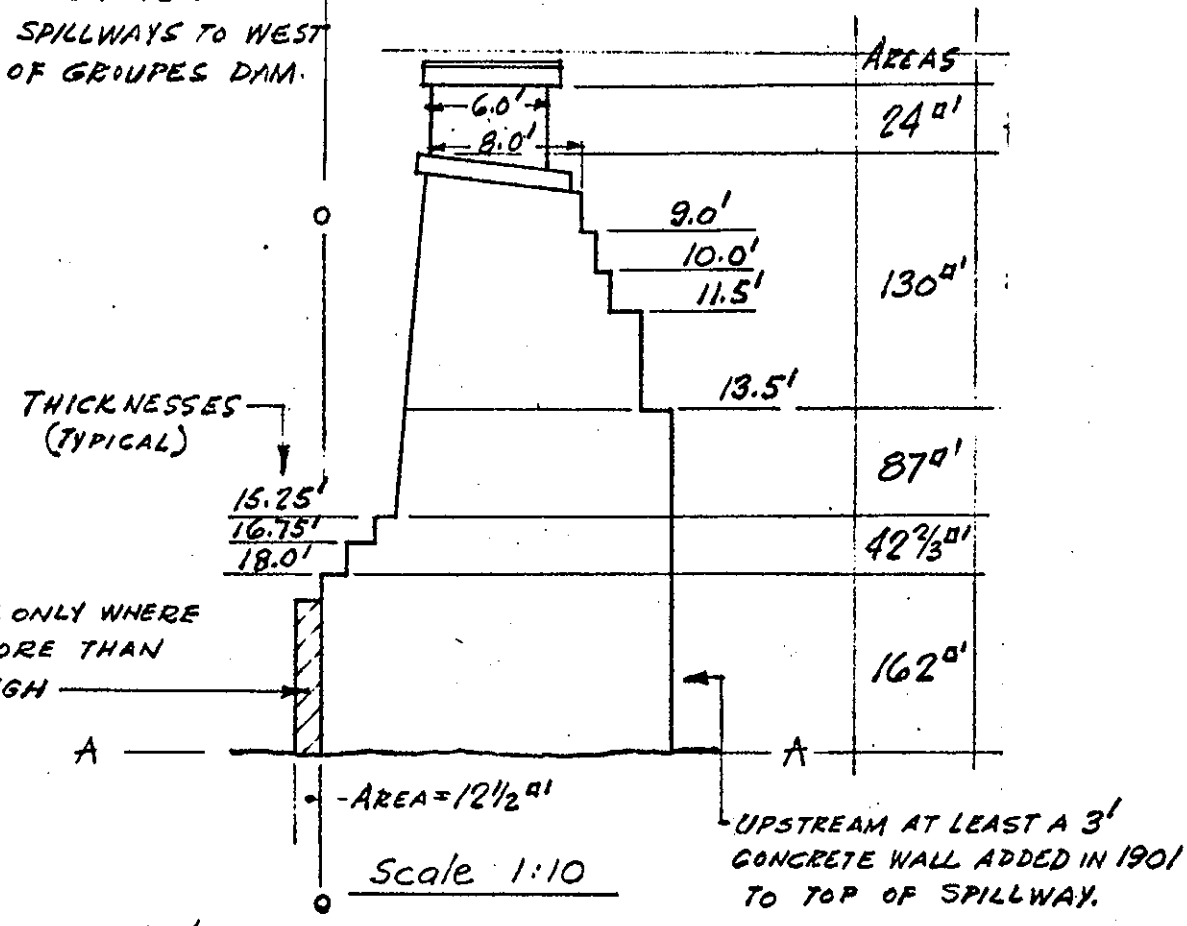
"Plan and Profile Map"
Proposed Spillway at Grupes Reservoir
C. N. Wood, C.E.
1905

"Improvements to Waterworks System,
Intake and Screen Chamber"
Nicholas S. Hill, Jr., C.E.
New York, New York
1933
4 Sheets

SUMMARY OF DATA AND CORRESPONDENCE


Spillway 293.7 El. Cap. 50,000,000 M.G.
16" Emergency Intake
Intake Gatehouse
24" valve
Grupes Reservoir
24" VALVE
30" VALVE
SPILLWAY
Chlorine House
16" Valves
Venturi 24"
24"
24" B.O. valves
24" Valves
20"
Silvermine River
24" C.I.
Bypass from John D. Hilne Lake
20" valve
20" "O2"
16" T.S.V.
20 T.S.V.
16" valve
12" plug
2" B.O.
Dall Tube Vault
24" valve
6" B.O.

FLOOD OVERTOPPED DAM BY 6"±
NEW DAM HAD 3' DISCHARGE
WAS FULL PRIOR TO FLOOD
AUXILIARY SPILLWAYS TO WEST
AND EAST OF GROUPES DAM.



WEST ABUTMENT 170' LONG
SPILLWAY 51' LONG
SPILLWAY ELEV. 2937 TOP 5' ABOVE
MAXIMUM HEIGHT 36'

OCT. 15	7:00 A.M.	3.13
	9:50 A.M.	1.45
	2:10 P.M.	0.58
	6:00 P.M.	1.95
	8:30 P.M.	1.68
	10:45 P.M.	2.00
OCT. 16	7:00 A.M.	2.70
	4:45 P.M	0.13
OCT. 17		0.39

BUCK, SEIFERT AND JOST
CONSULTING ENGINEERS
112 EAST 19TH STREET
NEW YORK 3, N. Y.

October 31, 1962

SUBJ: 401.12

Soiltesting, Inc.
47 Pershing Drive
Ansonia, Connecticut

Attention: Mr. Robert De Angelis

Re: First Taxing District
Norwalk, Connecticut
Grupe Dam

Gentlemen:

We are enclosing herewith a drawing showing the locations for a program of test borings required by us in connection with a study for reinforcing the existing Grupe Dam of the First Taxing District of the City of Norwalk, Connecticut. The location of the Reservoir is shown on the Norwalk North Quadrangle of the U.S.G.S. maps.

The borings shall be made from the surface of the ground to ledge rock and shall be carried a minimum of five feet into the ledge rock. The borings through the overburden shall be made by the dry sample method, in which the hole is cased to the rock. Samples shall be taken every five feet and at other intervals where a change in formation is indicated, by driving the casing to the desired depth, cleaning out the hole to the bottom of the casing and by driving a sample spoon of approved design not less than eighteen inches below the bottom of the casing into the material. The number of blows per foot to drive the casing and the number of blows for each six inches of sample spoon penetration shall be recorded. Samples shall be preserved in clear glass jars with air-tight covers, waxed after closing. Drilling into ledge shall be done with a core barrel and a diamond bit or other approved means which will produce a core from the rock penetrated of not less than one and three eighth inches in diameter. The drilling shall be done in such a manner

as to obtain the maximum possible core recovery. Cores shall be preserved in wooden boxes in the order in which they were taken.

Copies of the logs of the borings with complete information shall be forwarded to this office as soon as possible after each hole is completed. After completion of the work the samples and rock cores shall be delivered to the office of the First Taxing District at 3 Belden Avenue, Norwalk.

The work will be performed under our supervision and field inspection.

We will appreciate it if you will submit to us a proposal for performing this work. We suggest that the proposal be in the form of a lump sum on-and-off charge, a unit price per foot for borings through the overburden and a unit price per foot for borings in the rock. The proposal should be addressed to:

Commissioners, First Taxing District
City of Norwalk, Connecticut
c/o Buck, Seifert and Jost
Consulting Engineers
112 East 19th Street
New York 3, New York

The location of the holes will be staked in the field on Friday November 2nd, weather permitting.

We would like to have this work done coincident with or immediately following the boring program you are now doing for us for the Second Taxing District.

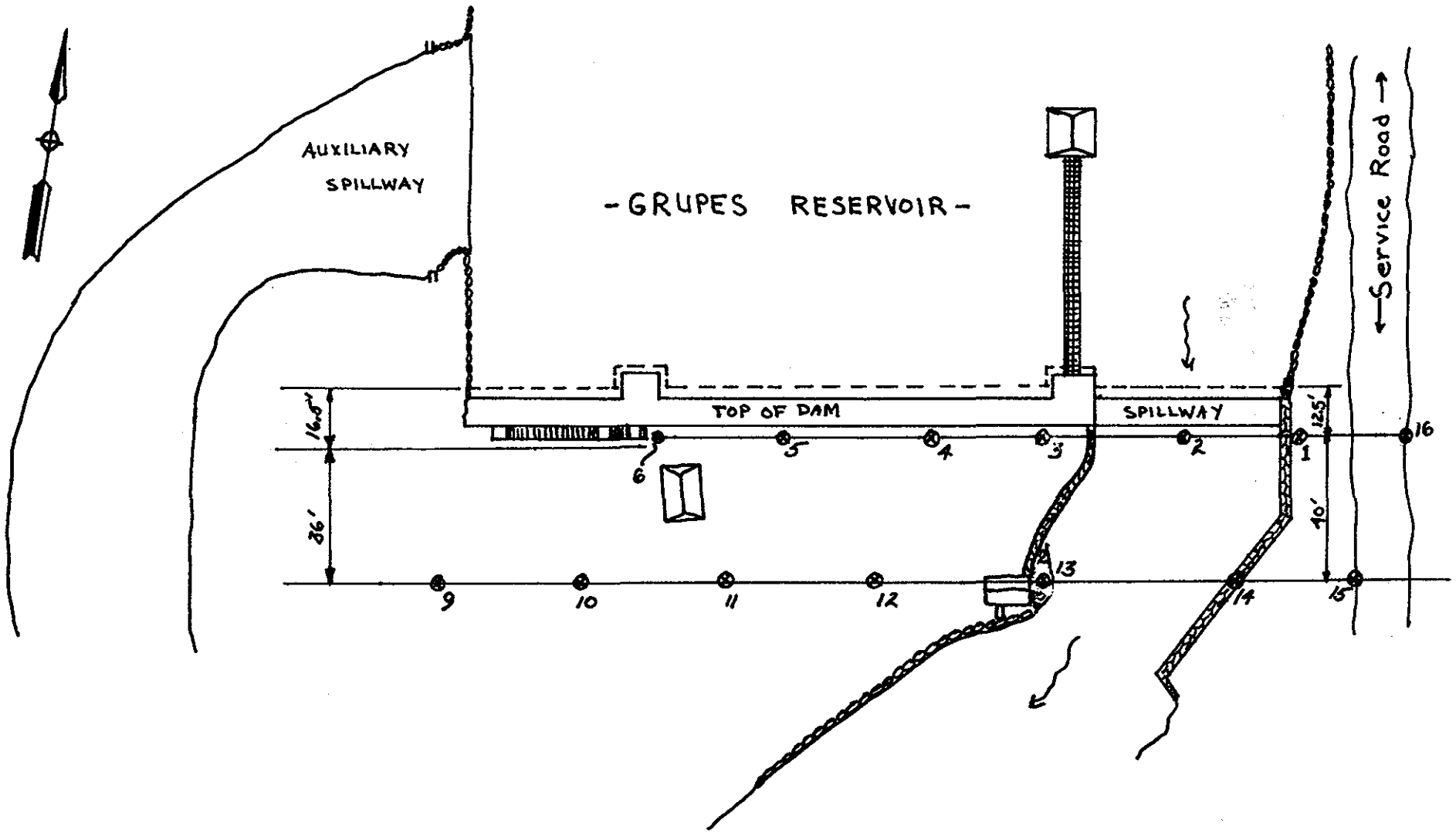
If you have any questions in connection with this program please let us know.

Yours very truly,

BUCK, SEIFERT AND JOST

Charles F. Jost

CFJ/dm
Enc.
cc: Mr. Riordan



BORING LOCATION PLAN

20 0 20 40

NOTE:

TAKEN FROM PLAN ENTITLED "GRUPE DAM SURVEY". NO DATE, NO SIGNATURE.

PREPARED BY: JAY A. COSTELLO
CAHN ENGINEERS, INC. 3-4-80

SOILTESTING, INC.

7 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 1

TRACTOR

PROJECT NO

LINE

MAN — DRILLER
D. A.J.

PROJECT NAME
Grupe Dam

STATION

ECTOR

LOCATION
New Canaan, Conn.

OFFSET
10' East of #1

GROUND WATER OBSERVATIONS
____ FT AFTER ____ HOURS
____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WI	SS	D.T.
SIZE I D	2½"	1 3/8"	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia.

Date Start 1/3/63 Date Fin 1/3/63
SURFACE ELEV. ____
GROUND WATER ELEV. NONE

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
220												Boulders and loose fill.
240												Heavy concentration of boulders.
188												
240												
190											5'0"	
310	1	D	0	0	5'0"	150		C	4	Run #1		
365		Refusal						C	2			Recovered 5" misc. boulders.
406								C	1			
581								C	4		9'0"	
538	2	D	0	0	10'0"	100		C	3		10'0"	
		Refusal						C	4			
								C	5	Run #2		Recovered 23" of fragmented Quarzite, Gneiss & Shist.
								C	5			
								C	6			
								C	5		15'0"	
												Bottom hole 15' 0"

'OUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 1

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

OPORTIONS USED TRACE = 0-10%, LITTLE = 10-20%, SOME = 20-35%, AND = 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 2

CONTRACTOR

FOREMAN —DRILLER
J.D. A.J.
INSPECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION New Canaan, Conn.

LINE

STATION

OFFSET 8' S.E. of #2

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WI	SS	D.T.
SIZE I.D.	2½"	1 3/8"	
HAMMER WT	300	140	BIT.
HAMMER FALL	24"	30"	Dia.

Date Start 1-4-63 Date Fin. 1-4-63
SURFACE ELEV. ____
GROUND WATER ELEV. ____

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
								C	4			Recovered 31" Red-brown shist & gray white granite.
								C	5			
								C	7			
								C	9			
								C	10		5'0"	
												Bottom Hole 5'0"

GROUND SURFACE TO ____ FT, USED ____ " CASING THEN ____ " CASING TO ____ FT.

HOLE NO. 2

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District, Norwalk, Conn.

SHEET 1 OF 1

HOLE NO. 4

TRACTOR

PROJECT NO

LINE

IEMAN — DRILLER T.B. M.N.

PROJECT NAME Grupe Dam

STATION

PECTOR

LOCATION New Canaan, Conn.

OFFSET

GROUND WATER OBSERVATIONS

AT ____ FT AFTER ____ HOURS

AT ____ FT AFTER ____ HOURS

	CASING W.I.	SAMPLER SS	CORE BAR D.T.
TYPE	~~2½"~~	1 3/8"	
SIZE I.D.	~~300~~	140	
HAMMER WT	~~24"~~	30"	Bit Dia.
HAMMER FALL			

Date Start 12/28 Date Fin. 12/28/63

SURFACE ELEV. ____

GROUND WATER ELEV. ____

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
17												Loose fill and boulders
35												
12												
39												
11												
340/10"	1	D	8"	0"	5'8"	8	100/2				5'10"	Refusal
	Refusal on casing and spoon											Bottom Hole 5'10"
												Note: Could not keep casing straight or seated due to numerous boulder & loose fill material. Will attempt aux. Hole. Bent shoe.

GROUND SURFACE TO ____ FT. USED ____ " CASING THEN ____ " CASING TO ____ FT.

HOLE NO. 4

D - DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB - UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District. Norwalk, Conn.

SHEET 1 OF 1

HOLE NO. 4A

CONTRACTOR

FOREMAN —DRILLER: T.B. M.N.

INSPECTOR

PROJECT NO

PROJECT NAME: Grupe Dam

LOCATION: New Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS

AT ____ FT AFTER ____ HOURS

AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WI	SS	D.T.
SIZE I D	2½"	1 3/8"	
HAMMER WT	300	140	
HAMMER FALL	24"	30"	BIT Dia.

Date Start 12/28 Date Fin. 12/28/63

SURFACE ELEV.

GROUND WATER ELEV.

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
98												Green brown C-F Sand and gravel; little silt.
11												
14												
79												
179												
98	1	D	18	14	6'6"	14	19	21				
75												
197												
220												
440	Refusal										10'0"	Refusal
												Bottom Hole 10' 0"
												Note: Could not keep casing straight or steady enough to core; casing also bent.

GROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 4A

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20% SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

7 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 4B

TRACTOR

MAN —DRILLER
T.B. M.N.

ECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
Nam Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
7'0" FT AFTER 18 HOURS
_____ FT AFTER _____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WI	SS	DT
SIZE I D	2½"	1 3/8"	..
HAMMER WT	300	140	
HAMMER FALL	24"	30"	Dia.

Date Start 12/28 Date Fin. 12/29/62
SURFACE ELEV. _____
GROUND WATER ELEV. -7'

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
10												Brown C-F Sand, C-F gravel. Some boulders.
21												
17												
20												
22	1	S	18	18	6'6"	12	14	11		Moist Med. Compact		
50												
90												
79												
50												
59	2	D	18	12	11'6"	15	20	27		Moist Compact	10'0"	
22												Gravish C-F Sand, C-F gravel Trace of silt.
26												
30												
79												
82	3	1"	0			150	Refusal				15'0"	
									C 4			Recovered 26" fragmented gray shist. (See wash sample)
									C 2			
									C 7			
									C 3			
									C 10		20'0"	
												Hole completed at 20'0"

ROUND SURFACE TO _____ FT. USED _____ " CASING THEN _____ " CASING TO _____ FT.

HOLE NO. 4B

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

ROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 5

CONTRACTOR

FOREMAN — DRILLER
T.B. M.N.

INSPECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION New Canaan, Conn

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I.D.	2⅜"	1 3/8"	
HAMMER WT	300	140	
HAMMER FALL	24"	30"	BIT Dia.

Date Start 12/29/62 Date Fin. 12/29/62
SURFACE ELEV. ____
GROUND WATER ELEV. ____

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
27												Brown C-F sand, course gravel, some boulders (fill)
30												
28												
50												
40	1	D	18	9"	6'6"	20	37	72				
60												
110											7'0"	
												Note: Having trouble to get past 7' Unable to keep casing straight. Will move hole 3' East.

GROUND SURFACE TO ____ FT. USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 5

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

B-13

SOILTESTING, INC.

7 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District Norwalk, Conn.

SHEET 1 OF 1

HOLE NO. 5A

TRACTOR

PROJECT NO

LINE

EMAN —DRILLER: T.B. M.M.

PROJECT NAME: Grupe Dam

STATION

ECTOR

LOCATION: New Canaan, Conn.

OFFSET: 3' East of 5

GROUND WATER OBSERVATIONS

5 FT AFTER 16 HOURS

FT AFTER HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WT	SS	DT
SIZE I.D.	2½"	1 3/8"	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia.

Date Start 12/29/62 Date Fin. 1/2/63

SURFACE ELEV.

GROUND WATER ELEV.

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
12												
18												Brown C-F Sand, Course gravel and Boulders (Fill)
10												
11												
20	1	D	18	12	6'6"	23	50	65				
39												
60												
175											8'0"	

Notes: Unable to get past 8'0". Casing broke off 3 times. Had to move the hole again.

ROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 5A

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED: TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District, Norwalk, Conn.

SHEET 1 OF 1

HOLE NO. 5B

CONTRACTOR

FOREMAN —DRILLER: T.B. M.N.

INSPECTOR

PROJECT NO

PROJECT NAME: Grupe Dam

LOCATION: New Canaan, Conn

LINE

STATION

OFFSET: 4' West of #5

GROUND WATER OBSERVATIONS

AT Dry FT AFTER 18 HOURS

AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WT	SS	DT
SIZE I.D.	2½"	1 3/8"	
HAMMER WT	300	140	
HAMMER FALL	24"	30"	BIT Dia.

Date Start 1/2/63 Date Fin. 1/3/63

SURFACE ELEV. ____

GROUND WATER ELEV. ____

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
31												Brown C-F Sand, Course gravel and boulders. (Fill)
20												
36												
54												
55	1	D	12	6"	6'0"	39	129	Refusal				
95											6'0"	
								C	29	Run #1		Drilled 3'0" Boulder
								C	12			
								C	11			
								C	2			
								C	3		11'0"	Gr. C-F. Sand, C-Gravel, & boulder
	2	D	18	8"	13'6"	19	15	39			13'6"	
								C	7	Run #2		Recovered 27" fragmented shist and Quartzite
								C	2			
								C	5			
								C	3			
								C	13		18'0	
												Bottom of hole 18'0.
												Note: Lost some water while coring.

GROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 5B

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

' Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District Norwalk, Conn.

SHEET 1 OF 1

HOLE NO. 6

RACTOR

PROJECT NO

LINE

MAN - DRILLER
.B. M.N.

PROJECT NAME
Grupe Dam

STATION

ECTOR

LOCATION
New Canaan, Conn.

OFFSET

GROUND WATER OBSERVATIONS

____ FT AFTER ____ HOURS

____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	D.T.
SIZE I D	2½"	1 3/8"	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia.

Date Start 1/3 Date Fin. 1/3/63

SURFACE ELEV.

GROUND WATER ELEV

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
99												Boulders & Fill
47												
69												
32												
199	1	D	0'	0"	5'0"	150	Refusal				5'0"	Refusal
												Bottom Hole 5'0"
												Note: Casing Bent & slanted unable to core. Will do Aux. Hole 3' East.

OUND SURFACE TO ____ FT. USED ____ " CASING THEN ____ " CASING TO ____ FT.

HOLE NO. 6

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

OPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

B-16

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 6A

CONTRACTOR

FOREMAN —DRILLER
T.B. M.N.

INSPECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET
3' East of #6

GROUND WATER OBSERVATIONS
AT -4 FT AFTER 18 HOURS
AT _____ FT AFTER _____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I D	2½"	1 3/8"	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia.

Date Start 1/3/63 Date Fin. 1/3/63
SURFACE ELEV. _____
GROUND WATER ELEV. -4

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
88												Brown C-F Sand, Course Gravel Some boulders, (Fill)
38												
52												
39												
63	1	D	18	18	6'6"	15	6	16		Wet	5'0	
15										Med		
17										Compact		
38												
97	Refusal on Casing										9'0	Drilled 2" Boulder
											10'0	
								C	7	Run #1		Bedrock with soft bands.
								C	3			
								C	8			
								C	5			
								C	15		15'6"	Rec. 34" fragmented gray shist
												Hole completed at 15'6".
												Note: lost wash water at 10'

GROUND SURFACE TO _____ FT, USED _____" CASING THEN _____" CASING TO _____ FT.

HOLE NO. 6A

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

1st. Taxing District

Conn.

CLIENT Norwalk, Conn.

HOLE NO 7

PROJECT NO

LINE

PROJECT NAME

STATION

DRILLER T.B. M.N.

LOCATION New Canaan, Conn.

OFFSET

Grupe Dam

GROUND WATER OBSERVATIONS

at ____ FT AFTER ____ HOURS

at ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I.D.	2½"	1 3/8"	
HAMMER WT	300	140	
HAMMER FALL	24"	30"	BIT Dia.

Date Start 1-4-63 Date Fin. 1-4-63

SURFACE ELEV. ____

GROUND WATER ELEV. ____

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
10												Topsoil
7											2'0"	
								C	13			Suspected Bedrock with intermitten soft layers.
								C	5			
								C	4			Rec. 35" white-gray and brown shist.
								C	9			
								C	12		7'0"	
												Hole completed at 7'0"

GROUND SURFACE TO ____ FT, USED ____ " CASING THEN ____ " CASING TO ____ FT.

HOLE NO. 7

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE = 0-10%, LITTLE = 10-20%, SOME = 20-35%, AND = 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 8

CONTRACTOR

FOREMAN —DRILLER
JD TJ

INSPECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WI	SS	DT
SIZE I.D.	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 1/4 Date Fin. 1/4/63
SURFACE ELEV. ____
GROUND WATER ELEV ~~XX~~ none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
38											1"	Topsoil
22												
39												Could not keep casing straigh t; casing also bent. Refusal
197												
361											5'0"	
												Bottom Hole 5'0"

GROUND SURFACE TO ____ FT. USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 8

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE = 0-10%, LITTLE = 10-20%, SOME = 20-35%, AND = 35-50%

SOILTESTING, INC.
' Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 8A

RACTOR

PROJECT NO

LINE

MAN —DRILLER
B MN

PROJECT NAME
Grupe Dam

STATION

ECTOR

LOCATION
New Canaan, Conn.

OFFSET
5' West of #8

GROUND WATER OBSERVATIONS
____ FT AFTER ____ HOURS
____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I.D.	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 1/4 Date Fin. 1/4/63
SURFACE ELEV.
GROUND WATER ~~Rev~~ none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
33											12"	Topsoil
36												
24												Brown overburden
142												Lost Wash water
216											5'0"	
	1	D	1"	0"	5'1"	100/		C	3	Run #1		Recovered 22" fragmented
		Refusal						C	5			quartzite & shist
								C	5			
								C	6			
								C	5		10'0"	
												Bottom Hole 10'0"
												Note: Lost wash water while coring

HOLE NO. 8A

OUND SURFACE TO ____ FT, USED ____ " CASING THEN ____ " CASING TO ____ FT.

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

OPORTIONS USED TRACE: 0-10%, LITTLE: 10-20% SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.
17 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 9

TRACTOR

PROJECT NO

LINE

EMAN —DRILLER
JD TJ

PROJECT NAME
Grupe Dam

STATION

PECTOR

LOCATION
New Canaan, Conn.

OFFSET

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WT	SS	DT
SIZE I.D.	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 1/5 Date Fin 1/5/63
SURFACE ELEV. ____
GROUND WATER ~~ELEV.~~ none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
41												.6" Topsoil
75												
228												
412												
395											5'0"	
												Bottom Hole 5'0"
												Note: Could not keep casing straight will attempt auxilary hole.

GROUND SURFACE TO ____ FT. USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 9

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

B-21

OILTESTING, INC.
Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 9A

ACTOR

AN —DRILLER
) TJ
CTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET
5' north of #9

ROUND WATER OBSERVATIONS
____ FT AFTER ____ HOURS
____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WT	SS	DT
SIZE I.D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start ____ Date Fin. ____
SURFACE ELEV. ____
GROUND WATER ~~EST.~~ none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
35												6" Topsoil
68												
89												Lost water when washing out casing
119												
197											5'	
	1	D	2"	0"		125/2"		C	4	Run #1		
		Refusal						C	4			Recovered 26" fragmented Quartzite & shist
								C	5			
								C	6			
								C	6		10'	
												Bottom Hole 10'0"

ROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 9A

ORY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

ROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 10

CONTRACTOR

FOREMAN — DRILLER
FD TJ

INSPECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I.D.	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 1/3 Date Fin. 1/4/63
SURFACE ELEV. ____
GROUND WATER ~~ELEV.~~ none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
6												
7											2'0"	Topsoil
								C	4	Run #1		
								C	7			Bedrock
								C	6			with small soft bands
								C	8			Recovered 38½" white;
								C	12		7'0"	grey & brown shist

GROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 10

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20% SOME: 20-35%, AND: 35-50%

B-23

SOILTESTING, INC.
7 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 11

RACTOR

MAN —DRILLER
MN

ECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
____ FT AFTER ____ HOURS
____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WI	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 12/21 Date Fin. 12/22/
SURFACE ELEV.
GROUND WATER EL ex none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
14												Boulders & loose fill
19												
10												
8												
9												
14	1	D	18"	0"	6'6"	7	6	5				
380/8"2		D	2"	0"	6'8"	100					6'8"	Refusal
				Refusal								Bottom Hole 6'8"
												Note: Casing bent slanted & loose; unable to core. Will attempt auxilary hole 4' east.

FOUND SURFACE TO ____ FT, USED ____ " CASING THEN ____ " CASING TO ____ FT.

HOLE NO. 11

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

SPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 11A

CONTRACTOR

FOREMAN — DRILLER: JD AJ

INSPECTOR

PROJECT NO

PROJECT NAME: Grupe Dam

LOCATION: New Canaan, Conn.

LINE

STATION

OFFSET: 4' east of #11

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WI	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 12/22 Date Fin 12/24/62
SURFACE ELEV. ____
GROUND WATER ELEV. ____

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
76												Boulders & loose fill
11												
53												
16												
390/11"											4'11"	Refusal
												Bottom Hole 4'11"

Note: Casing loose & slanted; cannot core, will attempt auxilary hole 4' south.

GROUND SURFACE TO ____ FT. USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 11A

D DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.
7 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 11B

RACTOR

PROJECT NO

LINE

MAN —DRILLER
D AJ

PROJECT NAME
Grupe Dam

STATION

ECTOR

LOCATION
New Canaan, Conn.

