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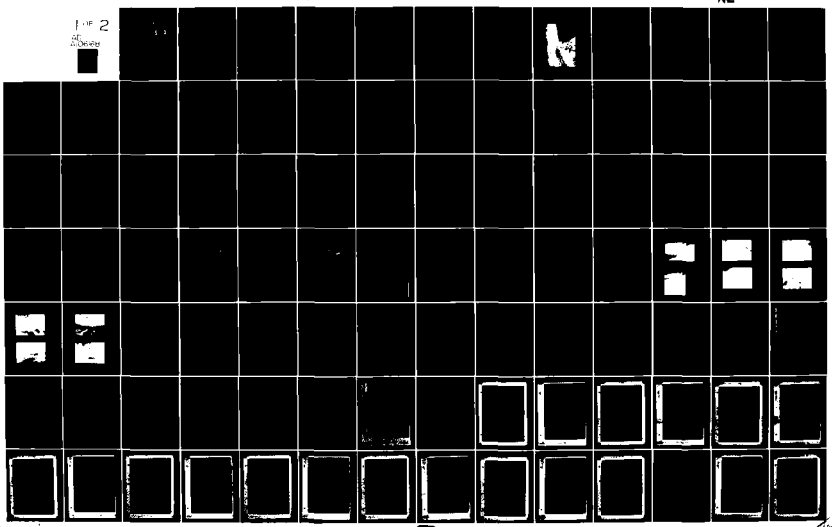

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LEVEL II

B & K LAKE NO. I DAM
WARREN COUNTY, MISSOURI
MO 30506

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

St. Louis District

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

SEPTEMBER, 1979

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

IN REPLY REFER TO

SUBJECT: B & K Lake No. 1 Dam (Mo. 30506) Phase I Inspection Report

This report presents the results of field inspection and evaluation of the B & K Lake No. 1 Dam (Mo. 30506).

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

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 50 percent of the Probable Maximum Flood
2) Overtopping could result in dam failure
3) Dam failure significantly increases the hazard to loss of life downstream

SUBMITTED BY: SIGNED — Chief, Engineering Division — 25 SEP 1979 — Date

APPROVED BY: SIGNED — Colonel, CE, District Engineer — 25 SEP 1979 — Date

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B & K LAKE NO. 1 DAM
WARREN COUNTY, MISSOURI

MISSOURI INVENTORY NO. 30506

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY
CONSOER, TOWNSEND AND ASSOCIATES LTD.
ST. LOUIS, MISSOURI
AND
ENGINEERING CONSULTANTS, INC.
ENGLEWOOD, COLORADO
A JOINT VENTURE

UNDER DIRECTION OF
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
FOR
GOVERNOR OF MISSOURI

SEPTEMBER 1979

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: B & K Lake No. 1 Dam, Missouri Inv. No. 30506
State Located: Missouri
County Located: Warren
Stream: An Unnamed Tributary of Lost Creek
Date of Inspection: May 19, 1979

Assessment of General Condition

B & K Lake No. 1 Dam was inspected using the "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed by the Chief of Engineers, U.S. Army, Washington, D.C., with the help of Federal and State agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

Based on the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. Within the estimated five mile damage zone downstream of the dam are seven houses, six buildings, and one road crossing which may be subjected to flooding, with possible damage and/or destruction, and possible loss of life. B & K Lake No. 1 Dam is in the small size classification since it is less than 40 feet high and impounds less than 1,000 acre-feet of water.

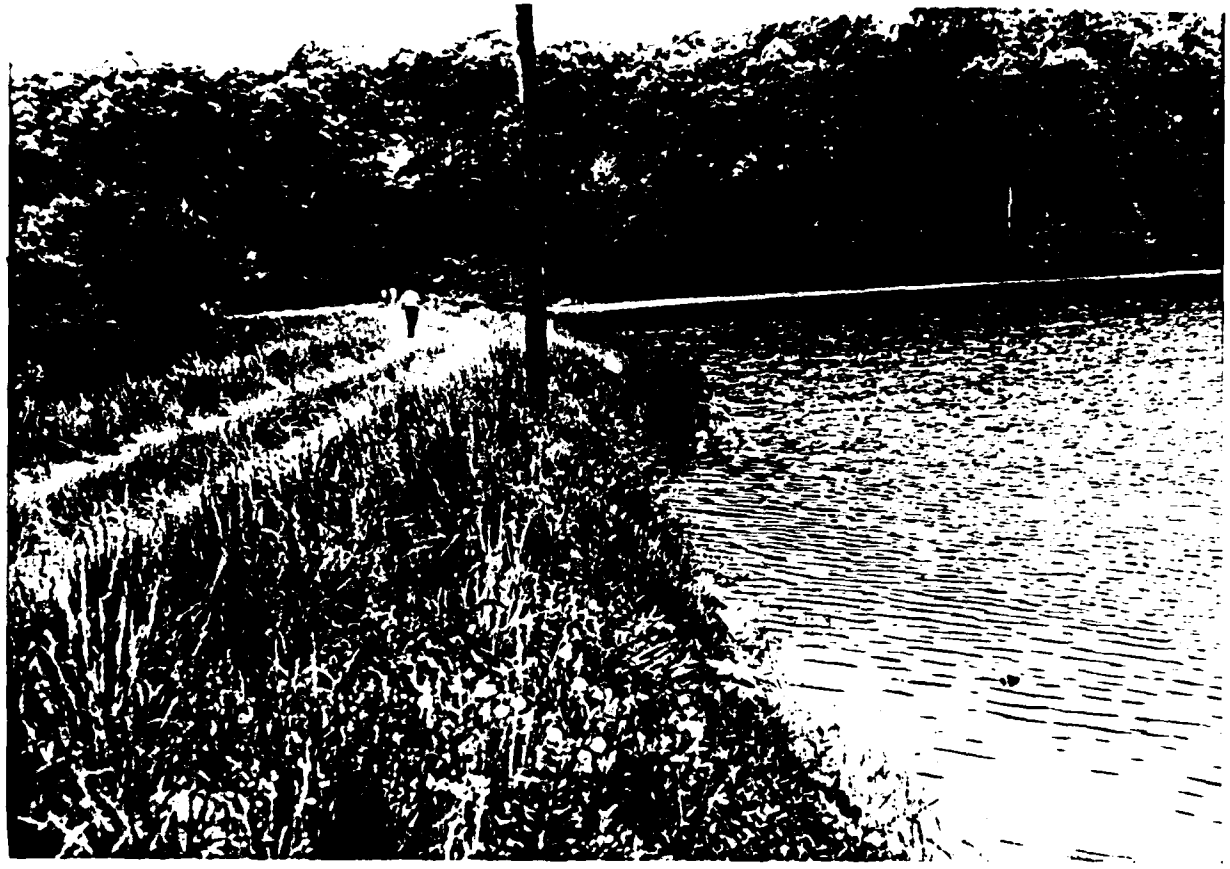
Our inspection and evaluation indicates that the spillway of B & K Lake No. 1 Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. B & K Lake No. 1 Dam being a small size dam with a high hazard potential, is required by the guidelines to pass from one-half of the Probable Maximum Flood to the Probable Maximum Flood without overtopping. Since there is high hazard potential downstream of the dam, the apropriate spillway design flood for this dam is the Probable Maximum Flood. It was determined that the reservoir/spillway system can accommodate 17 percent of the Probable Maximum Flood without overtopping the dam. Our evaluation also indicates that the reservoir/spillway system can accommodate the 100-year flood without overtopping the dam.

The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the region. The 100-year flood is defined as a flood having one percent chance of being equalled or exceeded during any given year.

Other deficiencies noted by the inspection team were: the seepage on the downstream slope at the right abutment contact; sloughing and erosion on the upstream embankment slope; trees and brush in the spillway channel; a need for periodic inspection by a qualified engineer and a lack of maintenance schedule. The lack of stability and seepage analyses on record is also a deficiency that should be corrected.

It is recommended that the owner take action to correct or control the deficiencies described above.

Walter G. Shifrin, P.E.



Overview of B & K Lake No. 1 Dam

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

B & K LAKE NO. 1 DAM, MISSOURI INV. NO. 30506

TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

TABLE OF CONTENTS

(Continued)

LIST OF PLATES

APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

B & K Lake No. 1 Dam, Missouri Inv. No. 30506

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August, 1972, authorizes the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspections. Inspection for B & K Lake No. 1 Dam was carried out under Contract DACW 43-79-C-0075 to the Department of the Army, St. Louis District, Corps of Engineers, by the engineering firms of Consoer, Townsend & Associates Ltd., and Engineering Consultants, Inc. (A Joint Venture), of St. Louis, Missouri.

b. Purpose of Inspection

The visual inspection of B & K Lake No. 1 Dam was made on May 19, 1979. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an assessment of hydrologic and hydraulic conditions at the site; presents an assessment as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

Subsurface investigations, laboratory testing, and detailed analyses were not within the scope of this study. The conclusions drawn herein, therefore, are based on the presence of, or absence of, obvious signs of distress. No warranty as to the absolute safety of the project features is implied by the conclusions presented in this report.

It should be noted that reference in this report to left or right abutments is as viewed looking downstream. Where left abutment or left side of the dam is used in this report, this also refers to east abutment or side, and right to the west abutment or side.

d. 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", Appendix D. 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 the Project

a. Description of Dam and Appurtenances

It should be noted that design drawings are not available for the dam or appurtenant structures. The following description is based on visual observations and information taken from Fenneman, N.M., "Physiographic of Eastern United States", 1946.

The dam is a compacted earthfill structure. The crest width is 14 feet, and the crest length is 475 feet. The crest elevation varies from 833.25 to 833.58 feet above MSL, and the maximum height of the embankment was measured as 28.0 feet.

The downstream slope of the embankment was measured to be 1V to 2H. It was not possible to accurately measure the upstream slope because of high reservoir level.

No riprap was placed on the upstream face. The entire exposed embankment has a grass cover.

There is a dam named as B & K Lake No. 2 Dam upstream of B & K Lake No. 1 Dam. The inventory number of the dam is Mo. 11002. The upstream dam has been taken into consideration in the hydrologic and hydraulic evaluation of B & K Lake No. 1 Dam.

The damsite is situated on the border between the Dissected Till Plain Section of Central Lowlands Physiographic Province which extends to the north and the Ozark Plateau Province to the south. Although the area in which the dam and reservoir are located was glaciated during Pleistocene time,

the till and loess which characterize the uplands of the Till Plains have been largely removed by erosion since the end of the Pleistocene. The area is characterized by wooded hills which have gentle to steep slopes.

The bedrock geology of the area, as shown on the Geologic Map of Missouri (1979), typically consists of gently northeastwardly dipping (ca. 30 - 50 feet/mile) sediments of Paleozoic age. North of Warren County these beds are often capped by young (Pleistocene) deposits of glacial drift and wind blown loess. In the southern areas of the county the bedrocks are generally covered by residual soil, colluvium, or alluvium. The rocks underlying the area are predominately carbonates (limestones and dolomites) although beds of sandstone and shale are not infrequent.

The bedrock of Warren County contains some minor folding. The largest known geologic structure in the area is a gentle anticline centered about 2 1/2 miles northwesterly of the town of Warrenton. This structure trends nearly north-south and is about 2 1/2 miles long. It is not known if this fold affects the attitude of the beds beneath the site.

The Soil Conservation Service reports (Soil Survey of Montgomery and Warren Counties, Missouri, 1978) that the soils in the bottom land at the damsite are clayey silt (ML) and cherty, clayey gravel (GC). The upslope soils consist largely of silty clay (CL-ML) and clay (CL).

The spillway for B & K Lake No. 1 Dam is an open channel depression located just beyond the right abutment of the dam. Approximately 50 feet downstream of the upstream edge of the spillway, which has a 12 inch high wire mesh trashscreen, a concrete weir has been constructed. This weir

is a 10 inch thick concrete wall with a total length of 54 feet. The weir is trapezoidal in shape, with a 16 foot bottom width, a side slope of 1V to 10.4H on the right bank and 1V to 20H on the left bank. Five 12-inch diameter corrugated metal pipes are constructed through the concrete weir, placed on 4 foot centers. The outside pipes have a total length of 6 feet, while the three inside pipes have a length of 4 feet. The elevation difference between the crest of the embankment and the crest of the concrete weir is 1 foot, 3 inches. The difference between the crest of the weir and the invert of the outside corrugated metal pipes is 1 foot, 4 inches, while the inside corrugated metal pipes are 8 inches lower than the outside pipes.

Discharges through the spillway pipe and over the weir flow through a channel adjacent to the right abutment contact to the downstream toe of the dam. The channel is an earth channel with rock riprap recently placed at the bottom and sides of the channel.

There is no low level drain pipe or outlet works for this dam.

b. Location

The dam is located at the headwaters of a small intermittant stream which is tributary to Lost Creek. The stream flows to the south about a quarter mile before entering Lost Creek.

Lost Creek flows southward from the confluence for about 2 miles and then southwesterly for about 11 miles where it flows into the Missouri River near the village of Gore just upstream of Mile 90. The upper reaches of Lost Creek are intermittant but, about 3 miles below the dam it becomes perennial.

The major access to the damsite from Warrenton, Missouri is west on the Interstate Highway No. 70 frontage road approximately 3 miles to a gravel road heading south, thence south on this road 1/4 mile to a private road to the east. The damsite is located at the end of the private road, approximately 1,000 feet from the beginning of the road. The dam and reservoir are shown in the Warrenton Quadrangle Sheet (7.5 minute series) in Section 24, Township 47 North, Range 3 West.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams", by the U.S. Department of the Army, Office of the Chief Engineer, the dam is classified in the dam size category as being "Small" since its storage is less than 1,000 acre-feet. The dam is also classified as "Small" in dam height category because its height is less than 40 feet. The overall size classification is, accordingly, "Small" in size.

d. Hazard Classification

The dam has been classified as having "High" hazard potential in the National Inventory of Dams, on the basis that in the event of failure of the dam or its appurtenances, excessive damage could occur to downstream property, together with the possibility of the loss of life. Our findings concur with the classification. Within the estimated five mile damage zone downstream of the dam are seven houses, six buildings, and one road crossing.

e. Ownership

The dam and lake are owned by B & K Construction Company. The mailing address is B & K Construction Company, c/o Ken Davis Sr., 4140 Cypress Road, St. Ann, Missouri, 63114.

f. Purpose of Dam

The purpose of the dam is to impound water for recreational use as a private lake.

g. Design and Construction History

B & K Lake No. 1 Dam was originally built in 1945 (est.) by Gene Rugh of Wright City, Missouri. Efforts to contact the original builder were futile and it is very doubtful if any formal design was done at the time of original construction.

The dam was rebuilt in 1977 by the present owner, Mr. Ken Davis of B & K Construction Company. Mr. Davis was his own engineer for the reconstruction and according to him, a 20 foot wide key trench was placed at the downstream toe. Also the crest width was increased from 6 feet to 14 feet. The owner informed the inspection team that the material for the reconstruction was taken from an area several hundred feet north of the left abutment.

h. Normal Operational Procedures

There are no specific operational procedures for the dam. The lake is used for recreational purposes and the water level below the spillway crest is controlled by rainfall, runoff and evaporation.

1.3 Pertinent Data *

a. Drainage Area (square miles):	0.25
b. Discharge at Damsite	
Estimated experienced maximum flood (cfs):	NA
Estimated ungated spillway capacity at maximum pool elevation (cfs):	125
c. Elevation (Feet above MSL)	
Top of dam:	833.25
Spillway crest:	
Service Spillway	830.0
Emergency Spillway	832.0
Normal Pool	830.0
Maximum Pool (PMF):	834.88
d. Reservoir	
Length of maximum pool:	1400 feet
e. Storage (Acre-Feet)	
Top of dam:	108
Spillway crest:	
Serivce Spillway	72
Emergency Spillway	92
Normal Pool:	72
Maximum Pool(PMF):	138

* Maximum pool referred to in this section indicates pool at top of dam elevation unless otherwise specified.

f. Reservoir Surface (Acres)

Top of dam:	13.2
Spillway crest:	
Service Spillway	9
Emergency Spillway	11.4
Normal Pool:	9.0
Maximum Pool(PMF):	15.5

g. Dam

Type:	Rolled Earthfill
Length:	475 feet
Structural Height:	28.0 feet
Hydraulic Height:	28.0 feet
Top width:	14.0 feet
Side slopes:	
Downstream	1V to 2H
Upstream	Unknown
Zoning:	Unknown
Impervious core:	Unknown
Cutoff:	Unknown
Grout curtain:	Unknown

h. Diversion and Regulating Tunnel None

i. Spillway

Type:	
Service Spillway	5 - 1′ diameter CMP, Uncontrolled
Emergency Spillway	Trapezoidal Concrete Weir, Uncontrolled
Length of weir:	

Service Spillway	5 - 1' diameter CMP
Emergency Spillway	16 feet

Crest Elevation (feet above MSL):

Service Spillway	830 for 3 pipes and 830.67 for 2 pipes
Emergency Spillway	832

j. Regulating Outlets None

SECTION 2 : ENGINEERING DATA

2.1 Design

Design drawings are not available for the dam for either the original construction or the modifications done in 1977.

2.2 Construction

No records or construction data is available for B & K Lake No. 1 Dam.

2.3 Operation

No operational data is available for the lake and dam because there is no specific operational procedure for this dam.

2.4 Evaluation

a. Availability

No design drawings, design computations, construction data, or operation data is available.

In addition, no pertinent data was available for review of hydrology, spillway capacity, flood routing through the reservoir, slope stability, seepage analysis, or foundation conditions.

b. Adequacy

The lack of engineering data did not allow for a definitive review and evaluation. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing and evaluating design, operation and construction data, but is based primarily on visual inspection, past performance history, and sound engineering judgment.

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

No valid engineering data is available.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

A visual inspection of the B & K Lake No. 1 Dam was made on May 19, 1979. The following persons were present during the inspection:

Name	Affiliation	Disciplines
Dr. M. A. Samad	Engineering Consultants, Inc.	Project Engineer, Hydraulics and Hydrology
Jon Diebel	Engineering Consultants, Inc.	Structural and Mechanical
Peter Strauss	Engineering Consultants, Inc.	Soils
Peter Howard	Engineering Consultants, Inc.	Geology
Kevin Blume	Consoer, Townsend & Assoc., Ltd.	Civil and Structural

Specific observations are discussed below.

b. Dam

The crest and downstream slope of the dam has a heavy grass cover which appears to be adequately protecting the embankment materials against surface erosion. The upstream slope has no riprap protection and has consequently undergone erosion from wave action. Scarps ranging from 1-3 feet high have been cut into the upper part of the upstream face. No trees or bushes were observed on the dam slopes.

The dam, as seen from materials in the scarps, appears to be composed of residual soils with gravel.

Some seepage in the form of standing water was seen next to a large tree adjacent to the downstream toe near the left abutment. Damp conditions were noted next to the spillway channel in a row of trees and bushes about 20 feet downstream of the downstream toe of dam near the right abutment. Standing water was seen at about the same level in the spillway channel. Boggy conditions were also seen about 300 feet downstream of the toe of the embankment at the central part of the dam.

No signs of instability were seen on the embankment or in the foundation at any location.

The present owner reported that the original dam leaked in the right abutment-spillway area. He reported that in 1977 he cleared trees from the downstream face and placed 9000 cubic yards of clay against the downstream slope to stop seepage. A core trench about 20 feet wide and 14 feet high was constructed at the downstream toe of the embankment and

the crest width increased to 14 feet during the embankment construction.

There are no rock outcrops at the damsite. According to the Geologic Map of Missouri (1979) the covered bedrock is Burlington Limestone (Osagean Series, Mississippian). The Burlington is predominately cherty, crinoidal limestone.

The Soil Conservation Service reports (Soil Survey of Montgomery and Warren Counties, Missouri, 1978) that the soils in the bottom land at the site are clayey silt (ML) and cherty, clayey gravel (GC). The upslope soils consist largely of silty clay (CL-ML) and clay (CL).

It is not known if the dam rests on bedrock or not. If it does, the Burlington will form an adequate foundation provided it was blanketed with sufficient impervious material to prevent the possible development of solution channels along possible joints or joint intersections in the limestone.

The type of material used in the embankment fill is not known.

c. Appurtenant Structures

(1) Spillway

The spillway approach channel to the concrete weir is covered by a thin grass cover. The center of the channel is a small erosion gully. The concrete in the weir structure is old and deteriorated, but appears to be structurally sound. The corrugated metal pipes through the concrete weir are in satisfactory condition.

Upstream and downstream of the weir trees and large brush are growing in the channel. This vegetation will inhibit flows through the spillway channel. The spillway channel downstream of the weir has recently had rock riprap placed in the bottom of the channel from a point approximately 30 feet downstream of the weir to and beyond the toe of the embankment. The sides of the channel exhibit sloughing and erosion due to flows through the spillway channel.

The spillway channel is separated from the embankment by a small ridge of natural ground. This ridge is heavily vegetated with trees and brush, but substantial erosion is occurring on the bank of this channel.

(2) Outlet Works

There is no low level drain or outlet works at the damsite.

d. Reservoir Area

The water surface elevation was approximately 830 feet above MSL at the time of inspection.

The reservoir rim is gently sloping with trees and woods near the shore. No evidence of instability was observed.

e. Downstream Channel

The downstream channel is well defined with some vegetative and tree growth. The channel joins Lost Creek about 1/4 mile downstream from the dam. No major obstacles were found in the channel which would significantly reduce the

hydraulic efficiency of the channel. Some erosion could be observed in a few areas.

3.2 Evaluation

The following items were observed which could affect the safety of the dam, or which will require maintenance within a reasonable period of time.

1. Wave erosion on the upstream embankment slope.

2. Seepage observed downstream of the toe of the embankment at the left and right abutment of the dam.

3. Trees and large brush growing in several areas of the spillway discharge channel.

4. Erosion on the banks of the spillway discharge channel, particularly on the left bank adjacent to the dam embankment.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

B & K Lake No. 1 Dam is used solely for recreational purposes. No provisions were made for drawing down the reservoir or regulating the water level. No formal operational procedures are in effect for this dam.

4.2 Maintenance of Dam

The dam is maintained by the owner Mr. Ken Davis and his caretaker, Mr. Bob Curtis who lives on the property. The dam seems to be maintained satisfactorily. the downstream and upstream slopes, along with the crest, seem to be kept free of saplings and bushes. Periodically the grasses are mowed on the dam. At the time of inspection it was apparent that the spillway channel had been recently lined with rocks ranging in size from 2 inches to 24 inches in diameter.

The approach channel to the spillway is somewhat blocked with trees and bushes. There is also a close-meshed trash rack at the entrance to the approach channel which is partially clogged with debris. These areas should receive attention within a reasonable period of time.

4.3 Maintenance of Operating Facilities

There are no operating facilities at the damsite which require maintenance. No water level records are kept for the lake.

4.4 Description of Any Warning System in Effect

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

4.5 Evaluation

The operation and maintenance for B & K Lake No. 1 Dam, with the exception of the spillway approach channel, seems to be satisfactory. Also the upstream slope at the water level is showing signs of erosion.

No operation is required for the lake and dam, however, the items suggested for maintenance should receive attention within a reasonable length of time.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The watershed area of B & K Lake No. 1 Dam upstream from the dam axis consists of approximately 157 acres. There is a dam named as B & K Lake No. 2 Dam (Mo. 11002) upstream of B & K Lake No. 1 Dam. The watershed area between the upstream dam and B & K Lake No. 1 Dam investigated in this report is about 132 acres. Most of the watershed area is wooded and covered with grass. Land gradients in the watershed average roughly 4 percent. B & K Lake Dam No. 1 is located on an unnamed tributary of Lost Creek. The reservoir is about 1/4 mile upstream from the confluence of the unnamed tributary and Lost Creek. At its longest arm the watershed is approximately 0.6 mile long. A drainage map showing the watershed area is presented as Plate 1 in Appendix B.

Evaluation of the hydraulic and hydrologic features of B & K Lake No. 1 Dam was based on criteria set forth in the Corps of Engineers' "Recommended Guidelines for Safety Inspection of Dams", and additional guidance provided by the St. Louis District of the Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using the methods outlined in the U.S. Weather Bureau Publication, Hydrometeorological Report No. 33. The probable maximum storm duration was set at 24 hours, and storm rainfall distribution was based on criteria given in EM 1110-2-1411 (Standard Project Storm). The SCS method was used

for deriving the unit hydrographs, utilizing the Corps of Engineers' computer program HEC-1 (Dam Safety Version). Two unit hydrographs were derived. One unit hydrograph was for the drainage above the B & K Lake No. 2 Dam; another unit hydrograph was for drainage area between B & K Lake No. 2 Dam and B & K Lake No. 1 Dam. The parameters of the unit hydrographs are presented in Appendix B. The SCS method was used for determining loss rate. The hydrologic soil group of the watershed was determined by use of published soil maps. The hydrologic soil group of the watershed and the SCS curve number are also presented in Appendix B. The curve number, the unit hydrograph parameters, and the PMP rainfall were directly input to the HEC-1 (Dam Safety Version) computer program to obtain the PMF hydrograph. The computed peak discharges of the PMF and one-half of the PMF at the B & K Lake No. 2 Dam reservoir are 647 cfs and 324 cfs respectively. The peak discharges of the PMF and one-half of the PMF between B & K Lake No. 2 Dam and B & K Lake No. 1 Dam are 2,376 and 1,368 cfs respectively.

Both the PMF and one-half of the PMF inflow hydrographs at the B & K Lake No. 2 Dam were routed through B & K Lake No. 2 Dam reservoir by the Modified Puls Method, also utilizing the HEC-1 (Dam Safety Version) computer program. The peak outflow discharges for the PMF and one-half of the PMF at B & K Lake No. 2 Dam are 520 cfs and 193 cfs, respectively. Both the PMF and one-half of the PMF when routed through the reservoir resulted in overtopping of B & K Lake No. 2 Dam. The outflow hydrographs at B & K Lake No. 2 Dam were combined with the PMF and one-half of the PMF hydrographs for B & K Lake No. 1 Dam. The combined hydrographs for both the PMF and one-half of the PMF, were then routed through B & K Lake No. 1 Dam reservoir. The peak outflow discharges for the PMF and one-half of the PMF at B & K Lake No. 1 Dam are

2,626 cfs and 1,217 cfs respectively. Both the PMF and one-half of the PMF, when routed through the reservoir resulted in overtopping of the B & K Lake No. 1 Dam.

The stage-outflow relations for the spillways were prepared from field notes, and sketches, prepared during the field inspection. The reservoir stage-capacity data were based on the U.S.G.S. Warrenton Quadrangle topographic map (7.5 minute series). The spillway and overtop rating curves and the reservoir capacity curves for B & K Lake No. 1 & No. 2 Dams are presented as Plates 2 through 5 in Appendix B.

From the standpoint of dam safety, the hydrologic design of a dam aims at avoiding overtopping. Overtopping is especially dangerous for an earth dam because the downrush of waters over the crest can erode the dam embankment and release all the stored water into the downstream floodplain. The safe hydrologic design of a dam requires a spillway crest height that can handle a very large and exceedingly rare flood without overtopping.

The Corps of Engineers designs its dams to safely pass the Probable Maximum Flood that is estimated could be generated from the upstream watershed. This is the generally accepted criterion for major dams throughout the world, and is the standard for dam safety where overtopping would pose any threat to human life. According to the Corps criteria, the hydrologic requirement for safety for this dam is the capability to pass from one-half of the Probable Maximum Flood to the Probable Maximum Flood without overtopping.

b. Experience Data

It is believed that no records of reservoir stage or spillway discharge are maintained for this site.

c. Visual Observations

Observations made of the spillway during the visual inspection are discussed in Section 3.1c(1) and evaluated in Section 3.2.

d. Overtopping Potential

As indicated in Section 5.1-a, both the Probable Maximum Flood and one-half of the Probable Maximum Flood, when routed through the reservoir, resulted in overtopping of the dam. The peak outflow discharges for the PMF and one-half of the PMF at B & K Lake No. 1 Dam are 2,626 cfs and 1,217 cfs respectively. The PMF overtopped the dam crest by 1.63 feet and one-half of the PMF overtopped the dam crest by 0.91 feet. The total duration of embankment overflow is 6.67 hours during the PMF, and 4.83 hours during one-half of the PMF. The spillways for B & K Lake No. 1 Dam are capable of passing a flood equal to approximately 17 percent of the PMF just before overtopping the dam.

The computed one percent chance flood using 100-year 24 hour rainfall data was routed through the reservoir. The routing results indicate that the spillway/reservoir system will accommodate the 100-year flood without overtopping the dam.

The failure of the dam could cause extensive damage to the property downstream of the dam and possible loss of life. Within the estimated five mile damage zone downstream of the dam are seven houses, six buildings and one road crossing.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There were no signs of settlement or distress observed on the embankment or foundation during the visual inspection. The upstream slope of the embankment is exhibiting sloughing and erosion due to wave action. The condition does not appear to be serious at this time, but the condition should be watched and the slope stabilized as required.

Seepage observed during the inspection is not believed to be serious enough to indicate an unsafe condition at this time. However, the seepage should be monitored and any changes in quantity, location or color should be reported and investigated. The recommended seepage and stability study should address this seepage in detail.

The spillway discharge channel should be cleared of all trees and large brush, and future growth should be prevented. The structural condition of the spillway weir is satisfactory. The discharge channel, however, is undergoing substantial erosion on the earthen banks of the channel. The erosion on the left bank is especially hazardous for the structural integrity of the embankment. The discharge channel is separated from the embankment by a thin wall of material, and continued erosion of the bank will eventually cause the bank to fail, allowing discharges to flow along the abutment contact of the dam. The owner has recently added some riprap

to the channel, but more riprap is required to adequately stabilize the bank of the channel.

b. Design and Construction Data

No design or construction data relating to the structural stability of the dam or appurtenant structures were found.

c. Operating Records

No operating records are available relating to the stability of the dam or appurtenant structures. Water levels in the reservoir have not been recorded, however, the reservoir was almost full on the day of inspection, and is assumed to be close to full at all time.

d. Post Construction Changes

The construction in 1977 of a core trench and the addition of material to the downstream embankment slope is a post construction change. This work probably increased the structural stability at the time it was done if the work was performed properly.

e. Seismic Stability

According to the Seismic Zone Map of Contiguous States, Form TM 5-809-10/NAVFAC P.355/AFM 88-3 Chapter 13; April 1973 the portion of Missouri in which B & K Lake No. 1 Dam is located is in Seismic Zone 2. This means there is only moderate damage probability. A detailed seismic analysis is not felt to be necessary for this embankment under present conditions.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed 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.

It should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is also important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that an unsafe condition could be detected.

a. Safety

The spillway capacity of B & K Lake No. 1 Dam was found to be "Seriously Indadequate". The spillway/reservoir system will accommodate only 17 percent of the PMF before overtopping the dam. The dam is overtopped by more than 1 1/2 feet during the PMF. The duration of overflow is over 6 hours. Overtopping could result in dam failure. If the body of the dam is made up of silty soils the probability of failure of the dam due to overtopping will increase.

The seepage observed below the downstream toe near the left and right abutments and in the spillway channel is not felt to indicate an unsafe condition at present. This seepage should be monitored for changes indicating a potential hazard. The recommended study should determine the cause and effect of the seepage.

The sloughing and erosion on the upstream embankment slope does not appear to be affecting the safety of the dam at this time, but the condition should be monitored and repairs made as required.

The spillway discharge channel is in need of remedial measures. The trees and brush in the spillway channel should be cleared, and future growth prevented. The vegetation in the channel will substantially reduce the hydraulic efficiency of the spillway.

Additional riprap will be required to stabilize the banks of the spillway channel. This should be accomplished in the near future to prevent further erosion of the banks of the channel.

b. Adequacy of Information

Prior information concerning the dam and appurtenant structures is not available. The information presented in this report is based upon visual inspection and simple field measurements.

c. Urgency

The remedial measures recommended in Paragraph 7.2 should be accomplished in the near future. The items recommended in Paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II Inspection

Based on results of the Phase I inspection, and if the remedial measures recommended in Paragraph 7.2 are undertaken as soon as possible, a Phase II inspection is not felt to be necessary.

7.2 Remedial Measures

a. Alternatives:

Spillway capacity and/or height of dam should be increased to accommodate the PMF without overtopping the dam.

b. O & M Procedures:

1. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of dams. This study should concentrate on the area exhibiting seepage on the downstream slope at the right abutment contact.

2. Monitor the condition of the upstream embankment slope, and make repairs to the slope as required.

3. Stabilize the banks of the spillway discharge channel to prevent future erosion and sloughing.

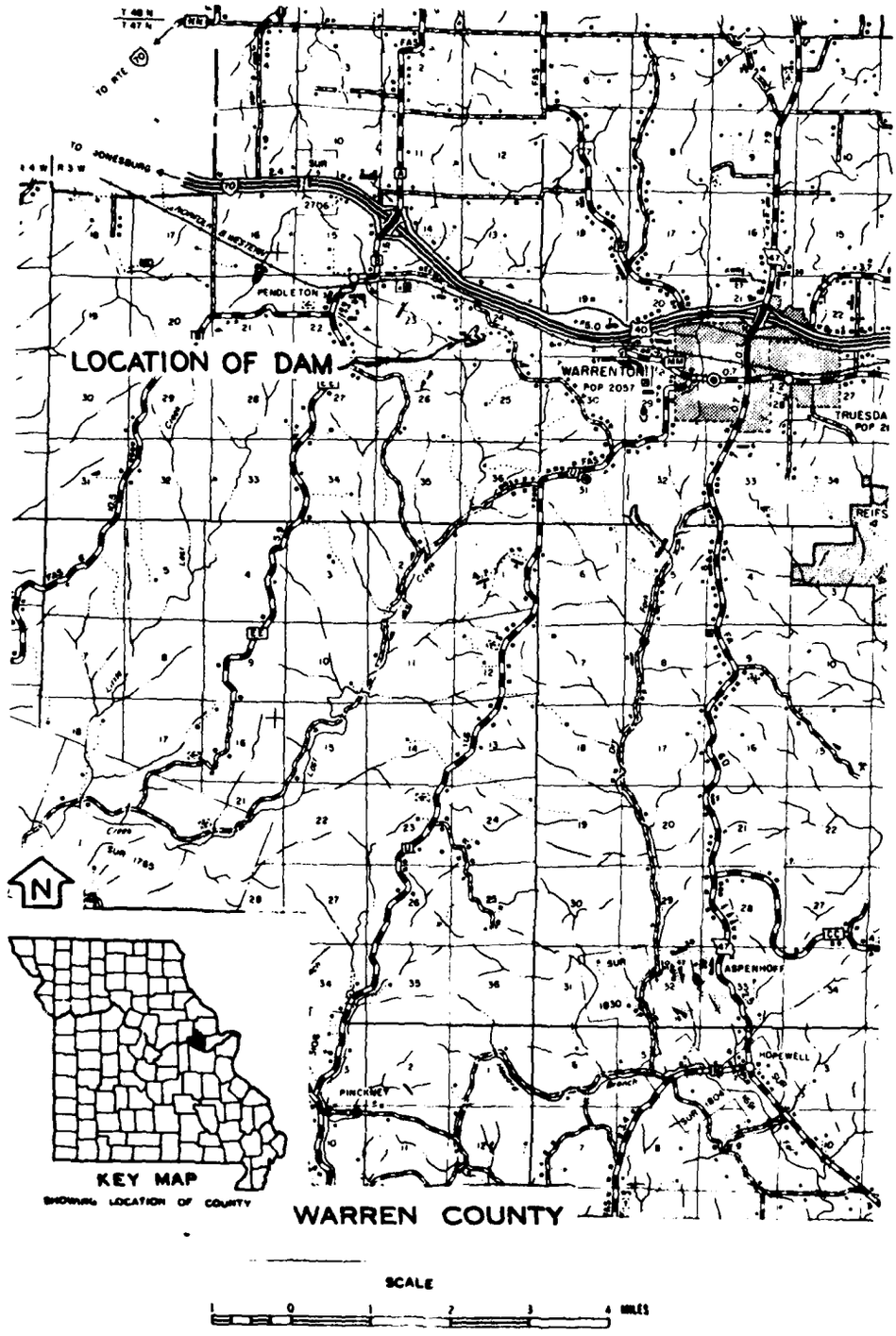
4. Clear the trees and large brush from the spillway discharge channel, and prevent future growth. This work should be done under the supervision of an engineer experienced in the design and construction of earth dams.

5. The owner should initiate the following programs.

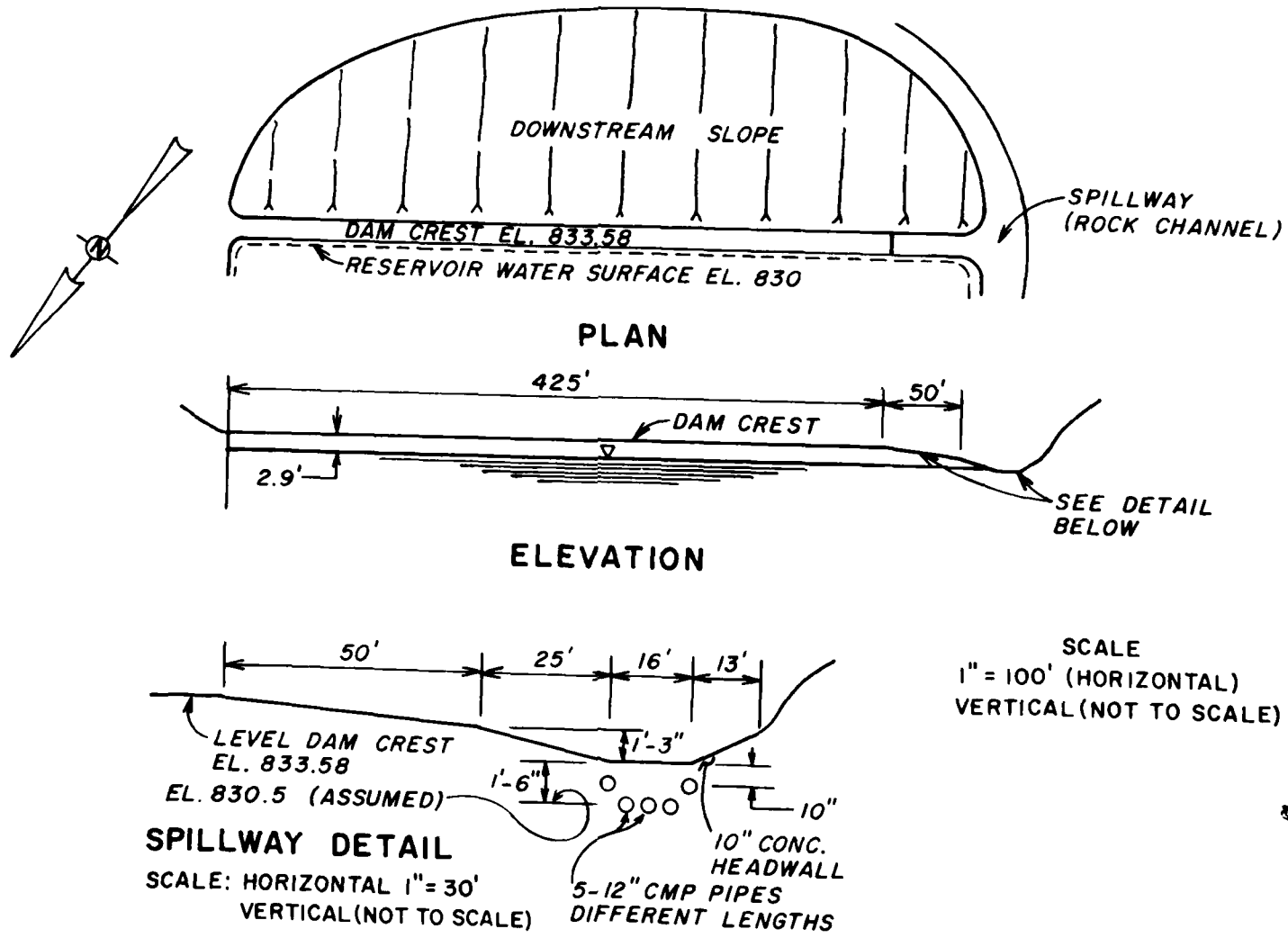
   (a) Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.

   (b) Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

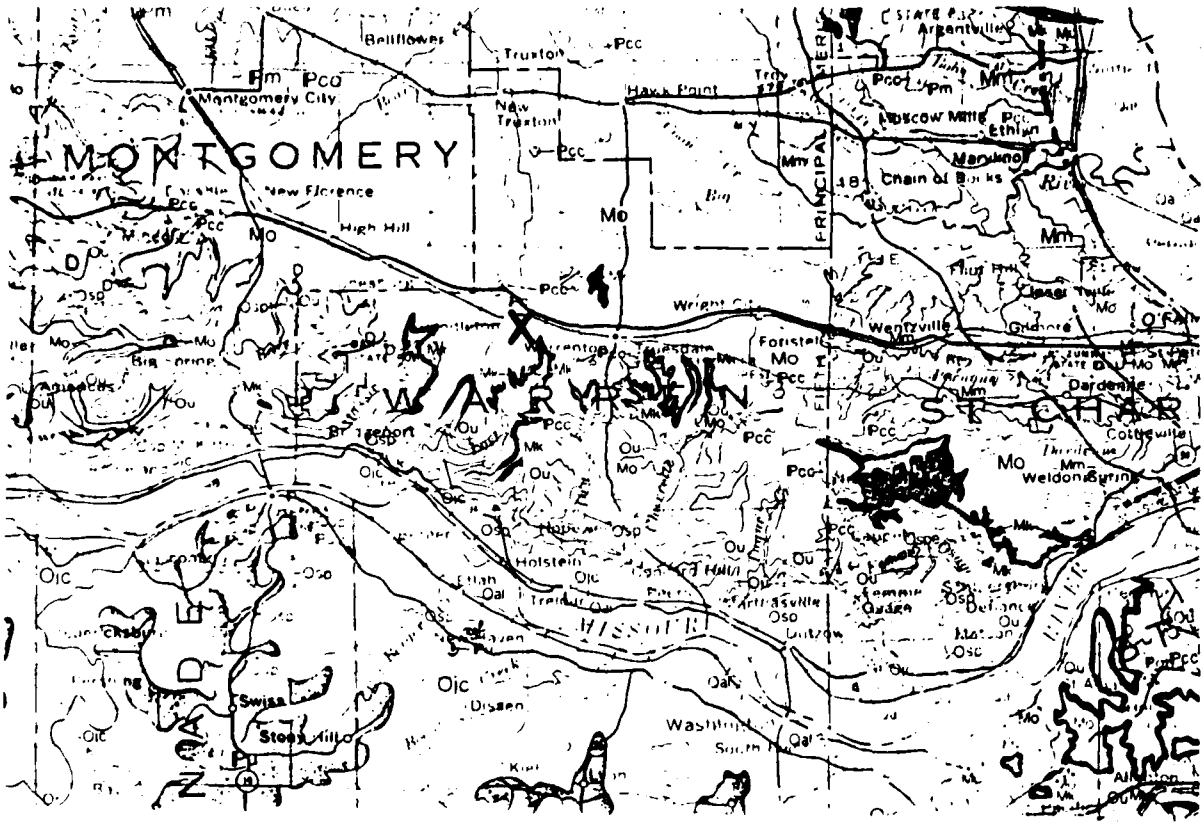
PLATES



LOCATION MAP - B & K LAKE NO. 1 DAM



B & K LAKE NO. 1 DAM (MO. 30506)
PLAN AND ELEVATION



QUARTERNARY { Qal - ALLUVIUM

PENNSYLVANIAN
- Pm - MARMATON GROUP
- Pcc - CHEROKEE GROUP

MISSISSIPPIAN
- Mm - ST. LOUIS LIMESTONE
  - SALEM FORMATION
  - WARSAW FORMATION
- Mo - BURLINGTON-KEOKUK FORMATION
- Mk - CHOTEAU GROUP

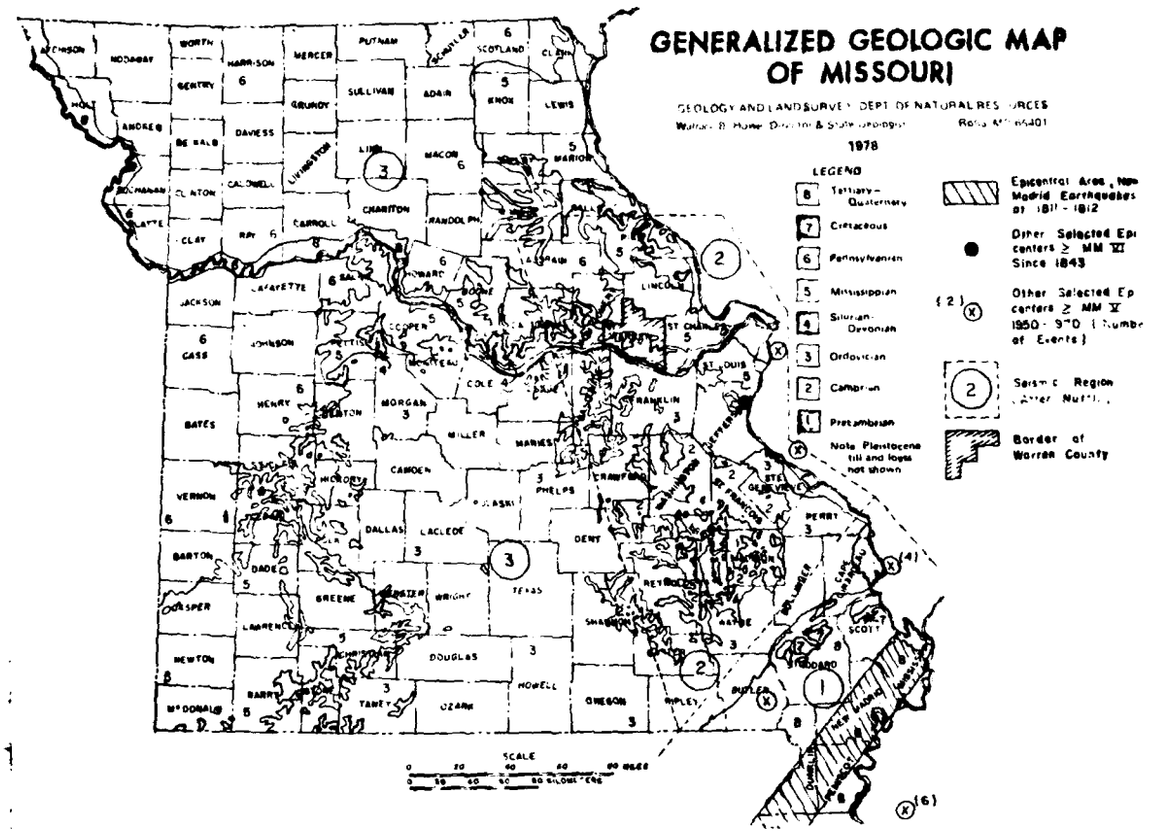
ORDOVICIAN
- Ou - NOIX LIMESTONE
  - MAQUOKETA SHALE
  - CAPE LIMESTONE
  - KIMMSWICK FORMATION
  - DECORAH FORMATION
  - PLATTIN FORMATION
  - JOACHIM DOLOMITE
- Osp - ST. PETER SANDSTONE
- Ojc - COTTER-POWELL FORMATION
  - JEFFERSON CITY DOLOMITE

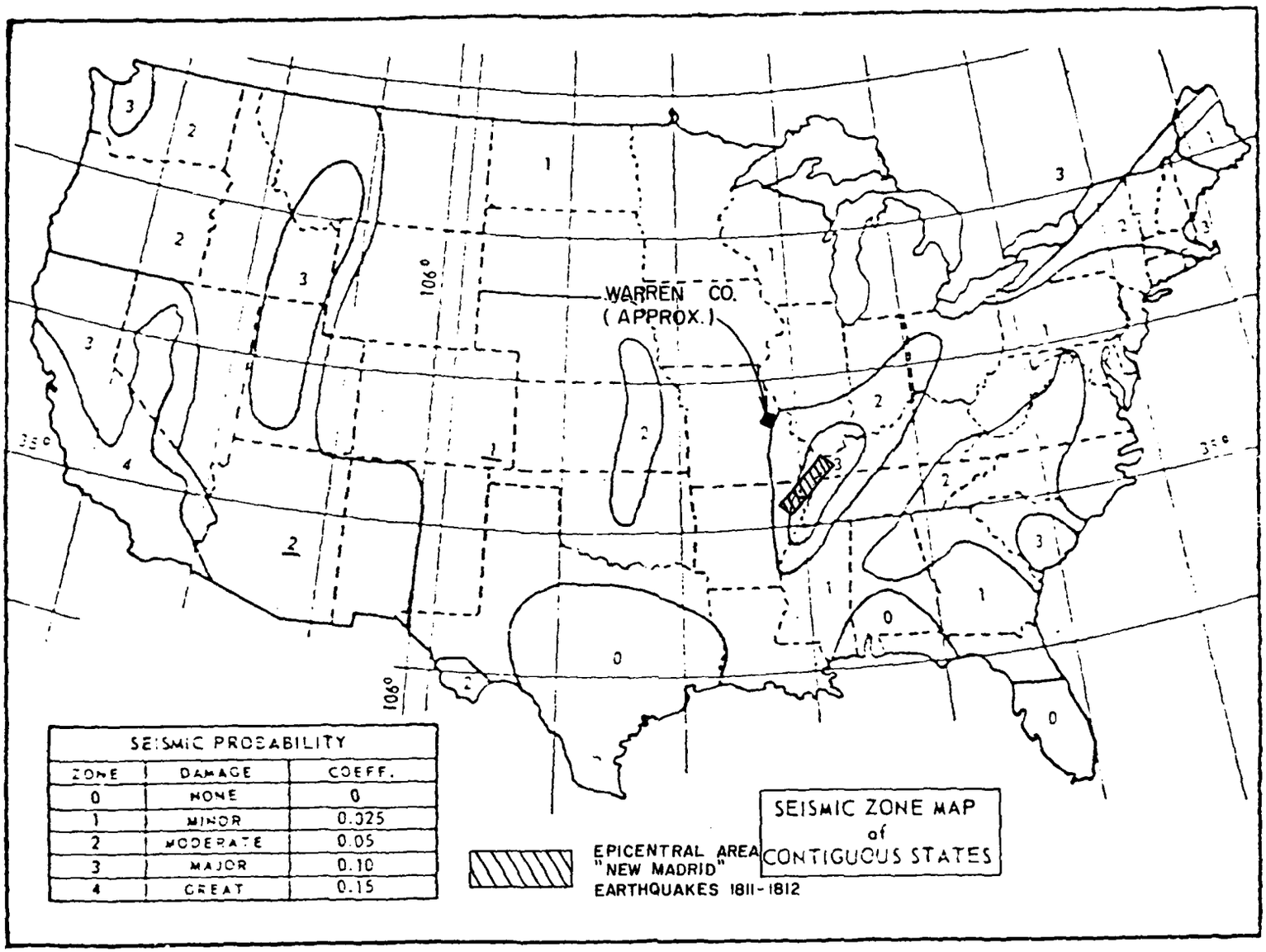
X LOCATION OF DAM MO. 30506

REFERENCE:
GEOLOGIC MAP OF MISSOURI, MISSOURI GEOLOGIC SURVEY, 1979.

10 0 10
SCALE OF MILES

GEOLOGIC MAP OF WARREN COUNTY AND ADJACENT AREA


GENERALIZED GEOLOGIC MAP OF MISSOURI
GEOLOGY AND LAND SURVEY DEPT OF NATURAL RESOURCES
1978
LEGEND
8 Tertiary–Quaternary
7 Cretaceous
6 Pennsylvanian
5 Mississippian
4 Silurian-Devonian
3 Ordovician
2 Cambrian
1 Precambrian
Note Pleistocene till and loess not shown
Epicentral Area, New Madrid Earthquakes of 1811 - 1812
Other Selected Epicenters ≥ MM VI Since 1843
Other Selected Epicenters ≥ MM V 1950 - 970 (Number of Events)
Seismic Region
Border of Warren County
SCALE



SEISMIC PROBABILITY		
ZONE	DAMAGE	COEFF.
0	NONE	0
1	MINOR	0.025
2	MODERATE	0.05
3	MAJOR	0.10
4	GREAT	0.15

APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

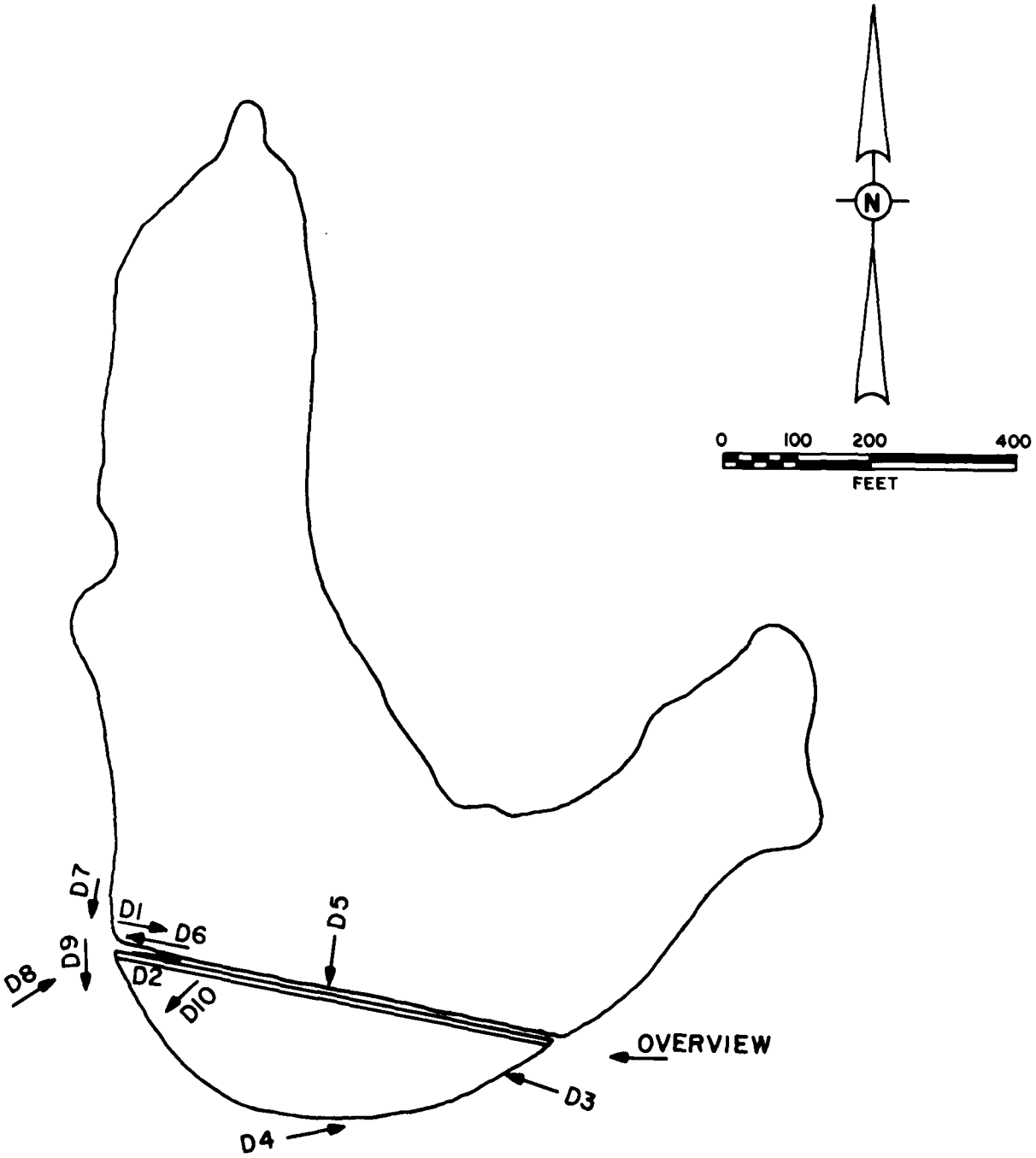


PHOTO INDEX
FOR
B & K LAKE NO. 1 DAM

B & K Lake No.1 Dam

D1 - Upstream embankment slope

D2 - Crest of embankment slope

D3 - Downstream embankment slope

D4 - Downstream embankment slope

D5 - View downstream of embankment

D6 - Spillway approach

D7 - Concrete weir in spillway channel

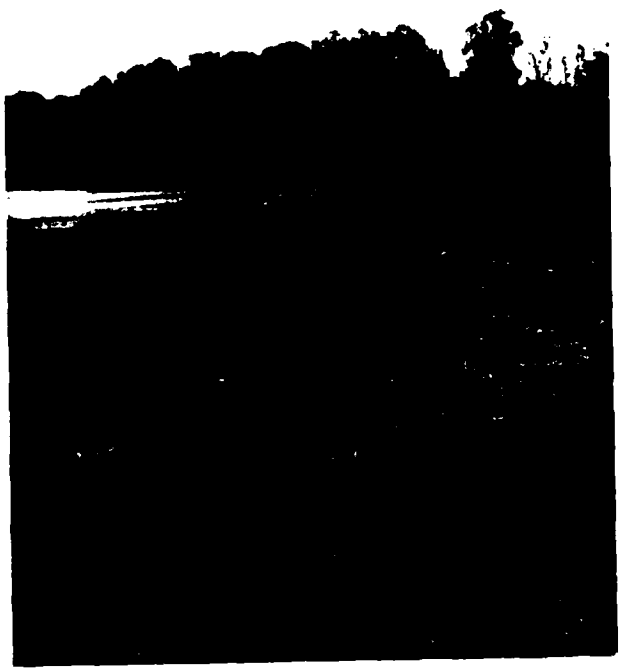
D8 - Pipes through concrete weir

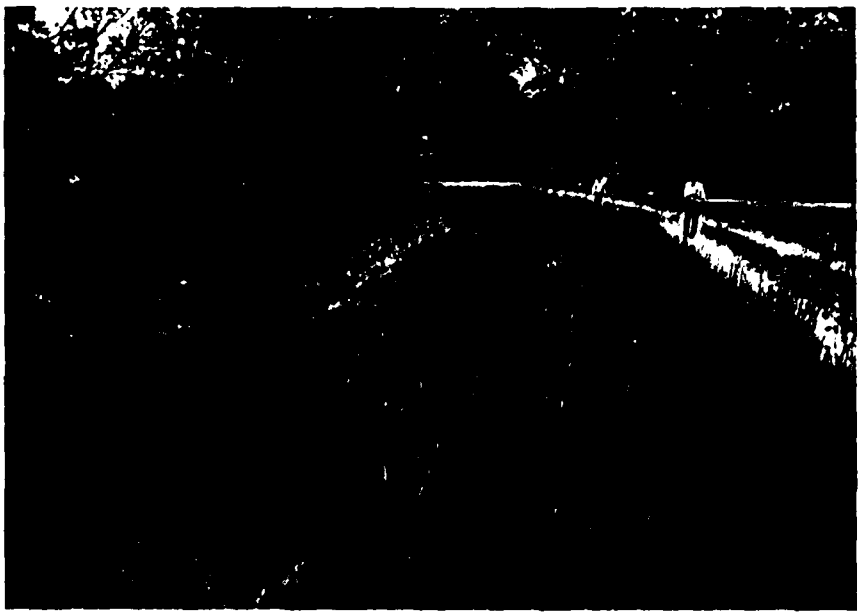
D9 - Spillway discharge channel

D10- View downstream of embankment

D1

D2





D3

D4

D5

D6

D7

D8

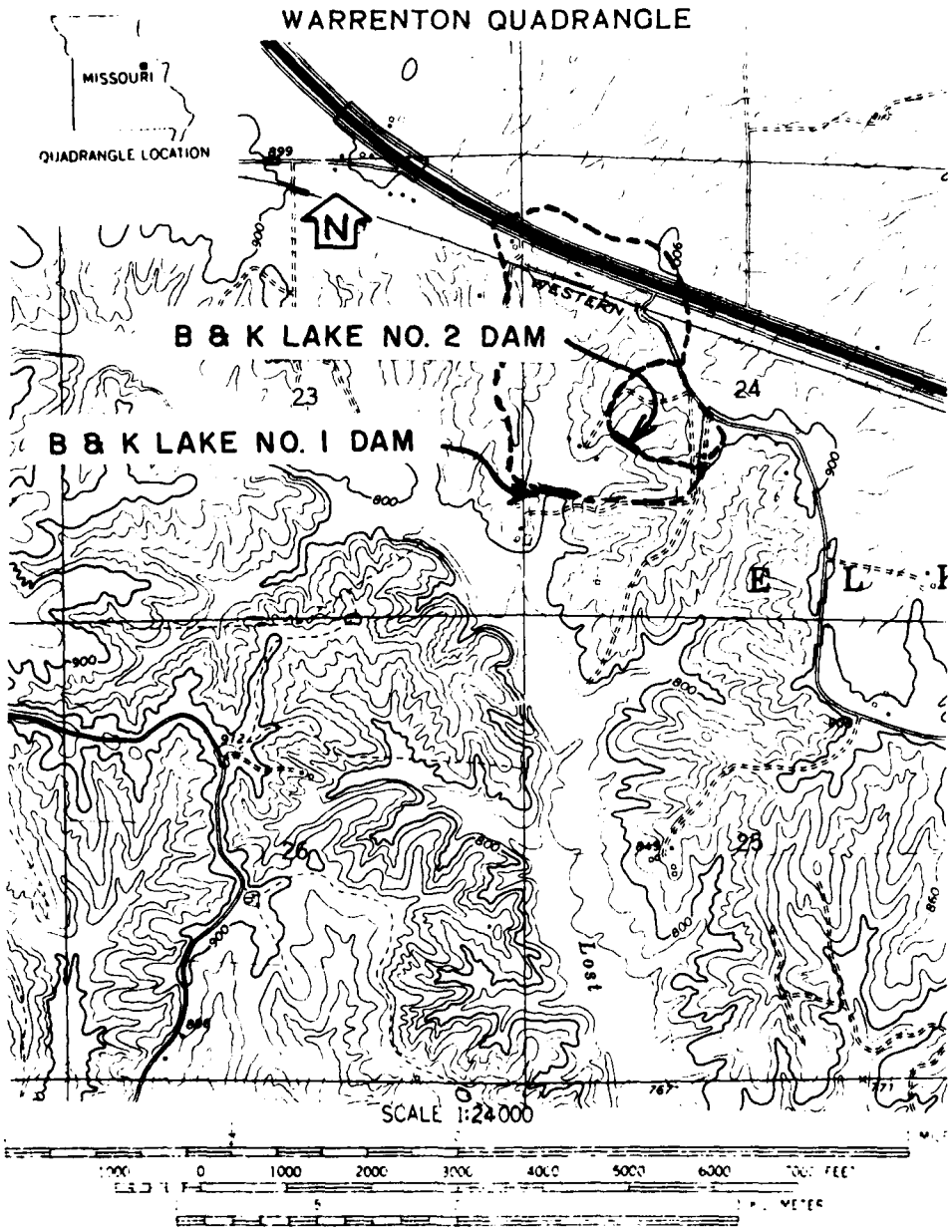
D9

D10

APPENDIX B

HYDROLOGIC COMPUTATIONS

PLATE 1, APPENDIX B



CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

DRAINAGE BOUNDARY — — — — —

B & K LAKE NO. 1 DAM (MO. 30506)
DRAINAGE BASIN

ECI-4 **PRC ENGINEERING CONSULTANTS, INC.**

Dam Safety Inspection – Missouri

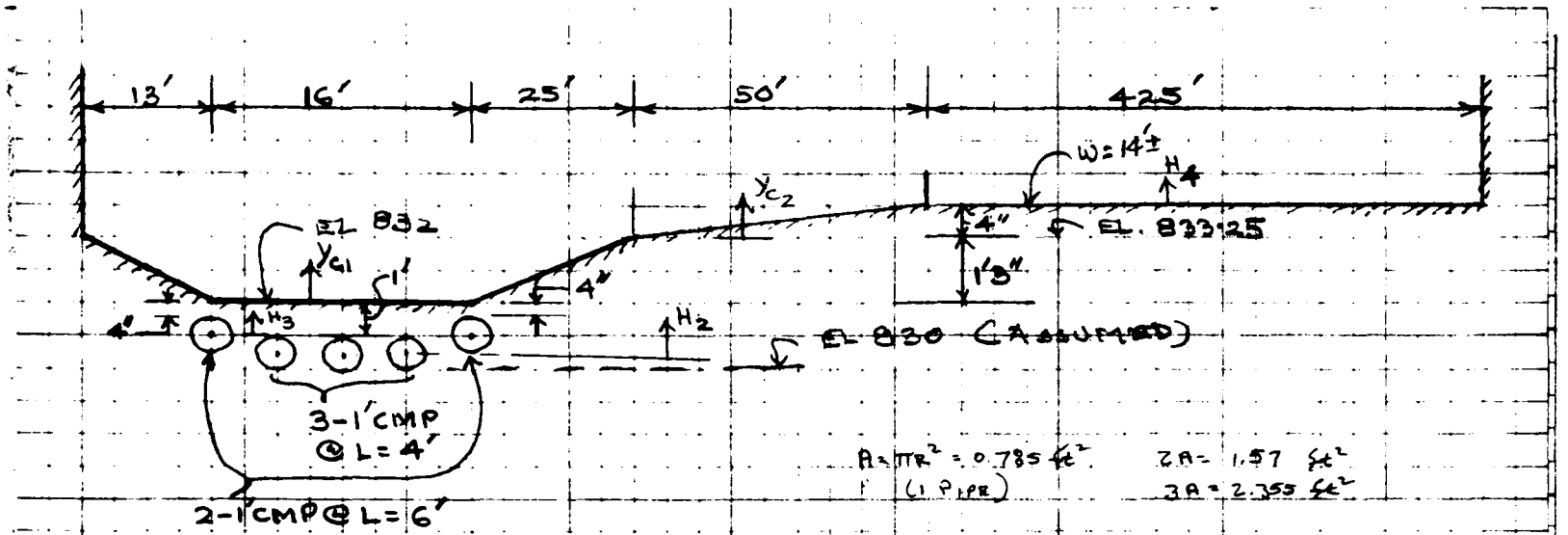
Big Lake No. 1 Dam

Spillway and Overtop

SHEET NO. 1 OF

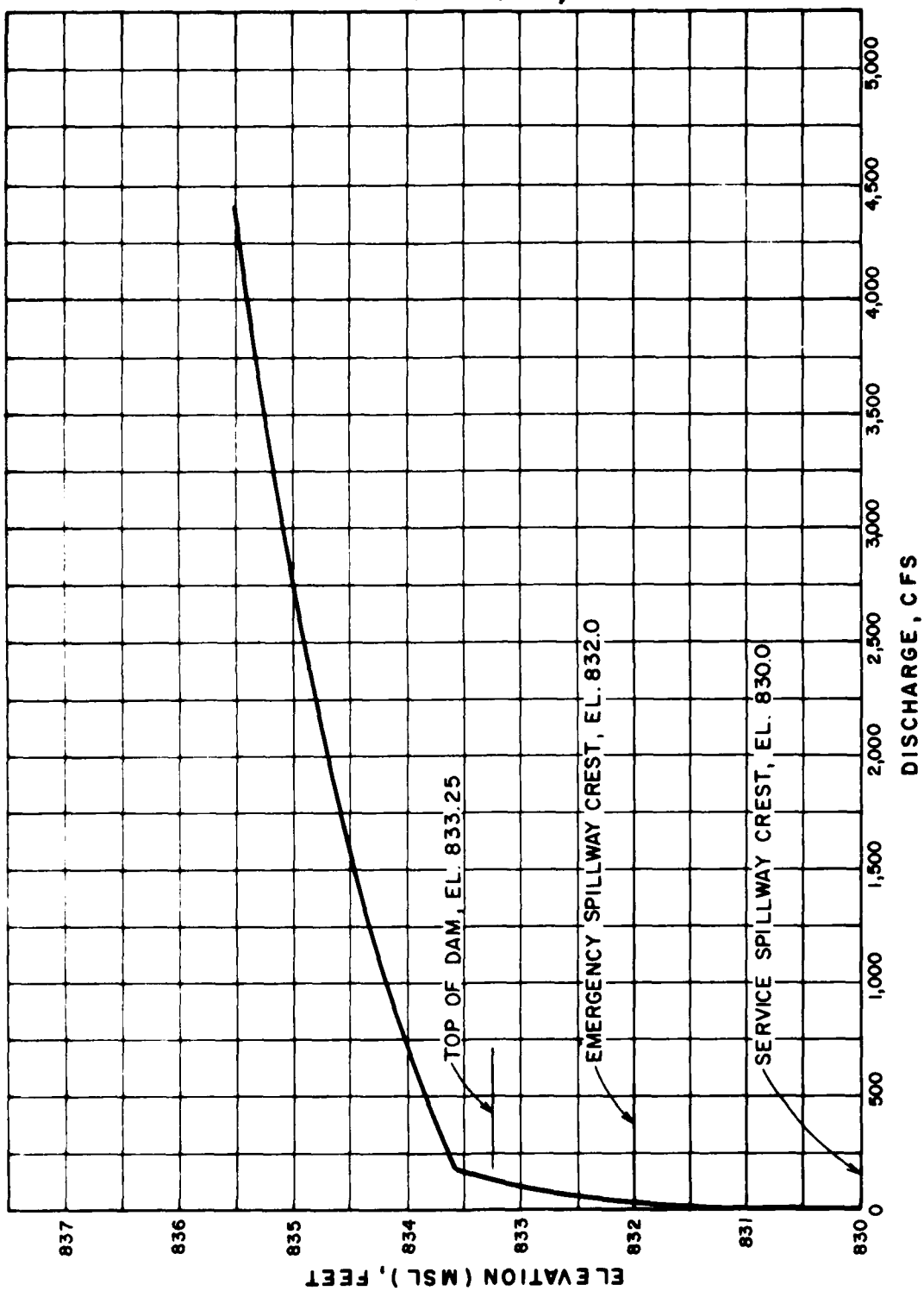
JOB NO. 1249

BY RW DATE 9-4-79



Y_{c1}	A_{c1}	T_{c1}	V_{c1} $5.67\sqrt{\frac{A_{c1}}{T_{c1}}}$	$\frac{V_{c1}^2}{2g}$	Q_{c1} = $A_{c1} \cdot V_{c1}$	US WS Elev. = 832 + $\frac{V_{c1}^2}{2g}$	H_2	$Q_2 = 0.7\sqrt{2gH_2}$	H_3	Q_3 $0.68A \cdot \sqrt{2gH_3}$	Y_{c2} (2/3 (US WS − 833.25))	A_{c2}	T_{c2}	V_{c2} = $5.67 \cdot \sqrt{\frac{A_{c2}}{T_{c2}}}$	Q_{c2} = $A_{c2} \cdot V_{c2}$	H_4	C_4	L_4	Q_4	Q_t = $Q_1 + Q_2 + Q_3 + Q_4$
0						832	1.5	16.2	1	8.57										24.8
0.5	11.8	31.2	3.49	0.19	41.2	832.69	2.19	19.6	1.69	11.14										71.9
1.0	31.2	46.4	4.65	0.34	145	833.34	2.84	22.3	2.34	13.1	0.06	0.27	9.0	0.98	0.26					180.7
1.25	47.8	54.0	5.10	0.40	243.4	833.65	3.15	23.5	2.65	13.9	0.27	5.4	40.0	2.08	11.2	0.07	2.66	425	209	293
2.00	84.3	54.0	7.08	0.78	596.8	834.78	4.28	27.9	3.78	16.6	1.02	48.7	50	5.24	253.7	1.70	2.64	425	1475	2,340
2.50	111.3	54.0	8.14	1.03	906	835.53	5.03	29.7	4.53	18.2	1.52	67.7	50	6.66	447	1.95	2.63	425	3044	4445

PLATE 2, APPENDIX-B



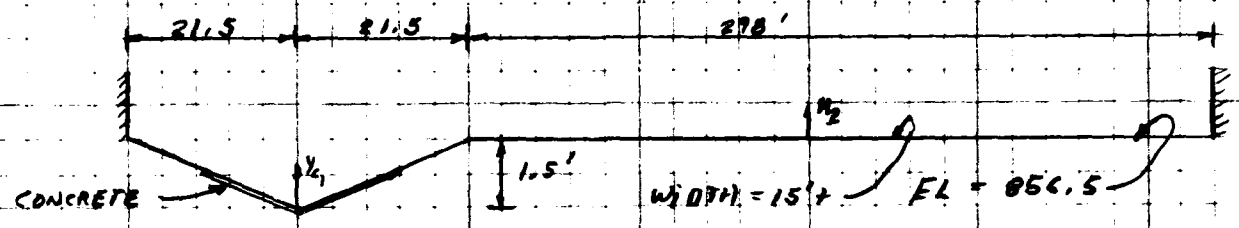
B & K LAKE NO. 1 DAM (MO. 30506)
SPILLWAY AND OVERTOP RATING CURVE

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 1 OF

B&K Lake No. 2 Dam, Upstream of B&K Lake No. 2 Dam JOB NO. EMP-0011-1

EMERGENCY SPILLWAY AND OVERTOP RATING CURVE BY KLG DATE 5-21-79

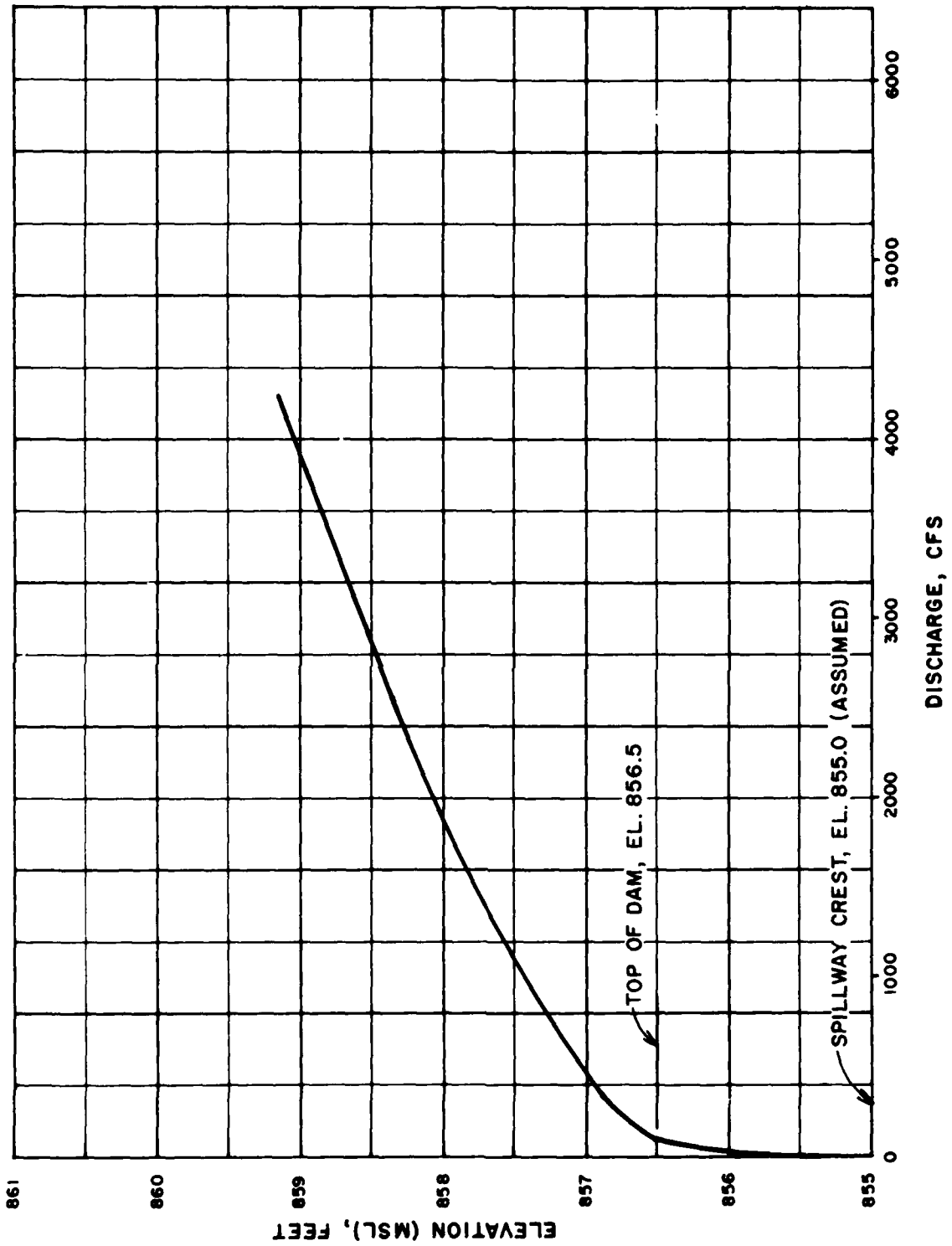


EL = 855 (ASSUMED)

CRITICAL DEPTH ASSUMED IN SPILLWAY SECTION.

Y_{c_1} (FT)	A_{c_1} (FT²)	T_{c_1} (FT)	$V_{c_1} = 5.67\sqrt{\frac{A_{c_1}}{T_{c_1}}}$	$\frac{V_{c_1}^2}{2g}$	$Q_{c_1} = A_{c_1} \cdot V_{c_1}$ (CFS)	U/S W.S. $= 855 + \frac{V_{c_1}^2}{2g} + Y_{c_1}$	H_2	C_2	L_2	$Q_2 = C_2 L_2 H_2^{3/2}$	$Q_T = Q_{c_1} + Q_2$
0	0	0	0	0	0	855	–	–	–	–	0
.5	3.58	14.33	2.84	0.12	10.17	855.62	–	–	–	–	10.17
1	14.33	28.67	4.01	0.25	57.46	856.25	–	–	–	–	57.46
1.5	32.25	43.0	4.91	0.37	158.35	856.87	.37	2.70	298	181.09	339.44
2.0	53.75	43.0	6.34	0.62	340.78	857.62	1.12	2.64	298	932.5	1273.28
2.5	75.25	43.0	7.50	0.87	564.38	858.37	1.87	2.63	298	2004.1	2568.55
3.0	96.75	43.0	8.51	1.12	823.34	859.12	2.62	2.63	298	3323.7	4147.06
3.5	118.25	43.0	9.40	1.37	1111.5	859.87	3.37	2.63	298	4848.6	5960.16
4.0	139.75	43.0	10.22	1.62	1428.25	860.62	4.12	2.63	298	6554.2	7982.42

PLATE-3, APPENDIX-B



B & K LAKE NO. 2 DAM
SPILLWAY & OVERTOP RATING CURVE

ECI-4 ENGINEERING CONSULTANTS, INC.

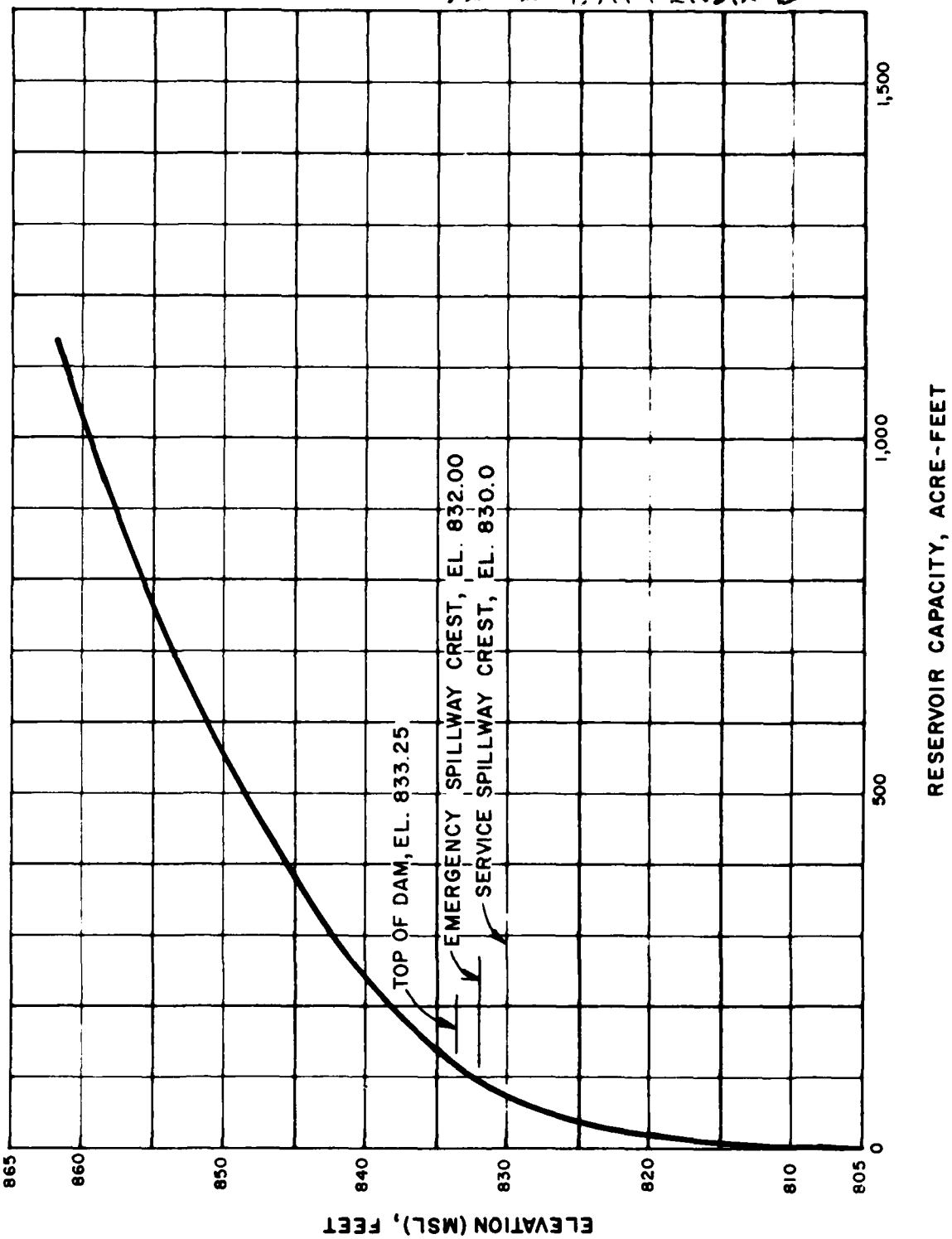
Dam Safety Inspection - Missouri SHEET NO. 1 OF
B&K Lake No. 2 Dam - #30506 JOB NO. 1240
Reservoir Area Capacity BY M.R.H. DATE 5-21-79

B&K Lake No. 1 Dam

Reservoir Area Capacity

Elev. M.S.L. (Ft.)	Reservoir Surface Area (Acres)	Incremental Volume (Ac.-ft.)	Total Volume (Ac.-ft.)	Remarks
806	0	0	0	Est. Streambed at Center of Dam.
830	9	72	72	Water Surface as shown on Quadrangle.
833.25	13.2	36	108	Top of dam.
840	25	122	234	Area measured on U.S.G.S. maps.
860	57	798	1032	Area measured on U.S.G.S. maps.

PLATE-4, APPENDIX-B



B & K LAKE NO. 1 DAM (MO. 30506)
RESERVOIR CAPACITY CURVE

ECI-4 ENGINEERING CONSULTANTS, INC.

Dam Safety Inspection - Missouri SHEET NO. 1 OF

B&K Lake No. 2 Dam Upstream of B&K Lake No. 1 Dam JOB NO. 1240

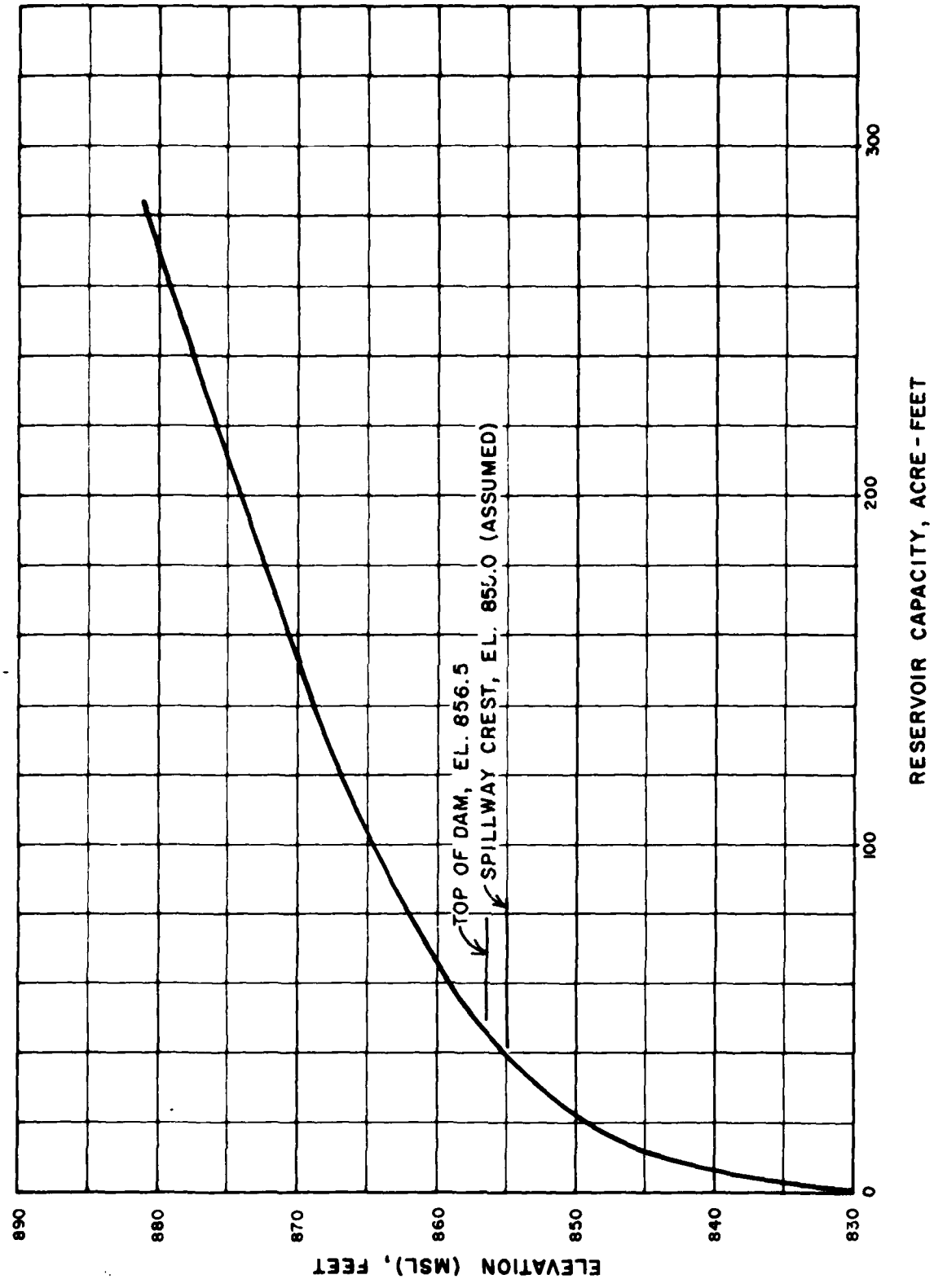
RESERVOIR AREA CAPACITY BY M.R.H. DATE 6-1-79

B&K Lake No. 2 Dam

RESERVOIR AREA CAPACITY

Elev. M.S.L. (Ft.)	Reservoir Surface Area (Acres)	Incremental Volume (Ac.-ft.)	Total Volume (Ac.-ft.)	Remarks
830	0	0	0	Est. Streambed Elev. at Dam.
855	4.7	39.2	39.2	W.S. as shown on U.S.G.S map (Elev. Assumed)
856.5	5.1	7.3	46.5	Top of Dam
860	6.1	19.6	66.1	Area as measured on U.S.G.S. map.
880	13.4	190.3	266.4	Area as measured on U.S.G.S. map.

PLATE-5, APPENDIX-B



B & K LAKE NO. 2 DAM
RESERVOIR CAPACITY CURVE

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / MISSOURI — SHEET NO. 1 OF
DAM # MO 30506 — JOB NO. 1240-001
PROBABLE MAXIMUM PRECIPITATION — BY MAG DATE 5/22/7

DAM NO MO 30506

DETERMINATION OF PMP

1. Determine drainage area of the basin

D.A. = 157 Ac = 0.25 Sq. mi

2. Determine PMP Index Rainfall

Location of centroid of basin:

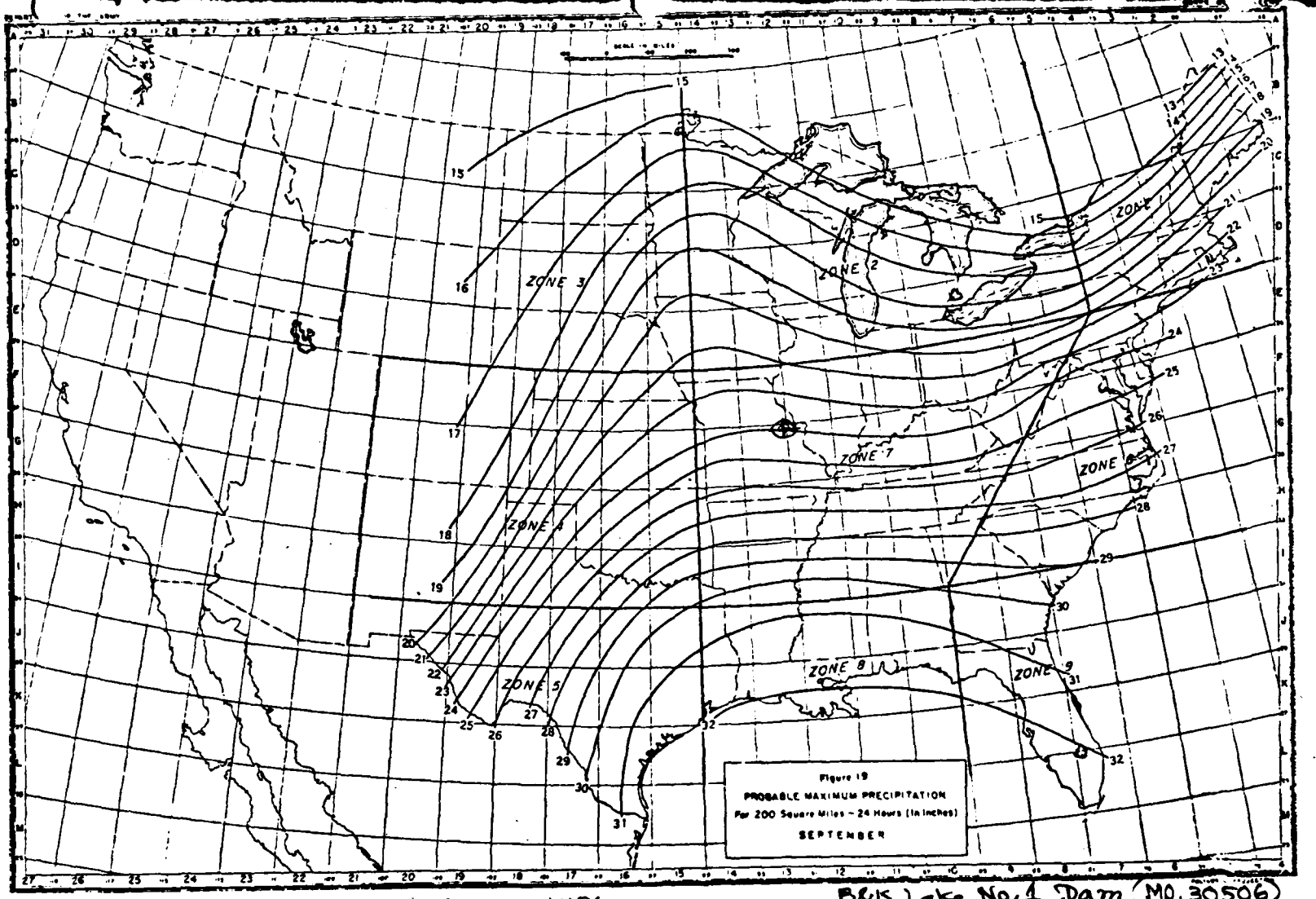
Long. = 91°12'57", Lat. = 38°40'59". ⇒ PMP = 24"
(From HMR #33, Fig 1)

3. Determine basin rainfall interms of percentage of PMP Index Rainfall for various durations:

Location: Long. = 91°12'57", Lat. = 38°40'59"

⇒ Zone 7

Duration (Hrs.)	Percent of Index Rainfall (%)	Total Rainfall (inches)	Rainfall Increments (inches)	Duration of Increment (Hrs.)
6	100	24	24.	6.
12	120	28.8	4.8	6
24	130	31.2	2.4	12



PMP FOR 200 SQ.MI.-24HRS
DURATION = 24"

B&K Lake No. 1 Dam (MO. 30506)
LOCATION OF CENTROID OF WATERSHED
LAT. = 38°40'59"; LONG. = 91°12'57"

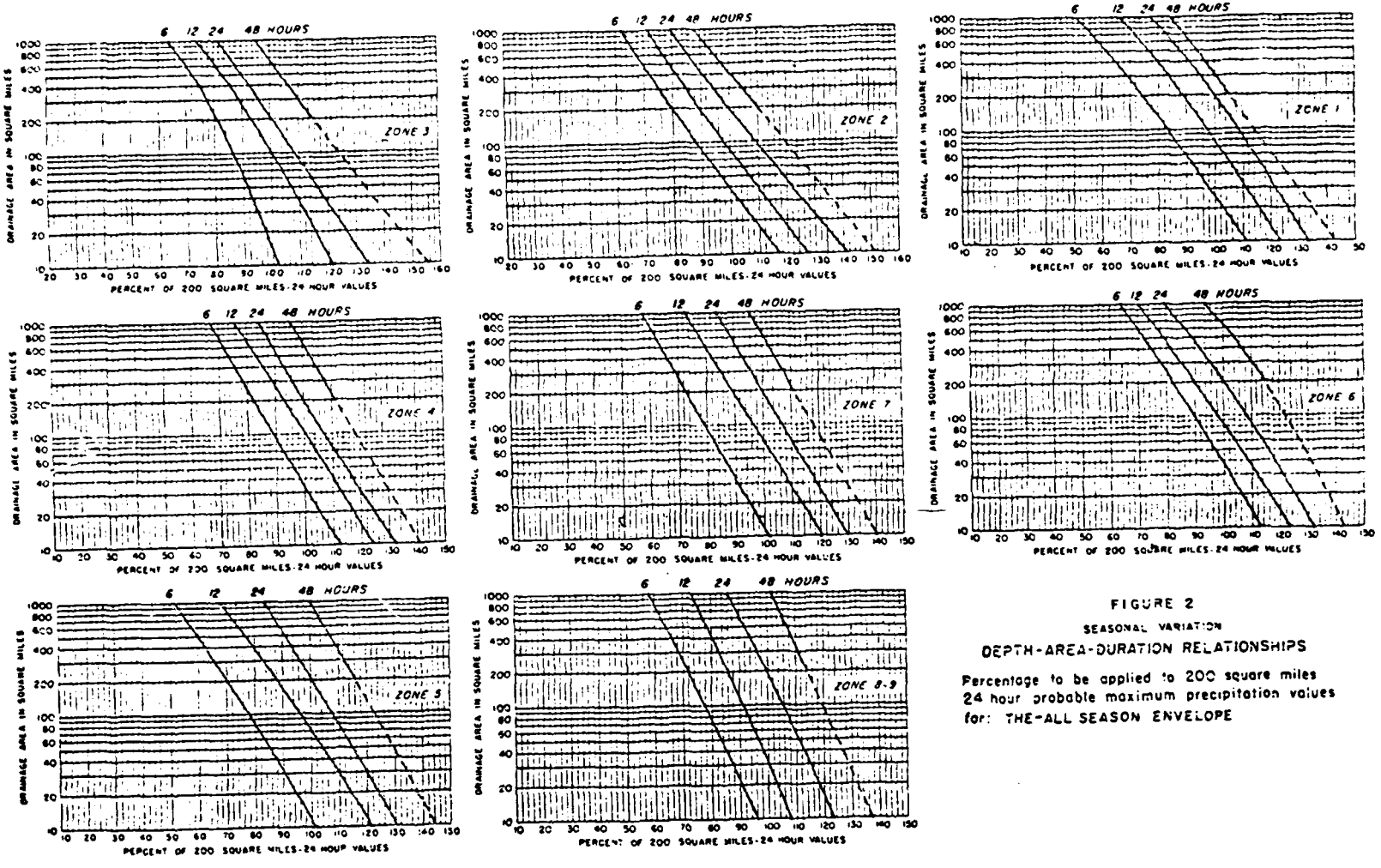


FIGURE 2

SEASONAL VARIATION

DEPTH-AREA-DURATION RELATIONSHIPS

Percentage to be applied to 200 square miles 24 hour probable maximum precipitation values for: THE-ALL SEASON ENVELOPE

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / MISSOURI — SHEET NO. 1 OF
B&K Lake No. 1 Dam (MO. 30506) — JOB NO. 1240-001
UNIT HYDROGRAPH PARAMETERS — BY MAB DATE 6-4-79

1. Drainage Area = 132 acres = 0.21 sq. mi.
2. Length of stream = (1.00" x 2000'/5280) = 0.38 miles
3. Elevation at drainage divide along the longest stream, $H_1 = 900'$
4. Reservoir elevation at spillway crest, $H_2 = 830'$
5. Difference in elevation, $\Delta H = 900 - 830 = 70'$
6. Time of concentration

a) By Kirpich formula:

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 0.38^3}{70}\right)^{0.385}$$

$$= 0.17 \text{ hr.}$$

b) By velocity estimate:

$$\text{Avg. Slope} = \frac{\Delta H}{L} = \frac{70}{2000} = 3.5\%$$

$\Rightarrow$ Avg. Velocity = 3 ft/sec

$$T_c = \frac{2000}{3 \times 60 \times 60} = 0.19 \text{ hr.}$$

Use $\underline{T_c = 0.18 \text{ hr}}$

7. Lag time, $L_t = 0.6 \times .18 = 0.11$ hr.
8. Unit duration, $D \leq \frac{L_t}{3} = 0.04 < 0.083$

Use $D = 0.083$ hr.

9. Time to peak, $T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + .11 = 0.15$ hr.
10. $q_p = \frac{484A}{T_p} = \frac{484 \times 0.21}{0.15} = 678$ cfs.

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / MISSOURI SHEET NO. 1 OF

B&K Lake No. 2 Dam U/S of B&K Lake No. 1 Dam JOB NO. 1240-001

UNIT HYDROGRAPH PARAMETERS BY MAS DATE 6-1-78

1. Drainage Area = 25 acres = 0.039 sq. mi.
2. Length of stream = (0.35 x 2000'/5280 ft/mi) = 0.13 miles
3. Elevation at drainage divide along the longest stream, $H_1 = 905'$
4. Reservoir elevation at spillway crest $H_2 = 850'$
5. Difference in elevation, $\Delta H = 905 - 855 = 50'$
6. Average slope of stream = $\frac{\Delta H}{L} = \frac{50}{700} = 7.14\%$
7. Time of Concentration

a) By Kirpich formula:

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times .13^3}{50}\right)^{0.385}$$

$$= 0.06 \text{ hour}$$

b) By velocity estimate:

Avg slope = 7.14% ⇒ Avg. velocity ≈ 5 ft/sec.

$$T_c = \frac{700}{5 \times 3600} = 0.04 \text{ hr.}$$

Use $T_c = 0.083$ hr to meet the Corps criteria of Minimum D = 5 minutes

8. Lag time, $L_t = 0.6 \times 0.083 = 0.05$ hr.
9. Unit duration: Use Minimum D = 5 minutes to meet the Corps criteria
10. Time to peak, $T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + 0.05 = 0.092$ hr.
11. $q_p = \frac{484A}{T_p} = \frac{484 \times .039}{0.092} = 205$ cfs

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / MISSOURI SHEET NO. 1 OF
B&K LAKE NO. 1 DAM (MO. 30506) JOB NO. 1240-001
DETERMINATION OF SOIL GROUP & CURVE NUMBER BY MAS DATE 6-1-79

MISSOURI DAM # MO. 30506

DETERMINATION OF HYDROLOGIC SOIL GROUP & SCS CURVE NUMBER

1. The Soils in the watershed consist of C & D group Soils. The 'C' group Soil seems to be predominent.

   Assume Soil group 'C' for the entire watershed.

2. Most of the watershed is wooded and covered with grass. Assume 'Fair' condition for infiltration purpose.

   Thus

   CN = 73 for Soil group 'C' & AMC-II

   ⇒ CN = 87 for AMC-III.

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / MISSOURI SHEET NO. 1 OF

B & K Lake No. 2 Dam U/S of B&K Lake No 1 Dam JOB NO. 1240-001

DETERMINATION OF SOIL GROUP & CURVE NUMBER BY MAS DATE 6-1-79

B&K LAKE NO. 2 DAM UPSTREAM OF B&K LAKE NO. 1 DAM

DETERMINATION OF HYDROLOGIC SOIL GROUP & SCS CURVE NUMBER

1. The soils in the watershed consist of C & D group soils but D group soil is predominent

   Assume 'D' group soil for this subwatershed.

2. Most of the watershed area is wooded and covered with grass. Assume 'Fair' condition for infiltration.

   Thus CN = 79 for soil group D & AMC-II

   ⇒ CN = 91 for AMC-III

HEC1DB INPUT DATA

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*****************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
*****************************

A                    DAM SAFETY INSPECTION - MISSOURI
A                      B AND K LAKE NO1 DAM (30506)
A                 PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING
B    300       0       5       0       0       0       0       0       0       0
B     3
J       1       2       1
J1    1.0     0.5
B       0*    0/51                                          1
K1  INPUT PRECIPITATION INDEX, RATIOS AND UNIT HYDROGRAPH PARAMETERS
M       1       2    0.039           0.039     1.0
P            24.0     100     120     130
T                                                     -1     -91
W            0.06
K       0       1
K       1    0/51                                     1
K1 ROUTE HYDROGRAPH THROUGH UPSTREAM DAM TO B AND K LAKE NO1 DAM( 30506 )
Y                                   1       1
Y1      1                                           -855.0      -1
Y4855.0   855.62  856.25  856.30  856.87  857.62  858.37  859.12  859.87  860.62
Y5      0.      10.     97.     102.    373.    1273.   2549.   4147.   5940.   7982.
SE      0.      39.     46.5    66.1    266.4
SE    830.     855.    856.5    860.    880.
SS 855.0
SD 856.5
K       0    3350                                     1
K1  INPUT INDEX PRECIPITATION, RATIOS, AND SCS UNIT HYDROGRAPH PARAMETERS
M       1       2    0.21            0.21     1.0
P            24.0     100     120     130
T                                                     -1    -87.0
W2           0.11
K       0       0       1
K       2   30506                                     1
K1  COMBINE HYDROGRAPHS BEFORE ROUTING THROUGH B AND K LAKE NO1 DAM( 30506 )
K       1   30506                                     1
K1  ROUTE COMBINED HYDROGRAPH THROUGH B AND K LAKE NO1 DAM( 30506 )
Y                                   1       1
Y1      1                                           -930.0      -1
Y4 830.0  832.80  832.69  833.25  833.34  833.65  834.78  835.53
Y5      0.      24.8    71.9    125     180.7   293     2340    9445
SS      0.      72.     108.    239.    1032.
SE    806.     830.    833.25  840.    850.
SS 830.
SD833.25
ZZ      99
```

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```
RUNOFF HYDROGRAPH AT        W/S1
ROUTE HYDROGRAPH TO         U/S1
RUNOFF HYDROGRAPH AT        30506
COMBINING 2 HYDROGRAPHS AT  30506
ROUTE HYDROGRAPH TO         30506
END OF NETWORK
```

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
LAST MODIFICATION   6 FEB 79
**********************************

RUN DATE = 79/03/09.
TIME = 1.07.16.

                    DAM SAFETY INSPECTION - MISSOURI
                    BLACK LAKE NO1 DAM (79006)
                PMF AND 5 PERCENT PMF DETERMINATION AND ROUTING

                              JO SPECIFICATION
          NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
         100      0       0       0       0       0       0       0       0       0
                                JOPER     NWT    LROPT   TRACE
                                            0       0       0

                    MULTI-PLAN ANALYSES TO BE PERFORMED
                              NPLAN= 1 NRTIO= 1 LRTIO= 1

          RTIOS=   1.00    .00

**********  **********  **********  **********  **********

                         SUB-AREA RUNOFF COMPUTATION

          INPUT PRECIPITATION INDEX, RATIOS AND UNIT HYDROGRAPH PARAMETERS

                    ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                     0/S1       0       0       0       0       0       1       0       0

                                  HYDROGRAPH DATA
          IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
              1       2     .60    0.00     .04    1.00   0.000       0       0

                                  PRECIP DATA
                    SPFE     PMS      R6     R12     R24     R48     R72     R96
                    0.00   24.00  100.00  120.00  130.00    0.00    0.00    0.00

                                  LOSS DATA
          LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
              0    0.00    0.00    1.00    0.00   0.00    1.00   -1.00  -91.00    0.00    0.00

          CURVE NO =  -91.00  WETNESS=  -91.00  EFFECT CN =  91.00

                                UNIT HYDROGRAPH DATA
                    TC=   0.00    LAG=    .05

                                RECESSION DATA
                    STRTQ=    0.00    QRCSN=    0.00    RTIOR= 1.00

          TIME INCREMENT TOO LARGE--(NHO IS GT LAG/2)

          UNIT HYDROGRAPH  5 END OF PERIOD ORDINATES, TC=    0.00 HOURS, LAG=    .00  VOL= 1.00
```

	209.	77.	198	4.	1.								

END-OF-PERIOD FLO.

HO.MA	TIME	PERIOD	RAIN	EXCS	LOSS	COMP Q	HO.MA	TIME	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.0	1	.01	0.00	.01	0.	1.01	11.55	151	.20	.20	.00	59.
1.01	[illegible]	[illegible]	.01	0.00	.01	0.	1.01	12.00	152	.20	.20	.00	59.
1.01	[illegible]	3	.01	0.00	.01	0.	1.01	12.05	153	.20	.20	.00	63.
1.01	[illegible]	4	.01	0.00	.01	0.	1.01	12.10	154	.20	.20	.00	0.
1.01	[illegible]		.01	0.00	.01	0.	1.01	12.15	155	.20	.20	.00	0.
1.01	[illegible]	5	.01	0.00	.01	0.	1.01	12.20	156	.20	.20	.00	60.
1.01	[illegible]	6	.01	0.00	.01	0.	1.01	12.25	157	.24	.24	.00	58.
1.01	.40		.01	0.00	.01	0.	1.01	12.30	158	.24	.24	.00	71.
1.01	.45	9	.01	0.00	.01	0.	1.01	12.35	159	.24	.24	.00	71.
1.01	.50	10	.01	0.00	.01	0.	1.01	12.40	160	.24	.24	.00	72.
1.01	.55	11	.01	0.00	.01	0.	1.01	12.45	161	.24	.24	.00	72.
1.01	1.00	12	.01	0.00	.01	0.	1.01	12.50	162	.24	.24	.00	72.
1.01	1.05	13	.01	0.00	.01	0.	1.01	12.55	163	.24	.24	.00	72.
1.01	1.10	14	.01	0.00	.01	0.	1.01	13.00	164	.24	.24	.00	72.
1.01	1.15	15	.01	.00	.01	0.	1.01	13.05	165	.24	.24	.00	72.
1.01	1.20	16	.01	.00	.01	0.	1.01	13.10	166	.24	.24	.00	72.
1.01	1.25	17	.01	.00	.01	0.	1.01	13.15	167	.24	.24	.00	72.
1.01	1.30	18	.01	.00	.01	0.	1.01	13.20	168	.24	.24	.00	72.
1.01	1.35	19	.01	.00	.01	0.	1.01	13.25	169	.24	.24	.00	84.
1.01	1.40	20	.01	.00	.01	0.	1.01	13.30	170	.30	.30	.00	89.
1.01	1.45	21	.01	.00	.01	1.	1.01	13.35	171	.30	.30	.00	90.
1.01	1.50	22	.01	.00	.01	1.	1.01	13.40	172	.30	.30	.00	90.
1.01	1.55	23	.01	.00	.01	1.	1.01	13.45	173	.30	.30	.00	90.
1.01	2.00	24	.01	.00	.01	1.	1.01	13.50	174	.30	.30	.00	90.
1.01	2.05	25	.01	.00	.01	1.	1.01	13.55	175	.30	.30	.00	90.
1.01	2.10	26	.01	.00	.01	1.	1.01	14.00	176	.30	.30	.00	90.
1.01	2.15	27	.01	.00	.01	1.	1.01	14.05	177	.30	.30	.00	90.
1.01	2.20	28	.01	.00	.01	1.	1.01	14.10	178	.30	.30	.00	90.
1.01	2.25	29	.01	.00	.01	1.	1.01	14.15	179	.30	.30	.00	90.
1.01	2.30	30	.01	.00	.01	1.	1.01	14.20	180	.30	.30	.00	90.
1.01	2.35	31	.01	.00	.01	1.	1.01	14.25	181	.18	.18	.00	87.
1.01	2.40	32	.01	.00	.01	1.	1.01	14.30	182	.36	.36	.00	94.
1.01	2.45	33	.01	.00	.01	1.	1.01	14.35	183	.36	.36	.00	106.
1.01	2.50	34	.01	.00	.01	1.	1.01	14.40	184	.55	.55	.00	146.
1.01	2.55	35	.01	.01	.01	1.	1.01	14.45	185	.64	.64	.00	175.
1.01	3.00	36	.01	.01	.01	2.	1.01	14.50	186	1.55	1.55	.00	375.
1.01	3.05	37	.01	.01	.01	2.	1.01	14.55	187	2.55	2.55	.01	647.
1.01	3.10	38	.01	.01	.01	2.	1.01	15.00	188	1.00	1.00	.00	420.
1.01	3.15	39	.01	.01	.01	2.	1.01	15.05	189	.64	.64	.00	200.
1.01	3.20	40	.01	.01	.01	2.	1.01	15.10	190	.55	.55	.00	159.
1.01	3.25	41	.01	.01	.01	2.	1.01	15.15	191	.36	.36	.00	133.
1.01	3.30	42	.01	.01	.01	2.	1.01	15.20	192	.36	.36	.00	110.
1.01	3.35	43	.01	.01	.01	2.	1.01	15.25	193	.28	.28	.00	94.
1.01	3.40	44	.01	.01	.01	2.	1.01	15.30	194	.28	.28	.00	85.
1.01	3.45	45	.01	.01	.01	2.	1.01	15.35	195	.28	.28	.00	85.
1.01	3.50	46	.01	.01	.01	2.	1.01	15.40	196	.28	.28	.00	84.
1.01	3.55	47	.01	.01	.01	2.	1.01	15.45	197	.28	.28	.00	84.
1.01	4.00	48	.01	.01	.01	2.	1.01	15.50	198	.28	.28	.00	84.
1.01	4.05	49	.01	.01	.01	2.	1.01	15.55	199	.28	.28	.00	84.
1.01	4.10	50	.01	.01	.01	2.	1.01	16.00	200	.28	.28	.00	84.
1.01	4.15	51	.01	.01	.01	2.	1.01	16.05	201	.28	.28	.00	84.
1.01	4.20	52	.01	.01	.01	2.	1.01	16.10	202	.28	.28	.00	84.
1.01	4.25	53	.01	.01	.01	2.	1.01	16.15	203	.28	.28	.00	84.
1.01	4.30	54	.01	.01	.01	2.	1.01	16.20	204	.28	.28	.00	84.
1.01	4.35	55	.01	.01	.01	2.	1.01	16.25	205	.22	.22	.00	72.

1.01	4.4	56	.01	.01	.01	5.	1.01	17.10	206	.02	.02	.00	68.
1.01	4.45	57	.01	.01	.01	5.	1.01	17.15	207	.02	.02	.00	67.
1.01	4.50	58	.01	.01	.01	5.	1.01	17.20	208	.02	.02	.00	66.
1.01	4.55	[illegible]	.01	.01	.01	5.	1.01	17.25	209	.02	.02	.00	66.
1.01	[illegible]	[illegible]	.01	.01	.01	5.	1.01	17.30	210	.02	.02	.00	66.
1.01	[illegible]	[illegible]	.01	.01	.01	5.	1.01	17.35	211	.02	.02	.00	66.
1.01	4.10	62	.01	.01	.01	5.	1.01	17.40	212	.02	.02	.00	66.
1.01	[illegible]	63	.01	.01	.01	5.	1.01	17.45	213	.02	.02	.00	66.
1.01	[illegible]	64	.01	.01	.00	5.	1.01	17.50	214	.02	.02	.00	66.
1.01	[illegible]	65	.01	.01	.00	5.	1.01	17.55	215	.02	.02	.00	66.
1.01	[illegible]	66	.01	.01	.00	5.	1.01	18.00	216	.02	.02	.00	[illegible]
1.01	[illegible]	67	.01	.01	.00	5.	1.01	18.05	217	.02	.02	.00	16.
1.01	[illegible]	68	.01	.01	.00	5.	1.01	18.10	218	.02	.02	.00	11.
1.01	[illegible]	69	.01	.01	.00	5.	1.01	18.15	219	.02	.02	.00	7.
1.01	.50	70	.01	.01	.00	5.	1.01	18.20	220	.02	.02	.00	6.
1.01	.55	71	.01	.01	.00	5.	1.01	18.25	221	.02	.02	.00	6.
1.01	[illegible]	72	.01	.01	.00	5.	1.01	18.30	222	.02	.02	.00	6.
1.01	[illegible]	73	.07	.05	.01	13.	1.01	18.35	223	.02	.02	.00	6.
1.01	6.1	74	.07	.05	.01	13.	1.01	18.40	224	.02	.02	.00	6.
1.01	.15	75	.07	.05	.01	14.	1.01	18.45	225	.02	.02	.00	7.
1.01	6.20	76	.07	.05	.01	15.	1.01	18.50	226	.02	.02	.00	6.
1.01	6.25	77	.07	.05	.01	15.	1.01	18.55	227	.02	.02	.00	6.
1.01	6.30	78	.07	.05	.01	15.	1.01	19.00	228	.02	.02	.00	6.
1.01	6.35	79	.07	.05	.01	15.	1.01	19.05	229	.02	.02	.00	6.
1.01	6.40	80	.07	.05	.01	15.	1.01	19.10	230	.02	.02	.00	6.
1.01	6.45	81	.07	.05	.01	16.	1.01	19.15	231	.02	.02	.00	6.
1.01	6.50	82	.07	.06	.01	17.	1.01	19.20	232	.02	.02	.00	6.
1.01	6.55	83	.07	.06	.01	17.	1.01	19.25	233	.02	.02	.00	6.
1.01	7.00	84	.07	.06	.01	17.	1.01	19.30	234	.02	.02	.00	6.
1.01	7.05	85	.07	.06	.01	17.	1.01	19.35	235	.02	.02	.00	6.
1.01	7.10	86	.07	.06	.01	17.	1.01	19.40	236	.02	.02	.00	6.
1.01	7.15	87	.07	.06	.01	17.	1.01	19.45	237	.02	.02	.00	6.
1.01	7.20	88	.07	.06	.01	17.	1.01	19.50	238	.02	.02	.00	6.
1.01	7.25	89	.07	.06	.01	17.	1.01	19.55	239	.02	.02	.00	6.
1.01	7.30	90	.07	.06	.01	18.	1.01	20.00	240	.02	.02	.00	6.
1.01	7.35	91	.07	.06	.01	18.	1.01	20.05	241	.02	.02	.00	6.
1.01	7.40	92	.07	.06	.01	18.	1.01	20.10	242	.02	.02	.00	6.
1.01	7.45	93	.07	.06	.01	18.	1.01	20.15	243	.02	.02	.00	6.
1.01	7.50	94	.07	.06	.01	18.	1.01	20.20	244	.02	.02	.00	6.
1.01	7.55	95	.07	.06	.01	18.	1.01	20.25	245	.02	.02	.00	6.
1.01	8.00	96	.07	.06	.01	18.	1.01	20.30	246	.02	.02	.00	6.
1.01	8.05	97	.07	.06	.01	18.	1.01	20.35	247	.02	.02	.00	6.
1.01	8.10	98	.07	.06	.01	18.	1.01	20.40	248	.02	.02	.00	6.
1.01	8.15	99	.07	.06	.01	19.	1.01	20.45	249	.02	.02	.00	6.
1.01	8.20	100	.07	.06	.01	19.	1.01	20.50	250	.02	.02	.00	6.
1.01	8.25	101	.07	.06	.00	19.	1.01	20.55	251	.02	.02	.00	6.
1.01	8.30	102	.07	.06	.00	19.	1.01	21.00	252	.02	.02	.00	6.
1.01	8.35	103	.07	.06	.00	19.	1.01	21.05	253	.02	.02	.00	6.
1.01	8.40	104	.07	.06	.00	19.	1.01	21.10	254	.02	.02	.00	6.
1.01	8.45	105	.07	.06	.00	19.	1.01	21.15	255	.02	.02	.00	6.
1.01	8.50	106	.07	.06	.00	19.	1.01	21.20	256	.02	.02	.00	6.
1.01	8.55	107	.07	.06	.00	19.	1.01	21.25	257	.02	.02	.00	6.
1.01	9.00	108	.07	.06	.01	19.	1.01	21.30	258	.02	.02	.00	6.
1.01	9.05	109	.07	.06	.00	19.	1.01	21.35	259	.02	.02	.00	6.
1.01	9.10	110	.07	.06	.00	19.	1.01	21.40	260	.02	.02	.00	6.
1.01	9.15	111	.07	.06	.00	19.	1.01	21.45	261	.02	.02	.00	6.
1.01	9.20	112	.07	.06	.00	19.	1.01	21.50	262	.02	.02	.00	6.
1.01	9.25	113	.07	.06	.00	19.	1.01	21.55	263	.02	.02	.00	6.
1.01	9.30	114	.07	.06	.00	19.	1.01	22.00	264	.02	.02	.00	6.
1.01	9.35	115	.07	.06	.00	19.	1.01	22.05	265	.02	.02	.00	6.

1.01	[illegible]	[illegible]	.07	.06	.00	17.	1.01	[illegible]	[illegible]	.02	[illegible]	[illegible]	7.
1.01	[illegible]	[illegible]	.07	.06	.00	17.	1.01	[illegible]	[illegible]	.02	.02	.0	6.
1.01	[illegible]	[illegible]	.07	.06	.00	17.	1.01	[illegible]	[illegible]	.02	.02	.00	7.
[illegible]	[illegible]	[illegible]	.07	.06	[illegible]	17.	1.01	[illegible]	[illegible]	.02	[illegible]	.00	6.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17.	[illegible]	[illegible]	[illegible]	.02	[illegible]	[illegible]	5.
1.01	[illegible]	[illegible]	.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.01	[illegible]	[illegible]	[illegible]	.06	[illegible]	17.	1.01	[illegible]	[illegible]	.02	.02	.00	6.
1.01	10.[illegible]	[illegible]	.07	.06	.00	17.	1.01	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	10.[illegible]	[illegible]	.07	.06	.00	17.	[illegible]	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	[illegible]	[illegible]	[illegible]	.06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02	.02	.00	6.
1.01	10.30	[illegible]	.07	.06	[illegible]	17.	1.01	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17.	1.01	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	10.[illegible]	[illegible]	.07	.06	[illegible]	17.	1.01	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	10.45	[illegible]	[illegible]	[illegible]	[illegible]	17.	1.01	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	10.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	10.55	131	.07	.06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	11.10	134	.07	.06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02	.02	.00	6.
[illegible]	11.15	135	.07	.06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02	[illegible]	[illegible]	[illegible]
1.01	11.20	[illegible]	.07	.06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02	.02	[illegible]	[illegible]
[illegible]	11.25	[illegible]	.07	.06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02	.02	[illegible]	6.
[illegible]	11.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.02	.02	[illegible]	6.
[illegible]	11.[illegible]	[illegible]	.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.
1.01	11.40	[illegible]	.07	[illegible]	[illegible]	2.	1.	[illegible]	[illegible]	0.00	0.00	.0	0.
1.01	11.45	141	.07	.07	[illegible]	20.	[illegible]	[illegible]	[illegible]	0.00	0.00	[illegible]	0.
[illegible]	11.50	[illegible]	.07	.07	[illegible]	23.	[illegible]	[illegible]	[illegible]	0.00	0.00	[illegible]	0.
1.01	[illegible]	[illegible]	.07	.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.00	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	.07	.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.00	0.00	[illegible]	0.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.00	0.00	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.	[illegible]	[illegible]	[illegible]	0.00	0.00	[illegible]	[illegible]
1.01	12.10	[illegible]	.09	.09	[illegible]	5.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59.	[illegible]	[illegible]	[illegible]	0.00	0.00	[illegible]	0.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59.	1.02	[illegible]	[illegible]	[illegible]	[illegible]	0.02	0.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.01	12.30	[illegible]	.09	.09	[illegible]	[illegible]	1.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
										SUM	31.[illegible]	39.34	1.16	[illegible]
											([illegible])(753.)([illegible]		29.61)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	647.	[illegible]	51.	[illegible]	[illegible]
CMS	[illegible]	[illegible]	1.	1.	[illegible]
INCHES		[illegible]3.78	39.34	[illegible]	39.34
MM		[illegible]	753.11	[illegible]	[illegible]
AC-FT		[illegible]	42.	6.	[illegible]
THOUS CU M		61.	77.	77.	77.

HYDROGRAPH AT STA U/S1 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	[illegible]	[illegible]	[illegible]
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	10.	17.	17.	15.	1[illegible].	16.	1[illegible].	1[illegible].	1[illegible].
16.	17.	17.	17.	17.	17.	17.	18.	18.	18.	18.
18.	18.	19.	19.	19.	19.	19.	19.	19.	19.	19.

```
    19.       19.       19.       19.       19.       19.       19.       19.       19.       19.
    19.       19.       19.       19.       19.       19.       19.       19.       19.       19.
    19.       19.       19.       19.       19.       19.       19.       19.       19.       19.
    20.  [illegible] [illegible]   2[illegible]. [illegible] [illegible] [illegible] 20. [illegible] 20.
    2[illegible].  20.       20.       20.  [illegible] [illegible] [illegible]     59.       59.       59.
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] 71.    71.       72.
[illegible]   72.       72.       72.       72.  [illegible] [illegible]  72.       84.       85.
[illegible]   90.       90.  [illegible] [illegible] [illegible] [illegible]  90.       90.       90.
    67.       94.      1[illegible].  14[illegible].  179.   373.  [illegible]  429.     256.     189.
   1[illegible]3.  113.  [illegible] [illegible] [illegible]  4.      84.  [illegible]   84.       84.
[illegible] [illegible] [illegible] [illegible]  7[illegible]. [illegible] [illegible] [illegible]  5[illegible].  36.
[illegible]   55.  [illegible] [illegible] [illegible] [illegible] [illegible]   11.  [illegible]     6.
     6.        6.        6.        6.  [illegible] [illegible] [illegible]    6.  [illegible]     6.
[illegible] [illegible]   7.  [illegible] [illegible]    6.        6.        6.        6.        6.
     5.        6.  [illegible] [illegible] [illegible]   6.        6.        6.        6.        6.
[illegible]    6.  [illegible] [illegible] [illegible] [illegible] [illegible]   5.        6.        6.
[illegible]    6.  [illegible] [illegible]    6.        6.        6.        6.        6.        5.
[illegible]    6.        6.  [illegible] [illegible]    6.  [illegible]    6.        6.        6.
[illegible]    6.        6.  [illegible]    6.        6.  [illegible]    6.        2.  [illegible]
     0.        0.  [illegible]    0.        3.        0.  [illegible]    0.        0.        0.

                       PEAK     6-HOUR    24-HOUR   72-HOUR   TOTAL VOLUME
               CFS    [illegible]7.   [illegible].   [illegible].   [illegible].   [illegible].
               CMS     10.         [illegible].        1.        1.        [illegible]57.
            INCHES             2[illegible].[illegible]8  3[illegible].0[illegible]  3[illegible].0[illegible]  [illegible]
                MM             6[illegible].[illegible]   76[illegible].[illegible]1  763.11   763.11
             AC-FT              [illegible]9.       62.       62.       62.
          THOUS CU M            [illegible].       77.       77.       77.

              HY[illegible]OGRAPH AT STA  U/S1 FOR PLAN 1, RTIO [illegible]
     0.        0.  [illegible]    0.        0.        0.        0.        0.        0.        0.
     0.        0.  [illegible]    1.  [illegible]    0.        0.        0.        0.        0.
     0.        0.  [illegible]    0.        0.        0.  [illegible]    1.        1.        1.
     1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
     1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
     1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
     1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
     1.        1.  [illegible]    7.        7.        7.        9.        8.        8.        8.
     8.        8.        9.  [illegible]    9.        9.        9.        9.        9.        9.
     9.        9.        9.        9.        9.        9.        9.        9.        9.        9.
     9.        9.        9.        9.        9.        9.        9.        9.        9.       10.
    10.       10.       10.       10.       10.       10.       10.       10.       10.       10.
    10.       10.       10.       10.       10.       10.       10.       10.       10.       10.
    10.       10.       10.       10.       10.       10.       10.       10.       10.       10.
    10.       10.       10.       10.       2[illegible].  28.   2[illegible].  30.    3[illegible].  30.
    30.       30.       30.       30.       30.      3[illegible].  3[illegible].  35.       36.  [illegible]
    35.       36.       36.  [illegible] [illegible]   36.       36.       36.       42.       44.
    45.       45.       45.       45.       45.       4[illegible].  45.       4[illegible].  45.       45.
   [illegible]3.  47.  [illegible]    7[illegible].  89.      186.     3[illegible].   215.     12[illegible].  [illegible]5.
   [illegible]7.  [illegible]7.  42.     43.  [illegible]   42.       42.       42.       42.       42.
    42.       42.       42.       4[illegible]. [illegible]   34.       33.       33.       33.       33.
[illegible]   33.       33.      [illegible]5.   5[illegible].   13.       13.        5.        4.        3.
     3.        3.        3.  [illegible] [illegible] [illegible]    3.        3.        3.  [illegible]
     3.        3.  [illegible] [illegible] [illegible] [illegible] [illegible]   3.        3.        3.
     3.        3.  [illegible]    3.        3.        3.        3.        3.        3.        3.
     3.        3.  [illegible]    3.        3.        3.  [illegible]    3.        3.        3.
[illegible]    3.  [illegible] [illegible] [illegible]    3.        3.        3.        3.        3.
     2.        3.  [illegible] [illegible] [illegible]    3.  [illegible]    3.        3.        3.
```

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
	[illegible]	[illegible]	16.	37.	[illegible]
	[illegible]	1.	3.	9.	124.
INCHES		11.[illegible]	15.[illegible]	[illegible]	1.[illegible]
AF		342.[illegible]	381.[illegible]	[illegible]	[illegible]
THOUSAND CU FT		35.	51.	51.	51.
CFS		39.	39.	39.	39.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE FROM [illegible] IMPOUNDMENT DOWNSTREAM DAM TO [illegible] LAKE NOT DAM (PRO [illegible])

ITRACE	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
[illegible]	1	[illegible]	[illegible]	[illegible]	0	0	0

				ROUTING DATA					
NSTDAY	NSTPS	LAG	AMSKK	X	TSK	STORAGE	ORDER		
0.0	0.000	0.00	1	1	0				0

NSTPW	NSTDL	LAG	AMSKK	X	TSK	STORAGE	ORDER			
1	[illegible]	[illegible]	.[illegible]	[illegible]	0.000	-855.	-1			

STAGE	[illegible]	[illegible]	[illegible]	855.50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FLOW	0.00	10.00	57.00	1[illegible]0.00	3[illegible].00	1273.00	[illegible]	4187.00	5960.00	[illegible]
CAPACITY=	[illegible]	39.	47.	[illegible]5.	260.					
ELEVATION=	[illegible]	855.	[illegible]7.	[illegible]	680.					

	CREL	SPILL	COQ	EXPW	ELEV	COAL	CAREA	EXPL
	855.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
856.5	0.0	0.0	0.

STATION [illegible] PLAN 1, [illegible]

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	2.	2.	2.	2.	3.	3.	3.	3.
4.	4.	4.	5.	5.	5.	5.	6.	6.	6.
7.	7.	7.	7.	8.	8.	8.	8.	8.	8.

9.	9.	9.	10.	10.	10.	11.	12.	12.	13.
14.	14.	15.	15.	15.	16.	16.	16.	17.	17.
17.	17.	18.	18.	18.	19.	19.	18.	18.	19.
14.	15.	15.	15.	15.	16.	16.	19.	19.	19.
15.	15.	15.	15.	15.	16.	16.	20.	21.	20.
4.	4.	4.	4.	4.	4.	4.	21.	22.	4.
4.	5.	5.	5.	5.	5.	5.	69.	70.	73.
5.	5.	5.	5.	5.	5.	5.	87.	88.	88.
5.	5.	48.	7.	1 .	213.	471.	520.	387.	276.
211.	192.	135.	151.	1 .	97.	9 .	95.	91.	82.
5.	5.	87.	87.	5.	5.	75.	77.	75.	73.
5.	71.	5.	5.	5.	5.	64.	55.	51.	44.
45.	45.	45.	45.	45.	37.	35.	23.	22.	20.
16.	5.	15.	15.	15.	14.	15.	12.	17.	11.
11.	15.	15.	15.	15.	15.	15.	13.	5.	3.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	6.	5.	5.
6.	5.	5.	5.	5.	7.	7.	7.	7.	7.
5.	7.	7.	7.	5.	5.	5.	5.	5.	5.

ST 150

33.	34.	35.	35.	35.	5.	37.	39.	33.	33.
33.	33.	34.	34.	5.	36.	35.	35.	35.	5.
35.	33.	5.	5.	5.	5.	35.	35.	34.	35.
37.	37.	37.	37.	5.	39.	39.	39.	39.	39.
5.	39.	39.	5.	35.	39.	35.	35.	35.	35.
5.	5.	35.	35.	5.	5.	35.	35.	35.	35.
5.	45.	46.	5.	5.	5.	5.	48.	48.	46.
5.	42.	42.	5.	5.	42.	42.	40.	40.	41.
5.	40.	41.	5.	41.	41.	41.	41.	41.	41.
41.	41.	41.	41.	41.	42.	42.	42.	42.	42.
41.	42.	42.	5.	42.	42.	42.	42.	42.	42.
5.	42.	42.	42.	5.	43.	43.	43.	43.	43.
43.	43.	43.	43.	5.	43.	43.	43.	43.	43.
5.	43.	43.	43.	43.	5.	43.	43.	43.	43.
5.	43.	43.	5.	5.	43.	43.	44.	44.	44.
44.	44.	44.	44.	5.	45.	45.	45.	45.	45.
45.	45.	45.	5.	5.	45.	45.	45.	46.	46.
46.	46.	46.	46.	5.	46.	5.	46.	46.	46.
46.	46.	46.	5.	47.	47.	48.	48.	48.	48.
47.	47.	47.	47.	46.	46.	46.	46.	5.	46.
46.	46.	46.	5.	5.	46.	46.	45.	45.	45.
46.	46.	46.	46.	5.	46.	45.	45.	45.	45.
44.	44.	44.	44.	44.	43.	43.	43.	43.	43.
43.	43.	43.	43.	43.	42.	42.	42.	42.	42.
42.	42.	42.	5.	42.	42.	42.	42.	42.	42.
42.	42.	42.	42.	42.	42.	42.	42.	42.	42.
42.	42.	42.	42.	42.	42.	42.	42.	42.	42.
42.	42.	42.	42.	42.	42.	41.	42.	42.	42.
42.	42.	41.	41.	41.	41.	41.	41.	41.	41.
41.	41.	41.	41.	41.	41.	41.	41.	41.	41.

STEP

855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0
855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0
855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0
855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0
855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0	855.0
855.0	855.1	855.1	855.1	855.1	855.1	855.1	855.1	855.1	855.1

```
[illegible]

PEAK OUTFLOW IS      820. AT TIME 15.[illegible] HOURS

                    [illegible]   [illegible]   [illegible]   [illegible]   TOTAL VOLUME
                                                                       [illegible]17.
       INCHES
           MM                                          741.[illegible]     741.[illegible]
       AC-FT                                   1.            1.
  THOUS CU M                                   7.            7.           75.

                     STATION [illegible] PLAN 1, RATIO [illegible]

                 END-OF-PERIOD HYDROGRAPH ORDINATES

                                OUTFLOW
[illegible]
   1.     1.     1.     1.     1.     1.     1.     1.     1.     1.
   8.     8.   [illegible]  8.  [illegible] [illegible] [illegible] 9.  10.   11.
  13.    14.    15.    17.  [illegible] [illegible] [illegible] 22. [illegible] 25.
  26.    27.    29.    28.  [illegible]  40. [illegible] [illegible] [illegible] [illegible]
```

39.	35.	[illegible]	37.	31.	[illegible]	39.	39.	[illegible]	40.
40.	[illegible]	[illegible]	41.	37.	[illegible]	137.	151.	142.	142.
137.	[illegible]	[illegible]	7.	[illegible]	[illegible]	[illegible]	54.	55.	54.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	45.	[illegible]	46.	47.
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11.	[illegible]	1.	1.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.	7.	7.	7.
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855.7	855.7	855.7	[illegible]	855.[illegible]	[illegible]	855.[illegible]	855.6	855.4	855.8
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855.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	855.7	855.6
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[illegible] 19[illegible] AT TIME [illegible]

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INCHES	[illegible]	1[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AC-FT	[illegible]	[illegible]	[illegible]	[illegible]	30.
THOUS CU	[illegible]	[illegible]	[illegible]	[illegible]	37.

********** ********** ********** ********** **********

UH-[illegible] CONVERSION TABLE

INPUT INDEX PRECIPITATION PERIOD NO. OF UNIT HYDROGRAPH PARAMETERS

ISTA	IQUAN	IQCON	ITAPE	JPLT	JPRT	INAME	ISTAQ	LAUTO
5[illegible]06				2		1	0	

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TAREA	TRSPC	RATIO	ISAME	ISTAQ	LOCAL
1	2	.01	0.00	.21	1.00	0.00		0	0

ROUTING DATA

SPEE	RMS	R6	R1	R2	R3	R4	R5
0.00	24.00	100.00	120.00	150.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTK	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	[illegible]	1.00	[illegible]	[illegible]	1.00	[illegible]	[illegible]	[illegible]	0.00

CURVE NO = [illegible] WETNESS = -1.00 EFFECT [illegible]

UNIT HYDROGRAPH DATA

TP= [illegible] UBAS= .11

RECESSION DATA

```
                         STRT  [illegible]   [illegible]   0.00   RTIMP= 1.00

          TIME INCREMENT TOO LARGE--(NHQ IS GT LAG/2)

               UNIT HYDROGRAPH [illegible]                                   .11   VOL= 1.00
             [illegible]

                                    END-OF-PERIOD FLOW
MO.DA  HR.MN PERIOD  RAIN  EXCS  LOSS    COMP Q       MO.DA HR.MN PERIOD  RAIN  EXCS  LOSS   COMP Q

[illegible]  .       1   .01    .    .01      6.       [illegible] [illegible] [illegible] [illegible] [illegible]  .01   [illegible]
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1.01  [illegible]  4  [illegible]  [illegible]  [illegible]  6.  [illegible]  [illegible]  [illegible]  .36  .36  [illegible]  751.
1.01  3.35  43  .01  [illegible]  .  .  [illegible]  [illegible]  193  [illegible]  .29  [illegible]  [illegible]
1.01  [illegible]  44  .01  [illegible]  [illegible]  6.  1.01  16.10  [illegible]  .28  [illegible]  [illegible]  [illegible]
1.01  [illegible]  45  .01  .00  .01  [illegible]  1.01  [illegible]  [illegible]  .28  .28  .00  [illegible]
1.01  [illegible]  46  .01  .00  .01  [illegible]  1.01  [illegible]  196  .28  .28  .00  [illegible]
1.01  3.5  47  .01  [illegible]  [illegible]  7.  1.01  [illegible]  197  .28  [illegible]  [illegible]  [illegible]
1.01  4.  48  .01  .00  .01  7.  1.01  [illegible]  [illegible]  .28  .28  [illegible]  [illegible]
1.01  4.0  49  .01  [illegible]  [illegible]  7.  1.01  [illegible]  [illegible]  .28  [illegible]  .00  [illegible]
1.01  4.10  50  .01  [illegible]  .01  7.  1.01  16.40  200  .28  .28  .00  [illegible]
```

1.01	4.15	51	.01	.01	.01	86.	1.01	16.[illegible]	201	.28	.28	.00	488.
1.01	4.20	52	.01	.00	.01	5.	1.01	16.55	203	.28	.28	.00	4[illegible]
1.01	4.25	53	.01	.01	.01	[illegible]	1.01	16.60	203	.28	.28	.00	4[illegible]
1.01	[illegible]	54	.01	.01	.01	[illegible]	1.01	17.00	204	.29	.28	.00	454.
1.01	[illegible]		.01	.01	[illegible]	[illegible]	1.01	17.[illegible]	[illegible]	.29	.29	.00	451.
1.01	4.45		.01	.01	.01	[illegible]	1.01	17.41	[illegible]	.29	.29	.00	[illegible]
1.01	4.45	57	.01	.01	.01	[illegible]	1.01	17.45	207	.29	.29	.00	371.
1.01	4.50	58	.01	.01	.01	[illegible]	1.01	17.50	208	.29	.29	.00	362.
1.01	4.55	59	.01	.01	.01	7.	1.01	17.55	[illegible]	.29	.32	.00	[illegible]
1.01	5.00	60	.01	.01	.01	[illegible]	1.01	17.60	210	.32	.29	.00	357.
1.01	5.05	61	.01	.01	.01	[illegible]	1.01	17.65	211	.29	.29	.00	[illegible]
1.01	5.01	[illegible]	.01	.01	.01	1[illegible]	1.01	17.69	212	.29	.29	.00	[illegible]
1.01	5.15	63	.01	.01	.01	1[illegible]	1.01	17.45	213	.29	.22	.00	3[illegible]
1.01	5.20	64	.01	.01	.01	1[illegible]	1.01	17.50	214	.29	.22	.00	357.
1.01	[illegible]		.01	.01	[illegible]	[illegible]	1.01	17.55	215	.29	.29	.00	[illegible]
1.01	5.25	[illegible]	.01	.01	.01	[illegible]	1.02	1.00	216	.29	.29	.00	[illegible]
1.01	5.30	67	.01	.01	.01	1[illegible]	1.01	18.00	217	.29	.29	.00	341.
1.01	5.40	68	.01	.01	.01	10[illegible]	1.01	1.01	218	.29	.22	.00	1[illegible]
1.01	5.45	69	.01	.01	.01	1[illegible]	1.01	[illegible]	219	.29	.29	.00	79.
1.01	[illegible]	70	.01	.01	.01	11.	1.01	1.[illegible]	220	.29	.29	.00	[illegible]
1.01	[illegible]	71	.01	.01	.01	1[illegible]	1.01	18.[illegible]	[illegible]	.29	.02	.00	[illegible]
1.01	[illegible]	72	.01	.01	.01	1[illegible]	1.01	1.[illegible]	222	.29	.29	.00	[illegible]
1.01	6.05	73	.02	.04	.04	22.	1.01	1.[illegible]	223	.29	.29	.00	[illegible]
1.01	[illegible]	74	.01	.04	.02	[illegible]	1.01	18.[illegible]	224	.29	.29	.00	53.
1.01	6.15	75	[illegible]	[illegible]	[illegible]	[illegible]	1.01	18.45	[illegible]	.29	.29	.00	52.
1.01	6.20	76	.02	.04	.04	[illegible]	1.01	1.[illegible]	[illegible]	.02	.29	.00	52.
1.01	[illegible]	77	.02	.04	.01	5[illegible]	1.01	1.[illegible]	227	.29	.29	.00	52.
1.01	6.[illegible]	78	.02	.04	.02	[illegible]	1.01	1.[illegible]	[illegible]	.29	.29	.00	52.
1.01	6.[illegible]	79	.01	.04	.02	[illegible]	1.01	1.[illegible]	[illegible]	.29	.29	.00	52.
1.01	[illegible]	[illegible]	.02	.05	.02	71.	1.01	1.[illegible]	[illegible]	.29	.02	.00	[illegible]
1.01	6.45	81	.02	.05	.02	71.	1.01	1.[illegible]	[illegible]	.02	.02	.00	[illegible]
1.01	[illegible]	82	.02	.05	.02	7[illegible]	1.01	1.[illegible]	[illegible]	.29	.29	.00	[illegible]
1.01	6.55	83	.02	.05	.00	77.	1.01	1.[illegible]	[illegible]	.29	.29	.00	52.
1.01	7.00	84	.02	.05	.01	7[illegible]	1.01	19.[illegible]	[illegible]	.29	.29	.00	52.
1.01	7.[illegible]	85	.02	.05	.02	7[illegible]	1.01	19.[illegible]	[illegible]	.29	.29	.00	52.
1.01	7.10	86	.02	.05	.02	81.	1.01	1.40	[illegible]	.29	.29	.00	[illegible]
1.01	7.15	87	.02	.05	.01	82.	1.01	19.[illegible]	[illegible]	.29	.29	.00	[illegible]
1.01	7.20	88	.02	.05	.01	83.	1.01	19.55	215	.29	.29	.00	52.
1.01	7.[illegible]	89	.02	.05	.01	84.	1.01	19.[illegible]	215	.29	.29	.00	[illegible]
1.01	7.30	[illegible]	.02	.05	.01	8[illegible]	1.01	20.00	24	.29	.29	.00	[illegible]
1.01	7.35	91	.02	.05	.01	[illegible]	1.01	20.05	241	.29	.29	.00	[illegible]
1.01	7.40	92	.02	.05	.01	87.	1.01	[illegible]	242	.29	.29	.00	[illegible]
1.01	7.45	93	.02	.05	.01	8[illegible]	1.01	20.15	243	.29	.29	.00	52.
1.01	7.50	94	.02	.06	.01	[illegible]	1.01	20.20	244	.29	.29	.00	52.
1.01	7.55	95	.02	.06	.01	[illegible]	1.01	20.25	245	.02	.02	.00	52.
1.01	8.00	96	.02	.06	.01	[illegible]	1.01	[illegible]	24[illegible]	.02	.02	.00	52.
1.01	8.05	97	.02	.06	.01	91.	1.01	[illegible]	24[illegible]	.02	.29	.00	52.
1.01	8.10	98	.02	.06	.01	91.	1.01	2[illegible]	24[illegible]	.02	.29	.00	[illegible]
1.01	8.15	99	.02	.06	.01	92.	1.01	21.40	24[illegible]	.02	.29	.00	[illegible]
1.01	8.20	100	.02	.06	.01	9[illegible]	1.01	21.45	250	.29	.02	.00	52.
1.01	8.25	101	.02	.06	.01	93.	1.01	[illegible]	251	.02	.02	.00	52.
1.01	8.30	102	.02	.06	.01	94.	1.01	[illegible]	252	.29	.29	.00	52.
1.01	8.35	103	.02	.06	.01	94.	1.01	21.[illegible]	253	.29	.29	.00	52.
1.01	8.40	104	.02	.06	.01	94.	1.01	[illegible]	254	.02	.29	.00	52.
1.01	8.45	105	.02	.06	.01	9[illegible]	1.01	1.15	255	.29	.02	.00	52.
1.01	8.50	106	.02	.06	.01	9[illegible]	1.01	21.20	256	.29	.29	.00	52.
1.01	8.55	107	.02	.06	.01	9[illegible]	1.01	[illegible]	257	.02	.29	.00	52.
1.01	9.00	108	.02	.06	.01	[illegible]	1.01	21.30	[illegible]	.29	.02	.00	52.
1.01	9.05	109	.02	.06	.01	9[illegible]	1.01	21.35	[illegible]	.02	.29	.00	52.
1.01	9.10	110	.02	.06	.01	97.	1.01	21.40	260	.29	.02	.00	52.

1.01	9.15	111	.07	[illegible]	.01	[illegible]	1.01	21.45	261	.02	[illegible]	.00	32.
1.01	[illegible]	111	.07	.05	.01	9.	1.01	[illegible]	262	.02	.02	.00	32.
1.01	9.	[illegible]	[illegible]	[illegible]	.01	9.	1.01	[illegible]	263	.02	.02	.00	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	.01	9.	1.01	[illegible]	[illegible]	.02	.02	.00	32.
1.01	[illegible]	[illegible]	[illegible]	.05	[illegible]	[illegible]	1.01	[illegible]	[illegible]	.02	.02	.00	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	266	[illegible]	[illegible]	[illegible]	32.
1.01	[illegible]	117	.07	.08	[illegible]	[illegible]	1.01	[illegible]	267	.02	.02	.00	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	268	.02	.02	.00	32.
1.01	9.55	119	[illegible]	[illegible]	.1	[illegible]	1.01	[illegible]	269	[illegible]	[illegible]	.00	32.
1.01	10.[illegible]	[illegible]	[illegible]	.05	.01	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	.00	32.
1.01	[illegible]	121	[illegible]	[illegible]	.01	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32.
1.01	[illegible]	122	[illegible]	.6	.1	[illegible]	[illegible]	[illegible]	272	.02	.02	[illegible]	32.
1.01	[illegible]	[illegible]	.07	[illegible]	.20	[illegible]	1.01	[illegible]	273	.02	.02	.00	32.
1.01	[illegible]	[illegible]	.07	[illegible]	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	.2	[illegible]	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	275	[illegible]	.02	.00	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27[illegible]	[illegible]	[illegible]	[illegible]	32.
1.01	[illegible]	127	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	277	.02	.02	[illegible]	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	171.	1.01	23.10	27[illegible]	[illegible]	.02	[illegible]	32.
1.01	10.[illegible]	129	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	27[illegible]	[illegible]	[illegible]	[illegible]	32.
1.01	10.50	13[illegible]	.07	[illegible]	[illegible]	151.	1.01	[illegible]	[illegible]	[illegible]	.02	.00	32.
1.01	[illegible]	[illegible]	.07	[illegible]	[illegible]	[illegible]	1.01	[illegible]	281	[illegible]	[illegible]	[illegible]	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	.00	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32.
1.01	11.15	[illegible]	[illegible]	.06	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	.02	.00	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32.
1.01	11.[illegible]	137	.07	.05	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.
1.01	[illegible]	141	[illegible]	.05	[illegible]	[illegible]	[illegible]	[illegible]	291	[illegible]	[illegible]	[illegible]	5.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	292	[illegible]	[illegible]	[illegible]	2.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.10	1.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.01	12.15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.02	[illegible]	297	[illegible]	[illegible]	[illegible]	0.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.10	0.03	[illegible]	0.
1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	.15	[illegible]	111.	[illegible]	1.30	300	0.00	0.20	.00	3.
									5[illegible]	31.00	[illegible]	1.[illegible]	47808.
										(79.[illegible])	(749.[illegible])	[illegible]	(1356.[illegible])

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CMS	[illegible]	[illegible]	[illegible]	[illegible]	1357.
INCHES		[illegible]	[illegible]	[illegible]	[illegible]
MM		[illegible]	[illegible]	748.60	748.60
AC-FT		[illegible]	330.	330.	330.
THOUS CU M		[illegible]	[illegible]	[illegible]	[illegible]

[illegible] HYDROGRAPH AT [illegible] FOR PLAN 1, ICHE 1

[illegible]	0.	0.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.	0.	0.	0.
[illegible]	0.	[illegible]	0.	[illegible]	[illegible]	[illegible]	3.	0.	[illegible]	[illegible]	0.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.	1.	2.	2.	2.
[illegible]	3.	[illegible]	[illegible]	[illegible]	[illegible]	4.	4.	4.	5.	5.	5.
[illegible]	7.	6.	[illegible]	6.	[illegible]	7.	7.	7.	7.	7.	7.

```
         8.          8.  [illegible]          8.  [illegible]          9.          9.          9.          9.          9.
[illegible]         10.         19.  [illegible]         13.         19.         13.         13.         11.         11.
[illegible]         11.         22.  [illegible]          4.         50.         49.         67.         69.         88.
[illegible] [illegible]         77.  [illegible]          3.  [illegible] [illegible] [illegible]         84.         87.
[illegible]         87.         80.  [illegible] [illegible] [illegible]         91.  [illegible]         92.         92.
[illegible] [illegible] [illegible]  [illegible] [illegible] [illegible] [illegible] [illegible]         96.         97.
[illegible]         97.         93.  [illegible] [illegible]         99.  [illegible]         99.  [illegible]        100.
       100.        130.  [illegible] [illegible]        101.        101.  [illegible]        101.  [illegible]        111.
[illegible]        102.  [illegible] [illegible] [illegible]        102.  [illegible] [illegible]        103.        103.
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]        311.
[illegible]        314.        315.  [illegible] [illegible]        316.  [illegible] [illegible] [illegible]        499.
[illegible] [illegible]        382.  [illegible] [illegible]        383.        394.        384.        417.        496.
[illegible]        475.        479.        451.  [illegible] [illegible] [illegible]        483.        433.        485.
[illegible]        450.        511.  [illegible] [illegible] [illegible] [illegible] [illegible]       2052.       1440.
[illegible]        791.  [illegible] [illegible]        464.        455.        456.        455.        454.        454.
       454.  [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]        362.        359.        357.
       357.        357.  [illegible]        357.  [illegible] [illegible] [illegible] [illegible]         77.         51.
        40.  [illegible] [illegible]         35.  [illegible]         32.  [illegible]         32.         82.         32.
        32.         32.  [illegible]         32.  [illegible] [illegible] [illegible]         32.         32.         32.
[illegible]  [illegible] [illegible] [illegible] [illegible]         32.  [illegible]         32.  [illegible]         32.
        32.         32.          32.         32.  [illegible]         32.  [illegible] [illegible] [illegible]         32.
        32.  [illegible] [illegible] [illegible] [illegible]         32.  [illegible]         32.         32.         32.
[illegible]  [illegible]         32.  [illegible] [illegible] [illegible] [illegible] [illegible]         32.         32.
[illegible]  [illegible]         32.  [illegible]         32.         32.  [illegible] [illegible] [illegible]         12.
[illegible]           2.          1.  [illegible] [illegible] [illegible] [illegible] [illegible]          0.          0.

