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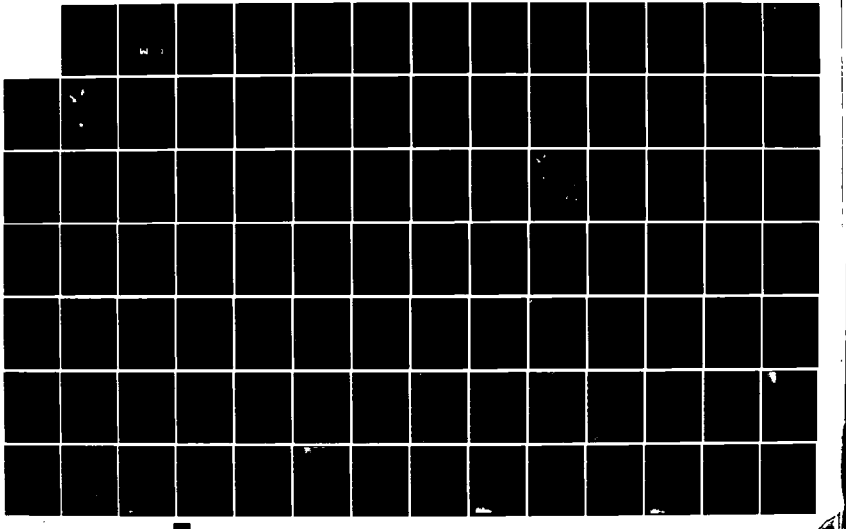

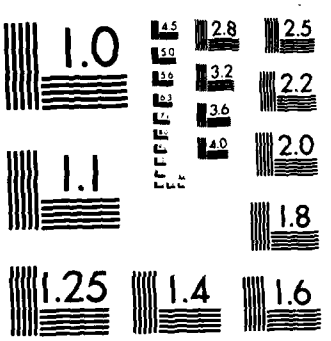

(1)

CONNECTICUT RIVER BASIN
SANDISFIELD, MASSACHUSETTS

WEST LAKE DAM
MA 00288

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

DECEMBER 1979

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

REPLY TO
ATTENTION OF
NEDED

JUL 22 1980

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

Dear Governor King:

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

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

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

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

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

WEST LAKE DAM

MA 00288

CONNECTICUT RIVER BASIN

SANDISFIELD, MASSACHUSETTS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) West 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
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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
Morley Brook (Tributary to Clam River)

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

The dam is an earthfill embankment about 920 feet in length, and 25 feet in height and has a reinforced concrete principle spillway. The dam has been rated fair. It has a classification of intermediate size and high hazard. Failure of the dam would pose a serious threat to about 11 houses, two major highway bridges, and three secondary road crossings.

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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	MA 288
Mass. D.P.W. No:	1-2-260-9
Name of Dam:	West Lake
Town:	Sandisfield
County and State:	Berkshire County, Massachusetts
Stream:	Morley Brook (Tributary to Clam River)
Date of Inspection:	November 1, 1979

BRIEF ASSESSMENT

The West Lake Dam, No. MA 288, is located on Morley Brook a tributary to the Buck and Clam Rivers, in the Town of Sandisfield, Massachusetts. The dam site is approximately two miles upstream of the Village of Montville and is located off of West Street. 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. The dam was completed in 1967. The dam is an earthfill embankment about 920 feet in length, and 25 feet in height and has a reinforced concrete principle spillway which maintains the recreation pool level and controls the release of stored floodwater, and a 100 foot wide earth excavated emergency spillway channel around the right abutment.

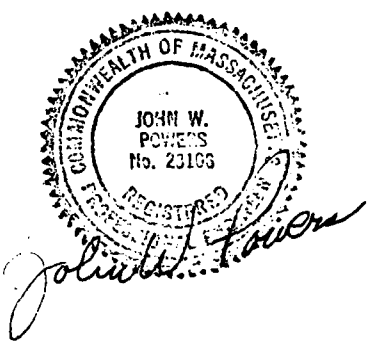
The dam and its appurtenances are in generally good condition but due to the very wet area downstream of the left embankment, the dam has been rated FAIR. This wet condition warrants further investigation. Some maintenance and minor remedial work is required as listed in Section 7.

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 1.46 square miles and the PMF test flood is 3,870 CFS. Routing the test flood through the reservoir, with the initial pool level at the high stage recreation pool level, resulted in a test flood outflow of 2,490 CFS which exceeds the capacity of the spillways and results in overtopping of the dam by 0.5 feet.

Failure of the dam would pose a serious threat to approximately 11 houses in the Montville area, two major highway bridge, and three secondary road crossings.

With the water level at top of dam the combined spillways are capable of discharging 2,160 cfs, which is equivalent to 87% of the test flood outflow.

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 West 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.

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, CHAIRMAN
Design 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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APPENDIX B - ENGINEERING DATA

APPENDIX C - PHOTOGRAPHS

APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS

APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

(2) Emergency Spillway

The emergency spillway channel is in good condition. There is a considerable amount of wetness along the right side of the channel, but this is caused by natural ground water, or ponded runoff. The channel itself was free of debris and only a few small trees were found overhanging the edge of the channel. The channel has been excavated through original ground.

The entire channel and side slopes have a heavy grass growth providing good erosion protection.

(c) Appurtenant Structures

1) Drop Inlet Principal Spillway

The principal spillway riser was found to be in good condition. The structure appeared to be structurally sound with no visible cracking, spalling, seepage, or efflorescence.

It was noted that some of the anchor bolts were missing or broken on the trash rack assemblies, and the anchor bolts on the grating are too long creating a hazardous walking condition.

The interior of the riser structure has collected a large amount of debris with branches being lodged on the sluice gate stem, and the 36 inch outlet conduit nearly plugged with branches and debris. The approach to the overflow weirs and low level orifice were clear of debris indicating that the trash racks are somewhat ineffective due to the accumulation inside of the structure. The sluice gate operator appears to be in good condition. The sluice gate was not operated during the visual inspection.

2) Pond Drain Inlet Pipe

At the time of the inspection, the water level was at the normal recreation pool level. Therefore, the inlet pipe and headwall structure were submerged and not visible.

3) Outlet Conduit

The 36 inch diameter conduit was found in good condition. The alignment was good and all interior joints were dry above the flow line. The interior of the conduit is in good condition with no visible spalling, cracking, or efflorescence.

At the location where the conduit enters the impact basin, the joint around the conduit has some grass growth between the pipe and the concrete structure, through the jointing material. The jointing material was found intact, but loose, around the pipe. No significant water or sand leakage was observed during our inspection.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

(a) General

The West Lake Dam, No MA 288 was in generally good condition at the time of the inspection except for the very wet area downstream of the left embankment which resulted in a FAIR rating.

(b) Dam

1) Earth Embankment

The upstream slope above water level and the downstream slope were found to have a very thick grass cover with seedling and brush growth becoming well established. No apparent movement, sloughing, slides or settlement was visible. The riprap protection along the upstream face was in good condition and extends up the embankment to an elevation varying from 2-3 feet above the recreation pool level. There is a dense stand of relatively small trees along the upstream and downstream toes at the right end of the embankment.

Some surface erosion has developed on the upstream embankment around the principal spillway. This erosion is considered to be minor.

The entire downstream toe from the principal spillway outlet to the left abutment was found wet. The standing water is a few inches deep in locations. All areas investigated were found to contain clear standing water, except, the downstream toe area about 30-40 feet from the left abutment which did have some visible flow of clear water. The wet area extended from the downstream toe about 50 feet downstream of the embankment.

Visual inspection of this area could not determine the extent to which this wet area is caused by seepage under and through the dam, and/or by ground water from the high ground downstream of the left abutment, and/or from the waste rock disposal area downstream of the dam's left side.

The foundation and toe drain pipe outlet from the left side of the dam was found to be plugged with grass growth and fines. Once this blockage was removed, the pipe flowed at a depth of 2-3 inches at the outlet. The right drain outlet was free from any blockages and was flowing about 1/2 inch deep at the outlet. The partial blockage of the left toe drain outlet may be at least partially responsible for the degree of wetness observed at the left downstream area.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

The design data for the West 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 1965. 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.

This design data was reviewed and found to be substantially correct and valid. Therefore, it was used extensively in preparing Section 5 and Appendix D of this report.

2.2 Construction Data

"As Built" record drawings were available for the West Lake dam. These drawings have been reviewed and found to show good agreement with the design drawings and visual inspection.

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

2.3 Operational Data

The dam is self regulating, therefore, no operational data is available. Under normal conditions the hydraulics of the principal spillway 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.

(6) *Downstream Channel:*

a)	Principal Spillway:	Riprapped channel 115± ft. to natural stream channel through fairly steep narrow valley
b)	Emergency Spillway:	Grass covered, earth excavated channel 270± ft. to wooded growth area discharging into natural stream channel 600± ft. downstream off dam

(j) Regulating Outlets

The only regulated outlet from the dam is the pond drain which is controlled by a manually operated 30 inch square sluice gate. This gate is located on the inside face of the pond side wall of the principal spillway riser with its invert at elevation 1,552.5. The floor stand operator is located on the top of the principal spillway riser. The gate is a Rodney Hunt, non seating head type, with a rising stem operator having the following identification:

52796-2
S-2600A

The gate is normally in the closed position, and only rarely operated for maintenance checks.

6) Zoning - Homogeneous, semi-pervious silty sand

7) Impervious Core - None

8) Cutoff - Variable width and depth, semi-pervious silty sand 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 excavated channel with level control section

2) Length of weir:

a)	Pond drain inlet:	30 inch diameter pipe
b)	Low stage inlet:	Rectangular orifice 28" wide x 16" high
c)	High stage inlet:	4 @ 4.5 ft. = 18 ft.
d)	Emergency spillway:	100 ft.

(3) Crest Elevation

a)	Pond drain inlet:	1,552.5 inv.
b)	Low stage inlet:	1,566.0
c)	High stage inlet:	1,568.0
d)	Emergency spillway:	1,571.0

(4) Gates: 30 inch square sluice gate on pond drain inlet

(5) Upstream channel:

a)	Principal Spillway:	Reservoir
b)	Emergency Spillway:	Grass covered earth excavated channel. 380± ft. to control section

3) Emergency spillway crest pool - Same as 2)

4) Top of dam - 3200 ft±

5) Test flood pool - Same as 4)

(e) Storage (acre-feet)

1) Normal pool - 480

2) Flood control pool - 820

3) Spillway crest pool

a) Low stage crest - 480

b) High stage crest - 608

c) Emergency spillway - 820

4) Top of dam - 1130

5) Test flood pool - 1180 (Dam overtopped by 0.5 ft)

(f) Reservoir Surface (acres)

1) Normal pool - 60

2) Flood-control pool - 74

3) Spillway crest

a) Low stage crest - 60

b) High stage crest - 66

c) Emerg. spillway crest - 74

4) Test flood pool - 83.2

5) Top of dam - 83.2

(g) Dam

1) Type - Earth embankment

2) Length - 920 ft±

3) Height - 25 ft±

4) Top Width - 12 ft

5) Side Slopes - 3 hor. on 1 vert. both faces, with 8 ft. horizontal berm at elev. 1566 of upstream embankment

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 36 inch, Invert Elev. 1552 and Discharge Capacity 157 cfs.

2) Maximum known flood at dam site - Unknown

3) Ungated spillway capacity at top of dam - 2160 cfs at 1575 elev.

4) Ungated spillway capacity at test flood elevation - 2490 cfs at 1575.5 elev. (Dam overtopped by 0.5 ft)

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 - 2490 cfs at 1575.5 elev. (Same as #4)

8) Total project discharge at top of dam - 2160 cfs at 1575.0 elev. (Same as #3)

9) Total project discharge at test flood elevation - 2490 cfs at 1575.50 elev.

(c) Elevation (ft. above MSL, NGVD)

1) Streambed at toe of dam - 1550±

2) Bottom of cutoff - 1547.5±

3) Maximum tailwater - Unknown

4) Recreation pool - 1566

5) Full flood control pool - 1571

6) Emergency spillway crest - crest elev. = 1571 ungated

7) Design surcharge - 1571

8) Top of dam - 1575.0

9) Test flood surcharge - 1575.5 (Dam overtopped 0.5 ft)

(d) Reservoir (Length in feet)

1) Normal pool - 2980 ft±

2) Flood Control pool - 3110 ft±

(f) Operator

The operation of the West Lake dam is the responsibility of the Commonwealth of Massachusetts, Division of Forests and Parks. The regional office responsible for the dam is as follows:

Commonwealth of Massachusetts
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 West Lake dam is a multiple-purpose dam which maintains a low level recreation pool and provides flood water storage to reduce downstream flooding from the dam's drainage area. Stored flood water is gradually released through low and high stage inlets of the principal spillway.

(h) Design and Construction History

The West Lake dam was designed by the U.S. Department of Agriculture, Soil Conservation Service. It was completed in the fall of 1967 and has been in operation since that time. A modification consisting of the installation of drains along the left abutment was completed in the fall of 1968.

(i) Normal Operation Procedure

The West Lake dam is normally self regulating with the only controlled outlet being the pond drain. This outlet is operated only as part of infrequent maintenance checks.

1.3 Pertinent Data

(a) Drainage Area

The drainage area for the West Lake dam covers approximately 1.46 square miles. The central portion of the drainage area is a swampy area from which Morley Brook orginates, 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 primarily off of Stump Road and West Street.

(b) Discharge at Dam Site

Normal discharge at the site is via the low and high stage inlets to the principal spillway and through the 36 inch diameter outlet conduit to the downstream channel. If flood flows occur of

0.04 ft/ft for about 270 feet where it discharges onto original ground downstream of the dam. The side slopes of the spillway excavation are at 2 horizontal to 1 vertical. The maximum depth of excavation is at the control section and is about 9 feet. The control section is approximately 4 feet below the top of the dam.

4) Foundation and Embankment Drainage (See page B-5)

A 3 foot wide trench drain of clean sand and gravel extends into the foundation materials and the coarse silty sand section of the downstream toe. The trench drain extends from the principal spillway left about 280 ft. and right about 250 ft., with a 10 inch diameter perforated CMP drain pipe extending the full 280 ft. left and 141 feet right of the principal spillway. Both 10 inch diameter trench drain outlet pipes discharge into the impact basin structure at the outlet of the principal spillway.

A blanket drain extends from the foundation trench drain to the downstream toe of the dam. The construction drawings indicate a rock toe section where the blanket drain intercepts the embankment. The "As Built" record drawings indicate that this riprap was not installed. Refer to drawing details included as Page B-5 of the Appendix for additional details.

(c) Size Classification

The dam's maximum impoundment (computed to the top of the dam) of about 1100 acre-feet and structural height of 25 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 severely damaging about 11 homes with attendant probable loss of more than a few lives, as well as two major highway bridges and three (3) secondary road bridges.

(e) Ownership

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

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

The riser structure is 19 feet high from the base of the foundation to the top of the structure. The inside dimensions are 3 feet x 10 feet with 12 inch thick walls. The inside bottom elevation of the riser structure is 1552.0. The low stage orifice is located on the upstream face and measures 28 inches wide x 16 inches high with an invert elevation of 1566.0. The high stage overflow weirs are formed by the tops of the riser section walls and have a total length of 18 feet with a crest elevation of 1568.0. There are three anti-vortex walls placed perpendicular to and across the top of the weir walls with a solid concrete platform bridging the two upstream anti-vortex walls as the sluice gate operator stand support. The downstream half of the structure has a piece of grating as a walkway and the low and high stage outlets are protected with trash racks consisting of galvanized angle iron.

The sluice gate which controls the 30 inch diameter pond drain is a 30 inch square gate mounted on a 6 inch deep wall thimble. The gate is operated by a rising stem, crank operated, floor stand located on the top of the structure.

The pond drain pipe consists of about 28 feet of 30 inch diameter A.B.B.C.C.M.P. conduit with a reinforced concrete inlet structure. This conduit enters the riser structure through the upstream right side via a 90° bend which has a concrete thrust block support.

The principal spillway structure has a 36 inch diameter outlet conduit to an impact basin located at the downstream toe of the dam. The 36 inch diameter conduit consists of reinforced concrete pipe with a continuous concrete bedding and three reinforced concrete anti-seep collars. The pipe has an inlet elevation of 1552.0 and and outlet elevation of 1551.69 with an overall length of 90.33 feet providing a slope of 0.0034 ft/ft.

The impact basin is constructed of reinforced concrete and is approximately 18 feet long x 14 feet wide with a reinforced concrete baffle spanning across the flow path to dissipate the energy from the high velocity outlet flow from the 36 inch diameter conduit during flood flows.

3) Emergency Spillway (See pages B-2, B-3, and B-4)

The emergency spillway consists of a grass covered earth excavated channel on the right abutment of the dam. The spillway channel has a control section approximately at elevation 1571.0 which is 100 feet wide and 30 feet long. The spillway approach channel, along the centerline, has a flat section for about 190 feet, then slopes upward at 0.02 ft/ft and curves to the left another 190 feet to the control section. The control section is level at elevation 1571 for a distance of about 30 feet. The discharge channel slopes downward at

the Buck River, Clam River and the Farmington River respectively. The dam and impoundment is located off of West Street and is about 1.7 miles from the center of Sandisfield.

The dam is located on the U.S.G.S. Monterey, Mass., quadrangle at latitude N42°-07'-46" and longitude W73°-09'-37". Refer to the location plan, and Appendix B for additional information.

(b) Description of Dam & Appurtenances

The dam consists of an earthfill embankment, a principle spillway consisting of a reinforced concrete drop inlet structure having a two stage riser section, a 36-inch diameter reinforced concrete outlet conduit, and a reinforced concrete impact basin at the conduit outlet. An emergency spillway is located on the right abutment and consists of a grass covered, earth channel excavated in natural ground To the right of the emergency spillway is an earthfill dike which is approximately 30 feet long and 2 feet high.

1) Embankment (See pages B-2 & B-3)

The following information has been taken from the As-Built Drawings dated 1965.

The dam embankment is approximately 920 feet long and has a maximum structural height of 25 feet. The upstream slope is 3 horizontal on 1 vertical and has an 8 foot berm (horizontal section) at elev. 1566.5, which is the approximate level of the normal recreation pool. The downstream slope is 3 horizontal on 1 vertical, and the width of the top of dam is 12 feet. The upstream slope surface is covered with dumped riprap to a level varying from 2 feet to 3 feet above the recreation pool water level.

The earthfill material is a silty sand (SM using Unified Soil Classification System) with fine silty sand comprising the central core, medium silty sand comprising the upstream and downstream outer sections and course silty sand comprising the downstream toe. A cutoff trench consisting of fine silty sand is located beneath the embankment along the centerline of the dam.

The top, downstream embankment, and upper portion of the upstream embankment are covered with grass growth.

2) Principal Spillway (See pages B-4, B-6, B-7, and B-8)

The principal spillway consists of a reinforced concrete drop inlet structure with a sluice gate controlled inlet pipe at invert elevation 1552.5 for the pond drain, an uncontrolled orifice inlet at invert elevation 1566 for the low stage pond outlet, and uncontrolled overflow weirs at elevation 1568 for the high stage pond outlet.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

WEST 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.

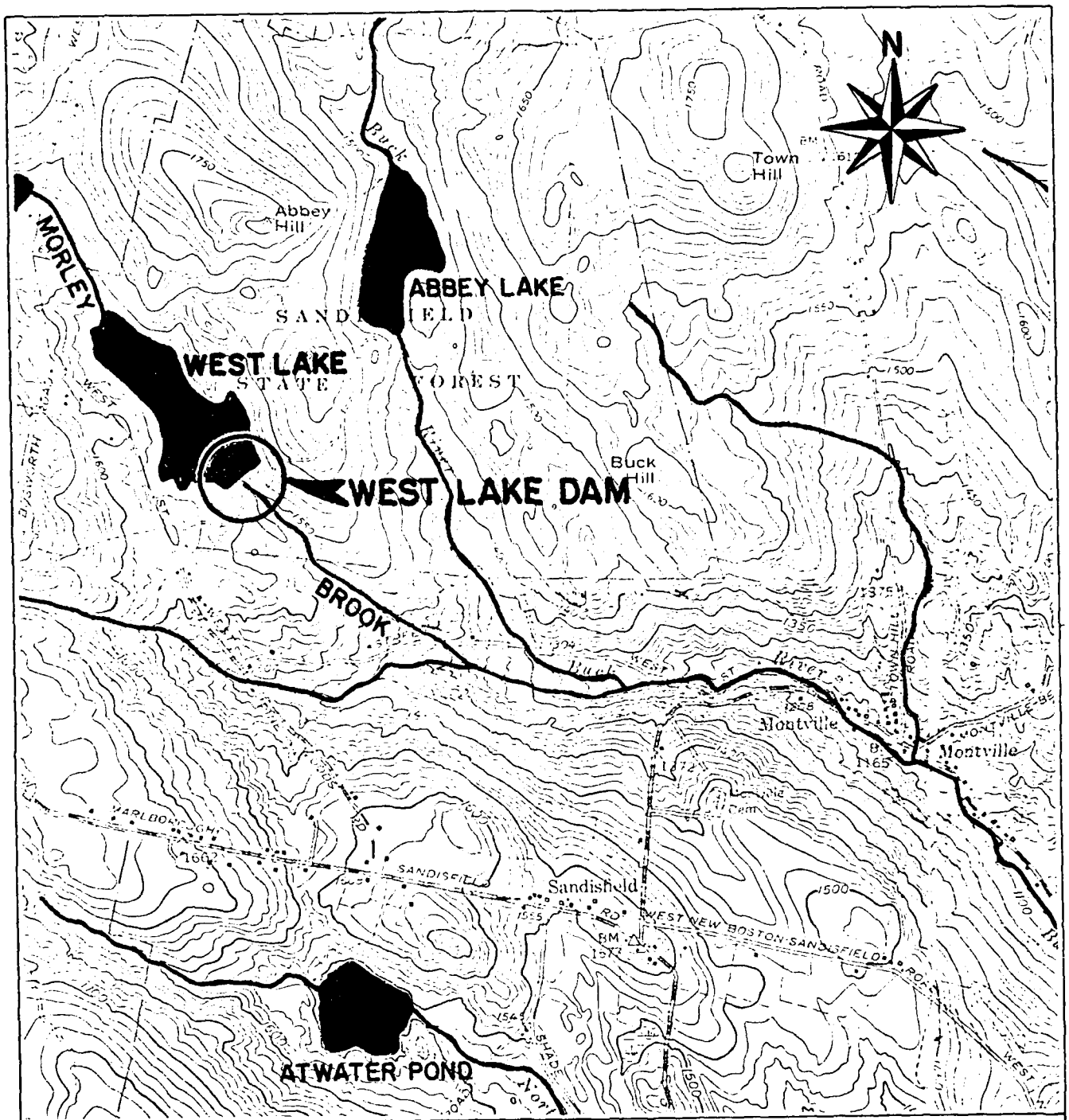
(c) Scope

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 West Lake Dam is located within the Town of Sandisfield, Massachusetts, about two miles upstream from the Village of Montville. The dam is located on Morley Brook which is a tributary to



- SCALE -

1000' 0 1000' 2000' 3000'

FROM: USGS MONTEREY, OTIS, SOUTH SANDISFIELD, AND TOLLAND CENTER, MASS. QUADRANGLE MAPS

(4) QUADRANGLE LOCATIONS

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

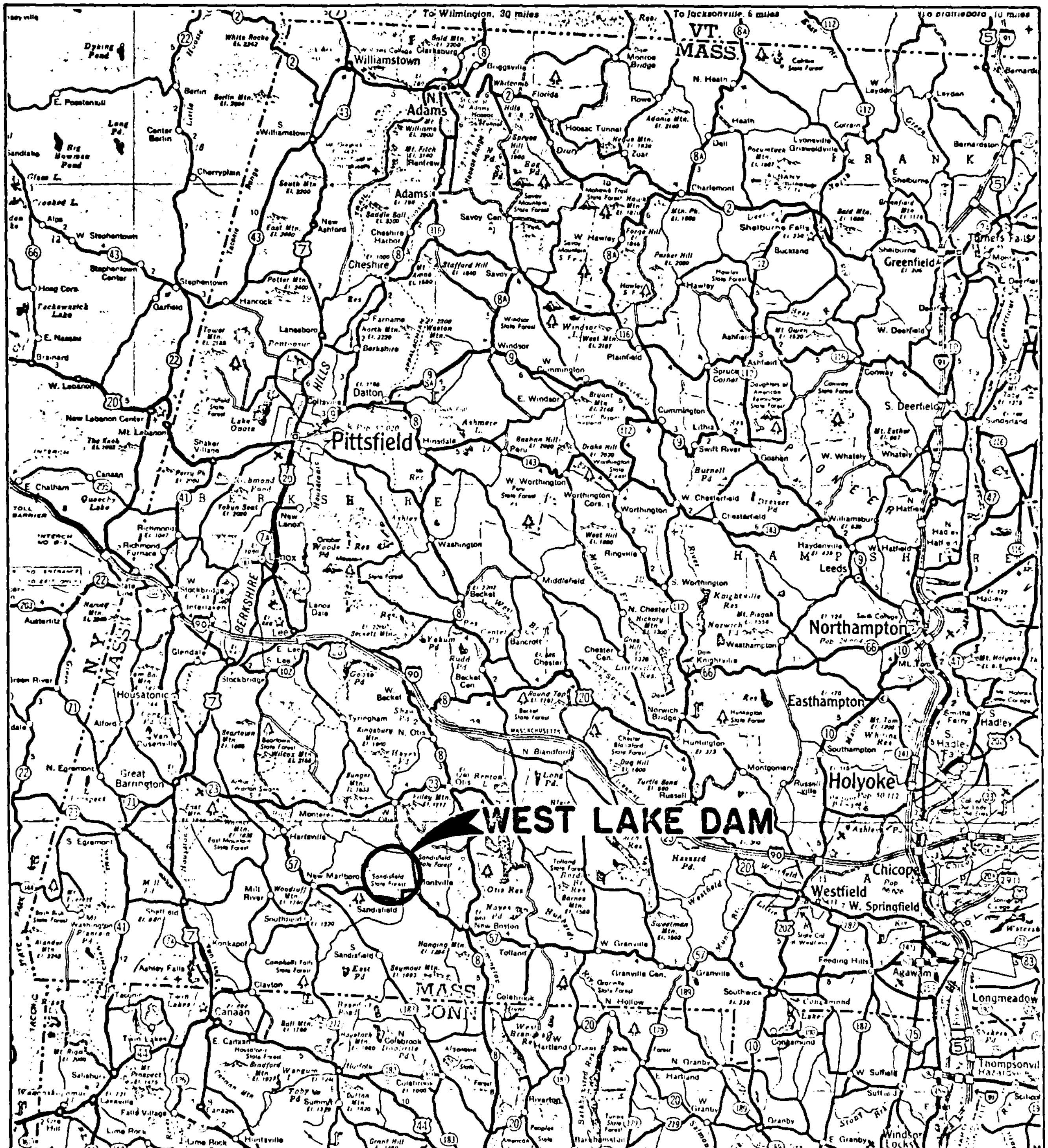
LOCUS PLAN 2

WEST LAKE DAM (MA 00288)
BERKSHIRE COUNTY

MASSACHUSETTS

SCALE: AS NOTED

DATE: DECEMBER 1979



5 0 5 10

SCALE IN MILES

MAP LOCATION

MASS.

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

LOCUS PLAN I

WEST LAKE DAM (MA 00288)
BERKSHIRE COUNTY

MASSACHUSETTS

SCALE: AS NOTED

DATE: DECEMBER 1979

4) Impact Basin

The impact basin was found to be in good condition with only a few minor cracks being visible, and no spalling, or efflorescence. The structure was clear of debris with free unobstructed outflow to the downstream channel.

(d) Reservoir Area

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

(e) Downstream Channel

The downstream channel is in good condition with only a slight amount of vegetation encroachment. The channel immediately downstream of the dam is unobstructed; however, some small tree debris has fallen across the channel as it enters the wooded area about 150 ft. downstream. Riprap protection of the channel is minimal, but appears to be adequate.

3.2 Evaluation

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

a) There is heavy scrub brush and seedling growth on the embankments.

b) There is a wet condition at the downstream toe area over the entire length of the left side of the dam; This condition may affect slope stability. The need for repairing, replacing, or adding to the subsurface drainage system should be investigated.

(c) There is considerable debris accumulated in the interior of the principal spillway.

(d) The anchor bolts on the trash racks should be repaired or replaced. The effectiveness of the present trash rack system in preventing the future accumulation of debris inside of the drop inlet should be investigated.

(e) The anchor bolts on the principal spillway walkway grating project above the walkway surface and create a hazardous condition.

(f) The downstream channel is partially obstructed with fallen trees.

(g) The area at the top of the impact basin endwall should be routinely inspected for settlement. If embankment material is lost through the loose jointing material around the 36 inch conduit, then a depression may appear in this area.

(h) There is a dense stand of small diameter trees along the upstream and downstream toes at the right end of the embankment.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

(a) General

No written operational procedures are available for this dam. The dam is normally self regulating. The sluice gate on the pond drain is normally in the closed position and is not routinely 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 are implemented by the Massachusetts Division of Forests and Parks.

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, the embankments were overgrown with scrub brush and seedlings, and a large amount of accumulated branch debris was inside of the spillway riser. This indicates that a routine maintenance program is not being followed.

(b) Operational Facilities

Discussions with the Division of Forests and Parks personnel indicated that the sluice gate for the pond drain is not routinely operated. A visual inspection of the gate operator indicated that lubrication is required.

There are no other facilities which require operation.

4.3 Evaluation

The extent of the growth on the dam embankments, and the condition of the principal spillway such as missing or broken anchor bolts on the trash racks and accumulated debris, and also the plugged condition of the left toe drain outlet indicate that improvements are needed in the routine maintenance program. These items should be checked and corrected on a routine, frequent basis. Brush and debris collected in and at the principal spillway should be removed on a regular basis, preferably weekly. In addition, the sluice gate should be operated annually as a minimum and kept well lubricated to prevent corrosion and maintain the operator in an operable condition.

Additional emphasis on routine maintenance will assist the owners in assuring the long term safety of the dam.

A formal, written downstream emergency flood warning system should be developed for this dam.

SECTION 5 - EVALUATION OF HYDRAULIC/ HYDROLOGIC FEATURES

5.1 General

West Lake Dam, No. MA 00288, 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 Morley Brook about 2 miles upstream of the Village of Montville in the Town of Sandisfield, Massachusetts. The dam is about 0.75 miles upstream of the confluence with the Buck River; 3.8 miles upstream of the confluence with the Clam River; and 5.7 miles upstream of the confluence with the Farmington River in the Town of New Boston, Massachusetts.

The drainage area upstream of the dam is 1.46 square miles (934 acres) with a mountainous perimeter and a swampy interior from which Morley Brook originates.

Development within the watershed is very limited and consists of approximately 8 structures which appear on the USGS quadrangle sheet. The area is mostly wooded with only a minor amount of open fields.

The dam itself is about 920 feet long and 25 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 36-inch diameter conduit through the dam. An emergency spillway, consisting of a 100 ft. wide earth excavated channel with a grass cover, carries flood flows which exceed the storage capacity of the impoundment around the dam to the downstream channel.

5.2 Design Data

The hydraulic features of the West 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 1964 and 1965.

The SCS has established the elevation of the low stage outlet as 1,566.0 which provides 480 acre-feet of storage including 2 acre-feet of sediment storage. The high stage storage as been set at elevaton 1,568.0 providing an additional 128 acre-feet of storage, and the emergency spillway crest set at elevation 1,571.0 providing an additional 212 acre-feet of storage above the high level pool, resulting in a total flood storage pool of 340 acre-feet.

5.3 Experience Data

No records of flow or stage are known to be available for the West Lake Dam.

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 West 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 Guide curves provided cover drainage areas as small as 2.0 sq. miles, whereas, the West Lake dam drainage area is only 1.46 sq. miles. Due to the non-availability of data for a drainage area of this size, an extrapolation of the guidance curve has been used.

Graphically extending the guidance curve results in a unit discharge of 2,650 cfs per square mile of drainage area which results in a PMF of 3,870 cfs for West 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 substantially correct and valid, 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 test flood through the reservoir indicate that the storage capacity of the impoundment area will reduce the test flood inflow of 3,870 cfs to a reservoir outflow of approximately 2,490 cfs. This assumes that the level of the recreation pond is at elevation 1,568.0 at the start of the storm, and the entire flood storage volume is available. Elevation 1,568.0 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 2,160 cfs. This is 87% of the calculated test flood outflow from the reservoir after routing. Therefore, the dam would be overtopped by about 6 inches.

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 West 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 confluences is PMF test flood for tributary watershed.

For an assumed breach equal to 40 percent of the dam width computed at half height, the breached width is 160 ft. The resulting dam failure flow using a water height of 25 ft. is 33,630 cfs.

The first damage area impacted by a dam failure flow is directly downstream of the dam. Prior to dam breach, the test flood flow is 2490 CFS resulting in a river stage of about 5 feet. After the dam failure the flow is 33,630 CFS resulting in a river stage of about 13 feet. There are no structures or developed areas directly downstream of the dam, therefore, the damage incurred will not be significant.

The second damage area impacted by dam failure flow is at the crossing of West Street about 3,500 feet downstream of the dam. There is one (1) structure shown on the USGS quadrangle and a concrete box culvert at this location. Prior to dam breach, the test flood flow is 2490 CFS resulting in a river stage of about 5 feet. The culvert has a surcharged capacity of 203 CFS, therefore, it is inundated and the roadway is overtopped. Flow will spill out of the main river channel and travel along the North side of West Street and begin to flood the house by about 2 feet. The dam failure attenuated flow is 30,900 CFS resulting in a river stage of about 13 feet. This will increase the depth of flow over West Street by about 5.5 feet and increase the house flooding by about 3 feet to a total inundated depth of about 5 feet. The potential for damage to the house and roadway exists prior to the dam breach occurring, but is significantly increased by the dam failure flow.

The third damage area impacted by dam failure flow is a second crossing of West Street about 7000 feet downstream of the dam. There is one (1) concrete culvert at this location. Tributary flow from the Abbey Lake Dam plus additional drainage area downstream of both West Lake and Abbey Lake converges with the river channel just upstream of this crossing. Prior to dam breach, the test flood flow is 9000 CFS resulting in a river stage of about 7 feet. The culvert has a surcharged capacity of 842 CFS; therefore, it is inundated and the roadway is overtopped. The dam failure attenuated flow is 35,600 CFS resulting in a river stage of about 12 feet. This will increase the depth of flow over the road by about 5 feet and significantly increase the potential for damage.

The fourth damage area impacted by dam failure flow is the Route 57 crossing about 10,500 feet downstream of the dam. There is a steel beam single span bridge at this location. Prior to dam breach, the test flood flow is 9000 CFS resulting in a river stage of about 11 feet. The bridge has a surcharged capacity of 1765 CFS; therefore, it is inundated and the roadway is overtopped. There are three (3) houses located upstream of the bridge which are less than 10 feet above the river channel. These houses will be flooded by about 3 feet. The dam failure attenutated flow is 33,300 CFS resulting in a river stage of about 16 feet. This will increase the depth of flow over the roadway by about 5 feet, and increase the house flooding to a total inundated depth of about 8 feet. Two (2) additional houses located upstream of the bridge will be flooded to a depth of about 2 feet and 4 feet due to the dam failure flow. The dam failure flow significantly increases the potential for damage to the major highway bridge and three (3) houses flooded by the prefailure test flood flow and inundates two (2) additional houses.

The fifth damage area impacted by the dam failure flow is the Village of Montville located along Route 57. Tributary flow converges with the river channel in the Village area and results in a prefailure test flood flow of 12,000 CFS and a river stage of about 6 feet. There are three (3) houses which are only a few feet above the river channel. These houses will be flooded by about 2 feet. The dam failure attenuated flow is 31,600 CFS resulting in a river stage of over 10 feet. The river stage will exceed the height of the Route 57 embankment and flood the north side of the roadway. The three (3) houses flooded by pre-failure flow will be flooded to a depth of about 6 feet and seven (7) additional houses will be flooded to a depth of about 4 feet. The dam failure flow results in overtopping the major highway embankment and flooding seven (7) houses in addition to the three (3) houses flooded by the prefailure flow.

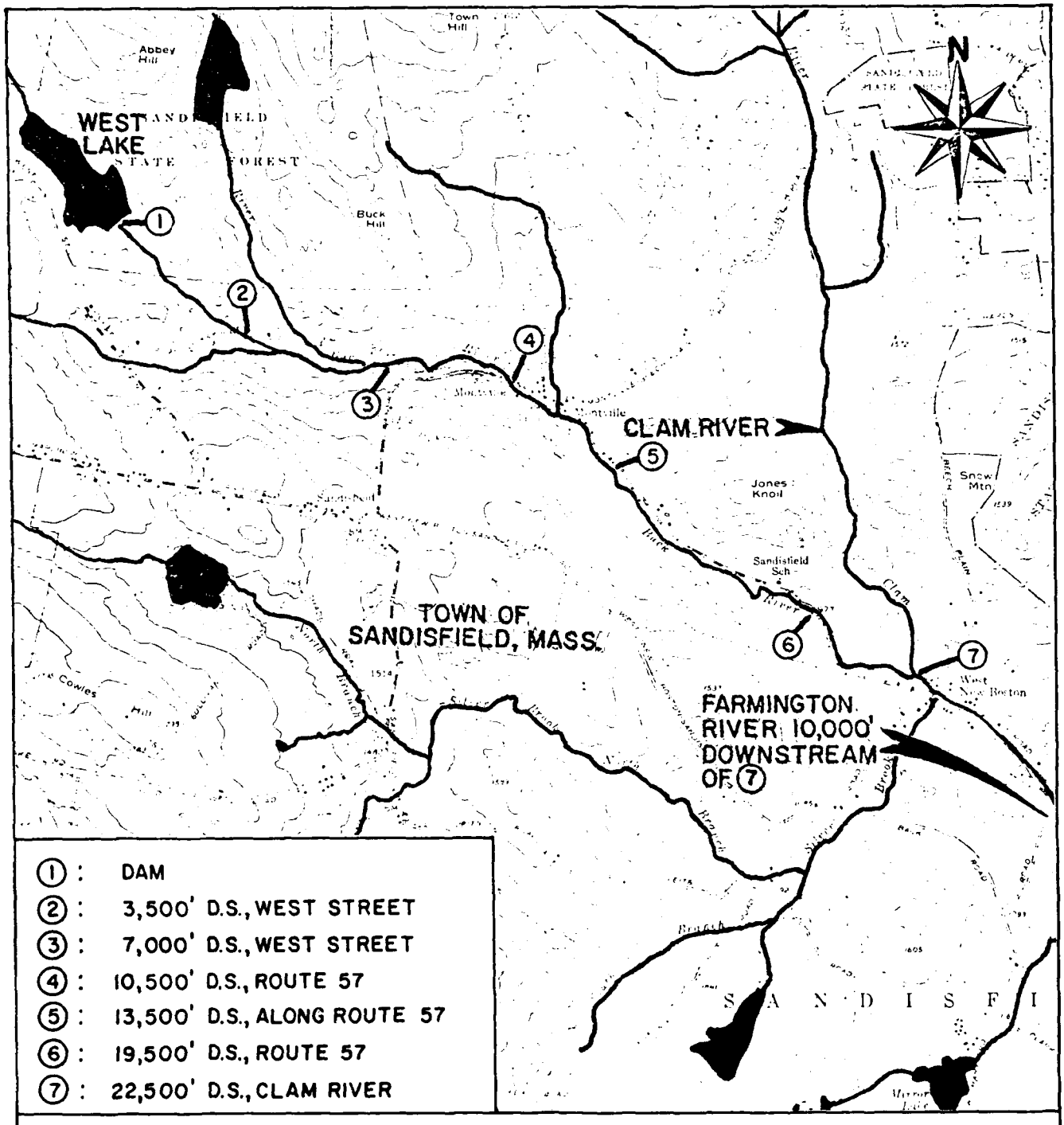
The sixth damage area impacted by the dam failure flow is a second crossing of Route 57 about 19,500 feet downstream of the dam. There is a steel beam single span bridge at this location. Prior to dam breach, the test flood flow is 12,000 CFS resulting in a river stage of about 8 feet. The roadway bridge is estimated to have a surcharged capacity of 2000 CFS; therefore, the bridge will be inundated and the roadway overtopped. The dam failure attenuated flow is 31,000 CFS resulting in a river stage of about 12 feet. At this river stage, a substantial amount of flow will spill out of the main channel and travel along the south side of Route 57. Ths will flood one (1) house to a depth of about 5 feet. The dam failure flow significantly increases the potential for damage to the major roadway bridge and floods one (1) house.

The seventh damage area impacted by dam failure flow is at the confluence with the Clam River just upstream of the Town of New Boston. Tributary flow from the Buck River drainage area results in a prefailure test flood flow of 14,900 CFS just upstream of the Clam River confluence. This results in a river stage of about 11 feet. There are two (2) houses which are less than 10 feet above the river channel. These will be flooded by about 4 feet. The dam failure attenuated flow

is 31,200 CFS resulting in a river stage of about 15 feet. This floods one (1) additional house by 4 feet and increases the depth of flooding to 8 feet for the prefailure flooded houses.

Downstream of the Clam River confluence, the net increase in river stage due to the West Lake Dam failure is about 1.5 feet. This increase will not significantly increase the damage potential to the downstream area.

In summary, the dam failure flow in conjunction with the PMF test flood flows from the tributary areas, has a high potential for severely damaging or destroying 11 homes with attendant probable loss of more than a few lives. The dam failure flow would result in overtopping the Route 57 highway embankment within the Village of Montville with a high potential for major damage to the primary roadway. In addition, the dam failure flow would greatly increase the probability of destruction of 2 primary roadway bridges, and 3 secondary roadway culverts. Downstream of the confluence with the Clam River in New Boston, the affects of a dam failure occurring during a PMF occurrence are negligible.



- SCALE -

1000' 0 1000' 2000' 3000' 4000' 5000'

FROM: USGS MONTEREY, OTIS, SOUTH SANDISFIELD, AND TOLLAND CENTER, MASS. QUADRANGLE MAPS

(4) QUADRANGLE LOCATIONS

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

WEST LAKE DAM (MA 00288)
BERKSHIRE COUNTY
MASSACHUSETTS

SCALE AS NOTED

DATE DECEMBER 1979

PROBABLE DOWNSTREAM IMPACT BEFORE AND AFTER DAM FAILURE

West Lake Dam MA 00288

Location	No. of Houses	Other Damage	Flow Rates		River Stage		Comments
			Before Failure CFS	After Failure CFS	Before Failure FT.	After Failure FT.	
1 Downstream of Dam	0	0	2490	33,360	5	13	No significant damage
2 3500' downstream at West Street	1	2 culverts	2490	30,900	5	13	Before failure culvert inundated, 1 house flooded 2 ft; after failure house flooded 5 ft.
3 7000' downstream at West Street	0	1 culvert	9000	35,600	7	12	Before failure culvert inundated
4 10,500' downstream at Route 57	5	1 bridge	9000	33,300	11	16	Before failure bridge inundated, 3 houses flooded 3 ft; after failure 3 houses flooded 8 ft; 1 house flooded 4 ft, 1 house flooded 2 ft.
5 13,500' downstream	10	Route 57 Roadway	12,000	31,600	6	10+	Before failure 3 houses flooded 2 ft; after failure 3 houses flooded 6 ft, 7 houses flooded 4 ft, Rt. 57 embankment inundated

Location	No. of Houses	Other Damage	Flow Rates Before Failure CFS	Flow Rates After Failure CFS	River Stage Before Failure FT.	River Stage After Failure FT.	Comments
6 19,500' downstream at Route 57	1	1 bridge	12,000	31,000	8	12	Before failure bridge inundated; after failure 1 house flooded 5 ft.
7 22,500' downstream at New Boston	3	---	14,900	31,200	11	15	Before failure 2 houses flooded 4 ft; after failure 2 houses flooded 8 ft, 1 house flooded 4 ft.

Total No. of houses flooded before failure = 9
Total No. of houses flooded after failure = 20

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation

The visual inspection of the dam embankments did not identify any conditions indicating instability of the slopes. No settlement, sloughing, or piping was observed, and no cracking of the surface could be detected.

The large extent of wetness downstream of the left embankment is of concern, however, and should be investigated further to determine what affects, if any, it may have on the downstream slope and foundation stability.

6.2 Design and Construction Data

a) Embankment

Analysis carried out during the design phase included an embankment slope stability analysis by the "Swedish Circle" method. Based on this analysis a 3 horizontal to 1 vertical embankment slope was utilized.

b) Appurtenant Structures

A review of the structural calculations for the design of the principal spillway structure and the outlet conduit revealed that these structures have been designed on the basis of sound engineering practice.

6.3 Post Construction Changes

The only post construction modification of the West Lake dam has been the installation of tile drains along the left abutment. This was completed in 1968, one year after the dam itself was completed. The SCS personnel determined that side hill seepage from the left abutment area was a problem, thus added a shallow drain system along this area.

The visual inspection identified a large amount of wetness near the left abutment, and downstream of the left embankment. This may indicate ineffective and/or inadequate operation of the drain system.

6.4 Seismic Stability

The West 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 FAIR condition due to the wet condition of the left downstream toe area.

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

7.2 Recommendations

The recommendation of this Phase I investigation is that the following additional study be made under the supervision of a registered professional engineer:

(a) Determine the cause of the wet condition of the area downstream of the left embankment. The condition should be investigated to determine its effects on the stability of the dam and foundation material, and to determine what corrective measures may be required.

7.3 Remedial Measures

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

(a) Clear scrub brush and seedling growth from the embankments, and maintain embankments clear of such growth and mowed.

(b) Clear debris from the interior of the principal spillway.

(c) Determine the effectiveness of the present trash rack system in preventing future accumulation of debris inside of the principal spillway. Modify racks as required to provide better interception of debris outside of structure.

(d) Repair or replace broken anchor bolts on the trash racks.

(e) Correct hazardous projection of anchor bolts on the principal spillway walkway grating.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
29 Cottage Street
Amherst, Massachusetts 01002

REPORT OF ANNUAL INSPECTION
CLAM RIVER WATERSHED
West Lake Site
by
Donald M. Stockwell

On June 26, 1967, the following people met at the West Lake site for the purpose of conducting the annual inspection:

Thomas Doucette, Water Resources Commission
Colonel K. S. Hand, of Sandisfield
Mr. Wilson, a visitor
John Folan, Soil Conservation Service
James Elasmar, Soil Conservation Service
Christopher Moustakis, Soil Conservation Service
Donald Stockwell, Soil Conservation Service

The West Lake site had been seeded as a dormant seeding last winter. Germination had occured so recently that no vegetative recommendations were made. A catch had been obtained on all seeded areas except for a portion of the emergency spillway control section. It is possible that a rather heavy application of the asphaltic emulsion on the control section may have delayed the germination of the seed. It was thought that more of the seed would still germinate and that the area should be watched and reported on the condition of the vegetative cover at this location be prepared again next year.

Donald Stockwell explained to the group that the Service had noticed problem areas along the berm and along the downstream left gutter and was proposing corrective measures. He explained that if the parties who shared the original construction costs approved of the proposal for corrective actions, the work would be installed and paid for as a construction cost. The left abutment of the dam had dried up considerably since spring and it was decided that the upper of the two proposed corrective tile lines was not needed.

Colonel Hand discussed the unfilled cellar hole with Thomas Doucette and requested that the work be included in the recreational development plans.

Colonel Hand pointed out drainage problems at the borrow area adjacent to the barn and at the West Beach area. As both areas were only supposed to be rough graded under the prime contract, Donald Stockwell pointed out that any work needed or plans to improve adverse moisture conditions would have to be incorporated in the recreational development plan.

A considerable amount of debris had washed up along the entire shoreline. Debris along the berm will be removed in the course of performing the

Date	Inspecting Agency
4/26/76	See Listing on Report
4/26/77	"
10/4/78	"
7/29/79	"

3. "As Built" Drawings

Page No.	Description
B-1	Cover Sheet
B-2	Plan of Storage and Borrow Areas
B-3	Plan of Dam & Emergency Spillway
B-4	Profiles
B-5	Drainage Details
B-6	Plan-Profile of Principal Spillway
B-7	Riser Details
B-8	Cradle, Collar, Pond Drain Inlet & Steel Sch.
B-9	Log of Test Holes
B-10	Log of Test Holes
B-11	Log of Test Holes
B-12	Log of Test Holes

APPENDIX B

ENGINEERING DATA
INDEX

1. Design and Construction Records:

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

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
"as built" drawings

2. Inspection Reports

Date	Inspecting Agency
6/26/67	See Listing On Report
5/22/68	"
5/19/69	"
6/11/70	"
9/17/70	"
5/21/71	"
7/25/72	"
6/25/73	"
7/17/74	"

APPENDIX B

ENGINEERING DATA

INSPECTION CHECK LIST

PROJECT West Lake Dam DATE 11/1/79

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

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

INSPECTION CHECK LIST

PROJECT West Lake Dam DATE 11/1/79

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	Emergency Spillway
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None - earth excavation
Trees Overhanging Channel	None
Floor of Approach Channel	Heavy sod cover, wet on east side
b. Weir and Training Walls	
General Condition of Concrete	N/A
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None - earth excavation
Trees Overhanging Channel	1 or 2 small trees - minor
Floor of Channel	Heavy sod cover, wet on east side
Other Obstructions	None
	Measured width - 100 ft. D.S. slope = 4.3%± Central section measured at 3.2 ft. above W.L. = elev. 1571.2 Channel discharges into wooded area with heavy small growth.

INSPECTION CHECK LIST

PROJECT West Lake Dam DATE 11/1/79

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Good
Rust or Staining	None
Spalling	None
Erosion or Cavitation	None visible
Visible Reinforcing	None
Any Seepage or Efflorescence	Slight efflorescence at minor crack on left wing wall
Condition at Joints	Good - some sand seepage & grass growth at 36" pipe entrance to structure, minor.
Drain holes	2 toe drain outlets, no weep holes
Channel	
Loose Rock or Trees Overhanging Channel	Some small tree growth on edges
Condition of Discharge Channel	Channel is free from debris, some vegetation encroachment just downstream of outlet structure. Some small trees down across channel about 250 ft. downstream. General condition is fair to good.

INSPECTION CHECK LIST

PROJECT West Lake Dam DATE 11/1/79

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Good
Rust or Staining on Concrete	None
Spalling	None
Erosion or Cavitation	None visible
Cracking	None
Alignment of Monoliths	Good
Alignment of Joints	Good alignment - dry joints
Numbering of Monoliths	N/A
	Outlet conduit is 36" diameter with 6 pipe sections. All 6 joints are dry on interior and alignment is good.
	Water depth @ outlet = 3-1/4".
	The inlet of the 36" dia. conduit is clogged with debris consisting mostly of tree branches. The degree of clogging is quite severe.

INSPECTION CHECK LIST

PROJECT West Lake Dam DATE 11/1/79

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	Note: loose and missing anchor bolts on trash racks. Manhole steps have been cut off flush with concrete.
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	None visible from top of riser
Cracks	None visible
Rusting or Corrosion of Steel	None visible
b. Mechanical and Electrical	No Electrical
Service Gate	Pond Drain sluice gate:
Note: There are no other Mechanical or Electrical Features	1. Rodney Hunt 52796-2 S-2600A 2. Condition is good 3. Branches lodged on stem guides

INSPECTION CHECK LIST

PROJECT West Lake Dam DATE 11/1/79

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	N/A
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	N/A
Condition of Concrete	
Stop Logs and Slots	

INSPECTION CHECK LIST

PROJECT West Lake Dam DATE 11/1/79

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	Measured 8.3' above W.L. 1568± + 8.3 = 1576.3±
Current Pool Elevation	1/2 inch over spillway weir elev. 1568±
Maximum Impoundment to Date	Unknown
Surface Cracks	None visible - heavy grass cover would not reveal small cracks if present
Pavement Condition	N/A
Movement or Settlement of Crest	None apparent
Lateral Movement	None apparent
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Surface water erosion down U.S. embank. to principal spillway. Some erosion at W.L. surface into embank.
Indications of Movement of Structural Items on Slopes	None apparent
Trespassing on Slopes	None apparent
Vegitation on Slopes	Brush & weeds both U.S. & D.S., heavy
Sloughing or Erosion of Slopes or Abutments	None apparent
Rock Slope Protection - Riprap Failures	No failures - top of rip-rap is 2-3 ft. above spillway weir
Unusual Movement or Cracking at or near Toes	None apparent
Unusual Embankment or Downstream Seepage	D.S. toe is wet along entire east side, little visible flow, much standing water Seeps are clear.
Piping or Boils	None apparent
Foundation Drainage Features	Toe drains both left & right discharge to outlet structure
Toe Drains	East toe drain outlet found plugged, cleared blockage, now flows clear.
Instrumentation System	None

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT West Lake Dam
MA 00288

DATE 11/1/79

TIME 8:00 A.M.

WEATHER Cloudy & Cool

W.S. ELEV. 1568+ U.S. ____ DN.S.

PARTY:

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

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

Also present:

R. Curran, U.S.D.A., Soil Conservation Service
C. Curtin, Massachusetts Division of Forests & Parks
R. Rando, Massachusetts Division of Forests & Parks

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

(f) Routinely check the foundation drain outlets to maintain the pipe outlets free from blockages and fully opened.

(g) Routinely check the embankment at the impact basin endwall for depressions or settlements due to a possible loss of material through the loose jointing material.

(h) Clear the downstream channel of fallen trees (250 ft. downstream).

(i) Operate the pond drain sluice gate at least annually as a maintenance check and maintain the operator well lubricated.

(j) Prepare a formal written downstream emergency flood warning system.

(k) Remove small diameter trees along the right end of the embankment and maintain an area of about 20 feet horizontally from each toe clear of trees.

(l) Continue the program of annual peridic technical inspections.

7.4 Alternatives

There are no meaningful alternatives to the above recommendations.

corrective work. No recommendations were made concerning the remaining debris. (It was pointed out that the Corps of Engineers occasionally requires the contractor to fill the permanent pool, float, corral and then guide the floating debris to a given point for subsequent removal. Such action might be considered for inclusion in subsequent PL 566 contracts.)

Donald M Stockwell

Donald M. Stockwell/mgc
Design Engineer
July 3, 1967

cc : M. Graf, Water Resources Commission
T. Doucette, Water Resources Commission
L. Diamond, Department of Natural Resources
Col. K. Hand, Sandisfield Conservation Commission
W. Warren, MUC
M. Meyers, Berkshire Conservation District
J. Elasmar, Project Engineer
K. Klingelhofer
C. Brown
C. Moustakis
B. Gullion, Department of Natural Resources
G. Bliss, Area Supervisor, Dept of Nat Res

U-11

TO: WATERSHED UNIT FILE

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
29 Cottage Street
Amherst, Massachusetts 01002

May 22, 1968

On May 1, 1968, the following people met at the Clam River Watershed, West Lake site, for the purpose of conducting an annual inspection on the Abbey and West Lake sites.

Thomas Doucette, Water Resources Commission
Henry Mathew, Assistant Superintendent, Mass. Div. of Forests and Parks
Carl Curtin, Mass. Div. of Forests and Parks
Stanley Linkovitch, Selectman, Sandisfield, Mass.
Colonel K. S. Hand, of Sandisfield
J. Czak, University of Massachusetts
W. Meyer, Chairman, Berkshire (County) Conservation District
W. Heaphy, Berkshire County Engineer
E. Turner, Berkshire County Engineer Office
G. Laycoc, Berkshire County Engineer Office
G. Garaini, Berkshire County Engineer Office
W. Warren, Soil Conservation Service, Pittsfield
C. Moustakis, Soil Conservation Service, Amherst
C. Dodge, Soil Conservation Service, Amherst

West Lake site

This site was completed in the Fall of 1967 and was modified in the Fall of 1968.

Trash has plugged the low stage opening of the riser. The pool will be lowered and trash removed in one week. It appears that ice has broken all the steps out of the riser. Since steps have been deleted from later sites, no recommendation was made on this item.

The gutter on the left abutment is carrying surface water. The tile line installed under the modification has partially drained the wet area on the left abutment. Water is flowing from the left abutment drain pipe. The gutter on the right side shows a few holes due to settlement in the disposal area. No action required at this time.

There are still wet areas in portions of the emergency spillway (primarily the inlet portion). These have been noted previously and are not considered serious. Some erosion was noted in the area of the old access road. This area was seeded in the Fall of 1967. These areas should be checked periodically and corrective measures taken if conditions become critical.

The construction of the new access road has created some ponding between the emergency spillway and the rock ford. Areas of this road are quite wet. It is suggested that ditching and/or culverts be considered for this area.

All areas of this site prevously seeded need to be limed and fertilized.

Soil tests were made last fall and recommendations for liming and fertilizing submitted by the Department of Plant and Soil Science, University of Massachusetts. On the day of the inspection, it was suggested to the local sponsors that those responsible for O-M take immediate action to lime and fertilize all areas. Application of the materials should be completed by the end of May.

Abbey site

This site was completed in the Fall of 1967. In general, it appears to be in very good condition. There is a small amount of trash at the riser which will be removed. There is some rill erosion on the left side of the outlet channel above the rip-rap. This does not appear serious, but should be checked periodically and reseeding performed when needed.

The emergency spillway presents most of the problems on this site. The disposal area off the left side of the downstream end of the emergency spillway has considerable erosion and settlement. While this is unsightly, it does not create any danger to the structure or effect the operation of the emergency spillway. It is doubtful that drainage could be installed in the disposal area due to presence of rocks and stumps. One solution would be to fill in the eroded and settled areas and reseed. No action is required now.

There is some slumping of the disposal area on the right side of the downstream end of the emergency spillway. At present this is not serious, but it should be checked in July and appropriate action taken.

The left side of the emergency spillway approach channel is wet. This is not a serious condition, but should be checked in July and appropriate action taken.

Water has started a rill on the right side of the emergency spillway discharge channel and is washing over the disposal area.

Reseeding of eroded areas in the emergency spillway discharge channel and the water spreading area to the right of the discharge channel is recommended. A re-evaluation of this problem should be made in July and appropriate action taken.

[illegible] INSPECTION REPORT, VEGETATIVE [illegible]

[illegible] 10, 1968 [illegible]

TIP LAKE: Seeding of the embankment was experimental with strips of various grass and legume species and combinations running at right angles to the center line of the dam. The Crown Vetch strips were excellent. Flat Pea was doing well. Birdsfoot Trefoil was spotty although on one strip it was seeding itself in. Grass strips were poor to terrible and in need of heavy fertilization especially with nitrogen. The topdressing recommendations for 1968 called for 40 lb. N., 80 lb. P_2O_5, 80 lb. K_2O per acre. Was this applied? I recommend that if the trials are complete, the grass areas be reseeded to crown vetch; if not, topdress grass areas with 1000 lb. 10-5-4 with 50% of nitrogen in organic form. Legume areas should be topdressed again this year but 400 lb. of 0-20-20 or equal could be substituted for the 1-2-2 ratio recommended last year.

The entrance channel and control section of the Emergency Spillway was so wet this year that large areas of grass cover drowned out completely. Either the EC should be tile drained or it should be seeded to Reed Canary Grass. With consideration of the soil tests made in Nov. 1967, I recommend working in 25 lb. 12-12-12 or equal and seeding to 1 lb. Reed Canary Grass per 1000 square feet.

Other seeded areas around the dam (spoil deposits, etc.) are in good legume - grass cover and annual topdressing should be continued as last year. The borrow area and picnic area have low quality grass cover and topdressing as recommended last year should be continued or increased. The two beaches are in poor cover with the bay beach kept very wet by seepage from the cut bank (see Technical Team report of 1968 on West Lake Complex for drainage recommendations and planting recommendations for the bank). Presumably, treatment of the beaches will be covered in the State's development plans and will include sanding.

Protection of the emergency spillway from vehicular encroachment by means of a barrier along the northwest bank is necessary and was also covered in the Technical Team Report. A small gully caused by such traffic should be cleaned out, repaired with earth, limed fertilized and seeded and protected from surface water with a diversion channel above it until healed.

The rock ford on the access road below the dam is in bad condition and as recommended in the Technical Team Report should be replaced with a bridge or properly paved ford.

As recommended in the Technical Team Report, the bank at the east end of the dam should be cleared of overhead shade to permit effective seeding to grass cover.

Carry out all topdressing and seeding operations mentioned above Sept. 15th to 20th.

(cont. on page2)

The Commonwealth of Massachusetts
Water Resources Commission
Leverett Saltonstall Building, Government Center
100 Cambridge Street, Boston 02202

OFFICE OF THE DIRECTOR
DIVISION OF WATER RESOURCES

September 17, 1970

Karl R. Klingelhofer
State Conservation Engineer
Soil Conservation Service
29 Cottage Street
Amherst, Mass. 01002

Re: Watershed Maintenance

Dear Karl:

Enclosed please find a completed copy of your Summary of Maintenance Needs.

~~In the Quaboag Watershed all seeding had to be deleted from the maintenance contract due to budgetary limitations.~~

Work done on the Clam Watershed was unsatisfactory and the contractor has been ordered to complete the maintenance there. So far all the work that has been done to our satisfaction are the filling of animal holes at the Abbey Site and the removal of dead trees beside the permanent pool at the West Lake Site. All three sites were supposedly limed and fertilized under the supervision of the Division of Forests and Parks.

As yet we know of no effective way to eliminate motor cycle and horse traffic on the sites. Four wheel vehicles for the most part have been kept off the sites.

~~Some of the work on the Horse Pond site such as removal of brush and dead trees can be done in the future by the clearing contractor. This was taken into consideration when the maintenance contract was written.~~

~~The contract for maintenance on the SuAsCo and Quaboag Watersheds was awarded to Caprera Construction Co. of Boylston, Massachusetts with bids of $9,722.50 and $5,600.00 respectively. The maintenance contract for the Clam Watershed was awarded to Arello, Inc. with a low bid of $4,250.00~~

Very truly yours,

Thomas F. Doucette

Thomas F. Doucette
Principal Civil Engineer

SEP. 2 1970

SUMMARY OF MAINTENANCE NEEDS AND ACCOMPLISHMENTS IN CLAM WATERSHED - 1970 ON PL-566 COMPLETED STRUCTURES IN MASSACHUSETTS

WATERSHED	STRUCTURE	NEED	ACCOMPLISHMENT (Date and Remarks)	APPROXIMATE COST
CLAM	West Lake	1. Mow and rake. 2. Fertilize small area on top of dam with 15-10-10 at 400 lb/acre. 3. Remove debris, branches, and tree stump around riser. 4. Clean outlet channel. 5. Replace trash bar on south corner of low stage trash rack. 6. Downed dead trees at the east end of the dam should be removed. 7. Dig a small ditch to connect seep at east abutment to upstream and downstream gutters of dam.	See attached letter for accomplishments in Clam River Watershed.	$2610.00
	Abbey Lake	1. Upstream slope of dam should be fertilized with 10-10-10 at 400 lb/acre on predominantly grass areas where legumes prevail fertilized with 400 lbs of 0-20-20 or equivalent per acre. 2. Fertilize slopes of emergency spillway with 10-10-10 at 400 lb/acre on predominantly grass areas. Slope area at southeast end of emergency spillway should be over-seeded. Where legumes prevail fertilize with 400 lbs. of 0-20-20 or equivalent per acre.		~~$600.00~~

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
29 Cottage Street
Amherst, Massachusetts 01002

REPORT OF THE ANNUAL INSPECTION

CLAM RIVER WATERSHED

June 11, 1970

On May 15, 1970 the following met at the West Lake Site, Clam River Watershed in the town of Sandisfield, Massachusetts for the purpose of conducting the annual inspection of the West Lake Site, the Abbey Site and the South Silver Site:

Thomas Doucette, Water Resources Commission
Fletcher Pyle, Water Resources Commission
Richard Spofford, Water Resources Commission
William Heaphy, County Engineer
Robert Saulnier, Assistant County Engineer
Colonel Hand, Sandisfield, Massachusetts
Stetson Adams, Department of Natural Resources
Edward Konieczny, Soil Conservation Service
James Elasmar, Soil Conservation Service

WEST LAKE SITE

The general appearance of the vegetative cover looks good. There is still a small area on top of the dam that needs to be fertilized with 15-10-10 at the rate of 600 lbs. per acre. 15-10-10 or 10-10-10 or equivalent of either fertilizer is acceptable. Area on the downstream side of the east abutment of the dam is covered with cut grass that has matted down and is smothering new growth of grass. It is recommended that a rotary mower be used for future mowing and area be raked after mowing.

On May 21,1970 Professor John M. Zak applied fertilizer to test plots on this site. Application was the equivalent of 100 lbs. of nitrogen per acre using 15-10-10 on the grass plots. The plots that had legumes received an application of 500 lbs. per acre of 0-20-20. Subsequent examination has shown a remarkable difference in color and growth between areas topdressed and not topdressed.

It was noted that debris and branches were stuck in the riser. This should be cleaned out as soon as possible so as not to plug the outlet. Tree stump at riser should be removed and the outlet channel cleaned. Trash bar missing on south corner of low stage rack and should be replaced. The condition of the concrete is good and the rip-rap at the outlet channel looks very good.

In the permanent pool area downed dead trees at the east end of the dam should be removed. Tom Doucette, WRC, talked to Stetson Adams about the possibility of the State letting a contract to accomplish this work.

Seep at the east abutment was in the same condition as last year. It is recommended that a small ditch be dug to connect this to the upstream and downstream gutters of the dam. Beach area is in the same condition as last year. No facilities yet.

The Department of Natural Resources is responsible for the operation and maintenance of this site.

ABBEY LAKE SITE

The upstream slope of the dam should be fertilized with 10-10-10 at the rate of 400 lbs. per acre on the predominantly grass areas. Where the legumes prevail fertilize with 400 lbs. of 0-20-20 or the equivalent per acre. The downstream slope of the dam looks very good. The slopes of the emergency spillway look much better than a year ago. It is recommended that area be fertilized again this year with 10-10-10 at the rate of 400 lbs. per acre on the predominantly grass areas and the slope area at the southeast end of the emergency spillway be overseeded (100' x 200'). Where the legumes prevail fertilize with 400 lbs. of 0-20-20 or the equivalent per acre. There is a sparse grass stand. In many places cut grass has matted down thus smothering new growth. It is suggested that future mowing be done with a rotary mower and raked.

Sticks and debris around riser should be removed.

The eroded areas on the left abutment and in the disposal area to the left of the emergency spillway are in the same condition as last year. This condition should not get much worse, but there is a possibility that a large storm might wash more material into the stream. However, corrective action in this area might divert the water to another location and possibly cause more damage. It was the general opinion to do nothing now, but to keep a close watch over the area.

A large wood chuck hole on the slope between the emergency spillway and the outlet channel was noted. This hole should be filled as soon as possible to prevent damage to this slope. Channel riprapping and the concrete looked very good. The access road was in good condition. It still needs the addition of some smaller rock to fill the voids.

The Massachusetts Department of Natural Resources is responsible for the operation and maintenance of this site.

SOUTH SILVER SITE

Except where trees and embankments protected last fall's seeding there is little or no grass cover on the South Silver site.

a-7

CLAM RIVER
1971

REPORT OF ANNUAL INSPECTION

CLAM RIVER WATERSHED

May 21, 1971

On May 18, 1971 the following met at the West Lake Site, Clam River Watershed in the town of Sandisfield, Massachusetts for the purpose of conducting the annual inspection of the West Lake Site, The abby Site, The South Silver Site and the North Silver Site:

E.T.Lewicke, Water Resources Commission
K. Maguire, Water Resources Commission
Douglas Poland, Natural Resources Commission
Stetson Adams, Department of Natural Resources
Douglas Lyman, Department of Natural Resources
Karl Klingelhofer, Soil Conservation Service
Don Basinger, Soil Conservation Service
Gene Mills, Soil Conservation Service
John Folan, Soil Conservation Service
James Elasmar, Soil Conservation Service
Edward Konieczny, Soil Conservation Service

WEST LAKE SITE

The general appearance of the vegetative cover looks very good. A big improvement from last year. Recommend fertilizing dam area with 5-10-10 at the rate of 600 lbs per acre. Some matting on the downstream slope of dam should be raked.

It was noted that branches and other debris were stuck in the Riser. This should be cleaned out so as not to plug the outlet. Alders growing on both banks of the dam and through the riprap. These alders should be cut and / or sprayed to kill further growth. The condition of the concrete is good and the riprap at the outlet channel looks good.

In the permanent pool area dead trees at the east end of the dam should be removed.

Seep at the east abutment was in the same condition as last year. It is recommended that a ditch be dug to divert the water into the upstream gutter of the dam. The Beach area is in the same condition as last year. No facilities yet.

An animal hole was noted on the downstream slope of the dam. This hole should be filled as soon as possible to prevent damage to the slope.

Repair rock ford in outlet channel so that automobiles may pass over.

The Massachusetts Department of Natural Resources is responsible for the operation and maintenance of this site.

ABBEY LAKE SITE

The vegetative cover was much improved from last year. The downstream slope was exceptionally good. The upstream slope should be fertilized with 5-10-10 at the rate of 600 lbs per acre. Grass in E.S. should be mowed. The slopes at the emergency spillway have improved since last year. It is recommended that the area be fertilized with 5-10-10 at the rate of 600 lbs per acre. It is recommended that tile drain be placed in wet area of Emergency Spillway.

Sticks and other debris around the riser should be removed.

The eroded areas on the left abutment and in the disposal area to the left of the emergency spillway are in the same condition as last year. It was the general opinion to keep a close watch over the area. Channel riprapping and the concrete looked very good.

The Massachusetts Department of Natural Resources is responsible for the operation and maintenance of this site.

SOUTH SILVER SITE

The general appearance of the vegetative cover was very much better than last year. Grass is growing in all areas. It is recommended that entire area be fertilized with 5-10-10 at the rate of 600 lbs per acre.

Several alternatives are present to vegetate the outlet of the emergency spillway at the South Silver Site. One of these is to plant shrubs:

The following shrubs are adaptable: Autumn Olive, Elaeagnus umbellata; spaced 4'x4' or Cornus Stolonifera, Red-Osier Dogwood; spaced 3' x 3' or; Juniperus, Communis, Common Juniper; spaced 5' x 5'.

Because the area is small (about 30' x 40') a solid planting of only one of the above species is recommended.

To help the shrubs grow a small amount of 10-10-10 should be mixed into the soil at planting time (1 oz.) or (1 tablespoon) per seedling, 2 year old.

Mulch after planting, wood chips to depth of 2 inches or old hay 2-4 inches.

The other alternative is to fill the rills created by water with a

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
29 Cottage Street
Amherst, Massachusetts 01002

July 25, 1972

REPORT OF ANNUAL INSPECTION

Clam River Watershed

On May 16, 1972, the following met at the South Silver Site, Clam River Watershed, in the Town of Sandisfield, Massachusetts, for the purpose of conducting the annual inspection of the South Silver Site, the North Silver Site, West Lake Site and the Abbey Site.

E. T. Lewicke, Water Resources Commission, Boston, Mass.
Col. K. S. Hand, Sandisfield, Mass.
Stetson Adams, Department of Natural Resources
Douglas Lyman, Department of Natural Resources
John F. Folan, Soil Conservation Service
James J. Elasmar, Soil Conservation Service

GENERAL

The Massachusetts Department of Natural Resources is responsible for the operation and maintenance of the sites.

Edward G. Konieczny, District Conservationist, SCS, was not present on May 16, 1972; however, he made a separate inspection trip at a later date and his comments on agronomic conditions and recommendations are included.

SOUTH SILVER SITE

Structural Conditions and Recommendations

Erosion was noted on the slopes between the diversion ditch and the emergency spillway. This condition is the same as it was a year ago. Erosion was also noted in the emergency spillway at the end of the dike. This area is no worse than it was a year ago. The access road and the road ditches need to be graded. Culverts need annual cleaning. Debris should be removed from the trash rack of the riser and from edges of the pool. The concrete in the riser looks good.

Agronomic Conditions and Recommendations

Grass on the earthen dam looks better than it has ever been. Flooding has killed off grasses in a strip 15 to 20 feet wide, the length of the dam. The dead grasses have created an effective mulch.

ABBEY LAKE SITE

Structural Conditions and Recommendations

Branches and other debris around the riser should be removed. The eroded areas on the left abutment and in the disposal area to the left of the emergency spillway are in the same condition as last year. Channel riprapping and the concrete looked very good.

Agronomic Conditions and Recommendations

Very effective mulch has been created by Crownvetch. Patches of Birdsfoot Trefoil are found throughout the area.

At outlet of emergency spillway Birdsfoot Trefoil is about 50% of cover. A light dose of 5-10-10 (400 pounds) or 8-16-16 (300 pounds) would help maintain legumes.

WEST LAKE SITE

Structural Conditions and Recommendations

Branches and other debris should be removed from toe of dam and riser area. The condition of the concrete and the riprap at the outlet channel looks good. In the permanent pool area, dead trees at the east end of the dam should be removed. Seep at the east abutment was in the same condition as last year. The beach area is in the same condition as last year. No facilities yet.

Agronomic Conditions and Recommendations

Thirty to forty willow trees 2 to 5 feet in height have become established at the edge of the riprap on the earth dam. Crownvetch mulch is present over most of the area. Apparently no mowing has taken place during the last two years.

Willow and alder are becoming established in open area between the maintenance shed and the lake. The trees are growing through the mulch and they will eventually present a problem if the area is to remain open. Cattails growing in wet pockets in this open area are esthetically pleasing.

Removal of trees and shrubs on the dam by pulling out or by chemical treatment is recommended.

Topdressing legumes, particularly on the dam at the rate of 400 pounds of 5-10-10 or 300 pounds of 8-16-16 is also recommended.

Submitted by

James Elasmar/nnf
Project Engineer

Edward Konieczny/nnf
District Conservationist

cc: Water Resources Commission (2)
J. Elasmar
E. Konieczny
County Engineer (Heaphy)
C. Moustakis
Chairman, Berkshire Cons. District
A. Verdi (4)
C. E. Mills
W/S File (2)

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
29 Cottage Street
Amherst, Massachusetts 01002

June 25, 1973

REPORT OF ANNUAL INSPECTION

Clam River Watershed

On May 4, 1973, the following met at West Lake Site, Clam River Watershed, in the Town of Sandisfield, Massachusetts, for the purpose of conducting the annual inspection of the West Lake Site, the Abbey Site, the South Silver Site, and the North Silver Site:

Kevin Maguire, Water Resources Commission, Boston, Mass.
Stetson Adams, Department of Natural Resources
Edward G. Konieczny, Soil Conservation Service
James. J. Elasmar, Soil Conservation Service

GENERAL

The Massachusetts Department of Natural Resources is responsible for the operation and maintenance of the sites.

WEST LAKE SITE

Structural Conditions and Recommendations

Branches and other debris should be removed from the toe of the dam and around the riser. In the permanent pool area, remove dead tree and other debris at the east end of the dam. Seep at the east abutment is the same as last year. Beach area is same as last year. The condition of the concrete and the riprap at the outlet channel looks good. No facilities as yet.

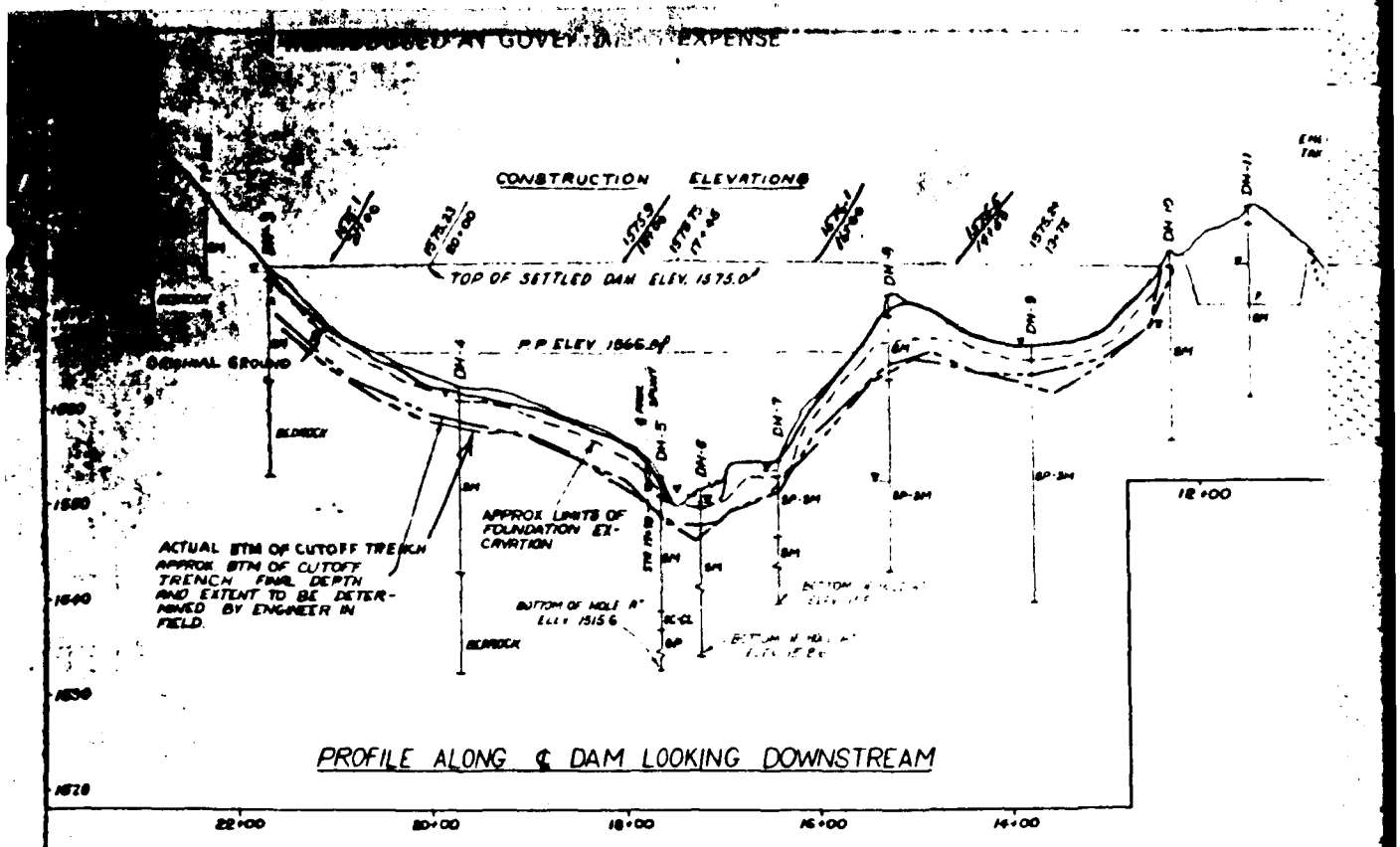
Agronomic Conditions and Recommendations

Willows and aspen 3 to 8 feet tall have become established within the rock riprap, primarily on the north side of the dam (West Street side). Some of the trees are now too large to pull out by hand.

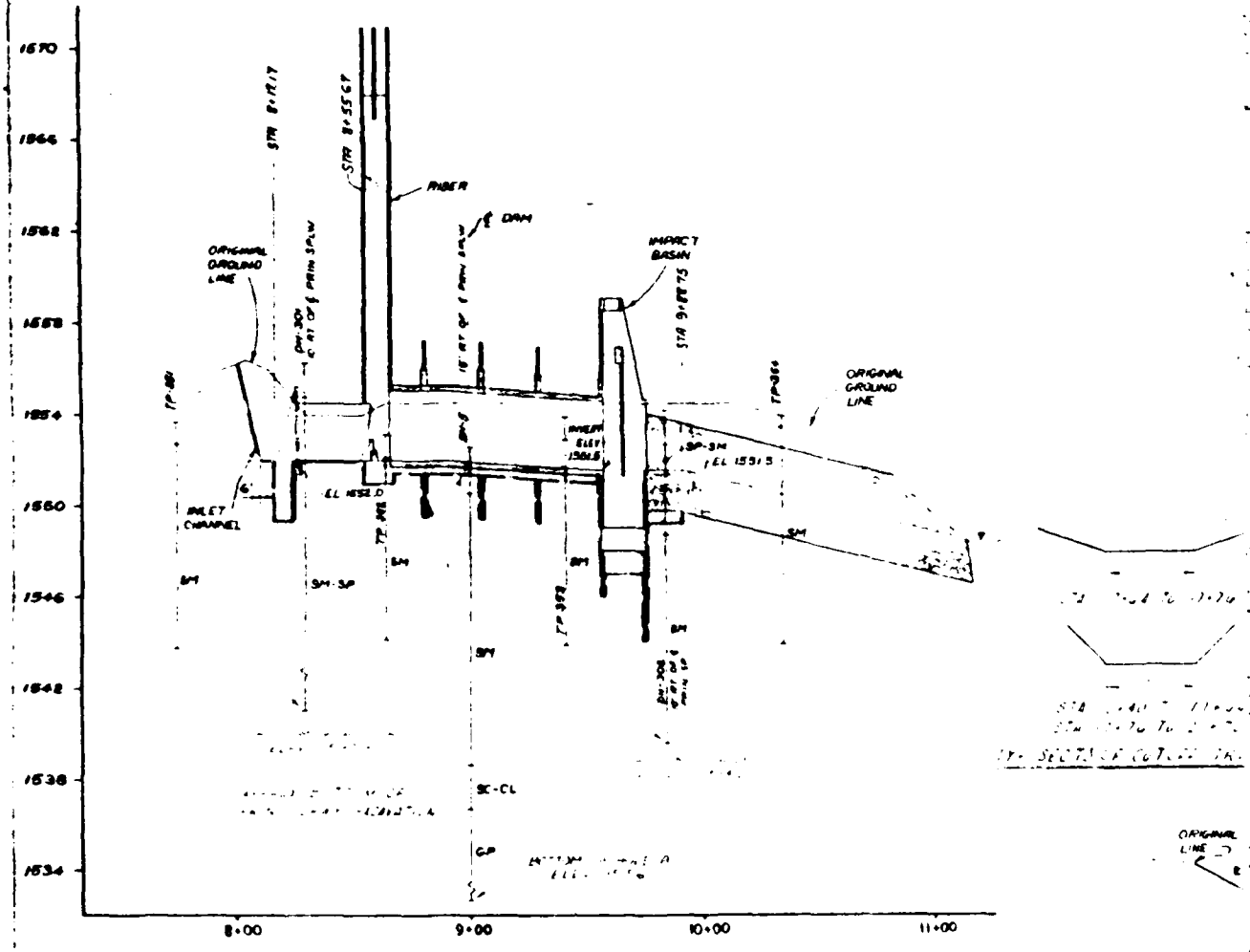
Vegetation on the dam looks very good and is providing effective ground cover. The dam has not been mowed. Predominant cover is crownvetch and it does not require mowing.

Area between maintenance shed and West Lake.
Willows and alders are established in the wet areas. Small trees are becoming established in the crownvetch and birdsfoot trefoil plantings.

Access road below the dam.
Tree seedlings are growing in the roadway. A newly erected sign allowing snowmobiling was observed along the road.



PROFILE ALONG ℄ DAM LOOKING DOWNSTREAM



PROFILE ALONG ℄ PRINCIPAL SPILLWAY

EMERGENCY SPILLWAY
CURVE NO. 4

STATION SCALE 4 CHORD
CURVE 2

LEGEND

- SEASONAL HIGH WATER
- PERMANENT POOL ELEV 1560
- CLEARING & GRUBBING LIMIT
- 1570 CONTOUR & VALUE
- WOODS ROAD
- STONE WALL
- STREAM
- SWAMP
- TEST PIT
- DRILL HOLE
- CLEARING LIMIT

AS BUILT

LAMPRIEY RIVER WATERSHED PROJECT
WEST LAKE MULTIPLE PURPOSE DAM
SANDOWN, MASSACHUSETTS
PLAN OF DAM & EMERGENCY SPILLWAY

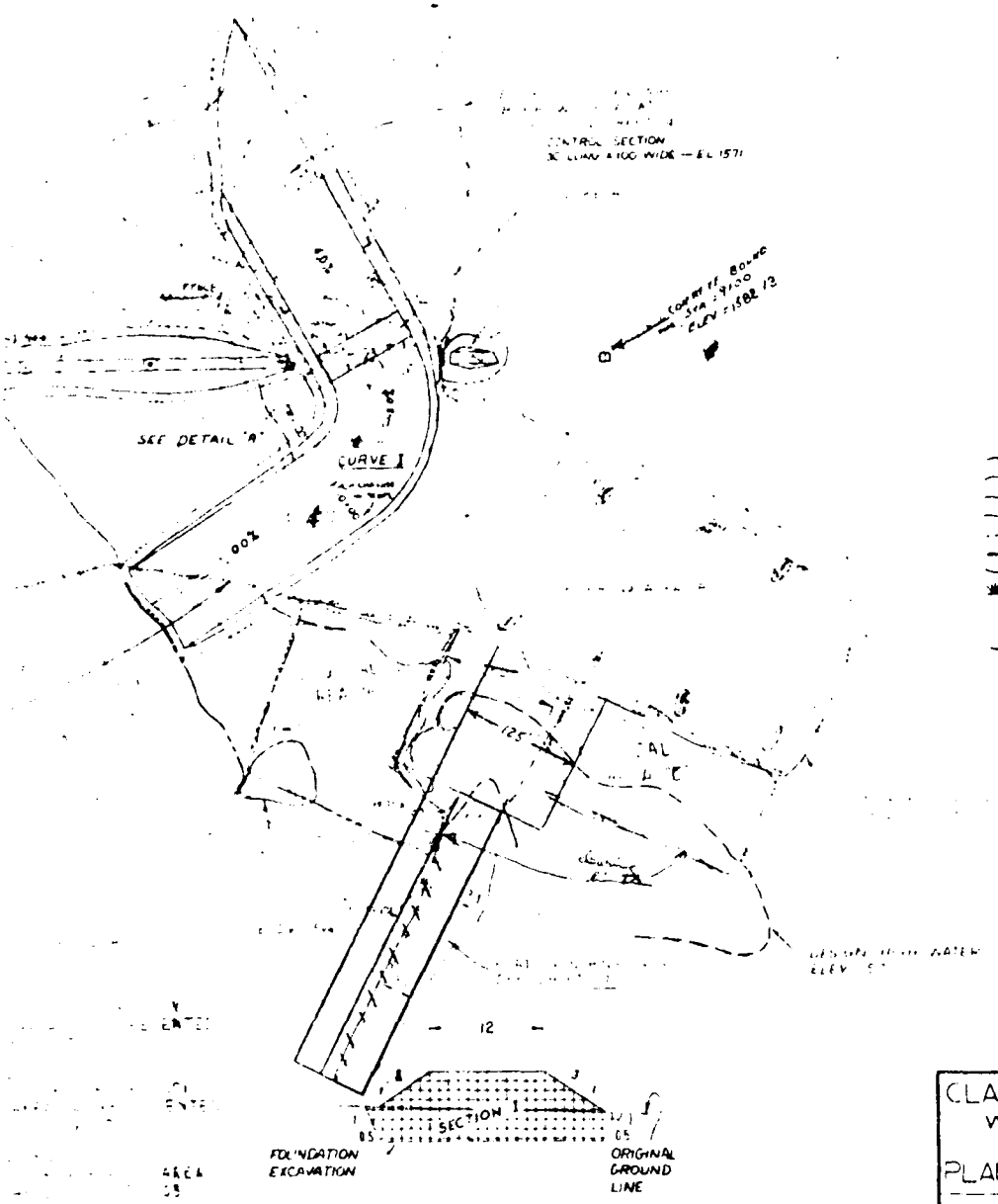
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MA - 351-P

REPRODUCED AT GOVERNMENT EXPENSE

EMERGENCY SPILLWAY
CURVE DATA

STATION DEFL ∠ CHOR
CURVE I



LEGEND

- DESIGN HIGH WATER
- PERMANENT POOL ELEV 1566
- CLEARING & GRUBBING LIMIT
- 1570 CONTOUR & VALUE
- WOODS ROAD
- STONE WALL
- STREAM
- SWAMP
- TEST PIT
- DRILL HOLE
- CLEARING LIMIT

Typical Section
DIKE "A"

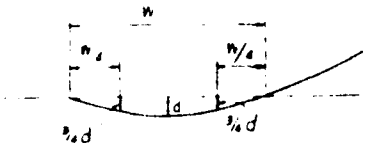
WATER CONTENT OF OPTIMUM.

AS-BI

CLAM RIVER WATERSHED PRO
WEST LAKE MULTIPLE PURPOSE D
SANDISFIELD, MASSACHUSETTS.
PLAN OF DAM & EMERGENCY SPIL

U. S. DEPARTMENT OF AGRICUL
SOIL CONSERVATION SERVI

Designed J. R. Date
Drawn
Traced
Checked B. J. GELINAS
Approved
Sheet No. 3
MA-3

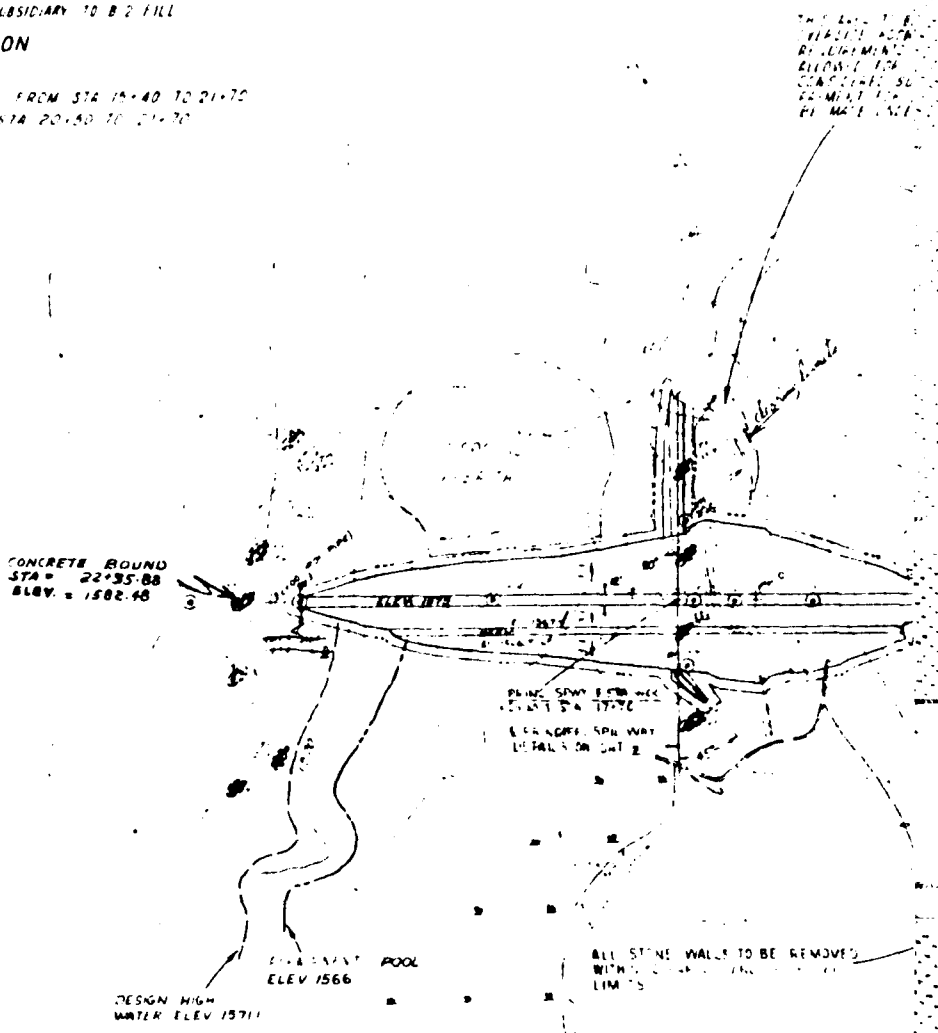


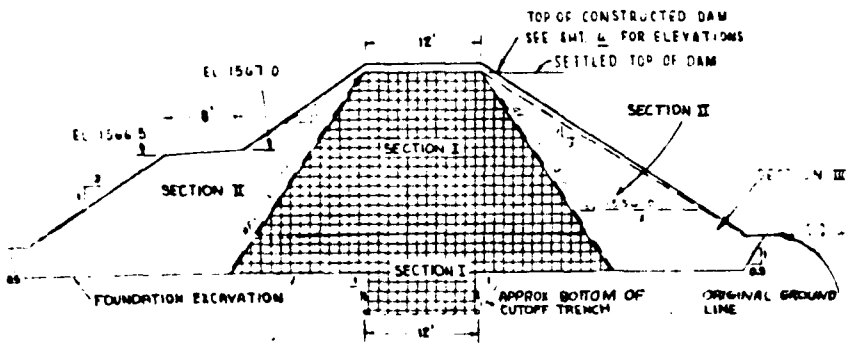
W = 6' d = 0.5'

SHAPING OF GUTTERS TO BE SUBSIDIARY TO B 2 FILL

TYPICAL SECTION GUTTERS

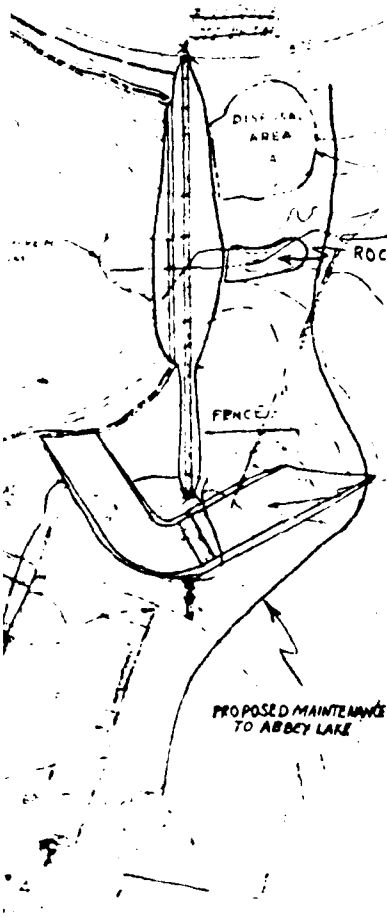
AT DOWNSTREAM TOES OF DAM FROM STA 19+40 TO 21+70
AND AT UPSTREAM TOE FROM STA 20+50 TO 21+70





TYPICAL SECTION OF EARTH FILL

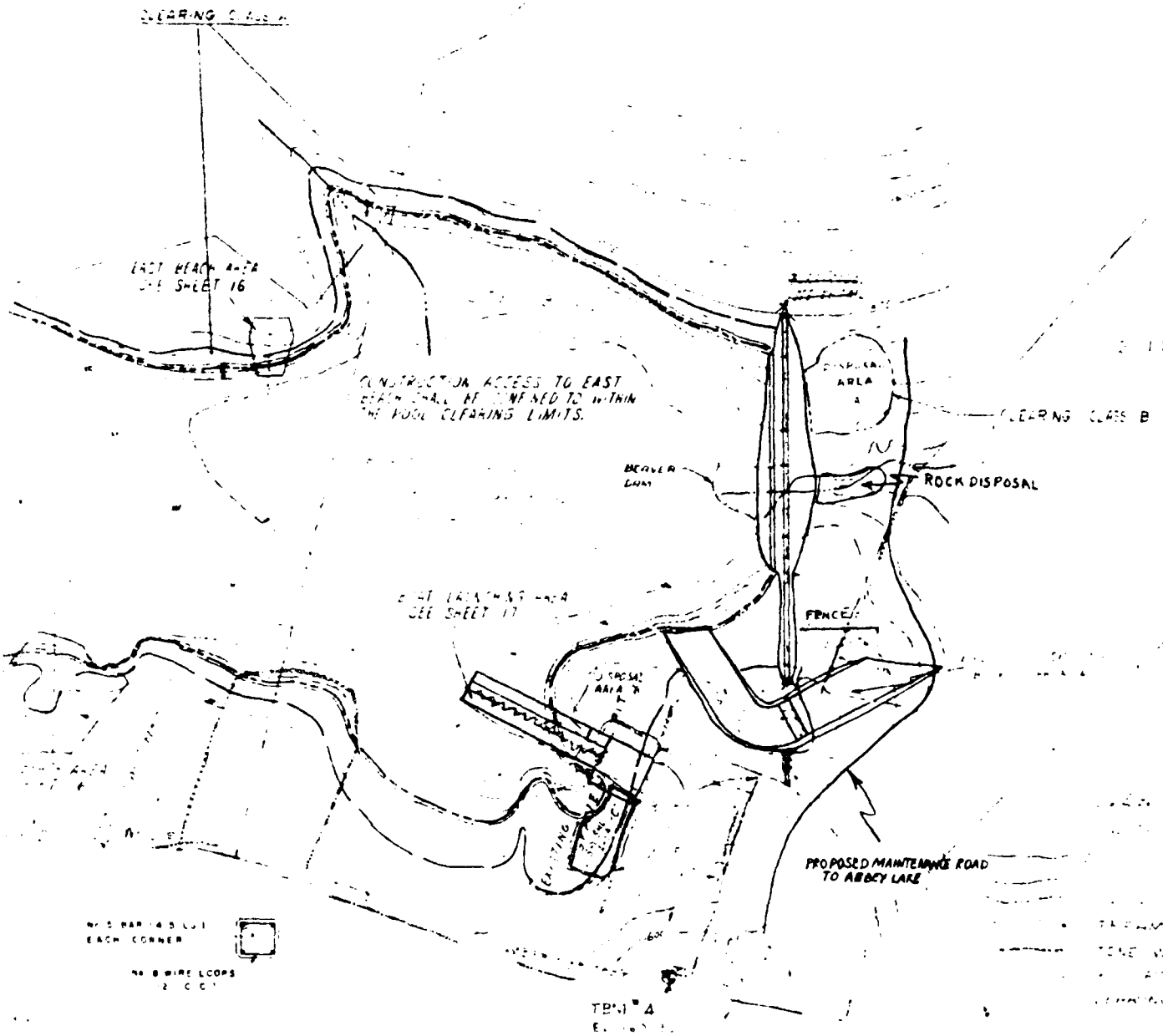
NOTE
FILL IS TO BE PLACED AT A
RANGING FROM - 1% TO + 3%

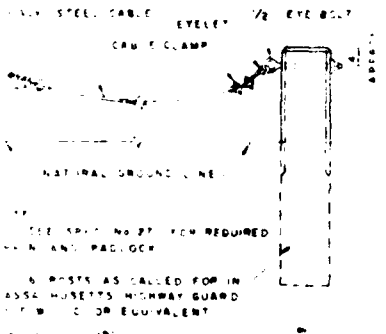


AS BUILT

PLAN OF STORAGE AND BORROW AREAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE





BARRICADE DETAILS

NOT TO SCALE

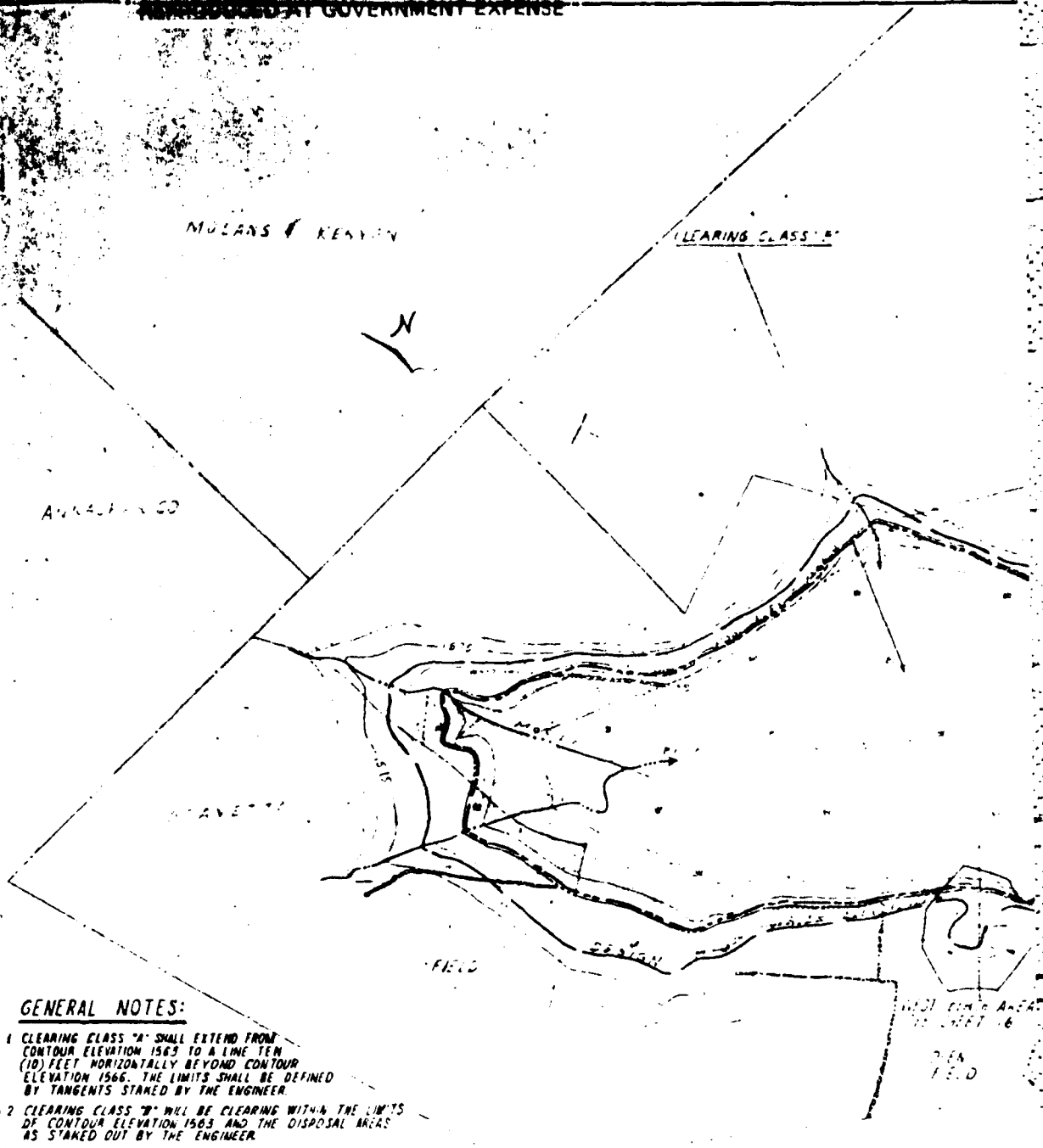
AS-

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PLAN OF STORAGE AND BORROW AREAS

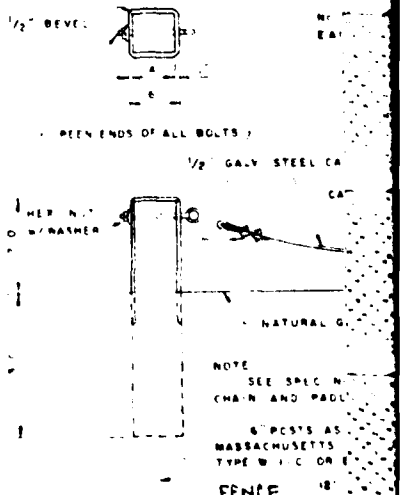
	Date	Approved by
Designed		Title
Drawn		Date
Traced		Sheet No. 2
Checked B.J. GEARHART		

REPRODUCED AT GOVERNMENT EXPENSE



GENERAL NOTES:

1. CLEARING CLASS "A" SHALL EXTEND FROM CONTOUR ELEVATION 1563 TO A LINE TEN (10) FEET HORIZONTALLY BEYOND CONTOUR ELEVATION 1566. THE LIMITS SHALL BE DEFINED BY TANGENTS STAKED BY THE ENGINEER.
2. CLEARING CLASS "B" WILL BE CLEARING WITHIN THE LIMITS OF CONTOUR ELEVATION 1563 AND THE DISPOSAL AREAS AS STAKED OUT BY THE ENGINEER.
3. IN THE CLASS "A" CLEARING, ALL STUMPS SHALL BE LEFT FLUSH WITH THE NATURAL GROUND SURFACE BY FLUSH CUTTING, SNAGGING, GRUBBING OR ANY OTHER METHOD PRODUCING SATISFACTORY RESULTS. CLASS "B" CLEARING SHALL BE SUCH THAT THE REMAINING STUMPS EXTEND NO HIGHER THAN 12" ABOVE THE NATURAL GROUND SURFACE. NATURAL GROUND SURFACE SHALL BE DEFINED AS THE AVERAGE GROUND ELEVATION FIVE (5) FEET OUT FROM THE CENTER OF THE TREE. CUTTING OF STUMPS BELOW THE DIRT LINE WILL NOT BE REQUIRED IN CLASS "B" CLEARING, PROVIDING THE TOP OF THE REMAINING STUMP IS BELOW ELEVATION 1563.
4. STONE WALLS WITHIN THE PERMANENT POOL CLEARING LIMITS PROTRUDING ABOVE ELEVATION 1563 SHALL BE REMOVED AND PAID FOR UNDER THE RESPECTIVE CLEARING ITEMS.
5. CLEARING AND GRUBBING. THE EMBANKMENT, EMERGENCY SPILLWAY, AND BORROW AREAS, INLET AND OUTLET CHANNELS SHALL BE CLEARED AND GRUBBED WITHIN LIMITS STAKED BY THE ENGINEER. THE EAST & WEST BEACH & LAUNCHING AREA SHALL BE CLEARED & GRUBBED WITHIN LIMITS STAKED BY THE ENGINEER BUT PAID FOR UNDER THEIR RESPECTIVE LUMP SUM BID ITEMS.
6. ALL BEAVER DAMS ENCOUNTERED IN THE FLOOD POOL BELOW ELEVATION 1571 AND 400 FEET DOWNSTREAM OF THE DAM CENTERLINE ARE TO BE COMPLETELY REMOVED AND THE MATERIAL DISPOSED OF BY BURNING, BURYING, OR OTHER METHODS APPROVED BY THE ENGINEER. THIS INCLUDES ALL DAMS ENCOUNTERED DURING CONSTRUCTION AND UNTIL THE DATE OF FINAL ACCEPTANCE OF THE WORKS OF IMPROVEMENT FROM THE CONTRACTOR. ALL THE ABOVE WORK SHALL BE CONSIDERED AS ONE CONSTRUCTION UNIT AND PAYMENT FOR SUCH WORK SHALL BE INCLUDED IN THE LUMP SUM ITEM UNDER STRUCTURE REMOVAL.



FENCE
BARRICADE

NOT TO

CLAM RIVER WATERSHED PROJECT

WEST LAKE MULTIPLE PURPOSE DAM

RECREATION DEVELOPMENT AND FLOOD PREVENTION

DRAINAGE AREA	934	ACRES
TOTAL STORAGE	820	ACRE FEET
FLOODWATER RETARDING STORAGE TO EMERGENCY SPILLWAY CREST	340	ACRE FEET
WATER SURFACE AREA AT RECREATION POOL	60	ACRES
HEIGHT OF DAM	25	FEET
VOLUME OF FILL	29,000	CUBIC YARDS

BUILT UNDER THE WATERSHED PROTECTION AND FLOOD PREVENTION ACT

by

MASSACHUSETTS WATER RESOURCES COMMISSION

and

BERKSHIRE CONSERVATION DISTRICT

with the assistance of

SOIL CONSERVATION SERVICE

of the

UNITED STATES DEPARTMENT OF AGRICULTURE

1965

Example - Showing how front sheet should look after being completed at Design Unit.

INDEX

SHEET 1 COVER SHEET
SHEET 2 PLAN OF STORAGE AND BORROW AREAS
SHEET 3 PLAN OF DAM AND EMERGENCY SPILLWAY
SHEET 4 PROFILES
SHEET 5 DRAINAGE DETAILS
SHEET 6 PLAN - PROFILE OF PRINCIPAL SPILLWAY
SHEET 7 RISER DETAILS
SHEET 8 RISER - STEEL DETAILS
SHEET 9 CRADLE, COLLAR, POND DRAIN AND STEEL SCHEDULE
SHEET 10 IMPACT BASIN DETAILS
SHEET 11 TRASH RACKS AND MISC DETAILS
SHEET 12 LOGS OF DRILL HOLES
SHEET 13 LOGS OF DRILL HOLES
SHEET 14 LOGS OF TEST PITS
SHEET 15 LOGS OF TEST PITS
SHEET 16 EAST & WEST BEACH DETAILS
SHEET 17 BOAT LAUNCHING AREA

LOCATION MAP

APPROVED	DATE

BERKSHIRE COUNTY COMMISSIONERS

CLAM RIVER WATERSHED PROJECT

COVER SHEET

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MA-351-P

REPRODUCED AT GOVERNMENT EXPENSE

MA-AS-TRIAL
3/22/76

U.S. Department of Agriculture
Soil Conservation Service

OPERATION AND MAINTENANCE RECORD

Project Clam River - West Lake Date July 29, 1979

Sponsoring Local Organization Water Resources

The Operation and Maintenance Inspection Record dated 4/26/77 showed a need for certain maintenance and repair jobs. These jobs have been completed as follows:

Agreed to Item No.	Maintenance Performed by: (Contributed Labor, Force Account, Contract, Etc.)	Actual Costs	Date Completed
	Remove logs & debris - clean trash Rack		
	Remove brush & growth in Area		
	Remove dead trees & debris east		
	side of shore - 300±		
	Remove debris from toe drain		
	outlet and brush		
		1100.-	7/29/77

REMARKS:

SCS Representative

Ernest Pluzzeen
SLO Representative

Distribution:
Mass. DWR; FmHA (if loan involved)
SCS

Report due: Annually
Nov. 1

NA-AS-TRIAL
3/22/76

OPERATION AND MAINTENANCE
INSPECTION RECORD

U.S. Dept. of Agriculture
Soil Conservation Service

Project CLAM RIVER WATERSHED Inspection Date 10-4-78

Site Name/No. WEST LAKE Type MULTI-PURPOSE

Type of Inspection: Special ☐ Annual ☒

Structure Operation: Satisfactory ☒ Unsatisfactory ☐

Sponsoring Local Organization: BERKSHIRE CONSERVATION DISTRICT, W.R.C.

Present for Inspection: Emil Strupaw, Tom Dagette, Tim Thompson, Yisehac Yohannes, James J. Flammia, Kay Cekan - SCS

ITEM	Condition * S or U	Maintenance & Needed Repairs	Estimated Costs	Agreed Date Repairs to be Completed
1. Vegetation	S	FERTILIZE 10-10-10 - 400#/ACRE	1500 -	APRIL 1979
2. Fences	S			
3. Principal Spillway	S	REMOVE DEBRIS FROM TRASH RACK	250 -	APRIL 1979
4. Emergency Spillway	S	CUT BRUSH E.S. SLOPES	350 -	APRIL 1979
5. Embankment & Riprap	S	CUT BRUSH BOTH SIDES OF EMBANKMENT - CUT TREES SLOPE OF E.S	1500 -	APRIL 1979
6. Reservoir Area	S			
7. Gates or Valves	S			
8. Outlet Channels	S			
9. Structure Drainage Outlets	S			
10. Access Rd.	S			
11.				

REMARKS: (over)

* S = Satisfactory; U = Unsatisfactory

Ralph E. Simpson (District Conservationist) James J. Flammia (Project Engineer) Thomas F. Daniello (SLO Representative)

MA-AS-TRIAL
4/12/76

OPERATION AND MAINTENANCE
INSPECTION RECORD

U.S. Dept. of Agriculture
Soil Conservation Service

Project CLAM RIVER W/S Inspection Date 4/26/77

Site Name/No. WEST LAKE Type Multi-Purpose

Type of Inspection: Special ☐ Annual ☒ Structure Operation: Satisfactory ☒ Unsatisfactory ☐

Sponsoring Local Organization: Berkshire Conservation District, W. R. C.

Present for Inspection: Ernest Stenzgeser, WRC, Ronald Thompson (SCS)
James J. Eleazer (SCS)

ITEM	Condition * S or U	Maintenance & Needed Repairs	Estimated Costs	Agreed Date Repairs to be Complete
1. Vegetation	S	400 lbs/Acre 10-10-10	$500-	7/77
2. Fences	S			
3. Principal Spillway	S	Remove logs + debris from trash rack	$100-	"
4. Emergency Spillway	S			
5. Embankment & Riprap	S	Remove brush growth	$100.-	"
6. Reservoir Area	S	Remove dead trees and debris, east shore for 500' ±	$1000.00	"
7. Gates or Valves	S	Stem replaced, gate does not close fully	$1,500.00	?
8. Outlet Channels	S			
9. Structure Drainage Outlets	S	Remove debris toe drain outlet and brush.	$100.00	"
10. Access Rd.	S		—	
11.		TOTAL	$3,200.00	

REMARKS: (over)

S = Satisfactory; U = Unsatisfactory

Ronald E. Thompson (SCS) James J. Eleazer (SCS) Ernest Stenzgeser
(District Conservationist) (Project Engineer) (SLO Representative)

(Report due, annually: July 1)

MA-AS-TRIAL
3/22/76

OPERATION AND MAINTENANCE
INSPECTION RECORD

U.S. Dept. of Agriculture
Soil Conservation Service

Project Cham Inspection Date 4/20/76

Site Name/No. West Lake Type Multi-PURPOSE

Type of Inspection: Special ☐ Annual ☒

Structure Operation: Satisfactory ☒ Unsatisfactory ☐

Sponsoring Local Organization: Bedshire Conservation District Water

Present for Inspection: Chris Reed (SCS), Carl Curtin (DEM), Doug Rea Council Bland (DEM), Ernie Struzzieri (USCS), Ron Thompson (SCS) (visit site alone).

ITEM	Condition * S or U	Maintenance & Needed Repairs	Estimated Costs	Agreed Date Repairs to be Complete
1. Vegetation	S	400 lbs/ac 5-10-10 4/76	$ 400	7/
2. Fences	S			7/
3. Principal Spillway	U	Remove logs from trash racks	$ 50	7/
4. Emergency Spillway	S		—	7/
5. Embankment & Riprap	U	Pull brush growth from dam + S/S + burn Riprap	$ 1000	7/
6. Reservoir Area	S		—	
7. Gates or Valves	U	replace broken gate stem sec. on riser	$ 1200	?
8. Outlet Channels	U	remove brush down from outlet channel + dispose of off site	$ 200	7/
9. Structure Drainage Outlets	U	clean out the drain pipe outlet	$ 25	7/21/76
10. Access Rd.	S		—	
11.		total	$ 2,925	

REMARKS: (over)

* S = Satisfactory; U = Unsatisfactory

Paul E. Thompson (District Conservationist)

[illegible] retiring (Project Engineer)

Ernest Struzzieri (SLO Representative)

(Report due annually: July 1)

July 17, 1974

REPORT OF ANNUAL INSPECTION

Clam River Watershed
Massachusetts

On July 16, 1974, the following met at West Lake Site, Clam River Watershed, in the town of Sandisfield, Massachusetts, for the purpose of conducting the annual inspection of the West Lake Site, the Abbey Site, the South Silver Site and the North Silver Site:

Kevin Maguire, Water Resources Commission, Boston, MA
Carl Curtin, Dept. of Natural Resources, Pittsfield, MA (DF&P)
Roger Northrup, Mass. Dept. of Public Works, Lenox, MA
Paul Fezzie, Mass. DPW, Lenox, MA
Cecil B. Currin, Soil Conservation Service, Amherst, MA
James J. Elasmar, Soil Conservation Service, Otis, MA
Ronald E. Thompson, Soil Conservation Service, Pittsfield, Mass.

GENERAL

The Massachusetts Department of Natural Resources is responsible for the operation and maintenance of the sites.

Structural Conditions and Recommendations

WEST LAKE SITE

1. Trees and shrubs should be removed from the emergency spillway.
2. Remove trees and shrubs from slopes of dam and around the outlet channel.
3. Remove logs and debris from around the trash racks.

ABBEY SITE

1. Branches and other debris around the riser should be removed.
2. Remove shrubs and trees from the slopes of dam.
3. Mow small area upstream of the dam.
4. The concrete and the channel riprap look good.

NORTH SILVER SITE

1. Remove logs and other debris from trash racks and from edges of permanent pool.
2. Remove logs from toe of dam.
3. Concrete at the riser and outlet channel look good.

SOUTH SILVER SITE

1. Access road and ditches should be regraded.
2. Culverts need to be cleaned.
3. Debris should be removed from trash racks of the riser and from the edges of the pool.
4. Remove boulders from emergency spillway.
5. Concrete in the riser looks good.

Trees and shrubs should be removed from the riprap area by pulling or by cutting and treating the stumps to prevent resprouting. The tree seedlings that are becoming established in the seeded area between the maintenance shed and West Lake should also be pulled out.

Lime at the rate of 2 tons per acre on all legume and grass areas to help to maintain desirable soil pH. Fertilize these areas with 600 pounds, 5-10-10 or 400 pounds, 8-16-16, or equivalent. It is desirable to maintain fertility for the growth of grasses and legumes. At least 25% of the nitrogen should be derived from an organic source.

Improvement of the roadway below the dam is needed for recreation uses and for access to the Abbey Lake Site. A bridge or culvert in the outlet channel is needed to cross the stream. Because the roadway on both sides of the stream is wet, roadside drains and a gravel base are required to develop it for recreation uses and as an access road to the Abbey Lake Site.

ABBEY LAKE SITE

Structural Conditions and Recommendations

Branches and other debris around the riser should be removed. Ditch along the access road needs to be regraded and a large tree should be removed from this road. Culverts need to be cleaned. The concrete and the channel riprap look very good.

Agronomic Conditions and Recommendations

A very effective mulch cover has been created by crownvetch and birdsfoot trefoil. The birdsfoot trefoil appears to be spreading and growing as well as the crownvetch. The mulch created by the birdsfoot trefoil, however, is not as thick.

An application of 2 tons of ground limestone and 600 pounds of 5-10-10 or 400 pounds of 8-16-16 or equivalent, per acre, will help to maintain soil pH and fertility for legumes. Part of the nitrogen, at least 25%, should be derived from an organic source.

NORTH SILVER SITE

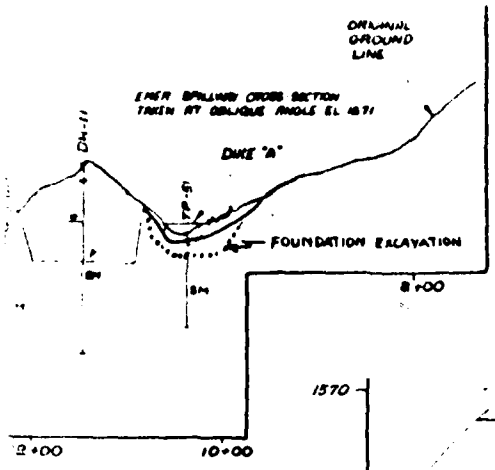
Structural Conditions and Recommendations

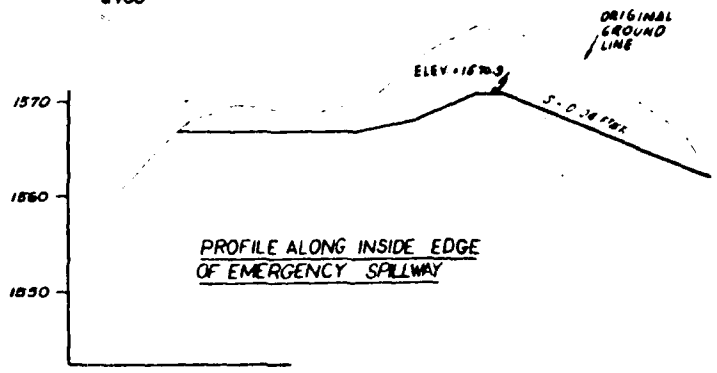
Remove logs along toe of dam and from trash rack of riser. Sloughed area from Sta 53+50 to Sta 55+00 has stabilized itself. It is recommended to seed sloughed area from Sta 66+00 to Sta 67+25. This area is a little worse than it was a year ago. See recommended seeding rates given below.

Agronomic Conditions and Recommendations

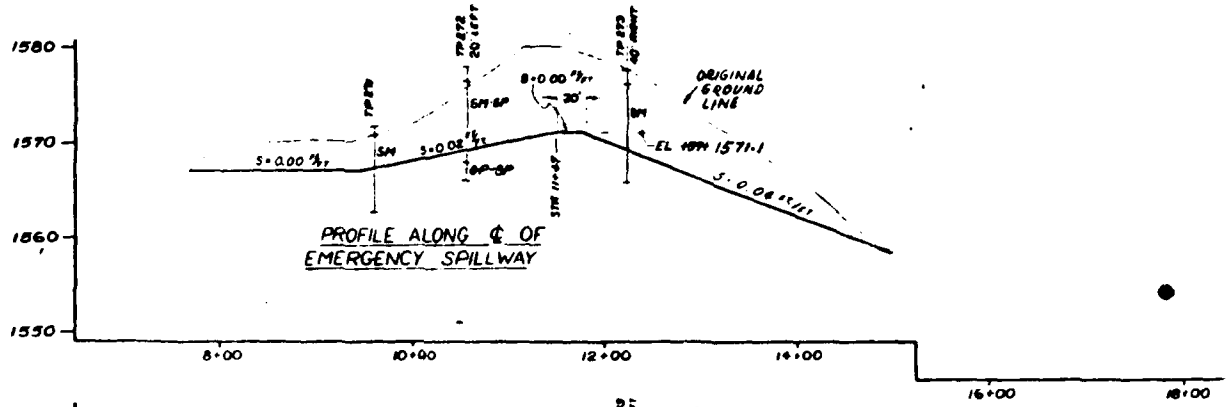
Grasses growing on the water side of the dam are spindly. Several bare spots, also on the water side of the dam, were observed. The White and Alsike clover strips observed last spring are not as prominent as they were last year. There is a pathway on top of the dam.

NOTE: FOR LOG DETAILS SEE SHEETS 11, 13, 14 & 15

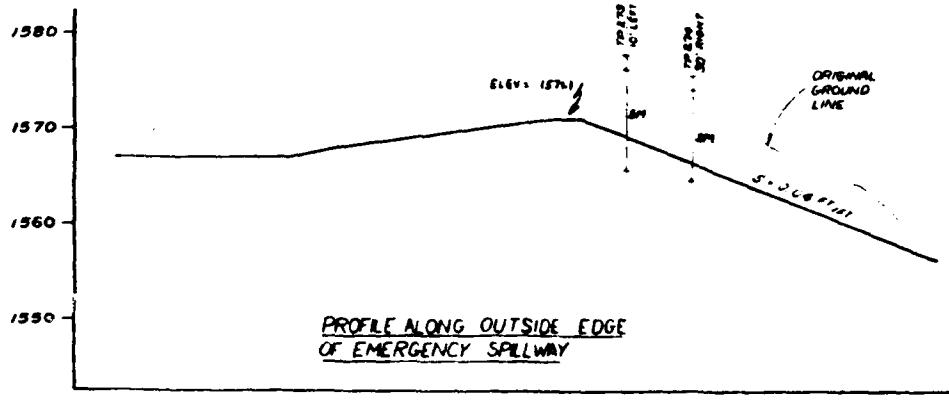




PROFILE ALONG INSIDE EDGE OF EMERGENCY SPILLWAY



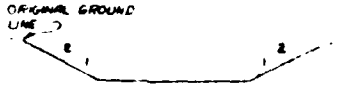
PROFILE ALONG ℄ OF EMERGENCY SPILLWAY



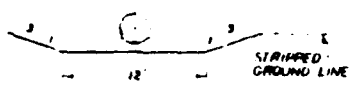
PROFILE ALONG OUTSIDE EDGE OF EMERGENCY SPILLWAY

ASB

CLAM RIVER WATERSHED
WEST LAKE MULTIPLE PURPOS
SANDISFIELD, MASSACHUSET
PROFILES

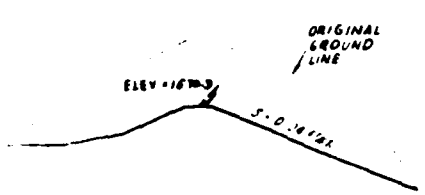


TYPICAL SECTION EMERGENCY SPILLWAY



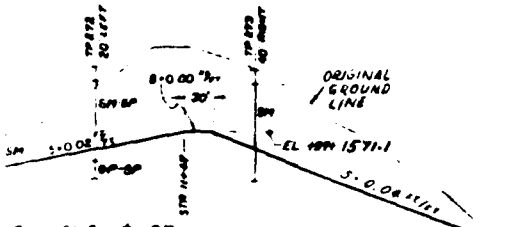
TYPICAL SECTION PRINCIPAL SPILLWAY EXCAVATION

NOTE: FOR [illegible] SEE SHEETS [illegible]



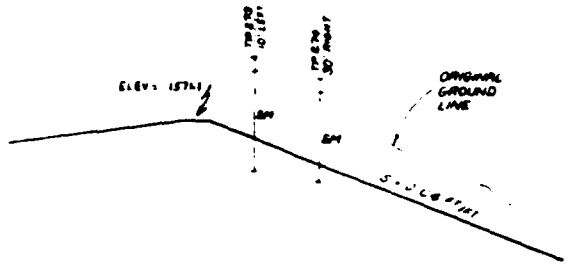
LONG INSIDE EDGE
ENCY SPILLWAY

1580
1570
1560
1550



E ALONG ℄ OF
ENCY SPILLWAY

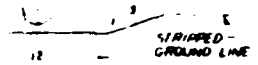
10+00 12+00 14+00 16+00 18+00



E ALONG OUTSIDE EDGE
ERGENCY SPILLWAY

AS BUILT

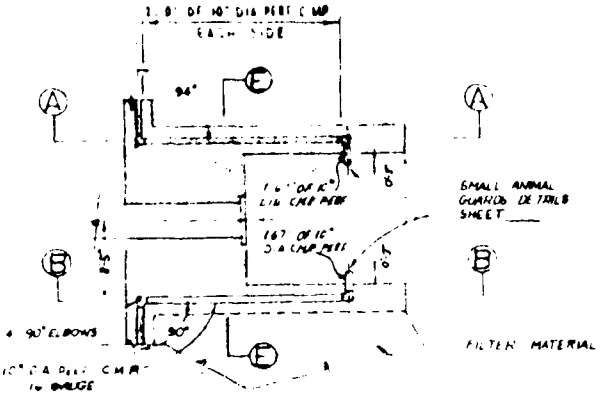
CLAM RIVER WATERSHED PROJECT
WEST LAKE MULTIPLE PURPOSE DAM
SANDISFIELD, MASSACHUSETTS
PROFILES



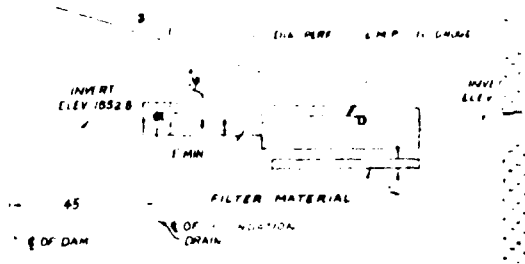
AL SECTION
PAL SPILLWAY
VATION

3

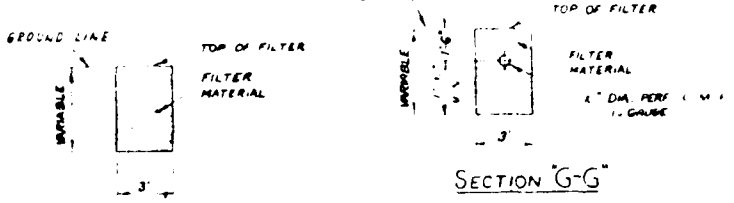
B-4



PLAN VIEW - OUTLET PIPES

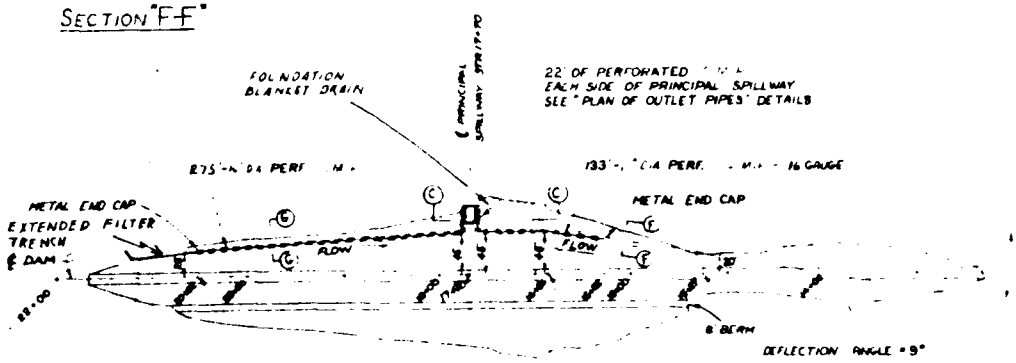


SECTION "A-A" & "B-B"

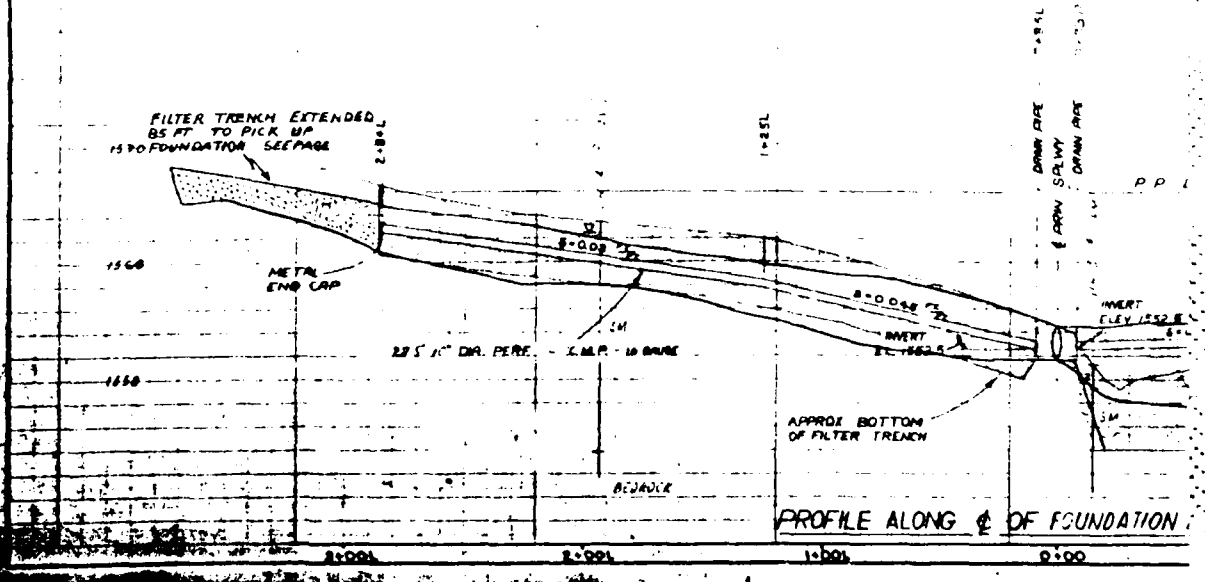


SECTION "G-G"

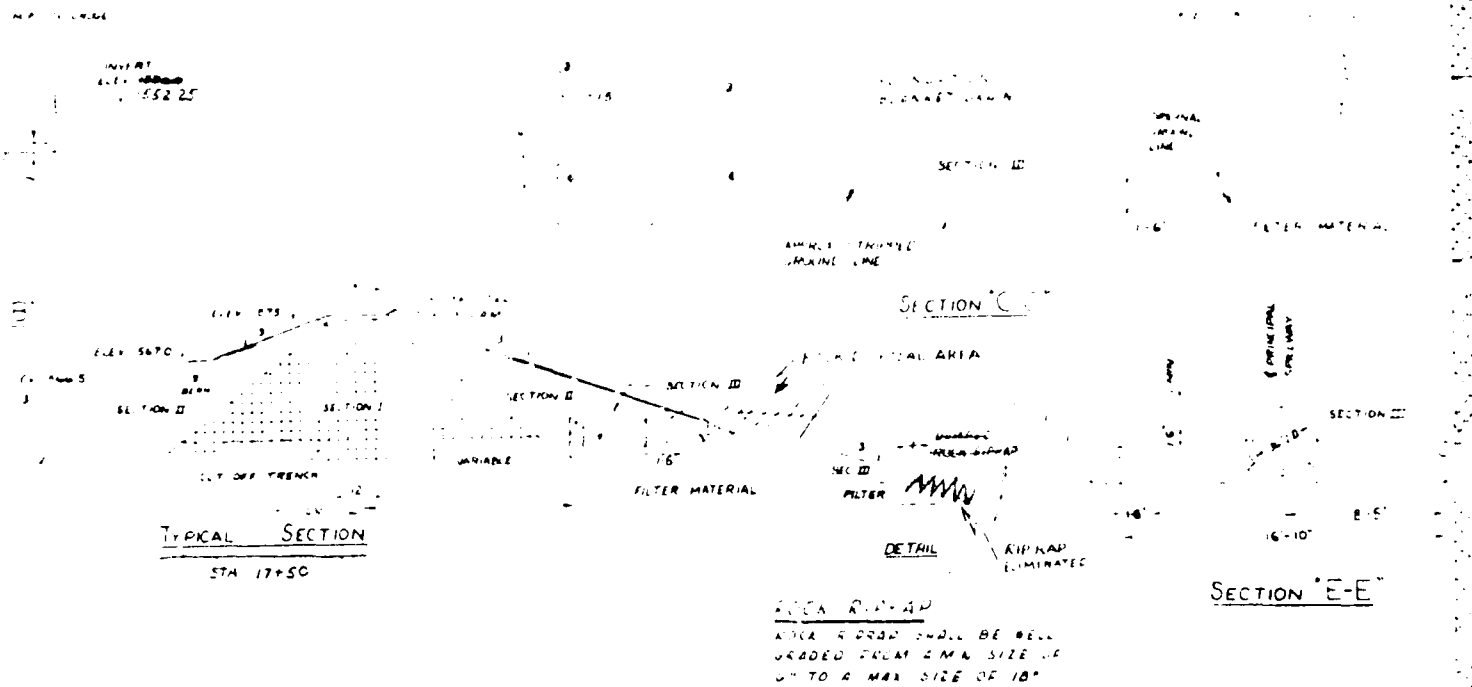
SECTION "F-F"



PLAN VIEW - DRAINAGE SYSTEM



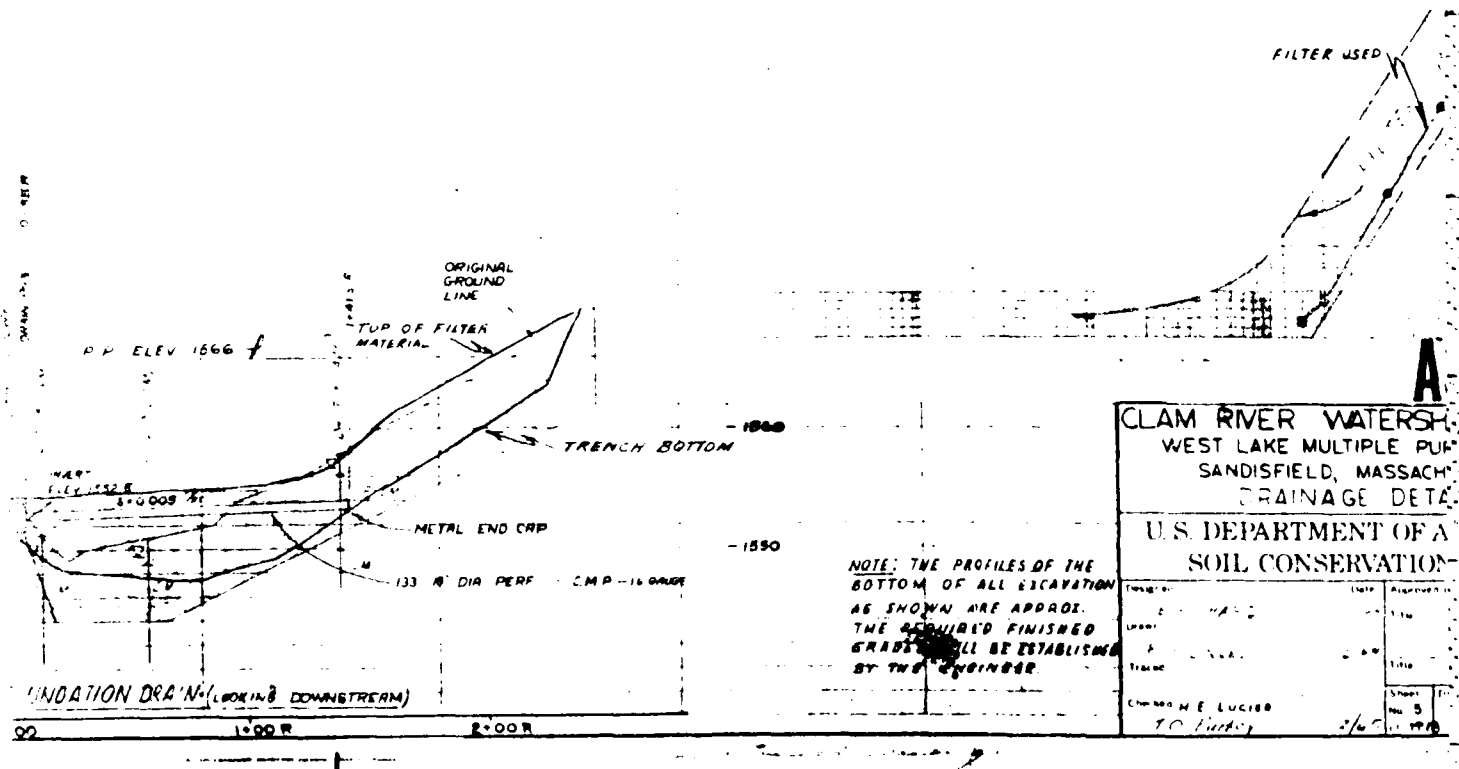
PROFILE ALONG ℄ OF FOUNDATION



TYPICAL SECTION
STA 17+50

RIPRAP

RIPRAP SHALL BE WELL GRADED FROM 2 MIN SIZE OF 6" TO A MAX SIZE OF 18"



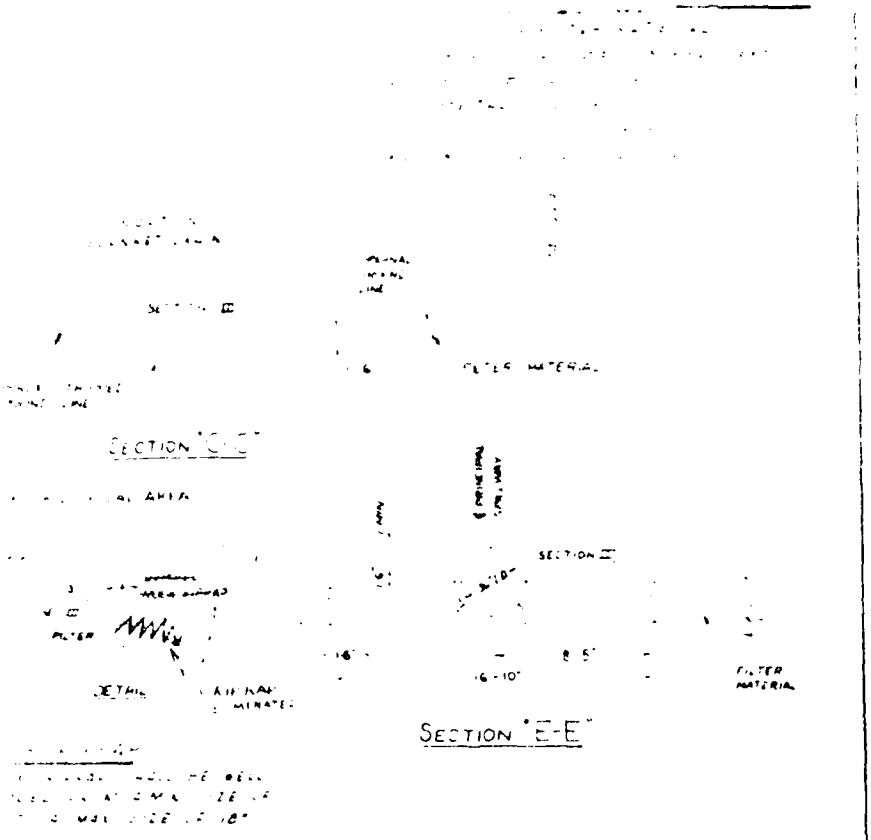
NOTE: THE PROFILES OF THE BOTTOM OF ALL EXCAVATION AS SHOWN ARE APPROX. THE REQUIRED FINISHED GRADES WILL BE ESTABLISHED BY THE ENGINEER.

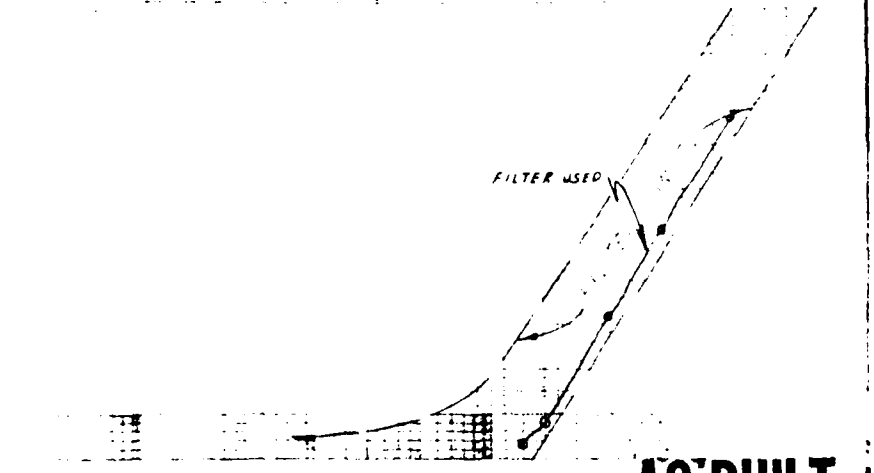
A

CLAM RIVER WATERSH
WEST LAKE MULTIPLE PUR
SANDISFIELD, MASSACH
DRAINAGE DETA

U.S. DEPARTMENT OF A
SOIL CONSERVATION

Designed H. E. LUCIER
T.C. Lucier 2/6
Sheet No. 5





AS BUILT

CLAM RIVER WATERSHED PROJECT
WEST LAKE MULTIPLE PURPOSE DAM
SANDISFIELD, MASSACHUSETTS
DRAINAGE DETAILS

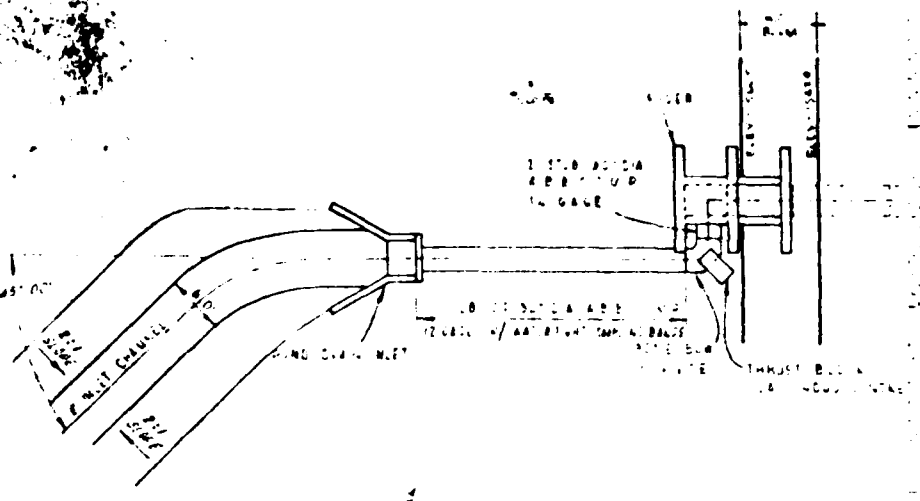
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

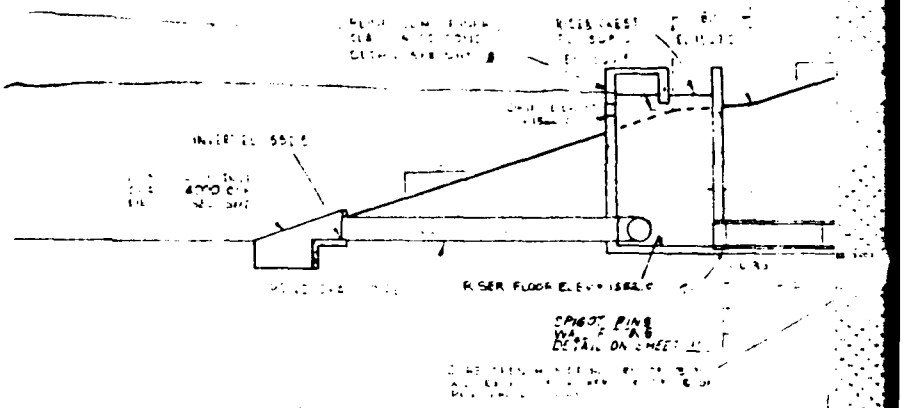
NOTE. THE PROFILES OF THE BOTTOM OF ALL EXCAVATION AS SHOWN ARE APPROX. THE REQUIRED FINISHED GRADES WILL BE ESTABLISHED BY THE ENGINEER.

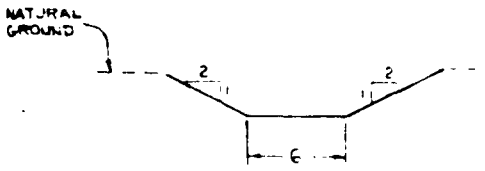
MA-351 P

3

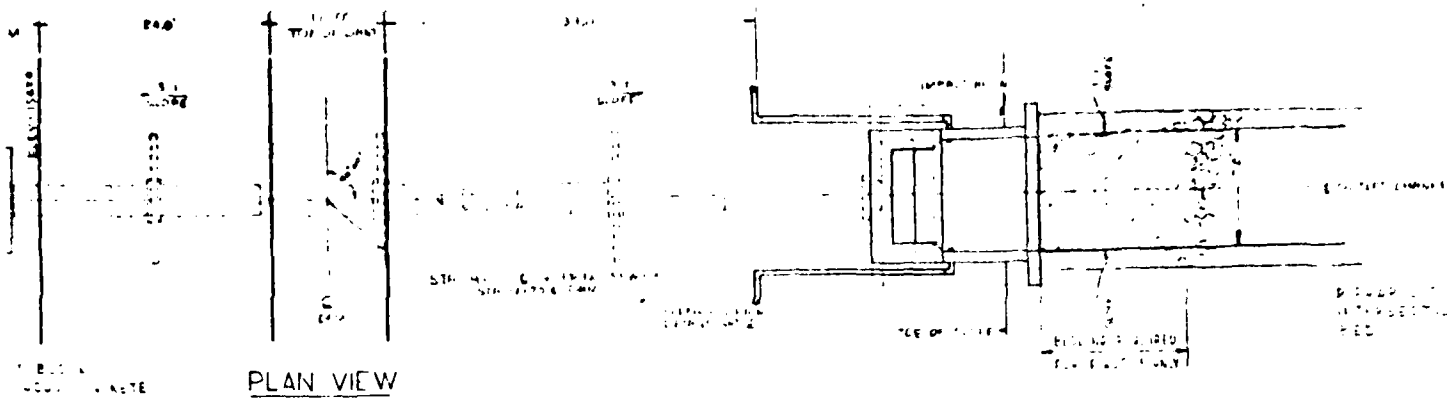
B-5



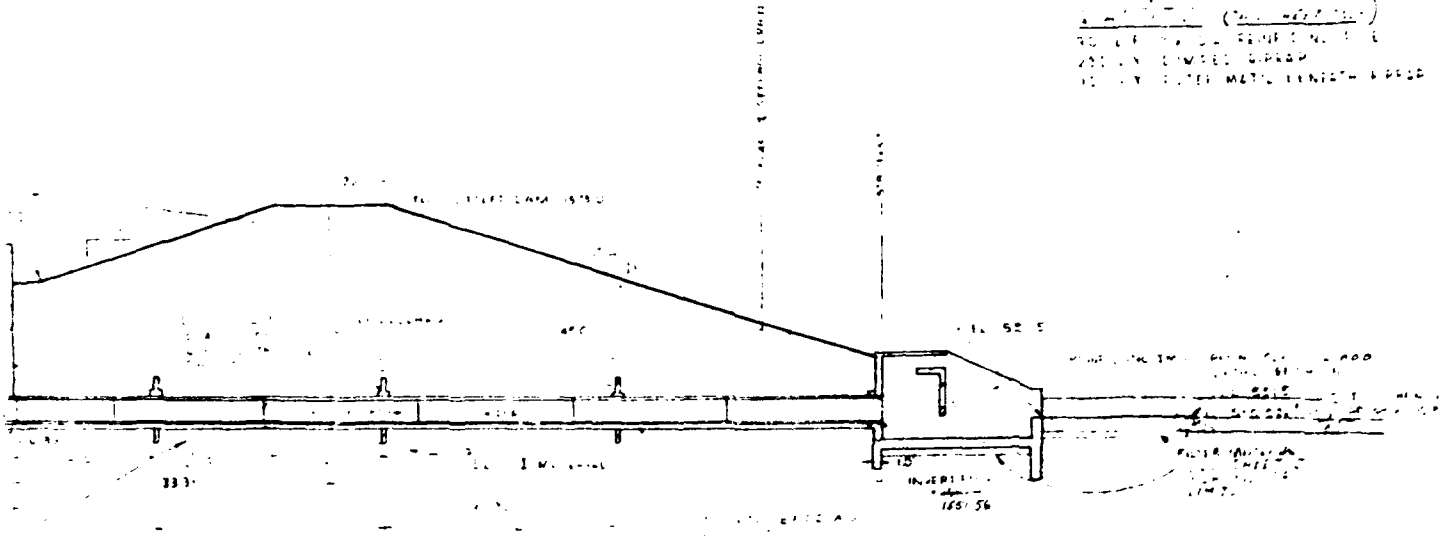


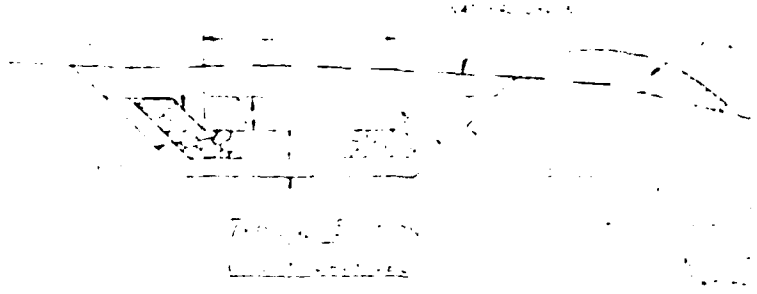


TYPICAL SECTION
INLET CHANNEL

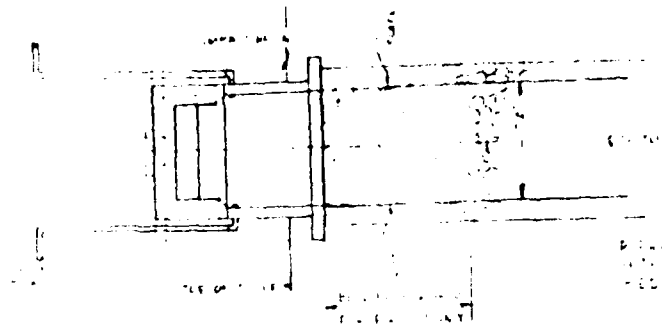


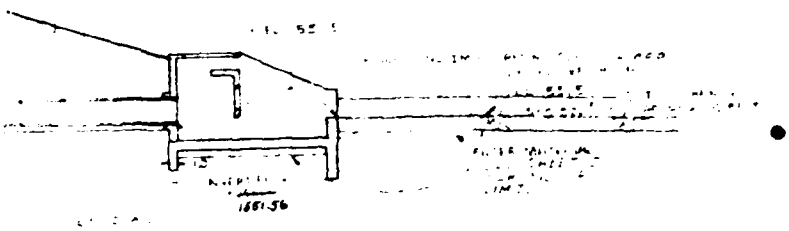
PLAN VIEW





U. S. DEPARTMENT O
SOIL CONSERVAT





91.33'

9,430

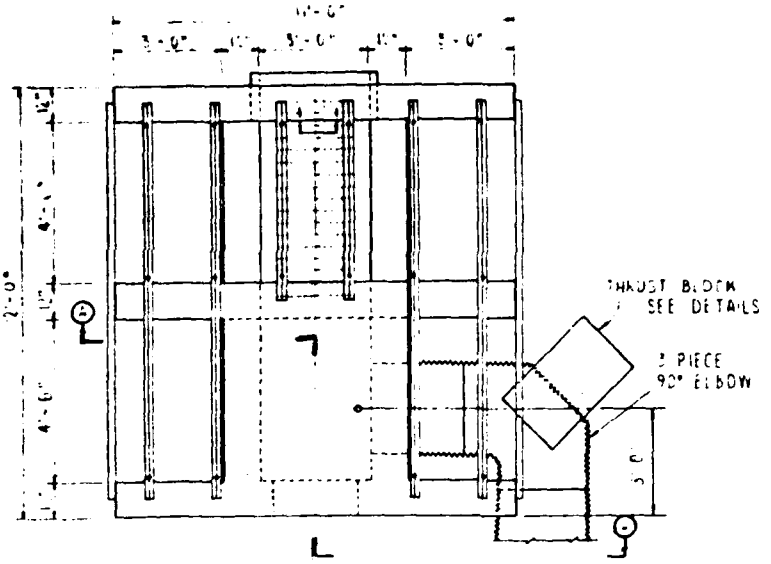
AS BUILT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

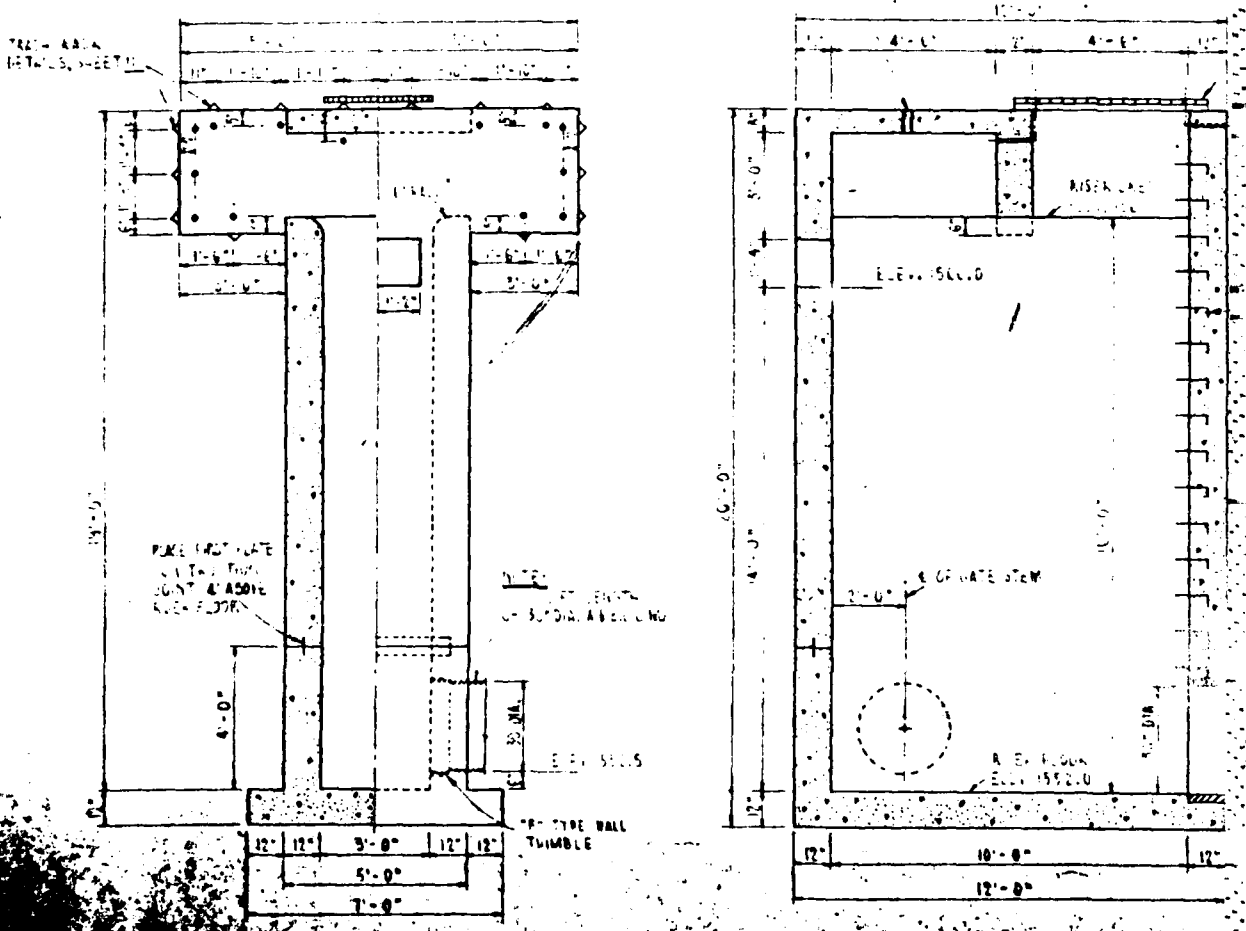
T.C. Parker

VA-351

PLATE CONST.
FOR ALL RISER



PLAN



SECTION A-A

SECTION ALONG CENTERLINE

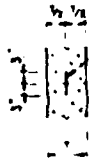
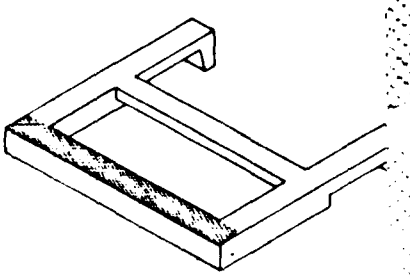
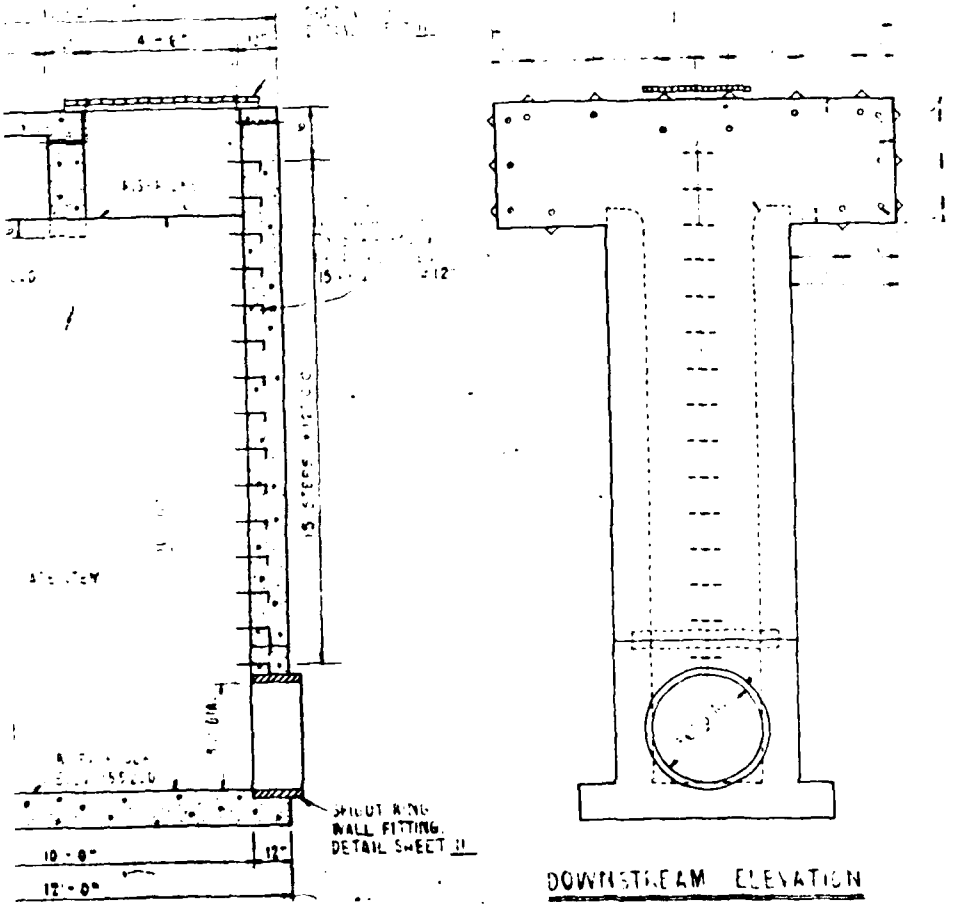


PLATE CONSTR JOINT
FOR ALL RISER JOINTS





DOWNSTREAM ELEVATION

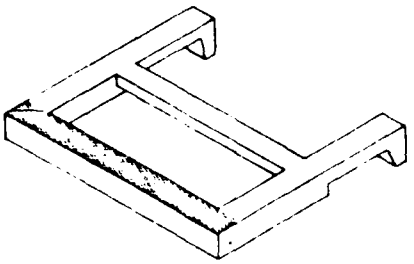
ALONG CENTERLINE

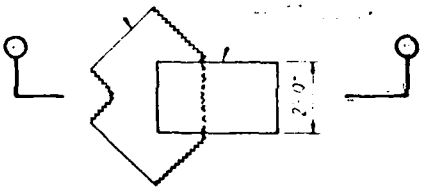
CLASS 4000
CONCRETE

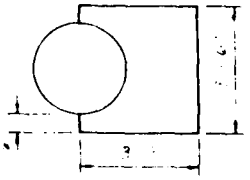
CLAM RIVER
WEST LAKE
SANDISFIE
RIS
U.S. DEPARTM
SOIL CONS
B.J. REHMANN
W.H. MORGAN
T.O. Purdy

1

2





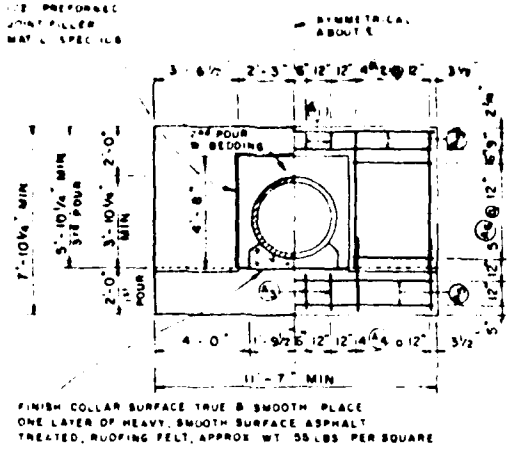


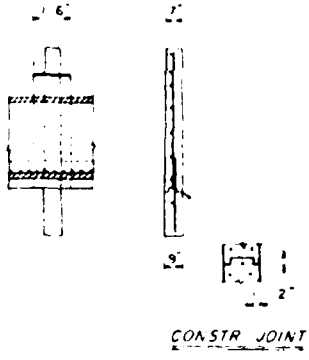
AS BUILT

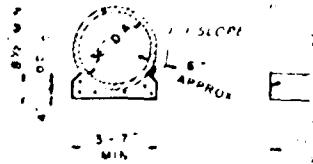
CLAM RIVER WATERSHED PROJECT
WEST LAKE MULTIPLE PURPOSE DAM
SANDISFIELD, MASSACHUSETTS
RISER DETAILS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by
B.J. GEHMAN	1/65	Title
Drawn W.H. NORMAN	JAN 65	Title
Traced		
Checked T.C. Purkey	2/65	Sheet No. 7 of #18 — Drawing No. MA-351-P

CLASS 4000 CONCRETE







CONCR.

REINFORCED CONCRETE ANTI-SEEP COLLAR DETAILS (3 REQ'D)

SCALE 0 1 2 3 4 5 6 FEET

CLASS 2500 CONCRETE

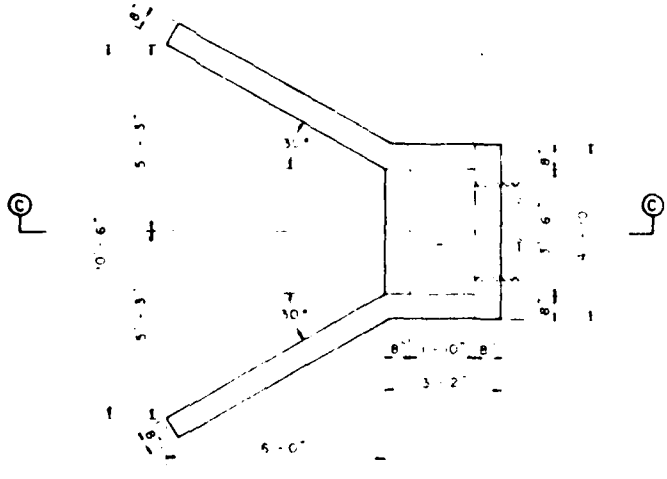
PROJECT QUANTITIES

STEEL

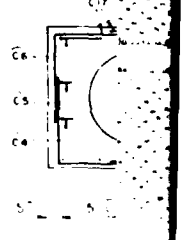
	4405	7812.6
		11,967.9

CONCRETE

	62.8
CLASS 2500	1



PLAN



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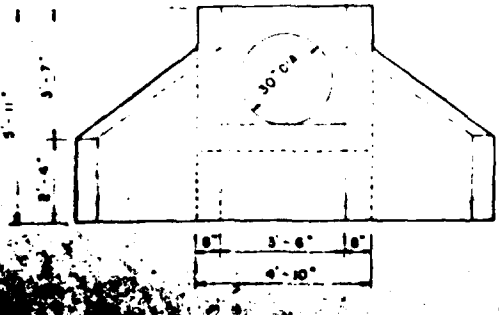
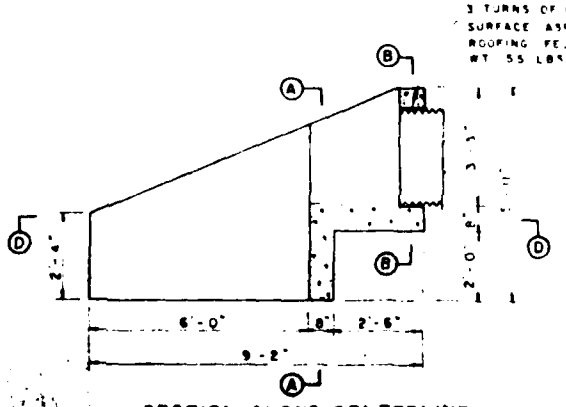
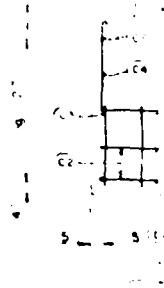


UPSTREAM ELEVATION



SECTION ALONG CENTERLINE

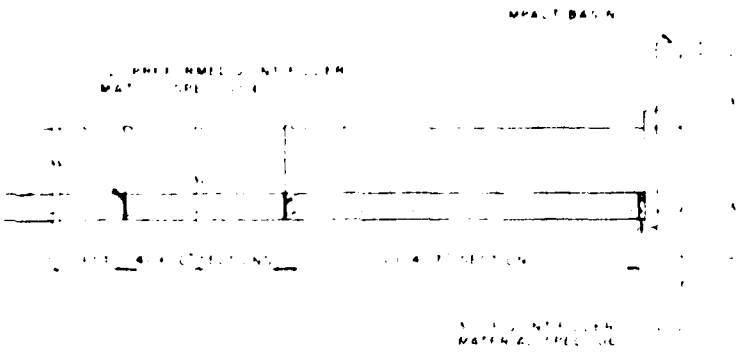


SECT

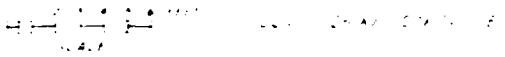
CLASS 4000 CONCRETE

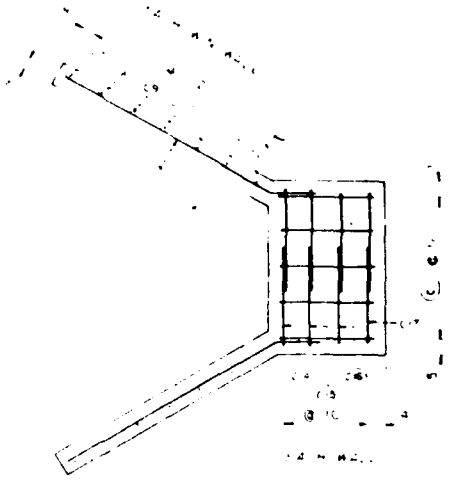
POND DRAIN INLET DETAILS

STEEL SCHEDULE

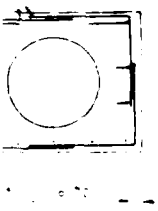


CRETE BEDDING DETAILS



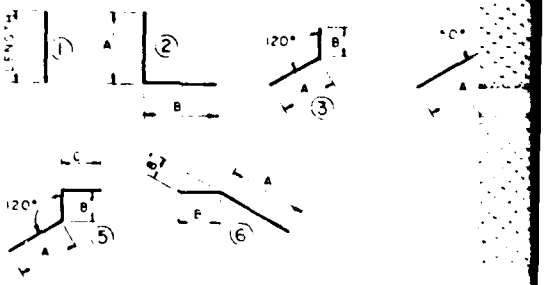


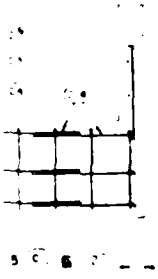
SECTION D-D



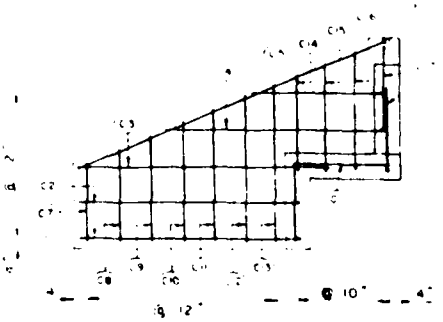
CTION B-B

BAR TYPES





CTION A-A



SECTION C C

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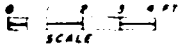


SCALE

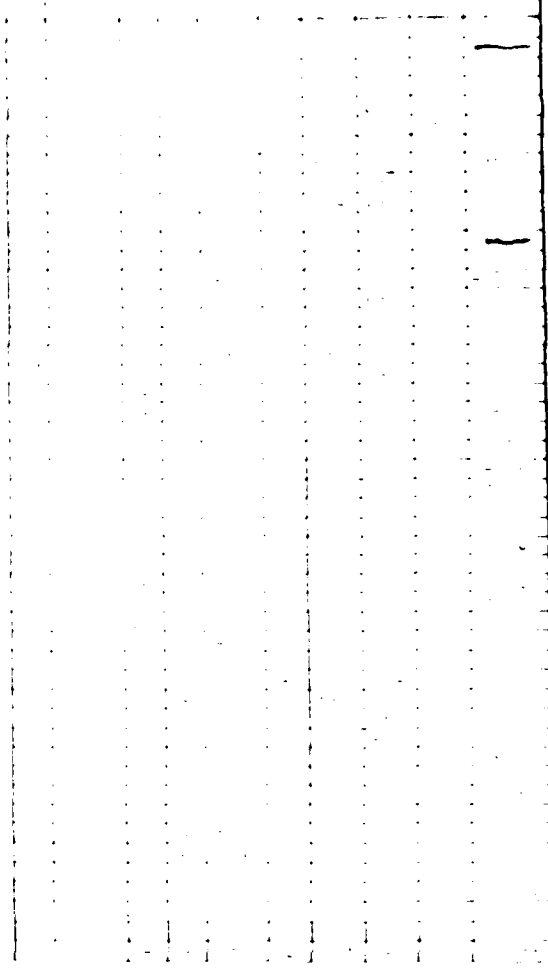
GENERAL NOTES:

1. ALL REINFORCING STEEL PLACED IN CONCR... POURED AGAINST THE GROUND SHAL... MINIMUM OF 3" CLEAR COVER. WHERE FORMS ARE USED ... SHALL HAVE A MINIMUM ...
2. ALL EXPOSED EDGES OF CONCRETE TO HA... A 3/4" CHAMFER UNLESS OTHERWISE N...

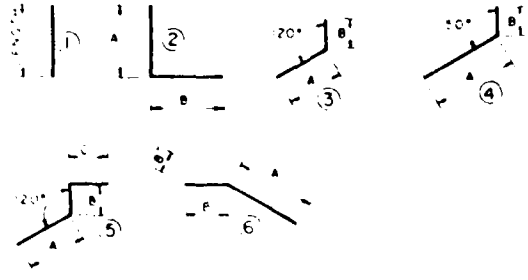
CLAM RIVER WATERSHED PROJ...
...T LAKE MULTIPLE PURPOSE DAM
SANDISFIELD, MASSACHUSETTS
CRADLE, COLLAR, POND DRAIN INLET & STEEL SCH...
U.S. DEPARTMENT OF AGRICULT...
SOIL CONSERVATION SERVICE

B J GERAGHTY	1-65	
W H MORGAN	JAN 65	
T O Furkey	2/65	MA-3...

STEEL SCHEDULE



BAR TYPES



GENERAL NOTES:

1. ALL REINFORCING STEEL PLACED IN CONCRETE POURED AGAINST THE GROUND SHALL HAVE A MINIMUM OF 3" CLEAR COVER. WHERE FORMS ARE USED, REINFORCING STEEL SHALL HAVE A MINIMUM OF 2" CLEAR COVER.
2. ALL EXPOSED EDGES OF CONCRETE TO HAVE A 3/4" CHAMFER UNLESS OTHERWISE NOTED.

AS BUILT

CLAM RIVER WATERSHED PROJECT

T LAKE MULTIPLE PURPOSE DAM

NDISFIELD, MASSACHUSETTS

CRADLE, COLLAR, POND DRAIN INLET & STEEL SCHEDULE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

B J [illegible]	1-65
W H MORGAN	JAN 65
T O Parker	2/65

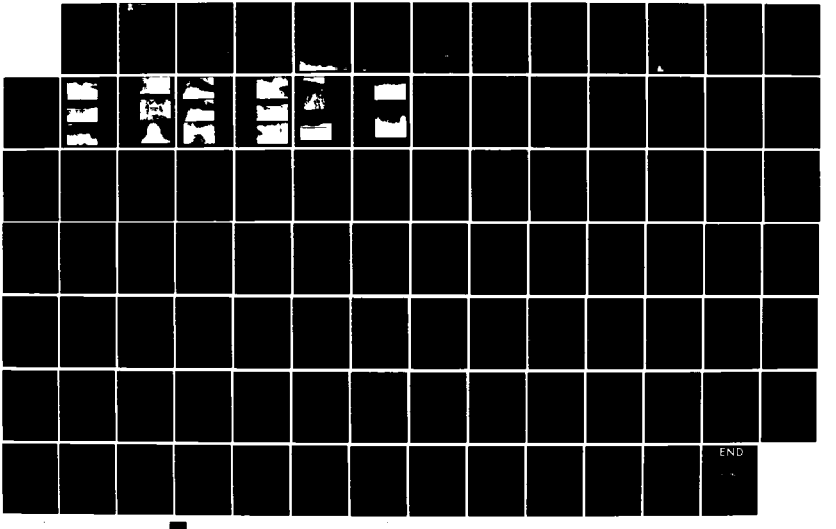
MA-351-P

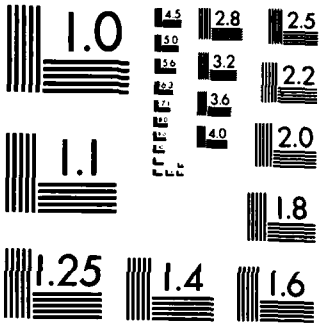
B-8

3

AD-A154 719 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS WEST LAKE DAM (MA 002.. (U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV DEC 79 2/2

UNCLASSIFIED F/G 13/13 NL





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

DH 1. ELEV. 1581.6

TOPSOIL, wet.

SAND, silty, with gravel, about 12% fines, fine sand 30%, medium sand 23%, coarse sand 20%, gravel 13%, cobbles 3%, boulders 2%, angular to subangular, maximum size 14", olive brown, wet to damp, structure massive, permeability low to impermeable, firm to very dense, glacial till.

10.0

BEDROCK, unweathered biotite gneiss, foliation planes nearly horizontal 6" to 18" apart, gray to dark gray.

RX= 100%

20.0

Bottom of hole

NOTE: Water level at 2.5' on 4/29/64.
Lost water at 15 feet.
Water level 4 ' on 4/28/64.

DH 3. ELEV. 1575.0

W.L. 4/29/64

TOPSOIL

1.5

SAND, silty with gravel, about 12% fines, fine sand 30%, medium sand 20%, coarse sand 22%, gravel 3%, cobbles 3%, angular to subangular, maximum size 8", olive brown to olive, wet to damp, massive, permeability low to impermeable, firm to very dense, moraine or till.

SM

12.0

BEDROCK, quartz, biotite gneiss, unweathered, fractures horizontal, foliation nearly vertical.

RX=85%

22.0

Bottom of hole.

NOTE: Water level 6" below ground surface 4/28/64.
Water level 6" 4/29/64

DH 4. ELEV. 1562.5

W.L. 5/4/64

TOPSOIL

1.5

SAND, silty, with gravel, about 15% fines, fine sand 20%, medium sand 29%, coarse sand 20%, gravel 15%, cobbles 5%, boulders 1%, angular to subangular, maximum size 8", olive brown to brown, wet to damp, structure massive, permeability low to impermeable, firm to dense, till.

SM

20.0

BEDROCK, quartz, biotite gneiss, unweathered, one horizontal fracture at 13 feet, foliation inclined about 60 degrees.

RX= 100%

30.0

Bottom of hole

NOTE: Water at 1 feet on following dates: 4/30; 5/1 and 5/4/64

DH 5. ELEV. 1558.6

TOPSOIL AND DUFF

8.0

W.L. 5/5/64

SAND, silty, with gravel, about 12% fines, fi... 20%, medium sand 23%, coarse sand 22%, gr...el ... angular to subangular, maximum size 3", olive ... to olive, wet to damp, structure massive, per... low to impermeable, firm to dense, moraine or till with 6" lense of fine gray sand from 3.0 8.5'.

SM

14.0

CLAY, silty wit' gravel, about 42% fines, fi... medium sand 13%, coarse sand 2%, gravel 1%, g... to subangular, maximum size 3/4", olive, d... massive, impermeable, very dense, moraine or ...

SC-CL

16.0

GRAVEL, sandy silty about 9% fines, fine sa... medium sand 1...%, coarse sand 15%, gravel 33%, ...%, angular to subangular, maximum size 30", moist, single grain, impermeable, very dense.

GM-SM

Cored 2.0' boulder.

RX=100%

Cored 2.5' boulder

RX=100%

37.0

Bottom of hole

Water level at 3.0' 5/6/64
Water level at 3.0' 5/5/64
NOTE: Drilled hole with Diamond Core, NX, N-S... recovered 90% of core.

DH ', ELEV. 1551.0

ORGANIC, sand and gravel with fines.

W.L. 2.0 5/14/64

SAND, silty with gravel, about 15% fines, fi... 20%, medium sand 25%, coarse sand ...%, gravel ... to subangular, maximum size 1", olive-brown ... damp, structure massive, low to impermeable ... dense to very dense, till or moraine.

SM

Ref.

Ref.

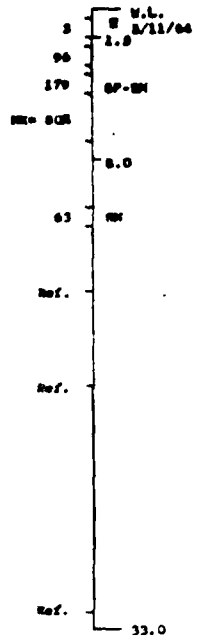
Ref.

