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HOUSATONIC RIVER BASIN
DANBURY, CONNECTICUT

EUREKA LAKE DAM
CT 00077

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

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AUGUST, 1979

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The project consists of two earthfill embankments, a spillway with two masonry weirs, and a masonry gatehouse. The upper embankment forms the reservoir dam, and the lower embankment which is 140+ ft. downstream, forms a filter basin between the two dams. The reservoir dam is 18 ft. high, 10 ft. wide at the crest and 250 ft. long and the filter basin dam is 20 ft. high, 280 ft. long and 6 ft. wide at the crest. The reservoir dam has riprap on both slopes whereas the filter basin dam has riprap on the upstream slope and a grass cover on the downstream slope.		

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NATIONAL DAM INSPECTION PROGRAM



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

AUGUST, 1979

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	<u>EUREKA LAKE DAM</u>
Inventory Number:	<u>00077</u>
State Located:	<u>CONNECTICUT</u>
County Located:	<u>FAIRFIELD</u>
Town Located:	<u>DANBURY</u>
Stream:	<u>TRIBUTARY SYMPAUG BROOK</u>
Owner:	<u>TOWN OF BETHEL</u>
Date of Inspection:	<u>MAY 4 and JULY 20, 1979</u>
Inspection Team:	<u>PETER M. HEYNEN, P.E.</u> <u>MIRON PETROVSKY</u> <u>GEORGE STEPHENS</u>

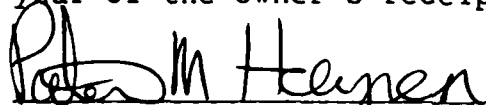
The project consists of two earthfill embankments, a spillway with two masonry weirs, and a masonry gatehouse. The upper embankment forms the reservoir dam, and the lower embankment which is 140+ feet downstream, forms a filter basin between the two dams. The reservoir dam is 18 feet high, 10 feet wide at the crest and 250 feet long and the filter basin dam is 20 feet high, 280 feet long and 6 feet wide at the crest. The reservoir dam has riprap on both slopes whereas the filter basin dam has riprap on the upstream slope and a grass cover on the downstream slope. The spillway extends along the left side of both dams, is 8+ feet wide and has an upper spillway weir adjacent to the reservoir dam and a lower weir adjacent to the filter basin dam. The two weirs are basically stone masonry with concrete sills and are very similar in construction. The spillway channel between the two weirs is separated from the filter basin by a stone masonry retaining wall. The stone gatehouse is located on the downstream slope of the filter basin dam. The outlets are a 12 inch low level outlet and a 6 inch gatehouse floor drain pipe. The low level outlet valve is operable.

Based upon the visual inspection at the site and past performance of the dam, the dam is judged to be in fair condition. No evidence of instability of the embankments or appurtenant structures was observed. There are some areas requiring attention, maintenance and monitoring, such as seepage on the downstream slope and toe of the filter basin dam, substantial erosion on the downstream slope of the filter basin dam near the outlet pipes and excessive seepage from the gatehouse drain pipe. Deterioration of the spillway training wall and lower spillway weir, and obstructions in the spillway channel were noted.

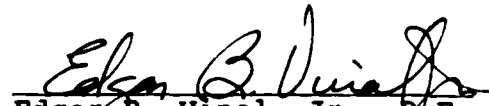
In accordance with Corps of Engineers Guidelines for the size (Small) and hazard (High) classification, the test flood will be equivalent to the Probable Maximum Flood (PMF). Peak inflow to the reservoir is 1200 cfs; peak outflow is 1020 cfs with the reservoir dam overtopped 1.1 feet and the filter basin dam overtopped 0.8 feet. The upper spillway capacity is 29 cubic feet per second (cfs) and the lower spillway capacity is 66 cfs, which is equivalent to 3% and 6% of the routed test flood outflow, respectively.

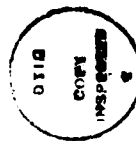
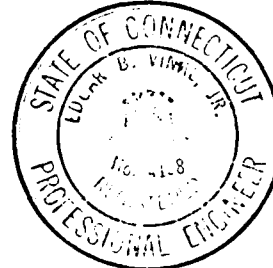
It is recommended that the owner retain the services of a registered professional engineer to perform a more detailed hydraulic/hydrologic analysis to determine the adequacy of the project discharge. Recommendations should then be made by the engineer and implemented by the owner. Attention should also be focused on seepage problems and erosion on the downstream slope of the filter basin dam, extension of the downstream outlets and rehabilitation of the spillway and the spillway channel.

The above recommendations and any 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.



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

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 thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an 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.

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(March 1979)

US ARMY ENGINEER DIV NEW ENGLAND
BOSTON, MASS.

ENGINEERS INC.

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED DAMS

EUREKA LAKE DAM
TR-SYMPANG BROOK

DAM NO.

DATE TAKEN

PHASE I INSPECTION REPORT

EUREKA LAKE 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 March 30, 1979 from John P. Chandler Colonel, Corps of Engineers. Contract No. 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 project is located on a tributary of Sym-paug Brook in a rural area of the town of Danbury, County of Fairfield, State of Connecticut. The dams are shown on the Bethel USGS Quadrangle Map having coordinates latitude N $41^{\circ}21.8'$ and longitude W $73^{\circ}26.3'$.

b. Description of Dams and Appurtenances - The project consists of two earthfill embankments. The upper dam retains the reservoir, and the lower dam which is 140+ feet downstream, forms a filter basin between the two dams. A spillway with two concrete weirs is located to the left end of both embankments.

The reservoir dam is 18+ feet high, 250+ feet long and 10+ feet wide at the crest. The filter basin dam is 20+ feet high, 280+ feet long and 6+ feet wide at the crest. The upstream and downstream slope inclinations for both embankments are approximately 2 horizontal to 1 vertical. Both slopes of the reservoir dam and the upstream slope of the filter basin dam are riprapped. A stone retaining wall with concrete facing is located around the perimeter of the sand filter in the filter basin. This wall is incorporated into the downstream slope of the reservoir dam and the upstream slope of the filter basin dam.

The spillway is 8+ feet long and consists of an upper weir at the reservoir dam, a lower weir at the filter basin dam and a 150+ foot spillway channel between the two weirs. The spillway weirs are similiar in construction, with masonry training walls, a 3 foot wide concrete sill and slots for stop-planks. Only the upper spillway weir has stop-planks installed which are 0.6 feet high. Freeboard between the top of the upper spillway stop-planks and the top of the reservoir dam is 1.2+ feet; freeboard from the top of the lower weir concrete sill to the top of the filter basin dam is 2.1+ feet. The masonry spillway training wall, located on the right side of the spillway, extends the length of the spillway channel and separates the spillway channel and the filter basin.

The gatehouse, on the right side of the downstream slope of the filter basin dam, is a stone masonry structure. A 12 inch tile low-level outlet and a 6 inch steel drain pipe outlet are located 25+ feet downstream of the gatehouse and 22+ feet below the top of the filter basin dam. The low level outlet extends beneath both embankments and the filter basin, serves as a draw-down for the reservoir and is controlled by a valve located at the gatehouse. The 12 inch gate valve is operable.

c. Size Classification - SMALL - The dam impounds 250 acre-feet of water with the reservoir level at the top of the filter basin dam which at elevation 549.8, is 20 feet above the outside limits of the downstream slope. According to the Recommended Guidelines the dam is classified as small in size.

d. Hazard Classification - HIGH - If the dam was to be breached, there is potential for loss of life and extensive property damage at a small housing project located approximately 1800 feet downstream at Reservoir Street.

e. Ownership - Town of Bethel
Town Hall
Library Place
Bethel, CT
First Selectman
(203) 743-9231

f. Operator - Mr. Larry Straiton, (203) 748-4411

g. Purpose - Water Supply

h. Design and Construction History - The following information is believed to be accurate based on the plans and correspondence available. The reservoir embankment was constructed by D.A. Chappell, Contractor, Chicago, in 1878. The filter basin and lower dam were designed and constructed by William B. Ryder & Son, Engineers and Contractors in 1892. In 1976 a new water treatment plant was designed by Cahn Engineers, Inc., Wallingford, Connecticut, and construction was completed in 1978. During the plant construction, the upper gatehouse on the upstream slope of the reservoir dam was removed and the use of the filter basin was discontinued.

i. Normal Operational Procedures - The water level in the reservoir is normally maintained at the upper spillway crest, elevation 548.3. The valve for the low level outlet is normally kept in a closed position. A raw water intake with a trashrack at elevation 533.0 is located at the right end of the dam. This inlet is used for water supply to the filter plant but does not control the water level in the reservoir.

1.3 PERTINENT DATA

a. Drainage Area - 0.48 square miles of moderately steep, relatively undeveloped, wooded terrain.

b. Discharge at Damsite - Discharge is from over the spillway and through the 12 inch low-level outlet located at the downstream slope of the filter basin embankment.

- | | |
|---|---|
| 1. Outlet Works (conduits): | 12inch low level outlet
@ Invert El. 527.3 ₊ |
| 2. Maximum known flood @
damsite: | N/A |
| 3. Lower spillway capacity
@ top of filter basin dam
el. 549.8: | 66 cfs. |
| Upper Spillway Capacity
@ top of reservoir dam
el. 549.5: | 29 cfs. |
| 4. Lower spillway capacity
@ test flood el. 550.6: | 110 cfs. |
| Upper Spillway capacity
@ test flood el 550.6: | 76 cfs. |
| 5. Gated spillway capacity @
normal pool el.: | N/A |
| 6. Gated spillway capacity @
test flood el.: | N/A |
| 7. Total spillway capacity @
test flood el.: | N/A |
| 8. Total project discharge @
test flood el. 550.6: | 1020 cfs. |
| c. <u>Elevations</u> (Feet Above Mean Sea Level) | |
| 1. Streambed @ centerline of dam: | N/A |
| 2. Maximum tailwater: | N/A |
| 3. Upstream portal invert
diversion tunnel: | N/A |
| 4. Recreation pool: | N/A |
| 5. Full flood control pool: | N/A |
| 6. Spillway crest (ungated): | Upper Weir - 548.3 ₊
Lower Weir - 547.7 ₊ |
| 7. Design surcharge (original
design): | N/A |
| 8. Top of dam: | Reservoir dam - 549.5 ₊
Filter basin dam - 549.8 ₊ |

9. Test flood design surcharge: N/A
- d. Reservoir
1. Length of maximum pool: 2300+ 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: 210+ acre-ft.
 4. Top of dam: 250+ acre-ft.
 5. Test flood Pool: 280+ acre-ft.
- f. Reservoir Surface
1. Recreation pool: N/A
 2. Flood control pool: N/A
 3. Spillway crest: 26+ acres
 4. Top of dam: 31+ acres
 5. Test flood pool: 33+ acres
- g. Dams
1. Type: Earthfill embankments
 2. Length: Reservoir dam 250 ft.
Filter basin dam 280 ft.
 3. Height: Reservoir dam 18 ft.
Filter basin dam 20 ft.
 4. Top width: Reservoir dam 10 ft.
Filter basin dam 6 ft.
 5. Side slopes: 2+H to 1+V Upstream
2+H to 1+V Downstream
 6. Zoning: N/A

- 7. Impervious core: Unknown
- 8. Cutoff: N/A
- 9. Grout curtain: N/A
- 10. Other: N/A
- h. Diversion and Regulatory Tunnel - N/A
- i. Spillway
 - 1. Type: Concrete sill
 - 2. Length of weir: Upper 8.0 ft.
Lower 7.8 ft.
 - 3. Crest elevation: Upper 548.3 (0.6' stopplanks)
Lower 547.7
 - 4. Gates: N/A
 - 5. Upstream Channel: Natural reservoir bottom
 - 6. Downstream Channel: Rock
 - 7. General: Right side of spillway is 150' long masonry training wall
- j. Regulating Outlets - Low-Level outlet at the downstream slope of the filter basin embankment.
 - 1. Invert: 427.3±
 - 2. Size: 12"
 - 3. Description: Tile
 - 4. Control Mechanism: Hand operated floor stand
 - 5. Other: N/A

SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Available Data - The available data consists of drawings by the Bethel Water Company, "Report on Water Works" by Thomas M. Riddick, Consulting Engineer and an inspection report by Clarence Blair Associates. Also, there is an inspection report dated July 1975, drawings titled "Eureka Water Treatment Plant" and correspondence concerning these drawings, from Cahn Engineers, Inc.

b. Design Features - The drawings and correspondence indicate the design features stated in Section 1.

c. Design Data - There were no engineering values, assumptions, test results or calculations available for the original construction.

2.2 CONSTRUCTION

a. Available Data - There were no as-built drawings or inspection records available for the construction.

b. Construction Consideration - No information was available.

2.3 OPERATIONS

Lake level readings are taken daily. It is reported that the dam spillway capacity has never been exceeded. No formal operation records are known to exist.

2.4 EVALUATION

a. Availability - Existing data was provided by the Town of Bethel, Cahn Engineers, Inc. and the State of Connecticut Department of Environmental Protection. The owner made the operations 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 final assessment of this dam must be based primarily on visual inspection, performance history, test borings, hydraulic computations of spillway capacity and approximate hydrologic judgements.

c. Validity - A comparison of records, data and visual observation reveals no significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The general condition of the dam is fair. Inspection did reveal some areas requiring maintenance and monitoring. The reservoir level was 549.0+ (May 4, 1979) and 546.5+ (July 20, 1979) and the filter Basin was filled at the time of our inspections.

b. Dam - The dam consists of two earthfill embankments located 140+ feet apart and forming a filter basin. A spillway is located adjacent to the left end of both embankments.

Reservoir Dam

Crest - The crest of the dam has a grass and weed cover. No misalignment, visible depressions or cracks were observed (Photo 1).

Upstream Slope - The slope protection is hand-placed riprap which did not have any visible displacements or areas needing replacement, although there is some vegetation between the stones (Photo 1).

Downstream Slope - The downstream slope inclination and protection is similar to the upstream slope. At the toe of the slope is a 2 foot thick masonry wall which forms the boundary for the sand filter. The downstream slope appeared to be in good condition (Photo 2).

Filter Basin Dam - The dam lies approximately 140 feet downstream of the reservoir dam.

Crest - The crest of the dam was covered with tall grass and weeds. No misalignment, visible settlement or cracks were observed (Photo 3).

Upstream Slope - The upstream slope is similar to the downstream slope of the reservoir dam. The riprap was in good condition, with no sloughing or erosion. Some weeds were noted on the slope (Photo 4).

Downstream Slope - The downstream slope is covered with grass and weeds.

Heavy Brush and trees up to 12 inches in diameter were observed on the slope and the toe of the dam (Photo 5). The lower portion and the toe of the dam were wet and swampy. Several seeps were discovered on the downstream slope. One of the seeps was located approximately 5 to 6 feet from the top of the dam and others were situated at the central portion of the dam 10 to 12 feet from the crest. The seepage flow was varied for each

seep, but was estimated at 0.5 to 3 gallons per minute with a total discharge of 5 to 6 gal./min. Considerable erosion was identified on the downstream slope near the center of the dam. This erosion is caused by discharge from the low level and gatehouse floor drain outlets, and was 6+ feet in depth and 10+ feet in width. Steady flow from the outlets saturates the downstream slope and toe, causing the swampy situation existing in this area.

Spillway - The upper spillway weir had no visible cracks or deteriorations. However, obstructions, such as a small brush and boulders, were observed in the channel between the two weirs. (Photo 7). The right training wall running along the length of this channel had cracks of up to 2 inches in size and deteriorating areas with wash-outs at the bottom of the wall (Photo 8). The sill of the lower weir was almost completely broken up with the right portion washed out (Photo 9). The floor of the downstream spillway channel was covered with rocks and boulders and heavily overgrown (Photo 10). Stop-planks, 0.6 feet high were installed at the upper wier but no stop-planks were installed at the lower weir.

c. Appurtenant Structures - The gatehouse on the downstream slope of the filter basin dam is in good condition (Photo 11). The 12 inch low level outlet pipe and 6 inch gatehouse floor drain had no outlet structure, leaving the area around these pipes exposed to erosion from outlet discharge. The flow from the 6 inch gatehouse floor drain seemed excessive for drainage from the gatehouse only and was measured at 18 to 20 gallons per minute (Photo 12). Flow into the filter basin is from seepage and overflow at the spillway retaining wall, precipitation and possible seepage through the reservoir embankment.

d. Reservoir Area - The shoreline surrounding the pond is heavily wooded and largely undeveloped.

e. Downstream Channel - The downstream channel is undeveloped, steep-sided and wooded to the initial impact area.

3.2 EVALUATION

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

1. Heavy grass, brush and trees on the downstream slope of the filter basin dam impede dam monitoring, accumulate moisture in the dam body which increases seepage and could cause damage if trees overturn during strong winds and/or hurricane conditions.
2. Although, at the present time the seepage through the filter basin dam appears to be stable, it could increase and jeopardize the safety of the embankment.

3. The steady flow from the 6 inch gatehouse floor drain pipe outlet indicates seepage through the filter basin dam. This flow is causing considerable erosion on the downstream slope and saturation of the slope and toe of the filter basin dam. This could result in deformation of the outlet pipe and sloughing of the downstream slope.
4. Obstructions in the spillway channel and the installation of stop-planks in the upper weir decrease the capacity of the spillway, increasing the potential for overtopping of the project.

SECTION 4: OPERATIONAL PROCEDURES

4.1 REGULATING PROCEDURES

The reservoir level readings are taken daily. There is no formal operation procedure known to exist. The low level outlet is operated only to regulate the water level in the reservoir.

4.2 MAINTENANCE OF DAM

The operator reported the grass is cut and brush removed every year on the crest of the reservoir embankment and the right abutment.

4.3 MAINTENANCE OF OPERATING FACILITIES

Maintenance consists of greasing the floor stand and opening the low level outlet valve to regulate the reservoir water level.

4.4 DESCRIPTION OF ANY FORMAL WARNING SYSTEM IN EFFECT

No formal warning system is in effect.

4.5 EVALUATION

The operation and maintenance procedures are generally fair with areas requiring improvement. A formal program of operation and maintenance should be implemented, including documentation to provide complete records for future reference. Also, a formal warning system should be developed and implemented within the time frame indicated in Section 7.1c. Remedial operation and maintenance recommendations are presented in Section 7.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. General - The dam is basically a low surcharge storage - high spillage earth embankment. There are two embankments 140+ feet apart which form a filter basin between them. There are also two weirs in the spillway, one located at each dam. The lower dam, or filter basin dam, is slightly higher than the reservoir dam.

b. Design Data - No computations could be found for the original dam construction or subsequent addition of the filter basin dam.

c. Experience Data - No information on serious problem situations arising at the dam was found, and it was reported that the dam has not been overtopped.

d. Visual Observations - There was brush and several boulders in the spillway channel between the two weirs and debris piled up just below the lower spillway weir.

e. Test Flood Analysis - The test flood for this high hazard, small size dam is equivalent to the Probable Maximum Flood (PMF) of 1200 cubic feet per second (cfs). Based upon "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March 1978, peak inflow to the reservoir is equal to the PMF (Appendix D-1); peak outflow is 1020 cfs with the upper dam overtopped 1.2 feet (Appendix D-4). Based upon our hydraulics computations, the lower spillway capacity is 66 cfs and the upper spillway capacity is 29 cfs, which is approximately 6% and 3% respectively, of the routed Test Flood outflow at the top of the lower dam.

f. Dam Failure Analysis - The dam failure analysis is based on the April, 1978 "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs" and the following:

1) The filter basin is no longer in use and the water level in this basin is normally maintained at or near the reservoir level, which will result in a higher hydrostatic head at the filter basin dam than at the reservoir dam.

2) The reservoir dam will be overtopped with the test flood to the top of the filter basin dam.

Considering the larger difference in head at the filter basin dam and the similarity in construction of the two dams, it is assumed that the filter basin dam will fail before the reservoir dam. Then, with the sudden drawdown of the water in the filter basin and the resulting increase in head at the reservoir dam, failure will probably occur at the reservoir dam

very soon after failure of the filter basin dam. Due to the insignificant amount of storage released to the initial impact area at failure of the filter basin dam, the reservoir dam will be used for failure analysis of this project. Based on the above considerations, the peak failure outflow from the reservoir dam breaching would be 7,700 cubic feet per second. A breach of this dam would result in a rise of 7.1 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 1.0 feet just before the breach, to a depth of 8.1 feet just after the breach. The rapid 7.1 foot increase in the water level at the initial impact area would endanger at least 2 houses approximately 1800 feet downstream at Reservoir Street. Also, approximately 1 mile downstream from the dam is the town of Bethel. In this area, there is a good possibility that the increased water level in Sympaug Brook will cause flooding at residences located near the streambed.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - The visual inspections did not reveal any indications of stability problems. There are areas of seepage and considerable erosion on the downstream slope of the filter basin embankment. Substantial obstructions in the spillway channel were observed.

b. Design and Construction Data - There is not enough design and construction data available to permit an in-depth assessment of the structural stability of the dam.

c. Operating Records - The operating records available do not include any indications of dam instability since its construction in 1878.

d. Post Construction Changes - Post construction changes include placement of a new sand filter on the bottom of the filter basin in 1960 and removal of the gatehouse at the reservoir dam in 1977 during construction of the water treatment plant.

e. Seismic Stability - The dam is in Seismic Zone 1 and according to the Recommended guidelines need not be evaluated for Seismic Stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition - Based upon the visual inspection of the site and its past performance, the dam appears to be in fair condition. No evidence of structural instability was observed in the dam or its appurtenances. The filter basin embankment is generally in fair condition with seepage, wet areas and considerable erosion on the downstream slope. Other areas of concern include deterioration of the lower concrete spillway weir, deterioration of the spillway channel right training wall, obstructions on the spillway channel floor, the spillway capacity and the lack of scheduled and continuous maintenance.

Based upon "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March, 1978, peak inflow to the reservoir is 1200 cubic feet per second; peak outflow (Test Flood) is 1020 cubic feet per second with the dam overtopped. Based upon our hydraulics computations, the upper and lower spillway capacities are 29 and 66 cubic feet per second, which are equivalent to approximately 3% and 6% of the routed Test Flood outflow, respectively.

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

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

d. Need for Additional Information - There is a need for more information as recommended in Section 7.2.

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 should be performed to determine the adequacy of the project discharge. Recommendations should be made by the engineer and implemented by the owner.
2. A comprehensive inspection of the dam. Items of particular importance are as follows:
 - a. Evaluation of the reservoir dam embankment when the reservoir level is high and the filter basin is empty.

- b. Evaluation of the filter basin embankment when the basin is full. Origin and significance of seepage on the downstream slope of the filter basin dam and through the 6 inch gatehouse floor drain pipe. Instrumentation of the embankment is desirable including installation of piezometers and seepage flow metering devices.
- c. Filling of the large erosion area on the downstream slope of the filter basin dam and extension of the low level and drain pipe outlets past the limits of the embankment slope so as to eliminate future erosion.
- d. Removal of the large trees from the downstream slope and toe of the filter basin embankment and filling of the resulting holes under supervision of the engineer.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures - The following measures should be undertaken within the time frame indicated in Section 7.1.c, and continued on a regular basis.

1. Round-the-clock surveillance should be provided by the owner during periods of unusually heavy precipitation or high project discharge. The owner should develop a downstream warning system 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 reference.
3. A comprehensive program of inspection by a registered, professional engineer qualified in dam inspection should be instituted on an annual basis.
4. Erosion area on the downstream slope of the filter basin embankment should be filled and slope protection placed.
5. Outlets for the 12 inch low level and 6 inch drain pipe should be extended out from the toe of the filter basin dam and an outlet structure installed for pipe support.

6. Seepage at the left end and central portion of the downstream slope of the filter basin dam as well as seepage from the 6 inch gatehouse drain pipe should be monitored periodically for measurement of flow rate. The wet area at the downstream toe should be delineated to insure that it does not expand toward the downstream slope.
7. Brush and small trees on the crest, downstream slope and toe of the filter basin embankment should be removed. The cutting of grass on these areas of the dam should be continued as part of the routine dam maintenance.
8. Concrete of the lower spillway weir should be repaired.
9. Right spillway training wall, having numerous cracks and small wash-outs, should be repaired.
10. All obstructions in the bottom and on the slopes of the spillway channel, including rocks, boulders, brush and trees should be removed.

