

AD-A106 632

ARMY ENGINEER DISTRICT MEMPHIS TN  
NATIONAL DAM SAFETY PROGRAM, TURKEY CREEK DAMS (MO 31101, MO 31--ETC(U)  
AUG 79 J L ANDERSON, H L SMITH, R O SMITH

F/G 13/13

UNCLASSIFIED

NL

1 of 2  
pages.



AD A106632

LEVEL 1

①

DTIC  
ELECTE  
S NOV 04 1981 D  
E

This document has been approved  
for public release and sale; its  
distribution is unlimited.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

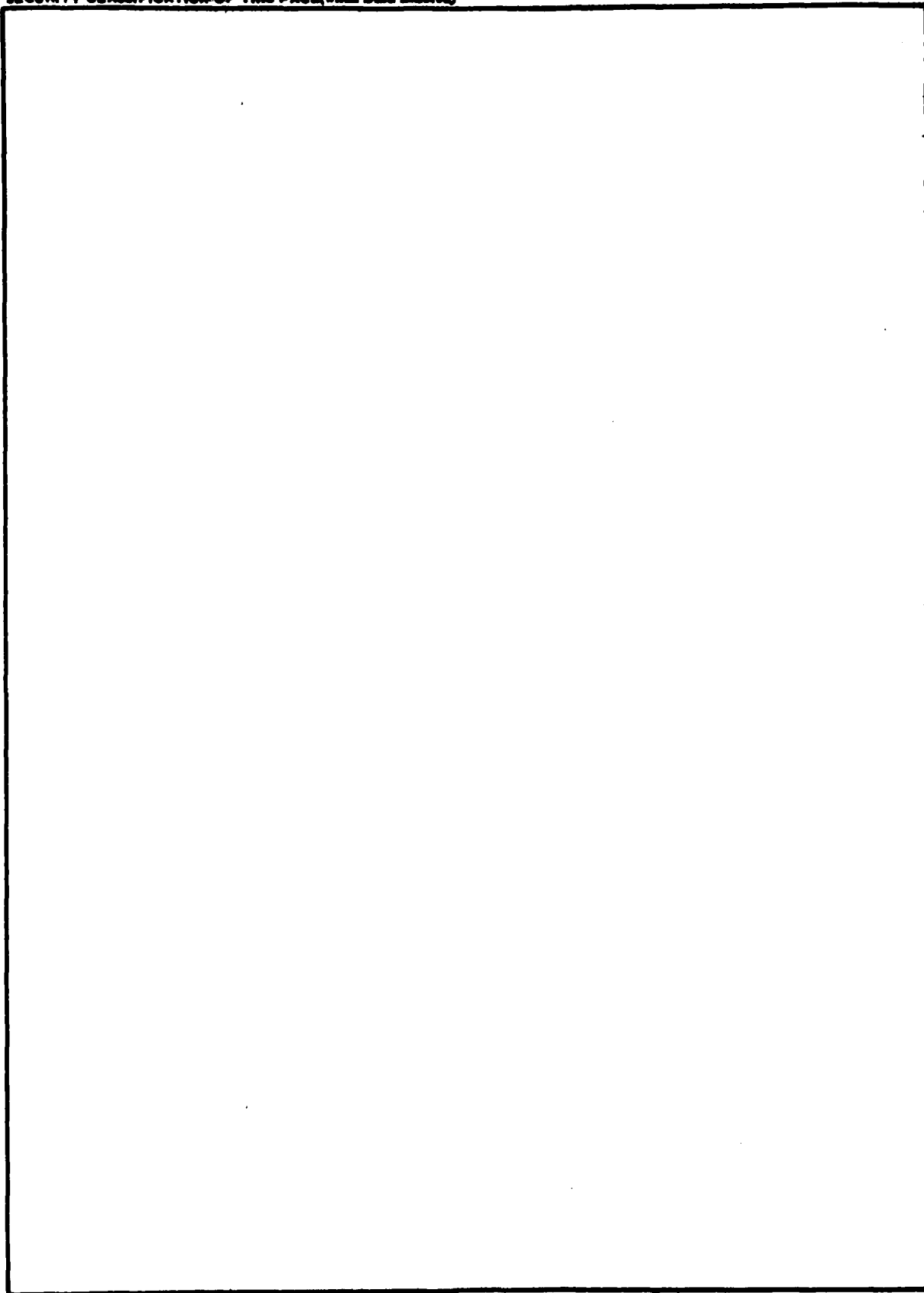
REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	AD-A106632	
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Turkey Creek Dams (MO 31101, 31108, 31109, 31602) Wayne County, Missouri		5. TYPE OF REPORT & PERIOD COVERED (9) Final Report
7. AUTHOR(s) Corps of Engineers, Memphis District (10) J. C. ...		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		8. CONTRACT OR GRANT NUMBER(s) N/A
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS (12) 1105
14. MONITORING AGENCY NAME & ADDRESS (If different from Controlling Office) (1) National Dam Safety Program. Turkey Creek Dams (MO 31101, MO 31108, MO 31109, MO 31602), Mississippi - Kaskaskia - St. Louis Basin, Wayne County, Missouri. Phase I Inspection Report.		12. REPORT DATE (11) August 1979
15. DISTRIBUTION STATEMENT Approved for release; distribution unlimited.		13. NUMBER OF PAGES Approximately 100
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		15. SECURITY CLASS. (of this report)  UNCLASSIFIED
18. SUPPLEMENTARY NOTES		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  Dam Safety, Lake, Dam Inspection, Private Dams, Lake Julia Dam, Lake of the Pines Dam, Turner's Dream Lake Dam, Lake Janna Dam.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.		

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

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)



SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

## INSTRUCTIONS FOR PREPARATION OF REPORT DOCUMENTATION PAGE

**RESPONSIBILITY.** The controlling DoD office will be responsible for completion of the Report Documentation Page, DD Form 1473, in all technical reports prepared by or for DoD organizations.

**CLASSIFICATION.** Since this Report Documentation Page, DD Form 1473, is used in preparing announcements, bibliographies, and data banks, it should be unclassified if possible. If a classification is required, identify the classified items on the page by the appropriate symbol.

### COMPLETION GUIDE

**General.** Make Blocks 1, 4, 5, 6, 7, 11, 13, 15, and 16 agree with the corresponding information on the report cover. Leave Blocks 2 and 3 blank.

**Block 1.** Report Number. Enter the unique alphanumeric report number shown on the cover.

**Block 2.** Government Accession No. Leave Blank. This space is for use by the Defense Documentation Center.

**Block 3.** Recipient's Catalog Number. Leave blank. This space is for the use of the report recipient to assist in future retrieval of the document.

**Block 4.** Title and Subtitle. Enter the title in all capital letters exactly as it appears on the publication. Titles should be unclassified whenever possible. Write out the English equivalent for Greek letters and mathematical symbols in the title (see "Abstracting Scientific and Technical Reports of Defense-sponsored RDT/E," AD-667 000). If the report has a subtitle, this subtitle should follow the main title, be separated by a comma or semicolon if appropriate, and be initially capitalized. If a publication has a title in a foreign language, translate the title into English and follow the English translation with the title in the original language. Make every effort to simplify the title before publication.

**Block 5.** Type of Report and Period Covered. Indicate here whether report is interim, final, etc., and, if applicable, inclusive dates of period covered, such as the life of a contract covered in a final contractor report.

**Block 6.** Performing Organization Report Number. Only numbers other than the official report number shown in Block 1, such as series numbers for in-house reports or a contractor/grantee number assigned by him, will be placed in this space. If no such numbers are used, leave this space blank.

**Block 7.** Author(s). Include corresponding information from the report cover. Give the name(s) of the author(s) in conventional order (for example, John R. Doe or, if author prefers, J. Robert Doe). In addition, list the affiliation of an author if it differs from that of the performing organization.

**Block 8.** Contract or Grant Number(s). For a contractor or grantee report, enter the complete contract or grant number(s) under which the work reported was accomplished. Leave blank in in-house reports.

**Block 9.** Performing Organization Name and Address. For in-house reports enter the name and address, including office symbol, of the performing activity. For contractor or grantee reports enter the name and address of the contractor or grantee who prepared the report and identify the appropriate corporate division, school, laboratory, etc., of the author. List city, state, and ZIP Code.

**Block 10.** Program Element, Project, Task Area, and Work Unit Numbers. Enter here the number code from the applicable Department of Defense form, such as the DD Form 1498, "Research and Technology Work Unit Summary" or the DD Form 1634, "Research and Development Planning Summary," which identifies the program element, project, task area, and work unit or equivalent under which the work was authorized.

**Block 11.** Controlling Office Name and Address. Enter the full, official name and address, including office symbol, of the controlling office. (Equates to funding/sponsoring agency. For definition see DoD Directive 5200.20, "Distribution Statements on Technical Documents.")

**Block 12.** Report Date. Enter here the day, month, and year or month and year as shown on the cover.

**Block 13.** Number of Pages. Enter the total number of pages.

**Block 14.** Monitoring Agency Name and Address (if different from Controlling Office). For use when the controlling or funding office does not directly administer a project, contract, or grant, but delegates the administrative responsibility to another organization.

**Blocks 15 & 15a.** Security Classification of the Report: Declassification/Downgrading Schedule of the Report. Enter in 15 the highest classification of the report. If appropriate, enter in 15a the declassification/downgrading schedule of the report, using the abbreviations for declassification/downgrading schedules listed in paragraph 4-207 of DoD 5200.1-R.

**Block 16.** Distribution Statement of the Report. Insert here the applicable distribution statement of the report from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

**Block 17.** Distribution Statement (of the abstract entered in Block 20, if different from the distribution statement of the report). Insert here the applicable distribution statement of the abstract from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

**Block 18.** Supplementary Notes. Enter information not included elsewhere but useful, such as: Prepared in cooperation with . . . Translation of (or by) . . . Presented at conference of . . . To be published in . . .

**Block 19.** Key Words. Select terms or short phrases that identify the principal subjects covered in the report, and are sufficiently specific and precise to be used as index entries for cataloging, conforming to standard terminology. The DoD "Thesaurus of Engineering and Scientific Terms" (TEST), AD-672 000, can be helpful.

**Block 20.** Abstract. The abstract should be a brief (not to exceed 200 words) factual summary of the most significant information contained in the report. If possible, the abstract of a classified report should be unclassified and the abstract to an unclassified report should consist of publicly-releasable information. If the report contains a significant bibliography or literature survey, mention it here. For information on preparing abstracts see "Abstracting Scientific and Technical Reports of Defense-Sponsored RDT&E," AD-667 000.

PHASE I REPORT  
NATIONAL DAM SAFETY REPORT

Name of Dams	Lake Julia Dam Lake of the Pines Dam Turner's Dream Lake Dam Lake Janna Dam
State Located	Missouri
County Located	Wayne County
Stream	Unnamed Tributary to Barnes Creek
Date of Inspection	16 May 1979

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	

Lake Julia Dam (Mo. 31101), Lake of the Pines Dam (Mo. 31109), Turner's Dream Lake Dam (Mo. 31108) and Lake Janna Dam (Mo. 31602) make up what are known as the Turkey Creek dams. The four Turkey Creek dams are presented in this Phase I inspection report because they act as a system both hydrologically and hydraulically.

The four Turkey Creek dams were inspected by an interdisciplinary team of engineers from the Memphis District, U.S. Army Corps of Engineers. The purpose of the inspection was to make an assessment of the general condition of the four dams with respect to safety, based upon available data and visual inspection, in order to determine if the dams pose hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, the Turkey Creek dams acting as a system are in the high downstream hazard potential classification. Failure of the dams would threaten the life and property of approximately eight families downstream of the dams and cause appreciable damage to highway E which is 1.2 miles downstream of the dams. Individually, the Turkey Creek dams are classified as follows; Lake Julia Dam (Mo. 31101) is classified as a small size dam with a high downstream hazard potential. Failure of this dam would cause overtopping or failure of Turner's Dream Lake Dam (Mo. 31108). Lake of the Pines Dam (Mo. 31109) is classified as an intermediate size dam with a high downstream hazard potential. Failure of this dam would cause overtopping or failure of Turner's Dream Lake Dam (Mo. 31108). Lake Janna Dam (Mo. 31602) is classified as a small size dam with a high downstream hazard potential. Turner's Dream Lake Dam (Mo. 31108) is classified as a small size dam with a high downstream hazard potential. Failure of this dam would threaten the life and property of approximately eight families downstream of the dam and cause appreciable damage to highway E which is 1.2 miles downstream of the dam.

The inspection and evaluation of the above mentioned dams indicate that the spillways in each dam will not meet the criteria set forth in the guidelines for dams having the previously mentioned size classification and hazard potential. Due to the fact that failure of either Lake Julia Dam (Mo. 31101) or Lake of the Pines Dam (Mo. 31109), or failure of any combination of Lake Julia Dam (Mo. 31101), Lake of the Pines Dam (Mo. 31109) or Lake Janna Dam (Mo. 31602), will cause overtopping or failure of Turner's Dream Lake Dam (Mo. 31108), the spillway/spillways in each dam are required to pass the Probable Maximum Flood (PMF) without the dams being overtopped. Also, Turner's Dream Lake Dam (Mo. 31108) is required to pass the PMF, because failure of the dam would result in a high hazard potential to life and property downstream of the dam. The PMF is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

The emergency spillway for Lake Julia Dam (Mo. 31101) will pass only 9 percent of the PMF before the dam embankment is overtopped. Because the spillway will not pass 1/2 of the PMF without overtopping and will not pass the 10-year frequency flood without overtopping, Lake Julia Dam (Mo. 31101) is classified as "unsafe emergency".

The emergency spillway for Lake of the Pines Dam (Mo. 31109), will pass only 20 percent of the PMF before the dam embankment is overtopped. Because the spillway will not pass 1/2 of the PMF without overtopping but will pass the 10-year frequency flood, Lake of Pines Dam (Mo. 31109) is classified as "unsafe non-emergency". The spillway will pass the 100-year flood without overtopping, which is a flood that has a 1 percent chance of being exceeded in any given year.

The emergency spillway for Turner's Dream Lake Dam (Mo. 31108) will pass only 20 percent of the PMF before the dam embankment is overtopped. The spillway will pass the 100-year flood without overtopping. However, Turner's Dream Lake Dam (Mo. 31108) is classified as "unsafe emergency" due to the 10-year frequency flood overtopping and probable failure of Lake Julia Dam (Mo. 31101) which in turn could cause overtopping and failure of Turner's Dream Lake Dam (Mo. 31108).

The discharge structure for Lake Janna Dam (Mo. 31602) will pass only 25 percent of the PMF before the dam embankment is overtopped. The discharge structure for Lake Janna Dam (Mo. 31602) will marginally pass the 100-year frequency flood. Because the discharge structure will not pass 1/2 at the PMF but will pass the 10-year frequency flood, Lake Janna Dam (Mo. 31602) is classified as "unsafe non-emergency".

It is recommended that the owner take action to correct or control the deficiencies described. Corrective works should be in accordance with analyses and design performed by an engineer experienced in the design and construction of dams.

*Jerry L. Anderson*

JERRY L. ANDERSON  
Hydraulic Engineer  
Memphis District  
Corps of Engineers

*Harold L. Smith*

HAROLD L. SMITH  
Geological Engineer  
Memphis District  
Corps of Engineers

*Ronald O. Smith*

RONALD O. SMITH  
Soils Engineer  
Memphis District  
Corps of Engineers

**SIGNED**

SUBMITTED BY: \_\_\_\_\_

Chief, Engineering Division

**28 SEP 1979**

\_\_\_\_\_  
Date

**SIGNED**

APPROVED BY: \_\_\_\_\_

Colonel, CE, District Engineer

**28 SEP 1979**

\_\_\_\_\_  
Date

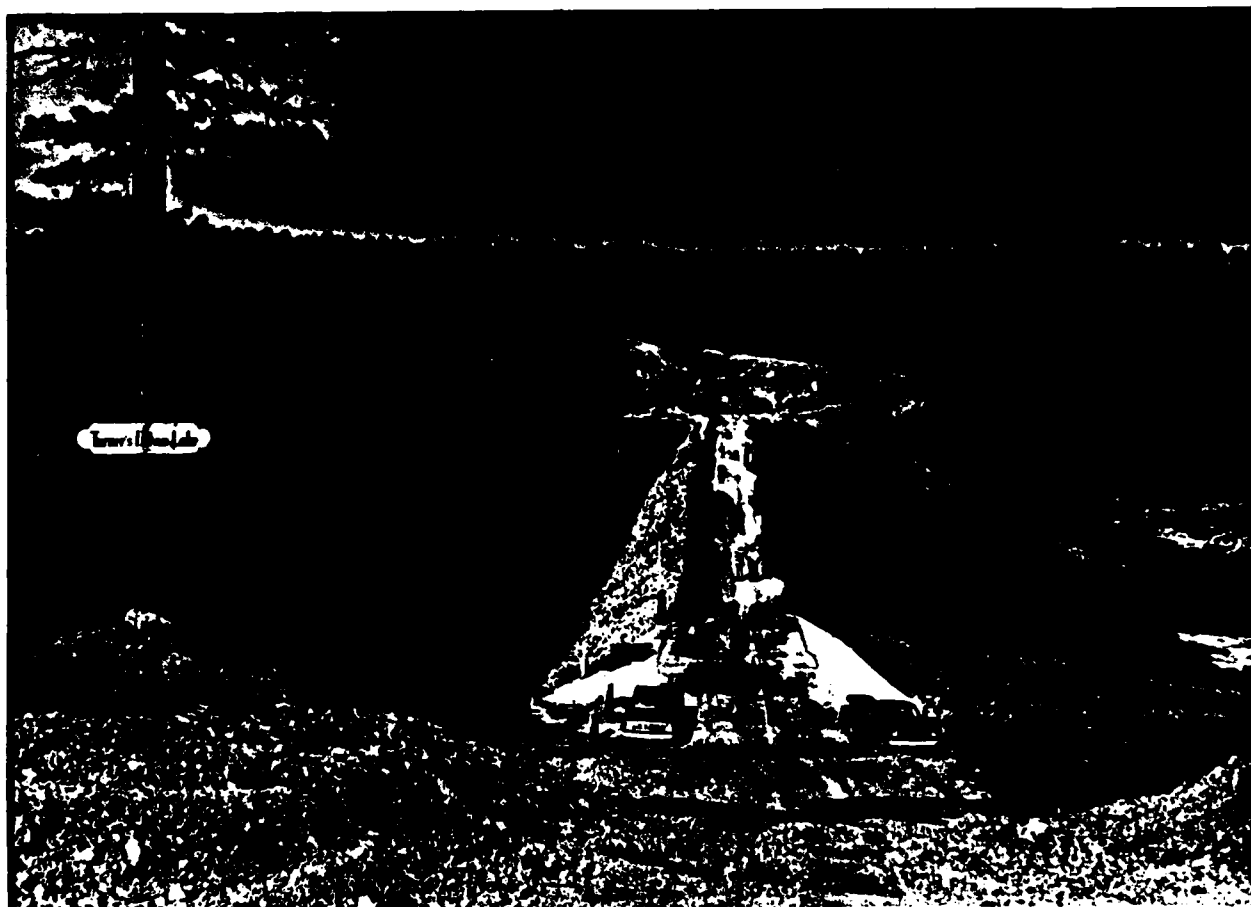




Overview of Lake Julia Dam and Lake



Overview of Lake of the Pines Dam and Lake



Overview of Turner's Dream Dam and Lake



Overview of Lake Janna Dam and Lake

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
TURKEY CREEK DAMS

TABLE OF CONTENTS

<u>Paragraph No.</u>	<u>Title</u>	<u>Page No.</u>
SECTION 1 - PROJECT INFORMATION		
1.1	General	1
1.2	Description of Project	1
1.3	Pertinent Data	3
SECTION 2 - ENGINEERING DATA		
2.1	Design	11
2.2	Construction	11
2.3	Operation	11
2.4	Evaluation	11
SECTION 3 - VISUAL INSPECTION		
3.1	Findings	12
3.2	Evaluation	16
SECTION 4 - OPERATIONAL PROCEDURES		
4.1	Procedures	17
4.2	Maintenance of Dam	17
4.3	Maintenance of Operation Facilities	17
4.4	Description of Any Warning System in Effect	17
4.5	Evaluation	17
SECTION 5 - HYDRAULIC/HYDROLOGIC		
5.1	Evaluation of Features	18
SECTION 6 - STRUCTURAL STABILITY		
6.1	Evaluation of Structural Stability	21
SECTION 7 - ASSESSMENT/REMEDIAL MEASURES		
7.1	Dam Assessment	22
7.2	Remedial Measures	22
APPENDICES		
A.	Hydrology and Hydraulics	
B.	Geology of Damsite	

TABLE OF CONTENTS (Cont'd)

LIST OF PLATES

General

<u>Plate No.</u>	<u>Title</u>
1A	Location Map
2A	Vicinity Topography

Lake Julia (No. 31101)

<u>Plate No.</u>	<u>Title</u>
1B	Dam Plan View
2B	Centerline Profile
3B	Cross-Section (Existing Condition)

<u>Photo No.</u>	<u>Title</u>
1B	Overview of Lake and Dam
2B	Upstream Embankment
3B	Downstream Embankment
4B	Inlet of Vertical Discharge
5B	Emergency Spillway
6B	Wavewash on Upstream Embankment
7B	Erosion Gully in Upstream Embankment near Left Abutment
8B	Erosion Gully in Downstream Embankment near Left Abutment
9B	Repaired Erosion Gulleys at Dam Crest

Lake of the Pines (No. 31109)

<u>Plate No.</u>	<u>Title</u>
1C	Dam Plan View
2C	Centerline Profile
3C	Cross-Section (Existing Condition)

<u>Photo No.</u>	<u>Title</u>
1C	Overview of Lake and Dam
2C	Upstream Embankment
3C	Downstream Embankment
4C	Inlet of Vertical Discharge
5C	Outlet of Vertical Discharge
6C	Emergency Spillway
7C	Spillway Outfall Channel
8C	Seepage at Downstream Toe
9C	Seepage Near Left Abutment
10C	Erosion on Upstream Embankment near Left Abutment
11C	Erosion on Downstream Embankment near Right Abutment
12C	Landside Ditch in Right Abutment

Turner's Dream Lake (No. 31108)

<u>Plate No.</u>	<u>Title</u>
1D	Dam Plan View
2D	Centerline Profile
3D	Cross-Section (Existing Condition)

<u>Photo No.</u>	<u>Title</u>
1D	Overview of Lake and Dam
2D	Upstream Embankment
3D	Downstream Embankment
4D	Inlet of Vertical Discharge
5D	Outlet of Discharge Structure
6D	Principal Outlet Channel
7D	Right Abutment Spillway
8D	Left Abutment Spillway
9D	Erosion on Downstream Embankment near Dam Crest
10D	Seepage in Right Abutment
11D	Spring Downstream of Right Abutment Spillway
12D	Wet Spot at Toe of Dam
13D	Landside Toe of Dam

Lake Janna (No. 31602)

<u>Plate No.</u>	<u>Title</u>
1E	Dam Plan View
2E	Centerline Profile
3E	Cross-Section (Existing Condition)

<u>Photo No.</u>	<u>Title</u>
1E	Overview of Lake and Dam
2E	Upstream Embankment
3E	Downstream Embankment
4E	Inlet of Vertical Discharge
5E	Discharge of Vertical Structure
6E	Outlet Channel
7E	Erosion Gulley in Downstream Embankment at Left Abutment
8E	Erosion Gulley on Downstream Embankment

Affected Downstream Features

<u>Photo No.</u>	
1F	Dwellings Downstream of Turkey Creek Dams
2F	Dwellings Downstream of Turkey Creek Dams



## SECTION 1 - PROJECT INFORMATION

### 1.1 GENERAL

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

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

c. Evaluation Criteria. Criteria used to evaluate the dams were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection" of Federal agencies and many State agencies, professional engineering organizations, and private engineers.

### 1.2 DESCRIPTION OF PROJECT

#### a. Description of Dams and Appurtenances.

(1) General. Lake Julia Dam (Mo. 31101), Lake of the Pines Dam (Mo. 31109), Turner's Dream Lake Dam (Mo. 31108), and Lake Janna Dam (Mo. 31602) make up what are known as the Turkey Creek dams. The four Turkey Creek dams are presented in this Phase I inspection report because they act as a system both hydrologically and hydraulically.

(2) Dams. The dams are earth structures built in a narrow valley in the uplands which border the Mississippi Embayment. Topography adjacent to the valley is rolling to steep. Soils in the area are formed of red silty clays with fragments of dolomite and chert. Topography in the vicinity of the dams is shown on Plate 2A.

#### (3) Appurtenant Structures.

(a) Lake Julia (Mo. 31101). Two vertical slotted standpipes constructed of 14 inch diameter steel pipe junctioned at some point beneath the surface of the water and bottom of the lake with 122 feet of 14 inch diameter steel pipe is the primary means of discharge. The standpipes are capped and the means of entry is by numerous slots (3/4 in. X 2-1/2 in.) cut vertically in the periphery which extend for approximately 4 feet from the top of the pipes (see Photo 4B). An emergency spillway is cut in the right abutment. The emergency spillway is a trapezoidal section with a bottom width of approximately 25 feet and side slopes of approximately 1V on 12H. The low point on the top of dam is only 0.6 foot higher than the crest of the emergency spillway.

(b) Lake of the Pines (Mo. 31109). Two vertical slotted standpipes constructed of 14 inch diameter steel pipe junctioned at some point beneath the surface of the water and bottom of the lake with 190 feet of 14 inch diameter steel pipe is the primary means of discharge. The standpipe is capped and means of entry is by numerous slots (3/4 in. X 2-1/2 in.) cut vertically in the periphery which extends for approximately 4 feet from the top of the pipes (See Photo 4C). An emergency spillway is cut in the left abutment. The emergency spillway is a trapezoidal section with a bottom width of approximately 38 feet and side slopes 1V on 2H. Initially the emergency spillway is covered by a concrete roadway, however the critical constructed section, further down the emergency spillway, is cut into the hillside.

(c) Turner's Dream Lake (Mo. 31108). Two vertical slotted standpipes constructed of 14 inch diameter steel pipe junctioned at some point beneath the surface of the lake and bottom of the lake with 185 feet of 14 inch diameter steel pipe is the primary means of discharge. The standpipe is capped and means of entry is by numerous slots (3/4 in. X 2 1/2 in.) cut vertically in the periphery which extends for approximately 4 feet from the top of the pipes (see Photo 4D). Two emergency spillways are cut in the right and left abutment respectively. The emergency spillway in the right abutment is a trapezoidal section with a bottom width of approximately 14 feet and side slopes of 1V on 6.5H. The entire flow surface of this spillway is a concrete roadway. The emergency spillway in the left abutment is also a trapezoidal section with a bottom width of approximately 25 feet and side slopes of 1V on 5H.

(d) Lake Janna (Mo. 31602). Two separate drop inlet structures are the primary means of discharge for this dam. Each respective drop inlet consists of approximately 2 feet of 14 inch steel pipe junctioned with 40 feet of 14 inch steel pipe through the embankment (see Photo 4E). There is no emergency spillway for this structure.

(4) Pertinent physical data for each of the Turkey Creek Dams are given in paragraph 1.3 below.

b. Location. The dams are located in the west central portion of Wayne County, Missouri, as shown on the Shook, Missouri Quadrangle sheet in Section 3.5, Township 29 North, Range 7 East (See Plate 1A).

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1 c above. Based on these criteria, the dams and impoundments have the following size classifications.

Lake Julia (MO 31101)-- Small  
Lake of the Pines (MO 31109) - Intermediate  
Turner's Dream Lake (MO 31108) - Small  
Lake Janna (MO 31602) - Small

d. Hazard Classification. Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph c above. Based on referenced guidelines and based on the fact that failure of one, all, or any combination of the upper dams could cause failure or overtopping of Turner's Dream Dam, all of the dams have been classified as high hazard dams.

e. Ownership. The Turkey Creek dams are owned by Mr. Bobby G. Turner of Route 2, Box 18, Lowndes, Missouri 63951.

f. Purpose of Dam. The dams form approximately 127 acres of recreational lakes for the Turkey Creek Resort.

g. Design and Construction History. Through conversation with the owner, it was determined that no design information was available on the Turkey Creek Dams. The dams were constructed by the present owner in the following years:

Lake Julia (Mo. 31101) - 1974  
Lake of the Pines (Mo. 31109) - 1976  
Turner's Dream Lake (Mo. 31108) - 1977  
Lake Janna (Mo. 31602) - 1972

The dams were constructed of red silty clays containing chert and dolomite excavated from the lake area. The material was placed in lifts by 6-yd bottom scrapers and 9-yd paddle scrapers and then compacted by several passes of a sheeps-foot roller. Each lift was then graded before additional lifts were placed. Each dam reportedly has a clay cutoff trench to rock varying in depth from 48 feet to 52 feet.

h. Normal Operation Procedure. No operating records exist. Normal rainfall, runoff, transpiration and evaporation all combine to maintain relatively stable surface elevations behind each dam. The emergency spillways, except the left abutment spillway of Turner's Dream Lake Dam, have been used at each dam, but the maximum depth of flow in each spillway is unknown.

### 1.3 PERTINENT DATA

#### I. Lake Julia (Mo. 31101)

a. Drainage Area. - 335 acres (Topographic Quadrangle)

b. Discharge at Damsite.

- (1) Discharge can take place through a set of vertical slotted standpipes junctioned with a single pipe which passes through the dam and an emergency spillway.
- (2) Estimated experienced maximum flood at the damsite - Unknown

c. Elevation. (Feet above MSL)

- (1) Observed Pool - 538.0
- (2) Normal Pool - 536.1
- (3) Spillway Crest - 540.5
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - Maximum - 543.9  
Minimum - 541.1
- (6) Maximum Pool (PMF) - 543.3
- (7) Invert of Discharge Pipe - 508.7
- (8) Streambed at Centerline of Dam - 508.0
- (9) Maximum Tailwater - Unknown

d. Reservoir. Length of maximum pool - 1800± feet.

e. Storage. (Acre - feet)

- (1) Observed Pool - 326
- (2) Normal Pool - 284
- (3) Spillway Crest - 385
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - Maximum - 481  
Minimum - 400
- (6) Maximum Pool (PMF) - 461

f. Reservoir Surface Area (Acres)

- (1) Observed Pool - 23.0
- (2) Normal Pool - 21.5
- (3) Spillway Crest - 24.6
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - Maximum - 31.5  
Minimum - 26.5
- (6) Maximum Pool (PMF) - 30.4

g. Dam.

- (1) Type - earth embankment
- (2) Length - 650± feet
- (3) Height - 34 feet maximum
- (4) Top width - 17± feet
- (5) Side Slopes
  - (a) Downstream - 1V on 2.5 H
  - (b) Upstream - 1V on 3.0 H
- (6) Zoning - Unknown
- (7) Impervious core - Unknown
- (8) Cutoff - 50 foot deep trench with width unknown
- (9) Grout curtain - Unknown

h. Diversion and Regulation Tunnel. None

i. Primary Discharge System.

- (1) Type - Two vertical slotted 14 inch diameter steel pipes junctioned with a 14 inch diameter steel pipe (see para 1.2 a (2)(a) - Lake Julia).
- (2) Length of 14 inch vertical pipes - Unknown
- (3) Length of 14 inch horizontal pipe - 122 feet (horizontal distance)
- (4) Top elevation of vertical pipe - 540.1 msl
- (5) Invert of discharge pipe - 508.7 msl

j. Emergency Spillway.

- (1) Type - Uncontrolled earthen with trapezoidal section
- (2) Width of weir - 25 feet (bottom width)
- (3) Length of weir - Not applicable
- (4) Side Slopes - 1V on 12 H
- (5) Crest Elevation - 540.5 msl

k. Regulating Outlet. None

II. Lake of the Pines (Mo. 31109)

a. Drainage Area. - 1189 acres (Topographic Quadrangle)

b. Discharge at Damsite.

- (1) Discharge can take place through a set of vertical slotted standpipes junctioned with a single pipe which passes through the dam and an emergency spillway.
- (2) Estimated experienced maximum flood at the damsite - Unknown

c. Elevation. (Feet above MSL)

- (1) Observed Pool - 544.3
- (2) Normal Pool - 542.7
- (3) Spillway Crest - 544.4
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - 549.0
- (6) Maximum Pool (PMF) - 551.2
- (7) Invert of Discharge Pipe - 508.6
- (8) Streambed at Centerline of Dam - 510
- (9) Maximum Tailwater - Unknown

d. Reservoir. Length of maximum pool - 3500± feet.

e. Storage. (Acre - feet)

- (1) Observed Pool - 759
- (2) Normal Pool - 665
- (3) Spillway Crest - 761
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - 1067
- (6) Maximum Pool (PMF) - 1234

f. Reservoir Surface Area. (Acres)

- (1) Observed Pool - 61.7
- (2) Normal Pool - 56.7
- (3) Spillway Crest - 62.0
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam 76.4
- (6) Maximum Pool (PMF) - 83.3

g. Dam.

- (1) Type - earth embankment
- (2) Length = 875± feet
- (3) Height - 44 feet maximum
- (4) Top width - 21± feet
- (5) Side slopes
  - (a) Downstream - 1V on 2.6 H
  - (b) Upstream - 1V on 2.8 H
- (6) Zoning - Unknown
- (7) Impervious core - Unknown
- (8) Cutoff - 48 foot deep trench with width unknown
- (9) Grout curtain - Unknown

h. Diversion and Regulation Tunnel. None

i. Primary Discharge System.

- (1) Type - Two vertical slotted 14 inch diameter steel pipe junctioned with a 14 inch diameter steel pipe (see para 1.2 a (2)(b) - Lake of the Pines).
- (2) Length of 14 inch vertical pipe - Unknown
- (3) Length of 14 inch horizontal pipe - 190 feet horizontal distance
- (4) Top elevation of vertical pipe - 546.7 (avg) msl
- (5) Invert of discharge pipe - 508.6 msl

j. Emergency Spillway.

- (1) Type - Uncontrolled earthen with trapezoidal section
- (2) Width of weir - 38 feet (bottom width)
- (3) Length of weir - Not applicable
- (4) Side slopes - 1V on 2 H
- (5) Crest Elevation - 544.4 msl.

k. Regulating Outlet. None

III. Turner's Dream Lake (Mo. 31108)

a. Drainage Area. - 241 acres  
268 (includes drainage area for Lake Janna)

b. Discharge at Dam Site.

- (1) Discharge can take place through a set of vertical slotted standpipes junctioned with a single pipe which passes through the dam and two emergency spillways.
- (2) Estimated experienced maximum flood at damsite - Unknown

c. Elevation. (Feet above MSL)

- (1) Observed Pool - 510.8
- (2) Normal Pool - 509.8
- (3) Spillway Crest - Right Abutment - 511.1  
Left Abutment - 512.7
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - Maximum - 518.5  
Minimum - 515.5
- (6) Maximum Pool (PMF) - 519.3
- (7) Invert of Discharge Pipe - 479.0
- (8) Streambed at Centerline of Dam - 480
- (9) Maximum Tailwater - Unknown

e. Storage. (Acre - feet)

- (1) Observed Pool - 578
- (2) Normal Pool - 531
- (3) Spillway Crest - Right Abutment - 592  
Left Abutment - 667
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - Maximum - 993  
Minimum - 817
- (6) Maximum Pool (PMF) - 1042

f. Reservoir Surface Area. (Acres)

- (1) Observed Pool - 48.2
- (2) Normal Pool - 46.3
- (3) Spillway Crest - Right Abutment - 48.8  
Left Abutment - 51.8
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - Maximum - 62.9  
Minimum - 57.2
- (6) Maximum Pool (PMF) - 64.4

g. Dam.

- (1) Type - earth embankment
- (2) Length - 600± feet
- (3) Height - 38 feet maximum
- (4) Top Width - 20± feet
- (5) Side slopes
  - (a) Downstream - 1V on 3.5 H
  - (b) Upstream - 1V on 2.9 H
- (6) Zoning - Unknown
- (7) Impervious Core - Unknown
- (8) Cutoff - 52 foot deep with the width unknown
- (9) Grout curtain - Unknown

h. Diversion and Regulating Tunnel. None

i. Primary Discharge System.

- (1) Type - Two vertical slotted 14 inch diameter steel pipes junctioned with a 14 inch diameter steel pipe (see para 1.2 a (2)(c) - Turner's Dream).
- (2) Length of 14 inch vertical pipes - Unknown
- (3) Length of 14 inch horizontal pipe - 185 feet (horizontal distance)
- (4) Top elevation of vertical pipes - 513.8 (avg) msl.
- (5) Invert of Discharge pipe - 479.0 msl.

j. Emergency Spillway.

- (1) Right Abutment
  - (1) Type - Uncontrolled concrete-lined approximately in cross-section.
  - (2) Width of weir - 14 feet (bottom width)
  - (3) Length of weir - Not applicable
  - (4) Side slopes - 1V on 6.5 H
  - (5) Crest Elevation - 511.1 msl.



(ii) Left Abutment

- (1) Type -Uncontrolled earthen trapezoidal in section
- (2) Width of weir - 25 feet (bottom width)
- (3) Length of weir - 250 from  $C_L$  of dam
- (4) Side Slopes - 1V on 5 H
- (5) Crest elevation - 512.7 msl

K. Regulating Outlet. None

IV. Lake Janna (Mo. 31602)

a. Drainage Area. - 26 acres (Topographic Quadrangle)

b. Discharge at Damsite.

- (1) Discharge can take place through two separate drop inlet structures each junctioned with a horizontal pipe that passes through the dam.
- (2) Estimated experienced maximum flood at the damsite - Unknown

c. Elevation. (Feet above MSL)

- (1) Observed Pool - 535.6
- (2) Normal Pool - 534.9
- (3) Spillway Crest - None
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - 537.5
- (6) Maximum Pool (PMF) - 538.2
- (7) Invert of Discharge Pipe - 532.7
- (8) Streambed at Centerline of Dam - 510
- (9) Maximum Tailwater - Unknown

d. Reservoir. Length of maximum pool - 900± feet

e. Storage. (Acre - feet)

- (1) Observed Pool - 37
- (2) Normal Pool - 35
- (3) Spillway Crest - Not Applicable
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - 42
- (6) Maximum Pool (PMF) - 44

f. Reservoir Surface Area. (Acres)

- (1) Observed Pool - 2.7
- (2) Normal Pool - 2.6
- (3) Spillway Crest - Not Applicable
- (4) Maximum Experienced Pool - Unknown
- (5) Top of Dam - 2.8
- (6) Maximum Pool (PMF) 2.9

g. Dam.

- (1) Type - earthen embankment
- (2) Length - 375± feet
- (3) Height - 32 feet maximum
- (4) Top Width - 20± feet
- (5) Side Slopes
  - (a) Downstream - 1V on 3.4 H
  - (b) Upstream - 1V on 2.2 H
- (6) Zoning - Unknown
- (7) Impervious core - Unknown
- (8) Cutoff - 48 foot deep with the width unknown
- (9) Grout curtain - Unknown

h. Diversion and Regulating Tunnel. None

i. Primary Discharge System.

- (1) Type - Two drop inlet structures constructed of 14 inch diameter steel pipe junctioned with 14 inch diameter steel pipe (see para 1.2 a (2)(d) - Lake Janna).
- (2) Length of 14 inch vertical pipe - 2 feet
- (3) Length of 14 inch horizontal pipe - 40 feet
- (4) Top elevation of drop inlet - 534.9 msl
- (5) Invert of discharge pipe - 532.7 msl

j. Emergency Spillway. None

k. Regulating Outlet. None

## SECTION 2 - ENGINEERING DATA

### 2.1 DESIGN

No design data are known to exist.

### 2.2 CONSTRUCTION

The dams were constructed by the present owner in the following years:

Lake Julia - 1974  
Lake of the Pines - 1976  
Turner's Dream Lake - 1977  
Lake Janna - 1972

The dams were constructed of red silty clays containing chert and dolomite excavated from the areas within the lakes. The material was placed in lifts by 6-yd bottom scrapers and 9-yd paddle scrapers and then compacted by several passes of a sheeps-foot roller. Each lift was then graded before additional lifts were placed. Each dam reportedly has a clay cutoff trench to rock varying in depth from 48 feet to 52 feet.

### 2.3 OPERATION

The emergency spillways, except the left abutment spillway at Turner's Dream Lake Dam, have been used at each dam, but the maximum depth of flow in each spillway is unknown.

### 2.4 EVALUATION

a. Availability. The only engineering data readily available is the personal recollection of the owner.

b. Adequacy. No hydraulic nor hydrologic design data was available to evaluate. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity. Not applicable.

## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

a. General. A visual inspection of Turkey Creek Dams was performed on 16 May 1979. Personnel making the inspection were employees of the Memphis District, Corps of Engineers, and included a hydraulic engineer, geologist, and soils engineer. Specific observations are discussed below.

b. Lake Julia (Mo. 31101)

(1) Dam. No detrimental settlement, cracking, slides or animal burrows were observed in or near the earth embankment.

Typical existing cross-sections of the embankment are shown on Plate 3B. The crown width was 17 feet. Based on the existing cross-section, the upstream embankment has an average slope of 1V on 3.0 H (see Plate 3B and Photo 2B) and the downstream embankment has an average slope of 1V on 2.5 H (see Plate 3B and Photo 3B).

The growth of trees and bushes is almost non-existent on the dam embankments (see Photos 1B, 2B, and 3B). On the downstream embankment grass has been sown to prevent erosion. However, erosion gulleys have formed near the dam crest. The most serious of these gulleys have been repaired with riprap (see Photo 9B). The upstream slope is protected with riprap except near the right abutment. In this area, slight wavewash is present on the dam face (see Photo 6B).

