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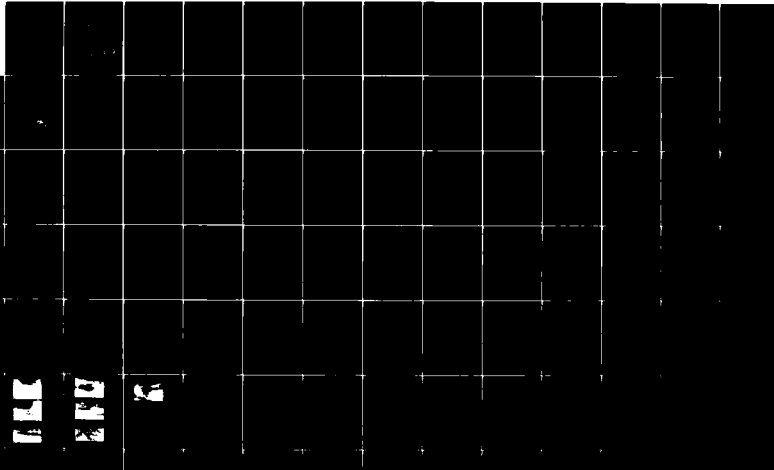
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS  
LIMESTONE DAM (HE 004... (U) CORPS OF ENGINEERS WALTHAM  
MA NEW ENGLAND DIV SEP 81

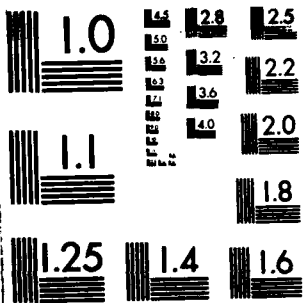
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Saint John River Basin Limestone, Maine Limestone Stream		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) -The dam is about 300 ft. long, 19 ft. high, and 9 ft. wide at the crest. The dam is rated fair because the spillway can not pass the test flood. It is small in size with a high hazard potential. No urgent or emergency actions are required for Limestone Community Dam based on this inspection.		

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LIMESTONE COMMUNITY DAM

ME 00492

ST. JOHN RIVER BASIN  
LIMESTONE, MAINE

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No. : ME 00492  
Name of Dam : Limestone Community Dam  
Town : Limestone  
County & State : Aroostook, Maine  
Stream : Limestone Stream  
Date of Inspection : November 6, 1979

BRIEF ASSESSMENT

Limestone Community Dam is a dual purpose recreation and flood water retarding structure. It is an earthfill structure with a slurry wall cutoff trench. The spillway is a concrete paved, broad crested weir and chute that discharges into a stilling basin. The flow over the weir is uncontrolled. The embankment is approximately 300 feet long, 19 feet high and 9 feet wide at the crest. A 36" diameter low level outlet allows the reservoir to be drained to Elev. 516.5 NGVD. The normal depth of the reservoir is approximately 20 feet. A fishway is located immediately to the right of the spillway chute. The original earthfill embankment structure had a gabion and timber covered spillway which was damaged prior to 1977. Repair of the structure was designed and performed in 1977. That same year, heavy flows again washed out the gabion covered spillway. In 1978, a concrete slab spillway surface was designed and constructed to replace the former gabion covered spillway. A recreation pool is maintained behind the pool at Elev. 526.5.

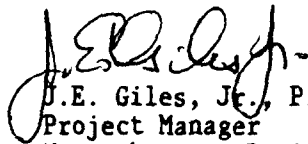
The embankment dam, outlet works, central spillway chute, concrete training walls and fishway were found in good condition. In the earthfill embankment itself, there were no dips, sags or other evidence of distress. The concrete structures including the broad crested weir spillway were sound with no visible evidence of deterioration. The grass cover on the embankment was well established. The rip-rap on both the downstream and upstream faces was in good condition.

Based on a maximum storage of approximately 130 acre-feet and a height of 19 feet, Limestone Community Dam is classified as small. The dam's hazard classification has been established as high based on the potential for loss of more than a few lives in the event of a dam failure. The test flood was the 1/2 PMF and was estimated for the 27.9 square mile drainage area of rolling terrain using the "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Safety Investigations", New England Division Corps of Engineers, March 1978. This yielded a peak inflow of 12890 cfs and a routed outflow of 12770 cfs. The

11 .

computed maximum reservoir level El. 536.2 was above the embankment crest El. 534 and overtopping of the embankment would occur.

No urgent or emergency actions are required for Limestone Community Dam based on this inspection. Remedial measures include developing a downstream warning system and conducting bi-annual technical inspections of the dam. It is also recommended that a second, more detailed hydrological study be performed on this dam to determine what effect flood routing through the two upstream dams would have on the performance of Limestone Community Dam.



J.E. Giles, Jr., P.E.

Project Manager

Massachusetts Registration No. 1643

11  
CORPS OF ENGINEERS

SIGNATURE PAGE

## 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 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 compliance with OSHA rules and regulations is also excluded.

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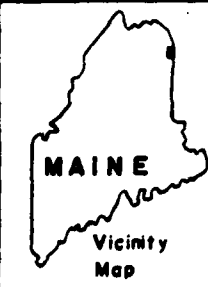
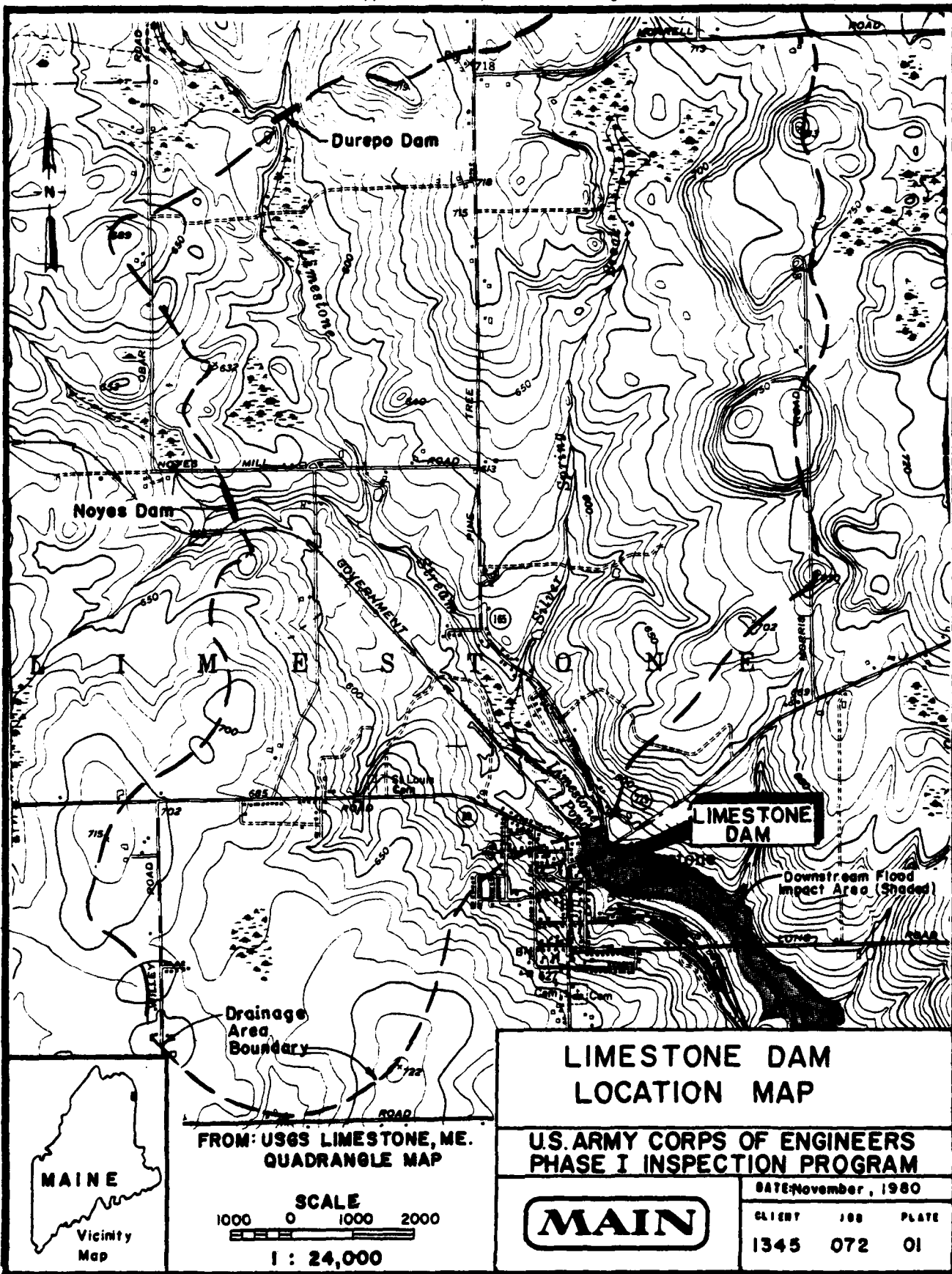
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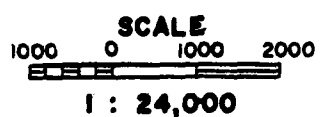


LIMESTONE COMMUNITY DAM  
VIEW FROM BRIDGE BELOW DAM

Approx. 0.2 sq. mi. of Drainage Area not shown on map.



FROM: USGS LIMESTONE, ME.  
QUADRANGLE MAP



<b>LIMESTONE DAM LOCATION MAP</b>		
<b>U.S. ARMY CORPS OF ENGINEERS PHASE I INSPECTION PROGRAM</b>		
<b>MAIN</b>		
DATE: November, 1980		
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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

LIMESTONE DAM, LIMESTONE MAINE

SECTION I

PROJECT INFORMATION

1.1 General

- a. Authority - Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Chas. T. Main, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Maine. Authorization and notice to proceed were issued to Chas. T. Main, Inc. under a letter of November 6, 1979 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0011 has been assigned by the Corps of Engineers for this work.
- b. Purpose
- (1) The purposes of the inspection program are: 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 effective dam safety programs for non-Federal dams.
  - (3) To update, verify and complete the National Inventory of Dams.
- c. Scope of Inspection Program - The scope of this Phase I inspection report includes:
- (1) Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

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

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

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

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

## 1.2 Description of Project

- a. Location - The Limestone Community Dam is located on Limestone Stream in the Town of Limestone, Aroostook County, Maine. The dam location is included on U.S.G.S. 7.5 minute series Quadrangle, Limestone, Maine with approximate coordinates N46°45'45", W67°49'30".
- b. Description of Dam and Appurtenances - The project consists of three principal features: an earthfill dam, a spillway chute, and a fishway. The dam embankment is approximately 300 feet long and 19 feet high. The original dam had approximately the same dimensions. (Design and construction details of the original structure were not available.) The reconstructed structure used the original dam earthfill embankment and filled in the areas which had washed out with new fill. The fill materials are of glacial till origin with zoning limited to placing the more impervious material in the core and the more pervious material in the outside shells. The structure has an approximate 2' x 9' slurry trench below the core.

The spillway is an uncontrolled broad crested weir and chute with crest Elev. 526.5 NGVD. The spillway surface is a concrete slab. This concrete structure replaces the previous gabion covered spillway which was washed out during high flows. The upstream and downstream slopes at the spillway are approximately 1 vertical to 2.5 horizontal. The sides of the spillway are vertical reinforced concrete training walls. The adjacent left and right embankments are grass covered. The fishway runs adjacent to the right spillway training wall with gravel fill separating the two. The dam is equipped with a 36" RCP reservoir drain located to the right of the spillway. The drain is controlled by a sluice gate that operates inside the 6' diameter concrete riser on the right embankment.

Plans, profiles, and sections of the dam and its appurtenant structures are included in Appendix B. Photographs are shown in Appendix C.

- 1/ . .
- c. Size Classification - The maximum embankment height is 19 feet above the stream channel and the maximum storage is 140 acre feet at El. 534.0. This gives the dam a small size classification (since the storage is greater than 50 and less than 1,000 acre-feet) in accordance with the Recommended Guidelines for Safety Inspection of Dams.
  - d. Hazard Classification - This facility is classified as a high hazard potential dam based on the potential for loss of more than a few lives in the event of a dam failure in eleven occupied dwellings downstream of the dam.
  - e. Ownership - The dam and associated works are owned by the Town of Limestone, Maine.
  - f. Operators - The project is designed for unsupervised operation. No manual operations are required to pass a flood flow. The project is operated and maintained by the Town of Limestone, Maine. The responsible person is Mr. Thomas Stevens, Town Manager, Limestone, Maine 04750, Telephone (207) 325-3131. (The Town Manager at the time of this inspection was Mr. Peerless J. Snow.)
  - g. Purpose of Dam - The project is a flood water retarding and recreational facility. The reservoir drain intake sluice gate is currently closed and the reservoir maintained at El. 526.5 for fish and recreation purposes.
  - h. Design and Construction History - Design and construction data concerning the original structure was not available. It is known that the original dam was similar to the existing structure except that it had wood timber training walls adjacent to the spillway and a combination of gabion/wood timber spillway surface rather than reinforced concrete. This dam was damaged during flood flows prior to 1977. The damage consisted primarily of a washout of the central spillway section. Rehabilitation of the structure was designed and performed in 1977 by Edward C. Jordan Company, Inc. from Presque Isle, Maine. During the same year the dam was again damaged by high flows. The following year, 1978, a federally assisted contract, "Rehabilitation of Community Dam, Heritage Conservation and Recreational Service, Project No. 23-00303" resulted in the present structure, completed in 1978. The design and repair work was by E.C. Jordan Co., Inc.
  - i. Normal Operating Procedures - The reservoir is normally maintained at El. 526.5 for recreation purposes. All flood flows are passed through the spillway chute which is designed for uncontrolled discharge. No other operating procedures are in evidence.

1.3 Pertinent Data

a. Drainage Area - Limestone Community Dam controls a drainage area of 27.9 square miles. The watershed is approximately 65 percent wooded and 35 percent agricultural. There are two dams upstream; Noyes Brook Dam, D.A. of 2.85 square miles, and Durepo Brook Dam, D.A. of 20.03 square miles.

b. Discharge at Damsite

(1) Outlet Works - The spillway is a broad crested weir at elevation 526.5 with a reinforced concrete deck. The weir is 116 feet wide. A sluice gate and 36"Ø RCP provide the capability to drain the reservoir to El. 516.5.

(2) Maximum known flood - Unknown.

(3) Spillway capacity at top of dam - 7150 cfs @ El. 534.0.

(4) Spillway capacity at test flood elev. - 10550 cfs @ El. 536.2.

(5) Gated spillway capacity at normal pond elevation - N/A.

(6) Gated spillway capacity at test flood elevation - N/A.

(7) Total project discharge at top of dam - 7150 cfs @ El. 534.

(8) Total project discharge at test flood elevation - 12773 cfs @ El. 536.2.

c. Elevations (feet above NGVD)

(1) Streambed at toe of dam	515.0
(2) Bottom of cutoff	502.0
(3) Maximum tailwater	Not available
(4) Normal pool	526.5
(5) Full flood control pool	N/A
(6) Spillway crest	526.5
(7) Design surcharge (Original Design)	Not available
(8) Top of dam	534.0
(9) Test flood surcharge	536.2

- d. Reservoir (Length in feet)
- |                         |      |
|-------------------------|------|
| (1) Normal pool         | 1400 |
| (2) Flood control pool  | N/A  |
| (3) Spillway crest pool | 1400 |
| (4) Top of dam          | 2900 |
| (5) Test flood pool     | 3300 |
- e. Storage (acre-feet)
- |                         |     |
|-------------------------|-----|
| (1) Normal pool         | 40  |
| (2) Flood control pool  | N/A |
| (3) Spillway crest pool | 40  |
| (4) Top of dam          | 142 |
| (5) Test flood pool     | 207 |
- f. Reservoir Surface (acres)
- |                        |     |
|------------------------|-----|
| (1) Recreation pool    | 8   |
| (2) Flood-control pool | N/A |
| (3) Spillway crest     | 8   |
| (4) Test flood pool    | 34  |
| (5) Top of dam         | 24  |
- g. Dam
- |                 |  |
|-----------------|--|
| (1) Type        | Earthfill  |
| (2) Length      | 300 feet   |
| (3) Height      | 19 feet  |
| (4) Top Width   | 9 feet   |
| (5) Side Slopes | Upstream 2.5 Hor. to<br>1 Vert.<br>Downstream 2.5 Hor. to<br>1 Vert. |

- |                     |                                 |
|---------------------|---------------------------------|
| (6) Zoning          | 2 zones                         |
| (7) Impervious Core | Most impervious toward the core |
| (8) Cutoff          | 2' x 9' slurry wall             |
| (9) Grout curtain   | N/A                             |
| (10) Other          | N/A                             |

h. Diversion and Regulating Tunnel

- |                           |     |
|---------------------------|-----|
| (1) Type                  | N/A |
| (2) Length                | N/A |
| (3) Closure               | N/A |
| (4) Access                | N/A |
| (5) Regulating Facilities | N/A |

i. Spillway (Principal)

- (1) Type - Broad crested weir with reinforced concrete deck
- (2) Length of weir - 116 feet
- (3) Crest elevation - 526.5
- (4) Gates - N/A
- (5) U/S Channel - N/A
- (6) D/S Channel - Natural
- (7) General - Reinforced concrete vertical training walls along both sides of spillway.

j. Regulating Outlets

- (1) Invert - El. 516.5
- (2) Size - 36" Dia. RCP
- (3) Description - Sluice gate to drain reservoir
- (4) Control Mechanism - 36"  $\phi$  Sluice gate w/screw operator
- (5) Other - None

1.

SECTION 2  
ENGINEERING DATA

2.1 Design

Information concerning the original design of the dam (prior to 1958) was unavailable. The reconstruction of the dam in 1977 was designed by the Edward C. Jordan Company, Inc., of Presque Isle, Maine. The latest rehabilitation of the structure (1978) was again designed by the E.C. Jordan Company. The design calculations used by this Company were unavailable to the inspection team. The construction drawings for both the "reconstruction" (1977) and "rehabilitation" (1978) were given to the inspection team by the Limestone Town Manager.

2.2 Construction

No construction records or photographs were available to the inspection team. A set of construction prints was reviewed. Those pertinent to this report are included in Appendix B. The drawings titled "Reconstruction of Community Dam" are those used for the earlier repair work (1977). The drawings titled "Rehabilitation of Community Dam" are those used for the later (existing) repair work (1978).

2.3 Operation

No formal operational procedures were available for review. The spillway is an uncontrolled structure requiring no manual operations.

2.4 Evaluation

- a. Availability: No design calculations were available to the inspection team. A set of General Contract Specifications for the latest repair work (1978) of the structure was reviewed.
- b. Adequacy: The lack of design calculations did not allow for a definitive review. Evaluation must be based on visual inspection, past performance history, and sound engineering judgment and experience.
- c. Validity: The limited data available restrict evaluation of the Limestone Community Dam and appurtenances to the visual inspection and sound engineering judgment. The field inspection indicated that the external features of Limestone Community Dam substantially agree with those shown on the available plans.

SECTION 3  
VISUAL INSPECTION

3.1 Findings

a. General - The field inspection was conducted by L. Seward and J. Jonas of Chas. T. Main, Inc. on 6 November 1979, and J. E. Giles, Jr. on August 12, 1981. On the date of inspection, the Limestone Community dam and appurtenances were in good condition. No urgent or emergency actions are required at this time.

b. Dam

(1) Crest - The embankment crest was true to line with no apparent dips, sags, cracks or other evidence of distress (Photo 6). The as-built camber was observed and appears unchanged. The crest is grass covered with no pavement.

(2) Upstream slopes - The upstream slope riprap appeared in good condition. The slopes above the normal pool El. 526.5 have a well developed tight grass cover (Photo 4). There was no evidence of sloughing or erosion on the slopes.

(3) Downstream slopes - The downstream slope rip-rap appeared in good condition. The slopes have well developed, tight grass covers. No significant gully action was observed on the slopes (Photos 5 and 6). No slides or sags were observed.

(4) Downstream toe - The downstream toe is generally dry with no boils or seeps observed.

(5) Underdrain system - None.

(6) Instrumentation - No instrumentation was observed.

c. Appurtenant Structures

(1) Spillway - The broad crested weir spillway and chute were in good condition (Photo 5). The adjacent reinforced concrete training walls were also in good shape with no visible deterioration.

(2) Fishway - The fishway appeared in good condition. The downstream fishway inlet is located on the right side of the spillway chute.

(3) The outlet works were not accessible. The visible portion of the circular concrete riser appeared in good condition.

d. Reservoir Area - No areas of potential or actual shoreline movement were observed (Photo 3).

e. Downstream Channel - Approximately 200 yards downstream, Limestone Stream flows under Highway 229. The opening in the bridge is approximately 7' x 29'.

3.2 Evaluation - In general, the dam and appurtenances are in good condition. The short abutment slopes are stable and in good shape. The concrete structures are sound. No urgent or emergency repairs are required.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

- a. General: The spillway is an uncontrolled crest structure. No manual operations are required to insure safe passage of a flood flow. No recent operation of the reservoir drain is reported.
- b. Description of Downstream Warning System: No warning system or emergency evacuation plans are in effect for this project.

4.2 Maintenance Procedures

- a. General: No regular maintenance procedures are in effect for this project.
- b. Operating Facilities: There are no manual operating facilities at this structure except for the reservoir drain gate. No regular maintenance procedures for the project operating facilities are specified.

4.3 Evaluation

The operating and maintenance procedures are limited for this project. The owner should establish procedures to inspect the structures regularly, to continue to keep the embankment free of brush and trees, and to monitor the level of the reservoir during periods of intense rainfall.

The owner should arrange to have a technical inspection made on a bi-annual basis. The owner should establish a downstream warning system to follow in the event of emergency conditions.

## SECTION 5

### EVALUATION OF HYDROLOGIC AND HYDRAULIC FEATURES

- 5.1 General - The watershed is 27.9 square miles of rolling terrain. The dam is located on the Limestone Stream in the Town of Limestone. The earth embankment develops sufficient storage to reduce the peak from 12890 cfs to 12773 cfs (about 1% reduction). The Durepo Brook (D.A. of 20 sq. mi) and the Noyes Brook (D.A. of 3 sq. mi.) Dams are inside the drainage area of the Limestone Community Dam, and they are part of the S.C.S. Limestone Watershed Work Plan.
- 5.2 Design Data - The dam was designed and constructed by the Edward C. Jordan Company Inc. from Presque Isle, Maine. The concrete section of the dam is in the form of a broad crested weir with a width of 116 feet and a crest elevation of 526.5 feet. The channel sides are formed by the vertical concrete walls that extend to Elev. 534. The dam embankment has the same top elevation of 534 feet. The reservoir drain system consists of a six foot diameter precast concrete riser with a reservoir drain inlet of reinforced concrete located about 300 feet upstream of the dam, a 36 inch inlet pipe with an invert elevation of 516.5 feet and an outlet downstream of the spillway apron. The upstream and downstream slopes of the spillway are approximately 1 vertical to 2.5 horizontal.
- 5.3 Experience Data - It is known that heavy flows in the past have seriously damaged the dam at least twice; once prior to 1977 and once in 1977. The magnitude of these flows was unavailable.
- 5.4 Test Flood Analysis - Based upon "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March 1978, the watershed classification (rolling), the PMF is estimated to be equivalent to 25,770 cfs. (921 csm). For this portion of Maine the Maximum Probable Runoff is assumed to be 13 inches. Upstream, the Durepo Brook and the Noyes Brook reservoirs control more than 80 percent of the drainage area. By considering the flood reducing effects of these reservoirs the test flood for this high hazard, small size dam is selected to be equivalent to the 1/2 PMF or 12,890 cfs (460 csm).

In our hydraulic computations, the flood routing starting elevation was the spillway crest elevation 526.5 NGVD. The routed test flood outflow was determined in accordance with Corps of Engineers "Guidance for Estimating Effect of Surge Storage on Maximum Probable Discharges", and the hydraulic characteristics of the dam. Spillway discharge was computed as flow over a weir. The routed test flood outflow was determined to be approximately 12770 cfs, (about one percent reduction), and corresponding water surface elevation 536.2 ft. The top of the dam is at elevation 534.0 ft and thus the dam would be overtopped by 2.2 ft. The spillway capacity of 7150 cfs is about 56 percent of the test flood.

Another test flood equivalent to 1/4 PMF (6442 cfs) was routed through the reservoir and the outflow was calculated to be 6410 cfs, 90 percent of the spillway capacity and no overtopping occurred.

- 5.5 Dam Failure Analysis - The dam failure was assessed using the "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs" prepared by the Corps of Engineers. The reservoir water level was assumed at the top of the dam prior to the breach event. The flooding damage was first analyzed for prefailure condition by considering a discharge from the dam equal to the spillway capacity, 7150 cfs. The water depths in the river due to this flood were calculated to be approximately 11 feet. About 14 houses 500-1000 feet downstream are located 5 to 10 feet above the stream bed. These houses and the bridge on the road of 229 will be damaged during this prefailure flood.

The additional flood discharge due to breaching of the dam was calculated to be 15600 cfs. In these calculations the reservoir volume prior to failure is 142 ac-ft, the breach height is 19 ft, and the breach width is 112 ft. Immediately downstream after the failure the total discharge becomes 22750 cfs with a depth of 16.8 ft. In this case the spillway becomes submerged and the decrease of its discharge is estimated to be 6 percent. The new spillway discharge of 6718 cfs together with routed breach discharges was considered in calculating the downstream water depths. The calculations (see Appendix D) showed that water depths will be 15.9 - 15.3 ft. and an additional 3 houses (previously unflooded) located 500 - 100 ft. downstream will be impacted by approximately 5-7 feet of water.

A second breach study was performed to evaluate the failure effect in dry conditions. In this case water levels were assumed at spillway crest elevation. The height of the breach was 11.5 ft. and the width 170 ft. The breach discharge was 3900 cfs. This was routed downstream. The calculations results show that about 11 houses will be flooded with water to depths of approximately three feet.

From these studies it is concluded that this dam should be classified as having a high hazard potential because more than a few lives could be lost in the event of a dam breach. Furthermore, it is shown that about fourteen homes are presently located in the flood plain area and will be damaged during a breach event.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation

The visual inspection of November 6, 1979 revealed no dips, sags, depressions or other evidence of instability. Nothing was noted that would indicate that the dam structure is unstable.

6.2 Design and Construction Data

Design calculations and construction records were not available for review in preparing this report. The construction drawings for the dam repair work were reviewed.

6.3 Post Construction Changes

No evidence of modification to the dam since the rehabilitation of the dam in 1978 was observed.

6.4 Seismic Stability

The dam is located in Seismic Zone No. 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 - This inspection indicates that the Limestone Community Dam is in good condition. The inspection revealed the following:
  - (1) There are approximately fourteen homes located in the flood plain immediately downstream. These will be damaged by a flow equal to the capacity of the spillway (or when the water level is at the top of the dam).
  - (2) The spillway capacity is 7150 cfs which is approximately 56 percent of the Test Flood outflow (1/2 PMF).
  - (3) The appearance of the concrete spillway and adjacent earthfill embankments is good.
- b. Adequacy of Information - The lack of in-depth engineering data did not allow for a definitive review of this dam. Therefore, the adequacy of the dam could not be assessed from the standpoint of reviewing design and construction data but is based solely on visual inspection and engineering judgment.
- c. Urgency - The remedial measures presented below should be implemented by the Owner within one year of receipt of this Report.

#### 7.2 Recommendations

1. Because of the location of this dam in a densely populated area and the results of the Dam Failure Analyses it is recommended that a second, more detailed hydrological study be performed for this dam. This study should take into consideration the reducing effects of the upstream (Durepo Brook and Noyes Brook) dams during flood flows as well as the effect that the Route 229 bridge immediately downstream will have.
2. It is also recommended that the homes or businesses located on the flood plain immediately downstream be relocated.

#### 7.3 Remedial Measures The owner should:

- a. Develop a downstream warning plan to be used in the event of an emergency at the dam.
- b. Establish a system to monitor the project during periods of intense rainfall.

- 11
- c. Implement a monthly visual inspection program of the dam and appurtenances. Observations should be recorded in a maintenance log.
  - d. Conduct bi-annual technical investigations of the project.
  - e. Establish regular maintenance procedures and continue to keep the embankments well-groomed and free of brush and trees.
  - f. Insure the operability of the reservoir drain.
  - g. Obtain and maintain a readily accessible set of as-built drawings and technical investigation reports.

APPENDIX A

FIELD INSPECTION CHECK LIST

INSPECTION CHECKLIST  
PARTY ORGANIZATION

PROJECT Limestone Community Dam

DATE Nov. 8, 1979

TIME 9:30

WEATHER Fair-Sunny - 40°F

U.S. ELEV. \_\_\_\_\_ U.S. \_\_\_\_\_ DN.S.

PARTY:

1. Lewis B. Seward - Hydrologist 6. \_\_\_\_\_
2. Jonas N. Jonas - Civil Engineer 7. \_\_\_\_\_
3. Peerless J. Snow - Limestone Town 8. \_\_\_\_\_  
Manager
4. J. E. Giles, Jr. - Project Manager\* 9. \_\_\_\_\_
5. \_\_\_\_\_ 10. \_\_\_\_\_

\*Separate Inspection Dec. 30, 1980  
PROJECT FEATURE Aug. 12, 1981

INSPECTED BY          REMARKS

1. All of the project features were inspected by each of the party members.
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

INSPECTION CHECKLIST

PROJECT Limestone Community Dam DATE Nov. 8, 1979  
 PROJECT FEATURE Earthfill dam w/concrete spillway NAME Lewis B. Seward  
 DISCIPLINE Hydro NAME Jan N. Jonas

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	534
Current Pool Elevation	527
Maximum Impoundment to Date	Not available
Surface Cracks	none visible
Pavement Condition	grassed and riprap at water line
Movement or Settlement of Crest	not noticeable
Lateral Movement	not noticed
Vertical Alignment	not noticed
Horizontal Alignment	good
Condition at Abutment and at Concrete Structures	very good - earthfill and riprap
Indications of Movement of Structural Items on Slopes	none visible
Trespassing on Slopes	none
Vegetation on Slopes	thick grass, not mowed
Sloughing or Erosion of Slopes or Abutments	none -
Rock Slope Protection - Riprap Failures	riprap at concrete intake walls - good condition
Unusual Movement or Cracking at or near Toes	none noticed
Unusual Embankment or Downstream Seepage	none
Piping or Boils	none
Foundation Drainage Features	2-in pipe relieving ports at toe of concrete spillway
Toe Drains	see above
Instrumentation System	none



INSPECTION CHECKLIST

PROJECT Limestone Community Dam DATE Nov. 8, 1979  
 PROJECT FEATURE Earthfill dam w/concrete NAME Lewis B. Seward  
 DISCIPLINE Hydro NAME Jan N. Jonas

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - CONTROL TOWER</u>	
a. <u>Concrete and Structural</u>	
General Condition	very good
Condition of Joints	tight
Spalling	none
Visible Reinforcing	none
Rustiny or Staining of Concrete	none
Any Seepage or Efflorescene	none
Joint Alignment	good
Unusual Seepage or Leaks in Gate Chamber	gate shaft was not accessible
Cracks	none
Rusting or Corrosion of Steel	none
b. <u>Mechanical and Electrical</u>	
Air Vents	none
Float Wells	none
Crane Hoist	none
Elevator	none
Hydraulic System	none
Service Gates	none
Emergency Gates	manually operated gate valve
Lightning Protection System	none
Emergency Power System	none
Wiring and Lighting System in Gate Chamber	none

INSPECTION CHECKLIST

PROJECT Limestone Community Dam DATE Nov. 8, 1979  
PROJECT FEATURE Earthfill dam in concrete NAME Lewis B. Seward  
spillway NAME Jan N. Jonas  
DISCIPLINE \_\_\_\_\_ NAME \_\_\_\_\_

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - TRANSITION AND CONDUIT</u></p> <p>General Condition of Concrete Rust or Staining on Concrete Spalling Erosion or Cavitation Cracking Alignment of Monoliths Alignment of Joints Numbering of Monoliths</p>	<p>Concrete pipe buried under dam embankment - not accessible for inspection.</p>







APPENDIX B  
ENGINEERING DATA

- Note: 1. All design records are in storage at the:  
National Archives and Records Service  
GSA Federal Archives and Records Center  
380 Trapelo Road, Waltham, Massachusetts 02154  
617-223-2657
2. No past inspection reports were available for review or are known to exist.

LIST OF ENCLOSED DRAWINGS

A. "Rehabilitation of Community Dam," Project No. 20131.

	<u>Drawing Number</u>
<u>1.</u> Existing Structure and Site Preparation	C-100 Sheet 1 of 8
<u>2.</u> Concrete Sections	C-102 Sheet 3 of 8
<u>3.</u> Sections	C-300 Sheet 4 of 8

B. "Reconstruction of Community Dam," Project No. 7409963 E.

	<u>Sheet Number</u>
<u>4.</u> Existing Site and Exploration Plan	1
<u>5.</u> Dam and Swimming Area Plan	7
<u>6.</u> Dam Profile and Gabion Plan View	8
<u>7.</u> Dam Cross Section	10
<u>8.</u> Subsurface Geologic Profile	16

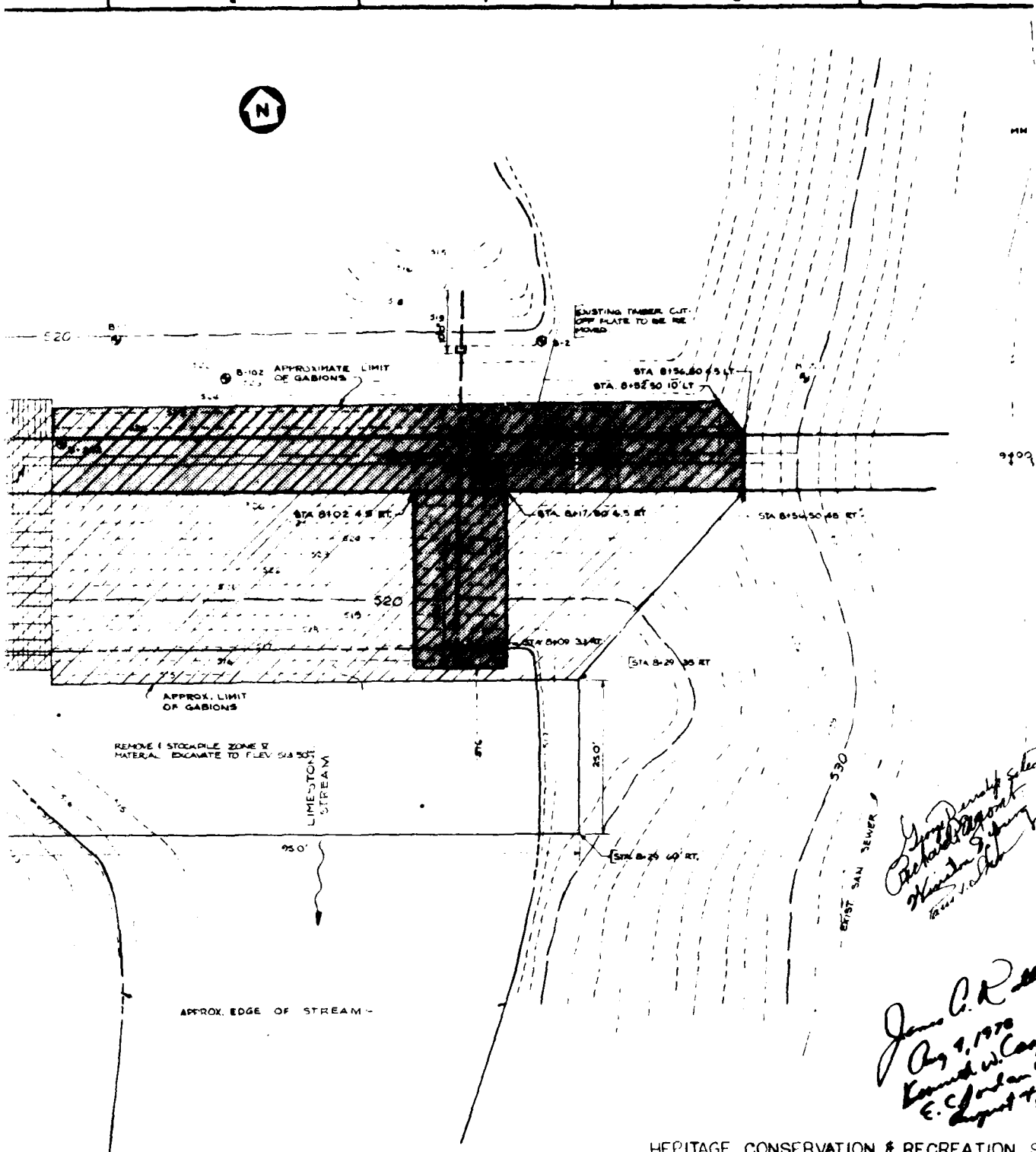
1/

References


Material from the following references was extracted and incorporated herein:

- a. "Limestone Stream Watershed Work Plan" Central Aroostook Soil Conservation District December, 1964.
- b. Limestone Community Dam Construction Drawings: "Rehabilitation of Community Dam" (8 sheets), 1978 and also "Reconstruction of Community Dam" (21 sheets), 1976.
- c. "Durepo Brook - Invitation to Bid" March 1971 SCS construction specification (Typ.)
- d. SCS Technical Information Storage and Retrieval System Printout.

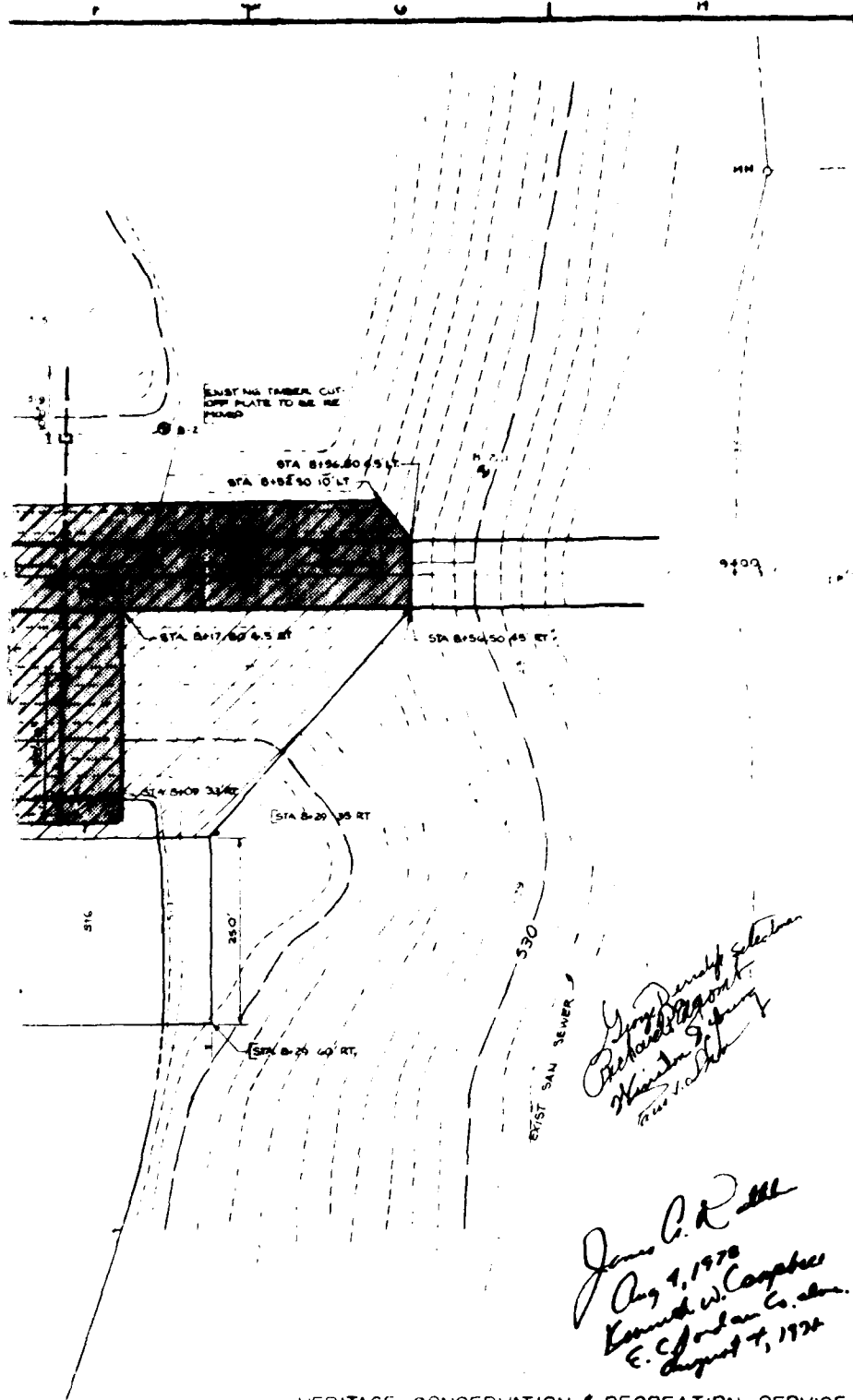




HERITAGE CONSERVATION & RECREATION S  
PROJECT NR 23-00303

BY CHICAPP	 <b>EDWARD C. JORDAN CO., INC.</b> ENGINEERING · PLANNING · ARCHITECTURE PORTLAND BANGOR PORTSMOUTH ISLE, MAINE	DRAWN <i>BEW</i> 7-14-78 CHECKED <i>GOC</i> DATE PROJECT <i>RE Dam</i> 07-14-78 SCALE 1" = 10' TITLE	REHABILITATION OF COMMUNITY DAM EXISTING STRUCTURE SITE PREPARATION 20131 C-10C SHT 1
		TOWN OF LIMESTONE LIMESTONE, MAINE	

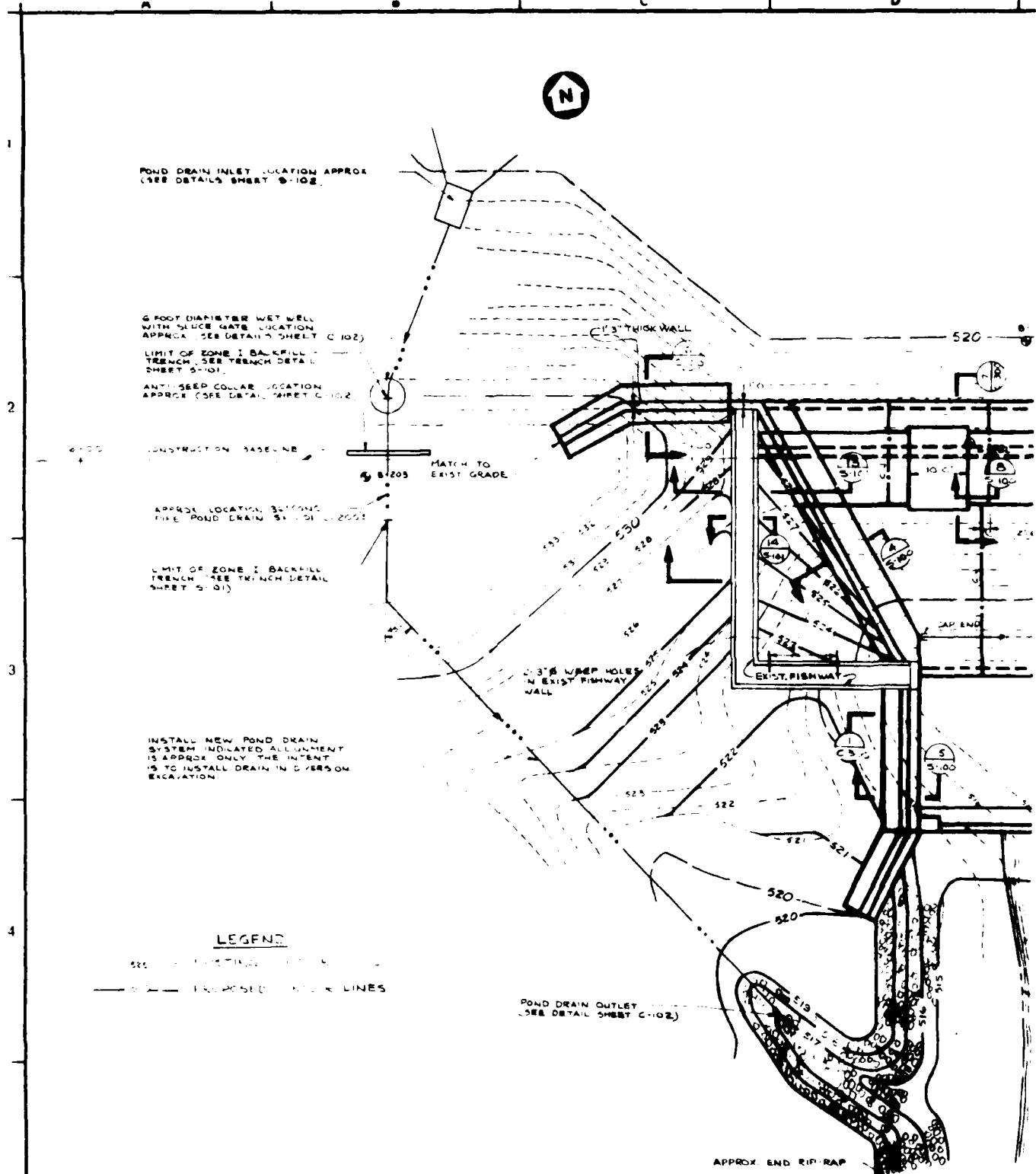
283



HERITAGE CONSERVATION & RECREATION SERVICE  
PROJECT NO 23-00303

<b>JORDAN CO., INC.</b> PLANNING ARCHITECTURE FOR PRESQUE ISLE, MAINE	DRAWN: <i>BLW</i> DATE: 7-16-78	PROJECT: REHABILITATION OF COMMUNITY DAM EXISTING STRUCTURE & SITE PREPARATION
	CHECKED: <i>GOC</i>	
LIMESTONE E. MAINE	DRAWN: <i>R. Blum</i> DATE: 07-18-78	PROJECT NO: 20131 SHEET: C-100 SHT. 1 OF 8
	SCALE: 1" = 10'	

2013



**LEGEND**

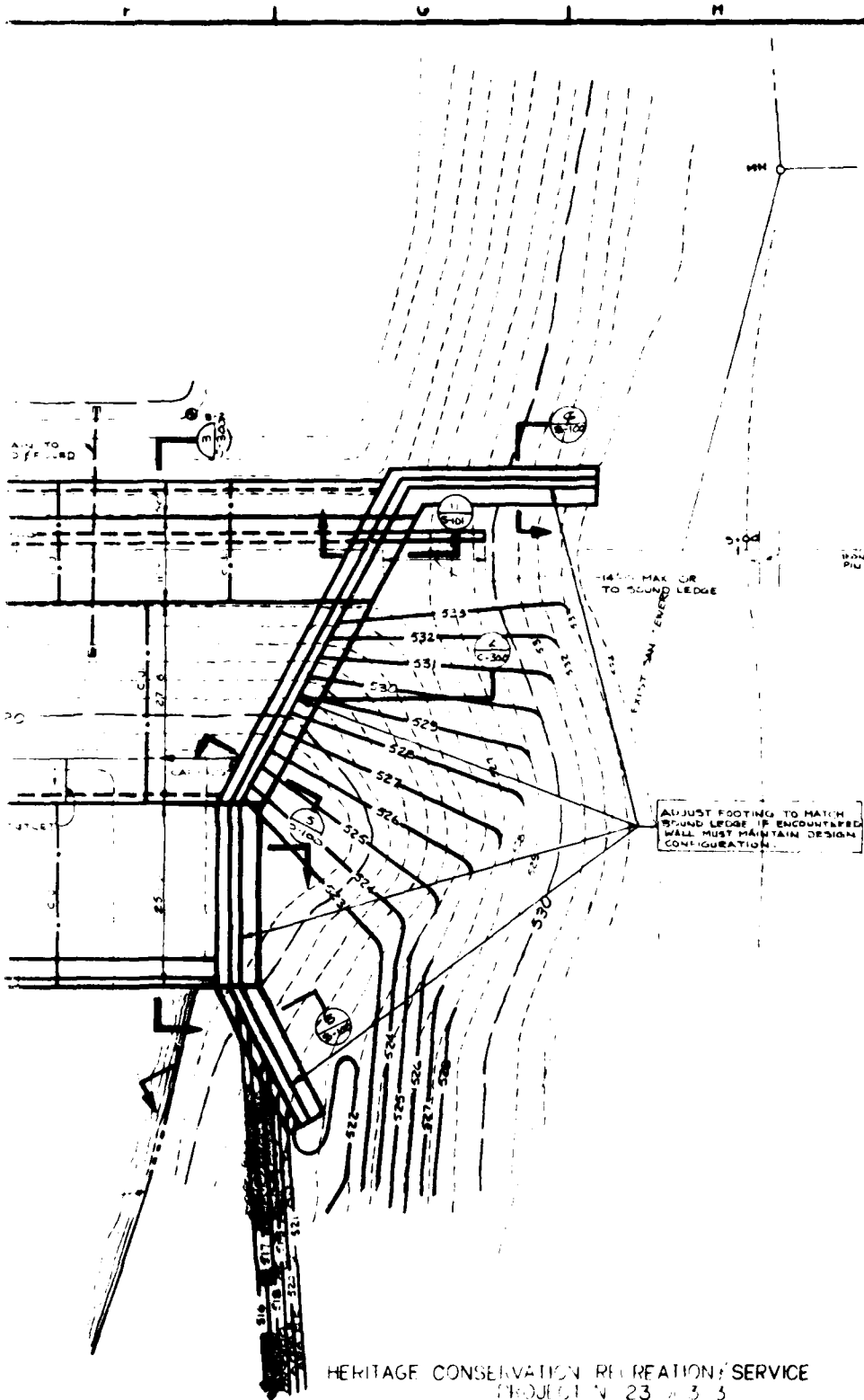
- EXISTING PIPE LINES
- PROPOSED PIPE LINES

NO	REFERENCE	DATE	STATUS	BY
1			FOR CONSTRUCTION	
2		7/21/78	GENERAL REVISION	
3		7/19/78	ISSUED FOR BID	

INCHES 0 1 2 3 4 5 6 7 8 9 10 11 12 CENTIMETERS

1003



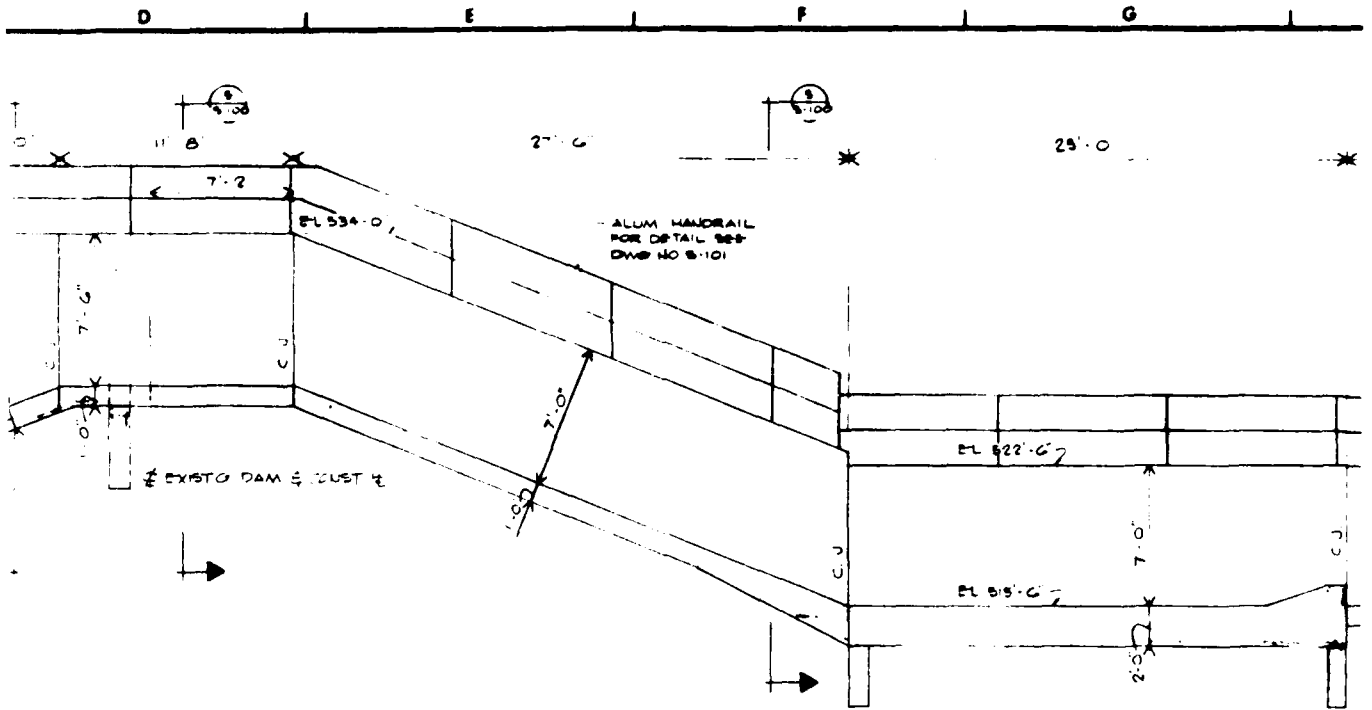


ADJUST FOOTING TO MATCH  
BOUND LEDGE IF ENCOUNTERED  
WALL MUST MAINTAIN DESIGN  
CONFIGURATION.

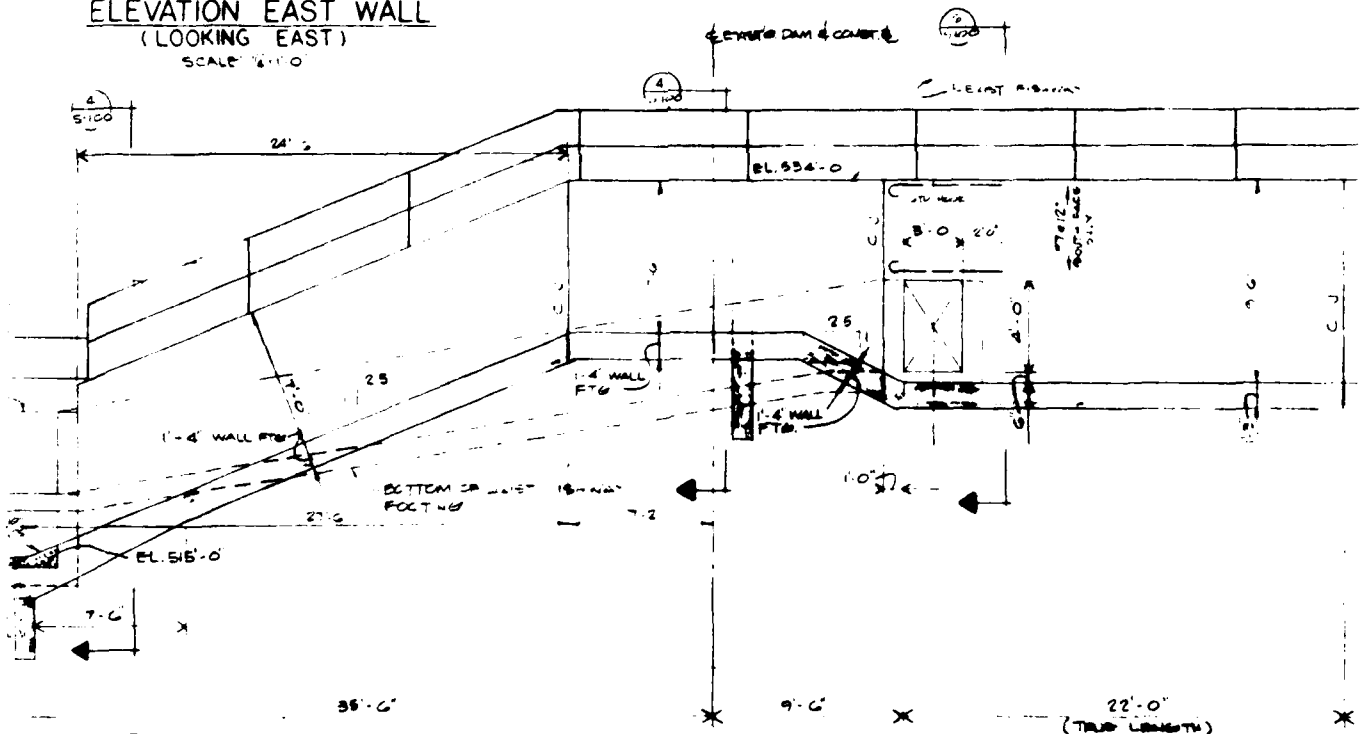
HERITAGE CONSERVATION RECREATION SERVICE  
PROJECT N. 23 - 3.3

C. JORDAN CO., INC. PLANNING ARCHITECTURE BANGOR PRESQUE ISLE MAINE	DATE: 7/14/88	REHABILITATION OF COMMUNITY DAM
	DRAWN BY: [Signature]	
LESTER L. LESTER LESTER L. LESTER ARCHITECTS BANGOR, MAINE	SCALE: 1" = 10'	GENERAL PLAN
	SHEET NO: 20131	SHEET 2 OF 5

393




ELEVATION EAST WALL  
(LOOKING EAST)  
SCALE: 1/8"=1'-0"



ELEVATION WEST WALL  
(LOOKING WEST)  
SCALE: 1/8"=1'-0"

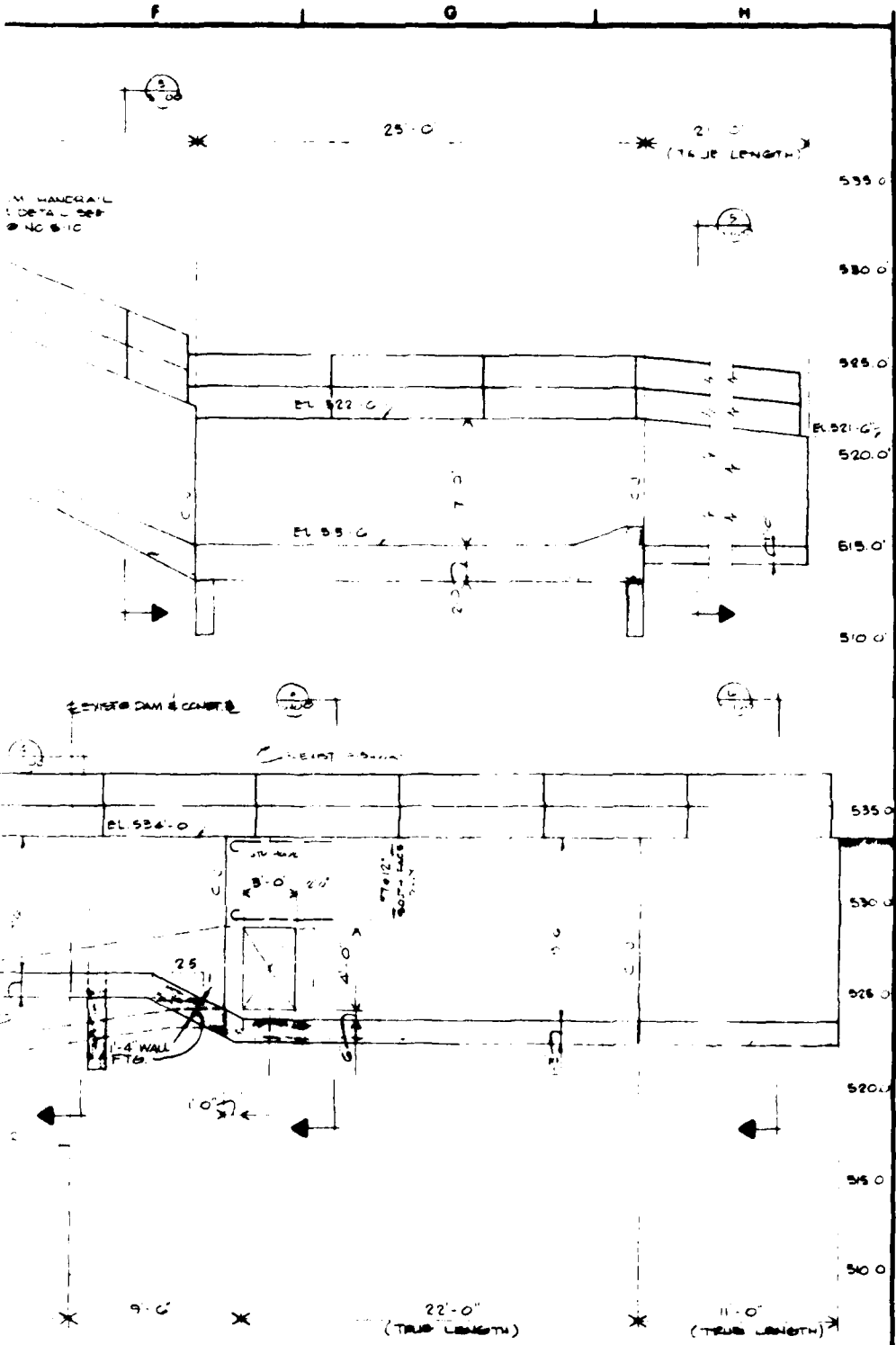
HERITAGE CONSERVATION &  
PROJECT NO. 2

	<b>EDWARD C. JORDAN CO., INC.</b> ENGINEERING · PLANNING · ARCHITECTURE PORTLAND · BANGOR · PRESQUE ISLE, MAINE	DRAWN: <i>K. CORREY</i> DATE: <i>7/11/76</i>	REHAER COMI  CONCRE
		CHECKED: <i>G. A. PINE</i> DATE: <i>07/15/76</i>	
		PROJECT: <i>2000</i> DATE: <i>07.11.76</i>	
		SCALE: <i>AS NOTED</i>	

193



REPRODUCED AT GOVERNMENT EXPENSE



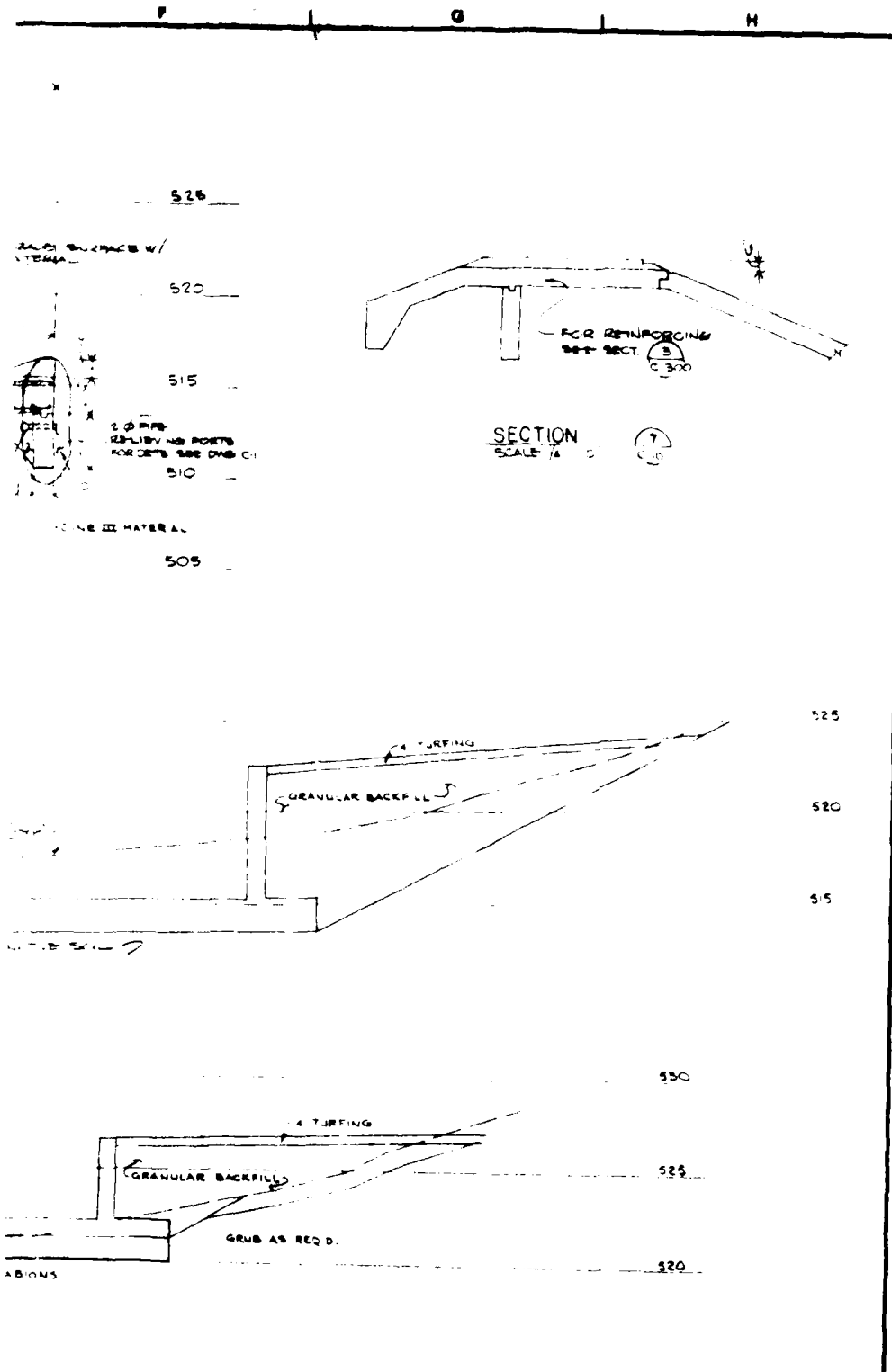
HERITAGE CONSERVATION & RECREATION SERVICE  
PROJECT NO 23-00303

<b>HARD C. JORDAN CO., INC.</b> ENGINEERING - PLANNING - ARCHITECTURE PORTLAND BANGOR PRESQUE ISLE, MAINE	DRAWN BY: <i>K. O. [unclear]</i> CHECKED BY: <i>[unclear]</i> DATE: <i>01/18/76</i>	REHABILITATION OF COMMUNITY DAM
	PROJECT NO: <i>23-00303</i> SHEET NO: <i>30F8</i>	CONCRETE SECTIONS
TOWN OF LIMESTONE LIMESTONE, MAINE	SCALE: AS NOTED	2031 C 102 SHT 30F8

303



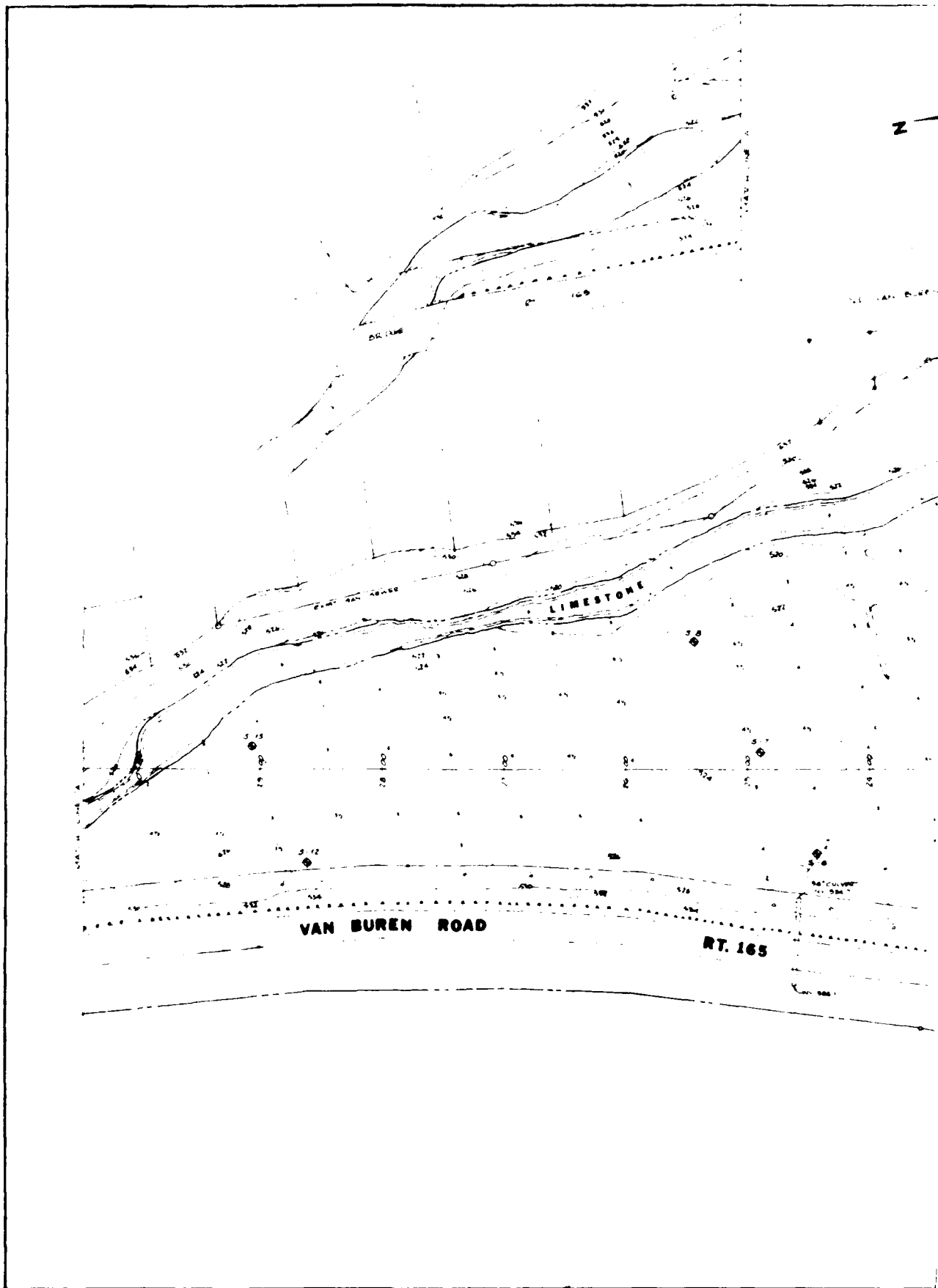




HERITAGE CONSERVATION & RECREATION SERVICE  
PROJECT NO 23-00303

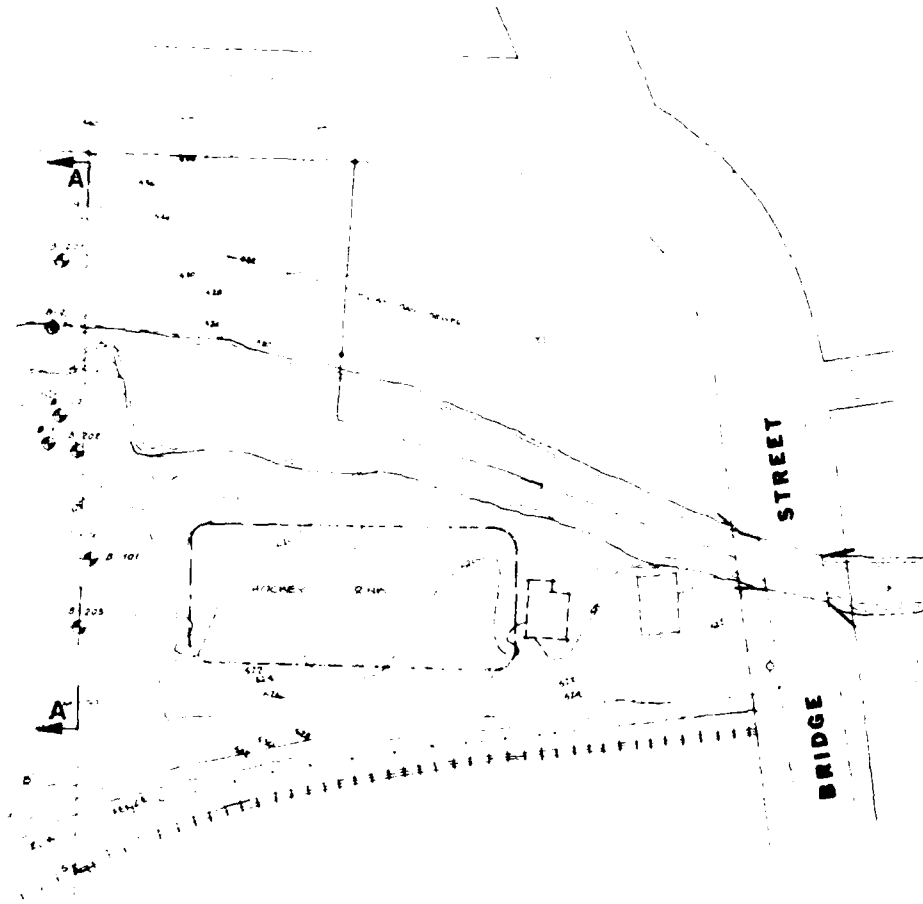
RD C. JORDAN CO., INC. LANDING PLANNING ARCHITECTURE LAND BANGOR PRESQUE ISLE, MAINE	DRAWN <i>Konig</i> 7/1/13 CHECKED <i>R. D. B.</i> 7/4/13	REHABILITATION OF COMMUNITY DAM	
	DATE <i>07/14/13</i>	SECTIONS	
PROJECT <i>07/14/13</i>	SHEET NO. <i>4</i>	PROJECT NO. 20131	DIV. 0
PROJECT NO. <i>4</i>	SHEET NO. <i>1-0</i>	C-300 SHEET 4 OF 8	DIV. 0

103



1-13



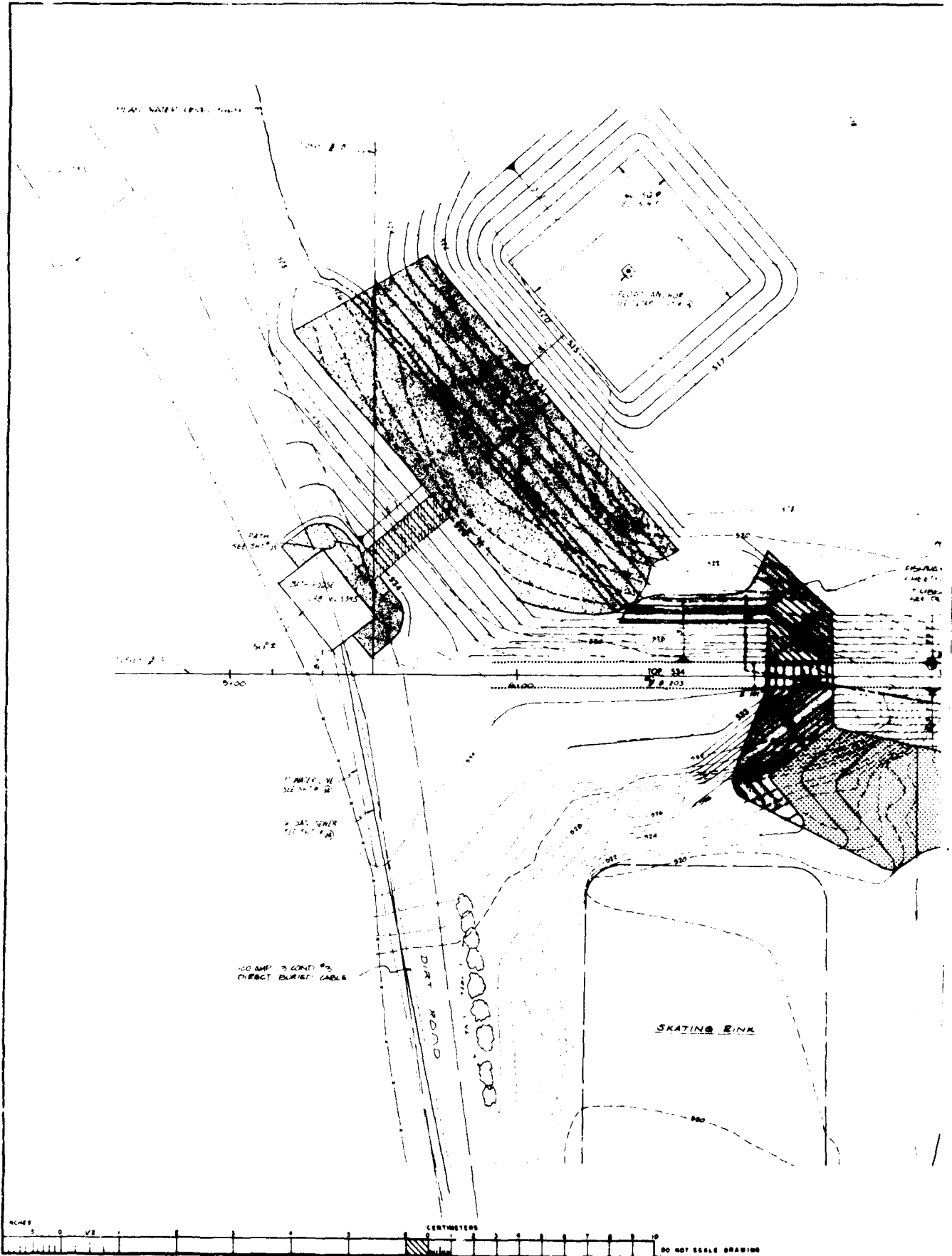


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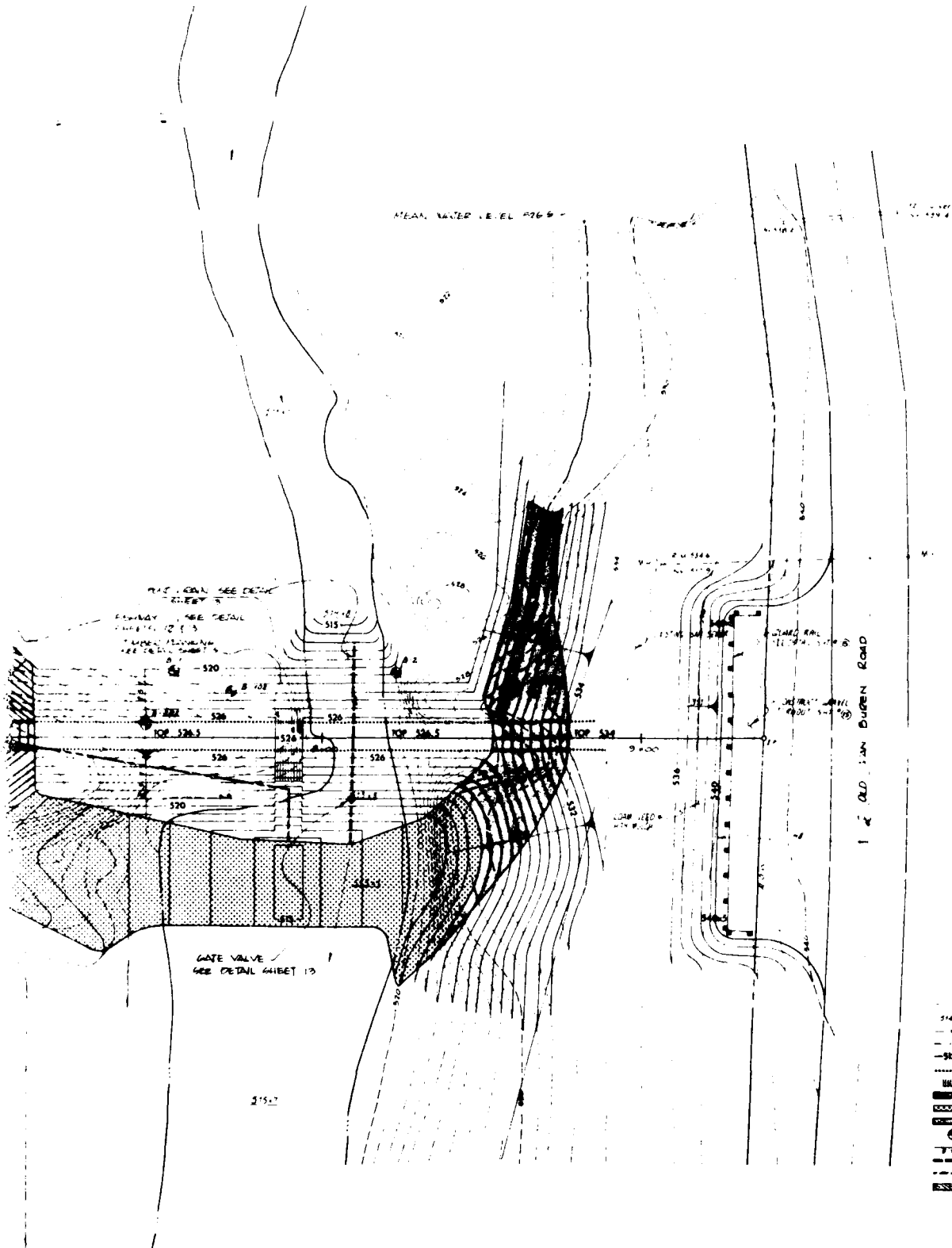
- - - - - EXISTING CONTOUR
- PROPERTY LINE
- SANITARY SEWER
- MANHOLE
- IRON PIN
- MONUMENT
- - - - - GUARDRAIL
- ◆ BORING (M.T.B.)
- HAND SOUNDING (M.T.B.)
- 1' APPROX DEPTH OF LAKE

DATE	06	<b>TOWN OF LIMESTONE</b> LIMESTONE, MAINE	RECONSTRUCTION OF COMMUNITY DAM	REV	1
BY	APP				
CHECKED					
APPD					
APPD					
APPD	013	Jordan Gorriil Associates Geotechnical Consultants	TITLE: EXISTING SITE / EXPLORATION PLAN		
		PORTLAND, BANGOR AND PRESQUE ISLE, MAINE	SCALE: 1"=50' JOB NO: 7409963 C		

333



1513

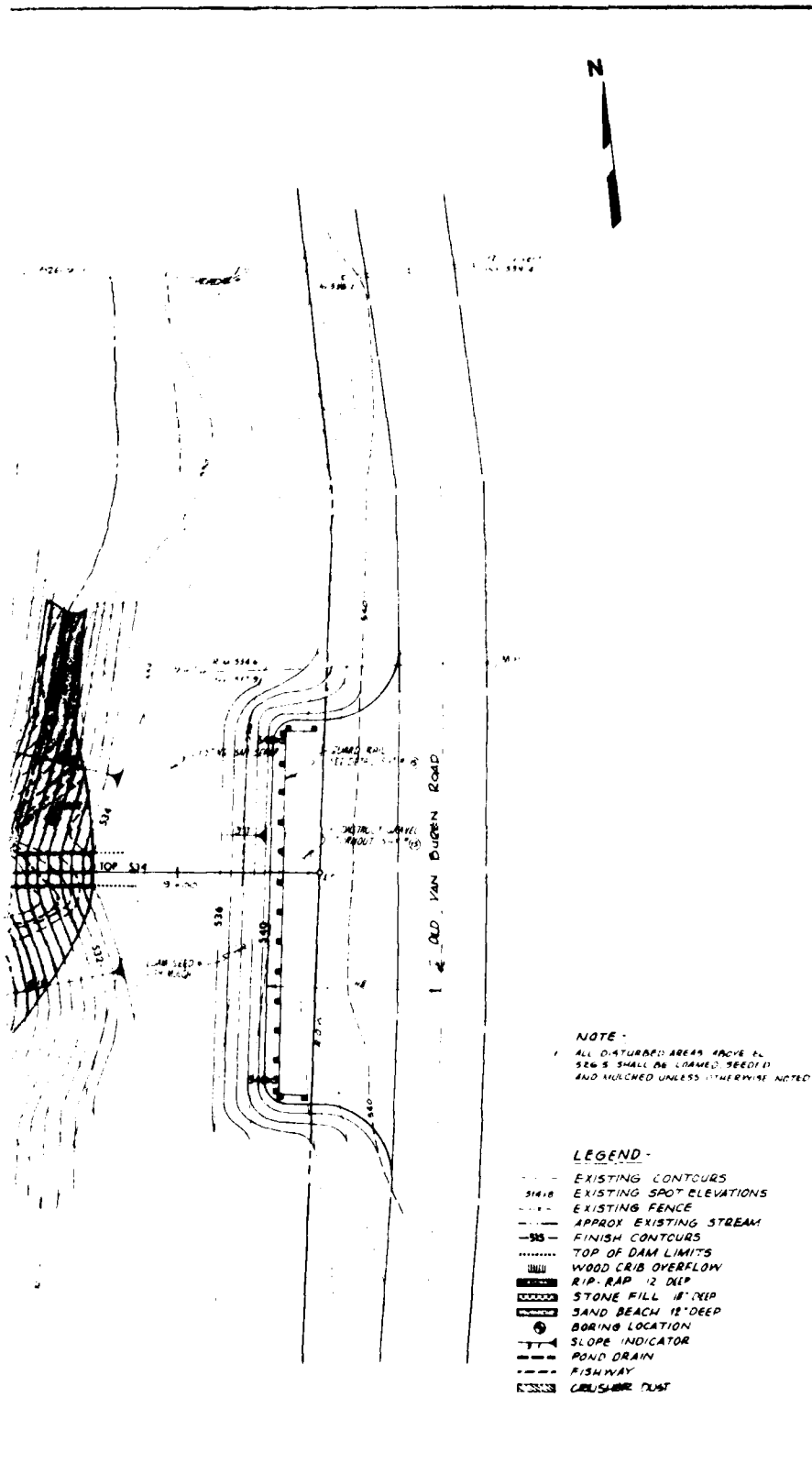


NOTE:  
ALL DISTANCES ARE  
GIVEN IN FEET UNLESS  
OTHERWISE NOTED

- LEGEND -**
- EXISTING CON.
  - EXISTING SPOT
  - EXISTING FENC.
  - APPROX EXISTING
  - 515--- FINISH CONTOUR
  - TOP OF DAM LIA
  - WOOD CRIB OVER
  - RIP-RAP 2' ON
  - STONE FILL 1'
  - SAND BEACH 12'
  - BORING LOCATION
  - SLOPE INDICATOR
  - POND DRAIN
  - FISHWAY
  - CRUSHED LIME

DESIGNED BY	JMS	CLIENT	TOWN OF LIMESTONE LIMESTONE, MAINE	PROJECT	RECONSTRUCTION COMMUNITY DAM
CHECKED BY	AMP/GAN	ENGINEER	EDWARD C. JORDAN CO., INC.	TITLE	DAM & SWIMMING PLAN
DATE	9/10/76	AS ADVERTISED	ENGINEERING, PLANNING, ARCHITECTURE	SCALE	1" = 20'
REV	DATE	BY	STATUS	APP'D	9B
			AS SUBMITTED FOR REVIEW		

2-33



NOTE -  
 ALL DISTURBED AREAS ABOVE EL  
 526'S SHALL BE LOAMED, SEEDED  
 AND MULCHED UNLESS OTHERWISE NOTED

- LEGEND -
- - - - - EXISTING CONTOURS
  - 514.0 EXISTING SPOT ELEVATIONS
  - - - - - EXISTING FENCE
  - - - - - APPROX EXISTING STREAM
  - - - - - FINISH CONTOURS
  - TOP OF DAM LIMITS
  - WOOD CRIB OVERFLOW
  - RIP-RAP 12" DEEP
  - STONE FILL 18" DEEP
  - SAND BEACH 12" DEEP
  - BORING LOCATION
  - SLOPE INDICATOR
  - POND DRAIN
  - FISHWAY
  - CRUSHED LUST

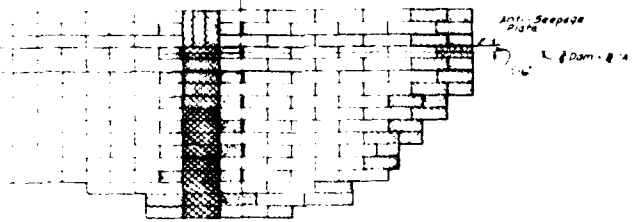
DESIGN	4/5	CLIENT	TOWN OF LIMESTONE LIMESTONE, MAINE	PROJECT	RECONSTRUCTION OF COMMUNITY DAM	SHEET NO	7	
DRAWN	AMP/GAN					DRAWING NO.		
CHECK								
APPR		EDWARD C. JORDAN CO., INC.		TITLE	DAM & SWIMMING AREA PLAN			
APPR		ENGINEERING, PLANNING, ARCHITECTURE PORTLAND, BANGOR, AND FRENCH ISLE, MAINE		SCALE	1" = 20'	JOB NO	409963.0	REV NO

373



8+00

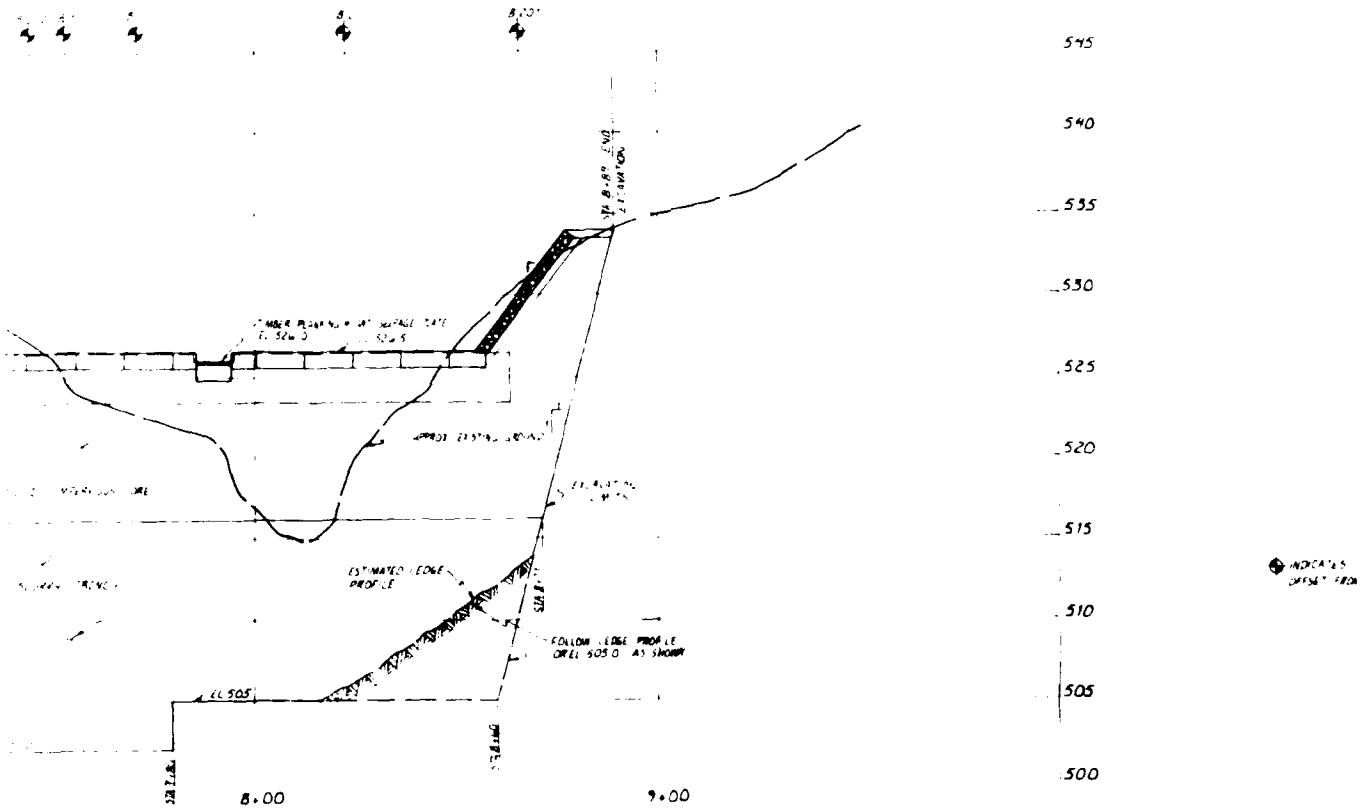
9+00



GABION PLAN VIEW

LEGEND:

- 3' x 6' Gabion 12' Deep
- 3' x 9' Gabion 12' Deep
- 3' x 12' Gabion 12' Deep
- ▨ 3' x 9' Gabion 8' Deep







DESIGN	SYC	CLIENT TOWN OF LIMESTONE LIMESTONE, MAINE	PROJECT RECC COM
DRAWN	JR		
CHECKED	JR	EDWARD C. JORDAN CO., INC. ENGINEERING, PLANNING, ARCHITECTURE FOOTBRIDGE, GARDEN, AND PRODUCE ISLE, MAINE	TITLE GABION SCALE 1"
APPROVED	WLD		
REV	DATE	BY	STATUS
1	1/1/74	AG	ADVERTISED
2	8/24/74	AS	SUBMITTED FOR REVIEW

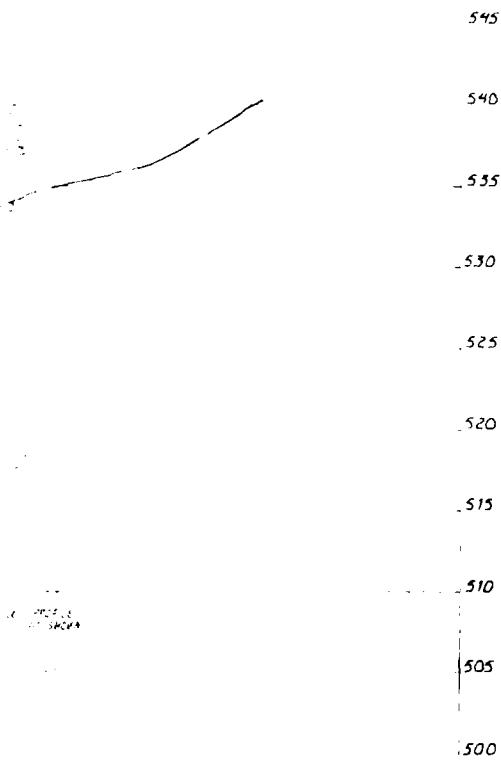
2023

REPRODUCED AT GOVERNMENT EXPENSE

2.00

LEGEND:

-  3x6 Gabion 12' Deep
-  3x8 Gabion 12' Deep
-  3x12 Gabion 12' Deep
-  3x9 Gabion 8' Deep



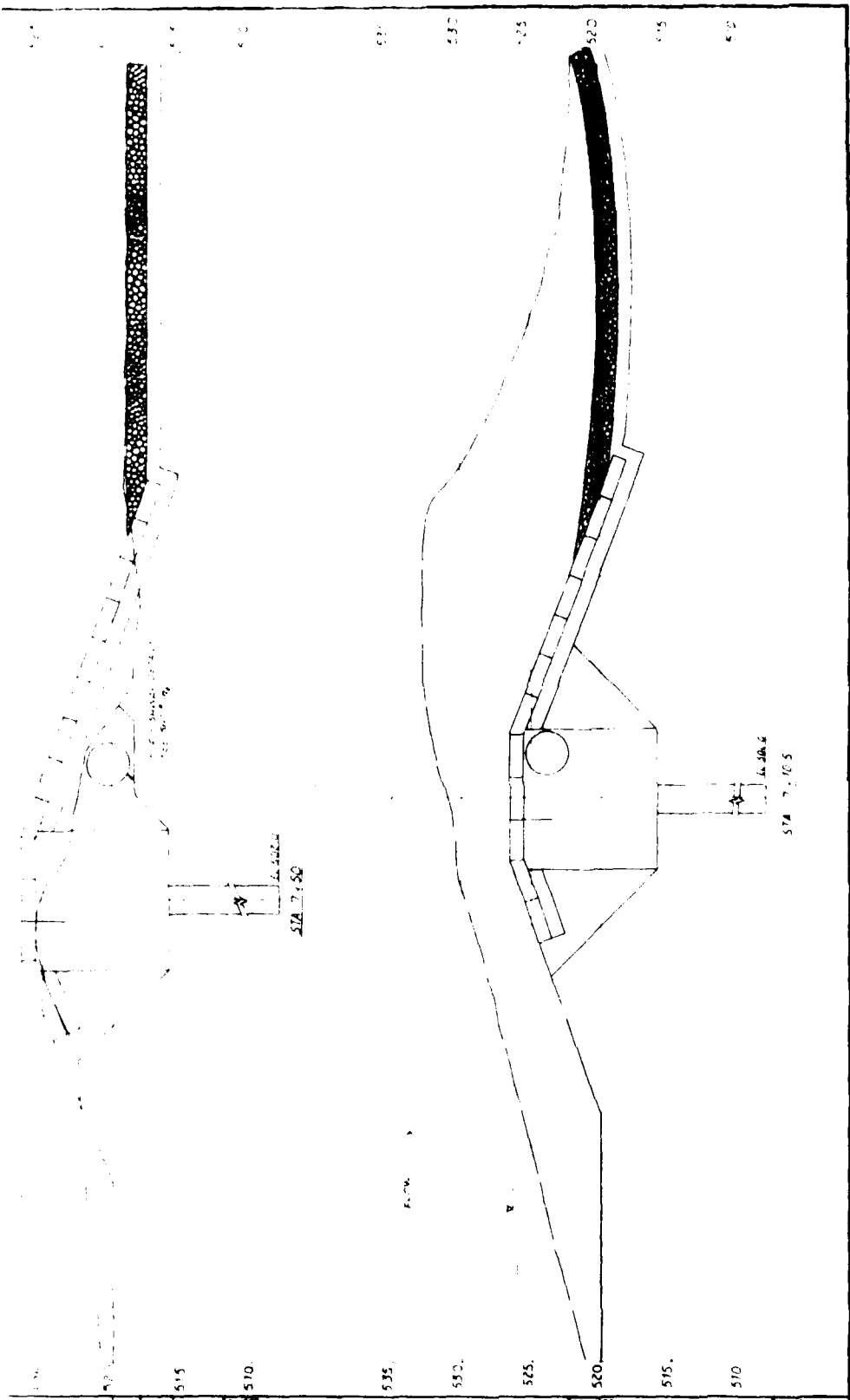
INDICATES BOUNDS 50% STRONG MIN. BE  
OFFSET FROM BASELINE SEE SHEET FOR LAYOUT

DESIGNED BY	SRK	CLIENT	TOWN OF LIMESTONE LIMESTONE, MAINE	PROJECT	RECONSTRUCTION OF COMMUNITY DAM	SHEET NO.	8
DRAWN BY	SRK					DRAWING NO.	
CHECKED BY	SRK	ENGINEER	EDWARD C. JORDAN CO., INC.	TITLE	DAM PROFILE GABION PLAN VIEW	DATE	REV. NO.
DATE REVIEW	SRK						
STATUS	APPD.	APPD.	SRK				

3033

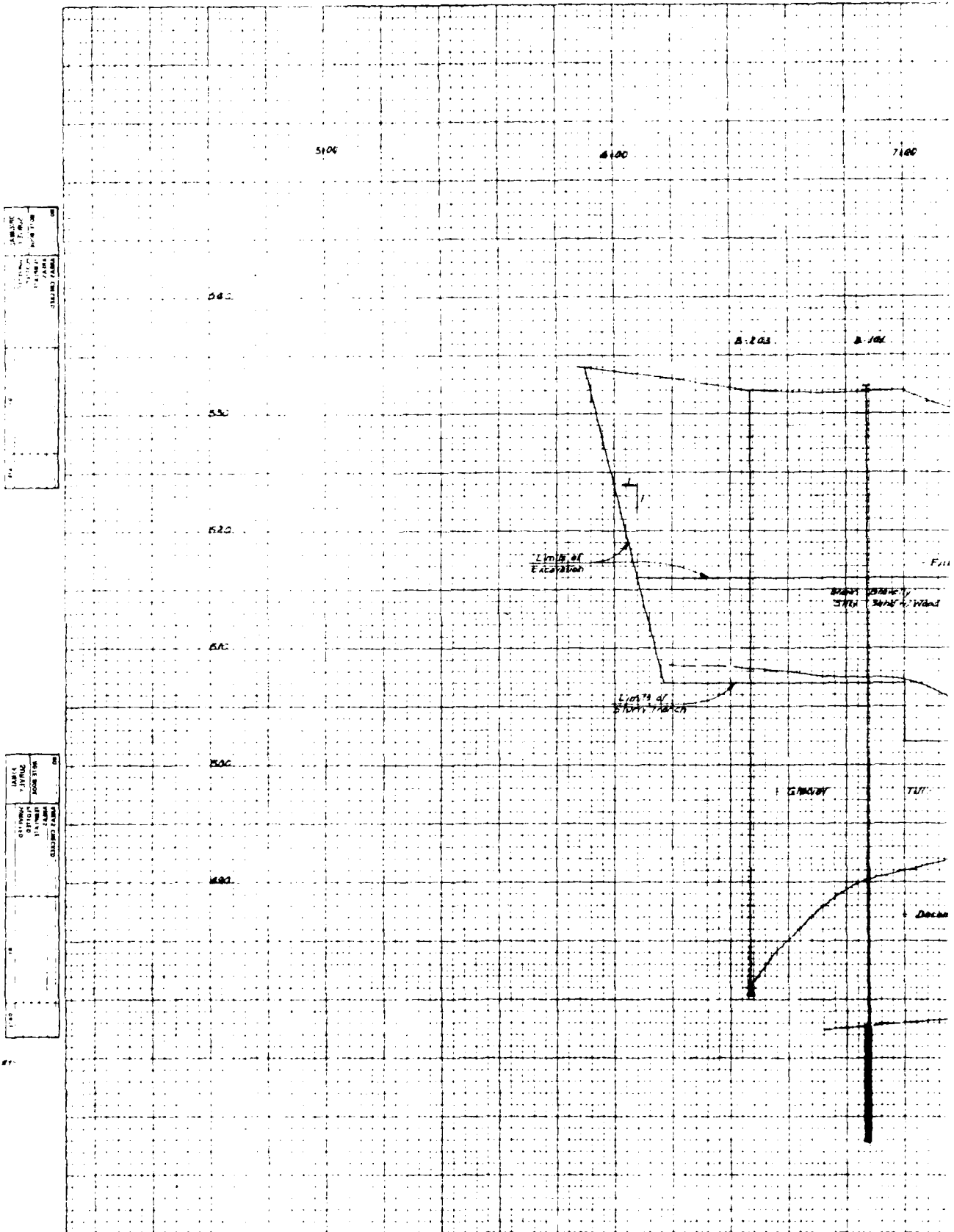






DESIGN	SPR	TOWN OF LIMESTONE LIMESTONE, MAINE	PROJECT	RECONSTRUCTION OF COMMUNITY DAM	SHEET NO	
DRAWN	GA		TITLE		NO.	
CHECKED	GA		EDWARD C JORDAN CO., INC.		DAM CROSS SECTION	DRAWING NO
APPROVED	GA		ENGINEERING, PLANNING, ARCHITECTURE		SCALE	JOB NO
APPROVED	GA		PORTLAND, MAINE, AND PRESQUE ISLE, MAINE		NO. 74000-5	REV NO

3083

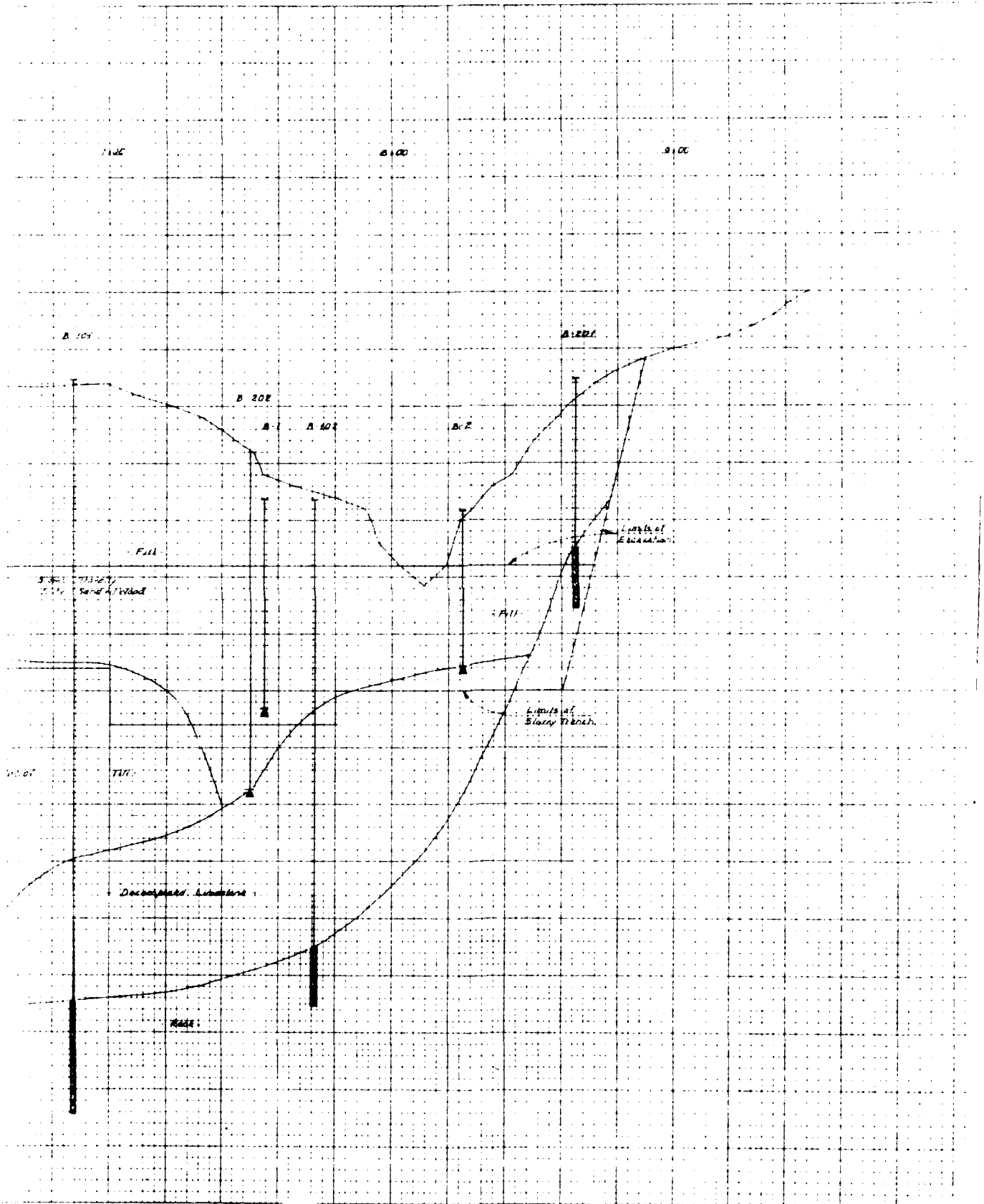


DATE	TIME	TEMPERATURE	WIND	MOON	SEA

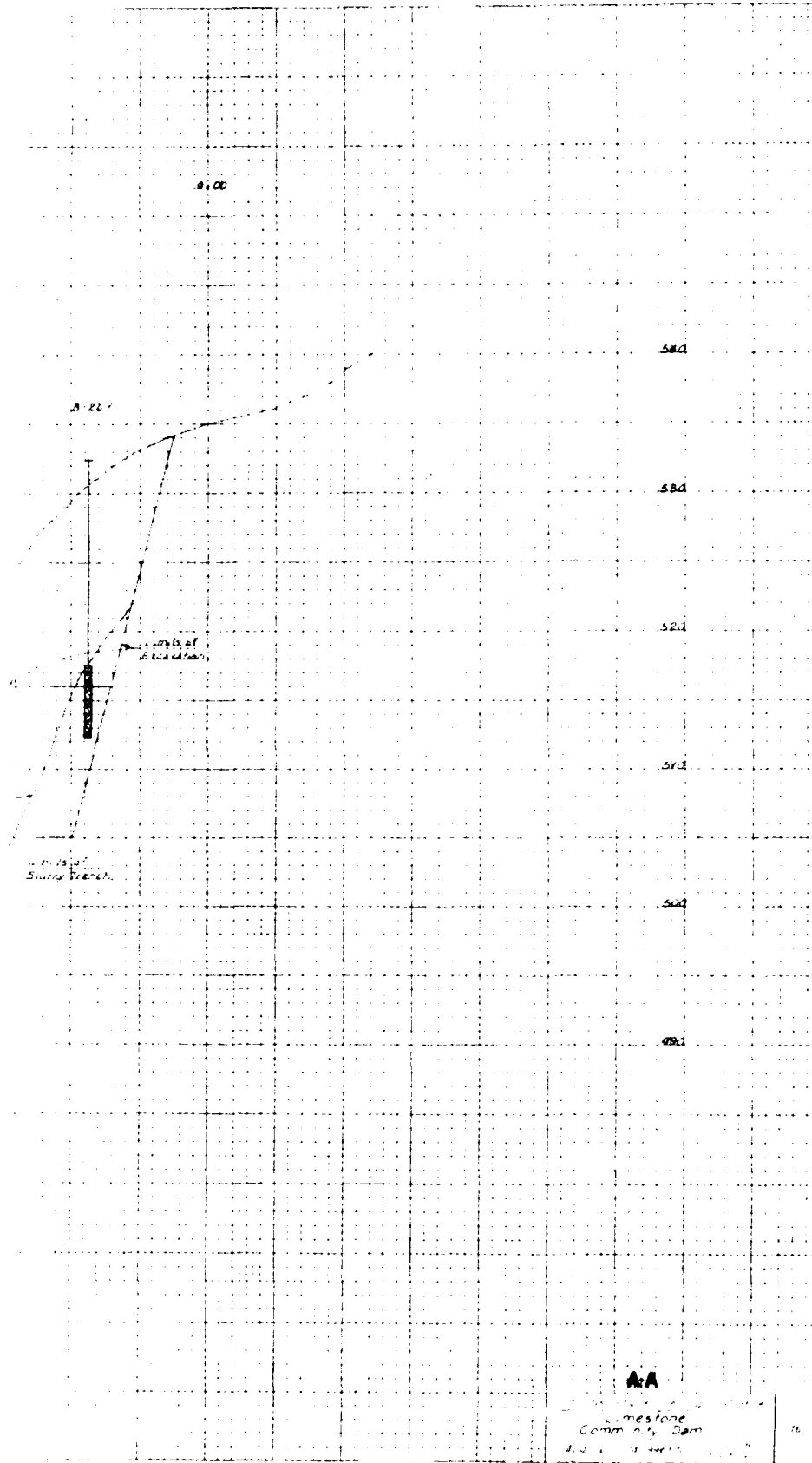
NO.	NAME	POSITION	DATE

1013

KOE  
SERIAL 7 1968 CD  
MILE J CROSS SECTION



2013



200

200

APPENDIX C

PHOTOGRAPHS



**LEGEND**

① PHOTO LOCATION

<b>LIMESTONE COMMUNITY DAM - PHOTO LOCATION</b>	
U.S. ARMY CORPS OF ENGINEERS PHASE I INSPECTION PROGRAM	
DATE November, 1980	
<b>MAIN</b>	CLIENT 100 PLATE <b>1345 72 2</b>

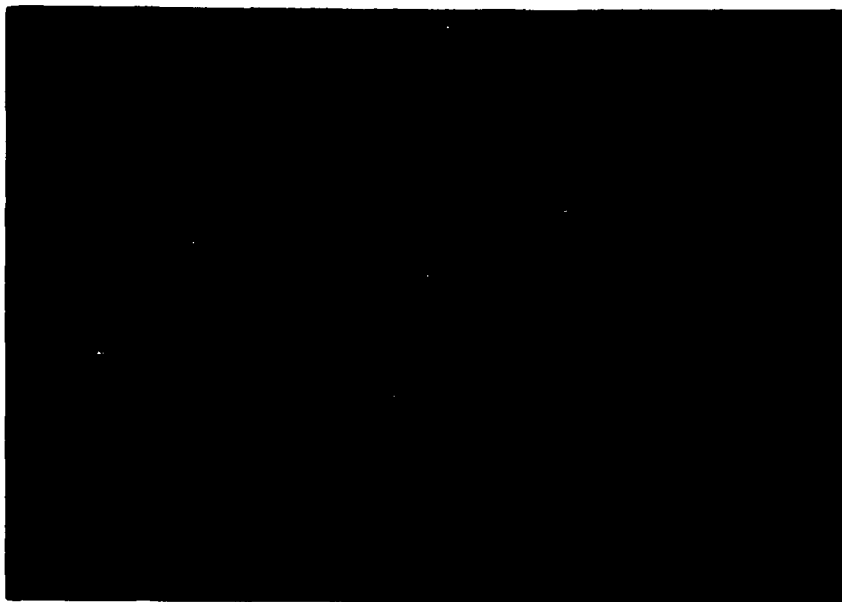


PHOTO #1  
VIEW FROM LEFT  
BANK ACROSS OLD  
HIGHWAY 165



PHOTO #2  
VIEW FROM LEFT BANK  
ACROSS OLD HIGHWAY  
165



PHOTO #3  
UPSTREAM VIEW OF  
RESERVOIR WITH NEW  
HIGHWAY 165



PHOTO #4  
RIGHT ABUTMENT WITH  
ROCKFILL DAM AND  
VALVE SHAFT



PHOTO #5  
SPILLWAY WITH FISH  
LADDER AND VALVE  
SHAFT

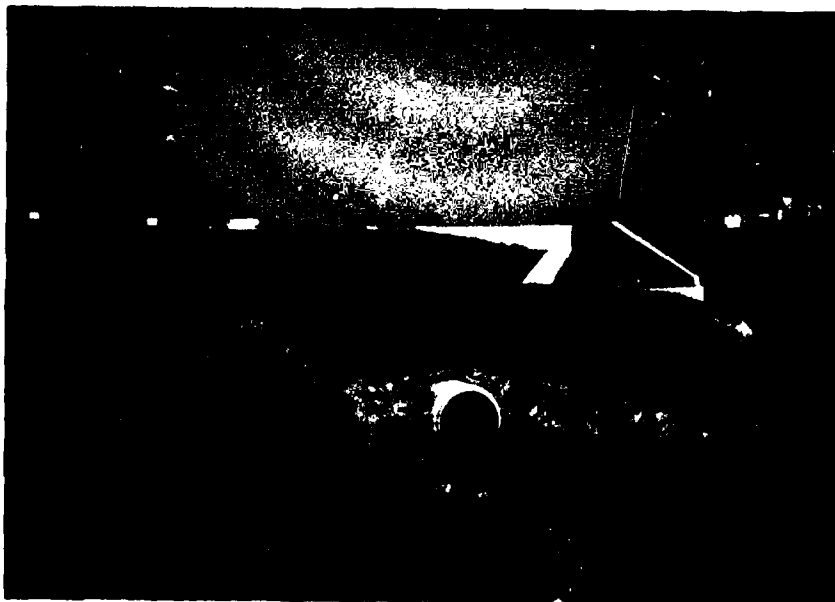


PHOTO #6  
OUTLET PIPE (36")  
FISH LADDER WITH  
RETAINING WALL AND  
SPILLWAY



PHOTO #7

VIEW UPSTREAM FROM

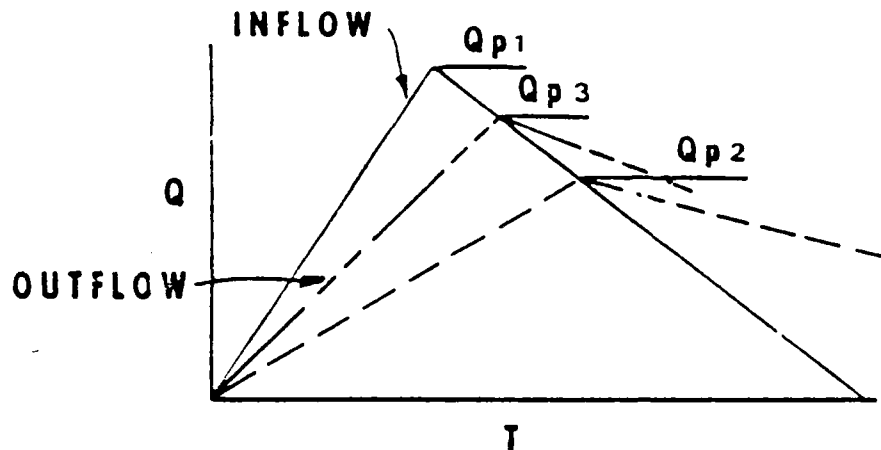
BELOW HIGHWAY 229

BRIDGE

APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS

## ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



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

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

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

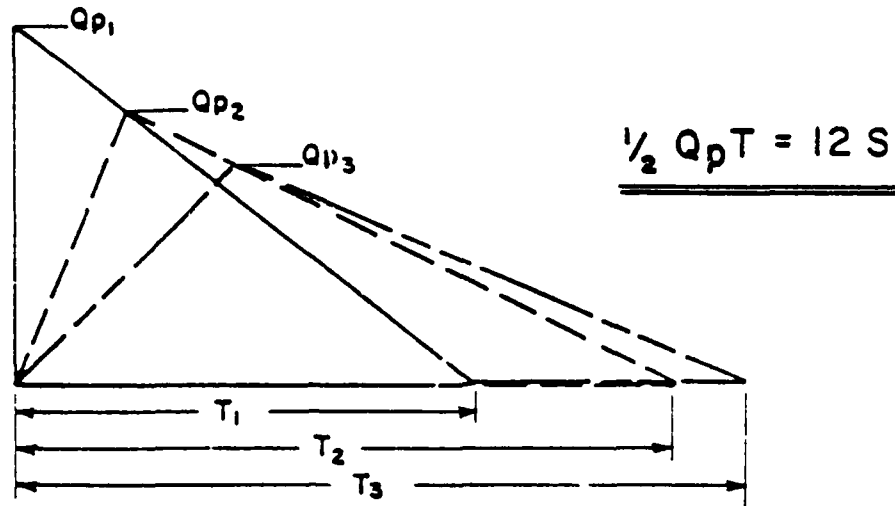
c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

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

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

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

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



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

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

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

$W_b$  = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 4 FT OF DIA LENGTH ACROSS RIVER AT MID HEIGHT.

$Y_0$  = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

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

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

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

B. DETERMINE TRIAL  $Q_{p2}$ .

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

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

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

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

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

APRIL 1978

## SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surchage Height and  
"STOR<sub>2</sub>" To Pass "Q<sub>p2</sub>"

b. Avg "STOR<sub>1</sub>" and "STOR<sub>2</sub>" and  
Compute "Q<sub>p3</sub>".

c. If Surchage Height for Q<sub>p3</sub> and  
"STOR<sub>AVG</sub>" agree O.K. If Not:

STEP 4: a. Determine Surchage Height and  
"STOR<sub>3</sub>" To Pass "Q<sub>p3</sub>"

b. Avg. "Old STOR<sub>AVG</sub>" and "STOR<sub>3</sub>"  
and Compute "Q<sub>p4</sub>"

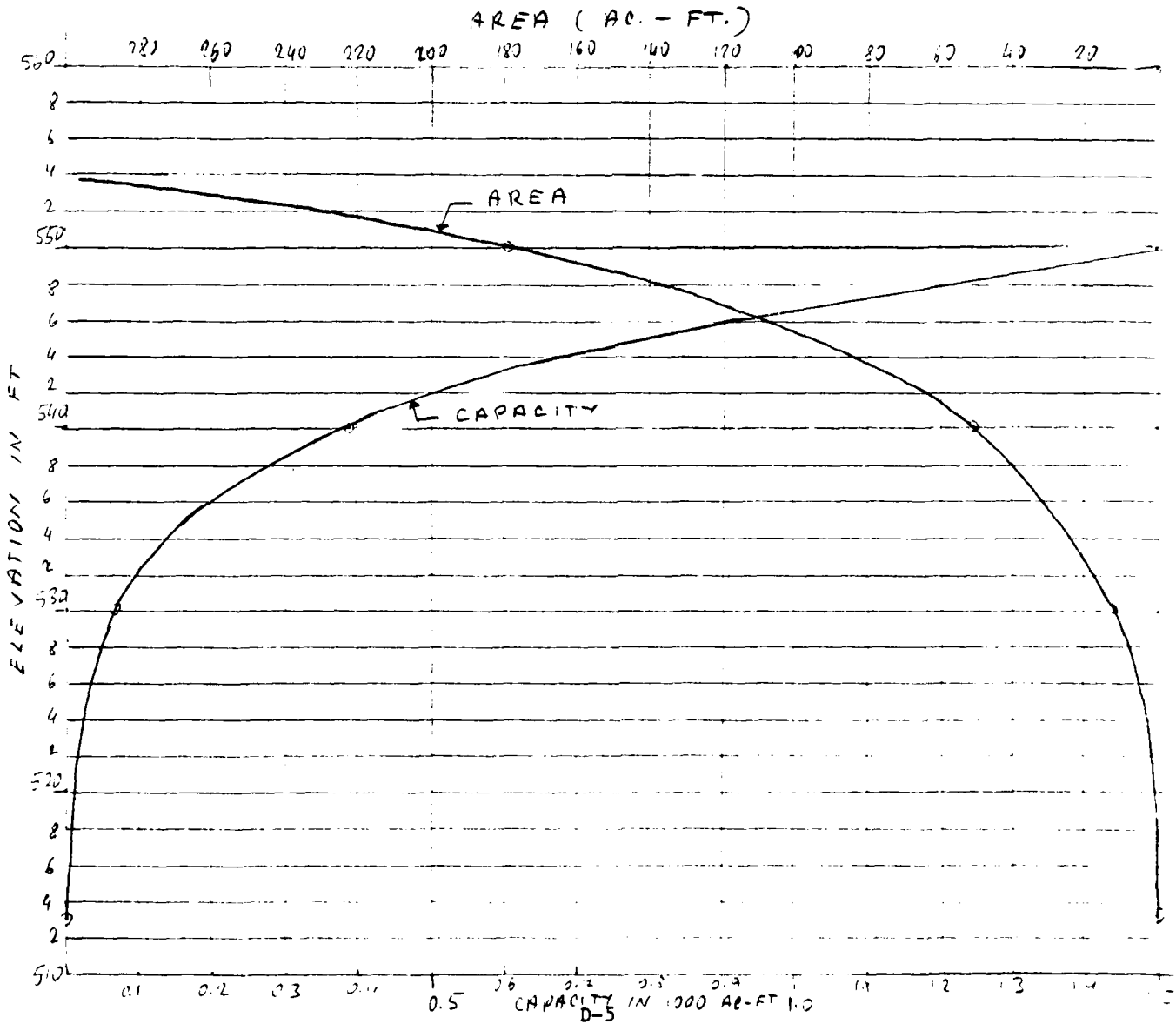
c. Surchage Height for Q<sub>p4</sub> and  
"New STOR<sub>AVG</sub>" should Agree  
closely

# MAIN

Client ORCS OF ENGINEERS Job No. 345-172 Sheet 1 of 4  
 Subject FLOOD ROUTING THROUGH RESERVOIR By T. OTOJA Date 4-21-72  
LIMESTONE COMMUNITY DAM Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

CAPACITY CURVE CALCULATIONS:

<u>ELV.</u>	<u>AREA (mi.<sup>2</sup>)</u>	<u>AREA (ACRE)</u>	<u>INCR. VOL. (AC-FT)</u>	<u>TOTAL VOL. (AC-F)</u>
513	0	0	0	0
530	0.02	12.8	725	725
540	0.08	51.2	320.0	3925
550	0.28	179.2	1152.0	1544.5



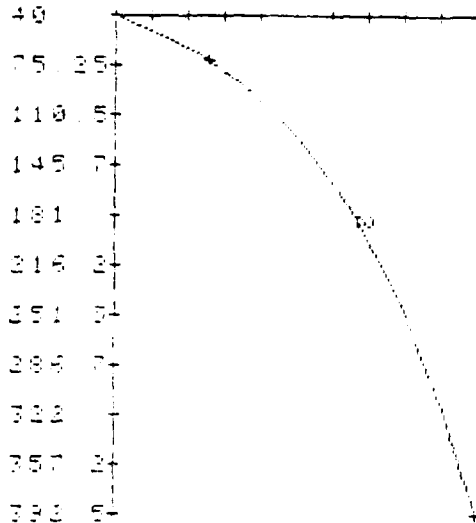
**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-072 Sheet 2 of 24  
 Subject LIMESTONE RESERVOIR By T. OTOVA Date 2-3-81  
CAPACITY CURVE FITTING Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

	I	X(I)	Y(I)
	1	40.0000	526.5000
	3	70.5000	530.0000
	5	99.5000	540.0000
ADJ. LOG REG. CODE	2		
SOURCE OF	SS	MS	F
TOTAL	2	98.2	
REG	1	98.2	98.2
RESID	1	0.0	0.0
R SQUARE =		1.000	

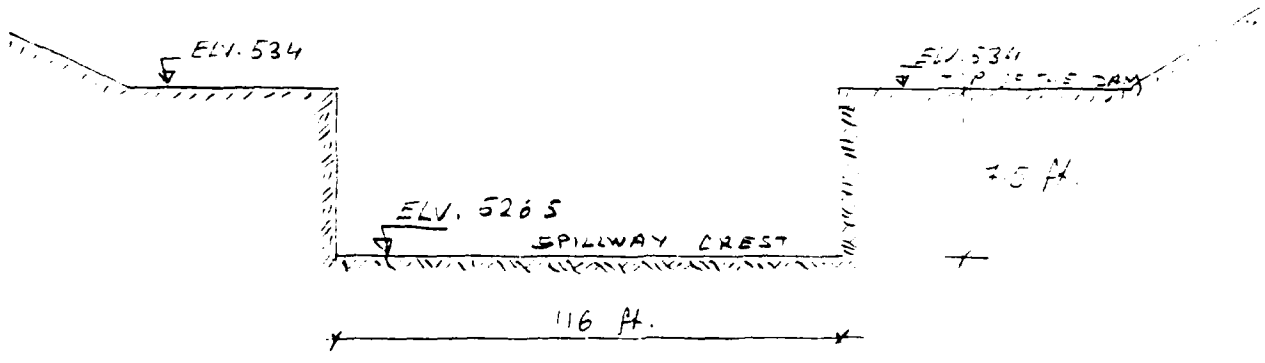
YHAT = 504.678 + 5.914 LOG X

5	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0



**MAIN**

Client CORPS OF ENGINEERS Job No. CE-772 Sheet 2 of 24  
 Subject LIMESTONE DAM By CTP Date 2-2-2  
SPILLWAY RATINGS CURVE Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_



Broad Crested Weir Formula,

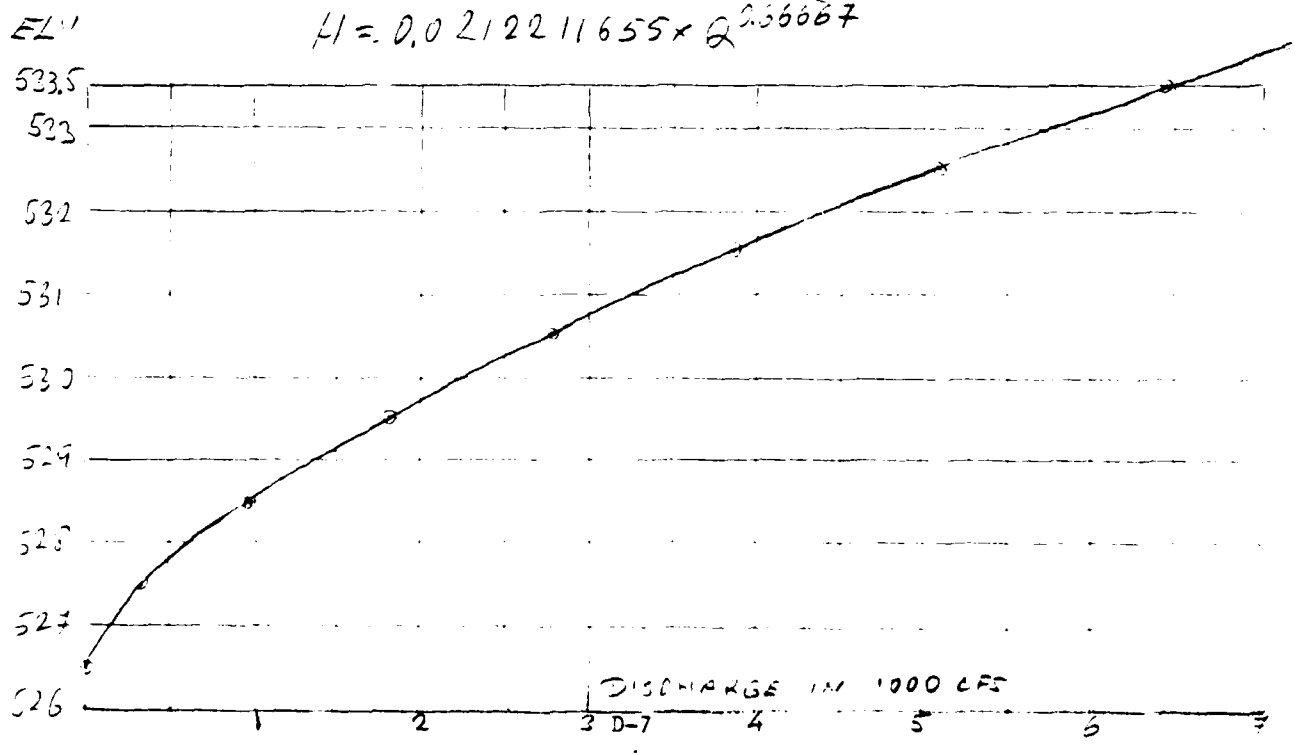
$$Q = C \cdot L \cdot H^{3/2}$$

$C \approx 3.0$   
 $L = 116$

$$Q = 348 \cdot H^{3/2}$$

$$H = \frac{1}{(348)^{2/3}} \cdot Q^{2/3}$$

$$H = 0.0212211655 \cdot Q^{2.56667}$$



**MAIN**

Client CORDS & ENGINEERS Job No. 345-272 Sheet 7 of 12  
Subject LIMESTONE RESERVOIR By T. T. F. A. Date 2-2-21  
FLOOD ROUTING CALCULATIONS Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

Drainage Area = 27.9 sq mi

For 17" runoff for rating curve  $Q_{PMF} = 350 \text{ cfs/sq mi}$

$$Q_{PMF} = 350 \times 27.9 = 9765 \text{ cfs.}$$

For this part of MAIN the Depth-Area-Duration curves yield a 13" of runoff. The Corps of Engineers New England Division also agrees that 13" of runoff should be used in the calculations.

In this case

$$\text{New } Q_{PMF} = 9765 \times \frac{13}{17} = 7477 \text{ cfs.}$$

The test flood is selected to be  $\frac{1}{2}$  PMF for test calculation. The routing calculations are presented in the following pages

$$\text{Test Flood} = 7477 \times \frac{1}{2} = 3738 \text{ cfs.}$$

The flood routing calculations are presented in pages 5 and 6. As it can be seen from the results the flow is surging. Had the  $\frac{1}{2}$  PMF been selected and the calculations were repeated (pages 7 and 8). The flood distribution (see fig. 1) is found to be almost equal to the eq.  $Q = 3738 \text{ cfs.}$

**MAIN**

Client CORPS OF ENGINEERS Job No. 315-17 Sheet 4 of 12  
Subject LIMESTONE CHANNEL SUPERIOR By T. J. W. Date 1-1-51  
200 SOILS SPECIFICATIONS Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

In order to estimate the amount of the overflowing the rating formula is altered to take care of water over the rim and through the natural crevices.

The revision of the rating formula is presented in pages 9 and 10. The rating table is tabulated in page 11. The rating curve is illustrated in page 12.

The rating calculations are shown in cases 13 and 14.

In view of the results presented in page 14 it is estimated that about 2.2 ft. overflowing will occur during the test flood (1/2 PMF).

11

**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-272 Sheet 5 of 24  
Subject LIMESTONE RESERVOIR By T. DOTOVA Date 2-3-81  
FLOOD ROUTING CALCULATIONS Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

ESTIMATING  
EFFECT OF SURCHARGE STORAGE  
ON MAXIMUM PROBABLE DISCHARGES

These calculations are performed according to the Corps of Engineers Guidelines

LIMESTONE DAM

DRAINAGE AREA

DRAINAGE AREA  
 $A = 27.9 \text{ (sq mi)}$

PEAK INFLOW  
 $Q_{p1} = 12985 \text{ (cfs)}$

PRINCIPAL SPILLWAY CREST ELEV.  
 $ELV1 = 526.5 \text{ (ft)}$

EMERGENCY SPILLWAY CREST ELEV.  
 $ELV2 = 526.5 \text{ (ft)}$

Emergency Spillway Rating Curve is defined as:

$$H = a + Q^b$$

$a = .0013311655$   
 $b = .66267$

The Capacity - Elev. curve is defined as:

$$ELV = m + n + Log(\text{Volume})$$

$m = 504.578$   
 $n = 9.314$

TOTAL PMF RUNOFF  
 $R = 13 \text{ (in)}$

CALCULATIONS

STEP 1

Reduction of the OAI due to starting elevation at Principal Spillway crest elev.

Volume at 526.5 (ft)

$\text{Volume}_1 = ELV1 - ELV2 = 0 \text{ (ft)}$   
 $\text{Volume}_1 = 40.04 \text{ (ac-ft)}$

Volume at 526.5 (ft)

$\text{Volume}_2 = ELV1 - ELV2 = 0 \text{ (ft)}$   
 $\text{Volume}_2 = 40.04 \text{ (ac-ft)}$

Diff. of Volumes

$\text{Diff. Volume} = 0 \text{ (ac-ft)}$   
 $\text{Diff. Volume} = 0 \text{ (in)}$

$\text{NEW } Q_{p1} = Q_{p1} + 1 - Q_{p1}$   
 $\text{NEW } Q_{p1} = 12985 \text{ (cfs)}$

STEP 2

Surcharge Height

$H = a + Q_{p1}^b$   
 $H = 11.66 \text{ (ft)}$

Surcharge Volume

$ELV = ELV2 + H$   
 $ELV = 538.16 \text{ (ft)}$

$\text{Volume} = 287.758 \text{ (ac-ft)}$

$\text{STOP1} = \text{Volume} - \text{Volume}_2$

$347.717 \text{ (ac-ft)}$

D-10  $\text{STOP1} = 16 \text{ (in)}$

**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-072 Sheet 6 of 24  
 Subject LIMESTONE RESERVOIR By T. OTOVA<sup>017</sup> Date 2-3-81  
FLOOD ROUTING CALCULATIONS Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

Corresponding Discharge:

$$Qp3 = Qp1 * (1 - \text{STOR1} / R)$$

$$Qp3 = 12719 \text{ (cfs)}$$

$$\text{NEW STO. AVE.} = ( \text{OLD STO. AVE.} + \text{STOR3} ) / 2$$

$$\text{NEW STO. AVE.} = .16 \text{ (in.)}$$

STEP 3

Surcharge Height:

$$H = a * Qp2 ^ b$$

$$H = 11.56 \text{ (ft.)}$$

$$Qp4 = Qp1 * ( 1 - \text{NEW STO. AVE} / R )$$

$$Qp4 = 12722 \text{ (cfs)}$$

Surcharge Height:

$$H4 = a * Qp4 ^ b$$

$$H4 = 11.56 \text{ (ft.)}$$

Surcharge Volume (STOR2):

$$ELW = ELW2 + H$$

$$ELW = 538.06 \text{ (ft.)}$$

$$E2 = H4 + H2$$

$$E2 = 538.06 \text{ (ft.)}$$

Volume = 282 943 (ac-ft)

$$\text{Diff. Volume} = \text{Volume} - \text{Volume2}$$

$$\text{Diff. Volume} = 242.902 \text{ (ac-ft)}$$

or

$$\text{STOR2} = .16 \text{ (in.)}$$

C H E C K I N G :

$$E3 - E2 = 0 \text{ (ft.)}$$

$$\text{OLD STO. AVE.} = ( \text{STOR1} + \text{STOR2} ) / 2$$

$$\text{OLD STO. AVE.} = .16 \text{ (in.)}$$

$$Qp3 = Qp1 * ( 1 - \text{OLD STO. AVE.} / R )$$

$$Qp3 = 12721 \text{ (cfs)}$$

R E S U L T S :

$$\text{AVERAGED DISCHARGE} = 12721 \text{ (cfs)}$$

$$\text{WATER SURFACE ELEV.} = 538.06 \text{ (ft.)}$$

$$\text{SURCHARGE HEIGHT} = 11.56 \text{ (ft.)}$$

STEP 4

Surcharge Height:

$$H3 = a * Qp3 ^ b$$

$$H3 = 11.56 \text{ (ft.)}$$

$$\text{CREST ELEV. OF THE DAM}$$

$$Ec = 534 \text{ (ft.)}$$

$$\text{VOLUME AT DAM CREST ELEV}$$

$$Vc = 142.318 \text{ (ac-ft)}$$

VOLUME AT MAX WATER SURFACE ELEV

$$Vw = 283.001 \text{ (ac-ft)}$$

Diff. Volume (STOR3):

$$E1 = H3 + H2$$

$$E1 = 538.06 \text{ (cfs)}$$

$$\text{Volume} = E1 * (E1 - mc) / n$$

$$\text{Volume} = 282.989 \text{ (ac-ft)}$$

$$\text{STOR3} = \text{Volume} - \text{Volume2}$$

$$\text{STOR3} = 242.949 \text{ (ac-ft)}$$

or

$$\text{STOR3} = .16 \text{ (in.)}$$

**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-072 Sheet 7 of 24  
 Subject LIMESTONE RESERVOIR By T. OTUKA Date 2-3-81  
FLOOD ROUTING CALCULATIONS Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

-----  
 CALCULATIONS  
 -----

-----  
 ESTIMATING  
 -----  
 EFFECT OF SURCHARGE STORAGE  
 -----  
 ON MAXIMUM PROBABLE DISCHARGES  
 -----

These calculations are performed according to the Corps of Engineers Guidelines

LIMESTONE DAM

D A T A  
 -----

DRAINAGE AREA,  
 $A = 27.9 \text{ (sq.mile)}$

PEAK INFLOW,  
 $Q_{P1} = 6442 \text{ (cfs)}$

PRINCIPAL SPILLWAY CREST ELEV.,  
 $ELW1 = 526.5 \text{ (ft)}$

EMERGENCY SPILLWAY CREST ELEV.,  
 $ELW2 = 526.5 \text{ (ft)}$

Emergency Spillway Rating Curve is defined as:

$$H = a + Q^b$$

$$a = 0212311855$$

$$b = 66667$$

The Capacity - Elev. curve is defined as:

$$ELV = m + n \sqrt[3]{\text{Local Volume}}$$

$$m = 594.673$$

$$n = 5.914$$

TOTAL RBF RUNOFF,  
 $R = 17 \text{ (in.)}$

S T E P 1  
 -----

Reduction of the crest due to starting elevation at Principal Spillway crest elev.

Volume at 526.5 (ft)

$$\text{Volume1} = \text{Area} \cdot \text{ELW1} - \text{m} \cdot \text{Area}$$

$$\text{Volume1} = 40.04 \text{ (ac-ft)}$$

Volume at 526.5 (ft)

$$\text{Volume2} = \text{Area} \cdot \text{ELW2} - \text{m} \cdot \text{Area}$$

$$\text{Volume2} = 40.04 \text{ (ac-ft)}$$

Diff. of Volumes:

$$\text{Diff. Volume} = 0 \text{ (ac-ft)}$$

or,

$$\text{Diff. Volume} = 0 = 0 \text{ (in.)}$$

$$\text{NEW } Q_{P1} = Q_{P1} \cdot (1 - 0.2R)$$

$$\text{NEW } Q_{P1} = 6442 \text{ (cfs)}$$

S T E P 2  
 -----

Surcharge Height:

$$H = a + Q_{P1}^b$$

$$H = 7.34 \text{ (ft)}$$

Surcharge Volume:

$$\text{ELV} = \text{ELW2} + H$$

$$\text{ELV} = 533.84 \text{ (ft)}$$

$$\text{Volume} = 138.621 \text{ (ac-ft)}$$

$$\text{STOP1} = \text{Volume} - \text{Volume2}$$

$$\text{STOP1} = 98.58 \text{ (ac-ft)}$$

or,

$$\text{STOP1} = 0.6 \text{ (in.)}$$

**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-032 Sheet 8 of 24  
Subject LIMESTONE RESERVOIR By T. OTOVA Date 2-3-77  
FLOOD ROUTING CALCULATIONS Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

Corresponding Discharge,

$Q_{P3} = Q_{P1} * (1 - \text{STOR1} / R)$   
 $Q_{P3} = 6409 \text{ (cfs)}$

$\text{NEW STO. AVE.} = ( \text{OLD STO. AVE.} + \text{STOR3} ) / 2$   
 $\text{NEW STO. AVE.} = .06 \text{ (in.)}$

S T E P 3

$Q_{P4} = Q_{P1} * ( 1 - \text{NEW STO. AVE.} / R )$   
 $Q_{P4} = 6409 \text{ (cfs)}$

Surcharge Height,

Surcharge Height

$H = a * Q_{P3} ^ b$   
 $H = 7.32 \text{ (ft.)}$

$H4 = a * Q_{P4} ^ b$   
 $H4 = 7.32 \text{ (ft.)}$

Surcharge Volume,  $\text{STOR2}$ ,

$E2 = H4 + H2$   
 $E2 = 533.92 \text{ (ft.)}$

$\text{ELW} = \text{ELW2} + H$   
 $\text{ELW} = 533.92 \text{ (ft.)}$

Volume = 138.106 (ac-ft)

Diff. Volume = Volume - Volume2  
Diff. Volume = 98.065 (ac-ft)  
or  
 $\text{STOR2} = .06 \text{ (in.)}$

C H E C K I N G :  
 $E3 - E2 = 0 \text{ (ft.)}$

$\text{OLD STO. AVE.} = ( \text{STOR1} + \text{STOR2} ) / 2$   
 $\text{OLD STO. AVE.} = .06 \text{ (in.)}$

R E S U L T S :

$Q_{P3} = Q_{P1} * ( 1 - \text{OLD STO. AVE.} / R )$   
 $Q_{P3} = 6409 \text{ (cfs)}$

AVERAGED DISCHARGE = 6409 (cfs)

WATER SURFACE ELEV. = 533.92 (ft.)

S T E P 4

SURCHARGE HEIGHT = 7.32 (ft.)

CREST ELEV. OF THE DAM  
 $E_c = 534 \text{ (ft.)}$

Surcharge Height

VOLUME AT DAM CREST ELEV.  
 $V_c = 142.318 \text{ (ac-ft)}$

$H3 = a * Q_{P3} ^ b$   
 $H3 = 7.32 \text{ (ft.)}$

VOLUME AT MAX. WATER SURFACE ELEV.

Diff. Volume,  $\text{STOR3}$ ,

$V_w = 138.106 \text{ (ac-ft)}$

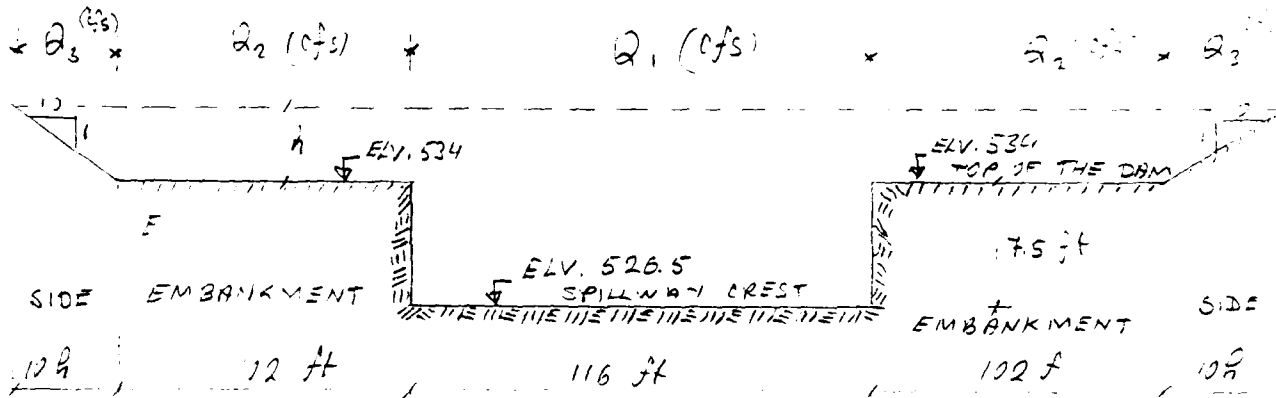
$E1 = H3 + H2$   
 $E1 = 533.92 \text{ (cfs)}$   
Volume =  $E_{P3} * (E1 - m) * n$   
Volume = 138.107 (ac-ft)

$\text{STOR3} = \text{Volume} - \text{Volume2}$   
 $\text{STOR3} = 98.067 \text{ (ac-ft)}$   
or  
 $\text{STOR3} = .06 \text{ (in.)}$

**MAIN**

Client CORP. OF ENGINEERS Job No. 345-742 Sheet 3 of 14  
 Subject LIMESTONE COMMUNITY RES. By T. J. J. J. Date 2-9-74  
FLOOD ROUTING Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

DETERMINATION OF THE OVERTOPPING



RATING FORMULA FOR THE SPILLWAY

$$Q_1 = C \times L \times H^{3/2}$$

$$Q_1 = 3.0 \times 116 \times H^{3/2} = 348 H^{3/2} \quad \text{--- (I)}$$

$$\text{or } H = \frac{1}{(348)^{2/3}} \times Q_1^{2/3}$$

$$H \approx 0.2202122 \times Q_1^{2/3} \quad \text{--- (II)}$$

RATING FORMULA FOR THE EMBANKMENTS

$$2 \times Q_2 = 2.9 \times 102 \times 2 \times h^{3/2}$$

$$2 \times Q_2 = 591.6 h^{3/2} \quad \text{--- (III)}$$

**MAIN**

Client CORPS OF ENGINEERS Job No. 265-172 Sheet 10 of 24  
 Subject LIMESTONE COMMUNITY RESERVOIR By T. OTTO Date 2-2-21  
FLOOD ROUTING Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

RATING FORMULA FOR THE SIDES

$$2 \times Q_3 = \frac{1.49 \times A \times R^{2/3} \times S^{1/2}}{m} \times 2$$

$$A = \frac{10 \times h \times h}{2} = 5h^2$$

$$P = [h^2 + (10h)^2]^{0.5} = h(1+10^2)^{0.5} \approx 10.05h$$

$$R = \frac{A}{P} = \frac{5h^2}{10.05h} = 0.4975 \times h$$

$m = 0.07$  }  
 $S = 0.04$  } 30th estimated

$$2 \times Q_3 = \frac{1.49 \times 5 \times h^2 \times (0.4975)^{2/3} \times h^{2/3} \times (0.04)^{0.5}}{0.07} \times 2$$

$$2 \times Q_3 = \frac{1.49 \times 5 \times (0.4975)^{2/3} \times (0.04)^{0.5} \times 2}{0.07} \times h^{8/3}$$

$$2 \times Q_3 \approx 26.73 \times h^{8/3} \quad \text{--- (IV)}$$

FOR THE CASE OF OVERTOPPING  
 THE RATING FORMULA:

$$Q = Q_1 + 2Q_2 + 2Q_3 \quad L = h + 7.5$$

$$Q = 348 (h + 7.5)^{3/2} + 591.6 h^{3/2} + 26.73 h^{8/3}$$

**MAIN**

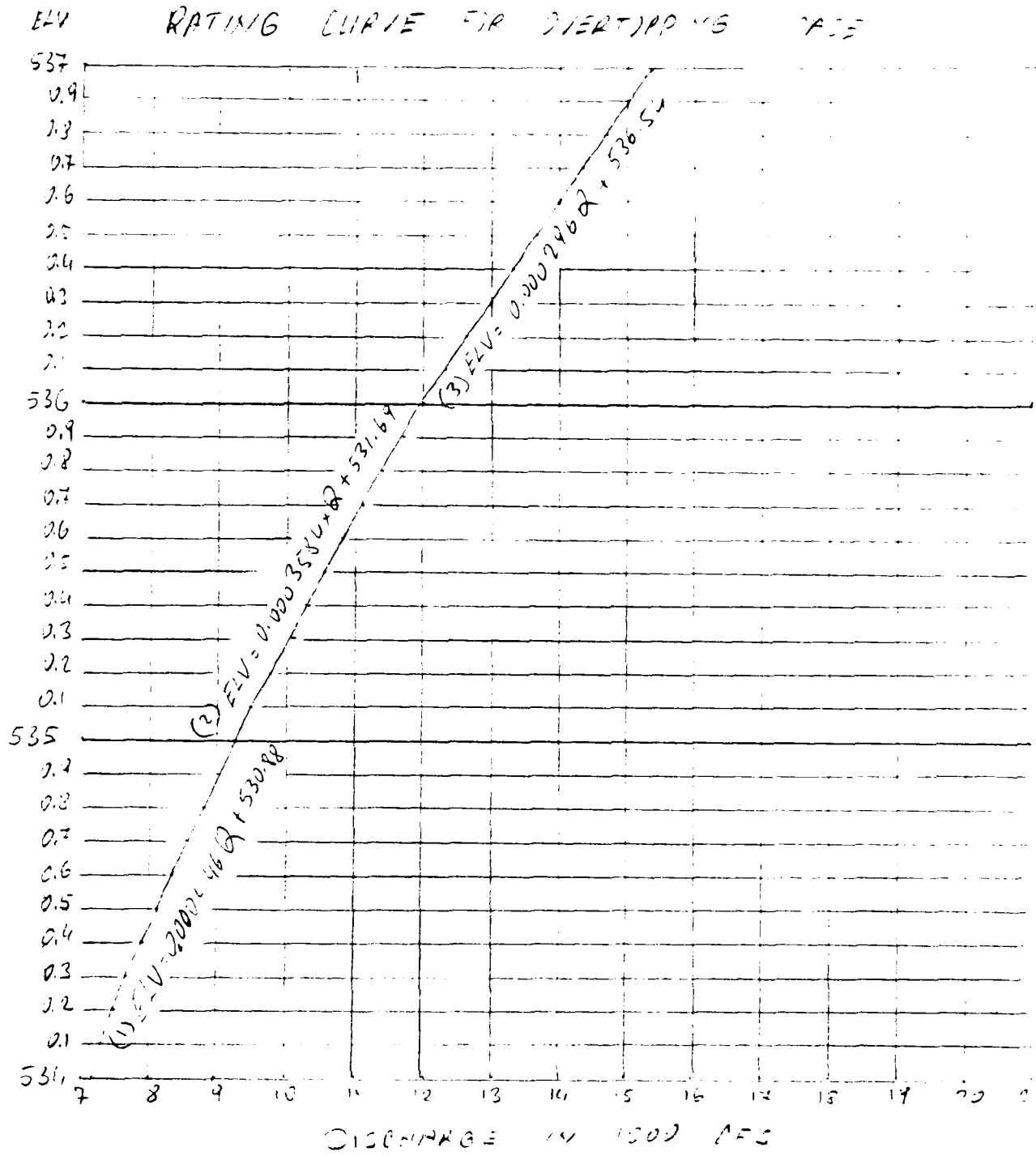
Client CORPS OF ENGINEERS Job No. 1345-072 Sheet 11 of 24  
 Subject LIMESTONE COMMUNITY RESERVOIR By T. OTOVA Date 2-4-87  
FLOOD ROUTING Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

RATING TABLE FOR WATER LEVELS ABOVE THE DAM

HEIGHT	DISCHARGE
0	77147
0	77300
0	77440
0	77560
0	77660
0	77740
0	77800
0	77840
0	77860
0	77870
0	77870
0	77860
0	77840
0	77800
0	77740
0	77660
0	77560
0	77440
0	77300
0	77147
0	76980
0	76800
0	76600
0	76380
0	76140
0	75880
0	75600
0	75300
0	74980
0	74640
0	74280
0	73900
0	73500
0	73080
0	72640
0	72180
0	71700
0	71200
0	70680
0	70140
0	69580
0	69000
0	68400
0	67780
0	67140
0	66480
0	65800
0	65100
0	64380
0	63640
0	62880
0	62100
0	61300
0	60480
0	59640
0	58780
0	57900
0	57000
0	56080
0	55140
0	54180
0	53200
0	52200
0	51180
0	50140
0	49080
0	48000
0	46900
0	45780
0	44640
0	43480
0	42300
0	41100
0	39880
0	38640
0	37380
0	36100
0	34800
0	33480
0	32140
0	30780
0	29400
0	27980
0	26540
0	25080
0	23600
0	22100
0	20580
0	19040
0	17480
0	15900
0	14300
0	12680
0	11040
0	9380
0	77147

**MAIN**

Client DOBR JE ENGINEERS Job No. 345-272 Sheet 12 of 24  
 Subject ZIMESTONE COMMUNITY SEWER By J. J. J. Date 8-1-71  
FLOOD ROUTING Ckd. Rev



OR,  
 (1)  $H_1 = 0.000246Q - 3.12$       (3)  $H_1 = 0.000296Q - 1.55$   
 (2)  $H_1 = 0.000358Q - 2.31$       b-17  $H_1 =$  surcharge height (ft)

**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-072 Sheet 13 of 24  
 Subject LIMESTONE COMMUNITY RESERVOIR By T. OTOVA<sup>017</sup> Date 2-4-21  
FLOOD ROUTING Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

ESTIMATING  
EFFECT OF SUPCHARGE STORAGE  
ON MAXIMUM PROBABLE DISCHARGES

Rating Curve Channel Discharges

Q1= 7147  
 Q2= 9242  
 Q3= 12032

These calculations are performed according to the Corps of Engineers Guidelines

The Capacity - Elv. curve is defined as:

$Elv = m + n * Log(Volume)$

m= 504.678  
 n= 5.914

LIMESTONE DAM

TOTAL PMF RUNOFF,  
 R= 13 (in.)

O A T A :

CALCULATIONS:

DRAINAGE AREA,  
 A= 27.9 (sq.mi.)

S T E P 1

PEAK INFLOW,  
 Qp1= 12885 (cfs)

Reduction of the Qp1 due to starting elevation at Principal Spillway crest elev.

THE CREST ELV. OF THE DAM = 534 (ft)

PRINCIPAL SPILLWAY CREST ELEV.,  
 ELV1= 526.5 (ft.)

Volume at 526.5 (ft.)

EMERGENCY SPILLWAY CREST ELEV.,  
 ELV2= 526.5 (ft.)

$Volume1 = Exp((ELV1-m)/n)$   
 Volume1 = 40.04 (ac-ft)

Rating Curve is defined as :

Volume at 526.5 (ft.)

$H = a1 * Q ^ b1$  (III) for before overtopping  
 $H = a1 * Q + b1$  (III) for after overtopping

$Volume2 = Exp((ELV2-m)/n)$   
 Volume2 = 40.04 (ac-ft)

a1 = .0202122  
 b1 = .66667

Diff. of Volumes:

a2 = .000446  
 b2 = -3.12

Diff. Volume = 0 (ac-ft)  
 or,  
 Diff. Volume, D= 0 (in.)

a3 = .0003584  
 b3 = -2.31

a4 = .000296  
 b4 = -1.56

NEW Qp1=Qp1\*(1-D/R)  
 NEW Qp1 = 12885 (cfs)

**MAIN**

STEP 4

Job No. 1345-072-010

By T.OTOVA

Client CORPS OF ENGINEERS

Subject LIMESTONE RES. FLOOD ROUTING

Surcharge Height  
From Formula (III)  
H3 = 9.72 (ft.)

Ckd. \_\_\_\_\_  
Sheet 1a of 2a  
Date 2-4-81  
Rev. \_\_\_\_\_

STEP 2

Surcharge Height,

From Formula (III)  
H = 9.75 (ft.)

Surcharge Volume,

ELW = ELW3 + H  
ELW = 536.25 (ft.)

Volume = 288 343 (ac-ft)

STOR1 = Volume - Volume2

STOR1 = 168.303 (ac-ft)

or  
STOR1 = .11 (in.)

Corresponding Discharge,

Qp2 = Qp1 \* (1 - STOR1 / R)  
Qp2 = 12773 (cfs)

STEP 3

Surcharge Height,

From Formula (III)  
H = 9.72 (ft.)

Surcharge Volume, STOR2,

ELW = ELW3 + H  
ELW = 536.22 (ft.)

Volume = 307 177 (ac-ft)

Diff. Volume = Volume - Volume2  
Diff. Volume = 167.137 (ac-ft)

or  
STOR2 = .11 (in.)

OLD STOR. AVE = ( STOR1 + STOR2 ) / 2

OLD STOR. AVE = .11 (in.)

Qp3 = Qp1 \* ( 1 - OLD STOR. AVE. / R )

Qp3 = 12773 (cfs)

D-19

Diff. Volume, STOR3,

E1 = H3 + H2  
E1 = 536.22 (cfs)  
Volume = EXP((E1-m)/n)  
Volume = 207.181 (ac-ft)

STOR3 = Volume - Volume2  
STOR3 = 167.141 (ac-ft)  
or  
STOR3 = .11 (in.)

NEW STOR. AVE. = ( OLD STOR. AVE. + STOR3 ) / 2  
NEW STOR. AVE. = .11 (in.)

Qp4 = Qp1 \* ( 1 - NEW STOR. AVE. / R )  
Qp4 = 12773 (cfs)

Surcharge Height

From Formula (III)  
H4 = 9.72 (ft.)

E2 = H4 + H2  
E2 = 536.22 (ft.)

C H E C K I N G :

E3 - E2 = 0 (ft.)

R E S U L T S :

AVERAGED DISCHARGE = 12773 (cfs)

WATER SURFACE ELEV = 536.22 (ft.)

SURCHARGE HEIGHT = 9.72 (ft.)

CREST ELEV. OF THE DAM  
Ec = 534 (ft.)

VOLUME AT DAM CREST ELEV.  
Vc = 142.318 (ac-ft)

VOLUME AT MAX WATER SURFACE ELEV

VW = 207.182 (ac-ft)

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**MAIN**

Client CORPS OF ENGINEERS Job No. 1245-077 Sheet 15 of 24  
 Subject LIMESTONE COMMUNITY DAM By T. TOVA Date 2-4-81  
FAILURE ANALYSES Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

Determination of the pre-failure depths and the submergence of the spillway due to failure discharges.

LIMESTONE DAM  
 DAM FAILURE ANALYSES  
 -----

These calculations are performed according to the RULE OF THUMB procedures of the Corps of Engineers.

The breach discharge:  
 $Q_{pl} = 8.27 * W_b * e^{0.5} * Y_0^{3/2}$

Where,

$Y_0$  is the height of the breach (from river bed to the max. pool level)

$W_b$  is 35% of the length of the dam, or  $W_b = 35 * W_d$

$e$  is the acceleration of the area with  $(32.2 \text{ ft-sec}^{-2})$

$Y_0 = 19 \text{ (ft)}$

$W_d = 320 \text{ (ft)}$

$W_b = 112 \text{ (ft)}$

From above equation:  
 $Q_{pl} = 15595 \text{ (cfs)}$

The natural channel cross sections are simplified as triangular cross sections

The stage-discharge relationship becomes as:

$h = [1.068 * n * \tan(\alpha) + 0.1 * 0.0001 * 2.43 * 80.5]^{1/3} * Q^{1/3}$

Where,

- $Q$  = Discharge (cfs)
- $n$  = Side slope angle (deg)
- $\alpha$  = Channel slope

The cross section Area:

$A = h^2 / \tan(\alpha) \quad (II)$

The Volume of the Reservoir

$V = 143 \text{ (ac-ft)}$

$Q = 118520 \text{ (cud-ft)}$

**MAIN**

Client CORP OF ENGINEERS

Job No. 1345-077 Sheet 16 of 24

Subject LIMESTONE DAM

By T. OTOVA Date 2-4-21

FAILURE ANALYSES

Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

$Q_{P2} = Q_{P1} + (1 - V1 / V2)$

$Q_{P2} = 15535 \text{ cfs}$

From Formula (I)

$Q = Q_{P2} + Q_t$

$Q = 22682 \text{ cfs}$

$h = 16 \text{ (ft)}$

From Formula (II)

$A = 4872 \text{ (sq-ft)}$

Residual Area:

$A_2 = A - A_1$

$A_2 = 3363 \text{ (sq-ft)}$

$W_2 = A_2 \times L$

$W_2 = 33639 \text{ (cub-ft)}$

$W_{ave} = (W_1 + W_2) / 2$

$W_{ave} = 23679 \text{ (cub-ft)}$

$Q_{P2} = Q_{P1} + (1 - W_{ave} / W_1)$

$Q_{P2} = 15535 \text{ cfs}$

From Formula (I)

$Q = Q_{P2} + Q_t$

$h_2 = 16.8 \text{ (ft)}$

**RESULTS**

- 1.) Prefailure Height = 10.9 (ft)
- 2.) Postfailure Height = 16.8 (ft)
- 3.) Breach Discharge = 15535 (cfs)
- 4.) Reach Length = 10 (ft)

REACH WIDTH CALCULATIONS

Test flood discharge:  
 $Q_t = 7147 \text{ (cfs)}$

- $z = 4 \text{ (deg)}$
- $S = .004$
- $n = .07$
- $L = 10 \text{ (ft)}$

From Formula (I)

Prefailure height:

$h_1 = 10.9 \text{ (ft)}$

From Formula (II)

$A_1 = 1715 \text{ (sq-ft)}$

$Q = Q_{P1} + Q_t$

From Formula (I)

Total Height:

$h = 16.9 \text{ (ft)}$

From Formula (II)

Total Area:  
 $A = 4887 \text{ (sq-ft)}$

Residual Area:

$A_2 = A - A_1$

$A_2 = 3371 \text{ (sq-ft)}$

Residual Volume:

$W_1 = L \times A_2$

$W_1 = 33719 \text{ (cub-ft)}$

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**MAIN**

Client CORPS OF ENGINEERS

Job No. 134C-072 Sheet 17 of 24

Subject LIMESTONE DAM

By T. OTOVA Date 2-4-81

FAILURE ANALYSES

Rev.             
 $Q_{p2} = Q_{p1} * (1 - W1 / W)$

$Q_{p2} = 12567 \text{ (cfs)}$

From Formula (I)

$Q = Q_{p2} + Q_t$

$Q = 13714 \text{ (cfs)}$

P E A C H ( I ) CALCULATIONS

Test flood discharge:  
 $Q_t = 7147 \text{ (cfs)}$

$s = 4 \text{ (deg)}$   
 $S = .004$   
 $n = .07$   
 $L = 500 \text{ (ft)}$

From Formula (I)

Prefailure height,

$h_1 = 10.9 \text{ (ft)}$

From Formula (II)

$A_1 = 1715 \text{ (sq ft)}$

$Q = Q_{p1} + Q_t$

From Formula (I),  
Total Height,  
 $h = 16.8 \text{ (ft)}$

From Formula (II),  
Total Area,  
 $A = 4079 \text{ (sq-ft)}$

Residual Area,  
 $A_2 = A - A_1$   
 $A_2 = 2363 \text{ (sq-ft)}$

Residual Volume,

$W_1 = L * A_2$

$W_1 = 1181372 \text{ (cub-ft)}$

$h = 16 \text{ (ft)}$

From Formula (III)

$A = 2672 \text{ (ft)}$

Residual Area,

$A_2 = A - A_1$

$A_2 = 1356 \text{ (ft)}$

$W_2 = A_2 * L$

$W_2 = 978277 \text{ (cub-ft)}$

$Wave = (W_1 + W_2) / 2$

$Wave = 1080124 \text{ (cub-ft)}$

$Q_{p2} = Q_{p1} * (1 - Wave / W)$

$Q_{p2} = 12827 \text{ (cfs)}$

From Formula (I)

$Q = Q_{p2} + Q_t$

$h_2 = 16.1 \text{ (ft)}$

RESULTS

1 ) Prefailure Height = 10.9 (ft)

2 ) Postfailure Height = 16.1 (ft)

3 ) Breach Discharge = 12827 (cfs)

4 ) Beach Length = 500 (ft)

**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-072 Sheet 18 of 24  
Subject LIMESTONE DAM By T. OTTAVIA Date 2-4-81  
FAILURE ANALYSIS Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

$$Q_{P2} = Q_{P1} * (1 - V1 / V)$$
$$Q_{P2} = 10757 \text{ (cfs)}$$

From Formula (I),

$$Q = Q_{P2} + Q_t$$
$$Q = 17904 \text{ (cfs)}$$

REACH (2) CALCULATIONS

Test flood discharge:  
 $Q_t = 7147 \text{ (cfs)}$

$a = 4 \text{ (deg.)}$   
 $S = .004$   
 $n = .07$   
 $L = 500 \text{ (ft)}$

From Formula (I),  
Prefailure height,  
 $h_1 = 10.9 \text{ (ft)}$

From Formula (II),  
 $A_1 = 1715 \text{ (sq. ft.)}$

$Q = Q_{P1} + Q_t$

From Formula (I),  
Total Height,  
 $h = 15.1 \text{ (ft)}$

From Formula (II),  
Total Area,  
 $A = 3707 \text{ (sq-ft)}$

Residual Area,  
 $A_2 = A - A_1$   
 $A_2 = 1992 \text{ (sq-ft)}$

Residual Volume,  
 $V_1 = L * A_2$   
 $V_1 = 996117 \text{ (cub-ft)}$

$h = 15 \text{ (ft)}$

From Formula (II),  
 $A = 3416 \text{ (ft)}$

Residual Area,  
 $A_2 = A - A_1$   
 $A_2 = 1700 \text{ (ft)}$

$V_2 = A_2 * L$   
 $V_2 = 850390 \text{ (cub-ft)}$

$Wave = (V_1 + V_2) / 2$   
 $Wave = 923253 \text{ (cub-ft)}$

$Q_{P2} = Q_{P1} * (1 - Wave / V)$   
 $Q_{P2} = 10909 \text{ (cfs)}$

From Formula (I),  
 $Q = Q_{P2} + Q_t$   
 $h_2 = 15.5 \text{ (ft)}$

RESULTS

- 1 ) Prefailure Height = 10.9 (ft)
- 2 ) Postfailure Height = 15.5 (ft)
- 3 ) Breach Discharge = 10909 (cfs)
- 4 ) Reach Length = 500 ft

**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-D-2 Sheet 19 of 24  
 Subject LIMESTONE DAM By T. STOVA Date 2-5-21  
FAILURE ANALYSES Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

Determination of the downstream flood levels by considering the reduction of the spillway discharge due to submergence effects.

"Ref. Design of Small Dams, pp. 380 figure 252, 1948."

$H_e = 7.5 \text{ ft}$   $h_d = 14 - 16.8 = 2.7 \text{ ft}$   $h_d/H_e = 0.29$

$\frac{h_d + H_e}{H_e} = \frac{17}{7.5} = 2.53$

Reduction = 6 percent

$Q_E = 7147 \times 0.94 = 6718 \text{ cfs}$

LIMESTONE DAM  
 DAM FAILURE ANALYSES  
 -----

These calculations are performed according to the RULE OF THUMB procedures of the Corps of Engineers

The breach discharge  
 $Q_{B1} = 8.27 * W_b * a * 0.5 * 100^{3/2}$

Where,

$W_b$  is the height of the breach from river bed to the main pool level.

$a$  is 75% of the length of the dam, or  $W_b = .75 * W_d$

$g$  is the acceleration of the gravity (32.2 ft/sec<sup>2</sup>)

$W_b = 19 \text{ (ft)}$

$W_d = 320 \text{ (ft)}$

$W_b = 113 \text{ (ft)}$

From above equation,  
 $Q_{B1} = 15595 \text{ cfs}$

The natural channel cross sections are simplified as triangular cross sections

The stage-discharge relationship becomes as

$h = [1.066 * (n + \tan^2 \alpha) * Q / C]^{2/3} * 1.48 * S^{1/3}$

Where

- $Q$  = Discharge (cfs)
- $n$  = Side slope angle (degrees)
- $S$  = Channel slope

The cross section Area

$A = h^2 / 2 * \tan^2 \alpha$

The Volume of the Reservoir

$V = 143 \text{ (acre-ft)}$

or

$V = 6135520 \text{ (cu-ft)}$

ADA 156 277

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS  
LIMESTONE DAM (ME 004... (U) CORPS OF ENGINEERS WALTHAM  
MA NEW ENGLAND DIV SEP 81

23

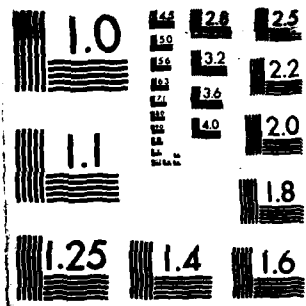
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-072 Sheet 20 of 24  
 Subject LIMESTONE DAM By T. OTOVA Date 2-5-81  
FAILURE ANALYSIS Ctd. Rev.

$$Q_{P2} = Q_{P1} * (1 - V1 / V)$$

$$Q_{P2} = 12580 \text{ (cfs)}$$

From Formula (I),

$$Q = Q_{P2} + Q_t$$

$$Q = 19298 \text{ (cfs)}$$

$$h = 15 \text{ (ft)}$$

From Formula (II),

$$A = 3613 \text{ (ft)}$$

Residual Area,

$$A_2 = A - A_1$$

$$A_2 = 1976 \text{ (ft)}$$

$$V_2 = A_2 * L$$

$$V_2 = 988064 \text{ (cub-ft)}$$

$$V_{ave} = (V_1 + V_2) / 2$$

$$V_{ave} = 1091997 \text{ (cub-ft)}$$

$$Q_{P2} = Q_{P1} * (1 - V_{ave} / V)$$

$$Q_{P2} = 12842 \text{ (cfs)}$$

From Formula (I),

$$Q = Q_{P2} + Q_t$$

$$h_2 = 15.9 \text{ (ft)}$$

**RESULTS**

- 1.) Prefailure Height = 10.7 (ft)
- 2.) Postfailure Height = 15.9 (ft)
- 3.) Breach Discharge = 12842 (cfs)
- 4.) Reach Length = 500 (ft)

REACH (1) CALCULATIONS

Test flood discharge:  
 $Q_t = 5718 \text{ (cfs)}$

- $z = 4 \text{ (deg.)}$
- $S = .004$
- $n = .07$
- $L = 500 \text{ (ft)}$

From Formula (I),

Prefailure height,

$$h_1 = 10.7 \text{ (ft)}$$

From Formula (II),

$$A_1 = 1637 \text{ (sq-ft)}$$

$$Q = Q_{P1} + Q_t$$

From Formula (I),

Total Height,

$$h = 16.7 \text{ (ft)}$$

From Formula (II),

Total Area,

$$A = 4029 \text{ (sq-ft)}$$

Residual Area,

$$A_2 = A - A_1$$

$$A_2 = 2391 \text{ (sq-ft)}$$

Residual Volume,

$$V_1 = L * A_2$$

$$V_1 = 1195930 \text{ (cub-ft)}$$

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**MAIN**

Client CORP OF ENGINEERS Job No. 1345-032 Sheet 21 of 24  
Subject LIMESTONE DAM By T. O. F. J. A. Date 2-5-81  
FAILURE ANALYSES Cld. \_\_\_\_\_ Rev. \_\_\_\_\_

$$Qp2 = Qp1 * ( 1 - V1 / V )$$
$$Qp2 = 10752 \text{ (cfs)}$$

From Formula (I),

$$Q = Qp2 + Qt$$
$$Q = 17470 \text{ (cfs)}$$

P E A C H ( 2 ) CALCULATIONS

Test flood discharge:  
 $Qt = 6718 \text{ (cfs)}$

$$a = 4 \text{ (deg.)}$$
$$S = .004$$
$$n = .07$$
$$L = 500 \text{ (ft)}$$

From Formula (I),

Prefailure height,

$$h1 = 10.7 \text{ (ft)}$$

From Formula (II),

$$A1 = 1637 \text{ (sq. ft.)}$$

$$Q = Qp1 + Qt$$

From Formula (I),  
Total Height,  
 $h = 15.9 \text{ (ft)}$

From Formula (II),  
Total Area,  
 $A = 3650 \text{ (sq-ft)}$

Residual Area,  
 $A2 = A - A1$   
 $A2 = 2012 \text{ (sq-ft)}$

Residual Volume,

$$V1 = L * A2$$

$$V1 = 1006436 \text{ (cub-ft)}$$

$$h = 15 \text{ (ft)}$$

From Formula (II),

$$A = 3354 \text{ (ft)}$$

Residual Area,

$$A2 = A - A1$$

$$A2 = 1716 \text{ (ft)}$$

$$V2 = A2 * L$$

$$V2 = 858142 \text{ (cub-ft)}$$

$$Vave = ( V1 + V2 ) / 2$$

$$Vave = 932289 \text{ (cub-ft)}$$

$$Qp2 = Qp1 * ( 1 - Vave / V )$$

$$Qp2 = 10906 \text{ (cfs)}$$

From Formula (I),

$$Q = Qp2 + Qt$$

$$h2 = 15.3 \text{ (ft)}$$

RESULTS :

- 1.) Prefailure Height = 10.7 (ft)
- 2.) Postfailure Height = 15.3 (ft)
- 3.) Breach Discharge = 10906 (cfs)
- 4.) Reach Length = 500 (ft)

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**MAIN**

Client CORPS OF ENGINEERS Job No. 1345-272 Sheet 22 of 24  
Subject LIMESTONE DAM By T. OTOVA Date 2-5-21  
FAILURE ANALYSES Chd. \_\_\_\_\_ Rev. \_\_\_\_\_

Determination of the downstream flood levels due to failure of the dam in dry conditions ( $Q_{test} = 0$  cfs)

LIMESTONE DAM  
DAM FAILURE ANALYSES  
-----

These calculations are performed according to the RULE OF THUMB procedures of the Corps of Engineers

The breach discharge:  
 $Q_{b1} = 3/27 * W_b * a^{0.5} * Y_o^{3/2}$

Where,

$Y_o$  is the height of the breach (from river bed to the max. pool level)

$W_b$  is 35% of the length of the dam, or  $W_b = .35 * W_d$

$a$  is the acceleration of the gravity (32.2 ft/sec<sup>2</sup>)

- $Y_o = 11.5$  (ft)
- $W_d = 170$  (ft)
- $W_b = 59$  (ft)

From above equation:  
 $Q_{b1} = 3901$  (cfs)

The natural channel cross sections are simplified as triangular cross sections

The stage-discharge relationship becomes as:

$$h = [ 1.068 * n * \tan(a) * Q / C_{os}(a)^{2/3} / S^{1/3} ]^{3/8} \dots (I)$$

Where,

- $Q$  = Discharge (cfs)
- $a$  = Side slope angle (deg)
- $S$  = Channel slope

The cross section Area:

$$A = h^2 / \tan(a) \dots (II)$$

The Volume of the Reservoir:

- $V = 40$  (ac-ft)
- or
- $V = 1742400$  (cub-ft)

**MAIN**

11

Client CORPS OF ENGINEERS Job No. 1345-072 Sheet 23 of 24  
 Subject LIMESTONE DAM By T. OTUVA Date 2-5-81  
FAILURE ANALYSES Chd. \_\_\_\_\_ Rev. \_\_\_\_\_

REACH (1) CALCULATIONS

Test flood discharge:  
 $Q_t = 0$  (cfs)

$s = 4$  (deg.)  
 $S = .004$   
 $n = .07$   
 $L = 500$  (ft)

From Formula (I),

Prefailure height,

$h_1 = 0$  (ft)

From Formula (II),

$A_1 = 0$  (sq-ft)

$Q = Q_{p1} + Q_t$

From Formula (I),  
Total Height,  
 $h = 8.7$  (ft)

From Formula (II),  
Total Area,  
 $A = 1089$  (sq-ft)

Residual Area,  
 $A_2 = A - A_1$   
 $A_2 = 1089$  (sq-ft)

Residual Volume

$V_1 = L * A_2$

$V_1 = 544793$  (cub-ft)

$Q_{p2} = Q_{p1} * (1 - V_1 / V)$

$Q_{p2} = 2681$  (cfs)

From Formula (I),

$Q = Q_{p2} + Q_t$

$Q = 2681$  (cfs)

$h = 7$  (ft)

From Formula (II),

$A = 822$  (ft)

Residual Area,

$A_2 = A - A_1$

$A_2 = 822$  (ft)

$V_2 = A_2 * L$

$V_2 = 411250$  (cub-ft)

$V_{ave} = (V_1 + V_2) / 2$

$V_{ave} = 478021$  (cub-ft)

$Q_{p2} = Q_{p1} * (1 - V_{ave} / V)$

$Q_{p2} = 2681$  (cfs)

From Formula (I),

$Q = Q_{p2} + Q_t$

$h_2 = 7.7$  (ft)

RESULTS :

1 ) Prefailure Height = 0 (ft)

2 ) Postfailure Height = 7.7 (ft)

3 ) Breach Discharge = 2681 (cfs)

4 ) Reach Length = 500 (ft)

MAIN

Client CORPS OF ENGINEERS

Job No. 1345-077 Sheet 24 of 24

Subject LIMESTONE DAM

By T. OTOVA Date 2-5-81

FAILURE ANALYSES

Chd. \_\_\_\_\_ Rev. \_\_\_\_\_

REACH (2) CALCULATIONS

Test flood discharge:

$Q_t = 0$  (cfs)

$z = 4$  (deg.)

$S = .004$

$n = .07$

$L = 500$  (ft)

$h = 6$  (ft)

From Formula (I),

$A = 693$  (sq-ft)

Residual Area,

$A_2 = A - A_1$

$A_2 = 693$  (sq-ft)

$V_2 = A_2 * L$

$V_2 = 346642$  (cub-ft)

$V_{ave} = (V_1 + V_2) / 2$

$V_{ave} = 387486$  (cub-ft)

$Q_{p2} = Q_{p1} * (1 - V_{ave} / V)$

$Q_{p2} = 2201$  (cfs)

From Formula (I),

$Q = Q_{p2} + Q_t$

$h_2 = 7$  (ft)

From Formula (I),

Prefailure height,

$h_1 = 0$  (ft)

From Formula (II),

$A_1 = 0$  (sq-ft)

$Q = Q_{p1} + Q_t$

From Formula (I),

Total Height,

$h = 7.7$  (ft)

From Formula (II),

Total Area,

$A = 856$  (sq-ft)

Residual Area,

$A_2 = A - A_1$

$A_2 = 856$  (sq-ft)

Residual Volume,

$V_1 = L * A_2$

$V_1 = 428329$  (cub-ft)

$Q_{p2} = Q_{p1} * (1 - V_1 / V)$

$Q_{p2} = 2135$  (cfs)

From Formula (I),

$Q = Q_{p2} + Q_t$

$Q = 2135$  (cfs)

RESULTS :

1.) Prefailure Height = 0 (ft)

2.) Postfailure Height = 7 (ft)

3.) Breach Discharge = 2201 (cfs)

4.) Reach Length = 500 (ft)

APPENDIX E

"NATIONAL INVENTORY OF DAMS IN THE UNITED STATES"

PART III - INVENTORY OF DAMS IN THE UNITED STATES  
SUPPLEMENTARY DATA

IDENTITY NUMBER  
TABLE  
1 2 3 4 5 6 7  
MED0002

LOCATION	TOWN										MED PERMIT NO										STATE NUMBER										FERC NO										USGS SHEET									
	LIMESTONE										LIMESTONE										LIMESTONE										LIMESTONE										LIMESTONE									

DRAINAGE CHARACTERISTICS	DRAINAGE AREA SQ MI										FLOW DATA										CREST ELEV M.S.L.										RESERVOIR AREA ACRES										FLASH BOARD FT										OUTLET CONDUITS SIZE										INVERT ELEV M.S.L.																		
	28										MIN C.F.S. 10										AVE C.F.S. 10										MAX C.F.S. 10										ARBIT ELEV M.S.L. 526.5										USABLE STORAGE ACRE FEET 40										BOARD FT NO										35								

POWER DATA	GENERATION UNITS										AVERAGE ANNUAL GENERATION K.W.H.										LAST YEAR										RETIRED YEAR										FORMER USE										CAPACITY FACTOR																		
	INSTALLED CAP. K.W.										PLANNED CAP. K.W.										1950										1951										1952										1953										1954								

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1 JAN 79 80 (TEST)

**PART II - INVENTORY OF DAMS IN THE UNITED STATES**  
(PURSUANT TO PUBLIC LAW 92-367)

See reverse side for instructions.

	FORM APPROVED OMB NO. 48-00421 REQUIREMENTS CONTROL SYMBOL DASH-CRE-17	IDENTITY NUMBER
		1 2 3 4 5 6 7
		ME 00492

	[29]	[30]	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]	[40]	[41]	[42]	[43]	[44]	[45]	
<b>STATISTICS</b>	CREST LENGTH (ft)		SPILLWAY		VOLUME OF DAM (CY)		POWER CAPACITY		NAVIGATION LOCKS								BLANK	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

<b>MSC DATA</b>	OWNER	ENGINEERING BY
	[46]	[47]
	TOWN OF LIMESTONE	JORDAN C EDWARD C JORDAN CO INC
	[48]	[49]
	CONSTRUCTION BY	[50]
		JORDAN CO INC

<b>MSC DATA (Continued)</b>	REGULATORY AGENCY	MAINTENANCE
	[51]	[52]
	NONE	NONE
	[53]	[54]
	CONSTRUCTION	OPERATION
	[55]	[56]
	NONE	NONE

<b>MSC DATA (Continued)</b>	INSPECTION BY
	[57]
	NONE
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<b>REMARKS</b>	AUTHORITY FOR INSPECTION
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**U.S. GOVERNMENT PRINTING OFFICE**

**PART I - INVENTORY OF DAMS IN THE UNITED STATES**  
(PURSUANT TO PUBLIC LAW 92-367)

See reverse side for instructions

FORM APPROVED OMB NO. 49-10421 REGULATORY CONTROL SYMBOL DASH-CR-17	IDENTITY NUMBER STATE 1 2 3 4 5 6 7 ME 00 492
--	---

[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[110]	[111]	[112]						
DIVISION	STATE	COUNTY	COUNTY	CONGR DIST	STATE	COUNTY	NAME	LATITUDE (North)	LONGITUDE (West)	REPORT DATE						
DAY	MO	YR														
NE	ME	03	02	02	XX	XX	COMMUNITY DAM	46	58	67	4	9	5	7	8	10

[131]	[132]
POPULAR NAME	NAME OF IMPONDMENT
SAME	LIMESTONE COMMUNITY POND

[151]	[152]	[153]	[154]	[155]	[156]	[157]	[158]	[159]	[160]
DIST	FARM	DAM	CITY - TOWN - VILLAGE	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	POPULATION			
01				LIMESTONE		0			

[21]	[22]	[23]	[24]	[25]	[26]	[27]	[27A]	[27B]	[27C]	[27D]	[27E]	[27F]
TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (ft)	HYDRAULIC HEAD (ft)	IMPONDING CAPACITIES	CORPS DIST.	VERIFICATION DATE	DA	MO	YR	BLANK	
RE	1978	CR	19	19	MAXIMUM (ccf - ft)	NORMAL (ccf - ft)	DA	MO	YR			
RE	1978	CR	19	19	42	40	NNNN					

[28]
REMARKS

END

DATE  
FILMED

8 - 85

END

DATE  
FILMED

8 - 85