33.0

Bottom of hole

Water level at 1.5' on 5 1...
Water level at 1.5' on 5 14 ...
NOTE: Casing to 1...' no water loss wit... 15.

DH 7, ELEV. 1334.8



TOPSOIL

SAND, silty, with gravel, about 16% fines, fine sand 18%, medium sand 18%, coarse sand 24%, gravel 30%, cobbles 10%, boulders 13%, angular to subangular, maximum size 36", olive brown to olive, moist to damp, structure massive, low to impermeable permeability, firm to very dense, weathered till to 3.0', then dense. Cored 2.5' boulder.

SAND, silty, with gravel, about 15% fines, fine sand 26%, medium sand 23%, coarse sand 13%, gravel 13%, boulders 10%, angular to subangular, maximum size 9", olive, damp, structure massive, impermeable, very dense, glacial till.

125 fines, fine sand
3 23%, gravel 23%,
ize 3", olive brown
massive, permeability
, moraine or glacial
cored from 3.0' -

55 fines, fine sand 33%,
gravel 8%, gravel angular
olive, damp, structure
moraine or till.

fines, fine sand 10%,
, gravel 33%, boulders
um size 33", gray,
very dense, moraine.

Bottom of hole

Water level at 1.0' on 5/11/64.

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
DH-Drill Holes	601-699
TP-Test Pits	701-799

MODIFIED 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, v.fine sands; sandy or sil
CL	Clays of low to medium plasticity; silty or gravelly clays
CH	Clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous
OL	Organic silts and organic silty clays of plasticity
OH	Organic clays or silts of medium to high plasticity

Key to DRILL HOLE (DH) LOGS

N = Number of blows required for 1-ft. penetration, using 3.0" O.D. split barrel sampler, 300# hammer, and 18" drop.

Unified Soil Classification Symbol.

Depth in hole.

Percent rock core recovery in each drill run.

Bottom of hole

Vertical scale 1" = 5'

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

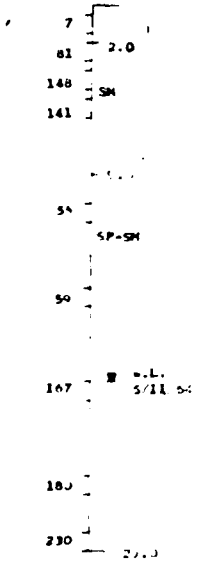
All holes were advanced by continuous drive sampling 4.5'. Holes were then advanced by NX diamond drilling between drive samples.

ore, NX, M-Series,

ea.

5% fines, fine sand
, gravel 15%, angular
olive-brown to olive,
impermeable permeability,
ine.

DH 9, ELEV. 1372.1



TOPSOIL, red-brown

SAND, silty, with gravel, about [illegible] fines, fine sand 20%, medium sand 23%, coarse sand 23%, [illegible]vel 20%, angular to subangular, maximum size 1½", olive, [illegible] structure massive, permeability low to impermea[illegible] firm to dense, moraine or till.

SAND, with gravel, about 7% fines, fine sand 15%, medium sand 23%, coarse sand 20%, gravel 30%, cobbles 3%, boulders 3%, angular to subangular, maximum size 7", red-brown, wet, structure single grain, low permeability, moraine.

Bottom of hole

Water level at 17 feet on 5/7/64.
Water level at 12 feet on 5/8/64
Water level at 20 feet on 5/11/64

Permeability tests:
15.0 - 1[illegible] = 13.3 feet day
2[illegible].0 - 21.0 = 2.6 feet day
25.0 - 26.0 = 0.75 feet per day

as wit 15.0' head.

AS BUIL

Location of Test Holes shown on Plan view

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

CLAM RIVER WATERSHED PROJECT
WEST LAKE, MULTIPLE PURPOSE DAM
Sandisfield, Massachusetts

LOG OF TEST HOLES
(DRILL HOLES)

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: [illegible]
Karl R. Kling, State Conservationist

Typed by: W.M.B.

MA-5[illegible]

1

2

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
DH-Drill Holes	601-699
TP-Test Pits	701-799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels; 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, v.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

Key to DRILL HOLE (DH) LOGS

N=10 — N = Number of blows required for 1-ft. penetration, using 3.0" O.D. split barrel sampler, 300# hammer, and 18" drop.

21 SM — Unified Soil Classification Symbol.

13.0 — Depth in hole.

Percent rock core recovery in each drill run.

95% — Material greater than ¾ inch by weight 4 per cent

Bottom of hole

Vertical scale 1" = 5'

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

All holes were advanced by continuous drive sampling to 4.5'. Holes were then advanced by NX diamond drilling between drive samples.

, with gravel, about 10% fines, fine sand 15%, ... 15%, coarse sand 30%, gravel 30%, cobbles ...% 15%, angular to subangular, maximum size ... brown to olive, moist to damp, structure ... to impermeable permeability, firm to very ...thered till to 3.0', then dense. ...boulder.

..., with gravel, about 15% fines, fine sand 20%, ...d 25%, coarse sand 15%, gravel 15%, boulders ...r to subangular, maximum size 5", olive, damp, ...assive, impermeable, very dense, glacial till.

holes

... at 1.0' on 5/11/64.

red-brown

...y, with gravel, about 12% fines, fine sand 20%, ...d 25%, coarse sand 25%, gravel 20%, angular to ..., maximum size 1½", olive, damp, structure ...permeability low to impermeable, firm to dense, ... till.

...h gravel, about 7% fines, fine sand 15%, medium ... coarse sand 20%, gravel 30%, cobbles 3%, ...%, angular to subangular, maximum size 7", ... wet, structure single grain, low permeability,

...ter

...el at 17 feet on 5 7/64.
...el at 13 feet on 5 8/64
...el at 23 feet on 5 11/64

...r tests:
...) feet d...
...) feet d...
...) feet per day.

AS BUILT

Location of Test Holes shown on Plan view

NOTES: water levels do no necessarily represent static water levels.

CLAM RIVER WATERSHED PROJECT
WEST LAKE MULTIPLE PURPOSE DAM
Sandisfield, Massachusetts

LOG OF TEST HOLES
(DRILL HOLES)

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: [illegible]

Typed by: [illegible] E.M.B.

Earl R. Klimpelhafer
State Conservation Engineer

MA-351-P

B

BH 9, ELEV. 1560.8

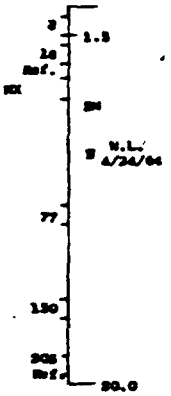
TOPSOIL

SAND, silty, with gravel, about 10% fines, fine sand 20%, medium sand 30%, coarse sand 30%, gravel 12%, cobbles 3%, angular to subangular, maximum size 8", olive brown to olive, wet to damp, structure massive, permeability low to impermeable, firm to dense, glacial till.

Bottom of hole

Water at the surface on 4/30/64, 5/1/64 and 5/4/64.

BH 10, ELEV. 1576.6



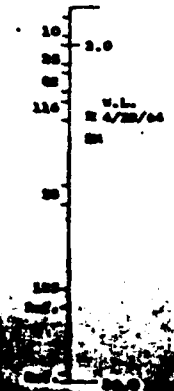
TOPSOIL

SAND, silty, with gravel, about 12% fines, fine sand 20%, medium sand 23%, coarse sand 20%, gravel 12%, cobbles 3%, boulders 3%, angular to subangular, maximum size 6", brown to olive, wet to damp, structure massive, permeability low to impermeable, dense to very dense, glacial till.

Bottom of hole

Water level at 5.0' on 4/27/64
Water level at 8.0' on 4/28/64
Water level at 8.0' on 4/29/64

BH 11, ELEV. 1561.1



TOPSOIL

SAND, silty, with gravel, about 12% fines, fine sand 20%, medium sand 40%, coarse sand 10%, gravel 12%, angular to subangular, maximum size 3", olive brown to olive, damp, structure massive, permeability low to medium, dense to very dense, glacial till.

Bottom of hole

Water level at 8.0' on 4/28/64

BH 30A, ELEV. 1554.2

TOPSOIL

SAND, dirty, with gravel, about 12% fines, fine sand 20%, medium sand 30%, coarse sand 20%, gravel 12%, angular to subangular, olive brown moist to damp, structure massive, permeability low impermeable, firm to very dense, moraine or glac weathered from 1.5' to 3.0'.

Bottom of hole

Water level at 2.5' on 5/11/64
Water level at 2.5' on 5/12/64

BH 30B, ELEV. 1554.2

TOPSOIL

SAND, dirty with gravel, about 8% fines, fine sand 20%, medium sand 30%, coarse sand 20%, gravel 22%, angular to subangular, maximum size 1", brown to olive brown, moist, single grain structure, permeability medium, firm, valley fill and weathered till.

SAND, silty, with gravel, about 12% fines, fine sand 23%, medium sand 3%, coarse sand 23%, gravel 12%, angular to subangular, 1/4" maximum size, olive, damp, structure massive, permeability low to impermeable, dense to very dense.

Bottom of hole

Water level at 3.0' on 5/3/64

NOTE: No water loss at 5 and 10 feet with 10 to 15 foot head.

ith gravel, about 10% fines, fine sand 15%,
l, coarse sand 30%, gravel 30%, cobbles 15%,
ngular to subangular, olive brown to olive,
structure massive, permeability low to
ire to very dense, moraine or glacial till
1.5' to 3.0'.

' 2.5' on 5/11/64
2.5' on 5/12/64

ith gravel, about 8% fines, fine
ium sand 30%, coarse sand 30%,
ngular to subangular, maximum
n to olive brown, moist, single
re, permeability medium, firm,
nd weathered till.

with gravel, about 15% fines, fine
ium sand 20%, coarse sand 25%,
ngular to subangular, 3/4" maximum
damp, structure massive, permeability
rable, dense to very dense.

:2
at 3.0' on 5/3/64

r loss at 5 and 10 feet with 10 and
head.

CLAM RIVER WATERSHED
WEST LAKE MUSKEGON PR.
Smithfield, Muscogee

LOG OF TEST HO
(DRILL HOLES)

U. S. DEPARTMENT OF
SOIL CONSERVATIO

Investigated by: Date
Plotted by: U.S.G.S.

(2)

AS BUILT

CLAM RIVER WATERSHED PROJECT
WEST LAKE MULTIPLE PURPOSE DAM
Sandisfield, Massachusetts

LOG OF TEST HOLES
(DRILL HOLES)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: Date

Typed by: U.S.S.

Approved by: Earl S. Klimpelhoffer
Title: State Conservation Engineer

Drawing No. MA-351-P1

(3)

[illegible] (Engineers)

TP-98, ELEV. 1274.8 4/23/64 R.G.L.

0.0	2.0	TOPSOIL	
2.0	10.0	SAND, silty, with gravel and cobbles and boulders; fines 12%, fine sand 13%, medium sand 20%, coarse sand 10%, gravel 8%, cobbles 8%, boulders 10%, angular to subangular, maximum size 30", olive brown, wet, structure low to medium, blocky, permeability low to impermeable, dense, glacial till.	SM
10.0		Bottom of hole.	

NOTE: Water entering pit estimated 2 gal/min. through seams under topsoil and around boulders above 4.0'.

D.S. #91.1 2.0' - 10.0'

TP-99, ELEV. 1284.6 4/23/64 D.S.M.

0.0	1.0	TOPSOIL	
1.0	16.0	SAND, silty, with gravel, fines 13%, fine sand 20%, medium sand 23%, coarse sand 13%, gravel 13%, cobbles 8%, boulders 8%, angular to subangular, maximum size 20" with 3" lenses of gravel at 6 feet, yellow brown to olive, moist, structure massive, permeability low to impermeable, dense to very dense, glacial till or moraine.	SM
16.0		Bottom of hole	

NOTE: Water entering pit at 6 feet, estimated 2 gal/min.

D.S. #92.1 2.0' - 16.0'

TP-100, ELEV. 1284.2 4/23/64 D.S.M.

0.0	1.0	TOPSOIL	
1.0	12.0	SAND, silty, with gravel, fines 10%, fine sand 20%, medium sand 20%, coarse sand 13%, gravel 13%, cobbles 13%, boulders 8%, angular to subangular, maximum size 24" with 4" lenses of gravel at 11 feet, brown to olive, moist, structure massive, permeability low to impermeable, firm to dense, glacial till.	SM (SM)
12.0		Bottom of hole.	

NOTE: Water entering at 11 feet, too little to estimate.

D.S. #100.1 1.0' - 12.0' (SM plus 6" discarded)

TP-102, ELEV. 1282.1 4/23/64 D.S.M.

0.0	1.5	TOPSOIL	SM
1.5	10.0	SAND, silty, with gravel and cobbles, fines 12%, fine sand 20%, medium sand 22%, coarse sand 17%, gravel 13%, cobbles 10%, boulders 5%, angular to subangular, 12" maximum size, olive, moist, structure massive, permeability low to impermeable, firm to dense, glacial till.	
10.0		Bottom of hole. Boulders and cobbles.	

NOTE: Water entering pit at 10 feet from boulders and cobbles in bottom, estimated 10 gal/per minute

D.S. #102.1 1.5' - 10.0'

TP-103, ELEV. 1249.9 4/23/64 DSM

0.0	1.5	TOPSOIL	
1.5	10.0	SAND and gravel, fines 7%, fine sand 10%, medium sand 13%, coarse sand 35%, gravel 33%, cobbles 8%, angular to subrounded, maximum size 5", thinly bedded, olive brown, moist to wet, structure single grain, permeability high, loose, outwash.	SP SW
10.0		Bottom of hole.	

NOTE: Water entering pit below 5', estimated 5 gal/per minute. Hole caving.

D.S. 103.1 1.5' - 10.0' (2% plus 6" discarded)

TP-104, ELEV. 1281.1 4/23/64 D.S.M.

0.0	1.5	TOPSOIL	
1.5	12.0	SAND, dirty, fines 8%, fine sand 9%, medium sand 20%, coarse sand 13%, gravel 10%, cobbles 7%, maximum size 8", olive, damp, structure massive, permeability low, loose to firm, ground moraine.	SM
12.0		Bottom of hole.	

D.S. #104.1 1.5' - 12.0' (1% plus 6" discarded)

TP-105, ELEV. 1282.7 4/23/64 D.S.M.

0.0	1.5	TOPSOIL	
1.5	10.0	SAND, silty, with gravel and cobbles, fines 12%, fine sand 27%, medium sand 30%, coarse sand 15%, gravel 10%, cobbles 5%, boulders 1%, angular to subangular, maximum size 16", brown to olive brown, damp, structure massive, permeability low to impermeable, firm to dense, ground moraine or till.	SM
10.0		Bottom of hole	

D.S. 105.1 1.5' - 10.0' (estimated 4% plus 6" discarded)

TP-107, ELEV. 1290.3 4/23/64 D.S.M.

0.0	1.5	TOPSOIL	
1.5	12.0	SAND, silty, with gravel, fines 13%, fine sand 20%, medium sand 20%, coarse sand 15%, gravel 15%, cobbles 15%, boulders 2%, angular to subangular, maximum size 14", olive brown, damp to wet, massive structure, permeability low to impermeable, firm to dense, ground moraine or till.	SP SM SM
12.0		Bottom of hole	

NOTE: Water entering pit at 12', estimated 1 gal minute on 4/23/64.

D.S. #107.1 1.5' - 12.0'

TP-108, ELEV. 1286.7 4/23/64 D.S.M.

0.0	1.5	TOPSOIL	
1.5	8.0	SAND, silty, with gravel, fines 12%, fine sand 17%, medium sand 20%, coarse sand 15%, gravel 13%, cobbles 5%, boulders 1%, angular to subangular, 10" maximum size, brown to olive brown, damp, massive, permeability low to impermeable, firm to dense, ground moraine or till.	SM
8.0	11.0	GRAVEL, with sand and cobbles, fines 1%, fine sand 5%, medium sand 12%, coarse sand 24%, gravel 50%, cobbles 8%, boulders [illegible], maximum size 14", [illegible], olive-brown, [illegible], angular to subangular, permeability [illegible], dense, glacial moraine.	GW
11.0		Bottom of hole	

*T[illegible] [illegible] entering [illegible] at 8', [illegible] gal/min. [illegible]

D.S. [illegible] 1.5' - [illegible] (est. [illegible] plus 6" discarded)

[illegible] - 11.0'

TP-[illegible], ELEV. 157[illegible] 4/23/64 [illegible]

0.0	0.5	[illegible]	
0.5		Bottom of hole	

TP-[illegible], ELEV. 157[illegible] [illegible]

0.0	1.[illegible]	TOPSOIL	
1.[illegible]	12.[illegible]	SAND, silty with gravel, fines [illegible], fine sand [illegible], medium sand 15%, coarse sand [illegible], gravel 1[illegible], cobbles 5%, angular to subangular, maximum size 14", brown to olive brown, wet to damp, structure low to impermeable, permeability low to impermeable, dense, glacial till, preconsolidated.	
12.[illegible]		Bottom of hole	

*T[illegible] water entering pit at 4', estimated [illegible] gal. per min.

D.S. [illegible] 1.[illegible] - 12.[illegible]

* All percentages are estimates and all classifications are field classifications.

(1)

4/23/64 D.B.M.

sand 3%, medium SM
gravel 10%, cobbles
damp, structure
dense to firm,

lb plus 6" discarded)

4/23/64 D.B.M.

cobbles, fines SM
d 5%, coarse
3%, boulders
aximum size 15",
structure massive,
se, firm to dense,

estimated 4%

4/23/64 D.B.M.

es 1 in, fine SP-
rse sand 15%, SM
ers 2%,
m size 1",
sive structure,
se, firm to

1.5', estimated
%.

4/23/64 D.B.M.

es 12", fine SM
se sand 15%,
ers 1%,
m size 1",
sive structure,
se, firm to

TP-253, ELEV. 1574.2 4/23/64 D.B.M.

0.0	1.5	TOPSOIL
1.5	3.5	SAND, silty, with gravel, fines 12%, fine sand 30%, medium sand 30%, coarse sand 15%, gravel 15%, cobbles 5%, boulders 3%, angular SM
3.5		GNEISS bedrock, fractured.
		Bottom of hole.

TP-254, ELEV. 1582.0 4/23/64 D.B.M.

0.0	1.5	TOPSOIL AND DUFF
1.5	9.0	SAND, silty, with gravel, fines 12%, fine sand 20%, medium sand 30%, coarse sand 15%, gravel 15%, cobbles 5%, boulders 3%, angular to subangular, yellow-brown to olive, damp, structure massive, impermeable, dense, glacial till, preconsolidated. SM
9.0		Bottom of hole.

NOTE: Water entering pit at 18 inches about 2 gal/per min.

D.S. 254.1 1.5' - 9.0'

TP-255, ELEV. 1582.6 4/23/64 D.B.M.

0.0	1.5	
1.5	9.0	SAND, silty, with gravel, fines 12%, fine sand 20%, medium sand 30%, coarse sand 15%, gravel 20%, cobbles 2%, boulders 1%, angular to subangular, maximum size 14", brown to olive brown, damp, structure massive, impermeable, glacial till, preconsolidated. SM
9.0		Bottom of hole.

NOTE: Water entering pit at 9 feet, estimated 6 gal/per minute.

D. S. 255.1 1.5' - 9.0'

TP-256, ELEV. 1581.2 4/23/64 D.B.M.

0.0	1.0	TOPSOIL AND DUFF
1.0	6.0	SAND, silty, with gravel, fines 15%, fine sand 45%, medium sand 15%, coarse sand 15%, gravel 10%, cobbles 5%, angular to subangular, maximum size 6", 5" gravel lense at 4.5', yellow brown to olive, moist, structure massive, permeability low, loose to dense, glacial till, preconsolidated.
6.0		Bottom of hole

NOTE: Water entering pit at 4.5 feet.

D.S. 256.1 1.0' - 6.0'

TP-257, ELEV. 1577.1 4/23/64 D.B.M.

0.0	1.0	TOPSOIL
1.0	7.0	SAND, silty with gravel, fines 20%, fine sand 35%, medium sand 25%, coarse sand 15%, gravel 15%, cobbles 5%, trace of boulders, angular to subangular, non-plastic, maximum size 6", brown to olive brown at 2', wet, structure low to medium block, permeability low to impermeable, loose to dense, glacial till.
7.0		Bottom of hole.

NOTE: Water entering pit at 6.5', estimated 5 gal/min.

D.S. 257.1 1.0' - 7.0'

TP-258, ELEV. 1579.4 4/24/64 D.B.M.

0.0	1.5	TOPSOIL
1.5	9.5	SAND, silt, with gravel, about 15% fines, fine sand 45%, medium sand 15%, coarse sand 6%, gravel 17%, cobbles 5%, angular to subrounded, maximum size 6", yellow brown, damp to wet, structure massive, permeability low, dense to very dense, morainal SM
9.5		Bottom of hole.

NOTE: water entered pit at 6.5'.

D.S. 271.1 1.5' - 9.5' (estimated 15% plus 6" discarded)

TP-272, ELEV. 1577.8 4/24/64

0.0	1.5	TOPSOIL
1.5	10.0	SAND, dirty with gravel, about 8% fines, fine sand 34%, medium sand 10%, coarse sand 9%; gravel 40%, cobbles 3%, angular to subrounded, maximum size 10", yellow-brown, damp to wet.
10.0	12.0	GRAVEL, with sand and cobbles, about 4% fine sand 10%, medium sand 15%, coarse sand gravel 45%, cobbles 6%, angular to subangular, tan-brown, wet, structure single grain, high, morainal.
12.0		Bottom of hole.

NOTE: water entered pit at 10', estimated 3 gal/min.

D.S. #272.1 1.5' - 10.0' (estimated 5% discarded)

TP-273, ELEV. 1577.9 4/24/64

0.0	1.5	TOPSOIL
1.5	12.0	SAND, silty with gravel, about 10% fines, fine sand 30%, medium sand 9%, coarse sand 9%, gravel 15%, cobbles 9%, angular to subrounded, maximum size 8", tan brown, damp to wet, single grain structure, low permeability, dense, morainal.
12.0		Bottom of hole.

NOTE: water entered pit at 11.0' as wet

D.S. 273.1 1.5' - 12.0' (est. 4% plus 6" discarded)

TP-274, ELEV. 1577.9 4/24/64

0.0	1.5	TOPSOIL
1.5	11.0	SAND, silty with gravel and cobbles, about 10% fines, fine sand 30%, medium sand 9%, coarse sand 9%, gravel 15%, cobbles 9%, angular to subangular, maximum size 10", tan-brown, damp to wet, single grain structure, low permeability low, dense to very dense, morainal.
11.0		Bottom of hole.

NOTE: Water entered pit at 9' -- too little estimate.

D.S. 274.1 1.5' - 11.0' (estimated 6" discarded)

TP-275, ELEV. 1573.7 4/24/64

0.0	1.0	TOPSOIL
1.0	11.0	SAND, silt, with gravel, about 1 to fine sand 25%, medium sand 30%, coarse sand 15%, gravel 15%, cobbles 5%, boulders 1%, angular to subangular, maximum size 12", yellow-brown, damp moist, structure massive, permeability low, loose to dense, glacial till, preconsolidated.
11.0		Bottom of hole.

NOTE: Water entering pit at 3.5', estimated 5 gal/min.

D.S. 275.1 1.0' - 11.0'

Location of Test Pits shown on Plan view.

[illegible]

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Investigation
Test Pit Data (Test Pits)
Scale
Date
By

(2)

4/23/64 D.E.M.

...vel, fines 12%, fine ... SM
...nd 30%, coarse sand 18%, ...
...%, boulders 3%, angular- ...
...tured.

4/23/64 D.E.M.

...avel, fines 12%, fine ... SM
...d 34%, coarse sand 15%, ...
...4%, boulders 3%, angular ...
...-brown to olive, damp, ...
...rmeable, dense, glacial ...
...t.

...pit at 18 inches ...
...er min.

...- 9.0'

4/23/64 D.E.M.

...avel, fines 12%, fine ... SM
...d 30%, coarse sand 15%, ...
...%, boulders 1%, ...
...%, maximum size 14", ...
..., damp, structure ...
..., glacial till, pre-

...pp pit at 9 feet, ...
...gal/per minute.

...' - 9.0'

4/23/64 D.E.M.

...avel, fines 15%, fine ... SM
...%, coarse sand 15%, ...
...%, angular to subangular, ...
...gravel lense at 4.5', yellow ...
...t, structure massive, per- ...
...e, glacial till, ...

...pit at 4.5 feet.

...' - ...'

4/23/64 D.E.M.

...avel, fines 4%, fine ... SM
...%, coarse sand ...%, ...
...%, trace of boulders, ...
...ar, non-plastic, maxim- ...
...sive brown at 2', wet, ...
...dium dense, permeability, ...
...ium - heavy, glacial ...

...pit at ...', estimated ...

...' - ...'

4/23/64 D.E.M.

...avel, about 1% fines, SM
...ne sand 17%, coarse sand ...
...ses 38%, ...ler than ...
...%, ...ellow, damp ...
...sive, ...minus fill ...
...material

...pit at ...'

...' (estimated 1% plus ...
...discarded)

TP-272, ELEV. 1377.8 4/24/64 D.E.M.

0.0	1.8	TOPSOIL
1.8	10.0	SAND, dirty with gravel, about 8% fines, SM-SP fine sand 34%, medium sand 10%, coarse sand, (SM) 3%; gravel 40%, cobbles 3%, angular to sub-rounded, maximum size 10", yellow-brown, damp to wet.
10.0	12.0	GRAVEL, with sand and cobbles, about 4% fines, GP-SP fine sand 10%, medium sand 13%, coarse sand 20%, gravel 43%, cobbles 6%, angular to subangular, tan-brown, wet, structure single grain, permeability high, morainal.
12.0		Bottom of hole.

NOTE: water entered pit at 10', estimated flow 3 gal/min.

D.S. #272.1 1.5' - 10.0' (estimated 5% plus 6" discarded)

TP-273, ELEV. 1377.6 4/24/64 D.E.M.

0.0	1.5	TOPSOIL
1.5	12.0	SAND, silty with gravel, about 18% fines, SM fine sand 30%, medium sand 9%, coarse sand (SM) 3%, gravel 15%, cobbles 5%, angular to sub-rounded, maximum size 6", tan brown, damp to wet, single grain structure, low permeability, dense, morainal.
12.0		Bottom of hole.

NOTE: water entered pit at 11.0' as very small seep.

D.S. 273.1 1.5' - 12.0' (est. 4% plus 6" discarded)

TP-274, ELEV. 1372.9 4/24/64 D.E.M.

0.0	1.5	TOPSOIL
1.5	11.0	SAND, silty with gravel and cobbles, about SM 18% fines, fine sand 30%, medium sand 9%, coarse sand 3%, gravel 15%, cobbles 3%, angular to subangular, maximum size 10", tan-brown, damp to wet, single grain structure, permeability low, dense to very dense, morainal.
11.0		Bottom of hole.

NOTE: water entered pit at 9' -- too little to estimate.

D.S. 274.1 1.5' - 11.0' (estimated 10% plus 6" discarded.)

TP-331, ELEV. 1373.7 4/23/64 K.G.L.

0.0	1.0	TOPSOIL
1.0	13.0	SAND, silty, with gravel, about 12% fines, fine sand 24%, medium sand 25%, coarse sand 13%, gravel 11%, cobbles 5%, boulders 0%, angular to subrounded, maximum size 10", silty organic litter and roots, brown-tan, damp moist, structure low to medium blocky, permeability low to impermeable, dense, glacial till, preconsolidated.
13.0		Bottom of hole.

NOTE: ...water entered pit at 3.0', estimated ... gal/min.

D.S. 331.1 1.0' - 13.0'

Location of Test Pits shown on Plan view.

AS BUILT

...A. ... DAM PROJECT

... MULTIPLE PURPOSE DAM
... Mass.

... OF TEST HOLES (TEST PITS)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated ...

Drawn ... Approved ...
Traced ... Area Conservationist
Checked ...

MA-351-P

(3)

B-11

XP-332, R&BV, 1333.1 4/22-23/64 D.E.M.

0.0	1.0	TOPSOIL	
1.0	9.0	SAND, silty, with gravel, about 20% fines, fine sand 20%, medium sand 15%, coarse sand 3%, gravel 12%, cobbles 3%, boulders 5%, angular to subrounded, maximum size 24", gray to red-brown, moist to wet, structure low to medium blocky, permeability low to impermeable, dense, glacial till.	SM
9.0		Bottom of hole.	

NOTE: water entered pit at zone 3.0' - 4.0' estimated 3 gal/min.

XP-333, R&BV, 1333.0 4/22/64 K.G.L.

0.0	1.0	TOPSOIL, dark brown, wet	
1.0	10.0	SAND, silty with gravel and cobbles, about 20% fines, fine sand 20%, medium sand 35%, coarse sand 10%, gravel 13%, cobbles 5%, trace of boulders, angular to subrounded, maximum size 18", yellowish-brown, moist to damp, structure low to medium blocky, permeability low to impermeable, loose to very dense, glacial till.	SM
10.0		Bottom of hole.	

NOTE: water entering pit 0.0' - 2.5', estimated 2-3 gal/min.

D.S. 333.1 1.0' - 10.0'

XP-334, R&BV, 1334.0 4/21/64 K.G.L.

0.0	0.5	TOPSOIL	
0.5	2.0	SAND, silty with gravel, about 15% fines, fine sand 30%, medium sand 10%, gravel 10%, cobbles 10%, boulders 20%, angular to subangular, maximum size 24", surface boulders with roots, orange brown, wet, permeability low to medium, loose, weathered till.	SM
2.0	10.0	SAND, silty with gravel, about 30% fines, fine sand 15%, medium sand 40%, coarse sand 3%, gravel 10%, cobbles 2%, boulders trace, maximum size 12", olive brown to gray, wet, structure low to medium blocky, permeability low to impermeable, dense, glacial till, preconsolidated.	SM
10.0		Bottom of hole.	

NOTE: Water entering pit 0.0 - 3.0' estimated 2 gals/min.

D. S. 334.1 2.0' - 10.0'

AS BUILT

CLAM RIVER WATERSHED PROJECT

WEST LAKE MULTIPLE PURPOSE DAM
Sandisfield, Mass.

LOGS OF TEST HOLES (TEST PITS)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: [illegible] Date

Typed by: W.H.S.

Traced

Checked [illegible] Date

Approved: Earl F. Klingenheber
Title: State Conservation Engineer

Sheet No. 15

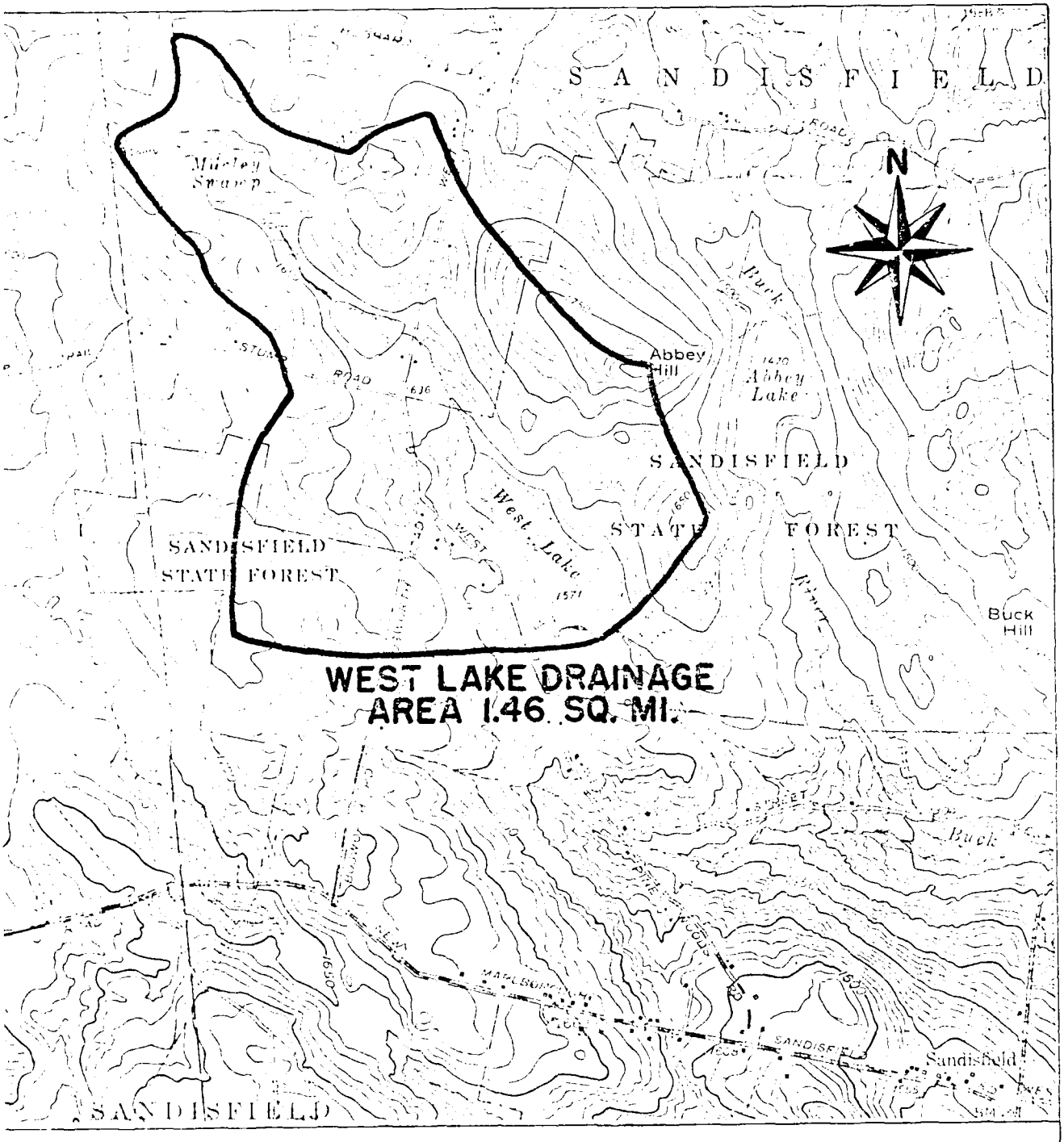
Drawing No. MA-351-P

MA-351

B-12

APPENDIX C

PHOTOGRAPHS



- SCALE -
1000' 0 1000' 2000' 3000'

FROM: USGS MONTEREY, AND SOUTH SANDISFIELD, MASS. QUADRANGLE MAPS

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

WEST LAKE DAM (MA 00288)
BERKSHIRE COUNTY MASSACHUSETTS

			SCALE : AS NOTED
			DATE : DECEMBER 1979

OHD 12/5/79
Checked By: Moe

U-11-C?

West Lake Dam

1

Spillway Adequacy Analysis

references:

1.) S.C.S Design Report

2) S.C.S. "as Built" Drawings

3). Recommended guidelines for safety inspection of dams, COE, Nov. 1976

4) Preliminary guidance for estimating Maximum Probable Discharges in Phase I dam investigations, COE, March 1978

5) U.S.G.S. quadrangle sheets.

are located in close proximity to the discharge stream. In addition there are 2 bridges which are located on West St., and 1 bridge on RT. 57 just upstream of Montville.

∴ Review of USGS quad. sheet & S.C.S design book which calculates a Structure Class "C" determines a high hazard classification

West Lake Dam: Intermediate Size High Hazard.

Required Spillway Design Flood = PMF

Storage Volume vs Pool Elevation:

data on storage vs pool elevations has been taken from S.C.S. design book, General Section.

	Elev.	Storage	Surface Area
	1566	480 acre-ft	60 acres
	1568	608 "	66 "
	1571	820 "	74 "
top dam	1575	1133 "	83.2 "

note storage listed is cummulative and denotes total capacity of impoundment.

∴ Max storage = 1133 acre-ft

Size Classification is "Intermediate"

$1{,}000 < \underline{1{,}133} > 50{,}000$

The hazard would appear to be "high" due to the Village of Montville being about 2 miles downstream. More than a few homes

OHD 12/5/79

Checked By: Moe

U-11-29

West Lake Dam

Size & Hazard Classification

Dam data: reference S.C.S. "As Built" Plans. dated 1965

original stream channel elev. = 1550 ±

top of dam elev = 1575

height of dam = 25 ft

Outlet elevations:

a) riser orif's inv. elev. 1566
16" high x 28" long

b) riser weir crest elev. 1568
4 broad crested weirs each at 4'-6" long w/2 end contractions.

c) emergency spillway control section elev. 1571
sod covered channel w/ 100' wide x 30' long control section. See capacity calcs. for details.

OHD 12/27/79
Checked By: MOE

U-11-C7
West Lake Dam

Appendix D

Hydraulic & Hydrologic Calculations

Index

	Pages
Size & Hazard Classification	D-2
Spillway adequacy analysis	D-5
Summary of Downstream Conditions With Dam Failure	D-18
Downstream Conditions With Dam Failure	D-28

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

PHOTO 15

Emergency spillway approach channel looking downstream and control section after 90° bend

PHOTO 16

Emergency spillway discharge channel and receiving area

PHOTO 13

Typical standing water in area downstream of left abutment

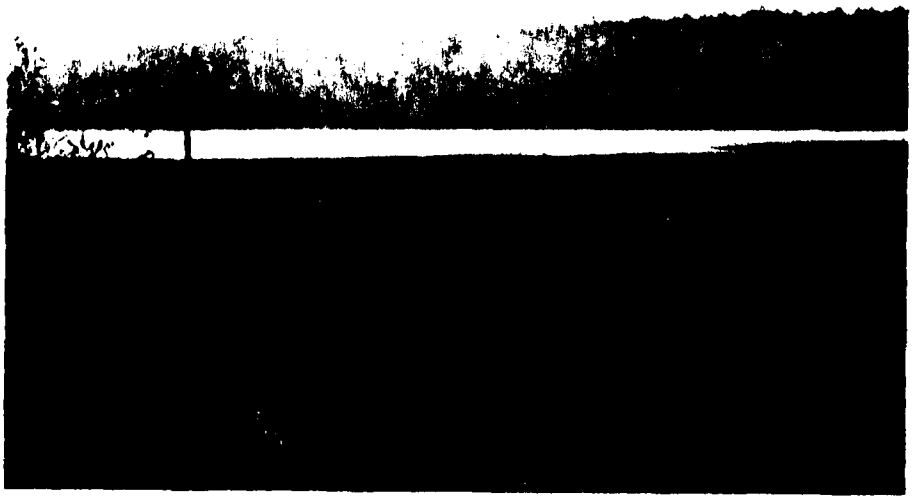


PHOTO 14

Emergency spillway approach channel. Note standing water on west side of channel (right side looking downstream)

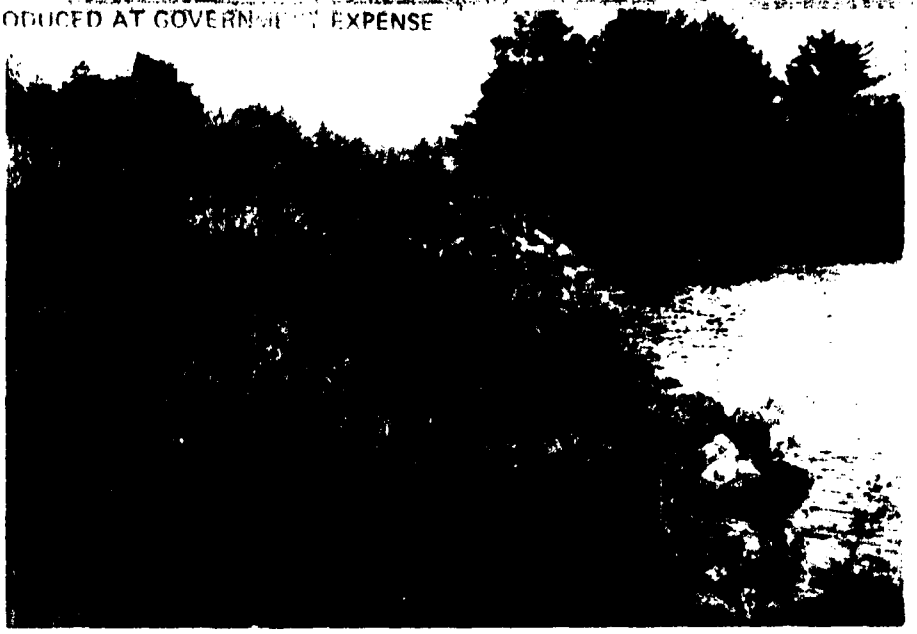


PHOTO 10

Upstream embankment looking west from drop inlet structure towards right abutment

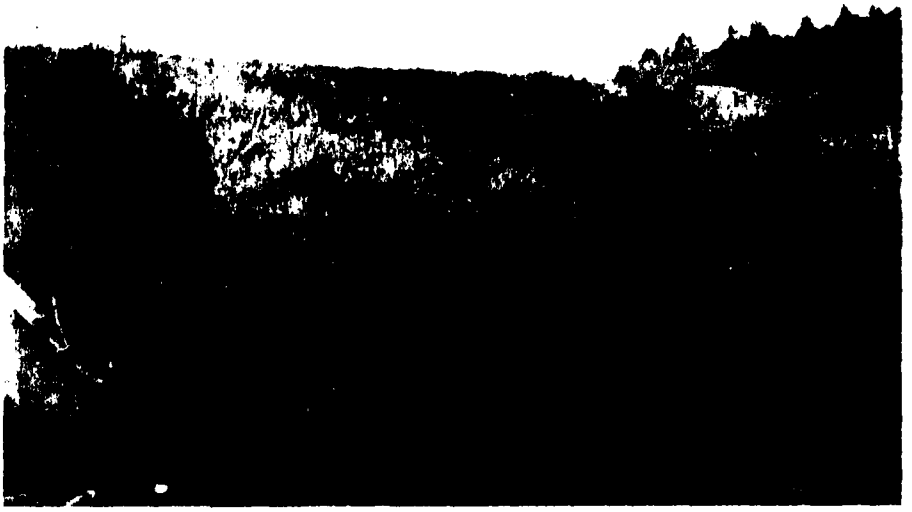


PHOTO 11

Downstream embankment looking west towards left abutment from impact basin

PHOTO 12

View of wet area upstream of left embankment. High ground on right of photo is waste disposal area.

