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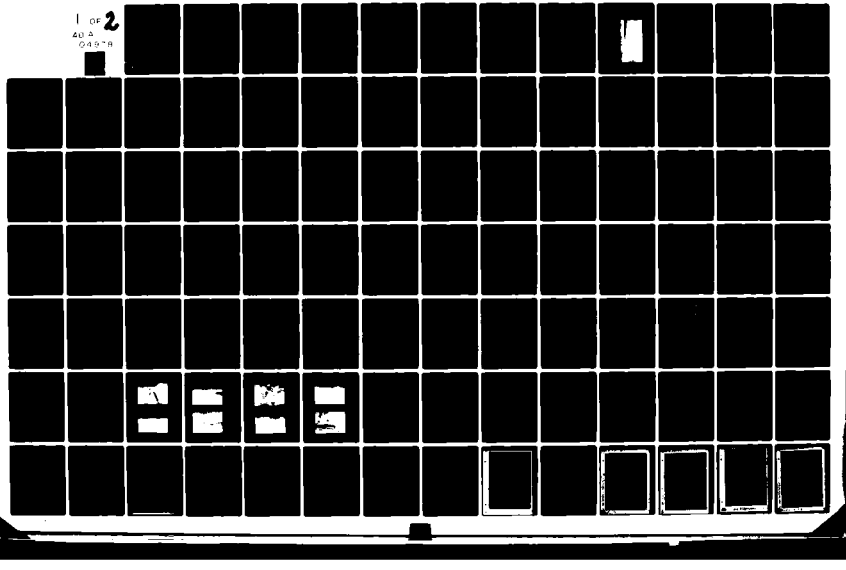

LEVEL II

MISSISSIPPI·SALT·QUINCY RIVER BASIN

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LAKEVIEW DAM
LINCOLN COUNTY, MISSOURI
MO. 10543

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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

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

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

IN REPLY REFER TO

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: SIGNED
Chief, Engineering Division — 28 SEP 1979
Date

APPROVED BY: SIGNED
Colonel, CE, District Engineer — 28 SEP 1979
Date

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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

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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.

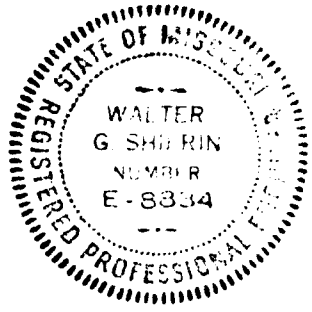
Our inspection and evaluation indicate that the spillway of Lakeview Dam meets the criteria set forth in the guidelines for a dam having the above size and hazard potential. Lakeview Dam, being a small size dam with a high hazard potential, is required by the guidelines to pass from one-half Probable 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 accomodate the Probable Maximum Flood without overtopping the dam.

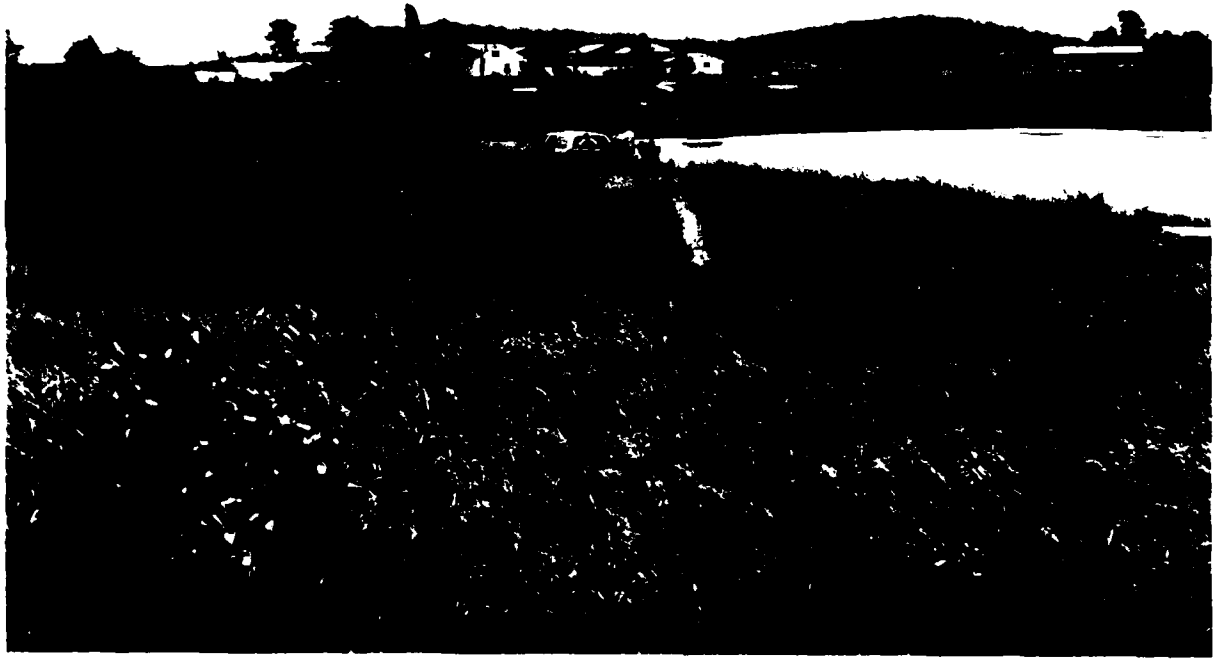
The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the region.

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 recommended.

Water G. Shifrin, P.E.





Overview of Lakeview Dam

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

LAKEVIEW DAM, I.D. No. 10543

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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.

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 to 3H and 1V to 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 to 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 to 3H and 1V to 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 to 6H on the east side of the channel and 1V to approximately 14H 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 None

i. Spillway

Type:		
Principal Spillway		Drop inlet, uncontrolled
Right Emergency Spillway		Open channel, uncontrolled
Left Emergency Spillway		Open channel, uncontrolled
Length of weir:		
Principal Spillway	12.3 feet	(Drop Inlet Spillway)
Right Emergency Spillway	93 feet	
Left Emergency Spillway	36 feet	
Crest Elevation (feet above MSL):		
Principal Spillway	545.5 feet	
Right Emergency Spillway	553.0 feet	
Left Emergency Spillway	554.0 feet	

j. Regulating Outlets

Type:	Livestock water supply
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.

SECTION 3: VISUAL INSPECTION

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:

Name	Affiliation	Disciplines
David J. Kerkes	Engineering Consultants, Inc.	Soils
Peter Howard	Engineering Consultants, Inc.	Geology
Mark R. Haynes	Engineering Consultants, Inc.	Civil, Structural and Mechanical
Kenneth L. Bullard	Engineering Consultants, Inc.	Hydraulics and Hydrology
Kevin Blume	Consoer, Townsend & Assoc., Ltd.	Civil and Structural

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 occured 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 clos. 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 fossilferous. 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 fossilferous. 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 inaccesible 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. Downsteam 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.

SECTION 5: HYDRAULIC/HYDROLOGIC

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

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 accomodated 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 accomodate 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.

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 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.

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 by any chance that an unsafe condition could be detected.

a. Safety

The spillway/reservoir system of Lakeview Dam is capable of accomodating 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.

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.

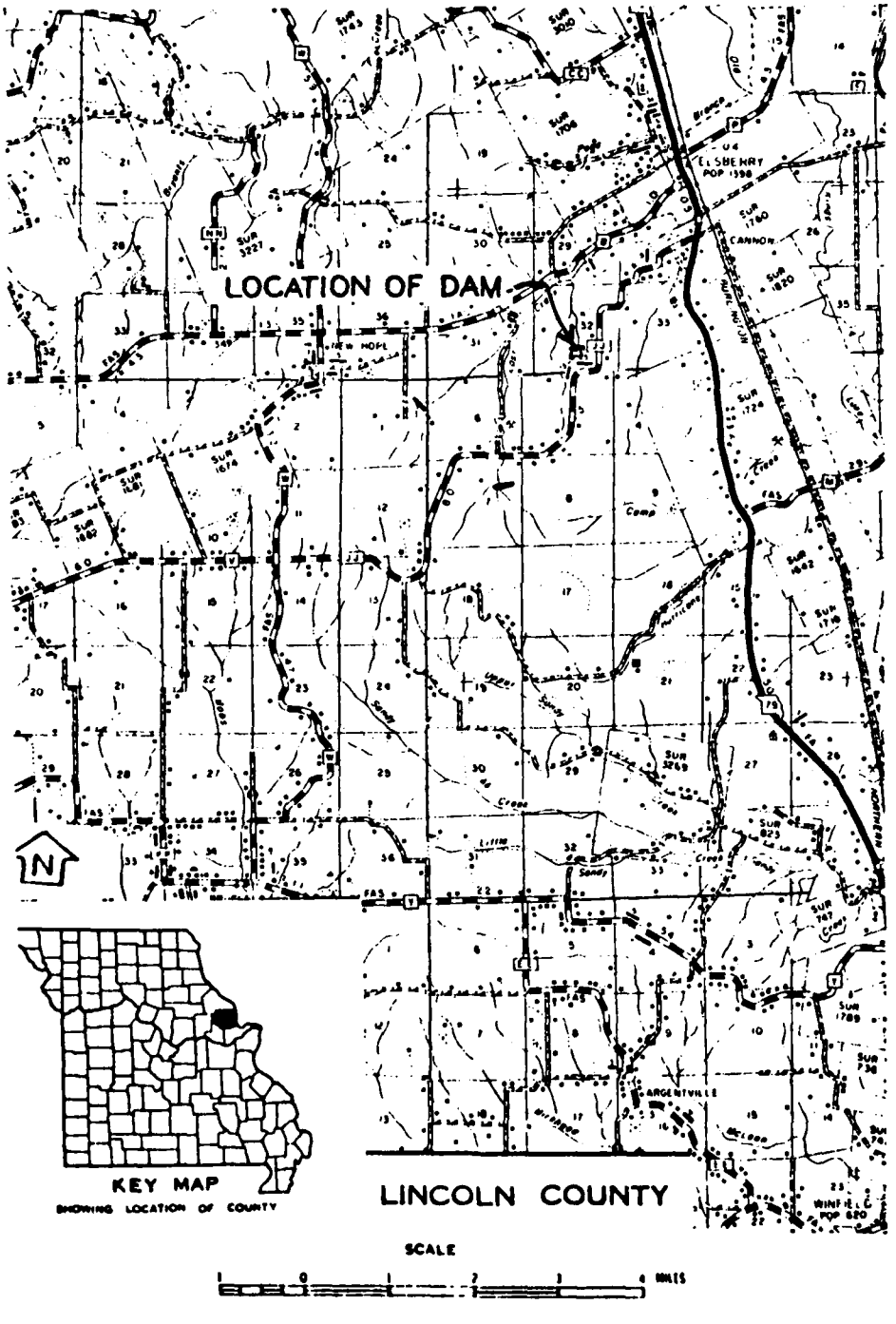
(b) Monitor the longitudinal cracks from the dam crest to the emergency spillway on the left abutment for any changes in quantity or size and report any changes.

The owner should initiate the following programs:

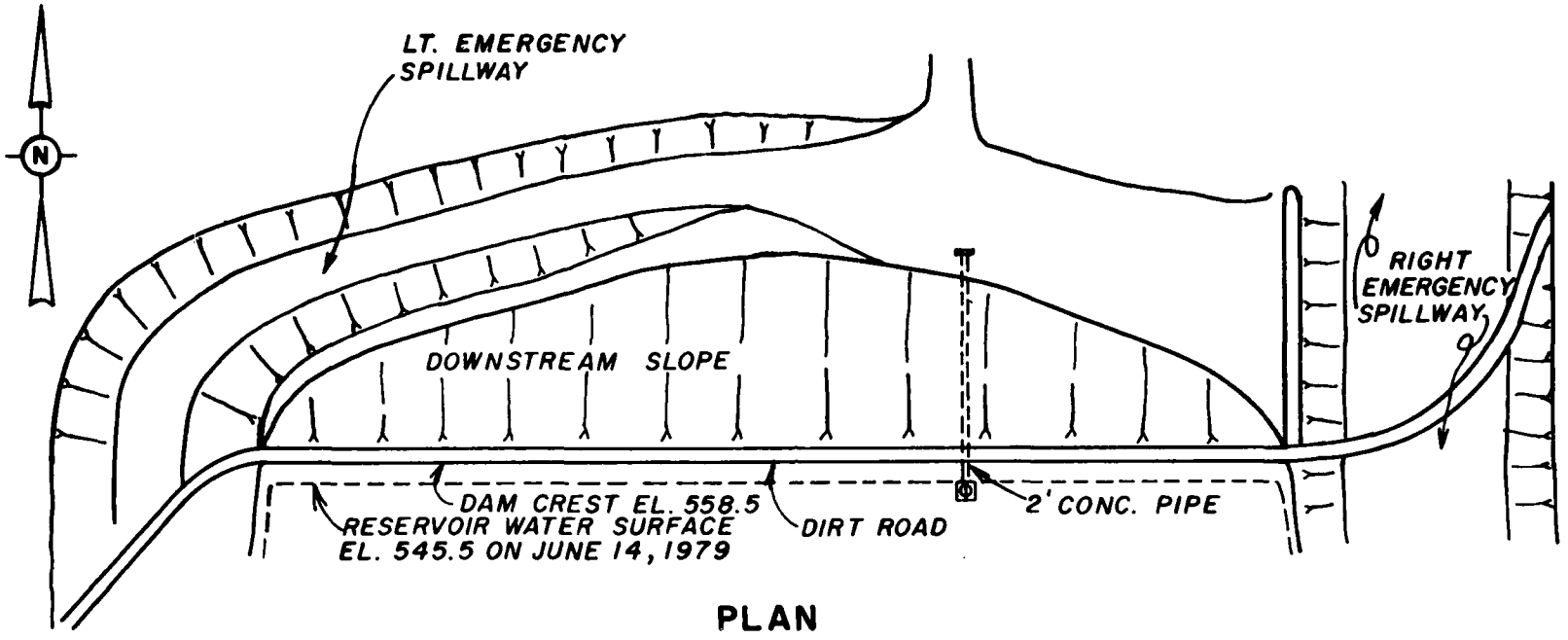
(a) Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.

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

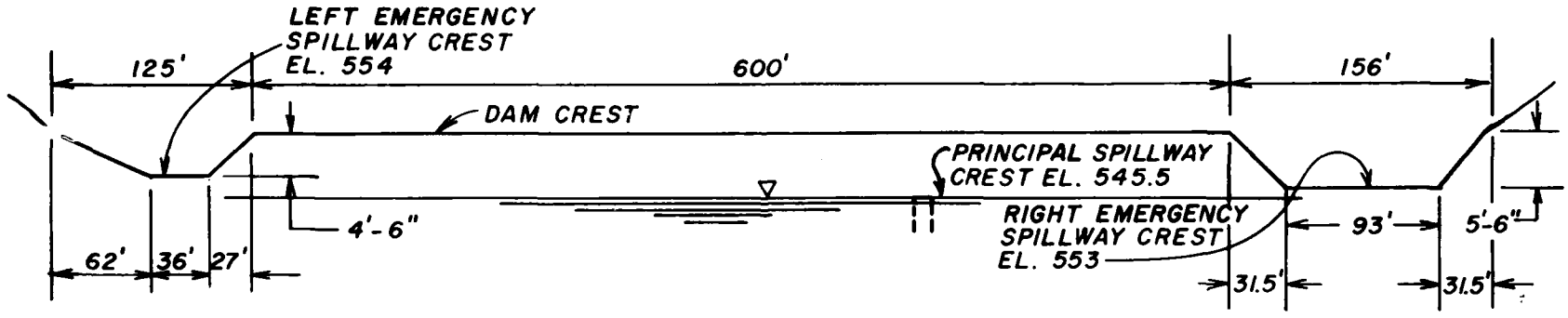
PLATES



LOCATION MAP – LAKEVIEW DAM



PLAN

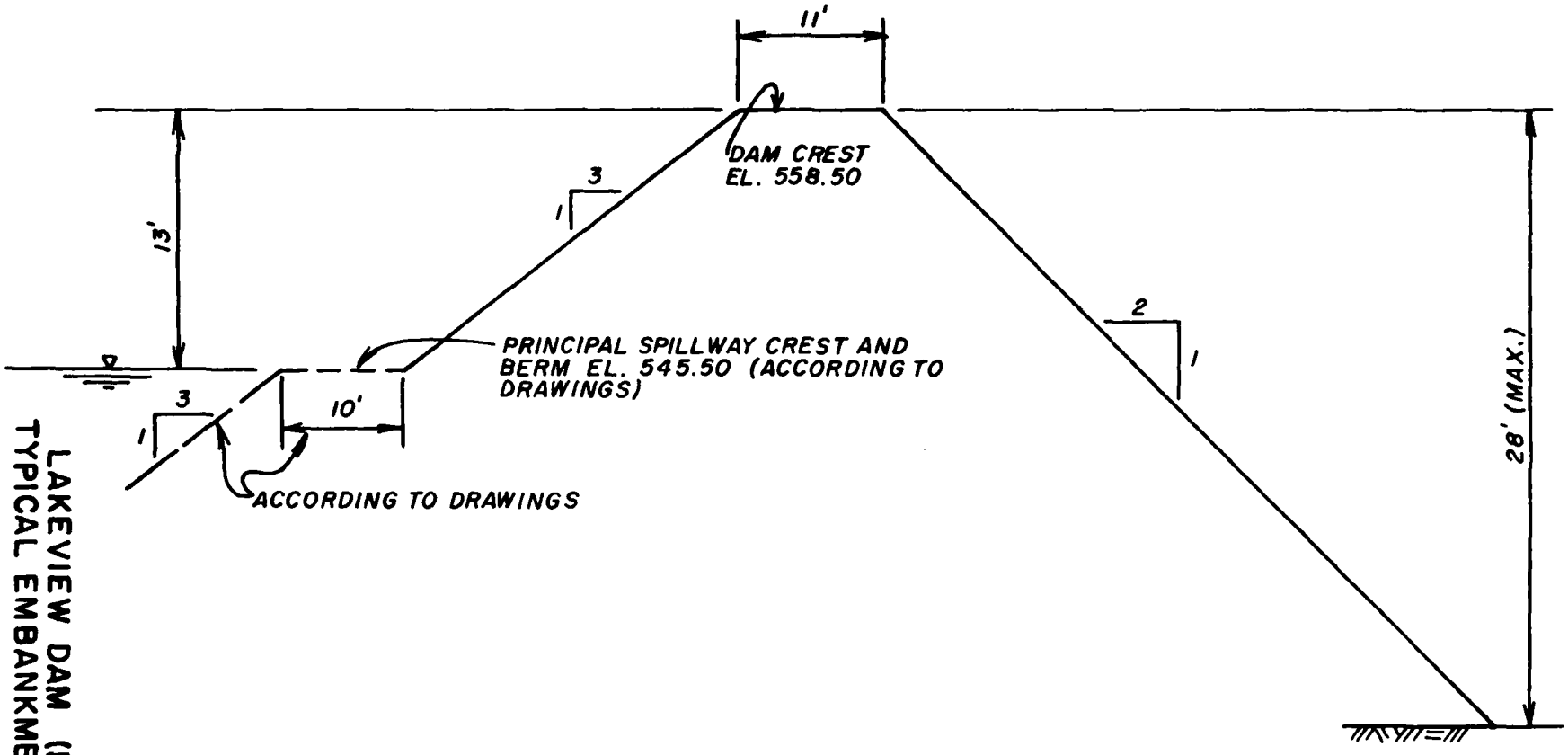


ELEVATION

SCALE
1" = 100' (HORIZONTAL)
VERTICAL (NOT TO SCALE)

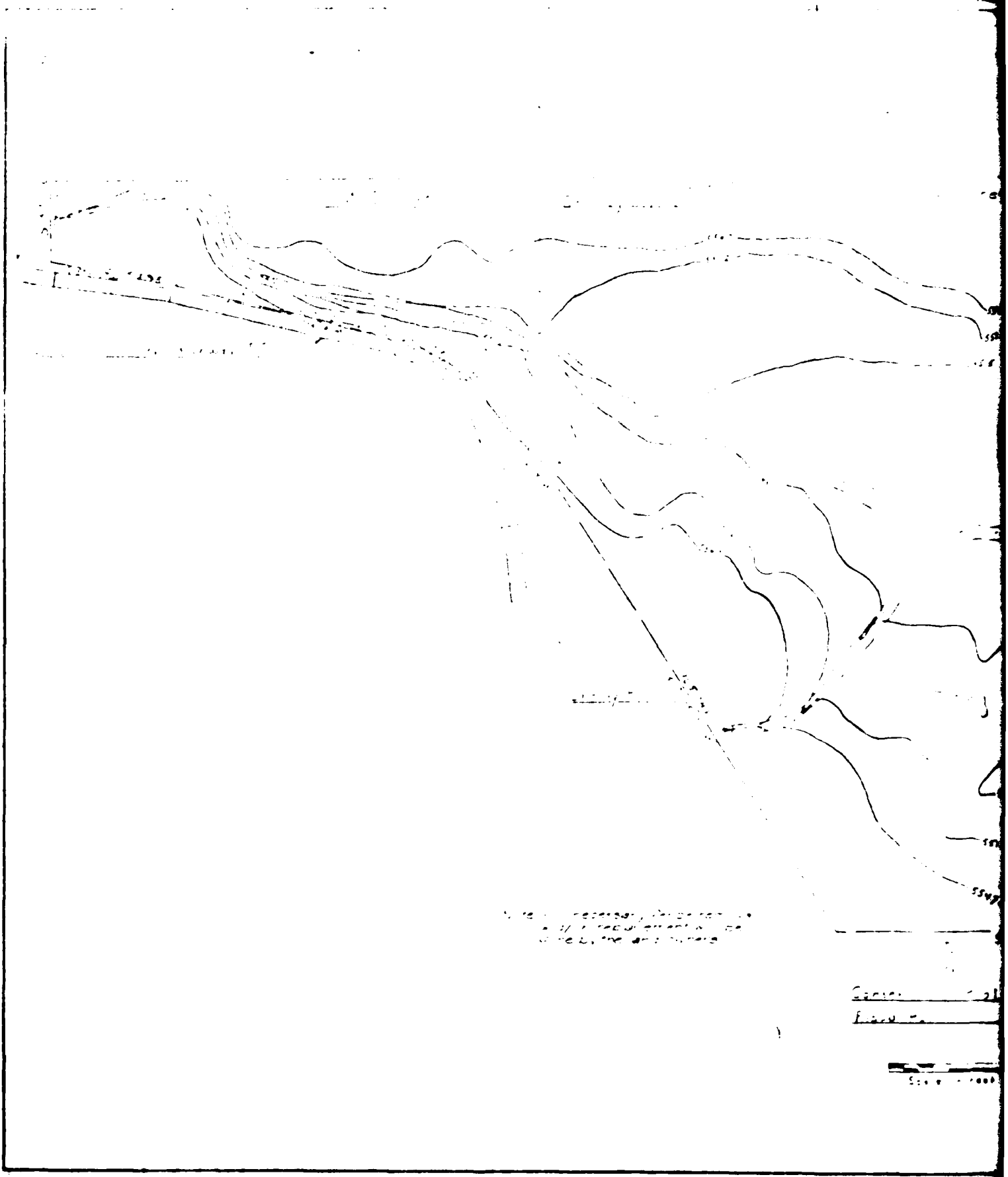
LAKEVIEW DAM (MO. 10543)
PLAN AND ELEVATION

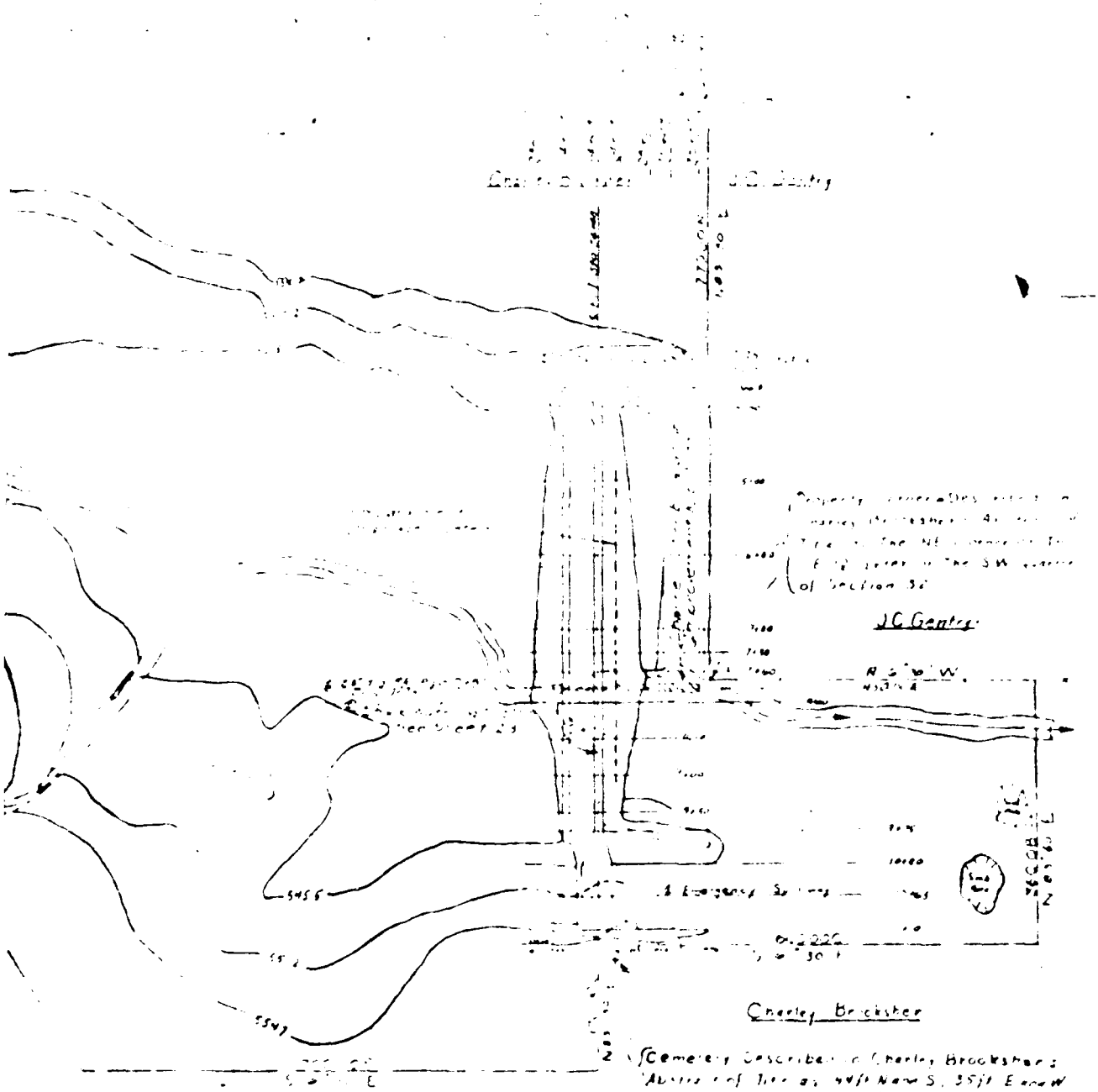
2



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

LAKEVIEW DAM (MO. 10543)
TYPICAL EMBANKMENT SECTION





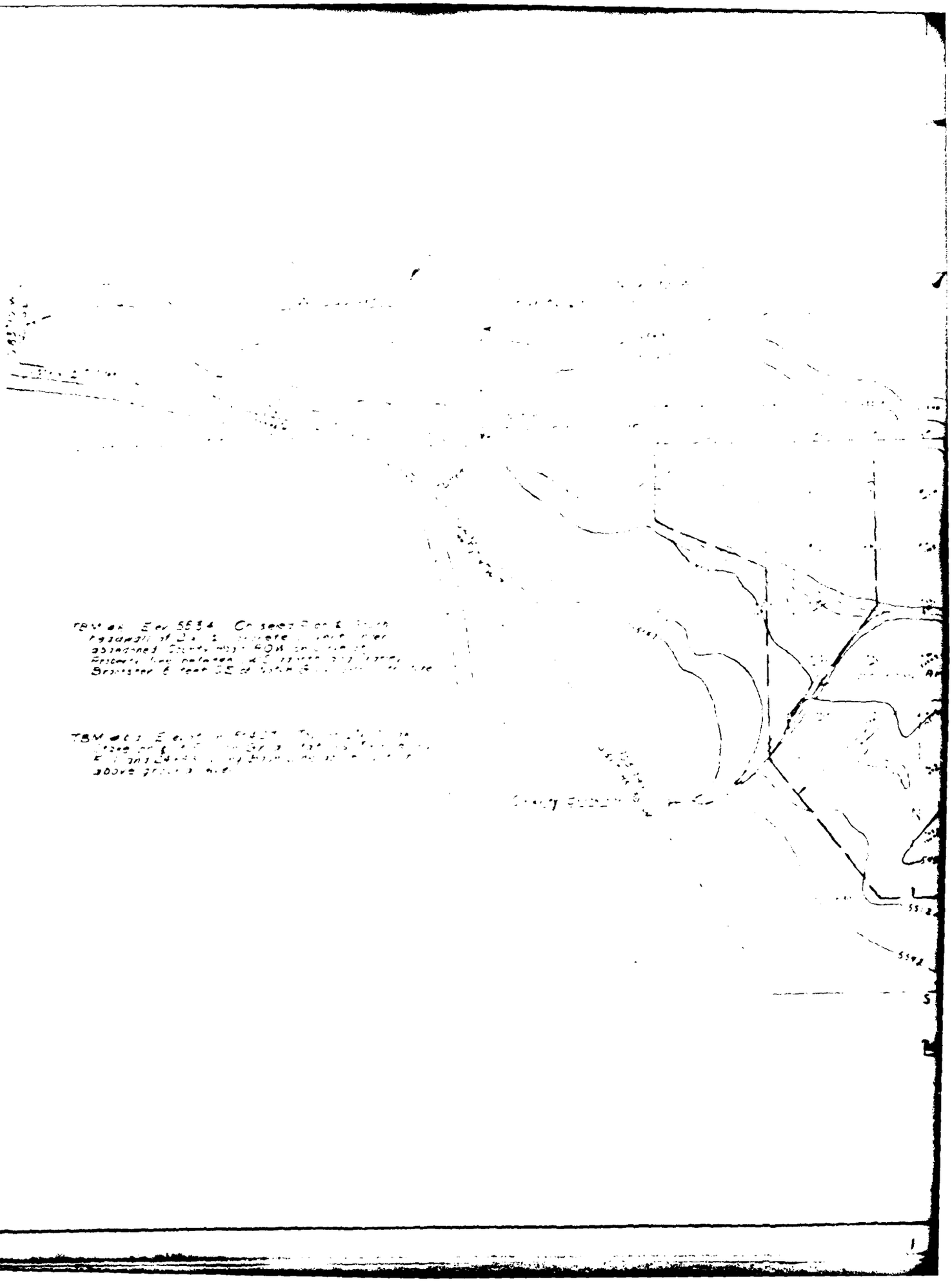
SITE MAP

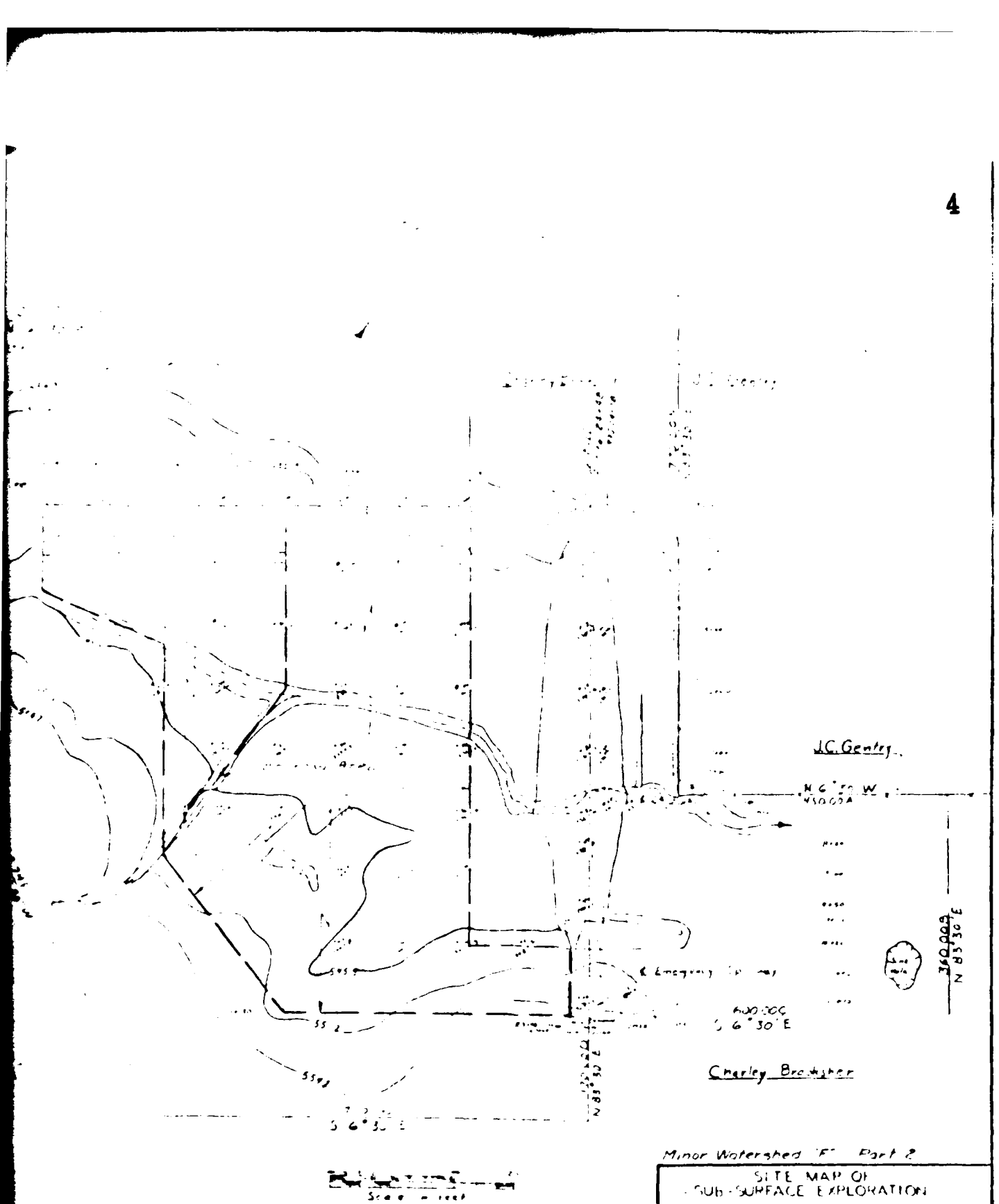
LOST CREEK WATERSHED PROTECTION PROJECT
SOIL DISTRICT OF [illegible] COUNTY MO

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SE-45167 P

12

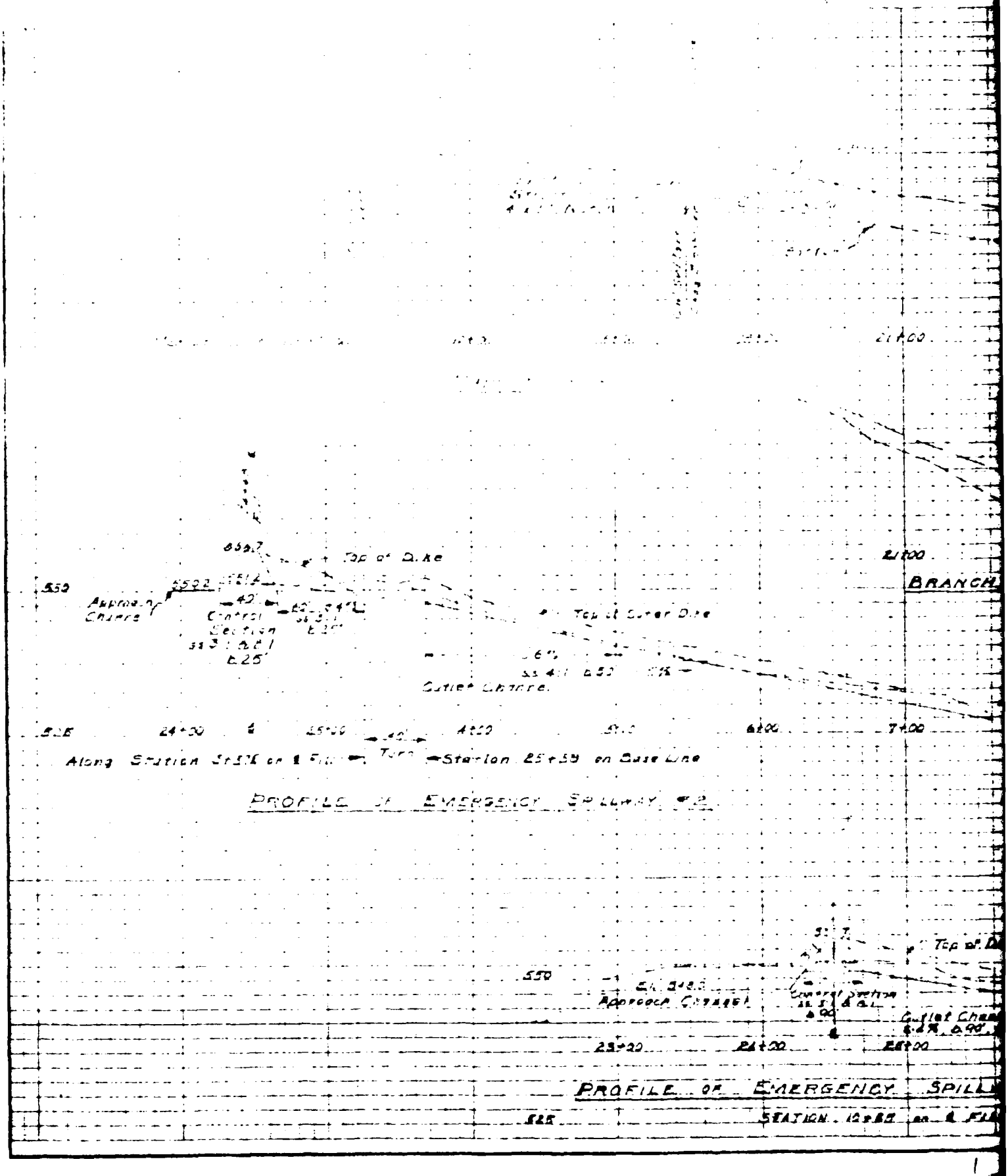


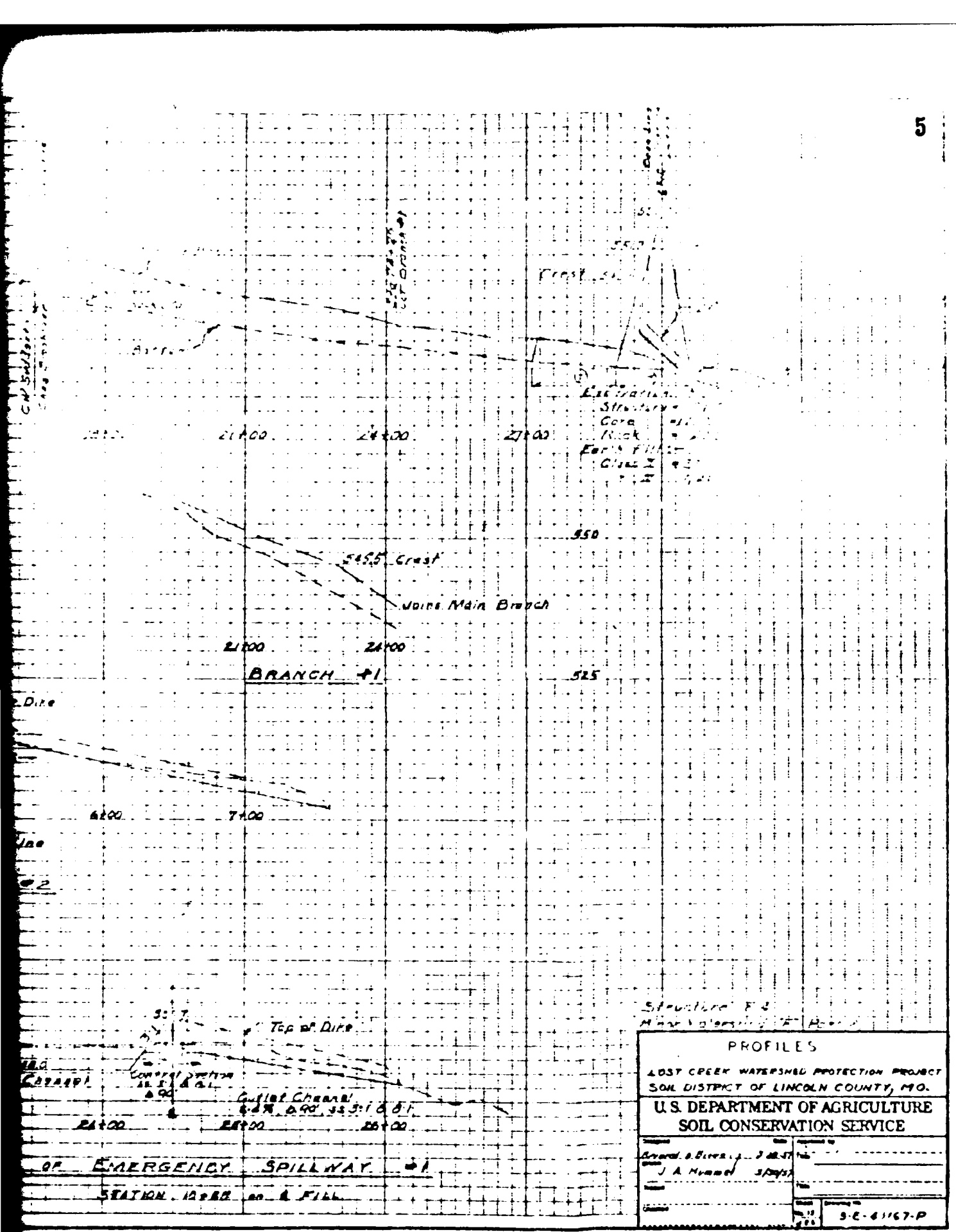


Minor Watershed 'F' Part 2

SITE MAP OF
SUB-SURFACE EXPLORATION
LOST CREEK WATERSHED PROTECTION
PROJECT, SOIL DISTRICT OF LINCOLN CO. MO.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE


Top of Dike
Approach Channel
Control Section
Outlet Channel
Top of Outer Dike
BRANCH
Along Station 21+56 on ℄ Fill — Top — Station 25+59 on Dike Line
PROFILE OF EMERGENCY SPILLWAY #2
Approach Channel
PROFILE OF EMERGENCY SPILL
STATION



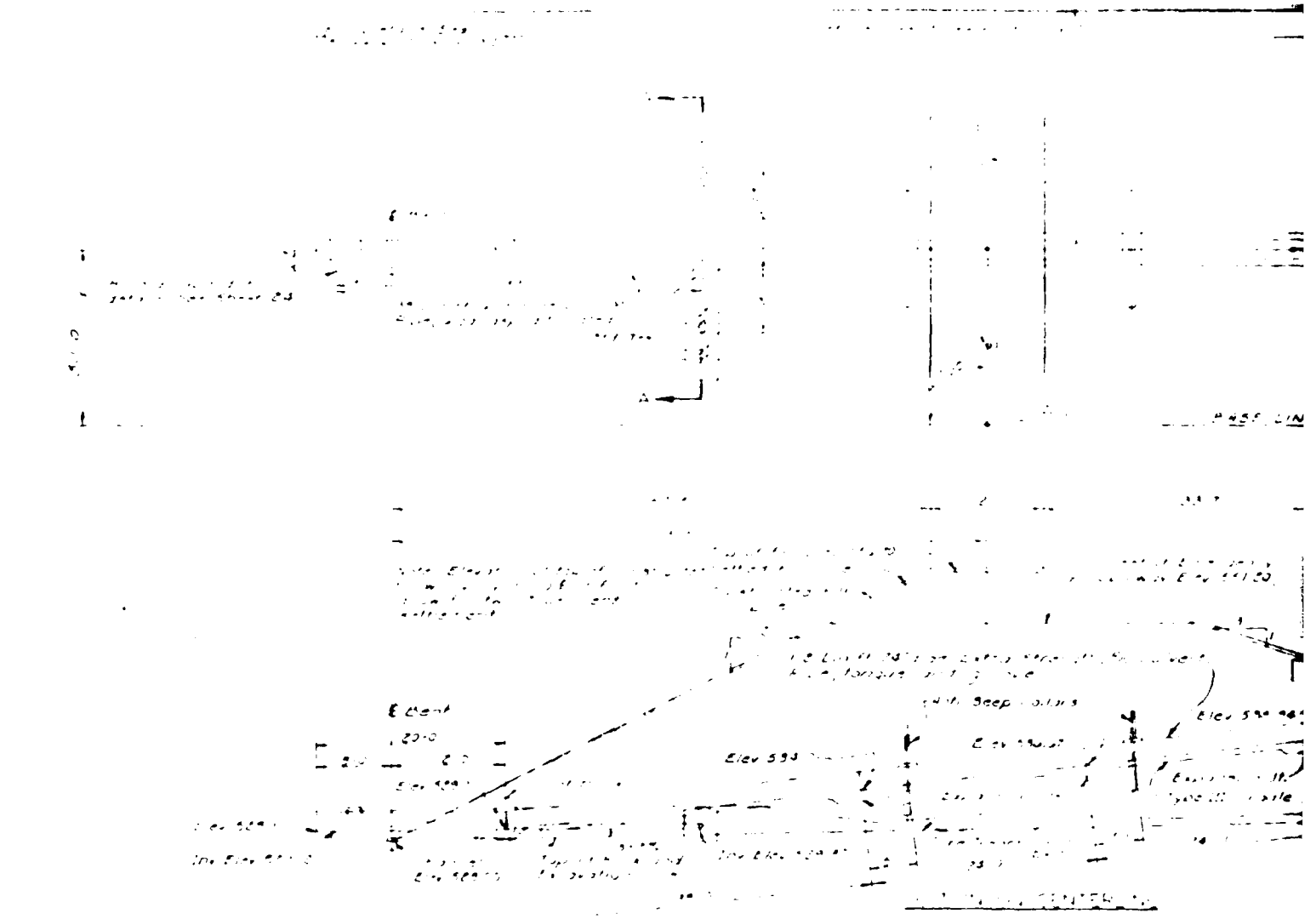
PROFILES

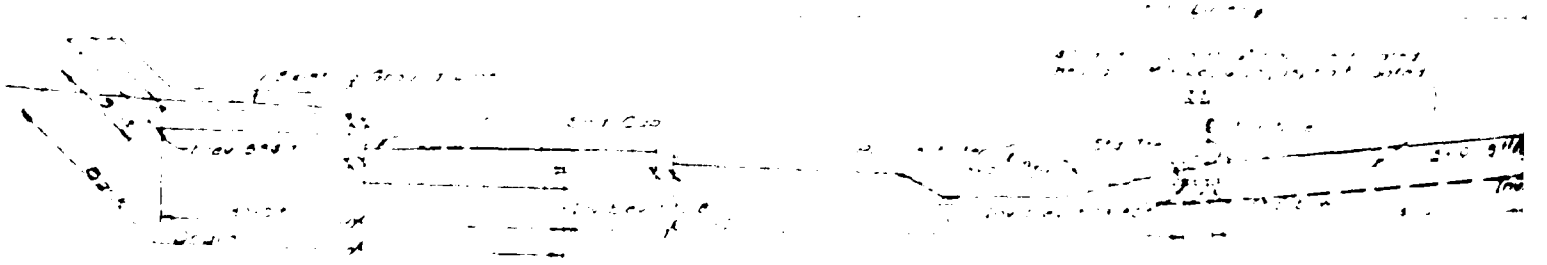
LOST CREEK WATERSHED PROTECTION PROJECT
SOIL DISTRICT OF LINCOLN COUNTY, MO.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Approved: S. Elvis, Jr. 3-28-57
J. A. Hudson 3 Days

S-E-61167-P



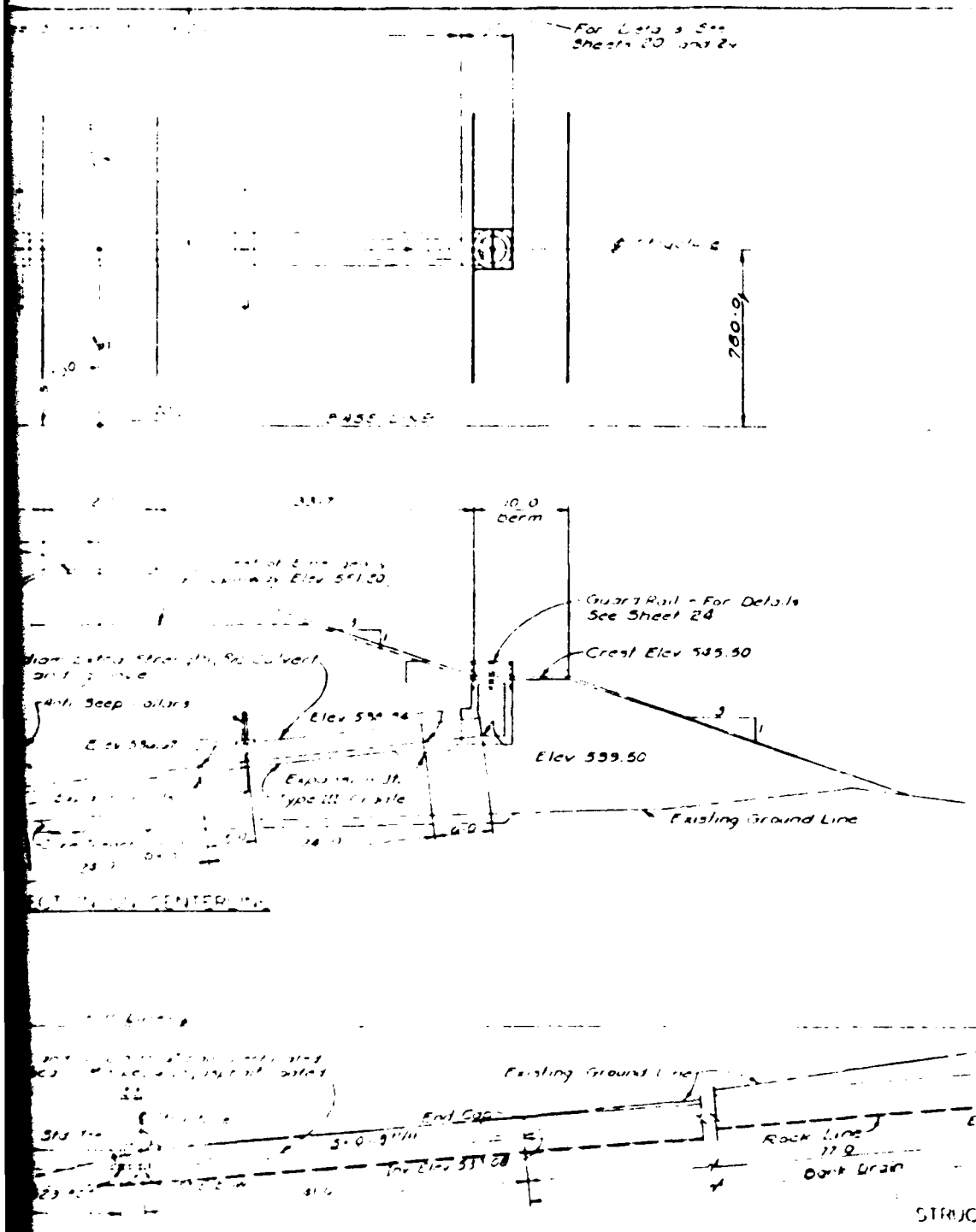


SECTION A-A

Embankment Drainage System
See Sheet 24 for Details of Cross Section

QUANTITIES

Plain Concrete
Reinforced Concrete
Steel Reinforcement
Spillway Reinforced Concrete Culvert Pipe 24" diam. Extra Strength
Drainage Pipe Corrugated Metal Pipe Culvert Pipe 6" dia. 16 ga. Galvanized
Drainage Pipe Corrugated Metal Pipe 24" dia. 16 ga. Asphalt Coated
Drainage Pipe Drains
Guard Rail



STRUCTURE F-4

STA 24+48

SECTION A-A

Emergency Drainage System
See Sheet 24 for Details of Cross Section

QUANTITIES

	11.73 Cu Yds
	9.66 Cu Yds
	634.8 Pounds
Culvert Pipe 24" diam, Extra Strength	118.0 Lin Ft
Metal Pipe Perforated 6" dia, 16 ga, asphalt coated	164.0 Lin Ft
Metal Pipe 6" dia, 16 ga, asphalt coated	99.0 Lin Ft
	189.0 Cu Yds
	Part Job

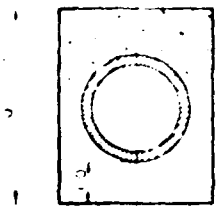
H.C. DROP INLET 24" DIAM. PIPE
GENERAL LAYOUT
Minor Watershed "F" Part E
Last Creek Watershed Protection Project
Soil District of Lincoln County, Missouri

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

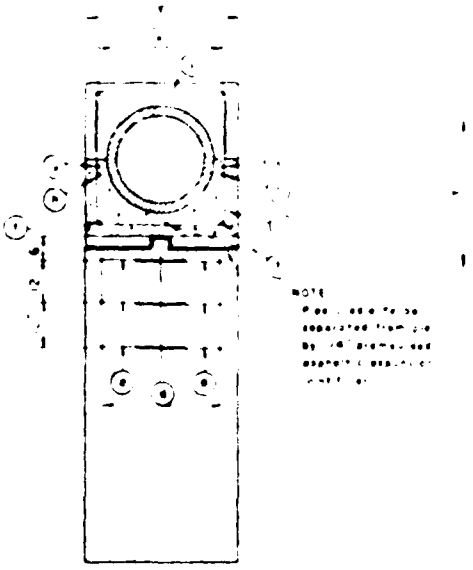
D.G. Greenwood	3 20 87		
J.W. Sylvester	3-6-87		
D.S. Yeterang	3-6-87	16	3 E 45/47-P

24" DIAM PI

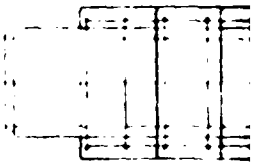
R/C PIPE DIAM	DIMENSIONS	STEEL QUANTITIES							CONCRETE		
		Footing	Bent						Footing	Bent	Drain Suppo
		#4 Bars	#3 Bars	#4 Bars	#5 Bars	#6 Bars	#7 Bars	#8 Bars			

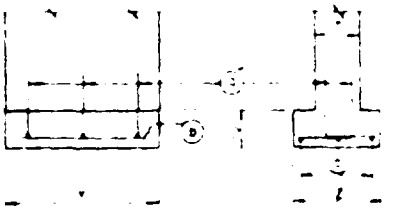


SECTION B-B



SECTION A-A

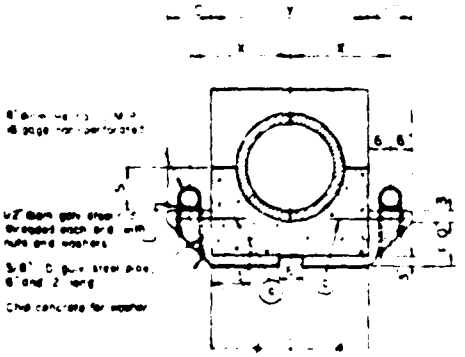




FRONT ELEVATION SIDE ELEV.

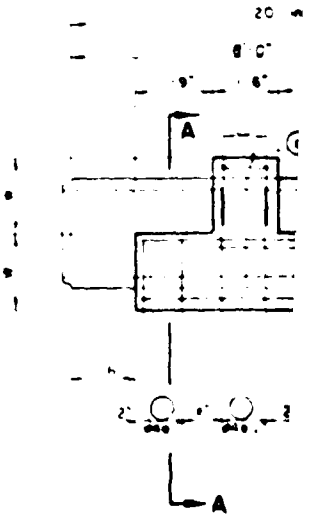
SPREAD FOOTING DETAIL

To be used on y when shown on plans



DRAIN SUPPORT DETAILS

To be used on y when shown on plans



A

A

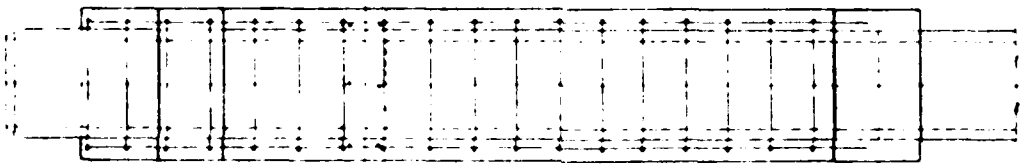
T = 2" (without forms, add 1 to thickness each side)

SID

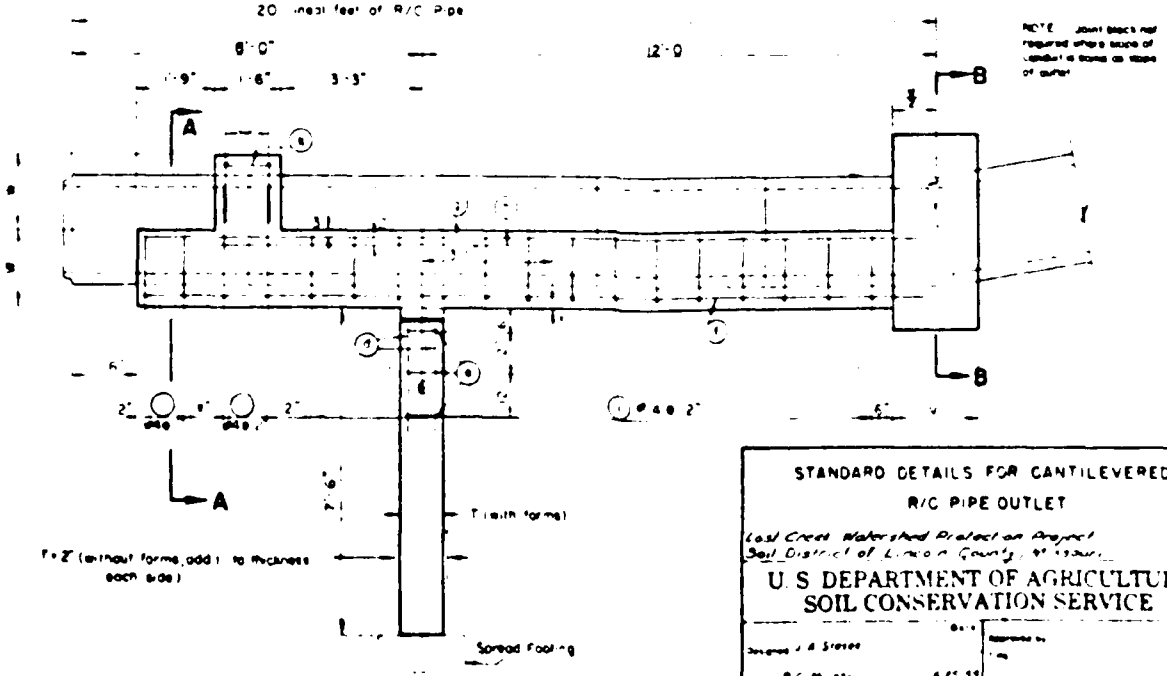
24" DIAM PIPE

CONCRETE QUANTITIES						
		Footing	Bent	Drain Support	Joint Block	Grand Total*	R/C PIPE DIAM

Drain Support is To be used only when shown on plans



PLAN



SIDE ELEVATION

STANDARD DETAILS FOR CANTILEVERED R/C PIPE OUTLET

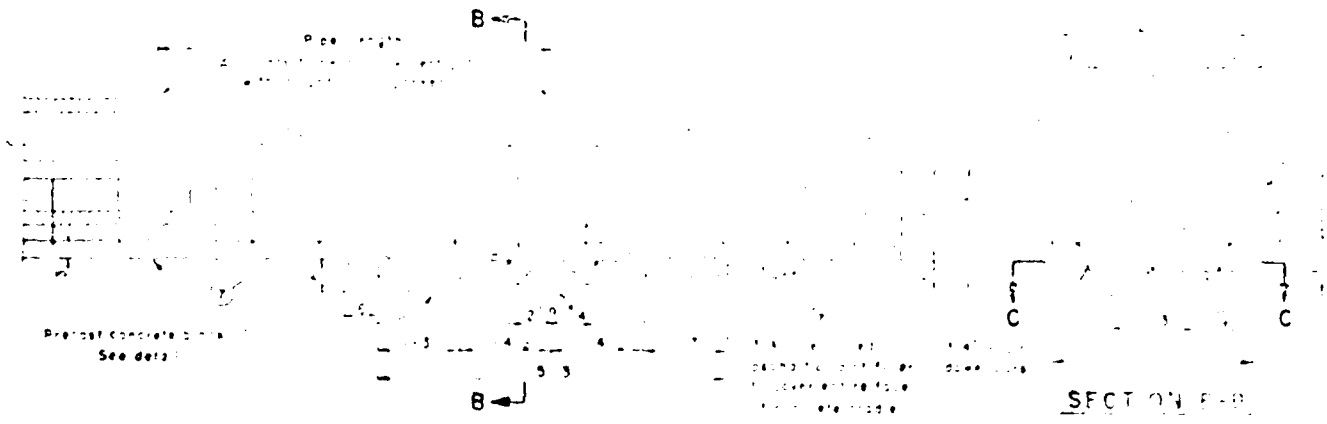
Lost Creek Watershed Protection Project
Soil District of Lincoln County, Wyoming

U. S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

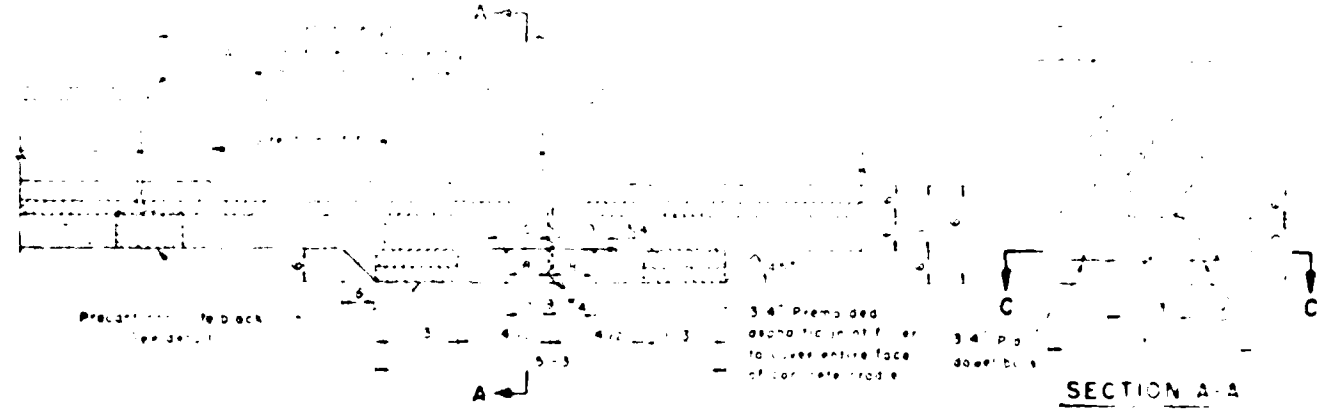
Designed A Strand
Drawn R C Mc Fly 6 27 79
Traced
Checked S Hand 6 27 79

Approved by
Date
Sheet No 7 of 20

S E - 45167 F1

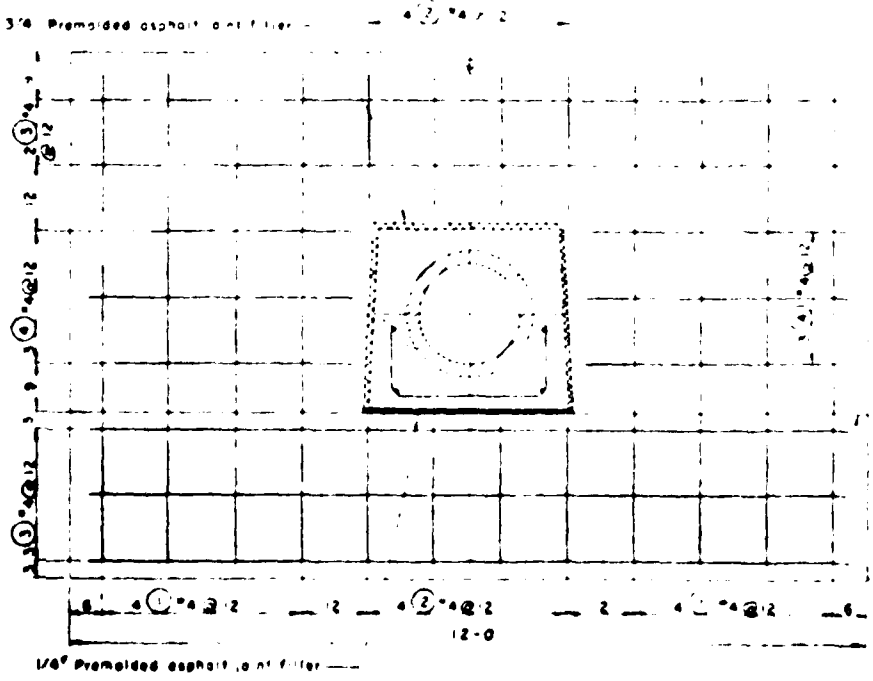


DETAILS OF EXPANSION JOINT AND TYPE II CRADLE



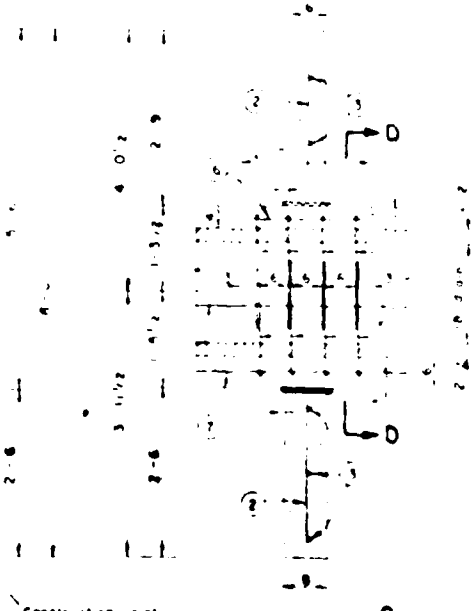
SECTION A-A

DETAILS OF EXPANSION JOINT AND TYPE III CRADLE



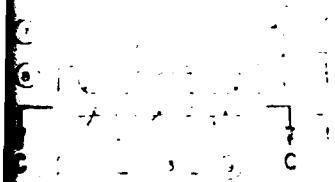
ELEVATION OF ANTI-SEEP COLLAR

Shown with Type II Cradle

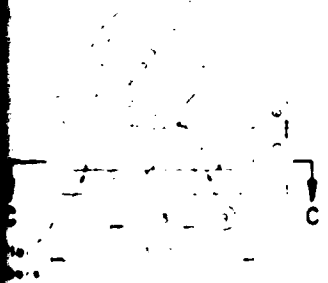


SECTION ON ℄

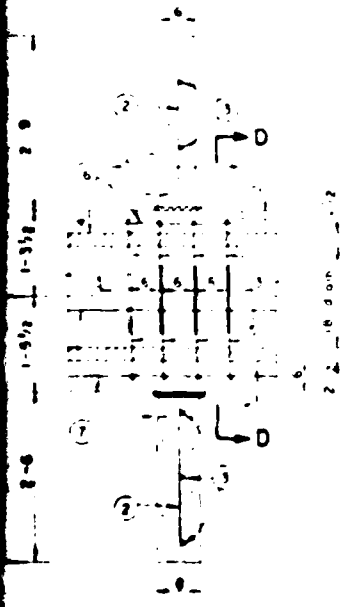
Shown with Type II Cradle



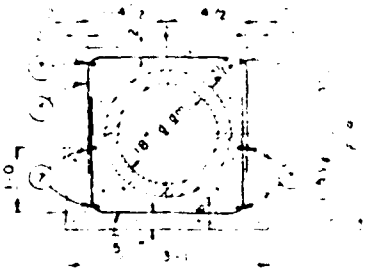
SECTION B-B



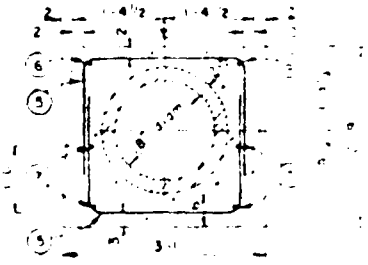
SECTION A-A



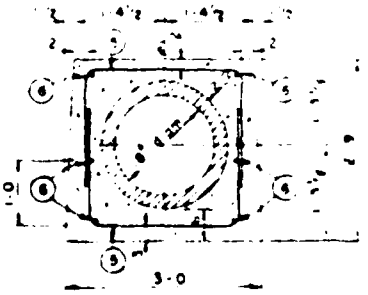
SECTION ON ℄
Shown with Type II Cradle



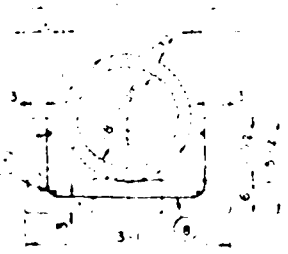
TYPE I CRADLE



SECTION D-D
with Type II Cradle



SECTION D-D
with Type III Cradle



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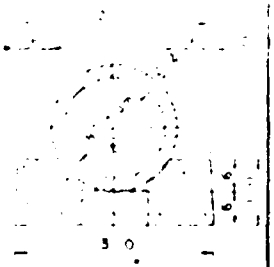
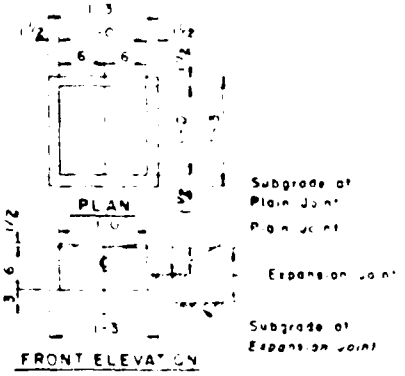


TYPE III CRADLE



FRONT ELEVATION

DETAILS OF PRECAST CONCRETE BLOCK

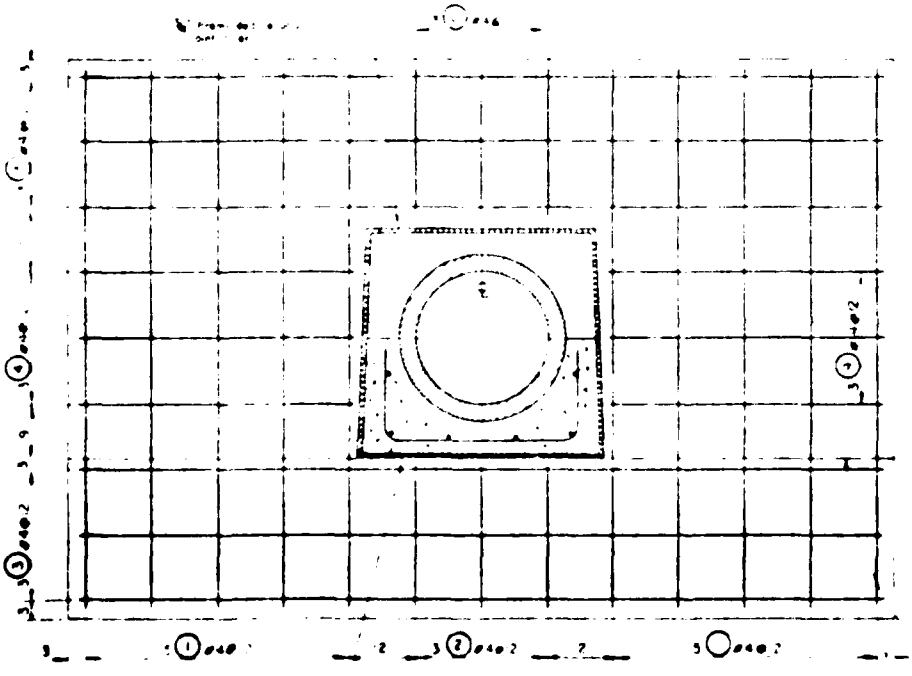
Note Concrete building brick or brick may be provided in lieu of precast concrete blocks as shown

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

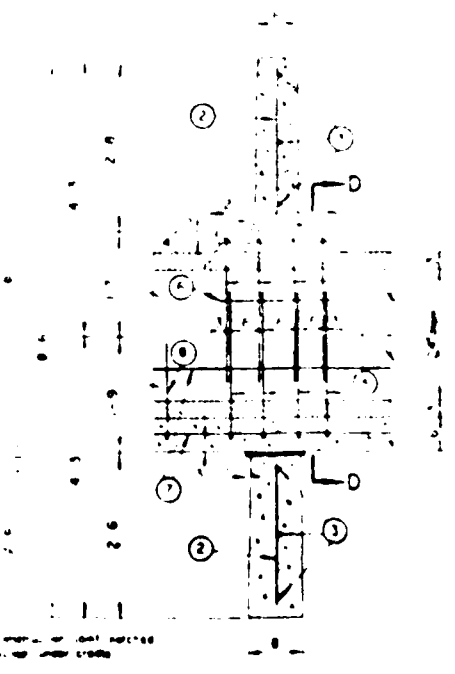
Last Creek Watershed Planning Project

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

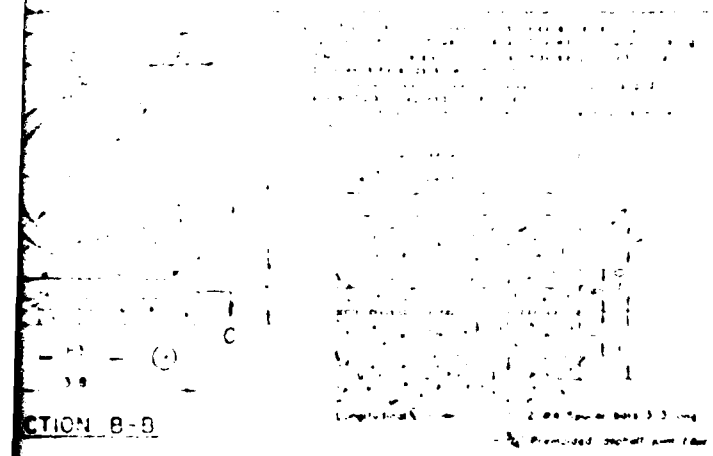
DETAILS OF EXPANSION JOINT AND TYPE II CRADLE



ELEVATION OF ANTI-SEEP COLLAR
(Shown with Type II Cradle)



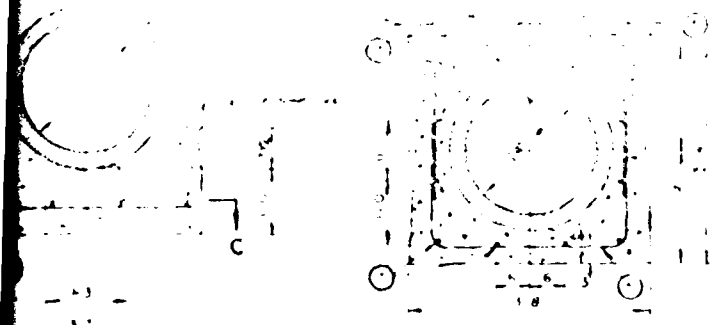
SECTION ON ℄
(Shown with Type II Cradle)



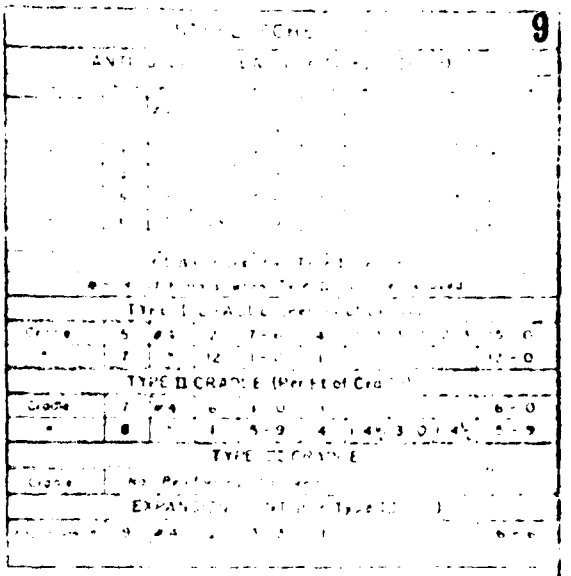
SECTION B-B

SECTION C-C

DOWEL BARS



SECTION A-A

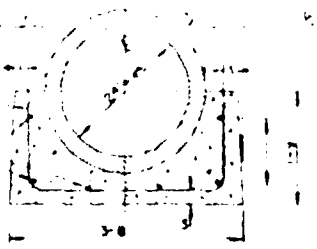


TYPE II CRADLE (Part Elevation of Cradle)

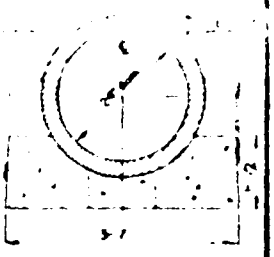
TYPE III CRADLE

EXPANSION JOINT (Type II Cradle)

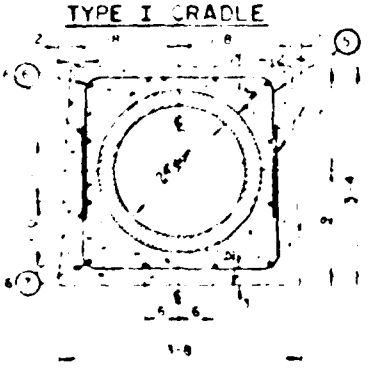
TYPE I CRADLE



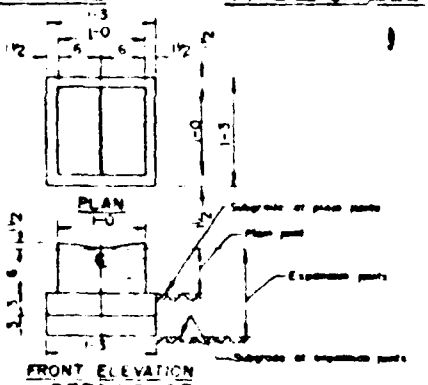
TYPE II CRADLE



TYPE III CRADLE



SECTION D-D
(With Type II Cradle)

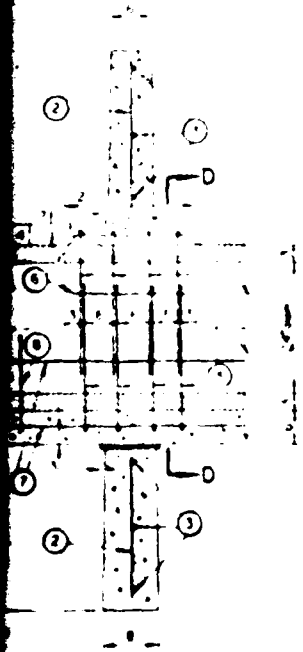


PLAN

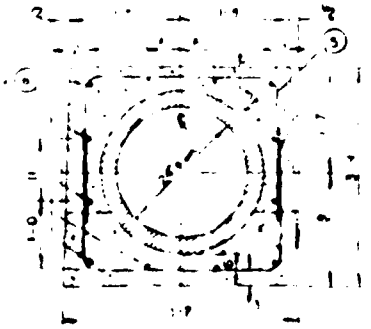
FRONT ELEVATION

DETAILS OF
PRECAST CONCRETE BLOCK

Concrete building blocks or brick may be provided in lieu of precast concrete blocks as shown



SECTION ON ℄
(Shown with Type II Cradle)

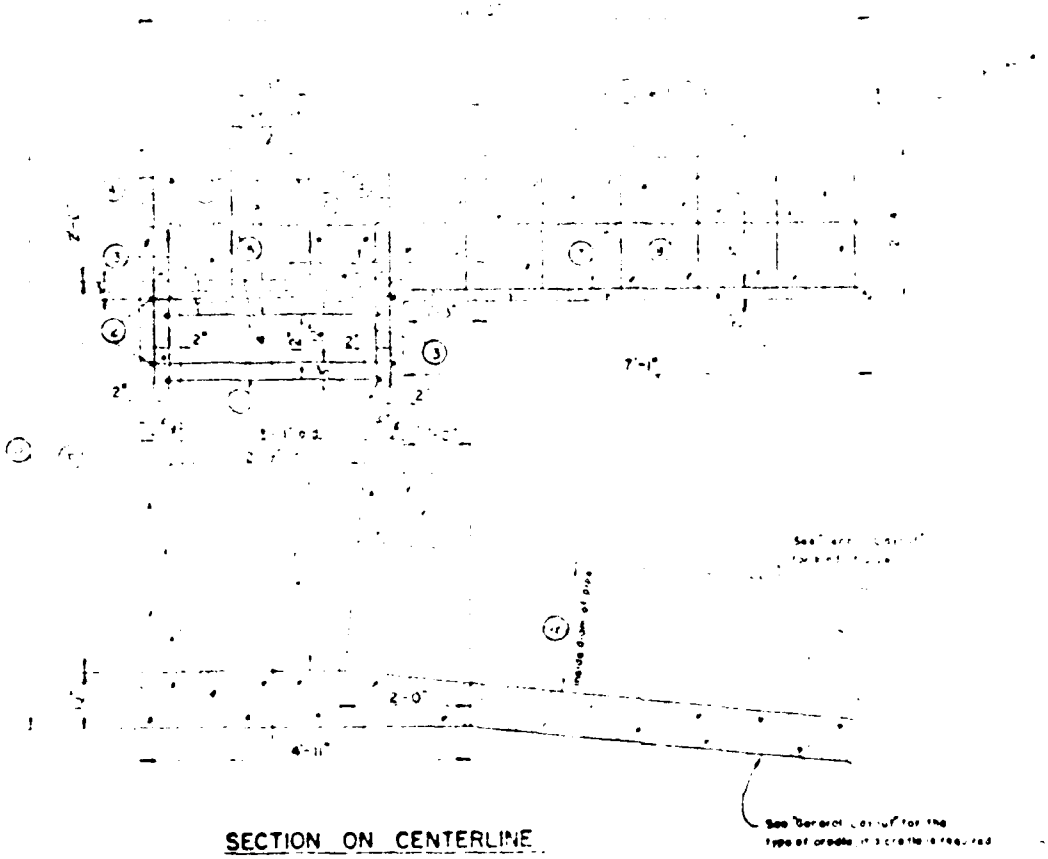


SECTION D-D
(with Type III Cradle)

DETAILS OF ANTI-SEEP COLLAR
EXPANSION JOINT AND CRADLES
FOR 24" PIPE

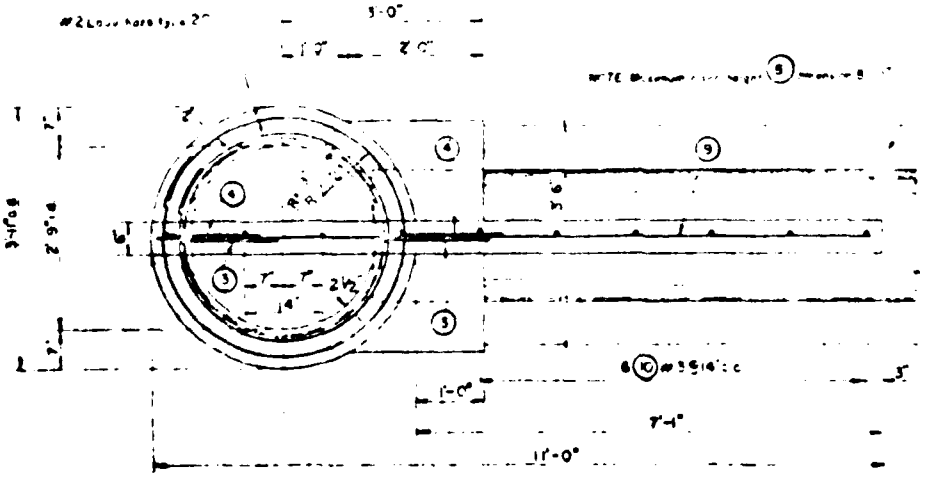
Leaf Creek Watershed Protection Project
Pike District of Lincoln County, Missouri

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

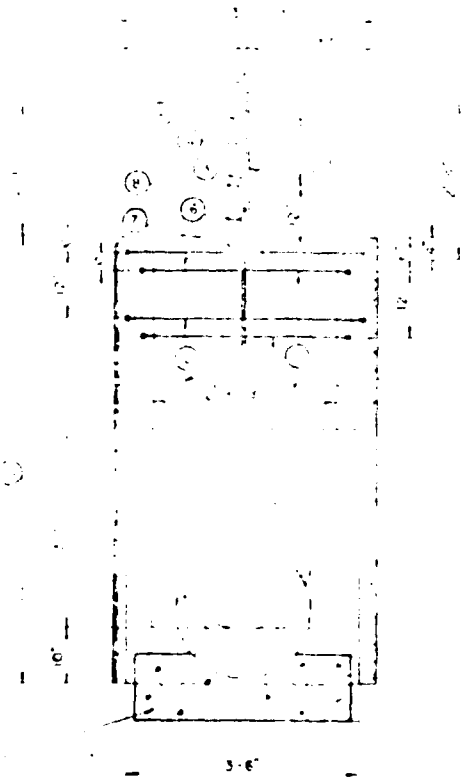


SECTION ON CENTERLINE

REAR ELEV

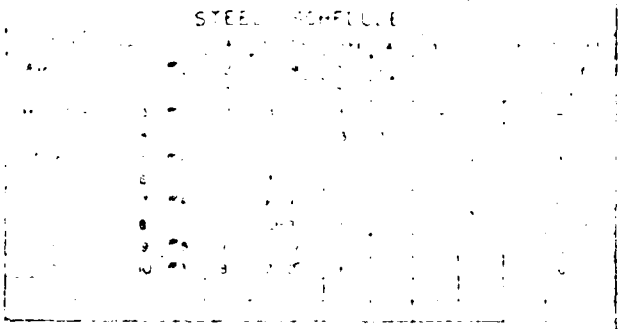


PLAN



REAR ELEVATION

STEEL REINFORCEMENT



QUANTITIES

#2	44	5			
#3	6				
#4	20	50			
#5	31	75			

BAR TYPE DETAILS

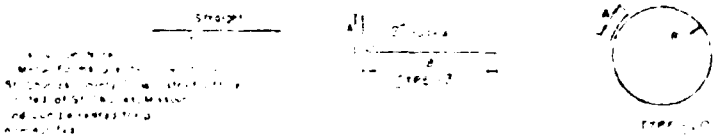


TABLE SHOWING DIMENSION & MATERIALS

Structure Number			
Outlet or Lateral			
Station			
DIMENSIONS			
(A)	6"	18"	24"
(B)	6'-0"	6'-0"	6'-0"
(C)	8'-10"	8'-10"	8'-10"
(D)	10"	10"	10"
MATERIAL	QUANTITY REQUIRED		
Volume of Concrete in Cu Yds	2.5	2.5	2.5

FOR STRUCTURES P-4 [illegible]

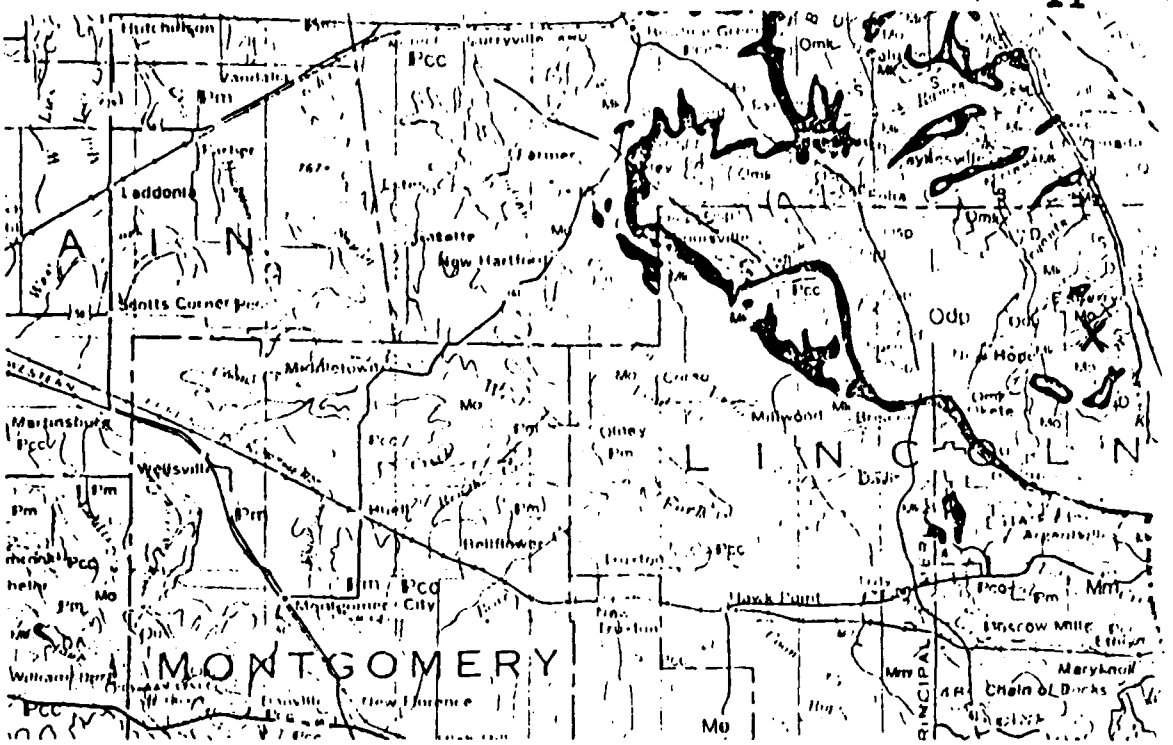
CONCRETE CIRCULAR RISER WITH 7" WALLS
FOR 18" & 24" DIAM RIC PIPE

Last Creek Watershed Protection Project
Soil District of Lincoln County, Missouri

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DESIGNED		SCALE AS SHOWN	
DRAWN			
TRACED			
CHECKED			
		DRAWING NO.	S-E-45167-D

12



QUARTERNARY — Qal - ALLUVIAN

PENNSYLVANIAN — Pcc - CHEROKEE GROUP

MISSISSIPPIAN
- Mm - MERAMECIAN SERIES
- Mo - OSAGEAN SERIES
- Mk - KINDERHOOKIAN SERIES, CHOTEAU GROUP

DEVONIAN — DEVONIAN UNDIVIDED

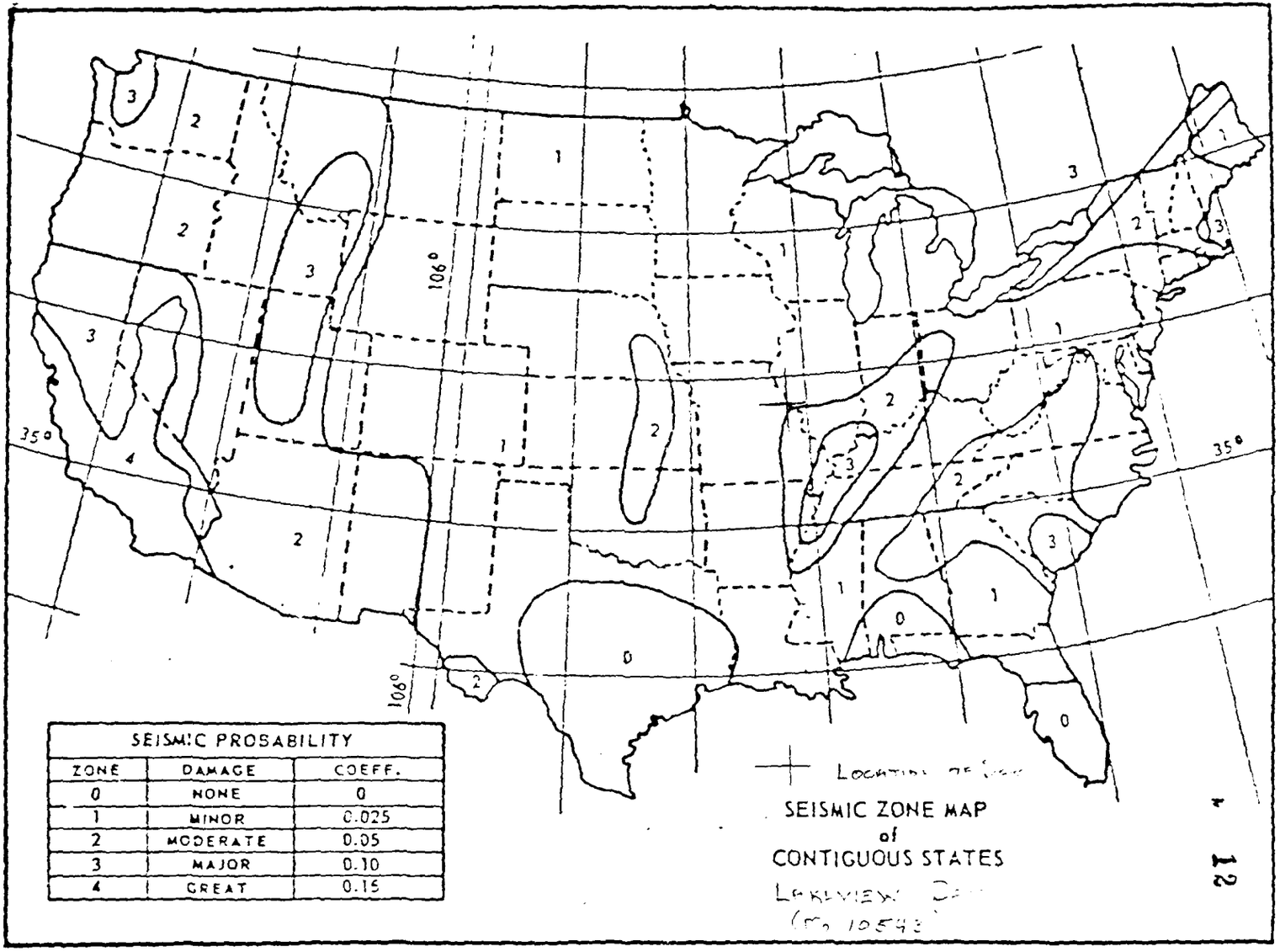
SILURIAN — S - SILURIAN UNDIVIDED

ORDOVICIAN
- Omk
  - NOIX LIMESTONE
  - MAQUOKETA SHALE
  - CAPE LIMESTONE
  - KIMMSWICK FORMATION
- Odp
  - DECORAH FORMATION
  - PLATTIN FORMATION
- 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



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

+ Location of Site

SEISMIC ZONE MAP
of
CONTIGUOUS STATES

Lakeview
(Mo. 10543

12

APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

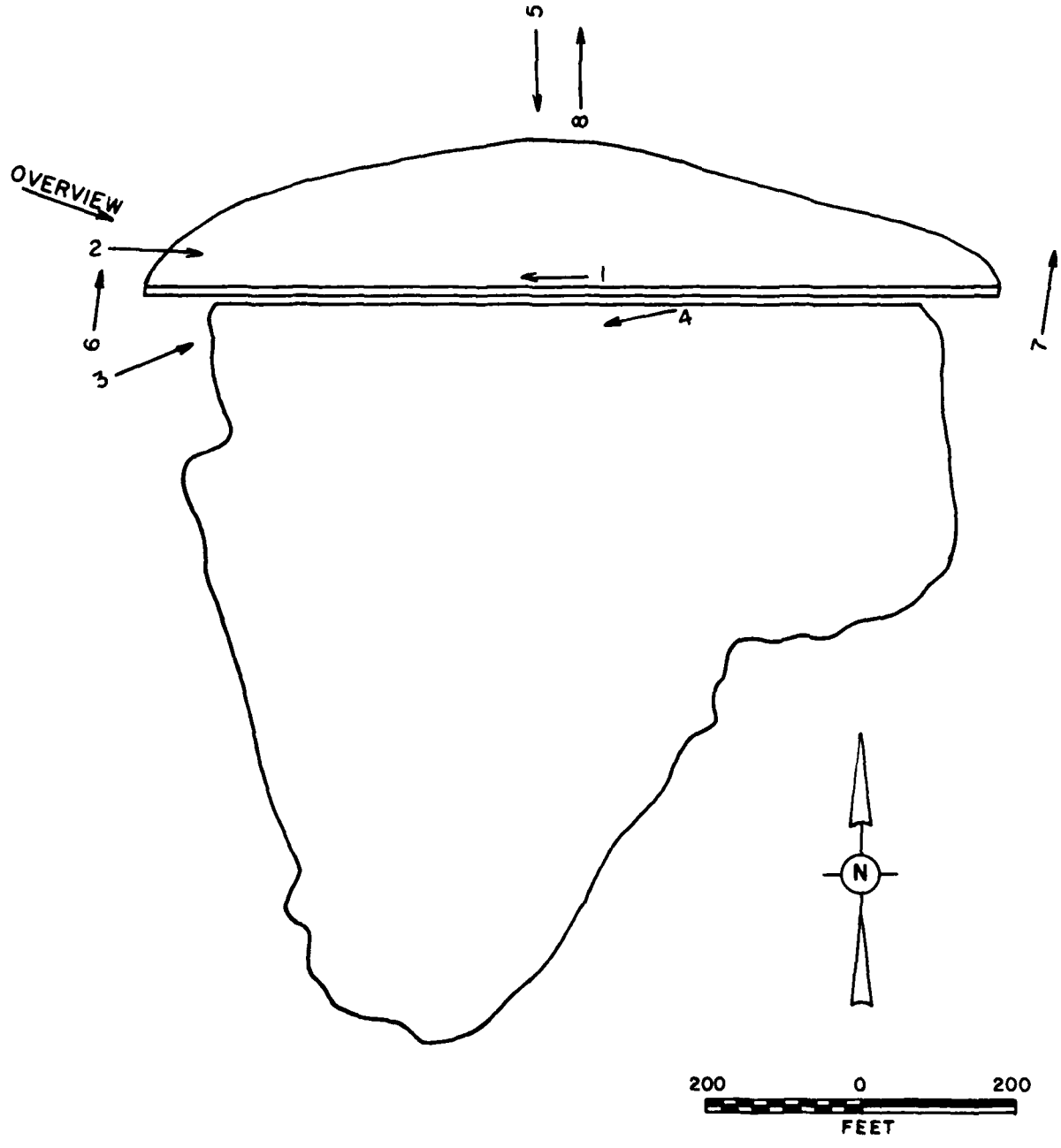


PHOTO INDEX
FOR
LAKEVIEW DAM

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 diamter 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.

Photo 1

Photo 2

Photo 3

Photo 4

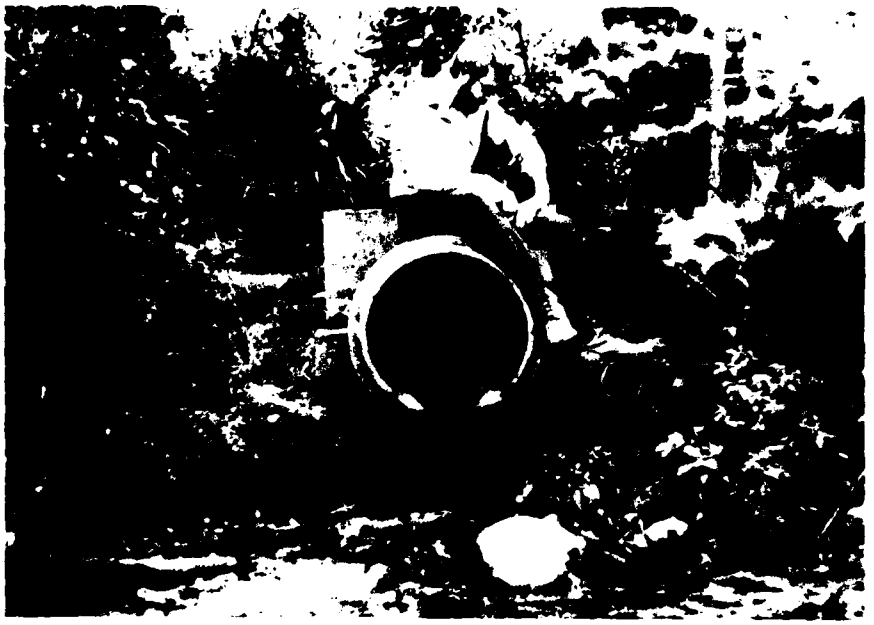


Photo 5

Photo 6

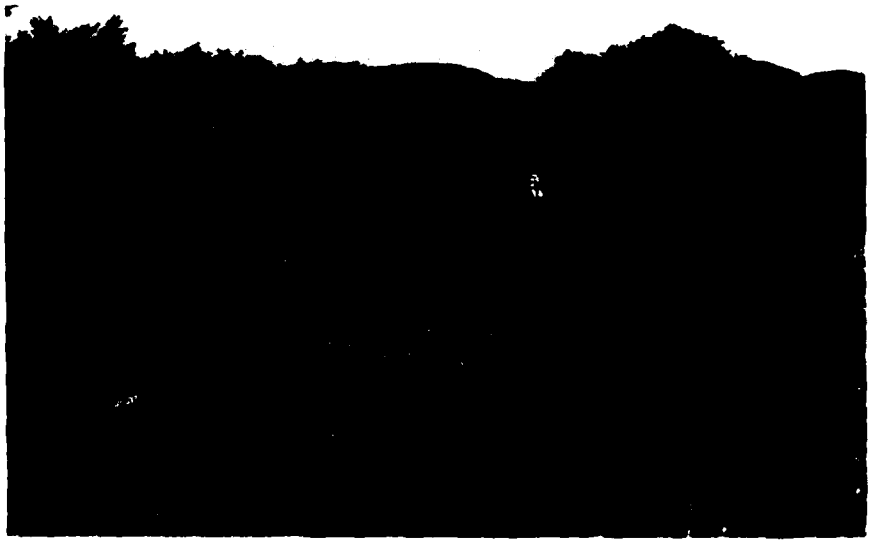


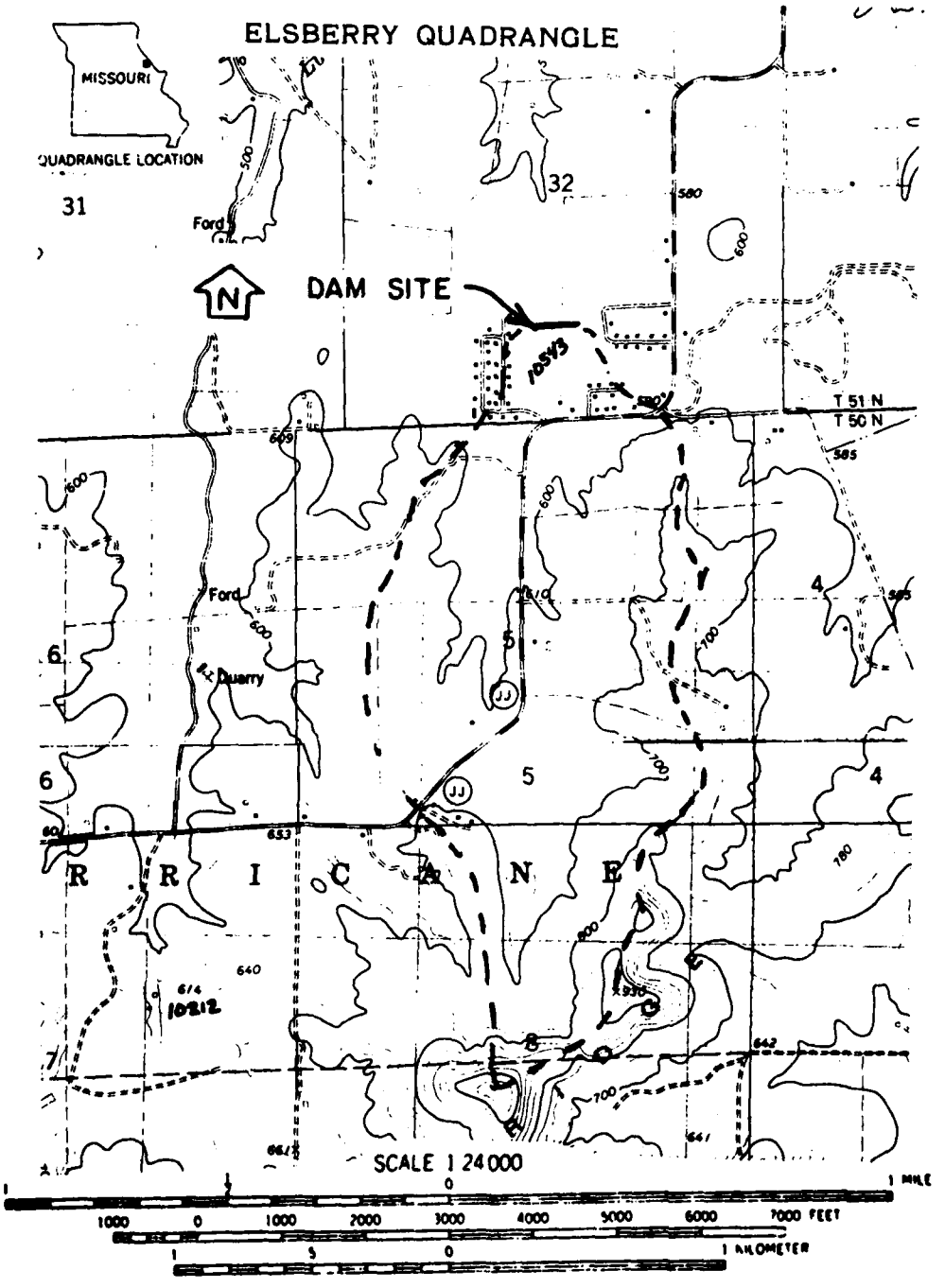
Photo 7

Photo 8

APPENDIX B

HYDROLOGIC COMPUTATIONS

PLATE 1, APPENDIX B



LAKEVIEW DAM (MO 10543)
DRAINAGE BASIN

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

DAM SAFETY INSPECTION - MISSOURI — SHEET NO. 4 OF
LAKEVIEW DAM (10543) — JOB NO. 1340-001-1
SPILLWAY AND OVERTOP RATING CURVE — BY JRH DATE 6-29-7

COMBINED RATING CURVE TABULATION

RESERVOIR WATER SURFACE ELEV.	H_T	PRINCIPAL SPILLWAY DISCHARGE $Q=14.81\sqrt{H_T}$	RIGHT EMERGENCY SPILLWAY DISCHARGE	LEFT EMERGENCY SPILLWAY DISCHARGE	DISCHARGE OVER TOP OF DAM	COMBINED DISCHARGE
545.5	15.5	0	—	—	—	0
546	16	13*	—	—	—	13
547	17	61	—	—	—	61
553	23	71	—	—	—	71
553.74	23.74	72	189	—	—	261
554.11	24.11	73	350	4.1	—	427
554.47	24.47	73	544	39	—	656
555.9	25.9	75	1590	348	—	2,013
556.6	26.6	76	2259	595	—	2,930
558.38	28.38	79	4325	1527	—	5,931
558.68	28.68	79	4804	1728	116	6,727
559.36	29.36	80	5828	2231	1282	9,421
560.00	30.0	81	6937	2776	2921	12,715

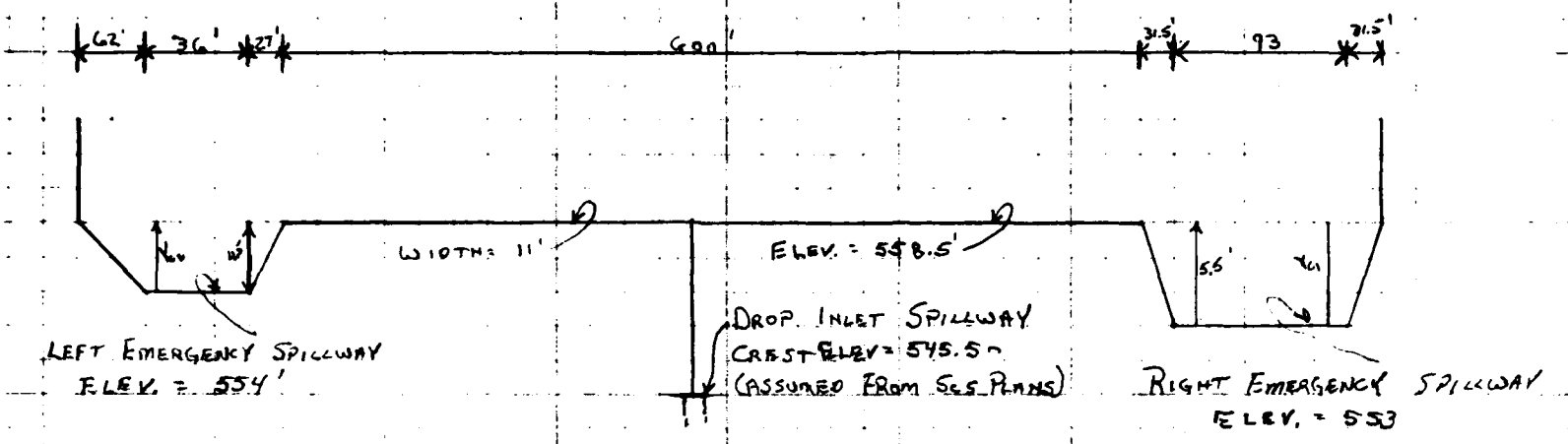
* WEIR FLOW CONTROLS

EC1-4 **ENGINEERING CONSULTANTS, INC.**

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 1 OF

LAKEVIEW DAM (10543) JOB NO. 1240-001-1

SPILLWAY AND OVERTOP RATING CURVE BY RKW DATE 6-26-12



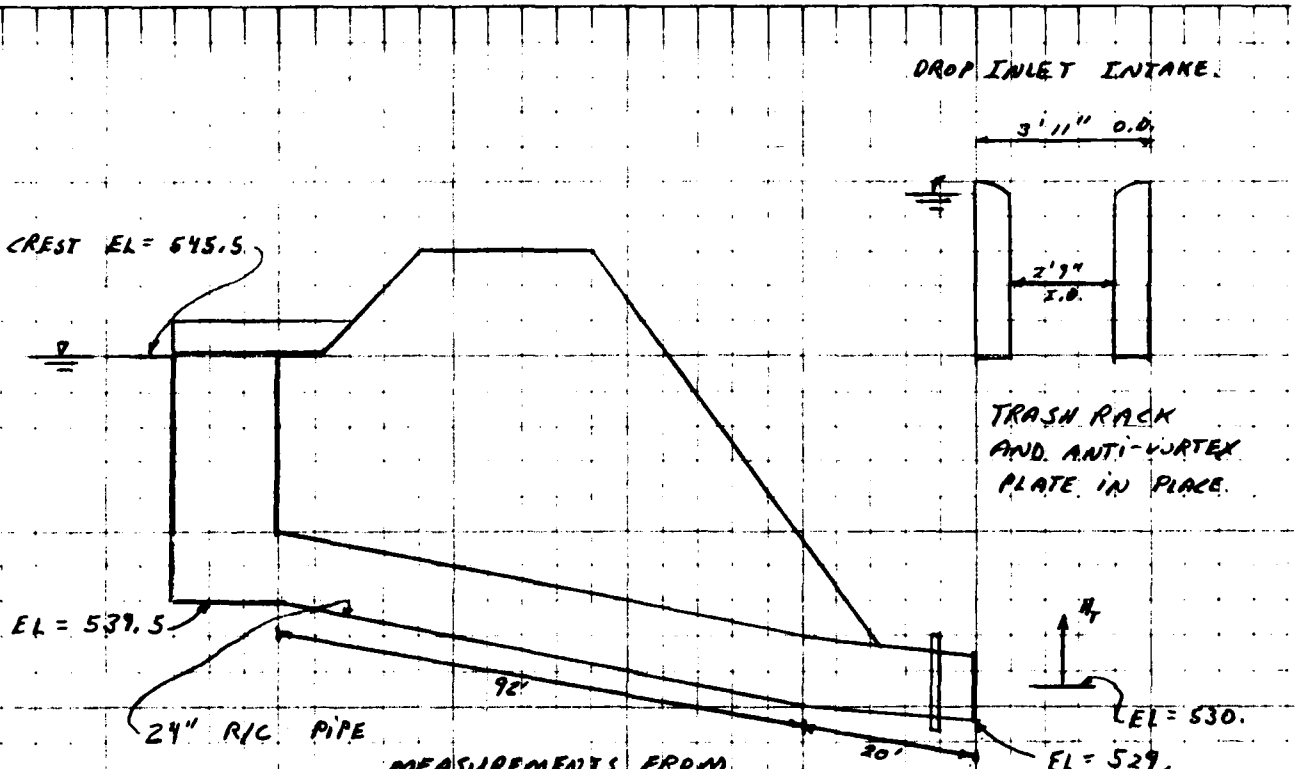
Y_{c_1}	A_{c_1}	T_{c_1}	$V_{c_1} = 5.67\sqrt{\frac{A_{c_1}}{T_{c_1}}}$	$\frac{V_{c_1}^2}{2g}$	$Q_{c_1} = A_{c_1} V_{c_1}$	U/S WS $= Y_{c_1} + \frac{V_{c_1}^2}{2g} + 553$	Y_{c_2}	A_{c_2}	T_{c_2}	V_{c_2}	$Q_{c_2} = A_{c_2} V_{c_2}$	C_1	L_1	H_1	$Q = C_1 L_1 H_1^{3/2}$	
0.5	47.9	98.7	3.95	0.24	189.2	553.74										189
0.75	73.0	101.6	4.80	0.36	350.4	554.11	.073	2.68	37.45	1.52	4.06					355
1.00	98.7	104.5	5.51	0.47	544.0	554.47	.32	12.5	47.33	3.08	38.6					583
2.00	208.9	115.9	7.61	0.90	1590.2	555.90	1.27	61.1	60.45	5.70	348.3					1939
2.50	268.3	121.6	8.42	1.11	2259	556.6	1.73	91.8	70.2	6.49	595.4					2854
3.75	429.3	136	10.07	1.64	4324.6	558.38	2.92	189.5	93.8	8.96	1527.2					5852
4.0	463.6	139.8	10.36	1.67	4804.2	558.68	3.12	208.6	97.7	8.28	1728.3	2.53	600	0.18	116	6648
4.5	534.5	144.5	10.90	1.86	5828	559.36	3.57	254.6	106.6	8.76	2230.9	2.48	600	0.86	1282	9841
5.0	608	150	11.41	2.02	6937	560.00	4.00	302.2	115.1	9.19	2776.4	2.45	600	1.50	2921	12679

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 2 OF

LAKEVIEW DAM (10543) JOB NO. 1240-001

PRINCIPAL SPILLWAY RATING CURVE BY KLB DATE 6-21-7



PRINCIPAL SPILLWAY DISCHARGE (ASSUME NO TAILWATER EFFECT)

AT W.L. = 546.0

a) WEIR FLOW. ASSUME $C = 3.03$

$L = \pi D = \pi \times 3.92' = 12.33'$

$H = 546 - 545.5 = 0.5$

$Q = CLH^{3/2} = 3.03 \times 12.33 \times 0.5^{3/2} = 13$ CFS

b) CHECK FOR PRESSURE FLOW: (Neglect friction in the drop pipe)

$H_T = \left(1 + K_e + f\frac{L}{D}\right)\frac{V^2}{2g}$

ASSUME $\epsilon = 0.005$, $\frac{\epsilon}{D} = .0025 \Rightarrow f \approx 0.025$, $K_e = 0.5$

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI — SHEET NO. 3 OF
LAKEVIEW DAM (10543) — JOB NO. 1240-001
PRINCIPAL SPILLWAY RATING CURVE — BY KLB DATE 6-21-7

$$H_T = \left(1 + 0.5 + 0.025 \frac{112}{2}\right) \frac{v^2}{2g}$$

$$H_T = 2.90 \frac{v^2}{2g} \Rightarrow V = 4.71 \sqrt{H_T}$$

$$Q = A \cdot V = \pi \frac{D^2}{4} \times 4.71 \sqrt{H_T} = 14.81 \sqrt{H_T}$$

$H_T = 546 - 530 = 16$

$Q = 14.81 \sqrt{16} = 59$ CFS.

∴ AT ELEV. 546 WEIR FLOW CONTROLS

AND $Q = 13$ CFS

AT W.L. = 547

a) WEIR FLOW, $H = 547 - 545.5 = 1.5$

$Q = CLH^{3/2} = 3.03 \times 12.33 \times 1.5^{3/2} = 69$ CFS.

b) PRESSURE FLOW

$Q = 14.81 \sqrt{H_T}$, $H_T = 547 - 530 = 17$

$Q = 14.81 \sqrt{17} = 61$ CFS.

∴ AT W.L. = 547 PRESSURE FLOW CONTROLS

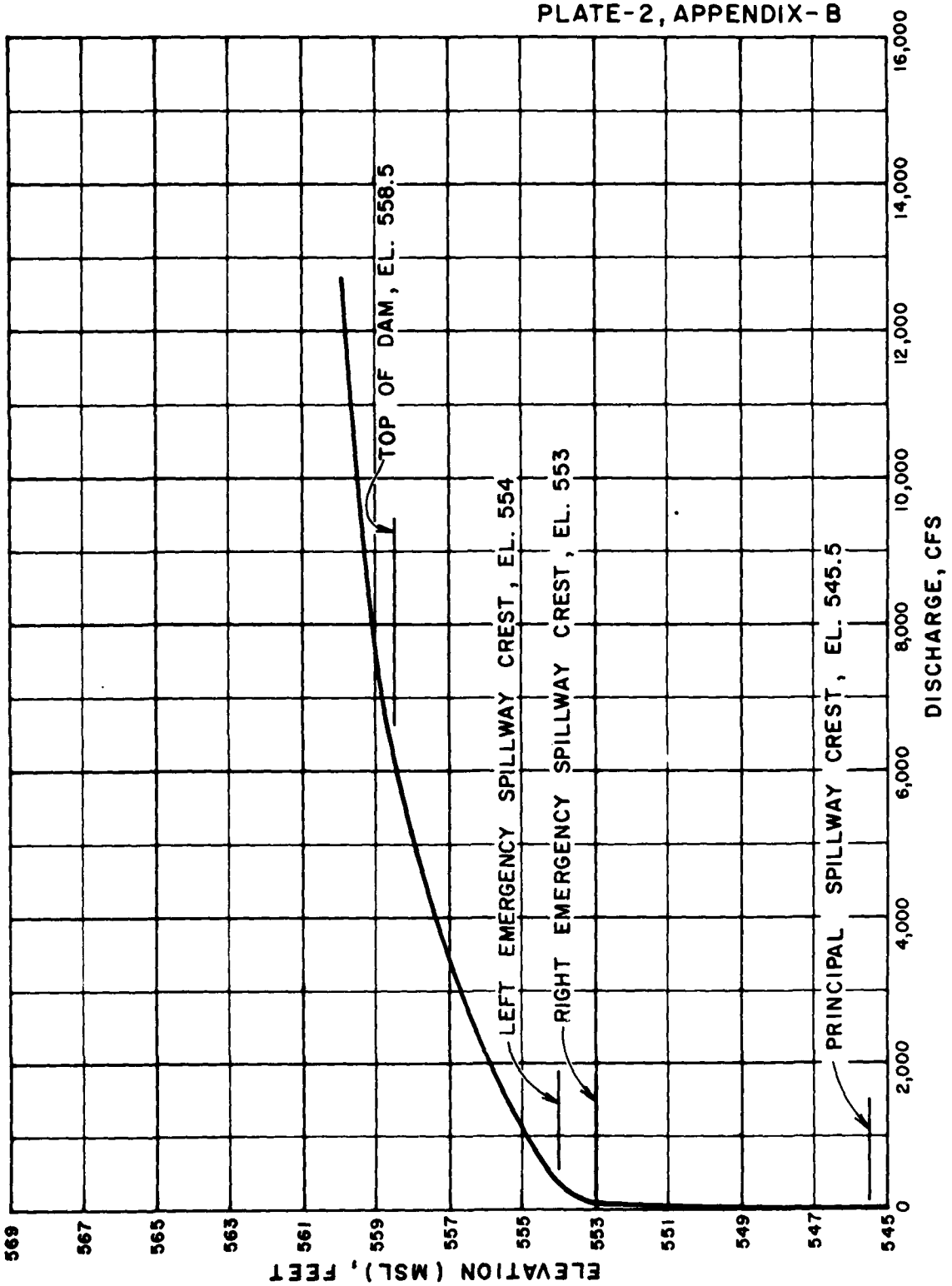
AND $Q = 61$ CFS.

ALSO FOR ALL ELEVATIONS ABOVE 547

PRESSURE FLOW WILL CONTROL

AND THE EQUATION $Q = 14.81 \sqrt{H_T}$ WILL BE USED

PLATE-2, APPENDIX-B



LAKEVIEW DAM (MO. 10543)
SPILLWAY & OVERTOP RATING CURVE

ECI-4 ENGINEERING CONSULTANTS, INC.

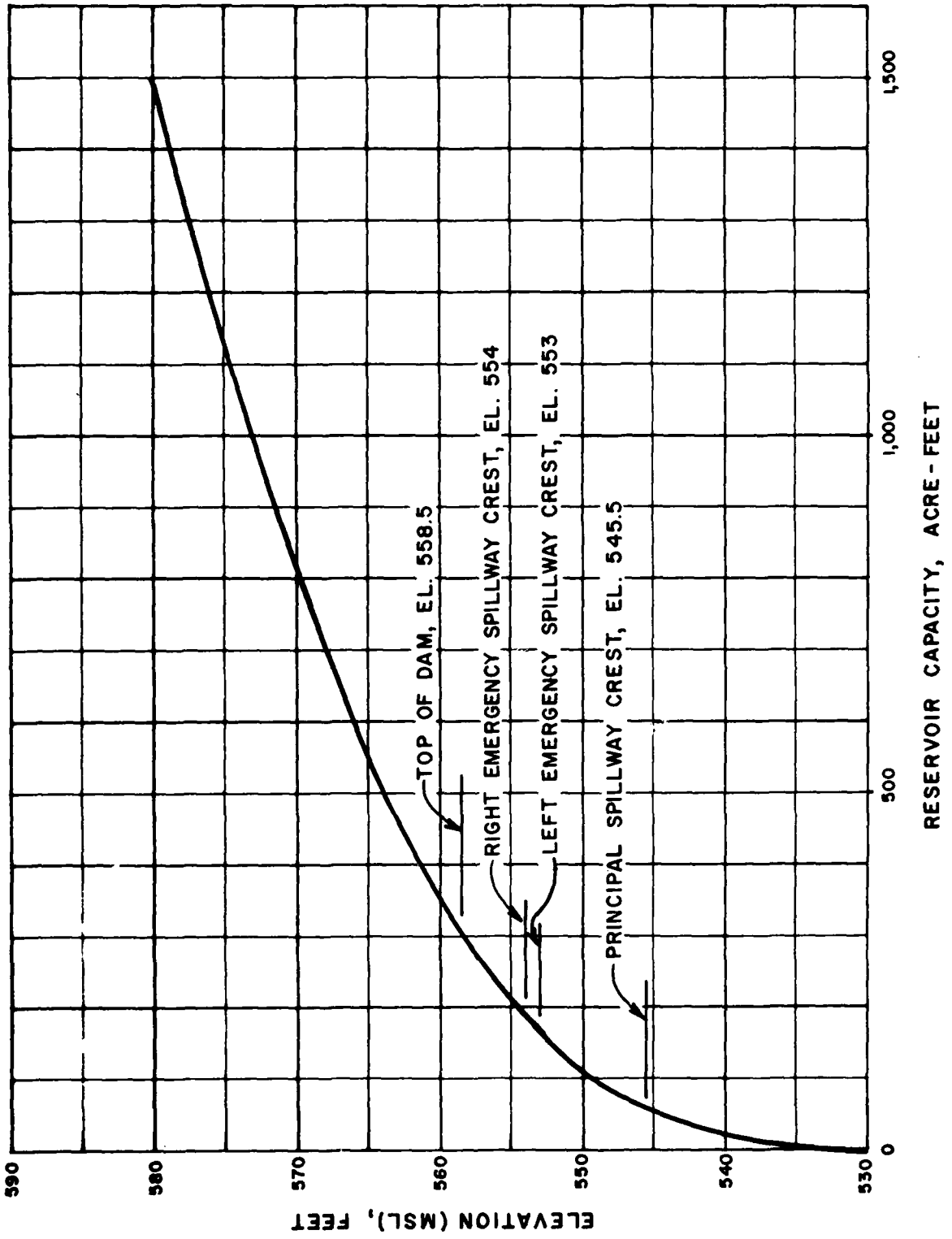
Dam Safety Inspection - Missouri SHEET NO. 1 OF
LAKEVIEW DAM - #10543 JOB NO. 1240
Reservoir Area Capacity BY M.R.H. DATE 5-30-7
D.N.E. ✓

LAKEVIEW DAM

Reservoir Area Capacity

Elev. M.S.L. (Ft.)	Reservoir Surface Area (Acres)	Incremental Volume (Ac-Ft.)	Total Volume (Ac-Ft.)	Remarks
530	0	0	0	Est. streambed at Dam
545.5	10.4	54	54	W.S. as shown on U.S.G.S. maps. (Elev. assumed) ASSUMED PRINCIPAL SPILLWAY CREST EL.
553	20.5	114	168	LEFT EMERGENCY SPILLWAY CREST EL.
554	22.5	21	189	RIGHT EMERGENCY SPILLWAY CREST EL.
558.5	30	118	307	TOP OF DAM EL.
560	33	47	354	AREA MEASURED ON USGS MAP.
580	85	1140	1494	MEASURED ON USGS MAP

PLATE - 3 , APPENDIX-B



LAKEVIEW DAM (MO. 10543)
RESERVOIR CAPACITY CURVE

DAM # MO. 10543

DETERMINATION OF PMP

1. DETERMINE DRAINAGE AREA OF BASIN

D. A. = 5H9 ACRES

2. DETERMINE PMP INDEX RAINFALL (200 SQ. MI + 24 HRS DUR.)

LOCATION OF CENTROID BASIN

LONG = 90° 48' 30" LAT = 39°07'38"

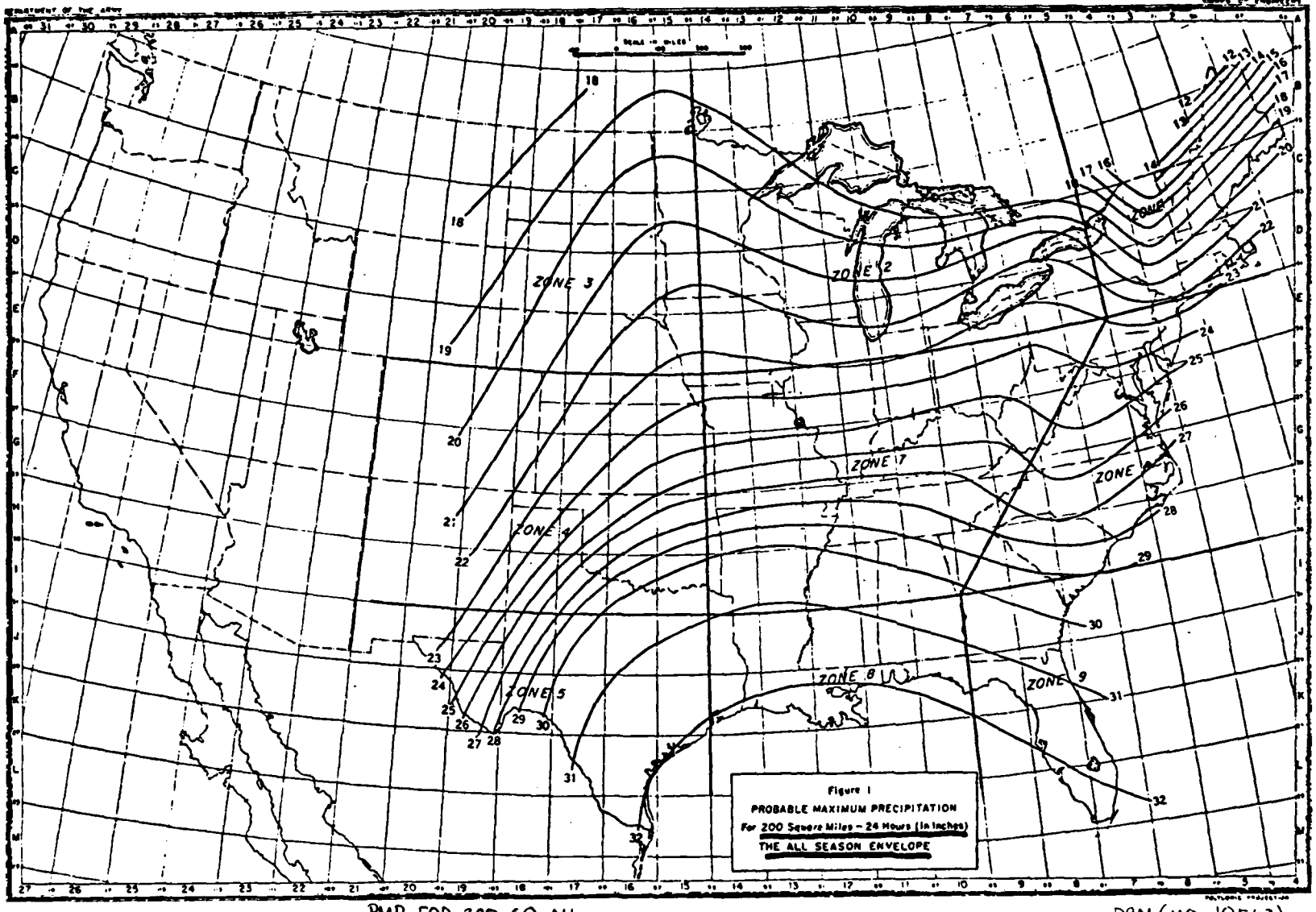
⇒ PMP = 24.7" (From Fig 1, HMR #33)

3. DETERMINE BASIN RAINFALL IN TERMS OF PERCENTAGE OF PMP INDEX RAINFALL FOR VARIOUS DURATIONS:

LOCATION LONG. = 90° 48' 30" LAT. = 39° 07' 38"

⇒ ZONE 7

DURATION (HRS)	PERCENT OF INDEX RAINFALL	TOTAL RAINFALL (IN.)	RAINFALL INCREMENTS	DURATION OF INCREMENTS
6	100	24.7	24.7	6
12	120	29.6	4.9	6
24	130	32.1	2.5	12



PMP FOR 200 SQ. MI.
24 HRS DURATION = 24.7"

DAM (MO. 10543)
LOCATION OF CENTROID
OF WATERSHED:
AT 39°27'36 LONG 90°48'30"

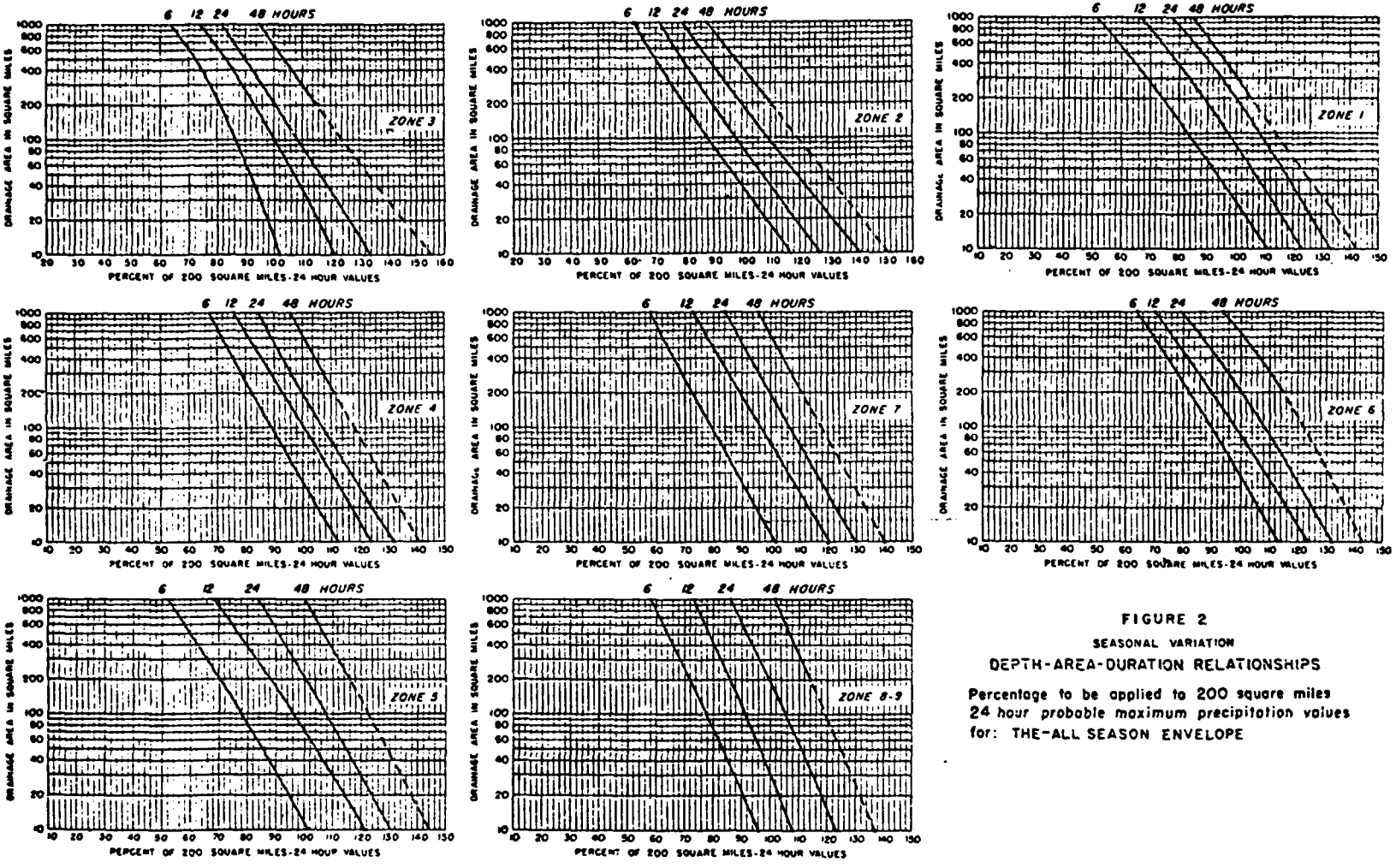


FIGURE 2

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
LAKEVIEW DAM # MO. 10543 JOB NO. 1240
UNIT HYDROGRAPH PARAMETERS BY DNZ ✓MAS DATE 6/11/79

1. DRAINAGE AREA, $A = 540$ ACRES $= 0.84$ SQ. MI.

2. LENGTH OF STREAM, $L_m = 1.78$ MILES $= 9398$ Ft

3. ELEVATION AT DRAINAGE DIVIDE ALONG LONGEST STREAM.
$H_1 = 830$ Ft

4. RESERVOIR ELEVATION AT SPILLWAY CREST, $H_2 = 545.5$

5. DIFFERENCE IN ELEVATION, $\Delta H = 284.5$

6. AVERAGE SLOPE OF STREAM $= \frac{\Delta H}{L} = \frac{284.5}{9398} = 3.03\%$

7. TIME OF CONCENTRATION:

a) BY KIRPICH FORMULA:

$$T_c = \left(\frac{11.9 \times L_m^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 1.78^3}{284.5}\right)^{0.385} = 0.57 \text{ HRS}$$

b) BY VELOCITY ESTIMATE: AVG VEL = 3 FPS

$$T_c = \frac{L}{V} = \frac{9398}{3(60 \times 60)} = 0.87 \text{ HRS}$$

USE $T_c = 0.57$ HRS

8. LAG TIME, $L_t = 0.6 \times 0.57 = 0.342$

9. UNIT DURATION, $D \leq \frac{L_t}{3} = \frac{0.342}{3} = 0.114 > 0.083$

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, $q_p = \frac{484\,A}{T_p} = \frac{484(0.84)}{0.384}$

$q_p = 1059$ CFS

LAKEVIEW DAM (MO.10543)

HYDROLOGIC SOIL GROUP & CURVE NUMBER

1. Watershed Soils consist of Group B and C Soils. Group B Soil seems to be predominent. Assume Soil group 'B' for the entire watershed.

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

LAKEVIEW DAM

100 YR FLOOD BY REGRESSION EQUATION

REGRESSION EQUATION FOR THE 100 YR FLOOD FOR MISSOURI:

$$Q_{100} = 89.1\ A^{0.934\ A^{-0.02}}\ S^{0.576}$$

WHERE:

A = DRAINAGE AREA IN SQ. MI.

S = MAIN CHANNEL SLOPE FT/MI. (AVG SLOPE BETWEEN 0.1 L AND 0.85 L)

FOR LAKEVIEW DAM:

A = 0.84 SQ. MI.

S = 92 FT/MI.

$$Q_{100} = 85.1\ (0.84)^{0.934\ (0.84)^{-0.02}}\ (92)^{0.576}$$

$$Q_{100} = 977\ CFS$$

HEC1DB INPUT DATA

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION  JULY 1978
 LAST MODIFICATION  26 FEB 79
**********
     1     A1    DAM SAFETY INSPECTION - MISSOURI
     2     A2    LAKEVIEW DAM (10543)
     3     A3    PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING
     4     I     300       0       5       0       0       0       0       0       0       0
     5     IT      5
     6     J     1       2       1
     7     JR    1     0.5
     8     K     1   10543                                           1
     9     K1  INPUT PRECIPITATION INDEX, RATIOS, AND UNIT HYDROGRAPH PARAMETERS
    10           1       9    0.44                 0.84      1.
    11                24.7     120     1.0       150
    12     T                                                        -66
    13                 .39
    14     K                      1
    15     K     1   10541                       2       0       1
    16     K1  ROUTE HYDROGRAPH THROUGH LAKEVIEW DAM (10543)
    17     Y                             1       1
    18     Y1    1                                          -545.5      -1
    19     Y4  544.5      546     547     548   552.74  554.11  554.47   555.9   556.6  559.32
    20     Y4  557.5   558.68  559.36     560
    21     Y5    0       13      61      71     261     427     656    2013    2930    5931
    22     Y5 6700     8727    9421   12715
    23     I     1       54     166     169     302     354    1494
    24     Y   544     545.5     552     554   559.5     560     580
    25     Y4  564.5
    26     Y   574.5
    27     Y     59
```

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT 13543
ROUTE HYDROGRAPH TO 19543
END OF NETWORK

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

RUN DATE = 79/07/16.
TIME = 0:**:02.

DAM SAFETY INSPECTION - MISSOURI
LAKEVIEW DAM (10943)
PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING

JOB SPECIFICATION

NO	NRD	NPLT	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
		5	0	0	0		0	0	0

JOPER	NWT	LROPT	TRACE
	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLA = 1 MPTIO= 2 LRTIO= 1

RTIOS= 1.00 .50

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

SUB-AREA RUNOFF COMPUTATION

INPUT PRECIPITATION INDEX, RATIOS, AND UNIT HYDROGRAPH PARAMETERS

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10943	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHY	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.84	0.00	.34	1.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.70	100.00	120.00	120.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
2	0.00	2.00	1.00	0.00	0.00	1.00	0.00	-8P.00	0.00	0.00

CURVE NO = -88.00 WETNESS = -1.00 EFFECT OF = 88.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .34

RECESSION DATA
STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 2 END-OF-PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .34 AREA= 1.00

129.	392.	795.	1035.	1052.	905.	686.	454.	31*.	226.
156.	110.	77.	54.	38.	27.	19.	13.	10.	7.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.00	1	.01	0.00	.01	0.	1.01	12.35	151	.21	.20	.01	1095.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.40	152	.21	.20	.01	1155.
1.01	.15	3	.01	0.00	.01	0.	1.01	12.45	153	.21	.20	.00	1199.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.50	154	.21	.20	.00	1230.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.55	155	.21	.20	.00	1253.
1.01	.30	6	.01	0.00	.01	0.	1.01	13.00	156	.21	.20	.00	1269.
1.01	.35	7	.01	0.00	.01	0.	1.01	13.05	157	.25	.24	.00	1286.
1.01	.40	8	.01	0.00	.01	0.	1.01	13.10	158	.25	.24	.00	1310.
1.01	.45	9	.01	0.00	.01	0.	1.01	13.15	159	.25	.24	.00	1349.
1.01	.50	10	.01	0.00	.01	0.	1.01	13.20	160	.25	.24	.00	1396.
1.01	.55	11	.01	0.00	.01	0.	1.01	13.25	161	.25	.24	.00	1442.
1.01	1.00	12	.01	0.00	.01	0.	1.01	13.30	162	.25	.24	.00	1482.
1.01	1.05	13	.01	0.00	.01	0.	1.01	13.35	163	.25	.24	.00	1512.
1.01	1.10	14	.01	0.00	.01	0.	1.01	13.40	164	.25	.24	.00	1533.
1.01	1.15	15	.01	0.00	.01	0.	1.01	13.45	165	.25	.24	.00	1548.
1.01	1.20	16	.01	0.00	.01	0.	1.01	13.50	166	.25	.24	.00	1558.
1.01	1.25	17	.01	0.00	.01	0.	1.01	13.55	167	.25	.24	.00	1566.
1.01	1.30	18	.01	0.00	.01	0.	1.01	14.00	168	.25	.24	.00	1571.
1.01	1.35	19	.01	0.00	.01	0.	1.01	14.05	169	.31	.31	.00	1583.
1.01	1.40	20	.01	0.00	.01	0.	1.01	14.10	170	.31	.31	.00	1610.
1.01	1.45	21	.01	0.00	.01	0.	1.01	14.15	171	.31	.31	.00	1661.
1.01	1.50	22	.01	0.00	.01	0.	1.01	14.20	172	.31	.31	.00	1726.
1.01	1.55	23	.01	0.00	.01	0.	1.01	14.25	173	.31	.31	.00	1782.
1.01	2.00	24	.01	0.00	.01	1.	1.01	14.30	174	.31	.31	.00	1849.
1.01	2.05	25	.01	0.00	.01	2.	1.01	14.35	175	.31	.31	.00	1892.
1.01	2.10	26	.01	0.00	.01	3.	1.01	14.40	176	.31	.31	.00	1921.
1.01	2.15	27	.01	0.00	.01	4.	1.01	14.45	177	.31	.31	.00	1941.
1.01	2.20	28	.01	0.00	.01	5.	1.01	14.50	178	.31	.31	.00	1956.
1.01	2.25	29	.01	0.00	.01	7.	1.01	14.55	179	.31	.31	.00	1967.
1.01	2.30	30	.01	0.00	.01	8.	1.01	15.00	180	.31	.31	.00	1974.
1.01	2.35	31	.01	0.00	.01	9.	1.01	15.05	181	.19	.19	.0	1965.
1.01	2.40	32	.01	.00	.01	11.	1.01	15.10	182	.38	.37	.00	1945.
1.01	2.45	33	.01	0.00	.01	12.	1.01	15.15	183	.38	.37	.00	1925.
1.01	.50	34	.01	0.00	.01	14.	1.01	15.20	184	.56	.56	.00	1974.
1.01	2.55	35	.01	0.00	.01	15.	1.01	15.25	185	.46	.45	.00	2127.
1.01	3.00	36	.01	0.00	.01	16.	1.01	15.30	186	1.88	1.88	.01	2516.
1.01	3.05	37	.01	0.00	.01	18.	1.01	15.35	187	2.63	2.62	.01	3264.
1.01	3.10	38	.01	0.00	.01	19.	1.01	15.40	188	1.03	1.03	.00	4681.
1.01	3.15	39	.01	0.00	.01	20.	1.01	15.45	189	.66	.65	.00	6112.
1.01	3.20	40	.01	0.00	.01	21.	1.01	15.50	190	.56	.56	.00	6986.
1.01	3.25	41	.01	0.00	.01	23.	1.01	15.55	191	.38	.37	.00	7486.
1.01	3.30	42	.01	0.00	.01	24.	1.01	16.00	192	.38	.37	.00	6570.
1.01	3.35	43	.01	0.00	.01	25.	1.01	16.05	193	.29	.29	.00	5697.
1.01	3.40	44	.01	.00	.01	26.	1.01	16.10	194	.29	.29	.00	4763.
1.01	3.45	45	.01	0.00	.01	27.	1.01	16.15	195	.29	.29	.00	4013.
1.01	3.50	46	.01	.01	.01	29.	1.01	16.20	196	.29	.29	.00	3425.
1.01	3.55	47	.01	.01	.01	30.	1.01	16.25	197	.29	.29	.00	2969.
1.01	4.00	48	.01	.01	.01	30.	1.01	16.30	198	.29	.29	.00	2644.
1.01	4.05	49	.01	.01	.01	31.	1.01	16.35	199	.29	.29	.00	2410.
1.01	4.10	50	.01	.01	.01	32.	1.01	16.40	200	.29	.29	.00	2248.
1.01	4.15	51	.01	.01	.01	33.	1.01	16.45	201	.29	.29	.00	2138.
1.01	4.20	52	.01	.01	.01	34.	1.01	16.50	202	.29	.29	.00	2056.
1.01	4.25	53	.01	.01	.01	35.	1.01	16.55	203	.29	.29	.01	2001.
1.01	4.30	54	.01	.01	.01	35.	1.01	17.00	204	.29	.29	.00	1962.
1.01	4.35	55	.01	.01	.01	36.	1.01	17.05	205	.29	.29	.00	1937.

1.01	4.40	56	.01	.01	.01	37.	1.01	17.10	206	.03	.03	.00	1684.	
1.01	4.45	57	.01	.01	.01	38.	1.01	17.15	207	.03	.03	.00	1674.	
1.01	4.50	58	.01	.01	.01	39.	1.01	17.20	208	.03	.03	.00	1664.	
1.01	4.55	59	.01	.01	.01	39.	1.01	17.25	209	.03	.03	.00	1667.	
1.01	5.00	60	.01	.01	.01	40.	1.01	17.30	210	.03	.03	.00	1608.	
1.01	5.05	61	.01	.01	.01	41.	1.01	17.35	211	.03	.03	.00	1564.	
1.01	5.10	62	.01	.01	.01	42.	1.01	17.40	212	.03	.03	.00	1535.	
1.01	5.15	63	.01	.01	.01	42.	1.01	17.45	213	.03	.03	.00	1515.	
1.01	5.20	64	.01	.01	.01	43.	1.01	17.50	214	.03	.03	.00	1501.	
1.01	5.25	65	.01	.01	.01	44.	1.01	17.55	215	.03	.03	.00	1491.	
1.01	5.30	66	.01	.01	.01	44.	1.01	18.00	216	.03	.03	.00	1485.	
1.01	5.35	67	.01	.01	.01	45.	1.01	18.05	217	.02	.02	.00	1454.	
1.01	5.40	68	.01	.01	.01	46.	1.01	18.10	218	.02	.02	.00	1391.	
1.01	5.45	69	.01	.01	.01	46.	1.01	18.15	219	.02	.02	.00	1308.	
1.01	5.50	70	.01	.01	.01	47.	1.01	18.20	220	.02	.02	.00	991.	
1.01	5.55	71	.01	.01	.01	47.	1.01	18.25	221	.02	.02	.00	774.	
1.01	6.00	72	.01	.01	.01	48.	1.01	18.30	222	.02	.02	.00	587.	
1.01	6.05	73	.07	.04	.03	62.	1.01	18.35	223	.02	.02	.00	445.	
1.01	6.10	74	.07	.04	.03	66.	1.01	18.40	224	.02	.02	.00	352.	
1.01	6.15	75	.07	.04	.03	93.	1.01	18.45	225	.02	.02	.00	287.	
1.01	6.20	76	.07	.04	.02	126.	1.01	18.50	226	.02	.02	.00	240.	
1.01	6.25	77	.07	.05	.02	147.	1.01	18.55	227	.02	.02	.00	208.	
1.01	6.30	78	.07	.05	.02	161.	1.01	19.00	228	.02	.02	.00	185.	
1.01	6.35	79	.07	.05	.02	230.	1.01	19.05	229	.02	.02	.00	169.	
1.01	6.40	80	.07	.05	.02	258.	1.01	19.10	230	.02	.02	.00	158.	
1.01	6.45	81	.07	.05	.02	280.	1.01	19.15	231	.02	.02	.00	150.	
1.01	6.50	82	.07	.05	.02	294.	1.01	19.20	232	.02	.02	.00	145.	
1.01	6.55	83	.07	.05	.02	297.	1.01	19.25	233	.02	.02	.00	141.	
1.01	7.00	84	.07	.05	.02	307.	1.01	19.30	234	.02	.02	.00	138.	
1.01	7.05	85	.07	.05	.02	316.	1.01	19.35	235	.02	.02	.00	136.	
1.01	7.10	86	.07	.05	.01	324.	1.01	19.40	236	.02	.02	.00	135.	
1.01	7.15	87	.07	.06	.01	331.	1.01	19.45	237	.02	.02	.00	134.	
1.01	7.20	88	.07	.06	.01	337.	1.01	19.50	238	.02	.02	.00	134.	
1.01	7.25	89	.07	.06	.01	343.	1.01	19.55	239	.02	.02	.00	134.	
1.01	7.30	90	.07	.06	.01	348.	1.01	20.00	240	.02	.02	.00	134.	
1.01	7.35	91	.07	.06	.01	353.	1.01	20.05	241	.02	.02	.00	134.	
1.01	7.40	92	.07	.06	.01	357.	1.01	20.10	242	.02	.02	.00	134.	
1.01	7.45	93	.07	.06	.01	361.	1.01	20.15	243	.02	.02	.00	134.	
1.01	7.50	94	.07	.06	.01	365.	1.01	20.20	244	.02	.02	.00	134.	
1.01	7.55	95	.07	.06	.01	368.	1.01	20.25	245	.02	.02	.00	134.	
1.01	8.00	96	.07	.06	.01	371.	1.01	20.30	246	.02	.02	.00	134.	
1.01	8.05	97	.07	.06	.01	374.	1.01	20.35	247	.02	.02	.00	134.	
1.01	8.10	98	.07	.06	.01	377.	1.01	20.40	248	.02	.02	.00	134.	
1.01	8.15	99	.07	.06	.01	380.	1.01	20.45	249	.02	.02	.00	134.	
1.01	8.20	100	.07	.06	.01	382.	1.01	20.50	250	.02	.02	.00	134.	
1.01	8.25	101	.07	.06	.01	385.	1.01	20.55	251	.02	.02	.00	134.	
1.01	8.30	102	.07	.06	.01	387.	1.01	21.00	252	.02	.02	.00	134.	
1.01	8.35	103	.07	.06	.01	389.	1.01	21.05	253	.02	.02	.00	134.	
1.01	8.40	104	.07	.06	.01	391.	1.01	21.10	254	.02	.02	.00	134.	
1.01	8.45	105	.07	.06	.01	393.	1.01	21.15	255	.02	.02	.00	134.	
1.01	8.50	106	.07	.06	.01	395.	1.01	21.20	256	.02	.02	.00	134.	
1.01	8.55	107	.07	.06	.01	397.	1.01	21.25	257	.02	.02	.00	134.	
1.01	9.00	108	.07	.06	.01	398.	1.01	21.30	258	.02	.02	.00	134.	
1.01	9.05	109	.07	.06	.01	400.	1.01	21.35	259	.02	.02	.00	134.	
1.01	9.10	110	.07	.06	.01	401.	1.01	21.40	260	.02	.02	.00	134.	
1.01	9.15	111	.07	.06	.01	403.	1.01	21.45	261	.02	.02	.00	134.	
1.01	9.20	112	.07	.06	.01	404.	1.01	21.50	262	.02	.02	.00	134.	
1.01	9.25	113	.07	.06	.01	405.	1.01	21.55	263	.02	.02	.00	134.	
1.01	9.30	114	.07	.06	.01	406.	1.01	22.00	264	.02	.02	.00	134.	
1.01	9.35	115	.07	.06	.01	408.	1.01	22.05	265	.02	.02	.00	134.	

AD-A104 978 PRC CONSOER TOWNSEND INC ST LOUIS MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. LAKEVIEW DAM (MO 10543), MISSISSIP--ETC(U)
SEP 79 W G SHIFRIN DACW43-79-C-0075
UNCLASSIFIED NL

1.01	9.40	116	.07	.06	.00	407.	1.01	22.10	266	.02	.02	.00	134.	
1.01	9.45	117	.07	.06	.00	411.	1.01	22.15	267	.02	.02	.00	134.	
1.01	9.50	118	.07	.06	.00	411.	1.01	22.20	268	.02	.02	.00	134.	
1.01	9.55	119	.07	.06	.00	412.	1.01	22.25	269	.02	.02	.00	134.	
1.01	10.00	120	.07	.06	.00	413.	1.01	22.30	270	.02	.02	.00	134.	
1.01	10.05	121	.07	.06	.00	414.	1.01	22.35	271	.02	.02	.00	134.	
1.01	10.10	122	.07	.06	.00	414.	1.01	22.40	272	.02	.02	.00	134.	
1.01	10.15	123	.07	.06	.00	415.	1.01	22.45	273	.02	.02	.00	134.	
1.01	10.20	124	.07	.06	.00	416.	1.01	22.50	274	.02	.02	.00	134.	
1.01	10.25	125	.07	.06	.00	417.	1.01	22.55	275	.02	.02	.00	134.	
1.01	10.30	126	.07	.06	.00	418.	1.01	23.00	276	.02	.02	.00	134.	
1.01	10.35	127	.07	.06	.00	419.	1.01	23.05	277	.02	.02	.00	134.	
1.01	10.40	128	.07	.06	.00	419.	1.01	23.10	278	.02	.02	.00	134.	
1.01	10.45	129	.07	.07	.00	420.	1.01	23.15	279	.02	.02	.00	134.	
1.01	10.50	130	.07	.07	.00	420.	1.01	23.20	280	.02	.02	.00	134.	
1.01	10.55	131	.07	.07	.00	421.	1.01	23.25	281	.02	.02	.00	134.	
1.01	11.00	132	.07	.07	.00	422.	1.01	23.30	282	.02	.02	.00	134.	
1.01	11.05	133	.07	.07	.00	422.	1.01	23.35	283	.02	.02	.00	134.	
1.01	11.10	134	.07	.07	.00	423.	1.01	23.40	284	.02	.02	.00	134.	
1.01	11.15	135	.07	.07	.00	423.	1.01	23.45	285	.02	.02	.00	134.	
1.01	11.20	136	.07	.07	.00	424.	1.01	23.50	286	.02	.02	.00	134.	
1.01	11.25	137	.07	.07	.00	424.	1.01	23.55	287	.02	.02	.00	134.	
1.01	11.30	138	.07	.07	.00	425.	1.02	0.00	288	.02	.02	.00	134.	
1.01	11.35	139	.07	.07	.00	425.	1.02	.05	289	0.00	0.00	0.00	131.	
1.01	11.40	140	.07	.07	.00	426.	1.02	.10	290	0.00	0.00	0.00	123.	
1.01	11.45	141	.07	.07	.00	426.	1.02	.15	291	0.00	0.00	0.00	107.	
1.01	11.50	142	.07	.07	.00	427.	1.02	.20	292	0.00	0.00	0.00	85.	
1.01	11.55	143	.07	.07	.00	427.	1.02	.25	293	0.00	0.00	0.00	64.	
1.01	12.00	144	.07	.07	.00	428.	1.02	.30	294	0.00	0.00	0.00	45.	
1.01	12.05	145	.21	.20	.01	444.	1.02	.35	295	0.00	0.00	0.00	31.	
1.01	12.10	146	.21	.20	.01	459.	1.02	.40	296	0.00	0.00	0.00	22.	
1.01	12.15	147	.21	.20	.01	602.	1.02	.45	297	0.00	0.00	0.00	15.	
1.01	12.20	148	.21	.20	.01	745.	1.02	.50	298	0.00	0.00	0.00	11.	
1.01	12.25	149	.21	.20	.01	888.	1.02	.55	299	0.00	0.00	0.00	7.	
1.01	12.30	150	.21	.20	.01	1001.	1.02	1.00	300	0.00	0.00	0.00	5.	
									SUM	32.11	30.53	1.58	198505.	
										(816.)	(775.)	(40.)	(5621.84)	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7196.	2176.	569.	662.	198478.
CMS	201.	62.	16.	19.	5620.
INCHES		24.11	30.53	30.53	30.53
MM		612.51	775.40	775.40	775.40
AC-FT		1340.	1367.	1367.	1367.
THOUS CU M		1655.	1686.	1686.	1686.

HYDROGRAPH AT STA 10545 FOR PLAN 1, RTIO 1

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.	2.	3.	4.	5.	7.	8.	
9.	11.	12.	14.	15.	16.	18.	19.	20.	21.	
23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	
33.	34.	35.	35.	36.	37.	38.	39.	39.	40.	
41.	42.	42.	43.	44.	44.	45.	46.	46.	47.	
48.	48.	52.	46.	53.	120.	167.	201.	230.	252.	
270.	284.	297.	307.	316.	320.	331.	327.	345.	348.	
353.	357.	361.	366.	371.	371.	374.	377.	380.	382.	

399.	387.	390.	391.	393.	395.	397.	398.	400.	401.	
405.	404.	405.	406.	408.	409.	411.	411.	412.	413.	
414.	414.	415.	416.	417.	418.	418.	419.	420.	420.	
421.	422.	422.	423.	425.	426.	424.	425.	425.	426.	
426.	426.	427.	427.	444.	496.	604.	739.	880.	1001.	
1083.	1139.	1199.	1233.	1295.	1345.	1386.	1410.	1384.	1396.	
1437.	1462.	1512.	1533.	1488.	1558.	1564.	1571.	1585.	1610.	
1611.	1726.	1792.	1844.	1892.	1891.	1941.	1956.	1967.	1978.	
1965.	1945.	1925.	1877.	2127.	2515.	3364.	4681.	6112.	6995.	
7687.	8571.	9287.	9763.	9913.	9995.	2363.	2444.	2410.	2248.	
2125.	2066.	2001.	1972.	1937.	1883.	1811.	1741.	1667.	1608.	
1564.	1.15.	1515.	1.01.	1491.	14 .	1454.	1371.	1205.	991.	
771.	597.	445.	352.	287.	240.	208.	185.	169.	158.	
150.	145.	141.	138.	136.	135.	134.	134.	134.	134.	
134.	134.	134.	134.	134.	134.	134.	134.	134.	134.	
134.	134.	134.	134.	134.	134.	134.	134.	134.	134.	
134.	134.	134.	134.	134.	134.	134.	134.	134.	134.	
134.	134.	134.	134.	134.	134.	134.	134.	134.	134.	
134.	134.	134.	134.	134.	134.	134.	134.	131.	123.	
107.	81.	64.	55.	51.	22.	11.	11.	7.	5.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CF	7489.	2178.	967.	967.	193478.
CMS	201.	62.	27.	27.	5520.
INCHES		24.11	30.83	30.83	42.83
AC-FT		612.91	775.40	775.40	1087.
		1380.	1367.	1367.	1367.
THOUS CU		1332.	1496.	1696.	1696.

HYDROGRAPH AT STA 10583 FOR PLAN 1, RTIO 2

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.	2.	3.	3.	4.
5.	5.	6.	7.	8.	9.	9.	9.	10.	11.
11.	12.	12.	13.	13.	14.	15.	15.	16.	16.
16.	17.	17.	18.	18.	19.	19.	19.	20.	20.
20.	21.	21.	21.	22.	22.	22.	23.	23.	23.
24.	24.	24.	25.	27.	29.	37.	101.	113.	126.
135.	142.	148.	153.	158.	162.	165.	169.	171.	174.
176.	178.	181.	182.	184.	186.	187.	189.	190.	191.
192.	194.	195.	196.	198.	197.	198.	199.	200.	201.
201.	202.	203.	203.	204.	204.	205.	205.	206.	206.
207.	207.	208.	208.	209.	209.	209.	210.	210.	210.
211.	211.	211.	211.	212.	212.	212.	212.	213.	213.
213.	213.	213.	214.	232.	248.	301.	370.	440.	500.
547.	578.	599.	615.	626.	635.	643.	655.	675.	698.
721.	741.	756.	766.	774.	779.	783.	786.	791.	805.
831.	863.	885.	904.	946.	961.	971.	978.	983.	987.
982.	972.	963.	987.	1063.	1258.	1682.	2340.	3056.	3492.
3543.	3205.	2648.	2382.	2111.	1713.	1484.	1322.	1205.	1124.
1066.	1029.	1000.	981.	964.	942.	929.	920.	934.	804.
749.	767.	757.	750.	746.	742.	737.	695.	693.	695.
687.	943.	899.	179.	145.	120.	104.	93.	85.	79.
74.	72.	71.	69.	68.	67.	67.	67.	67.	67.
67.	67.	67.	67.	67.	67.	67.	67.	67.	67.
67.	67.	67.	67.	67.	67.	67.	67.	67.	67.
67.	67.	67.	67.	67.	67.	67.	67.	67.	67.
67.	67.	67.	67.	67.	67.	67.	67.	67.	67.

67.	67.	67.	67.	67.	67.	67.	67.	66.	66.
65.	43.	32.	23.	19.	11.	7.	5.	4.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2047.	1545.	543.	231.	99230.
CMS	100.	31.	15.	6.	2810.
INCHES		15.22	15.26	15.26	15.26
MM		386.29	387.70	387.70	387.70
AC-FT		540.	643.	643.	643.
THOUS CU M		666.	793.	793.	793.

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH ALPENTER DAM (10543)

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10543	1	3	0	2	2	1	3	2

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAVE	ICON	IPMP	LSTR
0.0	0.00	0.00	1	1	0	0	3

NSTPS	MSTOR	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	2	0.100	0.20	0.300	-540.	-1

STAGE	545.50	549.00	552.00	555.50	558.74	559.11	564.47	566.90	566.60	568.38
	558.5	559.63	559.39	560.37						
FLOW	0.00	13.00	61.00	71.00	261.00	402.00	651.00	2013.00	2430.00	5931.00
	405.23	472.00	9401.00	10715.00						
CAPACITY	0.	54.	116.	169.	207.	354.	1494.			
ELEVATION	530.	546.	552.	554.	559.	561.	580.			

CREL	SPWID	COQ	EXPW	CLEVL	COQL	CAREA	EXPL
545.5	0.0	0.0	0.	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
568.5	0.	0.0	0.

STATION 10543, PLAN 1, RATIO 1

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.	1.	1.	1.	1.	1.	2.	2.	2.	2.
3.	3.	3.	3.	3.	3.	4.	4.	4.	5.
5.	6.	6.	6.	7.	7.	7.	8.	8.	8.
9.	9.	9.	10.	10.	11.	11.	11.	12.	12.
13.	15.	19.	19.	19.	19.	21.	24.	29.	33.

SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING

PEAK FLO[illegible] STORAGE (END OF PERIOD) SUMMARY FOR [illegible] PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

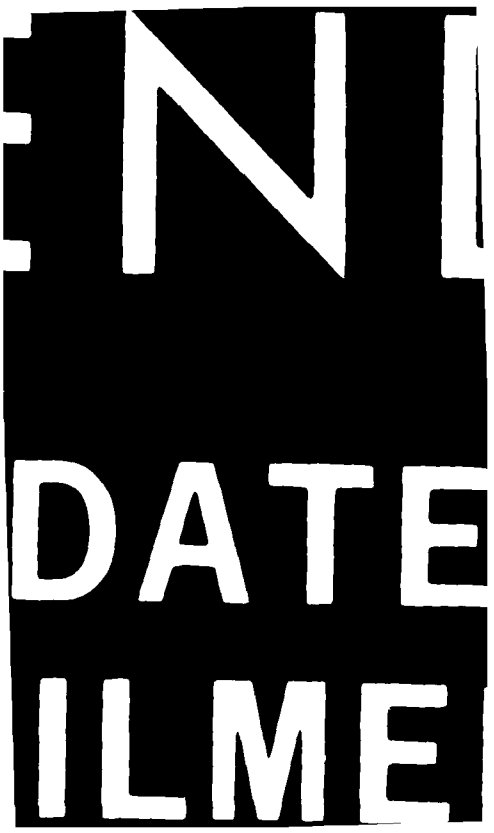
OPERATION	STATION	AREA	PLAN	RATIO 1 1.00	RATIO 2 .50
HYDROGRAPH AT	18563	.84	1	7086.	3593.
		(2.18)		(200.66)(	101.73)(
ROUTED TO	18563	.54	1	6026.	2820.
		(2.18)		(170.63)(	79.84)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	541.50	545.[illegible]	558.50
STORAGE	[illegible].	59.	307.
OUTFLOW	[illegible].	0.	6053.

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
1.00	[illegible]	0.00	30[illegible].	6026.	0.00	16.[illegible]	0.00
[illegible]	[illegible]	0.00	2[illegible].	2020.	0.00	16.00	0.00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DATE
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