OFFSET 4' south of #11

GROUND WATER OBSERVATIONS
4'0" FT AFTER 136 HOURS
4'0" FT AFTER 18 HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 12/24 Date Fin. 12/27
SURFACE ELEV.
GROUND WATER ELEV.

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
19												Brn CMF sand coarse gravel and boulders; soft possibly fill
26												
11												
11												
9	1	D	18"	16"	6'6"	10	13	11				
18												
34												
38											8'0"	
50												Greyish cmf sand & gravel; some boulders
100	2	D	12"	10"	11'0"	77	100	Refusal			11'0"	
								C	7	Run #1		Bedrock with soft bands of rock
								C	4			Recovered 25" fragmented quartzite gniess & shist
								C	21			
								C	9			
								C	12		16'0"	
												Bottom Hole 16'0"
												Note: Low recovery due to soft bands

OUND SURFACE TO ____ FT, USED ____ " CASING THEN ____ " CASING TO ____ FT.

HOLE NO. 11B

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

OPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 12

CONTRACTOR

FOREMAN —DRILLER
TB MN

INSPECTOR

PROJECT NO

PROJECT NAME
Grape Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 12/19 Date Fin. 12/19
SURFACE ELEV.
GROUND WATER ELEV.

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
27												Boulders & loose fill
19												
139												
27												
55											5'2"	Refusal
	1	D	2"	0"	5'2"	100						
			Refusal									
												Bottom Hole 5'2"
												Note: Unable to seat casing to core due to loose fill & boulders. Will attempt auxilary hole 4' east

GROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT

HOLE NO. 12

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

17 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District Norwalk, Conn.

SHEET 1 OF 1

HOLE NO. 12A

ITRACTOR

EMAN —DRILLER: TB MN

PECTOR

PROJECT NO

PROJECT NAME: Grupe Dam

LOCATION: New Canaan, Conn.

LINE

STATION

OFFSET: 4' east of #12

GROUND WATER OBSERVATIONS

Y -5 FT AFTER 18 HOURS

Y -4 FT AFTER 136 HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WI	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 12/19 Date Fin. 12/20

SURFACE ELEV.

GROUND WATER ELEV. -4'

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
18											1'	Topsoil
20												Brn. CMF sand coarse gravel
110											3'	& boulders (possibly fill)
82												Greyish CMF sand & gravel
52	1	D	18"	18"	5'6"	29	50	33				little silt(possibly fill)
47												
47												
25												
38												
60	2	D	12"	9"	11'0"	49	90	Refusal			10'0"	
											11'0"	Same as above
								C	19	Run #1		Rec. 6"
								C	5		13'0"	Bedrock with soft bands
								C	30	Run #2		
								C	26			Recovered 36" green granite
								C	40			
								C	50			
								C	59		18'0"	

Bottom Hole 18'0"
Note: Left 1'11" of core down in hole; unable to crack it off. Started to loose water at 13'6"

ROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 12A

: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

ROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 13

CONTRACTOR

FOREMAN —DRILLER: TB MN

INSPECTOR

PROJECT NO

PROJECT NAME: Grupe Dam

LOCATION: New Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
AT 4'6" FT AFTER 18 HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR.
TYPE	WT	SS	DT
SIZE I.D.	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 1/4 Date Fin. 1/4/63
SURFACE ELEV. ____
GROUND WATER ELEV. -4'6"

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
	39												Brn coarse to med fine sand; coarse gravel (possibly fill)
	40												
	20												
	16												
5	19	1	D	18"	12"	6'6"	21	19	20			5'0"	
	44												
	75												
	196												
	84												
0	359											10'0"	Same as above
		2	D	0"	0"	10'0"	100		C	5			Suspected bedrock
									C	13			
									C	14			Recovered 36" grey-wht granit
5									C	19			
									C	23		15'0"	
													Bottom Hole 15'0"
0													
5													
0													

GROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 13

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 14

CONTRACTOR

FOREMAN — DRILLER: TB JD

INSPECTOR

PROJECT NO

PROJECT NAME: Grupe Dam

LOCATION: New Canaan, Conn

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WI	SS	DT
SIZE I.D.	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 1/3 Date Fin. 1/3/63
SURFACE ELEV.
GROUND WATER ~~ELEV.~~ none

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
	26												
	140												
	210												
	390		Refusal									4'0"	Casing bent at 4'0"
5													Bottom Hole 4'0"
0													
5													
0													

GROUND SURFACE TO ____ FT. USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE No4

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20% SOME: 20-35%, AND: 35-50%

B-30

SOILTESTING, INC.
17 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 14A

ITRACTOR

EMAN — DRILLER
D AJ

PECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET 5' north of #14

GROUND WATER OBSERVATIONS
-9' FT AFTER 18 HOURS
FT AFTER HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WI	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 1/4 Date Fin. 1/4/63
SURFACE ELEV.
GROUND WATER ELEV. -9'

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
30												6" Topsoil
162												
289												
365												
581												
440	1	D	0"	0"		100/0"		C	4			Refusal on casing at 5'
365								C	2			Run #1 6" recovery - Boulders
429								C	1			See wash sample
510								C	2			
568								C	3		10'	
	2	D	0"	0"		100/0"		C	3			Run #2 Lost most of wash water when coring
								C	5			
								C	5			Recovered 30" grey shist & white granite
								C	6			
								C	6		15'	
												Bottom Hole 15'

OUND SURFACE TO ____ FT. USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 14A

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PORTIONS USED TRACE: 0-10%, LITTLE: 10-20%, SOME: 20-35%, AND: 35-50%

B-31

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 15

CONTRACTOR

FOREMAN — DRILLER
JD AJ

INSPECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WI	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 12/28 Date Fin. 12/28/62
SURFACE ELEV. ____
GROUND WATER ELEV XX none

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
	90												Casing Bent
	125												
	350/6"		Refusal									2'6"	Refusal
5													Bottom Hole 2'6"
0													
5													
0													
5													
0													
5													
0													

GROUND SURFACE TO ____ FT. USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 15

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE = 0-10%, LITTLE = 10-20% SOME = 20-35%, AND = 35-50%

SOILTESTING, INC.
7 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 15A

TRACTOR

PROJECT NO

LINE

EMAN DRILLER
JD AJ

PROJECT NAME
Grupe Dam

STATION

ECTOR

LOCATION
New Canaan, Conn.

OFFSET 5' north of #15

GROUND WATER OBSERVATIONS
_____ FT AFTER _____ HOURS
_____ FT AFTER _____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	NT	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 12/28 Date Fin. 12/28
SURFACE ELEV. _____
GROUND WATER obsv none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
100												
307												
410		Refusal									3'0"	Refusal
												Bottom Hole 3'0"

ROUND SURFACE TO _____ FT. USED _____" CASING THEN _____" CASING TO _____ FT

HOLE NO. 15A

DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

CRIPTIONS USED TRACE = 0-10% LITTLE = 10-20% SOME = 20-35%, AND = 35-50%

B-33

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 15B

CONTRACTOR

PROJECT NO

LINE

FOREMAN — DRILLER: JD AJ

PROJECT NAME: Grupe Dam

STATION

INSPECTOR

LOCATION: New Canaan, Conn.

OFFSET: 10' east of #15

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia

Date Start 12/29 Date Fin 12/29
SURFACE ELEV.
GROUND WATER ELEV. ~~xx~~ none

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
	75												
	210												Casing bent
	375												lost shoe
	380												
	310											5'0"	Refusal
5		1	D	0"	0"	100/0"							
				Refusal									Bottom Hole 5'0"
0													
5													

GROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 15B

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED: TRACE = 0-10%, LITTLE = 10-20%, SOME = 20-35%, AND = 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 15C

CONTRACTOR

FOREMAN · DRILLER
JD AJ

INSPECTOR

PROJECT NO

PROJECT NAME
Grupe Dam

LOCATION
New Canaan, Conn.

LINE

STATION

OFFSET
24' East of #15

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	W1	SS	DT
SIZE I D	2 1/2	1 3/8	
HAMMER WT	300	140	BIT
HAMMER FALL	24"	30"	Dia.

Date Start 12/29 Date Fin 1/3/63
SURFACE ELEV ____
GROUND WATER ELEV ~~XX~~ none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
30											8"	Asphalt & stone base
42												
110												Grey C-F sand & gravel; trace silt
228												
265											5'	
478	1	D	6"	5"	5'6"	175		C	4			
362								C	2	Run #1		Recovered 6" (see wash sample) boulders
574								C	2			
466								C	3			
608								C	4		10'	
								C	5	Run #2		
								C	5			Recovered 39" grey granite
								C	6			
								C	8			
								C	8		15'	
												Bottom Hole 15'

ROUND SURFACE TO ____ FT, USED ____" CASING THEN ____" CASING TO ____ FT.

HOLE NO. 15C

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

REPORT HAS USED TRACE: 0-10%, LITTLE: 10-20% SOME: 20-35%, AND: 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 16

CONTRACTOR

FOREMAN — DRILLER: JD AJ

INSPECTOR

PROJECT NO

PROJECT NAME: Grupe Dam

LOCATION: New Canaan, Conn.

LINE

STATION

OFFSET

GROUND WATER OBSERVATIONS
AT ____ FT AFTER ____ HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	WT	SS	DT
SIZE I D	2 1/2	1 3/8	BIT
HAMMER WT	300	140	
HAMMER FALL	24"	30"	Dia

Date Start 12/27 Date Fin. 12/27
SURFACE ELEV
GROUND WATER ~~EOY~~ none

CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE TYPE	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN.)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
24												Topsoil 6"
80												
390	Refusal							C	1	Run #1	3'	
410								C	1			Brn C-F sand; some gravel trace of silt
580											5'	
65	1	D	18"	16"	6'6"	23	28	29				
168												
410	Refusal										7'	
225										Run #2		
144											9'	
80	2	D	6"	7"	11'6"	145						
185												
100												
58												
665	3	D	0"	0"	15'0"	100					15'	
			Refusal					C	4	Run #3		Recovered 36" fragmented grey granite
								C	4			
								C	5			
								C	5			
								C	6		20'	
												Bottom Hole 20'0"

GROUND SURFACE TO ____ FT. USED ____" CASING THEN ____" CASING TO ____ FT

HOLE NO. 16

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE = 0-10%, LITTLE = 10-20% SOME = 20-35%, AND = 35-50%

No. NCN 21 WATER RESOURCES COMMISSION Long. 73° 21.3' 5
SUPERVISION OF DAMS
Inventoried By WPS INVENTORY DATA Lat. 41° 11.3' CT 57

Date 15 APRIL 1965

Name of Dam or Pond GROPES RESERVOIR

Code No. NW 3.5 SL 6.5

Nearest Street Location VALLEY ROAD

Town NEW CANAAN

U.S.G.S. Quad. NORWALK NORTH

Name of Stream SILVERMINE RIVER

Owner FIRST DISTRICT WATER DEPARTMENT

Address 3 BELDEN AVENUE

NORWALK

? ~~time~~ 1871

Pond Used For WATER SUPPLY DA 10.25M

Dimensions of Pond: Width 200 FEET Length 3300 FEET Area ~~16~~ 22.0 ACRES

Total Length of Dam 200 FEET Length of Spillway 25 FEET

Location of Spillway EAST END OF DAM

Height of Pond Above Stream Bed 30 FEET

Height of Embankment Above Spillway 5 FEET

Type of Spillway Construction CONCRETE CAP

Type of Dike Construction MASONRY

Downstream Conditions WOODS, ROADS

Summary of File Data

Remarks

Would Failure Cause Damage? YES Class B

24 Maple Ave.
Bloomfield, Conn. 06002
June 27, 1972

Dr. Joe Webb Peoples, Director
Connecticut Geological and Natural History Survey
Wesleyan Station
Middletown, Conn. 06457

Dear Dr. Peoples:

I would like to call to your attention a potentially hazardous situation concerning the bedrock geology in the Norwalk North quadrangle.

The dam at Grupes Resevoir, near the western edge of the quadrangle, is located on calc-silicate gneiss. This rock contains calcite and surface exposures directly below the dam exhibit considerable solution of several layers.

If similar solution is occurring in the subsurface and if the dam is anchored to these rocks, then the dam foundation may have weakened.

I would appreciate knowing whether or not this condition has been monitored by the appropriate agency.

Sincerely yours,

Richard L. Kroll

ROALD HAESTAD, INC.
CONSULTING ENGINEERS

751 West Main Street • Waterbury, Conn. 06708 • Tel. 203 755-2254

MEMORANDUM

DATE: September 5, 1972

TO: File 016-01-10

Grupes Reservoir Dam, New Canaan, Conn.

FROM: RJH

SUBJECT: Investigation

REFERENCES:

Grupes Reservoir Dam
Owner: Norwalk Second District
Norwalk, Connecticut

General Manager: Mr. Nick Bredice

Borings: Soiltesting, Inc.
Seymour, Connecticut

Consultants:
The Henry Souther Engineering Company
Roderick Hewitt
Frederick Almquist

Buck, Seiffert and Jost

Connecticut Geological and Natural History Survey
Dr. Joseph Webb Peoples, Director
Dr. Richard L. Kroll
Newark State College
Union, New Jersey Phone: 201-527-2257

ROALD HAESTAD, INC.

MEMO: September 5, 1972
Grupes Reservoir Dam
Page 2 of 2

COMMENTS:

Had a call from O'Brian, they do not have any information on the Grupes Dam.

I called Dr. Peoples. Dr. Kroll was summer help-with mapping the geology of Connecticut. Dr. Peoples would like to have the copies of borings at Mill River and Trinity Dams and also the report that Dr. Matt Walton made on Mill River. I will try and get hold of this for him.

I called Dr. Kroll, he told me of surface deterioration of the rock near Grupes Dam, but doesn't know how long this has taken place. He will send me some of the data he has.

I then called Norwalk Water Company, second district and spoke with the General Manager, Mr. Nick Bredice. He said that they were using Henry Souther in Hartford as their Consultant, and that they had sent copies of their borings to them. Apparently borings were done in 1962 at the dam.

I called Henry Souther and spoke with Mr. Hewitt. They are gathering information on the dam for DEP. He thought the dam might be 100 years old. Thought the Consultant for the dam at that time was Buck, Seiffert and Jost, and they have contacted them for drawings they may have. I said that I would not double up, but wait until they had the information available for the DEP.

I made a tentative appointment with Mr Bredice of the Norwalk Water Company, for Friday at 9:00, September 8.

Have received U.S.G.S. maps of the area - in the mail today.