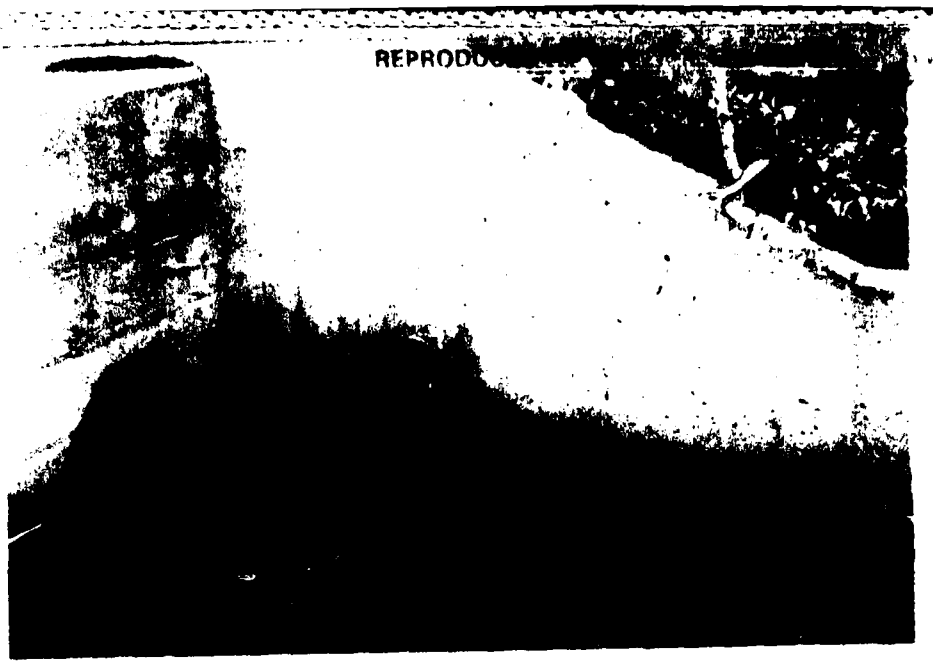


PHOTO 7

10" toe drain outlet pipe into impact basin from left side drain. Note blockage due to silt and grass growth

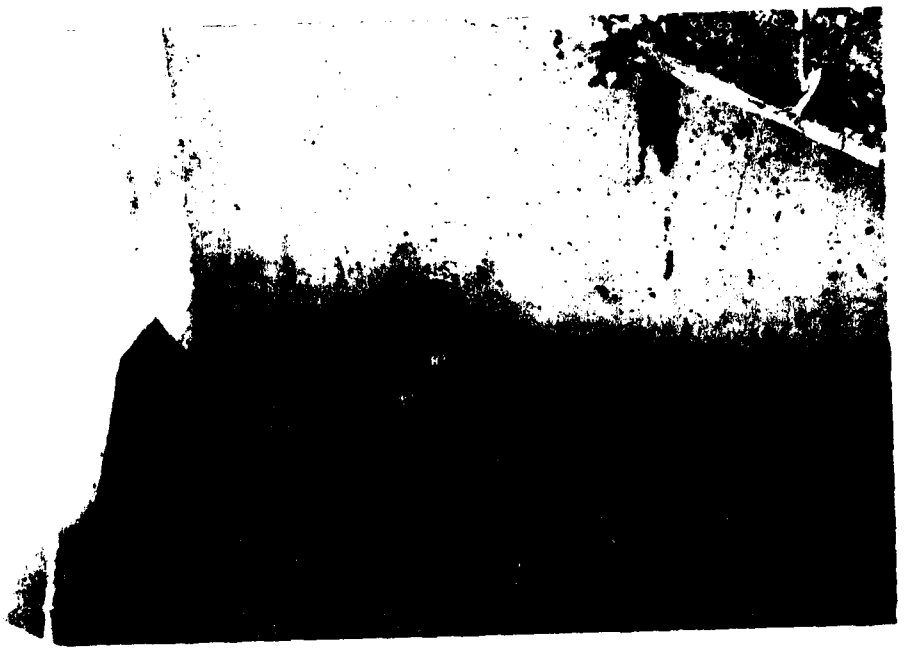


PHOTO 8

Toe drain pipe outlet flow with blockage removed

PHOTO 9

Downstream channel looking south from impact basin

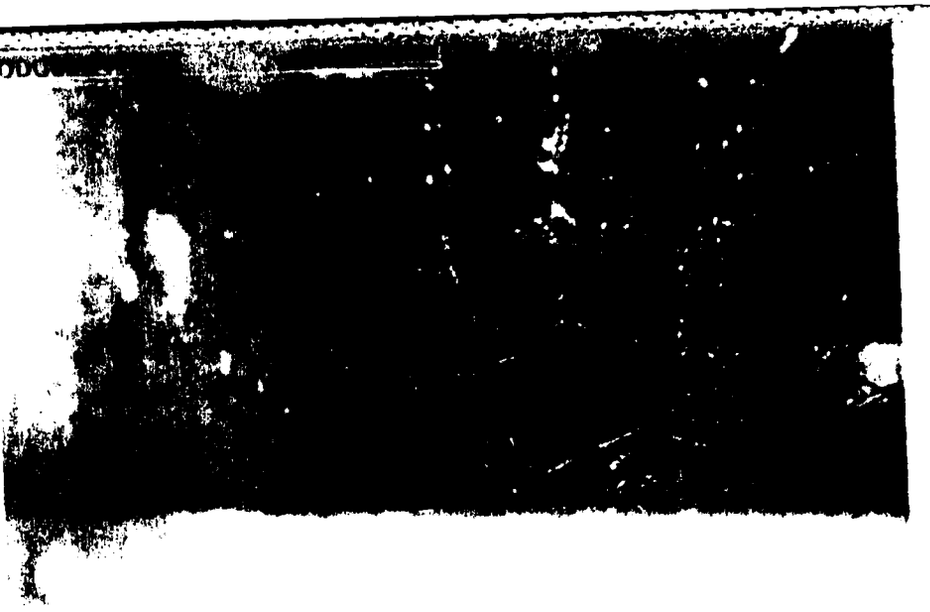


PHOTO 4

Trash debris clogging inlet to 36" conduit inside of drop inlet structure

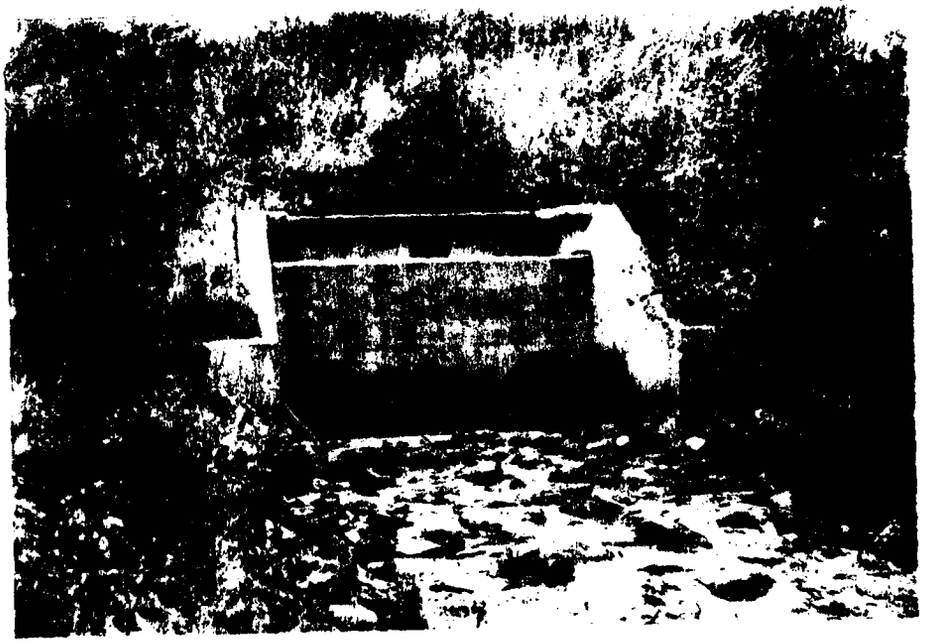


PHOTO 5

Impact basin structure at outlet of 36" principal spillway conduit. Note grass growth from drain pipe outlet

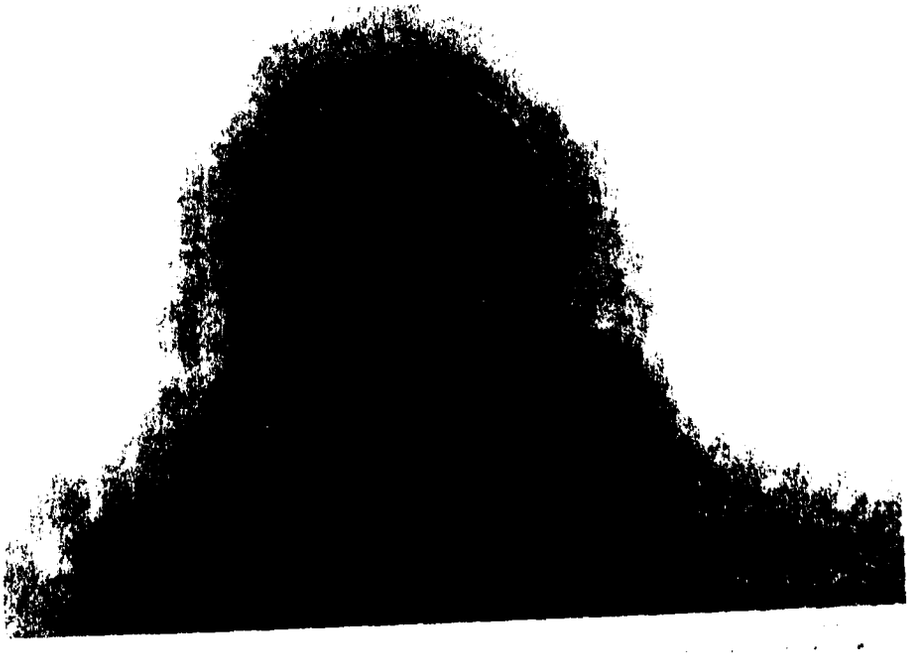


PHOTO 6

Interior of 36" principal spillway conduit viewed from outlet end. Note daylight cannot be seen at inlet due to debris blockage

PHOTO 1

Dam overview looking west from left abutment

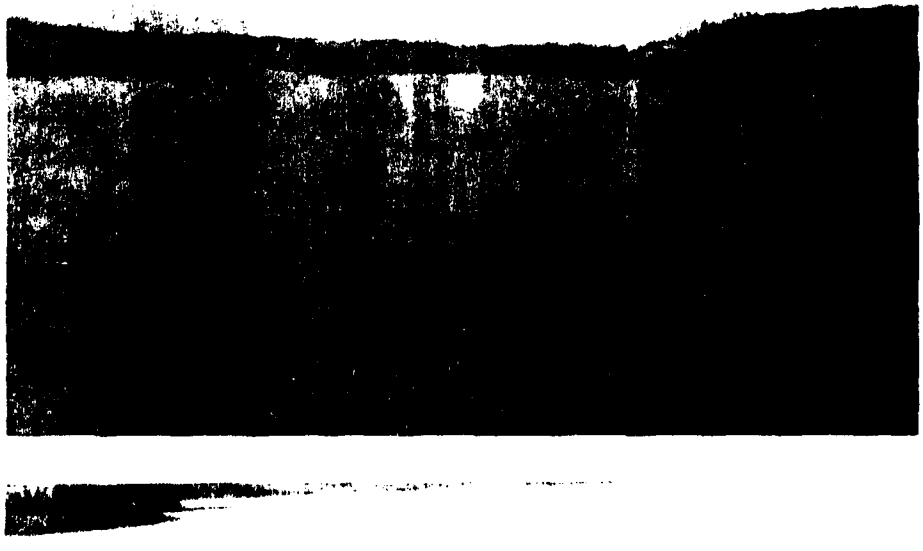


PHOTO 2

Impoundment at recreation pool elevation looking northwest from left end of embankment

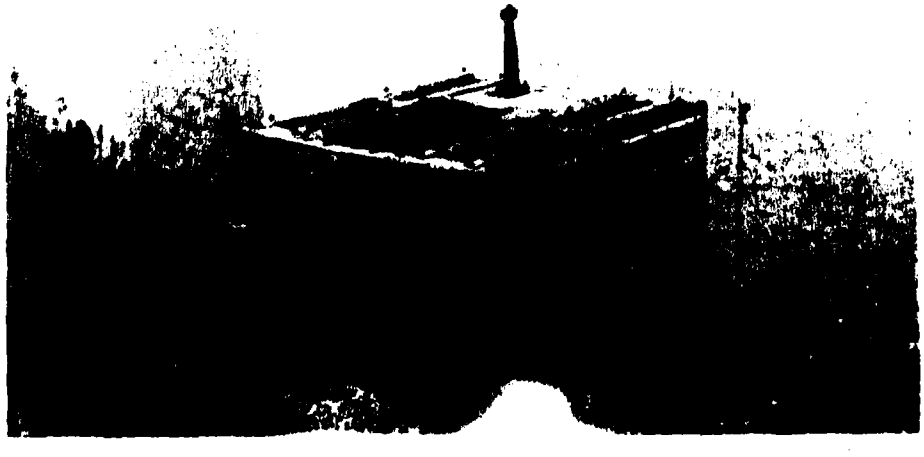
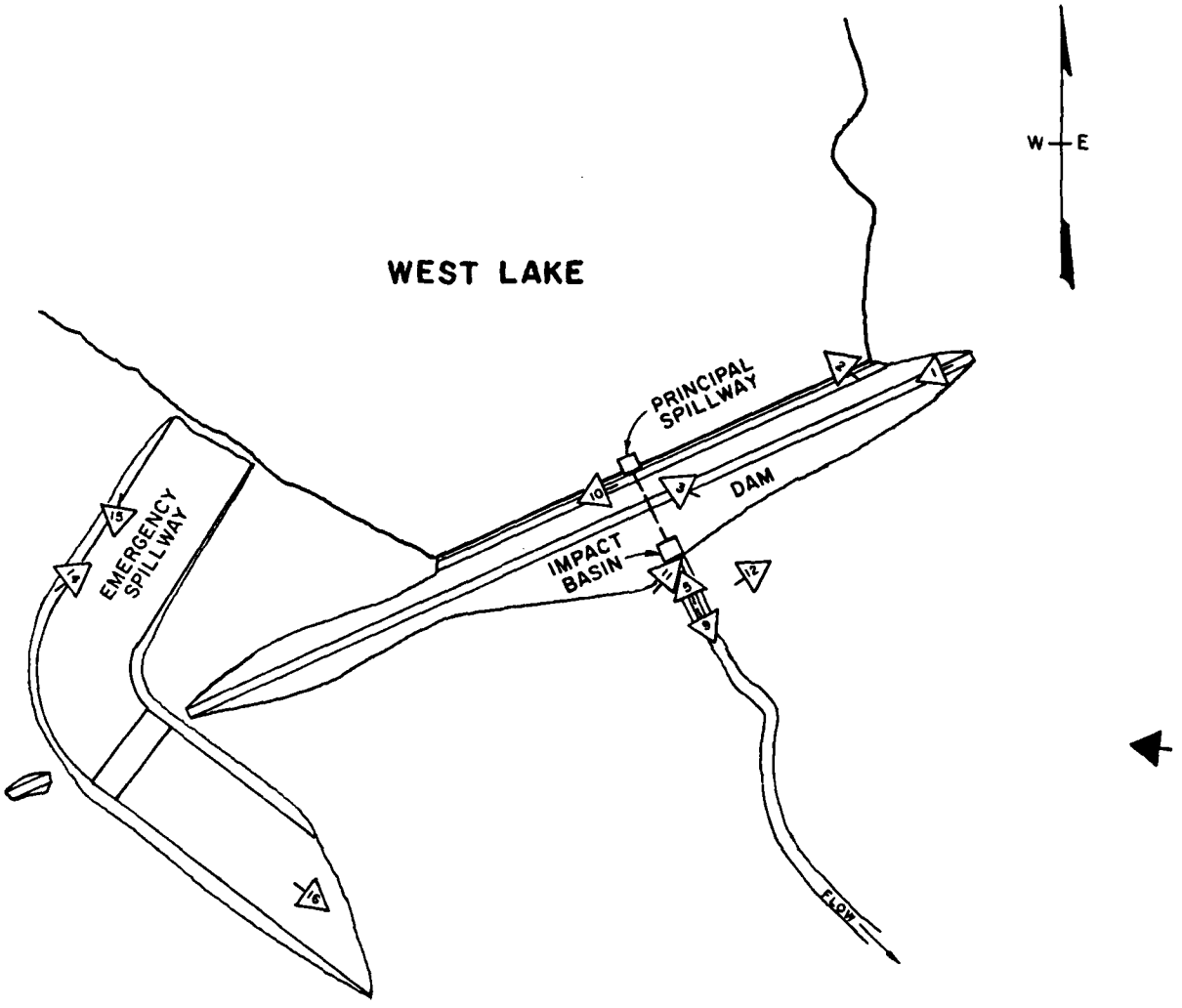


PHOTO 3

Principal spillway drop inlet structure



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

WEST LAKE DAM (MA 00288)
BERKSHIRE COUNTY MASSACHUSETTS

SCALE: NONE

DATE: DECEMBER 1979

Area from 1" = 2000' scale USGS topo maps indicates 860 acres = 1.34 mi^2

S.C.S. design book lists 934 acres = 1.46 mi^2

use S.C.S. determined drainage area

D.A. = 934 acres = 1.46 mi^2

(A) MPF Determination:

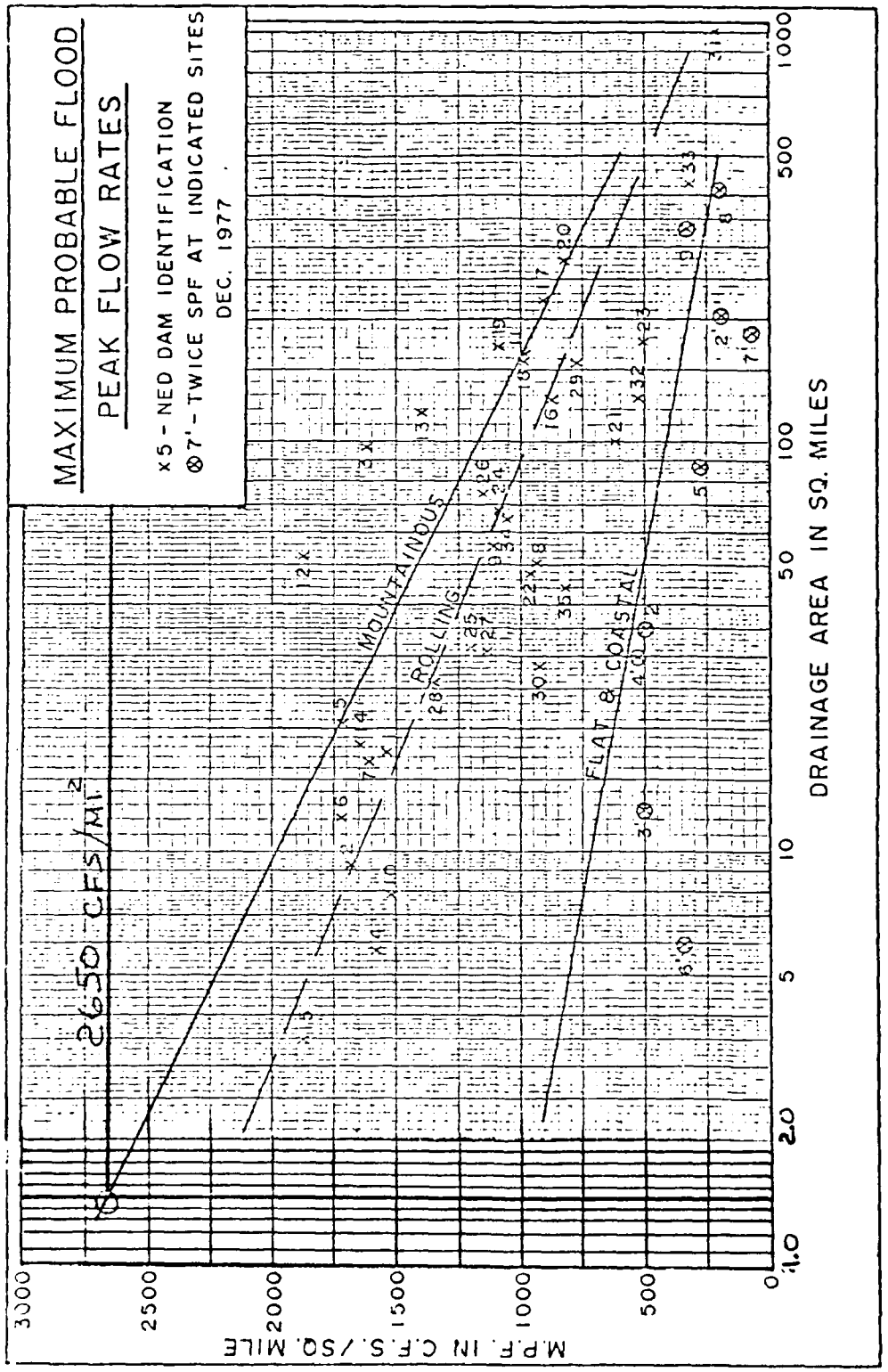
terrain is mountainous

D.A. = 1.46 mi^2

The curve provided in the COE guidance only covers D.A.'s greater than 2 mi^2. No other data available ∴ extend curve to the left for 1.46 mi^2.

Extrapolation of COE guidance curve to D.A. = 1.46 mi^2 with mountainous terrain results in unit discharge of 2650 CFS/mi^2

MPF = 1.46 × 2650 CFS/mi^2 = 3870 CFS



Extrapolation of COE Guidance Curve for M.P.F.

(B) Spillways Capacity:

There are 3 outlets

1. Principal spillway orifice
2. " " weir
3. Emergency spillway.

The S.C.S. design book calculates and tabulates the discharge rates of the combined spillways at varies pond elevations up to and including the crest of the dam. These calculations have been reviewed, and determined to be valid and correct, and therefore have been used for this analysis.

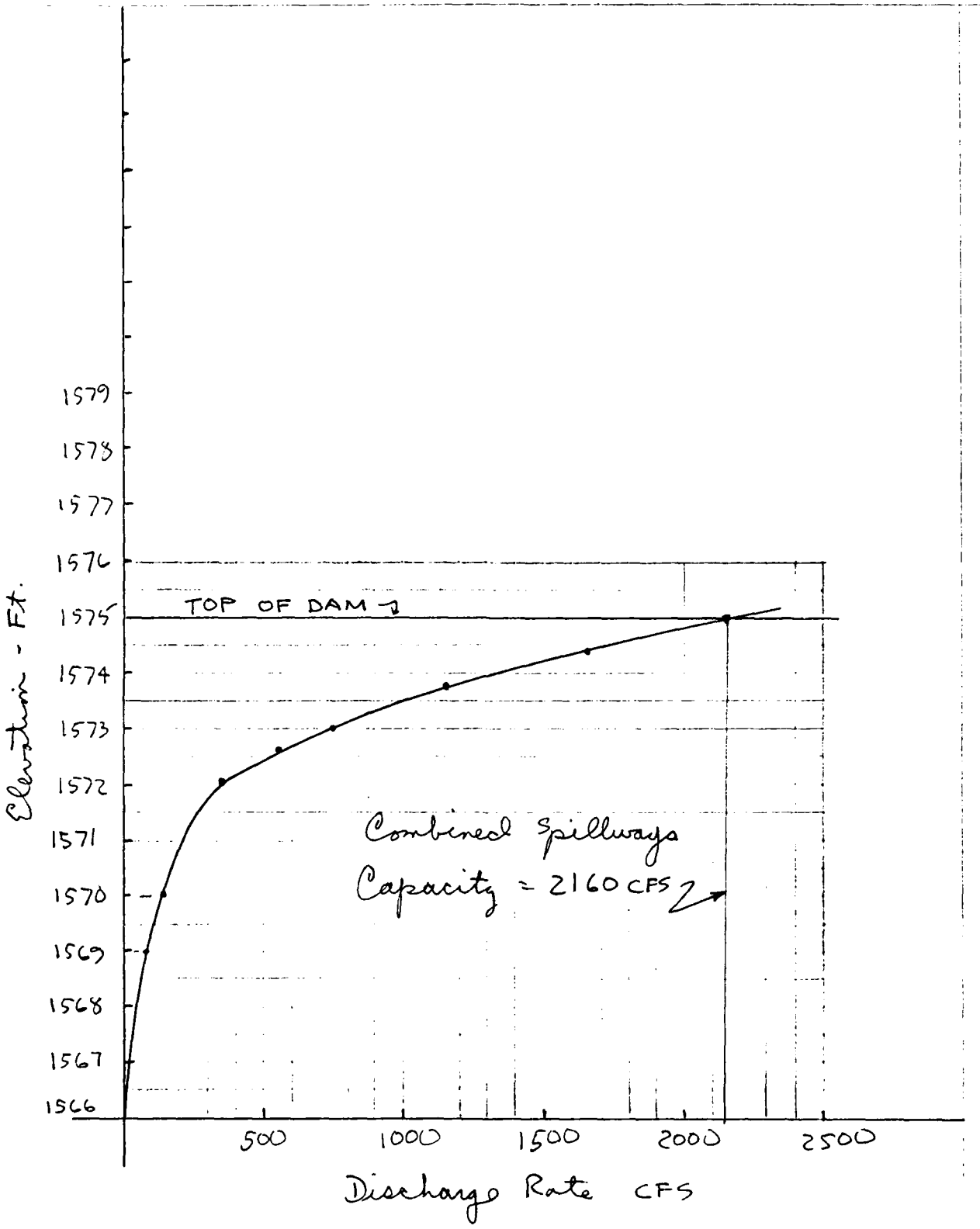
The tabulated discharge rates vs. pond elevation are as follows: Note that the 36"ϕ principal spillway outlet pipe is the limiting element at pond elevations above 1569.5 ±

OHD 12/5/79
Moe

U-11-29

B C

ELEV.	① ORIFICE	② WEIR	①+② PIPE	③ EMERG. SPILLWAY	TOTAL
1566.0	0	0	0	0	0
1566.5	–	–	–	–	–
1567.0	12	0	0	0	12
1568.0	19	0	0	0	19
1568.5	22	20	42	0	42
1569.0	25	56	81	0	81
1569.4	27	93	120	0	120
1569.8	29	135	137	0	137
1570.0	29	158	138	0	138
1571.0	33	290	142	0	142
1572.08			146	200	346
1572.59			148	400	548
1573.0			149	600	749
1573.40			151	800	951
1573.72			152	1000	1152
1574.43			155	1500	1655
1575.0			157	2000	2157


1579
1578
1577
1576
1575
1574
1573
1572
1571
1570
1569
1568
1567
1566
Elevation - Ft.
TOP OF DAM
Combined Spillways
Capacity = 2160 CFS
500
1000
1500
2000
2500
Discharge Rate CFS

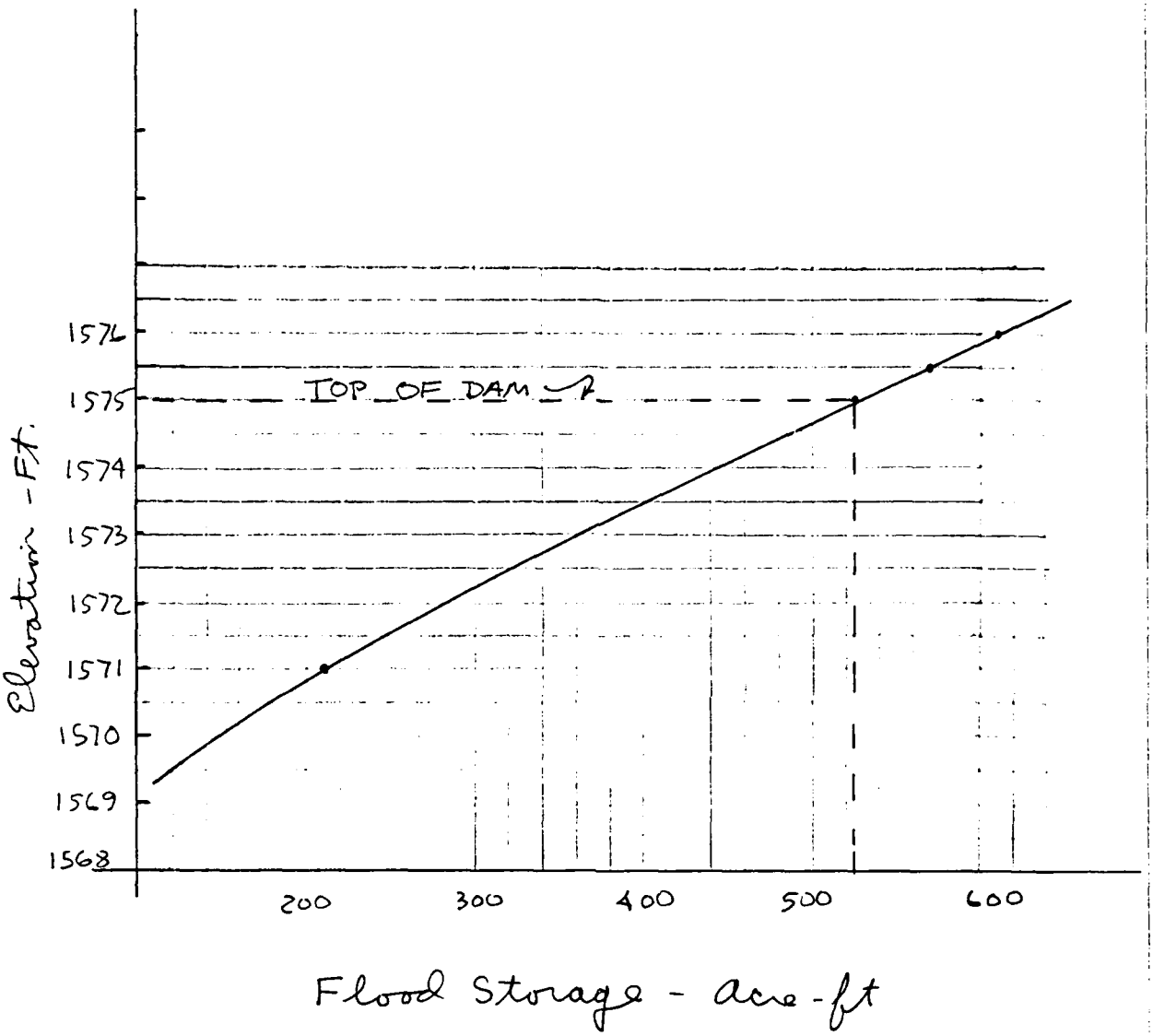
(c) Estimated Effects of Surcharge Storage On Test Flood Outflow

Test Flood inflow = 3870 CFS

Assume that the pond elevation is at the crest of the high stage overflow weirs at the start of the storm.

Elev. 1568.0 = 0 Storage

Elevation	Surface Area	Storage
1568	66 acres	0
1571	74 acres	212 acre-ft
1575	83.2 acres	525 " "
1575.5	84 acres	567 " "
1576	85 "	609 " "


1576
1575
TOP OF DAM
1574
1573
1572
1571
1570
1569
1568
Elevation - Ft.
200
300
400
500
600
Flood Storage - acre-ft

Moe

Discharge vs. Elev of Water Over the top of the dam.

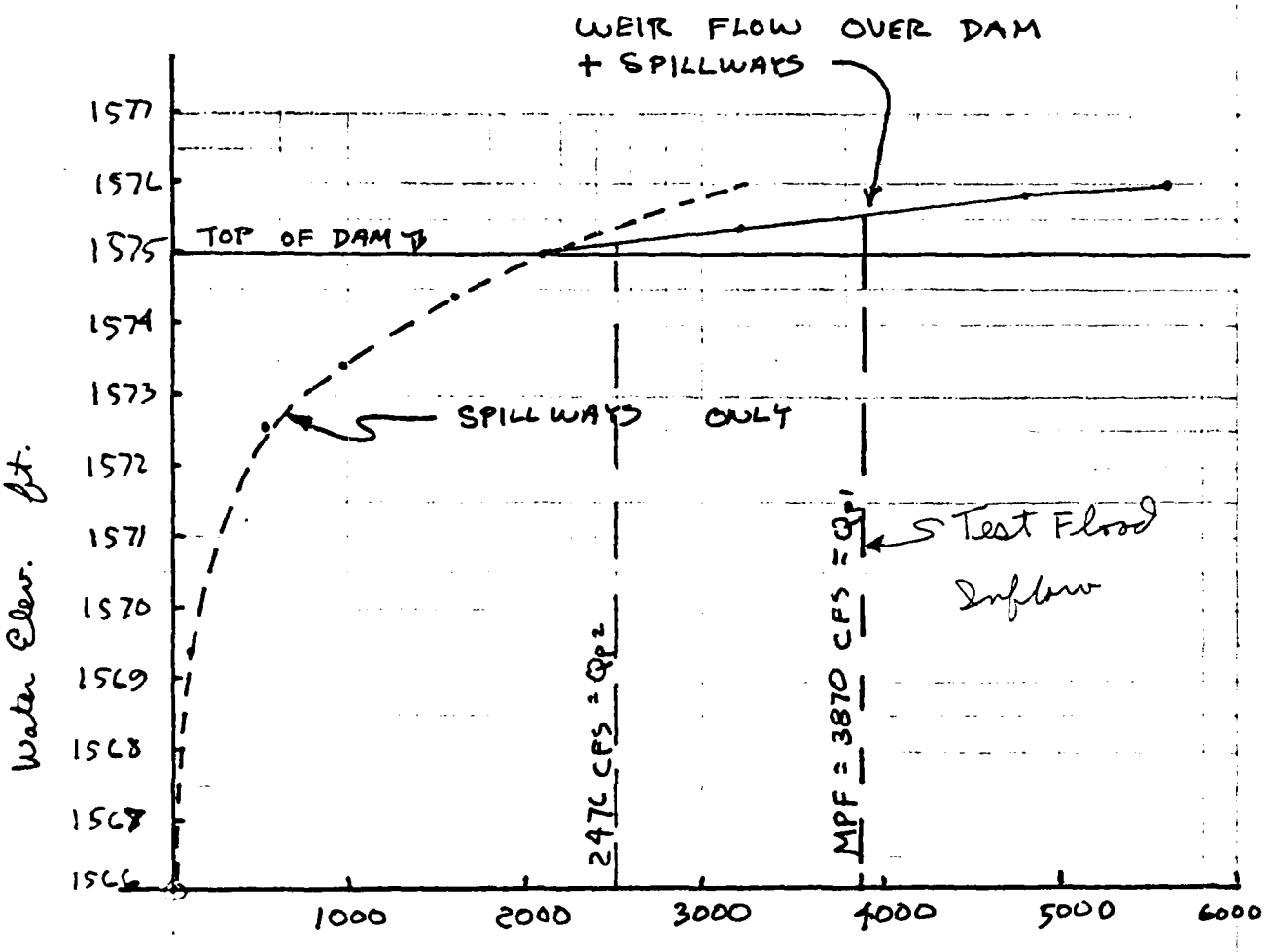
Dam acting as broad crested weir top width = 12 ft.

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

Discharge Rate - Dam Only.

H	C*	L	$H^{3/2}$	Q
0.2	3.1	920	0.089	254 CFS
0.4		"	0.252	718 "
0.8		"	0.715	2039 "
1.0		"	1.0	2852 "
2.0		"	2.828	8065 "
3.0		"	5.196	14,818 "
4.0		"	8.0	22,816 "
5.0		"	11.180	31,885 "

* reference: Small Dam Design
U.S. Dept of Interior, 1973



Discharge Rate - CFS
(Total Outflow Including Weir Flow Over the Dam)

Moe

Flood Routing

Trial #1 $Q_{p1} = 3870$ CFS

$Elev._1 = 1575.5$

$Stor_1 = 530$ acre-ft

530 acre-ft ÷ 934 acres = 0.567 ft = 6.8 in

$$Q_{p2} = 3870\left(1 - \frac{6.8}{19}\right) = 2476 \text{ CFS}$$

Trial #2 $Q_{p2} = 2476$ CFS

$Elev_2 = 1575.2$

$Stor_2 = 520$ acre ft

$$\text{Ave Stor} = \frac{530 + 520}{2} = 525 \text{ acre-ft}$$

525 acre-ft ÷ 934 acres = 0.562 ft = 6.75 in

$$Q_{p3} = 3870\left(1 - \frac{6.75}{19}\right) = 2496 \text{ CFS}$$

Q_{p1} = Elev 1575.5 @ 2476 CFS

Q_{p2} = Elev 1575.2 @ 2496 CFS

∴ use Q out = 2490 CFS

elev = 1575.3 ft

Calculated Q out utilizing storage capacity = 2490 CFS

Combined spillways capacity at top of dam elev. = 2160 CFS

$$\frac{2160}{2490} = 0.87 = 87\%$$

Summary Of Downstream Conditions With Dam Failure.

The following area number designations refer to the "Location and Downstream Hazard Maps".

① Downstream of Dam

Q before = 2490 CFS ; Depth = 5 ft
Q after = 33,630 CFS ; Depth = 13 ft

no significant damage before & after dam failure.

② West Street Crossing 3,500' D.S.

Q before = 2490 CFS

The depth due ~~to~~ the natural stream channel would be about 5 ft, however, the road culvert has a surcharged capacity of only 260 CFS which is greatly exceeded. The culvert will be inundated & the roadway overtopped. Flow will also travel along the North side of West Street

and begin to slightly flood one house.

Q after = 30,900 CFS

The depth due to the natural stream channel would be about 13 ft. The roadway is abut 8½ ft above the stream channel, therefore, it will be severely overtopped by an additional 5½ feet of water. The 1 house will be flooded to a depth of abut 5 ft.

∴ Q before : culvert overtopped
1 house flooded 2± ft

Q after : culvert overtopped 5½ + ft
1 house flooded 5± ft

③ West Street Crossing 7000 ft. D.S.

The tributary flow from the Abbey Lake Dam plus additional drainage area South of West & Abbey converges with the stream channel just upstream of area ③

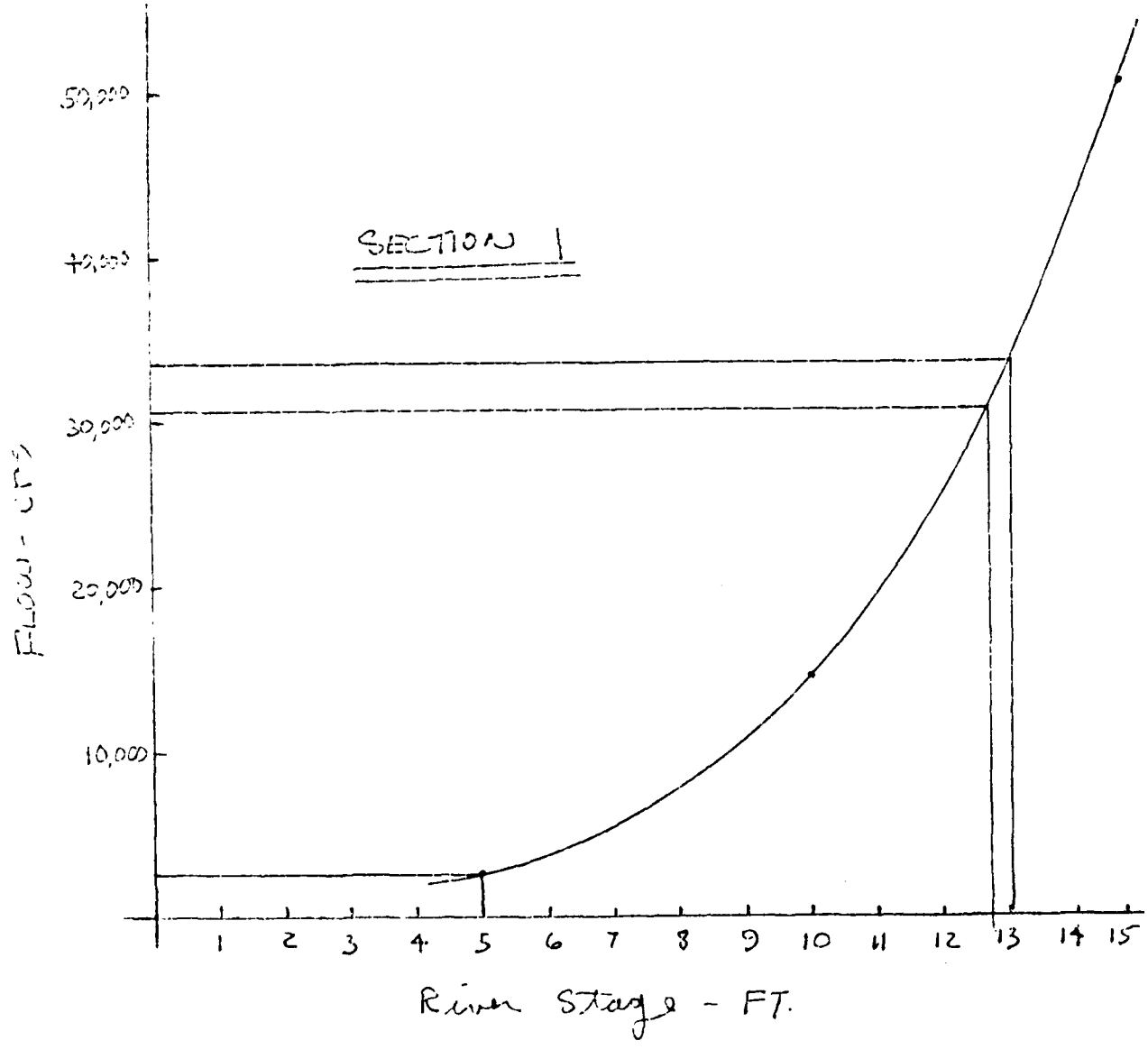
Q before = 9000 CFS

The depth due to the natural stream channel would be about 7 ft, however, the road culvert has a surcharged capacity of 1030 CFS which is greatly exceeded. The culvert will be inundated and the roadway overtopped.

Q after = 35,600 CFS

The depth due to the natural stream channel would be about 12 ft. The roadway will be inundated by about 5 feet of water.

