

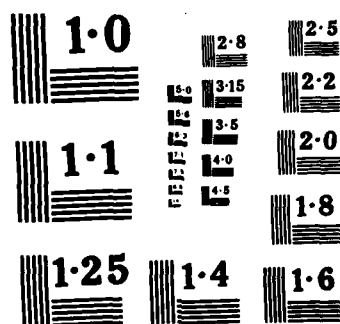
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
ROSEMARY LAKE DAM (MA.) (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JAN 80

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NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

AD-A155 811

CHARLES RIVER BASIN
NEEDHAM, MASSACHUSETTS

ROSEMARY LAKE DAM
MA 01112

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

JANUARY 1980

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is an earth embankment about 440 ft. long with a top width of about 50 ft. The dam is small in size with a hazard potential of high. The dam appears to be in fair condition. There are various operation and maintenance measures that the owner should undertake,		



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

REPLY TO
ATTENTION OF
NEDED

MAY 30 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

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

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, the town of Needham, Massachusetts.

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

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

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

ROSEMARY LAKE DAM

MA 01112

CHARLES RIVER BASIN

NEEDHAM, MASSACHUSETTS

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: MA 01112
Name of Dam: Rosemary Lake Dam
Town: Needham
County and State: Norfolk, Massachusetts
Stream: Rosemary Brook
Date of Inspection: October 16, 1979

BRIEF ASSESSMENT

Rosemary Lake Dam is an earth embankment approximately 440 feet long with a top width of about 50 feet. The upstream face of the dam is a stone parapet wall and the downstream slope of the embankment which is the lawn of an apartment complex is an estimated 20H:1V. The service and auxiliary spillways are both drop-inlet structures which discharge into two 66-inch diameter conduits; however, the conduits are 48-inch diameter at their downstream outlets. The dam once furnished the water needs of a mill located at the damsite; however, the impounded waters are now used for recreational purposes by the Town of Needham.

The lake behind the dam is about 1,100 feet long and has a surface area at the spillway crest level of about 15 acres. The drainage area above the dam is 1.2 sq. miles and the maximum storage at the top of the dam is about 91 acre-feet. The height of the dam is approximately 12 feet; therefore the size classification is "Small." A breach of the dam would have a critical effect on the 210 unit apartment complex built immediately downstream of the dam as well as having an impact on an elementary school 1,700 feet downstream and seven homes 3,700 feet downstream. The dam has been classified as having a "High" hazard potential. Based on the "Small" size and "High" hazard potential, the range for the test flood is one-half of the Probable Maximum Flood (PMF) to the full PMF. The selected test flood for the project is one-half of the PMF based on the dam height, storage capacity and downstream flood impact area.

The dam appears to be in fair condition. The upstream stone parapet wall appears to be aligned properly and there were no signs of depressions, seepage or other deficiencies observed along the crest and downstream slope of the embankment. About 5 gpm seepage was noted entering a storm sewer on the upstream side of the dam along Rosemary Street.

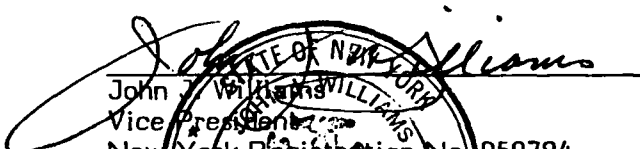
The test flood peak inflow for the facility was computed as 1,020 cfs. The routed test flood outflow is also 1,020 cfs which results in the dam being overtopped

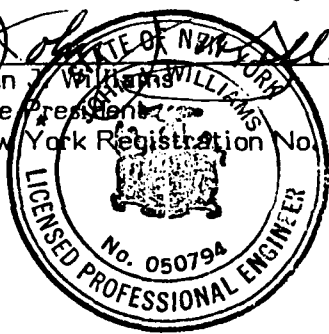
by 0.7 feet. The spillway system can pass 247 cfs or about 24 percent of the routed test flood outflow without overtopping of the dam.

Within one year after receipt of this Phase I Inspection Report, the Owner, the Town of Needham, should retain the services of a qualified registered professional engineer and implement the results of his evaluation of the following: (1) assess further the potential for overtopping and the adequacy of the spillways; (2) study the cause of the seepage to the storm sewer located under Rosemary Street; (3) investigate the seismic stability of the dam.

The Owner should also implement the following operation and maintenance measures: (1) clear obstructions from the channel downstream of the spillway conduits; (2) verify the operability of the low level drain gate valve; (3) repair or replace the grating on the auxiliary spillway inlet structure; (4) develop a formal surveillance and flood warning plan, including round-the-clock monitoring during heavy precipitation; and (5) institute a program of annual technical inspection.

O'BRIEN & GERE ENGINEERS, INC.


John J. Williams
Vice President
New York Registration No. 050794



Date 22 FEB. 80

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

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

Aramast Mahtesian

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Letter of Transmittal	
Brief Assessment	
Review Board Page	
Preface	i
Table of Contents	ii-iv
Overview Photo	v
Location Map	vi

REPORT

1. PROJECT INFORMATION

1.1 General	1-1
a. Authority	1-1
b. Purpose of Inspection	1-1
1.2 Description	1-1
a. Location	1-1
b. Description of Dam and Appurtenances	1-1
c. Size Classification	1-2
d. Hazard Classification	1-2
e. Ownership	1-3
f. Operator	1-3
g. Purpose of Dam	1-3
h. Design and Construction History	1-3
i. Normal Operational Procedures	1-3
1.3 Pertinent Data	1-3
a. Drainage Area	1-3
b. Discharge at Damsite	1-3
c. Elevation	1-4
d. Reservoir	1-4
e. Storage	1-5
f. Reservoir Surface	1-5
g. Dam Data	1-5
h. Diversion and Regulating Tunnel	1-5
i. Spillways	1-5
j. Regulating Outlets	1-6

TABLE OF CONTENTS (Con't)

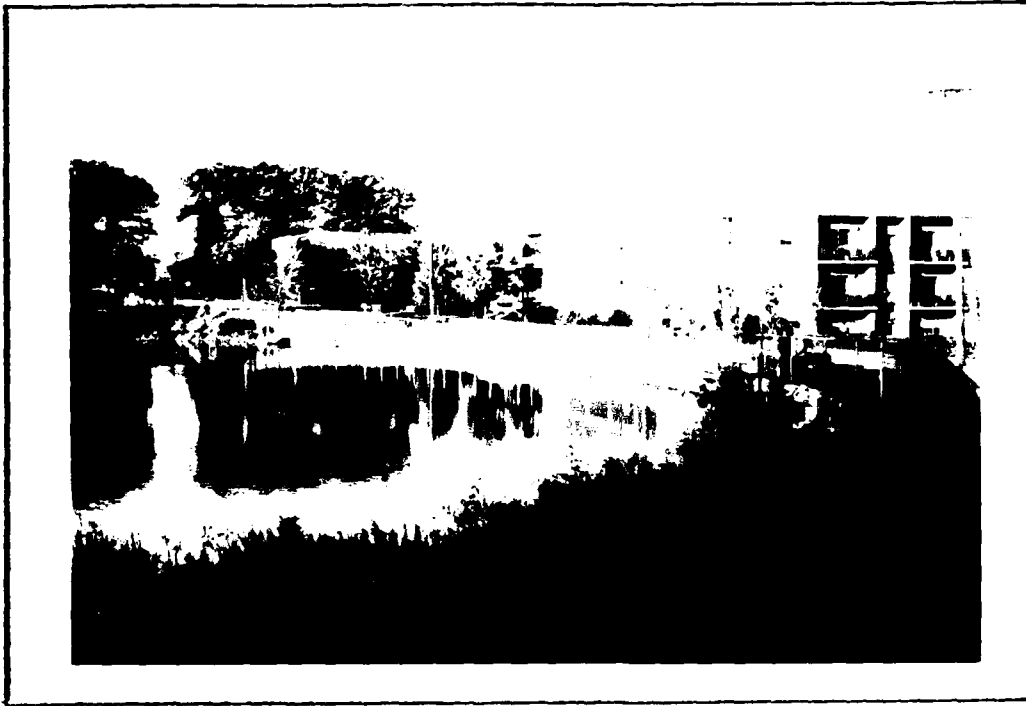
<u>SECTION</u>	<u>PAGE</u>
2. ENGINEERING DATA	
2.1 Design	2-1
2.2 Construction	2-1
2.3 Operation	2-1
2.4 Evaluation	2-1
a. Availability	2-1
b. Adequacy	2-1
c. Validity	2-1
3. VISUAL INSPECTION	
3.1 Findings	3-1
a. General	3-1
b. Dam	3-1
c. Appurtenant Structures	3-1
d. Reservoir Area	3-1
e. Downstream Channel	3-2
3.2 Evaluation	3-2
4. OPERATIONAL AND MAINTENANCE PROCEDURES	
4.1 Operational Procedures	4-1
a. General	4-1
b. Description of Any Warning System in Effect	4-1
4.2 Maintenance Procedures	4-1
a. General	4-1
b. Operating Facilities	4-1
4.3 Evaluation	4-1
5. EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES	
5.1 General	5-1
5.2 Design Data	5-1
5.3 Experience Data	5-1
5.4 Test Flood Analysis	5-1
5.5 Dam Failure Analysis	5-2

TABLE OF CONTENTS (Con't)

<u>SECTION</u>	<u>PAGE</u>
6. EVALUATION OF STRUCTURAL STABILITY	
6.1 Visual Observation	6-1
6.2 Design and Construction Data	6-1
6.3 Post-Construction Changes	6-1
6.4 Seismic Stability	6-1
7. ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES	
7.1 Dam Assessment	7-1
a. Condition	7-1
b. Adequacy of Information	7-1
c. Urgency	7-1
7.2 Recommendations	7-1
7.3 Remedial Measures	7-2
a. Operation and Maintenance Procedures	7-2
7.4 Alternatives	7-2

APPENDICES

APPENDIX A - INSPECTION CHECKLIST	A-1 to A-10
APPENDIX B - ENGINEERING DATA	B-1 to B-4
APPENDIX C - PHOTOGRAPHS	C-1 to C-4
APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS	D-1 to D-15
APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS	



OVERVIEW OF THE UPSTREAM FACE OF ROSEMARY LAKE DAM. (10/16/79)



OVERVIEW OF THE DOWNSTREAM FACE OF ROSEMARY LAKE DAM. (10/16/79)

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

At the time of inspection, the dam showed no visible signs of instability. The stone parapet wall at the upstream face of the dam appears to be sound and there is no significant evidence of pavement deterioration on Rosemary Street. The downstream slope also appears to be in good condition and is well maintained.

6.2 Design and Construction Data

There is no known design and construction data available for the original dam or for any subsequent modifications.

6.3 Post Construction Changes

The only known modifications of the original dam construction consist of the following:

- a. Reconstruction of the stone masonry parapet wall along the upstream face of the dam in 1933.
- b. Plugging of the inlet to the race serving the former Tillotson Rubber Company (date unknown).
- c. Paving and repaving of Rosemary Street on the dam crest (dates unknown).
- d. Construction of the apartment complex just to the north of Rosemary Street with subsequent lawn construction which modified the downstream slope of the dam (approximate date, 1974).
- e. It appears that the 66-inch diameter outlet conduits from the service and auxiliary spillways were extended with 48-inch diameter reinforced concrete pipe at the same time the apartment complex was constructed.

6.4 Seismic Stability

Rosemary Lake Dam is located in Seismic Zone 3 of the "Seismic Zone Map of Contiguous States." Considering its "High" hazard classification, a seismic stability investigation should be conducted as recommended in Section 7.

The peak inflow and routed outflow for the test flood were both calculated to be 1,020 cfs. The routed test flood outflow corresponds to a stage of 3.4 feet above the service spillway crest and 0.7 feet above the top of the dam. The combined spillway capacity without overtopping the dam was calculated to be 247 cfs which is about 24 percent of the routed test flood outflow.

5.5 Dam Failure Analysis

A failure of the embankment was simulated by the HEC-1-DB computer program assuming a 44-foot wide and 8.7-foot deep breach with vertical side slopes developing within one hour. The failure is assumed to occur with the reservoir surface at the top of dam elevation. The resulting outflow was routed to the 210-unit apartment complex located approximately 150 feet downstream of the dam. The increase in stream depth at this point was computed to be 7.2 feet. About 1,700 feet downstream, in the vicinity of an elementary school, the increase in stream depth is about 5.3 feet and about 3,700 feet downstream, in the vicinity of 7 homes, the increase in stream depth is about 6.6 feet.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Rosemary Lake Dam has a watershed about 1.2 miles long and 1.0 miles wide. The drainage area lies almost entirely within the Town of Needham which is developed residentially, commercially and industrially. The topography is hilly ranging from Elev. 250 to Elev. 99 at the damsite. Rosemary Brook approaches the reservoir from the west and south adjacent to the basin divide. The watercourse meanders excessively through the basin.

5.2 Design Data

Neither hydraulic nor hydrologic design data is available for Rosemary Lake Dam.

5.3 Experience Data

No records of high reservoir pools or dam overtoppings are available for this site.

5.4 Test Flood Analysis

Based on the "Small" size and "High" hazard potential, the range for the test flood is one-half of the Probable Maximum Flood (PMF) to the full PMF. The selected test flood is one-half of the PMF based on the relatively small storage capacity and the resistance to breaching due to the extremely flat downstream slope. Hydrologic and hydraulic calculations were performed with the assistance of the HEC-1-DB computer program. The flood hydrographs were constructed from the Snyder unit hydrographs using average coefficients, an initial infiltration of zero, and a constant loss rate of 0.05 inches per hour. The Hop Brook Adjustment Factor was used to reduce the Probable Maximum Precipitation based on the drainage area. Stage vs. Discharge and Stage vs. Storage relationships above the spillway crest were developed for Rosemary Lake Dam. Since both the service and auxiliary spillways discharge into underground conduits, calculations were performed using an orifice equation to approximate the capacity of the two conduits. The results indicate that the discharge capacities of both spillways are orifice controlled for all heads greater than two feet above the spillway crests. The impoundment was assumed to be at the service spillway crest at the beginning of the storm event. Because of the excessive meandering of the watercourse through the basin, the time of travel from the farthest point in the basin is longer than might be expected for a drainage area of this size. Therefore, the lag time is estimated to be about 3 hours for construction of the unit hydrograph.

SECTION 4

OPERATION AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. The normal operational procedures consist of opening the auxiliary spillway sluice gate during periods of heavy precipitation and/or runoff and draining the lake each year in order to clean the adjacent swimming pool area prior to the start of the swimming season.

b. Description of Any Warning System in Effect. According to the Owner's representative, there is no formal warning system in effect. However, if a situation should arise where there would be a chance of the dam overtopping, the residents of the apartment complex immediately downstream of the dam would be notified by the Town of Needham personnel.

4.2 Maintenance Procedures

a. General. Rosemary Lake is maintained by the Parks and Recreation Department for recreation purposes. Consequently, personnel from that department would be involved in clearing debris from spillway inlets and performing other similar maintenance tasks. In general, however, any maintenance of the dam is performed through the Department of Public Works on an as needed basis.

b. Operating Facilities. Operation of the auxiliary spillway sluice gate is controlled through the office of Mr. Jack Marr, Town Engineer. Mr. Marr's office would be responsible for notifying the Department of Public Works if maintenance work would need to be performed on the gate or other dam facilities.

