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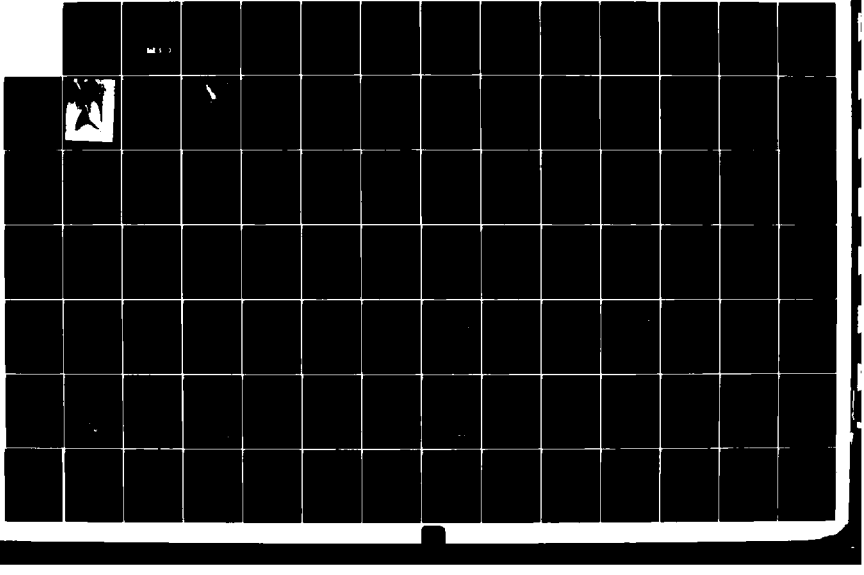

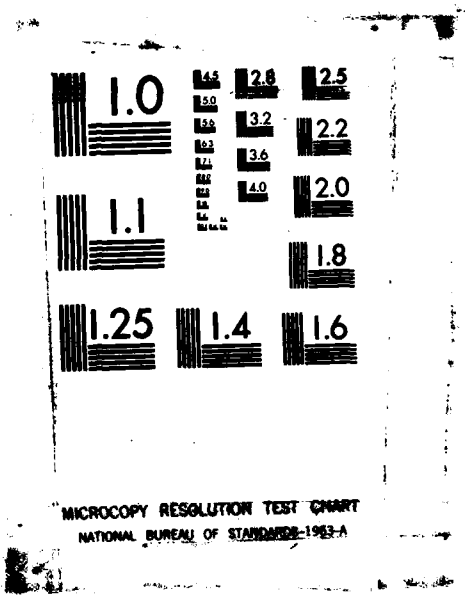
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CONNECTICUT RIVER BASIN
SANDISFIELD, MASSACHUSETTS

CLAM LAKE DAM
MA 01052

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

FEBRUARY 1980

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 01052	2. GOVT ACCESSION NO. AD-A155743	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Clam Lake Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE February 1980 13. NUMBER OF PAGES 95
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

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

18. SUPPLEMENTARY NOTES

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

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

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Sandisfield, Massachusetts
Clam River

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

The dam is an earthfill embankment about 950 ft. long and 94 ft. high. The dam was found to be in poor condition. It is intermediate in size with a hazard potential of high A great deal of maintenance and major remedial work as listed in section 7 must be undertaken by the owner.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

JAN 06 1981

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

Dear Governor King:

Inclosed is a copy of the Clam Lake (MA-01052) 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.

The brief assessment included at the beginning of the report contains a discussion of two serious deficiencies relating to the condition of the principal spillway and to the emergency spillway side slopes. Because of this the dam has been rated in poor condition. Both the Commonwealth of Massachusetts and the U.S. Department of Agriculture, Soil Conservation Service are aware of these problems and design of corrective modifications is currently underway.

I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts.

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

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

Sincerely,

WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Division Engineer

Incl
As stated

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

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Acting Division Engineer

Incl
As stated

CLAM LAKE DAM

MA 01052

CONNECTICUT RIVER BASIN

SANDISFIELD, MASSACHUSETTS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	MA 01052
Mass. D.P.W. No:	1-2-260-11
Name of Dam:	Clam Lake
Town:	Sandisfield
County and State:	Berkshire County, Massachusetts
Stream:	Clam River
Date of Inspection:	November 1, 1979 and November 7, 1979

BRIEF ASSESSMENT

The Clam Lake Dam, No. MA 01052, is located on the Clam River, a tributary of the West Branch of the Farmington River, in the Town of Sandisfield, Massachusetts. The dam site is approximately three miles upstream of the Village of West New Boston and is located off of Montville-Beech Plain Road. The dam is a multiple purpose recreation and flood protection facility which is owned by the Massachusetts Division of Water Resources. It was designed by the U.S. Department of Agriculture, Soil Conservation Service and construction was completed in 1977. The dam is an earthfill embankment about 950 feet in length, and 94 feet in height, has a reinforced concrete principal spillway which is designed to maintain the recreation pool level and control the release of stored floodwater, and a 385 foot wide earth fill and earth excavated emergency spillway channel around the left abutment. No water is presently impounded by the dam because of serious deficiencies related to the soundness of the principal spillway structure and emergency spillway side slopes. Both of these deficiencies were noted by SCS prior to the completion of construction.

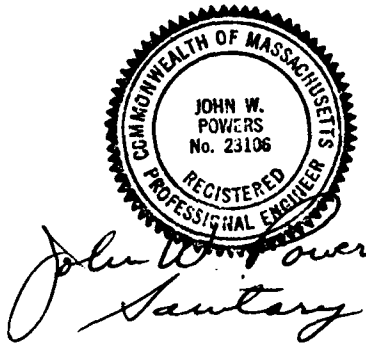
The dam and appurtenances were found to be in POOR condition. The visual inspection indicated that the emergency spillway side slopes are unstable, the downstream emergency spillway slopes have eroded, the principal spillway structure is failing at the transition, the pond drain intake structure is defective and the upstream and downstream slopes of the dam show erosion. The defective pond drain structure, erosion of the dam embankment and the erosion of the emergency spillway channel warrant additional investigations. The side slope instability and failure of the principal spillway has been investigated thoroughly by the Soil Conservation Service. The summary, conclusions, and recommendations of the SCS investigation reports are reproduced herein in Appendix B.

The test flood for this dam has been determined to be the Probable Maximum Flood (PMF), based on a classification of INTERMEDIATE size and HIGH hazard. The drainage area is 10.8 square miles and the test flood is 21,060 CFS. Routing the test flood through the reservoir, with the initial pool level at the normal recreation stage, resulted in test flood outflow of 14,960 CFS which does not exceed the capacity of the spillways. Total discharge capacity with water at top of dam is 16,150 CFS.

Failure of the dam will pose a serious threat to approximately 25 houses and buildings, one major road bridge, one secondary road bridge, 9000 feet of major road, and a cemetery in addition to damage caused by the PMF flow through the spillway and tributary drainage areas.

A great deal of maintenance and major remedial work as listed in Section 7 must be undertaken by the Owner. Listed items include: repair of riser structure, develop access to top of dam, determine cause of and correct slope failures and causes of erosion of slopes.

The recommendations for additional investigations and recommended remedial measures as listed in Section 7 should be implemented within one year of receipt of this report by the Owner.



John W. Powers
Massachusetts Registration 23106

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

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual 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.

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

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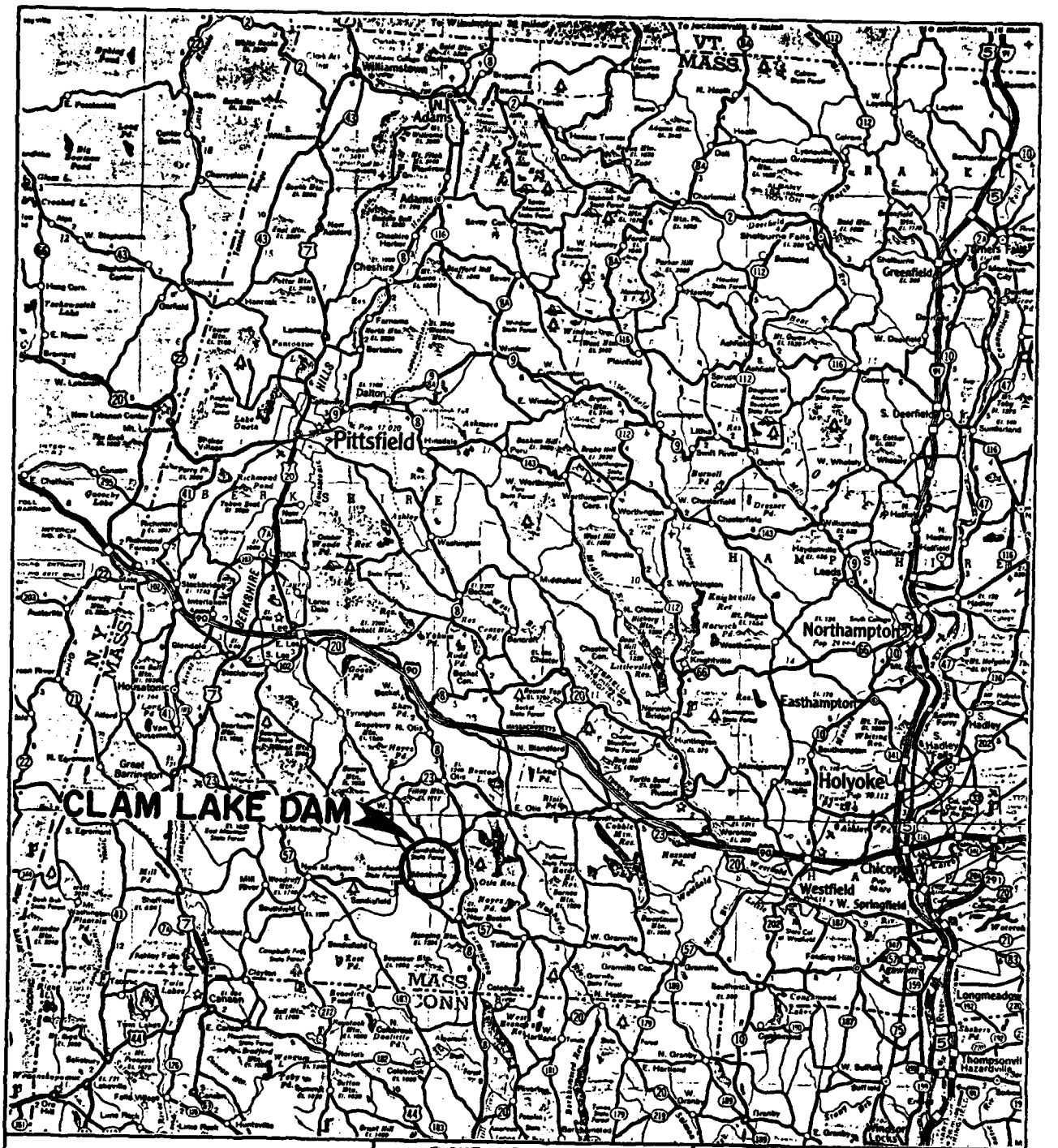

TIGHE & BOND / SCI
CONSULTING ENGINEERS
EASTHAMPTON, MASS.

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

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SCALE IN MILES

MASS.
MAP LOCATION

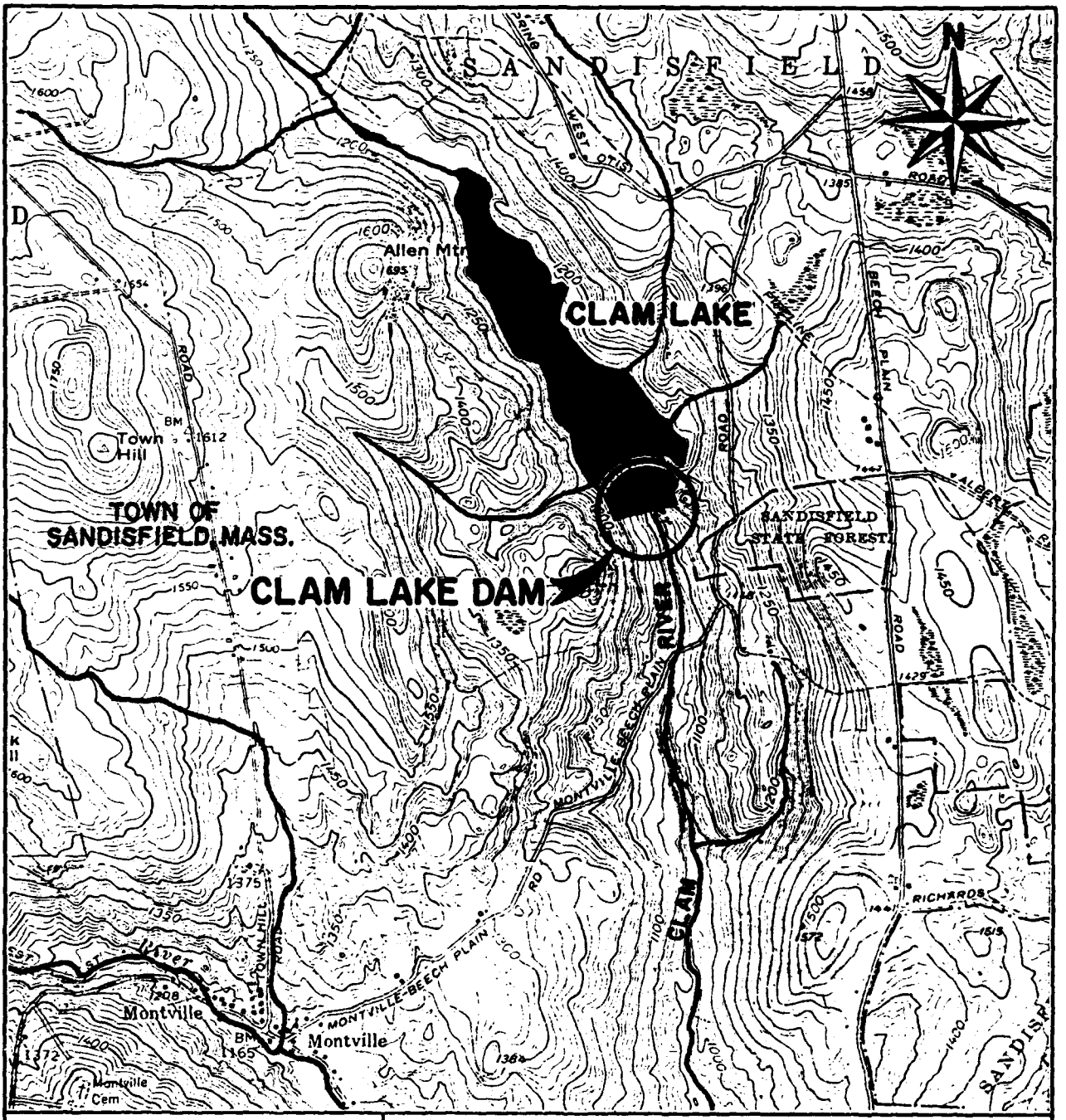
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCUS PLAN I

CLAM LAKE DAM (MA 01052)
BERKSHIRE COUNTY

SANDISFIELD
MASSACHUSETTS

SCALE : AS NOTED
DATE : FEBRUARY 1980



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FROM: U.S.G.S. MONTEREY, OTIS, SOUTH SANDISFIELD, AND TOLLAND CENTER, MASS. QUADRANGLE MAPS

QUADRANGLE LOCATION

TIGHE & BOND / SCI
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U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCUS PLAN 2

CLAM LAKE DAM (MA 01052)
BERKSHIRE COUNTY

SANDISFIELD
MASSACHUSETTS

SCALE: AS NOTED

DATE: FEBRUARY 1980

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

CLAM LAKE DAM

SECTION 1

PROJECT INFORMATION

1.1 General

(a) Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam 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. Tighe & Bond/SCI has been retained by the New England Division to inspect and report on selected dams in Massachusetts. Authorization and notice to proceed were issued to Tighe & Bond/SCI under a letter of October 24, 1979 from Colonel William E. Hodgson, Jr., Corps of Engineers. Contract No. DACW-33-80-C-0005 has been assigned by the Corps of Engineers for this work.

(b) Purpose

1) 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) Encourage and prepare the states to initiate quickly effective dam safety programs for non-federal dams.

3) Update, verify, and complete the National Inventory of Dams.

(c) Scope

The program provides for the inspection of non-federal dams in the high hazard potential category based upon location of the dams, and those dams in the significant hazard potential category believed to represent an immediate danger based on condition of the dams.

1.2 Description of Project

(a) Location

The Clam Lake Dam is located within the Town of Sandisfield, Massachusetts, on the Clam River about three miles upstream from West New Boston. The Clam River is a tributary of the West

Branch of the Farmington River. The dam is accessible by way of Montville-Beech Plain Road from West New Boston.

The dam is located on the U.S.G.S. Otis, Mass., quadrangle at longitude N 42°-08'-18" and latitude W 73°-06'-24". Refer to the location plan, and Appendix B for additional information.

(b) Description of Dam & Appurtenances

The dam consists of an earthfill embankment, a principal spillway consisting of a reinforced concrete drop inlet structure having a two stage riser section, a 60-inch diameter reinforced concrete outlet conduit, and a plunge pool excavated in ledge at the conduit outlet. An emergency spillway is located on the left abutment and consists of a grass covered, partly earth excavated through natural ground and partly earth filled channel. The crest of the spillway is provided with a 12" wide concrete weir.

1) Embankment (See pages B-5, B-6, B-7, B-9 and B-10)

The following information has been taken from the Construction Drawings dated 1972.

The dam embankment is approximately 950 feet long and has a maximum structural height of 94 feet. The upstream slope is 3 horizontal on 1 vertical and has a 20 foot terrace (horizontal section) at elev. 1145.0, which is the approximate level of the normal recreation pool. The downstream slope is 2.5 horizontal on 1 vertical, and the width of the top of dam is 26 feet. The upper portion of the upstream slope surface is covered with dumped riprap from 5 feet below the normal pool elevation to the top of the dam.

The embankment material is sand, silty with gravel. A 10' wide section of drain fill beginning 41' from the dam centerline, extends from about elevation 1156.0 on a slope of 1.5 horizontal to 1 vertical to the foundation, which is bedrock and glacial till. The drain fill extends the full length of the dam and is provided with a foundation drain conduit which outlets at each side of the 60" conduit at the endwall. A cutoff trench consisting of the sand, silty with gravel is located beneath the embankment along the centerline of the dam.

The downstream embankment, and upper portion of the upstream embankment are covered with riprap.

2) Principal Spillway (See pages B-9, B-10, and B-12)

The principal spillway consists of a reinforced concrete drop inlet structure with a sluice gate controlled inlet pipe at invert elevation 1100.00 for the pond drain, a sluice gate controlled orifice inlet at invert elevation 1141.3 for the low level bottom release, an uncontrolled orifice at elevation

1143.3 for the high level bottom release, uncontrol weirs at elevation 1144.3 for the normal pool level and uncontrolled weirs at elevation 1153.0 for the high stage outlet.

The riser structure is 59½ feet high from the base of the foundation to the top of the structure. The inside dimensions are 5 feet x 15 feet.

The structure is provided with a gate well having dimensions of 2.5 feet x 5.5 feet which extends from elevation 1097.0 to 1143.3. Provision for stop logs exist from 1143.3 to 1144.3. The purpose of the gate well is to provide facilities for gating the pond drain and to provide a bottom release of water when the impoundment level is below the normal pool elevation of 1144.3.

The walls of the riser normal to the centerline of the dam vary in thickness from 36" beginning at the base to a height of 9 feet and decrease in thickness by 3" every 5 feet to a height of 44 feet above the base. From 44 feet above the base to the crest of the high stage weir the walls are 12" thick. The walls of the riser parallel to the centerline of the dam, including the gate well walls are 12" thick from top to bottom. (See Sheet B-12)

The top of the riser is provided with flared out walls, 45° to the horizontal, parallel to the centerline of the dam, from 45.5 feet above the base to 55.5 feet. At 55.5 feet above the base to 59.5 feet the walls are vertical.

Trash racks of galvanized steel angles are provided between the flared walls to prevent the clogging of the high stage weir. Also, a galvanized steel angle trash rack is formed over the top of the gate well to prevent debris from clogging that opening.

The bottom of the riser is formed to make a transition from the rectangular vertical section to a 60" diameter outlet pipe.

The inside bottom elevation of the riser structure is 1097.0. The low level and high level bottom release orifices are located on the upstream side of the riser inside the gate well. The low level orifice is 17" x 12" and the high level orifice is 4 feet x 12 inches. These orifices are at elevations 1141.3 and 1143.3 respectively. The normal pool level orifice is located on the side faces of the riser and measures 53 inches wide x 12 inches high with an invert elevation of 1144.3. The high level overflow weirs are formed by the tops of the riser section walls and have a total length of 30 feet with a crest elevation of 1153.0. The two flared walls of the riser act as anti-vortex walls perpendicular to and across the top of the weir walls with a solid concrete platform bridging the two walls and acting as the support for the sluice gate operator stands.

The sluice gate which controls the 48 inch diameter pond drain is a 48 inch square gate mounted on a 12 inch deep wall thimble. The gate is operated by a rising stem, crank operated, gear assisted floor stand located on the top of the riser structure.

The sluice gate which controls the low stage bottom release is a 12" x 17" gate which opens downward. The gate is operated by a rising stem, hand wheel operated, floor stand located on top of the riser.

The pond drain pipe consists of about 120 feet of 48 inch diameter reinforced concrete water pipe conduit with a concrete bedding and reinforced concrete inlet structure. This conduit enters the riser structure through the upstream side of the gate well on the riser.

The principal spillway structure has a 60 inch diameter outlet conduit which discharges to a plunge pool located at the downstream toe of the dam. The 60 inch diameter conduit consists of reinforced concrete water pipe with a continuous concrete bedding and nine reinforced concrete anti-seep collars. The pipe has an inlet invert elevation of 1097.0 and an outlet invert elevation of 1088.0 with an overall length of 312 feet.

The plunge pool is constructed from excavated ledge and is approximately 50 feet long x 12 feet wide with a toe wall spanning across the downstream end of the flow path to dissipate the energy from the high velocity outlet flow from the 60 inch diameter conduit during flood flows.

3) Emergency Spillway (See pages B-6 and B-11)

The emergency spillway consists of a grass covered earth fill and earth excavated channel on the left abutment of the dam. The spillway channel has a control section approximately at elevation 1172.0 which is 385 feet wide and 50 feet long. A 12 inch wide buried concrete curb weir is located at the downstream end of the flat crest of the spillway. The spillway approach channel, along the centerline, slopes upward at 4% from the impoundment area. The discharge channel slopes downward at 3% to the edge of a steeper discharge slope. The spillway discharges down a 2 horizontal to 1 vertical slope at the toe of which is original ground downstream of the dam. The side slopes of the spillway channel are at 2 horizontal to 1 vertical. The maximum depth of excavation is just upstream of the control section and is about 32 feet. The control section is approximately 6 feet below the top of the dam.

The maximum depth of fill in the discharge channel of the emergency spillway is about 48 feet.

The toe of the emergency spillway left side slope is provided with a drain composed of sand and gravel with a 6" drainpipe discharging at both ends of the spillway. The drain is not continuous through the crest of the spillway being interrupted by the emergency spillway weir control section.

4) Foundation and Embankment Drainage (See page B-)

A trench drain of clean sand and gravel extends into the foundation at the toe of the drainfill. The trench drain extends from the principal spillway conduit left about 490 ft. and right about 240 ft., with a 4 inch diameter A.C. perforated drain pipe extending 425 ft. left and 175 feet right of the principal spillway. Both 4 inch diameter trench drain outlet pipes discharge into the plunge pool basin through the end wall at the outlet of the principal spillway. Also, a blanket drain is provided at the valley floor section about 140' wide and extending horizontally from the toe of the drain fill to the toe of the dam.

(c) Size Classification

The dam's maximum impoundment (computed to the top of the dam) of about 3800 acre-feet and structural height of 94 feet place it in the INTERMEDIATE size classification.

(d) Hazard Classification

The hazard potential classification for this dam is HIGH because of the significant potential for loss of human life and property which may occur in the event of a failure. There is a high potential for damaging about 25 houses with attendant probable loss of more than a few lives, as well as one major bridge, one secondary bridge, 9000 feet of major road and a cemetery.

(e) Ownership

The Clam Lake dam is owned by the Commonwealth of Massachusetts, Division of Water Resources. The address is as follows:

Commonwealth of Massachusetts
Department of Environmental Management
Division of Water Resources
100 Cambridge Street
Boston, Massachusetts 02202
Telephone No.: 617-727-3170

(f) Operator

The operation of the Clam Lake Dam is the responsibility of the Commonwealth of Massachusetts, Department of Environmental Management, Division of Forests and Parks. The regional office responsible for the dam is as follows:

Commonwealth of Massachusetts
Department of Environmental Management
Division of Forests and Parks
Pittsfield State Forest
Cascade Street
Pittsfield, Massachusetts 01201

Mr. Douglas G. Poland is the Regional Supervisor. The telephone number is 413-442-8992.

(g) Purpose of Dam

The Clam Lake Dam is a multiple-purpose dam which is designed to maintain a low level recreation pool and provide flood water storage to reduce downstream flooding from the dam's drainage area. Stored flood water would be gradually released through low and high level inlets of the principal spillway.

(h) Design and Construction History

The Clam Lake Dam was designed by the U.S. Department of Agriculture, Soil Conservation Service. It was completed in the fall of 1977 and has not been in operation since that time because of deficiencies in the emergency spillway slope stability and the principal spillway riser. The Owner, Commonwealth of Massachusetts, and the SCS are presently planning corrective measures deemed necessary by them as reported in investigations conducted in early 1978. (See Page B-1)

(i) Normal Operation Procedure

The Clam Lake Dam would normally be self regulating with the only controlled outlets being the pond drain and the low level bottom release. These outlets are operated only as part of infrequent maintenance checks.

1.3 Pertinent Data

(a) Drainage Area

The drainage area for the Clam Lake Dam covers approximately 10.8 square miles. The upper portion of the drainage area has some swamps and existing natural and manmade impoundments from which the Clam River originates, and the surrounding perimeter areas are primarily mountainous woodland with some open areas. There is some development of farms and homes within the watershed area.

(b) Discharge at Dam Site

Normal discharge at the site is via the low level and high level inlets to the principal spillway and through the 60 inch diameter outlet conduit to the downstream channel. If flood flows occur of sufficient magnitude and duration to fill the flood water

storage available, then excess flow will be discharged around the dam via the emergency spillway channel.

1) Outlet works (conduit) size 60 inch, Invert Elev. 1097.0 and Discharge Capacity 950 cfs at Elevation 1178.

2) Maximum known flood at dam site - Unknown

3) Ungated spillway capacity, principal and emergency, at top of dam - 16,150 cfs at 1178 elev.

4) Ungated spillway capacity at test flood elevation - 14,960 cfs at 1177.7 elev.

5) Gated spillway capacity at normal pool elevation: None

6) Gated spillway at test flood elevation: None

7) Total spillway capacity at test flood elevation - 14,960 cfs at 1177.7 elev. (Same as #4)

8) Total project discharge (principal and emergency spillways) at top of dam - 16,150 cfs at 1178.0 elev. (Same as #3)

9) Total project discharge at test flood elevation - 14,960 cfs at 1177.7 elev. (Same as #4)

(c) Elevation (ft. above MSL)

1) Streambed at toe of dam - 1084±

2) Bottom of cutoff - 1079±

3) Maximum tailwater - Unknown

4) Normal Recreation pool - 1144.3

5) Full flood control pool - 1172

6) Emergency spillway crest - crest elev. = 1172 ungated

7) Design surcharge - 1173.68

8) Top of dam - 1178.0

9) Test flood surcharge - 1177.7

(d) Reservoir (Length in feet)

1) Normal pool - 3500 ft±

2) Flood Control pool - 6600 ft±

3) Emergency spillway crest pool - (Same as 2)

4) Top of dam - 7000 ft±

5) Test flood pool - (Same as 4)

(e) Storage (acre-feet)

1) Normal pool - 750

2) Flood control pool - 3060

3) Spillway crest pool

a) Low stage crest - 750

b) High stage crest - 1310

c) Emergency spillway - 3060

4) Top of dam - 3840

5) Test flood pool - 3800

(f) Reservoir Surface (acres)

1) Normal pool - 47

2) Flood-control pool - 120.5

3) Spillway crest

a) Low stage crest - 47

b) High stage crest - 67

c) Emerg. spillway crest - 120.5

4) Test flood pool - 139

5) Top of dam - 140

(g) Dam

1) Type - Earth embankment

2) Length - 950 ft±

3) Height - 94 ft±

4) Top Width - 26 ft

5) Side Slopes - 3 hor. on 1 vert. on upstream face, with 20 ft. terrace at elev. 1143.0 of upstream embankment. 2.5 hor. on 1 vert. on downstream face.

6) Zoning - Homogeneous, semi-pervious sand, silty with gravel

7) Impervious Core - None

8) Cutoff - Variable width and depth, sand, silty with gravel earthfill

9) Grout curtain - None

(h) Diversion and Regulating Tunnel

Not applicable

(i) Spillways

1) Type:

a)	Principal spillway:	Reinforced concrete drop inlet
b)	Emergency spillway:	Grass covered, earth fill and excavated channel with level control section. Buried concrete curb weir at downstream end of level section at same elevation

2) Length of weir:

a)	Pond drain inlet:	48 inch diameter pipe
b)	Low stage bottom release (gated):	Rectangular orifice 17 inches wide x 12 inches high
c)	High stage bottom release (ungated):	Rectangular orifice 4 feet wide x 1 foot high
d)	Low stage inlet:	Two rectangular orifices 4.4 feet wide x 1 foot high
e)	High stage inlet:	Two weirs 15 ft. long = 30 ft.
f)	Emergency spillway:	385 ft.

(3) Crest Elevation

a)	Pond drain inlet:	1100.0 inv.
b)	Low stage bottom release	1141.3

c) High stage bottom release 1143.3

d) Low stage inlet: 1144.3

e) High stage inlet: 1153.0

f) Emergency spillway: 1172.0

(4) Gates: 48 inch square sluice gate on pond drain inlet and 17 inch x 12 inch open down, low stage bottom release

(5) Upstream channel:

a) Principal Spillway: Stream bed (no impoundment)

b) Emergency Spillway: Grass covered earth fill and excavated channel.

(6) Downstream Channel:

a) Principal Spillway: Ledge excavated plunge pool to natural stream channel through narrow valley

b) Emergency Spillway: Grass covered, earth fill and excavated channel

(j) Regulating Outlets

The regulated outlets from the dam include the pond drain and the low stage bottom release. The pond drain is controlled by a manually operated 48 inch square sluice gate. This gate is located on the outside face of the principal spillway riser inside the gate well with its invert at elevation 1098. The floor stand operator is located on the top of the principal spillway riser. The gate is a Rodney Hunt, seating type, with a rising stem gear assisted operator having the following identification:

43939-2
S-5020A

The gate would normally be in the closed position, if the reservoir was functional and would only be operated for maintenance checks and normal (permanent) pool dewatering purposes.

The low stage bottom release is controlled by a manually operated rectangular 17 inch x 12 inch sluice gate. This gate is located on the inside of the face of the principal spillway riser with its invert at elevation 1141.3. The floor stand operator is located on the top of the principal spillway riser. The gate is a

Rodney Hunt, non-seating type, open down and the operator has the following identification:

43939-2
S-2600A

The gate is normally in the closed position and would only be operated for maintenance checks and when the normal pool is below the high stage bottom release elevation.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

The design data for the Clam Lake Dam provided by the Soil Conservation Service includes hydrologic and hydraulic computations and summaries, structural calculations, a geological report, soil laboratory test data, a summary of embankment slope stability analysis, and other design information all contained within a "Design Report" dated January 1971. The design of the dam and appurtenances is based primarily on a number of Soil Conservation Service Publications which are listed in the General Section of the Design Report.

2.2 Construction Data

Design drawings were available for the Clam Lake Dam. These drawings have been reviewed and found to show good agreement with the visual inspection. Since deficiencies have been noted by the Owner and the Soil Conservation Service, "As Built" record drawings have not been issued pending the completion of remedial measures. Completed record drawings may be reviewed at the USDA Soil Conservation Service Office, Cottage Street, Amherst, Massachusetts 01002.

Appendix B contains copies of the more important design drawings. These copies have been made from originals provided by the Soil Conservation Service.

2.3 Operational Data

The dam has not been put into service due to a number of recognized deficiencies. Therefore, no operational data is available. Under normal operating conditions, the hydraulics of the principal spillway would maintain a low level recreation pool.

2.4 Evaluation of Data

(a) Availability

Sufficient data is available to permit an evaluation of the dam when combined with findings of the visual inspection.

(b) Adequacy

There is sufficient design and construction data to permit an assessment of dam safety when combined with the visual inspection, past performance, and sound engineering judgment.

(c) Validity

Since the observations of the inspection team generally confirm the available data, a satisfactory evaluation for validity is indicated.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

(a) General

The Clam Lake Dam, No MA 01052 was in POOR condition at the time of the inspection.

(b) Dam

1) Earth Embankment

There are many areas on the downstream slope of the dam where the riprap bedding has washed out. Many areas around the outlet conduit headwall and the swale formed by the intersection of the dam embankment and the emergency spillway embankment showed signs of similar erosion of the bedding material.

The upstream slope near the top of the dam is not uniform due either to improper grading during construction or subsequent settlement.

Some trespassing was noted on the upstream slope between the base of the dam and the beginning of the riprap protective cover. The trespassing appeared to be of the 4 wheel drive vehicle and motorcycle type. Unprotected earth slope areas of the upstream face of the embankment (below elevation 1145.0) are exposed to surface water erosion. There were signs that the reservoir pool has been as high as elevation 1134; whether due to flood flows exceeding the capacity of the 48 inch drain or to unauthorized closing of the pond drain sluice gate is unknown.

Flowing water was noted in the drainage channel at the right toe of the downstream face of the embankment. Since there was no water impounded at the time of the inspection, it can be concluded that the source of this water is ground water from the right abutment area.

There was no discharge in either foundation drain outlet. The ends of the drain pipes have been damaged by vandals; the right drain pipe was broken off inside the sleeve through the headwall.

A serious condition exists relative to the accessibility of the top of the dam. Access is by way of Montville Beech Plain Road to the toe of the dam or across the emergency spillway from Beech Plain Road; access by vehicle by either of these routes is difficult to impossible; neither route would be available during flood conditions since these routes would be blocked by impounded water in the reservoir.

2) Emergency Spillway

The emergency spillway is in poor condition.

The left slope of the spillway channel is unstable due to the existence of a stream diverted along the top of the slope. The slope is saturated and slippage has occurred in many areas. It is reported that this stream has overflowed the diversion channel eroding the side slope of the spillway channel.

Trespassing by four wheel drive vehicles and motorcycles has aggravated the condition of the slope. During construction of the dam and spillway, the unstable condition of the slope was recognized and crushed stone was placed on the slope as a remedial measure. This has proven to be less than effective.

Erosion of the downstream face of the emergency spillway training wall embankment was noted between the crest and the beginning of the riprap. Small channels have been eroded by runoff because of the lack of vegetation cover.

The spillway at the transition from the discharge channel to the riprap protected discharge slope is severely eroded and the riprap is being undercut by runoff. Failure of the slope at the transition due to local runoff indicates that serious erosion problems will result when the emergency spillway is in operation.

The right training dike embankment of the emergency spillway, downstream of the spillway crest, is eroding under the riprap cover.

The right downstream training dike does not have sufficient vegetative cover to prevent erosion when the spillway is operating. Also, the right side of spillway floor downstream of the spillway crest slopes about 6 inches in 100 feet toward the training dike. This will result in an imbalanced flow against the training wall and erosion could cause the dike to fail.

The vegetative growth on the spillway floor and slopes is inadequate to prevent surface water erosion or erosion due to spillway flood flows.

The crest and weir wall are in good condition and the grade along the centerline of the emergency spillway appears to conform to the construction plans.

c) Appurtenant Structure

1) Drop Inlet Principal Spillway

The principal spillway riser to the top of the transition section is in poor condition. Cracks, up to 1/16 inch wide were found running continuous from the floor up the walls and running across the transition section ceiling, indicating probable structural weakening of the integrity of the transition section at the base of the riser. Some form ties have either not been cut off, have been poorly patched after being cut off, or have not been patched at all.

The riser structure above the transition section appeared to be in good condition.

The stems and guides for the pond drain sluice gate have been damaged. Guides are broken and the stem is distorted. This damage appears to be the work of vandals.

The gate operators appear to be in good condition, but require some lubrication. Most of the nuts used to fasten the bottom release operator and the pond drain operator are loose.

Vandals have removed the manhole cover at the top of the riser and dropped it into the riser structure.

2) Pond Drain Inlet Structure and Conduit

The pond drain inlet structure is in poor condition. The headwall and wing walls are cracked. Evidence of vertical and horizontal movement of the wing walls suggest foundation failure and shear or moment failure at the interface joint between the head and wing walls. The trash rack bars on the pond drain inlet opening are damaged and cannot function as intended.

The 48 inch diameter pond drain pipe appeared to be in good condition with no visible misalignment or defective joints.

3) Outlet Conduit

The 60 inch diameter conduit was found to be in good condition. The first joint downstream of the riser structure appears to have been grouted. All other joints were found to be evenly spaced and no evidence of prior leakage was observed in the conduit.

4) Plunge Pool and End Wall

The plunge pool which as cut in ledge appears to be in good condition and functioning as intended.

The end wall at the outlet of the 60 inch diameter conduit is in fair condition. There is vertical crack from the top of the outlet conduit to the top of the wall. Also, the right top corner of the endwall has been fractured by vandals.

(d) Reservoir Area

The shore of the reservoir is generally medium sloping woodland. It appears stable and in good condition.

(e) Downstream Channel

The downstream channel is in good condition with no vegetation encroachment. The channel immediately downstream of the dam is unobstructed. Riprap protection of the channel is in good condition and appears to be adequate.

3.2 Evaluation

The dam is in poor condition with areas for additional investigation and/or remedial work being as follows:

a) Bedding material is eroding from beneath the riprap slope protection on the downstream face of the embankment.

b) Unprotected earth surfaces on the upstream face of the embankment (submerged by normal pool under operating conditions) are subject to surface water erosion as well as erosion due to fill and draw cycles during high runoff periods.

c) The upstream slope surface is not uniform.

d) There appears to be frequent trespassing on the embankment and the emergency spillway channel side slopes.

e) The outlet ends of the foundation drain pipe are damaged.

f) There is no reasonable access to the top of the dam at any time and no access at all in full flood time.

g) The left slope of the emergency spillway channel is unstable.

h) The transition from emergency spillway discharge channel to the riprap protected discharge is severely eroded.

i) The right training wall of the emergency spillway discharge channel is not protected against erosion.

j) The downstream end of the emergency spillway channel floor slopes toward the right training wall.

k) The inlet structure at the entrance to the pond drain conduit is structurally unsound.

l) The principal spillway transition section is structurally unsound.

m) The stem guides for the pond drain sluice gate have been damaged.

n) Most of the nuts on the sluice gate operating stands are loose.

o) The first joint in the 60-inch outlet conduit downstream of the riser structure appears to have been grouted.

p) The end wall at the outlet of the 60 inch diameter conduit is cracked.

q) The emergency spillway pitches back towards the face of dam. In the event of overtopping or erosion of emergency spillway training dike erosion of the unprotected dam face could occur.

r) The reservoir was not storing water and therefore other possible problems, such as leakage, could not be viewed.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

(a) General

No written operational procedures are available for this dam. The dam would be self regulating when in operation. The sluice gate on the pond drain and the low stage bottom release would normally be closed and would not routinely be operated.

(b) Description of Warning System In Effect

There is no written warning system in effect.

4.2 Maintenance Procedures

(a) General

An annual inspection is made by the Soil Conservation Service and recommendations resulting from this inspection would normally be implemented by the Massachusetts Division of Forests and Parks if the dam was in service.

Typical maintenance items assigned to the Division of Forests and Parks includes liming and fertilizing, mowing, clearing of accumulated debris, etc. At the time of this Phase I inspection some items of maintenance such as liming and fertilizing are not being carried out because of the proposed major modification work which is anticipated.

(b) Operational Facilities

Discussions with Division of Forests and Parks personnel indicated that the sluice gate for the pond drain is not operated but remains in the open position because they are aware of the poor condition of the dam's emergency and principal spillways. Also, the low stage bottom release is not operated because there is no requirement to do so at this time. A visual inspection of the gate operators indicated that lubrication is required.

There are no other facilities which require operation.

4.3 Evaluation

Since the dam is not in service and will not be placed in service until such time as the spillway problems are resolved, a valid evaluation of the operation and maintenance procedures cannot be made. It must be pointed out, however, that if a major storm event occurs before remedial repairs are completed, in which the capacity of the low level outlet weir was exceeded, the dam would impound water up to the elevation of the high level outlet weir or possibly the emergency spillway crest level. If such an event should occur, it could, in turn, result in

a significant increase in the loading on the spillway riser, thus aggrevating the previously discussed evidence of structural instability of the riser transition section.

A formal, written downstream emergency flood warning system should be developed for this dam before it is placed in service.

SECTION 5 - EVALUATION OF HYDRAULIC/ HYDROLOGIC FEATURES

5.1 General

Clam Lake Dam, No. [illegible] 01052, is a multiple-purpose recreation and floodwater storage facility which was designed by the Soil Conservation Service (SCS), as part of the overall Clam River flood protection project.

The dam is located on the Clam River about 3 miles upstream of the Village of West New Boston in the Town of Sandisfield, Massachusetts and is about 4.5 miles upstream from the confluence of the Clam River with the West Branch of the Farmington River.

The drainage area upstream of the dam is 10.8 square miles with generally mountainous topography.

Development within the watershed is very limited and consists of only a few structures which appear on the USGS quadrangle sheet. The area is mostly wooded with only a minor amount of open fields and ponds.

The dam itself is about 950 feet long and 94 feet high, and is an earthfill embankment. The facility has a principal spillway which maintains a low stage recreation pool and discharges all normal stream flows via a 60-inch diameter conduit through the dam. An emergency spillway, consisting of a 385 ft. wide earth fill and excavated channel with a grass cover, is designed to carry flood flows which exceed the storage capacity, at elevation 1172, of the impoundment around the dam to the downstream channel.

5.2 Design Data

The hydraulic features of the Clam Lake Dam have been designed by the S.C.S. to retard a 100 year frequency storm without discharge occurring in the emergency spillway. The calculations included in the SCS Design Report include storage vs. elevation, stage discharge curves for the combined spillways, and routing of the 100 year frequency storm through the reservoir. These calculations are dated 1971.

The SCS has established the elevation of the low stage outlet as 1144.3 which provides 750 acre-feet of storage including 2 acre-feet of sediment storage. The high stage storage was set at elevaton 1153.0 providing an additional 560 acre-feet of storage, and the emergency spillway crest set at elevation 1172 providing an additional 1750 acre-feet of storage above the 1153 level pool, resulting in a total flood storage pool of 2310 acre-feet.

5.3 Experience Data

No records of flow or stage are known to be available for the Clam Lake Dam since it has just recently been completed and has not been placed in service.

5.4 Test Flood Analysis

The selection of the test flood is based on the Corps of Engineers, "Recommended Guidelines for Safety Inspection of Dams," dated November 1976. These guidelines state that dams classified as "Intermediate" in size, and "High" in hazard potential be tested against the "Probable Maximum Flood" for the region within which the dam is located.

The determination of the PMF for the Clam Lake Dam is based on the Corps of Engineers "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations" dated March 1978. The test flood was determined by reference to the mountainous curve in this "Guidance" for a drainage area of 10.2 square miles.

The unit flow of 1,950 cfs per square mile which results in an PMF of 21,060 cfs for the Clam Lake Dam.

The purpose of this Phase I investigation is to assess the dam's overtopping potential and its ability to store and/or discharge the test flood. This requires determing the storage characteristics of the impoundment area and the stage vs. discharge characteristics of the spillway. The SCS design report tabulates all of this data, and our review has determined the information to be in accordance with standard design practices, therefore, as noted in the computations included in Appendix D, this information has been utilized in performing the test flood analysis.

The test flood has been routed through the reservoir using the iteration process as outlined in the Corps of Engineers, "Preliminary Guidance for Estimating Probable Maximum Discharges in Phase I Dam Safety Inspections." The results of routing the PMF through the reservoir indicate that the storage capacity of the impoundment area will reduce the PMF inflow of 21,060 cfs to a reservoir outflow of approximately 14,960 cfs. This assumes that the level of the recreation pond is at elevation 1143.3 at the start of the storm, and the entire flood storage volume is available. Elevation 1,153.0 is the crest elevation of the high stage overflow weirs.

The combined spillways have a discharge capacity with the water level at the top of the dam of 16,150 cfs which is sufficient to pass the calculated PMF outflow ot 14,960.

5.5 Dam Failure Analysis

A dam failure analysis using the procedures in the Corps of Engineers, "Rule of Thumb Guidance for Estimating Downstream Failure Hydrographs" dated April, 1978, was performed for the Clam Lake Dam. The assumed conditions are as follows:

1. Water level prior to breach is at top of dam elevation.

2. Stream flow at time of breach is PMF test flood for the reach in question.

3. Stream flow at confluence, is PMF for tributary watershed.

Prior to dam failure the PMF outflow from the dam and the PMF from tributary drainage areas will cause significant damage downstream and possibly the lose of a few lives. The damage that will result includes 11 houses, four bridges and 13,000 feet of roadway.

For an assumed breach equal to 40 percent of the dam width computed at half height, the breached width is 236 ft. The resulting dam failure flow using a water height of 94 ft. is 361,975 cfs.

The first area impacted by the dam failure is at a crossing of Montville-Beech Plain Road. There is a steel beam-wood deck bridge at the crossing. The roadway will be severely overtopped and the structure inundated by about 34 feet of water. The structure can be expected to fail and the roadway washed out.

The second and major area impacted by the dam failure is the Village of West New Boston at the confluence of the Clam River and the Buck River. The failure of the dam would result in potential lose of lives, homes, out buildings, private property, major roadways and a bridge. The area will be inundated with as much as 19 feet of water.

The third area to be impacted would be an area west of New Boston near the intersection of Beech Plain Road and New Boston-New Hartford Road. The failure of the dam in this area will result in potential loss of lives, homes, outbuildings, private property, major roadways, a cemetery and a major road bridge. The area would be inundated by as much as 11 feet of water.

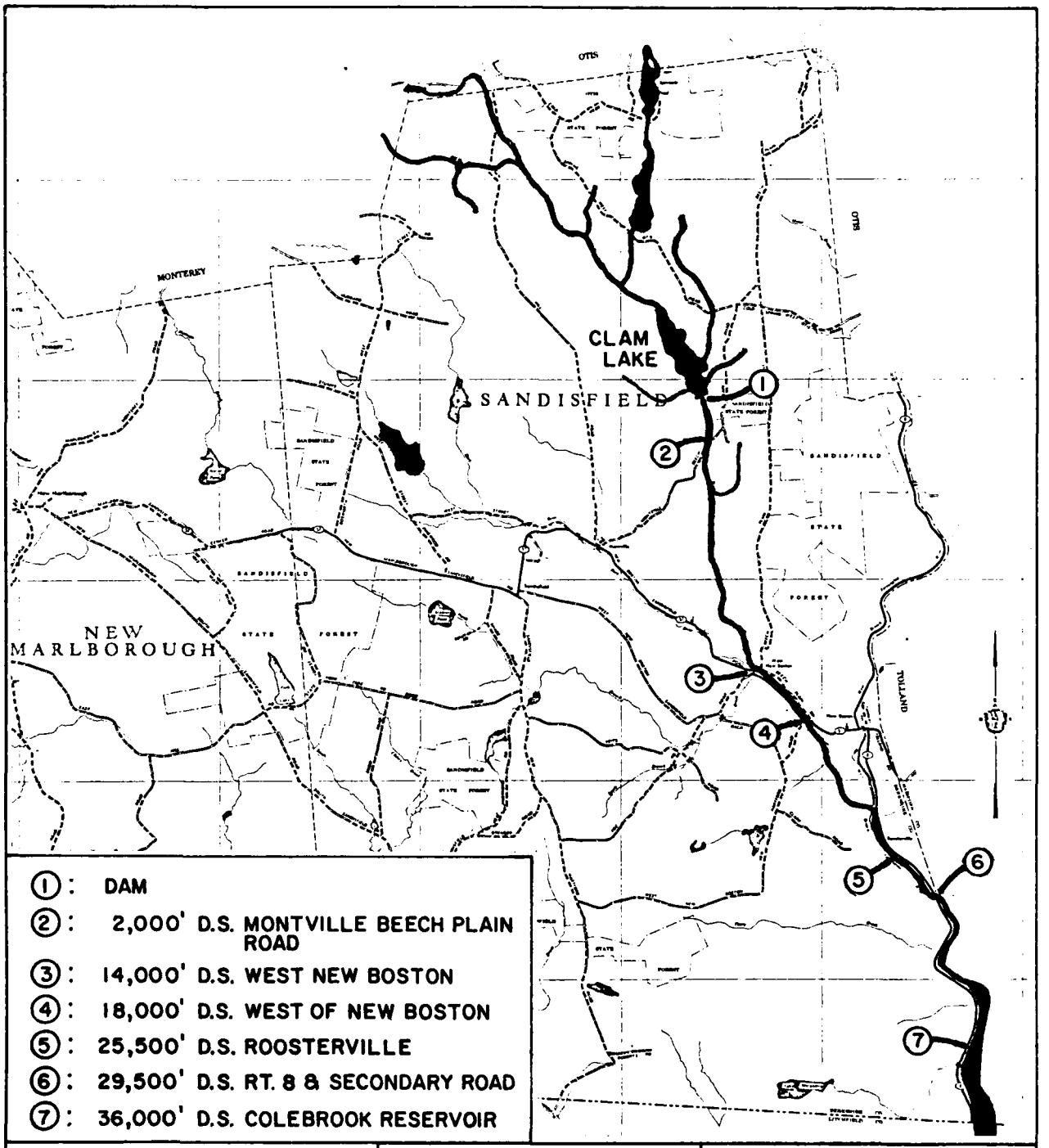
The fourth area to be impacted by the dam failure would be the Village of Roosterville, which is on the West Branch of the Farmington River. The failure of the dam in this area will result in potential lose of life, homes, outbuildings, private property, a major roadway and a bridge. The area would be inundated by as much as 26 feet of water.

The fifth area to be impacted by the failure of the dam would be downstream of Roosterville on the West Branch of the Farmington River where Rt. 8 and a secondary road crosses the River. This area would experience damage to the secondary road and the secondary road bridge. Since Rt. 8 has recently been constructed, it would be expected that the bridge would adequately pass the flood due to failure of the dam. The area would be inundated with about 26 feet of water.

The sixth area to be impacted by the dam failure flood in the Colebrook Reservoir. It is estimated that sufficient storage would be available to retard any additional flooding downstream. The surface elevation is estimated to rise about 8 feet due to the volume of flood water from the dam failure.

PROBABLE DOWNSTREAM IMPACT OF DAM FAILURE
CLAM LAKE DAM
MA 01052

Area Location	Impact Area	Flood Flow Prior to Dam Failure (cfs)	Stage Prior to Dam Failure (Ft.)	Flood Flow After Dam Failure	Stage After Dam Failure (Ft.) (cfs)	Downstream Damage After Dam Failure		Comments
						No. of Houses	Other	
1 Dam	--	15,000	5.7'	362,000	Dam Failure	0	Dam	No downstream damage prior to dam failure.
2 2000'DS	1	15,000	8	242,000	34	0	1 Bridge	Montville Beech Plain Rd. is a secondary road. Before dam failure 1 bridge inundated.
3 14,000'DS	2	20,500	9	151,500	19	19±	1 Bridge 5000' of road	Roadway and bridge are major. Before dam failure no damage.
4 18,000'DS	3	53,000	8	184,000	11	6±	1 Bridge 4000' of road 1 cemetery	Roadway and bridge are major. Before dam failure no damage.
5 25,500'DS	4	135,000	21	225,000	26	11	1 Bridge 13,000' of road	Bridge and roadway are major. Before dam failure 11 houses, 1 bridge & 13,000 ft. of road inundated.
6 29,500'DS	5	135,000	21	255,000	26	0	2 Bridges	One bridge is major, one bridge is secondary. Before failure 2 bridges inundated.
7 36000'DS	6	---	--	---	--	---	---	Flood attenuated by being routed through Colebrook Reservoir. Dam Failure will result in reservoir rising 8'±. Before failure no affect.



① : DAM
② : 2,000' D.S. MONTVILLE BEECH PLAIN ROAD
③ : 14,000' D.S. WEST NEW BOSTON
④ : 18,000' D.S. WEST OF NEW BOSTON
⑤ : 25,500' D.S. ROOSTERVILLE
⑥ : 29,500' D.S. RT. 8 & SECONDARY ROAD
⑦ : 36,000' D.S. COLEBROOK RESERVOIR

-SCALE-

1/2 0 1 2 MILES

2,000 0 2,000 4,000 6,000 8,000 10,000 FEET

FROM: GENERAL HIGHWAY MAP, BERKSHIRE COUNTY

TIGHE & BOND / SCI
CONSULTING ENGINEERS
EASTHAMPTON, MASS.

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND DOWNSTREAM HAZARD MAP

CLAM LAKE DAM (MA 01052)
BERKSHIRE COUNTY

SANDISFIELD
MASSACHUSETTS

SCALE: AS NOTED

DATE: FEBRUARY 1980

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation

The visual inspection of the dam embankments identified irregularities in the grade of the upstream slope embankment which are cause for concern. Erosion of sand and silt from beneath the riprap, protective layer on the downstream embankment slope was also noted.

The principal spillway structure was found to be unstable. Cracks were noted in the transition section and those cracks showed displacement.

The inlet structure wingwalls for the pond drain are cracked and displacement indicates differential movement of the sections.

The left slope of the emergency spillway is unstable due to a diversion ditch at the top of slope combined with the steep side slopes. The area of the emergency spillway at the transition from the grass surface to the riprap slope is eroded and the riprap is undercut.

The poor condition of the vegetative cover on slopes and channel bottom of the emergency spillway indicates that soil erosion could occur if the structure was in service.

6.2 Design and Construction Data

Design data for the emergency spillway side slopes and the spillway channel is not included in the SCS Design Report. From the design plans, it appears that a slope design at 2 horizontal to 1 vertical was utilized but under the field conditions at the site, this slope is too steep.

6.3 Post Construction Changes

There have been no post construction modifications to the structure but, due to the many embankment and structural problems recognized to date, extensive studies have been made by the Soil Conservation Service to determine the source of the problems and to recommend corrective actions.

6.4 Seismic Stability

The Clam Lake Dam is located in seismic zone 1. According to the recommended Corps of Engineers Guidelines, a seismic analysis is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

(a) Condition

The dam and its appurtenances are in POOR condition due to the recognized deficiencies in the emergency spillway and principal spillway as well as numerous other deficiencies noted during this inspection.

(b) Adequacy of Information

There is sufficient design and construction data to permit an assessment of dam safety when combined with visual inspection, past performance, and sound engineering judgment.

(c) Urgency

The recommendations and remedial measures described herein should be implemented by the owner within one year upon receipt of this Phase I Inspection Report.

7.2 Recommendations

The recommendations of this Phase I investigation are that the following additional studies be made, under the supervision of a qualified registered engineer:

a) Determine the cause of erosion problems throughout the project site including:

   i. Erosion of soil from beneath riprap on the downstream embankment slopes.

   ii. Surface erosion on the upstream face of the dam.

   iii. Erosion of the left slope of the emergency spillway.

   and determine what corrective measures are required and implement those corrective measures.

b) Determine causes of the slope stability problems throughout the project site including:

   i. Undercutting of the riprap slope at the transition section from the emergency spillway.

   ii. Left slope of emergency spillway.

   and determine what corrective measures are required and implement those corrective measures.

c) Determine the cause of the upstream embankment slope irregularities and what corrective measures are required and implement those corrective measures.

d) Finalize and implement a suitable design for a new riser structure or a suitable repair of the existing structure.

e) Develop reliable means of access to the top of the dam at all conditions of runoff.

f) Determine why grout was placed in the first joint of the 60" diameter pipe out of the riser structure, determine what corrective measures are required and implement them.

g) Determine what corrective measures are required to pitch side slope of emergency spillway away from face of dam and implement those corrective measures.

h) Develop and implement a method to routinely monitor seepage through the dam embankment.

7.3 Remedial Measures

The recommendation of this Phase I investigation is that the following remedial and/or maintenance items be carried out:

a) Repair right foundation drain outlet pipe at the endwall.

b) Repair the right corner of the end wall.

c) After erosion and stability problems are solved by a qualified registered engineer, place topsoil where necessary and seed all exposed earth surfaces on the dam embankment, spillway channel and spillway training dike embankment to prevent erosion of soil.

d) Rebuild the inlet structure and trash racks.

e) Repair and replace the stem guides for the pond drain gate.

f) Lubricate and exercise the two gate operators on a regular basis.

g) Prepare a formal written downstream emergency flood warning system.

h) Implement measures to ensure 48 inch gate on low level spillway is kept in a fully open position and the reservoir normally kept "dry" until all of the above recommendation and remedial measures can be implemented. A program of monitoring during periods of intense rainfall should be initiated.

7.4 Alternatives

There are no meaningful alternatives to the above recommendations.

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Clam Lake Dam

DATE 11/1/79

TIME 11:30 A.M.

WEATHER Clear and cool

W.S. ELEV. 1100± U.S. 1084± DN.S.

PARTY:

1. J.W. Powers, P.E., Project Manager
2. G.H. McDonnell, P.E., Hydrology/Hydraulics
3. D.M. Lenart, P.E., Civil
4. E.A. Moe, P.E., Soils/Hydraulics
5. O.H. Dumais, Civil
6.
7.
8.
9.
10.

PROJECT FEATURE	INSPECTED BY	REMARKS
1. All features inspected by inspection party		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Also present:

R.Curran, U.S.D.A., Soil Conservation Service

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Clam Lake Dam

DATE 11/7/79*

TIME 1:00 P.M.

WEATHER Sunny and Cool

W.S. ELEV. 1100± U.S. 1084± DN.S.

PARTY:

1. E.J. Harvey, P.E., Structural
2. O.H. Dumais, Civil
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Interior of principal spillway structure	Dumais & Harvey	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

* Special followup inspection with SCS personnel to inspect interior of principal spillway; arrangements made to accompany SCS personnel on this special inspection previously scheduled by SCS.

Inspection notes for this inspection are incorporated on the following pages with comments for our 11/1/79 inspection.

Also present:

C. Dodge	S.C.S. Amherst, MA office
D. Wallin	S.C.S. Penn. office
L. Thomas	S.C.S. Penn. office
E. Alling	S.C.S. Wash., D.C. office
~~G. Greenleaf~~	~~S.C.S. Pittsfield, MA office~~
C. Curran	S.C.S. Amherst office

INSPECTION CHECK LIST

PROJECT Clam Lake Dam DATE 11/1/79

PROJECT FEATURE All Features NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	No access to gates if flood condition
Crest Elevation	1178.0
Current Pool Elevation	1100 (Invert of drain inlet)
Maximum Impoundment to Date	1134 (Debris and wave scars)
Surface Cracks	None
Pavement Condition (Rip Rap Faces)	Downstream slope good but some erosion under rock. Upstream slope near crest not uniform.
Movement or Settlement of Crest	None apparent
Lateral Movement	None apparent
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Intersection of dam & spillway slopes show erosion. Sand & silt washed from under rip rap at both abutments & around discharge end wall
Indications of Movement of Structural Items on Slopes	None apparent
Trespassing on Slopes	None apparent on rock slope, but below upstream face shows some vehicular traffic.
Vegitation on Slopes	Poor with add'l. vegetation required.
Sloughing or Erosion of Slopes or Abutments	Gravel washed out from under rip rap and rock has settled 396 ft. from right abutment.
Rock Slope Protection - Riprap Failures	Sand & silt wash out from under rip rap during rainfall.
Unusual Movement or Cracking at or near Toes	None apparent
Unusual Embankment or Downstream Seepage	Flow of water running right toe channel
Piping or Boils	None (No water impounded)
Foundation Drainage Features	Foundation drain outlet pipes dry & ends damaged by vandals.
Toe Drains	End of pipes damaged and pipes dry
Instrumentation System	None
Access to Crest	In event of flood no access to riser

INSPECTION CHECK LIST

PROJECT Clam Lake Dam DATE 11/1/79

PROJECT FEATURE All Features NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good condition, needs grass cover
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Good condition but more grass required
b. Weir and Training Walls	Concrete crest flush with spillway floor. No erosion protection on training wall slope.
General Condition of Concrete	Good with some chips
Rust or Staining	None apparent
Spalling	None
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None
Drain Holes	None
c. Discharge Channel	Channel floor good until the transition between soil floor and riprap. Under cutting noted & sloped section shows failure of rockfill.
General Condition	
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Good grade but requires more grass
Other Obstructions	Left slopes of spillway failing due to drainage ditch diversion along crest. Vehicular traffic noted on slopes far left. Slip outs & failures noted on left side.
d. Other	Training wall right no erosion protection. Also, s.w. floor pitch 6" in 100' to wall to cause rapid erosion.

INSPECTION CHECK LIST

PROJECT Clam Lake Dam DATE 11/1/79

PROJECT FEATURE All Features NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	End wall cracked at centerline of pipe. Right corner cracked from vandals.
Rust or Staining	None
Spalling	None
Erosion or Cavitation	None
Visible Reinforcing	None
Any Seepage or Efflorescence	None
Condition at Joints	Good
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	Good
Conduit	Good condition. Joints in good condition.

INSPECTION CHECK LIST

PROJECT Clam Lake Dam DATE 11/1/79

PROJECT FEATURE All Features NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Above embankment good. Cracks noted in transition section.
Rust or Staining on Concrete	Extensive staining in transition. Form ties exposed.
Spalling	No spalling noted in entire structure.
Erosion or Cavitation	Concrete eroded at sluice gate at base of riser.
Cracking	Numerous cracks in transition area.
Alignment of Monoliths	Good
Alignment of Joints	Pipe joints are in good condition. First joint out of riser grouted on 60" pipe.
Numbering of Monoliths	N/A

INSPECTION CHECK LIST

PROJECT Clam Lake Dam — DATE 11/1/79

PROJECT FEATURE All Features — NAME

DISCIPLINE — NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Good condition
Slope Conditions	Good
Bottom Conditions	Good
Rock Slides or Falls	None
Log Boom	N/A
Debris	None
Condition of Concrete Lining	N/A
Drains or Weep Holes	N/A
b. Intake Structure	
Condition of Concrete	Wing walls are cracked
Stop Logs and Slots	Trash racks are damaged and debris could enter conduit.

INSPECTION CHECK LIST

PROJECT Clam Lake Dam DATE 11/1/79

PROJECT FEATURE All Features NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	Good
Condition of Joints	Good
Spalling	None
Visible Reinforcing	None
Rusting or Staining of Concrete	None
Any Seepage or Efflorescence	None
Joint Alignment	Good
Unusual Seepage or Leaks in Gate Chamber	Structure not in use.
Cracks	None visible (no access to lower sections at time of first inspection) Second inspection noted numerous cracks
Rusting or Corrosion of Steel	None
b. Mechanical and Electrical	
Air Vents	N/A
Float Wells	N/A
Crane Hoist	N/A
Elevator	N/A
Hydraulic System	N/A
Service Gates	Rodney Hunt 43939-2 S-2600A One nut of 4 tight
Emergency Gates	Rodney Hunt 43939-2 Gear Assisted S-5020A (2 of 4 nuts on) both gates open.
Lightning Protection System	N/A
Emergency Power System	N/A
Wiring and Lighting System in Gate Chamber	N/A

INSPECTION CHECK LIST

PROJECT Clam Lake Dam DATE 11/1/79

PROJECT FEATURE All Features NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	
Bearings	N/A
Anchor Bolts	N/A
Bridge Seat	N/A
Longitudinal Members	N/A
Under Side of Deck	N/A
Secondary Bracing	N/A
Deck	N/A
Drainage System	N/A
Railings	N/A
Expansion Joints	N/A
Paint	N/A
b. Abutment & Piers	
General Condition of Concrete	N/A
Alignment of Abutment	N/A
Approach to Bridge	N/A
Condition of Seat & Backwall	N/A

APPENDIX B

ENGINEERING DATA

APPENDIX B

ENGINEERING DATA

INDEX

List of Available Documents

1. Design and Construction Records

Design records include the following:

construction drawings
construction specifications
construction revisions
design criteria
layout
hydraulic design
foundation and embankment design
geology report
soil testing report
structural computations
quantity estimates
inspector's notes
seeding schedule

Construction records include the following:

inspector's and engineer's diaries
soil testing reports
concrete testing reports
material certifications
equipment guarantees
correspondence
quantities
pay estimates

2. Reports on problems with riser and emergency spillway slope

The following records are kept on file by the U.S. Department of Agriculture, Soil Conservation Service, and may be obtained through their office located on Cottage Street in Amherst, Massachusetts.

1/19/78 Final Report of the committee investigating potential deficiencies in the emergency spillway and associated areas, Clam Lake Dam Site, Clam River Watershed, Mass.

3/24/78 Engineering Investigation Report Clam River Watershed Project Clam Lake Site.

A brief summary of these reports is appended hereto.

Construction Drawings

Copies of the following drawings are appended hereto:

3.

Drawings	Title	Page No.
1	Cover sheet	B-3
2	Plan of Storage Area	B-4
5	Plan of dam site	B-5
6	Plan of Emergency Spillway	B-6
7	Fill Placement	B-7
9	Foundation Drain Detail	B-8
10	Principal Spillway plan and profile	B-9
11	Principal Spillway details	B-10
13	Emergency Spillway Profiles	B-11
18	Riser Details	B-12
25 & 26	Reservoir drain inlet detail	B-13,14
30, 31, 32		
33, 34	Logs of test holes	B-15,16,17,18,19

From U.S.D.A. Soil Conservation Service, Amherst, Massachusetts, March 24, 1978, "Engineering Investigation Report Clam River Watershed Project Clam Lake Site."

CONCLUSIONS AND RECOMMENDATIONS

1. At the time this riser was designed (late 1971) the horizontal embankment loading used in design was assumed to be that developed by active earth pressures. Design Note No. 17, published on April 1977, shows that active pressure assumptions underestimate the embankment moment when used in the design of a riser with a monolithic transition elbow. The vertical earth load imparted to the cantilevered transition elbow causes a restraining force which results in higher moments. Design Note No. 17 recommends that "at rest" lateral pressures be used for the embankment loading assumptions.

   The Committee concludes that the effects of this loading condition, dealt with as item 3 on page 4 of Mr. Alling's memorandum, were the main cause of the cracking observed in the transition elbow.

   Although it seems reasonable to use the At Rest Lateral Pressure Theory in this case, the Committee nevertheless recommends that future structures of this type be constructed in a manner that will allow movement of the vertically projected structural member. This will reduce the horizontal load to a minimum.

2. The November 23, 1977 memo by Alling notes several problem areas, either within the design computations or not covered in the design computations. Although the Committee has centered on cantilever embankment loading as the main cause of structural failure, these other areas should be taken into consideration in any design work for repair or reconstruction of this riser, or on future designs of this type.

3. The Committee recommends a follow-up check of the riser be made as soon as weather and terrain conditions permit. Sufficient additional measurements and photographs should be made so that detailed drawings can be prepared showing the location and sizes of the cracks. These should be similar to the drawings prepared as Exhibits 23 through 27 of the Engineering Investigation Report for Site 3A, Newton-Hoffman Creek Watershed, New York, September 15, 1976. This would include drawings showing any cracking that may have developed in the vertical section of the riser, at elevations above the special elbow, subsequent to earlier checks (which found no cracking in that section).

   It is recommended that a grid system be marked off on the affected portions of the riser to assist in locating damage, preparing drawings, and providing a key to photographic records. This would speed up subsequent checks also.

An attempt should also be made to measure any displacement of the riser that may have taken place. Reports from earlier meetings indicate concern that displacement had taken place, but no measurements have been made.

The recommended documentation is needed to establish the severity extent of the damage to the riser and to correlate structure performance with that predicted from analysis of the design and with performance of other afflicted structures (e.g. Site 3A, Newton-Hoffman).

4. Concurrent with the Committees' work, studies of corrective measures for repair of the riser have been underway. Details of the current proposal for repair are contained in a March 2, 1978 memo to Cletus J. Gillman from Benjamin Isgur. Inasmuch as this proposal is well-grounded and has reached an advanced stage of discussion, the Committee spent little time on recommendations for repair and supports the proposal noted above.

From "Final Report of the Committee investigating potential deficiencies in the emergency spillway and associated areas, Clam Lake Site, Clam River Watershed, Massachusetts, January 10, 1978."

FINAL REPORT

"This is the final report of the committee investigating stability problems of the emergency spillway side slopes at Clam Lake Site in the Clam River Watershed, Berkshire County, Massachusetts. Construction was completed and the final inpection conducted on October 14, 1977. A copy of the memo from Dr. Isgur to Peter G. Waldo, October 7, 1977, which established this committee is in appendix C.

Nine problem areas were identified in a preliminary report (see memo from the committee to Cecil B. Currin, dated October 20, 1977, included in appendix C). These problem areas are located in figure 1 which is a plan view of the emergency spillway area. These nine problems were divided into two groups with the more serious labeled as primary problems. Table 1 presents the primary problems and lists apparent causes of these problems. Table 2 is similar and presents the less serious, or secondary, problems.

The committee thinks that the basic cause of the stability problems of the side slopes and the diversion channel was the design decision to leave Beech Plain Road undisturbed. In order to keep away from Beech Plain Road, the design called for 2:1 side slopes throughout a large portion of the outside edge of the spillway. These steep side slopes have since proven to be inadequate considering the proximity of the diversion to the spillway and the severe winter conditions at the site. The extent and history of these problems are documented in appendices A and B.

It is apparent to the committee that any solution to the primary problems will call for relocation of the road or installation of expensive retaining devices such as cribbing. The economics of installing such devices should be weighted against relocating portions of the road. Additional surveying and subsurface investigations appear to be necessary before a final design can be prepared."

CLAM RIVER WATERSHE
CLAM LAKE MULTIPLE-PUR
RECREATION AND FLOOD PRE

DRAINAGE AREA
TOTAL STORAGE
FLOODWATER RETARDING STORAGE
TO EMERGENCY SPILLWAY CREST
WATER SURFACE AREA
AT PERMANENT POOL
HEIGHT OF DAM
VOLUME OF FILL 52E

BUILT UNDER THE WATERSHED PR(
FLOOD PREVENTION A(
by
MASSACHUSETTS DEPARTMENT of NATUR/
and
MASSACHUSETTS WATER RESOURCES
and
BERKSHIRE CONSERVATION DIST
of the
COMMONWEALTH of MASSACHU
with the assistance of
SOIL CONSERVATION SERVIC
of the
UNITED STATES DEPARTMENT of AG
1972

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RSHED PROJECT
E-PURPOSE DAM
OD PREVENTION

6900 ACRES
3050 ACRE FEET
2300 ACRE FEET

47 ACRES

88 FEET
525,000 CUBIC YARDS

HED PROTECTION AND
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f NATURAL RESOURCES

SOURCES COMMISSION

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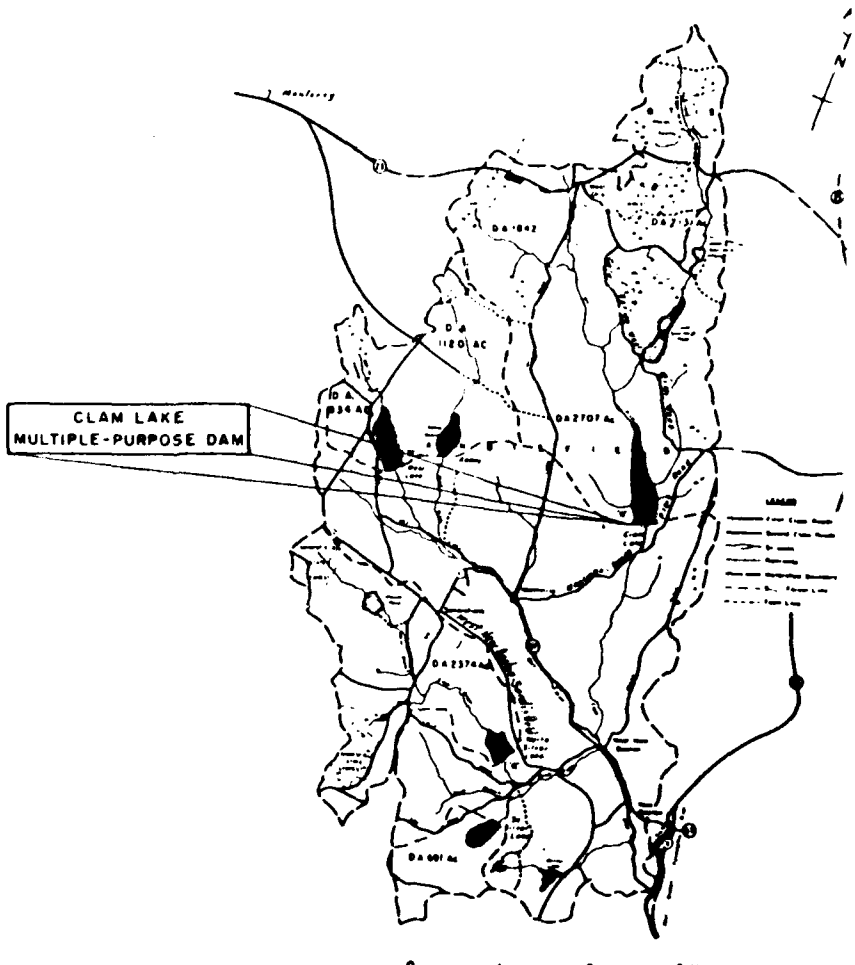

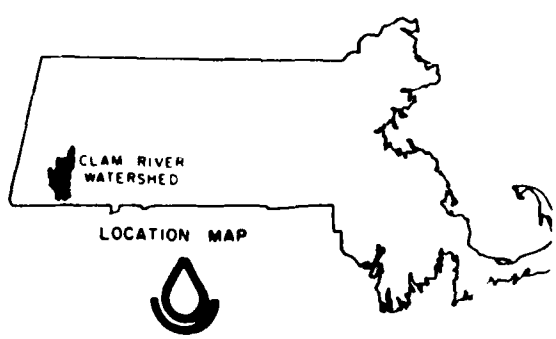

SHEET 14 - EMERGENCY SPILLWAY DRAIN
SHEET 15 - EMERGENCY SPILLWAY DRAINAGE DETAILS
SHEET 16 - ROCK TREATMENT DETAILS
SHEET 17 - FARM FIELD FENCE DETAILS
SHEETS 18 to 23 - RISER DETAILS
SHEET 24 HIGH & LOW STAGE TRASH RACK DETAILS
SHEETS 25 & 26 - RESERVOIR DRAIN INLET DETAILS
SHEET 27 CONDUIT DETAILS
SHEET 28 HEADWALL DETAILS
SHEET 29 - EMERGENCY SPILLWAY WEIR DETAILS
SHEETS 30 to 34 - LOGS OF TEST HOLES
SHEET 35 STABILIZATION OF STRUCTURES
SHEET 36 JUTE NETTING & CHAIN LINK FENCE DETAILS

CLAM RIVER WATERSHED
CLAM LAKE MULTIPLE-PURPO
SANDISFIELD, MASSACHUSE

COVER SHEET

U. S. DEPARTMENT OF AGRI
SOIL CONSERVATION SE

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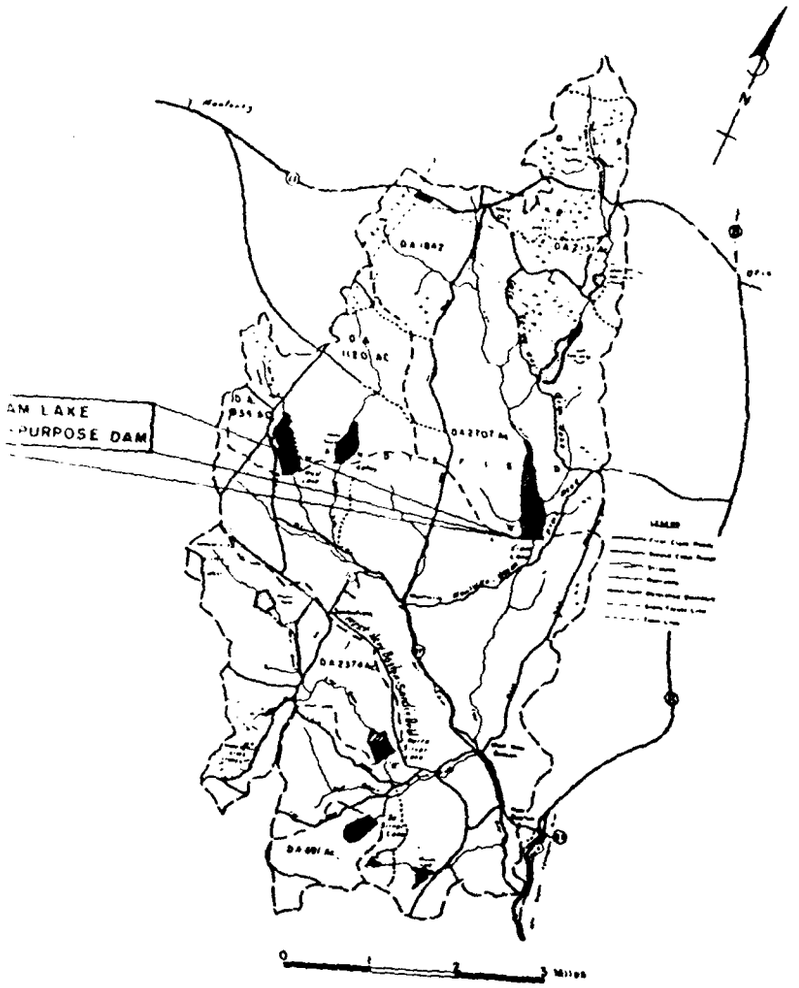
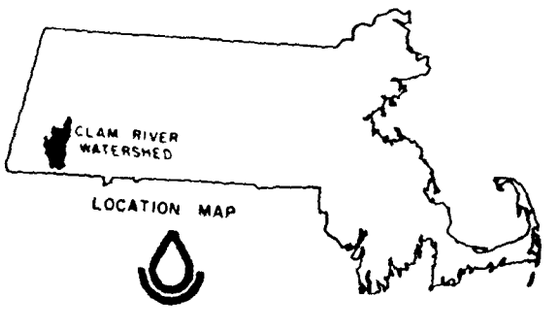




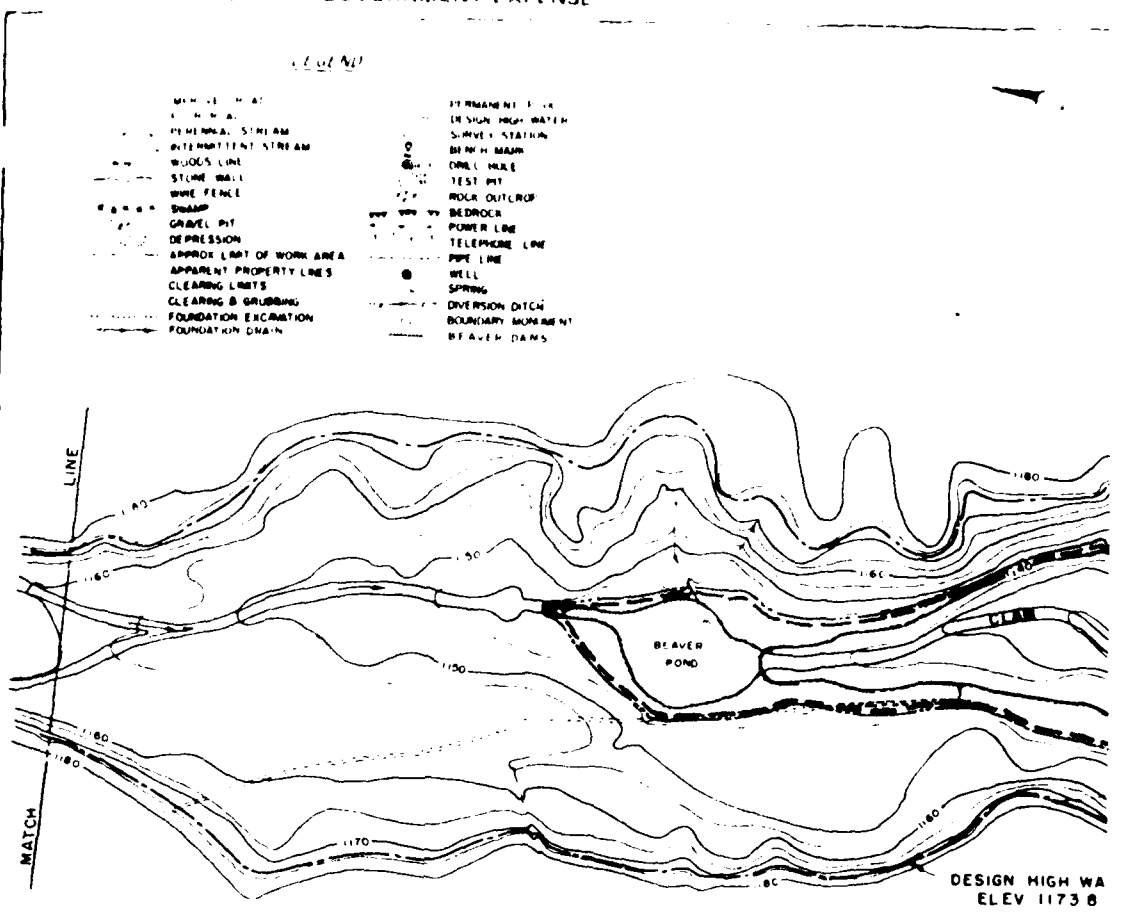
LOCATION MAP

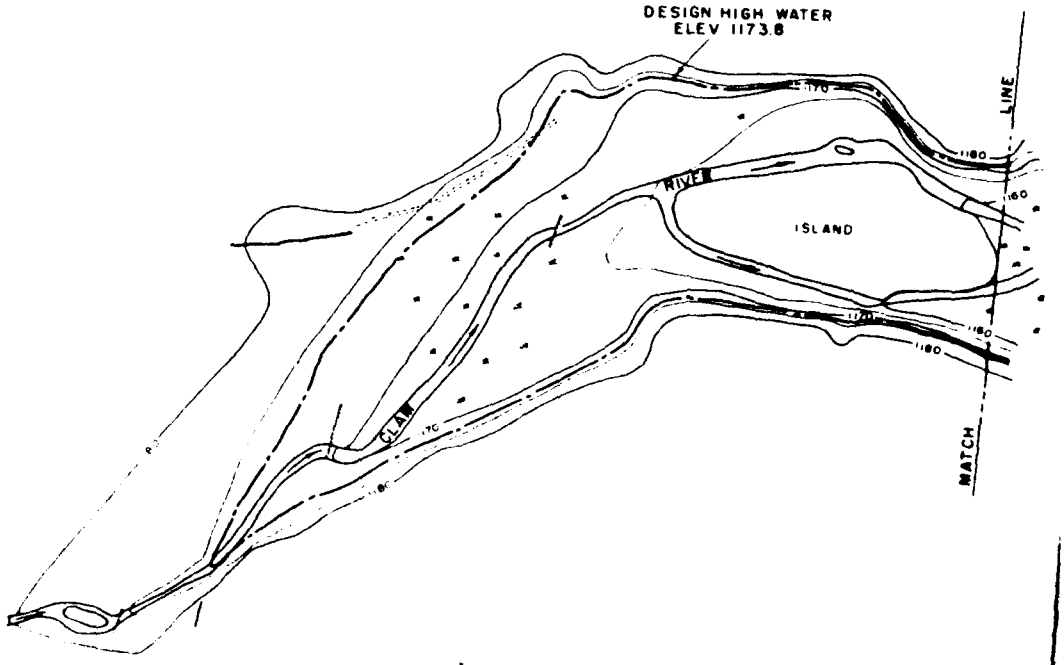
CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

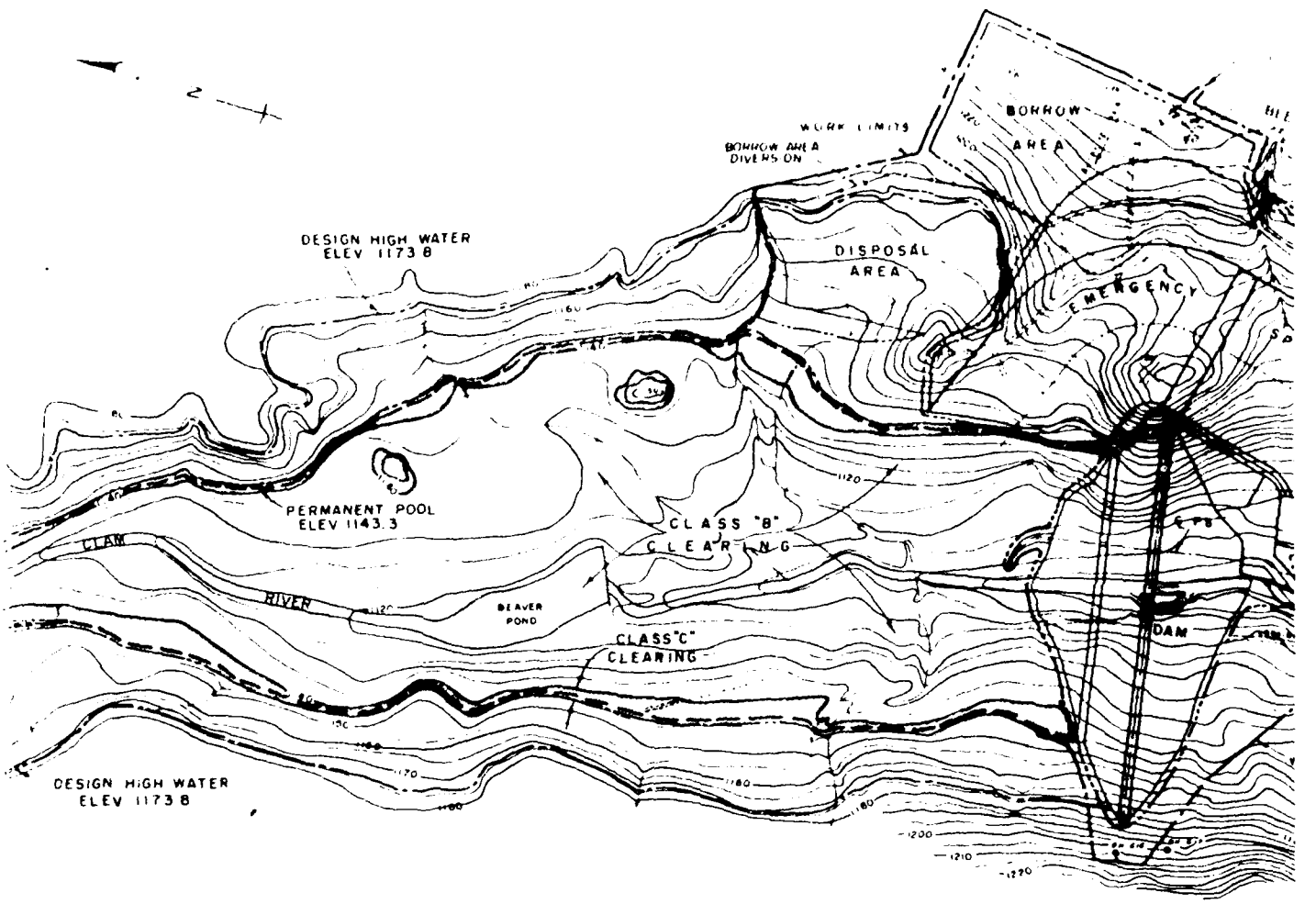
COVER SHEET

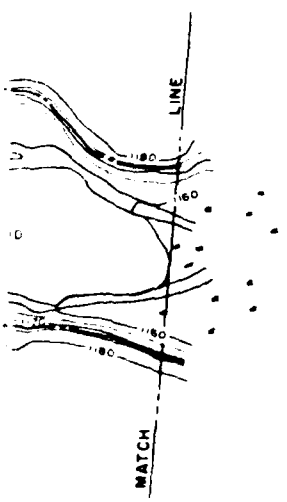
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed — A. A. TIBBETTS — Date 9-71	Approved by — Date
Drawn — P. J. WILDA — Date 11-3-71	For — Date
Traced — Date	Title
Checked — J. J. ELAGHAN, G. W. STOCKWELL — Date 8-8-72	Sheet No. 1 of 10 — Drawing No. MA-357 P









CLEARING REQUIREMENTS	
CLEARING CLASS "C"	ALONG THE EDGE OF THE PERMANENT POOL FROM THE 1140.3 CONTOUR TO 10' HORIZONTALLY BEYOND THE 1143.3 CONTOUR
CLEARING CLASS "B"	WITHIN THE DISPOSAL AREAS AND WITHIN THE PERMANENT POOL BELOW ELEVATION 1140.3
CLEARING & GRUBBING	DAM, EMERGENCY SPILLWAY, BORROW AREA, DIVERSION, INLET & OUTLET CHANNELS AND ROCK DISPOSAL

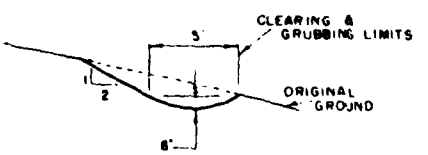
TBM 1 (ELEV 1210.56) TOP OF 2' BOULDER 60' U/S OF STA 9+25

TBM 251 (ELEV 1277.72) TOP OF 2' x 4' BOULDER APPROX 90' WEST OF BEECH PLAIN ROAD.

TBM 341 (ELEV 1099.79) TOP OF 2' x 3' ROCK WEST SIDE CLAM RIVER, EAST SIDE LOGGING ROAD

NOTES:

1 ORIGINAL TOPO SURVEYED BY M NOYES
2 ADDED SURVEY (ABOVE ELEV 1160) BY I
3 LOCATION OF BEAVER PONDS AS OF JU
4 NO WASTE MATERIAL SHALL BE LEFT B POOL CONTOUR (ELEVATION 1143.3) AN
5 THE SURFACE OF THE BORROW AND DI BE LEFT NEAT AND IN A SIGHTLY CON TO PROVIDE POSITIVE DRAINAGE. SI LEFT NO STEEPER THAN 2:1



BORROW AREA DIVERSION
TYPICAL SECTION
NOT TO SCALE

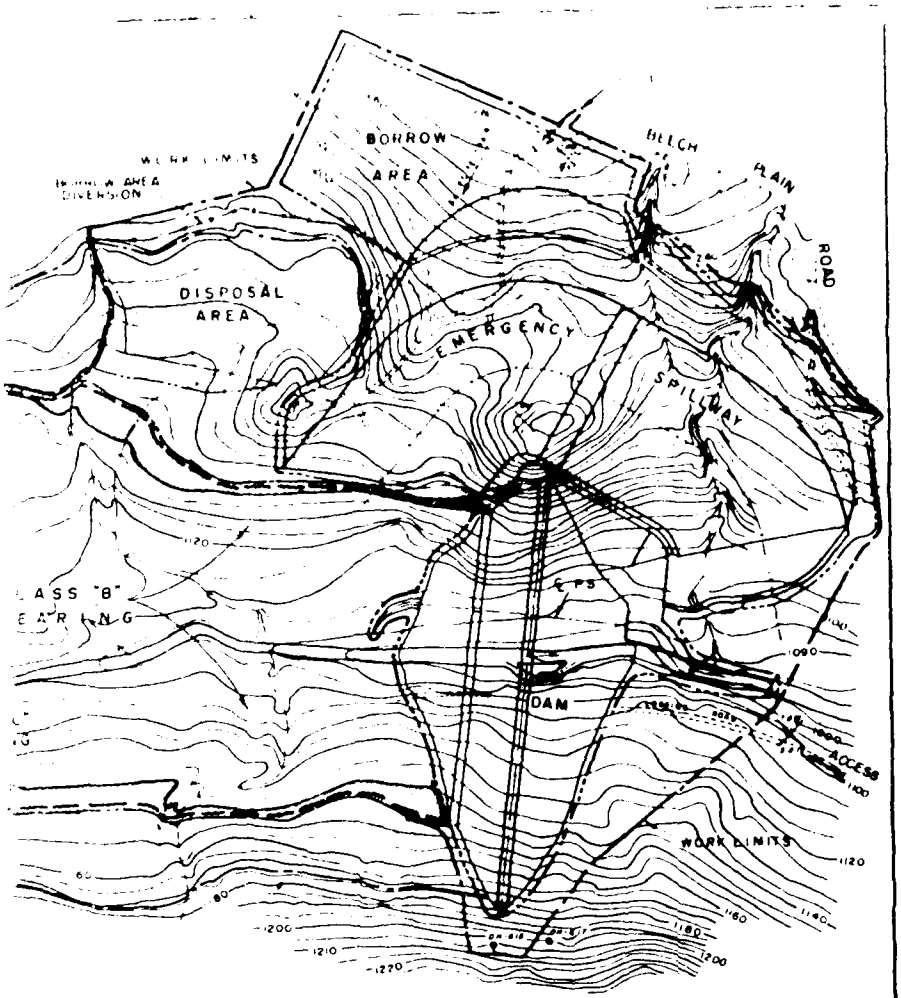
200 0 SCALE IN FEE

CLAM RIVER WATERS
CLAM LAKE MULTIPLE-
SANDISFIELD, MASS

PLAN OF STORA

U. S. DEPARTMENT OF
SOIL CONSERVATI

	Date	
Designed J. A. TIBBETTS	8-71	Approv
Drawn F. J. WILDA	12-21-71	Title
Traced F. J. WILDA	9-19-72	Sheet
Checked J. F. CLARKAR	3-9-72	No. 2 of 3



...TS

...MANENT POOL ...G HORIZONTALLY

... AND WITHIN THE ...ATION 1140.3

...BORROW AREA, ...CHANNELS AND

... 60 U/S OF

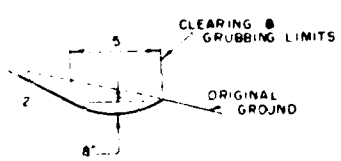
...ULDER APPROX

...OCK WEST SIDE ...ROAD

NOTES:

1. ORIGINAL TOPO SURVEYED BY M NOYES 1962
2. ADDED SURVEY (ABOVE ELEV 1160) BY R BROWN & ASSOC 1970
3. LOCATION OF BEAVER PONDS AS OF JULY 1970
4. NO WASTE MATERIAL SHALL BE LEFT BETWEEN THE PERMANENT POOL CONTOUR (ELEVATION 1143.3) AND ELEVATION 1100.0.
5. THE SURFACE OF THE BORROW AND DISPOSAL AREAS SHALL BE LEFT NEAT AND IN A SIGHTLY CONDITION AND SLOPED TO PROVIDE POSITIVE DRAINAGE. SIDE SLOPE SHALL BE LEFT NO STEEPER THAN 2:1

200 0 200 400
SCALE IN FEET



...OW AREA DIVERSION
...YPICAL SECTION
NOT TO SCALE

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

PLAN OF STORAGE AREA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date
Designed J. A. TIBBETTS	9-71
Drawn F. V. WILDA	12-21-71
Traced F. V. WILDA	9-10-72
Checked J. J. ELAGMAR	9-72

Approved by .....
Title .....
Title .....
Sheet No. 2 of 30
Drawing No. MA-387 P

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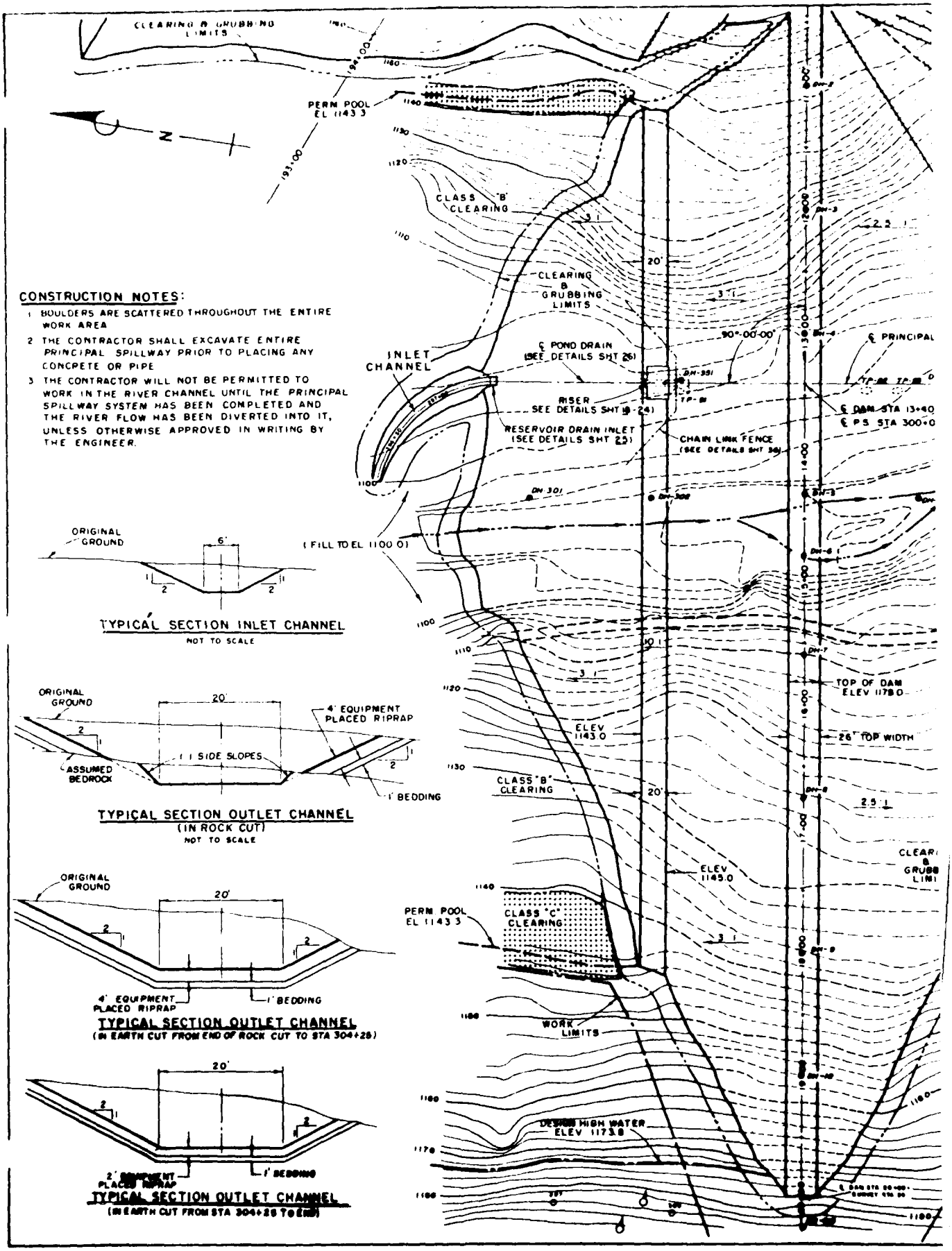
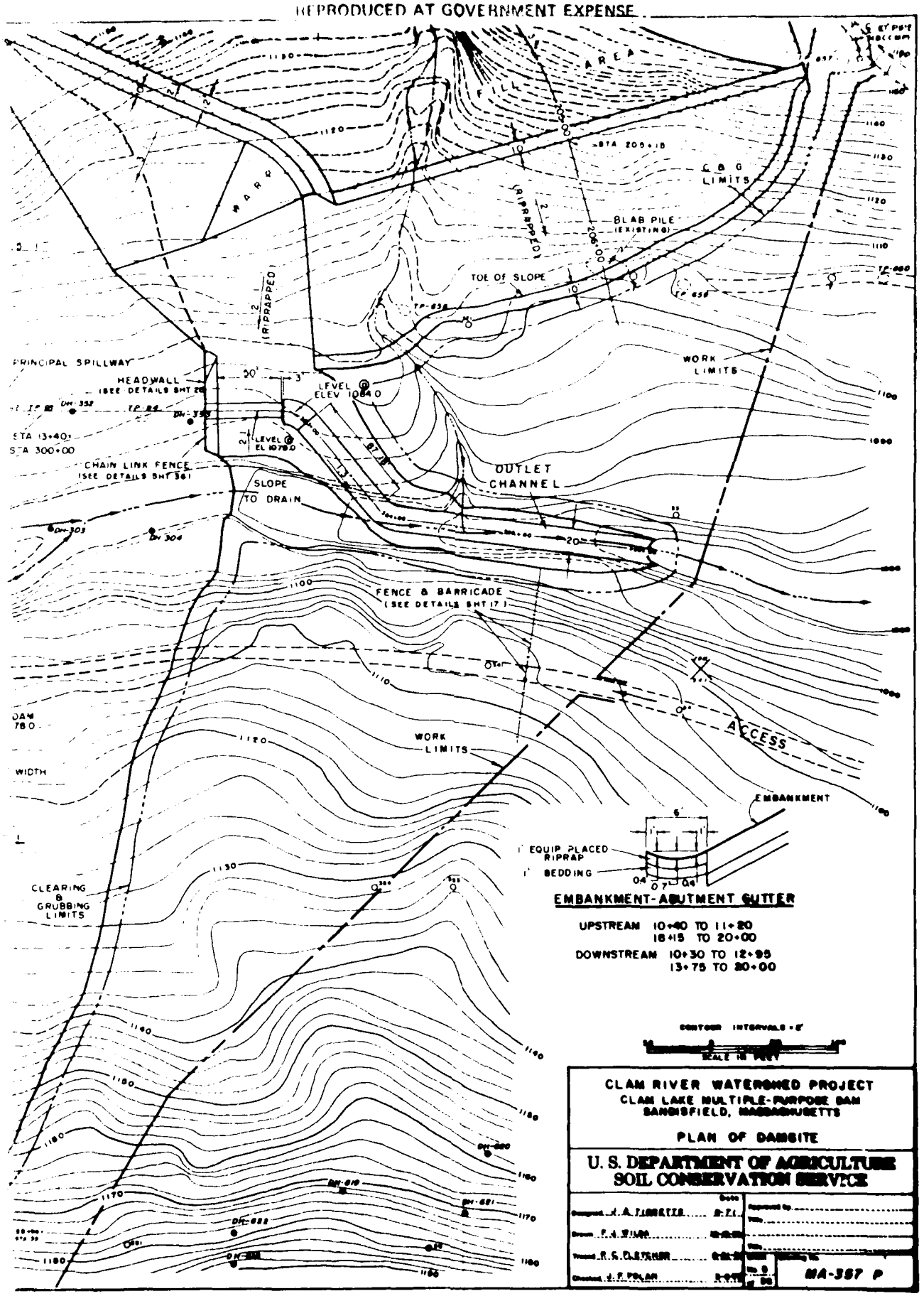


TYPICAL SECTION INLET CHANNEL
NOT TO SCALE

TYPICAL SECTION OUTLET CHANNEL
(IN ROCK CUT)
NOT TO SCALE

TYPICAL SECTION OUTLET CHANNEL
(IN EARTH CUT FROM END OF ROCK CUT TO STA 304+28)

TYPICAL SECTION OUTLET CHANNEL
(IN EARTH CUT FROM STA 304+28 TO END)



CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

PLAN OF DAMSITE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J. A. FIORETTE 8-'71
Drawn P. A. WILDE
Traced R. S. CLEVELAND
Checked J. P. POLAN

Approved by
Title
Title
Sheet No. 8 of 36
MA-357 P

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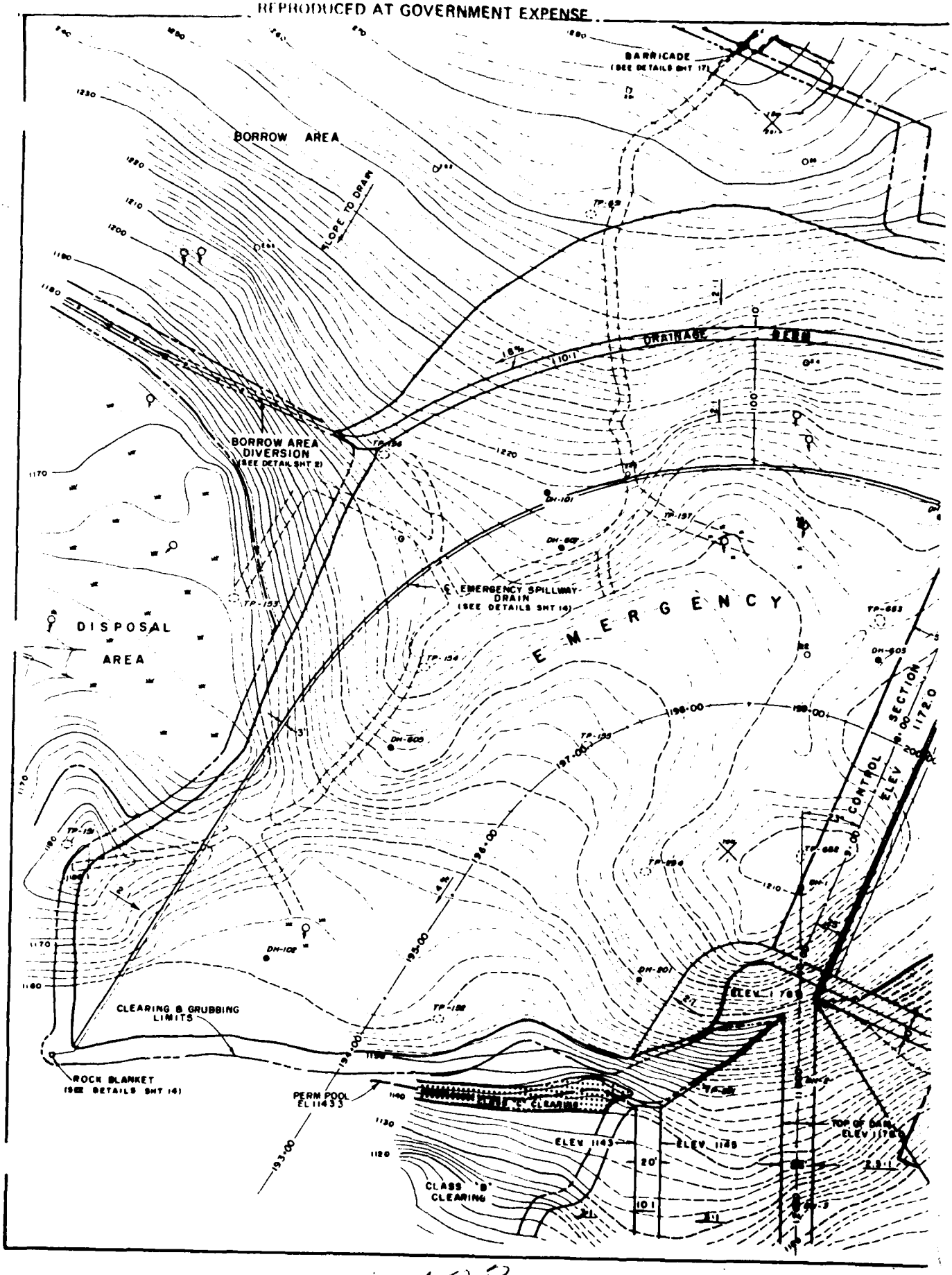

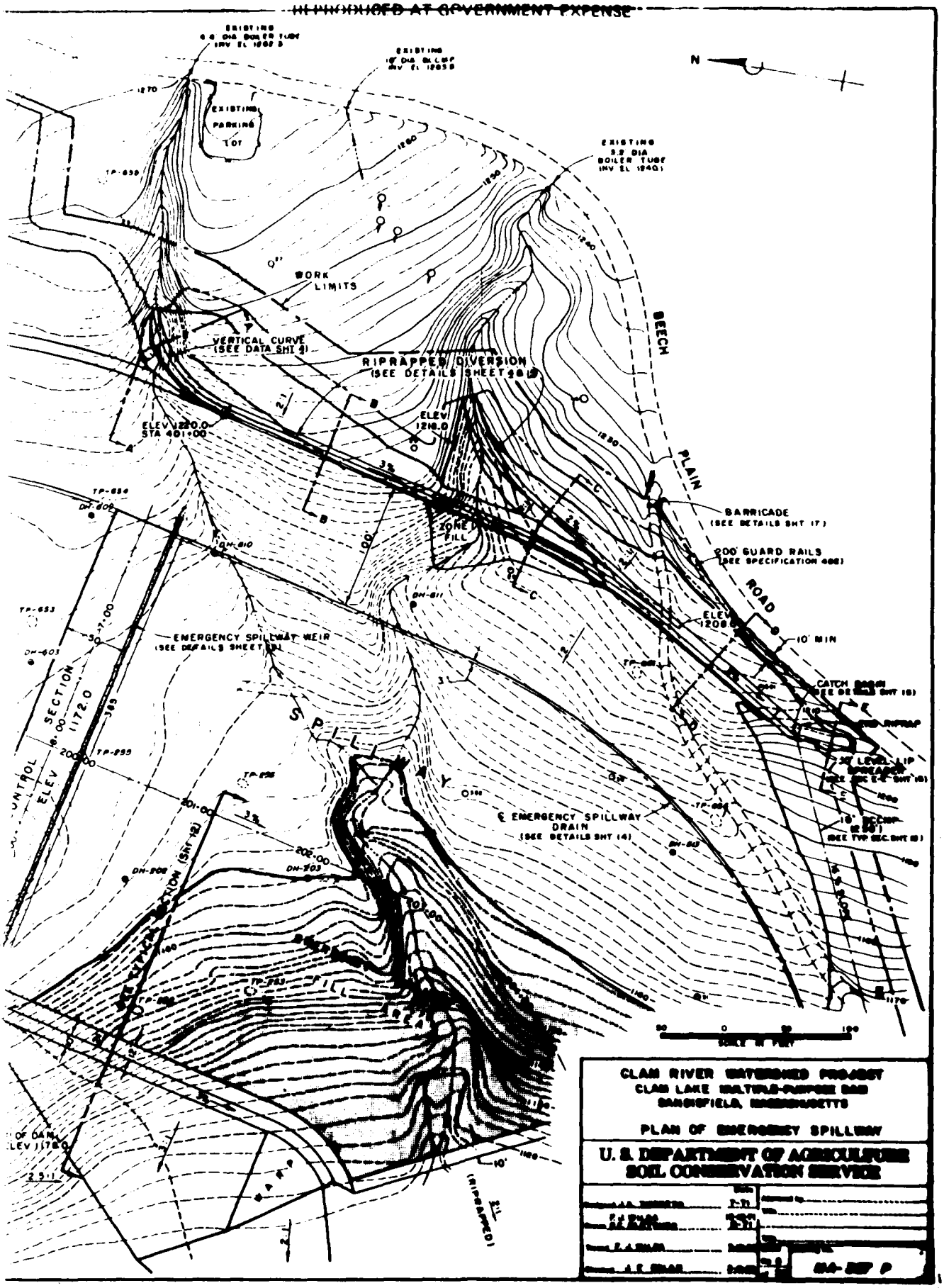

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

PLAN OF EMERGENCY SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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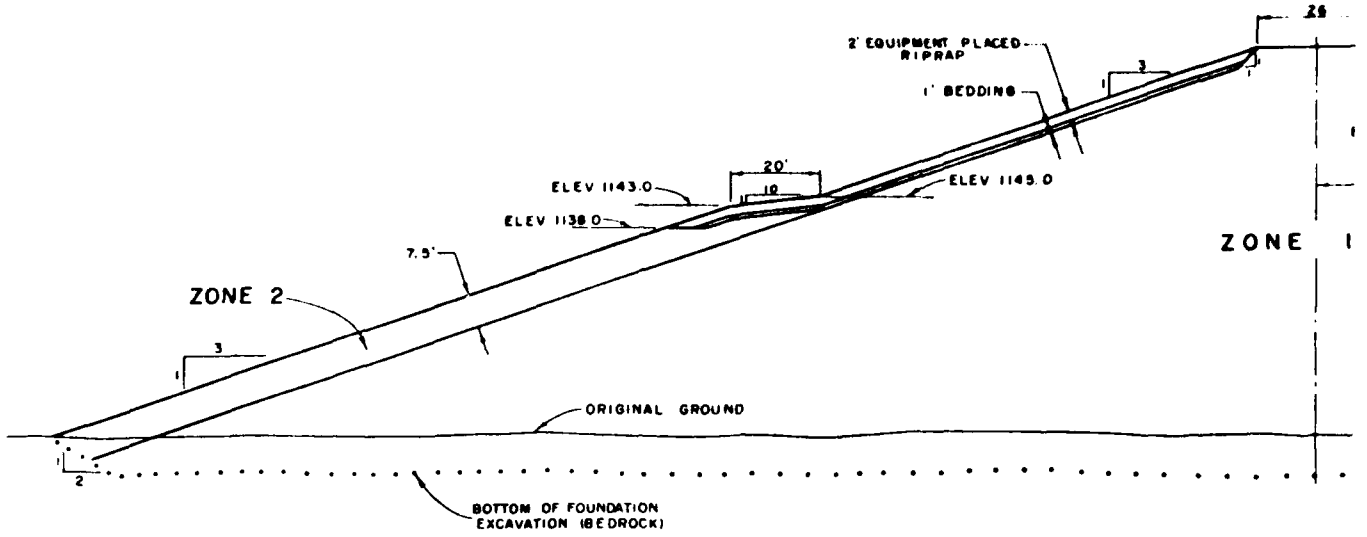
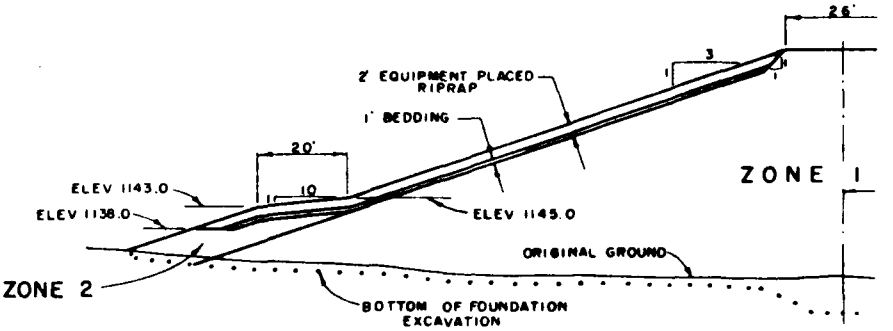


TYPICAL SECTI(



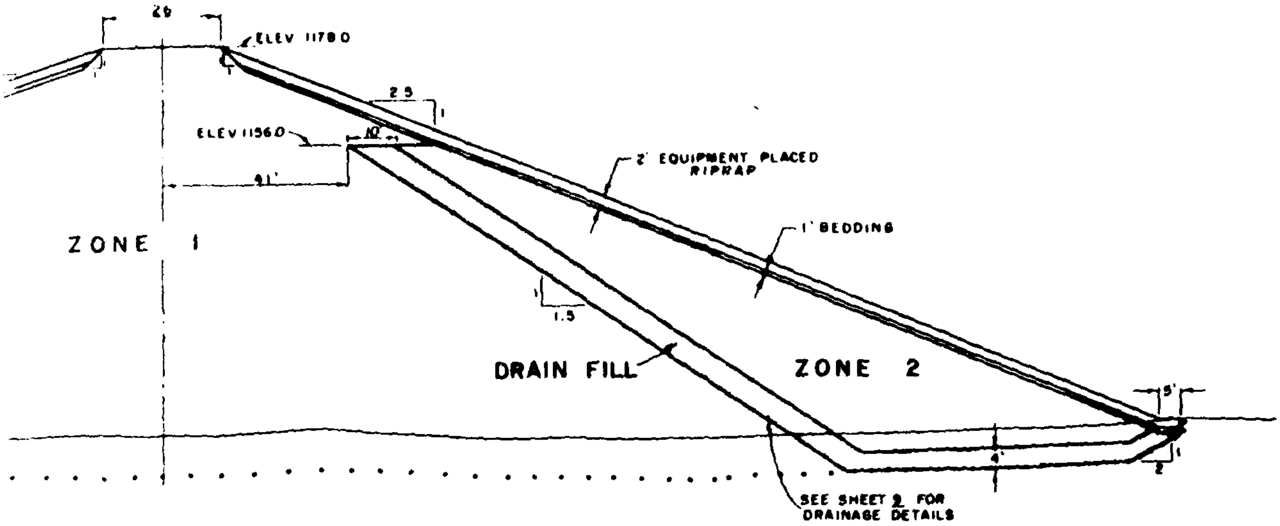
TYPICAL SECTIO

EARTH FILL REQUIREMENTS						
ZONE	MATERIAL	MAXIMUM ROCK SIZE	MAXIMUM LIFT △	MINIMUM △ WATER CONTENT	COMPACTION CLASS	COMPACTION DEFINITION
1	SAND, SILTY WITH GRAVEL REPRESENTED BY TP 156 (2.5'-10'), DH 3 (1.5'-23'), TP 656 (1.0'-12'), TP 256 (3'-10'), TP 154 (2.5'-10'), TP 651 (1'-10')	6"	9"	OPTIMUM	A	100% MAX DENSITY BY ASTM D 698 METHOD A
2	SILTY SAND AND GRAVELY SAND REPRESENTED BY TP 254 (3'-10'), TP 256 (3'-10'), TP 652 (0.5'-10'), TP 653 (1'-10'), TP 654 (1'-10') DH 9 (0-12'), DH 10 (0-10')	8"	12"	OPTIMUM	C	4 PASSES PER LAYER OF FILL w/ PNEUMATIC TIRED ROLLER WEIGHING AT LEAST 50 TONS OR AN EQUIVALENT METHOD APPROVED BY THE ENGINEER
E S FILL	SAND, SILTY WITH GRAVEL SIMILAR TO THAT SHOWN IN ZONE 1.	12"	18"	OPTIMUM	C	

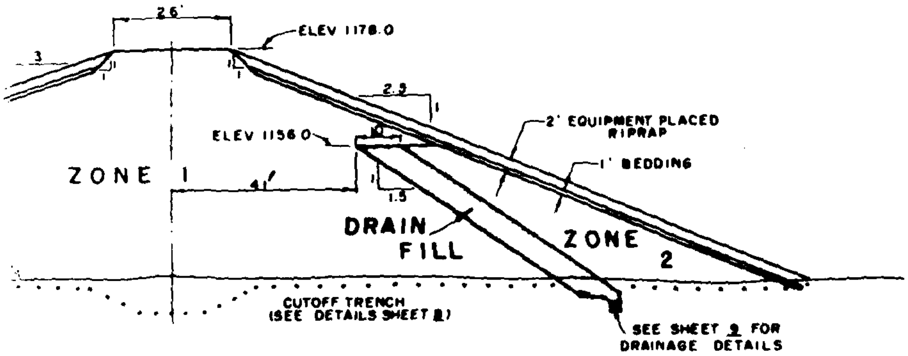
△ MAXIMUM LIFT THICKNESS PRIOR TO COMPACTION
△ BASED ON STANDARD PROCTOR

CONSTRUCTION NOTES:

1. EQUIPMENT PLACED RIPRAP SHALL BE WELL GRADE SIZE EQUAL TO THE DEPTH SHOWN 60% TO 75% BE LARGER THAN ⅓ OF THE DEPTH SHOWN.
2. BEDDING SHALL BE WELL GRADED BETWEEN ¾" AN TO 70% PASSING THE ¾" SIEVE.
3. REPRESENTATIVE ROCK SAMPLES FROM THIS WATER ALL SAMPLES TESTED CONFORM TO MATERIAL SPE



AL SECTION (VALLEY)



AL SECTION (ABUTMENTS)

NOTE:
DELETE FOUNDATION DRAIN ABOVE ELEV 1143.0

HALL BE WELL GRADED AND HAVE A MAXIMUM
HOWN 60% TO 75% OF THE RIPRAP SHALL
DEPTH SHOWN

ADED BETWEEN 3/16" AND 3 1/2" WITH 30%
IEVE

ES FROM THIS WATERSHED HAVE BEEN TESTED
RM TO MATERIAL SPECIFICATION 523.

20 0 20 40
SCALE IN FEET

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

FILL PLACEMENT

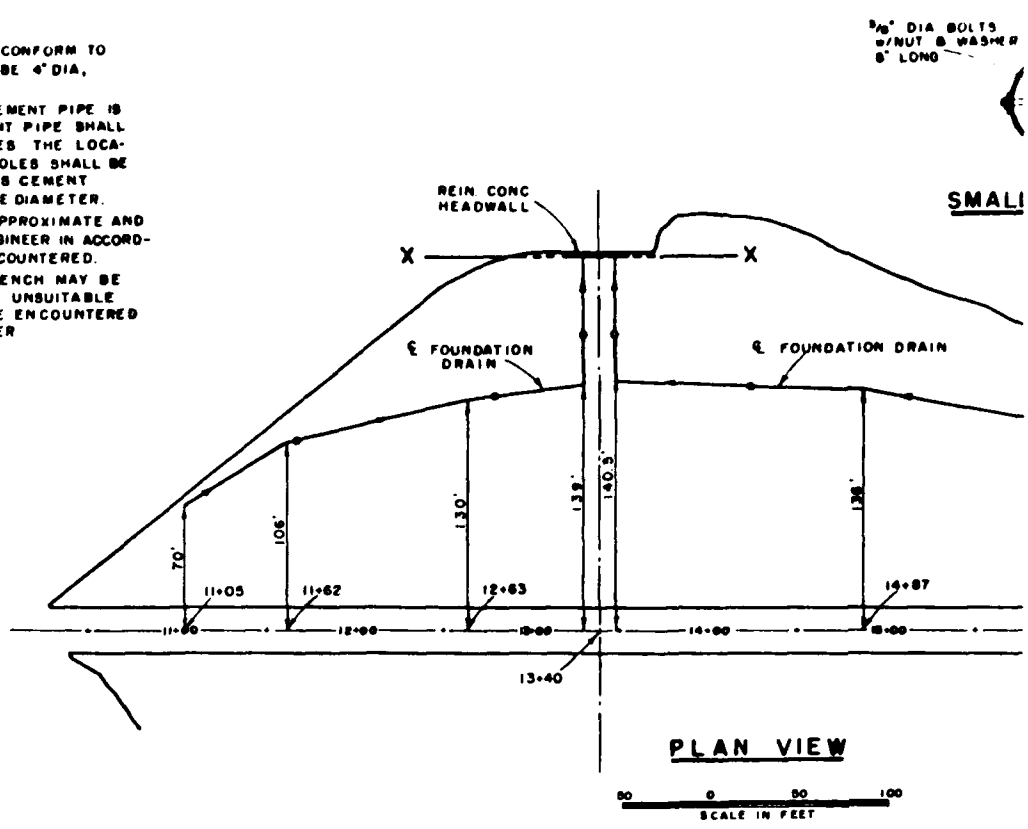
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

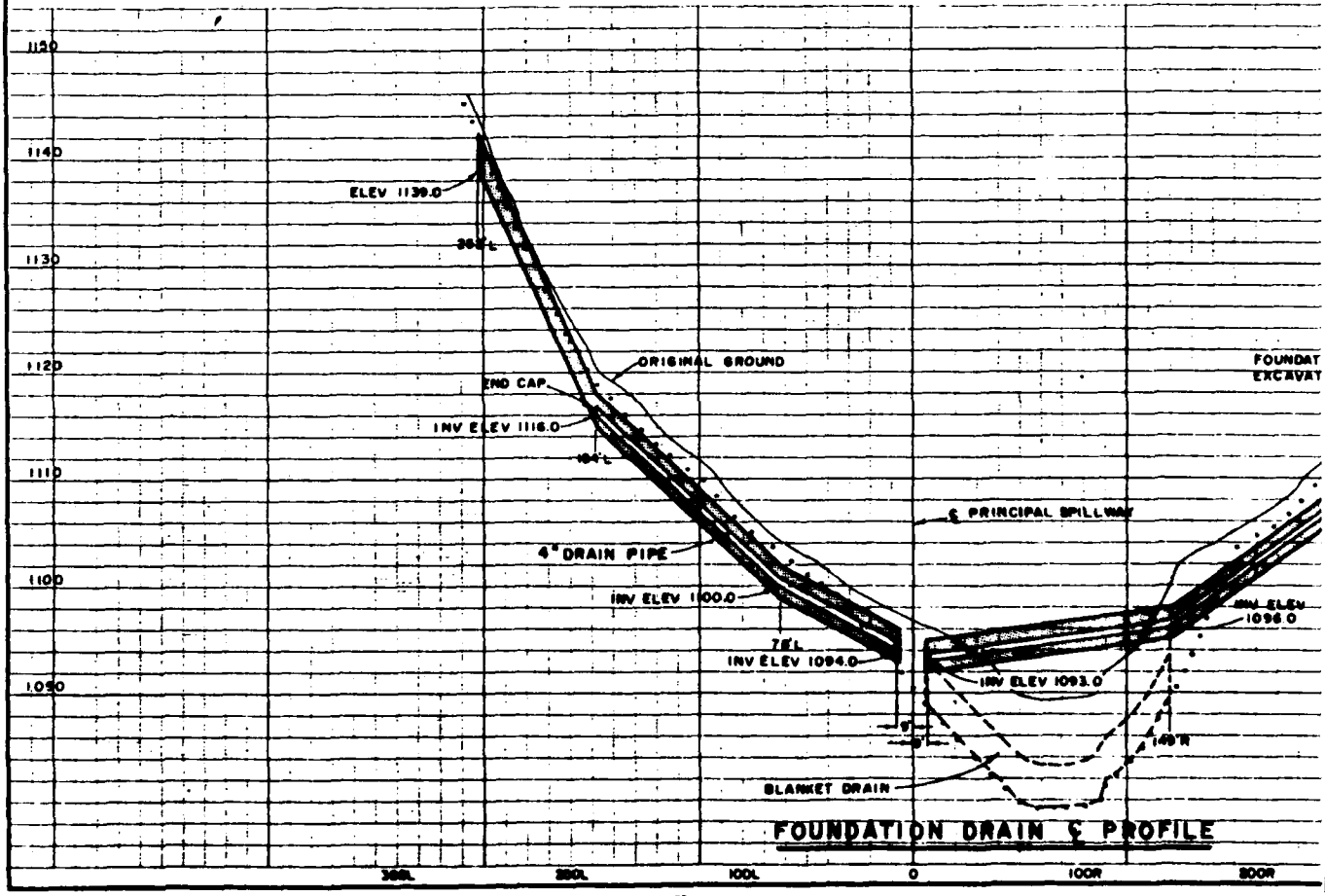
Designed J.A. [illegible] 8/71
Drawn F.J. WILDA [illegible]
Traced
Checked J.E. [illegible] [illegible]
Approved by
Title

MA-387 P

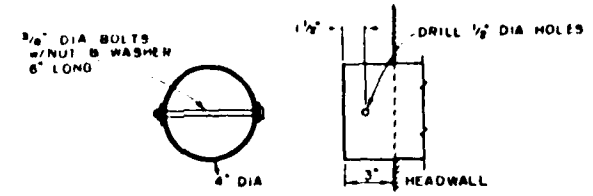
CONSTRUCTION NOTES

1. ASBESTOS CEMENT PIPE SHALL CONFORM TO SPECIFICATION 549 AND SHALL BE 4" DIA, CLASS 4000
2. WHEN PERFORATED ASBESTOS CEMENT PIPE IS REQUIRED, THE ASBESTOS CEMENT PIPE SHALL BE PERFORATED WITH ½" HOLES THE LOCATION AND NUMBER OF THESE HOLES SHALL BE SIMILAR TO THOSE IN ASBESTOS CEMENT UNDERDRAIN PIPE OF THE SAME DIAMETER.
3. THE EXCAVATION LIMITS ARE APPROXIMATE AND WILL BE ADJUSTED BY THE ENGINEER IN ACCORDANCE WITH THE CONDITIONS ENCOUNTERED.
4. THE DEPTH OF THE DRAIN TRENCH MAY BE INCREASED IN SOME AREAS IF UNSUITABLE OR PERVIOUS MATERIALS ARE ENCOUNTERED AS DIRECTED BY THE ENGINEER



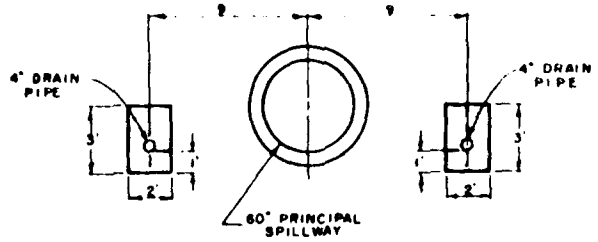


192



SMALL ANIMAL GUARD DETAILS

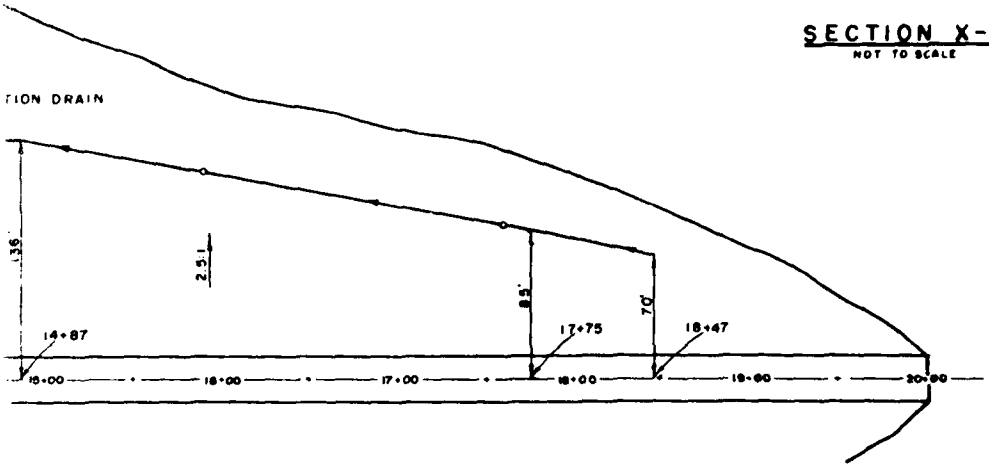
NOT TO SCALE



SECTION X-X

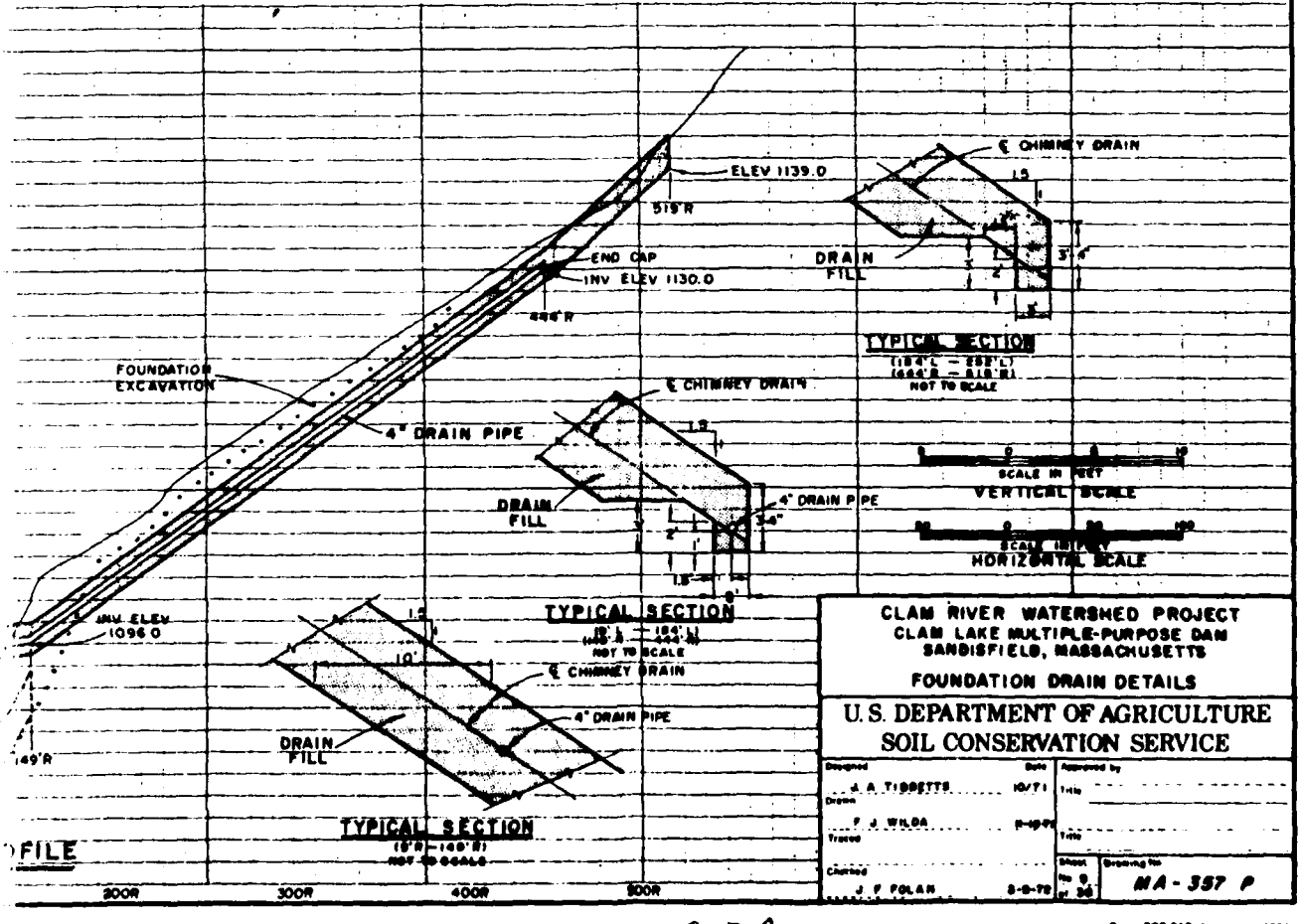
NOT TO SCALE

TION DRAIN



DRAIN FILL REQUIREMENTS	
SIEVE NO	% PASSING
3/4"	100%
1/2"	90 - 100
3/8"	40 - 75
#4	5 - 25
#8	0 - 10
#16	0 - 5

100



FILE

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

FOUNDATION DRAIN DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	J. A. TIBBETTS	Date	10/71
Drawn	P. J. WILDA	Date	8-19-72
Traced		Date	
Checked	J. F. FOLAN	Date	8-8-72
Approved by		Title	
		Title	
Sheet No.	9 of 36	Drawing No.	MA-357 P

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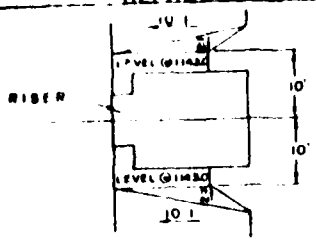
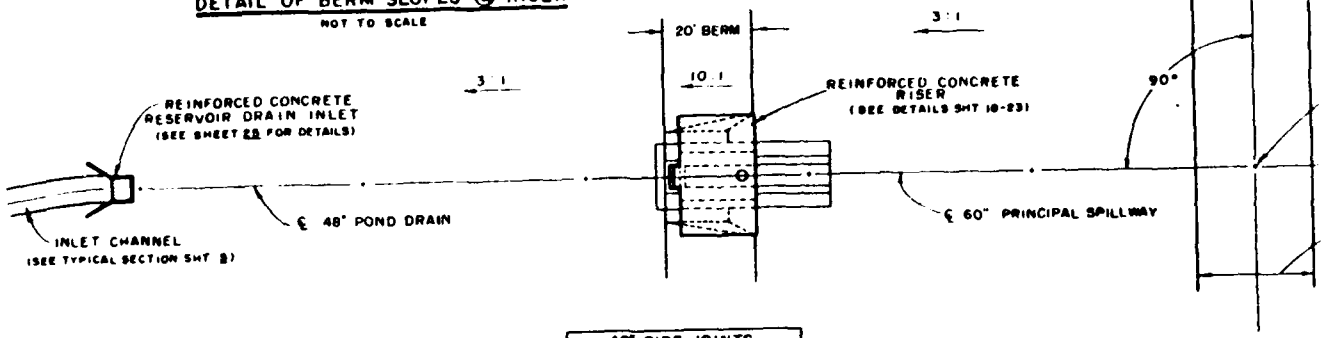
Form SCS-317 (November 1966)

D-5



DETAIL OF BERM SLOPES @ RISER

NOT TO SCALE



PLAN

SCALE IN FEET

48" PIPE DATA

48" REINFORCED CONCRETE WATER PIPE

(2) 4.0' SECTIONS	8.0'
(2) 8.0' SECTIONS	16.0'
(6) 16.0' SECTIONS	96.0'
TOTAL =	120.0'

PRESSURE HEAD = 73.7

LOAD = 50,330 LBS PER LINEAR FOOT BASED ON OUTSIDE DIAMETER OF 60"

MINIMUM 3-EDGE BEARING STRENGTH FOR 0.001" CRACK (PRESTRESSED) EQUALS 18,920 LBS PER LINEAR FOOT (AWWA C-301).

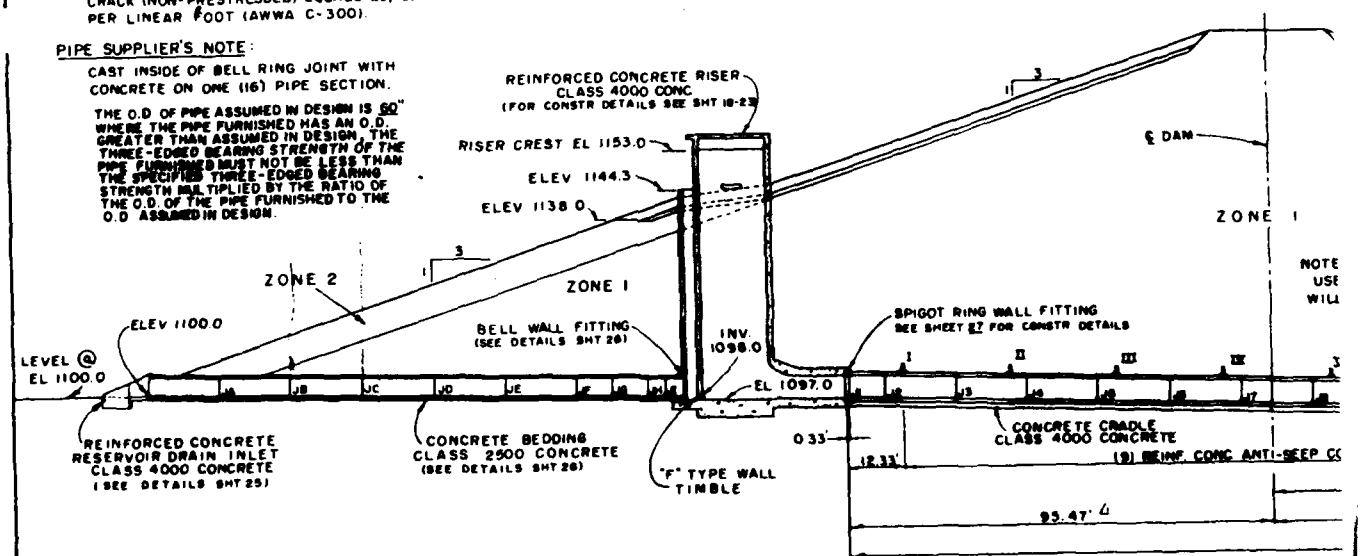
MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED) EQUALS 25,163 LBS PER LINEAR FOOT (AWWA C-300).

PIPE SUPPLIER'S NOTE:

CAST INSIDE OF BELL RING JOINT WITH CONCRETE ON ONE (16) PIPE SECTION.

THE O.D OF PIPE ASSUMED IN DESIGN IS 60" WHERE THE PIPE FURNISHED HAS AN O.D. GREATER THAN ASSUMED IN DESIGN, THE THREE-EDGED BEARING STRENGTH OF THE PIPE FURNISHED MUST NOT BE LESS THAN THE SPECIFIED THREE-EDGED BEARING STRENGTH MULTIPLIED BY THE RATIO OF THE O.D. OF THE PIPE FURNISHED TO THE O.D ASSUMED IN DESIGN.

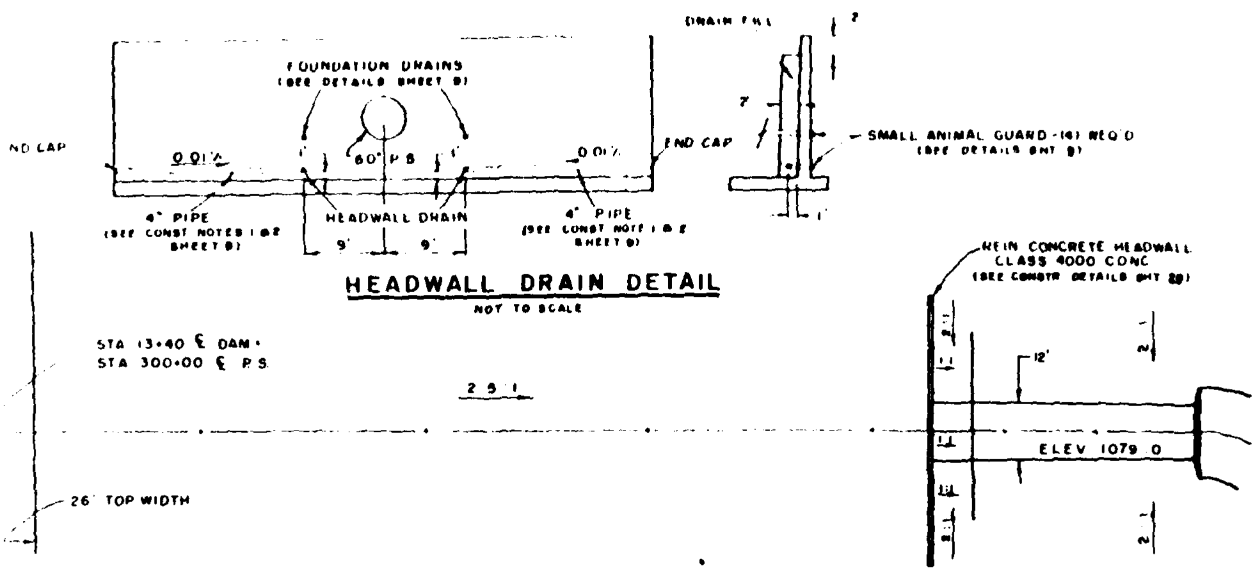
48" PIPE JOINTS		
JOINT	Δ DISTANCE FROM INLET	INVERT ELEVATION
INLET	0	1100.0
JA	16	1099.73
JB	32	1099.47
JC	48	1099.20
JD	64	1098.93
JE	80	1098.67
JF	96	1098.40
JG	104	1098.27
JH	112	1098.13
JI	116	1098.07
OUTLET	120	1098.00



PROFILE

SCALE IN FEET

Δ DIMENSIONS OF CONCRETE PIPE LENGTHS ARE BASED ON NOMINAL LENGTHS AND DO NOT INCLUDE CREEP.



ANTI-SEEP COLLARS		
COLLAR	℄ DISTANCE FROM TRANSITION WALL	INVERT OF PIPE
I	12.33	1096.65
II	36.33	1095.96
III	60.33	1095.27
IV	84.33	1094.58
V	108.33	1093.88
VI	132.33	1093.19
VII	156.33	1092.50
VIII	180.33	1091.81
IX	204.33	1091.12

60" PIPE JOINTS		
JOINT	℄ DISTANCE FROM TRANSITION WALL	INVERT ELEVATION
J1	0.33	1097.00
J2	8.33	1096.77
J3	24.33	1096.31
J4	40.33	1095.85
J5	56.33	1095.38
J6	72.33	1094.92
J7	88.33	1094.46
J8	104.33	1094.00
J9	120.33	1093.54
J10	136.33	1093.08
J11	152.33	1092.62
J12	168.33	1092.15
J13	184.33	1091.69
J14	200.33	1091.23
J15	216.33	1090.77
J16	232.33	1090.31
J17	248.33	1089.85
J18	264.33	1089.38
J19	280.33	1088.92
J20	296.33	1088.46
OUTLET	312.33	1088.00

60" PIPE DATA

60" REINFORCED CONCRETE WATER PIPE
(1) 8.0' SECTION 8.0'
(19) 16.0' SECTIONS 304.0'
(1) WALL FITTING
TOTAL: 312.0'

PRESSURE HEAD = 83.2

LOAD = 164,742 LBS PER LINEAR FOOT BASED ON OUTSIDE DIAMETER OF 80"

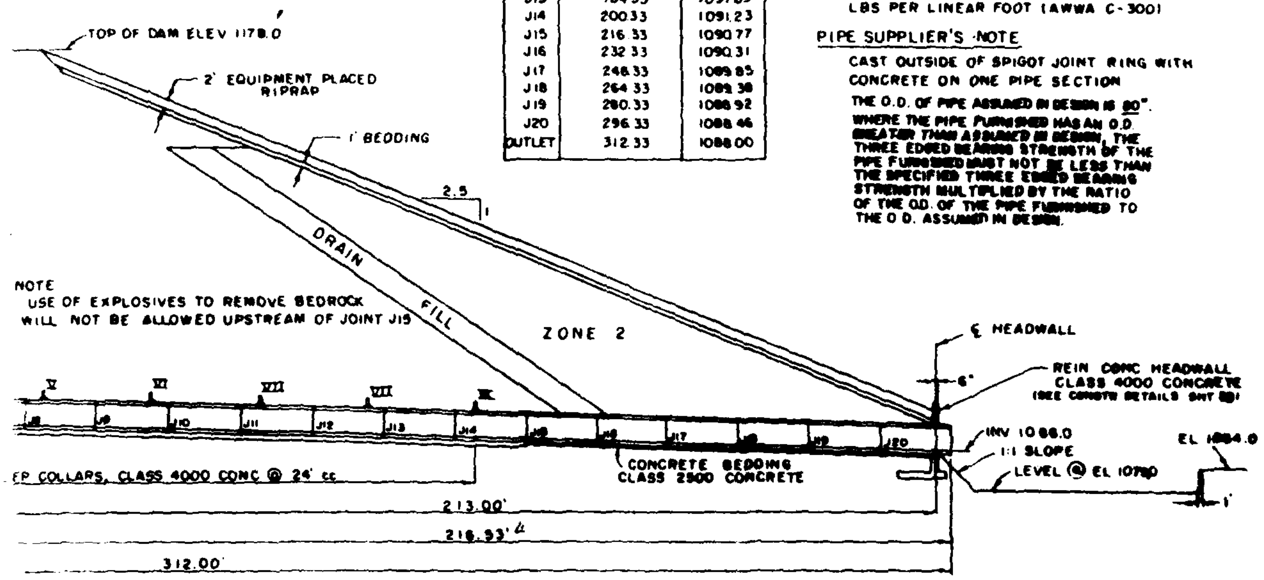
MINIMUM 3-EDGE BEARING STRENGTH FOR 0.001" CRACK (PRESTRESSED) EQUALS 37,872 LBS PER LINEAR FOOT (AWWA C-301)

MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED) EQUALS 50,369 LBS PER LINEAR FOOT (AWWA C-300)

PIPE SUPPLIER'S NOTE

CAST OUTSIDE OF SPIGOT JOINT RING WITH CONCRETE ON ONE PIPE SECTION

THE O.D. OF PIPE ASSUMED IN DESIGN IS 80". WHERE THE PIPE FURNISHED HAS AN O.D. GREATER THAN ASSUMED IN DESIGN, THE THREE EDGED BEARING STRENGTH OF THE PIPE FURNISHED MUST NOT BE LESS THAN THE SPECIFIED THREE EDGED BEARING STRENGTH MULTIPLIED BY THE RATIO OF THE O.D. OF THE PIPE FURNISHED TO THE O.D. ASSUMED IN DESIGN.



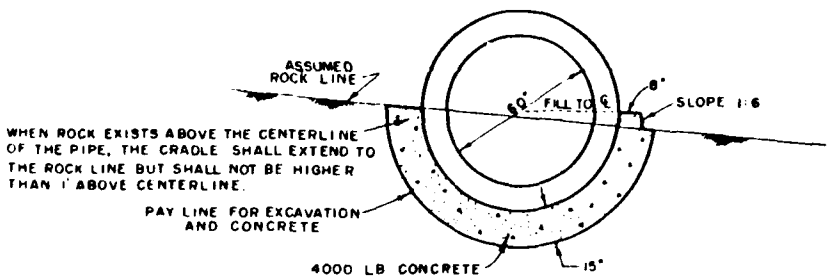
CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

PRINCIPAL SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

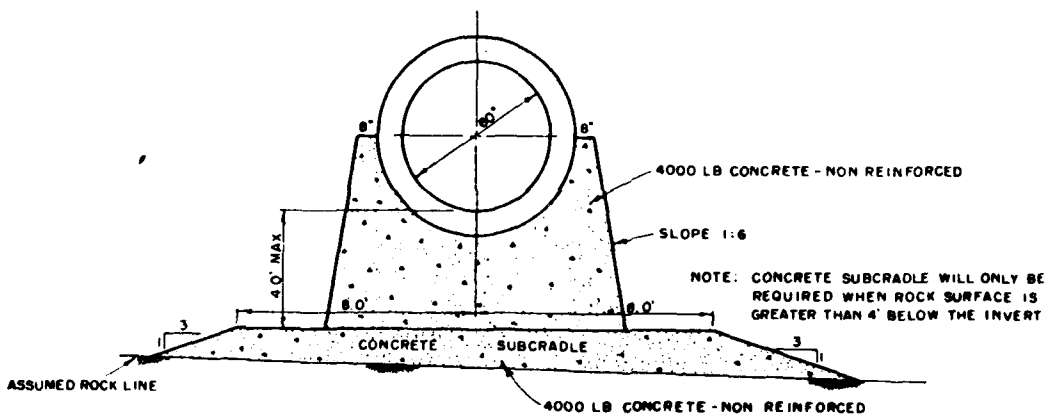
Designed J. A. TIBBETTS 10/71
Drawn F. J. WILBA
Checked C. H. BARKER

MA-387 P



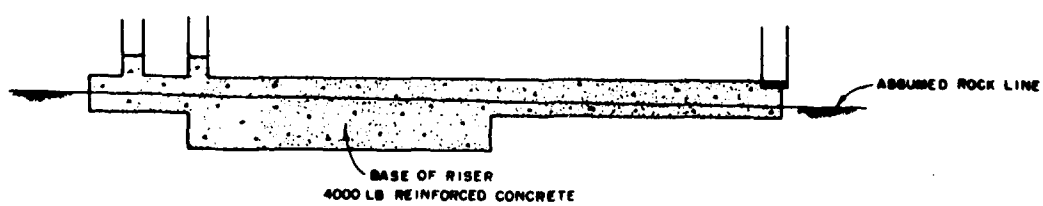
PRINCIPAL SPILLWAY WITH CRADLE IN AREAS REQUIRING ROCK EXCAVATION

NOT TO SCALE



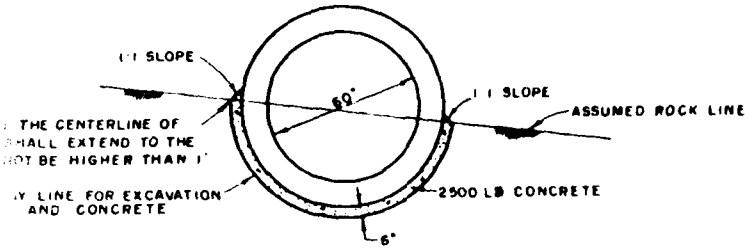
PRINCIPAL SPILLWAY WITH CRADLE IN AREAS NOT REQUIRING ROCK EXCAVATION

NOT TO SCALE

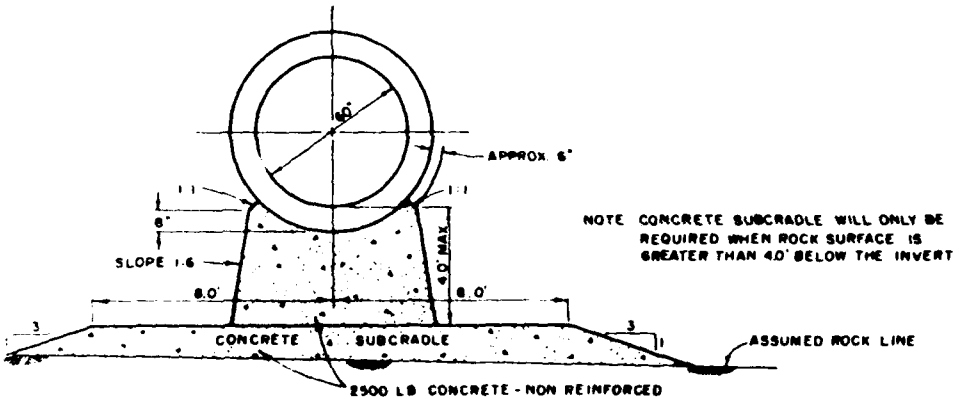


DETAIL OF RISER BASE

NOT TO SCALE



PRINCIPAL SPILLWAY WITH BEDDING
IN AREAS REQUIRING ROCK EXCAVATION
NOT TO SCALE



NOTE CONCRETE SUBCRADLE WILL ONLY BE REQUIRED WHEN ROCK SURFACE IS GREATER THAN 40" BELOW THE INVERT

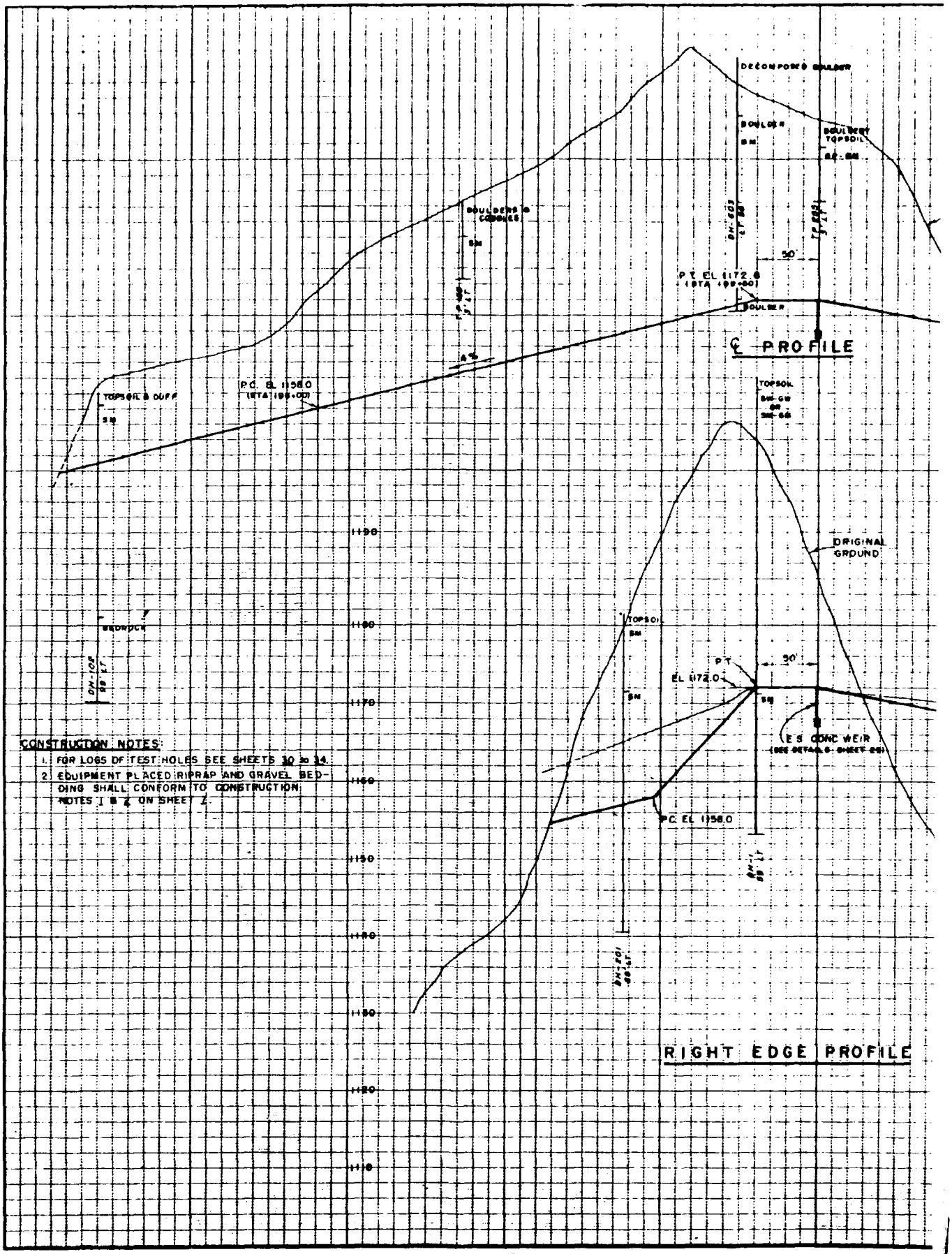
PRINCIPAL SPILLWAY WITH BEDDING
IN AREAS NOT REQUIRING ROCK EXCAVATION
NOT TO SCALE

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

PRINCIPAL SPILLWAY DETAILS

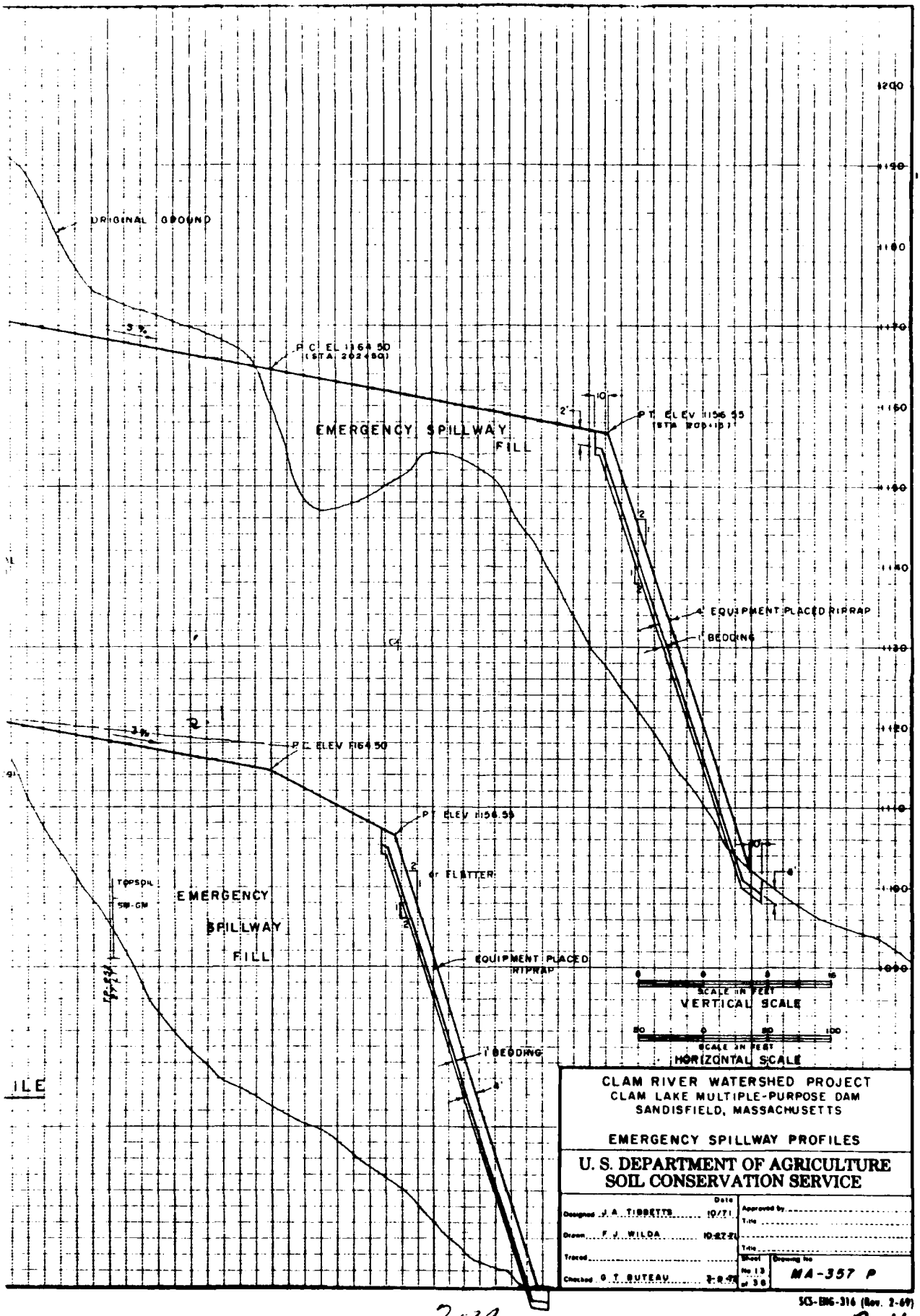
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	A.A. TIBBETTS	10/71	Approved by
Drawn	P.A. BILBA	10-71	Title
Traced			Date
Checked	A.R. COLAS	11-10-71	Sheet No. 11 of 30 — NA-387 P



CONSTRUCTION NOTES:

1. FOR LOGS OF TEST HOLES SEE SHEETS 10 to 14.
2. EQUIPMENT PLACED RIPRAP AND GRAVEL BEDDING SHALL CONFORM TO CONSTRUCTION NOTES 1 & 4 ON SHEET 2.



CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

EMERGENCY SPILLWAY PROFILES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

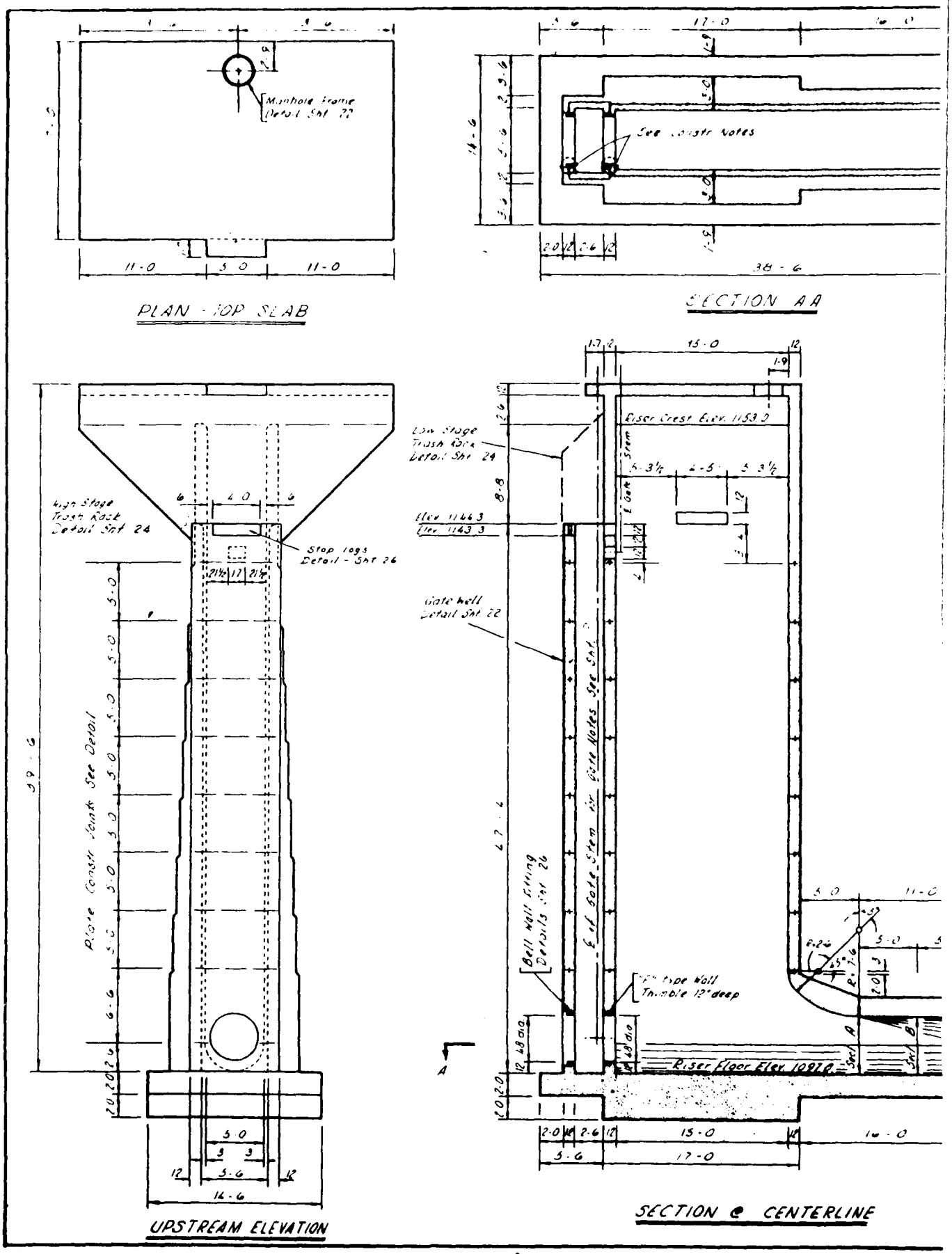
	Date
Designed J. A. TIBBETTS	10/71
Drawn F. J. WILDA	10-27-71
Traced	
Checked G. T. BUTEAU	2-8-72

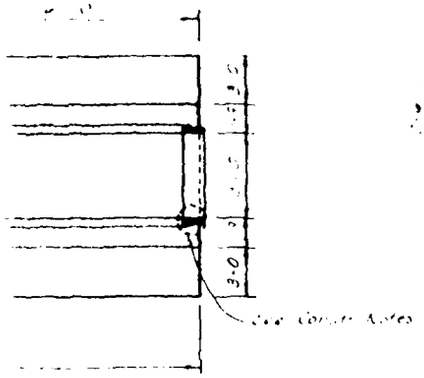
Approved by
Title
Title
Sheet No. 13 of 38
Drawing No. MA-357 P

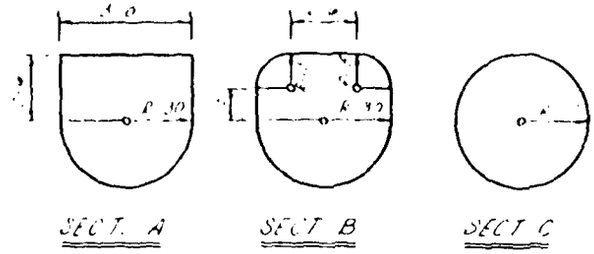
SCS-EMG-316 (Rev. 2-69)

2072

B-11







CONSTR JOINT.

¼" x 6" carbon steel plate to conform to Spec SHI continuous thru constr. joint.
Splices shall be either
1 Butt welded
2 Lapped 3" & bolted
3 Lapped 3" & fillet welded.

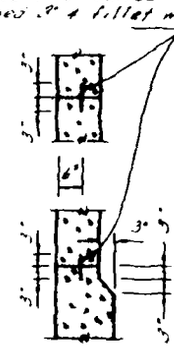
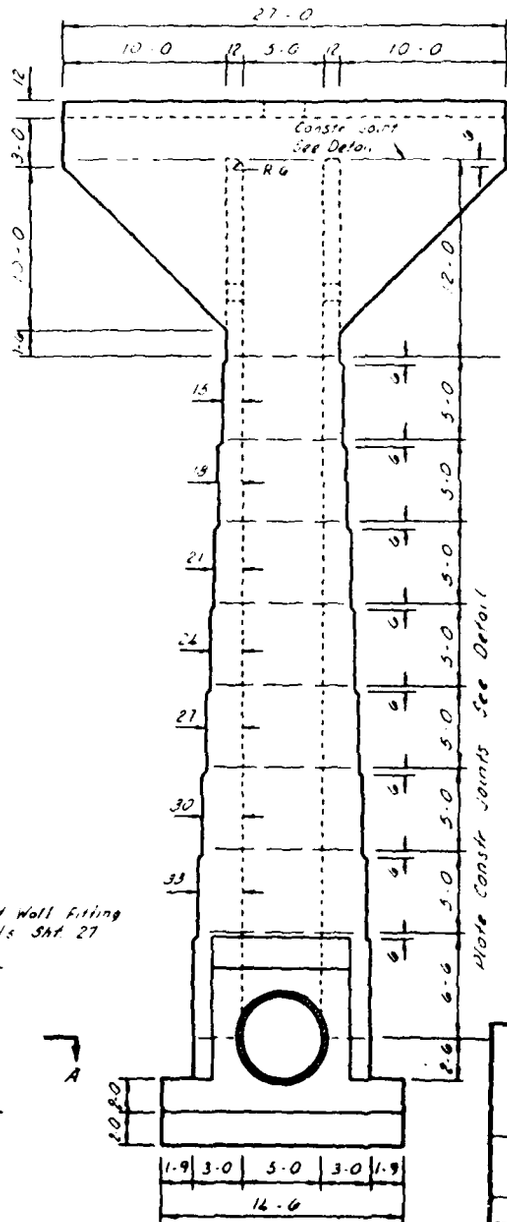
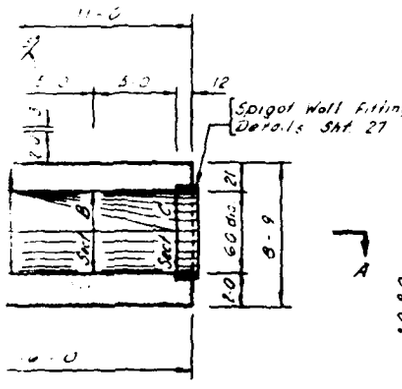


PLATE
CONSTR JOINT



CONSTR NOTES:

¼" x 6" steel plate of the constr. joint shall be butt welded to the steel cylinder of the wall fittings & wall thimble.



CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

RISER DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed C. Hodge
Drawn N. Brewington Dec 71
Traced
Checked C. Hodge

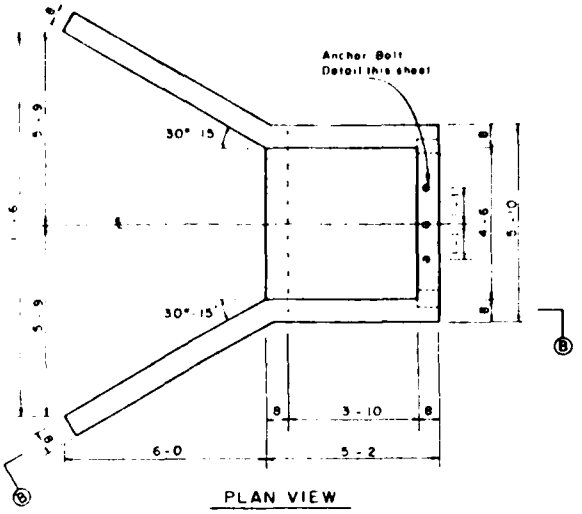
MA-387 P

NE

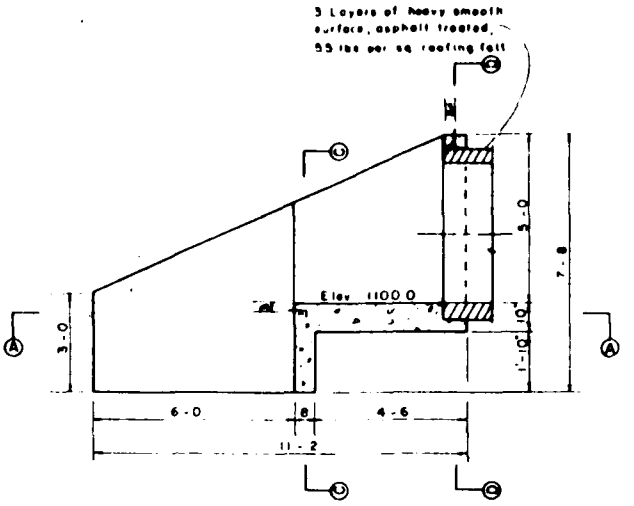
DOWNSTREAM ELEVATION

202

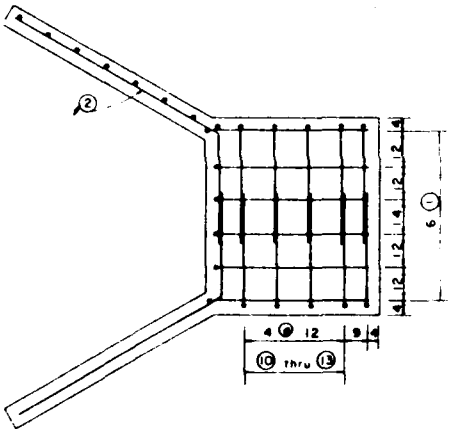
B-1



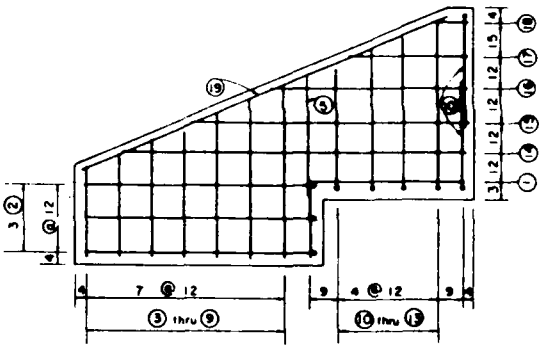
PLAN VIEW



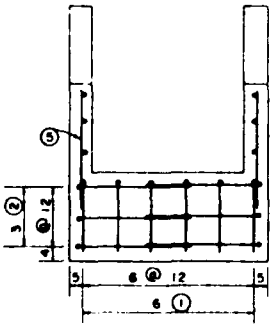
SECTION ALONG CENTERLINE



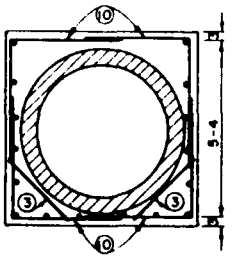
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

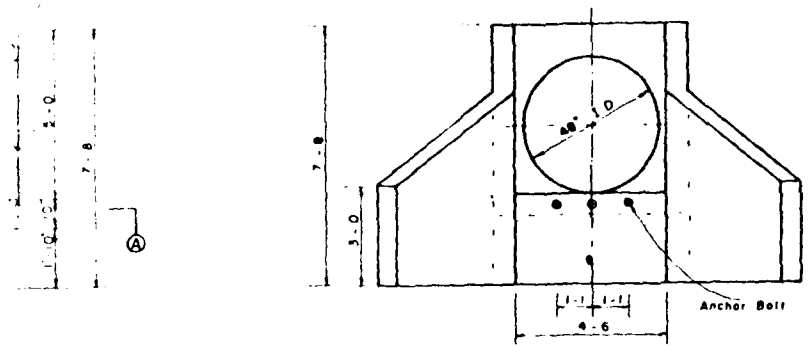
10/2

CONSTRUCTION NOTES

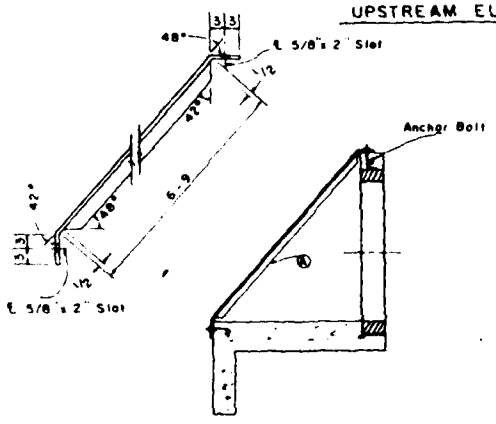
1. Material in reservoir drain trash rack shall conform to Spec 581 for structural steel
2. Trash rack to be galvanized in accordance with Spec 582

NOTE

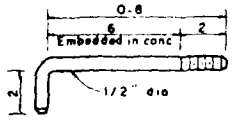
For construction details see sheet 10



UPSTREAM ELEVATION

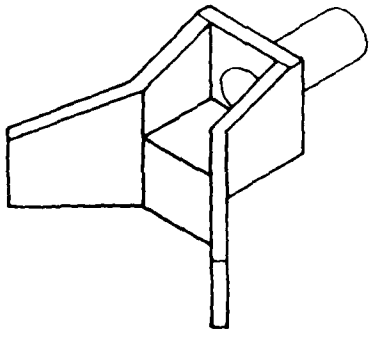


TRASH RACK

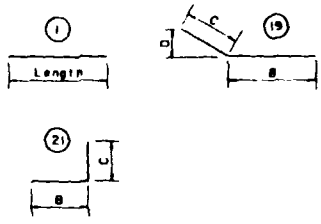


ANCHOR BOLT

ASTM A-276, 1/2" dia, Class 302 or 303, With Type-2 nuts and washers



ISOMETRIC



BAR TYPES

BILL OF MATERIAL
RESERVOIR DRAIN TRASH RACK

ITEM	SIZE	LENGTH	QUANTITY
Angle Ⓐ	1 1/2" x 1 1/2" x 1/4"	6'-9"	3
Anchor Bolt	1/2" dia	2" x 8"	6

RESERVOIR DRAIN STEEL SCHEDULE

MARK	QUAN	SIZE	LENGTH	TYPE	B	C	D	TOTAL LENGTH
1	6	4	6 - 9	21	4-7	2-2		40 50
2	6	4	10 - 3	19	7-0	3-3	2-10	61 50
3	4	4	2 - 9	1				11 00
4	2	4	3 - 0	1				6 00
5	4	4	3 - 6	1				14 00
6	2	4	3 - 9	1				7 50
7	2	4	4 - 3	1				8 50
8	2	4	4 - 9	1				9 50
10	6	4	6 - 9	21	3-6	3-3		40 50
11	2	4	7 - 6	21	4-3	3-3		15 00
12	2	4	7 - 9	21	4-6	3-3		15 50
13	2	4	8 - 3	21	5-0	3-3		16 50
14	2	4	10 - 3	19	3-3	5-0	2-0	20 66
15	2	4	8 - 3	19	3-3	5-0	2-0	16 50
16	2	4	5 - 9	19	0-9	3-0	2-0	11 50
17	2	4	3 - 3	1				6 66
18	2	4	1 - 0	1				2 00
19	2	4	12 - 3	19	7-3	5-0	2-0	24 50

QUANTITIES (this sheet only)

STEEL
No 4 Bar 327.50 Ft = 218.77 lbs

CONCRETE (Class 4000)
Conduit I.D 48" 3.8 Cu Yds

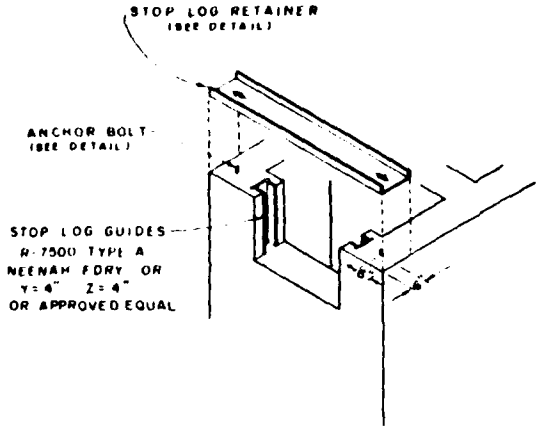
CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

RESERVOIR DRAIN INLET DETAILS

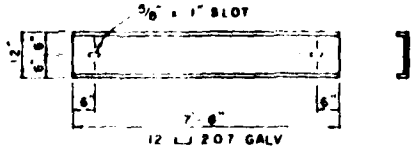
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date
Designed	J A TIBBETTS	1/72
Drawn	P J WILDA	1-20-72
Traced		
Checked	C H DODGE	1-26-72

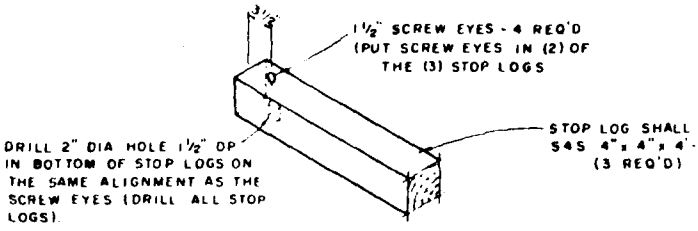
Approved by
Title
Title
Sheet No. 88 36
Drawing No. MA-357 P



ISOMETRIC VIEW



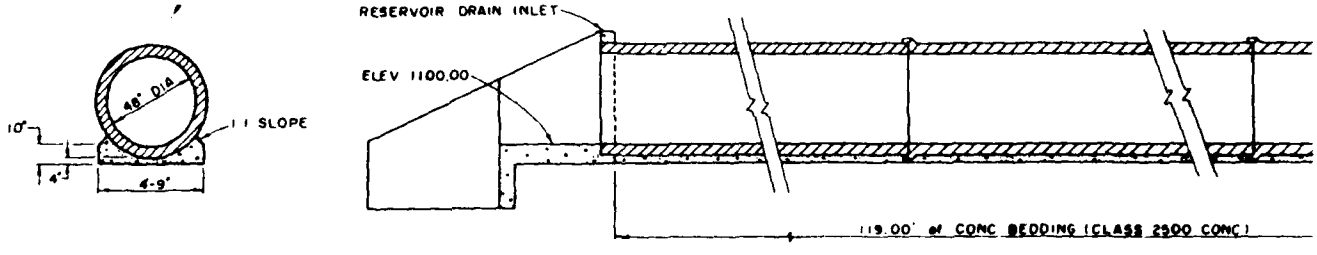
STOP LOG RETAINER
NOT TO SCALE



STOP LOG DETAIL
NOT TO SCALE

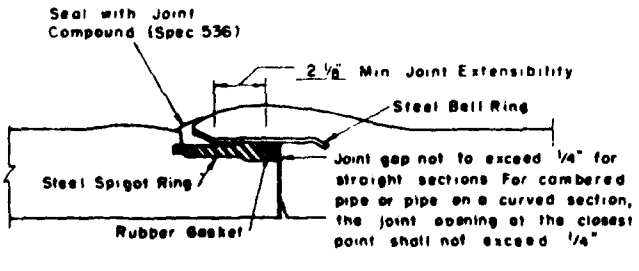
GATE WELL V

BELL RING WALL

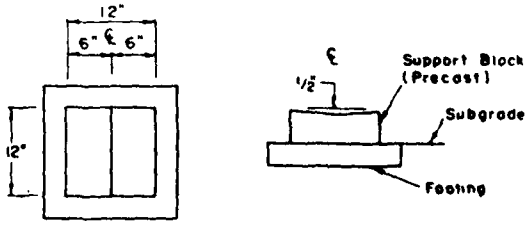


CONCRETE BEDDING
(48" POND DRAIN)

0 4 8
SCALE IN FEET



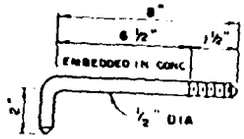
REINFORCED CONCRETE WATER PIPE JOINT



PLAN FRONT ELEVATION

SUGGESTED SUPPORT BLOCK

NOTE: The Contractor shall determine the number and size of the blocks

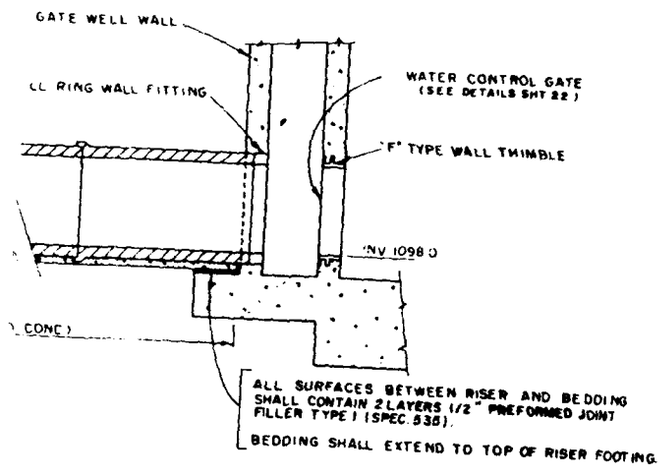


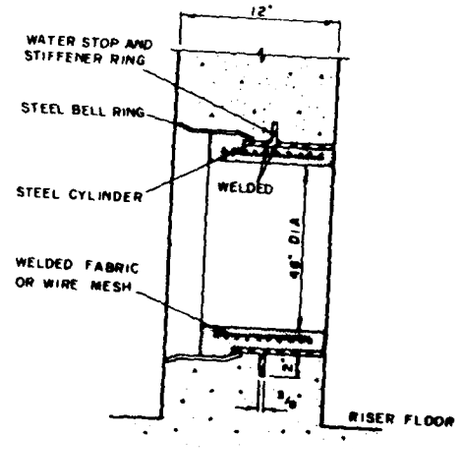
ANCHOR BOLT

Stainless Steel (Class 303, 303 Se or 304, Condition A)

Supply with washers and Type 2 nuts

LOG SHALL BE
4" x 4" x 4 - 7"
(3 REQ'D)





BELL RING FITTING

Support Block
Precast)

Subgrade

Footing

ON

K

CLAM RIVER WATERSHED PROJECT CLAM LAKE MULTIPLE-PURPOSE DAM SANDISFIELD, MASSACHUSETTS	
STOP LOG & RESERVOIR DRAIN INLET DETAILS	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed A.A.TIBBETTS 10-(71) Drawn P.J. WILDA 10-27-71 Traced Checked C.H. DODGE 10-29-71	Approved for Title Date Sheet No. 22 of 30 MA-387 P

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B-14

LOG OF TEST BORES

DH-1, ELEV. 1212.0 6/8/65 B.E.M.

0.0	1.5	TOPSOIL	
1.5	42.0	SAND, with gravel, about 10% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 15% gravel, 8% cobbles, 2% boulders, angular to sub-rounded, maximum size 14", tan-brown, damp, high permeability, dense, kame terrace.	SW-GW or SW-GR
42.0	59.0	SAND, silty with gravel, about 20% fines, 20% fine sand, 25% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, angular to sub-rounded, maximum size 6", olive-brown, damp, low permeability, to impermeable, dense to very dense, glacial till.	SM
59.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	3	84
2.	1.5 - 3.0	115/6	50
3.	10.0 -11.5	51	33

NOTE: Water level at 4.5 feet on 6/15/65. Hole dry at 28 feet on 6/16/65. Casing 28 feet. Hole at 29 feet on 6/15/65. Hole dry at 40 feet on 6/21/65. Pipe to 40 feet. Could not get tape below 35 feet on 7/14/65.

DH-2, ELEV. 1154.0 6/22/65 E.G.L.

0.0	2.0	TOPSOIL	
2.0	16.5	SAND, silty with gravel, about 18% fines, 32% fine sand, 25% medium sand, 15% coarse sand, 10% gravel, angular, hard, maximum size 3", brown, damp, to moist at 4.0, low permeability, dense to very dense, glacial till.	SM
16.5	52.0	SAND, silty with gravel, about 30% fines, 35% fine sand, 15% medium sand, 5% coarse sand, 10% gravel, 5% cobbles, angular, hard, maximum size 8", olive-brown, damp, impermeable, very dense, glacial till.	SM
52.0	59.0	BEDROCK, hard, unweathered Pre-Cambrian Gneiss, fractures mostly horizontal, spaced 18 to 30 inches apart, foliation dipping about 45 degrees.	
59.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	37	67
2.	1.5 - 3.0	84	56
3.	3.0 - 4.5	63	78
4.	4.5 - 6.0	22	56
5.	12.0 -13.0	160/8	67
6.	22.0 -23.6	172	84
7.	27.0 -28.5	180	77
8.	32.0 -33.0	323/9	100
9.	42.0 -42.5	200/7	94
10.	47.5 -48.5	903/10	100

Rock Core

No.	Depths	% Recovery
1.	52.0 -54.0	100
2.	54.0 -59.0	100

NOTE: Water level at 3 feet on 6/24/65, water level at 13 feet on 7/14/65.

DH-3, ELEV. 1124.8 6/18-21/65 E.G.L.

0.0	1.5	TOPSOIL	
1.5	13.0	SAND, silty with gravel, about 18% fines, 25% fine sand, 10% medium sand, 15% coarse sand, 32% gravel, angular, hard, with some decomposed Schist fragments, damp, low permeability, dense to very dense, colluvium.	SM
13.0	23.0	SAND, silty with gravel, about 20% fines, 15% fine sand, 25% medium sand, 10% coarse sand, 15% gravel, 5% cobbles, 10% boulders, angular, hard, maximum size 12", gray, damp, impermeable, very dense, glacial till.	SM
23.0	39.0	BEDROCK, gray, hard, quartz, biotite, feldspar gneiss, foliation dipping about 45 degrees, moderately to badly fractured, fractures spaced 1 to 8 inches, nearly horizontal and dipping about 45 degrees.	
39.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	18	78
2.	1.5 - 3.0	50	89
3.	3.0 - 4.0	100/5	67
4.	10.0 -11.5	84	45
5.	16.5 -17.0	100/5	95

Rock Core

No.	Depths	% Recovery
1.	23.0 -24.0	100
2.	24.0 -29.0	100
3.	29.0 -34.0	100
4.	34.0 -39.0	100

Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	23.5 -34.0	3 inches	25	18.5
2.	28.0 -34.0	3 inches	25	15.3
3.	35.0 -39.0	3 inches	25	.02

NOTE: Water level at 20.5 feet on 7/14/65, Hole dry to 16 feet on 6/21/65. Lost drilling water at 27.0 feet.

DH-4, ELEV. 1101.8 6/16/65 B.E.M.

0.0	2.0	TOPSOIL	
2.0	16.0	BEDROCK, hard, unweathered, gray gneiss, containing much quartz and biotite, fracturing mostly horizontal, some dipping about 60 degrees, foliation dipping about 45 degrees.	
16.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	4	67
2.	1.5 - 2.1	106/7	100

Rock Core

No.	Depths	% Recovery
1.	2.0 - 6.0	88
2.	6.0 - 8.5	100
3.	8.5 -13.0	100
4.	13.0 -16.0	94

Pressure Test

No.	Depths	Psi	Q/gpm
1.	8.5 -16.0	25	12

NOTE: Water level at 2 feet on 7/13/65.

DH-5, ELEV. 1089.7 5/17-18/65 E.G.L.

