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NATIONAL DAM INSPECTION PROGRAM. ORSON POND DAM (NDI NUMBER PA---ETC(U)
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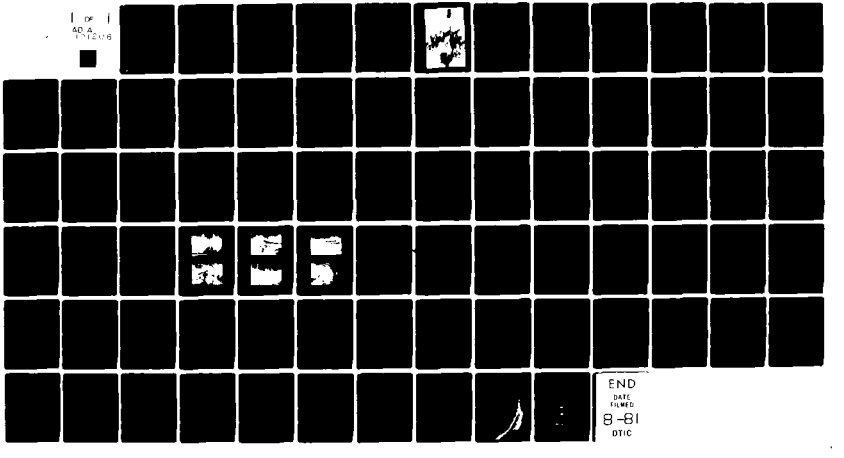

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LEVEL II

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SUSQUEHANNA RIVER BASIN

UNNAMED TRIBUTARY OF EAST BRANCH OF LACKAWANNA RIVER
WAYNE COUNTY, PENNSYLVANIA

ORSON POND DAM

NDI No. PA 00136

PennDER No. 64-25

Dam Owner: Clyde Howell

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

prepared for

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland 21203

prepared by

MICHAEL BAKER, JR., INC.

Consulting Engineers

4301 Dutch Ridge Road

Beaver, Pennsylvania 15009

April 1981

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SUSQUEHANNA RIVER BASIN

ORSON POND DAM
WAYNE COUNTY, COMMONWEATH OF PENNSYLVANIA
NDI No. PA 00136
PennDER No. 64-25

11 Apr 81

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(6) PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.

Orson Pond Dam (NDI Number PA-00136, [illegible] 64-25) Susquehanna River Basin, Tributary of Dyberry Creek, Wayne County, Commonwealth of Pennsylvania, Phase I Inspection Report

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: MICHAEL BAKER, JR., INC.
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4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

Contract DACW31-81-C-0011

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PREFACE

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

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. 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

Orson Pond Dam, Wayne County, Pennsylvania
NDI No. PA 00136, PennDER No. 64-25
Unnamed Tributary of East Branch of Lackawanna River
Inspected 30 October 1980

ASSESSMENT OF GENERAL CONDITIONS

Orson Pond Dam ~~is owned by Clyde Howell~~ and is classified as a "Significant" hazard - "Small" size dam. The dam was found to be in fair overall condition at the time of inspection.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will not pass the 100-year flood without overtopping the dam. A spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF) is required for Orson Pond Dam. Because the dam is on the low end of the "Small" size category in terms of storage capacity and height, the 100-year flood was chosen as the SDF. During the 100-year flood, the dam is overtopped by a maximum depth of 1.79 feet for a total duration of 9.33 hours. The spillway is therefore considered "Inadequate." It is recommended that the owner immediately develop recommendations for remedial measures to reduce the overtopping potential of the dam.

Several items of remedial work should be immediately initiated by the owner. Item 1 below should be completed under the guidance of a qualified professional engineer experienced in the design of hydraulic structures for dams. These include:

1) Develop remedial measures to ensure that the dam will not be overtopped by the 100-year flood.

2) Repair the outlet conduit or fill it with concrete.

3) Cut the apple tree and the brush on the dam and below the toe of the dam.

4) Remove the debris and cut the vegetation in the downstream channel.

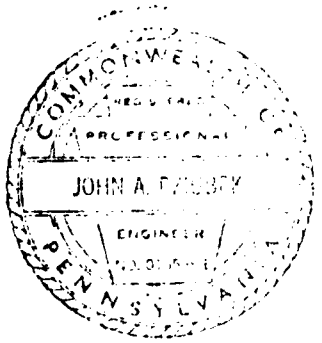
In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented. An emergency drawdown plan should be developed in case an emergency drawdown of the pond should become necessary. These should be included in a formal maintenance and operations manual for the dam.



Submitted by:

MICHAEL BAKER, JR., INC.

John A. Dziubek, P.E.
Engineering Manager-Geotechnical

Date: 24 April 1981

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineers

Date: 11 MAY 81

ORSON POND DAM

Overall View of Dam from Right Abutment

TABLE OF CONTENTS

APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
ORSON POND DAM
NDI No. PA 00136, PennDER No. 64-25

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 inspection of dams throughout the United States.

b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances - Orson Pond Dam is an earthfill dam with a dry masonry downstream face. There appears to be a concrete core wall located along the upstream edge of the crest, however, no plans are available for the dam which show the extent of this core wall. The dam is approximately 116 feet long and 13.5 feet high. The embankment has a minimum crest elevation of 2019.8 feet Mean Sea Level (ft. M.S.L.) and a crest width of about 12 feet. The upstream face of the embankment has a slope of 2H:1V (Horizontal to Vertical) and is protected by stone riprap. The downstream face of the dam is a dry-laid masonry wall with a slope of 1H:2V.

The spillway, located on the right side of the embankment, has a broad crested concrete weir. The spillway is 9 feet wide perpendicular to the direction of flow, has a crest width of 12 feet, and a crest elevation of 2017.0 feet M.S.L. Concrete spillway training walls extend from the spillway crest to the top of the dam. The spillway approach has a slope of 6H:1V. The spillway discharges over a vertical drop at the downstream edge of the crest. The downstream channel has a mild slope and contains some vegetation and a large amount of debris.

The outlet works for the dam consist of a 32 inch riveted and welded steel plate pipe that was sealed and plugged by the owner after the gate valve at the upstream end began leaking extensively.

b. Location - Orson Pond Dam is located on an unnamed tributary of the East Branch of the Lackawanna River approximately one-tenth of a mile southeast of Orson, Pennsylvania. The structure is located in Preston Township, Wayne County, Pennsylvania. The coordinates for the dam are N 41° 48.8' and W 75° 26.8'. The dam and reservoir are shown on the USGS 7.5 minute topographic quadrangle, Orson, Pennsylvania.

c. Size Classification - The height of the dam is 13.5 feet. Storage at the top of the dam (elevation 2019.8 ft. M.S.L.) is 200 acre-feet. The dam is therefore in the "Small" size category.

d. Hazard Classification - There are two houses, one barn and one shed located 450 to 700 feet downstream from the dam in Orson, Pennsylvania, which may suffer economic damage if the dam were to fail; however, no loss of life is believed likely to occur. These structures are located from 5 to 10 feet above the streambed. Therefore, Orson Pond Dam is considered to be in the "Significant" hazard category.

e. Ownership - The dam is owned by Clyde Howell, P.O. Box 254, Waymart, Pennsylvania 18474.

f. Purpose of Dam - The reservoir is used for recreation.

g. Design and Construction History - According to the owner, the dam was built in 1849 to be used with a saw mill. No other information is available.

h. Normal Operational Procedures - The dam is normally maintained at or near the spillway crest, elevation 2017.0 ft. M.S.L.

1.3 PERTINENT DATA

a. Drainage Area (square miles) -	1.30
b. Discharge at Dam Site (c.f.s.) -	
Maximum Known Flood (1969) -	100
Spillway Capacity at Maximum Pool (El. 2019.8 ft. M.S.L.) -	130

c. Elevation* (feet above Mean Sea Level [ft. M.S.L.]) -

Design Top of Dam -	Unknown
Minimum Top of Dam -	2019.8
Maximum Design Pool -	Unknown
Spillway Crest -	2017.0
Streambed at Toe of Dam -	2006.3
Maximum Tailwater of Record -	Unknown

d. Reservoir (feet) -

Length of Maximum Pool (El. 2019.8 ft. M.S.L.) -	2700
Length of Normal Pool (El. 2017.0 ft. M.S.L.) -	2000

e. Storage (acre-feet) -

Top of Dam (El. 2019.8 ft. M.S.L.) -	200
Normal Pool (El. 2017.0 ft. M.S.L.) -	130

f. Reservoir Surface (acres) -

Top of Dam (El. 2019.8 ft. M.S.L.) -	29
Normal Pool (El. 2017.0 ft. M.S.L.) -	20

g. Dam -

Type - Earthfill with dry masonry downstream face	
Total Length Including Spillway (feet) -	116
Height (feet) - Design -	Unknown
Field -	13.5
Top Width (feet) -	12
Side Slopes - Upstream -	2H:1V
Downstream -	1H:2V
Zoning -	None
Impervious Core - The top of a concrete wall was observed at the upstream edge of the crest. No information is known about the depth of the wall.	
Cut-off -	Unknown
Drains -	None

h. Diversion and Regulating Tunnel - None

*All elevations are referenced to the spillway crest of the dam, El. 2017.0 ft. M.S.L., as estimated from the USGS 7.5 topographic quadrangle, Orson, Pennsylvania.

i. Spillway -

Type - Broad-crested concrete weir	
Location - Left end of embankment	
Width of Crest Parallel to Flow (feet) -	12
Length of Crest Perpendicular to Flow (feet) -	9
Crest Elevation (ft. M.S.L.) -	2017.0
Gates -	None
Downstream Channel -	The downstream channel has a mild slope with some vegetation and debris restricting the channel.

j. Outlet Works - The 32 inch riveted and welded steel plate outlet conduit has been sealed and plugged. No other outlets are in the dam.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

There are no design data available for review concerning the Orson Pond Dam. The only information available is File No. 64-25 of the Pennsylvania Department of Environmental Resources (PennDER). This file included:

1) Information survey sheet of the dam, dated 1914.

2) Various photos and post-construction inspection reports. The latest, dated 14 July 1974, was filed by a representative of the United States Bureau of Reclamation. Other than brush growing on the upstream face of the dam, no serious problems were found and the dam was said to be in fair to good condition during that inspection. The latest PennDER report is dated 14 April 1965 and reported the dam to be in need of extensive repairs.

3) Various correspondence concerning the inspections and the ownership of the dam.

2.2 CONSTRUCTION

The owner indicated the dam was built in 1849 for a saw mill. No other information is available.

2.3 OPERATION

No formal records are available for operation of the dam and reservoir. The spillway is uncontrolled and the owner reported that the reservoir does not fluctuate very much from the spillway crest level.

2.4 EVALUATION

a. Availability - The information used is readily available from PennDER's File No. 64-25.

b. Adequacy - The information available combined with the visual inspection measurements and observations is adequate for a Phase I Inspection of this dam.

c. Validity - There is no reason at the present time to doubt the validity of the available engineering data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The dam was found to be in fair overall condition at the time of inspection on 30 October 1980. No unusual weather conditions were experienced during the inspection. Noteworthy deficiencies observed during the visual inspection are described briefly in the following paragraphs. The complete visual inspection checklist, field sketch, top of dam profile, and typical cross-section are given in Appendix A.

b. Dam - A 7 inch diameter apple tree is located on the crest of the dam near the left abutment. Some brush is located on the right side of the dam and below the toe at the center of the dam.

c. Appurtenant Structures - The outlet conduit intake has been sealed and plugged. The pipe, near the end, has rusted through and some of the rockfill is protruding through the pipe. The conduit should either be repaired or filled with concrete.

No significant problems concerning the spillway were observed.

d. Reservoir Area - An abandoned railroad grade is located along the right shoreline. The left reservoir shoreline is moderately sloped. Located approximately one mile upstream from Orson Pond Dam is a natural lake named Lake Lorain (PennDER I.D. No. 64-NL25). No significant problems were observed in the reservoir area.

e. Downstream Channel - The downstream channel contains debris from general dumping. The downstream channel is rock-lined, overgrown with vegetation, and mildly sloping. Twin stone box culverts (4 feet by 4 feet) carry the flow under an abandoned railroad line located approximately 200 feet downstream. PA Routes 370 and 690 are respectively located 450 feet and 700 feet downstream. There are two houses, one barn, and one shed located in Orson, Pennsylvania, which may be damaged in the event of a dam failure.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no formal written instructions for lowering the reservoir or evacuating the downstream area in case of an impending dam failure. It is recommended that formal emergency procedures be adopted.