RJH: 2 hours

cc: William H. O'Brian, III
Civil Engineer
DEP

ROALD HAESTAD, INC.
CONSULTING ENGINEERS

751 West Main Street • Waterbury, Conn. 06708 • Tel. 203 755-2254

September 14, 1972

State of Connecticut
Department of Environmental Protection
Water and Related Resources
State Office Building
Hartford, Connecticut 06115

Attention: Mr. William H. O'Brian, III
Civil Engineer

Dear Mr. O'Brian:

On Friday, September 8, 1972, Mr. Nick Bredice, General Manager of the Norwalk Water Company, First District, and I, inspected the Grupes Reservoir Dam in New Canaan, Connecticut.

The overall condition of the dam indicates that there is no immediate problem, or danger of failure.

We will send in our report as soon as we receive all the supplemental data.

Very truly yours,

ROALD HAESTAD, INC.

By Roald Haestad
Roald Haestad

RH:jh

WATER & RELATED RESOURCES
RECEIVED
SEP 18 1972
ANSWERED
REFERRED
FILED

APPENDIX C

DETAIL PHOTOGRAPHS

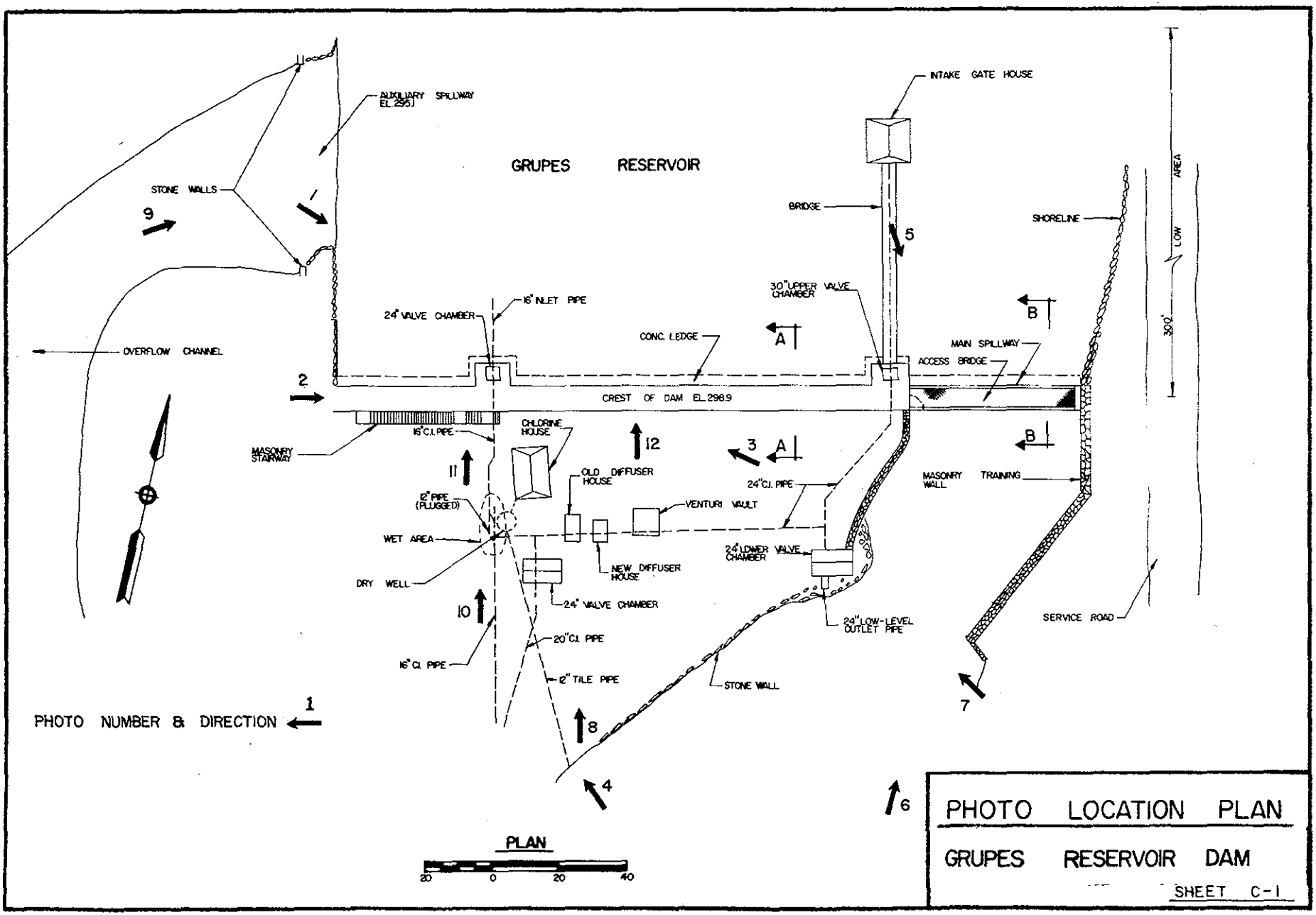


PHOTO LOCATION PLAN

GRUPES RESERVOIR DAM

SHEET C-1

Photo 1 - Upstream slope and emergency intake valve chamber. (Nov. 1979)

Photo 2 - Crest of dam and gatehouse (Nov. 1979)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Grupes Reservoir Dam Silvermine River New Canaan, Connecticut CE #27 660 KE DATE Dec '79 PAGE C-1
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	

Photo 3 - Downstream slope of dam (Nov. 1979)

Photo 4 - Outlet for 12 inch pipe to drywell (Nov. 1979)

Photo 5 - Spillway from upstream (Nov. 1979)

Photo 6 - Spillway from downstream. (Nov. 1979)

Photo 7 - Valve chamber and outlet for 24 inch low-level outlet (Nov. 1979)

Photo 8 - Brick Chlorine house, valve chamber for 20 inch supply line, and diffuser house on right. (Nov. 1979)

Photo 9 - Auxiliary spillway from downstream (Nov. 1979)

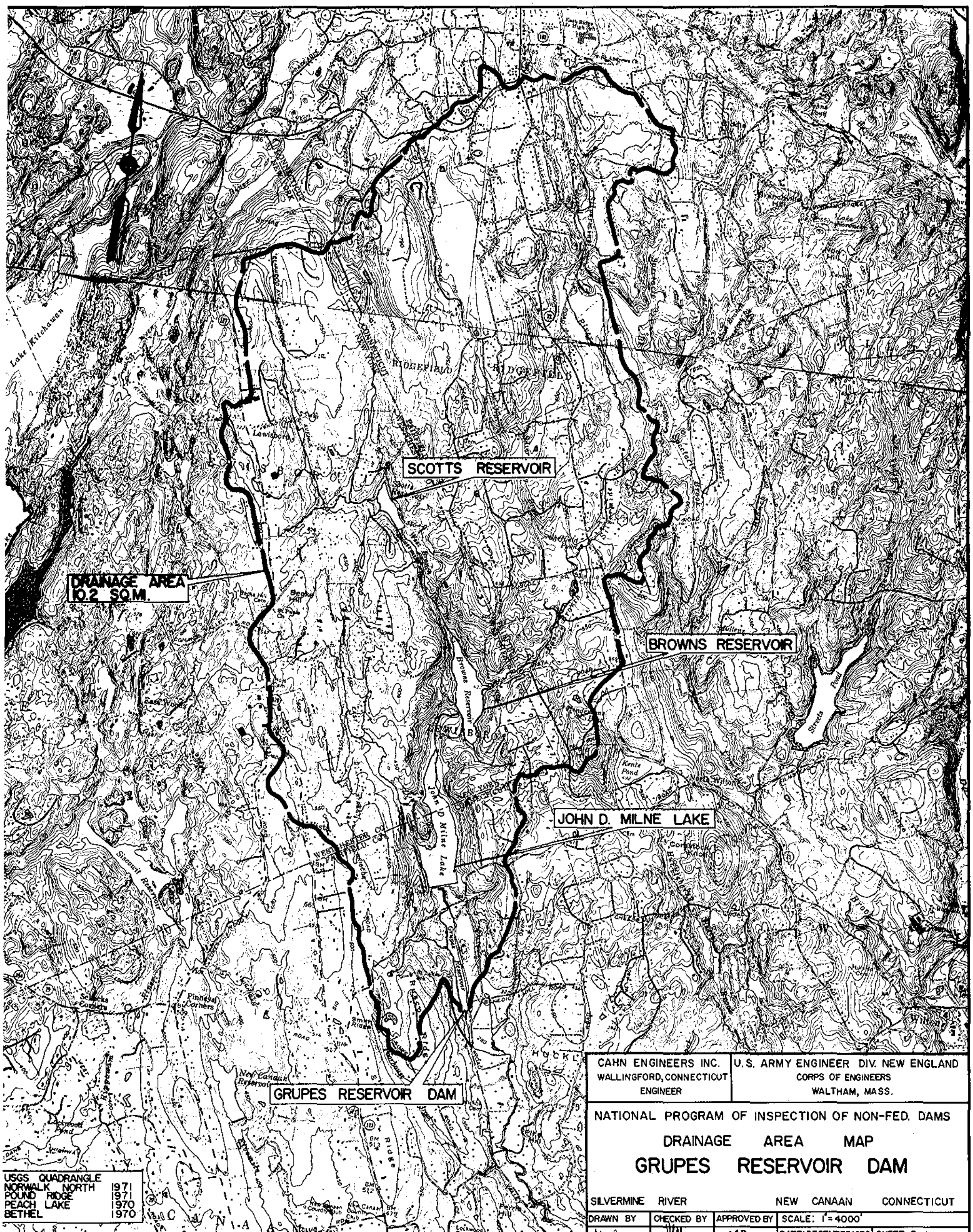
Photo 10 - Wet area near chlorine house and drywell.(Nov. 1979)

Photo 11- seepage near stairway at right downstream side of dam. (Dec. 1979).

Photo 12 - Seepage at central downstream side of dam. Note grouting pipe. (Dec. 79)

APPENDIX D

HYDRAULIC/HYDROLOGIC COMPUTATIONS



USGS QUADRANGLE	
NORWALK NORTH	1971
POUND RIDGE	1971
PEACH LAKE	1970
BETHEL	1970

CAHN ENGINEERS INC.
WALLINGFORD, CONNECTICUT
ENGINEER

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

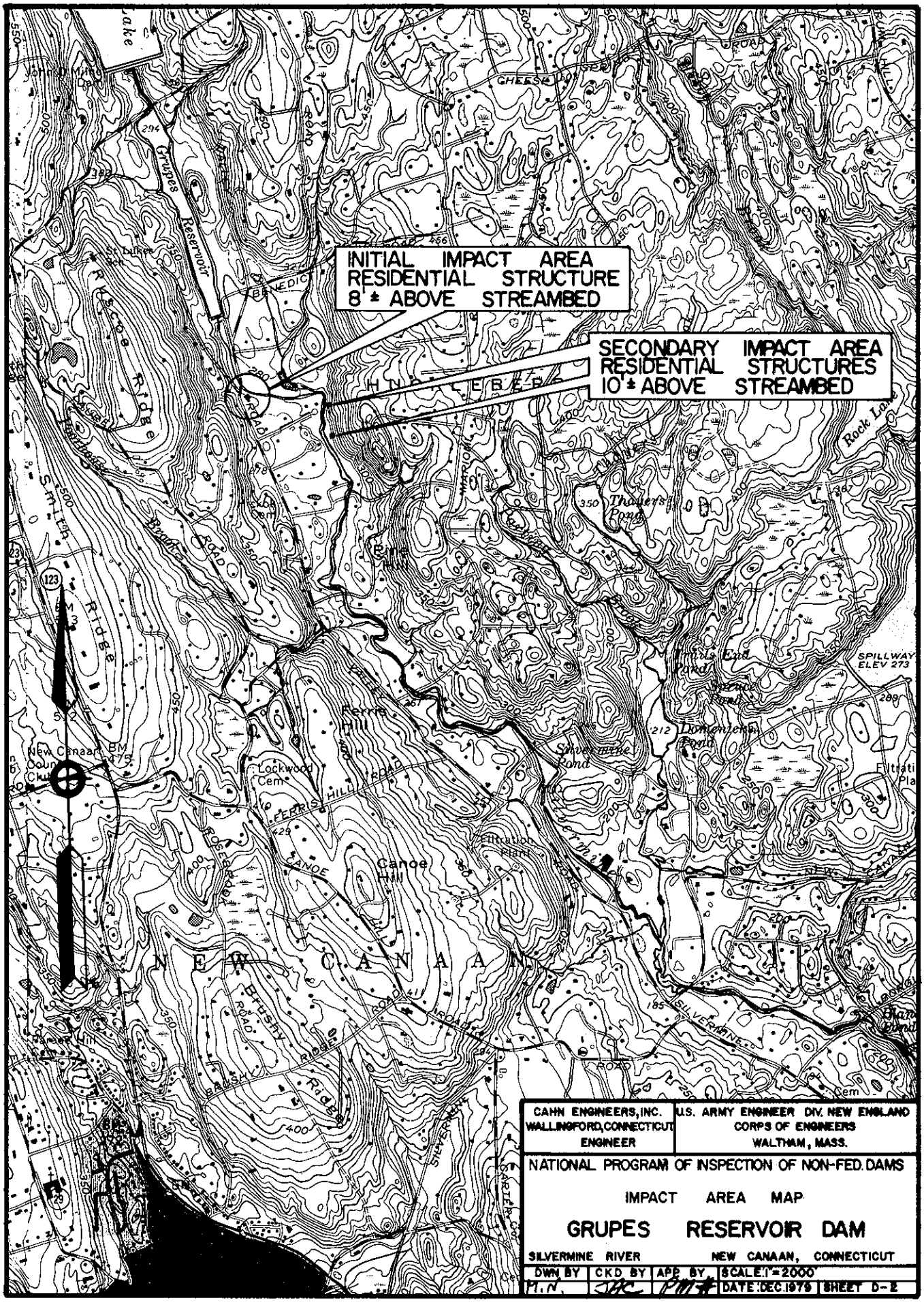
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

DRAINAGE AREA MAP

GRUPES RESERVOIR DAM

SILVERMINE RIVER   NEW CANAAN   CONNECTICUT

DRAWN BY	CHECKED BY	APPROVED BY	SCALE: 1" = 4000'
M. N.	[illegible]	GAB	DATE: DECEMBER 1979 — SHEET D-1



CAHN ENGINEERS, INC. WALLINGFORD, CONNECTICUT ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

IMPACT AREA MAP

GRUPES RESERVOIR DAM

SILVERMINE RIVER NEW CANAAN, CONNECTICUT

DWN BY	CKD BY	APP BY	SCALE 1" = 2000'
M.N.	JRC	PMS	DATE: DEC. 1979 SHEET D-2

HYDROLOGIC/HYDRAULIC INSPECTION

GRUPES RESERVOIR DAM, NEW CANAAN, CT.

