LEVEL
MISSISSIPPI-SALT-QUINCY RIVER BASIN

LAKEVIEW DAM
LINCOLN COUNTY, MISSOURI
MO. 10543

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
**Title**: Phase I Dam Inspection Report  
National Dam Safety Program  
Lakeview Dam (MO 10543)  
Lincoln County, Missouri

**Author**: Consoer, Townsend and Associates, Ltd.

**Performing Organization**: U.S. Army Engineer District, St. Louis  
Dam Inventory and Inspection Section, LMSED-PD  
210 Tucker Blvd., North, St. Louis, Mo. 63101

**Controlling Office**: U.S. Army Engineer District, St. Louis  
Dam Inventory and Inspection Section, LMSED-PD  
210 Tucker Blvd., North, St. Louis, Mo. 63101

**Report Date**: September 1979

**Number of Pages**: Approximately 90

**Program Element Project, Task Area & Work Unit Numbers**: DAAW-79-C-0075

**Distribution Statement (of this Report)**
Approved for release; distribution unlimited.

**Distribution Statement (of the abstract entered in Block 20, if different from Report)**
National Dam Safety Program, Lakeview Dam (MO 10543), Mississippi-Salt-Quincy River Basin, Lincoln County, Missouri.  
Phase I Inspection Report.  

**Supplementary Notes**

**Key Words**: Dam Safety, Lake, Dam Inspection, Private Dams

**Abstract**: This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.
SUBJECT: Lakeview Dam (Mo. 10543) Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Lakeview Dam (Mo. 10543).

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

SUBMITTED BY: Chief, Engineering Division

APPROVED BY: Colonel, CE, District Engineer

28 SEP 1979

Date

Access

MTS
MTC M
Under
Justice
LAKEVIEW DAM
LINCOLN COUNTY, MISSOURI

MISSOURI INVENTORY NO. 10543

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
Name of Dam: Lakeview Dam, Missouri Inv. No. 10543  
State Located: Missouri  
County Located: Lincoln  
Stream: Buck Creek  
Date of Inspection: June 14, 1979

Assessment of General Condition

Lakeview Dam was inspected by the engineering firms of Consoer, Townsend & Associates LTD. and Engineering Consultants Inc. (A Joint Venture) of St. Louis, Missouri 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.

The overall condition of the dam appears to be good. The dam does not exhibit signs of structural instability at this time. The dam appears to be inadequately maintained.
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. The estimated damage zone extends approximately 3 miles downstream of the dam. Within the damage zone are five dwellings, four buildings and a sewage disposal lagoon which may be subjected to flooding, with possible damage and/or destruction, and possible loss of life. The Lakeview 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 indicate that the spillway of Lakeview Dam meets the criteria set forth in the guidelines for a dam having the above size and hazard potential. Lakeview Dam, being a small size dam with a high hazard potential, is required by the guidelines to pass from one-half Probable Maximum Flood to the Probable Maximum Flood without overtopping. Since there is high hazard potential downstream of the dam, the appropriate spillway design flood for this dam is the Probable Maximum Flood. It was determined that the reservoir/spillway system can accommodate the Probable Maximum 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.

Other conditions noted by the inspection team were: erosion of the upstream slope; heavy vegetation and trees on the upstream and downstream slopes; obstructions in the downstream channels; minor seepage observed at the principal spillway outlet; and the longitudinal cracks from the dam crest to the emergency spillway on the left abutment.
The absence of seepage and stability analyses is a
deficiency which should be corrected. Periodic inspections by a
qualified engineer and establishing a maintenance log are recom-
mended.

Water G. Shifrin, P.E.
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

LAKEVIEW DAM, I.D. No. 10543

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Sect. No.</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECTION 1</td>
<td>PROJECT INFORMATION</td>
<td>1</td>
</tr>
<tr>
<td>1.1</td>
<td>General</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>Description of Project</td>
<td>3</td>
</tr>
<tr>
<td>1.3</td>
<td>Pertinent Data</td>
<td>8</td>
</tr>
<tr>
<td>SECTION 2</td>
<td>ENGINEERING DATA</td>
<td>11</td>
</tr>
<tr>
<td>2.1</td>
<td>Design</td>
<td>11</td>
</tr>
<tr>
<td>2.2</td>
<td>Construction</td>
<td>11</td>
</tr>
<tr>
<td>2.3</td>
<td>Operation</td>
<td>11</td>
</tr>
<tr>
<td>2.4</td>
<td>Evaluation</td>
<td>11</td>
</tr>
<tr>
<td>SECTION 3</td>
<td>VISUAL INSPECTION</td>
<td>14</td>
</tr>
<tr>
<td>3.1</td>
<td>Findings</td>
<td>14</td>
</tr>
<tr>
<td>3.2</td>
<td>Evaluation</td>
<td>19</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS
(Continued)

<table>
<thead>
<tr>
<th>Sect. No.</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECTION 4</td>
<td>OPERATION PROCEDURES</td>
<td>20</td>
</tr>
<tr>
<td>4.1</td>
<td>Procedures</td>
<td>20</td>
</tr>
<tr>
<td>4.2</td>
<td>Maintenance of Dam</td>
<td>20</td>
</tr>
<tr>
<td>4.3</td>
<td>Maintenance of Operating Facilities</td>
<td>20</td>
</tr>
<tr>
<td>4.4</td>
<td>Description of Any Warning System in Effect</td>
<td>21</td>
</tr>
<tr>
<td>4.5</td>
<td>Evaluation</td>
<td>21</td>
</tr>
<tr>
<td>SECTION 5</td>
<td>HYDRAULIC/HYDROLOGIC</td>
<td>22</td>
</tr>
<tr>
<td>5.1</td>
<td>Evaluation of Features</td>
<td>22</td>
</tr>
<tr>
<td>SECTION 6</td>
<td>STRUCTURAL STABILITY</td>
<td>26</td>
</tr>
<tr>
<td>6.1</td>
<td>Evaluation of Structural Stability</td>
<td>26</td>
</tr>
<tr>
<td>SECTION 7</td>
<td>ASSESSMENT/REMEDIAL MEASURES</td>
<td>29</td>
</tr>
<tr>
<td>7.1</td>
<td>Dam Assessment</td>
<td>29</td>
</tr>
<tr>
<td>7.2</td>
<td>Remedial Measures</td>
<td>32</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS
(Continued)

LIST OF PLATES

<table>
<thead>
<tr>
<th>Plate No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LOCATION MAP</td>
</tr>
<tr>
<td>2</td>
<td>PLAN AND ELEVATION OF DAM</td>
</tr>
<tr>
<td>2A</td>
<td>TYPICAL EMBANKMENT SECTION</td>
</tr>
<tr>
<td>3-10</td>
<td>DESIGN DRAWINGS</td>
</tr>
<tr>
<td>11</td>
<td>GEOLOGIC MAP</td>
</tr>
<tr>
<td>12</td>
<td>SEISMIC ZONE MAP</td>
</tr>
</tbody>
</table>

APPENDICES

APPENDIX A  -  PHOTOGRAPHS

APPENDIX B  -  HYDROLOGIC COMPUTATIONS
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

LAKEVIEW DAM, Missouri Inv. No. 10543

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 the Lakeview 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 the Lakeview Dam was made on June 14, 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 west abutment or side, and right to the east 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 Project

a. Description of Dam and Appurtenances

The following description is based exclusively on the original design drawings, observations and measurements made during the visual inspection. "As-built" drawings were not available for the dam during the preparation of this report.

The dam consists of a homogeneous earthfill embankment between earth abutments. According to available drawings, the crest is 12 feet wide and 607 feet long. Field measurements show the crest width to be 11 feet and a length of 600 feet. The crest elevation, according to the drawings, is 556.7 feet above MSL. From field measurements, the crest elevation was found to be approximately 558.5 feet above MSL. The maximum height of the embankment is 28 feet.

The downstream slope is 1V to 2H. The upstream slope is 1V to 3H from the crest to elevation 545.5 feet. At elevation 545.5 feet, a 10-foot wide berm was constructed, according to available drawings. Then, the upstream slope continues from elevation 545.5 feet to streambed elevation at a slope of 1V to 3H according to the plans.

According to the available drawings, a cutoff trench, with side slopes of 1V to 1H and a base width of 10 feet, was excavated parallel to the dam axis. The trench was excavated to the bedrock foundation, according to the plans.

-3-
There are three spillways for the Lakeview Reservoir. The principal spillway is located 195 feet to the left of the right abutment. The spillway is a 33-inch inside diameter reinforced concrete drop inlet structure which connects to a 24-inch inside diameter concrete pipe which passes under the embankment. The 24-inch concrete pipe is about 112 feet in length with a maximum slope of 11.2%. A 28-inch tall by 11-foot long concrete wall was constructed across the center of the drop inlet as an anti-vortex device. The concrete wall was constructed from the outside edge of the drop inlet across the opening of the drop inlet and into the embankment. A metal framework structure over the drop inlet was provided as a trashrack.

The right emergency spillway is cut into the right abutment and is a grass-lined, open channel. According to the available drawings, the control section of the spillway was constructed with side slopes of $1V:3H$ and $1V:8H$, a bottom width of 90 feet, and a crest elevation of 551.2 feet above MSL. From field measurements, the control section of the spillway has a cross section with side slopes of approximately $1V:6H$, a bottom width of 93 feet, and a crest elevation of 553.0 feet above MSL.

The left emergency spillway is cut into the left abutment and is a grass-lined, open channel. According to the available drawings, the control section of the spillway was constructed with side slopes of $1V:3H$ and $1V:8H$, a bottom width of 25 feet, and a crest elevation of 551.2 feet above MSL. From field measurements, the control section of the spillway has a cross section with side slopes of $1V:6H$ on the east side of the channel and $1V$ to approximately 14$H$ on the west side, a bottom width of 36 feet, and a crest elevation of 554.0 feet above MSL.
According to the plans, a livestock water supply system was provided.

A 6-inch diameter perforated helical metal pipe was provided in the embankment as an interceptor drain. The outlet of the drain is located 2 feet 3 inches to the left of the centerline. According to the drawings, the drain was placed parallel to the crest extending 43 feet to the right of the drain outlet and 101 feet to the left of the drain outlet.

b. Location

The Lakeview Dam is located on Buck Creek, Lincoln County, Missouri. The nearest downstream community is Elsberry, population 1,398, which is approximately 2.5 miles downstream. The dam and reservoir are shown on the Elsberry Quadrangle Sheet (7.5 minute series) in Section 32, Township 51 North, Range 2 East.

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 size 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 damage zone, which extends of about three miles downstream from the dam are five dwellings, four buildings and a sewage disposal lagoon.

e. Ownership

Lakeview Dam is owned privately by Mr. Richard Green. The mailing address is Mr. Richard Green, Route 1, Box 163, Elsberry, Missouri 64434.

f. Purpose of Dam

The purpose of the dam is for flood control.

g. Design and Construction History

The available records show that the dam was designed in March, 1957 by the Department of Agriculture, Soil Conservation Service as part of the Lost Creek Watershed Protection Project. The design engineer's name, as listed on the plans, is Mr. Browning. The dam was built in 1957-58 by Ray & Briscoe, a local construction company.
h. Normal Operational Procedures

Normal procedure is to allow the flood control reservoir to remain as full as possible with the water level being controlled by rainfall, runoff, evaporation and the elevation of the spillway crest.
1.3 Pertinent Data*

a. Drainage Area (square miles): 0.84

b. Discharge at Damsite

Estimated experienced maximum flood (cfs): NA
Estimated ungated spillway capacity at maximum pool elevation (cfs): 6050

c. Elevation (Feet above MSL)

Top of dam: 558.5
Spillway crest:
   Principal Spillway: 545.5
   Right Emergency Spillway: 553.0
   Left Emergency Spillway: 554.0
Normal Pool: 545.5
Maximum Pool (PMF): 558.48

d. Reservoir

Length of maximum pool (Feet): 2600

e. Storage (Acre-Feet)

Top of dam: 307
Spillway crest:
   Principal Spillway: 54
   Right Emergency Spillway: 189
   Left Emergency Spillway: 168
Normal Pool: 54
Maximum Pool (PMF): 306

f. Reservoir Surface (Acres)

Top of dam: 30
Spillway crest:
Principal Spillway 10.4
Right Emergency Spillway 22.5
Left Emergency Spillway 20.5
Normal Pool: 10.4
Maximum Pool (PMF): 29.9

g. Dam
Type: Earthfill
Length: 600 feet (from field measurements)
Structural Height: 28 feet (from field measurements)
Hydraulic Height: 28 feet
Top width: 11 feet (from field measurements)
Side slopes:
  Downstream 1V to 2H (according to design drawings)
  Upstream 1V to 3H from the crest to elevation 545.5. A 10-foot wide berm at elevation 545.5. 1V to 3H from elevation 545.5 to streambed elevation (according to design drawings)
Zoning: Homogeneous
Impervious core: NA

Cutoff: According to the drawings, a cutoff trench with a 10-foot bottom width and 1V to 1H side slopes was provided.

Grout curtain: Unknown
h. Diversion and Regulating Tunnel

i. Spillway

Type:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Spillway</td>
<td>Drop inlet, uncontrolled</td>
</tr>
<tr>
<td>Right Emergency Spillway</td>
<td>Open channel, uncontrolled</td>
</tr>
<tr>
<td>Left Emergency Spillway</td>
<td>Open channel, uncontrolled</td>
</tr>
</tbody>
</table>

Length of weir:

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Spillway</td>
<td>12.3 ft (Drop Inlet Spillway)</td>
</tr>
<tr>
<td>Right Emergency Spillway</td>
<td>93 ft</td>
</tr>
<tr>
<td>Left Emergency Spillway</td>
<td>36 ft</td>
</tr>
</tbody>
</table>

Crest Elevation (feet above MSL):

<table>
<thead>
<tr>
<th>Type</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Spillway</td>
<td>545.5 ft</td>
</tr>
<tr>
<td>Right Emergency Spillway</td>
<td>553.0 ft</td>
</tr>
<tr>
<td>Left Emergency Spillway</td>
<td>554.0 ft</td>
</tr>
</tbody>
</table>

j. Regulating Outlets

Type: 

<table>
<thead>
<tr>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock water supply</td>
</tr>
</tbody>
</table>

Length: Unknown

Closure: Unknown

Maximum Capacity: Unknown

* The term "maximum pool" used in this section refers to pool level at the top of dam elevation unless otherwise specified.
SECTION 2: ENGINEERING DATA

2.1 Design

Design drawings are available from the Department of Agriculture, Soil Conservation Service, and are included as part of this report. The drawings were prepared in March of 1957 by the Department of Agriculture, Soil Conservation Service. "As-built" drawings, geologic and soil mechanics reports can be obtained from the Department of Agriculture, Soil Conservation Service, however, they were not available during the preparation of this report.

2.2 Construction

No data is available concerning the construction of the dam and appurtenant structures, other than the construction history given in Section 1.2g.

2.3 Operation

No operation records are available for the Lakeview Dam.

2.4 Evaluation

a. Availability

The availability of engineering data is poor and consists only of the design drawings mentioned in Section 2.1, State Geological Maps and U.S.G.S. Quadrangle Sheets. Information on subsurface investigations, soil testing, or slope
stability analysis was not available. As mentioned in Section 2.1, "as-built" drawings, geologic and soil mechanics reports for this dam can be obtained from the Department of Agriculture, Soil Conservation Service, however, they were not available during the preparation of this report. No information on design hydrology or hydraulic design was available.

b. Adequacy

The conclusions presented in this report are based on field measurements, the available engineering data, past performance and present condition of the dam. The data available is inadequate to evaluate the hydraulic and hydrologic capabilities of the dam.

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 loading) and made a matter of record. In the absence of seepage and stability analyses no quantitative evaluation of the structural stability can be made.

c. Validity

Only a partial set of design drawings was available for review. From field measurements the dam appears to have been constructed according to the available drawings, except for the discrepancies described in Section 1.2a. The livestock watering system is shown on the plans to have been placed to the right of the principal spillway, however, from field observations, the system was found to have been placed to the left of the principal spillway. Lakeview Dam was
originally named Structure F4 by the Soil Conservation Service.
3.1 Findings

a. General

A visual inspection of the Lakeview Dam was made on June 14, 1979. The following persons were present during the inspection:

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Disciplines</th>
</tr>
</thead>
<tbody>
<tr>
<td>David J. Kerkes</td>
<td>Engineering Consultants, Inc.</td>
<td>Soils</td>
</tr>
<tr>
<td>Peter Howard</td>
<td>Engineering Consultants, Inc.</td>
<td>Geology</td>
</tr>
<tr>
<td>Mark R. Haynes</td>
<td>Engineering Consultants, Inc.</td>
<td>Civil, Structural and Mechanical</td>
</tr>
<tr>
<td>Kenneth L. Bullard</td>
<td>Engineering Consultants, Inc.</td>
<td>Hydraulics and Hydrology</td>
</tr>
<tr>
<td>Kevin Blume</td>
<td>Consoer, Townsend &amp; Assoc., Ltd.</td>
<td>Civil and Structural</td>
</tr>
</tbody>
</table>

Specific observations are discussed below.
b. Dam

The crest of the dam has a dirt access road. The vegetative cover on the crest outside of roadway was very tall and unmaintained at the time of the inspection. There was no evidence of significant settlement or cracking on the crest. No significant deviations in horizontal or vertical alignment were apparent. There was no evidence of the dam ever being overtopped.

The upstream slope had no evidence of riprap protection. Considerable erosion has occurred on the slope near the water surface in several places due to wave action. The slope was overgrown with tall grass, a few small trees and several bushes. The slope appeared to be unmaintained. No depressions or settlements were apparent on the slope.

The downstream slope of the embankment was overgrown with tall grass and several trees and bushes. The slope appeared to be unmaintained. No seepage was apparent at the toe of the slope. No depressions, bulges or settlements were apparent on the downstream slope. But due to the heavy vegetation on the slope, a comprehensive inspection of the slope was hampered. Materials removed immediately below the vegetation cover on the embankment appeared to be a clayey silt.

According to the "Missouri General Soil Map and Soil Association Descriptions" published by the Soil Conservation Service, the materials in the general area of the dam are classified as a Lindley silt loam of the Central Mississippi Valley Wooded Slopes family. The Lindley silt may be susceptible to excessive erosion. It is not known if the Lindley silt was used in the embankment.
Both the left and right abutments were at approximately the same elevation as the crest of the dam. Both abutments appeared to be natural earth material with adequate grass protection. No seepage was observed in or around either abutment. No evidence of slope movement was apparent in either abutment. The access road across the dam goes down the side slope of the spillway and through the spillway on both sides of the dam. Several longitudinal cracks were observed from the dam crest to the emergency spillway on the left abutment. The cracks were several feet in length and up to 12" deep. The cracks were not continuous.

No signs of rodent activity in either the embankment or the abutments were apparent.

c. Project Geology

The dam is situated in the Dissect Till Plains Section of the Central Lowlands Province (Fenneman, N.M., "Physiography of Eastern United States", 1946). This area was glaciated during Pleistocene time, at the close of which relatively thick deposits of glacial till were left. The entire area exhibits a karst topography with frequent sink holes.

Regionally, in the dam area, the rocks are dipping gently (about 50 feet per mile) to the northeast off of the Ozark uplift to the south ("Structural Features Map of Missouri", 1971). About seven miles to the south of the dam site is the Cap au Gres fault. This major feature is traceable from Illinois to near Bowling Green, Missouri. The fault is not known to be active and does not appear to have affected the rocks at the damsite.
Bedrock is exposed at the damsite. The rocks consist of thin-bedded, slabby, gray limestone. Some beds are fossiliferous. Based on the lithologic descriptions on a published map (Geologic Map of Missouri, 1961) the rocks most probably belong to the Cape Limestone which is described as fossiliferous. The rocks at the damsite are essentially flat lying. Two sink holes were observed in the channel below the spillway outlet.

d. Appurtenant Structures

(1) Spillways

The concrete drop inlet structure is in good condition. No spalling or cracking of the concrete was observed. The trashrack was in good condition and unclogged. The concrete anti-vortex device was also in good condition with no spalling or cracking observed. Leakage in the 24-inch diameter concrete pipe was detected. The leakage appeared to be along the conduit pipe because the drop inlet structure invert was dry but a flow of less than 1 gpm was observed at the outlet of the conduit. No spalling or cracking of the concrete were observed in the exposed portion of the conduit. The joints of the exposed portion of the conduit showed no sign of misalignment.

The emergency spillways were both heavily covered with grass. The right emergency spillway channel was obstructed by a row of large trees and a fence which was covered by heavy vegetation. The left emergency spillway channel was not obstructed. No indication of instability in the slopes was apparent. The right emergency spillway appeared to be excavated to bedrock because several outcrops of bedrock were observed.
(2) Outlet Works

No regulated outlet works was provided for the Lakeview Dam except for a livestock watering system. The inlet and outlet of the system were not located. A clay pipe which is assumed to house the control of the system was located in some heavy brush approximately 15 feet to the west of the 24-inch conduit outlet and 20 feet upstream from the 24-inch conduit outlet. The control was inaccessible because the clay pipe housing was filled with soil.

e. Reservoir Area

The water surface elevation was 545.5 feet above MSL on the day of the inspection.

The reservoir rim is gently sloped and no indication of instability or severe erosion were readily apparent. The slopes above the reservoir are heavily grassed. Several homes are built around the reservoir rim.

f. Downstream Channel

The downstream channel of the 24-inch conduit was a well-defined, narrow rock-lined, open channel. The channel was obstructed with a fence and a row of large trees. The channel extends for approximately 100 feet downstream and then flows into an open grassy pasture.

The downstream channel for the left emergency spillway was a well-defined, grass-lined, open channel. The channel was obstructed by a row of large trees at the point where the channel converges with the downstream channel of the 24-inch conduit.
The downstream channel for the right emergency spillway was a well-defined, grass-lined open channel for approximately 150 feet and then the channel was obstructed by a row of large trees and a fence. Beyond the obstruction, the channel is an open grassy pasture.

3.2 Evaluation

The visual inspection did not reveal any items which are sufficiently significant to indicate a need for immediate remedial action.

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

1. The obstructions in the downstream channels of the 24-inch diameter conduit and the right emergency spillway.

2. The erosion of the upstream slope due to wave action.

3. The heavy vegetative cover on the upstream and downstream slopes.
SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Lakeview Dam was built to impound water for flood control as part of the Lost Creek Watershed Protection Project. The only operating facility is a livestock watering system, but it appears the system has been abandoned. The water level is controlled by rainfall, runoff, evaporation and the spillway elevation.

4.2 Maintenance of Dam

The dam is maintained by the owner, Mr. Richard Green. The maintenance of the dam appears to be inadequate. Both the upstream and downstream slopes are covered with dense vegetation, bushes and trees. There have not been any major repairs done to the dam itself since its original construction.

4.3 Maintenance of Operating Facilities

The livestock watering system appears to have been abandoned. The intake and outlet of the system was not located during the visual inspection. The clay pipe housing the control of the system was located, but the control of the system could not be seen due to the soil and debris covering it.
4.4 Description of Any Warning System in Effect

The inspection team is not aware of any existing warning system for this dam.

4.5 Evaluation

The maintenance at Lakeview Dam appears to be inadequate at this time. The lack of maintenance has allowed the embankment section to deteriorate. The remedial measures described in Section 7 should be undertaken to improve the condition of the dam.
5.1 **Evaluation of Features**

a. **Design**

The watershed area of the Lakeview Dam upstream from the dam axis consists of approximately 540 acres. The watershed is mainly agricultural land with some wooded and urbanized areas. Land gradients in the higher regions of the watershed average roughly 12 percent, and in the lower areas surrounding the reservoir average about 3 percent. The Lakeview Reservoir is located on Buck Creek. The reservoir is about 1 mile upstream from the confluence of the Buck Creek and Lost Creek. At its longest arm the watershed is approximately 1.8 miles long. A drainage map showing the watershed area is presented as Plate 1 in Appendix B.

Evaluation of the hydraulic and hydrologic features of Lakeview 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 hydrograph, utilizing the Corps of Engineers' computer program HEC-1 (Dam Safety Version). The unit

-22-
hydrograph parameters are presented in Appendix B. The SCS method was also 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, the PMP index rainfall and the percentages for various durations 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 are 7,086 cfs and 3,543 cfs respectively.

Both the PMF and one-half of the PMF inflow hydrographs were routed through the reservoir by the Modified Puls Method also utilizing the HEC-1 (Dam Safety Version) computer program. The reservoir was assumed at the principal spillway crest level at the start of the routing computation. The peak outflow discharges for the PMF and one-half of the PMF are 6,026 and 2,820 cfs respectively. Both the PMF and one-half of the PMF, when routed through the reservoir, can be accommodated by the spillway/reservoir system without overtopping the dam.

The stage-outflow relation for the spillway was prepared from field notes, sketches, and available design drawings. The reservoir stage-capacity data were based on the U.S.G.S. Elsberry, MO. Quadrangle topographic map (7.5 minute series). The combined spillways and overtop rating curve and the reservoir capacity curve are presented in Plates 2 & 3 respectively 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 suddenly into the downstream floodplain. The safe hydrologic design of a dam requires a spillway discharge capability, in combination with an embankment crest height that can handle a very large and exceedingly rare flood without overtopping.

The Corps of Engineer 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 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. However, there was no evidence of water ever passing through either the emergency spillway or over the top of the dam.

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 no overtopping of the dam. The 100-year flood is equal to approximately 14 percent of the PMF, therefore, 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. The estimated damage zone extends approximately three miles downstream of the dam. Within the damage zone are five dwellings, four buildings, and a sewage disposal lagoon.
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 heavy growth of vegetation and trees on both the upstream and downstream slopes should be cleared. The growth prevented proper inspection of the embankment in addition to providing a hazard to the embankment.

The erosion of the upstream slope due to wave action was not serious enough to indicate an unsafe condition. Nevertheless, the damaged areas should be repaired and protected within a reasonable period of time.

Neither the principal spillway drop inlet nor the 24-inch reinforced concrete discharge pipe exhibited any evidence of misalignment or structural instability. The seepage observed, at the outlet of the pipe, is felt to have no significant effect on the structural stability of the dam. Nevertheless, the seepage should be monitored and any changes in quantity or color should be reported and investigated. There are no signs of instability of the slopes of the emergency spillways.

The longitudinal cracks from the dam crest to the emergency spillway on the left abutment appear to be shrinkage cracks. The cracks, in their present condition, are not serious enough to affect the stability of the dam. Never-
theless, the cracks should be monitored during periodic visual inspections and any significant change in quantity or size should be reported and investigated.

b. Design and Construction Data

No design computations were uncovered during the report preparation phase. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available. No embankment or foundation soil parameters are available for carrying out a conventional stability analysis on the embankment. No construction data or specifications relating to the degree of embankment compaction are available for use in a stability analysis.

c. Operating Records

No operating records are available relating to the stability of the dam. The water level on the day of the inspection was at the crest of the principal spillway, and it is assumed that the reservoir remains close to full at all times. No regulated outlet works exist at the damsite except for the livestock watering system. The livestock watering system appears to have been abandoned because the housing of the control of the system was full of soil and debris.

d. Post Construction Changes

No post construction changes are known to exist which will affect the structural stability of the dam.
e. Seismic Stability

The dam is located in seismic Zone 1, as defined in "Recommended Guidelines For Safety Inspection of Dams" as prepared by the Corps of Engineers, and therefore, does not require a seismic stability analysis.
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 by any chance that an unsafe condition could be detected.

a. Safety

The spillway/reservoir system of Lakeview Dam is capable of accommodating the Probable Maximum Flood without overtopping the dam. Therefore the spillway capacity of Lakeview Dam is considered "Adequate".
The dam embankment appears to be in fair structural condition. The erosion due to wave action on the upstream embankment slope, if allowed to continue, could jeopardize the safety of the dam. Therefore, the erosion should be repaired and the slope protected from further damage. No seepage and stability analyses were available for review. No signs of distress were observed in the embankment or in the foundation.

The obstructions in the downstream channels of the 24-inch conduit and the right emergency spillway pose a possible hazard to the normal operation of the two spillways. Therefore, the obstructions should be removed and the channels kept free of trees and debris. The seepage through the conduit of the principal spillway does not jeopardize the safety of the embankment in its present condition, but it should be monitored for any changes in quantity or color.

The trees and bushes on both the upstream and downstream slopes should be removed from the slopes and an adequate protective grass cover retained on the slopes. This should be accomplished under guidance of an engineer experienced in the design and construction of earthen dams. Indiscriminate clearing could jeopardize the safety of the embankment.

The emergency spillway, cut through the right abutment, is virtually on the limestone bedrock. If the spillway flows, no erosional problems should occur. The limestone is competent and serves as an adequate foundation for the dam. The area about the reservoir exhibits karst topography. Thus, the area in the shallow subsurface is undoubtedly cavernous, therefore, monitoring of possible development of solution channels through the rock should be carried out from time to time.

-30-
b. Adequacy of Information

The conclusions presented in this report are based on field measurements, the available engineering data, past performance and present condition of the dam. Information on the design hydrology, hydraulic design, and the operation and maintenance of the dam as well as seepage and stability analyses were not available. To supplement available data and allow for a more definite evaluation of the dam, it is recommended that the following programs be initiated:

1. Periodic inspection of the dam by an engineer experienced in the design and construction of earthen dams should be made and this inspection report made a matter of record.

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

3. Perform seepage and stability analyses comparable to the "Recommended Guidelines for Safety Inspection of Dams".

c. Urgency

The remedial measures recommended in Paragraph 7.2 should be accomplished within a reasonable period of time.

d. Necessity for Phase II Inspection

Based on results of the Phase I inspection, a Phase II inspection is not felt to be necessary.
7.2 Remedial Measures

a. Alternatives

Not applicable

b. O & M Procedures

1. The following corrective measures should be undertaken within a reasonable period of time:

(a) Repair erosion due to wave action on the upstream slope and protect the slope from further damage.

(b) Remove all heavy vegetation and trees from both the upstream and downstream slopes and retaining an adequate protective grass cover on both slopes.

(c) Remove trees and debris from the downstream channels of the principal spillway and the right emergency spillway and the channels and fences kept free of trees and debris.

(d) Seepage and stability analysis should be performed by a professional engineer experienced in the design and construction of earthen dams.

2. The following conditions should be monitored:

(a) Monitor the seepage through the outlet conduit of the principal spillway for changes in quantity or color and report any changes.
(b) Monitor the longitudinal cracks from the dam crest to the emergency spillway on the left abutment for any changes in quantity or size and report any changes.

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.
LAKEVIEW DAM (MO. 10543) PLAN AND ELEVATION

PLAN

LT. EMERGENCY SPILLWAY

DOWNSTREAM SLOPE

DAM CREST EL. 558.5
RESERVOIR WATER SURFACE
EL. 545.5 ON JUNE 14, 1979

DIRT ROAD

2' CONC. PIPE

LEFT EMERGENCY SPILLWAY CREST
EL. 554

600'

156'

62' 36' 27'

4' - 6''

DAM CREST

ELEVATION

PRINCIPAL SPILLWAY CREST EL. 545.5

RIGHT EMERGENCY SPILLWAY CREST
EL. 553

93' 5' - 6''

31.5'

31.5'

SCALE
1'' = 100' (HORIZONTAL)
VERTICAL (NOT TO SCALE)
LAKEVIEW DAM (MO. 10543)

TYPICAL EMBANKMENT SECTION

TYPICAL EMBANKMENT SECTION
(AS MEASURED IN FIELD)
NOT TO SCALE

DAM CREST EL. 558.50

PRINCIPAL SPILLWAY CREST AND
BERM EL. 545.50 (ACCORDING TO
DRAWINGS)

ACCORDING TO DRAWINGS

11'

28' (MAX.)

10'

1

3

1

2
Along Station 24+20 on E.F. = Top = Station 25+59 on Base Line

Profile of Emergency Spillway No.
SECTION B-B

SECTION A-A

SPREAD FOOTING DETAIL
To be used on spread footing only

DRAIN SUPPORT DETAILS
To be used on pump station or drain
CONCRETE QUANTITIES

<table>
<thead>
<tr>
<th>Item</th>
<th>Footing</th>
<th>Bent</th>
<th>Drain</th>
<th>Joint</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3</td>
<td>22</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

PLAN

SIDE ELEVATION

STANDARD DETAILS FOR CANTILEVERED R/C PIPE OUTLET

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DETAILS OF EXPANSION JOINT AND TYPE III CRADLE

SECTION A-A

DETAILS OF EXPANSION JOINT AND TYPE III CRADLE

SECTION ON C

ELEVATION OF ANTI-SEEP COLLAR

Shown with Type III Cradle
SECTION 0-0

SECTION A-A

SECTION D-D

TYPE I CRADLE

TYPE II CRADLE

TYPE III CRADLE

SECTION D-D

PRECAST CONCRETE BLOCK

DETAILS OF ANTI-SEEP COLLAR EXPANSION JOINT AND CRADLES FOR 18" PIPE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DETAILS OF ANTI-SEEP COLLAR EXPANSION JOINT AND CRADLES FOR 18" PIPE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SECTION ON G

SECTION D-D
SECTION ON CENTERLINE

PLAN
QUARTERNARY — Qal - ALLUVIAN  
SILURIAN — S - SILURIAN UNDIVIDED

PENNSYLVANIAN — Pcc - CHEROKEE GROUP

Mm — MERAMECIAN SERIES

MISSISSIPPIAN

Mo — OSAGEAN SERIES

Mk — KINDERHOOKIAN SERIES, CHOTEAU GROUP

DEVONIAN — DEVONIAN UNDIVIDED

NOIX LIMESTONE
MAQUOKETA SHALE
CAPE LIMESTONE
KIMMISWICK FORMATION

ORDOVICIAN

Omk

DECORAH FORMATION
PLATTIN FORMATION

Odp

Osp — ST. PETER'S SANDSTONE

X — LOCATION OF DAM, MO. 10543

REFERENCE:

GEOLOGIC MAP OF MISSOURI, MISSOURI GEOLOGIC SURVEY,
a) 1961, b) 1979

GEOLOGIC MAP OF LINCOLN COUNTY AND ADJACENT AREA
APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION
PHOTO INDEX FOR LAKEVIEW DAM
Lakeview Dam

Photo 1. - View of the crest of the embankment.
Photo 2. - View of the downstream embankment slope.
Photo 3. - View of the upstream embankment slope.
Photo 4. - View of the intake to the drop inlet structure.
Photo 5. - View of the outlet of the 24-inch diameter concrete conduit. Note interceptor drain outlet to the right of the conduit.
Photo 6. - View of the emergency spillway on the left abutment.
Photo 7. - View of the emergency spillway on the right abutment. Note rock outcrops.
Photo 8. - View of the discharge channel of the 24-inch diameter concrete conduit.
Lakeview Dam

Photo 1

Photo 2
Lakeview Dam

Photo 3

Photo 4
Lakeview Dam

Photo 5

Photo 6
Lakeview Dam

Photo 7

Photo 8
APPENDIX B

HYDROLOGIC COMPUTATIONS
PLATE I, APPENDIX B

ELSBERRY QUADRANGLE

DAM SITE

SCALE 1:24,000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

DRAINAGE BOUNDARY

LAKEVIEW DAM (MO 10543)
DRAINAGE BASIN
**Comprehensive Rating Curve Tabulation**

<table>
<thead>
<tr>
<th>Reservoir Water Surface Elevation</th>
<th>H,</th>
<th>Principal Spillway Discharge (Q=H²/81.12)</th>
<th>Right Emergency Spillway Discharge</th>
<th>Left Emergency Spillway Discharge</th>
<th>Discharge Over Top of Dam</th>
<th>Combined Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>545.5</td>
<td>18.5</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>54.6</td>
<td>16</td>
<td>13*</td>
<td>-</td>
<td>-</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>547</td>
<td>17</td>
<td>61</td>
<td>-</td>
<td>-</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>553</td>
<td>23</td>
<td>71</td>
<td>-</td>
<td>-</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>553.74</td>
<td>23.74</td>
<td>72</td>
<td>1.89</td>
<td>-</td>
<td>2.61</td>
<td></td>
</tr>
<tr>
<td>554.47</td>
<td>24.11</td>
<td>73</td>
<td>350</td>
<td>4.7</td>
<td>427</td>
<td></td>
</tr>
<tr>
<td>554.47</td>
<td>24.11</td>
<td>73</td>
<td>350</td>
<td>4.7</td>
<td>427</td>
<td></td>
</tr>
<tr>
<td>565.9</td>
<td>25.9</td>
<td>75</td>
<td>1570</td>
<td>348</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>566.6</td>
<td>26.6</td>
<td>76</td>
<td>2251</td>
<td>575</td>
<td>2930</td>
<td></td>
</tr>
<tr>
<td>569.68</td>
<td>28.68</td>
<td>79</td>
<td>4325</td>
<td>1527</td>
<td>5731</td>
<td></td>
</tr>
<tr>
<td>569.68</td>
<td>28.68</td>
<td>79</td>
<td>4804</td>
<td>1720</td>
<td>116</td>
<td>6727</td>
</tr>
<tr>
<td>559.3</td>
<td>29.36</td>
<td>80</td>
<td>5828</td>
<td>2231</td>
<td>1282</td>
<td>5421</td>
</tr>
<tr>
<td>540.00</td>
<td>30.8</td>
<td>81</td>
<td>6937</td>
<td>2774</td>
<td>2921</td>
<td>1.2715</td>
</tr>
</tbody>
</table>

*Weir Flow Controls*
<table>
<thead>
<tr>
<th>$V_{c,1}$</th>
<th>$A_{c,1}$</th>
<th>$T_{c,1}$</th>
<th>$V_{c,2}$</th>
<th>$A_{c,2}$</th>
<th>$T_{c,2}$</th>
<th>$V_{c,3}$</th>
<th>$A_{c,3}$</th>
<th>$T_{c,3}$</th>
<th>$Q_{c,1}$</th>
<th>$R_{c,1}$</th>
<th>$C_{1}$</th>
<th>$L_{1}$</th>
<th>$H_{1}$</th>
<th>$Q_{c,2}$</th>
<th>$H_{2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>47.9</td>
<td>98.7</td>
<td>3.95</td>
<td>0.24</td>
<td>187.2</td>
<td>5.53.74</td>
<td>189</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.75</td>
<td>73.0</td>
<td>101.4</td>
<td>4.80</td>
<td>0.36</td>
<td>350.8</td>
<td>5.54.11</td>
<td>355</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td>98.7</td>
<td>104.8</td>
<td>5.51</td>
<td>0.47</td>
<td>548.9</td>
<td>5.55.79</td>
<td>583</td>
<td>1939</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>2887</td>
<td>118.3</td>
<td>8.40</td>
<td>0.90</td>
<td>1594.2</td>
<td>5.55.79</td>
<td>1583</td>
<td>2284</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.50</td>
<td>26231</td>
<td>121.4</td>
<td>8.43</td>
<td>1.11</td>
<td>2259</td>
<td>5.56.4</td>
<td>2284</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.76</td>
<td>4483</td>
<td>139.6</td>
<td>10.07</td>
<td>1.61</td>
<td>4784.6</td>
<td>5.58.38</td>
<td>5352</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00</td>
<td>4084</td>
<td>139.8</td>
<td>10.36</td>
<td>1.67</td>
<td>4809.2</td>
<td>5.58.68</td>
<td>6948</td>
<td>1146</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>3315</td>
<td>149.4</td>
<td>10.90</td>
<td>1.81</td>
<td>5238.6</td>
<td>5.59.26</td>
<td>984</td>
<td>1282</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.00</td>
<td>608</td>
<td>150</td>
<td>11.41</td>
<td>2.02</td>
<td>6737</td>
<td>5.60.09</td>
<td>12.689</td>
<td>12.689</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DAM SAFETY INSPECTION - MISSOURI
LAKENET DAM (10543)  
JOB NO. 1240-001

PRINCIPAL SPILLWAY RATING CURVE
BY KL.B  
DATE 6-21-7

CREST EL = 695.5
EL = 592.5

24" R/C PIPE

90°

MEASUREMENTS FROM
SEC PLANS, FIELD CHECKED
WHERE POSSIBLE

PRINCIPAL SPILLWAY DISCHARGE (ASSUME NO TAILWATER EFFECT)

AT W.L. = 546.0

1) WEIR FLOW

\[ Q = C_2 \cdot H^{\frac{3}{2}} = 3.03 \cdot 19.33^{\frac{3}{2}} = 13 \text{ CFS} \]

2) CHECK FOR PRESSURE FLOW: (Negligible friction in pipe)

\[ H_f = \left( 1 + K_e + \frac{\varepsilon}{6} \right) \frac{v^2}{2g} \]

ASSUME \( \varepsilon = 0.005 \)

\( \frac{\varepsilon}{6} = 0.008 \approx 0.005 \)

\( K_e = 0.5 \)
\[ H_t = \left( 1 + 0.5 + 0.025 \frac{H_t^{1/2}}{2} \right) \frac{v^2}{2g} \]

\[ H_t = 2.90 \frac{v^2}{2g} \Rightarrow v = 4.71 \sqrt{H_t} \]

\[ Q = A \cdot v = \pi \frac{D^2}{4} \cdot 4.71 \sqrt{H_t} = 14.81 \sqrt{H_t} \]

\( H_t = 546 - 530 = 16 \)

\[ Q = 14.81 \sqrt{16} = 59 \text{ cfs} \]

2. At Elevation 546, weir flow controls and \( Q = 13 \text{ cfs} \)

At W.L. = 5.47

a) Weir flow, \( H = 547 - 545.5 = 1.5 \)

\[ Q = \frac{cfH^{3/2}}{3.03 \times 12.53 \times 45.5/2} = 69 \text{ cfs} \]

b) Pressure flow,

\[ Q = 14.81 \sqrt{H_t} \text{ with } H_t = 547 - 530 = 17 \]

\[ Q = 14.81 \sqrt{17} = 61 \text{ cfs} \]

2. At W.L. = 5.47, pressure flow controls and \( Q = 61 \text{ cfs} \)

Also for all elevations above 5.47, pressure flow will control and the equation \( Q = 14.81 \sqrt{H_t} \) will be used.
LAKEVIEW DAM (NO. 10543)
SPILLWAY & OVERTOP RATING CURVE
<table>
<thead>
<tr>
<th>Elev. M.S.L. (FH)</th>
<th>Reservoir Surface Area (Acres)</th>
<th>Inundation Volume (Ac. - Ft)</th>
<th>Total Volume (Ac. - Ft)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>530</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Est. Streambed at Dam</td>
</tr>
<tr>
<td>545.5</td>
<td>10.4</td>
<td>54</td>
<td>54</td>
<td>W.S. as shown on USGS Maps. (Elev. Assumed) Assumed Principal Spillway Crest El.</td>
</tr>
<tr>
<td>553</td>
<td>20.5</td>
<td>119</td>
<td>168</td>
<td>Left Emergency Spillway Crest El.</td>
</tr>
<tr>
<td>554</td>
<td>22.5</td>
<td>21</td>
<td>189</td>
<td>Right Emergency Spillway Crest El.</td>
</tr>
<tr>
<td>558.5</td>
<td>30</td>
<td>118</td>
<td>307</td>
<td>Top of Dam El.</td>
</tr>
<tr>
<td>560</td>
<td>33</td>
<td>47</td>
<td>354</td>
<td>Area Measured on USGS Map.</td>
</tr>
<tr>
<td>580</td>
<td>85</td>
<td>1140</td>
<td>1494</td>
<td>Measured on USGS Map.</td>
</tr>
</tbody>
</table>
PLATE 3, APPENDIX-B

LAKEVIEW DAM (MO. 10543)
RESERVOIR CAPACITY CURVE
**DAM SAFETY INSPECTION - MISSOURI**

**DAM # MO. 10543**

**PROBABLE MAXIMUM PRECIPITATION**

**ENGINEERING CONSULTANTS, INC.**

**JOB NO. 1240**

**DATE: 6/11/7**

---

**DETERMINATION OF PMP**

1. **Determine Drainage Area of Basin**
   
   \[ D. A. = 540 \text{ acres} \]

2. **Determine PMP Index Rainfall (200 sq. mi. + 24 hrs. dur.)**
   
   **Location of Centroid Basin**
   
   \[ \text{Long} = 90° 98' 30'' \quad \text{Lat} = 39° 07' 58'' \]
   
   \[ \text{PMP} = 24.7'' \text{ (From Fig. 4, HUR # 38)} \]

3. **Determine Basin Rainfall in Terms of Percentage of PMP Index Rainfall for Various Durations:**

   **Location**
   
   \[ \text{Long} = 90° 98' 30'' \quad \text{Lat} = 39° 07' 58'' \]
   
   \[ \Rightarrow \text{Zone 7} \]

<table>
<thead>
<tr>
<th>Duration (Hrs)</th>
<th>Percent of Index Rainfall</th>
<th>Total Rainfall (In.)</th>
<th>Rainfall Increments</th>
<th>Duration of Increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>100</td>
<td>24.7</td>
<td>24.7</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>120</td>
<td>29.6</td>
<td>4.9</td>
<td>6</td>
</tr>
<tr>
<td>24</td>
<td>130</td>
<td>32.1</td>
<td>2.5</td>
<td>12</td>
</tr>
</tbody>
</table>
1. DRAINAGE AREA, A = 540 ACRES = 0.84 SQ. MI
2. LENGTH OF STREAM, L = 1.78 MILES = 9396 FT
3. ELEVATION AT DRAINAGE DIVIDE ALONG LONGEST STREAM, H₁ = 830 FT
4. RESERVOIR ELEVATION AT SPILLWAY CREST, H₂ = 545.5
5. DIFFERENCE IN ELEVATION, ΔH = 284.5
6. AVERAGE SLOPE OF STREAM = \( \frac{ΔH}{L} = \frac{284.5}{9396} = 3.03\% \)
7. TIME OF CONCENTRATION:
   a) BY KIRPICH FORMULA:
      \( T_c = \left( \frac{11.9 \times L^3}{ΔH} \right)^{0.385} = \left( \frac{11.9 \times 1.78^3}{284.5} \right)^{0.385} \approx 0.57 \) HRS
   b) BY VELOCITY ESTIMATE: AVG. VEL = 3 FPS
      \( T_c = \frac{L}{V} = \frac{9396}{3(60 \times 60)} = 0.009 \) HRS
     USE: \( T_c = 0.57 \) HRS
8. LAG TIME, \( L_t = 0.6 \times 0.57 = 0.342 \)
9. UNIT DURATION, \( D = \frac{L_t}{3} = \frac{0.342}{3} = 0.114 > 0.083 \)
    USE: D = 0.083
10. TIME TO PEAK, \( T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + 0.342 = 0.384 \)
11. PEAK DISCHARGE, \( q_p = \left( \frac{4.94 \times A}{T_p} \right) = \left( \frac{4.94 \times 0.84}{0.384} \right) \approx 105.9 \) CFS
HYDROLOGIC SOIL GROUP & CURVE NUMBER


2. The watershed is mainly agricultural land with some wooded and urbanized areas. Assume the hydrologic condition of the watershed as 'Fair'.

Thus, \( CN = 74 \) for AMC-II

\[ \Rightarrow CN = 88 \] for AMC-III
Regression Equation for the 100 yr Flood For Missouri:

\[ Q_{100} = 85.1 \times A^{0.934} \times S^{-0.02} \]

WHERE:

- \( A \) = Drainage Area in sq. mi.
- \( S \) = Main channel slope in ft/mi. (Avg. slope between 0.14 and 0.85)

For Lakeview Dam:

\( A = 0.84 \) sq. mi.
\( S = 92 \) ft/mi.

\[ Q_{100} = 85.1 \times (0.84)^{0.934} \times (92)^{-0.02} \]

\[ Q_{100} = 977 \text{ CFS} \]
<table>
<thead>
<tr>
<th>i</th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
<th>N4</th>
<th>N5</th>
<th>N6</th>
<th>N7</th>
<th>N8</th>
<th>N9</th>
<th>N10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Input Precipitation Index, Ratios, and Unit Hydrograph Parameters**

<table>
<thead>
<tr>
<th>i</th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
<th>N4</th>
<th>N5</th>
<th>N6</th>
<th>N7</th>
<th>N8</th>
<th>N9</th>
<th>N10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Input Hydrograph Through All View Day (1st View)**

<table>
<thead>
<tr>
<th>i</th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
<th>N4</th>
<th>N5</th>
<th>N6</th>
<th>N7</th>
<th>N8</th>
<th>N9</th>
<th>N10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Input Hydrograph Through All View Day (2nd View)**

<table>
<thead>
<tr>
<th>i</th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
<th>N4</th>
<th>N5</th>
<th>N6</th>
<th>N7</th>
<th>N8</th>
<th>N9</th>
<th>N10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS
SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING