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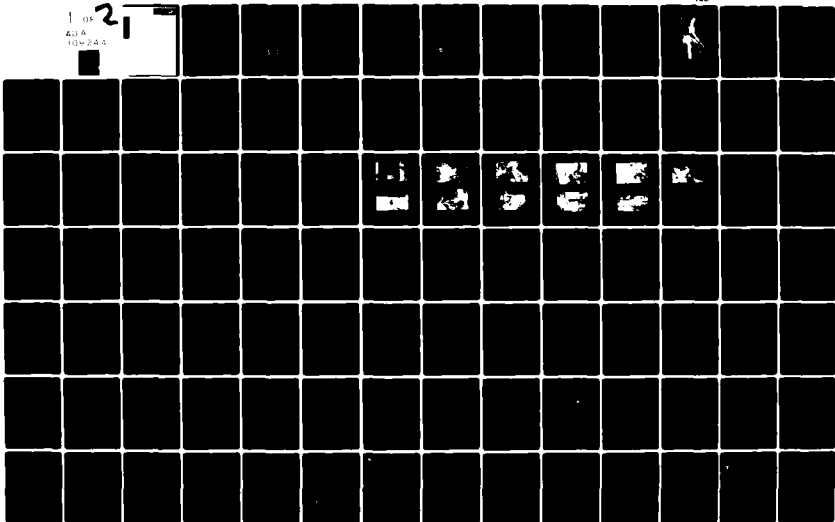
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NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE, --ETC(U)  
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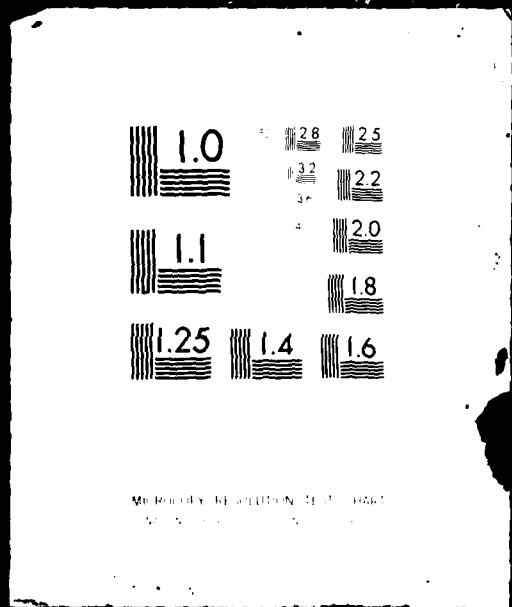




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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. <b>DA-A108244</b>	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) National Program of Inspection of Non-Federal Dams Tennessee. Houser Creek Dam No. 2 (Inventory Number TN 13114) near Union City, Tennessee, Obion County, TN., North Fork Obion River Basin.		5. TYPE OF REPORT & PERIOD COVERED Phase 1 Investigation Report
7. AUTHOR(s)		6. PERFORMING ORG. REPORT NUMBER
8. PERFORMING ORGANIZATION NAME AND ADDRESS Winsett-Simonds, Consterdine & Associates, Inc. P.O. Box 40045 Memphis, Tennessee 38104		9. CONTRACT OR GRANT NUMBER(s) DACW-62-81-C-0056
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, Nashville P.O. Box 1070 Nashville, TN 37202		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Tennessee Department of Conservation Division of Water Resources 4721 Trousdale Drive Nashville, TN 37220		12. REPORT DATE September, 1981
		13. NUMBER OF PAGES
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams Dam Safety National Dam Safety Program Houser Creek Dam No. 2, TN Union City, TN  Obion County, TN Embankments Visual Inspection Structural Analysis		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Houser Creek Dam No. 2 is located in Obion County, Tennessee approximately 2 miles north of Union City, Tennessee. It is an earth fill embankment 26.5 feet high and 1350 feet long and impounds a 23.8 acre lake. The crest width is 14 feet. Facilities for discharge from the reservoir include a concrete service spillway with inside intake dimensions of 9 feet by 3 feet. The riser is 15 feet high located near the center of the impoundment with a 36 inch concrete pipe barrel through the dam. The emergency spillway is located in the left abutment and has a bottom width of 200 feet and side slopes of 1V on 3H. Its		

depth below the low point of the dam is 4.5 feet. A slide gate is attached to the upstream face of the service spillway at the bottom to draw down the impoundment. (At the time of inspection, this gate was open and the impoundment was drawn down.) The embankment slopes are approximately 1V on 3H on the downstream slope and 1V on 3H on the upstream slope. The lack of proper maintenance was found to be the major problem during the inspection of Houser Creek Dam No. 2. A dense growth of trees and brush covered both the downstream and upstream slopes of the dam. The concrete riser also showed signs of vandalism with the removal of debris guards. The dense vegetation on the slopes of the dam prevented a close inspection of the conditions of the slope. The dam is in the small size category and has a downstream hazard potential classification of high by the Corps of Engineers and "I" by the State of Tennessee. On the basis of hydraulic analysis, Houser Creek Dam No. 2 flood storage (845 acre-feet) and emergency spillway are adequate to safely pass the 1/2 Probable Maximum Flood (PMF), which the Office of the Chief of Engineers (O.C.E.) Guidelines specify to be the design flood for a dam in the small size and high hazard categories. At this time, the dam is considered "Significantly Deficient". It is recommended that a qualified engineer be engaged to: Recommend measures to the owner for removal of all trees and underbrush from both slopes of the dam; determine if any unsafe conditions exist on both slopes of the dam after removal of the vegetation; inspect riser, barral, and plunge pool and recommend remedial measures if needed; evaluate the stability of the dam with earthquake loading; development an emergency action plan to alert downstream residents in the event a major problem develops with Houser Creek Dam No. 2; and, develop a regular inspection and maintenance plan.

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DEPARTMENT OF THE ARMY  
NASHVILLE DISTRICT, CORPS OF ENGINEERS  
P. O. BOX 1070  
NASHVILLE, TENNESSEE 37202

21 SEP 1981

IN REPLY REFER TO

ORND-G

Honorable Lamar Alexander  
Governor of Tennessee  
Nashville, TN 37219

Dear Governor Alexander:

Furnished herewith is the Phase I Investigation Report on Houser Creek Dam No. 2 near Union City, Tennessee. The report was prepared under the authority and provisions of PL 92-367, the National Dam Inspection Act, dated 8 August 1972.

The report presents details of the field inspection, background information, technical analyses, findings, and recommendations for improving the condition of the dam.

Based upon the inspection and subsequent evaluation, Houser Creek Dam No. 2 is classified as significantly deficient due to excessive growth of trees and brush on the embankment.

The recommendation concerning removal of the trees and brush on the embankment and others contained in this report should be undertaken in the near future.

Public release of the report and initiation of public statements fall within your prerogative. However, under provisions of the Freedom of Information Act, the Corps of Engineers is required to respond fully to inquiries on information contained in the report and to make it accessible for review on request.

Your assistance in keeping me informed of any further developments will be appreciated.

Sincerely,

*Lee W. Tucker, LTC*

LEE W. TUCKER  
Colonel, Corps of Engineers  
Commander

1 Incl  
As stated

CF:  
Mr. Robert A. Hunt, Director  
Division of Water Resources  
4721 Trousdale Drive  
Nashville, TN 37220

PHASE I INSPECTION  
HOUSER CREEK DAM NO. 2  
OBION COUNTY, TENNESSEE

Prepared By:  
WINSETT-SIMMONDS, CONSTERDINE & ASSOCIATES, INC.



## ABSTRACT

Houser Creek Dam No. 2 is located in Obion County, Tennessee approximately 2 miles north of Union City, Tennessee. It is an earth fill embankment 26.5 feet high and 1350 feet long and impounds a 23.8 acre lake. The crest width is 14 feet. Facilities for discharge from the reservoir include a concrete service spillway with inside intake dimensions of 9 feet by 3 feet. The riser is 15 feet high located near the center of the impoundment with a 36 inch concrete pipe barrel through the dam. The emergency spillway is located in the left abutment and has a bottom width of 200 feet and side slopes of 1V on 3H. Its depth below the low point of the dam is 4.5 feet. A slide gate is attached to the upstream face of the service spillway at the bottom to draw down the impoundment. At the time of inspection, this gate was open and the impoundment was drawn down.

The embankment slopes are approximately 1V on 3H on the downstream slope and 1V on 3H on the upstream slope. The lack of proper maintenance was found to be the major problem during the inspection of Houser Creek Dam No. 2. A dense growth of trees and brush covered both the downstream and upstream slopes of the dam. The concrete riser also showed signs of vandalism with the removal of debris guards. The dense vegetation on the slopes of the dam prevented a close inspection of the conditions of the slope.

Houser creek Dam No. 2 is in the small size category and has a downstream hazard potential classification of high by the Corps of Engineers and "I" by the State of Tennessee.

On the basis of hydraulic analysis, Houser Creek Dam No. 2 flood storage (845 acre-feet) and emergency spillway are adequate to safely pass the  $\frac{1}{2}$  Probable Maximum Flood (PMF), which the Office of the Chief of Engineers (O.C.E.) Guidelines specify to be the design flood for a dam in the small size and high hazard categories.

At this time, the dam is considered "Significantly Deficient". It is recommended that a qualified engineer be engaged to: Recommend measures to the owner for removal of all trees and underbrush from both slopes of the dam; determine if any unsafe conditions exist on both slopes of the dam after removal of the vegetation; inspect riser, barrel, and plunge pool and recommend remedial measures if needed; evaluate the stability of the dam with earthquake loading; develop an emergency action plan to alert downstream residents in the event a major problem develops with Houser Creek Dam No. 2; and, develop a regular inspection and maintenance plan.

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OVERVIEW PHOTO

PHASE I INSPECTION  
HOUSER CREEK DAM NO. 2  
OBION COUNTY, TENNESSEE

SECTION 1 - GENERAL

- 1.1 Authority - The Phase I inspection of this dam was carried out under the authority of the Tennessee Code Annotated 70-2501 to 70-2530, "The Safe Dams Act of 1973", in cooperation with the Corps of Engineers under the authority of PL 92-367, "The National Dam Inspection Act".
- 1.2 Purpose and Scope - This report is prepared under guidance contained in Department of the Army, Office of the Chief of Engineers, Recommended Guidelines for Safety Inspection of Dams, for a Phase I investigation. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analysis involving topographic mapping, subsurface investigation, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. Additional data or data furnished containing incorrect information could alter the findings of this report.

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

- 1.3 Past Inspections - Annual inspections are made by the USDA Soil Conservation Service. The last inspection was made on May 27, 1980.
  
- 1.4 Miscellaneous Details - On the day of the Phase I inspection, the weather was clear with a temperature of 87 degrees and the wind was calm. The level of the lake was drawn down to the elevation of the gate valve at the bottom of the riser.
  
- 1.5 Inspection Team Members - Field inspection was made by the following Winsett-Simmonds, Consterdine & Associates, Inc. personnel:

William E. Bush, P.E.  
Civil Engineer

Dr. Fred H. Kellogg, P.E.  
Geotechnical Engineer

The team was accompanied by Messrs. George Moore and David Roe of the Tennessee Division of Water Resources.

## SECTION 2 - PROJECT DESCRIPTION

2.1 Location - Houser Creek Dam No. 2 is located in Obion County, Tennessee approximately two miles north of Union City, Tennessee. It can be located on USGS map "Union City, Tennessee" at longitude  $89^{\circ}5'52''$  and latitude  $36^{\circ}26'45''$ .

### 2.2 Description

2.2.1 Embankment - The Houser Creek Dam No. 2 is an earth embankment dam with a northeast-southwest orientation, a maximum height of 26.5 feet and a length of 1350 feet. The crest width is 14 feet. The upstream slope averages 1V on 3H and the downstream slope averages 1V on 3H.

2.2.2 Service Spillway/Low Level Outlet - The service spillway is a concrete structure with inside dimensions of 9 feet by 3 feet and is 15 feet high. This structure has a 36 inch concrete pipe barrel through the dam with a cantilevered outlet. Drawdown facilities are provided by a 24 inch head gate attached to the bottom of the concrete riser.

2.2.3 Emergency Spillway - The emergency spillway is located in the left abutment and has a bottom width of 200 feet and side slopes of 1V on 3H. Its depth below the low point of the dam is 4.5 feet and its maximum capacity at this depth was calculated to be 5100 cfs.

- 2.2.4 Reservoir and Drainage Area - The reservoir has a surface area of 23.8 acres at normal pool elevation with a fetch of 1100 feet. The normal impounding capacity of the reservoir is estimated to be 58.2 acre-feet with an additional 845 acre-feet of flood storage. The drainage area is 730 acres and the predominant soil association is Memphis-Loring-Grenada.
- 2.2.5 Miscellaneous - The dam was built in 1964 under PL 566, "The Watershed Protection and Flood Prevention Act". The design was by the USDA Soil Conservation Service, Nashville, Tennessee. The present owner is Dr. W. B. Dunlap. The Houser Creek Watershed District is responsible for maintenance of the structure.

## SECTION 3 - INSPECTION FINDINGS

### 3.1 Specific Findings

#### 3.1.1 Embankment

Geology - The soils found in the area of Houser Creek Dam No. 2 are generally low plasticity, silty clay belonging to Group "CL" of the Unified Classification System.

The Houser Creek Dam No. 2 lies upon the unconsolidated sediments of the Gulf Coastal Plain. These sedimentary beds have a gradual dip in a West-North West direction. This area is blanketed with 20 feet or more of brown silty loess.

Formations of the Eocene series lies below the loess. The Jackson formation lies immediately below the loess and below this are formations of the Claiborne group. Shallow wells in the area, less than 130 feet in depth, usually tap sand members in the Jackson formation. Deeper wells in the area tap the thick sands of the Claiborne group.

Crest - The longitudinal alignment of Houser Creek Dam No. 2 is straight with a northeast-southwest orientation. The crest is traversed with a unpaved road that is in poor condition with several deep ruts made by vehicle traffic that were holding water. Approximately, the west half of the crest has been pitched so that water drains down the backslope.

The crest receives very little protection from the remaining sod. No longitudinal or transverse surface cracks were observed on the crest. The reservoir had been completely drawn down at the time of inspection.

Upstream Slope - The undesirable vegetative growth on this slope is extremely bad. Trees up to 8 inches in diameter, honeysuckle, and blackberry vines prevent a close observation of the upstream slope. In a few open areas, the slope appeared to be benched with a series of small benches approximately two feet horizontal and one foot vertical. No cracks were observed, but a hole (jug) was found near the center of the dam. This hole was approximately 12 to 18 inches deep and 6 inches in diameter and ran parallel to the slope for approximately three feet.

Downstream Slope - Undesirable vegetation similar to that of the upstream slope completely covered the downstream slope and make the observation of holes and other deformities difficult. Several open paths have been made by off-the-road recreational vehicles on the downstream slope. A small bulge was discernable, approximately halfway down the slope on several of the paths located on the western half of the dam. No surface cracks were noted on the slope nor was there evidence of heaving at the embankment toe. The eastern end

of the toe has been encroached on by plowing and other cultivation. No wet or saturated areas or other evidences of seepage were noted. The toe drain was functioning as evidenced by flow from both pipes adjacent to the 36 inch barrel.

Abutment - No erosion of contact of the embankment with the abutment or surface water runoff was observed. The abutments appeared to be in good condition.

3.1.2 Seismic Zone - The Houser Creek Dam No. 2 is in Seismic Zone 3. No record of any stability analysis could be found.

3.1.3 Seepage - There was no evidence of seepage observed during this inspection.

3.1.4 Spillways - The service spillway for Houser Creek Dam No. 2 is beginning to show neglect. Maintenance has not been performed on this structure recently as the debris guards have been removed. Debris completely covers the screen that protects the orifice from debris. Vegetation surrounding the service spillway is so dense that the service spillway structure cannot be observed from approximately 25 feet away. Channels have been dug near the service spillway to drain the sediment pool that has exposed the foundations of the service spillway structure.

The emergency spillway is located in the left abutment. The general condition of the emergency spillway is fair. The entrance channel is grown up with trees and other small brush and in the control section, trees are beginning to grow. The exit channel presently is clear with the lower section under cultivation.

3.1.5 Downstream Inspection and Hazard Classification - The Houser Creek Dam No. 2 has a hazard potential classification of high. There are approximately ten houses located 4500 feet below the dam that are in the probable flood path in the event of a failure of the Houser Creek Dam No. 2.

3.1.6 Hydrology and Hydraulics - According to O.C.E. Guidelines, dams with a high hazard, small size classification should have storage and spillway capacity to pass the  $\frac{1}{2}$  to full PMF without overtopping the dam. The Probable Maximum Precipitation (PMP) is 28.6 inches in 6 hours, yielding 26.60 inches to runoff. Time of concentration was estimated to be 0.57 hours and flood storage from normal pool to the low point of top of dam is estimated to be 845 acre-feet. Routing of the  $\frac{1}{2}$  PMF (Antecedent Moisture Condition II), produced a peak outflow of 1457 cfs which was safely passed by the structure.

The full PMF was routed through the dam and produced a peak outflow of 5746 cfs. The impoundment cannot pass this peak discharge without minor overtopping of 0.1 feet for 0.25 hours.

The 100-year, 6 hour (AMC III), flood was routed through the structure. The 100-year, 6 hour precipitation was 5.2 inches. The Houser Creek Dam No. 2 contained this storm without flow in the emergency spillway.

### 3.2 Conclusions and Recommendations

#### 3.2.1 Conclusions

- a. Hydraulic analysis indicated that the Houser Creek Dam No. 2 can safely pass the design flood ( $\frac{1}{2}$  PMF) and can pass the full PMF with minor overtopping of 0.1 feet for 0.25 hours.
- b. On the basis of engineering judgement and visual observations, the embankment appears to be stable.
- c. Dense undesirable vegetation covers both slopes of the dam making close observation of the slope surfaces almost impossible. The trees and brush should be removed and replaced with sod.
- d. The riser appears to have been vandalized as evidenced by the removal of the trash guards and by channels cut at the base of the riser exposing the foundations and the top of the 36 inch conduit.

- e. The plunge pool for the outlet pipe is eroding the slope behind the pipe and could cause future problems if not corrected.
- f. Houser Creek Dam No. 2 is within Seismic Zone 3. Stability analysis of the embankment with earthquake loading is not within the scope of this report.
- g. Houser Creek Dam No. 2 is considered "Significantly Deficient" due to the undesirable vegetation on both the upstream and downstream slopes and in the emergency spillway.

### 3.2.2 Recommendations

A qualified engineer should be engaged to:

- a. Plan and supervise the removal of all trees and underbrush from both slopes of the dam and emergency spillway.
- b. Determine if unsafe conditions exist on both slopes of the embankment and design and supervise construction of remedial measures to provide a safe embankment, if necessary.
- c. Investigate the service spillway system and suggest corrective measures if needed.
- d. Evaluate the stability of the dam with earthquake loadings.
- e. Develop a regular program for inspection and maintenance of the embankment and spillway on at least an annual basis.

- f. Develop an emergency action plan to alert downstream residents in the event a major problem develops with Houser Dam No. 2.

The owner should replace the trash bars on the riser as soon as possible.

#### SECTION 4 REVIEW BOARD FINDINGS

The Interagency Review Board for the National Program of Inspection of non-Federal Dams met in Nashville on 6 August 1981 to examine the technical data contained in the Phase I investigation report on Houser Creek Dam No. 2. The Review Board considered the information and recommended that (1) in Section 3.1.1, the paragraph on Geology should be expanded to include a more detailed description of the geology of the area, and (2) the condition classification be changed from "deficient" to "significantly deficient." They agreed with other report conclusions and recommendations. A copy of the letter report presented by the Review Board is included in Appendix F.

APPENDIX A  
DATA SUMMARY SHEET



### A.3 OUTLET STRUCTURES

- A.3.1 Drawdown Facilities - 24" diameter slide gate on concrete riser. Invert elevation 362.0 feet MSL.
- A.3.2 Service Spillway - Concrete riser with inside dimensions of 3.0 feet width and 9.0 feet length. Low stage orifice 6" x 30" at elevation 357 and two high stage weirs 9 feet long and one foot high at elevation 362. Outfall pipe through dam is 36" I.D.
- a. Normal pool elev. 357 feet MSL
  - b. Length of pipe 158 feet
  - c. Maximum discharge capacity 190 cfs
- A.3.3 Emergency Spillway (left abutment)
- a. Crest elevation 364 feet
  - b. Side slope (left) 1V on 3H
  - c. Side slope (right) 1V on 3H
  - d. Depth 4.5 feet
  - e. Bottom width 200 feet
  - f. Maximum capacity 5100 cfs
  - g. Control section 20 feet
- A.3.4 Emergency Spillway (right abutment) None

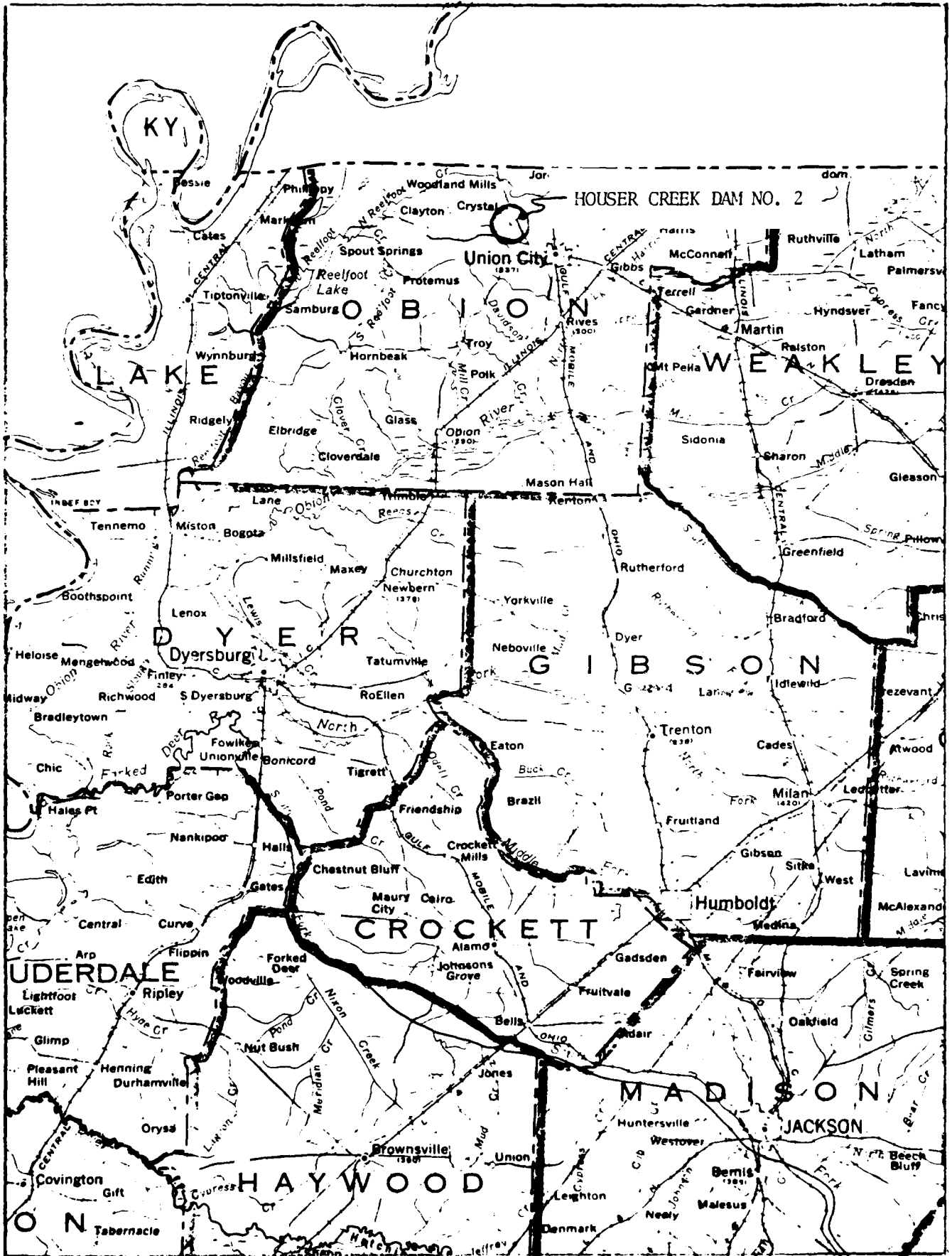
### A.4 HISTORICAL DATA

- A.4.1 Construction Date 1964
- A.4.2 Designer USDA-SCS
- A.4.3 Builder Holt Construction
- A.4.4 Owner Dr. W. B. Dunlap
- A.4.5 Previous Inspection SCS 5/27/80
- A.4.6 Seismic Zone 3

### A.5 DOWNSTREAM HAZARD DATA

- A.5.1 Downstream Hazard Potential Classification
- a. Corps of Engineers High
  - b. State of Tennessee I
- A.5.2 Persons in Probable Flood Path 30
- A.5.3 Downstream Property 10 houses & street
- A.4.4 Warning Systems None

APPENDIX B  
SKETCHES AND LOCATION MAPS



LOCATION MAP  
16

Cone

PIPE

BM

377

381

369

372

Dak Grove Park

372

374

378

384

103

Salem Ch

393

375

M 17

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HOUSER CREEK #2

384

(22)

363

365

BM 364

McDowell Chapel

Hoosier

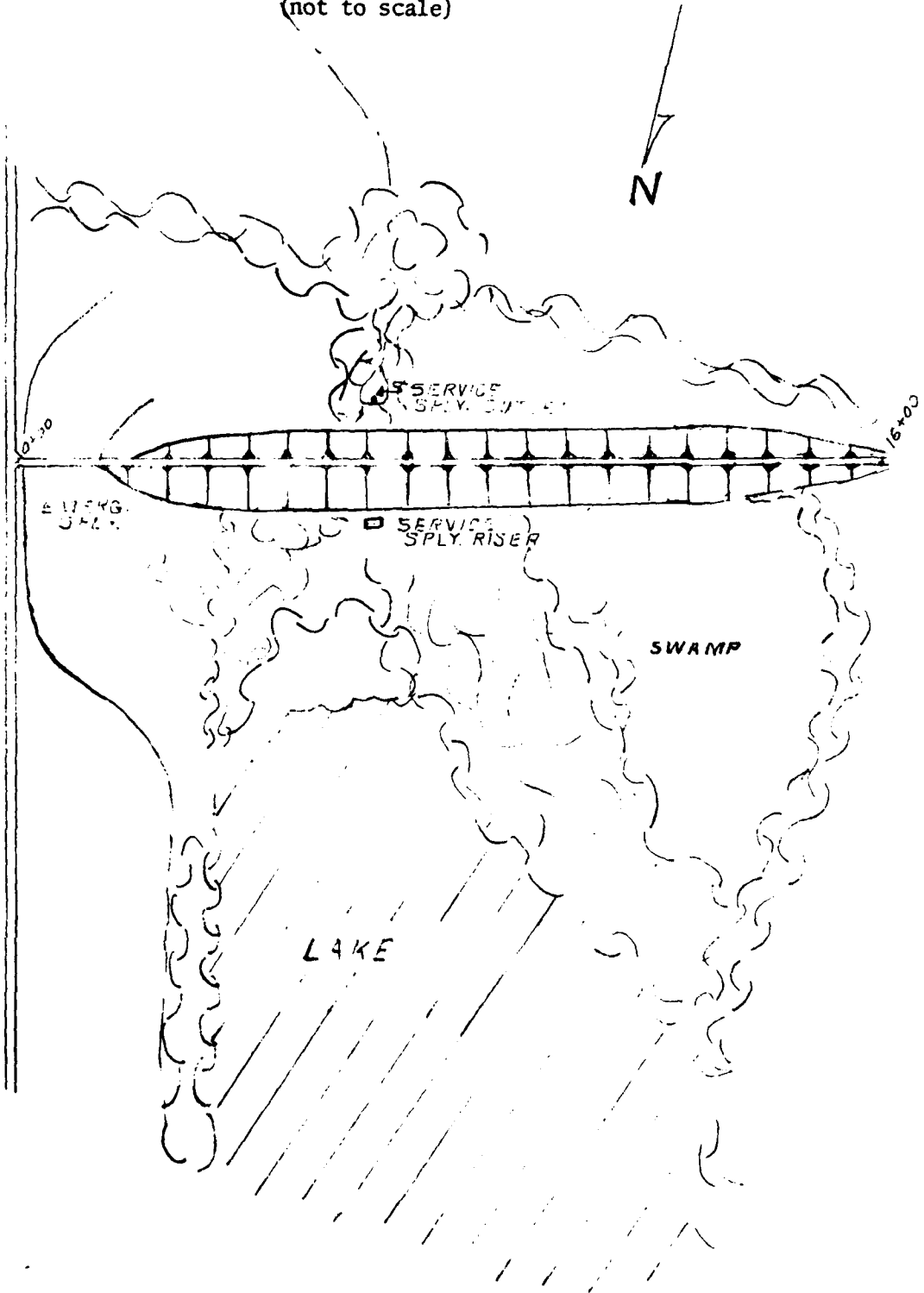
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Houser Creek #2  
Union City  
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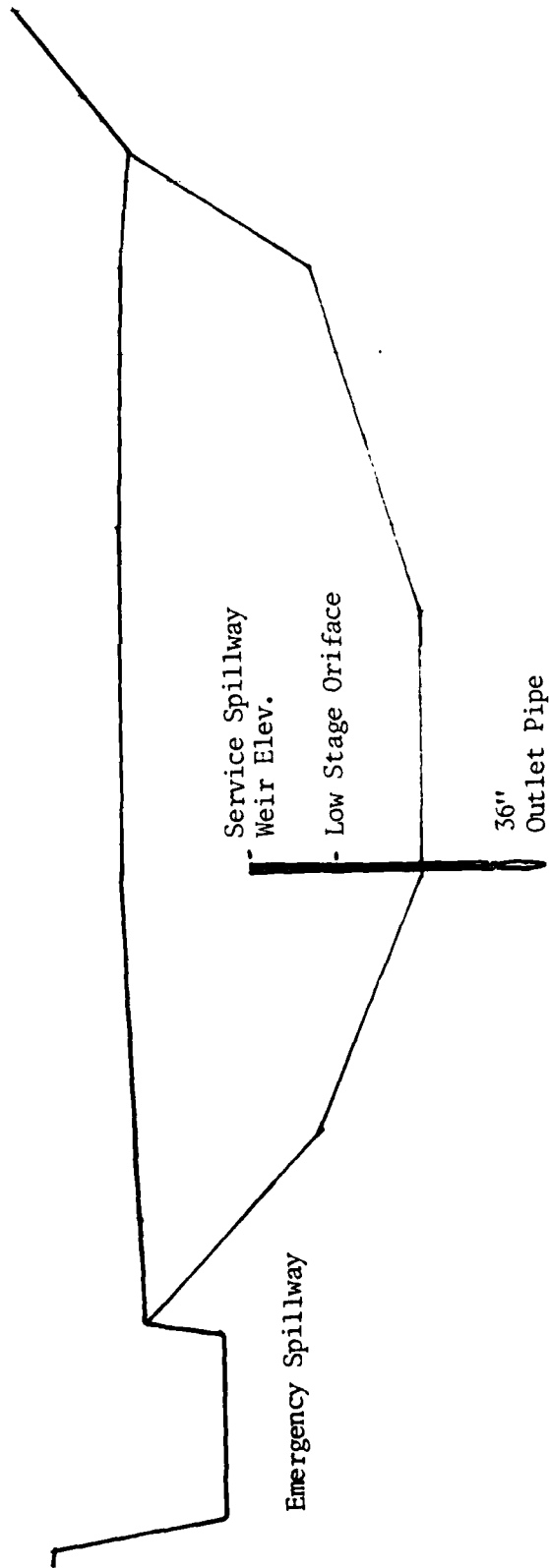
HOUSER CREEK DAM NO. 2