0.0	7.0	BOULDERS, and cobbles with gravel and sand, angular, hard, maximum size 14", high permeability, alluvium.	
7.0	17.0	BEDROCK, gray, hard, quartz, biotite, feldspar gneiss, foliation dipping about 60 degrees. Joints nearly horizontal and dipping about 45 degrees, spaced 1 to 30 inches.	
17.0		Bottom of Hole.	

Rock Core

No.	Depths	% Recovery
1.	7.0 - 8.0	100
2.	8.0 -13.0	100
3.	13.0 -17.0	100

Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	9.0 -17.0	3 inches	25	14.4
2.	12.0 -17.0	3 inches	25	0.86

NOTE: Water level at 0.3 feet on 7/13/65

DH-6, ELEV. 1090.2 6/16/65 B.E.M.

0.0	1.5	TOPSOIL and BOULDERS	
1.5	9.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 15% medium sand, 30% coarse sand, 7% gravel, 2% cobbles, 1% boulders, angular to sub-rounded, maximum size 14", tan-brown, wet, low to medium permeability, dense, valley fill.	SM
9.0	23.0	BEDROCK, hard, gray, biotite gneiss, unweathered, with fractures mostly horizontal and tight but some dipping about 60 degrees, fractures spaced 10 to 18 inches apart, foliation dipping about 45 degrees.	
23.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	1.5 - 3.0	36	77
2.	3.0 - 4.5	59	0
3.	7.0 - 8.5	33	44

Rock Core

No.	Depths	% Recovery
1.	9.0 -12.0	100
2.	12.0 -13.0	10
3.	13.0 -18.0	100
4.	18.0 -23.0	100

Pressure Test

No.	Depths	Psi	Q/gpm
1.	10.0 - 23.0	25	1

NOTE: Water level at 0.5 feet on 7/13/65.

DH-7, ELEV.

0.0	1.5
1.5	12.0
12.0	22.0
22.0	

DH-8, ELEV.

0.0	1.5
1.5	5.0
5.0	18.0
18.0	

DH-9, ELEV.

0.0	12.
12.0	30.
30.0	

DH-1, ELEV. 1140.0 6/10-14/65 D.E.M.

0.0	1.5	TOPSOIL and DUFF
1.5	12.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 15% medium sand, 15% coarse sand, 15% gravel, 7% cobbles, 3% boulders, soft, highly weathered, maximum size 16", tan-brown, damp, low permeability to impermeable, dense to very dense, glacial till. SM
12.0	22.0	BEDROCK, dark gray, biotite gneiss, hard, fractures 6 to 30 inches apart, mostly horizontal, foliation dipping about 80 degrees.
22.0		Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	3	33
2.	1.5 - 3.0	23	77
3.	3.0 - 4.5	55	77

Rock Core

No.	Depths	% Recovery
1.	12.0 -14.0	90
2.	14.0 -19.0	100
3.	19.0 -22.0	96

Pressure Test

No.	Depths	Psi	Q/gpm
1.	13.0 -22.0	25	trace

NOTE: Water level at 7 feet on 7/14/65.

DH-8, ELEV. 1124.5 6/15/65 D.E.M.

0.0	1.5	TOPSOIL
1.5	5.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 15% medium sand, 15% coarse sand, 15% gravel, 7% cobbles, 3% boulders, soft and weathered, maximum size 16", tan-brown, damp, low to medium permeability, dense to very dense, glacial till. SM
5.0	18.0	BEDROCK, hard, dark gray biotite gneiss, fractures mostly horizontal, some dipping about 60 degrees, spaced 8 to 20 inches apart, foliation dipping about 80 degrees.
18.0		Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	3	44
2.	1.5 - 3.0	28	777
3.	3.0 - 4.5	128/12	55

Rock Core

No.	Depths	% Recovery
1.	3.0 - 9.0	100
2.	9.0 -14.0	81
3.	14.0 -18.0	70

Pressure Test

No.	Depths	Psi	Q/gpm
1.	7.0 -12.0	20	packer failed
2.	12.0 -18.0	20	10

NOTE: Water level-no measurement. Packers stuck in hole.

DH-9, ELEV. 1136.0 6/16/65 D.E.M.

0.0	12.0	BOULDERS, with silty sand matrix, about 3% fines, 7% fine sand, 5% medium sand, 5% coarse sand, 80% boulders, angular to sub-angular, hard, unweathered, maximum size 24", gray, damp, high permeability, dense, slope wash and residual.
12.0	30.0	BEDROCK, hard, dark gray, biotite gneiss, moderately weathered at top 2 feet, with separation of foliation planes, fractures mostly horizontal, some dipping about 60 degrees, spaced 10 to 20 inches apart. Foliation dipping about 80 degrees.
30.0		Bottom of Hole.

Rock Core

No.	Depths	% Recovery
1.	11.0 -12.0	100
2.	12.0 -17.0	100
3.	17.0 -22.0	80
4.	22.0 -25.0	83
5.	25.0 -30.0	100

Pressure Test

No.	Depths	Psi	Q/gpm
1.	14.0 -30.0	25	0

NOTE: Water level at 2.5 feet on 7/14/65.

LEGEND

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1 -99
Borrow Area	101-199
Emergency Spillway	201-299
Centerline of Outlet Structure	301-399
Stream Channel	401-499
Relief Wells	501-599
	601-699
	701-799

DH-Drill Holes
TP-Test Pits

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels; gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels; gravel-sand-silt mixtures
GC	Clayey gravels; gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sands; sand-silt mixtures
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, very fine sands; sandy or clayey silts
CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays or silts of medium to high plasticity

****

All Soil and Rock description and classifications were determined by visual examination in the field.

When possible, all holes were advanced by continuous drive sampling to 6.0 feet. Holes were then advanced by NX diamond drilling between drive samples. Drive samples taken with a 3-inch O.D. split spoon sampler.

Location of Test Holes shown on Plan View

NOTE: Water levels do not necessarily represent static water levels.

Psi = pounds per square inch water pressure
Q/gpm = quantity of water in gallons per minute
K/ft/day = permeability in feet per day
D.S. = Disturbed Sample

The Unified Soil Classification System classifies only those materials which are smaller than three inches.

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated Date
Designed D. MILLS & K. LANE 1965
Drawn .....
Traced .....
Checked D. MILLS 3-1966
Approved by .....
Title .....
Title .....
Sheet No. 30 of 30
Drawing No. MA-357 P

SCS-313B (APRIL 1963)

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B-15

LOG OF TEST HOLES

DH-10, ELEV. 1136.0 5/17-18/65 R.G.L.

0.0	10.0	COBBLES, GRAVEL and BOULDERS, about 3% fines, 7% fine sand, 5% medium sand, 5% coarse sand, 80% gravel, 30% cobbles, 30% boulders, sub-round to angular, hard, slope wash.
10.0	20.0	BEDROCK, gray, hard, quartz, biotite feldspar gneiss, foliation dipping about 45 degrees, joints spaced 1/2 to 16 inches dipping about 30 degrees.
20.0		Bottom of Hole.

Rock Core

No.	Depths	% Recovery
1.	10.0 -12.0	100
2.	12.0 -15.0	100
3.	15.0 -17.0	100
4.	17.0 -20.0	100

Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	12.0 -20.0	3 inches	25	14.8
2.	16.5 -20.0	3 inches	25	4.20

NOTE: Water level at 11 feet on 7/14/65

DH-101, ELEV. 1214.2 6/18-24/65 D.E.M.

0.0	1.5	TOPSOIL	
1.5	40.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, angular to sub-rounded, soft, maximum size 42", olive-brown, damp, low permeability, dense to very dense, glacial till.	SM
40.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	17	77
2.	1.5 - 3.0	15	88
3.	3.0 - 4.5	212	83
4.	4.5 - 5.2	196/8	33
5.	10.0 -11.5	176	88
6.	15.0 -16.5	176	50
7.	20.0 -20.1	100/1	0
8.	30.0 -30.9	198/9	10
9.	35.0 -36.5	154	61
10.	38.5 -40.0	276	33

NOTE: Water level at 25 feet on 6/24/65, water level at 13.5 feet on 7/14/65. Boulders from 35.0-38.5 feet.

DH-102, ELEV. 1160.0 6/21-24/65 D.E.M.

0.0	1.5	TOPSOIL and DUFF	
1.5	30.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, angular to sub-rounded, maximum size 24", olive-brown, damp, low permeability to impermeable, very dense, glacial till.	SM
30.0	40.0	BEDROCK, grey biotite gneiss, hard, fractures spaced 8 to 18 inches apart, mostly horizontal, some dipping about 70 degrees, foliation dipping about 70 degrees.	
40.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	71	72
2.	1.5 - 3.0	145	67
3.	3.0 - 4.5	71	77
4.	4.5 - 6.0	74	94
5.	10.0 -11.5	53	77
6.	15.0 -16.5	697	94
7.	20.0 -21.5	683	88

Rock Core

No.	Depths	% Recovery
1.	30.0 -34.0	100
2.	34.0 -40.0	100

NOTE: Water level at 7 feet on 6/23/65, water level at 8 feet on 6/24/65, water level at 7.5 feet on 7/14/65.

DH-201, ELEV. 1161.3 6/23-24/65 D.E.M.

0.0	1.5	TOPSOIL	
1.5	10.0	SAND, silty with gravel, about 18% fines, 32% fine sand, 25% medium sand, 15% coarse sand, 7% gravel, 2% cobbles, 1% boulders, angular, hard, maximum size 16", olive-brown, damp, low permeability, dense, slope wash.	SM
10.0	42.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, hard, angular, to sub-angular, maximum size 8", olive-brown, damp, impermeable, very dense, glacial till.	SM
42.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	2	67
2.	1.5 - 3.0	26	77
3.	3.0 - 4.5	38	77
4.	4.5 - 6.0	50	44
5.	10.0 -11.5	48	44
6.	15.0 -16.5	44	39
7.	20.0 -21.5	50	0
8.	25.0 -26.5	96	55
9.	30.0 -31.5	73	34
10.	35.0 -36.5	61	34

NOTE: Water level at 3 feet on 6/24/65, water level at 18.5 feet on 7/14/65.

DH-202, ELEV. 1182.5 6/23-24/65 R.G.L.

0.0	4.0	TOPSOIL	
4.0	12.0	SAND, silty with gravel, about 15% fines, 20% fine sand, 25% medium sand, 20% coarse sand, 15% gravel, 5% cobbles, angular, hard, maximum size 6", olive-brown, damp, low permeability to impermeable, medium to dense, kame terrace.	SM
12.0	42.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, hard, angular, maximum size 18", olive-brown, damp, impermeable, very dense, glacial till.	SM
42.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	2	78
2.	1.5 - 3.0	4	78
3.	3.0 - 4.5	4	78
4.	4.5 - 6.0	5	78
5.	10.0 -11.5	29	78
6.	15.0 -16.3	130/8	67
7.	20.0 -21.5	96	77
8.	25.0 -26.5	110	100
9.	30.0 -31.5	131	67
10.	35.0 -36.5	116	77
11.	40.5 -42.0	163	34

NOTE: Water level at 13 feet on 7/14/65

DH-203, ELEV. 1163.1 6/24/65 D.E.M.

0.0	1.5	TOPSOIL	
1.5	41.5	SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 10% gravel, 7% cobbles, 3% boulders, angular, hard, maximum size 16", brown, damp, low to medium permeability, loose to very dense.	SM
41.5		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	3	88
2.	1.5 - 3.0	2	67
3.	3.0 - 4.5	6	67
4.	4.5 - 6.0	8	88
5.	15.0 -16.5	16	73
6.	20.0 -21.5	36	77
7.	25.0 -26.5	42	50
8.	30.0 -31.5	34	72
9.	35.0 -36.5	101	44
10.	40.0 -41.5	137	77

NOTE: Water level at 15 feet on 7/14/65.

DH-10
0.0
7.0
17.0

DH-102
0.0
8.0
18.0

DH-103
0.0
9.0
19.0

DH-20
0.0
1.5
13.0
23.0

1092

DH-301, ELEV. 1095.6 6/21-22/65 E.G.L.

0.0	7.0	GRAVEL, COBBLES and Boulders in a silty sand matrix, angular to hard, maximum size 14", medium to high permeability, alluvium.
7.0	17.0	BEDROCK, quartz biotite feldspar gneiss, moderately hard from 7 to 12 then hard, seamy from 7 to 12, foliation dipping about 80 degrees. Joints horizontal spaced 1 to 24 inches, with a 6" weathered seam at 11 feet.
17.0		Bottom of Hole.

Rock Core

No.	Depths	% Recovery
1.	7.0 - 12.0	60
2.	12.0 - 17.0	100

Rock Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	7.2 - 17.0	3 inches	12	11.7

2. Could not place packer below 11.0 feet.

NOTE: Water level at 3.5 feet on 7/14/65.

DH-302, ELEV. 1091.8 6/21/65 E.G.L.

0.0	8.0	GRAVEL, COBBLES and BOULDERS with silty sand matrix, angular, hard, maximum size 14", medium to high permeability, alluvium.
8.0	18.0	BEDROCK, dark grey, biotite quartz, feldspar gneiss, moderately hard to hard below 11.0 feet, foliation dipping about 85 degrees, fractures spaced 1 to 18 inches generally horizontal with a few dipping about 30 degrees.
18.0		Bottom of Hole.

Rock Core

No.	Depths	% Recovery
1.	8.0 - 9.5	88
2.	9.0 -11.5	100
3.	11.0 -16.0	88
4.	16.0 -18.0	100

Rock Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	9.5 -18.0	3 inches	25	5.7

NOTE: Water level at surface on 7/14/65

DH-303, ELEV. 1098.7 6/15-16/65 D.E.M.

0.0	9.0	SAND, silty with gravel, about 15% fines, 15% fine sand, 30% medium sand, 25% coarse sand, 10% gravel, 4% cobbles, 1% boulders, angular to sub-angular, hard, maximum size 18 inches, tan-brown, wet, high permeability, very dense.
9.0	19.0	BEDROCK, hard, grey biotite gneiss, fractures nearly horizontal some dipping 60 degrees, spaced 8 to 20 inches apart, foliation dipping about 80 degrees.
19.0		Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	220/8	33
2.	6.0 - 7.5	141	55

Rock Core

No.	Depths	% Recovery
1.	9.0 -14.5	100
2.	14.0 -19.0	100

Pressure Test

No.	Depths	Psi	Q/gpm
1.	9.5 -19.0	25	23
2.	14.0 -19.0	25	0

NOTE: Water level at surface on 7/14/65

DH-304, ELEV. 1090.6 6/11/65 D.E.M.

0.0	1.5	TOPSOIL and DUFF
1.5	13.0	SAND, silty with gravel, about 18% fines, 22% fine sand, 40% medium sand, 10% coarse sand, 10% gravel, angular to sub-rounded, maximum size 1", tan-brown, low to medium permeability, wet, firm to very dense, valley fill.
13.0	23.0	BEDROCK, firm, dark, grey biotite gneiss, with quartz stringers, fractures nearly horizontal, spaced 8 to 20 inches apart, foliation dipping about 80 degrees.
23.0		Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	4	77
2.	1.5 - 3.0	34	67
3.	3.0 - 4.5	34	67
4.	5.0 - 6.5	152	72

Rock Core

No.	Depths	% Recovery
1.	13.0 -14.0	85
2.	14.0 -15.0	100
3.	15.0 -20.0	85
4.	20.0 -23.0	100

Pressure Test

No.	Depths	Psi	Q/gpm
1.	14.0 -19.0	25	18
2.	19.0 -23.0	25	trace

NOTE: Water level at 6 feet on 6/14/65, at 3 feet on 7/14/65

TEST PITS

TP-151, ELEV. 1184.7 6/24/65 K.G.L.

0.0	7.0	TOPSOIL
7.0	10.0	GRAVEL, sandy with silt, cobbles and boulders about 15% fines, 10% fine sand, 10% medium sand, 10% coarse sand, 30% gravel, 17% cobbles, 8% boulders, angular, hard, maximum size 18", brown, damp, low permeability, very dense, ground moraine. GM
10.0		Bottom of Pit.

D.S. 151.1 2.0 to 10.0 (2 bags), 15% larger than 6" discarded.

NOTE: Water level-no pipe.

TP-152, ELEV. 1160.0 6/24/65 K.G.L.

0.0	3.0	TOPSOIL
3.0	10.0	SAND, silty with gravel, about 30% fines, 35% fine sand, 12% medium sand, 3% coarse sand, 10% gravel, 5% cobbles, 5% boulders, angular, hard, maximum size 14", olive-brown, damp to moist, low permeability, dense, glacial till. SM
10.0		Bottom of Pit.

D.S. 152.1 3.0 to 10.0 6% larger than 6" discarded.

NOTE: Seepage at 9.5 feet. Estimated flow less than .5 gpm. Water level dry on 7/14/65.

TP-153, ELEV. 1170.8 6/24/65 K.G.L.

0.0	5.0	BOULDERS and COBBLES, in an organic silty sand matrix, about 5% fines, 5% fine sand, 5% medium sand, 5% coarse sand, 10% gravel, 20% cobbles, 30% boulders, sub-rounded to angular, maximum size 30", black, wet, high permeability, loose, alluvium.
5.0	10.0	SAND, silty with gravel, about 18% fines, 22% fine sand, 10% medium sand, 5% coarse sand, 35% gravel, 5% cobbles, 5% boulders, angular, hard, maximum size 14", gray, moist, impermeable, very dense, glacial till. GM-SM
10.0		Bottom of Pit.

D.S. 153.1, 5.0-10.0 6% larger than 6" discarded.

NOTE: Water entering pit at 3.0. Estimated flow 1.5 gpm.. Water level at 5 feet on 7/14/65.

TP-154, ELEV. 1208.7 6/24/65 K.G.L.

0.0	2.5	BOULDERY TOPSOIL
2.5	10.0	SAND, silty with gravel, about 15% fines, 35% fine sand, 15% medium sand, 5% coarse sand, 20% gravel, 5% cobbles, 5% boulders, angular, hard, maximum size 16", light brown, damp, low, very dense, ground moraine. SM
10.0		Bottom of Pit.

D.S. 154.1, 2.5-10.0 6% larger than 6" discarded.

NOTE: Water level dry on 7/14/65.

TP-155, ELEV. 1189.6 6/24/65 K.G.L.

0.0	4.5	BOULDERS AND COBBLES, in an organic silty sand matrix, about 5% fines, 2% fine sand, 2% medium sand, 2% coarse sand, 4% gravel, 10% cobbles, 75% boulders, angular to sub-rounded, hard, maximum size 36", black, wet, medium, loose, alluvium.
4.5	10.0	SAND, silty with gravel, about 18% fines, 25% fine sand, 15% medium sand, 5% coarse sand, 20% gravel, 15% cobbles, 2% boulders, angular to sub-angular, hard, maximum size 14", brown, moist, low permeability, very dense, ground moraine. SM
10.0		Bottom of Pit.

D.S. 155.1, 4.5-10.0 10% larger than 6" discarded.

NOTE: Water entering pit 1.0-4.5. Estimated flow less than 1 gpm. Water level at 3.5 on 7/14/65

TP-156, ELEV. 1214.1 6/24/65 K.G.L.

0.0	2.5	TOPSOIL
2.5	10.0	SAND, silty with gravel, about 15% fines, 25% fine sand, 15% medium sand, 8% coarse sand, 30% gravel, 5% cobbles, 2% boulders, angular, hard, maximum size 13", olive-brown, damp, low permeability, very dense, glacial till. SM
10.0		Bottom of Pit.

D.S. 156.1, 2.5-10.0 5% larger than 6" discarded.

NOTE: Water level dry on 7/14/65.

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by ... Date
Drawn ... Approved by ...
Traced ... Title ...
Checked B. MILLS 3-1-66 Title ...
Sheet No. 31 of 36 Drawing No. MA 357 P

SCS-313B (APRIL 1963)

B-16

CLAM RIVER

DH-604 Elev. 1203.0 7/29 to 8/3/70 PAR/DBM

0.0	7.5	Decomposed boulder, gneiss Tan brown, dry, low permeability, dense, Decomposed Rock	
7.5	9.5	Boulder.	
9.5	30.0	SAND, silty with gravel, about 20% fines, 10% fine sand, 20% medium sand, 35% coarse sand, 15% gravel, subangular, decomposed rock bits, 3/4-inch maximum size, grey, moist, low permeability, very dense, GLACIAL TILL.	SM
30.0	32.5	Boulder.	
32.5		Bottom of Hole.	

Drive Samples No.	Depth	Blows/ft.	% Recovery
1.	0.0-1.5'	54	100
2.	1.5-3.0'	101	78
3.	3.0-4.5'	134	72
4.	9.5-10.0'	143/6" ref.	0
5.	15.0-16.5'	105	67
6.	20.0-21.5	87	34
7.	25.0-25.3	100/3" ref.	0
8.	30.0-31.5'	70	50
9.	32.5-33.0'	100/6" ref.	100

NOTE: Water level at 14 feet 8 inches on 8/3/70.

DH-605 Elev. 1194.9 8/10 to 8/11/70 DBM

0.0	1.0	TOPSOIL and SILT.	
1.0	12.5	SAND, silty with gravel, about 15% fines, 15% fine sand, 20% medium sand, 40% coarse sand, 10% gravel, subangular, 3/4-inch maximum size, grey, damp, medium permeability, loose to dense, OUTWASH.	SM
12.5	41.5	SAND, silty with gravel, about 40% fines, 15% fine sand, 15% medium sand, 20% coarse sand, 10% gravel, subangular, 3/4-inch maximum size, grey-green, damp, low permeability, dense to very dense, GLACIAL TILL.	SM
41.5		Bottom of Hole.	

Drive Samples No.	Depth	Blows/ft.	% Recovery
1.	0.0-1.5'	3	100
2.	1.5-3.0'	16	100
3.	3.0-4.5'	12	100
4.	5.0-5.3'	100/3" ref.	0
5.	10.0-11.5'	23	70
6.	15.0-15.1'	100/1" ref.	0
7.	20.0-20.5'	103/6" ref.	60
8.	25.0-25.5'	100/6" ref.	40
9.	30.0-30.4'	100/4" ref.	0
10.	35.0-35.8'	137/10"	60

DH-607 Elev. 1213.8 8/5 to 8/7/70 DBM

0.0	1.0	TOPSOIL.	
1.0	51.5	SAND, silty with gravel, about 20% fines, 15% fine sand, 15% medium sand, 30% coarse sand, 20% gravel, subangular, 2-inch maximum size, tan to grey-green at 6 feet, damp, low permeability, dense, Weathered Till to 6 feet, GLACIAL TILL.	SM
51.5		Bottom of Hole.	

Drive Samples No.	Depth	Blows/ft.	% Recovery
1.	0.0-1.5'	10	100
2.	1.5-3.0'	26	95
3.	3.0-4.5'	88	80
4.	5.0-6.5'	102	60
5.	10.0-11.5'	40	70
6.	15.0-16.5'	74	67
7.	20.0-20.9'	129/9" ref.	60
8.	25.0-25.1'	100/1" ref.	0
9.	30.0-30.9'	164/11" ref.	100
10.	35.0-35.1'	100/1" ref.	0
11.	40.0-41.5'	163	68
12.	45.0-45.5'	100/6" ref.	67
13.	50.0-50.5'	102/6" ref.	100

DH-609 Elev. 1212.2 7/29 to 7/31/70 DBM

0.0	2.0	TOPSOIL.	
2.0	26.0	SAND, silty with gravel, about 20% fines, 15% fine sand, 15% medium sand, 35% coarse sand, 15% gravel, subangular, highly decomposed rock bits, light olive brown, moist, medium permeability, loose, Weathered Till, to 5 feet olive-brown, wet, low permeability, very dense, GLACIAL TILL.	SM
26.0	46.5	SAND, silty, about 45% fines, 25% fine sand, 20% medium sand, 7% coarse sand, 3% gravel, olive-grey, moist, low permeability, very dense, Glacial Till.	SM
34.0	35.0	Boulder.	
46.5		Bottom of Hole.	

Drive Samples No.	Depth	Blows/ft.	% Recovery
1.	0-1.5'	46	67
2.	1.5-3.0'	18	67
3.	4.0-5.5'	91/6" ref.	67
4.	10.0-11.5'	92	56
5.	15.0-15.5'	50/6" ref.	0
6.	16.5-17.5'	125/6 ref.	50
7.	20.0-21.5'	126	61
8.	25.0-26.5'	135	61
9.	30.0-31.5'	140	56
10.	35.0'	100/0" ref.	0
11.	38.0-39.0'	160/12" ref.	87
12.	40.0-40.8'	100/11" ref.	93
13.	45.0-46.5'	130	100

Permeability Tests No.	Depth	Hole Size	Head	Loss
1.	6'	3"	Ground	Failed
2.	10'	3"	Ground	Slight
3.	11.5'	2" x 18"	Ground	Slight
4.	15'	3"	Ground	Failed
5.	20'	3"	Ground	Failed

a Head - Pipe above ground.

NOTE: Water level at 17.5 feet on 8/4/70.

DH-610 Elev. 1199.5 8/3 to 8/6/70 DBM

0.0	3.0	TOPSOIL and SLOPEWASH.	
3.0	36.5	SAND, silty with gravel, about 20% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 15% gravel, subangular, 2-inch maximum size, brown to blue-grey at 6 feet, damp, medium permeability, dense to very dense, GLACIAL TILL with decrease in coarse sand and gravel at 22 feet.	SM
36.5		Bottom of Hole.	

Drive Samples No.	Depth	Blows/ft.	% Recovery
1.	0.0-1.5'	11	100
2.	1.5-3.0'	19	72
3.	3.0-4.5'	36	80
4.	4.5-6.0'	47	70
5.	10.0-11.5'	20	70
6.	15.0-16.5'	22	67
7.	20.0-21.5'	73	90
8.	25.0-26.5'	66	80
9.	30.0-31.5'	59	67
10.	35.0-36.5'	59	100

DH-611 Elev. 1189.9 8/11 to 8/11/70 DBM

0.0	1.0	TOPSOIL.	
1.0	5.0	SAND, with gravel, about 8% fines, 12% fine sand, 30% medium sand, 40% coarse sand, 10% gravel, subangular, 2-inch maximum size, grey, damp, medium permeability, loose to dense, OUTWASH.	SP-SM
5.0	30.0	SAND, silty with gravel, about 40% fines, 15% fine sand, 15% medium sand, 20% coarse sand, 10% gravel, subangular, 1/4-inch maximum size, olive to green-grey, damp, low permeability, dense, GLACIAL TILL.	SM
30.0		Bottom of Hole.	

Drive Samples No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5'	14	100
2.	1.5 - 3.0'	44	70
3.	5.0 - 6.5'	33	70
4.	10.0 -11.6'	72	67
5.	15.0 -16.5'	61	67
6.	20.0 -21.5'	98	67
7.	25.0 -26.5'	96	67

DH-613
0.0
1.0
28.0

DH-615
0.0
1.0
3.0
15.0
18.0
29.0

DH-616
0.0
2.0
4.0
8.0
15.0
28.0

BH-613 Elev. 1181.7 8/6 to 8/10/70 DBH

0.0	1.0	TOPSOIL.
1.0	28.0	SAND, silty with gravel, about 45% fines, 10% fine sand, 10% medium sand, 30% coarse sand, 5% gravel, subangular, 1-inch maximum size, olive-brown, damp, low permeability, dense to very dense, GLACIAL TILL. SM
28.0		Bottom of Hole.

Drive Samples

No.	Depth	Blws./ft.	% Recovery
1.	0.0 - 1.8'	2	100
2.	1.5 - 3.0'	6	100
3.	3.0 - 4.5'	11	90
4.	4.5 - 6.0'	22	90
5.	10.0 -11.5'	30	80
6.	15.0 -15.8'	165/9" ref.	67
7.	20.0 -20.9'	174/10" ref.	70
8.	25.0 -25.5'	100/6" ref.	60

BH-615 Elev. 1183.28 8/3 to 8/4/70 PAB

0.0	1.0	CONCRETE.
1.0	3.0	TOPSOIL.
3.0	15.0	SAND, silty with gravel, about 25% fines, 15% fine sand, 10% medium sand, 40% coarse sand, 10% gravel, subangular, some particles decomposed, olive-brown, moist, low permeability, very dense, Weathered Till. SM
15.0	18.0	SAND, silty with gravel, about 25% fines, 15% fine sand, 10% medium sand, 30% coarse sand, 20% gravel, Decomposed rock particles, olive-gray, moist, low permeability, very dense, GLACIAL TILL. SM
18.0	29.0	BEDROCK, grey, biotite hornblende gneiss, foliations dipping about 70°. From 18 to 21 feet, highly fractured. Fractures spaced about 1/2-inch to 2-inches apart. 21 to 29 feet -- moderately fractured. Fractures spaced about 8 to 14 inches.
29.0		Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	1.0 - 2.4'	98/5" ref.	66
2.	4.0 - 5.5'	101	66
3.	10.0 -11.5'	71	44
4.	15.0 -16.5'	131/6" ref.	66

Rock Core Runs

No.	Depth	Recovery
1.	18.0 -19.0'	50
2.	19.0 -20.0'	90
3.	20.0 -24.0'	100
4.	24.0 -29.0'	90

Permeability Test

No.	Depth	Hole Size	Head*	Loss
1.	10.5'	2" x 18"	Ground	Slight

* head - pipe above ground

BH-616 Elev. 1196.03 8/5 to 8/6/70 PAB

0.0	2.0	No drilling - Removed boulders by hand.
2.0	4.0	TOPSOIL.
4.0	8.0	SAND, silty with gravel, about 25% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, subangular, some decomposed rock particles, 1¼-inch maximum size, olive-brown, moist, low permeability, dense, Weathered Till. SM
8.0	15.0	SILT, sandy with about 55% fines, 22% fine sand, 15% medium sand, 5% coarse sand, 3% gravel, 1/2-inch maximum size, olive brown, moist, low permeability, medium dense, GLACIAL TILL. ML
15.0	28.0	BEDROCK, grey biotite hornblende gneiss, foliations dipping about 70°. Fractures are about 12 to 18-inches apart -- mostly horizontal; all tight.
28.0		Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	2.0 - 3.5'	39	83
2.	3.5 - 5.0'	58	66
3.	10.0'-11.5'	29	44

Rock Core Runs

No.	Depth	% Recovery
1.	15.0 - 15.9'	88
2.	15.9 - 20.0'	95
3.	20.0 - 25.0'	100
4.	25.0 - 28.0'	100

BH-617 Elev. 1191.98 8/6 to 8/7/70 PAB

0.0	3.0	TOPSOIL.
3.0	16.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 25% medium sand, 15% coarse sand, 15% gravel, decomposed rock, 1-inch maximum size, olive-brown, wet, medium permeability, very dense, GLACIAL TILL. SM
8.5 to 10.0		BOULDER.
14.9 to 16.0		BOULDER.
16.0	28.0	BEDROCK, grey, biotite hornblende gneiss. Foliations dipping about 70°. Moderately fractured -- spaced about 12 to 18 inches apart -- mostly horizontal; all tight.
28.0		Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.5 to 2.0'	23	78
2.	2.0 - 3.0'	94/4" ref.	33
3.	4.5 - 6.0'	72	78
4.	10.0 - 11.5'	71	66

Rock Core Runs

No.	Depth	% Recovery
1.	14.9 - 18.0'	91
2.	18.0 - 23.0'	100
3.	23.0 - 28.0'	100

NOTE: Water level at 5.5 feet on 8/6/70.

BH-618 Elev. 1185.72 8/10 to 8/11/70 PAB

0.0	3.5	TOPSOIL.
3.5	10.0	SAND, silty with gravel, about 15% fines, 20% fine sand, 25% medium sand, 25% coarse sand, 15% gravel, subangular, with some decomposed rock bits, 3/4-inch maximum size, light olive-brown, moist, low permeability, very dense, GLACIAL TILL. SM
6.0	8.0	Cobbles and Boulders.
10.0	26.0	BEDROCK -- grey biotite horghlende gneiss, foliations dipping about 70°. Moderately, fractured. Fractures spaced about 6 to 14 inches apart, mostly horizontal.
26.0		Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5'	16	66
2.	1.5 - 2.9'	101/11" ref.	78
3.	5.0 - 6.5'	129	66

Rock Core Runs

No.	Depth	Recovery
1.	10.0 - 13.5'	76
2.	13.5 - 18.5'	95
3.	18.5 - 23.5'	100
4.	23.5 - 26.0'	100

NOTE: Water level at 6.92 feet on 8/11/70.

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by ... Date ... Approved by ...
Designed ... B. WILLS & R.P. [illegible] 8/70 ... Title ...
Typed by ... N. LONGTAIN ...
Traced ... Title ...
Checked ... B. WILLS ... Sheet No. 26 of 26 ... Drawing No. MA-357 P

SCS-3138 (APRIL 1963)

292

B-17

DH-619 Elev. 1172.44 8/11 to 8/12/70 PAB

0.0 – 3.0 TOPSOIL AND ROOTMAT.

3.0 – 11.5 SILTY SAND, gravelly, about 15% fines, 10% fine sand, 25% medium sand, 30% coarse sand, 20% gravel, subangular, 3/4-inch maximum size, olive-brown, moist, medium-low permeability, very dense, GLACIAL TILL. SM

6 to 10' BOULDER.

10.5 to 11.5' BOULDER.

11.5 – 25.0 BEDROCK, grey, biotite hornblende gneiss, foliations dipping about 70°. Highly fractured. Fractures spaced about 1 to 8 inches apart. Fractures are not all tight.

25.0 Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.5 - 2.0'	30	66
2.	4.0 - 5.5'	99	66

Rock Core Runs

No.	Depth	% Recovery
1.	6.0 - 10.0'	68
2.	11.5 - 16.5'	97
3.	16.5 - 21.5'	100
4.	21.5 - 25.0'	100

DH-620 Elev. 1158.73 8/12 to 8/12/70 PAB

0.0 – 1.5 TOPSOIL, ROOTS.

1.5 – 5.0 BOULDER.

5.0 – 9.5 SAND, silty, with gravel, about 20% fines, 15% fine sand, 25% medium sand, 30% coarse sand, 10% gravel, subangular, 1-inch maximum size, olive-brown, moist, medium-low permeability, dense, GLACIAL TILL. SM

9.5 – 17.5 BEDROCK, grey, biotite, hornblende, gneiss. Folistions dipping about 70°. Highly fractured with sand seams. Fractures spaced 1/2-inch to 6 inches apart.

17.5 Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	1.0 - 1.5'	18	100
2.	5.0 - 5.8'	60/10" ref.	78

Rock Core Runs

No.	Depth	% Recovery
1.	9.5 - 12.5'	93
2.	12.5 - 17.5'	83

NOTE: Water level at 9.5 feet on 8/12/70.

DH-621 Elev. 1171.82 8/13 to 8/13/70 DEM

0.0 – 1.5 TOPSOIL.

1.5 – 9.0 COBBLES and BOULDERS, with some silt and gravel matrix, ENGLACIAL DRIFT.

9.0 – 21.0 BEDROCK, grey, biotite hornblende gneiss, moderately fractured, fractures spaced 12 to 18 inches apart, most fractures dipping about 70 degress, some horizontal.

21.0 Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5	4	100
2.	1.5 - 2.2	41/7" ref.	40

Rock Core Runs

No.	Depth	% Recovery
1.	9.0 - 11.0'	75
2.	11.0 - 16.0'	100
3.	16.0 - 21.0'	93

NOTE: Water level at 9 feet on 8/13/70.

DH-622 Elev. 1179.3 8/13 to 8/14/70 DEM

0.0 – 11.0 COBBLES and BOULDERS, with some silt and gravel matrix, unable to obtain drive samples. ENGLACIAL DRIFT.

11.0 – 21.0 BEDROCK, grey, biotite hornblende gneiss, moderately fractured. Fractures spaced 12 to 18 inches apart. Most fractures dipping about 70°. Some horizontal.

21.0 Bottom of Hole.

Rock Core Run

No.	Depth	% Recovery
1.	11.0 - 16.0'	80
2.	16.0 - 21.0'	100

DH-351 Elev. 1101.8 8/12 to 8/12/70 DEM

0.0 – 1.5 TOPSOIL and ROOTMAT.

1.5 – 6.5 SAND, with gravel, about 15 fines, 10% fine sand, 10% medium sand, 50% coarse sand, 20% gravel, subangular, 2-inch maximum size, red-brown, damp, medium permeability, dense, FLOODPLAIN. SP

6.5 – 16.5 BEDROCK, grey, biotite hornblende gneiss, moderately fractured, fractures dipping about 60 degrees. Some horizontal. All fractures tight. BEDROCK.

16.5 Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5'	15	100
2.	1.5 - 3.0'	82	70
3.	3.0 - 4.5'	24	80
4.	5.0 - 5.3'	100/4" ref.	100

Rock Core Runs

No.	Depth	% Recovery
1.	10.5 - 10.5'	95
2.	10.5 - 16.5'	70

NOTE: Water level at 2.75 on 8/12/70.

DH-352 Elev. 1098.4 8/13 to 8/13/70 PAB

0.0 – 2.0 TOPSOIL.

2.0 – 3.5 SAND, silty with gravel, about 25% fines, 20% fine sand, 25% medium sand, 20% coarse sand, 10% gravel, subangular, 3/4-inch maximum size, red-brown, damp, medium permeability, medium dense, Floodplain Deposite. SM

3.5 – 14.5 BEDROCK, grey, biotite hornblende gneiss, foliations dipping about 80°. Highly fractured from 3'6" to 8'6". Fractures spaced about 3 to 5 inches apart. Very slightly fractured from 8'6" to 14'6".

14.5 Bottom of Hole.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5'	17	78
2.	1.5 - 3.0'	26	83
3.	3.0 - 3.5'	100/6" ref.	27

Rock Core Runs

No.	Depth	% Recovery
1.	3.5 - 8.5'	73
2.	8.5 - 14.5'	100

NOTE: Water level at 4.58 feet on 8/13/70.

DH-353 Elev. 1095.2 8/13 to 8/14/70 PAB

0.0 – 1.5 TOPSOIL and ROOT MAT.

1.5 – 7.0 SAND, with gravels, about 5% fines, 15% fine sand, 35% medium sand, 30% coarse sand, 15% gravel, subangular, 3/4-inch maximum size, red-brown, damp, high permeability, dense, Floodplain Deposite. SP SM

7.0 – 17.0 BEDROCK, grey, biotite hornblende gneiss, moderately fractured, foliations dipping about 60°. Most fractures are horizontal. All tight. BEDROCK.

17.0 Bottom of Boring.

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5'	7	88
2.	1.5 - 3.0'	28	83
3.	3.0 - 4.5'	98	83
4.	5.0 - 5.5'	100/6" ref.	33

Rock Core Runs

No.	Depth	% Recovery
1.	7.0 - 12.0'	100
2.	12.0 - 17.0'	100

TP-651 10.0 / 0.0 / 1.0

TP-652 10.0 / 0.0 / 0.5

TP-653 10.0 / 0.0 / 1.0

TP-654 10.0 / 0.0 / 1.0

TP-655 10.0 / 0.0 / 1.0

TP-656 12.0 / 0.0 / 1.0

TP-657 12.0 / 0.0 / 3.0

10.0

TEST PIT
CLAM LAKE, CLAM RIVER WATERSHED

TP-651 — 6/8 to 6/8/71 — DBM

0.0	1.0	TOPSOIL AND ROOTMAT.	
1.0	10.0	SAND, silty with gravel, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 18-inch maximum size, olive-brown, damp, low permeability, very dense, GLACIAL TILL est. 20% + 6-inch size. Disturbed Sample: 4 to 9 feet.	SM
10.0		Bottom of Pit.	

TP-652 — 6/8 to 6/8/71 — DBM

0.0	0.5	TOPSOIL and ROOTMAT.	
0.5	10.0	SAND and gravel, some silt, about 10% fines, 10% fine sand, 15% medium sand, 35% coarse sand, 30% gravel, sub-rounded, 24-inch maximum size, tan-brown, damp, medium-high permeability, dense, Ice contact sand and gravel with cobbles and boulders to 9 6' est. 40% cobbles and boulders then about 25% + 6-inch size. Some rock fragments highly weathered. Disturbed Samples: 3 to 10 feet.	SP-SM or GP-GM
10.0		Bottom of Pit.	

TP-653 — 6/8 to 6/8/71 — DBM

0.0	1.0	TOPSOIL and ROOTMAT.	
1.0	10.0	SAND and GRAVEL, some silt, about 10% fines, 10% fine sand, 15% medium sand, 35% coarse sand, 30% gravel, sub-rounded, 18-inch maximum size, tan-brown, damp, medium-high, dense, Ice contact sand and gravel, est. 25% + 6-inch size. Some rock fragments highly weathered. Disturbed Samples: 2 to 9 feet.	SP-SM or GP-GM
		Bottom of Pit.	

TP-654 — 6/8 to 6/8/71 — DBM

0.0	1.0	TOPSOIL and ROOTMAT.	
1.0	10.0	SAND and GRAVEL, with some silt, about 10% fines, 10% fine sand, 15% medium sand, 35% coarse sand, 30% gravel, sub-rounded, 20-inch maximum size, tan-brown, damp, medium-high permeability, dense, Ice contact sand and gravel, est. 25% + 6-inch size. Some rock fragments highly weathered. Disturbed Samples: 3 to 10 feet.	SP-SM or GP-GM
10.0		Bottom of Pit.	

TP-655 — 6/10/71 — DBM

0.0	1.0	TOPSOIL and ROOTMAT.	
1.0	12.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 15-inch maximum size, olive-brown to 7 foot then blue-grey, damp to wet, low permeability, very dense, GLACIAL TILL weathered to 7 foot with water. Seep at 7 foot. Disturbed Sample 7 to 11 feet.	SM
12.0		Bottom of Pit.	

TP-656 — 6/10/71 — DBM

0.0	1.0	TOPSOIL and ROOTMAT.	
1.0	12.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 9-inch maximum size, olive-brown, damp, low permeability, very dense, GLACIAL TILL. Disturbed Sample 2 to 12 feet.	SM
12.0		Bottom of Pit.	

TP-657 — 6/10/71 — DBM

0.0	3.0	TOPSOIL and ROOTMAT and FILL.	
3.0	10.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 14-inch maximum size, olive-brown, damp, low permeability, very dense, GLACIAL TILL. Disturbed Sample: 3 to 9 feet.	SM
10.0		Bottom of Pit.	

Test Pits (cont'd) — Clam River Watershed — Clam Lake Site

TP-658 — 6/10/71 — DBM

0.0	7.0	COBBLES and BOULDERS, with sand and gravel, matrix water entering pit at est. 5 gpm.	
7.0		Bedrock and bottom of pit.	

TP-659 — 6/10/71 — DBM

0.0	1.0	TOPSOIL and ROOT MAT.	
1.0	3.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 14-inch maximum size, red-brown, wet, medium permeability, loose, WEATHERED GLACIAL TILL.	SM

TP-660 — 6/10/71 — DBM

0.0	1.0	TOPSOIL and ROOT MAT.	
1.0	5.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 36-inch maximum size, red-brown, wet, medium permeability, loose, WEATHERED GLACIAL TILL.	SM
5.0		BEDROCK and BOTTOM OF PIT.	

TP-661 — 6/10/71 — DBM

0.0	1.0	TOPSOIL and ROOT MAT.	
1.0	11.0	SAND, silty with gravel, and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 22-inch maximum size, olive-brown, damp, low permeability, very dense, GLACIAL TILL.	SM
11.0		Bottom of Pit.	

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated D MILLS & P BRINKMAN	Date 8/70	Approved by
Typed N LONCZAK		Title
Traced		Title
Checked C H DODGE		Sheet No 33 of 36 — Drawing No MA 357-P

SCS-313B (APRIL 1963)

B-N

LOG OF TEST HOLES

[illegible], ELEV. [illegible] 6/24/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 20% fines, 20% fine sand, 25% medium sand, 10% coarse sand, 15% gravel, 5% cobbles, 5% boulders, angular, hard, maximum size 18", damp, low permeability, very dense, glacial till.	SM
10.0		Bottom of Pit.	

B.S. 197.1, 3.0-10.0 6% larger than 6" discarded.

NOTE: Water level at 7.5' on 7/14/65

TP-251, ELEV. 1150.1 6/24/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 15% fines, 27% fine sand, 15% medium sand, 15% coarse sand, 20% gravel, ~~5% coarse sand, 10% gravel~~, 10% cobbles, 3% boulders, angular, hard, maximum size 14", olive-brown, damp, low permeability, very dense, ground moraine.	SM
10.0		Bottom of Pit.	

B.S. 251.1, 3.0-10.0 5% larger than 6" discarded.

NOTE: Water level at 8' on 7/14/65

TP-252, ELEV. 1151.0 6/25/65 E.G.L.

0.0	2.5	TOPSOIL	
2.5	10.0	SAND, gravelly with silt, about 10% fines, 25% fine sand, 15% medium sand, 5% coarse sand, 30% gravel, 10% cobbles, 5% boulders, angular to sub-rounded, maximum size 24", brown, moist to wet, low to medium permeability, dense, ground moraine.	SM-GM
10.0		Bottom of Pit.	

B.S. 252.1 (2 bags) 2.5-10.0 8% larger than 6" discarded.

NOTE: Water level at 0.5' on 7/14/65.

TP-253, ELEV. 1145.3 6/25/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 25% fines, 35% fine sand, 15% medium sand, 5% coarse sand, 15% gravel, 3% cobbles, 2% boulders, angular, hard, maximum size 13", olive-brown, damp, impermeable, very dense, glacial till.	SM
10.0		Bottom of Pit.	

B.S. 253.1, 3.0-10.0 3% larger than 6" discarded.
NOTE: Water level dry on 7/14/65.

TP-254, ELEV. 1199.3 6/25/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 10% fines, 25% fine sand, 10% medium sand, 10% coarse sand, 35% gravel, 8% cobbles, 2% boulders, angular, hard, maximum size 14", brown, damp, low permeability, very dense, ground moraine.	GP-GM
10.0		Bottom of Pit.	

B.S. 254.1, 3.0-10.0 6% larger than 6" discarded.

NOTE: Water level dry on 7/14/65.

TP-255, ELEV. 1194.6 6/25/65 E.G.L.

0.0	3.0	BOULDERY TOPSOIL	
3.0	10.0	SAND, gravelly with cobbles, about 7% fines, 20% fine sand, 15% medium sand, 10% coarse sand, 35% gravel, 13% cobbles, 2% boulders, sub-round to sub-angular, maximum size 12", brown, damp, high permeability, dense, kame terrace.	GP-GM
10.0		Bottom of Pit.	

B.S. 255.1 (2 bags) 3.0-10.0, 8% larger than 6" discarded.

NOTE: Water dry on 7/14/65.

TP-256, ELEV. 1174.4 6/25/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 25% fines, 35% fine sand, 10% medium sand, 2% coarse sand, 23% gravel, 3% cobbles, 2% boulders, angular, hard, maximum size 18", olive-brown, damp, impermeable, very dense, glacial till.	SM
10.0		Bottom of Pit.	

B.S. 256.1, 3.0-10.0 3% larger than 6" discarded.

NOTE: Water level at 7.0' on 7/14/65.

TP-91 ELEV. 6/24/66

0.0	1.0	TOPSOIL.
1.0	5.0	SAND, silty, cobbles and boulders, dark, ALLUVIAL VALLEY FILL.
5.0		Bedrock at bottom of test pit.

TP-92 ELEV.

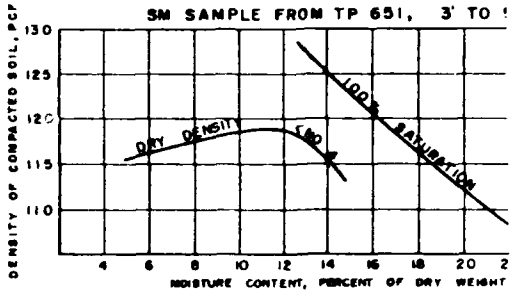
0.0	1.0	TOPSOIL.
1.0	5.0	SAND, silty, gravel, cobbles and boulders, grey, ALLUVIAL VALLEY FILL.
5.0		Bottom of pit. Bedrock. Water entering at 5.0.

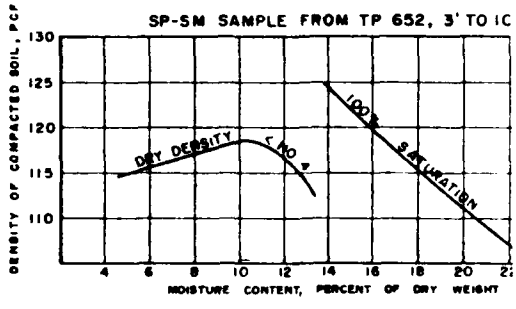
TP-93 ELEV.

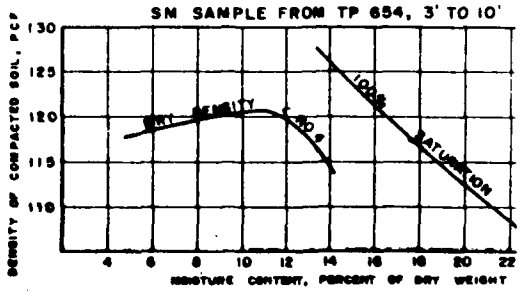
0.0	1.0	TOPSOIL.
1.0	5.0	SAND, silty, gravel, cobbles and boulders, grey, ALLUVIAL FILL.
5.0		Bottom of pit. Bedrock, Water entering at 5.0.

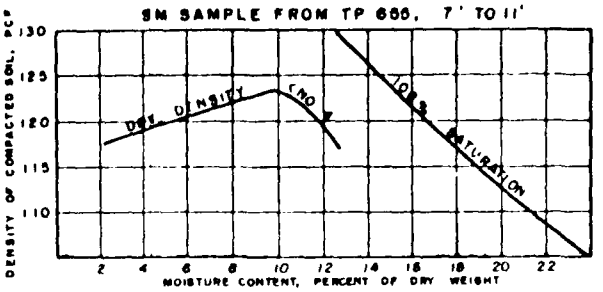
TP-94 ELEV.

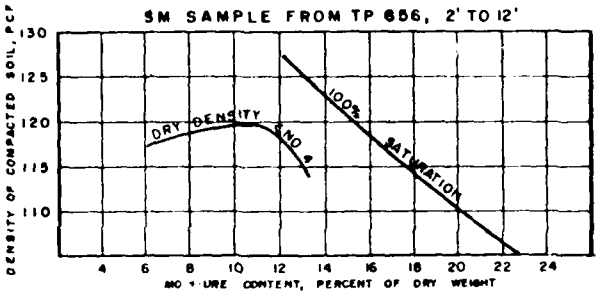
0.0	1.5	TOPSOIL.
1.5	4.0	SAND, silty, dark, ALLUVIAL VALLEY FILL.
4.0		Bedrock at bottom of pit.

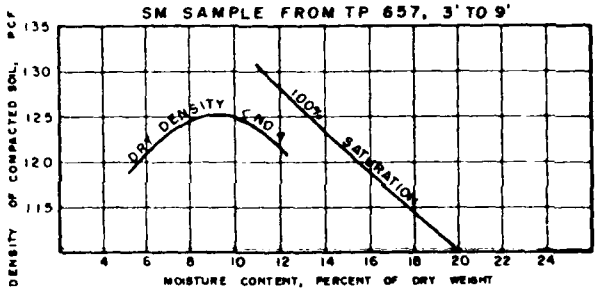


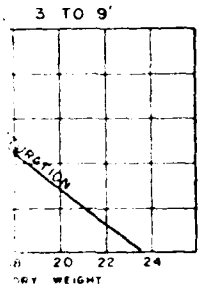


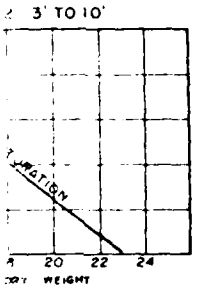


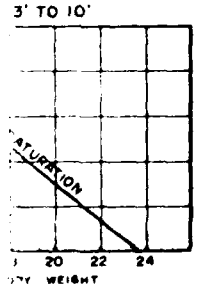












CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

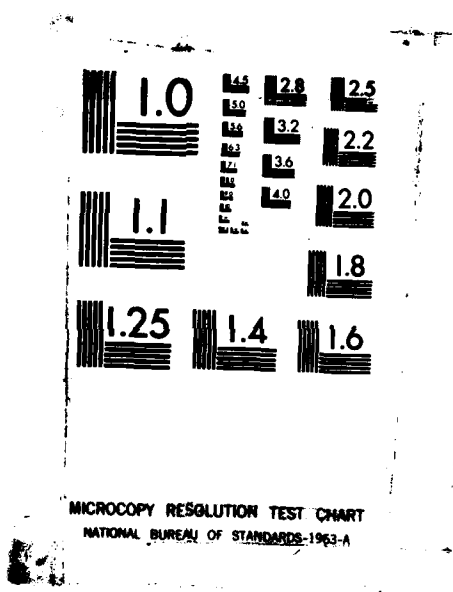
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed ... Date
Drawn ... 1958
Traced ...
Checked DONALD MILLS 8-2-58
Approved by ...
Title ...
Title ...
Sheet No. 24 of 26
Drawing No. MA 357-P

SCS-313D (APRIL 1958)

AD-A155 703 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS CLAM LAKE DAM (MA 010..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV FEB 80 2/2

UNCLASSIFIED F/G 13/13 NL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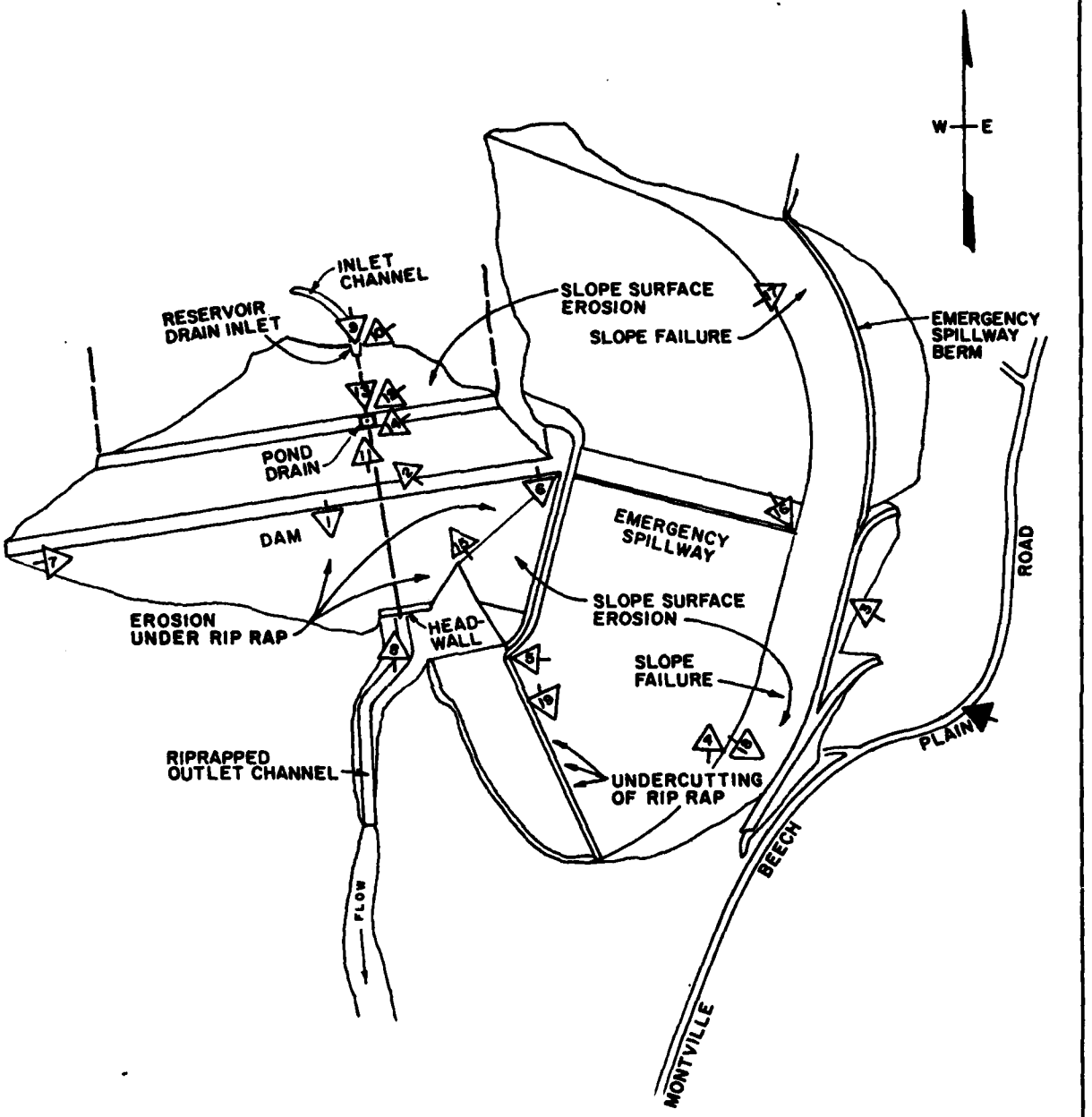
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

APPENDIX C

SELECTED PHOTOGRAPHS OF PROJECT



OVERVIEW (AERIAL)

APPENDIX C

TIGHE & BOND / SCI CONSULTING ENGINEERS EASTHAMPTON, MASS.	U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND ORIENTATION OF PHOTOS

CLAM LAKE DAM (MA 01052)
BERKSHIRE COUNTY

SANDISFIELD
MASSACHUSETTS

SCALE: NONE

DATE: FEBRUARY 1980

Photo 1

Overview of downstream channel looking south from top of dam.

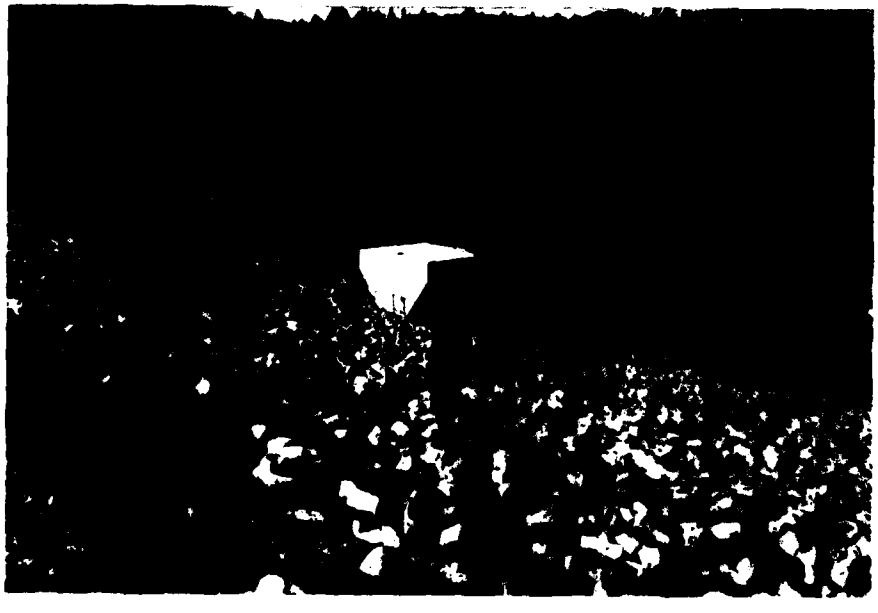


Photo 2

Overview of reservoir area, upstream embankment and principal spillway structure looking northwesterly from embankment.

Photo 3

Overview of emergency spillway crest, weir wall and dam crest looking west from top of left slope of emergency spillway.

oto 4

Overview of emergency spillway approach channel looking Northerly from toe of spillway discharge channel.

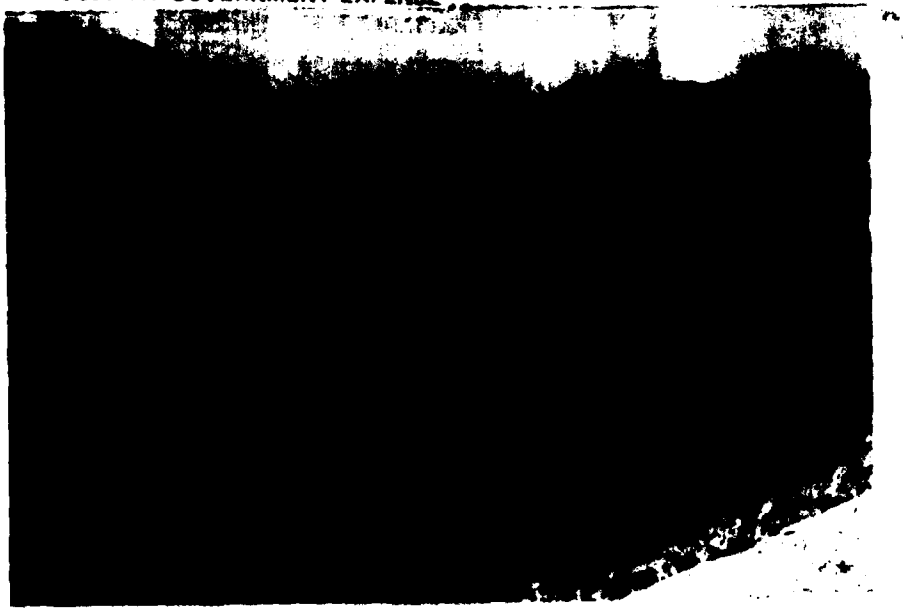


Photo 5

Overview of downstream embankment looking westerly from training wall of emergency spillway.

Photo 6

Overview of emergency spillway training wall slope looking southerly from dam crest.
Note: Erosion of slope.

Photo 7

Overview of downstream embankment, spillway discharge channel and left slope of emergency spillway. Note: The sloughing of left spillway slope.

Photo 8

60-inch outlet conduit and end wall. Note the crack above pipe and missing foundation drain pipe outlet to the left of the 60-inch conduit.

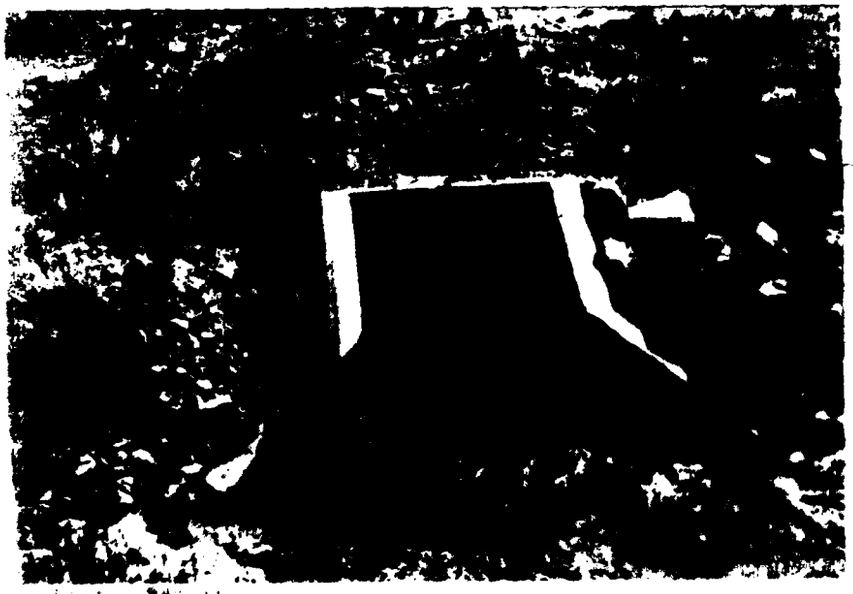


Photo 9

Pond drain inlet structure. Note damaged trash racks.

