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NATIONAL DAM SAFETY PROGRAM. SHEPPARD MEYERS DAM (NDS NY 337), --ETC(U)
MAY 78 DACW31-78-C-0044
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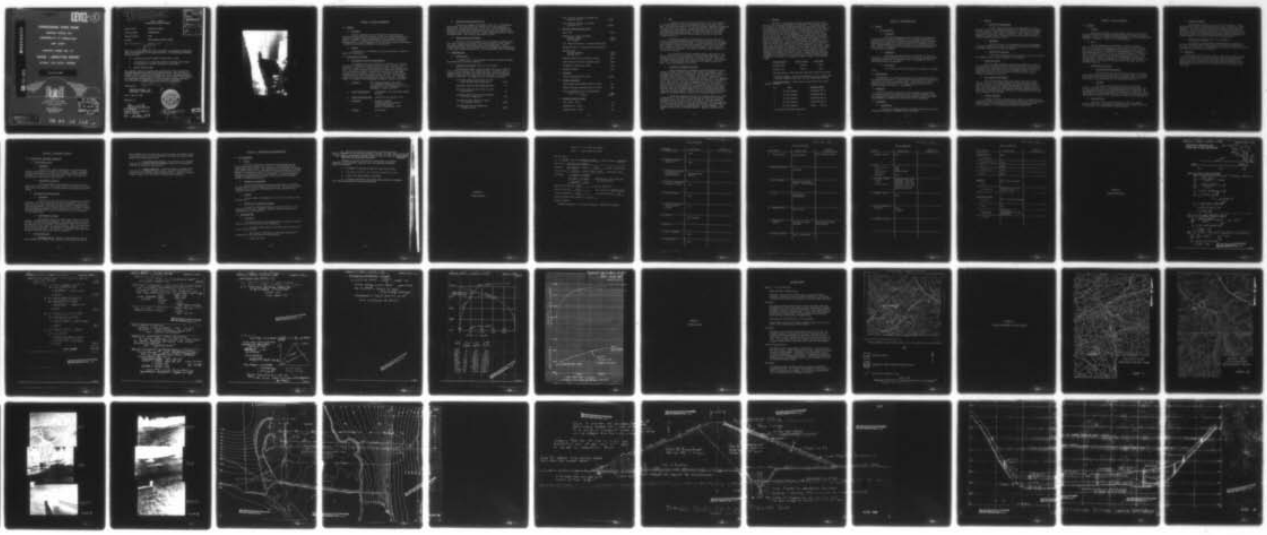

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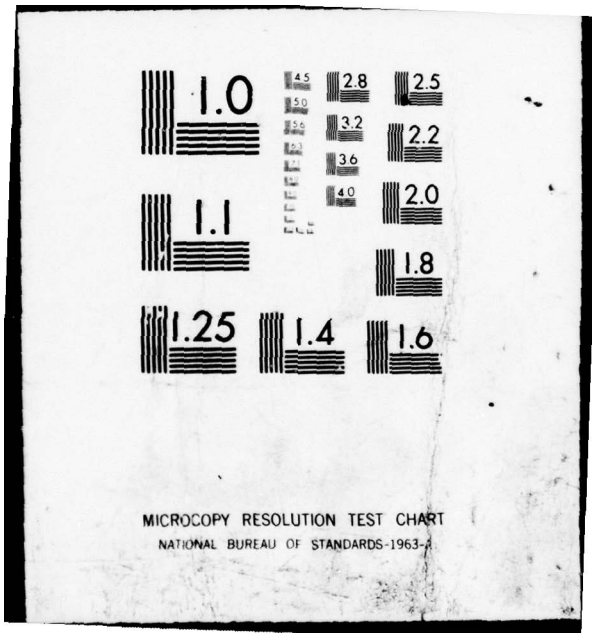
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NATIONAL BUREAU OF STANDARDS-1963-A

LEVEL II 1

SUSQUEHANNA RIVER BASIN

SHEPPARD MEYERS DAM

COMMONWEALTH OF PENNSYLVANIA

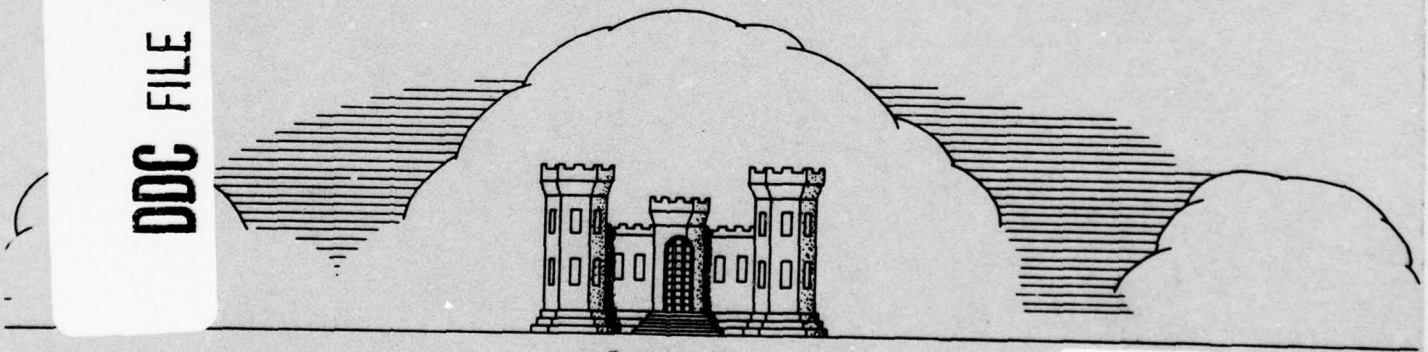
YORK COUNTY

INVENTORY NUMBER NDS 337

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

DACW31-78-C-0044



Prepared For
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland
by
BERGER ASSOCIATES, INC.
CONSULTING ENGINEERS
HARRISBURG, PA.

(6) National Dam Safety Program. Sheppard Meyers Dam (NDS NY 337), Susquehanna River Basin, York County, Pennsylvania. Phase 1 Inspection Report.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: SHEPPARD & MYERS

State Located: PENNSYLVANIA

County Located: YORK

Stream: SOUTH BRANCH CONEWAGO CREEK

Date of Inspection: MARCH 30, 1978

(11) 30 May 78

(12) 55 p.

Based on a visual inspection, past performance and available engineering data, the dam appears to be in good condition. The following recommendations are made:

1. All gates should be opened at least twice a year.
2. Installation of a trash boom around the morning glory should be considered to prevent reduction in efficiency.
3. Repair spillway slab.

The combined outlets of spillway and morning glory will not pass the Probable Maximum Flood without overtopping the dam. Half the PMF will, however, easily be passed and therefore, the dam is considered adequate. In the event of unusual heavy precipitation, an around-the-clock surveillance plan should be implemented to detect possible trouble conditions and a formal downstream warning system should be established.

(15) DACW31-78-C-0044

Submitted By:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

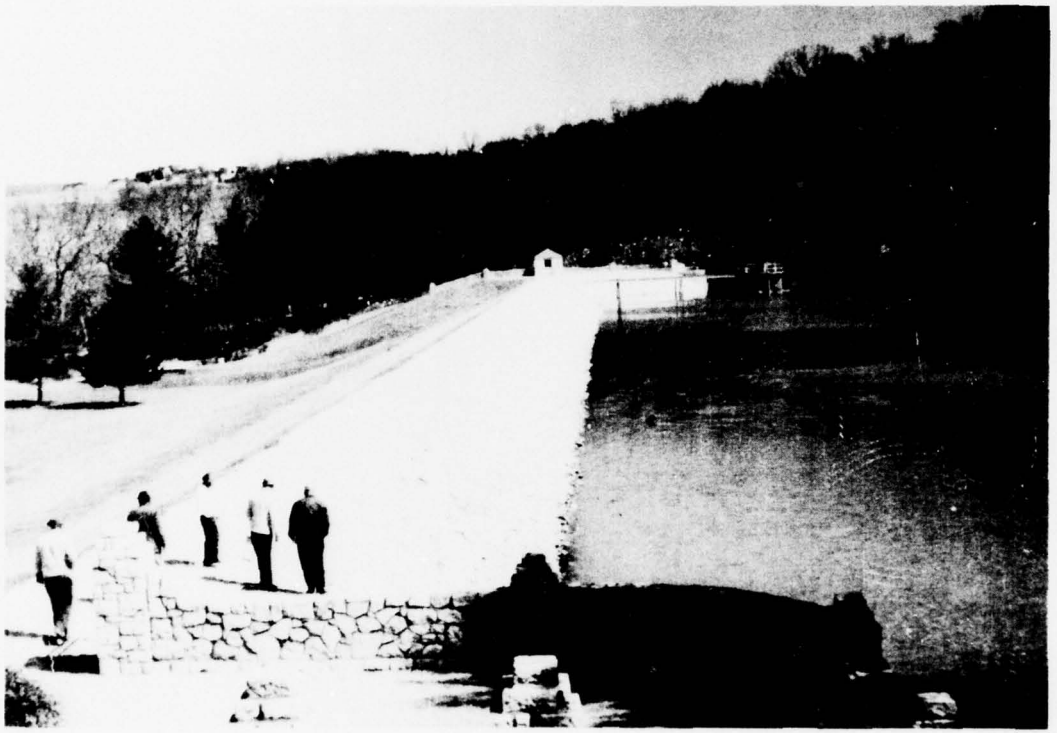
Date; May 23, 1978

Approved by:

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
HENDRIK JONGSMA
ENGINEER No. 5553E

G. R. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE: 30 May 1978



OVERVIEW

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Dam Inspection Act, Public Law 92-367 (Appendix III) authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspections of dams throughout the United States. The Phase I Inspection and Report are limited to a review of available data, a visual inspection of the dam site and basic calculations to determine the hydraulic adequacy of the spillway.

b. Purpose

The purpose is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Sheppard & Myers dam consists of earthfill with rockfill protection. The dam has a cutoff trench and a grout curtain. The spillway is located in the right abutment and has a crest length of 85 feet. The control tower has a morning glory intake with five gates and a 10 foot diameter conduit. The tower is accessed by a footbridge. Construction was completed in March, 1933. The crest of the spillway and Morning Glory were raised about one foot in 1957. The dam crest length is 760 feet and the maximum fill height is 38 feet. Appendix D, Plates III through IX has photographs and typical section of the dam.

b. Location: West Manheim Township, York County
U.S. Quadrangle, Manchester, Md. - Pa.
Latitude 39° - 43.9', Longitude 76° - 57.3'
(Appendix D, Plates I and II)

c. Size Classification: Intermediate (1,317 acre-feet, height 38 feet)

d. Hazard Classification: Significant (see Section 3.1.e)

e. Ownership: Borough of Hanover
Hanover Municipal Waterworks
118 Railroad Street
Hanover, Pennsylvania 17331

f. Purpose: Water Supply

g. Design and Construction History

The dam was designed by Albright & Friel, Inc., Philadelphia, Pennsylvania, and construction was started in 1932 and completed in March, 1933. An application report is on file. In 1957, application was made to increase the storage capacity by raising the spillway crest and morning glory intake by one foot. Permit was granted and the raising occurred in 1957. The spillway was repaved in 1963.

h. Normal Operating Procedures

The dam is for water supply and flow releases are made through the outlet structure as required. The actual intake for water supply is a small diversion dam located about 4 miles downstream. Inflow occurring when water level is above 703.6 is discharged over the spillway. If pool level reaches elevation 703.7 the morning glory starts discharging.

1.3 PERTINENT DATA

a. Drainage Area

5.7 Square Miles. The watershed is owned by Hanover Municipal Waterworks and is rural in character.

b. Discharge at Dam Site (cubic feet per second)

Maximum known floods at the dam site were those of 1972 and 1975. There is no gage and no records are kept. The water company manager recalls that these two floods were about equal and they each reached a stage of three to four feet over the crest of the spillway. Assume 4.0 foot head. See Appendix B for discharge calculations.