4.2 MAINTENANCE OF DAM

There are no formal records of maintenance or formal procedures for evaluating the necessity of maintenance for the structure. It is recommended that formal inspection procedures be developed.

4.3 MAINTENANCE OF OPERATING FACILITIES

There are no operating facilities at the dam. An emergency drawdown plan should be developed in case an emergency drawdown of the pond should become necessary.

4.4 DESCRIPTION OF ANY WARNING SYSTEM

There are no warning procedures in the event of a dam failure. An emergency warning procedure should be developed.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

The current operational features are adequate for the purpose they serve. However, it is recommended that a formal maintenance and operations manual be prepared for the dam.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data - No hydrologic or hydraulic design calculations are available for Orson Pond Dam.

b. Experience Data - The owner reported that the maximum flood of record at the site occurred during 1969. During the flood, the reservoir level was approximately 29 inches above the spillway crest. This corresponds to a flow of approximately 100 c.f.s.

c. Visual Observations - During the visual inspection, no problems were observed which would indicate that the dam and appurtenant facilities could not perform satisfactorily during a flood event.

Lake Lorain, located 4400 feet upstream from Orson Pond, is a natural lake.

d. Overtopping Potential - Orson Pond Dam is a "Small" size - "Significant" hazard dam requiring evaluation for a spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF). Because the dam is on the low end of the "Small" size category in terms of storage capacity and height, the 100-year flood was chosen as the SDF.

Using material from "The Hydrologic Study - Tropical Storm Agnes" prepared by the Special Studies Branch, Planning Division, North Atlantic Division, Corps of Engineers, in New York City, December 1975, the peak inflow to the impoundment for the 100-year flood was calculated to be 915 c.f.s. The hydrologic characteristics of the basin, specifically, the Snyder's Unit Hydrograph Parameters, were obtained from a regionalized analysis conducted by the Baltimore District of the U.S. Army Corps of Engineers. Using the Snyder's unit hydrograph coefficients for this drainage area, an initial rainfall loss of 1.0 inch, and a constant loss rate of 0.05 inch per hour thereafter, a peak inflow of 878 c.f.s. was obtained. This peak inflow is within 6 percent of the peak inflow computed previously; therefore, this hydrograph was used for the hydrologic analysis.

The hydraulic capabilities of the dam, reservoir, and spillway were evaluated with the aid of the U.S. Army Corps of Engineers' Flood Hydrograph Package, HEC-1 DB. The 100-year flood was routed through Lake Lorain, downstream to Orson Pond where the hydrograph from Lake Lorain was combined with the runoff hydrograph for Orson Pond. The combined hydrograph was then routed through Orson Pond Dam.

The analyses revealed that during the 100-year flood, the dam would be overtopped by a maximum depth of 1.79 feet for a total duration of 9.33 hours.

e. Spillway Adequacy - As outlined in the above analyses, the spillway will not pass the SDF without overtopping the dam; therefore, the spillway is considered "Inadequate."

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - The outlet conduit has rusted considerably near the end of the conduit and some of the rockfill is protruding through the pipe. It is recommended that either this portion of the pipe be repaired or the pipe be filled with concrete to prevent a partial collapse of the pipe.

b. Design and Construction Data - No design or construction data were available for review. Generally, for this type of dam, if the ratio of the width of the stonewall portion of the dam is greater than 0.5 times the height of the dam (0.5 w/h), then stability of the dam due to overturning or sliding is not a problem. (Reference: "Evaluation and Repair of Stonewall-earth Dams," by Kent A. Healy, Proceedings of "Safety of Small Dams" conference, New England College, Henniker, New Hampshire, August 4-9, 1974, pp. 149-178). The w/h ratio for this dam is estimated at slightly less than one and, except for the outlet pipe discussed in paragraph 6.1.a., no signs of instability were observed during the visual inspection. Therefore, further assessments of the structural stability are not considered necessary.

c. Operating Records - No operating records are available. Nothing in the procedures described by the owner's representative indicates concern for the structural stability of the dam.

d. Post-Construction Changes - No changes adversely affecting the structural stability of the dam have been performed.

e. Seismic Stability - The dam is located in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams." This is a zone of minor seismic activity. Therefore, further consideration of the seismic stability is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety - Orson Pond Dam was found to be in fair overall condition at the time of inspection. Orson Pond Dam is a "Significant" hazard - "Small" size dam requiring a spillway capacity in the range of the 100-year flood to the 1/2 PMF. Because the dam is on the low end of the "Small" size category in terms of storage capacity and height, the 100-year flood was chosen as the SDF. As presented in Section 5, the spillway and reservoir are not capable of passing the 100-year flood without overtopping the dam. During the 100-year flood, the dam is overtopped by a maximum depth of 1.79 feet for a total duration of 9.3[illegible] hours. Therefore, the spillway is considered "Inadequate."

b. Adequacy of Information - The information available and the observations made during the visual inspection are considered sufficient for a Phase I Inspection Report.

c. Urgency - The owner should immediately initiate the further evaluation discussed in paragraph 7.1.d.

d. Necessity for Additional Data/Evaluation - The hydraulic/hydrologic analysis performed in connection with this Phase I Inspection Report has indicated the need for additional spillway capacity. It is recommended that the owner, under the guidance of a professional engineer experienced in the design of hydraulic structures for dams, develop remedial measures to ensure that the dam will not be overtopped by the 100-year flood.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed certain items of remedial work which should be performed by the owner without delay. Item 1 below should be completed under the guidance of a qualified professional engineer experienced in the design of hydraulic structures for dams. These include:

1) Develop remedial measures to ensure that the dam will not be overtopped by the 100-year flood.

2) Repair the outlet conduit or fill it with concrete.

3) Cut the apple tree and the brush on the dam and below the toe of the dam.

4) Remove the debris and cut the vegetation in the downstream channel.

5) Provide means to draw down reservoir during an emergency.

In addition, the following operational measures are recommended to be undertaken by the owner:

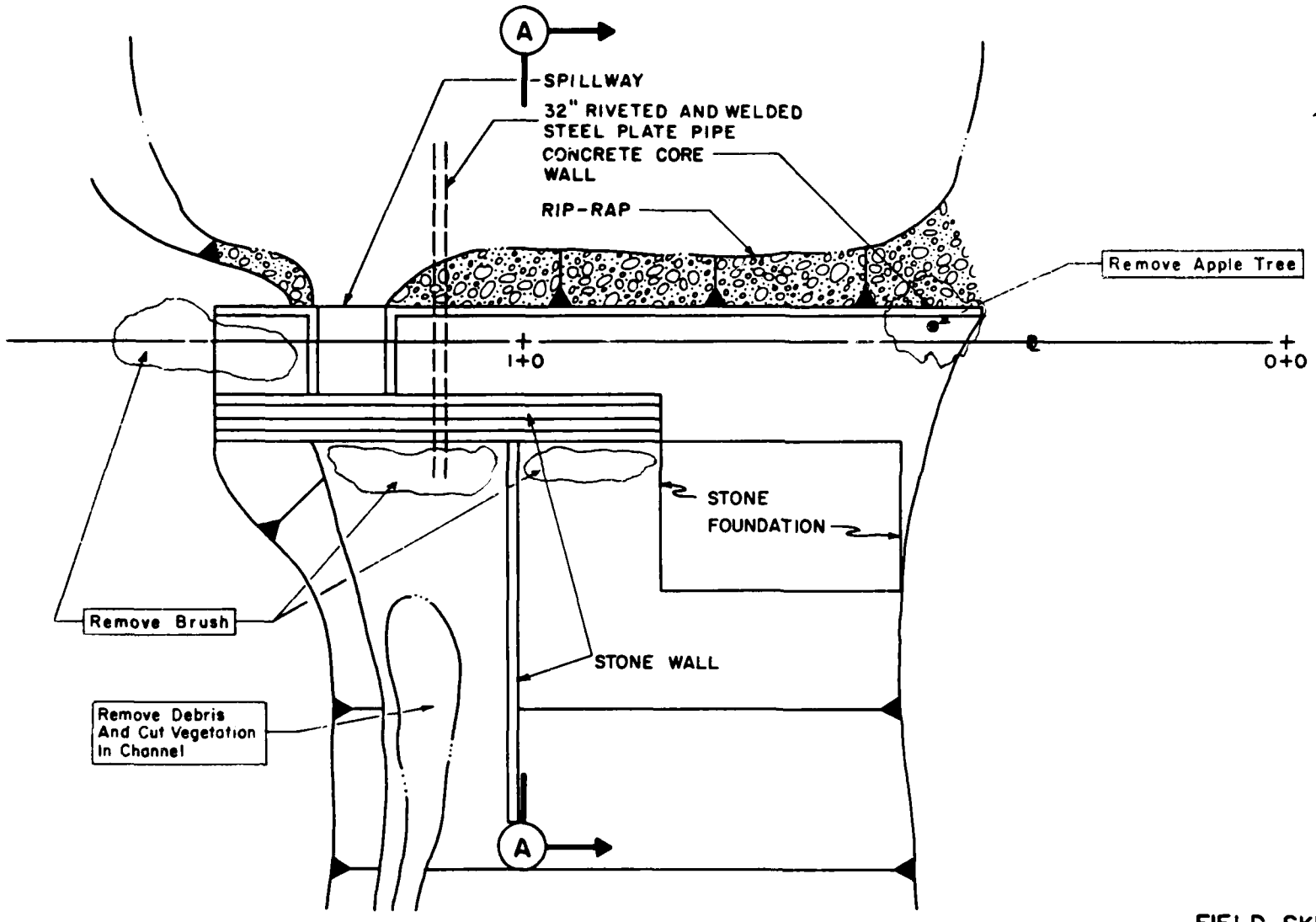
1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, activate the emergency operation and warning system.

It is further recommended the formal inspection, maintenance, and operation procedures and records be developed and implemented. An emergency drawdown plan should be developed in case an emergency drawdown of the pond should become necessary. These should be included in a formal maintenance and operations manual for the dam.

CROSS SECTION TAKEN AT STA 1+0



FIELD SKETCH

ORSON POND DAM

NDI NO. PA00136

Penn DER NO. 64-25

SCHEMATIC - NOT TO SCALE

APPENDIX A

VISUAL INSPECTION CHECK LIST, FIELD SKETCH, TOP OF DAM PROFILE, AND TYPICAL CROSS-SECTION

Check List
Visual Inspection
Phase 1

Name of Dam Orson Pond Dam **County** Wayne **State** PA **Coordinates** Lat. N 41°48.8'

NDI # PA 00136
PennDER # 64-25

Long.W 75°26.8'

Date of Inspection 30 October 1980 **Weather** Overcast **Temperature** 40° F.

Pool Elevation at Time of Inspection 2016.41 ft. M.S.L.* **Tailwater at Time of Inspection** None M.S.L.

*All elevations referenced to spillway crest elevation 2017.00 ft. M.S.L. assumed from U.S.G.S. 7.5 minute topographic quadrangle, Orson, PA.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Ulinski
Wayne D. Lasch
Jeffrey S. Maze

Owner's Representatives:

Mr. Clyde Howell

James G. Ulinski Recorder

MASONRY DAMS

Name of Dam: ORSON POND DAM
NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE	None observed	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Good condition	
DRAINS	None observed	
WATER PASSAGES	Not Applicable	
FOUNDATION	No problems observed.	

MASONRY DAMS

Name of Dam: ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	None observed	
STRUCTURAL CRACKING	None observed	
VERTICAL AND HORIZONTAL ALIGNMENT	Good condition	
MONOLITH JOINTS	Not Applicable	
CONSTRUCTION JOINTS	Not Applicable	
VEGETATION	A 7 in. diameter apple tree is located on the left end of the crest. Some brush is located on the right side of the dam and below the toe near the center of the dam.	Cut the brush and the apple tree.