4.3 Evaluation

For the most part, it appears that the dam is adequately maintained and operated. There is no evidence of overtopping and the existing facilities, including appurtenant structures and downstream drainage ways, appear to be in good condition, except for the grating on the auxiliary spillway inlet structure which needs to be repaired or replaced.

The Owner's representative did not know if the low level gate valve a few feet to the left of the service spillway is operable.

e. Downstream Channel. The two discharge conduits from the service and auxiliary spillways terminate at a headwall approximately 300 feet north of the dam. A rectangular-shaped channel with masonry walls conveys the flow another 150 feet to the north and discharges it into a natural stream bed. The width of the channel varies from 13 feet at the headwall to approximately 9 feet at the point of discharge. The height varies within a range of 4 to 5 feet. The bottom of the discharge channel has a significant amount of debris consisting primarily of stones and tree branches. Approximately 50 feet downstream of the headwall, a single lane concrete bridge has been constructed across the channel. There is a cross-sectional flow area of about 47 square feet under the bridge.

The stream bed downstream of the discharge channel averages about 8 feet in width with 2H:1V side slopes. A small amount of vegetation lines the channel, but does not appear to restrict the flow significantly.

The apartment buildings on the left side of the brook could experience appreciable damage if runoff significantly exceeds the channel capacity.

3.2 Evaluation

The dam appears to be in fair condition. The stone masonry parapet wall is tilted slightly towards the lake and 3 tree stumps were observed along the parapet wall near the left abutment. About 5 gpm of presumed seepage was noted discharging from the Storm sewer on the south side of Rosemary Street.

The grating on the auxiliary spillway inlet structure needs to be repaired or replaced. The size elevation, alignment and operability of the low level drain located a few feet to the left of the service spillway should be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of Rosemary Lake Dam was performed on October 16, 1979. At the time of inspection, the level of the lake was about 2 inches above the crest of the service spillway and approximately 8 inches below the crest of the auxiliary spillway. Underwater areas were not inspected.

Observations and comments made during the field inspection appear on a checklist included as Appendix A of this report.

b. Dam. The dam appears to be in fair condition. The stone masonry parapet wall, rebuilt in 1933, appears to be sound; however, it is tilted slightly towards the lake. In addition, 3 tree stumps were observed along the parapet wall near the left abutment as shown on page 2, Appendix C of this report.

Rosemary Street is located on the top of the dam and appears to be in good condition with only slight longitudinal pavement cracking. It was also noted that there was about 5 gpm of presumed seepage discharging from the storm sewer on the south side of Rosemary Street.

An apartment complex is located just downstream of the dam. In essence, the grassed lawn of the apartment complex forms the downstream slope of the embankment and appears to be very well maintained.

c. Appurtenant Structures. The service and auxiliary spillway inlets appear to be in good structural condition. The only apparent problem is with the bar grating over the auxiliary spillway which is in need of repair or replacement.

It was not possible to adequately assess the condition of the discharge conduits extending from the spillway inlets to the downstream channel. However, the outlets of the pipes are unobstructed and appear to be in good condition.

The valve for a low level drain is located a few feet to the left of the service spillway inlet structure. The size, elevation and alignment of this drain is unknown.

d. Reservoir Area. The slopes along the perimeter of the lake are well vegetated and appear to be stable and free from appreciable erosion. Except for the eastern bank of the lake, the slopes are very gradual.

Further information with regard to the accumulation of silt on the lake bottom was obtained from the Owner and is included in Appendix B of this report.

SECTION 2

ENGINEERING DATA

2.1 Design

No design information relative to the dam construction is available according to Mr. Gary Petrini, Chairman of the Rosemary Lake Reclamation and Building Committee.

2.2 Construction

There is no known information with regard to the construction of Rosemary Lake Dam. The only information available indicates that the stone masonry wall forming the upstream face of the dam was rebuilt in 1933.

2.3 Operation

According to the Town Engineer, Mr. Jack Marr, the sluice gate in the auxiliary spillway inlet chamber is used to draw down the reservoir in anticipation of heavy precipitation and/or runoff. The only other time the sluice gate is operated is when the lake is drained each year to facilitate cleaning of the adjacent swimming pool.

It is not known whether the low level gate valve located immediately to the left of the service spillway is operable.

2.4 Evaluation

a. Availability. All information made available was obtained from personnel of the Town of Needham.

b. Adequacy. Sufficient information was obtained during the field investigation and through conversations and material obtained from the Owner's representative for the purpose of conducting a Phase I dam evaluation.

c. Validity. It appears that the information obtained with regard to the dam's history and the plans obtained from the tax assessor's office are valid.

j. Regulating Outlets.

1. Low level sluice gate inside the auxiliary spillway inlet structure.

Invert Elev.	92.9
Size	2 feet wide by 3 feet high
Description	Sluice gate in upstream wall of auxiliary spillway inlet chamber.
Control Mechanism	Hand wheel

2. Low level drain to the left of the service spillway, the size, elevation and alignment is not known.

e. Storage. (Acre-Feet)

Normal Pool	45
Flood Control Pool	NA
Spillway Crest Pool	45
Top of Dam	91
Test Flood Pool	105

f. Reservoir Surface. (Acres)

Normal Pool	15
Flood Control Pool	NA
Spillway Crest	15
Top of Dam	20
Test Flood Pool	21

g. Dam Data.

Type	Earth embankment
Length	440 feet+
Height	12 feet+
Top Width	50 feet+
Side Slopes	20H:1V (downstream) vertical (upstream)
Zoning	Unknown
Impervious Core	Unknown
Cutoff	Unknown
Grout Curtain	Unknown

h. Diversion and Regulating Tunnel.

Not Applicable

i. Spillways.

Service Spillway

Type	Sharp-crested
Length of Weir	7 feet
Crest Elevation	99.1
Gates	NA
Upstream Channel	None
Downstream Channel	66-inch to 48-inch RCP

Auxiliary Spillway

Type	Sharp-crested
Length of Weir	18 feet
Crest Elevation	99.9
Gates	NA
Upstream Channel	None
Downstream Channel	66-inch to 48-inch RCP

2) Maximum Known Flood. There is no known flood data available for this site.

3) Ungated Spillway Capacity at Top of Dam. The total spillway capacity is restricted to the sum of the capacities through the outlet conduits from the service and auxiliary spillways. Therefore, the total ungated spillway capacity with orifice control is 247 cfs with the reservoir surface at the top of dam Elevation of 101.7.

4) Ungated Spillway Capacity at Test Flood Elevation. The total spillway capacity is restricted to the flow through the outlet conduits. With a test flood Elevation of 102.4, the discharge capacity through the two spillways is estimated to be 330 cfs.

5) Gated Spillway Capacity at Normal Pool Elevation. Not Applicable.

6) Gated Spillway Capacity at Test Flood Elevation. Not applicable.

7) Total Spillway Capacity at Test Flood Elevation. The total spillway capacity with orifice control at test flood Elevation 102.4 is restricted to the capacity of the two discharge conduits, which was computed to be 330 cfs.

8) Total Project Discharge at Top of Dam. (See 3 above)

9) Total Project Discharge at Test Flood Elevation. The combined discharge capacity of the spillways and the flow over the dam at test flood Elevation 102.4, is 1,018 cfs.

c. Elevation. (Feet above NGVD)

Streambed at Toe of Dam	90 +
Bottom of Cutoff	Unknown
Maximum Tailwater	95+
Recreation Pool	99
Full Flood Control Pool	NA
Spillway Crest (Service)	99
(Auxiliary)	99.9
Design Surge (Original Design)	Unknown
Top of Dam	101.7
Test Flood Design Surge	102.4

d. Reservoir Length. (Feet)

Normal Pool	1,100
Flood Control Pool	NA
Spillway Crest Pool	1,100
Top of Dam	1,400
Test Flood Pool	1,500

e. Ownership. The dam is owned by the Town of Needham, Massachusetts. The Town's Parks and Recreation Director, Mr. Richard Foot, is the Owner's representative. He may be contacted at 1471 Highland Avenue, Needham, Massachusetts, 02192, (617-444-5100).

f. Operator. The dam is operated by personnel from the office of the Town Engineer, Mr. Jack Marr, at 470 Dedham Avenue, Needham, Massachusetts, 02192, (617-444-5100, ext. 141).

g. Purpose of Dam. The dam was originally constructed to impound water for the purpose of providing industrial water power. The impoundment is currently used for recreational purposes.

h. Design and Construction History. The design and construction history of the original dam, and for most of the subsequent modifications, is unknown. The only known reconstruction took place in 1933 when the stone masonry wall along the upstream face of the dam was rebuilt. No details of the wall reconstruction have been found.

i. Normal Operational Procedures. The normal operating procedures include:

1) Opening the auxiliary spillway sluice gate during periods of heavy precipitation and/or runoff.

2) Draining the lake each year in order to clean the adjacent swimming pool area prior to the start of the swimming season.

1.3 Pertinent Data

a. Drainage Area. The drainage area above Rosemary Lake Dam is 1.2 square miles. Nearly the entire area is developed for residential, commercial and industrial purposes. The topography is hilly ranging from Elev. 250 to Elev. 99 at the normal pool.

b. Discharge at Damsite.

1) Outlet Works. There are two conduits which convey discharge from Rosemary Lake. One reinforced concrete pipe, which measures 66 inches in diameter at the inlet and 48 inches in diameter at the outlet, extends approximately 300 feet northerly from the service spillway to a rectangular-shaped open channel. With the reservoir surface at the top of dam, the service spillway discharge capacity with orifice control is 92 cfs.

A second conduit extends from the auxiliary spillway to a headwall at the same discharge location as that for the service spillway conduit. It consists of a section of 66-inch diameter pipe which appears to have been extended with an unknown length of 48-inch diameter reinforced concrete pipe. Assuming the same conditions stated for the service spillway outlet, the auxiliary spillway discharge capacity with orifice control would be 155 cfs.

1) The upstream face of the dam consists of a vertical stone masonry wall of unknown depth.

2) The crest of the dam is almost completely covered with asphalt and concrete pavement due to the presence of Rosemary Street and an adjoining sidewalk. The total crest width is approximately 50 feet.

3) The downstream slope of the embankment consists of a gradually sloping grass lawn from the edge of Rosemary Street to an apartment complex.

The service spillway inlet is located approximately 120 feet west of the eastern dam abutment and consists of a 7-foot wide sharp-crested weir. Water overtopping the weir drops approximately 8.5 feet and flows approximately 300 feet in a northerly direction via a reinforced concrete pipe where it discharges into an open channel. The pipe is 66 inches in diameter in the inlet chamber, but is only 48 inches in diameter at the downstream outlet. The downstream channel is discussed in Section 3.1.e of this report.

The auxiliary spillway is located approximately 20 feet east of the main spillway as shown on Plate 1 of Appendix B. This spillway consists of a five-sided structure with a total overflow weir length of eighteen feet. Other features of the auxiliary spillway include:

1) A 2-foot by 3-foot low level sluice gate which may be used to assist in draining the lake.

2) A 36-inch diameter storm sewer draining to the inlet structure from the east. The contributing drainage area is not known.

3) An outlet pipe which extends approximately 300 feet in a northerly direction to an open channel. The pipe is 66 inches in diameter in the inlet chamber, but only 48 inches in diameter at the downstream outlet.

An operator for the low level drain valve is located a few feet to the left of the service spillway. The size, elevation and alignment of this low level drain are unknown.

Further details of the spillway system are shown on pages B-1 and B-2 of Appendix B.

c. Size Classification. Rosemary Lake Dam has a maximum height of approximately 12 feet which places it in the "Small" size category because it is less than 40 feet high. It also falls into the "Small" size category for storage since its maximum storage capacity is about 91 acre-feet which is less than the 1,000 acre-foot upper limit for "Small" size dams. Therefore, Rosemary Lake Dam is in the "Small" size category.

d. Hazard Classification. Because of the presence of a 210-unit apartment complex within 150 feet downstream of the dam, it is likely that a dam failure would result in excessive property damage and probable loss of life. Therefore, the dam is considered a "High" hazard potential structure.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
ROSEMARY LAKE DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspections throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. O'Brien & Gere Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the Commonwealth of Massachusetts. Authorization and notice to proceed were issued to O'Brien & Gere Engineers, Inc. by a letter from the Corps of Engineers dated November 6, 1979 and signed by Col. William E. Hodgson, Jr. Contract No. DACW33-80-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection. The purpose of performing technical inspection and evaluation of non-federal dams is to:

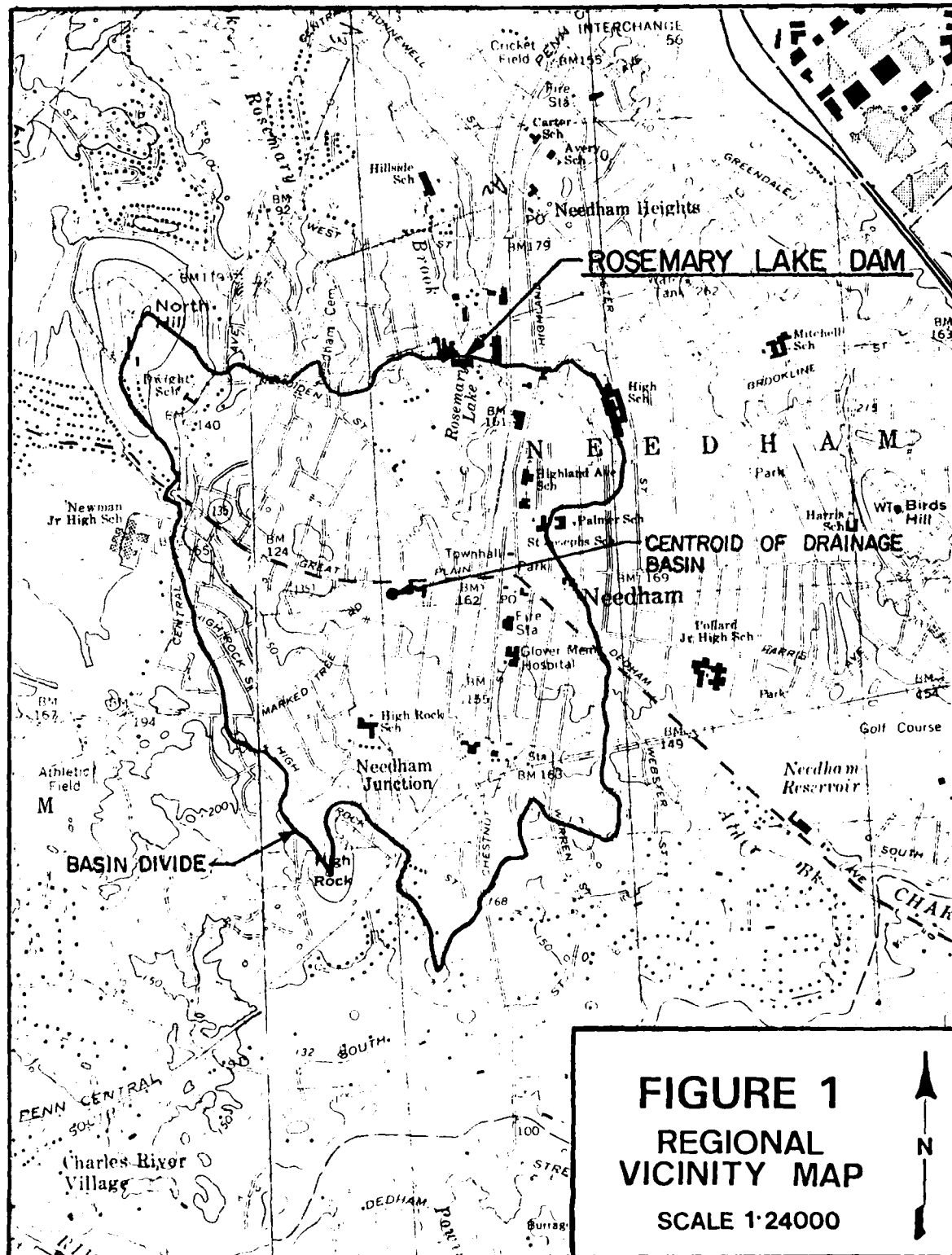
- 1) *Identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.*
- 2) Encourage and prepare the states to quickly initiate effective dam safety programs for non-federal dams.
- 3) Update, verify, and complete the National Inventory of Dams.