Calculated maximum known flood (4.0 foot head) Spillway and Morning Glory	4,400
Warm water outlet at pool elevation 703.6	23
Diversion tunnel low pool outlet at pool elevation 673	24
Diversion tunnel outlet at pool elevation 703.6 all 5 gates open	240
Straight spillway capacity at maximum pool elevation 710.35	5,500
Morning glory weir at maximum pool elevation 710.35	3,900

Total spillway capacity at maximum pool elevation 710.35	9,400
Total spillway capacity to top dam elevation 711.5	11,300

c. Elevation (feet mean sea level)

Top of dam	711.5
Maximum pool - design surcharge	
Original design	708.0
1957 Redesign	710.35
Full flood control pool - no flood control pool.	
Recreation pool - No provisions for recreation.	
Spillway Crest	
Straight spillway	703.6
Morning Glory	703.7
Upstream portal invert diversion tunnel	670.5
Downstream portal invert diversion tunnel	668.5
Streambed at centerline of dam	673.o
Maximum tailwater	680

d. Reservoir

Length of maximum pool in feet	4,000

e. Storage (acre-feet)

Water supply pool elevation 675.0 to 703.6	620
Design surcharge elevation 703.6 to 710.35	490
Top of surcharge to top of dam elevation 710.35 to 711.5	103
Total	1,213

f. Reservoir Surface (acres)

Top of dam - 711.5	92
Maximum pool - 710.35	87
Spillway crest - 703.6	58

g. Dam

A typical section of the dam is shown on Plate VIII, Appendix D. The dam consists of an earthen embankment with a top width of 10 feet. The upstream portion is of Class "A" material, defomed as impervious fill rolled in 6 inch layers. The upstream slope is 2.5H to 1V and has a fifteen-inch-thick hand-laid riprap protection from the top to about four feet below normal pool level. At this point there is an 8-foot wide berm formed with rockfill which extends to the toe of fill with a slope of 4H to 1V.

The upper ten feet of the downstream face has a slope of 2H to 1V, the remaining downstream slope is 2.5H to 1V except for the large toe drain which has a 4H to 1V slope. The downstream part of the embankment consists of Class "B" material embankment, rolled in 6-inch layers and a rockfill toe drain with an 8 inch tile drain. Class B material is not defined in the plans. The entire downstream slope is sodded over 12 inches of top soil.

At a distance of 30 feet upstream from the centerline of the dam, a trench with a bottom width of 25 feet has been excavated to rock foundation, and a concrete core wall, 24 inches thick and 5 feet high, has been constructed along the centerline of this trench. This concrete core wall is capping grout holes placed at 8'0" centers and 10 feet deep. Top of dam elevation is at 711.5.

h. Diversion and Regulating Tunnel

During construction, streamflow was carried through a 10-foot diameter circular concrete conduit; this conduit is imbedded in rock foundation for about half its diameter. The thickness of the conduit is 18 inches, and at points 25, 40, and 55 feet from the upstream end, concrete collars 24 inches in thickness were placed. After the completion of the dam, a circular vertical intake well was attached to the upstream end of this conduit. This well is equipped with four 18-inch sluice gates located at varying elevations from the bottom of the conduit. The top of the well is at an elevation 2 inches above that of the straight spillway crest and supplements the spillway in discharging flood water. The well tower has an inside diameter of 10 feet and the morning glory crest has a 23-foot diameter. Plates III and V in Appendix D have photographs of the Morning Glory and the ten-foot diameter conduit outlet.

The bottom opening in the tower is a 30-inch valve with invert elevation 670.5. The other four 18-inch sluice gates have centerline elevations of 682.75, 686.75, 690.75 and 694.75. They are manually operated from a platform on top of the morning glory which is connected by a cast-in-place concrete footbridge with the dam. The downstream end of the 10 foot conduit is at elevation 668.5 and has wingwalls. The channel connects with the wasteway channel. Length of conduit is 165 feet.

i. Spillway

The plan of the spillway is shown in Appendix D, Plate VII. Plates IV and V show photographs of the spillway. The spillway consists of a channel cut through the hillside above the right end of the dam. At the upper end of this channel is an uncontrolled concrete ogee section, 18 inches high and 85 feet in length. The ogee section is set in rock, but no grouting is indicated on the plan. The distance between the crest of this weir and top of embankment is 7.9 feet after the raising of the weir in 1957. A curved channel leads from the weir to a point 198 feet downstream, where the width has gradually been reduced from 85 feet at the spillway to 25 feet. This portion of the channel is on a grade of 3.16 percent. The bottom of the channel is paved with concrete with a thickness of 12 inches, and the sides, which are on a slope of 1/2H to 1V, are paved with concrete with a thickness of 18 inches. This side paving is carried to a height of 7 feet above the bed of the channel. From a point 198 feet away from the weir to a point 296 feet away, the channel is on a grade of 20 percent. This latter stretch of channel increases in width from 25 feet to 50 feet. Downstream from this point the grade of the channel is 4.14 percent over 150 foot length and then changes to .15 percent in the wasteway channel leading to the original creek.

Crest Elevation	Prior to 1958	After 1958
Straight Ogee	702.60	703.6
Morning Glory	702.75	703.7

Upstream channel - Both spillways take water directly from pool.

Downstream channel - Clear with exception of a low, constricted opening, highway bridge about 200 feet downstream from dam.

j. Regulating Outlets. Intake tower is fitted with five sluice valves as follows:

No	Type	Elevation (feet)
1	18 inch diameter	Centerline 694.75
2	18 inch diameter	Centerline 690.75
3	18 inch diameter	Centerline 686.75
4	18 inch diameter	Centerline 682.75
5	*30 inch diameter	Invert 670.50

*In series with 30-inch flap valve

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

a. Data Available

1. Hydraulics

The permit application report by Pennsylvania Department of Environmental Resources (PennDER) for the original construction in 1932 and for the raising of the spillway crest states that the supplied discharge for a design Q of 4,700 cfs would leave a freeboard of 3.8 feet. Calculations after raising the crests of the spillway and morning glory indicate a freeboard of 1.15 feet with an outflow of 9,600 cfs. No other data is available.

2. Embankment

The design drawings indicate that borings and test pits were made. A grout curtain was shown on the record set, indicating that grouting was done under the spillway crest. No permeability test of impervious material is available.

3. Structures

No structural design calculations are available in PennDER files.

2.2 CONSTRUCTION

The appearance of the dam indicates that the construction was done by a qualified contractor. Plans of Record indicate that the construction was done in accordance with design plans. Cutoff trench is shown as being carried to rock surface. No in-place compaction test of the impervious material (Class "A") is available.

2.3 OPERATION

No formal records of operation or flow discharges are available. The manager indicated that there have been no specific problems. There is no program for opening and testing sluice gates at regular intervals. The embankment and appurtenance structures are well maintained.

2.4 EVALUATION

a. Availability

A full set of design drawings, including borings, were the only design data available at PennDER or from the owner.

b. Adequacy

1. Hydraulics and Hydrology

In 1957, when the two weirs were raised about 1.0 foot, Albright & Friel made a complete analysis of the hydraulics and hydrology of this reservoir. Their study was available in the file, and is based on a storm having a peak inflow of 10,000 cfs. They routed this storm through the reservoir and concluded that the outflow would be 9,600 cfs and the freeboard would be 1.1r feet.

2. Embankment

Having no records of the material used for the embankment no seepage analysis can be made. The general design slopes and rockfill protections indicate that the dam is adequate.

3. Appurtenant Structures

A review of the design drawings indicates that all structures are adequate for all normal conditions to be expected.

c. Operating Records

While no formal operating records are available for review, it was reported by the operator that no major problems have occurred since construction was completed in 1933. The largest floods occurred during the Agnes Storm (June, 1972) and Eloise (September, 1975). It was stated that the water level was about 4 feet over the weir section, leaving a freeboard of four feet.

d. Post Construction Changes

The only major post-construction change took place in 1957, when the crests of the straight spillway and the morning glory were raised by 1.0 feet. In 1963 application was made to repair the spillway. The work consisted of removal of disintegrated concrete from the chute floor and repaving the approximately 500-foot-long chute with a 2-inch layer of gunited concrete. This layer is reinforced with wire mesh and is anchored to the old slab.

e. Seismic Stability

The dam is located in Seismic Zone 1 and it is considered that the static stability is such that the dam will withstand a minor earthquake - Induced dynamic forces are under the normal safety margins used for static stability. No calculations were made to confirm this.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The general appearance of this project indicates that the dam and appurtenances were formally engineered and are very well maintained. Appendix D, Plates III through VI have photographs of the dam and appurtenant structures. Appendix A contains the visual checklist.

b. Dam

The dam embankment is maintained in excellent condition. There was no evidence of seepage on the slope and the toe was dry and hard. A few places on the embankment indicated mole activity under the snow during the winter. Downstream of the embankment is a large wet area which reportedly dries out in the summertime (Plate VI). This wet area is probably caused by a spring and the area has been tiled. The area is about 100 feet from the toe of the embankment. There was no evidence of any cracking, sloughage or visually detectable settlement in the embankment. The riprap on the slope and the dam crest road is in excellent condition.

c. Appurtenant Structures

1. Intake Tower and Footbridge

This structure was in good condition except for the base of one manual crank for the sluice gate at elevation 686.0. The base is broken loose from the concrete and the gate probably cannot be operated. The inside of the morning glory was not inspected (Plate III).

2. Spillway

The spillway crest and walls are in good condition, except a few minor cracks. The spillway slab shows deterioration. The two inch layer applied in 1963 has disintegrated over a large area and was probably not sufficiently anchored and bonded to the old slab. One slab about 200 feet downstream from the crest has been seriously displaced and should be repaired as soon as possible (Plates IV and V, Appendix D).

d. Reservoir Area

The area is clean and well maintained. The water company manager reports that they dredge the upstream end of the pool every five to ten years so as to preserve the storage capacity.

e. Downstream Channel

The downstream channel is clean and well maintained. A highway bridge about 200 feet downstream from the dam is low and has a small opening. In an extreme flood it would tend to increase the tailwater elevation. The first community located about 18 miles downstream of this dam is East Berlin. The downstream area of the Conewago Creek traverses an area with appreciable agricultural development and many highways. The hazard category for this dam is considered to be significant.

f. Morning Glory Spillway (Plate III, Appendix D)

The opening to the spillway is obstructed by the supports for the valve operating platform which are also the concrete enclosures for the five valve stem risers. Floating drift could catch on these obstructions and reduce the capacity of the spillway.

3.2 EVALUATION

The observed condition of the project is very good. Except for the repair of the spillway, the observed and discussed deficiencies should have little effect on the safety of the dam. The protection of the morning glory by a trash rack or trash boom should be considered. Such protection would maintain the full efficiency of this structure during high flows.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURE

An interview with Mr. Topper and Mr. Bernard Smith of the Hanover Municipal Waterworks indicated that there is no established procedure for operating the dam, other than maintaining the pool at spillway crest elevation 703.6 as long as possible. Releases through the intake tower sluice gates are made as required for the domestic water supply intake about four miles downstream.

4.2 MAINTENANCE OF DAM

The dam embankment is very well maintained. The grass is closely cut and kept in good condition. The embankment is free of unsuitable plant growth.

4.3 MAINTENANCE OF OPERATING FACILITIES

The sluice gates are not operated regularly and there is no specific greasing program for easier operation.

4.4 WARNING SYSTEM

There is no formal warning system in effect. A caretaker lives close to the facilities and is able to keep a constant watch in case of emergencies. Due to the adequacy of the spillway in previous heavy rain storms no warning system has been considered necessary.