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 Eureka Lake Dam

DATE: May 4 and July 20, 1979

TIME: 2:30 - 4:30 P.M.

WEATHER: 75-85°F, sunny

W.S. ELEV. 5490± (May 4) U.S.

5465± (July 20) U.S.

PARTY:

INITIALS:

DISCIPLINE:

- | | | | |
|----|------------------------|-------------------------------|-----------------------------|
| 1. | <u>Peter M. Heynen</u> | <u>PMH</u> | <u>Cahn Engineers, Inc.</u> |
| 2. | <u>Miron Petrorsky</u> | <u>MP</u> | <u>Cahn Engineers, Inc.</u> |
| 3. | <u>George Stephens</u> | <u>GS</u> | <u>Cahn Engineers, Inc.</u> |
| 4. | <u>Larry Straiton</u> | <u>(Owner Representative)</u> | <u>Town of Bethel</u> |
| 5. | _____ | _____ | _____ |
| 6. | _____ | _____ | _____ |

PROJECT FEATURE

INSPECTED BY

REMARKS

- | | | | |
|-----|--------------------------------------|--------------------|--|
| 1. | <u>Reservoir Embankment</u> | <u>PMH, MP, GS</u> | |
| 2. | <u>Filter Basin Embankment</u> | <u>PMH, MP, GS</u> | |
| 3. | <u>Gate house</u> | <u>PMH, MP, GS</u> | |
| 4. | <u>Outlet Structure</u> | <u>PMH, MP, GS</u> | |
| 5. | <u>Spillway and Spillway Channel</u> | <u>PMH, MP, GS</u> | |
| 6. | _____ | _____ | |
| 7. | _____ | _____ | |
| 8. | _____ | _____ | |
| 9. | _____ | _____ | |
| 10. | _____ | _____ | |
| 11. | _____ | _____ | |
| 12. | _____ | _____ | |

PERIODIC INSPECTION CHECK LIST

Page A-2

PROJECT Eureka Lake Dam

DATE 5/1/79 and 7/20/79

PROJECT FEATURE Reservoir Dam

BY PMH, MP, GS

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	549.5±
Current Pool Elevation	549.0± (5/1/79) and 546.5± (7/20/79)
Maximum Impoundment to Date	Unknown
Surface Cracks	none observed
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	
Indications of Movement of Structural Items on Slopes	none observed
Trespassing on Slopes	none
Sloughing or Erosion of Slopes or Abutments	} none observed
Rock Slope Protection-Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	} N/A
Toe Drains	
Instrumentation System	

PERIODIC INSPECTION CHECK LIST

Page A-3

PROJECT Eureka Lake Dam

DATE 5/4/79 and 7/20/79

PROJECT FEATURE Filter Basin Dam

BY PMH, MP, GS

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	549.8±
Current Pool Elevation	549.5±(5/4/79) and 549.5±(7/20/79)
Maximum Impoundment to Date	unknown
Surface Cracks	none observed
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	
Indications of Movement of Structural Items on Slopes	} none observed
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	D/S slope erosion at outlets
Rock Slope Protection-Riprap Failures	u/s slope riprap, appears good
Unusual Movement or Cracking at or Near Toes	none observed
Unusual Embankment or Downstream Seepage	seepage on left side and central portion of D/S slope, wet area at toe
Piping or Boils	none observed
Foundation Drainage Features	
Toe Drains	} none observed
Instrumentation System	

PERIODIC INSPECTION CHECK LIST

Page A-4

PROJECT Eureka Lake Dam

DATE 5/4/79 and 7/20/79

PROJECT FEATURE Gate House

BY PMH, M.P. GS

AREA EVALUATED	CONDITION
<u>OUTLET WORKS-CONTROL TOWER</u>	<i>Stone masonry structure on d/s slope of filter basin dam</i>
a) <u>Concrete and Structural</u> General Condition Condition of Joints Spalling Visible Reinforcing Rusting or Staining of Concrete Any Seepage or Efflorescence Joint Alignment Unusual Seepage or Leaks in Gate Chamber Cracks Rusting or Corrosion of Steel	<i>appears good</i> <i>N/A</i> } <i>None observed</i> <i>Appears good</i> <i>Some</i> } <i>Not observed</i>
b) <u>Mechanical and Electrical</u> Air Vents Float Wells Crane Hoist Elevator Hydraulic System Service Gates Emergency Gates Lightning Protection System Emergency Power System Wiring and Lighting System	} <i>N/A</i> <i>12" gate valve, operable</i> } <i>N/A</i>

PERIODIC INSPECTION CHECK LIST

Page A-5

PROJECT Eureka Lake Dam

DATE 5/4/79 and 7/20/79

PROJECT FEATURE Outlet Structure

BY PMH, MP, GS

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS-OUTLET STRUCTURE AND</u> <u>OUTLET CHANNEL</u></p>	<p>12" low level outlet and 6" drain pipe on d/s slope of filter basin dam</p>
<p>General Condition of Concrete</p>	<p rowspan="3">} N/A</p>
<p>Rust or Staining</p>	
<p>Spalling</p>	
<p>Erosion or Cavitation</p>	<p>10' x 6' x 4' erosion at pipe outlets</p>
<p>Visible Reinforcing</p>	<p>N/A</p>
<p>Any Seepage or Efflorescence</p>	<p>none observed</p>
<p>Condition at Joints</p>	<p>N/A</p>
<p>Drain Holes</p>	<p>N/A</p>
<p>Channel</p>	
<p>Loose Rock or Trees Overhanging Channel</p>	<p>none observed</p>
<p>Condition of Discharge Channel</p>	<p>Erosion of d/s slope and toe of filter basin dam</p>

PERIODIC INSPECTION CHECK LIST

Page A-6

PROJECT Eureka Lake Dam

DATE 5/4/79 and 7/20/79

PROJECT FEATURE Spillway and Spillway Channel

BY PMH, MP, GS

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u></p>	
<p>a) <u>Approach Channel</u></p>	
<p>General Condition</p>	<p>appears good</p>
<p>Loose Rock Overhanging Channel</p>	<p>none observed</p>
<p>Trees Overhanging Channel</p>	<p>none observed</p>
<p>Floor of Approach Channel</p>	<p>hand placed r.prap, good</p>
<p>b) <u>Weir and Training Walls</u></p>	
<p>General Condition of Concrete</p>	<p>Upper & lower concrete sill with masonry training walls</p>
<p>Rust or Staining</p>	<p>Upper weir - good; lower weir - poor</p>
<p>Spalling</p>	<p>none observed</p>
<p>Any Visible Reinforcing</p>	<p>wash-out of sill at lower weir, cracks in channel right training wall</p>
<p>Any Seepage or Efflorescence</p>	<p>} none observed</p>
<p>Drain Holes</p>	<p>N/A</p>
<p>c) <u>Discharge Channel</u></p>	
<p>General Condition</p>	<p>poor</p>
<p>Loose Rock Overhanging Channel</p>	<p>none observed</p>
<p>Trees Overhanging Channel</p>	<p>some</p>
<p>Floor of Channel</p>	<p>boulders & cracks</p>
<p>Other Obstructions</p>	<p>heavy brush on slopes & floor of discharge channel</p>

APPENDIX B

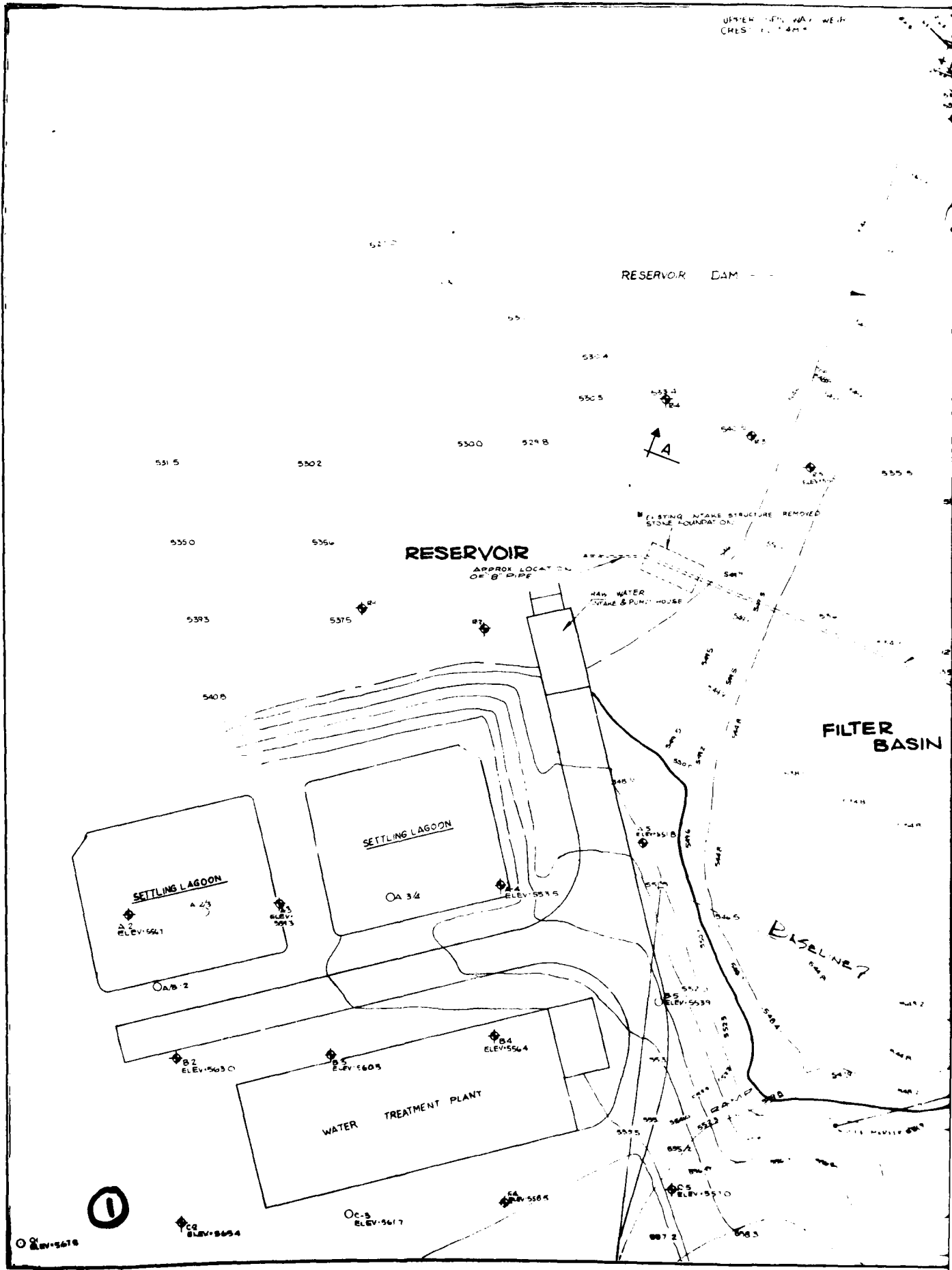
ENGINEERING DATA AND CORRESPONDENCE

UPPER LEFT WALL WEIR
CHES. 1. 1. 4M

RESERVOIR DAM

RESERVOIR

FILTER BASIN



① Elev. 5618

UPPER SPILLWAY WEIR
CREST EL 548.5

APPROX EDGE OF CHANNEL

LOWER SPILLWAY WEIR
CREST EL 547.7

RESERVOIR DAM

MASONRY WA

SEEPAGE

FILTER BASIN DAM

SEEPAGE

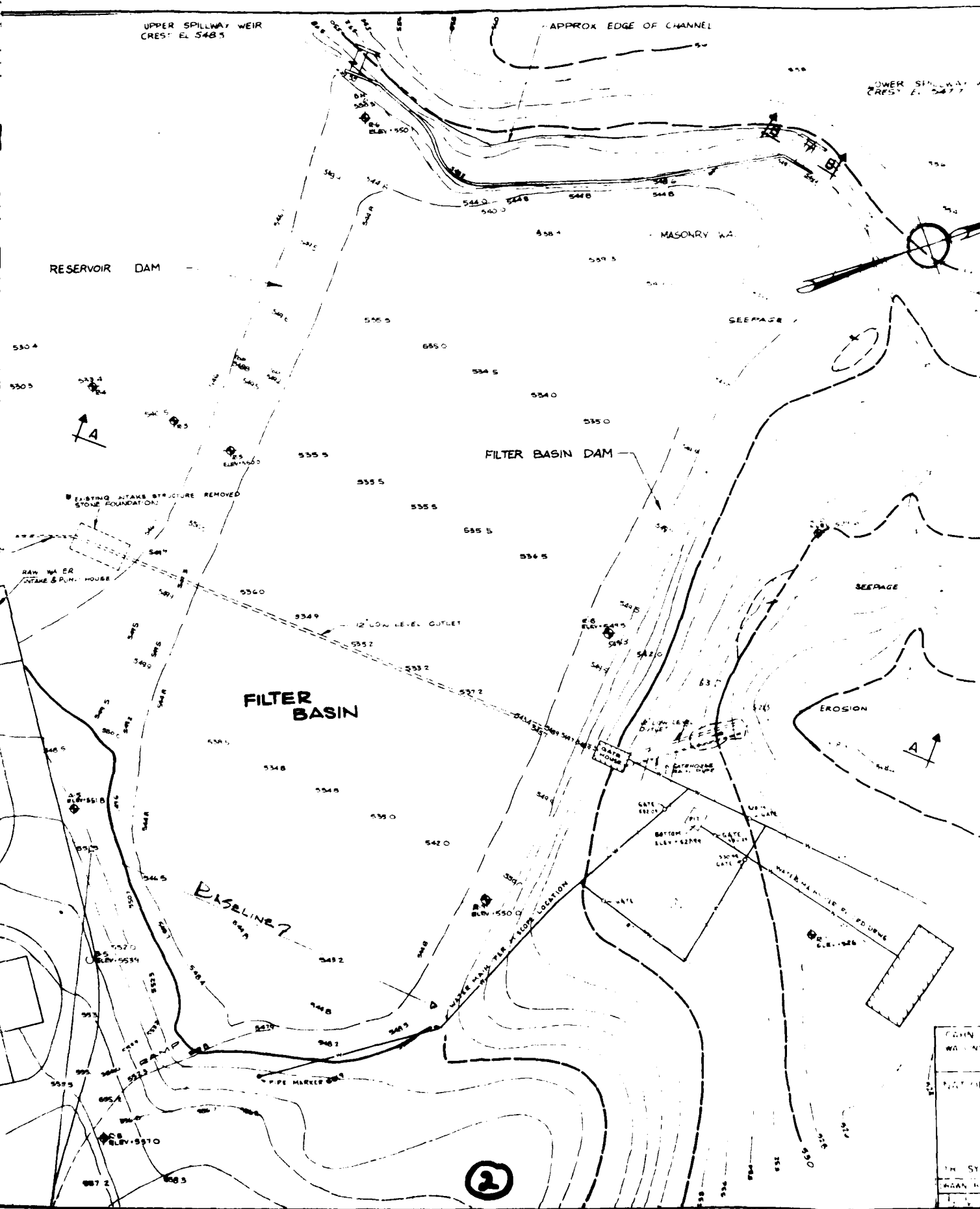
FILTER BASIN

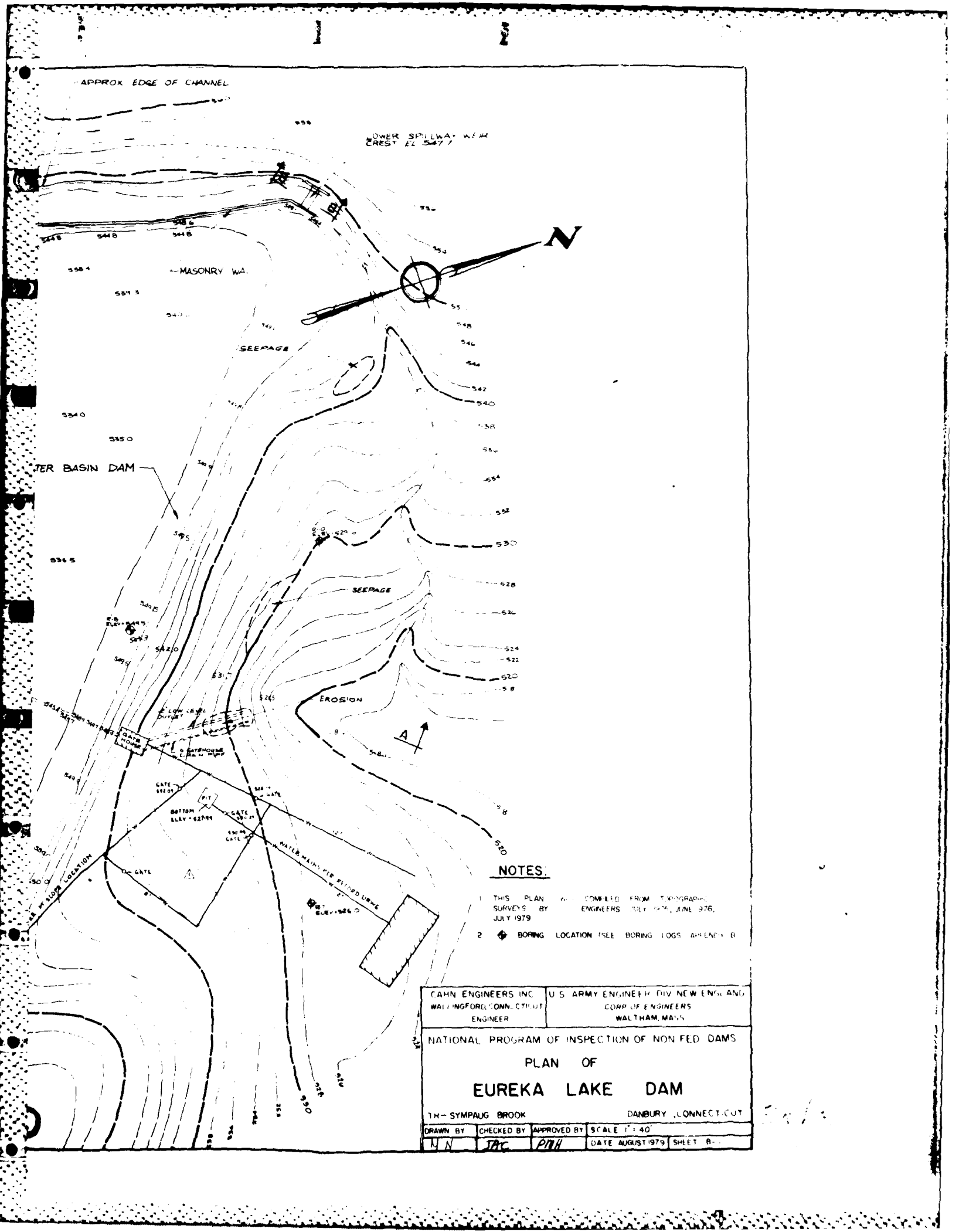
EROSION

BASELINE 7

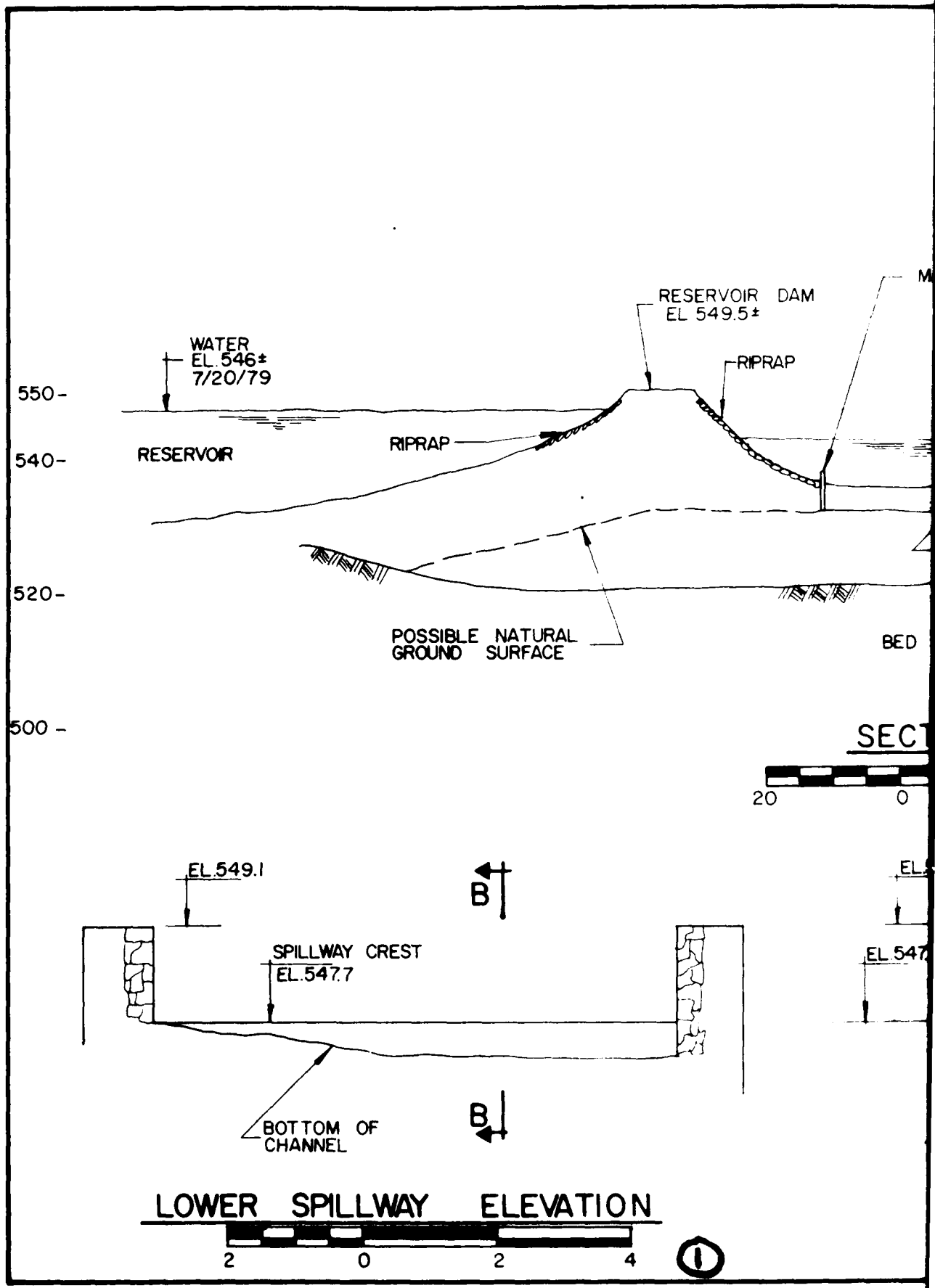
2

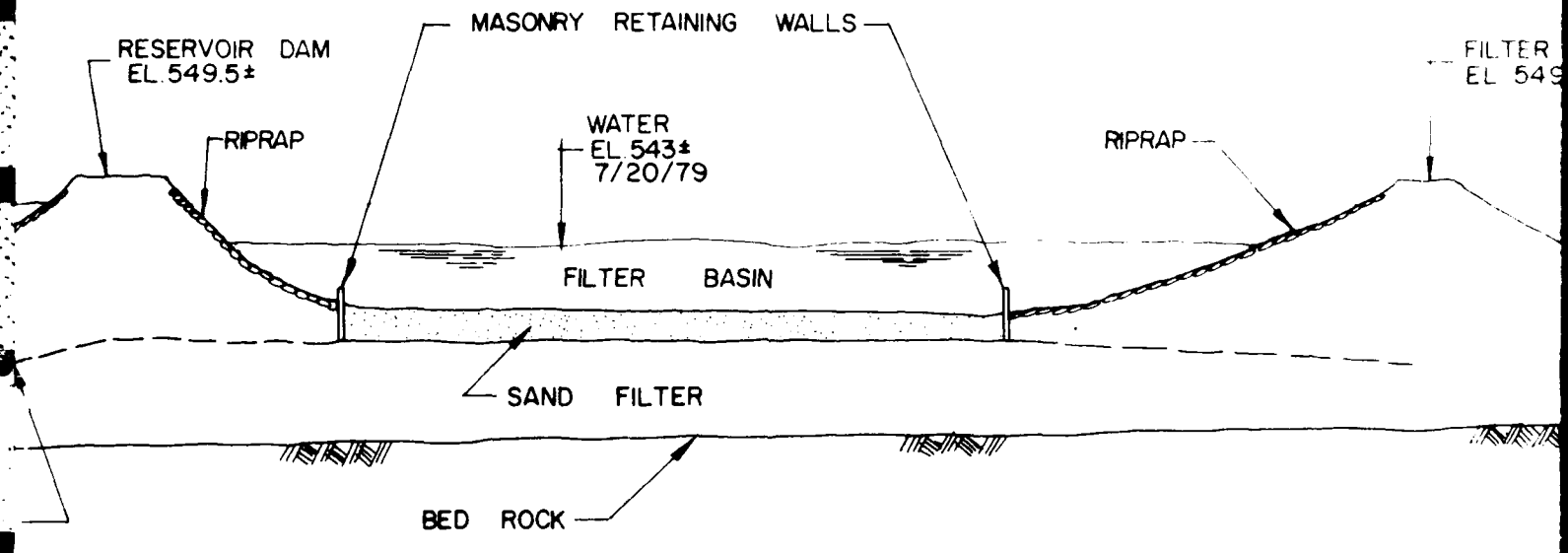
CHIEF ENGINEER
WATER CONTROL ENGINEER
NATURAL
SYMBOL
SCALE
DATE



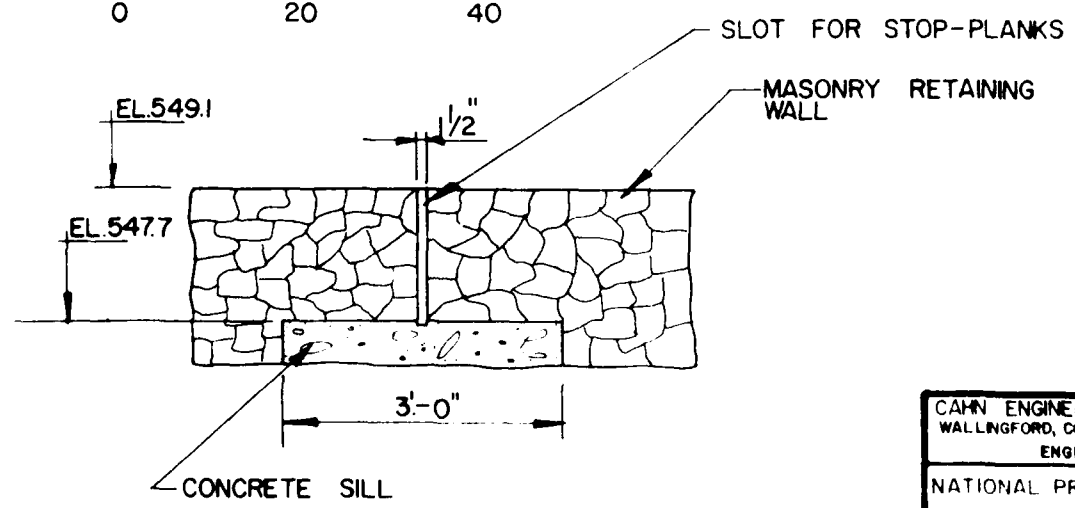


CAHN ENGINEERS INC WALLINGFORD, CONNECTICUT ENGINEER	U.S. ARMY ENGINEER DIV NEW ENGLAND CORP OF ENGINEERS WALTHAM, MASS
NATIONAL PROGRAM OF INSPECTION OF NON FED DAMS	
PLAN OF EUREKA LAKE DAM	
TH - SYMPAUG BROOK DANBURY, CONNECTICUT	
DRAWN BY JAN	CHECKED BY JBC
APPROVED BY PTH	SCALE 1" = 40'
DATE AUGUST 1979	SHEET R-1