Only one area of seepage was observed on the downstream embankment. A saturated spongy area was located approximately 43 feet downstream of Sta. 9+36. However, no significant flow was emerging from the area, and the seepage flow did not appear to be piping any material from the embankment. The inspection team was unable to check the downstream toe for seepage because it was submerged by the lake behind Turner's Dream Lake Dam (Mo. 31108).

Erosion gulleys exist on the upstream and downstream embankments of the left abutment (see Photos 7B and 8B). These gulleys are the result of surface runoff and do not pose a serious threat to the integrity of the dam.

(2) Appurtenant Structures. Two vertical slotted standpipes constructed of 14 inch diameter steel pipe extends junctioned at some point beneath the surface of the water and bottom of the lake with 122 feet of 14 inch diameter steel pipe is the primary means of discharge. The standpipe is capped and the means of entry is by numerous slots cut vertically in the periphery which extends for approximately 4 feet from the top of the pipes (see Photo 4B). The drop inlet appears to be in good condition. The outlet pipe was submerged by the lake behind Turner's Dream Lake Dam (Mo. 31108) and could not be inspected. An emergency spillway is cut in the right abutment. The emergency spillway is a concrete covered spillway of trapezoidal section with a bottom width of approximately 25 feet

and side slopes of approximately 1V on 12H. The low point on the top of dam is only 0.6 ft. higher than the crest of the emergency spillway. The emergency spillway and outfall channel appear to be in good condition.

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

(4) Downstream Channel. No downstream channel exists because the lake behind Turner's Dream Lake Dam (Mo. 31108) extends to the landside toe of Lake Julia Dam (Mo. 31101).

c. Lake of the Pines (Mo. 31109).

(1) Dam. No detrimental settlement, cracking, slides or animal burrows were observed in or near the earth embankment.

Typical existing cross-sections of the embankment are shown on Plate 3C. The crown width was 20 feet. Based on the existing cross-section, the upstream embankment has an average slope of 1V on 2.8H (see Plate 3C and Photo 2C) and the downstream embankment has an average slope of 1V on 2.6H (see Plate 3C and Photo 3C).

The dam has no trees but a few small bushes growing on the downstream slope. Grass has been sown on the downstream slope and has prevented any major erosion (See Photo 1C). The upstream slope is protected by riprap up to within 3 feet of the dam crest (see Photo 2C). Only slight erosion and wavewash appear above the riprap on the upstream embankment.

Seepage emerges from the dam embankment in three locations. These locations are 97 feet downstream of Sta. 2+25, 87 feet downstream of Sta. 6+81 and 33 feet downstream of Sta. 8+70. Only the seep area downstream of Sta. 6+81 appears to be seeping more than 5 gpm. None of the seepage flows appeared to be piping material from the embankment or foundation.

Small erosion gulleys exist in each abutment on both the upstream and downstream embankments (see Photos 10C, 11C and 12C) and at the downstream embankment toe near the left abutment. These gulleys are the result of surface runoff and do not pose a serious threat to the integrity of the dam.

(2) Appurtenant Structures. Two vertical slotted standpipes constructed of 14 inch diameter steel pipe junctioned at some point beneath the surface of the water and bottom of the lake with 190 feet of 14 inch diameter steel pipe is the primary means of discharge. The standpipe is capped and means of entry is by numerous slots cut vertically in the periphery which extends for approximately 4 feet from the top of the pipes (see Photo 4C). The drop inlet appears to be in good condition. However, the discharge pipe was submerged by the lake behind Turner's Dream Lake Dam (Mo. 31108) and could not be inspected.

An emergency spillway is cut in the left abutment. The emergency spillway is a trapezoidal section with a bottom width of approximately 38 feet and side slopes 1V on 2H. Initially the emergency spillway is covered by a concrete roadway, however the critical constricted section further down the emergency spillway is cut into a hillside. Slight erosion exists in the spillway outfall channel for its entire length. Numerous natural springs also exist throughout the length of the outfall channel.

(3) Reservoir Area. No wave wash, excessive erosion or slides were observed along the shore or reservoir.

(4) Downstream Channel. No downstream channel exists because the lake behind Turner's Dream Lake Dam (Mo. 31108) extends to the landside toe of Lake of the Pines Dam (Mo. 31109).

d. Turner's Dream Lake (Mo. 31108).

(1) Dam. No detrimental settlement, cracking, slides or animal burrows were observed in or near the earth embankment. Typical existing cross-sections of the embankment are shown on Plate 3D. The crown width was 20 feet. Based on the existing cross-section, the upstream embankment has an average slope of 1V on 2.9 H (See Plate 3D), and the downstream embankment has an average slope of 1V on 3.5 H (see Plate 3D and Photo 3D).

This dam, being of recent construction, has no bushes or trees growing on the dam crest or embankments. Grass has been sown on the downstream slope, but it is not thick enough to prevent surface erosion (see Photo 3D). The upstream slope is protected by riprap up to the dam crest (see Photo 2D).

An area of light seepage flow is located 67 feet downstream of Sta. 2+00 near the right abutment. The area is soft and seeps less than 5 gpm. However, no material appeared to be piping from the embankment.

Numerous shallow erosion gulleys have formed on the downstream embankment (see Photo 9D). The erosion begins at Sta. 5+90 and extends to the left abutment. There is also an erosion gully at the toe of the dam near the right abutment.

A low area with ponded water was observed approximately 100 feet from the left abutment near the embankment toe (see Photo 12D). The area was supporting a growth of small cattails. The water in this area was probably the result of surface runoff instead of seepage.

(2) Appurtenant Structures. Two vertical slotted standpipes constructed of 14 inch diameter steel pipe junctioned at some point beneath the surface of the lake and bottom of the lake with 185 feet of 14 inch diameter steel pipe is the primary means of discharge. The standpipe is capped and means of entry is by numerous slots cut vertically in the periphery which extends for approximately 4 feet from the top of the pipes (see Photo 4D). The drop inlet and discharge pipe appear to be in good condition. The outlet pipe discharges into an earth stilling basin located

approximately 138 feet downstream of the dam centerline (see Photo 6D). The stilling basin is approximately 40 feet in diameter.

Two emergency spillways are cut in the right and left abutments respectively. The emergency spillway in the right abutment is a trapezoidal section with a bottom width of approximately 14 feet and side slopes of 1V on 6.5 H. The entire flow surface of this spillway is a concrete roadway. Slight erosion exists throughout the length of the spillway outfall channel. The emergency spillway in the left abutment is also a trapezoidal section with a bottom width of approximately 25 feet and side slopes 1V on 5 H. Natural springs exist throughout the length of the left abutment spillway channel. Erosion gulleys in the spillway outfall channel appear to have been repaired.

(3) Reservoir Area. No wavewash, excessive erosion or slides were observed along the shore of the reservoir.

(4) Downstream Channel. The outlet channel consists of two streams which converge into one channel approximately 300 feet from the dam centerline. No trees or bushes exist in the outlet channel until approximately 400 feet from the dam centerline.

e. Lake Janna (Mo. 31602).

(1) Dam. No detrimental cracking, slides or animal burrows were observed in or near the earth embankment.

Typical existing cross-sections of the embankment are shown on Plate 2E. The crown width is 20 feet. Based on the existing cross-section, the upstream embankment has an average slope of 1V on 2.2 H (see Plate 3E and Photo 2E), and the downstream embankment has an average slope of 1V on 3.4 H (see Plate 3E and Photo 3E).

No trees or bushes are growing on the dam crest or embankments. A good stand of grass has been grown on the downstream embankment (see Photo 3E).

No seepage was reported in the abutments, downstream embankments or near the toe of the dam. However, the toe of the dam could not be inspected for seepage because it is submerged by the lake behind Turner's Dream Lake Dam (Mo. 31108).

Only slight erosion was observed on the dam embankments. The most serious erosion was a small gully located in the left abutment (see Photo 7E). An erosion gully also existed on the downstream embankment 50 feet from the left abutment (see Photo 8E).

At approximate Sta. 2+00 two depressions were observed on the downstream embankment. These depressions appeared to be the result of slight settlement of the dam embankment.

(2) Appurtenant Structures. Two separate drop inlet structures are the primary means of discharge for this structure (see Photo 4E). Each respective drop inlet consists of approximately 2 feet of 14 inch steel pipe junctioned with 40 feet of 14 inch horizontal pipe through the embankment. The drop inlets and outlet pipes appear to be in good condition. There is no emergency spillway for this structure. The outlet channel for the primary discharge was in good condition (see Photo 6E).

(3) Reservoir Area. No wave wash, excessive erosion, or slides were observed in the reservoir area.

(4) Downstream Channel. No downstream channel exists because the Lake behind Turner's Dream Lake Dam (Mo. 31108) extends to the land side toe of Lake Janna Dam (Mo. 31602).

### 3.2 EVALUATION

None of the conditions observed are significant enough to indicate a need for immediate remedial action or a serious potential of failure of any of the Turkey Creek Dams. Visually observed seepage, erosion on the dam embankments, and erosion in the spillway outfall channels are deficiencies which left uncontrolled or uncorrected could lead to the development of potential problems.



## SECTION 4 - OPERATIONAL PROCEDURES

### 4.1 PROCEDURES

The primary discharge systems and emergency spillways for the Turkey Creek Dams are uncontrolled; therefore, no regulating procedures exist for these structures.

### 4.2 MAINTENANCE OF DAMS

The dam embankments and appurtenant structures appear well maintained.

### 4.3 MAINTENANCE OF OPERATING FACILITIES

Not applicable.

### 4.4 WARNING SYSTEM

The inspection team is not aware of any existing warning system for these dams.

### 4.5 EVALUATION

The maintenance of these dams appears adequate.

## SECTION 5 - HYDRAULIC/HYDROLOGIC

### 5.1 EVALUATION OF FEATURES

a. Design Data. No hydraulic nor hydrology design data was available to evaluate.

b. Experience Data. The drainage area for the Turkey Creek Dams was developed using the USGS Gipsy, Missouri; Lowndes, Missouri; McGee, Missouri; and Shook, Missouri Quadrangles. The spillway and dam layouts are from surveys made during the inspection.

c. Visual Observations.

(1) Lake Julia (Mo. 31101).

- (a) The vertical drop inlets and emergency spillway are in good condition.
- (b) The vertical shafts are located approximately in the center of the dam, while the spillway is located in the right abutment. Releases from either structure will not endanger the integrity of the dam.

(2) Lake of the Pines (Mo. 31109).

- (a) The vertical drop inlets and emergency spillway are in good condition.
- (b) The vertical shafts are located approximately in the center of the dam, while the spillway is located in the left abutment. Releases from either structure will not endanger the integrity of the dam.

(3) Turner's Dream Lake (Mo. 31108).

- (a) The vertical drop inlets and emergency spillways are in good condition.
- (b) The vertical shafts are located approximately in the center of the dam, while spillways are located in both the left and right abutment. Releases from the principal outlet or either spillway will not endanger the integrity of the dam.

(4) Lake Janna (Mo. 31602).

- (a) The vertical drop inlets are in good condition.
- (b) The vertical shafts are the only means of discharge and are located near the right abutment.

d. Overtopping Potential. For the size classification of small to intermediate and a high hazard potential, the respective spillway/spillways of each dam must pass the Probable Maximum Flood (PMF). The Probable Maximum Flood is defined as the flood discharge that may be discharged from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

(1) Lake Julia Dam (Mo 31101). The spillway will safely pass 9 percent of the Probable Maximum Flood (PMF) at a discharge of 46 cfs without overtopping. The PMF will overtop the embankment for a period of 18 hours at a maximum depth of 2.2 feet with a peak discharge of 3800 cfs. The 1/2 PMF will overtop the embankment for a period of 12 hours at a maximum depth of 1.6 feet with a peak discharge of 1800 cfs. The 10-year frequency flood will also overtop the embankment. Due to the fact that failure of Lake Julia Dam (Mo 31101) will cause failure or overtopping of Turner's Dream Lake Dam (Mo 31108), this dam is required by the guidelines to pass the PMF. Because the spillway will not pass the 1/2 PMF without overtopping and will not pass the 10-year frequency flood without overtopping, Lake Julia Dam (Mo 31101) is classified as "unsafe emergency".

(2) Lake of the Pines Dam (Mo 31109). The spillway will safely pass 20 percent of the PMF at a discharge of 1100 cfs without overtopping. The PMF will overtop the embankment for a period of 7 hrs at a maximum depth of 2.2 feet with a peak discharge of 9300 cfs. The 1/2 PMF will overtop the embankment for a period of 4.5 hours at a maximum depth of 1.3 feet with a peak discharge of 4500 cfs. The 100-year frequency flood will not overtop the embankment. Due to the fact that failure of Lake of the Pines Dam (Mo 31109) will cause failure or overtopping of Turner's Dream Lake Dam (Mo 31108), this dam is required by the guidelines to pass the PMF. Because the spillway will not pass the 1/2 PMF without overtopping, the dam is classified as "unsafe non-emergency".

(3) Turner's Dream Lake Dam (Mo 31108). The spillway will safely pass 20 percent of the PMF at a discharge of 1500 cfs without overtopping. The PMF will overtop the embankment for a period of 8 hours at a maximum depth of 3.8 feet with a peak discharge of 14000 cfs. The 1/2 PMF will overtop the embankment for a period of 5 hours at a maximum depth of 2.2 feet with a peak discharge of 6600 cfs. The 100-year frequency flood will not overtop the embankment. Due to the high hazard potential to life and property downstream of the dam, this dam is required by the guidelines to pass the PMF. Because the spillway will not pass the 1/2 PMF without overtopping, and because Lake Julia Dam (Mo 31101) would fail or be overtopped by the 10-year frequency flood which in turn would cause overtopping or failure of Turner's Dream Lake Dam (Mo 31108), Turner's Dream Lake Dam (Mo 31108) is classified as "unsafe emergency".

(4) Lake Janna Dam (Mo 31602). Lake Janna Dam has no emergency spillway. The routing procedure was started at the top of the drop inlet structures and all references to flow are made with respect to this initial condition. The outlet structures will safely pass 25 percent of the PMF at a discharge of 40 cfs without overtopping. The PMF will overtop the embankment for a period of 5.5 hours at a maximum depth of 0.7 feet with a peak discharge of 440 cfs without overtopping. The 1/2 PMF will overtop the embankment for a period of 4 hours at a maximum depth of 0.5 feet with a peak discharge of 220 cfs. The 100-year frequency flood will marginally pass the structure without overtopping based on the above mentioned initial conditions. Due to the high hazard potential to life and property downstream of the Turkey Creek Dams, this dam is required to pass the PMF. Because the structure will not pass the 1/2 PMF without overtopping, the dam is classified as "unsafe non-emergency".

The data utilized in the preparation of the estimates was obtained from various Federal reports, data from field inspection and survey of each respective dam and output from COE program, HEC-1, Dam Safety Version.

## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations. Visual observations of the Turkey Creek Dams and their appurtenant structures are discussed and evaluated in SECTIONS 3 and 5.

b. Design and Construction Data. The design and construction data were limited to that information discussed in SECTION 2.

c. Operation Records. There have been no operations which have affected the structural stability of the Turkey Creek Dams.

d. Post Construction Changes. No post construction changes exist which will affect the structural stability of the dam.

## SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

### 7.1 ASSESSMENT OF DAMS

a. Safety. A few items were noted during the visual inspection of the Turkey Creek Dams which should be corrected or controlled. These items are detailed in paragraph 7.2 c. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

The emergency spillway for Lake Julia Dam (Mo 31101) will pass only 9 percent of the PMF before the dam embankment is overtopped. Because the spillway will not pass 1/2 of the PMF without overtopping and will not pass the 10-year frequency flood without overtopping, Lake Julia Dam (Mo 31101) is classified as "unsafe emergency".

The emergency spillway for Lake of the Pines Dam (Mo 31109), will pass only 20 percent of the PMF before the dam embankment is overtopped. Because the spillway will not pass 1/2 of the PMF without overtopping but will pass the 10-year frequency flood, Lake of Pines Dam (Mo 31109) is classified as "unsafe non-emergency". The spillway will pass the 100-year flood without overtopping, which is a flood that has a 1 percent chance of being exceeded in any given year.

The emergency spillway for Turner's Dream Lake Dam (Mo 31108) will pass only 20 percent of the PMF before the dam embankment is overtopped. The spillway will pass the 100-year flood without overtopping. However, Turner's Dream Lake Dam (Mo 31108) is classified as "unsafe emergency" due to the 10-year frequency flood overtopping and probable failure of Lake Julia Dam (Mo 31101) which in turn could cause overtopping and failure of Turner's Dream Lake Dam (Mo 31108).

The discharge structure for Lake Janna Dam (MO 31602) will pass only 25 percent of the PMF before the dam embankment is overtopped. The discharge structure for Lake Janna Dam (MO 31602) will marginly pass the 100-year frequency flood. Because the discharge structure will not pass 1/2 of the PMF but will pass the 10-year frequency flood, Lake Janna Dam (Mo 31602) is classified as "unsafe non-emergency".

b. Adequacy of Information. Due to the lack of engineering design and construction data, the conclusions in this report were based on performance history and external visual conditions. The inspection team considers that these data are sufficient to support the conclusions herein. However, 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.

c. Urgency. The remedial measures recommended in paragraph 7.2 should be accomplished in the near future. The item recommended in paragraph 7.2 a should be pursued on a high-priority basis.

d. Necessity for Phase II. Based on the results of the Phase I inspection, no Phase II inspection is recommended.

e. Seismic Stability. The dams are located in Seismic Zone 2. However, they are located very near the boundary between Seismic Zones 2 and 3. Since these dams are located in Seismic Zone 2 and the proximity of Seismic Zone 3, it is possible that an earthquake could occur of sufficient intensity to cause severe damage or failure of the dams.

## 7.2 REMEDIAL MEASURES

a. Alternatives. Spillway sizes at each dam and/or the height of each dam should be increased to pass the Probably Maximum Flood without over-topping the dams.

b. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record. The seepage conditions described for each dam in Section 3 should be taken into account in performing the seepage and stability analyses.

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

### (1) Lake Julia Dam (Mo 31101)

(a) Riprap should be placed on the upstream slope near the right abutment where the riprap blanket is non-existent. This will prevent further deterioration of the dam section from wave wash.

(b) The saturated, spongy area on the downstream embankment at Sta. 9+36 should be monitored for seepage. If seepage develops, then this condition should be rectified.

(c) The erosion gulleys on the upstream and downstream embankment near the left abutment should be repaired.

(d) A detailed inspection of the dam should be made periodically by an engineer experienced in the design and construction of dams.

### (2) Lake of the Pines Dam (Mo 31109)

(a) The downstream embankment should be monitored closely for seepage and erosion. If seepage quantities and/or erosion observed during monitoring indicate increases or signs of material being piped from the embankment, immediate action should be taken to rectify these conditions.

(b) The erosion gulleys in each abutment on both the upstream and downstream embankments should be repaired.

(c) A detailed inspection of the dam should be made periodically by an engineer experienced in design and construction of dams.

(3) Turner's Dream Lake Dam (Mo 31108)

(a) Establish and maintain a grass cover on the downstream embankment slope.

(b) Repair the downstream embankment near the dam crest where numerous erosion gulleys have formed.

(c) The downstream embankment at approximate Sta 2+00 should be monitored closely for seepage and erosion. If seepage quantities and/or erosion observed during monitoring indicate increases or signs of material being piped from the embankment, immediate action should be taken to rectify these conditions.

(d) A detailed inspection of the dam should be made periodically by an engineer experienced in design and construction of dams.

(4) Lake Janna Dam (Mo 31602)

(a) Monitor the small depressions in the downstream embankment at Sta. 2+00. If the depressions increase in size, action should be taken to rectify the condition.

(b) A detailed inspection of the dam should be made periodically by an engineer experienced in design and construction of dams.



APPENDIX A  
HYDROLOGY AND HYDRAULICS

APPENDIX A  
HYDROLOGY AND HYDRAULICS

Narrative. The methods and sources of data were primarily those suggested by the Hydraulics Branch, St. Louis District Corps of Engineers. Specific references and method will be discussed below. Each particular section will be discussed as a whole except where specific differences necessitate discussing each dam uniquely. A field inspection and survey was made to determine the topographic and physical features of the dam and outlet structures. HEC-1, Dam Safety Version was used in conjunction with appropriate input parameters to compute inflow hydrographs, determine storage and route the flow through each respective structure. The hydraulic analysis consisted of analyzing Lake Julia and Lake of the Pines on an individual basis with respect to the overtopping potential and then analyzing Turner's Dream in tandem using the outflow hydrographs from Lake Julia and Lake of the Pines plus the sub-area inflow hydrograph of Turner's Dream. A 48-hour duration rainfall was used in this analysis. Also the drainage area and any consequent storage due to the location of Lake Janna was considered as part of Turner's Dream during this analysis. Lake Janna was so small that it was analyzed using a 24-hour duration rainfall by itself to develop the overtopping potential.

a. Rainfall. The PMF was developed using Hydrometeorological Report No. 33. The "Hop Brook" reduction factor was not used to adjust the rainfall for this study. The distribution of rainfall was developed using the criteria as described by EM 1110-2-1411 (Standard Project Storm).

(1) Lake Julia, Lake of the Pines, and Turner's Dream 48- hour duration

PMF Rainfall	27.0 inches
PMF Percentages	6 hr - 102
	12 hr - 120
	24 hr - 130
	48 hr - 140

(2) Lake Janna - 24 hour duration

PMF Rainfall	27.0 inches
PMF Percentages	6 hr - 102
	12 hr - 120
	24 hr - 130

b. Unit Hydrograph Coefficients. The unit hydrograph for each respective drainage basin was developed using the Snyder Method as outlined in HEC-1, Dam Safety Version. Two methods of determining time of concentration were used, namely the Snyder Method and Kirpich Method. The two equations are described below and then the respective input parameters are listed separately.

Snyder Method:  $t_p = C_t (L L_{CG})^{0.3}$  ; L and  $L_{CG}$  in miles

Kirpich: 
$$t_c = .00013 \left( \frac{L \text{ ft}}{\sqrt{\text{Slope, ft/ft}}} \right)^{.77}$$

Where L = length of the main stream channel from the outlet to the divide; when used in Kirpich Equation, the unit is feet.

$L_{CG}$  = length along the main channel to a point opposite the watershed centroid

$C_t$  = Coefficient used in Snyder Method

$t_p$  = time to peak, hours

$t_c$  = time of concentration, hours

(1) Lake Julia

L = 4620 ft = 0.88 mi.

$L_{CG}$  = 2860 ft = 0.54 mi.

Stream slope = 124 ft/mi = .023 ft/ft

$C_t$  = .5

$t_p$  = 0.40 hr. (Snyder)

$t_c$  = 0.37 hr. (Kirpich)

A time to peak of 30 minutes was chosen to describe the unit hydrograph for the drainage basin for several reasons. Namely .5 hours is not too much different than the approximate 25 minutes indicated by the formula; .5 hours was necessary to achieve the minimum number of ordinates to describe the unit hydrograph that would be compatible with using a 48-hour PMF and 10-minute duration rainfall.

Using a  $t_p$  of 0.5 hours, the Snyder Method gave a  $t_c$  = 0.63 hours as developed by HEC-1, Dam Safety Version.

(2) Lake of the Pines

$$L = 11000 \text{ ft} = 2.08 \text{ mi.}$$

$$L_{CG} = 6740 \text{ ft} = 1.28 \text{ mi.}$$

$$\text{Stream slope} = 63 \text{ ft/mi} = .012 \text{ ft/ft}$$

$$C_t = .7$$

$$t_p = 0.94 \text{ hr. (Snyder)}$$

$$t_c = 0.92 \text{ hr. (Kirpich)}$$

A  $t_p$  of 60 minutes was chosen to develop the unit hydrograph characteristics since this value agrees very well with the predicted values of Snyder's time to peak and Kirpich time of concentration. The  $t_c$  was 1.16 hours as developed by HEC-1, Dam Safety Version.

(3) Turner's Dream

$$L = 5100 \text{ ft} = 0.97 \text{ mi.}$$

$$L_{CG} = 2960 \text{ ft} = 0.56 \text{ mi.}$$

$$\text{Stream Slope} = 107 \text{ ft/mile} = .020 \text{ ft/ft}$$

$$C_t = .5$$

$$t_p = 0.42 \text{ hr (Snyder)}$$

$$t_c = 0.42 \text{ hr (Kirpich)}$$

A  $t_p$  of 0.5 hours was chosen primarily for the same reason discussed in the Lake Julia section. The  $t_c$  was 0.65 hours as developed by HEC-1, Dam Safety Version.

(4) Lake Janna

$$L = 1500 \text{ ft} = 0.28 \text{ mi.}$$

$$L_{CG} = 800 \text{ ft} = 0.15 \text{ mi.}$$

$$\text{stream slope} = 179 \text{ ft/mi} = .033 \text{ ft/ft}$$

$$C_t = .5$$

$$t_p = 0.19 \text{ hr (Snyder)}$$

$$t_c = 0.13 \text{ hr (Kirpich)}$$

These values were so low that a representative value of  $t_p = 15$  minutes was chosen and 24-hour PMF with a 5 minute duration rainfall was

selected to model the inflow hydrograph to Lake Janna.

The general soils map of Wayne County indicates that these dams lie in an area where the soil is of the Clarksville Association which is gently sloping to moderately steep soils that have loamy subsoil with fragipan. This places the area in a Soil Group B. The primary soil cover consists of woods in a fair hydrologic condition which gives a value of CN of 78 for antecedent moisture condition III. Hence a value for  $C_p$  of about .65 was chosen for all but Turner's Dream to be used in the Snyder Method for unit hydrograph development. For Turner's Dream a value of  $C_p$  of .7 was chosen since about 20 percent of the drainage area is lake surface. HEC-1 actually balances the  $C_p$  value to achieve one inch of volume under the hydrograph but the values are still very nearly the same. The remaining parameters for the Snyder unit hydrograph are listed below:

- (i) Lake Julia  
 $C_p = .651$   
Drainage Area = 0.523 sq. mi.
- (ii) Lake of the Pines  
 $C_p = .653$   
Drainage Area = 1.858 sq. mi.
- (iii) Turner's Dream  
 $C_p = .699$   
Drainage Area = .418 sq. mi.
- (iv) Lake Janna  
 $C_p = .652$   
Drainage Area = .041 sq. mi.

The unit hydrograph ordinates are found in the computer printout for each respective analysis.

c. Loss Rates. A loss rate of .5 inches initially and .05 in/hr was chosen for each analysis based upon engineering experience.

d. Base Flow and Antecedent Flood Conditions. A base flow of 1 cfs was selected and the routing was starting at the respective low points in the emergency spillway for each structure except Lake Janna where the routing was started at the top of the drop inlet. Listed below are the appropriate starting elevations.

<u>Dam</u>	<u>Elevation, msl</u>
Lake Julia	540.5
Lake of the Pines	544.4
Turner's Dream	511.1
Lake Janna	534.9

e. Hydrograph Routing. HEC-1, Dam Safety Version uses the single routing step of the "Modified Puls" method. Routing through the emergency spillway and over the embankment was accomplished using the non-level dam top option of the HEC-1, Dam Safety Version coupled with a critical energy consideration of the flow. The routing through the standpipes or drop inlet was determined on an individual basis. A particular problem was encountered concerning how to evaluate the flow through the vertical slots for all dams except Lake Janna. The orifice equation was utilized to estimate the flow per slot based on some average head and then accumulated over a given depth of flow. These values were then compared to pipe full conditions and it was found that pipe full conditions govern over the depths considered. Only those parameters necessary to calculate flow for pipe full conditions will be listed. Also it was decided to use a head loss coefficient of 1.0 to account for entrance losses. In addition only the horizontal pipe distance could be ascertained during the field survey. With these restraints denoted, listed below are the pertinent parameters used to rate the flow through the primary discharge structures.

Common Assumptions

head losses:

$$h_{ent} = \frac{v^2}{2g}$$

$$h_{bend} = \frac{v^2}{2g}$$

$$h_{exit} = \frac{v^2}{2g}$$

$$h_f = \text{friction loss (Manning's Equation)}$$

(1) Lake Julia

D = 14 inch - steel pipe

L = 122 feet

n = .012

$$Q = .4207 A_{14} \sqrt{2g} H^{1/2}$$

Invert Elevation from which to calculate H,  
height of head = 509.2 msl.

(2) Lake of the Pines

D = 14 inch - steel pipe

L = 190 feet

n = .012

$$Q = .3746 A_{14} \sqrt{2g} H^{1/2}$$

Invert Elevation from which to calculate H,  
height of head = 509.2 msl.

(3) Turner's Dream

D = 14 inch - steel pipe

L = 185 feet

n = .012

$$Q = .3775 A_{14} \sqrt{2g} H^{1/2}$$

Invert Elevation from which to calculate H,  
height of head = 479.7 msl.

(4) Lake Janna. Since the routing for Lake Janna started at the high point of the drop inlet, two conditions of flow existed namely; (1) weir flow and (2) pipe-full flow.

No. of pipes = 2

D = 14 inch - steel pipe

L = vertical = 2.2 feet

length = 40 feet

head losses:

$$h_{ent} = .5 \frac{v^2}{2g}$$

$$h_{bend} = \frac{v^2}{2g}$$

$$h_{exit} = \frac{v^2}{2g}$$

$$(1) \text{ Weir Flow/pipe: } Q = 3.1 P_{14} H^{3/2}$$

$$(2) \text{ Pipe Full/pipe: } Q = .5449 A_{14} \sqrt{2g} H^{3/2}$$

H<sub>1</sub>, measured from top of drop inlet at elevation = 534.9 msl.

H<sub>2</sub>, measured from centerline of outlet end of pipe = 533.2 msl.

The rating curve was input into the computer model on Y4 and Y5 cards and can be found as input for the Lake Janna analysis.

f. Storage. The storage was calculated using the option without HEC-1, Dam Safety Version with input consisting of elevation and respective surface areas which were McGee, Missouri; Shook, Missouri; and Lowdes, Missouri Quadrangle.

\*\*\*\*\*  
 PLUMB MACHINERY PACKAGE (REF-1)  
 DAM SAFETY VERSION JULY 1974  
 LAST MODIFICATION 26 FEB 74  
 \*\*\*\*\*

[illegible]



MUN DATE: 27 AUG 79  
TIME: 10.45.03

**(LAKE JULIA)**

				J(JIA SPECIFICATION)				
00	NMR	NMJN	IUAY	IMR	IMTN	METRC	JPLY	IPRT
000	0	10	-0	-0	-0	-0	-0	-0
		JPEM	5	NMT	LROPT	TRACE		
				-0	-0	-0		
								NSTAN
								-0

MULTIPLAN ANALYSES TO BE PERFORMED  
NPIANS 1 NRTJUS 9 LRYTUE 1[illegible]

## SUH-AREA RUNOFF COMPUTATION

PRIMEABLE MAXIMUM PRECIPITATION=4H HW DURATION

ISTAW	ICOMP	IFCON	IJAPE	JPLT	JPRY	INAMP	ISTAGE	TAUTIC
1	0	-0	-0	-0	-0	1	-0	-0

		HYDROGRAPH DATA							
INVTG	IUNG	IAMEA	SNAP	TPSDA	TPSPC	WATIO	ISNDW	ISAME	LOCAL
1	1	.52	-0.	.52	1.00	-0.	-0	-0	-0

	PMS	K6	PRFCIP DATA		R9A	R7Z	R9B
SDFP			P12	M24			
-0.	27.00	102.00	120.00	130.00	140.00	-0.	-0.

LUSS DATA										
INRPT	STKWD	ULTKW	WTJUL	FXAIN	STKKS	RTIOA	STJTI	CNSTL	ALSMX	RTTMP
-0	-0.	-0.	1.00	-0.	-0.	1.00	.50	.05	-0.	-0.

UNIT HYDROGRAPH DATA  
TPE .50 CPE .65 NIAS -0

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNUYER CP AND TP ARE TCM 3.40 AND PS 2.22 INTERVALS

```

UNIT MATH-LOG-APR IN FAD-CONF-PLNTD IN-INITATES, LAGZ      .50 MWDPS, CPZ      .46 VOLZ 1.00
71. 205. 405. 428. 522. 124. 203. 32.

```

[illegible]

# SUMMARY OF DAM SAFETY ANALYSIS (LAKE JULIA)

RATIO OF PHE	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 540.50 385. 20.	SPILLWAY CHEST 540.50 385. 20.	TOP OF DAM 541.10 400. 57.	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FATIGUE HOURS
0.05	540.44	0.	385.	20.	0.	0.	0.	0.
0.06	540.49	0.	385.	20.	0.	0.	0.	0.
0.07	540.49	0.	385.	20.	0.	0.	0.	0.
0.08	540.71	0.	390.	25.	0.	42.83	0.	0.
0.09	540.99	0.	397.	46.	0.	42.67	0.	0.

# SUMMARY OF DAM SAFETY ANALYSIS (LAKE JULIA)

PLAN 1 .....

*****												
RATIO OF BME	MAXIMUM RESERVOIR W.S.ELEV	ELEVATION STORAGE OUTFLOW	INITIAL VALUE		SPILLWAY CREST		TOP OF DAM		DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS		TIME OF FATIGUE HOURS
			540.50 345. 20.	540.50 345. 20.	540.50 345. 20.	541.10 400. 57.	541.10 400. 57.	541.10 400. 57.				
.10	541.21		.11	403.	72.	1.83	42.50	0.			0.	
.15	541.74		.64	417.	321.	4.50	40.67	0.			0.	
.20	542.03		.93	425.	601.	5.67	40.33	0.			0.	
.25	542.17		1.07	429.	856.	6.83	40.33	0.			0.	
.30	542.29		1.19	432.	1044.	7.83	40.33	0.			0.	
.35	542.34		1.29	435.	1228.	8.50	40.33	0.			0.	
.40	542.40		1.38	438.	1412.	9.33	40.33	0.			0.	
.50	542.65		1.55	442.	1782.	11.83	40.17	0.			0.	
1.00	543.31		2.21	461.	3756.	18.33	40.17	0.			0.	

THOUS CU M

904.

1142.

1206.

1240.

# \*\*\*\*\* SUN-AREA RUNOFF COMPUTATION (LAKE OF THE PINES) \*\*\*\*\*

PROBABLE MAXIMUM PRECIPITATION-MM HH DURATION

ISTAQ	ICOMP	IECUN	ITAPE	JPLT	JPRY	TNAME	ISTAGE	TAUTN
1	-0	-0	-0	-0	-0	1	-0	-0

## HYDROGRAPH DATA

IMYR	TUNG	TAMFA	SNAP	TPSDA	TRSPC	HAUTO	ISNOW	ISAME	LOCAL
1	1	1.00	-0.	1.00	1.00	-0.	-0	-0	-0

## PRECIP DATA

SPFF	PMS	WA	R12	R24	R48	R72	R96
-0.	27.00	102.00	120.00	130.00	140.00	-0.	-0.

## LOSS DATA

LRMT	STMP	DLTAP	RILOI	ERAIN	STNKS	RILOK	SIRTL	CNSTL	ALSMX	RTTMP
-0	-0.	-0.	1.00	-0.	-0.	1.00	.50	.05	-0.	-0.

## UNIT HYDROGRAPH DATA

TPZ 1.01 CPE .65 NTAE -0

## RECESSION DATA

SIRIOZ 1.00 UNCSNZ 1.00 RTTRDZ 2.00  
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE 1.00 AND 1.00 INTERVALS

UNIT HYDROGRAPH 31 END-OF-PERIOD UNDIMINATES, LAGZ 1.00 HOURS, CPE .65 VOLZ 1.00

50.	142.	349.	547.	700.	781.	777.	644.	561.	440.
377.	304.	253.	207.	170.	139.	114.	94.	77.	63.
52.	42.	35.	28.	23.	19.	16.	13.	11.	9.

MO,DA	HR,MM	PERIOD	RATN	EXCS	LUSS	END-OF-PERIOD FLOW	MO,DA	HR,MM	PERIOD	RATN	EXCS	LUSS	COMP Q
1.01	1.10	1	.00	0.	.00	1.02	1.02	1.10	151	.03	.02	.01	74.
1.01	1.20	2	.00	0.	.00	1.02	1.02	1.20	152	.03	.02	.01	74.
1.01	1.30	3	.00	0.	.00	1.02	1.02	1.30	153	.03	.02	.01	74.
1.01	1.40	4	.00	0.	.00	1.02	1.02	1.40	154	.03	.02	.01	74.
1.01	1.50	5	.00	0.	.00	1.02	1.02	1.50	155	.03	.02	.01	74.
1.01	2.00	6	.00	0.	.00	1.02	1.02	2.00	156	.03	.02	.01	74.
1.01	2.10	7	.00	0.	.00	1.02	1.02	2.10	157	.03	.02	.01	74.
1.01	2.20	8	.00	0.	.00	1.02	1.02	2.20	158	.03	.02	.01	74.
1.01	2.30	9	.00	0.	.00	1.02	1.02	2.30	159	.03	.02	.01	74.
1.01	2.40	10	.00	0.	.00	1.02	1.02	2.40	160	.03	.02	.01	74.
1.01	2.50	11	.00	0.	.00	1.02	1.02	2.50	161	.03	.02	.01	74.
1.01	3.00	12	.00	0.	.00	1.02	1.02	3.00	162	.03	.02	.01	74.
1.01	3.10	13	.00	0.	.00	1.02	1.02	3.10	163	.03	.02	.01	74.
1.01	3.20	14	.00	0.	.00	1.02	1.02	3.20	164	.03	.02	.01	74.
1.01	3.30	15	.00	0.	.00	1.02	1.02	3.30	165	.03	.02	.01	74.
1.01	3.40	16	.00	0.	.00	1.02	1.02	3.40	166	.03	.02	.01	74.
1.01	3.50	17	.00	0.	.00	1.02	1.02	3.50	167	.03	.02	.01	74.
1.01	4.00	18	.00	0.	.00	1.02	1.02	4.00	168	.03	.02	.01	74.
1.01	4.10	19	.00	0.	.00	1.02	1.02	4.10	169	.03	.02	.01	74.
1.01	4.20	20	.00	0.	.00	1.02	1.02	4.20	170	.03	.02	.01	74.
1.01	4.30	21	.00	0.	.00	1.02	1.02	4.30	171	.03	.02	.01	74.

**PLAN 1 .....**

SUMMARY OF DAM SAFETY ANALYSIS (LAKE		
INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
549.40	504.40	549.00
761.	761.	1067.
19.	19.	1197.

FLUVENT  
STORAGE  
OUTFLOW

**PLAN 1 .....**

MATTU ID DATE	MAXIMUM RESERVOIR NO. 5, 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
.10	540.97	0.	925.	432.	0.	42.50	0.
.15	547.95	0.	991.	750.	0.	42.17	0.
.20	548.70	0.	1009.	1040.	0.	42.00	0.
.25	549.31	.31	1090.	1640.	2.17	41.50	0.
.30	549.60	.60	1112.	2310.	2.67	41.17	0.
.35	549.82	.82	1128.	2940.	3.33	41.00	0.
.40	549.94	.99	1141.	3525.	3.67	40.83	0.
.50	550.25	1.25	1161.	4541.	4.50	40.83	0.
.60	551.10	2.10	1234.	9305.	6.83	40.67	0.



# (TURNER'S DREAM)

HYDROGRAPH DATA  
 IMAWA IMAWA SNAP TRSPA TRSPC RATIO ISNOW ISAME LOCAL  
 1 1 .42 -0. .42 1.00 -0. -0 -0 -0 -0

PRECIP DATA  
 SPTF PMS R4 R12 R24 P4A R72 R94  
 -0. 27.00 102.00 120.00 130.00 140.00 -0. -0. -0.

LUSS DATA  
 LWAFT STWAK OLTAH WTIUL FWAIV STRKS RTTAK STRTI CNSTL ALSMX RTTHP  
 -0 -0. -0. 1.00 -0. -0. 1.00 .50 .05 -0. -0.

UNIT HYDROGRAPH DATA  
 TPE .50 CPE .70 NTAS -0

RECESSION DATA  
 SINTRE 1.00 UNCSN 1.00 RTTIRE 2.00  
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNOW CP AND TP ARE 1C= 3.92 AND R= 1.87 INTERVALS

UNIT HYDROGRAPH 12 FWD-OF-PEAK ORDINATES, LAGE .50 HOURS, CPE .70 VOL= 1.00  
 42. 212. 347. 300. 154. 89. 51. 30. 17.

MO,DA	HM,MN	PERIOD	WATN	EXUS	LUSS	COMP Q	END-OF-PERIOD FLOW	MO,DA	HM,MN	PERIOD	RATN	EXUS	LUSS	COMP Q
1.01	1.10	1	.00	0.	.00	1.	1.02	1.02	1.10	151	.03	.02	.01	32.
1.01	1.20	2	.00	0.	.00	1.	1.02	1.20	1.20	152	.03	.02	.01	34.
1.01	1.30	3	.00	0.	.00	1.	1.02	1.30	1.30	153	.03	.02	.01	34.
1.01	1.40	4	.00	0.	.00	1.	1.02	1.40	1.40	154	.03	.02	.01	35.
1.01	1.50	5	.00	0.	.00	1.	1.02	1.50	1.50	155	.03	.02	.01	35.
1.01	1.00	6	.00	0.	.00	1.	1.02	2.00	2.00	156	.03	.02	.01	35.
1.01	1.10	7	.00	0.	.00	1.	1.02	2.10	2.10	157	.03	.02	.01	35.
1.01	1.20	8	.00	0.	.00	1.	1.02	2.20	2.20	158	.03	.02	.01	35.
1.01	1.30	9	.00	0.	.00	1.	1.02	2.30	2.30	159	.03	.02	.01	35.
1.01	1.40	10	.00	0.	.00	1.	1.02	2.40	2.40	160	.03	.02	.01	35.
1.01	1.50	11	.00	0.	.00	1.	1.02	2.50	2.50	161	.03	.02	.01	35.
1.01	2.00	12	.00	0.	.00	0.	1.02	3.00	3.00	162	.03	.02	.01	35.
1.01	2.10	13	.00	0.	.00	0.	1.02	3.10	3.10	163	.03	.02	.01	35.
1.01	2.20	14	.00	0.	.00	0.	1.02	3.20	3.20	164	.03	.02	.01	35.
1.01	2.30	15	.00	0.	.00	0.	1.02	3.30	3.30	165	.03	.02	.01	35.
1.01	2.40	16	.00	0.	.00	0.	1.02	3.40	3.40	166	.03	.02	.01	35.
1.01	2.50	17	.00	0.	.00	0.	1.02	3.50	3.50	167	.03	.02	.01	35.
1.01	3.00	18	.00	0.	.00	0.	1.02	4.00	4.00	168	.03	.02	.01	35.
1.01	3.10	19	.00	0.	.00	0.	1.02	4.10	4.10	169	.03	.02	.01	35.
1.01	3.20	20	.00	0.	.00	0.	1.02	4.20	4.20	170	.03	.02	.01	35.
1.01	3.30	21	.00	0.	.00	0.	1.02	4.30	4.30	171	.03	.02	.01	35.
1.01	3.40	22	.00	0.	.00	0.	1.02	4.40	4.40	172	.03	.02	.01	35.
1.01	3.50	23	.00	0.	.00	0.	1.02	4.50	4.50	173	.03	.02	.01	35.
1.01	4.00	24	.00	0.	.00	0.	1.02	5.00	5.00	174	.03	.02	.01	35.
1.01	4.10	25	.00	0.	.00	0.	1.02	5.10	5.10	175	.03	.02	.01	35.
1.01	4.20	26	.00	0.	.00	0.	1.02	5.20	5.20	176	.03	.02	.01	35.
1.01	4.30	27	.00	0.	.00	0.	1.02	5.30	5.30	177	.03	.02	.01	35.
1.01	4.40	28	.00	0.	.00	0.	1.02	5.40	5.40	178	.03	.02	.01	35.
1.01	4.50	29	.00	0.	.00	0.	1.02	5.50	5.50	179	.03	.02	.01	35.
1.01	5.00	30	.00	0.	.00	0.	1.02	6.00	6.00	180	.03	.02	.01	35.
1.01	5.10	31	.00	0.	.00	0.	1.02	6.10	6.10	181	.03	.02	.01	41.
1.01	5.20	32	.00	0.	.00	0.	1.02	6.20	6.20	182	.03	.02	.01	64.
1.01	5.30	33	.00	0.	.00	0.	1.02	6.30	6.30	183	.03	.02	.01	100.
1.01	5.40	34	.00	0.	.00	0.	1.02	6.40	6.40	184	.03	.02	.01	139.
1.01	5.50	35	.00	0.	.00	0.	1.02	6.50	6.50	185	.03	.02	.01	167.
1.01	6.00	36	.00	0.	.00	0.	1.02	7.00	7.00	186	.03	.02	.01	181.
1.01	6.10	37	.01	0.	.01	0.	1.02	7.10	7.10	187	.03	.02	.01	181.

# SUMMARY OF DAM SAFETY ANALYSIS (TURNER'S DREAM)

PLAN 1 .....

RATIO OF PMF	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 511.10 542. 1A.	SPILLWAY CREST 511.10 592. 1A.	TOP OF DAM 515.50 617. 1586.	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	513.70	0.	723.	454.	0.	43.50	0.	0.	0.
.15	514.71	0.	774.	974.	0.	42.50	0.	0.	0.
.20	515.38	0.	810.	1084.	0.	42.17	0.	0.	0.
.25	515.99	.49	845.	2185.	2.83	41.67	0.	0.	0.
.30	516.49	.99	873.	3082.	3.50	41.33	0.	0.	0.
.35	516.89	1.39	896.	3989.	3.83	41.00	0.	0.	0.
.40	517.21	1.71	916.	4844.	4.33	40.83	0.	0.	0.
.50	517.72	2.22	946.	6557.	5.17	40.67	0.	0.	0.
1.00	519.20	3.70	1002.	14020.	7.63	40.50	0.	0.	0.



\*\*\*\*\*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 24 FEB 79  
 \*\*\*\*\*

		NON-FEDERAL DAM INSPECTION		NO NUMBER ASSIGNED		LAKE JANNA		(LAKE JANNA)	
1	2	3	4	5	6	7	8	9	10
1	A	300	0	5	-0	-0	-0	-0	-0
2	A	5	9	1					
3	A	1	.15	.2	.35	.4	.5	1.	
4	R	1							
5	1	0							
6	J	1							
7	1	.1							
8	K	0							
9	1	1							
10	M	1							
11	P	1							
12	T	27.0							
13	N	.652							
14	X	1							
15	K	1							
16	K1								
17	V								
18	V1	1							
19	V4	534.9							
20	V5	0							
21	SA	0							
22	SE	510							
23	SS	534.9							
24	SD	537.5							
25	SL	0							
26	SV	537.5							
27	K	99							

PRORABLE MAXIMUM PRECIPITATION-24 HR DURATION

ROUTED FLOWS THROUGH LAKE JANNA

1	2	3	4	5	6	7	8	9	10
1	1	536.9	537.4	537.9	538.4	538.9	539.4	539.9	540.4
2	1	16.72	17.98	19.16	20.27	21.32	22.32	23.32	24.20
3	1	4.203	5.40	6.60	7.80	9.00	10.20	11.40	12.60

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

RUN DATE: 21 AUG 79  
 TIME: 08.21.56

# (LAKE JANNA)

NON-FEDERAL DAM INSPECTION  
 NO NUMBER ASSIGNED  
 LAKE JANNA

## JUR SPECIFICATION

NQ	NHR	NMTN	IDAY	IHR	IMIN	MFTRC	TPLT	JPRT	NSTAN
300	0	5	-0	-0	-0	-0	-0	-0	-0
			JOPER	NWT	LROPT	TRACE			
			5	-0	-0	-0			

## MULTI-PLAN ANALYSIS TO BE PERFORMED

NPLAN= 1 NRTIO= 9 LRTIO= 1  
 RTIO= .10 .15 .20 .25 .30 .35 .40 .50 1.00

\*\*\*\*\*

## SUM-AREA RUNOFF COMPUTATION

## PROBABLE MAXIMUM PRECIPITATION-24 HR DURATION

ISTAU	ICOMP	TECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	-0	-0	-0	-0	1	-0	-0

## HYDROGRAPH DATA

IMYD	ITUG	TAKEA	SNAP	TPSDA	THSPC	RATTO	ISNOW	ISAME	LOCAL
1	1	.04	-0.	.04	1.00	-0.	-0	-0	-0

## PRECIP DATA

SPFF	PMS	RA	P12	R24	R48	R72	R96
-0.	27.00	102.00	120.00	130.00	-0.	-0.	-0.

## LOSS DATA

LROPT	STHR	DLTKR	RTIOL	FRAIN	STRS	PITOK	STRI	CNSTL	ALSMY	PITMP
-0	-0.	-0.	1.00	-0.	-0.	1.00	.50	.05	-0.	-0.

## UNIT HYDROGRAPH DATA

TP= .25 CPE= .65 NTAS= -0

## RECESSION DATA

SINTO= 1.00 ORCSNE 1.00 RTIO= 2.00  
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE 1.00 AND 2.21 INTERVALS

UNIT HYDROGRAPH 14 FND=OF-PERTON ORIGINATES, LAKE .25 HOURS. CP= .46 VOL= 1.00 5.  
 11. 39. 64. 67. 50. 32. 20. 15. 8.  
 3. 2. 1.

## FND=OF-PERTON FLOW

WU.F	HR.MN	PFTON	RAIN	EXCS	LOSS	EXCS	LOSS	COMP Q
1.01	.05	1	.02	0	0	0	0	0

# SUMMARY OF DAM SAFETY ANALYSIS (LAKE JANNA)

PLAN 1 .....

WATTU OF PWF	MAXIMUM RESERVOIR W.S.ELEV	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 534.90 35. 0.	SPILLWAY CREST 534.90 35. 0.	TOP OF DAM 537.50 42. 19.	DURATION OVER TOP HOURS	MAXIMUM OUTFLOW CFS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	535.80		0.	38.	15.	0.	16.33	0.	0.
.15	536.82		0.	39.	17.	0.	16.58	0.	0.
.20	537.07		0.	41.	18.	0.	17.25	0.	0.
.25	537.54		.09	43.	33.	2.17	16.02	0.	0.
.30	537.74		.24	43.	44.	2.50	16.08	0.	0.
.35	537.84		.14	43.	137.	2.75	15.92	0.	0.
.40	537.89		.39	43.	169.	2.92	15.83	0.	0.
.50	537.90		.46	44.	217.	3.07	15.83	0.	0.
1.00	538.20		.70	44.	443.	5.58	15.83	0.	0.

APPENDIX B  
GEOLOGY OF DAMSITE

APPENDIX B  
GEOLOGY OF DAMSITE

General Geology. The following geologic information was obtained from a search of the very limited available literature, one field inspection of the site and the Shook quarry about 8 miles southwest of Turkey Creek, and core borings taken recently by the Memphis District Corps of Engineers in connection with a subsurface investigation of Wappapello Dam (15 miles south of Turkey Creek).

Field investigations conducted at Turkey Creek revealed rock on two of the hills surrounding the lake. This material was determined to be float. Other investigations as mentioned earlier indicate the dam to be founded on 60 to 140 feet of residuum material underlain by crystalline dolomite of the Gasconade formation of the Ordovician System.

Subsurface investigations at Wappapello Dam indicate 60 to 140 feet of residuum material underlain by crystalline rock. The residuum is composed of red clay with sand and rock fragments of limestone, dolomite and chert. A light tan to gray, medium to coarsely crystalline dolomite with numerous vuggy zones and inclusions of yellow to tan chalky chert were found beneath the residuum. The formation is believed to be the Roubidoux and contains zones of dolomitic limestone and dolomitic sandstone. The top 30 to 35 feet of this formation contained zones that were highly fractured with numerous solution cavities. The Roubidoux was found to vary in thickness from 60 to 80 feet with the base of the formation being fairly confident rock with minor fractures and vugs. At the base of the Roubidoux black shale partings underlain by a lense of siltstone were found. The underlying rock was very similar to the Roubidoux but believed to be the Gasconade formation. It consisted of tannish gray and gray mottled medium crystalline dolomite containing numerous irregular stylolites and pink calcite inclusions. Several lenticular zones of sandstone, dolomitic sandstone and cherty dolomite were found in the top 100 feet of this formation. Vuggy Zones existed that were partly filled with tan stained calcite. Predominately this formation is sound rock with only a few fractured zones.

Field investigations at the Shook quarry indicate about 100 feet of residuum material. It had been stripped off during the quarry operation and was impossible to determine the exact thickness. The residuum was underlain with dolomite believed to be the Gasconade formation.

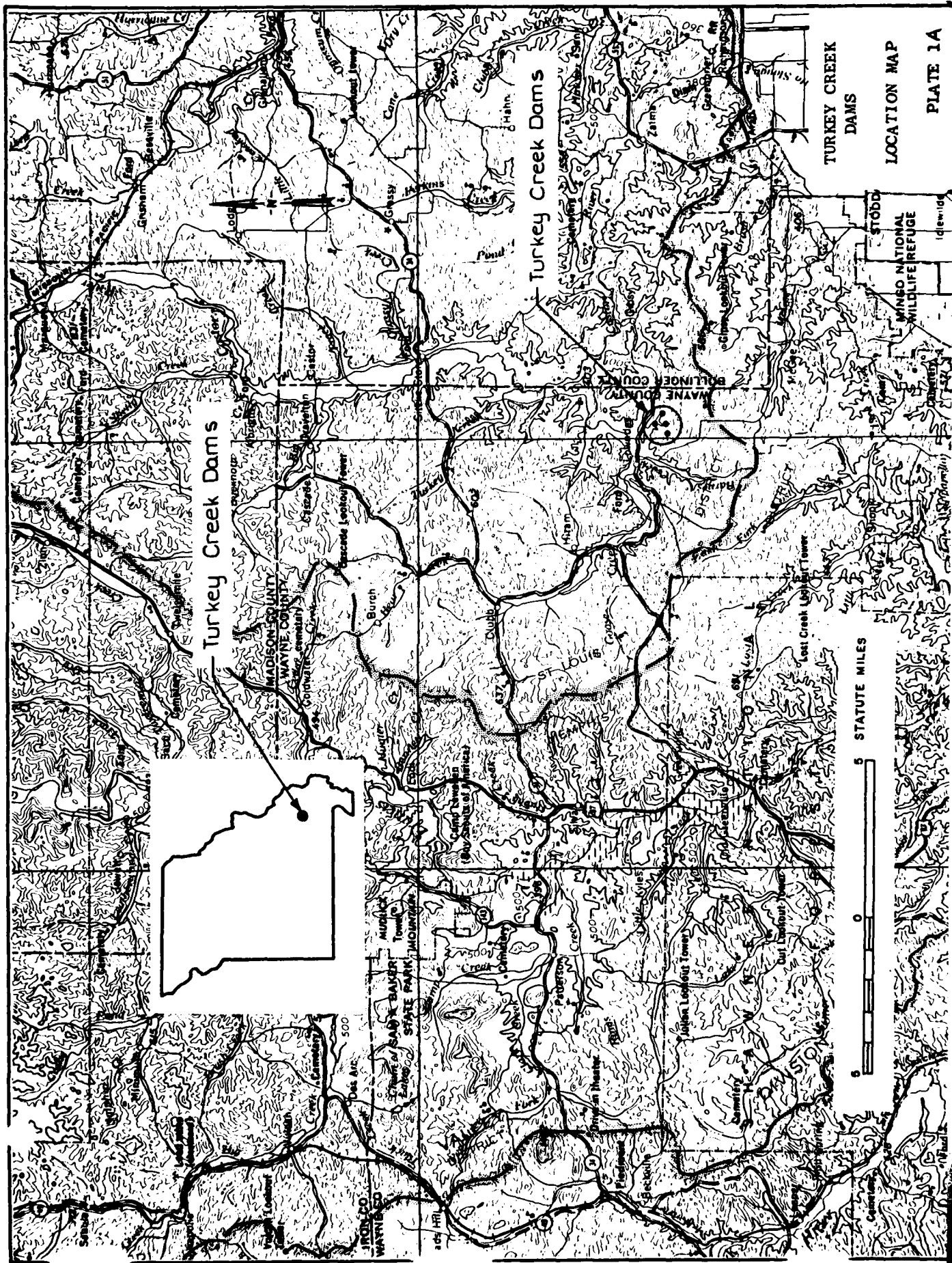
Regional structure of the area is controlled somewhat by the Mississippi Embayment, a southerly plunging syncline whose axis is basically outlined by the course of the Mississippi River. The regional dip of the beds is about 1 to 2 degrees toward the Mississippi Embayment.

Two major joint systems are present in this area. One system runs northwest to southeast and a second northeast of southwest with vertical fractures. A minor joint system exists in the North-South and East-West directions. The topography and stream patterns of the area are greatly

influenced by these joints. Solution zones were found to exist along joints and bedding planes. Caves and sink holes of various sizes are numerous in some areas of the Roubidoux and the Gasconade which are a direct result of solution activity.

Site Description. Turkey Creek dams are situated in an area of rolling hills with the maximum relief being about 100 feet. Prior to construction of the dams, valley drainage served as a minor tributary to Bear Creek. Field investigations revealed an outcrop on a recent road cut west of dam 31101 and on a hill north west of dam 31109 at about elevation 575.0 msl. The rock consisted of interbedded sandstone, siltstone and cherty dolomite. The sandstone had a very weak, highly erodable red zone that graded into a more resistant granular sandstone. The siltstone layers were about 6 inches in thickness, friable and highly erodable. The cherty dolomite was highly resistant to weathering but fractured and broke into fragments and blocks as the sandstone and siltstone weathered. No other outcrops were found. It was reported by local residents that water wells had been drilled to a depth of 210 feet without encountering confident rock. Therefore the outcrops are believed to be float. Similar rock characteristics exist at Wappapello Dam on the north abutment but after exploration it was determined to be float.

All the Turkey Creek Dams were constructed of predominately the same material. The embankment, abutment and foundation material are the same, consisting of residuum. The residuum is composed of red clay with sand and rock fragments. The residuum thickness at the dam site may range from 60 to 200 feet. Considering other investigations and the regional structure the float material may be of the Roubidoux formation. The residuum is probably underlain by dolomite or dolomitic limestone of the Gasconade formation, of which the top 30 feet probably exists as a weathered surface with solution cavities and fractured zones. Numerous areas of seepage were located on the dams and this problem will be addressed in another section of this report. No other hazardous features such as soft seams, expansive clays or other geologic irregularities were noted. However, the lake is located within the Seismic Risk Zone 2 but borders very close to the Seismic Risk Zone 3.



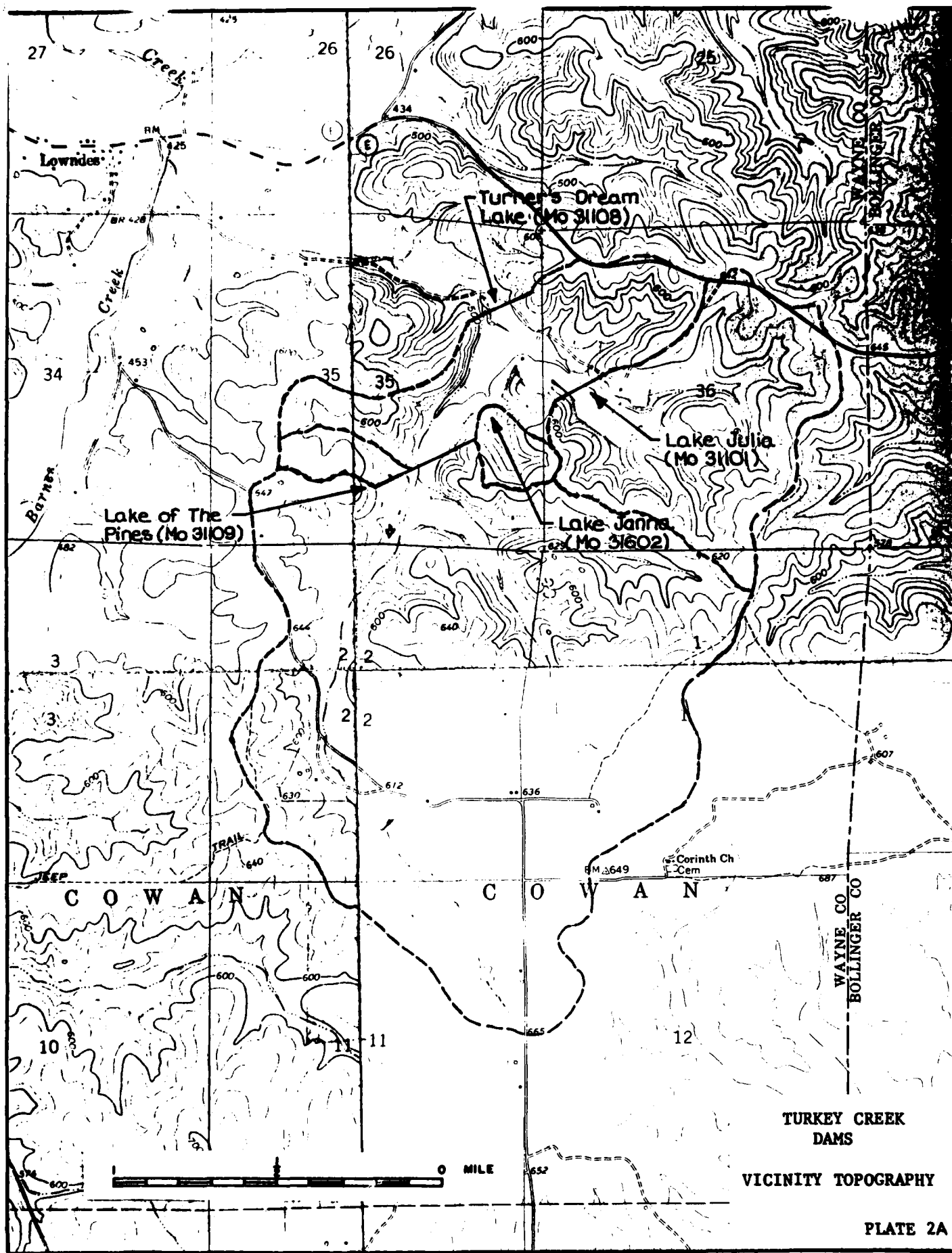
— Turkey Creek Dams

— Turkey Creek Dams

TURKEY CREEK  
DAMS

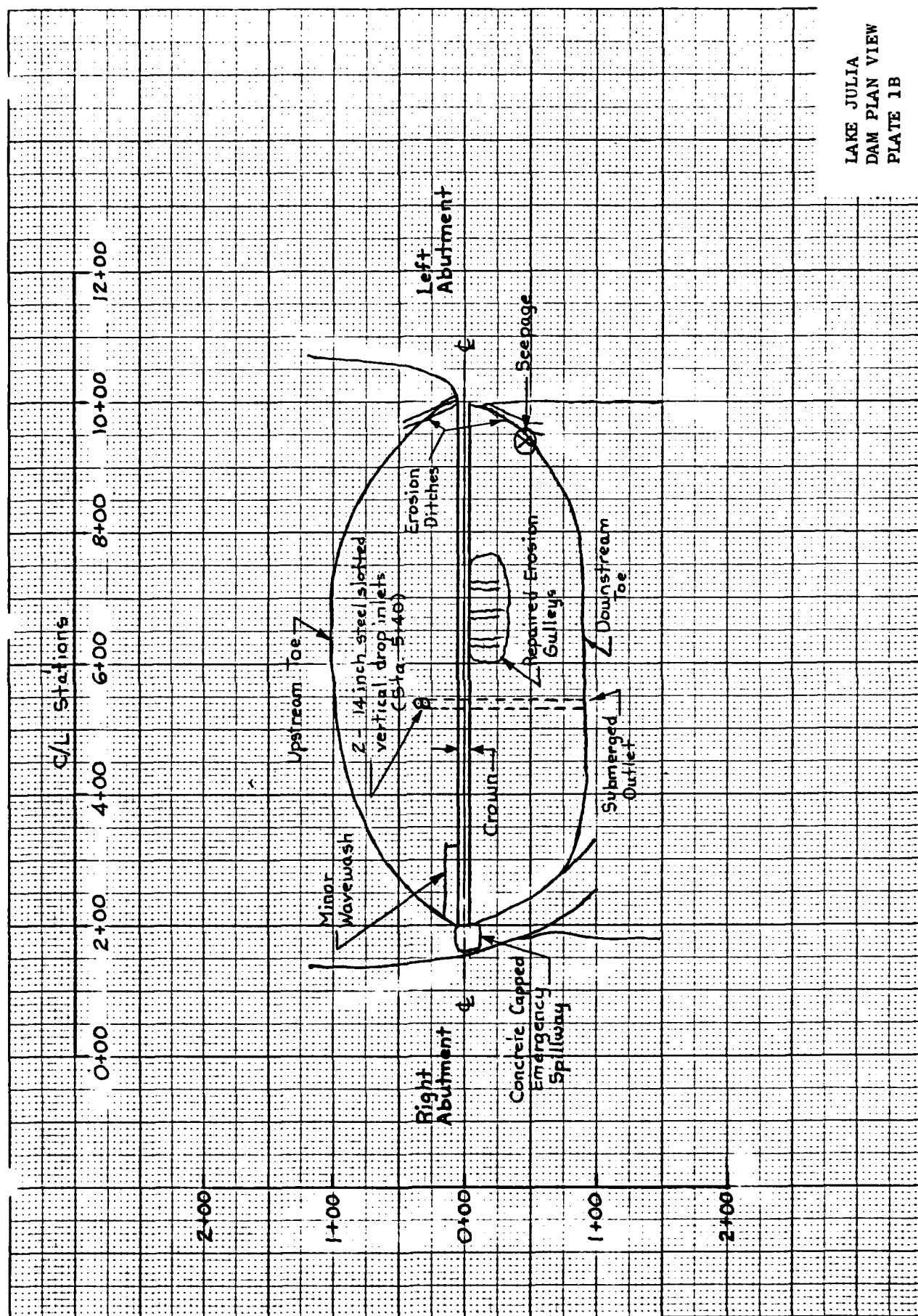
LOCATION MAP

PLATE 1A

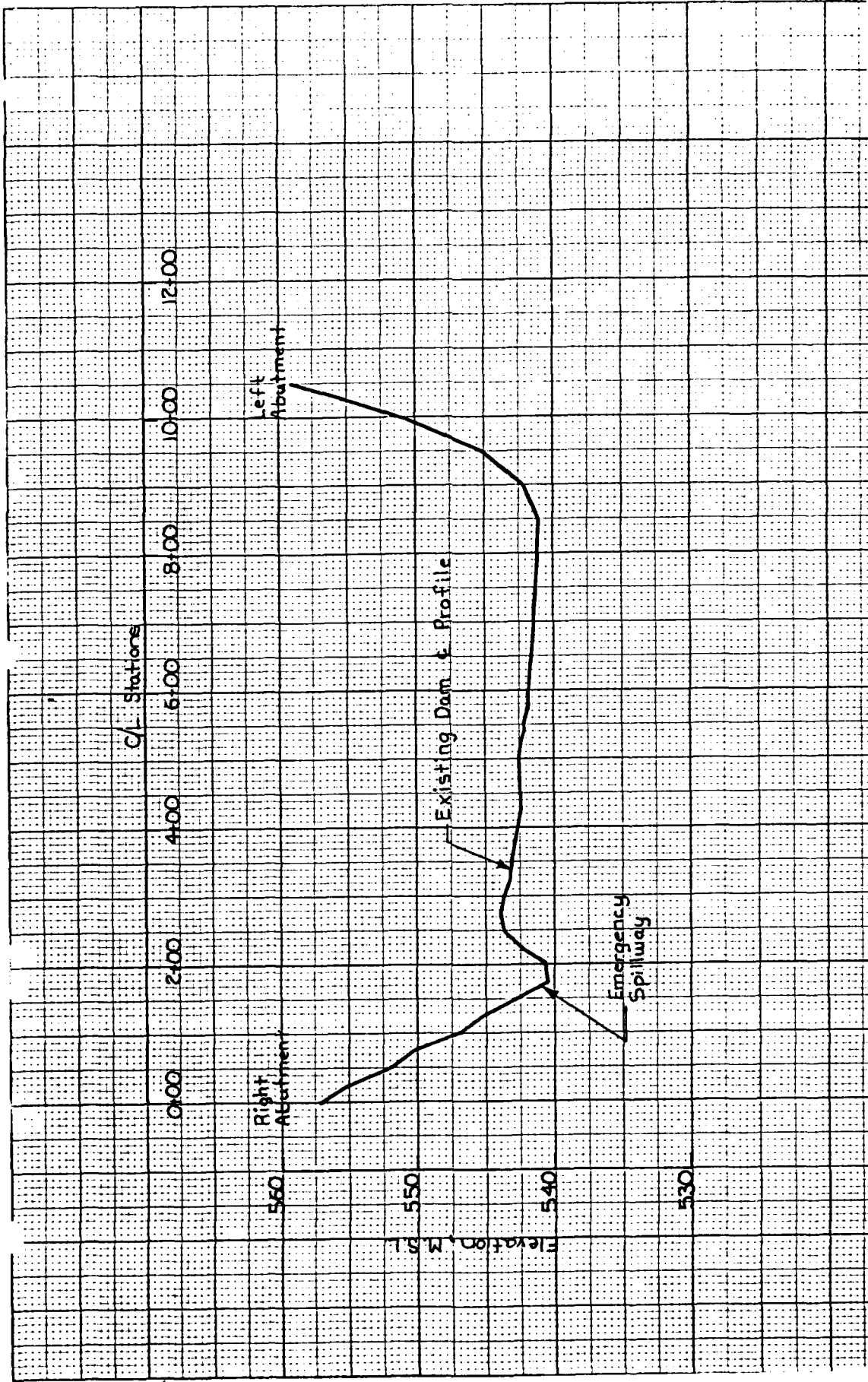




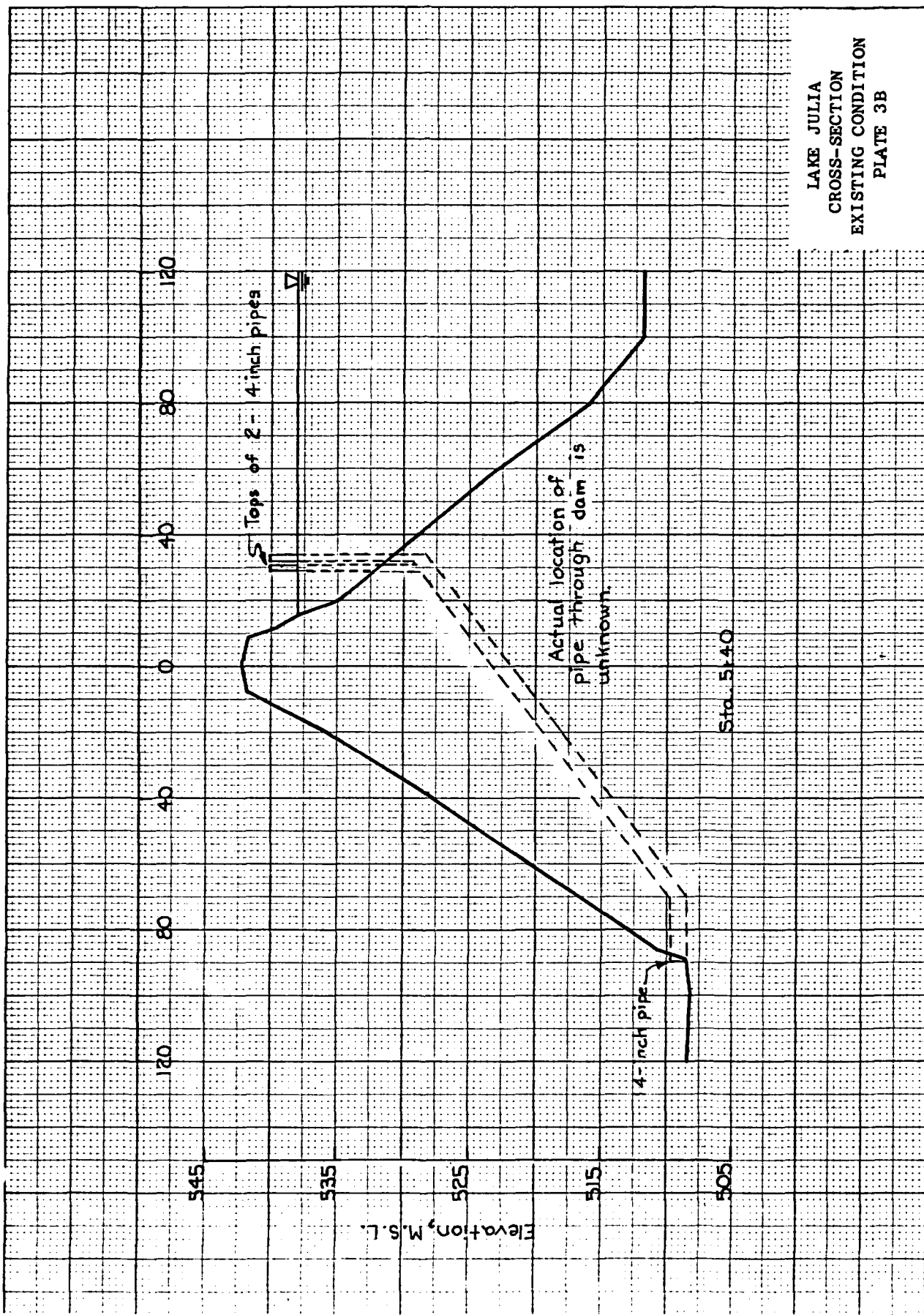
LAKE JULIA  
DAM PLAN VIEW  
PLATE 1B



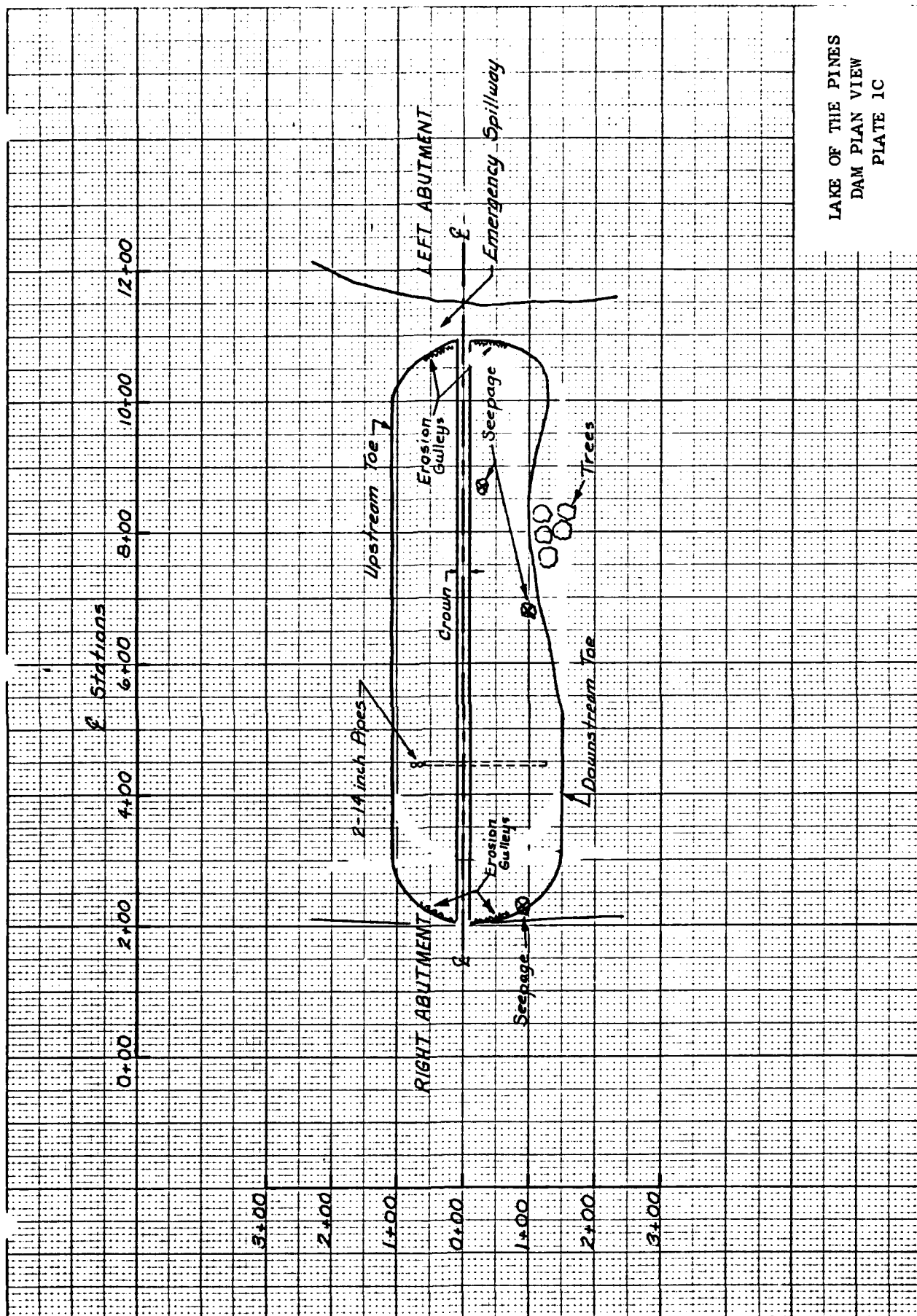
LAKE JULIA  
CENTERLINE PROFILE  
PLATE 2B

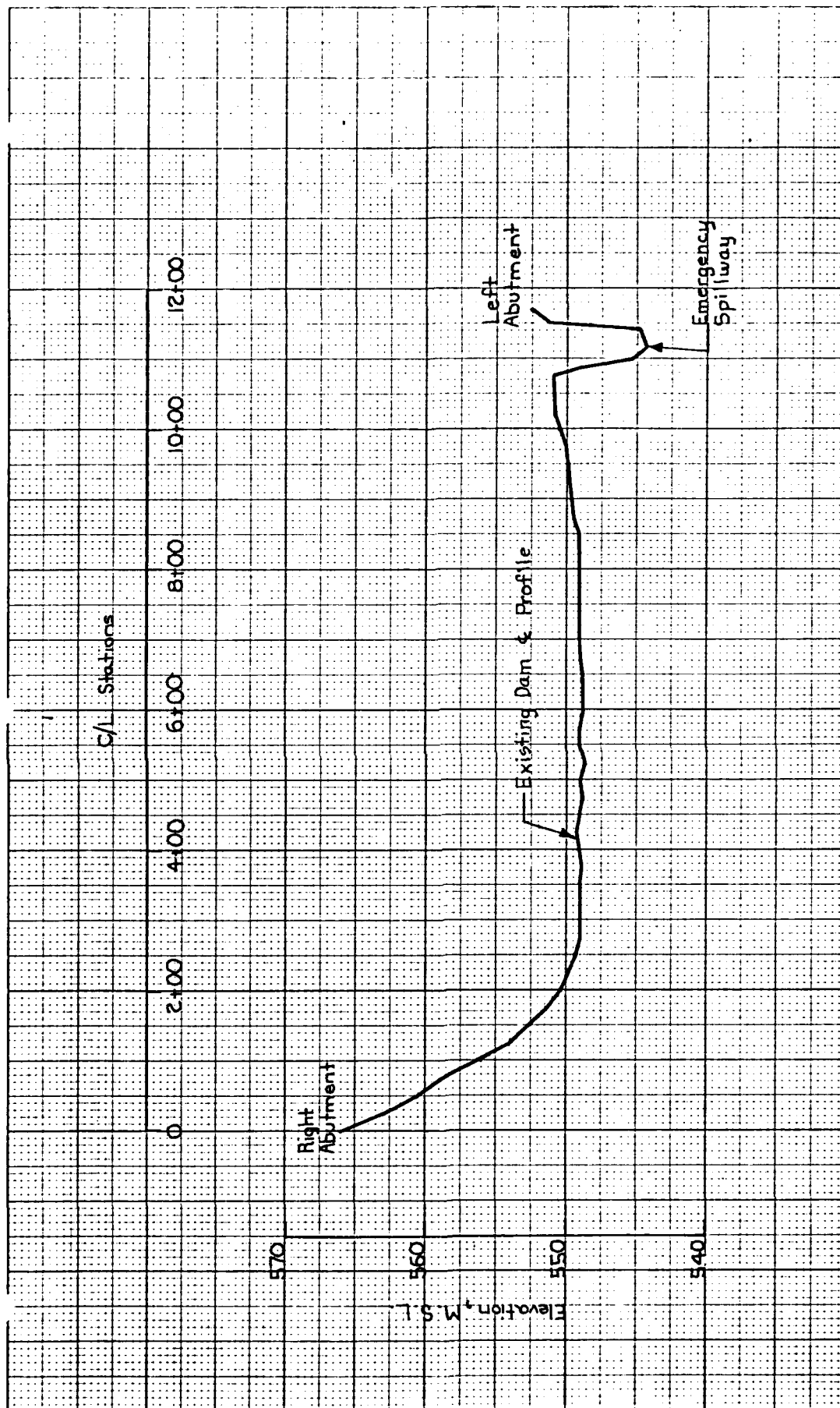


LAKE JULIA  
CROSS-SECTION  
EXISTING CONDITION  
PLATE 3B



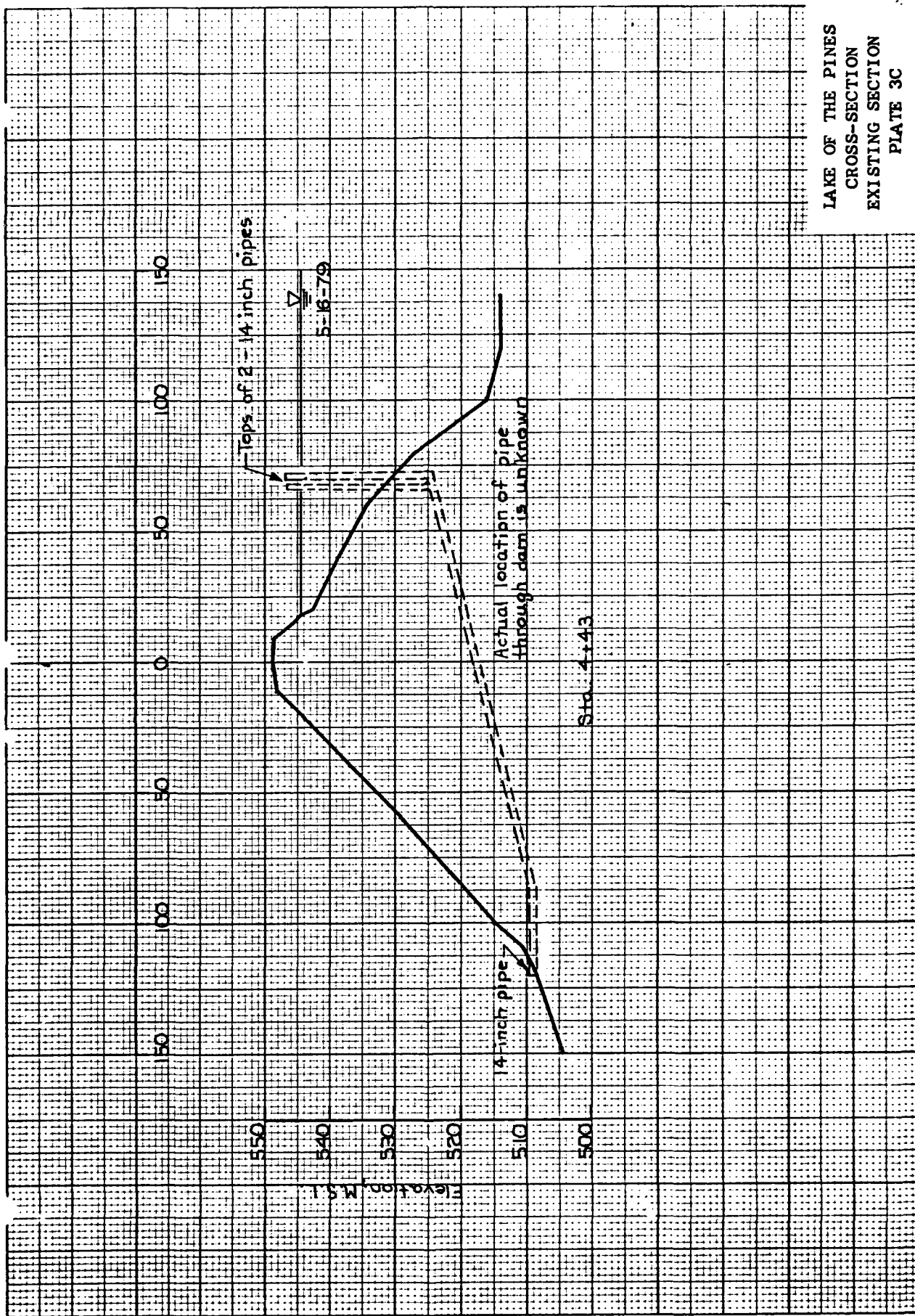
LAKE OF THE PINES  
DAM PLAN VIEW  
PLATE 1C





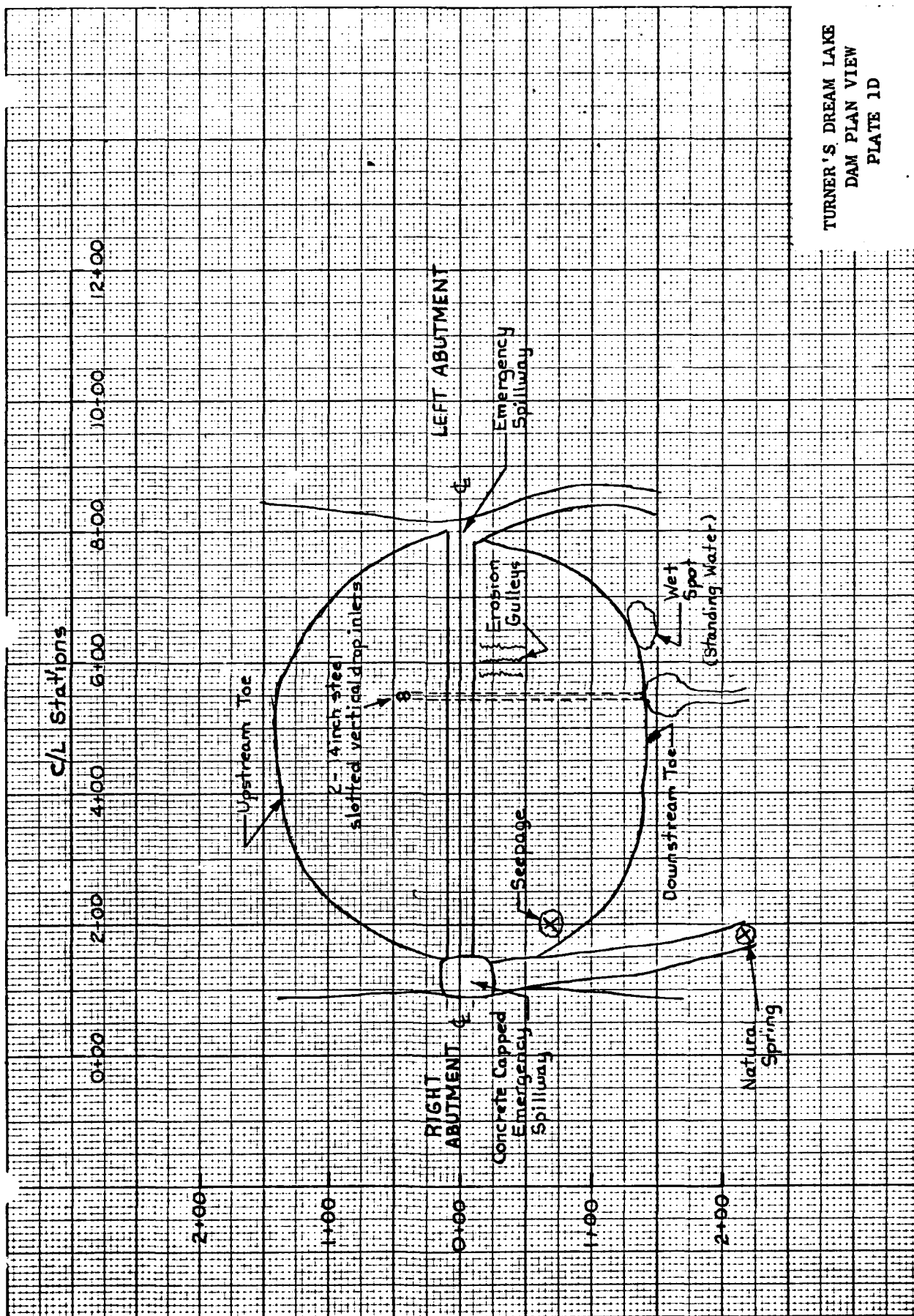
LAKE OF THE PINES  
CENTERLINE PROFILE  
PLATE 2C

LAKE OF THE PINES  
CROSS-SECTION  
EXISTING SECTION  
PLATE 3C

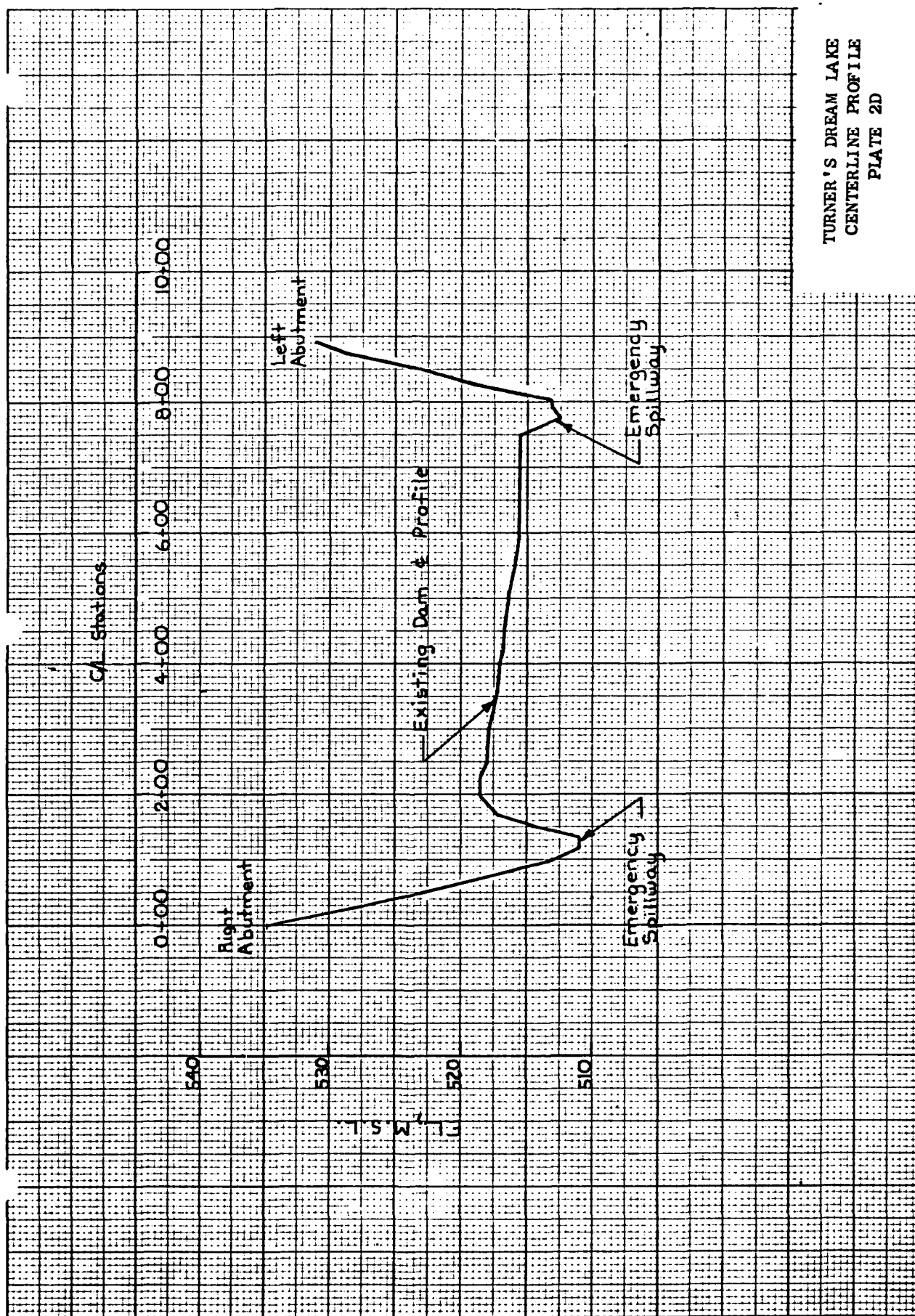




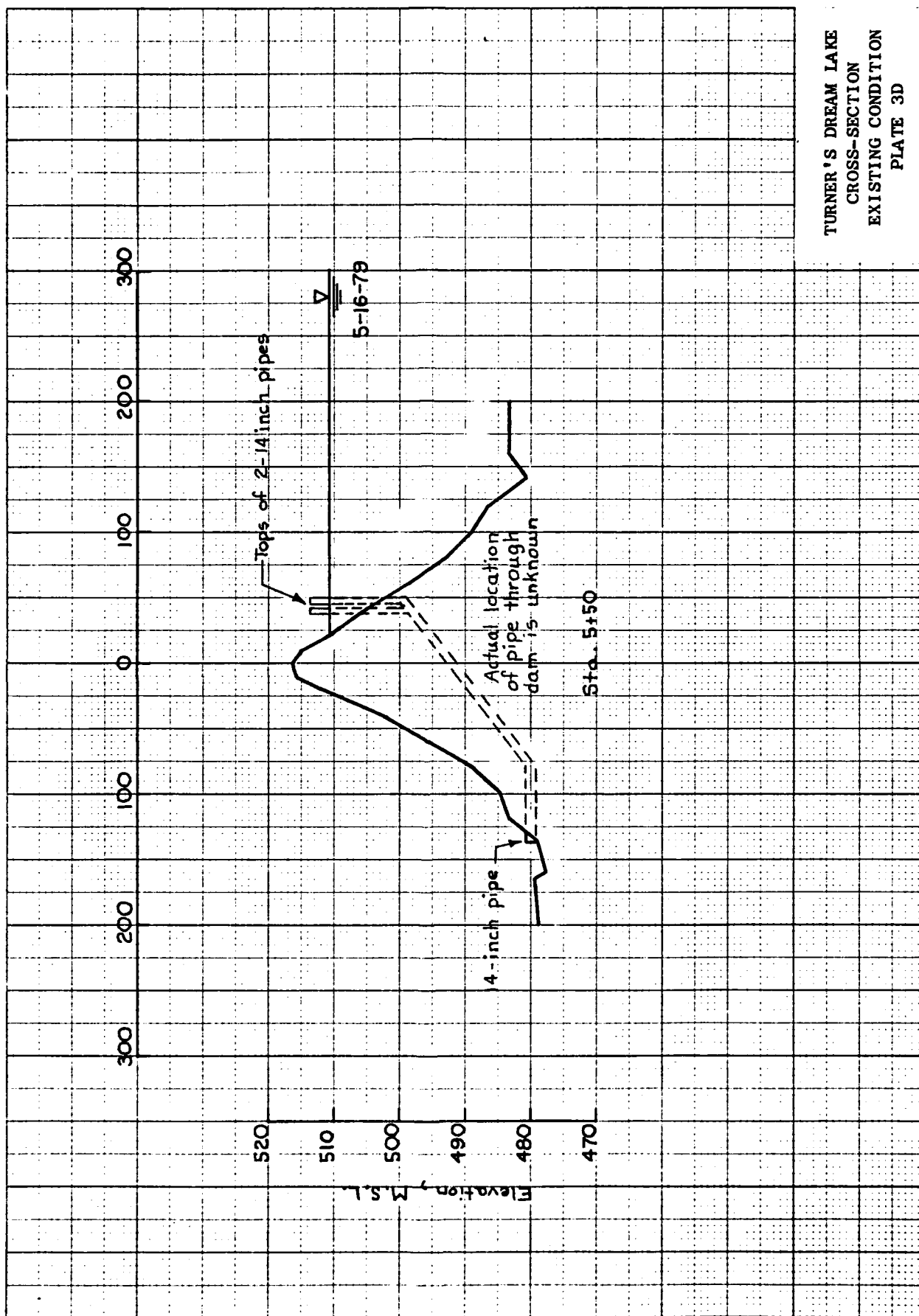
TURNER'S DREAM LAKE  
DAM PLAN VIEW  
PLATE 1D



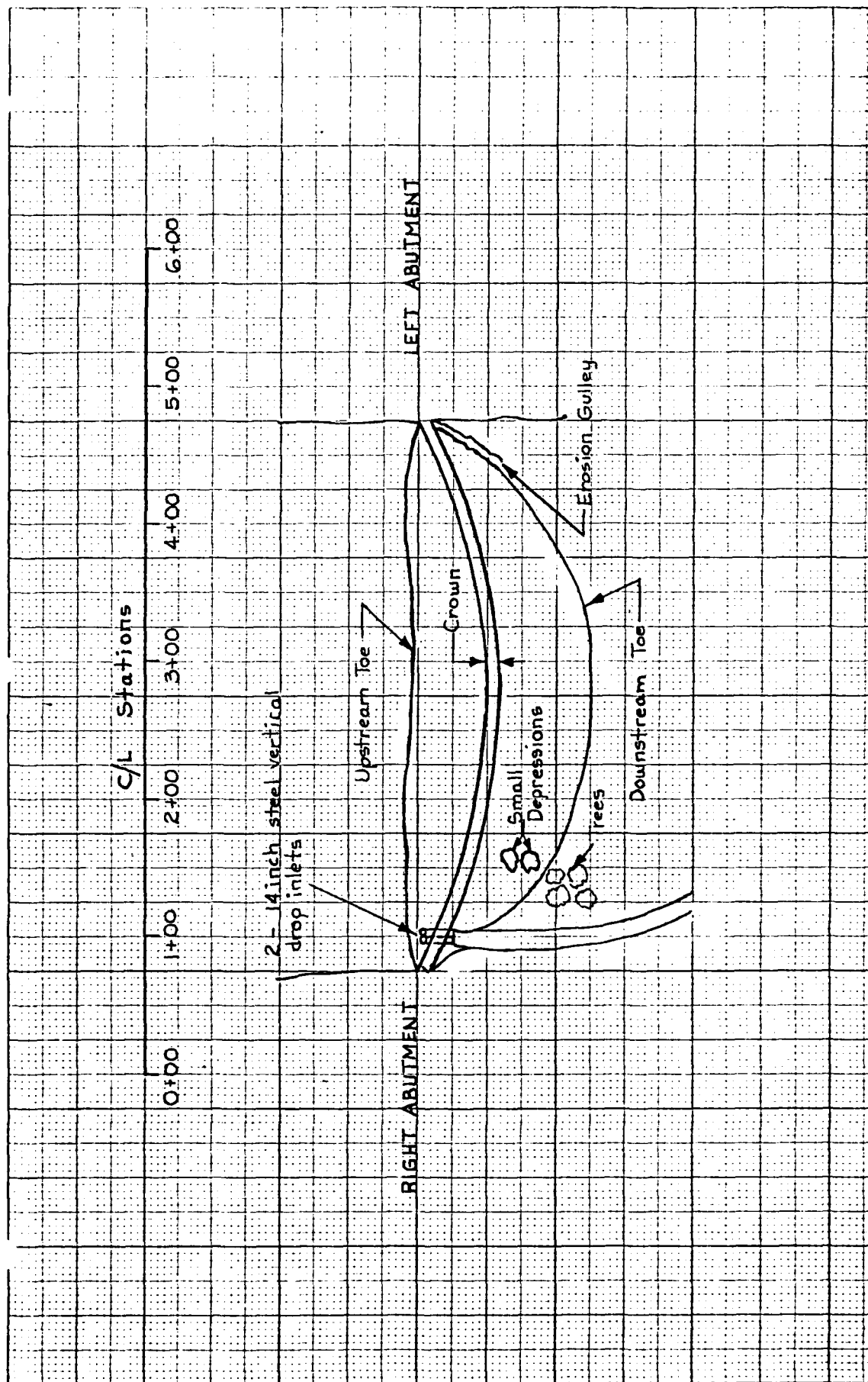
TURNER'S DREAM LAKE  
CENTERLINE PROFILE  
PLATE 2D

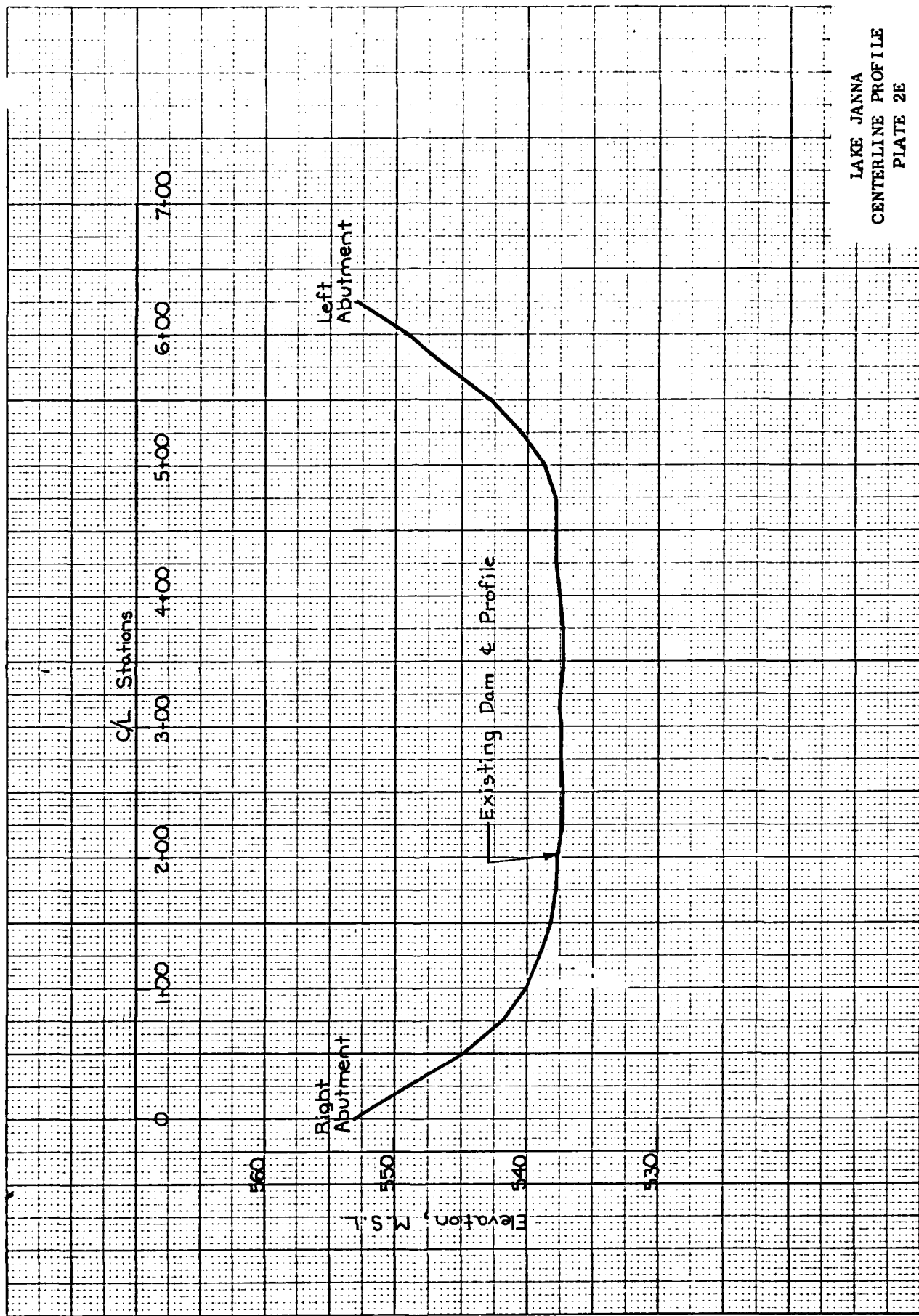






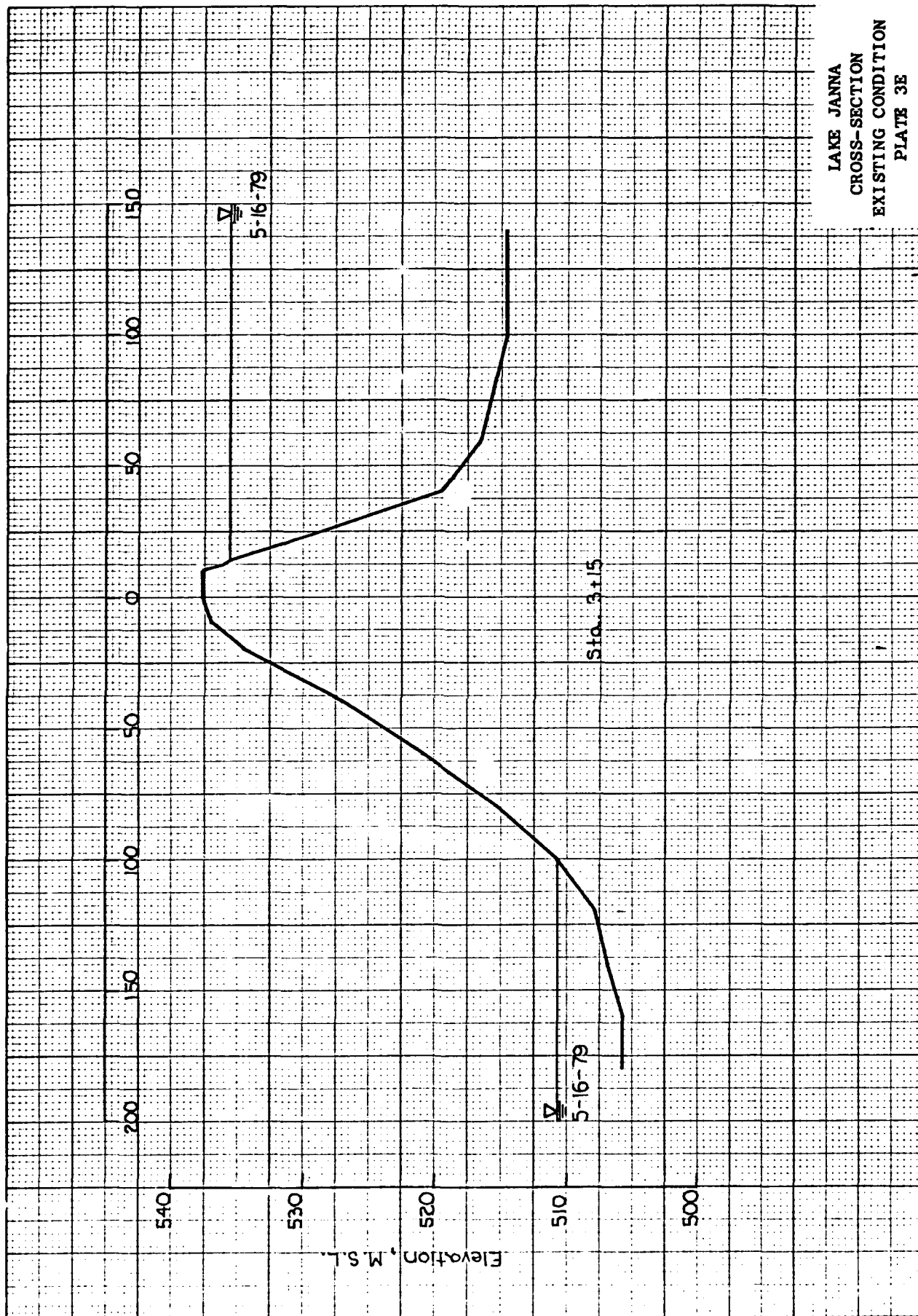
TURNER'S DREAM LAKE  
CROSS-SECTION  
EXISTING CONDITION  
PLATE 3D





LAKE JANNA  
CENTERLINE PROFILE  
PLATE 2E

LAKE JANNA  
CROSS-SECTION  
EXISTING CONDITION  
PLATE 3E



LAKE JULIA



PHOTO 1B: Overview of Lake and Dam

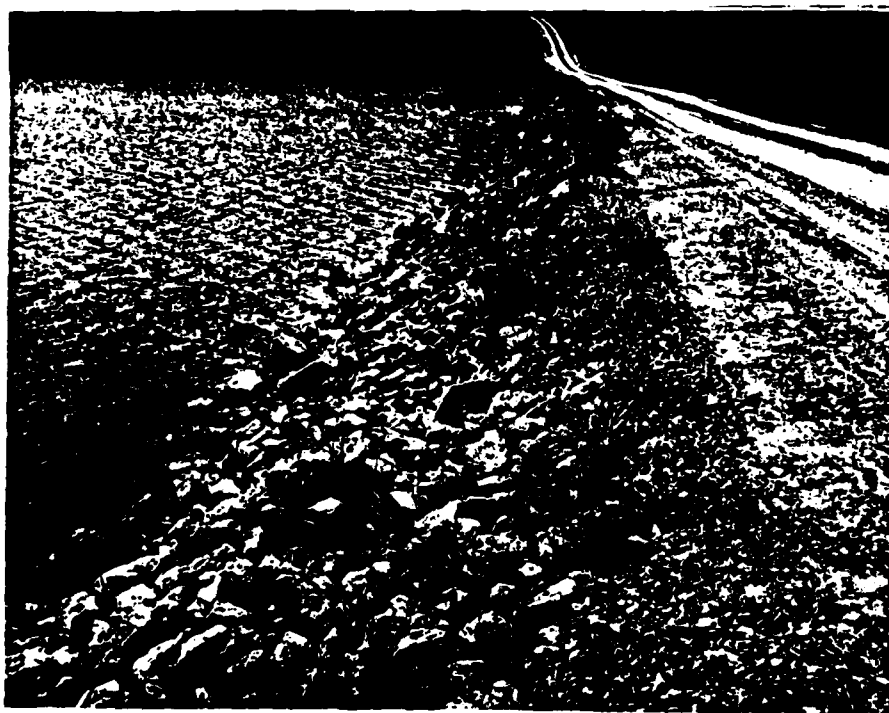


PHOTO 2B: Upstream Embankment



PHOTO 3B: Downstream Embankment

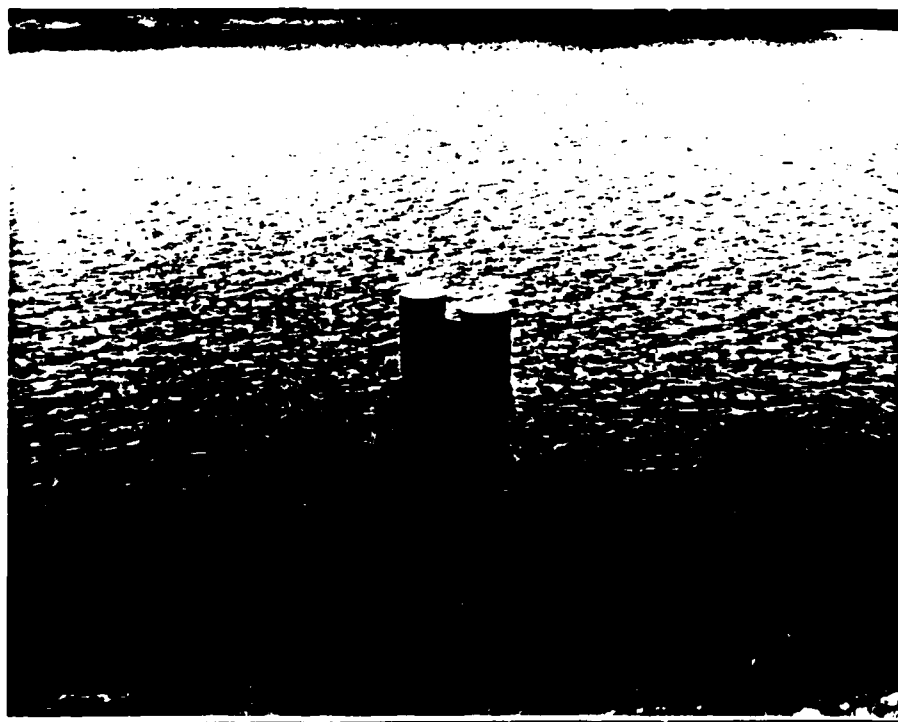


PHOTO 4B: Inlet of Vertical Discharge



PHOTO 5B: Emergency Spillway



PHOTO 6B: Wavewash on Upstream Embankment





PHOTO 7B: Erosion Gully in Upstream Embankment  
near Left Abutment



PHOTO 8B: Erosion Gully in Downstream Embankment  
near Left Abutment

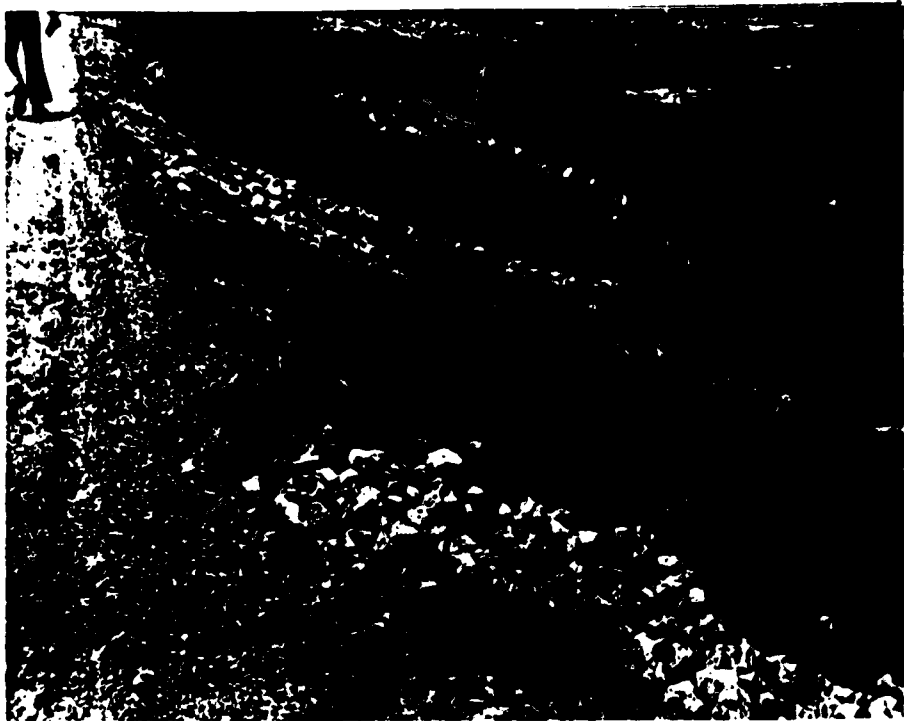


PHOTO 9B: Repaired Erosion Gulleys at Dam  
Crest

LAKE OF THE PINES



PHOTO 1C: Overview of Lake and Dam



PHOTO 2C: Upstream Embankment



PHOTO 3C: Downstream Embankment



PHOTO 4C: Inlet of Vertical Discharge



PHOTO 5C: Outlet of Vertical Discharge



PHOTO 6C: Emergency Spillway



PHOTO 7C: Spillway Outfall Channel



PHOTO 8C: Seepage at Downstream Toe



PHOTO 9C: Seepage Near Left Abutment



PHOTO 10C: Erosion on Upstream Embankment near  
Left Abutment





PHOTO 11C: Erosion on Downstream Embankment  
near Right Abutment



PHOTO 12C: Landside Ditch in Right Abutment

TURNER'S DREAM LAKE

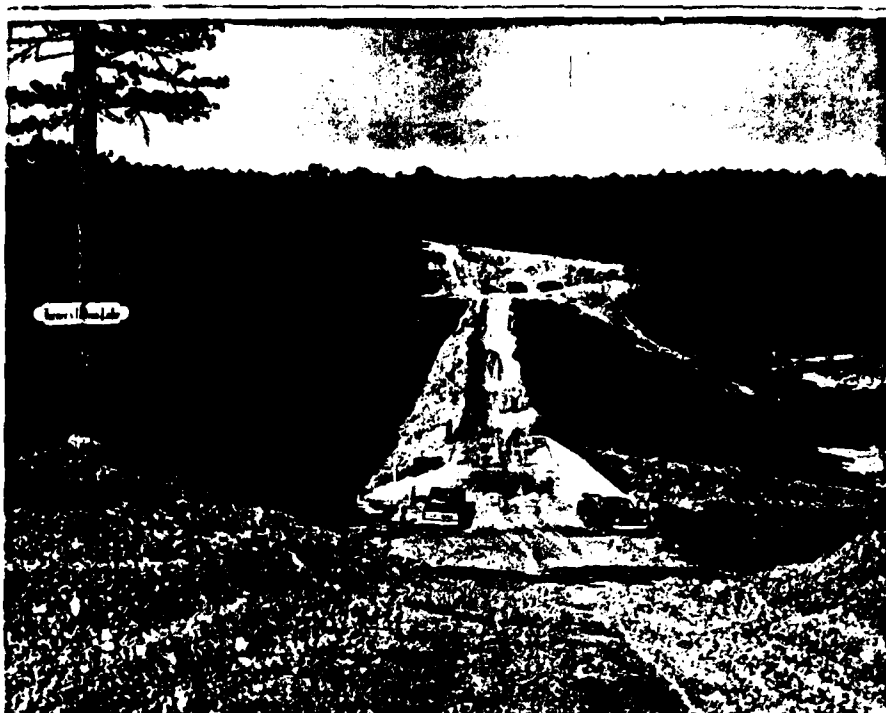


PHOTO 1D: Overview of Lake and Dam



PHOTO 2D: Upstream Embankment



PHOTO 3D: Downstream Embankment

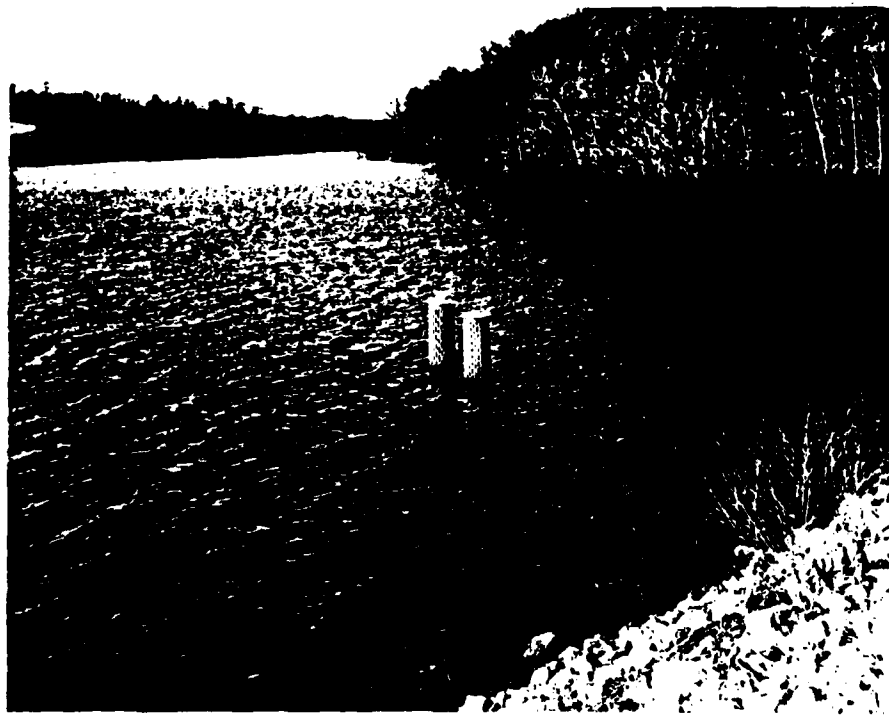


PHOTO 4D: Inlet of Vertical Discharge

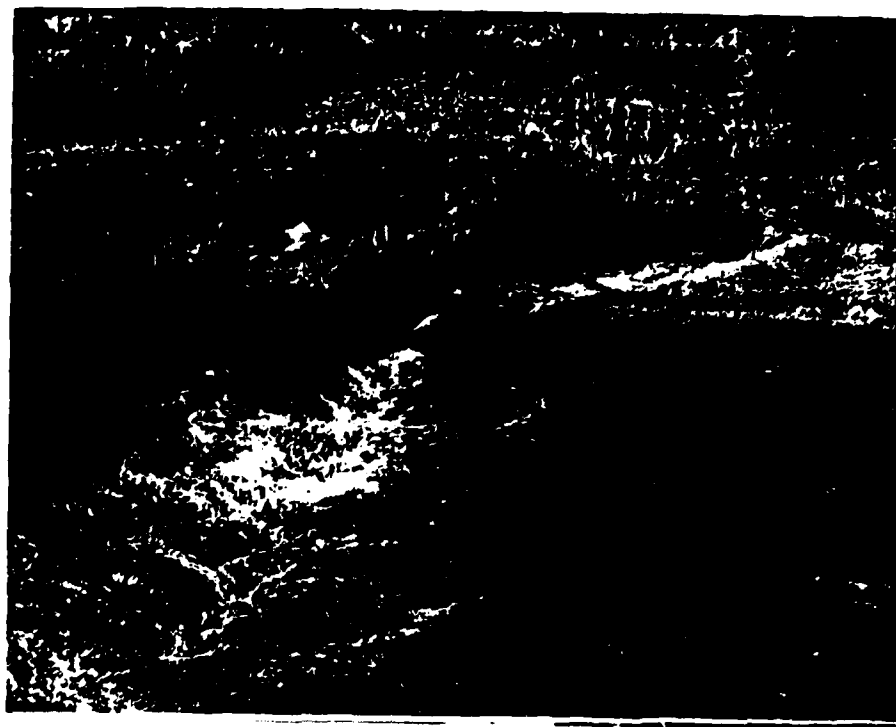


PHOTO 5D: Outlet of Discharge Structure



PHOTO 6D: Principal Outlet Channel



PHOTO 7D: Right Abutment Spillway



PHOTO 8D: Left Abutment Spillway



PHOTO 9D: Erosion on Downstream Embankment  
near Dam Crest



PHOTO 10D: Seepage in Right Abutment



PHOTO 11D: Spring Downstream of Right Abutment



PHOTO 12D: Wet Spot at Toe of Dam





PHOTO 13D: Landside Toe of Dam

AD-A106 632

ARMY ENGINEER DISTRICT MEMPHIS TN

F/G 13/13

NATIONAL DAM SAFETY PROGRAM. TURKEY CREEK DAMS (MO 31101, MO 31--ETC(U)

AUG 79 J L ANDERSON, H L SMITH, R O SMITH

UNCLASSIFIED

NL

2-2  
2-2



END

DATE

FILED

12-81

DTIC

LAKE JANNA

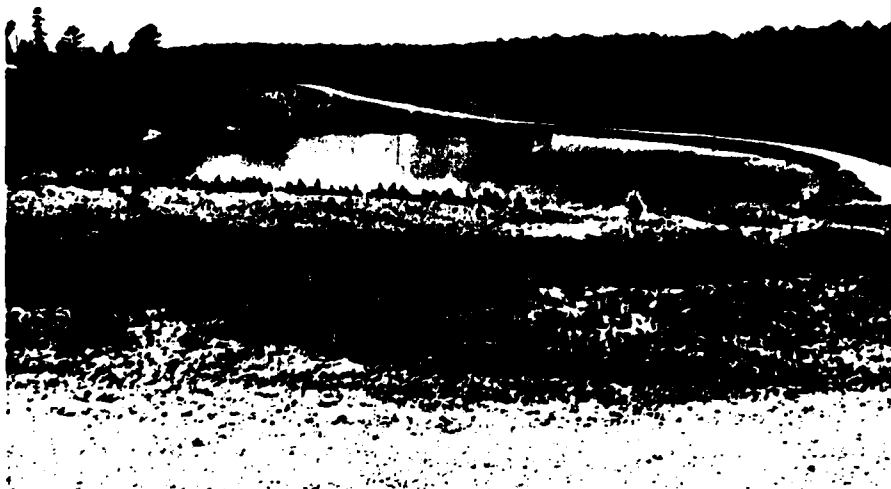


PHOTO 1E: Overview of Lake and Dam



PHOTO 2E: Upstream Embankment



PHOTO 3E: Downstream Embankment



PHOTO 4E: Inlet of Vertical Discharge



PHOTO 5E: Discharge of Vertical Structure



PHOTO 6E: Outlet Channel



PHOTO 7E: Erosion Gulley in Downstream  
Embankment at Left Abutment



PHOTO 8E: Erosion Gulley on Downstream Embankment

**AFFECTED DOWNSTREAM FEATURES**





PHOTO 1F: Dwellings Downstream of Turkey Creek Dams



PHOTO 2F: Dwellings Downstream of Turkey  
Creek Dams