4.5 EVALUATION

The dam is extremely well maintained and operated. There is, however, no warning system, no regular inspection schedule by qualified engineers and in case of emergency there are no plans for a quick draw-down.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

This dam was built in 1933. The original design used a maximum discharge of 6,580 cfs. The spillway crest elevations were raised about 1.0 foot in 1958 on the basis of a new design calculation using a peak inflow of 10,000 cfs and a peak outflow of 9,600 cfs. This change reduced the freeboard to 1.15 foot. Calculations made for this analysis show a total spillway capacity of 9,400 cfs for the same freeboard.

b. Experience Data

The water company manager reports maximum floods to date were those in 1972 and 1975 which each produced a discharge of about 4,100 cfs. This is only recollection, as no flow records are kept. There have been no problems.

c. Visual Observations

The only problems observed were the constricting highway bridge 200 feet downstream from the dam. The lack of a drift boom to protect morning glory spillway from floating drift could reduce the efficiency of the Morning Glory.

d. Overtopping Potential

The dam is classified for size as an intermediate dam and in the Hazard Classification as significant. The recommended Spillway Design Flood (SDF) for these classifications is between half PMF (Probable Maximum Flood) and PMF. Calculations in Appendix B indicate that the PMF for this dam is 16,000 cfs. On Page 2 of the calculations it is indicated that the combined maximum capacity of the spillway and morning glory is 11,300 cfs. The required storage capacity of the impounded lake would have to be 4,800 acre-feet, but only 590 acre-feet is available. The potential for overtopping of Sheppard & Myers dam thus exists.

e. Spillway Adequacy

The combined capacity of the spillway and the morning glory is 11,300 cfs or 71 % of the PMF and it is considered to be inadequate. Comparing the total spillway capacity with one-half the PMF (8,000 cfs) it can be judged that the total spillway capacity of this dam is not seriously inadequate.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

1. Embankment

There were no visual observations of undue embankment stresses, which would be indicated by sloughage, cracking or seepage. The wet area beyond the toe seems to be caused by a spring and poor drainage, as it dries out in the summertime. There is no cause for concern due to the distance from the toe.

2. Appurtenant Structures

The slab movement in the spillway is the most serious failure of the structures. The cracked base of the stand on the intake tower could cause water loss if the gate would be used and could not be closed.

b. Design and Construction Data

1. Embankment

There is no design criteria for the embankment stability available. The borings indicate good stable foundation. The use of a grout curtain, cutoff trench and core wall indicate an adequate effort in design assumptions. The design slopes and lack of seepage indicate that the design was adequate for pool levels up to top of dam. A record drawing indicating depth of cutoff trench and core wall is available in the PennDER files.

2. Appurtenant Structures

The spillway slab is 12 inches thick, placed on the rock surface. No drain system is indicated. The spillway walls are placed on 1/2H to 1V and are 18 inches thick and poured against the rock cut. Rock anchors are not indicated, on the drawings. Weep holes are located at the bottom of the walls. No distress or displacement was found in any of the spillway walls. The absence of a drainage system under the spillway slab could have caused the slab movement.

c. Operating Records

1. Operating Records. While no formal operating records were available for review, it was reported by the dam manager that no

major problems have occurred since the dam has been operational (1933). It was noted that the facility withstood the floods of tropical storms Agnes in 1972 and Eloise in 1975.

2. Post-Construction Changes. The raising of the spillway crest and morning glory have had no adverse effect on the structural stability of the dam or appurtenances.

3. Seismic Stability. The dam is located in Seismic Zone No.1 and it is considered that the static stability is sufficient to withstand minor earthquake-induced dynamic forces. However, no calculations, studies, etc., were done to confirm this conclusion.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

a. Safety

The visual inspection, review of design drawings and the operational history indicate that the dam is in good condition and functioning satisfactorily. The combination of the spillway and morning glory intake tower will not pass the PMF without overtopping of the dam. However, the capacity is well in excess of one-half of the PMF, and is, therefore, not considered seriously inadequate. Significant seepage through the embankment does not seem to occur and the toe drainage system is working satisfactorily.

b. Adequacy of Information

Sufficient hydrology and hydraulic information is available, and the need for further studies is not indicated. The condition of the embankment does not require investigations of the permeability and stability of the fill.

c. Urgency

The most urgent recommendation is the need for repair of the spillway slab.

d. Necessity for Additional Studies

The need for additional studies of these facilities is not indicated at this time. However, attention should be given to the recommendations presented below.

7.2 RECOMMENDATIONS

a. Facilities

In order to assure a continued satisfactory operation of this facility, the following actions are recommended:

1. The owner should repair the spillway slab as soon as the water level will permit.

2. Owner should investigate the need and feasibility of installing a trash boom around the morning glory.

3. Repair gate lift.

4. The wet spot below the dam should be observed periodically to determine if the condition worsens or extends, in time, closer to the dam. If this occurs, a geotechnical engineer should be hired to study the underseepage condition.

b. Operation and Maintenance Procedures

Although the dam and facilities are maintained in excellent condition, it is considered important that the following procedures should be developed:

1. A schedule of opening all gates at least twice a year.

2. A greasing schedule of the operating mechanism of gates.

3. A pool staff gage should be installed.

4. A formal surveillance and warning system should be developed to be used during periods of high precipitation.

APPENDIX A

VISUAL CHECKLIST

CHECK LIST - DAM INSPECTION PROGRAM

PHASE I - VISUAL INSPECTION REPORT

NAD NO. 337

PA. ID # 67-466 NAME OF DAM Sheppard & Meyers HAZARD CATEGORY Significant

TYPE OF DAM: Earthfill with rockfill

LOCATION: West Manheim TOWNSHIP York COUNTY, PENNSYLVANIA

INSPECTION DATE 3-30-78 WEATHER Clear - Breezy TEMPERATURE 40°±

INSPECTORS: H. Jongsma - R. Houseal
R. Steacy - J. Powers
A. Bartlett - C. Gray

Accompanies by: Mr. Topper and Mr. Bernard Smith

NORMAL POOL ELEVATION: 703.6 AT TIME OF INSPECTION:

BREAST ELEVATION: 711.5 POOL ELEVATION: Spillway Crest

SPILLWAY ELEVATION: 703.6 TAILWATER ELEVATION: 669

MAXIMUM RECORDED POOL ELEVATION: 3' to 4'

GENERAL COMMENTS:

Excellent Appearance - very well maintained - pleasant surroundings

DAM NO. NAD 337

VISUAL INSPECTION

EMBANKMENT	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. SURFACE CRACKS	None	
B. UNUSUAL MOVEMENT BEYOND TOE	None	
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	None, some mole activity	
D. VERTICAL & HORIZONTAL ALIGNMENT OF CREST	O.K.	
E. RIPRAP FAILURES	None	
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	O.K.	
G. SEEPAGE	None apparent	
H. DRAINS		
J. GAGES & RECORDER	None	
K. COVER(GROWTH)	Grass	

DAM NO. NAD 337

VISUAL INSPECTION

OUTLET WORKS	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. INTAKE STRUCTURE	Morning Glory	Needs trash protection
B. OUTLET STRUCTURE	Excellent	
C. OUTLET CHANNEL	Lined with limestone riprap. Good Condition	
D. GATES	Five gates on morning glory	
E. EMERGENCY GATE	One of above	
F. OPERATION & CONTROL	Five gates, manual operated	One stand torn loose from platform
G. BRIDGE (ACCESS)	Steel - grated deck	

DAM NO. NAD 337

VISUAL INSPECTION

SPILLWAY	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. APPROACH CHANNEL	None	
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	 Good Good Slight Surface Good	
C. DISCHARGE CHANNEL Lining Cracks Spilling Basin	Generally good - some spalling - one slab displaced - 200' from spillway. Good - weep holes at flor line - seem to be too low.	
D. BRIDGE & PIERS	None	
E. GATES & OPERATION EQUIPMENT	None No gages	
F. CONTROL & HISTORY		

DAM NO. NAD 337

VISUAL INSPECTION

MISCELLANEOUS	OBSERVATIONS	REMARKS & RECOMMENDATIONS
INSTRUMENTATION	None	
Monumentation		
Observation Wells	None	
Weirs	None	
Piezometers	None	
Other	None	
RESERVOIR	Pine trees all around	
Slopes		
Sedimentation	Dredged at upper end every 10 years	
DOWNSTREAM CHANNEL		
Condition	Good - very little erosion	
Slopes	O.K.	
Approximate Population	New Berlin - Approximately 10 miles downstream	
No. Homes		

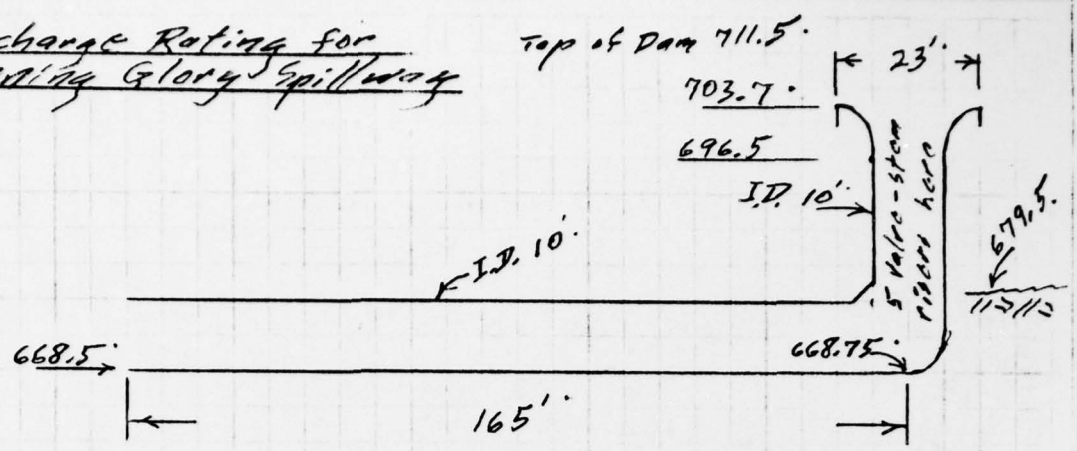
APPENDIX B

HYDROLOGY/HYDRAULICS

SUBJECT Appendix [illegible]

COMPUTED BY RES DATE 5-19-78 CHECKED BY JJP 5-22-78

Discharge Rating for Morning Glory Spillway



Pool at 711.5 (Top of Dam)

Ref. "Design of Small Dams" First Ed. P 311-326

$\frac{H_o}{R_s} = \frac{711.5 - 703.7}{11.5} = 0.68$

$\frac{P}{R_s} = \frac{703.7 - 679.5}{11.5} = 2.10$

$C_o = 2.83$ (From fig. 223)

$Q = C_o (2\pi R_s - 5) H_o^{3/2}$

← 5 piers @ 1 ft.

