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DELAWARE RIVER BASIN
BRANCH OF SHEHAWKEN CREEK, WAYNE COUNTY

PENNSYLVANIA

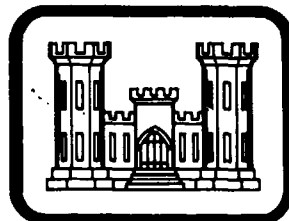
PERCH POND DAM

NDI ID NO. PA-00135
DER ID NO. 64-23

CAMP STARLIGHT, INC.

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



Prepared by
Geo-Technical Services, Inc.
CONSULTING ENGINEERS & GEOLOGISTS

851 S. 19th Street
Harrisburg, Pennsylvania 17104

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

AUGUST 1981

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BRANCH OF SHEHAWKEN CREEK, WAYNE COUNTY
PENNSYLVANIA

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NDI ID NO. PA-00135
DER ID NO. 64-23

CAMP STARLIGHT, INC.

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DACW31-81-C-0019

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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 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 reasonable 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.

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
BRIEF ASSESSMENT OF GENERAL CONDITION
AND
RECOMMENDED ACTION

Name of Dam: Perch Pond Dam
NDI ID No. PA-00135
DER ID No. 64-23

Size: Small (13.5 feet high; 246 acre-feet)

Hazard Classification: Significant

Owner: Camp Starlight, Inc.
c/o Edward H. Dix, Superintendent
Starlight, Pennsylvania 18461

State Located: Pennsylvania

County Located: Wayne

Stream: Branch of Shehawken Creek

Date of Inspection: June 23, 1981

Perch Pond Dam is judged to be in good structural condition based on the visual inspection. Based on the location of the downstream dwellings and the fact that a few lives could be lost should the dam fail, the dam is classified as a significant hazard dam. Based on criteria established for these studies, the recommended Spillway Design Flood (SDF) varies between the 100-year flood and 1/2 of the Probable Maximum Flood (1/2 PMF). The 100-year flood was selected for the SDF. Since the spillway cannot pass the 100-year flood without overtopping the dam, the spillway is rated as inadequate.

The following investigations and remedial measures are recommended for immediate implementation by the owner. All investigations and design of remedial measures should be performed under the direction of a Professional Engineer, experienced in the design and construction of dams.

- (1) Increase the spillway capacity to pass at least the 100-year flood flow without overtopping the dam.

PERCH POND DAM

- (2) Repair the spalled spillway walls.
- (3) Verify the operational condition of the upstream intake valve and provide other means to draw down the reservoir level in emergencies, should the valve be found inoperative or non-existent.
- (4) Remove the brush and trees from the dam crest and toe.
- (5) Monitor the rate and turbidity of the leakage at the toe of the dam and take appropriate action as required.

In addition, the owner should institute the following operational and maintenance procedures:

- (1) Develop an emergency warning system which should include round-the-clock monitoring of the dam during periods of unusually heavy rains and a plan to contact the few downstream residents who would be affected by a dam failure.
- (2) Institute an inspection program to include monitoring the leakage at the toe of the dam for signs of internal erosion. As presently required by Bureau of Dams and Waterway Management of PENNDEP, the program shall include an annual inspection of the dam by a Professional Engineer, experienced in the design and construction of dams. Deficiencies found during annual inspection should be remedied as necessary.



Submitted by:

GEO-TECHNICAL SERVICES, INC.

Gideon Yachin
GIDEON YACHIN, P.E.

Date: August 31, 1981

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

James W. Peck
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer
Date: 10 Sep 81

PERCH POND DAM (PA-00135)

(ARROW POINTS AT SPILLWAY)



OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PERCH POND DAM
NDI# PA-00135, PENNDA # 64-23

SECTION 1
GENERAL INFORMATION

1.1 General.

a. Authority: The inspection was performed pursuant to the authority granted by the National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct 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 or property.

1.2 Description of Project.

a. Dam and Appurtenances: Perch Pond Dam is a composite earthfill-masonry structure, consisting of an earthfill embankment located between two dry stone masonry walls. The upstream wall is covered with concrete on the lake side of the wall. The dam is 165 feet long and 13.5 feet high. The crest is 16 feet wide, including the masonry walls.

The spillway is a 12.7 foot long broad crested weir with a center pier that is 2.1 feet wide. The weir slab, pier and the lower 2 feet of the spillway sidewalls are concrete. The upper portions of the spillway walls are stone and mortar. The spillway discharges into a rock lined plunge pool at the toe of the dam.

The outlet works for the dam is an 8" cast iron pipe through the dam. Details of the inlet and the operational status of the outlet works could not be determined.

b. Location: The dam is located on a Branch of Shehawken Creek in Preston Township, Wayne County, Pennsylvania, approximately 1 mile southwest of Starlight, Pennsylvania. The dam and reservoir are contained within the Hancock, PA - NY 7.5 minute series USGS Quadrangle Map at Latitude N41°53'04" and Longitude W75°20'45". A Location Map is shown in Appendix E.

c. Size Classification: Small (13.5 feet high and 246 acre-feet maximum storage).

d. Hazard Classification: Significant (see paragraph 3.1e).

e. Ownership: Camp Starlight, Inc., c/o Edward H. Dix, Superintendent, Starlight, Pennsylvania 18461.

f. Purpose of Dam: Recreation.

g. Design and Construction History: Information related to design and construction of the dam is not available. Data obtained from the Pennsylvania Department of Environmental Resources (PENNDER) indicate that the dam was constructed in 1913. Inspection reports and photographs indicate the upstream stone wall was faced with concrete in 1948. This information is on file with PENNDER.

h. Normal Operating Procedure: The pool is maintained at the spillway crest by flow over the spillway.

1.3 Pertinent Data:

a. <u>Drainage Area:</u>	1.32 Sq. Miles
b. <u>Discharge at Damsite:</u>	
Maximum known flood at damsite	Unknown
Outlet works at maximum pool elevation	Not Applicable
Spillway capacity at maximum pool elevation	152 cfs
c. <u>Elevation</u> (feet above msl). For datum see 3.1a.	
Top of dam	
Design Conditions	Unknown
Existing Conditions (lowest point)	1499.1
Maximum Pool	
Design Conditions	Unknown
Existing Conditions	1499.1
Normal Pool	1496.0
Upstream invert outlet works	Unknown
Downstream invert	1487.3
Streambed at toe of dam	1485.6
d. <u>Reservoir Length:</u>	
Normal Pool	4880 feet
Maximum Pool	5380 feet
e. <u>Storage:</u>	
Normal Pool	76 acre-feet
Maximum Pool	246 acre-feet
f. <u>Reservoir Surface:</u>	
Normal Pool	48 acres
Maximum Pool	62 acres

- g. Dam:
- | | |
|------------------|--------------------------------------|
| Type | Dry stone masonry and earthfill |
| Length (feet) | 165 |
| Height (feet) | 13.5 |
| Top Width (feet) | 16.0 |
| Side Slopes | Downstream 3V:1H, Upstream Vertical: |
- h. Diversion and Regulating Tunnel: None
- i. Spillway:
- | | |
|-----------------------|--------------------|
| Type | Broad Crested Weir |
| Length of Weir (feet) | 10.6 |
| Crest Elevation | 1496.0 |
| Upstream Channel | None |
| Downstream Channel | Natural Stream Bed |
- j. Regulating Outlets:
- | | |
|---------|-----------|
| Type | 8" C.I.P. |
| Length | Unknown |
| Closure | Unknown |
| Access | Submerged |

SECTION 2

ENGINEERING DATA

2.1 Design.

There is no information available relative to the design of the dam.

2.2 Construction.

No information concerning construction of the dam is available.

2.3 Operation.

There are no records available to indicate the past operational procedures for the dam. The present normal operation of the facility is described in paragraph 1.2h, Section 1.

2.4 Other Information.

Dam inspection reports were provided by the Bureau of Dams and Waterway Management, Department of Environmental Resources (PENNDER), Commonwealth of Pennsylvania.

On-site inspections were made in July 1917, October 1924, June 1930, November 1935, October 1941 and July 1948. The reports indicate that the concrete facing of the upstream wall and the spillway was done in the spring of 1948.

2.5 Evaluation.

a. Availability: The owner's representative had no information related to the design, construction or the operation of the dam. Pertinent dam features were obtained by survey on the inspection date. There are no other sources of information available for the evaluation of the facility.

b. Adequacy: The available data are very limited and the dam safety assessment must be primarily based on the visual inspection, performance history and the hydrologic and hydraulic analyses, presented in Section 5. The collected data are considered adequate for Phase I report.

c. Validity: There is no reason to question the validity of the available data.

SECTION 3

VISUAL INSPECTION

3.1 Observations.

a. General: The overall appearance of the dam and appurtenances is fair. A plan of the dam and annotated field observations are shown on Exhibit A-1, Appendix A. Surveyed profiles and typical sections of the dam are presented in Exhibits A-2 and A-3. The survey datum for this inspection is based on the lake elevation shown on the USGS 7.5 Minute Quadrangle (see Exhibit E-1). Pertinent observed features are indicated on the photographs in Appendix C.

b. Embankments: The earth embankment and exposed masonry walls appear to be in good condition.

A 30 GPM leak was observed at the bottom of the downstream wall approximately 7 feet left of the spillway. No evidence of internal erosion was noticed (see photograph 19, Appendix C).

Brush and small trees were observed on the dam crest. Trees to 12" in diameter are growing along the toe of the dam.

c. Appurtenant Structures:

(1) Spillway: The spillway is a rectangular, broad crested weir 12.7 feet wide including a 2.1 foot wide concrete center pier. There is a wood plank walkway bridge over the spillway. The spillway is concrete lined with the bottom slab and lower wall being in fair condition. The mortar of the upper spillway walls is badly spalled. The spillway discharges by free fall into a natural plunge pool 2.5 feet deep, 40 feet wide and 20 feet long.

(2) Outlet Works: The outlet end of an 8" cast iron pipe is located 3+ feet left of the spillway at the toe of the dam. No inlet structure or gate was observed. The operating condition of the outlet works is unknown.

d. Reservoir Area: The watershed draining to the pond is wooded mountain land with 10 to 20 percent slopes. There is no evidence of unstable slopes that would affect the dam stability. The watershed features are presented in Exhibit E-1. Geologic conditions of the general area are described in Appendix F. The potential of increased development changing the hydrologic characteristics of the watershed is considered to be remote.

e. Downstream Channel: The channel immediately downstream of the dam is a steep mountain stream. Potential damage is limited to several dwellings and bridges that are located 0.7 and 1.6 miles downstream of the pond (see photographs 21 thru 23, Appendix C).

A few lives could be lost and significant damage to property could occur should the dam fail. The dam is classified as a significant hazard structure.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Normal Operating Procedures.

The reservoir is maintained at normal pool with excess flow discharging over the spillway.

4.2 Maintenance of Dam.

Maintenance of the dam is minimal and appears to be limited to mowing of grass on the dam crest.

4.3 Maintenance of Operating Facilities.

The outlet facilities are not systematically operated. The operational status of the control facilities could not be determined at the time of inspection.

4.4 Warning System.

There is no formal warning system in effect at the present time.

4.5 Evaluation.

A formal maintenance plan for the dam and spillway is required. The outlet works should be made operational and frequent inspections should be made to verify conditions at the dam. A method of drawing down the lake should be provided in the event of emergency. An emergency warning system and evacuation plan for the downstream residents is necessary to prevent loss of life should the dam fail.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Design Data.

There are no hydrologic or hydraulic data available for Perch Pond Dam.

5.2 Experience Data.

There are no records available relative to maximum stages or discharges at the dam.

5.3 Visual Observations.

Based on the visual inspection and field survey described in Section 3, the observations relevant to hydrology and hydraulics are evaluated as follows:

a. Embankments: The spillway elevation is 1496.0 and the low point on the embankment is 1499.1, resulting in 3.1 feet of freeboard. The variation in the crest of dam elevation is shown in Exhibit A-2, Appendix A, and is based on the field survey on the inspection date.

b. Spillway: The spillway is a divided rectangular broad-crested weir with an effective length of 10.6 feet. The spillway flow discharges into a plunge pool at the toe of the dam. Hydraulic analysis of the spillway is presented in Appendix D. The spillway features are shown in photographs 3, 8, 9, 10 and 17 in Appendix C.

c. Reservoir Area: There are no upstream hydraulic structures which would influence flood flow into Perch Pond.

Future development to the extent that would alter hydrologic and hydraulic conditions is not anticipated.

d. Downstream Conditions: There are no downstream conditions which would affect Perch Pond Dam hydraulically. The downstream channel is steep and backwater due to high discharges would have no effect on the spillway analysis.

5.4 Method of Analysis.

Hydrologic and hydraulic evaluation was made in accordance with the procedures and guidelines established by the U.S. Army Corps of Engineers, Baltimore District, Phase I Safety Inspection of Dams. The analysis is presented in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF): According to criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (small) and hazard potential (significant) of the Perch Pond Dam is between the 100-year flood and the one-half Probable Maximum Flood (1/2 PMF). Because of the small reservoir storage capacity and the distance to potential damage centers, the 100-year flood is selected as the SDF for the Perch Pond Dam.

b. Results of Analysis: Pertinent results are presented in Appendix D. The analysis reveals that at the existing top of dam elevation, the spillway will discharge 152 cfs when the water surface in Perch Pond reaches the low point on the crest of the dam. The computed 100-year flood for the 1.32 square-mile drainage area above the dam is 550 cfs.

5.6 Spillway Adequacy.

Because the present capacity of the spillway will not pass the selected SDF without overtopping the crest of the dam, the spillway is rated as inadequate.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations.

The visual inspection of Perch Pond Dam is described in Section 3. Observations relevant to the dam's structural stability are evaluated below:

a. Dam: One point source leak was noted during the inspection (see paragraph 3.1b). There is no evidence of piping to suggest that internal erosion of the embankment is presently occurring.

b. Appurtenant Structures:

(1) Spillway: The lower portion of the spillway appears to be sound. The upper portions of the spillway walls are badly spalled (see photographs 9 and 10, Appendix C).

(2) Outlet Works: The intake for the outlet works could not be operated; consequently, pressure flow conditions in the 8" CIP could not be observed.

6.2 Design and Construction Data.

There is no documented design or construction data.

6.3 Past Performance.

The dam apparently has performed adequately since its construction in 1913.

6.4 Stability.

a. Static: The dam is considered to be stable under static loading conditions.

b. Seismic: The dam is located in seismic zone 1. If the dam has adequate structural stability under static conditions, it is assumed to be able to withstand the minor seismic forces expected in this zone.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety:

(1) The Perch Pond Dam is judged to be in good structural condition based on the visual inspection. Based on the location of the downstream dwellings and the fact that a few lives could be lost should the dam fail, the dam is classified as a significant hazard dam. Based on criteria established for these studies, the recommended Spillway Design Flood (SDF) varies between the 100-year flood and 1/2 of the Probable Maximum Flood (1/2 PMF). Because of the small reservoir storage capacity and the distance to potential damage centers, the 100-year flood was selected for the SDF. Since the spillway cannot pass the 100-year flood without overtopping the dam, the spillway is rated as inadequate.

(2) A summary of the observed deficiencies is described below:

<u>DESCRIPTION</u>	<u>OBSERVED DEFICIENCIES</u>
<u>Earth Embankments</u>	
Dam	25 to 30 GPM leak at the base of the dam. Brush and trees on the dam crest and large trees at the toe of the downstream wall.
<u>Appurtenant Structures</u>	
Spillway	Spalled spillway walls; inadequate discharge capacity.
Outlet Works	The operational condition of the inlet valve requires verification. Means to draw down the reservoir must be provided in emergencies.

b. Adequacy of Information: There are no design or construction data available for Perch Pond Dam. The visual inspection and computations performed as part of this study, as well as the past performance of the facility, are sufficient for the Phase I Dam Safety assessment.

c. Urgency: The recommendations presented in Section 7.2 should be implemented immediately.

d. Necessity for Further Investigations: In order to accomplish some of the remedial measures outlined in paragraph 7.2, further investigation by a Professional Engineer experienced in the design and construction of dams will be necessary.

7.2 Recommendations and Remedial Measures.

a. The following investigations and remedial measures are recommended for immediate implementation by the owner.

(1) Increase the spillway capacity to pass at least the 100-year flood flow without overtopping the dam.

(2) Repair the spalled spillway walls.

(3) Make the outlet works operable or provide other means to draw down the reservoir level in emergencies.

(4) Remove the trees and brush from the dam crest and the toe of the downstream wall.

(5) Monitor the rate and turbidity of the leakage at the toe of the dam and take appropriate action as required.

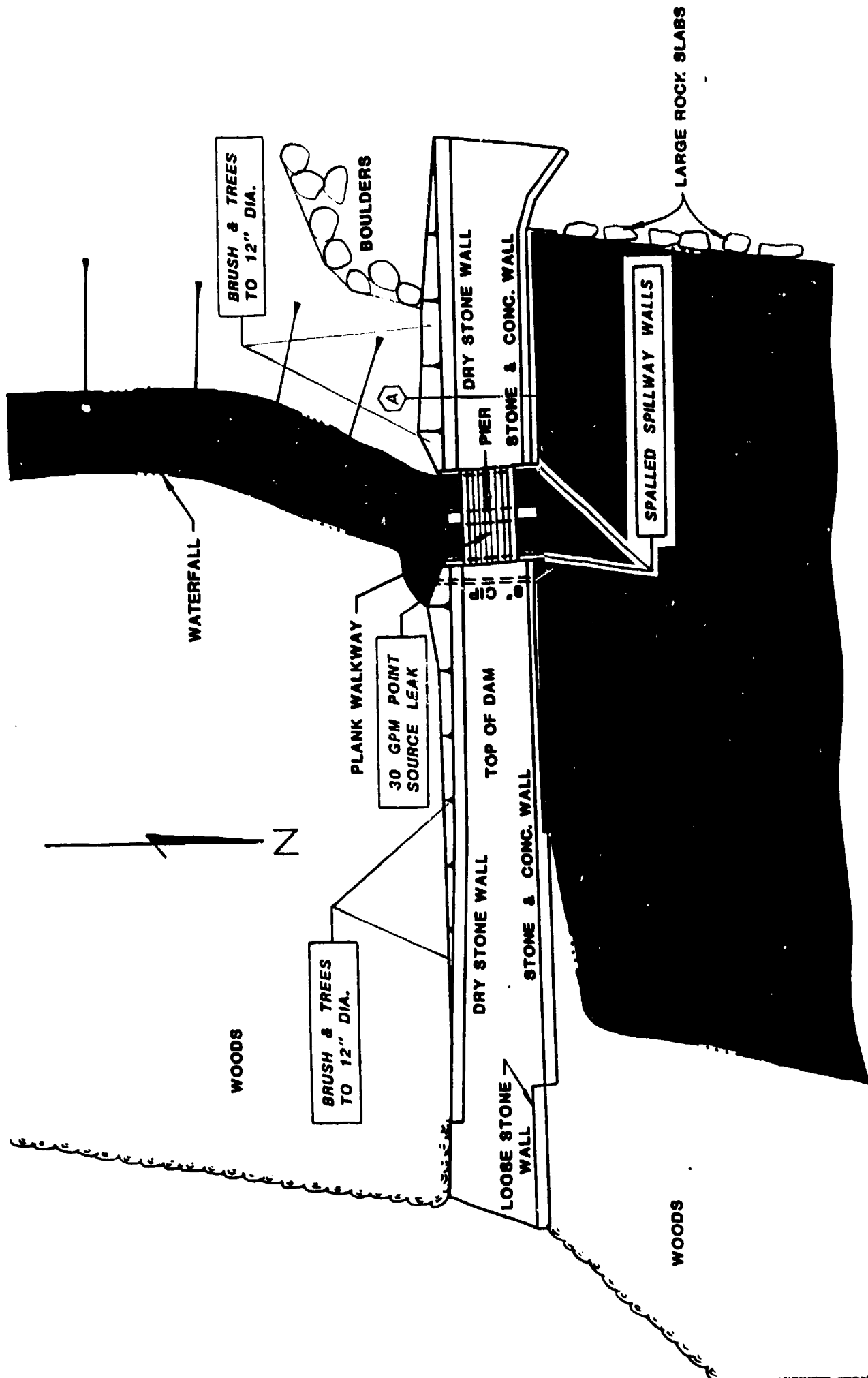
b. In addition, the owner should institute the following operational and maintenance procedures.

(1) Develop an emergency warning system which should include round-the-clock monitoring of the dam during periods of unusually heavy rains and a plan to contact the few downstream residents who would be affected by a dam failure.

(2) Institute an inspection program to include monitoring the leakage at the toe of the dam for increased flow or evidence of internal erosion. As presently required by Bureau of Dams and Waterway Management of PENNDA, the program shall include an annual inspection of the dam by a Professional Engineer, experienced in the design and construction of dams. Deficiencies found during annual inspection should be remedied as necessary.

APPENDIX A

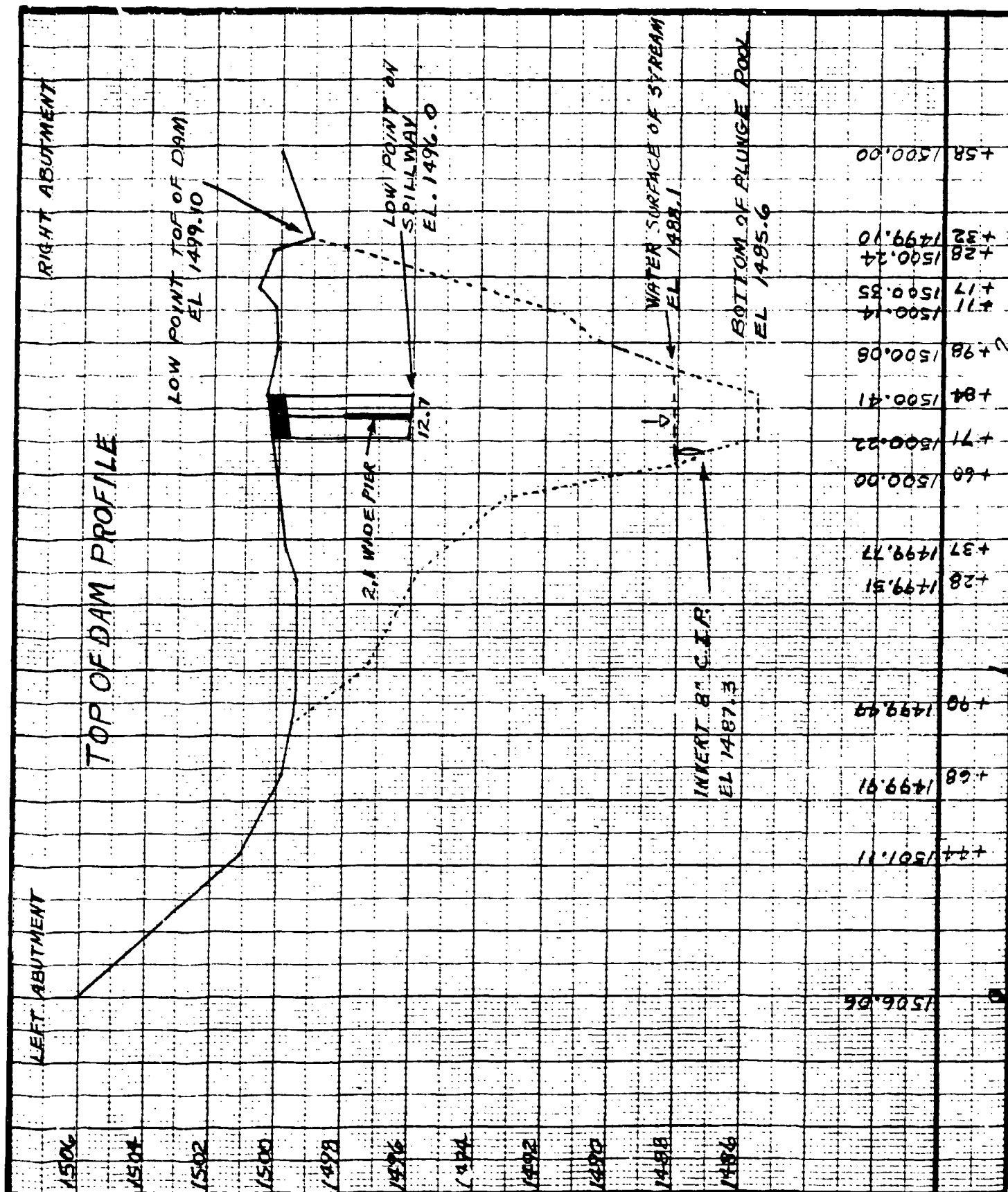
VISUAL INSPECTION - CHECKLIST AND FIELD SKETCHES

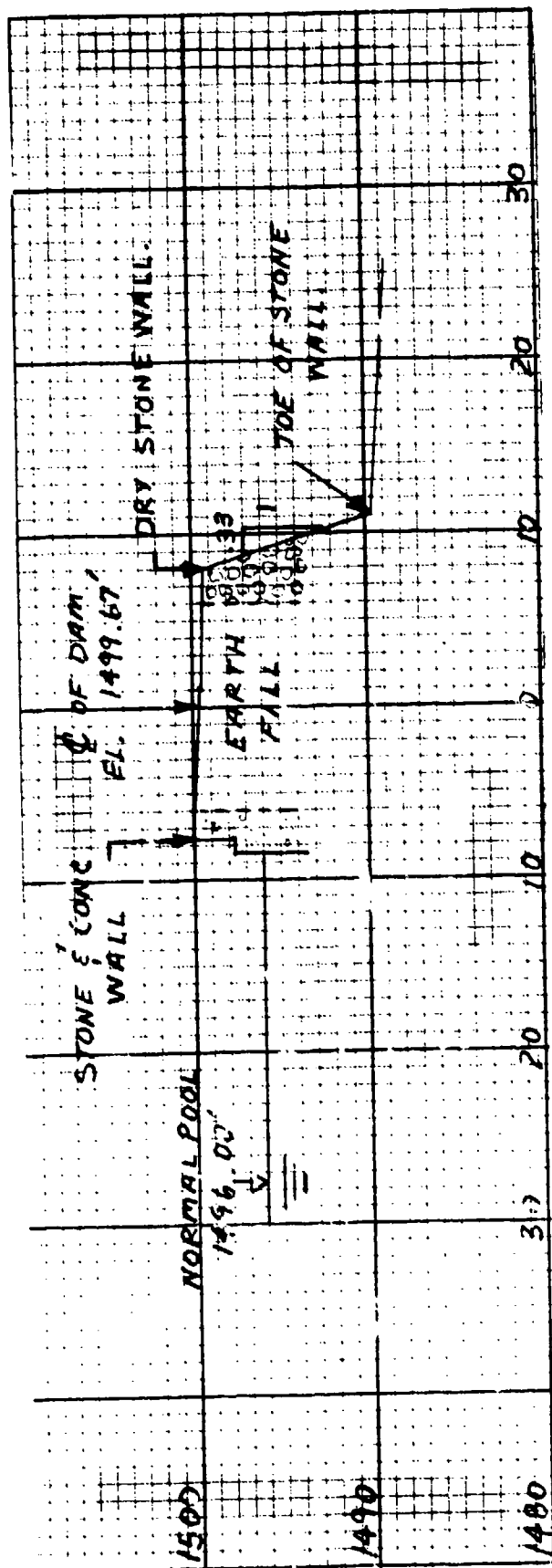


PERCH POND DAM
GENERAL PLAN - FIELD INSPECTION NOTES

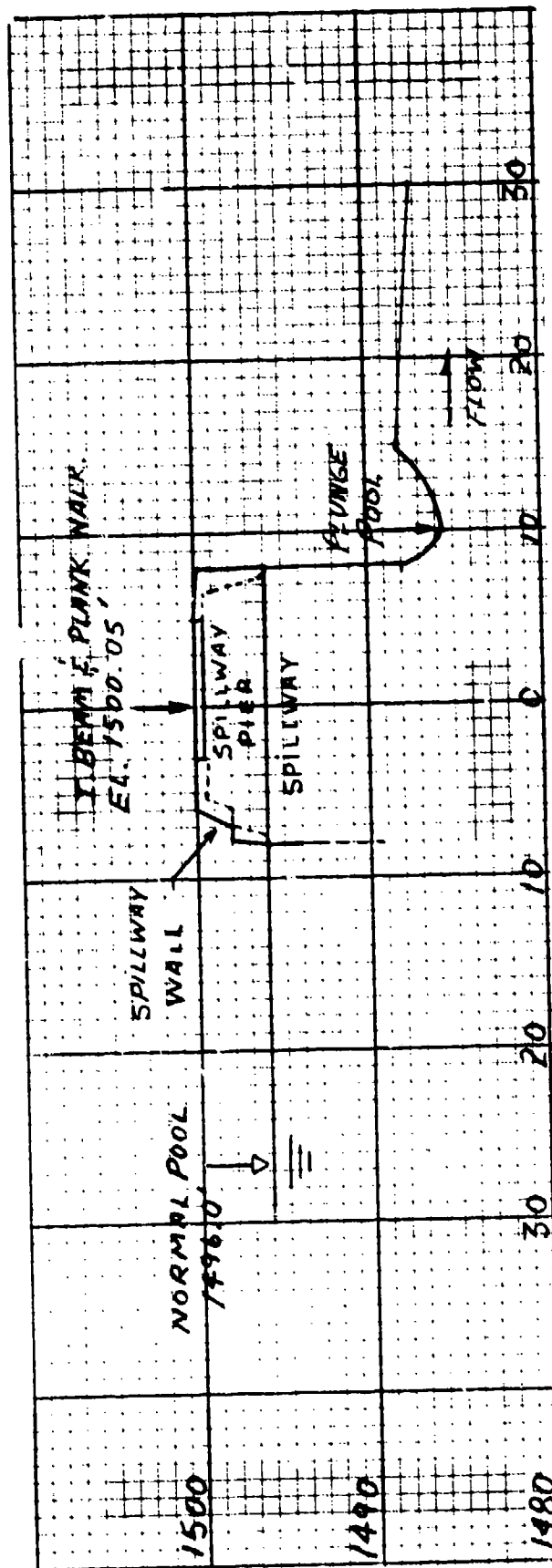
GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB _____
SHEET NO 1 OF 1
CALCULATED BY RJM DATE 7-20-81
CHECKED BY _____ DATE _____
SCALE HORZ 1" = 40' VERT. 1" = 4'





SECTION A



CHECK LIST VISUAL INSPECTION PHASE 1

NAME OF DAM Perch Pond Dam STATE Pennsylvania COUNTY Wayne

NDI # PA - 00135 PENNIDER # 64-23

TYPE OF DAM Earth, dry stone & concrete SIZE Small HAZARD CATEGORY Significant

DATE(S) INSPECTION June 23, 1981 WEATHER Cloudy TEMPERATURE 19°C 6p 12:30 p.m.

POOL ELEVATION AT TIME OF INSPECTION 1496.0 M.S.L.

TAIL WATER AT TIME OF INSPECTION 1488.3 M.S.L.

OTHERS

OWNER REPRESENTATIVES

INSPECTION PERSONNEL

<u>Gideon Yachin, Engineer</u>	<u>Dave Dix, Camp Supt.</u>
<u>James Diaz, Geologist</u>	<u>Hy. Schmieder, Camp Director</u>
<u>Ronald Mather, Surveyor</u>	

RECORDED BY James Diaz

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA - 00135
SURFACE CRACKS	None - Upstream face concrete in good condition. Downstream face dry stone masonry in good condition. Earth material between, no settlement, no cracks or holes.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical alignment is good. Horizontal alignment if fair. There is a low spot on right abutment.	
RIPRAP FAILURES	N.A. Upstream concrete face in good condition.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good	

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDM# PA - 00135
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	None	
ANY NOTICEABLE SEEPAGE	25 to 30 GPM point source leak at bottom of downstream stone wall about 7 feet left of spillway and 12"+ above invert of outlet pipe.	
STAFF GAGE AND RECORDER	None	
DRAINS	None	
ROCK OUTCROPS	Brownish gray sandstone outcrops 50 to 100' downstream on right abutment. Strike N50°E to N10°W; Dip 20°NW and 5°SW. Large sandstone slabs 0 to 100 feet upstream on right abutment appear to be displaced or loose sections of rock.	
DAM FOUNDATION, TREES, OTHER	The bedrock outcrops immediately downstream indicate the dam foundation is on sandstone bedrock. Several trees 6 to 12 inches in diameter are growing within inches of the downstream toe. Brush and small trees are growing on the dam and downstream stone wall.	

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDM# PA - 00135
INTAKE STRUCTURE	None visible.	
OUTLET CONDUIT (CRACKING AND SPALLING OF CON- CRETE SURFACES)	An 8" diameter CIP with invert 1.0' below water surface of plunge pool.	
OUTLET STRUCTURE	None	
OUTLET CHANNEL	Natural stream channel with steep 10' bank on left (2H on 1V) and gentle 5' high right bank (10H on 1V).	
GATE(S) AND OPERA- TIONAL EQUIPMENT	None visible. A 9' long key (2 1/4" square opening) found downstream and the 8" CIP outlet pipe suggests an 8" gate valve exists.	

SERVICE SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA.-00135
TYPE AND CONDITION	A 12.7' wide broad crested concrete weir including a 2.1' wide concrete center pier with about 3.7' clearance to underside of a 15" steel "I" beam bridge section. The channel floor and lower walls in fair condition. The upper parts of both walls are badly spalled.	
APPROACH CHANNEL	None. Lake discharges directly into spillway channel.	
SPILLWAY CHANNEL AND SIDEWALLS	Double channel with concrete walls, slab and center concrete pier. The left half is approximately 5.3'W X 3.6'H at bottom of spillway bridge. Right half is approximately 5.5'W and 3.7'H and had a flow of about 300 GPM. The top 3.4' of both side walls (stone and mortar) were badly spalled for a distance of 3 to 5 feet from the upstream end.	
STILLING BASIN PLUNGE POOL	A 2.5' deep natural plunge pool about 40' wide extends about 20 feet downstream to the natural stream channel.	
DISCHARGE CHANNEL	A natural stream channel with gently sloped wooded side slopes and a flat gravel and cobble streambed.	
BRIDGE AND PIERS EMERGENCY GATES	Concrete center pier 2.1' wide by 3.7' high supports a bridge. The upstream section is a 15" wide steel "I" beam, the middle 8' consists of 1" x 2" planks. The downstream section consists of 3 closely spaced steel rails.	

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA -00135
TYPE AND CONDITION	No constructed emergency spillway. The low area (1'+H x 15'+W) on the right abutment would serve as a limited capacity emergency spillway.	
APPROACH CHANNEL	Natural low area on right abutment.	
OUTLET STRUCTURE	None	
DISCHARGE CHANNEL	None. Natural slope of right abutment.	

INSTRUMENTATION

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA - 00135
MONUMENTATION SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHERS	None	
OPERATION AND MAINTENANCE DATA	None, other than occasional mowing of grass on crest of dam.	

RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA - 00135
SLOPES: RESERVOIR	Grass covered left side slopes are 10 to 20 percent. Wooded right side slopes are 15 to 25 percent. There are no slope conditions that could affect the safety of the dam.	
SEDIMENTATION	Slight.	
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Natural wooded channel.	
SLOPES: CHANNEL VALLEY	Wooded gentle side slopes.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	A 2-story frame house 70' left of creek and 11.3' above channel about 3,500' downstream. A cottage and house trailer about 8,500' downstream.	
WATERSHED DESCRIPTION	Wooded mountain area.	

APPENDIX B

ENGINEERING DATA - CHECKLIST

**CHECK LIST
ENGINEERING DATA
PHASE I**

NAME OF DAM Perch Pond Dam

ITEM	REMARKS	NDI# PA - 00135
PERSONS INTERVIEWED AND TITLE	David Dix, Camp Superintendent Hly Schmiever, Camp Director	
REGIONAL VICINITY MAP	See Appendix E	
CONSTRUCTION HISTORY	None Available	
AVAILABLE DRAWINGS	None Available	
TYPICAL DAM SECTIONS	See Exhibit A-3, Appendix A	
OUTLETS PLAN DETAILS DISCHARGE RATINGS	8 inch diameter cast iron pipe None Available None Available None Available	

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDI# PA - 00135
SPILLWAY PLAN SECTION DETAILS	A 12.7 foot wide broad crested weir including 2.1 feet wide center pier. None Available None Available None Available	
OPERATING EQUIP- MENT PLANS AND DETAILS	None Available	
DESIGN REPORTS	None Available	
GEOLOGY REPORTS	None Available	
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None Available	
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	None Available	

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDIN# PA - 00135
BORROW SOURCES	Unknown	
POST CONSTRUCTION DAM SURVEYS	None available other than the survey on the present inspection (6/23/81).	
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None Available	
HIGH POOL RECORDS	None Available	
MONITORING SYSTEMS	None	
MODIFICATIONS	In the spring of 1948, a 12-inch thick concrete wall was placed on the upstream face of the dam to reduce leakage.	

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDI# PA - 00135
PRIOR ACCIDENTS OR FAILURES	None reported	
MAINTENANCE RECORDS MANUAL	None Available	
OPERATION RECORDS MANUAL	None Available	
OPERATIONAL PROCEDURES	Self-regulating.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None	
MISCELLANEOUS		

**CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA**

NDI ID # PA-00135
PENNDER ID # 64-23

SIZE OF DRAINAGE AREA: 1.32 square miles
ELEVATION TOP NORMAL POOL: 1496.0 STORAGE CAPACITY 76 ac. ft.
ELEVATION TOP FLOOD CONTROL POOL NA STORAGE CAPACITY: NA
ELEVATION MAXIMUM DESIGN POOL: NA STORAGE CAPACITY: NA
ELEVATION TOP DAM: 1499.1' STORAGE CAPACITY: 246 ac. ft.

SPILLWAY DATA

CREST ELEVATION: 1496.0 feet above MSL
TYPE: Rectangular broad crested weir with center pier
CREST LENGTH: 10.6 feet effective length
CHANNEL LENGTH: 15.5 feet
SPILLOVER LOCATION: near center of dam
NUMBER AND TYPE OF GATES: None

OUTLET WORKS

TYPE: 8-inch diameter cast iron pipe
LOCATION: At toe of downstream wall, 3 feet left of spillway
ENTRANCE INVERTS: Unknown
EXIT INVERTS: 1487.3'
EMERGENCY DRAWDOWN FACILITIES: Not accessable, operation could not be verified

HYDROMETEOROLOGICAL GAGES

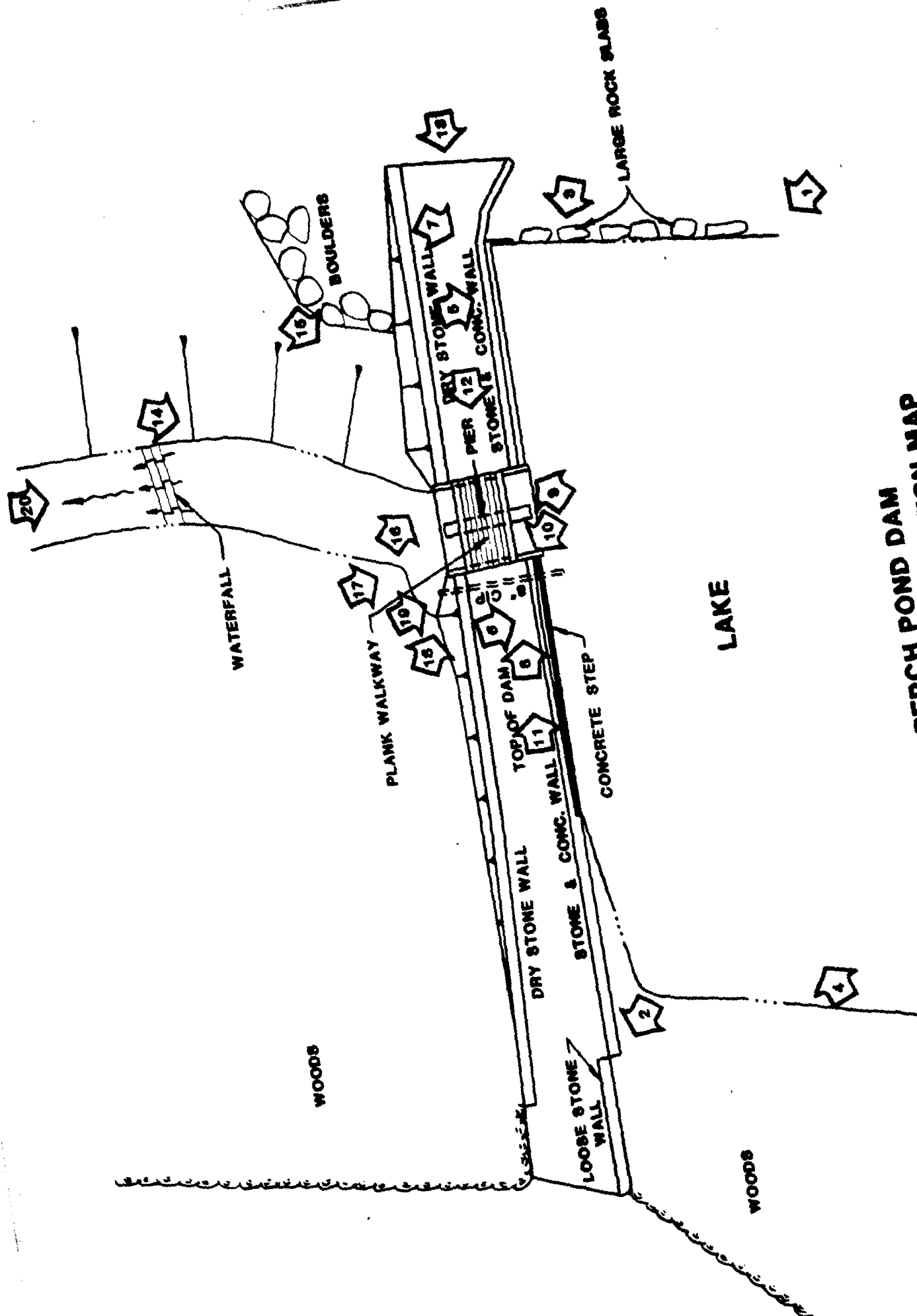
(None)

TYPE: _____
LOCATION: _____
RECORDS: _____

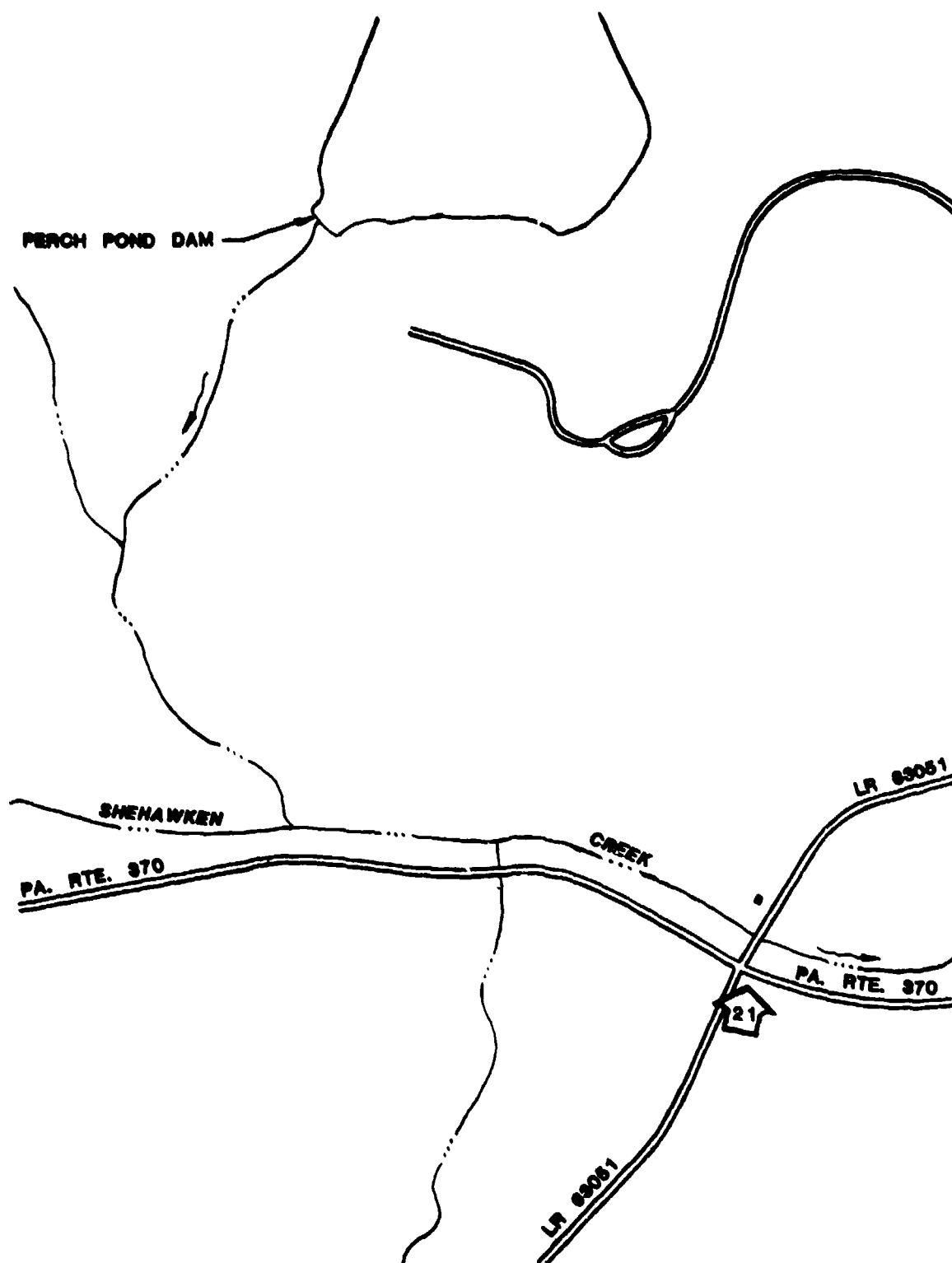
MAXIMUM NON-DAMAGING DISCHARGE: Unknown

APPENDIX C

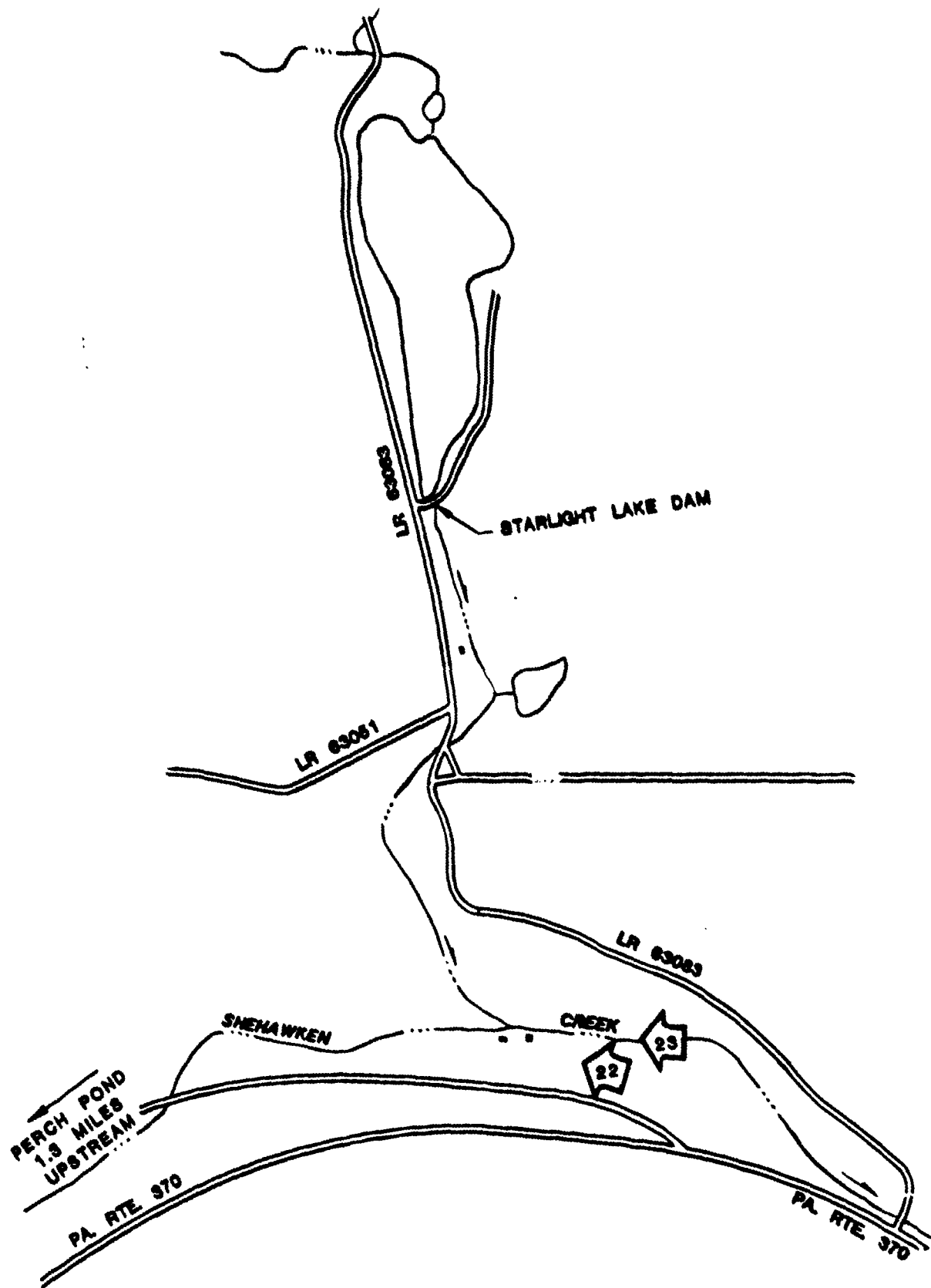
PHOTOGRAPHS



PERCH POND DAM
PHOTOGRAPHS LOCATION MAP

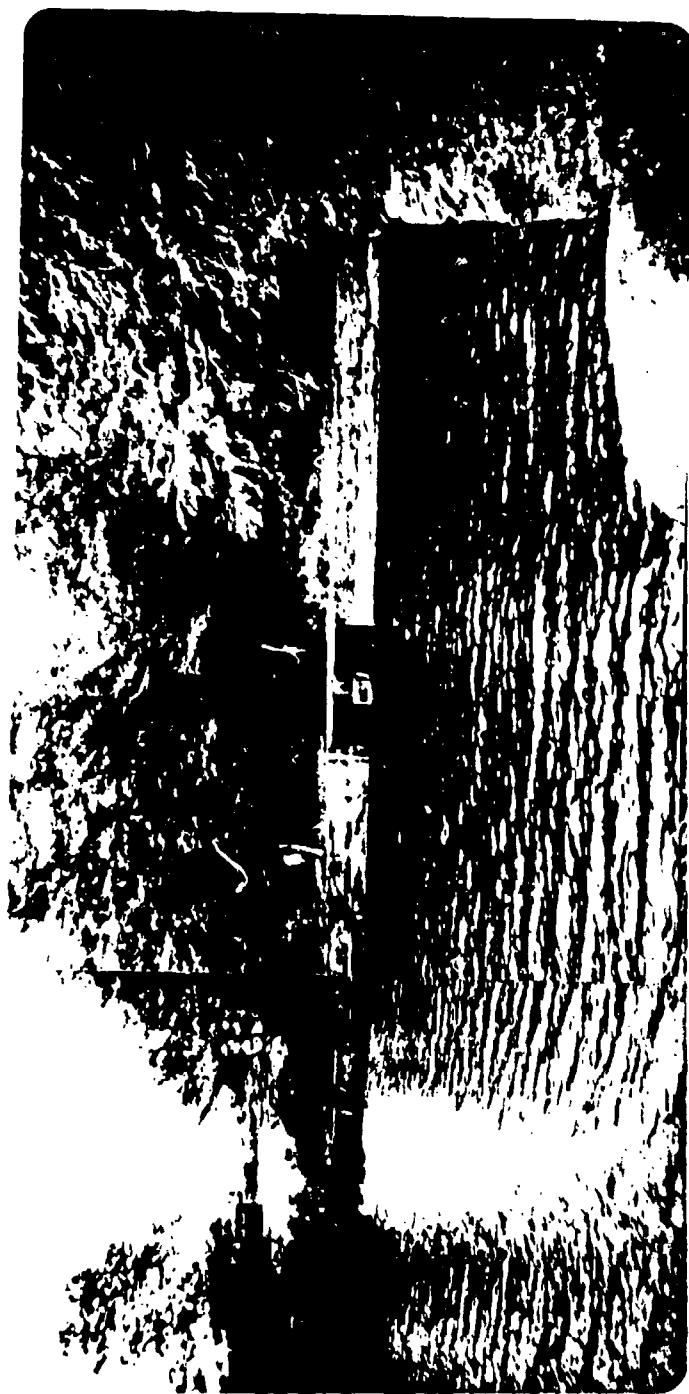


**PERCH POND DAM
DOWNSTREAM PHOTOGRAPHS LOCATION MAP**



**PERCH POND DAM
DOWNSTREAM PHOTOGRAPHS LOCATION MAP**

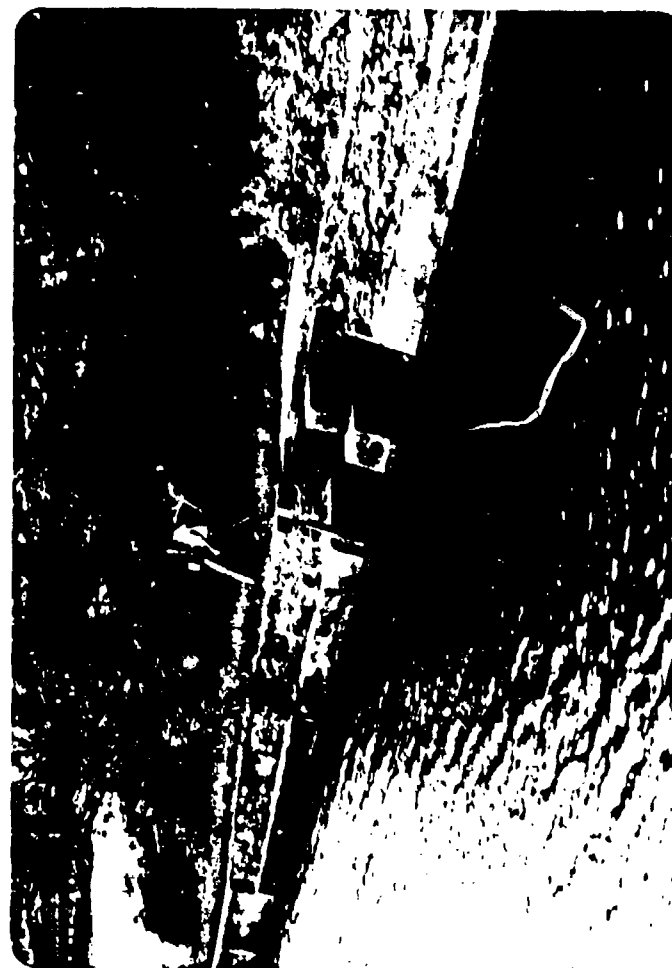
EXHIBIT C-8



1. GENERAL VIEW



2. LEFT ABUTMENT



3. VIEW FROM RIGHT SHORELINE

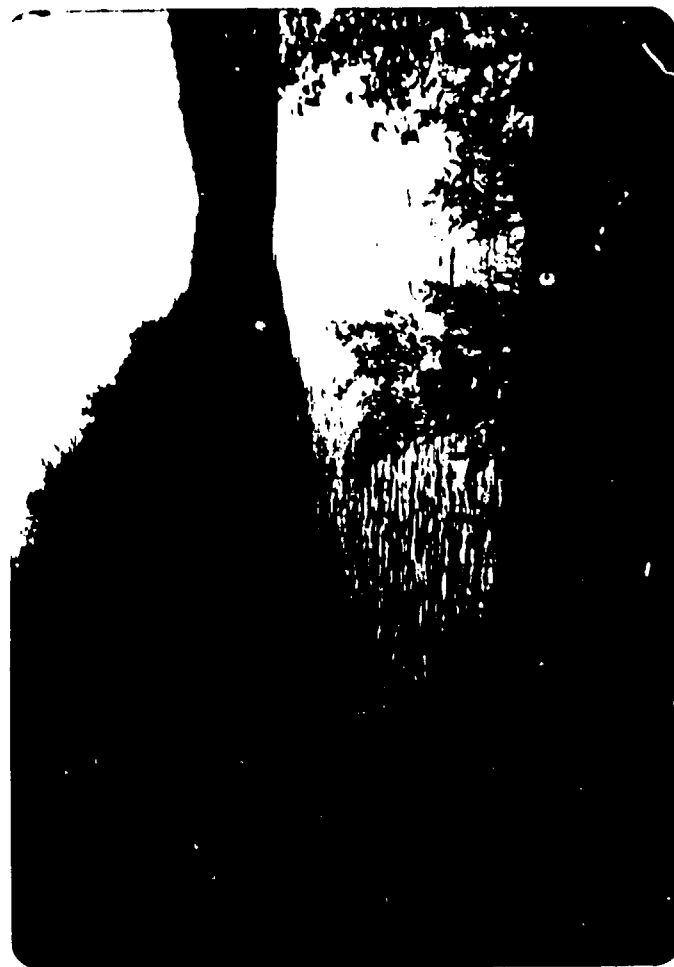
UPSTREAM FACE OF DAM



4. UPSTREAM FACE OF DAM, RIGHT ABUTMENT



5. SHORELINE NEAR RIGHT ABUTMENT
(SHOWING LOOSE BOULDERS AT EDGE OF WATER)



6. RIGHT SHORELINE FROM TOP OF DAM



7. UPSTREAM VIEW OF PERCH POND



8. LOOKING TOWARD RIGHT ABUTMENT

SPILLWAY

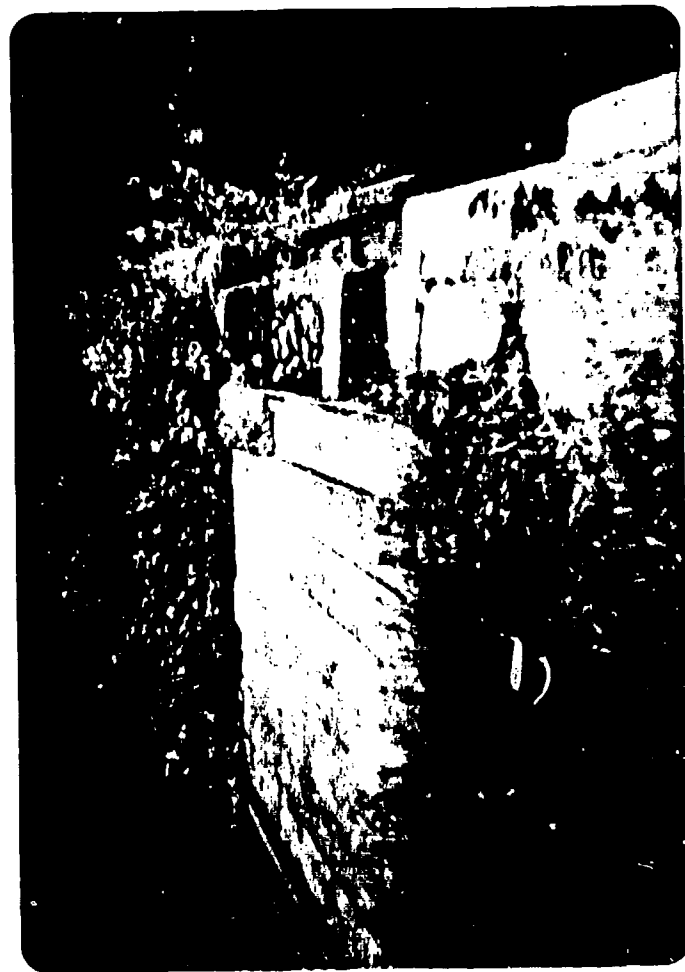


9. RIGHT SPILLWAY WALL (PIER IN FOREGROUND)



10. LEFT SPILLWAY WALL

CREST OF DAM



11. FACING RIGHT ABUTMENT

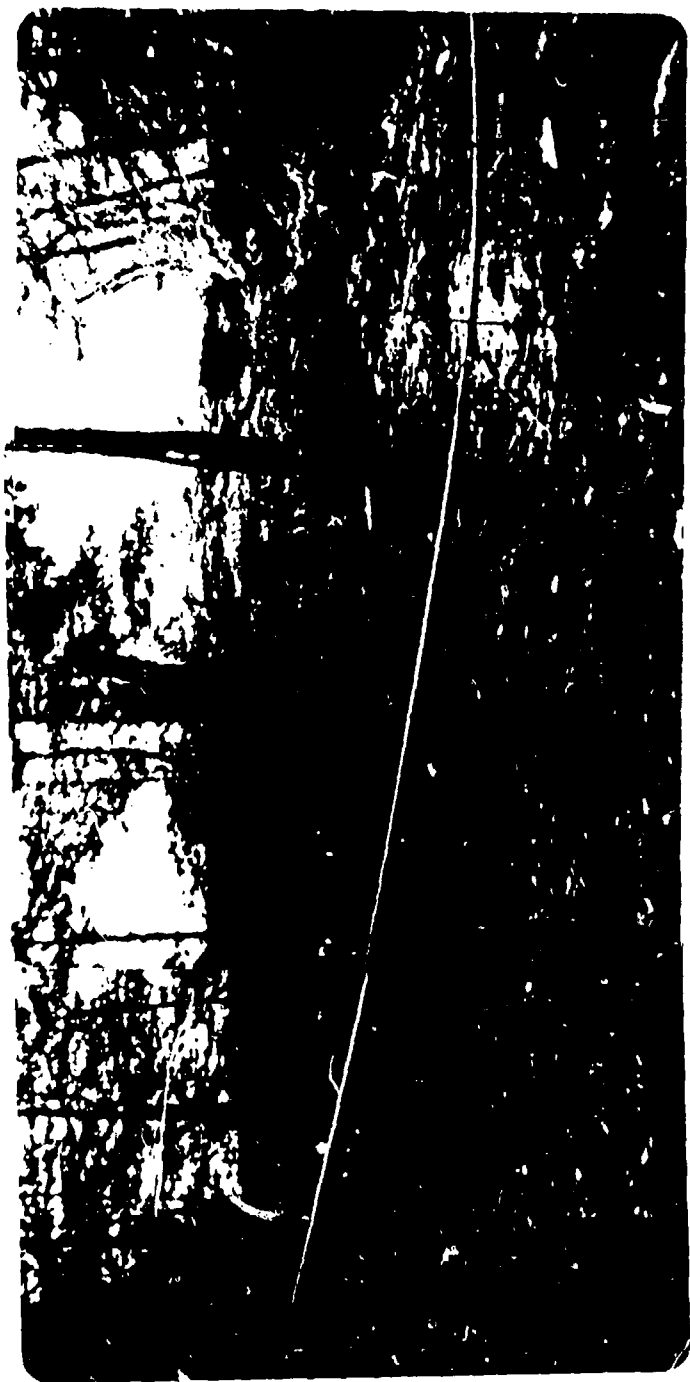
SPILLWAY BRIDGE



12. FACING LEFT ABUTMENT



13. VIEW FROM RIGHT ABUTMENT



14. UPSTREAM VIEW OF DAM (SHOWING STREAMBED BELOW PLUNGE POOL)



15. LARGE BOULDER (LOWER LEFT CORNER)



16. LOOKING TOWARD RIGHT ABUTMENT

DOWNSTREAM FACE OF DAM



17. SPILLWAY AND PLUNGE POOL



POINT SOURCE SEEPAGE

18. LOCATION OF INSERT
(SEE PHOTOGRAPH 19)

DOWNSTREAM FACE OF DAM



19. OUTLET PIPE (SHOVEL) & POINT SOURCE SEEPAGE



20. WATERFALL, LOOKING UPSTREAM (DAM IN BACKGROUND,
UPSTREAM OF PIPELINE, SEE PHOTO 14)



21. 3500 FEET DOWNSTREAM OF DAM



22. 1.6 MILES DOWNSTREAM (STREAM RIGHT OF BUILDINGS)
DOWNSTREAM HAZARD



23. STREAM CHANNEL TO RIGHT OF BUILDINGS IN PHOTO 22
DOWNSTREAM HAZARD

APPENDIX D

HYDROLOGY AND HYDRAULICS

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB PERCH POND
SHEET NO. 1 OF 1
CALCULATED BY SPH DATE 5/81
CHECKED BY _____ DATE _____
SCALE _____

GENERAL DATA - PERCH POND DAM

RIVER BASIN	DELAWARE
STREAM NAME	SHEHAWKEN CR'K.
NDI I.D. NO	PA - 0135
DER I.D. NO	64-023
OWNER	CAMP STALIGHT INC.
LOCATION	BUCKINGHAM TWP.
CO.	WAYNE
QUAD.	HAUCCOCK, NY-PA.
LAT.	41° - 53' - 04"
LONG.	75° - 20' - 45"
SIZE	SMALL
HAZARD	SIGNIFICANT
DRAINAGE AREA	1.32 MI ²

Watershed Features

UNDEVELOPED
MOD. - STEEP SLOPES
SMALL SWAMP IN HEADWATERS

PHOTOREVISED 1973
1903

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB NDI - FA

SHEET NO _____

OF _____

CALCULATED BY _____

DATE _____

CHECKED BY _____

DATE _____

PERCH POND DAM

POND STORAGE

FROM DER. BULLETIN #5 :

POND VOL = 233 MG = 75.9 ACFT

SURF. AREA = 37 Ac.

FROM USGS QUAD - SURF. AREA @ EL. 1496 = 47.7 Ac

LOW POINT ON DAM = 1499.1

AREA AT 1500 = 66.1 ACFT.

VOL. AT EL. 1496 (SPILLWAY CHEST)

USE BULL#5 VALUE = 76 ACFT

VOL AT LOW POINT ON DAM:

AREA = $47.7 + \frac{18.4 \times 3.1}{4} = 62.0 \text{ Ac}$

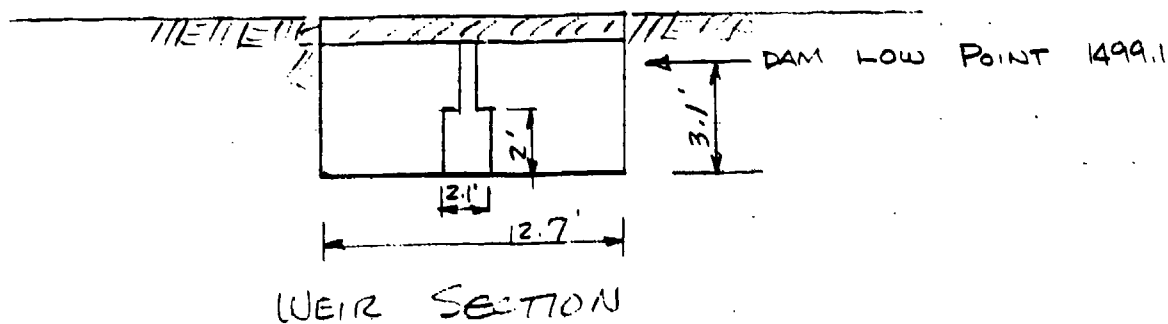
$$\text{VOL} = 76 + \frac{3.1}{4} (62.0 - 47.7 + \sqrt{62.0(47.7)})$$

= 246 ACFT (MAY. POOL)

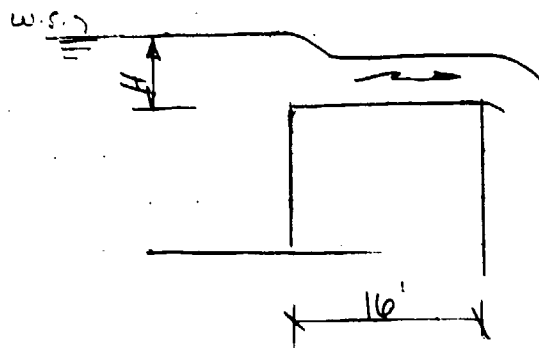
GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB NDI - PA
SHEET NO. _____ OF _____
CALCULATED BY JK DATE 8/81
CHECKED BY _____ DATE _____
PERCH POND DAM

SPILLWAY RATING



RATE SPILLWAY AS BROAD CRESTED
EFFECTIVE LENGTH = $12.7 - 2.1 = 10.6' = L$



$$Q = CLH^{1.5}$$

FROM KINGS HANDBOOK OF HYDRAULICS $\sim C = 2.63$
for crest breadth of 15' & head $\sim 3.0'$

Max. H PRIOR TO OVERTOPPING = 3.1

$$\therefore \text{MAX DISCHARGE} \sim Q_{\text{max}} = 2.63(10.6)(3.1)^{1.5} = \underline{152 \text{ cfs}}$$

DETERMINE 100 YR FLOOD

REF.

- 1) "REGIONAL FREQUENCY STUDY, UPPER DELAWARE AND HUDSON RIVER BASINS" NEW YORK DIST. C.O.E. 1974
- 2) C.O.E. MEMO 4/22/81

$$\text{Log}(Q_m) = C_m + 0.87 \text{ Log}(A)$$

$$A = 1.32 \text{ mi}^2$$

$$C_m = 1.8 \text{ (FIG. 2)}$$

$$\text{Log}(Q_m) = 1.8 + 0.87 \text{ Log}(1.32) = 1.9$$

$$S = C_s - 0.05 \text{ Log}(A)$$

$$C_s = 0.345 \text{ (FIG. 3)}$$

$$S = 0.345 - 0.05 \text{ Log}(1.32) = 0.339$$

$$\text{Log}(Q_p) = \text{Log}(Q_m) + K_{pg} S$$

$$p = 100 \text{ yr.}$$

$$g = 0.2 \text{ (FIG. 5)}$$

$$K_{pg} = 2.48$$

$$\text{Log}(Q_p) = 1.9 + 2.48(0.339) = 2.74$$

$$Q_{100} = 549.5 \quad \text{say} \quad \underline{\underline{550 \text{ cfs}}}$$

NOTE: SPILLWAY CAPACITY AT MAX. POOL ELEV. $\approx 152 \text{ cfs}$

APPENDIX E

EXHIBITS

STARRUCCA, PA. - N. Y.

N4152.5-W7522 5/7 5

1968
PHOTOREVISED 1978

HANCOCK, PA. - N. Y.

N4152.5-W7515.7 5

1965
PHOTOREVISED 1973

Mountain

Hiawatha Lake

Hempstead Lake

Starlight Lake

Island Lake

Pleasant Valley

Starlight

Sh SCALE 1:24000

EXHIBIT E-1

REGIONAL VICINITY

AND

WATERSHED BOUNDARY MAP

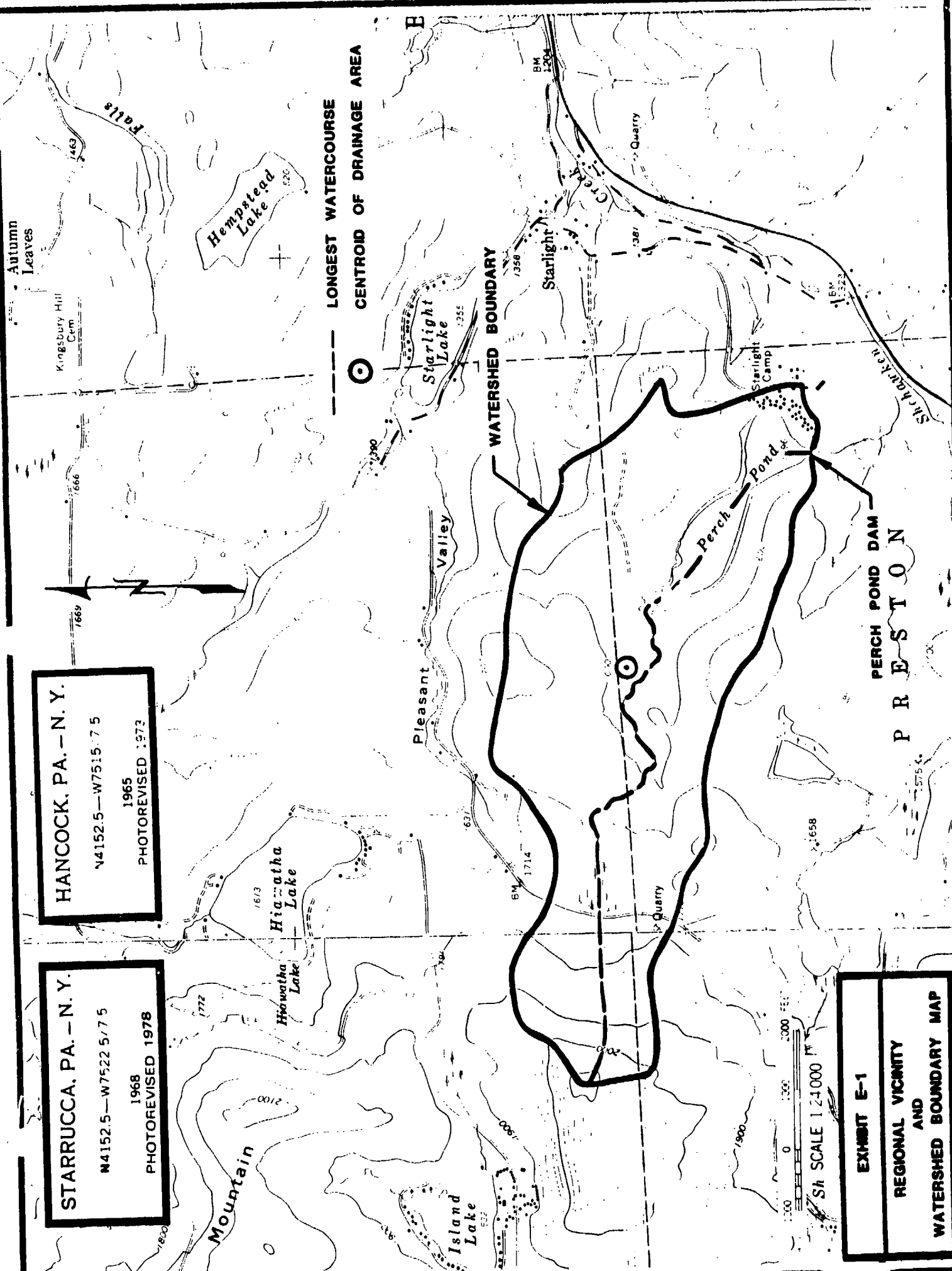
LONGEST WATERCOURSE
CENTROID OF DRAINAGE AREA

WATERSHED BOUNDARY

Perch Pond

PERCH POND DAM

P R E S T O N





5/16/17 VIEW OF UPSTREAM WALL



6/22/48 VIEW OF UPSTREAM WALL AND SPILLWAY



6/16/17 VIEW OF SPILLWAY AND DOWNSTREAM WALL

MAY 1965



MAY 1965 VIEW OF SPILLWAY AND DOWNSTREAM WALL

APPENDIX F

GEOLOGY

PERCH POND DAM

APPENDIX F

GEOLOGY

The Perch Pond Dam and reservoir area are located within the Glaciated Allegheny Plateau Section of the Appalachian Plateau Physiographic Province. Except where bedrock is exposed, deposits of glacial drift of variable thickness cover the entire area. The drift was deposited by the Wisconsin Ice Sheet during the Pleistocene period of geologic time.

The glacial drift is composed primarily of till which is a reddish-brown, unsorted, compact mixture of clay, silt, sand, gravel, and cobbles with occasional boulder sized pieces. The stone pieces are sub-angular to rounded and consist mainly of sandstone and siltstone derived from the Catskill Formation, the dominant rock formation in the area. The clay content and compact nature of the till makes it a relatively impervious soil type.

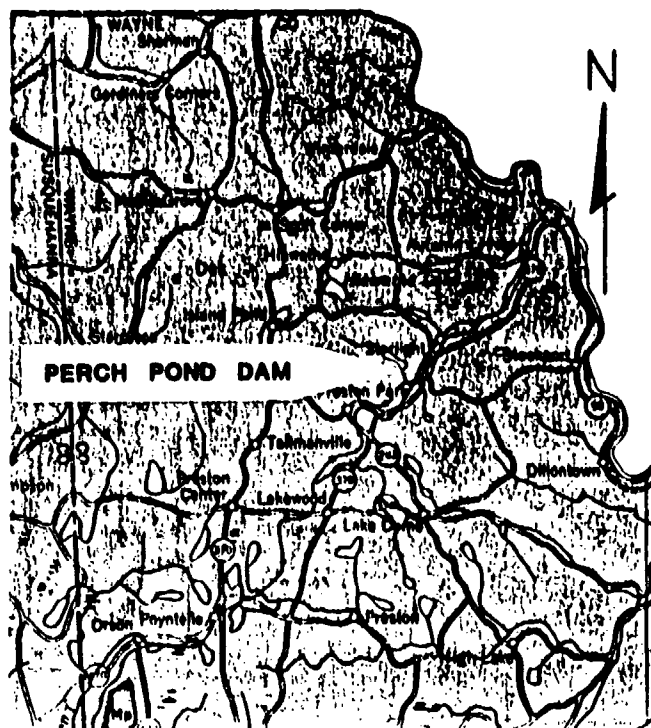
Some deposits of glacial outwash and Kame terraces are also found in the area. These deposits are composed of loose, poorly sorted to stratified deposits of silt, sand and gravel. The Kame and outwash deposits are generally very pervious.

Other loose, pervious soils in the area are the recent deposits of alluvial silt, sand, and gravel with some clay. These soils are localized and limited to streambeds and flood plain areas.

The bedrock underlying the entire dam and reservoir area is the Catskill Formation of the Susquehanna Group. This group of formations is of Upper Devonian age. The Catskill strata generally consists of well indurated red shale, siltstone and fine sandstone with some gray, green and brown shale, siltstone and sandstone layers. Occasional conglomeratic layers are encountered. The red shales are the dominant lithology and the residual soils derived from this rock are usually high in clay and silt and contain numerous flaky and angular fragments and flat, slabby boulders. The downstream face of the dam was built with Catskill boulders.

The regional structure of the bedrock in the area indicates that the bedrock underlying the dam and reservoir area is gently folded. Surface exposures of brownish gray sandstone bedrock about 50 feet downstream from the right abutment strike N5°E to N10°W and dip 2°NW to 5°SW.

Ref.: Ground Water of Northeastern Pennsylvania, Stanley W. Lohman, 1937; Bulletin W-4, Pennsylvania Geologic Survey.



0 1 2 3 4 5 10 MILES

SCALE: 1" = 4 MILES

LEGEND

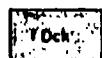
DEVONIAN UPPER

CENTRAL AND EASTERN PENNSYLVANIA



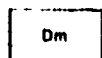
Oawayo Formation

Brownish and greenish gray, fine and medium grained sandstones with some shales and scattered calcareous lenses; includes red shales which become more numerous eastward. Relation to type Oawayo not proved.



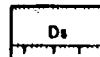
Catskill Formation

Chiefly red to brownish shales and sandstones; includes gray and greenish sandstone tongues named Elk Mountain, Hanendale, Shohola, and Delaware River in the east.



Marine beds

Gray to olive brown shales, graywackes, and sandstones; contains "Chemung" beds and "Portage" beds including Hurket, Bruller, Harrell, and Trimmers Rock; Tully Limestone at base.



Susquehanna Group

Barbed line is "Chemung-Catskill" contact of Second Pennsylvania Survey County reports; barbs on "Chemung" side of line

NOTE:

GEOLOGIC MAP AND LEGEND
OBTAINED FROM GEOLOGIC MAP
OF PENNSYLVANIA BY PA.
TOPOGRAPHIC AND GEOLOGIC
SURVEY, DATED 1960

PHASE 1 INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

PERCH POND DAM GEOLOGIC MAP

GEO - Technical Services, Inc.
HARRISBURG, PA

AUGUST, 1981

EXHIBIT F