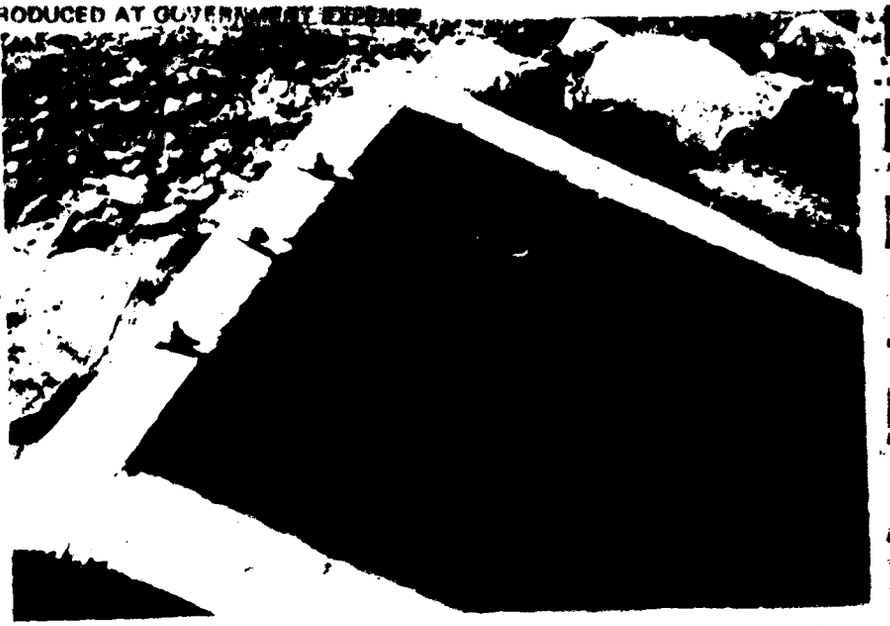


Photo 10

Pond drain inlet structure wing wall. Note cracks in concrete.

Photo 11

Gate well of principal spillway structure. Note the lower two stem guides are damaged.

Photo 12

Crack on right wall of riser transition.

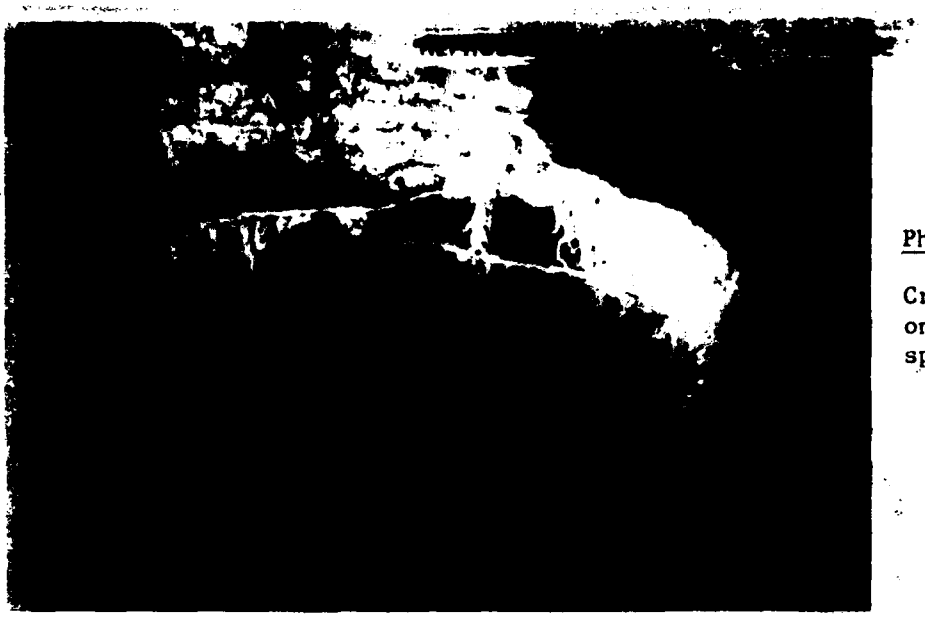


Photo 13

Cracks and efflorescence on transition of principal spillway riser.

Photo 14

Crack in transition near the vertical downstream face of the principal spillway riser.

Photo 15

Closeup of silt from beneath rip rap on downstream side of embankment.

Photo 16

Close-up of left slope toe of emergency spillway at crest. Note groundwater seepage from slope.

Photo 17

Left slope of emergency spillway. Note slope failure and erosion.

Photo 18

Left slope of emergency spillway. Note erosion.

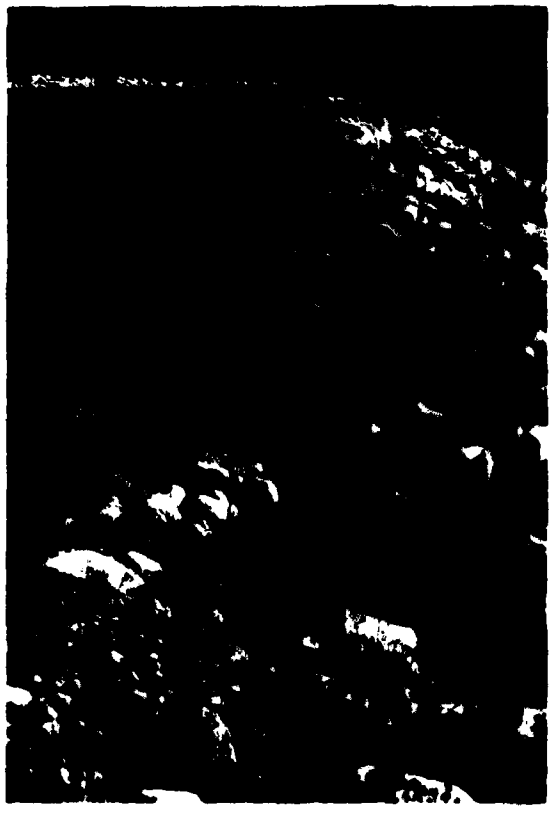
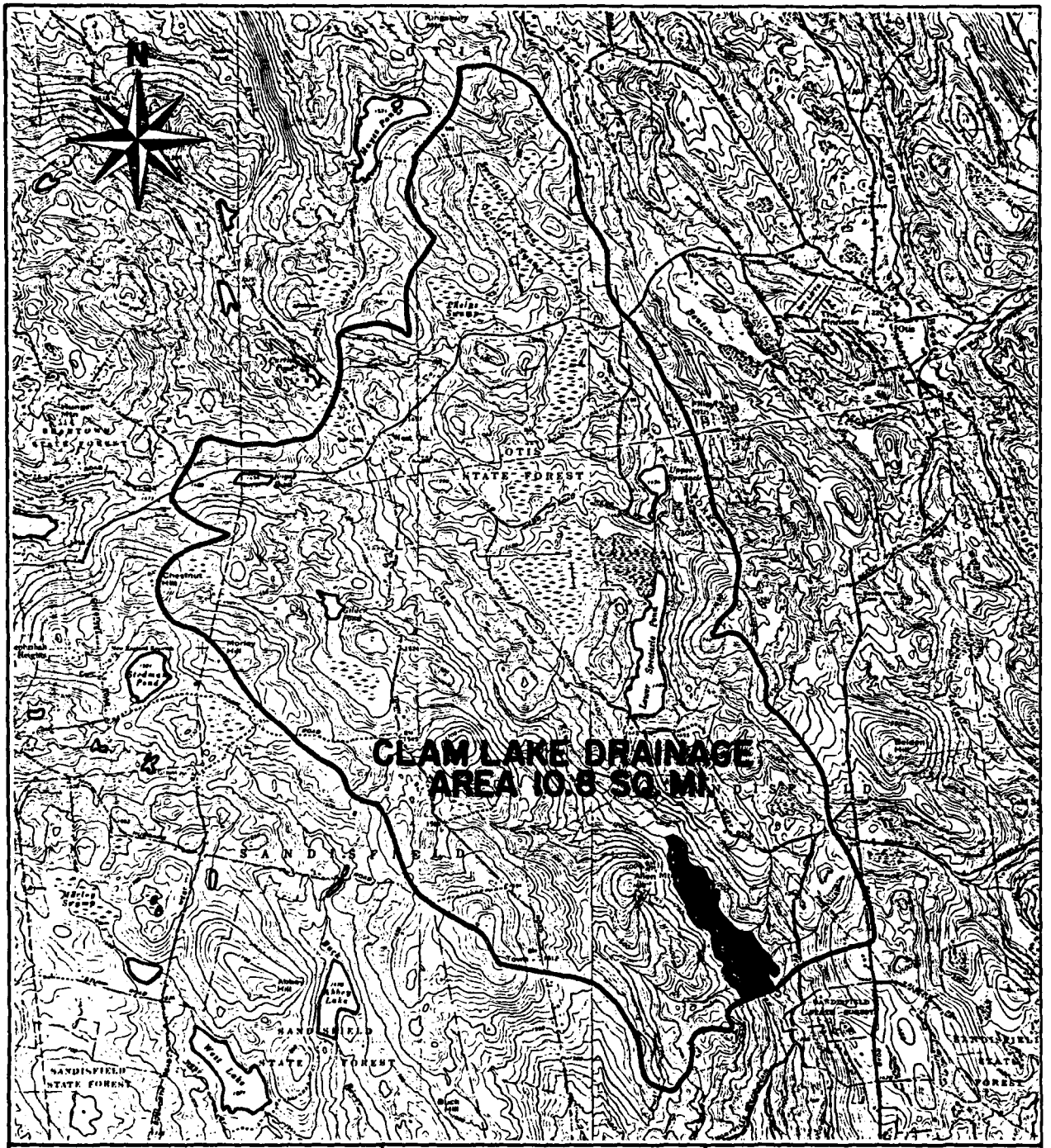


Photo 19

Transition of grass covered channel to riprap slope of emergency spillway. Note erosion and undercutting of rip rap by runoff.

APPENDIX D

OUTLINE OF DRAINAGE AREA AND COMPUTATIONS



-SCALE-

1/2 0

MILES

1000 0 1000 2000 3000 4000 5000 6000 7000

FEET

FROM: U.S.G.S. MONTEREY, AND OTIS, MASS. QUADRANGLE MAPS

QUADRANGLE LOCATION

TIGHE & BOND / SCI
CONSULTING ENGINEERS
EASTHAMPTON, MASS.

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

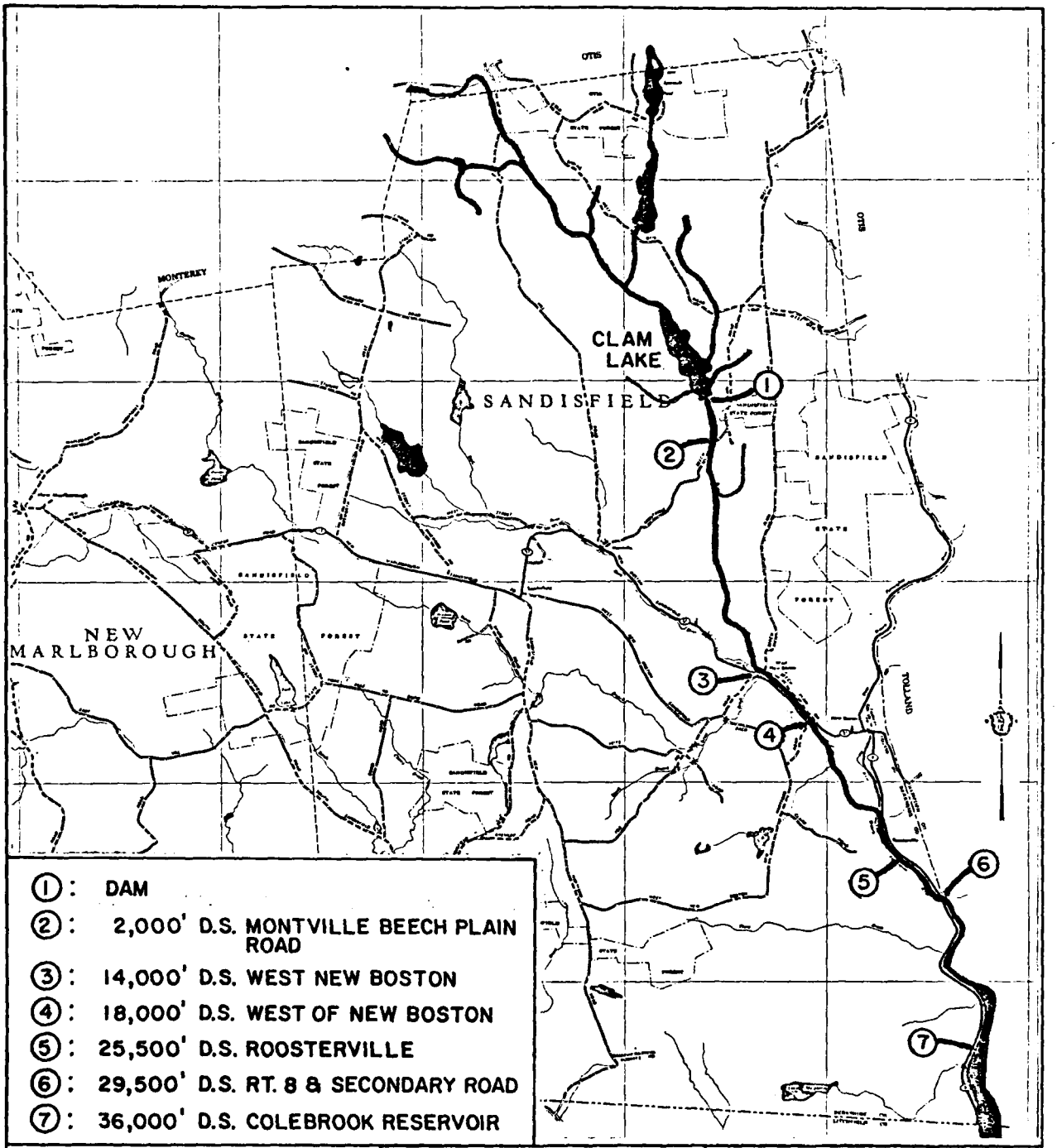
DRAINAGE AREA MAP

CLAM LAKE DAM (MA 01052)
BERKSHIRE COUNTY

SANDISFIELD
MASSACHUSETTS

SCALE: FEBRUARY 1980

DATE: AS NOTED



① : DAM

② : 2,000' D.S. MONTVILLE BEECH PLAIN ROAD

③ : 14,000' D.S. WEST NEW BOSTON

④ : 18,000' D.S. WEST OF NEW BOSTON

⑤ : 25,500' D.S. ROOSTERVILLE

⑥ : 29,500' D.S. RT. 8 & SECONDARY ROAD

⑦ : 36,000' D.S. COLEBROOK RESERVOIR

-SCALE-

1/2 0 1 2

MILES

2,000 0 2,000 4,000 6,000 8,000 10,000

FEET

FROM: GENERAL HIGHWAY MAP, BERKSHIRE COUNTY

TIGHE & BOND / SCI
CONSULTING ENGINEERS
EASTHAMPTON, MASS.

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND DOWNSTREAM HAZARD MAP

CLAM LAKE DAM (MA 01052)
BERKSHIRE COUNTY

SANDISFIELD
MASSACHUSETTS

SCALE: AS NOTED

DATE: FEBRUARY 1980

Clan Lake Dan Sandisfield Mass.

Drainage Area = 6900 Acres = 10.8 sm

Water surface = 47 Acres

Size Classification

To Spillway Elev { Height of Dam = 88 ft (Intermediate)
Storage at E.S Crest = 3050 A.F. (Intermediate)

Top of Dam { Height of Dam = 94 ft
Storage = 3840 A-F } (Intermediate)

∴ Use Intermediate

Hazard Potential - High

Test Flood - PMF

Drainage Area

Basin has mostly steep slopes with some hilly terrain.

Use the mountainous curve to find the PMF

PMF = 1950 CFS x 10.8 sm

= 21,060 cfs

January 3, 1980

Reservoir Routing Computations

Elevation Data

Dam Crest - 1178

Emergency Spill. Crest - 1172

Riser Crest - 1153

Orifice - 1143.3

Sediment Pool - 1107.0

Original Ground - 1097.0

Storage Data

Sediment storage (1097-1107) - 12 AF

Multi Purpose Pool (1107 - 1143.3) - 738 AF

Flood Stor(1) (1143.3 - 1153 - 560 AF

Flood Stor(2) (1153 - 1172) - 1750 AF

Area Data

Sediment Storage - 3 A

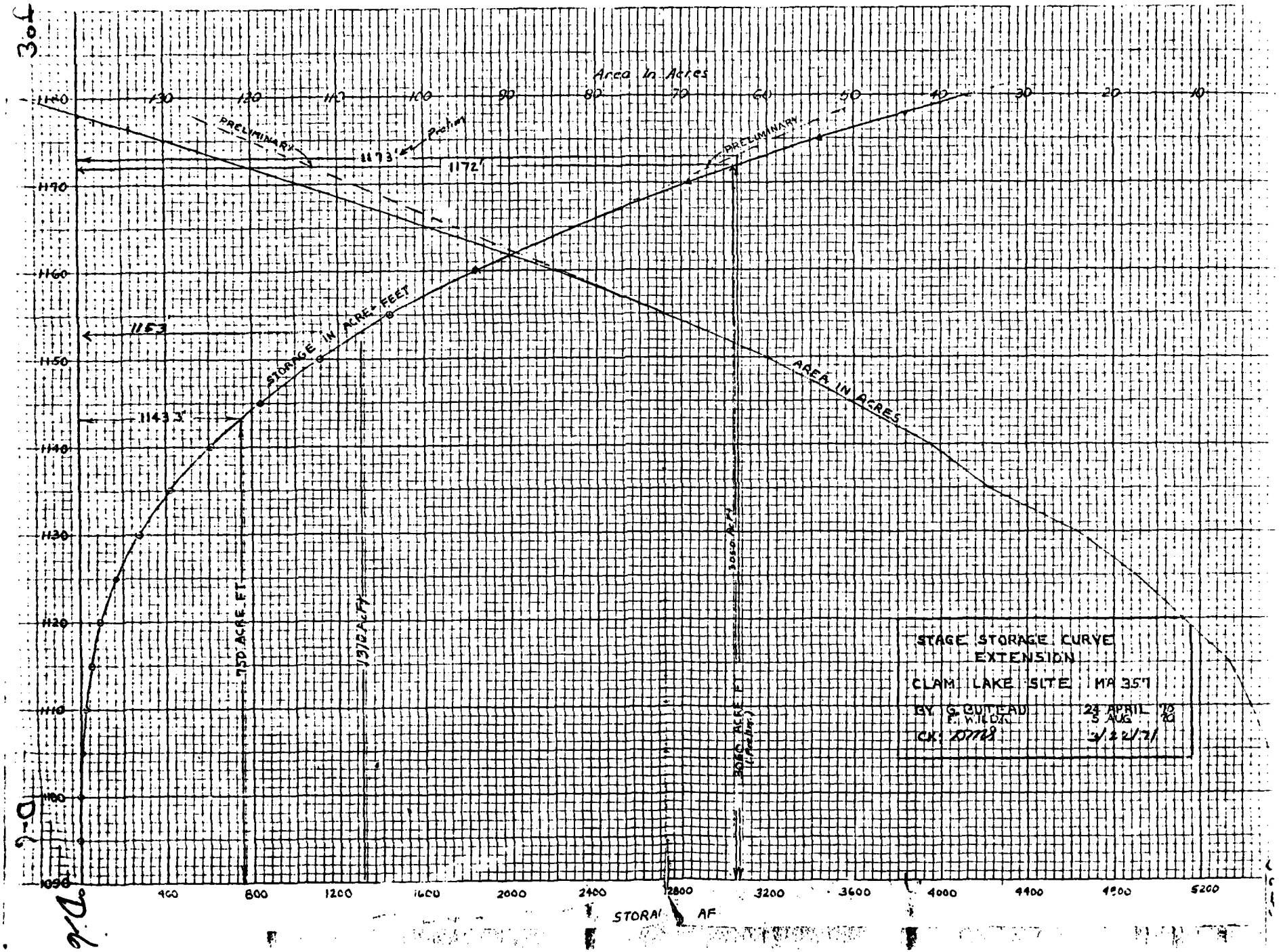
Multi Purpose - 47 A

Flood Stor 1 - 67 A

Flood Stor 2 - 120.5 A

Stage - Storage and spillway rating information contained in the hydraulic/hydrology section of the Design Folder prepared by the Soil Conservation Service has been reviewed and found valid for this analysis.

D-5


Area in Acres
PRELIMINARY
2nd Int
1173'
1172'
PRELIMINARY
1153
1143.3'
STORAGE IN ACRE-FEET
AREA IN ACRES
750 ACRE FT
1372 AC FT
3060 AC FT
3060 ACRE FT (Preliminary)
STORAGE AF
STAGE STORAGE CURVE EXTENSION
CLAM LAKE SITE MA 357
BY G. GUTEAU 24 APRIL 70
F. WILDA 5 AUG 70
CK: DMM 3/22/71

SCS-MGT-360
Rev. 2-69

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Tabular Computations

Stage-discharge (Used to study effects of Cold Water Release on the Routings)

Elev	1143.3=0 H	$H^{3/2}$	Low Stage Weir Q= $12.4H^{3/2}$	1143.8=E H	$H^{1/2}$	Low orifice Q= $19.86H^{1/2}$	1144.3=0 H	$H^{3/2}$	Intermediate weirs Box $31H^{3/2}$	orif. $27.34^{1/2}$	1144.8=E H	$H^{1/2}$	Intermediate orifice Q= $42.4H^{1/2}$	1153.0=0 H	$H^{3/2}$	High Stage Weir Q= $93H^{3/2}$		Total
1143.3	0																	0.
1143.8	.5	.3536	4.4	0														4.4
1144.2	.9	.8538	10.6	.4	.63	12.1												10.6
1144.3	1.0	1.0	12.4	.5	.71	13.7	0.											12.4
1144.4	1.1	1.1537	14.3	.6	.77	14.8	.1	.0316	1.0	.9								15.2
1144.5	1.2	1.3145	16.3	.7	.84	16.2	.2	.0894	2.8	2.4								18.6
1144.6	1.3	1.4822	18.4	.8	.89	17.1	.3	.1643	5.1	4.5								21.6
1144.7	1.4	1.6565	20.5	.9	.95	18.5	.4	.2530	7.8	6.7								25.2
1144.8	1.5	1.837	22.8	1.0	1.00	19.3	.5	.3536	11.0	9.7	0							29.0
1145.0				1.2	1.10	21.2	.7	.5857	18.2	16.0	.2	.45	19.1					37.2
1150.0				6.2	2.49	48.0	5.7	13.61	421.9	371.6	5.2	2.28	96.7					144.7
1153.0				9.2	3.03	58.4					8.2	2.86	121.3	0.				179.7
1153.5				9.5	3.08	59.3					8.7	2.95	125.1	.5	.3536	32.9		217.3
1154.0				10.2	3.19	61.4					9.2	3.03	128.5	1.0	1.0	93		282.9
1155.0				11.2	3.35	64.5					10.2	3.19	135.3	2.0	2.83	263.2		463.0
1156.0				12.2	3.49	67.2					11.2	3.35	142.0	3.0	5.196	483.2		692.4
1156.5				12.7	3.56	68.6					11.7	3.42	145.0	3.5	6.548	609.0		822.6
1157.0				13.2	3.63	69.9					12.2	3.49	148.0	4.0	8.0	744.0		961.4

This weir has no effect on the high stage or orifice flows shown can be used as an indicator of the amount of cold water released.

D-7

D-6

A-431

SCS-MGT-347a
Rev. 2-69

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Outlet Station		Pipe		Principal Spillway Flow		E.S. Flow										
					0.												
					9.4												
					10.6												
					12.4												
					15.2												
					18.0												
					21.6												
					25.2												
					27.0												
					37.1												
					144.7												
					172.7												
	63.	7.34	809.9		217.3												
	63.5	7.91	812.9		282.9												
	64.5	8.03	819.1		962.0												
		8.09	823.5		992.4												
		8.12	828.2		822.6												
	66.5	8.15	831.3		831.3												
		8.34	850.7		850.7												
	72.5	8.12	903.8		909.8												
	81.5	9.03	921.1		921.1												
	82.5	9.09	926.2		926.2		670		1596.2								
	83.5	9.14	932.3		932.3		2370		3302.3								
	84.5	9.19	937.4		937.4		4750		5687.4								

Spillway and Conduit Rating

The principal spillway has three sets of orifices for water release at normal pool elevations. The first orifice (gated) is set at elevation 1141.3 and is 1' x 1.42'. The second orifice is set at 1143.3 and is 1' x 4.1'. The third orifice is set at 1144.3 and consists of two (2) openings 1' x 4.4'. All one foot dimensions being the height of the openings.

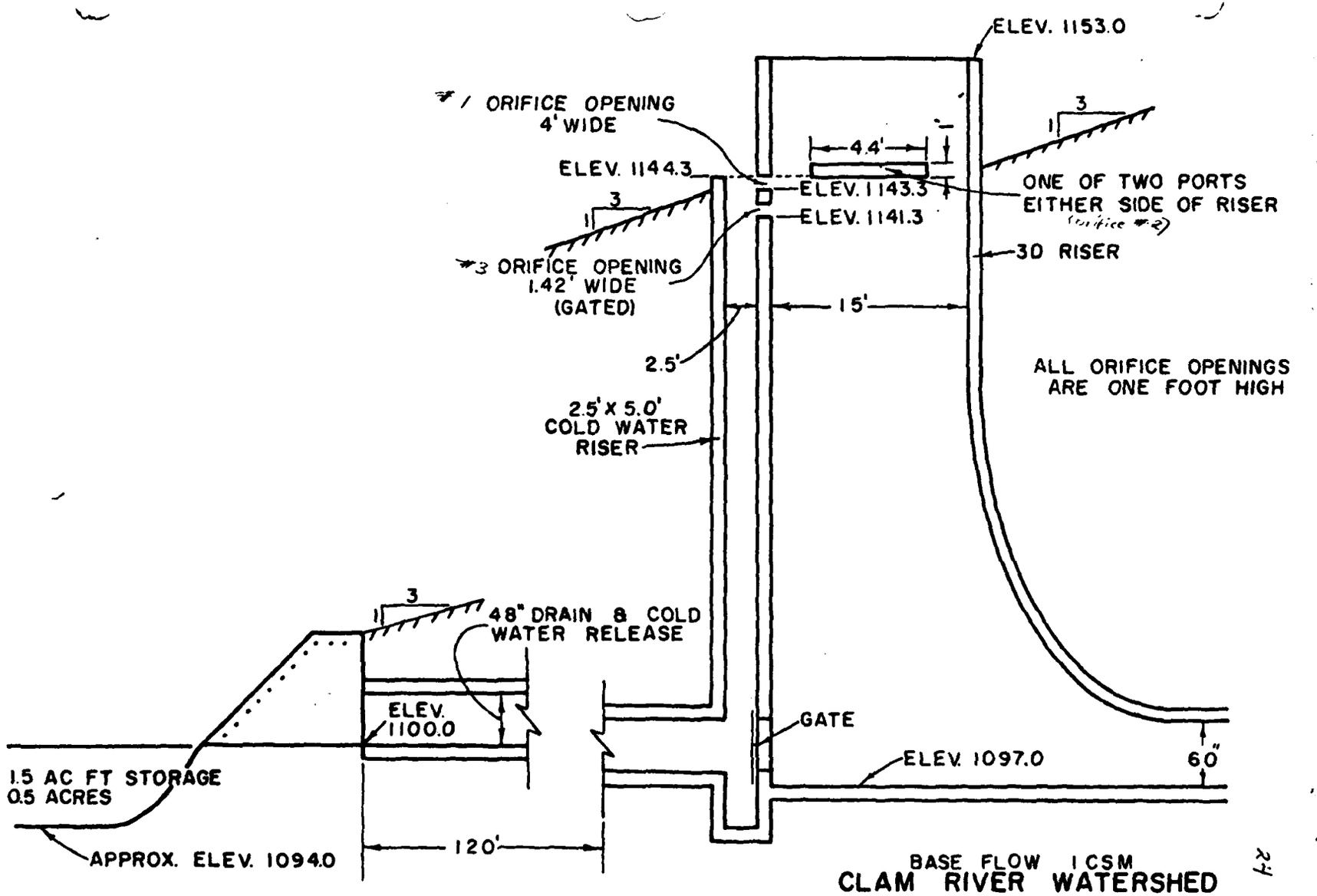
The riser also has a first stage flood weir at 1153.0 on each side of the riser. The weir on each side of the riser is 15' long. This weir acts as an orifice once the stage gets to 1156.

The emergency spillway for the dam is cut into the left abutment and is 385 ft wide. The approach channel has a slope of -2.3% from the crest and the discharge channel has a slope of 1.8% away from

the crest. The crest is flat for 50' and a concrete weir is at the down stream edge of the flat crest. Slopes to each side of the spillway are on a 2 horizontal to 1 vertical. The E.S. crest is set at elevation 1172.0 MSL. A 5' diameter conduit carries water from the principal spillway under the dam to a plunge pool on the down stream side. The discharge of the principal spillway is limited by the capacity of the conduit.

A 48" pond drain carries water to the riser from the inlet structure but normally the gate will be closed and the only contribution this conduit will have to discharge is the release of bottom waters thru the gate well on the upstream side of the riser.

D-16



BASE FLOW 1 CSM

CLAM RIVER WATERSHED

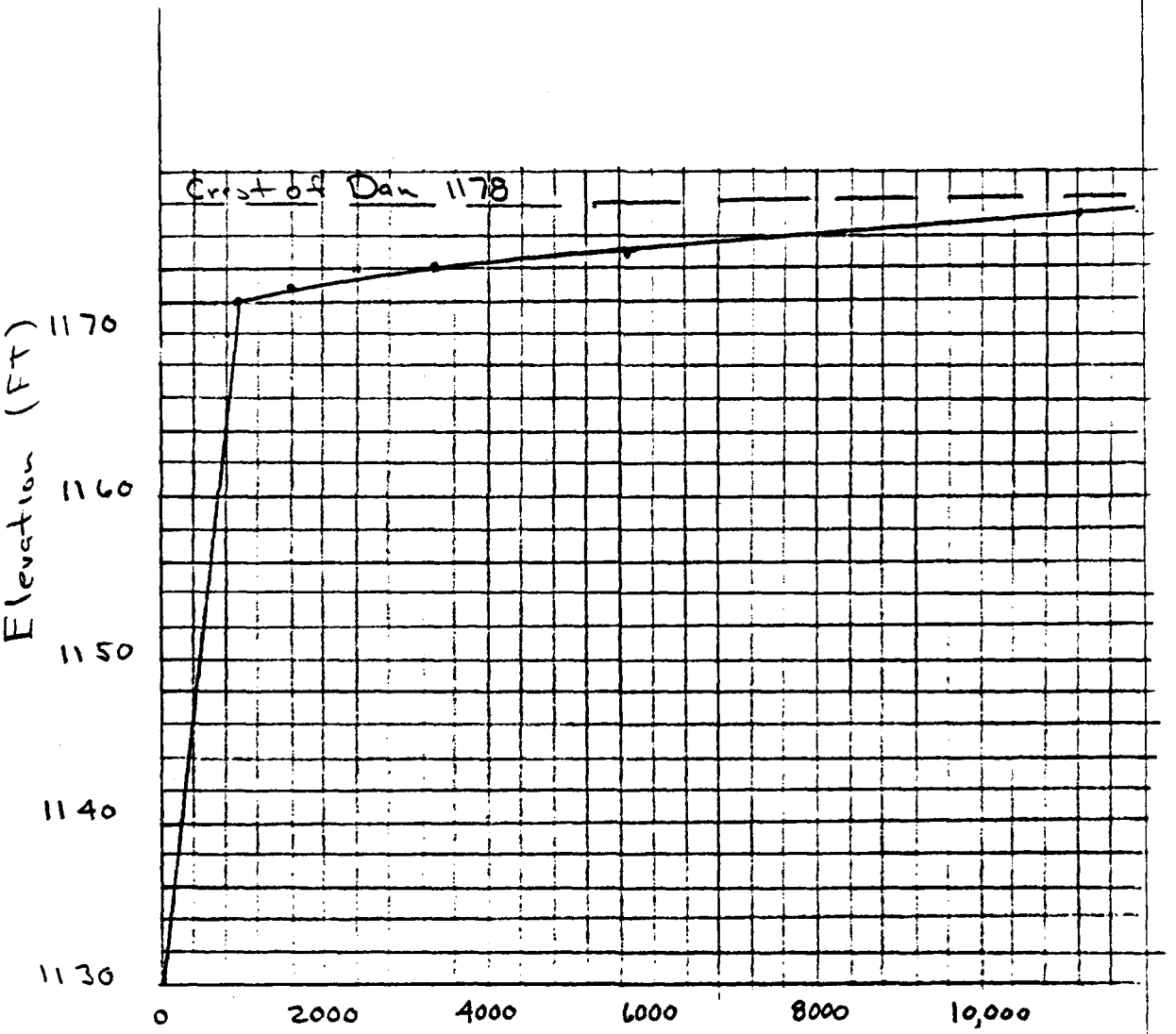
CLAM LAKE SITE

SKETCH OF COLD WATER RELEASE

P.C.F. 6-29-71

D-11

Spillway Rating Curve



Additional Pt On Curve

Elevation	h	Q (conduit)	h	Q (ES)	h	Q (Dam)	Q Tot
1176	85.5	943.2	4	7750	-		8693.2
1177	86.5	948.7	5	11,200	-		12,148.7
1178	87.5	954.1	6	15,200	-		16,154.1
1179	88.5	959.6	7	19,200	1	2569	22,728.6
					2	7565.7	

D-12

D-12

Computation of additional points

Conduit $Q = C_p H^{1/2}$ (1143.3)

$Q = 102 H^{1/2}$

$Q = 102(85.5)^{1/2} = 943.2$

$Q = 102(86.5)^{1/2} = 948.7$

$Q = 102(87.5)^{1/2} = 954.1$

$Q = 102(88.5)^{1/2} = 959.6$

Spillway $Q = C L H^{3/2}$ (1172)

(Using data in SCS Folder)

H_p	Q
4	7750
5	11,200
6	15,200
7	19,200

Dam $Q = C L H^{3/2}$ (1178)

$C = 2.6$, $L = 988$ ft

1179 $Q = (2.6)(988)(1)^{3/2} = 2568.8$

1180 $Q = (2.6)(988)(2) = 7565.7$

1181 $Q = (2.6)(988)(3) = 13,347.9$

D-13

D-13

Reservoir Routing

Surcharge elevation to pass 21,060 cfs is 1178.8 − 1143.3 = 35.5 ft

From SCS Surface Area - Elevation Curve

Area @ 1178.8 = 142 A

Area @ 1143.3 = 47 A

Volume of Surcharge $\frac{(142+47)}{2} \times 35.5$

= 3355. AF

Q_{p1} = 21,060 cfs

$Sto_1 = \frac{3355}{6900} = 0.49' \times 12 = 5.8"$

$Q_{p2} = 21{,}060\left(1 - \frac{5.8"}{19}\right) =$

= 14,631 CFS

1177.5
1143.3

Surcharge height for Q_{p2}, H = 34.2'

1177.5

Volume of Surcharge $\frac{(138+47)}{2} \times 34.2'$

= 3164 AF

$Sto_2 \quad \frac{3164}{6900} = .46 \times 12 = 5.5"$

$Q_{p3} = 21{,}060\left(1 - \frac{5.5}{19}\right) =$

= 14,963 CFS

H = 34.4'

1177.7
1143.3
34.4

D-14

D-14

H for Q_{p2} and Q_{p3} agree

∴ Surcharge Height H = 34.4

or 1143.3 + 34.4 = 1177.70

Crest of dam is at 1178.00

therefore the dam will not be overtopped and the spillway is adequate.

$$Q_p = \frac{8}{27} w_b \sqrt{g} y_o^{3/2}$$

w_b = breach width at mid height of dam (40% of 590) = 236

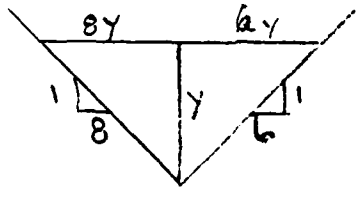
y_o = height from riverbed to pool at failure Assume WL at dam crest 1178.0

$$Q_{p1} = \frac{8}{27}(236)(5.68)(94)^{3/2} =$$

$$Q_{p1} = 301,975 \text{ CFS}$$

The first major impact area to be considered is the Town of West New Boston at the confluence of the Clam River, Silver Brook and the Buck River.
The reach is 14,000 ft long

Looking up Valley



$A = \frac{1}{2}(6y^2 + 8y^2) = 7y^2$

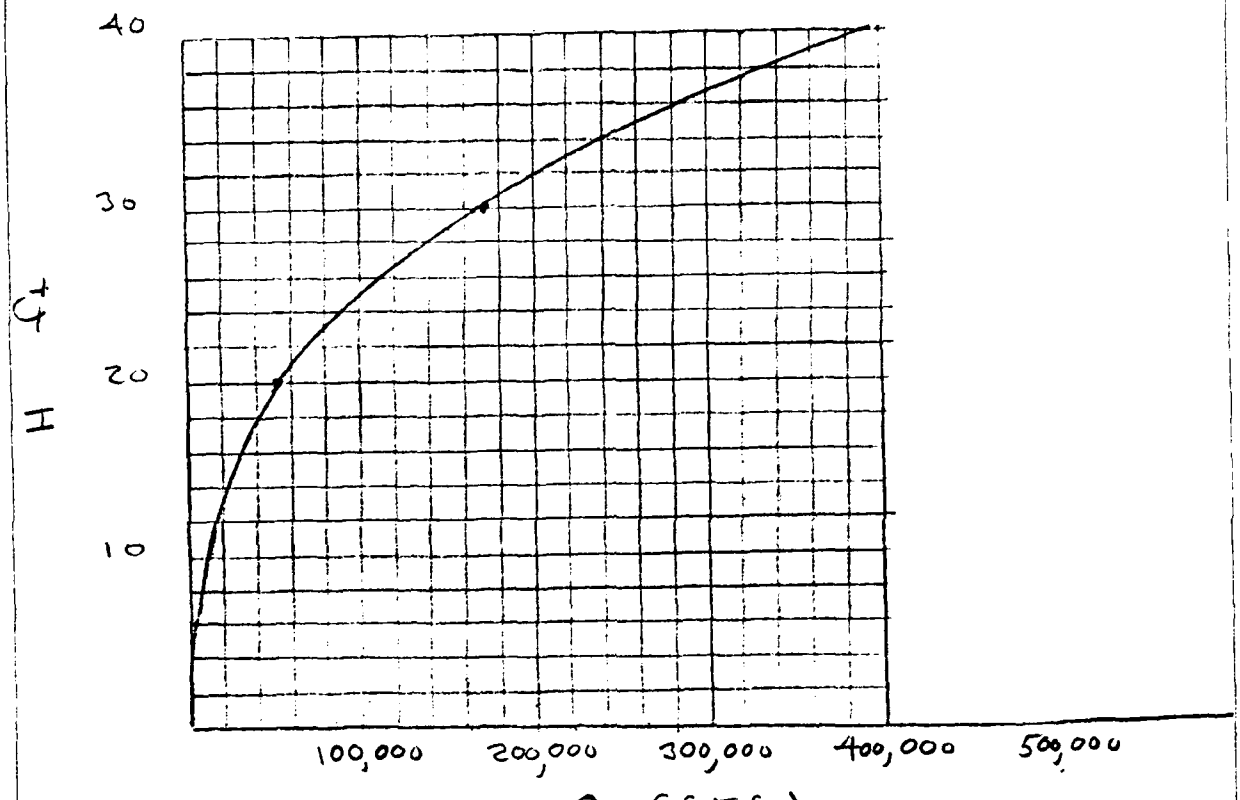
$WP = \sqrt{37}\cdot y^2 + \sqrt{61}y^2$
$= 14.1y$

Average x Section $R = 0.5\ y$

D-16

$n = 0.04$ (mountain stream) $\quad S = 0.014$ ft/ft

Plot Stage – Discharge Curve



Try 20'

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$$Q = \left(\frac{1.486}{0.04}\right)(2800)(10.0)^{2/3}(0.12)$$

$$Q = 57{,}982.7 \text{ CFS}$$

Try 30'

$$Q = \frac{1.486}{0.04}(4300)(15.0)^{2/3}(0.12)$$

$$Q = 170{,}975.3 \text{ CFS}$$

D-17

Reach Outflow ①

Q_{p1} = 361,975 cfs

$Y \approx 39'$ Use only ½ reach (Uniform xsect.)

$V = (7{,}000)(39)^2(7) \div 43{,}560$

$= 1{,}711$ AF

Storage at Dam Crest = 3840 AF

$Q(trial) = 361{,}975\left(1 - \frac{V_1}{S}\right)$

$= 361{,}975\left(1 - \frac{1711}{3840}\right) =$

$= 200{,}689$ CFS, $Y \approx 32'$

$V_2 = (7{,}000)(32)^2(7) \div 43560$

$= 1152$ AF

$V_{ave} = (1711 + 1152) \div 2 = 1432$

$Q_{p2} = (361{,}975)\left(1 - \frac{1432}{3840}\right) =$

* $Q_{p2} = 226{,}989$ $Y \approx 33'$

Reach Outflow (2)

$Q_{p2} = 226{,}989$ $Y \approx 33'$

$V_1 = (7000)(33)^2(7) \div 43560 = 1225$ AF

$Q_{trial} = 226{,}989\left(1 - \frac{1225}{3840}\right) = 154{,}577$ CFS

$Y \approx 29'$

$V_2 = (7000)(29)^2(7) \div 43560 = 941$ AF

$V_{ave} = (1225 + 941) \div 2 = 1086$ AF

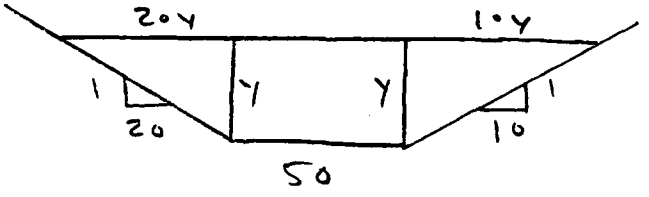
$Q_{p3} = 226{,}989\left(1 - \frac{1086}{3840}\right) = 162{,}794$ CFS

* $Q_{p3} = 162{,}794$ CFS $Y \approx 30'$

January 4, 1980

The third reach that is of significance is 2000 ft downstream the Clear River below West New Boston. Since the Buck River watershed is not large the PMF flow from that area will not be included in this analysis and due to existing flood control structures, (dams) the flood impact will not be significant. The Qp from the Buck River is negligible compared to the Qp of the Clear River.

Reach X Section (looking up valley)



$$A = 50y + \frac{1}{2}(20y^2 + 10y^2) = 50y + 15y^2$$
$$y(50 + 15y)$$

$$WP = 50 + \sqrt{401y^2} + \sqrt{101y^2} = 50 + 30.1y$$

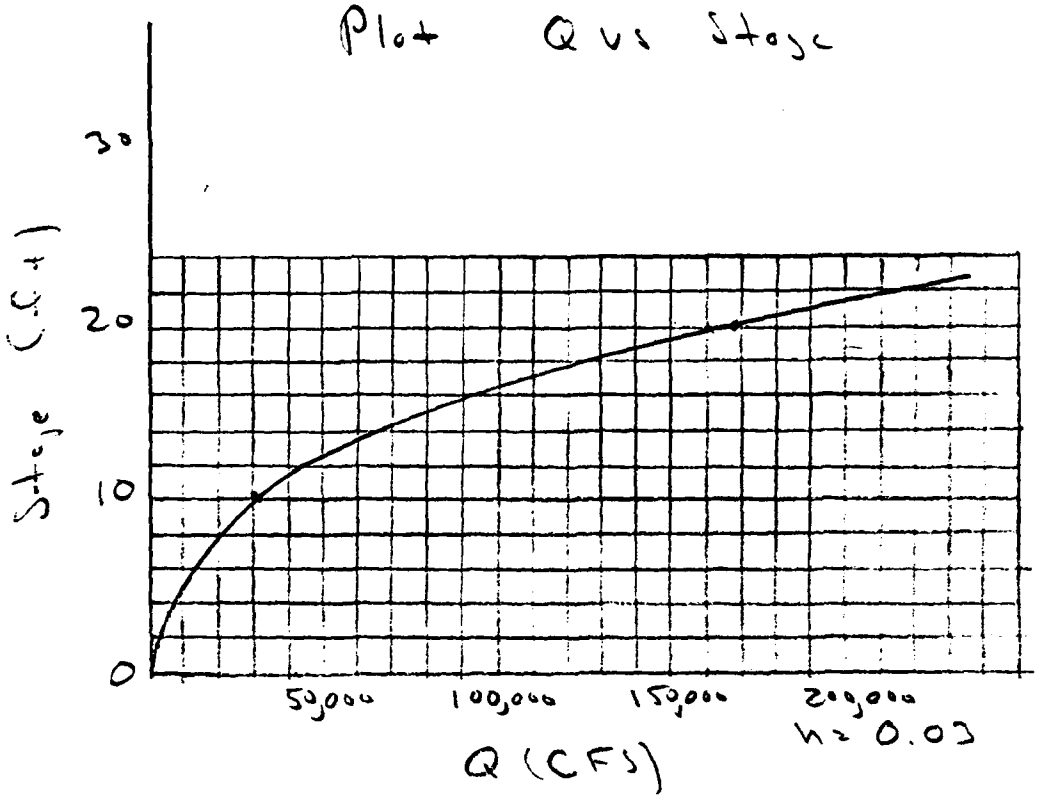
$$R = \frac{50y + 15y^2}{50 + 30.1y} = \frac{y(50 + 15y)}{50 + 30.1y}$$

$n = 0.03$

$S = 0.01$

D-19

Plot Q vs Stage



Try 10'

$$Q = \frac{1.486}{0.03} A R^{2/3} S^{1/2}$$

$$Q = \frac{1.486}{0.03}(2000)(5.6)^{2/3}(0.1)$$

$$Q = 131,259 \text{ CFS}$$

Try 20'

$$Q = \frac{1.486}{0.03}(7000)(10.7)^{2/3}(0.1)$$

$$Q = 168,498 \text{ CFS}$$

$Q_{p3} = 162,794$ CFS

Reach Outflow (3)

$H \approx 19.5'$

$V = (2000)(6679) = 43560 = 307$ AF

$Q(\text{trial}) = 162,794\left(1 - \frac{307}{3040}\right) = 149,779$ CFS

$H = 19.0$ ft

D-20

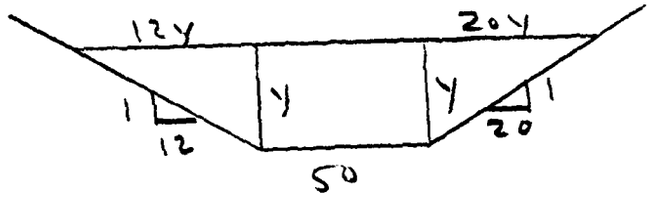
D-20

$V = (2000)(6365) \div 43560 = 292$ AF

$Q_{p4} = 162{,}794\left(1 - \frac{300}{3840}\right) = 150{,}074$ CFS

$Q_{p4} = 150{,}074$ CFS Hr 19.1

The fourth reach is 7000' downstream of West New Boston on the Clear River. This reach is 5000 ft downstream of the previous



$A = 50y + \frac{1}{2}(12y^2 + 20y^2) = y(50 + 32y)$

$WP = 50 + \sqrt{145y^2} + \sqrt{401y^2}$

$= 50 + 32.1y$

$R = \frac{y(50 + 32y)}{(50 + 32.1y)}$ 10570

$n = 0.03$ $S = 0.01$

Determine Points on Stage vs Flow

Try 10'

$Q = \frac{1.486}{0.03}(3700)(9.97)^{2/3}(0.1)$

$Q = 84{,}963$ CFS

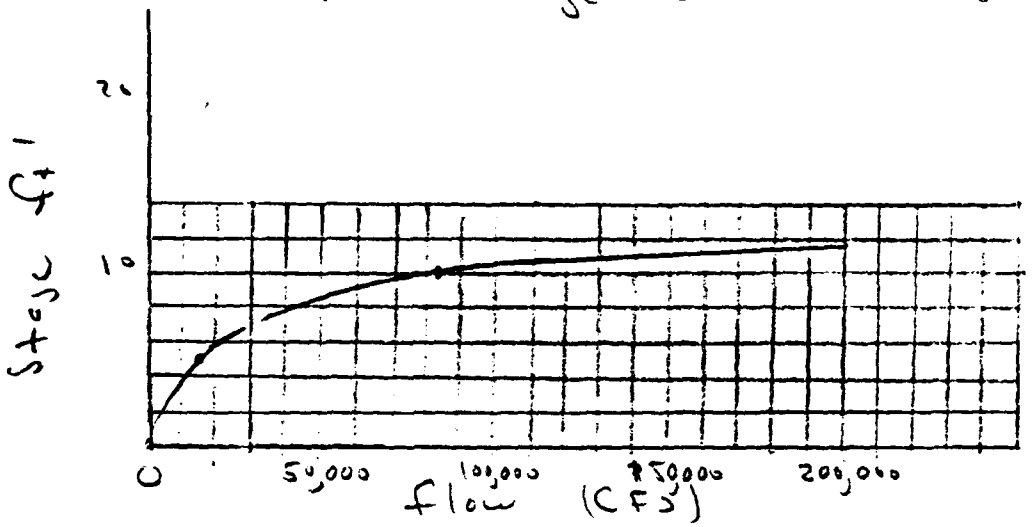
Try 5'

$Q = \frac{1.486}{0.03}(1050)(4.9)^{2/3}(0.1)$

$Q = 15{,}012$ CFS

D-21

Plot Stage vs Flow Curve



$Q_{pA} = 150,074$ CFS $\quad H \approx 11$ ft

Reach outflow ④

$V = (5000')(4422) \div 43560 = 508$ AF

$Q_{(trial)} = 150,074\left(1 - \frac{508}{3840}\right) = 130,221$ CFS

$H \approx 10.5'$

$V = (5000)(4053) \div 43560 = 465$ AF

$V_{ave} = (508 + 465) \div 2 = 487$ AF

$Q_{pT} = (150,074)\left(1 - \frac{487}{3840}\right) =$

$Q_{pT} = 131,041$ CFS $\quad H \approx 10.5'$

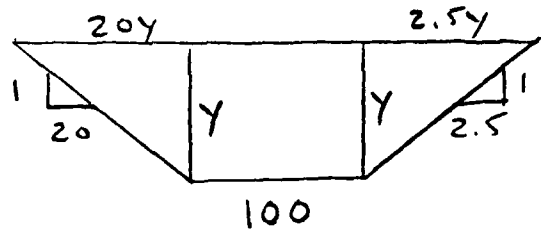
The fifth reach will extend from 7000' downstream of West New Boston to the confluence of the Clam River with the West Branch of the Farmington River and along the WBF River to a bridge

D-22

Just south of P-5

The reach is 8500 ft long.
The PMF for the WBF River and the Clay River is, from COE Curve
1200 cfs/sm x 92 sm = 110,400 cfs

X Section Looking up the Valley



$A = 100y + \frac{1}{2}(20y^2 + 2.5y^2) = 100y + 11.25y^2$

$WP = 100 + \sqrt{401y^2} + \sqrt{7.25y^2} = 100 + 22.7y$

$R = \frac{100y + 11.25y^2}{100 + 22.7y}$

$S = 0.0054$

$n = 0.03$

Determine Stage vs Flow curve for Reach

Try H = 10'

$Q = \frac{1.49}{n}(A)(R)^{2/3}(S^{1/2})$

$Q = \frac{1.49}{0.03}(2125)(6.5)^{2/3}(.0054)^{1/2}$

(0.07)

Q 25,678 CFS

D-23

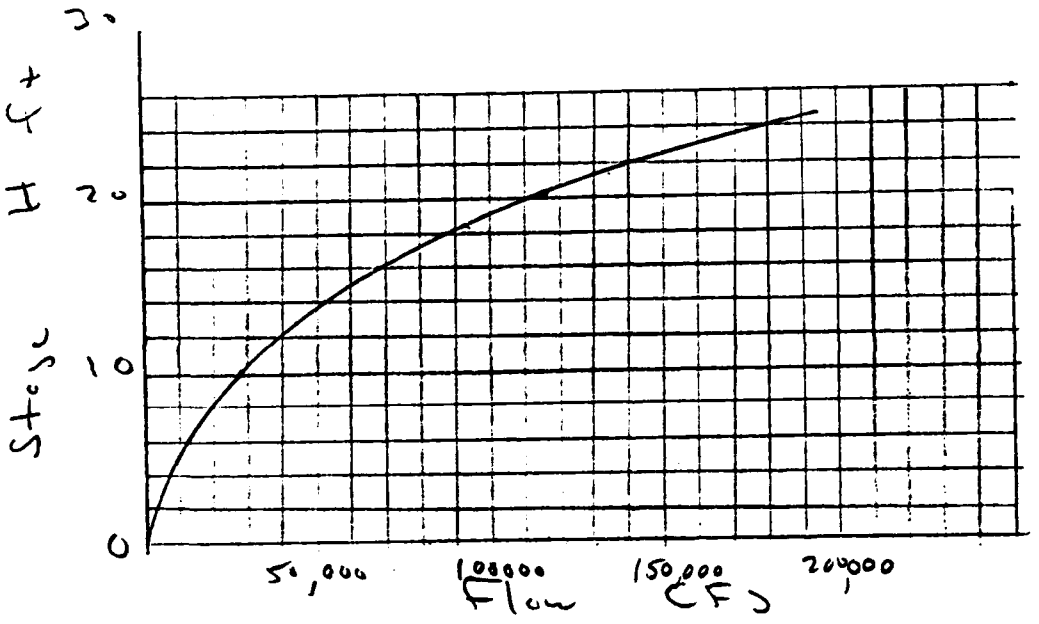
D-23

Try H: 20'

$$Q = \frac{1.486}{0.03}(6500)(5.11)(0.07)$$

Q = 116,257 CFS

Plot Stage vs Discharge



Q_{PF} = 131,041 CFS H ≈ 20.5 ft

Reach Outflow (5)

V = (8500)(6778) ÷ 43560 = 1323 AF

$Q_{p(Inv.1)}$ 131,041 $\left(1 - \frac{1323}{3540}\right)$ = 85,893 CFS

H = 18'

V = (8500)(5448) ÷ 43560 = 1063 AF

V_{ave} = (1323 + 1063) ÷ 2 = 1193

$Q_{p6} = 131{,}041\left(1 - \frac{1193}{3040}\right) = 90{,}338$ CFS

* $Q_{PC} = 90,330$ CFS $H \approx 18.25'$

(Without PMF of Farmington River and other adjacent areas.)

The attenuated flow from the fifth reach is 90,330 CFS without the PMF from the Farmington River. With the Farmington River PMF the flow would be 225,330 CFS.

Beyond the fifth reach is the Cole Brook Res. The dam failure flow from Clam Lake will amount to 3840 AF. The normal surface area of the Cole Brook Res is about 460 A. Therefore, the Colebrook Reservoir surface will rise about 8 ft to store the failure volume of 3840 AF. The normal pool elevation of Cole Brook Res is 701 and the crest of the dam is about 780. Therefore the store requirement of 8 ft for the failure volume is less than 10% of the flood storage available for flood detention.

major roadways, and a cemetery.

4) The dam failure flow in the fifth reach will result in a stage of about 18.25 ft with an attenuated flow of 90,330 CFS. If the PMF of the W. Branch of the Farmington River is included the stage will be about 26 ft and the flow will be 225,330 CFS. This flood will result in damage to about 11 homes and buildings, two major highway bridges, one secondary road bridge and about 13,000 feet of road.

5) Because of the existence of Cole Brook Reservoir, a flood control structure, the failure flow will be stored and no further downstream damage will likely occur

D-27

Summary of Flow Due to Dam Failure

Area	Location	Flow CFS
(1)	At Dam	341,975
(2)	2000' DS	226,989
(3)	14000' DS	162,754
(4)	18,000' DS	131,041
(5)	25,500 DS	90,330
(6)	29,500 DS	90,330
(7)	34,000' DS	Flood Stored

Conclusions
(Not including PMF for adjacent DAs)

1) The spillways for the dam are adequate to handle the PMF and the structure will not be over-topped.

2) Dam failure flow is in the first + second reaches from the dam to the confluence of the Clam River and the Buck River will result in a stage of 30 to 33' with an attenuated failure flow from 226,989 to 162,794 CFS. The failure flow will result in the loss of a wooden bridge on Montville Beech-Plain Rd.