$Q = 2.83 (72.26 - 5)(7.8)^{3/2}$

$= 2.83 \times 67.26 \times 21.78$

$= 4,146$ cfs

Pool at 710.35 (Design pool)

$\frac{H_o}{R_s} = \frac{710.35 - 703.7}{11.5} = 0.58$, $C_o = 3.15$

$Q = 3.15 \times 67.26 \times (6.65)^{3/2}$

$= 3,630$ cfs

Pool at 707.7 (Max. flood reported = 4 ft. head)

$\frac{H_o}{R_s} = \frac{4}{11.5} = 0.35$, $C_o = 3.66$

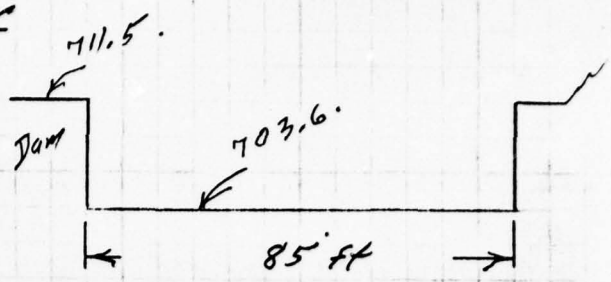
$Q = 3.66 \times 67.26 \times (4)^{3/2}$

$= 1,969$ cfs

OBJECT _____

COMPUTED BY RES DATE 5-19-78 CHECKED BY JJP-5/22/78

Discharge Rating for Straight Spillway



Pool at 711.5 (top of dam)

$L = 85'$

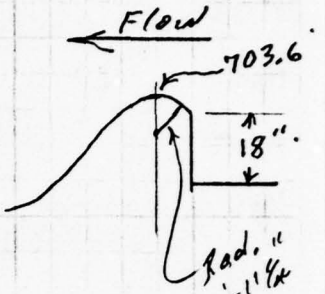
$H = 711.5 - 703.6 = 7.9'$

$C = 3.8$

$Q = CLH^{3/2}$

$= 3.8 \times 85 \times (7.9)^{3/2}$

$= 7,172$ cfs



Pool at 710.35 (Design pool)

$H = 710.35 - 703.6 = 6.75$

$C = 3.7$

$Q = 3.7 \times 85 \times (6.75)^{3/2}$

$= 5515$ cfs

$C = 3.7$ at $H = 7$. From designer

Pool at 707.7 (Max. flood reported)

$H = 707.7 - 703.6 = 4.1$ ft

$C = 3.4$

$Q = 3.4 \times 85 \times (4.1)^{3/2}$

$= 2399$ cfs

Pool Elev. (ft)	Morning Glory (cfs)	Straight (cfs)	Total Spillway (cfs)
711.5	4146	7172	11,300
710.35	3630	5515	9,100
707.7	1969	2399	4,400

(see plot on sheet 9)

SUBJECT [illegible]

COMPUTED BY _____ DATE 3-31-78 CHECKED BY JJ Jr

Warm water outlet 18" sluice gate

℄ at 694.75

Assume it is round

Pool at spillway crest = 703.6

Head = 703.6 - 694.75 = 8.85 ft

Area = $\pi R^2 = \pi \times (1.75)^2 = 1.77$

$Q = Ca\sqrt{2gh} = 0.545 \times 1.77\sqrt{2 \times 32.2 \times 8.85}$

$= .965\sqrt{570} = .965 \times 23.9 = 23.0$ cfs

Diversion tunnel low pool discharge

Bottom outlet is 30" valve, invert at 670.5 ft

Assume pool at 670.5 + 2.5 = 673.0 ft

$Q = Ca\sqrt{2gh} = 0.545 \times 4.90\sqrt{2 \times 32.2 \times 1.25} = 2.67\sqrt{80.5}$

$= 2.67 \times 8.97 = 23.9$ cfs

OBJECT

COMPUTED BY [illegible] DATE [illegible] CHECKED BY JJPJr

Diversion tunnel outlet, all 5 gates open
Pool at 703.6

		cfs
Gate No 1.		23.0
2.	$h = 703.6 - 690.75 = 12.8$ ft.	
	$Q = .965\sqrt{2 \times 32.2 \times 12.8}$	
	$= .965\sqrt{824} = .965 \times 28.7$	
	$= 27.7$	27.7
3.	$h = 703.6 - 686.75 = 16.8$ ft.	
	$Q = .965\sqrt{2 \times 32.2 \times 16.8}$	
	$= .965\sqrt{1082} = .965 \times 32.9$	
	$= 31.7$	31.7
4.	$h = 703.6 - 682.75 = 20.8$	
	$Q = .965\sqrt{2 \times 32.2 \times 20.8}$	
	$= .965\sqrt{1340} = .965 \times 36.6$	
	$= 35.3$	35.3
5.	$h = 703.6 - 670.25 = 33.4$	
	$Q = C a \sqrt{2gh}$	
	$= 0.545 \times 4.90\sqrt{2 \times 32.2 \times 33.4}$	
	$= 2.67\sqrt{2151} = 2.67 \times 46.4$	
	$= 123.9$	123.9
	Total 5 gates	242 cfs

SUBJECT [illegible]

COMPUTED BY RES DATE 4-3-78 CHECKED BY JJPJr

Maximum tailwater
Estimate 11.5 ft. over downstream invert
of tunnel = 668.5 + 11.5 = 680 ft.

Design Surcharge - Area-capacity curves were not available. Estimated curves were developed from area of lake measured on USGS topo map and from design total capacity.

From estimated curves	Elev MSL	Capacity Ac-Ft.
	710.35	1105
	703.6	617
		488 Design Surcharge

Top of dam	711.5 =	1208	Ac.Ft.
Design maximum	710.35 =	1105	
		103	Ac ft. ✓

Size classification
Storage at top of dam = 1208 Ac.-Ft.
Height = 711.5 - 675.0 = 36.5 Ft ✓
Use "Intermediate"

Hazard Potential classification
No homes. Damage would be limited to roads, highway bridges and water treatment plant.
Use "significant" ✓

Recommended Spillway Design Flood
"significant" and "Intermediate"
Use ½ Probable Maximum Flood
Susquehanna Region I
Drainage Area 5.17 Sq. Mi
PMF = 2800 cfs/Sq. Mi
= 15,960 cfs
½ PMF = 7980 cfs

Time = 25 Hours
$\frac{25}{24}$ = 1.04 Days

From PMF curves furnished by
Baltimore District - Corps of Eng.

SUBJECT [illegible]

COMPUTED BY RES DATE 4-6-78 CHECKED BY JJDJr

Overtopping Potential

A 1. PMF not available from owner.

2. PMF = 15,960 cfs (from Conte plot).

B 1. Maximum spillway capacity to top of dam (711.5 ft)

11,300 cfs

(see sheet 2)

B 3. b. (1)

Spillways will pass $\frac{11,300}{15,960} = 71\%$ of PMF

From short cut relations furnished by Balt. Dist. Corps of Eng

$\frac{\text{Req. Res. St.}}{\text{Vol of Inflow}} = .29$

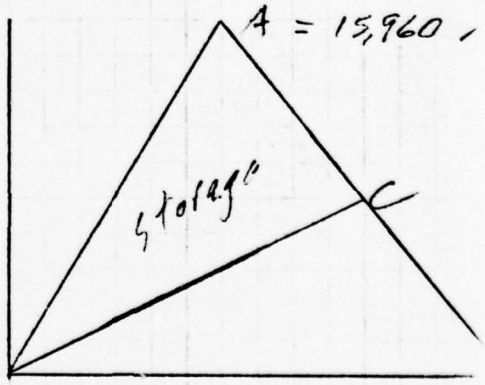
Vol of Inflow =

$\frac{15,960 \times 1.04}{2} = 8299$ cfs-days

Req storage = $.29 \times 8299$

= 2406 cfs-days,

= 4772 Ac. ft.



Storage 703.6 to 711.5 = 1208 − 617

Avail = 591 Ac-ft. (Dam will be overtopped by PMF)

COMPUTED BY RES DATE 5-17-78 CHECKED BY JWL 5-22-78

Overtopping Potential (cont.)

consider ½ PMF = $\frac{15,960}{2}$ = 7,980 cfs.

From rating curve sheet pool elev. for ½ PMF = 709.7 ft elev. neglecting storage.

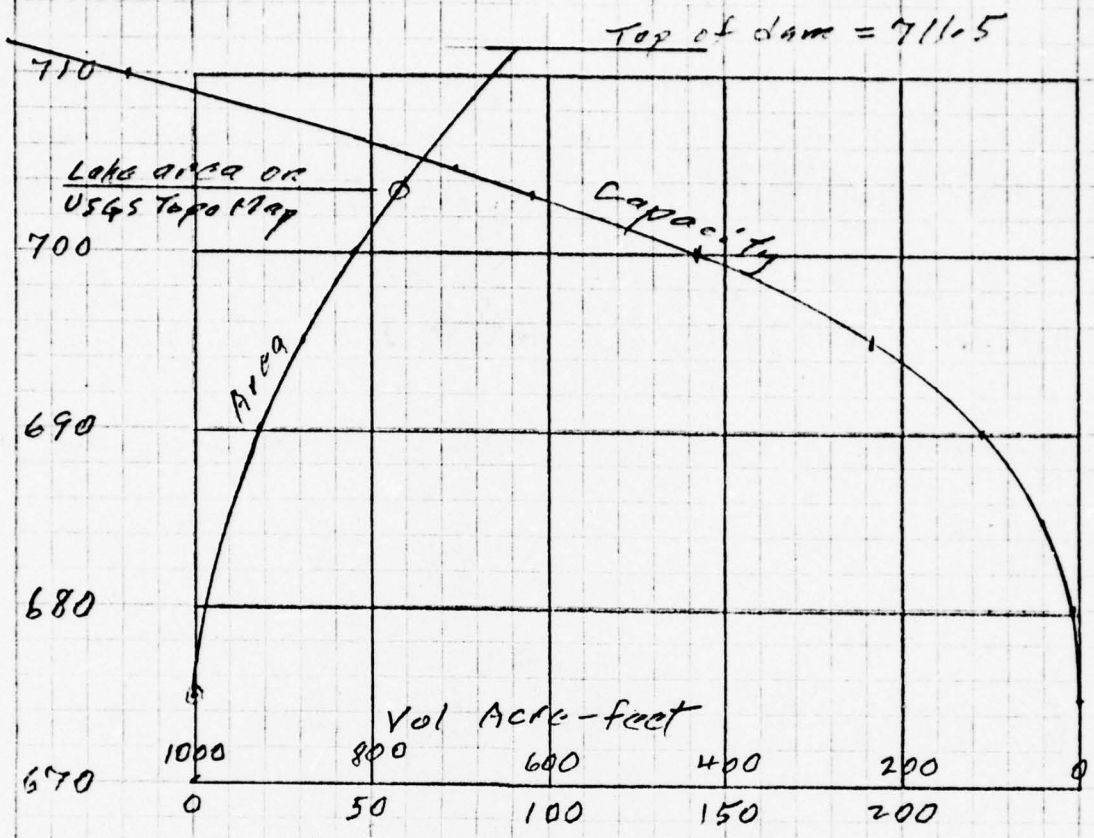
Freeboard = 711.5 - 709.7 = 1.8 ft.

Dam will pass ½ PMF.

