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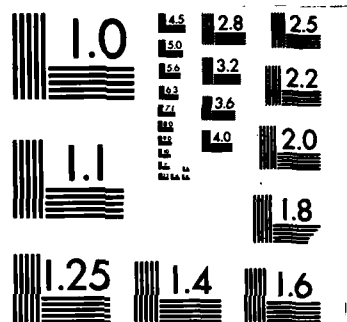
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
BUCK STREET EAST DAM (..U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV FEB 79

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MERRIMACK RIVER BASIN
PEMBROKE, NEW HAMPSHIRE

BUCK STREET EAST DAM

NH 00445

NHWRB NO. 190.06

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

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REPORT DOCUMENTATION PAGE		RECEIVING INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NH 00445	2. GOVT ACCESSION NO. AD-A156512	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Buck Street East Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE February 1979
		13. NUMBER OF PAGES 61
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		16a. DECLASSIFICATION/DOWNGRADING SCHEDULE
18. DISTRIBUTION STATEMENT (of this Report) APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
19. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
20. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY. Merrimack River Basin Pembroke, New Hampshire Suncook River		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a composite structure consisting of cut granite masonry and concrete with an overall length of about 53.5 ft. and a maximum structural height of 11.75 ft. The dam is generally in good condition. It is small in size with a low hazard potential. It is recommended that provisions be made by the owner to repair the scoured concrete portion of the outlet works sluiceway structure and to remove the debris from the upstream face of the dam.		

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REPLY TO
ATTENTION OF
NEDED

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

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Dear Governor Gallen:


I am forwarding to you a copy of the Buck Street East 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 Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, New Hampshire Water Resources Board, Concord, New Hampshire 03301.

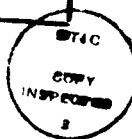
Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely yours,


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated



BUCK STREET EAST DAM

NH 00445

NHWRB 90.06

MERRIMACK RIVER BASIN
PEMBROKE, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LETTER OF TRANSMITTAL
FROM THE CORPS OF ENGINEERS TO THE STATE
TO BE SUPPLIED BY THE CORPS OF ENGINEERS

NATIONAL DAM INSPECTION PROGRAM
PHASE I - INSPECTION REPORT
BRIEF ASSESSMENT

Identification No.: 00445
Name of Dam: Buck Street East Dam
Town: Pembroke
County and State: Merrimack, New Hampshire
Stream: Suncook River
Date of Inspection: November 16, 1978

Buck Street East Dam is a composite structure consisting of cut-granite masonry and concrete with an overall length of approximately 53.5 feet and a maximum structural height of about 11.75 feet. The dam was originally constructed in 1923. Engineering data available consisted of a set of plans dated 1967 and 1968 showing additions and improvements made to the dam in about 1969. No construction specifications or design calculations were available.

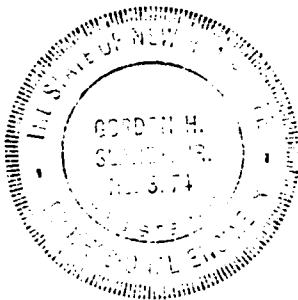
The visual inspection indicated that the dam was in generally good condition. The inspection revealed loss of joint mortar on the vertical downstream face of the spillway section, scouring of concrete on the lower portion of the outlet works sluiceway structure and a broken lock on the gate house structure. Also, the inspection revealed loss of mortar in the joints between the cut-granite blocks of the masonry training wall along the east side of the channel and debris located at the upstream face of the dam.

Based on its small size and low hazard classification in accordance with the Corps guidelines, the test flood is equal to a 100 year storm. The spillway will pass only about 17 percent of the test flood and is considered inadequate. The nonoverflow section would be overtopped by 9.9 feet under test flood conditions.

It is recommended that provisions be made by the owner to repair the scoured concrete portion of the outlet works sluiceway structure, replace the broken lock on the gate

house to avoid unauthorized use of the gates and to remove the debris from the upstream face of the dam. Also, the spillway section and left training wall of the downstream channel should be monitored periodically. Should seepage become evident, further provisions for repairing the joints of these cut-block sections should be considered.

The recommendations and remedial measures are described in Section 7 and should be addressed by the owner within two years after receipt of this Phase I - Inspection Report.



Gordon H. Slaney, Jr.

Gordon H. Slaney, Jr., P.E.
Project Engineer

Howard, Needles, Tammen & Bergendoff
Boston, Massachusetts

This Phase I Inspection Report on Buck Street East 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.

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control 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 aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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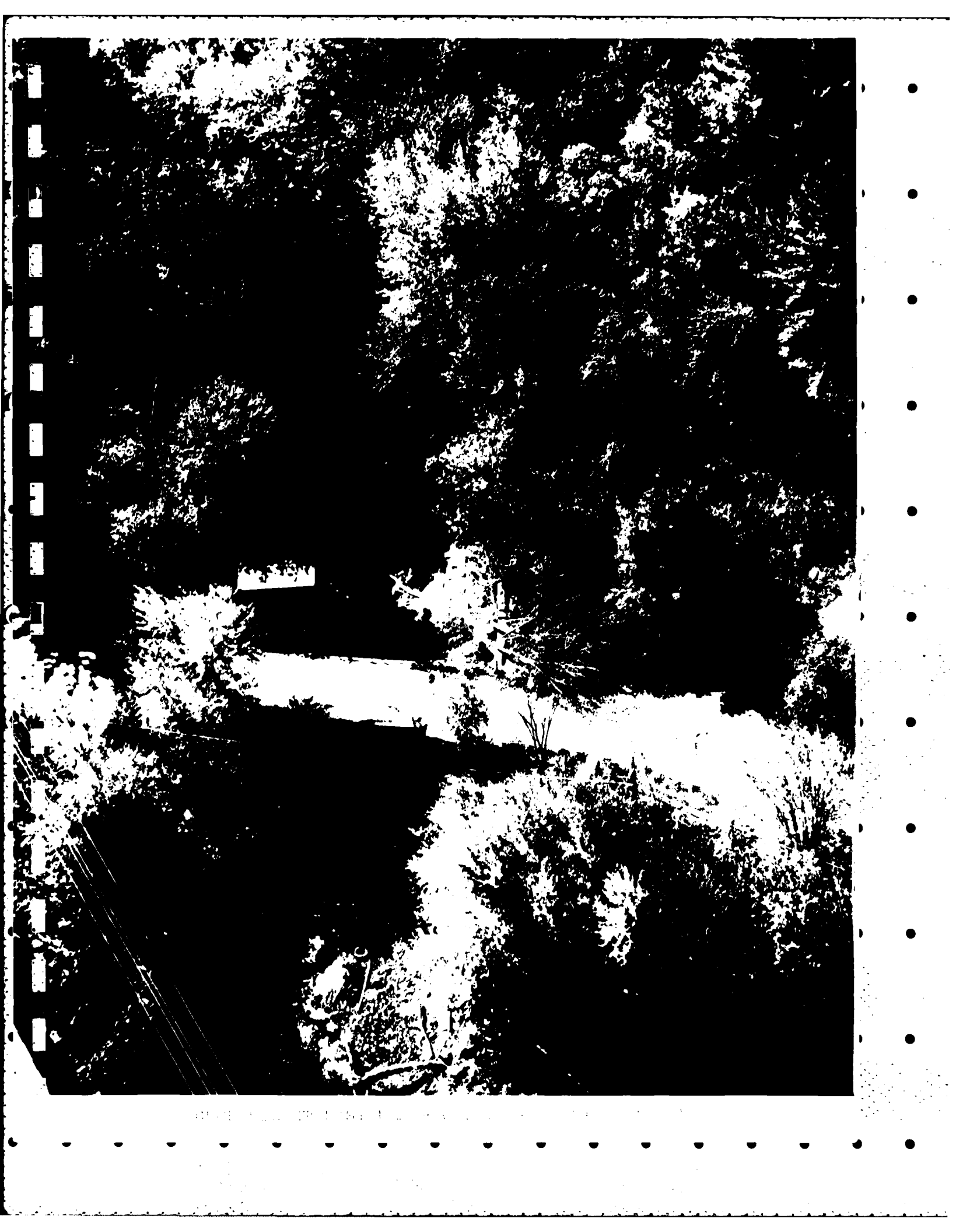
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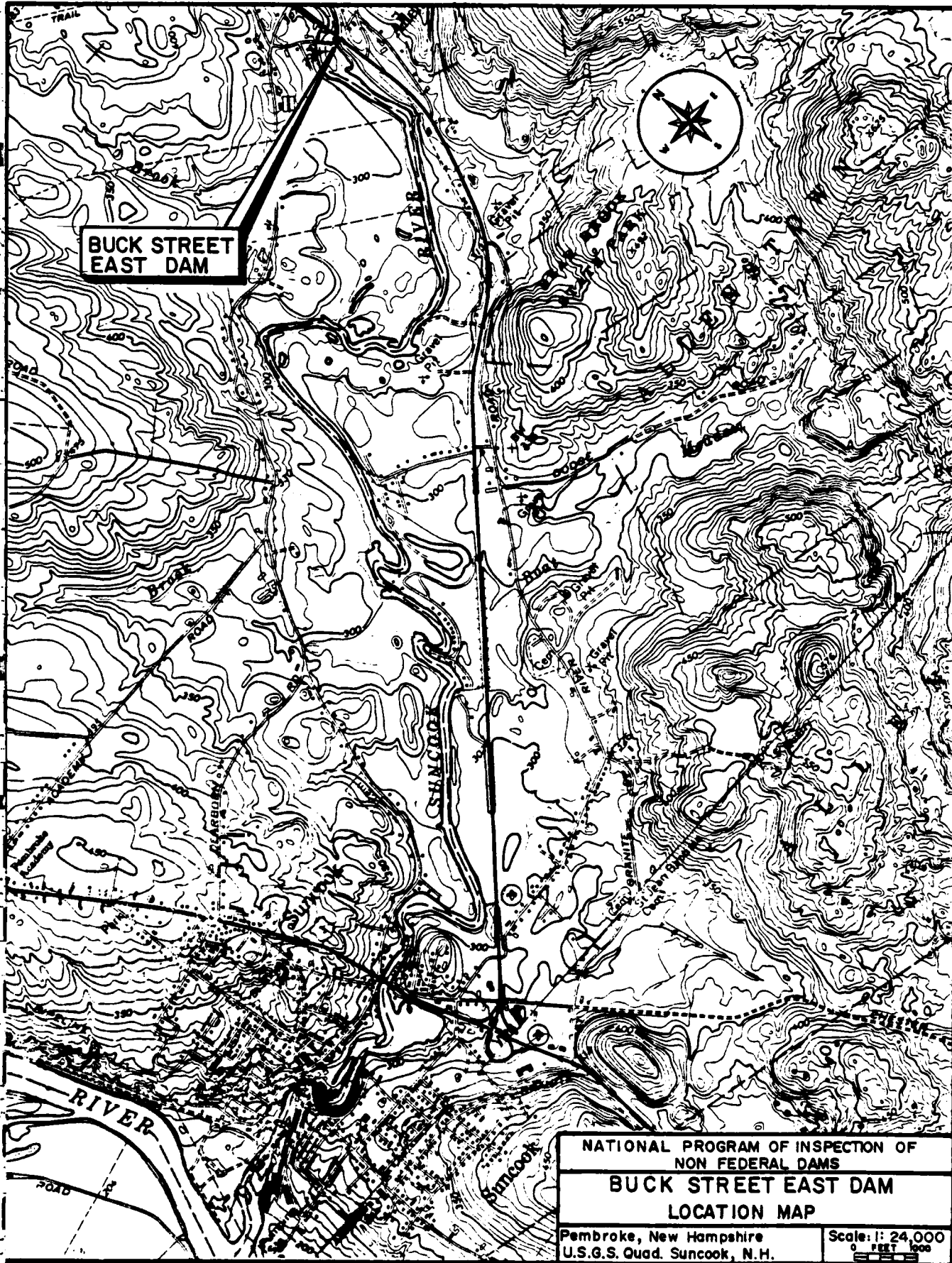
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BUCK STREET
EAST DAM

