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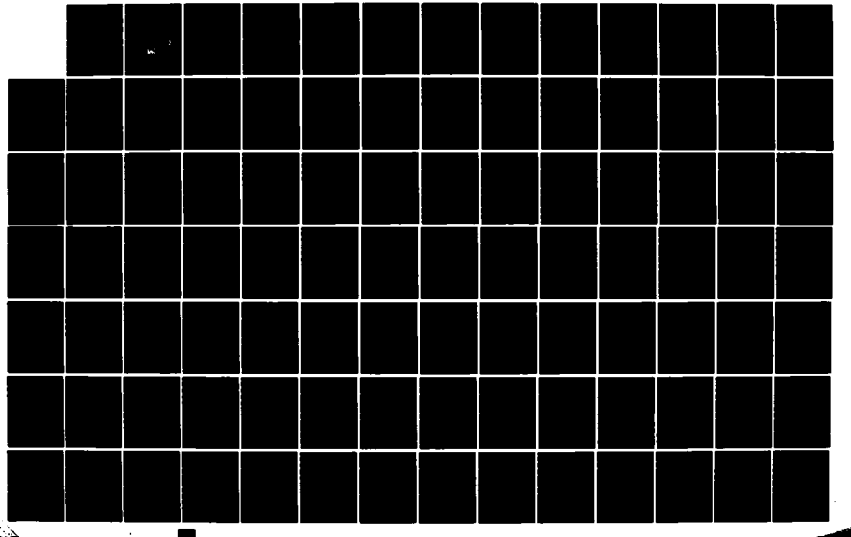

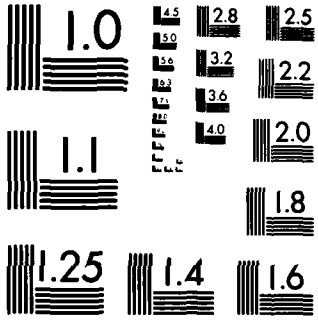

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AD-A155 633

CONNECTICUT RIVER BASIN
BLANDFORD, MASSACHUSETTS

BLACK BROOK DAM
MA 01057

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

MARCH 1980

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 01057	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Black Brook Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE March 1980 13. NUMBER OF PAGES 90
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

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

18. SUPPLEMENTARY NOTES

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

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

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Blanford, Massachusetts
Black Brook

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

The dam is an earthfill embankment about 1168 ft. long and 60 ft. high. The dam and appurtenances were found to be in fair condition. It is intermediate in size with a hazard classification of high. Failure of the dam would pose a serious threat to about 75 structures, most of which are houses, in the Russell area, one major highway bridge, and one secondary road crossing.

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

REPLY TO
ATTENTION OF:

MAR 17 1981

NEDED

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

Dear Governor King:

Inclosed is a copy of the Black Brook Dam (MA-01057) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

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

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,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

BLACK BROOK DAM

MA 01057

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CONNECTICUT RIVER BASIN

BLANDFORD, MASSACHUSETTS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

REPRODUCED AT GOVERNMENT EXPENSE
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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	MA 01057
Mass. D.P.W. No:	1-7-33-8
Name of Dam:	Black Brook Dam
Town:	Blandford
County and State:	Hampden County, Massachusetts
Stream:	Black Brook
Date of Inspection:	11/20/79

BRIEF ASSESSMENT

The Black Brook Dam, is located on Black Brook a tributary to Bradley Brook and the Westfield River and is in the Town of Blandford, Massachusetts. The dam site is approximately 2.6 miles upstream along Bradley Brook and Black Brook from the Town of Russell and is located off of Martin Phelps Road in Blandford. The dam is a multiple purpose water supply and flood protection facility which is owned by the Town of Russell through its Water Commission. It was designed by the U.S. Department of Agriculture, Soil Conservation Service and was completed in 1971. The dam is an earthfill embankment about 1168 feet in length, and 60 feet in height and has a reinforced concrete principal spillway which maintains the water supply pool level and controls the release of stored floodwater, and a 50 foot wide earth and ledge excavated emergency spillway channel in the right abutment.

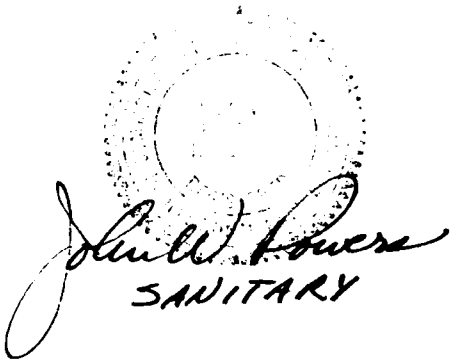
The dam and appurtenances were found to be in FAIR condition. The visual inspection indicated that silt from under the upstream riprap is being washed out by runoff and wave action to form small deltas in the pond, the trash rack on the riser has been damaged, the toe of the dam is wet along the abutments and the floor of the discharge channel of the emergency spillway is wet. 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 2.3 square miles and the PMF test flood is 5,800 CFS. Routing the test flood through the reservoir, with the initial pool level at the water supply pool elevation, results in a test flood outflow of 2,700 CFS which does not exceed the capacity of the spillways. Pool elevation at test flood conditions is 893 MSL which is 3 feet below the top of dam.

The combined spillways have a capacity of about 5000 CFS with the water level at the top of the dam. This capacity is about 185% of the routed test flood outflow from the reservoir.

Failure of the dam would pose a serious threat to approximately 75 structures, most of which are houses, in the Russell area, one major highway bridge, and one secondary road crossing.

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 Black Brook Dam (MA-01057) 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.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

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

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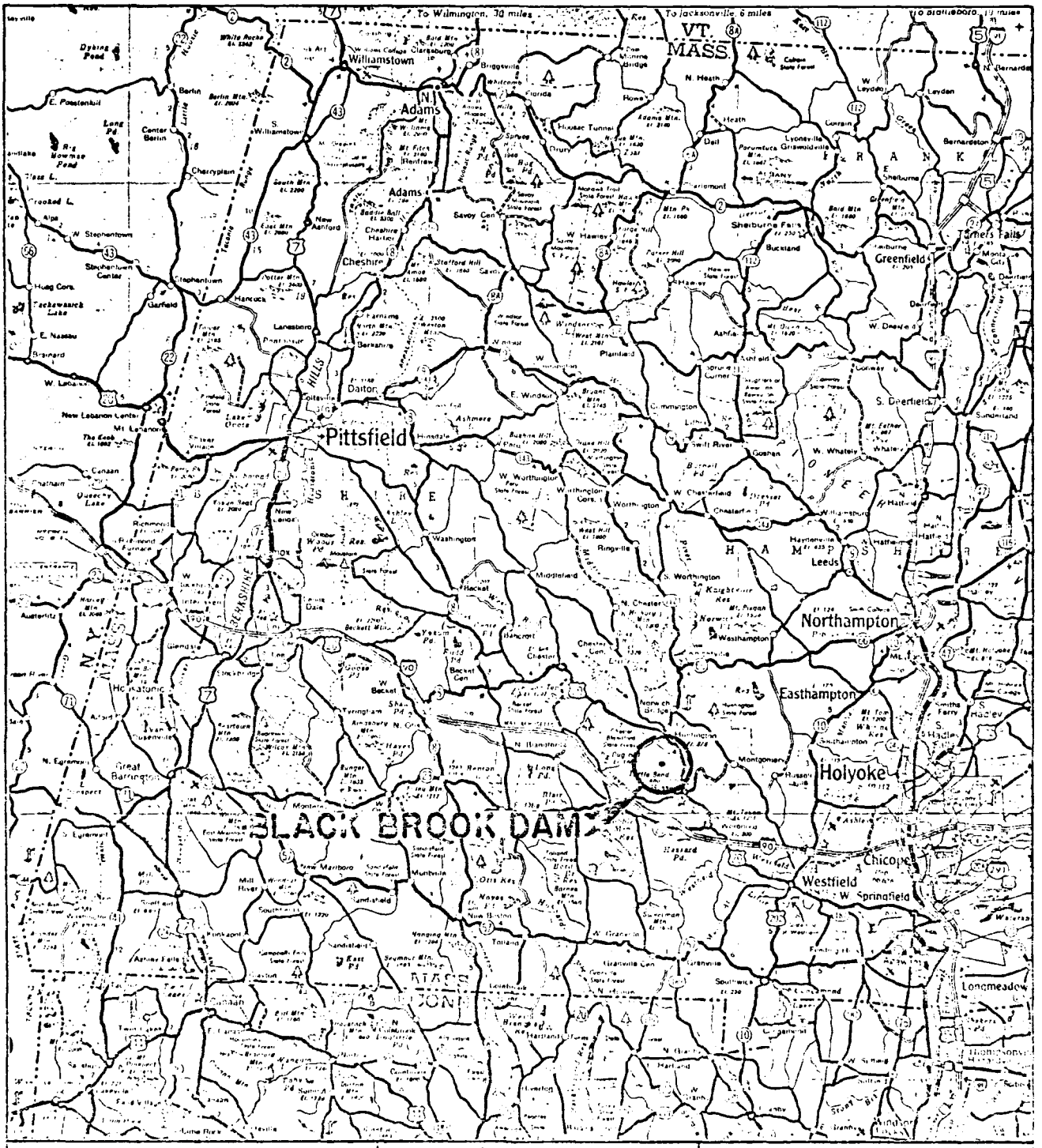

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MASS.

MAP LOCATION

TIGHE & BOND / SCI
CONSULTING ENGINEERS
EASTHAMPTON, MASS.

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

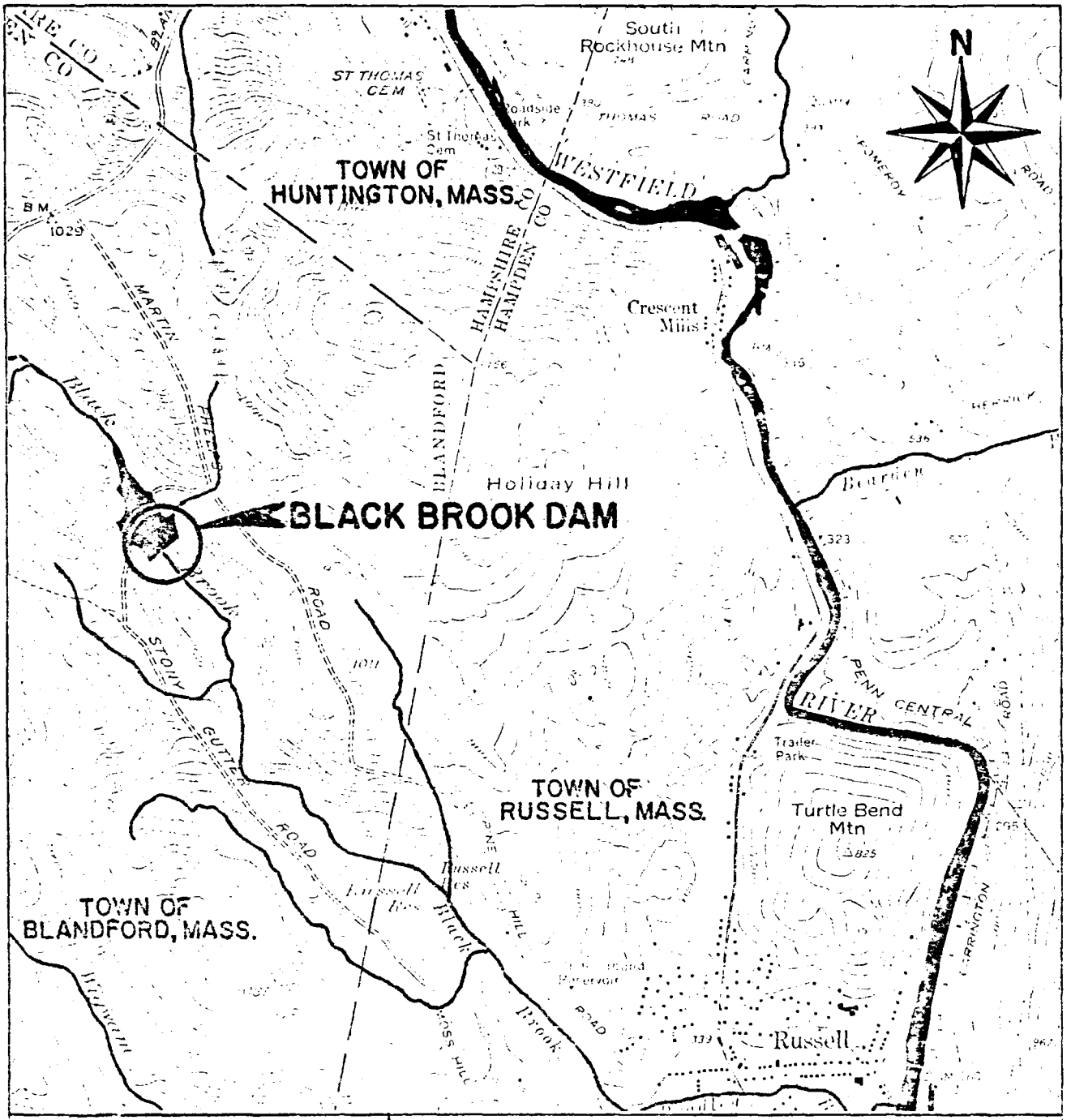
LOCUS PLAN I

BLACK BROOK DAM (MA 01057)
HAMPDEN COUNTY

BLANDFORD
MASSACHUSETTS

SCALE: AS NOTED

DATE: MARCH 1980



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FROM: U.S.G.S. BLANDFORD, AND WORONOCO, MASS. QUADRANGLE MAPS

QUADRANGLE LOCATION

TICHE & 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

BLACK BROOK DAM (MA 01057)
HAMPDEN COUNTY

BLANDFORD
MASSACHUSETTS

SCALE: AS NOTED

DATE: MARCH 1980

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

BLACK BROOK 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 Black Brook Dam is located in the Town of Blandford, Massachusetts, about 2.6 miles upstream from the Town of Russell. The dam is located on Black Brook which is a tributary to Bradley

Brook and the Westfield River, respectively. The dam and impoundment is located off of Martin Phelps Road in the Town of Blandford.

The dam is located on the U.S.G.S. Blandford and Woronoco, Mass., quadrangles at latitude N42°-12'-36" and longitude W72°-53'-18". Refer to the location plan, and Appendix B for additional information.

(b) Description of Dam & Appurtenances

The dam consists of an earthfill embankment, a principal spillway consisting of a reinforced concrete drop inlet structure having a two stage riser section, a 36-inch diameter reinforced concrete outlet conduit, and a reinforced concrete impact basin at the conduit outlet. An emergency spillway is located in the right abutment and consists of a grass covered earth channel excavated in natural ground and ledge.

1) Embankment (See pages B-1, B-2, B-3 and B-5)

The following information has been taken from the As-Built Drawings dated 1972.

The dam embankment is approximately 1,168 feet long and has a structural height of 60 feet. The upstream slope is 2.5 horizontal on 1 vertical. The downstream slope is 2.5 horizontal on 1 vertical, and the width of the top of dam is 18 feet. The upstream slope surface is covered with dumped riprap to the top of dam; riprap has been placed on the downstream face to elevation 885 MSL.

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

The top of the dam is covered with grass growth.

2) Principal Spillway (See pages B-7 and B-9)

The principal spillway consists of a reinforced concrete drop inlet structure with a sluice gate controlled inlet pipe at invert elevation 841.0 for the pond drain, an uncontrolled orifice inlet at invert elevation 863.5 for the water supply pool and uncontrolled overflow weirs at elevation 876 for the high stage pond outlet.

The riser structure is 38.2 feet high from the base of the foundation to the top of the structure. The inside dimensions are 3 feet x 9 feet with walls that vary in thickness from 21" to 10". The inside bottom elevation of the riser structure is 840.0. The low stage water supply orifice is

located on the upstream face and measures 26 inches wide x 12 inches high with an invert elevation of 863.5. 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 876.0. There are two anti-vortex walls perpendicular to the top of the weir walls with a solid concrete platform bridging the two walls. The sluice gate operator stand is supported on this platform. The anti-vortex walls flare out and up from about elevation 869.5 to 876.0 at a 45° angle. Them the walls are vertical for about 2.1 feet to the surface of the platform. Galvanized angle irons have been bolted between the walls to act as a trash rack.

The sluice gate which controls the 18 inch diameter pond drain is an 18 inch square gate mounted on a 12 inch deep wall thimble. The gate is operated by a rising stem, crank operated, floor stand located on the top of the riser structure.

The pond drain consists of about 40 feet of 18 inch diameter reinforced concrete water pipe with a reinforced concrete inlet structure. This conduit enters the riser structure through the upstream side.

The principal spillway structure has a 36 inch diameter outlet conduit discharging 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 six reinforced concrete anti-seep collars. The invert elevation of the outlet pipe is 840.0 at the principal spillway and 836.0 at the impact basing with an overall length of 232.33 feet and a slope of 0.017 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-4 and B-8)

The emergency spillway consists of a grass covered earth and ledge excavated channel in the right abutment of the dam. The spillway channel has a control section at elevation 887.5 which is 50 feet wide and 30 feet long. A concrete weir 3' wide exists on the downstream edge of the flat control section and extends between the toe of slopes in the spillway. The spillway approach channel, along the centerline, has a section sloping up towards the control section at 2% for about 225 feet, then 1.59% for about 175 feet to the control section. The control section is level at elevation 887.5 for a distance of about 30 feet. The discharge channel slopes downward at 2.5% for about 175 feet and then 2.15% for about 160 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 in earth and somewhat steeper where ledge outcrops were encountered. The maximum depth of excavation is at the control section and is about 32 feet. The control section is approximately 8.5 feet below the top of the dam.

4) Foundation and Embankment Drainage (See page B-6)

A 4 foot wide trench drain of clean sand and gravel extends into the foundation of the downstream toe. The trench drain extends from the centerline of the principal spillway left about 548 ft. and right about 602 ft., with an 8 inch diameter perforated CMP drain pipe extending the full length of the trench. Both 8 inch diameter trench drain outlet pipes discharge into the impact basin structure at the outlet of the principal spillway.

(c) Size Classification

The dam's maximum impoundment (computed to the top of the dam) of about 1620 acre-feet and structural height of 60 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 75 structures, most of which are houses with attendant probable loss of more than a few lives, as well as one major highway bridge and one secondary road bridge.

(e) Ownership

The Black Brook Dam is owned by the Town of Russell acting through its Board of Water Commissioners. The address is as follows:

Town of Russell
Board of Water Commissioners
Box 164
Russell, Massachusetts

(f) Operator

The operation of the Black Brook dam is the responsibility of the Town of Russell acting through its Board of Water Commissioners. The contact person for the Water Commissioners is Mr. Edward Miller. The telephone number is 1-413-862-3276.

(g) Purpose of Dam

The Black Brook Dam is a multiple-purpose dam which maintains a low level water supply 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 Black Brook Dam was designed by the U.S. Department of Agriculture, Soil Conservation Service. It was completed in the fall of 1971 and has been in operation since that time.

(i) Normal Operation Procedure

The Black Brook 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 and in the event the Town of Russell requires downstream flow for water supply when the water level is below the low stage inlet.

1.3 Pertinent Data

(a) Drainage Area

The drainage area for the Black Brook Dam covers approximately 2.3 square miles. The drainage area from which Black Brook originates, and the surrounding perimeter areas are primarily mountainous woodland with some open areas. There are no developments within the watershed.

(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 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:
   a) Pond drain, 18 inch dia., inv. elev. 841.40 NGVD sluice gate controlled, Maximum Capacity 74 CFS.

   b) low stage inlet orifice, 25 inch wide x 12 inches high, inv. elev. 863.5 NGVD, ungated, Maximum Capacity 67 CFS.

2) Maximum known flood at dam site:

It is reported that the highest pond elevation to date was observed during the fall of 1979. During this period the pond elevation was at approximately 868 ft. NGVD. Pond elevation during the March, 1980 flood flows reportedly did not reach elevation 868 ft. NGVD. No discharge flow data or recorded pond elevation data is available.

3) Ungated spillway capacity at top of dam

With the water level at the top of the dam (elev. 896 feet NGVD) spillway capacities are as follows:

principal spillway		220 CFS
emergency spillway		4780 CFS
	Total	5000 CFS

4) Ungated spillway capacity at test flood elevation

With the water level at the test flood elev. (893 feet NGVD) spillway capacities are as follows:

principal spillway		215 CFS
emergency spillway		2485 CFS
	Total	2700 CFS

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:

2700 cfs at elev. 893 feet NGVD. (Same as #4)

8) Total project discharge at top of dam:

5000 cfs at elev. 896 feet NGVD. (Same as #3)

9) Total project discharge at test flood elevation:

2700 cfs at elev. 893 feet NGVD.

(c) Elevation (ft. above MSL)

1) Streambed at toe of dam - 336.±

2) Bottom of cutoff - 834±

3) Maximum tailwater - Unknown

4) Recreation pool - Not Applicable

5) Normal Water supply pool - 863.5

6) High stage flood control pool - 876.0

7) Full flood control pool - 887.5

8) Emergency spillway crest elevation = 887.5 ungated

9) Design surcharge - 885.8

10) Top of dam - 896

11) Test flood surcharge - 893

(d) Reservoir (Length in feet)

1) Normal water supply pool - 1920 ft±

2) Flood Control pool - 4000 ft±

3) Emergency spillway crest pool - 4000 ft.±

4) Top of dam - 4400 ft±

5) Test flood pool - 4300

(e) Storage (acre-feet)

1) Normal water supply pool - 74

2) Flood control pool - 942

3) Spillway crest pool

a) Low stage crest (water - supply pool) - 74

b) High stage crest - 330

c) Emergency spillway - 942

4) Top of dam - 1620

5) Test flood pool - 1340

(f) Reservoir Surface (acres)

1) Normal water supply pool - 11

2) Flood-control pool - 69

3) Spillway crest

a) Low stage crest (water supply pool) - 11

b) High stage crest - 34

c) Emerg. spillway crest - 69

4) Test flood pool - 76

5) Top of dam - 81

(g) Dam

1) Type - Earth embankment

2) Length - 1168 ft±

3) Height - 60 ft±

4) Top Width - 18 ft

5) Side Slopes - 2.5 hor. on 1 vert. both faces.

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 and ledge excavated channel with level control section and buried concrete weir wall

2) Length of weir:

a)	High stage inlet:	2 @ 9 ft. = 18 ft.
b)	Emergency spillway:	50 ft.

(3) Crest Elevation

a)	High stage inlet:	876.0
b)	Emergency spillway:	877.5

(4) Gates: None

(5) Upstream channel:

a)	Principal Spillway:	Reservoir
b)	Emergency Spillway:	Grass covered earth and ledge excavated channel.

(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 and ledge excavated channel to wooded area discharging into natural stream channel downstream of dam

(j) Regulating Outlets

The only regulated outlets from the dam consist of a pond drain which is controlled by a manually operated 18 inch square sluice gate and an ungated low stage inlet orifice. The sluice gate is located on the inside face of the pond side wall of the principal spillway riser with its invert at elevation 841.0. The floor stand operator is located on the top of the principal spillway riser. The gate is a Joyce-Cridland, non seating head type, with a rising stem operator having the following identification:

WJ70-4508
WJ65

The gate is normally in the closed position, and only rarely operated for maintenance checks and to allow water to flow in the stream to the downstream water intake reservoir.

The pertinent data regarding these outlets are as follows:

a) Pond drain, 18 inch dia., inv. elev. 841.40 NGVD, Maximum capacity 74 CFS, controlled by an 18 inch square sluice gate.

b) Low stage inlet orifice, 25 inches wide x 12 inches high, inv. elev. 863.5 NGVD, ungated, maximum capacity 67 CFS.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

The design data for the Black brook 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 1969 and 1970. 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. Since water supply was one aspect of the project, the Soil Conservation Service, by regulation, contracted for the design of the water supply appurtenances with a private engineering firm. The firm's name is Loewer Sargent and Assoc. of Kensington, MD.

This design data was reviewed and found to be in accordance with good engineering practice. 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 Black Brook 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 for flood control purposes, and no operational data is available. Under normal conditions the hydraulics of the principal spillway maintain a low level water supply pool and flood flows are discharged via the high stage overflow weirs of the principle spillway and the emergency spillway.

During periods of low runoff from the watershed, the Town of Russell Water Department may release water from the impoundment in order to augment the flow entering the lower intake reservoir. The 18 inch diameter pond drain and sluice gate must be used for this purpose. There are no other regulating gates to be operated. Information from the Water Department indicated that the pond drain has never been operated for water supply purposes and the present Water Department Superintendent reports that he has never operated the pond drain gate.

2.4 Evaluation of Data

(a) Availability

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

(b) Adequacy

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

(c) Validity

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

SECTION 3 - VISUAL INSPECTION

3.1 Findings

(a) General

The Black Brook Dam, No MA 01057, was in FAIR condition at the time of the inspection.

(b) Dam

1) Earth Embankment (See Photos 3, 4, 8 & 9)

The upstream face of the dam embankment showed a surface irregularity in the slope to the right of the spillway riser. Also, fine sand was being eroded from under the riprap at a number of locations at the normal water supply pool water line and was forming small sand deltas at the waterline.

The top of the dam and the downstream face above elevation 885.0 has a heavy grass cover which is well established. There is some evidence of trespassing on the dam by trail motorcycles which have caused minor damage to grassed areas.

The toe of the dam at both the right and left abutments is wet with a slight noticeable movement of water downhill towards the impact basin. No movement of silt was evident, however. The wetness could be caused by ground water seeping from the watershed above the dam since a significant amount of area drains towards the dam.

Small diameter trees were noted growing along the right end of the embankment.

The heavy grass growth on the embankment prevented a thorough inspection of this feature.

(2) Emergency Spillway (See Photos 5 & 6)

The emergency spillway channel is in good condition. There is a considerable amount of wetness downstream of the crest weir wall, but this must be natural ground water. The channel itself was free of debris but significant growth of weeds and grass exists. The channel has been excavated through original ground and ledge.

The channel and side slopes have a heavy grass growth providing good erosion protection where ledge outcrops do not exist.

(c) Appurtenant Structures

1) Drop Inlet Principal Spillway (See hotos 1 & 7)

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 one of the trash rack bars was missing and a second was damaged on the left side of the riser.

2) Pond Drain Inlet Pipe

At the time of the inspection, the water level was at the normal water supply 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 with only a small hydraulic jump in the flow being noted at the third joint in from the impact basin. All visible interior joints were dry above the flow line. The interior of the conduit that was visible is in good condition with no spalling, cracking, or efflorescence.

4) Impact Basin (See Photos 2, 10, 11 & 12)

The impact basin was found to be in good condition with only a few minor shrinkage 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 (See Photo 1)

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

(e) Downstream Channel (See Photo 2)

The downstream channel is in good condition with only a slight amount of vegetation encroachment. The channel immediately downstream of the dam is unobstructed. Riprap protection of the channel is minimal, but appears to be adequate.

3.2 Evaluation

The dam is generally in FAIR condition with the following deficiencies being noted:

(a) Silt and fine sand is eroding from under the riprap on the upstream face at the water line and washing into the pond.

(b) There is a surface irregularity in the upstream slope to the right of the principal spillway.

(c) The toe of the dam at both the right and left abutments is wet.

(d) One of the trash rack bars is missing on the left side of the principal spillway riser.

(e) Trespassing by wheeled vehicles on the dam and emergency spillway was evident.

(f) There is a heavy grass growth on the dam 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 for flood control purposes. The sluice gate on the pond drain is normally in the closed position and is not routinely operated. It is reported that the gate has not been operated since 1974 and is believed to have been operated once prior to 1974 for maintenance purposes.

(b) Description of Warning System In Effect

There is no written downstream 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 Town of Russell through its Board of Water Commissioners.

Typical maintenance items assigned to the Town of Russell include liming and fertilizing, mowing, clearing of accumulated debris, etc. At the time of this Phase I inspection the embankments and emergency spillway channel were overgrown with a heavy growth of grass. Also, a trash rack bar was missing from the riser.

(b) Operational Facilities

The only facility which requires operation is the pond drain sluice gate. This gate may be used to release impounded water to the downstream water supply intake reservoir and also to completely drain the impoundment.

Discussions with a representative of the Town of Russell Water Commissioners indicated that the sluice gate for the pond drain is not routinely operated and it has not been required to release impounded water for water supply purposes. 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 emergency spillway channel, and the missing and damaged trash rack bar on the riser indicate that improvements are needed in the routine maintenance program. These items should be checked and corrected on a routine,

frequent basis. In addition, the sluice gate should be operated at least 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 and put into operation.

SECTION 5 - EVALUATION OF HYDRAULIC/ HYDROLOGIC FEATURES

5.1 General

Black Brook Dam, No. MA 01057, is a multiple-purpose water supply and floodwater storage facility which was designed by the Soil Conservation Service (SCS), as part of the overall Westfield River flood protection project.

The dam is located on Black Brook in the Town of Blandford, Massachusetts about 2.6 miles upstream along Bradley Brook and Black Brook of the Town of Russell. The dam is about 2.5 miles upstream of its confluence with Bradley Brook and 3 miles upstream of the confluence of Bradley Brook and the Westfield River in the Town of Russell, Massachusetts.

The drainage area upstream of the dam is 2.3 square miles (1485 acres) with a mountainous perimeter and interior from which Black Brook originates.

No development exists in the watershed due to the use of impounded water for water supply. The area is primarily wooded with only a minor amount of open fields.

The dam itself is about 1168 feet long and 60 feet high, and is an earthfill embankment. The facility has a principal spillway which has low and high stage inlets and discharges all normal stream flows via a 36-inch diameter conduit through the dam. An emergency spillway, consisting of a 50 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.

The dam has a sluice gate controlled pond drain which may be used to release impounded water to the downstream water supply intake reservoir and also to completely drain the impoundment.

5.2 Design Data

The hydraulic features of the Black Brook Dam have been designed by the S.C.S. to retard a 100 year frequency storm without discharge occurring in the emergency spillway. The top of the dam elevation was established based on a maximum probable storm as determined by S.C.S. The design storm for establishing the top of the dam was based on 23.1 inches of rainfall resulting in 18.6 inches of runoff. The peak design inflow is 12,150 CFS and the routed design outflow is 3712 CFS at a pond elevation of 895.90. The calculations included in the SCS Design Report include storage vs. elevation, stage discharge curves for the combined spillways, and routing of the various test floods through the reservoir. These calculations are dated 1969 and 1970.

5.3 Experience Data

No records of flow or stage are known to be available for the Black Brook 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" (PMF) for the region within which the dam is located.

The determination of the PMF for the Black Brook 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.

Graphically, the guidance curve gives a unit discharge of 2,500 cfs per square mile of drainage area which results in a PMF of 5,800 cfs for Black Brook 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 5,800 cfs to a reservoir outflow of approximately 2,700 cfs at a pond elevation of 893 ft. NGVD. This assumes that the level of the water supply (normal pool) pond is at elevation 863.5, which is the invert of the low stage orifice, at the start of the storm, and the entire flood storage volume is available.

The combined spillways have a discharge capacity with the water level at the top of the dam (elev. 896.0 ft. NGVD) of 5,000 cfs. The combined spillways have a capacity of 185% of the routed test flood outflow and a freeboard of 3.0 feet remains to the top of the dam at test flood stage.

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 Black Brook Dam. The assumed conditions are as follows:

1. Water level prior to breach is at test flood elevation.

2. Stream flow downstream of dam at time of breach is PMF test flood spillway outflow.

For an assumed breach equal to 40 percent of the dam width computed at half height, the breached width is 272 ft. The resulting dam failure flow using a water elevation of 893 ft. MSL is 207,300 cfs.

The first and second damage areas impacted by the dam failure would be the dam itself and the water supply pipeline for the City of Springfield, Massachusetts just downstream. Prior to the dam failure the flow in the stream would be 2,700 cfs with a stage of 6 feet. After the dam failure the flow would be 206,000 cfs at a stage of 37 feet. There are no houses or other forms of development in the area of the dam, therefore, damage would be confined to the dam structure and appurtenances and to the water supply pipeline for the City of Springfield, Massachusetts.

The third damage area impacted by the dam failure would be the Town of Russell water supply reservoir about 6000' downstream of the Black Brook dam. The reservoir, small in volume, will not add to the flow but would most likely be damaged by the failure. Thus, the Town would loose its water supply. Prior to the failure the dam would most likely withstand the flow and no damage would result.

The fourth area to be impacted would be a culvert and bridge crossing at the intersection of Bradley Brook and State Highway Route 20. Prior to the dam failure the test flood spillway flow would be 2,700 cfs resulting in a river stage of 2 feet. No structures nor the roadway will be flooded by pre-failure flows. After the dam failure the flood flows will be 96,400 cfs and the water level will be 20 feet above the brook bed. This flow will inundate about 16 houses approximately 3 to 5 feet, 1,000 feet of secondary road, 1,000 feet of primary road, and the road bridge at the crossing of Route 20 over Bradley Brook.

The fifth area to be impacted would be a secondary road bridge downstream of the Route 20 crossing. Prior to dam failure the test flood outflow would be 2,700 cfs resulting in a river stage of 24 feet above the brook bed. No structures nor the roadway will be flooded by pre-failure flows. After the dam failure, the flow will be 93,600 cfs and the brook stage will be 21 feet above the brook bed. The flow will flood between 35 to 40 structures, about 10 to 12 feet, two secondary streets totaling about 1500 feet, and a secondary road bridge.

The sixth impact area will be a foot bridge ruins just upstream from the confluence of Bradley Brook with the Westfield River. Prior to the dam failure the test flood flow will be 2,700 cfs and the brook stage will be 6 feet above the brook bed. No structures nor the roadway will be flooded by pre-failure flows. After the dam failure the flow will be 79,100 cfs and the brook stage will be 22 feet above the brook bed. This will inundate about 18 homes and about 1000 feet of secondary street.

The seventh and eighth areas to be impacted will be the confluence of the Bradley Brook with the Westfield River and a mill dam downstream. Prior to the dam failure, the river flow will be 2,700 cfs. The river stage will be about elev. 272 feet. After the dam failure the flow in the river will be 70,000 cfs, resulting in a river stage of about elev. 284 at the mill dam. This will flood the railroad tracks, which parallel the river, and the mill structure by about 4 feet.

Downstream of the mill dam, the dam failure flow will be quickly dissipated by the flat slope and broad channel of the Westfield River. The dam failure flow will not constitute a serious damage potential downstream of impact area 8.

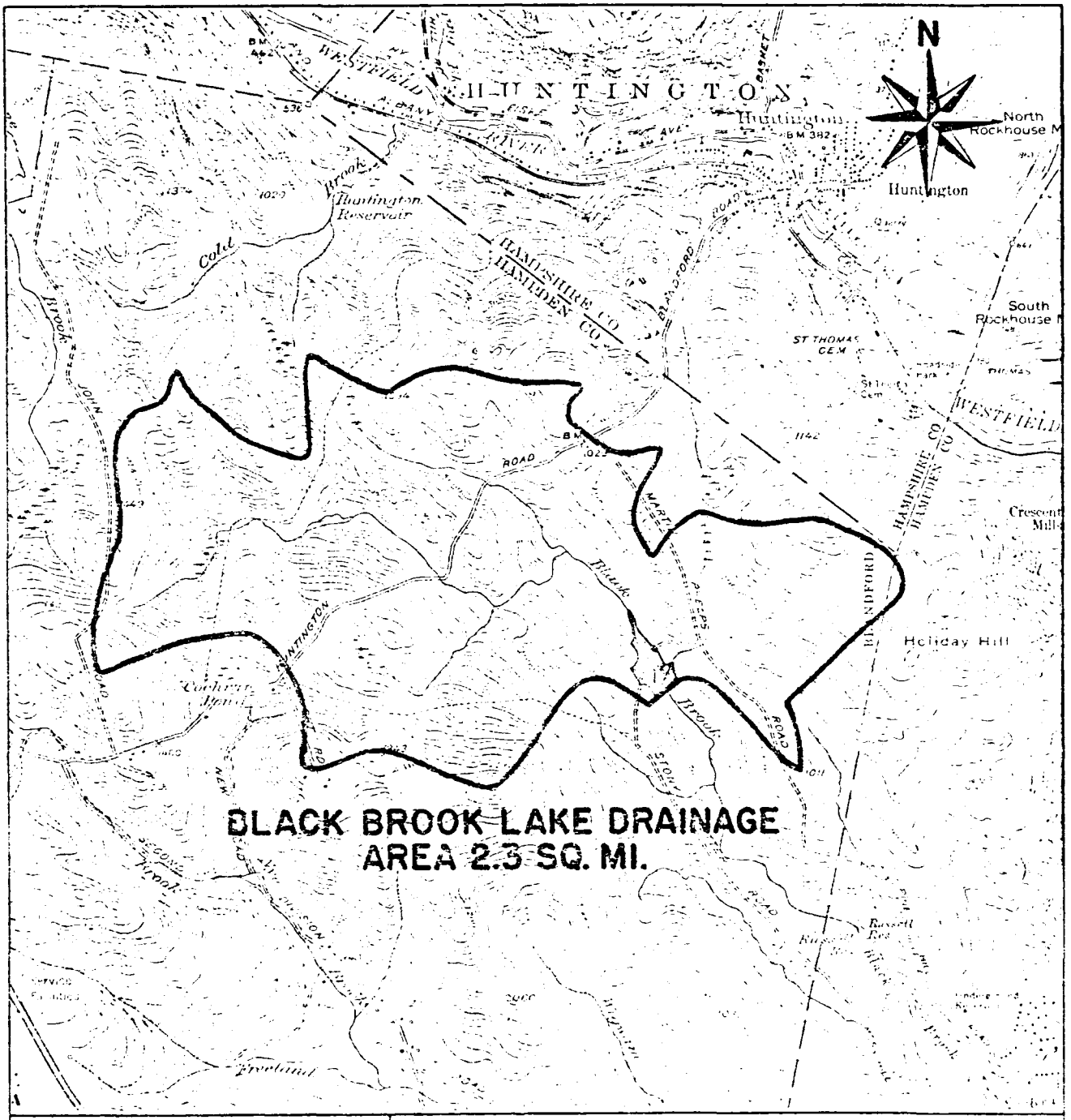
PROBABLE DOWNSTREAM IMPACT BEFORE AND AFTER DAM FAILURE

Black Brook Dam 01057

Location	No. of Structures	Other Damage	Flow Rates		River Stage		Comments
			Before Failure CFS	After Failure CFS	Before Failure FT. (over road)	After Failure FT. (over road)	
1 Dam	0	0	2,700	207,300	6	37	No significant damage
2 100' DS Water Supply Pipeline	0	Pipeline crossing Black Brook	2,700	206,000	6	37	After failure potential loss of water supply pipeline
3 6000' DW Water Supply Reservoir	0	Dam	2,700	127,100	6	31	After failure potential loss of water supply dam
4 11,250' DS State Route 20	16	1 bridge & 2 culverts 1000' secondary road, 1000' primary road	2,700	96,400	2	20 (9.2)	After failure 16 houses flooded, 1000 ft. primary road, 1 bridge, 2 culverts
5 12,250' DS Second-Secondary Road	40	1 bridge 1500' secondary road	2,700	93,600	2	21 (3.5)	After failure 40 houses flooded, 2 streets totalling 1000' and 1 bridge
6 14,250 Footbridge ruins	18	1 Footbridge ruins 1000' secondary road	2,700	79,100	6	21.5 (4.5)	After failure 5 houses flooded

	Location	No. of Structures	Other Damage	Flow Rates: Before Failure CFS	Flow Rates: After Failure CFS	River Stage: Before Failure FT. (over road)	River Stage: After Failure FT. (over road)	Comments
7	14,300 Confluence w/Westfield River	0	---	2,700	79,100	272 MSL	284 MSL	No significant damage
8	14,600 DS Mill Dam on Westfield River	1	Mill Dam 2000' RR	2,700	70,000	272 MSL	284 MSL (4)	After failure mill structure & 2000' RR will be flooded 4± ft.

Total no. of structures flooded by Pre-failure flow = 0
Total no. of structures flooded by Past failure flow = 75±



-SCALE-

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

FROM: U.S.G.S. BLANDFORD, AND WORONOCO, MASS. QUADRANGLE MAPS

QUADRANGLE LOCATION

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

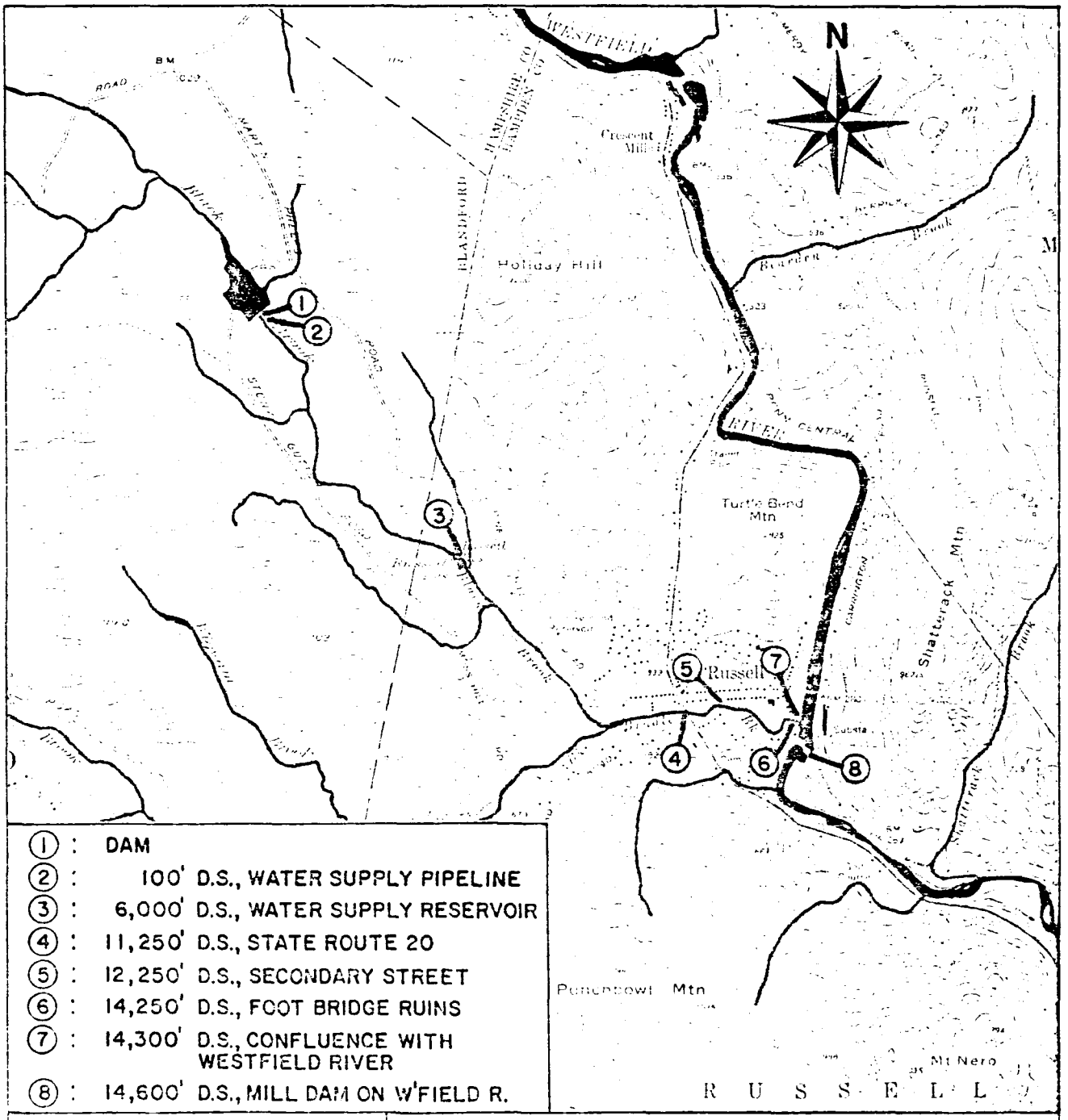
DRAINAGE AREA MAP

BLACK BROOK DAM (MA 01057)
HAMPDEN COUNTY

BLANDFORD
MASSACHUSETTS

SCALE : AS NOTED

DATE : MARCH 1980



-SCALE-

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

FROM: U.S.G.S. BLANDFORD, AND WORONOCO, MASS. QUADRANGLE MAPS

QUADRANGLE LOCATION

TICHE & 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

BLACK BROOK DAM (MA 01057)
HAMPDEN COUNTY

BLANDFORD
MASSACHUSETTS

SCALE: AS NOTED

DATE: MARCH 1980

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation

The visual inspection of the dam embankments did identify conditions that warrant further investigation of the slopes. The erosion of silt from under the riprap on the upstream face at the water line is of concern and should be investigated to determine the affect on stability. There is a surface irregularity on the upstream face of the embankment to the right of the principal spillway riser.

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

6.2 Design and Construction Data

) Embankment

Analysis carried out during the design phase included an embankment slope stability analysis by the "Swedish Circle" method. Based on this analysis a 2.5 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

There have been no post construction changes to the dam and appurtenances.

6.4 Seismic Stability

The Black Brook 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 upstream embankment surface irregularity, the wet condition of the downstream toe and the erosion of the silt from under the riprap.

(b) Adequacy of Information

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

(c) Urgency

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

7.2 Recommendations

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

(a) Determine the cause of the wet conditions at the toe of the embankment. These conditions should be investigated to determine the effects on the stability of the dam and foundation material, and to determine what corrective measures may be required, which should then be implemented.

(b) Determine the cause of silt erosion from under the riprap on the upstream face and develop and implement corrective measures, if required.

(c) Investigate the cause of the irregularity in the slope of the upstream embankment to the right of the principal spillway and develop and implement corrective measures, if required.

7.3 Remedial Measures

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

(a) Replace and repair trash rack bars.

(b) Routinely check the upstream embankment for depressions or settlements due to the loss of material from under riprap.

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

(d) Mow the grass cover on the dam embankment and maintain it in mowed condition.

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

(f) Discourage trespassing on the dam and embankments by motor vehicles.

(g) Develop an "Emergency Action Plan" that will include an effective preplanned downstream warning system, locations of emergency equipment, materials and manpower, authorities to contact and potential areas that require evacuation. This Plan should include monitoring the dam during and immediately after periods of heavy rainfall.

(h) Continue the program of annual technical inspections by a registered professional engineer qualified in dam design and inspection.

7.4 Alternatives

There are no practical alternatives to the above Recommendations and Remedial Measures.

APPENDIX A

VISUAL CHECKLIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Black Brook Dam

DATE 11/20/79

TIME 9:00 A.M.

WEATHER Cloudy & Cool

W.S. ELEV. 863± U.S. 836± DN.S.

PARTY: Tighe & Bond/SCI

1. George McDonnell, P.E., Hydrologic/Hydraulic
2. John Powers, P.E., Project Manager
3. David Lenart, P.E., Civil
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

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

Also present:

Dennis Verdi, USDA, SCS
Ed Miller, Board of Water Commissioners

INSPECTION CHECK LIST

PROJECT Black Brook Dam DATE _____

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	
Current Pool Elevation	2" over normal w.l.
Maximum Impoundment to Date	Appears to be principal SW elev.
Surface Cracks	None
Pavement Condition	Upstream and downstream good
Movement or Settlement of Crest	None noted
Lateral Movement	None noted
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	L&R abutments good None
Indications of Movement of Structural Items on Slopes	Slopes down & upstream good
Trespassing on Slopes Vegitation on Slopes Sloughing or Erosion of Slopes or Abutments	Some minor tracks of MC Some brush growing in rock fill near toe Erosion of silt from under riprap at water line.
Rock Slope Protection - Riprap Failures	Slight irregularity in slope right of spillway
Unusual Movement or Cracking at or near Toes	None-toe along R&L abutment is wet but slight flow
Unusual Embankment or Downstream Seepage	None - same as above
Piping or Boils	None
Foundation Drainage Features	Flow (slight) no sediment
Toe Drains	Good - standing water with slight flow
Instrumentation System	N/A

Copy available to DTIC does not permit fully legible reproduction

INSPECTION CHECK LIST

PROJECT Black Brook Dam DATE

PROJECT FEATURE NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good - heavy grass growth
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Solid and dry
b. Weir and Training Walls	Good, crest 50' wide at toe of slopes
General Condition of Concrete	Good
Rust or Staining	N/A
Spalling	N/A
Any Visible Reinforcing	N/A
Any Seepage or Efflorescence	N/A
Drain Holes	N/A
c. Discharge Channel	Good heavy grass growth
General Condition	Floor wet about 100' downstream of crest
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Firm but wet
Other Obstructions	None

Copy available to DTIC does not permit fully legible reproduction

INSPECTION CHECK LIST

PROJECT Black Brook Dam DATE _____

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	No access to tower inside
a. Concrete and Structural	Lower trash rack left missing-one damaged
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
Cracks	None
Rusting or Corrosion of Steel	Ladder has slight rust
b. Mechanical and Electrical	N/A
Air Vents	N/A
Float Wells	N/A
Crane Hoist	N/A
Elevator	N/A
Hydraulic System	N/A
Service Gates	N/A
Emergency Gates	Joyce-Cridland 5 Ton Ser W/J70-4508 Model MJ65
Lightning Protection System	N/A
Emergency Power System	N/A
Wiring and Lighting System in Gate Chamber	N/A

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INSPECTION CHECK LIST

PROJECT Black Brook Dam DATE _____

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Good - plastering done to finish
Rust or Staining	None
Spalling	None
Erosion or Cavitation	None
Visible Reinforcing	None
Any Seepage or Efflorescence	None
Condition at Joints	Good
Drain holes	Good
Channel	Good
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	Good Pipe alignment good but 3rd joint had hydraulic jump noted. Not visible entirely

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INSPECTION CHECK LIST

PROJECT Black Brook Dam DATE _____

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Good - access limited - no access to inside
Rust or Staining on Concrete	None
Spalling	None
Erosion or Cavitation	None visible
Cracking	None visible
Alignment of Monoliths	None visible
Alignment of Joints	Good
Numbering of Monoliths	N/A

Copy available to DTIC does not permit fully legible reproduction

INSPECTION CHECK LIST

PROJECT Black Brook Dam DATE _____

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	
Bottom Conditions	Notaccessible water level at normal pool elevation
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

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INSPECTION CHECK LIST

PROJECT Black Brook Dam DATE _____

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

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

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APPENDIX B

ENGINEERING DATA

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 (Appended)

Date	Inspecting Agency
9/21/78	See Listing On Report
5/18/77	"
6/9/77	"
5/11/77	"
5/24/76	"
6/4/75	"
6/2/75	"
7/15/74	"
9/17/73	"
3/28/73	

3. "As Built" Drawings (Appended)

Page No.	Description
B-1	Cover Sheet
B-2	Plan of Site
B-3	Plan of Dam Site
B-4	Plan of Emergency Spillway
B-5	Typical Section
B-6	Foundation Drainage Details
B-7	Principal Spillway - Plan & Profile
B-8	Emergency Spillway Drain - Plan & Profile
B-9	Riser Details
B-10	Conduit Details
B-11	Reservoir Drain Details
B-12	Impact Basin Details
B-13-16	Log of Test Holes

SOIL CONSERVATION SERVICE
ST, MASSACHUSETTS

Soil Conservation Service
4 Whalley, St
Hadley, Mass. 01035

OPERATION AND MAINTENANCE REPORT

[illegible]
MA-[illegible]-10
8- - R.S.Lands.
File Code 12-13-12

and Site Beatty Brook, Block Brook Date

Sponsoring Local Organization Town of Russell

A VERIFIED FILE

U-21 (Prelim File)

The Operation and Maintenance Inspection Record dated 4-21-78 showed a need for certain maintenance and repair work. This and other maintenance has been completed as follows:

Agreed to Item No.	Maintenance Performed by: (contributed Labor, Force Account, Contract, Etc.)	Actual Costs	Date Completed
1	Town of Russell Water Dept. Work was done By the Town of Russell Highway Dept.	$100.00	10-1-78
4	Town of Russell Water Dept.	$70.00	4-30-79
5	Town of Russell Water Dept.	$35.00	4-30-79
7	Town of Russell Water Dept.	$20.00	10-15-78
6	Town of Russell Water Dept.	$30.00	10-15-78

REMARKS:

[illegible] Representative

Joseph P. Skarbek
SCS Representative

Distribution:
Mass. DWM&WR (if loan involved)
SCS
Sponsor

Report due: Annually

USDA - SOIL CONSERVATION SERVICE
AMHERST, MASSACHUSETTS

OPERATION AND MAINTENANCE
INSPECTION RECORD

MA-AS-9
8-78
File Code 12-13-17

Project Bradley BK Watershed Inspection Date 9/21/78

Site Name/No. BACK Brook S. 16 Purpose Flood prev + water supply

Type of Inspection: Special ☐ Annual ☒

Structure Operation: Satisfactory ☒ Unsatisfactory ☐

Sponsoring Local Organization: Town of Russell

Present for Inspection: Patrick Shackley Town Water Board, John Arnold Hampden Conservation Dist, Donald Hall Mass Water Res Div, J Elsinger, C Laverin, C Mecastaris, W Johnson SCS

ITEM	Condition * (S or U)	Maintenance & Needed Repairs	Estimated Costs	Agreed Date Repairs to be complete
1. Vegetation	S	Generally excellent. Mow grass area in emergency spillway.	250	July '79
2. Fences	S	Do not mow or cultivate		
3. Principal Spillway	S			
4. Emergency Spillway	S	Remove down tree and pile of wood. Cut small trees encroaching at entrance.	$50	Dec. 15 '78
5. Embankment & Riprap	S	Prevent weedy growth from encroaching on dike and rip rap	100	Dec. 15 '78
6. Reservoir Area	S			
7. Gates and Valves	S	Operate and lubricate gate equipment at least once a year	$50	Nov. 15 '79
8. Outlet Channels	S			
9. Structure Drainage Outlets	S	Remove plant growth in toe drain outlet.	$10	Nov. 15 '79
10. Access Rd.	S			
11.				

S - Satisfactory; U - Unsatisfactory

Copy given to [illegible]

Patrick Shackley Jr. Donald Hall Jr. Chas C. Laverin

O&M INSPECTION RECORD
CHECK LIST

Items to be checked at time of inspection may include, but not be limited to, the following:

1. Vegetation
   a. Need for cutting &/or spraying
   b. Need for reseeding, fertilizing, liming
   c. Evidence of winter injury, insect damage, disease.
   d. Need for mowing and removal of excess mowed vegetation.
   e. Other_____
2. Fences
   a. Loose or damaged posts
   b. Loose or broken wires
   c. Accumulated debris in fence
   d. Condition of gates and cables
3. Principal Spillway
   a. Obstructions in spillway
   b. Condition of outlet and riser
      (1) Signs of seepage
      (2) Separation of joints
      (3) Cracks, breaks, or deterioration of concrete
      (4) Differential settlement
   c. Sediment level in relation to the top of riser
   d. Scour at outlet
   e. Condition of trash racks
4. Emergency Spillway
   a. Erosion
   b. Sedimentation
   c. Weeds, logs, or other obstructions, reducing channel capacity
   d. Deposition or sloughing
   e. Drainage problems
   f. Seeps
5. Embankment and Riprap
   a. Settlement or cracking
   b. Erosion
   c. Leakage
   d. Rodent, wildlife, or livestock damage
   e. Wave damage
6. Reservoir Area
   a. Undesirable vegetative growth
   b. Cut or fallen trees
   c. Slash and other debris
   d. Erosion of banks
7. Gates and Valves
   a. Damage by debris, ice freezing, rust or corrosion
8. Channels
   a. Sedimentation
   b. Bank cutting
   c. Debris accumulation
   d. Condition of riprap or other works of improvement
      (1) Undermining
      (2) Damage or deterioration
      (3) Adjacent channel scouring
   e. Adjacent property damage
9. Structure Drainage Outlets
   a. Drainage outlet pipes
      (1) Clean or dirty water
      (2) Rodent guard attached and functioning
      (3) Pipes free flowing, no obstructions
      (4) Evidence of seepage
         (a) Adjacent to pipes
         (b) Lower 1/3 downstream slope & flood plain
   b. Rock toe drains
      (1) Free draining into stilling basin or collection channels
      (2) Clean or dirty water
10. Access Roads
11. Safety Hazards
12. Signs
13. Vandalism

(Page 3: continued)

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C.W. [illegible]

MA-AS-TRIAL
3/22/76

U.S. Department of Agriculture
Soil Conservation Service

OPERATION AND MAINTENANCE RECORD

Project BLIDLEY BROOK U/S - BLACK BROOK Date 5/18/77

Sponsoring Local Organization TOWN OF RUSSELL

The Operation and Maintenance Inspection Record dated 5/24/76 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
1	4,500 LBS - FERTILIZER 5-10-10,	# 350.00	SEPT. 30, 1976
3	TRASH REMOVED FROM TRASH RACK	125.00	SEPT. 30, 1976
4	DEBRIS REMOVED	50.00	Sept. 30, 1976
5	LOGS + DEBRIS REMOVED.	100.00	Sept. 30, 1976
6	DEBRIS REMOVED	50.00	Sept. 30, 1976
10.	DITCHING CONSTRUCTED	100.00	Sept 30, 1976

REMARKS:

SCS Representative
District Conservationist

SLO Representative
Chairman, Water Board

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

Report due: Annually
Nov. 1

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

29 Cottage Street, Amherst, Massachusetts

Date: June 3, 1976

SUBJECT: AS - Distribution of Operation and Maintenance Inspection Report/s (PL 566)

TO: 1. Charles Kennedy (3 copies)
Director and Chief Engineer
Division of Water Resources
Mass. Dept. of Environmental Mgt.
100 Cambridge Street
Boston, MA 02202

2. Soil Conservation Service
District Conservationist/s
W. Warren
Project Engineer
J. Elasmar
State Administrative Officer
(file copy)
State Conservation Engineer

SPONSORS:
Chairman, Hampden Cons. District
c/o Hadley SCS

Chairman, Board of Selectmen,
Town Hall, Russell, MA 01071

Chairman, Board of Selectmen
Town Hall, Blandford, MA 01008

Mrs. Florence Pomeroy
P.O. Box 85
Russell, MA 01071

Attendees:
Mr. Ernest Castro
Moss Hill Rd.
Russell, MA 01071

Mr. Charles Kenyon, Highway Foreman
Public Works Dept, Town Hall, Russell, MA 01071

Mr. Edward Miller
Water Commission
Town Hall, Russell, MA

Enclosed are reports of the O&M inspection held in the Bradley Brook (watershed) for the sites listed below:

Site	Date Inspection Performed
Black Brook	5/24/76

Sincerely,

C. E. Wall Acting

Dr. Benjamin Isaur
State Conservationist

1 Enclosure/s

Archive

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

29 Cottage Street, Amherst, Massachusetts

Date: June 9, 1977

SUBJECT: AS - Distribution of Operation and Maintenance Inspection Report/s (PL 566)

TO:

1. Charles Kennedy (3 copies)
Director and Chief Engineer
Division of Water Resources
Mass. Dept. of Environmental Mgt.
Boston, MA 02202

2. Soil Conservation Service
District Conservationist/s
W. Warren
Project Engineer
J. Elasmar
State Administrative Officer ✓
(file copy)
State Conservation Engineer

SPONSORS:

Chairman, Hampden Cons. District
c/o Hadley SCS

Chairman, Board of Selectmen
Town Hall, Russell, MA 01071

Chairman, Board of Selectmen
Town Hall, Blandford, MA 01008

Mrs. Florence Pomeroy
P. O. Box 35
Russell, MA 01071

Attendees:

Mr. Ernest Castro
Moss Hill Rd.
Russell, MA 01071

Mr. Charles Kenyon, Highway Foreman
Public Works Dept. Town Hall, Russell, MA 01071

Mr. Edward Miller
Water Commission
Town Hall, Russell, MA

Enclosed are reports of the O&M inspection held in the Bradley Brook Watershed for the sites listed below:

Site	Date Inspection Performed
Black Brook	5/11/77

Sincerely,

Dr. Benjamin Isaac
State Conservationist

1 Enclosure

MA-AS-TRIAL
3/22/76

OPERATION AND MAINTENANCE
INSPECTION RECORD

U.S. Dept. of Agriculture
Soil Conservation Service

Project BRADLEY BROOK WATERSHED Inspection Date 5/11/77

Site Name/No. BLACK BROOK Type MULTI-PURPOSE

Type of Inspection: Special ☐ Annual ☒

Structure Operation: Satisfactory ☒ Unsatisfactory ☐

Sponsoring Local Organization: TOWN OF RUSSELL

Present for Inspection: Joseph D. Shumbaugh, WMFW Assoc.
James J. Connor Ernest Kingsbury

ITEM	Condition * S or U	Maintenance & Needed Repairs	Estimated Costs	Agreed Date Repairs to be Complete
1. Vegetation	S	Excellent condition, Topdress vetch 300 Lb/A 0-20-20; topdress grass with 300 Lb/A 10-10-10. Seed red canary grass in small wet areas.	$350	
2. Fences	S			
3. Principal Spillway	S			
4. Emergency Spillway	S	Remove growth for shape, north side.	75.00	
5. Embankment & Riprap	S.	Remove debris on d/stream face high water line. Riprap looks good	250.00	
6. Reservoir Area	S	Remove growth from inlet		
7. Gates or Valves	S			
8. Outlet Channels	S	Remove brush and cut trees	100.00	
9. Structure Drainage Outlets	S			
10. Access Rd.	S	Road looks good		
11.				

REMARKS: (over)

* S = Satisfactory; U = Unsatisfactory

William Brown James J. Connor
(District Conservationist) (Project Engineer)

(SLO Representative)

(Report due annually: July 1)

MA-AS-TRIAL
5/22/76

RATION AND MAINTENANCE INSPECTION RECORD

U.S. Dept. of Agriculture
Soil Conservation Service

Project BRADLEY BROOK WATERSHED Inspection Date 5/24/76

Site Name/No. BLACK BROOK Type MULTI PURPOSE

Type of Inspection: Special ☐ Annual ☑

Structure Operation: Satisfactory ☑ Unsatisfactory ☐

Sponsoring Local Organization: TOWN OF RUSSELL

Present for Inspection: Clarence Kimball - Highway Foreman
M.F. Warren, E. Stimpson, Edward Viglirolo, K. Maguire U.R.
[illegible]

ITEM	Condition * S or U	Maintenance & Needed Repairs	Estimated Costs	Agreed Date Repairs to be Complete
1. Vegetation	S	Excellent condition. Topdress annually Crown vetch 300 Lb per acre 5-25-26 Fescue mixed 300 Lb per acre 10-10-76	$25 per acre	Sept 30 1976
2. Fences	S			
3. Principal Spillway	S	Remove debris from trash rack	50.00	"
4. Emergency Spillway	S	Remove debris from mouth of spillway	180.00	"
5. Embankment & Riprap	S.	Remove logs + debris along u/s face Riprap looks good, Fill D/S abutment gully with 2" stone	320.00	"
6. Reservoir Area	S	Remove brush from edge of pool area	50.00	
7. Gates or Valves	S			
8. Outlet Channels	S			
9. Structure Drainage Outlets	S			
10. Access Rd.	S	Town has placed gravel on road. Need some ditching	100.00	"
11.				

REMARKS: (over) * S = Satisfactory; U = Unsatisfactory

Copy available [illegible] permit [illegible]

[illegible] (District Conservationist) [illegible] (Project Engineer) [illegible] (SLO Representative)

(Report due annually: July 1)

June 4, 1975

REPORT OF ANNUAL INSPECTION

BLACK BROOK SITE BRADLEY BROOK WATERSHED

On June 2, 1975, the following met at Black Brook Site in the Town of Blandford, Massachusetts for the purpose of conducting the annual inspection.

Frank LaBombard	Supt., Water Department-Town of Russell
Edward Miller	Water Commission-Town of Russell
Don Lambert	Hampden Conservation ~~Services~~ District
Kevin Maguire	Water Resources Commission-Boston
Ken Wood	Water Resources Commission-Boston
William F. Warren	Soil Conservation Service-Hadley
James J. Klasmar	Soil Conservation Service-Otis

General

The Town of Russell is responsible for the operation and maintenance of this site.

Structural Conditions and Recommendations

1. Remove logs and debris U/S toe of dam and from edges of permanent pool.
2. Remove debris from trash rack.
3. Trash rack bar broken at high stage.
4. Repair Entrance Gate.
5. Outlet end of S.C. wet, repair tire tracks.(6" perforated under drain in place)
6. Fill D/S abutment gutter with 2" stone.

Submitted by:

James J. Klasmar
Project Engineer
Otis, Ma.

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ANNUAL INSPECTION
BLACK BROOK SITE

Agronomic Conditions and Recommendations

Agronomic conditions in general are excellent. Dike slopes and most other areas are covered with a very fine stand of crownvetch with some fescue. As recommended last year mowing was discontinued with no detrimental effects discernible. Some areas of this soil in the borrow areas and on the left of the stone gutter have a somewhat thin cover of fescue but it is better than last year. A wet area of the emergency spillway is without vegetative cover. Small eroded areas of the downstream side of the dike (noted last year) were filled with soil, fertilized and seeded.

Topdress crownvetch with 300 lb. per acre 0-20-20 or equal.

Topdress grass in borrow areas, etc. with 300 lb. per acre 10-10-10. This is more critical than the vetch.

Sow Reed Canary Grass at the rate of 1 lb. per 1000 square feet in the bare wet area of the emergency spillway.

Diversion berms on the access road have been worn down and are to be rebuilt.

Submitted by

William F. Warren
District Conservationist
Hadley

DISTRIBUTION OF [illegible] PLEY BROOK O&M REPORT:
INSPECTION HELD 6/2/75

Attendees:

Mr. Frank LaBombard, Superintendent
Water Dept.
Town Hall
Russell, MA 01071

Town of Russell responsible for O&M (except Freeland Site)

Mr. Edward Miller
Water Commission
Town Hall
Russell, MA 01071

Mr. Donald Lambert, Chairman
Hampden Conservation District
c/o SCS office in Hadley
also cc to his home: Moulton Hill Rd.
Monson 01057

Co-Sponsor of watershed

Division of Water Resources:

K. Maguire
K. Wood
. Div. of Water Resources
100 Cambridge St.
Boston, MA 02202

Also to C.Kennedy

William Warren, DC, SCS, Hadley

James Blasmar, Project Engr,SCS, Otis

Always Mrs. Florence Pomeroy
P. O. Box 85
Russell, MA 01071

State office SCS, Amherst, MA

C. Currin/ENR FILE
A. Verdi/Dion with originals

7/15/74

REPORT OF ANNUAL INSPECTION

BRADLEY BROOK WATERSHED

On June 24, 1974, the following met at the Black Brook Site in the Town of Blanford, Massachusetts for the purpose of conducting the annual inspection.

Frank LaBombard	Supt. of Water Department, Town of Russell
William Mikuski	Chairman, Board of Selectmen - Russell
Kevin Maguire	Water Resources Commission - Boston
William Warren	Soil Conservation Service - Hadley
William Annable	Soil Conservation Service - Amherst
James Elasmar	Soil Conservation Service - Otis
George Greenleaf	Soil Conservation Service - Otis

GENERAL

The Town of Russell is responsible for the operation and maintenance of this site.

STRUCTURAL CONDITIONS AND RECOMMENDATIONS

Logs should be removed from the upstream slope of the dam and from the edges of the permanent pool. Large field stones should be placed in eroded outlet section to prevent future erosion. Diversion ditches at the northern and southern construction access road should be deepened so that water will flow east of the road. A small area on the west slope of the emergency spillway has slipped; however this does not seem critical and will be watched for future erosion. The condition of the concrete looks good. The repairs at the borrow area look very good. Eroded lower end of dry channel just north of the riprapped brook near the dam should be shaped and lined with large field stone.

AGRONOMIC CONDITIONS AND RECOMMENDATIONS

Vegetation generally is in very good condition although some areas of exposed subsoil show nutrient deficiencies in the yellow thin condition of the grass. Topdress crownvetch annually with 300 lb. 0-20-20 and grasses with 300 lb. 10-10-10 or equal per acre. Galled spot on downstream side, west end, of dam should be repacked with loam, fertilized and seeded. Mowing of crownvetch is not necessary and not recommended unless in the future brush begins to encroach.

Submitted by,

James J. Elasmar
Project Engineer

William F. Warren
District Conservationist

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

September 17, 1973

REPORT OF ANNUAL INSPECTION
Bradley Brook Watersned

On August 29, 1973, the following met at the Black Brook Site, Bradley Brook Watershed, in the Town of Russell, Massachusetts, for the purpose of conducting the annual inspection of the Black Brook Site:

Mrs. Florence B. Pomeroy	Water and Conservation Commissions
Mr. Frank LaBombard	Superintendent, Water Department
Mr. James J. Elasmar	Soil Conservation Service

Mr. William Warren, District Conservationist, made a review of the site on 8/1/73.

GENERAL

The Town of Russell is responsible for the operation and maintenance of this site.

STRUCTURAL CONDITION AND RECOMMENDATION

Logs and other debris should be removed from the upstream slope of the dam. Weeds growing between the rocks on the upstream riprapped slope should be sprayed to kill the growth. Remove dead trees from the edges of the permanent pool. The condition of the concrete and the riprap at the outlet channel looks good.

It was noted that the town of Russell has filled in eroded ditches north and south of the riprapped waterway. The area south of the waterway was filled with earth and seeded. The eroded ditch north of the waterway was filled with 3" - 4" stone and looks very good. It is recommended that large stones be placed at the steep outlet section to prevent future erosion.

VEGETATIVE CONDITIONS AND RECOMMENDATIONS

The grass and legume cover has made remarkable development after a slow start in the spring of 1972. Dike slopes above the rock riprap are a solid heavy growth of Crown Vetch. Other areas are predominantly fescues, somewhat "thin" and nitrogen-starved in the borrow areas, good to excellent elsewhere including the emergency spillway bottom and slopes.

Mow and rake the heavy fescue stands in August or September. Topdress "thin" fescue grass stands in borrow areas with 500 lbs. 10-10-10, or equal, per acre. Other fescue areas should be topdressed with 300 lbs. 10-10-10 per acre. At least 25% of the nitrogen should be derived from an organic source. The Crown Vetch should be topdresse with 300 lbs. of 0-20-20, or equal, per acre.

Concurred in: Donald L. Basinger, State Conservation Engineer; Christopher G. Moustakis, State Resource Conservationist

cc: C. Kennedy, DNR (3) -- 1 for DFW
J. Elasmar — D. Basinger
W. Warren (5) — C. Moustakis
A. Verdi (2) — D. Stockwell
NHG file

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

REVISED Aug. 28, 1972

REPORT OF ANNUAL INSPECTION
Bradley Brook Watershed

On July 25, 1972, the following met at the Black Brook Site, Bradley Brook Watershed, in the Town of Russell, Massachusetts, for the purpose of conducting the annual inspection of the Black Brook Site:

Mrs. Florence B. Pomeroy	Water and Conservation Commissions
Mr. Gerald R. Pomeroy	Town Moderator
Mr. Vernon A. Shattuck	Selectman, Town of Russell
Mr. Edward Miller	Selectman, Town of Russell
Mr. Frank LaBombard	Superintendent, Water Department
Mr. Gregory T. Buteau	Soil Conservation Service
Mr. James J. Elasmar	Soil Conservation Service

Mr. William Warren, District Conservationist, made a review of the site on June 10, 1972.

Heavy and continuous rains this spring caused erosion damage on dormant seeded areas and washed out the left bank of the stone waterway. Some soil slips occurred on cut slopes in the borrow area. Erosion was noted along the bottom of the diversion ditch located above the emergency spillway and on the downstream face of the dam. Erosion from the barricades at Martin Phelps Road and from the south end of the borrow area toward the riprapped waterway has occurred. The general appearance of the vegetative cover looks good in spite of a late start this spring. Crown vetch is coming along quite well.

Since the scheduled inspection, SCS has made additional studies of the site and is preparing a proposal for repair of the areas damaged by erosion. This proposal will be submitted to the Town for consideration at a later date.

A dead tree on the upstream side of the dam, right of the riser, should be removed. Debris along the upstream toe of the dam and along the permanent pool should also be removed.

The entire site should be topdressed with fertilizer by the town as soon as possible. Topdress all vegetated areas that are not scheduled for repairs. A map is attached showing areas to be topdressed and application rates. A sample contract is attached for town reference, if they plan to contract for this work. This work is maintenance and is the responsibility of the Town.

