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NATIONAL DAM SAFETY PROGRAM. JAMES RIVER BASIN. SUGAR HOLLOW (I--ETC(U)
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JAMES RIVER BASIN

Name of Dam: Sugar Hollow
Location: Albemarle County, State of Virginia
Inventory Number: VA 00303

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED FOR

NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

PREPARED BY
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SEPTEMBER 1978

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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by 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 conditions 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.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Sugar Hollow
State: Virginia
County: Albemarle
Stream: Moormans River
Date of Inspection: 25 July 1978

BRIEF ASSESSMENT OF DAM

Sugar Hollow Dam is a gated concrete gravity structure, approximately 77 feet high and 480 feet long. The dam is owned and operated by the Rivanna Water and Sewer Authority for the water supply of the City of Charlottesville.

The gated spillway will pass 18 percent of the Probable Maximum Flood when closed, 62 percent of the Probable Maximum Flood when opened, and 80 percent of the Probable Maximum Flood with the gates removed. Therefore, the spillway is inadequate. Structural calculations indicate that the dam meets the stability requirements of the Recommended Guidelines for Safety Inspection of Dams with respect to overturning and sliding for the Probable Maximum Flood and normal pool conditions.

The owner should immediately conduct a detailed assessment of spillway capacity to pass the Probable Maximum Flood. This assessment should include the possibility of removing the spillway gates as well as other measures. Remedial work that can be performed as part of the annual maintenance program should include: monitoring clear minor seepage areas during higher reservoir levels, cleaning mud and debris from the drainage gallery, clearing plugged foundation drains, operating the lift gates to check for proper functioning, and repairing erosion on the left upstream shoreline.

MICHAEL BAKER, JR., INC.

Michael Baker, III, P.E.
Chairman of the Board and
Chief Executive Officer

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OVERALL VIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: SUGAR HOLLOW ID# VA 00303

SECTION 1 - PROJECT INFORMATION

1.1 General

1.1.1 Authority: Public Law 92-367, 8 August 1972 authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams. The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Description of Project

1.2.1 Description of Dam and Appurtenances: Sugar Hollow Dam, also known as Moormans River Storage Dam, is a concrete gravity structure 480 feet long, as measured along the upstream arc. The 480 feet length consists of a 225 feet spillway, a 100.5 feet south bulkhead, and a 154.5 feet north bulkhead (see Plates 1 and 2). The maximum height of the dam is 77 feet. A drainage gallery extends from abutment to abutment with 3.5 inch diameter pipe foundation drains spaced at regular intervals throughout the gallery. The drains were observed during the inspection (see Plate 3).

A stilling pool located at the toe of the dam is impounded by a seven feet high concrete overflow dam (see Photo 3).

To the left of the stilling pool at the toe of the dam is a 30 inch diameter blow off pipe and a 24 inch diameter water supply main which exits from the gallery tunnel and traverses the left bank of the downstream channel (see Plate 5).

The spillway is of the gated crest type with eight gates approximately 25 feet long and five feet high. The individual gates are raised or lowered by a single electric motor driven gate hoist. The hoist is mounted on rails extending across the entire length of the spillway to permit access to each gate.

The intake tower is located adjacent to the left end of the spillway.

1.2.2 Location: Sugar Hollow Dam is located on Moormans River approximately five miles upstream from the Town of Whitehall, Virginia (population 55) and approximately 18.2 miles northwest of Charlottesville, Virginia (population 32,000). Camp Sugar Hollow, a summer camp for girl scouts, is located approximately 1.1 miles downstream from the dam and is occupied on a seasonal basis. The operator's residence for this dam is located several hundred feet downstream. A Location Plan is included in this report.

1.2.3 Size Classification: The maximum height of the dam is 77 feet. The reservoir volume to the gated spillway crest is 1667 acre-feet. Therefore, the dam is in the "intermediate" size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

1.2.4 Hazard Classification: Due to the proximity of the Town of Whitehall, Virginia with a population of 55, the Girl Scout camp 1.1 miles downstream, and the dam operator's residence; many lives could be lost in the event of failure of the dam. Therefore the dam is considered in the "high" hazard category as defined by Section 2.1.2 of the Recommended Guidelines for Safety Inspection of Dams. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: The Sugar Hollow Dam is owned by the Rivanna Water and Sewer Authority, Charlottesville, Virginia.

1.2.6 Purpose of Dam: The dam is used for water supply to the City of Charlottesville, Virginia. There is also limited recreational fishing on the reservoir.

1.2.7 Design and Construction History: The existing facility was designed for the owner by Mr. Edward W. Saunders, Consulting Engineer, Charlottesville, Virginia in January 1946. The core borings were made in December 1944 and January 1945 by Mott Drilling Company, Huntingdon, West Virginia. The construction was done by Faulconer Construction Co. in 1950. No known construction has been undertaken since the dam was built.

1.2.8 Normal Operational Procedures: The reservoir is normally operated with pool level at the top of the spillway crest gates, elevation 975.0. Two 18 inch diameter intake pipes with invert elevations of 936.22 and 962.72 are located on the upstream face of the intake tower. Intakes connect to a 24 inch diameter waterline with invert elevation 913.79 which supplies the City of Charlottesville. A 30 inch diameter blow off line is located within the intake tower and has an invert elevation of 913.17.

There is no formal maintenance schedule at the dam site. However, there is a resident dam operator.

1.3 Pertinent Data

1.3.1 Drainage Area: The drainage area of Sugar Hollow Dam is approximately 17.2 square miles.

1.3.2 Discharge at Dam Site: The maximum flood at the dam site is not known.

Gated Spillway
Pool level at top of dam

Gates closed.	5288 c.f.s.
Gates opened.	17,928 c.f.s.
Gates removed	23,240 c.f.s.

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet M.S.L.	Reservoir Capacity Area acres (a)	Reservoir Capacity Acre-feet (a)	Reservoir Capacity Watershed inches (b)	Length feet
Top of dam	980.0	53	1590	1.7	-
Gated spillway crest (c)	970.0	45	1105	1.2	2600
(d)	975.0	48	1320	1.4	-
Streambed at centerline of dam	915±	-	-	-	-

(a) Total area and storage.
(b) Based on 17.2 square miles.
(c) Crest gates opened.
(d) Crest gates closed.

SECTION 2 - ENGINEERING DATA

2.1 Design: The design data reviewed included the following:

1) Photocopies of the design plans prepared by Saunders and Wheeler Consulting Engineers in 1946 and furnished by the Rivanna Water and Sewer Authority (Plates 1 through 5).

2) Core borings performed by Mott Core Drilling Company in 1944 and 1945 (Appendix V).

3) Storage graphs were prepared by Polglaze and Basenberg Engineers, 1959.

No structural design calculations were available.

2.2 Construction: The construction of the dam was completed by Faulconer Construction Co. in 1950. Construction photos were taken and are available at the Rivanna Water and Sewer Authority's office.

2.3 Operation: The dam is operated and maintained by the Rivanna Water and Sewer Authority as part of its water supply system. There is a full time dam operator; however, no formal records of operation were available.

2.4 Evaluation

2.4.1 Design: The drawings provided by the Rivanna Water and Sewer Authority were adequate to review the design of the Sugar Hollow Dam. Although structural design calculations were not available, the layout and general dimensions of the dam did not indicate any obvious design deficiencies.

2.4.2 Construction: There were no as-built plans or concrete cylinder test results provided to adequately assess the quality of work performed. The design drawings were checked against the as-built conditions, and there appeared to be little or no deviation between the two.

2.4.3 Operation: Based on the visual inspection and the review of the design plans, the operation of the water supply facility by full time personnel is adequate.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

3.1.1 General: The dam and its appurtenant structures were found to be in good overall condition at the time of the inspection. The problems noted during the visual inspection of the dam do not require immediate remedial treatment but should be corrected as a part of a regular maintenance schedule. Noteworthy deficiencies are described briefly in the following paragraphs. A complete visual inspection check list is given in Appendix III.

3.1.2 Dam: Generally, all concrete structures appeared to be in good condition. However, minor spalling of the spillway beneath the main overflow section was observed.

Evidence of spalling, cracking and seepage was observed on the downstream face of the left non-overflow section. Clear seepage was observed at the construction joints. Vegetation was observed to be growing on the downstream face of the left non-overflow section.

The original intake dam which is now being used to impound the stilling basin is in fair condition. Spalled and cracked areas were noted sporadically along the crest of the small dam. Eroded areas in the concrete face were also noted with flow present in these areas (see Photo 3).

Although the dam was grouted during construction, active seepage is present in the left abutment area near the toe of the dam adjacent to the 24 inch water supply line for a distance of approximately 40 feet in the downstream direction. Drainage was present from a four inch terra-cotta drain. Drainage and clear seepage amounted to approximately three g.p.m., two-thirds of which was drainage from the terra-cotta pipe.

Within the gallery that extends through the dam, 3.5 inch foundation drains were present at regular intervals. The drains were full of water at the time of inspection. Water from the drains is collected by an overflow trough that extends the entire length of the

gallery. Water was present in the overflow trough (see Plate 3). Part of the drainage system appeared to be functioning properly. Some of the drains in the right end of the gallery were covered with mud and debris, and were not functioning.

Within the gallery, spalling was evident at construction joints along with moisture and calcite deposits. This was typical for all construction joints.

3.1.3 Appurtenant Structures: Some minor spalling and surface cracks were present on the intake tower and the walkway along the crest of the dam. Neoprene sealant had been "squeezed" out of the expansion joints along the crest; approximately one-fourth to one-half of an inch of expansion material is remaining. The crest gates were in good condition with no leakage present. It was reported during the time of inspection that the gates were not regularly operated. This was verified by the fact that the tracked gate hoist had a light coating of rust on the tracks and the hoist.

3.1.4 Reservoir Area: Evidence of erosion in the left abutment area upstream of the dam was observed at the time of inspection. No other areas of erosion were observed. Minor sedimentation of the reservoir was present in the upstream end.

3.1.5 Downstream Channel: The streambed of the downstream channel consists of boulders, cobbles and sandy gravel. Some granite is also exposed. The stream channel is heavily overgrown with ground cover, and the presence of small trees two to three years old was evident at the time of inspection.

3.2 Evaluation

3.2.1 Dam: The concrete in the spillway and right non-overflow area is in good condition and requires no further investigation. The concrete in the left non-overflow area adjacent to the main spillway shows evidence of clear seepage. The Rivanna Water and Sewer Authority should monitor these seepage areas.

The foundation drains in the gallery which have been plugged with mud and debris should be cleaned to prevent hydrostatic pressure build-up in the foundation.

The entrance to the gallery in the right non-overflow area allows infiltration of mud and debris. To prevent future accumulations of mud and debris, a drainage ditch should be built to channel the runoff and mud away from this entrance. The gallery should also be cleaned.

The clear seepage at the toe of the dam in the right non-overflow area (three g.p.m.) and at the left abutment area (one g.p.m.) does not appear to be a serious problem at the present time. However, the Rivanna Water and Sewer Authority should also continue to monitor these seepage areas.

The outlet of the four inch terra-cotta drain should be uncovered, and a channel should be provided for flow. Also, the heavy growth should be cut.

3.2.2 Appurtenant Structures: The small original intake dam that is now impounding the stilling pool is cracking and spalling. At the present time, no detrimental effects to the stilling basin were observed. However, the condition should be observed in the future to insure that the deteriorated condition does not effect the efficiency of the stilling basin.

It was reported at the time of inspection and visually verified that the lift gates have not been operated for some time. It is recommended that regular operations of the lift gates' equipment be done to insure their working order.

3.2.3 Reservoir Area: The erosion of the left bank area 100 feet upstream of the dam should be controlled by placement of riprap to assure this erosion does not continue and eventually affect the stability in the left abutment area.

3.2.4 Downstream Channel: No further investigation is necessary.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: Operational procedures are generally discussed in paragraphs 1.2.8 and 2.3. The normal reservoir elevation of 975.0 is controlled by the gated primary spillway overflow.

The dam is controlled by a resident operator and visited by maintenance personnel from the Rivanna Water and Sewer Authority.

Rapid emergency drawdown is controlled through the 30 inch diameter drawdown line (invert elevation of 913.17), which is located within the intake tower. The operating condition of the control valve for this line is unknown.

4.2 Maintenance of Dam: Because of its water supply function, the dam has an on site resident operator and is frequently visited by maintenance personnel. The dam is generally in good condition; except for minor spalling, cracking, clear seepage from some construction joints, and growth of vegetation.

4.3 Maintenance of Operating Facilities: Maintenance personnel of the Rivanna Water and Sewer Authority operate the two slide gates for the 18 inch discharge pipes into the intake tower for the 24 inch water supply line. The spillway crest gates appear to be in good condition but they are not operated regularly.

4.4 Warning System: At the present time, there is no warning system or evacuation plan in operation. It is recommended that a formal emergency procedure be prepared, and prominently displayed and furnished to all operating personnel. This should include:

1) How to operate the dam during an emergency.

2) Who to notify, including public officials, in case evacuation from the downstream area is necessary.

3) Procedures for evaluating inflow during periods of emergency operation.

4.5 Evaluation: Maintenance of the dam by personnel of the Rivanna Water and Sewer Authority is considered to be acceptable. However, the operating condition of the valve in the 30 inch drawdown line should be determined.

SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

5.1 Design: A stage versus storage curve, received from the Rivanna Water and Sewer Authority, was the only design data available for use in the analyses of hydrologic and hydraulic conditions.

5.2 Hydrologic Records: Flood discharge information is available for the Whitehall stream gaging station from 1951 to date. The gage has a drainage area of 11.4 square miles and is located approximately 0.73 mile upstream of the dam on the North Fork Moormans River.

5.3 Flood Experience: No records are available.

5.4 Flood Potential: The flood potential of the dam was evaluated by routing various hydrographs as shown in Table 5.1.

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1, paragraph 1.3.3.

Flow from the reservoir is regulated by eight crest gates, five feet high, 25.5 feet wide. Crest elevation with gates opened is 970.0, and with gates closed is elevation 975.0. With the exceptions of discharge through the lake drain and water supply pipes, all outflow from the reservoir passes through the gated spillway.

Outlet discharge capacity, reservoir area, and hydrograph and routing determinations were calculated as part of this report. The routing of the Probable Maximum Flood (P.M.F.), one-half P.M.F., and 100 year hydrographs began with the reservoir level at the spillway crest elevation 975.0 with the crest gates closed, at elevation 970.0 with the crest gates open, and at elevation 970.0 with the crest gates removed.

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance in various hydrographs are shown in the following table:

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal			Hydrograph: 100 Year			Hydrograph: 1/2 P.M.F.			Hydrograph: P.M.F.		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
Peak flow, c.f.s.												
Inflow	-	-	-	7880	7880	7880	14507	14507	14507	29014	29014	29014
Outflow	-	-	-	7657	7743	7743	14360	14273	14316	28970	28560	28901
Peak elev., ft. M.S.L.	975.0	970.0	970.0	980.8	974.6	974.6	982.5	977.2	976.4	985.4	983.1	981.3
Gated spillway												
Depth of flow, ft. (d)	-	-	-	9.8	3.6	3.6	11.0	5.0(g)	5.9(g)	13.0	9.6	10.2
Average velocity, f.p.s. (e)	-	-	-	10.9	10.7	10.7	12.6	14.0	14.0	14.7	19.0	16.7
Non-overflow section (f)												
Depth of flow, ft.	-	-	-	0.5	-	-	1.5	-	-	3.3	1.8	0.8
Average velocity, f.p.s.	-	-	-	4.1	-	-	7.1	-	-	10.2	7.6	5.1
Duration of overtopping, hrs.	-	-	-	2.7	-	-	6.2	-	-	8.5	4.3	2.9

(a) Gates completely closed.
(b) Gates completely open.
(c) Gates removed.
(d) Depth of flow over crest (elevation 970.0).
(e) Weighted veolocity over spillway and walkway.
(f) Sections of dam on either side of spillway.
(g) Orifice flow between dam crest and gate, and between dam crest and walkway.

NAME OF DAM: SUGAR HOLLOW

5.7 Reservoir Emptying Potential: The 30 inch cast-iron pipe entering at a low level below the spillway will permit withdrawal of about 163 c.f.s. with the reservoir level at the crest (elevation 970.0) and essentially dewater the reservoir in about five days.

5.8 Evaluation: Sugar Hollow Dam with an "intermediate" size-"high" hazard classification must pass a spillway design flood equal to the P.M.F. As shown in Table 5.1, the P.M.F. was routed and found to overtop the dam by an average depth of 1.8 feet with the crest gates open. The spillway passes the one-half P.M.F. with the gates open.

The P.M.F., one-half P.M.F., and 100 year flood were also routed with the gates closed, and all floods were found to overtop the dam. With the gates closed the spillway would pass 18 percent of the P.M.F. without overtopping. The spillway with the gates open will pass approximately 62 percent of P.M.F. With the gates completely removed, the spillway passes 80 percent of the P.M.F. Therefore, the spillway is inadequate.

It should be indicated that conclusions pertain to present day conditions, and that the effect of future development on the hydrology has not been considered.

SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: The structure is founded on hard granite. Joints with a dip between 80° to 90° were observed in localized rock exposures. Some moderately dipping cleavage planes were also observed. Selected pervious rockfill was placed adjacent to the downstream face of the dam with a silty sand and gravel cover. Upstream of the dam, selected impervious fill with a 1.5 feet cover of riprap was indicated on the design drawings. This was not visible at the time of inspection.

Both abutments were founded on hard jointed granite with joint dips ranging from 80° to 90°. Clear seepage was observed along portions of the cleavage plane sloping downstream from the toe of the dam in the left abutment area.

6.2 Stability Analysis

6.2.1 Visual Observations: No unusual misalignment or structural cracking was observed during the visual inspection. A small amount of clear seepage from the granite joints in the left abutment area was noted. In addition to the clear seepage from the abutment area, some clear seepage was observed to be coming from the horizontal and vertical construction joints in the left abutment area.

6.2.2 Design Data: Since there were no design calculations available, stability analyses were performed on a full section through the dam (see Appendix VI). The stability computations were made in accordance with Gravity Dam Design, U.S. Army Corps of Engineers, Manual EM 1110-2-2200, 23 November 1960 (including Change 2) and ETL 1110-2-184, February 1974.

Stability analyses were completed for three cases:

I. Water level at normal pool (elevation 975.0) with ice load and normal tailwater of nine feet (the spillway gates were assumed to be closed).

II. Water level 3.1 feet over top of dam elevation 980.0 with no ice load and tailwater at elevation 914.0. (The 3.1 feet height was based on the calculated P.M.F. elevation. The spillway crest gates were assumed to be completely opened.)

II. Water level again 3.1 feet over top of dam elevation 980.0 with no ice load. (However, the tailwater was estimated to be at elevation 920.0, and the spillway crest gates were assumed to be completely opened.)

The results of the stability analyses show the resultant force is within the middle one-third of the base and a factor of safety against sliding that is well above that required. The high values of angle of internal friction (Φ = 31°) and average shear strength (S_o = 1825 p.s.i.) of the quartz monzonite are primarily responsible for the very large factor of safety against sliding.

The $\frac{\Sigma H}{\Sigma V}$ for Case I normal conditions is 0.64 as compared to the allowable of 0.65.

The $\frac{\Sigma H}{\Sigma V}$ for Case II is 0.79 as compared to the allowable of 0.65. However the factor of safety against sliding is very large.

The $\frac{\Sigma H}{\Sigma V}$ for Case III is 0.81. However the factor of safety against sliding is again very large.

6.2.3 Operating Records: There is no instrumentation for indicating movement of the structure under prior maximum loading conditions.

6.2.4 Post-Construction Changes: No post-construction changes were observed.

6.3.5 Seismic Stability: The dam is located in Seismic Zone 2; therefore, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: Sugar Hollow Dam meets all stability requirements according to EM 1110-2-2200.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: Clear minor seepage and erosion were observed at Sugar Hollow Dam. The primary concern for Sugar Hollow Dam, however, is the spillway capacity. The spillway is gated and was evaluated for three operating conditions:

1) Gates closed.

2) Gates opened.

3) Gates removed.

With the gates closed, the spillway passes 18 percent of the P.M.F. With the gates opened, the spillway passes 62 percent of the P.M.F. With the gates removed, the spillway passes 80 percent of the P.M.F. Therefore, the spillway is inadequate.

The stability of Sugar Hollow Dam meets the criteria required by the Recommended Guidelines for Safety Inspection of Dams for normal pool with ice load and during the P.M.F.

The Rivanna Water and Sewer Authority provided design drawings which were adequate to conduct a Phase I evaluation.

7.2 Recommended Remedial Measures: The inspection and subsequent hydrologic/hydaulic analyses revealed work which should be done immediately by the owner. This is to perform a detailed investigation of spillway capacity with the aim of increasing the capacity by possibly removing the lift gates and lowering the normal pool to the spillway crest.

Lower priority items which should be performed as part of the maintenance program are:

1) Monitor clear seepage near the 24 inch water supply line and in the right abutment for a possible increase in flow, especially during higher reservoir levels.

2) Clear the plugged foundation drains in the gallery and clear the entire gallery of mud and debris.

3) Uncover the outlet of the four inch terra-cotta drain, provide a channel for flow, and remove the heavy growth.

4) Check concrete in the intake dam of the stilling pool for progressive deterioration.

5) Annually operate the lift gates to assure proper functioning.

6) Repair erosion of the left upstream shoreline.

7) Divert surface runoff from the gallery entrance.

8) The operating condition of the valve in the 30 inch drawdown line should be determined.

APPENDIX I

PLATES

CONTENTS

Location Plan

Plate 1: General Plan of Dam

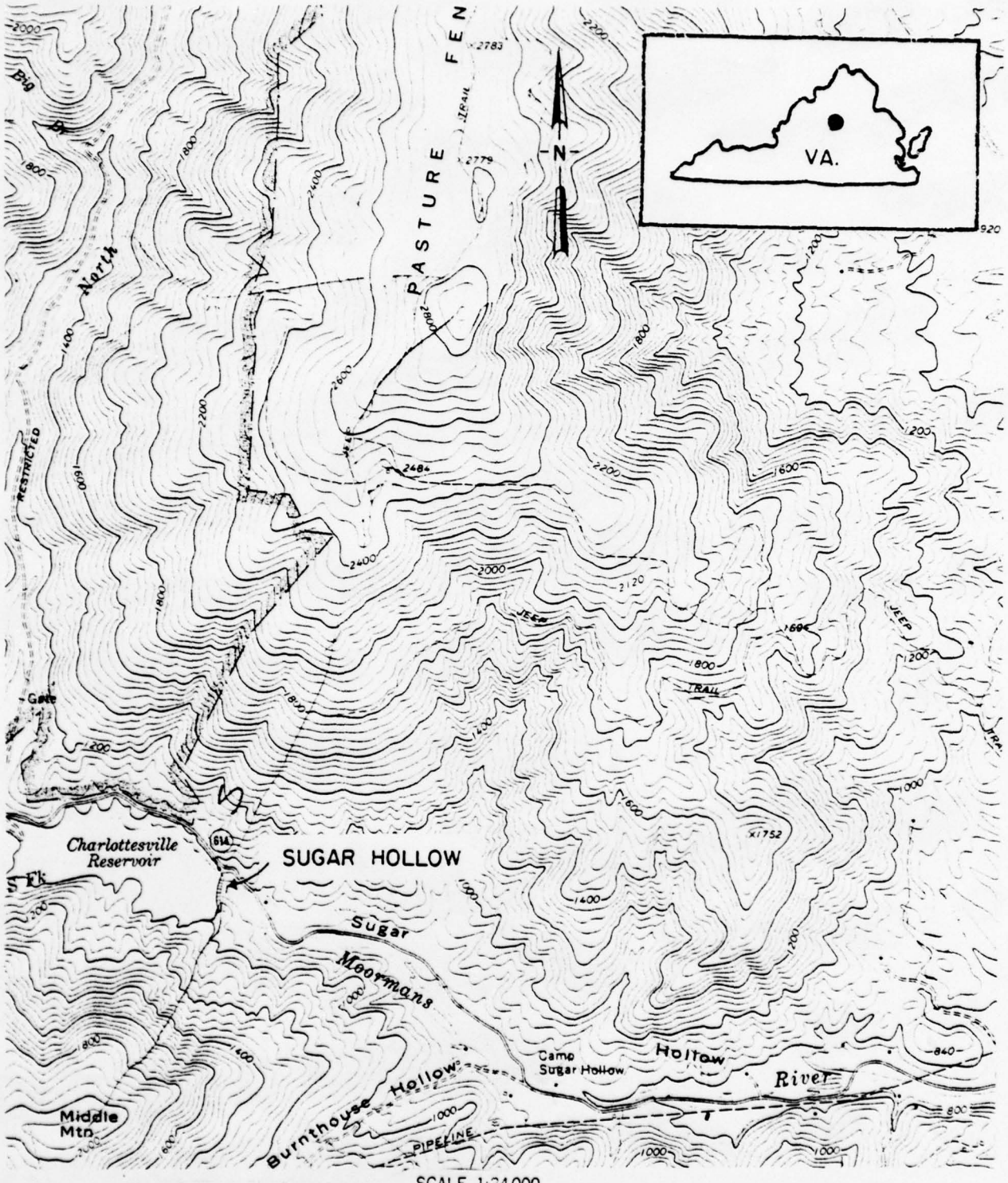
Plate 2: Elevation of Dam

Plate 3: Galleries, Drains and Grout Pipes

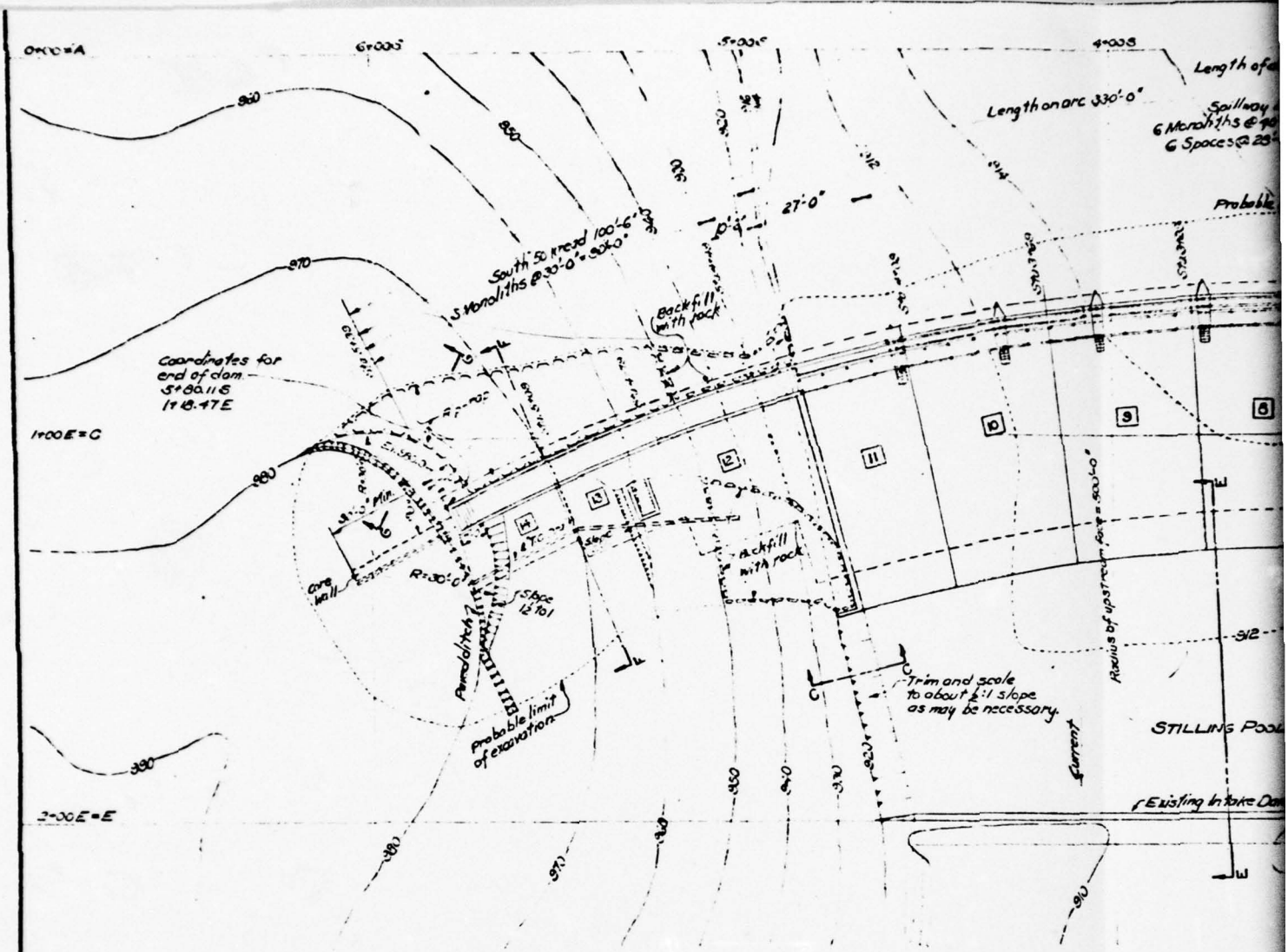
Plate 4: Sections, Construction Joints, Water Stops and Spraywalls

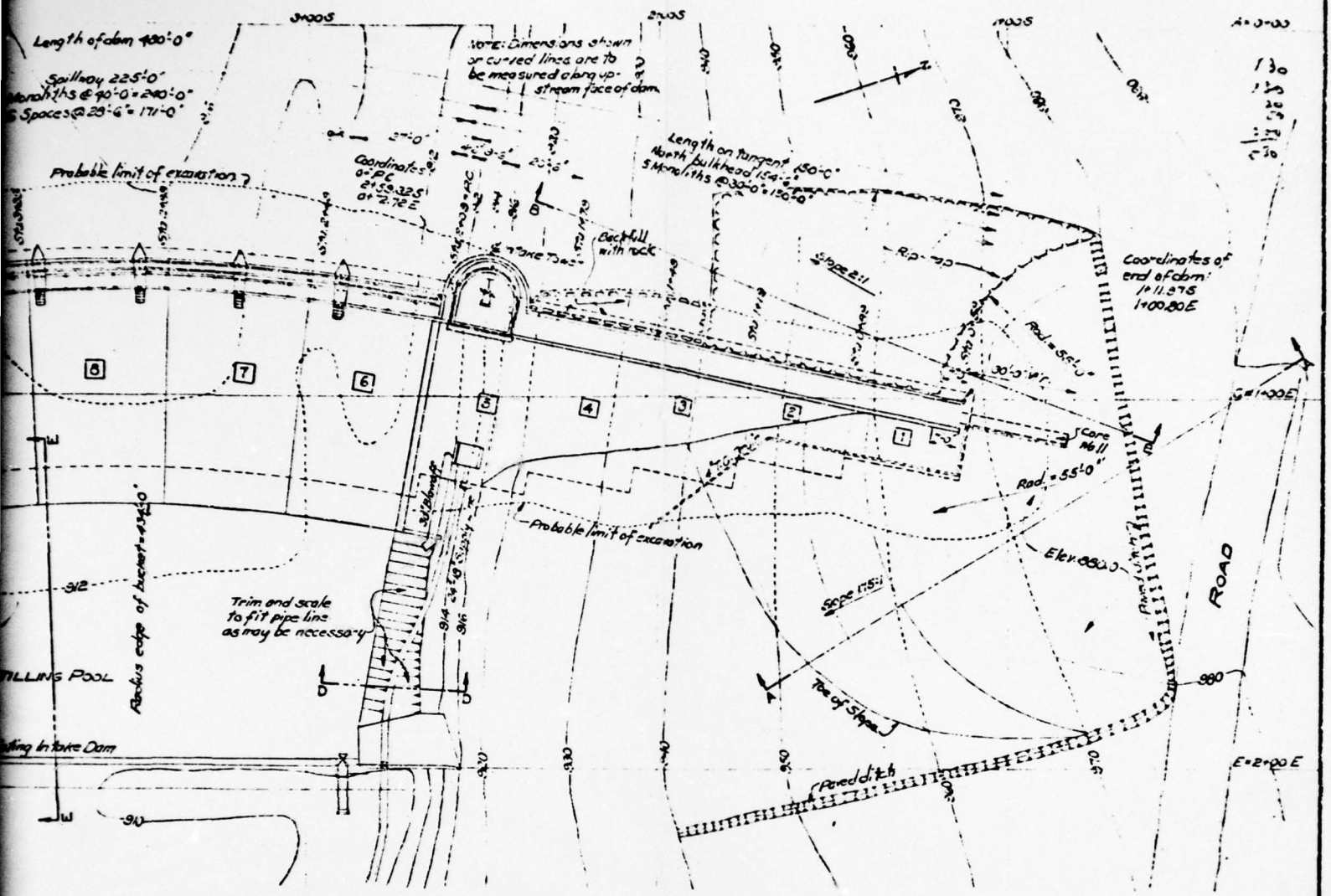
Plate 5: Details of Intake Tower

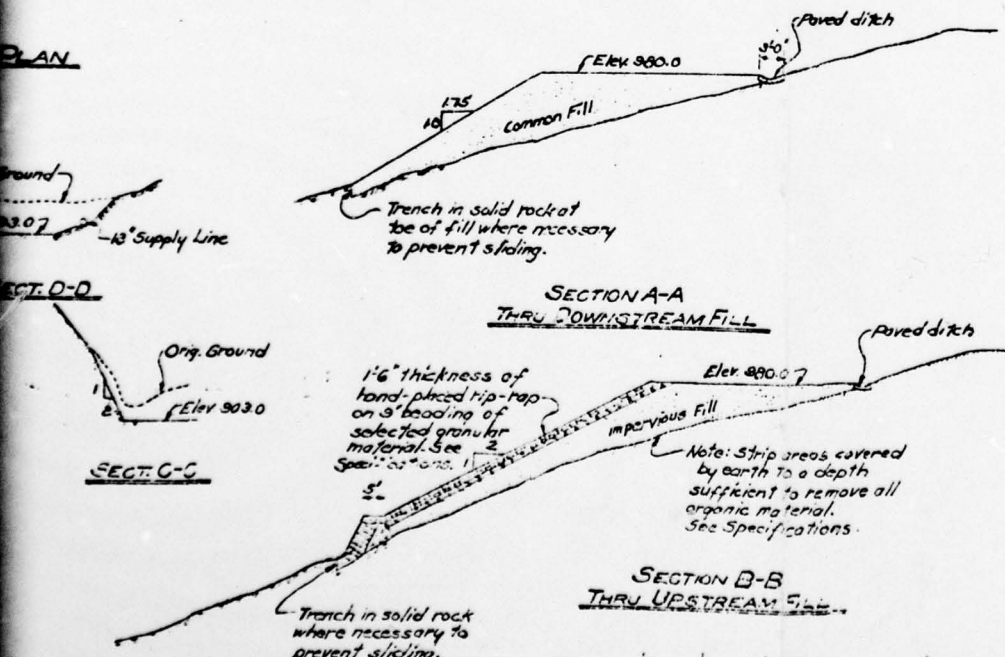
NAME OF DAM: SUGAR HOLLOW



LOCATION PLAN
SUGAR HOLLOW







Note: Cost of paved ditches is to be absorbed in the unit price bid for Item 13 in the Schedule of Bid Items.

NOTE: ⑥ Denotes monolith number.
For more explicit instructions regarding construction of fills and placement of backfills see Specifications, also see 'BACKFILL NOTE' on Sheet 7.

PLATE 1

BY	DATE	CHARACTER	APPROVED

REVISIONS

E. W. SAUNDERS, CONSULTING ENGINEER
F. W. WHEELER, DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA

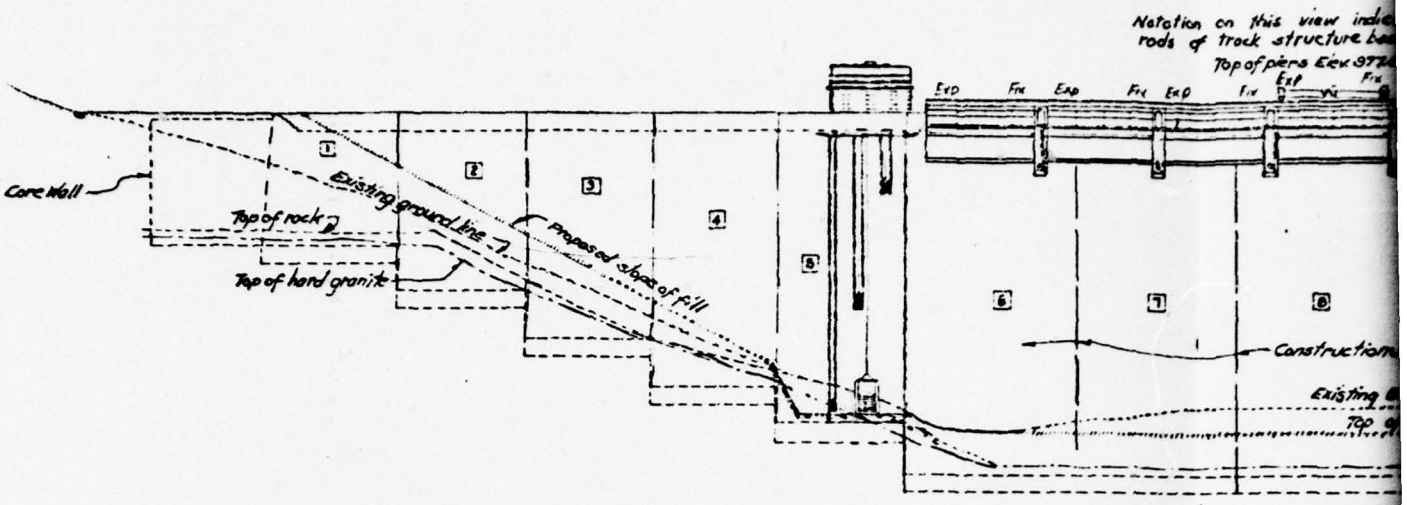
CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY VIRGINIA

MOORMAN'S RIVER STORAGE DAM
GENERAL PLAN

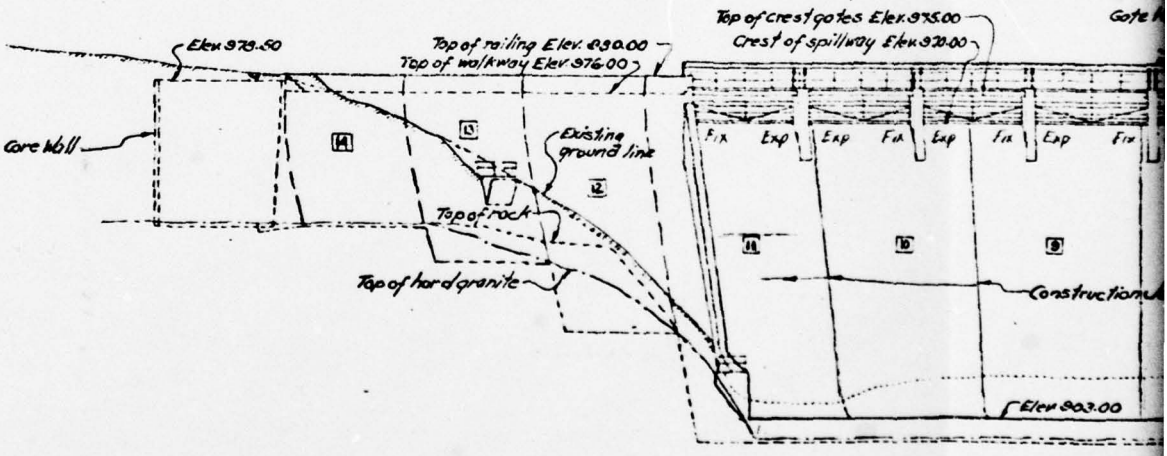
DRAWN BY	SCALES	SHEET
TRACED BY	1"=20'-0"	6
CHECKED BY		

RECOMMENDED FOR APPROVAL _____ CITY MANAGER
DATE _____ APPROVED _____ MAYOR

2

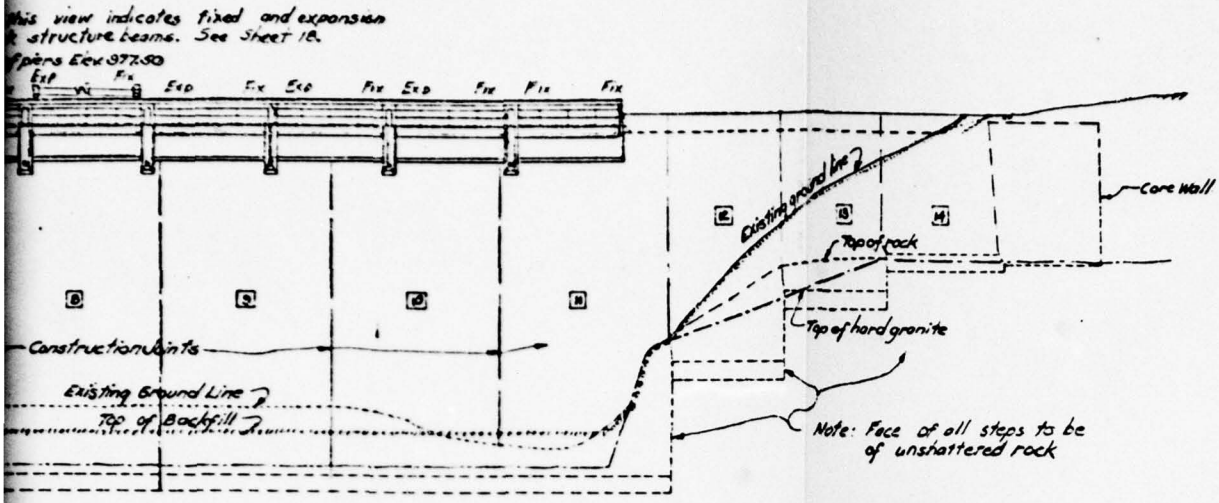


UPSTREAM

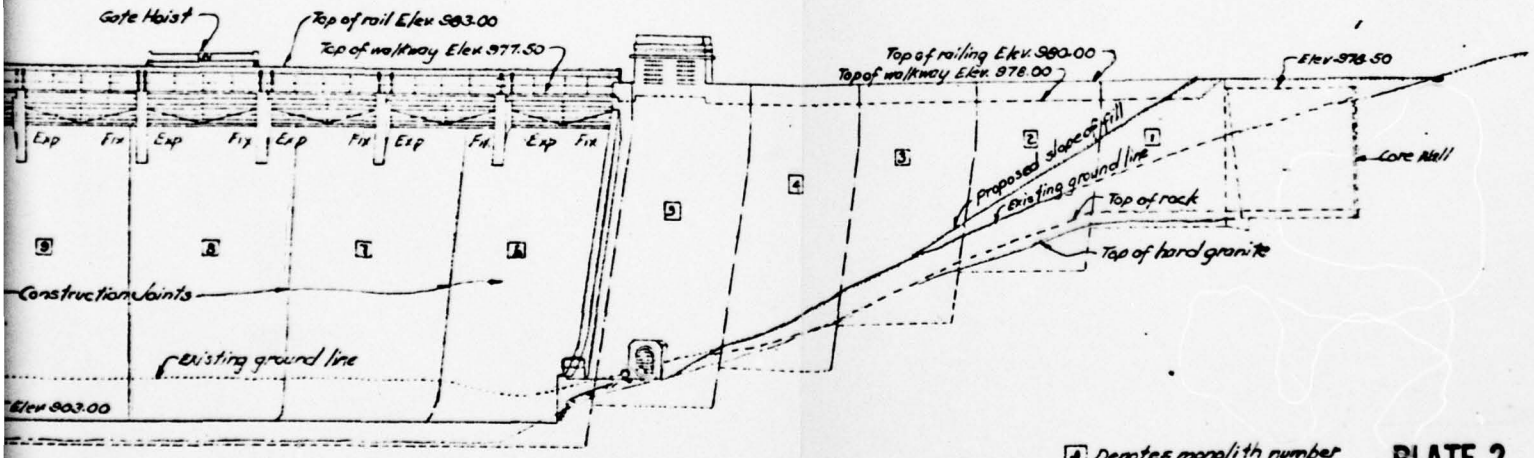


DOWNS

Notation on this view indi
bea



UPSTREAM ELEVATION



4 Denotes monolith number

PLATE 2

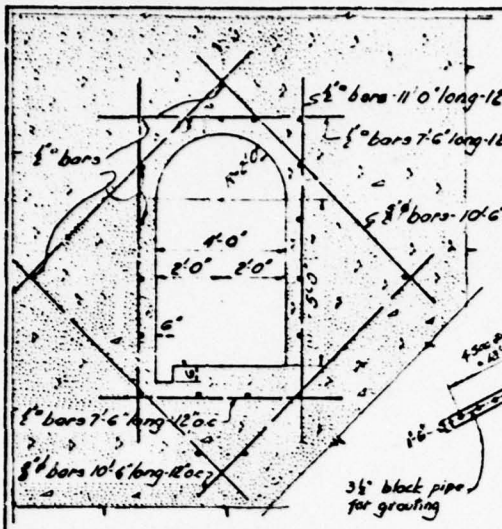
DOWNSTREAM ELEVATION

n this view indicates fixed and expansion ends of walkway beams. See Sheet 15.

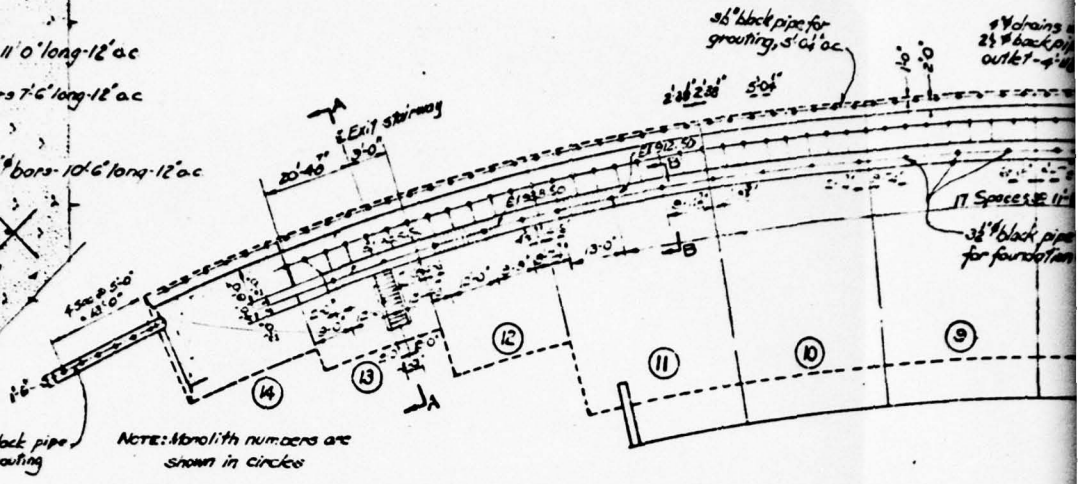
E. W. SAUNDERS, CONSULTING ENGINEER	F. W. WHEELER, DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA	
CITY OF CHARLOTTESVILLE	
ALBEMARLE COUNTY	VIRGINIA
MOORMAN'S RIVER STORAGE DAM	
ELEVATIONS	
DRAWN BY / TRACED BY / CHECKED BY	SCALES 1"=20'-0"
SHEET 7	
RECOMMENDED FOR APPROVAL ... CITY MANAGER	
DATE ... APPROVED ...	

2

BY	DATE	CHARACTER	APPROVED



TYPICAL SECTION
THRU DRAINAGE GALLERY
Scale: 3/8"-1'-0"



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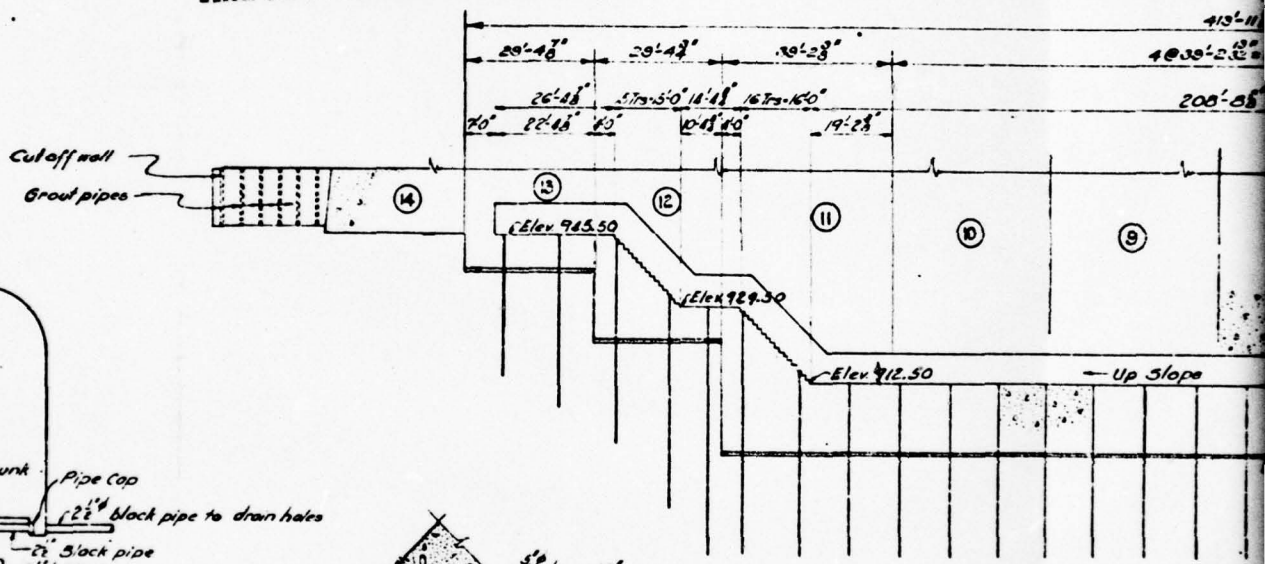
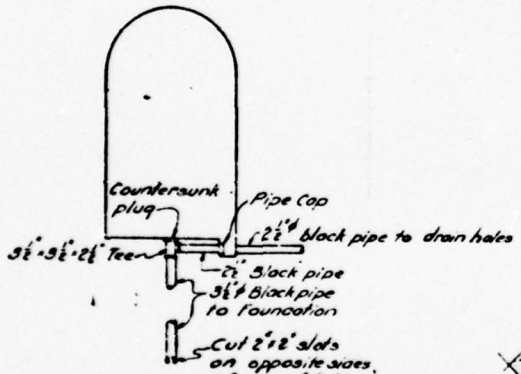
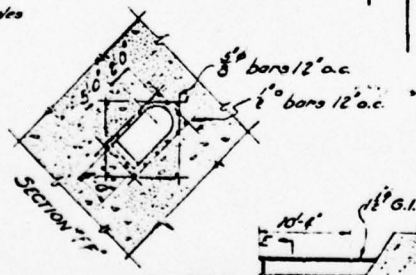
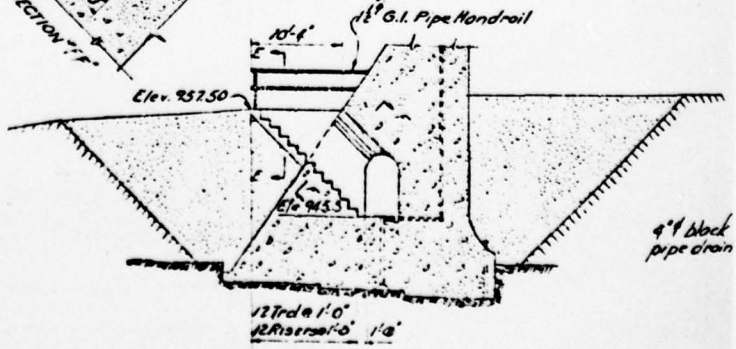




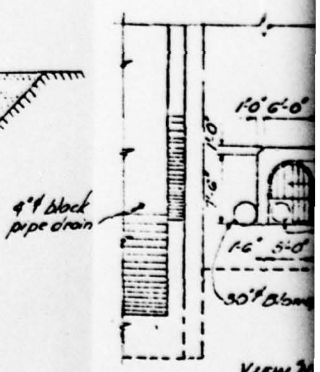
SECTION "BB"
TYPICAL DETAIL OF
DRAIN PIPES
Scale: 3/8"-1'-0"



SECTION "EE"



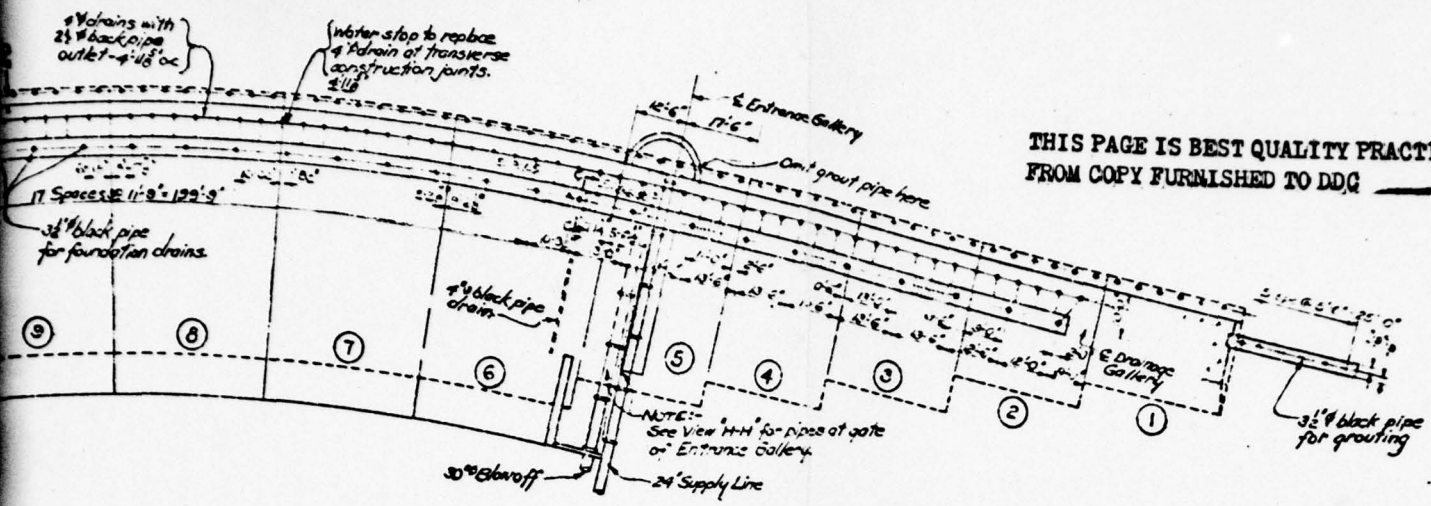
SECTION "AA"
Scale: 1"=10'-0"



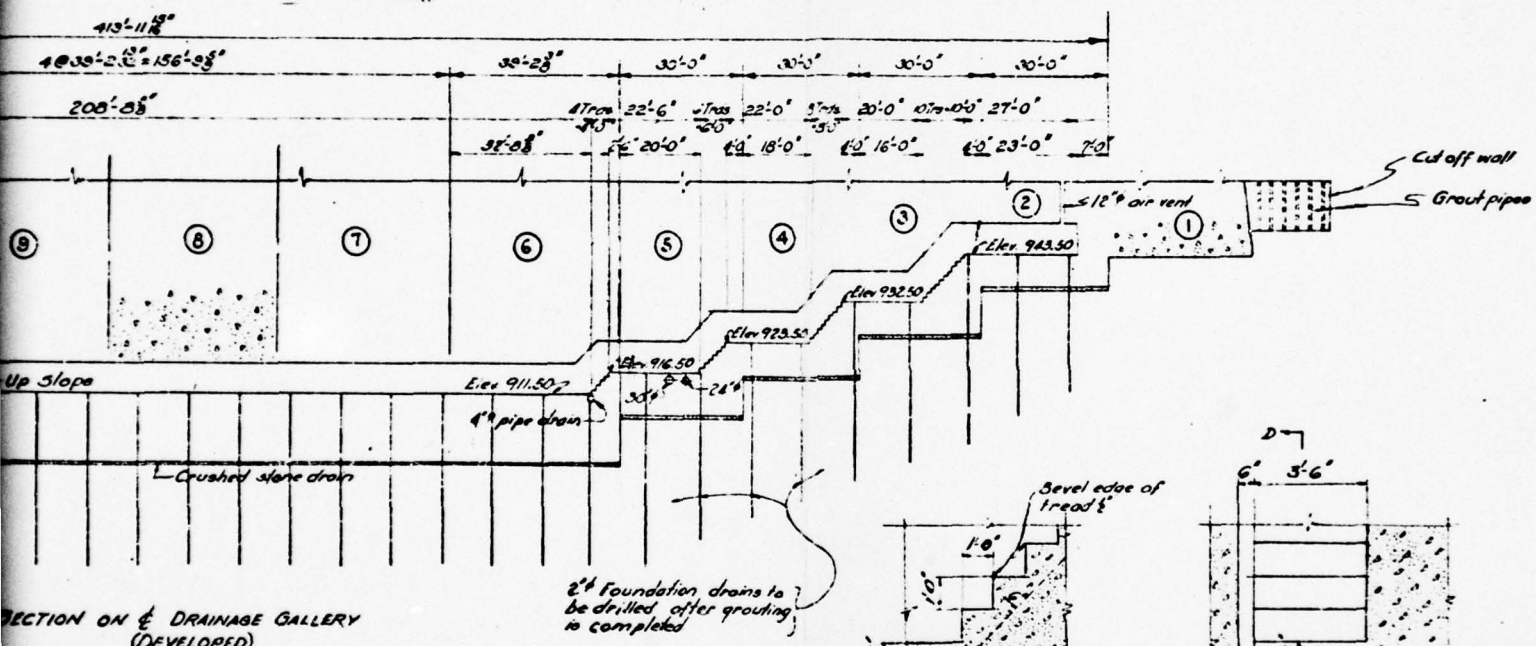
CUTAWAY PLAN OF DRAINA
Scale: 1in = 20

SECTION ON
Sc

VIEW



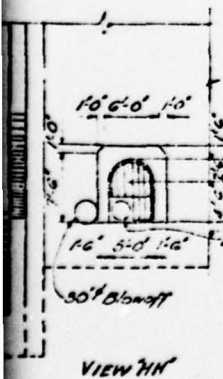
N OF DRAINAGE GALLERIES
Scale: 1in = 20ft



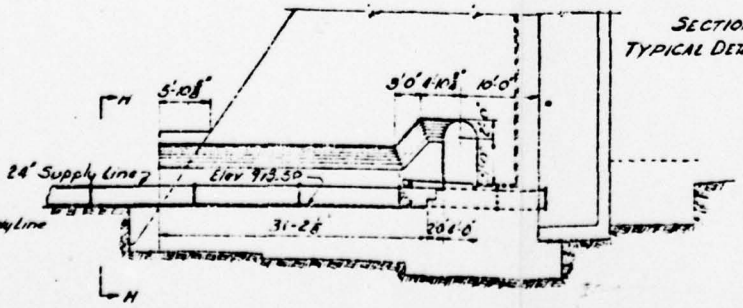
ECTION ON ℄ DRAINAGE GALLERY
(DEVELOPED)
Scale: 1in = 20ft.

SECTION 'DD'
TYPICAL DETAIL of STEPS

D
SECTION 'CC'
TYPICAL DETAIL OF STEPS
Scale ⅜" = 1'-0"



VIEW 'HH'



SECTION 'EE'
ON ℄ of ENTRANCE GALLERY
Scale: 1"=10'-0"

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		REVISIONS	

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F. W. WHEELER — DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA

CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY — VIRGINIA

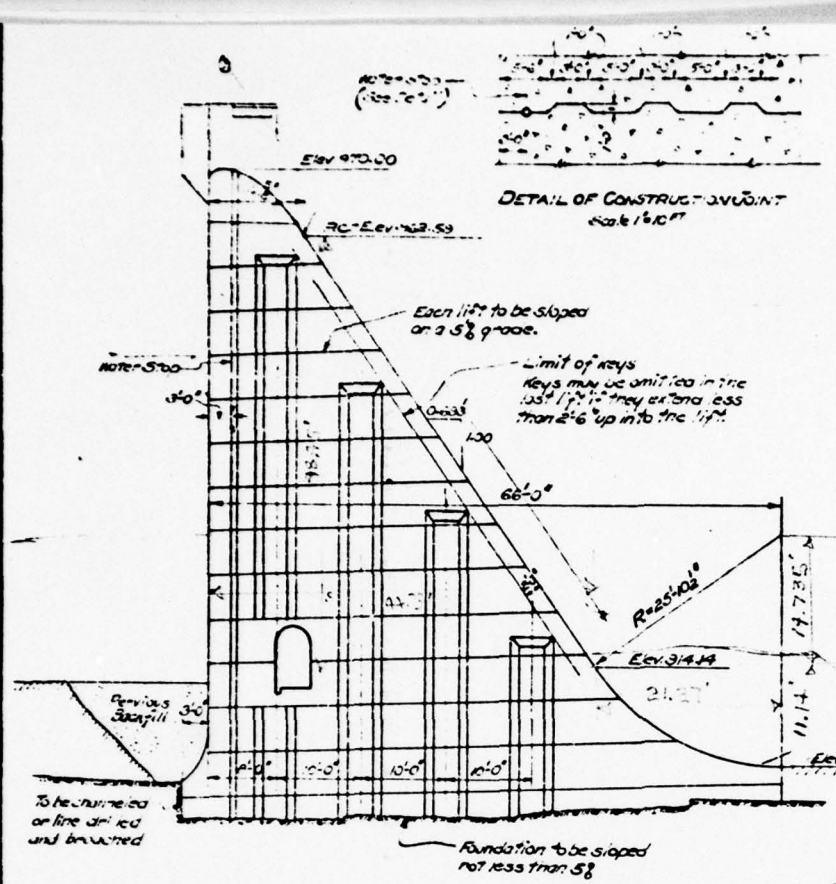
MOORMAN'S RIVER STORAGE DAM
GALLERIES, DRAINS AND GROUT PIPES

DRAWN BY	SCALES	SHEET
TRACED BY	AS NOTED	9
CHECKED BY		

RECOMMENDED FOR APPROVAL _____ CITY MANAGER
DATE _____ APPROVED _____ MAYOR

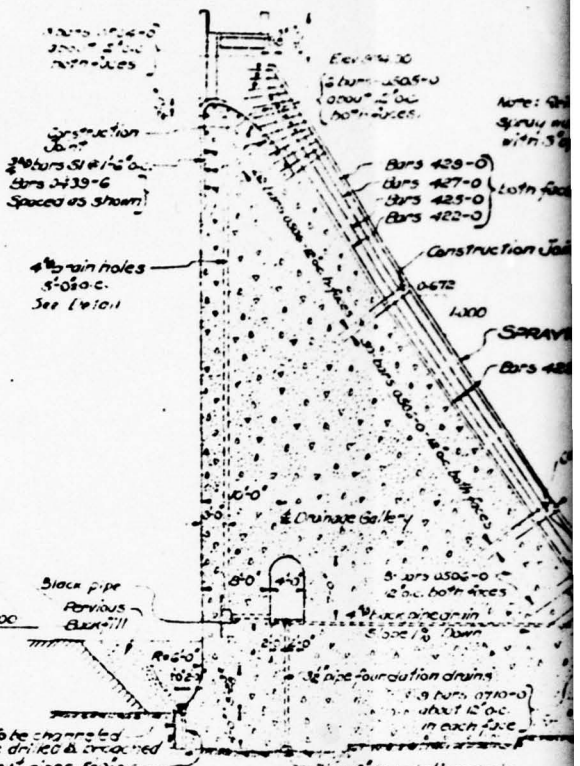
PLATE 3

2

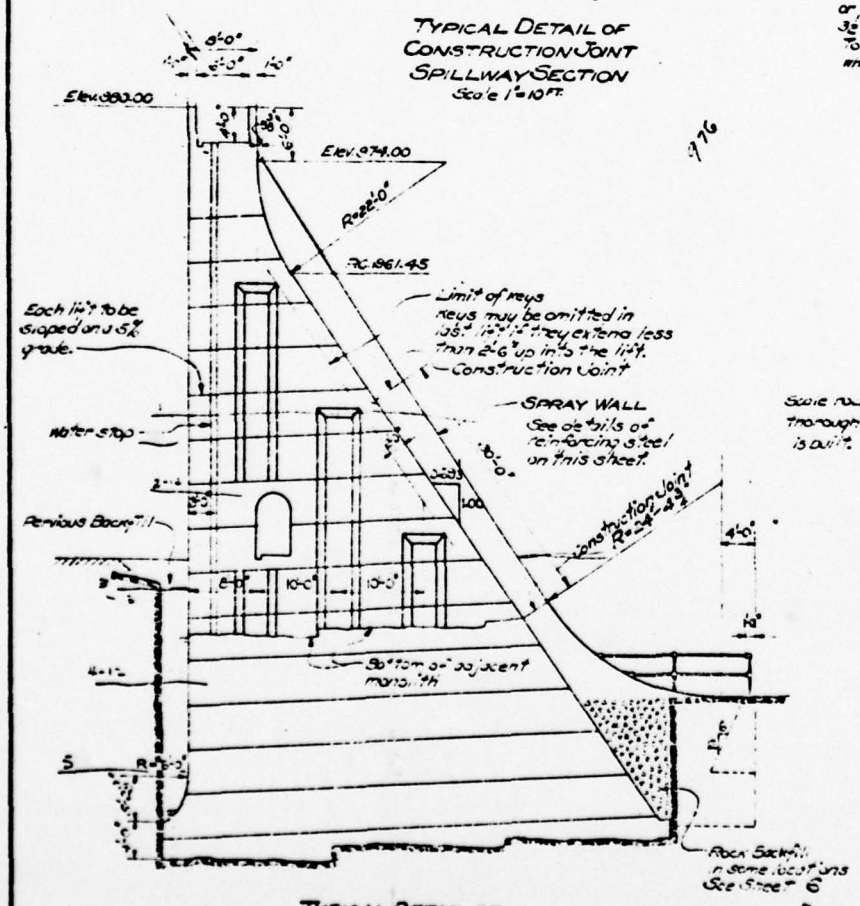


DETAIL OF CONSTRUCTION JOINT
Scale 1"=10 FT.

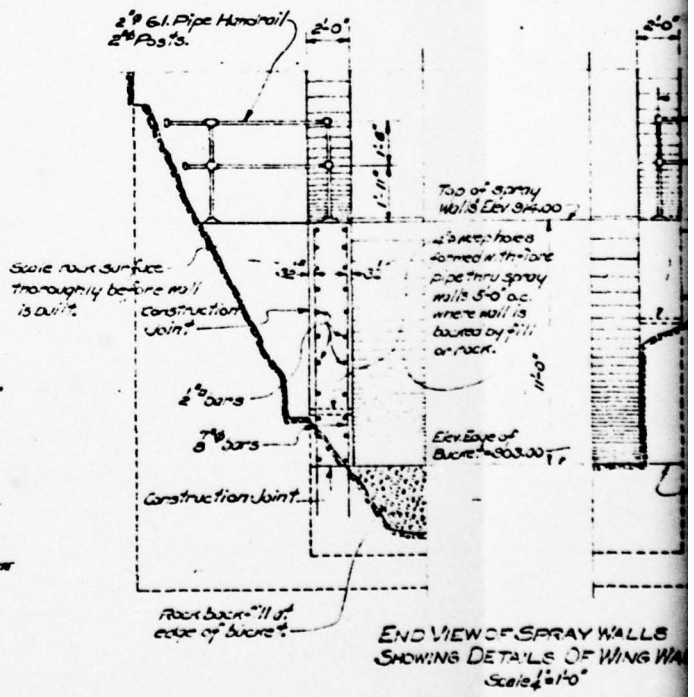
TYPICAL DETAIL OF CONSTRUCTION JOINT SPILLWAY SECTION
Scale 1"=10 FT.



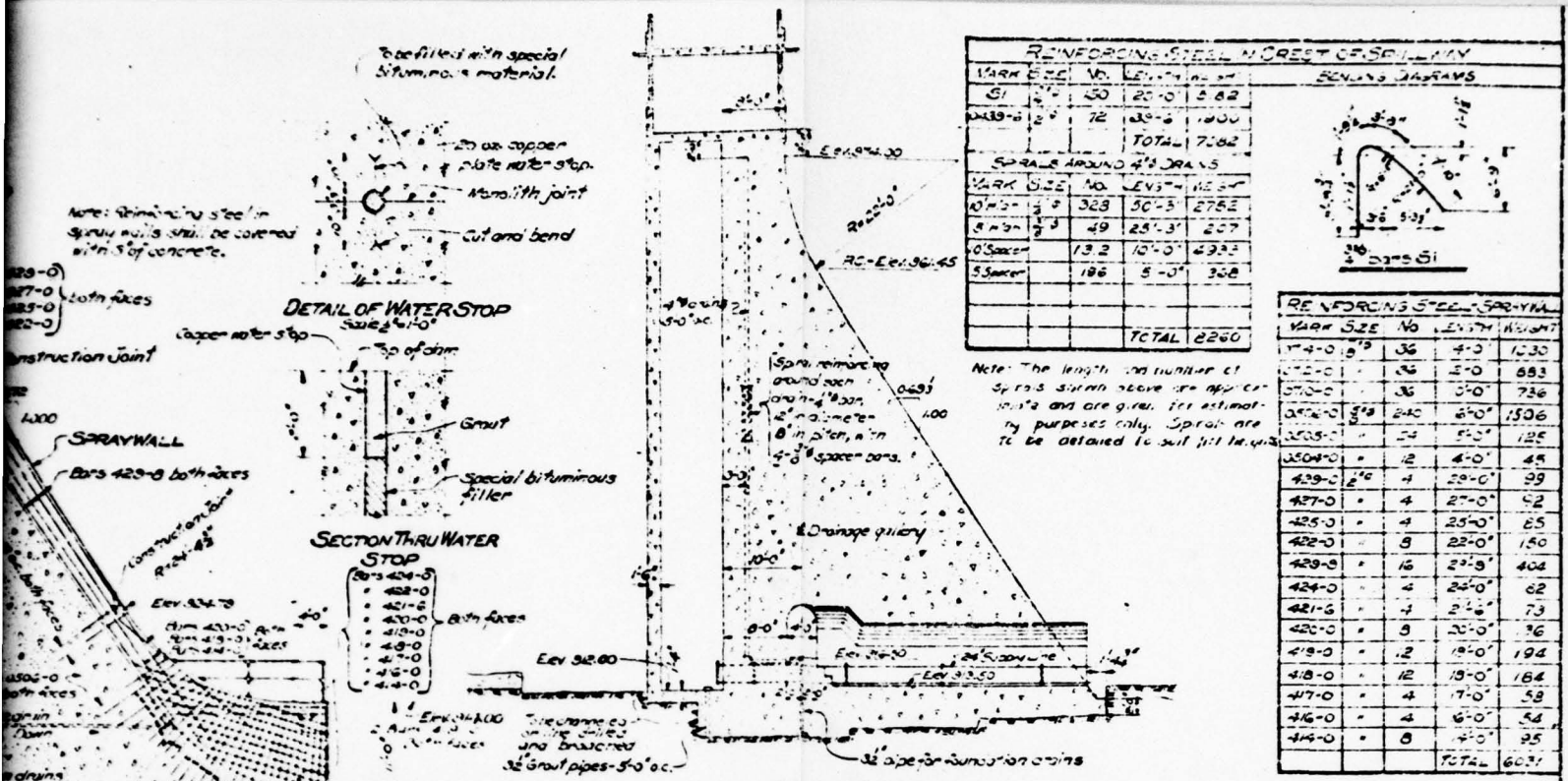
SECTION THRU SPILLWAY
Scale 1"=10'-0"



TYPICAL DETAIL OF CONSTRUCTION JOINT
BULKHEAD SECTION
Scale 1"=10 FT.



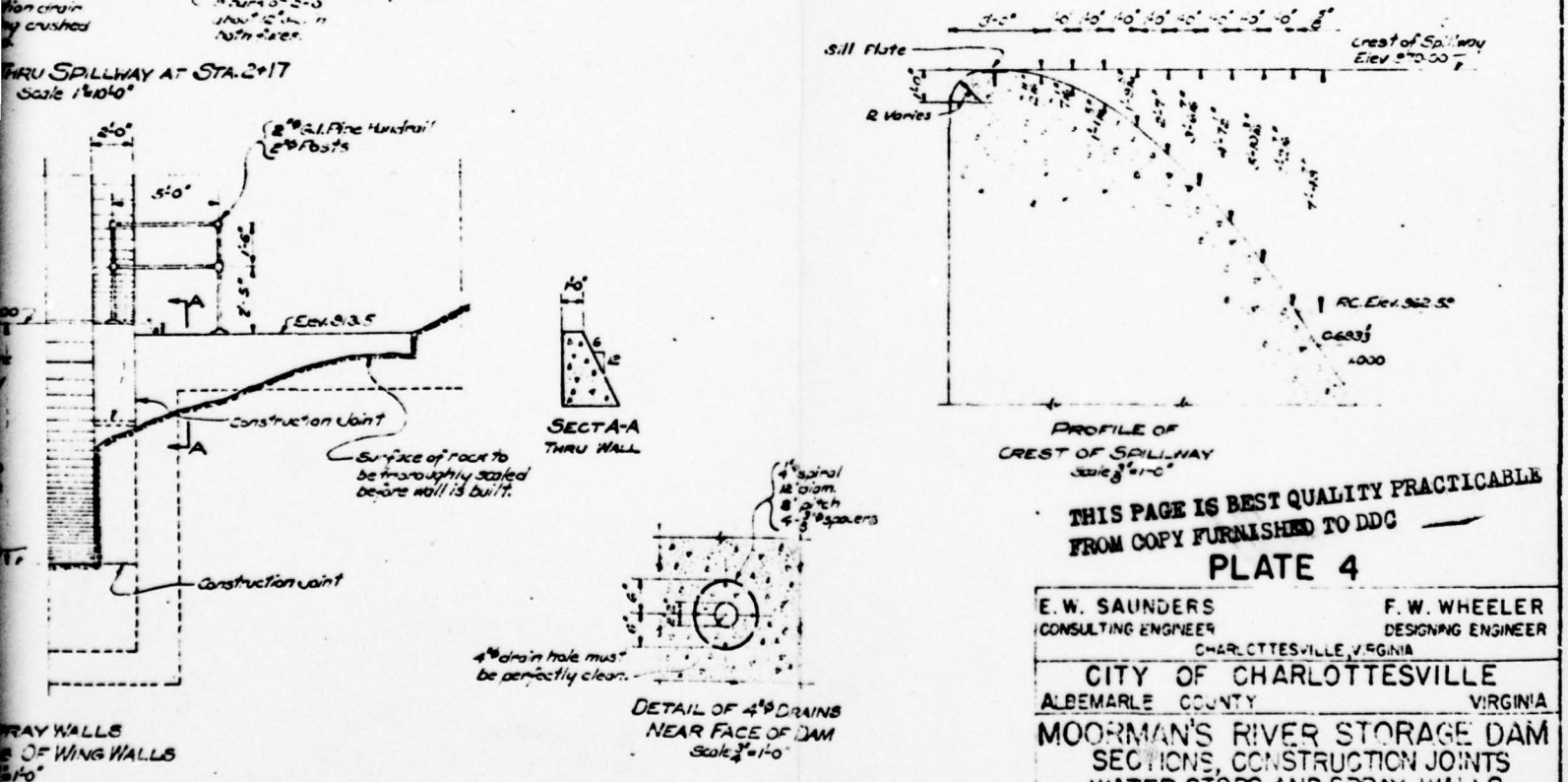
END VIEW OF SPRAY WALLS SHOWING DETAILS OF WING WA
Scale 1"=10"



REINFORCING STEEL IN CREST OF SPILLWAY					
MARK	SIZE	NO.	LENGTH	WEIGHT	SCHEDULE DIAGRAMS
S1	¾"	50	20'-0"	2 682	
439-6	2"	72	39'-6"	4800	
			TOTAL	7482	
SPACER AROUND 4½ DRAINS					
MARK	SIZE	NO.	LENGTH	WEIGHT	
10 Spacer	¾"	328	50'-3"	2782	
8 Spacer	¾"	49	25'-3"	207	
6 Spacer		132	10'-0"	2932	
5 Spacer		186	5'-0"	368	
			TOTAL	6260	

Note: The length and number of spirals shown above are approximate and are given for estimating purposes only. Spirals are to be detailed to suit job conditions.

REINFORCING STEEL IN SPRAY WALLS				
MARK	SIZE	NO	LENGTH	WEIGHT
443-0	⅝"	36	4'-0"	1030
433-0	"	36	3'-0"	693
343-0	"	36	3'-0"	736
439-6	⅝"	240	6'-0"	1506
3503-0	"	24	5'-3"	125
3504-0	"	12	4'-0"	49
439-0	2"	4	39'-0"	99
427-0	"	4	27'-0"	92
425-0	"	4	25'-0"	85
422-0	"	8	22'-0"	150
429-8	"	16	29'-8"	404
424-0	"	4	24'-0"	82
421-6	"	4	21'-6"	73
420-0	"	8	20'-0"	136
419-0	"	12	19'-0"	194
418-0	"	12	19'-0"	184
417-0	"	4	17'-0"	58
416-0	"	4	16'-0"	54
414-0	"	8	14'-0"	95
			TOTAL	6031



THRU SPILLWAY AT STA. 2+17
Scale 1"=10'-0"

SPRAY WALLS
OF WING WALLS
1"=10'-0"

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PLATE 4

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F. W. WHEELER, DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA

CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY VIRGINIA

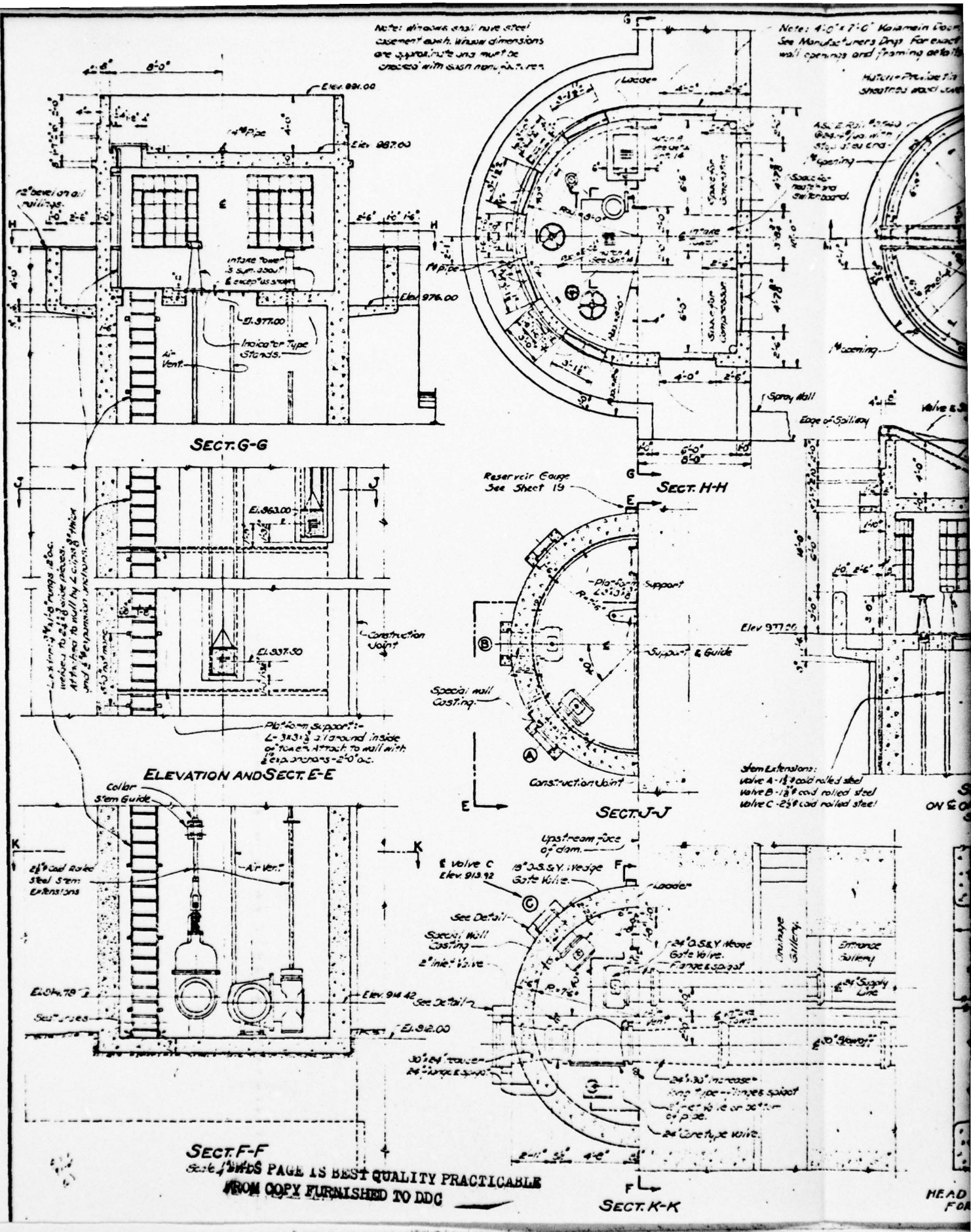
MOORMAN'S RIVER STORAGE DAM
SECTIONS, CONSTRUCTION JOINTS
WATER STOPS, AND SPRAY WALLS

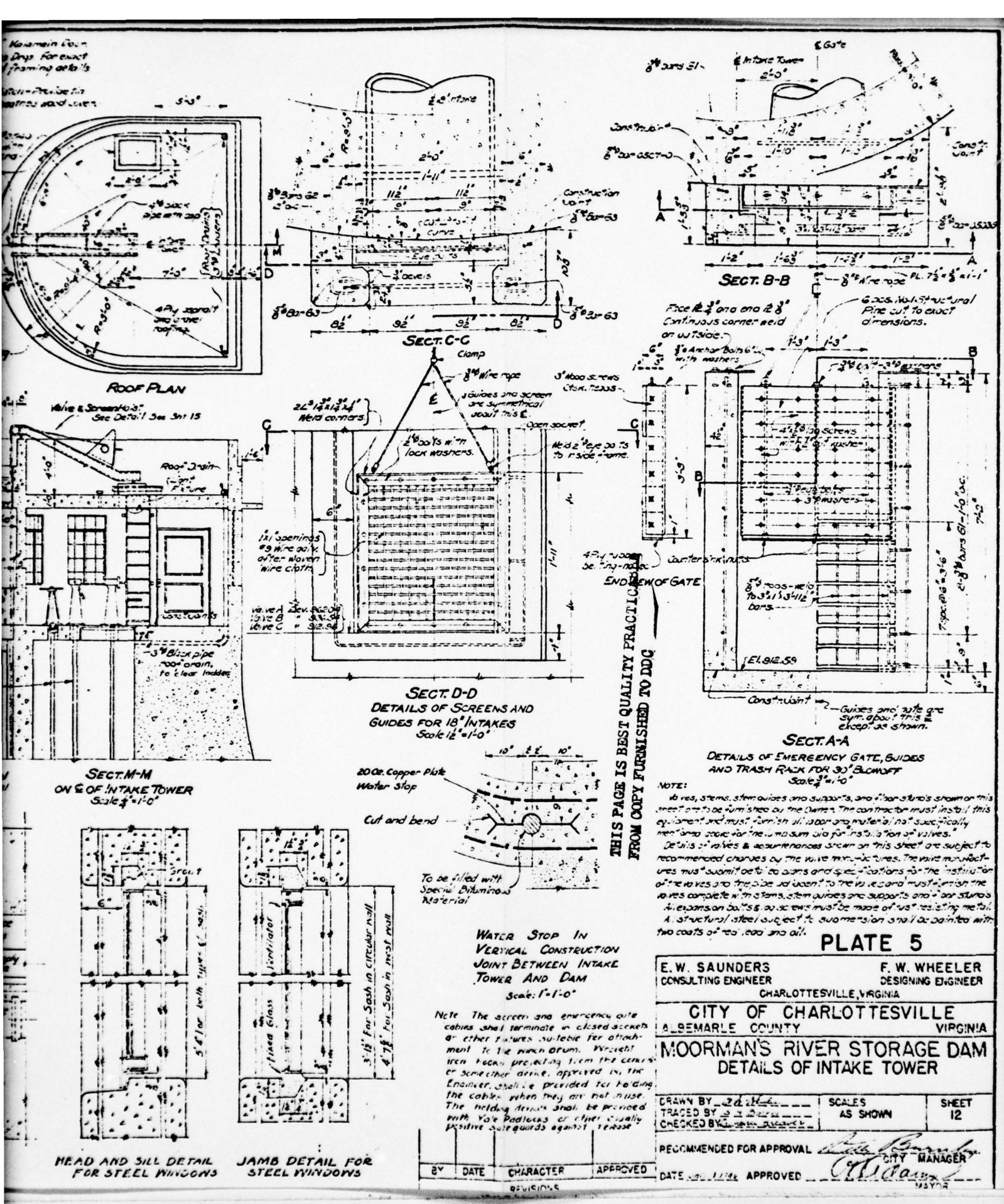
DRAWN BY
TRACED BY
CHECKED BY
SCALES AS NOTED
SHEET 6

RECOMMENDED FOR APPROVAL
CITY MANAGER
DATE APPROVED
MAYOR

BY	DATE	CHARACTER	APPROVED
REVISIONS			

2





WATER STOP IN VERTICAL CONSTRUCTION JOINT BETWEEN INTAKE TOWER AND DAM
Scale: 1"=1'-0"

Note: The screen and emergency gate cables shall terminate in closed sockets or other fixtures suitable for attachment to the winch drum. Wrought iron hooks projecting from the corners or some other device, approved by the Engineer, shall be provided for holding the cables when they are not in use. The holding devices shall be provided with Yale Padlocks or other equally positive safeguards against release.