GENERAL PLAN  
(not to scale)



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HOUSER CREEK DAM NO. 2  
OBION COUNTY  
PROFILE

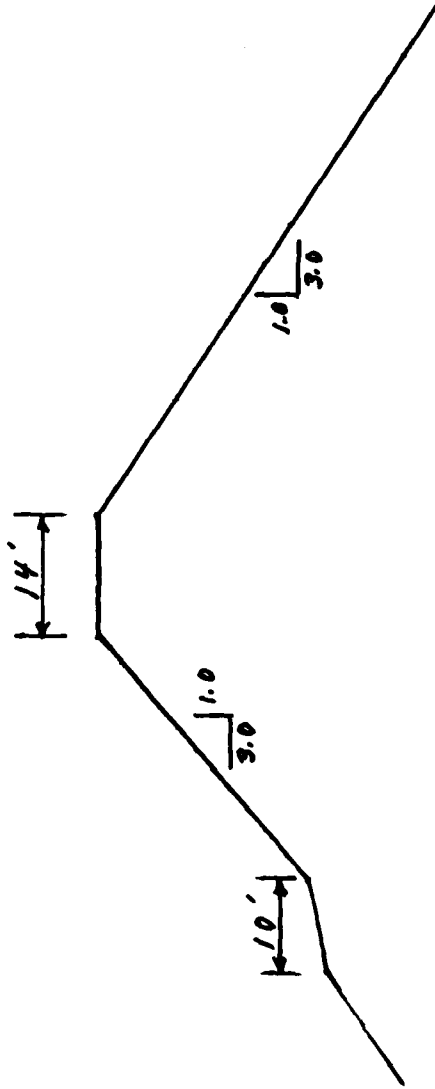


0 2 4 6 8 10 12 14 16 18 20  
100 Feet

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HOUSER CREEK DAM NO. 2  
OBION COUNTY  
TYPICAL CROSS-SECTION



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360

350

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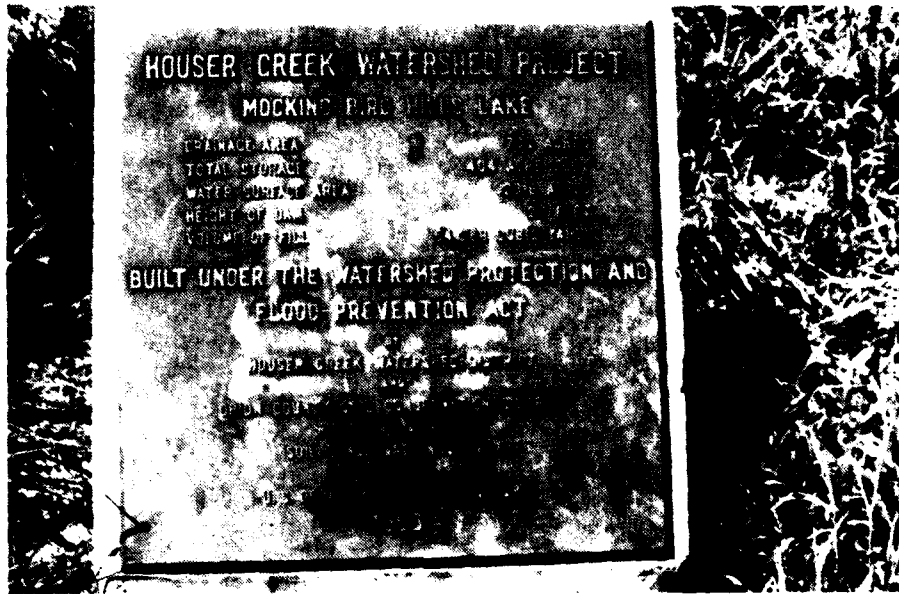
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APPENDIX C  
PHOTOGRAPHIC RECORD



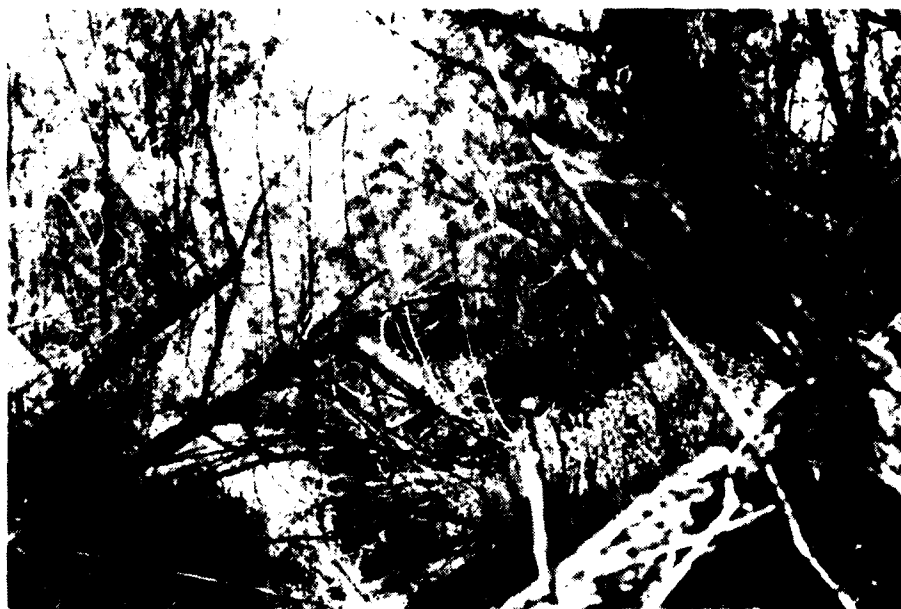
1. Monument for Houser Creek Dam No. 2.



2. View of top of Houser Creek Dam No. 2 from west abutment.



3. Downstream slope near east abutment-typical tree and brush growth.



4. Typical upstream slope vegetative growth. Note riser in center of picture.



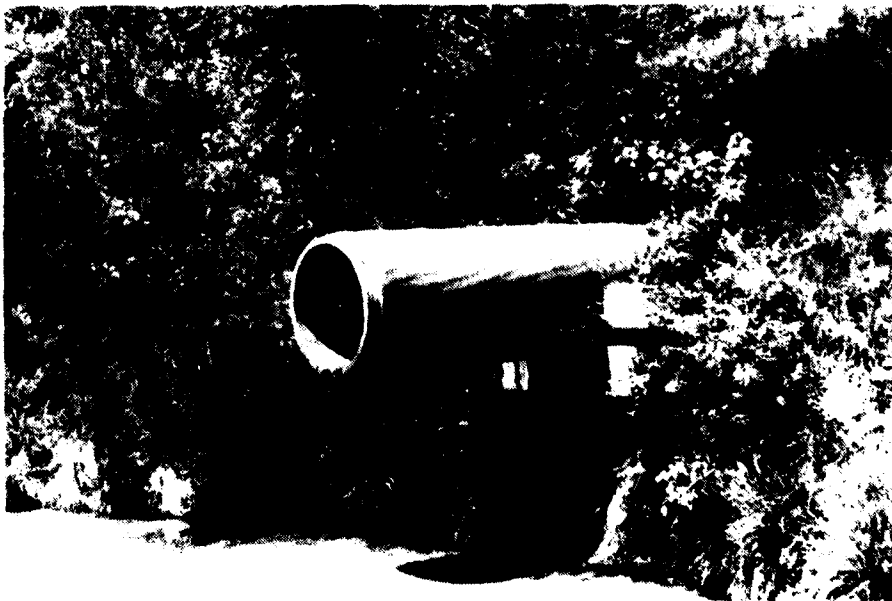
5. Hole in upstream slope of Dam approximately 6 inches in diameter at top, 15 inches deep and runs parallel to slope approximately 3 feet.



6. Close up of service spillway riser. Note debris guards have been removed.



7. Excavation at base of riser has exposed foundation and top of pipe.



8. 36 inch outfall pipe and plunge pool.



9. Erosion of bank behind 36 inch outfall pipe above plunge pool.



10. Control section of emergency spillway in east abutment.



11. Subdivision immediately below Houser Dam No. 2.

APPENDIX D  
INSPECTION TEAM TRIP REPORTS

TRIP REPORT  
HOUSER DAM NO. 2  
OBION COUNTY, TENNESSEE

GENERAL ENGINEERING OBSERVATIONS  
April 28, 1981

General. An engineering inspection was made of the Houser Creek Dam No. 2 with Dr. Fred H. Kellogg, Kellogg Engineering. The team was accompanied by Messrs. George Moore and David Roe of the Tennessee Division of Water Resources. The weather was clear with a temperature of 87 degrees. The wind was calm. The water level of the lake had been drawn down to the invert of the gate valve on the riser.

Embankment. The longitudinal alignment of Houser Creek Dam No. 2 is straight with a northeast-southwest orientation. The crest is traversed with an unpaved road that has several deep ruts made by vehicle traffic that were holding water. The west half of the crest appears to be pitched so that water drains down the backslope. It is estimated that there is a two foot differential in height between the upstream and downstream elevations. No longitudinal or transverse surface cracks were noted. The general condition of the surface is poor. The average top width of the dam is estimated to be 15 feet.

The upstream slope is completely covered with a dense growth of trees up to eight inches in diameter, honeysuckle, and blackberry vines. The slope is impenetrable at certain areas and machetes have to be used to cut through to inspect the surface. The slope is benched with a series of small benches approximately two feet horizontal and one foot vertical. No riprap was observed on

this slope for protection. No cracks were observed, but a hole (jug) was found near the center of the dam. This hole was approximately 12 to 18 inches deep and about 6 inches in diameter at the top. The hole paralleled the slope for approximately three feet.

The downstream slope was essentially in the same condition as the upstream slope with regard to undesirable vegetation. This vegetation made it difficult to observe holes and other deformities on the downstream slope. However, there appears to be a small bulge approximately halfway down the slope along the western half of the dam. There were no surface cracks noted on this slope. No surface cracks or evidence of heaving was noted but at the eastern end of the toe, it has been encroached upon by plowing and the cultivation of the field. There were no wet areas or evidence of seepage on the face of the slope, but the brush and trees were too dense to make a good inspection. The toe drain was functioning. The fill contact with the outlet structure appeared to be good but the plunge pool has eroded back behind the pipe. There was no erosion of contact of the embankment with the abutment from surface water runoff on the upstream or downstream slopes. No springs or indications of seepage along the contact were noted. No springs or indications were noted even a short distance downstream from the embankment.

Instrumentation. There were no monuments for surveys nor were there any observation wells, weirs, piezometers nor other instrumentation.

Spillways. The service spillway is a concrete structure with inside dimensions of 9 feet by 3 feet and is 15 feet high. This structure is a two stage structure

and has a low stage orifice and a high stage weir. The debris guards have been removed from the structure and the orifice guard is completely covered with debris. The 24 inch head gate has been opened and the lake has been drained down to that level. The outlet structure is a 36 inch concrete pipe. Channels have been cut around the structure for drainage so that the foundation of the riser is now exposed. The top portion (8 to 12 inches) of the barrel at its junction with the riser has been exposed. The outlet structure at the downstream end of the pipe is in good condition, but the plunge pool around the cantilevered brace has severe erosion. The toe drains, corrugated metal pipes, were working as evidenced by a small flow from each. The 36 inch pipe barrel appears to be in good condition, from observation of the outlet end.

The emergency spillway is located in the left abutment. The general condition is fair. The entrance channel is grown up in trees and other small brush. Trees are beginning to grow at the entrance of the control section. The exit channel is clear with the lower end of the exit channel being under cultivation. Both the emergency and service spillways are badly in need of maintenance.

The emergency drawdown facility is a gate valve on the service spillway riser. It was open at the time of inspection.

Reservoir. The reservoir slopes are covered with heavy brush near the dam. Upstream, the areas are cleared and appear to be adjacent to cultivated fields. The conditions of the upstream reservoir appear that sedimentation is a problem. Outflow from the structure at this point is very turbid.

Recommendations. The most serious deficiency noted during this inspection is the

lack of maintenance on the structure. The tall trees, blackberry vines, and saplings on both slopes should be removed and both slopes be inspected in detail by a engineer qualified in dam inspections.

Wm. E. Bush, P.E., Director  
Civil & Water Resources Engr.  
TN License No. 4177

MOCKINGBIRD HILLS LAKE  
HOUSER CREEK DAM NO. 2

INTRODUCTION. This is an earth flood control dam built by the U.S. Soil Conservation Service in 1964. The dam is located just west of State Highway No. 5, about two miles northwest of Union City, Tennessee. It is 27 feet high, with a normal pool of 23.8 acres and a maximum surface of 112 acres. The elevation of the top of the dam is 368 feet, that of the normal pool is at 357 feet. The volume of earth fill is 54,268 cubic yards. The lake is fed by a 732 acre drainage area. The dam has been classified as high hazard. The soils are generally low plasticity, silty clay, belonging to Group "CL" in the Unified System.

LEFT (SOUTHEAST) ABUTMENT. This abutment is a gently sloping loess hill, heavily covered with grass and weeds, but with almost no trees. The highway runs along the abutment ridge. No contact erosion has developed at the contact of the abutment and the fill.

EMERGENCY SPILLWAY. The emergency spillway is located at the left abutment. The spillway crest is at elevation 364, and is supposed to be 200 feet wide at this level. The spillway is so irregular and overgrown with grass, bush, and weeds, that this could not be verified. The spillway slopes are quite flat, except at the northwest side, where the road crosses the spillway and transverses the crest steeply. To enter the spillway, it rises steeply again to the west of the dam. A path leading from the crest of the dam to the upstream side of the spillway has

developed some erosion near the crest. The outlet channel leads directly downstream then turns to run at a flat angle to the dam. It is heavily overgrown with grass, bush, and vines. The approach channel rises gently from the normal pool level. Water is retained by an earth furrow at about six inches above a swamp buggy road leading across this channel.

CREST. The crest is 1,350 feet long and 14 feet wide. A rough, unstabilized road runs along the crest. This is half bare, and had water standing in low spots. The crest slopes downstream along virtually the entire length. Where water had been standing, the soil has formed hexagonal drying cracks. The dry soil forms a fine dust under traffic. No longitudinal nor transverse cracks were found. Along the shoulders, there is a heavy grass cover, so cracks, holes, or jugs, if any, are difficult to impossible to see. The soils belong to Group "ML" in the Unified System.

UPSTREAM SLOPE. This slope was design at IV on 3H. The slope roughly conforms to this, but has developed small benches about a foot, vertically. The slope is generally rough under the the grass along its entire length. It is heavily covered with bush and three to four inch trees, so that, in places, the slope cannot be seen at all. It was possible to determine that erosion had developed under the grass. Near the southeast abutment, the slope is benched and sloughing right at the top of the dam. Toward the northwest, the maximum size of the trees increases to six inches. About two thirds of the way across the dam, a good sized jug has developed in a small bench, a few feet below the crest. It is about six inches in diameter, and extends downward vertically about a foot, then slopes down

another two feet. The slope still has small benches, but they are not as numerous here as they were near the southeast abutment. One lower bench was found about three to four feet above the bottom of the slope, apparently at an old water line.

As the northwest abutment is approached, the maximum size of trees increases to eight to ten inches. The slope here is hidden by bush and vines. About 300 feet from the northwest abutment, there is a small bulge showing on a path leading down the slope. Honeysuckle vines hide the slope for the rest of the way to the northwest abutment.

SERVICE SPILLWAY. The service spillway is a 36 inch reinforced concrete pipe 158 feet long. The riser is just beyond the upstream toe and about one third of the way from the southeast to the northwest abutment. Draw-down is controlled by a slide gate at the riser. High stage pool at elevation 362, and the outlet is at elevation 345. The spillway discharges into a plunge pool. The side just southeast of the pipe has eroded to a vertical, and in places, undercut bank. A berm has been erected between the pool and the downstream toe of the dam. A slight trickle was coming out of the pipe.

NORTHWEST ABUTMENT. The northwest abutment is a loess hill that rises to a considerable height above the crest of the dam. The slope is well covered with grass. No signs of contact erosion were present.

DOWNSTREAM SLOPE. The downstream slope was constructed at 1V on 3H, and generally maintains this slope, although some bulges and benches have

developed. The slope is protected by a blanket drain discharging into two pipes located on either side of the service spillway. Both pipes were discharging small streams of water.

No signs of seepage, wet spots or phreatophytes were noted, although this slope, like the upstream slopes, is so heavily covered with bush, vines, and trees that such conditions could have been missed. Considering the slopes, active blanket drain, and tight soil, it is highly unlikely that any surface seepage has developed.

Near the northwest abutment, this slope is benched just below the crest. The entire slope is very rough, and erosion has developed under the grass. Some stooling has occurred near the northwest abutment. About 300 feet from the northwest abutment, a bulge was seen along a path, about half-way down the slope. About 600 feet from this abutment, another path showed a bulge which looks like the same one. Another 50 feet to the southwest, is a bulge close to the crest. Still another 150 feet to the southeast, the bulge is about halfway down the slope, on a path. Where there are no paths, the slope cannot be seen in this area. The bulge is still visible 150 feet on, through the trees. Near the path to the riser, the downstream slope is benched about one third of the way down from the crest.

The honeysuckle gets thicker and the slope less visible as the southeast abutment is approached. The slope is still rough where the dam is only ten feet high.

RECOMMENDATIONS. In general, the dam appears well-built and safe. However, the growth needs to be burned off both slopes so that these slopes can be inspected more adequately. This is particularly true of the downstream slope. The slopes should be protected by vegetation that develops a thicker root complex than that presently available. After the slopes are cleared, the necessity for any building up or smoothing of the slopes can be better judged. The plunge pool needs protection along its upstream side, with rock or concrete fragments or filter cloth. A more adequate maintenance schedule needs to be developed.

Report submitted 25 May 1981

F. H. Kellogg, P.E.  
Consulting Engineer

APPENDIX E  
HYDRAULIC AND HYDROLOGIC DATA

## HYDRAULICS AND HYDROLOGIC CALCULATIONS

Houser Creek Dam No. 2 is located in Obion County, Tennessee. The present land use is estimated to be 73 percent cultivated, 24 percent pasture, and 3 percent water. The soil is predominantly Memphis-Loring-Grenada and is classified as a "C" soil. The runoff curve number was calculated to be 85 AMC II.

The Houser Creek Dam No. 2 is a small size, high hazard potential dam. As such it is required to pass the  $\frac{1}{2}$  PMF without overtopping. Using the U.S. Weather Service TP-40, the 6-hour PMP was estimated to be 28.6 inches yielding 26.60 inches runoff (RCN 85 AMC II). The  $\frac{1}{2}$  PMF which is derived from the Probable Maximum Precipitation was routed with a 13.30 inch runoff (RCN 85 AMC II).

The total inflow of the  $\frac{1}{2}$  PMF into the reservoir is about 809 acre-feet with a maximum peak of 6712 cfs. Houser reservoir has a maximum storage from the crest of the service spillway to the top of the dam of 845 acre-feet and a maximum spillway discharge rate of 5140 cfs. The impoundment is adequate to safely pass the  $\frac{1}{2}$  PMF.

The total inflow of the full PMF into the reservoir is about 1618 acre-feet with a maximum peak of 12,257 cfs. The routed peak outflow was 5746 cfs. The impoundment cannot pass this peak without minor overtopping.

The 6-hour, 100-year flood containing 5.2 inches of precipitation was routed through the dam using a RCN of 94 (AMC III). This produced a runoff of 4.50

inches and a routed peak discharge of 68 cfs. Houser Dam contained the storm with no flow in the emergency spillway and with a freeboard of 5.5 feet.

The 1-10 day, 100-year storm was routed through the structure and did not produce flow in the emergency spillway.

The inflow hydrograph was calculated by methods contained in Section 4, Chapter 21 of the SCS National Handbook. Weir constants in the formula  $Q=CLH^{3/2}$  were found in King and Brater "Handbook of Hydraulics", fifth edition. The routing equation used was:

$$I_1 + I_2 + \left( \frac{2S_1}{\Delta t} - O_1 \right) = \left( \frac{2S_2}{\Delta t} + O_2 \right) .$$

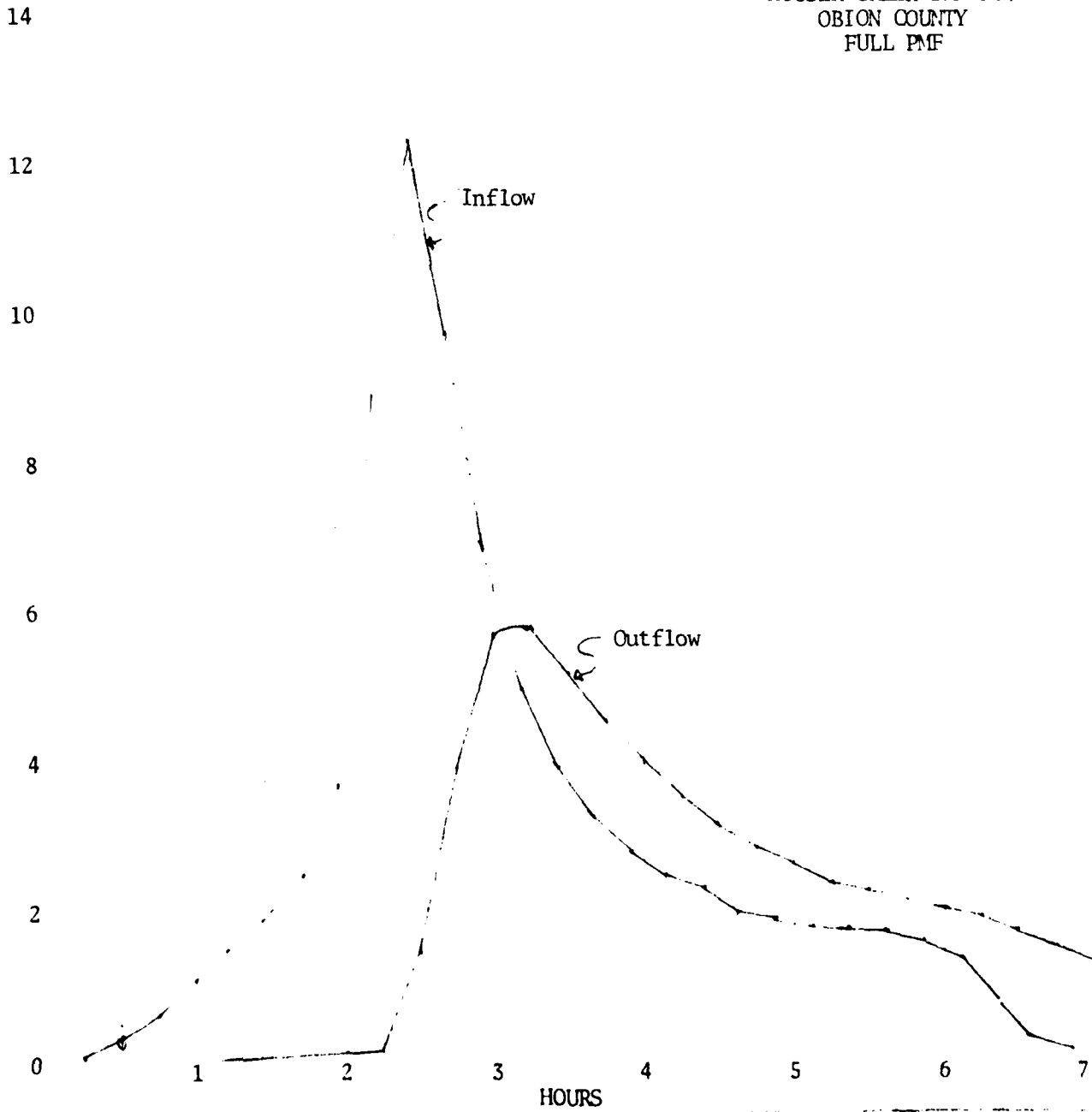
Basic engineering data was obtained from the following sources: Engineering surveys of the impoundment structure; U.S. Geologic Survey Topographic Maps; Aerial photographs; USDA Soil Conservation Service Soil Survey Maps; Rainfall Data and Hazard Classification from the Tennessee Division of Water Resources.

HYDRAULIC AND HYDROLOGIC SUMMARY

Frequency of Occurrence	Duration	Antecedent Moisture Condition	
		II	III
100-year	6-hour	Will Pass	Will Pass
100-year	10-day		
$\frac{1}{2}$ PMF <sup>1</sup>	6-hour	Will Pass	Will Pass
PMF	6-hour	Will Overtop 0.1 foot for 0.25 hours	Will Overtop 0.2 foot for 0.3 hours

<sup>1</sup>Probable Maximum Flood

HOUSER CREEK DAM NO. 2  
OBION COUNTY  
FULL PMF





4.1.1.1.1	1.1	1.1	1.1	1.1
4.1.1.1.2	1.1	1.1	1.1	1.1
4.1.1.1.3	1.1	1.1	1.1	1.1
4.1.1.1.4	1.1	1.1	1.1	1.1
4.1.1.1.5	1.1	1.1	1.1	1.1
4.1.1.1.6	1.1	1.1	1.1	1.1
4.1.1.1.7	1.1	1.1	1.1	1.1
4.1.1.1.8	1.1	1.1	1.1	1.1
4.1.1.1.9	1.1	1.1	1.1	1.1
4.1.1.1.10	1.1	1.1	1.1	1.1
4.1.1.1.11	1.1	1.1	1.1	1.1
4.1.1.1.12	1.1	1.1	1.1	1.1
4.1.1.1.13	1.1	1.1	1.1	1.1
4.1.1.1.14	1.1	1.1	1.1	1.1
4.1.1.1.15	1.1	1.1	1.1	1.1
4.1.1.1.16	1.1	1.1	1.1	1.1
4.1.1.1.17	1.1	1.1	1.1	1.1
4.1.1.1.18	1.1	1.1	1.1	1.1
4.1.1.1.19	1.1	1.1	1.1	1.1
4.1.1.1.20	1.1	1.1	1.1	1.1

### HYDROGRAPH COMPUTATION

DATE 6/30/81  
 COMPUTED BY WEB  
 CHECKED BY \_\_\_\_\_

Project- Houser Creek Dam No. 2  
 FULL PMF

DR. AREA 1.14 SQ. MI.      STRUCTURE CLASS \_\_\_\_\_

$T_c$  0.57 HR.      STORM DURATION 6 HR.

POINT RAINFALL 28.7 IN.

ADJUSTED RAINFALL:

AREAL FACTOR \_\_\_\_\_ IN. \_\_\_\_\_

DURATION FACTOR \_\_\_\_\_ IN. \_\_\_\_\_

RUNOFF CURVE NO. 85

$Q$  26.60 IN.

HYDROGRAPH FAMILY NO. 1

COMPUTED  $T_p$  0.40 HR.

$T_0$  5.85 HR.

( $T_c$  /  $T_p$ )  
 COMPLETED 14.63      USED 16

REVISED  $T_p$  0.37

$$q_p = \frac{484A}{REV. T_p} = \frac{1491}{0.37} \text{ CFS.}$$

$$(Q \cdot q_p) = \frac{39667}{0.37} \text{ CFS.}$$

$$n \text{ COLUMN} = (T_c / T_p) \cdot REV. T_p \quad q \text{ COLUMN} = (q_c / q_p) \cdot Q \cdot q_p$$

$$Q \text{ COLUMN} = (Q_t / Q) \cdot Q$$

	$t = (T_c / T_p) \cdot REV. T_p$	$q = (q_c / q_p) \cdot Q \cdot q_p$	$Q_t = (Q_t / Q) \cdot Q$
	t HOURS	q CFS	Q INCHES
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2	0.24	40	
3	0.49	238	
4	0.73	595	
5	0.98	1071	
6	1.22	1468	
7	1.47	1864	
8	1.71	2459	
9	1.95	3649	
10	2.20	8846	
11	2.44	12257	
12	2.69	9639	
13	2.93	6783	
14	3.17	4919	
15	3.42	3848	
16	3.66	3213	
17	3.91	2777	
18	4.15	2420	
19	4.40	2182	
20	4.64	1983	
21	4.88	1864	
22	5.13	1785	
23	5.37	1745	
24	5.62	1706	
25	5.86	1587	
26	6.11	1349	
27	6.35	793	
28	6.59	317	
29	6.84	159	
30	7.08	79	
31	7.32	40	
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34		645(1.14)	OK

Winslett-Simmonds, Consterline & Associates, Inc.

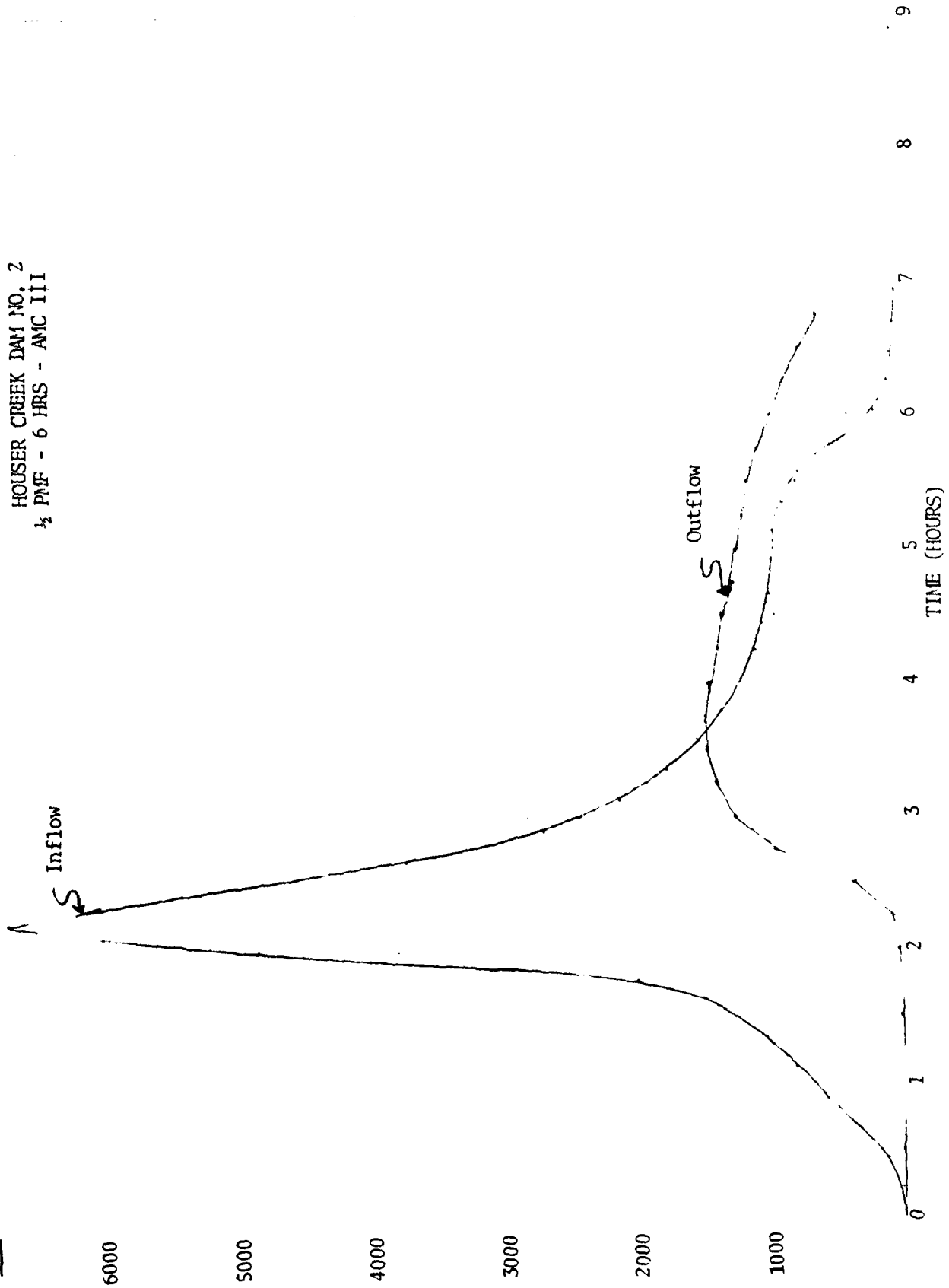
121 SOUTH BARKSDALE STREET P. O. BOX 10045 MEMPHIS, TENNESSEE 38104

TELEPHONE 901 274-0400

*Systems Engineer*

cfs

HOUSER CREEK DAM NO. 2  
1/2 PMF - 6 HRS - AMC III



1. The first part of the document is a list of names and addresses of the members of the committee.

2. The second part of the document is a list of the names and addresses of the members of the committee.

3. The third part of the document is a list of the names and addresses of the members of the committee.

4. The fourth part of the document is a list of the names and addresses of the members of the committee.

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17. The seventeenth part of the document is a list of the names and addresses of the members of the committee.