I) PERFORMANCE AT PEAK FLOOD CONDITIONS:

1) PROBABLE MAXIMUM FLOOD (PMF):

a) WATERSHED CLASSIFIED AS "ROLLING"

b) WATERSHED AREA (D.A.):

THE GRUPES RESERVOIR IS THE FURTHEST D/S OF A SERIES OF FOUR RESERVOIRS REGULATING THE SILVERMINE RIVER FOR WATER SUPPLY PURPOSES. THE TOTAL WATERSHED IS ITEMIZED AS FOLLOWS:*

i) D.A. TO SCOTTS RESERVOIR: $(DA)_S \cong 1.9$ sq mi

ii) INCREMENTAL D.A. TO BROWNS RES: $\Delta_{S,B} \cong 5.5$ sq mi

iii) D.A. TO BROWNS RESERVOIR: $(DA)_B \cong 7.4$ sq mi

iv) INCREM. D.A. TO J.D. MILNE LAKE: $\Delta_{B,M} \cong 1.9$ sq mi

v) D.A. TO JOHN D. MILNE LAKE: $(DA)_M \cong 9.3$ sq mi

vi) INCREM. D.A. TO GRUPES RES.: $\Delta_{M,G} \cong 0.9$ sq mi

vii) TOTAL D.A. TO GRUPES RESERVOIR: D.A. $= (DA)_G \cong \underline{10.2}$ sq mi

c) PEAK FLOODS (FROM NED-ACE GUIDELINES - GUIDE CURVES FOR PMF):

ALTHOUGH THE RESERVOIRS U/S FROM GRUPES REGULATE (±) 91% OF THIS RESERVOIR WATERSHED, THEIR SURCHARGE STORAGE EFFECT

*NOTE: DRAINAGE AREAS FROM CONN. DEP, BULLETIN No. 1, 1972 (GAZETTEER OF NATURAL DRAINAGE AREAS) P. 70 AND C.E. MEASURE ON USGS NORWALK NORTH, CT.; BETHEL, CT.; PEACH LAKE, NY-CT.; AND, POUND RIDGE, NY-CT. QUADRANGLE SHEETS.

GRUPES RESERVOIR DAM

1, C + Con Ad) PEAK FLOWS

ON PEAK FLOOD REDUCTION IS NEGLIGEABLE BECAUSE OF THEIR "NORMALLY FULL RESERVOIR" STATUS AND THEIR RELATIVELY SMALL SURFACE AREA WHICH TOTALS ONLY (±) 130 ac OR (±) 2% OF THE WATERSHED.

THEREFORE, PEAK FLOODS AT GRUPES RESERVOIR WILL BE ESTIMATED BASED ON THE PEAK FLOW RATE FOR THE ENTIRE WATERSHED.

i) PMF ≅ 1600 cfs/sq mi × 10.2 ≅ 16300 cfs

ii) ½ PMF ≅ 8150 cfs

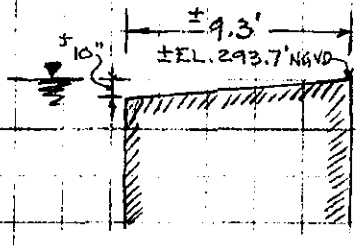
2) SURCHARGE AT PEAK INFLOWS (PMF AND ½ PMF)

a) OUTFLOW RATING CURVE

i) SPILLWAYS:

GRUPES RESERVOIR DAM HAS TWO SPILLWAYS. THE PRINCIPAL SPILLWAY, TO THE LEFT OF THE DAM, IS A STONE MASONRY TRAPEZOIDAL WEIR WITH VERTICAL U/S AND D/S FACES AND CREST SLOPING UPWARD TOWARDS THE D/S FACE AT (±) 1¼" TO 1'. THE D/S EDGE OF THE CREST (FLOW LINE) IS AT (±) ELEV.* 293.7' NGVD. (SEE SKETCH BELOW)

IN PLAN, THE SPILLWAY LENGTH BELOW (±) ELEV. 295.1' NGVD



NOTE: DATA FROM C.E. FIELD OBSERVATIONS AND AVAILABLE DWGS. FURNISHED BY THE NORWALK 1ST TAXING DISTRICT WATER CO.

*ELEVATIONS AS SHOWN ON THE NORW. 1ST TAXING DISTRICT WATER CO. "GRUPES DAM SURVEY" - SCALE 1"=20' ARE ASSUMED TO BE MSL OR, NATIONAL GEODETIC VERTICAL DATUM (NGVD).

GROPES RESERVOIR DAM

2.a - (Cont'd) OUTFLOW RATING CURVE - SPILLWAYS

IS ONLY $L_1 \doteq 44.6'$ BECAUSE THERE IS A (±)1.4' HIGH SILL AT THE RIGHT END OF THE SPILLWAY WHICH KEEPS THE FALLING NAPPE AWAY FROM THE CHANNEL SIDEWALL BELOW. ABOVE ELEV. 295.1' NGVD, THE SPILLWAY LENGTH IS $L_2 \doteq 48.9'$. THE HEIGHT BETWEEN THE SPILLWAY CREST AND THE TOP OF THE DAM IS $H \doteq 5.2'$. THE SPILLWAY IS SPANNED BY A STEEL FOOT BRIDGE WITH LOW CHORD AT (±) ELEV. 299.4' NGVD (±6" ABOVE THE TOP OF THE DAM) AND TWO STEEL GIRDERS (±) 1' HIGH (±) TOP ELEV. 300.4' NGVD)

AN UNLINED CHANNEL TO THE RIGHT OF THE DAM (WEST SHORE), (±)60' WIDE WITH A BOTTOM ELEV. 295.1' NGVD (±) 1.4' ABOVE THE PRINCIPAL SPWY. CREST) SERVES AS AN AUXILIARY SPILLWAY. THE ORIGINAL SILL BETWEEN TWO EXISTING (±)5' HIGH SIDE WALLS ON THE CHANNEL HAS BEEN DESTROYED (SEE NORWICH 1ST TAXING DISTRICT WATER CO. "GROPE DAM SURVEY" MAP)

ASSUMING $C \doteq 3.1$ FOR THE PRINCIPAL SPILLWAY AND $C \doteq 2.7$ FOR THE AUXILIARY SPILLWAY AND USING THE CREST ELEVATION OF THE PRINCIPAL SPILLWAY AS DATUM (ELEV 293.7' NGVD) THEIR DISCHARGE IS APPROXIMATED BY (SEE SKETCH P. D-5):

1') PRINCIPAL SPILLWAY:

$$(Q_s)_1 \doteq 3.1 \times 44.6\, H^{3/2} + 3.1 \times 4.3\,(H-1.4)^{3/2} = 140H^{3/2} + 13(H-1.4)^{3/2}$$

($H \leq 5.7'$ OR LOW CHORD OF FOOT BRIDGE)

2') AUXILIARY SPILLWAY:

$$(Q_s)_2 \doteq 2.7 \times 60\,(H-1.4)^{3/2} \doteq 160\,(H-1.4)^{3/2}$$

THEREFORE, THE COMBINED DISCHARGE OF THE SPILLWAYS CAN BE

GRUFES RESERVOIR DAM

2, a - Cont'd) OVERFLOW RATING CURVE - SPILLWAYS

APPROXIMATED (TO THE LOW CHORD OF THE FOOT BRIDGE) BY:

$$Q_s' = 140H^{3/2} + 170(H-1.4)^{3/2} \qquad (H \leq 5.7')$$

BECAUSE OF THE FOOT BRIDGE, THE PRINCIPAL SPILLWAY WILL HAVE ORIFICE FLOW AND THE DISCHARGE OF THE SPILLWAYS ABOVE (±) ELEV. 299.4' NGVD, FOR DEPTHS $5.7' < H \leq 6.7'$ IS APPROXIMATED BY:

$$Q_s'' = (Q_s)_1' + (Q_s)_2 \; ; \; (Q_s)_1' = CA\sqrt{2gH_1} \approx 1200(H-2.9)^{1/2}$$

($C = 0.55$ $A \approx 270$ $H_1 \approx H - 2.9$)

$$(Q_s)_2 \approx 160(H-1.4)^{3/2}$$

$$\therefore Q_s'' \approx 1200(H-2.9)^{1/2} + 160(H-1.4)^{3/2} \qquad (5.7' < H \leq 6.7')$$

FOR SURCHARGES $H > 6.7'$, THE PRINCIPAL SPILLWAY (ORIFICE) FLOW WILL BE COMBINED WITH THE WEIR FLOW OVER THE FOOT BRIDGE GIRDERS AND THE OVERFLOW EQUATION FOR THE SPILLWAYS IS APPROXIMATELY:

$$Q_s''' = Q_s'' + (Q_s)_1'' \; ; \; (Q_s)_1'' \approx 2.7 \times 52(H-6.7)^{3/2} \approx 140(H-6.7)^{3/2}$$

(FOR THE GIRDERS: $C = 2.7$ AND $L \approx 52'$)

$$\therefore Q_s''' \approx 1200(H-2.9)^{1/2} + 140(H-6.7)^{3/2} + 160(H-1.4)^{3/2} \qquad (H > 6.7')$$

ii) EXTENSION OF THE RATING CURVE FOR SURCHARGES OVERTOPPING THE DAM AND/OR ADJACENT TERRAIN.

GRUFES RES. DAM IS A STONE MASONRY DAM WITH A TOP ELEVATION OF (±) 298.9' NGVD. THE DAM AND ADJACENT TERRAIN REMAIN AT THIS ELEVATION FOR A TOTAL LENGTH OF (±) $L = 190'$. THE WIDTH OF THE

GRUPES RESERVOIR DAM

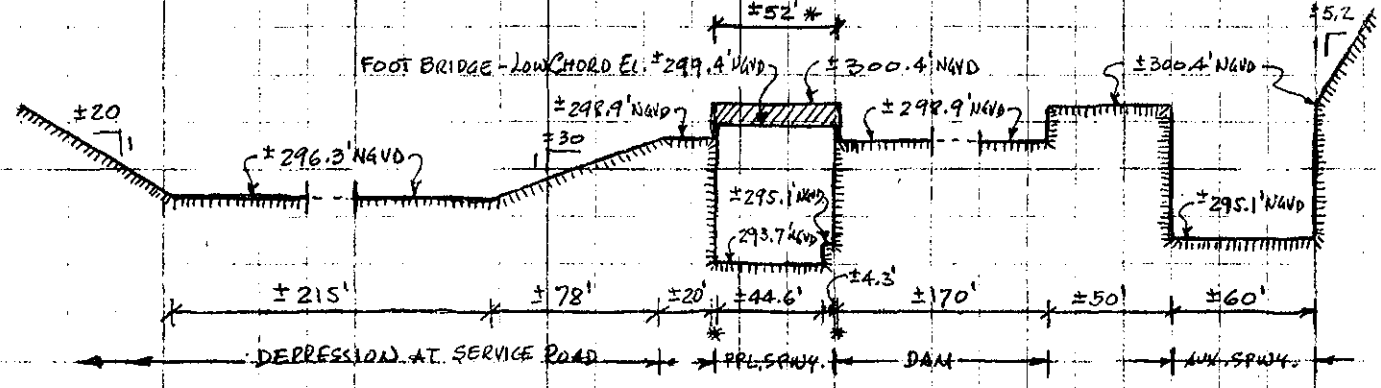
2, a - Cont'd) OUTFLOW RATING CURVE

PORTION OF THE OVERFLOW PROFILE CAN BE CONSIDERED, IN GENERAL, THE PREVAILING TOP WIDTH OF THE DAM, (±) ?.'

TO THE LEFT OF THE PRINCIPAL SPILLWAY, THE DAM TIES PERPENDICULARLY TO THE SERVICE ROAD WHICH RUNS PARALLEL TO THE LEFT (EAST) SHORE OF THE RESERVOIR. THE ROAD FORMS A DEPRESSION (±) 215' LONG, AT (±) ELEV. 296.3' NGVD, WITH 30 H TO 1 V (RIGHT) AND 20 H TO 1 V (LEFT) SIDE SLOPES. THIS DEPRESSION OVERFLOWS INTO A LOW AREA WHICH APPARENTLY DRAINS TO SILVERMINE RIVER ½ FROM GRUPES DAM. OVERFLOW THROUGH THIS DEPRESSION WILL BE ASSUMED TO OCCUR ABOVE ELEV. 296.3' NGVD, ALTHOUGH DRY STONE WALLS (±) 1.7' HIGHER, BORDER THE ROAD AT BOTH SIDES. (SEE OVERFLOW PROFILE SKETCH BELOW).

BETWEEN THE DAM AND THE AUXILIARY SPILLWAY, THE NATURAL TERRAIN WHICH FORMS AN OVERFLOW PROFILE (±) 50' LONG WILL BE ASSUMED FOR SIMPLIFICATION AT (±) ELEV. 300.4' NGVD.

THE TERRAIN BEYOND THE RIGHT SIDE WALL OF THE AUXILIARY SPWY. (TOP ELEV. (±) 300.4' NGVD) SLOPES UPWARD AT (±) 5.2 H TO 1 V.