Notes:

Valves, stems, stem guides and supports, and anchor stands shown on this sheet are to be furnished by the Owner. The contractor must install this equipment and must furnish all labor and material not specifically mentioned under the lump sum bid for installation of valves.

Details of valves & appurtenances shown on this sheet are subject to recommended changes by the valve manufactures. The valve manufactures must submit details, plans and specifications for the installation of the valves and the side slope at which the valves complete with stems, stem guides and supports and anchor stands.

All expansion bolts & screws must be made of rust resisting metal.

All structural steel subject to submersion shall be painted with two coats of red lead and oil.

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BY	DATE	CHARACTER	APPROVED

REVISIONS

PLATE 5

E. W. SAUNDERS, CONSULTING ENGINEER
F. W. WHEELER, DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA

CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY VIRGINIA

MOORMAN'S RIVER STORAGE DAM
DETAILS OF INTAKE TOWER

DRAWN BY	SCALES	SHEET
TRACED BY	AS SHOWN	12
CHECKED BY		

RECOMMENDED FOR APPROVAL _____ CITY MANAGER

DATE _____ APPROVED _____ MAYOR

APPENDIX II

PHOTOGRAPHS

CONTENTS

Photo 1: View of Main Overflow Spillway Gate Hoist in Upper Right Corner

Photo 2: Clear Seepage, Calcite Stains, Cracked and Spalled Areas of Non-Overflow Section

Photo 3: Original Low Head Dam Downstream of Main Dam (Now serves as end sill of stilling basin for Sugar Hollow Dam.)

Photo 4: View of Gate Hoist

Photo 5: View of 30 Inch Blowoff Pipe (Left) and 24 Inch Water Supply Main (Right)

Photo 6: View of 24 Inch Water Supply Main at Exit From Drainage Gallery

Photo 7: Erosion of North Bank 100 Feet Upstream of Left Abutment

Photo 8: Reservoir Looking Upstream From Dam

Photo 9: View of Downstream Channel Beyond Stilling Pool

Note: Photographs were taken 25 July 1978.

NAME OF DAM: SUGAR HOLLOW

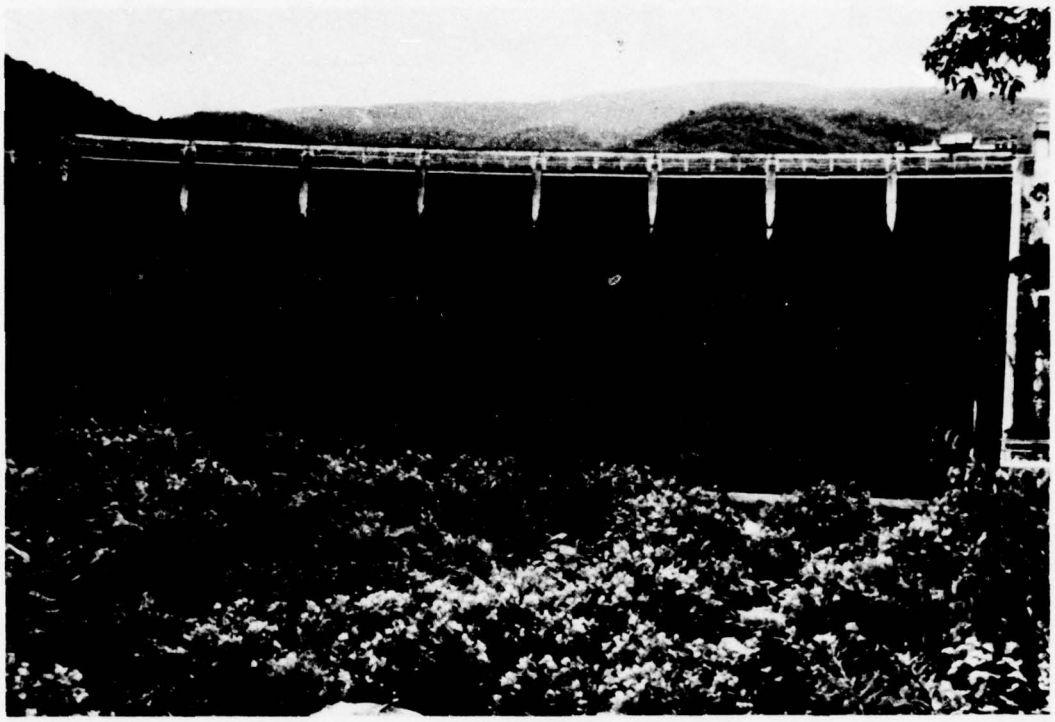


PHOTO 1. View of Main Overflow Spillway Gate Hoist in Upper Right Corner

PHOTO 2. Clear Seepage, Calcite Stains, Cracked and Spalled Areas of Non-Overflow Section

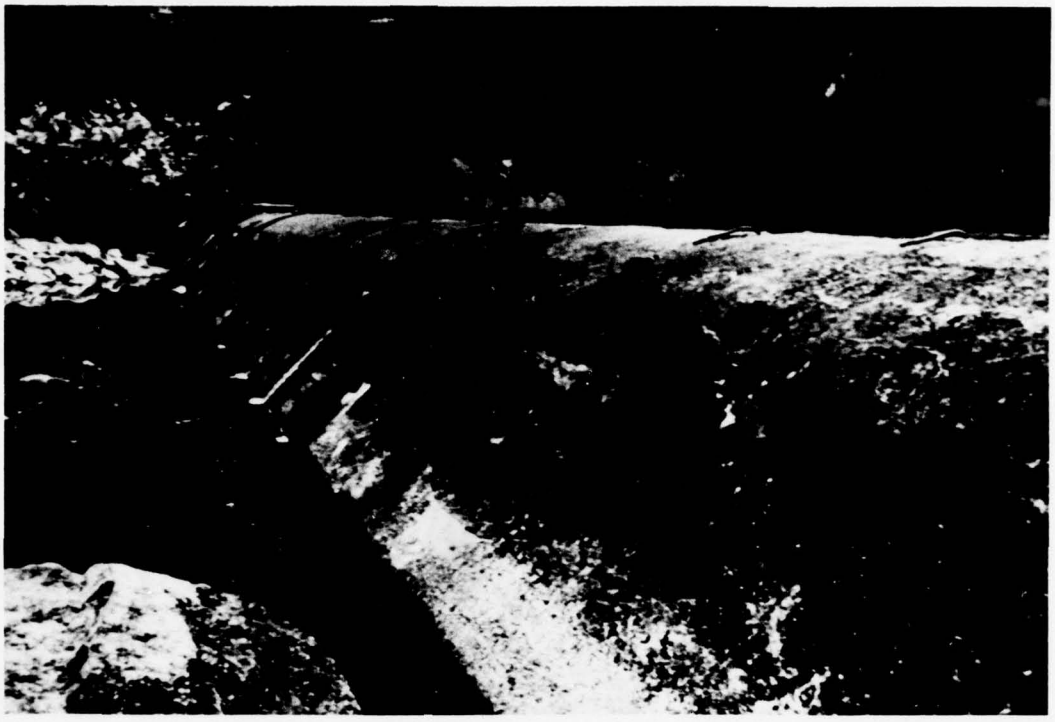


PHOTO 3. Original Low Head Dam Downstream of Main Dam
(Now serves as End Sill of Stilling Basin for Sugar Hollow Dam)

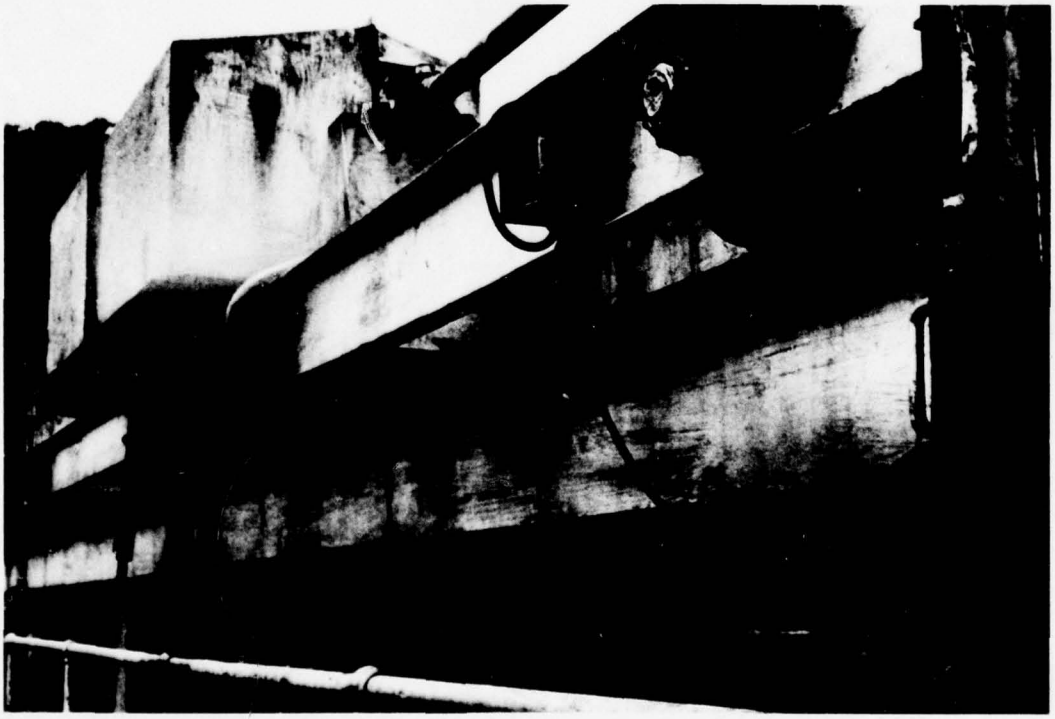


PHOTO 4. View of Gate Hoist

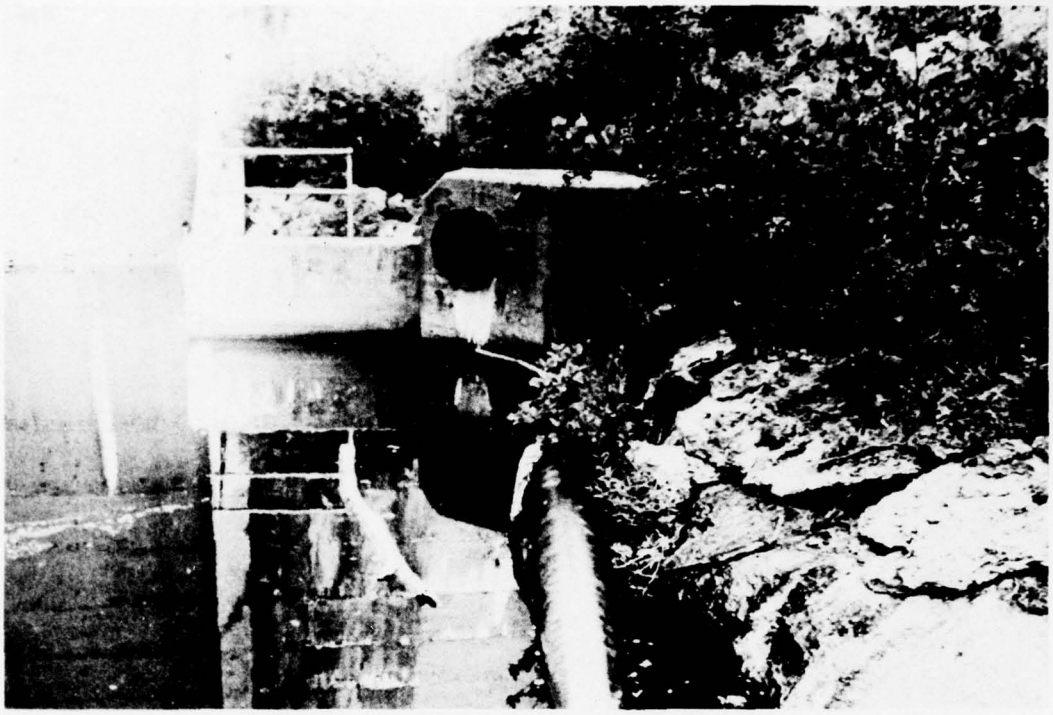


PHOTO 5. View of 30 Inch Blowoff Pipe (Left) and 24 Inch Water Supply Main (Right)

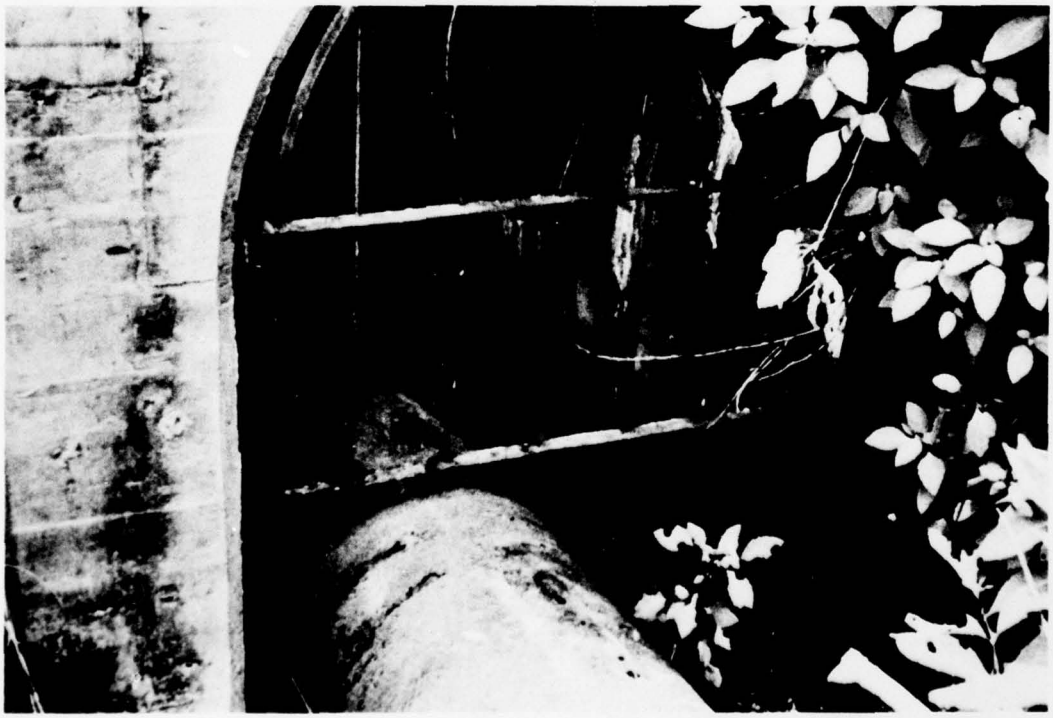


PHOTO 6. View of 24 Inch Water Supply Main at Exit From Drainage Gallery

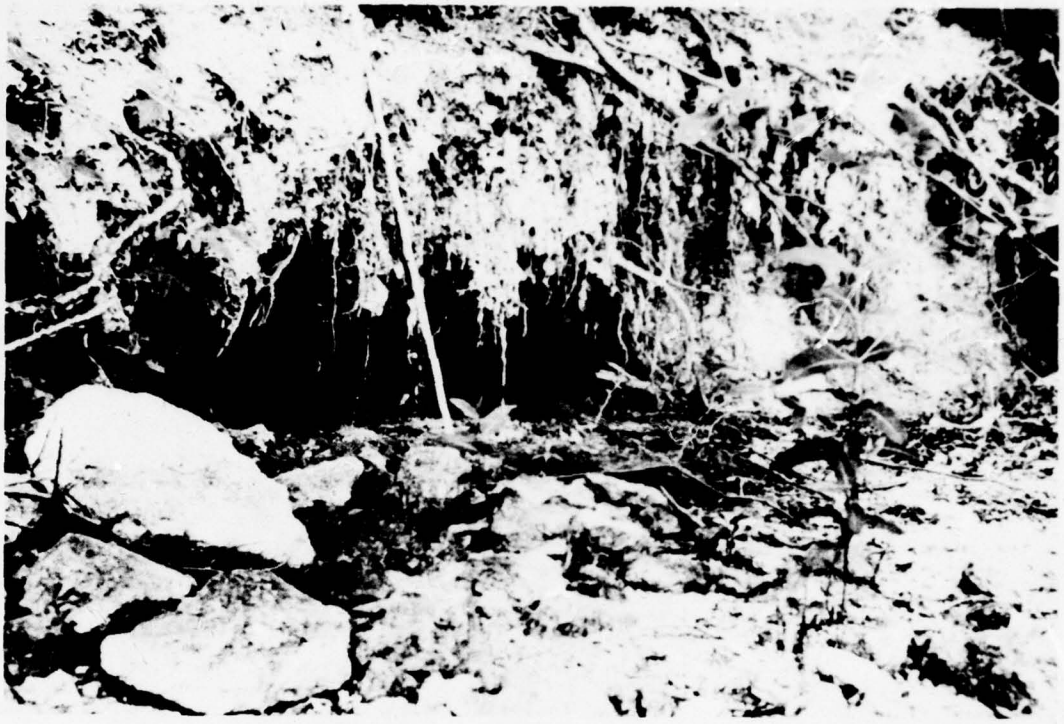


PHOTO 7. Erosion of North Bank 100 Feet Upstream of Left Abutment

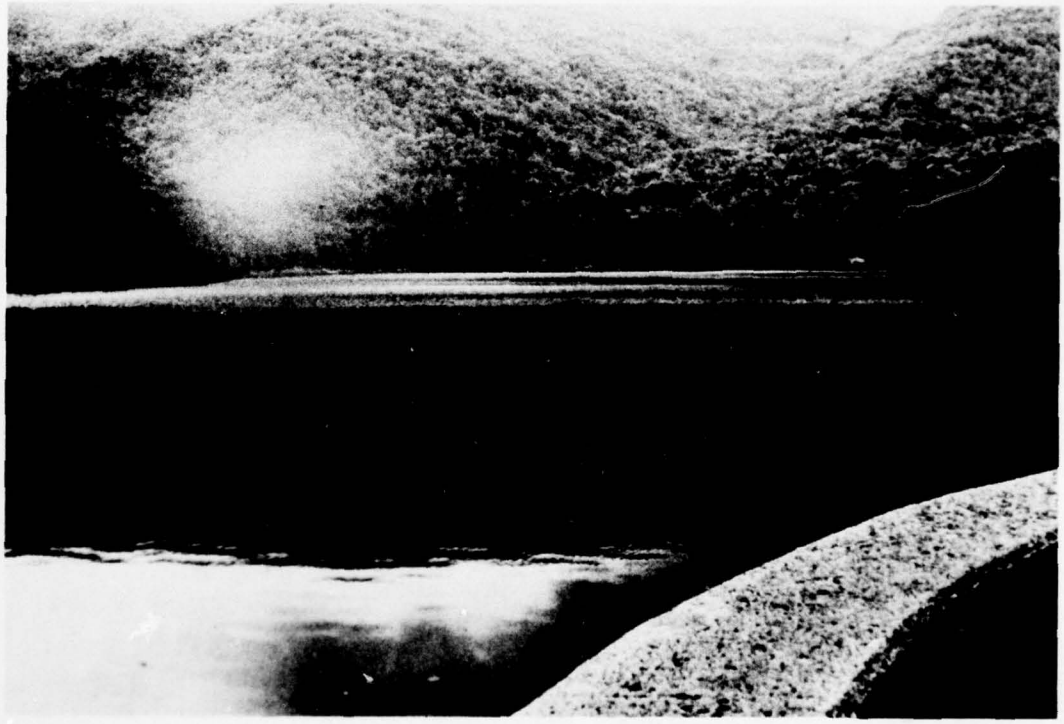


PHOTO 8. Reservoir Looking Upstream From Dam

SUGAR HOLLOW DAM

PHOTO 9. View of Downstream Channel Beyond Stilling Pool

APPENDIX III

CHECK LIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name Dam Sugar Hollow County Albemarle State Virginia Coordinates Lat. 3808.2 Long. 7844.3

Date Inspection 25 July 1978 Weather Cloudy Temperature 85°F.

Pool Elevation at Time of Inspection 975 M.S.L. Tailwater at Time of Inspection 912 M.S.L.

III-1

Inspection Personnel:

MICHAEL BAKER, JR., INC.:

M. Moore
T. Dougan
W. Sheafer

VIRGINIA WATER CONTROL BOARD:

Bill Lorenz

T. Dougan Recorder

CONCRETE/MASONRY DAMS

SUGAR HOLLOW

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
BACKFILL ADJACENT TO DAM	According to the design drawings, selected rockfill was placed next to the downstream face with silty sand and gravel outside. 1.5 feet of riprap stone over nine inches of granular material overlying impervious fill on the upstream side is called for in the plans. The materials were observed downstream.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Both abutments of the structure are founded on hard granite with joints. One set of joints is approximately perpendicular to the axis of the dam and dips from 80° to 90°. Clear seepage was observed from the left side of the dam toe.	
DRAINS III-2	Gallery drains are shown on design drawings. All drains in left concrete section appeared to be unclogged. All drains were full of water. Drains located in right concrete section had a mud cover. One-half of the drains in this area were not visible because of mud. They may be clogged.	Drains in right concrete section should be cleared of mud and debris.
WATER PASSAGES	An arch culvert located at the toe of the dam in left abutment area carried a 24 inch water supply line. No flow was present in culvert. A trough was located in the gallery for collecting overflow from foundation drains. The trough had two to three inches of water for the entire length. The flow rate was minimal.	
FOUNDATION	Concrete section founded on hard granite as indicated by the borings. The foundation was stepped, only the top of the foundation was visible. Joints dipping 80° to 90° were observed in rock exposures in the vicinity. Some moderately dipping cleavage planes were also apparent. The rock is either the Marshall or Crozet Granite of the Precambrian Virginia Blue Ridge Crystalline Complex.	

CONCRETE/MASONRY DAMS

SUGAR HOLLOW

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Surface cracks and spalls were present throughout the entire dam (superficial in nature--no repairs necessary). The crest of the spillway and the center gated section had considerable spalling due to constant overflow in this area.	
STRUCTURAL CRACKING	No structural cracking was present in the dam. Evidence of cracking was present in an appurtenant structure (walkway outlet culvert).	
VERTICAL AND HORIZONTAL ALIGNMENT	No misalignment was present in the dam structure.	
EXPANSION JOINTS	Expansion joints were in fair condition. Evidence of expansion and contraction was visible. Neoprene sealant was being "sequeezed" from joints; one-half inch of sealant material remained.	
CONSTRUCTION JOINTS	Evidence of seepage was visible in the construction joints in the left concrete section adjacent to the main spillway. Calcite stains were present from longitudinal and transverse joints. Considerable spalling was evident in the same area near the 24 inch water supply line.	
SEEPAGE AND DRAINAGE	Drainage from a covered outlet of a four inch terra-cotta drain, leakage at several joints. Seepage at the downstream toe on the left side. The total flow was measured at three g.p.m., most of which apparently came from the terra-cotta drain.	It is recommended that the outlet of the terra-cotta drain be uncovered, a channel be provided for flow and heavy growth be cut.

OUTLET WORKS

SUGAR HOLLOW

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Minor spalling was evident in the 30 inch outlet conduit at construction joints. Calcite stains and a small amount of seepage was observed. Condensation was present on both walls in the gallery.	
INTAKE STRUCTURE	The intake structure was in fair condition. Gates could not be observed or operated during the inspection.	
OUTLET STRUCTURE	Outlet structure consisted of a 30 inch diameter blow off pipe. No obstruction was observed at time of inspection.	
OUTLET CHANNEL	There is no outlet channel. The 30 inch blow off pipe is directed into the stilling pool.	
EMERGENCY GATE	This consists of the 24 inch cone valve on the blow off pipe. It was not operated during the inspection.	

GATED SPILLWAY

SUGAR HOLLOW

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	A stilling pond is located at the toe of the dam and was impounded by means of an old concrete dam located downstream of present dam. Riprap was present on the bottom of the stilling pond. Stilling pond depth (7.5± feet).	
APPROACH CHANNEL	There is none.	
DISCHARGE CHANNEL	Discharged water flows into the Moormans River.	
BRIDGE AND PIERS	Piers between spillway gates are in good condition with some minor surface cracking.	
GATES AND OPERATION EQUIPMENT	Eight vertically hoisted gates were present. No leakage was evident. The gates are operated by a hoist on rails above the gates. They were not operated during inspection nor have they been operated recently.	Operate gates at least yearly to insure proper functioning.

INSTRUMENTATION

SUGAR HOLLOW

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	U.S.G.S. Bench Mark.	
OBSERVATION WELLS	There are none.	
WEIRS	There are no flow measuring weirs.	
PIEZOMETERS	There are none.	
OTHER		

RESERVOIR

SUGAR HOLLOW

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Some erosion was visible in left bank just upstream of dam. The banks along the shore consist of silty sand with gravel, boulders and rock fragments. Soft to medium hard weathered granite is exposed in several areas. The slopes are moderately steep and wooded. Some wooden debris has been deposited on the shore.	
SEDIMENTATION	Some sedimentation was evident last year when the lake level was drawn down 35 feet. Sedimentation was in upstream reaches.	

DOWNSTREAM CHANNEL

SUGAR HOLLOW

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Heavily overgrown with trees and brush in main channel. The streambed consists of boulders and cobbles with sandy gravel. Granite is exposed in some areas primarily near the stilling basin.	
SLOPES	The slopes consist of sand and gravel with cobbles in some areas, portions with hard granite exposed. There is some clear seepage along cleavage planes toward the stream from the hillside, primarily on the left side of the valley. Granite is at or near the surface of the valley slopes.	
APPROXIMATE NO. OF HOMES AND POPULATION	Eight to ten homes are located in immediate downstream area, with an approximate population of 35. A girl scout camp is also located approximately 1000 yards downstream and is a seasonal operation.	

APPENDIX IV

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

SUGAR HOLLOW

ITEM	REMARKS
PLAN OF DAM	Enclosed with design drawings (see Plates 1 and 2).
REGIONAL VICINITY MAP	Enclosed (see Location Plan).
CONSTRUCTION HISTORY	Photos of construction are available from the Rivanna Water and Sewer Authority.
TYPICAL SECTIONS OF DAM	Enclosed in report (see Plate 4).
HYDROLOGIC/HYDRAULIC DATA	None was available.
OUTLETS - PLAN	Enclosed (see Plate 5).
- DETAILS	Enclosed (see Plate 5).
- CONSTRAINTS	Enclosed (see Plate 5).
- DISCHARGE RATINGS	Enclosed (see Plate 5).
RAINFALL/RESERVOIR RECORDS	None were available at the dam site.

SUGAR HOLLOW

ITEM	REMARKS
DESIGN REPORTS	None were available.
GEOLOGY REPORTS	None were available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None were available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Boring records are available.
POST-CONSTRUCTION SURVEYS OF DAM	None were available.
BORROW SOURCES	No information on borrow source was available.

SUGAR HOLLOW

ITEM	REMARKS
MONITORING SYSTEMS	There are none.
MODIFICATIONS	Information on modifications was not available.
HIGH POOL RECORDS	None were available.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None are available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None were reported.
MAINTENANCE OPERATION RECORDS	None were available.

SUGAR HOLLOW

ITEM	REMARKS
SPILLWAY PLAN	Enclosed (see Plates 1, 2, 3 and 4).
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Enclosed (see Plate 5).

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 17.2 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 970 (gates open) (1105 acre-feet)
975 (gates closed) (1320 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 980 (1460 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 980

ELEVATION TOP DAM: 980

CREST: Gated Spillway

a. Elevation 970
b. Type Ogee shape with slide gates
c. Width Eight sections at 25.5 feet each
d. Length Not Applicable
e. Location Spillover Center of dam
f. Number and Type of Gates Eight crest gates operated by moveable lift

OUTLET WORKS:

a. Type 30 inch blow off pipe
b. Location Gate house
c. Entrance inverts 914.4
d. Exit inverts 914.4
e. Emergency draindown facilities 30 inch diameter drain

HYDROMETEOROLOGICAL GAGES:

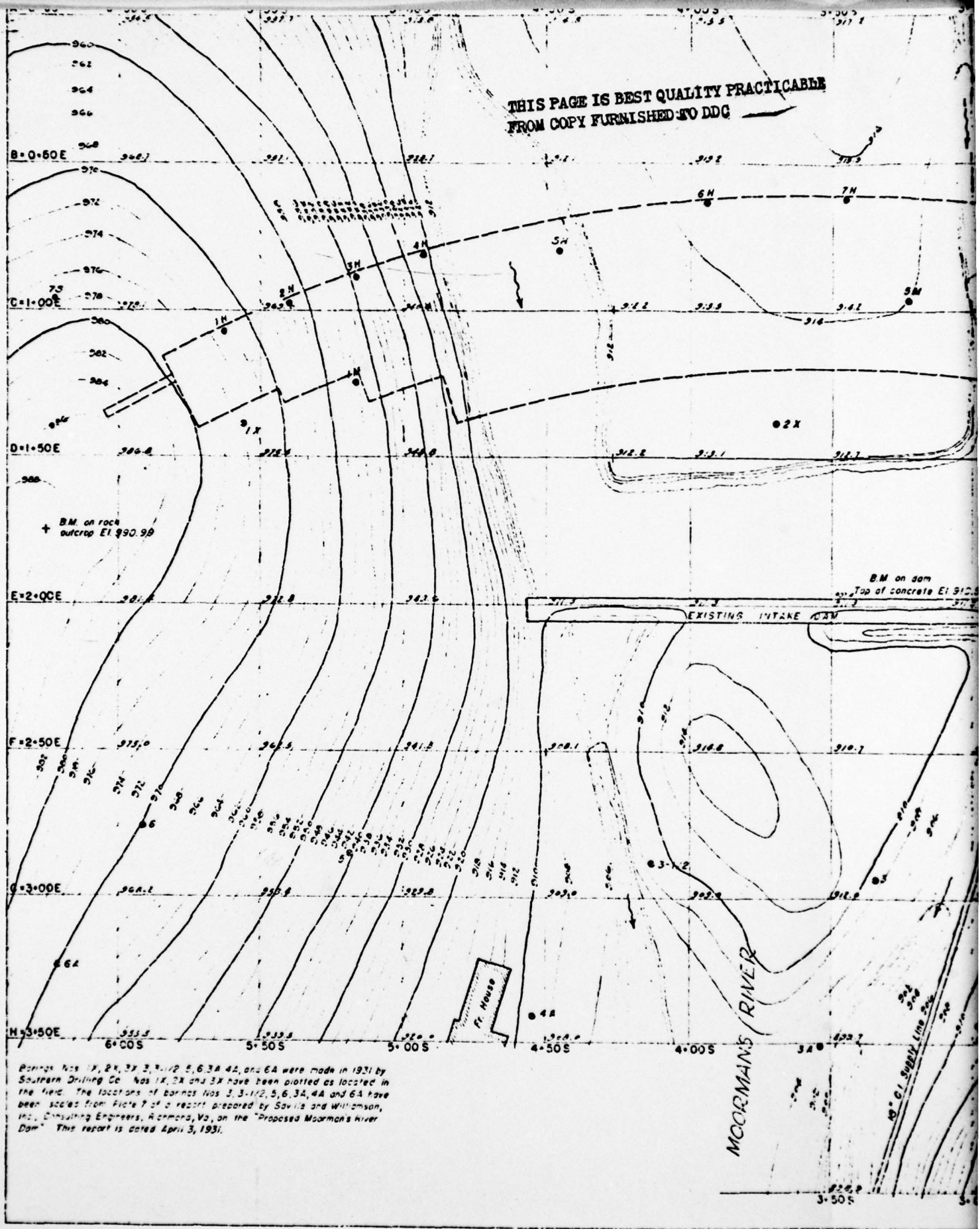
a. Type Streamflow gage
b. Location Less than one mile upstream of dam on North Fork of Moormans River
c. Records 1951 to date

MAXIMUM NON-DAMAGING DISCHARGE Unknown

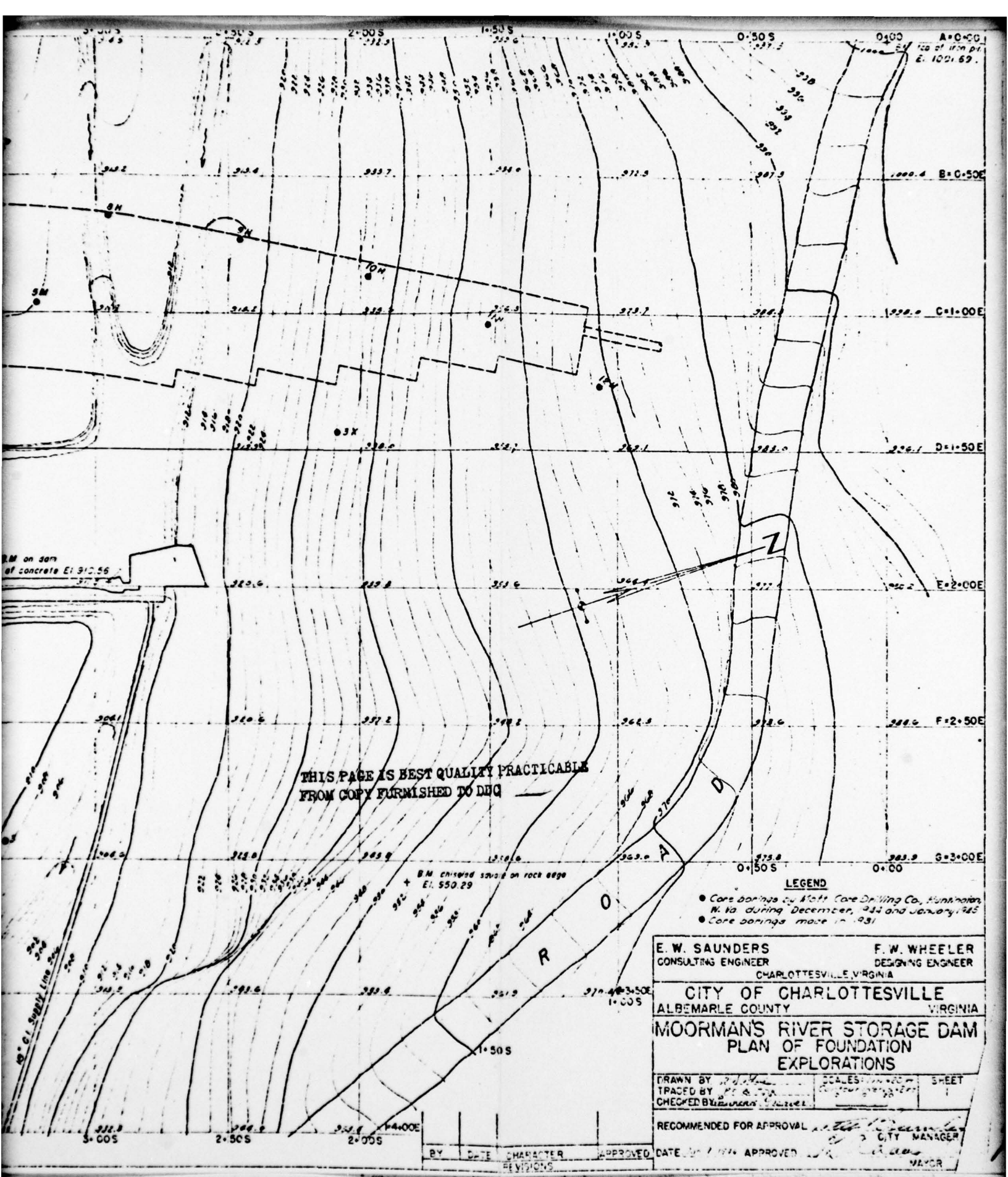
NAME OF DAM: SUGAR HOLLOW

APPENDIX V

BORING LOGS AND LOCATIONS



Borings Nos 1X, 2X, 3X, 3-1/2, 5, 6, 3A, 4A, and 6A were made in 1931 by Southern Drilling Co. Nos 1X, 2X and 3X have been plotted as located in the field. The locations of borings Nos 3, 3-1/2, 5, 6, 3A, 4A and 6A have been scaled from Plate 7 of a report prepared by Savage and Williamson, Inc., Consulting Engineers, Richmond, Va., on the "Proposed Moorman's River Dam" This report is dated April 3, 1931.



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FROM COPY FURNISHED TO DDC

E. W. SAUNDERS
CONSULTING ENGINEER

F. W. WHEELER
DESIGNING ENGINEER

CHARLOTTESVILLE, VIRGINIA

CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY VIRGINIA

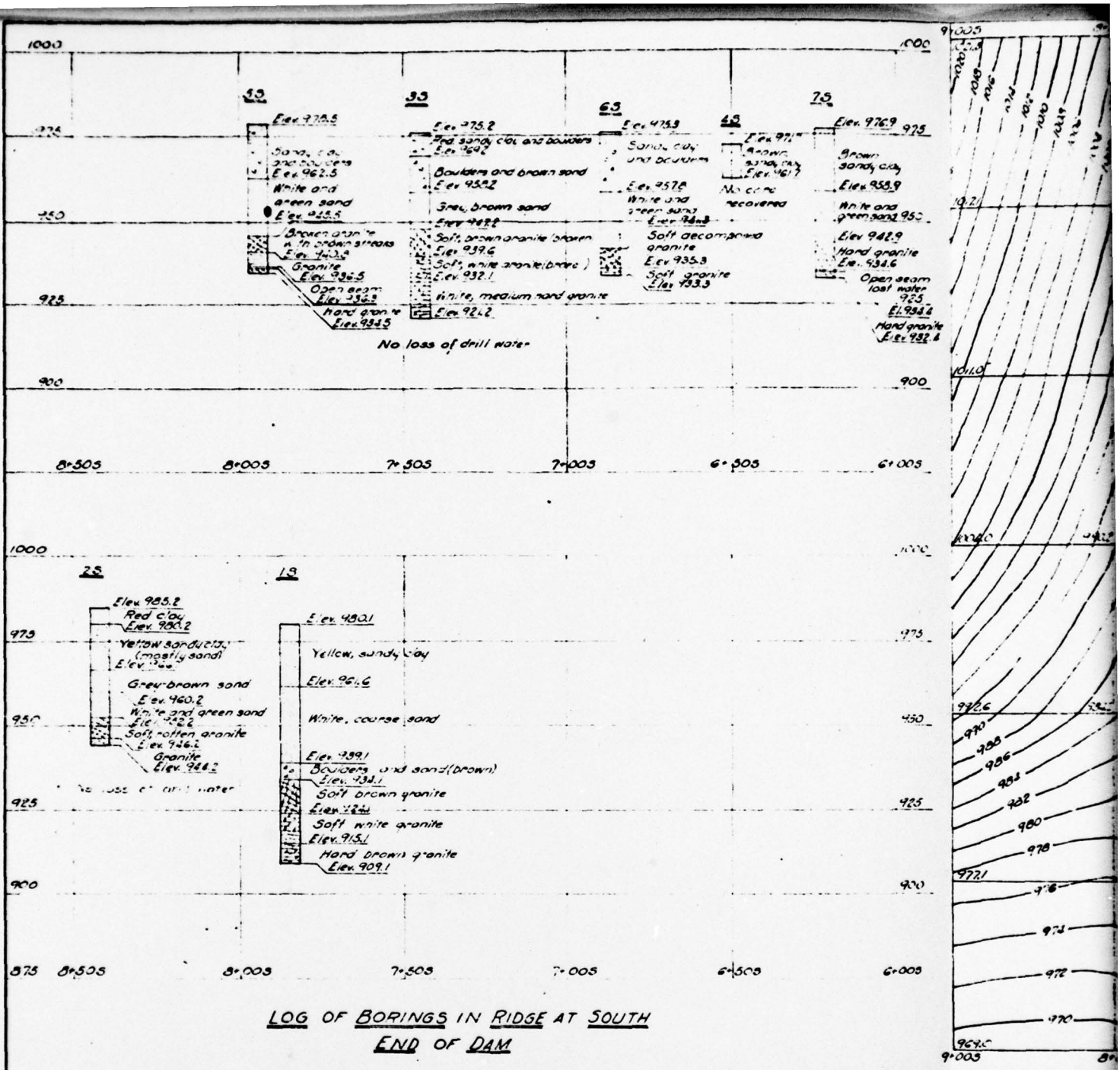
MOORMAN'S RIVER STORAGE DAM
PLAN OF FOUNDATION EXPLORATIONS

DRAWN BY
TRACED BY
CHECKED BY
SCALES
SHEET 1

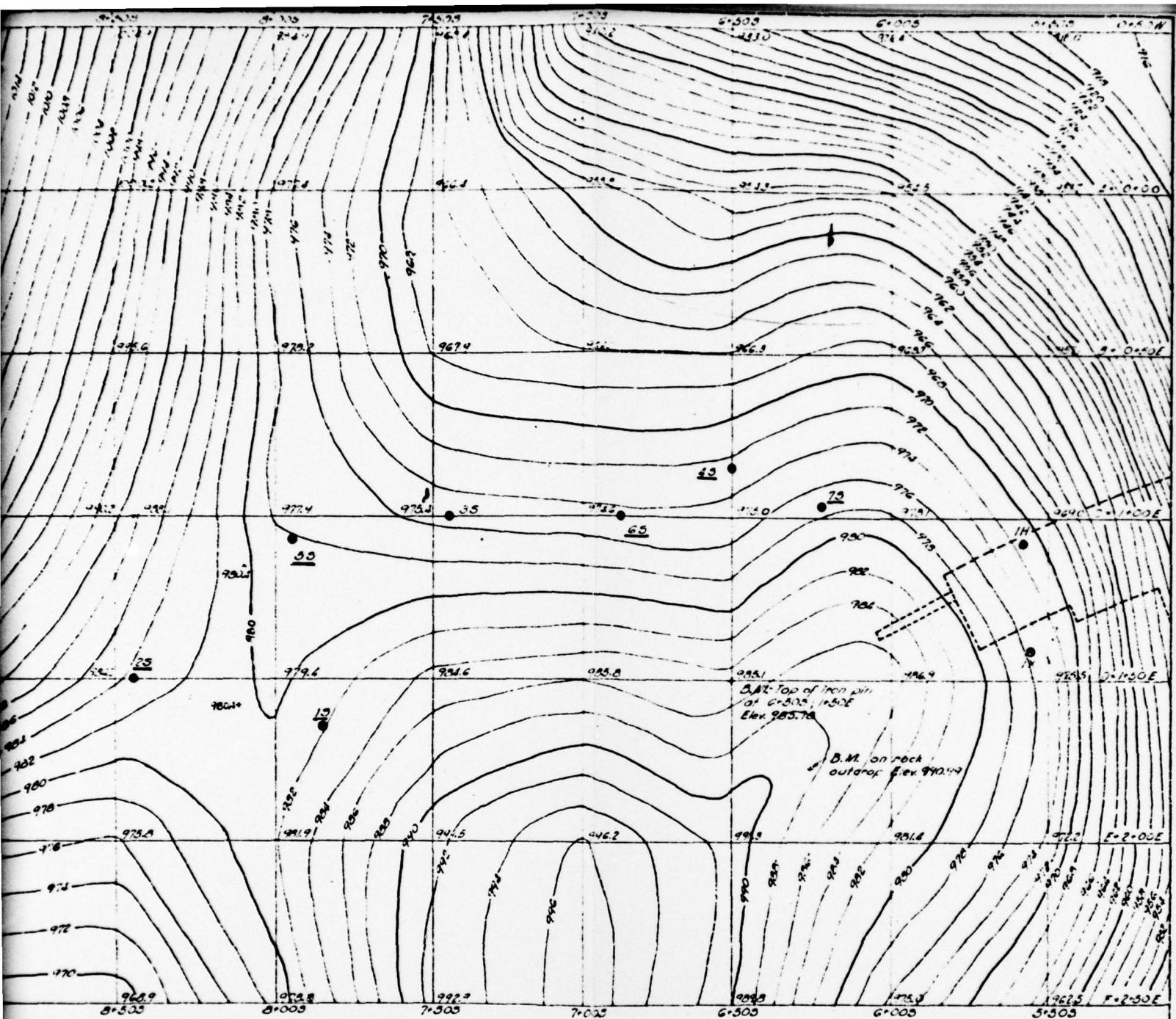
RECOMMENDED FOR APPROVAL
CITY MANAGER

DATE APPROVED
MAYOR

BY	DATE	CHARACTER	APPROVED
REVISIONS			



LOG OF BORINGS IN RIDGE AT SOUTH END OF DAM



LOCATION PLAN OF BORINGS IN RIDGE AT SOUTH END OF DAM

LEGEND:
- Boring No. 1X was by Southern Drilling Co. in 1931.
- Borings numbered 13 thru 73 and 1H were by Watt Core Drilling Co., Huntington, W. Va. during December, 1944 and January, 1945. All cores were drilled with a 3" diamond bit.

LEGEND

Boulders and sandy-clay overburden

Sand

Broken granite

Soft, coarse-grained granite

Hard and dense granite

BY	DATE	CHARACTER OF REVISIONS	APPROVED	DATE APPROVED

E. W. SAUNDERS, CONSULTING ENGINEER
F. W. WHEELER, DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA

CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY VIRGINIA

MOORMAN'S RIVER STORAGE DAM
LOG BORINGS SOUTH OF DAM SITE

DRAWN BY	SCALES:	SHEET
TRACED BY		2
CHECKED BY		

RECOMMENDED FOR APPROVAL, CITY MANAGER

APPROVED MAYOR

1000
990
980
970
960
950
940
930
920
910
900
890
880
870
860
850

6+503

6+003

5+503

5+

LOG OF GROUTING OPERATIONS

HOLE 1H

Date: Jan 22, 1945
First packer set at Elev 902.2
At 188 sacks of 8 gal/sack grout grout appeared in hole 3H

Hole 3H was plugged
At 293 sacks of 8 gal/sack grout grout appeared in stream
Date: Jan 29, 1945
Packer set of Elev 902.2
pressure of 120 p.s.i. was held
Raised packer to Elev 912.2
Used 40 sacks of cement in 8 gal/sack grout; changed to 6 gal/sack grout

At 523 sacks pressure was 20 p.s.i.
At 588 " " 25 p.s.i.
Date: Jan. 30, 1945
Packer set of Elev 922.2, hole did not take grout of 100 p.s.i.
Raised packer to Elev 932.2, hole would not take grout
Raised packer to Elev 942.2, used 6 gal/sack grout. After 135 bags of cement had been used grout appeared in stream 15 ft. below point at which it had previously appeared. Stopped pumping for 30 min. Pumped in 8 sacks of 5 gal/sack grout and grout appeared in stream.
Date: Feb. 3, 1945
Packer set at Elev. 942.2. After 133 sacks of 6 gal/sack grout had been pumped, grout appeared in stream at same place as on Jan 30
Date: Feb. 5, 1945
Packer set at Elev. 942.2. Used 10 sacks of cement in 6 gal/sack grout then changed to 5 gal/sack grout
Pumped a total of 200 sacks of cement
Packer was then moved to 2H
Packer again set at Elev 942.2
166 sacks of 3½ gal/sack grout was pumped without a rise in pressure.
Date: Feb. 6, 1945
At 35 bags of cement in 8 gal./sack pressure rose to 30 p.s.i.
Changed to 5 gal./sack grout at 55 bags of cement pressure rose to 100 p.s.i. but delivery pressure was reduced to 75 p.s.i.
At 212 bags cement changed to 3 gal/sack grout.
At 234 sacks of cement pressure held at 60 p.s.i. Hole would not take more grout
A total of 1753 sacks of cement was used in this hole

HOLE 2H

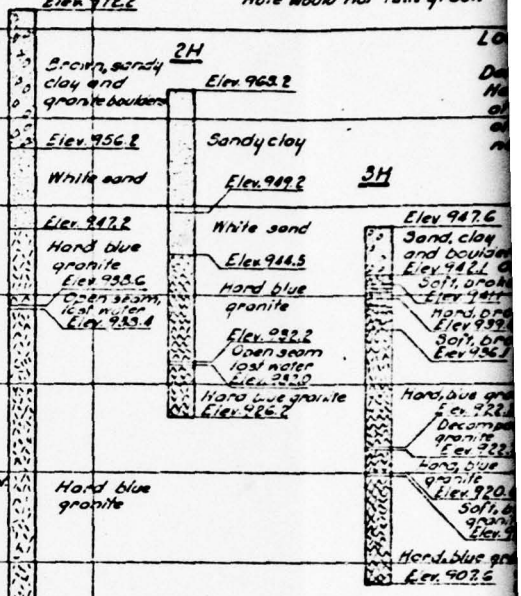
Date: Feb. 3, 1945
Packer set at Elev. 932.2 6 gal/sack grout was used. At 3 pressure rose and held at 125 p.s.i. Raised packer to 165 sacks of cement pressure was 35 p.s.i. Pur out

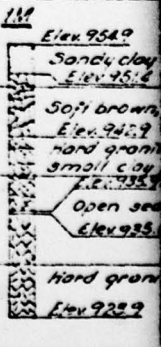
Date: Feb. 5, 1945
Hole was plugged with grout at Elev. 944.2.23 a result of grouting other holes.

LOG OF GROUTING OPERATIONS HOLE 3H

Date: Feb 5, 1945
Hole was plugged with grout at Elev 922.5 as a result of grouting other holes
Packer set at Elev 922.6
Hole would not take grout.

For log of Hole 7S see Sheet 2





LOG OF GROUTING OPERATIONS

...sand. At 3 sacks of cement ...packer to Elev 943.2 at ...Ran out of cement.

OPERATIONS

...with grout ...pressure of ...ches ...9226 ...the grout.

LOG OF GROUTING OPERATIONS
HOLE 5H
Date: Jan. 22, 1945
Grout entered this hole from hole H1 and this hole was plugged.

LOG OF GROUTING OPERATIONS
HOLE 6H
Date: Jan 23, 1945
Packer set at Elev. 898.6
34 sacks of cement in 6 gal/sack grout delivery pressure was 20 p.s.i. changed to 6 gal/sack grout.
At 325 sacks of cement - pressure was 35 p.s.i.
" 350 " " " " " 50 " "
" 362 " " " " " 70 " "
Ran out of cement.
Remarks: This hole never held pressure, but it is apparent from the continued increase in delivery pressure that the hole was near refusal when the grouting was stopped.

LOG OF GROUTING OPERATIONS
HOLE 4H
Date: Feb 5, 1945
Hole was plugged with grout at Elev 911.6 due to grouting other holes. This hole would not take grout.

960
950
940
930
920
910
900
890
880
870
860
850

Elev 947.6
Sand, clay and boulders Elev 942.1 Overburden
Soft, broken granite Elev 941
Hard, broken granite Elev 933.4
Soft, broken granite Elev 926.1 Lost water

4H
Elev. 929.6
Sandy clay Elev. 925.6 Overburden.
Hard granite Elev. 920.0
Soft, rotten granite Elev. 919.1
Hard granite Elev. 915.1
Hard, broken granite Elev. 913.2
Hard granite Elev. 908.2
Hard, broken granite Elev. 907.9
Hard granite Elev. 905.6
Soft, broken granite Elev. 903.6
Hard granite
Elev. 863.6
Hard, broken granite Elev. 862.0
Hard granite Elev. 856.6

Hard, blue granite Elev. 922.9
Decomposed granite Elev. 922.3
Hard, blue granite Elev. 920.9
Soft, brown granite Elev. 919.6
Hard, blue granite Elev. 902.6

5H
Elev. 912.9
Sand and boulders
Elev. 900.3 Overburden
Hard granite
Elev. 863.6
Broken granite Elev. 861.0
Hard granite Elev. 857.9

6H
Elev. 914.6
Sand and boulders
Elev. 900.2 Overburden
Hard granite Elev. 899.3
Broken granite Elev. 897.1
Hard granite Elev. 895.1
Broken granite Elev. 893.6
Hard granite Elev. 890.0
Broken granite Elev. 888.0
Hard granite Elev. 880.8
Broken granite Elev. 880.8
Hard granite Elev. 879.6

5+00S 4+50S 4+00S 3+50S

Logs of core borings shown on this sheet have been copied from the drillers reports and logs of the grouting operations have been copied from daily reports by J.W. Carter, City Inspector. The holes were drilled with a 2" diamond bit; this work and the grouting having been done by the Mott Core Drilling Co, Huntington, W. Va. The cores are available for inspection.

960
Elev. 954.9
Sandy clay Elev. 951.6
950
Soft brown, broken granite Elev. 945.9
Hard granite with small clay partings Elev. 935.9
940
Open seam, lost water Elev. 935.0
930
Hard granite
Elev. 929.9
920

5+00S 4+50S

LEGEND
Boulders and Sand, Clay overburden
Sand
Broken granite
Soft, coarse-grained granite
Hard and dense granite

BY	DATE	CHARACTER OF REVISION	APPROVED

E. W. SAUNDERS, CONSULTING ENGINEER
F. W. WHEELER, DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA

CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY VIRGINIA

MOORMAN'S RIVER STORAGE DAM
LOG OF BORINGS ON DAM SITE

DRAWN BY
TRACED BY
CHECKED BY
SCALES: 1 in. = 10 ft.
SHEET 3

RECOMMENDED FOR APPROVAL
CITY MANAGER
DATE APPROVED

Log of Grouting Operations

Hole 7H

Date: Jan. 25, 1945
Packer set at Elev. 896.2
2 sacks of cement in 8 gal. sack grout were used. Pressure held at 20 p.s.i.

Log of Grouting Operations

Hole 8H

Date: Jan. 25, 1945
Packer set at Elev. 896.0
3 sacks of cement in 6 gal. sack grout were used. Pressure held at 120 p.s.i.

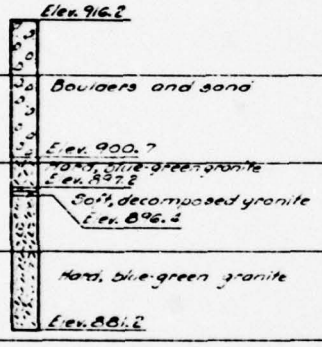
Log of Grouting Operations

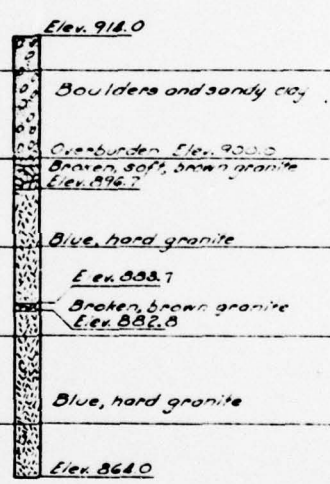
Hole 9H

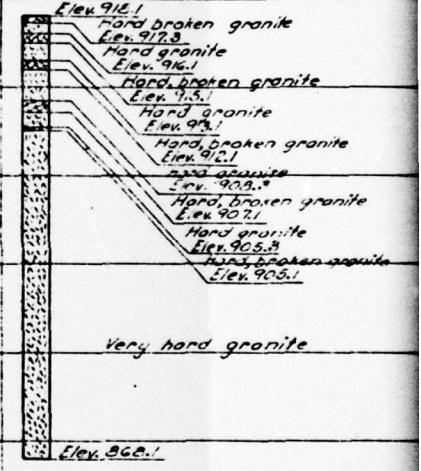
Date: Feb. 5, 1945
Packer set at Elev. 893.1
Hole was tested with water and pressure held at 85 p.s.i.
Packer set at Elev. 903.1
Hole was tested with water and lost pressure slowly.
Started grouting with 6 gal/sack grout at 115 p.s.i. pressure.
At 25 sacks of cement pressure was 30 p.s.i.
At 34 " " " held at 50 p.s.i.

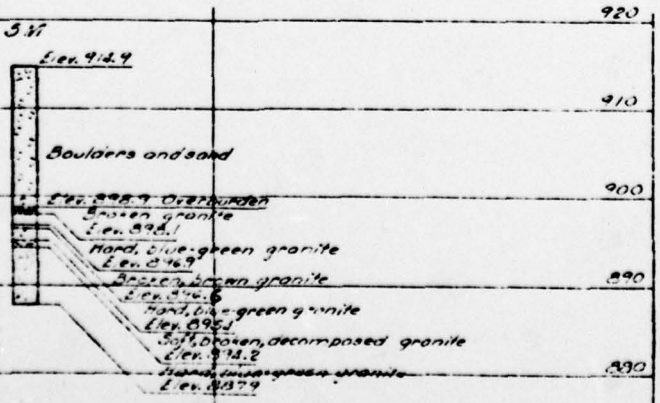
Log of Gr

Hol
Date: Ja
Packer
Used 6
1st 2 sack
Packer
At 195 sa
Packer
At 204 s
A total
used in
which
used o









Log of Grouting Operations — Hole 10H

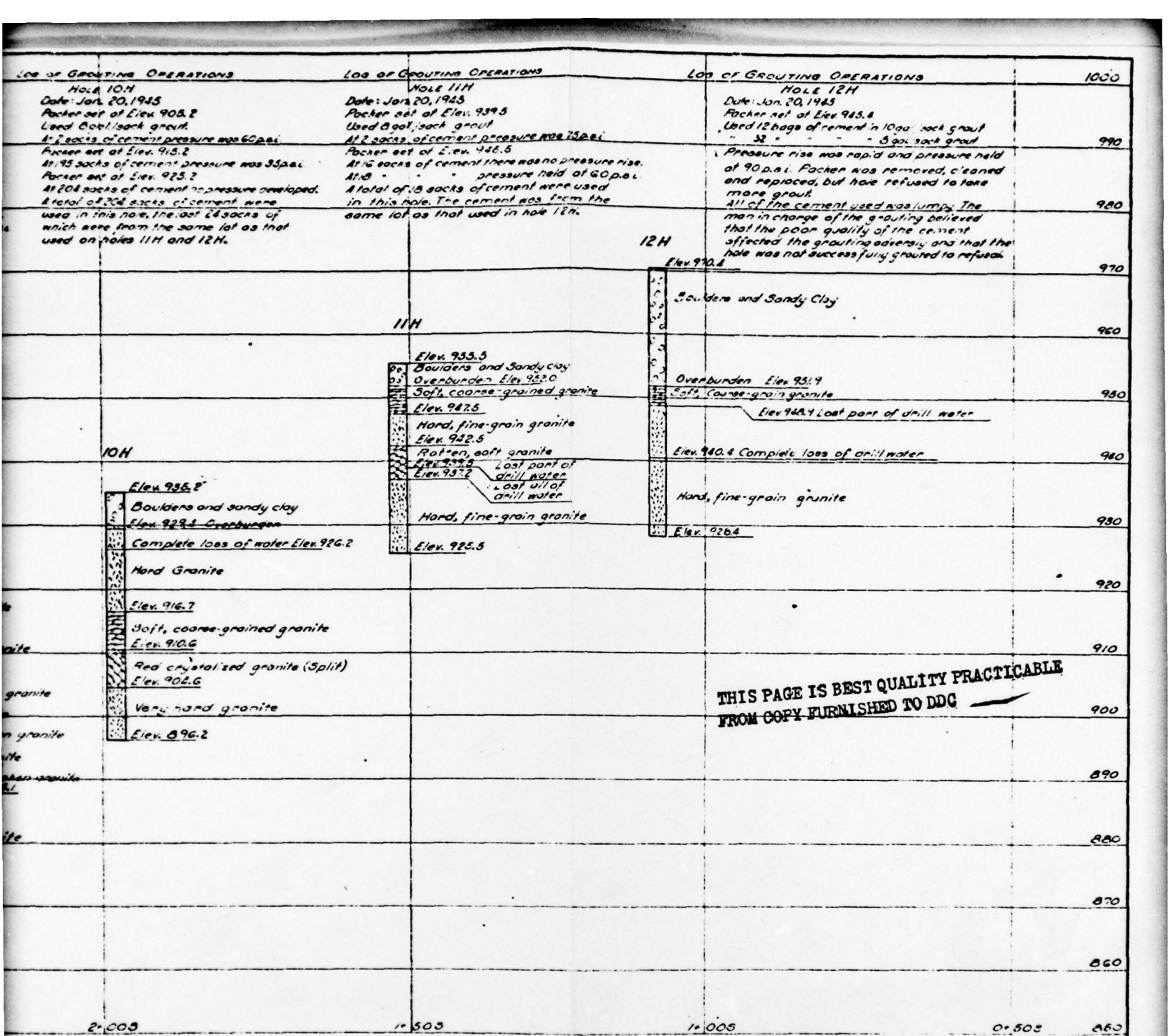
Date: Jan. 20, 1945
Packer set at Elev. 908.2
Used Bag/sack grout.
At 5 sacks of cement pressure was 60 p.s.i.
Packer set at Elev. 918.2
At 95 sacks of cement pressure was 35 p.s.i.
Packer set at Elev. 925.2
At 208 sacks of cement no pressure developed.
A total of 208 sacks of cement were used in this hole. The last 68 sacks of which were from the same lot as that used on holes 11H and 12H.

Log of Grouting Operations — Hole 11H

Date: Jan. 20, 1945
Packer set at Elev. 939.5
Used 8 gal./sack grout
At 2 sacks of cement pressure was 35 p.s.i.
Packer set at Elev. 926.5
At 16 sacks of cement there was no pressure rise.
At 18 " " " pressure held of 60 p.s.i.
A total of 18 sacks of cement were used in this hole. The cement was from the same lot as that used in hole 12H.

Log of Grouting Operations — Hole 12H

Date: Jan. 20, 1945
Packer set at Elev. 965.4
Used 12 bags of cement in 10 gal./sack grout
" 32 " " " 8 gal./sack grout
Pressure rise was rapid and pressure held of 90 p.s.i. Packer was removed, cleaned and replaced, but have refused to take more grout.
All of the cement used was lumpy. The man in charge of the grouting believed that the poor quality of the cement affected the grouting adversely and that the hole was not successfully grouted to refusal.



Logs of core borings shown on this sheet have been copied from the drillers reports and the logs of the grouting operations have been copied from daily reports by J. W. Carter, City Inspector. The holes were drilled with a 3 inch diamond bit, this work and the grouting having been done by the Mott Core Drilling Co., Huntington, W. Va. The cores are available for inspection.

LEGEND

- Boulders and sandy clay overburden
- Broken granite
- Soft, coarse-grained granite
- Hard and dense granite

BY	DATE	CHARACTER OF REVISIONS	APPROVED

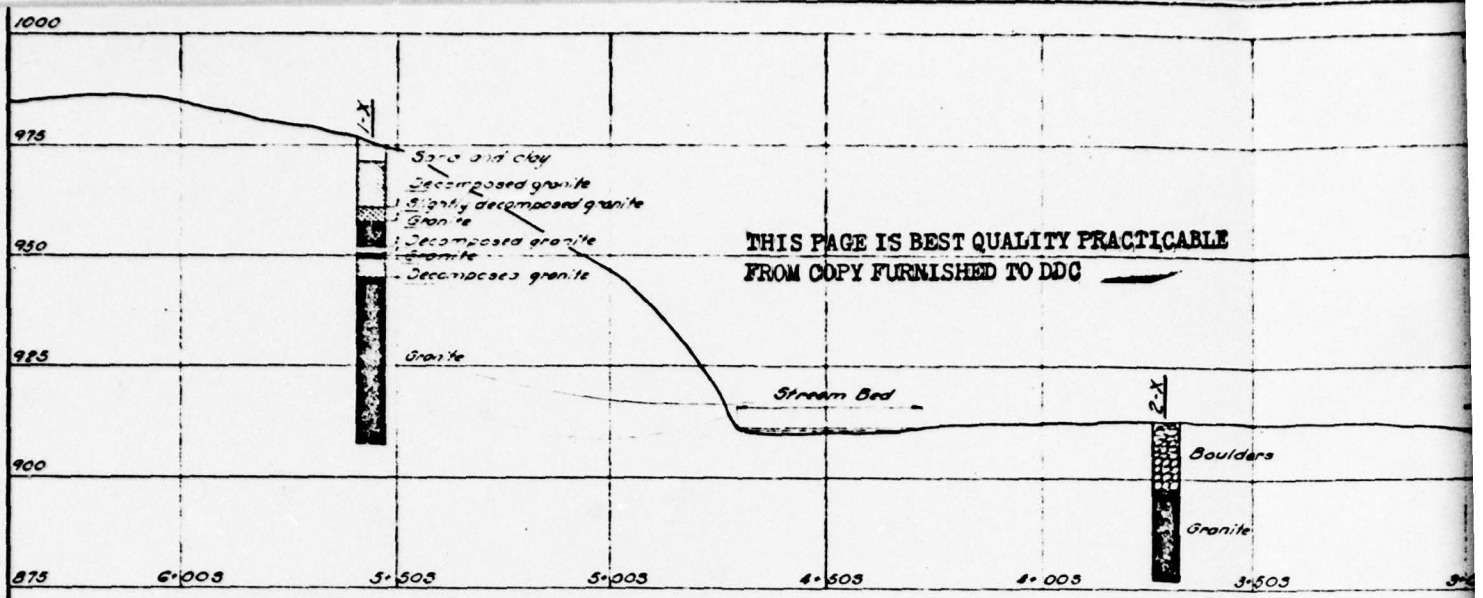
E. W. SAUNDERS, CONSULTING ENGINEER — F. W. WHEELER, DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA

CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY VIRGINIA

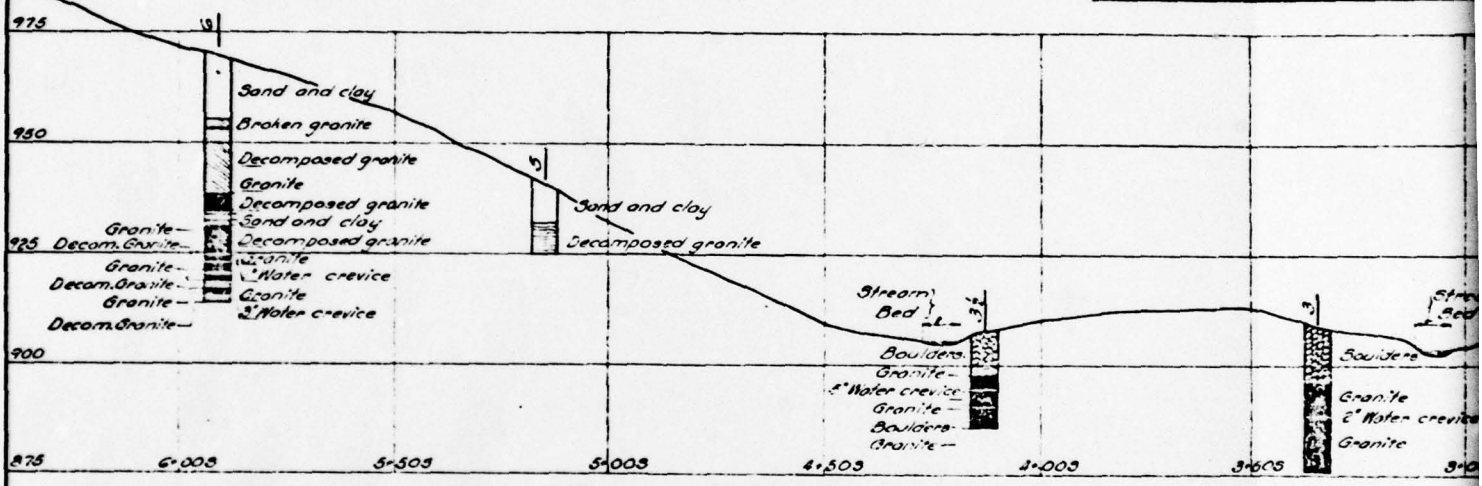
MOORMAN'S RIVER STORAGE DAM
LOG OF BORINGS ON DAM SITE

DRAWN BY
TRACED BY
CHECKED BY
SCALES: 1 IN. = 10 FT.
SHEET 4

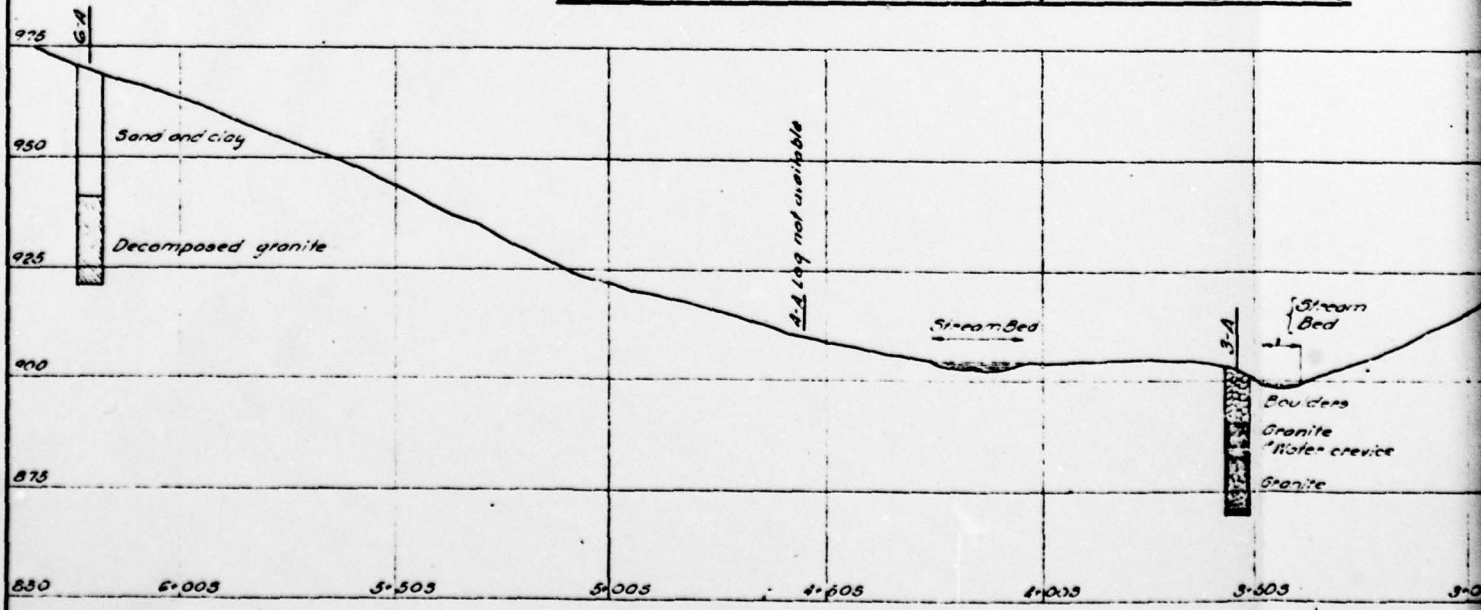
RECOMMENDED FOR APPROVAL ..... CITY MANAGER
DATE Jan 1 1945 APPROVED .....



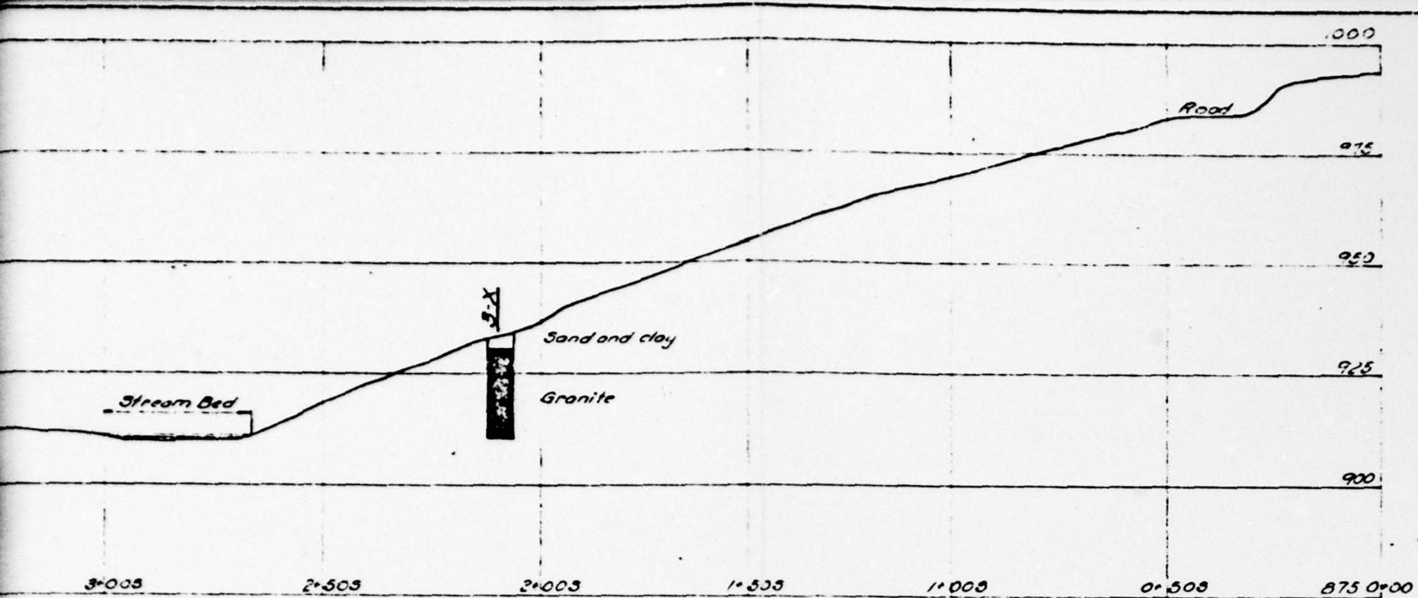
PROFILE ALONG LINE



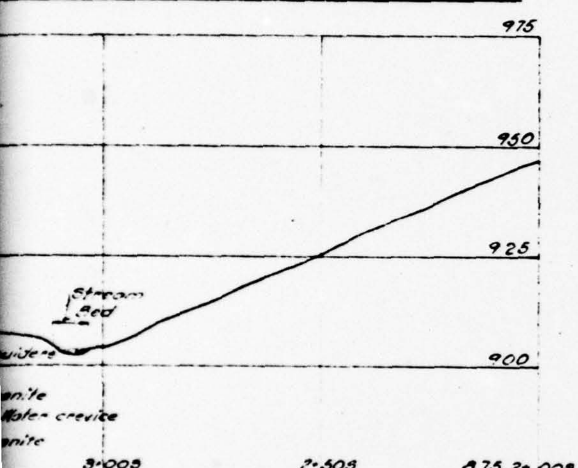
PROFILE SHOWING HOLES 3, 3½, 5 AND 6 - NEAR 2+85E

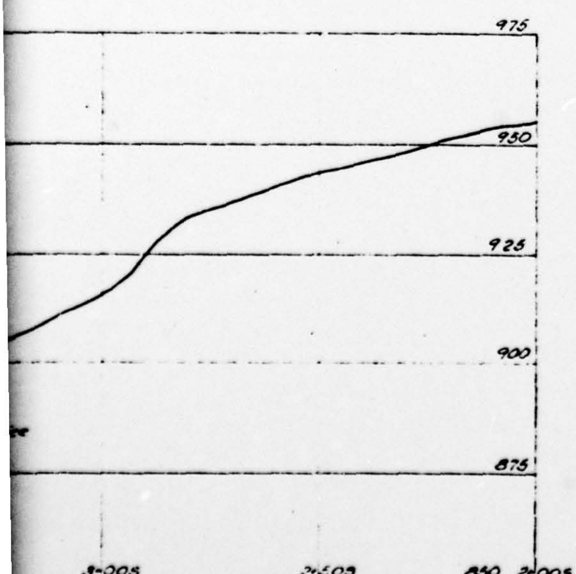


PROFILE ALONG LINE OF "A" HOLES - NEAR 3+40E



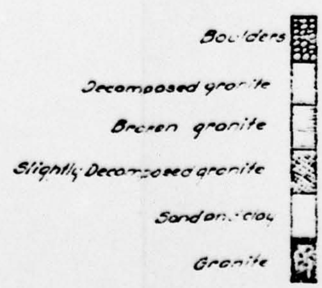
LINE OF "X" HOLES - ABOUT 1+40E





Records of core borings shown on this sheet have been copied from Plate 8 of a report prepared by Saville and Williamson, Inc., Consulting Engineers, Richmond, Va., on the "Proposed Moormans River Dam." This report is dated April 3, 1931. The borings were made by the Southern Drilling Co.

LEGEND



BY	DATE	CHARACTER	APPROVED
REVISIONS			

E.W. SAUNDERS, CONSULTING ENGINEER — F. W. WHEELER, DESIGNING ENGINEER
CHARLOTTESVILLE, VIRGINIA

CITY OF CHARLOTTESVILLE
ALBEMARLE COUNTY, VIRGINIA

MOORMAN'S RIVER STORAGE DAM
GEOLOGICAL PROFILES & LOGS OF BORINGS DOWNSTREAM FROM DAM

DRAWN BY ______ SCALES ______ SHEET 5
TRACED BY ______
CHECKED BY ______

RECOMMENDED FOR APPROVAL ______ CITY MANAGER
DATE ______ APPROVED ______ MAYOR

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APPENDIX VI

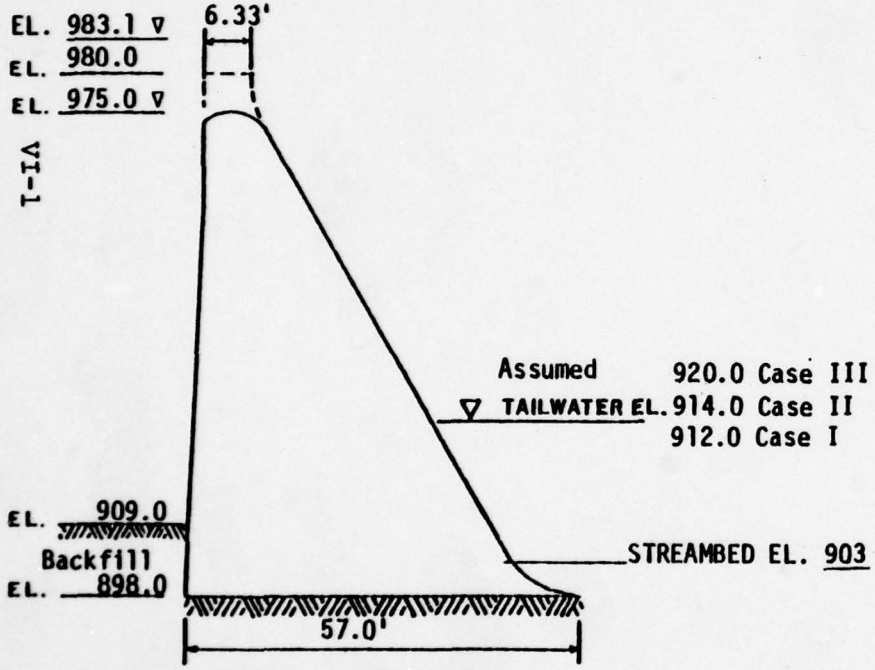
STABILITY ANALYSES

GRAVITY DAM DESIGN
STABILITY ANALYSIS

SUGAR HOLLOW

ANALYSIS DONE ON X FULL SECTION ___ PARTIAL SECTION
LOCATION OF SECTION Station 2+17 (see Plate 4)
ANALYSIS PREPARED BY M. Mill, Michael Baker, Jr., Inc.

LOADING CASE	ELEV. HEAD WATER	ELEV. TAIL WATER	ΣV	ΣH	ΣH/ΣV	LOCATION RESULTANT FROM TOE	% BASE IN COMPRESSION	FACTOR SAFETY SLIDING	FOUNDATION PRESSURE	
									TOE	HEEL
Case I Normal Pool Ice Load	975.0	912.0	224,807#	144,586#	0.64	23.1'	100	104(1)	6186 PSF	1702 PSF
Case II P.M.F.	983.1	914.0	209,129#	165,116#	0.79	19.4'	100	91(1)	7168 PSF	170 PSF
Case III P.M.F.	983.1	920.0	196,754#	159,936#	0.81	19.7'	100	94(1)	6649 PSF	254 PSF



(1) Jointed Quartz Monzonite
$\phi = 31°$
$S_o = 1825$ psi
From ETL 1110-2-184