1.2 Description of Project (Information for this dam was obtained from the Town of Needham)

a. Location. Rosemary Lake Dam is located along the northern shore of Rosemary Lake on Rosemary Brook in the Town of Needham, Massachusetts. The dam is shown on the "Newton, Massachusetts" USGS Quadrangle at coordinates N 42° 17.2' and W 71° 14.4'. A regional vicinity map of the Rosemary Lake area has been included as Figure 1, Page vi.

Rosemary Brook outlets into the Charles River approximately 3 miles downstream from Rosemary Lake Dam. The major damage center is a 210-unit apartment complex immediately downstream of the dam.

b. Description of Dam and Appurtenances. Rosemary Lake Dam is an earth embankment approximately 440 feet long with a maximum embankment height of about 12 feet. The dam has the following features:



SECTION 7

ASSESSMENT, RECOMMENDATIONS & PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The dam appears to be in fair condition based on the visual inspection of the site on October 16, 1979. The stone masonry parapet wall is tilted slightly towards the lake and 3 tree stumps were observed along the parapet wall near the left abutment. About 5 gpm of presumed seepage was noted discharging from the storm sewer on the south side of Rosemary Street.

The grating on the auxiliary spillway inlet structure needs to be repaired or replaced. The size, elevation, alignment and operability of the low level drain located a few feet to the left of the service spillway should be verified.

The peak inflow and routed outflow rates for the test flood were both calculated to be 1,020 cfs. The routed test flood outflow corresponds to a stage of 3.4 feet above the service spillway and 0.7 feet above the top of the dam. The spillway system is able to pass 247 cfs or about 24 percent of the routed test flood outflow without overtopping of the dam.

A breach of the dam with the water in the lake assumed to be at the top of the dam would result in an increase in stream depth at the apartment complex of 7.2 feet. About 1,700 feet downstream, in the vicinity of an elementary school, the increase in stream depth is about 5.3 feet and about 3,700 feet downstream, in the vicinity of 7 homes, the increase in stream depth is about 6.6 feet.

b. Adequacy of Information. The information made available by the Town combined with that obtained during the field investigation is considered adequate for a Phase I evaluation.

c. Urgency. The recommendations and remedial measures described in this Section should be implemented within one year of receipt of this Phase I Inspection Report.

7.2 Recommendations

Within one year after receipt of this Phase I Report, the Owner, the Town of Needham, should retain the services of a qualified registered professional engineer and implement the results of his evaluation of the following:

- 1) Assess further the potential for overtopping and the adequacy of the spillways.
- 2) Study the cause of the seepage to the storm sewer located under Rosemary Street.

- 3) Investigate the seismic stability of the dam.

7.3 Remedial Measures

a. Operation and Maintenance Procedures. The Owner should also implement the following operation and maintenance measures:

1. Clear obstructions from the channel downstream of the spillway conduits.
2. Verify the operability of the low level drain gate valve.
3. Repair or replace the grating on the auxiliary spillway inlet structure.
4. Develop a formal surveillance and flood warning plan, including round-the-clock monitoring during heavy precipitation.
5. Institute a program of annual technical inspection.

7.4 Alternatives

No valid alternatives to the recommendations described above are considered feasible for this dam.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
INSPECTION TEAM ORGANIZATION

Project: Rosemary Lake Dam
National I.D. #: MA 01112
Location: Needham, Ma.
Type of Dam: Earth Embankment
Inspection Date(s): October 16, 1979
Weather: Clear, Cool
Pool Elevation: _____ MSL

Inspection Team

Leonard Beck	O'Brien & Gere	Structures
Steve Snider	O'Brien & Gere	Foundations & Materials
Al Hanscom	O'Brien & Gere	Structures
Rod Georges	Bryant & Associates	Hydrology/Hydraulics

*Mr. John J. Williams, Vice-President, O'Brien & Gere has visited the site but not necessarily in conjunction with the inspection team.

Owner's Representative

Mr. Richard Foot ; Parks & Recreation
Director ; Needham, Ma.

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

National I.D. #: MA 01112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT (Con't)</u>	
Unusual Movement or Cracking at or near Toes	<i>None observed</i>
Unusual Embankment or Downstream Seepage	<i>Seepage to storm sewer located along crest.</i>
Piping or Boils	<i>None observed</i>
Foundation Drainage Features	<i>NA</i>
Toe Drains	<i>NA</i>
Instrumentation System	<i>NA</i>

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

National I.D. #: MA 01112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS - SERVICE SPILLWAY</u>	
a. Approach Channel	
General Condition	<i>Unknown, Submerged</i>
Loose Rock Overhanging Channel	<i>None</i>
Trees Overhanging Channel	<i>None</i>
Floor of Approach Channel	<i>Unknown, Submerged</i>
b. Weir and Training Walls	
General Condition of Concrete	<i>Good</i>
Rust or Staining	<i>Corrugated Metal Weir</i>
Spalling	<i>Slight</i>
Any Visible Reinforcing	<i>None</i>
Any Seepage or Efflorescence	<i>None observed</i>
Drain Holes	<i>None observed</i>
c. Discharge Channel	
General Condition	<i>Good, clear of major size debris.*</i>

*See Note 1, next page.

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

National I.D. #: MA 01112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS - SERVICE SPILLWAY (Con't)	
Loose Rock Overhanging Channel	<i>Insignificant</i>
Trees Overhanging Channel	<i>Few</i>
Floor of Channel	<i>Rough, much debris</i>
Other Obstructions	<i>Concrete channel width narrows downstream</i>
<u>Misc. Notes :</u> 1.) Discharge over weir flows ~ 150 feet via a 66-inch to 48-inch culvert to rectangular shaped concrete channel. 2.) Suspected that 72-inch dia culvert was extended with 48-inch dia. RCP.	

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

National I.D. #: MA 01112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS - <u>AUX.</u> <u>SPILLWAY</u> a. Approach Channel General Condition Loose Rock Overhanging Channel Trees Overhanging Channel Floor of Approach Channel b. Weir and Training Walls General Condition of Concrete Rust or Staining Spalling Any Visible Reinforcing Any Seepage or Efflorescence Drain Holes c. Discharge Channel General Condition	<i>Unknown, Submerged</i> <i>None</i> <i>None</i> <i>Unknown, Submerged</i> <i>Very Good</i> <i>Grating over drop inlet is rusted.</i> <i>Slight</i> <i>None</i> <i>Leakage @ Sluice Gate</i> <i>NA</i> <i>66-inch to 48-inch dia. conduit - condition unknown. Channel condition is good.</i>

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

National I.D. #: MA 5112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS - AUX. <u>SPILLWAY (Con't)</u> Loose Rock Overhanging Channel Trees Overhanging Channel Floor of Channel Other Obstructions	<i>Insignificant</i> <i>Few</i> <i>Rough, much debris</i> <i>Concrete channel width narrows downstream</i>

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

National I.D. #: MA 01112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE - SERVICE SPILLWAY</u>	
a. Approach Channel	
Slope Conditions	<i>Unknown, Submerged</i>
Bottom Conditions	<i>Unknown, Submerged</i>
Rock Slides or Falls	<i>None</i>
Log Boom	<i>NA</i>
Debris	<i>Negligible</i>
Condition of Concrete Lining	<i>NA</i>
Drains or Weep Holes	<i>NA</i>
b. Intake Structure	
Condition of Concrete	<i>Very Good</i>
Stop Logs and Slots	<i>None</i>

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

National I.D. #: MA 01112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - INTAKE CHANNEL AND</u> <u>INTAKE STRUCTURE - AUX. SPILLWAY</u>	
a. Approach Channel	
Slope Conditions	Unknown, Submerged
Bottom Conditions	Unknown, Submerged
Rock Slides or Falls	None, Drop Inlet
Log Boom	NA
Debris	Slight
Condition of Concrete Lining	NA
Drains or Weep Holes	NA
b. Intake Structure	
Condition of Concrete	Very Good
Stop Logs and Slots	NA

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

ational I.D. #: MA 01112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	Outlet conduit condition unknown. Channel good.
Rust or Staining	NA
Spalling	Slight
Erosion or Cavitation	None observed
Visible Reinforcing	None
Any Seepage or Efflorescence	None observed
Condition at Joints	Unknown
Drain Holes	None observed
Channel (d/s of concrete chan.)	Meandering, clear of major size debris
Loose Rock or Trees Overhanging Channel	Several trees
Condition of Discharge Channel	Fair

VISUAL INSPECTION CHECK LIST

Project: Rosemary Lake Dam

tional I.D. #: MA 01112

Date(s): October 16, 1979

AREA EVALUATED	CONDITIONS
<u>INLET WORKS - TRANSITION AND CONDUIT</u>	
General Condition of Concrete	Good @ overflow - condition of RCP unknown.
Rust or Staining on Concrete	Slight
Spalling	Slight
Erosion or Cavitation	None observed
Cracking	None observed
Alignment of Monoliths	NA
Alignment of Joints	Unknown
Numbering of Monoliths	NA

APPENDIX B

ENGINEERING DATA

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



7. CHANNEL ABOUT 2000 FEET DOWNSTREAM OF THE DAM WITH HILLSIDE ELEMENTARY SCHOOL IN THE BACKGROUND LOOKING DOWNSTREAM. (10/16/79)



8. CHANNEL ABOUT 4000 FEET DOWNSTREAM OF THE DAM AT CENTRAL AVE. (10/16/79)



5. DOWNSTREAM CHANNEL ABOUT 500 FEET DOWNSTREAM OF THE DAM LOOKING UPSTREAM (10/16/79)



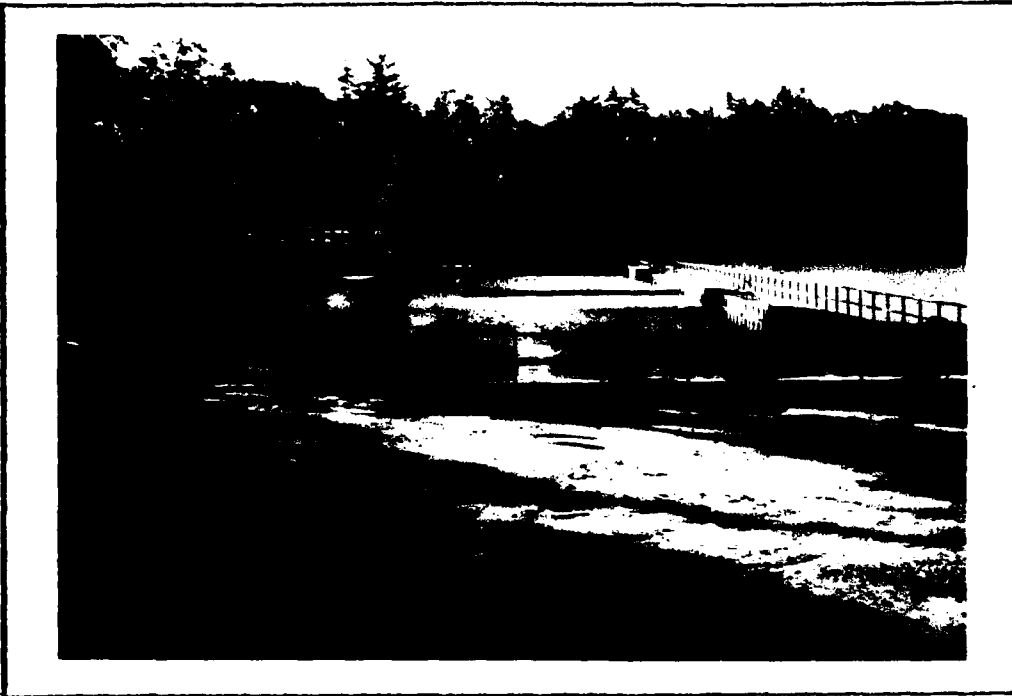
6. SEWERAGE PUMPING STATION ABOUT 2000 FEET DOWNSTREAM OF THE DAM ON THE LEFT BANK. (10/16/79)



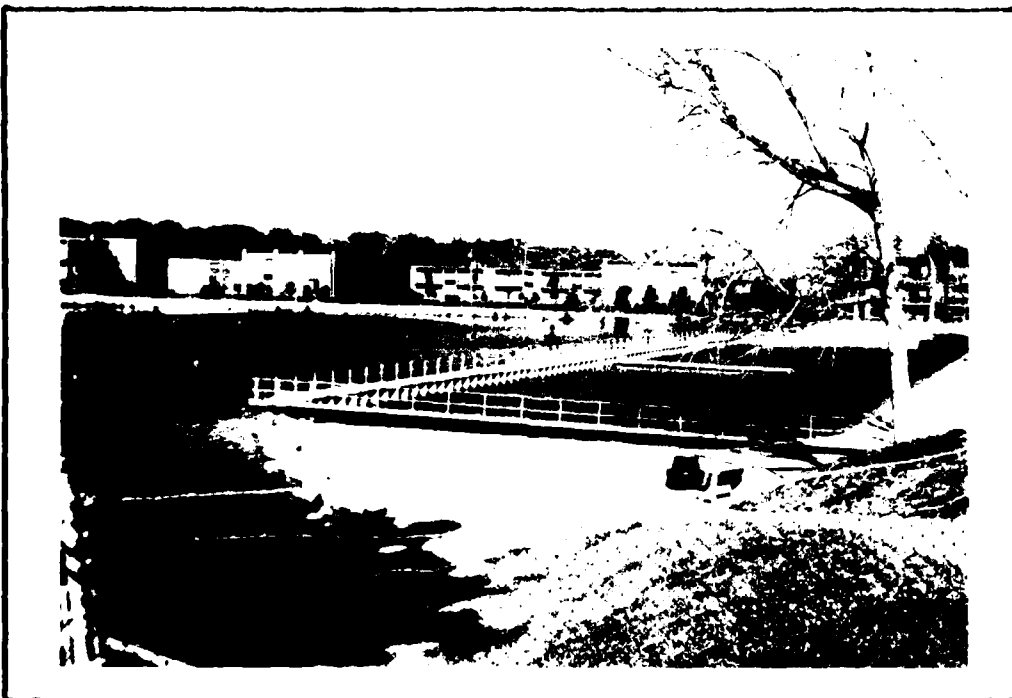
3. UPSTREAM FACE OF THE DAM SHOWING CUT OFF TREES IN THE FOREGROUND. (10/16/79)