EMBANKMENT - Not Applicable

Name of Dam ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS		
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE		
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES		

EMBANKMENT - Not Applicable

Name of Dam ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST		
RIPRAP FAILURES		

EMBANKMENT - Not Applicable

Name of Dam ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM		
ANY NOTICEABLE SEEPAGE		
STAFF GAGE AND RECORDER		
DRAINS		

OUTLET WORKS

Name of Dam: ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Near the end of the outlet conduit the pipe has rusted considerably. At this point the pipe has become sheared and some rockfill is protruding into the pipe (see right side of Photo 6).	Repair damaged portion of the pipe or fill the pipe with concrete.
INTAKE STRUCTURE	Intake was submerged at time of inspection. Owner reports sealing and plugging the intake structure.	
OUTLET STRUCTURE	Good condition	
OUTLET CHANNEL	Good condition	
EMERGENCY GATE	None	

UNGATED SPILLWAY

Name of Dam: ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Good condition	
APPROACH CHANNEL	Good condition	
DISCHARGE CHANNEL	Good condition	
BRIDGE AND PIERS	None	

GATED SPILLWAY - Not Applicable

Name of Dam: ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		

INSTRUMENTATION

Name of Dam: ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed	
OBSERVATION WELLS	None observed	
WEIRS	None observed	
PIEZOMETERS	None observed	
OTHER		

RESERVOIR

Name of Dam: ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	An abandoned railroad grade is located along the right shoreline. The left reservoir shoreline is moderately (5° - 15°) sloped.	
SEDIMENTATION	Average depth of the reservoir is 5 ft. The greatest depth is 12 ft. Sedimentation is not a serious problem in the reservoir.	
UPSTREAM DAMS	Located approximately 1 mi. upstream from Orson Pond Dam is a natural lake named Lake Lorain (PennDER No. 64-NL25).	

DOWNSTREAM CHANNEL

Name of Dam: ORSON POND DAM

NDI # PA 00136

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel is rock-lined and overgrown with vegetation. Twin stone box culverts (4 ft. by 4 ft.) carry the flow under an abandoned railroad line approximately 200 ft. downstream. The downstream channel has debris in it from general dumping.	Remove the debris from the channel and cut the vegetation.
SLOPES	The downstream channel is mildly sloped.	
APPROXIMATE NO. OF HOMES AND POPULATION	There are 2 houses, 1 barn, and 1 shed located downstream in Orson, PA, which may be damaged in the event of a dam failure. An abandoned railroad line is approximately 200 ft. downstream. PA Routes 370 and 690 are respectively located 450 ft. and 700 ft. downstream.	

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THE BAKER ENGINEERS

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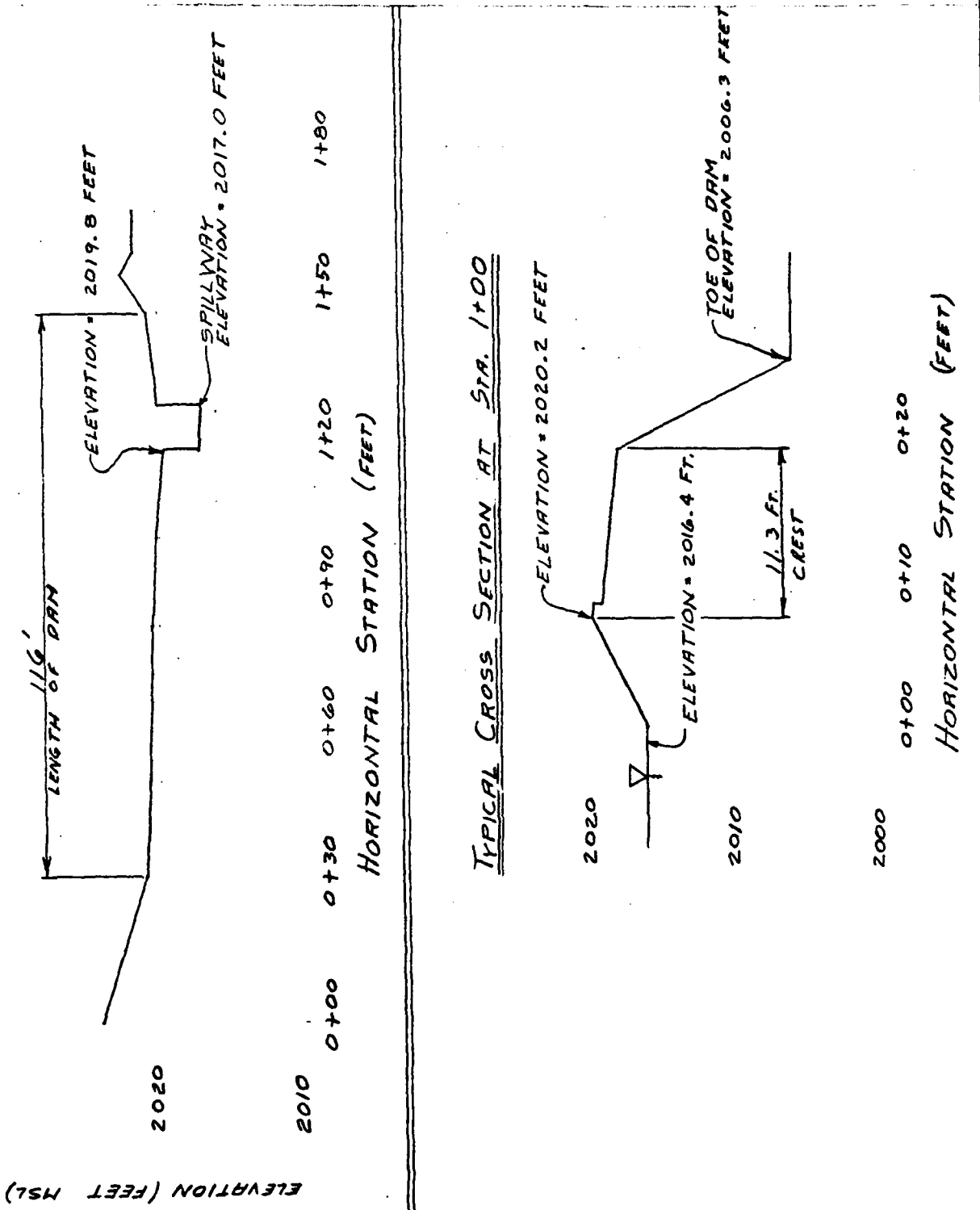
Beaver, Pa. 15009

ORSON POND DAM

TOP OF DAM PROFILE
TYPICAL CROSS-SECTION

DATE OF INSPECTION: 30 October 1980



APPENDIX B

ENGINEERING DATA CHECK LIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: ORSON POND DAM
NDI # PA 00136

ITEM	REMARKS
PLAN OF DAM	None available, see Plate 3 for Field Sketch.
REGIONAL VICINITY MAP	A USGS 7.5 minute topographic quadrangle, Orson, Pennsylvania, was used to prepare the vicinity map which is enclosed in this report as the Location Plan (Plate 1).
CONSTRUCTION HISTORY	The dam was constructed in 1849 to be used as a sawmill. No other information is available.
TYPICAL SECTIONS OF DAM	None available, see Plate 4 for inspection Cross Section.
HYDROLOGIC/HYDRAULIC DATA	None available
OUTLETS - PLAN	None available
- DETAILS	None available
- CONSTRAINTS	None available
- DISCHARGE RATINGS	None available
RAINFALL/RESERVOIR RECORDS	None available

Name of Dam: ORSON POND DAM

NDI # PA 00136

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	No geology reports are available for the dam. See Appendix F for Regional Geology.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	No design computations are available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	No information available
POST-CONSTRUCTION SURVEYS OF DAM	None performed
BORROW SOURCES	No information available

ITEM	REMARKS
MONITORING SYSTEMS	None observed
MODIFICATIONS	According to the current owner, after he obtained the dam in 1965, the following repairs were performed: 1) Repaired back wall of the spillway, November 1965 2) Rebuilt walls and installed 12 in. thick spillway apron, June 1966 3) Placed riprap on right upstream face of dam (right of the spillway), June 1974 4) Built cofferdam in front of outlet pipe with 2 layers of 2 in. thick oak and 3 layers of blue clay in front of the stop logs, summer of 1976 5) Placed riprap in the spillway stilling basin, August 1977
HIGH POOL RECORDS	The 14 July 1972 inspection reported 12 in. above the spillway crest for Hurricane Agnes. It also reported a high water 3 years earlier of 29 in. above spillway crest. No other information available.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	A representative of the United States Bureau of Reclamation performed the last inspection on 14 July 1972. An inspection was performed by a PennDER representative on 14 April 1965. These and a few earlier reports are available in the PennDER file.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported in the available information.

Name of Dam: ORSON POND DAM

NDI # PA 00136

ITEM	REMARKS
MAINTENANCE OPERATION RECORDS	No formal records of maintenance are kept.
SPILLWAY PLAN, SECTIONS, and DETAILS	No information available
OPERATING EQUIPMENT PLANS & DETAILS	No information available

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.30 sq. mi., gentle wooded slopes

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 2017.0 ft. M.S.L. (130 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 2019.8 ft. M.S.L. (200 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 2019.8 ft. M.S.L. (minimum top of dam)

SPILLWAY: Broad-crested concrete weir

a. Crest Elevation 2017.0 ft. M.S.L.
b. Type Broad-crested concrete weir
c. Width of Crest Parallel to Flow 12 ft.
d. Length of Crest Perpendicular to Flow 9.0 ft.
e. Location Spillover Right side of embankment
f. Number and Type of Gates None

OUTLET WORKS: None - 32 in. riveted and welded steel plate pipe, sealed and plugged

a. Type
b. Location Near center of dam
c. Entrance Inverts Sealed and plugged
d. Exit Inverts 2009.57 ft. M.S.L.
e. Emergency Drawdown Facilities None

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE 100 c.f.s. (1969)

APPENDIX C

PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View of Dam - Overall View of Dam from Right Abutment

Photograph Location Plan

Photo 1 - View of Upstream Slope from Left Abutment

Photo 2 - View of Dam Crest from Left Abutment

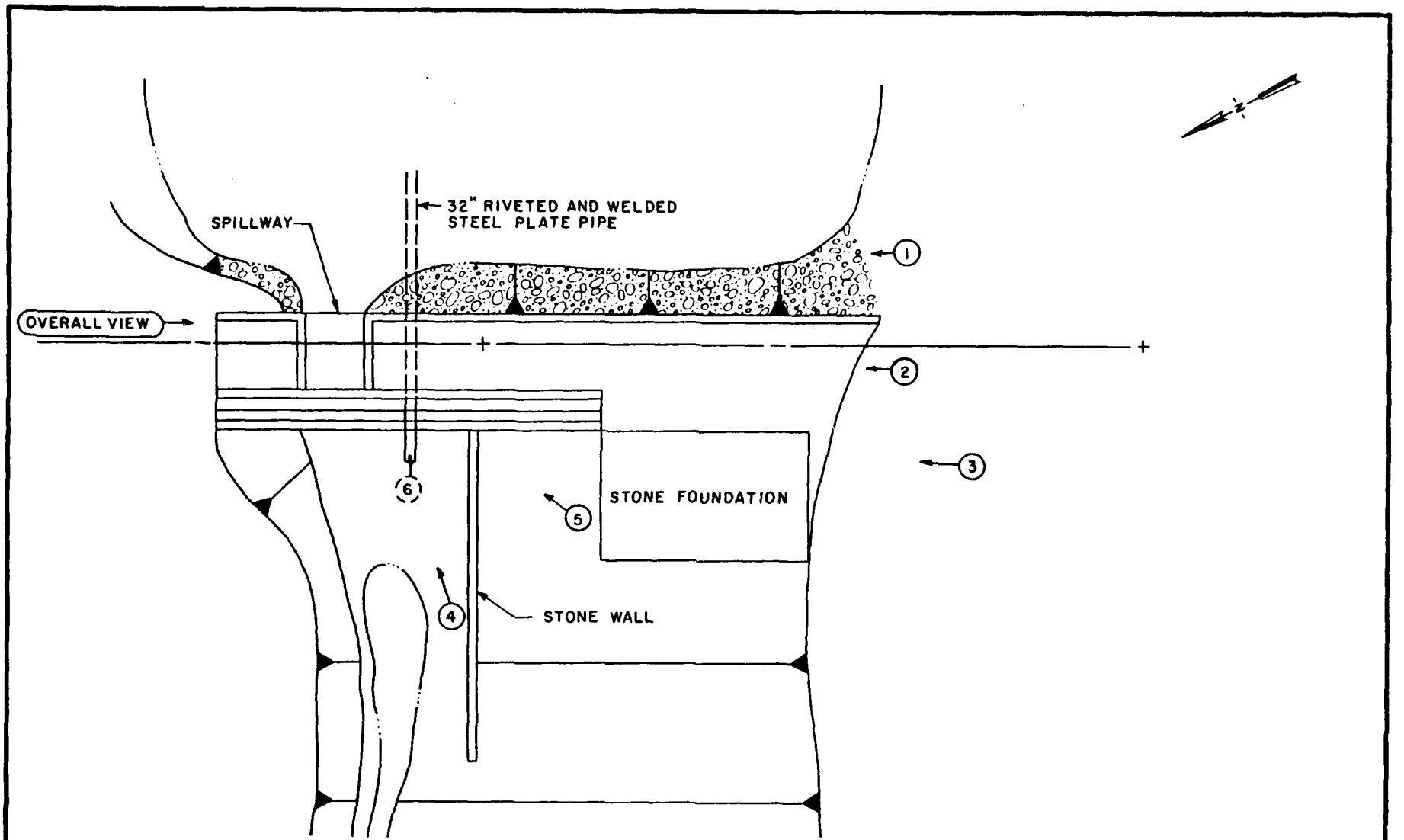
Photo 3 - View of Downstream Face of Dam from Left Abutment

Photo 4 - View of Downstream End of Spillway

Photo 5 - View of Downstream Face of Dam Showing Location of Outlet Conduit

Photo 6 - View Inside Outlet Conduit

Note: Photographs were taken on 30 October 1980.



PHOTOGRAPH LOCATION PLAN

ORSON POND DAM

NDI NO. PA00136

PennDER NO. 64-25

Photographs Taken 30 October 1980

ORSON POND DAM

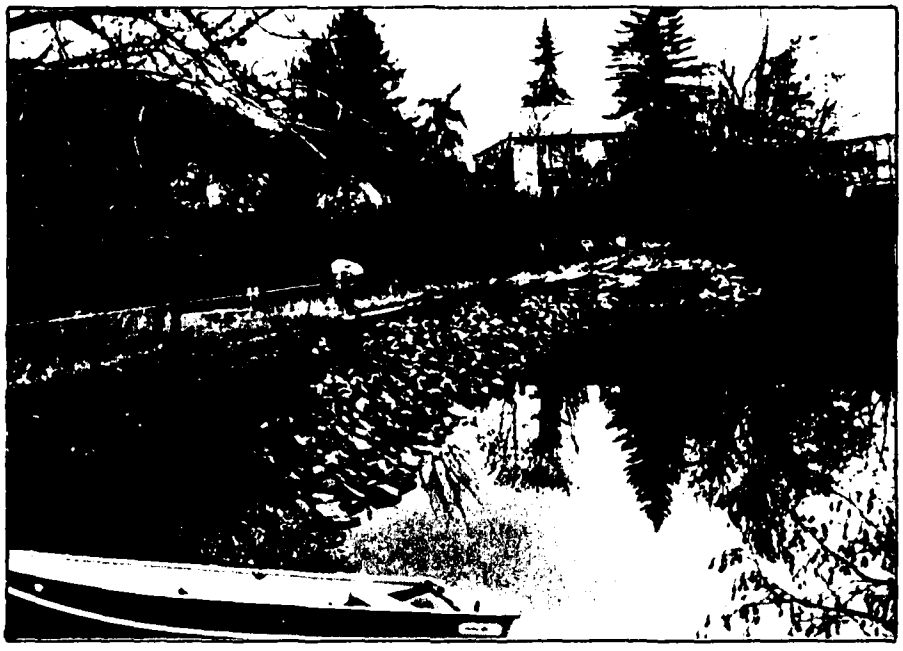


PHOTO 1. View of Upstream Slope from Left Abutment

PHOTO 2. View of Dam Crest from Left Abutment

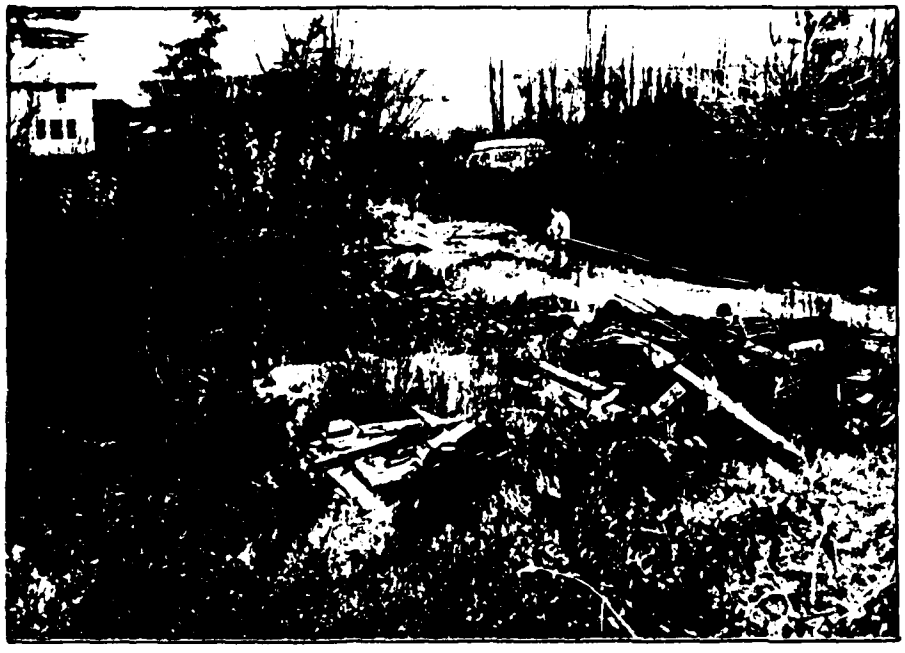


PHOTO 3. View of Downstream Face of Dam from Left Abutment

PHOTO 4. View of Downstream End of Spillway

PHOTO 5. View of Downstream Face of Dam Showing Location of Outlet Conduit

PHOTO 6. View Inside Outlet Conduit

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

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THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject: Orson Pond Dam — S.O. No. ____
Appendix D - Hydrologic and — Sheet No. ____ of ____
Hydraulic Computations — Drawing No. ____
Computed by ____ Checked by ____ Date ____

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The hydrologic determinations presented in this Phase I Inspection Report are based on the use of a Snyder's unit hydrograph developed by the U.S. Army Corps of Engineers. Due to the limited number of gaging stations available in this hydrologic region and the wide variations of watershed slopes, the Snyder's coefficients may yield results of limited accuracy for this watershed. As directed, however, a further refinement of these coefficients is beyond the scope of this Phase I Investigation.

In addition, the conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: ORSON POND DAM

100-YEAR STORM = 6.4 INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	LAKE LORAIN	ORSON POND DAM			
Drainage Area (square miles)	0.37	0.93			
Cumulative Drainage Area (square miles)	0.37	1.30			
Adjustment of PMP for Drainage Area (%)[1]					
6 Hours	100-YEAR	100-YEAR			
12 Hours	STORM	STORM			
24 Hours	DISTRIBUTION	DISTRIBUTION			
48 Hours	ON SHEET 7	ON SHEET 7			
72 Hours					
Snyder Hydrograph Parameters					
Zone [2]	11	11			
C_p/C_t [3]	0.62/1.50	0.62/1.50			
L (miles) [4]	0.62	1.71			
L_{ca} (miles)[4]	0.20	0.62			
$t_p = C_t (L \cdot L_{ca})^{0.3}$ (hours)	0.80	1.53			
Spillway Data					
Crest Length (ft)	3.0	9.0			
Freeboard (ft)	0.5	2.8			
Discharge Coefficient	2.70	DISCHARGE RATING			
Exponent	1.5	DEVELOPED ON SHEET 5			

[1] Technical Paper No. 40, Cooperative Studies Section, U.S. Weather Bureau, Washington, D.C., 1961.

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

[3] Snyder's Coefficients.

[4] 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.

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Subject ORSON POND DAM S.O. No.
HYDRAULIC DATA Sheet No. 2 of 18
Drawing No.
Computed by GWT Checked by WDL Date 12-3-80

STORAGE CALCULATIONS

AREA VS. ELEVATION (MEASURED FROM QUAD)

ELEVATION (FT)	SURFACE AREA (ACRES)
2017	20.20
2020	29.38
2040	153.35

NORMAL POOL STORAGE

STORAGE VOLUME = $V_{NP} = h/3\ (A_1 + A_2 + \sqrt{A_1 A_2})$

h = ESTIMATED AVERAGE DEPTH = 7.6 FT.
A_1 = SURFACE AREA OF NORMAL POOL = 20.20 Ac.
A_2 = SURFACE AREA OF RESERVOIR BOTTOM = 15.21 Ac.
(ESTIMATED FROM AVERAGE DEPTH AND RESERVOIR SIDE SLOPES)

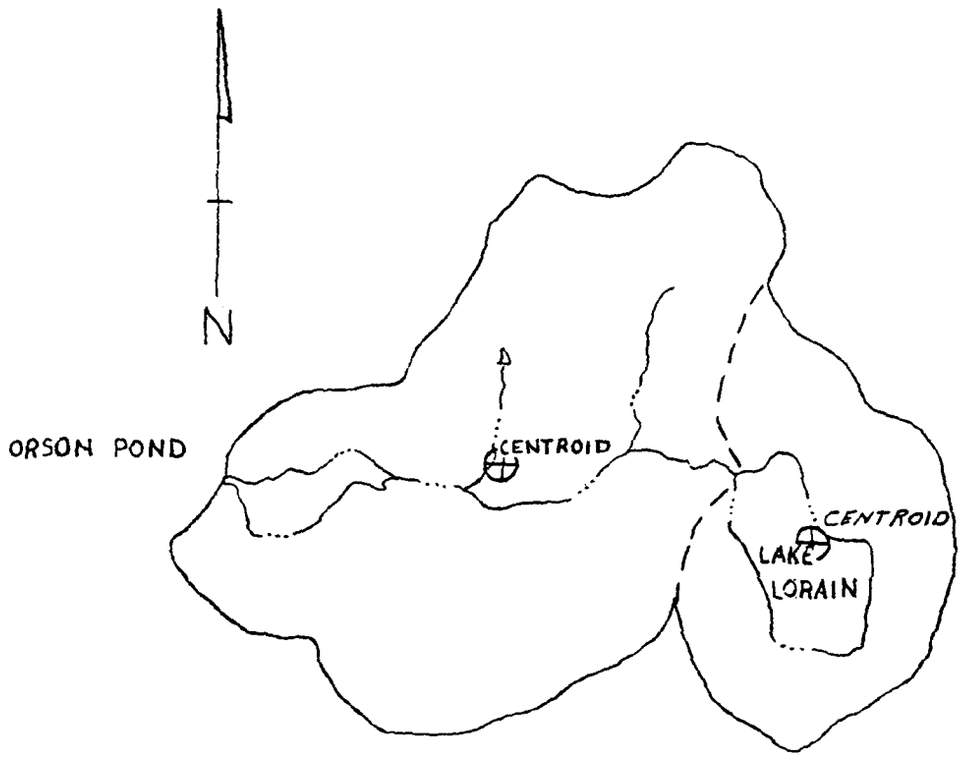
NORMAL POOL STORAGE = $V_{NP} = 7.6/3\ (20.20 + 15.21 + \sqrt{(20.20)(15.21)})$

$V_{NP} = 134.11$ Ac.-Ft.

TOP OF DAM STORAGE

202 Ac.-Ft. (FROM HEC-1 ANALYSIS)

QUAD:
ORSON



ORSON POND:
DRAINAGE AREA AND
CENTROID MAP

0 2000 4000 6000

SCALE: 1" = 2000'

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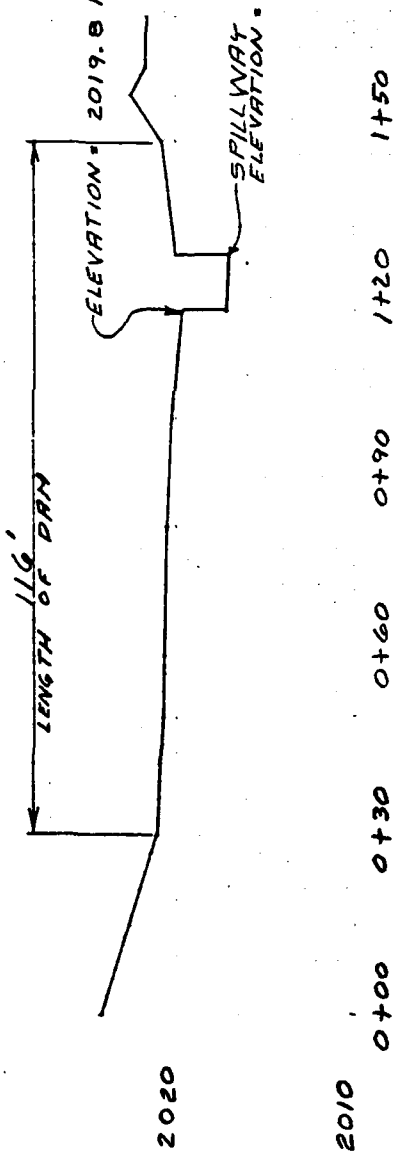
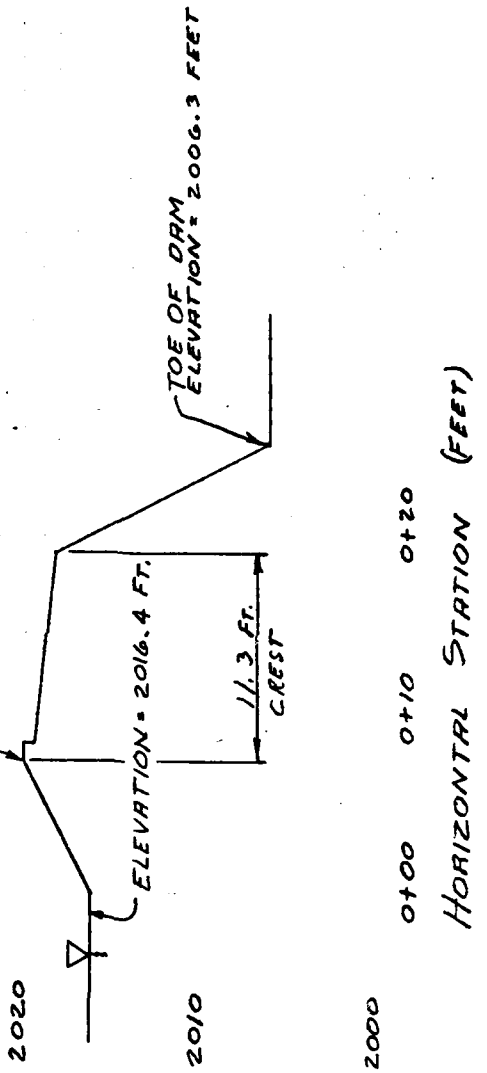
Subject ORSON POND DAM — S.O. No. 13837-00-AFA-18
TOP OF DAM PROFILE — Sheet No. 4 of 19
TYPICAL CROSS SECTION — Drawing No.
Computed by GWT — Checked by WDL — Date 11-19-80

TOP OF DAM PROFILE (LOOKING DOWNSTREAM):

LENGTH OF DAM = 116 FEET



TYPICAL CROSS SECTION AT STA. 1+00



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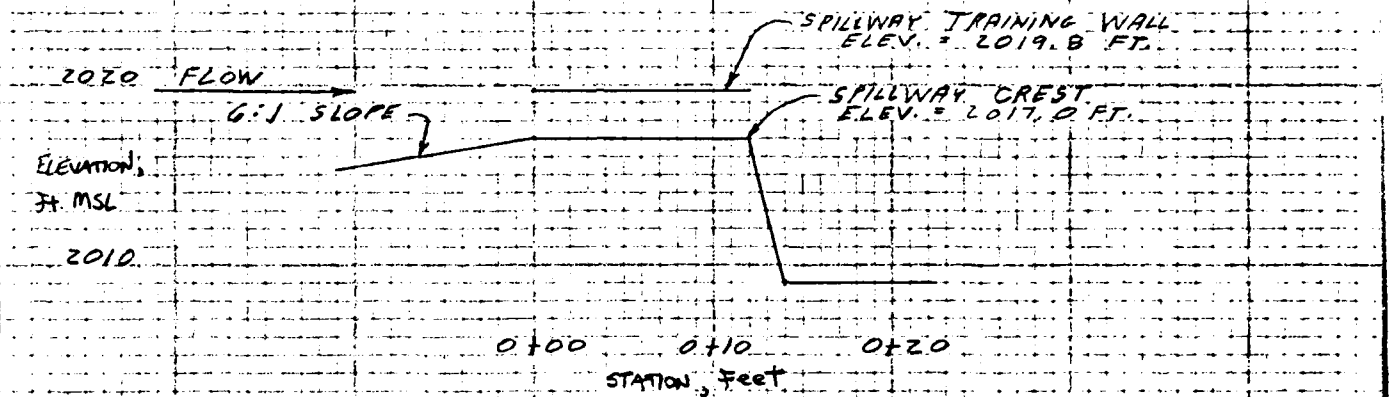
Subject ORSON POND DAM — S.O. No. 13237-00-ARA-18
SPILLWAY DISCHARGE RATING — Sheet No. 5 of 19
Drawing No.
Computed by GWT — Checked by WDL — Date 11/24/90

SPILLWAY PROFILE



DEVELOP RATING CURVE BASED UPON CRITICAL FLOW OVER SPILLWAY

$V = \sqrt{gD}$ (CHOW, OPEN CHANNEL HYDRAULICS, P. 43)

D = MEAN HYDRAULIC DEPTH = $\frac{\text{FLOW AREA}}{\text{FREE SURFACE TOP WIDTH}} = \frac{A}{T}$

g = 32.2 FT/SEC²

V = MEAN FLOW VELOCITY

Q = AV

SPILLWAY ELEV., FT.	FLOW DEPTH, FT.	AREA, FT²	TOP WIDTH, FT.	A/T	V, FT/SEC	Q, CFS	V²/2g	RESERVOIR SURFACE, FT.
2017.0	0	0	0.0	0	0	0	0	2017.00
2017.2	0.2	0.9	9.0	0.1	1.79	1.61	0.05	2017.25
2017.5	0.5	3.6	9.0	0.4	3.59	12.92	0.20	2017.70
2018.0	1.0	8.1	9.0	0.9	5.38	43.58	0.45	2018.45
2018.5	1.5	12.6	9.0	1.4	6.71	84.55	0.70	2019.20
2019.0	2.0	17.1	9.0	1.9	7.82	133.72	0.95	2019.95
2019.5	2.5	21.6	9.0	2.4	8.79	189.86	1.20	2020.70
2020.0	3.0	26.1	9.0	2.9	9.66	252.13	1.45	2021.45
2020.5	3.5	30.6	9.0	3.4	10.46	320.08	1.70	2022.20
2021.0	4.0	35.1	9.0	3.9	11.21	393.47	1.95	2022.95
2022.0	5.0	44.1	9.0	4.9	12.56	553.89	2.45	2024.45
2023.0	6.0	53.1	9.0	5.9	13.78	731.72	2.95	2025.95

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Subject ORSON POND DAM S.O. No. _____
LAKE LORAIN ASSUMPTIONS Sheet No. 6 of 19
Drawing No. _____
Computed by GWT Checked by _____ Date 1-20-81

ROUTING FOR LAKE LORAIN WAS ACCOMPLISHED BY TREATING THE NATURAL OUTLET CHANNEL AS A "NATURAL" DAM AND SPILLWAY.

MODELLING ASSUMPTIONS FOR LAKE LORAIN ARE AS FOLLOWS:

SPILLWAY ELEVATION = 2050 FT.

SPILLWAY DISCHARGE RATING.

$Q = CLH^{3/2}$

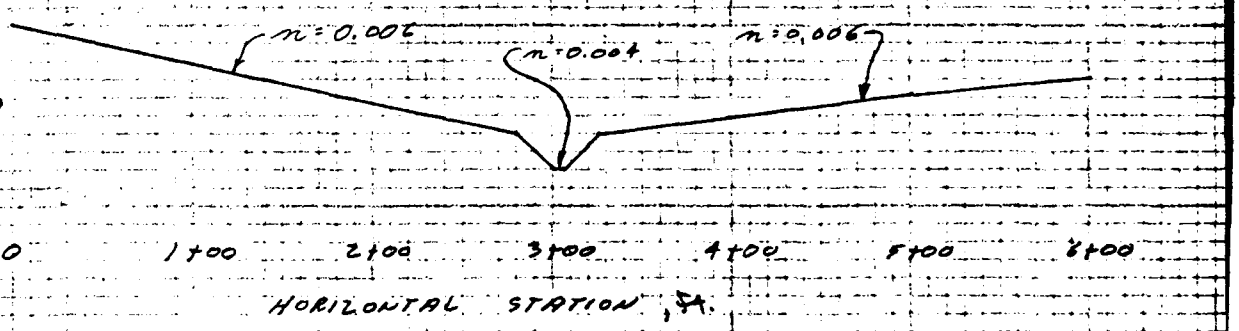
C = 2.70

L = WEIR CREST WIDTH = 3 FT.

TOP OF DAM ELEVATION = 2050.5 FT.

LENGTH OF DAM = 300 FT.

TYPICAL DOWNSTREAM ROUTING CHANNEL



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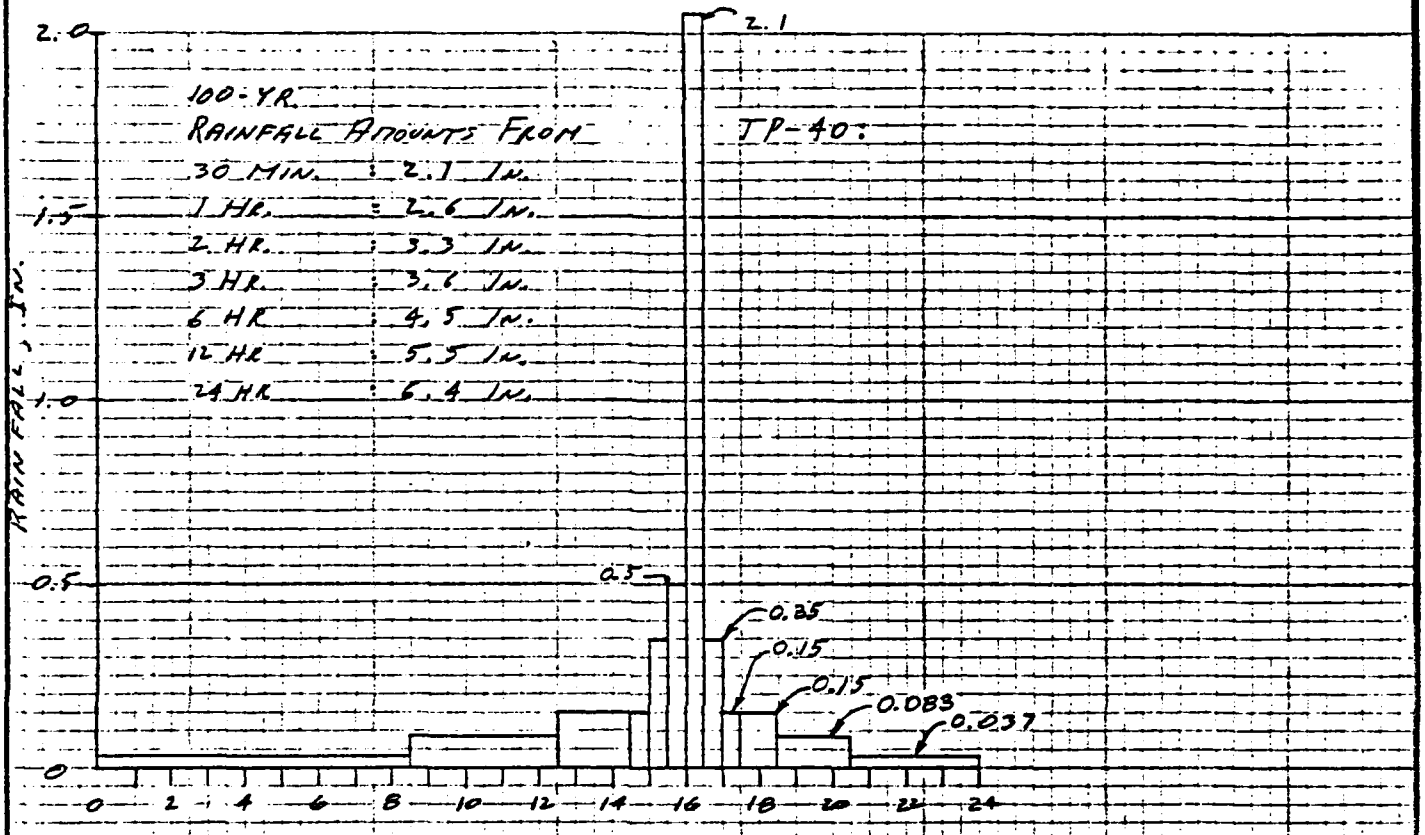
Subject ORSON POND DAM — S.O. No. _____
100-YEAR STORM DISTRIBUTION — Sheet No. 7 of 19
Drawing No. _____
Computed by GWT — Checked by WDL — Date 11-25-80



RAINFALL DISTRIBUTION:
(30 MINUTE INTERVALS)

INTERVAL NUMBERS	% TOTAL RF OCCURING IN EACH INTERVAL
1-17	0.6
18-25	1.3
26-29	2.3
30	2.3
31	5.4
32	7.8
33	32.8
34	5.4
35	2.3
36-37	2.4
38-41	1.3
42-48	0.6

TOTAL = 100 %

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Subject ORSON POND DAM S.O. No.
100-YEAR DISCHARGE Sheet No. 8 of 19
CALCULATION Drawing No.
Computed by GWT Checked by WDL Date 12-3-80

THE INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD WAS CALCULATED USING MATERIAL FROM "THE HYDROLOGIC STUDY - TROPICAL STORM AGNES" PREPARED BY THE SPECIAL STUDIES BRANCH, PLANNING DIVISION, NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS, IN NEW YORK CITY.

