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               NATIONAL DAM INSPECTION PROGRAM. LAKE KIMBERLY DAM, NDI NUMBER --ETC(U)
               APR 81   DACW-31-81-C-0013
UNCLASSIFIED   NL

LEVEL

SUSQUEHANNA RIVER BASIN

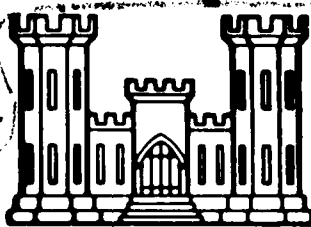## LAKE KIMBERLY DAM

HOWARD V. LIGHTNER

NDI NO. PA-00949
DER NO. 50-062

PERRY COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM.

Lake Kimberly Dam, NDI Number PA-00949
DER Number 50-062. Susquehanna River Basin,
Perry County,
Pennsylvania.
Phase I Inspection
Report.

PREPARED FOR
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore , Maryland 21203

DACW31-81-C-0013

BY

Berger Associates

Harrisburg , Pennsylvania 17105

APR 81

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PREFACE

This report has been 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. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

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 frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid 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.

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITIONS
AND RECOMMENDATIONS

Name of Dam: LAKE KIMBERLY DAM

State & State No.:   PENNSYLVANIA, 50-062

County: PERRY

Stream: TRIBUTARY TO SHERMAN CREEK

Date of Inspection: November 4, 1980

Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in poor condition.

In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is significant. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). The recommended SDF for this structure is the 100 year flood. The spillway does not have the capacity for passing the 100 year flood without overtopping the dam. The spillway, therefore, is considered to be inadequate, but not seriously inadequate.

The following recommendations are presented for immediate action by the owner:

1.   That, to preclude the necessity of a detailed hydrologic and hvdraulic study, the crest be made uniform to an elevation of at least one foot above the principal spillway elevation. This work should be done under the direction of a professional engineer experienced in the design and construction of dams.

2.   That the upstream and downstream slopes be cleared of all trees, brush and weeds and that the slopes be maintained on a regular basis.

3.   That provisions be made for upstream closure of the drawdown pipe in case of an emergency.

4.   That the slough on the downstream slope be repaired and reseeded under the direction of an engineer experienced in the design and construction of dams.

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5.   That the 10-inch outlet pipe be extended and the slope repaired
     and that an adequate rock protected plunge pool be provided.
     This work should be done under the direction of an engineer.

6.   That the obstruction be removed from the drop inlet pipe.

7.   That the upstream slope be protected from wave action erosion.

8.   That a formal surveillance and downstream warning system be
     developed for use during periods of high or prolonged rainfall.

9.   That an operation and maintenance manual be prepared for
     guidance in the operation of the dam during normal and emer-
     gency conditions, and that a schedule be developed for the
     annual inspection of the dam and its appurtenant structures.

SUBMITTED BY: APPROVED BY:

     BERGER ASSOCIATES, INC.
     HARRISBURG, PENNSYLVANIA
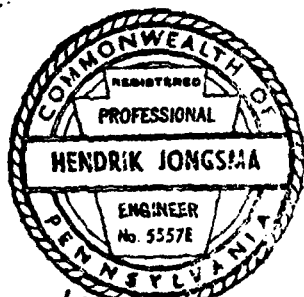
DATE: April 3, 1981
                                       JAMES W. PECK
                                       Colonel, Corps of Engineers
                                       District Engineer

                                       DATE: 22 APR 81

COMMONWEALTH OF PENNSYLVANIA
REGISTERED
PROFESSIONAL
HENDRIK JONGSMA
ENGINEER
No. 5557E

OVERVIEW

KIMBERLY LAKE DAM

Photograph No. 1

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE KIMBERLY DAM

NDI NO. PA-00949
DER NO. 50-062

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

The Dam Inspection Act, Public Law 92-367, authorized the
Secretary of the Army, through the Corps of Engineers, to initiate a
program of inspections of dams throughout the United States.

B. Purpose

The purpose of this inspection is to determine if the dam
constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Note: Design data for this dam does not exist. It was
estimated from the U.S.G.S. Quadrangle sheet that
normal pool elevation is 645. This elevation was
used as the top of the overflow pipe of the principal
spillway.

Lake Kimberly Dam is an earthfill dam constructed along a
curved centerline. The length of the embankment is about 600 feet and
its height is a maximum of 16 feet above the streambed. The principal
outlet is an 8-inch vertical drop inlet pipe located on the upstream
slope which discharges through a 10-inch pipe near the toe of the down-
stream slope. An emergency spillway located in the left abutment,
consists of a 35 foot wide grass covered channel. The reservoir can be
lowered through a 4-inch drawdown pipe which has a downstream valve
control. The present low point in the dam crest profile is at the same
elevation as the emergency spillway elevation.

B. Location: Southwest Madison Township, Perry County
U.S.G.S. Quadrangle - Andersonburg, Pa.
Latitude 40°-20.6', Longitude 77°-25.7'
Appendix E, Plates I & II

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C. Size Classification: Small: Height – 16 feet
                                                 Storage – 51 acre-feet

D. Hazard Classification: Significant (refer to Section 3.1.E.)

E. Ownership: Mr. Howard V. Lightner
                            Box 248
                            Loysville, PA   17047

F. Purpose: Recreation

G. Design and Construction History

The structure was designed and constructed by Mr. Styninger, Newport, Pennsylvania. Some assistance for the design was provided by *the Soil Conservation Service.* The dam was constructed around 1970.

H. Normal Operating Procedures

All normal inflow is discharged through the 8-inch vertical standpipe. The owner stated that the valve on the four inch drawdown pipe is opened during periods of heavy precipitation and when the pool level reaches the emergency spillway crest elevation.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

Computed for this report:	0.18

B. Discharge at Dam Site (cubic feet per second)
See Appendix D for hydraulic calculations.

Maximum known flood (estimated from records of U.S.G.S. gage on nearby Bixler Run, June, 1972)	128
Outlet works at pool Elev. 645.0	0.5
Outlet works at low pool Elev. 635.0	0.3
Emergency spillway capacity at pool Elev. 645.2	0.0
Principal spillway capacity at pool Elev. 645.2	1.7

C. Elevation (feet above mean sea level)

Top of dam (low point)	645.2

Principal spillway (standpipe)	645.0
Emergency spillway crest	645.2
Upstream portal invert (estimated)	632
Downstream portal invert	628.7
Streambed at downstream toe of dam (estimate)	629

D. Reservoir (miles)

Length of normal pool (Elev. 645.0)	0.4
Length of maximum pool (Elev. 645.2)	0.4

E. Storage (acre-feet)

Spillway crest (Elev. 645.0)	50
Top of dam (Elev. 645.2)	51

F. Reservoir Surface (acres)

Spillway crest (Elev. 645.0)	6.6
Top of dam (Elev. 645.2)	6.7

G. Dam

Refer to Plates A-I, A-II and A-III in Appendix A for schematic plan and section.

Type: Earthfill.

Length: 600 feet.

Height: 16 feet.

Top Width: Design – Unknown; Survey – 7 feet.

Side Slopes:		Design	Surveyed
	Upstream	Unknown	Irregular
	Downstream	Unknown	3.2H to 1V

Zoning: Unknown.

Cutoff: Trench excavated to a maximum depth of about 5 feet and backfilled with impervious material.

Grouting: None.

H. **Outlet Facilities**

Type:	4-inch pipe.
Control:	4-inch valve located at downstream toe.
Location:	Between right abutment and center of dam.

I. **Spillway**

Emergency:

Type:	Uncontrolled, sod lined, broad crested weir and channel. The upstream channel slope is 4.7 percent. The downstream channel has about a 2.0 percent slope.
Width:	35' on bottom with side slope of 2.7H to 1V on right.
Crest Elevation:	645.2
Location:	Left abutment.

Principal:

Type:	Uncontrolled, 8-inch diameter, vertical pipe, drop inlet with 10-inch diameter outlet pipe.
Crest Elevation:	645
Location:	Near center of dam.

J. **Regulating Outlets**

See Section 1.3.H. above.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Engineering design data for Lake Kimberly Dam does not exist. The owner stated that design drawings were not prepared for the facilities. It is unknown what the original design dam crest elevation was.

2.2 CONSTRUCTION

Mr. Styninger, Newport, Pennsylvania, was the contractor/designer for this project. Construction took place around 1970. Records of construction do not exist. Mr. Howard Lightner, the owner, stated that a trench was excavated along the centerline of the dam. Depth of the trench was estimated at five feet, except over a section to the right of the 4-inch drawdown pipe. In this area, limestone was encountered close to the surface.

Mr. Lightner indicated that the borrow material was obtained from the reservoir area and that the most impervious material was used for backfilling the trench. He also stated that a sheepsfoot roller was used for compaction.

The area of the reservoir and dam was a swampy area prior to construction of the embankment.

2.3 OPERATION

Records of operation are not maintained by the owner. Within one or two weeks after construction was completed, a slough occurred on the downstream slope in the area indicated on Plate A-I. This condition has not been improved nor repaired.

Records of maximum pool elevations are not maintained. The owner stated that during the Agnes storm (June, 1972), the emergency spillway discharged about 1.5 feet of water. Most of the embankment was overtopped at that time without significant damage.

2.4 EVALUATION

A. Availability

Engineering design and construction data do not exist.

B. Adequacy

Because of the lack of engineering data, the assessment of the dam is based on the results of the visual inspection.

C. Operating Records

Operating records have not been maintained.

D. Post Construction Changes

There is no information that post construction changes have been made at these facilities.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of Lake Kimberly Dam is poor. The low point of the dam crest is at the same elevation as the emergency spillway crest. The upstream slope has been eroded by wave action and a large slough has occurred on the downstream slope. Heavy brush growth in the slough area prevented close observation. The embankment was built across a marshy field and areas of the downstream toe are still marshy. Seepage on the downstream slope was not detected. The outlet of the principal spillway has eroded a portion of the embankment at its point of termination.

The visual inspection check list and sketches of the general plan and profile of the dam, as surveyed during the inspection, are presented in Appendix A of this report. Photographs of the facilities taken during the inspection are reproduced in Appendix C.

Mr. Howard Lightner accompanied the inspectors on the day of inspection.

B. Embankment

The centerline of the dam was constructed along a curved alignment in its center section, with short tangents at both abutments (Photograph No. 1, Page iv). The crest averages about 7 feet in width. Its surface is grass covered except for a bare bike trail.

The upstream slope has been eroded by wave action and is rather steep above the normal pool elevation over most of its length (Section Sta. 3+20, Plate A-III). Cattails and other weeds are growing at the normal pool elevation on the slope.

The downstream slope, near the left and right abutments, is flat and in good condition with a good grass mat protection, except where the bike trail has killed the grass. The center portion of the downstream slope is overgrown with trees, briars and brush (Photograph No. 4). In this area a 50 foot long slope failure was observed (Photographs No. 8 and 9 and Plate A-III, Appendix A). The owner stated that this slough occurred one or two weeks after construction was completed. Repairs were never made. Heavy brush in this area prevented close observation. Seepage was not detected during the inspection. The pool level was several feet below normal at that time. A woodchuck hole is located in this slough area.

The immediate area beyond the downstream toe of the center portion of the dam is wet and swampy over a considerable length. According to the owner, this area was swampy prior to construction of the dam. There were no indications of seepage on the embankment.

C.   Appurtenant Structures

The principal spillway is an 8-inch drop inlet pipe located on the upstream slope. The 8-inch diameter pipe was obstructed with a plastic container. This obstruction should be removed. This vertical pipe is connected to a 10-inch horizontal discharge pipe which discharges above the downstream toe in a small eroded plunge pool (Photograph No. 7). The embankment at this location has been eroded to a near vertical slope. It appears that a section of the pipe has been broken off.

The emergency spillway is located in the left abutment and consists of a grassed earth channel with an irregular cross section (Photograph No. 2). The survey indicates that the emergency spillway crest is at about the same elevation as the low point of the dam crest.

A 4-inch drawdown pipe is located near the center of the dam. This pipe has no control on the upstream end. Flow is controlled at the downstream toe where a valve is located in a buried barrel. The valve was opened during the inspection and is in good operating condition. The owner stated that the valve is opened several times a year when the pool level rises more than several inches above the normal pool level.

D.   Reservoir Area

The slopes around the reservoir are flat to moderate with woodlands on the right side and open fields on the left side. The banks are stable and sedimentation due to erosion does not appear to be a problem.

E.   Downstream Channel

The downstream channel enters into Sherman Creek about 700 feet downstream from the dam. The immediate downstream channel is not defined through the swampy area. Two homes are located within 500 feet downstream from the dam within the flood plain. A potential hazard to life exists downstream if the dam fails, however possible loss of lives would be less than a few. The hazard category is therefore considered to be "Significant."

3.2 EVALUATION

The overall evaluation of the facilities indicates that Lake Kimberly Dam is in poor condition. The growth of trees, brush and weeds should be removed, and the upstream slope should be protected from wave action. The crest profile is irregular and should be brought to a uniform elevation higher than the emergency spillway elevation in order to prevent overtopping. The downstream slope should be repaired where the slough has occurred and where the outlet pipe has eroded the embankment. The outlet pipe should be extended beyond the downstream toe of the embankment, and a rock protected plunge pool should be constructed at the end of the outlet pipe.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Lake Kimberly Dam was constructed for recreational use and as a reservoir for fire protection. Maintenance procedures are very limited and there are no operational procedures other than the opening of the valve on the 4-inch drawdown pipe during periods of heavy rainfall.

4.2 MAINTENANCE OF DAM

The inspection indicates that there is no maintenance performed on the embankment. Trees, brush and weed growth is not controlled. Sloughs and erosion of the embankment have not been repaired.

4.3 MAINTENANCE OF OPERATING FACILITIES

The drawdown facility is operated several times a year. There are, however, no procedures for greasing and maintaining the valve.

4.4 WARNING SYSTEM

There is no formally organized surveillance and downstream warning system in existence at the present time.

4.5 EVALUATION

The operational procedures for Lake Kimberly Dam are minimal. It is recommended that a program be developed for regular maintenance of the dam, which should include the removal of weeds, brush and trees, and the greasing and operation of the drawdown valve on a regular basis. The slough on the downstream slope should be repaired. The outlet discharge condition should also be repaired. A formal surveillance plan and downstream warning system should be developed for implementation during periods of heavy or prolonged precipitation.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

Hydrologic and hydraulic analyses do not exist.

B. Experience Data

There are no records of flood levels at Lake Kimberly Dam. It was reported that the June, 1972, flood produced a flow in the emergency spillway about 1.5 feet deep. This flood overtopped the dam. Based on records of the U.S.G.S. stream gage on Bixler Run at nearby Loysville, Pennsylvania, this flood (June, 1972) produced an inflow to Lake Kimberly Dam estimated to be 128 cfs.

C. Visual Observations

It was noted that the 9" drop inlet pipe was obstructed with a plastic container. There has been considerable erosion at the downstream end of the principal spillway discharge pipe. It was also noted that the emergency spillway crest was the same elevation as the low point in the embankment.

No other conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event until the dam is overtopped.

D. Overtopping Potential

Lake Kimberly Dam has a total storage capacity of 51 acre-feet and the overall height is 16 feet above the streambed. These dimensions indicate a size classification of "small." The hazard classification for this dam is "Significant" (see Section 3.1.E.).

The Spillway Design Flood (SDF) for a dam having the above classifications should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). Because of the small downstream population and small size of the dam, the recommended SDF for this dam is the 100 year flood. The SDF peak inflow is 248 cfs (see Appendix D for hydraulic calculations).

Comparison of the estimated SDF peak inflow of 248 cfs with the estimated total discharge capacity of less than one cfs indicates that a potential for overtopping of the Lake Kimberly Dam exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam does not have the necessary storage available to pass the SDF without

overtopping. The spillway-reservoir system passes the SDF with about 0.9 foot of overtopping based on the present low point in the crest profile. With the crest uniform at an elevation of 646, the project will pass the SDF with about 0.2 foot of overtopping.

E.   Spillway Adequacy

Calculations show that the total spillway discharge capacity and reservoir storage capacity, based on the existing low point elevation for the dam profile, cannot pass the SDF without overtopping to a depth of about 0.9 feet (refer to Appendix D).

Since the total spillway discharge and reservoir storage capacity cannot pass the SDF without overtopping, and since the dam is not classified as high hazard, the spillway is considered to be inadequate, but not seriously inadequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of Lake Kimberly Dam did not detect any signs of seepage through the embankment. The immediate downstream area is wet and swampy. This condition appears to have been in existence prior to construction. It was reported that a small limestone area was encountered close to the surface and to the right of the center portion of the dam.

A large slough and heave occurred shortly after construction was completed. The owner stated that no further movement has occurred since that time. Information indicating the cause of this slide is not available. Heavy growth of briar prevented close observation. The erosion of the downstream slope at the outlet of the 10-inch discharge pipe should be repaired. Wave action is receding the upstream slope. The crest of the dam has an irregular profile.

2. Appurtenant Structures

In order to repair the downstream slope at the outlet of the 10-inch pipe, it appears that the pipe will have to be extended. To prevent future erosion, a rock lined plunge pool is considered necessary.

B. Design and Construction Data

Design and construction data for this dam do not exist. The owner stated that a cutoff trench was excavated along the centerline of the dam, estimated at being as deep as five feet. This trench was shallow in the area where limestone was encountered.

C. Operating Records

Operating records for this dam have not been maintained by the owner.

D. Post Construction Changes

There are no indications that post construction modifications have been made to the dam or its appurtenant structures.

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E.   Seismic Stability

        This dam is located in Seismic Zone 1, and it is considered
that the static stability is sufficient to withstand minor earthquake-
induced dynamic forces. No studies or calculations have been made to
confirm this assumption.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection indicates that Lake Kimberly Dam is in poor condition. Engineering design and construction data are not available for review. The dam was overtopped during the 1972 flood "Agnes" without apparent serious damage. A slough on the downstream slope indicates that an unstable condition existed shortly after construction was completed. The erosion at the outlet discharge point is of concern. Improved maintenance practices are required.

In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is significant. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). The recommended SDF for this structure is the 100 year flood.

The hydrologic and hydraulic computations indicate that the combination of storage capacity and the discharge capacity of the spillway is insufficient to pass the recommended SDF without overtopping the dam. The spillway is therefore considered to be inadequate, but not seriously inadequate.

B. Adequacy of Information

The visual inspection is considered to be sufficiently adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations presented below should be implemented immediately.

D. Additional Studies

Additional studies are not required at this time if the top of dam is made uniform at the recommended elevation and other recommendations are implemented immediately.

7.2 RECOMMENDATIONS

In order to assure the continued satisfactory operation of this dam, the following recommendations are presented for immediate implementation by the owner:

1. That, to preclude the necessity of a detailed hydrologic and hydraulic study, the crest be made uniform to an elevation of at least one foot above the principal spillway elevation. This work should be done under the direction of a professional engineer experienced in the design and construction of dams.

2. That the upstream and downstream slopes be cleared of all trees, brush and weeds, and that the slopes be maintained on a regular basis.

3. That provisions be made for upstream closure of the drawdown pipe in case of an emergency.

4. That the slough on the downstream slope be repaired and reseeded under the direction of an engineer experienced in the design and construction of dams.

5. That the 10-inch outlet pipe be extended and the slope be repaired and that an adequate rock protected plunge pool be provided. This work should be done under the direction of an engineer.

6. That the obstruction be removed from the drop inlet.

7. That the upstream slope be protected from wave action erosion.

8. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

9. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures.

APPENDIX A

CHECK LIST OF VISUAL INSPECTION REPORT

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 50-062

NDI NO. PA-00949

NAME OF DAM   Lake Kimberly Dam   HAZARD CATEGORY Significant

TYPE OF DAM   Earth embankment.

LOCATION Southwest Madison TOWNSHIP   Perry   COUNTY, PENNSYLVANIA

INSPECTION DATE 11/4/80   WEATHER Cloudy, Light rain   TEMPERATURE 40-50°

INSPECTORS: R. Houseal (Recorder)   OWNER'S REPRESENTATIVE(s):

H. Jongsma   Howard V. Lightner

R. Shireman

A. Bartlett

(est.
NORMAL POOL ELEVATION: 645.0 U.S.G.S.)AT TIME OF INSPECTION:

BREAST ELEVATION: 646.0 (estimated)   POOL ELEVATION: 642.7

SPILLWAY ELEVATION: 645.2   TAILWATER ELEVATION:

MAXIMUM RECORDED POOL ELEVATION: June, 1972 (Agnes) 1.5 feet in emergency
                          spillway. Dam overtopped.
GENERAL COMMENTS:

Reservoir level appears to be 2.3 feet below normal pool.

Embankment alignment is curved. No riprap on upstream or downstream slope.
Erosion due to wave action is evident on upstream slope. Cattail growth
covers about one-half of the upstream slope.

Slope slump evident on downstream slopes - owner indicated that this slump
occurred shortly after the completion of the dam during a heavy rain.

Heavy brush, small trees and briar growth on about one-half of downstream
slope.

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	Surface cracks were not observed on the crest of the embankment. Unable to observe any cracks on slopes due to growth of brush, leaves, etc.
B. UNUSUAL MOVEMENT BEYOND TOE	One area has been displaced forming a bench on the downstream slope.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	A major slough or slope failure is evident on the downstream slope. Refer to cross section. Erosion is occurring due to wave action on the upstream slope. Groundhog hole located in slumped area.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	Horizontal alignment is curved. Refer to profile for vertical information. (Plate A-II)
E. RIPRAP FAILURES	No riprap.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Abutments with natural ground appear to be sound.
G. SEEPAGE	The middle third of the embankment lies in an old swamp. This area is now and has continually been wet. Could not observe any specific seepage due to heavy growth on slope and downstream of slope.
H. DRAINS	None.
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Crest - grass covered - bare bike trail in center. Downstream slope - partial field grass, partial brush, trees and briars. Upstream slope - some grass and cattails, no riprap.

VISUAL INSPECTION
OUTLET WORKS

	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	Vertical 8" diameter standpipe (steel).
B. OUTLET STRUCTURE	Horizontal 10" steel pipe. This pipe does not extend beyond the embankment slope. Erosion due to discharge is causing decay of the embankment in this area.
C. OUTLET CHANNEL	Outlet channel is ill defined. Discharge flows from 10" pipe through an irregular ditch then into the swampy area, then to Sherman Creek.
D. GATES	No gates - 4" pipe with valve is used to lower the reservoir when deemed necessary.
E. EMERGENCY GATE	None.
F. OPERATION & CONTROL	No formal control. Owner uses 4" pipe to control reservoir level during heavy precipitation.
G. BRIDGE (ACCESS)	None.

VISUAL INSPECTION
SPILLWAY

	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	Direct from reservoir at left side.

B. WEIR:
    Crest Condition
    Cracks
    Deterioration
    Foundation
    Abutments
	Grassed channel.

C. DISCHARGE CHANNEL:
    Lining
    Cracks
    Stilling Basin
	Wide flat area with some weeds.

D. BRIDGE & PIERS	None.
E. GATES & OPERATION EQUIPMENT	None.
F. CONTROL & HISTORY	Flow of about 1.5 feet during Agnes as stated by the owner.

VISUAL INSPECTION

	OBSERVATIONS AND REMARKS
INSTRUMENTATION	
Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	None.
RESERVOIR	
Slopes	Moderate 10°-15°.
Sedimentation	None reported.
Watershed Description	Woodlands.
DOWNSTREAM CHANNEL	
Condition	Not defined.
Slopes	Flat.
Approximate Population	4 to 8 persons.
No. Homes	Two homes.

Hillside

Beach

Emergency Spillway

Grass

Principal Spillway

10" Pipe

Eroded Embankment

Pool
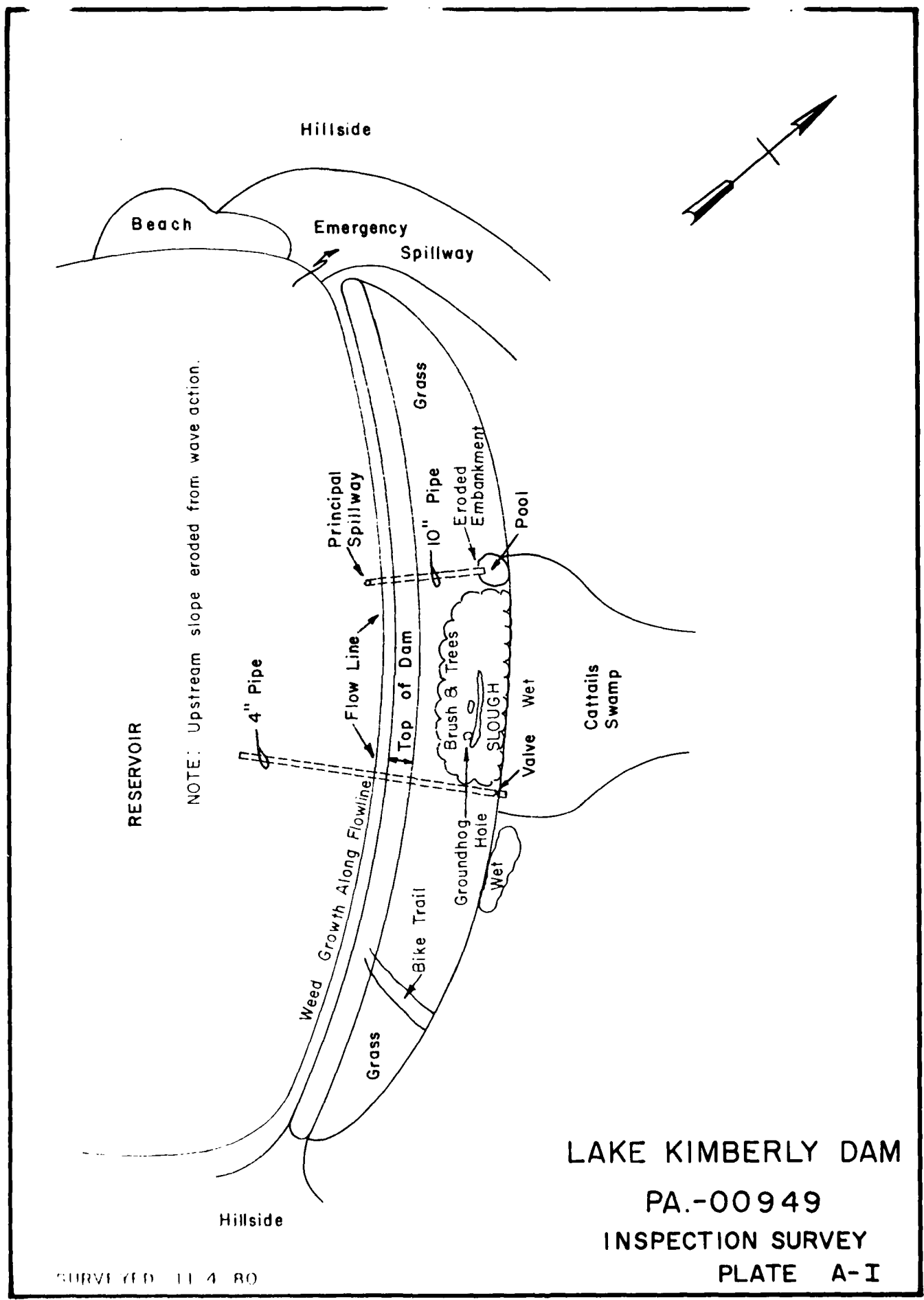
NOTE: Upstream slope eroded from wave action.

RESERVOIR

4" Pipe

Flow Line

Top of Dam

Brush & Trees

SLOUGH

Valve

Wet

Cattails Swamp

Weed Growth Along Flowline

Bike Trail

Groundhog Hole

Wet

Grass

Hillside

LAKE KIMBERLY DAM

PA.-00949

INSPECTION SURVEY

PLATE A-I

SURVEYED 11 4 80

EMBANKMENT PROFILE
LOOKING UPSTREAM

647.5 — 0+0
645.2
646.3
646.1 — 1+00
646.1
646.5
10" Pipe
646.5 — 2+00
646.6
646.6
646.3 — 3+00
646.2
645.9
4" Pipe
645.6 — 4+00
645.2
645.8 — 5+00
645.9
646.2 — 6+00
647.1
649.5

650
640

SPILLWAY PROFILE

W.S.

642.7 — 0+00
644.7 — 0+40
645.4 — 0+80
FLOW
644.7 — 1+20
643.6 — 1+60
639.6

640
630
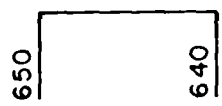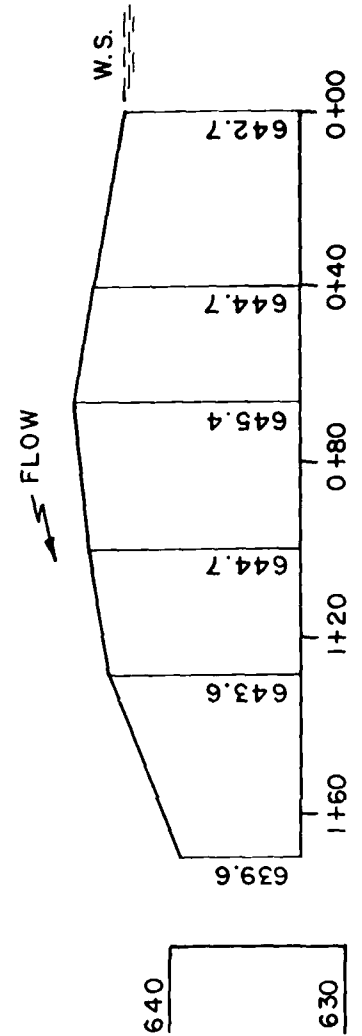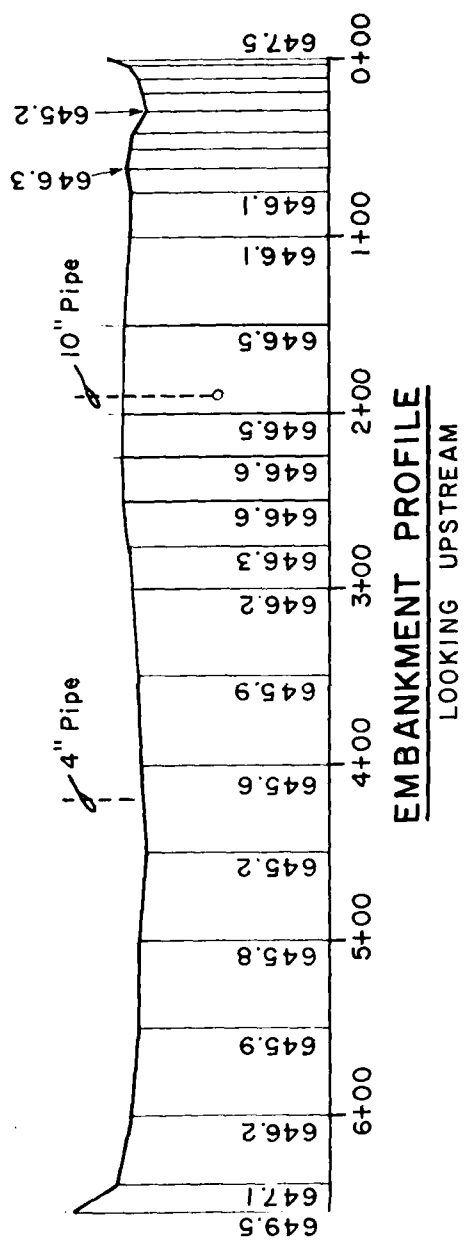
LAKE KIMBERLEY DAM

PA - 00949

INSPECTION SURVEY

SURVEYED 11-4-80

PLATE   A-II
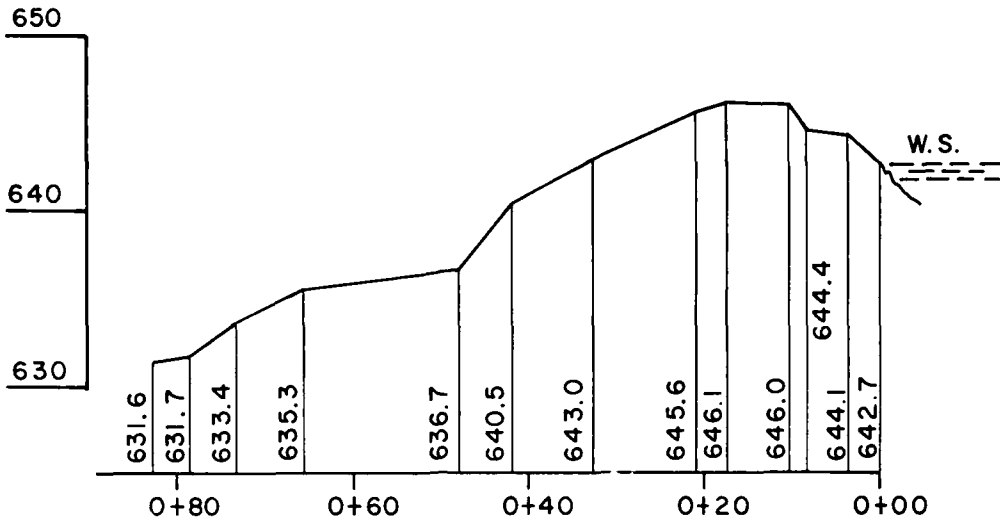
EMBANKMENT SECTION STA. 3+20
IN AREA OF SLIDE

Elevations (left to right): 631.6, 631.7, 633.4, 635.3, 636.7, 640.5, 643.0, 645.6, 646.1, 646.0, 644.4, 644.1, 642.7

Stations: 0+80, 0+60, 0+40, 0+20, 0+00

W.S.
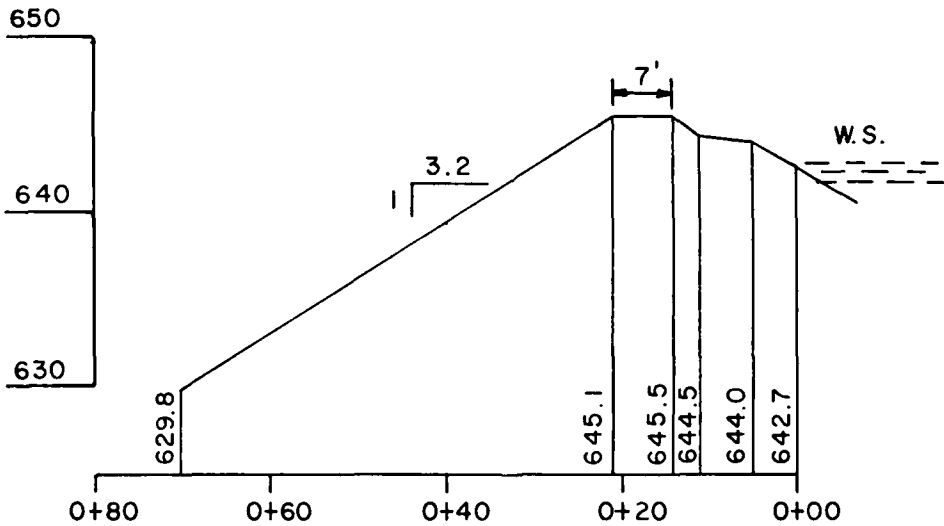
EMBANKMENT SECTION STA. 4+50

7'

3.2
1

Elevations: 629.8, 645.1, 645.5, 644.5, 644.0, 642.7

Stations: 0+80, 0+60, 0+40, 0+20, 0+00

W.S.

LAKE KIMBERLEY DAM

PA - 00949

INSPECTION SURVEY

PLATE   A-III

APPENDIX B

CHECK LIST OF ENGINEERING DATA

PA DER # 50-062

NDI NO. PA-00 949

NAME OF DAM   Lake Kimberly Dam

ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle - Andersonburg, Pa. See Plate II, Appendix E
CONSTRUCTION HISTORY	Built and designed by Styninger, Newport, Pennsylvania, with some aid by S.C.S. Constructed in 1970.
GENERAL PLAN OF DAM	Not available.
TYPICAL SECTIONS OF DAM	Not available.
OUTLETS: 　　PLAN 　　DETAILS 　　CONSTRAINTS 　　DISCHARGE RATINGS	Not available.

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	No records.
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	One test pit excavated in swampy area. Filled with water. No records.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	From reservoir and side hill.

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	No records.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None.
MAINTENANCE & OPERATION RECORDS	No records.
SPILLWAY PLAN, SECTIONS AND DETAILS	Not available.

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	No plans.
CONSTRUCTION RECORDS	No records.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	No reports.
MISCELLANEOUS	

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Woodlands, some farmland.

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 645.0   Acre-Feet 50

TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 645.2 Acre-Feet 51

MAXIMUM DESIGN POOL: Elev. 646±

TOP DAM: Elev. 645.2

SPILLWAY:	PRINCIPAL	EMERGENCY
a. Elevation	645	645.2
b. Type	Drop inlet	Uncontrolled, sod lined, broad crested weir
c. Width	8" diameter	35'
d. Length	--	--
e. Location Spillover	Near center of dam	Left abutment
f. Number and Type of Gates	None	None

OUTLET WORKS:

a. Type   4" pipe

b. Location   Between center and right side of dam

c. Entrance inverts 632±

d. Exit inverts   628.7

e. Emergency drawdown facilities   4" valve on pipe

HYDROMETEOROLOGICAL GAGES:

a. Type   None

b. Location

c. Records

MAXIMUM KNOWN OPERATING DISCHARGE   1 cfs

APPENDIX C

PHOTOGRAPHS
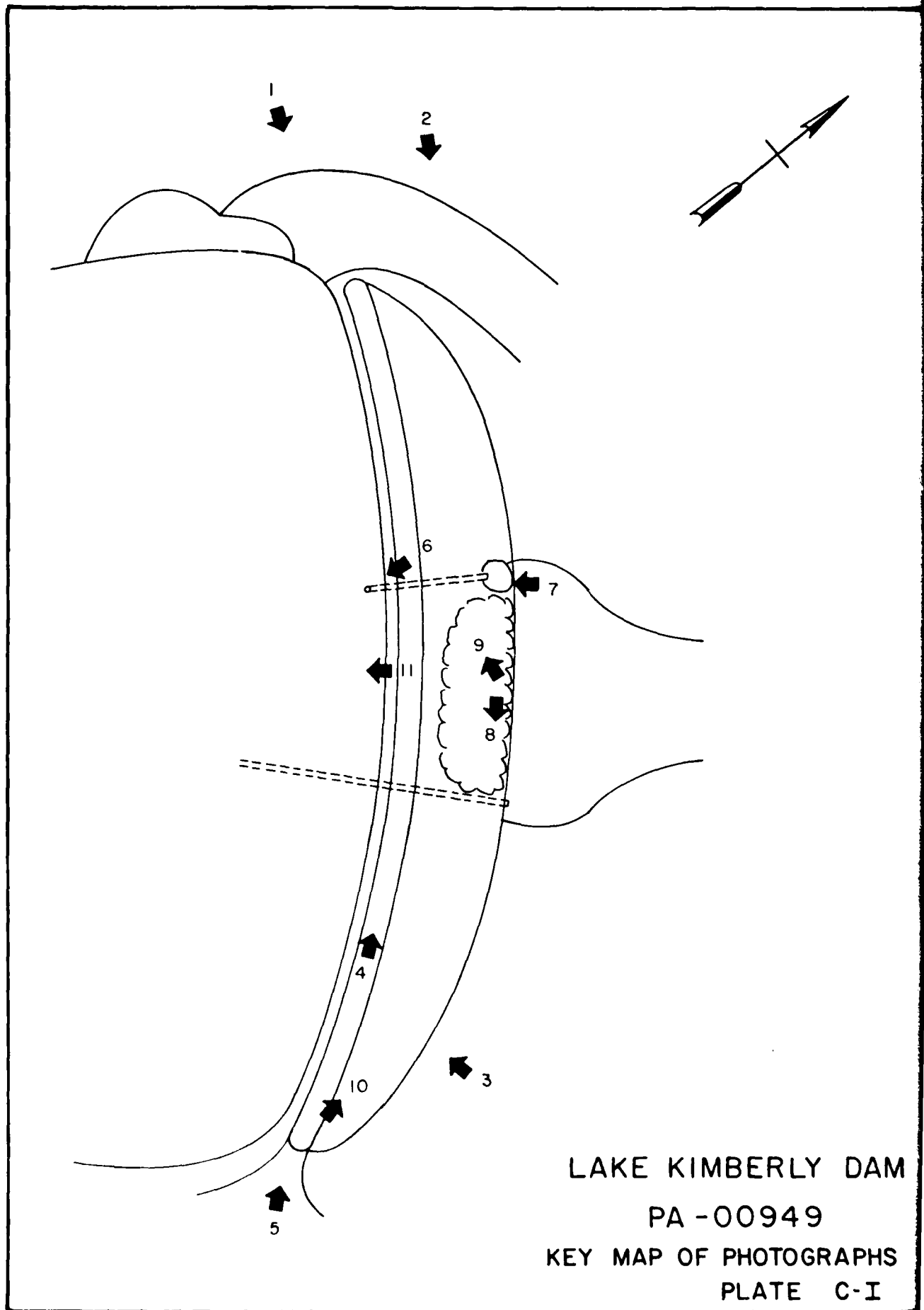
LAKE KIMBERLY DAM

PA-00949

KEY MAP OF PHOTOGRAPHS

PLATE C-I

EMERGENCY SPILLWAY AND LEFT ABUTMENT - NO. 2

BICYCLE TRACK ON DOWNSTREAM SLOPE - NO. 3

BRUSH & TREES ON DOWNSTREAM SLOPE – NO. 4

CATTAILS ON UPSTREAM SLOPE – NO. 5
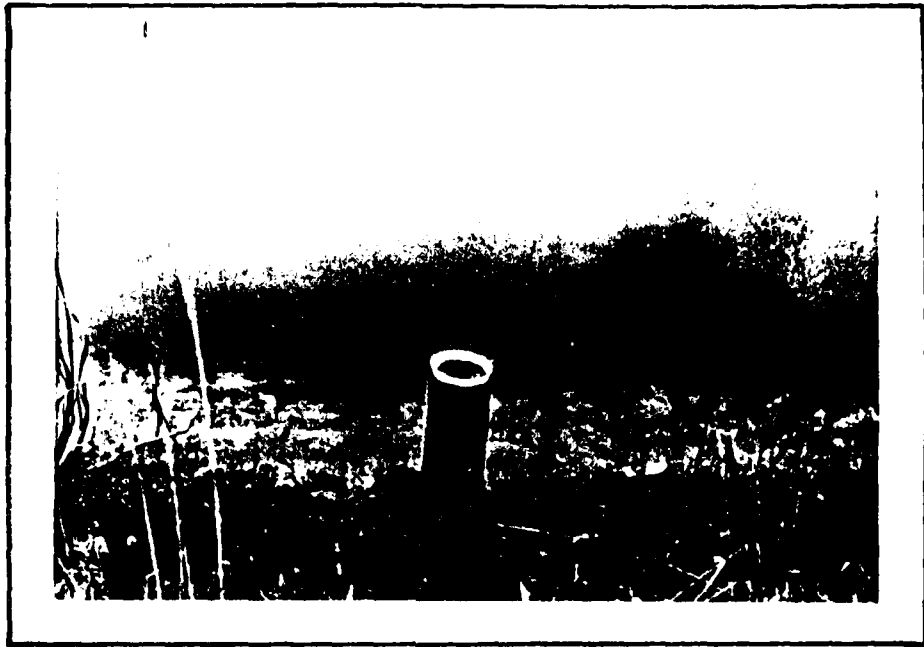
8-INCH OUTLET PIPE - NO. 6

END OF OUTLET PIPE - NO. 7
NOTE: ERODED AND STEEP EMBANKMENT

PA-00949

Plate C-IV

OVERGROWN SLOUGH AREA - NO. 8

SLOUGH AND TREE AT TOE - NO. 9

DOWNSTREAM AREA - NO. 10
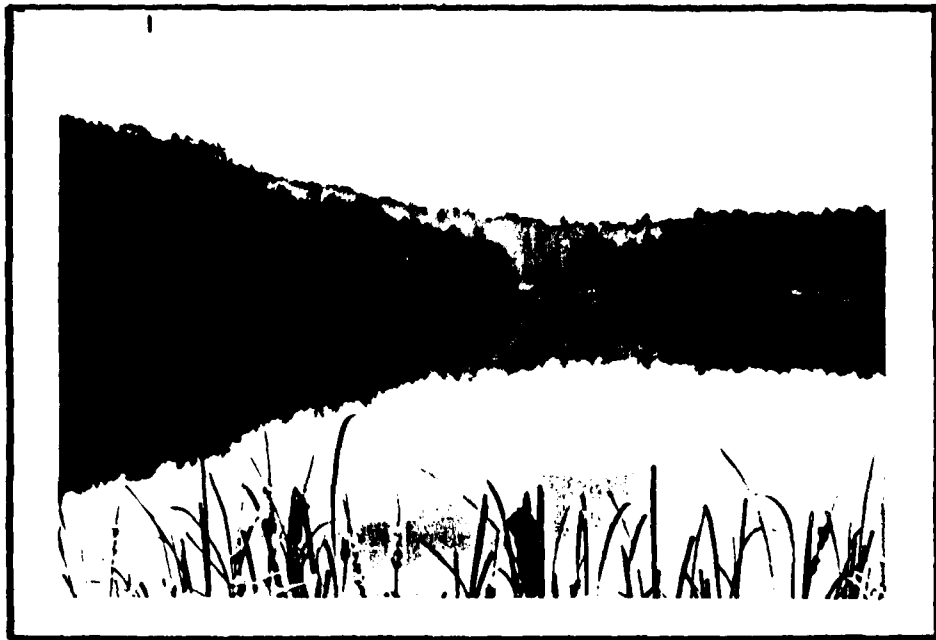
RESERVOIR AREA - NO. 11

PA-00949
Plate C-VI

APPENDIX D

HYDROLOGY AND HYDRAULIC CALCULATIONS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the over-topping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.

- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.

SPILLWAY RATING
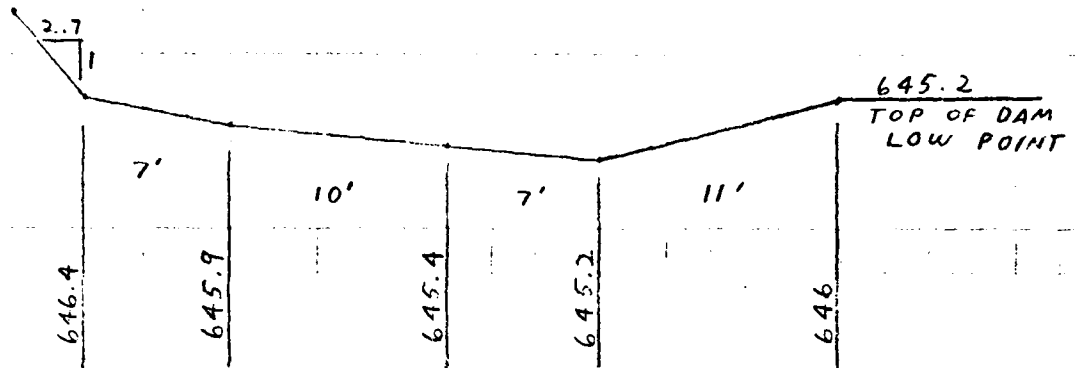
BROAD CRESTED WEIR
$$C = 2.7 \quad (KING'S\ HDBK.)$$

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

NOTE: ASSUME TOP OF DAM IMPROVED
        IS AT ELEVATION 646.0

$H_1 = (646 - 645.9)/2 = .05$

$L_1 = 7 \times (1/5) = 1'$

$H_2 = 646 - ((645.9 + 645.4)/2) = .35$

$L_2 = 10'$

$H_3 = 646 - ((645.4 + 645.2)/2) = .7$

$L_3 = 7'$

$H_4 = (646 - 645.2)/2 = .4$

$L_4 = 11'$

$$Q = 2.7 \times 1 \times (.05)^{1.5} + 2.7 \times 10 \times (.35)^{1.5} + 2.7 \times 7 \times (.7)^{1.5} + 2.7 \times 11 \times (.4)^{1.5}$$

$$= 24\ CFS$$

DISCHARGE THROUGH PRINCIPAL SPILLWAY

646
TOP OF DAM (IMPROVED)

645.2
LOW POINT, TOP OF DAM

645
TOP OF
DROP INLET

8"
DIA

10"

640.8
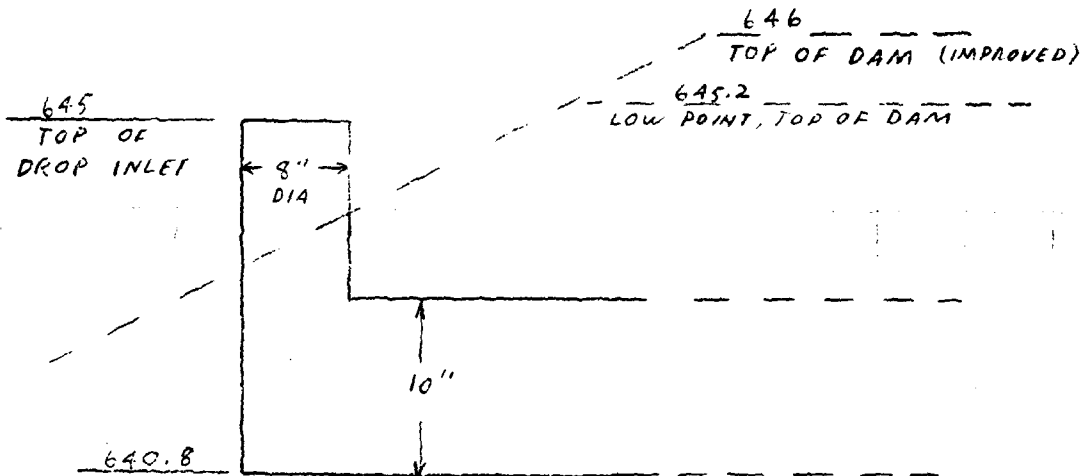
$C = 0.6$ (KING'S HDBK)

$$Q = C A \sqrt{2 g H}$$

$$H = 646 - 645 = 1'$$

$$Q = 0.6 \times \pi \times (8/12)^2 / 4 \times (2 \times 32.2 \times 1)^{.5}$$

$$= 1.7 \ CFS$$

AT ELEV. 645.2   (EXISTING LOW POINT, TOP OF DAM)

$$Q = C L H^{3/2}$$ $C = 3.3$ SHARP CRESTED WEIR
(KING'S HDBK)

$$H = 645.2 - 645 = 0.2'$$

$$Q = 3.3 \times \pi \times 8/12 \times (0.2)^{1.5}$$

$$= 0.6 \ CFS$$

EMBANKMENT RATING

$$Q = C L H^{3/2}$$ $C = 2.7$ (KING HOEK)

AT ELEV 645.6
$2.7 \times 50 \times (.2)^{1.5} = 12$
$2.7 \times 33 \times (.2)^{1.5} = 8$ $\Sigma = 20$ CFS

AT ELEV 646
$2.7 \times 17 \times (.05)^{1.5} = 1$
$2.7 \times 50 \times (.25)^{1.5} = 17$
$2.7 \times 50 \times (.6)^{1.5} = 62$
$2.7 \times 50 \times (.4)^{1.5} = 34$
$2.7 \times 50 \times (.15)^{1.5} = 8$
$2.7 \times 17 \times (.05)^{1.5} = 1$ $\Sigma = 123$ CFS

AT ELEV 646.2
$2.7 \times 12 \times (.15)^{1.5} = 2$
$2.7 \times 5 \times (.05)^{1.5} = -$
$2.7 \times 8 \times (.05)^{1.5} = -$
$2.7 \times 25 \times (.1)^{1.5} = 6$
$2.7 \times 12 \times (.05)^{1.5} = -$
$2.7 \times 50 \times (.15)^{1.5} = 5$
$2.7 \times 50 \times (.8)^{1.5} = 97$
$2.7 \times 50 \times (.7)^{1.5} = 79$
$2.7 \times 50 \times (.35)^{1.5} = 28$
$2.7 \times 50 \times (.15)^{1.5} = 8$ $\Sigma = 228$ CFS

AT ELEV 646.5
$2.7 \times 12 \times (.45)^{1.5} = 10$
$2.7 \times 10 \times (.3)^{1.5} = 4$
$2.7 \times 15 \times (.3)^{1.5} = 7$
$2.7 \times 25 \times (.4)^{1.5} = 17$
$2.7 \times 50 \times (.2)^{1.5} = 12$
$2.7 \times 17 \times (.1)^{1.5} = 1$
$2.7 \times 25 \times (.25)^{1.5} = 8$
$2.7 \times 50 \times (.45)^{1.5} = 41$
$2.7 \times 50 \times (.75)^{1.5} = 88$
$2.7 \times 50 \times (1.1)^{1.5} = 156$
$2.7 \times 50 \times (1)^{1.5} = 135$
$2.7 \times 50 \times (.65)^{1.5} = 71$
$2.7 \times 50 \times (.4c)^{1.5} = 41$
$2.7 \times 15 \times (.1)^{1.5} =$ $\Sigma = 593$ CFS

EMBANKMENT RATING (CONT.)

AT ELEV (4)

$$2.7 \times 12 \times (.95)^{1.5} = 30$$
$$2.7 \times 10 \times (.8)^{1.5} = 19$$
$$2.7 \times 12 \times (.8)^{1.5} = 29$$
$$2.7 \times 20 \times (.9)^{1.5} = 58$$
$$2.7 \times 50 \times (.7)^{1.5} = 79$$
$$2.7 \times 50 \times (.5)^{1.5} = 48$$
$$2.7 \times 45 \times (.45)^{1.5} = 20$$
$$2.7 \times 25 \times (.4)^{1.5} = 17$$
$$2.7 \times 25 \times (.55)^{1.5} = 28$$
$$2.7 \times 25 \times (.75)^{1.5} = 44$$
$$2.7 \times 50 \times (.95)^{1.5} = 125$$
$$2.7 \times 50 \times (1.25)^{1.5} = 189$$
$$2.7 \times 50 \times (1.6)^{1.5} = 273$$
$$2.7 \times 50 \times (1.5)^{1.5} = 248$$
$$2.7 \times 50 \times (1.15)^{1.5} = 166$$
$$2.7 \times 50 \times (.95)^{1.5} = 125$$
$$2.7 \times 35 \times (.4)^{1.5} = 24$$

$$\Sigma = 1522 \ CFS$$

DISCHARGE RATING CURVE

DISCHARGE
100 CFS

ELEV.

DISCHARGE THROUGH _____

(remaining handwritten calculations illegible)

MAXIMUM KNOWN FLOOD AT DAMSITE

IT WAS REPORTED THAT THE MAXIMUM KNOWN FLOOD
AT LAKE KIMBERLY DAM RAISED THE WATER LEVEL
... ... KIMBERLY ... REACH AN ELEVATION ABOUT
... FEET HIGH... THAN THE EMERGENCY SPILLWAY
... AND OVERTOPPED THE EMBANKMENT. FROM
... DISCHARGE ... CURVE IT IS ESTIMATED
... THIS ... WHICH OCCURRED IN JUNE 1972,
PRODUCED A DISCHARGE OF ABOUT 1030 CFS.
... ON THE ... OF THE U.S.G.S. GAGING
... RIVER ... AT NEARBY LOYSVILLE,
IN 1972 ... MAXIMUM ... FLOOD WAS OBSERVED
... A DISCHARGE ... 4450 CFS. THE INFLOW
... FLOOD ... ESTIMATED TO BE :

$$... \left(\frac{...}{...} \right)^{...} \times 4400$$

... OF FLOOD

... DESCRIPTION
... STORAGE 5... ACRE FEET
... HEIGHT ... 16 FEET
... CLASSIFICATION IS "SMALL"

... CLASSIFICATION
... LOCATED NEAR THE
... CHANNEL
... SIGNIFICANT

... DESIGN FLOOD
... GUIDELINES INDICATE USE
... OF THE ... IN THE RANGE OF THE 100 YEAR
... TO ... THE PROBABLE MAXIMUM

100 YEAR FLOOD

REF: "HYDROLOGIC STUDY, TROPICAL STORM AGNES", NORTH ATLANTIC DIVISION, U.S. ARMY, CORPS OF ENGINEERS.

LAKE KIMBERLY   D.A. = 0.18 SQ. MI.

(FIG. 21) $C_M = 1.9$

$$LOG(Q_M) = C_M + 0.75 \, LOG(A)$$

$$= 1.9 + 0.75 \, LOG(.18)$$

$$= 1.3415$$

(FIG. 22) $C_S = .36$

$$S = C_S - .05 \, LOG(A)$$

$$= .36 - .05 \, LOG(.18)$$

$$= .397$$

(FIG. 23)   SKEW = +.45

STANDARD DEVIATE = 2.65056

$$LOG(Q(P)) = LOG(Q_M) + K(P,g) \, S$$

$$= 1.3415 + (2.65056)(.397)$$

$$= 2.3938$$

$$Q_1 = 248 \ CFS$$

BY RLS DATE 1/19/81   **BERGER ASSOCIATES**   SHEET NO. 9 OF 12
CHKD. BY   DATE   PROJECT D0590
SUBJECT   LAKE KIMBERLY

<u>100 YR FLOOD</u>   (CONT.)

TOTAL RAINFALL   (FROM TP-40)

DURATION (HR)	DEPTH (IN)
.5	2.22
1	2.76
2	3.39
3	3.73
6	4.57
12	5.38
24	6.28
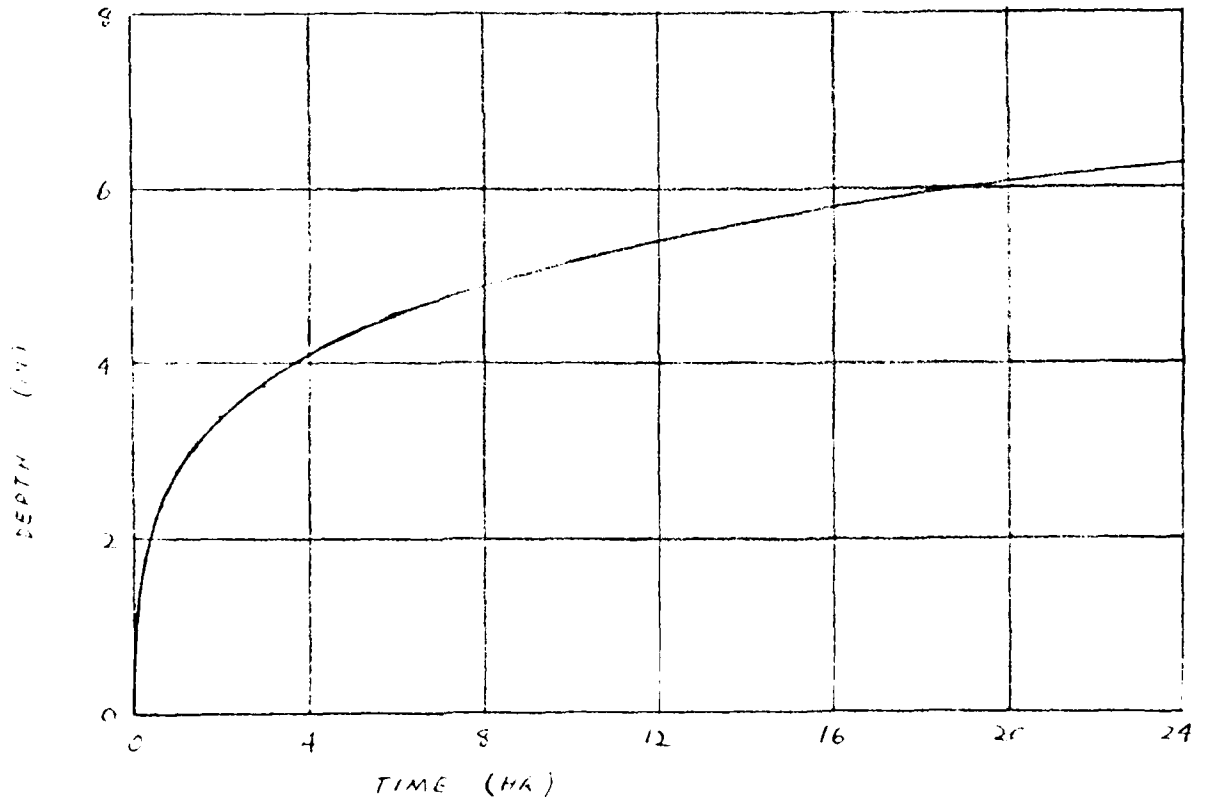
SCS PARAMETERS

CLASS

SOIL TYPE : KLINESVILLE (PREDOMINANT) — D

WEIKERT — D

ALBRIGHTS ⎫ (SMALL AMOUNTS) — C

CALVIN ⎭ — ⁀

USE : CLASS D

COVER: FOREST LAND, SOME FARM LAND

$CN = 83$

LAG :

$L = 4000'$

$Y = 85'/4000 \times 100\% = 2.125\%$

$S = (1000/CN) - 10$

$$LAG = \frac{(L)^{0.8} \cdot (S+1)^{0.7}}{1900 \times (Y)^{0.5}}$$

$$= .60 \ HR$$

$Q_{100} = 244 \ CFS \quad \cong 248 \ CFS$

SUBJECT _____   LAKE KIMBERLY DAM

SPILLWAY CAPACITY CURVE   (EXISTING)
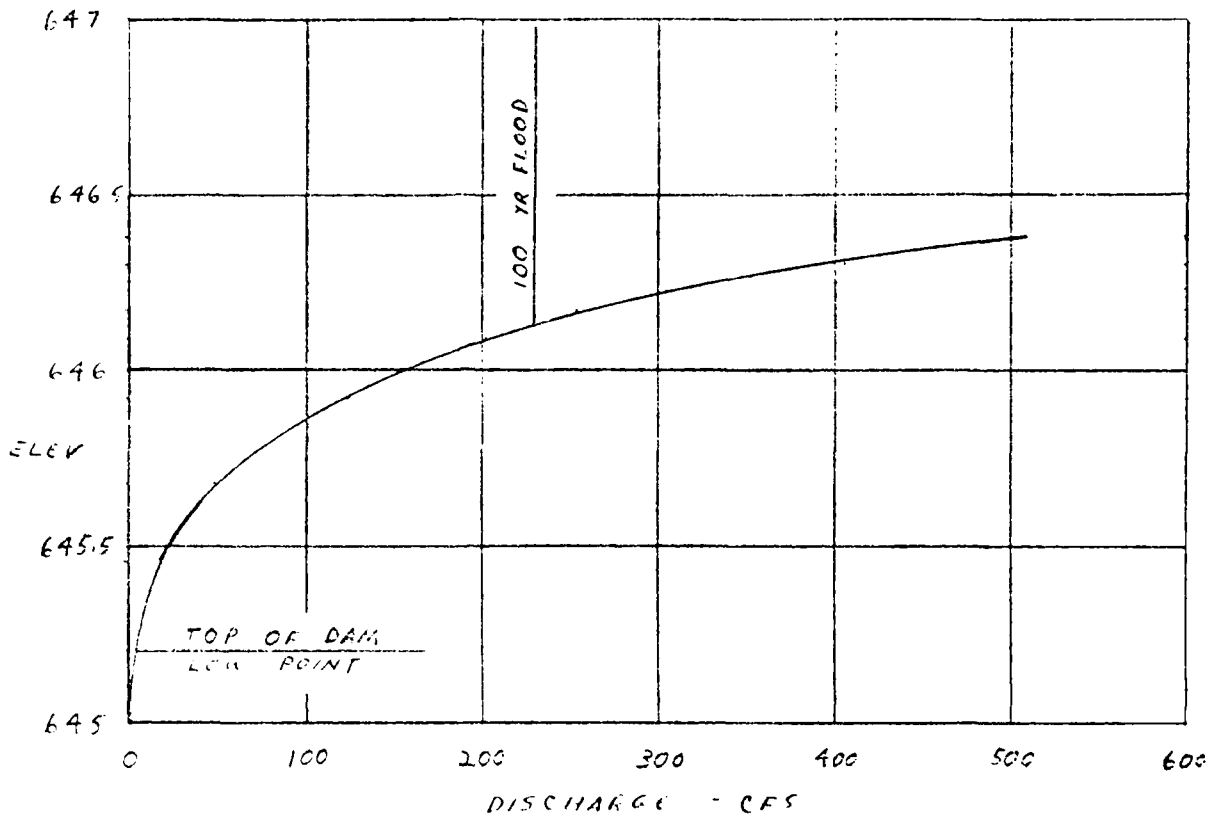
SPILLWAY CAPACITY CURVE   (EXISTING)

BY BLS DATE 2/3/81   **BERGER ASSOCIATES**   SHEET NO. 12 OF 12
CHKD. BY DATE   PROJECT D0590
SUBJECT LAKE KIMBERLY DAM

SPILLWAY CAPACITY CURVE   (IMPROVED)

ELEV.

DISCHARGE - CFS
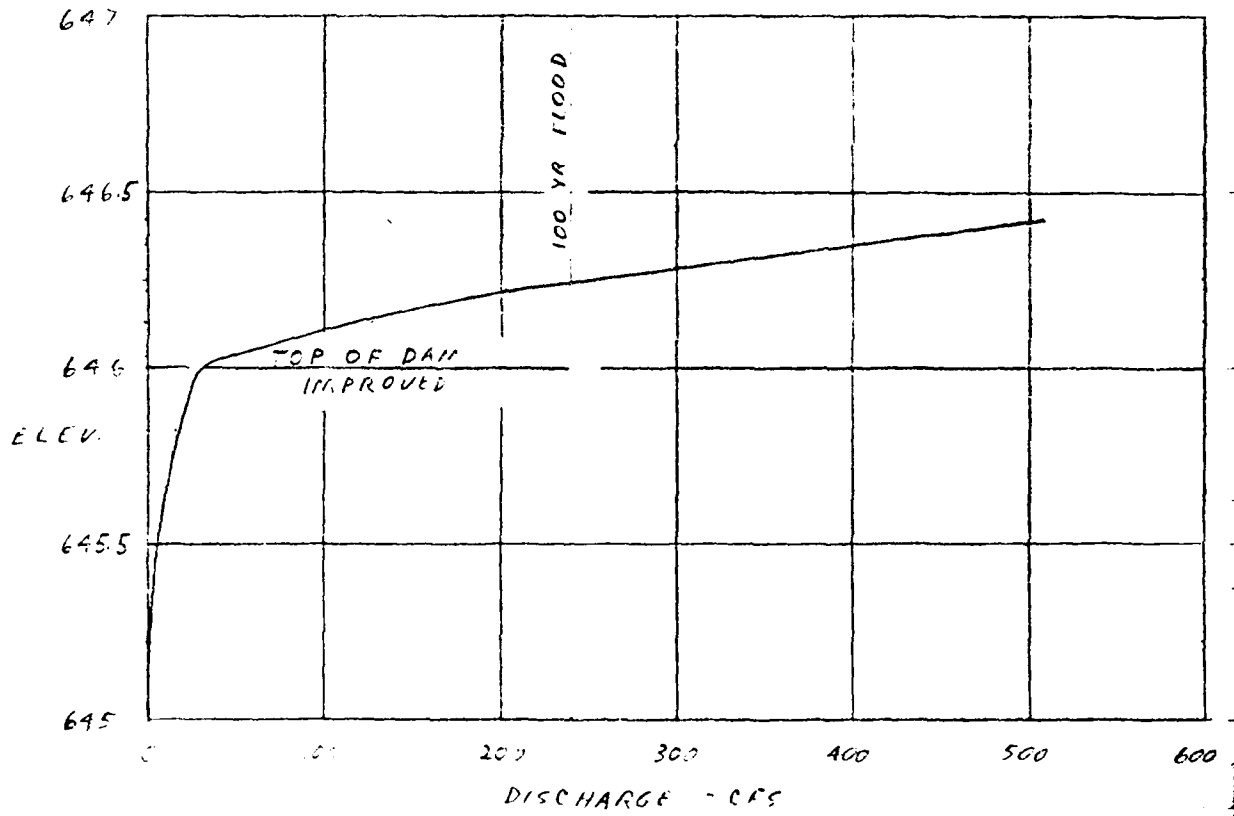
HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: __Lake Kimberly Dam__   RIVER BASIN: __Susquehanna__

PROBABLE MAXIMUM PRECIPITATION (PMP) = __23.2__ INCHES/24 HOURS [9]

(FOR FOOTNOTES SEE NEXT PAGE)

STATION	1	2	3	4
STATION DESCRIPTION	LAKE KIMBERLY	LAKE KIMBERLY DAM	.	
DRAINAGE AREA (SQUARE MILES)	.18			
CUMULATIVE DRAINAGE AREA (SQUARE MILE)	.18	.18		
ADJUSTMENT OF PMP FOR DRAINAGE AREA (%) 6 HOURS				
12 HOURS				
24 HOURS				
48 HOURS				
72 HOURS				
SNYDER HYDROGRAPH PARAMETERS ZONE [3]	18			
C_p/C_t [4]	.50/2.1			
L (MILES) [5]	.74			
L_{ca} (MILES) [5]	.38			
$T_p = C_t (L \cdot L_{ca})^{0.3}$ (Hours)	1.44			
SPILLWAY DATA CREST LENGTH (FT.)		EMERGENCY 35	PRINCIPAL 8" Dia.	
FREEBOARD (FT.)		0	.2	
DISCHARGE COEFFICIENT		2.7	.6	
EXPONENT		1.5	--	
ELEVATION		645.2	645	
AREA [6] (ACRES) NORMAL POOL 645	6.6			
ELEV. __660__	16.5			
ELEV. ____				
STORAGE (ACRE-FEET) NORMAL POOL [7]	50			
ELEV. __622.2__ [8]	0			
ELEV. ____ [8]				
ELEV. ____ [8]				

[1] Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

[2] Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

[3] Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

[4] Snyder's Coefficients.

[5] L = Length of longest water course from outlet to basin divide.

   L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

[6] Planimetered area encompased by contour upstream of dam.

[7] PennDER files.

[8] Computed by conic method.

[9] Hydrometeorological Report No. 40, U.S. Army Corps of Engineers, 1965.

```
    1        A1     LAKE KIMBERLY DAM    ****    TRIBUTARY TO SHERMAN CREEK
    2        A2     SOUTHWEST MADISON TWP., PERRY COUNTY, PA.
    3        A3     NDI # PA-00949     PA DER # 50-62
    4        B     300      0     15      0      0      0      0      0     -4      0
    5        B1     5
    6        J      1      1      1
    7        J1     1
    8        K             1                                  1
    9        K1            INFLOW  HYDROGRAPH
   10        M      2    .18
   11        O     96
   12        O1   .01    .01    .01    .01    .02    .02    .02    .02    .02    .02
   13        O1   .02    .02    .02    .02    .02    .02    .02    .02    .02    .02
   14        O1   .02    .02    .02    .02    .02    .03    .03    .03    .03    .03
   15        O1   .03    .04    .04    .04    .05    .05    .06    .06    .07    .08
   16        O1   .08    .08    .08    .10    .13    .19    .35   1.70    .52    .20
   17        O1   .17    .12    .09    .03    .03    .08    .07    .07    .06    .06
   18        O1   .05    .04    .04    .04    .04    .03    .03    .03    .03    .03
   19        O1   .02    .02    .02    .02    .02    .02    .02    .02    .02    .02
   20        O1   .02    .02    .02    .02    .02    .02    .02    .02    .02    .02
   21        O1   .02    .02    .01    .01    .01    .01
   22        T                                                 -1    -83
   23        W1          .60
   24        X    -1.5   -.05      2                            .
   25        K      1      2                                   1
   26        K1            RESERVOIR  ROUTING
   27        Y                          1
   28        Y1     1                                   50     -1
   29        Y4    645  645.6    646  646.2  646.5    647
   30        Y5      0     24    149    269    670   1672
   31        $A      0    6.6   16.5
   32        $E  622.2    645    660
   33        $$    645
   34        $D  645.2
   35        K     99
```

```
1                    PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS


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

```
                              JOB SPECIFICATION
        NO    NHR   NMIN   IDAY   IHR   IMIN   METRC   IPLT   IFRT   NSTAN
        300    0     15     0      0     0       0      0     -4      0
                             JOPER   NWT   LROPT   TRACE
                               5      0      0       0



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

            RTIOS=   1.00



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

                        SUB-AREA RUNOFF COMPUTATION

                     INFLOW  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
           0      2     .18    0.00    .18    0.00    0.000     0       0       0

                               LOSS DATA
     LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSNX   RTIMP
       0     0.00    0.00    1.00    0.00    0.00    1.00   -1.00  -83.00   0.00    0.00

       CURVE NO = -83.00  WETNESS =  -1.00  EFFECT CN =   83.00

                         UNIT HYDROGRAPH DATA
                        TC=  0.00   LAG=   .60

                            RECESSION DATA
                  STRTQ=   -1.50   QRCSN=   -.05   RTIOR= 2.00

  0                              END-OF-PERIOD FLOW
 NO.DA  HR.MN  PERIOD  RAIN  EXCS  LOSS   COMP Q     NO.DA  HR.MN  PERIOD  RAIN  EXCS  LOSS   COMP Q

                                                      SUM   6.28  4.35  1.93   2107.
                                                          ( 160.)( 111.)(  49.)(  59.66)



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

                        HYDROGRAPH ROUTING

                     RESERVOIR  ROUTING

                     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   ISPRNT
                       1       0      0    0.000   0.000  0.000    50.     -1
```

```
        STAGE    645.00      645.60      646.00      646.20      646.50      647.00

        FLOW     0.00        24.00      149.00      269.00      670.00     1672.00

    SURFACE AREA=      0.         7.        17.

       CAPACITY=       0.        50.       218.

      ELEVATION=     622.       645.       660.

                         CREL   SPWID   COOW   EXPW   ELEVL   COOL   CAREA   EXPL
                         645.0    0.0    0.0    0.0     0.0    0.0     0.0    0.0

                                                DAM DATA
                                        TOPEL   COOD   EXPD   DAMWID
                                        645.2    0.0    0.0     0.

PEAK OUTFLOW IS     229. AT TIME  12.75 HOURS



1         **********        **.******        **.******        **.******        **.******



           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)


                                                      RATIOS APPLIED TO FLOWS
   OPERATION    STATION    AREA    PLAN  RATIO 1
                                          1.00



   HYDROGRAPH AT    1      .18      1     244.
                    (     .47)      (    6.91)(

   ROUTED TO        2      .18      1     229.
                    (     .47)      (    6.48)(

1                                SUMMARY OF DAM SAFETY ANALYSIS


      PLAN  1 ...............              INITIAL VALUE   SPILLWAY CREST   TOP OF DAM
                                ELEVATION      644.93          645.00         645.20
                                STORAGE         50.             50.            51.
                                OUTFLOW          0.              0.             8.


                   RATIO    MAXIMUM    MAXIMUM   MAXIMUM   MAXIMUM   DURATION    TIME OF     TIME OF
                    OF      RESERVOIR   DEPTH    STORAGE   OUTFLOW   OVER TOP   MAX OUTFLOW  FAILURE
                    PMF     W.S.ELEV   OVER DAM   AC-FT      CFS      HOURS       HOURS       HOURS
                     50

                   1.00     646.13      .93       58.       229.     13.75       12.75       0.00
   EOI ENCOUNTERED.
```

```
..........................
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION    JULY 1978
  LAST MODIFICATION  01 APR 80
***********************************
```

1	A1	LAKE KIMBERLY DAM	****	TRIBUTARY TO SHERMAN CREEK							
2	A2	SOUTHWEST MADISON TWP., PERRY COUNTY, PA.									
3	A3	NDI # PA-00949	PA DER # 50-62								
4	B	300	0	15	0	0	0	0	0	-4	0
5	B1	5									
6	J	1	1	1							
7	J1	1									
8	K		1					1			
9	K1		INFLOW HYDROGRAPH								
10	M		2	.18							
11	Q	96									
12	Q1	.01	.01	.01	.01	.02	.02	.02	.02	.02	.02
13	Q1	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
14	Q1	.02	.02	.02	.02	.02	.03	.03	.03	.03	.03
15	Q1	.03	.04	.04	.04	.05	.05	.06	.06	.07	.08
16	Q1	.08	.08	.08	.10	.13	.19	.35	1.70	.52	.20
17	Q1	.17	.12	.09	.08	.08	.08	.07	.07	.06	.06
18	Q1	.05	.04	.04	.04	.04	.03	.03	.03	.03	.03
19	Q1	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
20	Q1	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
21	Q1	.02	.02	.01	.01	.01	.01				
22	T							-1	-83		
23	W1		.60								
24	X	-1.5	-.05	2							
25	K	1	2					1			
26	K1		RESERVOIR ROUTING								
27	Y			1							
28	Y1	1						50	-1		
29	Y4	645	645.6	646	646.2	646.5	647				
30	Y5	0	4	26	180	625	1703				
31	$A	0	6.6	16.5							
32	$E	622.2	645	660							
33	$S	645									
34	$D	646	•								
35	K	99									

```
1               PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS


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

```
                        JOB SPECIFICATION
         NQ    NHR    NMIN    IDAY    IHR    IMIN    METRC    IPLT    IPRT    NSTAN
         300    0     15       0
```

```
                        JOPER    NWT   LROPT  TRACE
                          5       0      0      0



                   MULTI-PLAN ANALYSES TO BE PERFORMED
                       NPLAN= 1 NRTIO= 1 LRTIO= 1
            RTIOS=   1.00



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

                   SUB-AREA RUNOFF COMPUTATION

                   INFLOW  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
        0       2     .18     0.00     .18     0.00    0.000    0       0       0

                        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  -83.00    0.00    0.00

      CURVE NO = -83.00  WETNESS =  -1.00  EFFECT CN =  83.00

                        UNIT HYDROGRAPH DATA
                     TC=  0.00   LAG=  .60

                        RECESSION DATA
             STRTQ=   -1.50   QRCSN=   -.05   RTIOR= 2.00

    0                            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   6.28  4.35  1.93   2107.
                                                     ( 160.)( 111.)(  49.)(  59.66)



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

                   HYDROGRAPH ROUTING

                   RESERVOIR  ROUTING

             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  ISFRAT
             1       0       0    0.000    0.000   0.000    50.     -1
```

```
STAGE      645.00      645.60      646.00      646.20      646.50      647.00

FLOW        0.00        4.00       26.00      180.00      625.00     1703.00

SURFACE AREA=       0.        7.       17.

CAPACITY=       0.       50.      218.

ELEVATION=      622.      645.      660.
```

```
                     CREL   SPWID   COQW    EXPW    ELEVL   COQL    CAREA   EXPL
                     645.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0

        8                                    DAM DATA
                                     TOPEL    COQD    EXPD   DAMWID
                                     646.0     0.0     0.0     0.
```

PEAK OUTFLOW IS   235. AT TIME 12.50 HOURS

          **********   **********   **********   **********   **********
1

     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)

                                                RATIOS APPLIED TO FLOWS

OPERATION   STATION   AREA   PLAN RATIO 1
                                            1.00

HYDROGRAPH AT   1   .18   1   244.
                  (.47)   (6.91)(

ROUTED TO   2   .18   1   235.
                  (.47)   (6.65)(

1   SUMMARY OF DAM SAFETY ANALYSIS
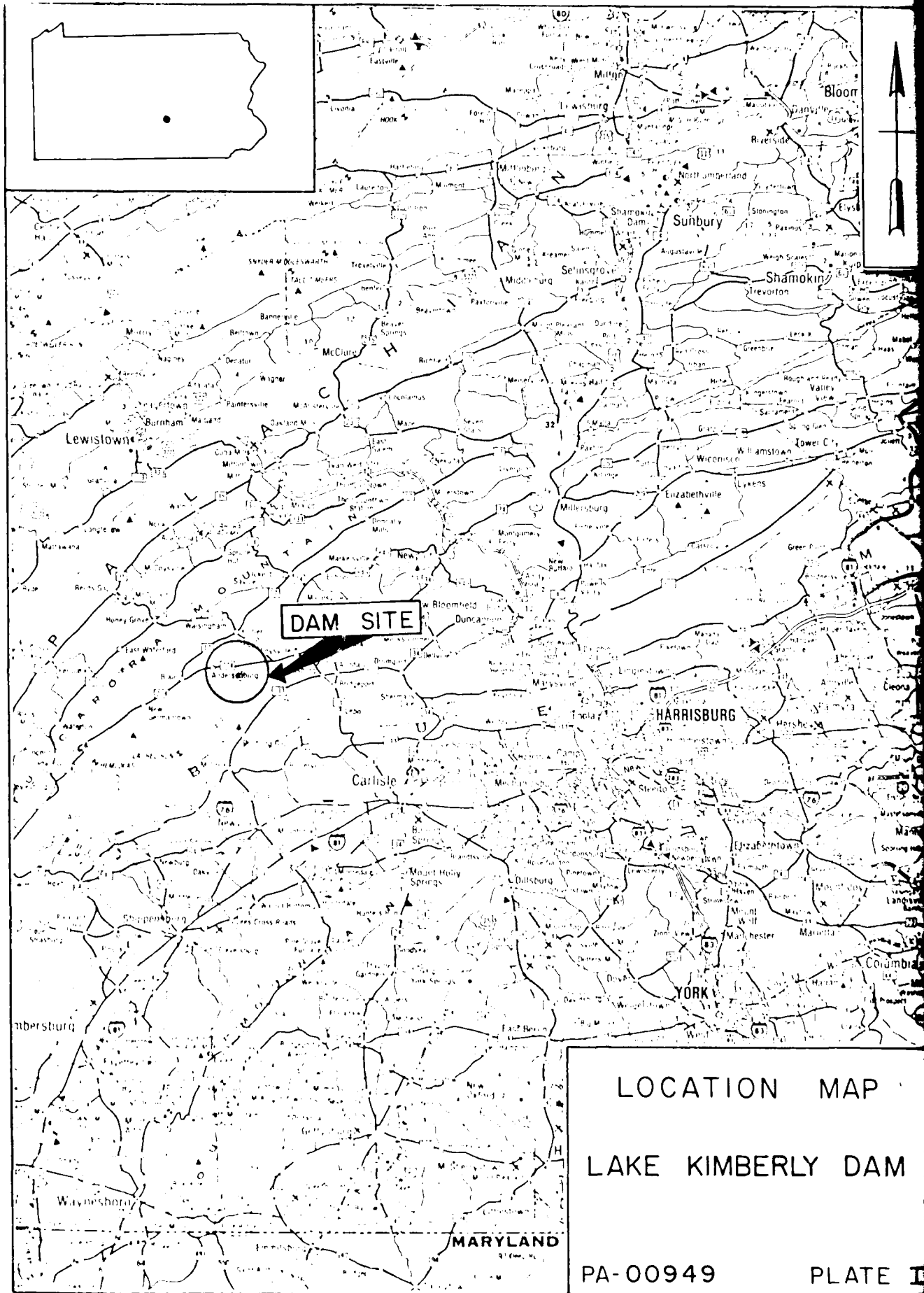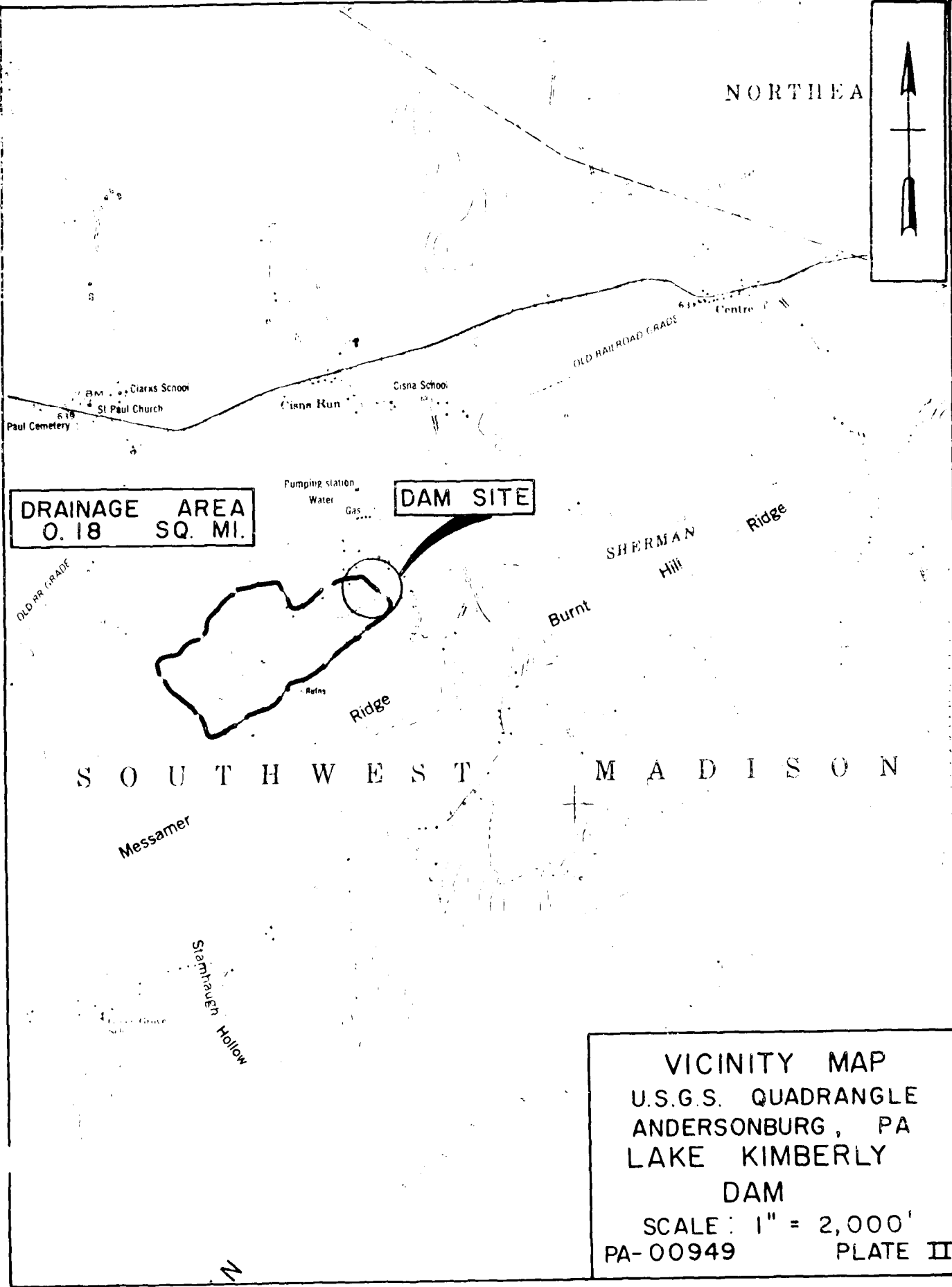
     PLAN 1 ....   INITIAL VALUE   SPILLWAY CREST   TOP OF DAM
                       ELEVATION   644.93   645.00   646.00
                       STORAGE   50.   50.   57.
                       OUTFLOW   0.   0.   26.
```

| RATIO OF PMF SDF | 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 | 646.24 | .24 | 59. | 235. | 3.25 | 12.50 | 0.00 |

```
EOI ENCOUNTERED.
N>
```

APPENDIX E

PLATES

DAM SITE

LOCATION MAP

LAKE KIMBERLY DAM

PA-00949   PLATE I

NORTHEA

Centre

OLD RAILROAD GRADE

BM Clarks School
St Paul Church
Cisna School
Paul Cemetery
Cisna Run

Pumping station
Water
Gas

DAM SITE

**DRAINAGE AREA
0.18 SQ. MI.**

SHERMAN Hill Ridge

OLD RR GRADE

Burnt

Being Ridge

S O U T H W E S T   M A D I S O N

Messamer

Stambaugh Hollow

N

**VICINITY MAP
U.S.G.S. QUADRANGLE
ANDERSONBURG, PA
LAKE KIMBERLY
DAM**
SCALE: 1" = 2,000'
PA-00949   PLATE II

APPENDIX F

GEOLOGIC REPORT

GEOLOGIC REPORT

BEDROCK - DAM AND RESERVOIR

The dam and reservoir are located within the Silurian Age Bloomsburg
Formation. This formation consists of brownish and some grayish-
red shale, siltstone and sandstone with local lenses of olive-gray
sandstone, localized thin impure limestone and a conglomerate
belonging to the Bridgeport member near the middle.

STRUCTURE

The dam lies within the Ridge and Valley Provience. The Bloomsburg
Formation is a formation of intermediate competency and the axis of
major folds and faults trend N55°-65°E with dip between 50° and 55°
and a plung ranging from 5°-10°. There are two general joint
orientations, one N50°-40°E, parallel to the strike of the bedding
and the other N20°-40°W or at right angles to the general strike.

OVERBURDEN

The overburden in this area consists of a residual soils or asaprolite
with the possibility of alluvial sediments resulting from the
proximity of Sherman Creek.

AQUIFER CHARACTERISTICS

The Bloomsburg Formation has little primary or secondary porosity
or permeability. Its ability to transmit or store water is related
to the degree of fracturing and the amount of weathering these
fractures have undergone. The median water yield for this formation
is 13 gpm with a range of 1-100 gpm. It is considered to have a
"fair" water yielding potential. Subsurface seepage shoul' be of
little concern, but depends on the localized lithology.

DISCUSSION

There are no available construction plans for this dam. However,
the Bloomsburg Formation does provide a good foundation base.

SOURCES OF INFORMATION

1. Johnson, H.E., 1970. Groundwater Resources of the Loysville
    and Mifflintown Quadrangle in South Central Pennsylvania:
    Pennsylvania Geological Survey W-27.

2. McGlade, W.G., et. al., 1972. Engineering Characteristics of
    the Rocks of Pennsylvania: Pennsylvania Geological Survey
    EG-1.

GEOLOGIC MAP - LAKE KIMBERLY DAM

SCALE 1:24000

1/2   0   1 Mile

LEGEND

| Sb | Bloomsburg Formation |

DATE FILMED

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