∴ Q before : roadway overtopped
Q after : increased depth = 5± ft


SECTION 1
50,000
40,000
30,000
20,000
10,000
FLOW - CFS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
River Stage - FT.

b) Depth = 10 ft

Top Width = 150 ft

Area = $\frac{10 \times 150}{2}$ = 750 FT^2

hyd. rad = 750 ÷ 160 = 4.7

Vel = 19.5 FPS

Q = 19.5 × 750 = 14,600 CFS

c) Depth = 15 ft

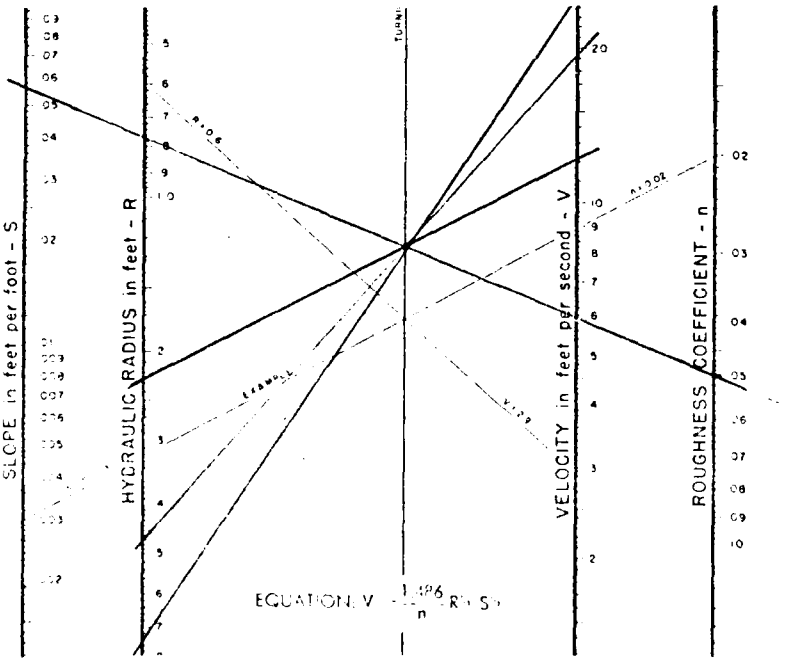
Top Width = 270 ft

Area = $\frac{15 \times 270}{2}$ = 2025 ft^2

hyd rad = 2025 ÷ 280 = 7.2

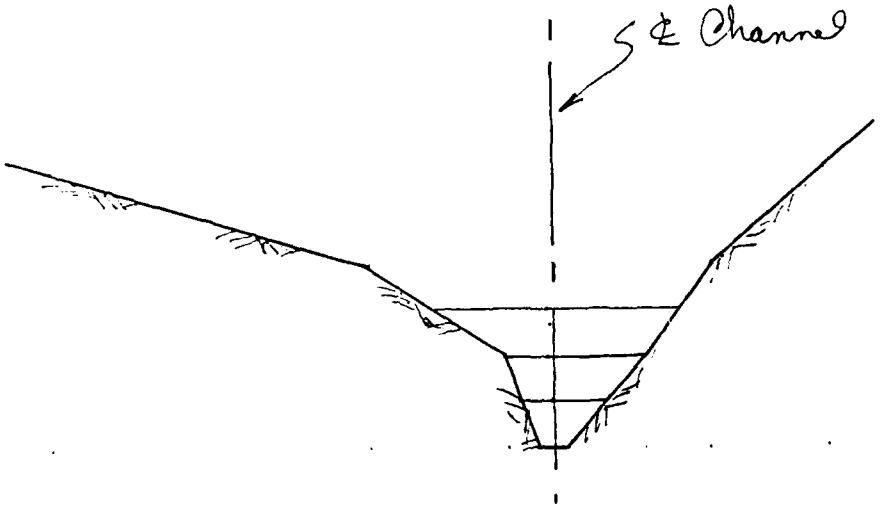
Vel = 25 FPS

Q = 25 × 2025 = 50,600 CFS



(F) Downstream Channel Flow VS. Stage

Section 1 :



1" = 200' HOR
1" = 20' VER

Channel Slope = 40' ÷ 700' = 0.057

Manning n = 0.05

a) Depth = 5 ft

Top Width = 90 ft

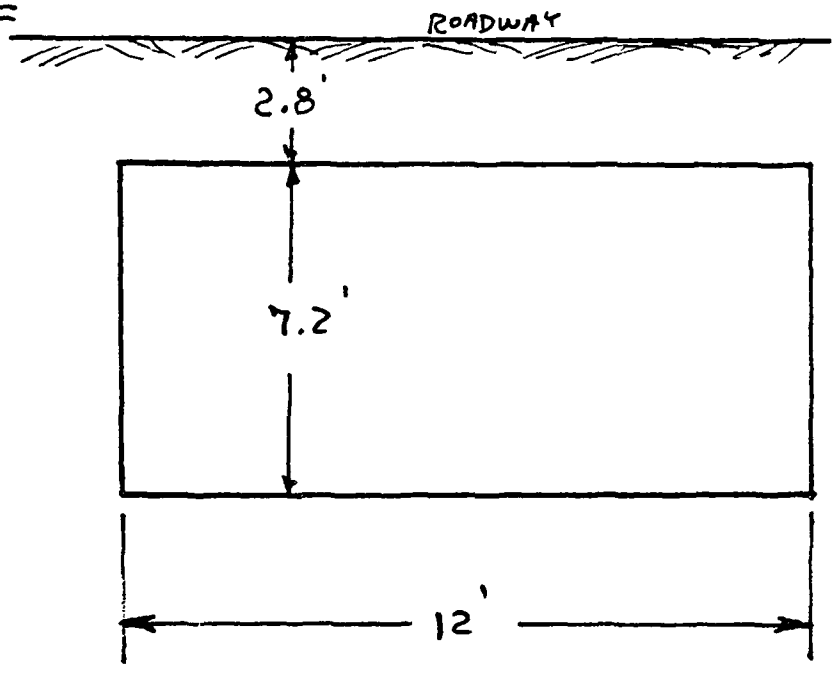
Area = $\frac{5 \times 90}{2}$ = 225 FT^2

hyd. rad = 225 ÷ 100 = 2.25

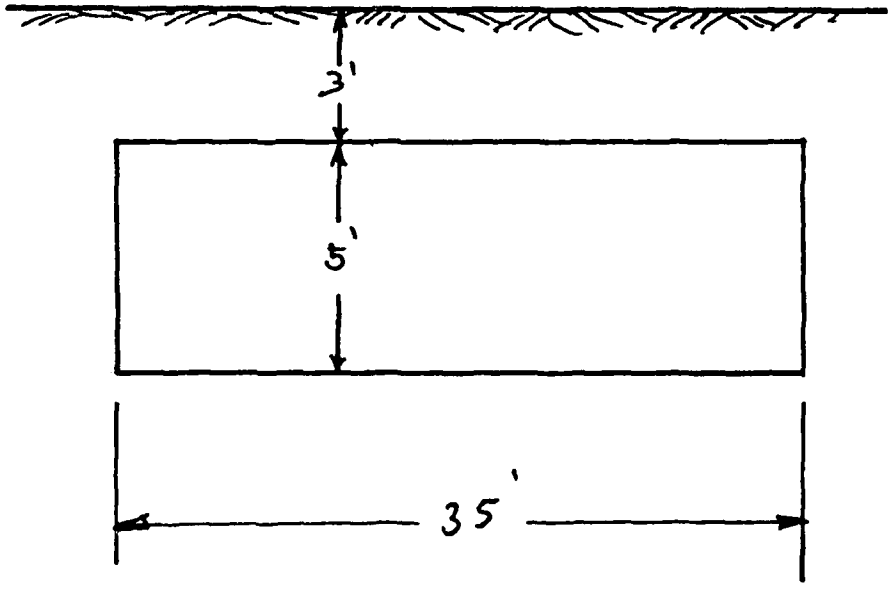
Vel = 12 FPS

Q = 12 x 225 = 2700 CFS

2. Box Culvert #2

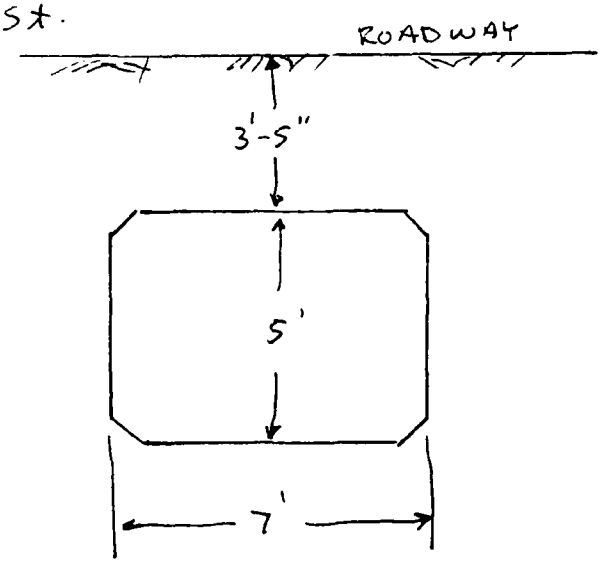


3. Bridge #3 : Route 57



(E) Existing Culverts & Bridges : See Capacity Calcs in Section (G)

1. Box Culvert #2 : West St.



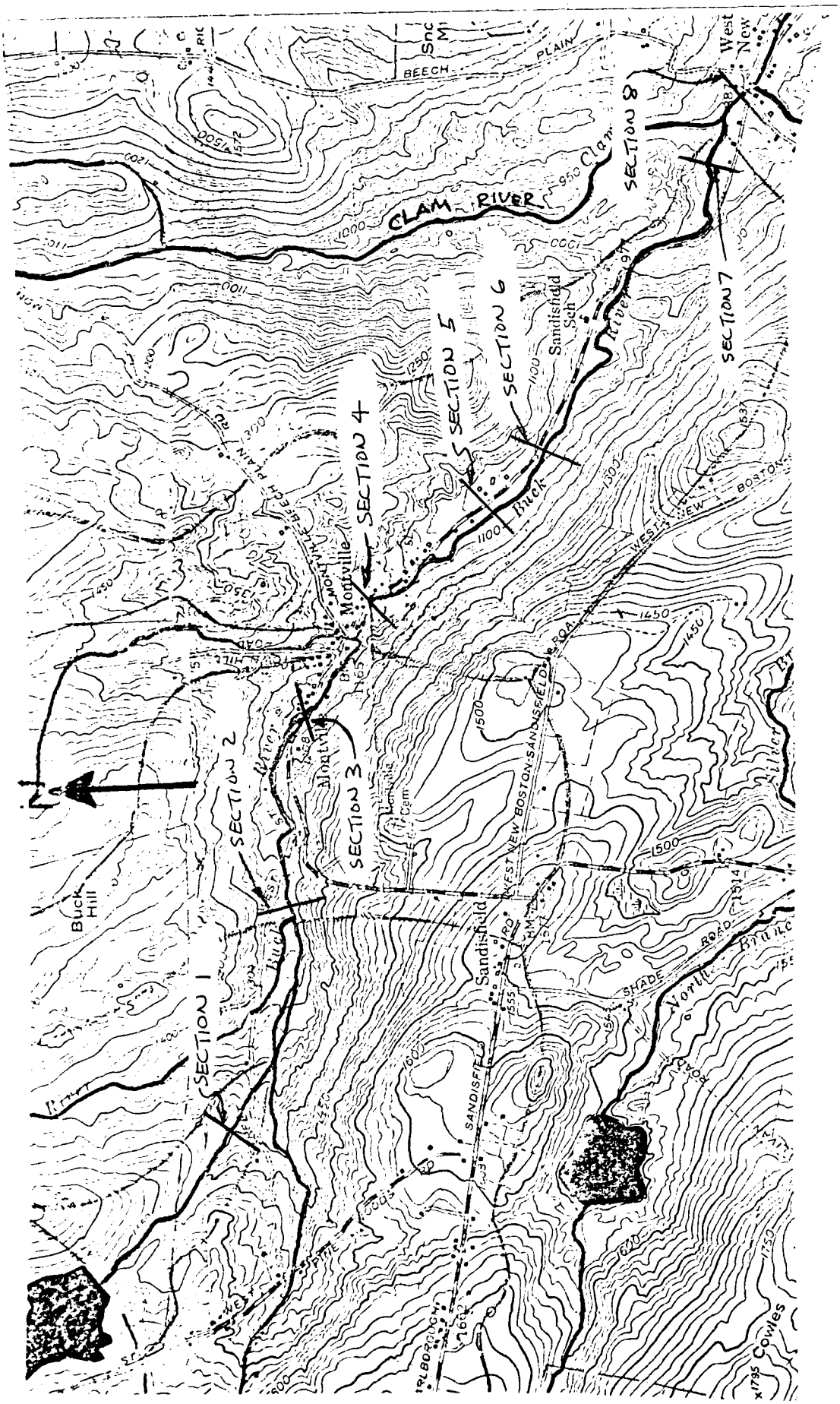
Length = 52'
Δelev. = 1.7'

Note: The ground elevation to the east of the inlet is at the crown of the box culvert. Therfore, max surcharge is the crown elev. of the culvert.

OHD 2/8/80

U-11-20

2



D-2

OHD 12/6/79
Checked By: Moe

U-11-29

West Lake Dam

Downstream Conditions With Dam Failure

reference: "Rule of Thumb" Guidance For Estimating Downstream Dam Failure Hydrographs.

(A) Reservoir Storage @ Failure = 1133 acre-ft (top of dam)

(B) Length of dam at mid height is about 400 ft

$\therefore 40\% = 0.4 \times 400 = 160$ ft

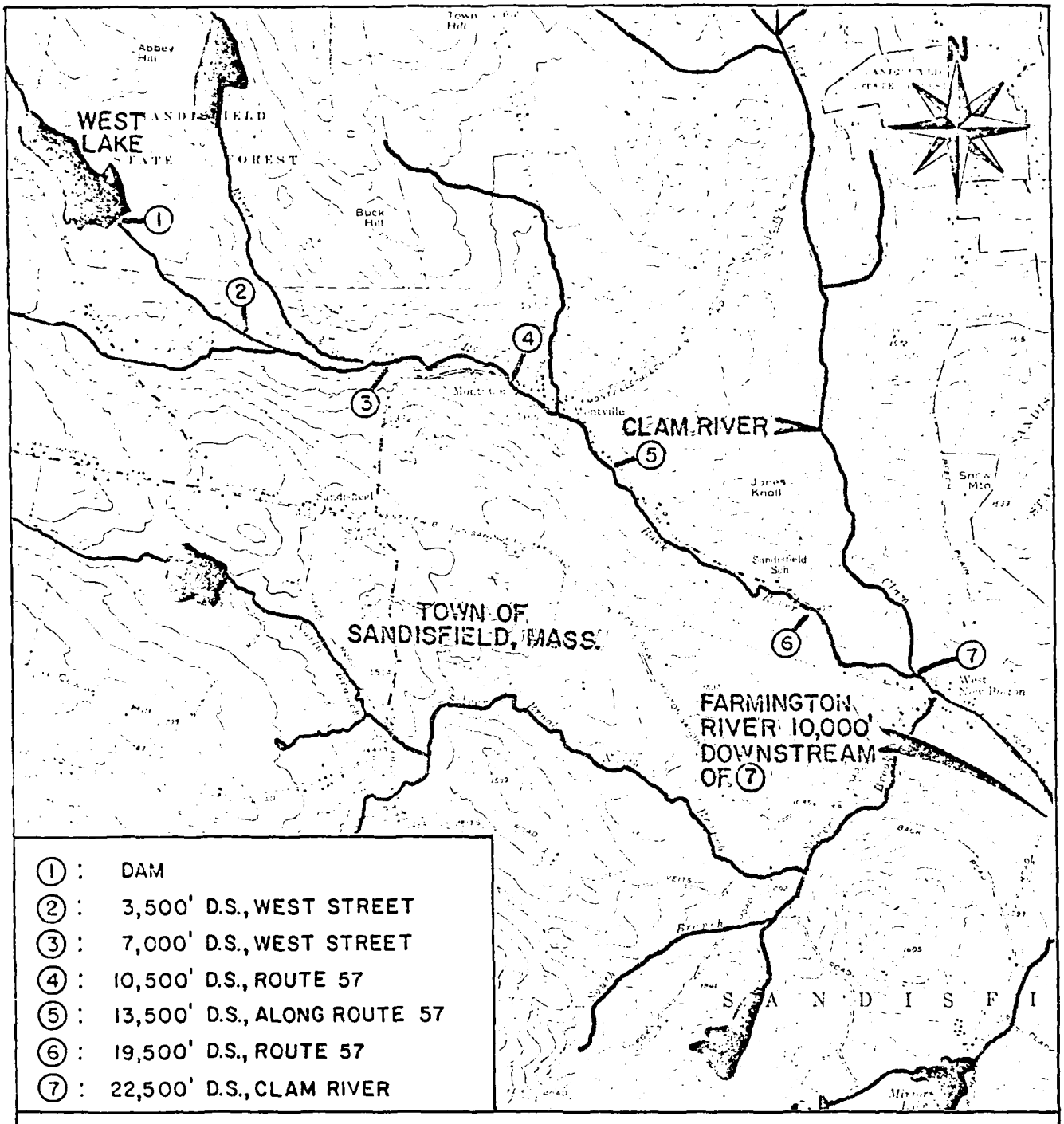
Failure length = 160 ft = W_b

(C) Depth of Water = 25 ft = Y_o (top of dam)

(D) Peak Failure Outflow:

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

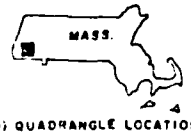
$$Q_{p1} = \left(\frac{8}{27}\right)(160')\left(\sqrt{32.2}\right)(25)^{3/2} = 33,630 \text{ CFS}$$



-SCALE-

1000' 0 1000' 2000' 3000' 4000' 5000'

FROM: USGS MONTEREY, OTIS, SOUTH SANDISFIELD, AND TOLLAND CENTER, MASS. QUADRANGLE MAPS



(4) QUADRANGLE LOCATIONS

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

WEST LAKE DAM (MA 00288)
BERKSHIRE COUNTY
MASSACHUSETTS

SCALE: AS NOTED

DATE: DECEMBER 1979

Total Damage Potential

	Before Failure	After Failure
(2)	Secondary Road culvert overtopped	overtopping increased 5½ ft
	1 house flooded 2 ft	1 house flooded 5 ft
(3)	Secondary Road culvert overtopped	overtopping increased 5 ft
(4)	Primary Road bridge overtopped by 3 ft	overtopping increased 6 ft
	3 houses flooded 3 ft	3 houses flooded 9 ft
		1 house flooded 4 ft
		1 house flooded 2 ft
(5)	3 houses flooded 2 ft	3 houses flooded 6 ft
		Primary Road overtopped
		7 houses flooded 4 ft
(6)	Primary Road bridge overtopped	overtopping increased 4 ft
		1 house flooded 5 ft
(7)	2 houses flooded 4 ft	2 houses flooded 8 ft
		1 house flooded 4 ft

Q after = 31,200 CFS : Depth = 15 ft

The 2 houses previously flooded are now increased to a depth of 8 ft. 1 additional house is located about 10 ft above the stream channel and will be flooded by 4-5 feet of water

∴ Before Failure : 2 houses flooded 4± ft

after Failure 2 houses flooded 8± ft
1 house flooded 4± ft

B) Downstream of Confluence :

Q before = 29,900 CFS ; Depth = 14.5 ft

Q after = 46,200 CFS ; Depth = 16 ft

The additional 1.5 foot of flooded depth will not significantly add to the damage potential.

to have a surcharged capacity of about 2000 CFS, therefore, the bridge will be overtopped.

Q after = 31,000 CFS : Depth = 12 ft

The flow breaking over the roadway will also flow along the South side of Rt. 57 and flood 1 house by 5I ft.

∴ Before Failure : bridge overtopped

After Failure : increase over bridge = 4 ft
1 house flooded 5I ft.

⑦ Confluence With Clam River 21,000' D.S.

a) Upstream of confluence

Q before = 14,900 CFS ; Depth = 11 ft

There are 2 houses which are less than 10 ft above the stream channel. These will be flooded by 4I ft.

and flood both sides of the road to a depth of just over 10 ft. The 3 houses previously flooded will be increased to a depth of about 6 ft. 7 additional houses will be flooded by the dam failure flow. 2 are on the South side of Rt 57 and 5 are on the North side of Rt-57. These houses will be flooded to a depth of 3 or 4 feet.

∴ Before Failure : 3 houses flooded 2± ft

∴ after Failure : Rt. 57 overtopped
3 houses flooded 6± ft
7 houses flooded 4± ft

⑥ Route 57 Crossing 18,300 ft D.S.

Q before = 12,000 CFS

The depth due to the natural stream channel would be about 8 ft. The roadway bridge is estimated

probably be flooded by about 4 ft, and 1 house by about 2 ft

∴ Q before : Bridge overtopped by 3 ft
3 houses flooded 3 ft

Q after : Bridge overtopped by 9 ft
3 houses flooded 9 ft
1 house flooded 4 ft
1 house flooded 2 ft

⑤ Village of Montville Area along Rt. 57
Beginning 11,700 ft D.S. to 14,100 ft D.S.

Q before = 12000 CFS ; Depth = 6 ft

There are 3 houses which are only a few feet above the stream channel which will be flooded by 2± feet.

Q after = 31,600 CFS ; Depth = 10 ft

The river stage will exceed the height of the Rt. 57 embankment

④ Route 57 Crossing 9,500 ft. D.S.

Q before = 9000 CFS

The depth due to the natural stream channel would be about 11 ft. The roadway bridge has a low cord height of 5 feet above the stream channel, the roadway is 8 ft above the stream channel, and the bridge has a surcharged capacity of 1930 CFS, therefore, the bridge will be overtopped by about 3 ft of water.

There are 3 houses located upstream of the bridge which are less than 10 feet above the stream channel. These will be flooded by about 3 ft of water.

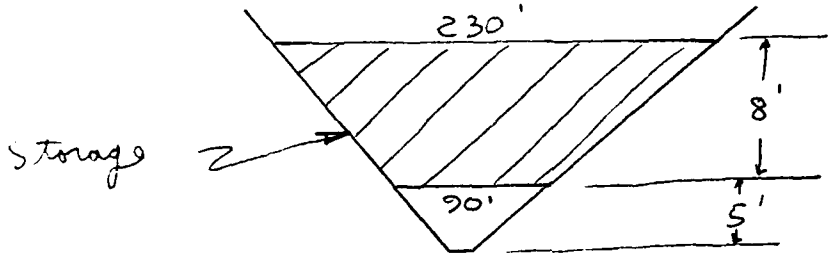
Q after = 33,300 CFS

The depth due to the natural stream channel would be about 16 ft. This will increase the flooded depth over the bridge and the 3 houses by 6 feet. 1 additional house will

Test Flood outflow before failure : 2490 CFS
River Stage = 5 ft

Dam Failure Flow = 33,630 CFS
River Stage = 13 ft

Dampening Due To Upstream Reach :



$$\text{Storage} = \frac{90+230}{2} \times 8 \times \frac{3300}{43,560} = 97 \text{ acre-ft}$$

$$Q_{P2\ TRIAL} = 33,630\left(1-\frac{97}{1133}\right) = 30,800 \text{ CFS}$$

@ 30,800 CFS : Depth = 12.7 ft
Top Width = 220 ft

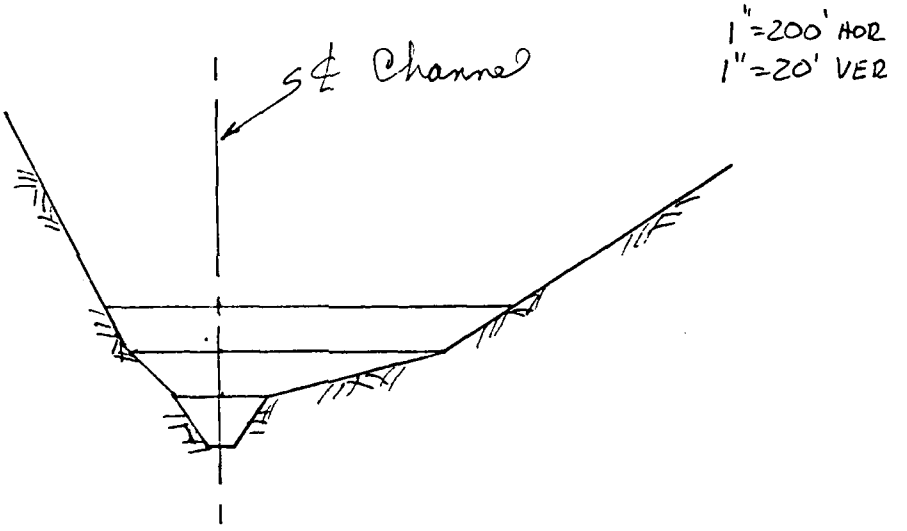
$$\text{Storage} = \frac{90+220}{2} \times 7.7 \times \frac{3306}{43,560} = 90 \text{ acre-ft}$$

Ave. Storage = $\frac{90+97}{2}$ = 93.5 acre-ft

$Q_{P2} = 33{,}630\left(1 - \frac{93.5}{1133}\right) = 30{,}900$ CFS

∴ Outflow to reach #2 = 30,900 CFS

Section 2:



Channel Slope = 20' ÷ 800' = 0.025

n = 0.05

a) Depth = 5 ft

Top Width = 100 ft

Area = $\frac{5 \times 100}{2}$ = 250 ft^2

hyd. rad. = 250 ÷ 110 = 2.3

Vel = 8.2 FPS

Q = 8.2 × 250 = 2050 CFS

b) Depth = 10 ft

Top Width = 350 ft

Area = $\frac{10 \times 350}{2}$ = 1750 ft^2

hyd. rad = 1750 ÷ 360 = 4.9

Vel = 14 FPS

Q = 14 × 1750 = 24,500 CFS

c) Depth = 15 ft

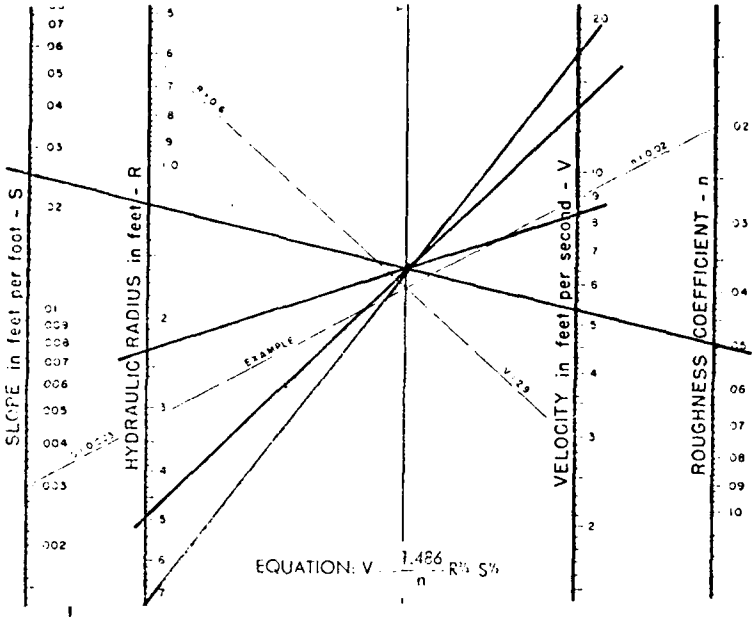
Top Width = 450 ft

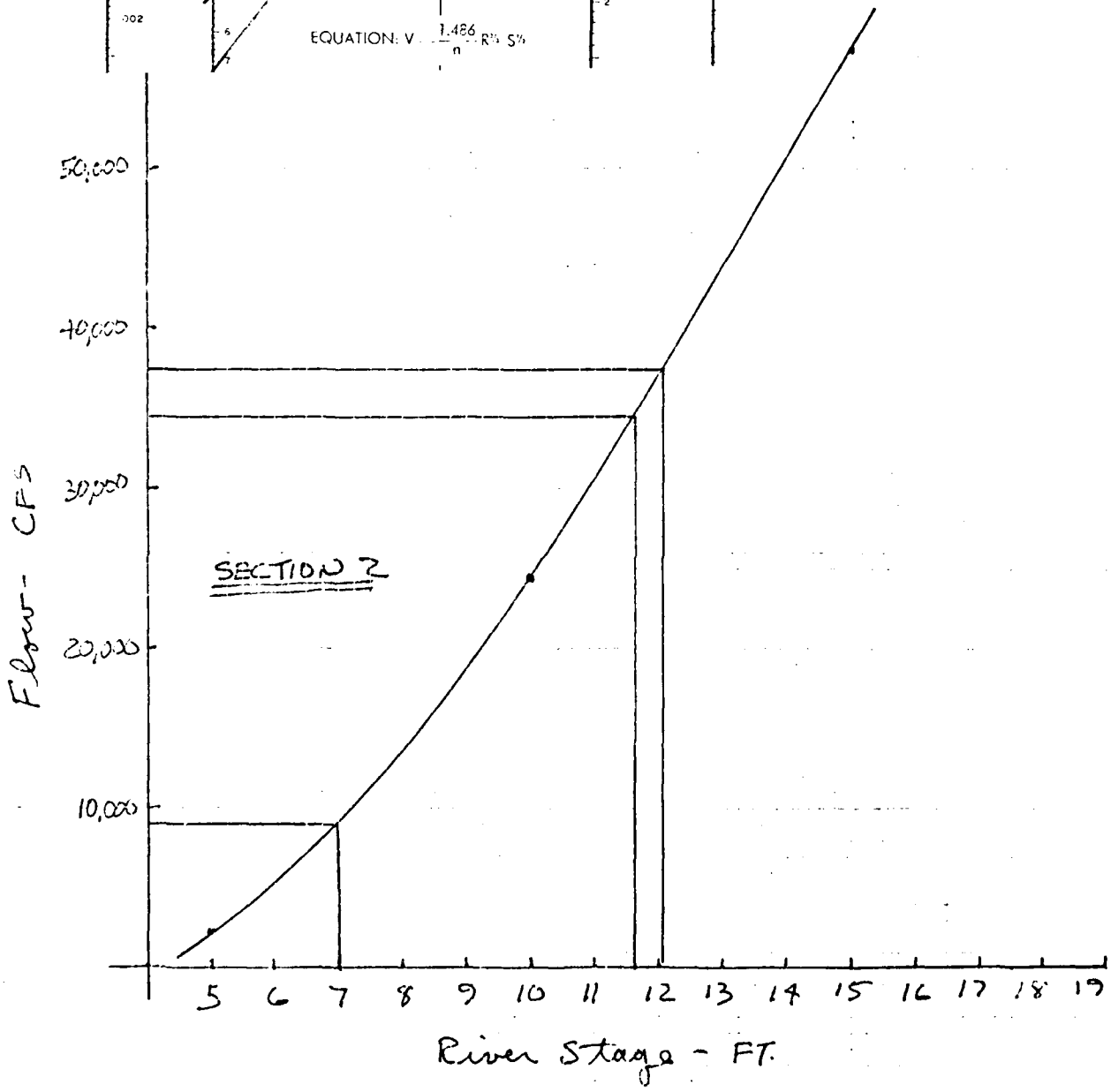
Area = $\frac{15 \times 450}{2}$ = 3375 ft^2

hyd. rad = 3375 ÷ 460 = 7.3

Vel = 17 FPS

Q = 17 × 3375 = 57,400 CFS


SLOPE in feet per foot - S
HYDRAULIC RADIUS in feet - R
VELOCITY in feet per second - V
ROUGHNESS COEFFICIENT - n
EXAMPLE
EQUATION: V = 1.486/n R^⅔ S^½


50,000
40,000
30,000
20,000
10,000
Flow - CFS
SECTION 7
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
River Stage - FT.

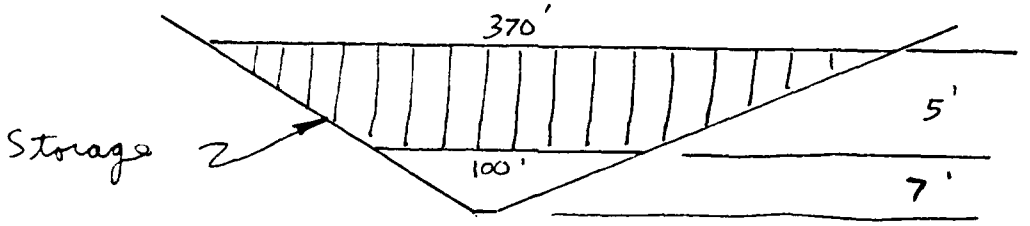
Test Flood Outflow before failure 2490 CFS
*Tributary Confluence Flow 6510 CFS
total 9000 CFS

River Stage = 7 ft

Dam Failure Flow = 30,900 CFS
*Tributary Confluence Flow = 6510 CFS
37,410 CFS

River Stage = 12 ft

Dampening Due To Upstream Reach:



$$\text{Storage} = \frac{\frac{100+370}{2} \times 5 \times 2100}{43{,}560} = 57 \text{ acre-ft}$$

* See calcs section (H), part 3

$Q_{P3\ TRIAL} = 37,400\left(1 - \frac{57}{1133}\right) = 35,500$ CFS

@ 35,500 CFS : Depth = 11.6 ft
Top Width = 350 ft

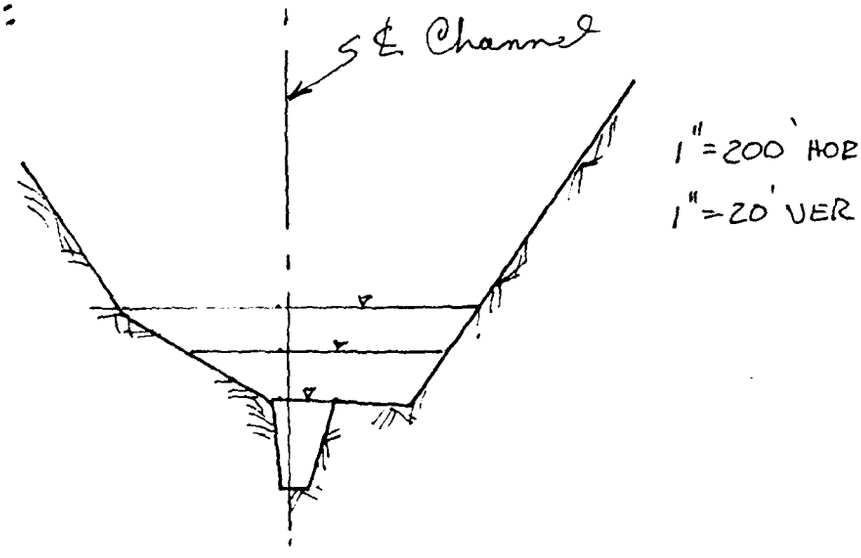
$$\text{Storage} = \frac{\frac{100+350}{2} \times 4.6 \times 2100}{43,560} = 50 \text{ acre-ft}$$

$$\text{Ave. Storage} = \frac{50+57}{2} = 53.5 \text{ acre-ft}$$

$$Q_{P3} = 37,400\left(1 - \frac{53.5}{1133}\right) = 35,600 \text{ CFS}$$

∴ Outflow to reach #3 = 35,600 CFS

Section-3 :



@ Channel Slope = 20' ÷ 500' = 0.04
n = 0.05

a) Depth = 10 ft

Top. Area = 70 ft

Area = $\frac{10+70}{2} \times 10 = 400\ ft^2$

hyd. rad = 400 ÷ 74 = 5.4

Vel = 18 FPS

Q = 18 × 400 = 7200 CFS

b) Depth = 15 ft

Top Width = 290 ft

Area = $400 + \left[\frac{190+290}{2} \times 5\right] = 1600\ ft^2$

hyd. rad = 1600 ÷ 300 = 5.3

Vel = 18 FPS

Q = 18 × 1600 = 28,800 CFS

c) Depth = 20 ft

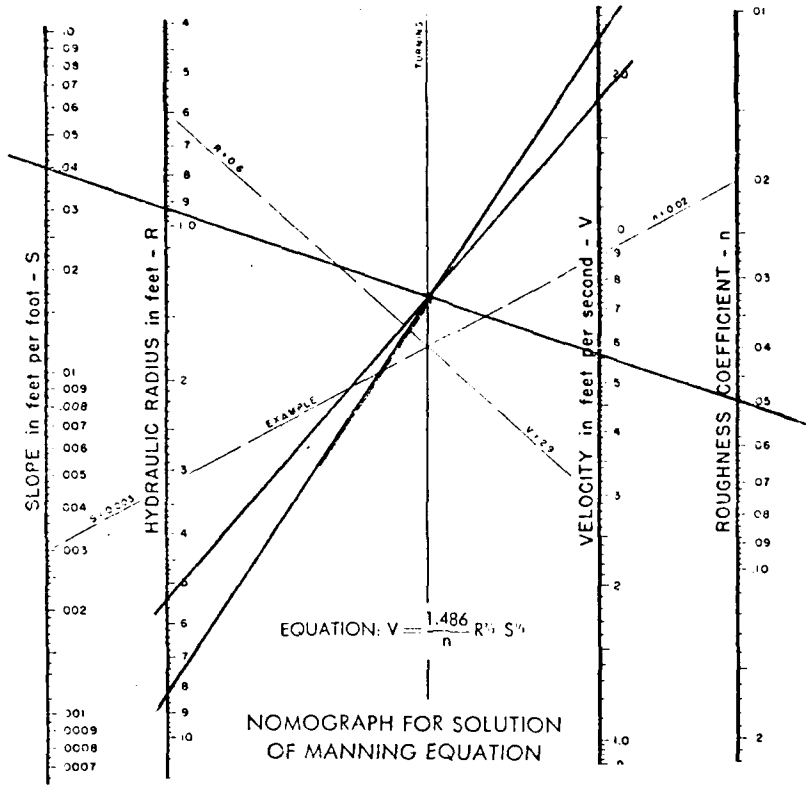
Top Width = 400 ft

Area = $400 + \left[\frac{190+400}{2} \times 10\right] = 3350\ ft^2$

hyd. rad = 3350 ÷ 410 = 8.2

Vel = 24 FPS

Q = 24 × 3350 = 80,400 CFS

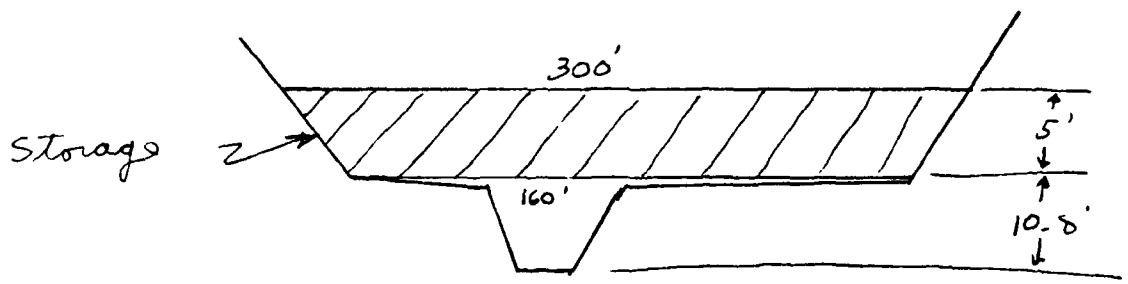

SLOPE in feet per foot - S
HYDRAULIC RADIUS in feet - R
VELOCITY in feet per second - V
ROUGHNESS COEFFICIENT - n
EXAMPLE
EQUATION: V = 1.486/n R^⅔ S^½
NOMOGRAPH FOR SOLUTION
OF MANNING EQUATION

80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
Flow - CFS
SECTION 3
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
River Stage - FT.

Test Flood Flow before failure = 9000 CFS
River Stage = 10.8 ft

Dam Failure Flow = 35,600 CFS
River Stage = 15.8 ft

Dampening Due To Upstream Reach:



$$\text{Storage} = \frac{\frac{160+300}{2} \times 5 \times 2900}{43{,}560} = 77 \text{ acre-ft}$$

$$Q_{P4\ TRIAL} = 35{,}600\left(1 - \frac{77}{1133}\right) = 33{,}200 \text{ CFS}$$

@ 33,200 CFS : Depth = 15.5 ft
Top Width = 290 ft

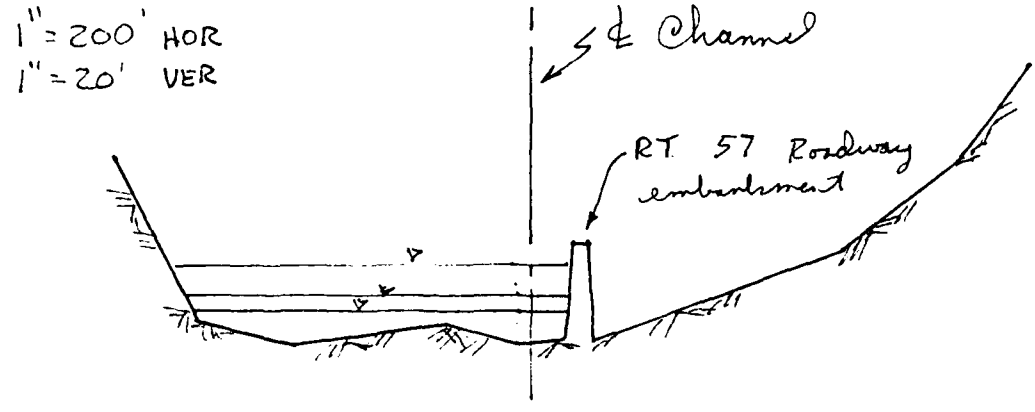
$$\text{Storage} = \frac{\frac{160+290}{2} \times 4.7 \times 2900}{43{,}560} = 70 \text{ acre-ft}$$

$$\text{Average Storage} = \frac{77+70}{2} = 73.5 \text{ acre-ft}$$

$Q_{P4} = 35,600\left(1 - \frac{73.5}{1133}\right) = 33,300$ CFS

∴ Outflow to reach # 4 = 33,300 CFS

Section 4:



Channel Slope = 20' ÷ 950' = 0.021

n = 0.05

a) Depth = 3 ft

Top Width = 400 ft

Area = $\frac{390+400}{2} \times 3 = 1185$ ft²

hyd rad. = 1185 ÷ 410 = 2.9

Vel = 8.8 FPS

Q = 8.8 × 1185 = 10,400 CFS

b) Depth = 5 ft

Top Width = 420 ft

Area = $\frac{390+420}{2} \times 5 = 2000$ ft^2

hyd. rad = $2000 \div 430 = 4.7$

Vel = 12 FPS

Q = $12 \times 2000 = 24{,}000$ CFS

c) Depth = 8 ft

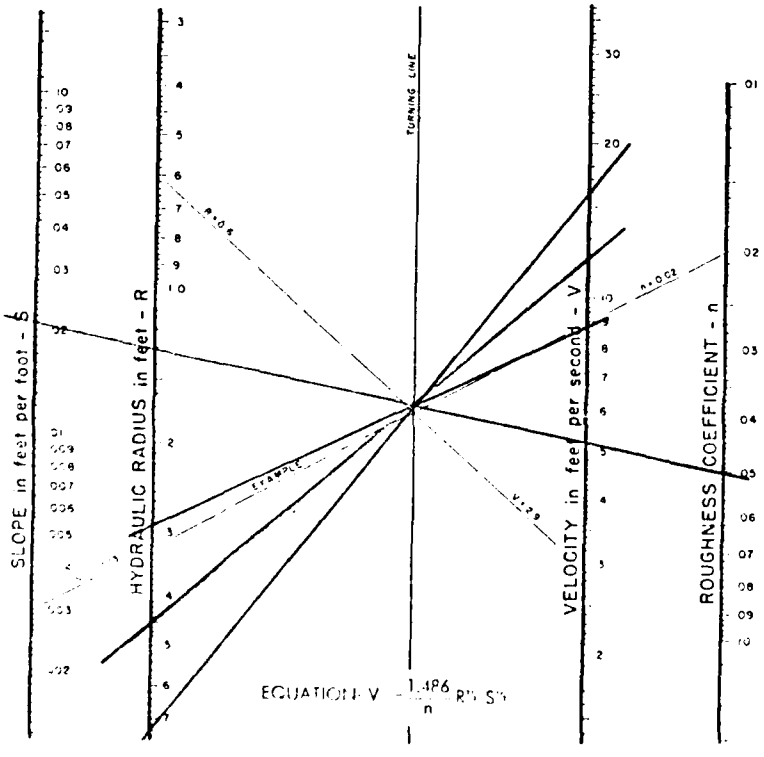
Top Width = 440 ft.

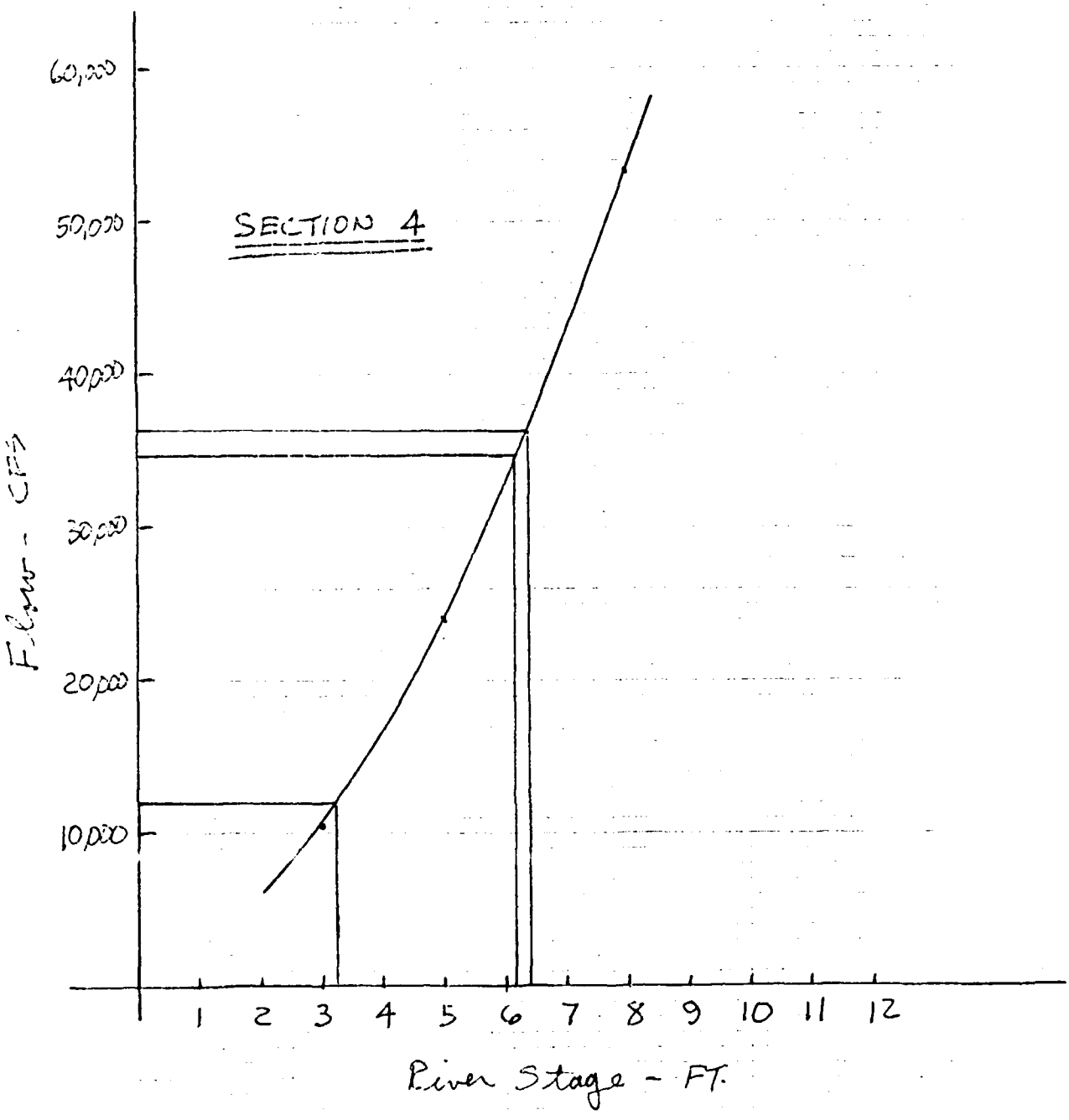
Area = $\frac{390+440}{2} \times 8 = 3320$ ft^2

hyd. rad = $3320 \div 450 = 7.4$

Vel = 16 FPS

Q = $16 \times 3320 = 53{,}100$ CFS




SECTION 4
60,000
50,000
40,000
30,000
20,000
10,000
Flow - CFS
1
2
3
4
5
6
7
8
9
10
11
12
River Stage - FT.

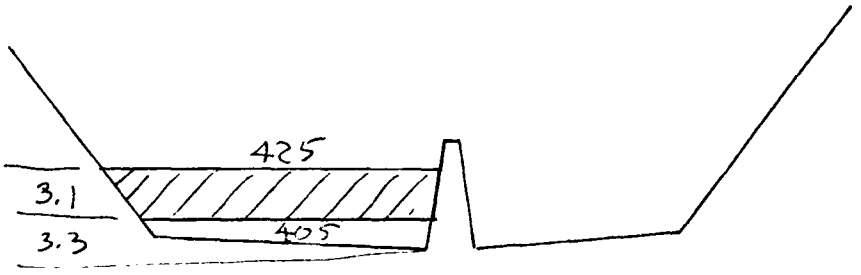
Test Flood Flow before failure = 9,000 CFS
*Tributary Confluence Flow = 3000 CFS
total = 12,000 CFS

River Stage = 3.3 ft

Dam Failure Flow = 33,300 CFS
*Tributary Confluence Flow = 3,000 CFS
total 36,300 CFS

River Stage = 6.4 ft

Dampening Due To Upstream Reach:



$$\text{Storage} = \frac{\frac{405+425}{2} \times 3.1 \times 1600}{43{,}560} = 47 \text{ acre-ft}$$

$$Q_{ps} = 36{,}300\left(1 - \frac{47}{1133}\right) = 34{,}800 \text{ CFS}$$

* See Calcs section (H), part 3

@ 34,800 CFS ; Depth = 6.2

Top Width = 420

$$\text{Storage} = \frac{\frac{405+420}{2} \times 2.9 \times 1600}{43{,}560} = 44 \text{ acre-ft}$$

$$\text{Ave. Storage} = \frac{44+47}{2} = 45.5 \text{ acre-ft}$$

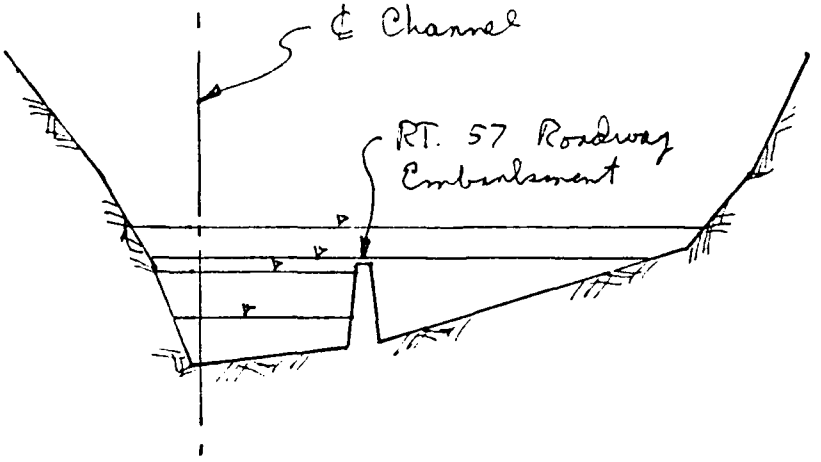
$$Q_{P5} = 36{,}300\left(1 - \frac{45.5}{1133}\right) = 34{,}800 \text{ CFS}$$

∴ Outflow to reach # 5 = 34,800 CFS.