                        PEAK      6-HOUR     24-HOUR     72-HOUR   TOTAL VOLUME
               CFS  [illegible] [illegible] [illegible] [illegible]   [illegible]
               CMS       77.   [illegible] [illegible] [illegible]       1357.
            INCHES               23.5[illegible] [illegible] [illegible] [illegible]
                MM              [illegible]   744.6[illegible] [illegible]  74[illegible].6[illegible]
             AC-FT                   264.   [illegible] [illegible]   [illegible]
        THOUS CU M                   326.        427.  [illegible]    [illegible]

                     HYDROGRAPH AT STA 3 [illegible] FOR PLAN 1, RTIO 2
[illegible]           0.          0.          0.          0.          0.          0.          0.          0.          0.
         0.           0.  [illegible]          0.          0.          0.          0.  [illegible] [illegible]          0.
[illegible]           0.          0.          0.          0.          0.          1.          1.          1.          1.
         1.           1.  [illegible] [illegible]          2.          2.  [illegible]          2.          2.          3.
         3.           3.          3.          5.  [illegible]          3.  [illegible]          3.          4.          4.
         4.           4.          4.          4.          4.          4.          4.          4.          5.          5.
         5.           5.  [illegible]          5.  [illegible]          5.  [illegible]          5.          5.          5.
         5.           6.         11.         21.         27.         30.         33.         33.  [illegible]         56.
        37.          34.         34.  [illegible] [illegible] [illegible]         41.         42.         42.         43.
        43.          43.  [illegible]         44.  [illegible] [illegible] [illegible] [illegible]         46.         44.
        45.          47.         47.         47.  [illegible] [illegible] [illegible] [illegible]         48.         48.
        49.          49.         49.         47.         49.         49.         49.         50.         50.         50.
        50.          50.         50.         50.         50.         50.  [illegible]         51.         51.         51.
        51.          51.         51.         51.          1.         51.  [illegible] [illegible]         51.         51.
        51.          51.         52.         52.         76.        119.        141.  [illegible]        154.        156.
       157.         157.        157.  [illegible] [illegible] [illegible] [illegible]        179.  [illegible]        189.
       190.         191.        191.        191.        191.  [illegible] [illegible]        132.  [illegible] [illegible]
       233.         236.        240.        240.        241.        241.  [illegible]        241.        241.  [illegible]
       219.         215.  [illegible]        313.  [illegible] [illegible]       1159.       1358.  [illegible]        723.
[illegible]         395.        320.  [illegible]        242.  [illegible] [illegible]        227.  [illegible]        727.
[illegible]         227.        227.        227.        216.  [illegible] [illegible]        191.  [illegible]        179.
       178.         178.        178.        178.        179.        178.  [illegible]         74.  [illegible]         76.
[illegible]          18.         17.         16.         16.         16.         16.         16.         16.         16.
```

15.	15.	15.	15.	15.	15.	15.	16.	16.	16.
15.	15.	15.	15.	15.	15.	15.	16.	16.	16.
15.	15.	15.	15.	15.	15.	15.	16.	16.	16.
16.	15.	15.	15.	15.	15.	15.	16.	16.	16.
16.	15.	15.	16.	16.	16.	16.	16.	16.	16.
12.	16.	15.	16.	15.	15.	15.	16.	15.	6.
0.	1.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	17[illegible].	[illegible].	[illegible].	[illegible].	23[illegible].
CMS	33.	[illegible].	[illegible].	[illegible].	67[illegible].
INCHES		11.[illegible]	14.74	14.74	14.74
AC-FT		2[illegible].	374.34	374.34	374.34
THOUS CU M		1[illegible].	[illegible].	[illegible].	1[illegible].
		1[illegible].	[illegible].	[illegible].	203.

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(ON THE HYDROGRAPHS

FOR STATION HY[illegible] (FROM ROUTING THROUGH [illegible] LAKE **NO.1 DAM** [illegible])

ITAB	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
[illegible]	[illegible]				[illegible]	1	0	0

JM DA[illegible] HYDROGRAPH AT [illegible] 500 [illegible] 1 RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	0.	0.	0.	0.	1.	1.	2.	2.	2.
3.	3.	3.	4.	4.	4.	4.	5.	5.	5.
6.	6.	6.	7.	7.	7.	7.	8.	8.	8.
8.	9.	9.	9.	9.	9.	10.	10.	10.	10.
10.	11.	11.	11.	11.	11.	12.	12.	12.	12.
12.	12.	54.	54.	54.	62.	67.	70.	73.	75.
77.	79.	81.	84.	84.	86.	87.	89.	90.	91.
93.	94.	95.	96.	97.	98.	99.	100.	100.	101.
102.	103.	103.	103.	104.	105.	106.	108.	109.	110.
111.	112.	113.	113.	114.	114.	115.	116.	116.	117.
117.	117.	118.	118.	119.	119.	119.	119.	120.	120.
120.	120.	121.	121.	121.	121.	121.	122.	122.	122.
122.	122.	122.	123.	170.	261.	308.	330.	341.	347.
351.	354.	357.	359.	361.	363.	379.	408.	424.	432.
435.	437.	442.	444.	449.	449.	451.	452.	477.	525.
545.	555.	560.	564.	566.	568.	569.	570.	570.	571.
625.	815.	749.	722.	695.	1[illegible].	2720.	3256.	2419.	1716.
1261.	963.	770.	643.	583.	562.	552.	547.	545.	543.
540.	542.	541.	539.	534.	473.	450.	439.	434.	430.
429.	427.	426.	426.	425.	425.	344.	203.	130.	97.
82.	74.	69.	65.	62.	60.	58.	56.	54.	52.
51.	50.	49.	48.	47.	46.	45.	45.	44.	43.
43.	43.	42.	42.	42.	42.	42.	42.	42.	42.
42.	42.	42.	42.	41.	41.	41.	41.	41.	41.
41.	41.	41.	41.	41.	41.	41.	41.	41.	41.
41.	40.	40.	40.	40.	40.	40.	40.	40.	40.
40.	40.	40.	40.	40.	40.	40.	40.	39.	19.

12.	9.	7.	7.	7.	6.	6.	5.	5.	5.	5.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	[illegible]	[illegible]	197.	183.	5[illegible]27.
CMS	[illegible]	1[illegible].	[illegible]	[illegible]	[illegible]36.
INCHES		23.[illegible]	2[illegible].43	[illegible]	[illegible]
MM		9[illegible].	747.62	747.[illegible]	747.[illegible]
AC-FT		311.	391.	3[illegible]1.	391.
THOUS CU M		38[illegible].	482.	4[illegible]2.	4[illegible]2.

SUM OF HYDROGRAPHS AT [illegible] FLOW [illegible]

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	2.	2.	2.	2.	2.	2.	3.	3.	3.
3.	3.	4.	4.	4.	4.	4.	4.	4.	4.	4.
3.	4.	4.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	1.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	37.
39.	42.	[illegible]	41.	4[illegible].	4[illegible].	4[illegible].	[illegible]	4[illegible].	[illegible]	46.
[illegible]	[illegible]	47.	[illegible]	[illegible]	[illegible]	4[illegible].	50.	[illegible]	[illegible]	51.
51.	51.	52.	52.	[illegible]	53.	[illegible]	53.	53.	53.	54.
54.	54.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	56.	56.	56.
[illegible]	[illegible]	57.	57.	57.	57.	[illegible]	57.	58.	58.	58.
58.	59.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59.	[illegible]	[illegible]	59.
59.	59.	59.	[illegible]	59.	127.	[illegible]	[illegible]	164.	[illegible]	[illegible]
[illegible]	171.	173.	17[illegible].	176.	178.	18[illegible].	201.	209.	213.	
[illegible]	217.	[illegible]	[illegible]	221.	[illegible]	220.	223.	245.	256.	
267.	273.	274.	277.	[illegible]	279.	[illegible]	281.	[illegible]	292.	
[illegible]	2[illegible].	297.	3[illegible].	447.	633.	1[illegible].	1[illegible].	1[illegible].	[illegible]2.	
63[illegible].	4[illegible].	[illegible]	34[illegible].	31[illegible].	[illegible]	[illegible]	289.	3[illegible]2.	241.	
28[illegible].	279.	27[illegible].	27[illegible].	25[illegible].	[illegible]	[illegible]	[illegible]	2[illegible]4.	222.	
[illegible]	22[illegible].	219.	21[illegible].	218.	217.	17[illegible].	19[illegible].	71.	54.	
4[illegible].	41.	34.	[illegible]	35.	33.	3[illegible].	3[illegible].	[illegible]	28.	
27.	27.	26.	26.	[illegible]	2[illegible].	[illegible]	2[illegible].	[illegible]	25.	
25.	25.	25.	25.	24.	24.	24.	24.	24.	24.	
24.	24.	24.	24.	[illegible]	[illegible]	23.	[illegible]	23.	23.	
23.	23.	23.	23.	23.	[illegible]	2[illegible].	2[illegible].	[illegible]	[illegible]	
22.	22.	22.	22.	22.	[illegible]	22.	22.	[illegible]	22.	
[illegible]	21.	21.	21.	21.	21.	21.	21.	17.	11.	
7.	6.	5.	5.	4.	4.	4.	4.	4.	4.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1561.	31[illegible].	98.	94.	[illegible]37.
CMS	44.	9.	3.	3.	3[illegible].
INCHES		11.[illegible]	14.70	14.70	14.70
MM		[illegible]	373.46	373.46	373.4[illegible]
AC-FT		1[illegible].	195.	195.	195.
THOUS CU M		191.	241.	241.	241.

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HYDROGRAPH ROUTING

SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 .50
HYDROGRAPH AT	1/ 1	.04 (.13)	1	647. (18.33)	324. (9.17)
ROUTED TO	1/S1	.04 (.13)	1	322. (9.12)	171. (4.87)
HYDROGRAPH AT	2/S2	.21 (.54)	1	2756. (77.47)	1366. (38.74)
COMBINED	3/S3	.25 (.64)	1	3056. (86.22)	1537. (43.51)
ROUTED TO	3/S3	.25 (.64)	1	2[illegible]6. (74.35)	1217. (34.47)

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	[illegible]	[illegible]	[illegible]
STORAGE	[illegible]	[illegible]	[illegible]
OUTFLOW	[illegible]	[illegible]	[illegible]

RATIO OF PMF	MAXIMUM RESERVOIR WSELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE (AC-FT)	MAXIMUM OUTFLOW (CFS)	DURATION OVER TOP (HOURS)	TIME OF MAX OUTFLOW (HOURS)	TIME OF FAILURE (HOURS)
1.00	[illegible]	.52	[illegible]	[illegible]	.83	[illegible]	0.00
.50	[illegible]	.14	[illegible]	[illegible]	.73	[illegible]	0.00

AD-A106 168 PRC CONSOER TOWNSEND INC ST LOUIS MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. B & K LAKE NUMBER 1 DAM (MO 30506)--ETC(U)
SEP 79 W G SHIFRIN DACW43-79-C-0075

UNCLASSIFIED NL

2 OF 2
AD
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END
DATE
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11-81
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SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	430.00	430.00	433.25
STORAGE	7.	70.	108.
OUTFLOW	0.	0.	125.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE 1000-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	434.[illegible]	1.63	[illegible]	2626.	[illegible].57	15.75	0.00
.50	434.[illegible]	.01	125.	1217.	4.83	15.75	0.00

PERCENT OF PMF FLOOD ROUTING
EQUAL TO SPILLWAY CAPACITY

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	U/S1
ROUTE HYDROGRAPH TO	U/S1
RUNOFF HYDROGRAPH AT	[illegible]
COMPUTE HYDROGRAPH AT	[illegible]
ROUTE HYDROGRAPH TO	10506

END OF NETWORK

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION       JULY 1978
  LAST MODIFICATION  25 FEB 79
**********************************

DATE= 12/ 9/14
TIME= 15.06.49
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DAM SAFETY INSPECTION - MISSOURI
BLACK LAKE **NO1 DAM** (MO 326)
PERCENT OF PMF DETERMINATION AND ROUTING

JOB SPECIFICATION

NH	NHR	NMIN	IDAY	IHR	IPRT	METRC	LTI	IPRT	NSTAN
100	0	5		0	0		0	4	0
			JOPER	NWT	KOPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSIS TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= .15 .16 .17 .18 .19 .20 .21 .22 .23

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SUB-AREA RUNOFF COMPUTATION

INPUT PRECIPITATION INDEX, RATIOS AND UNIT HYDROGRAPH PARAMETERS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
0/01	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISAME	LOCAL
1	2	.04	0.00	.04	1.00	0.00	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.00	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIMP	STRTL	CSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-91.00	0.00	0.00

CURVE NO = -91.00 WETNESS = -1.00 EFFECT CN = 91.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .05

RECESSION DATA
STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

HO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	HO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

SUM 31.20 30.04 1.16 9062.
(792.)(763.)(29.)(256.51)

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH UPSTREAM DAM TO BLACK LAKE NO1 DAM (30506)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
0/1	1	0		0	0	1	0	0

ROUTING DATA

GLOSS	CLOSS	AVG	IPES	ISAME	IOPT	IPMP	LCTR
0.0	0.00	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.0	-8855.	-1

STAGE	855.00	855.62	856.25	856.50	856.87	857.62	858.37	859.12	859.87	[illegible]
FLOW	0.00	10.00	57.00	170.00	339.00	1273.00	2569.00	4147.00	5560.00	[illegible]
CAPACITY=	0.	39.	47.	[illegible]	206.					
ELEVATION=	850.	855.	857.	860.	880.					

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
850.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
850.5	0.0	0.0	0.

PEAK OUTFLOW IS 24. AT TIME 15.92 HOURS

PEAK OUTFLOW IS 27. AT TIME 15.83 HOURS

PEAK OUTFLOW IS 30. AT TIME 15.83 HOURS

PEAK OUTFLOW IS 33. AT TIME 15.83 HOURS

PEAK OUTFLOW IS 36. AT TIME 15.83 HOURS

PEAK OUTFLOW IS 39. AT TIME 15.83 HOURS

PEAK OUTFLOW IS 42. AT TIME 15.83 HOURS

PEAK OUTFLOW IS 46. AT TIME 15.83 HOURS

PEAK OUTFLOW IS [illegible] AT TIME 15.83 HOURS

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SUB-AREA RUNOFF COMPUTATION

INPUT INDEX (PRECIPITATION, RATIOS, AND SCS UNIT HYDROGRAPH PARAMETERS)

ISTA	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
30506	0	0	0	0	0	1	0	

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSPC	TRSDA	RATIO	ITRSO	ISAME	LOCAL
1	2	.21	0.00	.21	1.00	0.00	2	0	0

PRECIP DATA

SPFE	PI	P6	P12	P24	P48	P72	P96
0.00	34.00	100.00	120.00	130.00	0.00	0.00	.00

LOSS DATA

LROPT	STRTQ	DLTKR	RTIOL	ERAIN	STRKS	RTIOR	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-87.00	0.00	0.00

CURVE NO = -87.00 WETNESS = -1.00 EFFECT CN = 87.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= .11

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

AREA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	31.20	29.48	1.72	473886
										(792.)	(749.)	(44.)	(1356.04)

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COMBINE HYDROGRAPHS

COMBINE HYDROGRAPHS BEFORE ROUTING THROUGH B AND K LAKE DAM NO.1 (30506)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
30506	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

ROUTE COMBINED HYDROGRAPH THROUGH B AND K LAKE DAM NO.1 (3 506)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
3050	1	0		0	0	1	0	0

ROUTING DATA

			IRES	ICAME	IOPT	IPAU		LSTR
	0.		1	1	0	0		

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ICPRT
1	0	0	0.000	0.000	0.000	[illegible]	-1

STAG	830.00	832.[illegible]	833.69	834.25	837.74	837.65	838.78	835.[illegible]
[illegible]	0.00	24.00	71.[illegible]	125.00	140.72	293.00	2340.[illegible]	4445.00

CAPACITY=	0.	72.	108.	[illegible]	1032.
ELEVATION=	806.	[illegible]	[illegible]3.	840.	[illegible]

CREL	SPWID	COQ=	EXPO	ELEVL	COQL	CAREA	EXPL
830.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
[illegible]	0.0	0.0	0.

PEAK OUTFLOW IS 8[illegible]. AT TIME 16.67 HOURS

PEAK OUTFLOW IS 99. AT TIME 1[illegible].25 HOURS

PEAK OUTFLOW IS 11[illegible]. AT TIME 16.2[illegible] HOURS

PEAK OUTFLOW IS 130. AT TIME 16.17 HOURS

PEAK OUTFLOW IS 165. AT TIME 16.06 HOURS

PEAK OUTFLOW IS 192. AT TIME 16.00 HOURS

PEAK OUTFLOW IS 213. AT TIME 16.00 HOURS

PEAK OUTFLOW IS 235. AT TIME 16.00 HOURS

PEAK OUTFLOW IS 859. AT TIME 16.00 HOURS

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .15	RATIO 2 .16	RATIO 3 .17	RATIO 4 .18	RATIO 5 .19	RATIO 6 .20	RATIO 7 .21	RATIO 8 .22	RATIO 9 .23
				RATIOS APPLIED TO FLOW								
[illegible]	07/ 1	.[illegible] (.10)	1	3[illegible]. (2.75)	1[illegible]. (2.[illegible])	110. (3.12)	11[illegible]. (3.[illegible])	123. (3.48)	129. (3.67)	136. (3.85)	142. (4.03)	149. (4.22)
[illegible]	07/51	.24 (.15)	1	24. (.67)	2[illegible]. (.7[illegible])	5[illegible]. (.8[illegible])	7[illegible]. (.[illegible])	3[illegible]. (1.0[illegible])	39. (1.1[illegible])	42. (1.18)	44. (1.25)	46. (1.3[illegible])
[illegible] AT	3050[illegible]	.21 (.54)	1	41[illegible]. (11.62)	4[illegible]. (12.40)	45[illegible]. (12.17)	4[illegible]. (13.[illegible])	528. (14.72)	547. (15.49)	575. (16.27)	602. (17.[illegible])	[illegible]. (17.[illegible])
[illegible]	3050[illegible]	.25 (.64)	1	4[illegible]. (12.17)	461. (13.04)	491. (13.91)	5[illegible]. (14.77)	552. (15.63)	582. (16.49)	612. (17.35)	642. (18.19)	71. (19.[illegible])
[illegible]	3050[illegible]	.23 (.64)	1	95. (2.42)	99. (2.[illegible])	115. (3.1[illegible])	13[illegible]. (3.67)	165. (4.68)	192. (5.44)	213. (6.04)	[illegible]. (6.5[illegible])	255. (7.22)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ..... INITIAL VALUE SPILLWAY CREST TOP OF DAM

ELEVATION	[illegible]	855.00	856.00
STORAGE	39.	[illegible]	47.
OUTFLOW	0.	0.	102.

RATIO OF PMF	MAXIMUM RESERVOIR WS ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE ACRE-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.15	855.[illegible]	0.00	43.	24.	0.00	15.92	0.00
.16	855.[illegible]	0.00	43.	27.	0.00	15.83	0.00
.17	855.[illegible]	0.00	44.	30.	0.00	15.83	0.00
.18	855.[illegible]	0.00	44.	33.	0.00	15.83	0.00
.19	855.97	0.	44.	36.	0.00	15.83	0.00
.20	856.01	0.00	44.	39.	0.00	15.83	0.00
.21	856.04	0.00	44.	42.	0.00	15.83	0.00
.22	856.08	0.00	44.	44.	0.00	15.83	0.00
.23	856.11	0.00	45.	46.	0.00	15.83	0.00

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	8[illegible].	8[illegible].	8[illegible].25
STORAGE	7[illegible].	7[illegible].	1[illegible].
OUTFLOW	0.	0.	12[illegible].

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.15	832.[illegible]	0.00	105.	[illegible].	0.10	16.67	0.00
.16	832.[illegible]	[illegible]	1[illegible].	8[illegible].	[illegible]	16.25	0.00
.17	833.12	[illegible]	107.	1[illegible].	[illegible]	16.25	0.00
.18	833.24	.01	1[illegible].	135.	.25	16.17	0.00
.19	833.[illegible]	.07	1[illegible].	15[illegible].	.4[illegible]	16.08	0.00
.20	833.37	.12	116.	192.	1.17	16.00	0.00
.21	833.[illegible]	.18	111.	213.	1.[illegible]	16.00	0.00
.22	833.46	.2[illegible]	112.	235.	1.38	16.00	0.00
.23	833.[illegible]	.2[illegible]	114.	25[illegible].	1.83	16.0[illegible]	0.00

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