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20. The twentieth part of the document is a list of the names and addresses of the members of the committee.

4. 17. 1941

11. 11. 1941

4. 25. 1941

11. 11. 1941

4. 26. 1941

11. 11. 1941

4. 27. 1941

11. 11. 1941

4. 28. 1941

11. 11. 1941

4. 29. 1941

11. 11. 1941

4. 30. 1941

11. 11. 1941

4. 31. 1941

11. 11. 1941

4. 32. 1941

11. 11. 1941

4. 33. 1941

11. 11. 1941

1/2 PMF - 6 HOURS - AMC II

HYDROGRAPH COMPUTATION		DATE _____ COMPUTED BY _____ CHECKED BY _____					
Project- Houser Creek Dam No. 2  DR. AREA <u>1.14</u> SQ. MI.    STRUCTURE CLASS _____  T <sub>c</sub> <u>0.57</u> HR.    STORM DURATION _____ HR. POINT RAINFALL <u>15.22</u> IN. ADJUSTED RAINFALL: AREAL FACTOR _____ IN. _____ DURATION FACTOR _____ IN. _____  RUNOFF CURVE NO <u>85</u>  Q <u>13.30</u> IN.  HYDROGRAPH FAMILY NO. <u>1</u>  COMPUTED T <sub>p</sub> <u>0.40</u> HR.  T <sub>0</sub> <u>5.4</u> HR.  T <sub>0</sub> <u>13.50</u> COMPUTED    USED <u>16</u>  REVISED T <sub>p</sub> <u>0.338</u>  $q_p = \frac{484A}{REV. T_p} = \frac{1632.43}{0.338} = 4830$ CFS. $(Q)_p = 21711.27$ CFS.  W COLUMN = (T <sub>p</sub> , REV. T <sub>p</sub> )    Q COLUMN = (q <sub>p</sub> , Q <sub>p</sub> )  Q COLUMN = (Q <sub>t</sub> , Q <sub>0</sub> )		T <sub>p</sub>	REV. T <sub>p</sub>	q <sub>p</sub>	Q <sub>p</sub>	Q <sub>t</sub>	Q <sub>0</sub>
	t	t	q	Q	Q	Q	Q
	HOURS	CFS	INCHES	INCHES	INCHES	INCHES	INCHES
1	0	0	0	0	0	0	0
2	.22	22					
3	.45	130					
4	.67	326					
5	.89	586					
6	1.12	803					
7	1.34	1021					
8	1.56	1346					
9	1.78	1998					
10	2.01	4843					
11	2.23	6712					
12	2.45	5278					
13	2.68	3715					
14	2.90	2694					
15	3.12	2107					
16	3.35	1760					
17	3.57	1521					
18	3.79	1325					
19	4.02	1195					
20	4.24	1086					
21	4.46	1021					
22	4.68	978					
23	4.91	956					
24	5.13	935					
25	5.35	869					
26	5.58	739					
27	5.80	435					
28	6.02	174					
29	6.25	87					
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34	check =	44,727(.22) =	13.38"				

WILSON SYSTEMS CONSULTING ASSOCIATES, INC.    645(1.14)    *OK*

421 SOUTH BARBARALE STREET    P. O. BOX 1004    MEMPHIS, TENNESSEE 38104

TELEPHONE 901-274-6600

*Systems Engineers*

cfs

HOUSER CREEK DAM NO. 2  
100 YEAR 6 HRS - AMC III

3000

2500

2000

1500

1000

500

0

Inflow

Outflow

TIME (HOURS)

10

9

8

7

6

5

4

3

2

1

0

PROJECT INFORMATION

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TITLE: [Illegible]

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0.7500 0

1.0000 0

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1.5000 0

1.7500 0

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0

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7,2000

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100 YEAR 6 HOURS - AMC III

HYDROGRAPH COMPUTATION

DATE \_\_\_\_\_  
 COMPUTED BY \_\_\_\_\_  
 CHECKED BY \_\_\_\_\_

Project - Houser Creek Dam No. 2

DR. AREA 1.14 SQ. MI. STRUCTURE CLASS \_\_\_\_\_

$T_c$  0.57 HR. STORM DURATION 6 HR.

POINT RAINFALL 5.2 IN.

ADJUSTED RAINFALL \_\_\_\_\_

AREAL FACTOR \_\_\_\_\_ IN. \_\_\_\_\_

DURATION FACTOR \_\_\_\_\_ IN. \_\_\_\_\_

RUNOFF CURVE NO. 94

$Q$  4.50 IN.

HYDROGRAPH FAMILY NO. 1

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$T_o$  5.6 HR.

COMPLETED  $T_p$  14.00 USED 16

REVISED  $T_p$  0.35

$$q_p = \frac{484A}{REV. T_p} = \frac{1576.46}{0.35} \text{ CFS.}$$

$$Q_{c,2} = 7094.1 \text{ CFS.}$$

$$N \text{ COLUMN} = T_p + REV. T_p \quad @ \text{ COLUMN} = 'q_c' 'q_p' 'Q_{c,2}'$$

$$Q \text{ COLUMN} = 'Q_t' 'Q_c'$$

	$T_p$	Rev. $T_p$	$q_c$	$q_p$	$Q_{c,2}$	$Q_t$	$Q_c$	$Q_c$
	t		q	Q				
	HOURS		CFS					INCHES
1	0		0					0
2	.43		7					
3	.46		43					
4	.69		106					
5	.92		192					
6	1.16		262					
7	1.39		333					
8	1.62		440					
9	1.85		653					
10	2.08		1584					
11	2.31		2195					
12	2.54		1726					
13	2.77		1215					
14	3.00		881					
15	3.23		689					
16	3.47		576					
17	3.70		498					
18	3.93		434					
19	4.16		391					
20	4.39		356					
21	4.62		334					
22	4.85		320					
23	5.08		313					
24	5.31		306					
25	5.54		285					
26	5.78		242					
27	6.01		142					
28	6.24		57					
29	6.47		28					
30	6.70		14					
31	6.93		7					
32	7.16		0					
33						14,629		
34	check					14,629 (.2)		= 4.0"

WILSON SUTTON & ASSOCIATES, INC. 645 (1.14) *ok*  
 121 SOUTH BARSDALE STREET P.O. BOX 1004 MEMPHIS TENNESSEE 38104  
 TELEPHONE 901-274-0000  
*Systems Engineers*

POWER CURVE FIT COMPLIANT

\*\*\*\*\*

PROJECT # 1000000000

PHASE

BY MICHAEL J. ...

BY MICHAEL J. ...

DATE 01/05/2000

\*\*\*\*\*

FOR THE USE OF THE ...

POWER CURVE FIT COMPLIANT

\*\*\*\*\*

PROJECT # 1000000000

PHASE

BY MICHAEL J. ...

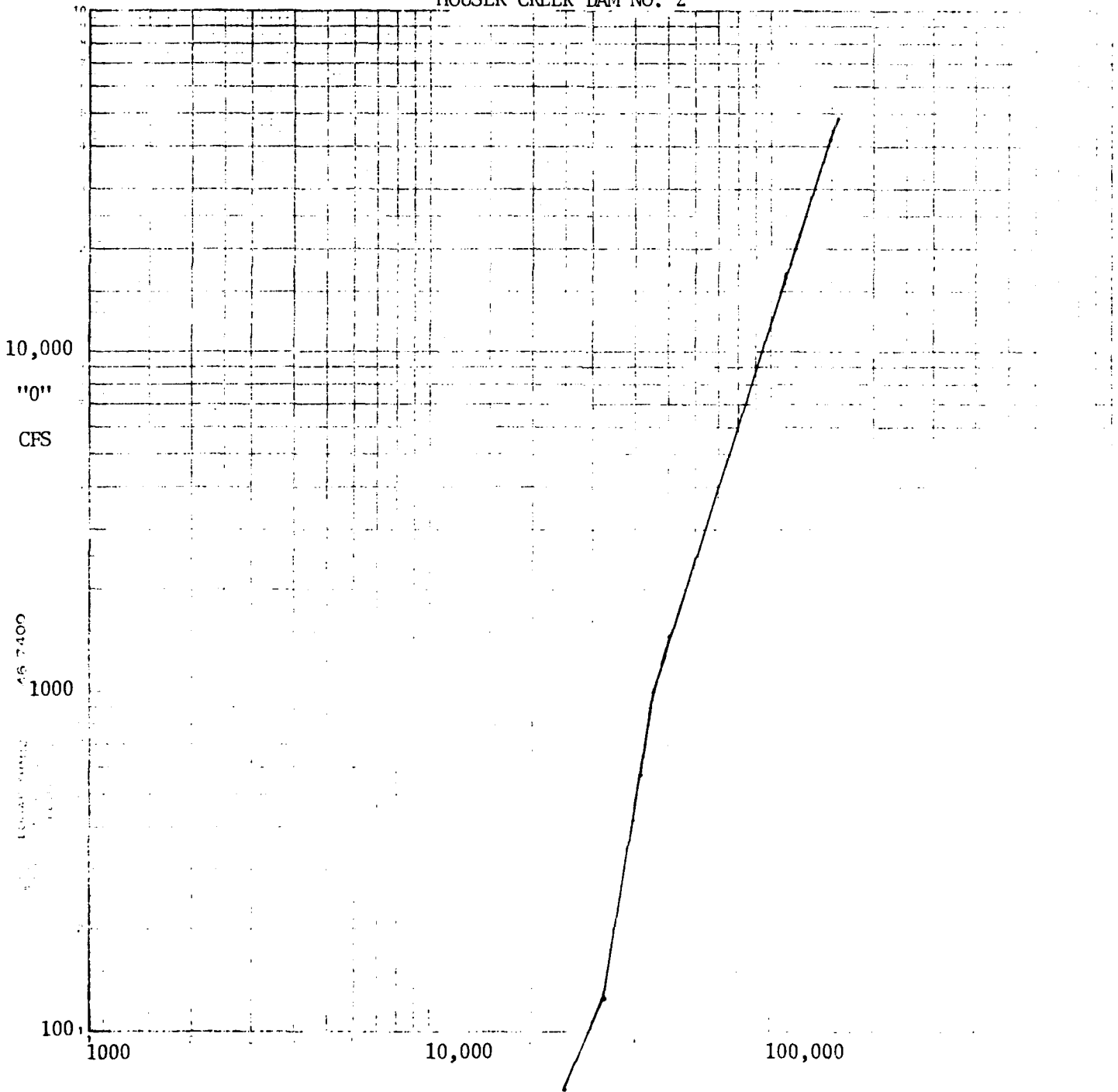
BY MICHAEL J. ...

DATE 01/05/2000

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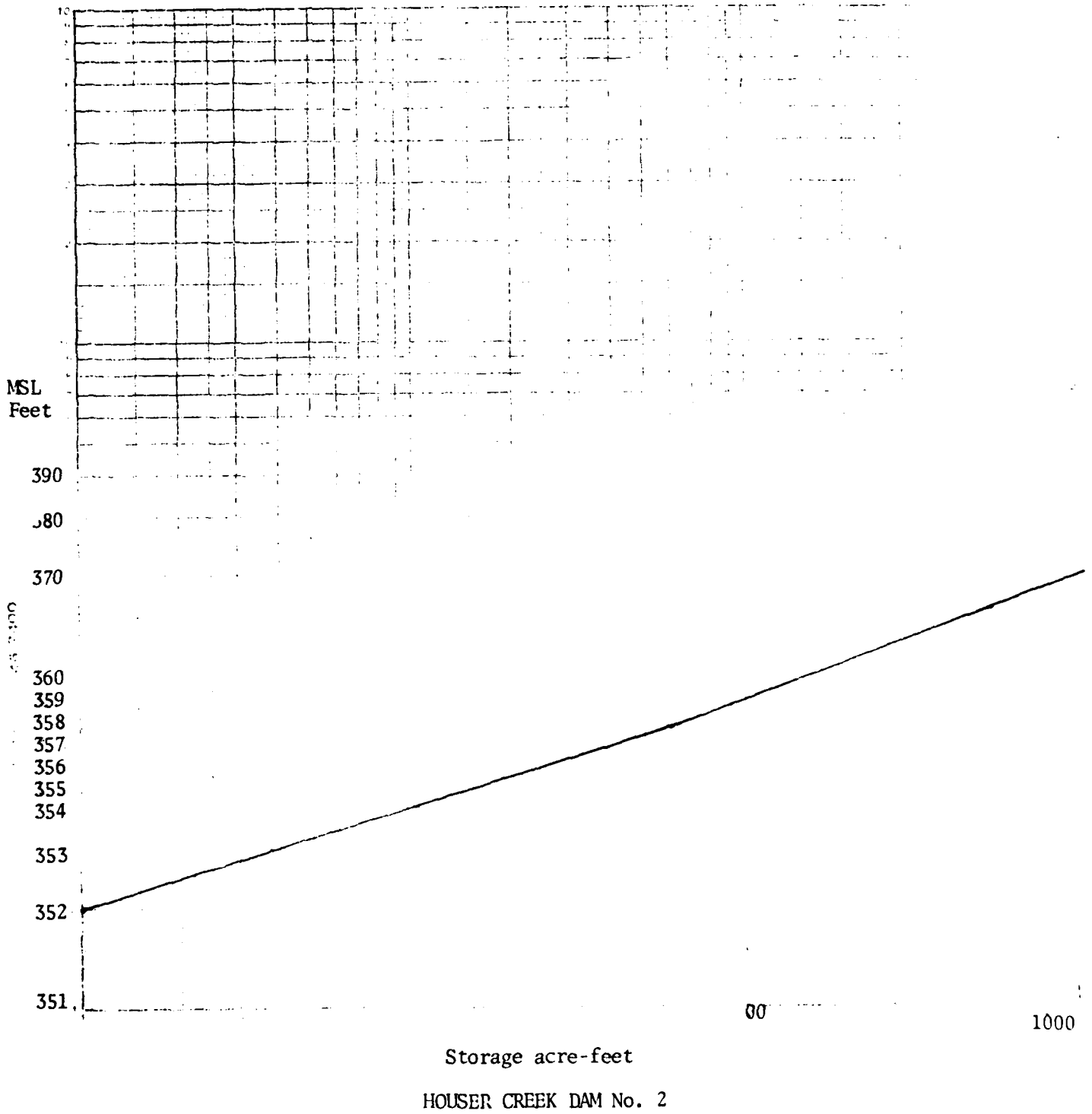
FOR THE USE OF THE ...

Houser Creek Dam No. 2



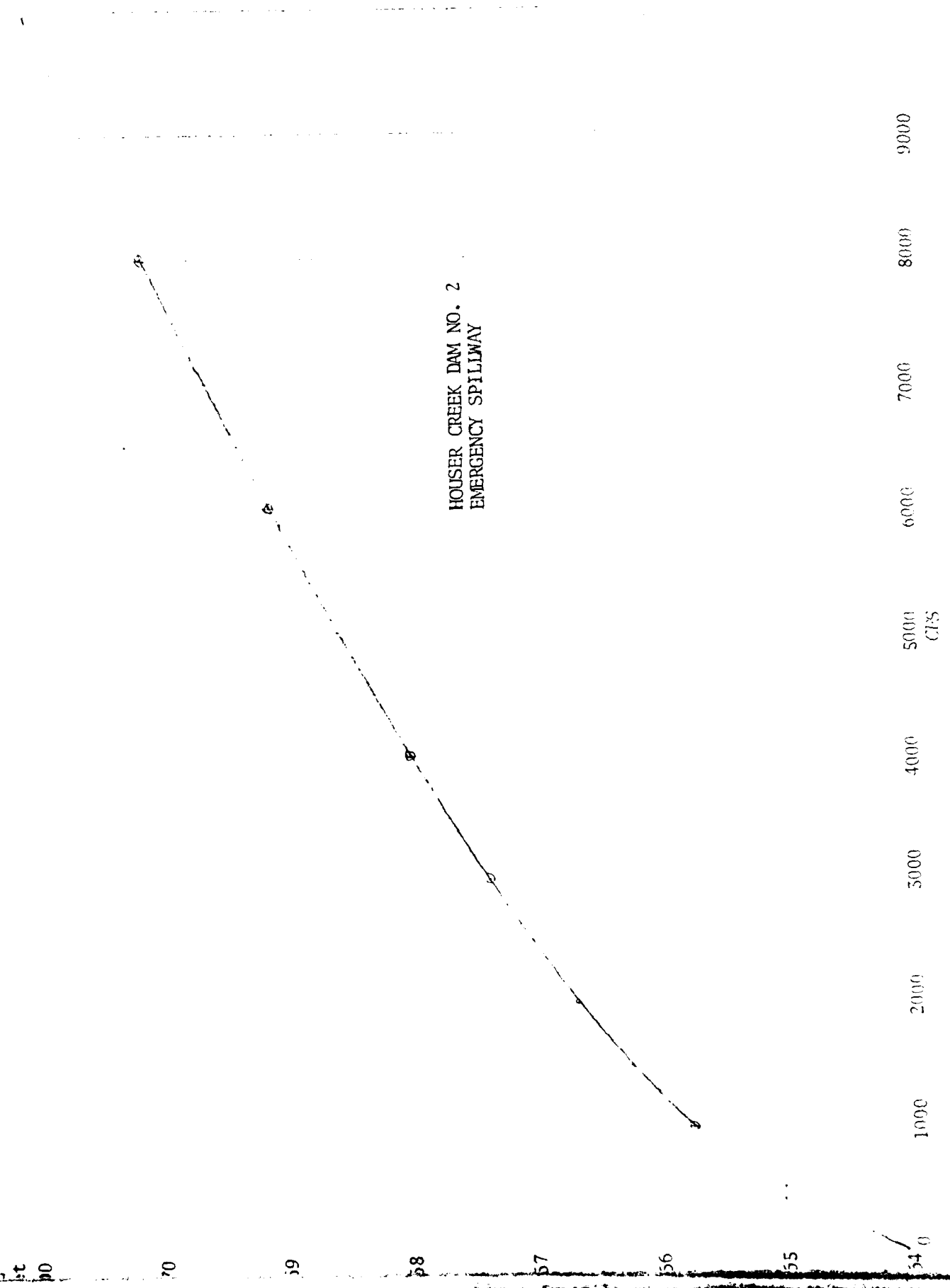
$$\frac{2s}{dt} + 0$$

dt = 0.25 hrs.



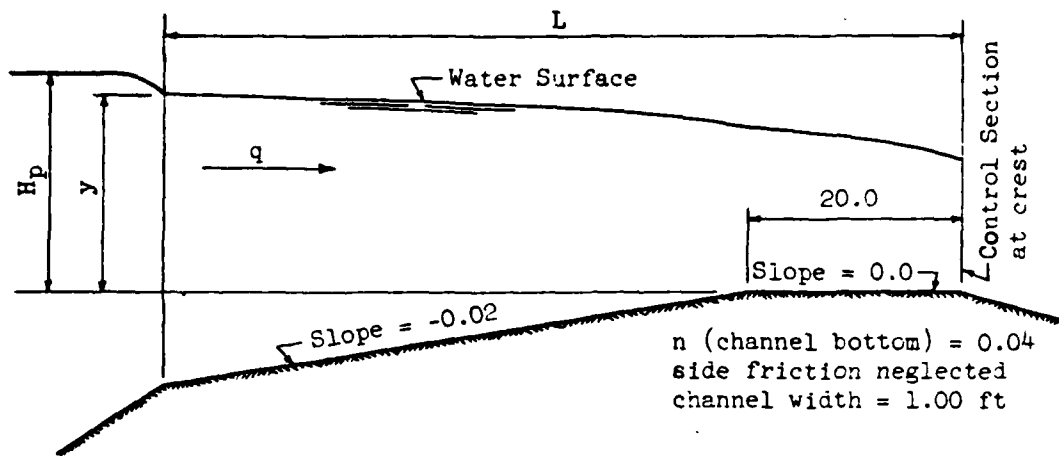
1000

HOUSER CREEK DAM NO. 2  
EMERGENCY SPILLWAY



9000  
8000  
7000  
6000  
5000  
4000  
3000  
2000  
1000  
54.0  
55  
56  
57  
58  
59  
70  
9000

# EARTH SPILLWAYS: Values of $H_p$ and $y$ for given values of $q$ and $L$



$H_p$  given in top figures;  $y = H_p - v^2/2g$  given in bottom figures

L in ft	$q = 5$ cfs	$q = 10$ cfs	$q = 15$ cfs	$q = 20$ cfs	$q = 30$ cfs	$q = 40$ cfs
20.0	1.58 1.77	2.40 2.02	3.00 2.55	3.58 2.98	4.75 3.76	5.72 4.77
40.0	1.65 1.55	2.49 2.27	3.10 2.86	3.70 3.34	4.86 4.20	5.85 4.96
60.0	1.68 1.61	2.53 2.38	3.23 2.99	3.84 3.51	4.95 4.41	5.90 5.21
80.0	1.70 1.65	2.55 2.43	3.27 3.03	3.89 3.62	4.97 4.55	5.95 5.48
100.0	1.71 1.67	2.57 2.48	3.30 3.14	3.91 3.69	5.01 4.65	5.99 5.50
120.0	1.72 1.69	2.59 2.51	3.31 3.18	3.93 3.74	5.03 4.72	6.02 5.59
140.0	1.72 1.70	2.61 2.54	3.31 3.21	3.95 3.79	5.05 4.78	6.04 5.66
160.0	1.73 1.71	2.61 2.56	3.34 3.24	3.96 3.82	5.07 4.85	6.06 5.72
180.0	1.73 1.71	2.62 2.57	3.34 3.26	3.98 3.85	5.09 4.87	6.08 5.78
200.0	1.73 1.72	2.62 2.58	3.34 3.27	3.98 3.87	5.09 4.90	6.10 5.82

REFERENCE

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE  
 ENGINEERING DIVISION - DESIGN SECTION

STANDARD DWG. NO.

ES-124

SHEET 2 OF 7

DATE 11-21-56

EMERGENCY SPILLWAY CALCULATIONS SCS-ES 124 Sheet 2 of 7.

L = 200 ft.      Control Sect. = 20 ft.      Width = 200 ft.

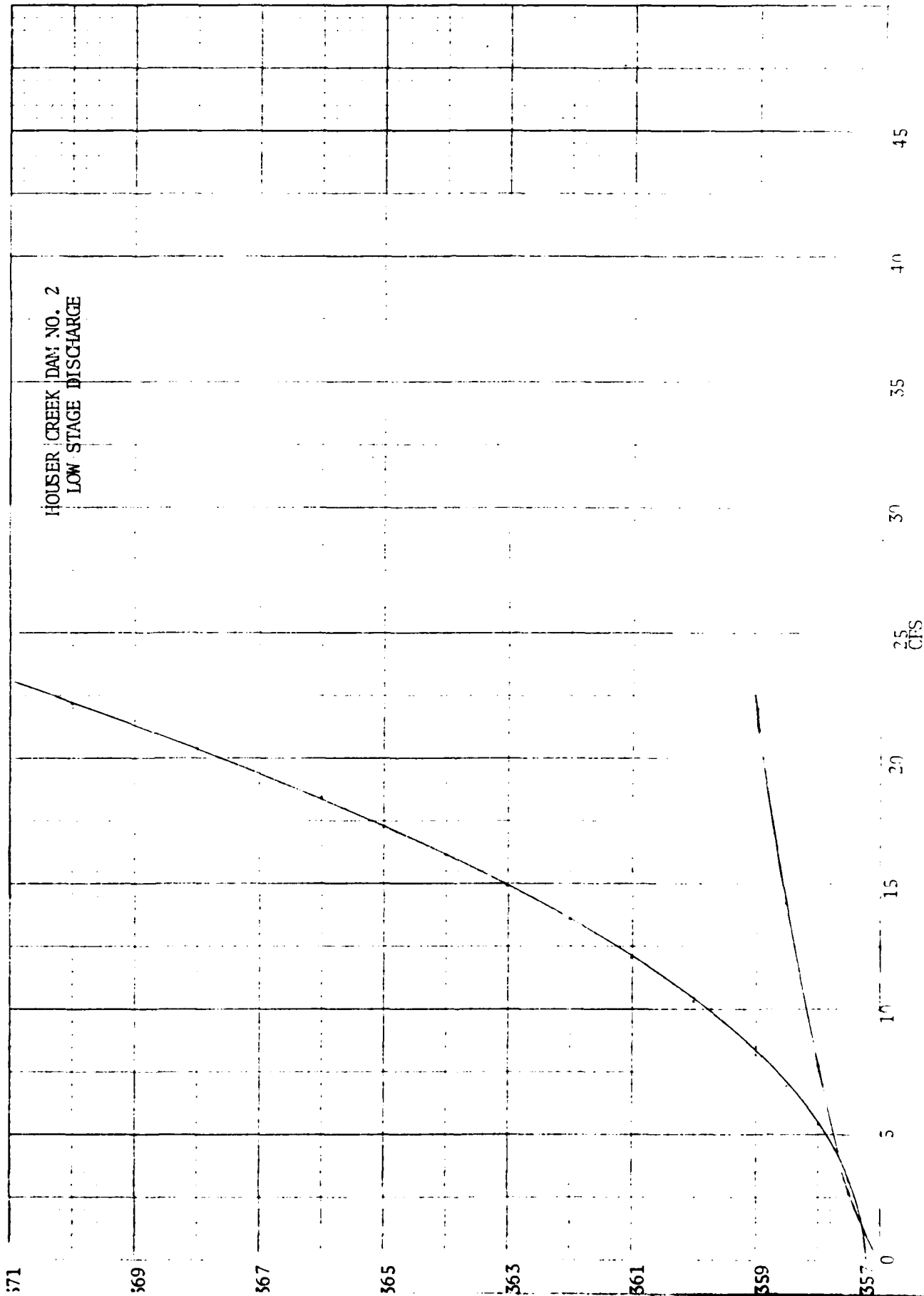
h <sub>p</sub>	MSL Elev.	Cfs/ft.	Total Cfs
1.73	365.73	5	1000
2.62	366.62	10	2000
3.34	367.34	15	3000
3.98	367.98	20	4000
5.09	369.09	30	6000
6.10	370.10	40	8000

11-1-77

HOUSER CREEK DAM NO. 2

LOW STAGE DISCHARGE

ev.



HOUSER CREEK DAM NO. 2 DISCHARGE

Low Stage  
Invert Elev. 357.0'  
 0.5' x 2.5'

Weir Flow       $Q = CLH^{3/2}$        $C = 3.1$        $L = 2.5$   
 (  $Q = 7.75 H^{1.5}$  )

<u>Elev.</u>	<u>H</u>	<u>Q</u>
357.0	0	0
357.5	.5	2.74
358.0	1.0	7.75
358.5	1.5	14.24
359.0	2.0	21.92

Orifice Flow       $Q = CA \sqrt{2gh} = (.62)(1.25) \sqrt{64.4 H}$   
 = .775  $\sqrt{64.4H}$

<u>Elev.</u>	<u>H</u>	<u>Q</u>	<u>Elev.</u>	<u>H</u>	<u>Q</u>
357.25	0	0	366	8.75	18.40
357.50	.25	3.11	368	10.75	20.39
358.0	.75	5.39	370	12.75	22.21
359.0	1.75	6.95			
360.0	2.75	10.31			
361.0	3.75	12.04			
362.0	4.75	13.55			
363	5.75	14.91			
364	6.75	16.16			
365	7.75	17.31			

HIGH STAGE  
HOUSER CREEK DAM NO. 2

Elev.

376

374

372

370

368

366

364

362

0

50

100

150

200

250

300

DISCHARGE (CFS)

U.S. GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION  
BOSTON OFFICE  
100 WATER STREET  
BOSTON, MASSACHUSETTS 02109

High Stage  
Inlet Elev. 362.0  
 9' x 1'

Weir Flow

$C = 3.1$

$L = 2 \times 9'$

$Q = CLH^{1.5} = 55.8 H^{1.5}$

<u>Elev.</u>	<u>H</u>	<u>Q</u>
362.0	0	0
362.5	.5	19.73
363.0	1.0	55.8
363.5	1.5	102.51
364.0	2.0	157.83

Orifice Flow

$Q = 2(.62)(9' \times 1') \sqrt{64.4 H}$

<u>Elev.</u>	<u>H</u>	<u>Q</u>
362.5	0	0
363	.5	63.33
364	1.5	109.69
365	2.5	141.60
366	3.5	167.55
367	4.5	189.98
368	5.5	210.03
368.5	6.0	219.4
369	6.5	228.33
370	7.5	245.27
371	8.5	261.11

HOUSER CREEK DAM NO. 2  
PIPE DISCHARGE

Pipe Flow Calculations

D = 36"

Conduit  $K_f = 0.00616$

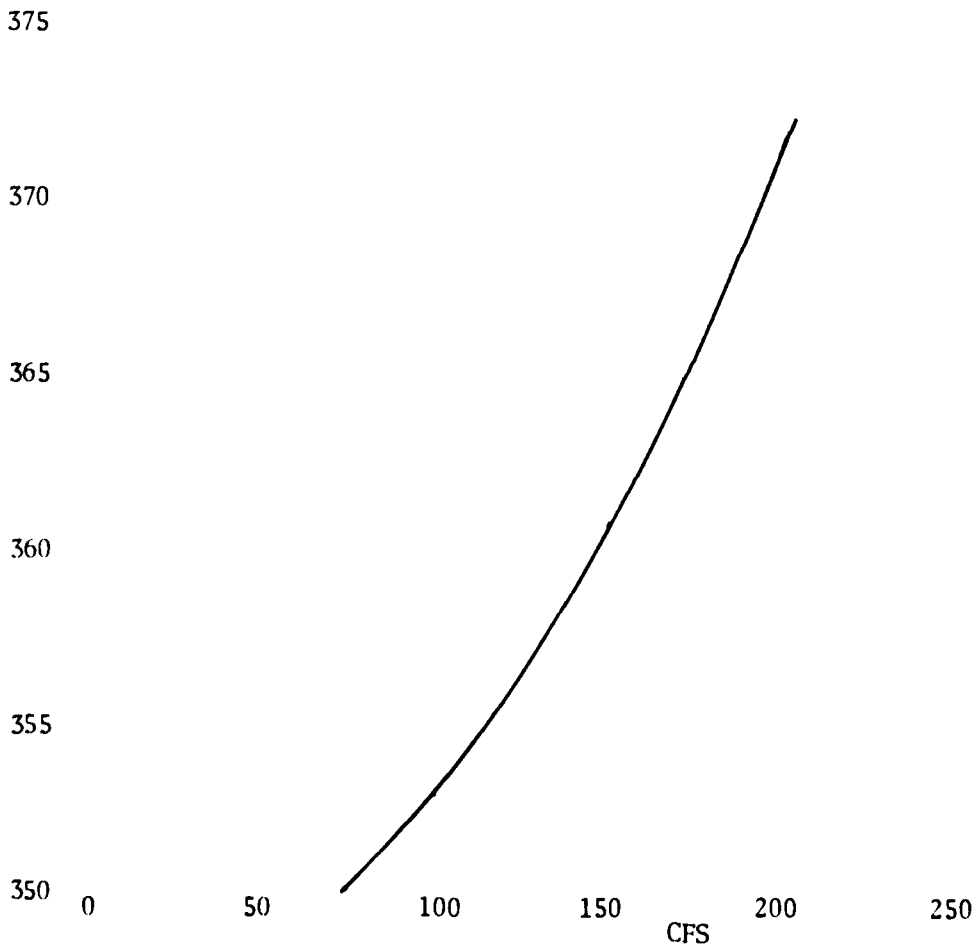
Riser  $K_f = 0.00421$

Entrance Loss =  $1.0 V^2/2g$

$$H = 14 \times 0.00421 \times V_R/2g + V_p/2g + 158 \times 0.00616 \times V_p/2g$$

Assume	Flow (cfs)	$V_p$	$V_R$	H (ft.)	Elev.
	75	10.61	2.78	3.46	349.96
	100	14.14	3.704	6.13	352.63
	150	21.22	5.55	13.83	360.33
	200	28.29	7.41	24.57	371.07

Elev.

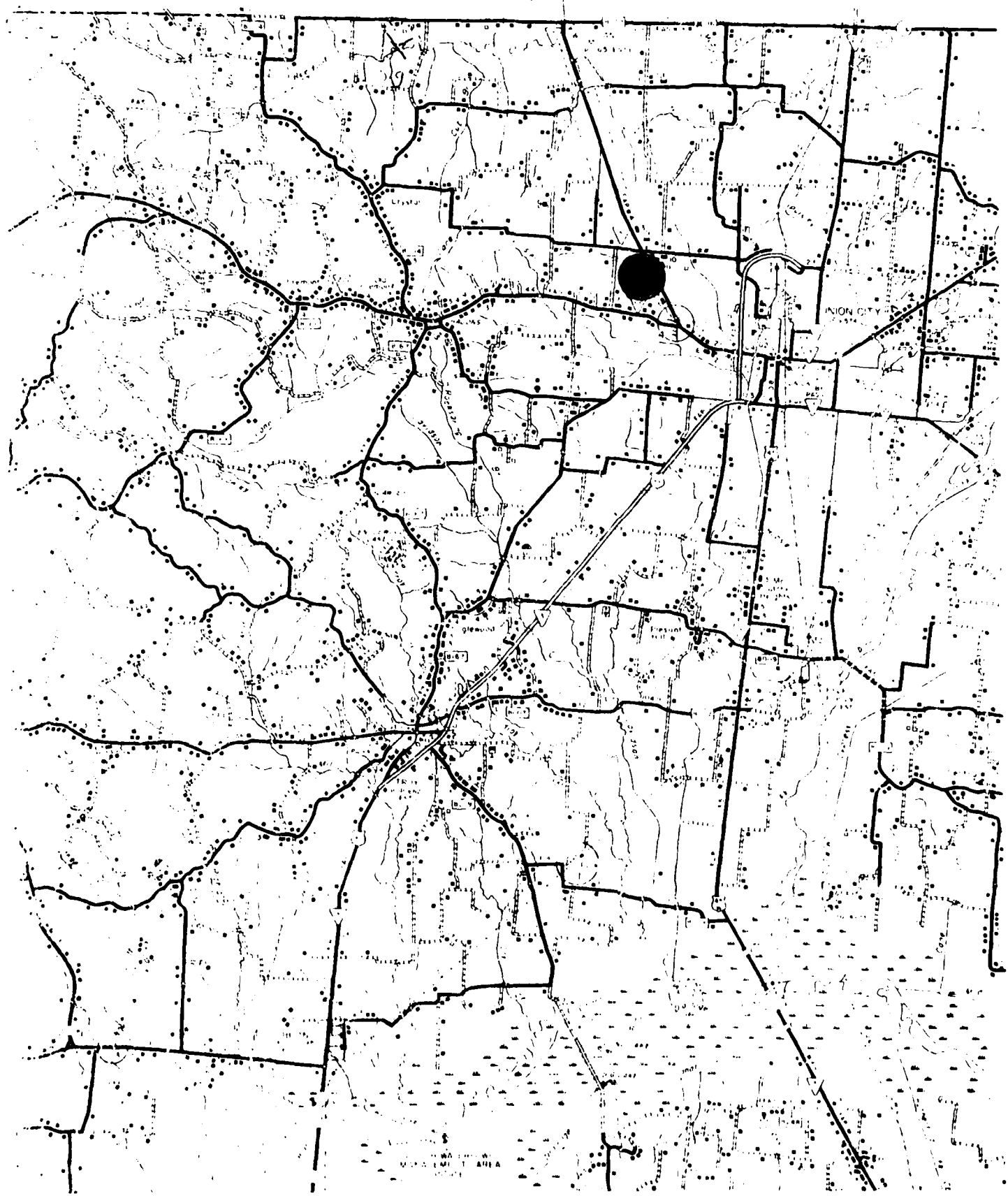


APPENDIX F  
DAM INVENTORY DATA SHEET

DAM INVENTORY DATA SHEET  
DEPARTMENT OF CONSERVATION  
DIVISION OF WATER RESOURCES

ID NUMBERS STATE(ID): 66-7015 FEDERAL(FED ID): TN-13114  
 NAME(PROJECT): Houser Creek Dam #2 REGION(R): West  
 OWNER(S): Dr. W. B. Dunlap Sr.  
 ADDRESS: 1391 Armstrong, Union City, TN 38261  
 TELEPHONE RESIDENCE: 385-~~5743~~ 2694 BUSINESS: 385-5312  
 COUNTY: Obion QUAD: 427NE-Union City  
 LOCATION LATITUDE: 36° 26' 45", LONGITUDE: 89° 05' 52"  
 STREAM(SOURCE): Trib. Houser Creek RIVER MILE:  BASIN: 300  
 PURPOSE OF DAM: Flood control YEAR COMPLETE: 1967  
 CONTRACTOR(CONT): Holt Construction LOCATION: Milan, TN  
 ENGINEER(ENG): SCS LOCATION: Nashville, TN  
 TYPE OF DAM(TYC): Earth SIZE CLASSIFICATION: Small  
 DOWNSTREAM HAZARD POTENTIAL CLASSIFICATION STATE(H) 1 FEDERAL(FH) High  
 CERTIFICATE EXPIRATION DATE(EXP DATE):   
 STRUCTURAL HEIGHT(SHT): 26.5 FEET, HYDRAULIC HEIGHT(HHT): 150 FEET  
 CREST LENGTH(LGTH): 1350 FEET, CREST WIDTH(WDTH): 14 FEET  
 UPSTREAM SLOPE(U/S): 3 :1, DOWNSTREAM SLOPE (D/S): 3 :1  
 POOL AREA NORMAL(NSURF): 23.6 ACRES, MAXIMUM(M/SURF): 112 ACRES  
 ELEVATION(FEET MSL), STORAGE CAPACITY(ACRE-FEET)  
 TOP OF DAM (ELEV1) 368.5, (TO/STR) 394  
 EMERGENCY SPILLWAY CREST (ELEV2) 364.0, (EM/STR) 468  
 NORMAL POOL (ELEV3) 357.0, (N/STR) 114  
 EMERGENCY SPILLWAY MATERIAL(ESM) Veg earth, SIZE(SZ) 200'  
 SERVICE SPILLWAY MATERIAL(SSM) RC riser, skirte SIZE(SZ) 3' x 9'  
 DRAINAGE AREA(DA): 730Ac 1.14 SQ. MILES, CURVE NUMBER(CN): 25 AMCII  
 TIME OF CONCENTRATION(TC):  HOURS, MAXIMUM 6-HR RAIN: 20.23 INCHES  
 COMMENTS: INVENTORIED BY: George Moore DATE: 1/2/81  
 REVISED BY:  DATE:  D/S HAZARD BY: Moore DATE: 1/2/81  
 OTHER NAME OF PROJECT: EVANETT POOL AREAS OBTAINED BY: As built plans  
 OTHER CONTACT AT DAM: W. B. Dunlap Sr. PHONE: 855 112  
 DATA OBTAINED FROM: As built plans  
 EMER. SPIL. DESC.: 3:1 side slopes; 20' control section  
 SERV. SPIL. DESC.: 150' x 36" RC pipe  
 ELEVATIONS REF. TO:  APPROX ELEV:  FT MSL  
 DRAWDOWN DRAIN: MATERIAL: Slide gate on riser SIZE: 24" dia ELEVATION: 340.0  
 OTHER COMMENTS: Normal pool elev at high stage is 362.0. Outlet elev 345.0;  
Outlet channel elev 342.0; lowest point keyway 340.0; Vol of fill 54,260

K E N 67 T U C K



Houser Creek #2  
Union City  
427NE  
1954  
10' contour interval

68'

403

Salem  
Ch

30'

BM  
417

384

382

372

HOUSER  
CREEK #2

375

363

350

HOUSER  
CREEK #1

ELVYN  
OLIVER, JR.

363

365

361

350

348

BM  
314

McDowell  
Chapel

Hoosier

364

354

350

Joyner  
Cem

348

BM  
340

PIPE

LINE

C



**TENNESSEE DEPARTMENT OF CONSERVATION**  
DIVISION OF WATER RESOURCES  
Suite 402 A, Box 42  
225 Madison Avenue  
Jackson, Tennessee 38301  
901/424-3051

MEMORANDUM

TO: Files  
FROM: George Moore  
SUBJECT: Houser Creek Dam #2  
DATE: August 11, 1981

During a phone conversation on April 27, 1981, Dr. W. B. Dunlap stated that the lake area behind Houser Creek Dam #2 had filled with sediment and trees were growing in the lake area and on the dam. Dr. Dunlap expressed dissatisfaction with the condition of the lake and dam and stated that he would appreciate any assistance we might be able to give in prompting the appropriate officials to undertake the needed remedial work.

GM:lt

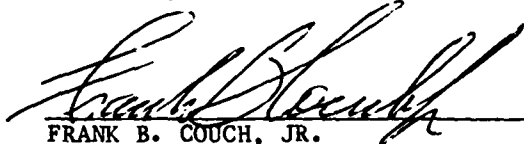
cc: Bill Bush ✓

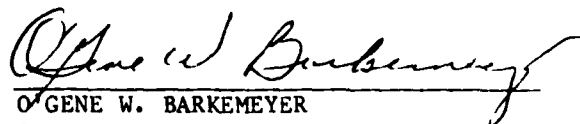
ORND-G


NON-FEDERAL DAM INSPECTION REVIEW BOARD  
PO BOX 1070  
NASHVILLE, TENNESSEE 37202

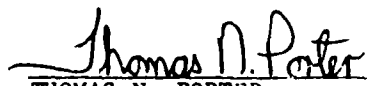
Commander, Nashville District  
US Army Corps of Engineers  
PO Box 1070  
Nashville, TN 37202

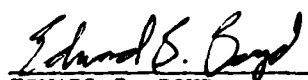
1. The Interagency Review Board, appointed by the Commander on 19 June 1981, presents the following recommendations after meeting on 6 August 1981, to consider the Phase I investigation report on Houser Creek Dam No. 2 performed by Winsett-Simmonds, Consterdine & Associates, Inc., under contract to the Tennessee Department of Conservation.
2. In Section 3.1.1, the paragraph on Geology should be expanded to include a more detailed description of the geology of the area.
3. The condition classification should be changed from "deficient" to "significantly deficient."
4. The Board is in agreement with other report conclusions and recommendations following minor revisions.


  
FRANK B. COUCH, JR.  
Chief, Geotechnical Branch  
Chairman

  
GENE W. BARKEMEYER  
State Conservation Engineer  
Soil Conservation Service

  
ROBERT A. HUNT  
Director, Division of Water Resources  
State of Tennessee

  
THOMAS N. PORTER  
Hydraulics Engineer  
Alternate, Hydrology and Hydraulics  
Branch

  
EDWARD B. BOYD  
Hydrologic Technician  
Alternate, US Geological Survey

  
L. E. LOCKETT  
Structural Engineer  
Alternate, Design Branch

APPENDIX G  
USDA-SCS  
ANNUAL INSPECTION REPORT

ANNUAL MAINTENANCE INSPECTIONS - FLOODWATER RETARDING STRUCTURES

WATERSHED Houser Creek SITE NO. 2  
LOCATION Approx. 2.5 miles NW of Union City  
Just West of St. Hwy No. 5 INSPECTION DATE 5/27/80

A. EMBANKMENT

1. Type and condition of vegetation Peacoe-good in open areas, poor where woody growth is on dam
2. Is woody growth present? Yes
3. Are cracks present? No
4. Has sliding occurred? No
5. Are irregularities caused by settlement evident? No
6. Are eroded areas or gullies present? No
7. Is toe or area below dam wet? No
8. Are concentrated leaks present? No
9. If wetness or leaks are present, explain changes since last inspection None evident
10. Are sinks present in vicinity of dam? None evident
11. Condition of berm and areas subject to wave erosion Not visible-under water
12. Is dispersion (jugging) evident? No
13. Floating debris from reservoir Yes

B. PRINCIPAL SPILLWAY

- i. Condition of trash racks Good
2. Debris lodged in openings No
3. Indications of cracks in riser or conduit None visible

4. Condition of concrete (riser, bent & impact basin) Portion that is visible is good

5. Is manhole cover in place? Yes

6. Condition of gates Not visible - under silt

C. STILLING BASIN AND OUTLET CHANNEL

1. Type and condition of vegetation Fescue - good

2. Is stilling basin eroding? Yes - sloughing

3. Are banks of outlet channel stable? Yes

4. Is outlet channel degrading? Some - stable now

5. Is channel free of obstructions? vegetative growth

6. Boils in stilling basin or outlet channel? None evident

7. If boils are present, is there an accumulation of soil or sand around boil? none evident

8. If leakage is evident, is it clear? none evident

9. Condition of riprap none

D. FOUNDATION DRAIN

1. Iron oxide deposits on pipe? Yes slight

2. Other blockages in pipe? None

3. Condition of animal guards Good

4. Flow from pipe (none, trickle, moderate or strong) Trickle

5. Sand or silt in discharge? No

E. EMERGENCY SPILLWAY

1. Type and condition of vegetation Fescue - good

2. Erosion? slight

3. Do roads cross or go through spillway which will concentrate flow or contribute to erosion? Road crosses but does not appear to contribute to erosion.
4. Are fences present which will obstruct flow? No
5. Has spillway been altered? No
6. Woody growth that could obstruct flow? Willows are in entrance to spillway

F. BORROW AREA

1. Type and condition of vegetation Fescue - good
2. Erosion? very little

G. RESERVOIR

1. Shoreline wave erosion? Shoreline inundated
2. Woody growth? Willow bushes up to 6" in diameter cover at least half of reservoir area
3. Floating debris? Yes
4. Sinks or holes? None evident

H. FENCES

1. Condition of fences N/A

I. MISCELLANEOUS

1. Has land use in watershed changed enough since structure was designed to alter runoff significantly? Yes - more cultivated land
2. Has land use in the flood plain below the dam changed enough since design to alter hazard classification? Some houses have been built in flood plain below dam

J. CONCLUSIONS AND RECOMMENDATIONS

Sediment pool is almost filled with silt. Very little silt. storage remaining. Sediment pool is grown up in willow trees.  
Dam is almost completely covered with small trees. These are almost too large to bush hog. They need to be cut.