SUBJECT

COMPUTED BY LRE DATE 4-13-78 CHECKED BY JJJr

5-22-78

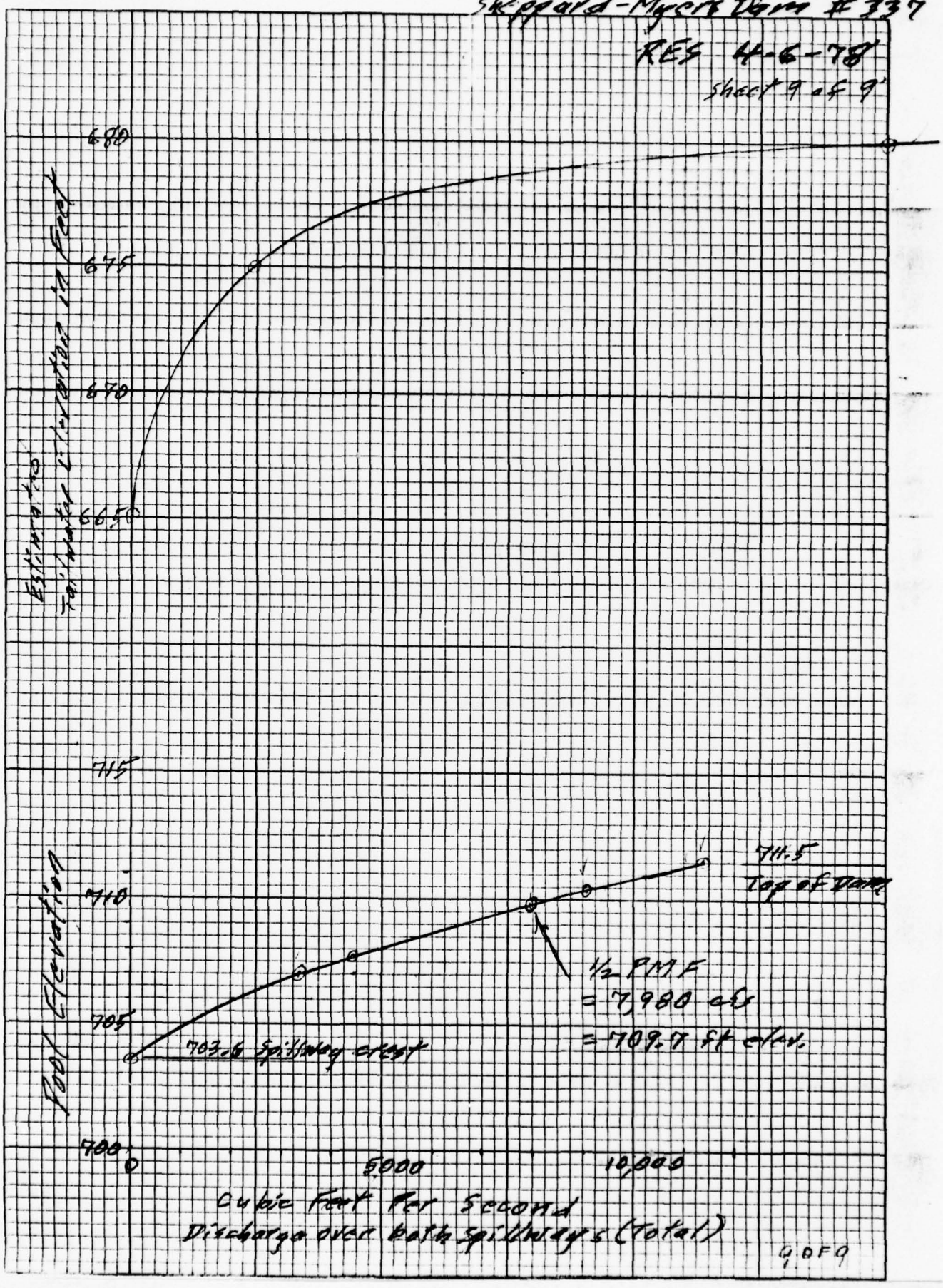


Elev.	Area Acres	Vol. Ac. Ft.	Cum. Ac. Ft.
675	0	0	0
680	3	7.5	7.5
685	10	32.5	40.0
690	19	72.5	112.5
695	31	125.0	237.5
700	46	192.5	430.0
703.6	58	187.2	617.2
705	64	85.4	702.6
710	85	372.5	1075.1
710.35	87	30.1	1105.2
711.5	92	102.9	1208.1

Skeppard-Myers Dam #337

RES 4-6-78

Sheet 9 of 9



9 OF 9

APPENDIX C

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam and Reservoir

Formation Name: Marburg Schist.

Lithology: Bluish gray to silvery green fine grained schist, composed of muscovite, chlorite, albite and quartz. Local layers of quartzite and quartzitic conglomerate have been mapped separately.

Structure

The rocks of southern York County have been intensely folded and metamorphosed at least three times in their long history. Bedding is folded, contorted, and often obliterated. Three generations of cleavage can often be distinguished. In this area, the schistosity is the most obvious parting. The schistosity strikes generally N60°E and dips steeply north to steeply south.

Information on joint directions is not available.

The dominant direction of air photo fracture traces in the area is N60°W. Other directions are N5°W and N10°E.

Overburden

According to the available longitudinal section of the dam, the average thickness of overburden at the site was eight to ten feet. No detailed core boring logs were available. The section also shows that core wall averaged ten feet, of which, five feet was in rock. At two points, the wall went deeper, thirteen feet near the original stream channel, and fifteen feet near the left abutment.

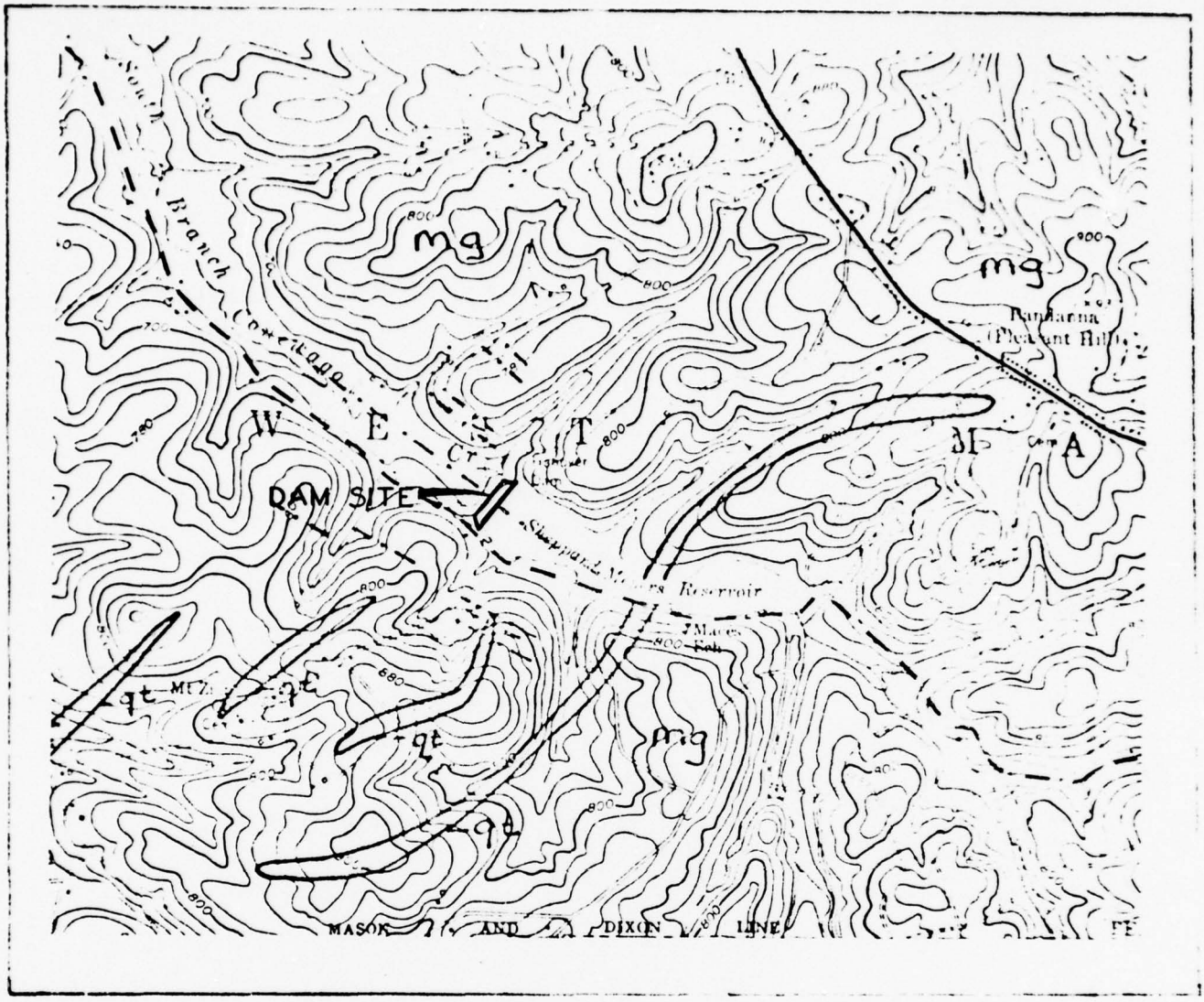
Aquifer Characteristics

The Marburg schist is generally a poor aquifer. Few wells yield more than 15 gpm. Larger yielding wells re most likely when located on upland stream valleys. The schist is of low porosity and is essentially impermeable. Permeability is secondary, on fractures such as fracture cleavage and on joints. Joints controlling valley formation, such as the dominant N60°W air photo fracture trace are the principal porosity zones.

Discussion

It seems clear that the cutoff trench was dug into relatively unweathered schist. The fracture zone parallel to the valley is a focus of potential minor leakage. As this flow is through fresh rock, the possibility of enlargement is remote.

Geologic Map - Sheppard-Meyers Dam



(from geologic map of York County, Pa., by Stose and Jonas, 1939.)

KEY

mg — Marburg schist

qt — quartzite layer within Marburg schist

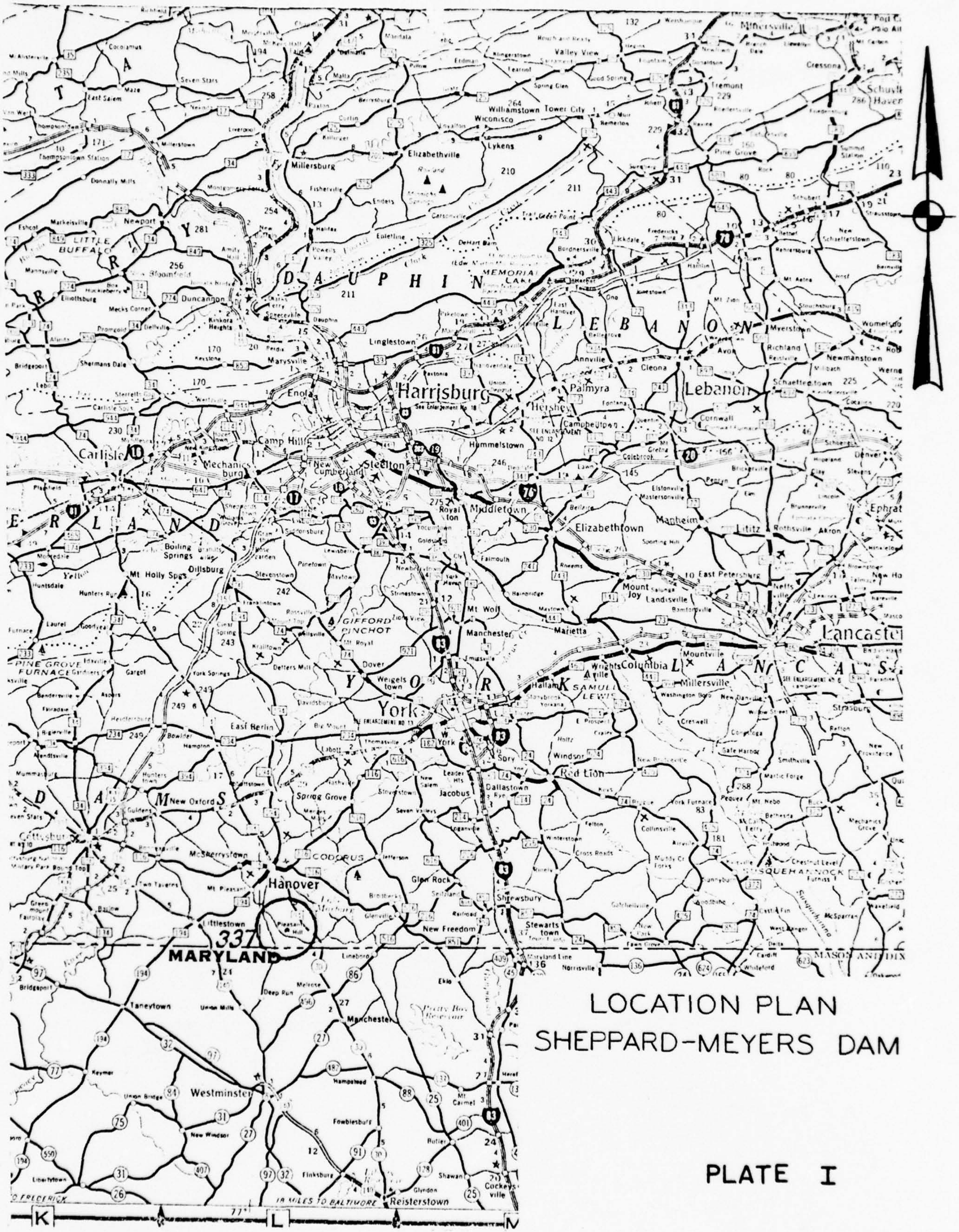
air photo fracture trace

N

SCALE 1:24000

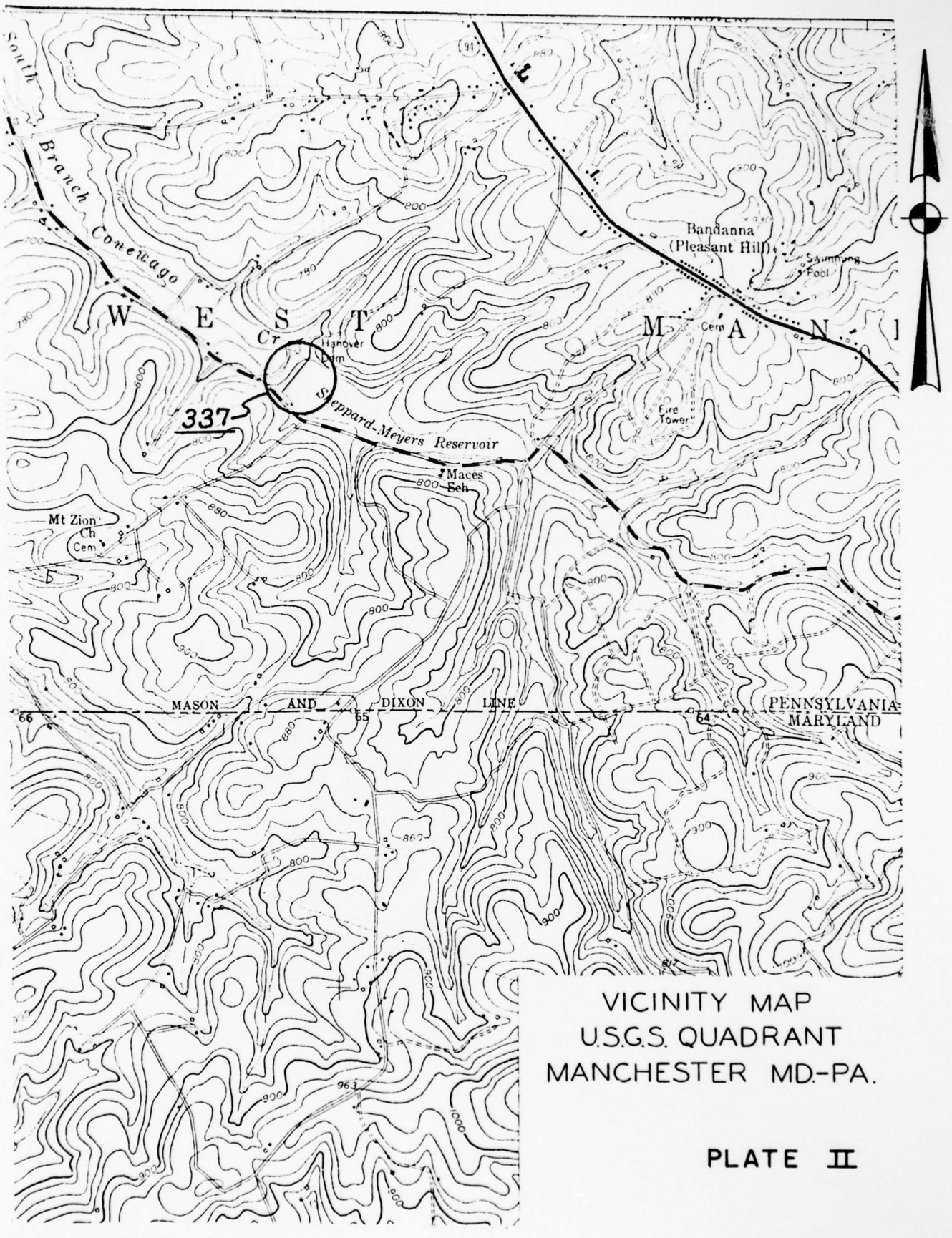
APPENDIX D

LOCATION, PHOTOGRAPHS & DESIGN DRAWINGS



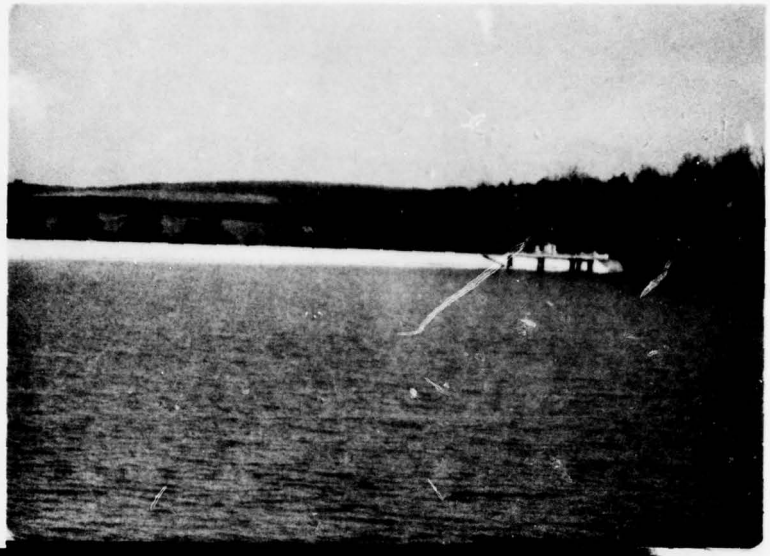
LOCATION PLAN
SHEPPARD-MEYERS DAM

PLATE I



VICINITY MAP
U.S.G.S. QUADRANT
MANCHESTER MD.-PA.

PLATE II

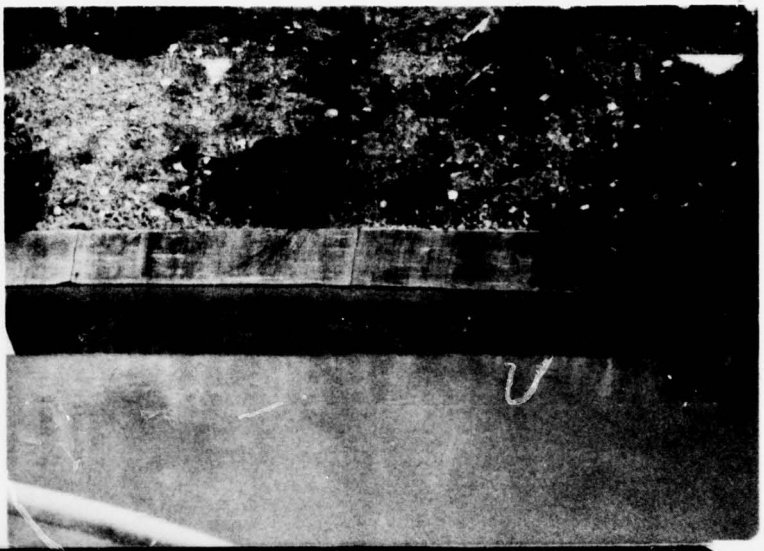


Upstream View
Of Dam

Morning Glory
Intake Tower

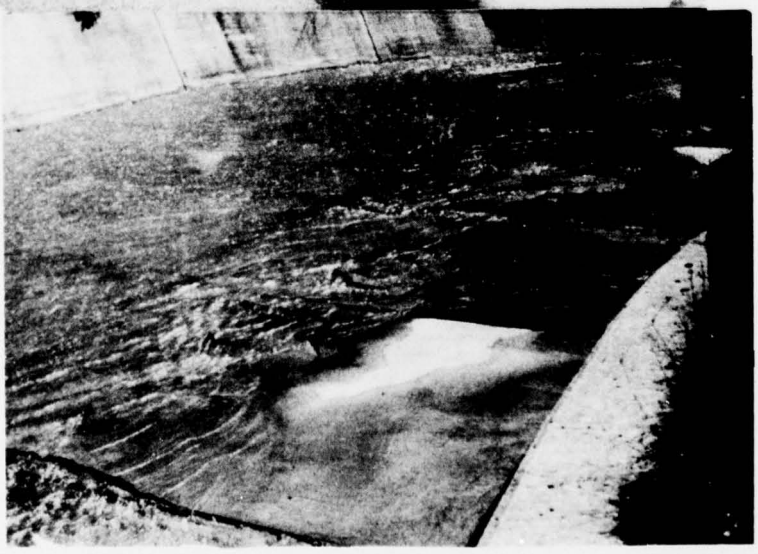
Upstream
Embankment

PLATE III



Spillway
Entrance

Spillway

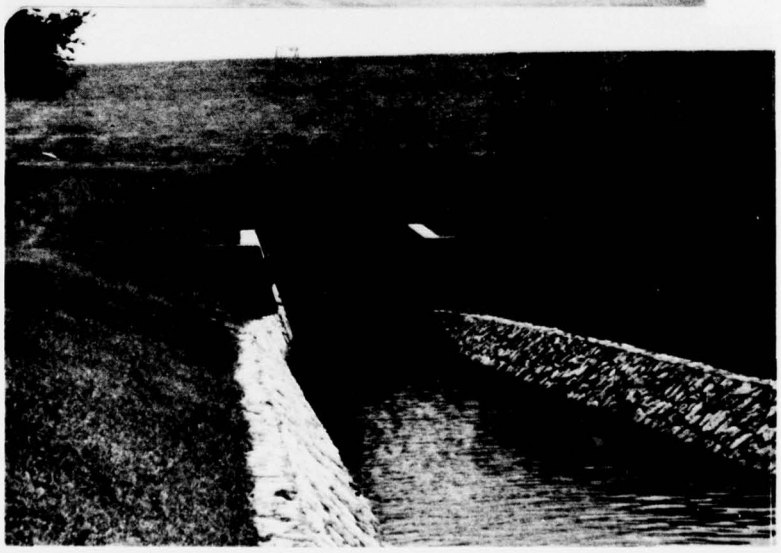


Spillway
Chute

PLATE IV

Spillway
Chute

Wasteway
Channel



10 Feet Diameter
Outlet

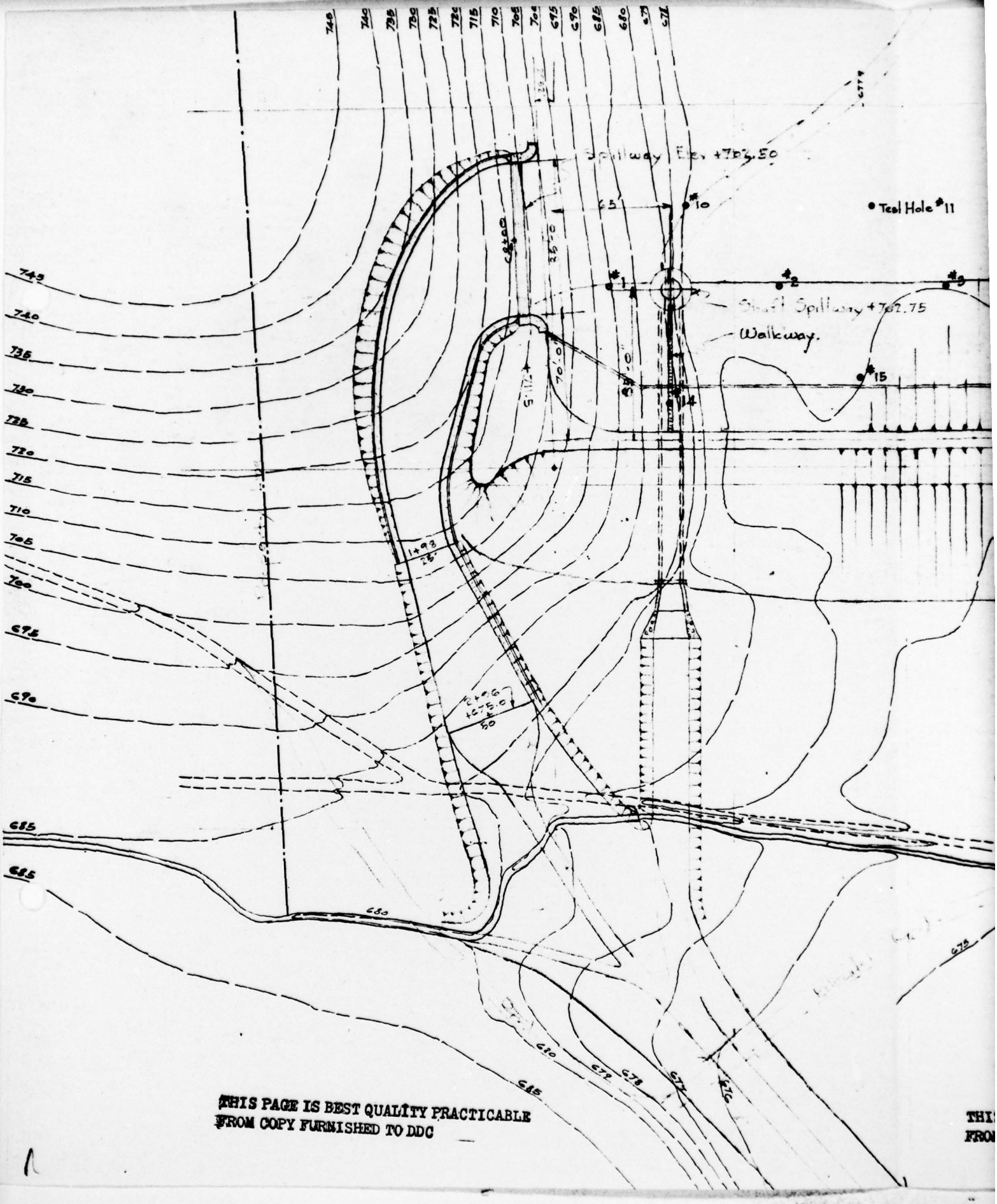
PLATE V

Downstream
Embankment

"Wet" Area
"Springs"

Embankment Slope
'Mole Activity"

PLATE VI



2

ated Roadway

337

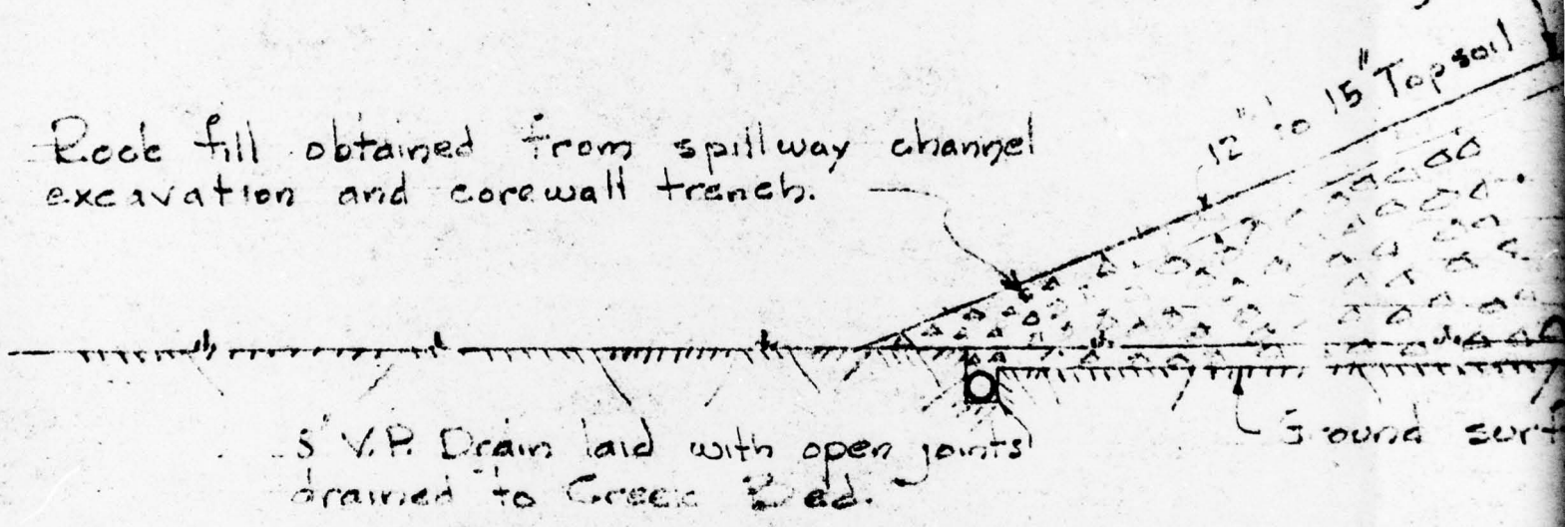
PLATE VII

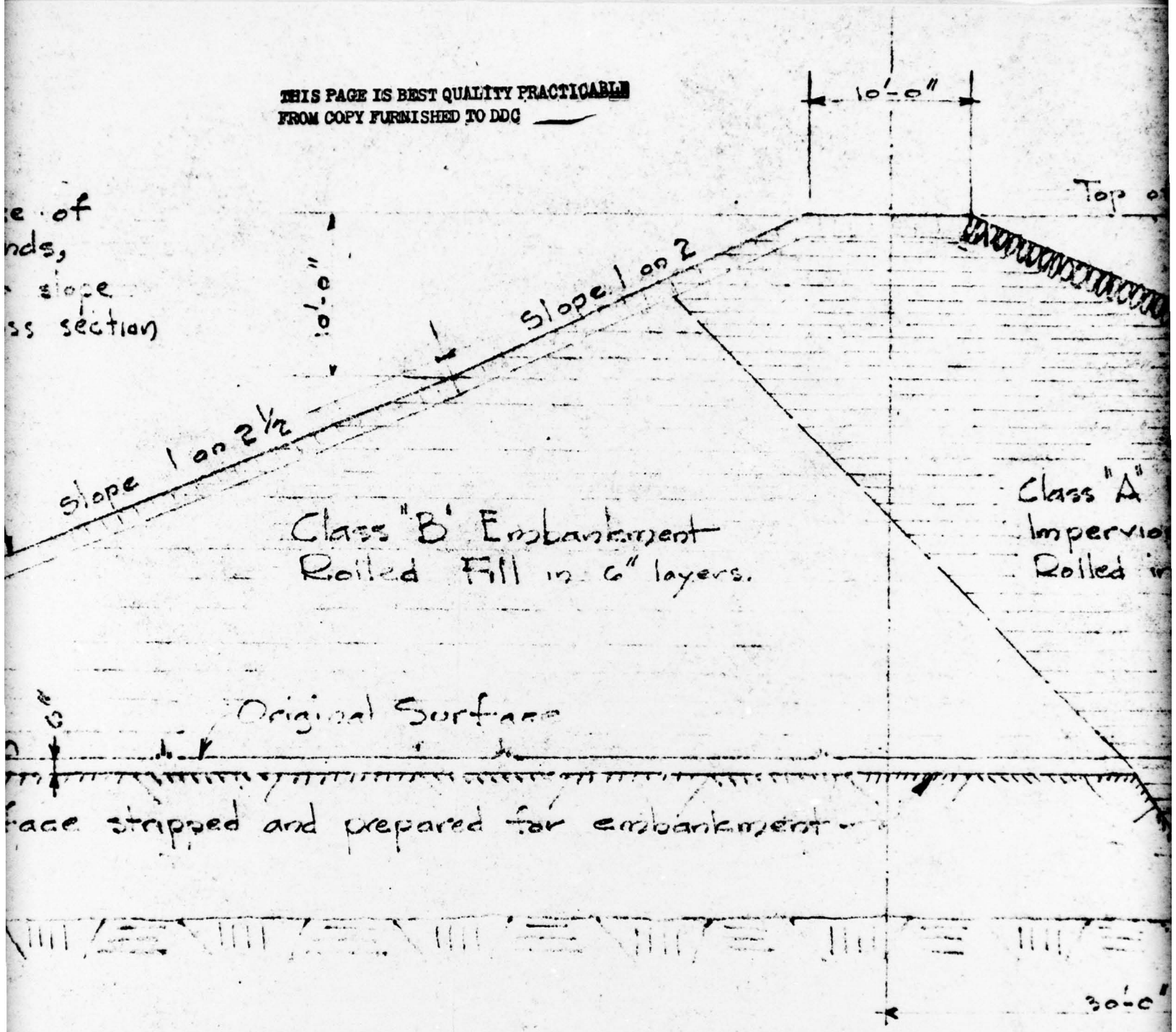
3

Slopes of upstream and downstream face
dam, including rounded off portions at en
to be maintained throughout so that no
will be steeper than that shown on cros

Stripping from site of dam to be placed on
downstream side of dam and later used
as top soil on downstream slope.

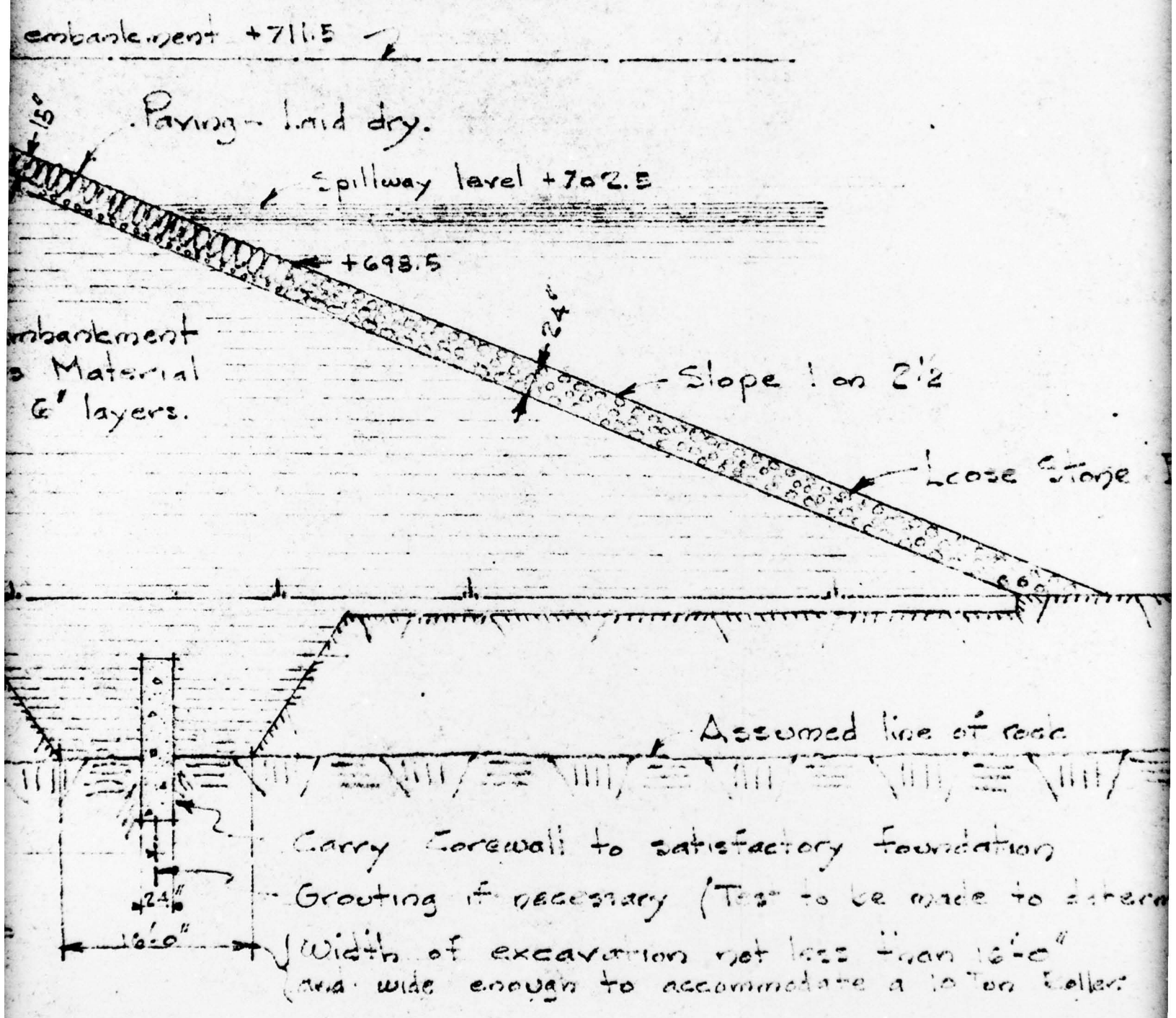
Rock fill obtained from spillway channel
excavation and corewall trench.