Submitted by:

James Elasmar/wmb
Project Engineer

2 Attachments

William Warren
District Conservationist

cc: C. Kennedy, DWR (3) --1 for DPW
J. Elasmar D. Basinger
W. Warren (5) C. Moustakis
A. Verdi (2) D. Stockwell
ENG file

REPRODUCED AT GOVERNMENT EXPENSE

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
WATER SUPPLY AND FLOOD PREVENTION

DRAINAGE AREA	1485	ACRES
TOTAL STORAGE	942	ACRE FEET
FLOODWATER RETARDING STORAGE (TO EMERGENCY SPILLWAY CREST)	864	ACRE FEET
RUSSELL WATER SUPPLY		
VOLUME OF STORAGE	74	ACRE FEET
SURFACE AREA	11	ACRES
HEIGHT OF DAM	56	FEET
VOLUME OF FILL	200,000	CUBIC YARDS

BUILT UNDER THE WATERSHED PROTECTION AND
FLOOD PREVENTION ACT
by
TOWN OF RUSSELL
and
MASSACHUSETTS
WATER RESOURCES COMMISSION
and
HAMPDEN CONSERVATION DISTRICT
with the assistance of
SOIL CONSERVATION SERVICE
of the
UNITED STATES DEPARTMENT of AGRICULTURE
1970

BLACK BR.
MULTIPLE-PURI

INDEX

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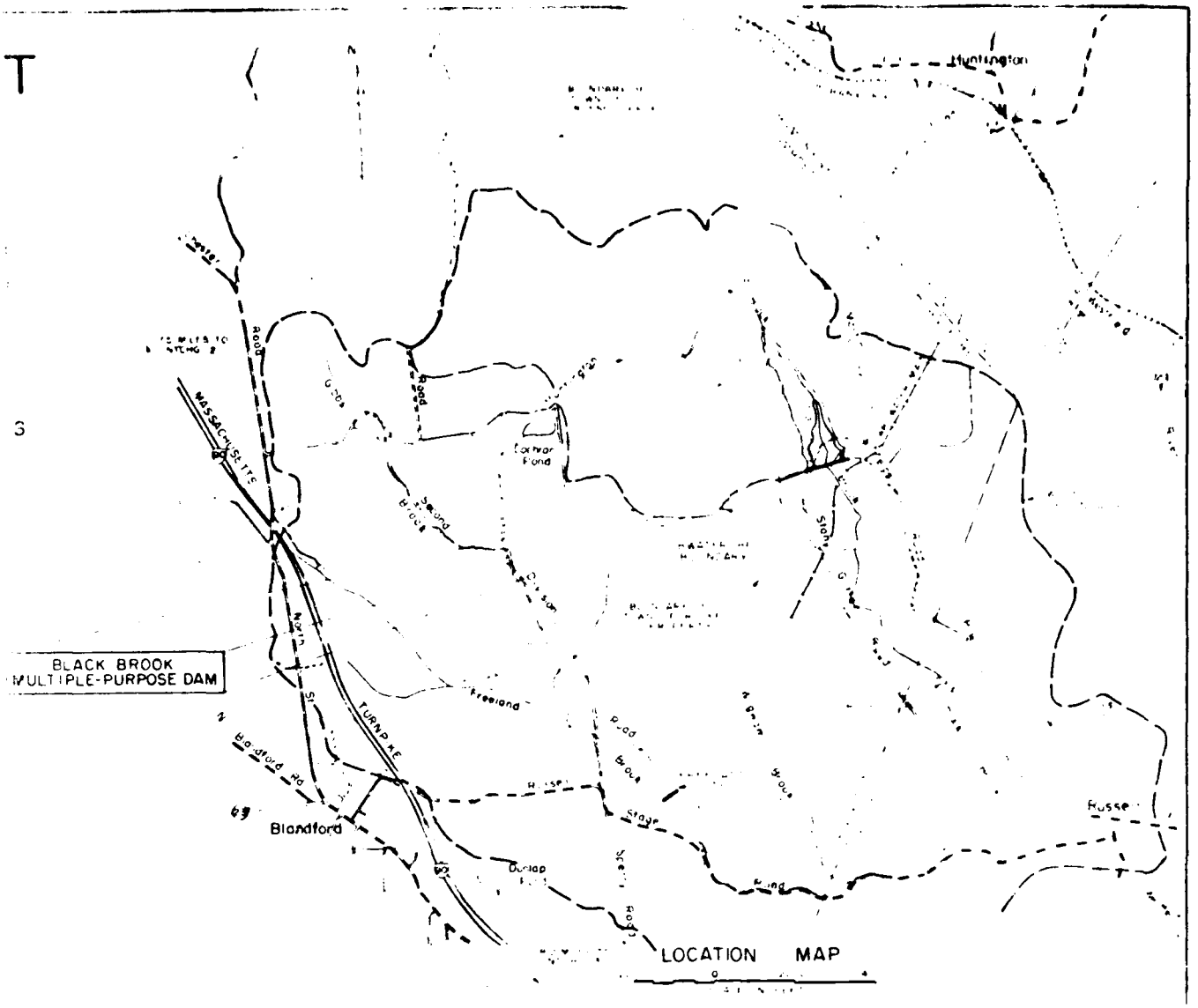
REPRODUCED AT GOVERNMENT EXPENSE



MASSACHUSETTS

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BRADLEY BROOK WATERSHED

"AS BUILT"

"AS BUILT"

Prepared by :

Approved by :

PLAN APPROVED BY THE

COMMISSIONERS

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

COVER SHEET

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed

Drawn P. J. WILDA

Traced

Checked

Approved by

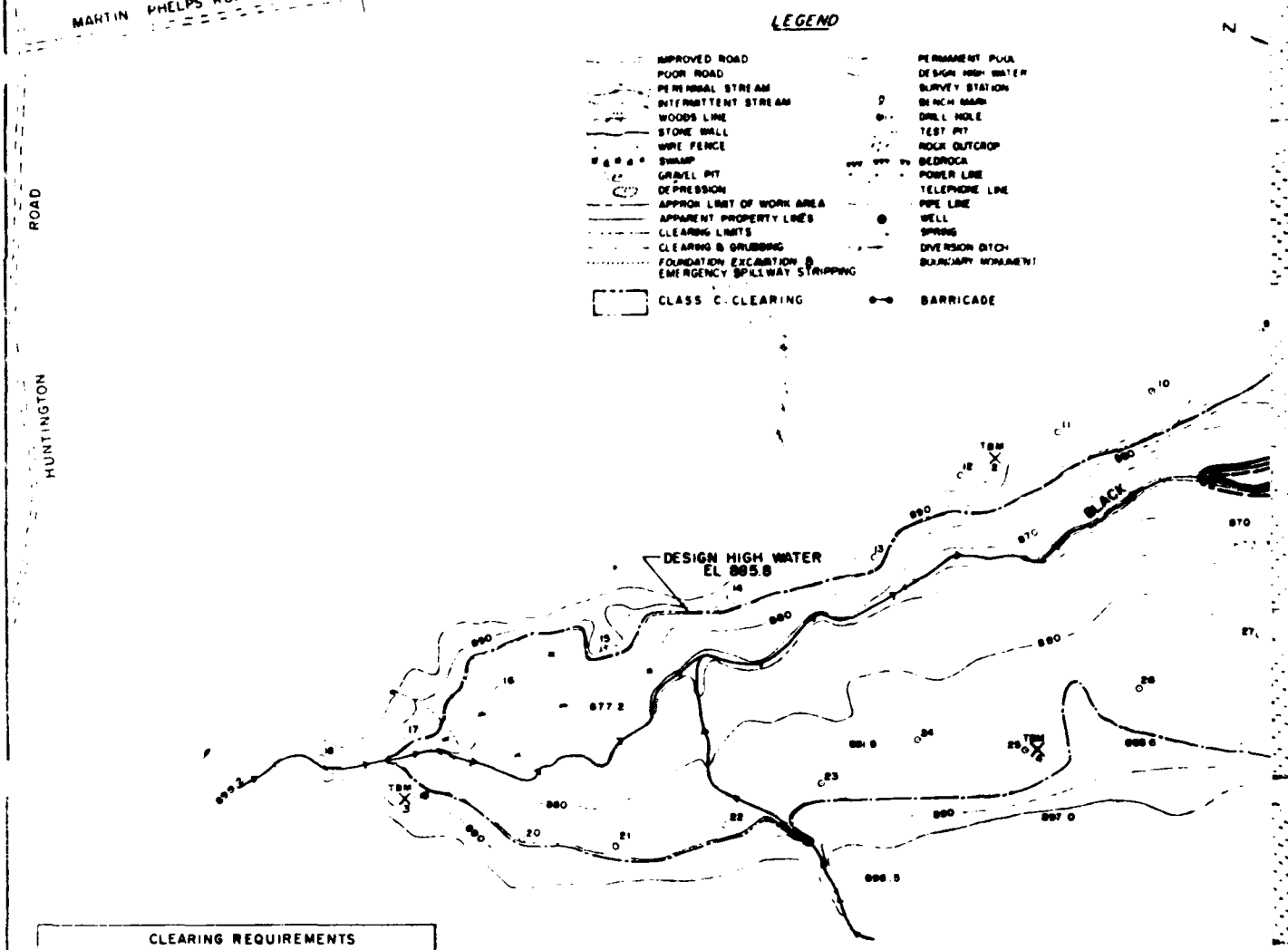
Title

Date

Drawing No. MA-371 P

B-1

REPRODUCED AT GOVERNMENT EXPENSE



CLEARING REQUIREMENTS	
CLEARING CLASS C	NORTH OF STONY GUTTER ROAD ENTIRE AREA TO 10' HORIZONTALLY BEYOND ELEV 863.5 SOUTH OF STONY GUTTER ROAD ALONG EDGE OF THE PERMANENT POOL FROM CONTOUR 860.5 TO 10' HORIZONTALLY BEYOND THE 863.5 CONTOUR EXCEPT WITHIN LIMITS OF THE BORROW AREA
CLEARING CLASS B	WITHIN THE DISPOSAL AREAS AND PERMANENT POOL BELOW ELEVATION 860.5 EXCEPT BORROW AREA AND PORTION OF PERMANENT POOL NORTH OF STONY GUTTER ROAD
CLEARING & GRUBBING	DAM, EMERGENCY SPILLWAY, BORROW AREA, DIVERSION, INLET & OUTLET CHANNELS AND ROCK WASTE AREAS

NOTES

SEE SHEETS 4 AND 5 FOR DAM AND EMERGENCY SPILLWAY CLEARING & GRUBBING LIMITS

CONSTRUCTION DETAILS

(1) NO WASTE MATERIAL SHALL BE LEFT BELOW ELEVATION 863.5

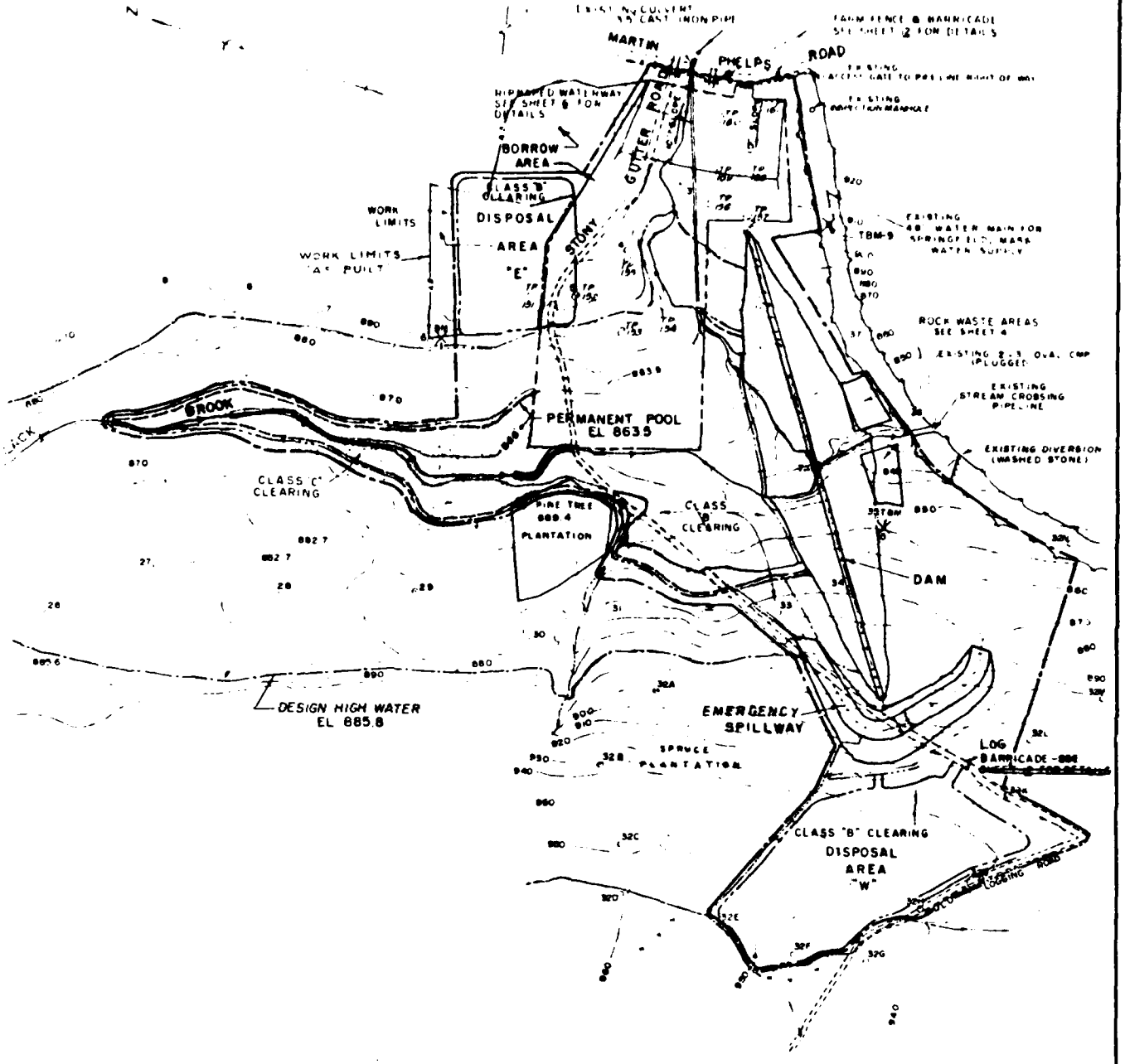
(2) THE SURFACE OF DISPOSAL AREAS SHALL BE LEFT NEAT AND IN A SIGHTLY CONDITION AND SLOPED TO PROVIDE POSITIVE DRAINAGE SIDE SLOPES SHALL BE LEFT NO STEEPER THAN 2:1

(3) SEE SHEETS 4 & 5 FOR LOCATIONS OF TEST PITS AND DRILL HOLES NOT SHOWN ON THIS DRAWING

(4) SIDE SLOPES OF BORROW AREA SHALL BE 2:1 OR FLATTER EXCEPT ALONG EASTERN EDGE OF THE BORROW AREA WHERE IT SHALL BE 10:1

1 1 2

REPRODUCED AT GOVERNMENT EXPENSE



TBM-1 (ELEV 895.63) KNOB ON LARGE STONE

TBM-5 (ELEV 855.73) KNOB ON LARGE BOULDER NEAR STA 35

TBM-9 (ELEV 906.34) BRASS DISC, ℄ PIPELINE, ON CONCRETE BOUND

SCALE IN FEET
CONTOUR INTERVALS 5'
PLANETABLE SURVEY NOV-DEC '68
PARTY CHIEF - J LACE

AS BUILT

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

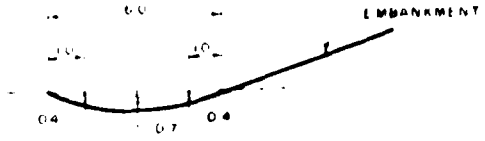
PLAN OF SITE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date	
Designed	C. H. DODGE		Approved by
Drawn	F. J. WILDA	2-69	Title
Traced	F. J. WILDA	3/69	Title
	G. T. BUTEAU		Sheet No. 2 of 20
Checked	D. M. STOCKWELL	4-69	Drawing No. MA-371 P

B-2

REPRODUCED AT GOVERNMENT EXPENSE



EMBANKMENT-ABUTMENT GUTTER

UPSTREAM 10+05 TO 12+98
16+10 TO 22+90

DOWNSTREAM 10+15 TO 14+50
18+00 TO 22+85

THE DOWNSTREAM EMBANKMENT-ABUTMENT GUTTERS SHALL BE CONSTRUCTED SO AS TO DIVERT THE FLOW INTO THE ROCK WASTE

CONSTRUCTION DETAILS:

1 THE ROCK WASTE ON THE WEST BANK MAY BE ENLARGED IF NEEDED

2 DEFINITION OF METHOD 1 SPECIFICATION 21
- a THE UPPER LIMIT SHALL BE THE GROUND SURFACE AS IT EXISTS AFTER THE CLEARING PORTION OF THE CLEARING & GRUBBING OPERATION
- b THE LOWER AND LATERAL LIMITS SHALL BE THE TRUE SURFACE OF THE COMPLETED EXCAVATION AS AUTHORIZED BY THE ENGINEER.

N

EL 843.19

NO STEEPER THAN

ROCK WASTE

SLOPE

APPROX EL 880

WORK LIMITS

TOP OF B&M EL 896.0

CLEARING AND GRUBBING LIMITS

SPUR

CLASS 'C' CLEARING

CLASS 'B' CLEARING

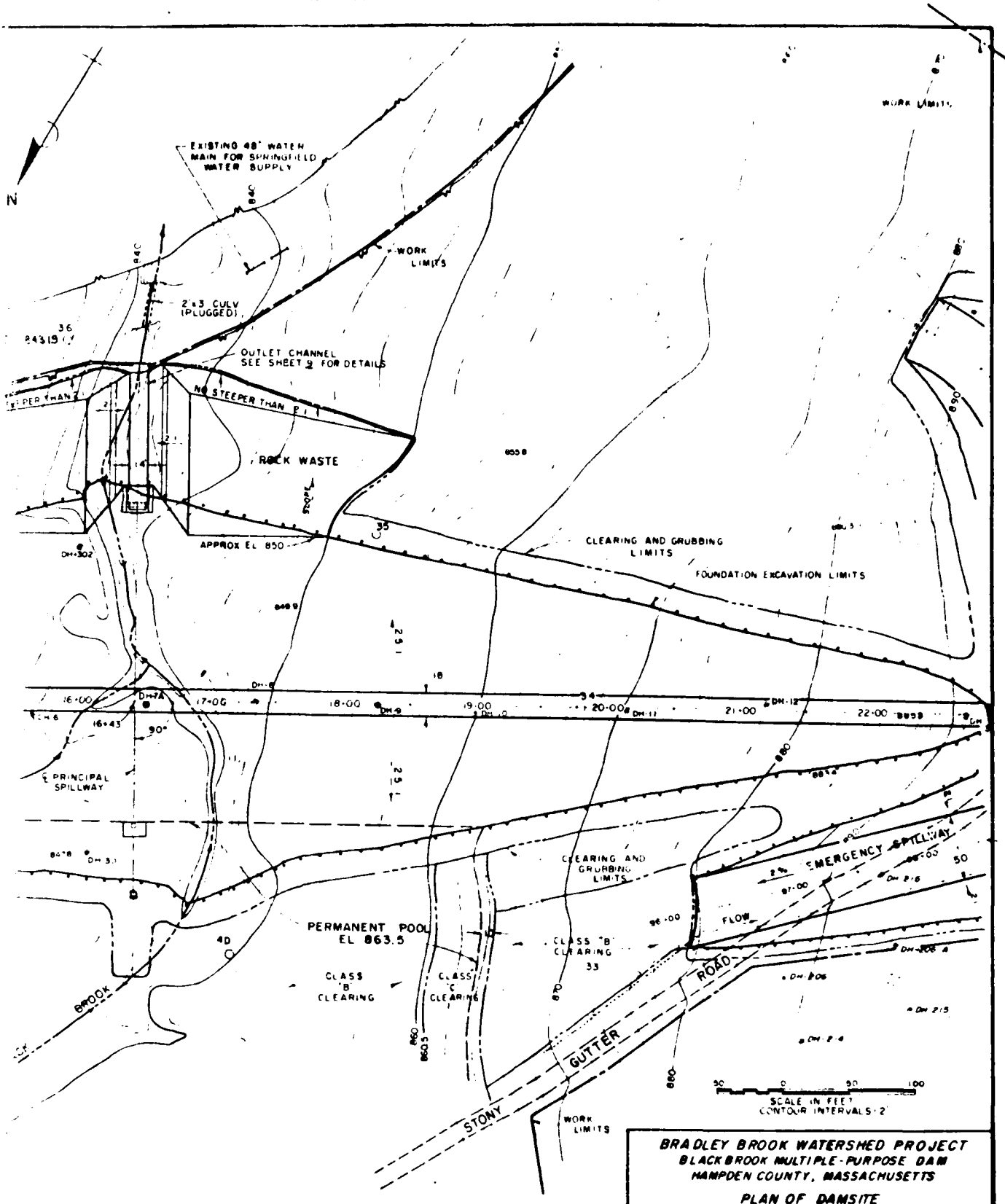
BORROW AREA
SEE SHEET 2 FOR DETAILS

BLACK

10+00 11+00 12+00 13+00 14+00 15+00 16

DH-1 DH-2 DH-3 DH-4 DH-5 DH-6

REPRODUCED AT GOVERNMENT EXPENSE



BRADLEY BROOK WATERSHED PROJECT
BLACKBROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

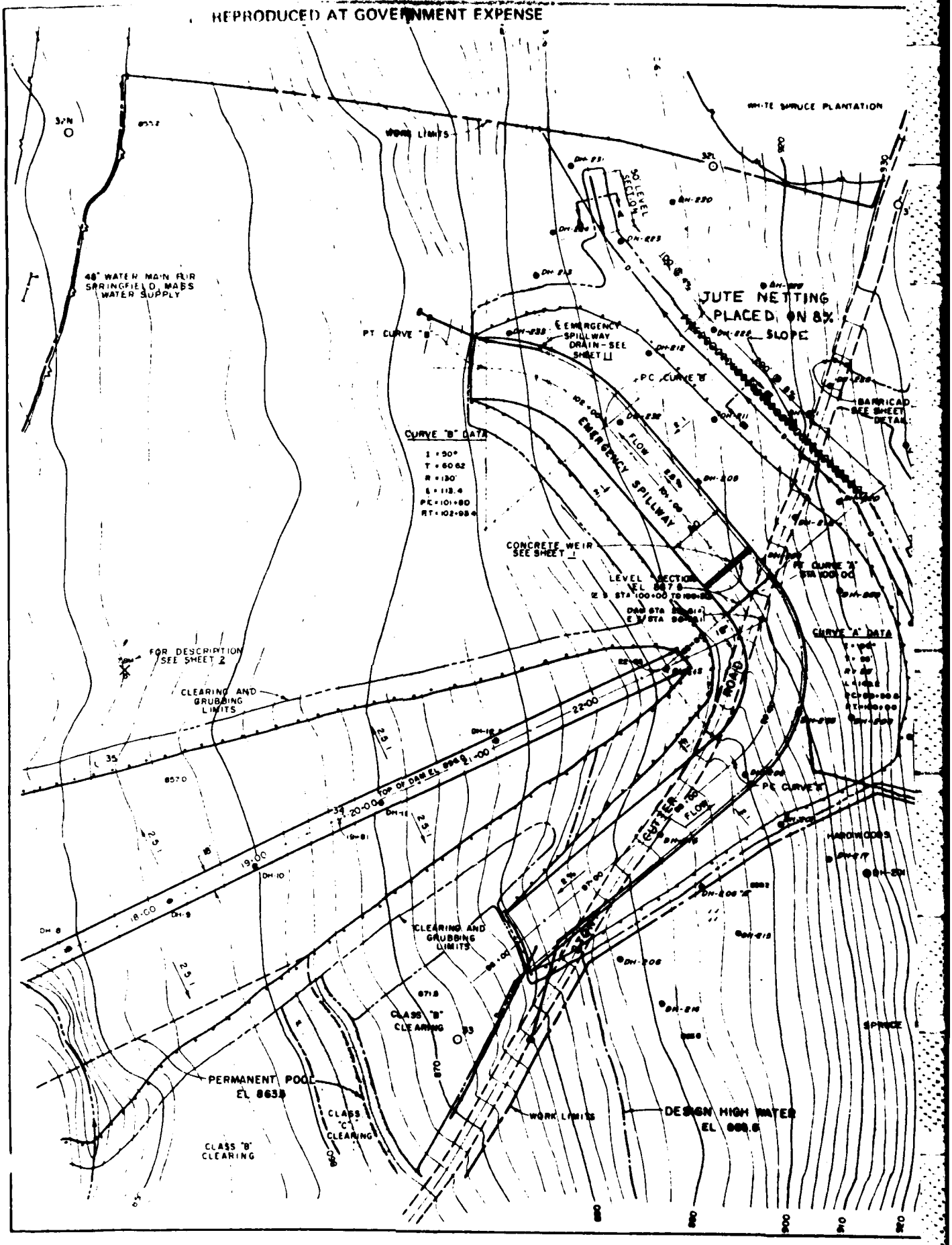
PLAN OF DAMSITE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

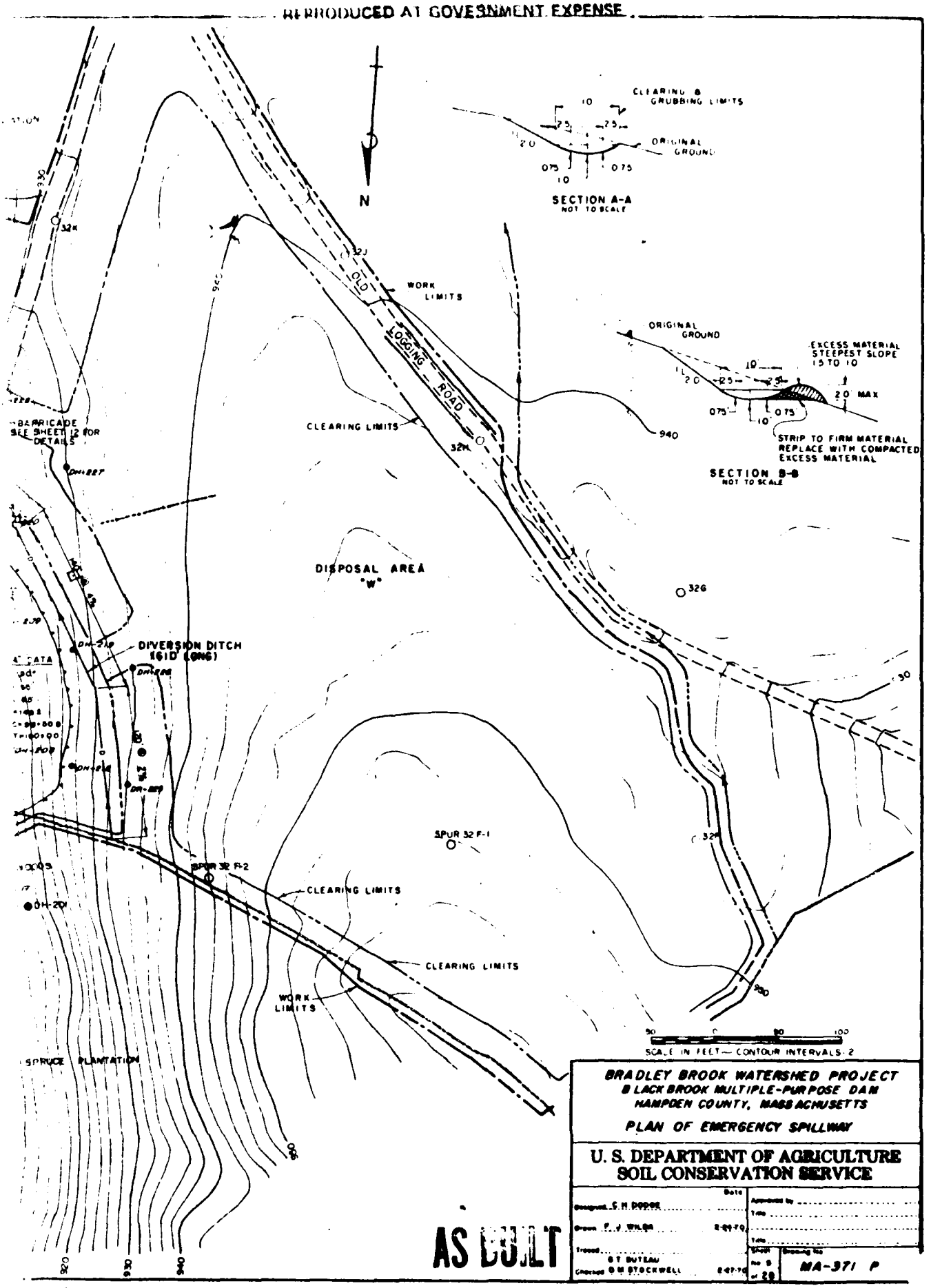
	Date		
Designed C H DODGE		Approved by	
Drawn F. J. RILEY	8-24-70	Title	
Traced G T BUTEAU		Title	
Checked D M STOCKWELL	8-27-70	Sheet No. 6 of 28	Drawing No. MA-371 P

B-3

REPRODUCED AT GOVERNMENT EXPENSE



REPRODUCED AT GOVERNMENT EXPENSE



AS BUILT

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

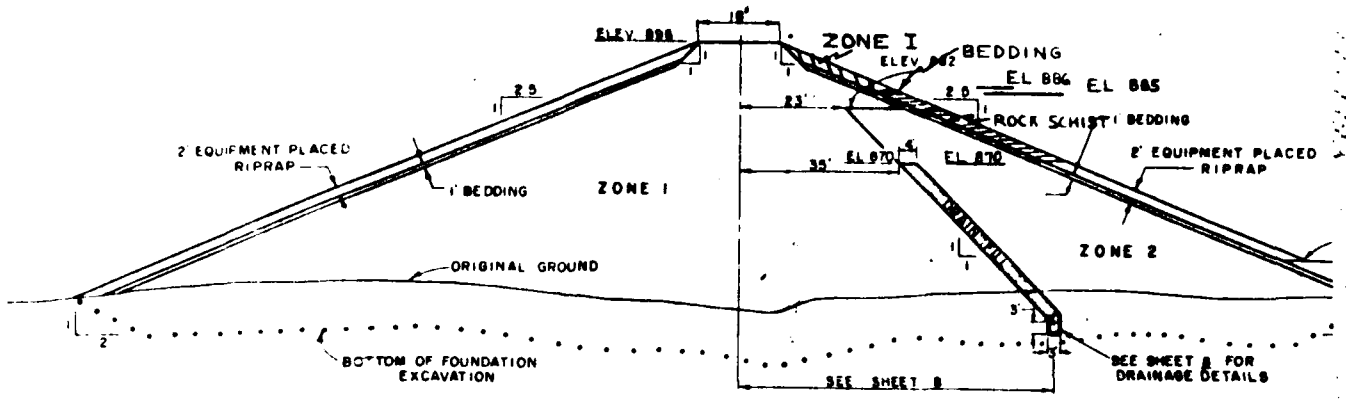
PLAN OF EMERGENCY SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

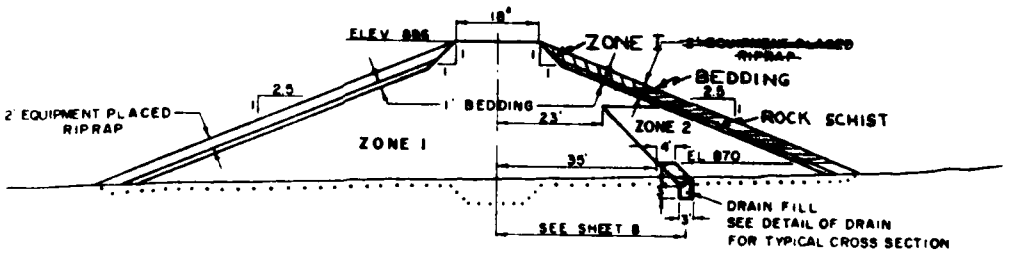
	Date	
Designed C H PEPPER		Approved by
Drawn F. J. WILDA	2-27-70	Title
Traced		Title
S T BUREAU		Sheet No. 8 of 29
Checked G M STOCKWELL	2-27-70	Drawing No. MA-371 P

B-4

REPRODUCED AT GOVERNMENT EXPENSE



TYPICAL SECTION (VALLEY)



TYPICAL SECTION (ABUTMENTS)

EARTH FILL REQUIREMENTS

ZONE	MATERIAL	MAXIMUM ROCK SIZE	MAXIMUM LIFT (2)	MINIMUM WATER CONTENT	COMPACTION CLASS	COMPACTION DEFINITION
1	SAND (SM) FROM BORROW AREA REPRESENTED BY TP-152 (1.0' TO 8.0'), TP-155 (1.0'-12.0') AND TP-161 (1.5'-13.0')	6"	9"	OPTIMUM	A	95% MAX DENSITY BY ASTM D698, METHOD A
2	SAND (SM) FROM EMERGENCY SPILLWAY EXCAVATION REPRESENTED BY DH-203 (0.5'-10.0'), DH-216 (1.0'-11.0') DH-232 (1.0'-15.0') SAND (SP-SM) (SM) FROM CUTOFF TRENCH REPRESENTED BY DH-2 (1.0'-7.5') DH-9 (1.0'-27.0') SAND (SM-GM) (SM) FROM FOUNDATION EXCAVATION REPRESENTED BY DH-6 (1.0'-10.5') AND DH-8 (1.5'-10.0')	12"	18"	WET (1)	C	4 PASSES PER LAYER OF FILL OF PNEUMATIC TIRED ROLLER WEIGHING AT LEAST 50 TONS

(1) THOROUGHLY WET, BUT NOT SO WET AS TO CAUSE ADHERENCE OF THE SOIL TO THE TIRES OF THE EQUIPMENT NOR TO CAUSE BOGGING DOWN OF THE EQUIPMENT

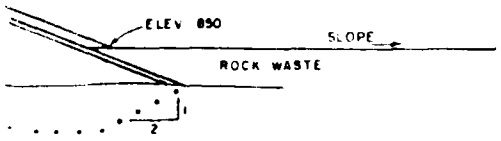
(2) MAXIMUM LIFT THICKNESS PRIOR TO COMPACTION

TYPICAL

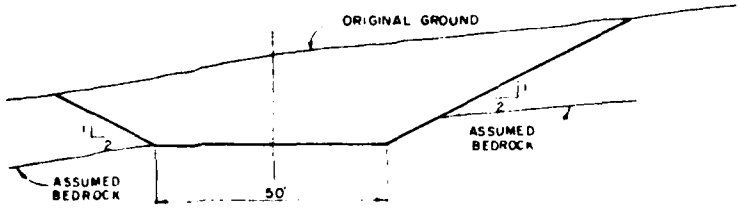
REPRODUCED AT G... EXPENSE

1. EQUIPMENT PLACED RIPRAP SHALL BE WELL GRADED FROM A MAXIMUM SIZE OF 2.0' TO A MINIMUM SIZE OF 0.25'. 60% TO 75% OF THE RIPRAP SHALL HAVE A MAXIMUM DIMENSION OF 1.25' TO 2.0'.
2. BEDDING SHALL BE WELL GRADED BETWEEN $^{3}/_{16}$" AND 3 $^{1}/_{2}$".
3. REPRESENTATIVE ROCK SAMPLES FROM THIS WATERSHED HAVE BEEN TESTED. ALL SAMPLES TESTED CONFORM TO MATERIAL SPECIFICATION 523.
4. ALL MICA SCHIST AND PEGMATITE EXCAVATED FROM THE EMERGENCY SPILLWAY SHALL BE PLACED IN ROCK WASTE AREAS.
5. THE WATERWAY SHALL START AT THE CULVERT UNDER MARTIN PHELPS ROAD AND END WHERE IT INTERSECTS BEDROCK OR THE PERMANENT POOL, WHICHEVER IS THE HIGHER ELEVATION.

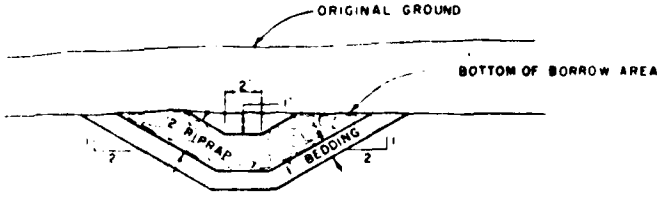
MENT PLACED
RIPRAP



2 FOR
DETAILS



TYPICAL SECTION-EMERGENCY SPILLWAY



TYPICAL SECTION OF RIPRAPPED WATERWAY
(BORROW AREA)
NOT TO SCALE

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

TYPICAL SECTIONS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed C. PROSE	1/79	Approved by	
Drawn F. J. WILDA	2-09-79	Title	
Traced		Title	
G.T. DUTEAU		Sheet No. 6 of 28	Drawing No. MA-371 P
Checked D.R. BROCKWELL	2-27-79		

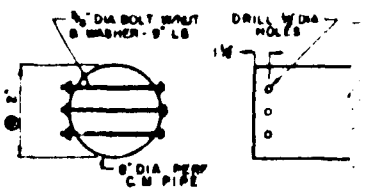
B-5

REPRODUCED AT GOVERNMENT EXPENSE

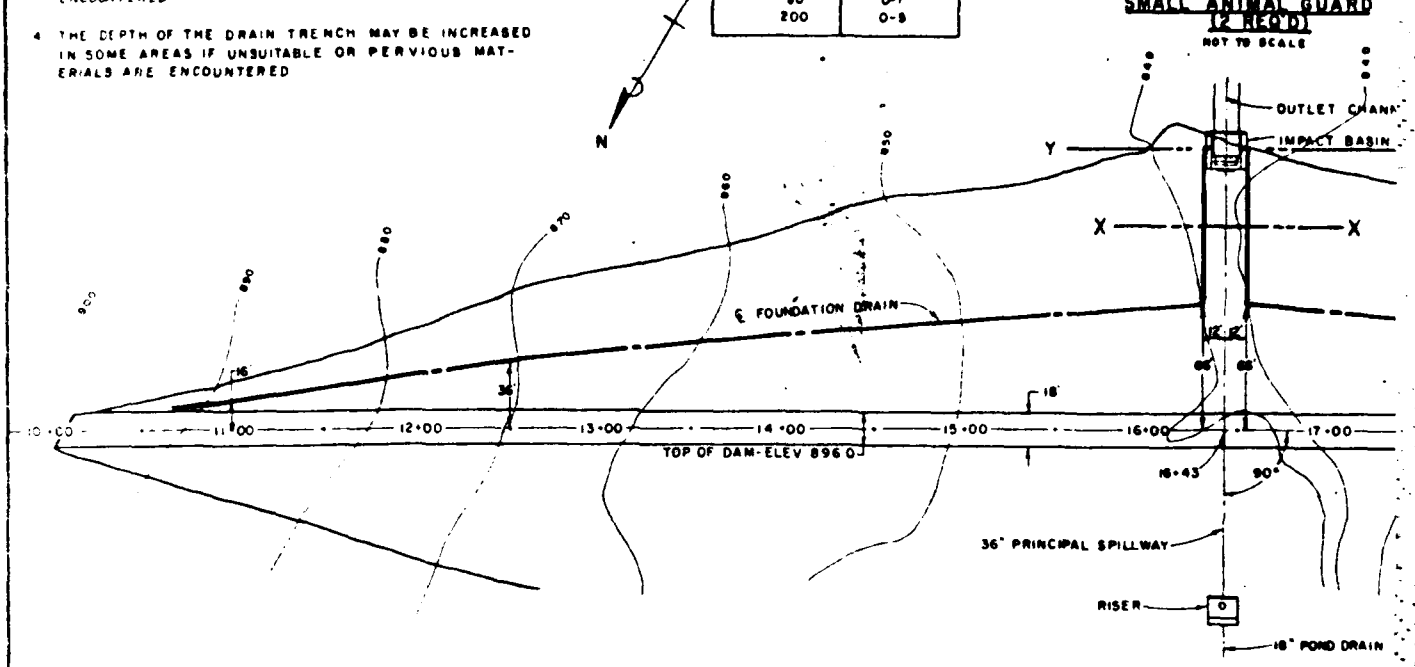
CONSTRUCTION NOTES

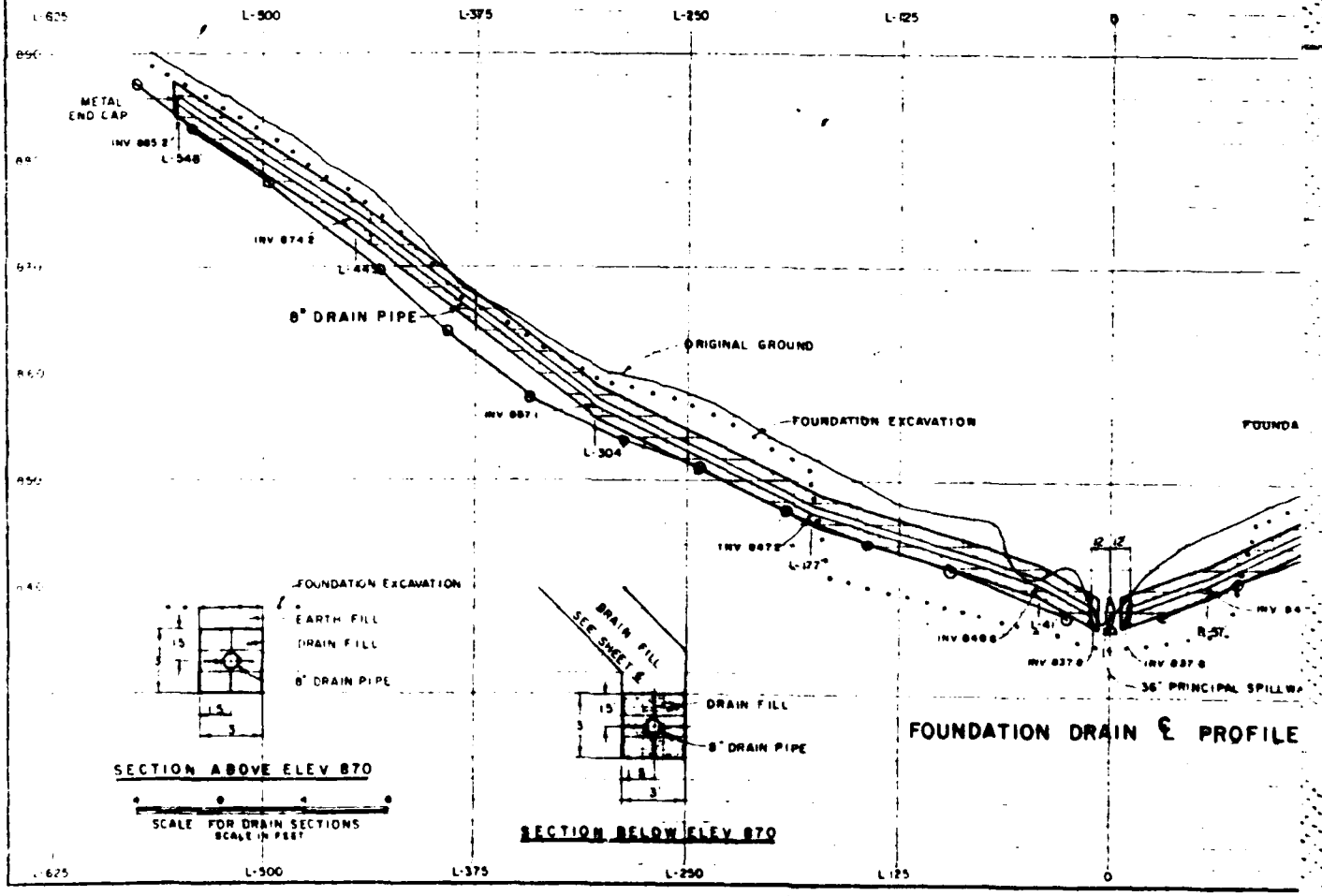
1. ALL DRAIN PIPE SHALL CONFORM TO SPECIFICATION 551 AND SHALL BE 8" DIA, 18 GAUGE, SHAPE 1, CLASS I, COATING G PERFORATED PIPE
2. PIPE SHALL BE LAID WITH 5/16" PERFORATIONS ON LOWER SIDE
3. THE EXCAVATION LIMITS ARE APPROXIMATE AND WILL BE ADJUSTED IN ACCORDANCE WITH CONDITIONS ENCOUNTERED
4. THE DEPTH OF THE DRAIN TRENCH MAY BE INCREASED IN SOME AREAS IF UNSUITABLE OR PERVIOUS MATERIALS ARE ENCOUNTERED

DRAIN FILL GRADATION	
SIEVE NO	% PASSING
1"	100
3/8"	92-100
#4	72-90
#8	40-70
#16	0-38
#30	0-10
#50	0-7
#200	0-5

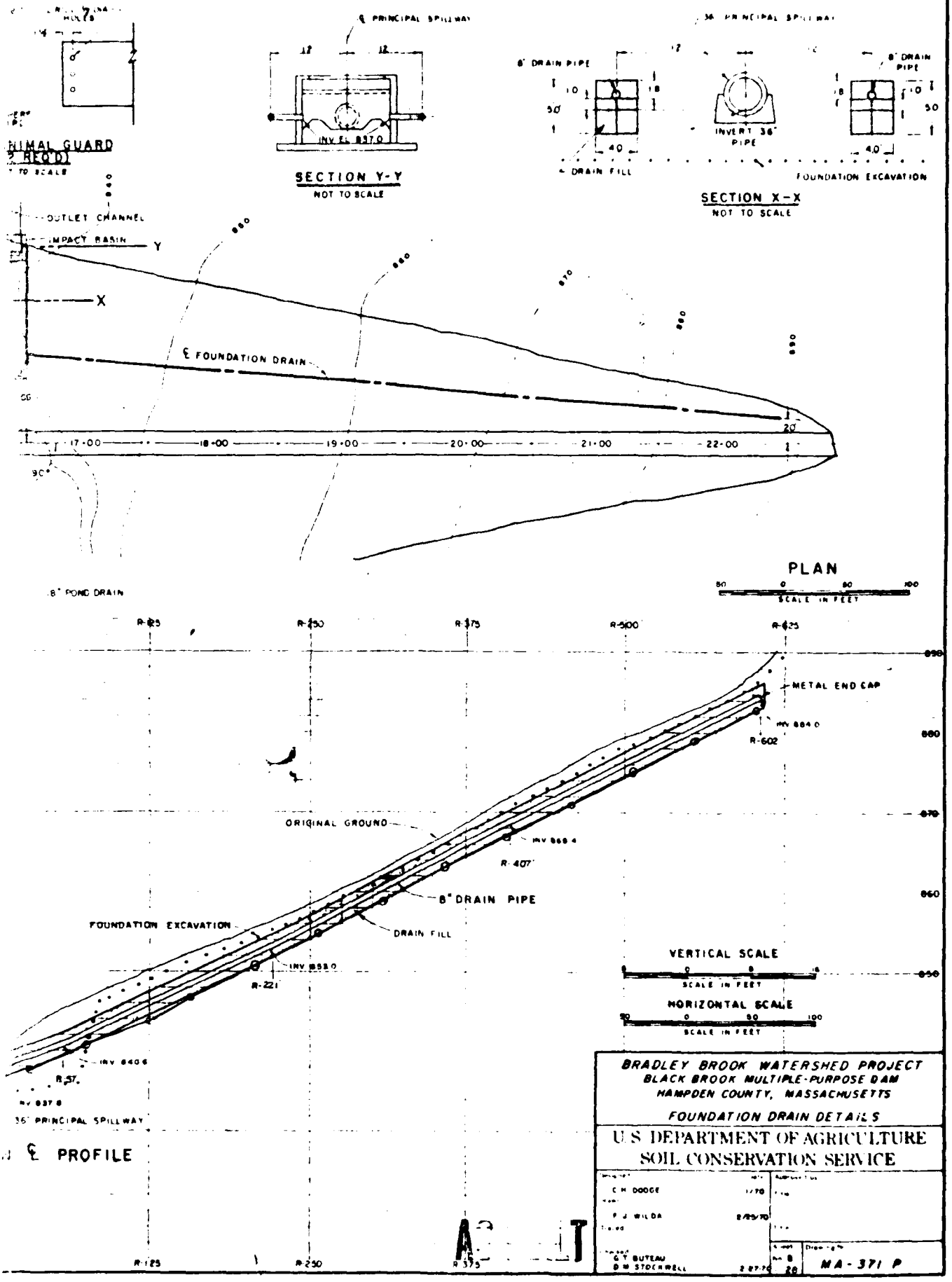


SMALL ANIMAL GUARD (2 REQ'D)
NOT TO SCALE





REPRODUCED AT GOVERNMENT EXPENSE



BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

FOUNDATION DRAIN DETAILS

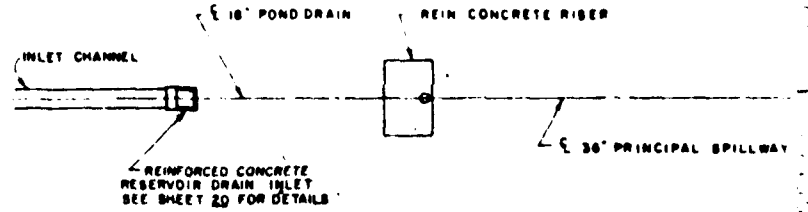
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

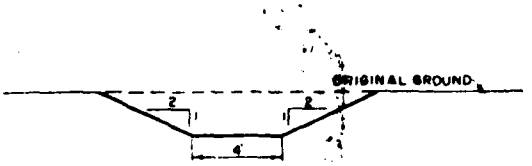
C.H. DODGE	1/70		
F.J. WILDA	2/25/70		
G.T. BUTEAU		Sheet No. 8 of 20	MA-371 P
D.W. STOCKWELL	2-27-70		

B-6

REPRODUCED AT GOVERNMENT EXPENSE

2.5 TO 1 SLOPE





INLET CHANNEL EXCAVATION
NOT TO SCALE

18" PIPE DATA

18" REINFORCED CONCRETE WATER PIPE

(1) 8'C SECTION	8.0
(2) 16.0' SECTION	32.0
(1) WALL FITTING	TOTAL= 40.0'

PRESSURE HEAD = 56

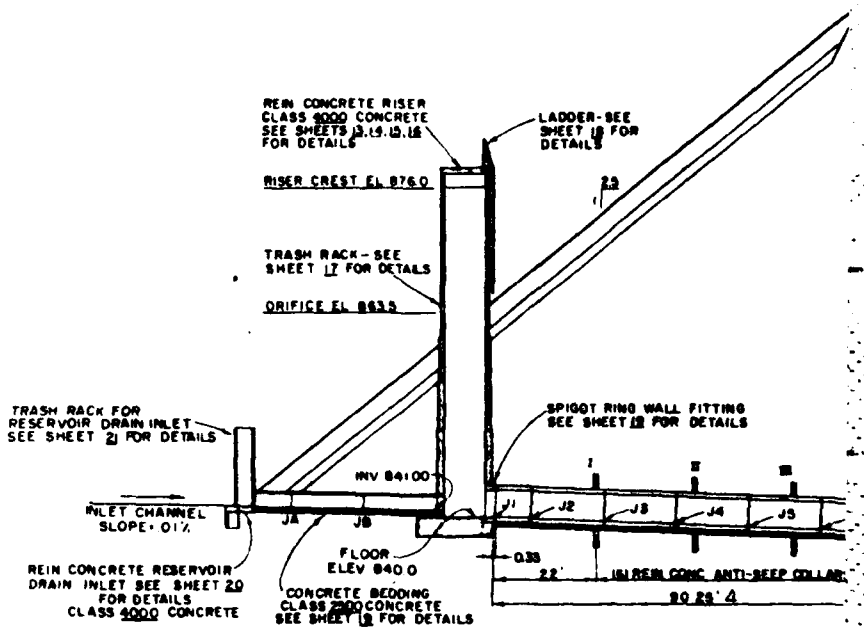
LOAD = 16,233 LBS PER LINEAR FOOT BASED ON OUTSIDE DIAMETER OF 2.17

MINIMUM 3-EDGE BEARING STRENGTH FOR 0.001" CRACK (PRESTRESSED) EQUALS 6080 LBS PER LINEAR FOOT (AWWA C-301)

MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED) EQUALS 8086 LBS PER LINEAR FOOT (AWWA C-300)

PIPE SUPPLIER'S NOTE

CAST INSIDE OF BELL RING JOINT WITH CONCRETE ON ONE PIPE SECTION



36" PRINCIPAL SPILLWAY

JOINT NO	DISTANCE FROM RISER WALL Δ	INVERT ELEVATION
J1	0.33	840.00
J2	8.33	840.00
J3	24.33	839.96
J4	40.33	839.88
J5	56.33	839.77
J6	72.33	839.61
J7	88.33	839.42
J8	104.33	839.19
J9	120.33	838.93
J10	136.33	838.63
J11	152.33	838.28
J12	168.33	837.90
J13	184.33	837.48
J14	200.33	837.03
J15	216.33	836.53
J16	232.33	836.00

ANTI-SEEP COLLARS

COLLAR NO	DISTANCE FROM DWSTRM FACE OF RISER Δ	INVERT OF PIPE
I	22	839.97
II	44	839.86
III	66	839.68
IV	86	839.45
V	110	839.11
VI	132	838.71

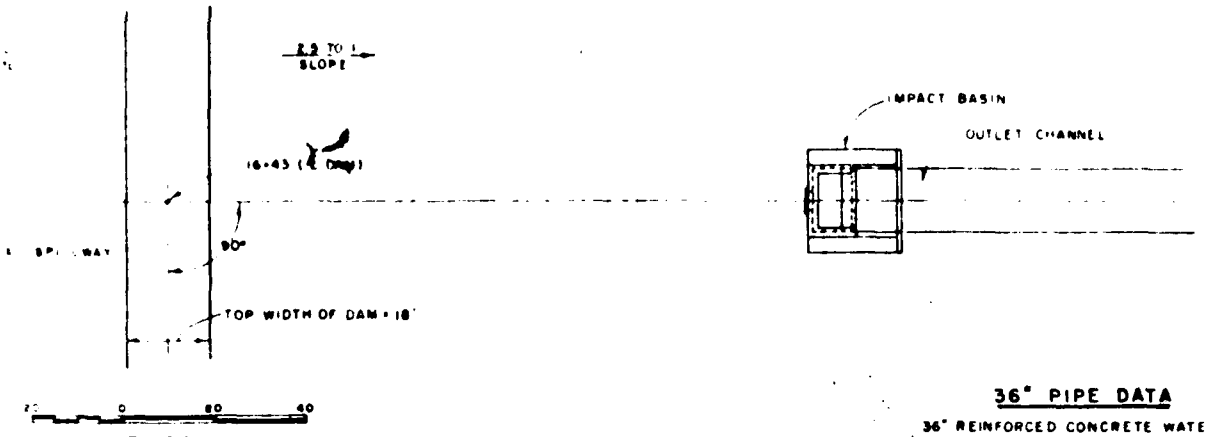
18" RESERVOIR DRAIN

JOINT	DISTANCE FROM INLET Δ	INVERT ELEVATION
INLET	0	841.48
JA	8	841.32
JB	24	841.16
OUTLET	40	841.00

ROCK WASTE

NOTE:
Δ DIMENSIONS OF CONCRETE PIPE LE ARE BASED ON NOMINAL LENGTHS DO NOT INCLUDE CREEP

REPRODUCED AT GOVERNMENT EXPENSE



PLAN

36" PIPE DATA

36" REINFORCED CONCRETE WATER PIPE

(1) 8.0' SECTION	8.0'
(14) 16.0' SECTION	224.0'
(1) WALL FITTING	
TOTAL	232.0'

PRESSURE HEAD = 57

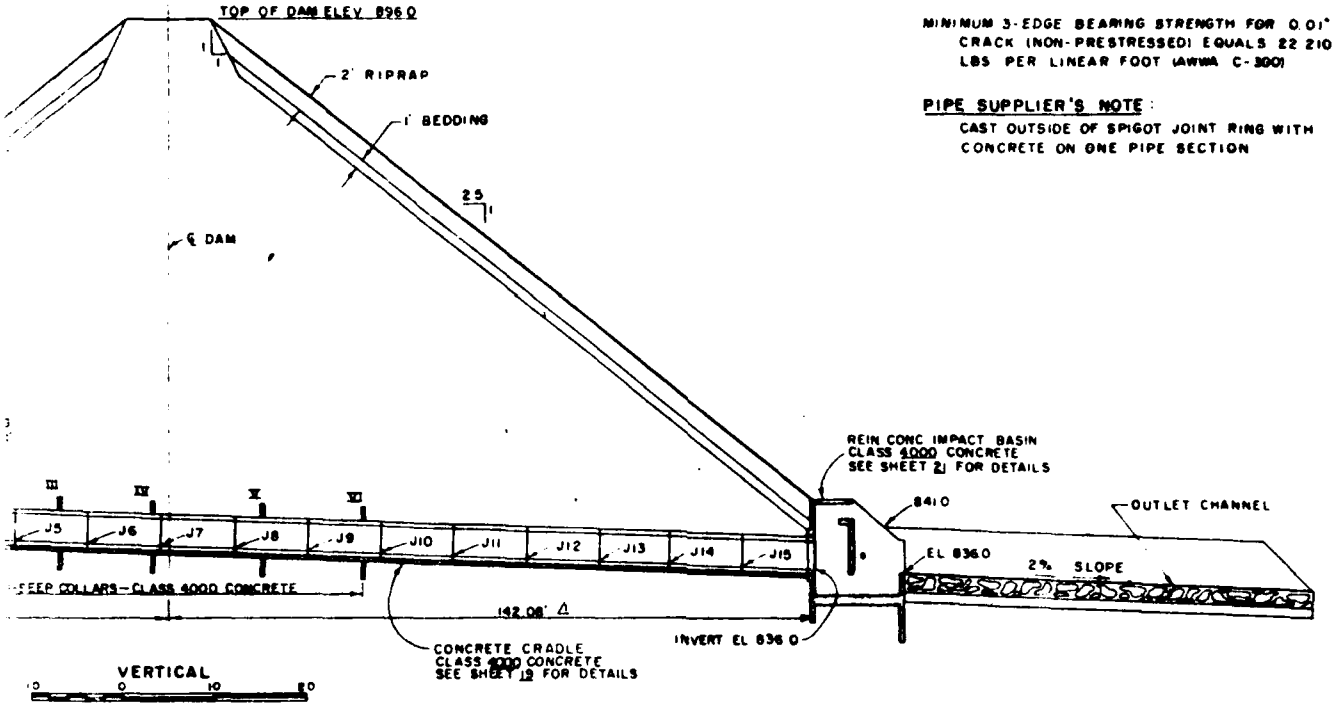
LOAD = 67,800 LBS PER LINEAR FOOT BASED ON OUTSIDE DIAMETER OF 4.0'

MINIMUM 3-EDGE BEARING STRENGTH FOR 0.001" CRACK (PRESTRESSED) EQUALS 16,700 LBS PER LINEAR FOOT (AWWA C-301)

MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED) EQUALS 22,210 LBS PER LINEAR FOOT (AWWA C-300)

PIPE SUPPLIER'S NOTE:

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



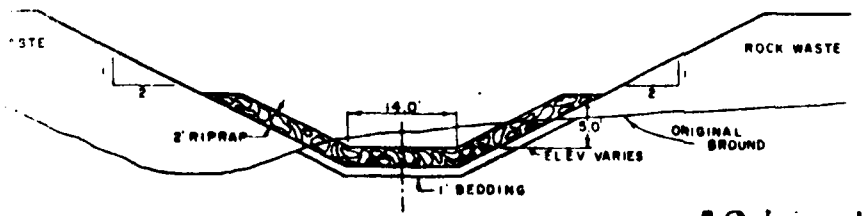
VERTICAL

HORIZONTAL

SCALES IN FEET

PROFILE

ALL CONCRETE PIPE SHALL BE STEEL CYLINDER TYPE



OUTLET CHANNEL

NOT TO SCALE

...TE PIPE LENGTHS
...AL LENGTHS AND
...P

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

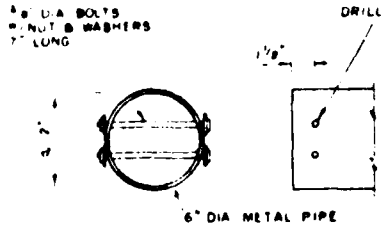
PRINCIPAL SPILLWAY-PLAN & PROFILE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

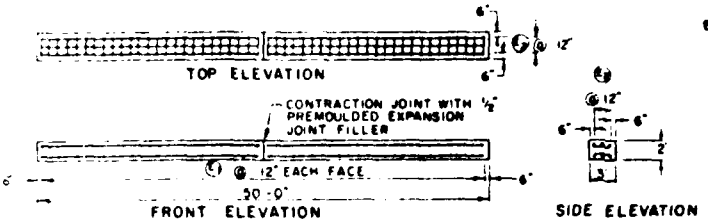
Designed G.H. REESE	Date 1/70	Approved by	
Drawn F.J. WILDA	8-27-70	Title	
Traced		Title	
Checked S.T. BUTEAU, D.M. STOCKWELL	8-27-70	Sheet No. 9 of 28	Drawing No. MA-371 P

B-7

PRODUCED AT GOVERNMENT EXPENSE



SMALL ANIMAL GUARD DETAILS (2 REQ'D)



EMERGENCY SPILLWAY REINFORCED CONCRETE WEIR

(CLASS 4000 CONC)

NOT TO SCALE

CONCRETE WEIR REIN STEEL SCHEDULE								
	QUAN	SIZE	LENGTH	TYPE	B	C	D	TOTAL FT
E	100	6	2'-6"	I				250-0
E	12	6	24'-0"	I				288-0

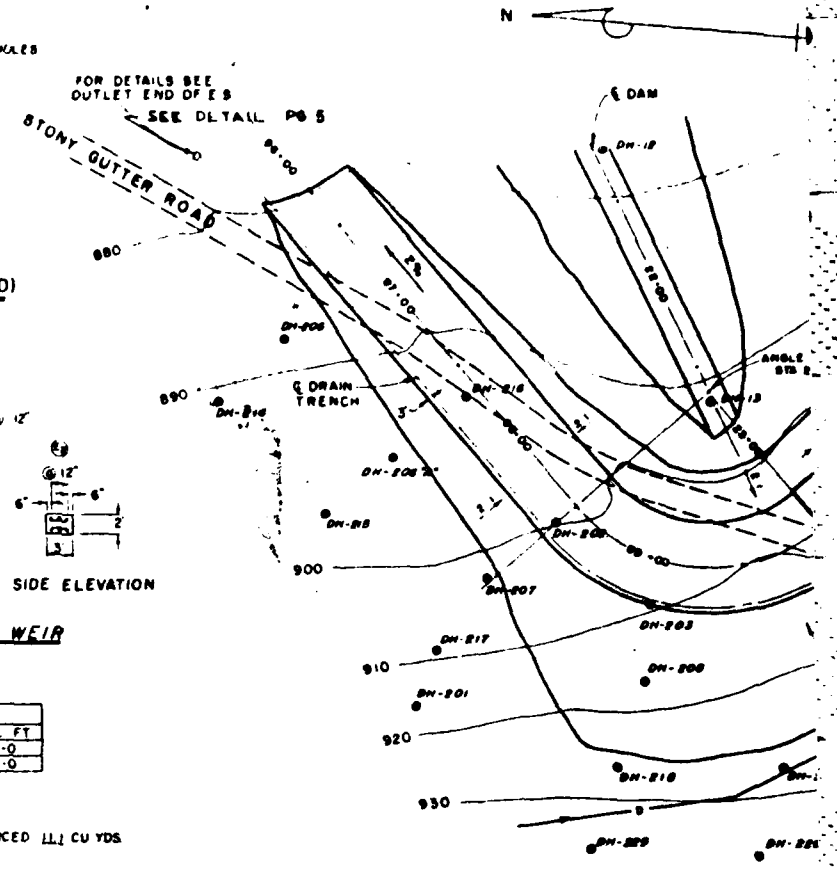
QUANTITIES (THIS SHEET ONLY):

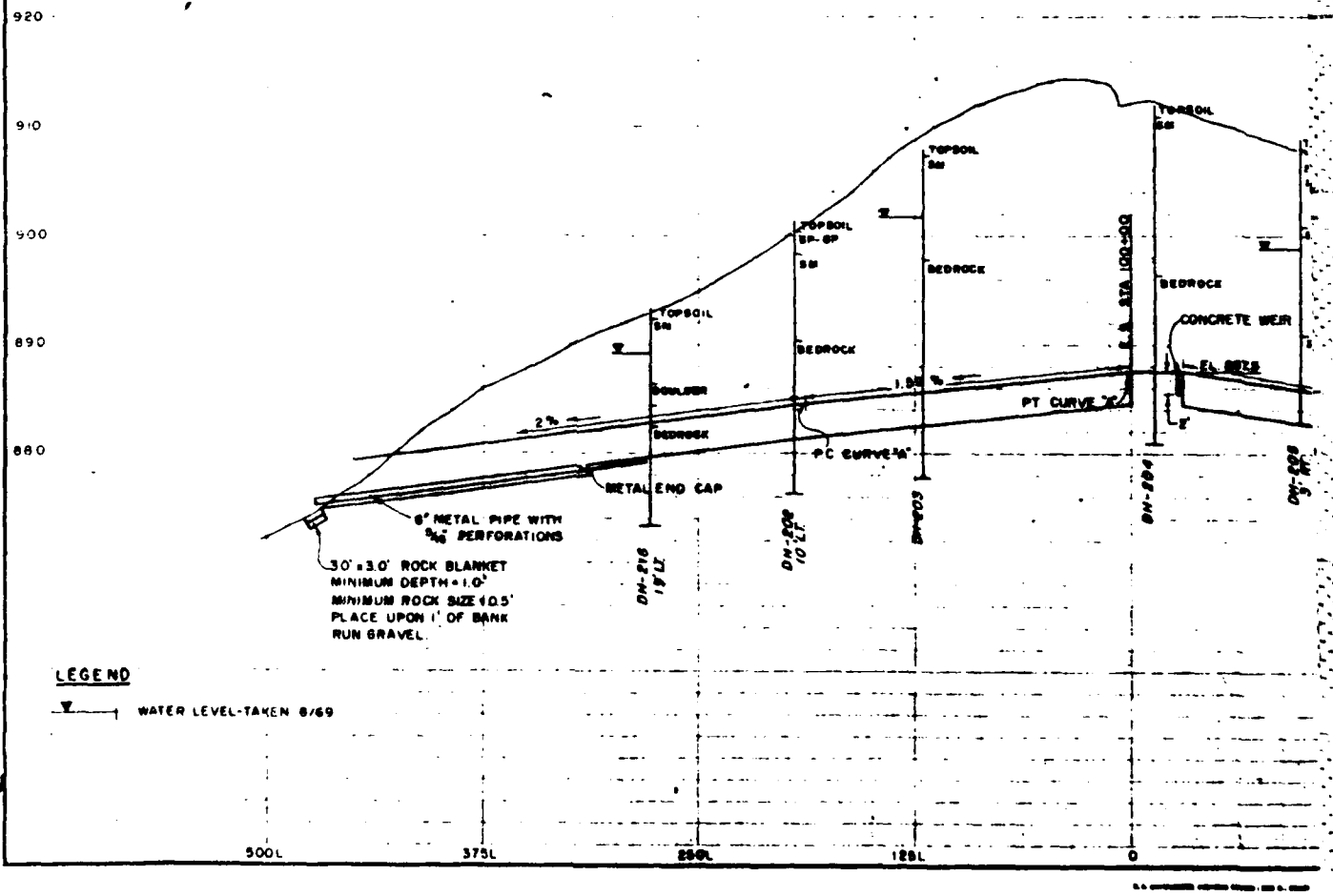
STEEL

No 6 BAR 538-0" = 808 ± LBS

CONCRETE

CLASS 4000, REINFORCED 11.1 CU YDS

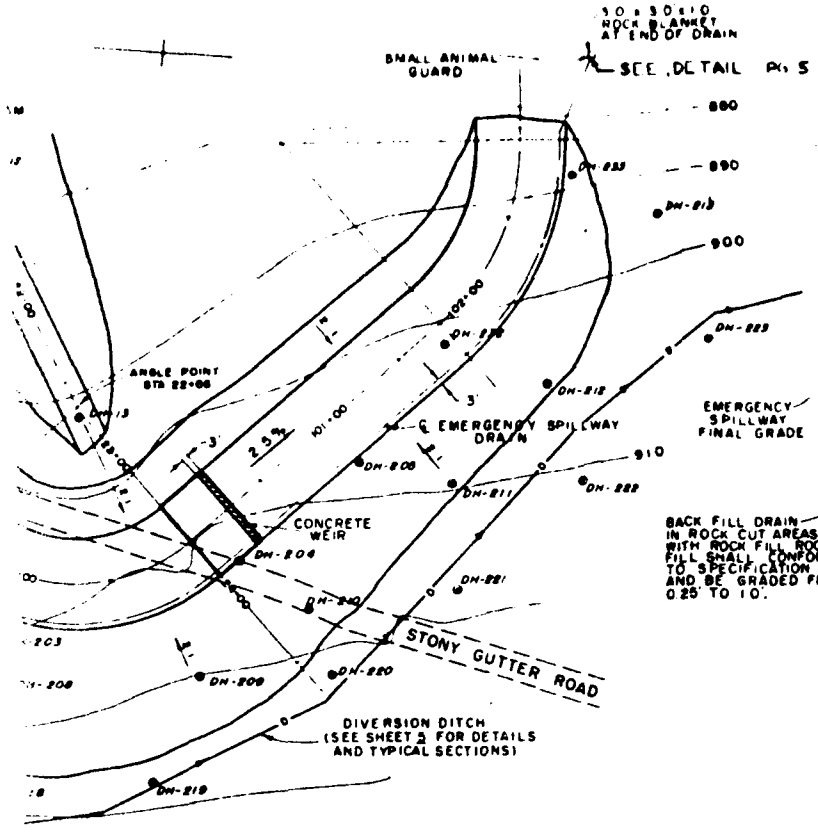




LEGEND

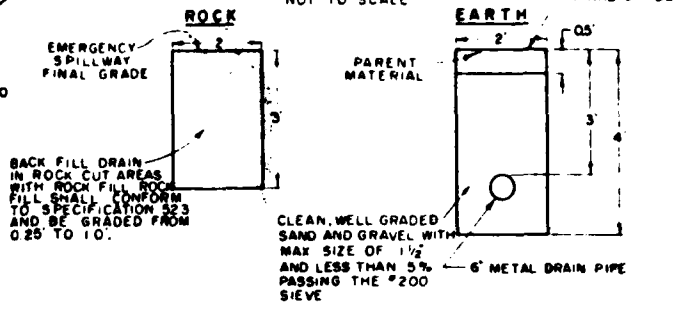
WATER LEVEL-TAKEN 8/69

REPRODUCED AT GOVERNMENT EXPENSE

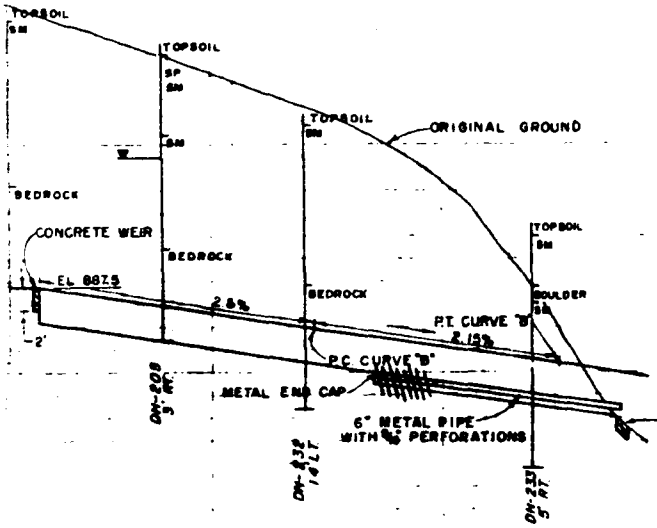


TYPICAL SECTIONS

NOT TO SCALE



PLAN

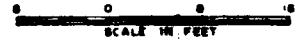


CONSTRUCTION DETAILS:

1. FOR LOGS OF TEST HOLES SEE SHEETS 23,24,25,26 & 27
2. CORRUGATED METAL PIPE SHALL CONFORM TO SPECIFICATION 551 AND BE 6" DIAMETER, 18 GAUGE, SHAPE I, CLASS II, COATING C PERFORATED AND NON-PERFORATED.
3. THE LENGTH OF PIPE SHOWN IS APPROXIMATE AND WILL BE ADJUSTED IN ACCORDANCE WITH CONDITIONS ENCOUNTERED
4. END SECTION (20') OF 6" DRAIN PIPE SHALL BE NON-PERFORATED

PROFILE

VERTICAL SCALE



HORIZONTAL SCALE

AS BUILT

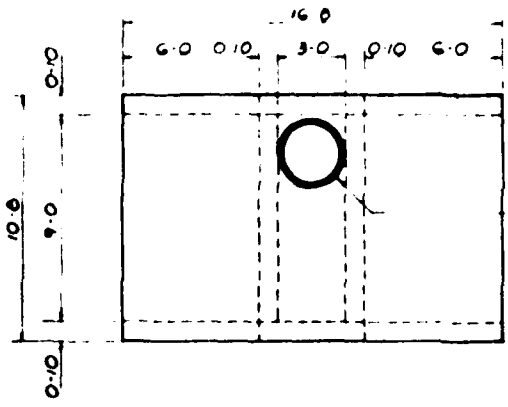
BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS
EMERGENCY SPILLWAY DRAIN-PLAN & PROFILE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved By
C DODGE	1-'79	Title
Drawn	3-9-70	
F J WILDA		Title
Traced		
Checked G T BUTEAU D R STOCKWELL	3-9-70	Sheet No. 11 of 28 — Drawing No. MA-371 P

B-8

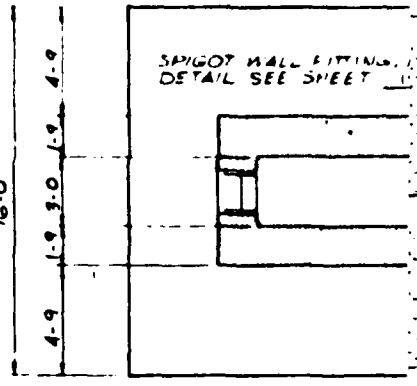
REPRODUCED AT GOVERNMENT EXPENSE



MANHOLE FRAME FOR DETAIL SEE SHEET 18

FOR DETAIL OF TRASH-RACK ANGLES AND GRATING SEE SHEET 17

TOP PLAN



SECTION A-A

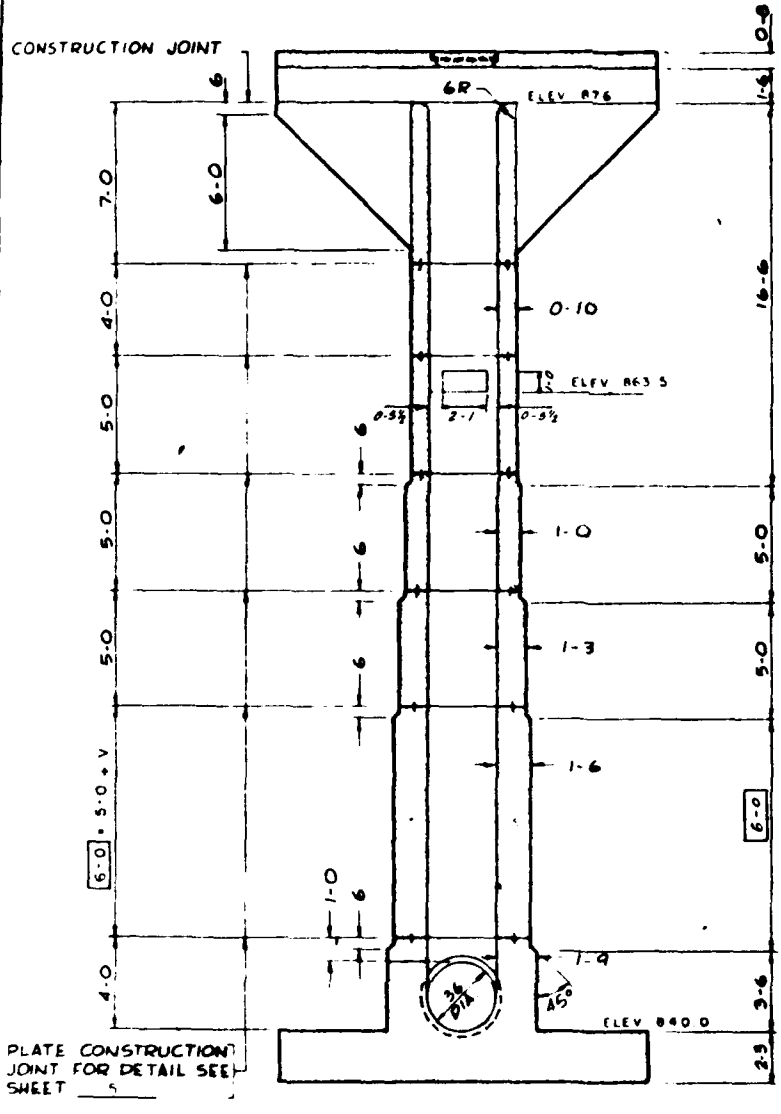
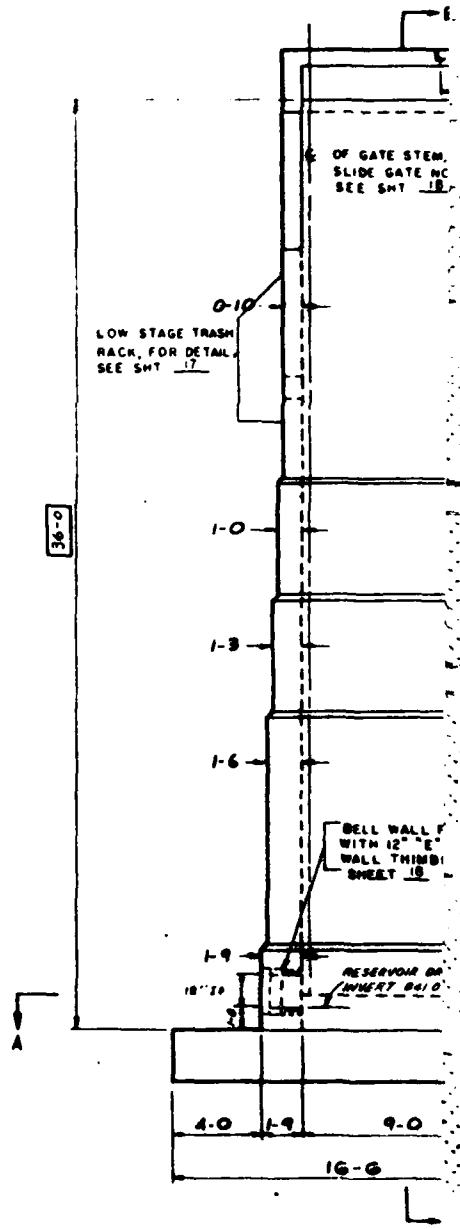


PLATE CONSTRUCTION JOINT FOR DETAIL SEE SHEET 5

SECTION B-B



SIDEWALL ELE

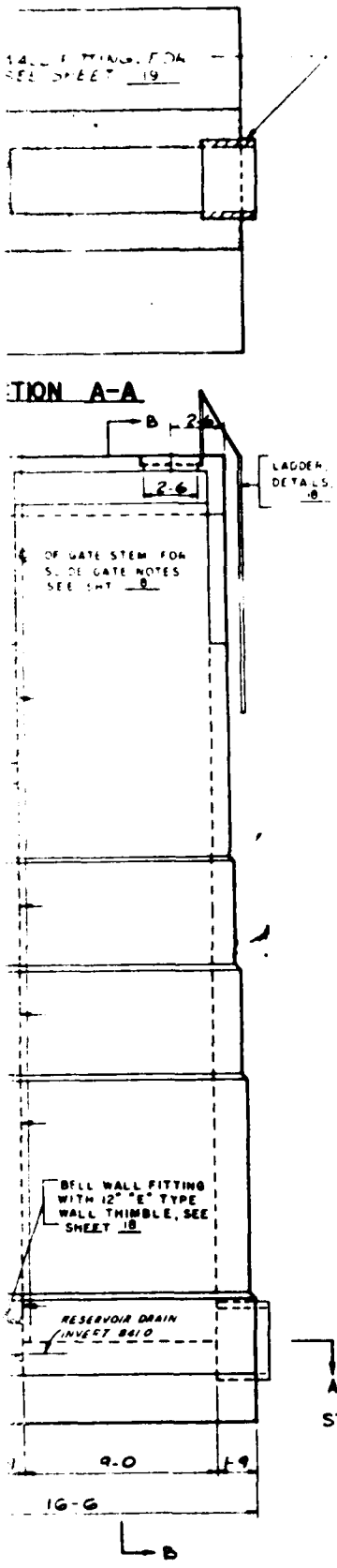
LENG
LENG

0 1 2 3 4 5 6 7 8 9
SCALE IN FEET

STANDARD COVERED RISER		
DESIGN CONSTANTS	f'_c = 4000 psi	f_c = 1600 psi
	n = 8	f_s = 20,000 psi
STANDARD DWG NO	ES 3036-4030E	
DATE 6-65	SHEET 1 OF 4	

LOEWER SARGENT & ASSOC.
ARCHITECTS & ENGINEERS
3720 FARRAGUT AVE KENSINGTON, MD

REPRODUCED AT GOVERNMENT EXPENSE



STEEL SCHEDULE

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
B1	6	17	15-6	1	-	-	263-6
B2	6	16	16-0	1	-	-	256-0
B3	4	15	5-0	1	-	-	75-0
B4	8	46	9-6	21	4-2	5-4	437-0
B5	6	16	16-0	1	-	-	256-0
B6	6	11	15-6	1	-	-	170-6
B7	8	7	15-6	1	-	-	108-6
B8	6	4	7-3	1	-	-	29-0
B9	5	10	6-2	21	0-11	5-3	61-8
B10	5	4	8-2	21	0-11	7-3	32-8
B11	5	26	8-1	21	0-11	7-2	210-2
B12	6	12	10-0	1	-	-	120-0
B13	5	7	4-0	1	-	-	28-0
B14	7	4	11-0	21	4-0	7-0	44-0
B15	7	10	11-6	21	4-3	7-3	115-0
B16	7	2	9-5	21	2-2	7-3	18-10
B17	7	2	8-9	21	1-6	7-3	17-6
B18	7	4	8-7	21	1-4	7-3	34-4
B19	7	2	9-0	21	1-9	7-3	18-0
B20	5	2	3-2	1	-	-	6-4
B21	5	2	2-5	1	-	-	4-10
B22	5	1	2-4	1	-	-	2-4
B23	5	2	2-5	1	-	-	4-10
B24	5	2	2-9	1	-	-	5-6
B25	7	46	4-4	1	-	-	199-4
B26	5	10	3-8	1	-	-	36-8
R1	5	26	7-7	1	-	-	197-2
R2	5	8	7-7	1	-	-	60-8
R3	5	30	5-6	1	-	-	165-0
R4	5	14	5-6	1	-	-	77-0
R5	6	4	10-0	1	-	-	40-0
R6	5	4	4-0	1	-	-	16-0
R7	6	8	10-8	21	3-10	6-10	85-4
R8	6	14	10-0	1	-	-	140-0
R9	5	14	4-0	1	-	-	56-0
R10	5	36	10-4	21	3-8	6-8	372-0
R11	5	4	9-10	21	3-5	6-5	39-4
R12	5	30	3-8	1	-	-	110-0
R13	5	14	3-8	1	-	-	51-4
R14	5	26	6-7	1	-	-	171-2
R15	5	8	6-7	1	-	-	52-8
R16	5	30	4-6	1	-	-	135-0
R17	5	14	4-6	1	-	-	63-0
R18	6	14	9-8	1	-	-	135-4
R19	5	14	3-8	1	-	-	51-4
R20	7	28	10-6	21	3-9	6-9	294-0
R21	7	4	10-0	21	3-6	6-6	40-0
R22	5	30	3-8	1	-	-	110-0
R23	5	10	3-8	1	-	-	36-8
R24	5	20	6-7	1	-	-	131-8
R25	5	6	6-7	1	-	-	39-6
R26	5	22	4-6	1	-	-	99-0
R27	5	10	4-6	1	-	-	45-0
R28	6	14	9-8	1	-	-	135-4
R29	5	10	3-8	1	-	-	36-8
R30	7	28	10-0	21	3-6	6-6	280-0
R31	7	4	9-8	21	3-4	6-4	38-8
R32	5	22	3-8	1	-	-	80-8

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
R33	5	10	3-8	1	-	-	36-8
R34	5	16	10-7	1	-	-	169-4
R35	5	6	10-7	1	-	-	63-6
R36	5	16	10-7	1	-	-	169-4
R37	5	8	10-7	1	-	-	84-8
R38	5	20	9-8	1	-	-	193-4
R39	5	8	9-8	1	-	-	77-4
R40	5	40	9-0	21	3-0	6-0	360-0
R41	5	8	9-8	1	-	-	77-4
R42	5	8	9-8	1	-	-	77-4
R43	5	20	9-0	21	3-0	6-0	180-0
T1	6	16	6-6	1	-	-	104-0
T2	6	12	9-8	1	-	-	116-0
T3	5	10	9-9	1	-	-	108-0
T4	5	6	8-10	1	-	-	53-0
T5	6	6	8-10	1	-	-	53-0
T6	5	28	9-0	21	3-0	6-0	252-0
T7	5	2	3-8	1	-	-	7-4
T8	5	2	9-8	1	-	-	18-4
T9	5	2	9-2	1	-	-	18-4
T10	5	2	11-8	1	-	-	23-4
T11	5	2	14-2	1	-	-	28-4
T12	5	2	16-3	1	-	-	32-6
T13	5	4	7-8	1	-	-	30-8
T14	5	4	6-5	1	-	-	25-8
T15	5	4	5-2	1	-	-	20-8
T16	5	4	3-11	1	-	-	15-8
T17	5	4	2-8	1	-	-	10-8
T18	5	4	10-7	19	2-2	8-5	42-4
T19	5	2	4-3	1	-	-	8-6
T20	5	2	6-8	1	-	-	13-4
T21	5	2	9-2	1	-	-	18-4
T22	5	2	11-8	1	-	-	23-4
T23	5	2	14-2	1	-	-	28-4
T24	5	2	16-3	1	-	-	32-6
T25	5	4	7-8	1	-	-	30-8
T26	5	4	6-5	1	-	-	25-8
T27	5	4	5-2	1	-	-	20-8
T28	5	4	3-11	1	-	-	16-8
T29	5	4	2-8	1	-	-	10-8
T30	5	4	10-7	19	2-2	8-5	42-4
T31	5	2	16-3	1	-	-	32-6
T32	5	2	16-3	1	-	-	32-6
T33	4	24	9-8	1	-	-	232-0
T34	6	2	6-2	1	-	-	12-4
T35	4	9	16-3	1	-	-	146-3
T36	4	4	6-7	1	-	-	26-4
T37	5	2	2-8	21	1-10	0-10	5-4
T38	5	28	7-9	21	1-10	5-11	217-0
T39	5	2	8-5	21	1-10	6-5	16-6
T40	4	4	6-7	1	-	-	26-4
T41	4	9	16-3	1	-	-	146-3

QUANTITIES

STEEL

#4 BARS -	652-2	- 436	LBS
#5 BARS -	55.32	- 5748	LBS
#6 BARS -	1643 32	- 2450	LBS
#7 BARS -	999-8	- 2248	LBS
#8 BARS -	545-6	- 1457	LBS
		2 357	LBS

CONCRETE = 71.7 + 1.67 V = 73 37 CU. YDS

WALL ELEVATION

LENGTH OF #5 BARS = (4995-6) + (LENGTH OF BARS R1, R2, R3, R4 AND R6)
LENGTH OF #6 BARS = (1505-8) + (LENGTH OF BARS R5 AND R7)

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

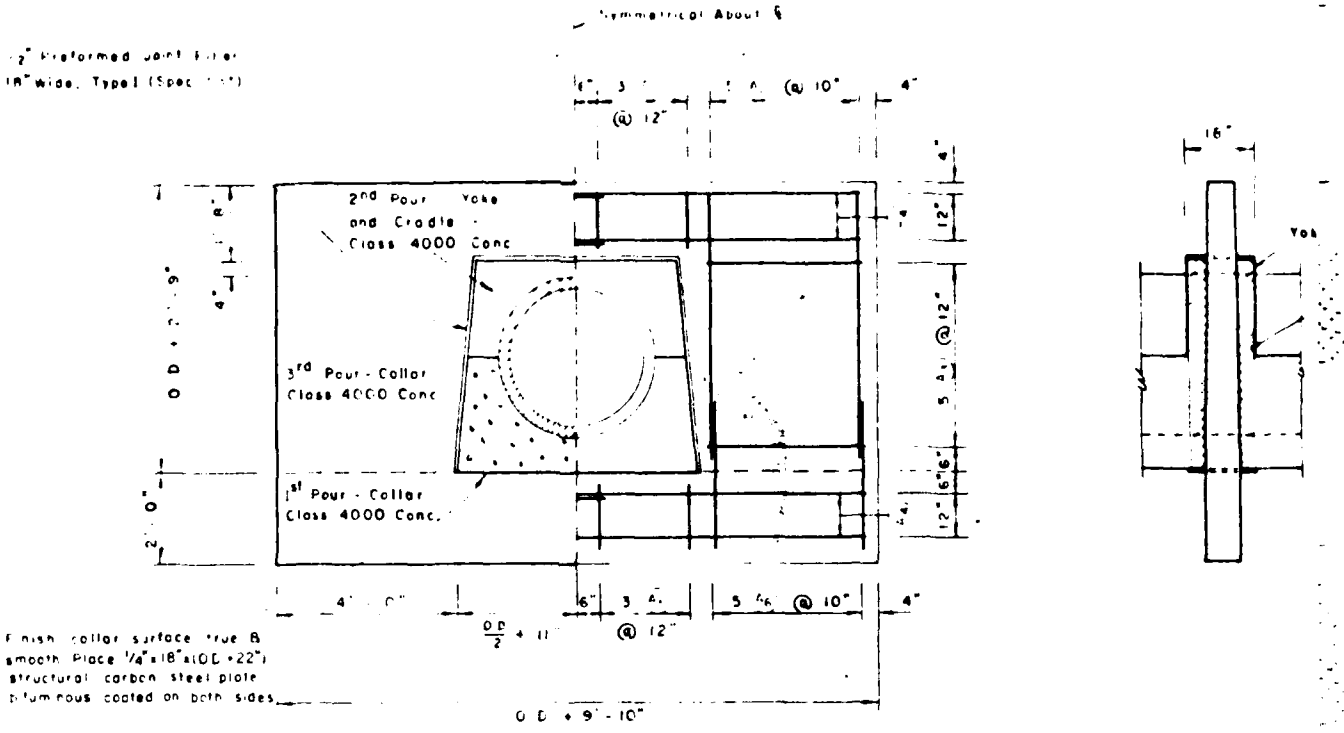
RISER DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Adapted		Date	Approved by
Designed	T. L. BROWN	2-70	Title
Drawn			Date
Traced			Sheet No. 13 of 28
Checked	M. NIKOLICH	2-70	Drawing No. MA-371 P

17 B-9

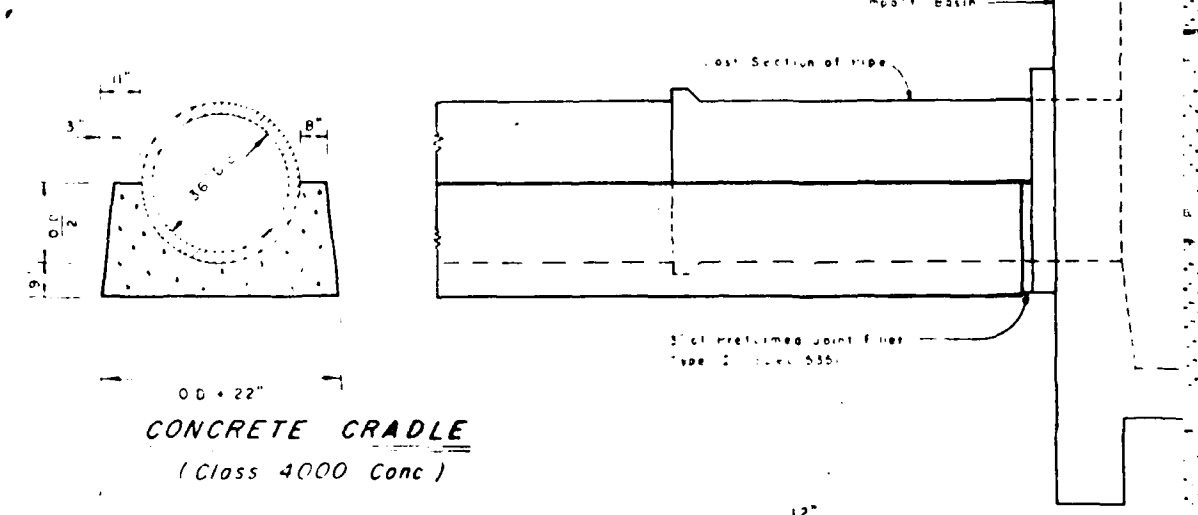
REPRODUCED AT GOVERNMENT EXPENSE



Finish collar surface true & smooth Place ¼" x 18" x (OD + 22") structural carbon steel plate bituminous coated on both sides

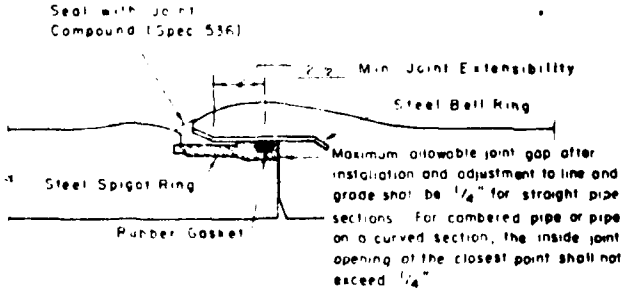
REINFORCED CONCRETE ANTI - SEEP COLLAR

6 - Req'd

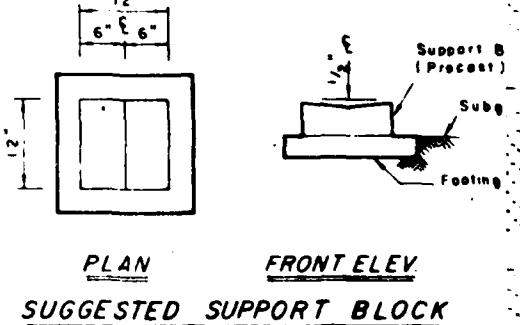


CONCRETE CRADLE

(Class 4000 Conc)



REINFORCED CONCRETE PIPE - JOINT DETAILS



SUGGESTED SUPPORT BLOCK

NOTE The contractor shall determine the number and size of the blocks

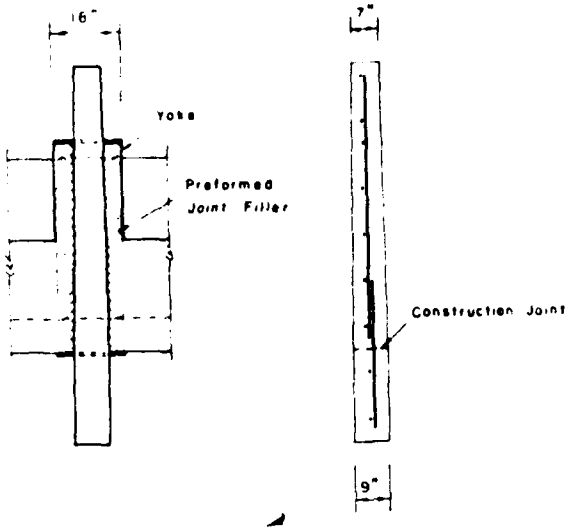
REPRODUCED AT GOVERNMENT EXPENSE

SEEP COLLAR STEEL SCHEDULE

Mark	Size	Length	Type	Number Required	Total Number	Total Length
A 1	4	1 - 3	1	6	12	
A 2	4	6 - 0	1	10		
A 3	4	5 - 6	1	10		
A 4	4	7 - 6	1	8	48	
A 5	4	1 - 6	1	6		
A 6	4	3 - 9	1	10		

NOTE

Bar lengths do not change with changes in outside diameter of pipe



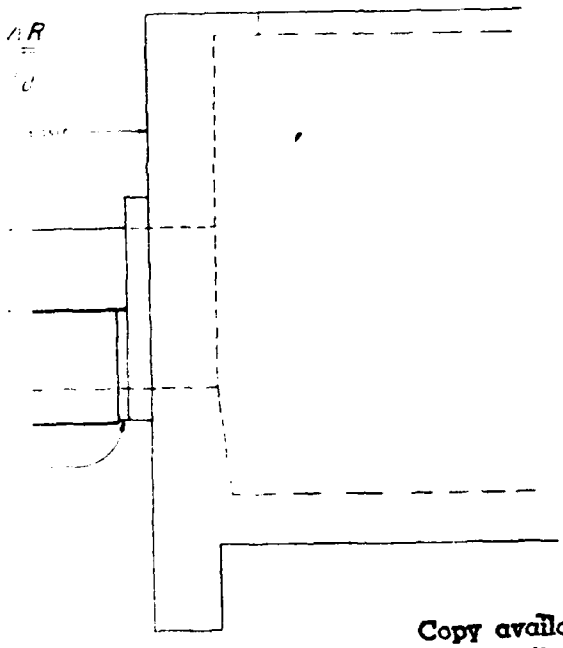
QUANTITIES (This Sheet Only)

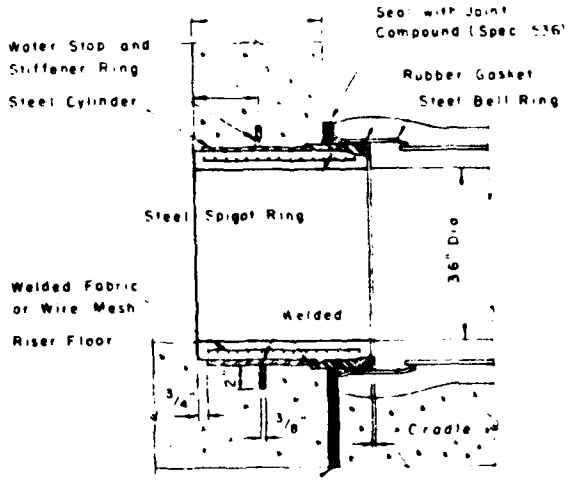
STEEL

No. 4 Bar [illegible] 56 Lbs

CONCRETE

Class 4000 9423 Cu Yds
Class 2500 239 Cu Yds





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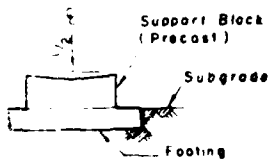
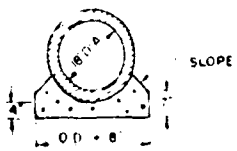
SPIGOT WALL FITTING



FRONT ELEV

PORT BLOCK



CONCRETE BEDDING
CLASS 2500 CONC

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

CONDUIT DETAILS

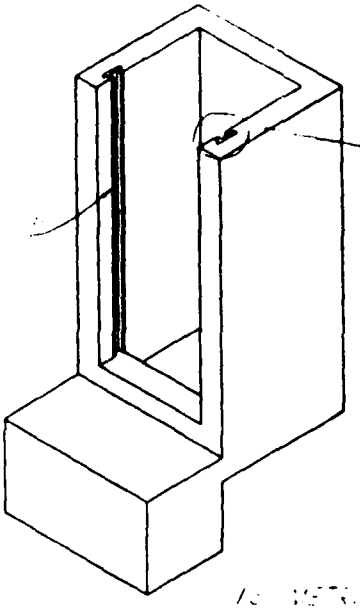
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

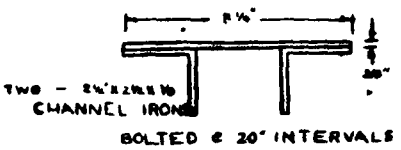
ADAPTED [illegible] BROWN 2/70
[illegible] BROWN 2/70
[illegible] MA-371 P

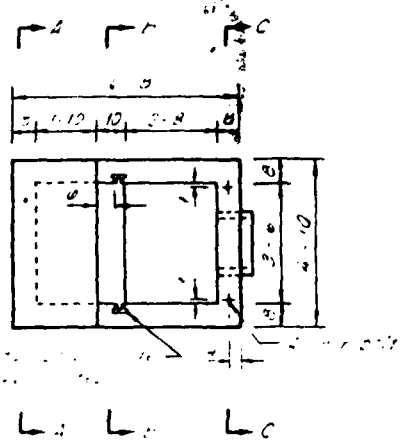
AS BUILT

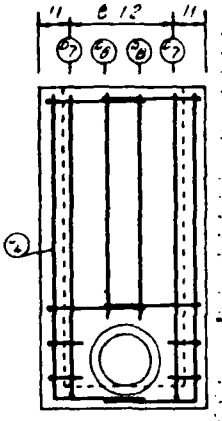
B-10

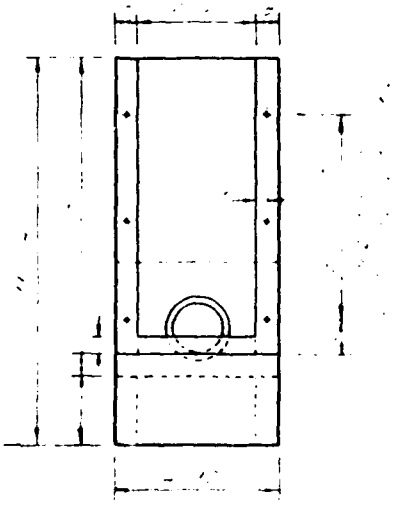
REPRODUCED AT GOVERNMENT EXPENSE

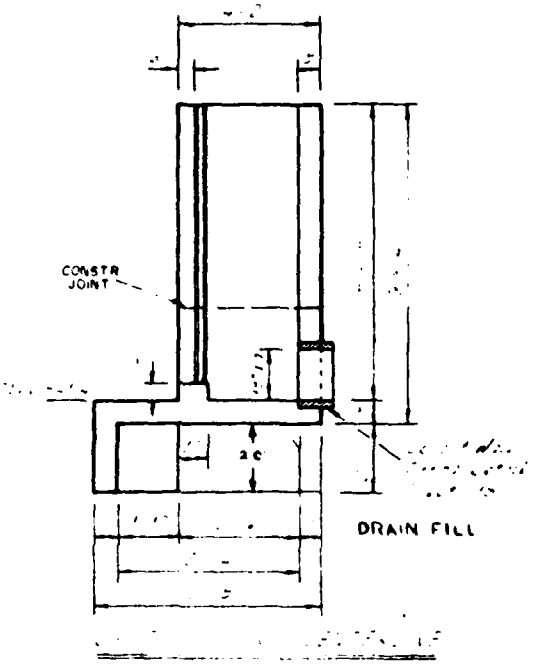


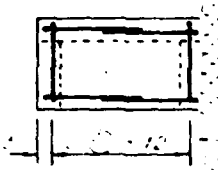




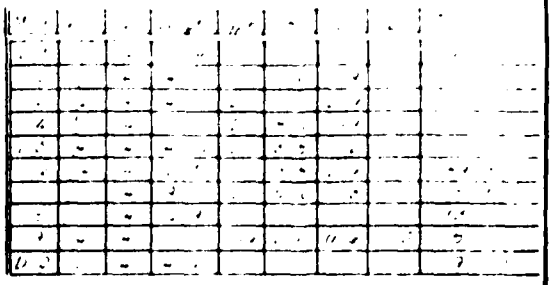


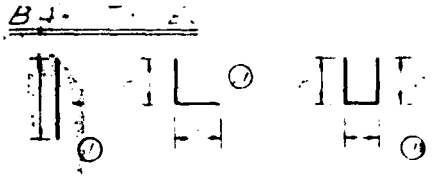


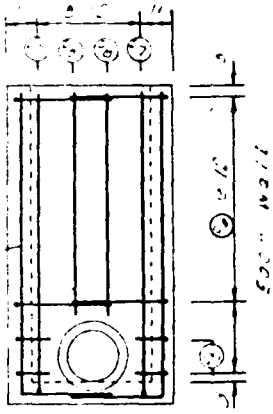


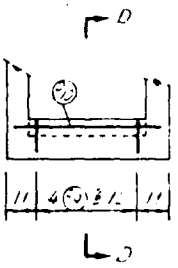


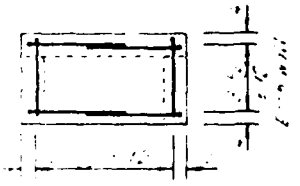
REPRODUCED AT GOVERNMENT EXPENSE

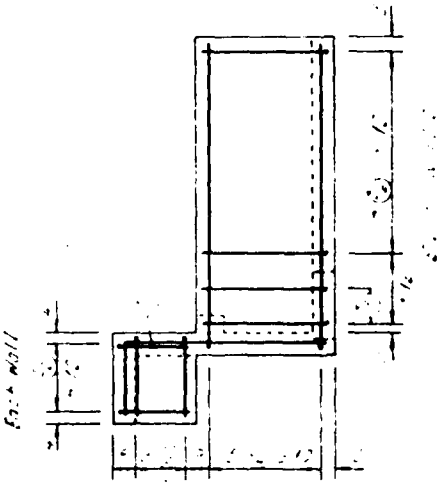


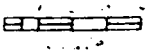












BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

RESERVOIR DRAIN INLET DRAIN

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MA-371 P

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AS BUILT

B-11

SCS-313C (9-66)

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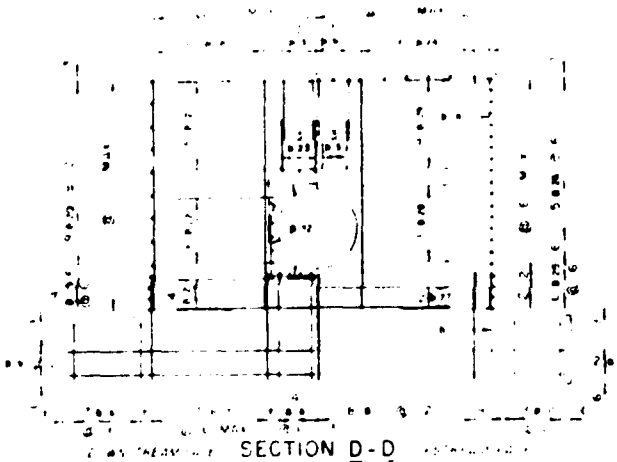
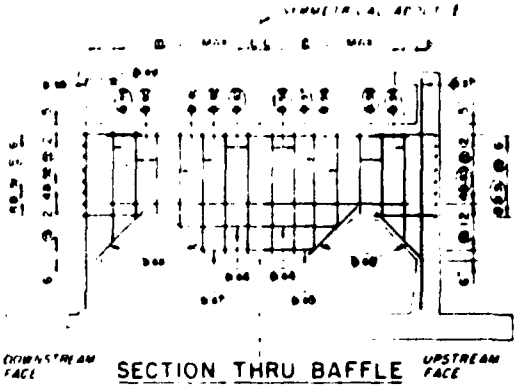
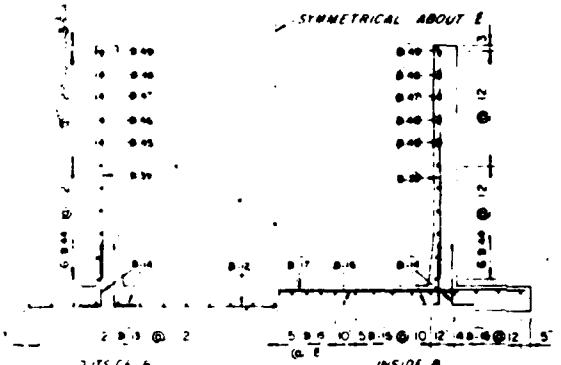


SECTION D-D

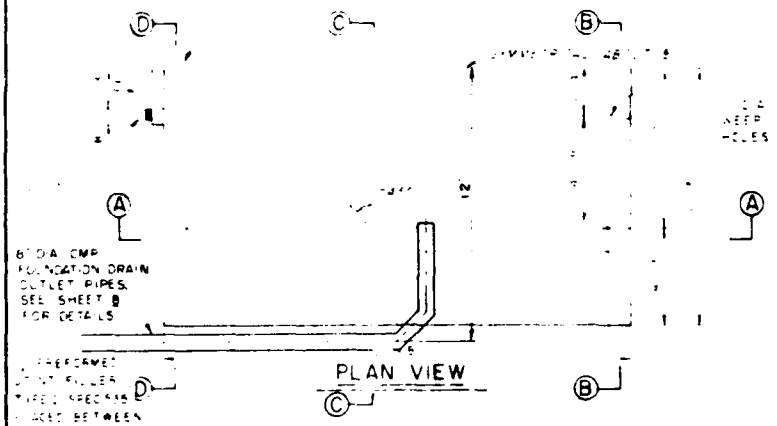


SECTION THRU BAFFLE

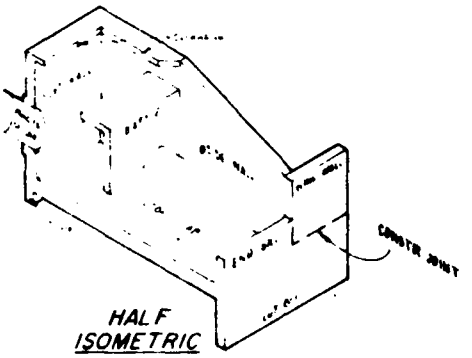


SECTION C-C

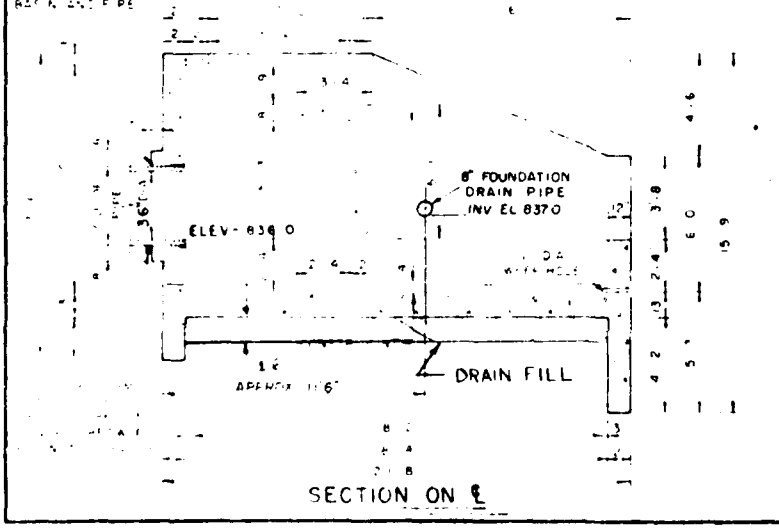
PLAN OF FLOOR SLAB



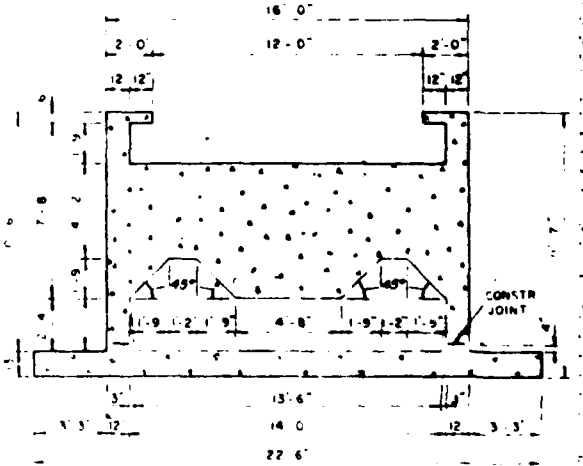
PLAN VIEW



HALF ISOMETRIC

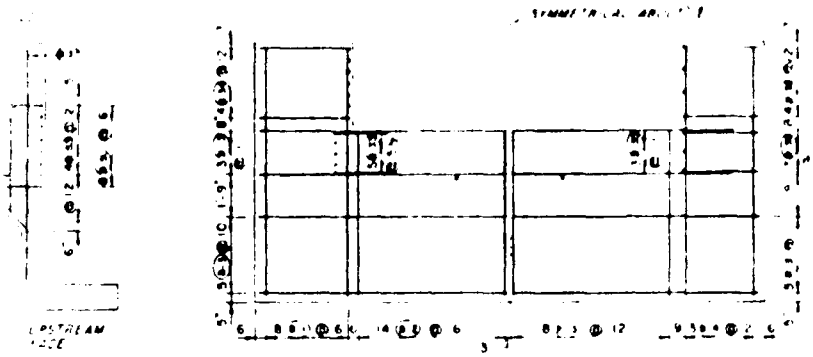


SECTION ON ℄

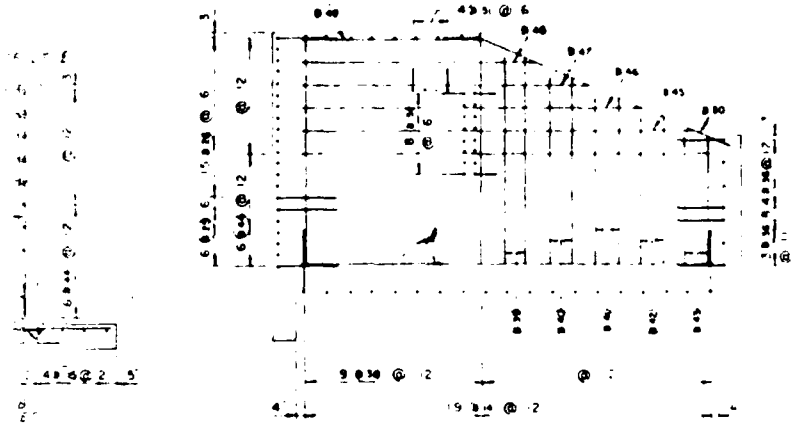


SECTION THRU BAFFLE

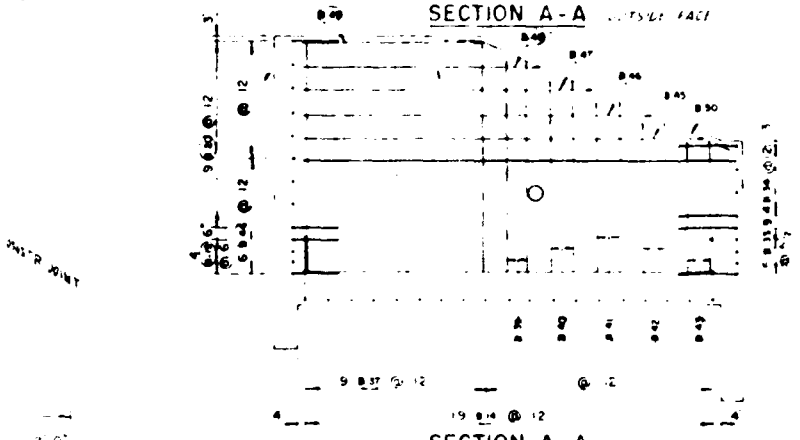
REPRODUCED AT GOVERNMENT EXPENSE



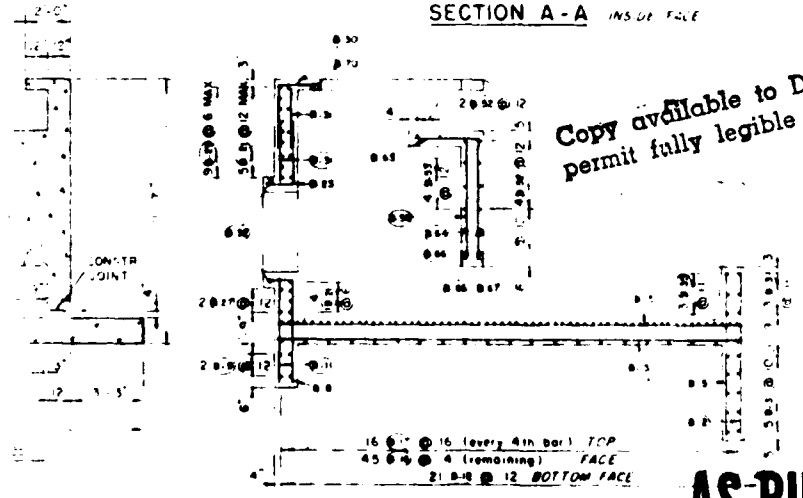
DOWNSTREAM FACE SECTION B-B UPSTREAM FACE



SECTION A-A



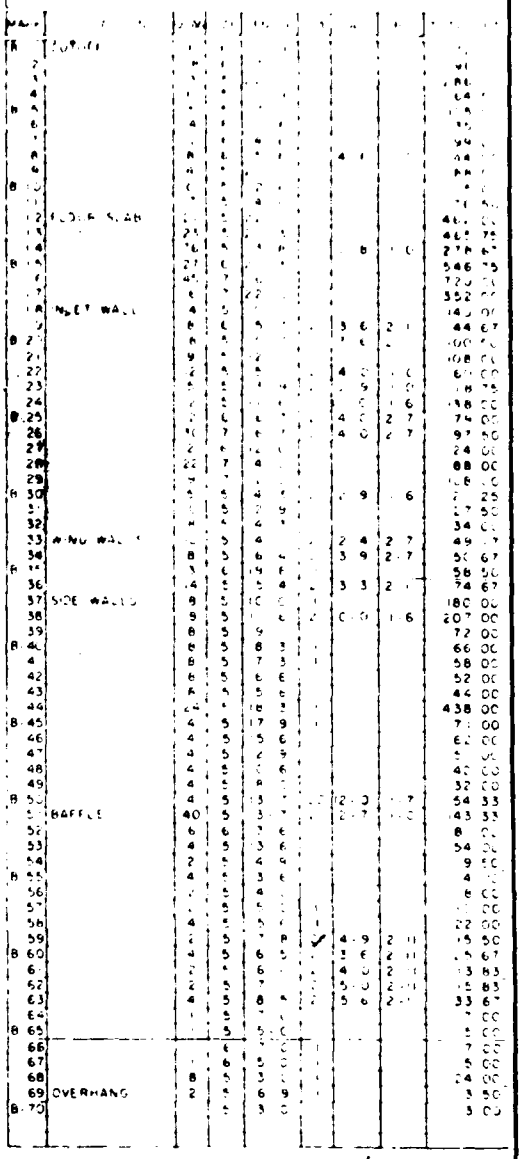
SECTION A-A INSIDE FACE



SECTION ON ℄

Construction Details
See Sheet ___

STEEL SCHEDULE



1 21 22

BAR TYPES

QUANTITIES (THIS SHEET ONLY)

REINFORCING STEEL

NO. 5 BARS	452 (9 L.S.T.)	47,555 LBS
NO. 6 BARS	391.92 L.S.T.	2,507 LBS
NO. 7 BARS	1465.55 L.S.T.	19,955 LBS

CONCRETE

CLASS 4000 49.5 CU. YDS.

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AS-BUILT

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

IMPACT BASIN DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed R. A. GALLO Date; E. J. MERCER - F. D. THEURER	Approved by ... Title ...	
Drawn M. NIKOLICH	Title ...	
Traced ...	Title ...	
Checked L. R. REGA	Sheet No. 22 of 28	Drawing No. MA-371 P

B-12

REPRODUCED AT GOVERNMENT EXPENSE

[illegible]	[illegible]	[illegible]	MEL
0.0	1.0		TOPSOIL, leaf mulch.
1.0	21.0	SM	SAND, silty with gravel, about 25% fines, 20% fine sand, 20% medium sand, 25% coarse sand, 10% gravel, Angular, 1/2-inch maximum size, brown changing to olive at 9 feet, moist, low permeability, very dense, WEATHERED GLACIAL TILL to 9 feet
21.5			Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	7	100
2.	1.5 - 3.0'	45	100
3.	3.0 - 4.5'	51	68
4.	4.5 - 6.0'	79	100
5.	7.0 - 7.5	110/6"	50
6.	10.0 - 11.5	131	100
7.	15.0 - 16.5	85	88
8.	20.0 - 21.5	130	50

Permeability Tests

No.	Depth	Hole Size	H	Loss
1.	5'	3-1/2"	5.5	Very slight Est. 0.1
2.	10'	3-1/2"	5.3	None
3.	15'	3-1/2"	5.0	None
4.	20'	3-1/2"	-	None

NOTE: Water level at 3.9' below ground on 8/15/69.

DH-2	ELEV. 877..	5/13/69 - 8/14/69	MEL
[illegible]	[illegible]	TOPSOIL, rootmat.	
[illegible]	7.5	SAND, gravel, silty, about 10% fines, 20% fine sand, 35% medium sand, 25% coarse sand, 2% gravel, sub-round, 3/8-inch maximum size, brown, moist, medium to low permeability, dense, OUTWASH TERRACE.	SP-SM
7.5	21.5	SAND, silty with gravel, about 25% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, Angular, 1/3-inch maximum size, olive-brown, moist, low permeability, very dense, GLACIAL TILL.	SM
21.5		Bottom of hole.	

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	8	100
2.	1.5 - 3.0'	32	50
3.	3.0 - 4.5'	80/6"	50
4.	6.0 - 6.0'	91	100
5.	[illegible]	105	100
6.	15.0 -16.5'	94	50
7.	20.0 -21.5'	83	50

Permeability Test

No.	Depth	Hole Size	H	Loss
1.	5'	4"	5.3	0.9 gpm
2.	10'	3-1/2"	5.6	None
3.	15'	3-1/2"	5.4	None
4.	20'	3-1/2"	5.5	None

NOTE: Water level at

DH-3	ELEV. 880.7	8/12/69 - 8/13/69	MEL
[illegible]	[illegible]	TOPSOIL, leaf mulch.	
[illegible]	21.0	SAND, gravel, some silt, about 7% fines, 23% fine sand, 30% medium sand, 20% coarse sand, 13% gravel, rounded, 1/2-inch maximum size, brown, damp, medium-high permeability, dense, TERRACE DEPOSITS.	SP-SM
21.0	[illegible]	SAND, silty, about 25% fines, 25% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, angular, 1/2-inch maximum size, grey, moist, low permeability, very dense, GLACIAL TILL.	SM
[illegible]		Bottom of hole.	

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
[illegible]	[illegible]	8	100
[illegible]	[illegible]	66	100
[illegible]	[illegible]	130	88
[illegible]	[illegible]	121	100

Permeability Tests

No.	Depth	Hole Size	H	Loss
[illegible]	[illegible]	[illegible]	5.8	Casing leaked
[illegible]	[illegible]	[illegible]	5.7	None
[illegible]	[illegible]	3-1/2"	5.3	None
[illegible]	2	3-1/2"	5.1	None

NOTE: Water level at [illegible] below ground on 8/12/69.

DH-4	ELEV. [illegible]	8/11/69 - 8/12/69	MEL
0.0	1.0	TOPSOIL, rootmat.	
1.0	20.0	SAND, silty with gravel, about 25% fines, 25% fine sand, 15% medium sand, 20% coarse sand, 15% gravel, sub-angular, 1/2-inch maximum size, brown to olive-gray at 7.5', moist, low permeability, medium dense, GLACIAL TILL weathered to 7.5 feet.	SM
20.0		Bottom of hole.	

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5	9	100
2.	1.5 - 3.0	11	100
3.	3.0 - 4.5	68	50
4.	7.5 - 9.0	66	100
5.	10.0 -11.5	100	100

Permeability Tests

No.	Depth	Hole Size	H	Loss
1.	5'	4"	5.1	very slight Est. 0.1
2.	10'	3"	5.5	None
3.	15'	3"	5.3	None
4.	15-20'	3"	5.1	None

NOTE: Water level at -- pipe frozen on 8/10/69.

DH-5	ELEV. 850.0	8/7/69 - 8/10/69	MEL
0.0	1.0	TOPSOIL, rootmat.	
1.0	9.5	SAND, silty, some gravel and rock fragments, about 10% fines, 30% fine sand, 20% medium sand, 25% coarse sand, 15% gravel, angular, 1-inch maximum size, brown, moist, low permeability, dense, WEATHERED GLACIAL TILL, or GLACIAL OUTWASH.	SM
9.5	45.5	SAND, silty, some gravel, about 25% fines, 25% fine sand, 20% medium sand, 20% coarse sand, 10% gravel, angular, 1/2-inch maximum size, grey, damp, low permeability, very dense, GLACIAL TILL.	SM
45.5	57.0	BEDROCK, mica-schist.	

Standard Penetration Test

No.	Depth	Blow/Ft.	% Recovery
1.	0.0 - 1.5'	9	100
2.	1.5 - 2.5'	80/6"	50
3.	4.5 - 6.0'	137	100
4.	10.0 - 11.5	41	100
5.	15.0 - 16.5'	118	50
6.	20.0 - 21.5'	115	50
7.	35.0 - 36.5'	100	100
8.	42.0 - 43.0	120/6"	50

Permeability Tests

No.	Depth	Hole Size	H	Loss
1.	5'	4"	5.1	Casing leaked
2.	10'	4"	5.0	Very slight
3.	15'	4"	5.0	None
4.	20'	3-1/2"	5.6	None
5.	25'	3-1/2"	5.5	None
6.	30	3-1/2"	5.1	None
7.	35	3-1/2"	5.4	None
8.	40'	3-1/2"	0	None
9.	45'	3-1/2"	0	None

Rock Core Runs

No.	Depth	% Recovery
1.	45.5 - 47.0	50
2.	47.0 - 52.0	70
3.	52.0 - 57.0	68

Rock Pressure Test

No.	Depth	Psi	Loss
1.	47.0 - 57	50	None

NOTE: Water level at 4.5 below ground on 8/11/69.

DH-6	ELEV. 8[illegible].5	7/31/69 - 8/5/69	MEL
0.0	1.0	TOPSOIL, rootmat.	
1.0	10.5	SAND, gravel, silty, about 20% fines, 11% fine sand, 10% medium sand, 10% coarse sand, 4% gravel, sub-rounded, 1-inch maximum size, brown, wet, medium permeability, loose, VALLEY ALLUVIUM.	SM-SC
10.5	41.0	SAND, silty with gravel, about 25% fines, 15% fine sand, 25% medium sand, 25% coarse sand, 10% gravel, angular, 1/2-inch maximum size, grey, damp, low permeability, very dense, GLACIAL TILL.	SM
41.0	[illegible]	Bedrock - mica-schist	

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5	6	100
2.	1.5 - 3.0	13	100
3.	3.0 - 4.5	177	50
4.	4.5 - 6.0	125	100
5.	10.0 -10.5	200/6"	50
6.	33.5 -35.0	93	100
7.	40.0 -41.0	150/6"	100

DH-7	(Lost)
Rock Core Runs	
No.	Depth
1.	41-42
2.	46-47
3.	51-52

DH-7A	
0.0	
0.5	
10.0	
13.0	
26.0	
60.0	

DH-8	
0.0	
1.5	
10.0	
23.0	
35.0	

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REPRODUCED AT GOVERNMENT EXPENSE

DH-6 (Cont'd)

Rock Core Runs

No.	Depth	% Recovery
1.	41-46'	40
2.	46-51'	90
3.	51-56'	80

Permeability Tests

No.	Depth	Hole Size	H	Loss
1.	5'	4"	4'	None
2.	10'	4"	4'	None
3.	15'	4"	4'	None
4.	20'	4"	4'	None
5.	25'	4"	4'	None
6.	30'	3"	4'	None
7.	60'	3"	4'	None

Rock Pressure Test

No.	Depth	PSI	Loss
1.	46 - 56	50	None

NOTE: Water level at hole flowing from top of bedrock. Flow- 0.2 gpm Hyd. Head at +4.6

DH-7A ELEV. 842.07 9/3/68 - 9/6/68 SM

0.0	0.5	TOPSOIL.
0.5	4.5	GRAVEL, sandy, some silt, about 5% fines, 16% fine sand, 22% medium sand, 10% coarse sand, 47% gravel, sub-rounded, 1-inch maximum size, brown-grey at 2.5', deep to wet at 4.0', medium permeability, loose, RECENT ALLUVIUM.
4.5	10.0	SAND, silty, some gravel, about 10% fines, 30% fine sand, 32% medium sand, 10% coarse sand, 18% gravel, sub-angular, 1/2-inch maximum size, greyish brown, wet, medium permeability, dense, CHANNEL FILL.
10.0	13.0	SAND, silty, some gravel, about 21% fines, 51% fine sand, 15% medium sand, 3% coarse sand, 7% gravel, angular, 1/2-inch maximum size, brown, wet, medium permeability, dense, CHANNEL FILL.
13.0	26.0	SAND, silty, some gravel, about 22% fines, 43% fine sand, 10% medium sand, 3% coarse sand, 22% gravel, angular, 3/4-inch maximum size, grey, moist, low permeability, dense, GLACIAL TILL.
26.0	60.0	BEDROCK, cored from 26 to 30 feet. Rec. 1-inches highly weathered, oxidized mica-schist, fractured, fractures spaced 1-inch to 1-foot apart, dipping about 75°.
60.0		Bottom of hole.

Standard Penetration Tests

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	4	12
2.	1.5 - 3.0'	65	88
3.	3.0 - 4.5'	37	88
4.	4.5 - 6.0'	52	66
5.	10.0 - 11.5'	41	33
6.	15.0 - 16.5'	22	88
7.	20.0 - 21.5'	162	50
8.	25.0 - 26.5'	206	50

Permeability Test

No.	Depth	Hole Size	H	Loss
1.	5'	4"	4'	Casing leaked
2.	10'	4"	4'	No loss
3.	15'	4"	4'	None
4.	15-20'	3-1/2"	4'	None
5.	25'	3-1/2"	4'	None

Rock Core Runs

No.	Depth	% Recovery
1.	26 - 30'	58
2.	30' - 33'	0
3.	33 - 37.5'	100
4.	37.5 - 41.0'	100
5.	41.0 - 46.0'	80
6.	46.0 - 51.0'	100
7.	51.0 - 52.0'	100
8.	52.0 - 57.0	100
9.	57.0 - 60.0	100

NOTE: Water level - Artesian flow: Shut in Press: 3.5 No flow Press. - Static water level drilled.

DH-8 ELEV. 845.2 8/1/68 - 8/6/68 SM

0.0	1.5	TOPSOIL, rootmat.
1.5	10.0	SAND, silty with gravel, about 20% fines, 5% fine sand, 15% medium sand, 10% coarse sand, 25% gravel, sub-rounded, 1/2-inch maximum size, brown, wet, medium permeability, medium dense, OUTWASH.
10.0	23.0	SAND, silty, about 35% fines, 20% fine sand, 20% medium sand, 15% coarse sand, 10% gravel, angular, 1/2-inch maximum size, grey, moist, low permeability, very dense, GLACIAL TILL.
23.0	35.	BEDROCK, highly weathered, soft mica-schist at top, badly fractured.
35.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	44	13
2.	1.5 - 3.0'	45	50
3.	3.0 - 4.5	83	5
4.	6.0 - 6.5	121	5

DH-9 ELEV. 844.6 8/8/68 - 8/12/68 SM

0.0	1.0	TOPSOIL, rootmat, wet.
1.0 (2 Ft. to 5.5 ft. boulder)	27.0	SAND, silty, some gravel, about 20% fines, 15% fine sand, 30% medium sand, 10% coarse sand, 10% gravel, 5% cobbles, angular, 1/2-inch maximum size, brown, moist, medium to low permeability, dense, GLACIAL TILL (top 4 feet weathered).
27.0	39.0	BEDROCK, mica-schist to 37, gneiss to 39, 30-35°
39.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	7	0
2.	1.5 - 3.0'	7	0
3.	3.0 - 4.5'	7	0
4.	4.5 - 6.0'	27	0
5.	10.0 - 11.5'	53	10

Permeability Test

No.	Depth	Hole Size	H	Loss
1.	5'	4"	4'	None
2.	10'	4"	4'	None
3.	15'	4"	4'	None
4.	20'	4"	4'	None

Rock Core Runs

No.	Depth	% Recovery
1.	39 - 44'	0
2.	44 - 49'	0
3.	49 - 54'	0

NOTE: Water level at 4.5 ft. after 24 hrs.

DH-10 ELEV. 855.8 8/8/68 - 8/12/68 SM

0.0	1.0	TOPSOIL, rootmat, leaf mulch.
1.0	20.0	SAND, silty with some gravel, about 30% fines, 5% fine sand, 25% medium sand, 20% coarse sand, 5% gravel, angular, 1/2-inch maximum size, brown to grey, damp, low permeability, loose, GLACIAL TILL, (Top 3' weathered)
20.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	8	13
2.	4.5 - 6.0'	25	100
3.	6.0 - 7.5'	15	0
4.	6.0 - 6.5'	75	0
5.	10.0 - 11.5'	84	0
6.	15.0 - 16.5'	152	13

Permeability Test

No.	Depth	Hole Size	H	Loss
1.	5'	4"	5'	Leaked
2.	10'	4"	5'	More
3.	15'	3"	5'	None
4.	20'	3"	5'	None

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS
LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SURVEY DATED: [illegible]
DESIGN DATED: 12-68
TYPED: [illegible] 12-68

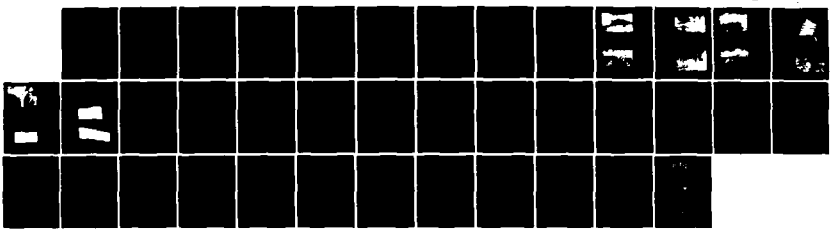
AS BUILT

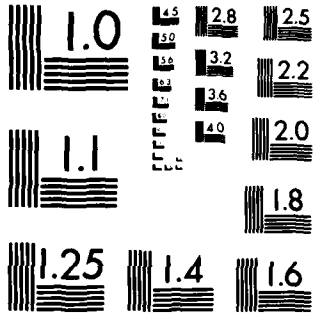
23 MA-371 G
24

B-13

AD-A155 633 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
BLACK BROOK DAM (MA 0..(U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAR 80

UNCLASSIFIED F/G 13/13 NL





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

REPRODUCED AT GOVERNMENT EXPENSE

	ELEV.	
...	1..	TOPSOIL, rootmat, [illegible]
...	2...	SAND, [illegible] some gravel, [illegible] about 2% silt, 3% fine sand, 1% medium sand, 3% coarse sand, 1% gravel, angular, 3/4-inch maximum size, brown to gray, [illegible] feet, moist, [illegible] permeability, very dense, GLACIAL TILL (less dense in top [illegible] foot).
...	...	Bottom of hole.

Standard Penetration Tests

No.	Depth	Blows/Ft.	% Recovery
1.	[illegible]	[illegible]	100
2.	[illegible] - 3.0'	18	90
3.	3.0 - [illegible]	17	0
4.	[illegible] - 6.0'	100	50
5.	[illegible]	110	50

Permeability Tests

No.	Depth	Hole Size		Loss
1.	[illegible]	[illegible]	[illegible]	Casing leaked
2.	[illegible]	[illegible]	[illegible]	very slight
3.	[illegible]	3-1/2"	[illegible]	none
4.	[illegible]-25'	3"	[illegible]	None

	ELEV.	[illegible] 8/13/69 HEL
...	...	TOPSOIL, rootmat, fine-grained sediment.
1...	...0	SAND, silty with gravel & boulders, about 2[illegible] fines, 2½ fine sand, 2½ medium sand, 1½ coarse sand, [illegible] gravel, angular, 3-inch maximum size, brown to gray, [illegible] feet, moist, low permeability, dense, GLACIAL TILL (weathered in top 4 foot).
15...	...0	BEDROCK, weathered mica schist.
...	...	Bottom of hole.

Standard Penetration Test

No.	Depth	Blows/Ft.	% Recovery
1.	[illegible] - 1.5'	[illegible]	100
2.	[illegible] - 3.0	18	100
3.	[illegible] - [illegible]	35	50
4.	[illegible] - 6.0	75	100

Rock Core Runs

No.	Depth	% Recovery
1.	[illegible]	0

Permeability Tests

No.	Depth	Hole Size		Loss
1.	[illegible]	[illegible]	[illegible]	Very slight
2.	[illegible]	[illegible]	[illegible]	None
3.	15'	3"	[illegible]	None
4.	20'	3"	[illegible]	None

	ELEV.	[illegible] 8/12/69 - 8/13/69 HEL
...	...	TOPSOIL, rootmat, leaf mulch.
...	...0	SAND, silty with gravel and mica, about 2[illegible] fines, 30% fine sand, [illegible] medium sand, 1½ coarse sand, 5% gravel, angular, 1/2-inch maximum size, brown, low to [illegible] permeability, dense, WEATHERED GLACIAL TILL.
...	2...	BEDROCK, mica-schist.
25...		Bottom of hole.

Standard Penetration Tests

No.	Depth	Blows/Ft.	% Recovery
1.	[illegible] - 1.5	[illegible]	100
2.	[illegible] - 3.0	18	80
3.	[illegible] - [illegible]	33	80
4.	[illegible] - 6.0	50	97

Permeability Tests

No.	Depth	Hole Size		Loss
1.	[illegible]	3-1/2"	>1	Casing leaked
2.	[illegible]	3-1/2"	[illegible]	No
3.	[illegible]	3-1/2"	Gr.	None

Rock Core Runs

No.	Depth	% Recovery
1.	[illegible]-17	10
2.	[illegible]-21	70
3.	21-25	60

Rock Pressure Test:

No.	Depth	PSI	Loss
1.	[illegible] - 25'	25	[illegible] GPM

	ELEV.	[illegible] 8/6/69 HEL
0.0	0.5	TOPSOIL.
0.5	9.0	SAND, silty, some organic, about [illegible]% fines, 3% fine sand, 2% medium sand, 4% coarse sand, 2% gravel, 3/4-inch maximum size, brown, moist, medium SP-SM permeability, loose, TERRACE DEPOSITS.
9.0	14.5	GRAVEL, sand with rock fragments, about 5% fines, 3% fine sand, 10% medium sand, 20% coarse sand, 6% gravel, angular, 1-inch maximum size, brown, damp, SP-SM medium permeability, very dense
		(11.5 to 12.5 boulder)
14.5	30.0	BEDROCK, mica schist, top 4 feet highly weathered and fractured.
30.0		Bottom of hole.

Standard Penetration Tests

No.	Depth	Blows/Ft.	% Recovery
1.	0.0 - 1.5'	5	100
2.	1.5 - 3.0'	37	88
3.	3.0 - 4.5'	86	86
4.	4.5-5.5 '	111/6"	66
5.	10.0-11.5'	100/3"	100
6.	15.0-16.1	137/8"	100

Permeability Tests

No.	Depth	Hole Size		Loss
1.	5'	[illegible]	[illegible]	Casing leaked
2.	10'	2"-3/8"	Gr.	15.1 GPM
3.	10-15'	3-1/2"	Gr.	15.1 GPM
4.	17-30'	3"	Gr.	Very slight

Rock Core Runs

No.	Depth	% Recovery
1.	15-17'	0
2.	17-21'	100
3.	21-25'	100
4.	25-30	100

NOTE: Water level at 21.0' below ground on 9/11/69

BH-202	ELEV. 901.3	8/[illegible]69 - 8/6/69 HEL
0.0	1.0	TOPSOIL, rootmat.
1.0	3.0	SAND, gravel, about 4% fines, 1% fine sand, 26% medium sand, 20% coarse sand, 40% gravel, subrounded, 1/4-inch maximum size, brown, moist, medium permeability, medium dense, OUTWASH TERRACE. SP-GP
3.0	11.0	SAND, silty, some gravel, about 30% fines, 15% fine sand, 20% medium sand, 20% coarse sand, 15% gravel, angular, 1/2-inch maximum size, gray-brown, moist, low permeability, very dense, GLACIAL TILL. SM
11.0	25.0	BEDROCK, mica schist, fractured, weathered (top 3') fractures spaced 2" to 6" apart. Most fractures dipping 70°, some horizontal.
25.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Blows/Ft.	% Recovery
1.	0.0 - 1.5'	2	100
2.	1.5 - 3.0'	22	100
3.	3.0 - 4.5'	62	100
4.	4.5 - 6.0'	82	100

Rock Core Runs

No.	Depth	% Recovery
1.	11-15	40
2.	15-18	100
3.	18-23	80

NOTE: Water level at - pipe frozen 12/5/69.

BH-203	ELEV. 907.8	8/6/69 HEL
0.0	0.5	TOPSOIL.
0.5	10.0	SAND, silty, some gravel, about 15% fines, 15% fine sand, 30% medium sand, 25% coarse sand, 15% gravel, sub-rounded, 1/2-inch SM maximum size, brown to gray, moist, low to medium permeability, dense, GLACIAL TILL, weathered in top 5 feet.
10.0	30.0	BEDROCK - mica schist - moderately fractured fractures 6 inches to 1.5 inches apart, most fractures dipping 80°, some horizontal.
30.0		Bottom of hole.

Rock Core Runs

No.	Depth	% Recovery
1.	10-13'	70
2.	13-14'	75
3.	14-19'	80
4.	19-24'	100
5.	24-29'	100
6.	29-30'	100

Standard Penetration Test

No.	Depth	Blows/Ft.	% Recovery
1.	0.0 - 1.5	3	100
2.	1.5 - 3.0	22	80
3.	3.0 - 4.5	70	100
4.	4.5 - 6.0	60	66

NOTE: Water level at [illegible] below ground on [illegible]

BH-204	ELEV. 911.2	8/7/69 HEL
0.0	1.0	TOPSOIL, rootmat.

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...(Cont'd) ELEV. ...

...

15.5 20.5

SAND, silty with gravel, about 5% 20% fines, 30% fine sand, 20% medium sand, 15% coarse sand, 15% gravel, sub-angular, 3/4-inch maximum size, brown to grey, ... low permeability, dense, GLACIAL TILL, weathered in top 5 feet.

20.5 31.0

BEDROCK, pegmatite, mostly feldspar and mica; few fractures, soft.

BEDROCK, mica schist, highly fractured, fractures 2-12 inches apart, most fractures dipping about 70 from horizontal.

31.0

Bottom of hole.

Standard Penetration

No.	Depth	Bl./ft.	% Recovery
1.	0.0 - 1.5	13	100
2.	1.5 - 3.0	11	100
3.	3.0 - 4.5	106	88
4.	4.5 - 5.5	1ai/6"	100
5.	10.0 -10.5	103/6"	100

Rock Core Runs

No.	Depth	% Recovery
1.	15.5-18	20%
2.	18-23	20%
3.	23-28	45%
4.	28-31	50%

NOTE: Water level at... pipe frozen on 12/5/69.

DH-205 ELEV. 900.0 8/11/69 - 8/12/69 HEL

0.0 1.0

TOPSOIL, rootmat.

1.0 8.0

SAND, gravel, silty, about 10% fines, 20% fine sand, 35% medium sand, 20% coarse sand, 15% gravel, sub-rounded, 1/2-inch maximum size, brown, moist, medium permeability, loose glacial outwash, TERRACE DEPOSITS. SP-SM

8.0 18.0

SAND, silty with gravel, about 25% fines, 25% fine sand, 15% medium sand, 20% coarse sand, 20% gravel, angular, 1/2-inch maximum size, brown to grey, moist, low permeability, very dense, GLACIAL TILL.

18.0 26.0

BEDROCK - mica-schist - badly weathered - poor recovery

26.0

Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./ft.	% Recovery
1.	0.0 - 1.5	4	100
2.	1.5 - 3.0	80	100
3.	3.0 - 4.5	44	90
4.	4.5 - 5.5	97/6"	50
5.	10.0 -11.5	80	100

Rock Core Runs

No.	Depth	% Recovery
1.	18-21'	30%
2.	21-26'	20%

NOTE: Water level at 10.0' below ground on 8/12/69

DH-206 ELEV. 889.1 7/31/69 - 8/1/69 HEL

0.0 1.0

TOPSOIL, rootmat.

1.0 3 to 4' cored boulder 19.0

SAND, silty, about 25% fines, 25% fine sand, 15% medium sand, 25% coarse sand, 10% gravel, angular, 1/2-inch maximum size, brown to grey, moist, low permeability, very dense, GLACIAL TILL.

19.0

REFUSAL, Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./ft.	% Recovery
1.	0.0 - 1.5	3	100
2.	1.5 - 3.0	108	100
3.	4.0 - 5.5	111	100
4.	10.0 -11.5	152	100
5.	15.0 -16.5	152	100
6.	18.0 -19.0	125/6"	50

NOTE: Water level at 10.0 below ground on 8/4/69.

DH-206A ELEV. 895.7 8/5/69 - 8/6/69 HEL

0.0 1.0

TOPSOIL, rootmat

1.0 11.0

SAND, gravel, silty, about 10% fines, 10% fine sand, 25% medium sand, 30% coarse sand, 25% gravel, sub-angular, 1-inch maximum size, brown to grey, damp, medium to low permeability, SP-SM medium dense, GLACIAL TILL, weathered to 3.5'.

11.0 21.0

BEDROCK, pegmatite, mostly feldspar and mica, few fractures, fractured, fractures ... apart, fractures ... Bottom ...

Standard Penetration Test

No.	Depth	Bl./ft.	% Recovery
1.	...	...	100
2.	1.5 - 3.0	...	80
3.	3.0 - ...	...	...
4.	4.5 - 6.0	...	...
5.	...	...	50

Rock Core Runs

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

NOTE: Water level leveling at surface 8- ... fm. some ... and ... low.

DH-207 ELEV. ... 8/1/69 - 8/6/69 HEL

0.0 ... 1.0

TOPSOIL, rootmat.

1.0 cored boulder 7 to 9 feet 10.0

SAND, silty, some gravel, about 5% 35% fines, 25% fine sand, 15% medium sand, 10% coarse sand, 15% gravel, angular, 1-inch maximum size, grey, damp, low permeability, very dense, GLACIAL TILL.

10.0 27.0

BEDROCK, mica-schist, top 6 ft. badly weathered, rotten, highly fractured, fractures 2 to 3 inches apart, dipping 70°.

27.0

Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./ft.	% Recover
1.	0.0 - 1.5	4	100
2.	1.5 - 3.0	53	100
3.	3.0 - ...	...	100
4.	... - 5.0	53	...

Rock Core Runs

No.	Depth	% Recovery
1.	10.0 - ...	97
2.	15.0 - 20.0	...
3	20.0 - 25.0	...
4.	25.0 - 27.0	100

NOTE: Water level at 10.5 below ground ...

DH-208 ELEV. ... 8/7/69 - 8/8/69 HEL

0.0 1.0

TOPSOIL, Rootmat.

1.0 10.0

SAND, silty, some gravel, about 30% 30% fines, 20% fine sand, 15% medium sand, 25% coarse ... 10% gravel, angular, 1/2-inch maximum size, brown to grey, moist, low permeability, dense, GLACIAL TILL.

10.0 17.0

BEDROCK, mica-schist, badly fractured 1 to 3 inches apart, most fractures dipping 70°, some horizontal.

17.0 40.0

BEDROCK, pegmatite, mostly feldspar and mica slightly fractured, fractured 0 to 3 feet apart.

40.0

Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./ft.	% Recovery
1.	0.0 - ...	3	...
2.	1.5 - 3.0	...	100
3.	3.0 - ...	60	...
4.	4.5 - 6.0	53	100

AS BUILT

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

INVESTIGATED BY D MILLS Date 12/69
TYPED N LONCZAK 12/69

MA-371 G

B-14

REPRODUCED AT GOVERNMENT EXPENSE

8/7/69 - 8/8/69 MEL

Rock Core Runs

No.	Depth	% Recovery
1.	10.0 - 15.0	15%
2.	15.0 - 20.0	0%
3.	20.0 - 23.0	0%
4.	23.0 - 28.0	100%
5.	28.0 - 31.0	100%
6.	31.0 - 36.0	95%
7.	36.0 - 38.0	100%
8.	38.0 - 40.0	100%

NOTE: Water level at 8 feet below ground on 8/8/69.

8/18/69 - 8/19/69 MEL

0.0 - 1.0 TOPSOIL, roots, leaf mulch.

1.0 - 3.0 SAND, gravel, some silt, about 10% fines, 25% fine sand, 20% medium sand, 30% coarse sand, 15% gravel, sub-rounded, 1/4-inch maximum size, brown, moist, medium permeability, loose, GLACIAL OUTWASH TERRACE. SP-SM

3.0 - 20.0 SAND, silty with gravel, about 20% fines, 25% fine sand, 25% medium sand, 20% coarse sand, 10% gravel, angular, 1/2-inch maximum size, brown to gray, moist, low permeability, very dense, GLACIAL TILL (weathered) SM

20.0 - 37.0 BEDROCK - mica-schist, top 3 feet highly weathered, moderately fractured, fractures 6 to 12 inches apart, fractures dipping 70°.

37.0 Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	2	100%
2.	1.5 - 3.0'	9	100%
3.	3.0 - 4.5'	66	66%
4.	10.0 -11.5'	96	86%
5.	15.0 -16.0'	125/5"	88%

Rock Core Runs

No.	Depth	% Recovery
1.	16-17	95
2.	17-20	65
3.	20-25	95
4.	25-29	95
5.	29-32	80
6.	32-37	100

NOTE: Water level at 3.1 below ground on 8/19/69.

BH-3 ELEV. 916.7

8/6/69 - 8/11/69 MEL

0.0 - 1.0 TOPSOIL, rootmat.

1.0 - 17.0 SAND, silty with gravel, about 25% fines, 30% fine sand, 30% medium sand, 5% coarse sand, 1% gravel, angular, 1/2-inch maximum size, brown to gray at 5 feet, moist, low permeability, dense, GLACIAL TILL, weathered in top 5 feet. SM

17.0 - 39.0 BEDROCK, mica-schist moderately fractured fractures spaced 6 to 12 inches apart most fractures dipping 70°, some horizontal.

39.0 Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	3	100
2.	1.5 - 3.0'	31	100
3.	3.0 - 4.5'	83	88
4.	4.5 - 6.0'	110 on rock	100
5.	10.0 -11.0'	120	100
6.	15.0 -15.5'	97/6"	50

Rock Core Runs

No.	Depth	% Recovery
1.	17.0 - 18.0'	100
2.	18.0 - 22.5'	100
3.	22.5 - 27.5'	90
4.	27.5 - 32.5'	75
5.	32.5 - 38.0'	75

NOTE: Water level at 7.4ft below ground on 8/11/69.

8/12/69 - 8/13/69 MEL

0.0 - 1.0 TOPSOIL, roots, etc.

1.0 - 17.0 SAND, silty, some gravel, about 20% fines, 30% fine sand, 30% medium sand, 10% coarse sand, 10% gravel, angular, 1/2-inch maximum size, brown to grey at 4 feet, wet, medium permeability, loose, GLACIAL TILL. SM

17.0 - 30.0 BEDROCK, mica-schist, moderately fractured, fractures 6 to 12 inches apart, most fractures dipping 70° some horizontal.

30.0 Bottom of hole.

BH-211 ELEV. 914.2

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	4	100
2.	1.5 - 3.0'	5	100
3.	3.0 - 4.5'	67	50
4.	4.5 - 5.5'	100/6"	50

Rock Core Runs

No.	Depth	% Recovery
1.	17 - 20'	95
2.	20 - 25'	90
3.	25 - 30'	80

NOTE: Water level at 4.6 feet below ground on 8/12/69.

BH-212 ELEV. 901.5

8/19/69 - 8/20/69 MEL

0.0 - 1.0 TOPSOIL, roots, leaf mulch.

1.0 - 15.0 SAND, silty with gravel, about 20% fines, 25% fine sand, 25% medium sand, 20% coarse sand, 10% gravel, angular, 1/4-inch maximum size, brown to gray, moist, low permeability, very dense, GLACIAL TILL, weathered in top 5 feet. SM

(8 to 10.5 boulder)

15.0 - 28.0 BEDROCK, mica-schist with some quartz seams 3 to 6 inches thick, moderately fractured, fractures 6 to 12 inches apart. Most fractures dipping 70°, some horizontal.

28.0 Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.5 - 1.5'	4	100
2.	1.5 - 3.0'	24	88
3.	3.0 - 4.5'	46	50
4.	4.5 - 6.0'	84	50
5.	11.0 -12.5'	94	50

Rock Core Runs

No.	Depth	% Recovery
1.	15-20'	40
2.	20-23'	50
3.	23-28'	60

NOTE: Water level at 4.6 feet below ground on 8/21/69.

BH-213 ELEV. 8[illegible]

8/11/65 - 8/15/69 MEL

0.0 - 1.0 TOPSOIL, roots, leaf mulch.

1.0 - 7.5-9.5 cored 16.5 boulder SAND, silty with gravel, about 25% fines, 20% fine sand, 25% medium sand, 15% coarse sand, 15% gravel, angular, 1/2-inch maximum size, brown to gray, moist, low permeability, very dense, GLACIAL TILL, weathered to 6 feet. SM

16.5 Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	2	100
2.	1.5 - 3.0'	6	100
3.	3.0 - 4.5'	34	100
4.	4.5 - 5.5'	100/6"	66
5.	10.0 -11.0'	49	50
6.	15.0 -16.5'	44	100

NOTE: No water reading.

BH-214 ELEV. 89[illegible]

8/18/69 - 8/18/69 MEL

0.0 - 1.0 TOPSOIL, roots, leaf mulch.

1.0 - 11.5 SAND, silty with gravel, about 20% fines, 25% fine sand, 25% medium sand, 20% coarse sand, 10% gravel, angular, 3/4-inch maximum size, brown to gray, moist, low permeability, dense to very dense, GLACIAL TILL, weathered to 6 feet.

11.5 Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	5	100
2.	1.5 - 3.0'	18	100
3.	3.0 - 4.5'	34	50
4.	4.5 - 6.0'	70	50
5.	10.0 -11.5'	118	88

NOTE: Water level at 4.7 feet below ground on 8/18/69.

BH-215 ELEV. [illegible]

8/15/69 - 8/16/69 MEL

0.0 - 1.0 TOPSOIL, roots.

1.0 - 13.0 SAND, silty, with gravel, about 15% fines, 20% fine sand, 30% medium sand, 20% coarse sand, 15% gravel, sub-rounded, 3/4-inch maximum size, brown to gray, moist, low permeability, dense to very dense, GLACIAL TILL.

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	10.0		Rock: A. metabasite, hard, few fractures.
			Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	4	100
2.	1.5 - 3.0'	25	100
3.	3.0 - 4.5'	36	100
4.	4.5 - 6.0'	86	100

Rock Core Runs

No.	Depth	% Recovery
1.	10-15'	100
2.	15-20	100

NOTE: Water level at 1.1 below ground on 8/18/69.

% Recovery
100
100
50
50

feet below

HEL

about SM
25% medium
% gravel,
permeability,
weathered

some quarts
, moderately
12 inches
ping 70°,

% Recovery
100
88
50
50
50

feet below

HEL

about SM
, 25%
sand,
-inch
gray, moist,
ense,
to feet.

% Recovery
100
100
100
88
50
100

HEL

about 20%
medium
% gravel,
size, brown
eability,
CIAL TILL.

% Recovery
100
100
50
96
98

set below

6/69 HEL

, about
, 30% medium
15% gravel,
imum size,
ow permeability,
ACIAL TILL.

DH-216 ELEV. [illegible] 8/13/69 - 8/11/69 HEL

0.0	1.0	TOPSOIL, rootmat.
1.0	11.0	SAND, silty with gravel, about 20% fines, 20% fine sand, 30% medium sand, 15% coarse sand, 15% gravel, angular, 1-inch maximum size, brown to grey at 9 feet, moist, low to medium permeability, very dense, GLACIAL TILL. SM
1.0		7 to 9 feet cored boulder
11.0	20.0	BEDROCK, mica-schist, moderately fractured, fractures 6 to 12 inches apart, most fractures dipping 70°, some horizontal.
20.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0-1.5'	3	100
2.	1.5-3.0'	4	88
3.	3.0-4.5'	32	50
4.	4.5-6.0'	61	88
5.	10.0-11.0'	100/6"	100

Rock Core Runs

No.	Depth	% Recovery
1.	11.0-15'	100
2.	15.0-20'	90

NOTE: Water level at 1.0 feet below ground on 8/18/69

8/18/69 HEL

DH-217 ELEV. [illegible]

0.0	1.0	TOPSOIL, roots, leaf mulch.
1.0	12.0	SAND, silty with gravel, some cobbles, 15% fines, 20% fine sand, 20% medium sand, 25% coarse sand, 20% gravel, sub-angular, 3-inch maximum size, brown to grey at 9 feet, moist, medium permeability, dense to very dense, GLACIAL TILL. SM
1.0		4 to 12 ft. cored boulder
12.0	20.0	BEDROCK, mica-schist, moderately fractured, fractures spaced 6-12 inches apart, most fractures [illegible], some horizontal.
20.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	4	80
2.	1.5 - 3.0'	5	50
3.	[illegible]	[illegible]	50
[illegible]			

Rock Core Runs

No.	Depth	% Recovery
[illegible]		
5.	27.0-30.0	100

NOTE: Water level at 1.1 below ground on 8/18/69.

DH-218 ELEV. [illegible] HEL

0.0	1.0	TOPSOIL, rootmat.
1.0	1.0	SAND, gravelly, some silt, about [illegible] SP-SM medium sand, 20% coarse sand, 20% fines, sub-rounded, 2-inch maximum size, brown to grey, moist, MARINE SILT-AND CLAY.
1.0		SAND, silty, with gravel, about 20% fines, 20% fine sand, 20% medium sand, 20% coarse sand, 20% gravel, angular, 6-inch maximum size, brown to grey, moist, low permeability, very dense, GLACIAL TILL. SM

10.0	50.0	BEDROCK, mica-schist, moderately fractured, fractures spaced 2 inches apart, most fractures dipping 70°, some horizontal.
50.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	2	100
2.	1.5 - 3.0'	3	100
3.	3.0 - 4.5'	27	100
4.	4.5 - 6.0'	80	100

Rock Core Runs

No.	Depth	% Recovery
1.	10-15'	85
2.	15-18'	85
3.	18-23'	100
4.	23-28'	100
5.	28-33'	100
6.	33-38'	100
7.	38-43'	100
8.	43-47'	100
9.	47-50'	100

NOTE: Water level at 6.0 feet below ground on 8/21/69.

DH-219 ELEV. 928.8 8/14/69 - 8/15/69 HEL

0.0	1.0	TOPSOIL, roots.
1.0	13.0	SAND, silty with gravel, about 20% fines, 20% fine sand, 25% medium sand, 15% coarse sand, 20% gravel, sub-rounded, 3/4-inch maximum size, brown to grey, moist, low permeability, loose to very dense, GLACIAL TILL. SM
13.0	47.0	BEDROCK, mica-schist, top 7 feet highly fractured, then moderately fractured, fractures 6-12 inches apart, most fractures dipping about 50° some horizontal.
47.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	2	100
2.	1.5 - 3.0'	4	100
3.	3.0 - 4.5'	17	100
4.	4.5 - 6.0'	92	100

Rock Core Runs

No.	Depth	% Recovery
1.	13 - 14.5'	65
2.	14.5-18.0'	90
3.	18.0-23.0'	100
4.	23.0-28.0'	100
5.	28.0-32.0'	100
6.	32.0-37.0'	100
7.	37.0-42.0'	100
8.	42.0-47.0'	100

NOTE: Water level at 15.0 feet below ground on 8/15/69.

DH-220 ELEV. 928.8 8/19/69 - 8/21/69 HEL

0.0	1.0	TOPSOIL, roots, leaf mulch.
1.0	4.0	SAND, gravel, some silt, about 10% fines, 20% fine sand, 35% medium sand, 30% SP-SM coarse sand, 5% gravel, sub-angular, 3/4-inch maximum size, brown, moist, medium permeability, loose, SLOPE WASH.
4.0	15.0	SAND, silty with gravel, about 20% fines, 25% fine sand, 25% medium sand, 20% SM coarse sand, 10% gravel, angular, 2-inch maximum size, brown to grey, moist, low permeability, very dense, GLACIAL TILL.
15.0	36.0	BEDROCK, mica-schist, moderately fractured, fractures spaced 6 inches apart, most fractures dipping 60°, some horizontal.
36.0		Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./Ft.	% Recovery
1.	0.0 - 1.5'	12	100

AS BUILT

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS
LOGS OF TEST HOLES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

INVESTIGATED BY D. MILLS 12/69
TYPED N. LONCZAK 12/69

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B-15

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[illegible] ELEV. [illegible] [illegible] - 8/16/69 HEL

[illegible] Bottom of hole

Standard Penetration Test

No.	Depth	Bl./ft.	% Recovery
[illegible]	0.0 - 1.[illegible]	[illegible]	100
2.	1.5 - 3.0'	17	88
3.	3.0 - [illegible]	50	100
[illegible]	[illegible] - [illegible]	106/6"	50
[illegible]	10.0 -11.5'	98	100

Rock Core Runs

No.	Depth	% Recovery
1.	12 - 17'	100
2.	17 - 22'	100
3.	22 - 26'	100

NOTE: Water level not recorded.

[illegible] ELEV. [illegible] 8/[illegible]/69 HEL

[illegible] 1.0 TOPSOIL, roots.

[illegible] ([illegible] to 7.0 cored boulder) [illegible] SAND, silty with gravel, about 20% fines, 25% fine sand, 25% medium sand, 20% coarse sand, 10% gravel, angular, 3/4-inch maximum size, brown to grey, moist, low permeability, dense, to very dense, GLACIAL TILL. SM

[illegible] Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./ft.	% Recovery
1.	[illegible] - 1.5'	2	100
2.	1.5 - 3.0'	8	100
3.	3.[illegible] - [illegible]	26	50
[illegible]	[illegible] - [illegible]	100/6"	88
[illegible]	[illegible] -11.5'	63	100
6.	15.[illegible] -16.5'	34	100
7.	20.0 -21.5'	72	50

NOTE: Water level not recorded.

[illegible] ELEV. [illegible] 7/31/69 - 8/4/69 HEL

[illegible] [illegible] TOPSOIL, rootmat.

[illegible] [illegible] SAND, gravel, silt, mica-schist, about 10% fines, 10% fine sand, 25% medium sand, 30% coarse sand, 25% gravel, sub-rounded, 3/4-inch maximum size, brown, moist, medium permeability, dense to very dense, VALLEY ALLUVIUM. SP-SM

[illegible] 32.0 SAND, silty, some gravel, about 25% fines, [illegible]% fine sand, 10% medium sand, 20% coarse sand, 15% gravel, angular, 1/2-inch maximum size, grey, moist, low permeability, very dense, GLACIAL TILL. SM

[illegible] [illegible] BEDROCK, mica-schist, weathered in top [illegible] feet, moderately fractured.

[illegible] Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./ft.	% Recovery
1.	[illegible] - 1.[illegible]	11	100
2.	[illegible] - [illegible]	177	100
3	[illegible] - [illegible]	252	100
[illegible]	[illegible] - [illegible]	[illegible]	100
[illegible]	[illegible] -[illegible]	[illegible]	100
[illegible]	[illegible] -[illegible]	100	50

Permeability Tests

No.	Depth	Hole Size	K	Loss
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	Or	None
[illegible]	[illegible]	[illegible]	Or	Very slight
[illegible]	2[illegible]	[illegible]	Or	None
[illegible]	2[illegible]	[illegible]	Or	None
[illegible]	[illegible]	[illegible]	Or	[illegible] slight
[illegible]	[illegible]	[illegible]	Or	Very slight

Rock Core Runs

No.	Depth	% Recovery
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Packer Tests

No.	Depth	Bpi	K	Loss
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] unable to seat

Water level at ground level on 8/5/69

[illegible] ELEV. [illegible] [illegible] - 8/[illegible]/69 HEL

[illegible] TOPSOIL, rootmat

[illegible] SAND, gravel, some silt, about 08 fines, [illegible] fine sand, 3.5 medium sand, 2.5 coarse sand, 2.5 gravel, sub-rounded, 1-inch maximum size, brown, wet, medium to high permeability, dense, ALLUVIUM.

[illegible] SAND, silty, some gravel, about 15% fines, [illegible]% fine sand, 15% medium sand, 15% coarse sand, gravel, angular, 1-inch maximum size, grey-tan, damp, medium to low permeability, very dense, GLACIAL TILL.

[illegible] (Cont'd ELEV. [illegible] 8/5/69 HEL

87.0 60.0 BEDROCK, mica-schist, hard.

60.0 Bottom of hole.

Standard Penetration Test

No.	Depth	Bl./ft.	% Recovery
1.	0.0 - 1.5'	8	100
2.	1.5 - 3.0'	16	100
3.	3.0 - 4.5'	70	88
4.	6.0 - 7.5'	42	88
5.	7.5 - 9.0'	136	50
6.	11.0 -12.5'	104	100
7.	15.0 -15.2'	100/2"	0
8.	20.0 -21.5'	90	100

Permeability Tests

No.	Depth	Hole Size	K	Loss
1.	5'	4"	5.3	Cavity formed
2.	10'	4"	5.6	very slight
3.	15'	3"	5.5	None
4.	20'	3"	5.5	None
5.	25'	3"	[illegible]	None

Rock Core Runs

No.	Depth	% Recovery
1.	27 - 30'	90
2.	30 - 35'	95
3.	35 - 40	95

Packer Tests

No.	Depth	Bpi	K	Loss
1.	27.[illegible] - 40.5	35	[illegible]	None

NOTE: Water level at ground level on 8/6/69.

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1	99	Stream channel	401	499
Borrow area	101	199	Relief wells	501	599
Emergency spillway	201	299		601	699
Centerline of outlet structure	301	399		701	799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels, gravel sand mixtures
GP	Poorly graded gravels
GM	Silty gravels, gravel sand silt mixtures
GC	Clayey gravels, gravel sand clay mixtures
SW	Well graded sands, sand gravel mixtures
SP	Poorly graded sands
SM	Silty sand
SC	Clayey sands, sand clay mixtures
ML	Silts with liquid limit of 50 or less
MH	Silts with liquid limit above 50
CL	Clays with liquid limit of 50 or less
CH	Clays with liquid limit above 50
OL	Organic silts and clays with liquid limit of 50 or less
OH	Organic silts and clays with liquid limit above 50

TP-151

0.0

9.0

TP-152

0.0%

1.0

8.0

TP-153

0.0

1.0

8.0

TP-154

0.0

1.0

12.0

TP-155

0.0

1.0

12.0

TP-156

0.0

1.0

12.0

TP-157

0.0

1.0

13.0

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REPRODUCED AT GOVERNMENT EXPENSE

TP-151	ELEV.	12/1/69	HEL	
0.0	9.0	TOPSOIL removed, sand, silty, about 30% fines, 40% fine sand, 15% medium sand, 15% coarse sand, 10% gravel, sub-angular, 12-inch maximum size, olive, damp, low permeability, dense, GLACIAL TILL, about 10% plus 6-inch size.		
9.0		BEDROCK.		
		No Sample.		

TP-152	ELEV. 891.6	12/1/69	HEL	
0.0	1.0	TOPSOIL.		
1.0	8.0	SAND, silty, about 20% fines, 40% fine sand, 15% medium sand, 15% coarse sand, 10% gravel, sub-angular, 15-inch maximum size, red-brown to olive at 3 feet, damp, low permeability, dense, GLACIAL TILL, about 15% plus 6-inch size.		
8.0		BEDROCK.		
		No Sample.		

TP-153	ELEV. 879.8	12/1/69	HEL	
0.0	1.0	TOPSOIL.		
1.0	8.0	SAND, silty, about 20% fines, 40% fine sand, 15% medium sand, 15% coarse sand, 10% gravel, sub-angular, 2½-inch maximum size, red-brown to olive at 3 feet, damp, low permeability, dense, GLACIAL TILL, about 15% plus 6-inch size.		
8.0		BEDROCK.		
		Sample 153.1 -- 3 feet to 8 feet.		

TP-154	ELEV. 879.2	12/1/69	HEL	
0.0	1.0	TOPSOIL.		
1.0	12.0	SAND, silty, about 20% fines, 40% fine sand, 15% medium sand, 15% coarse sand, 10% gravel, sub-angular, 20-inch maximum size, red-brown to olive at 3 feet, damp, low permeability, dense, GLACIAL TILL, about 12% plus 6-inch size.		
12.0		Bottom of pit.		
		No Sample.		

TP-155	ELEV. 894.8	12/1/69	HEL	
0.0	1.0	TOPSOIL.		
1.0	12.0	SAND, silty with gravel and cobbles, about 20% fines, 40% fine sand, 20% medium sand, 10% coarse sand, 10% gravel, angular, 18-inch maximum size, olive, damp, low permeability, dense, GLACIAL TILL, about 10% plus 6-inch size.		
12.0		Bottom of pit.		
		Sample 155.1 -- 3 feet to 12 feet.		

TP-156	ELEV. 894.7	12/1/69	HEL	
0.0	1.0	TOPSOIL.		
1.0	12.0	SAND, silty, with gravel and cobbles, about 20% fines, 40% fine sand, 20% medium sand, 10% coarse sand, 10% gravel, angular, 18-inch maximum size, olive, damp, low permeability, dense, GLACIAL TILL, about 15% plus 6-inch size.		
12.0		Bottom of pit.		
		No sample.		

TP-157	ELEV. [illegible]	12/1/69	HEL	
0.0	1.0	TOPSOIL.		
1.0	14.0	SAND, silty with gravel, about 20% fines, 40% fine sand, 20% medium sand, 10% coarse sand, 10% gravel, sub-angular, 18-inch maximum size, olive, damp, low permeability, dense, GLACIAL TILL, about 15% plus 6-inch size.		
14.0		Bottom of pit.		
		Sample 157.1 -- 3 feet to 14 feet		

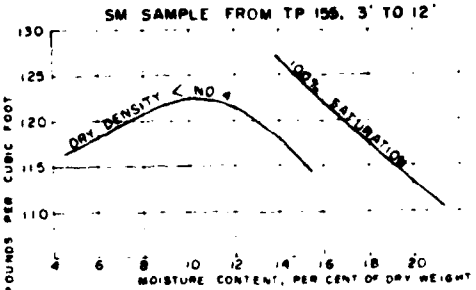
TP-160	ELEV. 894.5	12/2/69	HEL	
0.0	1.0	TOPSOIL.		
1.0	13.0	SAND, silty with gravel, about 20% fines, 40% fine sand, 20% medium sand, 10% coarse sand, 10% gravel, sub-angular, 18-inch maximum size, olive, damp, low permeability, dense, GLACIAL TILL, about 15% plus 6-inch size.		
13.0		Bottom of pit		
		No Sample.		

TP-161	ELEV. [illegible]	12/2/69	HEL	
0.0	1.0	TOPSOIL.		
1.0	13.0	SAND, silty with gravel, about 20% fines, 40% fine sand, 20% medium sand, 10% coarse sand, 10% gravel, sub-angular, 18-inch maximum size, olive, damp, low permeability, dense, GLACIAL TILL, about 15% plus 6-inch size.		
13.0		Bottom of pit.		
		Sample 161.1 -- 3 feet to 13 feet		

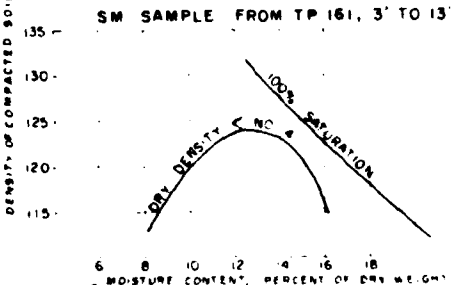
NOTE: Samples above 3 feet are not taken because of Japanese Beetle quarantine.

COMPACTION CURVES STANDARD PROCTORS

SM SAMPLE FROM TP 158, 3' TO 12'



SM SAMPLE FROM TP 161, 3' TO 13'



AS BUILT

BRADLEY BROOK WATERSHED PROJECT
BLACK BROOK MULTIPLE-PURPOSE DAM
HAMPDEN COUNTY, MASSACHUSETTS

LOGS OF TEST HOLES

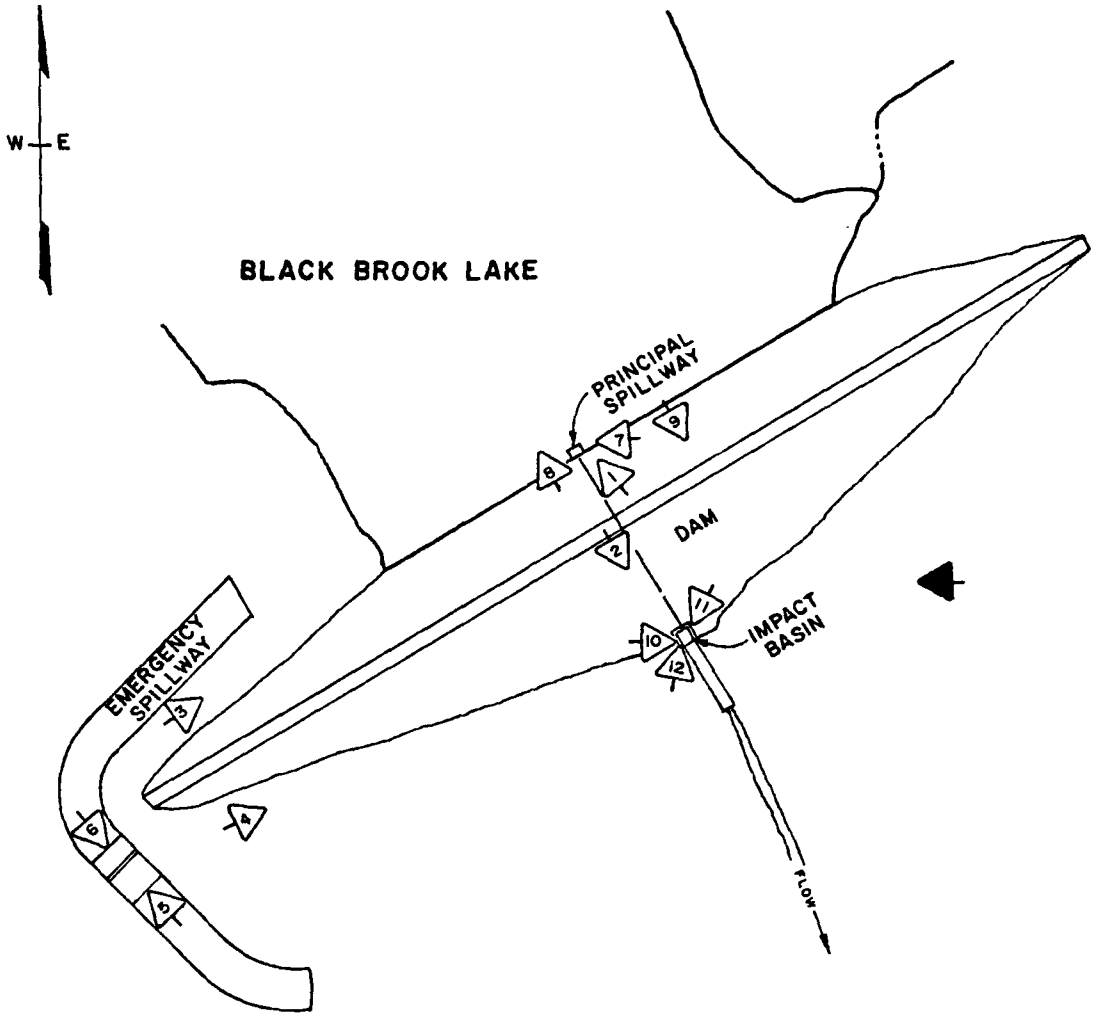
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

INVESTIGATED BY D MILLS 12/69
TYPED N LONCZAK 12/69

MA-371 6

APPENDIX C

PHOTOGRAPHS



OVERVIEW (AERIAL)

3 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

BLACK BROOK DAM (MA 01057)
HAMPDEN COUNTY

BLANDFORD
MASSACHUSETTS

SCALE: NONE

DATE: MARCH 1980

REPRODUCED AT GOVERNMENT EXPENSE

Photo 1

Overview of impoundment and principle spillway

Photo 2

Overview of impact basin and downstream channel

TO PRODUCED AT GOVERNMENT EXPENSE

[illegible]

[illegible] of upstream [illegible] of dam from [illegible] channel of [illegible] spillway on [illegible] side of dam

[illegible]

[illegible] of downstream [illegible] of dam from [illegible] emergency spill- [illegible] training wall

REPRODUCED AT GOVERNMENT EXPENSE

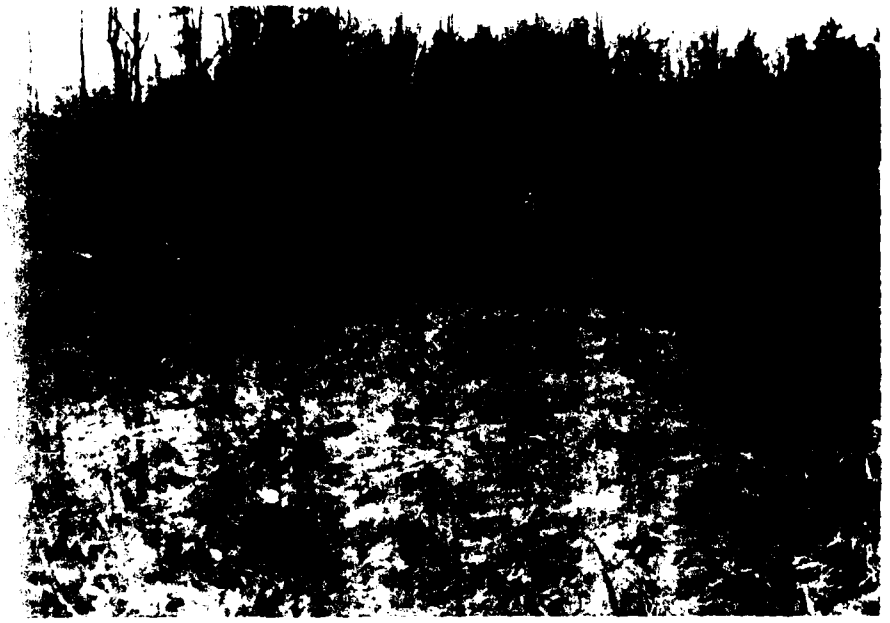


Photo 5

Overview of approach channel of emergency spillway from discharge channel

Photo 6

Overview of discharge channel of emergency spillway looking downstream from a point just below crest of spillway

REPRODUCED AT GOVERNMENT EXPENSE

Photo 7

View of left side or principle spillway. Note trash rack damage and missing bar.

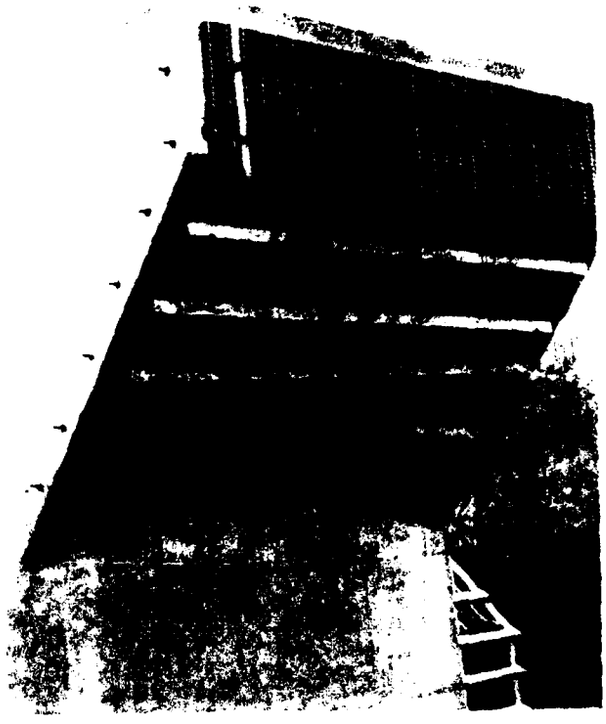


Photo 8

[illegible] of silt that has washed out from under riprap on upstream embankment at normal pool elevation.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 9

View of silt material used for bedding riprap on upstream side of embankment

Photo 10

View of left foundation drain at impact basin. Note flow and buildup of slime.

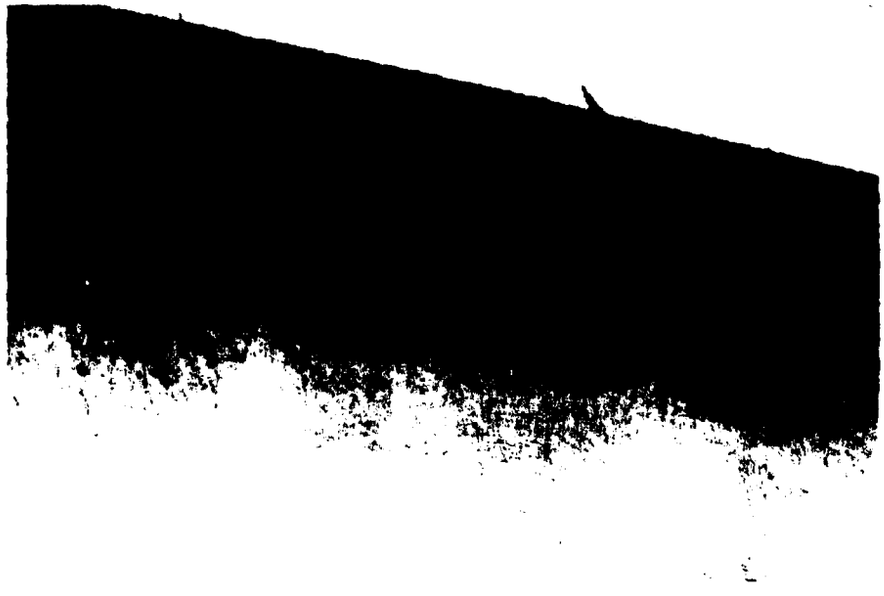
REPRODUCED AT GOVERNMENT EXPENSE

hoto 11

iew of right foundation drain
: impact basin. Note flow
nd buildup of slime

sto 12

ew of underside of impact basin
erhang. Note cracks and efflo-
escence.

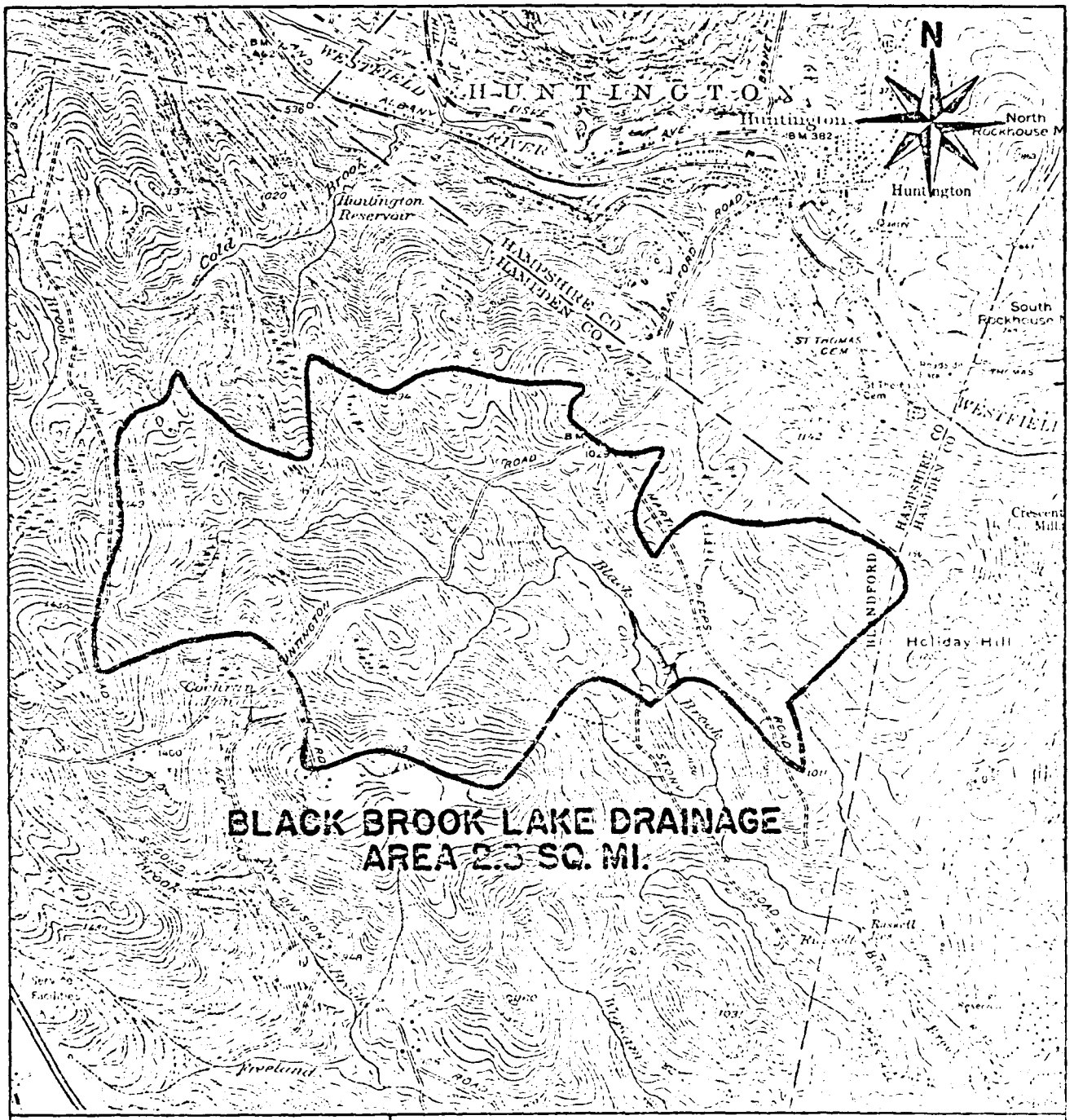


APPENDIX D

OUTLINE OF DRAINAGE AREA AND COMPUTATIONS

APPENDIX D

OUTLINE OF DRAINAGE AREA AND HYDRAULIC COMPUTATIONS



-SCALE-

1000' 0 1000' 2000' 3000' 4000' 8000'

FROM: U.S.G.S. BLANDFORD, AND WORONOCO, MASS. QUADRANGLE MAPS

QUADRANGLE LOCATION

TIGHE & BOND / SCI
CONSULTING ENGINEERS
EASTHAMPTON, MASS.

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

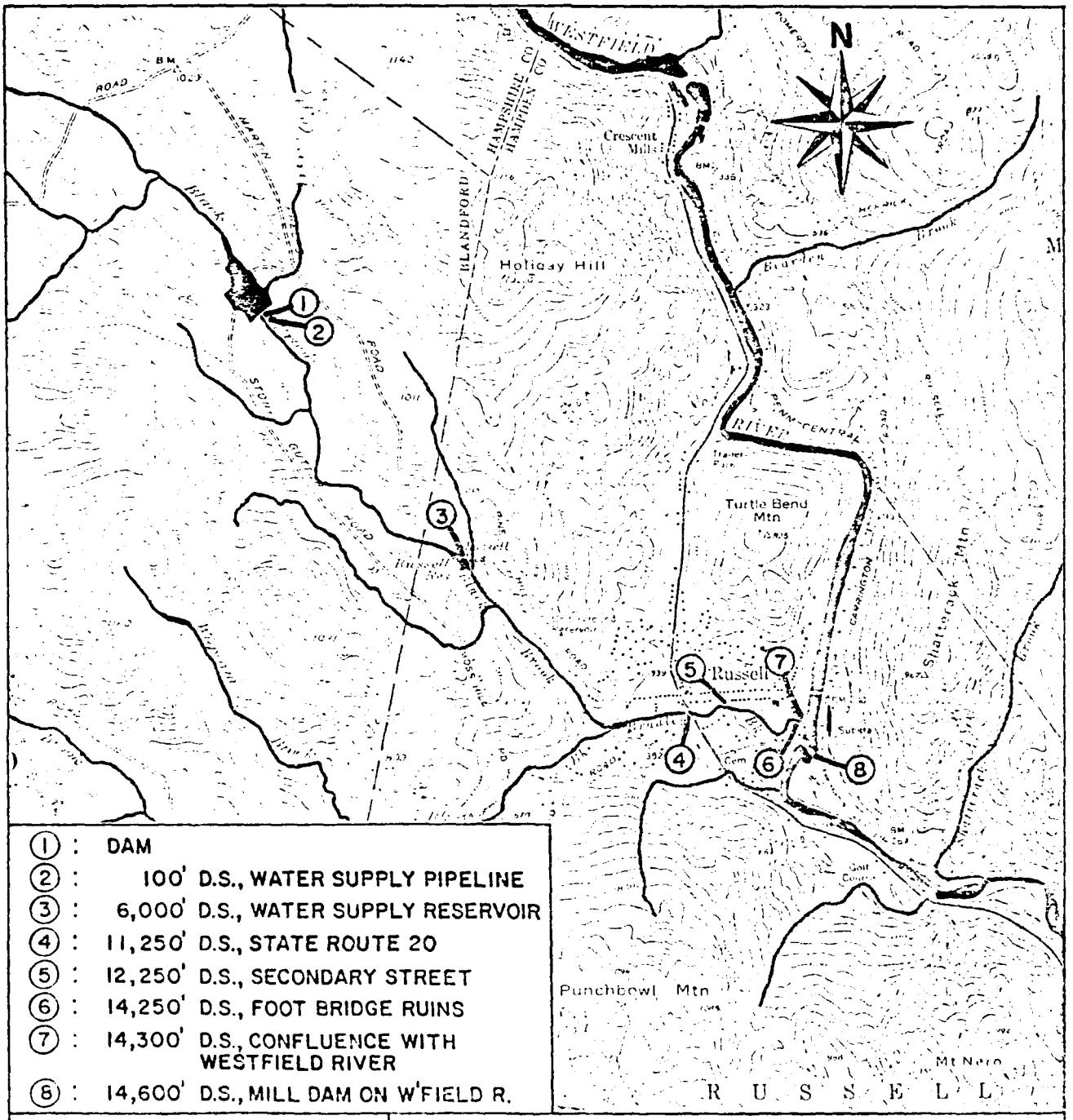
DRAINAGE AREA MAP

BLACK BROOK DAM (MA 01057)
HAMPDEN COUNTY

BLANDFORD
MASSACHUSETTS

SCALE : AS NOTED

DATE : MARCH 1980



(1)	:	DAM
(2)	:	100' D.S., WATER SUPPLY PIPELINE
(3)	:	6,000' D.S., WATER SUPPLY RESERVOIR
(4)	:	11,250' D.S., STATE ROUTE 20
(5)	:	12,250' D.S., SECONDARY STREET
(6)	:	14,250' D.S., FOOT BRIDGE RUINS
(7)	:	14,300' D.S., CONFLUENCE WITH WESTFIELD RIVER
(8)	:	14,600' D.S., MILL DAM ON W'FIELD R.

-SCALE-

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

FROM: U.S.G.S. BLANDFORD, AND WORONOCO, MASS. QUADRANGLE MAPS

QUADRANGLE LOCATION

TIGHE & BOND / SCI
CONSULTING ENGINEERS
EASTHAMPTON, MASS.

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND DOWNSTREAM HAZARD MAP

BLACK BROOK DAM (MA01057)
HAMPDEN COUNTY

BLANDFORD
MASSACHUSETTS

SCALE: AS NOTED

DATE: MARCH 1980

2/23/80 [illegible] Connecticut Moe

Black Brook Dam

Drainage Area - 23 SM

1) Size Classification

Height of Dam

Top of dam - 896.0

S.S Toe - 833.7

Height of dam 62.3

62.3 ft > 40 but < 100

∴ Intermediate

Storage at Top of Dam - 1620 AF

1620 AF > 1000 AF but < 50,000

∴ Intermediate

[illegible]

2) Hazard Potential

[illegible]

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2/23/80 Mac 2

Area in basin is mountainous

-less for the mountainous areas

from COE and Gould For Fel

PMF Discharge:

∴ Disch. for mountainous

= 2700 cfs/sm

Disch. = 2700 × 2.0 = 5750 cfs

use 5750 cfs

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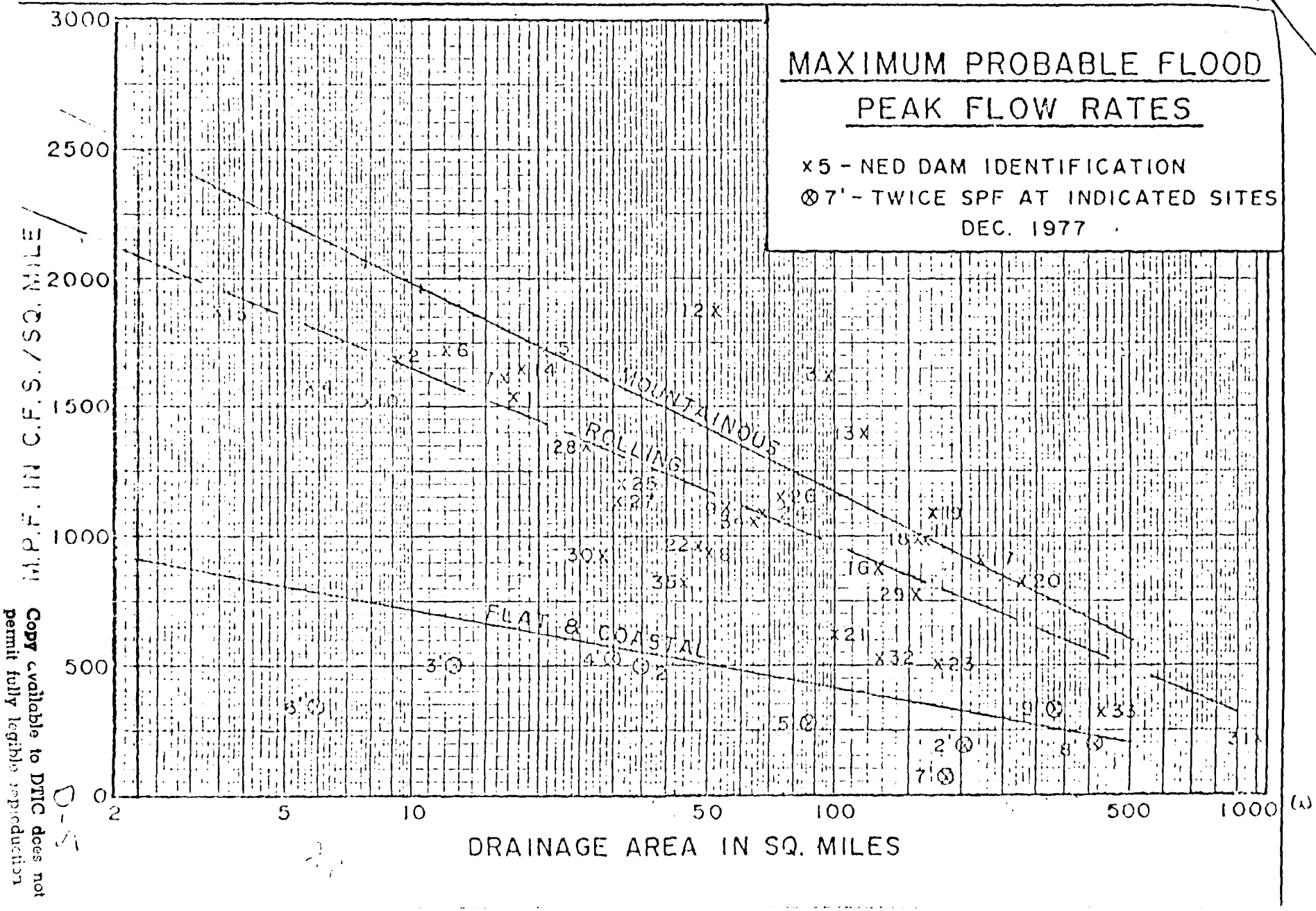

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Spillway and Conduit Rating

The principal spillway has a normal [illegible] with 3'6" [illegible] which is 2'-1" [illegible] and [illegible] high. Also the [illegible] has a high stage weir [illegible] the [illegible] of the dam [illegible] having a [illegible] of 13

A 36 ϕ concrete pipe extends [illegible] the dam from the riser to the [illegible]

[illegible] has been excavated around the right side of the dam in the abutment. The spillway is 50' wide at the [illegible] where the dam has a flat crest 30' wide at elevation 385.7 [illegible] has a [illegible] concrete weir [illegible]

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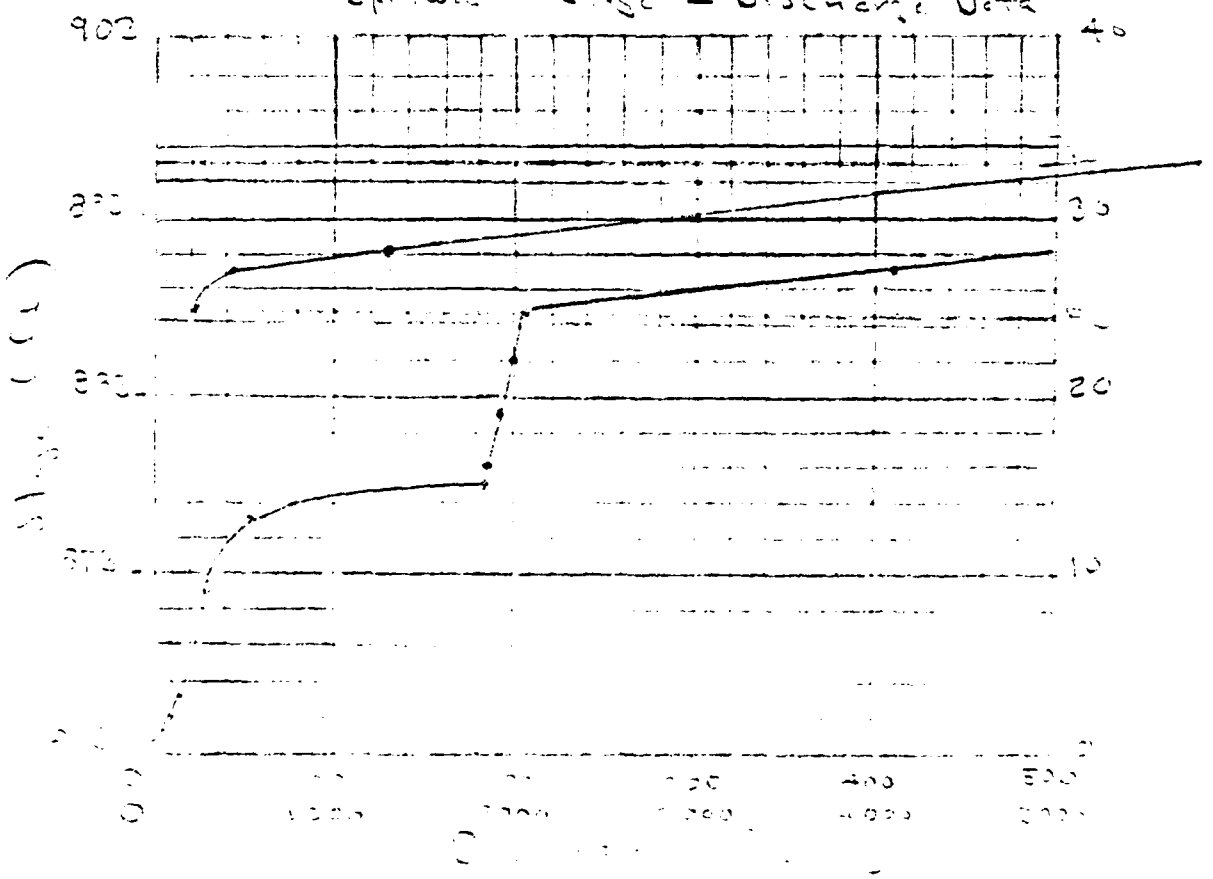
D-6

There exists an 18" reservoir drain from the drain structure in the reservoir to the base of the riser.

The following spillway and conduit rating information was taken from the hydraulic section of the design file for the Black Brook Dam site, other SCS releases. The following information was taken from the files and technical releases and includes the computations of the data [illegible] for plotting.

Spillway Stage – Discharge Data



D-7

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Reservoir Routing

Surcharge elevation to pass (Qp1) 5500 cfs

elevation = 896.5 ±

Surcharge height = 896.50 ±
− 863.50
33.00

From SCS Storage - Elevation Curve
for hydrologic study of the Dry Fork

Stor. @ 896.50 = 1680 AF

Stor. @ Bottom = 79 AF

Volume = 1612 AF

Depth = $\frac{1612 \text{ AF}}{148 \text{ AC}}$ = 1.09 or 13"

Depth (5500 cfs − $\frac{13}{12}$) = 1831 cfs

Surcharge elev. for Qp1 = 892.0 ±

Volume 891.7 ± = 1280 AF

891.7 ± = 79 AF
1212

$\frac{1212 \text{ AF}}{148 \text{ AC}}$ = 8.2 or 9.8"

[illegible] = 5309 cfs

[illegible] = 1280 AF
79 AF
1359 AF

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2/22/80 [illegible] MC

REVISED BY SHD

Spillway Rating Curve

Supplemental to Design Folder Info

Elev	Conduit	E S	Dam	Total
887.5	204.5	0	–	204.5
890	209.9	200	–	409.9
89[illegible].0	213.0	1100	–	1313.0
897	223.1	5600	3755	9580

Q over dam $= cLH^{3/2}$ $C = 3.3$ $L = 1138'$ $H = 1'$

$Q_{897} = 3755$ cfs

Capacity of Low Stage Outlet:

[illegible] 33" x 2" [illegible] 833.3 [illegible]

[illegible] = 866 − 833.3 = 32.8 [illegible]

[illegible] $\sqrt{2(32.2)[illegible]}$ = 67 cfs

[illegible]

Copy available to DTIC does not permit fully legible reproduction

Storm $\frac{1282.4 F}{1487 A} = 0.86$ or $10.3''$

$Q_{pA} = 5000\left(1 - \frac{10.3}{19}\right) =$

Q_{pA} 2655 cfs

Discharge Elev. 892.5

Volume 892.5 − 1300 AF

Volume 891.7 − 78 AF

1222 AF

Storm $\frac{1222}{1487} = 0.83$ or $9.9''$

Storm agrees with Storm A

∴ Dam will not be overtopped

Stage will be at 893 and

discharge will be 2655 cfs

Copy available to DTIC does not permit fully legible reproduction

DAM FAILURE ANALYSIS

$Q_1 = 8/27\ W_b \sqrt{g}\ Y_b^{3/2}$

W_b: Mid height = Dam = (316+934)/2 = 565

Length across river to original ground at Elev. 865 (see sheet 4/28SCS) = 692'

19+62 − 12+92 = 670'

Sta 19+62 = 692'

Sta 6+92

$W_b = 40\%$ of 680 = 272'

Y_b: Min. of Dam Elev. at Spillway Top Elev. = 893

Base Elev. at C/L Dam = 834

Y_b = 59'

$Q_1 = 8/27 (27.2\sqrt{32.2})\ 59^{3/2} =$ 227,053 cfs

DAM FAILURE ROUTING

Drainage Area at Dam = 2.2 sq. mi.

Spillway Top Elev. = Pool Maximum Surface

Spillway Top Flow Discharge = 2500 cfs.

Top of Dam Peak Discharge = 227,050 cfs.

Time of Peak Flow = 1050 hrs.

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4/13/60 DAM FAILURE Mac BLACK EAGLE DAM

FIRST REACH: DAM TO RUSSELL RES.

Length: 41, 3.50 = 415"
[illegible] = 3.50"
Length = [illegible] 2.50" (2700) = 6700 ft.

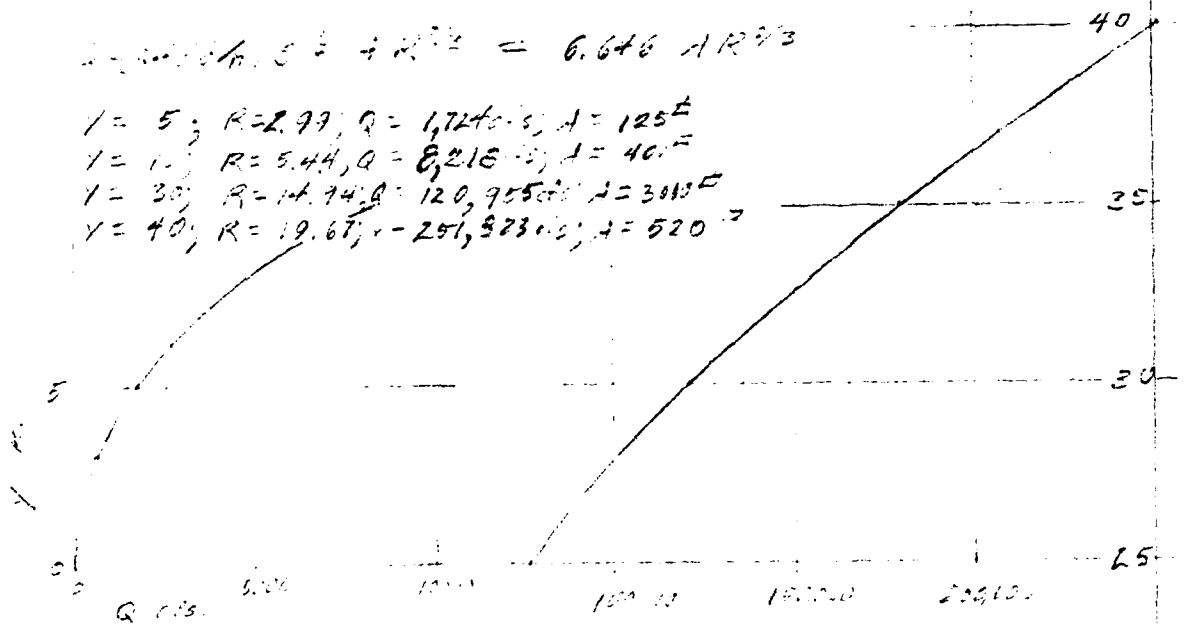
Slope S = (834 - 620)/6700 0.032 ft/ft

n = 0.04

Valley X Section:

A = 12y + 4/2 y² = 12y + 2y²
WP = 4.12y + 2.24y + 12 = 6.36y + 12
R = A/WP = [illegible]
Q = 1.49/n S^½ R^⅔ = 6.646 AR^⅔

y = 5; R = 2.99; Q = 1,724 c.f.s.; A = 125 ft²
y = 10; R = 5.44; Q = 6,216 c.f.s.; A = 402 ft²
y = 30; R = 14.94; Q = 120,955 c.f.s.; A = 3018 ft²
y = 40; R = 19.67; Q = 251,923 c.f.s.; A = 5201 ft²



Before failure [illegible] y = 27.0 ft; V = 6.2; A = 177 ft²; V = 177 [illegible]/4350 = 27. ft.

After failure [illegible] y = 37.1 ft; A = 430 ft²; V = 1150 [illegible]/4350 = 8.12 ft.

D = [illegible] = 2700 - 2.48 (11 - [illegible]/1350) = 2700 + 193.65 = 2893.65 ft.

[illegible] = 5; y = 2.5 ft; A = [illegible] Y_av = 697 - 419/2 = 555.5 ft.

[illegible] = 555.5/5 = 2700 (12.44) = 127 [illegible]

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REACH 2: Russell Rd. to Stage Brook

Reach Length: 1.55" (2700') = 4200'

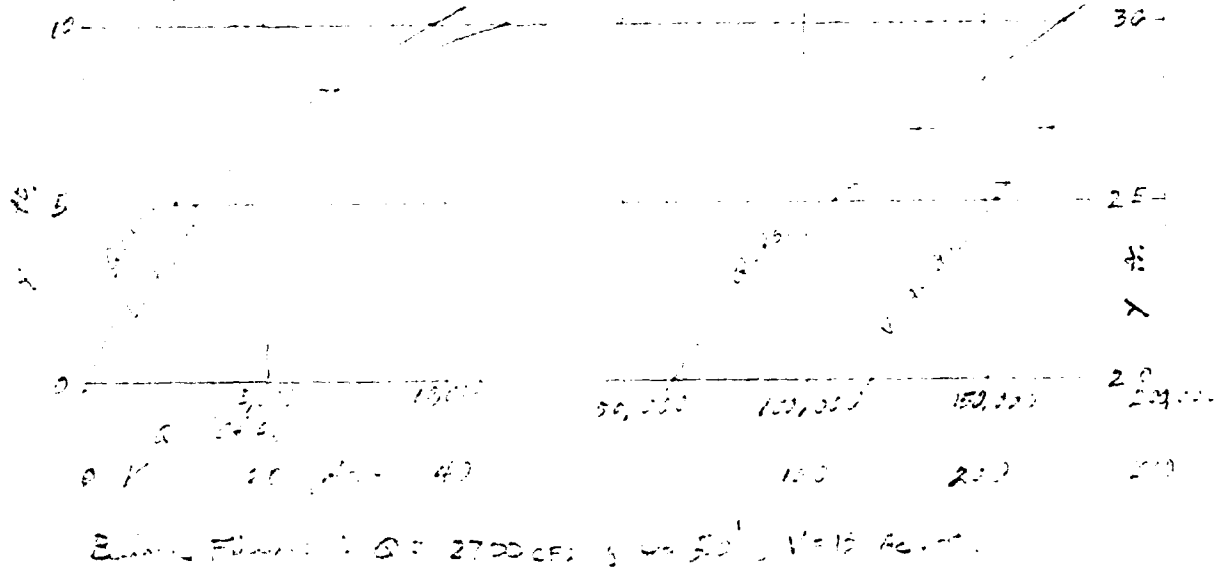
Slope: (620 - 344)/4200 = 0.065

Valley X-section: same as reach 1; n = 0.040

MPF Ranch: Drainage Area: Dam = 2.3 sq.mi
Dam to Stage Brook = 1.87
4.17 sq.mi

$Q = 1.49/n\, S^{1/2} A R^{2/3} = 3.471 A R^{2/3}$

Y = 5'; R = 2.991; Q = 2,498 cfs; A = 125 ft²; V = 12.1 ft/s.
Y = 10'; R = 5.435; Q = 11,712 cfs; A = 401 ft²; V = 38.6 ft/s.
Y = 20'; R = 10.94; Q = 172,376 cfs; A = 1000 ft²; V = 259. ft/s.
Y = 25'; R = 12.576; Q = 103,941 cfs; A = 2125 ft²; V = 205 ft/s.
Y = 30'; R = 10.205; Q = 62,337 cfs; A = 1491 ft²; V = 135 ft/s.



Existing Flow: Q = 2700 cfs; Y = 5.0', V = 12 ft/s.

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CHD REVISED 7/1/80

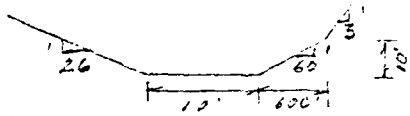
DAM FAILURE HYDRAULICS — MAS BLACK BROOK DAM

REACH 3, Stage Brook Confluence to Westfield River

Reach length L_3 = 1.49(2711) = 4033'

Slope: (345 − 220)/4033 = 0.0310 ft/ft

n = 0.03; Valley X-Section:



$Y < 10'$: $A = 26Y^2/2 - 10Y + 60Y^2/2 = 43Y^2 - 10Y$

$Y = Y-10$, $A = 4430 + 260Y^2/2 + 670Y + 3Y^2/2 = 444.5Y^2 + 270Y + 1430$

$Q = 1.49 AR^{2/3} S^{1/2} = 7.21 A R^{2/3}$

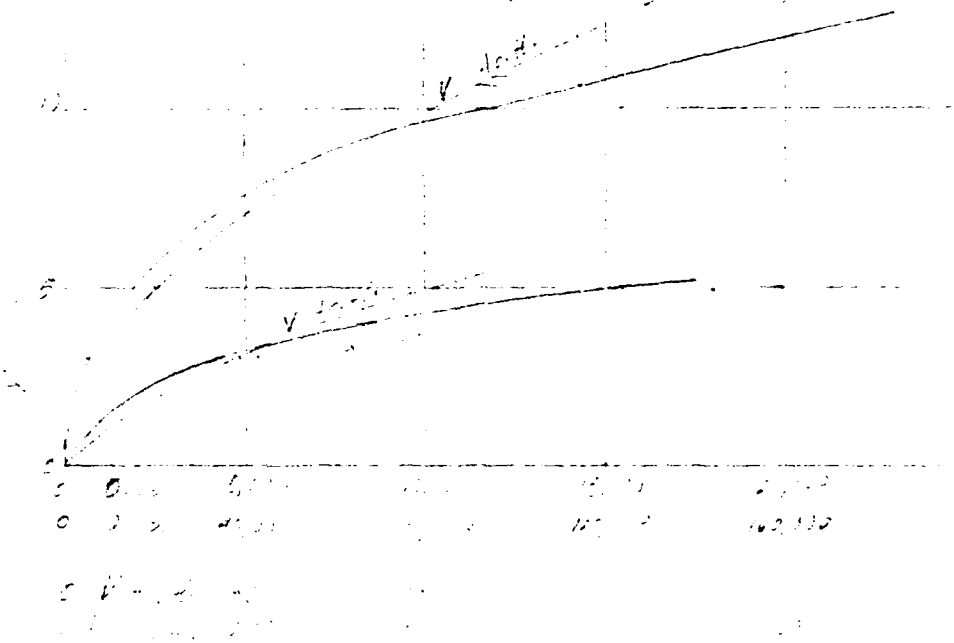
$Y = 5'$; $R = 2.55'$; $Q = 15,426$ cfs; $A = 1250$ sq. ft.; $V = 12.3$ ft./sec.

$Y = 10'$; $R = 5.256'$; $Q = 95,230$ cfs; $A = 4430$ sq. ft.; $V = 43.4$ ft./sec.

$Y = 8'$; $R = 4.57'$; $Q = 64,110$ cfs; $A = 4170$ sq. ft.; $V = 33$ ft./sec.

$Y = 12'$; $R = 6.37'$; $Q = 161,465$ cfs; $A = 6,130$ sq. ft.; $V = 50.7$ ft./sec.

$Y = 14'$; $R = 7.17'$; $Q = 240,750$ cfs; $A = 8,110$ sq. ft.; $V = 74.6$ ft./sec.



Base Failure: Q = 2,700 cfs; Y = 2.3'; V = 37 ft./sec.

Full Failure: Q_{BF} = 2700 + 105,300 = 108,000 cfs; Y = 10.4'; V = 440 ft./sec.

$Q_{PF} = 2700 + 105,300\left(1 - \frac{440-37}{1300}\right) = 2700 + 73,900 = 76,600$ cfs

Y = 3.4'; V = 37.5 ft./sec.

$V_{max} = \frac{440+37}{2} = 238.5$ ft./sec.

$Q_{max} = 2700 + 105,300\left(1 - \frac{238.5-37}{1300}\right) = 2700 + 73,400 = 76,100$ cfs

Y = 3.4'

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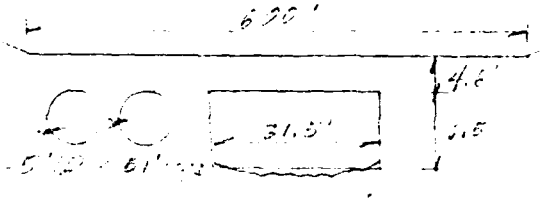
HAZARD #4



$Q_p = 2,700$ CFS

2700 cfs < 6,372 cfs Capacity

∴ dispersion contained by retaining wall

adjacent Failure : $Q_{p2} = 108,000 - 23,200\left(\frac{1600}{400}\right) = 96,400$ cfs

Flow Over Road = 96,400 − 6370 = 90,000 cfs

$H = \left(90000/3(600)\right)^{2/3} = 13.7'$

Depth of Flow = 2/3 (13.7') = 9.2'

$V_{avg} = 10.2$ FPS

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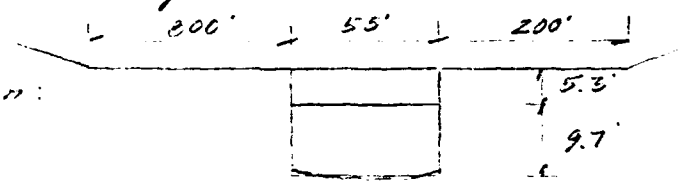
HAZARD ⑤

Secondary Street over Bradley Brook



Bridge section:

A = 55 × 9.7 = 534 sq. ft. Channel velocity = 2.2 fps = V

Assume head differential on bridge = 5'

Q = A √(2gH) = 534 √(2(32.2)5) = 14,100 cfs (Bridge)

Bridge Max. capacity Q = 2,700 cfs.

2,700 cfs < 14,100 cfs Capacity

∴ depth controlled by stream channel

After Failure: $Q_{P2} = 79{,}100 + 28{,}900\left(\frac{200}{4000}\right) = 93{,}600$ cfs

Flow Over Road = 93,600 − 14,100 = 79,500 cfs.

$H = \left(79{,}500/3(1033)\right)^{2/3} = 8.7'$

Depth of Failure = 2/3 (8.7') = 5.8'

Vol = 13 ± FS.

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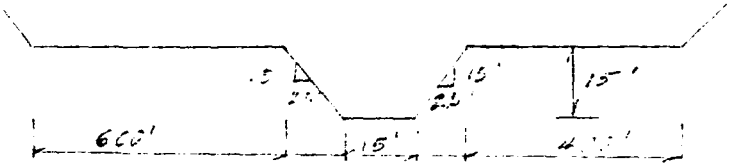
Control for design flow in Bridge Creek at Westfall River is channel at former footbridge site.

Assume trapezoidal cross-section:



channel characteristics: n = .050; S = .02; A = 675 sq ft

Q = 1.49/n A R^2/3 S^1/2 = 79,100 cfs

Flow over roadway = 79,100 − 22,500 = 56,600 cfs

Flow over roadway = broad crested weir

Q = CLH^3/2 = 2.6 (600) H^3/2 = 56,600 ; H = 7.2'

Y = 22' + 7.2' = 29.2'; A = 49,110 sq ft; V = 115 fps

Flow through culvert = 79,100 − 49,110 = 29,990 cfs

H = 29,990 / (60 × 32.2)^1/2 = 5.6' Y = 15 + 5.6 = 20.6

Y = 20' ; R = 10.3 ; A = 28,700 sq ft ; V = 1.04 fps

Flow through culvert = 79,100 − 28,700 = 42,400 cfs

H = (42,400 / 3.1(60+0))^2/3 = 6.2' Y = 15 + 6.2 = 21.2'

∴ Y = 21.5 ± '

Depth of flow over roadway = 2/3 (21.5 − 15) = 4.3'

Flow = 2.6 × 600 × 4.3^3/2 = 27,900 cfs

Flow through culvert = 79,100 − 27,900 = 51,200 cfs

A = 1,100 sq ft

∴ V = 46.5 fps

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ONE REVISION TITLE

Dams ... Type ... Spillway ... Dam

Weight ... Effect ...

Effect of Stress Distribution on Weathhill High Dam
Edge Load ... Dam

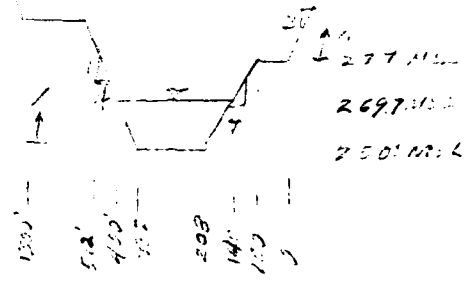
...

$W = .175$

$S = 2.4 \times 62.5 = 150$

$A = \frac{1}{2}y = 4y^2 \quad \frac{1}{2}A = 130y^2 + 3y(130)$

$Q = 1.49 \frac{1}{n} A R^{2/3} S^{1/2} = 3.1 \times 74.1 \times 2^{1/2}$



$Y = 27'$; $R = 18.17'$; $Q = 174,000$ cfs; $A = 3,240$ sq ft; $V = 54.1$ fps; $W = 340'$
$Y = 35'$; $R = 23.11'$; $Q = 278,000$ cfs; $A = 3,900$ sq ft; $V = 32.4$ fps
$Y = 45'$; $R = 28.61'$; $Q = 505,000$ cfs; $A = 15,750$ sq ft; $V = 37.4$ fps
$Y = 41'$; $R = 25.95'$; $Q = 319,000$ cfs; $A = 11,276$ sq ft; $V = 35$ fps
$Y = 17'$; $R = 12.55'$; $Q = 61,500$ cfs; $A = 2,934$ sq ft; $V = 21$ fps

Weathhill Dam: Top Elev = 300'

Assume 20' free overflow crest at Elev 269.7
9' below Top of Dam Normal Section 300' long.

Y'	V	H'	Q	H=H'+7	Q	H=H'+7	Q	Q Total
				L=100, C=40		L=200, C=40	130(Y-7)V	
13'		13	27,000		7,400		0	44,400
27	30	34	159,000		143,100		50,700	352,400
17	15	255	74,250		50,300		19,200	144,250
3	-	3	4,160		-		-	4,160
2	-	2	2220		-		-	2,220

Dam

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Westfield River Floods

Before Dam Failure

$Q = 2,700$ cfs

Stage = Elev. 272.2 ± MSL

After Dam Failure

$Q_1 = 79,100$ cfs Stage = Elev. 284.4 ± M.S.L.

Storage above dam - Valley cross section

Storage $= 200' \times 13,000' \times (284 - 272)/3 = 200$ ac. ft

$Q_{out} = 2,700 + 76,400\left(1 - \frac{200}{1350}\right) = 2700 + 65,000 = 67,700$ cfs

Stage = Elev. 284.0

Flood stage is 4=' above R.R. tracks & mill structure.

Destruction of the dam at the plane failure plane will be quite attenuated and not contain a significant portion.

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APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY	MO	YR
A	1057	NED	MA	013	01				BLACK BROOK DAM	4212.6	7253.3	03	MAR	80

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
	BLACK BROOK RESERVOIR

(16) REGION	(17) BASIN	(18) RIVER OR STREAM	(19) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(20) DIST FROM DAM (MI.)	(21) POPULATION
01	08	BLACK BROOK	RUSSELL	20	1600

(22) TYPE OF DAM	(23) YEAR COMPLETED	(24) PURPOSES	(25) STRUCTURAL HEIGHT (FT.)	(26) HYDRAULIC HEIGHT (FT.)	(27) IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	NORMAL (ACRE–FT.)	(28) DIST	(29) OWN	(30) FED R	(31) PRV/FED	(32) SCS A	(33) VER/DATE
REPG	1971	CS	60	57	1340	74	NED	N	N	N	B	

(34) REMARKS
28 AT TEST FLOOD SURCHARGE

(35) D/S HAS	(36) SPILLWAY CREST LENGTH	TYPE	WIDTH (FT.)	(37) MAXIMUM DISCHARGE (FT.)	(38) VOLUME OF DAM (CY)	(39) POWER CAPACITY INSTALLED (MW)	PROPOSED (MW)	(40) NAVIGATION LOCKS NO	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	1168	U	50	5000	200000											

(41) OWNER	(42) ENGINEERING BY	(43) CONSTRUCTION BY
TOWN OF RUSSELL	USDA SCS	UNKNOWN

(44) REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
MA DEQE	MA DEQE	MA DEQE	MA DEQE

(45) INSPECTION BY	(46) INSPECTION DATE DAY | MO | YR	(47) AUTHORITY FOR INSPECTION
TIGHE & BOND DIV OF SCI	20NOV79	PL 92-367

(48) REMARKS
55 MAX DISCHARGE WITH RESERVOIR AT TOP OF DAM

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END

FILMED

7-85

DTIC