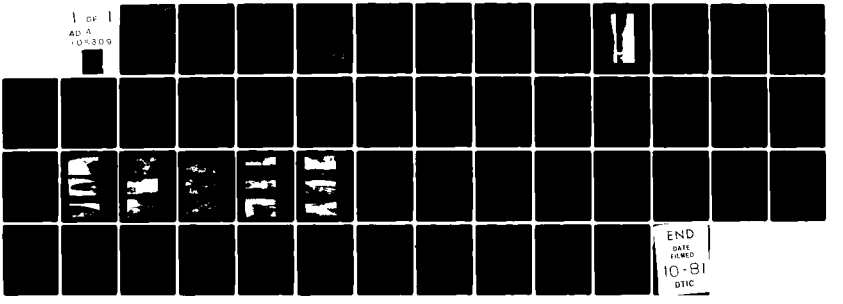
AD-A105 309 HOSKINS-WESTERN-SONDEREGGER INC LINCOLN NE F/G 13/13
NATIONAL DAM SAFETY PROGRAM. FAYETTE NEW CITY LAKE DAM (MO 1013--ETC(U)
SEP 78 H P HOSKINS DACW43-78-C-0155
UNCLASSIFIED NL



MISSOURI-KANSAS CITY BASIN

FAYETTE NEW CITY LAKE DAM

HOWARD COUNTY, MISSOURI

MO 10130

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: HOSKINS-WESTERN-SONDEREGGER, INC.

FOR: STATE OF MISSOURI

SEPTEMBER, 1978

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A105	3. RECIPIENT'S CATALOG NUMBER 307
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Fayette New City Lake Dam (MO 10130) Howard County, Missouri		5. TYPE OF REPORT & PERIOD COVERED Final Report
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Hoskins-Western-Sonderegger, Inc.		8. CONTRACT OR GRANT NUMBER(s) DACW43-78-C-0155
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		12. REPORT DATE September 1978
		13. NUMBER OF PAGES Approximately 45
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) National Dam Safety Program. Fayette New City Lake Dam (MO 10130), Missouri - Kansas City Basin, Howard County, Missouri. Phase I Inspection Report.		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIB

Approved for release; distribution unlimited.

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

18. SUPPLEMENTARY NOTES

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

Dam Safety, Lake, Dam Inspection, Private Dams

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

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Fayette New City Lake Dam (Mo. 10130), Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Fayette New City Lake Dam (Mo. 10130).

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe because of through seepage near the left abutment, ponding, and a large unexplained hole downstream of the dam.

SUBMITTED BY: SIGNED — Chief, Engineering Division — 15 MAR 1979 — Date

APPROVED BY: SIGNED — Colonel, CE, District Engineer — 19 MAR 1979 — Date

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
FAYETTE NEW CITY LAKE DAM
MO 10130

TABLE OF CONTENTS

PHASE I

NATIONAL DAM SAFETY PROGRAM

Name of Dam	Fayette New City Lake Dam
State Located	Missouri
County Located	Howard County
Stream	Tributary to Adams Fork
Date of Inspection	September 20, 1978

Fayette New City Lake Dam was inspected by an interdisciplinary team of engineers from Hoskins-Western-Sonderegger, Inc. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as an intermediate size dam with a high downstream hazard potential. Failure would threaten life and property. The estimated damage zone extends five miles downstream of the dam. Immediately downstream of the dam is Rogers Lake Dam (Mo. 10370). Rogers Lake begins approximately 1,000 feet downstream from the Fayette New City Lake Dam. Rogers Lake Dam is approximately 1¼ miles further downstream. Failure of Fayette New City Lake Dam would probably cause failure of Rogers Lake Dam. Within the downstream damage zone of Rogers Lake Dam are fifteen houses, three improved road bridges, one state highway bridge and one railroad bridge.

Our inspection and evaluation indicates that the spillway does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. The spillway will pass the 100-year frequency storm and will just pass the storm equal to 50% of the Probable Maximum flood without overtopping the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meterorologic and hydrologic conditions that are reasonably possible in the region.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These analyses should be obtained in the future.

Other deficiencies visually observed by the inspection team were weeds, grass and bushes growing through the riprap on the upstream face; weeds, grass, many small trees and bushes covering the downstream face; erosion of the upstream face; seepage from the toe of the dam near the right spillway wall; seepage from approximate permanent pool elevation near the right spillway wall; possibility of seepage along the old stream channel; ponding of water near the downstream toe at the right abutment; inlet to the spillway nearly blocked with tree and brush growth; deterioration of the concrete in the ogee spillway section; horizontal cracks in

the concrete weir; a wire fence along the top of the weir which could collect floating debris and affect flow through the spillway; and open joints in the concrete exit channel.

Several items of preventive maintenance need to be initiated by the owner. These are described in detail in the body of the report.

H. P. Hoskins

Harold P. Hoskins, P.E.
Hoskins-Western-Sonderegger, Inc.
Lincoln, Nebraska

OP-1

PHOTOGRAPH NO. 1
OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
FAYETTE NEW CITY LAKE DAM - MO 10130
HOWARD COUNTY, MISSOURI

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of the Fayette New City Lake Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The dam is an earth fill about 650 feet in length and 35 feet in height. Topography adjacent to the site is moderately steep. Soils exposed on the slopes are lean clays (CL) derived from glacial till or from the underlying limestone and shale formations.

(2) The spillway is located on the left (north) abutment and consists of a concrete ogee weir and concrete chute.

(3) A 10 inch cast iron water supply line passes through the base of the dam near the right abutment.

(4) Pertinent physical data are given in paragraph 1.3 below.

b. Location. The dam is located in the central portion of Howard County, Missouri as shown on Plate A2. The dam is shown on Plate A1 in the NW 1/4 of Section 4, T50N, R16W. The lake formed by the dam is shown in the NW 1/4 of Section 4, the NE 1/4 of Section 5, T50N, R16W and the SE 1/4 of Section 32, T51N, R16W.

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, this dam and impoundment is in the intermediate size category.

d. Hazard Classification. Guidelines for determining hazard classification are given in the same guidelines referenced in paragraph c above. Discharges from this dam will flow into Rogers Lake immediately downstream. If failure of this dam could cause the failure of Rogers Lake Dam, this dam would be classed as High Hazard. The damage zone downstream from Rogers Lake Dam includes fifteen houses, three improved road bridges, one state highway bridge and one railroad bridge.

e. Ownership. This dam is owned by the City of Fayette, 117 South Main Street, Fayette, Missouri 65248. Attention: Bobby Crowley, Superintendent of Water and Sewer Department.

f. Purpose of Dam. The dam forms a 107 acre municipal water supply and recreation lake.

g. Design and Construction History. No design or construction records were available for this dam. It was reportedly constructed in 1918. In 1961 the crest of the dam was raised 12 feet from elevation 730 to elevation 742.

h. Normal Operating Procedures. This lake is used as a supplemental water supply for the City of Fayette. Withdrawal facilities are operated as needed. It was reported that flow through the spillway in 1973 caused some erosion at the lower end which was subsequently repaired with broomed concrete and surface grout.

1.3 PERTINENT DATA

a. Drainage Area - 895 acres (1.4 square miles).

b. Discharge at Damsite.

(1) All discharge at the damsite is through an uncontrolled reinforced concrete ogee type weir and spillway.

(2) Estimated maximum flood at damsite - unknown.

(3) The emergency spillway capacity varies from 0 c.f.s. at elevation 737.2 feet (top of ogee weir crest) to 2080 c.f.s. at elevation 741.2 feet (low point on dam crest and maximum pool level).

c. Elevation (Feet Above M.S.L.).

(1) Top of dam - 741.2 (low point), 742.0 (nominal)

(2) Crest of ogee weir - 737.2.

(3) Streambed at center line of dam - 707±.

(4) Maximum tailwater - unknown.

d. Reservoir. Length of maximum pool - 5,500 feet ±.

e. Storage (Acre-feet) - Top of dam (low point) - 1410.

f. Reservoir Surface (Acres).

(1) Top of dam (low point) - 117.

(2) Ogee weir crest - 107.

g. Dam.

(1) Type - earth embankment.

(2) Length - 650 feet ±.

(3) Height - 35 feet ±.

(4) Top width - 21 to 26 feet (measured).

(5) Side Slopes.

(a) Downstream - 3H on 1V (measured).

(b) Upstream - Exposed section - 4H on 1V (measured).

(6) Zoning - unknown.

(7) Impervious core - unknown.

(8) Cutoff - unknown.

(9) Grout curtain - unknown.

(10) Wave protection - riprap up to about 2 feet below crest elevation.

h. Diversion and Regulation. There is a diversion structure for the City of Fayette water supply, 10 inch line.

i. Spillway.

(1) Principal - none.

(2) Emergency.

(a) Type - ogee weir.

(b) Control section - 45° upstream face with nappe-fitting profile, 75 feet crest length, upstream height approximately 0.5 foot, vertical abutments.

(c) Crest elevation - 737.2 feet M.S.L.

(d) Upstream channel - mud and rocks with several small trees and reeds growing within 20 feet upstream of crest.

(e) Downstream channel - Concrete floor and sidewalls. Floor 4.5 feet lower than crest at ogee weir toe.

j. Regulating Outlets - none.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design data were available for this dam.

2.2 CONSTRUCTION

No construction data were available for this dam. It was reported that it was constructed in 1918 and raised 12 feet in 1961.

2.3 OPERATION

The spillway is uncontrolled. A 10 inch water line is used as needed to withdraw municipal water for Fayette, Missouri.

2.4 EVALUATION

a. Availability. There are no engineering data available for this dam.

b. Adequacy. Seepage and stability analyses comparable to the requirements of the 'Recommended Guidelines for Safety Inspection of Dams' were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity. Not applicable.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of the Fayette New City Lake Dam was made on September 20, 1978. Engineers from the firm of Hoskins-Western-Sonderegger, Inc. making the inspection were: Stephen Nickel, Geology and Soil Mechanics; Gordon Jamison, Hydrology and Hydraulics; Garold Ulmer, Civil Engineer; and Richard Walker, Hydrology. Additional information concerning the dam and its operation was obtained from H.D. Rugg, City Water Plant Superintendent. Specific observations are discussed below.

b. Dam. The upstream slope from the water line to a point 1' ± below the crest was found to be covered with a light riprap of semi-durable limestone. The riprap appears to be hand-placed and is less than 1 foot thick. Erosion to a depth of 15 to 18 inches had penetrated the riprap immediately above the permanent pool elevation at several locations in the vicinity of the water supply outlet works(see Photo No. 5). Weeds and grass were growing through the riprap for the entire length of the dam. A few small bushes were also growing through the riprap.

The downstream slope of the dam was covered by weeds and grasses, with many bushes and small trees. The density of the growth on the lower half of the downstream slope made it difficult to determine the condition of this section of embankment. No slides were noted on the downstream slope. However, seepage was observed near the right side of the spillway, near the left abutment. The seepage appeared to be emanating from two separate areas, one near the downstream toe of the embankment between 30 and 100 feet from the right spillway wall and one on the downstream face of the dam approximately between elevations 732 and 737, covering a width of approximately 3 feet at a distance of about 10 feet from the wall. The flow from the lower seep was estimated to be less than 1 gallon per minute. The flow from the upper seep was negligible, but the embankment surface was wet and the soil was saturated. The seepage water in both seeps was clear.

Near the right abutment there is a diked pond approximately 50 feet downstream from the toe of the embankment. The pond is retained by a road embankment and has a 6-inch pipe riser to maintain a pool level. At the time of the inspection the water level was below the top of the riser, consequently no flow could be measured. This water may be from seepage in the old stream channel. Between this pond and the toe of the embankment was an unexplained hole, approximately 8 feet by 5 feet and up to 2 feet deep. The bottom of the hole was above the level of the pond, and there was no water in the hole.

The abutments apparently consist of plastic silty clay, similar to that in the embankment. The presence of limestone blocks in the embankment would indicate that limestone ledges are probably present beneath the mantle of silty clay, although no outcrops were observed. Neither slides nor seepage were noticed in the abutments.

c. Appurtenant Structures.

(1) Spillway. The spillway consists of an ogee weir with a concrete outfall or exit channel, built at the left abutment. Spillway details are shown in Appendix C. The inlet to the spillway is riprapped and was found to be nearly blocked with trees and bushes. No erosion of the inlet was observed. The concrete in the ogee section is deteriorating, and the weir had several horizontal cracks from which water was seeping. A wire fence along the top of the weir could affect the operation of the spillway. The seepage water coming out of the ogee weir flowed along the concrete floor of the channel and disappeared into a joint about 25 feet downstream from the weir (see Photo No. 12).

(2) Water supply inlet. The water supply inlet riser stands in the reservoir near the right abutment. A 10-inch water supply line is said to lead away from the riser. It is not known whether this water line can be used as an emergency drawdown works. No details of the water supply inlet are known. It is not known whether any valves exist on the 10-inch water supply line. No information is available concerning the water supply outlet works. No other outlet works were found.

d. Reservoir Area. No wave wash, excessive erosion, or slides were observed along the shore of the reservoir.

e. Downstream Channel. The bottom of the outfall or exit channel below the ogee weir is paved with concrete. Vertical concrete walls and limestone masonry walls form the sides of the channel where it descends through the embankment. Beyond approximately the toe of the embankment, the sides of the channel are formed of broomed concrete. This appears to be a repair of erosion damage. At the end of the concrete channel bottom, the channel narrows considerably and is pretty well overgrown with weeds, bushes, and trees. Channel erosion is not significant. Approximately 1000 feet downstream the channel flows into Rogers Lake.

f. Downstream Hazards. No residences are located immediately downstream from the dam. However, any significant discharge could affect the operation and stability of Rogers Lake Dam.

3.2 EVALUATION

The heavy vegetation on the downstream slope, especially the lower half, made it impossible to fully observe the structural conditions on the slope. The small trees now growing on the downstream slope, if allowed to continue to grow, would have the potential of causing failure of the dam. The erosion in the upstream slope is a cause for alarm. If this erosion is left unchecked, it could lead to potential failure due to wave action. Additional riprap is needed all along the upstream face to prevent similar erosion in other areas. The trees in the inlet to the spillway and the fence along the top of the ogee section should be removed to allow the spillway to function as intended. The condition of the ogee section of the spillway indicates the need for remedial action to prevent its eventual failure. The joints in the upper portion of the concrete exit channel bottom should be sealed to prevent the infiltration of water. This will also reduce the possibility of failure of the channel bottom during spillway operation. The cause and correction of the seepage to the right of the spillway should be investigated. This seepage, if left uncontrolled, could lead to potential failure of the embankment and/or the spillway structure.

The source of water in the pond downstream from the toe of the dam and the affects of this impoundment on structural stability of the dam should be investigated. The cause and repair of the hole between the pond and the downstream toe of the dam should be investigated.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no controlled outlet works for this dam, except the 10-inch water supply line, and no regulating procedures exist.

4.2 MAINTENANCE OF DAM

The amount of brush and number of trees on the upstream slope and in the entrance section of the spillway indicate that it has been several years since vegetative control measures have been performed.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facility at this dam is the water supply system which is operated as a part of the total system which includes this reservoir, Rogers Lake and Fayette Old City Reservoir.

4.4 DESCRIPTION OF WARNING SYSTEM IN EFFECT

The inspection team is not aware of any warning system in effect at this dam.

4.5 EVALUATION

Brush and trees growing on the upstream slope, trees and brush growing in the entrance section of the spillway and deterioration of concrete in the spillway could lead to potential of failure if left uncontrolled.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. No design data were found for this dam. According to city employees the dam was raised approximately 12 feet about 1961. One page of cross section plans were found indicating the intended change.

b. Experience Data. The drainage area, reservoir surface area, and elevation-storage data were developed from the USGS Fayette, Missouri and Glasgow, Missouri 7 1/2 minute topographic quadrangle maps. The hydraulic computations for the spillway and dam overtopping discharge ratings were based on data collected in the field at the time of the field inspection.

c. Visual Observations.

(1) The ogee weir appears to be in poor condition with horizontal cracks and deteriorating concrete. The spillway exit channel appears to be in good condition, except for open expansion joints. The trees and weeds in the approach channel probably would reduce the efficiency of the weir.

(2) The woven-wire fence attached to the 2-inch iron-pipe posts imbedded vertically into the top of the weir crest could act as a trash collector in a major flood. The resulting stresses could possibly break the weir crest and would destroy the fence.

(3) The discharges from this lake are impounded in Rogers Lake located about 1000 feet downstream from Fayette New City Lake. It appears that maximum water levels in Rogers Lake would nearly impinge upon the toe of this structure.

d. Overtopping Potential. The spillway will pass both the 100-year flood and 50% of the PMF without overtopping. The PMF will overtop the dam a maximum of 1.9 feet and for a period of 4.0 hours. The spillway will just pass 50% of the PMF before overtopping the dam. The results of the routing through the reservoir are tabulated in regards to the following conditions.

Frequency	Peak Inflow Discharge c.f.s.	Peak Outflow Discharge c.f.s.	Maximum Pool Elevation	Freeboard Top of Dam Min. Elev. 741.2	Time Dam Overtopping Hrs.
100-Year	1550	720	739.1	+2.1	-
1/2 PMF	3740	2050	741.2	0	-
PMF	7560	6410	743.1	-1.9	5.0
0.50 PMF	3740	2050	741.2	0	-

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and an intermediate size. Therefore, the PMF is the test for the adequacy of the dam and its spillways.

The St. Louis District, Corps of Engineers, in a letter dated 11 August, 1978 has estimated the damage zone as extending five miles downstream from the dam. Immediately downstream of the dam is Rogers Lake Dam (Mo. 10370). Failure of Fayette New City Lake Dam could cause failure of Rogers Lake Dam. Within the downstream damage zone of Rogers Lake Dam are fifteen houses, three improved road bridges, one state highway bridge and one railroad bridge.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations. Visual observations which adversely affect the structural stability of this dam are discussed in Section 3. These include the following features: small trees and rank vegetation on both slopes, trees in the spillway inlet channel, seepage from the embankment near the spillway, ponded water of unknown source near the embankment toe at the right abutment, cracks and deteriorating concrete in the ogee weir of the spillway, the fence along the weir, open joints in the concrete on the bottom of the exit channel, and erosion of the upstream face which has penetrated the riprap in several locations near the right abutment.

b. Design and Construction Data. No design or construction data were available.

c. Operating Records. Other than the water supply inlet, there are no operating structures at this dam.

d. Post Construction Changes. Increasing the crest elevation approximately 12 feet in 1961 and increasing the pool elevation probably could affect the structural stability of the dam. Additional investigation and analysis would be required to evaluate these affects.

e. Seismic Stability. This dam is in Seismic Zone 1. An earthquake of the magnitude used for design in this seismic zone is not expected to cause structural failure of this dam.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. Several items were noted during the visual inspection which could seriously threaten the safety of the dam if not corrected or controlled. These items include uncontrolled vegetation on both slopes of the dam, erosion through the riprap at several locations in the upstream slope, seepage from the embankment near the spillway, possible seepage below the dam near the right abutment, uncontrolled trees in the spillway inlet channel, cracks and deteriorating concrete in the ogee weir of the spillway, the fence along the weir, and open joints in the concrete on the bottom of the exit channel. The Probable Maximum Flood will overtop the dam. The spillway will just pass 50% of the PMF before overtopping the dam.

Overtopping of this dam will affect Rogers Lake Dam just downstream from the Fayette New City Lake Dam (See Plate A-1 and Photo No. 16).

b. Adequacy of Information. Since no engineering or construction data were available, the conclusions of this report are based upon performance history and visual observations. The inspection team considers that these data are sufficient to support the conclusions herein. Neither a seepage nor a stability analysis were found. This is a deficiency which should be corrected in the near future.

c. Urgency. The remedial measures recommended in paragraph 7.2 should be accomplished in the near future.

d. Necessity for Phase II. A Phase II investigation is not called for. However, additional engineering data and analyses should be obtained by the owner, at the owner's expense, to evaluate and design the recommended remedial measures.

e. Seismic Stability. This dam is in Seismic Zone 1. An earthquake of the magnitude used for design in this seismic zone is not expected to cause structural failure of this dam.

7.2 REMEDIAL MEASURES

a. Alternatives. The size of the spillway and/or the height of the dam should be increased and/or the permanent pool elevation should be lowered so that the Probable Maximum Flood can be passed without overtopping the dam. Regardless of which of these alternatives are chosen, additional investigations and analyses should be conducted to determine the structural

characteristics and stability of the present embankment. These analyses should include a seepage analysis to determine the source of seepage near the spillway and to determine whether there is any seepage near the right abutment below the dam. The cause and corrective action for the leaking joints in the exit channel should be studied. The services of an engineer experienced in the design of dams should be obtained to perform the investigations and analyses of the present dam and to design the appropriate modifications and remedial measures.

b. O & M Maintenance and Procedures. The following O & M maintenance and procedures are recommended:

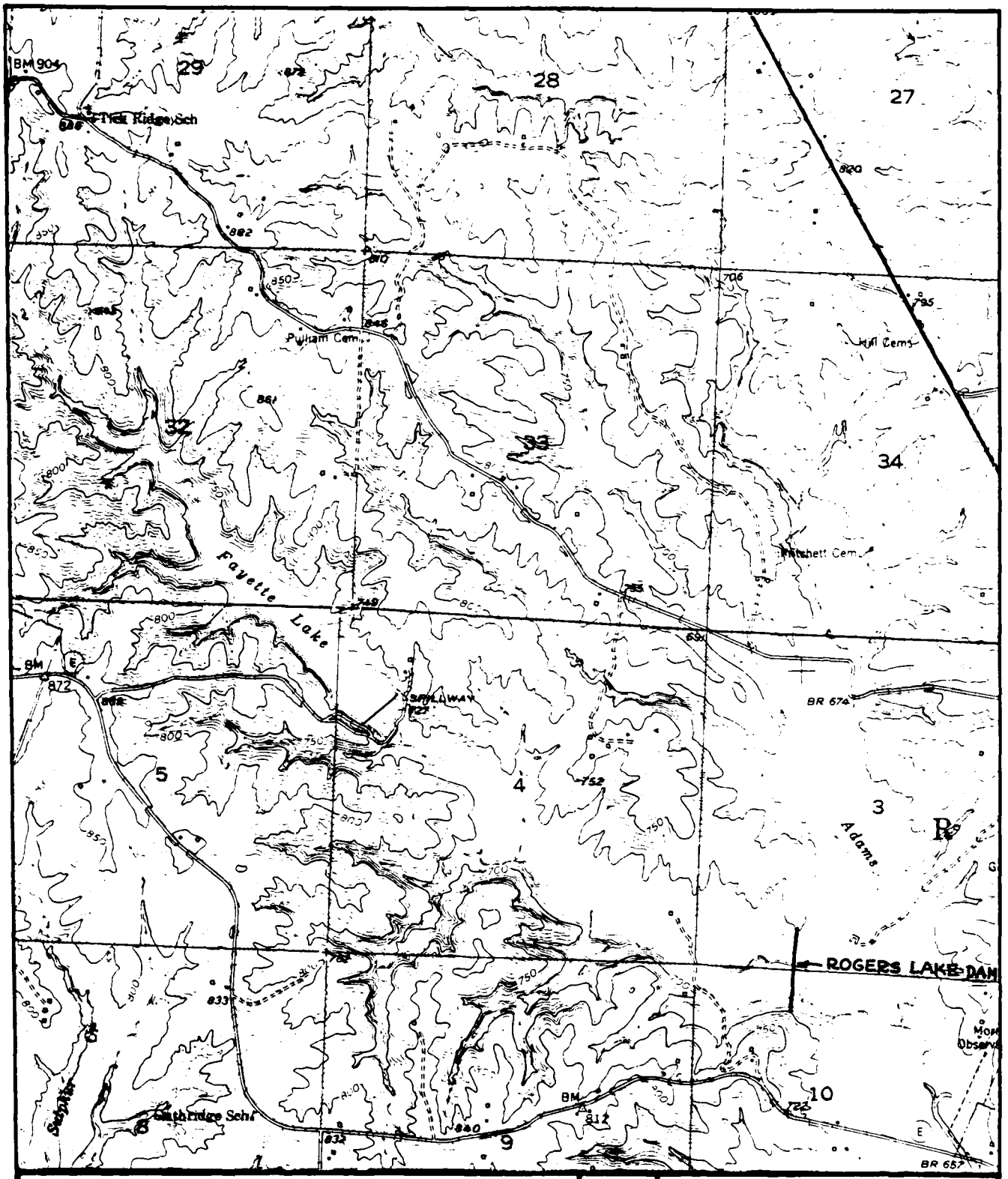
(1) A program should be developed and put into action to keep trees and brush off the dam and out of the spillway inlet and to control other vegetation.

(2) The erosion damage to the upstream slope should be repaired. Additional riprap, sized for this reservoir, should be placed on top of the existing riprap on the upstream slope to prevent further erosion of the slope and to eliminate the potential for breaching of the dam by erosion.

(3) The ogee weir should be repaired if it is to remain in place. The fence along the top of the ogee weir should be removed.

(4) The dam should be inspected regularly by qualified personnel to determine the presence of seepage on the downstream slope, in the abutments, or below the downstream toe, to determine the presence of slides in the downstream slope, and to observe the upstream slope for erosional damage.

APPENDIX A
MAPS



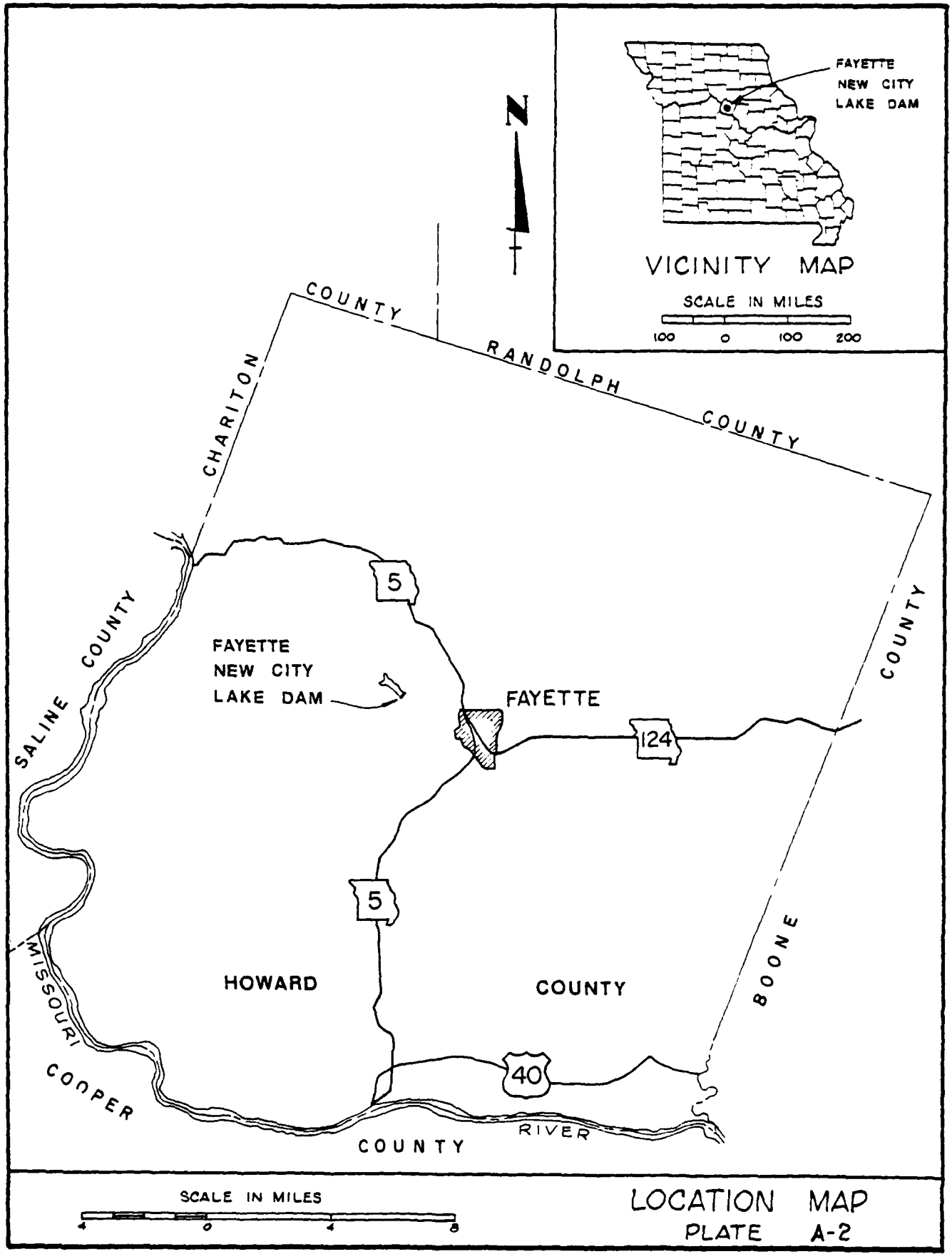
SCALE IN FEET
2000 1000 0 2000 4000
1000 500 0 1000
SCALE IN METERS

N

FAYETTE NEW CITY LAKE DAM

VICINITY TOPOGRAPHY

PLATE A-1


FAYETTE
NEW CITY
LAKE DAM
VICINITY MAP
SCALE IN MILES
100 0 100 200
N
CHARITON COUNTY
RANDOLPH COUNTY
SALINE COUNTY
BOONE COUNTY
FAYETTE
NEW CITY
LAKE DAM
FAYETTE
5
124
5
40
HOWARD COUNTY
MISSOURI
COOPER COUNTY
RIVER
SCALE IN MILES
4 0 4 8
LOCATION MAP
PLATE A-2

APPENDIX B
PHOTOGRAPHS

PHOTO NO. 2
UPSTREAM SLOPE TAKEN
FROM EMERGENCY SPILLWAY

PHOTO NO. 3
INLET STRUCTURE
TAKEN FROM STA. 5+00

PHOTO NO. 4
INLET STRUCTURE AND
UPSTREAM SLOPE TAKEN
FROM RIGHT ABUTMENT

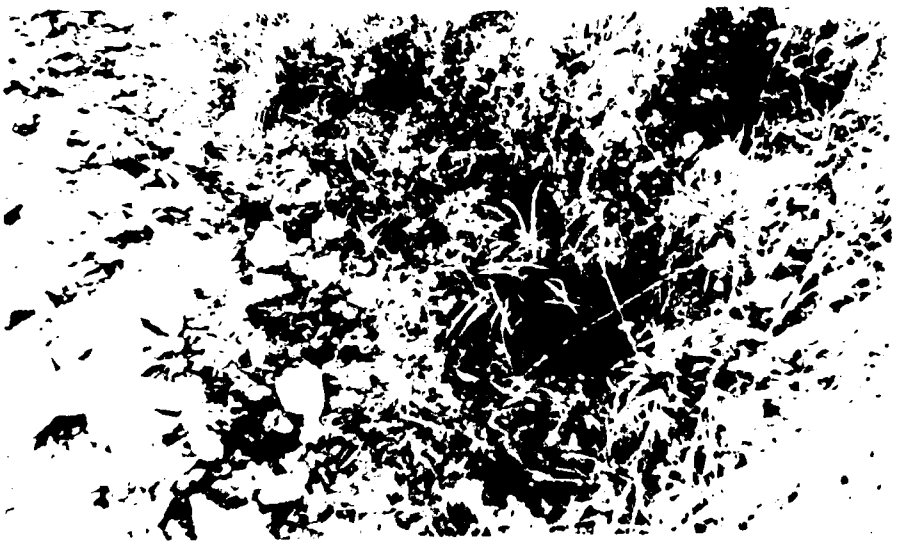


PHOTO NO. 5
CLOSE-UP OF UPSTREAM
SLOPE EROSION. STA. 4+70
TO STA. 6+00

PHOTO NO. 6
RIGHT ABUTMENT
TAKEN FROM STA. 4+70

PHOTO NO. 7
DIKED POOL BELOW
RIGHT ABUTMENT

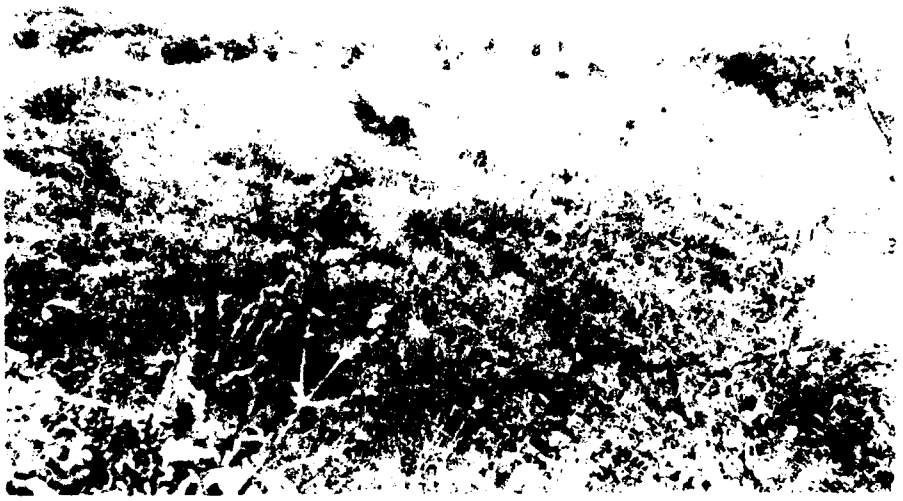


PHOTO NO. 8
DOWNSTREAM SLOPE
TAKEN FROM RIGHT
ABUTMENT. NOTE
VEGETATIVE CHANGE
ONE-HALF WAY UP

PHOTO NO. 9
DEPRESSION NEAR
TOE. STA. 4+50

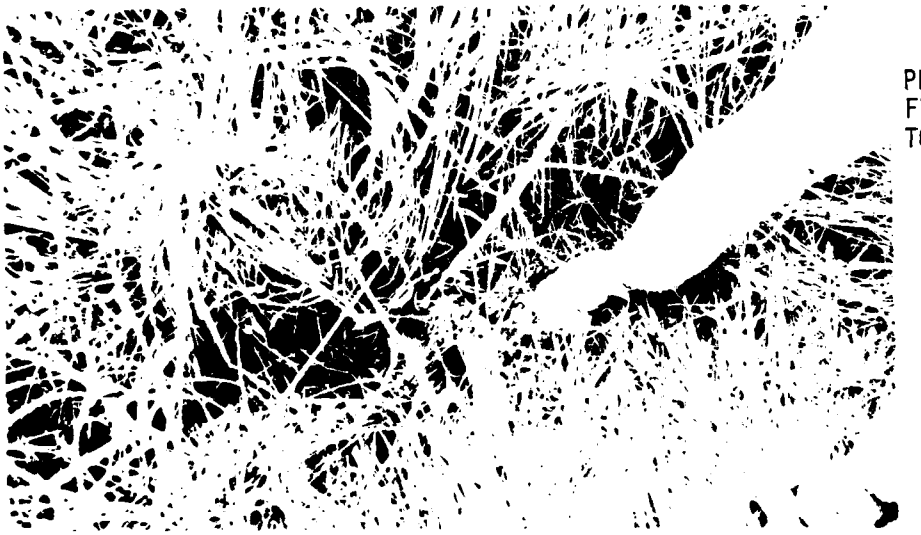


PHOTO NO. 10
FREE WATER NEAR
TOE. STA. 0+50

PLATE B-3

PHOTO NO. 11
UPSTREAM VIEW OF
OGEE SPILLWAY

PHOTO NO. 12
WATER LEAKING FROM
CRACK IN WEIR

PHOTO NO. 13
DOWNSTREAM FROM
OGEE SPILLWAY

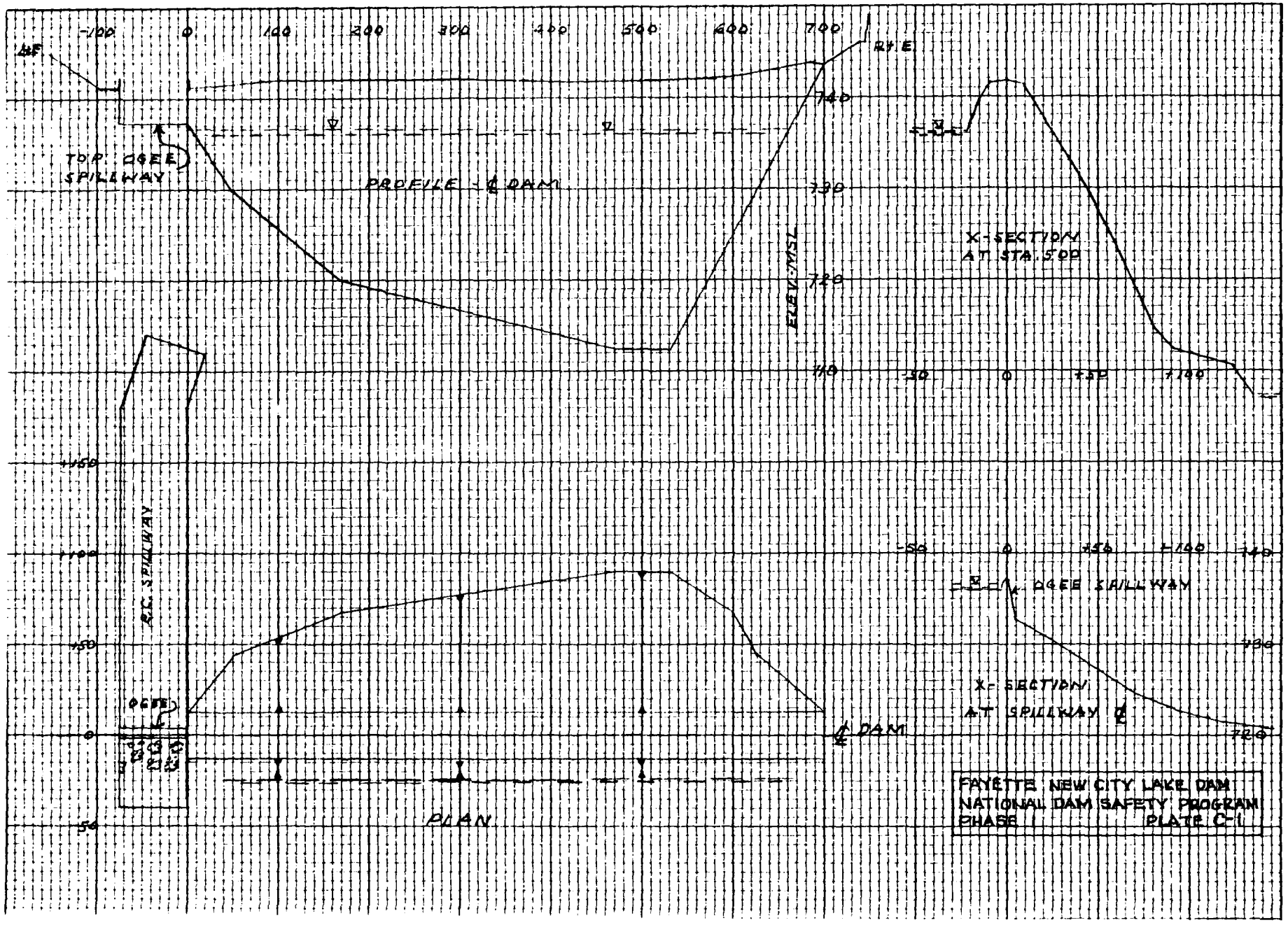
PHOTO NO. 14
EXIT CHANNEL
FOR EMERGENCY
SPILLWAY

PHOTO NO. 15
LEFT ABUTMENT
TAKEN FROM STA. 4+70

PHOTO NO. 16
DOWNSTREAM FROM
DAM. TAKEN FROM
STA. 4+70

PLATE B-5

APPENDIX C
PLAN, PROFILE AND SECTIONS


-100
0
100
200
300
400
500
600
700
RT E
TOP OGEE SPILLWAY
PROFILE - ℄ DAM
ELEV-MSL
740
730
720
X-SECTION AT STA. 500
110
-50
0
+50
+100
+150
+50
0
-50
R.C. SPILLWAY
OGEE
PLAN
℄ DAM
-50
0
+50
+100
+140
OGEE SPILLWAY
X-SECTION AT SPILLWAY ℄
730
720
FAYETTE NEW CITY LAKE DAM
NATIONAL DAM SAFETY PROGRAM
PHASE I
PLATE C-1

APPENDIX D
HYDROLOGIC COMPUTATIONS

HYDROLOGIC COMPUTATIONS

1. The Mockes dimensionless standard curvalinear unit hydrograph and the SCS TR-20 program were used to develop the inflow hydrographs (see Plate D1). The inflow hydrograph for the 100-year flood was generated by the consultant using the TR-20 program.

   a. Six-hour, twelve-hour, and twenty-four hour 100-year rainfall for the dam location was taken from NOAA Technical Paper 40. The 24-hour probable maximum precipitation was taken from the curves of Hydrometeorological Report No. 33 and current Corps of Engineers and St. Louis District policy and guidance for hydraulics and hydrology.

   b. Drainage area = 1.40 square miles (895 acres).

   c. Time of concentration of runoff = 58 minutes (computed from "Kirpich" formula.) 1/

   c. Time of concentration of runoff = 58 minutes.

   d. The antecedent storm conditions were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMCIII). The initial pool elevation was assumed at the crest of the spillway.

   e. The total 24-hour storm duration losses for the 100-year storm were 1.21 inches. The total losses for the 24-hour duration 1/2 PMF storm were 1.30 inches. The total losses for the PMF storm were 1.35 inches. These data are based on SCS runoff curve No. 90 and antecedent moisture conditions from SCS AMCIII.

   f. Average soil loss rates = 0.05 inch per hour approximately.

2. The ogee weir discharge rating was developed using the standard formula $Q = CLH^{3/2}$ and coefficients derived from diagrams found in the Bureau of Reclamation publication, "Design of Small Dams". The flows over the dam crest were based on the broad-crested weir equation $Q = CLH^{3/2}$, where H is the head on the dam crest; the coefficient C, which varies with head, was taken from the USGS publication "TWRI, Book 3, Chapter 5, Measurement of Peak Discharge at Dams by Indirect Methods".

3. Floods were routed through the reservoir using the TR-20 program to determine the capabilities of the spillway and dam embankment crest. The storm rainfall patterns, inflow hydrographs and routed outflow hydrographs are shown on Plate D2.

   1/ The computation interval for the runoff hydrograph is automatically adjusted to 0.17 Tc by the TR-20 computer program.

FAYETTE NEW CITY LAKE DAM - #10130

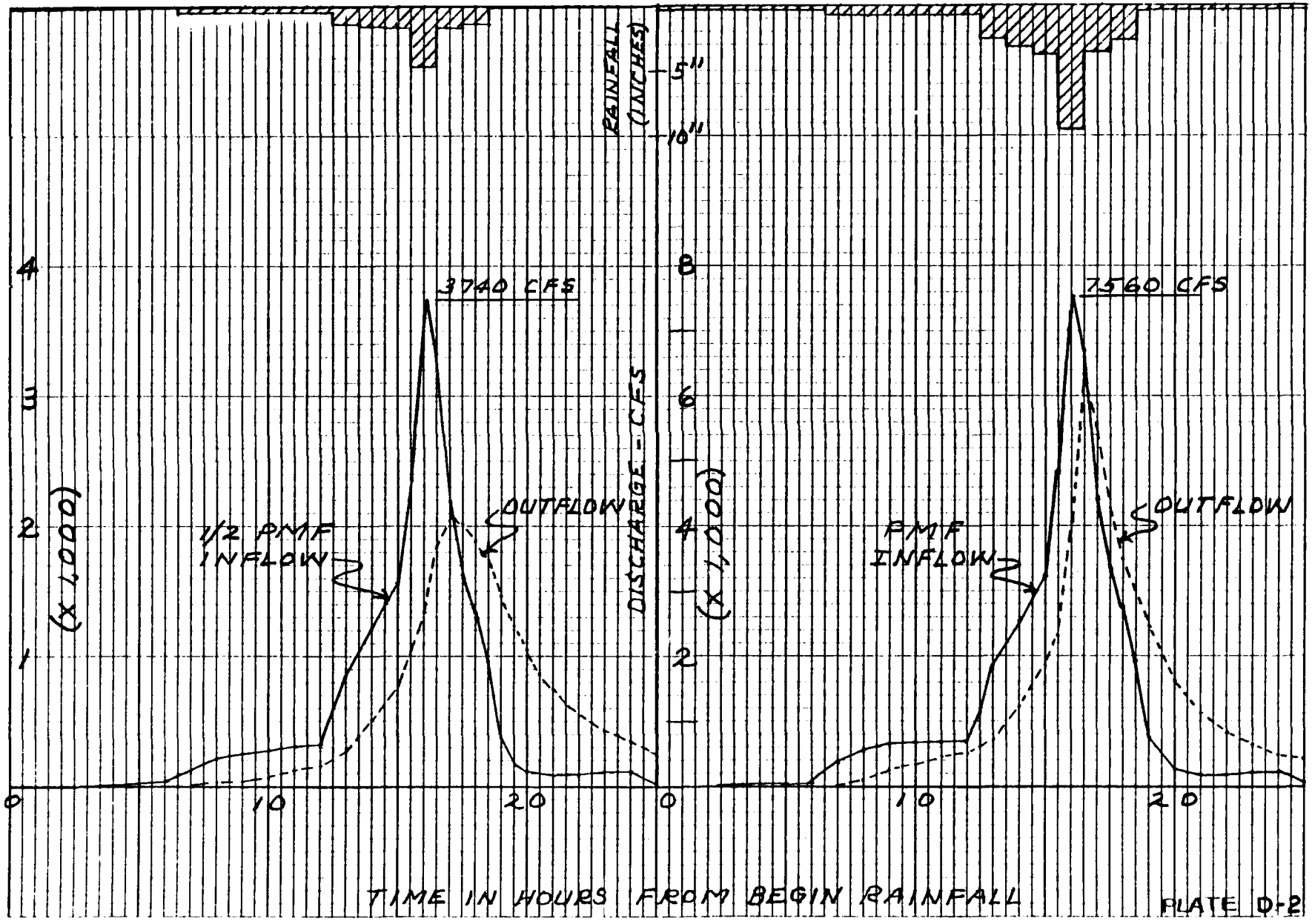


PLATE D-2

HOSKINS-WESTERN-SONDEREGGER

CALCULATIONS FOR

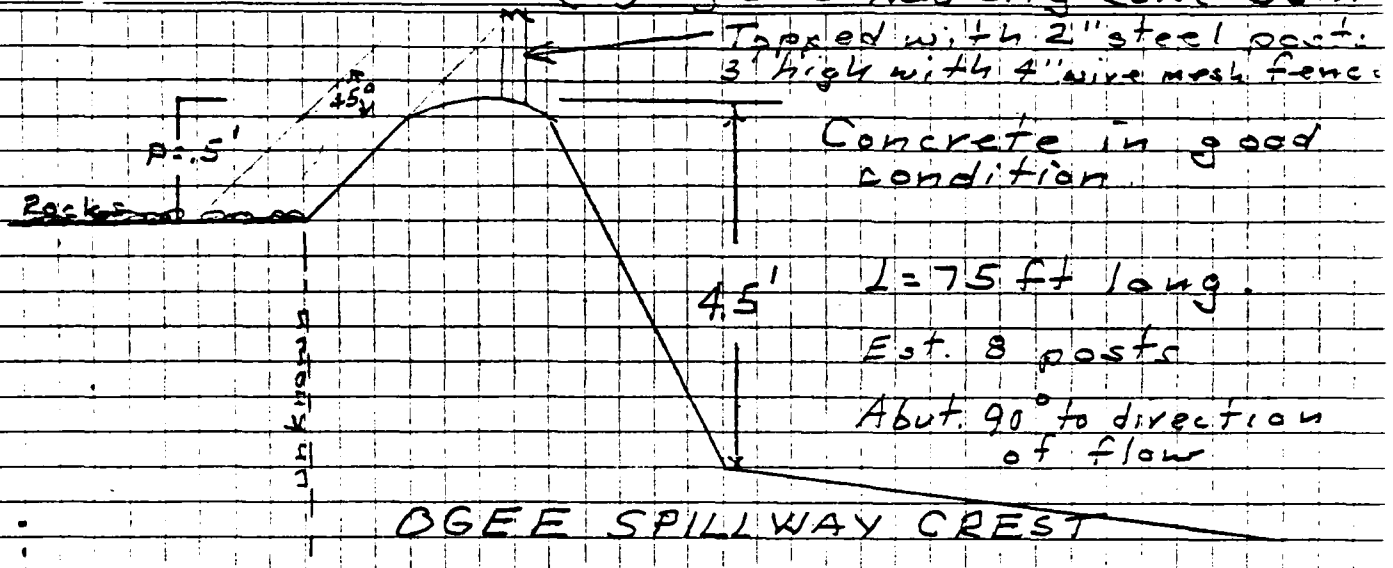
COMPUTED BY GGJ DATE 10/6/78 SHEET NO. 1 OF 2

CHECKED BY _____ DATE _____ JOB NUMBER 78/3095

PROJECT Mo Dam Insp.

Mo. No 10130

(#2) Fayette New City Lake Dam



From USBR "Design of Small Dams" - Spillway Sect.

General Equation = $Q = C L H_e^{3/2}$ pg 271

To adj. for effect of steel posts and fence on top of dam and abutment effects the length of crest is adjusted by the following formula

$L = L' - 2(N K_p + K_a) H_e$ pg. 271 (assume posts as piers)

$K_p = .02$ (round posts + Fence)

$L = 75 - 2(8 \times .02) + .20) H_e$

$= 75 - 2(.16 + .20) H_e$

$= 75 - .72 H_e$

C = From Figs. 189 & 191 pgs. 276, 277.

PLATE D-3

HOSKINS-WESTERN SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

TABULATION SHEET

COMPUTED BY GGJ DATE 10/6-9/78 SHEET NO. 2 OF 2
CHECKED BY _____ DATE _____ JOB NUMBER 78/3005
PROJECT Mo Dam INEP

CALCULATIONS FOR
OGEE SPILLWAY Rtg.
Faye He New City Lake (#2) 10130

	H	L	C				Q	
		(75-72H)	$\frac{P}{H}$	C_V	$C_{45°}$		$C_{45°}L$	$H^{3/2}$
Elev. 737.2	0	2	3		4	5	6	7 0
1 737.3	.1	74.9	5	3.95	3.93			9
737.4	.2	74.9	2.5	3.94	3.92			26
737.6	.4	74.7	1.25	3.91	3.89			74
737.8	.6	74.6	.83	3.87	3.88			135
5 738.2	1.0	74.3	.5	3.90	3.85			286
738.7	1.5	73.9	.33	3.71	3.79			515
739.2	2.0	73.6	.25	3.62	3.73			776
739.7	2.5	73.2	.2	3.56	3.68			1065
740.2	3.0	72.8	.17	3.50	3.64			1377
10 740.7	3.5	72.5	.14	3.46	3.61			1714
Low pt dam Crest 741.2	4.0	72.1	.125	3.45	3.61			2082
741.7	4.5	71.8	.11	3.40	3.57			2447
742.2	5.0	71.4	.1	3.40	3.57			2850
742.5	5.3	71.2	.1	3.40	3.57			3101
15 743.0	5.8	70.8	.1	3.40	3.57			3530
743.5	6.3	70.4	.1	3.40	3.57			3974
741.4	4.2	72.0	.12	3.40	3.57			2212
742.0	4.8	71.5	.1	3.40	3.57			2694
20								
25								
30								

PLATE D-4

HOSKINS-WESTERN-SONDEREGGER

COMPUTED BY GSJ DATE 10/9/78 SHEET NO. ___ OF ___

CHECKED BY ___ DATE ___ JOB NUMBER 73/3095

CALCULATIONS FOR

PROJECT ___

Combined Rating

	Elev.	OGEE	EMBANK.	TOTAL
OGEE Crest	737.2	0		0
	737.3	9	-	9
	737.4	26	-	26
	737.6	74	-	74
	737.8	135	-	135
	738.2	286	-	286
	738.7	515	-	515
	739.2	776	-	776
	739.7	1065	-	1065
	740.2	1377	-	1377
	740.7	1714	-	1714
	741.2	2082	0	2092
	741.4	2212	3	2215
	741.7	2447	30	2477
	742.0	2684	150	2834
	742.2	2850	386	3236
	742.5	3101	954	4055
	743.0	3530	2371	5900
	743.5	3974	4087	8061

PLATE D-5

HYDROLOGY PROGRAM FOR IBM 1130 - DATED JULY, 1968

MO DAM INSP FAYETTE NEW CITY LAKE DAM TR-20 ROUTING.

EXECUTIVE CONTROL CARD OPERATION LIST

MO DAM INSP FAYETTE NEW CITY LAKE DAM

C TABLE VELOCITY INCREMENT = 0.200

8	0.0000	0.0800	0.1600	0.2500	0.3200
8	0.3700	0.4100	0.4500	0.4900	0.5100
8	0.5400	0.5700	0.5900	0.6100	0.6300
8	0.6500	0.6600	0.6700	0.6900	0.7000
8	0.7100	0.7200	0.7300	0.7400	0.7500
8	0.7600	0.7700	0.7700	0.7300	0.7900
8	0.7900	0.8000	0.8100	0.8100	0.8200
8	0.8200	0.8300	0.8300	0.8400	0.8400
8	0.8400	0.8500	0.8500	0.8600	0.8600
8	0.8600	0.8600	0.8700	0.8700	0.8700
8	0.8800	0.8800	0.8800	0.8900	0.8900
8	0.8900	0.8900	0.8900	0.8900	0.9000
8	0.9000	0.9000	0.9000	0.9000	0.9100
8	0.9100	0.9100	0.9100	0.9100	0.9100
8	0.9200	0.9200	0.9200	0.9200	0.9200
8	0.9200	0.9200	0.9200	0.9300	0.9300
9 ENDTBL					

STRUCTURE NO. 1

	ELEVATION	DISCHARGE	STORAGE
8	737.2000	0.0000	940.0000
9 ENDTBL			

DIMENSIONLESS HYDROGRAPH - DELTA T =484.00

8	0.0000	0.0300	0.1000	0.1900	0.3100
8	0.4700	0.6600	0.8200	0.9300	0.9900
8	1.0000	0.9900	0.9300	0.8600	0.7800
8	0.6800	0.5600	0.4600	0.3900	0.3300
8	0.2800	0.2410	0.2070	0.1740	0.1470
8	0.1260	0.1070	0.0910	0.0770	0.0660
8	0.0550	0.0470	0.0400	0.0340	0.0290
8	0.0250	0.0210	0.0180	0.0150	0.0130
8	0.0110	0.0090	0.0080	0.0070	0.0060
8	0.0050	0.0040	0.0030	0.0020	0.0010
8	0.0000	0.0000	0.0000	0.0000	0.0000
9 ENDTBL					

RAINFALL TABLE NO. 1 TIME INCREMENT = 0.50

8	0.0000	0.0080	0.0170	0.0260	0.0350
8	0.0450	0.0550	0.0650	0.0760	0.0870
8	0.0990	0.1120	0.1250	0.1400	0.1560
8	0.1740	0.1940	0.2190	0.2540	0.3030
8	0.5150	0.5830	0.6240	0.6540	0.6820
8	0.7050	0.7270	0.7480	0.7670	0.7840
8	0.8000	0.8160	0.8300	0.8440	0.8570
8	0.8700	0.8820	0.8930	0.9050	0.9160
8	0.9260	0.9360	0.9460	0.9550	0.9650
8	0.9740	0.9830	0.9920	1.0000	1.0000
9 ENDTBL					

RAINFALL TABLE NO. 2 TIME INCREMENT = 0.02

8	0.0000	0.0100	0.0200	0.0200	0.0300
8	0.0400	0.0500	0.0600	0.0700	0.0800
8	0.1000	0.1100	0.1300	0.1400	0.1700
8	0.1900	0.2200	0.2700	0.3500	0.4400
8	0.5200	0.6000	0.6300	0.6600	0.6800
8	0.7000	0.7200	0.7400	0.7600	0.7700
8	0.7900	0.8000	0.8200	0.8300	0.8400
8	0.8500	0.8700	0.8800	0.8900	0.9000
8	0.9100	0.9200	0.9300	0.9400	0.9500
8	0.9567	0.9633	0.9700	0.9800	0.9900
8	1.0000	1.0000	1.0000	1.0000	1.0000
9 ENDTBL					

RAINFALL TABLE NO. 3 TIME INCREMENT = 0.50

8	0.0000	0.0700	0.1400	0.2100	0.2800

PLATE D-6

```
8                0.3500    0.4300    0.5000    0.5800    0.6500
8                0.7300    0.8000    0.8800    1.2700    1.6600
8                2.0500    2.4400    2.8300    3.2200    3.6100
8                4.0000    4.4000    4.7900    5.1800    5.5800
8                6.8400    8.1000    9.6100   11.1200   13.0100
8               14.9000   19.6800   24.4700   26.2900   28.0000
8               29.3000   30.7700   30.8600   30.9900   31.1000
8               31.2100   31.3200   31.4300   31.5400   31.6500
8               31.7600   31.8800   32.0000   32.1100   32.1100
9 ENDTBL
```

PLATE D-7

STANDARD CONTROL INSTRUCTIONS

			HYDROGRAPHS						OUTPUT OPTIONS						
SUBRTN	XSECTN	STRCT	IN1	IN2	OUT	DATA NO. 1	DATA NO. 2	DATA NO. 3	PR	H	F	V	PU	SM	
RUNOFF	0	1	0	0	6	1.400	78.000	0.970	1	1	0	1	0	0	
RESVOR	0	1	6	0	7	737.200	0.000	0.000	1	1	1	1	0	0	
ENDATA															

END OF LISTING

PLATE D-8

ADDITIONS TO TABULAR DATA FOLLOW

STRUCTURE NO. 1

8	737.2000	0.0000	940.0001
8	737.3000	9.0000	960.0001
8	737.4000	26.0000	975.0001
8	737.6000	74.0000	990.0001
8	737.8000	135.0000	1020.0001
8	738.2000	286.0000	1050.0002
8	738.7000	515.0001	1110.0002
8	739.2000	776.0001	1170.0002
8	739.7000	1065.0002	1230.0002
8	740.2000	1377.0002	1300.0002
8	740.7000	1714.0002	1350.0002
8	741.2000	2082.0004	1410.0002
8	741.4000	2215.0004	1440.0002
8	741.7000	2477.0004	1470.0002
8	742.0001	2834.0004	1520.0002
8	742.2000	3236.0004	1540.0002
8	742.5001	4055.0004	1580.0002
8	743.0001	5900.0009	1640.0002
8	743.5001	8060.0009	1710.0002

EXECUTIVE CONTROL CARD   OPERATION INCREM,   MAIN TIME INCREMENT= 0.25
EXECUTIVE CONTROL CARD,   OPERATION COMPUT,   FROM XSECTN/STRUCT 0/ 1   TO XSECTN/STRUCT 97 1
STARTING TIME= 0.00   RAIN DEPTH= 1.00   RAIN DURATION= 1.00   RAIN TABLE NO.= 3   SOIL CONDITION= 3
ALTERNATE NO.= 1   STORM NO.= 1

SUBROUTINE RUNOFF   STRUCTURE 1   PMF
AREA= 1.40   INPUT RUNOFF CURVE= 78.0   TIME OF CONCENTRATION= 0.97
COMPUTED CURVE NO. = 89.8

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
11.11	677.058	(RUNOFF)
16.17	7555.813	(RUNOFF)
23.66	213.061	(RUNOFF)

HYDROGRAPH, TZERO= 2.00   DELTA T= 0.25   DRAINAGE AREA= 1.40

TIME											
2.00	DISCHG	0.00	2.81	6.62	12.01	18.44	25.09	30.79	35.62	41.48	47.15
4.50	DISCHG	51.33	54.66	59.04	63.68	66.61	68.66	72.86	103.20	185.41	290.25
7.00	DISCHG	396.69	462.89	510.77	544.79	570.64	590.12	605.66	617.94	628.08	636.26
9.50	DISCHG	643.13	648.95	654.06	659.63	667.00	673.75	676.71	676.65	676.60	678.61
12.00	DISCHG	689.08	802.59	1124.06	1534.39	1853.29	2051.36	2251.73	2426.14	2553.00	2670.15
14.50	DISCHG	2852.36	3057.12	3233.65	3685.74	4821.43	6238.47	7256.33	7511.16	6700.36	5424.61
17.00	DISCHG	4404.35	3792.26	3341.05	2393.65	2756.30	2471.32	1919.84	1260.27	779.22	509.61
19.50	DISCHG	365.38	287.03	244.86	222.13	209.89	203.21	199.61	198.45	198.38	198.38
22.00	DISCHG	198.38	198.38	198.49	199.74	203.54	208.34	211.88	212.69	208.78	190.32
24.50	DISCHG	145.73	91.10	50.12	26.79	14.52	7.68	4.08	2.07	1.06	0.41

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 30.7648 (32.11 / 1.35)   CFS-HRS= 27796.59   ACRE-FT= 2297.11

SUBROUTINE RESVOR   STRUCTURE 1
SURFACE ELEVATION= 737.20

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
16.50	6406.804	743.11

HYDROGRAPH, TZERO= 2.00   DELTA T= 0.25   DRAINAGE AREA= 1.40

TIME											
2.00	DISCHG	0.00	0.01	0.05	0.14	0.28	0.48	0.73	1.03	1.36	1.76
2.00	ELEV	737.20	737.20	737.20	737.20	737.20	737.20	737.20	737.21	737.21	737.21
4.50	DISCHG	2.22	2.69	3.19	3.72	4.29	4.88	5.49	6.25	7.53	10.73
4.50	ELEV	737.22	737.22	737.23	737.24	737.24	737.25	737.26	737.26	737.28	737.31
7.00	DISCHG	18.55	31.72	60.85	84.75	104.21	123.01	159.[illegible]	200.14	241.99	258.91
7.00	ELEV	737.35	737.42	737.54	737.63	737.69	737.76	737.85	737.97	738.08	738.16
9.50	DISCHG	309.04	334.60	358.65	381.27	402.67	422.97	442.11	459.91	476.35	491.02
9.50	ELEV	738.25	738.30	738.35	738.40	738.45	738.49	738.54	738.57	738.61	738.64
12.00	DISCHG	506.20	525.63	563.26	629.16	720.73	833.22	957.67	1086.93	1210.91	1323.73
12.00	ELEV	738.68	738.72	738.79	738.91	739.09	739.29	739.51	739.75	739.99	740.11
14.50	DISCHG	1438.91	1688.44	1864.25	2050.76	2283.27	2676.39	[illegible]	[illegible]	6362.52	6317.04
14.50	ELEV	740.38	740.66	740.90	741.16	741.48	741.99	[illegible]	742.93	743.10	743.07
17.00	DISCHG	5589.36	4869.91	4241.51	3414.99	3466.75	[illegible]	[illegible]	[illegible]	2953.94	[illegible]

PLATE D-9

17.00	ELEV	742.91	742.72	742.55	742.41	742.29	742.17	742.00	741.85	741.64	741.45
19.50	DISCHG	1999.84	1800.39	1608.61	1429.58	1305.71	1200.95	1128.25	1037.16	957.65	885.67
19.50	ELEV	741.08	740.81	740.54	740.27	740.08	739.93	739.78	739.65	739.51	739.38
22.00	DISCHG	820.51	762.87	714.32	670.01	629.72	593.27	560.32	530.38	504.32	481.22
22.00	ELEV	739.27	739.17	739.08	738.99	738.91	738.84	738.78	738.72	738.67	738.62
24.50	DISCHG	457.48	431.76	404.36	376.60	349.53	323.91	299.78	274.64	247.64	224.22
24.50	ELEV	738.57	738.51	738.45	738.39	738.33	738.28	738.23	738.16	738.09	738.05

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 29.4667 CFS-HRS= 26623.70 ACRE-FT= 2200.18

ENDCMP 1

PLATE D-10

EXECUTIVE CONTROL CARD OPERATION COMPUT. FROM XSECTN/STRUCT 0/ 1 TO XSECTN/STRUCT 0/ 1
STARTING TIME= 0.00 RAIN DEPTH= 10.50 RAIN DURATION= 1.00 RAIN TABLE NO.= 3 SOIL CONDITION= 3
ALTERNATE NO.= 1 STORM NO.= 4

SUBROUTINE RUNOFF STRUCTURE 1
AREA= 1.40 INPUT RUNOFF CURVE= 78.0 TIME OF CONCENTRATION= 0.97
COMPUTED CURVE NO. = 89.8

PEAK TIMES: 16.17, 23.66
PEAK DISCHARGES: 3744.523, 106.135
PEAK ELEVATIONS: (RUNOFF), (RUNOFF)

TIME			HYDROGRAPH, TZERO= 3.75				DELTA T= 0.25		DRAINAGE AREA= 1.40		
3.75	DISCHG	0.00	1.68 1	3.24	4.86	6.52	8.39 5	10.50	11.89	13.29	15.176
6.25	DISCHG	23.99	47.85	83.74	119.357	148.60	173.17	193.45	210.68 8	225.15	237.59
8.75	DISCHG	248.21	257.499	265.47	272.51	278.67	284.2010	289.62	295.61	301.10	306.6311
11.25	DISCHG	306.69	308.53	311.16	317.6112	372.38	525.46	722.06	877.39 13	980.85	1043.63
13.75	DISCHG	1168.14	1234.69 14	1296.54	1390.06	1494.51	1589.0715	1811.85	2377.01	3002.79	3612.4916
16.25	DISCHG	3723.88	3325.15	2694.00	2188.7617	1885.68	1662.11	1418.46	1372.10 18	1230.60	956.15
18.75	DISCHG	631.67	388.1219	253.85	182.02	142.99	121.9220	110.67	104.57	101.25	99.4621
21.25	DISCHG	98.87	98.85	98.85	98.8522	98.85	98.91	99.53	101.42 23	103.82	105.58
23.75	DISCHG	105.99	104.0424	95.14	72.62	45.40	24.9725	13.55	7.23	3.82	2.0526
26.25	DISCHG	1.03	0.50	0.20	0.0527	0.00	0.00				

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 14.7677 CFS-HRS= 13335.89 ACRE-FT= 1101.91

1.80

SUBROUTINE RESVOR STRUCTURE 1
SURFACE ELEVATION= 737.20

½ PMF

PEAK TIMES: 17.11
PEAK DISCHARGES: 2053.640
PEAK ELEVATIONS: 741.16

TIME			HYDROGRAPH, TZERO= 3.75				DELTA T= 0.25		DRAINAGE AREA= 1.40		
3.75	DISCHG	0.00	0.00 4	0.03	0.06	0.11	0.18 5	0.27	0.37	0.48	0.61 6
3.75	ELEV	737.20	737.20	737.20	737.20	737.20	737.20	737.20	737.20	737.20	737.20
6.25	DISCHG	0.78	1.11	1.71	2.63 7	3.85	5.30	6.99	8.75 8	10.23	11.20
6.25	ELEV	737.20	737.21	737.21	737.22	737.24	737.25	737.27	737.29	737.32	737.35
8.75	DISCHG	23.48	33.71 9	43.29	62.41	75.32	83.00 10	92.16	100.40	108.53	116.55 11
8.75	ELEV	737.38	737.43	737.49	737.55	737.60	737.63	737.65	737.68	737.71	737.73
11.25	DISCHG	124.33	131.87	145.08	161.81 12	179.92	206.51	247.76	290.53 13	346.37	398.21
11.25	ELEV	737.76	737.78	737.82	737.87	737.91	737.98	738.09	738.22	738.35	738.44
13.75	DISCHG	453.23	509.99 14	574.31	640.45	709.41	781.33 15	868.27	984.51	1144.91	1337.92 16
13.75	ELEV	738.56	738.68	738.81	738.94	739.07	739.20	739.35	739.56	739.82	740.15
16.25	DISCHG	1622.59	1856.98	1994.33	2047.61 17	2046.36	2013.89	1961.70	1893.46 18	1827.51	1759.64
16.25	ELEV	740.56	740.89	741.08	741.15	741.15	741.10	741.03	740.95	740.85	740.73
18.75	DISCHG	1619.08	1474.67 19	1341.48	1242.56	1147.48	1057.60 20	968.36	886.76	812.45	747.02 21
18.75	ELEV	740.55	740.34	740.14	739.98	739.83	739.68	739.53	739.39	739.26	739.19
21.25	DISCHG	692.03	641.01	594.58	551.76 22	515.06	481.64	452.62	423.91 23	401.58	378.87
21.25	ELEV	739.03	738.94	738.85	738.77	738.69	738.62	738.56	738.50	738.45	738.40
23.75	DISCHG	358.15	338.95 24	320.79	302.81	285.81	269.23 25	251.30	233.23	132.70	173.99 26
23.75	ELEV	738.35	738.31	738.27	738.23	738.19	738.12	738.06	738.00	737.95	737.90
26.25	DISCHG	156.90	141.46	131.86	126.46 27	121.26	116.27	111.46	106.89 28	102.43	98.08
26.25	ELEV	737.85	737.81	737.78	737.77	737.75	737.73	737.72	737.70	737.69	737.67

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 13.9265 CFS-HRS= 12[illegible] ACRE-FT= 1[illegible]

ENDCMP 1

PLATE D-11

HYDROLOGY PROGRAM FOR IBM 1130 - DATED JULY, 1968

MO DAM INSP FAYETTE NEW CITY LAKE DAM

EXECUTIVE CONTROL CARD OPERATION LIST

TR=20 PLOTTING.

MO DAM INSP FAYETTE NEW CITY LAKE DAM

C TABLE VELOCITY INCREMENT = 0.200

8	0.0000	0.0800	0.1800	0.2700	0.3200
8	0.3700	0.4100	0.4500	0.4900	0.5100
8	0.5400	0.5700	0.5900	0.6100	0.6300
8	0.6500	0.6600	0.6700	0.6900	0.7000
8	0.7100	0.7200	0.7300	0.7400	0.7500
8	0.7600	0.7700	0.7700	0.7800	0.7900
8	0.7900	0.8000	0.8100	0.8100	0.8200
8	0.8200	0.8300	0.8300	0.8400	0.8400
8	0.8400	0.8500	0.8500	0.8600	0.8600
8	0.8600	0.8600	0.8700	0.8700	0.8700
8	0.8800	0.8800	0.8800	0.8900	0.8900
8	0.8900	0.8900	0.8900	0.8900	0.9000
8	0.9000	0.9000	0.9000	0.9000	0.9100
8	0.9100	0.9100	0.9100	0.9100	0.9100
8	0.9200	0.9200	0.9200	0.9200	0.9200
8	0.9200	0.9200	0.9200	0.9300	0.9300
9 ENDTBL					

STRUCTURE NO. 1

	ELEVATION	DISCHARGE	STORAGE
8	737.2000	0.0000	940.0000
9 ENDTBL			

DIMENSIONLESS HYDROGRAPH - DELTA T =484.00

8	0.0000	0.0300	0.1000	0.1900	0.3100
8	0.4700	0.6600	0.8200	0.9300	0.9900
8	1.0000	0.9900	0.9300	0.8600	0.7800
8	0.6900	0.5600	0.4600	0.3900	0.3300
8	0.2800	0.2410	0.2070	0.1740	0.1470
8	0.1260	0.1070	0.0910	0.0770	0.0660
8	0.0550	0.0470	0.0400	0.0340	0.0290
8	0.0250	0.0210	0.0180	0.0150	0.0130
8	0.0110	0.0090	0.0080	0.0070	0.0060
8	0.0050	0.0040	0.0030	0.0020	0.0010
8	0.0000	0.0000	0.0000	0.0000	0.0000
9 ENDTBL					

RAINFALL TABLE NO. 1 TIME INCREMENT = 0.50

8	0.0000	0.0080	0.0170	0.0260	0.0350
8	0.0450	0.0550	0.0650	0.0760	0.0870
8	0.0990	0.1120	0.1250	0.1400	0.1560
8	0.1740	0.1940	0.2190	0.2540	0.3030
8	0.5150	0.5830	0.6240	0.6540	0.6820
8	0.7050	0.7270	0.7480	0.7670	0.7840
8	0.8000	0.8160	0.8300	0.8440	0.8570
8	0.8700	0.8820	0.8930	0.9050	0.9160
8	0.9260	0.9360	0.9460	0.9550	0.9650
8	0.9740	0.9830	0.9920	1.0000	1.0000
9 ENDTBL					

RAINFALL TABLE NO. 2 TIME INCREMENT = 0.02

8	0.0000	0.0100	0.0200	0.0300	0.0300
8	0.0400	0.0500	0.0600	0.0700	0.0800
8	0.1000	0.1100	0.1300	0.1400	0.1700
8	0.1900	0.2200	0.2700	0.3500	0.4900
8	0.5200	0.6000	0.6300	0.6600	0.6800
8	0.7000	0.7200	0.7400	0.7600	0.7700
8	0.7900	0.8000	0.8200	0.8300	0.8400
8	0.8500	0.8700	0.8800	0.8900	0.9000
8	0.9100	0.9200	0.9300	0.9400	0.9500
8	0.9567	0.9633	0.9700	0.9800	0.9900
8	1.0000	1.0000	1.0000	1.0000	1.0000
9 ENDTBL					

RAINFALL TABLE NO. 3 TIME INCREMENT = 0.50

8	0.0000	0.0300	0.0600	0.0900	0.1200

PLATE D-12

```
      0.1500    0.1800    0.2100    0.2400    0.2700
      0.3000    0.3300    0.3600    0.4400    0.5200
      0.6000    0.6800    0.7600    0.8500    0.9300
      1.0200    1.1000    1.1900    1.2700    1.3600
      1.6300    1.9000    2.2200    2.5500    2.9500
      3.3600    4.3800    5.4100    5.7300    6.1700
      6.4600    6.7600    6.8000    6.8500    6.8900
      6.9400    6.9800    7.0300    7.0700    7.1200
      7.1600    7.2100    7.2500    7.3000    7.3000
 9 ENDTBL
```

PLATE D-13

STANDARD CONTROL INSTRUCTIONS

			HYDROGRAPHS			DATA NO. 1	DATA NO. 2	DATA NO. 3	OUTPUT OPTIONS					
	XSECTN	STRCT	IN1	IN2	OUT				PK	H	E	V	PH	SM
SUBRTN			0	0	6	1.400	78.000	0.970	1	1	0	1	0	0
RUNOFF	0	1	6	0	7	737.200	0.000	0.000	1	1	1	1	0	0
RESVOR														
ENDATA														

END OF LISTING

ADDITIONS TO TABULAR DATA FOLLOW

STRUCTURE NO. 1

8	737.2000	0.0000	940.0001
8	737.3000	9.0000	960.0001
8	737.4000	26.0000	975.0001
8	737.6000	74.0000	990.0001
8	737.8000	135.0000	1020.0001
8	738.2000	286.0000	1050.0002
8	738.7000	515.0001	1110.0002
8	739.2000	776.0001	1170.0002
8	739.7000	1065.0002	1230.0002
8	740.2000	1377.0002	1300.0002
8	740.7000	1714.0002	1350.0002
8	741.2000	2082.0004	1410.0002
8	741.4000	2215.0004	1440.0002
8	741.7000	2477.0004	1470.0002
8	742.0001	2834.0004	1520.0002
8	742.2000	3236.0004	1540.0002
8	742.5001	4055.0004	1580.0002
8	743.0001	5900.0009	1640.0002
8	743.5001	8060.0009	1710.0002

EXECUTIVE CONTROL CARD OPERATION INCREM. MAIN TIME INCREMENT= 0.25
EXECUTIVE CONTROL CARD OPERATION COMPUT. FROM XSECTN/STRUCT 0/ 1 TO XSECTN/STRUCT 0/ 1
STARTING TIME= 0.00 RAIN DEPTH= 1.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 3 SOIL CONDITION= 3
ALTERNATE NO.= 1 STORM NO.= 1

SUBROUTINE RUNOFF STRUCTURE 1
AREA= 1.40 INPUT RUNOFF CURVE= 78.0 TIME OF CONCENTRATION= 0.97
COMPUTED CURVE NO. = 89.8

100-Yr.

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
16.19	1545.939	(RUNOFF)
21.29	81.008	(RUNOFF)
22.29	81.111	(RUNOFF)
23.29	81.041	(RUNOFF)
23.90	79.040	(RUNOFF)

HYDROGRAPH, TZERO= 4.50 DELTA T= 0.25 DRAINAGE AREA= 1.40

TIME											
4.50	DISCHG	0.00	1.61	2.67	3.82	5.00	6.17	7.36	9.96	15.74	29.67
7.00	DISCHG	32.39	39.53	45.88	51.54	56.70	61.38	65.79	70.43	76.24	81.00
9.50	DISCHG	85.17	87.44	91.15	95.42	97.43	99.59	101.52	105.09	106.51	106.99
12.00	DISCHG	110.40	132.26	180.90	261.51	320.68	362.38	402.45	440.84	473.27	504.51
14.50	DISCHG	545.24	589.14	630.33	720.60	963.81	1257.77	1464.08	1559.82	1561.17	1122.00
17.00	DISCHG	915.23	790.42	695.89	622.05	573.61	510.55	410.78	285.40	190.40	140.57
19.50	DISCHG	112.05	95.11	87.89	85.47	82.27	79.08	79.27	80.97	80.11	78.19
22.00	DISCHG	79.07	81.00	80.14	78.23	79.11	81.04	80.17	78.26	78.72	79.77
24.50	DISCHG	59.84	37.87	20.84	11.14	6.04	3.20	1.70	0.87	0.43	0.19
27.00	DISCHG	0.04	0.00	0.00	0.00						

1.30
1.21

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 6.0899 CFS-HRS= 5502.26 ACRE-FT= 454.70

SUBROUTINE RESVOR STRUCTURE 1
SURFACE ELEVATION= 737.20

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
17.43	723.675	739.09

HYDROGRAPH, TZERO= 4.50 DELTA T= 0.25 DRAINAGE AREA= 1.40

TIME											
4.50	DISCHG	0.00	0.00	0.02	0.05	0.09	0.14	0.20	0.28	0.40	0.58
4.50	ELEV	737.20	737.20	737.20	737.20	737.20	737.20	737.20	737.20	737.20	737.20
7.00	DISCHG	0.83	1.16	1.54	1.98	2.46	2.99	3.55	4.14	4.78	5.47
7.00	ELEV	737.20	737.21	737.21	737.22	737.22	737.23	737.23	737.24	737.25	737.26
9.50	DISCHG	6.19	6.93	7.70	8.49	9.76	11.80	13.95	15.92	18.00	20.05
9.50	ELEV	737.26	737.27	737.28	737.29	737.30	737.31	737.32	737.34	737.35	737.36
12.00	DISCHG	22.10	24.40	30.30	42.77	58.66	72.78	84.59	102.10	119.71	133.02
12.00	ELEV	737.37	737.39	737.41	737.46	737.53	737.60	737.68	737.69	737.75	737.79
14.50	DISCHG	166.09	206.28	246.16	268.30	550.95	581.82	608.25	587.57	636.01	671.36
14.50	ELEV	737.83	737.90	737.89	738.20	738.39	737.42	738.58	738.76	738.91	739.01
17.00	DISCHG	703.08	721.99	723.51	717.77	707.46	692.58	67 .39	645.78	618.62	592.33
17.00	ELEV	739.07	739.09	739.09	739.08	739.06	739.04	739.00	738.95	738.89	738.80

PLATE D-15

19.50	DISCHG	535.97	499.08	464.16	433.21	412.26	387.10	363.74	342.22	322.57	305.92
19.50	ELEV	738.73	738.66	738.59	738.53	738.47	738.42	738.36	738.32	738.27	738.23
22.00	DISCHG	286.82	266.63	248.24	231.63	216.42	202.94	190.84	179.81	169.77	160.64
22.00	ELEV	738.20	738.14	738.09	738.05	738.01	737.97	737.94	737.91	737.87	737.86
24.50	DISCHG	151.46	141.32	133.02	128.20	125.28	118.40	113.63	109.01	104.55	100.26
24.50	ELEV	737.84	737.81	737.79	737.77	737.76	737.74	737.72	737.71	737.70	737.68
27.00	DISCHG	96.14	92.18	88.39	84.75	81.26	77.92	74.71	70.35	69.85	61.01
27.00	ELEV	737.67	737.65	737.64	737.63	737.62	737.61	737.60	737.58	737.56	737.54

TOTAL WATER IN INCHES ON DRAINAGE AREA= 5.4716 CFS-HRS= 4943.75 ACRE-FT= 404.55

ENDCMP 1

PLATE D-16