GRUPES RESERVOIR DAM — OVERFLOW PROFILE

*NOTE: BRIDGE OVERLAPS ABUTMENTS

GRURES RESERVOIR DAM

2, 2-Cm'd) OVERFLOW RATING CURVE

THEREFORE, ASSUMING $C = 2.7$ FOR THE OVERFLOW AT ALL OVERTOPPING POINTS AND AN EQUIVALENT LENGTH FOR THE SLOPING TERRAIN, THE OVERFLOW CAN BE APPROXIMATED BY THE FOLLOWING EQUATIONS:

1') SLOPING TERRAIN TO THE RIGHT OF THE AUXIL. SPWY.:

$$L'_{R_2} = \underbrace{\tfrac{3}{4}(5.2)}_{\sim 3.47}(H-6.7) \quad \therefore \quad Q'_{R,S} = \underline{9.4(H-6.7)^{5/2}}$$

2') TERRAIN BETWEEN DAM AND AUX. SPWY. (+EL. 300.4' NGVD):

$$Q_{D,S_2} = 2.7 \times 50 (H-6.7)^{3/2} = \underline{140(H-6.7)^{3/2}}$$

3') TOP OF DAM AND TERRAIN AT (±) EL. 298.9' NGVD:

$$Q_D = 2.7 \times 190 (H-5.2)^{3/2} = \underline{510(H-5.2)^{3/2}}$$

4') ROAD DEPRESSION, SLOPING TERRAIN AT RIGHT:

$$L'_{R,RD} = \tfrac{2}{3}(30)(H-2.6) \quad \therefore \quad (Q'_{R,RD})_1 = \underline{54(H-2.6)^{5/2}} \quad H \leq 5.2'$$

$$(Q'_{R,RD})_2 = 2.7 \times 78 (H-3.2)^{3/2} = \underline{210(H-3.2)^{3/2}} \quad \text{FOR } H > 5.2'$$

5') ROAD DEPRESSION - TERRAIN AT ELEV. (±) 296.3' NGVD

$$Q_{RD} = 2.7 \times 215 (H-2.6)^{3/2} = \underline{580(H-2.6)^{3/2}}$$

6') ROAD DEPRESSION, SLOPING TERRAIN AT LEFT:

$$L'_{L,RD} = \underbrace{\tfrac{2}{3}(20)}_{\sim 13.3}(H-2.6) \quad \therefore \quad Q'_{L,RD} = \underline{36(H-2.6)^{5/2}}$$

NOTE: IF THE ROAD DEPRESSION IS CLOSED TO TOP ELEVATION OF THE DAM, EQUATIONS (4'), (5') AND (6') ARE REPLACED BY:

$$Q^*_{RD} = 2.7 \times 345 (H-5.2)^{3/2} + 36(H-5.2)^{5/2} = \underline{930(H-5.2)^{3/2} + 36(H-5.2)^{5/2}}$$

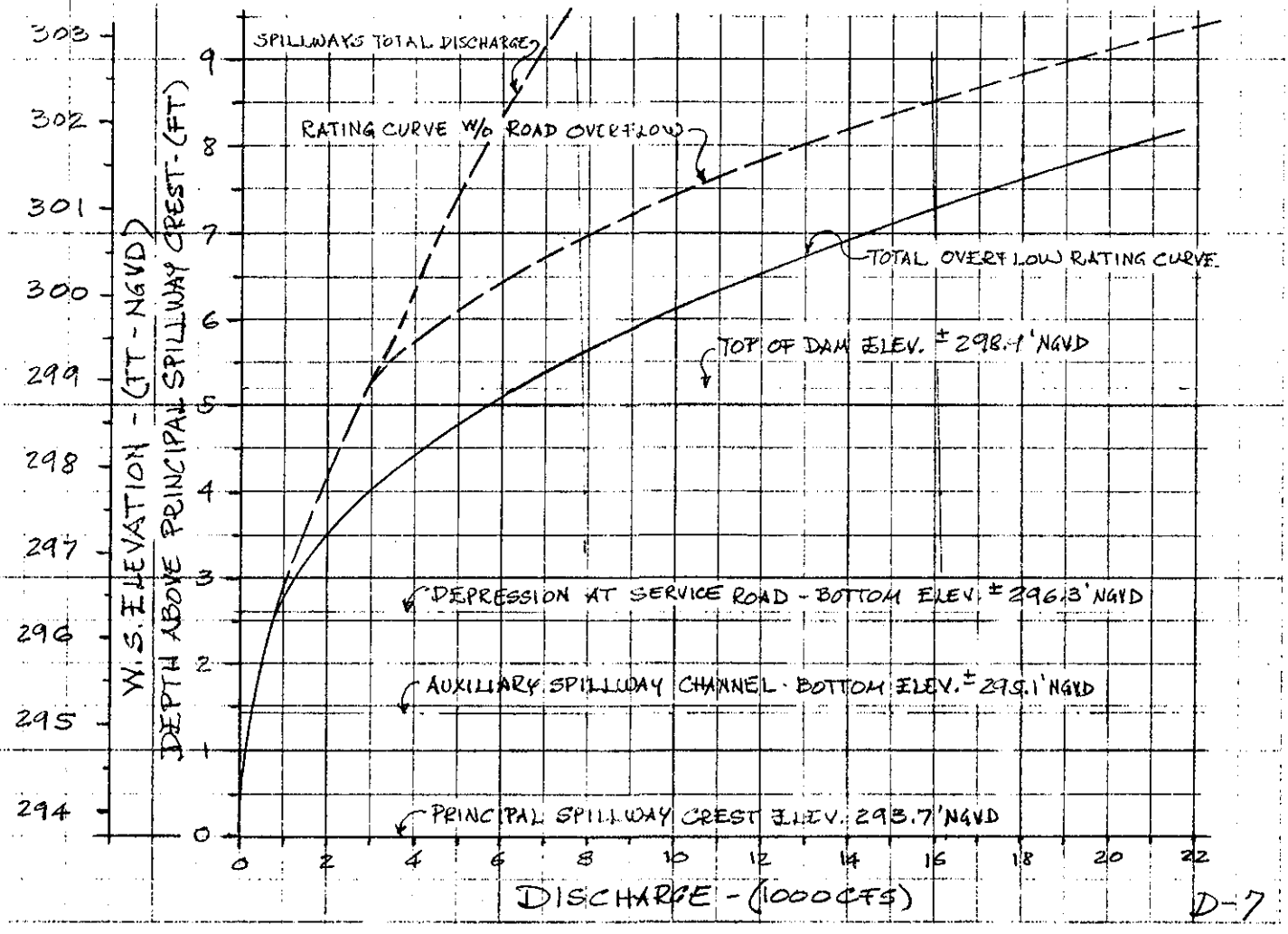
GRUPES RESERVOIR DAM

2, a- (Cont'd) OVERFLOW RATING CURVE

THEREFORE, THE TOTAL OUTFLOW RATING CURVE IS APPROXIMATED BY:

$$Q = Q_s^* + 9.4(H-6.7)^{5/2} + 140(H-6.7)^{3/2} + 510(H-5.8)^{3/2} + 580(H-2.6)^{3/2} + 36(H-2.6)^{5/2} + (Q'_{L,RD})^*$$

WHERE Q_s^* IS THE TWO SPILLWAYS OVERFLOW GIVEN BY THE EQUATIONS ON P. D-4 AND $(Q'_{L,RD})^*$ IS THE ROAD OVERFLOW GIVEN BY THE EQUATIONS (4') ON P. D-6. THE RESULTING OUTFLOW RATING CURVE FOR GRUPES RESERVOIR DAM IS AS FOLLOWS:



GRUPES RESERVOIR DAM

2-Cont'd) SURCHARGE AT PEAK INFLOWS

b) SURCHARGE HEIGHT TO PASS PEAK INFLOWS (Q_p & Q_p')

i) @ Q_p = PMF ≈ 16300 CFS $H_1 \approx$ 7.4' ($H_1 \approx$ 8.6' W/o ROAD OVERFLOW)

ii) @ $Q_p' = \frac{1}{2}$ PMF ≈ 8150 CFS $H_1' \approx$ 5.7' ($H_1' \approx$ 7.0' W/o ROAD OVERFLOW)

c) EFFECT OF SURCHARGE STORAGE ON PEAK OUTFLOWS:

i) AVERAGE LAKE AREA WITHIN EXPECTED SURCHARGE:

1') LAKE AREA AT FLOWLINE (ELEV. 293.7' NGVD): $A_{WL} \approx$ 23 AC

2') AREA AT CONTOUR 300' NGVD*: $A_{300} \approx$ 26 AC

3') AREA AT CONTOUR 310' NGVD*: $A_{310} \approx$ 39 AC

∴ AREA AT ELEV. 303' MSL (MAX. EXPECTED SURCH.): $A_{303} \approx$ 30 AC

∴ AVE. AREA WITHIN EXPECTED SURCHARGE: $A = 26.5$ AC. SAY, $\bar{A} =$ 27 AC.

*NOTE: AREAS FROM USGS NORWALK NORTH, CONN-NY, QUADRANGLE SHEET AND C.N. WOOD "FLOWAGE MAP" OF GRUPE RESERVOIR, DATED 1892, AND CITY OF NORWALK, FIRST TAKING DISTRICT "MAP OF RESERVOIRS", DATED FEB 1930

ii) ASSUME NORMAL POOL AT FLOWLINE ELEVATION: ELEV. 293.7' NGVD

iii) WATERSHED AREA: D.A. = 10.2 SQ MI (SEE P. D-1)

iv) DISCHARGE (Q_p) AT VARIOUS HYPOTHETICAL SURCHARGE ELEVATIONS:

H = 9' V = 27 x 9 = 243 AC-FT ∴ $S = \frac{243}{10.2 \times 53.3} = 0.45$"

H = 4' V = 108 AC-FT ∴ S = 0.20"

GRUPES RESERVOIR DAM

2.c-(Cont'd) EFFECT OF SURCHARGE STORAGE ON PEAK OUTFLOWS:

FROM APPROXIMATE ROUTING NED-ACE GUIDELINES AND 19" MAX. PROBABLE R.O. IN NEW ENGLAND.

$Q_{P_2} = Q_{P_1}(1-\frac{S}{19})$ AND FOR ½ PMF: $Q'_{P_2} = Q'_{P_1}(1+\frac{S}{9.5})$

∴ FOR THE PREVIOUS HYPOTHETICAL SURCHARGES:

$H = 9'$ $Q_{P_2} = 15900^{CFS}$ $Q'_{P_2} = 7760^{CFS}$

$H = 4'$ $Q_{P_2} = 16100^{CFS}$ $Q'_{P_2} = 8060^{CFS}$

AND FOR $H = 0$ $Q_{P_2} = 16300^{CFS}$ $Q'_{P_2} = 8150^{CFS}$

d) PEAK OUTFLOWS (Q_{P_3} & Q'_{P_3})

USING NED-ACE GUIDELINES "SURCHARGE STORAGE ROUTING" ALTERNATE METHOD (SEE RATING CURVE P. D-7):

$Q_{P_3} \doteq 16000^{CFS}$ $H_3 \doteq 7.3'$ FOR $Q_{P_1} = PMF$ ($Q_{P_3}^{*} = 15900^{CFS}$; $H_3^{*} = 8.5'$ W/o ROAD OVERFLOW)

$Q'_{P_3} \doteq 7900^{CFS}$ $H'_3 \doteq 5.6'$ FOR $Q'_{P_1} = \frac{1}{2}PMF$ ($Q'^{*}_{P_3} = 7850^{CFS}$; $H'^{*}_3 = 6.9'$ W/o ROAD OVERFLOW)

3) SPILLWAY CAPACITY RATIO TO PEAK INFLOWS AND OUTFLOWS:

a) SPILLWAY CAPACITY TO ELEVATION OF FIRST LOW POINT:
(ROAD DEPRESSION ≐ EL. 296.3' NGVD) (H=2.6'): $(Q_S)_1 \doteq 810^{CFS}$

∴ THE TOTAL SPILLWAY CAPACITY (2-SPANS) TO FIRST OVERFLOW ELEVATION IS (±) 5.0 % OF THE INFLOW (Q_R) AND (±) 5.1% OF THE OUTFLOW (Q_3) AT PEAK FLOOD = PMF.

GRUPES RESERVOIR DAM

3.a - Cont'd) SPILLWAY CAPACITY RATIO TO PEAK INFLOWS & OUTFLOWS

LIKEWISE, THE TOTAL SPILLWAY CAPACITY TO FIRST OVERFLOW) ELEV. IS (±) 9.9% OF THE INFLOW (Q_{P_1}) AND (±) 10% OF THE OUTFLOW (Q_{P_2}) AT PEAK FLOOD = ½ PMF

b) SPILLWAY CAPACITY TO TOP OF DAM (ASSUMING NO ROAD OVERFLOW):
$H = 5.2'$ $\therefore (Q_{S,E})_2 \doteq 2900$ CFS (TOTAL OF BOTH SPILLWAYS)

$\therefore$ THE TOTAL SPILLWAY CAPACITY TO TOP OF DAM W/O ROAD OVERFLOW IS (±) 18% OF THE INFLOW (Q_{P_1}) AND ALSO, OF THE OUTFLOW (Q_{P_2}) AT PEAK FLOOD = PMF.
LIKEWISE, THE TOTAL SPILLWAY CAPACITY FOR THESE CONDITIONS (3.b) IS (±) 36% OF THE INFLOW (Q'_{P_1}) AND (±) 37% OF THE OUTFLOW (Q'_{P_2}) AT PEAK FLOOD = ½ PMF

c) SPILLWAY CAPACITY TO TOP OF DAM (INCLUDING ROAD OVERFLOW):
$H = 5.2'$ $\therefore (Q_{S,E})_2 \doteq 2900 + 3400 \doteq 6300$ CFS (SPWY + ROAD)

$\therefore$ THE TOTAL SPILLWAY CAPACITY TO TOP OF DAM INCLUDING ROAD OVERFLOW IS (±) 39% OF BOTH, THE INFLOW (Q_{P_1}) AND THE OUTFLOW (Q_{P_2}) AT PEAK FLOOD = PMF
LIKEWISE, THE TOTAL SPILLWAY CAPACITY FOR THESE CONDITIONS (3.c) IS (±) 77% OF THE INFLOW (Q'_{P_1}) AND (±) 80% OF THE OUTFLOW (Q'_{P_2}) AT PEAK FLOOD = ½ PMF

d) SPILLWAY CAPACITY TO PMF AND ½ PMF SURCHARGES:

1) CAPACITY TO PMF SURCHARGE (TOTAL BOTH SPILLWAYS ONLY)
$H_3 \doteq 7.3'$ $\therefore (Q_E)_3 \doteq 4900$ CFS

$\therefore$ THE TOTAL SPILLWAY CAPACITY (W/O INCLUDING THE ROAD OVERFLOW) TO PMF SURCHARGE IS (±) 30% OF THE INFLOW (Q_{P_1}) AND (±) 31% OF THE OUTFLOW (Q_{P_2}) AT PEAK FLOOD = PMF
INCLUDING THE ROAD OVERFLOW AS SPILLWAY CAPACITY, $(Q_{S,E})_3 = 4900 + 9400 = 14300$ CFS
OR (±) 88% THE INFLOW (Q_{P_1}) AND (±) 89% THE OUTFLOW (Q_{P_2}) AT PEAK FLOOD = PMF

GRUPES RESERVOIR DAM

3,C,6'-Cont'd) SPILLWAY CAPACITY TO PMF SURCHARGE

w/o THE ROAD OVERFLOW, $(H_3^*)_2 = 8.5'$: $(Q_3^*)_2 \doteq 6200$ CFS OR THE SPILLWAY CAPACITY TO PMF SURCHARGE IS (±)38% OF (Q_I) AND (±)39% OF (Q_3^*) AT PEAK FLOOD = PMF

ii) CAPACITY TO ½ PMF SURCHARGE (TOTAL BOTH SPILLWAYS ONLY).
$H_3' = 5.6'$ ∴ $(Q_c)_4 \doteq 3300$ CFS

∴ THE TOTAL SPILLWAY CAPACITY (w/o INCLUDING THE ROAD OVERFLOW) TO ½ PMF SURCHARGE IS (±)40% OF THE INFLOW (Q_I') AND (±)42% OF THE OUTFLOW (Q_3') AT PEAK FLOOD = ½ PMF
INCLUDING THE ROAD OVERFLOW) AS SPILLWAY CAPACITY, $(Q_{c,e})_4 \doteq 3300 + 4400 =$ 7700 CFS OR, (±)94% THE INFLOW (Q_I') AND (±)97% THE OUTFLOW (Q_3') AT PEAK FLOOD = ½ PMF
w/o THE ROAD OVERFLOW, $(H_3'^* = 6.9')$: $(Q_3^*)_4 \doteq 4500$ CFS OR, THE SPILLWAY CAPACITY TO ½ PMF SURCHARGE IS (±)55% OF (Q_I') AND (±)57% OF $(Q_3'^*)$ AT PEAK FLOOD = ½ PMF.

NOTE: GRUPES RESERVOIR DAM HAS A 24"ϕ - (±)135' LONG, VALVED OUTLET WITH ELEV. (±)273.3' NGVD. NEGLECTING THE SLUICE GATES LOSSES AT THE INTAKE TOWER AND OTHER PIPING MINOR LOSSES, THE OUTLET CAPACITY UNDER A HEAD OF (±)23' (FIRST OVERFLOW - ELEV. 296.3' NGVD) IS ESTIMATED AT (±)60 CFS AND UNDER A HEAD OF (±)25' (TOP OF DAM ELEV. 298.9' NGVD) IS (±)65 CFS.

GRUPES RESERVOIR DAM

II) DOWNSTREAM FAILURE HAZARD

1) POTENTIAL IMPACT AREA

A LARGE NUMBER OF HOUSES LOCATED ALONG SILVERMINE RIVER DOWN TO THE CITY OF NORWALK AND, PARTICULARLY THOSE LOCATED (±) 1400' TO 12000' D/S FROM THE DAM, NEAR VALLEY ROAD AND HAVING FIRST FLOOR ELEVATIONS RANGING FROM (±) 5' TO 13' ABOVE THE STREAM, CONSTITUTE THE POTENTIAL IMPACT AREA IN CASE OF FAILURE OF THE GRUPES RESERVOIR DAM.

2) FAILURE AT GRUPES RESERVOIR DAM:

a) BREACH WIDTH:

i) HEIGHT OF DAM

TOP OF DAM (±) ELEV. 298.9' NGVD
D/S TOE OF DAM (STREAMBED) - (±) ELEV.* 272.3' NGVD
$\therefore H_w = 26.6'$ SAY, $H_w = \underline{27'}$

ii) MID-HEIGHT OF DAM: (±) ELEV. 286' NGVD ($298.9 - \frac{26.6}{2} = 285.6'$ SAY, 286 NGVD)

iii) APPROX. MID-HEIGHT LENGTH: $L_w = {}^{*}192'$ (*FROM C.E. FIELD MEASUREMENTS ON 10/16/79)

iv) BREACH WIDTH (SEE NED-ACE D/S DAM FAILURE GUIDELINES)

$W = 0.4 \times 192 = 77'$ ∴ ASSUME $W_b = \underline{77'}$

b) PEAK FAILURE OUTFLOW (Q_P)

ASSUME SURCHARGE TO TOP OF DAM (ELEV. 298.9' NGVD)

GRUPES RESERVOIR DAM

2.6-Cont'd) PEAK FAILURE OUTFLOW

c) HEIGHT AT TIME OF FAILURE: $Y_o \approx 27'$

ii) SPILLWAYS DISCHARGE AT TIME OF FAILURE:

1') SPILLWAYS: $Q_S = 2900$ CFS
2') ROAD DEPRESSION: $Q_{2D} = 3400$ CFS
3') TOTAL DISCH. TO SILVERMINE R.: $Q_o = 6300$ CFS

iii) BREACH OUTFLOW (Q_b)

$$Q_b = \tfrac{8}{27} W_b \sqrt{g}\, Y_o^{3/2} \approx 18200 \text{ CFS}$$

iv) PEAK FAILURE OUTFLOW (Q_{P_1}) TO SILVERMINE RIVER:

$$Q_{P_1} = Q_o + Q_b \approx 24500 \text{ CFS}$$

c) FLOOD DEPTH IMMEDIATELY D/S FROM DAM:

$$Y \approx 0.44\, Y_o \approx 12'$$

d) ESTIMATE OF D/S FAILURE CONDITIONS AT POTENTIAL IMPACT AREA:

(SEE NED-ACE GUIDELINES FOR ESTIMATING D/S FAILURE HYDROGRAPHS)

i) REACH OF SILVERMINE RIVER BETWEEN THE DAM AND THE IMPACT AREA:

THE (±)1400' LONG REACH OF SILVERMINE RIVER FROM THE GRUPES RESERVOIR DAM TO THE INITIAL IMPACT AREA AT VALLEY ROAD, IS APPROXIMATELY V-SHAPED WITH (±) 30° TO 1° AND

GRUPES RESERVOIR DAM

2,d-Cont'd) FAILURE CONDITIONS AT IMPACT AREA

(±)18"TO 1' SIDE SLOPES TO A DEPTH OF (±)40'. THE AVERAGE SLOPE OF THE REACH IS (±) 0.5%.

ii) GRUPES RESERVOIR STORAGE AT TIME OF FAILURE:

CAPACITY OF RESERVOIR TO FLOW LINE: $S_{WL} \doteq 55.7^{MG} \doteq 171^{AC-FT}$
(DATA FROM CITY OF NORWALK - FIRST TAXING DISTRICT "MAP OF RESERVOIRS" SCALE 1"=300', DATED FEB. 1930)

∴ STORAGE AT TIME OF FAILURE: $S_{MAX} \doteq 171 + 5.2 \times 27^{*} \doteq \underline{311}^{AC-FT}$
$(S/2 \doteq 155^{AC-FT})$
*$\bar{A} = 27^{AC}$ - SEE P. D-8

NOTE: THE ACE-US INVENTORY OF DAMS, DATED JAN. 24, 1978, P. 7 GIVES $S_{MAX} = 435^{AC-FT}$ AND $S_{NORM} = 396^{AC-FT}$.

iii) PEAK INFLOW TO REACH: $Q_{P_1} \doteq 24500^{CFS}$ (SEE P. D-13)

iv) APPROXIMATE STAGE AT POTENTIAL IMPACT AREA AFTER FAILURE OF GRUPES RESERVOIR DAM:

$Q_{P_1} \doteq 24500^{CFS}$; $^{*}Y_1 \doteq 12.1'$; $V_1 \doteq 113^{AC-FT}$ $\angle \frac{S}{2}$ ok (ON REACH OF 1400'; $^{*}n \doteq 0.050$)

$Q_{P_2} = Q_{P_1}(1 - \frac{V}{S})_{AV} \doteq 15600^{CFS}$ ∴ $Y_{2_{AV}} \doteq 10.2'$; $V_{2_{AV}} \doteq 80.4^{AC-FT}$; $\bar{V} \doteq 96.7^{AC-FT}$ ∴ $Q_2 \doteq 16900^{CFS}$

∴ REACH OUTFLOW: $Q_{P_2} \doteq \underline{16900}^{CFS}$ STAGE: $Y_2 \doteq \underline{10.5'}$
(SIMILARLY, W/O ROAD OVERFLOW: $Q_{P_1}^{*} = 21100^{CFS}$; $Q_{P_2}^{*} \doteq 15100^{CFS}$; $Y_2^{*} \doteq 10.1'$)

c) APPROXIMATE STAGE BEFORE FAILURE:

SILVERMINE RIVER FLOW BEFORE FAILURE: $Q_0 \doteq \underline{6300}^{CFS}$ ∴ $Y \doteq \underline{7.3'}$
(NOTE: W/O ROAD OVERFLOW: $Q_0 = 2900^{CFS}$ ∴ $Y_0 = 5.4'$)

f) RAISE IN STAGE AT IMPACT AREA: $\Delta Y \doteq \underline{3.2'}$ ($\Delta Y_0 \doteq 4.7'$ W/O ROAD OVERFLOW)

GRUPES RESERVOIR DAM

III) SELECTION OF TEST FLOOD

1) CLASSIFICATION OF DAM ACCORDING TO NED-ACE GUIDELINES:

a) SIZE: *STORAGE (MAX) = 311 ACFT (50 < S < 1000 ACFT)

*HEIGHT = 27' (25 < H < 40 FT)

*NOTE: STORAGE (SEE P. D-14); HEIGHT (SEE P. D-12)

∴ SIZE CLASSIFICATION: SMALL

b) HAZARD POTENTIAL: AS A RESULT OF THE DS FAILURE ANALYSIS AND IN VIEW OF THE IMPACT THAT FAILURE OF GRUPES RESERVOIR DAM MAY HAVE ON THE POTENTIAL IMPACT AREA DESCRIBED ON P. D-12, THIS DAM IS CLASSIFIED AS HAVING:

HAZARD CLASSIFICATION: HIGH

2) TEST FLOOD: PMF = 16300 CFS

THIS SELECTION IS MADE BASED ON THE RESULTS OF THE PREVIOUS ANALYSES AND CLASSIFICATION.

GRUPES RESERVOIR DAM

IV) SUMMARY AND COMMENTS

1) TEST FLOOD = PMF ≅ 16300 CFS
(PARALLEL COMPUTATIONS HAVE BEEN MADE FOR ½ PMF ≅ 8150 CFS AND ARE ALSO SUMMARIZED BELOW)

2) PERFORMANCE AT PEAK FLOOD CONDITIONS:
a) PEAK INFLOWS: Q_1 = PMF ≅ 16300 CFS Q'_1 ≅ ½ PMF ≅ 8150 CFS
b) PEAK OUTFLOWS: Q_{P3} ≅ 16000 CFS Q'_{P3} ≅ 7900 CFS
c) SPILLWAY CAPACITY:
i) TO FIRST LOW POINT (ROAD DEPRESSION); (H ≅ 2.6'): $(Q_S)_1$ ≅ 810 CFS
OR, (±) 5.1% OF (Q_{P3}) AND (±) 10% OF (Q'_{P3})
ii) TO TOP OF DAM (ASSUMING NO ROAD OVERFLOW); (H = 5.2'): $(Q_S)_2$ ≅ 2900 CFS
OR, (±) 18% OF (Q_{P3}) AND (±) 37% OF (Q'_{P3})
(INCLUDING ROAD OVERFLOW): (H = 5.2'): $(Q_{S,R})_2$ = 6300 CFS OR,
(±) 39% OF (Q_{P3}) AND (±) 80% OF (Q'_{P3})
iii) TO PMF SURCHARGE (H_3 ≅ 7.3'): $(Q_S)_3$ ≅ 4900 CFS OR, (±) 31% OF (Q_{P3})
(INCL. ROAD OVERFLOW): (H_3 ≅ 7.3'): $(Q_{S,R})_3$ ≅ 14300 CFS OR, (±) 89% OF (Q_{P3})
(½ ROAD OVERFLOW): (H_3^* ≅ 8.5'): $(Q_S^*)_3$ ≅ 6200 CFS OR, (±) 39% OF $(Q_P^*)_3$
iv) TO ½ PMF SURCHARGE (H'_3 ≅ 5.6'): $(Q'_S)_4$ ≅ 3300 CFS OR, (±) 42% OF (Q'_{P3})
(INCL. ROAD OVERFLOW): (H'_3 ≅ 5.6'): $(Q'_{S,R})_4$ ≅ 7700 CFS OR, (±) 97% OF (Q'_{P3})
(½ ROAD OVERFLOW): ($H_3'^*$ ≅ 4.9'): $(Q_S^*)_4$ ≅ 4500 CFS OR, (±) 57% OF $(Q_P'^*)_3$

THEREFORE, AT TEST FLOOD Q_P = PMF, THE DAM IS OVERTOPPED TO A DEPTH OF (±) 2.1' (WS (2) ELEV. 301.0' NGVD) OR, TO A SURCHARGE OF (±) 2.3' ABOVE THE PRINCIPAL SPILLWAY CREST ELEV. 293.7' NGVD. ½ THE ROAD OVERFLOW. THE SURCHARGE WILL BE (±) 8.5' AND THE CORRESPONDING OVERTOPPING OF THE DAM WILL BE (±) 3.3' (WS ± ELEV. 302.2' NGVD)

SIMILARLY, AT Q'_P = ½ PMF, THE DAM IS OVERTOPPED (±) 0.4' (WS (2) EL. 299.3' NGVD)

GRIFFES RESERVOIR DAM

2,C-(Cont'd) SUMMARY AND CONCLUSIONS

OR, TO A SURCHARGE OF (±)5.6' ABOVE THE PRINCIPAL SPILLWAY CREST. W/O THE ROAD OVERFLOW, THE SURCHARGE WILL BE (±)6.9' AND THE CORRESPONDING OVERTOPPING OF THE DAM WILL BE (±)1.7' (W.S. ELEV. 300.6' NGVD)

3) DOWNSTREAM FAILURE CONDITIONS:

a) PEAK FAILURE OUTFLOW: $Q_p \doteq 24500$ CFS (W/O ROAD OVERFL. $Q_p^* \doteq 21100$ CFS)

b) FLOOD DEPTH IMMEDIATELY D/S FROM DAM: $Y_o \doteq 12'$

c) CONDITIONS AT THE INITIAL IMPACT AREA D/S FROM DAM (SILVERMINE RIVER)

i) APPROXIMATE STAGE BEFORE FAILURE: $Y_o \doteq 7.3'$ ($Q_o \doteq 6300$ CFS)
W/O ROAD OVERFLOW $Y_s \doteq 5.4'$ ($Q_s \doteq 2900$ CFS)

ii) APPROXIMATE STAGE AFTER FAILURE: $Y_3 \doteq 10.5'$ ($Q_3 \doteq 16900$ CFS)
W/O ROAD OVERFLOW $Y_3^* \doteq 10.1'$ ($Q_3^* \doteq 15100$ CFS)

iii) APPROXIMATE RAISE IN STAGE AFTER FAILURE: $\Delta Y \doteq 3.2'$
W/O ROAD OVERFLOW: $\Delta Y_s \doteq 4.7'$

PRELIMINARY GUIDANCE

FOR ESTIMATING

MAXIMUM PROBABLE DISCHARGES

IN

PHASE I DAM SAFETY

INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

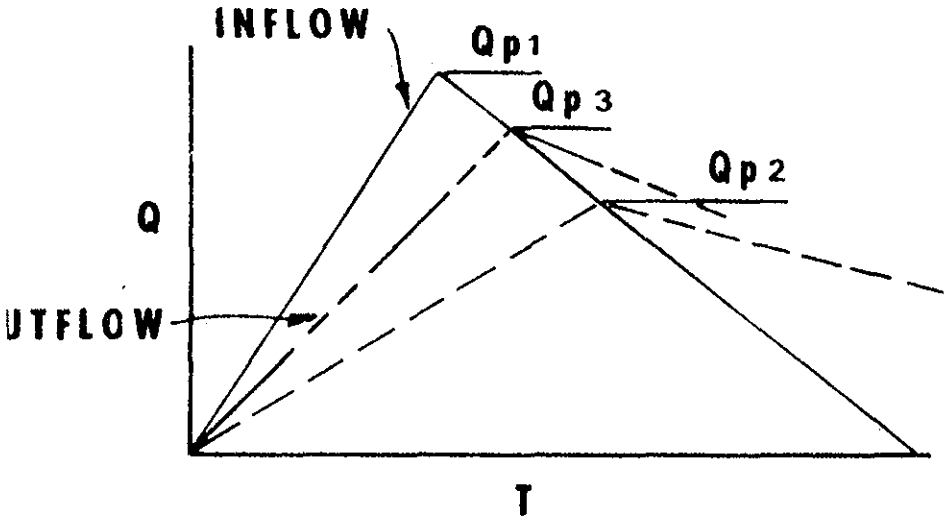
MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
3.	Thomaston	158,000	97.2	1,625
4.	Northfield Brook	9,000	5.7	1,580
5.	Black Rock	35,000	20.4	1,715
6.	Hancock Brook	20,700	12.0	1,725
7.	Hop Brook	26,400	16.4	1,610
8.	Tully	47,000	50.0	940
9.	Barre Falls	61,000	55.0	1,109
10.	Conant Brook	11,900	7.8	1,525
11.	Knightville	160,000	162.0	987
12.	Littleville	98,000	52.3	1,870
13.	Colebrook River	165,000	118.0	1,400
14.	Mad River	30,000	18.2	1,650
15.	Sucker Brook	6,500	3.43	1,895
16.	Union Village	110,000	126.0	873
17.	North Hartland	199,000	220.0	904
18.	North Springfield	157,000	158.0	994
19.	Ball Mountain	190,000	172.0	1,105
20.	Townshend	228,000	106.0(278 total)	820
21.	Surry Mountain	63,000	100.0	630
22.	Otter Brook	45,000	47.0	957
23.	Birch Hill	88,500	175.0	505
24.	East Brimfield	73,900	67.5	1,095
25.	Westville	38,400	99.5(32 net)	1,200
26.	West Thompson	85,000	173.5(74 net)	1,150
27.	Hodges Village	35,600	31.1	1,145
28.	Buffumville	36,500	26.5	1,377
29.	Mansfield Hollow	125,000	159.0	786
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS
BASED ON TWICE THE
STANDARD PROJECT FLOOD
(Flat and Coastal Areas)

	River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1.	Pawtuxet River	19,000	200	190
2.	Mill River (R.I.)	8,500	34	500
3.	Peters River (R.I.)	3,200	13	490
4.	Kettle Brook	8,000	30	530
5.	Sudbury River.	11,700	86	270
6.	Indian Brook (Hopk.)	1,000	5.9	340
7.	Charles River.	6,000	184	65
8.	Blackstone River.	43,000	416	200
9.	Quinebaug River	55,000	331	330

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Qp_1) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Qp_1".

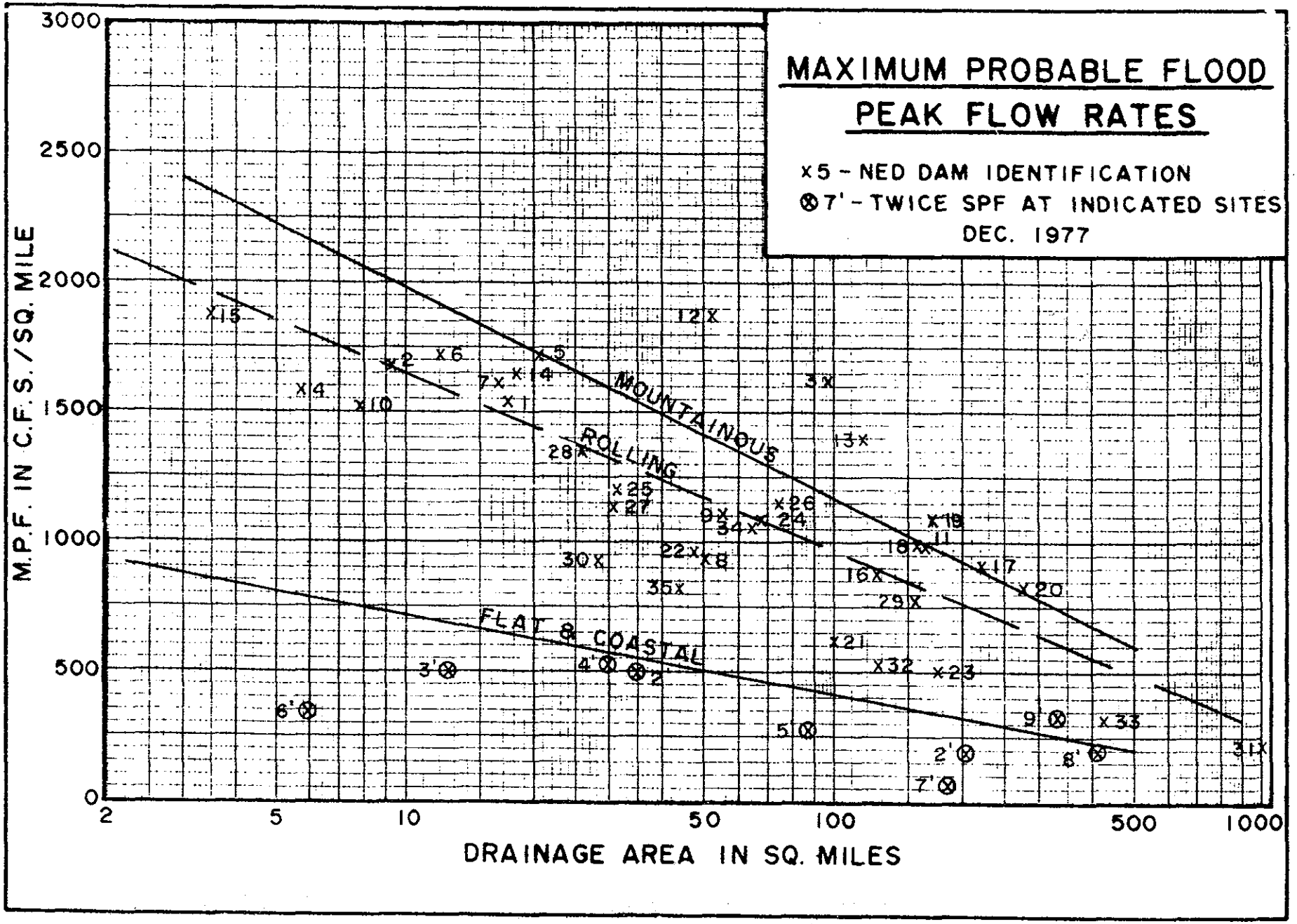
b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Qp_2 = Qp_1 \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Average "$STOR_1$" and "$STOR_2$" and Determine Average Surcharge and Resulting Peak Outflow "Qp_3".


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITES
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
DRAINAGE AREA IN SQ. MILES
3000
2500
2000
1500
1000
500
0
2
5
10
50
100
500
1000
MOUNTAINOUS
ROLLING
FLAT & COASTAL
x15
x4
x10
x2
x6
7x
x14
x1
x5
12x
3x
13x
28x
x25
x27
x26
9x
34x
x24
x19
11
18x
x17
x20
16x
29x
30x
22x
x8
35x
x21
x32
x23
3'⊗
4'⊗
⊗2
6'⊗
5'⊗
9'⊗
x33
2'⊗
8'⊗
7'⊗
31x

SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Avg "$STOR_1$" and "$STOR_2$" and Compute "Qp_3".

c. If Surcharge Height for Qp_3 and "$STOR_{AVG}$" agree O.K. If Not:

STEP 4: a. Determine Surcharge Height and "$STOR_3$" To Pass "Qp_3"

b. Avg. "Old $STOR_{AVG}$" and "$STOR_3$" and Compute "Qp_4"

c. Surcharge Height for Qp_4 and "New $STOR_{Avg}$" should Agree closely

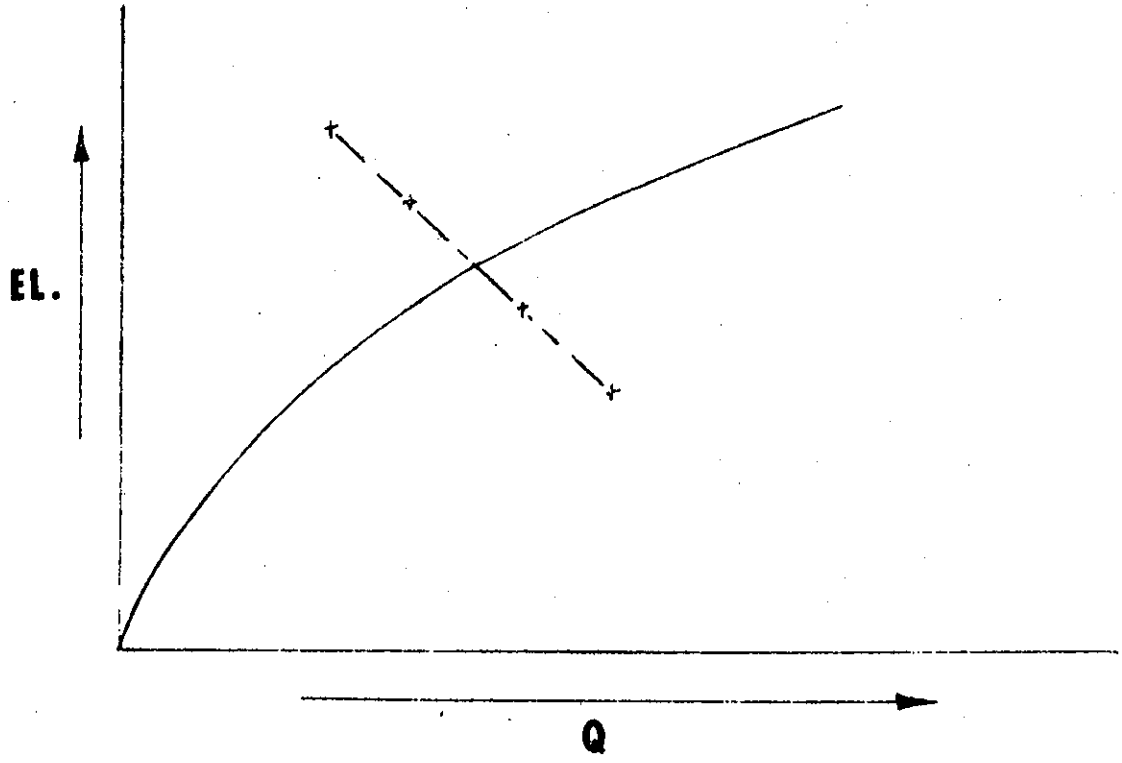
SURCHARGE STORAGE ROUTING ALTERNATE

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR}{19}\right)$$

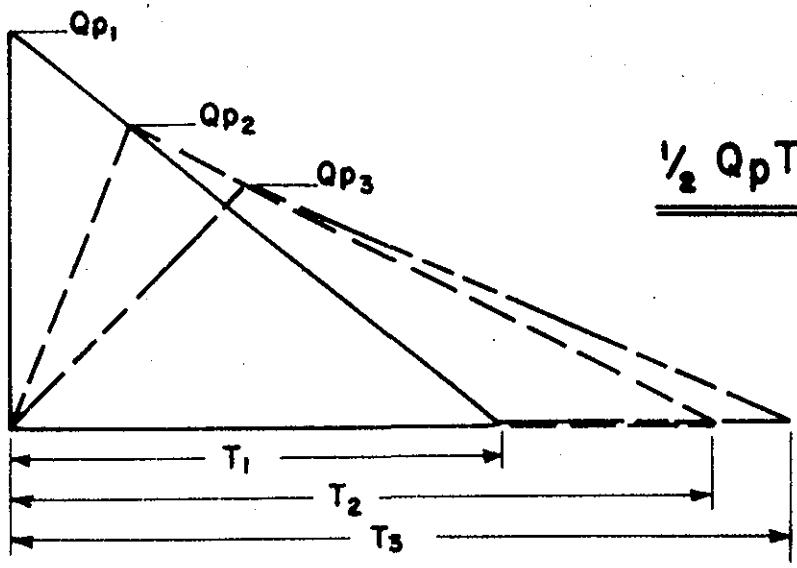
$$Q_{p2} = Q_{p1} - Q_{p1}\left(\frac{STOR}{19}\right)$$

FOR KNOWN Q_{p1} AND 19'' R.O.

Q_{p2}	STOR	EL.



"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$\frac{1}{2} Q_p T = 12 S$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Qp_1 = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Qp_2(TRIAL) = Qp_1 (1 - \frac{V_1}{S})$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Qp_2 = Qp_1 (1 - \frac{V_{AVG}}{S})$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS