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NATIONAL DAM SAFETY PROGRAM. COVE DAM NUMBER 1 (VA 06905), FRED--ETC(U)
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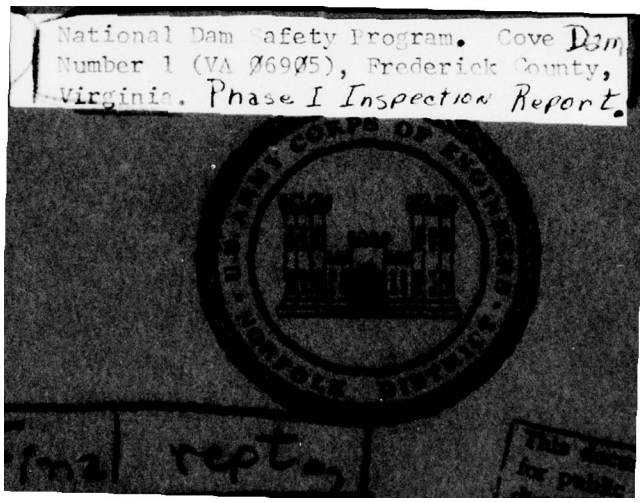

National Dam Safety Program. Cove Dam
Number 1 (VA Ø69Ø5), Frederick County,
Virginia. Phase I Inspection Report.
rept

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

CONTENTS

NAME OF DAM: COVE NO. 1

NATIONAL DAM SAFETY PROGRAM
PHASE I INSPECTION REPORT

REVISION NO. 2 TO COVE #1 DAM

Delete paragraph 7.2.4.

REVISION NO. 1 TO PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

COVE #1

The cover color is revised to white. The actual cover will not be changed. Each recipient of a copy of this report should notate the existing cover. In addition, add to Section 7, the following paragraphs:

7.1.1 Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the embankment would be overtopped for all storms exceeding approximately 30% of the PMF. The spillway is therefore, adjudged as seriously inadequate and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

7.2.1 In accordance with paragraph 7.1.1, it is recommended that within two months from the date of notification to the Governor of the Commonwealth of Virginia, the owner engage the services of a professional consultant to determine by more sophisticated methods and procedures the adequacy of the spillway. Even though the seriously inadequate spillway would produce a dam failure primarily from hydrologic reasons, remedial measures in structural or geotechnical areas may be needed to remove the dam from an unsafe classification. Within 6 months of the date of notification to the governor, the professional consultant's report of appropriate remedial mitigating measures should have been completed and the owner should have an agreement with the Commonwealth of Virginia to a reasonable time frame in which all remedial measures will be complete. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Cove No. 1
State: Virginia
County: Frederick
Stream: Tributary to Laurel Run
Date of Inspection: 16 June 1978

BRIEF ASSESSMENT OF DAM

The Cove Dam No. 1 is an earthfill dam approximately 26 feet high and 440 feet long, owned and operated by the Cove Operators.

The dam is classified as "small" size-"high" hazard. The emergency spillway passes the 100 year frequency storm, but the dam is overtopped by 30 percent of the Probable Maximum Flood. The spillway must pass at least the one-half Probable Maximum Flood as required by the Recommended Guidelines for Safety Inspection of Dams. Due to the proximity of Enon Springs Girl Scout Camp located less than a mile downstream, dam failure as a result of overtopping would significantly increase the hazard to loss of life from that which would exist just before an overtopping failure. The spillway is therefore seriously inadequate.

The visual inspections and review of engineering data, made in June 1978, indicate deficiencies requiring immediate attention. It is recommended that:

1) Further investigation should be made to assess the required spillway capacity, crest elevation increase, piping potential, and slope stability.
2) The outlet pipe should be repaired to serve its intended function as a drain for the lake, or the leaking plug now in the pipe should be sealed.
3) Remove the trees from the embankment, and regrade and reseed the slopes and the top of dam.
4) Determine the seepage path through the embankment and abutments.
5) Remove debris from and add riprap to the stilling basin.
6) Provide an evacuation plan for downstream residents when the lake level approaches the crest of the embankment.

MICHAEL BAKER, JR., INC.

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

SUBMITTED: Original signed by JAMES A. WALSH
James A. Walsh
Chief, Design Branch

RECOMMENDED: Original signed by ZANE M. GOODWIN
Zane M. Goodwin
Chief, Engineering

APPROVED: Original signed by LEONARD C. GREGOR
Major Corps of Engineers
Acting District Engineer

Date: SEP 15 1978

COMMONWEALTH OF VIRGINIA
MICHAEL BAKER III
NO. 3176
CERTIFIED PROFESSIONAL ENGINEER

OVERALL VIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: COVE NO. 1 ID# VA 06905

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: Cove Dam No. 1 consists of an earth embankment approximately 26 feet high and 440 feet long. Seepage control is provided by a rock toe drain, reportedly built by the owner instead of a tile and gravel toe drain specified by the designer. The primary spillway consists of a 24 inch corrugated metal pipe without a riser. The discharge is controlled by a section cut out of the 24 inch corrugated metal pipe with no control valves or gates. The emergency spillway is a trapezoidal shaped earth excavation and is located on the left abutment.

1.2.2 Location: Cove Dam No. 1 is located on a tributary to Laural Run which flows into Back Creek.

1.2.3 Size Classification: The maximum height of the dam is 26 feet. The reservoir volume to the top of dam is 380 acre-feet. Therefore, the dam is in the "small" size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

1.2.4 Hazard Classification: Due to the proximity of the Girl Scout Camp, Camp Enon Springs located less than a mile downstream, and the seven miles distance to the Town of Gore, Virginia with a population of about 150, many lives could be lost in the event of failure of the dam. Therefore, this 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 dam is owned by the Cove Operators--A.W.K. McDowell, Manager.

1.2.6 Purpose of Dam: The dam is used for recreational purposes at a commercial camping area.

1.2.7 Design and Construction History: The existing facility was designed for the owner by R.M. Bartenstein and Associates. The dam was built by the owner beginning in 1958 or 1959. Construction was completed in 1960.

1.2.8 Normal Operational Procedures: The lake level is not regulated.

1.3 Pertinent Data

1.3.1 Drainage Area: The drainage area of Cove Dam No. 1 is 1.3 square miles.

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

Principal Spillway:

Pool level at emergency spillway crest	23 c.f.s.
Pool level at top of dam	27 c.f.s.

Emergency Spillway:

Pool level at top of dam	327 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 Area acres	Reservoir Capacity Acre-feet	Reservoir Capacity Watershed inches (a)	Reservoir Capacity Watershed inches (b)	Length feet
Top of dam	1155.1	31.42	379.9	10.5	5.4	N.A.
Maximum pool, design surcharge						
Emergency spillway crest	1153.6	26.99	295.6	8.2	4.2	N.A.
Principal spillway crest (normal pool)	1152.7	24.33	264.0	7.3	3.8	2400
Streambed at centerline of dam	1131.0	-	-	-	-	-

(a) Uncontrolled drainage area of 0.68 square miles.
(b) Total drainage area of 1.31 square miles, including drainage area of Cove Dam No. 2.
N.A.-Not Available

SECTION 2 - ENGINEERING DATA

2.1 Design: The design data reviewed included the following:

1) Plans and Specifications by R.M. Bartenstein and Associates, dated May 1958.

2) Construction and Operation Memorandum by A.W.K. McDowell (partial-owner), dated June 1978.

2.2 Construction: The dam, built by the owner, was finished in 1960. No records of quality control or construction progress were presented by the owner.

2.3 Operation: No formal operating procedures are used. The 10 inch outlet pipe is plugged with concrete.

2.4 Evaluation

2.4.1 Design: Although the owner furnished the original plans and specifications for the dam, observations and the owner's description indicate that the design was changed significantly from the plans. Changed items are:

1) No vortex baffle or riser on the primary spillway.

2) Tile and filter toe drain was replaced by a rock toe drain.

3) No outlet pipe was installed for the toe drain.

4) The emergency spillway width of 56 feet is less than shown on the plans (65 feet). The decreased spillway width reduced the capacity of the spillway.

5) No riprap was placed in the outlet channel for the primary or emergency spillways.

6) The primary spillway was relocated to the right side of the embankment.

No reason was given for these changes and omissions. All the above items are important facets of dam design. The specifications

written by the designer, R. M. Bartenstein and Associates, were done with the consideration that the owner would construct the dam. The designer cautioned against changing the spillway section and generally wrote the specifications in a very instructional manner.

2.4.2 Construction: The Construction and Operation Memorandum (Appendix V) describes the equipment and materials used to build the dam but does not contain any quality control records or daily construction reports.

2.4.3 Operation: The plugging of the 10 inch outlet pipe prevents the dam from being drained. The statement on operational experience in the Construction and Operation Memorandum describes the removal of a beaver dam at the primary spillway. However, the memorandum does not contain specific information on reservoir levels and spillway erosion.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

3.1.1 General: The field inspection was made on 16 June 1978. No unusual weather conditions were experienced and the lake was at normal pool. The dam and appurtenant structures were found to be in good physical condition except for tree growth on the embankment, clear seepage at the toe, and poorly graded spillway channels.

3.1.2 Dam: Silty sand and gravel with cobbles were observed on portions of the dam surface. Silty clay with rock fragments were observed on other portions. The dam has many trees and brush growing on the downstream face and a few trees growing on the upstream face (see Photo 1). These trees and brush should be removed to prevent the root system from damaging the embankment. Ground cover should be planted to keep the erosion to a minimum. The top of the dam has vehicle ruts which are dry. The crest of the embankment varies irregularly in elevation between the abutments from a low elevation at the right abutment of 1155.1 to a high elevation of 1157.3 above the spillway. This is an unfavorable condition, particularly when the embankment is overtopped causing a concentration of flow in one area of the dam and increased velocities. Presently, the crest is not seriously eroded indicating that the embankment has probably not been overtopped to date.

Clear seepage, which was too distributed to measure, is present 100 feet from the right abutment extending through a 50 feet wide area at the toe of the embankment. In addition, there is a 20 feet wide pond of reddish-brown water near the center of the embankment toe (see Photo 2). The color is due to an iron precipitate. This situation occurs because of an imperfectly plugged 10 inch drainpipe that flows at 0.75 g.p.m. An explanation of this plugged drain is described in the Construction and Operation Memorandum (Appendix V). There is also a 100 feet long wet area due to clear seepage from the left abutment at the downstream toe.

3.1.3 Appurtenant Structures: The approach channel to the emergency spillway has no riprap or other forms of erosion protection.

3.1.4 Reservoir Area: No serious deficiencies were observed in the reservoir area.

3.1.5 Downstream Channel: The discharge channel of the emergency spillway is poorly defined, with low unprotected banks which may overflow during a flood discharge. Additional grading and riprap placement should be done to confine the flow of the water.

The stilling basin for the 24 inch outlet pipe is roughly shaped and contains trash (see Photo 4). The stilling basin should be cleaned, enlarged and completely covered with more riprap.

3.2 Evaluation: The repair of the emergency spillway, repair of the outlet pipe, raising and leveling the crest, and the removal of trees should be done as soon as possible to prevent damage to the embankment and the emergency spillway. The other repairs can be done as routine maintenance items since they do not threaten the integrity of the dam.

The clear seepage at the toe appears to be from two sources: the plugged and buried 10 inch outlet pipe, and along the base of dam. The plug should be reconstructed to make an effective seal. The entire length of the 10 inch pipe should be plugged. The clear seepage along the base of the drain is uncontrolled. (The drain which was originally planned might have intercepted this seepage.) It may be necessary to control the clear seepage with the installation of perforated pipes (asphalt coated corrugated metal pipe or plastic) to act as collectors at the embankment toe and to carry the water beyond the toe of the dam. Further investigation is necessary to evaluate the effects of the observed seepage on piping potential and slope stability.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: No formal operating procedures are followed for this dam. There are no working valves or gates to operate.

4.2 Maintenance of Dam: The dam is privately owned and maintained by the owners, the Cove Operators. No records of maintenance were available.

4.3 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 maintenance personnel. This should include:

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

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

4.4 Evaluation: The maintenance of the dam is poor with respect to the removal of trees and brush. However, the primary spillway pipe was free of debris and siltation (see Photo 4). The owner should immediately provide a means of draining the lake by repair of the existing, plugged, 10 inch drain or by new construction.

SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

5.1 Design: Cove Dam No. 1 was designed by R. M. Bartenstein and Associates of Warrenton, Virginia, for the Cove Operators. The owner has made available a copy of the Specifications for Cove Dam No. 1 (Appendix VI). Hydraulic and hydrologic computations were not available at the time of this report; therefore, the results contained herein were based upon limited information received and collected by Michael Baker, Jr., Inc., Consulting Engineers.

The as-built conditions vary greatly from the design conditions including such items as spillway size, dam elevation and outlet works. These differences are listed in paragraph 2.4.1.

5.2 Hydrologic Records: No records of the lake levels were available. However, field observations indicate that the emergency spillway has been activated in the past.

5.3 Flood Experience: No records are available.

5.4 Flood Potential: Performance of the reservoir by routing various flood hydrographs is shown in Table 5.1.

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

Regulation of flow from the reservoir is automatic. Normal flows are controlled by the primary spillway at elevation 1152.7 until the water rises to the emergency spillway elevation 1153.6.

The flood inflow to Cove Dam No. 1 is partially controlled by Cove Dam No. 2, which is located upstream, by its storage capabilities. Cove Dam No. 2 controls about 48 percent of the drainage area of Cove Dam No. 1; therefore, its effects were included in the hydrologic evaluations.

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

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal	Hydrograph 100 Year	1/2 P.M.F.	P.M.F.
Peak flow, c.f.s.				
Inflow	-	992	2147	4962
Outflow	-	79	1957	4824
Peak elev., ft. M.S.L.	1152.7	1154.1	1156.1	1157.0
Emergency spillway(a)				
Depth of flow, ft.	-	0.3	1.5	2.1
Avg. velocity, f.p.s.	-	3.1	7.0	8.2
Non-overflow section				
Depth of flow, ft.	-	-	0.5(b)	1.0(c)
Avg. velocity, f.p.s.	-	-	3.9	5.5
Tailwater elev., ft. M.S.L.	-	-	-	-

(a) Spillway passes 30 percent of P.M.F.
(b) Duration of overtopping - 2.4 hours.
(c) Duration of overtopping - 5.2 hours.

5.7 Reservoir Emptying Potential: The reservoir presently has no facilities to drain the lake. The owner has, however, indicated that there are plans to install a siphon drain.

5.8 Evaluation: The emergency spillway is of sufficient capacity to pass flood waters resulting from a 100 year frequency rainfall. However floods of a magnitude equal to the Probable Maximum Flood (P.M.F.) and one-half P.M.F. would cause dam embankment overtopping as indicated in Table 5.1. The emergency spillway, including storage effects of the reservoir, will pass about 30 percent of the P.M.F. without overtopping the dam.

It should be noted 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: No information on soil and rock conditions was available. Bedrock is not exposed in the immediate area of the dam. There was no rock excavation in the emergency spillway.

6.2 Stability Analysis

6.2.1 Visual Observations: No evidence of sloughing or sliding in the embankment, cut slopes or drainage structures was observed. Clear seepage occurs in three areas at the downstream toe of the dam. The seepage from a grouted outlet pipe has formed a small pond with a measured flow of 0.75 g.p.m. (see Photo 2).

The other areas of clear seepage may be due to lack of internal drainage. The owner substituted a rock toe drain for the tile and filter toe drain shown on the original plans. The existence of the rock toe drain could not be verified by observation due to vegetation and a cover of soil. Since a properly graded toe drain would tend to arrest occurrence of piping due to seepage in the embankment, a limited investigation is necessary to confirm the drain's composition, size and extent.

6.2.2 Design and Construction Data: No stability calculations or as-built construction plans are available. A Construction and Operation Memorandum (Appendix V), written in June 1978; original plans; and Specifications for Cove Dam No. 1 (Appendix VI) were supplied by the owner, who constructed the dam. There is a significant difference between the original plans and the observed features. These differences are discussed in paragraph 2.4.

6.2.3 Operating Records: A statement describing the operational experience since the lake was filled in 1960 has been provided by the owner in a memorandum included in this report as Appendix V.

6.2.4 Post-Construction Changes: The only reported alteration to the dam since its construction was the grouting of the 10 inch outlet pipe near the middle of the embankment.

6.2.5 Seismic Stability: Cove Dam No. 1 is located at the demarcation line between Seismic Zones 1 and 2. This location is considered to present no hazard by earthquakes according to the Recommended Guidelines for Safety Inspection of Dams.

6.3 Evaluation: Although no slope stability failures were observed on the embankment; the seepage on and below the downstream toe, the unknown composition of the embankment materials, and the absence of quality control records indicate the need for further investigation of embankment stability.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: There are findings as a result of this inspection that indicate deficiencies requiring immediate attention. The spillway is considered adequate to pass the 100 year frequency storm without overtopping the embankment. However, the dam will be overtopped by 30 percent of the P.M.F. In addition, clear seepage at the toe of the embankment needs to be further assessed.

The owner provided a Construction and Operating Memorandum (Appendix V) as well as design plans, and Specifications for Cove Dam No. 1 (Appendix VI). These documents were helpful in assessing the history and present condition of the dam.

A detailed assessment of increasing spillway capacity and assessment of seepage conditions, including the clear seepage from the outlet pipe is needed immediately.

7.2 Recommended Remedial Measures

The inspection revealed certain items of rehabilitation or other work which should be done immediately by the owners. These are:

1) Further investigation is necessary to reduce the overtopping potential, and define the source and internal profile of seepage within the embankment. Piezometers may have to be installed.

2) Drain the lake with a syphon as indicated by the owner and repair the cemented plug in the 10 inch outlet pipe, or repair the pipe to serve its original function which was to drain the lake.

3) Remove all the trees from the embankment, and regrade and reseed the crest and the slopes.

4) Enlarge and regrade the emergency spillway to a uniform cross section. Further investigation should indicate the amount of spillway enlargement or crest elevation increase necessary to pass at least the one-half P.M.F.

5) Confirm the condition and extent of the rock toe.

6) Remove trash and add riprap lining at the stilling basin, outlet channel and the upstream embankment slope.

7) Investigate the stability of the embankment after measuring seepage levels.

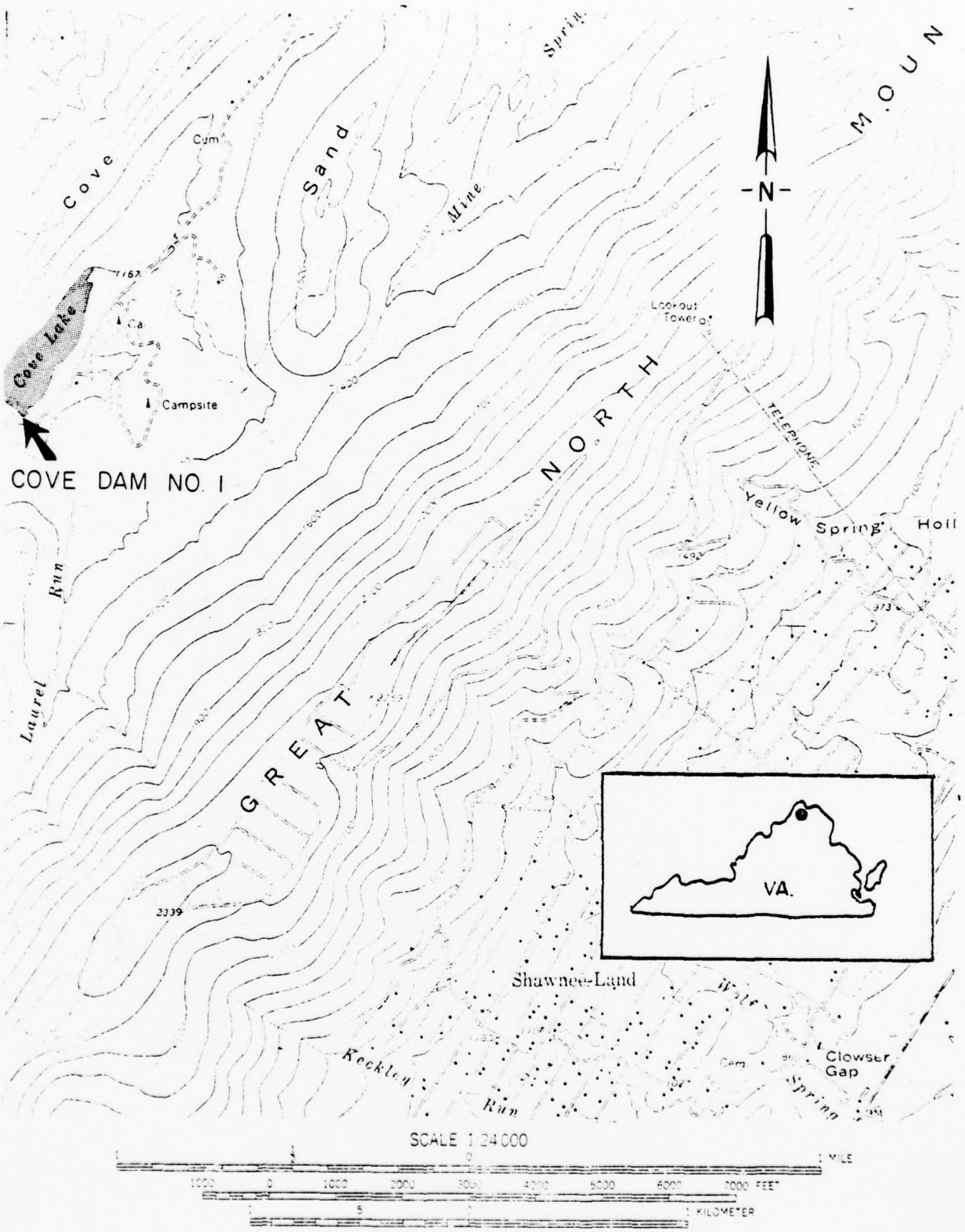
Those items requiring further investigation should be done by a professional engineer experienced in dam design and construction.