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Inspected by: William C. Johnson  
Sponsor Representative

Date: 5/27/80

Inspected by: Wayle A. Zucker  
SCS Representative

Date: 5/27/80

Name and title of others assisting with inspection:

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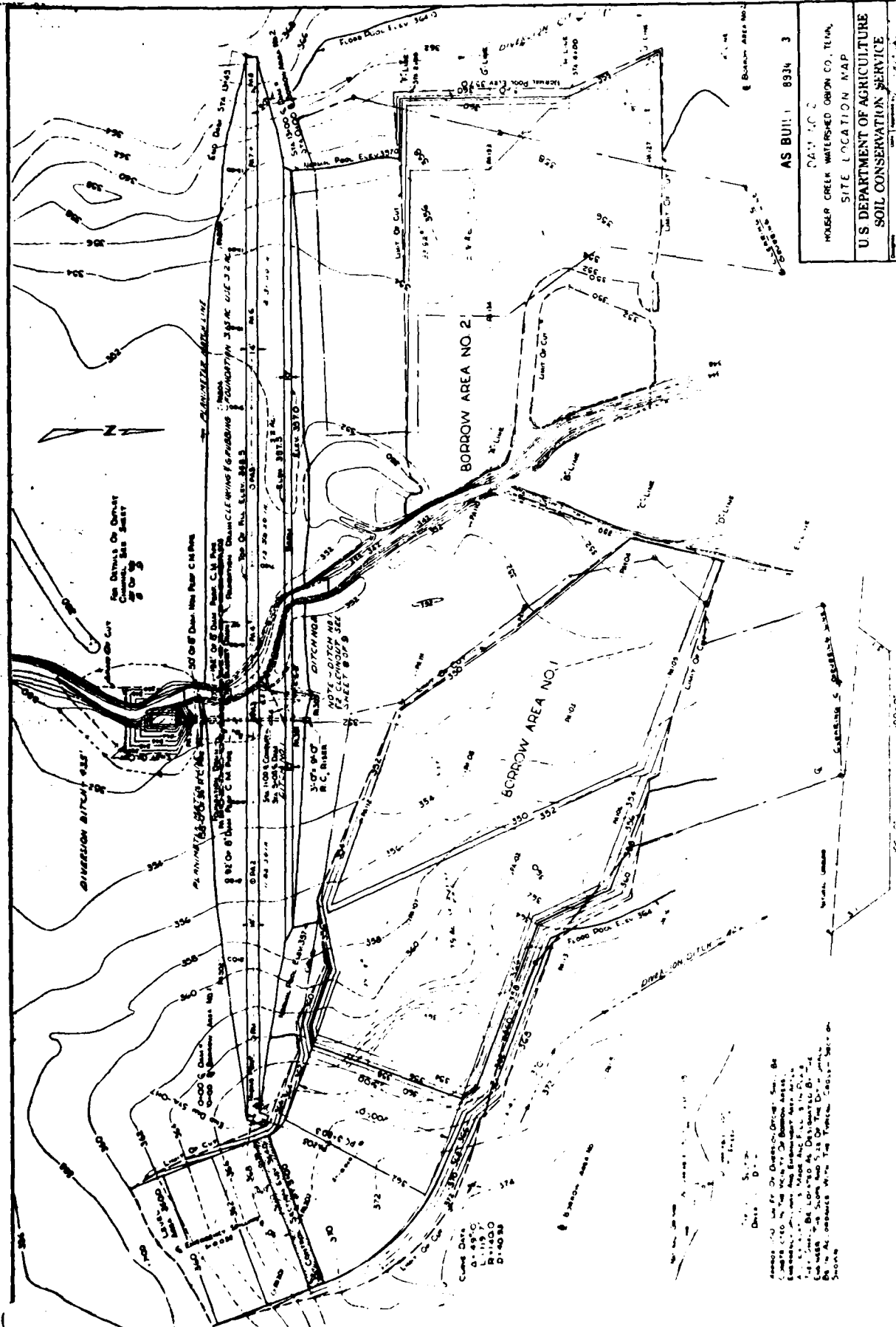
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APPENDIX H  
AS-BUILT PLANS







AS BUILT 8934 3  
 DATE 10-2  
 HOUSE CREEK WATERSHED ORION CO. TENN.  
 SITE LOCATION MAP  
 U.S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE

Scale 1" = 100'  
 SECTION  
 Engineering Solution

Checked by: [Signature]  
 Date: 5-1-28  
 Approved by: [Signature]  
 Date: 5-1-28  
 Prepared by: [Signature]  
 Date: 5-1-28



**STEEL SCHEDULE FOR BENT - ALTERNATE NO 1**

Location	Part	Material	Quantity	Notes
A	B	30" x 12" x 1/2"	100.00	AS BUILT
	C	30" x 12" x 1/2"	100.00	
B	D	30" x 12" x 1/2"	100.00	AS BUILT
	E	30" x 12" x 1/2"	100.00	
C	F	30" x 12" x 1/2"	100.00	AS BUILT
	G	30" x 12" x 1/2"	100.00	
D	H	30" x 12" x 1/2"	100.00	AS BUILT
	I	30" x 12" x 1/2"	100.00	
E	J	30" x 12" x 1/2"	100.00	AS BUILT
	K	30" x 12" x 1/2"	100.00	

**STEEL SCHEDULE FOR BENT - ALTERNATE NO 2**

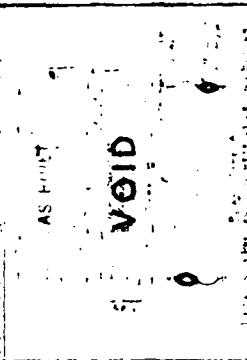
Location	Part	Material	Quantity	Notes
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	C	30" x 12" x 1/2"	100.00	
B	D	30" x 12" x 1/2"	100.00	AS BUILT
	E	30" x 12" x 1/2"	100.00	
C	F	30" x 12" x 1/2"	100.00	AS BUILT
	G	30" x 12" x 1/2"	100.00	
D	H	30" x 12" x 1/2"	100.00	AS BUILT
	I	30" x 12" x 1/2"	100.00	
E	J	30" x 12" x 1/2"	100.00	AS BUILT
	K	30" x 12" x 1/2"	100.00	

**STEEL SCHEDULE FOR TOWER - ALTERNATE NO 1**

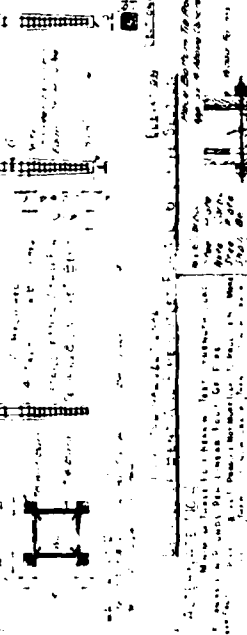
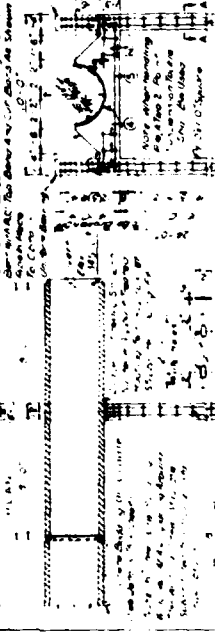
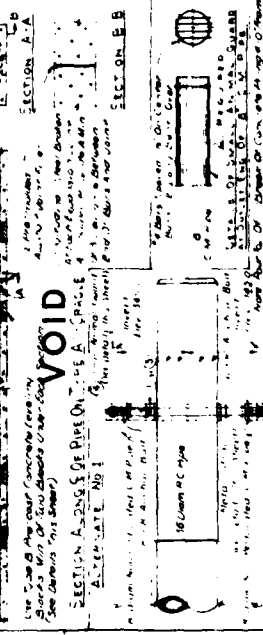
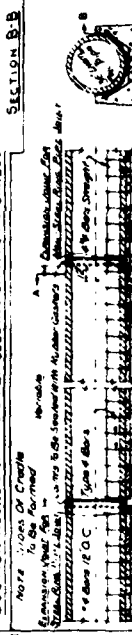
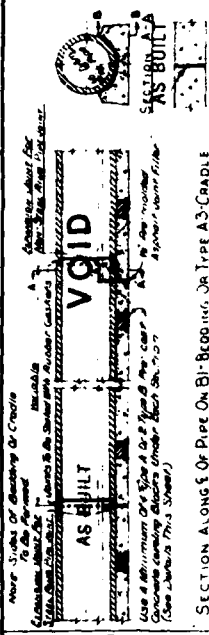
Location	Part	Material	Quantity	Notes
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	C	30" x 12" x 1/2"	100.00	
B	D	30" x 12" x 1/2"	100.00	AS BUILT
	E	30" x 12" x 1/2"	100.00	
C	F	30" x 12" x 1/2"	100.00	AS BUILT
	G	30" x 12" x 1/2"	100.00	
D	H	30" x 12" x 1/2"	100.00	AS BUILT
	I	30" x 12" x 1/2"	100.00	
E	J	30" x 12" x 1/2"	100.00	AS BUILT
	K	30" x 12" x 1/2"	100.00	

**STEEL SCHEDULE FOR TOWER - ALTERNATE NO 2**

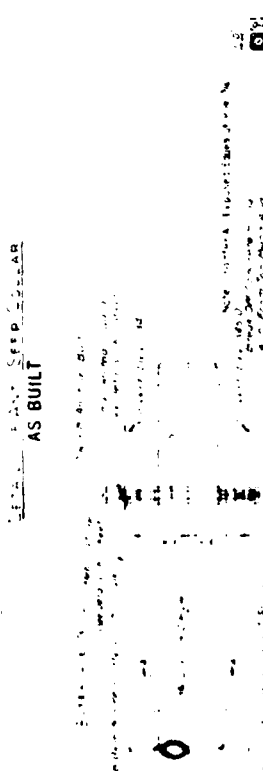
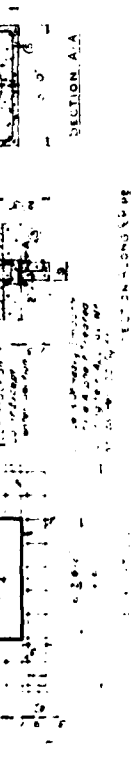
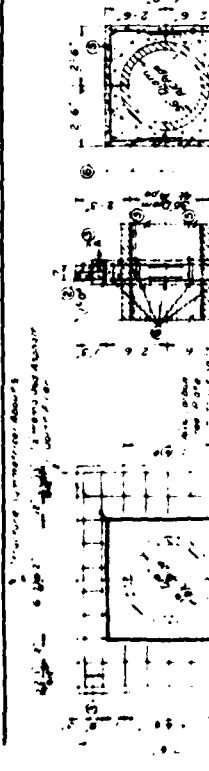
Location	Part	Material	Quantity	Notes
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	C	30" x 12" x 1/2"	100.00	
B	D	30" x 12" x 1/2"	100.00	AS BUILT
	E	30" x 12" x 1/2"	100.00	
C	F	30" x 12" x 1/2"	100.00	AS BUILT
	G	30" x 12" x 1/2"	100.00	
D	H	30" x 12" x 1/2"	100.00	AS BUILT
	I	30" x 12" x 1/2"	100.00	
E	J	30" x 12" x 1/2"	100.00	AS BUILT
	K	30" x 12" x 1/2"	100.00	



HOUSEHOLD REGISTERED ON CO. TENN.  
 U.S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE



U.S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE



U.S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE







APPENDIX I  
HAZARD POTENTIAL  
AND  
CONDITION CLASSIFICATION DEFINITIONS

AD-A108 244

TENNESSEE STATE DEPT OF CONSERVATION NASHVILLE DIV 0--ETC F/G 13/13  
NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE, --ETC(U)  
SEP 81 W E BUSH DACW62-81-C-0056

UNCLASSIFIED

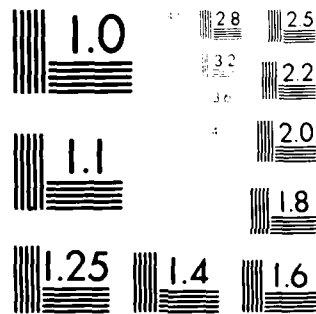
2 of 2

APR 1982



END  
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MICROCOPY RESOLUTION TEST CHART  
NBS 1963-A

DEPARTMENT OF THE ARMY  
OFFICE OF THE CHIEF OF ENGINEERS  
HAZARD POTENTIAL CLASSIFICATION\*

<u>Category</u>	<u>Loss of Life</u>	<u>Economic Loss</u>
Low	None expected (No permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than few	Excessive (Extensive community, industry or agriculture)

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\*U.S. Army Corps of Engineers, Recommended Guidelines for Safety Inspection of Dams.

TENNESSEE DEPARTMENT OF CONSERVATION

DIVISION OF WATER RESOURCES

DAMAGE POTENTIAL CATEGORY\*

<u>Category</u>	<u>Description</u>
1.	Dams located where failure would probably result in any of the following: loss of human life; excessive economic loss due to damage of downstream properties; excessive economic loss, public damage to roads or any public or private utilities.
2.	Dams located in predominantly rural or agricultural areas where failure may damage downstream private or public property but such damage would be relatively minor and within the general financial capabilities of the dam owner. Public hazard or inconvenience due to loss of roads or any public or private utilities would be minor and of short duration. Chances of loss of human life would be possible but remote.
3.	Dams located in rural or agricultural areas where failure may damage farm buildings or agricultural land but such damage would be more or less confined to the dam owner's property. No loss of human life would be expected.

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\* Tennessee Department of Conservation, Division of Water Resources, Rules and Regulations Applied to the Safe Dams Act of 1973. Chapter 0400-4-1.

## DEFINITION OF CONDITION CLASSIFICATION

"Unsafe - Emergency" - A dam in a state of imminent failure. State and local authorities and downstream residents should be advised immediately, reservoir drained, or combination of the above (e.g., advanced piping, major slope instability, recent sudden collapse of a portion of the foundation, imminent overtopping, etc.).

"Unsafe - Nonemergency" - A dam with obviously serious deficiencies which clearly could develop, or are developing, into failure modes but do not yet pose the threat of imminent failure. State and local authorities should be advised promptly and remedial work should begin as soon as practical. Someone should be assigned to periodically check on the dam's condition until remedial work is begun. Drawing down the reservoir should be considered, e.g., flowing seepage from embankment which could lead to piping, evidence of solution channels or cavitation in the foundation, seriously inadequate spillway capacity as per ETL 1110-2-234, history of recurring slope instability, etc.).

"Significantly Deficient" - A dam with deficiencies which, if left unchecked, would likely become serious deficiencies and could ultimately result in failure. Advise State authorities and recommend remedial work be scheduled in time to prevent substantial further deterioration of the condition(s)--usually within six months to a year or sooner (e.g., heavy growth of sizeable trees on slopes, potentially serious erosion, spillway discharge channel too close to embankment, etc.).

"Deficient" - A dam with deficiencies which need attention but which would not likely effect the safety of the dam unless left unchecked for a long period of time. Advise State authorities and recommend remedial action at owner's convenience but before the problem can escalate into a significant deficiency (e.g., brush and/or few or very small trees on embankment, long term deterioration of masonry or metal outlet features, formation of deep ruts in embankment roadway, deterioration of riprap, etc.).

"Not Deficient" - Well constructed and maintained dam with no apparent deficiencies relative to its safety and structural integrity.