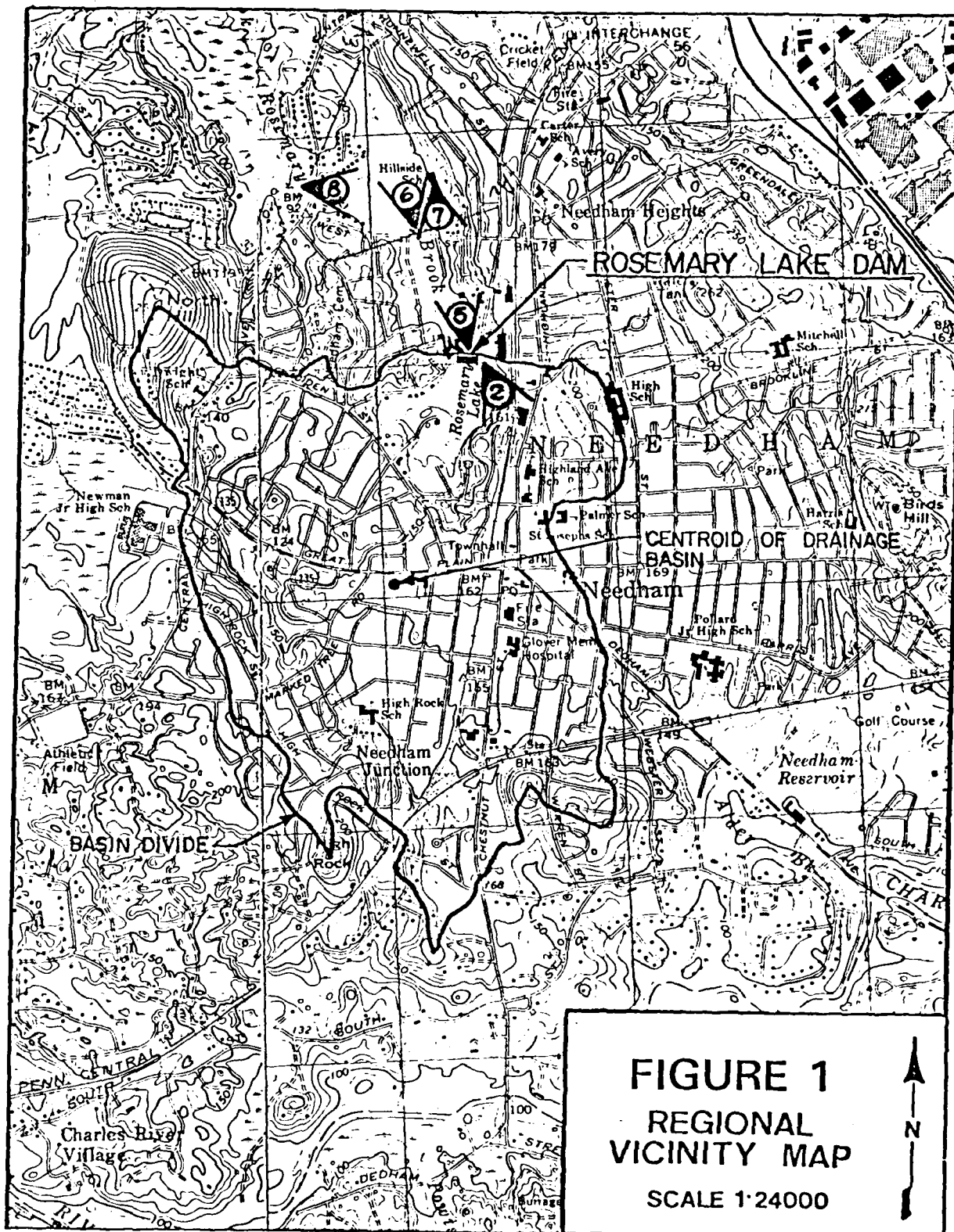
4. UPSTREAM FACE OF THE DAM SHOWING THE AUXILARY SPILLWAY IN THE FOREGROUND AND THE PRIMARY SPILLWAY IN THE BACKGROUND. (10/16/79)

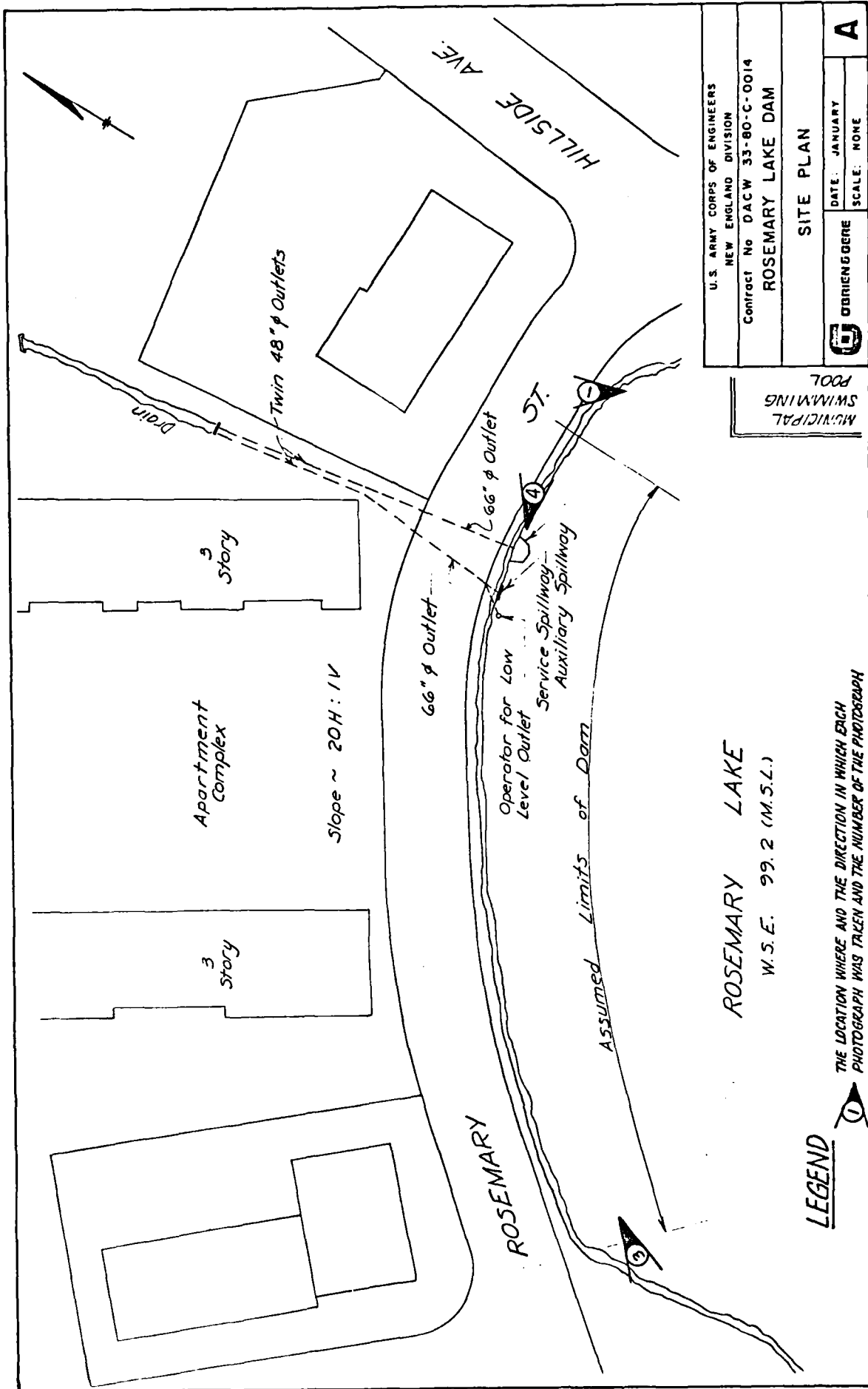


1. MUNICIPAL SWIMMING POOL BUILT IMMEDIATELY NEXT TO ROSEMARY LAKE AT THE LEFT ABUTMENT. (10/16/79)



2. UPSTREAM OVERVIEW OF ROSEMARY LAKE. (10/16/79)





APPENDIX C
SELECTED PHOTOGRAPHS OF PROJECT

LOCATION PLAN

Site Plan Sketch

Page
No.

A

Regional Plan

B

PHOTOGRAPHS

No.

Page
No.

1. Municipal swimming pool built immediately next to Rosemary Lake at the left abutment.
2. Upstream overview of Rosemary Lake.
3. Upstream face of the dam showing cut off trees in the foreground.
4. Upstream face of the dam showing the auxiliary spillway in the foreground and the primary spillway in the background.
5. Downstream channel about 500 feet downstream of the dam looking upstream.
6. Sewerage pumping station about 2000 feet downstream of the dam on the left bank.
7. Channel about 2000 feet downstream of the dam with Hillside Elementary School in the background looking downstream.
8. Channel about 4000 feet downstream of the dam at Central Ave.

1

1

2

2

3

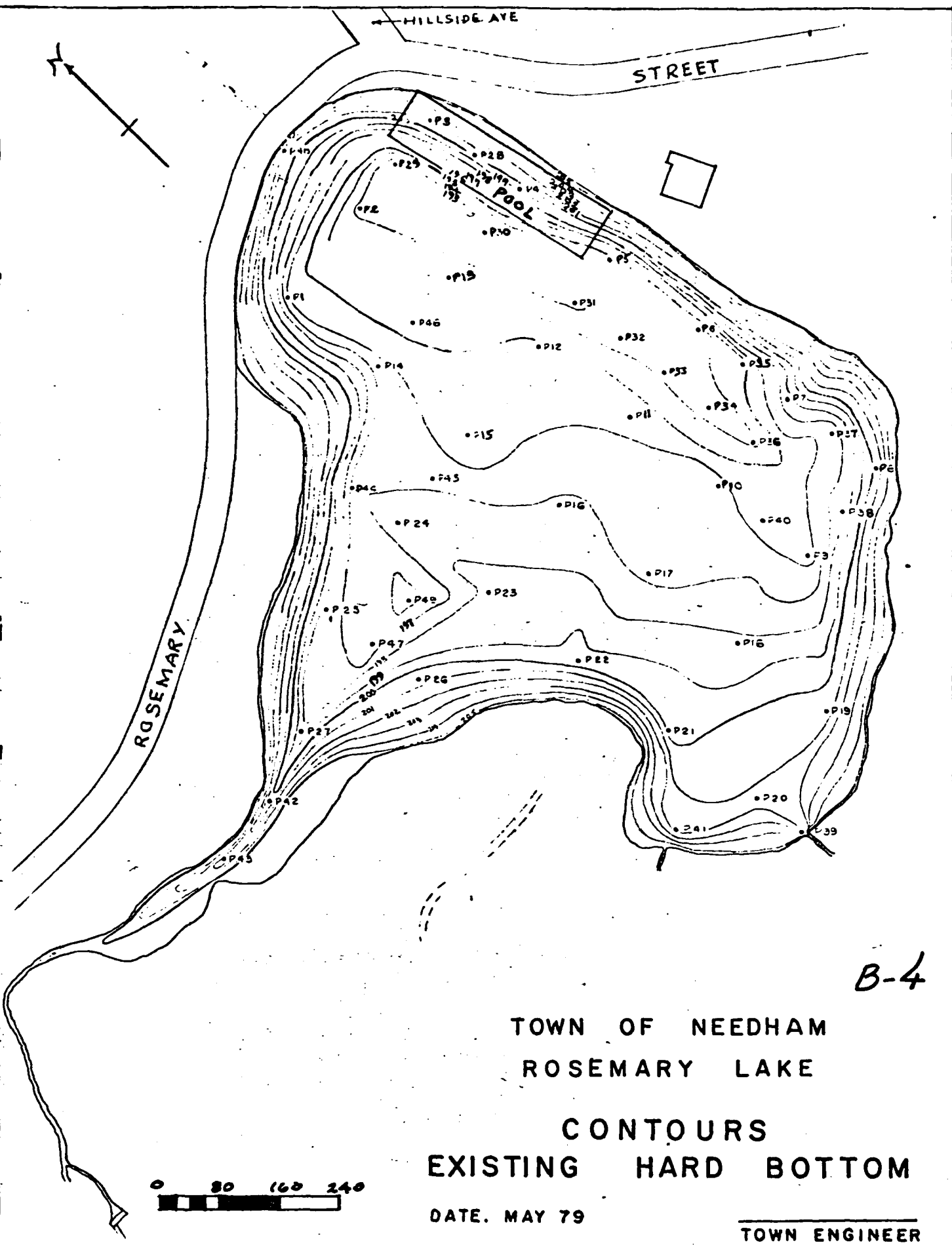
3

4

4

APPENDIX C

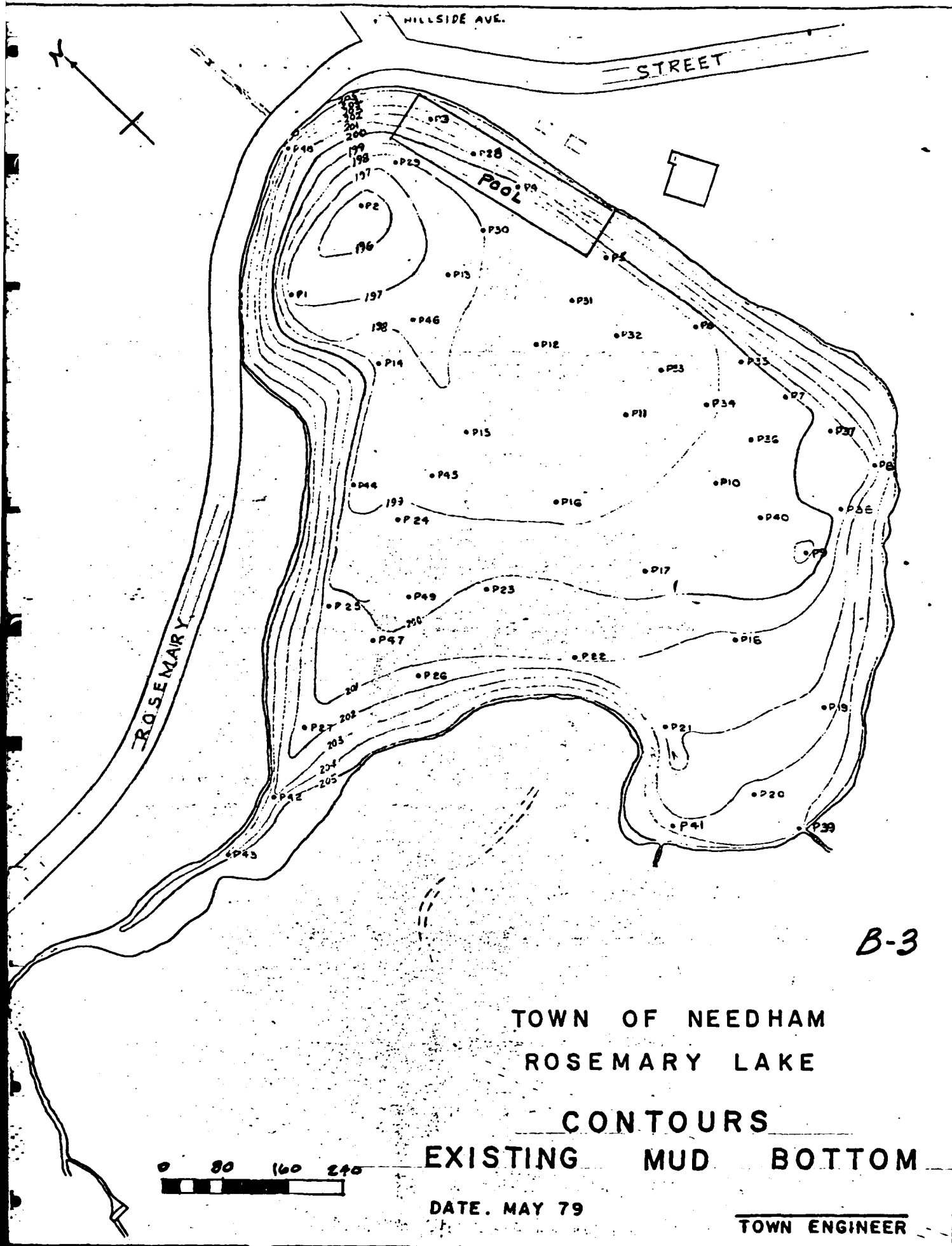
PHOTOGRAPHS



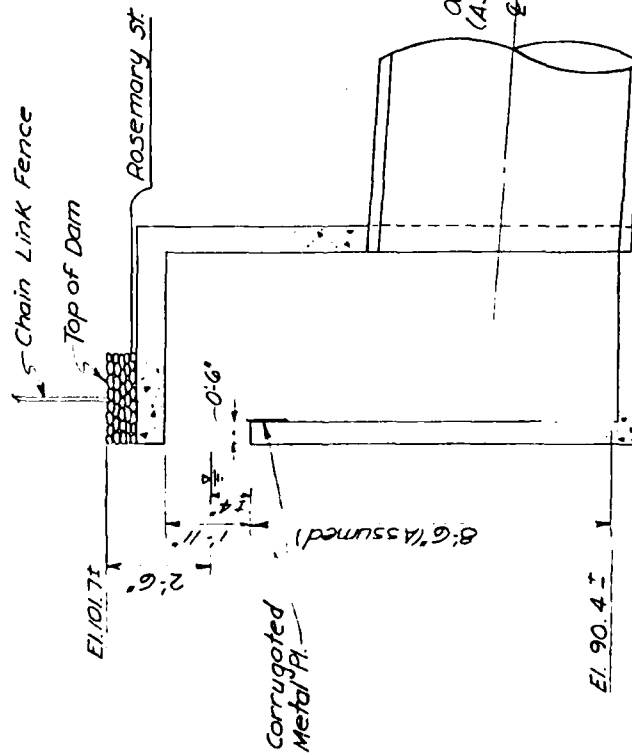
TOWN OF NEEDHAM
ROSEMARY LAKE
CONTOURS
EXISTING HARD BOTTOM

DATE. MAY 79

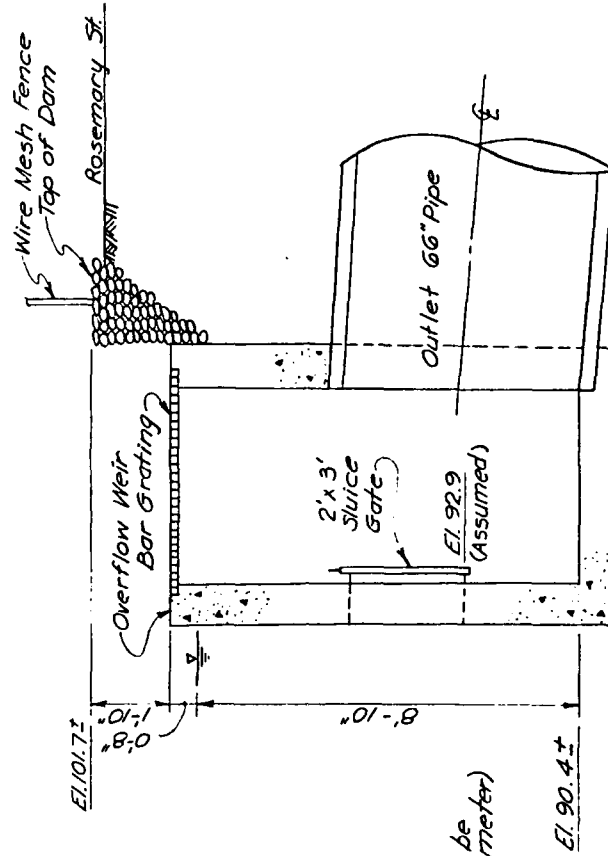
TOWN ENGINEER



Note:
All dimensions and elevations
are approximate.



SERVICE SPILLWAY SECTION



AUXILIARY SPILLWAY SECTION

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION

Contract No. DACW 33-80-C-0014

ROSEMARY LAKE DAM

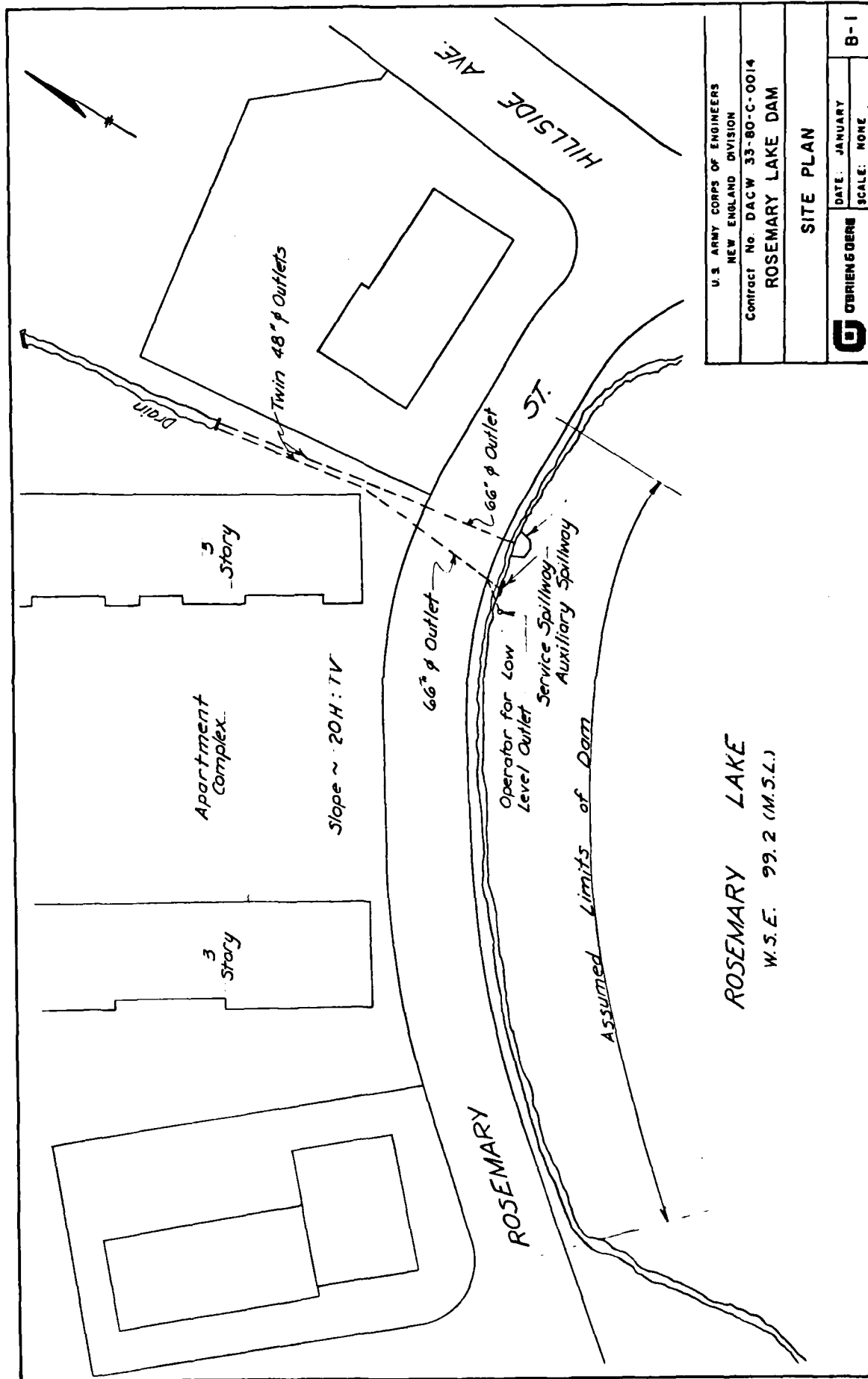
SPILLWAY SECTIONS



OBRIEN & GORE

DATE: JANUARY 1980
SCALE: NONE

B-2



U.S. ARMY CORPS OF ENGINEERS	
NEW ENGLAND DIVISION	
Contract No. DACW 33-80-C-0014	
ROSEMARY LAKE DAM	
SITE PLAN	
O'BRIEN & GERR	DATE: JANUARY
	SCALE: NONE
	B-1

ROSEMARY LAKE
W.S.E. 99.2 (M.S.L.)

SUBJECT <i>ROSEMARY LAKE DAM</i>	SHEET	BY	DATE	JOB NO
-------------------------------------	-------	----	------	--------

APPENDIX B

ENGINEERING DATA

TABLE of CONTENTS

	<u>PAGE</u>
<i>SITE PLAN</i>	<i>B-1</i>
<i>SPILLWAY SECTIONS</i>	<i>B-2</i>
<i>CONTOURS OF EXISTING MUD BOTTOM</i>	<i>B-3</i>
<i>CONTOURS OF EXISTING HARD BOTTOM</i>	<i>B-4</i>

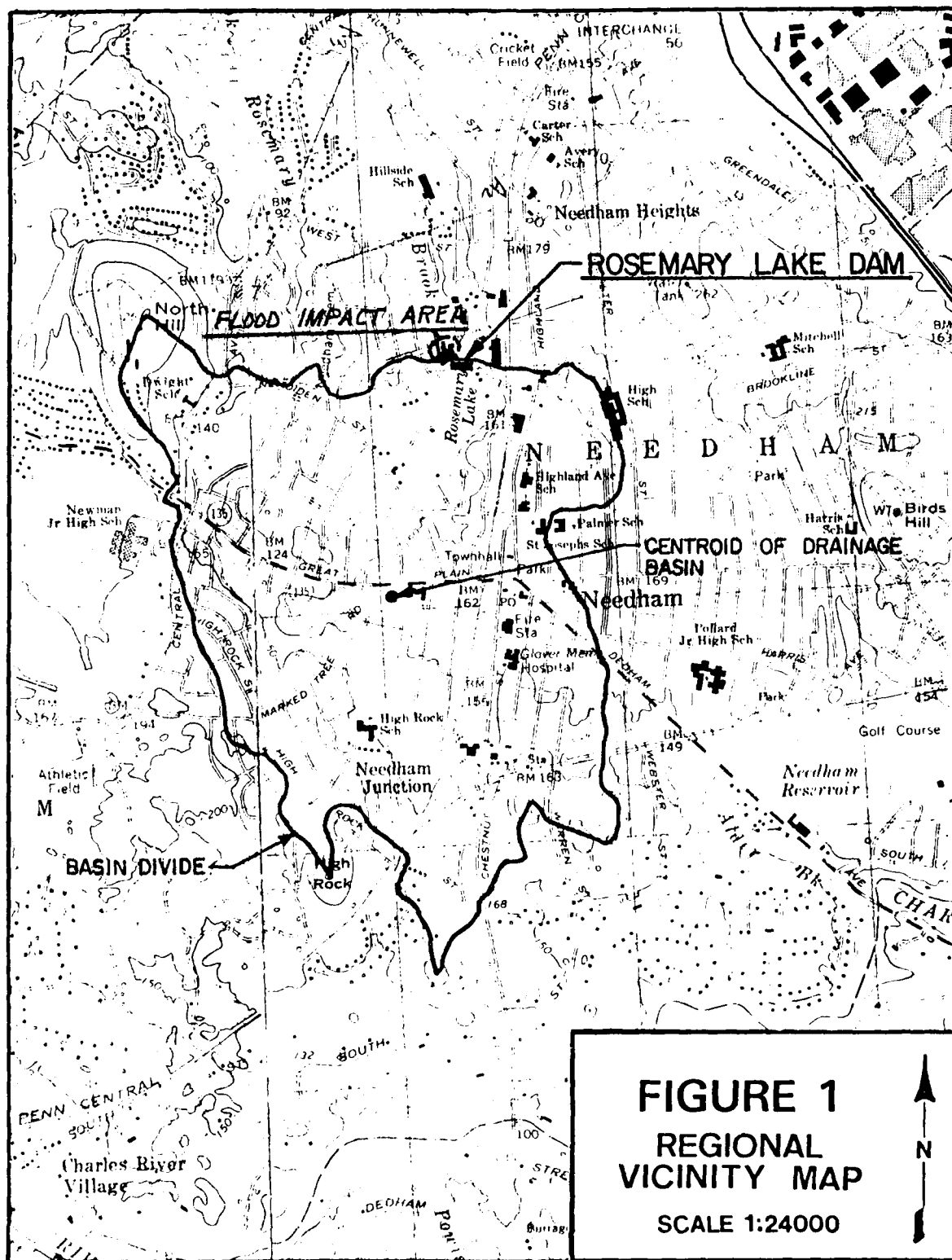
SUBJECT	SHEET	BY	DATE	JOB NO
ROSEMARY LAKE DAM				

APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS

TABLE OF CONTENTS

	<u>PAGE</u>
REGIONAL VICINITY MAP, FIGURE 1, SHOWING FLOOD IMPACT AREA	D-1
DESCRIPTION OF SPILLWAYS	D-2
T_p COMPUTATIONS & PMP DATA	D-3
STAGE - DISCHARGE COMPUTATIONS	D-4
STAGE - STORAGE COMPUTATIONS	D-4
STAGE - DISCHARGE & STAGE - STORAGE GRAPHS	D-5
DOWNSTREAM CROSS SECTIONS	D-6
HEC-1 DAM SAFETY VERSION, COMPUTER OUTPUT	D-7 to D-10
HEC-1 DAM SAFETY VERSION, BREACH ANALYSIS, COMPUTER OUTPUT	D-11 to D-15

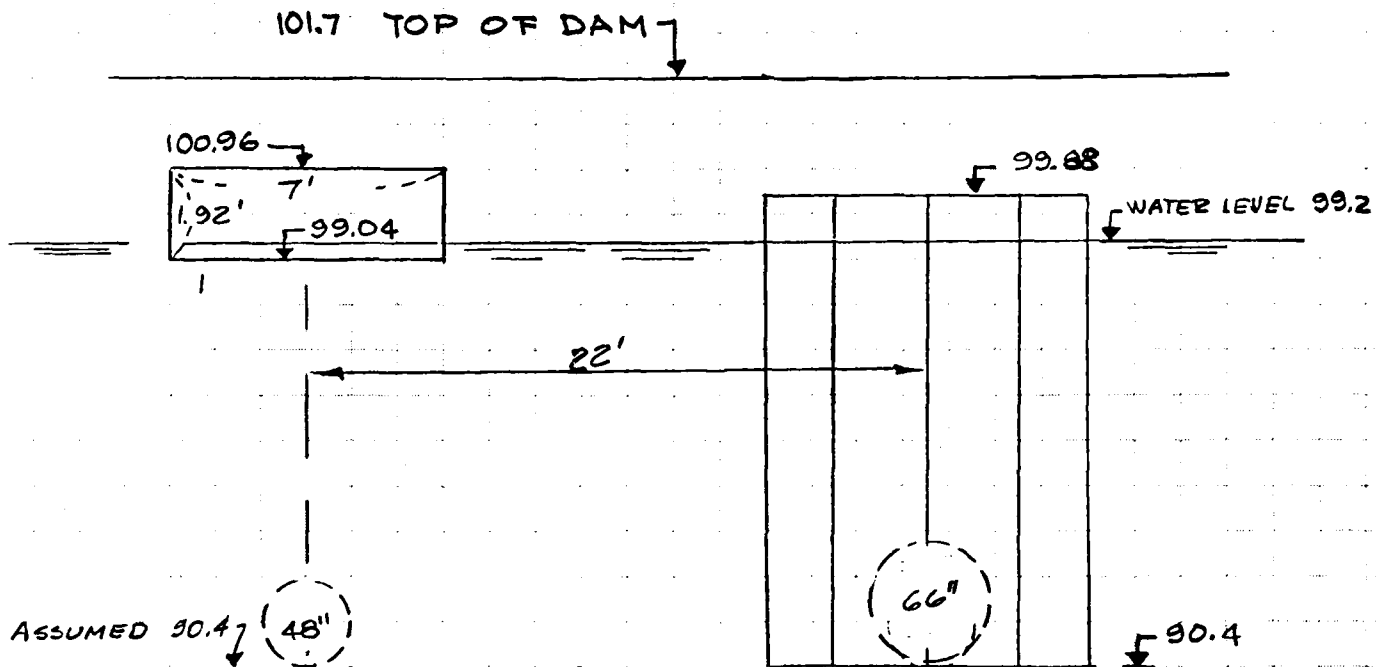


BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

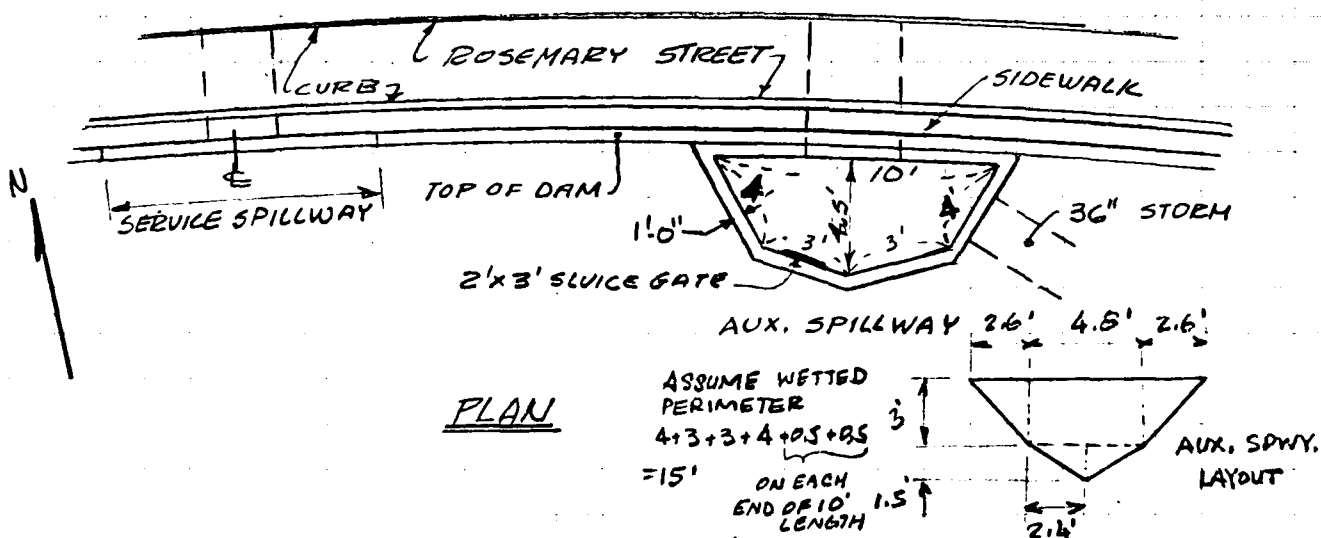
JOB NED-COE, ROSEMARY LAKE DAM
SHEET NO D-2 OF
CALCULATED BY RG DATE 10/30/79
CHECKED BY JS DATE 12/5/79
SCALE

ROSEMARY LAKE DAM

DESCRIPTION OF SPILLWAYS



ELEVATION



PLAN

NOTE:

AUXILLIARY SPILLWAY OUTLET
CONDUIT IS 48" IN DIAMETER
@ DOWNSTREAM END

D-2

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JOB NED-COE, ROSEMARY LAKE DAM
SHEET NO. D-3 OF _____
CALCULATED BY RG DATE 10/30/79
CHECKED BY JS DATE 12/5/79
SCALE _____

ROSEMARY LAKE DAM

DRAINAGE AREA = 1.23 sq Mi

$$C_t = 2.0$$

$$C_p = 0.5$$

T_p COMPS.

$L = 2.2$ Miles, $L_{ca} = 1.5$ Miles

$$T_p = C_t (L \times L_{ca})^{0.3}$$

$$T_p = 2.0 \times (2.2 \times 1.5)^{0.3} \approx \underline{\underline{3.00 \text{ Hours}}}$$

PMP DATA

FROM HMS # 33 THE 24 HOUR 200 sq Mi INDEX RAINFALL
IS 21.5"

Gh % OF INDEX FOR THIS BASIN

	= 111%
	= 124
	= 133

D-3

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BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, ROSEMARY LAKE DAM

SHEET NO. D-4 OF

CALCULATED BY RG

DATE OCT. 30, 1979

CHECKED BY JB

DATE 12/5/79

ROSEMARY LAKE DAM

SCALE

STAGE DISCHARGE

$H=0$ @ SPILLWAY CREST (ELEV: 99.04) Q_1

AUX SPILLWAY (ELEV: 99.88) Q_2

$C = 2.28$ FOR BROAD CRESTED WEIR

$C = 0.65$ FOR ORIFICE Q_1

$C = 0.67$ FOR ORIFICE Q_2

FOR $H=0$ $Q_1 = 0$

Q_1 FOR $0 < H < 1.92$ $Q_1 = 2.8 \times 7 \times H^{3/2}$

FOR $H > 1.92$ $Q_1 = 0.65 \times 13.44 \times \sqrt{2g} (H - 0.96)^{3/2}$ (ORIFICE)

Q_2 FOR $H < 0.84$ $Q_2 = 0$

FOR $0.84 < H < 2.24$ $Q_2 = 3.0 \times P (H - 0.84)^{3/2}$

FOR $H > 2.24$ $Q_2 = 5.37 \times A (H - 0.84)^{3/2}$

$P \approx 15'$

$P =$ WETTED PERIMETER

$A =$ OP. AREA (ORIFICE)

$A \approx 26 \text{ FT}^2$

REFER TO PAGES 12-26 & 12-27, U.S. DOT, FED. HIGHWAY ADMIN.
HYDRAULIC ENG'R. CIRCULAR #12

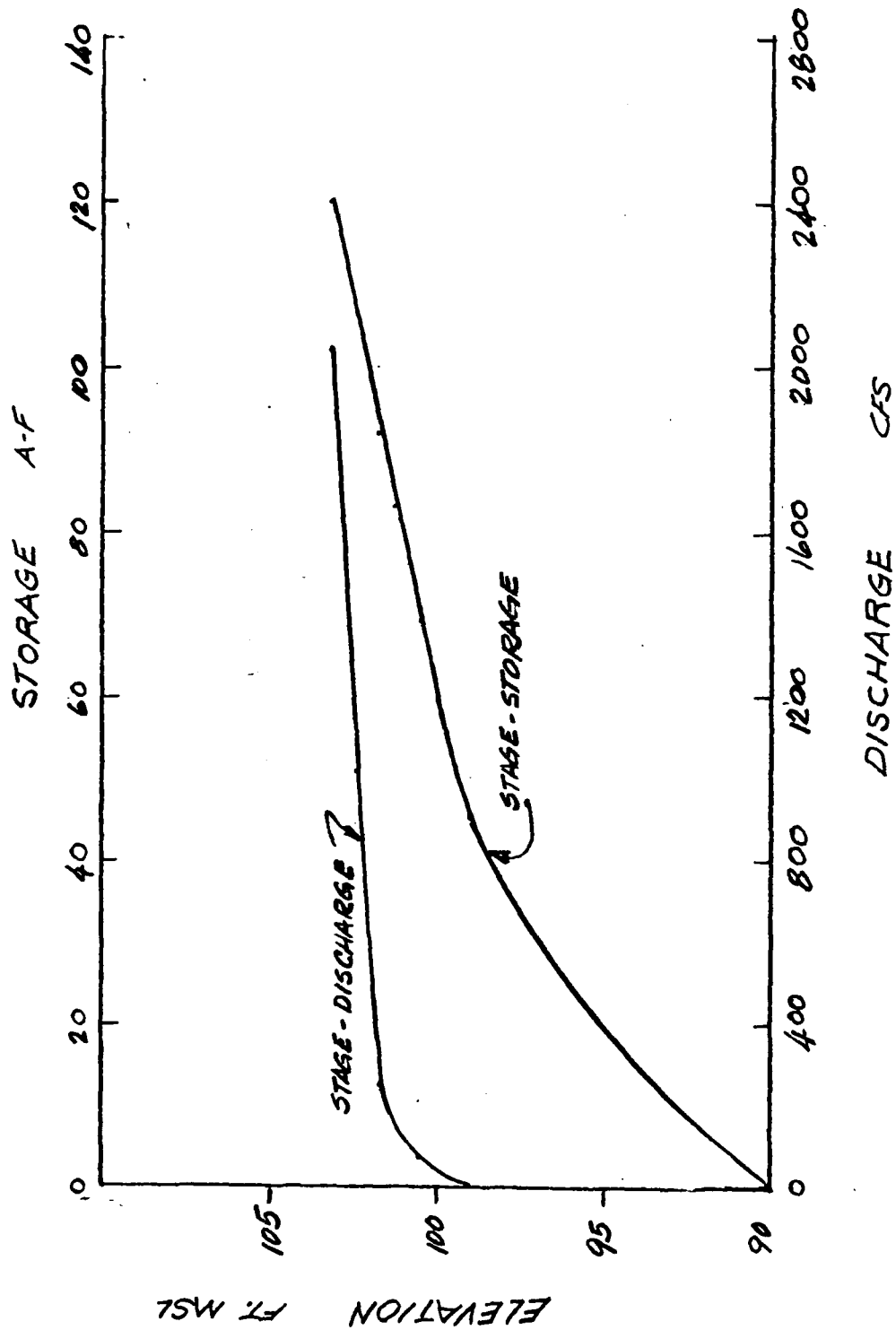
ELEVATION	H	SERVICE SPILLWAY	AUX SPILLWAY	AVE WIDTH FLOW OVER DAM	TOPOF DAM	E Q
USC & GS	FT.	Q_1 : CFS	Q_2 : CFS		Q_3 : CFS	CFS
99.04	0	0	0		0	0
100.04	1	19.6	3		0	23
101.04	2	71.5	56		0	128
102.04	3	100.1	205	277	155	460
103.04	4	122.2	248	322	1400	1770
104.04	5	140.9	285	349	3500	≈ 3330
105.04	6	157.4	317	378	6460	≈ 6930
106.04	7	172.3	346	405	10250	≈ 10770
107.04	8	186.0	374	450	15550	≈ 16110

STAGE - STORAGE

ELEV.	AREA
90	0
99	15
110	35

STORAGE (Computed by
HEC-1 program)
0
45
120 @ ELEV 103.13

D-4



ROSEMARY LAKE DAM
 STAGE VS. STORAGE
 STAGE VS. DISCHARGE

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648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, ROSEMARY LAKE DAM

SHEET NO. D-6 OF _____

CALCULATED BY RG DATE 10/30/79

CHECKED BY JS DATE 12/5/79

SCALE _____

ROSEMARY LAKE DAM
DOWNSTREAM X SECTIONS

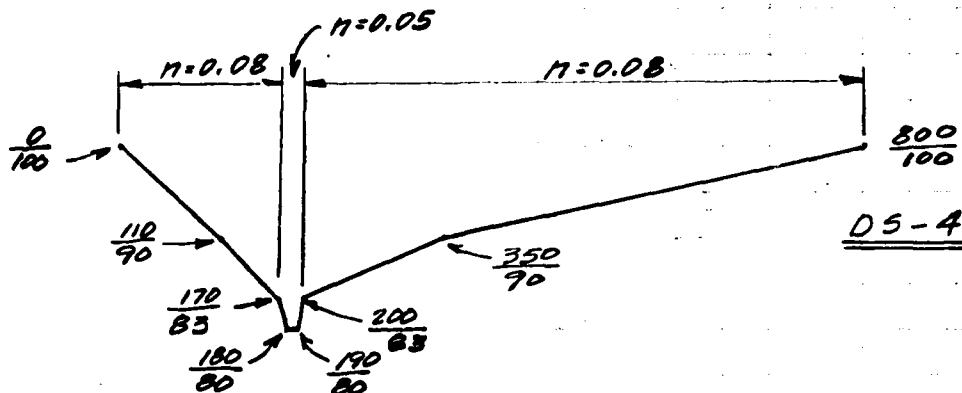
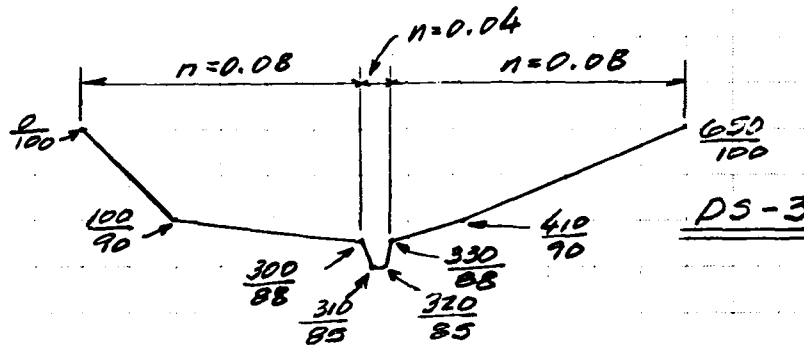
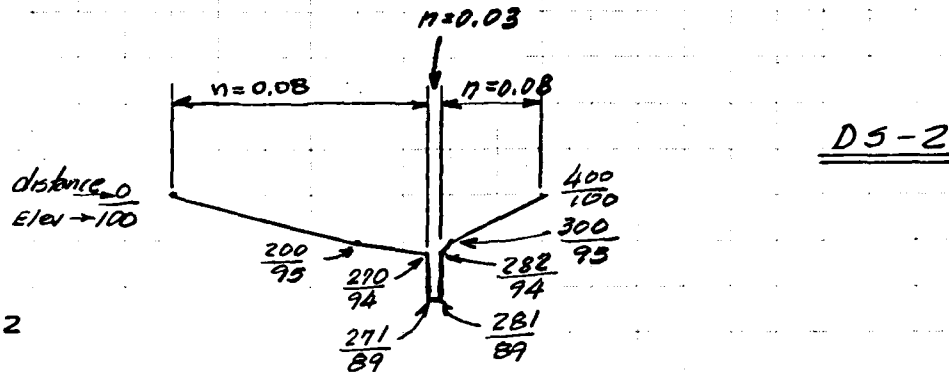
DAM 3-1

OUTLET

150'
DS-2

1500'
DS-3

2000'
5-4



D-6

FLOODS ROUTED THROUGH ROSEMARY LAKE DAM WITHOUT BREACHING

.....
FLOOD HYDROGRAPH PACKAGE (MC-1)
DAM SAFETY VERSION JULY 1974
LAST MODIFICATION 26 FEB 79
.....

INPUT

HYDROLOGIC ANALYSIS OF ROSEMARY LAKE DAM		NATIONAL DAM SAFETY PROGRAM		NEW ENGLAND DIVISION - COMPS OF ENGINEERS	
		0	0	0	0
1	A	300	0	-4	0
2	A	5	9	.75	1.0
3	H	1	.15	.3	1
4	J	.05	.25	.5	.75
5	J1	.1	.2	.3	.5
6	J2	.1	.25	.3	.5
7	J3	.1	.25	.3	.5
8	J4	.1	.25	.3	.5
9	J5	.1	.25	.3	.5
10	J6	.1	.25	.3	.5
11	J7	.1	.25	.3	.5
12	J8	.1	.25	.3	.5
13	J9	.1	.25	.3	.5
14	J10	.1	.25	.3	.5
15	J11	.1	.25	.3	.5
16	J12	.1	.25	.3	.5
17	J13	.1	.25	.3	.5
18	J14	.1	.25	.3	.5
19	J15	.1	.25	.3	.5
20	J16	.1	.25	.3	.5
21	J17	.1	.25	.3	.5
22	J18	.1	.25	.3	.5
23	J19	.1	.25	.3	.5
24	J20	.1	.25	.3	.5
25	J21	.1	.25	.3	.5

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT
ROUTE HYDROGRAPH TO
END OF NETWORK

DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

RUN DATE 02/11/80.
 TIME 13.12.04.

HYDROLOGIC ANALYSIS OF ROSEMARY LAKE DAM
 NATIONAL DAM SAFETY PROGRAM
 NEW ENGLAND DIVISION - COMPS OF ENGINEERS

JOH SPECIFICATION									
NU	NHR	N4IN	IUAY	IHR	JMIN	METRC	IPLT	IPRT	INSTAN
300	0	10	0	0	0	0	0	-4	0
JOPEP NWT LROPT TRACE									
5 0 0 0									

MULTI-PLAN ANALYSES TO BE PERFORMED

PERCENTAGES → RTIOS= .05 .10 .15 .20 .25 .30 .50 .75 1.00
 OF PAF USED

INFLOW HYDROGRAPH DEVELOPMENT

TEST FLOOD

SUB-AREA RUNOFF COMPUTATION

INFLOW TO ROSEMARY LAKE									
ISTAU	ICOMP	IECON	ITAPE	JPLT	JPAT	INAME	ISTAGE	IAUTO	
SEMARY	0	0	0	0	0	1	0	0	0

HYDROGRAPH DATA

INHDG	INHA	SNAP	TRSPA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1.23	0.00	1.23	0.00	0.000	0	1	0

PRECIP DATA

SPFF	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	124.00	133.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LRPPT	STIRK	OLTKR	RIOL	ERAIN	STRS	RTOK	STRL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 3.00 CP= .50 NTA= 0

SIRIU= -1.70 RECCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH END-OF-PERIOD ORIGINATES. LAG= 2.99 HOURS. CP= .50 VOL= .98									
2.	6.	13.	21.	30.	40.	51.	62.	73.	85.
97.	107.	115.	123.	129.	133.	136.	137.	136.	132.
126.	121.	116.	112.	107.	103.	99.	95.	91.	87.
84.	80.	77.	74.	71.	68.	65.	63.	60.	58.
55.	53.	51.	49.	47.	45.	43.	42.	40.	38.

SUM 22.44 21.44 1.20 10124
(541.)(551.)(30.)(2846.)

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HYDROGRAPH ROUTING

ROUTED OUTFLOW OF ROSEMARY LAKE

ISTAU	ICOMP	IECON	ITAPE	JPLT	JPMT	ISAME	ISTAGE	IAUTO
DAM-I	1	0	0	0	0	1	0	0
GLUSS	CLUSS	AVG	IMES	ISAME	IOPT	IMP	LSTM	
0.0	0.000	0.00	1	1	0	0	0	

MSIPS	NSIDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-99.	-1

STAGE	99.00	100.00	101.00	101.70	102.00	103.00	104.00	105.00	106.00	107.00
FLOW	0.00	23.00	128.00	247.00	460.00	1770.00	3430.00	6930.00	10770.00	14110.00

SURFACE AREA= 0. 15. 35.
CAPACITY= 0. 45. 312.
ELEVATION= 99. 99. 110.

STAGE-STORAGE DATA

SPILLWAY CREST ELEVATION → 99.0 99.0 99.0 99.0 99.0 99.0 99.0 99.0 99.0 99.0 99.0

DAM DATA
LOPEL COGO EXGO DAMWJU
101.7 0.0 0.0 0.0

TOP OF DAM ELEVATION → 101.7

.05 PMF → PEAK OUTFLOW IS 74. AT TIME 20.83 HOURS
.10 PMF → PEAK OUTFLOW IS 171. AT TIME 20.17 HOURS
.15 PMF → PEAK OUTFLOW IS 284. AT TIME 19.50 HOURS
.20 PMF → PEAK OUTFLOW IS 401. AT TIME 19.00 HOURS
.25 PMF → PEAK OUTFLOW IS 509. AT TIME 18.83 HOURS

ROUTED OUTFLOWS

.30 PMF → PEAK OUTFLOW IS 611. AT TIME 18.83 HOURS
TEST FLOOD → .50 PMF → PEAK OUTFLOW IS 1018. AT TIME 18.83 HOURS
.75 PMF → PEAK OUTFLOW IS 1526. AT TIME 18.83 HOURS
1.0 PMF → PEAK OUTFLOW IS 2041. AT TIME 18.67 HOURS

FLWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
HYDROGRAPH AT SEMARY ROUTED TO	1.23	3.19	1	102.	204.	307.	409.	511.	613.	1022.	1533.	2044.
	3.19	3.19	1	2.89	5.79	8.68	11.58	14.47	17.37	28.95	43.42	57.89
ROUTED OUTFLOWS	1.23	3.19	1	76.	171.	244.	401.	509.	611.	1018.	1526.	2041.
	3.19	3.19	1	2.15	4.85	7.04	11.34	14.40	17.20	28.82	43.21	57.78

RESULTS OF VARIOUS FLOODS AT ROSEMARY LAKE DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	ELEVATION	INITIAL VALUE	SPILLWAY CHEST	TOP OF DAM
STORAGE	99.00	99.00	99.00	101.70
OUTFLOW	45.	45.	45.	91.
	0.	0.	0.	247.

247. → SPILLWAY DISCHARGE CAPACITY

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.05	100.50	0.00	49.	76.	0.00	20.83	0.00
.10	101.25	0.00	83.	171.	0.00	20.17	0.00
.15	101.75	.05	92.	284.	1.83	19.50	0.00
.20	101.92	.22	95.	401.	4.33	19.00	0.00
.25	102.04	.34	98.	509.	5.83	18.83	0.00
.30	102.12	.42	99.	611.	7.00	18.83	0.00
.50	102.43	.73	105.	1018.	10.33	18.83	0.00
.75	102.81	1.11	113.	1526.	13.00	18.83	0.00
1.00	103.13	1.43	120.	2041.	14.83	18.67	0.00

→ TEST FLOOD ELEVATION

→ ROUTED TEST FLOOD OUTFLOW

4	H	300	0	10	0	0	0	0	0	-4	0
5	H1	5									
6	J	1	1	1							
7	J1	0									
8	K	1	0.04-1								
9	K1										
10	Y										
11	Y1	1									
12	Y4	99	100	101	101.7	102	103	104	105	106	107
13	Y5	0	23.0	128	247	460	1770	3930	6930	10770	16110
14	Y4	0	15	35							
15	SE	90	99	110							
16	SE	99									
17	SD	101.7									
18	SR	44	0.01	93.0	1	101.7	101.7				
19	K	1	0.05-2								
20	K1										
21	Y										
22	Y1	1									
23	Y6	0.08	0.03	0.04	0.09	100	150	0.007	-1		
24	Y7	0	100	200	25	270	94	271	89	281	89
25	Y7	282	94	300	95	400	100				
26	K	1	0.05-3								
27	K1										
28	Y										
29	Y1	1									
30	Y6	0.08	0.04	0.06	0.05	100	1500	0.003			
31	Y7	0	100	100	90	300	84	310	85	320	85
32	Y7	330	0.04	410	90	650	100				
33	K	1	0.05-4								
34	K1										
35	Y										
36	Y1	1									
37	Y6	0.08	0.05	0.06	0.05	100	2000	0.0025	-1		
38	Y7	0	100	110	90	170	83	180	80	190	80
39	Y7	200	83	350	90	800	100				
40	K	99									

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

ROUTE HYDROGRAPH TO DAM-1
ROUTE HYDROGRAPH TO DS-2
ROUTE HYDROGRAPH TO OS-3
ROUTE HYDROGRAPH TO US-4
END OF NETWORK

HYDROLOGIC ANALYSIS OF ROSEMARY LAKE DAM
NATIONAL DAM SAFETY PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

W/O NWM NMIN IDAY IHR IMIN METRC IPLT IPRT NSTAN
300 0 10 0 0 0 0 -4 0
JUPEN NWT LROPT TRACE
5 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLANE 1 NRTIO= 1 LRTIO= 1

NO INFLOW → RTIOS= 0.00

HYDROGRAPH-ROUTING

ROUTED OUTFLOW OF ROSEMARY LAKE

ISIAU ICOMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO
DAM-1 1 0 0 0 0 0 1 0 0

ROUTING DATA

GLUSS CLOSS AVG IRES ISAME IOPT IPMP LSTR
0.0 0.000 0.000 1 1 0 0

NSIPS NSTUL LAG AMSKK X TSK STORA ISPRAT
1 0 0 0.000 0.000 0.000 -102. 0

STAGE { 99.00 100.00 101.00 101.70 102.00 103.00 104.00 105.00 106.00 107.00
FLOW { 0.00 23.00 124.00 247.00 460.00 1770.00 3930.00 6930.00 10770.00 16110.00

SURFACE AREA= 0. 15. 35.
CAPACITY= 0. 45. 312.
ELEVATIONS= 90. 99. 110.

STAGE-STORAGE DATA

SPILLWAY CREST ELEVATION → 99.0

CHEL SPNU COOW EXPW ELEV COOL CANEA EXPL
99.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

TOP OF DAM ELEVATION → 101.7
DAM DATA
TOPEL COOD EXPD DAMWIO
0.0 0.0 0.0

BREACH DATA - FAILURE BEGINS
WSEL FAILEL WSEL FAILEL
101.70 101.70 101.70 101.70
IMMEDIATELY WITH RESERVOIR SURFACE
AT TOP OF DAM

BEGIN DAM FAILURE AT 0.00 HOURS

PEAK OUTFLOW IS 1239. AT TIME .94 HOURS

→ PEAK BREACH DISCHARGE

NORMAL DEPTH CHANNEL ROUTING

CROSS SECTION COORDINATES--STA.,ELEV.,STA.,ELEV.--ETC

STAGE-STORAGE AND
STAGE-DISCHARGE DATA
FOR THE DOWNSTREAM
CHANNEL AT THE FIRST
DAMAGE AREA

MAXIMUM STAGE IS 46.7

STREAM ELEVATION AT FIRST DAMAGE AREA

HYDROGRAPH ROUTING

SECOND DOWNSTREAM REACH

CHANNEL HUNTING REACH 2-3

ISLAN	ICOMP	IECON	ITAPE	IPLT	IMRT	ISAME	ISAGE	IAUTO
NS-3	1	0	0	0	0	1	0	0
VLUSS	CLASS	AVG	IMES	ISAME	IUPT	IPMP	ISPR	
0.0	0.000	0.000	1	1	0	0	0	
NSIYS	NSIOL	LAG	ANSKK	X	TSK	STORA	ISPRAT	
1	0	0	0.000	0.000	0.000	-1.	0	

UN(1) UN(2) UN(3) ELEV ELMAX ELNTH SEL CHANNEL CHARACTERISTICS AT SECOND DOWNSTREAM DAMAGE AREA

CROSS SECTION COORDINATES--STA.ELEV+STA.FLEV--ETC
0.00 100.00 100.00 9.00 300.00 88.00 310.00 85.00 320.00 85.00 } CROSS-SECTION OF DOWNSTREAM CHANNEL
330.00 88.00 410.00 90.00 650.00 100.00 AT SECOND DAMAGE AREA

STAGE- STORAGE AND	STORAGE	0.00	-34	83	146	229	321	413	505	597	689	781	873	965	1057	1149	1241	1333	1425	1517	1609	1701	1793	1885	1977	2069	2161	2253	2345	2437	2529	2621	2713	2805	2897	2989	3081	3173	3265	3357	3449	3541	3633	3725	3817	3909	4001	4093	4185	4277	4369	4461	4553	4645	4737	4829	4921	5013	5105	5197	5289	5381	5473	5565	5657	5749	5841	5933	6025	6117	6209	6301	6393	6485	6577	6669	6761	6853	6945	7037	7129	7221	7313	7405	7497	7589	7681	7773	7865	7957	8049	8141	8233	8325	8417	8509	8601	8693	8785	8877	8969	9061	9153	9245	9337	9429	9521	9613	9705	9797	9889	9981	10073	10165	10257	10349	10441	10533	10625	10717	10809	10901	10993	11085	11177	11269	11361	11453	11545	11637	11729	11821	11913	12005	12097	12189	12281	12373	12465	12557	12649	12741	12833	12925	13017	13109	13201	13293	13385	13477	13569	13661	13753	13845	13937	14029	14121	14213	14305	14397	14489	14581	14673	14765	14857	14949	15041	15133	15225	15317	15409	15501	15593	15685	15777	15869	15961	16053	16145	16237	16329	16421	16513	16605	16697	16789	16881	16973	17065	17157	17249	17341	17433	17525	17617	17709	17801	17893	17985	18077	18169	18261	18353	18445	18537	18629	18721	18813	18905	18997	19089	19181	19273	19365	19457	19549	19641	19733	19825	19917	20009	20101	20193	20285	20377	20469	20561	20653	20745	20837	20929	21021	21113	21205	21297	21389	21481	21573	21665	21757	21849	21941	22033	22125	22217	22309	22401	22493	22585	22677	22769	22861	22953	23045	23137	23229	23321	23413	23505	23597	23689	23781	23873	23965	24057	24149	24241	24333	24425	24517	24609	24701	24793	24885	24977	25069	25161	25253	25345	25437	25529	25621	25713	25805	25897	25989	26081	26173	26265	26357	26449	26541	26633	26725	26817	26909	27001	27093	27185	27277	27369	27461	27553	27645	27737	27829	27921	28013	28105	28197	28289	28381	28473	28565	28657	28749	28841	28933	29025	29117	29209	29301	29393	29485	29577	29669	29761	29853	29945	30037	30129	30221	30313	30405	30497	30589	30681	30773	30865	30957	31049	31141	31233	31325	31417	31509	31601	31693	31785	31877	31969	32061	32153	32245	32337	32429	32521	32613	32705	32797	32889	32981	33073	33165	33257	33349	33441	33533	33625	33717	33809	33901	33993	34085	34177	34269	34361	34453	34545	34637	34729	34821	34913	35005	35097	35189	35281	35373	35465	35557	35649	35741	35833	35925	36017	36109	36201	36293	36385	36477	36569	36661	36753	36845	36937	37029	37121	37213	37305	37397	37489	37581	37673	37765	37857	37949	38041	38133	38225	38317	38409	38501	38593	38685	38777	38869	38961	39053	39145	39237	39329	39421	39513	39605	39697	39789	39881	39973	40065	40157	40249	40341	40433	40525	40617	40709	40801	40893	40985	41077	41169	41261	41353	41445	41537	41629	41721	41813	41905	42000																																																																																						
STAGE- DISCHARGE	OUTFLOW	0.00	15.17	53.91	118.30	216.67	402.71	736.33	1308.93	2105.65	3098.43	4286.61	5669.44	7249.77	9030.88	11016.64	13211.34	15619.55	18246.00	21095.56	24173.22	27489.93	30984.93	34699.93	38584.93	42589.93	46754.93	50989.93	55289.93	59639.93	64039.93	68479.93	72949.93	77439.93	81939.93	86449.93	90959.93	95469.93	100000.00	104559.93	109129.93	113709.93	118299.93	122899.93	127499.93	132099.93	136699.93	141299.93	145899.93	150499.93	155099.93	159699.93	164299.93	168899.93	173499.93	178099.93	182699.93	187299.93	191899.93	196499.93	201099.93	205699.93	210299.93	214899.93	219499.93	224099.93	228699.93	233299.93	237899.93	242499.93	247099.93	251699.93	256299.93	260899.93	265499.93	270099.93	274699.93	279299.93	283899.93	288499.93	293099.93	297699.93	302299.93	306899.93	311499.93	316099.93	320699.93	325299.93	329899.93	334499.93	339099.93	343699.93	348299.93	352899.93	357499.93	362099.93	366699.93	371299.93	375899.93	380499.93	385099.93	389699.93	394299.93	398899.93	403499.93	408099.93	412699.93	417299.93	421899.93	426499.93	431099.93	435699.93	440299.93	444899.93	449499.93	454099.93	458699.93	463299.93	467899.93	472499.93	477099.93	481699.93	486299.93	490899.93	495499.93	500099.93	504699.93	509299.93	513899.93	518499.93	523099.93	527699.93	532299.93	536899.93	541499.93	546099.93	550699.93	555299.93	559899.93	564499.93	569099.93	573699.93	578299.93	582899.93	587499.93	592099.93	596699.93	601299.93	605899.93	610499.93	615099.93	619699.93	624299.93	628899.93	633499.93	638099.93	642699.93	647299.93	651899.93	656499.93	661099.93	665699.93	670299.93	674899.93	679499.93	684099.93	688699.93	693299.93	697899.93	702499.93	707099.93	711699.93	716299.93	720899.93	725499.93	730099.93	734699.93	739299.93	743899.93	748499.93	753099.93	757699.93	762299.93	766899.93	771499.93	776099.93	780699.93	785299.93	789899.93	794499.93	799099.93	803699.93	808299.93	812899.93	817499.93	822099.93	826699.93	831299.93	835899.93	840499.93	845099.93	849699.93	854299.93	858899.93	863499.93	868099.93	872699.93	877299.93	881899.93	886499.93	891099.93	895699.93	900299.93	904899.93	909499.93	914099.93	918699.93	923299.93	927899.93	932499.93	937099.93	941699.93	946299.93	950899.93	955499.93	960099.93	964699.93	969299.93	973899.93	978499.93	983099.93	987699.93	992299.93	996899.93	1001499.93	1006099.93	1010699.93	1015299.93	1019899.93	1024499.93	1029099.93	1033699.93	1038299.93	1042899.93	1047499.93	1052099.93	1056699.93	1061299.93	1065899.93	1070499.93	1075099.93	1079699.93	1084299.93	1088899.93	1093499.93	1098099.93	1102699.93	1107299.93	1111899.93	1116499.93	1121099.93	1125699.93	1130299.93	1134899.93	1139499.93	1144099.93	1148699.93	1153299.93	1157899.93	1162499.93	1167099.93	1171699.93	1176299.93	1180899.93	1185499.93	1190099.93	1194699.93	1199299.93	1203899.93	1208499.93	1213099.93	1217699.93	1222299.93	1226899.93	1231499.93	1236099.93	1240699.93	1245299.93	1249899.93	1254499.93	1259099.93	1263699.93	1268299.93	1272899.93	1277499.93	1282099.93	1286699.93	1291299.93	1295899.93	1300499.93	1305099.93	1309699.93	1314299.93	1318899.93	1323499.93	1328099.93	1332699.93	1337299.93	1341899.93	1346499.93	1351099.93	1355699.93	1360299.93	1364899.93	1369499.93	1374099.93	1378699.93	1383299.93	1387899.93	1392499.93	1397099.93	1401699.93	1406299.93	1410899.93	1415499.93	1420099.93	1424699.93	1429299.93	1433899.93	1438499.93	1443099.93	1447699.93	1452299.93	1456899.93	1461499.93	1466099.93	1470699.93	1475299.93	1479899.93	1484499.93	1489099.93	1493699.93	1498299.93	1502899.93	1507499.93	1512099.93	1516699.93	1521299.93	1525899.93	1530499.93	1535099.93	1539699.93	1544299.93	1548899.93	1553499.93	1558099.93	1562699.93	1567299.93	1571899.93	1576499.93	1581099.93	1585699.93	1590299.93	1594899.93	1599499.93	1604099.93	1608699.93	1613299.93	1617899.93	1622499.93	1627099.93	1631699.93	1636299.93	1640899.93	1645499.93	1650099.93	1654699.93	1659299.93	1663899.93	1668499.93	1673099.93	1677699.93	1682299.93	1686899.93	1691499.93	1696099.93	1700699.93	1705299.93	1709899.93	1714499.93	1719099.93	1723699.93	1728299.93	1732899.93	1737499.93	1742099.93	1746699.93	1751299.93	1755899.93	1760499.93	1765099.93	1769699.93	1774299.93	1778899.93	1783499.93	1788099.93	1792699.93	1797299.93	1801899.93	1806499.93	1811099.93	1815699.93	1820299.93	1824899.93	1829499.93	1834099.93	1838699.93	1843299.93	1847899.93	1852499.93	1857099.93	1861699.93	1866299.93	1870899.93	1875499.93	1880099.93	1884699.93	1889299.93	1893899.93	1898499.93	1903099.93	1907699.93	1912299.93	1916899.93	1921499.93	1926099.93	1930699.93	1935299.93	1939899.93	1944499.93	1949099.93	1953699.93	1958299.93	1962899.93	1967499.93	1972099.93	1976699.93	1981299.93	1985899.93	1990499.93	1995099.93	1999699.93	2004299.93	2008899.93	2013499.93	2018099.93	2022699.93	2027299.93	2031899.93	2036499.93	2041099.93	2045699.93	2050299.93	2054899.93	2059499.93	2064099.93	2068699.93	2073299.93	2077899.93	2082499.93	2087099.93	2091699.93	2096299.93	2100899.93	2105499.93	2110099.93	2114699.93	2119299.93	2123899.93	2128499.93	2133099.93	2137699.93	2142299.93	2146899.93	2151499.93	2156099.93	2160699.93	2165299.93	2169899.93	2174499.93	2179099.93	2183699.93	2188299.93	2192899.93	2197499.93	2202099.93	2206699.93	2211299.93	2215899.93	2220499.93	2225099.93	2229699.93	2234299.93	2238899.93	2243499.93	2248099.93	2252699.93	2257299.93	2261899.93	2266499.93	2271099.93	2275699.93	2280299.93	2284899.93	2289499.93	2294099.93	2298699.93	2303299.93	2307899.93	2312499.93	2317099.93	2321699.93	2326299.93	2330899.93	2335499.93	2340099.93	2344699.93	2349299.93	2353899.93	2358499.93	2363099.93	2367699.93	2372299.93	2376899.93	2381499.93	2386099.93	2390699.93	2395299.93	2399899.93	2404499.93	2409099.93	2413699.93	2418299.93	2422899.93	2427499.93	2432099.9

MAXIMUM STAGE IS 90.3

→ STREAM ELEVATION AT SECOND DAMAGE AREA

THIRD DOWNSTREAM REACH → CHANNEL ROUTING REACH 3-4

ISTAU	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DS-4	1	0	0	0	0	1	0	0
ULUSS	CLOSS	AVG	IHES	ISAME	LOPT	IPMP	LSTR	
0.0	0.00	0.00	1	1	0	0	0	
NSTPS	NSTOL	LAG	AMSKX	X	TSK	STORA	ISPRAT	
1	0	0	0.000	0.000	0.000	-1.	0	

NORMAL DEPTH CHANNEL ROUTING

UN(1) UN(2) UN(3) ELEV ELMAX ELNTH SEL CHANNEL CHARACTERISTICS AT THIRD DOWNSTREAM DAMAGE AREA

CROSS SECTION COORDINATES--STA.ELEV+STA.FLEV--ETC
0.00 100.00 110.00 90.00 170.00 83.00 140.00 80.00 190.00 80.00 } CROSS-SECTION OF DOWNSTREAM CHANNEL
200.00 83.00 350.00 90.00 800.00 100.00 AT THIRD DAMAGE AREA

STAGE-STORAGE AND		0.00	65	1.04	2.99	5.43	9.40	21.91	30.46	40.53
STAGE-DISCHARGE DATA		52.30	66.75	84.04	104.19	127.19	153.03	14.89	284.89	284.89
FOR THE DOWNSTREAM								213.26	247.65	
CHANNEL AT THE THIRD										
DAMAGE AREA										
STORAGE		0.00	18.57	68.49	158.06	320.98	549.01	924.67	1407.30	2034.57
OUTFLOW		3728.11	4815.05	6179.94	7848.41	9447.25	12203.39	14943.15	18092.18	21475.44
STAGE		40.00	41.05	42.11	43.16	44.21	45.26	46.32	47.37	48.42
		90.53	91.58	92.63	93.68	94.74	95.79	96.84	97.89	98.95
FLOW		0.00	15.57	68.49	158.06	320.98	549.01	924.67	1407.30	2034.57

ROSEMARY LAKE DAM BREACH OUTFLOW

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1									
ELEVATION		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM			
STORAGE		101.70		99.00		101.70			
OUTFLOW		247.		0.		247.			
FIRST DOWNSTREAM DAMAGE AREA → PLAN 1									
MAXIMUM		MAXIMUM		MAXIMUM		DURATION		TIME OF	
OF RESERVOIR		DEPTH		STORAGE		OUTFLOW		MAX OUTFLOW	
PMF WATERLEVEL		OVER DAM		AC-FT		CFS		HOURS	
0.00		101.68		0.00		91.		1239.	
								0.00	
								.94	
								0.00	
→ PEAK BREACH OUTFLOW									
STATION DS-2									
		MAXIMUM		MAXIMUM		MAXIMUM		MAXIMUM	
		FLOW, CFS		STAGE, FT		STAGE, FT		STAGE, FT	
		0.00		1225.		96.2		1.00	
→ STREAM ELEVATION AT FIRST DAMAGE AREA									
SECOND DOWNSTREAM DAMAGE AREA → PLAN 1									
		MAXIMUM		MAXIMUM		MAXIMUM		MAXIMUM	
		FLOW, CFS		STAGE, FT		STAGE, FT		STAGE, FT	
		0.00		1132.		90.2		1.00	
→ STREAM ELEVATION AT SECOND DAMAGE AREA									
THIRD DOWNSTREAM DAMAGE AREA → PLAN 1									
		MAXIMUM		MAXIMUM		MAXIMUM		MAXIMUM	
		FLOW, CFS		STAGE, FT		STAGE, FT		STAGE, FT	
		0.00		1035.		86.6		1.17	
→ STREAM ELEVATION AT THIRD DAMAGE AREA									

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS



INVENTORY OF DAMS IN THE UNITED STATES

STATE	DIVISION	COUNTY	COUNTY DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
MA	1112 NED	MA 021 09		ROSEMARY LAKE DAM	4217.2	7114.4	00JAN80

POPULAR NAME	NAME OF IMPONDMENT
	ROSEMARY LAKE

REGION BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 06	ROSEMARY BROOK	NEEDHAM	0	29750

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURE HEIGHT (FT.)	HYDRAULIC HEAD (FT.)	IMPONDING CAPACITIES (ACRES-FT.)
REOTPG	1800	R	12	12	91

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

REMARKS
STONE MAS FACE WALL , ESTIMATED CONST DATE 1920 YR BUILT EST FROM RCDS

D/S WAS	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CU YD)	POWER CAPACITY (MW)	INSTALLED	PROPOSED	NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	440 U	22	18000								

OWNER	ENGINEERING BY	CONSTRUCTION BY
TOWN OF NEEDHAM	UNKNOWN	UNKNOWN

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	MA DEGE	MA DEGE

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
O'BRIEN + GERE ENGINEERS INC.	160CT79	PL 92-367

REMARKS
AUX SPILLWAY EL APPROX 1 FT HIGHER THAN SERVICE SPILLWAY

END

FILMED

8-85

DTIC