3) The dam failure flow in the third and fourth reach from the confluence of the Clam and Buck River in West New Boston to the confluence of the Clam River with the West Branch of the Farmington River will result in a stage of about 19 to 11 and an attenuated flow of 150,074 to 131,041 CFS. The flow will result in damage to about 25 ± homes and buildings, two major bridges, about 9000 ft of

D-29

Significant Tributary Drainage Area Data

Location	DA (SM)		PMF (CFS)
1) From Dam To Confluence of Buck River with Clam River			
a) Clam River			
1) Todan	10.8 sm	–	15,000
2) To Buck R	2.2 sm	–	5,500
	13.0 sm		20,500
2) From confluence of Buck River to W Branch of Farmington River			
a) Clam to Buck	13.0 sm	–	20,500
b) Clam Buck to W B Farm.	2.5 sm	–	6,200
c) Silver Brook	5.0 sm	–	11,250
d) Buck River	8.6 sm	–	14,900
	29.1 sm		52,850
3) W Branch Farmington River to Colebrook Res			
a) Clam River	15.5 sm	–	26,700
b) Silver Brook	5.0 sm	–	11,250
c) Buck River	8.6 sm	–	14,900
d) Farmington River	62.9 sm	–	81,770
	92.0 sm		134,620

Flood Stage Inventory

	Area Location	Prior to Flood Flow	Stage Prior	After Failure of Dam	Stage
1	At Dam	15,000	5.7 (Capacity)	262,000	Dam Fail
2	2000 DS	15,000	8'	242,000	34
3	14,000 DS	20,500	9'	151,500	19
4	18,000' DS	53,000	8	184,000	11
5	25,500 DS	135,000	21	225,000	2(
6	29,500 DS	135,000	21	255,000	2(
7	36,000 DS	Flood Stage			

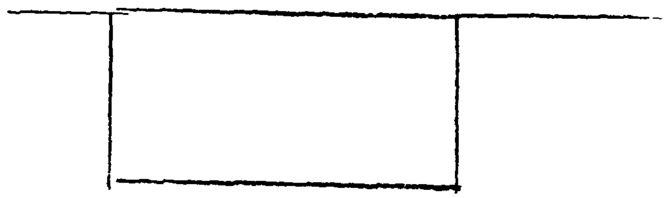
Bridge Crossing Data

1 Montville-Beech Plain Road Bridge

Area Loc 2

Streambed elevation ≈ 1060

Road bed elevation ≈ 1070



Dam failure flood elevation ≈ 1093

Dam failure flood + PMF elevation ≈ 1094

2) West New Boston - Sandisfield Rd Bridge

Area Loc 3

Streambed elevation — ≈ 868

Road bed elevation — ≈ 887

Dam failure flood elevation - ≈ 887.0

Dam failure flood + PMF elevation - ≈ 887.0

3) New Boston - New Hartford Rd Bridge

Area Loc 4

Streambed elevation - ≈ 827

Road bed elevation - ≈ 837

Dam failure flood elevation - ≈ 837.5

Dam failure + PMF elevation ≈ 837.5

4) Bridge at Roosterville

Area Loc 5

Streambed elevation - ≈ 765

Road bed elevation - ≈ 775

Dam failure flood elevation - ≈ 786

Dam failure flood = ≈ 791

5) R+8 Bridge over W Branch Farmington R

Area Loc 6

Stream bed elevation	≈	744
Road bed elevation	≈	758
Dam failure flood elev	≈	765
Dam failure + PMF elev	≈	770

6) Access Road Bridge East of R+8

Area Loc 6

Stream bed elevation	≈	740
Road bed elevation	≈	750
Dam failure flood elev	≈	761
Dam failure + PMF elev	≈	766

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(9) NAME	(10) LATITUDE (NORTH)	(11) LONGITUDE (WEST)	(12) REPORT DATE DAY | MO | YR
MA	1052	NE	MA	003	01				CLAM LAKE DAM	4208.3	7306.0	19FEB80

(12) POPULAR NAME	(14) NAME OF IMPOUNDMENT
	CLAM LAKE

(15) REGION	(16) BASIN	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	08	CLAM RIVER	SANDISFIELD (W.NEW BOSTON)	3	650

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	(27) NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REPG	1977	RC	94	93	3810	750	NED	N	N	N	B	

(28) REMARKS

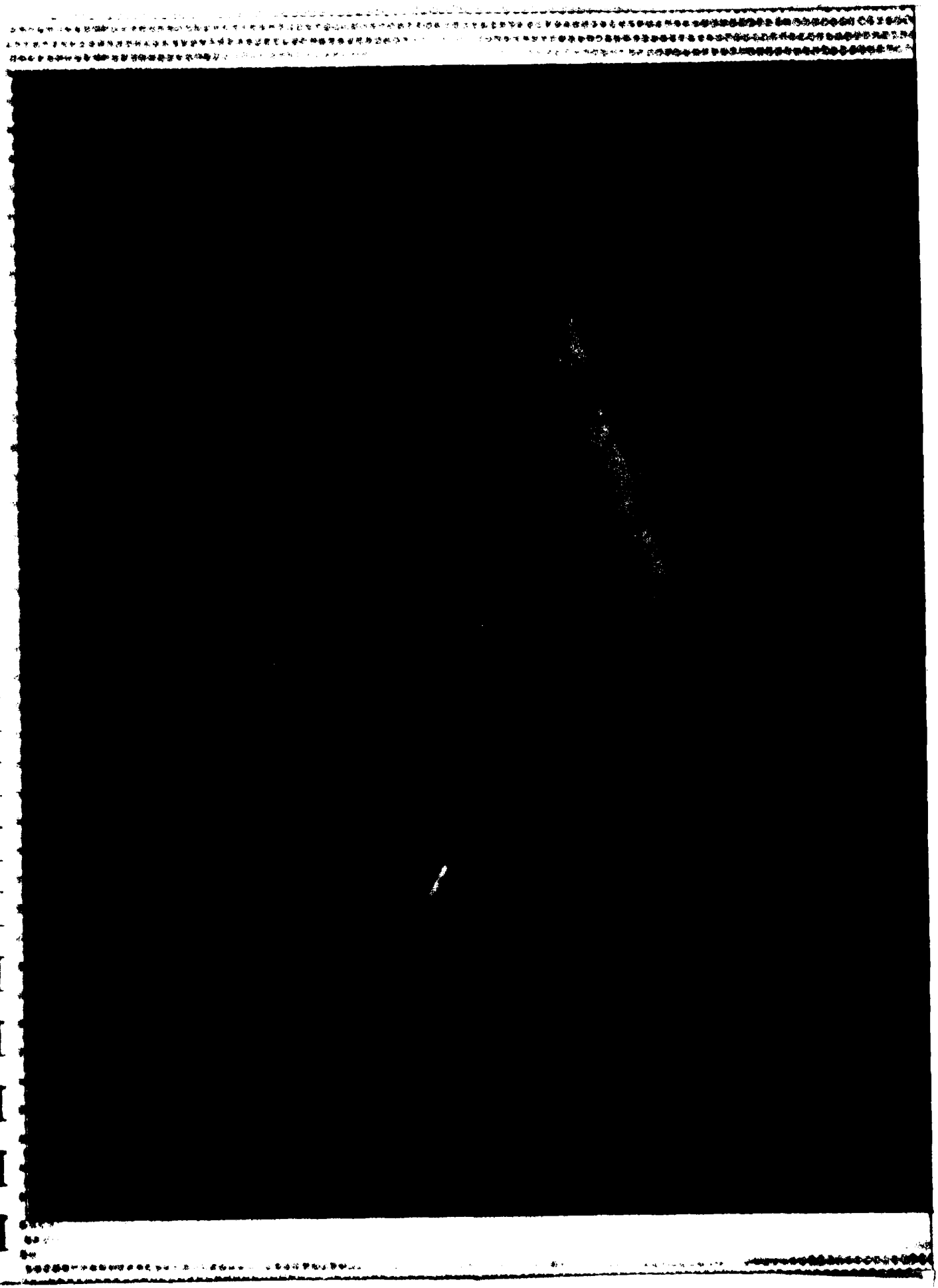
(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
1	950	U	385	16150												

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
COMM OF MASSACHUSETTS	US DEPT AGRICULTURE SCS	

(49) REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
US DEPT AGRIC SCS	US DEPT AGRIC SCS	COMM MASS DIV F+P	COMM MASS DIV F+P

(50) INSPECTION BY	(51) INSPECTION DATE DAY | MO | YR	(52) AUTHORITY FOR INSPECTION
TIGHE & BOND DIV OF SCI	01NOV79	P.L. 92 - 367

(53) REMARKS
51+52 DIV OF FORESTS + PARKS



CLAM RIVER WATERSHED PROJECT

CLAM LAKE MULTIPLE-PURPOSE DAM

RECREATION AND FLOOD PREVENTION

DRAINAGE AREA	6900	ACRES
TOTAL STORAGE	3050	ACRE FEET
FLOODWATER RETARDING STORAGE TO EMERGENCY SPILLWAY CREST	2300	ACRE FEET
WATER SURFACE AREA AT PERMANENT POOL	47	ACRES
HEIGHT OF DAM	88	FEET
VOLUME OF FILL	525,000	CUBIC YARDS

BUILT UNDER THE WATERSHED PROTECTION AND FLOOD PREVENTION ACT

by

MASSACHUSETTS DEPARTMENT of NATURAL RESOURCES

and

MASSACHUSETTS WATER RESOURCES COMMISSION

and

BERKSHIRE CONSERVATION DISTRICT

of the

COMMONWEALTH of MASSACHUSETTS

with the assistance of

SOIL CONSERVATION SERVICE

of the

UNITED STATES DEPARTMENT of AGRICULTURE

1972

INDEX

D PROJECT
POSE DAM
'ENTION

,900 ACRES
)050 ACRE FEET
300 ACRE FEET

47 ACRES

88 FEET
000 CUBIC YARDS

TECTION AND
T

L RESOURCES

COMMISSION

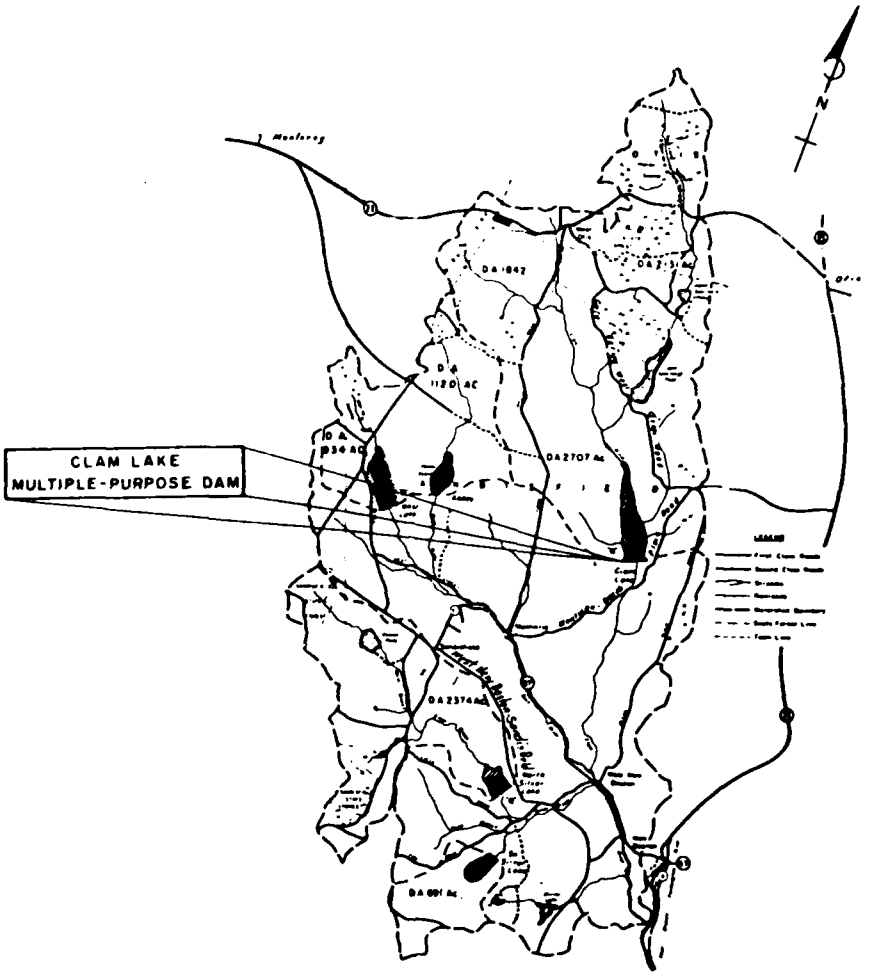
RICT

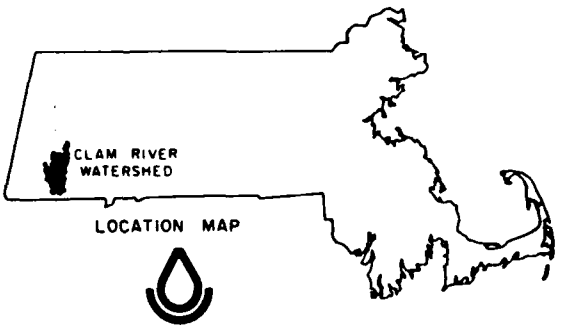
ETTS

E

ICULTURE

GENCY SPILLWAY DRAIN
GENCY SPILLWAY DRAINAGE DETAILS
TREATMENT DETAILS
FIELD FENCE DETAILS
ISER DETAILS
LOW STAGE TRASH RACK DETAILS
ESERVOIR DRAIN INLET DETAILS
UIT DETAILS
WALL DETAILS
GENCY SPILLWAY WEIR DETAILS
OOS OF TEST HOLES
ILIZATION OF STRUCTURES
NETTING & CHAIN LINK FENCE DETAILS





LOCATION MAP

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

COVER SHEET

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

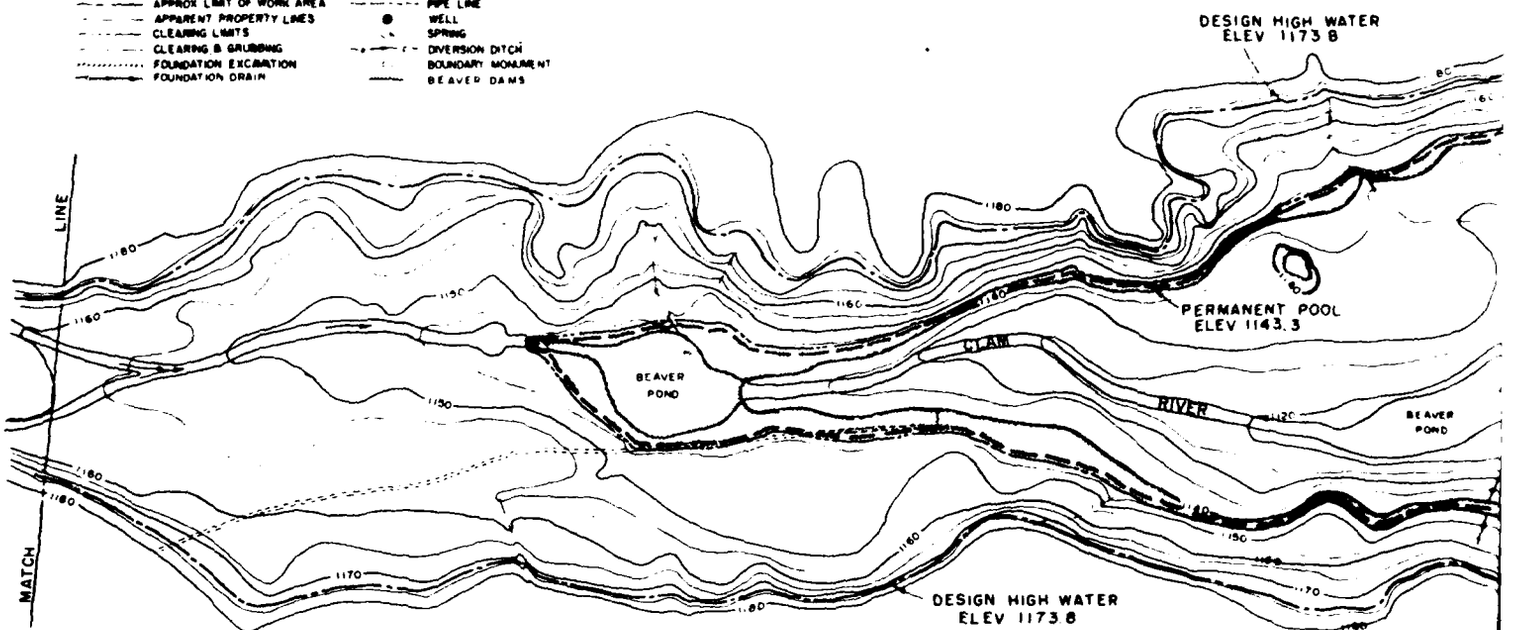
Designed J.A. TIBBETTS 9/71
Drawn P.J. WILDA 11-8-72
Traced
Checked J.J. ELLSWORTH, D.D. STOCKWELL 8-9-72
Approved by Donald E. Remington
Title State Conservationist
Title
Scale No. 1" = 1 mile
Drawing No. MA-357 P

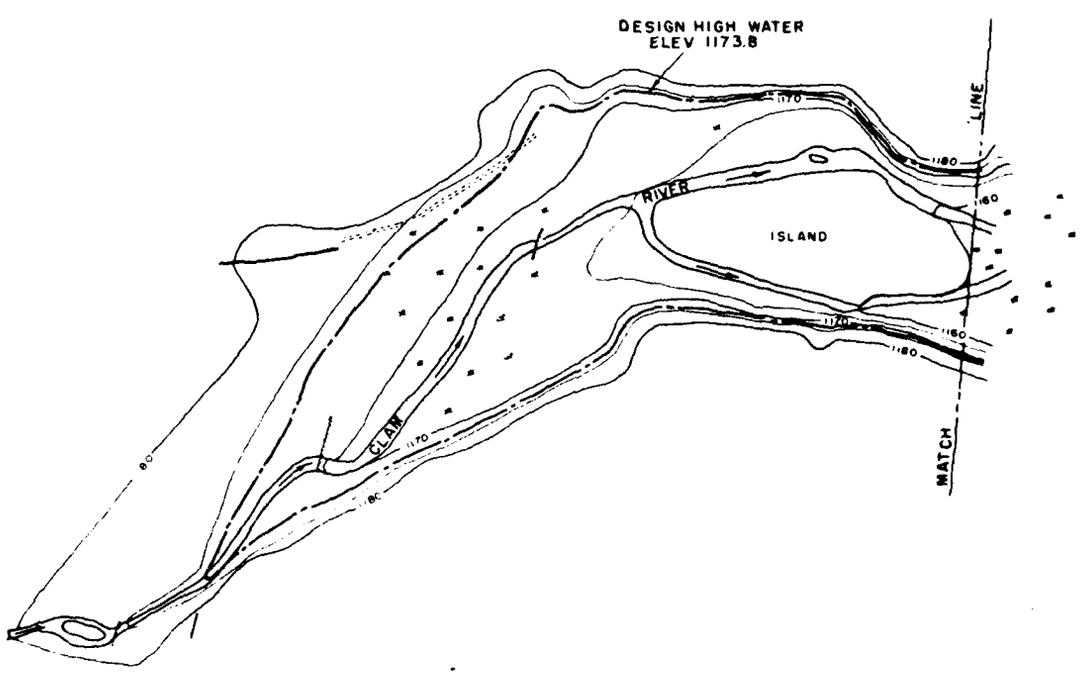
B-3

LEGEND

IMPROVED ROAD
POOR ROAD
PERENNIAL STREAM
INTERMITTENT STREAM
WOODS LINE
STONE WALL
WIRE FENCE
SWAMP
GRAVEL PIT
DEPRESSION
APPROX LIMIT OF WORK AREA
APPARENT PROPERTY LINES
CLEARING LIMITS
CLEARING & GRUBBING
FOUNDATION EXCAVATION
FOUNDATION DRAIN
PERMANENT POOL
DESIGN HIGH WATER
SURVEY STATION
BENCH MARK
DRILL HOLE
TEST PIT
ROCK OUTCROP
BEDROCK
POWER LINE
TELEPHONE LINE
PIPE LINE
WELL
SPRING
DIVERSION DITCH
BOUNDARY MONUMENT
BEAVER DAMS

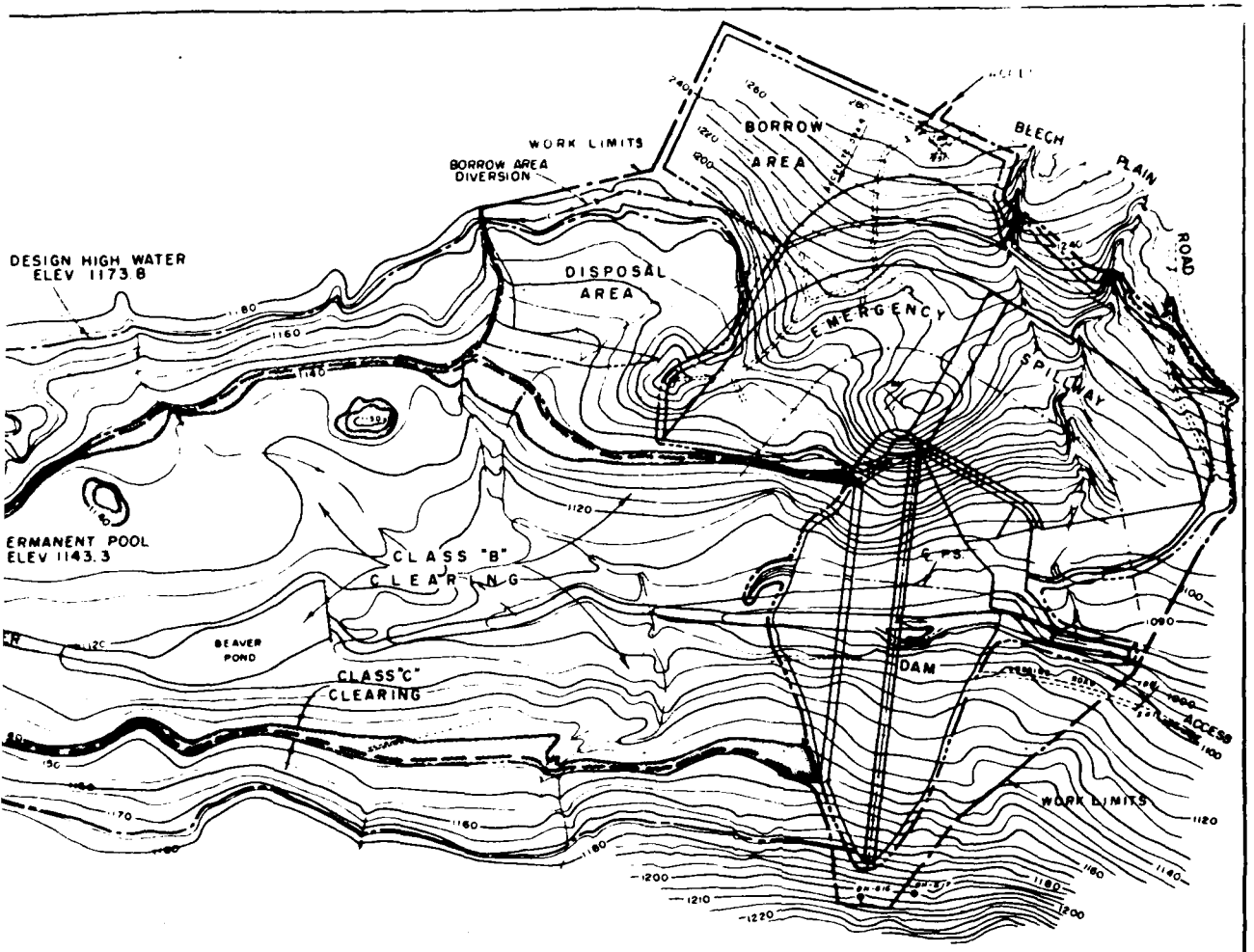
N





CLEARING	
CLEARING CLASS 'C'	ALONG THE EC FROM THE 114 BEYOND THE
CLEARING CLASS 'B'	WITHIN THE DI PERMANENT POO
CLEARING & GRUBBING	DAM, EMERGEN DIVERSION, (N ROCK DISPOSA

TBM 1 (ELEV 1210.56) TOP
STA 9+25
TBM 251 (ELEV 1277.72) TO
90' WEST OF BEEC
TBM 341 (ELEV 1099.79) TO
CLAM RIVER, EAST



CLEARING REQUIREMENTS	
CLEARING CLASS 'C'	ALONG THE EDGE OF THE PERMANENT POOL FROM THE 1140.3 CONTOUR TO 10' HORIZONTALLY BEYOND THE 1143.3 CONTOUR
CLEARING CLASS 'B'	WITHIN THE DISPOSAL AREAS AND WITHIN THE PERMANENT POOL BELOW ELEVATION 1140.3
CLEARING & GRUBBING	DAM, EMERGENCY SPILLWAY, BORROW AREA, DIVERSION, INLET & OUTLET CHANNELS AND ROCK DISPOSAL

NOTES:

1 ORIGINAL TOPO SURVEYED BY M NOYES 1962

2 ADDED SURVEY (ABOVE ELEV 1160) BY R BROWN & ASSOC 1970

3 LOCATION OF BEAVER PONDS AS OF JULY 1970

4 NO WASTE MATERIAL SHALL BE LEFT BETWEEN THE PERMANENT POOL CONTOUR (ELEVATION 1143.3) AND ELEVATION 1100.0.

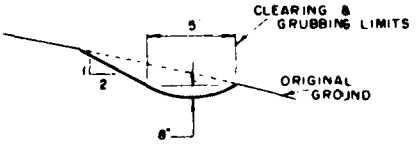
5 THE SURFACE OF THE BORROW AND DISPOSAL AREAS SHALL BE LEFT NEAT AND IN A SIGHTLY CONDITION AND SLOPED TO PROVIDE POSITIVE DRAINAGE. SIDE SLOPE SHALL BE LEFT NO STEEPER THAN 2:1

TBM 1 (ELEV 1210.56) TOP OF 2' BOULDER 60' U/S OF STA 9+25

TBM 251 (ELEV 1277.72) TOP OF 2' x 4' BOULDER APPROX 90' WEST OF BEECH PLAIN ROAD

TBM 341 (ELEV 1099.79) TOP OF 2' x 3' ROCK WEST SIDE CLAM RIVER, EAST SIDE LOGGING ROAD

200 0 200 400
SCALE IN FEET



BORROW AREA DIVERSION
TYPICAL SECTION
NOT TO SCALE

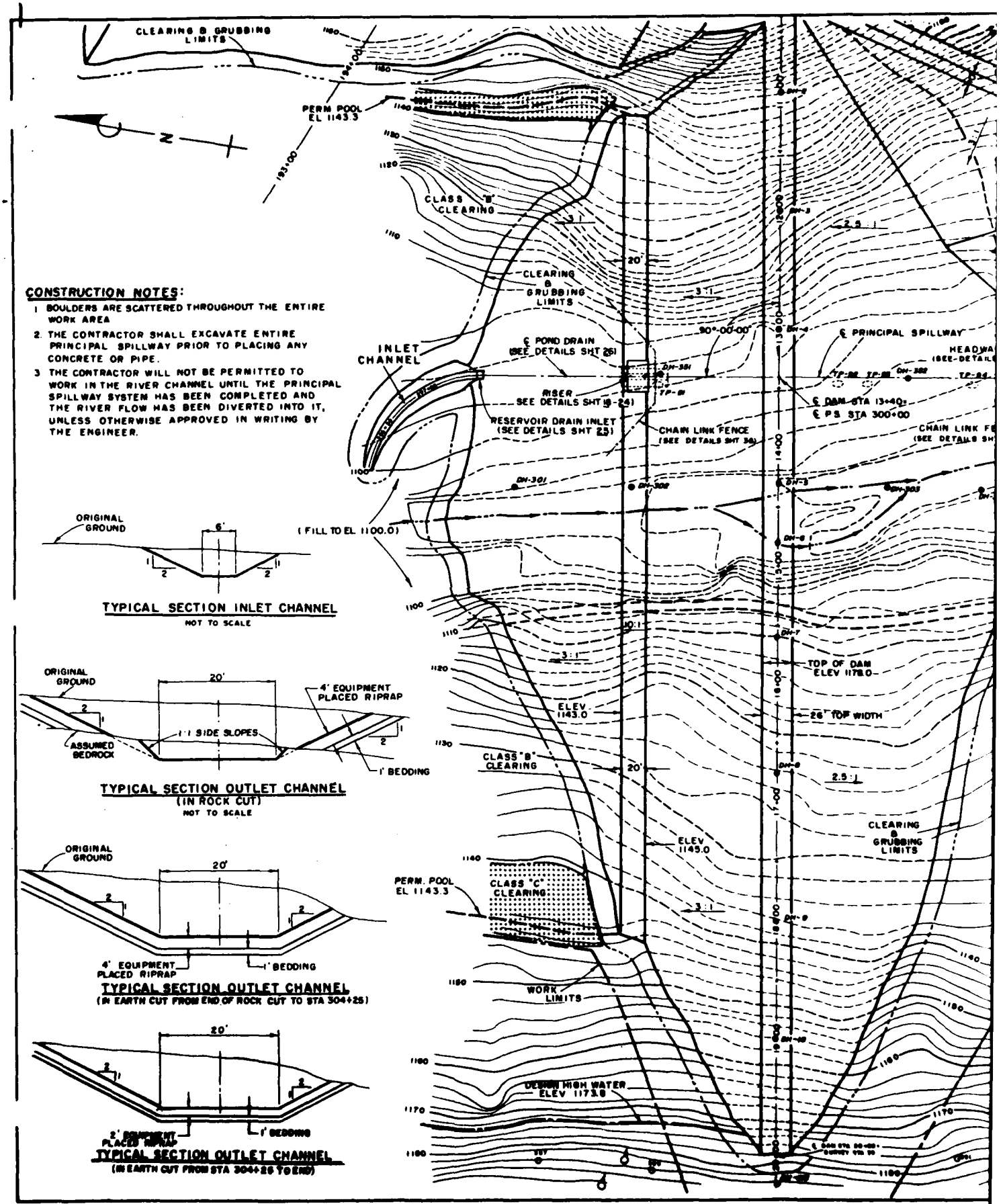
CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

PLAN OF STORAGE AREA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed J. A. TIBBETTS	8-71	Approved by	
Drawn F. V. WILDA	12-21-71	Title	
Traced F. V. WILDA	9-19-72	Sheet No. 2 of 36	Drawing No. MA-357 P
Checked J. J. CLARMAR	9-19-72		

B-4



CONSTRUCTION NOTES:

1. BOULDERS ARE SCATTERED THROUGHOUT THE ENTIRE WORK AREA
2. THE CONTRACTOR SHALL EXCAVATE ENTIRE PRINCIPAL SPILLWAY PRIOR TO PLACING ANY CONCRETE OR PIPE.
3. THE CONTRACTOR WILL NOT BE PERMITTED TO WORK IN THE RIVER CHANNEL UNTIL THE PRINCIPAL SPILLWAY SYSTEM HAS BEEN COMPLETED AND THE RIVER FLOW HAS BEEN DIVERTED INTO IT, UNLESS OTHERWISE APPROVED IN WRITING BY THE ENGINEER.

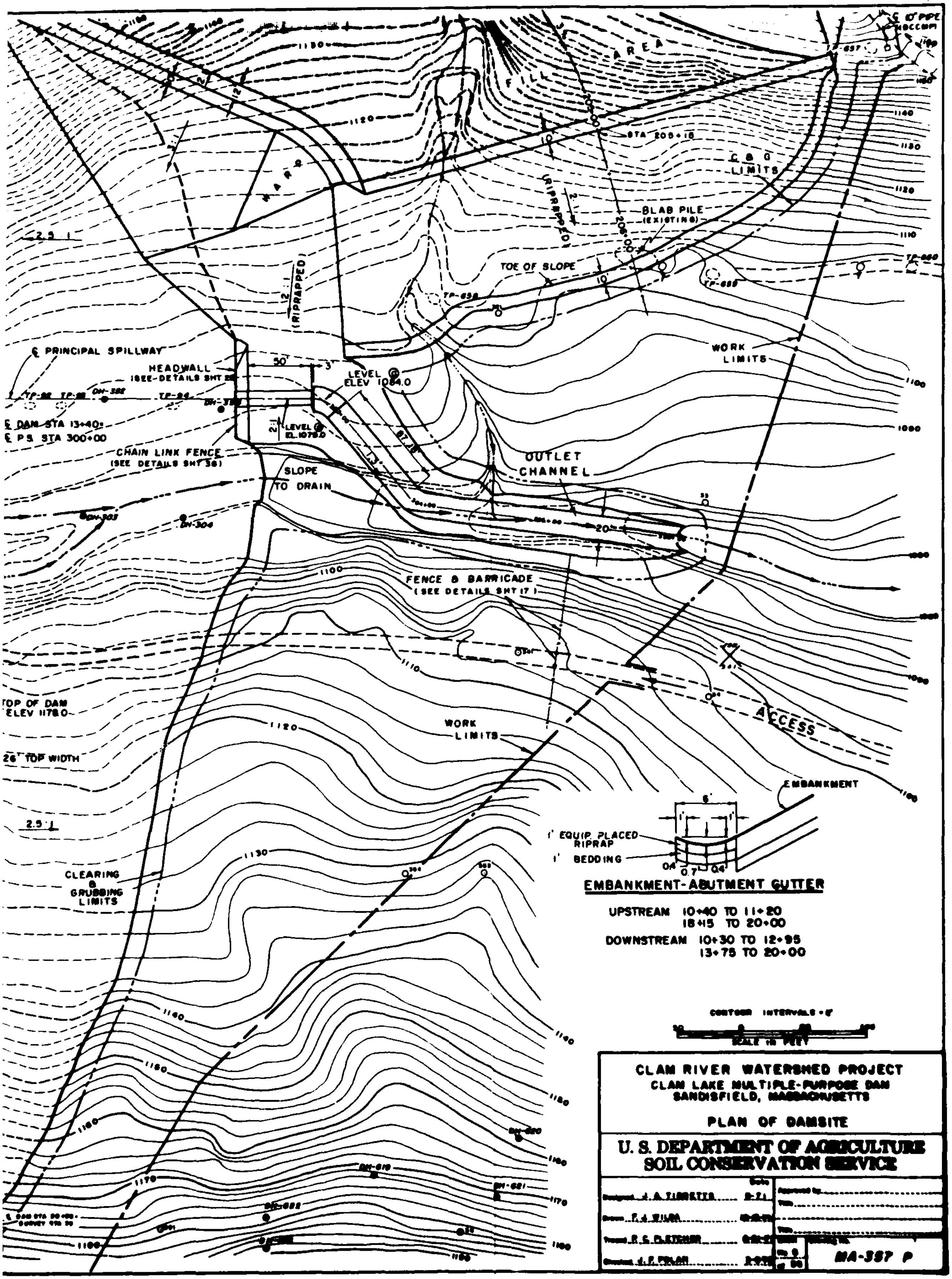
TYPICAL SECTION INLET CHANNEL
NOT TO SCALE

TYPICAL SECTION OUTLET CHANNEL
(IN ROCK CUT)
NOT TO SCALE

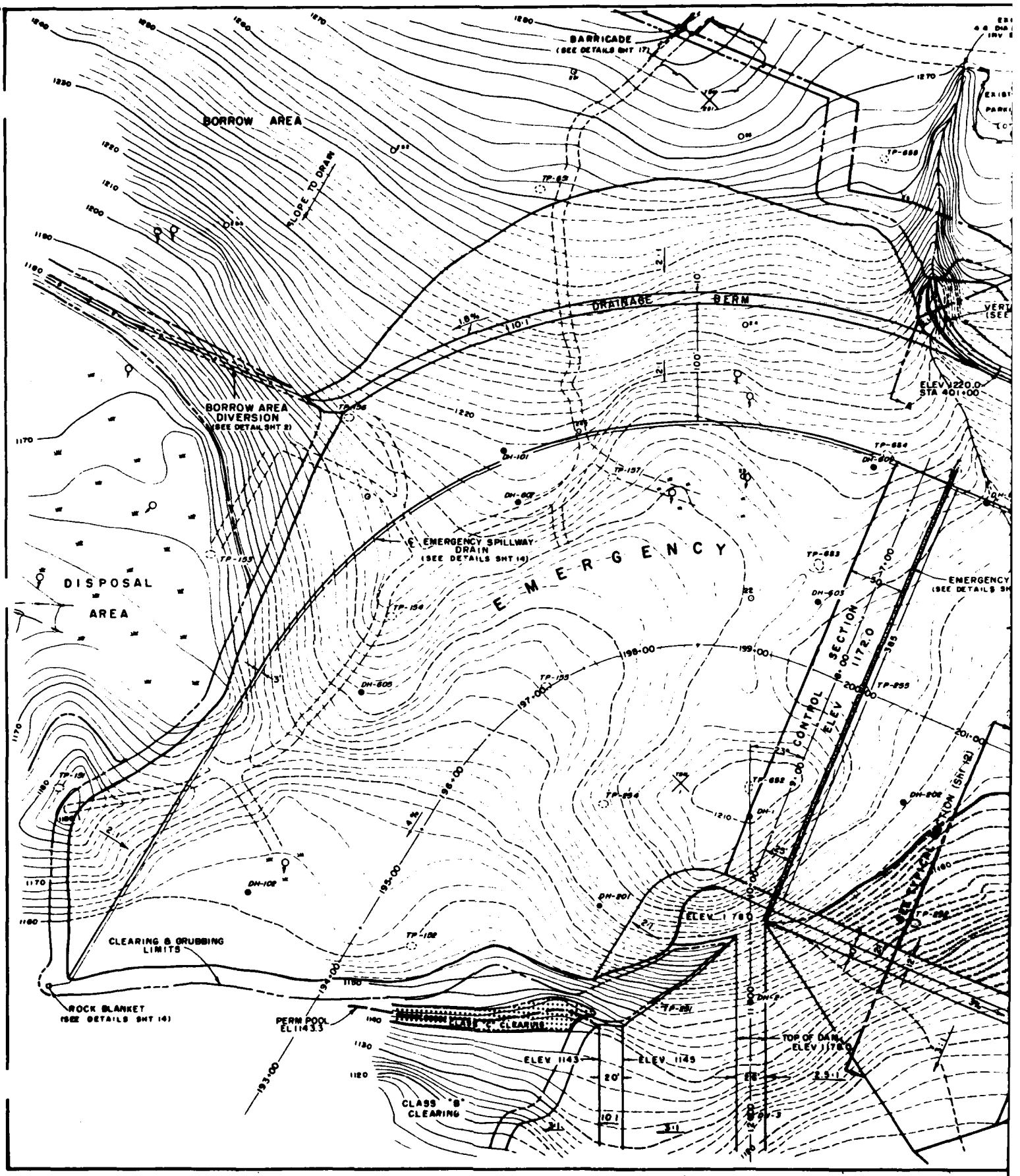
TYPICAL SECTION OUTLET CHANNEL
(IN EARTH CUT FROM END OF ROCK CUT TO STA 304+25)

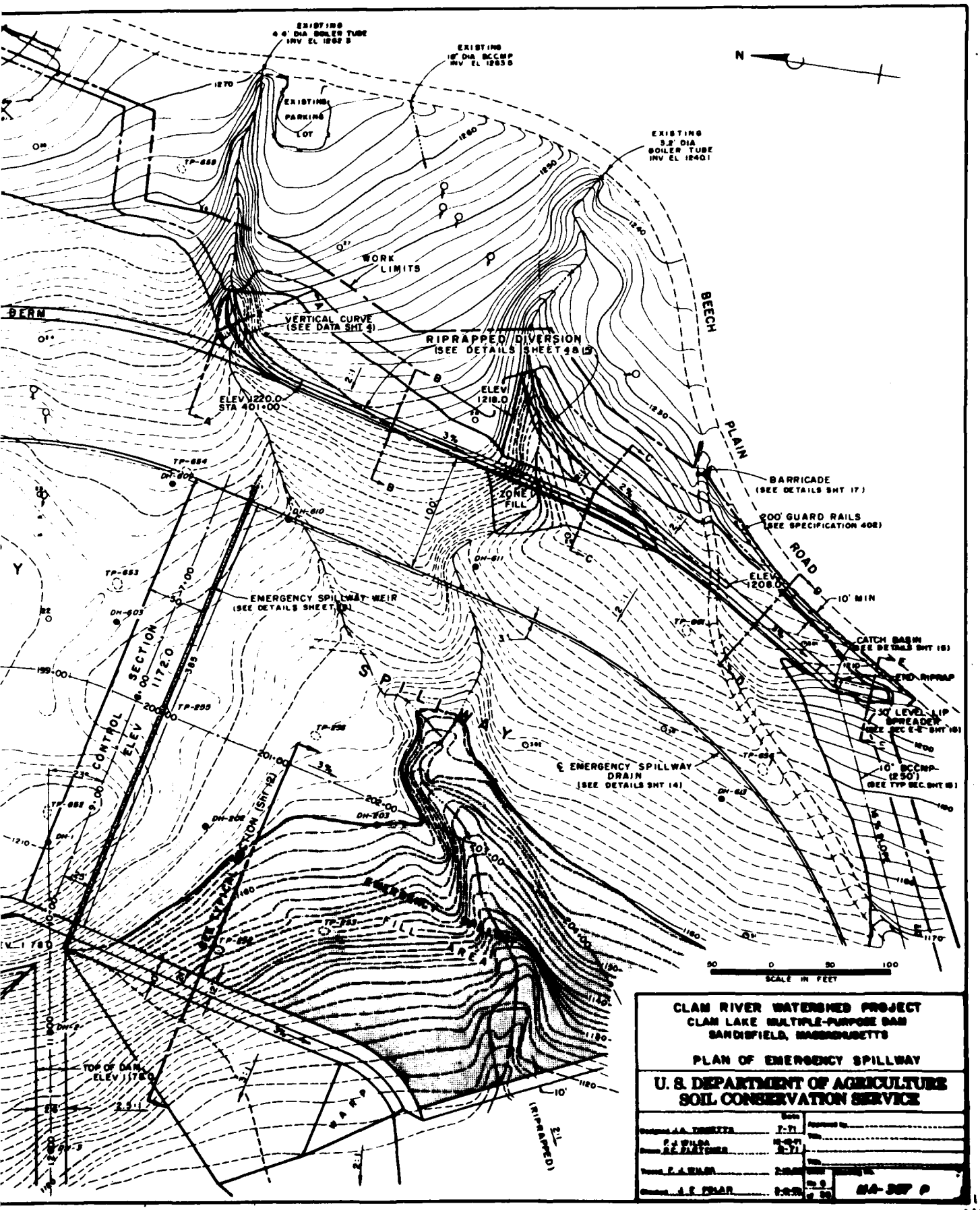
TYPICAL SECTION OUTLET CHANNEL
(IN EARTH CUT FROM STA 304+25 TO END)

2


FILL AREA
STA 205+18
C & G LIMITS
(RIPRAPPED)
SLAB PILE (EXISTING)
TOE OF SLOPE
TP-658
TP-660
2.5:1
12:1 (RIPRAPPED)
℄ PRINCIPAL SPILLWAY
HEADWALL (SEE DETAILS SHT 26)
50'
3'
LEVEL ELEV 1084.0
WORK LIMITS
℄ DAM STA 13+40±
℄ P.S. STA 300+00
LEVEL EL.1079.0
CHAIN LINK FENCE (SEE DETAILS SHT 36)
SLOPE TO DRAIN
OUTLET CHANNEL
DH-304
1100
FENCE & BARRICADE (SEE DETAILS SHT 17)
1110
TOP OF DAM ELEV 1178.0
1120
WORK LIMITS
ACCESS
26' TOP WIDTH
EMBANKMENT
2.5:1
1' EQUIP. PLACED RIPRAP
1' BEDDING
0.4'
0.7'
6'
1130
CLEARING & GRUBBING LIMITS
EMBANKMENT-ABUTMENT GUTTER
UPSTREAM 10+40 TO 11+20
18+15 TO 20+00
DOWNSTREAM 10+30 TO 12+95
13+75 TO 20+00
1140
1150
1160
1170
CONTOUR INTERVALS = 2'
SCALE IN FEET
CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS
PLAN OF DAMSITE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MA-387 P

B-5


BARRICADE
(SEE DETAILS SHT 17)
BORROW AREA
SLOPE TO DRAIN
DRAINAGE BERM
BORROW AREA DIVERSION
(SEE DETAIL SHT 2)
ELEV 1220.0
STA 401+00
DISPOSAL AREA
℄ EMERGENCY SPILLWAY DRAIN
(SEE DETAILS SHT 14)
EMERGENCY
CONTROL SECTION
ELEV 1172.0
CLEARING & GRUBBING LIMITS
ROCK BLANKET
(SEE DETAILS SHT 14)
PERM POOL
EL 1143.3
CLASS "B" CLEARING
ELEV 1143
ELEV 1145
TOP OF DAM
ELEV 1178.0
ELEV 1180

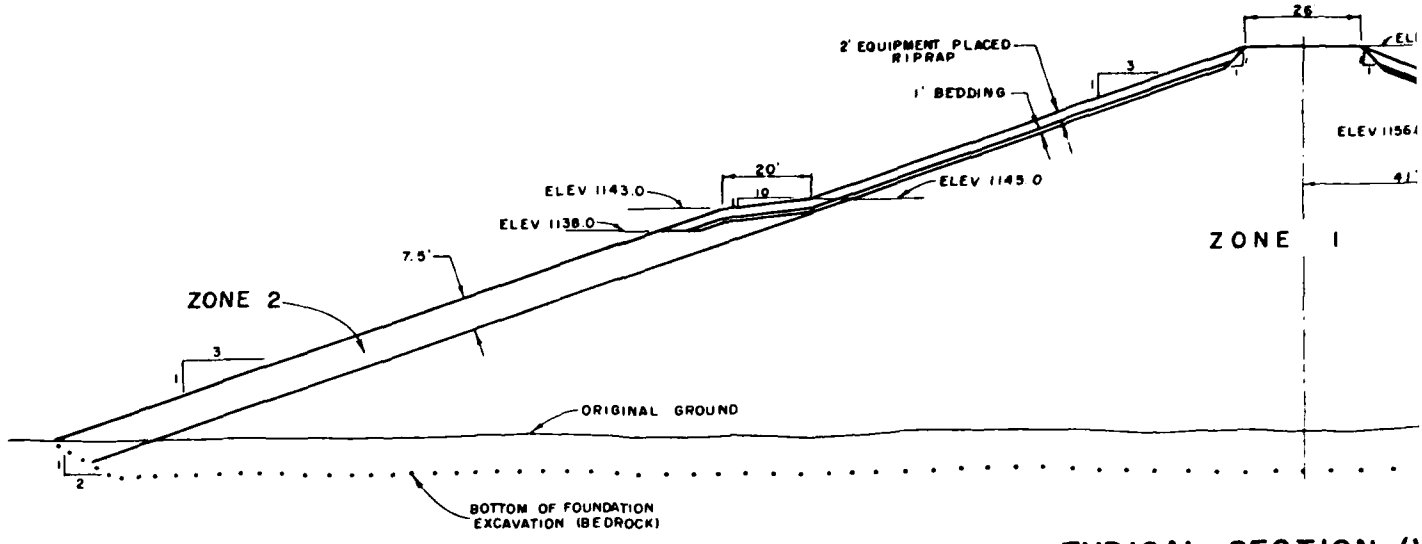


CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

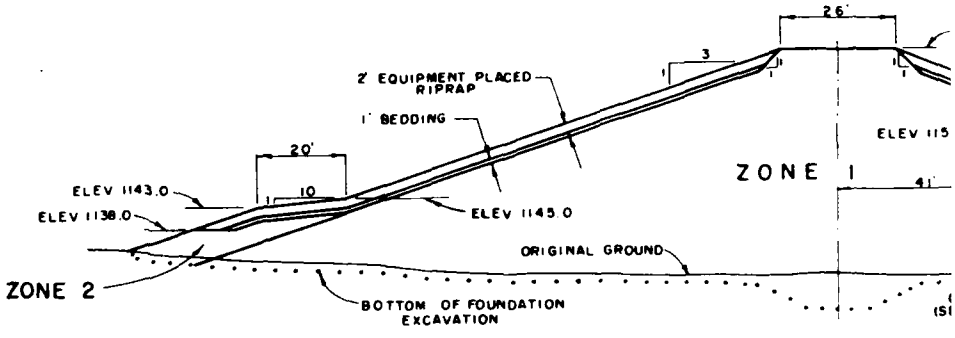
PLAN OF EMERGENCY SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MA-307 P



TYPICAL SECTION (



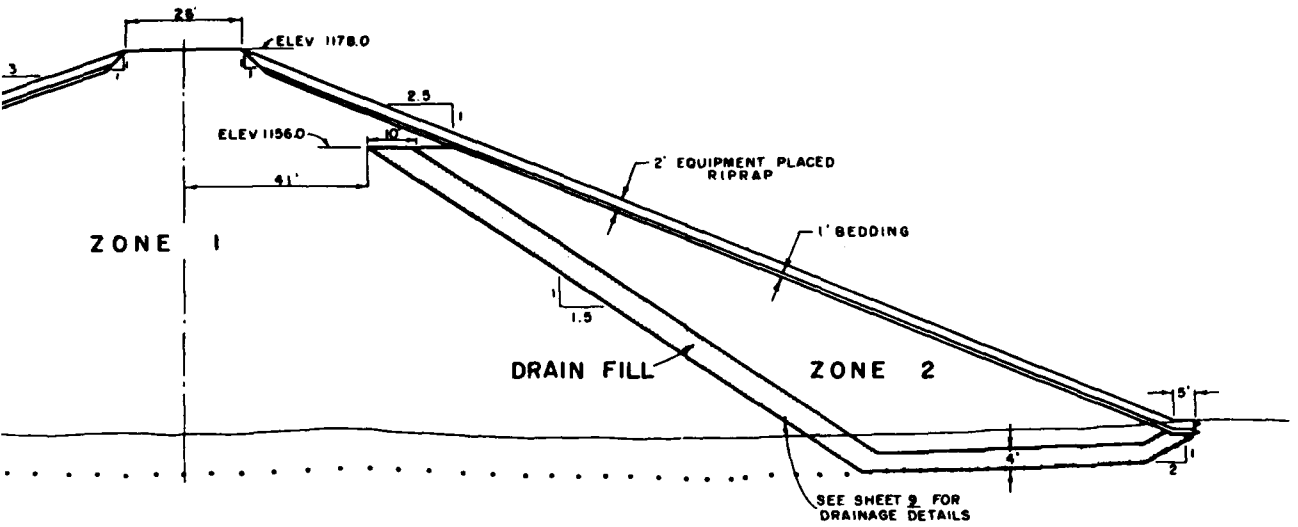
TYPICAL SECTION (AE

EARTH FILL REQUIREMENTS						
ZONE	MATERIAL	MAXIMUM ROCK SIZE	MAXIMUM LIFT △	MINIMUM △ WATERCONTENT	COMPACTION CLASS	COMPACTION DEFINITION
1	SAND, SILTY WITH GRAVEL REPRESENTED BY TP 156 (2.5'-10'), DH 3 (11.5'-23'), TP 656 (11.0'-12'), TP 256 (3'-10'), TP 154 (2.5'-10'), TP 651 (1'-10')	6"	9"	OPTIMUM	A	100% MAX DENSITY BY ASTM D 698 METHOD A
2	SILTY SAND AND GRAVELY SAND REPRESENTED BY TP 254 (3'-10'), TP 256 (3'-10'), TP 652 (10.5'-10'), TP 653 (1'-10'), TP 654 (1'-10') DH 9 (10-12'), DH 10 (0-10')	8"	12"	OPTIMUM	C	4 PASSES PER LAYER OF FILL w/ PNEUMATIC TIRED ROLLER WEIGHING AT LEAST 50 TONS OR AN EQUIVALENT METHOD APPROVED BY THE ENGINEER
E.S FILL	SAND, SILTY WITH GRAVEL SIMILAR TO THAT SHOWN IN ZONE 1.	12"	18"	OPTIMUM	C	

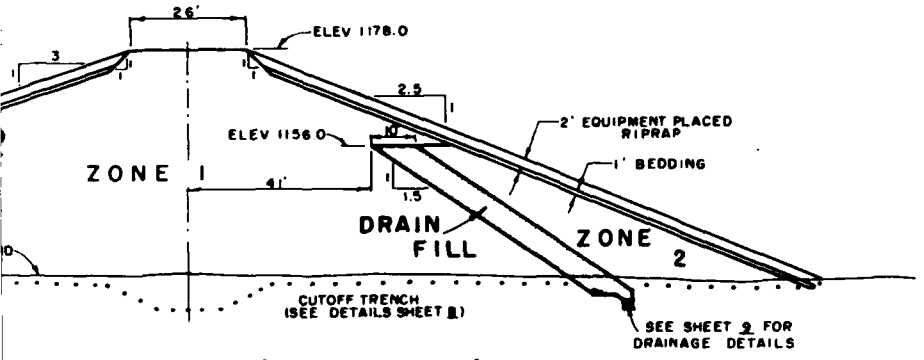
△ MAXIMUM LIFT THICKNESS PRIOR TO COMPACTION
△ BASED ON STANDARD PROCTOR.

CONSTRUCTION NOTES

1. EQUIPMENT PLACED RIPRAP SHALL BE WELL GRADED AND HAV SIZE EQUAL TO THE DEPTH SHOWN 60% TO 75% OF THE R/ BE LARGER THAN 3/4 OF THE DEPTH SHOWN
2. BEDDING SHALL BE WELL GRADED BETWEEN 3/4" AND 3 1/2" W TO 70% PASSING THE 3/8" SIEVE
3. REPRESENTATIVE ROCK SAMPLES FROM THIS WATERSHED HAV ALL SAMPLES TESTED CONFORM TO MATERIAL SPECIFICATIO



ICAL SECTION (VALLEY)



ICAL SECTION (ABUTMENTS)

NOTE:
DELETE FOUNDATION DRAIN ABOVE ELEV 1143.0

SHALL BE WELL GRADED AND HAVE A MAXIMUM
SHOWN 60% TO 75% OF THE RIPRAP SHALL
HE DEPTH SHOWN.
GRADED BETWEEN 3/4" AND 3 1/2" WITH 30%
SIEVE
PLES FROM THIS WATERSHED HAVE BEEN TESTED
NFORM TO MATERIAL SPECIFICATION 523.

20 0 20 40
SCALE IN FEET

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

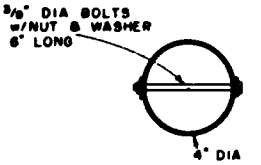
FILL PLACEMENT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed A.A. TIBBETTS 8/71
Drawn P.J. WILDA 11/8/71
Traced
Checked A.F. PALMA 11-8-71
Approved by
Title
Title
Sheet No. 7 of 20
Drawing No. MA-387 P

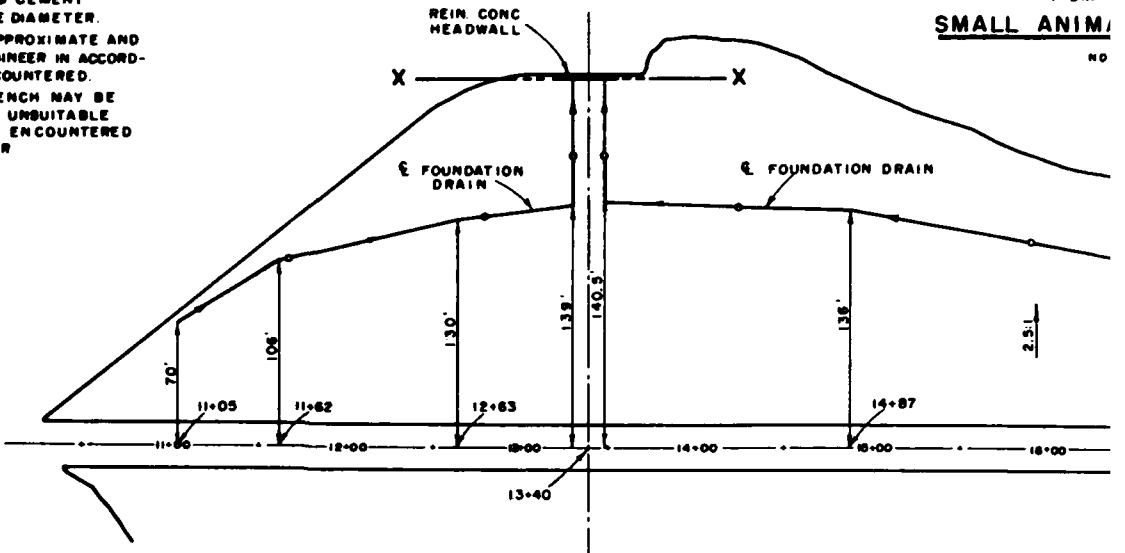
CONSTRUCTION NOTES:

1. ASBESTOS CEMENT PIPE SHALL CONFORM TO SPECIFICATION 545 AND SHALL BE 4" DIA, CLASS 4000.
2. WHEN PERFORATED ASBESTOS CEMENT PIPE IS REQUIRED, THE ASBESTOS CEMENT PIPE SHALL BE PERFORATED WITH 1/4" HOLES. THE LOCATION AND NUMBER OF THESE HOLES SHALL BE SIMILAR TO THOSE IN ASBESTOS CEMENT UNDERDRAIN PIPE OF THE SAME DIAMETER.
3. THE EXCAVATION LIMITS ARE APPROXIMATE AND WILL BE ADJUSTED BY THE ENGINEER IN ACCORDANCE WITH THE CONDITIONS ENCOUNTERED.
4. THE DEPTH OF THE DRAIN TRENCH MAY BE INCREASED IN SOME AREAS IF UNSUITABLE OR PERVIOUS MATERIALS ARE ENCOUNTERED AS DIRECTED BY THE ENGINEER

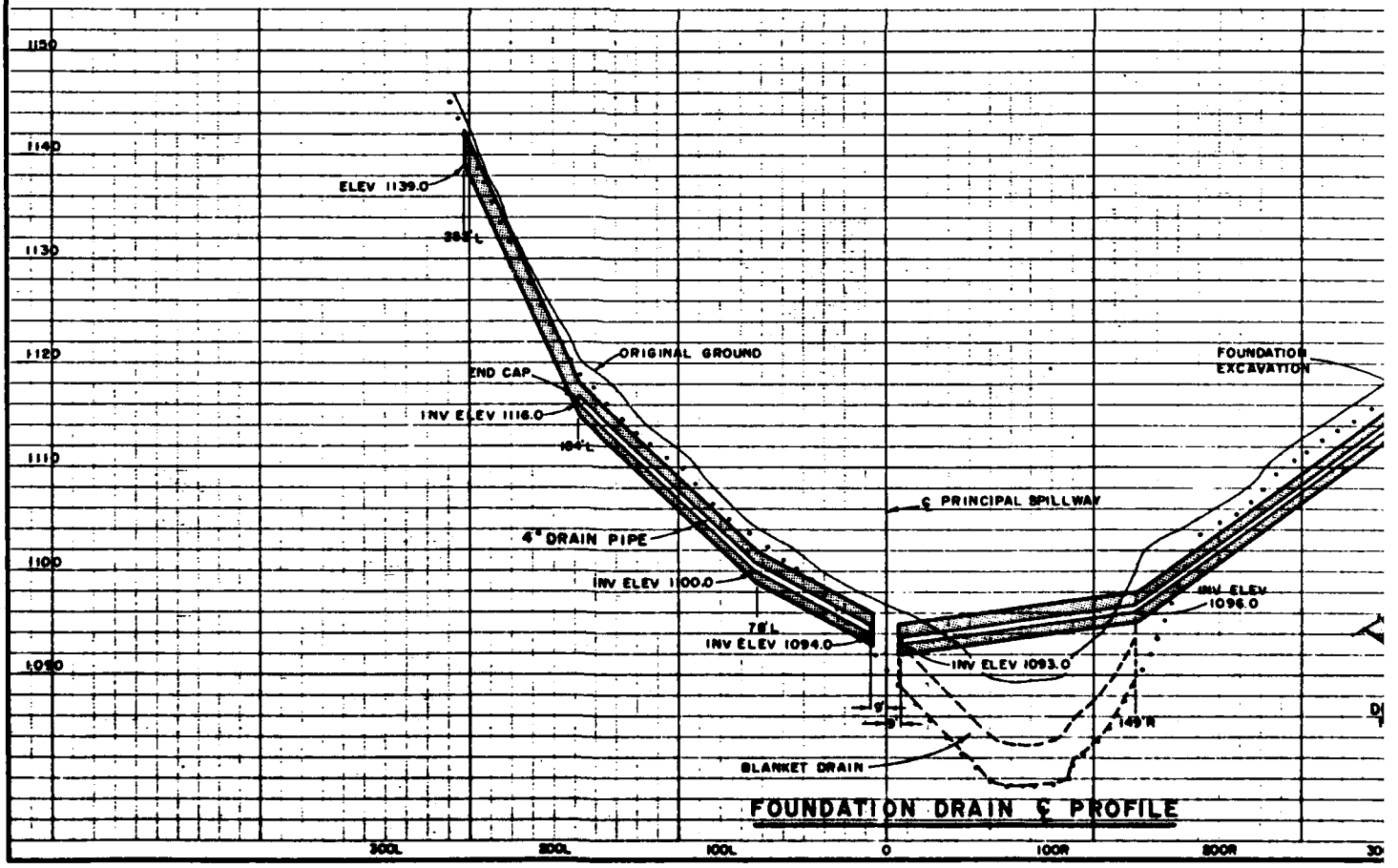


SMALL ANIM

NO

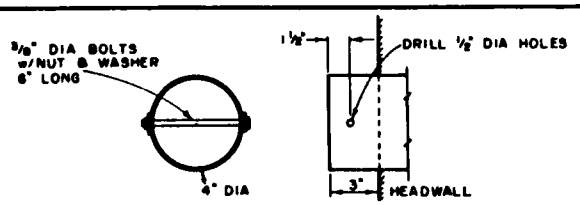


PLAN VIEW



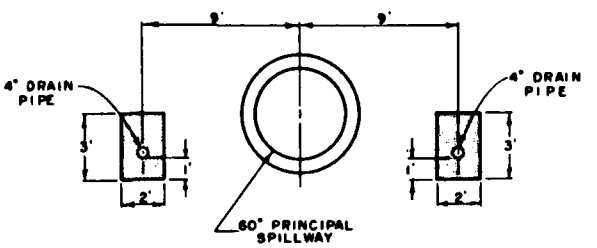
FOUNDATION DRAIN ℄ PROFILE

2



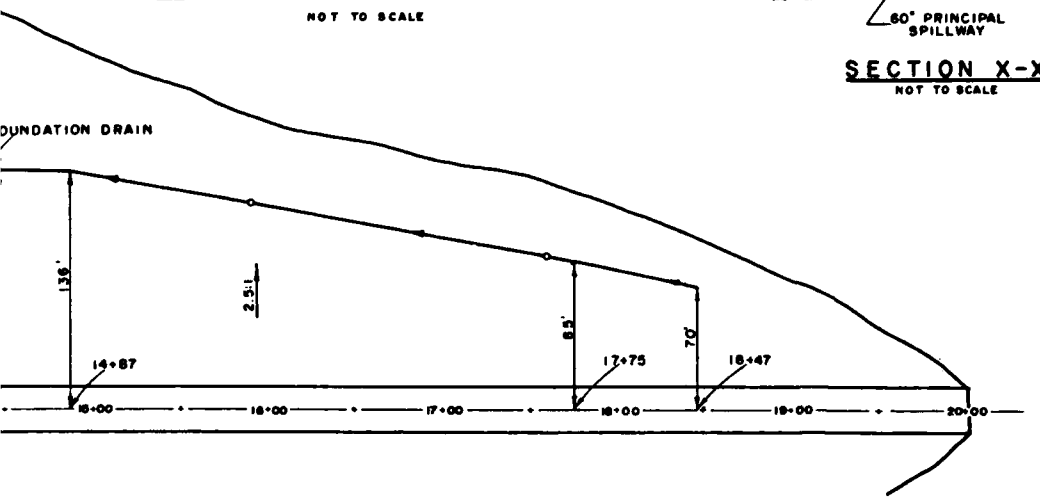
SMALL ANIMAL GUARD DETAILS

NOT TO SCALE



SECTION X-X

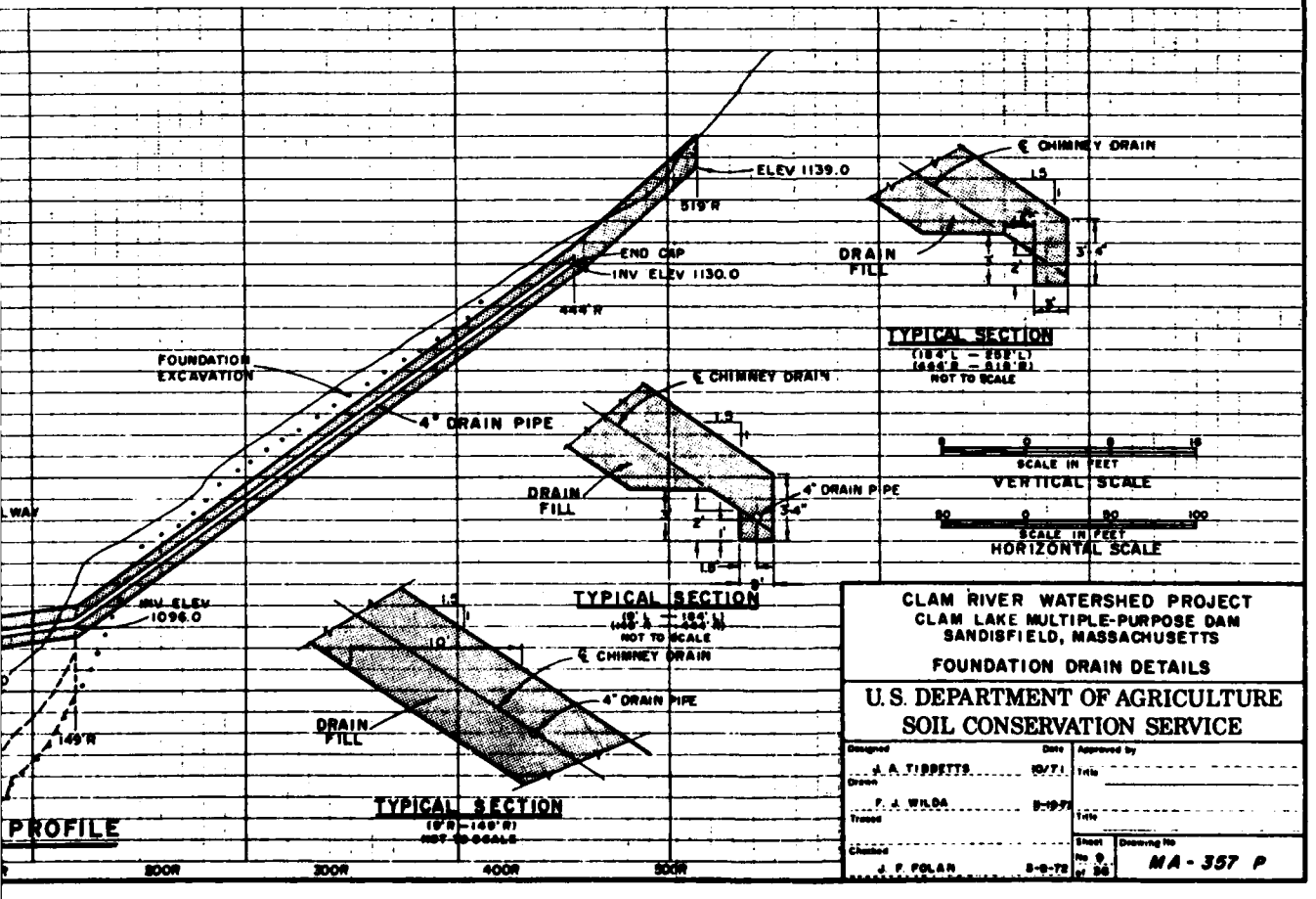
NOT TO SCALE



DRAIN FILL REQUIREMENTS	
SIEVE NO.	% PASSING
3/4"	100%
1/2"	90 - 100
3/8"	40 - 75
#4	5 - 25
#8	0 - 10
#16	0 - 5

IEW

0 100
ET



CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

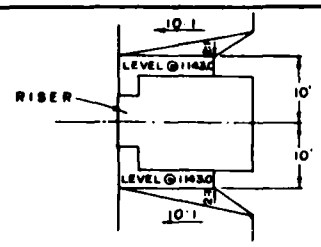
FOUNDATION DRAIN DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by	
J. A. TIPPETTS	10/71	Title	
Drawn			
P. J. WILDA	8-19-72	Title	
Traced			
Checked		Sheet No. 9 of 36	Drawing No. MA-357 P
J. P. FOLAN	8-8-72		

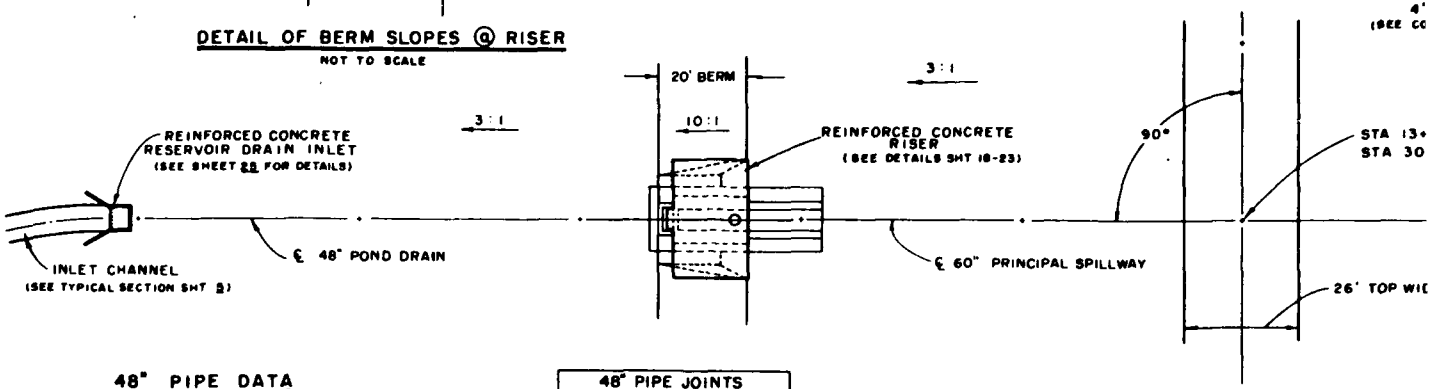
Form SCS-317 (November 1966)

B-8



DETAIL OF BERM SLOPES @ RISER

NOT TO SCALE



PLAN

20 0 20 40

SCALE IN FEET

48" PIPE DATA

48" REINFORCED CONCRETE WATER PIPE

(2) 4.0' SECTIONS	8.0'
(2) 8.0' SECTIONS	16.0'
(6) 16.0' SECTIONS	96.0'
TOTAL =	120.0'

PRESSURE HEAD = 73.7

LOAD = 50,330 LBS PER LINEAR FOOT BASED ON OUTSIDE DIAMETER OF 60"

MINIMUM 3-EDGE BEARING STRENGTH FOR 0.001" CRACK (PRESTRESSED) EQUALS 18,920 LBS PER LINEAR FOOT (AWWA C-301).

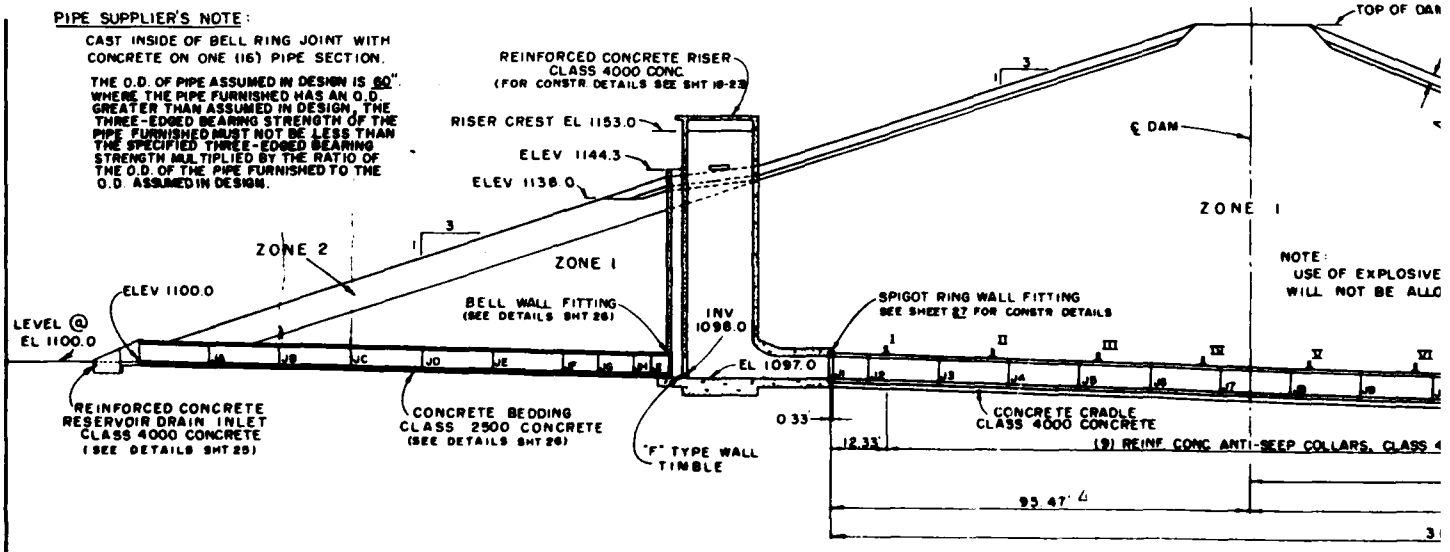
MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED) EQUALS 25,163 LBS PER LINEAR FOOT (AWWA C-300).

PIPE SUPPLIER'S NOTE:

CAST INSIDE OF BELL RING JOINT WITH CONCRETE ON ONE (16) PIPE SECTION.

THE O.D. OF PIPE ASSUMED IN DESIGN IS 60". WHERE THE PIPE FURNISHED HAS AN O.D. GREATER THAN ASSUMED IN DESIGN, THE THREE-EDGED BEARING STRENGTH OF THE PIPE FURNISHED MUST NOT BE LESS THAN THE SPECIFIED THREE-EDGED BEARING STRENGTH MULTIPLIED BY THE RATIO OF THE O.D. OF THE PIPE FURNISHED TO THE O.D. ASSUMED IN DESIGN.

48" PIPE JOINTS		
JOINT	Δ DISTANCE FROM INLET	INVERT ELEVATION
INLET	0	1100.0
JA	16	1099.73
JB	32	1099.47
JC	48	1099.20
JD	64	1098.93
JE	80	1098.67
JF	96	1098.40
JG	104	1098.27
JH	112	1098.13
JJ	116	1098.07
OUTLET	120	1098.00

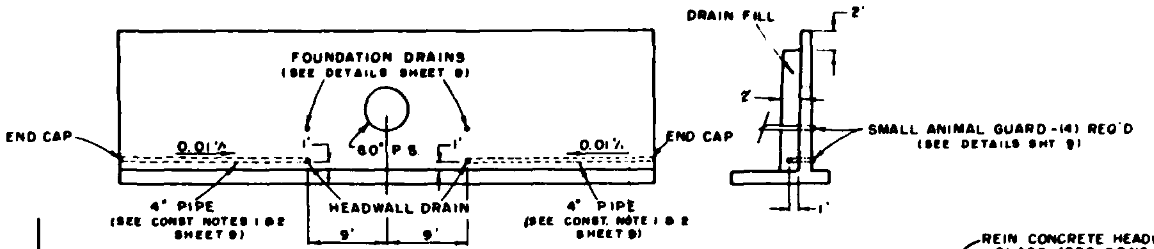


PROFILE

20 0 20 40

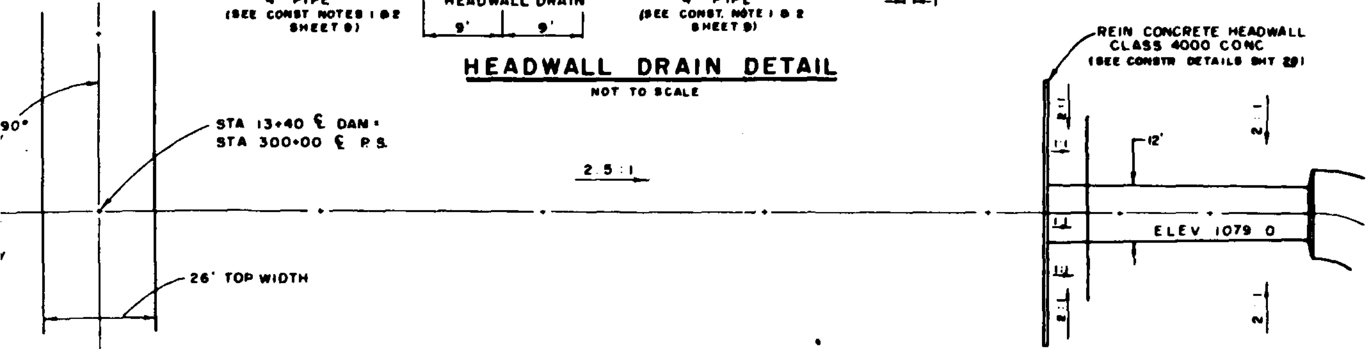
SCALE IN FEET

Δ DIMENSIONS OF CONCRETE PIPE LENGTHS ARE BASED ON NOMINAL LENGTHS AND DO NOT INCLUDE CREEP



HEADWALL DRAIN DETAIL

NOT TO SCALE



PLAN

0 20 40
SCALE IN FEET

ANTI-SEEP COLLARS		
COLLAR	DISTANCE FROM TRANSITION WALL	INVERT OF PIPE
I	12.33	1096.65
II	36.33	1095.96
III	60.33	1095.27
IV	84.33	1094.58
V	108.33	1093.88
VI	132.33	1093.19
VII	156.33	1092.50
VIII	180.33	1091.81
IX	204.33	1091.12

60" PIPE JOINTS		
JOINT	DISTANCE FROM TRANSITION WALL	INVERT ELEVATION
J1	0.33	1097.00
J2	8.33	1096.77
J3	24.33	1096.31
J4	40.33	1095.85
J5	56.33	1095.38
J6	72.33	1094.92
J7	88.33	1094.46
J8	104.33	1094.00
J9	120.33	1093.54
J10	136.33	1093.08
J11	152.33	1092.62
J12	168.33	1092.15
J13	184.33	1091.69
J14	200.33	1091.23
J15	216.33	1090.77
J16	232.33	1090.31
J17	248.33	1089.85
J18	264.33	1089.38
J19	280.33	1088.92
J20	296.33	1088.46
OUTLET	312.33	1088.00

60" PIPE DATA

60" REINFORCED CONCRETE WATER PIPE

(1) 8.0' SECTION	8.0'
(19) 16.0' SECTIONS	304.0'
(1) WALL FITTING	
TOTAL:	312.0'

PRESSURE HEAD = 83.2

LOAD = 164,742 LBS PER LINEAR FOOT BASED ON OUTSIDE DIAMETER OF 80"

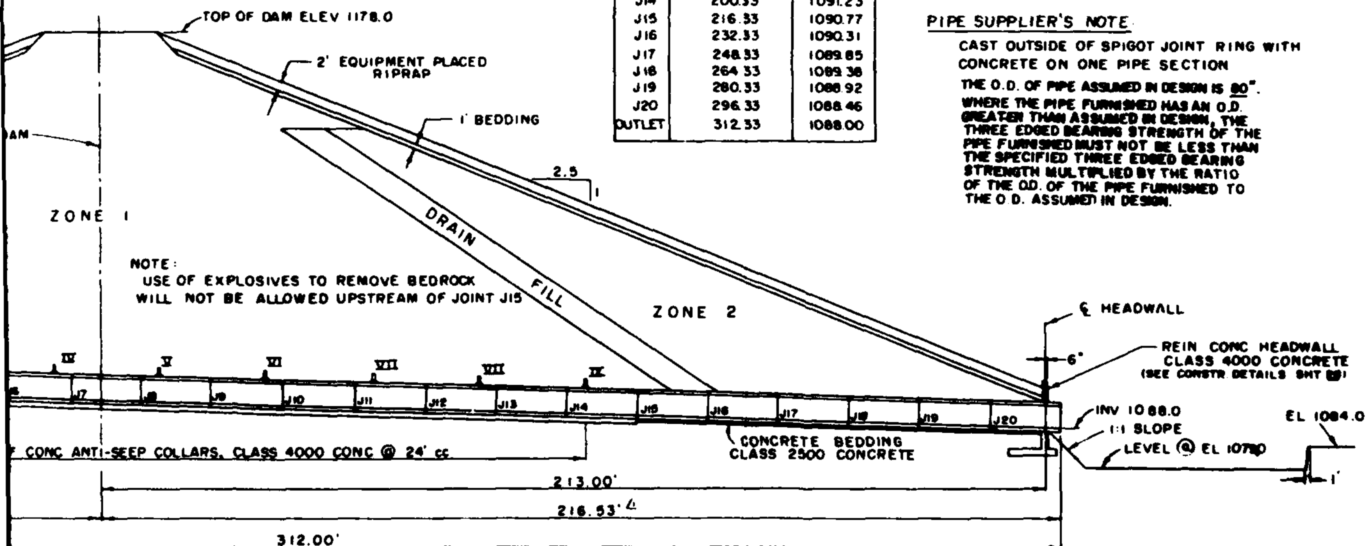
MINIMUM 3-EDGE BEARING STRENGTH FOR 0.001" CRACK (PRESTRESSED) EQUALS 37,872 LBS PER LINEAR FOOT (AWWA C-301).

MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED) EQUALS 50,369 LBS PER LINEAR FOOT (AWWA C-300)

PIPE SUPPLIER'S NOTE

CAST OUTSIDE OF SPIGOT JOINT RING WITH CONCRETE ON ONE PIPE SECTION

THE O.D. OF PIPE ASSUMED IN DESIGN IS 80". WHERE THE PIPE FURNISHED HAS AN O.D. GREATER THAN ASSUMED IN DESIGN, THE THREE EDGED BEARING STRENGTH OF THE PIPE FURNISHED MUST NOT BE LESS THAN THE SPECIFIED THREE EDGED BEARING STRENGTH MULTIPLIED BY THE RATIO OF THE O.D. OF THE PIPE FURNISHED TO THE O.D. ASSUMED IN DESIGN.



PROFILE

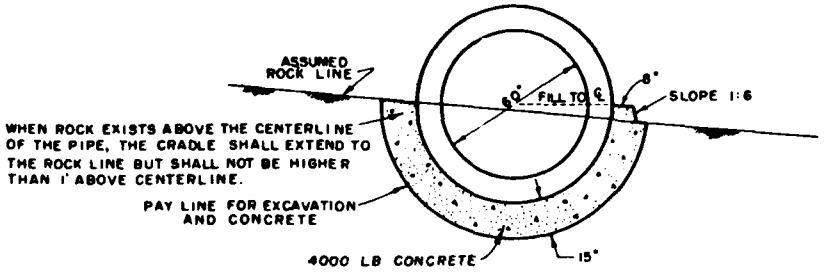
0 20 40
SCALE IN FEET

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

PRINCIPAL SPILLWAY

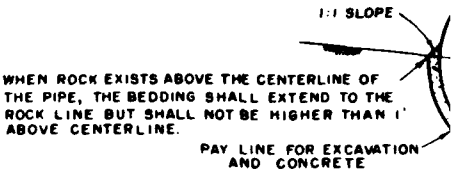
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J. A. TIBBETTS	10/71	Approved by
Drawn F. J. WILDA		Title
Traced		Title
Checked C. H. BROWE		Sheet No. 10 of 30 — MA-357 P

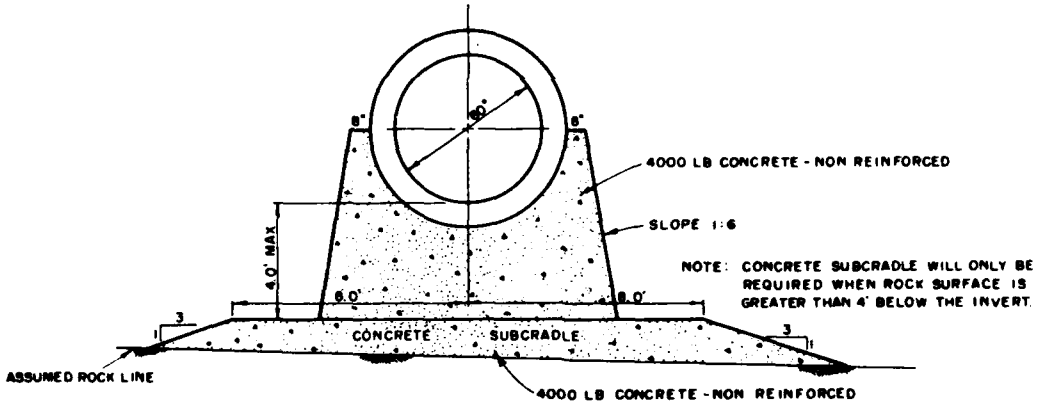


PRINCIPAL SPILLWAY WITH CRADLE IN AREAS REQUIRING ROCK EXCAVATION

NOT TO SCALE

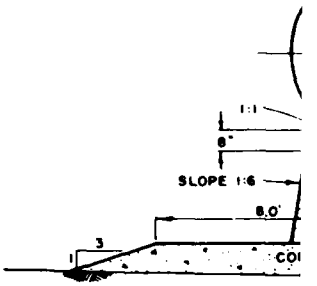


PRINCIPAL
IN AREAS RE

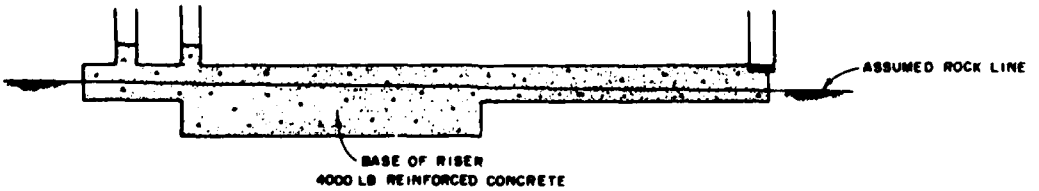


PRINCIPAL SPILLWAY WITH CRADLE IN AREAS NOT REQUIRING ROCK EXCAVATION

NOT TO SCALE

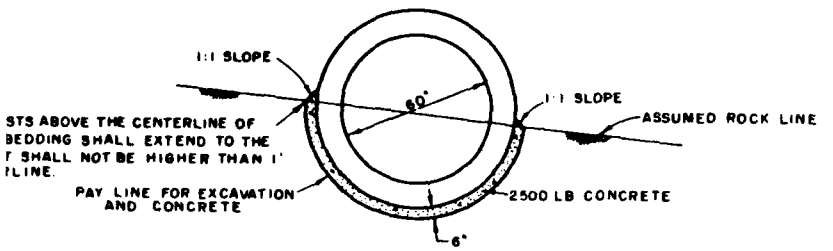


PRINCIPAL
IN AREAS NOT

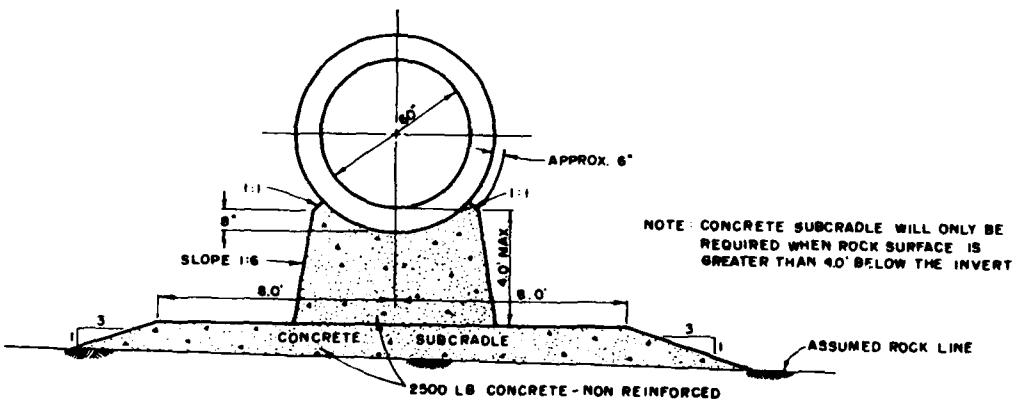


DETAIL OF RISER BASE

NOT TO SCALE



PRINCIPAL SPILLWAY WITH BEDDING
IN AREAS REQUIRING ROCK EXCAVATION
NOT TO SCALE



NOTE: CONCRETE SUBCRADLE WILL ONLY BE REQUIRED WHEN ROCK SURFACE IS GREATER THAN 4.0' BELOW THE INVERT

PRINCIPAL SPILLWAY WITH BEDDING
IN AREAS NOT REQUIRING ROCK EXCAVATION
NOT TO SCALE

LINE

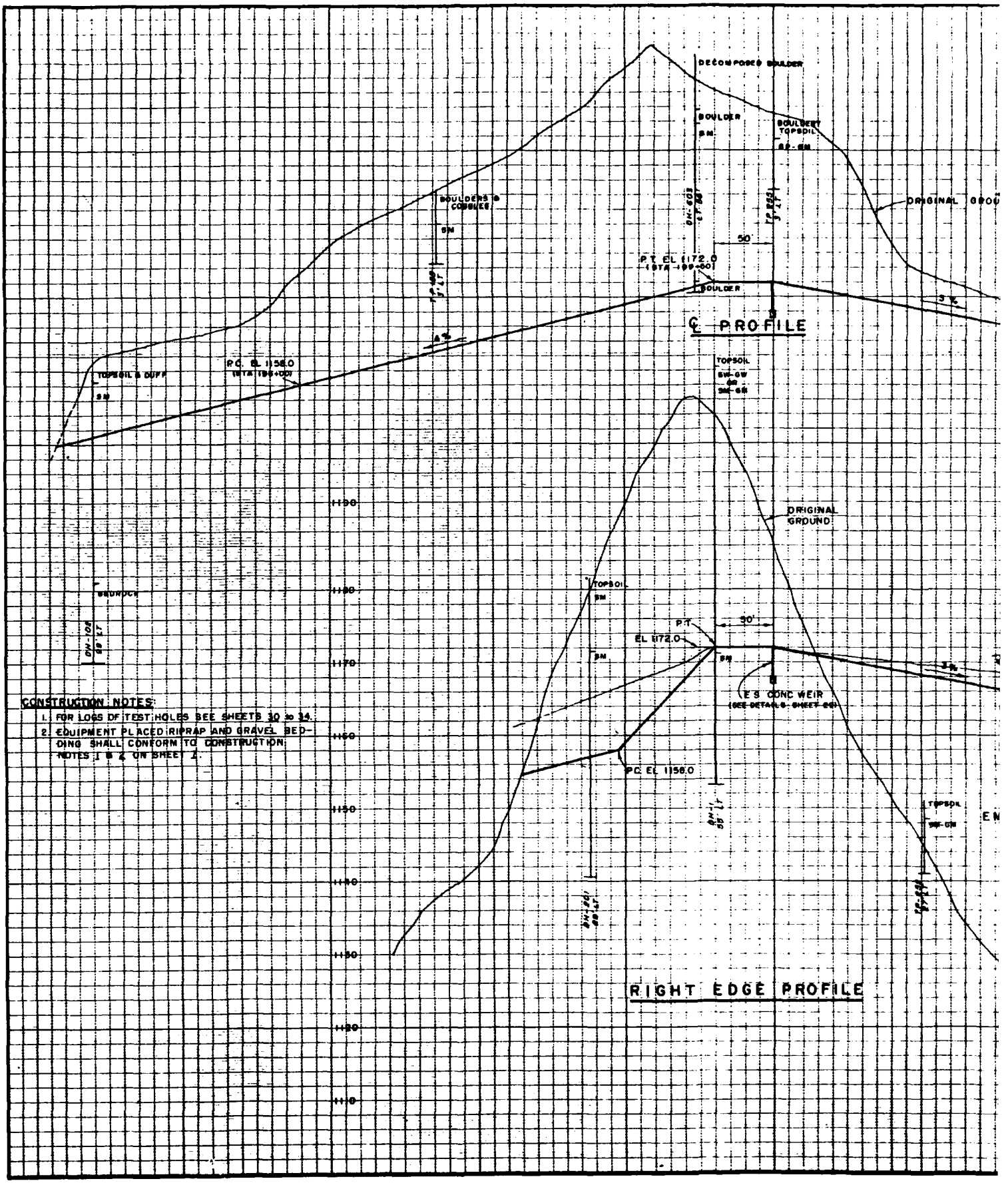
CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

PRINCIPAL SPILLWAY DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

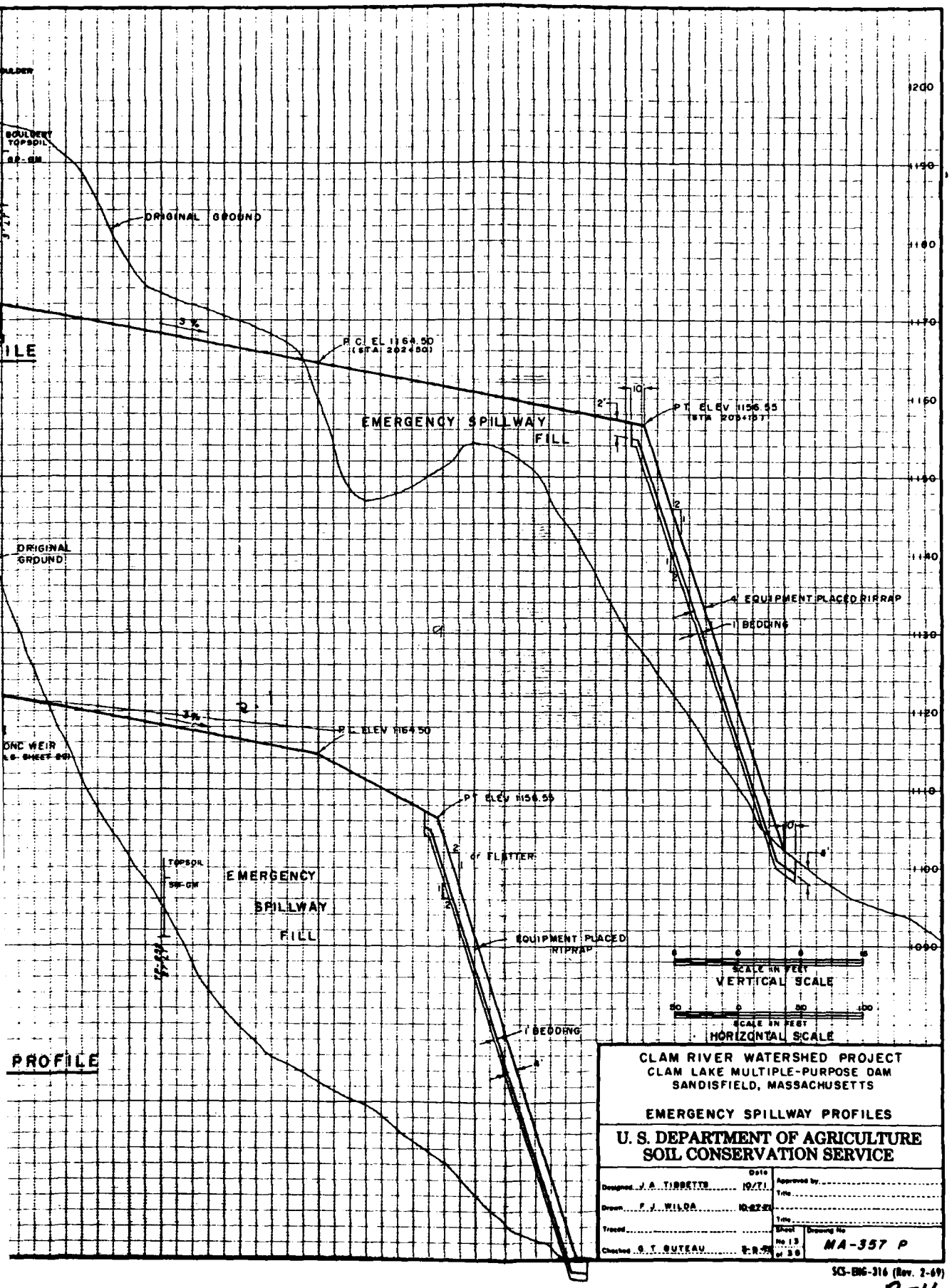
Designed A.A. TIBERTTS 10/71
Drawn F. A. SILPA 10-71
Traced
Checked A.E. POLAK 1-10-72

Approved by
Title
Date
Sheet No. 11 of 20 Sheets
MA-387 P



CONSTRUCTION NOTES:

1. FOR LOGS OF TEST HOLES SEE SHEETS 30 to 34.
2. EQUIPMENT PLACED RIPRAP AND GRAVEL BEDDING SHALL CONFORM TO CONSTRUCTION NOTES 1 & 2 ON SHEET 4.



CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

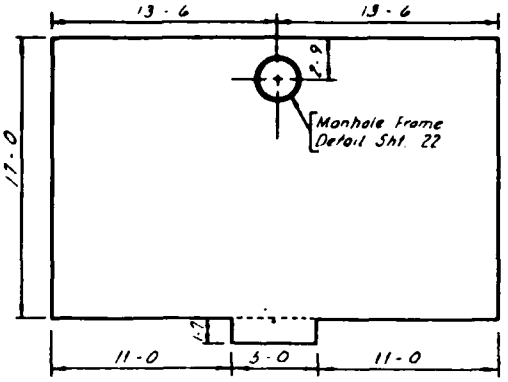
EMERGENCY SPILLWAY PROFILES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

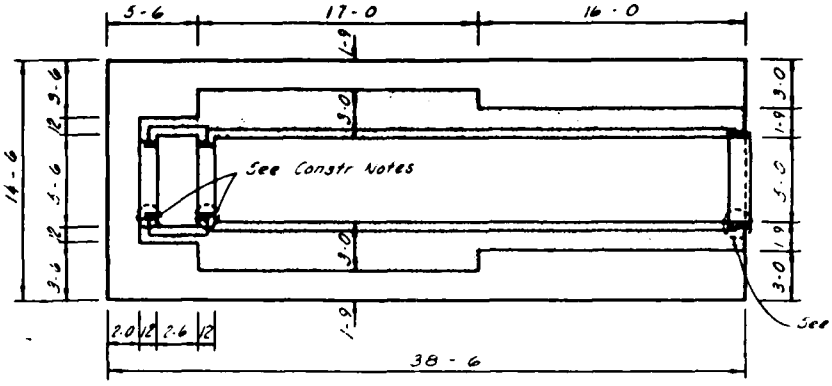
	Date		
Designed J.A. TIBBETTS	10/71	Approved by	
Drawn F.J. WILDA	10-27-71	Title	
Traced		Title	
Checked G.T. BUTEAU	11-8-71	Sheet No. 13 of 30	Drawing No. MA-357 P

SCS-ENG-316 (Rev. 2-69)

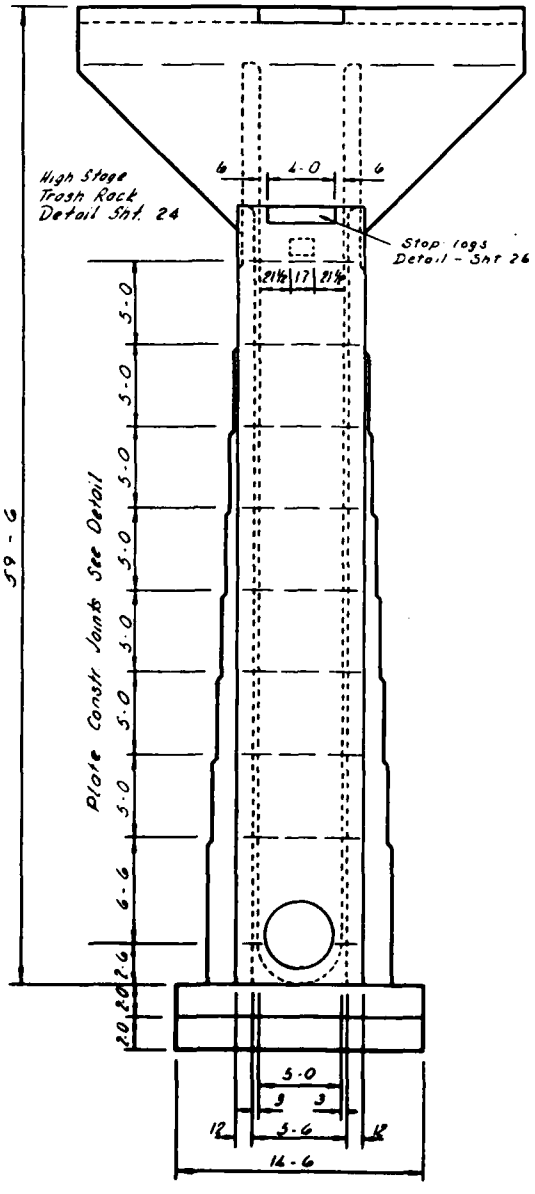
B-11



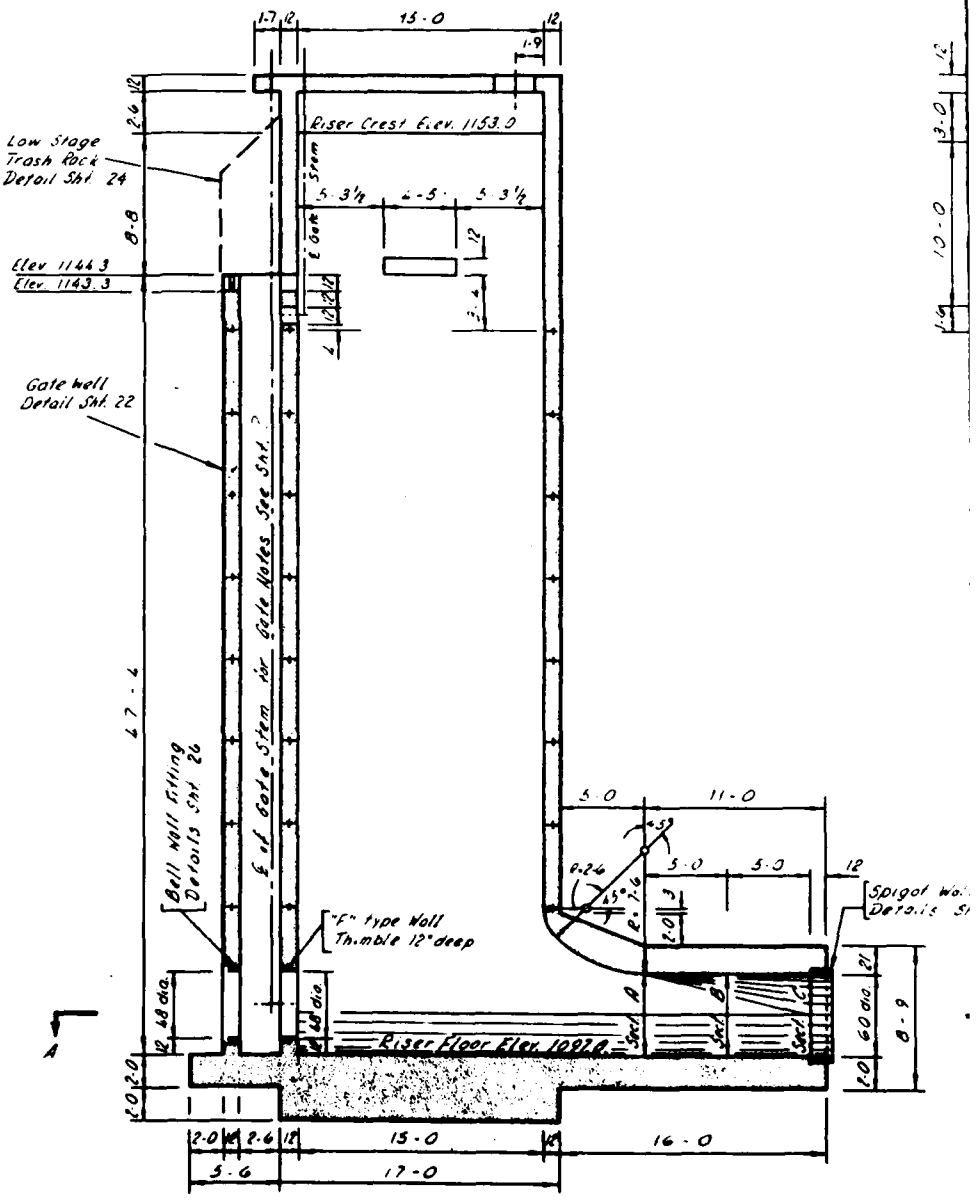
PLAN - TOP SLAB



SECTION AA

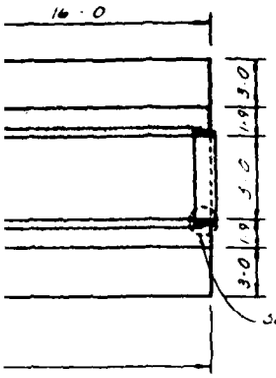


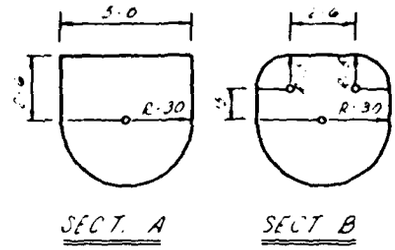
UPSTREAM ELEVATION



SECTION @ CENTERLINE

2





CONSTR JOINT

1/8" x 6" Carbon steel plate to conform to Spec. 581 continuous thru constr. joint.
Splices shall be either
1 Butt welded
2 Lapped 3" & bolted.
3 Lapped 3" & fillet welded.

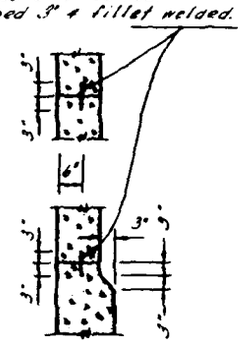
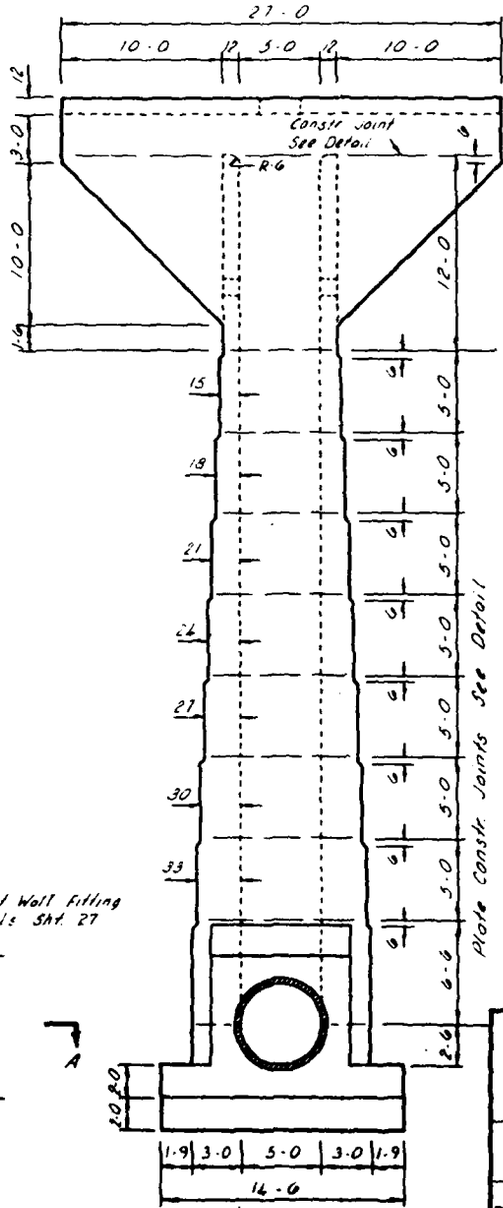
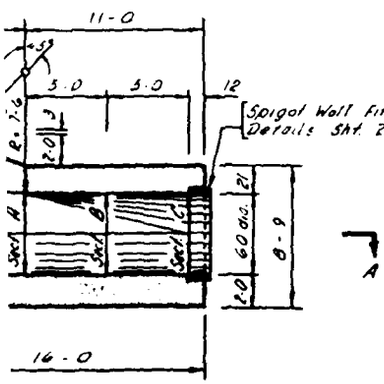


PLATE
CONSTR JOINT



CONSTR. NOTES:

1/4" x 6" steel plate of the constr. joint shall be butt welded to the steel cylinder of the wall fittings & wall thimble.



DOWNSTREAM ELEVATION

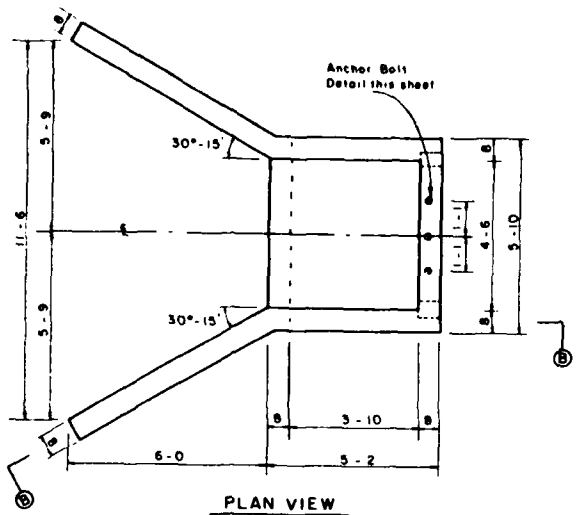
CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

RISER DETAILS

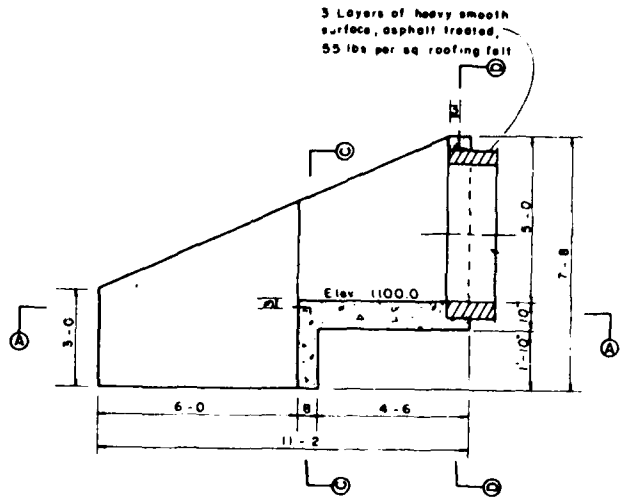
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed C. Hodge Date 11/71
Drawn H.T. Brewington Jr. Dec 71
Traced
Checked C. Hodge
Approved by
Title
Sheet No. 18 of 38
Drawing No. MA-387 P

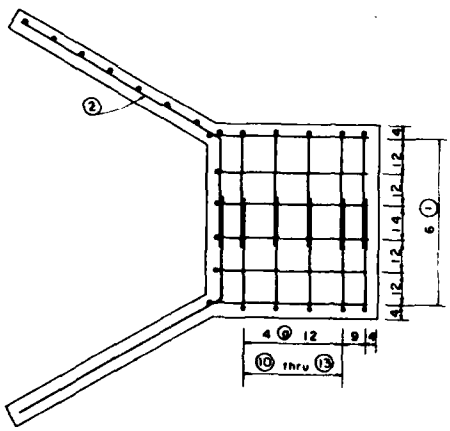
B-12



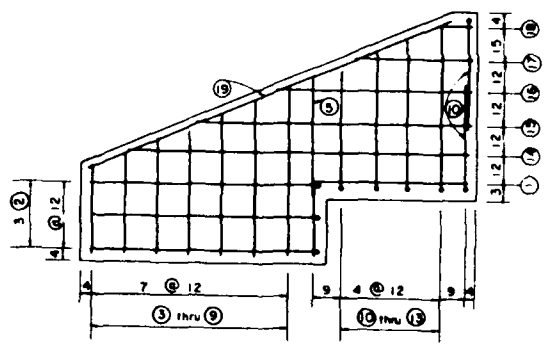
PLAN VIEW



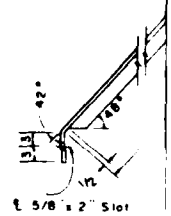
SECTION ALONG CENTERLINE

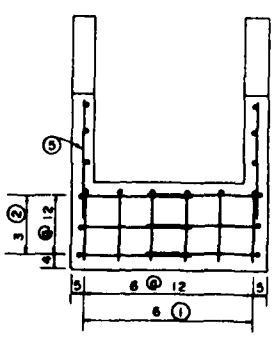


SECTION A-A



SECTION B-B





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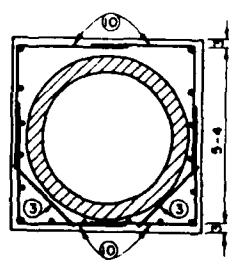

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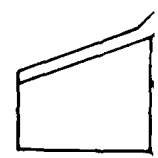
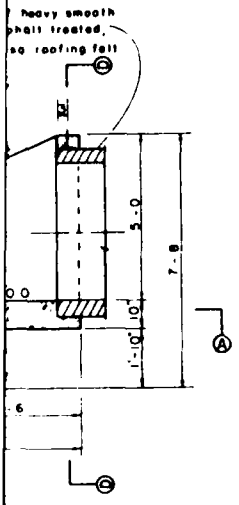
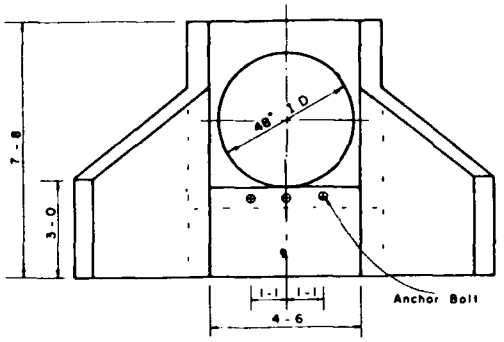


heavy smooth
phalt treated,
sq roofing felt





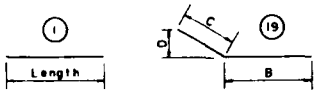
CONSTRUCTION NOTES

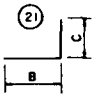
1 Material in reservoir drain trash rack shall conform to Spec 581 for structural steel

2 Trash rack to be galvanized in accordance with Spec 582

NOTE

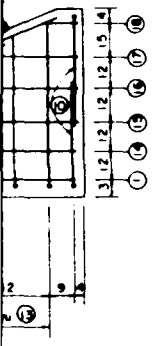
For construction details see sheet 10



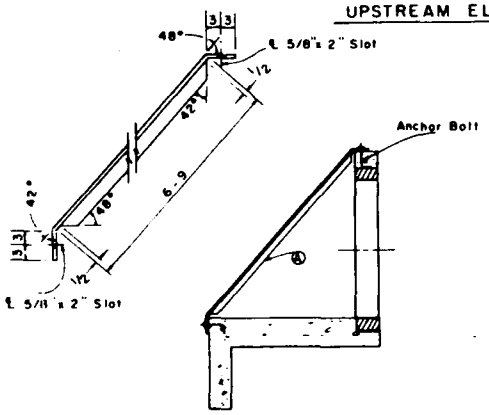


BAR TYPES

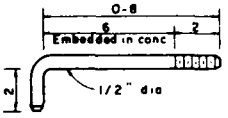
RLINE



UPSTREAM ELEVATION



TRASH RACK



ANCHOR BOLT

ASTM A-276, 1/2" dia, Class 302 or 303, With Type-2 nuts and washers

BILL OF MATERIAL
RESERVOIR DRAIN TRASH RACK

ITEM	SIZE	LENGTH	QUANTITY
Angle A	1 1/2" x 1 1/2" x 1/4"	6'-9"	3
Anchor Bolt	1/2" dia	2" x 8"	6

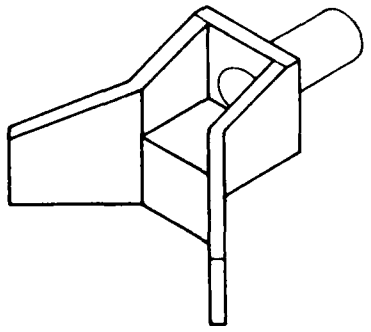
RESERVOIR DRAIN STEEL SCHEDULE

MARK	QUAN	SIZE	LENGTH	TYPE	B	C	D	TOTAL LENGTH
1	6	4	6 - 9	21	4-7	2-2		40 50
2	6	4	10 - 3	19	7-0	3-3	2-10	61 50
3	4	4	2 - 9	1				11 00
4	2	4	3 - 0	1				6 00
5	4	4	3 - 6	1				14 00
6	2	4	3 - 9	1				7 50
7	2	4	4 - 3	1				8 50
8	2	4	4 - 9	1				9 50
10	6	4	6 - 9	21	3-6	3-3		40 50
11	2	4	7 - 6	21	4-3	3-3		15 00
12	2	4	7 - 9	21	4-6	3-3		15 50
13	2	4	8 - 3	21	5-0	3-3		16 50
14	2	4	10 - 3	19	5-3	5-0	2-6	20 50
15	2	4	8 - 3	19	3-3	5-0	2-6	16 50
16	2	4	5 - 9	19	0-9	5-0	2-6	11 90
17	2	4	3 - 3	1				6 80
18	2	4	1 - 0	1				2 00
19	2	4	12 - 3	19	7-3	5-0	2-6	24 90

QUANTITIES (this sheet only)

STEEL
No 4 Bar 327.50 Ft = 218.77 lbs

CONCRETE (Class 4000)
Conduit I.D 48" 3.8 Cu Yds



ISOMETRIC

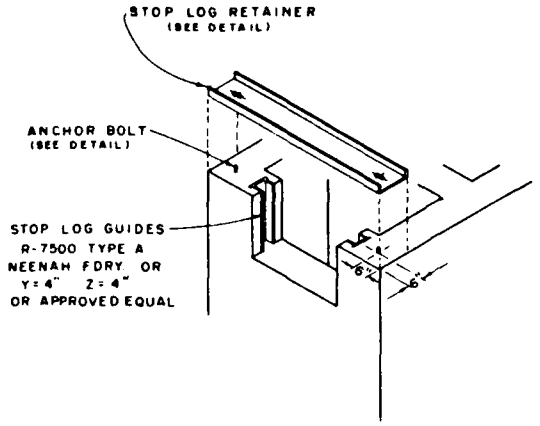
CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

RESERVOIR DRAIN INLET DETAILS

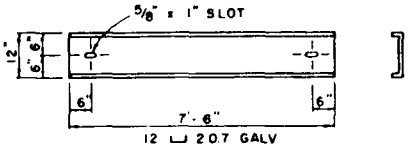
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date
Designed	J A TIBBETTS	1/72
Accepted	F J WILDA	1-28-72
Traced	C H DODGE	1-28-72

Approved By
Title
Sheet No. 35 36
Drawing No. MA-357 P

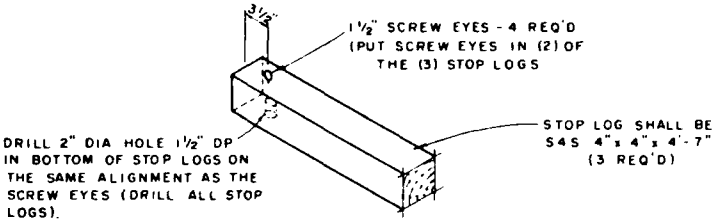


ISOMETRIC VIEW



STOP LOG RETAINER

NOT TO SCALE



STOP LOG DETAIL

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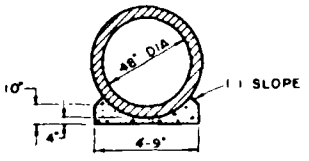
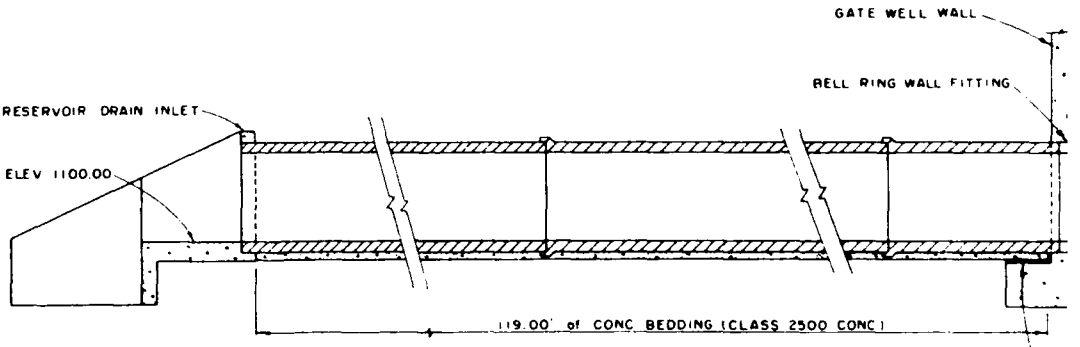


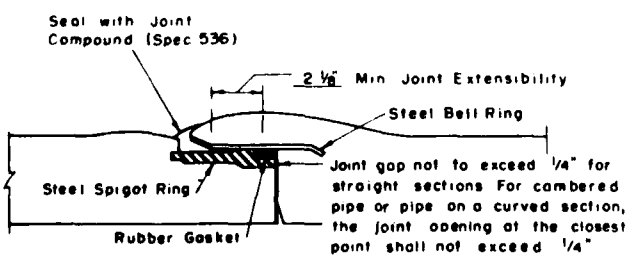


CONCRETE BEDDING

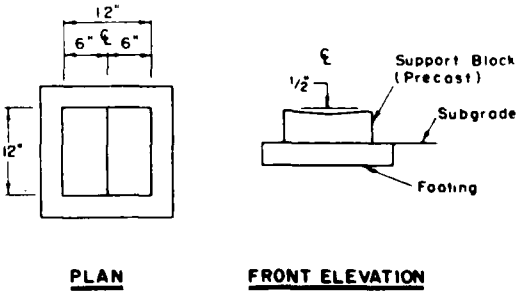
(48" POND DRAIN)

0 4 8

SCALE IN FEET



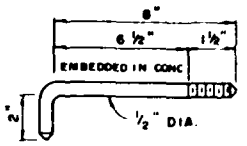
REINFORCED CONCRETE WATER PIPE JOINT



PLAN FRONT ELEVATION

SUGGESTED SUPPORT BLOCK

NOTE:
The Contractor shall determine the number and size of the blocks



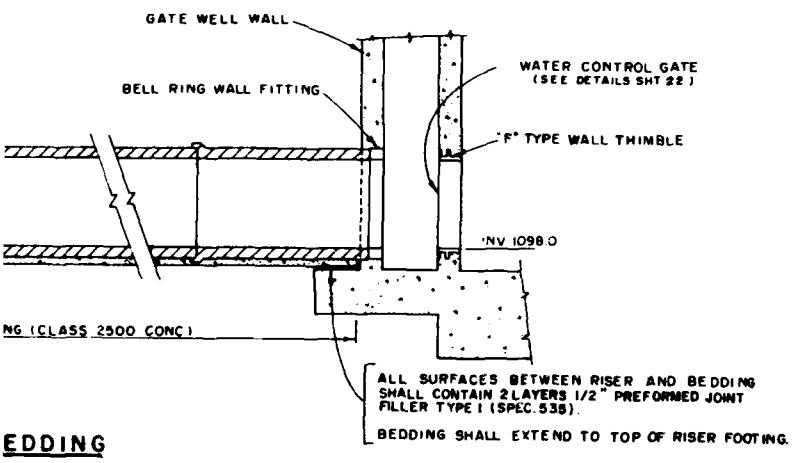
ANCHOR BOLT

Stainless Steel (Class 303, 303 Se or 304, Condition A)

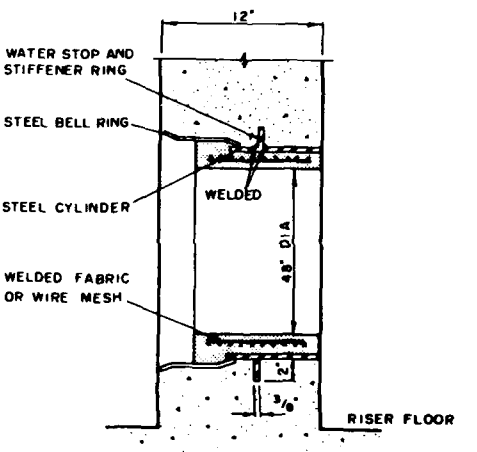
Supply with washers and Type 2 nuts

EYES - 4 REQ'D
EYES IN (2) OF
STOP LOGS

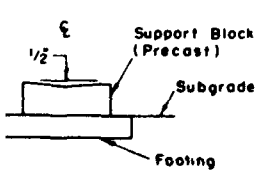
STOP LOG SHALL BE
S4S 4"x 4"x 4'-7"
(3 REQ'D)



EDDING
IN)



BELL RING FITTING



ONT ELEVATION

RT BLOCK

determine the
locks

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

STOP LOG & RESERVOIR DRAIN INLET DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed A.A. TIBBETTS	Date 10/71	Approved by
Drawn P.J. WILDA	12-2-71	Title
Traced		Title
Checked C.H. BOGGS	12-2-71	Scale: No. 20 / No. 50 — Drawing No. MA-387 P

B-14

LOG OF TEST BORES

DH-1, ELEV. 1212.0 6/8/65 D.E.M.

0.0	1.5	TOPSOIL	
1.5	42.0	SAND, with gravel, about 10% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 15% gravel, 8% cobbles, 2% boulders, angular to sub-rounded, maximum size 14", tan-brown, damp, high permeability, dense, kame terrace.	SW-GW or SM-GM
42.0	59.0	SAND, silty with gravel, about 20% fines, 20% fine sand, 25% medium sand, 13% coarse sand, 15% gravel, 4% cobbles, 1% boulders, angular to sub-rounded, maximum size 6", olive-brown, damp, low permeability, to impermeable, dense to very dense, glacial till.	SM
59.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	3	84
2.	1.5 - 3.0	115/6	50
3.	10.0 -11.5	51	33

NOTE: Water level at 4.5 feet on 6/15/65. Hole dry at 28 feet on 6/16/65. Casing 28 feet. Hole at 29 feet on 6/15/65. Hole dry at 40 feet on 6/21/65. Pipe to 40 feet. Could not get tape below 33 feet on 7/14/65.

DH-2, ELEV. 1154.0 6/22/65 K.G.L.

0.0	2.0	TOPSOIL	
2.0	16.5	SAND, silty with gravel, about 18% fines, 32% fine sand, 25% medium sand, 13% coarse sand, 10% gravel, angular, hard, maximum size 3", brown, damp, to moist at 4.0, low permeability, dense to very dense, glacial till.	SM
16.5	52.0	SAND, silty with gravel, about 30% fines, 35% fine sand, 15% medium sand, 5% coarse sand, 10% gravel, 5% cobbles, angular, hard, maximum size 8", olive-brown, damp, impermeable, very dense, glacial till.	SM
52.0	59.0	BEDROCK, hard, unweathered Pre-Cambrian Gneiss, fractures mostly horizontal, spaced 18 to 30 inches apart, foliation dipping about 45 degrees.	
59.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	37	67
2.	1.5 - 3.0	84	56
3.	3.0 - 4.5	63	78
4.	4.5 - 6.0	22	56
5.	12.0 -13.0	160/8	67
6.	22.0 -23.6	172	88
7.	27.0 -28.5	180	77
8.	32.0 -33.0	323/9	100
9.	42.0 -42.5	200/7	94
10.	47.5 -48.5	903/10	100

Rock Core

No.	Depths	% Recovery
1.	52.0 -54.0	100
2.	54.0 -59.0	100

NOTE: Water level at 3 feet on 6/24/65, water level at 13 feet on 7/16/65.

DH-3, ELEV. 1124.8 6/18-21/65 K.G.L.

0.0	1.5	TOPSOIL	
1.5	13.0	SAND, silty with gravel, about 18% fines, 25% fine sand, 10% medium sand, 15% coarse sand, 32% gravel, angular, hard, with some decomposed Schist fragments, damp, low permeability, dense to very dense, colluvium.	SM
13.0	23.0	SAND, silty with gravel, about 20% fines, 15% fine sand, 25% medium sand, 10% coarse sand, 15% gravel, 5% cobbles, 10% boulders, angular, hard, maximum size 12", gray, damp, impermeable, very dense, glacial till.	SM
23.0	39.0	BEDROCK, gray, hard, quartz, biotite, feldspar gneiss, foliation dipping about 45 degrees, moderately to badly fractured, fractures spaced 1 to 8 inches, nearly horizontal and dipping about 45 degrees.	
39.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	18	78
2.	1.5 - 3.0	30	89
3.	3.0 - 4.0	100/5	67
4.	10.0 -11.5	84	45
5.	16.5 -17.0	100/5	95

Rock Core

No.	Depths	% Recovery
1.	23.0 -24.0	100
2.	24.0 -29.0	100
3.	29.0 -34.0	100
4.	34.0 -39.0	100

Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	23.5 -34.0	3 inches	25	18.5
2.	28.0 -34.0	3 inches	25	15.3
3.	35.0 -39.0	3 inches	25	.02

NOTE: Water level at 20.5 feet on 7/14/65, Hole dry to 14 feet on 6/21/65. Lost drilling water at 27.0 feet .

DH-4, ELEV. 1103.6 6/16/65 D.E.M.

0.0	2.0	TOPSOIL	
2.0	16.0	BEDROCK, hard, unweathered, gray gneiss, containing much quartz and biotite, fracturing mostly horizontal, some dipping about 60 degrees, foliation dipping about 45 degrees.	
16.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	4	67
2.	1.5 - 2.1	106/7	100

Rock Core

No.	Depths	% Recovery
1.	2.0 - 6.0	88
2.	6.0 - 8.5	100
3.	8.5 -13.0	100
4.	13.0 -16.0	94

Pressure Test

No.	Depths	Psi	Q/gpm
1.	6.5 -16.0	25	12

NOTE: Water level at 2 feet on 7/13/65.

DH-5, ELEV. 1089.7 5/17-18/65 K.G.L.

0.0	7.0	BOULDERS, and cobbles with gravel and sand, angular, hard, maximum size 14", high permeability, alluvium.	
7.0	17.0	BEDROCK, gray, hard, quartz, biotite, feldspar gneiss, foliation dipping about 60 degrees. Joints nearly horizontal and dipping about 45 degrees, spaced 1 to 30 inches.	
17.0		Bottom of Hole.	

Rock Core

No.	Depths	% Recovery
1.	7.0 - 8.0	100
2.	8.0 -13.0	100
3.	13.0 -17.0	100

Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	9.0 -17.0	3 inches	25	14.4
2.	12.0 -17.0	3 inches	25	0.88

NOTE: Water level at 0.3 feet on 7/13/65

DH-6, ELEV. 1090.2 6/16/65 D.E.M.

0.0	1.5	TOPSOIL and BOULDERS	
1.5	9.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 15% medium sand, 30% coarse sand, 7% gravel, 2% cobbles, 1% boulders, angular to sub-rounded, maximum size 14", tan-brown, wet, low to medium permeability, dense, valley till.	SM
9.0	23.0	BEDROCK, hard, gray, biotite gneiss, unweathered, with fractures mostly horizontal and tight but some dipping about 60 degrees, fractures spaced 10 to 18 inches apart, foliation dipping about 45 degrees.	
23.0		Bottom of Hole.	

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	1.5 - 3.0	36	77
2.	3.0 - 4.5	59	0
3.	7.0 - 8.5	33	44

Rock Core

No.	Depths	% Recovery
1.	9.0 -12.0	100
2.	12.0 -13.0	10
3.	13.0 -18.0	100
4.	18.0 -23.0	100

Pressure Test

No.	Depths	Psi	Q/gpm
1.	10.0 - 23.0	25	1

NOTE: Water level at 0.5 feet on 7/13/65.

DH-7, ELEV. 1408.0

0.0	1.5	TOPSOI
1.5	12.0	SAND, sand, 7% cob maxim to imp
12.0	22.0	BEDROC to 30 dippi
22.0		Bottom

Standa

No.
1.
2.
3.

Rock C

No.
1.
2.
3.

Pressu

No.
1.

NOTE:

DH-8, ELEV. 1124.5

0.0	1.5	TOPSOI
1.5	5.0	SAND, fine s gravel maxim perme
5.0	18.0	BEDROC mostly spaced 80 deg
18.0		Bottom

Standa

No.
1.
2.
3.

Rock C

No.
1.
2.
3.

Pressu

No.
1.
2.

NOTE:

DH-9, ELEV. 1136.0

0.0	12.0	BOULDE 7% fi boulde maxim dense,
12.0	30.0	BEDROC weath plane about Folia
30.0		Bottom

Rock

No.
1.
2.
3.
4.
5.

Press

No.
1.

NOTE:

D.E.M.

ies, containing
mostly horizontal,
tion dipping about

% Recovery
67
100

3/65.

K.G.L.
nd sand, angular,
bility, alluvium.
s, feldspar gneiss,
Joints mostly
rces, spaced 1 to 30

Psi	Q/gpm
25	14.4
25	0.88

7/13/65

D.E.M.

, fines, 25% SM
arse sand, 7%
ngular to sub-
wn, wet, low to
y fill.
s, unweathered,
nd tight but some
s spaced 10 to 18
bout 45 degrees.

% Recovery
77
0
44

Q/gpm
1

7/13/65.

DH-7, ELEV. 1488.0 6/10-14/65 D.E.M.