NATIONAL PROGRAM OF INSPECTION OF
NON FEDERAL DAMS

BUCK STREET EAST DAM
LOCATION MAP

Pembroke, New Hampshire
U.S.G.S. Quad. Suncook, N.H.

Scale: 1: 24,000
0 FEET 1000

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
BUCK STREET EAST DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Howard, Needles, Tammen & Bergendoff has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed were issued to Howard, Needles, Tammen & Bergendoff under a letter of October 23, 1978, from John P. Chandler, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0356 has been assigned by the Corps of Engineers for this work.

b. Purpose

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

(2) To encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

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

1.2 Description of Project

a. Location. Buck Street East Dam is located on the Suncook River, approximately 5.3 miles upstream from its confluence with the Merrimack River, in the Town of Pembroke, New Hampshire. The dam is shown in U.S.G.S. Quadrangle, Sungook, New Hampshire, with coordinates approximately N43°09'36", W71°24'24", Merrimack County, New Hampshire. The location of Buck Street East Dam is shown on the Location Map immediately preceding this page.

b. Description of Dam and Appurtenances. Buck Street East Dam is a composite structure, approximately 53.5 feet long, consisting of cut-granite masonry and concrete. The structural height of the dam, measured from the river bed elevation to the top of the spillway, is about 8.0 feet. From the top of the spillway to the dam crest measures approximately 3.75 feet, giving a total height of 11.75 feet. The appurtenant works consist of a cut-granite masonry spillway, an outlet works consisting of a sluiceway with mechanically controlled wooden gates, and a concrete block gate house.

Figure 1, located in Appendix B, shows the plan of the dam and its appurtenant structures. Photographs of each structure are shown in Appendix C.

c. Size Classification. Small (hydraulic height - 11.75 feet high, storage - 413 acre-feet) based on both storage being less than 1000 acre-feet and height being less than 40 feet as given in Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. The dam's potential for damage rates it as a low hazard. A major breach of the Buck Street East Dam could result in some minimal flooding to a trailer park located 400 feet downstream of the dam. Three miles downstream of the dam there are about 7 dwellings which could expect flooding as a result of dam failure. The increased effect from breach of dam would probably be minimal and no loss of life, due to dam breach, would be expected.

e. Ownership. This dam is owned by the New Hampshire Water Resources Board, Concord, New Hampshire 03301.

f. Operator. This dam is maintained and operated by the State of New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire 03301. Chairman of the Water Resources Board is Mr. George M. McGee, Sr.; Mr. Vernon Knowlton is Chief Engineer. Telephone No. (603)271-1110.

g. Purpose of Dam. This dam is used for recreational purposes for the State Park located just upstream of the dam.

h. Design and Construction History. The dam at Buck Street East was originally constructed in about 1923 for the Suncook Mills Company to regulate the supply of water for power generation. No plans of the original construction

are available. About 1969 the outlet works structures were reconstructed by the New Hampshire Water Resources Board in conjunction with the Department of Fish and Game. No design or construction data were disclosed for this dam.

i. Normal Operating Procedure. No written operational procedures were disclosed for this dam. Normally the sluice gates in the outlet works are left open from mid October thru the winter months allowing the water level to be maintained at the natural river channel elevation. In the spring the gates are closed. During the summer months the water level is controlled by the spillway elevation, thus producing the recreational pool for the State Park.

1.3 Pertinent Data

a. Drainage Area. The drainage area tributary to Buck Street East Dam consists of approximately 240 square miles of flat to rolling, wooded terrain. Pittsfield is the only major town within the basin. Topographic elevation in the watershed ranges from 2384 to 280 feet MSL.

As this is a "run of the river" type dam the reservoir area is very small in comparison with the total watershed. The nearby area is wooded and has fairly even terrain. An abandoned road (Buck Street) crosses 25 feet upstream of the dam and Route 28 crosses 150' upstream. The reservoir area between the East Dam and Buck Street is filled with debris.

b. Discharge at Dam Site

(1) The outlet works for Buck Street East Dam consist of two 5.33 feet wide gates set on a concrete platform at the streambed elevation. There are no other outlet works on the East Dam. Invert elevation is 279.83 feet MSL.

(2) The maximum discharge at the Buck Street site is estimated to have been 18,500 cfs during the March 1936 flood. As the Buck Street East Dam is hydraulically interconnected with the Buck Street West Dam, it is estimated that the Buck Street East Dam passes approximately 18 percent of the river flow.

(3) The spillway capacity with the water surface at the top of dam is approximately 785 cfs at elevation 290.75.

(4) The spillway capacity with the water surface at the test flood elevation of 300.45 is approximately 3420 cfs.

(5) The total project discharge for the East Dam is 3420 cfs at elevation 300.45. It should be noted that the full test flood discharge at Buck Street flows over both the Buck Street East Dam and the Buck Street West Dam. Further details are given in Section 5 of this report.

c. Elevation (feet above MSL)

- (1) Streambed at centerline of dam - 279.83.
- (2) Maximum tailwater - 297.3 (est.)
- (3) Upstream portal invert diversion tunnel - none.
- (4) Recreation pool - 287.0.
- (5) Full flood control pool - N/A.
- (6) Spillway crest (permanent spillway) - 287.0.
- (7) Design surcharge - unknown.
- (8) Top Dam - 290.75.
- (9) Test Flood Surcharge - 300.45.

d. Reservoir (miles)

- (1) Length of Maximum Pool - N/A.
- (2) Length of Recreational Pool - N/A.
- (3) Length of Flood Control Pool - N/A.

e. Storage (Gross Acre-Feet)

- (1) Recreation Pool - 84.
- (2) Flood Control Pool - N/A.
- (3) Spillway Crest Pool - 84.
- (4) Top of Dam - 413.

f. Reservoir Surface (Acres)

- (1) Recreation Pool - 43

- (2) Flood Control Pool - N/A.
- (3) Spillway Crest - 43.
- (4) Test Flood Pool - 120.
- (5) Top Dam - 69.

g. Dam

- (1) Type - masonry granite.
- (2) Length - 53.5 feet, overall.
- (3) Height - 11.72.
- (4) Top Width - 8.0.
- (5) Side Slopes - US = N/A; DS = N/A.
- (6) Zoning - unknown.
- (7) Impervious core - none.
- (8) Cutoff - unknown.
- (9) Grout Curtain - unknown.
- (10) Other - none.

h. Diversion and Regulating Tunnel

None.

i. Spillway

- (1) Type - masonry weir.
- (2) Length of Weir - 32 feet.
- (3) Crest Elevation - 287.0.
- (4) Gates - none.
- (5) U/S Channel - none.
- (6) Downstream Channel. The channel immediately downstream of the dam is the easterly channel of the Suncook River. The streambed is a 50 foot wide rock bottom channel which joins the westerly channel of the river approximately 400 feet downstream of the dam.

j. Regulating Outlets. River level is regulated by two 5.33 foot wide gates with the inverts set at the approximate streambed elevation of 279.83. The gates are operated mechanically from a gate house constructed immediately above the waterway opening.

SECTION 2 ENGINEERING DATA

2.1 Design

The dam at Buck Street East was originally constructed in about 1923 for the Suncook Mills Company to regulate the supply of water for power generation. No plans or design data for the original construction are available. In 1969, the outlet works structure of the dam was reconstructed by the State of New Hampshire Water Resources Board in conjunction with the Department of Fish and Game.

A set of drawings (2 sheets) dated 1967 and 1968 showing these additions and improvements to the existing dam was the only design information found. No in-depth engineering calculations were found.

2.2 Construction

No construction records were available for use in evaluating the dam.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

A. Availability. Engineering data available for Buck Street East Dam is limited to the set of plans mentioned above. These plans are on file at the New Hampshire Water Resources Board.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgement.

c. Validity. The field investigation indicated that the external features of Buck Street East Dam substantially agree with those shown on the available plans.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of Buck Street East Dam was made on November 16, 1978. The inspection team consisted of personnel from Howard, Needles, Tammen & Bergendoff and Geotechnical Engineers, Inc. A representative of the State of New Hampshire Water Resources Board was also present for the inspection. Inspection checklists, completed during the visual inspection are included in Appendix A. At the time of the inspection, the water level was approximately 3 feet - 11 inches below the permanent spillway elevation. No water was passing over the spillway. The upstream face of the dam could only be inspected above this water level.

b. Dam. The dam consists of a stone-masonry overflow gravity section about 32 feet long and a twin-box stoplog section with an overall width of about 21 feet. The stoplog section consists of stone-masonry walls faced with concrete at each end, and a central concrete wall between the two boxes as shown in Photo 4.

The joints between the cut-stone blocks on the sloping top surface of the overflow section are filled with mortar which is in good condition (Photo 2). The joints between the cut-stone blocks on the vertical downstream face of the overflow section contain a few remnants of mortar, but most of the joints contain no mortar as shown in Photo 6.

Bedrock is visible in the channel immediately downstream of the dam, which is consistent with available records which indicate that the dam is built on "ledge". It appears that the right abutment is bedrock. The left abutment is hidden from view by training walls both upstream and downstream of the dam. No leakage was apparent through the dam or through the foundations and abutments; the presence of tailwater at the time of the inspection would have hidden foundation leakage if any were occurring.

Brush and several trees, about 6 to 8 inches in diameter, on the right abutment close to the dam were apparently cut a few months prior to the inspection. The stumps of the trees were still in place.

c. Appurtenant Structures. Visual inspection of the stone masonry spillway, outlet works with its structural components and spillway/sluiceway discharge channel did not reveal any evidence of stability problems. The concrete

surface at the sluiceway structure appeared to be new and in good condition. The spillway granite blocks are also in good condition, and there appeared to be no movements between the blocks.

The outlet works consists of a sluiceway structure (Photos 11, 12 and 13) with two wooden mechanically operated control gates and a concrete block gate house. The sluiceway structure is formed by the left training wall and the stone masonry pier separating the sluiceway and the spillway structures. The concrete facing, middle pier and apron slab of the outlet works were added during the reconstruction program, conducted in 1974 by the New Hampshire Water Resources Board. The concrete surface above the spillway crest elevation appeared to be in good condition with some scouring noted below this level. The sluiceway has two controlled openings, each 5.25 feet wide by 16 feet high. The gates (Photo 13) were not operated but visual inspection indicated that they were in good condition, and they were reported to be operational. The concrete block gate house was in good condition except for a broken lock on the doorway.

The spillway structure consists of large cut-granite blocks with mortar joints. Visual inspection revealed that the granite blocks and their alignment are in good condition. The joints between the blocks on the vertical downstream face, however, contain only remnants of mortar, most joints having no mortar (Photos 3 and 6). The spillway structure is founded on bedrock.

There is a cut-granite masonry training wall on the east side of the channel immediately downstream of the concrete stoplog structure. The mortar is missing locally from the joints between the cut-granite blocks, particularly in the lower section of the wall close to the tailwater level. Where the bottom of the wall can be seen above tailwater level, it rests on bedrock. No seepage was discharging from the joints between the cut-granite blocks at the time of the inspection.

d. Reservoir Area. The reservoir area at the Buck Street site is insignificant in terms of impoundage as both dams at this site are primarily run of the river type dams. The area in the vicinity of the dam consists of rolling, wooded terrain with some fields scattered throughout the area. A major state roadway (Route 28) crosses the river approximately 150 feet upstream of the dam. The abandoned Buck Street bridge crosses the river about 25 feet upstream of the dam. There were many large logs and stumps noted along the shores of the river. Heavy debris was also noted in the area between the abandoned Buck Street bridge and the dam.

e. Downstream Channel. The downstream channel has a ledge bottom for a short distance downstream at which point it appears to change to a rock strewn channel. There are many trees located along the shore but none of any consequence overhanging the channel. During the inspection, water was flowing at a depth of approximately 2 feet. The main Suncook River, beyond where the east and west branches join, appeared to be relatively clean with tree lined banks.

3.2 Evaluation

Visual inspection of the Buck Street East Dam indicates that the dam appears to be in generally good condition. The visual inspection confirms that the foundation of the dam and the right abutment are both bedrock. The nature of the left abutment could not be determined from the visual inspection since it was hidden by cut-granite masonry training walls both upstream and downstream of the dam, but the lack of visible seepage from the open joints of the downstream training wall indicates that the abutment is sound. The inspection revealed the following:

(a) Loss of joint mortar on the vertical downstream face of the spillway section.

(b) Scouring of concrete on the lower portion of the outlet works sluiceway structure.

(c) Broken lock on the gate house structure.

(d) Loss of mortar in the joints between the cut-granite blocks of the masonry training wall along the east side of the channel.

(e) Debris located at the upstream face of the dam.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedure

The Buck Street East Dam is used primarily to create an impoundment of water on the Suncook River, which impoundment is used for recreational purposes. The normal operational procedure for this dam is to open the sluice gate in the outlet works structure in about mid-October of each year, allowing the water level to be maintained at the natural river channel elevation during the winter months. In the spring, the gates are closed. During the summer months the water level is controlled by the spillway elevation, thus producing the recreational pool. It should be noted that the Buck Street East Dam is hydraulically interconnected with the Buck Street West Dam as they are separated only by an island in the Suncook River Channel.

4.2 Maintenance of Dam

This dam is visited by one of the State of New Hampshire Water Resources Board's dam operators approximately once per week. During these visits water levels are recorded, brush is cut as necessary, oiling of gates and painting are done as necessary and any major deficiencies that may be noted are reported to the Water Resources Board.

4.3 Maintenance of Operating Facilities

Maintenance on the outlet works facilities is done on an as needed basis.

4.4 Description of Warning Systems

There are no warning systems in effect at this facility.

4.5 Evaluation

The current operation and maintenance procedures for Buck Street East Dam are inadequate to insure that all problems encountered can be remedied within a reasonable period of time. The owner should establish a written operation and maintenance procedure as well as establishing a warning system to follow in event of flood flow conditions or imminent dam failure.

SECTION 5
HYDROLOGY AND HYDRAULIC ANALYSIS

5.1 Evaluation of Features

a. General. Buck Street East Dam is a composite structure consisting of cut-granite masonry and concrete having a total length of approximately 53.5 feet and a maximum structural height of about 11.75 feet. The appurtenant works consist of a spillway section and an outlet works structure. The spillway has a maximum opening of 32 feet wide by approximately 4 feet high. The outlet works structure consists of two mechanically operated 5.33 foot wide by 6.0 foot high wooden gates and a rock bottom outlet channel.

The dam is located on the Suncook River and creates an impoundment of water primarily used for recreational purposes. The Buck Street East Dam is hydraulically interconnected with the Buck Street West Dam as they are separated only by an island in the channel of the Suncook River. Buck Street East Dam is classified as being small in size having a maximum storage of about 413 acre-feet.

b. Design Data. No hydrologic or hydraulic design data were disclosed for Buck Street East Dam.

c. Experience Data. The maximum flow of 18,500 cfs for the March 1936 flood was estimated from the recorded maximum flow of 12,900 cfs at Chichester, New Hampshire. As indicated above, the Buck Street East Dam is hydraulically interconnected with the Buck Street West Dam. The Buck Street East Dam passes approximately 13 percent of river flows. No water level records were in evidence for the Buck Street location.

d. Visual Observation. No evidence of damage to any portion of the project from overtopping was visible at the time of the inspection.

e. Overtopping Potential. As no detailed design or operational information are available, hydrologic evaluation was performed using dam information gathered by field inspection, watershed size and an estimated test flood equal to the flood of record or approximately 1/4 the Probable Maximum Flood (PMF). Based on a drainage area of 240 square miles the test flood inflow at the Buck Street site was estimated to be 18,500 cfs. At this point it is noted that the 18,500 cfs test flood flow is for the Buck Street East

Dam as well as the Buck Street West Dam which is located 150 feet west of the Buck Street East Dam. These dams are hydraulically interconnected as they are separated only by an island in the Suncook River. Following the guidance given for estimating the effect of surcharge storage on the test flood discharge results in a peak outflow of 18,310 cfs. Approximately 18% of the test flood discharge passes on the east side of the island. As the maximum spillway capacity of the Buck Street East Dam is only 785 cfs (approximately 17 percent of the easterly flow) the Buck Street Dam will be overtopped by 9.7 ft. As this dam is a low "run of the river" type dam it is subjected to back-water conditions. The estimated tailwater for the test flood was accounted for in the surcharge analysis.

f. Dam Failure Analysis. The impact of failure of the dam at maximum pool (top of dam) was assessed using the "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers. The analysis included the reach of river from the dam to the Route 3 bridge in Suncook, New Hampshire. Failure of Buck Street East Dam at maximum pool would probably result in an increase of 1.2 feet over the stage resulting from full spillway flow, or from 9.6 to 10.8 feet. The full spillway discharge downstream also includes flow from the West Dam. It should be noted that the downstream stage for the test flood is estimated to be 18 feet.

The increase in flow from breach of dam could result in some flooding in a trailer park (not shown on USGS map) located 400 + feet downstream of the dam. Approximately 3 miles downstream of the dam there are about 7 dwellings located on the banks of the Suncook River that would experience flooding due to the flows that would be expected from full spillway condition. The increased effect from breach of dam would probably be minimal and no loss of life, due to dam breach, would be expected.

Channel storage will attenuate the flood wave so that it will be insignificant when compared to channel flows by the time it reaches the Route 3 bridge in Suncook.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observation. There was no evidence of structural instability due to geotechnical conditions. The foundation and right abutment of the dam appear to be founded on bedrock and there was no visible seepage discharging. The left abutment is hidden from view by cut-granite masonry training walls immediately upstream and downstream of the dam, but the absence of any seepage discharge from open joints in the wall downstream of the dam is indirect evidence that the left abutment is sound.

b. Design and Construction Data. The original dam was built in 1923, but none of the design and construction data are available. There is a drawing dated 1962 which shows a plan view of the dam. The evaluation of structural stability, therefore, must be based primarily on the information from the visual inspection.

c. Operating Records. No operating records were available for evaluation.

d. Post-Construction Changes. The outlet works structure was reconstructed in 1969. There are two sheets of drawings dated 1967 and 1968, respectively, which show details of the rehabilitation work for the outlet works structure.

e. Seismic Stability. The dam is located in Seismic Zone 2, and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual inspection indicates that the Buck Street East Dam is in generally good condition. The inspection revealed the following:

- (1) Loss of joint mortar on the vertical downstream face of the spillway section.
- (2) Scouring of concrete on the lower portion of the outlet works sluiceway structure.
- (3) Broken lock on the gate house structure.
- (4) Loss of mortar in the joints between the cut-granite blocks of the masonry training wall along the east side of the channel.
- (5) Debris located at the upstream face of the dam.

The hydraulic analysis reveals that the dam cannot pass the required test flood.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgement.

c. Urgency. This dam is in generally good condition. The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented by the owner within two years after receipt of this Phase I Inspection Report.

d. Need for Additional Investigation. No additional investigation is needed to complete Phase I.

7.2 Recommendations

Due to the dam's small size and low hazard classification, no further hydraulic analysis is recommended.

7.3 Remedial Measures

(a) The scoured concrete portion of the outlet works sluiceway section should be repaired.

(b) The broken lock on the gate house should be replaced to avoid unauthorized use of the outlet gates.

(c) The spillway section and left training wall of the downstream channel should be monitored periodically. Should seepage become evident, further provisions for repairing the joints of these cut-block sections should be considered.

(d) The debris located at the upstream face of the dam should be removed.

(e) A written operational procedure and warning system to follow in the event of flood flow conditions or imminent dam failure should be developed.

(f) The technical inspection program should be continued on a bi-annual basis.

7.4 Alternatives

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

APPENDIX A
INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Buck Street East Dam

DATE November 16, 1978

TIME 9:00 a.m.

WEATHER Sunny, Cool

W.S. ELEV. 283.1 U.S. 279.2 DN.S

PARTY:

- | | |
|-----------------------------|-----------|
| 1. <u>Gordon Slaney</u> | 6. _____ |
| 2. <u>Stan Mazur</u> | 7. _____ |
| 3. <u>Ronald Hirschfeld</u> | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Dam</u>	<u>Ronald Hirschfeld</u>	
2. <u>Spillway/Outlet Works</u>	<u>Gordon Slaney</u>	
3. _____	<u>Stan Mazur</u>	
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECK LIST

PROJECT Buck Street East Dam

DATE November 16, 1978

PROJECT FEATURE Dam

NAME R. Hirschfeld

DISCIPLINE Geotechnical Engineer

NAME _____

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	No embankment. Dam consists of cut-stone masonry, with recently constructed concrete stoplog structure.
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	

PERIODIC INSPECTION CHECK LIST

PROJECT Buck Street East Dam

DATE November 16, 1978

PROJECT FEATURE Intake Channel/Structure

NAME R. Hirschfeld

DISCIPLINE Structural/Hydraulic/Geotechnical
Engineers

NAME G. Slaney, S. Mazur

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	
Slope Conditions	Good, unused highway bridge across channel about 20 ft. upstream of dam.
Bottom Conditions	Bedrock.
Rock Slides or Falls	None.
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	None.
b. Intake Structure	
Condition of Concrete	Stone-masonry walls faced with concrete, good condition.
Stop Logs and Slots	Wooden gates, good condition.

PERIODIC INSPECTION CHECK LIST

PROJECT Buck Street East Dam DATE November 16, 1978

PROJECT FEATURE Outlet Works/Controls NAME S. Mazur

DISCIPLINE Structural Engineer NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	Stone-masonry and concrete structure with mechanically controlled wooden gates.
a. Concrete and Structural	
General Condition	Good.
Condition of Joints	Good.
Spalling	None observed.
Visible Reinforcing	None.
Rusting or Staining of Concrete	Some staining.
Any Seepage or Efflorescence	None observed.
Joint Alignment	Appears to be good.
Unusual Seepage or Leaks in Gate Chamber	None observed.
Cracks	No major cracks observed.
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	Mechanical control for wooden gates appear to be in good condition.
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

PROJECT Buck Street East Dam

DATE November 16, 1978

PROJECT FEATURE Transition and Conduit

NAME Stan Mazur

DISCIPLINE Structural Engineer

NAME _____

AREA EVALUATED

CONDITION

OUTLET WORKS - TRANSITION AND CONDUIT

None.

General Condition of Concrete

Rust or Staining on Concrete

Spalling

Erosion or Cavitation

Cracking

Alignment of Monoliths

Alignment of Joints

Numbering of Monoliths

PERIODIC INSPECTION CHECK LIST

PROJECT Buck Street East Dam

DATE November 16, 1978

PROJECT FEATURE Outlet Structure/Channel

NAME R. Hirschfeld

DISCIPLINE Structural/Hydraulic/Geotechnical
Engineers

NAME S. Mazur, G. Slaney

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	Sluiceway which is only way of out-letting water other than the spillway consists of mechanically controlled wooden gates. Gates and fascia concrete are in good condition.
Rust or Staining	Good. Some Staining.
Spalling	None observed.
Erosion or Cavitation	Structure is founded on bedrock foundation.
Visible Reinforcing	None.
Any Seepage or Efflorescence	None observed.
Condition at Joints	Appear to be in good condition.
Drain Holes	None.
Channel	
Loose Rock or Trees Overhanging Channel	Some trees overhanging channel.
Condition of Discharge Channel	Good.

PERIODIC INSPECTION CHECK LIST

PROJECT Buck Street East Dam

DATE November 16, 1978

PROJECT FEATURE Spillway/Channel

NAME R. Hirschfeld

DISCIPLINE Structural/Hydraulic/Geotechnical
Engineers

NAME S. Mazur, G. Slaney

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Good, unused highway bridge across channel about 20 ft. upstream of dam.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	Some trees.
Floor of Approach Channel	Bedrock.
b. Weir and Training Walls	Cut-granite masonry spillway with mortar. The mortar is missing locally from the joints between the granite blocks, particularly in lower sections.
General Condition of Concrete	
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	None.
c. Discharge Channel	
General Channel	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	Some trees overhanging channel.
Floor of Channel	Bedrock.
Other Obstructions	One log and one piece of cut stone (about 1½' x 1½' x 5') in channel.

PERIODIC INSPECTION CHECK LIST

PROJECT Buck Street East Dam

DATE November 16, 1978

PROJECT FEATURE Service Bridge

NAME Stan Mazur

DISCIPLINE Structural Engineer

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - SERVICE BRIDGE</u></p> <p>a. Super Structure</p> <p style="padding-left: 40px;">Bearings</p> <p style="padding-left: 40px;">Anchor Bolts</p> <p style="padding-left: 40px;">Bridge Seat</p> <p style="padding-left: 40px;">Longitudinal Members</p> <p style="padding-left: 40px;">Under Side of Deck</p> <p style="padding-left: 40px;">Secondary Bracing</p> <p style="padding-left: 40px;">Deck</p> <p style="padding-left: 40px;">Drainage System</p> <p style="padding-left: 40px;">Railings</p> <p style="padding-left: 40px;">Expansion Joints</p> <p style="padding-left: 40px;">Paint</p> <p>b. Abutment & Piers</p> <p style="padding-left: 40px;">General Condition of Concrete</p> <p style="padding-left: 40px;">Alignment of Abutment</p> <p style="padding-left: 40px;">Approach to Bridge</p> <p style="padding-left: 40px;">Condition of Seat & Backwall</p>	<p>None.</p>

APPENDIX B

ENGINEERING DATA

1. LIST OF DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS
2. PAST INSPECTION REPORTS
3. PLAN AND DETAILS

AVAILABLE ENGINEERING DATA

A set of drawings (2 sheets), dated 1967 and 1968, showing plans and details of the additions and improvements made to the dam in 1969 is available at the State of New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire 03301.

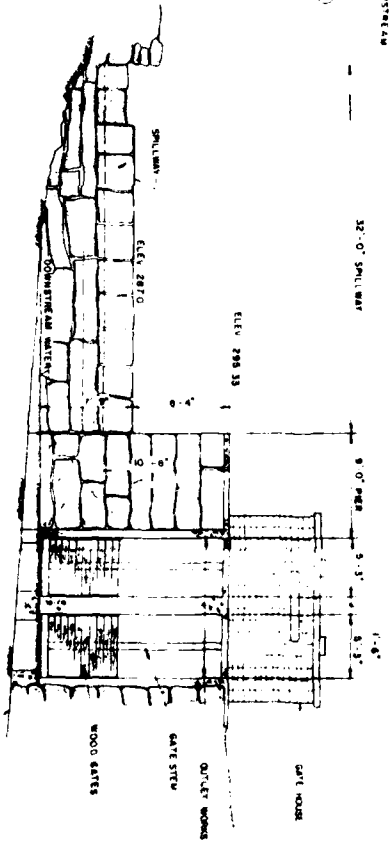
SUNCOOK RIVER

PLAN

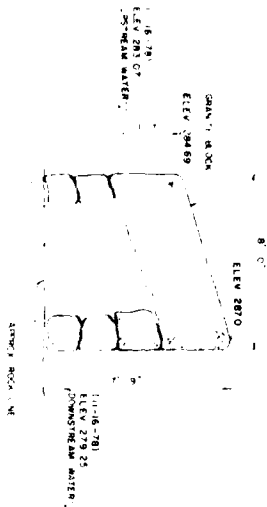
LEGEND
 27 INDICATES LOCATION WHERE PHOTO WAS TAKEN & DIRECTION



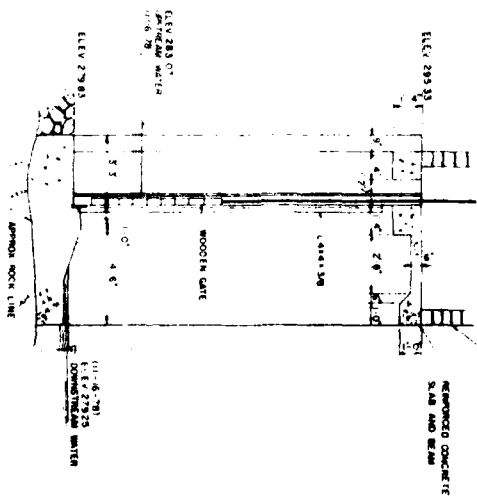
ELEVATION



SECTION A-A



SECTION B-B



NOTES

1. THE INFORMATION SHOWN ON THIS DRAWING IS BASED ON VISUAL INSPECTION OF THE DAM AND SURROUNDING AREA. NO TESTS OR ANALYSES WERE MADE. THE INFORMATION IS NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.
2. THE ELEVATIONS SHOWN ARE USCGS DATUM.

BULK STREET EAST DAM

DATE	11-16-78
BY	J. J. B. B.
CHECKED BY	J. J. B. B.
APPROVED BY	J. J. B. B.
SCALE	AS SHOWN

PAST INSPECTION REPORTS

M E M O

File

FROM: Stephen Burritt, Civil Engineer
THRU: Donald Rapoza, Asst. Chief Engineer
TO: Vern Knowlton, Chief Engineer
SUBJECT: Buck Street Dam

On July 26, 1977 I checked the condition of the Buck Street Dam in Pembroke. There are alot of logs and tree branches in front of the gate section. The right gate was open about 6" and some branches were washed under preventing its closing. There is too much trash that is too large to be removed by hand. I would recommend that the crane with clamshell be used for this. It would take about 1 day of crane time to complete this work.

SCB:njk

See Down Log

NEW HAMPSHIRE
WATER RESOURCES
BOARD
CONCORD, N. H.

PROJECT.....

SUBJECT.....

FILE.....

ACC.....

COMPUTER.....

CHECKER.....

CONT.
FROM ACC.....

CONT.
ON ACC.....

SUMMARY
ON ACC.....

DATE.....



SUNCOOK RIVER IN PEMBROKE
Suncook Mills
August 2, 1934



BUCK STREET DAM, PEMBROKE

April 4, 1963

East of Island



NEW HAMPSHIRE WATER CONTROL COMMISSION

REPORT ON DAM INSPECTION

TOWN Florida DAM NO. 1001 STREAM Frank River

OWNER Textron, Inc. ADDRESS ...

In accordance with Section 20 of Chapter 133, Laws of 1937, the above dam was inspected by me on 1/2/60 accompanied by ...

NOTES ON PHYSICAL CONDITION

Abutments Good

Spillway Good. Some minor leaks

Gates Operable. - Fast leak at left gate seal

Other ...

CHANGES SINCE LAST INSPECTION None

FUTURE INSPECTIONS No

This dam (is) (is not) a menace because I could not find

REMARKS Trash & drift wood in pond immediately

down spillway - no dam

Post down 10" to 2'.

Copy to Owner	Date

Inspector
INSPECTOR

(Additional Notes Over)

APPENDIX C

PHOTOGRAPHS

FOR LOCATION OF PHOTOS, SEE FIGURE 1
LOCATED IN APPENDIX B



PHOTO NO. 1 - Series of two photos (1 & 2) taken clockwise showing upstream channel and debris against upstream face of dam.



PHOTO NO. 2 - (See Photo No. 1).



PHOTO NO. 3 - Series of two photos (3 & 4) taken clockwise from left side of downstream channel showing right abutment, masonry spillway section, concrete sluiceway structure, and downstream training wall on left abutment.



PHOTO NO. 4 - (See Photo No. 3).

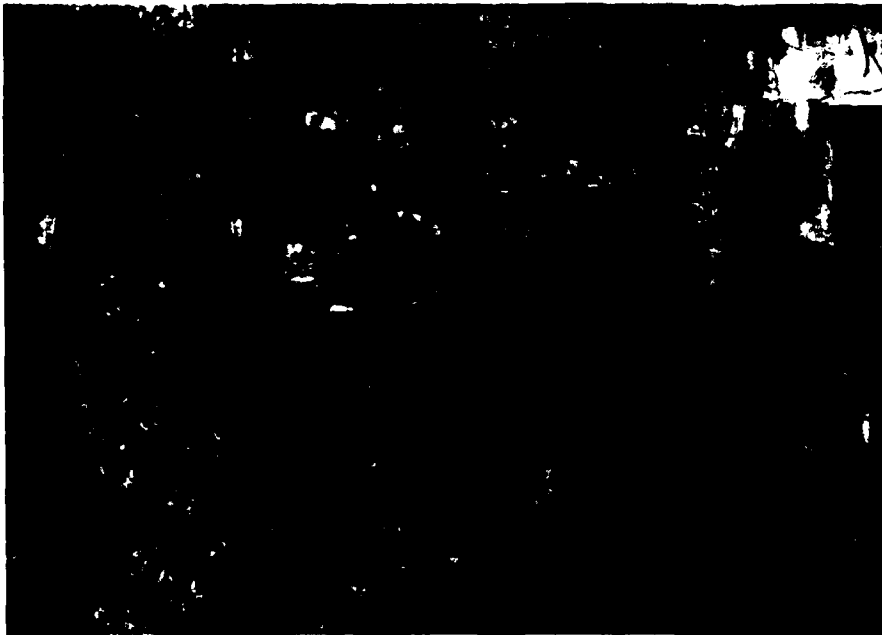


PHOTO NO. 5 - Series of three photos (5, 6 & 7) taken clockwise from right side of downstream channel showing downstream side of dam.



PHOTO NO. 6 - (See Photo No. 5).



PHOTO NO. 7 - (See Photo No. 5).



PHOTO NO. 8 - View of training wall on left side of channel downstream from concrete stoplog structure showing absence of mortar in joints near water level.



PHOTO NO. 9 - View of dam's upstream face from unused roadway upstream.



PHOTO NO. 10 - View of spillway structure and discharge channel from unused roadway upstream.



PHOTO NO. 11 - Upstream face of sluiceway structure.

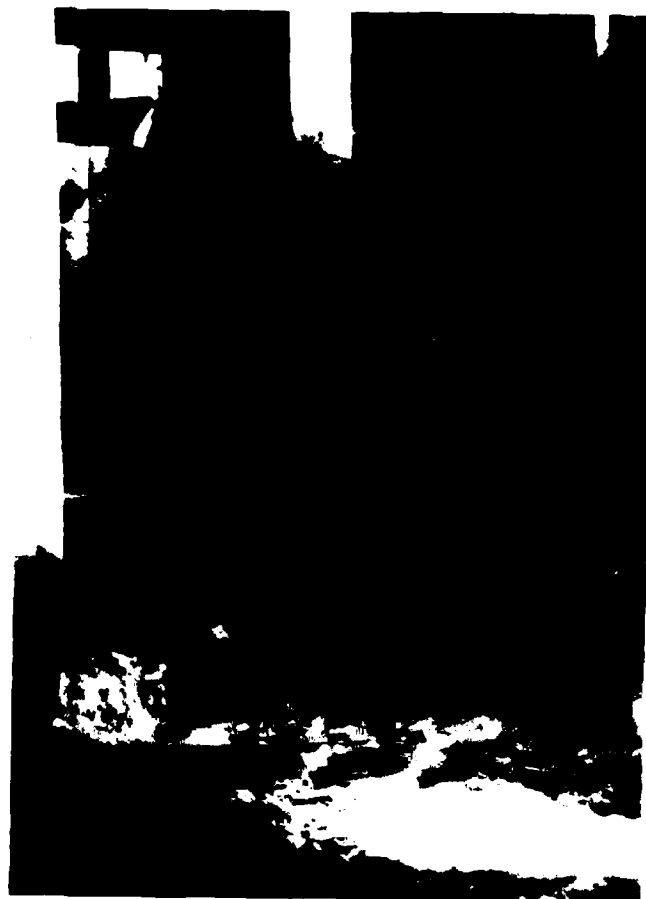


PHOTO NO. 12 - Downstream face
of sluiceway structure.



PHOTO NO. 15 - View from left abutment showing dam and unused roadway bridge upstream of dam



PHOTO NO. 16 - View looking downstream, under unused highway bridge from east bank of channel toward upstream face of dam.



PHOTO NO. 17 - Series of four photos (17, 18, 19 & 20) taken clockwise from downstream channel showing sluiceway structure, left training wall and discharge (river) channel.



PHOTO NO. 18 - (See Photo No. 17).



PHOTO NO. 19 - (See Photo No. 17).



PHOTO NO. 20 - (See Photo No. 17).

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF	Made by <u>RY</u>	Date <u>11/22/78</u>	Job No. <u>5628-11-18</u>
	Checked by <u>[initials]</u>	Date <u>2/1/79</u>	Sheet No. <u>1</u>
For <u>BUCK STREET EAST DAM</u>			

HYDRAULICS & HYDROLOGY

Buck Street East Dam is located in Pembroke, NH across the Suncook River in the Merrimack River Basin.

CLASSIFICATION Size: Small
Hazard: Low

Basic Data D.A. = 240 sq. mi. (HNTB checked)
Upstream Basin: Flat-Costal.

Reservoir: Normal storage: elev. 284.4
84 acre-ft

Max. Storage: elev 291.0
400 acre-ft

Surface area

Normal - 25 acres

Max. - 70 acres

Dam: Stone Masonary & granite block

Length 53.5 ft

Height 10.92 ft

Spillway: weir

Length: 32 ft

Crest elev. 287.0

Outlet: Concrete invert w piers

2 openings @ 5.33'

HNTB

Made by

RY

Date

11/27/78

Job No.

5628-11-18

Checked by

Date

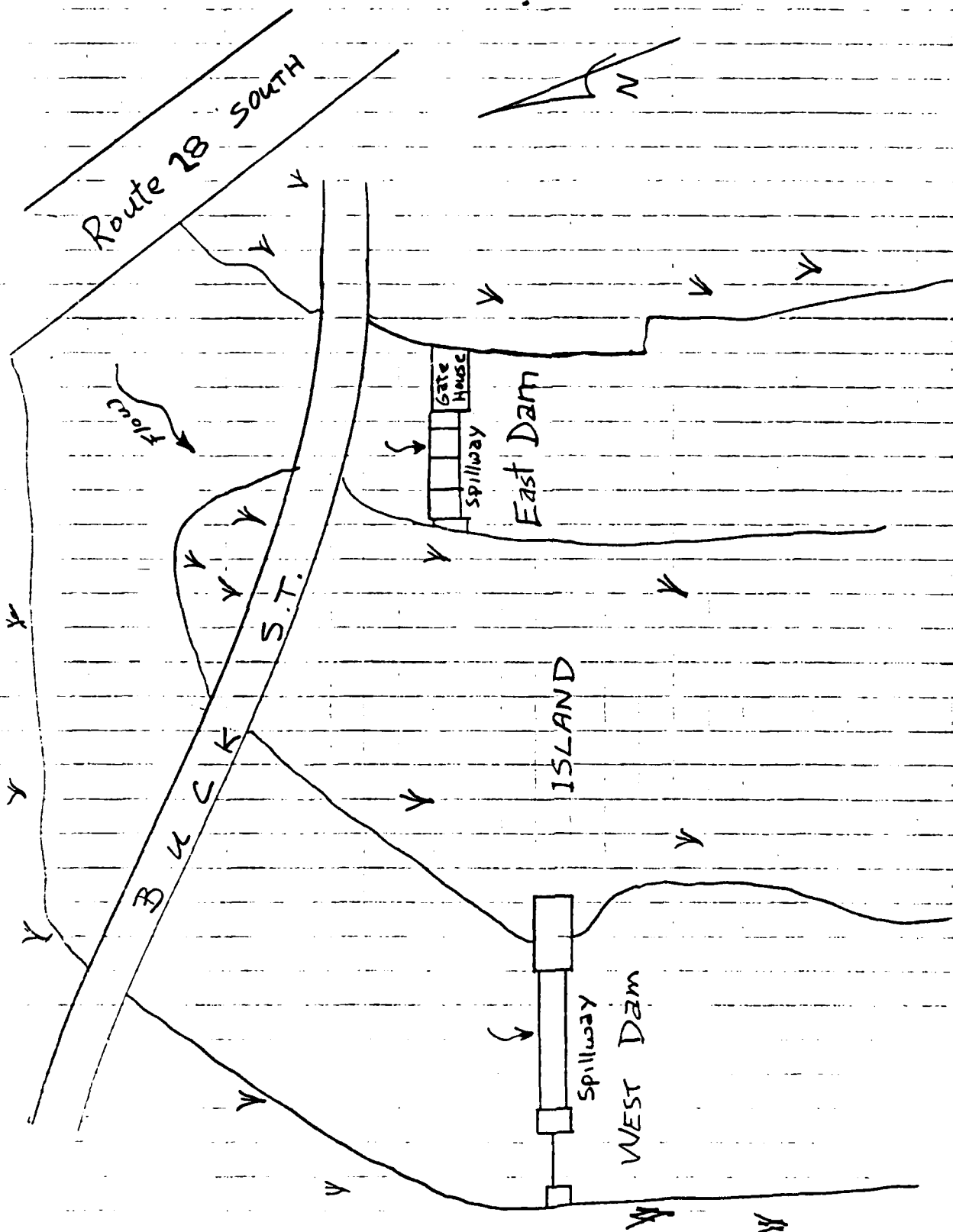
2/1/79

Sheet No.

2

For

BUCK ST.



Plan Buck St. Dams

HNTB

HOWARD NEEDLES TAMMEN & BERGENDOFF

Made by

RY

Date

11/22/78

Job No.

5628-11-1

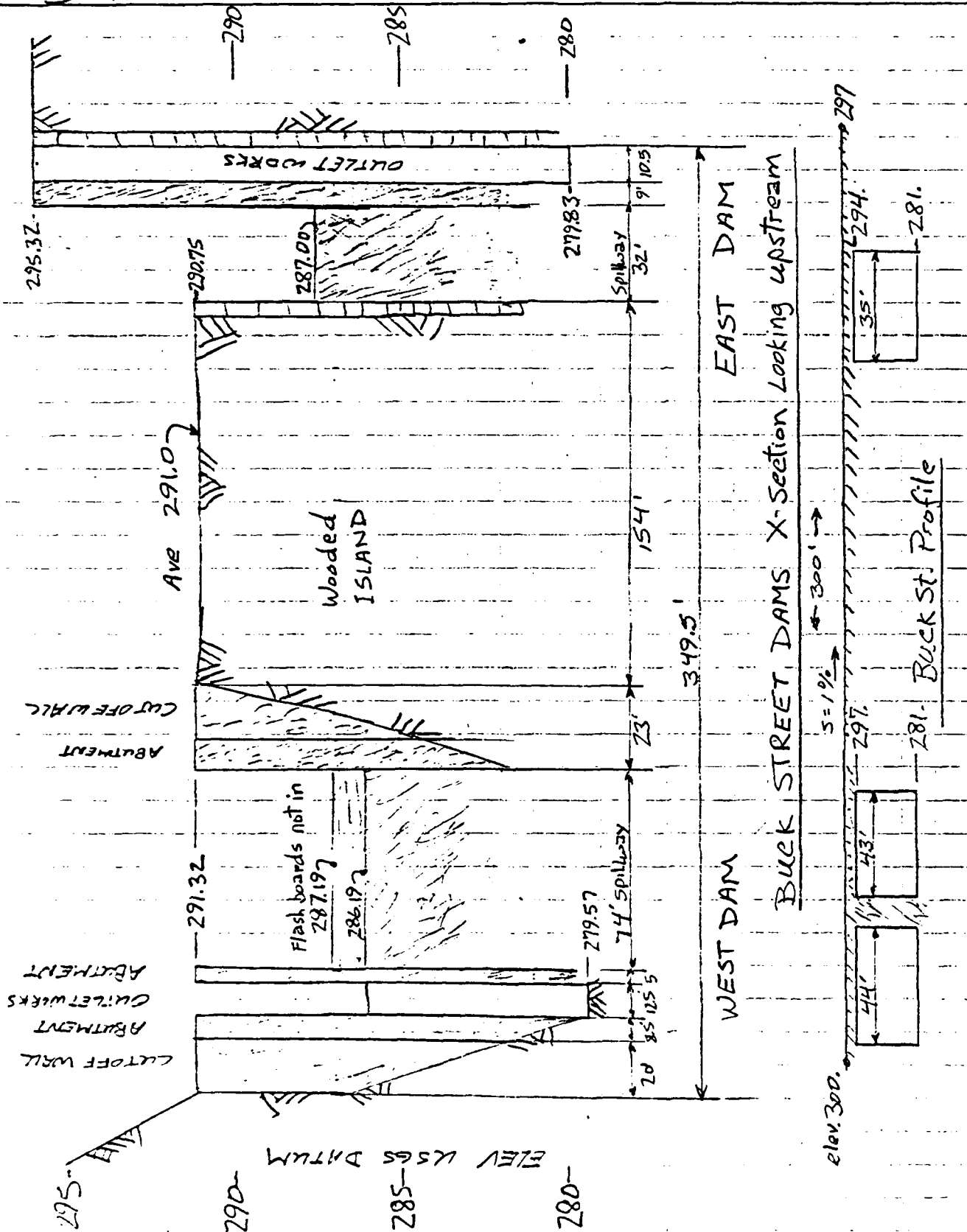
Checked by

Date

Sheet No.

3

For **BUCK STREET DAMS**



HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF For	Made by	RY	Date	12/11/78	Job No.	5628-11-16
	Checked by		Date		Sheet No.	4
BUCK STREET						

Step 1 Calculation of Spillway Design Flood

Classification size small
Hazard: Low

Hydrologic Evaluation Guideline recommends

SDF = 100yr to 50yr frequency

Size classification is in mid-range for storage capacity and low range for height.

Use 100yr flood for SDF.

Gaging Sta at Chichester N.H. 157 sq mi D.A.

MAR 1936 Q 12,900 cfs Max discharge

100yr Flood Discharge from: "Water Resources Investigation Merrimack River Basin" C.D.E. Waltham, Ma., August 1972

TABLE C-17 in Appendices

100yr discharge Natural Flood Peak = 12,100 cfs

$$\frac{12100 \text{ cfs}}{157 \text{ sq mi}} = 77 \text{ csm}$$

At BUCK STREET D.A. = 240 sq mi.

$$77 \text{ csm} \times 240 \text{ sq mi.} = 18,480 \text{ cfs}$$

USE 18500 cfs for SDF

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF For	Made by	RY	Date	12/1/78	Job No.	5628-11-
	Checked by		Date		Sheet No.	5
BUCK ST.						

Step 3 Calculation of Surcharge

Spillway Design Flood = 18,500 cfs

As the Buck Street Dams are hydraulically interconnected the following calculations to develop the stage-discharge curve include the spillways of both dams.

At the East Consider:

1. Gate Closed.
2. Gate house is the easterly boundry of flow.

At the West Dam consider

1. Stop logs in place to elev. 286.19.
2. End of westerly cutoff wall west flow boundry.

General Considerations

1. Negligible flow over island as it is heavily wooded and of varying elevations.

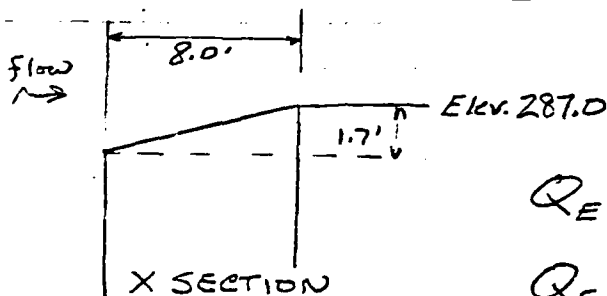
East Dam

Spillway

$$Q_E = CLH_E^{3/2}$$

$$C = 3.38$$

$$L = 32'$$



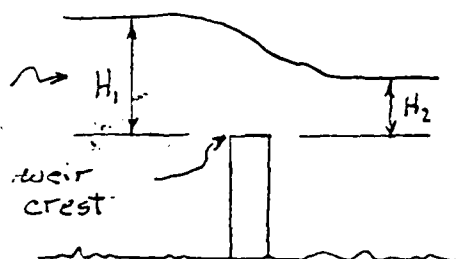
$$Q_E = 3.38(32)H_E^{3/2}$$

$$Q_E = 108 H_E^{3/2}$$

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF For BUCK STREET	Made by RY	Date 12/1/78	Job No 5628-11
	Checked by WY	Date 12-1-78	Sheet No 7

Submerged weirs

$$Q = Q_1 \left[1 - \left(\frac{H_2}{H_1} \right)^{1.5} \right]^{.385}$$



Q = ACTUAL DISCHARGE

Q_1 = Free Discharge

H_2 = Head above weir downstream side

H_1 = Head used for Q_1

$$H_2 = \text{TW elev} - \text{weir crest}$$

Section	H_1	H_2	DAM	Weir crest
			East West Abut'mts	
West DAM ABUTMENTS	$H + 0$	TW - 291.3		287.0
EAST DAM	$H + 4.3$	T.W. - 287.0		286.2
WEST DAM	$H + 5.1$	TW. - 286.2		291.3

Solve: weir submergence equation trial & error

$$Q_T = \sum Q_1 \left[1 - \left(\frac{H_2}{H_1} \right)^{1.5} \right]^{.385}$$

$$Q_T = 150H^{1.5} \left[1 - \left(\frac{H_2}{H} \right)^{1.5} \right]^{.385} + 108(H+4.3)^{1.5} \left[1 - \left(\frac{H_2}{H+4.3} \right)^{1.5} \right]^{.385} + 326(H+5.1)^{1.5} \left[1 - \left(\frac{H_2}{H+5.1} \right)^{1.5} \right]^{.385}$$

West DAM ABUTMENTS EAST DAM WEST DAM

1. From Fig 2 Find TW elev. For given Total Q
2. Using T.W. calculate H_2 for each section
3. Assume upstream trial w.s. elevation, subtract abutment elevation to obtain H
4. Substitute values in above expression to obtain trial Q_T
match to given Q , if equal, $H + 291.3$ = upstream w.s. elevation

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF For BUCK STREET	Made by RY	Date 12/1/78	JOB No 5628-1417
	Checked by [Signature]	Date 12/1/79	Sheet No 8

TABLE 2
stage-discharge
submerged weir

Elev	T.W. elev.	Q_T	Q_A	Q_E	Q_W
295.25	291.9	10,000 cfs	1155 cfs	2030 cfs	6815 cfs
296.65	293.4	12,000	1665	2400	7940
298.0	294.75	14,000	2180	2790	9130
300.65	297.3	18,500	3250	3610	11,640

Step 4 Effect of Surge Storage

MPFR = 19" MPF = $240 \times 300 = 72,000 \text{ cfs}$

100 yr R: $\frac{Q_{100}}{\text{MPF}} \times 19 = \frac{18,500}{72,000} \times 19 = 4.88 \text{ in}$

$Q_{P1} = 18,500 \text{ cfs}$

Surcharge₁ = elev 300.65 - 286.2 = 14.45

Vol of surge

$$\text{Stor}_1 = \frac{\frac{1}{2} \left(\frac{14.45}{.0002} \right) (150 \times 74.45)}{43560 \text{ sq ft/acre} \left(\frac{1}{12} \times 640 \text{ acres/mi}^2 \right) \times 240 \text{ ft}} = .05 \text{ mi}$$

See pg. for storage vol computation

$Q_{P2} = Q_{P1} \left(1 - \frac{\text{Stor}_1}{4.88} \right) = 18,500 \left(1 - \frac{.05}{4.88} \right) = 18,310 \text{ cfs}$

Surcharge₂ = 14.25

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF For	Made by	Ry	Date	12/4/78	Job No.	5628-11-17
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Buck Street

$$Stor_2 = (Surcharge_2)^2 \times (.000224) = .05 \text{ in}$$

$$Stor_{AVE} = \frac{Stor_1 + Stor_2}{2} = \frac{0.05 + .05}{2} = .05 \text{ in}$$

$$Q_{P3} = Q_{P1} \left(1 - \frac{Stor_{AVE}}{4.88}\right) = 18,500 \left(1 - \frac{.05}{4.88}\right) = 18,310 \text{ cfs}$$

Stor values within < 1% use Q_{P3} as outflow

Outflow = 18,310 cfs

Stage 300.45 or 14.25 ft above West Dam spillway

At the spillway design flood 18,310 cfs

West Dam - 14,890 cfs 82%

East Dam - 3,420 cfs 18%

Conclusions

- Both Buck St. East & Buck St West act together hydraulically as one dam across the Suncook River.
- The spillway & storage capacity of both dams combined can safely pass 23% of the test flood. of 18,310 cfs

Combined Spillways	4720 cfs.
East Dam	965 cfs
West Dam	3755 cfs
- Reservoir storage will reduce the SDF at the outlet from 18,500 cfs to 18,310 cfs or by 1.1%.
- At the test discharge of 18,310 cfs the East Dam crest will be overtopped by 9.7 ft and the West Dam crest by 9.15 ft.

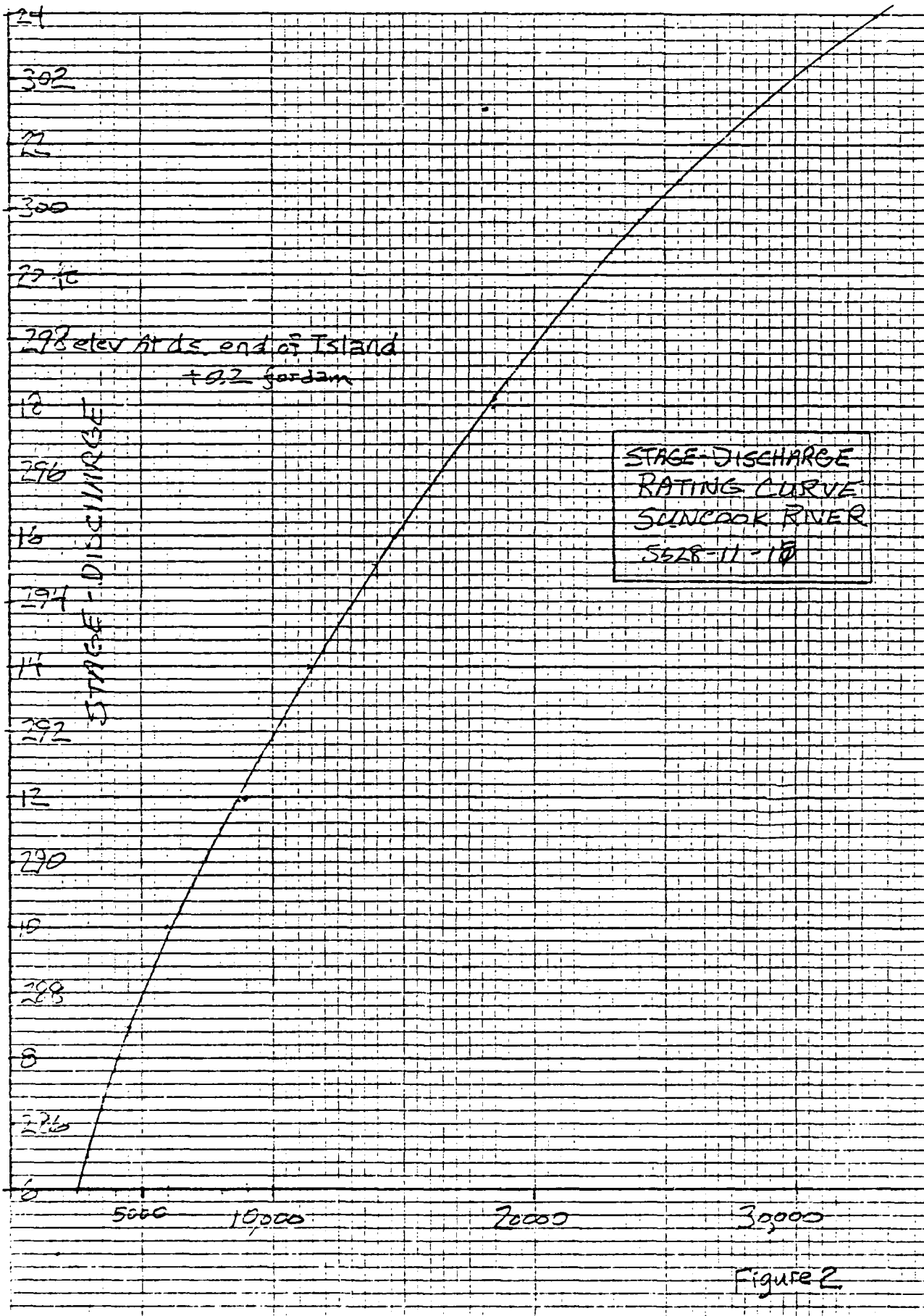
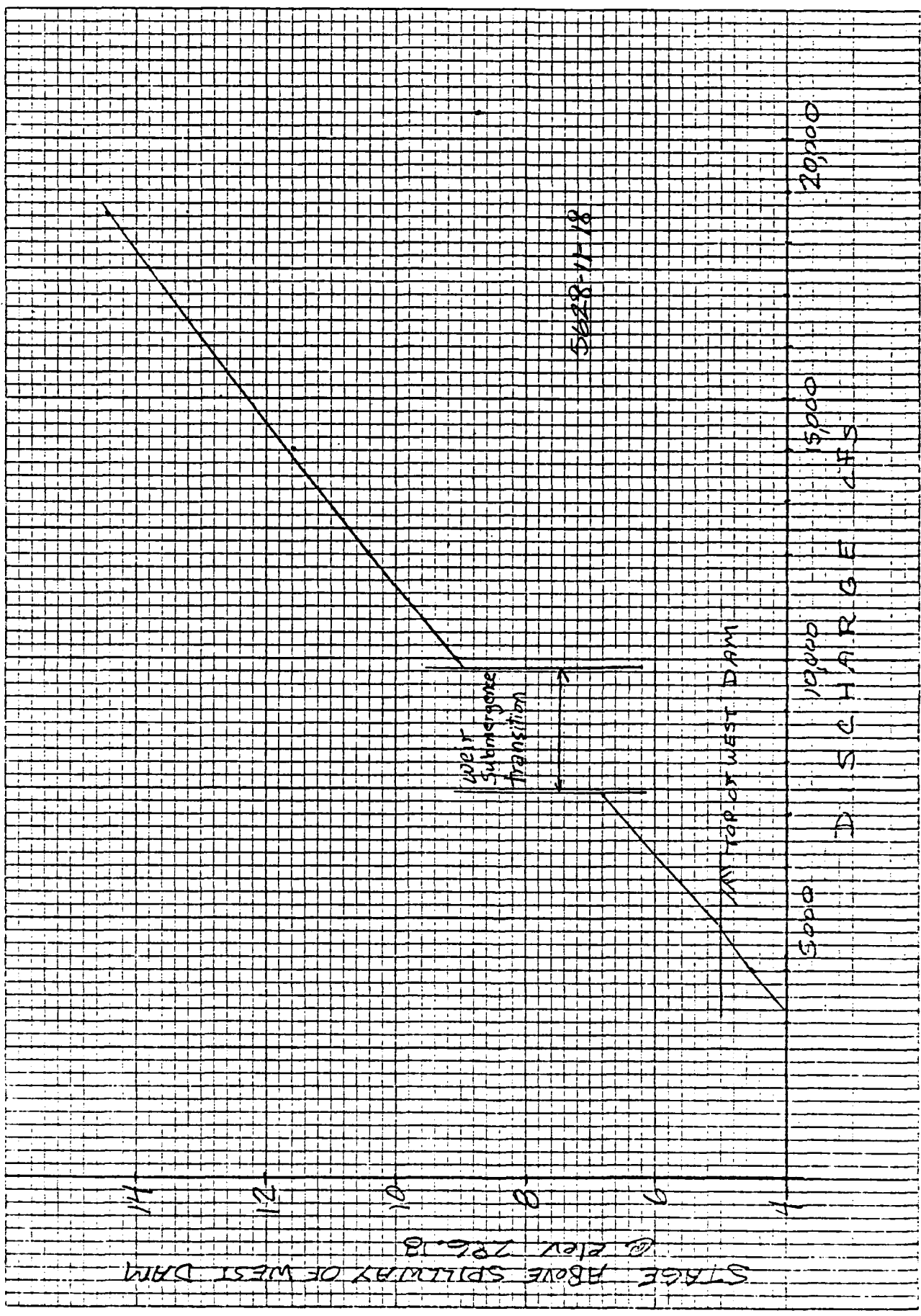


Figure 2



HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF For	Made by	RY	Date	11/13/78	Job No	5628-11-18
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BUCK STREET EAST						

Estimate of Downstream Failure Hydrograph "Rule of Thumb Method"

Step 1 Estimate of Reservoir Capacity

See Buck Street West Dam for calculations
Pool height on Buck St. West
controls
Therefore

Normal Storage	84 acre-ft.
Max. Storage	400 acre-ft
Net Storage	316 acre-ft

STEP 2 Peak Failure Outflow

$$Q_{P1} = \frac{8}{27} \sqrt{g} W_b Y_0^{3/2}$$

W_b = width of break = 40% of dam length

Y_0 = Total height from river bed to top of dam

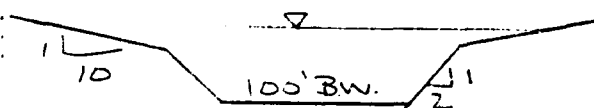
$$Q_{P1} = \frac{8}{27} \sqrt{g} (40)(535) \times (12.0)^{3/2} = 2115 \text{ cfs}$$

STEP 3 Stage Discharge Curve

$$S = 0.0006 \%$$

$$L = 19,500'$$

$$\eta = 0.03$$



<u>Stage</u>	<u>Discharge</u>
5'	1220 cfs
8'	4370
10'	5770
11'	6640
12'	7470

HNTB

HOWARD NEEDLES TAMMEN & BERGENDOFF

For

EAST

Made by

RY

Date

11/22/78

Job No.

5628-11-18

Checked by

PWC

Date

11/27/78

Sheet No.

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Step 4Reach Outflow

$$L = 11,000 \text{ ft} \quad Q_{P1} = 2115 \text{ cfs} \quad \text{Stage}_1 = 5.4 \text{ ft}$$

$$\text{area}_1 = 598 \text{ ft}^2$$

$$V_1 = \frac{598 \times 11,000}{43,560} = 151 \text{ acre-ft} \leq \frac{316}{2}$$

Reach length O.K.

$$Q_{P2\text{-TRIAL}} = Q_{P1} \left(1 - \frac{V_1}{S}\right) = 2115 \left(1 - \frac{151}{316}\right) = 1104 \text{ cfs}$$

$$\text{Stage}_2 = 3.7 \text{ ft} \quad \text{area}_2 = 397 \text{ ft}^2$$

$$V_2 = \frac{397 \times 11,000}{43,560} = 100 \text{ acre-ft}$$

$$V_{AVE} = \frac{V_1 + V_2}{2} = \frac{151 + 100}{2} = 126 \text{ acre-ft}$$

$$Q_{P2} = Q_{P1} \left(1 - \frac{V_{AVE}}{S}\right) = 2115 \left(1 - \frac{126}{316}\right) = 1270 \text{ cfs}$$

$$\underline{\text{Outflow} = 1270 \text{ cfs} \quad \text{stage} = 4.0 \text{ ft}}$$

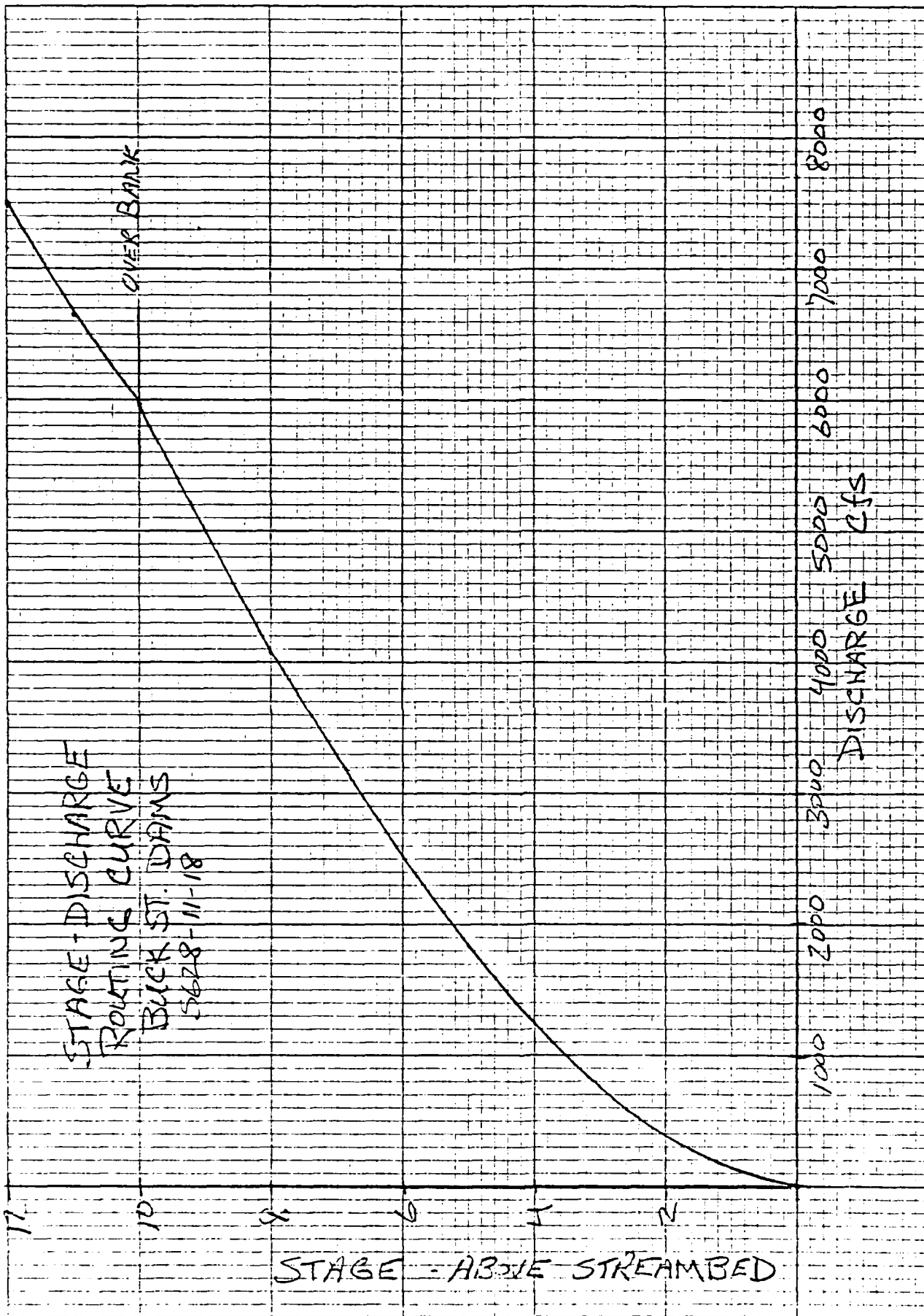


FIG 2.

Estimate of Downstream Dam Failure Hydrograph by "Rule of Thumb METHOD"

Step 1

Estimate of Reservoir Storage at time of failure:

No data on reservoir volume estimate

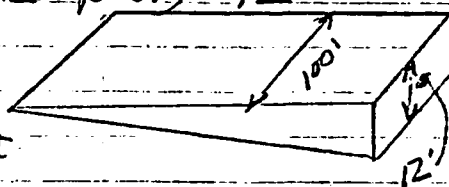
Ave streambed slope near dam

0.0006 1/1 USGS

Stream width 100'

Depth at dam (Normal pool) = 12'

$$\frac{\frac{1}{2} \left(\frac{6.6}{0.0006} \right) (100) (6.6)}{43560 \text{ sq/acre-ft}} = 84 \text{ acre-ft}$$



Normal Storage 275 acre-ft

Max. Storage at crest of dam

Depth 17.8 ft

$$\frac{\frac{12.0' (150' \times 12.0')}{2}}{43560 \text{ cu ft/acre-ft}} = 413 \text{ acre-ft}$$

Max Storage 880 acre-ft

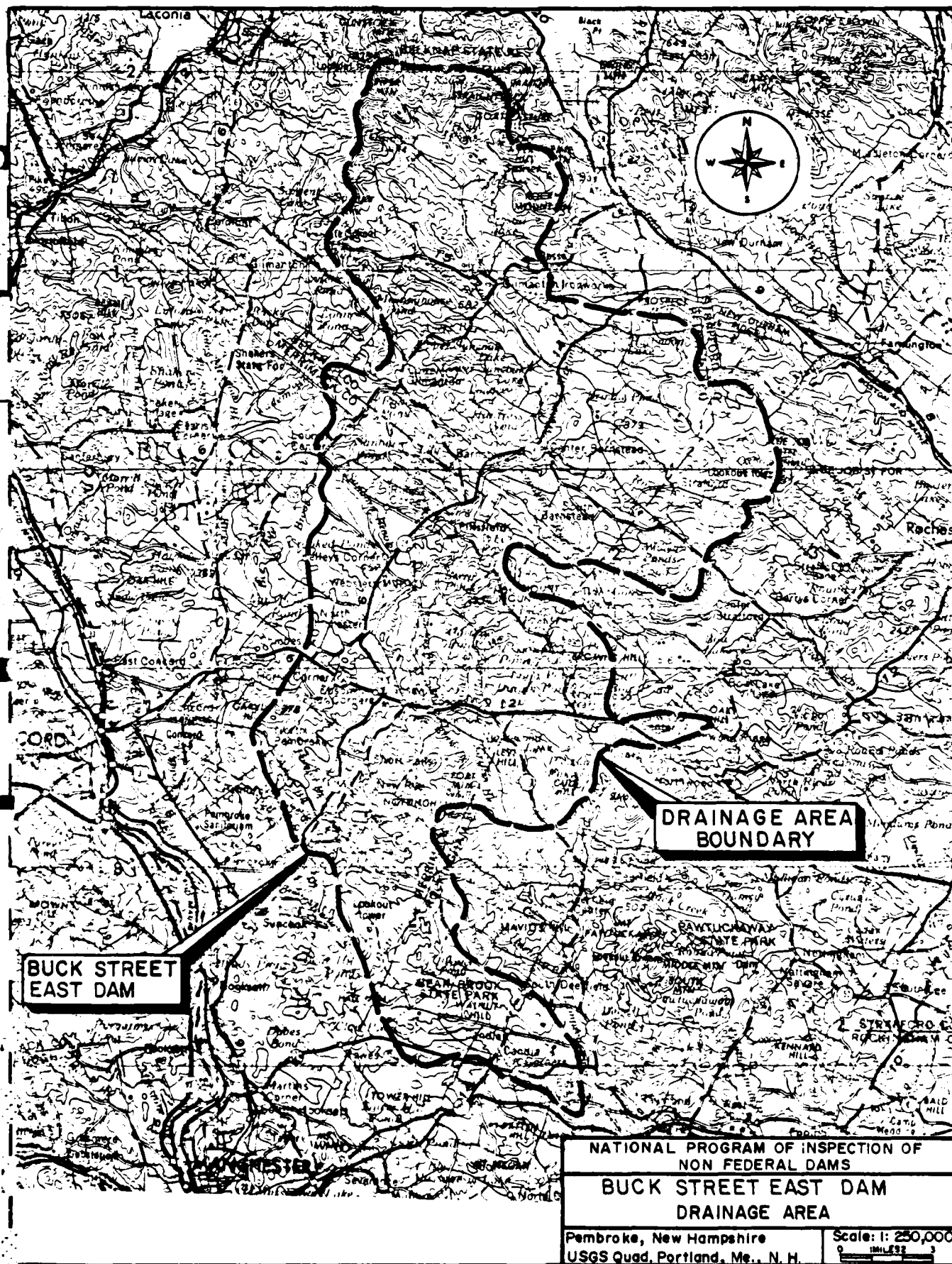
Use 880 acre-ft for S

Step 2 Peak Failure Outflow

$$Q_R = \frac{8}{27} \sqrt{g} W_b Y_0^{3/2}$$

W_b = width of breach = 40% of dam length

Y_0 = Total height from river bed to max pool elev



**DRAINAGE AREA
BOUNDARY**

**BUCK STREET
EAST DAM**

**NATIONAL PROGRAM OF INSPECTION OF
NON FEDERAL DAMS**
**BUCK STREET EAST DAM
DRAINAGE AREA**
Pembroke, New Hampshire
USGS Quad, Portland, Me., N. H. Scale: 1: 250,000
0 1 2 3 MILES

APPENDIX E

INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

1



END

FILMED

8-85

DTIC