A warning system should be devised that will alert downstream occupants to evacuate when the reservoir level approaches the top of the embankment. The downstream occupants should also be advised to evacuate during storms that coincide with the U.S. Weather Bureau's flash flood warning system.

APPENDIX I

PLATES

CONTENTS



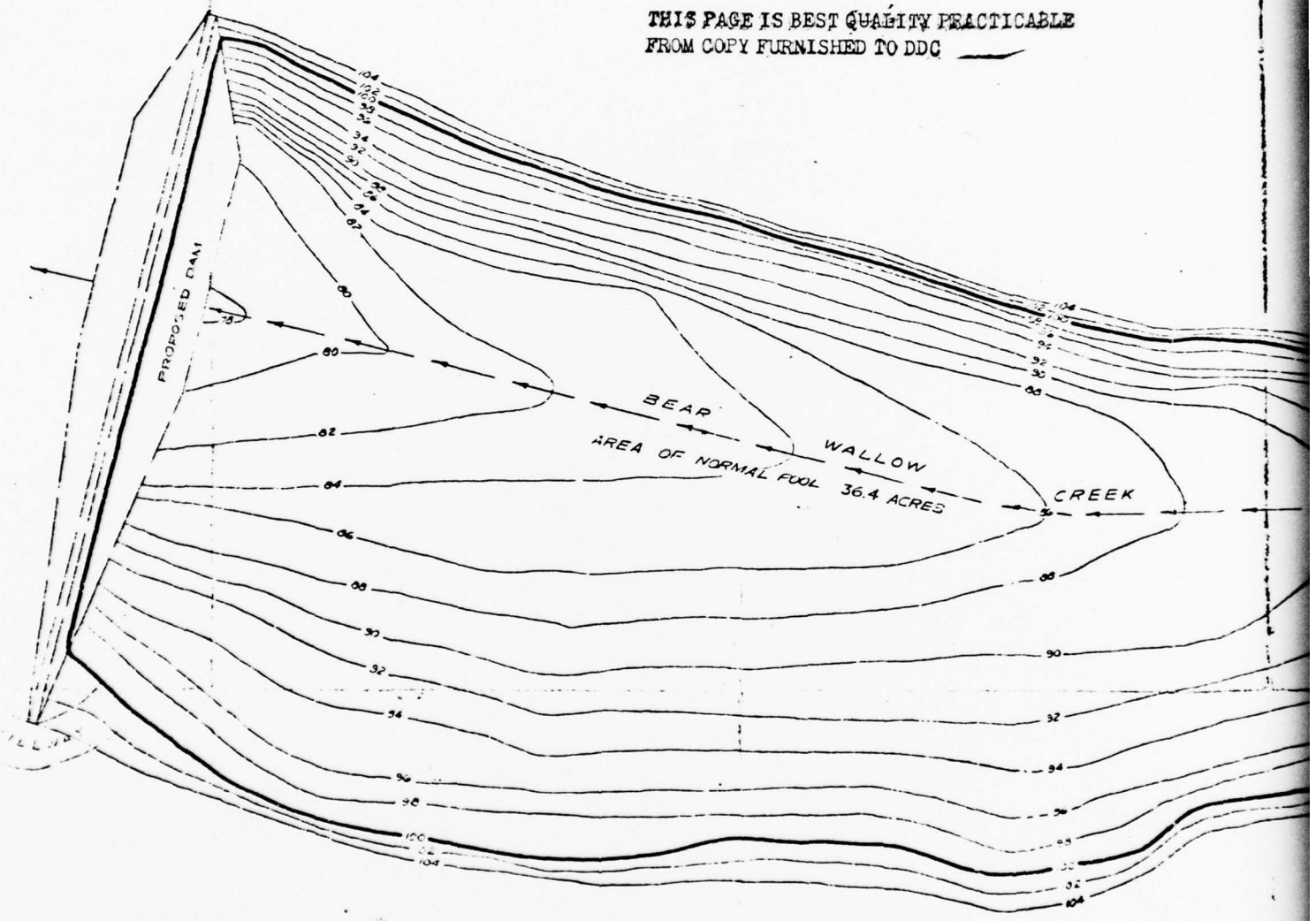
LOCATION PLAN

COVE DAM NO. 1

PROPOSED COVE LAK

McDOWELL ESTATE

FREDERICK COUNTY, VIRGINIA

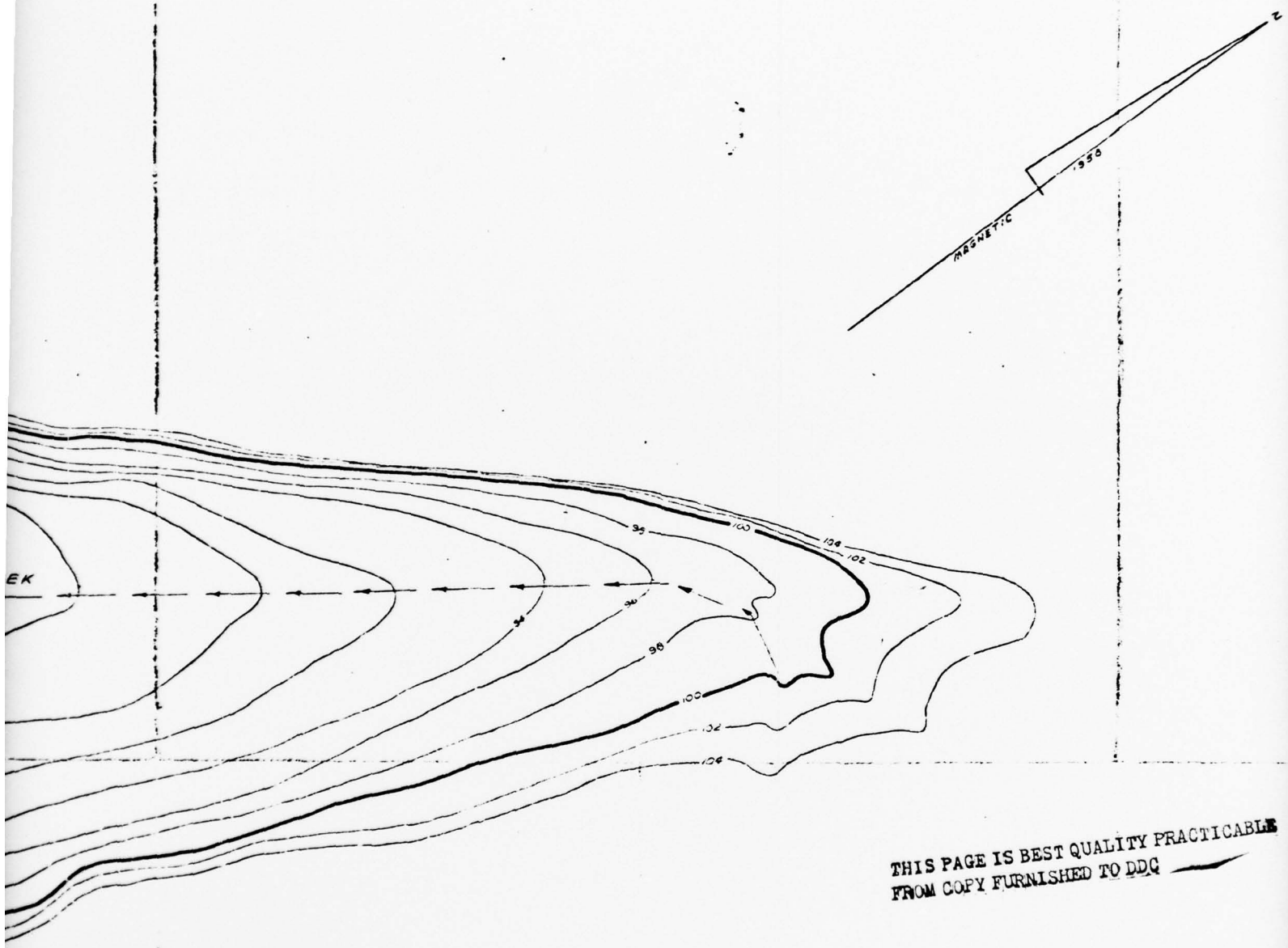


BOUNDARY OF NORMAL POOL ELEV 1000

COVE LAKE

LL ESTATE

COUNTY, VIRGINIA



PLATE

AL POOL ELEV 1000 FT

2

COVE LA	
VAN PATTEN STEIN & ASS	
ENGINEERS & SURVE	
WARRENTON, VIRGINIA	
SCALE 1"=100'	DATE 2-17-1958
DRAWN BY MICHAEL KELLY	CHECKED BY
APPROVED BY	