0.0	1.5	TOPSOIL and DUFF
1.5	12.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 15% medium sand, 15% coarse sand, 15% gravel, 7% cobbles, 3% boulders, soft, highly weathered, maximum size 16", tan-brown, damp, low permeability to impermeable, dense to very dense, glacial till. SM
12.0	22.0	BEDROCK, dark gray, biotite gneiss, hard, fractures 6 to 30 inches apart, mostly horizontal, foliation dipping about 80 degrees.
22.0		Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	5	33
2.	1.5 - 3.0	23	77
3.	3.0 - 4.5	55	77

Rock Core

No.	Depths	% Recovery
1.	12.0 -14.0	90
2.	14.0 -19.0	100
3.	19.0 -22.0	96

Pressure Test

No.	Depths	Psi	Q/gpm
1.	13.0 -22.0	25	trace

NOTE: Water level at 7 feet on 7/14/65.

DH-8, ELEV. 1124.5 6/15/65 D.E.M.

0.0	1.5	TOPSOIL
1.5	5.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 15% medium sand, 15% coarse sand, 15% gravel, 7% cobbles, 3% boulders, soft and weathered, maximum size 16", tan-brown, damp, low to medium permeability, dense to very dense, glacial till. SM
5.0	18.0	BEDROCK, hard, dark gray biotite gneiss, fractures mostly horizontal, some dipping about 60 degrees, spaced 8 to 20 inches apart, foliation dipping about 80 degrees.
18.0		Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	5	44
2.	1.5 - 3.0	28	777
3.	3.0 - 4.5	128/12	55

Rock Core

No.	Depths	% Recovery
1.	5.0 - 9.0	100
2.	9.0 -14.0	81
3.	14.0 -18.0	70

Pressure Test

No.	Depths	Psi	Q/gpm
1.	7.0 -12.0	20	packer failed
2.	12.0 -18.0	20	10

NOTE: Water level-no measurement. Packers stuck in hole.

DH-9, ELEV. 1136.0 6/16/65 D.E.M.

0.0	12.0	BOULDERS, with silty sand matrix, about 3% fines, 7% fine sand, 5% medium sand, 5% coarse sand, 80% boulders, angular to sub-angular, hard, unweathered, maximum size 24", gray, damp, high permeability, dense, slope wash and residual.
12.0	30.0	BEDROCK, hard, dark gray, biotite gneiss, moderately weathered at top 2 feet, with separation of foliation planes, fractures mostly horizontal, some dipping about 60 degrees, spaced 10 to 20 inches apart. Foliation dipping about 80 degrees.
30.0		Bottom of Hole.

Rock Core

No.	Depths	% Recovery
1.	11.0 -12.0	100
2.	12.0 -17.0	100
3.	17.0 -22.0	80
4.	22.0 -25.0	83
5.	25.0 -30.0	100

Pressure Test

No.	Depths	Psi	Q/gpm
1.	14.0 -30.0	25	0

NOTE: Water level at 2.5 feet on 7/14/65.

LEGEND

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1 -99
Borrow Area	101-199
Emergency Spillway	201-299
Centerline of Outlet Structure	301-399
Stream Channel	401-499
Relief Wells	501-599
	601-699
	701-799

DH-Drill Holes
TP-Test Pits

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravel; gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels; gravel-and-silt mixtures
GC	Clayey gravels; gravel-and-clay-mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sands; sand-silt mixtures
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, very fine sands; sandy or clayey silts
CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays or silts of medium to high plasticity

****

All Soil and Rock description and classifications were determined by visual examination in the field.

When possible, all holes were advanced by continuous drive sampling to 6.0 feet. Holes were then advanced by NX diamond drilling between drive samples. Drive samples taken with a 3-inch O.D. split spoon sampler.

Location of Test Holes shown on Plan View

NOTE: Water levels do not necessarily represent static water levels.

Psi = pounds per square inch water pressure
Q/gpm = quantity of water in gallons per minute
K/ft/day = permeability in feet per day
D.S. = Disturbed Sample

The Unified Soil Classification System classifie only those materials which are smaller than three inches.

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Investigated Designed D. MILLS & K. LUND	1965	Approved by	
Drawn		Title	
Traced		Title	
Checked D. MILLS	3-1-66	Sheet No 30 of 36	Drawing No MA-357 P

SCS-313B (APRIL 1963)

B-15

LOG OF TEST HOLES

DH-10, ELEV. 1134.8 5/17-18/65 R.G.L.

0.0 - 18.0 COBBLES, GRAVEL and BOULDERS, about 3% fines, 7% fine sand, 5% medium sand, 5% coarse sand, 30% gravel, 30% cobbles, 20% boulders, sub-round to angular, hard, slope wash.

18.0 - 20.0 BEDROCK, grey, hard, quartz, biotite feldspar gneiss, foliation dipping about 45 degrees, joints spaced 1/2 to 1½ inches dipping about 30 degrees.

20.0 Bottom of Hole.

Rock Core

No.	Depths	% Recovery
1.	10.0 -12.0	100
2.	12.0 -15.0	100
3.	15.0 -17.0	100
4.	17.0 -20.0	100

Pressure Test

No.	Depths	Hole Size	Psi	Q/ppm
1.	12.0 -20.0	3 inches	25	14.8
2.	16.5 -20.0	3 inches	25	4.20

NOTE: Water level at 11 feet on 7/14/65

DH-101, ELEV. 1214.2 6/18-24/65 D.E.M.

0.0 - 1.5 TOPSOIL

1.5 - 40.0 SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, angular to sub-rounded, soft, maximum size 42", olive-brown, damp, low permeability, dense to very dense, glacial till. SM

40.0 Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	17	77
2.	1.5 - 3.0	15	86
3.	3.0 - 4.5	212	83
4.	4.5 - 5.2	196/8	33
5.	10.0 -11.5	176	88
6.	15.0 -16.5	176	50
7.	20.0 -20.1	100/1	0
8.	30.0 -30.9	198/9	10
9.	33.0 -36.5	154	61
10.	38.5 -40.0	276	33

NOTE: Water level at 25 feet on 6/24/65, water level at 13.5 feet on 7/14/65. Boulders from 35.0-38.5 feet.

DH-102, ELEV. 1160.0 6/27-24/65 D.E.M.

0.0 - 1.5 TOPSOIL and DUFF

1.5 - 30.0 SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, angular to sub-rounded, maximum size 24", olive-brown, damp, low permeability to impermeable, very dense, glacial till. SM

30.0 - 40.0 BEDROCK, grey biotite gneiss, hard, fractures spaced 8 to 18 inches apart, mostly horizontal, some dipping about 70 degrees, foliation dipping about 70 degrees.

40.0 Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	71	72
2.	1.5 - 3.0	145	67
3.	3.0 - 4.5	71	77
4.	4.5 - 6.0	74	94
5.	10.0 -11.5	53	77
6.	15.0 -16.5	497	94
7.	20.0 -21.5	683	88

Rock Core

No.	Depths	% Recovery
1.	30.0 -34.0	100
2.	34.0 -40.0	100

NOTE: Water level at 7 feet on 6/23/65, water level at 8 feet on 6/24/65, water level at 7.5 feet on 7/14/65.

DH-201, ELEV. 1181.3 6/23-24/65 D.E.M.

0.0 - 1.5 TOPSOIL

1.5 - 10.0 SAND, silty with gravel, about 18% fines, 32% fine sand, 25% medium sand, 15% coarse sand, 7% gravel, 2% cobbles, 1% boulders, angular, hard, maximum size 16", olive-brown, damp, low permeability, dense, slope wash. SM

10.0 - 42.0 SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, hard, angular, to sub-angular, maximum size 8", olive-brown, damp, impermeable, very dense, glacial till. SM

42.0 Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	2	67
2.	1.5 - 3.0	26	77
3.	3.0 - 4.5	38	77
4.	4.5 - 6.0	50	44
5.	10.0 -11.5	48	44
6.	15.0 -16.5	44	39
7.	20.0 -21.5	39	0
8.	25.0 -26.5	96	55
9.	30.0 -31.5	73	34
10.	35.0 -36.5	61	34

NOTE: Water level at 3 feet on 6/24/65, water level at 18.5 feet on 7/14/65.

DH-202, ELEV. 1182.5 6/23-24/65 R.G.L.

0.0 - 4.0 TOPSOIL

4.0 - 12.0 SAND, silty with gravel, about 15% fines, 20% fine sand, 25% medium sand, 20% coarse sand, 15% gravel, 5% cobbles, angular, hard, maximum size 6", olive-brown, damp, low permeability to impermeable, medium to dense, kame terrace. SM

12.0 - 42.0 SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, 4% cobbles, 1% boulders, hard, angular, maximum size 18", olive-brown, damp, impermeable, very dense, glacial till. SM

42.0 Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	2	78
2.	1.5 - 3.0	4	78
3.	3.0 - 4.5	4	78
4.	4.5 - 6.0	5	78
5.	10.0 -11.5	29	78
6.	15.0 -16.3	130/8	67
7.	20.0 -21.5	96	77
8.	25.0 -26.5	110	100
9.	30.0 -31.5	131	67
10.	35.0 -36.5	116	77
11.	40.5 -42.0	163	34

NOTE: Water level at 13 feet on 7/14/65

DH-203, ELEV. 1163.1 6/24/65 D.E.M.

0.0 - 1.5 TOPSOIL

1.5 - 41.5 SAND, silty with gravel, about 20% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 10% gravel, 7% cobbles, 3% boulders, angular, hard, maximum size 16", brown, damp, low to medium permeability, loose to very dense. SM

41.5 Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	3	88
2.	1.5 - 3.0	2	67
3.	3.0 - 4.5	4	67
4.	4.5 - 6.0	8	88
5.	15.0 -16.5	16	73
6.	20.0 -21.5	36	77
7.	25.0 -26.5	42	50
8.	30.0 -31.5	34	72
9.	35.0 -36.5	101	44
10.	40.0 -41.5	137	77

NOTE: Water level at 15 feet on 7/14/65.

DH-301, ELEV. 1093.6 6/21-22/65 K.G.L.

0.0	7.0	GRAVEL, COBBLES and Boulders in a silty sand matrix, angular to hard, maximum size 16", medium to high permeability, alluvium.
7.0	17.0	BEDROCK, quartz biotite feldspar gneiss, moderately hard from 7 to 12 then hard, seamy from 7 to 12, foliation dipping about 80 degrees. Joints horizontal spaced 1 to 24 inches, with a 6" weathered seam at 11 feet.
17.0		Bottom of Hole.

Rock Core

No.	Depths	% Recovery
1.	7.0 - 12.0	60
2.	12.0 - 17.0	100

Rock Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	7.2 - 17.0	3 inches	12	11.7

2. Could not place packer below 11.0 feet.

NOTE: Water level at 3.5 feet on 7/14/65.

DH-302, ELEV. 1091.8 6/21/65 K.G.L.

0.0	8.0	GRAVEL, COBBLES and BOULDERS with silty sand matrix, angular, hard, maximum size 14", medium to high permeability, alluvium.
8.0	18.0	BEDROCK, dark grey, biotite quartz, feldspar gneiss, moderately hard to hard below 11.0 feet, foliation dipping about 85 degrees, fractures spaced 1 to 18 inches generally horizontal with a few dipping about 30 degrees.
18.0		Bottom of Hole.

Rock Core

No.	Depths	% Recovery
1.	8.0 - 9.5	88
2.	9.0 -11.5	100
3.	11.0 -16.0	88
4.	16.0 -18.0	100

Rock Pressure Test

No.	Depths	Hole Size	Psi	Q/gpm
1.	9.5 -18.0	3 inches	25	3.7

NOTE: Water level at surface on 7/14/65

DH-303, ELEV. 1098.7 6/15-16/65 D.E.M.

0.0	9.0	SAND, silty with gravel, about 15% fines, 15% fine sand, 30% medium sand, 25% coarse sand, 10% gravel, 4% cobbles, 1% boulders, angular to sub-angular, hard, maximum size 18 inches, tan-brown, wet, high permeability, very dense. SM
9.0	19.0	BEDROCK, hard, gray biotite gneiss, fractures nearly horizontal some dipping 60 degrees, spaced 8 to 20 inches apart, foliation dipping about 80 degrees.
19.0		Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	220/8	33
2.	6.0 - 7.5	141	55

Rock Core

No.	Depths	% Recovery
1.	9.0 -14.5	100
2.	14.0 -19.0	100

Pressure Test

No.	Depths	Psi	Q/gpm
1.	9.5 -19.0	25	25
2.	14.0 -19.0	25	0

NOTE: Water level at surface on 7/14/65

DH-304, ELEV. 1090.6 6/11/65 D.E.M.

0.0	1.5	TOPSOIL and DUFF
1.5	13.0	SAND, silty with gravel, about 18% fines, 22% fine sand, 40% medium sand, 10% coarse sand, 10% gravel, angular to sub-rounded, maximum size 1", tan-brown, low to medium permeability, wet, firm to very dense, valley fill. SM
13.0	23.0	BEDROCK, firm, dark, gray biotite gneiss, with quartz stringers, fractures nearly horizontal, spaced 8 to 20 inches apart, foliation dipping about 80 degrees.
23.0		Bottom of Hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	4	77
2.	1.5 - 3.0	34	67
3.	3.0 - 4.5	34	67
4.	5.0 - 6.5	152	72

Rock Core

No.	Depths	% Recovery
1.	13.0 -14.0	85
2.	14.0 -15.0	100
3.	15.0 -20.0	85
4.	20.0 -23.0	100

Pressure Test

No.	Depths	Psi	Q/gpm
1.	14.0 -19.0	25	18
2.	19.0 -23.0	25	trace

NOTE: Water level at 6 feet on 6/16/65, at 3 feet on 7/14/65

TEST PITS

TP-151, ELEV. 1184.7 6/24/65 K.G.L.

0.0	2.0	TOPSOIL
2.0	10.0	GRAVEL, sandy with silt, cobbles and boulders about 15% fines, 10% fine sand, 10% medium sand, 10% coarse sand, 30% gravel, 17% cobbles, 8% boulders, angular, hard, maximum size 18", brown, damp, low permeability, very dense, ground moraine. GM
10.0		Bottom of Pit.

D.S. 151.1 2.0 to 10.0 (2 bags), 15% larger than 6" discarded.

NOTE: Water level-no pipe.

TP-152, ELEV. 1160.0 6/24/65 K.G.L.

0.0	3.0	TOPSOIL
3.0	10.0	SAND, silty with gravel, about 30% fines, 35% fine sand, 12% medium sand, 3% coarse sand, 10% gravel, 5% cobbles, 5% boulders, angular, hard, maximum size 14", olive-brown, damp to moist, low permeability, dense, glacial till. SM
10.0		Bottom of Pit.

D.S. 152.1 3.0 to 10.0 6% larger than 6" discarded.

NOTE: Seepage at 9.5 feet. Estimated flow less than .5 gpm. Water level dry on 7/14/65.

TP-153, ELEV. 1170.8 6/24/65 K.G.L.

0.0	5.0	BOULDERS and COBBLES, in an organic silty sand matrix, about 5% fines, 5% fine sand, 5% medium sand, 5% coarse sand, 10% gravel, 20% cobbles, 50% boulders, sub-rounded to angular, maximum size 30", black, wet, high permeability, loose, alluvium.
5.0	10.0	SAND, silty with gravel, about 18% fines, 22% fine sand, 10% medium sand, 5% coarse sand, 35% gravel, 5% cobbles, 5% boulders, angular, hard, maximum size 14", gray, moist, impermeable, very dense, glacial till. GM-SM
10.0		Bottom of Pit.

D.S. 153.1, 5.0-10.0 6% larger than 6" discarded.

NOTE: Water entering pit at 3.0. Estimated flow 1.5 gpm. Water level at 5 feet on 7/14/65.

TP-154, ELEV. 1208.7 6/24/65 K.G.L.

0.0	2.5	BOULDERY TOPSOIL
2.5	10.0	SAND, silty with gravel, about 15% fines, 35% fine sand, 15% medium sand, 5% coarse sand, 20% gravel, 5% cobbles, 5% boulders, angular, hard, maximum size 16", light brown, damp, low, very dense, ground moraine. SM
10.0		Bottom of Pit.

D.S. 154.1, 2.5-10.0 6% larger than 6" discarded.

NOTE: Water level dry on 7/14/65.

TP-155, ELEV. 1189.6 6/24/65 K.G.L.

0.0	4.5	BOULDERS AND COBBLES, in an organic silty sand matrix, about 5% fines, 2% fine sand, 2% medium sand, 2% coarse sand, 4% gravel, 10% cobbles, 75% boulders, angular to sub-rounded, hard, maximum size 36", black, wet, medium, loose, alluvium.
4.5	10.0	SAND, silty with gravel, about 18% fines, 25% fine sand, 15% medium sand, 5% coarse sand, 20% gravel, 15% cobbles, 2% boulders, angular to sub-angular, hard, maximum size 14", brown, moist, low permeability, very dense, ground moraine. SM
10.0		Bottom of Pit.

D.S. 155.1, 4.5-10.0 10% larger than 6" discarded.

NOTE: Water entering pit 1.0-4.5. Estimated flow less than 1 gpm. Water level at 3.5 on 7/14/65

TP-156, ELEV. 1214.1 6/24/65 K.G.L.

0.0	2.5	TOPSOIL
2.5	10.0	SAND, silty with gravel, about 15% fines, 25% fine sand, 15% medium sand, 8% coarse sand, 30% gravel, 5% cobbles, 2% boulders, angular, hard, maximum size 13", olive-brown, damp, low permeability, very dense, glacial till. SM
10.0		Bottom of Pit.

D.S. 156.1, 2.5-10.0 5% larger than 6" discarded.

NOTE: Water level dry on 7/14/65.

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed D. MILLS & K. LUND Date 1965
Drawn
Traced
Checked D. MILLS 8-1-66
Approved by
Title
Title
Sheet No. 31 of 38
Drawing No. MA 357 P

SCS-313B (APRIL 1963)

B-16

CLAM RIVER

DH-601 Elev. 1203.0 7/29 to 8/3/70 PAR/DBM

0.0	7.5	Decomposed boulder gneiss Tan brown, dry, low permeability, dense, Decomposed Rock	
7.5	9.5	Boulder.	
9.5	30.0	SAND, silty with gravel, about 20% fines, 10% fine sand, 20% medium sand, 35% coarse sand, 15% gravel, subangular, decomposed rock bits, 3/4-inch maximum size, grey, moist, low permeability, very dense, GLACIAL TILL.	SM
30.0	32.5	Boulder.	
32.5		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0-1.5'	54	100
2.	1.5-3.0'	101	78
3.	3.0-4.5'	134	72
4.	9.5-10.0'	143/6" ref.	0
5.	15.0-16.5'	105	67
6.	20.0-21.5	87	34
7.	25.0-25.3	100/3" ref.	0
8.	30.0-31.5'	70	50
9.	32.5-33.0'	100/6" ref.	100

NOTE: Water level at 14 feet 8 inches on 8/3/70.

DH-605 Elev. 1194.9 8/10 to 8/11/70 DBM

0.0	1.0	TOPSOIL and SILT.	
1.0	12.5	SAND, silty with gravel, about 15% fines, 15% fine sand, 20% medium sand, 40% coarse sand, 10% gravel, subangular, 3/4-inch maximum size, grey, damp, medium permeability, loose to dense, OUTWASH.	SM
12.5	41.5	SAND, silty with gravel, about 40% fines, 15% fine sand, 15% medium sand, 20% coarse sand, 10% gravel, subangular, 3/4-inch maximum size, grey-green, damp, low permeability, dense to very dense, GLACIAL TILL.	SM
41.5		Bottom of Hole.	

Drive Samples

No.	Depth	Blo./ft.	% Recovery
1.	0.0-1.5'	3	100
2.	1.5-3.0'	16	100
3.	3.0-4.5'	12	100
4.	5.0-5.3'	100/3" ref.	0
5.	10.0-11.5'	23	70
6.	15.0-15.1'	100/1" ref.	0
7.	20.0-20.5'	103/6" ref.	60
8.	25.0-25.5'	100/6" ref.	40
9.	30.0-30.4'	100/4" ref.	0
10.	35.0-35.8'	137/10"	60

DH-607 Elev. 1213.8 8/5 to 8/7/70 DBM

0.0	1.0	TOPSOIL.	
1.0	51.5	SAND, silty with gravel, about 20% fines, 15% fine sand, 15% medium sand, 30% coarse sand, 20% gravel, subangular, 2-inch maximum size, tan to grey-green at 6 feet, damp, low permeability, dense, Weathered Till to 6 feet, GLACIAL TILL.	SM
51.5		Bottom of Hole.	

Drive Samples

No.	Depth	Blo./ft.	% Recovery
1.	0.0-1.5'	10	100
2.	1.5-3.0'	26	95
3.	3.0-4.5'	88	80
4.	5.0-6.5'	102	60
5.	10.0-11.5'	40	70
6.	15.0-16.5'	74	67
7.	20.0-20.9'	129/11" ref.	60
8.	25.0-25.1'	100/1" ref.	0
9.	30.0-30.9'	144/11" ref.	100
10.	35.0-35.1'	100/1" ref.	0
11.	40.0-41.5'	163	68
12.	45.0-45.5'	100/6" ref.	67
13.	50.0-50.5'	102/6" ref.	100

DH-609 Elev. 1212.2 7/29 to 7/31/70 DBM

0.0	2.0	TOPSOIL.	
2.0	26.0	SAND, silty with gravel, about 20% fines, 15% fine sand, 15% medium sand, 35% coarse sand, 15% gravel, subangular, highly decomposed rock bits, light olive brown, hard, medium permeability, loose, Weathered Till, to 5 feet olive-brown, wet, low permeability, very dense, GLACIAL TILL.	SM
26.0	46.5	SAND, silty, about 45% fines, 25% fine sand, 20% medium sand, 7% coarse sand, 3% gravel, olive-grey, moist, low permeability, very dense, Glacial Till.	SM
34.0	35.0	Boulder.	
46.5		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	%Recovery
1.	0-1.5'	46	67
2.	16-3.0	18	67
3.	40-5.5'	91/6" ref.	67
4.	1000-11.5'	92	56
5.	15.0-15.5'	50/6" ref.	0
6.	16.5-17.5'	125/6 ref.	50
7.	20.0-21.5'	126	61
8.	25.0-26.5'	135	61
9.	30.0-31.5'	140	56
10.	35.0'	100/0" ref.	0
11.	38.0-39.0'	160/12" ref.	87
12.	40.0-40.8'	100/11" ref.	93
13.	45.0-46.5'	130	100

Permeability Tests

No.	Depth	Hole Size	Heads	Loss
1.	6'	3"	Ground	Failed
2.	10'	3"	Ground	Slight
3.	11.5'	2" x 18"	Ground	Slight
4.	15'	3"	Ground	Failed
5.	20'	3"	Ground	Failed

a Head = Pipe above ground.

NOTE: Water level at 17.5 feet on 8/4/70.

DH-610 Elev. 1199.5 8/3 to 8/6/70 DBM

0.0	3.0	TOPSOIL and SLOPEWASH.	
3.0	36.5	SAND, silty with gravel, about 20% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 15% gravel, subangular, 2-inch maximum size, brown to blue-grey at 6 feet, damp, medium permeability, dense to very dense, GLACIAL TILL with decrease in coarse sand and gravel at 22 feet.	SM
36.5		Bottom of Hole.	

Drive Samples

No.	Depth	Blo./ft.	% Recovery
1.	0.0-1.5'	21	100
2.	1.5-3.0'	19	72
3.	3.0-4.5'	36	80
4.	4.5-6.0'	47	70
5.	10.0-11.5'	20	70
6.	15.0-16.5'	22	67
7.	20.0-21.5'	73	90
8.	25.0-26.5'	66	80
9.	30.0-31.5'	59	67
10.	35.0-36.5'	59	100

DH-611 Elev. 1189.9 8/11 to 8/11/70 DBM

0.0	1.0	TOPSOIL.	
1.0	5.0	SAND, with gravel, about 8% fines, 12% fine sand, 20% medium sand, 40% coarse sand, 10% gravel, subangular, 2-inch maximum size, grey, damp, medium permeability, loose to dense, OUTWASH.	SP-SM
5.0	30.0	SAND, silty with gravel, about 40% fines, 15% fine sand, 15% medium sand, 20% coarse sand, 10% gravel, subangular, 3/4-inch maximum size, olive to green-grey, damp, low permeability, dense, GLACIAL TILL.	SM
30.0		Bottom of Hole.	

Drive Samples

No.	Depth	Blo./ft.	% Recovery
1.	0.0 - 1.5'	14	100
2.	1.5 - 3.0'	44	70
3.	5.0 - 6.5'	33	70
4.	10.0 -11.6'	72	67
5.	15.0--16.5'	61	67
6.	20.0 -21.5'	98	67
7.	25.0 -26.5'	96	67

DH-613 Elev. 1

0.0	1.0
1.0	28.0
28.0	

DH-615 Elev. 1

0.0	1.0
1.0	3.0
3.0	15.0
15.0	18.0
18.0	29.0
29.0	

DH-616 Elev.

0.0	2.0
2.0	4.0
4.0	8.0
8.0	15.0
15.0	28.0
28.0	

DH-613 — Elev. 1181.7 — 8/6 to 8/10/70 — DBM

From	To	Description	
0.0	1.0	TOPSOIL.	
1.0	28.0	SAND, silty with gravel, about 45% fines, 10% fine sand, 10% medium sand, 30% coarse sand, 5% gravel, subangular, 1-inch maximum size, olive-brown, damp, low permeability, dense to very dense, GLACIAL TILL.	SM
28.0		Bottom of Hole.	

Drive Samples

No.	Depth	Bls./ft.	% Recovery
1.	0.0 - 1.5'	2	100
2.	1.5 - 3.0'	6	100
3.	3.0 - 4.5'	11	90
4.	4.5 - 6.0'	22	90
5.	10.0 - 11.5'	30	80
6.	15.0 - 15.8'	165/9" ref.	67
7.	20.0 - 20.9'	175/10" ref.	70
8.	25.0 - 25.5'	100/6" ref.	60

DH-615 — Elev. 1183.28 — 8/3 to 8/4/70 — PAB

From	To	Description	
0.0	1.0	COBBLES.	
1.0	3.0	TOPSOIL.	
3.0	15.0	SAND, silty with gravel, about 25% fines, 15% fine sand, 10% medium sand, 40% coarse sand, 10% gravel, subangular, some particles decomposed, olive-brown, moist, low permeability, very dense, Weathered Till.	SM
15.0	18.0	SAND, silty with gravel, about 25% fines, 15% fine sand, 10% medium sand, 30% coarse sand, 20% gravel, Decomposed rock particles, olive-grey, moist, low permeability, very dense, GLACIAL TILL.	SM
18.0	29.0	BEDROCK, grey, biotite hornblende gneiss, foliations dipping about 70°. From 18 to 21 feet, highly fractured. Fractures spaced about 1/2-inch to 2-inches apart. 21 to 29 feet -- moderately fractured. Fractures spaced about 8 to 14 inches.	
29.0		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	1.0 - 2.4'	98/5" ref.	66
2.	4.0 - 5.5'	101	66
3.	10.0 - 11.5'	71	44
4.	15.0 - 16.5'	131/6" ref.	66

Rock Core Runs

No.	Depth	Recovery
1.	18.0 - 19.0'	50
2.	19.0 - 20.0'	90
3.	20.0 - 24.0'	100
4.	24.0 - 29.0'	90

Permeability Test

No.	Depth	Hole Size	Head*	Loss
1.	10.5'	2" x 18"	Ground	Slight

* head - pipe above ground

DH-616 — Elev. 1196.03 — 8/5 to 8/6/70 — PAB

From	To	Description	
0.0	2.0	No drilling - Removed boulders by hand.	
2.0	4.0	TOPSOIL.	
4.0	8.0	SAND, silty with gravel, about 25% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, subangular, some decomposed rock particles, 1½-inch maximum size, olive-brown, moist, low permeability, dense, Weathered Till.	SM
8.0	15.0	SILT, sandy with about 55% fines, 22% fine sand, 15% medium sand, 5% coarse sand, 3% gravel, 1/2-inch maximum size, olive brown, moist, low permeability, medium dense, GLACIAL TILL.	ML
15.0	28.0	BEDROCK, grey biotite hornblende gneiss, folitations dipping about 70°. Fractures are about 12 to 18-inches apart -- mostly horizontal; all tight.	
28.0		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	2.0 - 3.5'	39	83
2.	3.5' - 5.0'	58	66
3.	10.0' - 11.5'	29	44

Rock Core Runs

No.	Depth	% Recovery
1.	15.0 - 15.9'	68
2.	15.9 - 20.0'	95
3.	20.0 - 25.0'	100
4.	25.0 - 28.0'	100

DH-617 — Elev. 1191.98 — 8/6 to 8/7/70 — PAB

From	To	Description	
0.0	3.0	TOPSOIL.	
3.0	16.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 25% medium sand, 15% coarse sand, 15% gravel, decomposed rock, 1-inch maximum size, olive-brown, wet, medium permeability, very dense, GLACIAL TILL.	SM
8.5 to 10.0		BOULDER.	
14.9 to 16.0		BOULDER.	
16.0	28.0	BEDROCK, grey, biotite hornblende gneiss. Foliations dipping about 70°. Moderately fractured -- spaced about 12 to 18 inches apart -- mostly horizontal; all tight.	
28.0		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.5 - 2.0'	23	78
2.	2.0 - 3.0'	94/12" ref.	33
3.	4.5 - 6.0'	72	78
4.	10.0 - 11.5'	71	66

Rock Core Runs

No.	Depth	% Recovery
1.	14.9 - 18.0'	91
2.	18.0 - 23.0'	100
3.	23.0 - 28.0'	100

NOTE: Water level at 5.5 feet on 8/6/70.

DH-618 — Elev. 1185.72 — 8/10 to 8/11/70 — PAB

From	To	Description	
0.0	3.5	TOPSOIL.	
3.5	10.0	SAND, silty with gravel, about 15% fines, 20% fine sand, 25% medium sand, 25% coarse sand, 15% gravel, subangular, with some decomposed rock bits, 3/4-inch maximum size, light olive-brown, moist, low permeability, very dense, GLACIAL TILL.	SM
6.0	8.0	Cobbles and Boulders.	
10.0	26.0	BEDROCK -- grey biotite hornblende gneiss, foliations dipping about 70°. Moderately, fractured. Fractures spaced about 6 to 14 inches apart, mostly horizontal.	
26.0		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5'	18	66
2.	1.5 - 2.9'	101/11" ref.	78
3.	5.0 - 6.5'	129	66

Rock Core Runs

No.	Depth	Recovery
1.	10.0 - 13.5'	76
2.	13.5 - 18.5'	95
3.	18.5 - 23.5'	100
4.	23.5 - 26.0'	100

NOTE: Water level at 6.92 feet on 8/11/70.

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by D. MILLS, R. F. [illegible] 8/70
Typed by R. LONCZAK
Traced
Checked D. MILLS
Approved by
Title
Title
Sheet No. 32 of 36
Drawing No. MA-357 P

SCS-313B (APRIL 1963)

DH-619 Elev. 1172.67 8/11 to 8/12/70 PAB

0.0	3.0	TOPSOIL AND ROOTMAT.	
3.0	11.5	SILTY SAND, gravelly, about 15% fines, 10% fine sand, 25% medium sand, 30% coarse sand, 20% gravel, subangular, 3/4-inch maximum size, olive-brown, moist, medium-low permeability, very dense, GLACIAL TILL.	SM
6 to 10'		BOULDER.	
10.5 to 11.5'		BOULDER.	
11.5	25.0	BEDROCK, grey, biotite hornblende gneiss, foliations dipping about 70°. Highly fractured. Fractures spaced about 1 to 8 inches apart. Fractures are not all tight.	
25.0		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.5 - 2.0'	26	66
2.	4.0 - 5.5'	99	66

Rock Core Runs

No.	Depth	% Recovery
1.	6.0 - 10.0'	68
2.	11.5 - 16.5'	97
3.	16.5 - 21.5'	100
4.	21.5 - 25.0'	100

DH-620 Elev. 1158.73 8/12 to 8/12/70 PAB

0.0	1.5	TOPSOIL, ROOTS.	
1.5	5.0	BOULDER.	
5.0	9.5	SAND, silty, with gravel, about 20% fines, 15% fine sand, 25% medium sand, 30% coarse sand, 10% gravel, subangular, 1-inch maximum size, olive-brown, moist, medium-low permeability, dense, GLACIAL TILL.	SM
9.5	17.5	BEDROCK, grey, biotite, hornblende, gneiss. Foliations dipping about 70°. Highly fractured with sand seams. Fractures spaced 1/2-inch to 6 inches apart.	
17.5		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	1.0 - 1.5'	18	100
2.	5.0 - 5.8'	60/10" ref.	78

Rock Core Runs

No.	Depth	% Recovery
1.	9.5 - 12.5'	93
2.	12.5 - 17.5'	83

NOTE: Water level at 9.5 feet on 8/12/70.

DH-621 Elev. 1171.82 8/13 to 8/13/70 DBM

0.0	1.5	TOPSOIL.	
1.5	9.0	COBBLES and BOULDERS, with some silt and gravel matrix, GLACIAL DRIFT.	
9.0	21.0	BEDROCK, grey, biotite hornblende gneiss, moderately fractured, fractures spaced 12 to 18 inches apart, most fractures dipping about 70 degrees, some horizontal.	
21.0		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5	4	100
2.	1.5 - 2.2'	41/7" ref.	40

Rock Core Runs

No.	Depth	% Recovery
1.	9.0 - 11.0'	75
2.	11.0 - 16.0'	100
3.	16.0 - 21.0'	93

NOTE: Water level at 9 feet on 8/13/70.

DH-622 Elev. 1179.3 8/13 to 8/14/70 DBM

0.0	11.0	COBBLES and BOULDERS, with some silt and gravel matrix, unable to obtain drive samples. GLACIAL DRIFT.	
11.0	21.0	BEDROCK, grey, biotite hornblende gneiss, moderately fractured. Fractures spaced 12 to 18 inches apart. Most fractures dipping about 70°. Some horizontal.	
21.0		Bottom of Hole.	

Rock Core Run

No.	Depth	% Recovery
1.	11.0 - 16.0'	80
2.	16.0 - 21.0'	100

DH-351 Elev. 1101.8 8/12 to 8/12/70 DBM

0.0	1.5	TOPSOIL and ROOTMAT.	
1.5	6.5	SAND, with gravel, about 4% fines, 10% fine sand, 10% medium sand, 56% coarse sand, 20% gravel, subangular, 2-inch maximum size, red-brown, damp, medium permeability, dense, FLOODPLAIN.	SP
6.5	16.5	BEDROCK, grey, biotite hornblende gneiss, moderately fractured, fractures dipping about 60 degrees. Some horizontal. All fractures tight. BEDROCK.	
16.5		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5'	15	100
2.	1.5 - 3.0'	82	70
3.	3.0 - 4.5'	24	80
4.	5.0 - 5.3'	100/4" ref.	100

Rock Core Runs

No.	Depth	% Recovery
1.	16.5 - 10.5'	95
2.	10.5 - 16.5'	70

NOTE: Water level at 2.75 on 8/12/70.

DH-352 Elev. 1098.4 8/13 to 8/13/70 PAB

0.0	2.0	TOPSOIL.	
2.0	3.5	SAND, silty with gravel, about 25% fines, 20% fine sand, 25% medium sand, 20% coarse sand, 10% gravel, subangular, 3/4-inch maximum size, red-brown, damp, medium permeability, medium dense, Floodplain Deposits.	SM
3.5	14.5	BEDROCK, grey, biotite hornblende gneiss, foliations dipping about 80°. Highly fractured from 3'6" to 8'6". Fractures spaced about 3 to 5 inches apart. Very slightly fractured from 8'6" to 14'6".	
14.5		Bottom of Hole.	

Drive Samples

No.	Depth	Blows/ft.	%Recovery
1.	0.0 - 1.5'	17	78
2.	1.5 - 3.0'	26	83
3.	3.0 - 3.5'	100/6" ref.	27

Rock Core Rung

No.	Depth	% Recovery
1.	3.5 - 8.5'	73
2.	8.5 -14.5'	100

NOTE: Water level at 4.58 feet on 8/13/70.

DH-353 Elev. 1095.2 8/13 to 8/14/70 PAB

0.0	1.5	TOPSOIL and ROOT MAT.	
1.5	7.0	SAND, with gravels, about 5% fines, 15% fine sand, 35% medium sand, 30% coarse sand, 15% gravel, subangular, 3/4-inch maximum size, red-brown, damp, high permeability, dense, Floodplain Deposits.	SP SM
7.0	17.0	BEDROCK, grey, biotite hornblende gneiss, moderately fractured, foliations dipping about 60°. Most fractures are horizontal. All tight. BEDROCK.	
17.0		Bottom of Boring.	

Drive Samples

No.	Depth	Blows/ft.	% Recovery
1.	0.0 - 1.5'	7	88
2.	1.5 - 3.0'	28	83
3.	3.0 - 4.5'	98	83
4.	5.0 - 5.5'	100/6" ref.	33

Rock Core Runs

No.	Depth	% Recovery
1.	7.0 - 12.0'	100
2.	12.0 - 17.0'	100

TP-651
0.0
1.0
10.0

TP-652
0.0
0.5
10.0

TP-653
0.0
1.0
10.0

TP-654
0.0
1.0
10.0

TP-655
0.0
1.0
12.0

TP-656
0.0
1.0
12.0

TP-657
0.0
3.0
10.0

8/12/70 DEM

ut 45 fines,
ium sand,
ravel, SP
imum size,
n permeability,

hornblende
ctured, fractures
es. Some
ures tight. BEDROCK.

ft.	% Recovery
	100
	70
	80
" ref.	100

REC

2.75 on 8/12/70.

3/70 PAB

l, about 25%
25% medium sand, SM
ravel, subangular,
red-brown, damp,
edium dense,

hornblende gneiss,
at 80°. Highly
8'6". Fractures
ches apart. Very
n 8'6" to 11'6".

/ft.	%Recovery
	78
5	83
0/6" ref.	27

covery
73
100

4.58 feet on

/70 PAB

ut 5% fines,
ium sand, 30%
, subangular, SP
red-brown, SM
, dense,

hornblende
tured,
t 60°. Most
ll. All tight.

/ft.	% Recovery
	88
	83
0/6" ref.	33

very
0
0

TEST PITS
CLAM LAKE, CLAM RIVER WATERSHED

TP-651 6/8 to 6/8/71 DEM

0.0	1.0	TOPSOIL AND ROOTMAT.	
1.0	10.0	SAND, silty with gravel, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 18-inch maximum size, olive-brown, damp, low permeability, very dense, GLACIAL TILL est. 20% + 6-inch size. Disturbed Sample: 3 to 9 feet.	SM
10.0		Bottom of Pit.	

TP-652 6/8 to 6/8/71 DEM

0.0	0.5	TOPSOIL and ROOTMAT.	
0.5	10.0	SAND and gravel, some silt, about 10% fines, 10% fine sand, 15% medium sand, 35% coarse sand, 30% gravel, sub-rounded, 24-inch maximum size, tan-brown, damp, medium-high permeability, dense, Ice contact sand and gravel with cobbles and boulders to P 6' est. 40% cobbles and boulders then about 25% + 6-inch size. Some rock fragments highly weathered. Disturbed Sample: 3 to 10 feet.	SP-SM or GP-GM
10.0		Bottom of Pit.	

TP-653 6/8 to 6/8/71 DEM

0.0	1.0	TOPSOIL and ROOTMAT.	
1.0	10.0	SAND and GRAVEL, some silt, about 10% fines, 10% fine sand, 15% medium sand, 35% coarse sand, 30% gravel, sub-rounded, 18-inch maximum size, tan-brown, damp, medium-high, dense, Ice contact sand and gravel, est. 25% + 6-inch size. Some rock fragments highly weathered. Disturbed Sample: 2 to 9 feet.	SP-SM or GP-GM
10.0		Bottom of Pit.	

TP-654 6/8 to 6/8/71 DEM

0.0	1.0	TOPSOIL and ROOTMAT.	
1.0	10.0	SAND and GRAVEL, with some silt, about 10% fines, 10% fine sand, 15% medium sand, 35% coarse sand, 30% gravel, sub-rounded, 20-inch maximum size, tan-brown, damp, medium-high permeability, dense, Ice contact sand and gravel, est. 25% + 6-inch size. Some rock fragments highly weathered. Disturbed Sample: 3 to 10 feet.	SP-SM or GP-GM
10.0		Bottom of Pit.	

TP-655 6/10/71 DEM

0.0	1.0	TOPSOIL and ROOTMAT.	
1.0	12.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 15-inch maximum size, olive-brown to 7 foot then blue-grey, damp to wet, low permeability, very dense, GLACIAL TILL weathered to 7 foot with water. Seep at 7 foot. Disturbed Sample 7 to 11 feet	SM
12.0		Bottom of Pit.	

TP-656 6/10/71 DEM

0.0	1.0	TOPSOIL and ROOTMAT.	
1.0	12.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 9-inch maximum size, olive-brown, damp, low permeability, very dense, GLACIAL TILL. Disturbed Sample 2 to 12 feet.	SM
12.0		Bottom of Pit.	

TP-657 6/10/71 DEM

0.0	3.0	TOPSOIL and ROOTMAT and FILL.	
3.0	10.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 14-inch maximum size, olive-brown, damp, low permeability, very dense, GLACIAL TILL. Disturbed Sample: 3 to 9 feet.	SM
10.0		Bottom of Pit.	

Test Pits (Cont'd) Clam River Watershed -- Clam Lake Site

TP-658 6/10/71 DEM

0.0	7.0	COBBLES and BOULDERS, with sand and gravel, matrix water entering pit at est. 5 gpm.	
7.0		Bedrock and bottom of pit.	

TP-659 6/10/71 DEM

0.0	1.0	TOPSOIL and ROOT MAT.	
1.0	3.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 14-inch maximum size, red-brown, wet, medium permeability, loose, WEATHERED GLACIAL TILL.	SM

TP-660 6/10/71 DEM

0.0	1.0	TOPSOIL and ROOT MAT.	
1.0	5.0	SAND, silty with gravel and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 36-inch maximum size, red-brown, wet, medium permeability, loose, WEATHERED GLACIAL TILL.	SM
5.0		BEDROCK and BOTTOM OF PIT.	

TP-661 6/10/71 DEM

0.0	1.0	TOPSOIL and ROOT MAT.	
1.0	11.0	SAND, silty with gravel, and cobbles, about 25% fines, 15% fine sand, 20% medium sand, 30% coarse sand, 10% gravel, sub-angular, 22-inch maximum size, olive-brown, damp, low permeability, very dense, GLACIAL TILL.	SM
11.0		Bottom of Pit.	

CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated D MILLS & P BRINKMAN 8/70 Date
Traced M LONCZAK
Traced
Checked C H DODGE
Approved by
Title
Title
Sheet No. 33 of 36
Drawing No. MA 357-P

SCS-313B (APRIL 1963)

B-18

LOG OF TEST HOLES

TP-251, ELEV. 1150.1 6/24/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 20% fines, 20% fine sand, 25% medium sand, 10% coarse sand, 15% gravel, 5% cobbles, 5% boulders, angular, hard, maximum size 18", damp, low permeability, very dense, glacial till.	SM
10.0		Bottom of Pit.	

D.S. 157.1, 3.0-10.0 6% larger than 6" discarded.

NOTE: Water level at 7.5' on 7/14/65

TP-252, ELEV. 1151.0 6/25/65 E.G.L.

0.0	2.5	TOPSOIL	
2.5	10.0	SAND, gravelly with silt, about 10% fines, 25% fine sand, 15% medium sand, 5% coarse sand, 30% gravel, 10% cobbles, 5% boulders, angular to sub-rounded, maximum size 24", brown, moist to wet, low to medium permeability, dense, ground moraine.	SM-GM
10.0		Bottom of Pit.	

D.S. 252.1 (2 bags) 2.5-10.0 8% larger than 6" discarded.

NOTE: Water level at 0.5' on 7/14/65.

TP-253, ELEV. 1145.3 6/25/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 25% fines, 35% fine sand, 15% medium sand, 5% coarse sand, 15% gravel, 3% cobbles, 2% boulders, angular, hard, maximum size 13", olive-brown, damp, impermeable, very dense, glacial till.	SM
10.0		Bottom of Pit.	

D.S. 253.1, 3.0-10.0 3% larger than 6" discarded.

NOTE: Water level dry on 7/14/65.

TP-254, ELEV. 1199.3 6/25/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 10% fines, 25% fine sand, 10% medium sand, 10% coarse sand, 35% gravel, 8% cobbles, 2% boulders, angular, hard, maximum size 14", brown, damp, low permeability, very dense, ground moraine.	GP-GM
10.0		Bottom of Pit.	

D.S. 254.1, 3.0-10.0 6% larger than 6" discarded.

NOTE: Water level dry on 7/14/65.

TP-255, ELEV. 1194.6 6/25/65 E.G.L.

0.0	3.0	BOULDERY TOPSOIL	
3.0	10.0	SAND, gravelly with cobbles, about 7% fines, 20% fine sand, 13% medium sand, 10% coarse sand, 35% gravel, 13% cobbles, 2% boulders, sub-round to sub-angular, maximum size 12", brown, damp, high permeability, dense, kame terrace.	GP-GM
10.0		Bottom of Pit.	

D.S. 255.1 (2 bags) 3.0-10.0, 8% larger than 6" discarded.

NOTE: Water dry on 7/14/65.

TP-256, ELEV. 1174.6 6/25/65 E.G.L.

0.0	3.0	TOPSOIL	
3.0	10.0	SAND, silty with gravel, about 25% fines, 35% fine sand, 20% medium sand, 5% coarse sand, 25% gravel, 5% cobbles, 2% boulders, angular, hard, maximum size 18", olive-brown, damp, impermeable, very dense, glacial till.	SM
10.0		Bottom of Pit.	

D.S. 256.1, 3.0-10.0 3% larger than 6" discarded.

NOTE: Water level at 7.0' on 7/14/65.

TP-91 ELEV. 6/24/66 ENG.

0.0	1.0	TOPSOIL.
1.0	5.0	SAND, silty, cobbles and boulders, dark, ALLUVIAL VALLEY FILL.
5.0		Bedrock at bottom of test pit.

TP-92 ELEV.

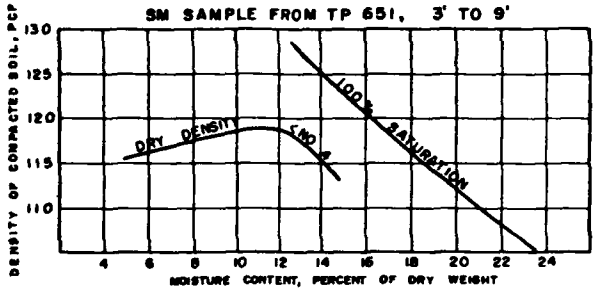
0.0	1.0	TOPSOIL.
1.0	5.0	SAND, silty, gravel, cobbles and boulders, grey, ALLUVIAL VALLEY FILL.
5.0		Bottom of pit. Bedrock. Water entering at 5.0.

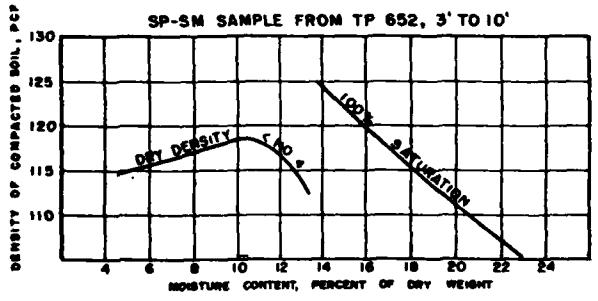
TP-93 ELEV.

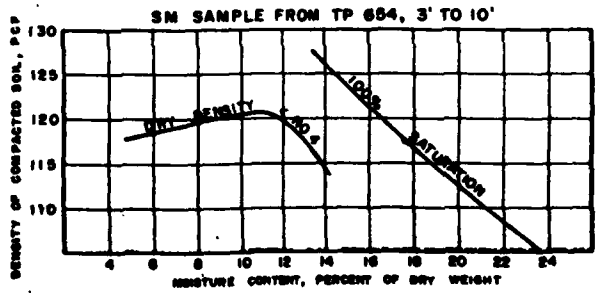
0.0	1.0	TOPSOIL.
1.0	5.0	SAND, silty, gravel, cobbles and boulders, grey, ALLUVIAL FILL.
5.0		Bottom of pit. Bedrock, Water entering at 5.0.

TP-94 ELEV.

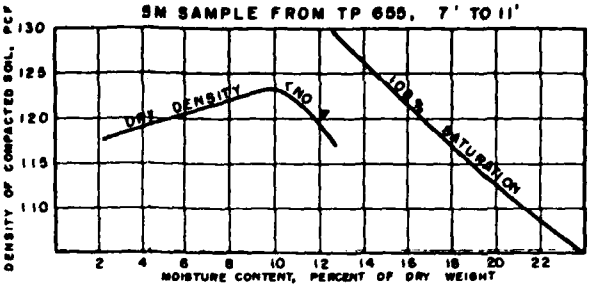
0.0	1.5	TOPSOIL.
1.5	4.0	SAND, silty, dark, ALLUVIAL VALLEY FILL.
4.0		Bedrock at bottom of pit.



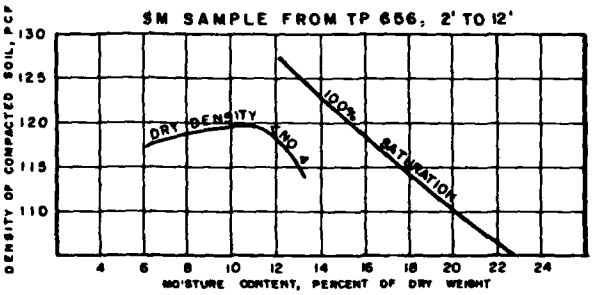




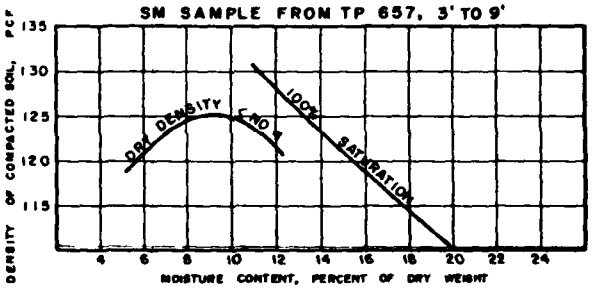
SM SAMPLE FROM TP 655, 7' TO 11'



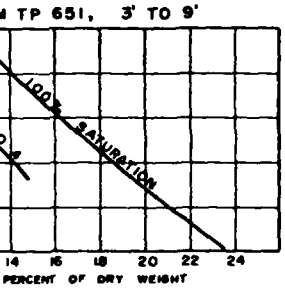
SM SAMPLE FROM TP 656, 2' TO 12'



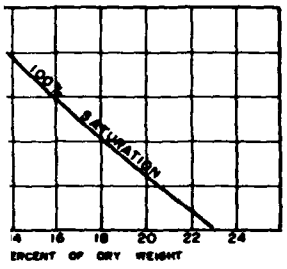
SM SAMPLE FROM TP 657, 3' TO 9'



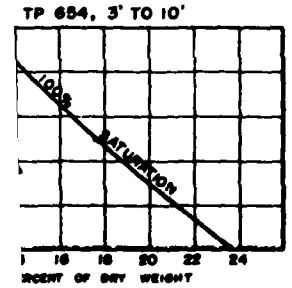
TP 651, 3' TO 9'



OM TP 652, 3' TO 10'



TP 654, 3' TO 10'



CLAM RIVER WATERSHED PROJECT
CLAM LAKE MULTIPLE-PURPOSE DAM
SANDISFIELD, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date 1958

Approved by

Title

Drawing No. MA 357-P

Sheet No 34 of 36

SCS-3138 (APRIL 1958)

B-19

Photo 1

Overview of downstream channel looking south from top of dam.

Photo 2

Overview of reservoir area, upstream embankment and principal spillway structure looking north-westerly from embankment.

Photo 3

Overview of emergency spillway crest, weir wall and dam crest looking west from top of left slope of emergency spillway.

Photo 4

Overview of emergency spillway approach channel looking northerly from toe of spillway discharge channel.

Photo 5

Overview of downstream embankment looking westerly from training wall of emergency spillway.

Photo 6

Overview of emergency spillway training wall slope looking southerly from dam crest.
Note: Erosion of slope.

Photo 7

Overview of downstream embankment, spillway discharge channel and left slope of emergency spillway. Note: The sloughing of left spillway slope.

Photo 8

60-inch outlet conduit and end wall. Note the crack above pipe and missing foundation drain pipe outlet to the left of the 60-inch conduit.

Photo 9

Pond drain inlet structure. Note damaged trash racks.

Photo 10

Pond drain inlet structure wing wall. Note cracks in concrete.

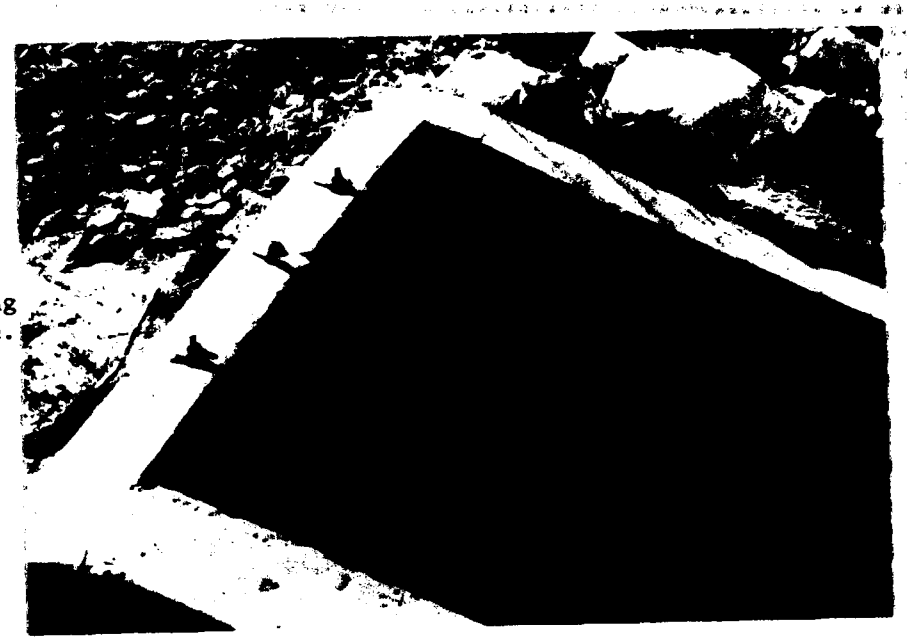


Photo 11

Gate well of principal spillway structure. Note the lower two stem guides are damaged.

Photo 12

Crack on right wall of riser transition.

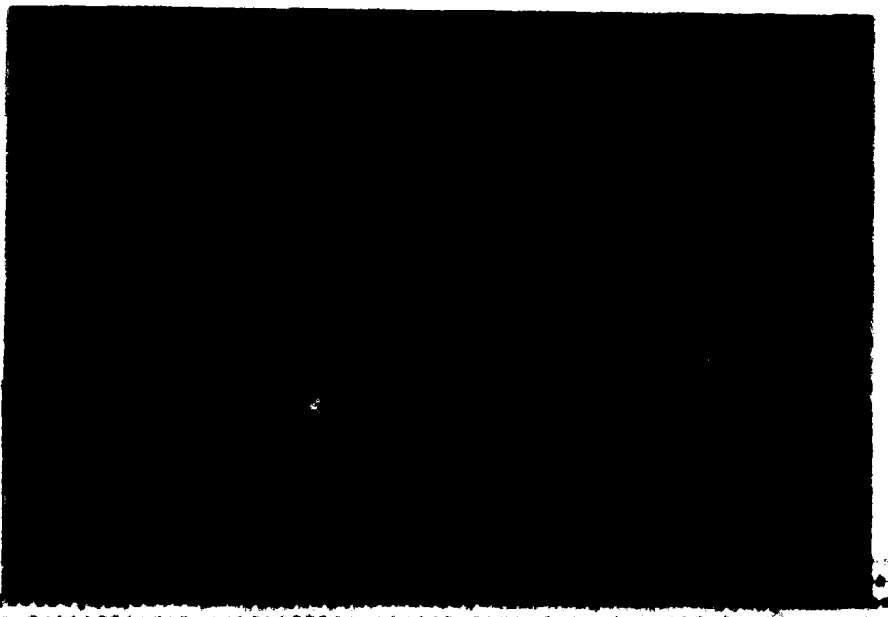


Photo 13

Cracks and efflorescence on transition of principal spillway riser.

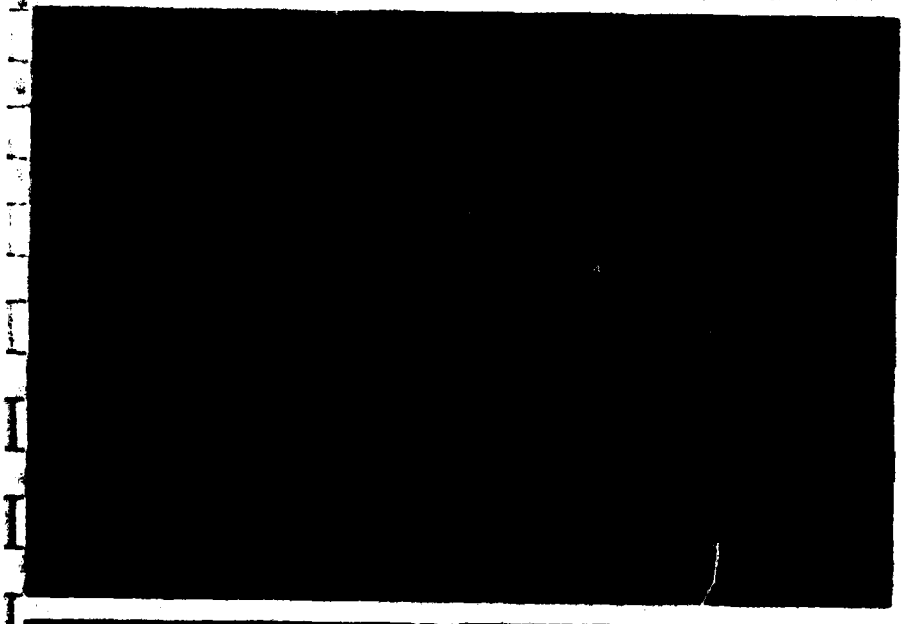


Photo 14

Crack in transition near the vertical downstream face of the principal spillway riser.

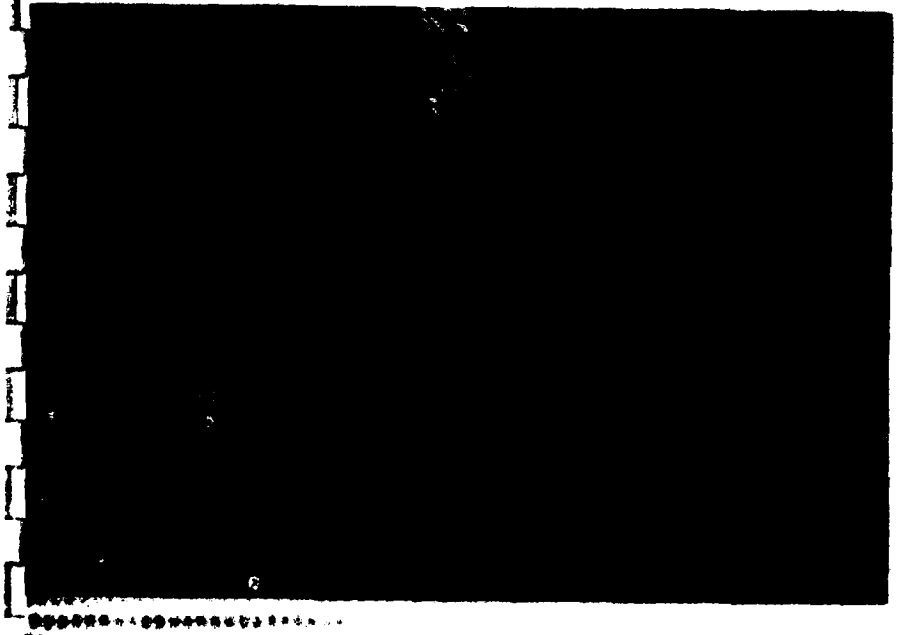


Photo 15

Closeup of silt from beneath rip rap on downstream side of embankment.

Photo 16

Closeup of left slope toe of emergency spillway at crest. Note groundwater seepage from slope.

Photo 17

Left slope of emergency spillway. Note slope failure and erosion.

Photo 18

Left slope of emergency spillway. Note erosion.

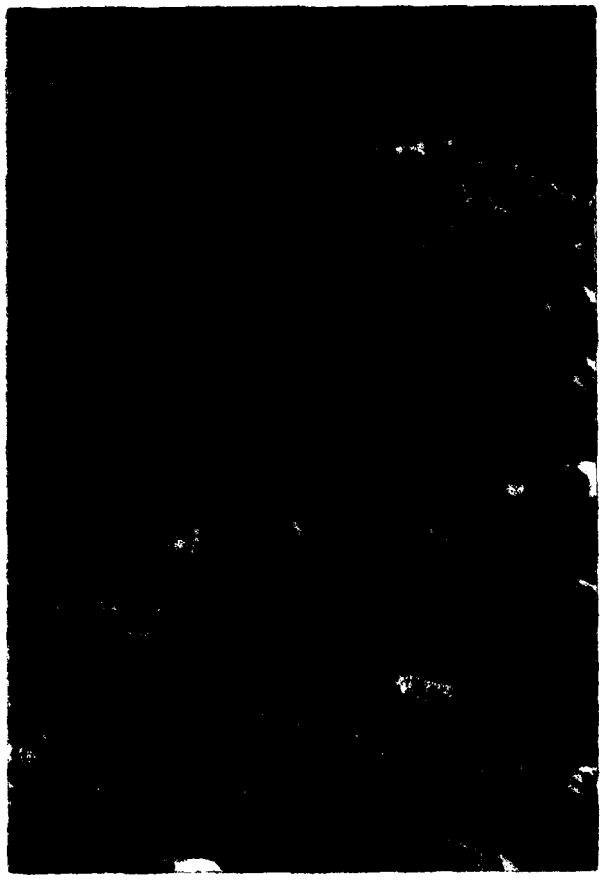
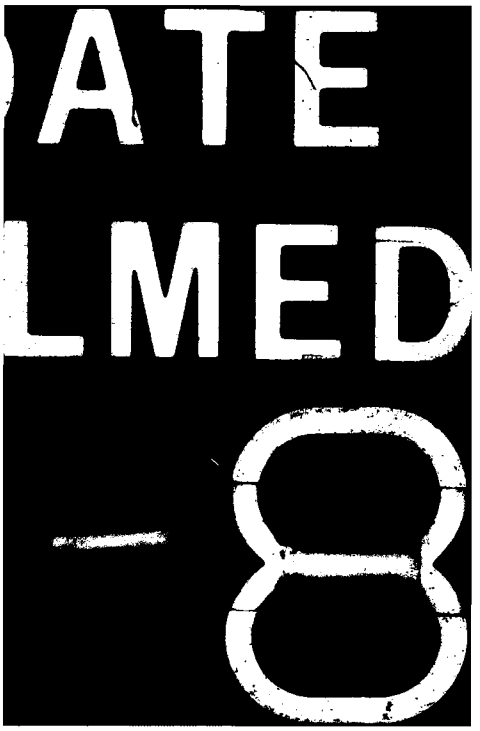


Photo 19

Transition of grass covered channel to riprap slope of emergency spillway. Note erosion and undercutting of rip rap by runoff.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