SECTION A-A



SECTION B-B

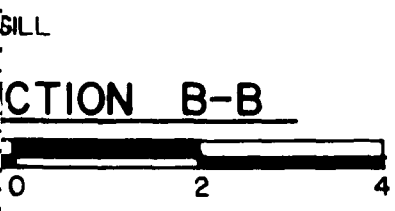
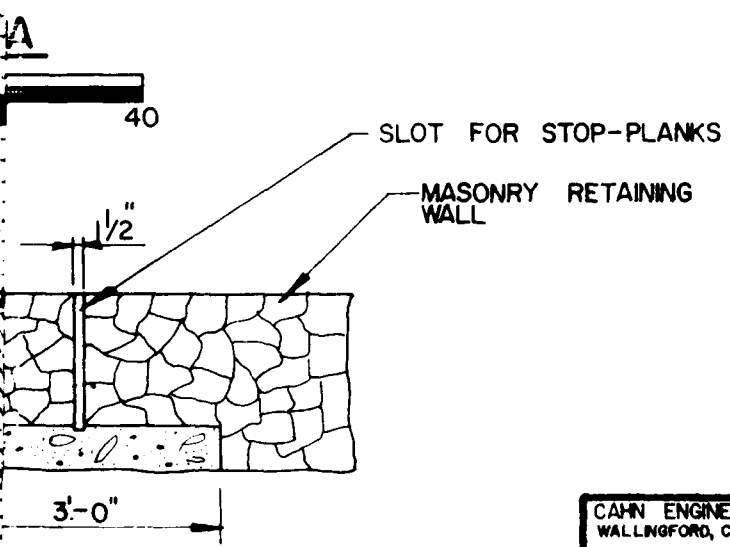
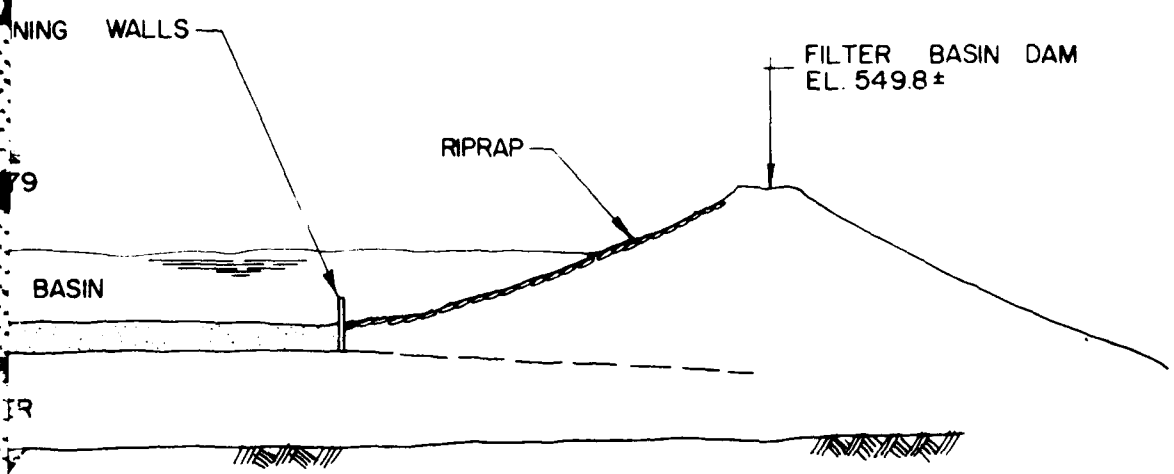


SECTION



CAHN ENGINEERS INC WALLINGFORD, CONNECTICUT ENGINEER		U.S. A
NATIONAL PROGRAM OF INSPECTION SECTIONS AND SPILLWAYS		
EUREKA LAKE		
TR-SYMPAUG BROOK		
DWN BY H. V.	CKD. BY G. E.	APP. BY P. W. DA

②



2

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 SECTIONS AND SPILLWAY ELEVATION			
EUREKA LAKE DAM			
TR-SYMPAUG BROOK		DANBURY, CONNECTICUT	
DWN. BY H. N.	CKD. BY [Signature]	APP. BY P. M.	SCALE: AS NOTED
		DATE: AUGUST 1979 SHEET B-2	

EUREKA LAKE DAM

EXISTING PLANS

"Plan and Lands"
The Bethel Water-Works (1891)
W.B. Rider, C.E.
2 sheets

"Slow Sand Filter"
Bethel, Conn. (Aug., 1960)
The Henry Souther Engineering Co.
Laurel St., Hartford, Conn.
1 sheet

"Pumping Station"
Bethel Water Dept. (Oct., 1962)
1 sheet

"Eureka Water Treatment Plant"
Town of Bethel, Conn.
Cahn Engineers, Inc.
Wallingford, Conn. (June 1976)
20 sheets

"Dam Inspection"
Town of Bethel, Conn. (July, 1975)
Cahn Engineers, Inc.
Wallingford, Conn.
2 sheets

SUMMARY OF DATA AND CORRESPONDENCE

<u>Date</u>	<u>To</u>	<u>From</u>	<u>Subject</u>	<u>Pg.</u>
July, 1947	Water Department Bethel, Conn.	Thomas M. Riddick, Consulting Engineer	Report on Water Works	B-3
Feb. 11, 1966	State of Connecticut Water Resources Commission	Clarence Blair Ass. Civil and Sanitary Engineers	Inspection Report	B-15
Sept. 18, 1975	Town of Bethel	Cahn Engineers, Inc. Consulting, Engineers	Inspection Report	B-19
March 28, 1977	Mr. Victor Galgowski Water Resources Unit Department of Environmental Protection	Cahn Engineers, Inc. Consulting Engineers	Construction at dam	B-59
March 28, 1977	Department of Environmental Protection, Water and Related Resources	Town of Bethel	Construction Permit	B-61

RECEIVED

AUG 8 1979

CAHN ENGINEERS

WATER DEPARTMENT
BETHEL, CONNECTICUT

REPORT ON WATER WORKS

SELECTMEN

Frederick H. Judd
Thomas C. Mannion
Edgar C. Platt, Sr.

BOARD OF FINANCE

Harold B. Senior
E. Ambrose English
Frank Mannion
George F. Carroll
Neil Lamond
Andrew Weber

THOMAS M. RIDDICK
Consulting Engineer
369 East 149th Street
New York City

July, 1947

B-3

NEED FOR CURRY

A complete and comprehensive Water Works Survey has long been needed in Bethel.

Most of the distribution system was laid between 1878 and 1890, and with the exception of transmission lines, practically all piping was four inches in size. Although carrying capacity was adequate for domestic use at the time it was laid, these pipelines have now corroded and tuberculated to such an extent that carrying capacity has been reduced more than fifty per cent. Pressures on the distribution system are inadequate for domestic consumption during times of high rates of flow, and from the standpoint of fire protection, this four inch piping offers only a false sense of security, regardless of static pressures.

The original (Eureka source) was well selected, and its use as the main supply should be continued. The yield of the watershed has been fully developed by two impounding reservoirs. For the past ten years supply has been equal only to normal consumption. Today water usage has so increased that a dry year (of say 35 inches rainfall) would produce a very serious water shortage. Several new factories have recently been connected to the distribution system, and a few additional are contemplated. These will impose a still greater burden on the Eureka System.

Copy available to DTIC does not
permit fully legible reproduction

The problem today is threefold. First, there is a need to increase the supply sufficiently to provide for all normal demands during dry years for the period of bond issue (say 25 to 30 years); second, to revamp the distribution system and to replace most of the existing four inch mains with larger sizes of pipe; and third, to improve the general quality of water delivered to consumers, if possible.

HISTORY OF WATER DEPARTMENT

The Bethel Water Department was formed under a Charter granted by the January session of the Connecticut Legislature in 1878, and approved by the Borough of Bethel on April 10th of the same year.

A report was made on May 13, 1878, by Mr. D.G. Penfield, Engineer, in which he estimated the cost of construction of Eureka Dam, transmission main to the Borough, Distribution System, etc., at \$26,141.00.

Bonds were issued on September 2, 1878, in the amount of \$25,000.00, and a contract for \$23,000.00 was awarded on June 10, 1878 to D. A. Chappell, Contractor (Chicago) for this construction.

In 1880 the Second Annual Report states that the distribution mains (which probably included supply mains) totaled about five miles, with 26 hydrants.

By 1891 the distribution system (and probably the supply system) totaled eleven miles, with 63 hydrants.

The likelihood of a water shortage arose in 1893. To augment Eureka Reservoir, a channel was opened from Mountain Pond, which permitted the drawing down of this source some three feet below the spillway level.

In 1878 a crude system of filtration was adopted. Sponges (and charcoal for taste improvements) were placed in the original gate house. This installation soon proved inadequate, and in 1892 a contract was let to William B. Ryder & Son, Engineers and Contractors, for the construction of the Eureka Slow Sand Filters, at a cost of approximately \$3,000. The contract called for the erection of a second dam across the valley (upper dam constructed 1878) just below that of the existing Eureka Dam.

Another water shortage in 1892 necessitated the purchase of a pump for Mountain Pond Reservoir, which was evidently below the level from which they could draw by gravity.

In 1893 a contract was let to Peter Sweeney for the construction of a pipeline from Mountain Pond to Eureka Reservoir, presumably to replace the existing channel.

The highway at Eureka Reservoir was abandoned in 1894 and a new road located. Considerable land lying between the road and the reservoir, and in the vicinity of Mountain Pond was purchased.

By 1901 the capacities of Hatch and Mountain Pond Reservoirs were inadequate. A contract was awarded to E. T. Andrews for the construction of a dam at Mountain Pond to further increase the storage of this collecting reservoir.

It became necessary in 1903 to provide water at sufficient pressure to supply Hoyts Hill and other areas situated at a relatively high elevation. An Artesian Well was drilled at a cost of approximately \$1,100. This well failed to develop the required yield as the location (on Hoyts Hill) was very poor since it had no appreciable drainage area.

Further sources were investigated, and in 1910 a dam was constructed at Wolf Swamp, impounding what is now known as Chestnut Ridge Reservoir. The contract was let to J. Boss for approximately \$33,000, and included 5329 feet of pipe - principally 18" size.

Another pump was purchased in 1912, probably for use at Mountain Pond, when the elevation of this reservoir dropped below that of gravity flow.

The raw Chestnut Ridge Reservoir water has always been of poor physical and chemical quality. Color ranges from 50 to 100 ppm, and iron from about 0.4 to 1.0 ppm. In an attempt to improve the quality of this water, pressure filters were installed at the Chestnut Ridge Reservoir in 1913, at a cost of approximately \$5,800.

These units did not effectively treat this water, and in 1926 and 1927, a Rapid Sand Filtration Plant was constructed, costing approximately \$18,000.

In 1933 the Eureka Slow Sand Filter, long overloaded, was enlarged at a cost of approximately \$2,500, and a Venturi Meter (approximately \$1,200) was installed on the transmission main from Eureka Reservoir.

The rapid sand filtration plant (Chestnut Ridge) was designed with a rated capacity of 100,000 gallons per day. Filter units were built in duplicate - 100,000 g.p.d. each, and the coagulation basin had a detention of four hours at 100,000 g.p.d., or two hours at 200,000 g.p.d. Due to increased water usage on the high service district, the capacities of the coagulation and clear water basins were insufficient, and additional basins were constructed in 1936 at a cost of approximately \$6,500.

In 1946 the Connecticut State Department of Health ordered the installation of a Chlorinator at the Chestnut Ridge Plant. Plans and Specifications were prepared by me for the work, and also for the badly needed general plant renovation. A Chlorinator was temporarily installed in the Filter Building, but the required renovation was deferred.

A threatened water shortage in late 1946 and early 1947 necessitated a general survey of the entire water system.

Your water collecting, treatment, and distribution facilities are as follows:

2. Raw Service Systems

A. Mountain Pond

Mountain Pond is essentially a small collecting reservoir situated on the Eureka watershed. The elevation of the spillway is approximately 390 feet and drainline 370 feet. This reservoir impounds approximately 64 million gallons, which are available by gravity, and an additional 10-20 million gallons may be discharged to Eureka Reservoir by pumping. The drainage area is 0.17 square miles, of which 12 per cent is water surface. Storage amounts to 426 million gallons per square mile of land surface, which is more than ample for the size of the catchment area. The reservoir is relatively deep (15 feet average) and this factor prevents the creation of tastes and odors due to algae or weed growths. Average yield is estimated at 0.16 M. G. D.

B. Eureka Reservoir

Eureka Reservoir impounds approximately 68 million gallons with overflow level at elevation 551 feet. The drainage area is 0.31 square miles, of which 13 per cent is water surface. Storage amounts to 259 million gallons per

square mile of land surface, and reservoir depth averages about 5 feet. This classifies this reservoir as being relatively shallow and tastes and odors are often present in the water due to growths of algae and weeds. This condition is accentuated in the late summer and fall months when the reservoir level may drop from 3 to 5 feet. Average yield is estimated at 0.26 M.G.D.

Mountain Pond is generally retained as a reserve supply, so as to maintain as high an operating level as possible in the Eureka Reservoir.

The combined drainage areas total 0.46 square miles and provides a storage of 132 M. G. This is equivalent to a storage of 314 M. G. per square mile of land surface, which is adequate for the watershed. A value of approximately 250 is considered satisfactory, and 400 (M.G.D. per square mile of land surface) is high.

These reservoirs are sufficiently large to accommodate an additional drainage area (land surface) of 0.11 square miles at a rating of 250 M. G. per square mile, 0.24 square miles at a rating of 300, or 0.46 square miles at a rating of 150.

The safe yield under these conditions is estimated as follows:

<u>Drainage Area</u> <u>Sq. Mi. Land Surface</u>	<u>Storage</u> <u>M.G. (24 Hr. Yield)</u>	<u>Average Yield</u> <u>M. G.D.</u>
0.42	314	0.42
0.53	250	0.51
0.66	200	0.61
0.66	100	0.72
1.32	100	0.99

It is obvious therefore, that by adding approximately 0.5 square miles of additional drainage area, the safe yield would be raised from 0.42 to 0.72 M.G.D., or an increase of 0.30 M.G.D., or 70 per cent.

This is of interest from the standpoint of increasing the yield of Eureka watershed by transfer of water from adjoining drainage areas (Kellogg property, West Redding Brook, Symeug, etc.). It must be borne in mind, of course, that the above values are based on developing the full yield of the added watershed - by storage or pumpage of all surface run-off.

C. Eureka Slow Sand Filters

There are two Slow Sand Filters at Eureka Reservoir, each having an approximate surface area of 3500 square feet. The combined area is therefore 0.16 acres. The capacity of these Filters, at a rating of 5.0 M. G. per acre per day, is therefore 800,000 G.P.D., which is almost twice the average yield of Mountain Pond and Eureka watersheds. These Filters have very small storage basins, however, (5000 gallons or 10 minutes detention at

peak rate of consumption). Hence, they are operated during times of peak flow at a rate of 1.25 M.G.D. or at a filter rating of about 8 M.G./acre/day, which is excessive.

Additional filters would be costly to construct since there is no available site capable of economical development. This condition could be considerably improved by the construction of a storage basin and installation of a rate controller. The capacity of this basin would have to be at least 100,000 gallons, however, and it would involve considerable expense.

Another needed improvement is the installation of a partition wall between the filters, so that one unit could remain in service when the other was being cleaned. This improvement, however, should be held in abeyance for several years until the filters are rebuilt.

D. Chlorinating Station

A W & T Automatic Chlorinator is housed in a small frame structure, built over the transmission line from Eureka Reservoir. A Venturi Meter and Recorder are also located here.

The original building burned down and the new structure has been damaged twice by soot from the oil-burning stove.

It would be advisable to replace this building with a well insulated brick structure, and to heat it during the winter electrically. To prevent damage resulting from chlorine leaks, the building should be divided into

two sections, one to house the chlorine cylinders, and the other for the chlorinator and rate of flow recorder.

2. High Service System

A. Chestnut Ridge Reservoir

This reservoir has a drainage area of 3.61 square miles, of which 16 per cent is water surface. A dam provides 33 M.G. of storage and an average depth of 8 feet. Like Bureka Reservoir, this shallow depth fosters growths of algae and weeds, which sometimes impart a disagreeable taste and odor to the water. The average yield is estimated at 0.27 M.G.D., which is greater than consumption on the High Service District. The reservoir, therefore, is normally maintained at a high level.

The physical and chemical qualities of this water are very bad, due to high color, high iron, and low alkalinity. In the light of present knowledge it is doubtful that this source of supply should have been selected.

B. Chestnut Ridge Rapid Sand Filtration Plant

The poor quality of Chestnut Ridge water has always been a source of trouble. Pressure filters were installed three years after the dam was erected but they were not able to properly treat this water. They were replaced by a Rapid Sand Filtration Plant (present capacity 0.2 M.G.D.) in 1930, but since there was no electric power at the site,

this plant had to be designed for semi-automatic operation, which is impractical for so small a Water Works. Today the plant is badly in need of renovation and enlargement. An aerator is required, the filters need complete rebuilding, rate controllers should be replaced, the existing chlorinator and hydraulic pumps should be properly located in an extension to the building. A Venturi Meter and Recorder are required for measurement of flow, a washwater pump is required for backwashing filters, and a new filter unit is necessary.

The cost of this work is estimated at about \$25,000.

Even with these improvements and the added facility of electric power (now on hand) this plant will still be difficult to operate on a part-time basis, and it is entirely too small for employment of three shifts of operators. Under these conditions no great improvement in the quality of water delivered to consumers can be assured, and the recent requirement (by the State Health Department) of continuous chlorination has and will continue to result in occasional periods when chlorinous tastes will be imparted to the water.

This plant can be more economically abandoned and held for emergency use, than renovated.

CLARENCE BLAIR ASSOCIATES

Civil and Sanitary Engineers

93 WHITNEY AVENUE

P. O. BOX 236

NEW HAVEN, CONNECTICUT 06502

TEL 777-7379

CHARLES E. AUGER, JR.
JOHN M. BREST
DONALD L. DISNEY
NICHOLAS PIPERAS, JR.

GER C. BROWN
JAMES C. BEACH
FRANK RAGAINI

CLARENCE M. BLAIR
(1906-1944)

RECEIVED
MAY 18 1975
CIVIL ENGINEERS

(344)

February 11, 1966

STATE WATER RESOURCES
COMMISSION
RECEIVED
FEB 24 1966
ASSIGNED _____
REFERRED _____
FILED _____

State of Connecticut
Water Resources Commission
State Office Building
Hartford 15, Connecticut

Re: EUREKA LAKE DAM
DANBURY, CONNECTICUT

Gentlemen:

Herewith is my report on Eureka Lake Dam in the Town of Danbury, Connecticut.

1. IDENTIFICATION

This report was made at the request of Mr. William P. Sander in a letter dated May 25, 1965.

An inspection of the structure was made by the writer and an assistant engineer on October 21, 1965.

A survey and profiles of the spillways were made on July 6, 1965.

The dam is located in the Town of Danbury, adjacent to the Danbury-Bethel town line on a tributary of Sympaug Brook and about 1.5 miles south westerly of the center of Bethel, at

Latitude 41-21-50

Longitude 73-26-15

The owner is the Village of Bethel Water Department.

2. FACTORS OF HAZARD

The valley downstream from the dam is narrow and has a steep gradient for about 0.3 of a mile.

A highway crosses the valley about 200 feet below the dam and another one about 1700 feet below.

Failure of the dam would undoubtedly cause considerable damage to both of these highways. There are no dwellings that are considered to be in a hazardous location. Below the second highway the stream enters a relatively wide, swampy, flood plain.

The reported capacity of the lake is 68 million gallons.

A possible hazard to this dam is the existence 3000 feet upstream of Mountain Pond Dam, subject of another report under this date.

Mountain Pond Dam stores about 64 million gallons and if it gave way during flood flow conditions it might tax the overflow capacity of Eureka Lake Dam.

However, Mountain Pond Dam is an earth dam and would probably release its storage slowly.

3. STRUCTURE

Eureka Lake Dam is an earth dam 250 feet long and approximately 30 feet high. Top width is 12 feet. The upstream slope is riprapped.

A filter basin has been constructed against the downstream slope of the dam by the construction of another embankment across the valley about 100 feet downstream from and parallel to the main dam. The top of this downstream embankment is 0.25 higher than the main dam. Water level in the filter basin was 2 inches lower than in the main lake at the time of our inspection.

The main dam has a spillway at its west end which discharges into a spillway channel extending along the west side of the filter basin to a point below the downstream embankment. The spillway on the main dam is 8 feet wide and the freeboard from the weir to the top of the embankment is 1.67 feet.

The filter basin is separated from the spillway channel by a masonry wall. This wall forms an overflow for the filter basin, with a freeboard of 1.75 feet to the top of the downstream embankment and about 80 feet long.

Some seepage was visible along the toe of the downstream slope of the downstream embankment. This was not sufficient to be considered a potential hazard.

In general, this dam and its appurtenances were in good condition and well maintained.

4. HYDROLOGY

Approximately 3000 feet upstream from these two dams is Mountain Pond Dam.

The drainage area tributary to Mountain Pond Dam is 90 acres or 0.14 square miles.

The drainage area tributary to Eureka Lake Dam but below Mountain Pond Dam is 205 acres or 0.32 square miles.

The total drainage area tributary to Eureka Lake Dam is then 0.46 square miles of which 30% is partially controlled by Mountain Pond.

Mountain Pond has a water surface comprising about 19% of its drainage area and therefore has an appreciable delaying effect on peak runoffs at the lower lake. A discussion of peak outflow at Mountain Pond is included in the report on that dam.

A hypothetical discharge at Eureka Lake was developed by use of a runoff hydrograph based on a storm having a rainfall of 6 inches in 12 hours. This storm has a recurrence interval of once in 100 years. A runoff factor of 100% was assumed.

The peak inflow at Eureka Lake was estimated to be 160 cfs. The inflow-outflow curves showed a peak outflow of 61 cfs. This would result in a maximum stage of 2.1 feet above the spillway weir of the main dam, and would overtop the dam by 0.4 feet.

The downstream embankment of the filter basin is slightly higher than the main dam and the overflow over the main dam into the filter basin would discharge over the masonry wall at the west end of the basin into the spillway channel.

5. SAFETY

In my opinion this dam is safe at the present time.

I do not believe that this dam requires periodic inspection by your Commission.

6. REQUIREMENTS

No work is necessary to put the dam in a safe condition.

It would be advisable as a precautionary measure to keep the spillway channel mowed and free from brush and weeds or other debris.

7. STATEMENT OF FACTS

Eureka Lake is a unit of the water supply system of the Village of Bethel Water Department.

Water Resources Commission
Eureka Lake Dam, Danbury, Conn.

February 11, 1966

The lake is impounded by an earth dam 250 feet long and approximately 30 feet high.

A filter basin has been constructed against the downstream slope of the dam by the construction of another dam or embankment, about 100 feet from and parallel to and to approximately the same height as the main dam.

A giving away of the structure would undoubtedly cause considerable damage to two highway crossings downstream. At the present time there are no dwellings which were judged to be in a hazardous location in case of a dam failure.

The drainage area tributary to the dam is 0.46 square miles of which 30% is partially controlled by an upstream dam.

A hypothetical storm of 100 year frequency was estimated to produce a peak outflow of 61 cfs. at Eureka Lake Dam. This would produce a stage which would overtop the main dam by 0.4 feet, a condition which is not considered hazardous because of presence of the filter basin with its adequate overflow weir immediately downstream.

8. CONCLUSION

In my opinion the dam is safe at the present time and no action is required.

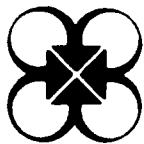
9. RECOMMENDATION

No action necessary except perhaps to urge the owner to keep the spillway clean.

Respectfully submitted,

Roger C. Brown

Roger C. Brown
Consulting Engineer



Cahn Engineers Inc.

CONSULTING ENGINEERS-COMMUNITY DEVELOPMENT CONSULTANTS

September 18, 1975

Mr. Frank Clark, First Selectman
Town of Bethel
Bethel Town Hall
Bethel, Connecticut 06801

RE: Dam Inspection
Eureka Lake Dam
Bethel Water Supply

Dear Mr. Clark:

We are pleased to submit in accordance with our agreement for engineering services with the Town of Bethel, our report on the Eureka Lake Dam Inspection.

The reservoir dam and filter basin dam are visually sound, and excluding abnormal operating procedures or unusual natural occurrences, no apparent hazard exists which may endanger the safety of the public. Outlined on Pages 1 and 2 of our report are recommendations regarding maintenance and upgrading of the existing dam. We recommend that the remedial work or upgrading of the existing dams be carried out as soon as possible, and that annual maintenance be conducted thereafter.

We will incorporate special conditions in our plans and specifications for the water treatment plant to ensure that the dam is protected during construction in accordance with recommendation "f" of this report.

We would like to acknowledge the support and assistance we received during the preparation of this report from the Town and especially from Larry Straiton. We appreciate the opportunity of preparing this report and look forward to being of continued service in assisting you in repairing the existing dams.

Very truly yours,

W. O. Doll, P.E.
Chief Engineer

Peter M. Heynen, P.E.
Chief Geotechnical Engineer

PMH:mbm

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CONCLUSIONS AND RECOMMENDATIONS

SITE TOPOGRAPHY AND GEOLOGY

RESULTS OF INSPECTION

- A. General
- B. Investigation
- C. Reservoir Dam
- D. Filter Basin Dam
- E. Appurtenant Structures

APPENDIX A

Exhibit No. 1 Topography and Boring Location Plan

Exhibit No. 2 Cross Section

Photographs - Figures 1 thru 4

APPENDIX B

Boring Logs

8/24/75

14 426 SØ

CONCLUSIONS AND RECOMMENDATIONS

The reservoir dam and the filter basin dam are visually sound and, excluding abnormal operating procedures or unusual natural occurrences, no apparent hazard exists which may endanger the safety of the public. No signs of embankment instability such as: piping of the embankment materials, (i.e. all seeping water is clear and no transportation of fine soil particles is occurring), cracking of the embankment, settlement along the embankment crest, sloughing along the embankment slopes, excessive animal burrows, or leakage through or along pipes were noted.

The following recommendations are made regarding maintenance and upgrading of the existing dams.

- a. Clean out the spillway channel and maintain its outlet area (cut brush, trees, etc.). Attached is a picture of the growth of the spillway, Figure 1.
- b. Backfill the area around the filter basin drain pipe or preferably extend the drain pipe away from the toe of the filter basin dam and backfill with rock. This erosion is causing an over-steepening of the overall downstream dam slope. Figure 2 shows the location of washed out area.

- c. The filter basin dam should be exterminated of burrowing animals which are causing voids in the top of the dam. The use of smoke is good for detecting burrows such as the one observed through the dam just at the highwater mark. These should be thoroughly plugged with compacted soil. Figure 3 is the area where animals burrow.
- d. A minimum of 1.5 to 2.0 feet of free board should be maintained for both dams. Free board is the distance from the water surface to the top of the dam. This must be maintained so that wave action or fast rising of the water will not overtop the dam. Figure 4 is an example of freeboard for the reservoir dam.
- e. In the low-water operation of the reservoir, sand-bagging the downstream weir in the spillway should be limited so that there is a minimum of 1.5 - 2.0 of freeboard. Overtopping could be dangerous to the stability of the filter basin dam if the freeboard isn't maintained.
- f. Construction operations and equipment on or near the dam should be done with extreme care. No heavy equipment such as dump trucks, front end loaders, etc. should be allowed on the dam.

8/24/75

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SITE TOPOGRAPHY AND GEOLOGY

The topography of the dam site area is depicted on Exhibit No. 1. The reservoir lies in a high glacial valley with its water surface varying between elevation 546 and 548. Eureka Lake is fed at its southern end from a higher sister lake named Mountain Pond. This lake has a surface elevation of 591 (+) (USGS). The hills immediately adjacent to the lake rise to about elevation 700 (+). The dams which pond the lake are constructed in a rugged V-shaped valley which drops quickly to elevation 380 in a distance of approximately 1700 feet (straight-line distance). The geology of the dam site, as indicated by a survey of the outcrops in the area and by core borings taken for associated work, consists of fractured and folded dark coarse schists and shistose gneiss. Bedrock is overlain by varying thicknesses of glacial till. The till is basically a brown, fine to coarse sand and gravel having some to trace silt and numerous cobbles. The depth of overburden at the site varies from zero feet where the bedrock is outcropping to 28 feet thick within the V-shaped valley.

8/24/75

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RESULTS OF INSPECTION

A. General

The reservoir dam for the public water supply of Bethel is constructed of native earth material consisting of brown fine to coarse sand, some fine to coarse gravel, some silt, and is protected on its upstream and downstream slopes by a thin layer of riprap. The dam is approximately 16 feet high with a length of 250 feet. The dam is 10 feet wide at its crest and has side slopes of 1 vertical to 2 horizontal both up and downstream. The dam is constructed on about 13 feet of glacial overburden which, in turn, rests on gray and white fractured gneiss.

The filter basin dam lies some 140 feet downstream of the reservoir dam and is quite similar in construction. It too is constructed of native earth material approximately 14 feet high with side slopes of 1 vertical to 2 horizontal. The length is about 280 feet and the width of the dam at the crest is about 6 feet. This dam is built on a sloping surface of about 15 feet of glacial till and on an old masonry wall on bedrock as indicated by Boring R-9. (See Profile, Exhibit No. 2).

8/25/75

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B. Investigations

A thorough program of on-site investigations was carried out in the preparation of this report. The site was visually inspected both during full reservoir conditions and while the filter basin section of the reservoir was dewatered for replacement of the sand filter bed.

The investigative program also included an exploratory drilling program. (The boring location plan (Exhibit No. 1) and the boring logs are in the Appendix. A review of the historical records concerning the reservoir and aerial photographs of the area were obtained and analyzed.

C. Reservoir Dam

During the normal operation of the water supply system, it is necessary to drain the filter basin periodically. At each draining the basin emptied in about 20 hours. The reservoir dam is subjected to this fairly rapid drawdown and it is reported and observed that seepage from the downstream face of the dam occurs only at or below approximately elevation 540 and only near the abutments (ends) of the dam when the elevation of the surface water is normal. This seepage is not substantial and there

8/24/75

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was no evidence that soil is being carried from the embankment by the seeping water. No sloughing or slope instability was observed on the downstream face or along the dam crest. This type of seepage would be expected from a homogeneous dam section and is not considered significant.

D. Filter Basin Dam

The filter basin dam is likewise subjected to the previously described drawdown and rapid filling conditions. No sloughing or instability was noted in either the upstream or downstream face of this dam. Some areas of seepage were noted along the downstream toe of the embankment. At both the embankment contacts, (where the dam meets the existing soil), it appears that more seepage is taking place on the northwest side abutment.

The apparent seepage may be exaggerated by the fact that the spillway exits above the elevation of the seepage and runs over the natural ground surface back to the original stream channel. Some seepage occurs near the center of the embankment at about elevation 527 or some seven feet below the lowest possible pool in the filter basin area.

Although seepage downstream of the filter basin dam is apparently continuous and fairly significant at times (no quantity estimates are available), there is no evidence of the seepage piping materials from the embankment and no history of increased leakage. The seepage is no cause for concern as long as it is clear and is not transporting fine grain soil.

E. Appurtenant Structures

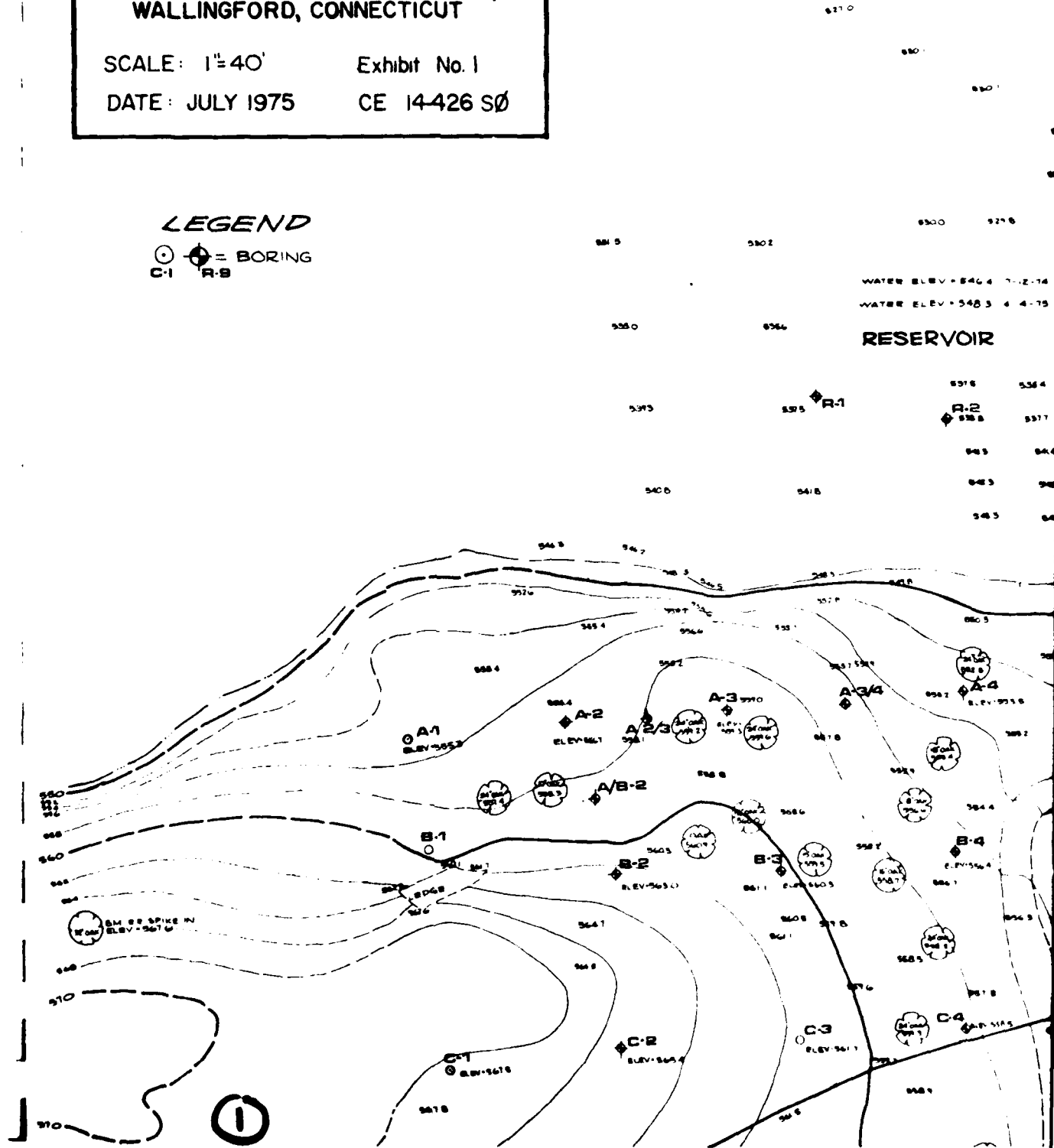
The raw water is piped through the dam into the filter basin. The water then percolates through the sand filter in the bottom of the basin and then is piped for chlorination and public consumption. An 8-foot wide, uncontrolled spillway with a crest at about elevation 546.5 lies at the northwest end of the dam. The spillway is formed by in-place rock on the valley wall and a masonry wall on the other side or against the dam embankments. The floor of the spillway appears to be paved with loose rock (boulder to cobble size). This spillway insures freeboard and passes excess water into the valley just downstream of the filter basin dam.

APPENDIX A

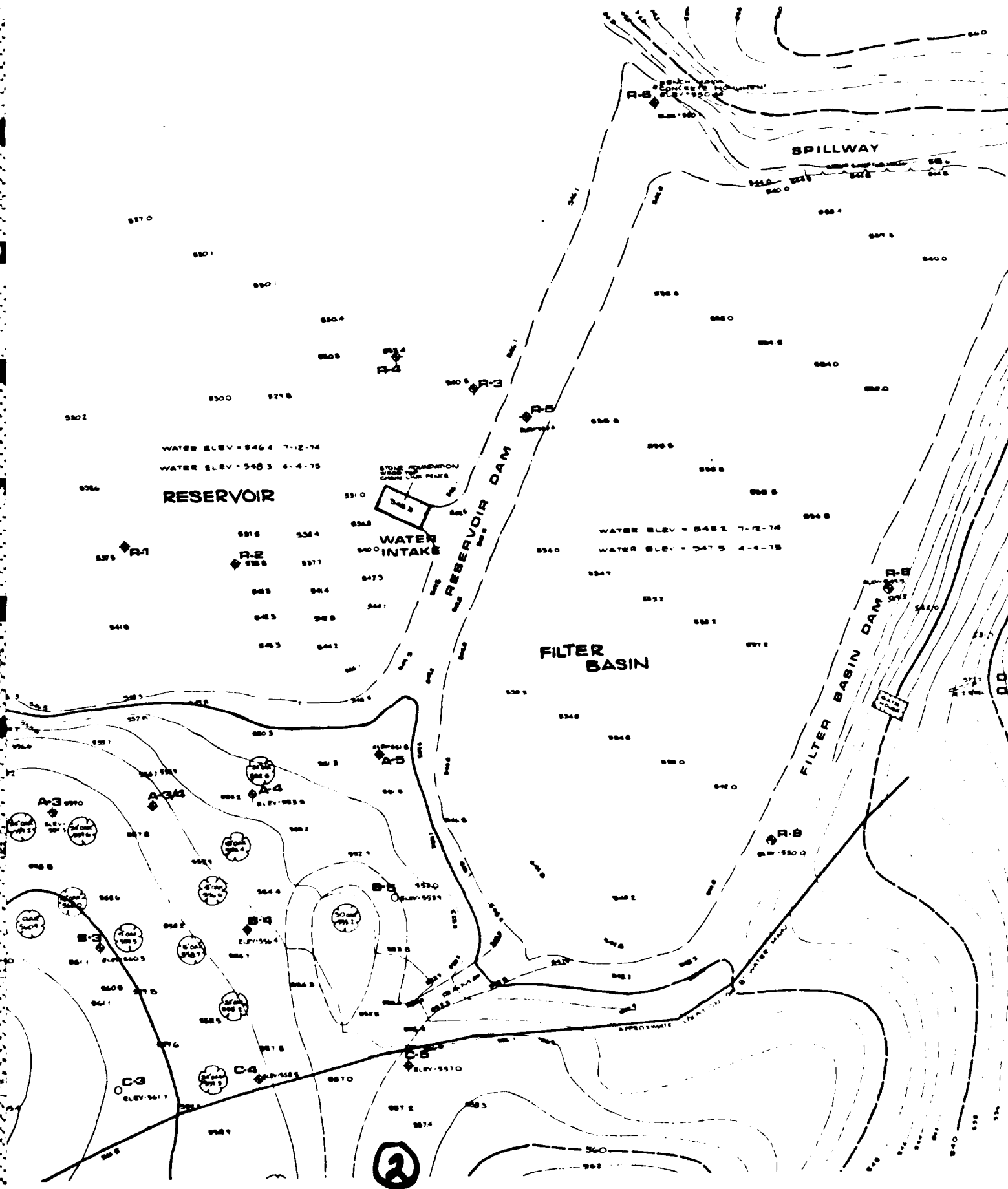
TOWN OF BETHEL	
DAM INSPECTION	
TOPOGRAPHIC AND BORING LOCATION PLAN	
CAHN ENGINEERS INC. WALLINGFORD, CONNECTICUT	
SCALE: 1"=40'	Exhibit No. 1
DATE: JULY 1975	CE 14-426 SØ

LEGEND

⊙ ⊕ = BORING
C-1 R-B

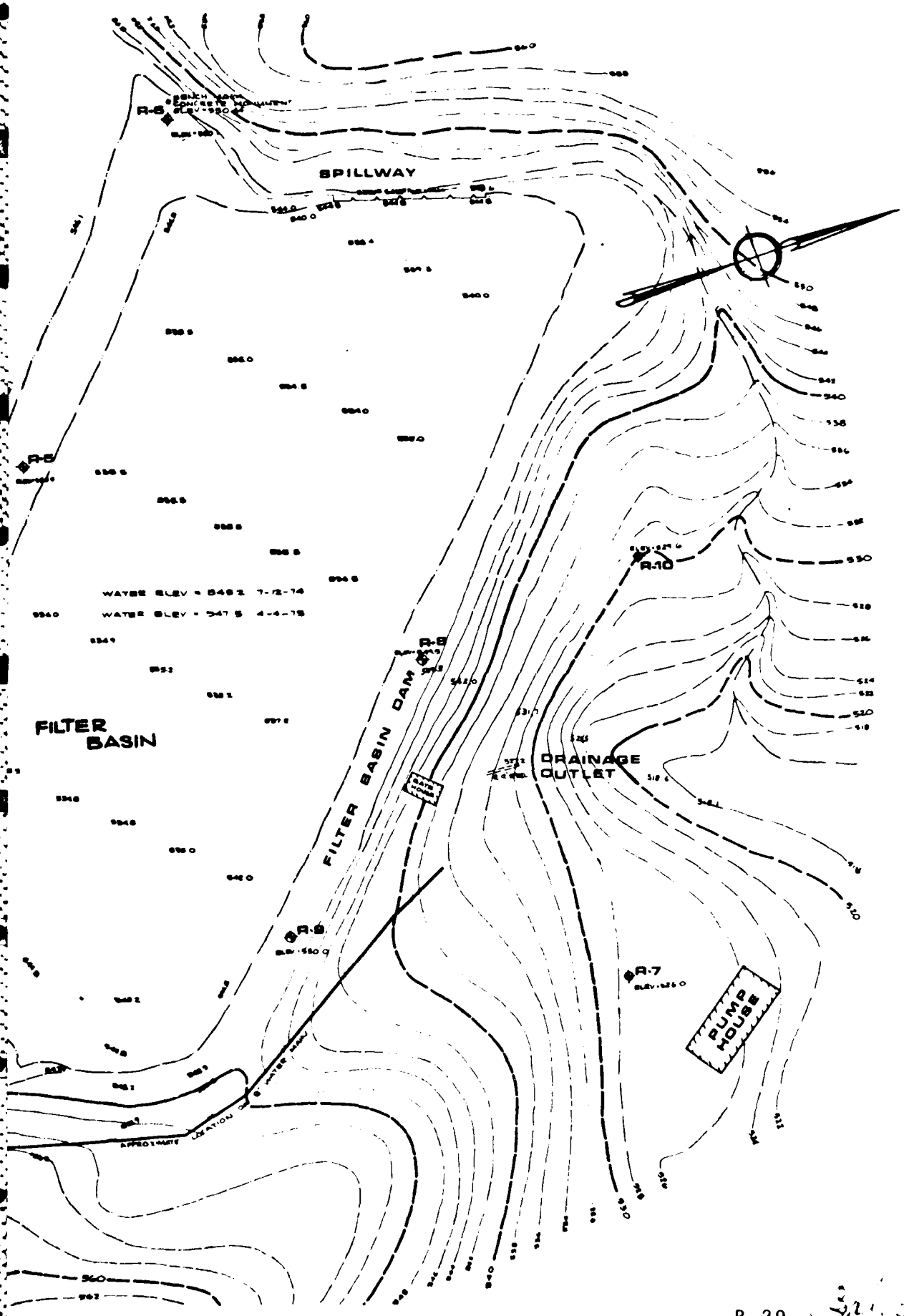


B-29

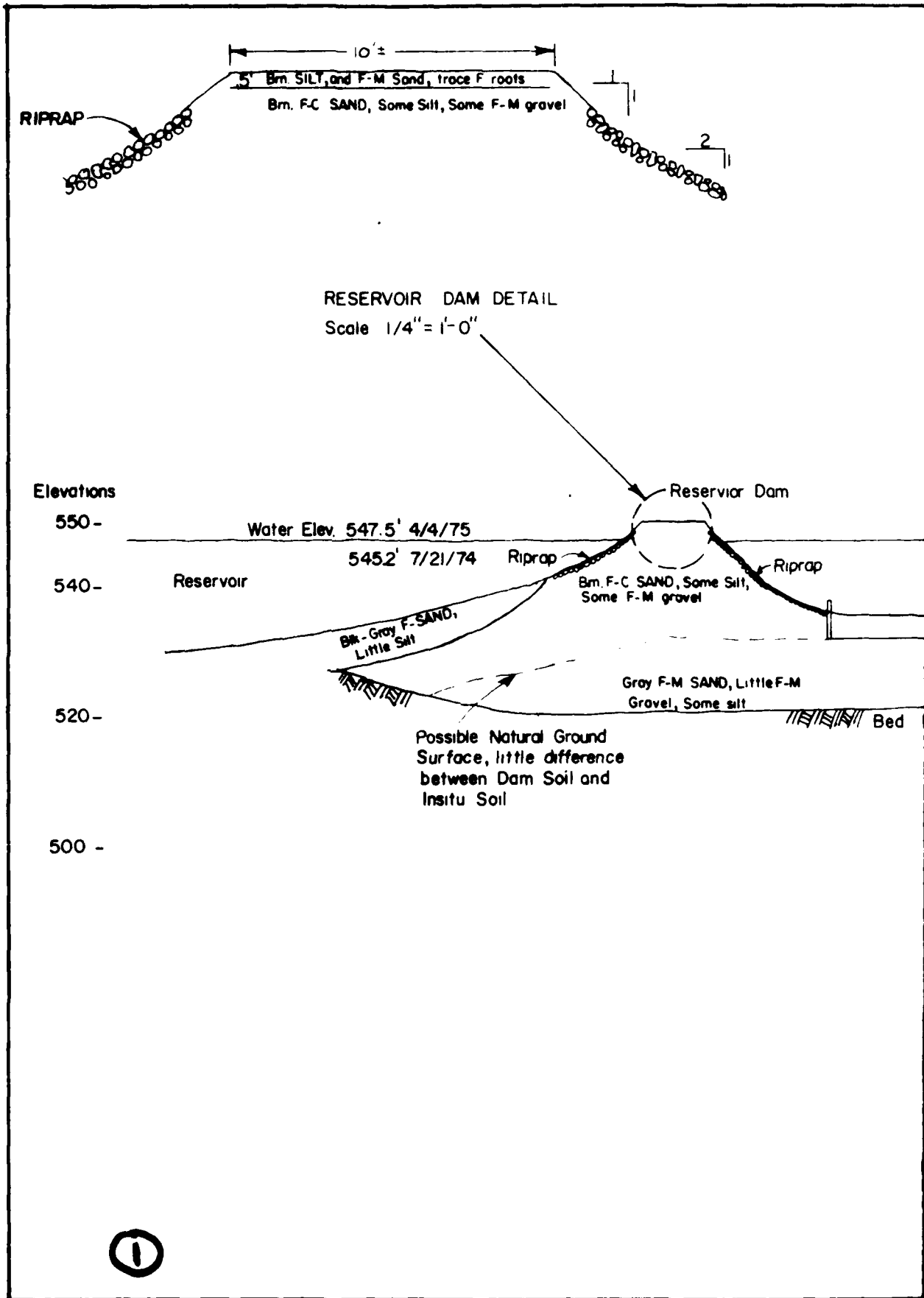


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Handwritten notes or signature

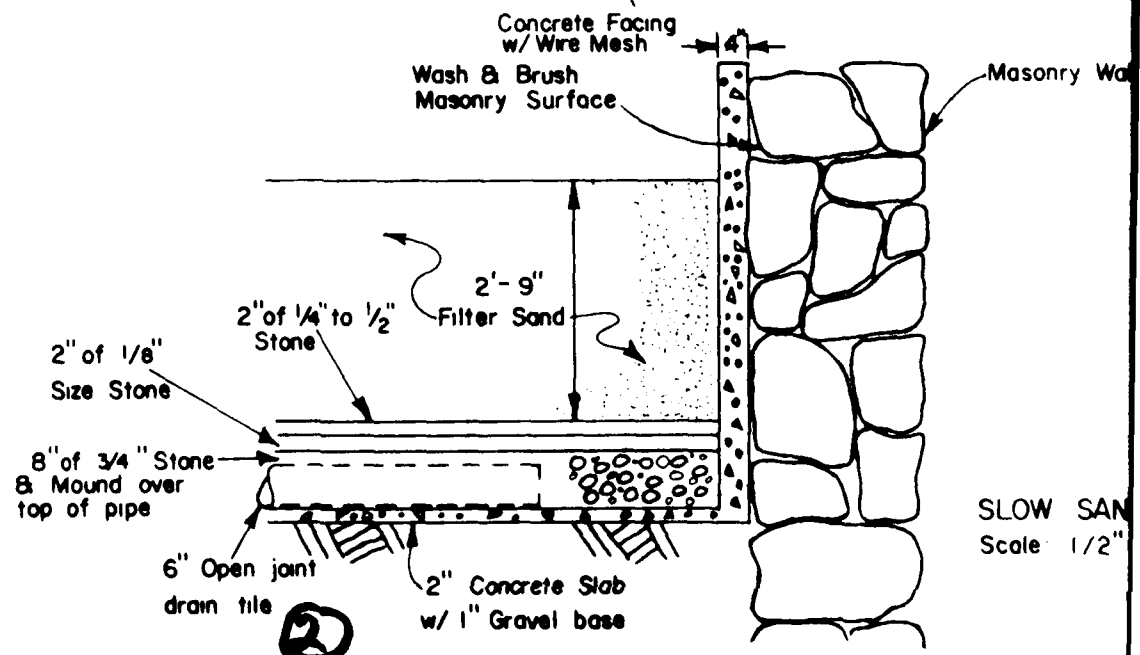
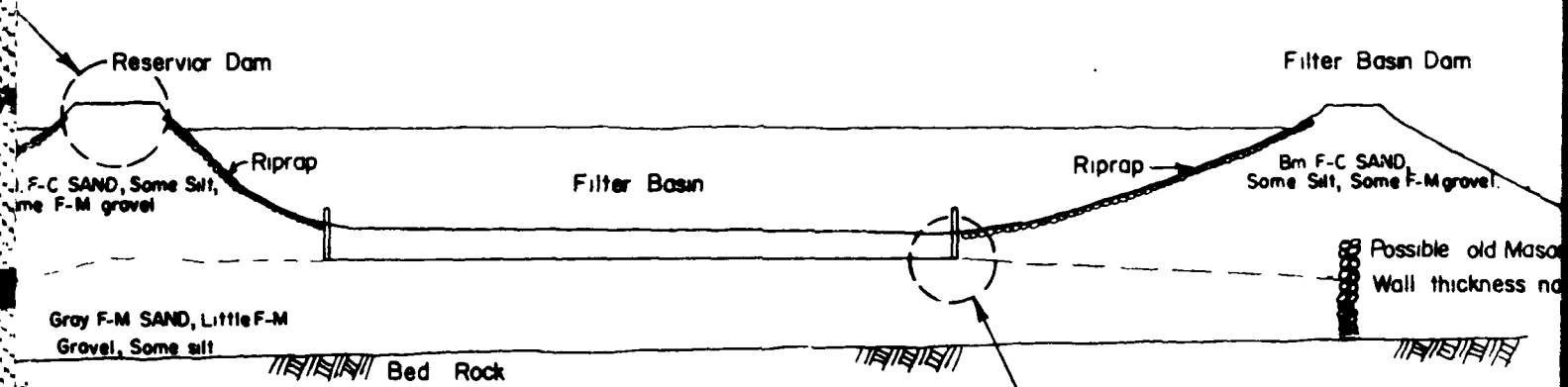


①

B-3c

TOW
 DAM
 CRO
 CAHN
 WALLING
 SCALE As s
 DATE JULY

SECTION A-A
 CROSS SECTION
 Scale 1" = 20'



SLOW SAND
 Scale 1/2"

B-30

TOWN OF BETHEL

DAM INSPECTION

CROSS SECTION

CAHN ENGINEERS INC.
WALLINGFORD, CONNECTICUT

SCALE: As shown

Exhibit No. 2

DATE: JULY 1975

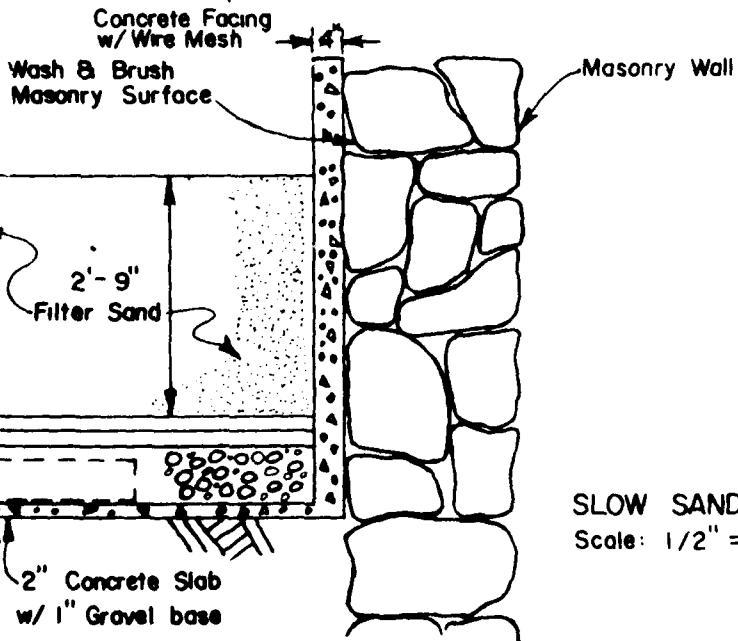
CE 14-426 SØ

Filter Basin Dam

Riprap

8m F-C SAND,
Some Silt, Some F-M gravel.

Possible old Masonry
Wall thickness not known



SLOW SAND FILTER

Scale: 1/2" = 1'-0"



FIG. 4



FIG. 1



FIG. 3



FIG. 2

APPENDIX B

General Borings, Inc.

Sheet of

P. O. BOX 7135 PROSPECT, CONNECTICUT 06712

REPORT OF AUGER BORINGS AND PIPE AND BAR PROBINGS

DOWN Bethel _____ LINE _____

PROJECT NAME Water Transmission Line _____ PROJECT NO. _____

BOREMAN F.C. C.S. _____ DATE WORK DONE 3/26/75 _____

INSPECTOR R.T. _____ FOR Town of Bethel _____

CONTRACTING ENGINEER

Station	Offset (Ft.)		Depth Probed (Ft.)	Soil Strata in Auger Holes		Remarks (Include: Groundwater depth, Size of Auger used, Description of Soil in Auger Holes, Depth of Auger Samples)
	From B L	From C L		From (Ft.)	To (Ft.)	
C-1				0'	.5'	Top soil.
				.5'	2.5'	Brown fine silty sand.
				2.5'	4.0'	Cobbles and boulders.
				4.0'	6.0'	Brown fine-medium sand, some fine-medium gravel.
			6.0'			Refusal at 6.0'. Ground Water Level-Dry
B-5				0'	4.0'	Brown fine-medium sand and silt, medium-f gravel.
				4.0'	7.0'	Brown fine-medium sand and silt, medium-f gravel, cobbles and boulders.
			7.0'			Refusal at 7.0'. Offset hole 5.0' North. Ground Water Level-Dry
B-5-A	OFFSET 5.0' North			0'	8.0'	Brown fine-medium sand and silt, medium-f gravel, cobbles and boulders.
			8.0'			Refusal 8.0'. Ground Water Level-Dry
A-1				0'	1.0'	Top soil, brown fine-medium sand and silt, fine-medium gravel.
				1.0'	6.0'	Cobbles and boulders, brown fine-medium s

CLIENT: <u>Town of Bethel</u>	General Borings, Inc. P. O. BOX 7135 PROSPECT, CONN. 06712	SHEET <u>1</u> OF <u>1</u> HOLE NO. <u>A 37</u>
CONTRACTOR <u>GBI #500</u>	PROJECT NAME <u>Water Transmission Line</u>	LINE
FOREMAN-DRILLER <u>F.C. C.S.</u>	LOCATION <u>Bethel, Conn.</u>	STATION
INSPECTOR <u>R.T.</u>		PROJECT
GROUND WATER OBSERVATIONS <u>Dry</u>	CASING TYPE <u>HA</u>	DATE <u>4/1</u>
AT <u>0</u> FT. AFTER <u>0</u> HOURS	SAMPLER <u>2 3/4"</u>	DEPTH <u>4.5'</u>
AT _____ FT. AFTER _____ HOURS	CORE BAR <u>1 1/2"</u>	TYPE
	SIZE I.D. <u>2 1/2"</u>	TYPE
	HAMMER WT. <u>140</u>	TYPE
	HAMMER FALL <u>5'</u>	TYPE
		DATE
		SURFACE ELEV.
		GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 8" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST.	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, TESTS, WASH WATER, SEAMS, ETC.
		NO.	TYPE	PEN	REC.	DEPTH @ BOT.	0-6	6-12	12-18				
							MOIST	ELEV.					
	1	ss	18"	5"	1.5'	1	5	5		moist medium	1.5'	1) black-brown fine-medium sand silt, trace roots. NOTE: 1.5'-4.5' contains no cobbles. Perusal at 4.5'.	
5											4.5'		
											EOB	END OF BORING 4.5' deep.	
0													
15													
20													
25													
30													
35													

TYPE OF SAMPLES:
 D=DRY W=WASHED C=CORED A=AUGER UP=UNDISTURBED PISTON
 UB=UNDISTURBED BALL CHECK VT=VANE TEST

TOTAL FOOTAGE EARTH BORING 4.5'

CLIENT: <u>Town of Bethel</u>	General Borings, Inc.	SHEET <u>1</u> OF <u>1</u>
	P. O. BOX 7135 PROSPECT, CONN. 06712	HOLE NO. <u>A-5</u>
CONTRACTOR <u>GBT #590</u>	PROJECT NAME <u>Water Transmission Line</u>	DATE
DRILLER <u>F.C. C.S.</u>	LOCATION <u>Bethel, Conn.</u>	
INSPECTOR <u>R.T.</u>		
GROUND WATER OBSERVATIONS	CASING TYPE <u>1A</u> SAMPLER <u>3/8"</u> CORE BAR <u>AX</u>	START DATE <u>3/21</u>
AT <u>4.5</u> FT. AFTER <u>0</u> HOURS	SIZE (D.) <u>2"</u> <u>1 3/8"</u> <u>1 1/8"</u>	STOP DATE
AT _____ FT. AFTER _____ HOURS	HAMMER WT _____ BT	SURFACE ELEV _____
	HAMMER _____ BT	GROUND WATER ELEV _____

DEPTH	CASING BLOWS PER FOOT	SAMPLE				DEPTH TO BOT.	BLOWS PER FOOT ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. MIN.	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION (SEE REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		NO.	TYPE	PEN	REC.		0-6	6-12	12-18				
		1	ss	24"	7"	2.0'	3	7	5	5		1) brown fine-medium sand, fine-medium gravel, little trace vegetation.	
		2	ss	24"	18"	4.0'	10	19	27	28		2) brown fine-coarse sand, silt, trace fine-medium gravel.	
5		3	ss	24"	12"	6.0'	12	13	13	16		3) Same as sample #1.	
		4	ss	24"	18"	8.0'	11	11	8	9	8.0'	4) Brown fine-medium sand, silt, trace fine-medium gravel.	
10		5	ss	24"	12"	10.0'	8	9	11	9		5) Same as sample #1.	
		6	ss	18"	12"	12.0'	25	43	29	28		6) brown fine-coarse sand, gravel, trace silt.	
		7	ss	24"	18"	14.0'	13	30	27	29		7) Same as sample #1.	
5		8	ss	18"	18"	15.5'	30	64	100		16.5'	8) Same as sample #6.	
										15.0'	Run #1		
										12.0'			
										11.0'			
										10.0'			
0		1	C	60"	26"	21.5'				13.0'	21.5'	Run #1 Cored Rock 10.5'-21.5' received 26" Quartz & chert.	
										13.0'	EOB		
5													
0													
5													
0													
5													
0													

END OF BORING 21.5'
16.5' Soil
5.0' Rock

CLIENT: <u>Town of Bethel</u>	General Borings, Inc. P. O. BOX 7135 PROSPECT, CONN 06712	SHEET <u>1</u> OF <u>1</u>
CONTRACTOR <u>GBI #590</u>	PROJECT NAME <u>Water Transmission Line</u>	HOLE NO. <u>A-2-2</u>
DREMAN-DRILLER <u>F.C. C.S.</u>	LOCATION <u>Bethel, Conn.</u>	STATION
SPECTOR <u>R.T.</u>		OFFSET
GROUND WATER OBSERVATIONS <u>Dry</u> FT. AFTER <u>0</u> HOURS	CASING TYPE <u>PA</u> SAMPLER <u>ST</u> CORE BAR	Start DATE <u>4/2</u> Finish DATE <u>4/2/75</u>
FT. AFTER _____ HOURS	SIZE I.D. <u>2"</u>	SURFACE ELEV. _____
	HAMMER WT. _____	GROUND WATER ELEV. _____
	HAMMER CAP _____	

CASING BLOWS PER FOOT	SAMPLE					BLOWS PER FT. ON SAMPLER (FORCE ON LUBE)			CORING TIME PER FT. (MIN)	TEXTURE	MOISTURE	DEPTH	FIELD IDENTIFICATION OF SAMPLES & REMARKS (INCL. CORING LOGS OF WASH WATER, SEAMS IN ROCK, ETC.)
	NO.	TYPE	PEN	REC.	DEPTH @ BOT.	0-6	6-12	12-18					
1	ss	18"	6"	1.5'	3	4	5		moist loose	1.5'	1' brown silt and fine sand, trace roots.		
										2.5'	Refused at 3.5'.		
										END OF RECORD			

TYPE OF SAMPLES: D=DRY W=WASHED C=CORED A=AUGER UP=UNDISTURBED PISTON
 UB=UNDISTURBED BALL CHECK VT=VANE TEST
 PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%
 TOTAL FOOTAGE EARTH BORING _____ B-41
 ROCK CORING _____

CLIENT: <u>Town of Bethel</u>	General Borings, Inc.		SHEET <u>1</u> OF <u>1</u>
	P. O. BOX 7135 PROSPECT, CONN. 06712		HOLE NO. <u>8-</u>
CONTRACTOR <u>GBI #590</u>	PROJECT NAME <u>Water Transmission Line</u>		LINE
FOREMAN-DRILLER <u>F.C. C.S.</u>	LOCATION <u>Bethel, Conn.</u>		STATION
INSPECTOR <u>R.T.</u>			OFFSET
GROUND WATER OBSERVATIONS		CASING <u>NA</u>	CORE BAR.
TEST <u>Dry</u> FT. AFTER <u>0</u> HOURS	TYPE	SAMPLER <u>1 3/8"</u>	DATE <u>3/25</u> <u>4/25/78</u>
TEST _____ FT. AFTER _____ HOURS	SIZE I.D.	<u>1 3/8"</u>	SURFACE ELEV. _____
	HAMMER WT	<u>140</u> LBS	GROUND WATER ELEV. _____
	HAMMER FALL		

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER FOOT ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS ON WASH WATER, SEAMS IN ROCK, ETC.
		NO.	TYPE	PEN	REC.	DEPTH @ BOT.	0-6	6-12				
	1	ss	18"	6"	1.5'	2	6	21	moist	.08'	Top Soil	
									medium	1.0'	1) Brown fine-medium sand, medium-coarse gravel, little	
										4.0'	FOR TYPE: 1.0'-4.0' cobbles and boulder. Refusal 4.0'.	
											END OF BORING 4.0' TEST	

TYPE OF SAMPLES: D=DRY W=WASHED C=CORED A=AUGER UP=UNDISTURBED PISTON UB=UNDISTURBED BALL CHECK VT=VANE TEST

TOTAL FOOTAGE
EARTH BORING _____

CLIENT: Town of Bethel **General Borings, Inc.** SHEET 1 OF 1
 P. O. BOX 7135 PROSPECT, CONN. 06712 HOLE NO. 1-3

CONTRACTOR: GBI #590 PROJECT NAME: Water Transmission Line LINE: _____
 FOREMAN-DRILLER: F.C. C.S. LOCATION: Bethel, Conn. STATION: _____
 INSPECTOR: R.T. OFFSET: _____

GROUND WATER OBSERVATIONS
 AT Dry FT. AFTER 0 HOURS TYPE: LA SAMPLER: 3 CORE BAR: AX
 DATE: 3/25 Start: 3:25 Finish: 3:45
 AT _____ FT. AFTER _____ HOURS SIZE I.O.: 1 3/8" 1 1/2"
 HAMMER NO.: 140 LBS: _____ BIT: _____
 HAMMER FALL: _____ RECORD: _____ GROUND WATER ELEV.: _____

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER MINUTE ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST.	START/CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS ON WASH, WATER, SEAMS IN ROCK, ETC.
		NO.	TYPE	PEN	REC.	DEPTH @ BOT.	0-6	6-12				
	1	ss	18"	6"	1.5'	1	1	2		moist very loose	.08' 2.0'	Top Soil. 1) Brown fine-medium sand, fine-medium gravel, little s
5	2	ss	18"	6"	6.5'	13	23	28		moist very dense	6.5'	2) Brown fine-coarse sand, medium-coarse gravel, some NOTE: Cobbles & boulder
10	3	ss	13"	12"	11.08'	37	110	50/1"		"		3) Brown fine-coarse sand and fine-coarse gravel, little Refusal on spoon at 11.08'. Advanced auger to 12.0'. #1
15	1	C	60"	25"	17.0'				3.0		12.0'	Run #1 Cored Rock 11.0'-17.0' EOB Recovered 25" Quartz & Gneis
20									2.0			
25									3.0			
30									3.0			
35									3.0			
40												

TYPE OF SAMPLES: TOTAL FOOTAGE
 O=DRY W=WASHED C=CORED A=AUGER UP=UNDISTURBED PISTON EARTH BORING _____
 UB=UNDISTURBED BALL CHECK VT=VANE TEST

CLIENT: <u>Town of Bethel</u>	General Borings, Inc. P. O. BOX 7135 PROSPECT, CONN. 06712	SHEET <u>1</u> OF <u>1</u> DATE NO. <u>8-11</u>
CONTRACTOR <u>GBI #590</u>	PROJECT NAME <u>Water transmission line</u>	DATE
FOREMAN-DRILLER <u>F.C. C.P.</u>	LOCATION <u>Bethel, Conn.</u>	SECTION
INSPECTOR <u>R.T.</u>		OFFSET

GROUND WATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	Start	End
AT <u>8</u> FT. AFTER <u>0</u> HOURS	TYPE <u>HA</u>	<u>3"</u>		DATE <u>3/24</u>	<u>3/24</u>
AT _____ FT. AFTER _____ HOURS	SIZE I.D. <u>3"</u>	<u>1 3/8"</u>		SURFACE ELEV. _____	
	HAMMER WT. _____	<u>1 1/2</u> LBS.	BIT <u>2"</u>	GROUND WATER ELEV. _____	
	HAMMER FALL _____				

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST.	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF REMARKS INCL. COLOR, GRAIN, WASH WATER, SEAMS, INCL. NO.
		NO.	TYPE	PEN	REC.	DEPTH TO BOT	0-6	6-12				
		1	ss	18"	6"	1.5'	2	3	3	moist loose		1) brown fine-coarse sand, fine-medium gravel, little
											3.5'	
											4.0'	
5		2	ss	18"	6"	6.5'	25	15	25	moist dense		2) brown fine-coarse sand, medium-fine gravel, little
												Notes: Cobbles and boulders
10		3	ss	18"	10"	11.5'	28	40	19	moist very dense		3) Same as sample #1.
											13.0'	Refused on Auger at 13.0'
											EOB	END OF BORING 13.0'

TYPE OF SAMPLES D-DRY W-WASHED C-CORED A-AUGER UP-UP-DISTURBED PISTON UB-UNDISTURBED BALL CHECK VE-VANE TEST	TOTAL FOOTAGE EARTH BORING <u>13.0'</u> CORE BORING <u>0'</u>
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CLIENT: Town of Bethel **General Borings, Inc.** SHEET 1 OF 1
 P. O. BOX 7135 PROSPECT, CONN. 06712 FILE NO. _____

CONTRACTOR: GBI #590 PROJECT NAME: Water transmission line

FOREMAN-DRILLER: F.C. C.F. LOCATION: Bethel, Conn. TOWN: _____

SPECTOR: R.T. TEST: _____

GROUND WATER OBSERVATIONS: Dry TYPE: SA Casing No. _____ Sampler No. _____ Core Bar No. _____
 FT. AFTER 0 HOURS SIZE 10. DATE: Start 3/26 3/27/77
 FT. AFTER _____ HOURS HAMMER W. _____ B.S. PT SURFACE ELEV. _____
 _____ HOURS HAMMER FALL _____ FOUND WATER ELEV. _____

CASING BLOWS PER FOOT	SAMPLE				BLOWS PER FT ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR UNDIST. MOIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF STRATA REMARKS INCLUDING REMARKS ON WATER SEAMS IN STRATA
	NO.	TYPE	PEN REC.	DEPTH @ BOT.	0-6"	6-12"	12-18"				
1	ss	18"3"	1.5'	3	4	5		moist loose	6.7'	Top soil.	
2	ss	16"10"	6.5'	7	20	30		moist very dense	7.0'	1) brown fine-medium sand, silt, trace fine-medium sand, trace roots. 2) brown silt and fine-medium sand, little fine-medium sand.	
3	ss	15"12"	11.25'	30	50	100/3"			11.5'	3) brown fine-course sand and medium-course gravel, trace roots. NOTE: Refusal on Auger at 11.5'.	
										END OF BORING 11.5' (11.25')	

TYPE OF SAMPLES: W-DRY W=WASHED C=CORED A=AUGER U=UNDISTURBED PISTON TOTAL FOOTAGE
 UB=UNDISTURBED BALL CHECK VT=VANE TEST EARTH BORING B-47

CLIENT <u>Town of Bethel</u>	General Borings, Inc.		SHEET <u>1</u> OF <u>1</u>
	P. O. BOX 7135 PROSPECT, CONN. 06712		PHONE NO. _____
CONTRACTOR <u>GBI #590</u>	PROJECT NAME <u>Water Transmission Line</u>		DATE _____
FOREMAN-DRILLER <u>L.C. D.R.S.</u>	LOCATION <u>Bethel, Conn.</u>		STATION _____
SPECTOR <u>J.S.</u>			OFFSET _____
GROUND WATER OBSERVATIONS		CASING SAMPLER CORE BAR TYPE <u>W</u> <u>W</u> <u>AX</u>	DATE <u>4/8</u> <u>1978</u>
AT _____ FT. AFTER _____ HOURS	TYPE _____		SURFACE ELEV. _____
AT _____ FT. AFTER _____ HOURS	SIZE I.D. _____		GROUND WATER ELEV. _____
	HAMMER WT. _____		
	HAMMER FALL _____		

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF STRATA REMARKS, INCLUDING COLOR, GRAIN, WASH WATER, SEAMS IN ROCK, ETC.
		NO.	TYPE	PEN	REC.	DEPTH @ ROT.	0-6	6-12				
		1	ss	24" 8"	2.0'	1	2	6	21	wet medium		1) Gray-brown fine-medium sand, little silt, trace fine gravel
		2	ss	24" 10"	4.0'	10	8	7	29	wet dense	4.75'	2) Gray medium-fine sand, little silt. Change in grain
		3	ss	4" 4"	4.33'	120	4"			" Boulder	7.25'	Brown coarse-fine sand, trace fine gravel, trace silt.
			ss	24" 0"	10.0'	11	9	13	16			3) Brown fine-medium coarse-fine sand, trace silt. No recovery at 10.0' - 10.5'
		4	ss	24" 10"	12.0'	11	13	13	60/5"	wet very dense	12.5'	4) Gray-brown fine-medium sand, trace fine gravel, trace silt.
		3 min. for first foot of rock core							5			
		1	C	60" 12"	17.5'				3		Run #1	Run #1 Cored Rock 16.0' - 17.5'
											17.5'	Recovered 12" Biotite Gneiss
											EOB	
												NOTE: Water Depth 9.0'
												END OF BORING 17.5'
												10.0' Soil
												7.5' Rock

TYPE OF SAMPLES: D-DRY W=WASHED C-CORED A=AUGER UP-UNDISTURBED PISTON UB-UNDISTURBED BALL CHECK VT-VANE TEST

TOTAL FOOTAGE EARTH BORING _____

CLIENT: Town of Bethel

General Borings, Inc.

P. O. BOX 7135 PROSPECT CONN 06712

SHEET 1 OF 2
HOLE NO. P-2

CONTRACTOR
GBI #590

PROJECT NAME
Water Transmission Line

DREMAN-DRILLER
L.C. D.R.W.

LOCATION
Bethel, Connecticut

INSPECTOR
J.S.

GROUND WATER OBSERVATIONS
AT _____ FT. AFTER _____ HOURS
AT _____ FT. AFTER _____ HOURS

CASING TYPE AI SAMPLER TYPE AM CORE BAR TYPE AM
SIZE (I.D.) 3" 1 3/8" 1 1/8"
HAMMER WT. 10 LBS. BT
HAMMER FALL 50 INCHES

Start DATE 4/8
SURFACE ELEV. _____
GROUND WATER ELEV. _____

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF STRATA REMARKS INCL. COLOR, GRAIN, WASH WATER, SEAMS IN ROCK, ETC.
		NO.	TYPE	PEN	REC.	DEPTH # BOT.	0-6"	6-12"				
	1	ss	24"	24"	2.0'	Push/12"			11	wet medium	1) Gray medium-fine sand & silt, trace fine gravel. No recovery 2.0'-4.0'.	
		"	"	6"	4.0'	7	8	7	9	"	5.0'	
		"	"	6"	6.0'	3	1	1	1	wet very loose	7.0'	
	2	"	"	22"	8.0'	1	2	3	1)	wet medium	2) Gray medium-fine sand, trace silt, trace fine gravel.	
	3	"	"	6"	10.0'	6	6	5	7	"	3) Same as Sample #1.	
	4	"	12"	1"	11.0'	11/6"	100/6"			wet very dense	11.0'	
									4		4) coarse gravel in sandstone.	
									5		Run#1	
									3		Core rock 11.0'-16.0'.	
									2		Recovered 12" Biotite (mica).	
	Run	1	C 60"	12"	16.0'				5		16.0'	
											EOB	
											END OF BORING 16.0'	
											11.0' Soil	
											5.0' Rock	
											Water depth at water table _____	

TYPE OF SAMPLES:
 O=DRY W=WASHED C=CORED A=AUGER UP=UNDISTURBED PISTON
 UB=UNDISTURBED BALL CHECK VT=VANE TEST

AD-R142 768

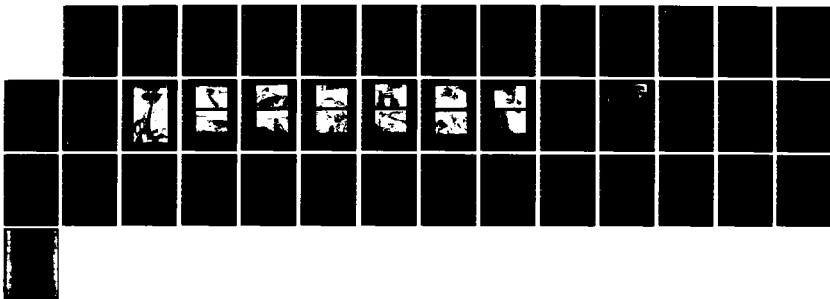
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
EUREKA LAKE DAM (CT 8... (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV AUG 79

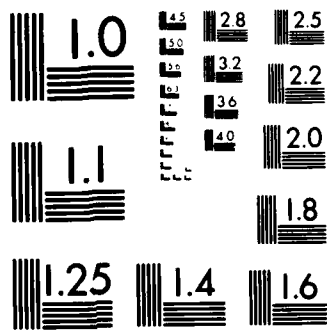
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UNCLASSIFIED

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

CLIENT: Town of Bethel

General Borings, Inc.

P. O. BOX 7135 PROSPECT, CONN. 06712

SHEET 1 OF 1

HOLE NO. P-3

CONTRACTOR
GBI #590

PROJECT NAME
Water Transmission line

LINE

FOREMAN-DRILLER
L.C. D.R.S.

LOCATION
Bethel, Conn.

STATION

INSPECTOR
R.T.

OFFSET

GROUND WATER OBSERVATIONS
DATE _____ FT. AFTER _____ HOURS

CASING TYPE FJ SAMPLER SC CORE BAR. AX

DATE Start 4/4 Finish 4/4/75

DATE _____ FT. AFTER _____ HOURS

SIZE I.D. 2 1/2" 1 3/8" 1 1/8"
HAMMER WT. _____
HAMMER FALL _____

SURFACE ELEV. _____
GROUND WATER ELEV. _____

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST.	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS ON WASH WATER, SLAMS IN ROCK, ETC.
		NO.	TYPE	PEN.	REC.	DEPTH @ BOT.	0-6	6-12				
	1	ss	24"	3"	2.0'	7	2	2	2	wet loose	1.0'	1) Black-gray fine-medium sand, some silt, little fine gravel. Brown-gray fine-coarse sand, some silt, some fine-medium gravel. 2) Brown fine-coarse sand, silt, some fine-medium gravel. 3) Same as sample #2. 4) Same as sample #2. No recovery at 10.0'. 5) Brown-gray fine-coarse sand, little fine-medium gravel, silt. 6) Gray fine-coarse sand, silt, little fine-coarse gravel. 7) Gray fine-coarse sand, silt, little fine-medium gravel. 8) Gray fine-coarse sand and fine-medium gravel, little silt. 9) Gray fine-coarse sand and fine-coarse gravel. 10) Gray fine-coarse sand, gravel, some silt. NOTE: Refusal on casing at 22.0'. Run #1 27.0' Fun #1 Cored Rock 22.0'-27.0'. Recovered 44" Gray Gneiss, White Quartz. NOTE: Depth of Water 5.25' END OF BORING 27.0' 22.0' Soil 5.0' Rock
	2	ss	24"	10"	4.0'	3	3	8	26	wet medium		
	3	ss	24"	6"	6.0'	24	14	17	18	wet dense		
	4	ss	24"	8"	8.0'	9	7	18	8	wet medium		
		ss	24"	0"	10.0'	3	2	4	3	wet loose		
	5	ss	24"	8"	12.0'	1	2	4	13	wet medium	12.0'	
	6	ss	24"	24"	14.0'	7	17	21	13	wet dense		
	7	ss	24"	9"	16.0'	6	19	23	13	"		
	8	ss	24"	24"	18.0'	8	9	15	21	"		
	9	ss	24"	14"	20.0'	45	57	47	60	wet dense		
	10	ss	21"	12"	21.75'	45	60	80	100/3"	"	22.0'	
									3			
									4			
									4			
									5			
									6			
	1	C	60"	44"	27.0'						27.0'	
											EOB	

TYPE OF SAMPLES:
 D=DRY W=WASHED C=CORED A=AUGER UP=UNDISTURBED PISTON
 UB=UNDISTURBED BALL CHECK VT=VANE TEST

TOTAL FOOTAGE
 EARTH BORING _____
 ROCK BORING _____

CLIENT: <u>Town of Bethel</u>	General Borings, Inc.	SHEET <u>1</u> OF <u>1</u>
	P. O. BOX 7135 PROSPECT, CONN. 06712	HOLE NO. <u>0-4</u>
CONTRACTOR	PROJECT NAME <u>Water Transmission Line</u>	DATE
FOREMAN-DRILLER <u>D.C. D.R.P.</u>	LOCATION <u>Bethel, Conn.</u>	
INSPECTOR <u>J.S.</u>		

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR.	Start
AT _____ FT. AFTER _____ HOURS	TYPE	<u>PC</u>	<u>SS</u>	<u>NX</u>	DATE <u>4/7</u> <u>4/7/77</u>
AT _____ FT. AFTER _____ HOURS	SIZE I.D.	<u>3"</u>	<u>1.25"</u>	<u>3.125"</u>	SURFACE ELEV. _____
	HAMMER WT.		<u>10</u> LBS.	<u>SIF</u>	GROUND WATER ELEV. _____
	HAMMER FALL		<u>5</u>	<u>12000</u>	

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST.	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.	
		NO.	TYPE	PEN	REC.	DEPTH @ BOT.	0-6	6-12					12-18
	1	ss	24"	6"	2.0'	4	10	9	10	wet	2.0'	1) Gray-black coarse-fine sand, little silt, trace fine gravel.	
	2	ss	24"	15"	4.0'	15	15	25	20	wet		2) Same as sample #1.	
	3	ss	21"	4"	5.75'	23	13	21	100/3	dense	6.25'	3) Same as sample #1.	
	1	C	24"	22"	8.25'				7.5	wet	Run #1		
	2	C	24"	24"	10.25'				10.0	very	8.25'	Run #1 Cored Rock 6.25'-8.25'	
	3	C	12"	11"	11.25'				8.0	dense	Run #2	Recovered 22" Biotite Gneiss.	
									7.0		10.25'	Run #1 Cored Rock 8.25'-10.25'	
									12.0		11.25'	Run #3 Recovered 24" Same as Run #1.	
											11.25'	Run #3 Cored Rock 10.25'-11.25'	
											EOB	Recovered 11" Same as Run #1.	
												END OF BORING 11.25'	
												6.25' Soil	
												5.0' Rock	
												NOTE: Depth of Water 16.5'	

TYPE OF SAMPLES	TOTAL FOOTAGE			
D=DRY	W=WASHED	C=CORED	A=AUGER	EARTH BORING _____
UB=UNDISTURBED BALL CHECK	UP=UNDISTURBED PISTON	VT=VANE TEST	B=BL	

CLIENT: Town of Bethel

General Borings, Inc.

P. O. BOX 7135 PROSPECT, CONN. 06712

SHEET 1

CONTRACTOR: BRI# 00

PROJECT NAME: Water Transmission Line

DATE: 3/31

FOREMAN: RILEY

LOCATION: Bethel, Conn.

OFFSET: _____

INSPECTOR: R.T.

TYPE: _____

DATE: 3/31

GROUND WATER OBSERVATIONS
AT _____ FT. AFTER _____ HOURS

TYPE: _____

DATE: 3/31

AT _____ FT. AFTER _____ HOURS

SIZE I.D.: _____
HAMMER Wt.: _____ LBS.
HAMMER FALL: _____

SURFACE ELEV.: _____
GROUND WATER ELEV.: _____

DEPTH	CASING BLOWS PER FOOT	SAMPLE				DEPTH TO BOT.	BLOWS PER MINUTE ON SAMPLER (FORCE ON TUBE)			CORRECTED TIME PER MINUTE	DENSITY OR CORRECTED MOIST.	START TO CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOILS AND REMARKS INCLUDING TESTS OF WATER, SEAM, AND GROUND
		NO.	TYPE	PEN.	REC.		0-6"	6-12"	12-18"				
5		1	ss	24"	3"	2.0'	2	7	7	4	moist medium	2.0'	1) brown fine-medium sand & silt, trace fine-medium gravel, trace roots.
		2	ss	24"	5"	4.0'	2	8	8	3	"		2) brown silt and fine-medium sand.
		3	ss	24"	10"	6.0'	1	1	1	1	wet very loose		3) same as sample #1. 4) same as sample #1, with roots, trace clay. Attempted Shelby sampler - no recovery
10			UP	24"	0"	8.0'	PRESS						
		4	ss	24"	0"	10.0'	6	1	2	1	wet very loose		5) brown fine-medium sand & silt, little fine-medium gravel, same as sample #1.
15		5	ss	24"	5"	12.0'	2	2	2	2	wet loose		6) same as sample #1.
		6	ss	24"	10"	14.0'	2	1	1	6	wet loose	14.0'	7) same as sample #1.
		7	ss	24"	1"	16.0'	12	20	20	8	wet medium		8) Medium-course gravel.
20		8	ss	24"	6"	18.0'	11	8	8	5	"		9) brown-gray fine-course sand & silt, some medium-course gravel.
			ss	24"	0"	17.0'	6	5	6	6	"		10) 14.0' Cables and bolts
		10	ss	24"	0"	21.0'	6	5	10	26	wet dense		11) gray fine-course sand & silt, little fine-medium gravel; No recovery 20.0'-21.0'.
25		11	ss	24"	16"	26.0'	50	51	56	72	wet very dense		12) brown-gray fine-medium sand & silt, some medium-course gravel.
													13) gray fine-medium sand & silt, some fine-medium gravel.
30									3.0				14) #1 Cored Rock 26.0'-27.0' recovered 27" section.
									10.0				
35									11.0				15) #2 Cored Rock 34.0'-35.0' recovered 14" section.
									12.0				
40									13.0				
									7.0				
									9.0				
									8.0				
									12.0				
									21.0				

Cables & bolts

TYPE OF SAMPLE: D-DRY W-WASHED C-CORED A-AUGER UP-UNDISTURBED PISTON UB-UNDISTURBED BALL CHECK VT-VANE TEST

TOTAL FOOTAGE: _____
EARTH BORING: B-52

CLIENT: Town of Bethel

General Borings, Inc.

P. O. BOX 7135 PROSPECT, CONN. 06712

SHEET 1 OF 1

WELL NO. 4-1

CONTRACTOR
GBI #590

PROJECT NAME
Water Transmission Line

FOREMAN-DRILLER
F.C. C.S.

LOCATION
Bethel, Conn.

STATION

INSPECTOR
R.T.

OFFSET

GROUND WATER OBSERVATIONS
AT 2.0 FT. AFTER 0 HOURS

TYPE
CASING 3" SA
SAMPLER 30" SO
CORE BAR. 1 1/8" AX

DATE 3/28

AT _____ FT. AFTER _____ HOURS

SIZE I.D.
HAMMER WT. 140 LBS.
HAMMER FALL 24" Diamond

SURFACE ELEV. _____
GROUND WATER ELEV. _____

DEPTH	CASING BLOWS PER FOOT	SAMPLE				DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			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.
		NO.	TYPE	PEN	REC.		0-6	6-12	12-18				
	1	ss	24"	6"	2.0'	2	3	6	37	moist	.5'	Top Soil.	
									very	dense	1.5'	1) Brown fine-medium sand, silt, trace fine-medium gravel, trace roots.	
	2	ss	24"	2"	4.0'	3	6	2	1	wet		2) Brown fine-medium sand, medium-coarse gravel, little silt.	
									very	loose	5.5'	3) Brown fine-coarse sand and coarse-medium gravel, little silt.	
	3	ss	24"	6"	6.0'	2	1	1	86	wet		4) Same as sample # .	
									very	dense	8.0'		
	4	ss	24"	8"	8.0'	44	35	40	76	wet			
									20.0	very			
									18.0	dense	Run #1		
									20.0				
									11.0				
	1	C	60"	36"	13.0'				12.0		13.0'	Run #1 Cored Rock 8.0'-13.0'	
											EOB	Recovered 36" Quartz & Gneiss (Changed Bit)	
												END OF BORING 13.0'	
												8.0' Soil	
												5.0' Rock	

TYPE OF SAMPLES:
 D=DRY W=WASHED C=CORED A=AUGER UP=UNDISTURBED PISTON
 UB=UNDISTURBED BALL CHECK VT=VANE TEST

TOTAL FOOTAGE
EARTH BORING 13.0' B-54

CLIENT: Town of Bethel

General Borings, Inc.

P. O. BOX 7135 PROSPECT, CONN. 06712

SHEET 1 OF 1
FILE NO. 257

CONTRACTOR
GB.#500

PROJECT NAME
Water Transmission Line

FOREMAN-DRILLER
M.C. C.B.

LOCATION
Bethel, Conn.

INSPECTOR
R.T.

GROUND WATER OBSERVATIONS
Surface AT 0 FT. AFTER 0 HOURS
AT _____ FT. AFTER _____ HOURS

CASING TYPE HA SAMPLE CORE BAR AS
SIZE I.D. 1 3/4"
HAMMER WT. 150 LBS. BIT 50 DIAMOND

DATE 4/2
SURFACE ELEV. _____
GROUND WATER ELEV. _____

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF STRATA REMARKS INCL. COLOR, LOSS TO WASH WATER, SEAMS, OR ROCKS, ETC.
		NO.	TYPE	PEN.	REC.	DEPTH OF BOT.	0-6	6-12				
	1	ss	18" 6"		1.5'	7	7	15		wet medium		1) brown fine-medium sand, silt, little fine-medium gravel
5	2	ss	18" 10"		6.5'	6	7	9		"	6.5'	2) same as sample #1.
10	3	ss	3" 2"		10.25'	100/3"			6.0	wet very dense	10.25'	3) brown fine-medium sand, silt, little medium-coarse gravel. Run #1 NOTE: 6.5'-10.25' Cobbles & boulders.
15	1	C	6" 38"		15.25'				9.0 12.0 24.0 22.0		15.25'	Run #1 Cored Rock 10.25'-15.25' Recovered 38" Gneiss.
20												INSTALLED 12.0' OR ELEVATION
25												Backfilled with Sakrete Con Miz-1.0' ground Observation
30												END OF PORTING 15.25' 10.25' Soil 5.0' Rock
35												

TYPE OF SAMPLES:
 C-CORE W-WASHED O-OVERDRIEN A-AUGER UP-UNDISTURBED PISTON
 UB-UNDISTURBED BALL CHECK VT-VANE TEST

TOTAL FOOTAGE
EARTH BORING B-55

CLIENT: <u>Town of Bethel</u>	General Borings, Inc.	SHEET <u>1</u> OF <u>1</u>
	P. O. BOX 7135 PROSPECT, CONN. 06712	HOLE NO. <u>R-6</u>
CONTRACTOR <u>GBI #590</u>	PROJECT NAME <u>Water Transmission Line</u>	LINE
FOREMAN-DRILLER <u>L.C. D.R.S.</u>	LOCATION <u>Bethel, Conn.</u>	STATION
INSPECTOR <u>R.T.</u>		OFFSET
GROUND WATER OBSERVATIONS AT <u>2.5</u> FT. AFTER <u>24</u> HOURS	CASING HW <u>4"</u> SAMPLER <u>1 3/8"</u> CORE BAR. <u>2 1/8"</u>	Start DATE <u>3/28</u> END DATE <u>4/17</u>
AT _____ FT. AFTER _____ HOURS	TYPE _____ SIZE I.D. _____ HAMMER WT. _____ HAMMER FALL _____	SURFACE ELEV. _____ GROUND WATER ELEV. _____
	30" LBS. BIT <u>Diamond</u>	

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			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.
		NO.	TYPE	PEN	REC.	DEPTH @ ROT.	0-6	6-12				
		1	ss	24"	6"	2.0'	1	2	1	2		
		2	ss	24"	3"	4.0'	1	2	1	1		
5			ss	24"	0"	6.0'	1	2	1	1		
		3	ss	24"	3"	8.0'	1	2	3	2		
0		4	ss	24"	3"	10.0'	5	2	1	1		
		5	ss	24"	1"	12.0'	4	3	1	2		
		6	ss	24"	4"	14.0'	4	2	1	1		
15			ss	17"	0"	15.42'	4	1	6/5"	50/0"	15.42'	
		1	C	24"	14"	17.42'				4	Run #1	No recovery at 14.0'-15.42'
										7	17.42'	Run #1 Cored Rock 15.42'-17.42'
										8	Run #2	Recovered 14" Gray-white Gneiss and Quartz.
		2	C	36"	18"	20.42'				5	20.42'	Run #2 Cored Rock 17.42'-20.42'
		3	C	42"	11"	21.42'				6	Run #4	Recovered 18" Gray-white Gneiss and Quartz.
		4	C	7"	6"	22.0'				8	Run #5	Run #3 Cored Rock 20.42'-21.42' Recovered 11" same as Run #2
										5	21.42'	Run #4 Cored Rock 21.42'-22.0'
										9	22.0'	Recovered 6" same as Run #1
		5	C	60"	40"	27.0'				8	27.0'	Run #5 Cored Rock 22.0'-27.0'
										9	Run #6	Recovered 40" Gray-white Gneiss and Quartz.
										11	30.0'	NOTE: 15.42'-27.0' drill water turned brown intermittently indicating possible mortar
		6	C	36"	23"	30.0'				30	Run #7	Run #6 Cored Rock 27.0'-30.0' Recovered 23" White Quartz, little gray Gneiss.
										5	35.0'	Run #7 Cored Rock 30.0'-35.0' Recovered 56" Same as Run #6
										6	EOB	NOTE: Used new Bit for Run #7
										7		NOTE: Boring backfilled with Sakrete Concrete Mix.
										9		
		7	C	60"	56"	35.0'				11		

TYPE OF SAMPLES:
D-DRY W-WASHED C-CORED A-AUGER UP-UNDISTURBED PISTON
UB-UNDISTURBED BALL CHECK VT-VANE TEST

TOTAL FOOTAGE
EARTH BORING 15.42 FT.

CLIENT: <u>Town of Bethel</u>	General Borings, Inc.		SHEET <u>1</u> OF <u> </u>
	P. O. BOX 7135 PROSPECT, CONN. 06712		HOLE NO. <u>R-1</u>
CONTRACTOR <u>GBI #990</u>	PROJECT NAME <u>Water Transmission Line</u>		DATE
FOREMAN-DRILLER <u>L.C. W.R.S.</u>	LOCATION <u>Bethel, Conn.</u>		STATION
INSPECTOR <u>R.T.</u>			OFFSET
GROUND WATER OBSERVATIONS		CASING SAMPLER CORE BAR.	Start End
AT <u>8.5</u> FT. AFTER <u>24</u> HOURS	TYPE <u>FJ</u> <u>AK</u> <u>AX</u>		DATE <u>4/1</u> <u>4/1</u>
AT <u> </u> FT. AFTER <u> </u> HOURS	SIZE I.D. <u>2 1/2"</u> <u>1 3/8"</u> <u>1 1/2"</u>		SURFACE ELEV. <u> </u>
	HAMMER WT. <u> </u> <u>140</u> LBS. BIT <u> </u>		GROUND WATER ELEV. <u> </u>
	HAMMER FALL <u> </u> <u> </u>		

DEPTH	CASING BLOWS PER FOOT	SAMPLE				DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT. (MIN.)	DENSITY OR CONSIST. MOIST	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS ON WASH WATER, SEAMS IN ROCK, ETC.
		NO.	TYPE	PEN	REC.		0-6	6-12	12-18				
5		1	ss	24"	5"	2.0'	1	2	3	2	dry	1.0'	1) Brown silty topsoil, Brown silt and fine-medium sand. 2) Brown fine-coarse sand, fine-coarse gravel, little silt. 3) Gray fine-coarse sand and gravel, trace silt. 4) Gray fine-coarse sand and gravel, trace silt. NOTE: Ran core bar from 7.0' to 10.0', drilling shows cobbles. 5) Brown fine-coarse sand and fine-medium gravel, little silt. 6) Gray-brown fine-medium sand, some silt, little fine-medium gravel. 7) Brown fine-coarse sand, silt, some fine-medium gravel. 8) Same as sample #7. NOTE: No recovery 18.0'-20.0'. 9) Brown fine-coarse sand and gravel, trace silt. NOTE: 22.0'-24.0' drilled but no recovery. 10) Brown fine-coarse sand, little fine-medium gravel, silt. NOTE: 25.5'-27.0' drilling shows brown fine-coarse sand and gravel, few cobbles. Run #1 Cored Rock 27.0'-32.0'. Recovered 30" Gray Gneiss, white Quartz. NOTE: Lost 50% drillwater at 5.0'-7.0'. Lost 100% drillwater 7.0'-27.0'. END OF BORING 32.0' 27.0' Soil 5.0' Rock Backfilled with Sakrete Concrete mix
		2	ss	12"	10"	3.0'	16	125			dry	3.0'	
		3	ss	6"	5"	4.5'	130				very dense	Boulder	
		4	ss	6"	6"	5.5'	130				"		
10			ss	0"	0"	7.0'	130				"		
		5	ss	24"	8"	12.0'	16	11	13	17	moist dense	10.0'	
15		6	ss	24"	10"	14.0'	10	11	21	16	wet dense		
		7	ss	24"	16"	16.0'	9	10	12	9	"		
20		8	ss	24"	10"	18.0'	8	14	10	8	wet medium		
			ss	24"	0"	20.0'	9	10	9	4	"		
25		9	ss	24"	18"	22.0'	9	17	41	115	wet dense	20.5'	
			ss	0"	0"	24.0'	130						
30		10	ss	6"	4"	25.5'	130				wet very dense	27.0'	
										3			
35										4			
										5			
40										5			
		1	C	60'	30"	32.0'				6			

TYPE OF SAMPLES: D-DRY W-WASHED C-CORED A-AUGER UP-UNDISTURBED PISTON UB-UNDISTURBED BALL CHECK VT-VANE TEST

TOTAL FOOTAGE BORED: 32.0'
 FATH BORED: B-57

CLIENT: Town of Bethel

General Borings, Inc.

P. O. BOX 7136 PROSPECT CONN. 06712

SHEET 1 OF 1
HOLE NO. B-56

CONTRACTOR
GBI #5(x)

PROJECT NAME
Water Transmission Line

LINE

FOREMAN-DRILLER
L.C. D.R.

LOCATION
Bethel, Conn.

STATION

INSPECTOR
R.T.

OFFSET

GROUND WATER OBSERVATIONS
AT Surface FT. AFTER 0 HOURS

CASING TYPE FJ SAMPLER 1 3/8" CORE BAR. AXM AX

DATE 3/25

AT _____ FT. AFTER _____ HOURS

SIZE I.D. 2 1/2" HAMMER WT. 140 LBS. BIT 30" Diamond

SURFACE ELEV. _____ GROUND WATER ELEV. _____

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			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.
		NO.	TYPE	PEN	REC.	DEPTH @ BOT.	0-6	6-12				
	1	ss	24"	14"	2.0'	1	1	2	34	wet dense	1.5' 2.0'	1) Gray fine-medium sand, silt. Brown fine-coarse sand, silt, trace fine gravel. NOTE: 2.0'-4.0' cobbles.
						2	5	25	16	wet dense	4.0'	
5	3	ss	24"	13"	8.0'	15	20	18	9	wet medium	8.0'	2) Brown fine-coarse sand, fine-coarse gravel, little 3) Same as sample #2. NOTE: Slipped sample 8.0'-11.0'
						5	6	5	7	"	8.0'	
10	4	ss	24"	10"	12.0'	8	7	7	8	"		4) Brown fine-coarse sand, fine-medium gravel, trace silt. 5) Brown fine-coarse sand, fine-coarse gravel.
						7	7	6	5	"		
15	6	ss	24"	18"	16.0'	5	15	36	100	wet very dense	14.5'	6) Brown fine-coarse sand, fine-medium gravel, trace silt. Brown fine-coarse sand and gravel, trace silt. NOTE: 16.0'-18.0' drilled
						60	100/3"			wet very dense		
20	7	ss	9"	6"	18.75'	60	100/3"					7) Brown fine-coarse sand and gravel, few cobbles, trace silt. NOTE: 18.75'-20.0' drilled 20.0'-20.25' refusal on spot no recovery.
						12						
25	1	C	24"	17"	22.25'				5		22.25'	Run #1 Cored Rock 20.25'-22.25' Recovered 17" White-gray Hornblende Gneiss. Run #2 Cored Rock 22.25'-25.25' Recovered 14" Same as Run #1
									6		25.25'	
30	2	C	36"	14"	25.25'				6.5		25.25'	
35												
40												

TYPE OF SAMPLES:
 D=DRY W=WASHED C=CORED A=AUGER UP=UNDISTURBED PISTON
 UB=UNDISTURBED BALL CHECK VT=VANE TEST

TOTAL FOOTAGE
EARTH BORING B-56

END OF BORING 25.25'
20.25' Soil
5.0' Rock



Cahn Engineers Inc.

CONSULTING ENGINEERS-COMMUNITY DEVELOPMENT CONSULTANTS

March 28, 1977

Mr. Victor F. Galgowski
Superintendent of Dam Maintenance
Water Resources Unit
Department of Environmental
Protection
State Office Building
Hartford, Connecticut 06115

Re: Eureka Lake Dam - Danbury
(CE #14 426 AD)

Dear Mr. Galgowski:

Reference is made to your letter of March 21, 1977 to Mr. Francis J. Clarke, First Selectman of the Town of Bethel regarding the construction adjacent to the dam at Eureka Lake.

As this firm is the consulting engineer for the Town, Mr. Clarke forwarded your letter to us for appropriate action.

The project involved at this site is the construction of the Eureka Water Treatment Plant. The project does not include any work (New Construction, Alteration, Repair, Removal) involving the dam itself. We are placing some riprap adjacent to new Raw Water Intake and Pump House which will cover a small portion of the upstream slope of the dam. On this basis, it was our understanding that a dam construction permit was not required.

However, in light of your letter, we have completed the Application and are forwarding it along with two sets of plans and specifications for your review.

Please see note #1 on page SI-1 of the plans and section 427, page S-13 of the Special Conditions regarding the special instructions to the contractor regarding the protection of the dam.

WATER RESOURCES
UNIT
RECEIVED
MAR 30 1977

ANSWERED _____
REFERRED _____
FILED _____

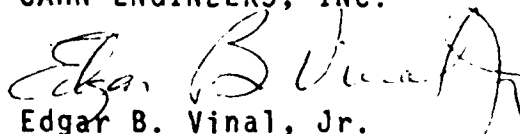
Cahn Engineers Inc.

Mr. Victor F. Galgowski
Page 2
March 28, 1977

If you have any questions, please contact me at
your convenience.

Very truly yours,

CAHN ENGINEERS, INC.


Edgar B. Vinal, Jr.
Senior Vice President

EBV/dac

Enclosures

cc: Frank Clarke

DEPARTMENT OF ENVIRONMENTAL PROTECTION
WATER AND RELATED RESOURCES
State Office Building
Hartford, Connecticut 06115

APPLICATION FOR CONSTRUCTION PERMIT FOR DAM

Owner Town of Bethel Date March 28, 1977
P.O. Address Bethel Town Hall Tel. No. 203-743-9231
Bethel, Connecticut 06801

Location of structure:

Town Danbury Shown on USGS Quadrangle Bethel
Name of Stream Eureka Lake at 2-1/2 inches ~~XXXX~~ south of Lat. 41°22' 30"
and 8-1/2 inches east of Long. 70° 30'
~~west~~

Directions for reaching site from nearest village or route intersection:

Intersection Rte. 53 & Rte. 302 - South on Rte. 53 to Reservoir Road/
West on Reservoir Road to Long Ridge Road - South on Long Ridge Rd.
2,000 ft. to driveway on right to Eureka Lake

This is an application for: (New Construction) (Alteration) (Repair) (Removal)
(check one or more of above)
None of the above, see Remarks

This pond is to be used for: Water Supply for Town of Bethel

Dimensions of Pond: width 1000 ft. length 2400 ft. area _____

Maximum depth of water immediately above dam: 20 ft.

Total length of dam: 250'

Length of spillway: 180'

Height of abutments above spillway: 2'

Type of spillway construction: Concrete and Stone

Type of dike construction: Earth Fill

Spillway section will be set on: (Bedrock) (Gravel) (Clay) (Till) (NA)
(check one of above)

Remarks: Project entails the construction of the Eureka Water Treatment
Plant which is southeast of the dam - only work on dam is the placement
of rip rap on a portion of the upstream slope.

Signed: Edgar B. Vinal, Jr.

Edgar B. Vinal, Jr. (owner) Sr. Vice President
Cahn Engineers, Inc. for the Town of Bethel
Name of Engineer, if any: Cahn Engineers, Inc.
Wallingford, Conn. 06492
(203) 265-6741

APPENDIX C

DETAIL PHOTOGRAPHS



(March 1979)

US ARMY ENGINEER DIV NEW ENGLAND SOCIETY OF ENGINEERS 33 THAM, MASS CIVIL ENGINEERS INC. 1000 WASHINGTON ST BOSTON, MASS	NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	EUREKA LAKE DAM TRUSSHEADS PROOF	DAM NO. 1000	DA 1000
---	--	-------------------------------------	--------------	---------



Photo 1 - Crest and upstream slope of reservoir dam from left end
(May 1979)



Photo 2 - Crest and downstream slope of reservoir dam from right
abutment (August 1979)

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

CAHN ENGINEERS INC.
WALLINGFORD, CONN
ENGINEER

NATIONAL PROGRAM OF

INSPECTION OF
NON-FED. DAMS

BEREA LAKE DAM

LYMPH BROOK

HANBURY, CONNECTICUT

CE # 27 669 KB

DATE Aug 79 PAGE C-1



Photo 3 - Crest and downstream slope of filter basin dam from right abutment (May 1979)



Photo 4 - Upstream slope of filter basin dam from right end (July 1979)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	EUREKA LAKE DAM
CAHN ENGINEERS INC. WALLINGFORD, CONN ENGINEER		TR. SYMPAUG BROOK DANBURY, CONNECTICUT
		CE # 27 060 KB
		DATE Aug 79 PAGE C-2



Photo 5 - Downstream slope of filter basin dam (July 1979)

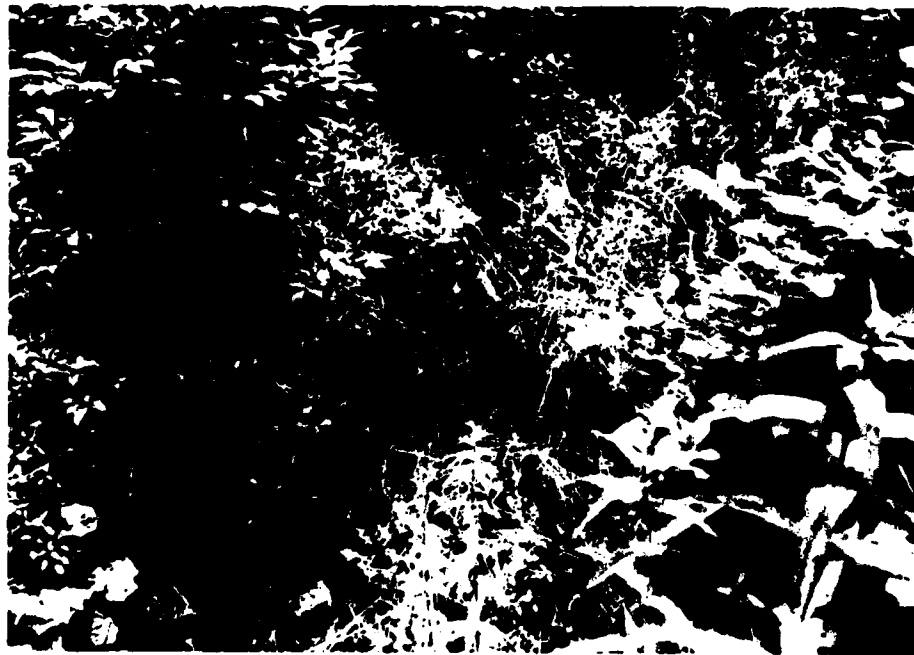


Photo 6 - Downstream toe of filter basin dam. Stream and wet area from outlet pipes (July 1979)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	EUREKA LAKE DAM
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER		TR SYMPAUG BROOK DANBURY, CONNECTICUT
		CE # 27 600 KB
		DATE Aug 79 PAGE C-3



Photo 7 - Upper spillway weir with stop-planks and spillway channel (May 1979)



Photo 8 - Masonry training wall of spillway channel from upstream. Note large crack at base of wall (August 1979)

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WALLINGFORD, CONN
ENGINEER

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

LUREKA LAKE DAM

TR. TYMPAUG BROOK

DANBURY, CONNECTICUT

CE # 27 000 KB

DATE Aug 79 PAGE 02



Photo 9 - Lower spillway weir and spillway channel from upstream
 Note wash-out at right side of spillway weir (May 1979)

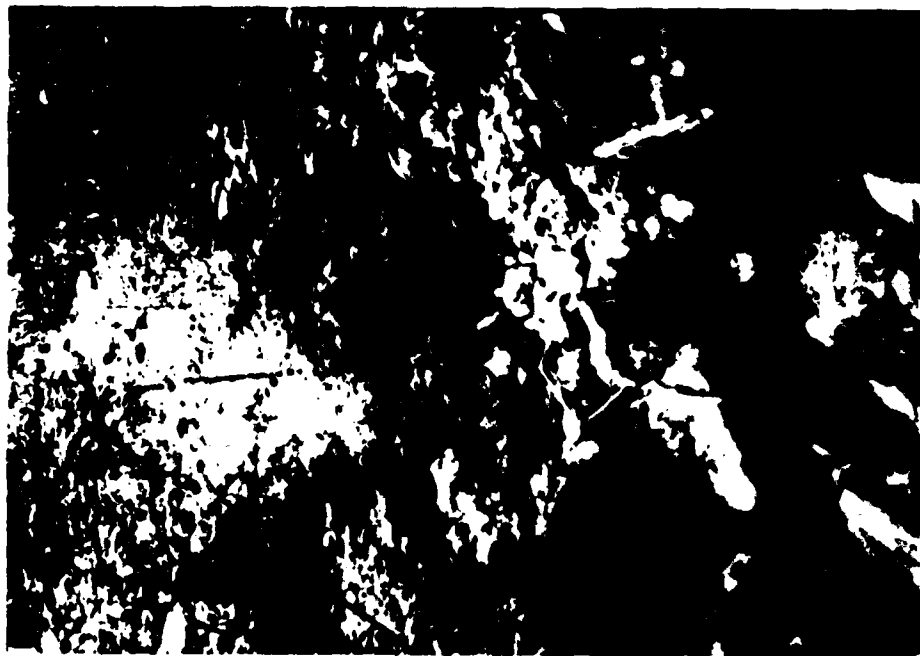


Photo 10- Spillway discharge channel
 downstream from lower weir (July 1979)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	NATIONAL PROGRAM OF	BEA LAKE DAM WYMAU RIVER WINDY, CONNECTICUT
CAHN ENGINEERS INC. WALLINGFORD, CONN ENGINEER	INSPECTION OF NON-FED. DAMS	CE # _____ DATE _____ PAGE _____



Photo 11 - Gatehouse on downstream slope of filter basin dam
(July 1979)

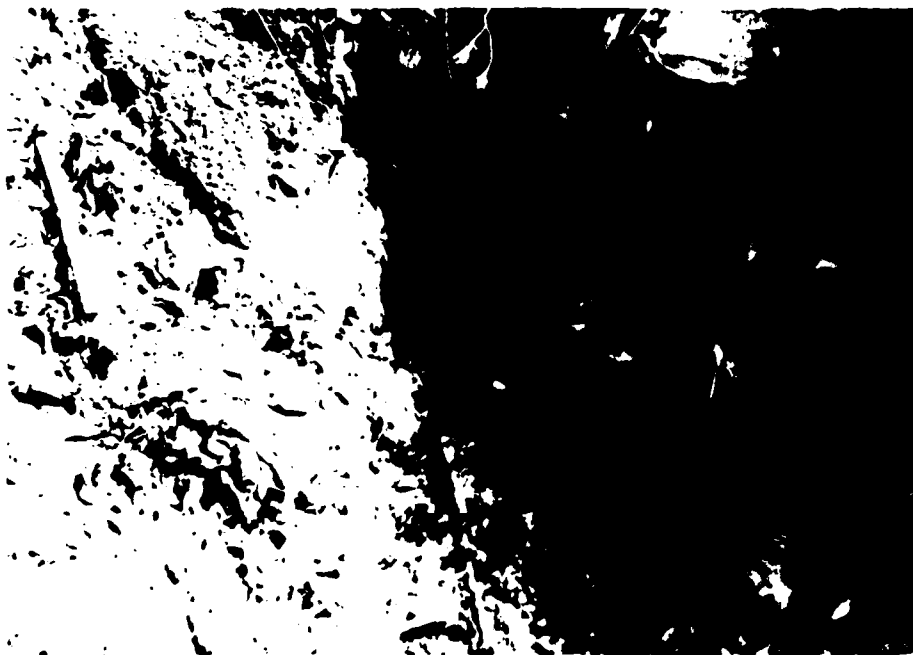


Photo 12 - 12 inch low level outlet (right) and 6 inch gatehouse
drain pipe (left) Note extensive erosion in this area.
(May 1979)

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CAHN ENGINEERS INC.
WALLINGFORD, CONN
ENGINEER

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

EUREKA LAKE DAM

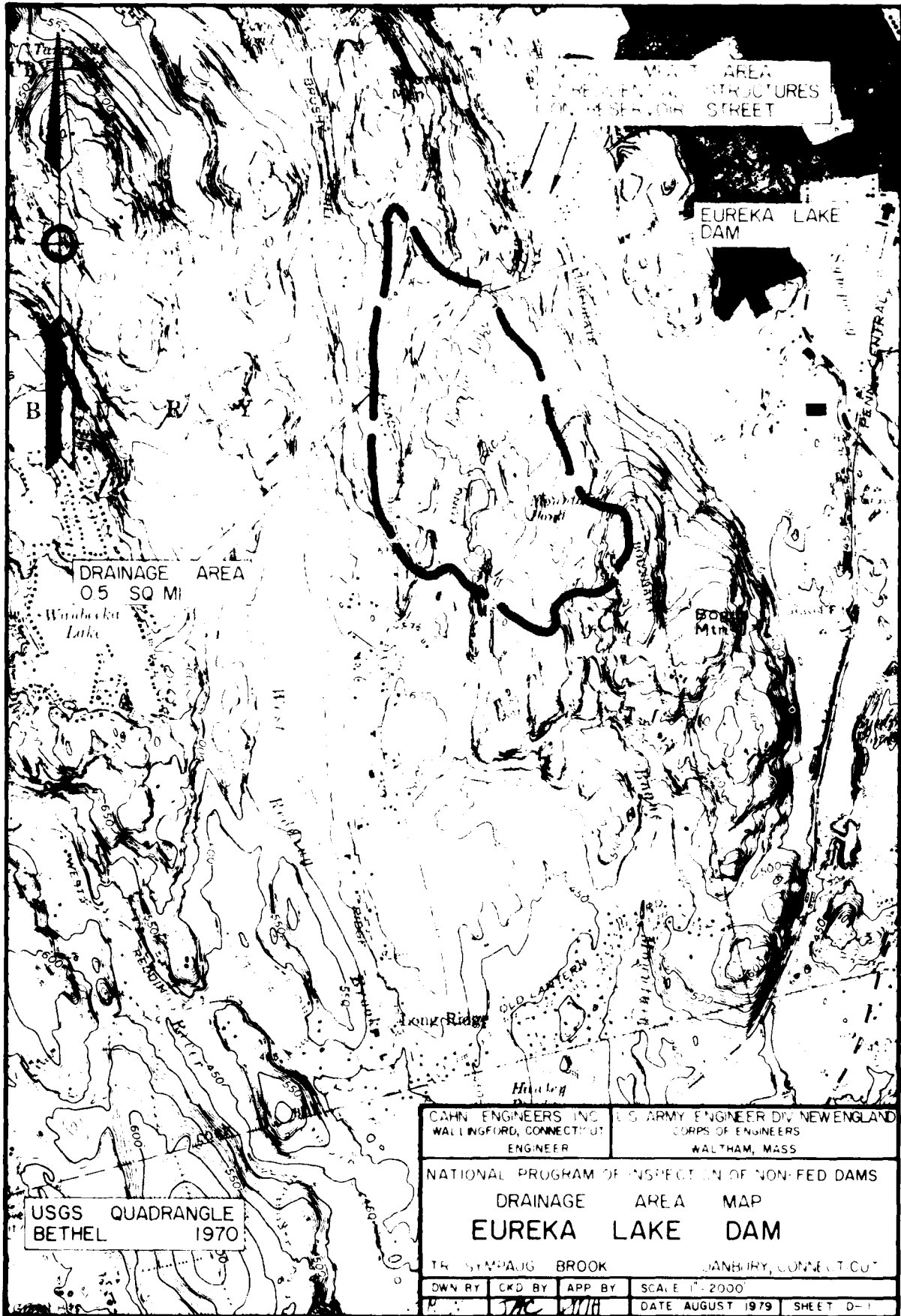
TP SYMBIAUG BROOK

DANBURY, CONNECTICUT

CE # 07-111-111

DATE 10/10/79 PAGE 001

APPENDIX D
HYDRAULICS/HYDROLOGIC COMPUTATIONS



Project N-F Lewis Imp. - Euroto Dam

Sheet 1 of 2

Computed By GAB Checked By AM SK

Date 21 Jul 79

Field Book Ref _____ Other Refs _____

Revisions _____

Hydrologic / Hydraulic Inspection

Euroto Dam, Danbury, Conn

D) Performance at Test Flood Conditions

1) Probable Maximum Flood

a) Watershed Rolling to Mountainous but classified as Rolling to account for minor storage provided by Mountain Pond

b) Watershed area = 310 acres or 0.42 sq. miles

c) Extrapolating from NED-ACE Guide Curves:

$$PMF = 2,600 \text{ cfs/sq. mile}$$

d) Therefore Peak Inflow:

$$PMF = (2600)(0.42) \approx 1200 \text{ cfs}$$

2) Spillway Design Flood (SDF)

a) Classification of Dams

i) Size: Storage = 250* ac. ft < 1,000 ac. ft
Height:

* 210 to spillway crest
Reservoir Dam 18'
Titter Dam 20'

Project N-F Dams Insp - Eureka Dam

Sheet 2 of 5

Computed By GAB Checked By Hil JAC

Date 21 Jul 77

Field Book Ref. _____ Other Refs _____

Revisions _____

2a-cont'd) classification

ii) Hazard Potential: The dams are located some 1800' upstream of some low houses and about 1 mile upstream of the town of Bethel.

iii) Size: Small
Hazard: High

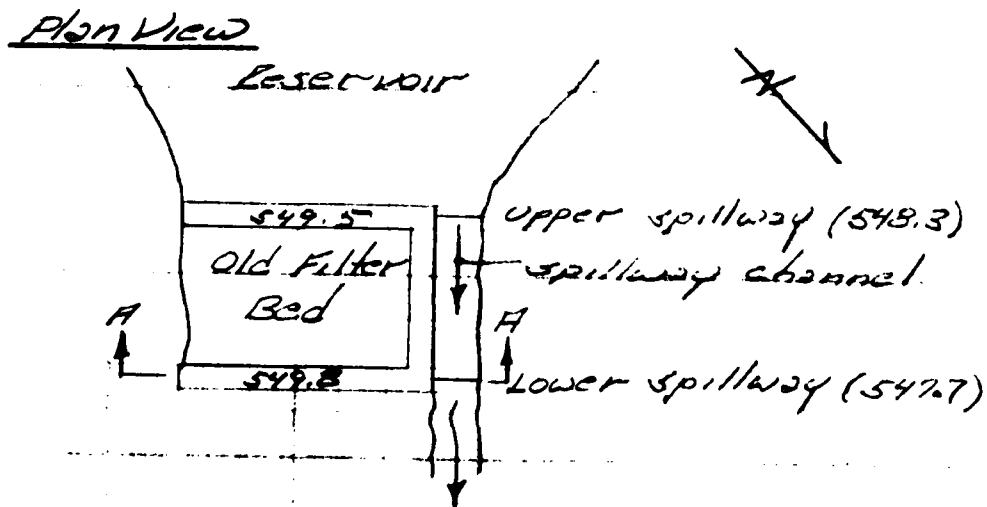
b) SDF = PMF = 1200 cfs $\frac{1}{2}$ PMF = 600 cfs

3) Surcharge at Peak Inflows

a) Peak Inflows $Q_p = 1200$ cfs

$Q_p = \frac{1}{2}$ PMF = 600 cfs

b) Most restrictive outlet (Section A-A)



Project N-E Dams Insp. - Lumberton Dam

Sheet 3 of 3

Computed By EAR Checked By JHC

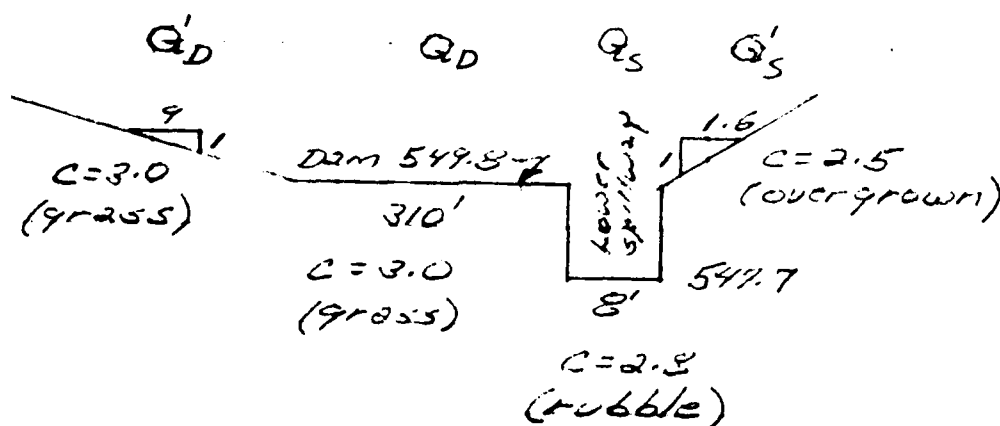
Date 21 Jul 77

Field Book Ref _____ Other Refs _____

Revisions _____

36-Cont'd) Most Restrictive Outlet

Section H-H



$$Q_S = (2.8)(8)(H)^{3/2} = 22.4H^{3/2}$$

$$Q'_S = 2.5(2/3)(1.6)(H-2.1)(H-2.1)^{3/2} = 2.67(H-2.1)^{5/2}$$

$$Q_D = (3.0)(310)(H-2.1)^{3/2} = 930(H-2.1)^{3/2}$$

$$Q'_D = (3.0)(2/3)(9)(H-2.1)(H-2.1)^{3/2} = 18(H-2.1)^{5/2}$$

therefore total outflow can be approximated by the following:

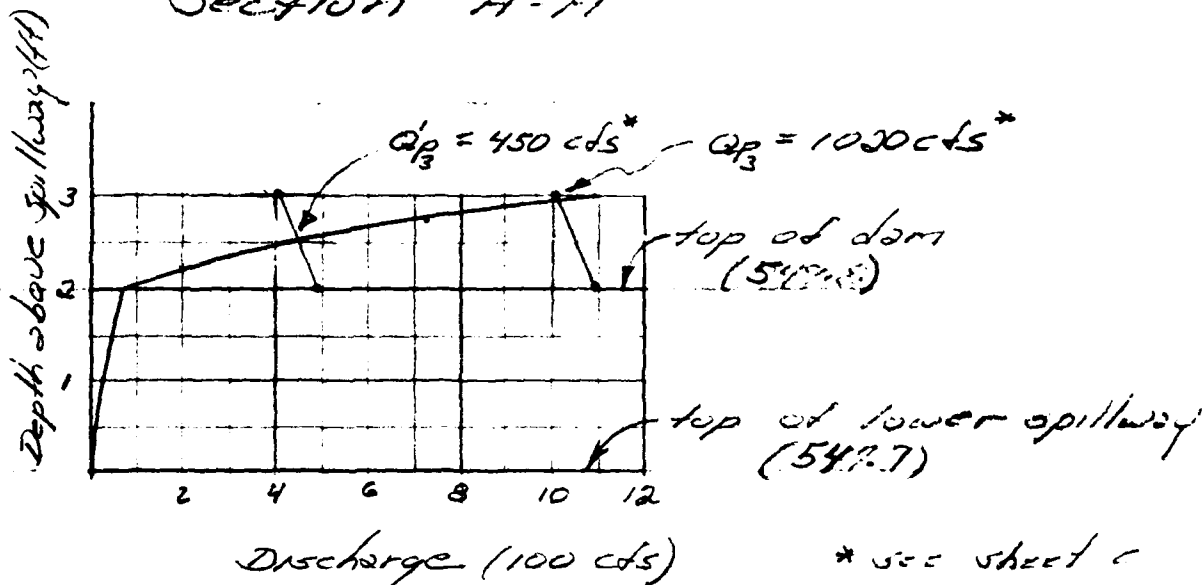
$$Q = 22.4H^{3/2} + 2.67(H-2.1)^{5/2} + 930(H-2.1)^{3/2} + 18(H-2.1)^{5/2}$$

$$Q = 22.4H^{3/2} + 20.7(H-2.1)^{5/2} + 930(H-2.1)^{3/2}$$

Project N-F Davis Temp - Eureka Dam
 Computed By GAB Checked By JAC
 Field Book Ref. _____ Other Refs. _____

Sheet 4 of 2
 Date 21 July 57
 Revisions _____

3)c) Outflow Rating Curve thru Section A-A



d) Surge Height to Pass Q_p (see A-A)

@ $Q_p = PMF = 1000 \text{ cfs}$ $H_s = 3.1'$

@ $Q_p = \frac{1}{2} PMF = 500 \text{ cfs}$ $H_s = 2.7'$

e) Spillway Capacity to Top of Dam

Upper: $C = 2.8$ $L = 80'$ $H = 1.2'$
 $Q_{su} = 29 \text{ cfs}$

Lower: $C = 2.8$ $L = 7.8'$ $H = 2.1'$ **
 $Q_{sl} = 66 \text{ cfs}$

* To top of reservoir dam

** To top of filter dam

Project N-F Dam's Temp - Foulke DamSheet 5 of 5Computed By G.R.B. Checked By H.W. JHCDate 2/16/77

Field Book Ref _____ Other Refs _____

Revisions _____

4) Amount of Storage on Discharge =
(Outflow)

a) Reservoir area 31 ac. = 5 (USGS)

b) Assume normal pool at elevation
of upper spillway = 548.3)

Elevation of lower spillway (Sec. A-A)
= 547.7 (see sheet 2) therefore
storage height = H over lower
spillway less 0.6' (548.3 - 547.7)

c) watershed area = 0.48 sqmils (see sheet 1)

d) Discharge, Q_p , at various
surcharge elevations.

H_h = height over lower spillway

$$H_h = 3' \quad V = (3 - 0.6)(31) = 74.4 \text{ ac ft}$$

$$S = 74.4 / 0.48 \times 53.3 = 2.9 \text{ ''}$$

$$H_h = 2' \quad V = (2 - 0.6)(31) = 43.4 \text{ ac ft.}$$

$$S = 43.4 / 0.48 \times 53.3 = 1.7 \text{ ''}$$

Project N-E Water Supply

Sheet 0 of 1

Computed By WAB Checked By JHC

Date 1/1/77

Field Book Ref _____ Other Refs _____

Revisions _____

4d cont'd) Discharge, Q_p

PMF

1/2 PMF

$$Q_p = Q_{p1}(1 - 5/19)$$

$$Q'_p = Q_{p1}(1 - 5/19.5)$$

$$Q_{p1} = 1200 \text{ cfs}$$

$$Q'_{p1} = 600 \text{ cfs}$$

$$H_h = 3 \quad Q_p = 1020 \text{ cfs}$$

$$Q'_p = 415 \text{ cfs}$$

$$H_h = 2 \quad Q_p = 1220 \text{ cfs}$$

$$Q'_p = 490 \text{ cfs}$$

$$Q_p = 1020 \text{ cfs}$$

$$Q'_p = 450 \text{ cfs}$$

$$H_h = 2.9$$

$$H_h = 2.6$$

$$\begin{aligned} \text{Pool elev} &= 2.9 + 547.7 \\ &= 550.6 \end{aligned}$$

$$\begin{aligned} \text{Pool elev} &= 2.6 + 547.7 \\ &= 550.3 \end{aligned}$$

Height over:

Height over:

Reservoir Dam

Reservoir Dam

1.1'

0.8'

Filter Dam

Filter Dam

0.8'

0.5'

Upper spillway

Upper spillway

2.3'

2.0'

Lower spillway

Lower Spillway

2.9'

2.6'

Project N-E Down Temp - Low Side DamSheet 1 of 2Computed By GRJ Checked By HU JACDate 2/1/77

Field Book Ref _____ Other Refs _____

Revisions _____

II Downstream Failure Hazard

- 1) Depth of flow in downstream channel before reservoir dam is overtopped



$$S = 10\%$$

$$n = 0.05$$

Channel section 1000'
Downstream from Dam
(Looking D/S)

Q (upper spillway) - 37 cfs (see sheet 4)

Normal depth = 1.0'

- 2) Peak flood and stage of immediate impact area (both dams must fail to release reservoir storage)
(Use reservoir dam for analysis)

a) Breach width

i) Mid-Height elevation = 540.5

ii) Approximate mid-height length $\approx 150'$

iii) Breach width $\approx .4 \times 150 = 60'$

Project N-E Dams Insp - E-1 - 6-2-74
Computed By GBB Checked By HLI JAC
Field Book Ref _____ Other Refs _____

Sheet 8 of 15
Date 23 Jul 74
Revisions _____

2b) Peak Failure Outflow (assume surcharge to top of dam)

i) Height at failure = $H_0 = 18'$

ii) Upper spillway discharge 29 cfs (sheet 4)

iii) Breach outflow (Q_b)

$$Q_b = \frac{2}{27} W_b \sqrt{g} H_0^{3/2} \approx 7,700 \text{ cfs}$$

iv) Peak failure outflow =

$$29 \text{ cfs} + 7,700 \text{ cfs} \approx 7,729 \text{ cfs}$$

c) Increase in normal depth due to dam failure (see sections shown on sheet 1)

Normal depth for 29 cfs from upper spillway 1.0'

Normal depth for 7,700 cfs 8.1'

Increase in depth due to dam failure 7.1'

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

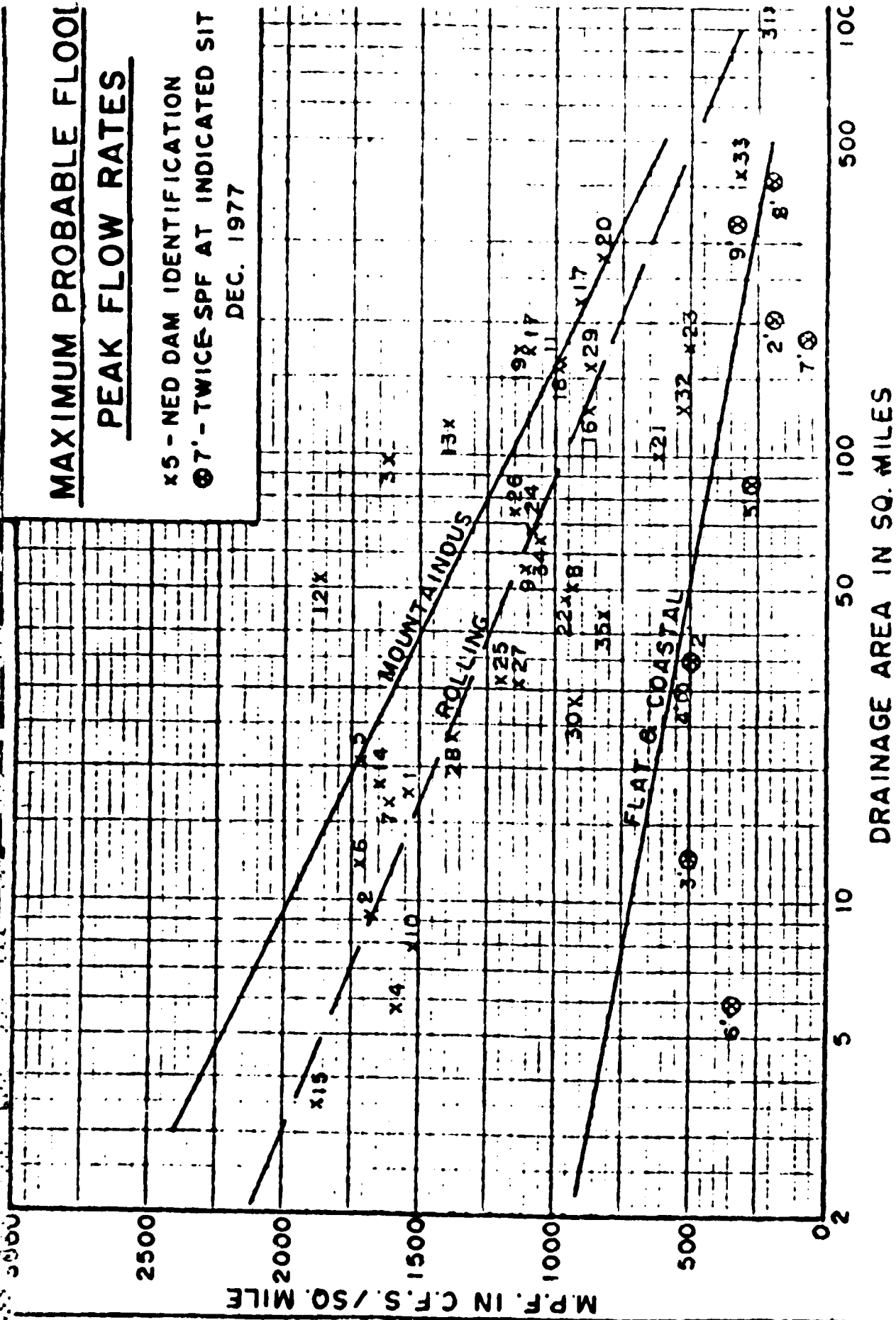
<u>Project</u>	<u>Q</u> (cfs)	<u>D.A.</u> (sq. mi.)	<u>MPF</u> cfs/sq. mi.
1. Hall Meadow Brook	26,600	17.2	1,546
2. East Branch	15,500	9.25	1,675
3. Thomaston	158,000	97.2	1,625
4. Northfield Brook	9,000	5.7	1,580
5. Black Rock	35,000	20.4	1,715
6. Hancock Brook	20,700	12.0	1,725
7. Hop Brook	26,400	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)

<u>River</u>	<u>SPF</u> (cfs)	<u>D.A.</u> (sq. mi.)	<u>MPF</u> (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

MAXIMUM PROBABLE FLOOD PEAK FLOW RATES

x5 - NED DAM IDENTIFICATION
 ⊗ 7' - TWICE-SPF AT INDICATED SIT
 DEC. 1977

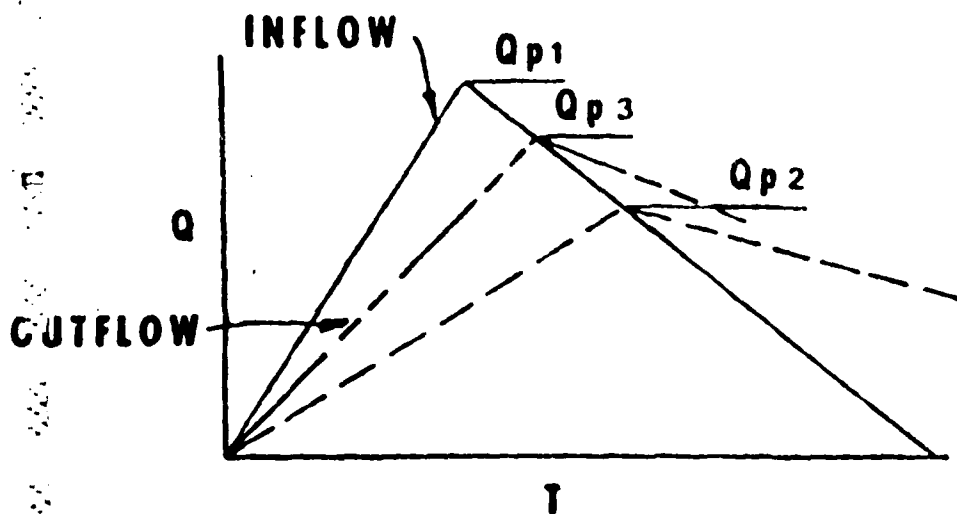


DRAINAGE AREA IN SQ. MILES

M.P.F. IN C.F.S./SQ. MILE

41

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Q_{p1}) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass " Q_{p1} ".

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

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

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and " $STOR_2$ " To Pass " Q_{p2} "

b. Average " $STOR_1$ " and " $STOR_2$ " and Determine Average Surcharge and Resulting Peak Outflow " Q_{p3} ".

SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surcharge Height and
"STOR₂" To Pass "Q_{p2}"

b. Avg "STOR₁" and "STOR₂" and
Compute "Q_{p3}".

c. If Surcharge Height for Q_{p3} and
"STOR_{AVG}" agree O.K. If Not:

STEP 4: a. Determine Surcharge Height and
"STOR₃" To Pass "Q_{p3}"

b. Avg. "Old STOR_{AVG}" and "STOR₃"
and Compute "Q_{p4}"

c. Surcharge Height for Q_{p4} and
"New STOR_{AVG}" should Agree
closely

SURCHARGE STORAGE ROUTING ALTERNATE

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

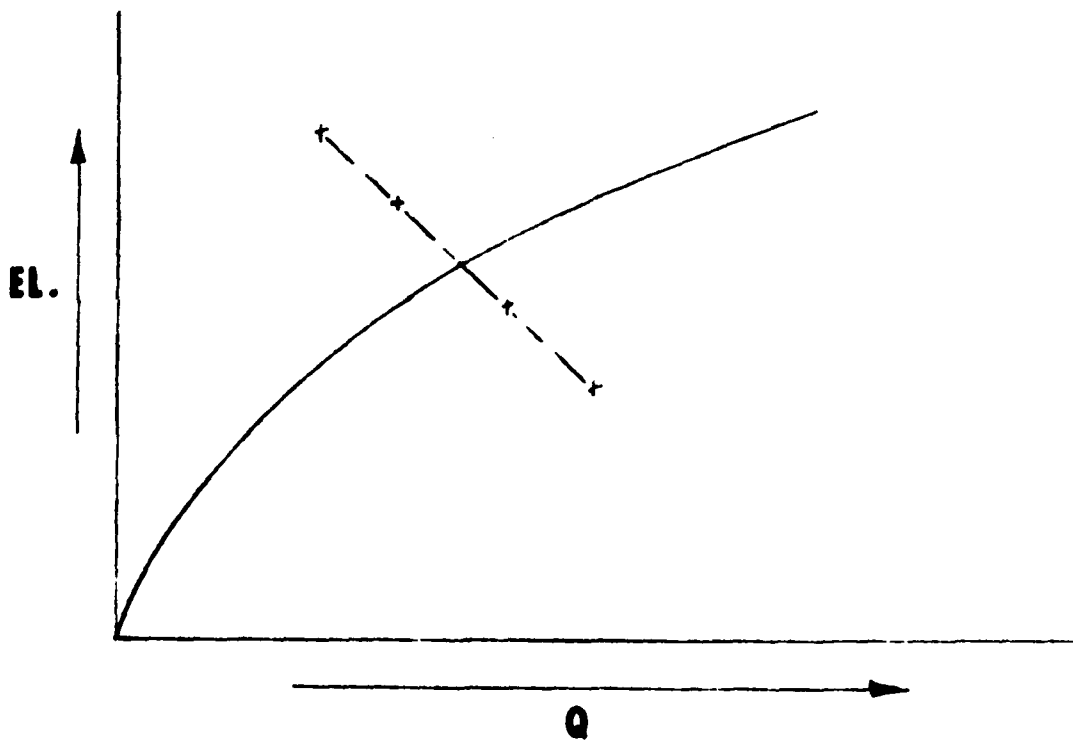
$$Q_{p2} = Q_{p1} - Q_{p1} \left(\frac{\text{STOR}}{19} \right)$$

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

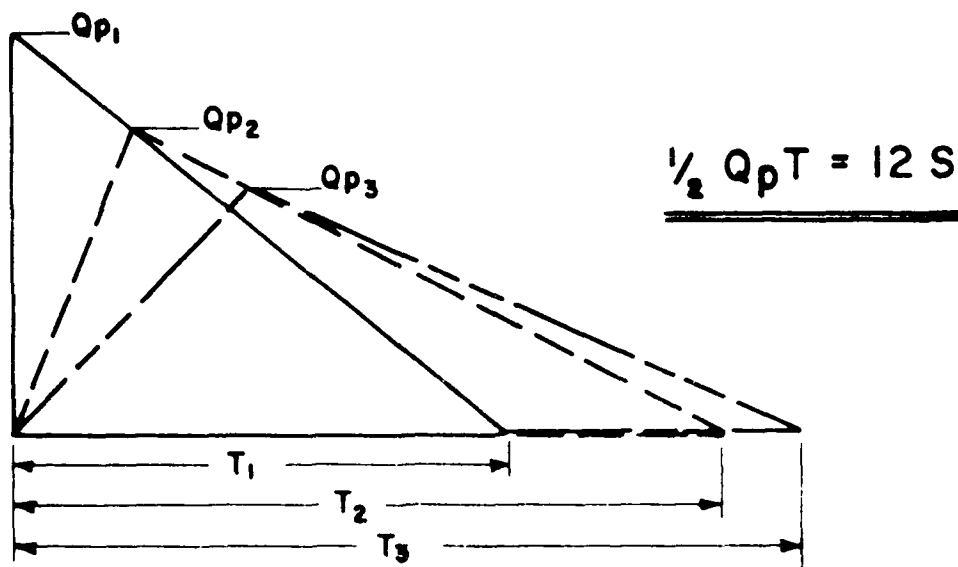
Q_{p2}
=====

STOR
=====

EL.
=====



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



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

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

$$Q_{p1} = \frac{8}{27} w_b \sqrt{g} Y_0^{3/2}$$

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

Y_0 = 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 ACCOMPANYING 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} .

$$Q_{p2} (\text{TRIAL}) = Q_{p1} \left(1 - \frac{V_1}{S}\right)$$

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

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

$$Q_{p2} = Q_{p1} \left(1 - \frac{V_{\text{avg}}}{S}\right)$$

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

APRIL 1978

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

RECORDED

INDEXED

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