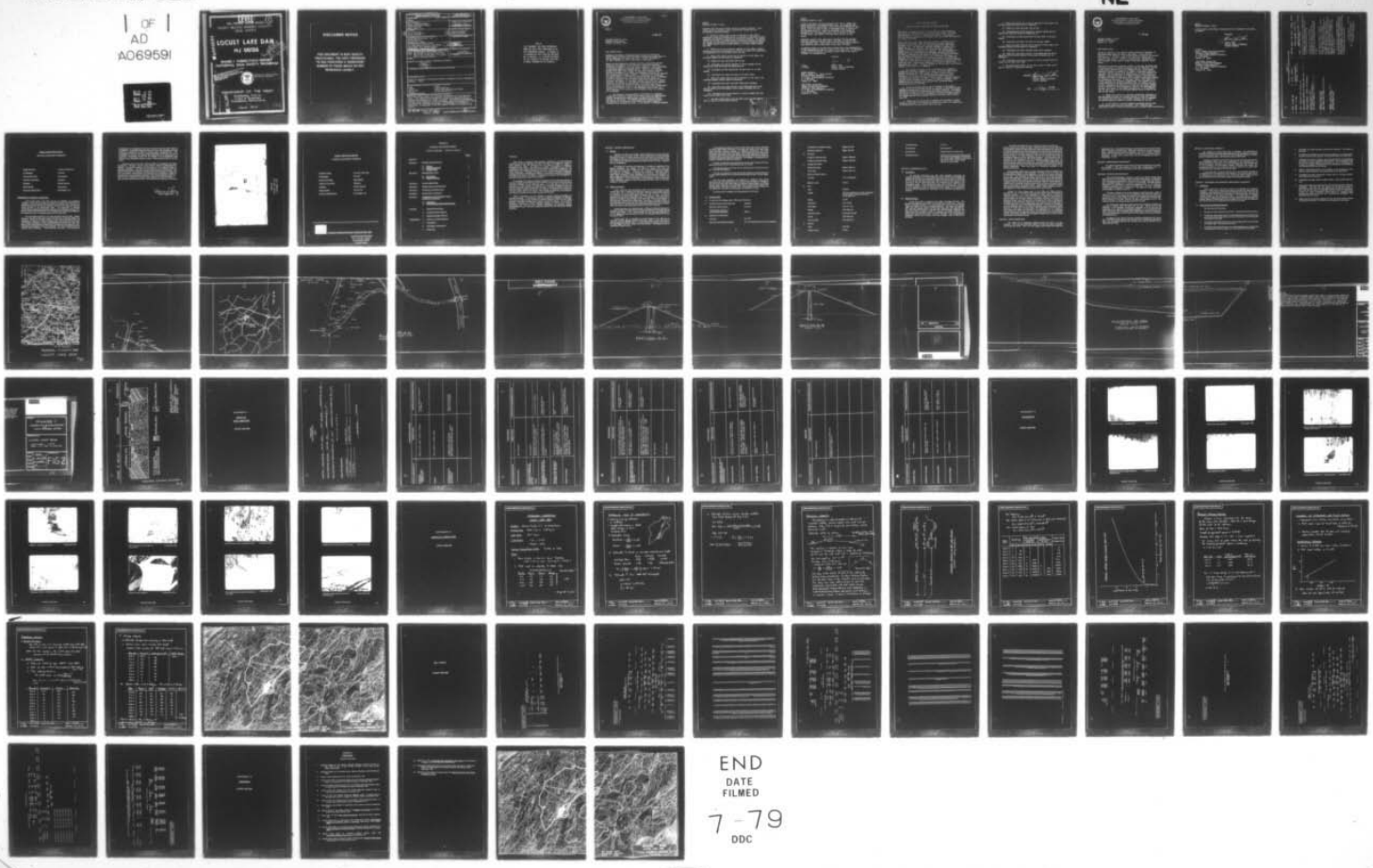
AD-A069 591 NEW JERSEY STATE DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/2
NATIONAL DAM SAFETY PROGRAM. LOCUST LAKE DAM (NJ 00126), DELAWA--ETC(U)
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LEVEL

DELAWARE RIVER BASIN

MUDDY BROOK, WARREN COUNTY

NEW JERSEY

AD A069591

LOCUST LAKE DAM

NJ 00126

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PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

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3. RECIPIENT'S CATALOG NUMBER:

4. TITLE (and Subtitle): Phase I Inspection Report
National Dam Safety Program
Locust Lake Dam
Warren County, N.J.

5. TYPE OF REPORT & PERIOD COVERED: (9) FINAL rept.,

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7. AUTHOR(s): (10) Dennis J. Leary P.E.

8. CONTRACT OR GRANT NUMBER(s): (15) DACW61-78-C-0124

9. PERFORMING ORGANIZATION NAME AND ADDRESS:
Langan Engineering Assoc. Inc.
970 Clifton Ave.
Clifton, N.J. 07013

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:

11. CONTROLLING OFFICE NAME AND ADDRESS:
U.S. Army Engineer District, Philadelphia (11)
Custom House, 2d & Chestnut Streets
Philadelphia, Pennsylvania 19106

12. REPORT DATE: Mar[illegible] 1979

13. NUMBER OF PAGES: 76

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18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Riprap
Outlet pipe
Seepage
Structural Analysis
Safety
Visual Inspection
National Dam Inspection Act Report
Locust Lake Dam, N.J.

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

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-D

30 MAY 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Locust Lake Dam in Warren County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Locust Lake Dam, a high hazard potential structure, is judged to be in poor overall condition. Also, the spillway is considered seriously inadequate since 7 percent of the Probable Maximum Flood (PMF) would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant, engaged by the owner, using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency

operation plan and warning system, should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analysis should be performed to determine the dam's embankment and foundation condition and structural stability. This should include test borings to determine material properties relative to stability and seepage and installation of piezometers to facilitate seepage studies. Any remedial measure found necessary should be initiated within calendar year 1980.

c. Within one year of the date of approval of this report, studies should be initiated to investigate and evaluate the amount and consequences of sedimentation that has occurred within the lake.

d. Within three months of the date of approval of this report, the following remedial actions should be completed:

(1) Remove all trees and brush from the dam.

(2) Investigate and develop measures to control seepage and wet spongy areas along and beyond the downstream toe.

(3) Investigate and make operational the gate valve in the gate chamber.

(4) Investigate and repair the drain in the gate chamber.

e. Within six months from the date of approval of this report, the following remedial actions should be completed:

(1) Investigate and repair upstream riprap where necessary.

(2) Completely plug animal burrows in the downstream face of the dam and provide protection against future animal burrowing into the embankment.

(3) Investigate and develop measures to control seepage below and around the low level outlet pipe.

f. The owner should operate the low level outlet at least twice a year, to ensure its operational condition.

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NAPEN-D
Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James J. Courter of the Thirteenth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

LOCUST LAKE DAM (NJ00126)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 6 and 7 December 1978 by Langan Engineering Associates, Inc. under contract to the State of New Jersey. The state, under agreement with the U. S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Locust Lake Dam, a high hazard potential structure, is judged to be in poor overall condition. Also, the spillway is considered seriously inadequate since 7 percent of the Probable Maximum Flood (PMF) would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant, engaged by the owner, using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system, should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analysis should be performed to determine the dam's embankment and foundation condition and structural stability. This should include test borings to determine material properties relative to stability and seepage and installation of piezometers to facilitate seepage studies. Any remedial measure found necessary should be initiated within calendar year 1980.

c. Within one year of the date of approval of this report, studies should be initiated to investigate and evaluate the amount and consequences of sedimentation that has occurred within the lake.

d. Within three months of the date of approval of this report, the following remedial actions should be completed:

(1) Remove all trees and brush from the dam.

(2) Investigate and develop measures to control seepage and wet spongy areas along and beyond the downstream toe.

(3) Investigate and make operational the gate valve in the gate chamber.

(4) Investigate and repair the drain in the gate chamber.

e. Within six months from the date of approval of this report, the following remedial actions should be completed:

(1) Investigate and repair upstream riprap where necessary.

(2) Completely plug animal burrows in the downstream face of the dam and provide protection against future animal burrowing into the embankment.

(3) Investigate and develop measures to control seepage below and around the low level outlet pipe.

f. The owner should operate the low level outlet at least twice a year, to ensure its operational condition.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 11 May 1979

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN

11 APR 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Locust Lake Dam (Federal I.D. No. NJ00126), a high hazard potential structure has recently been inspected. The dam is owned by the Locust Lake Company and is located on Muddy Brook, a tributary of Beaver Brook, approximatley 1.9 miles northwest of Hope near Mt. Herman in Belvidere Township, Warren County.

Using Corps of Engineers screening criteria, it has been determined that the dam's spillway is seriously inadequate since approximately 7 percent of the Probable Maximum Flood would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owner take the following measures within 30 days of the date of this letter:

a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, round-the-clock surveillance should be provided during periods of unusually heavy precipitation.

NAPEN-D
Honorable Brendan T. Byrne

A final report on this Phase I Inspection will be forwarded to you within two months.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Cy Furn:
Dirk C. Hofman, Actg Deputy Director
Division of Water Resources
N.J. Dept of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

UNSAFE DAM
NATIONAL PROGRAM OF INSPECTION OF DAMS

a. NAME: Locust Lake

b. ID NO.: NJ00126

c. LOCATION State: New Jersey County: Warren
River or Stream: Muddy Brook
Nearest D/D City or Town: Belvidere

d. HEIGHT: 21 Feet

e. MAXIMUM IMPOUNDMENT CAPACITY: 460 ac. ft.

f. TYPE: Earthfill with concrete core

g. OWNER: Locust Lake Company

h. DATE GOVERNOR NOTIFIED OF UNSAFE CONDITIONS: 11 Apr 79

i. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT
Preliminary report calcualtions indicate 7% of PMF would overtop the dam.

l. URGENCY CATEGORY: UNSAFE, Non-Emergency

m. EMERGENCY ACTIONS TAKEN:
Gov. notified of this condition by District Engineer's letter of 11 Apr 79

j. DESCRIPTION OF DANGER INVOLVED:
Overtopping and failure of the dam significantly increases hazard potential to loss of life and property downstream of dam.

n. REMEDIAL ACTIONS TAKEN:
N.J.D.E.P. will notify dam's owner upon receipt of our letter.

k. RECOMMENDATIONS GIVEN TO GOVERNOR:
Within 30 days of date of District Engineer letter the owner do the following:
a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, round-the-clock surveillance should be provided during periods of unusually heavy precipitation.

o. REMARKS: Final report, to be issued within six weeks, will have WHITE cover.

for G D Braun 5/20/79
W. H. ZINK, Coordinator
Dam Inspection Program
U.S.A.E.D., Philadelphia

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	LOCUST LAKE DAM
ID NUMBER:	NJ 00126
STATE LOCATED:	NEW JERSEY
COUNTY LOCATED:	WARREN
STREAM:	MUDDY BROOK
RIVER BASIN:	DELAWARE
DATE OF INSPECTION:	DECEMBER 1978

ASSESSMENT OF GENERAL CONDITIONS

Locust Lake Dam is 50 years old and an UNSAFE, non emergency condition. There are wet spongy areas along and beyond the downstream toe. Leakage is occurring below and around the low level outlet pipe. The crest and downstream slope of the dam are overgrown with brush and trees and there are animal burrows in the downstream slope. No information is available concerning the engineering properties of the dam and foundation materials. The spillway capacity as determined by CE Screening criteria is seriously inadequate. We estimate the dam can adequately pass only 6% of the PMF.

We recommend removal of all trees and brush from the dam. Animal burrows in the downstream face of the dam should be completely plugged and protection should be provided against future animal burrowing into the embankment. Measures to control seepage below and around low level outlet pipe should be developed. These recommendations should be done soon. Wet spongy areas along and beyond downstream toe should be investigated very soon and measures developed to control the seepage. The upstream riprap should be repaired where necessary. This should be done soon. The amount and

consequences of sedimentation that has occurred within the lake should be investigated. The engineering properties of the dam and foundation materials should be investigated by means of borings, tests, and piezometers. This investigation should be directed toward obtaining information for use in evaluating the strength and seepage characteristics of the embankment and foundation. Engineering studies of the stability of the embankment under different stress conditions should be made. These should be done in the near future.

The gate valve in the gate chamber should be investigated and made operational. The drain from the gate chamber should be investigated and repaired. The spillway capacity as determined by CE Screening criteria is seriously inadequate. The SDF and the capacity of the spillway should be determined using more precise and sophisticated methods and procedures. The need for and type of mitigating measures should be determined. Around the clock surveillance during periods of unusually heavy precipitation should be provided and a warning system established. These recommendations should be done very soon. Operate the low level outlet regularly, at least two times a year, to ensure operational condition. This should be done regularly in the future.

Dennis J. Leary

Dennis J. Leary, P.E.

Dam



OVERVIEW

LOCUST LAKE DAM

1 DECEMBER 1978

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	LOCUST LAKE DAM
ID NUMBER:	NJ 00126
STATE LOCATED:	NEW JERSEY
COUNTY LOCATED:	WARREN
STREAM:	MUDDY BROOK
RIVER BASIN:	DELAWARE
DATE OF INSPECTION:	DECEMBER 1978

LANGAN ENGINEERING ASSOCIATES, INC.

Consulting Civil Engineers
990 CLIFTON AVENUE
CLIFTON, NEW JERSEY
201-472-9366

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NATIONAL DAM SAFETY REPORT

LOCUST LAKE DAM FED ID No. NJ00126

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. 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 condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

SECTION 1 PROJECT INFORMATION

1.1 General

Authority to perform the Phase I Safety Inspection of Locust Lake Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 20 November 1978. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the US Army Engineers District, Philadelphia.

The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to safety of Locust Lake Dam and appurtenances based upon available data and visual inspection, and determine any need for emergency measures and conclude if additional studies, investigations and analyses are necessary and warranted. The assessment is made using screening criteria established in Recommended Guidelines for Safety Inspection of Dams prepared by the Department of Army, Office of the Chief of Engineers. It is not the purpose of the inspection report to imply that a dam meeting or failing to meet the screening criteria, is per se, certainly adequate or inadequate.

1.2 Project Description

Locust Lake Dam was constructed in 1929. It is a 223-ft-long, 21-ft high earthfill dam with a concrete core wall and a detached natural saddle spillway in rock about 100 ft to the right of the dam. The crest is about 8 ft wide and the upstream and downstream slopes are about 2 hor to 1 vert. The dam is reported to be founded on "solid slate rock." The spillway is 30-ft long and the channel is through a natural saddle in the slate rock. The low level outlet is a 24-in-dia cast iron pipe with a gate valve. The valve is in a gate chamber on the downstream side of the core wall at about the middle of the dam. Access is from the crest of the dam and the outlet pipe passes under the downstream slope and exits from the outlet pipe end wall at the toe of the slope.

Locust Lake Dam is on Muddy Brook, a tributary of Beaver Brook and is 1.9 miles northwest of Hope near Mt. Herman in Belvidere Township, Warren County, New Jersey. It is at north latitude 40° 55.2' and west longitude 75° 0.1'. A regional vicinity map is given in Fig 1 and essential features of the dam are given in Fig 2.

Locust Lake Dam is classified as being "Small" on the basis of its maximum reservoir storage volume of 460 ac-ft, which is more than 50-acre feet, but less than 1000-acre feet. It is also classifed as "Small" on the basis of its total height of 21 feet, which is less than 40 feet. Accordingly the dam is classified as "Small" in size.

In the National Inventory of Dams, Locust Lake Dam has been classified as having "High Hazard Potential" on the basis that failure of the dam would cause excessive property damage to residences downstream, and could potentially cause more than a few deaths. Visual inspection of the downstream area shows that breach of the dam would cause serious damage to at least two residences which are located about 400 feet downstream and could be hazardous to people utilizing the nearby low lying road. Accordingly, it is proposed not to change the Hazard Classification Potential.

The dam is reported to be owned by the Locust Lake Company c/o Silvia Stickle, Raymond Commerce Building, Newark, N.J. 07102.

The original purpose of the dam was to impound water to enhance the area for real estate development.

The dam was designed by Snook and Hardin, Engineers and Land Surveyors, 11 High Street, Newton, N.J. and constructed between October 1928 and August 1929.

The core wall foundation was inspected at different times during construction by State Representatives and found to be satisfactory. Leakage at the end of the low level outlet pipe was observed during filling of the lake in January 1929. These leaks were inspected several times between January 1929 and September 1930 and in August 1936. The available records indicate the conclusion was the leaks did not endanger the stability of the dam.

No information is available concerning operation of the dam.

1.3 Pertinent Data

a. At dam site the drainage area is 1592 acres (2.49 sq mi)

b.	Maximum known flood at Dam Site	Unknown
	Maximum Pool elevation:	El. 517.0
	Total spillway capacity at maximum pool elevation:	306 cfs
c.	Elevation (ft above MSL)	
	Top Dam:	El. 517.0
	Maximum pool-design surcharge:	El. 514.5 (Assumed to be at top of spillway)

	Streambed at centerline of dam:	Approx. El. 494
	Maximum tailwater:	Approx. El. 493
d.	Reservoir	
	Length of maximum pool:	Approx. 3200 feet
	Length of recreation pool:	Approx. 3200 feet
e.	Storage (acre-feet)	
	Design surcharge:	Approx. 300 ac ft
	Top of dam:	Approx. 390 ac ft
f.	Reservoir Surface (acres)	
	Top dam:	36 Ac. (estimated)
	Spillway crest:	34.9 Ac.
g.	Dam	
	Type:	Earthfill
	Length:	223 feet embankment with 30 ft detached natural saddle spillway about 100 ft to the right of it.
	Height:	21 feet
	Top Width:	8 to 10 feet
	Side Slopes:	2 hor to 1 vert
	Zoning:	None observed
	Impervious Core:	Concrete core wall
	Cutoff:	None observed
	Grout Curtain:	None observed
h.	Spillway	
	Type:	Over-fall
	Length of weir:	30 feet

	Crest Elevation:	El. 514.5
	U/S Channel:	None observed
	D/S Channel:	Shallow steep cut in slate rock
i.	Regulating Outlet	24-in-dia cast iron low level pipe passing under dam and discharging at downstream toe. Valve in gate chamber at downstream side of core wall. Access through manhole at crest of dam.

SECTION 2 ENGINEERING DATA

2.1 Introduction

No essential information has been made available concerning the engineering properties of the foundation and dam materials and the design and operation of the dam. Correspondence during construction concerns observation of the core wall foundation excavation, leaks at the downstream toe and at the end wall of the low level outlet pipe, and settlement of the surface of the downstream slope. These observations were made between 1929 and 1936. Available drawings are indiscernable consequently, the information is limited. It is not possible to make an evaluation of the validity of the information beyond limited confirmation by observation of the materials and geometry of the dam.

2.2 Regional Geology

Locust Lake Dam is located in the Valley and Ridge Province. This province encompasses one-twelfth of the land area of the state - chiefly in Warren and Sussex Counties. It is characterized by a series of nearly parallel ridges and valleys that trend northeast-southwest. The ridges are underlain with northwest dipping Silurian and Devonian sandstones and conglomerates. The upper Delaware Valley is underlain with weak Devonian limestones and shales while the Kittatinny Valley is underlain with folded Cambrian and Ordovician limestones and shales. Kittatinny Mountain is the most prominent topographic feature and its nearly even crest averages 1600 to 1800 feet in elevation.

The Valley and Ridge Province is divided into western, middle, and eastern sections that include the Upper Delaware Valley, Kittatinny Mountain, and Kittatinny Valley.The Upper Delaware Valley encompasses the region west of Kittatinny Mountain that has been eroded in Devonian limestones and shales. Kittatinny Mountain makes up the middle section of the Province and forms the eastern border of the Upper Delaware Valley and the northwestern border of Kittatinny Valley. The ridge is underlain with the very resistant lower Silurian Shawangunk conglomerate and High Falls sandstone. The northeastern side is bordered by the escarpments of the Shawangunk conglomerate, which rise steeply from the Kittatinny Valley floor. The Shawangunk conglomerate has been extensively broken up into large rock fragments by mechanical weathering and frost action and forms mass wasted talus slopes along the ramparts of the eastern escarpment. These talus slopes are extensively developed in the Delaware Water Gap.

The Kittatinny Valley area is a broad northeast-southwest lowland where the Harrisburg Peneplain is well developed. The valley is 10 to 13 miles wide and lies between the New Jersey Highlands on the east and Kittatinny Mountain on the west. The Wisconsin ice sheet covered all of the Valley and Ridge Province and deposited a terminal moraine south of the province near Belvidere. Much of the land surface north of the terminal moraine consists of a thin sheet of glacial till and ice-scoured bedrock surfaces.In addition, fluvial deposits of stratified drift consisting of eskers, kames, kame terraces, and deltas mantle many of the areas of the valley bottoms. Discontinuous recessional moraines were deposited during stillstands in the ice retreat. These moraines now form a discontinuous low band of hills across nearly all of Sussex County.

Glacial till covers large areas of the Valley and Ridge Province. Generally the till is extremely thin and sometimes present only in patches or as scattered boulders. It is best developed on broad summits, interstream surfaces, and in low passes or cols, and is thinnest or absent on steep slopes, on narrow ridges, and in narrow valleys. The greatest thickness of the till in the Kittatinny Valley is over 100 feet just on the edge of the valley at Ogdensburg. Estimates of the thickness range from 8 to 10 feet in the areas west of Kittatinny Mountain; 6 to 8 feet along the west slope of Kittatinny Mountain; 2 to 3 feet along the crest of Kittatinny Mountain; 5 to 10 feet on the limestone belts of Kittatinny Valley; 8 to 12 feet on the shale belts of Kittatinny Valley; and from 5 to 20 feet in Vernon Valley. The composition of till is largely of local origin and reflects the character of the underlying rock. It is generally compact because of the high clay content derived from the weathered shales and has many resistant boulders of Shawangunk conglomerate as well as erratics derived from more distant sources.

SECTION 3 VISUAL INSPECTION

The results of our inspection indicate Locust Lake Dam is in poor condition. The crest and downstream slope of the dam are heavily overgrown with brush and trees. There are wet spongy areas beyond and along the

downstream toe. Uncontrolled leakage is occurring below and around the end wall of the low level outlet pipe. Animal burrow holes are in the downstream slope. Upstream riprap has been displaced. The gate chamber contained several feet of water and it is not known whether or not the gate valve is functional. A copy of the Visual Check List and Photographs are given in Appendices 1 and 2.

SECTION 4 OPERATIONAL PROCEDURES

No essential information concerning operational procedures for the dam are available. The dam appears to have been unmaintained since its construction. No information is available concerning a warning system.

SECTION 5 HYDRAULIC/HYDROLOGIC

The hydraulic/hydrologic evaluation is based on a Spillway Design Flood (SDF) equal to the full Probable Maximum Flood (PMF) chosen in accordance with the evaluation guidelines for dams classified as High Hazard and Small in size. Hydrologic design data for this dam is not available. The PMF has been determined by developing a synthetic hydrograph based on the maximum probable precipitation of 22.2 inches (200 square mile - 24 hour). Hydrologic computations are presented in Appendix 4. The PMF peak inflow determined for the subject watershed is 8,327 cfs.

The dam is reported to have been designed to discharge safely a depth of water of 2.5 ft over the rock crest of the spillway with a spillway capacity of 123 cfs per sq mi. Accordingly, the capacity of the spillway at maximum pool elevation to the crest (El. 517.0) is 306 cfs which is significantly less than SDF. Flood routing for the PMF indicates the dam will overtop by 4.4 ft. We estimate the dam can adequately pass only 6% of the PMF.

The downstream potential damage center (two residential dwellings and roadway), is located about 400 feet from the dam. Based on our visual inspection of the immediate downstream topography and the dam, and our knowledge of the degree of overtopping potential, it is our opinion that dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

Drawdown of the reservoir has been evaluated assuming that the 24-in-dia C.I. lowlevel outlet pipe functions properly and is utilized for lowering the lake. Our calculations indicate that the lake level could be lowered 17 ft in approximately 5 days.

SECTION 6 STRUCTURAL STABILITY

The stability of Locust Lake Dam is uncertain. No information is available concerning the engineering properties of the foundation or materials of the dam and core wall. The fact that it has remained in place for 50 years does not necessarily mean it will continue to do so in the future.

Available construction information indicates that at the time the work was done, meaningful effort went into preparation of the specifications and construction control. However, the lack of knowledge concerning the properties of the materials, the downstream leakage conditions, and present day requirements lead us to the conclusion the dam is unlikely to be stable under increased stresses resulting from an extreme flood.

Locust Lake Dam is located in Seismic Zone 1 of the Seismic Zone Map of Contiguous States. The degree of static stability of the dam and appurtenances is assumed to be less than present day conventional safety margins and the dam is considered to be potentially unstable under earthquake loading.

SECTION 7 ASSESSMENT RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Assessment

Locust Lake Dam is 50 years old and in an UNSAFE, non emergency condition. There are wet spongy areas along and beyond the downstream toe. Leakage is occurring below and around the low level outlet pipe. The crest and downstream slope of the dam are overgrown with brush and trees and there are animal burrows in the downstream slope. No information is available concerning the engineering properties of the dam foundation and materials. The spillway capacity as determined by CE Screening criteria is seriously inadequate. We estimate the dam can adequately pass only 6% of the PMF.

7.2 Recommendations/Remedial Measures

We recommend the following:

1. Remove all trees and brush from the dam. This should be done very soon.
2. Completely plug animal burrows in the downstream face of the dam and provide protection against future animal burrowing into the embankment. This should be done soon.
3. Investigate and develop measures to control seepage below and around low level outlet pipe. This should be done soon.
4. Investigate and develop measures to control seepage and wet spongy areas along and beyond the downstream toe. This should be done very soon.

5. Investigate and repair upstream riprap where necessary. This should be done soon.

6. Investigate and evaluate the amount and consequences of sedimentation that has occurred within the lake. This should be done in the near future.

7. Investigate by means of borings, tests, and piezometers the engineering properties of the dam foundation and materials. This investigation should be directed toward obtaining information for use in evaluating the strength and seepage characteristics of the embankment and foundation. This should be done in the near future.

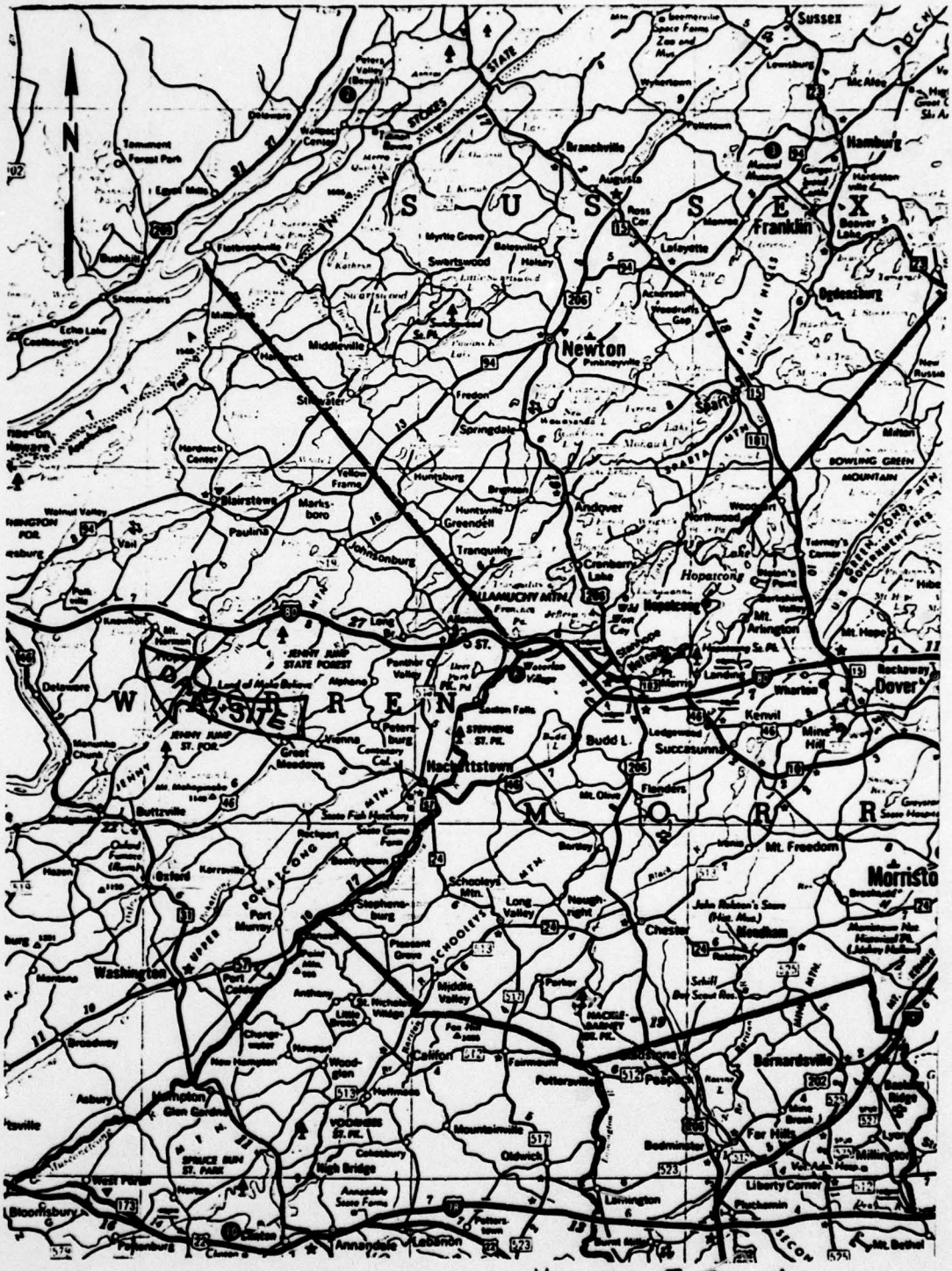
8. Perform engineering studies of the stability of the embankment under different stress conditions. This should be done in the near future.

9. Investigate and make operational the gate valve in the gate chamber. This should be done very soon.

10. Investigate and repair drain from gate chamber. This should be done very soon.

11. The spillway capacity as determined by CE Screening criteria is seriously inadequate. The SDF and the capacity of the spillway should be determined using more precise and sophisticated methods and procedures. The need for and type of mitigating measures should be determined. Around the clock surveillance during periods of unusually heavy precipitation should be provided, and a warning system established. This should be done very soon.

12. Operate the low level outlet regularly, at least two times a year, to ensure its operational condition. This should be done regularly in the future.

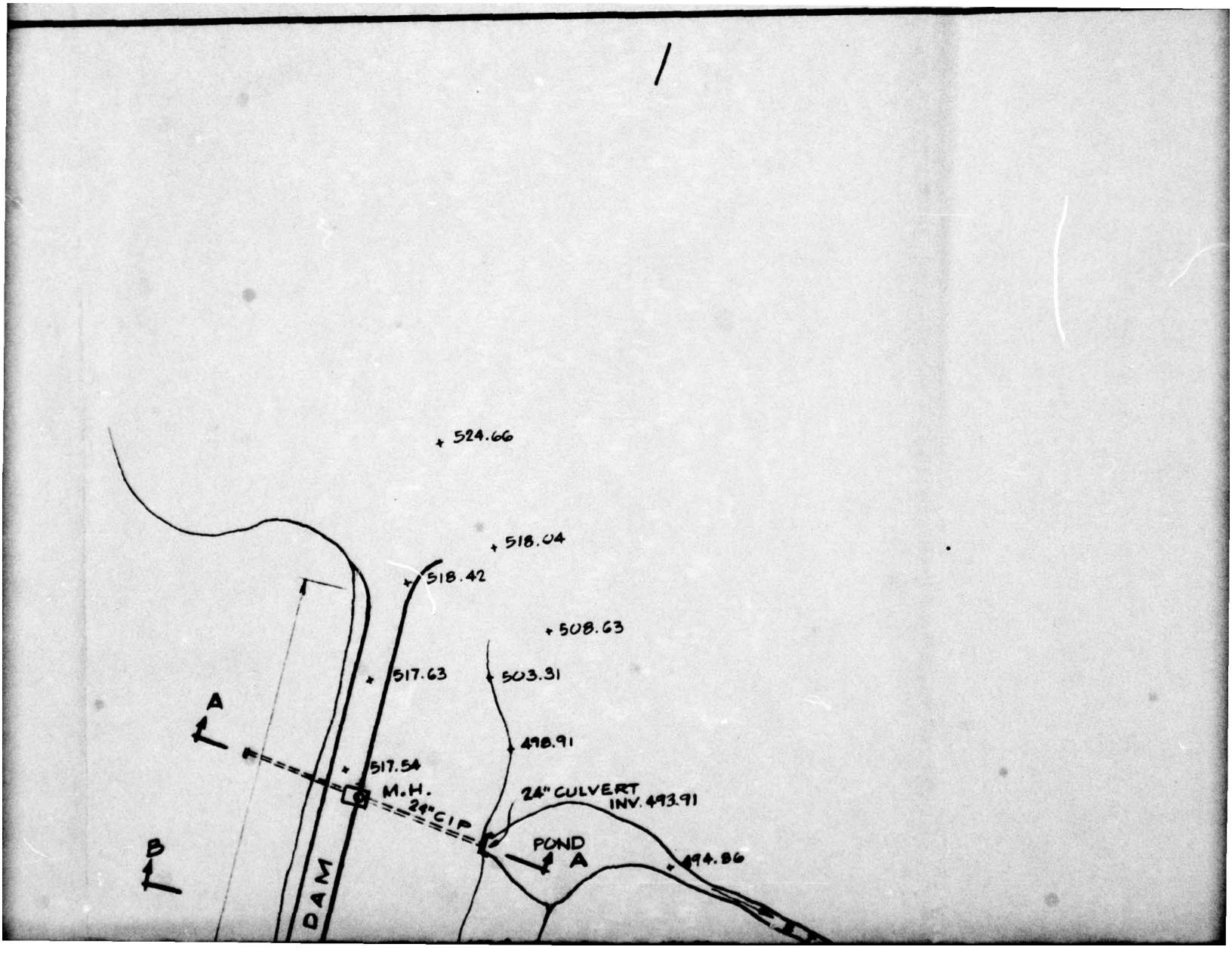


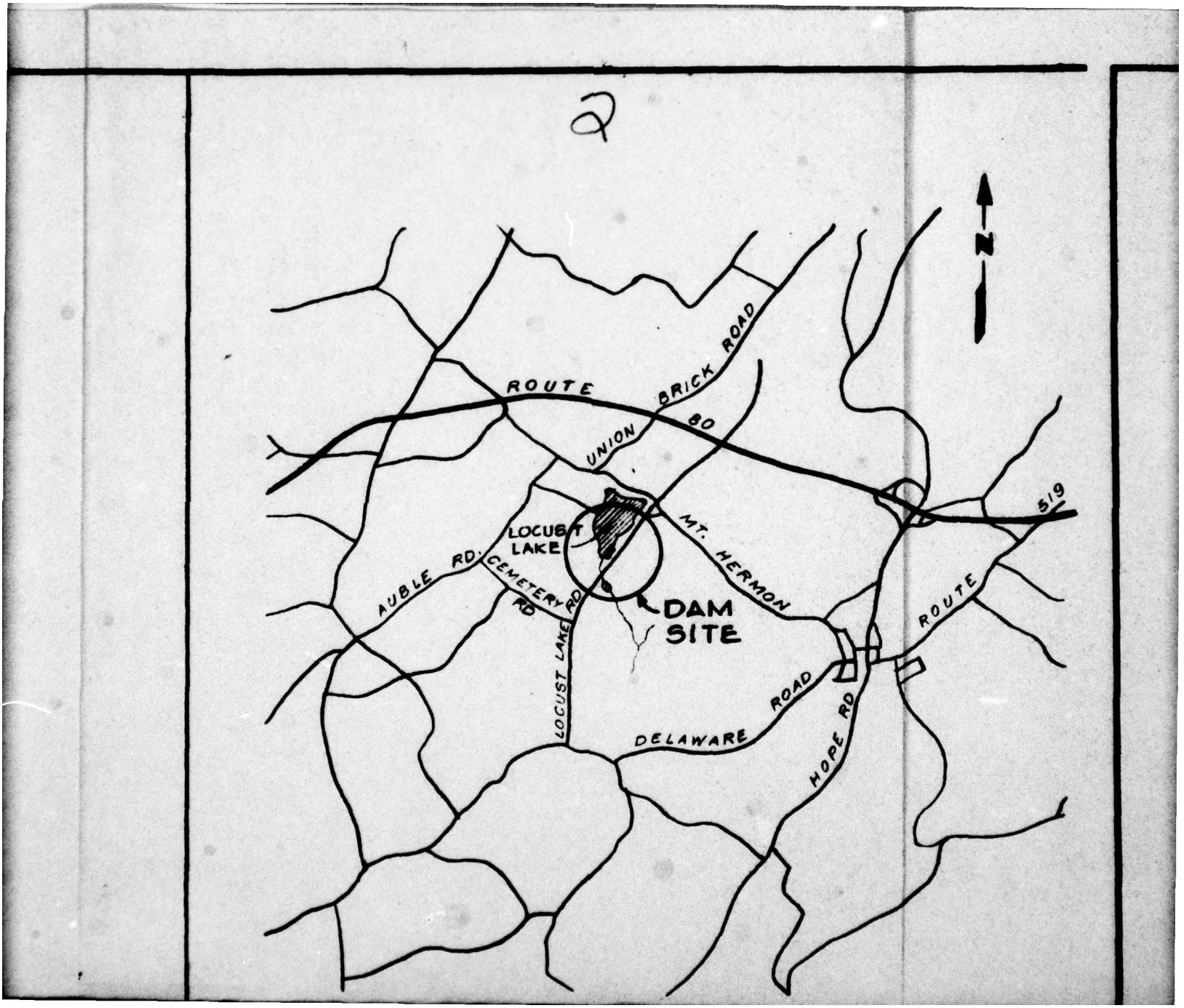
1in ≃ 5.2mi

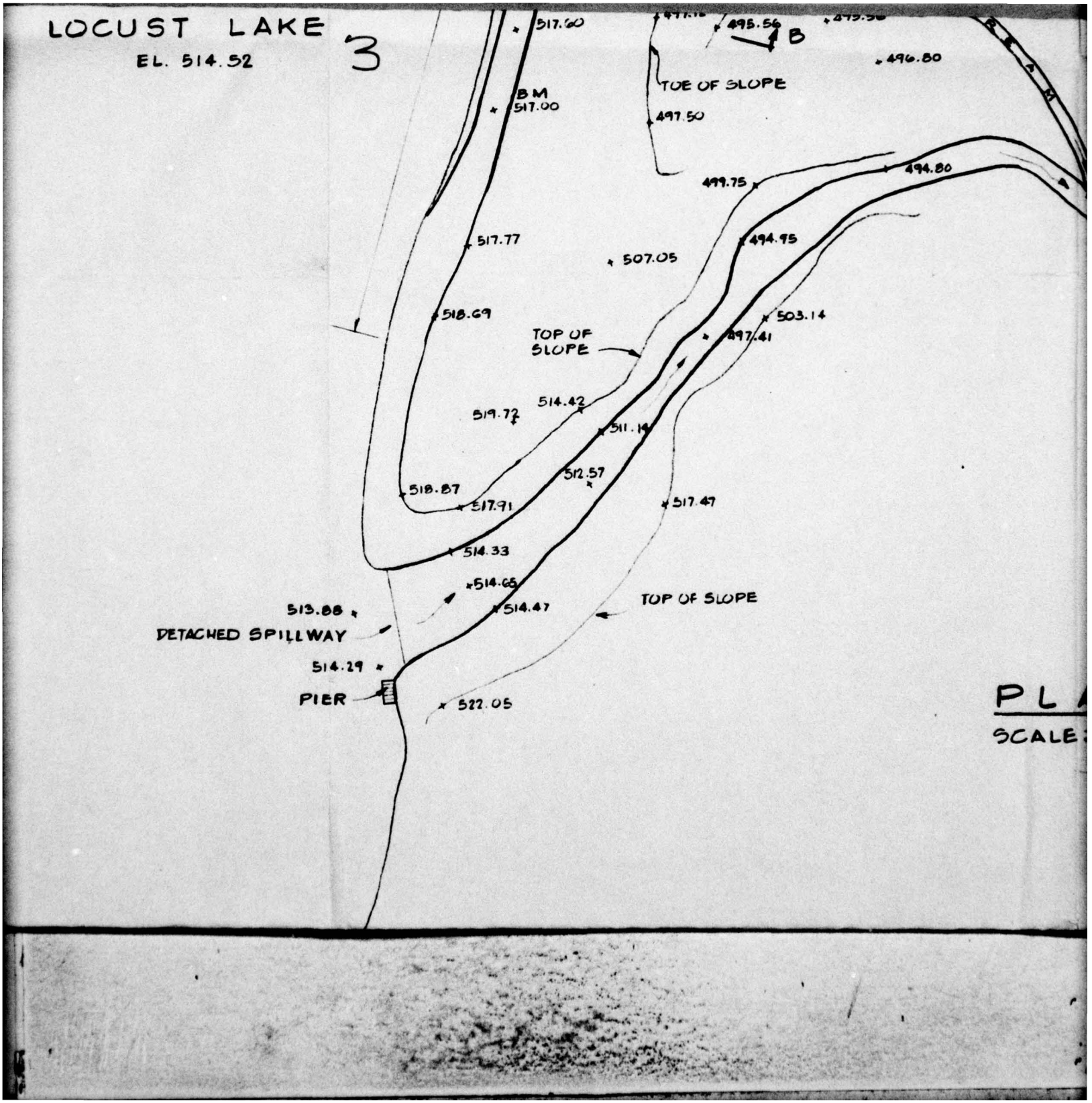
REGIONAL VICINITY MAP

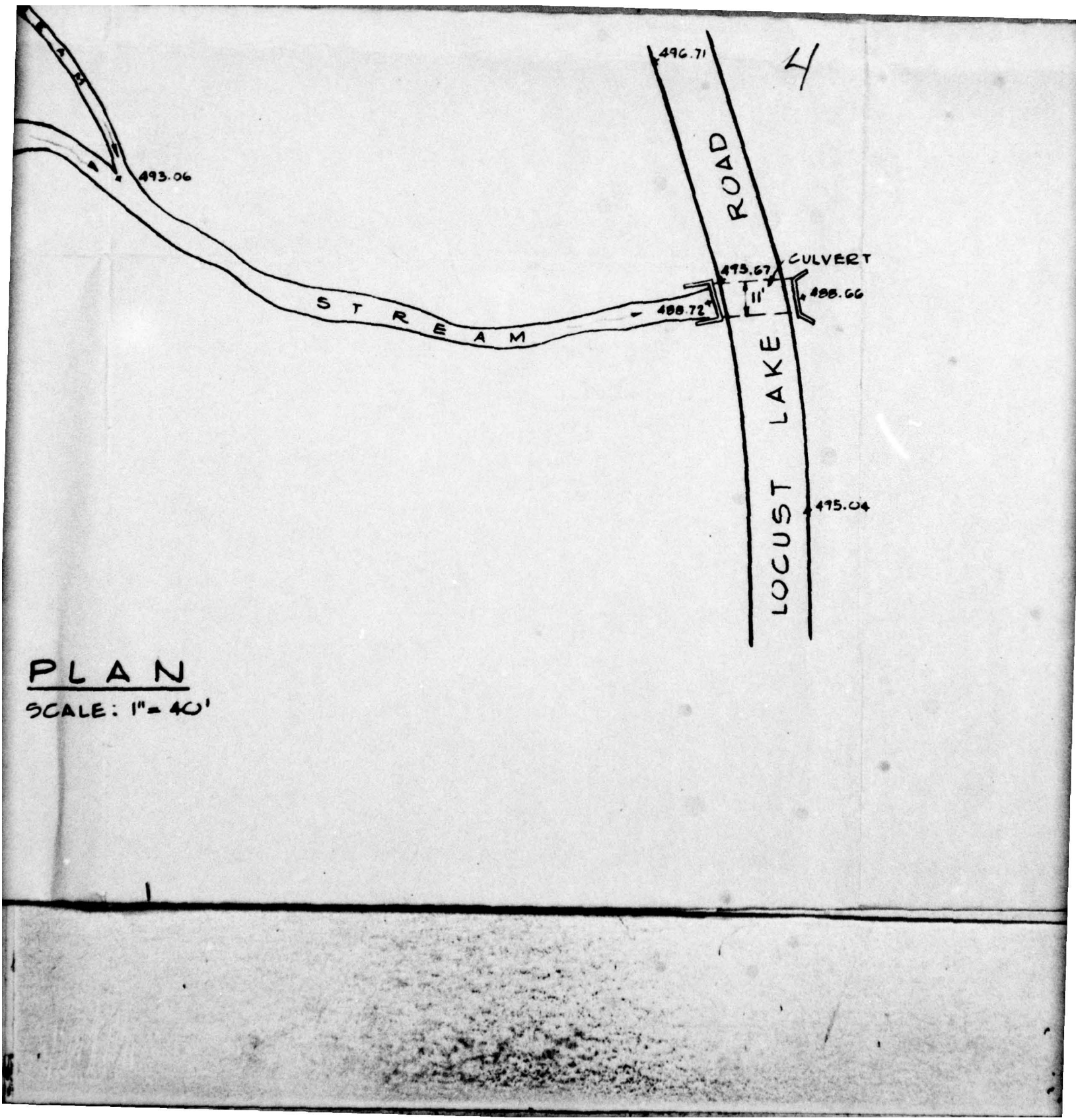
LOCUST LAKE DAM

Fig 1


524.66
518.04
518.42
508.63
517.63
503.31
A
498.91
517.54
M.H.
24" CIP
24" CULVERT
INV. 493.91
B
POND
A
494.86
DAM


2
N
ROUTE
BRICK ROAD
80
UNION
519
LOCUST LAKE
MT. HERMON
AUBLE RD.
CEMETERY RD
DAM SITE
ROUTE
LOCUST LAKE RD
DELAWARE ROAD
HOPE RD

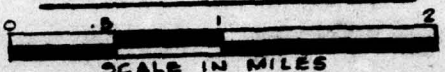

LOCUST LAKE
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519.77
518.87
517.91
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513.88
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522.05
TOE OF SLOPE
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495.56
B
496.80
499.75
494.80
494.95
507.05
503.14
497.41
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SLOPE
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511.14
512.57
517.47
514.47
TOP OF SLOPE
PL
SCALE



PLAN

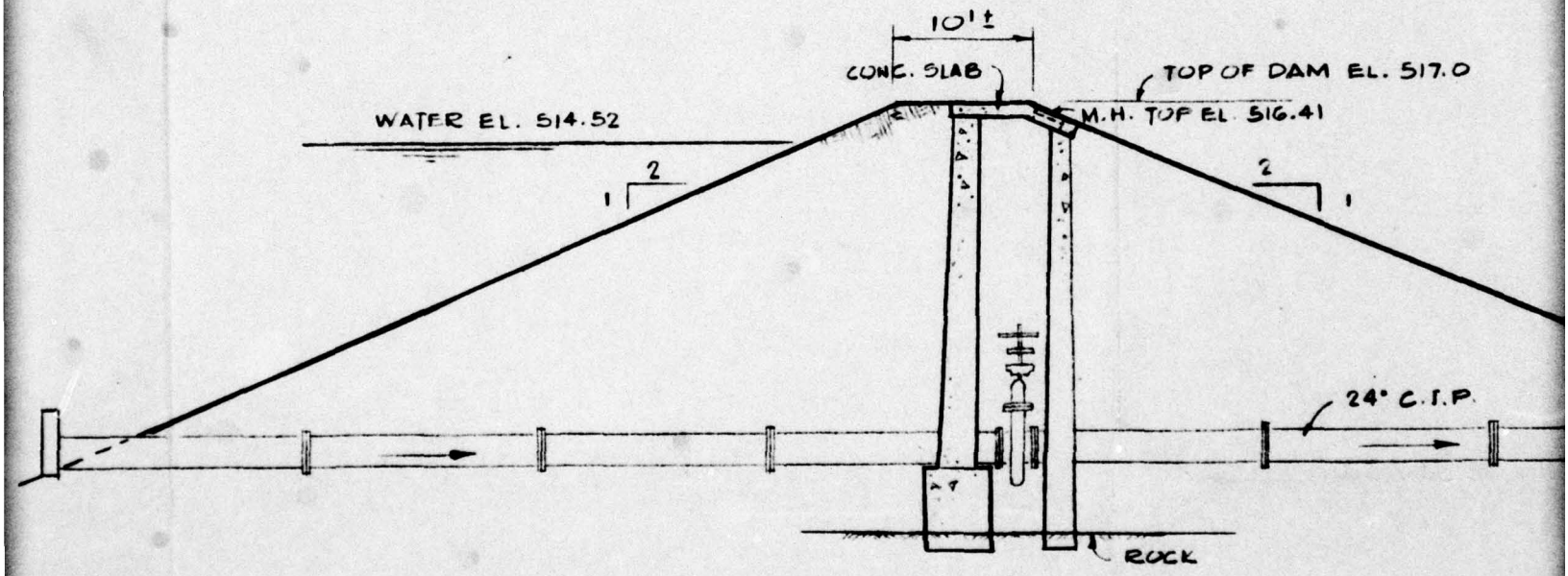
SCALE: 1" = 40'

KEY PLAN



5

6



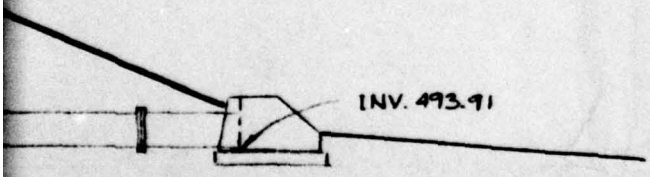
SECTION A-A

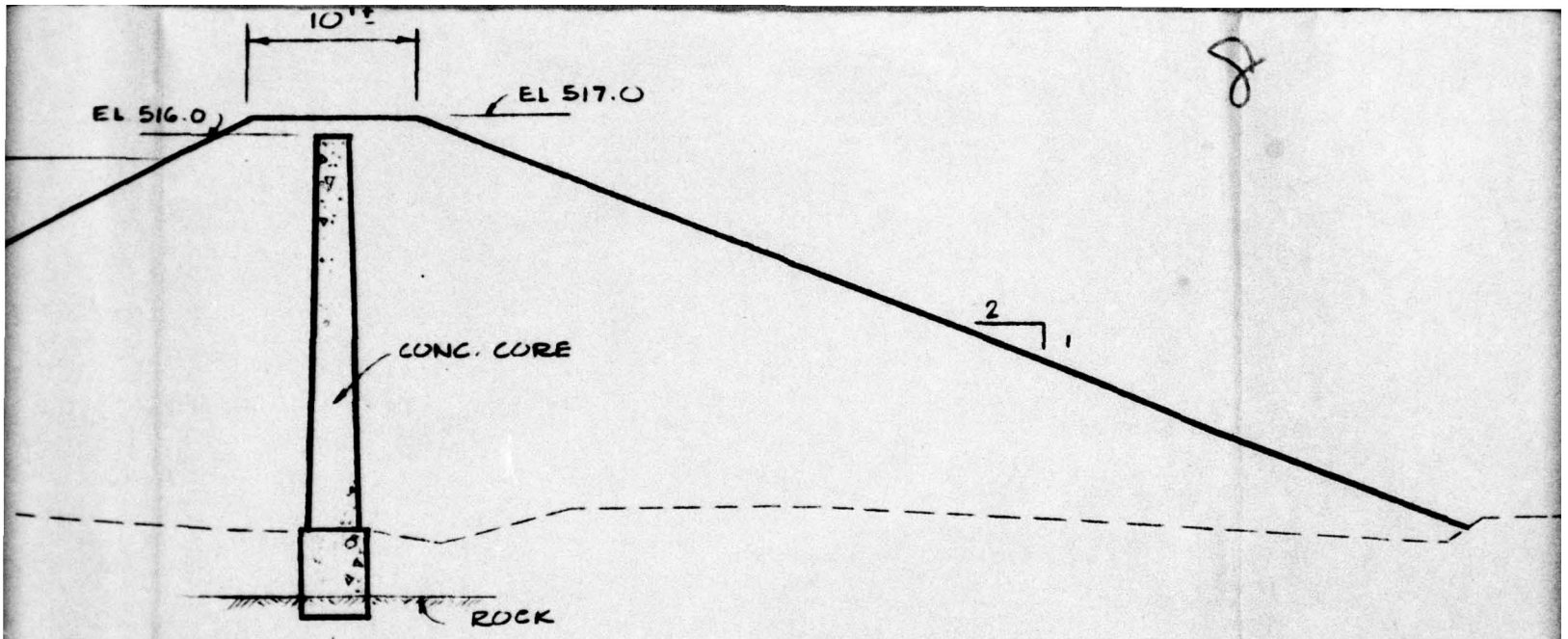
N.T.S.

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WATER EL. 514.52



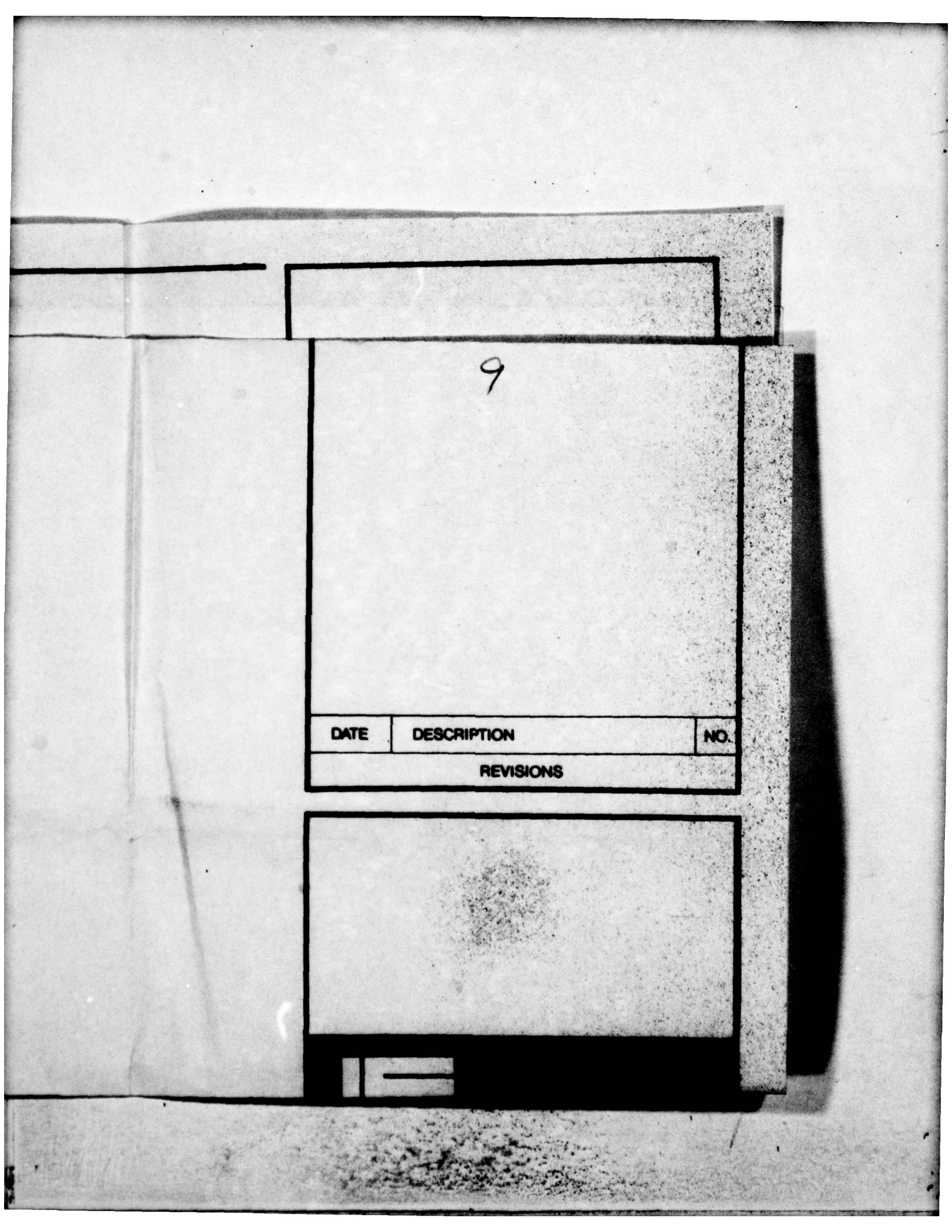


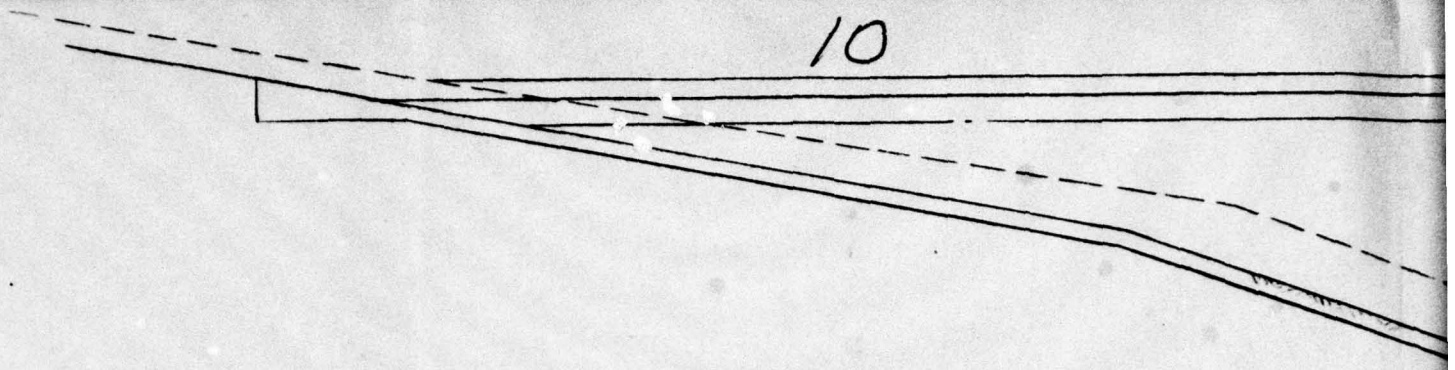


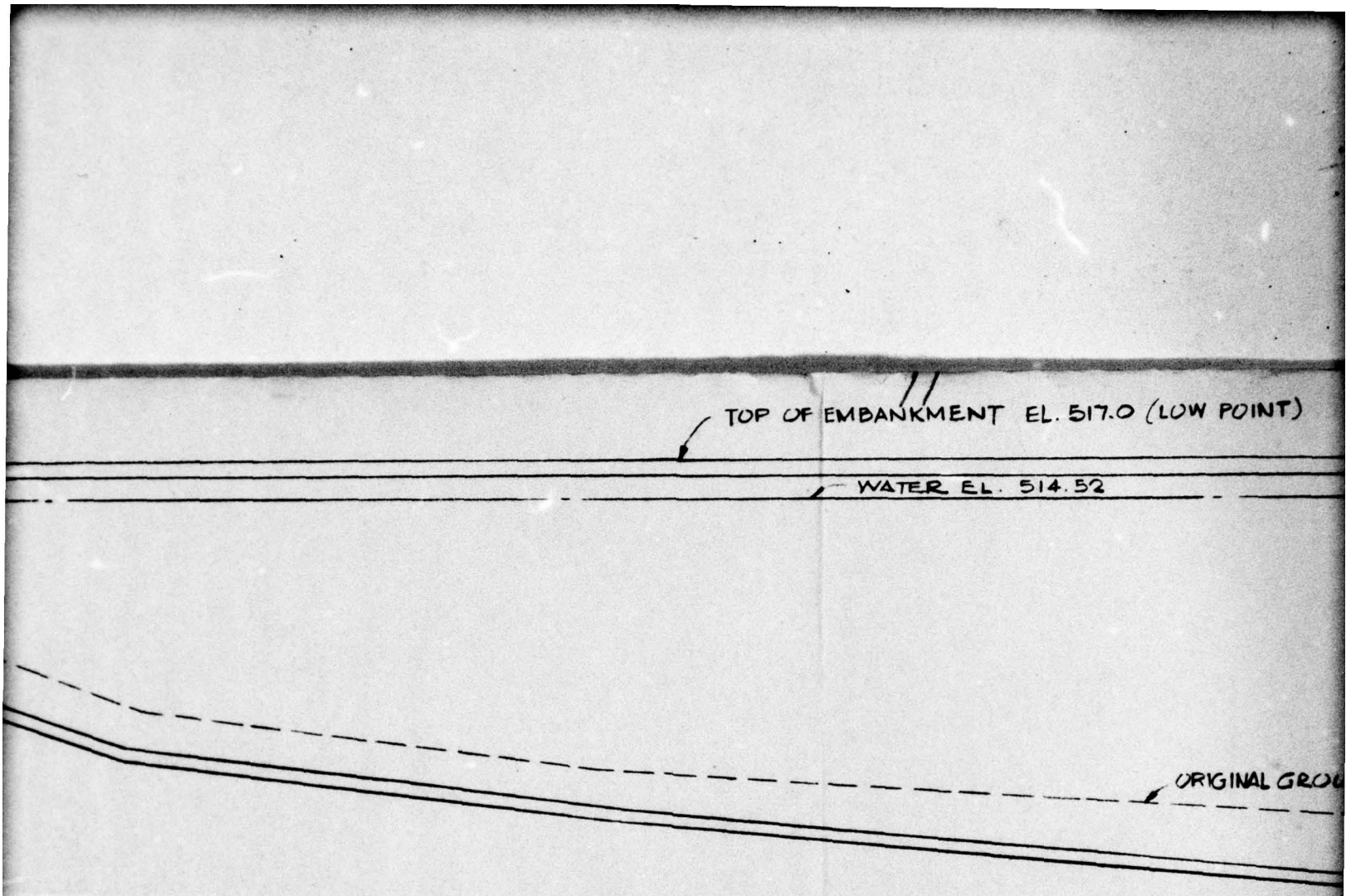
8

SECTION B-B

SCALE: 1" = 10'


9
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DESCRIPTION
NO.
REVISIONS


10

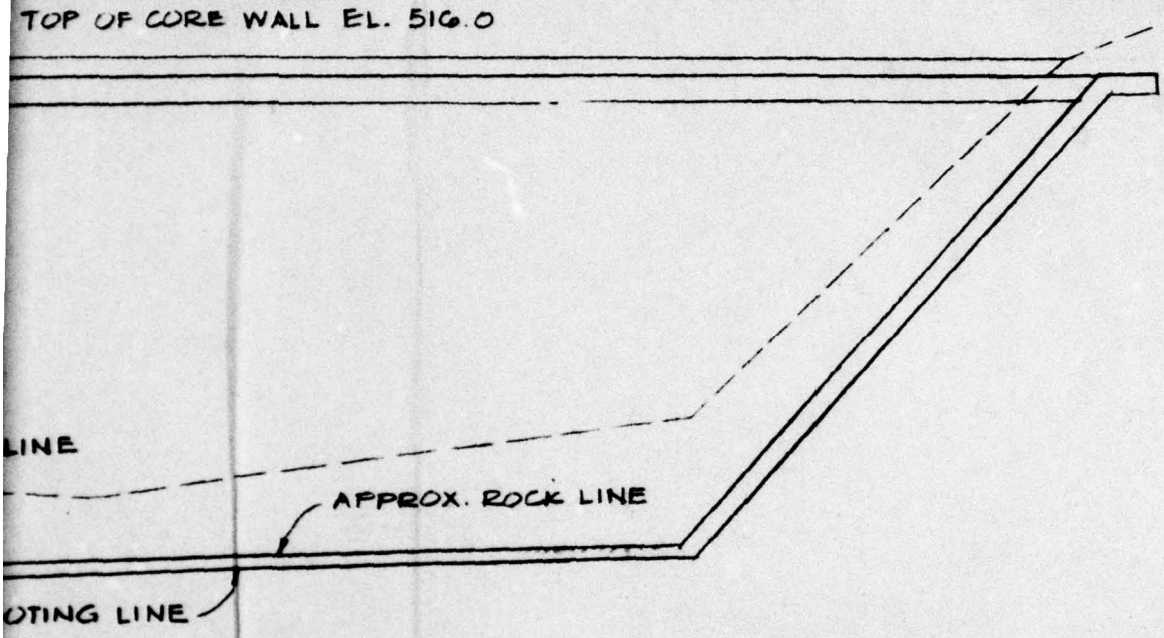


ELEVATION OF DAM

SCALE: 1" = 10'

(DIRECTION: LOOKING UPSTREAM
DETACHED SPILLWAY NOT INCLUDED)

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E ELEVATIONS SHOWN WERE OBTAINED USING A SURVEYOR'S TRANSIT D LEVEL. THEY ARE APPROXIMATE. THE BENCH MARK ELEVATION OF .00 ON THE TOP OF THE DAM WAS USED AS INDICATED ON THE DWGS BY OOK & HARDIN, ENGINEERS & SURVEYOR'S, NEWTON N.J. ENTITLED, CTIONS AND PROFILE OF DAM - LOCUST LAKE COMPANY - MT. HERMAN, RREN COUNTY N.J., SEPTEMBER 21, 1928. INFORMATION SHOWN BELOW OUND SURFACE AND WATER LEVEL ARE INFERRED ON THE BASIS OF FORMATION OF ABOVE MENTIONED DWGS.

PROJECT

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LOCUST

JANU

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JOB NO. J-78

DATE 15 J

SCALE AS N

DRN. BY J.B.

CHKD. BY D.J.

OR'S TRANSIT
LEVATION OF
THE DWGS BY
. ENTITLED,
T. HERMAN.
SHOWN BELOW
BASIS OF

PROJECT

PHASE I
INSPECTION & EVALUATION of NEW JERSEY DAMS

DRAWING TITLE

LOCUST LAKE DAM

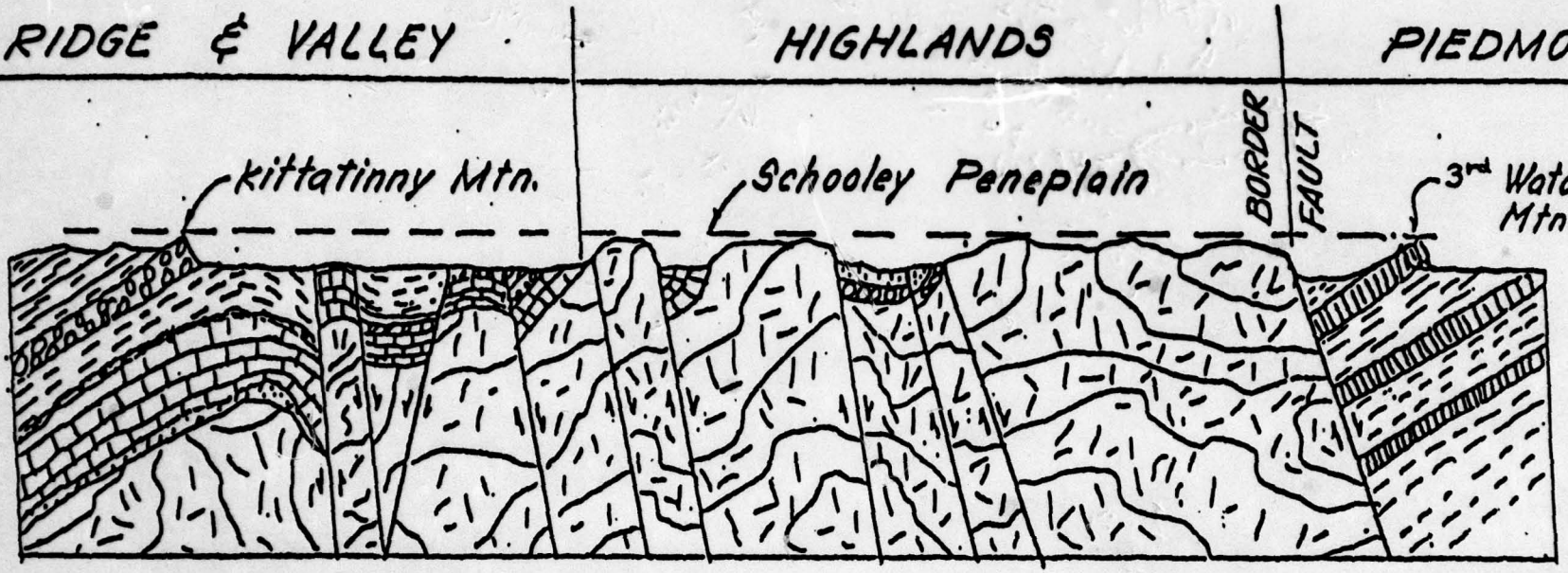
JANUARY 1979
FED. I.D. NO. NJ00126

JOB NO. J-783B	DRAWING NO. FIG 2
DATE 15 JAN 1979	
SCALE AS NOTED	
DRN. BY J.R.	
CHKD. BY D.J.L	

141

REGIONAL GEOLOGIC FEATURES

Fig. 3



Schematic Cross-section of Ridge & Valley Physiographic Province (After Wolfe; 1977)

APPENDIX I

CHECK LIST

VISUAL INSPECTION

LOCUST LAKE DAM

CHECK LIST
VISUAL INSPECTION
Phase I

NAME DAM Locust Lake Dam COUNTY Warren STATE New Jersey COORDINATORS N.J. DEP

DATE(s) INSPECTION see below WEATHER Clear TEMPERATURE 28° F - 33° F

POOL ELEVATION AT TIME OF INSPECTION 514* M.S.L. TAILWATER AT TIME OF INSPECTION 493* M.S.L.

*BM of 517 (ref. note on Fig. 2)

INSPECTION PERSONNEL:

J. Richards (12/6/78)
J. Rizzo (12/7/78)
D. Leary (12/6/78)
C. Campbell (12/7/78)
P. Yu (12/7/78)

James Richards RECORDER

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Debris, wood, brush, leaves in channel.	Channel should be cleaned of all debris.
SLOPES	Minor erosion in several areas.	
APPROXIMATE NO. OF HOMES AND POPULATION	2 homes directly downstream. Population est less than 10. Crest of dam is about 25 ft above level of homes.	Warning alarm system should be installed.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
OTHER	Downstream slope & crest covered with trees up to 6 inches in diameter.	Trees should be removed.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	At upstream and downstream edges of crest, several areas eroded up to 2 ft in depth.	Eroded areas should be suitably filled.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Several areas of the crest are out of horizontal alighment perpendicular to axis of dam. Vertical depressions of crest from 2 inches to 6 inches.	Suitable repairs should be made.
RIPRAP FAILURES	Several areas 1 - 2 ft in length on upstream riprap have failed. Trees & brush growing up through riprap displacing riprap.	Failed riprap areas should be repaired. Trees & brush should be removed.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
OTHER	An 11 inch diameter animal burrow hole is located 15 ft from the crest on the downstream face and midway between downstream toe of dam and concrete intake structure.	Animal burrow holes should be repaired.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Upstream area 4 ft X 2 ft shallow erosion at right abutment of embankment.	Eroded area should be suitably repaired.
ANY NOTICEABLE SEEPAGE	Downstream face soft and wet in most lower areas. Seeps ranging in size from 1 to 4 inches diameter right of blow-off outlet. 3 seeps located right of outlet structure. 1 seep located left of outlet structure.	Seeps should be further investigated.
STAFF GAGE AND RECORDER	None observed.	
DRAINS	None observed.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT		
INTAKE STRUCTURE	6 ft X 5.5 ft X 20 ft deep rectangular concrete structure, debris in structure.	Debris should be removed.
OUTLET STRUCTURE	Several small cracks observed in endwall of outlet pipe. Chamber contains approx. 8 ft of water. Gate and operators not observed.	Cracks should be repaired. Gates & operation equipment should be further investigated.
OUTLET CHANNEL	Leaves, branches, dead tree stumps in channel.	Debris materials should be removed.
EMERGENCY GATE	None observed.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARK OR RECOMMENDATIONS
SLOPES	Appear satisfactory.	
SEDIMENTATION	Estimate considerable sediment has accumulated in reservoir.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None observed.	
APPROACH CHANNEL	Leaves and tree branches extend into natural channel.	Leaves and tree branches should be removed and controlled.
DISCHARGE CHANNEL	Wood, debris, leaves, brush in channel.	Wood, debris, leaves & brush should be removed.
BRIDGE AND PIERS	None observed.	

APPENDIX 2

PHOTOGRAPHS

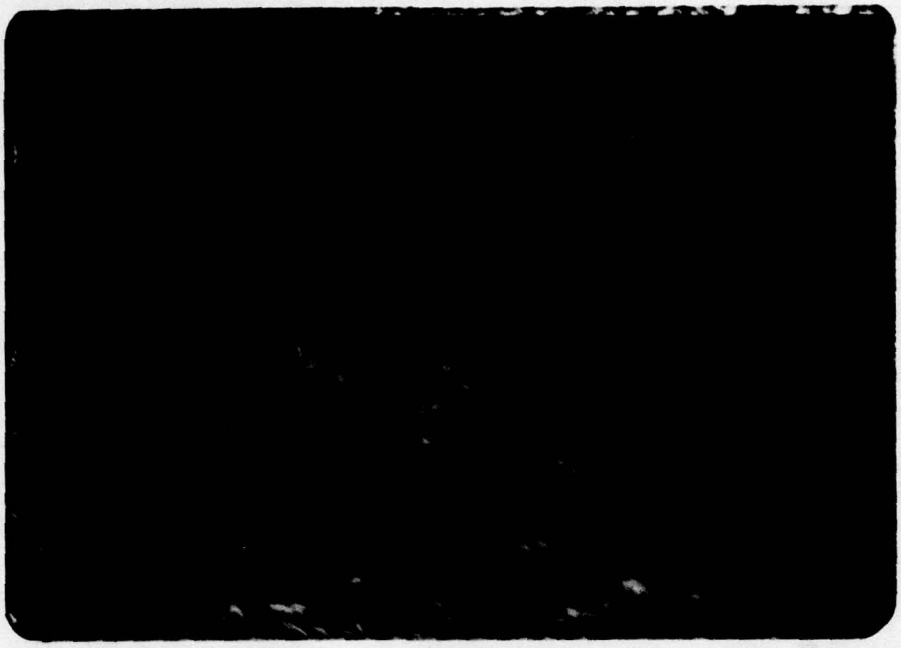
LOCUST LAKE DAM



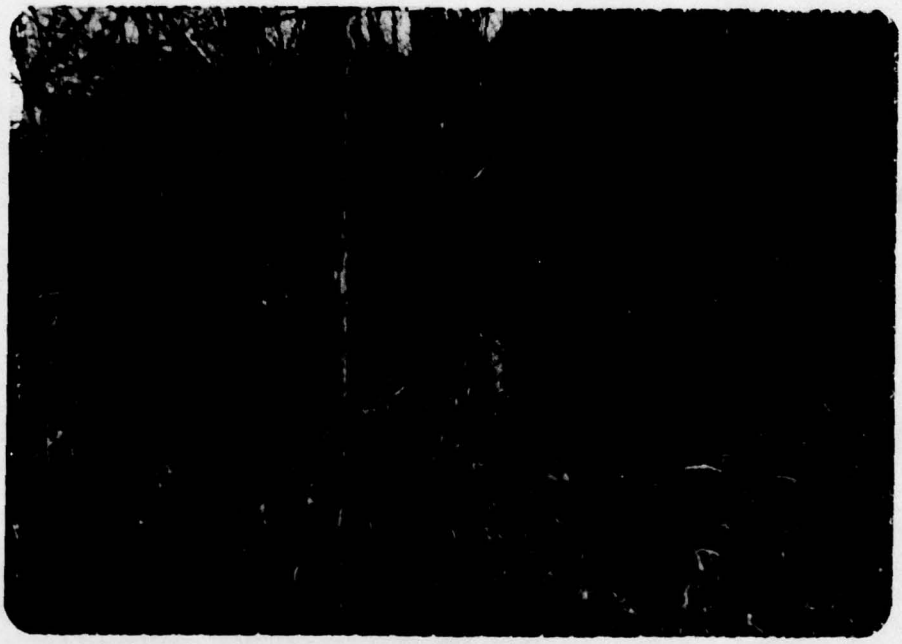
Upstream of dam. Looking North. 6 December 1978



Upstream of dam and right abutment. Looking South. 6 December 1978



Downstream slope of dam. 6 December 1978



View along crest of dam. 6 December 1978



Natural spillway at right side of embankment. 6 December 1978
Looking downstream.



Discharge from spillway. Looking upstream. 6 December 1978



Spillway. Looking downstream. 6 December 1978



Discharge channel. Looking downstream. 6 December 1978



Top of concrete valve chamber at crest of dam. 6 December 1978



Interior of valve chamber. 6 December 1978



Animal burrow hole in downstream slope. 6 December 1978



End wall of blow-off pipe at downstream toe of dam. 6 December 1978



Leakage around end-wall of blow-off pipe. 6 December 1978



Leakage at right side of end-wall of blow-off pipe. 6 December 1978

APPENDIX 3

HYDROLOGIC COMPUTATIONS

LOCUST LAKE DAM

LANGAN ENGINEERING ASSOCIATES, INC.

HYDROLOGIC COMPUTATIONS

LOCUST LAKE DAM

Location Warren County, N.J. on Muddy Brook

Drainage Area 1592 acres or 2.49 sq. mi.

Lake Area 34.9 Acres

Classification size - Small

Hazard - High

Spillway Design Flood (SDF) ½ PMF to PMF

PMP

1. Dam located in Zone 6 & zone 1 boundary
   PMP = 22.2 inches (200 sq. mi. - 24 hr.)

2. PMF must be adjusted for basin size

Duration	% Factor (for 10 sq. mi) Zone 6	Zone 1	Average	Reduction Factor*
0-6	112	111	112	
0-12	123	123	123	0.80
0-24	132	133	133	
0-48	142	142	142	

* pg. 44 "D.S.D."

BY Ry DATE 1-20-79, 3-12-79 Locust Lake Dam JOB NO. J-783B

CKED DATE 4-5-79 SHEET NO. 1 OF 11

LANGAN ENGINEERING ASSOCIATES, INC.

DETERMINE TIME OF CONCENTRATION

1. Majority area of watershed is woodland.
2. Longest watercourse is about 8500' stream & 1800' overland flow
3. Estimated slopes



$$\text{Overland} = \frac{65}{1800} = 3.6\%$$

$$\text{Stream} : \frac{210}{8500} = 2.5\%$$

4. Estimate T_c based on average velocity and length

	Slope	Velocity	remarks
overland flow	3.6%	0.5 fps	wooded
stream channel	2.5%	3 fps	waterway & gutter

$$T_c = \left[\frac{1800}{0.5} + \frac{8500}{3}\right] \div 3600 = 1.79 \text{ hrs.}$$

5. Estimate T_c from State DEP Nomograph

$\Delta H = 277'$

$L = 10300' = 1.95$ miles

$T_c = 38$ min.

BY Dry DATE 1-20-79 Locust Lake Dam JOB NO. J-783 B

CKD GBD DATE 4-5-79 SHEET NO. 2 OF 11

6. Estimate T_c from curve number method SCS (Tech Release 55 Fig. 3.8)

$l = 10300$

$$\text{Ave slope} = \frac{3.6 \times 1800 + 2.6 \times 8500}{10300} = 2.77\%$$

Take CN = 75

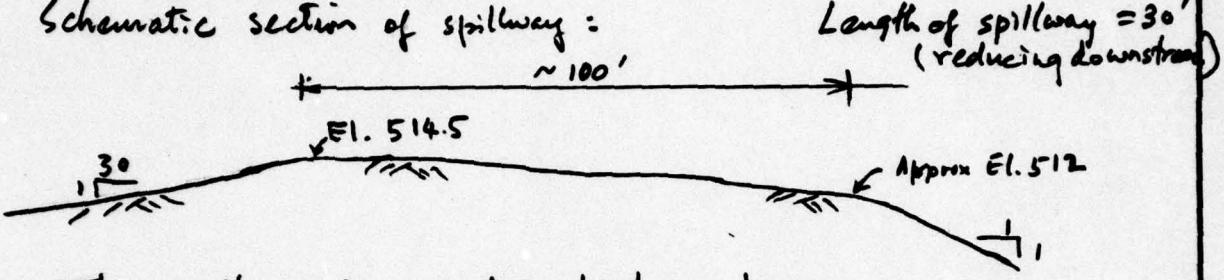
$\therefore L \doteq 1.5, \qquad T_c = \frac{1.5}{0.6} = 2.5 \text{ hrs.}$

Use $T_c = 2.0$ hrs. $\therefore$ **L = 1.2 hr.**

SPILLWAY CAPACITY

The spillway is a natural saddle in rock and it resembles slightly a broad-crested weir with inclined upstream slope, and a very broad and slightly inclined downward crest.

Schematic section of spillway:



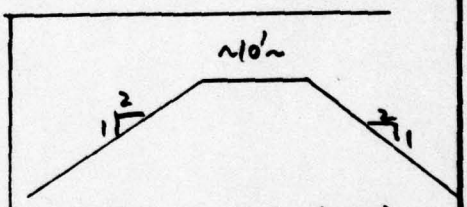
The spillway is reported to have been designed to discharge safely a depth of water of 2.5' over the rock crest with a capacity of 123 cfs/sq.mi

Use weir equation $Q = C L H^{3/2}$

Drainage area = 2.49 sq. mi

∴ design Q = 2.49 × 123 = 306 cfs

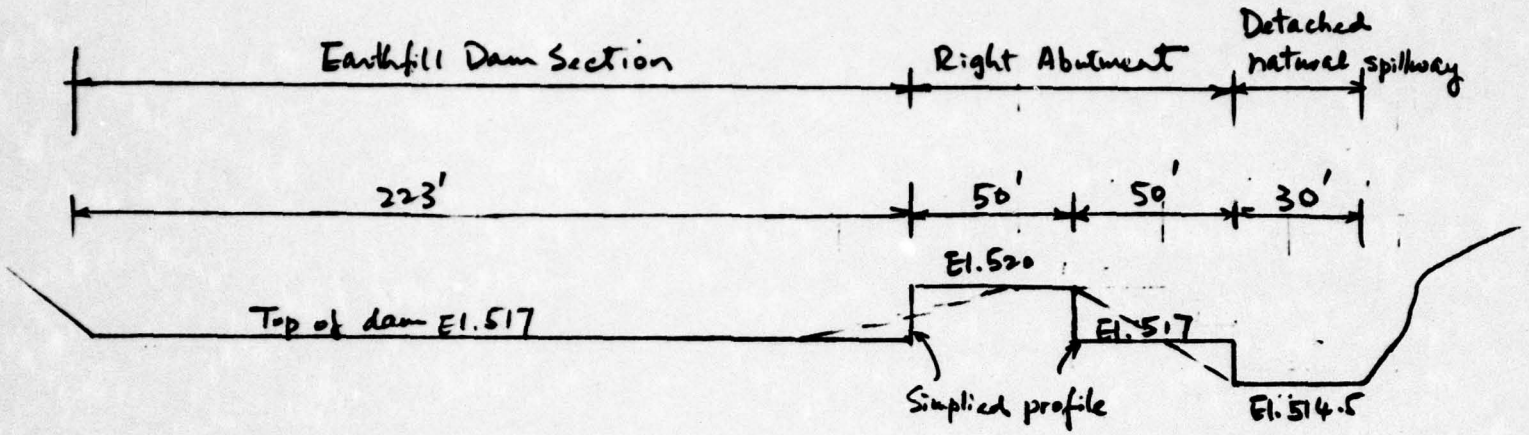
$$C = \frac{Q}{LH^{3/2}} = \frac{306}{30 \times 2.5^{3/2}} = 2.58$$



Dam Section (Typ.)

The dam locates about 100 feet to the right of the spillway (looking downstream). See their relatively locations and elevations shown on the schematic drawing next page. The dam has cross section similar to weir with trapazoidal cross-section with both faces inclined. Since embankment is overgrown with trees and topography in right abutment (area between dam section and spillway) is uneven, choose C value = 2.58 (same as spillway)

BY Dmj DATE 3-12-79 Locust Lake Dam JOB NO. T-7838
CKD'D ED DATE 4.5.79 SHEET NO. 5 OF



SCHEMATIC PROFILE OF DAM AND SPILLWAY

(Direction : Looking downstream)

For Spillway :

$$Q = 2.58 \times 30 \times H^{3/2} = 77.4 H^{3/2}$$

For Section above el. 517 (main dam ± ½ of right abutment)

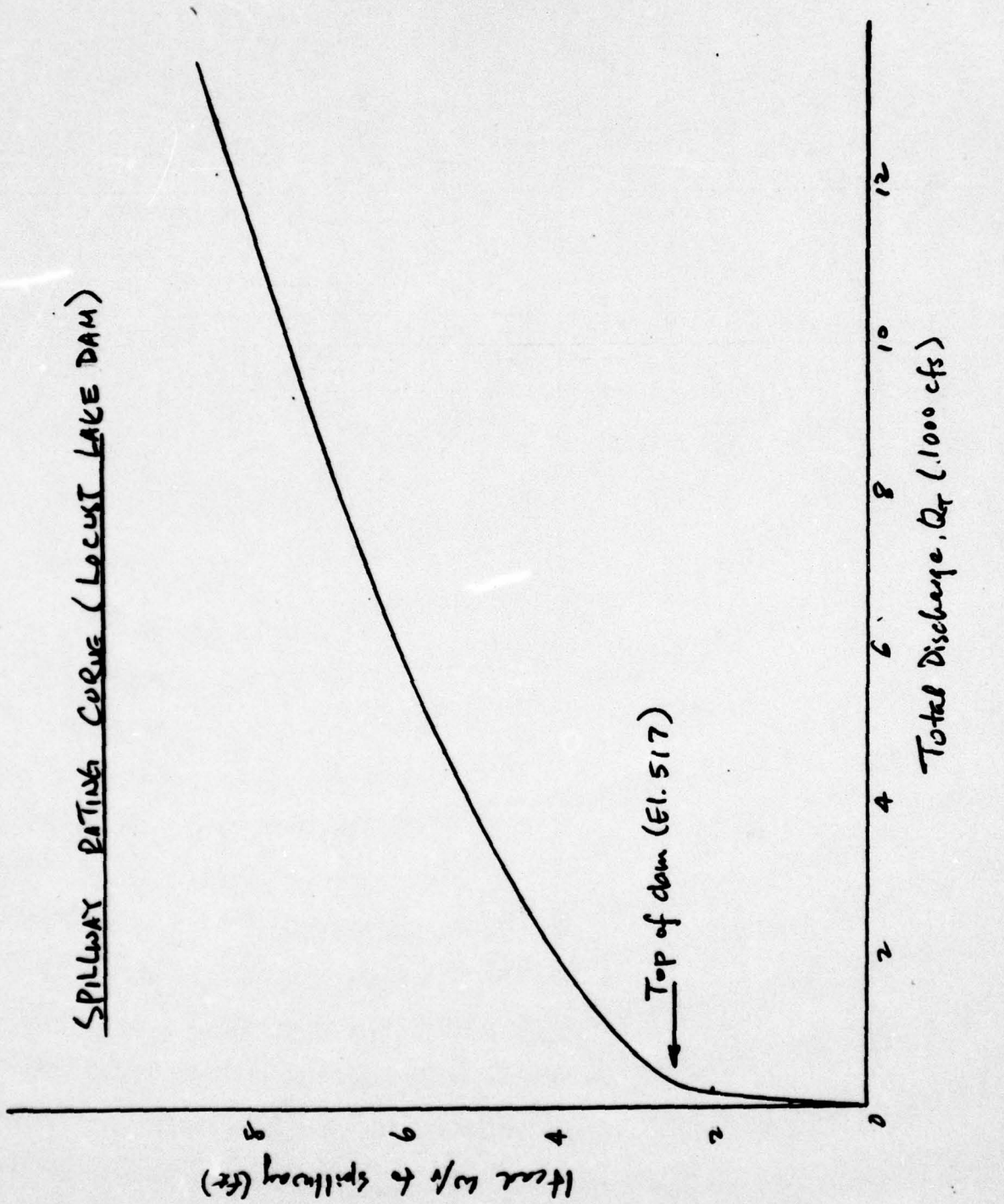
$$Q = 2.58 \times 273 \times H^{3/2} = 704.34 H^{3/2}$$

For Section above el. 520

$$Q = 2.58 \times 50 \times H^{3/2} = 129 H^{3/2}$$

Elev. (ft)	Spillway		Main Dam Section and ½ Right Abutment		½ Right Abutment above El. 520		Total (cfs) $Q_T = Q_s + Q_1 + Q_2$
	H(ft)	Q_s(cfs)	H(ft)	Q_1(cfs)	H(ft)	Q_2(cfs)	
514.5	0						0
515.5	1	77					77
516.5	2	219					219
517.0	2.5	306	0				306
518.0	3.5	507	1	704			1211
519.0	4.5	739	2	1992			2731
520.0	5.5	998	3	3660	0		4658
521.0	6.5	1283	4	5635	1	129	7047
522.0	7.5	1590	5	7875	2	365	9830
523.0	8.5	1918	6	10352	3	670	12940

LANGAN ENGINEERING ASSOCIATES, INC.



BY RJG DATE 1-23-13 Locust Lake Dam JOB NO. J-7838

CKD GED DATE 4-5-79 SHEET NO. 7 OF 11

Reservoir Storage Capacity

Assume a linear distribution for the area of the lake with elevation. Start at a zero storage at the crest of the spillway.

Area of Lake = 34.9 Acres

Length of equivalent square = 1233 ft

Average side slope ≐ 1V. : 3H (site inspection)

∴ for every foot of water above the crest of spillway, the length of equivalent square increases by

$= 1 \times 3 \times 2 = 6$ ft

Elev. (ft)	H(ft)	Length of equivalent square (ft)	Area of Lake (Acres)
514.5	0	1233	34.9
517.0	2.5	1248	35.8
523.0	8.5	1284	37.8

Elev. vs. Storage capacity to be calculated by HEC-1

Estimated storage at normal pool (El. 514.5) = 300 Ac-ft.

Vol. at top of dam (El. 517)

$= \frac{34.9+35.8}{2} \times 2.5 + 300$

≐ 390 Ac-ft.

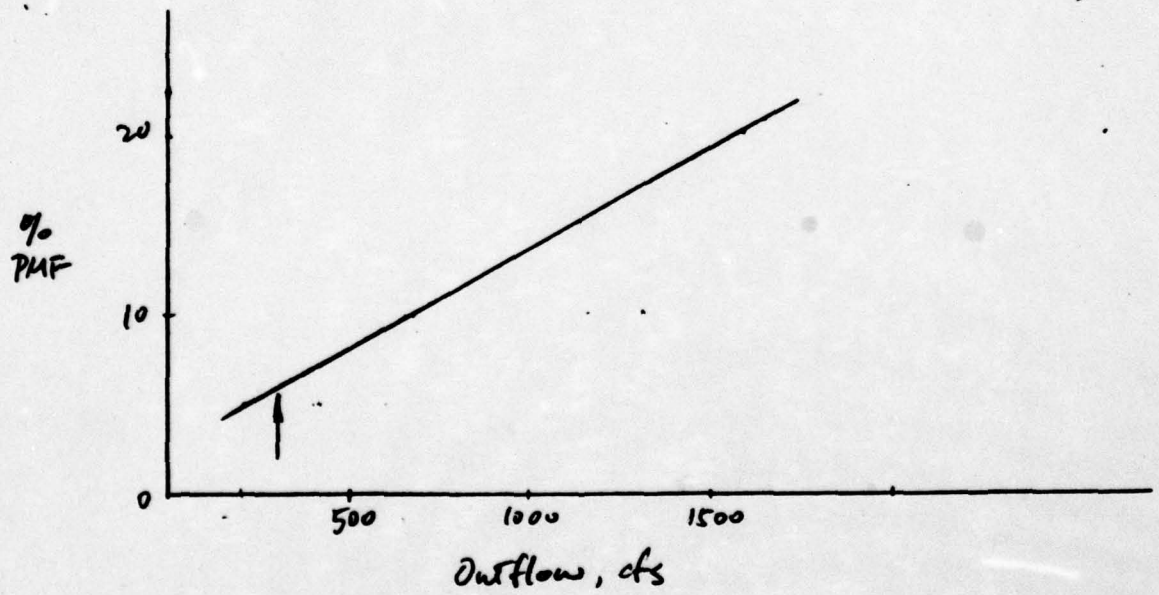
LANGAN ENGINEERING ASSOCIATES, INC.

SUMMARY OF HYDROGRAPH AND FLOOD ROUTING

1. Hydrograph and routing calculated using HEC-1
2. PMF peak inflow for Locust Lake is 8327 cfs
   (Routed to 8133 cfs)
3. Routing indicates that the dam will overtop by approximately 4.4 ft for PMF.

OVERTOPPING POTENTIAL

1. Various % of PMF have been routed using HEC-1
2. Plot peak outflow vs % PMF



3. Dam overtops at 571.0 with Q = 306 cfs

   ∴ dam can pass approximately 6% of PMF

BY RJ DATE 1-23-79 (5-16-79) Locust Lake Dam JOB NO. J-783B

CKD GDD DATE 9-5-79 SHEET NO. 9 OF 11

DRAWDOWN ANALYSIS

1. Outlet Structure

One 24-in dia C.I. low level outlet pipe with gate valve (it is not known if gate valve is functioning or not)

Note = For this analysis, the outlet pipe and valve assumed to be functioning properly.

2. Outlet Capacity

a. Elev. at outlet of pipe = 493.9 (use 494)

b. Elev. of Lake = 514.5 (Top of spillway). Take length of pipe = 80'

c. Pipe capacity based on

$$Q = C_p H^{1/2} \text{ where } C_p = A_p \sqrt{\frac{2g}{1+K_m+K_p L}}$$

Use $K_m = 1.0$, $n = 0.025 \rightarrow K_p = 0.0459$ (Ref. NEH, Section 5, Fs-42)

$L = 80$

Elev. (ft)	Head (ft)	Q (cfs)	Qavg. (cfs)
514.5	20.5	48	
			47
512.0	18	45	
			44
510.0	16	42	
			41
508.0	14	40	
			39
506.0	12	37	
			35
504.0	10	33	
			31
502.0	8	30	
			28
500.0	6	26	
			24
498.0	4	21	
			18
496.0	2	15	
494.0	0		

LANGAN ENGINEERING ASSOCIATES, INC.

3. Storage capacity

a. Estimate storage below spillway is 300 ac ft

b. Assume area varies linearly with height,

Assume bottom of lake at 498 with area = 2 acres

Elev. (ft)	Area (Ac)	Δ Storage (ac-ft)	Total storage
514.5	34.9		300
		89	
512.0	30		
		55	
510.0	26		
		47	
508.0	22		
		39	
506.0	18		
		31	
504.0	14		
		24	
502.0	10		
		16	
500.0	6		
		8	
498.0	2		

4. Assume inflow to be 2 cfs/sq.mi, $Q_{in} = 2.49 \times 2 = 4.98$ cfs.

Elev. (ft)	$Q_{out\,avg.}$ (cfs)	Q_{net}* (cfs)	Δ storage (Ac-ft)	Δt (hr)	Σ Δt (hr)
514.5	47	42	80	23	
512.0	44	39	55	17	
510.0	41	36	47	16	
508.0	39	34	39	14	
506.0	35	30	31	13	
504.0	31	26	24	11	
502.0	28	23	16	8	
500.0	24	19	8	5	107
498.0					← 4.5 days

*$Q_{net} = Q_{out\,avg.} - Q_{in} \doteq Q_{out\,avg.} - 5$

∴ lake lowered 16.5 ft in 4.5 days

BY Pyg DATE 1-23-79 Locust lake Dam JOB NO. J-783 B

CKD GED DATE 4.5.79 SHEET NO. 11 OF 11


Knowlton
Camp Kimkomuk
Mt Herman
Muddy
595



DRAINAGE BASIN
LOCUST LAKE DAM

LANGAN ENGINEERING ASSOCIATES, INC.

MAP SOURCE: U.S.G.S.
BLAIRSTOWN, PORTLAND
SCALE: 1" = 2000'

HEC-1 OUTPUT

LOCUST LAKE DAM

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  11 JAN 79
**********
```

```
     1                 A
     2                 A                    LOCUST LAKE DAM
     3                 A                    INFLOW HYDROGRAPH AND ROUTING
     4                 A                    N.J. DAM INSPECTION
     5                 R     150          0         20          0          0          0          0          0          0          0
     6                 R1      3
     7                 K                  1                                                                  1
     8                 K1    COMPUTE HYDROGRAPH
     9                 M       1          2       2.49                                 0.8
    10                 P                 22.2        112        123        133        142
    11                 T                                                                  1       .15
    12                 W2                1.2
    13                 X      -2          2          1
    14                 K       1          2                                              1
    15                 K1    ROUTING COMPUTATIONS
    16                 Y                                       1
    17                 Y1      1                                                                 -1
    18                 Y4  514.5      515.5      516.5      517.0      518.0      519.0      520.0      521.0      522.0      523.0
    19                 Y5      0         77        219        306       1211       2731       4658       7047       9830      12940
    20                 $A   34.9       35.8       37.8
    21                 $E  514.5      517.0      523.0
    22                 $$  514.5
    23                 $D  517.0
    24                 K      99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```
RUNOFF HYDROGRAPH AT          1
ROUTE HYDROGRAPH TO           2
END OF NETWORK
```

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  11 JAN 79
**********

RUN  DATE= 79/03/16.
     TIME= 07.35.15.
```

LOCUST LAKE DAM
INFLOW HYDROGRAPH AND ROUTING
N.J. DAM INSPECTION

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	20	0	0	0	0	0	0	0
			JOPER	NUT	LROPT	TRACE			
			3	0	0	0			

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

SUB-AREA RUNOFF COMPUTATION

COMPUTE HYDROGRAPH

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	2.49	0.00	2.49	.80	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.20	112.00	123.00	133.00	142.00	0.00	0.00

LOSS DATA

LKOPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.15	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 1.20

RECESSION DATA
STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 20 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 1.20 VOL= 1.00

143.	397.	754.	880.	808.	632.	401.	268.	194.	123.	
43.	56.	37.	25.	17.	11.	8.	6.	3.	1.	

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.20	1	.00	0.00	.00	5.	1.02	1.20	76	.04	0.00	.04	
1.01	.40	2	.00	0.00	.00	5.	1.02	1.40	77	.04	0.00	.04	
1.01	1.00	3	.00	0.00	.00	5.	1.02	2.00	78	.04	0.00	.04	
1.01	1.20	4	.00	0.00	.00	5.	1.02	2.20	79	.04	0.00	.04	
1.01	1.40	5	.00	0.00	.00	5.	1.02	2.40	80	.04	0.00	.04	
1.01	2.00	6	.00	0.00	.00	5.	1.02	3.00	R1	.04	0.00	.04	
1.01	2.20	7	.00	0.00	.00	5.	1.02	3.20	R2	.04	0.00	.04	
1.01	2.40	8	.00	0.00	.00	5.	1.02	3.40	R3	.04	0.00	.04	

SUM 25.22 20.37 4.85 98874.
(641.)(517.)(123.)(2799.80)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8327.	4703.	1357.	659.	98861.
CMS	236.	133.	38.	19.	2799.
INCHES		17.57	20.28	20.52	20.52
MM		446.25	515.09	521.17	521.17
AC-FT		2332.	2692.	2723.	2723.
THOUS CU M		2876.	3320.	3359.	3359.

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

HYDROGRAPH ROUTING

ROUTING COMPUTATIONS

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

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

STAGE	514.50	515.50	516.50	517.00	518.00	519.00	520.00	521.00	522.00	523.00
FLOW	0.00	77.00	219.00	306.00	1211.00	2731.00	4658.00	7047.00	9830.00	12940.00
SURFACE AREA=	35.	36.	38.							
CAPACITY=	0.	88.	309.							
ELEVATION=	515.	517.	523.							

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
514.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

IOPEL	COQD	EXPD	DAMWID
517.0	0.0	0.0	0.

END-OF-PERIOD HYDROGRAPH ORDINATES

MO.DA	HR.MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	.20	1	.33	5.	0.	0.	514.5
1.01	.40	2	.67	5.	1.	0.	514.5
1.01	1.00	3	1.00	5.	1.	0.	514.5
1.01	1.20	4	1.33	5.	1.	0.	514.5
1.01	1.40	5	1.67	5.	1.	1.	514.5
1.01	2.00	6	2.00	5.	2.	1.	514.5
1.01	2.20	7	2.33	5.	2.	1.	514.5
1.01	2.40	8	2.67	5.	2.	1.	514.5
1.01	3.00	9	3.00	5.	2.	1.	514.5
1.01	3.20	10	3.33	5.	2.	1.	514.5
1.01	3.40	11	3.67	5.	2.	1.	514.5
1.01	4.00	12	4.00	5.	3.	1.	514.5
1.01	4.20	13	4.33	5.	3.	1.	514.5
1.01	4.40	14	4.67	5.	3.	1.	514.5
1.01	5.00	15	5.00	5.	3.	1.	514.5
1.01	5.20	16	5.33	5.	3.	1.	514.5
1.01	5.40	17	5.67	5.	3.	1.	514.5
1.01	6.00	18	6.00	5.	3.	2.	514.5

1.02	5.00	87	29.00	5.	11.	5.	514.6
1.02	5.20	88	29.33	5.	10.	5.	514.6
1.02	5.40	89	29.67	5.	10.	5.	514.6
1.02	6.00	90	30.00	5.	10.	4.	514.6
1.02	6.20	91	30.33	12.	10.	4.	514.6
1.02	6.40	92	30.67	35.	11.	5.	514.6
1.02	7.00	93	31.00	80.	13.	6.	514.7
1.02	7.20	94	31.33	131.	19.	8.	514.7
1.02	7.40	95	31.67	178.	27.	12.	514.8
1.02	8.00	96	32.00	215.	37.	17.	515.0
1.02	8.20	97	32.33	239.	48.	22.	515.1
1.02	8.40	98	32.67	256.	60.	27.	515.3
1.02	9.00	99	33.00	265.	71.	32.	515.4
1.02	9.20	100	33.33	273.	87.	38.	515.6
1.02	9.40	101	33.67	277.	107.	43.	515.7
1.02	10.00	102	34.00	281.	125.	47.	515.8
1.02	10.20	103	34.33	283.	141.	51.	516.0
1.02	10.40	104	34.67	284.	156.	55.	516.1
1.02	11.00	105	35.00	285.	170.	58.	516.2
1.02	11.20	106	35.33	286.	182.	61.	516.2
1.02	11.40	107	35.67	286.	193.	64.	516.3
1.02	12.00	108	36.00	287.	203.	66.	516.4
1.02	12.20	109	36.33	355.	215.	69.	516.5
1.02	12.40	110	36.67	576.	246.	76.	516.7
1.02	13.00	111	37.00	994.	336.	90.	517.0
1.02	13.20	112	37.33	1498.	805.	108.	517.6
1.02	13.40	113	37.67	1998.	1323.	127.	518.1
1.02	14.00	114	38.00	2449.	1983.	143.	518.5
1.02	14.20	115	38.33	2812.	2456.	154.	518.8
1.02	14.40	116	38.67	3147.	2855.	163.	519.1
1.02	15.00	117	39.00	3483.	3243.	170.	519.3
1.02	15.20	118	39.33	3871.	3608.	177.	519.5
1.02	15.40	119	39.67	4781.	4211.	189.	519.8
1.02	16.00	120	40.00	6269.	5395.	209.	520.3
1.02	16.20	121	40.33	7832.	6953.	233.	521.0
1.02	16.40	122	40.67	8327.	8089.	248.	521.4
1.02	17.00	123	41.00	7938.	8133.	249.	521.4
1.02	17.20	124	41.33	7051.	7485.	240.	521.2
1.02	17.40	125	41.67	5963.	6533.	226.	520.8
1.02	18.00	126	42.00	5210.	5642.	212.	520.4
1.02	18.20	127	42.33	4565.	4931.	201.	520.1
1.02	18.40	128	42.67	3861.	4298.	190.	519.8
1.02	19.00	129	43.00	3049.	3590.	177.	519.4
1.02	19.20	130	43.33	2254.	2800.	162.	519.0
1.02	19.40	131	43.67	1575.	2144.	147.	518.6
1.02	20.00	132	44.00	1059.	1539.	132.	518.2
1.02	20.20	133	44.33	729.	1109.	120.	517.9
1.02	20.40	134	44.67	507.	857.	110.	517.6
1.02	21.00	135	45.00	357.	638.	102.	517.4
1.02	21.20	136	45.33	255.	467.	95.	517.2
1.02	21.40	137	45.67	183.	339.	90.	517.0
1.02	22.00	138	46.00	133.	291.	85.	516.9
1.02	22.20	139	46.33	101.	269.	81.	516.8
1.02	22.40	140	46.67	82.	247.	76.	516.7
1.02	23.00	141	47.00	70.	225.	72.	516.5
1.02	23.20	142	47.33	62.	208.	68.	516.4
1.02	23.40	143	47.67	56.	192.	64.	516.3
1.03	0.00	144	48.00	52.	178.	60.	516.2
1.03	.20	145	48.33	49.	164.	57.	516.1
1.03	.40	146	48.67	45.	152.	54.	516.0
1.03	1.00	147	49.00	38.	141.	51.	515.9
1.03	1.20	148	49.33	29.	129.	48.	515.9
1.03	1.40	149	49.67	22.	118.	45.	515.8
1.03	2.00	150	50.00	16.	108.	43.	515.7

PEAK OUTFLOW IS 8133. AT TIME 41.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8133.	4674.	1339.	649.	97312.
CMS	230.	132.	38.	18.	2756.
INCHES		17.46	20.01	20.20	20.20
MM		443.49	508.19	513.00	513.00
AC-FT		2318.	2656.	2681.	2681.
THOUS CU M		2859.	3276.	3307.	3307.

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

RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	8327.	4703.	1357.	659.	2.49
		(235.80)	(133.17)	(38.43)	(18.66)	(6.45)
ROUTED TO	2	8133.	4674.	1339.	649.	2.49
		(230.30)	(132.34)	(37.91)	(18.37)	(6.45)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	514.50	514.50	517.00
STORAGE	0.	0.	88.
OUTFLOW	0.	0.	306.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	521.39	4.39	249.	8133.	9.00	41.00	0.00

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 11 JAN 79
****

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 11 JAN 79

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	2
END OF NETWORK	

```
**********************************
LOCUST HYDROGRAPH PACKAGE (HEC-1)
A1 SAFETY VERSION      JULY 1978
 LAST MODIFICATION  11 JAN 79
**********************************

 DATE= 79/03/16.
 TIME= 07.51.05.
```

LOCUST LAKE DAM
% PMF
N.J. DAM INSPECTION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	20	0	0	0	0	0	4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 7 LRTIO= 1

RTIOS= 1.00 .50 .40 .30 .20 .10 .05

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

SUB-AREA RUNOFF COMPUTATION

COMPUTE HYDROGRAPH

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	2.49	0.00	2.49	.80	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.20	112.00	123.00	133.00	142.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.15	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 1.20

RECESSION DATA
STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	25.22	20.37	4.85	98874.
										(641.)	(517.)	(123.)	(2799.80)

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

HYDROGRAPH ROUTING

ROUTING COMPUTATIONS

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

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

STAGE	514.50	515.50	516.50	517.00	518.00	519.00	520.00	521.00	522.00	523.00
FLOW	0.00	77.00	219.00	306.00	1211.00	2731.00	4658.00	7047.00	9830.00	12940.00
SURFACE AREA=	35.	36.	38.							
CAPACITY=	0.	88.	309.							
ELEVATION=	515.	517.	523.							

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
514.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
517.0	0.0	0.0	0.

PEAK OUTFLOW IS 8133. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 4044. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 5231. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 2406. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 1583. AT TIME 41.00 HOURS

PEAK OUTFLOW IS 683. AT TIME 41.33 HOURS

PEAK OUTFLOW IS 211. AT TIME 42.33 HOURS

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS						
				RATIO 1 1.00	RATIO 2 .50	RATIO 3 .40	RATIO 4 .30	RATIO 5 .20	RATIO 6 .10	RATIO 7 .05
HYDROGRAPH AT	1	2.49	1	8327.	4164.	3331.	2498.	1665.	833.	416.
	(	6.45)	(	235.80)(	117.90)(	94.32)(	70.74)(	47.16)(	23.58)(	11.79)(
ROUTED TO	2	2.49	1	8133.	4044.	3231.	2400.	1583.	683.	211.
	(	6.45)	(	230.30)(	114.51)(	91.50)(	67.96)(	44.81)(	19.34)(	5.99)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	514.50	514.50	517.00
STORAGE	0.	0.	88.
OUTFLOW	0.	0.	306.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	521.39	4.39	249.	8133.	9.00	41.00	0.00
.50	519.68	2.68	186.	4044.	7.33	41.00	0.00
.40	519.26	2.26	170.	3231.	6.67	41.00	0.00
.30	518.78	1.78	153.	2400.	6.00	41.00	0.00
.20	518.24	1.24	133.	1583.	5.00	41.00	0.00
.10	517.42	.42	103.	683.	3.00	41.33	0.00
.05	516.45	0.00	69.	211.	0.00	42.33	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 11 JAN 79
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APPENDIX 4

REFERENCES

LOCUST LAKE DAM

APPENDIX 4

REFERENCES

LOCUST LAKE DAM

1. Inspection Report by J.N. Brooks, Hydraulic Engineer, 26 Sept., 24 Oct., 21 Nov., 1928, 29 Jan., 16 Apr., 30 Apr., 10 June, 17 Oct., 1929, 9 Sept., 1930, 18 Aug. 1936.

2. Inspection Report by A. Richards, Senior Assistant Engineer, dated 26 February 1930.

3. Report on Dam Application, #137, dated 25 September 1928.

4. Letter to Mr. H.D. Toy, Snook & Hardin, from J.N. Brooks, Hydraulic Engineer, Dept. of Conservation & Development, dated 21 November 1928.

5. Letter to Messrs. Snook & Hardin, from J.N. Brooks, Hydraulic Engineer, Dept. of Conservation & Development, dated 26 September 1928.

6. Letter to Mr. W.J. Hardin, from J.N. Brooks, Hydraulic Engineer, Dept. of Conservation & Development, 26 January 1929.

7. Letter to Mr. J.N. Brooks, Hydraulic Engineer, Dept. of Conservation & Development, from E.G. Stauber, Real Estate, dated 11 September 1933.

8. Letter to Mr. E.G. Stauber from H.T. Critchlow, Division Engineer, Dept. of Conservation & Development, dated 12 September 1933.

9. Specifications and schedule of quantities, date unknown, estimate September 1928.

10. Brater, Ernest F. and Kings, Horace W. Handbook of Hydraulics 5th Edition, McGraw-Hill Book Company 1963.

11. Chow, Ven Te, Ph.D, Open Channel Hydraulics, McGraw-Hill Book Company, 1959.

12. United States Dept. of Agriculture, Soil Conservation Service SCS National Engineering Handbook Section 4 Hydrology NEH-Notice 4-102, August 1972.

13. United States Dept. of Agriculture, Soil Conservation Service, Somerset, N.J. Urban Hydrology for Small Watersheds, Technical Release No. 55, January 1975.

14. United States Dept. of Commerce Weather Bureau, April 1956 Hydrometeorological Report No. 33, Washington, D.C.

15. United States Dept. of Interior, Bureau of Reclamation Design of Small Dams, Second Edition 1973, Revised Print 1977.

16. Wolfe, P.E., 1977, The Geology and Landscapes of New Jersey, Crane, Russak & Company, Inc., New York, New York, 351 pp.

17. Drawings (4) giving plans sections and profiles of dam and spillway prepared by Snook & Hardin Engineers & Surveyors, Newton, New Jersey, dated September 1928.

18. Baltimore County Bureau of Engineering 1974, Baltimore County, Storm Water Management Policy.


Knowlton
Camp Kinlokomuk
Mt Hermon


Silver Lake
Camp Hope
Brook
Beaver
H O P E
Hope
Warren Cem.
Swamp
MAP SOURCE: U.S.G.S.
BLAIRSTOWN, PORTLAND
SCALE: 1" = 2000'
DRAINAGE BASIN
LOCUST LAKE DAM
LANGAN ENGINEERING ASSOCIATES, INC.