Section 5 :

1" = 20' HOR

1" = 20' VER



Channel Slope = 20' ÷ 1200' = 0.017

n = 0.05

@ 31,000 CFS : Depth = 14.5 ft
Typ Width = 210 ft

$$\text{Storage} = \frac{\frac{190+210}{2} \times 3.7 \times 5000}{43,560} = 85 \text{ acre-ft.}$$

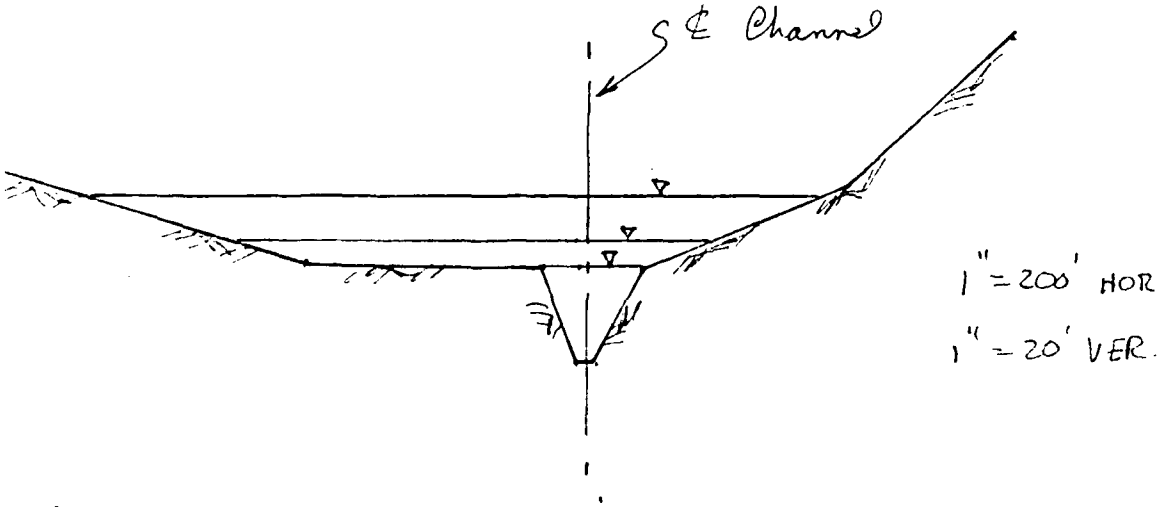
$$\text{Ave. Storage} = \frac{85+99}{2} = 92 \text{ acre-ft}$$

$$Q_{0.8} = 33,900\left(1 - \frac{92}{1133}\right) = 31,200 \text{ CFS.}$$

∴ Outflow to Reach # 8 = 31,200 CFS

The Confluence with the Clam River is just downstream of Section 7.

section 8:



@ Channel Slope = 20 ÷ 1000' = 0.02

Test Flood Before Failure = 12,000 CFS
+ Tributary Area Confluence = 2,900 CFS

total = 14,900 CFS

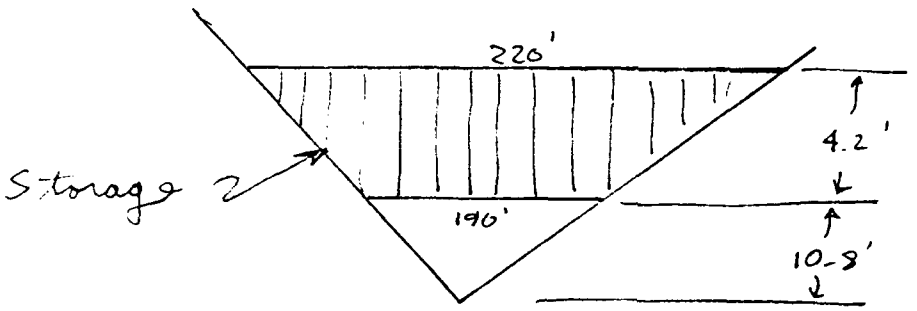
River Stage = 10.8 ft

Dam Failure Flow = 31,000 CFS
+ Tributary Area Confluence = 2,900 CFS

total = 33,900 CFS

River Stage = 15 ft

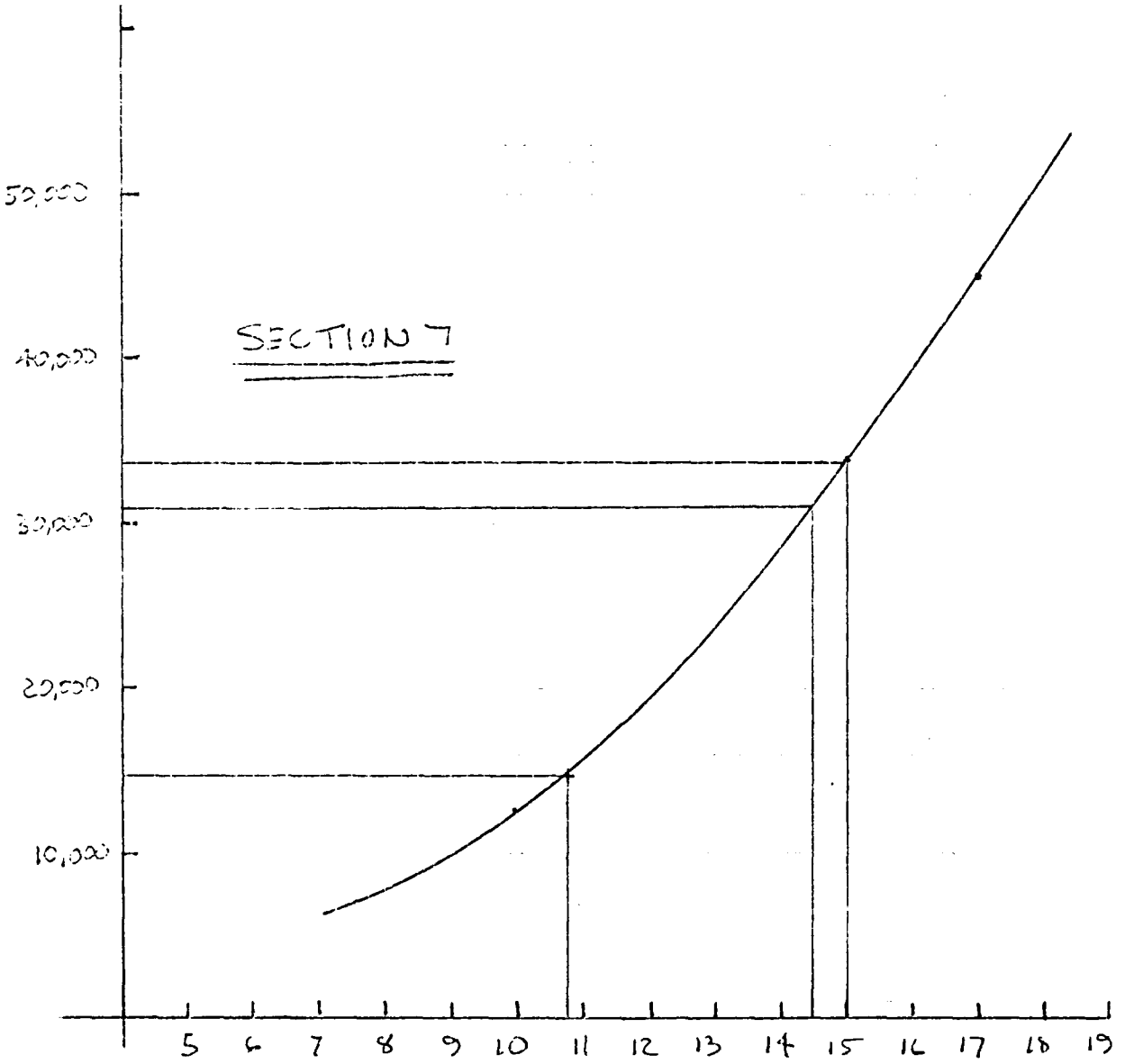
Dampening Due To Upstream Reach :



$$\text{Storage} = \frac{\frac{190+220}{2} \times 4.2 \times 5000}{43,560} = 99 \text{ acre-ft}$$

$$Q_{PS\ TRIAL} = 33,900\left(1 - \frac{99}{1133}\right) = 31,000 \text{ CFS}$$

* See Calcs section (H), part 5


50,000
40,000
30,000
20,500
10,000
SECTION 7
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

c) Depth = 17 ft

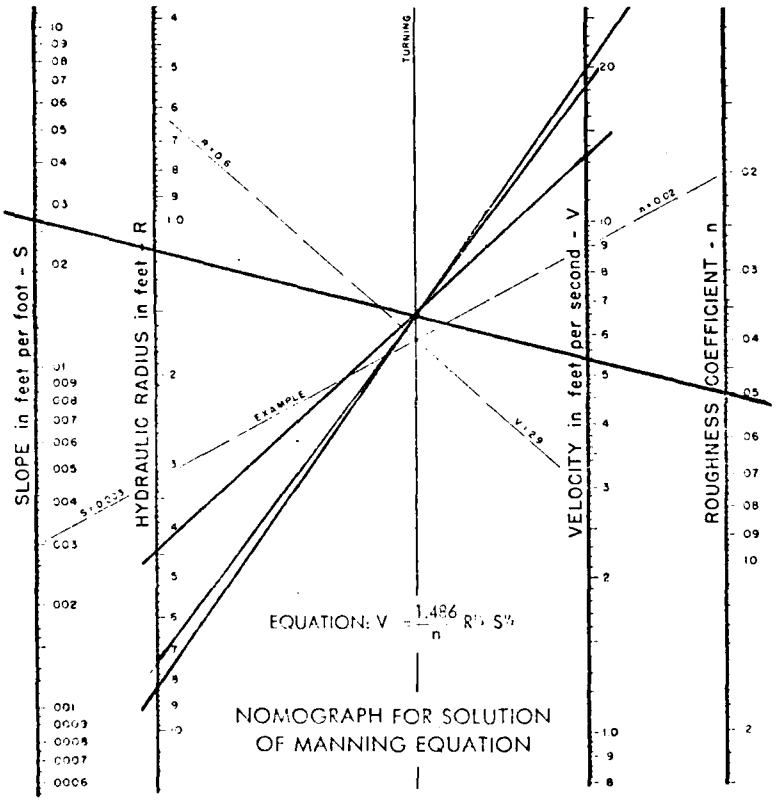
Top Width = 265 ft

Area = $\frac{17 \times 265}{2}$ = 2252 ft^2

hyd rad = 2252 ÷ 275 = 8.2

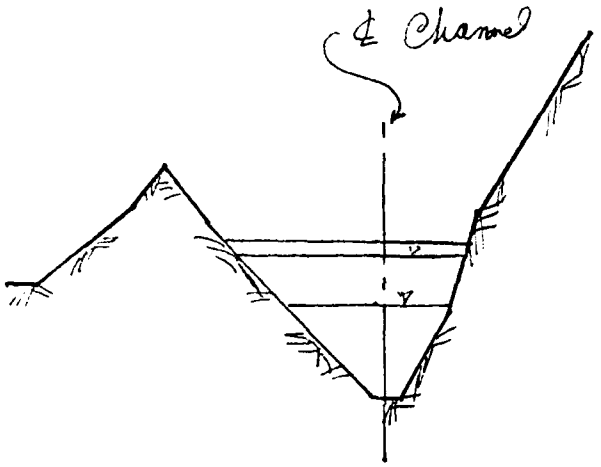
Vel = 20 FPS

Q = 20 × 2252 = 45,000 CFS.



NOMOGRAPH FOR SOLUTION OF MANNING EQUATION

Section 7 :



1" = 200' HOR
1" = 20' VER

Channel Slope = 30' ÷ 1100' = 0.027
n = 0.05

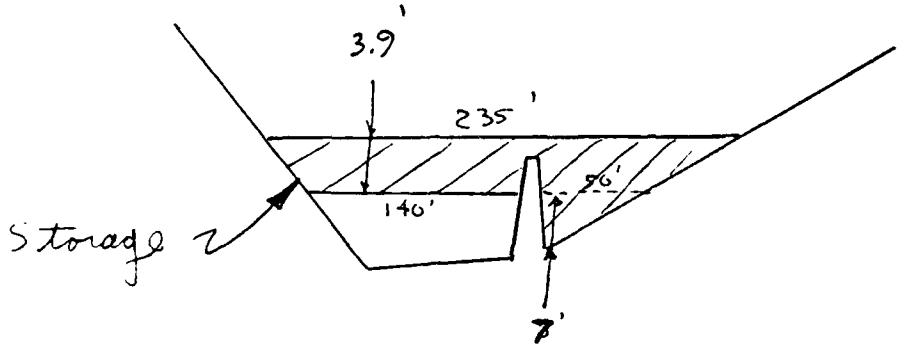
a) Depth = 10 ft
Top Width = 190 ft
Area = $\frac{190+10}{2}$ = 950 FT²
hyd rad = 950 ÷ 200 = 4.75
Vel = 13.5 FPS
Q = 13.5 × 950 = 12,800 CFS

b) Depth = 15 ft
Top Width = 250 ft
Area = $\frac{15 \times 250}{2}$ = 1875 ft²
hyd. rad = 1875 ÷ 260 = 7.2
Vel = 18 FPS
Q = 18 × 1875 = 33,800 CFS

Test Flood Before Failure = 12,000 CFS
River Stage = 7.9 ft

Dam Failure Flow = 31,600 CFS
River Stage = 11.8 ft

Dampening Due To Upstream Reach:

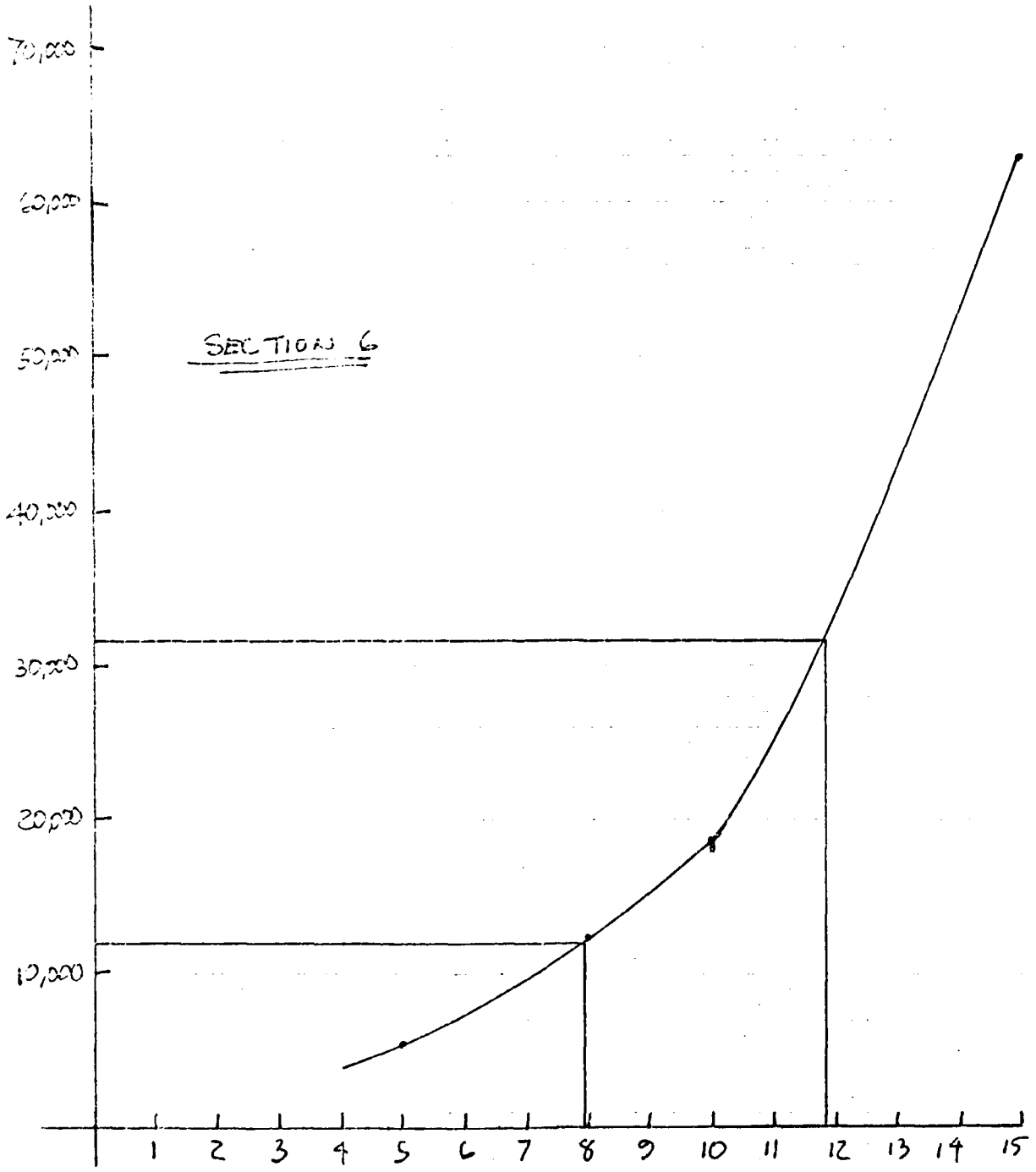


$$\text{Storage} = \frac{\left(\frac{235+196}{2} \times 3.9 \times 900\right) + \left(\frac{7 \times 50}{2} \times 900\right)}{43{,}560} = 21 \text{ acre-ft}$$

$$Q_{P7\ TRIAL} = 31{,}600\left(1 - \frac{21}{1133}\right) = 31{,}000 \text{ CFS}$$

averaging the difference in storage will have a negligible effect.

∴ Outflow to reach #7 = 31,000 CFS


70,000
60,000
50,000
40,000
30,000
20,000
10,000
SECTION 6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

d) Depth = 15 ft (Both Sides of Road)

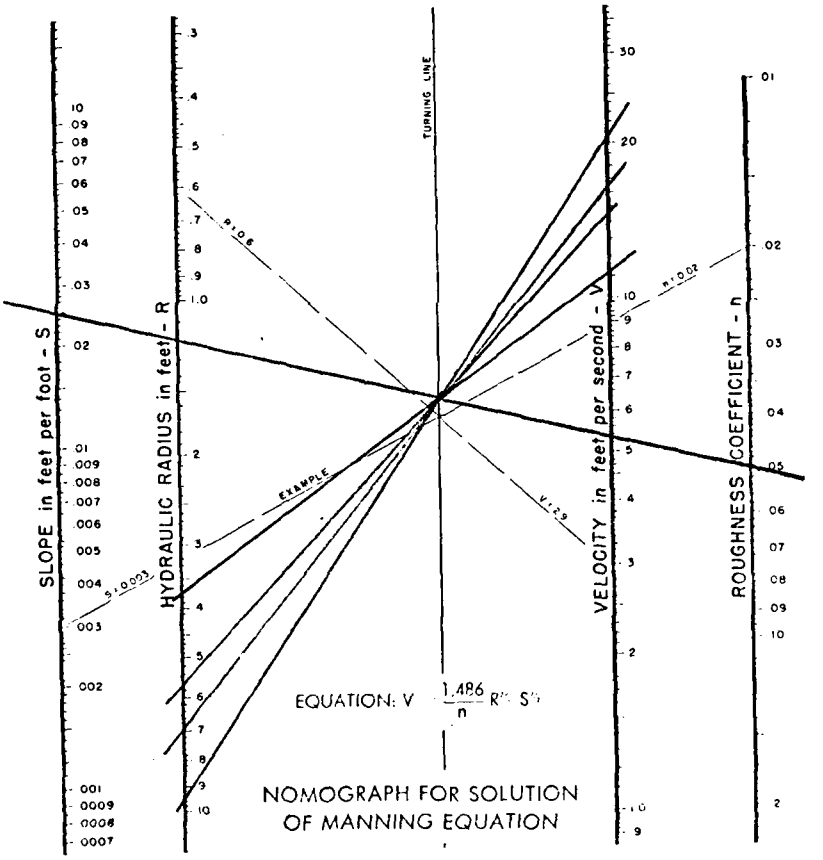
Top Width = 320 ft

Area = $\frac{70+320}{2} \times 15 = 3150$ ft^2

hyd. rad = 3150 ÷ 330 = 9.5

Vel = 20 FPS

Q = 20 × 3150 = 63,000 CFS



NOMOGRAPH FOR SOLUTION OF MANNING EQUATION

a) Depth = 5 ft

Top. Width = 115 ft

Area = $\frac{70+115}{2} \times 5 = 463$ ft^2

hyd. rad = 463 ÷ 125 = 3.7

Vel = 11.5 FPS

Q = 11.5 × 463 = 5,300 CFS

b) Depth = 8 ft

Top Width = 135 ft

Area = $\frac{70+135}{2} \times 8 = 820$ ft^2

hyd. rad = 820 ÷ 145 = 5.7

Vel = 15 FPS

Q = 15 × 820 = 12,300 CFS

c) Depth = 10 ft (South Side of Road Only)

Top Width = 150 ft

Area = $\frac{70+150}{2} \times 10 = 1100$ ft^2

hyd rad = 1100 ÷ 160 = 6.9

Vel = 17 FPS

Q = 17 × 1100 = 18,700 CFS

Ave. Storage = $\frac{54+153}{2}$ = 103.5 acre-ft

Q_{PS} = 34,800 $\left(1 - \frac{103.5}{1133}\right)$ = 31,600 CFS

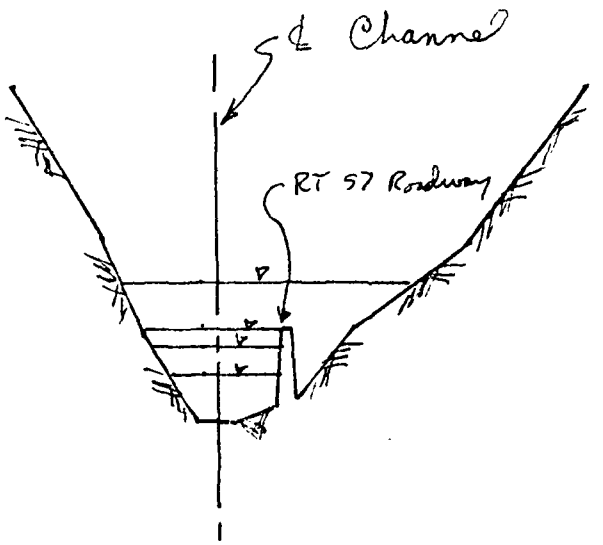
@ 31,600 CFS : Depth = 10.2 ft

∴ Flow will breaks over roadway.

use Q_{PS} = 31,600 CFS

∴ Outflow to Reach # 6 = 31,600 CFS

Section 6:



1" = 200' HOR
1" = 20' VER

Channel Slope = 20' ÷ 800' = 0.025

n = 0.05

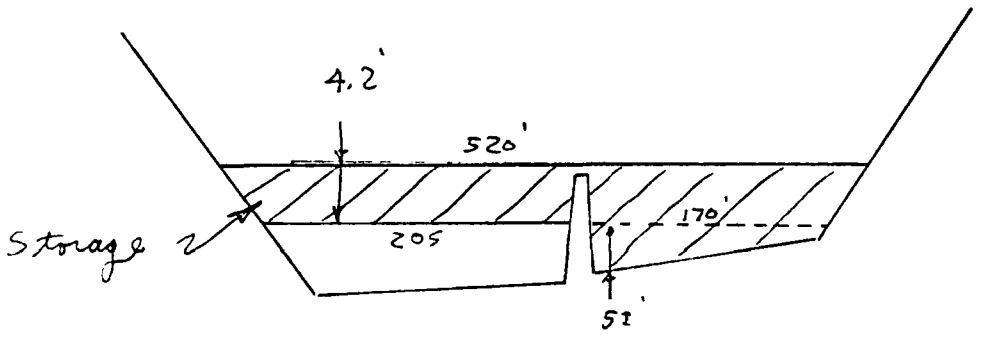
Test Flood Before failure = 12,000 CFS

River Stage = 6 ft

Dam Failure Flow = 34,800 CFS

River Stage = 10.2 ft

Dampening Due To Upstream Reach:



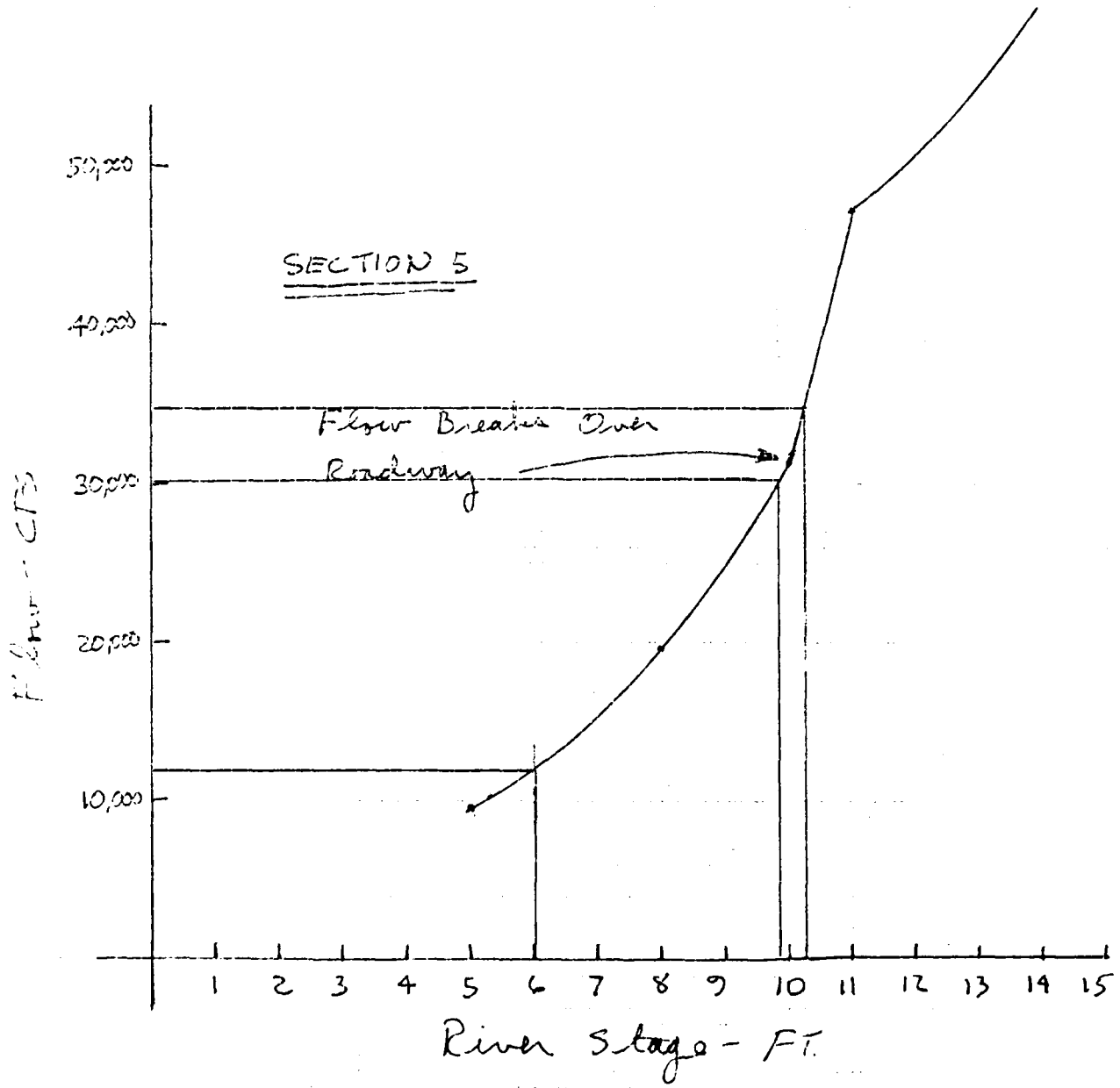
$$\text{Storage} = \left[\frac{\frac{375+520}{2} \times 4.2 \times 2900}{43{,}560}\right] + \frac{170 \times 5 \times 2900}{2 \times 43560} = 153 \text{ acre-ft}$$

$$Q_{PG\ TRIAL} = 34{,}800\left(1 - \frac{153}{1133}\right) = 30{,}100 \text{ CFS}$$

@ 30,100 CFS Depth = 3.8 ft

Top. Width = 220 ft

$$\text{Storage} = \frac{\frac{205+220}{2} \times 3.8 \times 2900}{43{,}560} = 54 \text{ acre-ft}$$


SECTION 5
50,000
40,000
30,000
20,000
10,000
Flow Breaks Over Roadway
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
River Stage - FT.

D) Depth = 8 ft

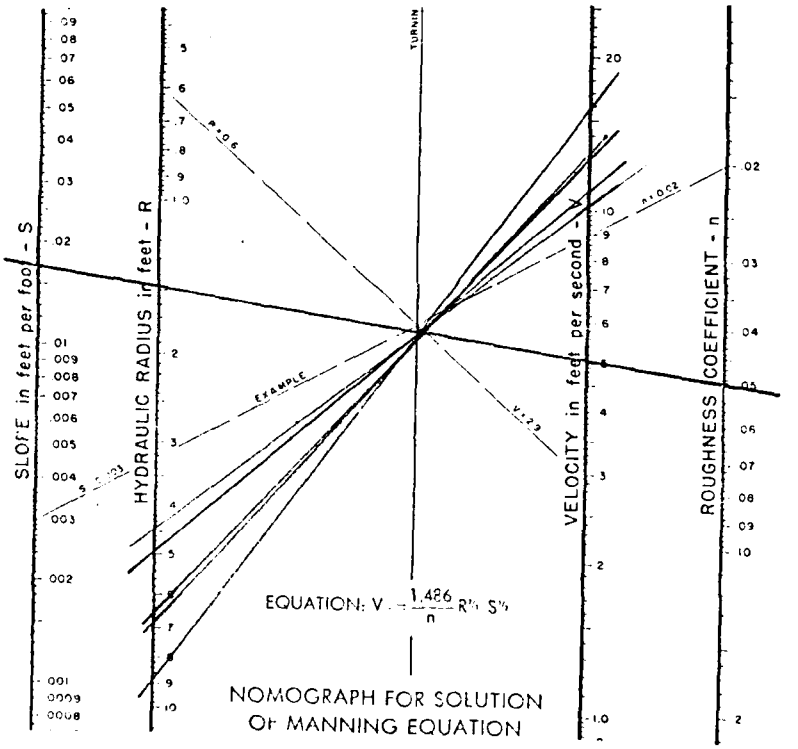
Top Width = 210

Area = $\frac{170+210}{2} \times 8 = 1520$ ft^2

hyd rad = 1520 ÷ 220 = 6.9

Vel = 13 FPS

Q = 13 × 1520 = 19,800 CFS



NOMOGRAPH FOR SOLUTION OF MANNING EQUATION

a) Depth = 5 ft

Top Width = 200 ft

Area = $\frac{170+200}{2} \times 5 = 925$ ft^2

hyd. rad = 925 ÷ 210 = 4.4

Vel = 10.5 FPS

Q = 10.5 × 925 = 9,700 CFS

b) Depth = 10 ft (South Side Road Only)

Top Width = 220 ft

Area = $\frac{170+220}{2} \times 10 = 1950$ ft^2

hyd. rad = 1950 ÷ 230 = 8.5

Vel = 16 FPS

Q = 16 × 1950 = 31,200 CFS

c) Depth = 10 ft (Both Sides of Road)

Top Width = 520 ft

Area = $\frac{170+520}{2} \times 10 = 3450$ ft^2

hyd. rad. = 3450 ÷ 530 = 6.5

Vel = 13 FPS

Q = 13 × 3450 = 44,900 CFS

a) Depth = 10 ft

Top Width = 110 ft

Area = $\frac{110 \times 10}{2}$ = 550 ft^2

hyd rad = 550 ÷ 120 = 4.6

Vel = 11.5 FPS

Q = 11.5 × 550 = 6,300 CFS.

b) Depth = 13 ft

Top Width = 520 ft

Area = 550 + $\left(\frac{360+520}{2} \times 3\right)$ = 1870 ft^2

hyd rad = 1870 ÷ 530 = 3.5

Vel = 9.8 FPS

Q = 9.8 × 1870 = 18,300 CFS

c) Depth = 18 ft

Top Width = 820 ft

Area = 550 + $\left(\frac{360+820}{2} \times 8\right)$ = 5270 ft^2

hyd. rad = 5270 ÷ 840 = 6.3

Vel = 14 FPS

Q = 14 × 5270 = 73,800 CFS.

D) Depth = 15 ft

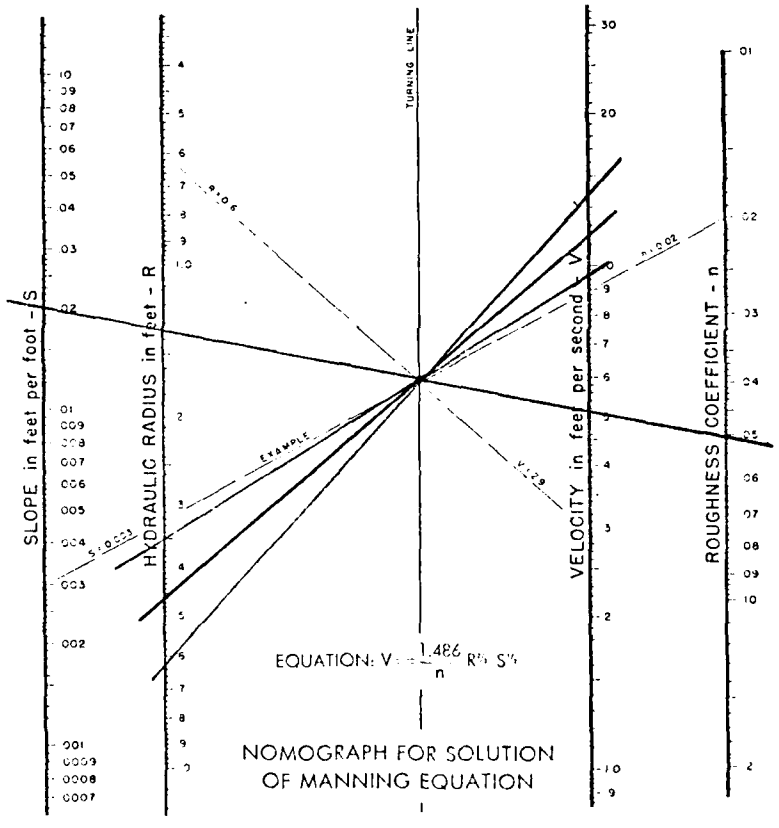
Top Width = 630 ft

Area = $550 + \left(\frac{360+630}{2} \times 5\right) = 3025$ ft^2

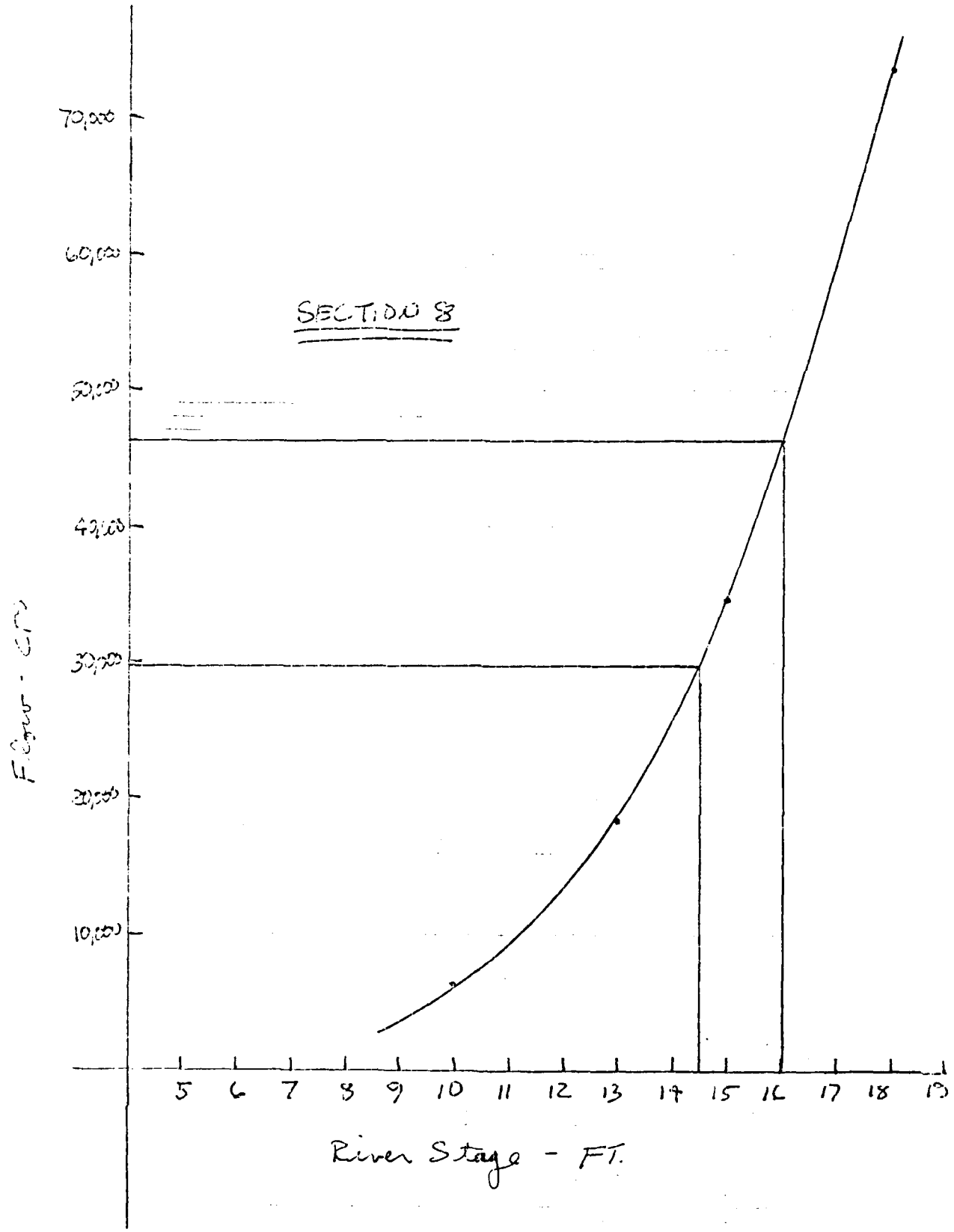
hyd rad = $3025 \div 650 = 4.7$

Vel = 11.5 FPS

Q = $11.5 \times 3025 = 34,800$ CFS



NOMOGRAPH FOR SOLUTION OF MANNING EQUATION


SECTION 8
70,000
60,000
50,000
40,000
30,000
20,000
10,000
Flow - CFS
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
River Stage - FT.

Test Flood Flow before failure = 14,900 CFS
*Clam River Confluence = 15,000 CFS
total = 29,900 CFS

River Stage = 14.5 ft

Dam Failure Flow = 31,200 CFS
*Clam River Confluence 15,000 CFS
total = 46,200 CFS

River Stage = 16.0 ft

∴ Change in river stage due to dam failure = 1.5 ft — no significant increase in damage potential.

$\frac{\text{Dam Failure Flow}}{\text{Clam River PMF}} = \frac{46,200 \text{ CFS}}{29,900 \text{ CFS}} = 1.54\%$

* See calcs section (H), part 2.

Confluence of Clam River & Farmington River @ New Boston :

D.A. = 92 mi^2 (includes Clam Watershed)

ref: "Yield of Streams in Massachusetts"
By. G.R. Higgins

Per. COE guide curves : PMF = 1300 CFS/mi^2

PMF = 92 x 1300 = 120,000 CFS.

$$\frac{\text{Dam Failure Flow}}{\text{Farmington River Flow}} = \frac{46,200}{120,000} = 38\%$$

Conclusion: Effects of dam failure are negligible downstream of the confluence with the Clam River.

⑥ Culvert Capacities

$$H - \text{losses} = \frac{V^2}{2g}$$

losses = entrance, friction

$$\text{losses} = 0.5\frac{V^2}{2g} + 0.4\frac{V^2}{2g}$$

$$\text{losses} = 0.9\frac{V^2}{2g}$$

$$H - 0.9\frac{V^2}{2g} = \frac{V^2}{2g}$$

$$H = 1.9\frac{V^2}{2g} \quad ; \quad V^2 = \frac{2gH}{1.9}$$

$$V = \sqrt{\frac{2gH}{1.9}}$$

1. Box Culvert #1 @ West St.

Area = $5' \times 7' = 35\ ft^2$

Surcharged max H = 1 ft due to tailwater

$$V = \sqrt{\frac{(2)(32.2)(1')}{1.9}} = 5.8 \text{ FPS}$$

$$Q = 35 \times 5.8 = 203 \text{ CFS}$$

2. Box Culvert # 2 @ West St.

Area = $12 \times 7.2 = 86.4$ ft^2

Surcharged to roadway H = 2.8 ft due to tailwater

$V = \sqrt{\frac{(2)(32.2)(2.8)}{1.9}} = 9.7$ FPS

$Q = 9.7 \times 86.4 = 842$ CFS

3. Bridge # 3 @ Route 57

Area = $35 \times 5 = 175$ ft^2

Surcharged to Roadway H = 3 ft

$V = \sqrt{\frac{(2)(32.2)(\quad)}{3}} = 10.1$ FPS

$Q = 10.1 \times 175 = 1765$ CFS

(H) Tributary Stream Flood Flows:

1. Abbey Lake Flow

D.A. = 1.75 mi^2

unit discharge = 2575 CFS/mi^2

Flood Flow = 4500 CFS inflow to reservoir

Flood water storage dampens the outflow from the reservoir to about 3200 CFS

2. Clam River Flow:

D.A. at confluence = 14 mi^2

unit discharge = 1850 CFS/mi^2

Flood Flow = 26,300 CFS

Flood water storage at the Clam Dam, dampens the outflow from the flood protection reservoir to about 15,000 CFS.

3. Tributary Flows entering at Section 2

D.A. = West Lake + Abbey Lake + D.S. to sect.2

D.A. = 1.46 + 1.75 + 2.0 = 5.21 mi^2

unit discharge = 2550 CFS/mi^2

Flood Flow = 5.21 × 2550 = 11,600 CFS

West & Abbey will dampen the flood flows by about 1300 CFS each, therefore, the actual flood flow at section 2 will be reduced to 9000 CFS

4. Tributary Flows entering at Section 4

D.A. = West Lake + Abbey Lake + D.S. to sect 4

D.A. = 1.46 + 1.75 + 3.76 = 6.97 mi^2

unit discharge = 2100 CFS/mi^2

Flood Flow = 6.97 × 2100 = 14,600 CFS

Dampened flow due to West & Abbey = 12,000 CFS

5. Tributary Flow entering at Section 7

D.A. = West + Abbey + D.S. to sect 7

D.A. = 1.46 + 1.75 + 5.32 = 8.53 mi^2

unit discharge = 2050 CFS/mi^2

Flood Flow = 8.53 × 2050 = 17,500 CFS

Dampened Flow due to West + Abbey

= 14,900 CFS

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

MA	28	MA 003 01		WEST LAKE DAM	4207.8 7309.6	31DEC79

POPULAR NAME	NAME OF IMPOUNDMENT
	WEST LAKE

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	06	MORLEY BROOK	VILLAGE OF MONTVILLE	2	100

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REPG	1967	CR	25	25	1133	480	NED	N	N	N	B	

REMARKS

17 MORLEY BROOK IS A TRIBUTARY TO THE BUCK RIVER 26 AT TOP OF DAM

D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	920	U	100	2160	29000											

OWNER	ENGINEERING BY	CONSTRUCTION BY
COM OF MASS DIV WATER RE	US DEPT AGRICULTURE SCS	ARTHUR H HEBERT + SON

REGULATORY AGENCY

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
US DEPT AGRIC SCS	US DEPT AGRIC SCS	COM OF MA DIV F+P	COM OF MA DIV F+P

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
TIGHE + BOND / SCI	01NOV79	PL 92-367

REMARKS

33 WATER ELEVATION AT TOP OF DAM 51+52 DIV OF FORESTS + PARKS

END

FILMED

7-85

DTIC