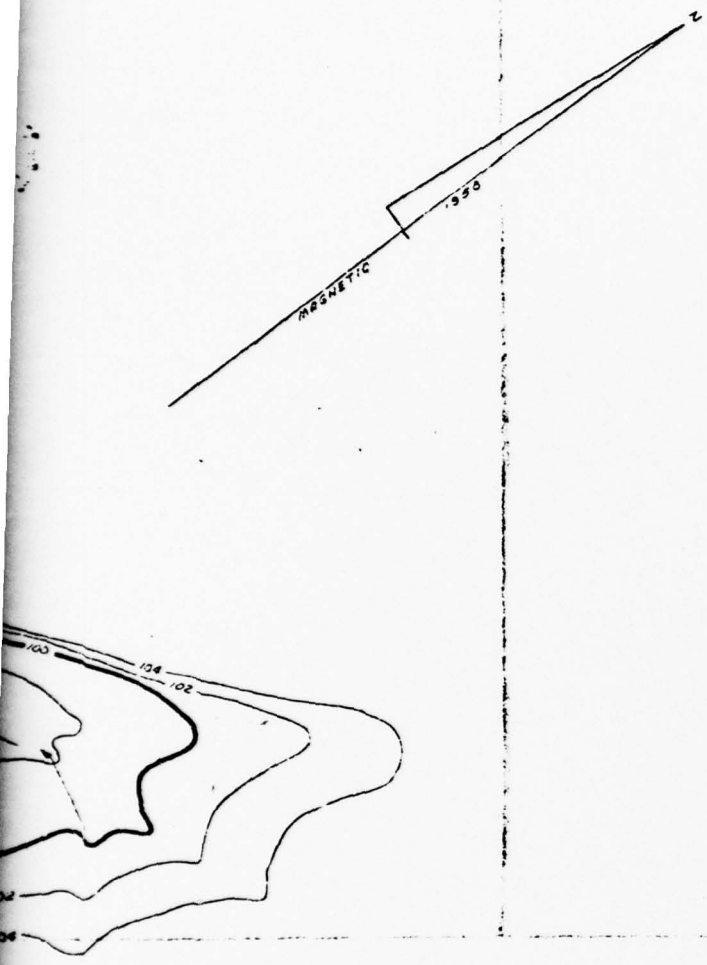


PLATE 1

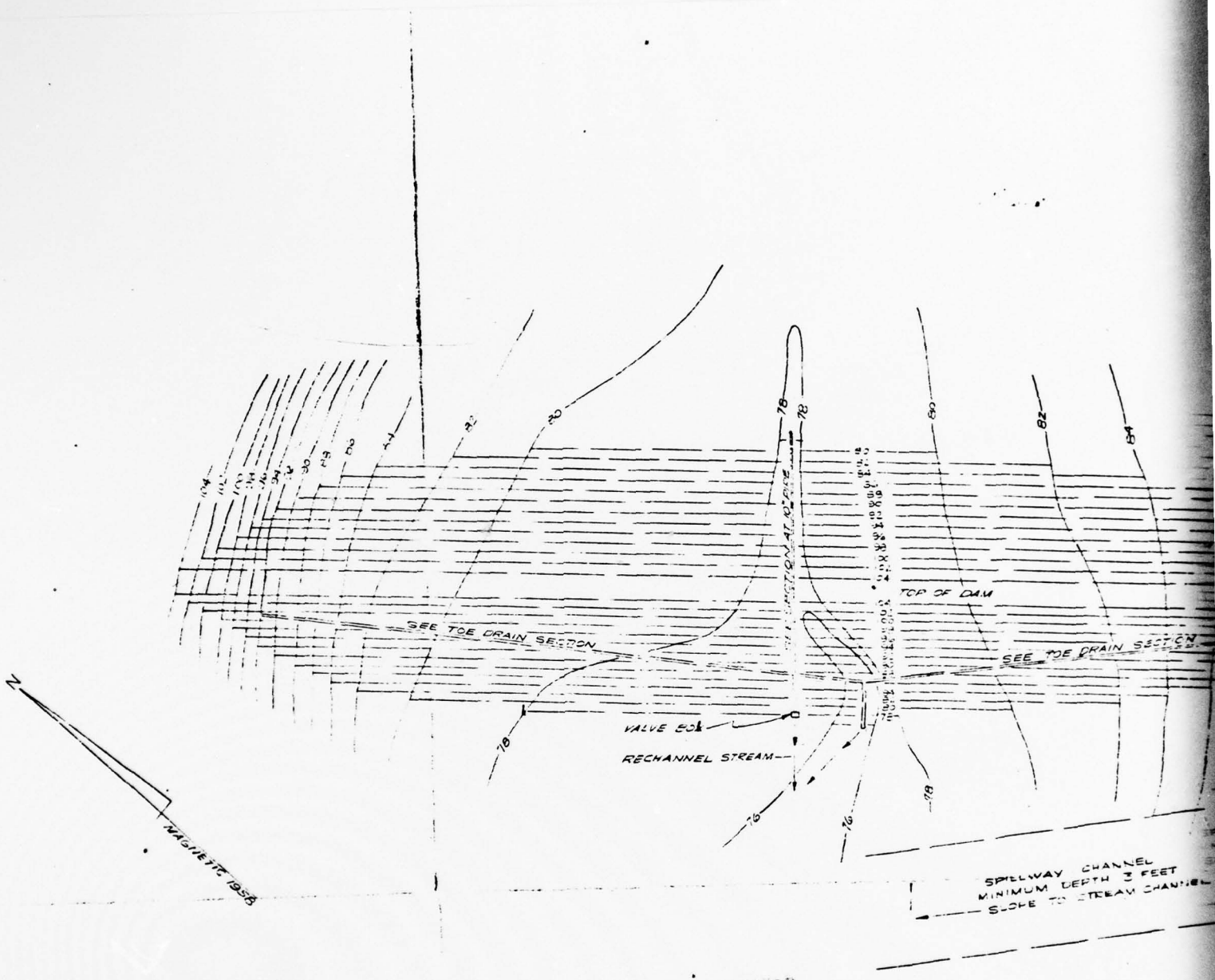
3

LOVE LAKE

GM PARTENHEIN & ASSOCIATES
ENGINEERS & SURVEYORS
WARRENTON, VIRGINIA

SCALE	DATE	SHEET
1" = 50'	21 MAY 1958	1 OF 2
DRAWN BY	CHECKED BY	APPROVED
MICHAEL KELLY		

APPROVED BY



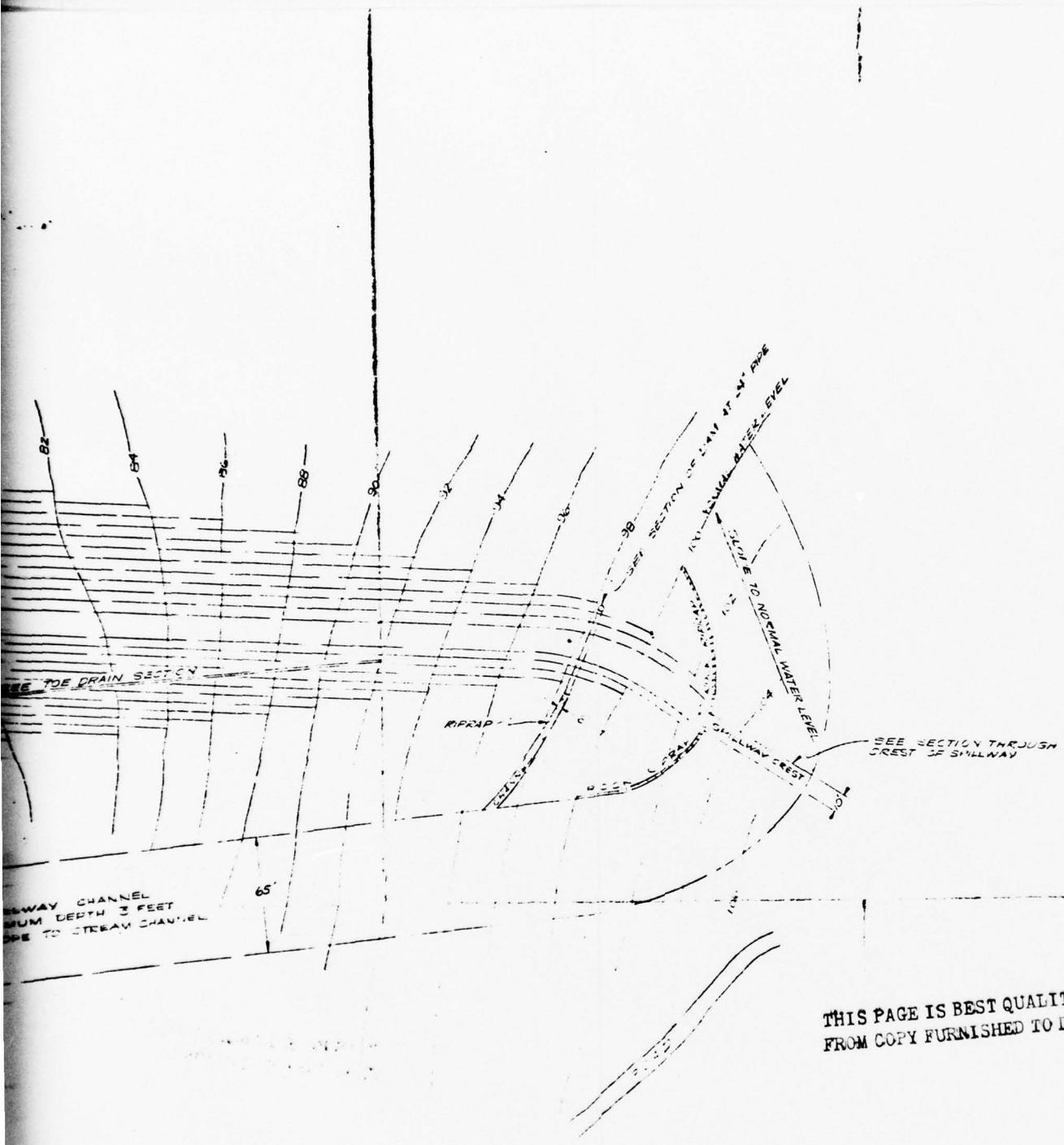
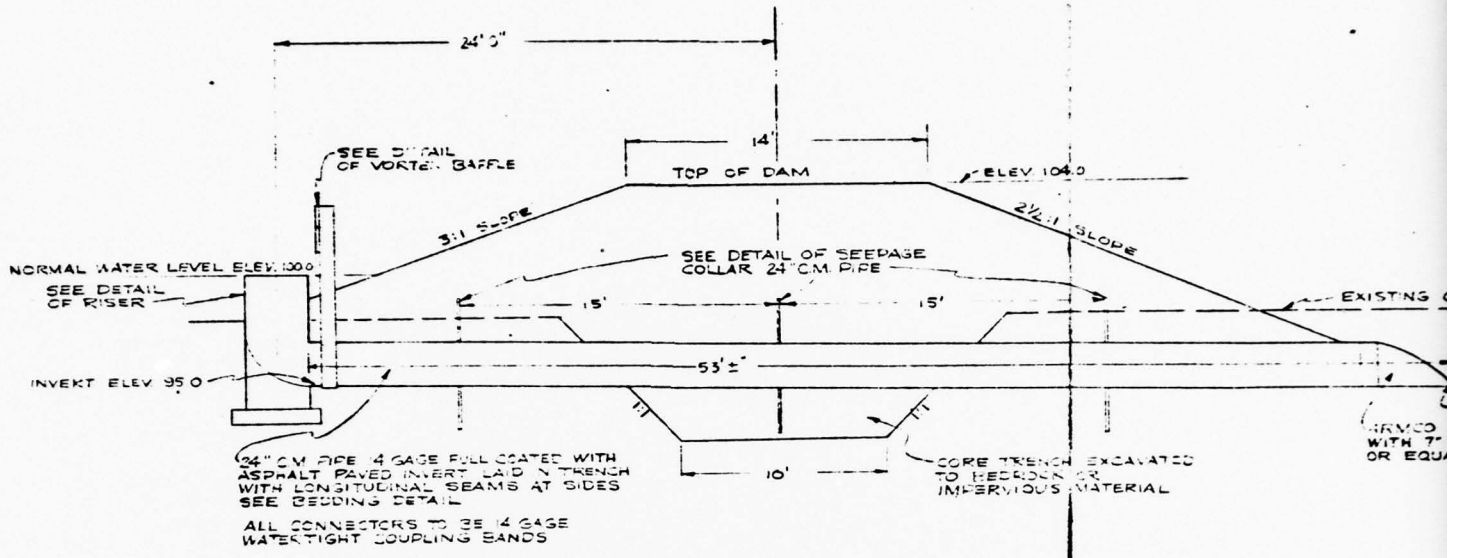


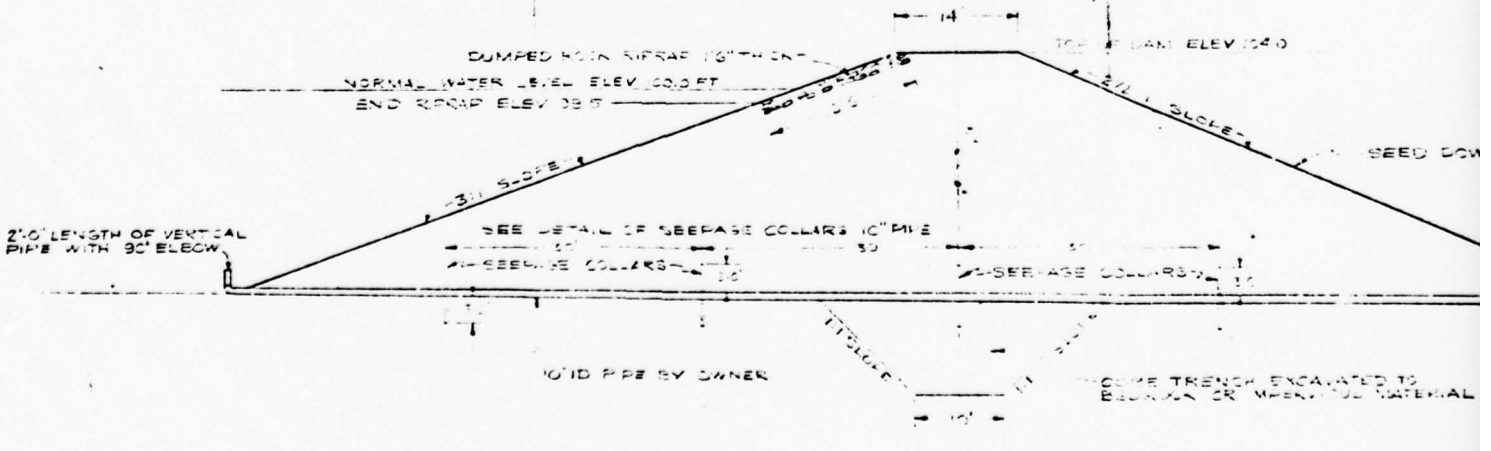
PLATE 2

2



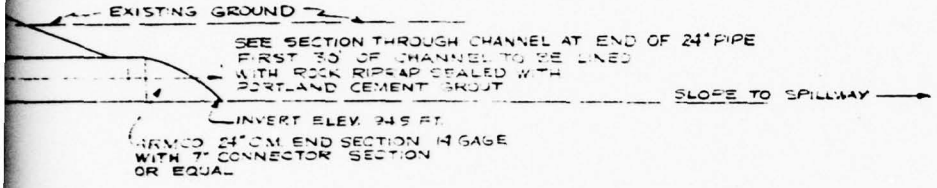
SECTION OF DAM AT 24 INCH PIPE

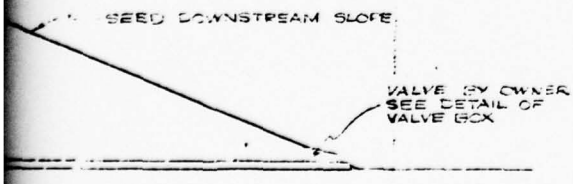
SCALE: ¼"=1'-0"



SECTION OF DAM AT 10 INCH PIPE

SCALE 1"=1'-0"





EXCAVATED TO
PERVIOUS MATERIAL

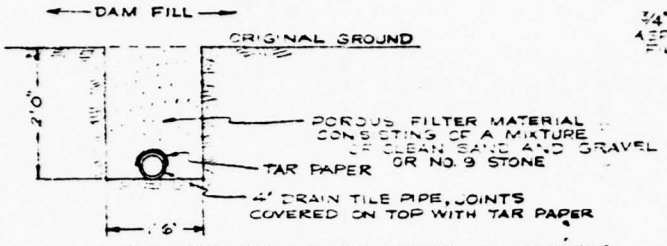
PLATE 3

JUNE LAKE

R. M. BUETTNER & ASSOCIATES
ENGINEERS & SURVEYORS

AS SHOWN	28 MAY 1974	3 OF 3
DRAWN BY MICHAEL KELLY	CHECKED BY	JOB NO.
APPROVED BY		

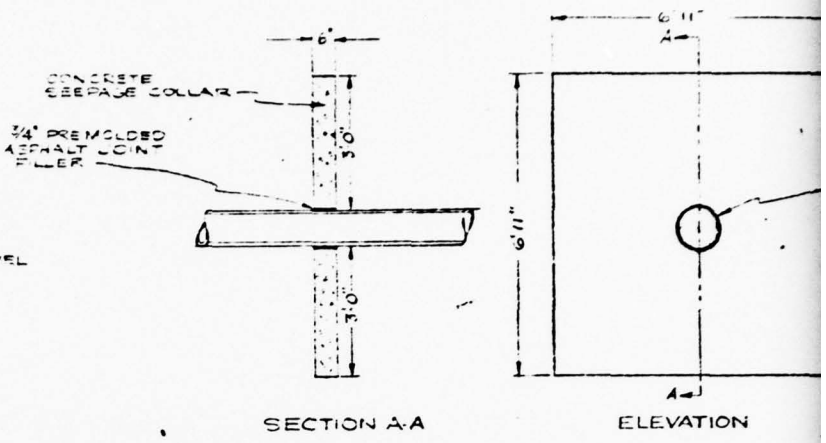
2



NOTE: SEE SHEET 2 FOR LOCATION OF TOE DRAIN

DETAIL OF TOE DRAIN

SCALE: 3/4"=1'-0"

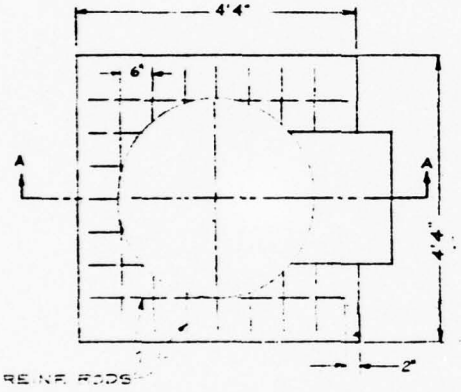


SECTION A-A ELEVATION

NOTE: ALTERNATIVE, FABRICATE SEEPAGE COLLAR FROM GALVANIZED SHEET METAL CUT TO FIT PIPE.

DETAIL OF SEEPAGE COLLAR FOR 10 INCH

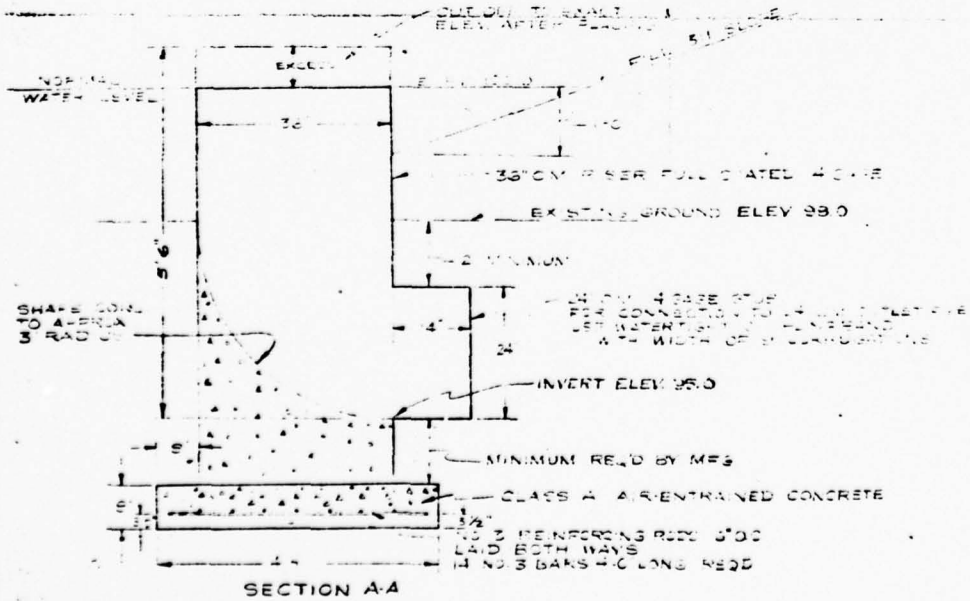
SCALE 1/2"=1'-0"



PLAN

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

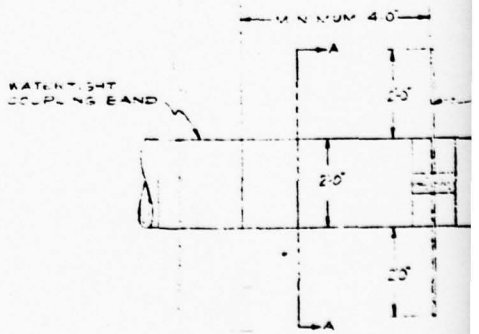
SECTION A



SECTION A-A

DETAIL OF RISER

SCALE 3/4"=1'0"

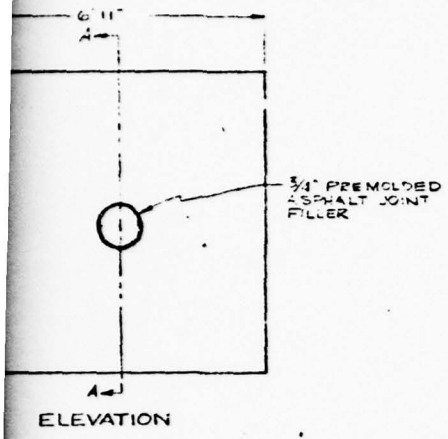


NOTE: LOCATE DIAPHRAGM ADJACENT JOINTED CONCRETE AND AT NEAR CENTER OF AS POSSIBLE.

24" C.M. PIPE

DETAIL OF SEEPAG

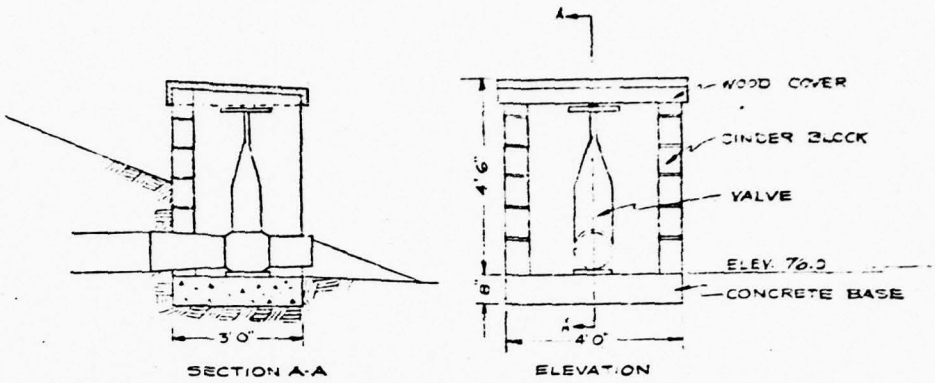
SCALE: 1/2"=1'-0"



ELEVATION

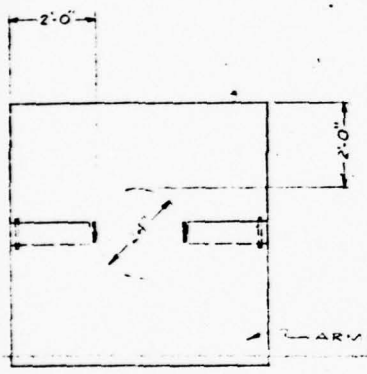
E SEEPAGE COLLAR
TAL CUT TO FIT

L OF
AR FOR 10 INCH PIPE
1'-0"

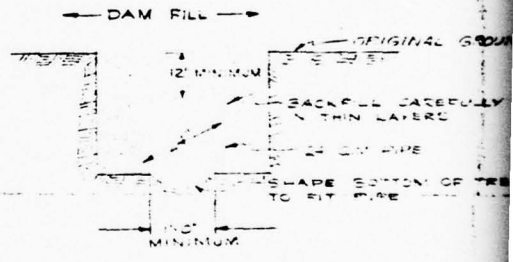


NOTE REVISE DIMENSIONS IF NECESSARY TO ACCOMODATE OWNER'S VALVE

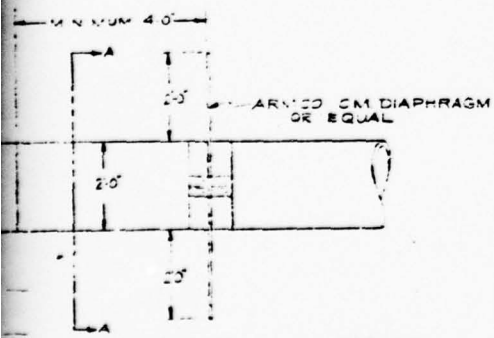
DETAIL OF VALVE BOX
SCALE: 1/2"=1'-0"



SECTION A-A

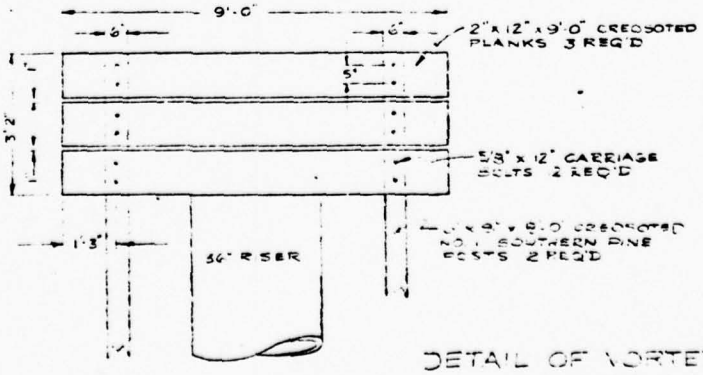


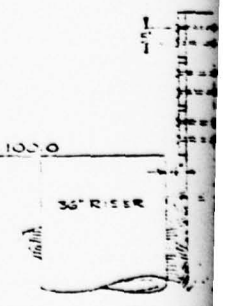
DETAIL OF BEDDING
24" CM PIPE
NOT TO SCALE



LOCATE DIAPHRAGM MIDWAY BETWEEN
NT RIVITED CIRCUMFERENTIAL SEAMS
NEAR CENTER OF PIPE LENGTH
SIBLE.

24" C.M. PIPE
IL OF SEEPAGE COLLAR
SCALE: 1/2"=1'-0"

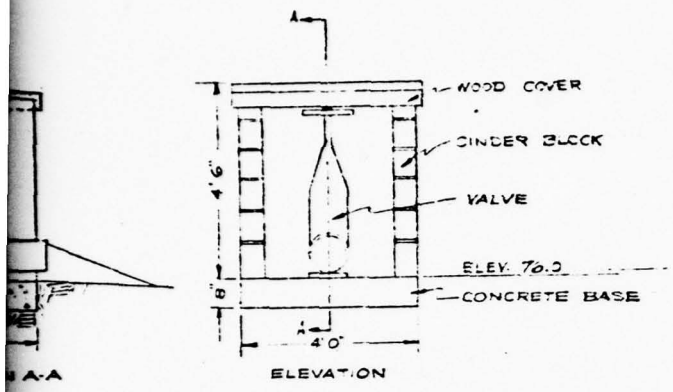




DETAIL OF VORTEX BAFFLE
SCALE 1/2"=1'-0"

PLAT

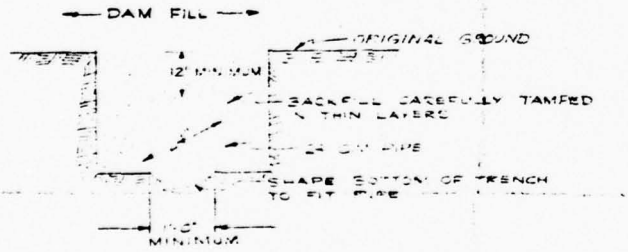
2



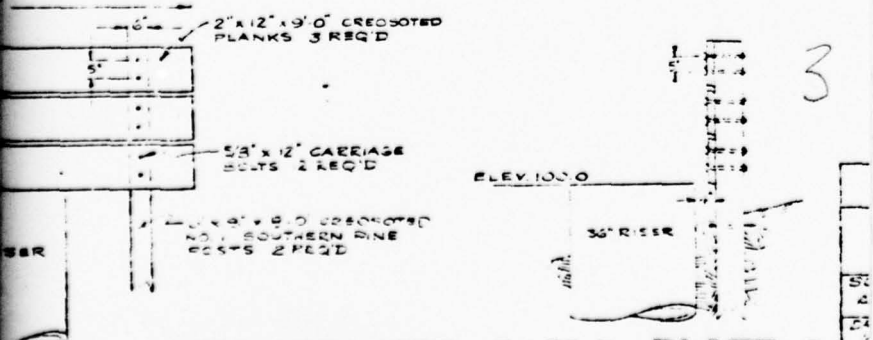
A-A

E DIMENSIONS IF NECESSARY TO ACCOMODATE OWNER'S VALVE

DETAIL OF VALVE BOX
SCALE: ½"=1'0"



DETAIL OF BEDDING
24" CM PIPE
NOT TO SCALE



3

DETAIL OF VORTEX BAFFLE
SCALE ½"=1'0"

PLATE 4

APPENDIX II

PHOTOGRAPHS

CONTENTS

Note: Photographs were taken 16 June 1978.

COVE DAM NO. 1

PHOTO 1

Top of Dam at Right Abutment Showing Dense Vegetation

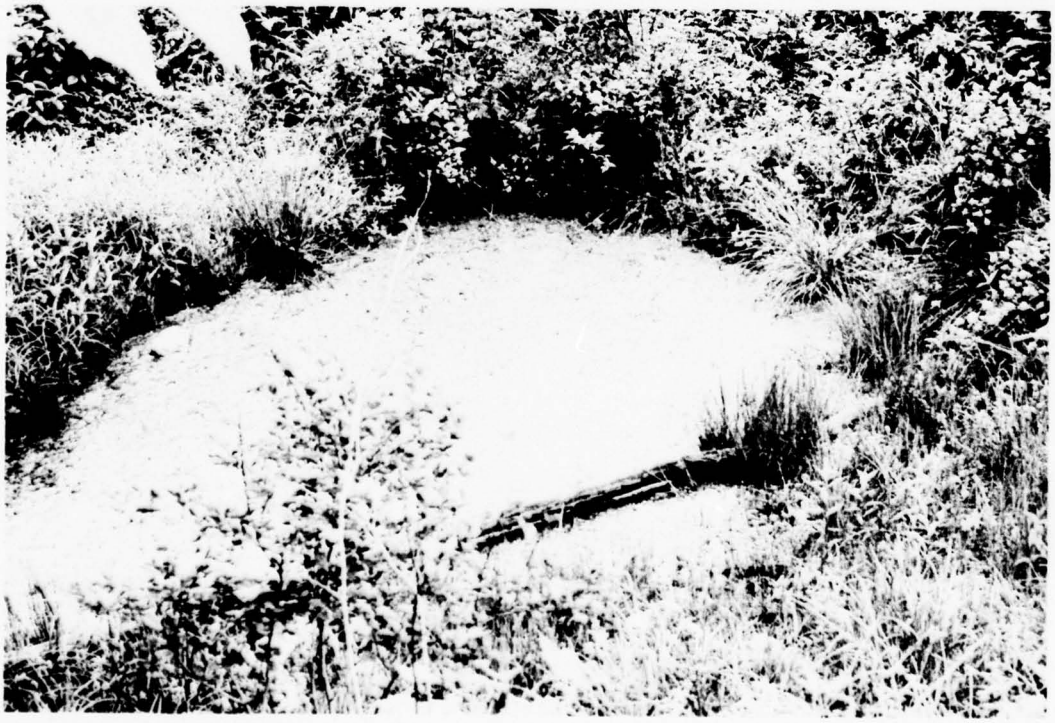


PHOTO 2

Small Red Pond at Covered Outlet of Sealed 10 Inch Pipe at Downstream Toe Near Middle of Dam

PHOTO 3

Inlet of 24 Inch C. M. P. Principal Spillway Near Right Abutment

PHOTO 4

Outlet of 24 Inch C. M. P. Principal Spillway Showing Stilling Basin With Trash and Downstream Channel

PHOTO 5

Approach to Emergency Spillway

PHOTO 6

Discharge Channel of Emergency Spillway Looking Upstream

APPENDIX III

CHECK LIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name Dam Cove No. 1 (Lower Dam) County Frederick State Virginia Coordinates Lat. 3911.2 Long. 7820.3

Date Inspection 16 June 1978 Weather Cloudy Temperature 75°F.

Pool Elevation at Time of Inspection 1152.7 M.S.L. Tailwater at Time of Inspection 1127.5 M.S.L.

Inspection Personnel:

MICHAEL BAKER, JR., INC.:

D. J. Greenwood
J. M. Thompson
W. L. Sheafer

COVE OPERATORS:

A. W. K. McDowell (Partial Owner)

D. J. Greenwood Recorder

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	There were no significant surface cracks observed during the field inspection.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	No unusual movement or cracking was visible at or beyond the toe.	The very heavy vegetation prevented a more thorough inspection.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	There was no visible sloughing of the embankment or abutment slopes. The vegetative cover on the dam is generally thick (see Photo 1) except for a road across the crest where there are areas without growth. Erosion is minimal. The abutment slopes do not appear to be eroded. Many fallen trees remain on the downstream slope primarily on the right side where they had been cut down.	Removal of the growing trees and other thick growth is recommended.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The vertical and horizontal crest alignment are irregular apparently because they were constructed in this manner. The dam does not appear to have shifted after construction.	The crest should be regraded to provide a horizontal crest. The crest elevations vary as much as two feet.
RIPRAP FAILURES	Riprap appears to be sparse or covered with granular soils. There are evidences of cobbles and boulders but not in the quantity called for by the owner's engineer along the upstream face of the dam. No adverse affects of deficient riprap were observed.	Riprap should be placed in sufficient size and quantity along the embankment and the spillway to prevent future erosional problems.

Cove No. 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONSTRUCTION MATERIAL	Damp, light brown silty sand and gravel with cobbles and boulders were observed in portions of the dam surface and yellowish-brown silty clay with rock fragments elsewhere. It was stated in a construction memorandum that a homogeneous well-graded sandy clay and granular material was used. Large rocks and boulders were placed at the downstream toe.	The embankment was reportedly compacted with passes of a heavy TD 18 bulldozer instead of a sheeps foot roller as recommended by an advisory engineer. No records of settlement were available.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	There is very little erosion of the dam and the abutment on the right side is in soil with good growth. The emergency spillway on the left side is only a few feet below the dam crest and the abutment contact is not well defined (see Photo 5). The soil is a yellowish-brown silty clay with rocks.	The vegetation should be cut regularly.
ANY NOTICEABLE SEEPAGE	Seepage at the downstream toe 100 feet from the right abutment in a 50 feet wide area was not measurable. A 20 feet wide pond of red water (from iron precipitate) (see Photo 2) near the downstream center at the outlet of a 10 inch pipe which was reportedly grouted after it had been damaged. The pipe was not visible--covered with earth. A flow of 0.75 g.p.m. was measured measured. There is a wet area (100 feet long) from seepage on the left abutment of the embankment toe.	The seepage is of sufficient quantity to warrant close regular inspection and/or piezometers. A siphon drain is scheduled to be installed in the fall of 1978 to replace the 10 inch pipe, according to the owner.
STAFF GAGE AND RECORDER	None	
DRAINS	The owner reported that the downstream toe drain had been constructed by bulldozing scattered sandstone rocks into a pyramid section. There is a cover of soil and topsoil with a vegetative growth which obscures inspection of the rocks. Previously reported seepage occurs at the toe. The engineer's plans called for an embedded four inch tile drainpipe with porous backfill.	The toe drain presently seems to be adequate but the materials appear to be mixed.
FOUNDATION	The foundation of the dam appears to be in soil. Silty clay and silty sand and gravel with boulders were observed in the vicinity. There are no boring log records available. Bedrock is not exposed in the immediate area. An eight to ten inch deep cut-off trench to impervious material had been recommended by the designer.	

Cove No. 1

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not Applicable	
INTAKE STRUCTURE	The principal spillway is located near the right abutment (not as shown on the plans) (see Photo 3). The spillway is a 24 inch C.M.P. with a three feet notch to control the lake level.	
OUTLET STRUCTURE	The outlet structure is a 24 inch diameter corrugated metal pipe which empties into a stream bed with rocks and boulders on clayey and sandy silt. Trash has collected below the pipe in a roughly formed stilling basin which does not match the plans (see Photo 4).	The stilling basin should be enlarged and covered more evenly with rock. Deposited debris should be removed periodically.
OUTLET CHANNEL	The channel is uneven with a stream bed of rocks, boulders, cobbles and soil in a wooded area (see Photo 4).	The channel appears to be adequate for the existing flow, but should be graded to a uniform cross section.
EMERGENCY GATE	There is none.	

Cove No. 1 UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	There is none.	
APPROACH CHANNEL	The approach channel to the emergency spillway is composed of compacted yellowish-brown and gray silty clay with some sandstone rocks. The confining banks are low and not well-formed. There is not a uniform concentration of rock slope protection (see Photo 5).	Placement of additional rocks or boulders as riprap adjacent to the dam abutment and the outside will prevent serious erosion if there is a large overflow.
DISCHARGE CHANNEL	The discharge channel is more granular than the approach channel, including more rocks. However, the discharge channel is not well formed either and eventually outlets into the woods towards a stream (see photo 6).	Additional grading of the channel would be advisable to confine the flow of water.
BRIDGE AND PIERS	There are none.	
BANKS OF CHANNEL	The banks are shallow and irregular so that the overflow is not well confined (see Photos 5 and 6).	Additional grading and placement of riprap is recommended to protect the abutment of the dam and surrounding area.

Cove No. 1

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	There are none.	
OBSERVATION WELLS	There are none.	
WEIRS	There are none.	
PIEZOMETERS	There are none.	
OTHER	There are none.	

Cove No. 1

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The reservoir slopes are well forested on the northwest side. The recreational campsite is on the southeast with grassy areas, few woods, boating and a small beach. There are few signs of erosion or sloughing.	
SEDIMENTATION	The reservoir has been extensively silted or was constructed in this manner near the emergency spillway. Soundings indicate depths of 27 to 31 feet at the right and center of the dam, respectively. This may have been the borrow area for the embankment. Depths near the spillway vary from zero to 13 feet.	

DOWNSTREAM CHANNEL

Cove No. 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The channel is generally in good condition with cobbles and boulders on the bottom as it flows through the woods. There is little debris along the channel except near the pipe outlet. The channel varies in width from 10 to 20 feet.	
SLOPES	The stream flows into the woods in the valley floor. The slopes of the streambed are 2.5 percent.	
APPROXIMATE NO. OF HOMES AND POPULATION	The dam is upstream from the Town of Gore, Virginia with a population of approximately 150. The town is a considerable distance (seven miles) from the dam by watercourse. A scout camp, Camp Enon Springs, is also located about one mile downstream.	

APPENDIX IV

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Cove No. 1

ITEM	REMARKS
PLAN OF DAM	A set of plans and specifications, as prepared by an engineer in 1958 before construction, were supplied by the owner. The owner provided a construction and operation memorandum especially for this inspection, in June 1978. The actual construction deviates considerably from the plans and specifications. Plate 1 shows a plan view of the dam.
REGIONAL VICINITY MAP	The Location Plan was prepared from U.S.G.S. 7.5 Minute Quadrangle sheets (Hayfield, VA and Capon Springs, VA-WV).
CONSTRUCTION HISTORY	No records of foundation investigation are available. A plan was prepared in 1958 and the dam was constructed by the owner, W. K. McDowell, in 1960.
TYPICAL SECTIONS OF DAM	Typical sections of the dam are enclosed in the Phase I Construction Report as Plate 2, as measured during the inspection. Also, the original designs are available.
HYDROLOGIC/HYDRAULIC DATA	None are available.
OUTLETS - PLAN and DETAILS	See Plates 1 and 3. Riser was not built as shown.
- CONSTRAINTS and DISCHARGE RATINGS	There are none.
RAINFALL/RESERVOIR RECORDS	No rainfall or reservoir records are available at the dam. Rainfall data is available from Virginia Climatological Records.

Cove No. 1

ITEM	REMARKS
DESIGN REPORTS	None are available.
GEOLOGY REPORTS	None are available.
DESIGN COMPUTATIONS	None are available.
HYDROLOGY & HYDRAULICS	
DAM STABILITY	
SEEPAGE STUDIES	
MATERIALS INVESTIGATIONS	Limited information is provided in the Appendix V - Construction and Operation Memorandum as supplied by the owner.
BORING RECORDS	
LABORATORY	
FIELD	
POST-CONSTRUCTION SURVEYS OF DAM	There were none.
BORROW SOURCES	No records are available.

Cove No. 1

ITEM	REMARKS
MONITORING SYSTEMS	There are none.
MODIFICATIONS	There are none.
HIGH POOL RECORDS	There are none.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Owner provided a Construction and Operation Memorandum (Appendix V), written less than a week before the safety inspection.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	There was none recorded.
MAINTENANCE OPERATION RECORDS	There are none.

Cove No. 1

ITEM	REMARKS
SPILLWAY PLAN	The spillways, both the primary and the emergency, vary considerably from those designed.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	There are none.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.3 square miles, wooded (0.6 square mile controlled by Cove No. 2)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1152.7 (317 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1155.1 (334 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 1155.1

ELEVATION TOP DAM: 1155.1

CREST: Emergency Spillway

a. Elevation 1153.5
b. Type Earth side-channel
c. Width 56 feet
d. Length Undefined
e. Location Spillover Left abutment
f. Number and Type of Gates None

OUTLET WORKS: Primary Spillway

a. Type Owner constructed fixed crest weir and pipe
b. Location Right abutment
c. Entrance inverts 1151.1
d. Exit inverts 1147.5
e. Emergency draindown facilities None presently, owner plans to install a siphon in fall, 1978.

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE Unknown

APPENDIX V

CONSTRUCTION AND OPERATION MEMORANDUM

June 12, 1978

CONSTRUCTION AND OPERATION MEMORANDUM

Cove Lake and Dam at

The Cove Campground

The Cove Lake, located approximately 5 miles south of Gore, Virginia is a 42 acre recreational lake established in a small valley known as Bear Wallow.

Construction and Physical Features:

The earth fill dam established in Bear Wallow is essentially a homogeneous structure with the only variation of material being the toe drain which was constructed by bulldozing the scattered sandstone rocks and boulders into a pyramid section at the downstream toe of the dam. The bulk of the dam is made up of a well-graded material consisting of sandy clay and granular material ranging from coarse sand through small six-inch ring size sandstone. The material is quite impervious and very stable, once compacted. The structure was constructed by a combination of bulldozed and scraper carried material, with each lift being tracked down by a heavy (TD18) bulldozer. The structure was completed in 1960, and has been in operation continuously since.

The dam has shown very little indication of seepage with the only indication being a small stagnant pool at the drain pipe which can be used to empty the lake.

Note: this drain has been closed since 1971 due to vandalism. The closure was accomplished by grouting the upstream end of the transite (cement asbestos) pipe through drain.

The nature of the vandalism was unauthorized opening of the through drain in very cold weather which allowed the lake to drain. At that time, extreme cold weather allowed the remaining pool to freeze over and lift the upstream valve block which fractured the through drain pipe just behind the block. This damage was repaired by closing the drain pipe with cement for approximately 10 feet. A siphon drain is to be installed in the Fall of 1978.

To date, the structure has shown no change in profile or elevation.

Operational Experience:

Since the initial filling of the lake in 1960 through this date, the operation of Cove Lake and dam has been normal, and with the exception of a requirement to remove debris from the normal drain which is deposited by a beaver colony, there have been no difficulties, nor are any anticipated. The impoundment has been through several major tropical storms and periods of heavy rain with no attention other than visual inspection. This structure is served by an approximate 300 acre water shed, chiefly comprised of heavily forested area. It is additionally served by a controlled water source of approximately 2000 acres of wooded area. This water source is arranged in shunt fashion, and may be directed to the lake through a 10" pipe or through the normal stream run-off and away from the lake. To date, the entire system operation has been nominal.

Alexander W. K. McDowell
Manager, The Cove Operators

AWKMcD/mf

APPENDIX VI

SPECIFICATIONS FOR COVE DAM NO. 1

SPECIFICATIONS FOR

COVE LAKE DAM

McDowell Estate

Frederick County, Virginia

23 May 1958

R.M. Bartenstein & Associates

305 Culpeper Street,

Warrenton, Virginia

SPECIFICATIONS FOR THE CONSTRUCTION OF COVE LAKE DAM

1. GENERAL:

The following specifications are drawn up with the understanding that the owner will construct his own dam in building Cove Lake. These specifications are therfore intended for instruction and are not sufficiently tight to be used for securing bids from contractors. Failure to comply with these specifications could result in a failure of the dam ranging all the way from expensive repairs to the possibility of endangering life and property in the areas downstream from the structure.

2. REMARKS:

The two principal areas of failure in earth dams occur from water overtopping the dam, in which case the downstream face is rapidly eroded; and when water leaks through the dam with sufficient velocity to erode the structure. Therefore from the point of view of safety, it is particularly important to develope the spillway section as it is shown on the plans, and to place the core and fill using the methods specified in order to obtain a homogeneous, reasonably water-tight structure. It is well to remember that no dam is completely water-tight regardless of the material used in its construction, and that the efforts required to comply with the embankment specifications are necessary to reduce the leakage to a point where it will neither cause dam failure nor seriously affect the water level during times of low stream flow.

3. EMBANKMENT:

Slope stakes for the embankment will be set by the engineer. These stakes will be offset 5 feet from the edges of the slope and will be marked to show the height of the fill required above the ground elevation where the stakes go into the ground. The builder of the dam should first set guidestakes 5 feet from the slope stakes around the entire area to be filled. He should next, by the use of his bulldozer, clear this area of all topsoil, trees, stumps, roots, the pervious material in the old stream bed and any other types of debris that would structurally weaken the dam.

All muck and peat should be removed from the area to receive the dam fill. Once this stage of the operation is completed, he should then construct the toe drain section which will help reduce excessive moisture in the fill.

Following the construction of the toe drain section, and before digging the core, the builder should provide means of temporarily damming the stream above the embankment site and divert the stream through the use of a pump adequate to take the stream flow.

The core of the dam should then be excavated to a sufficient depth to insure an impervious base. Unless unusual conditions are encountered this should be accomplished between 8 and 10 feet of depth. Following the excavation,suitable material for the construction of this core should be obtained, spread in the core trench and compacted to maximum density under optimum moisture. If the people engaged in performing this work are not experienced in obtaining this type of compaction it is recommended that soil tests be made of the material to be used for the fill and that a simple plunger type pressure gage be acquired to test the compaction of the fill as it is placed. It is noted that over-compaction of the fill can lead to the formation of unbinded layers, and it is recommended that if any portion of the fill becomes slick under compaction it should be scarified and reworked. The embankment material should be placed in 8 inch layers prior to compaction. the material should be sprinkled or harrowed, as the case may be, to adjust the water content to optimum moisture. Each 8 inch layer of fill should be rolled with a sheeps foot roller developing at least 200 pounds per square inch pressure on the face of its tamping feet. Generally speaking, the roller should pass over each layer six times, and each rolling should overlap a previously rolled area.

When the core trench has been refilled to existing grade, a trench should be cut through the core to allow the 10 inch drain line to go through. The line of the bottom of this trench should be set at least 2 feet lower than the surface of the compacted grade. It should be carefully bedded and then hand compacted until it has 1 foot of cover.

The 2 foot riser should be installed and carefully protected.

Following this stage of the operation, the entire area to receive the dam fill should be harrowed in order to obtain a unified bond with the fill material to be placed. The embankment should be brought up uniformly from slope stake to slope stake using good material throughout with the best material being used in the center over the core and the poorest material being used on the downstream section. Particular care should be exercized to use uniform material, insofar as is possible.

In the placing of the embankment no material shall be placed upon a frozen surface, nor shall any frozen material be placed in the embankment. If, during construction, any part of the embankment becomes frozen that portion should be broken and turned to the depth of the frost line, thoroughly thawed and then recompacted. All hard lumps of material and rocks larger than six inches which cannot be broken by the compacting equipment shall be removed from the fill. The fill material shall be brought up uniformly, however, it is specifically noted that the top surface of the fill shall be kept crowned with a grade of not less than 2 per cent so that the fill may drain freely toward the slopes during rains. The builders should exercise the upmost care to insure a thorough bonding of each new layer of fill. It is noted that in working over clays with equipment a pumping action can occur which will develope progressive softening if the clay is too moist. In the event the fill becomes soaked, the construction should stop at the first sign of softness therein and be discontinued until the material becomes stable. It is further noted that during the construction of a structure of this type summer flash thunder storms may create floods that can wash away huge amounts of fill material. The builder is cautioned to leave a part of the dam fill 65 feet in width at least 2 feet lower than the rest of the surface, and further to provide a temporary channel below the dam fill, so that this loss of material may be held to a minimum. He is further advised to be certain that the two foot riser section of the 10 inch drain pipe remains open and unobstructed, and that it is well above the surface of the adjacent mud so that this pipe may act to reduce the water

level in the dam as rapidly as possible following flash floods. It is estimated that the 10 inch drain pipe would remove all water in the completed lake within approximately three weeks provided no additional water was entering the lake. From this it can be seen that a heavy downpour filling the partially completed structure could halt construction operations for a long period. Construction operations should not proceed while water is standing against the upstream face of the dam. To counteract settlement the fill should be constructed to an elevation of 104.5 ft. along the higher portion of the dam and tapered to an elevation of 104.0 ft. at each end. It is estimated by the engineer that 44,000 cubic yards of material will be required to construct the dam fill, exclusive of the fill required for the core trench.

4. PREPARATION OF POOL AREA:

It is considered desirable in structures of this type to remove the material at the waters edge to obtain a minimum depth of two feet directly at the edge. This will prevent the progressive growth of weeds to a large extent, particularly if the pond is sufficiently fertilized to develope microscopic plant growth which will in turn prevent sunlight from reaching the bottom of the lake. Stakes will be set by the engineer at the normal water level line in order to facilitate this operation.

5. ROCK RIPRAP:

Rock riprap is shown along the waters edge on the upstream face of the dam, around the inside slope of the spillway, and along the exit channel of the trickle tube leading to the spillway. The riprap on the spillway has definite bearing on the strength of the structure and its resistance to floods. Other riprap specified will tend to reduce future maintenance costs.

The dry riprap should consist of stones weighing between 50 and 150 pounds each. They should be laid from the bottom of the bank upward and should be so placed as to overlap slightly the intent being to secure a shingle type surface that will shed the water.

The spaces between the large stone should be filled with stones of suitable size.

Where mortared riprap is specified, mortar will be placed around the larger stones and the adjacent stones will be shoved into contact. The area between the larger stones shall be filled with mortar and smaller stones shall be shoved into the mortar in those spaces.

6. INSTALLATION OF PIPES:

The pipes shall be of the type specified on the drawings. The 24 inch corrugated metal pipe shall be laid so that the longitudinal rivets are not in the flow line. It is particularly important to avoid any type of failure in this pipe during compaction. This may cause leaks that will weaken the dam structure, and for this reason hand tamping and laying should be very carefully accomplished so that the passage of heavy equipment over the fill will not damage the pipe.

7. MANUFACTURED ITEMS:

All manufactured items should be installed in accordance with the manufacturers recommendations. In case of doubt the engineer should be consulted.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: VA 06905	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): Phase I Inspection Report National Dam Safety Program Cove No. 1 Frederick County, State of Virginia	5. TYPE OF REPORT & PERIOD COVERED: Final
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Michael Baker, Jr., Inc.-Michael Baker III	8. CONTRACT OR GRANT NUMBER(s): DACW 65-78-D-0016
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: U. S. Army Engineering District, Norfolk 803 Front Street Norfolk, VA 23510	12. REPORT DATE: September 1978
	13. NUMBER OF PAGES: 57
14. MONITORING AGENCY NAME & ADDRESS (If different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

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

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151

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

Dams - VA
National Dam Safety Program Phase I
Dam Safety
Dam Inspection

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

(See reverse side)

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

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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.