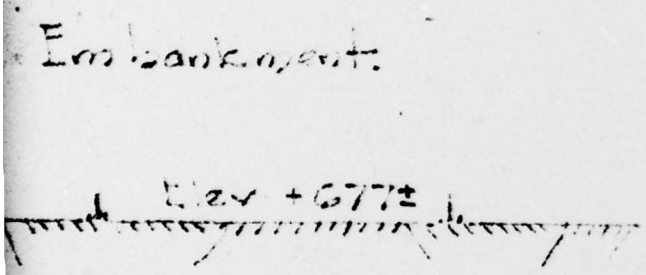


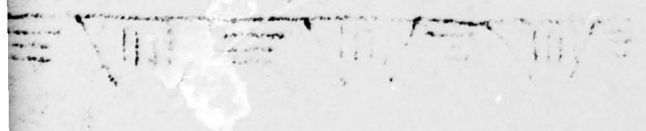
TYPICAL CROSS SECTION

Scale 1/8" = 1'-0"



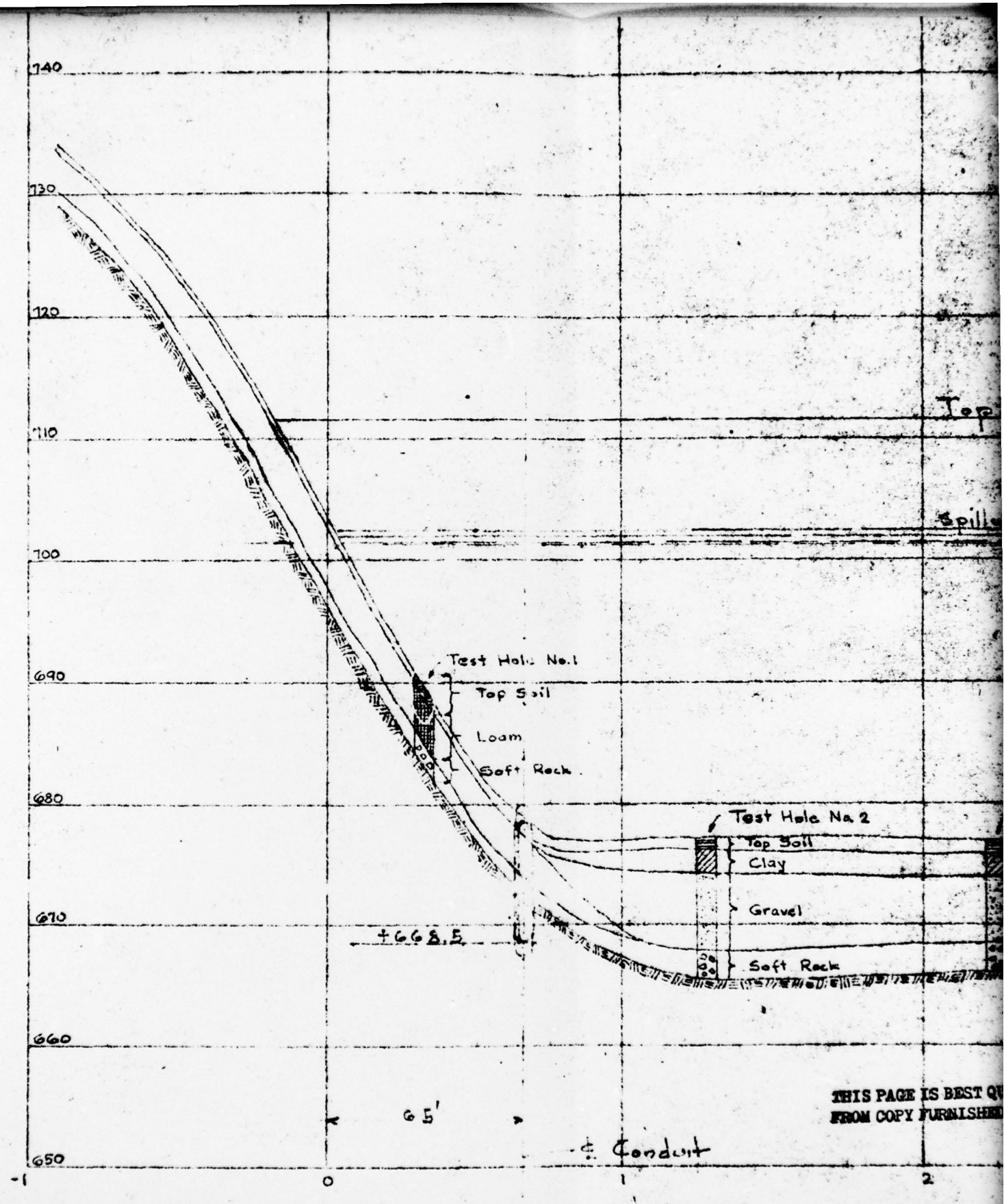
THROUGH DAM





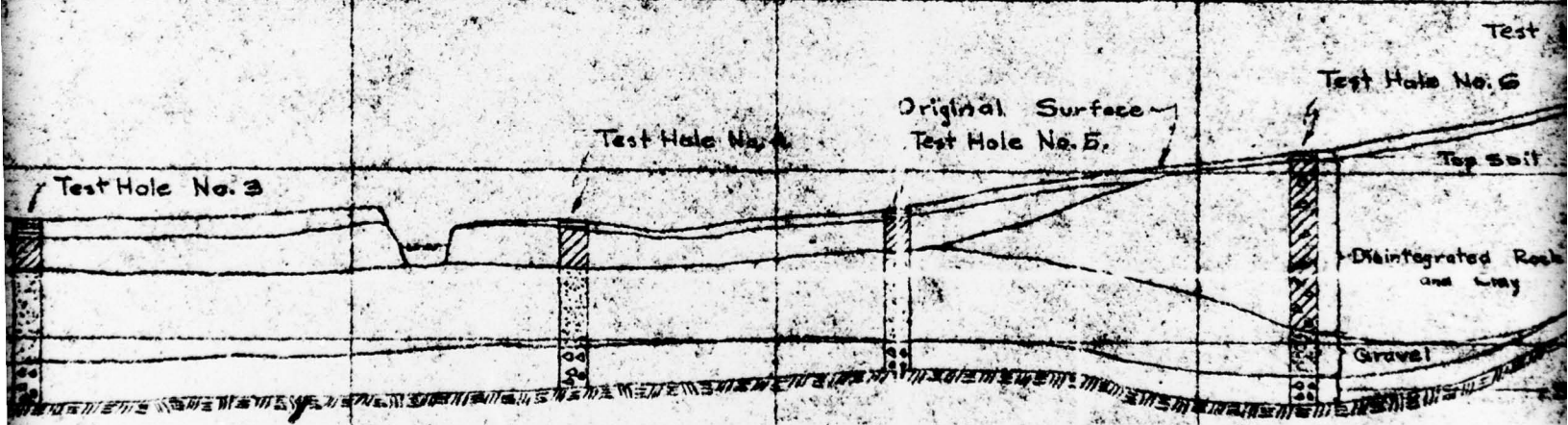
(Remove this.)

PLATE VIII



p of earth embankment +711.5

llway +702.5



Approximate Line of Rock from Original Test Borings
See Sheet No. 12 for Details

3 4 5

NGITUDINAL SECTION LOOKING UPSTREAM.

2

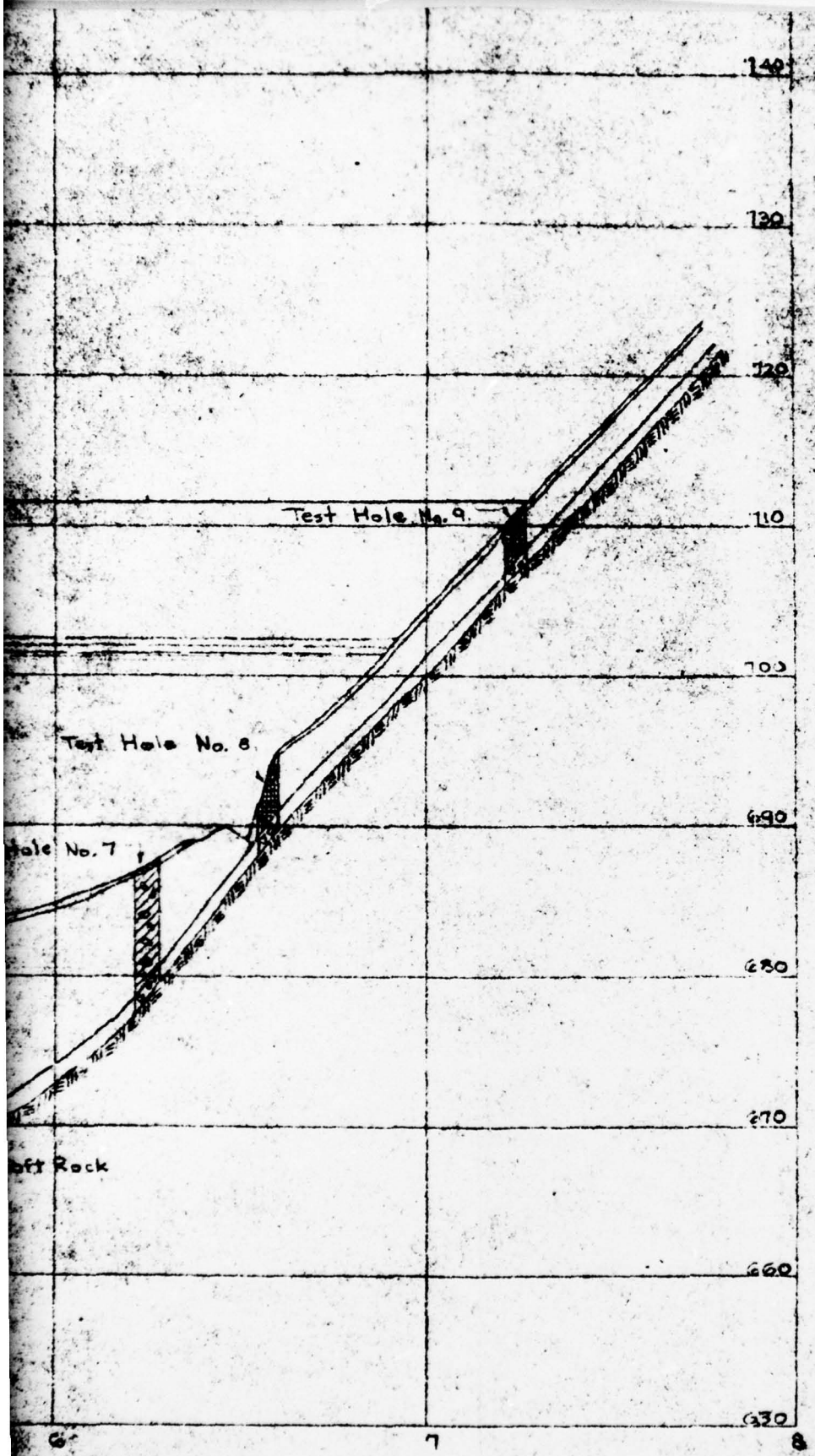


PLATE IX