DRAINAGE AREA - 0.93 Sq. Mi.

① COMPUTE THE MEAN LOGARITHM

$LOG(Q_m) = C_m + 0.75 \ LOG \ A$

$LOG(Q_m)$ = MEAN LOGARITHM OF ANNUAL FLOOD PEAKS
A = DRAINAGE AREA, Sq. Mi. = 1.30 Sq. Mi.
C_m = MAP COEFFICIENT FOR MEAN LOG OF ANNUAL PEAKS FROM FIG. 21 = 2.11

$LOG(Q_m) = 2.11 + 0.75(LOG\ 0.93)$
$= 2.0864$

② COMPUTE STANDARD DEVIATION

$S = C_s - 0.05 (LOG\ A)$

S = STANDARD DEVIATION OF THE LOGARITHMS OF THE ANNUAL PEAKS
C_s = MAP COEFFICIENT FOR STANDARD DEVIATION FROM FIG. 22 = 0.341
A = DRAINAGE AREA, Sq. Mi. = 0.93 Sq. Mi.

$S = C_s - 0.05 (LOG\ A)$
$= 0.341 - 0.05 (LOG\ 0.93)$
$= 0.3426$

③ SELECT SKEW COEFFICIENT FROM FIG. 23 = 0.16

④ $LOG(Q_{100}) = LOG(Q_m) + K(P,g)S$

$K(P,g)$ = STANDARD DEVIATE FOR A GIVEN EXCEEDENCE FREQUENCY PERCENTAGE (P) AND SKEW COEFFICIENT (g) FROM EXHIBIT 39 OF BEARD'S "STATISTICAL METHODS IN HYDROLOGY" = 2.45

$LOG(Q_{100}) = 2.0864 + 2.45 (.3426)$
$= 2.9258$

$Q_{100} = 843.$ CFS

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Subject LAKE LORAIN S.O. No.
100-YEAR DISCHARGE CALCULATION Sheet No. 9 of 19
Drawing No.
Computed by GWT Checked by Date 4/15/81

THE INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD WAS CALCULATED USING MATERIAL FROM "THE HYDROLOGIC STUDY - TROPICAL STORM AGNES" PREPARED BY THE SPECIAL STUDIES BRANCH, PLANNING DIVISION, NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS, IN NEW YORK CITY.

DRAINAGE AREA - 0.37

① COMPUTE THE MEAN LOGARITHM

$LOG(Q_m) = C_m + 0.75\ LOG\ A$

$LOG(Q_m)$ = MEAN LOGARITHM OF ANNUAL FLOOD PEAKS
A = DRAINAGE AREA, SQ. MI. = 0.37 SQ. MI.
C_m = MAP COEFFICIENTS FOR MEAN LOG OF ANNUAL PEAKS FROM FIG. 21 = 2.11

$LOG(Q_m) = 2.11 + 0.75\ (LOG\ 0.37)$
$= 1.7862$

② COMPUTE STANDARD DEVIATION

$S = C_s - 0.05\ (LOG\ A)$

S = STANDARD DEVIATION OF THE LOGARITHMS OF THE ANNUAL PEAKS.
C_s = MAP COEFFICIENT FOR STANDARD DEVIATION FROM FIG. 22 = 0.341
A = DRAINAGE AREA, SQ. MI., = 0.37 SQ. MI.

$S = 0.341 - 0.05\ (LOG\ 0.37)$
$= 0.3626$

③ SELECT SKEW COEFFICIENT FROM FIG. 23 = 0.16

④ $LOG(Q_{100}) = LOG(Q_m) + K(P,g)\ S$

K(P,g) = STANDARD DEVIATE FOR A GIVEN EXCEEDENCE FREQUENCY PERCENTAGE (P) AND SKEW COEFFICIENT (g) FROM EXHIBIT 39 OF BEARD'S "STATISTICAL METHODS IN HYDROLOGY"

$LOG(Q_{100}) = 1.7862 + 2.45(0.3626)$
$Q_{100} = 470$ CFS

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Subject ORSON POND DAM S.O. No.
100-YEAR DISCHARGE CALCULATIONS Sheet No. 10 of 19
TOTAL DRAINAGE AREA Drawing No.
Computed by GWT Checked by Date 4/15/81

THE INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD WAS CALCULATED USING MATERIAL FROM "THE HYDROLOGIC STUDY - TROPICAL STORM AGNES" PREPARED BY THE SPECIAL STUDIES BRANCH, PLANNING DIVISION, NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS, IN NEW YORK CITY.

DRAINAGE AREA - 1.30 SQ. MI.

① COMPUTE THE MEAN LOGARITHM

$LOG(Q_m) = C_m + 0.75 \, LOG A$

$LOG(Q_m)$ = MEAN LOGARITHM OF ANNUAL FLOOD PEAKS
A = DRAINAGE AREA, SQ. MI. = 1.30 SQ. MI.
C_m = MAP COEFFICIENTS FOR MEAN LOG OF ANNUAL PEAKS FROM FIG. 21 = 2.11

$LOG(Q_m) = 2.11 + 0.75 (LOG\ 1.30)$
$= 2.1955$

② COMPUTE STANDARD DEVIATION

$S = C_s - 0.05 (LOG A)$

S = STANDARD DEVIATION OF THE LOGARITHMS OF THE ANNUAL PEAKS.
C_s = MAP COEFFICIENT FOR STANDARD DEVIATION FROM FIG. 22 = 0.341
A = DRAINAGE AREA, SQ. MI., = 1.30 SQ. MI.

$S = 0.341 - 0.05 (LOG\ 1.30)$
$= .3353$

③ SELECT SKEW COEFFICIENT FROM FIG. 23 = 0.16

④ $LOG(Q_{100}) = LOG(Q_m) + K(P,g) S$

K(P,g) = STANDARD DEVIATE FOR A GIVEN EXCEEDENCE FREQUENCY PERCENTAGE (P) AND SKEW COEFFICIENT (g) FROM EXHIBIT 39 OF BEARD'S "STATISTICAL METHODS IN HYDROLOGY"

$LOG(Q_{100}) = 2.1955 + 2.45 (0.3353)$
$Q_{100} = 1035$ C.F.S.

FOR THE 100-YEAR FLOOD, A PEAK INFLOW TO ORSON POND DAM FROM THE TOTAL DRAINAGE AREA WAS CALCULATED TO BE 880 cfs USING THE HEC-1 DB PROGRAM. THIS IS WITHIN 15% OF THE FLOW CALCULATED ABOVE, WHICH IS AN ACCEPTABLE DIFFERENCE FOR THIS PHASE I INSPECTION REPORT ACCORDING TO THE BALTIMORE DISTRICT, CORPS OF ENGINEERS.

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1973
 LAST MODIFICATION  26 FEB 79
  MBJ UPDATE        04 JUN 79     100-YEAR STORM ROUTING
**********
    1          A1       NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
    2          A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF ORSON POND DAM
    3          A3       UNIT HYDROGRAPH BY SNYDERS METHOD
    4          B    300       0       20        0        0        0        0        0       -4        0
    5          B1     5
    6          J      1       1        1
    7          J1     1
    8          K      0       1                                          1
    9          K1       RUNOFF HYDROGRAPH TO LAKE LORAIN
   10          M      0       1     0.37
   11          O     48     6.2
   12          O1 0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   13          O1 0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.012   0.012   0.012
   14          O1 0.012   0.012   0.012   0.012   0.012   0.024   0.024   0.024   0.024   0.025
   15          O1 0.057   0.081   0.323   0.057   0.025   0.024   0.024   0.012   0.012   0.012
   16          O1 0.012   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   17          T                                                          1.0    0.05           0.217
   18          W   0.80    0.62
   19          X   -1.5   -0.05     2.0
   20          K      1       2                                          1
   21          K1       ROUTING FOR LAKE LORAIN
   22          Y                                       1       1
   23          Y1     1                                                -2050       0
   24          $A    33    51.8    82.6
   25          $E  2045    2050    2060
   26          $$  2050     3.0    2.70     1.5
   27          $D2050.5    2.70     1.5     300
   28          $L     0      20     100     150     300
   29          $V2050.5    2051  2051.5    2052  2052.5
   30          K      1       3                                          1
   31          K1       ROUTING THRU CHANNEL TO ORSON POND
   32          Y                                       1       1
   33          Y1     1                                                  0
   34          Y6  0.06    0.04    0.06    2017    2040    4400  0.0075
   35          Y7     0    2040     140    2037     280    2034     300    2032     303    2032
   36          Y7   325    2034     500    2036     600    2037
   37          K      0       4                                          1
   38          K1       RUNOFF HYDROGRAPH TO DAM
   39          M      0       1     0.93
   40          O     48     6.2
   41          O1 0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   42          O1 0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.012   0.012   0.012
   43          O1 0.012   0.012   0.012   0.012   0.012   0.024   0.024   0.024   0.024   0.025
   44          O1 0.057   0.081   0.323   0.057   0.025   0.024   0.024   0.012   0.012   0.012
   45          O1 0.012   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   46          T
   47          W   1.93    0.62
   48          X   -1.5   -0.05     2.0
   49          K      2       5                                          1
   50          K1       COMBINE HYDROGRAPHS FROM STATIONS 3 AND 4
```

SHEET 11 OF 19

```
51              K     1      6                                    1
52              K1      ROUTING FOR URSON POND DAM
53              Y                                    1      1
54              Y1    1                                                -2017.0      -1
55              Y4  2017  2017.3  2017.7  2018.4  2019.2  2019.9  2020.7  2021.4  2022.2  2022.9
56              Y42024.4  2025.3
57              Y5     0     1.6    12.9    43.6    84.6   133.7   189.9   252.1   320.1   393.5
58              Y5 553.9   731.7
59              $A 15.21   20.20   29.38  153.35
60              $E2009.4    2017    2020    2040
61              $$  2017
62              $U2019.8    3.08     1.5     116
63              $L     0      10      44     103     114     121     130
64              $V2019.8  2020.0  2020.5  2021.0  2021.5  2022.0  2022.5
65              K     99
```

SHEET 12 OF 19

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
  MBJ UPDATE         04 JUN 79
**********

RUN  DATE 12/23/80
     TIME   11.53

                    NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
                    HYDROLOGIC AND HYDRAULIC ANALYSIS OF URSON POND DAM
                    UNIT HYDROGRAPH BY SNYDERS METHOD

                                    JOB SPECIFICATION
          NQ     NMIN     NMIN     IDAY     IHR     IMIN    METRC     IPLT     IPRT    NSTAN
         300        0       20        0       0        0        0        0       -4        0
                                   JOPER      NHT    LROPT    ITRACE
                                       5        0        0        0        0

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

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

                              SUB-AREA RUNOFF COMPUTATION

                    RUNOFF HYDROGRAPH TO LAKE LURAIN

                              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       1    0.37     0.0    0.37     0.0     0.0      0       0       0

                                    LOSS DATA
          LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
              0     0.0     0.0    1.00     0.0     0.0    1.00    1.00    0.05     0.0    0.22

                                  UNIT HYDROGRAPH DATA
                                TP=  0.80    CP=0.62    NTA=  0

                                  RECESSION DATA
                          STRTQ=   -1.50    QRCSN=   -0.05    RTIOR= 2.00

                UNIT HYDROGRAPH 14 END-OF-PERIOD ORDINATES, LAG=   0.80 HOURS, CP= 0.62  VOL= 1.00
          41.     132.     174.     136.      86.      54.      34.      22.      14.       9.
           5.       3.       2.       1.

                                  END-OF-PERIOD FLOW
          0
    MO.DA  HR.MN  PERIOD    RAIN    EXCS    LOSS    COMP Q       MO.DA  HR.MN  PERIOD    RAIN    EXCS    LOSS    COMP Q

                                                SUM    6.20    5.08    1.12     3893.
                                                       157.48  129.03  28.45    110.24
```

SHEET 13 OF 19

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

HYDROGRAPH ROUTING

ROUTING FOR LAKE LORAIN

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	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-2050.	0

SURFACE AREA=	35.	52.	83.
CAPACITY=	0.	216.	882.
ELEVATION=	2045.	2050.	2060.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
2050.0	3.0	2.7	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
2050.5	2.7	1.5	300.

CREST LENGTH AT OR BELOW ELEVATION	0.	20.	100.	150.	300.
	2050.5	2051.0	2051.5	2052.0	2052.5

PEAK OUTFLOW IS 83. AT TIME 14.00 HOURS

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

HYDROGRAPH ROUTING

ROUTING THRU CHANNEL TO ORSON POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
3	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
0.0600	0.0400	0.0600	2017.0	2040.0	4400.	0.00750

SHEET 14 OF 19

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.0 2040.00 140.00 2037.00 280.00 2034.00 300.00 2032.00 303.00 2032.00
325.00 2034.00 500.00 2036.00 600.00 2037.00

STORAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.80	4.61	19.17	53.66	107.73	170.12	240.62
OUTFLOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	14.42	150.59	682.28	2030.68	4765.99	9012.87	14648.70
STAGE	2017.00	2018.21	2019.42	2020.63	2021.84	2023.05	2024.26	2025.47	2026.68	2027.89
	2029.10	2030.31	2031.53	2032.74	2033.95	2035.16	2036.37	2037.58	2038.79	2040.00
FLOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	14.42	150.59	682.28	2030.68	4765.99	9012.87	14648.70

MAXIMUM STAGE IS 2033.3

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF HYDROGRAPH TO DAM (Olson Pond)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
4	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	0.93	0.0	0.93	0.0	0.0	0	0	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0	0.0	0.0

UNIT HYDROGRAPH DATA
TP= 1.53 CP=0.62 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 26 END-OF-PERIOD ORDINATES, LAG= 1.54 HOURS, CP= 0.63 VOL= 1.00

22.	78.	152.	213.	241.	223.	180.	143.	113.	90.
71.	57.	45.	36.	28.	22.	18.	14.	11.	9.
7.	6.	4.	3.	3.	2.				

END-OF-PERIOD FLOW

0 MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	6.20	6.20	0.0	11586.
										157.11	157.11	0.11	328.088

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

COMBINE HYDROGRAPHS

COMBINE HYDROGRAPHS FROM STATIONS 3 AND 4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
5	2	0	0	0	0	1	0	0

SHEET 15 OF 16

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

HYDROGRAPH ROUTING

ROUTING FOR ORSUN POND DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	1	0	0	0	0	1	0	0

ROUTING DATA

JLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-2017.	-1

STAGE	2017.00	2017.30	2017.70	2018.40	2019.20	2019.90	2020.70	2021.10	2022.20	2022.90
	2024.40	2025.90								
FLOW	0.0	1.60	12.90	43.60	84.60	133.70	189.90	252.10	320.10	393.50
	553.90	731.70								
SURFACE AREA=	15.	20.	29.	153.						
CAPACITY=	0.	134.	208.	1874.						
ELEVATION=	2009.	2017.	2020.	2040.						

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
2017.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
2019.8	3.1	1.5	116.

CREST LENGTH AT OR BELOW ELEVATION	0.	10.	44.	103.	114.	121.	130.
	2019.8	2020.0	2020.5	2021.0	2021.5	2022.0	2022.5

PEAK OUTFLOW IS 658. AT TIME 13.33 HOURS

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

Sheet 16 of 19

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00
HYDROGRAPH AT	1	0.37 (0.96)	1	512. (14.50)
ROUTED TO	2	0.37 (0.96)	1	83. (2.36)
ROUTED TO	3	0.37 (0.96)	1	82. (2.32)
HYDROGRAPH AT	4	0.93 (2.41)	1	858. (24.30)
2 COMBINED	5	1.30 (3.37)	1	878. (24.86)
ROUTED TO	6	1.30 (3.37)	1	658. (18.63)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 LAKE LORRAN DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	2050.00	2050.00	2050.50
STORAGE	216.	216.	242.
OUTFLOW	0.	0.	3.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	2051.48	0.98	296.	83.	69.67	14.00	0.0

100-YEAR FLOOR ROUTING. PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	82.	2033.3	14.33

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 Reser. Pond. DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	2017.00	2017.00	2019.80
STORAGE	134.	134.	202.
OUTFLOW	0.	0.	127.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	2021.59	1.79	260.	698.	9.33	13.33	0.0

100-YEAR FLOOD ROUTING

SHEET 19 OF 19

APPENDIX E

PLATES

CONTENTS

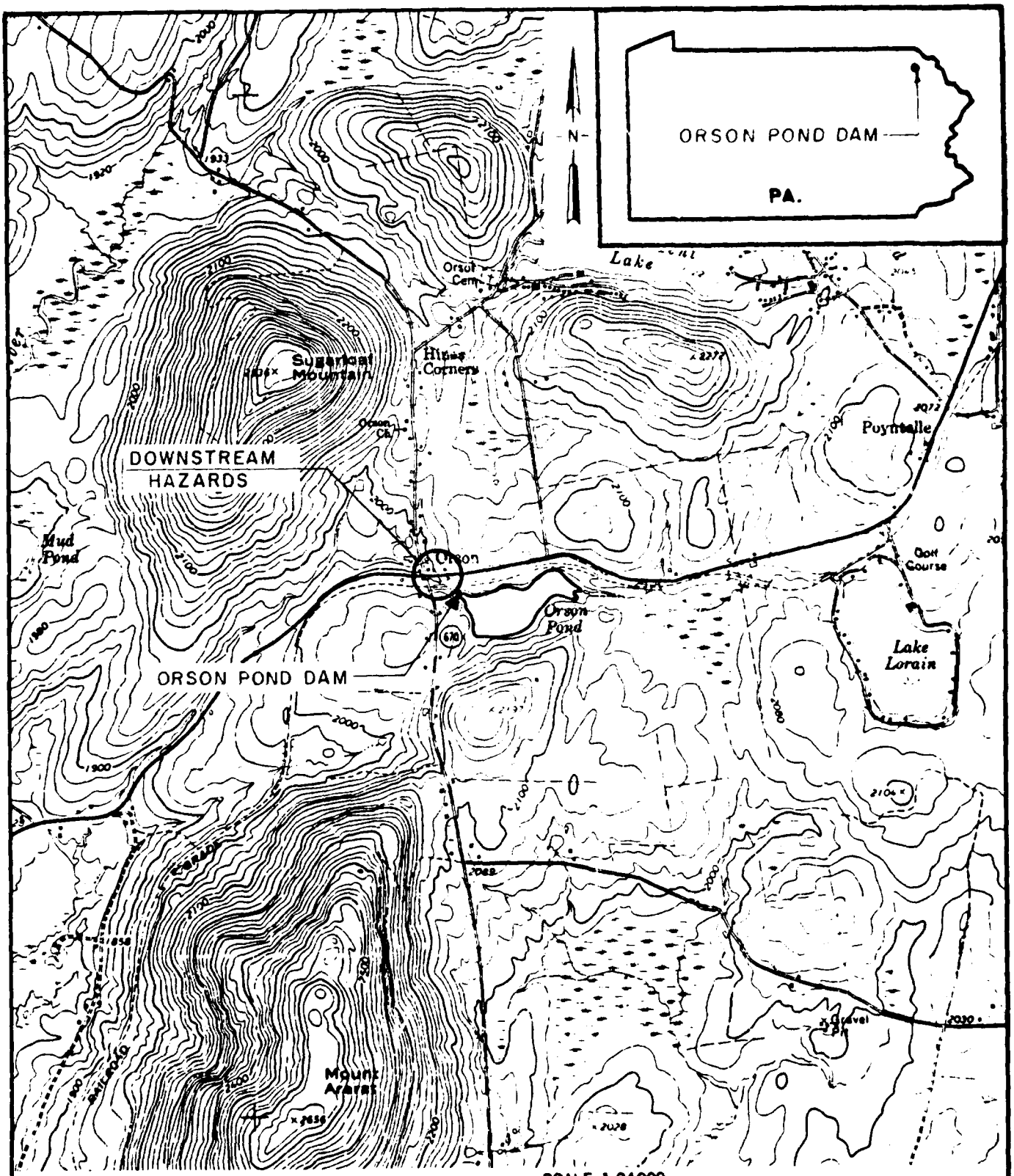


PLATE 1 LOCATION PLAN
ORSON POND DAM

REFERENCES:
1. U.S.G.S. 7.5' ORSON, PA. QUADRANGLE. 1968

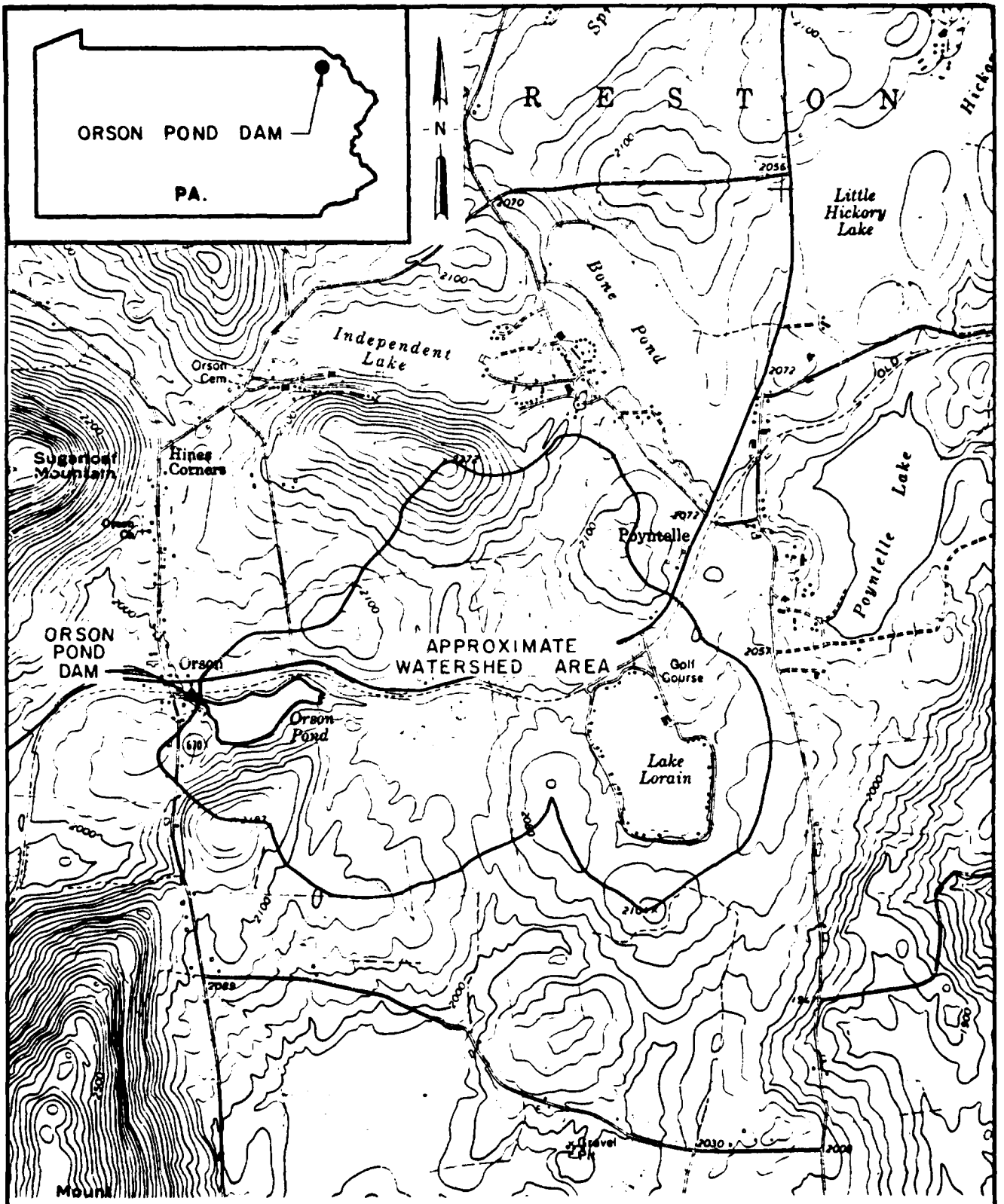


PLATE 2 WATERSHED MAP

ORSON POND DAM

REFERENCES:
1. U.S.G.S. 7.5' ORSON, PA. QUADRANGLE. PHOTOREVISED 1978

CROSS SECTION TAKEN AT STA 1+0

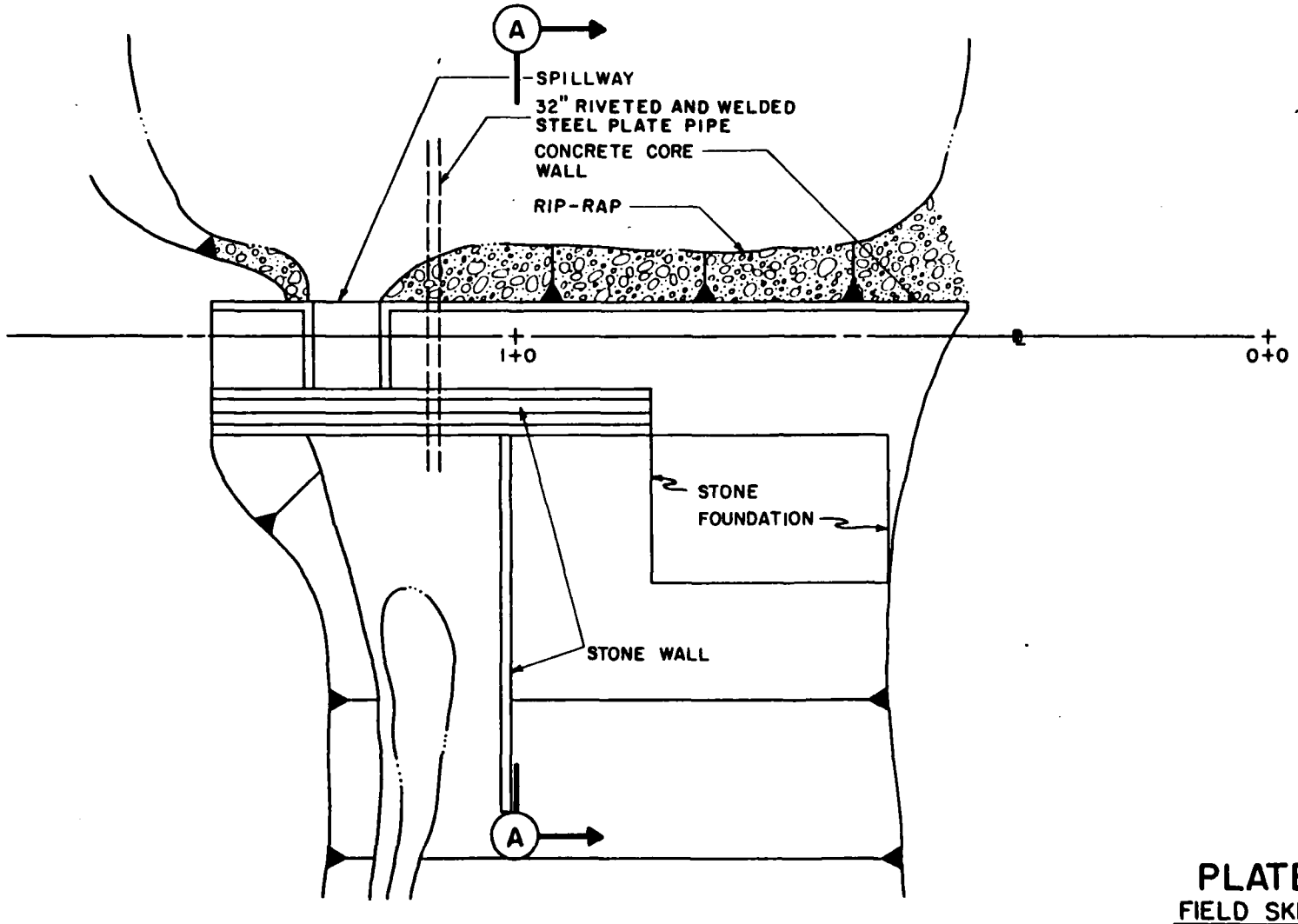


PLATE 3

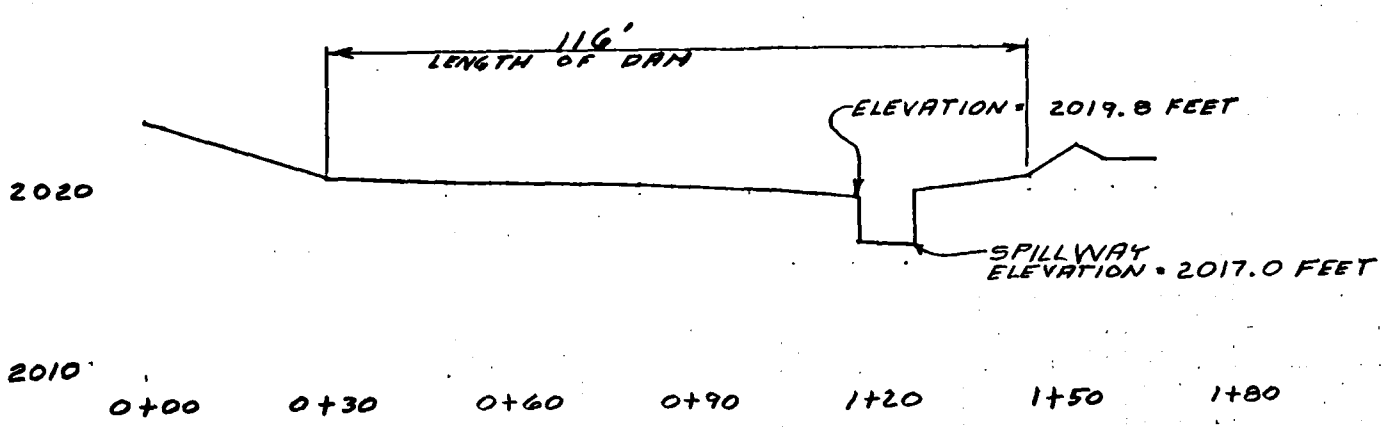
FIELD SKETCH

ORSON POND DAM
NDI NO. PA00136
Penn DER NO. 64-25
SCHEMATIC - NOT TO SCALE

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
Box 280
Beaver, Pa. 15009

TOP OF DAM PROFILE (LOOKING DOWNSTREAM):

LENGTH OF DAM = 116 FEET



TYPICAL CROSS SECTION AT STA. 1+00

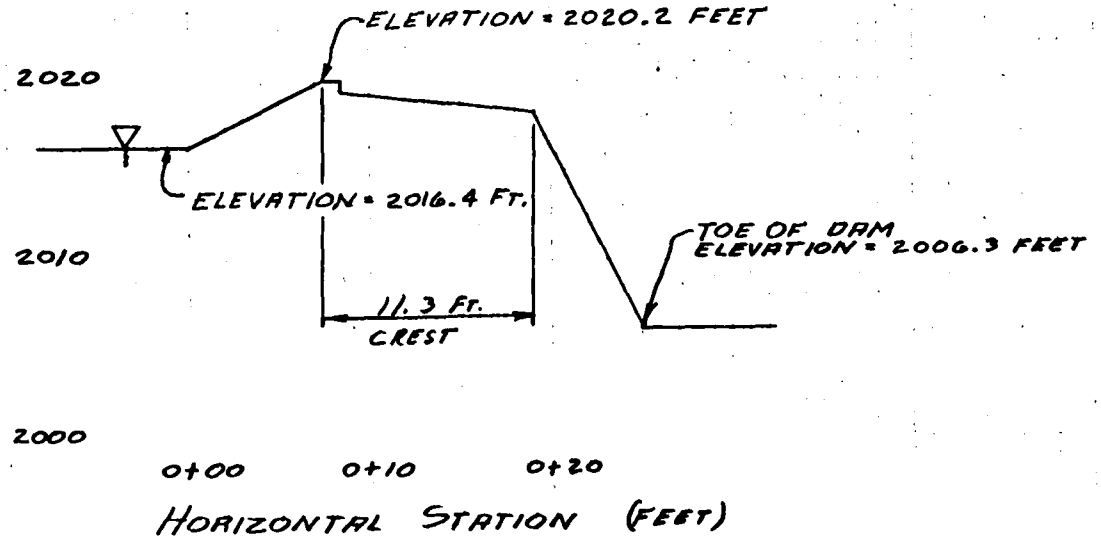


PLATE 4

APPENDIX F

REGIONAL GEOLOGY

ORSON POND DAM
NDI No. PA 00136, PennDER No. 64-25

REGIONAL GEOLOGY

Orson Pond Dam is located in the Glaciated Low Plateaus section of the Appalachian Plateaus physiographic province. Drainage is to the south via the Lackawanna River and relief in the area averages 600 feet. The area has been glaciated at least three times and, with the exception of Mount Ararat 1.5 miles southwest of the dam and Sugarloaf Mountain 0.75 miles northwest of the dam, is presently covered with Wisconsin Stage glacial deposits. According to the Soil Conservation Service's Soil Survey for Wayne County, the surface soils consist primarily of stoney, sandy silt loams of the Wellsboro-Morris association. No test borings were available for review; thus, the thickness of the overburden is difficult to ascertain.

Geologic references indicate that the bedrock in the vicinity of the dam consists of members of the Catskill Formation of the Susquehanna Group. Members of the Pocono Group of Mississippian age outcrop on the upper slopes of Sugarloaf Mountain and Mount Ararat. The Catskill is composed of bay and delta front, red and gray shales and sandstones but may also contain widely scattered, thin coal seams and scattered fish remains. The dam is situated at the northern extremity of the Lackawanna Syncline. This syncline is a gentle trough near the dam but deepens rapidly to the south.

GEOLOGIC MAP
Orson Pond Dam
NDI NO. PA 00136, Wayne County

Reproduced from Geologic Map of Pennsylvania, Pennsylvania Geological Survey, 4th Series

Scale: One Inch Equals Approximately Four Miles
See Legend, Next Page

GEOLOGY MAP LEGEND

DEVONIAN

UPPER

WESTERN PENNSYLVANIA

Dos Dk

Oswayo Formation
Greenish gray to gray shales, siltstones and sandstones becoming increasingly shaly westward; considered equivalent to type Oswayo. Riceville Formation Dr in Erie and Crawford Counties; probably not distinguishable north of Corry.

Dcr

Cattaraugus Formation
Red, gray and brown shale and sandstone with the proportion of red decreasing westward; includes Venango sands of drillers and Salamanca sandstone and conglomerate; some limestone in Crawford and Erie counties.

Conneaut Group
Alternating gray, brown, greenish and purplish shales and siltstones; includes "pink rock" of drillers and "Chemung" and "Girard" Formations of northwestern Pennsylvania.

Dca

Canadaway Formation
Alternating brown shales and sandstones; includes "Portage" Formation of northwestern Pennsylvania.

CENTRAL AND EASTERN PENNSYLVANIA

Dos

Oswayo 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 Oswayo not proved.

Dck

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

Dm

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

Ds

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

MIDDLE AND LOWER

Dh

Hamilton Group

Mahantango Formation
Brown to olive shale with interbedded sandstones which are dominant in places (Montebello); highly fossiliferous in upper part; contains "Centerfield coral bed" in eastern Pennsylvania.

Marcellus Formation
Black, fissile, carbonaceous shale with thick, brown sandstone (Turkey Ridge) in parts of central Pennsylvania.

Onondaga Formation
Greenish blue, thin bedded shale and dark blue to black, medium bedded limestone with shale predominant in most places; includes Selinsgrove Limestone and Needmore Shale in central Pennsylvania and Buttermilk Falls Limestone and Esopus Shale in easternmost Pennsylvania; in Lehigh Gap area includes Palmerton Sandstone and Bowmanstown Chert.

Dmo

Oriskany Formation
White to brown, fine to coarse grained, partly calcareous, locally conglomeratic, fossiliferous sandstone (Ridgeley) at the top; dark gray, cherty limestone with some interbedded shales and sandstones below (Shriver).

Helderberg Formation
Dark gray, calcareous [illegible] (Mandata) at the [illegible] equivalent [illegible] Ewen Shale and [illegible] Limestone to the east; dark gray, cherty, thin bedded, fossiliferous limestone (New Scotland) with some local sandstones in the middle; and, at the base dark gray, medium to thick bedded, crystalline limestone (Coeymans), sandy and shaly in places with some chert nodules.