OHIO RIVER BASIN
PIFFER RUN OF LITTLE SANDY CREEK, VENANGO COUNTY
PENNSYLVANIA

POLK DAM
NDI No. PA 00253
PennDER No. 61-7

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MICHAEL BAKER, JR., INC.
DACW31-80-C-0025

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

prepared by
MICHAEL BAKER, JR., INC.
Consulting Engineers
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Beaver, Pennsylvania 15019

March 1980

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OHIO RIVER BASIN

POLK DAM
VENANGO COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00253
PennDER No. 61-7

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Polk Dam (NDI Number PA-00253
PennDER Number 61-7), Ohio River Basin,
Fitter Run of Little Sandy Creek, Venango

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

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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
Polk Dam, Venango County, Pennsylvania
NDI No. PA 00253, PennDER No. 61-7
Piffer Run of Little Sandy Creek
Inspected 10 December 1979

ASSESSMENT OF GENERAL CONDITIONS

Polk Dam is owned by the Polk State School and Hospital 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 Polk Dam. The 100-year flood was chosen as the SDF. During the 100-year flood, the dam is overtopped by a maximum of 0.61 foot for a duration of 1.50 hours. The spillway is therefore considered "inadequate." It is recommended that the owner immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

Several items of remedial work should be performed by the owner without delay. Item 1 below should be completed by a qualified professional engineer experienced in the design of hydraulic and appurtenant structures for earth dams. These include:

1) The owner should immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

2) Fill the two depressions on the downstream slope of the dam and monitor these areas in future inspections to determine if additional remedial work is necessary.

3) The sloughing and erosion of the downstream slope adjacent to the spillway structure should be repaired. It is recommended that the slope be partially cut back in this area so as to decrease or stop the sloughing and erosion.
POLK DAM

4) After the sloughing and erosion noted in item 2 is repaired, the slightly tilted spillway wall should be repaired.

5) The masonry in the spillway structure should be repointed to prevent the migration of embankment material into the spillway and the infiltration of water from the spillway into the embankment.

6) Remove the silt and trash at the entrance to the spillway.

7) Fill the rodent/animal burrow in the embankment.

8) The condition and operability of the outlet works should be examined and any necessary repairs performed.

9) The tree to the right of the spillway on the upstream slope should be removed and the excavated area regraded and compacted.

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, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented.
POLK DAM

Submitted by:

MICHAEL BAKER, JR., INC.

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

Date: 28 March 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 29 April 1980
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- **Appendix B** - Engineering Data Check List
- **Appendix C** - Photograph Location Plan and Photographs
- **Appendix D** - Hydrologic and Hydraulic Computations
- **Appendix E** - Plates
- **Appendix F** - Regional Geology
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
POLK DAM
NDI No. PA 00253, PennDER No. 61-7

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 - Polk Dam is located on the grounds of the Polk State School and Hospital at Polk, Pennsylvania. It was constructed (estimated between 1895 and 1909) to supply water and ice for the facility but is no longer used in this capacity. Its present function is for ice skating in the winter and for aesthetics of the facility grounds.

Very little information exists concerning the original construction of this dam because records for Pennsylvanian dams were not kept prior to 1913.

The dam is approximately 25.7 feet high (maximum height) and 377 feet long. The upstream slope above the pool level is 1.67H:1V (Horizontal to Vertical) and the downstream slope is 4H:1V.

The spillway is a masonry stone structure located at the left abutment of the dam. The crest of the spillway is an open channel 10.5 feet long (perpendicular to flow) and 25 feet wide (parallel to flow). An 8.5 foot drop is located at the end of the 25 foot crest length. The downstream channel, consisting of masonry stone, continues for an additional 300 feet downstream.

The outlet works for the dam consist of an 8 inch or 10 inch cast-iron pipe through the embankment.
The owner is unsure of the correct size of the pipe, but the 8 inch size was more commonly used at the time of construction. A valve for the pipe is located just upstream of the crest of the embankment and a concrete riser and stem can be observed on the upstream slope. Details concerning the intake are unavailable. The discharge end of the pipe extends through the wall of the downstream channel. The pipe at this location is a 16 inch corrugated metal pipe.

b. Location - Polk Dam is located on a tributary of Little Sandy Creek in the Borough of Polk, Venango County, Pennsylvania. This tributary is known locally as Piffer Run. The coordinates of the dam are N 41° 22.5' and W 79° 55.8'. The dam and reservoir can be located on USGS 7.5 minute topographic quadrangles, Polk and Utica, Pennsylvania.

c. Size Classification - The maximum height of the dam from the minimum top of dam to the toe of the downstream slope (best information available) is 25.7 feet. The reservoir volume to the top of dam, Elevation 1099.7 feet Mean Sea Level (M.S.L.), is 115.0 acre-feet. The dam is therefore in the "Small" size category.

d. Hazard Classification - Because property damage is likely 2300 feet downstream from the dam but loss of life due to failure of the dam is unlikely, the dam is classified in the "Significant" hazard category.

e. Ownership - The dam and reservoir are owned by the Commonwealth of Pennsylvania, Department of Public Welfare, Polk State School and Hospital, P.O. Box 94, Polk, Pennsylvania 16342. Mr. Adam Gazek is the current Institutional Maintenance Superintendent.

f. Purpose of Dam - The reservoir is used for recreation and aesthetic appearances of the center grounds. At one time the reservoir was used for water and ice supply.

g. Design and Construction History - No specific design and construction history is available. The dam was constructed subsequent to the facilities (circa 1895) and prior to 1909.

h. Normal Operational Procedures - The spillway is uncontrolled and the reservoir is typically at the spillway crest elevation (Elevation 1093.0 feet
Since the dam and reservoir are on the grounds and a roadway is located on the crest, the maintenance personnel typically drive over the dam at least once a day.

1.3 PERTINENT DATA

<table>
<thead>
<tr>
<th>Category</th>
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<tbody>
<tr>
<td>a. Drainage Area (square miles)</td>
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<tr>
<td>b. Discharge at Dam Site (c.f.s.)</td>
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<tr>
<td>Maximum Flood</td>
<td>Unknown</td>
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<tr>
<td>Spillway Capacity</td>
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<td>c. Elevation² (feet above M.S.L.)</td>
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<tr>
<td>Average Top of Dam</td>
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<tr>
<td>Minimum Top of Dam</td>
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<tr>
<td>Spillway Crest</td>
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</tr>
<tr>
<td>Streambed at Toe of Dam²</td>
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<tr>
<td>Maximum Tailwater of Record</td>
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<td>d. Reservoir (feet)</td>
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<td>Length of Maximum Pool</td>
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<tr>
<td>Length of Normal Pool</td>
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<tr>
<td>e. Storage (acre-feet)</td>
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<td>f. Reservoir Surface (acres)</td>
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<tr>
<td>Height (feet)</td>
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</tr>
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</table>

¹El. 1098.0 ft. is the elevation of the low chord of the bridge deck over the spillway. The top of the bridge deck is at approximately the same elevations as the minimum top of dam. Sufficient head will not develop behind the bridge deck to increase flow through the spillway above the peak discharge of 315 c.f.s. before the dam is overtopped.

²All elevations referenced to assumed elevation of the bridge deck over the spillway, El. 1100.0 ft. M.S.L.

³Estimated.
Top Width (feet) - 21
Side Slopes - Upstream - 1.67H:1V
          Downstream - 4H:1V
Zoning - Unknown
Impervious Core - Unknown
Cut-off - Unknown
Grout Curtain - Unknown
Drains - None

h. Diversion and Regulating Tunnel - None

i. Spillway -
Type - Masonry stone open channel

Length of Crest Perpendicular to Flow (feet) - 10.5

Width of Crest Parallel to Flow (feet) - 25
Crest Elevation (feet M.S.L.) - 1093.0
Gates - None
Upstream Channel - Reservoir
Downstream Channel - Masonry stone rectangular channel

j. Regulating Outlets - An eight or ten inch cast-iron pipe (Note: The owner is unsure of the size. An eight inch pipe was a more commonly used size about the time the dam was constructed.) is located at Station 3+08 (See field sketch in Appendix A for stationing). A valve box is located on the upstream slope of the dam. The discharge end of the pipe which exits through the masonry stone wall of the downstream channel is a 16 inch corrugated metal pipe. No information is available concerning the intake.
SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The review of information for this dam included the Pennsylvania Department of Environmental Resources' (PennDER) File No. 61-7. The following information is contained in the correspondence file for this dam:


2) "Report on Condition of Dam by Owner" to the Water and Power Resources Board, Department of Forests and Waters, dated 2 May 1924.

3) Inspection Report by an engineer of the Water and Power Resources Board, date of inspection 4 August 1925.

4) Inspection Report by an engineer of PennDER, date of inspection 6 October 1965. This inspection noted that the owner was in the process of flattening the downstream slope. This report also noted trees and brush on the upstream face.

5) Miscellaneous correspondence in November and December, 1965 between PennDER and the Superintendent of Polk State School and Hospital concerning the brush on the upstream face.

6) Memorandum to file noting an inspection on 19 January 1966 by another engineer from PennDER noting that shrubs on the upstream face are not detrimental to the safety of the dam.

7) Four photos from the 1919 inspection and three photos from the 1965 inspection.

Information presenting the design or plans of the dam was not available.

2.2 CONSTRUCTION

The Polk State School and Hospital facilities were constructed circa 1895 and it is estimated the dam was constructed at the same time for water (and ice) supply. Modifications performed to the dam which are known to
the personnel currently responsible for the maintenance and can be determined from information available in the PennDER include:

1) The road on the crest of the dam was revised from brick or block lined (1919) to the current oil and chipped rock surface.

2) The downstream slope was flattened in October 1965. The photographs indicate the downstream face was very irregular prior to flattening. The method of filling was (according to the photograph) end dumping from the top of dam and hand spreading over the slope.

3) The pool was partially drawn down in 1946 or 1947 for dredging the upper end of the reservoir.

4) The pool was totally drained in the summer of 1963 and the reservoir dredged by Hasbrook Construction Company.

5) In 1970 a waterline, which passes through the downstream embankment parallel to the crest, was replaced by a waterline located downstream from the dam (see Plate 3 for details).

6) Repairs were made to the spillway training walls at the entrance to the spillway channel between Elevations 1097.0 and 1098.0 feet M.S.L. because of seepage along the right training wall. These repairs have corrected the seepage. This was completed in 1963.

7) The valve located in the valve box on the upstream slope of the dam was reportedly repaired or replaced. This probably was completed in 1963 in association with the reservoir drawdown.

2.3 OPERATION

Operation records are not available for this dam. The reservoir is usually at the spillway crest level.

2.4 EVALUATION

a. Availability - The information reviewed is readily available from PennDER's File No. 61-7. Additional information was obtained by interviewing the owner's personnel; however, this information is limited to the time period for which the personnel have been working for the owner.
b. Adequacy - The information available is adequate for a Phase I Inspection of this dam; however, it would be advantageous to the owner to pursue through the records of the State School facility and the original design file of the facility to locate any information concerning the original design which may be pertinent to the future operation and safety of the dam. This information should be properly recorded on engineering drawings for future reference.

c. Validity - There is no reason to doubt the validity of the information reviewed.
SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The dam and its appurtenant structures were found to be in fair overall condition at the time of inspection. A dusting of snow had fallen during the weekend preceding the inspection, but this snow had melted by the time of the inspection on 10 December 1979. Noteworthy deficiencies observed during the visual inspection are described briefly in the following paragraphs. The complete visual inspection check list, field sketch, top of dam profile, and typical cross-section are given in Appendix A.

b. Dam - The upstream slope is fairly steep above the reservoir level and minor erosion or surface sloughing has occurred. A tree was observed on the upstream face to the right of the spillway. Also, the upstream slope is covered with shrubs; however, the root system on these shrubs does not present the potential problem that the tree presents. A rodent hole was observed to the right of the valve box beneath the base of one of these shrubs. A sewerline was observed along the downstream edge of the roadway on the crest. This sewer was installed approximately 5.5 feet below the top of dam elevation.

A depression was observed at approximate Station 1+40 (stationing used during the visual inspection is shown on the field sketch in Appendix A). This depression was 11 feet by 12 feet and was 12 inches below the rest of the slope at the deepest point. According to the owner's personnel, a valve on the water supply pipe used to be at the same location as the depression but was later removed. He felt the depression may be the result of removing the valve. It was also observed that an 8 inch steel pipe exits through the stone masonry wall of the spillway discharge channel approximately in line with the depression observed on the dam. This pipe is probably the abandoned blow-off from the water supply pipe which was used in conjunction with the above mentioned valve. Depending on whether the pipe was plugged or left open when the valve was removed, this pipe could carry some of the soil material from the embankment with any seepage/drainage that entered the open ended pipe. It was observed at the discharge end of this pipe.
in the spillway channel that a very minor amount (less than 0.1 g.p.m.) of water was flowing from the pipe. The third and final possible reason for the depression is that poor filling and compaction procedures were used during the flattening of the downstream slope in 1965 and this depression occurred as a result of those procedures.

A depression was also observed at the junction of the embankment and the right spillway training wall (see field sketch). This depression was 5.5 feet by 7 feet and 4 feet deep. The owner's personnel reported that seepage had been occurring along this wall previously (prior to repairs in 1963) and this seepage passed through the masonry stone spillway training wall at this approximate location. The repairs performed have apparently corrected the seepage problem but the depression was not filled.

Adjacent to the right spillway training wall just downstream from the 8.5 foot drop some sloughing and erosion has occurred on the downstream slope. This area was apparently constructed overly steep during the flattening of the downstream slope.

c. Appurtenant Structures - The spillway structure appeared to be in reasonable condition. The right training wall was slightly tilted at the same approximate location as the erosion and sloughing mentioned above under paragraph 3.1.b. By partially cutting back the embankment slope at this location, some of the pressure on the wall may be reduced. Also, the joints in the masonry stone spillway walls appeared to be in need of repointing. This will help prevent the migration of embankment material into the spillway and help prevent water from entering the embankment. A small amount of silt and trash was present at the entrance to the spillway.

The valve box on the upstream slope was partially covered by embankment materials and the inspection cover could not be opened. The valve reportedly has not been operated for several years (estimated time it was last operated was in 1963 for the reservoir drawdown). The intake was submerged and details concerning its construction were not available. The discharge end of the 16 inch corrugated metal pipe was in an acceptable condition. It is estimated that the pipe through the embankment
is not a 16 inch corrugated pipe because of the date of construction of the dam and the fact that a valve is located at the midpoint in the embankment. (Note: During a later phone call to the owner's representative, the size and type of the pipe was discussed and the owner's representative contacted an individual who worked on the valve in 1963. He recalled that the pipe was an 8 or 10 inch cast-iron pipe.)

d. Reservoir Area - The reservoir slopes are relatively flat. The reservoir has been dredged a number of times to remove the sedimentation.

e. Downstream Channel - The downstream channel passes through a stone arch culvert approximately 1000 feet below the dam. This culvert is large enough that it will not restrict the flows from the dam. Located an additional 2300 feet downstream are approximately 25 homes which may suffer economic damage if the dam should fail. However, more potential damage from Little Sandy Creek flood flows is present because these homes are located in the floodplain of Little Sandy Creek. The confluence of Little Sandy Creek and Piffer Run (the local name for the tributary to Little Sandy Creek from the dam) is 2500 feet downstream from the dam. One mile downstream from the dam is the confluence of Little Sandy Creek and Sandy Creek.
SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES
There are no formal written procedures in the event of impending failure of the dam. It is recommended that formal emergency procedures be prepared, prominently displayed, and furnished to all operating personnel.

4.2 MAINTENANCE OF DAM
Maintenance of the dam is the responsibility of the engineering department of the state school and hospital. The embankment is kept well cut during the summer and the shrubs are trimmed when necessary. However, inspection procedures for evaluating the necessity of maintenance and formal records of any maintenance previously performed were not available. It is recommended that formal inspection, maintenance, and record procedures be developed and implemented.

4.3 MAINTENANCE OF OPERATING FACILITIES
Maintenance of the operating facilities has been performed when it has become necessary to use the facilities. However, procedures for evaluating the operability and condition of this facilities should be developed and implemented, and the facilities operated on at least an annual basis.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT
There is no warning procedure in the event of a dam failure. An emergency warning procedure should be developed.

4.5 EVALUATION OF OPERATIONAL ADEQUACY
It is not known whether the valve on the outlet pipe is operational. The condition and operability should be checked.
SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. **Design Data** - No hydrologic or hydraulic design calculations are available for Polk Dam.

b. **Experience Data** - No information concerning the effects of significant floods on the dam is available.

c. **Visual Observation** - At the time of the inspection, no conditions were observed which would seriously affect the functioning of the spillway or dam during a flood event.

There is one low spot on the dam crest (Station 2+00) which is approximately 0.3 foot below the average crest elevation.

d. **Overtopping Potential** - Polk 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 potential damage resulting from failure of the dam is on the low end of the "Significant" hazard - "Small" size categories, the 100-year flood was chosen as the SDF.

Using regression equations developed by the Pittsburgh District of the Corps of Engineers, the peak inflow to the impoundment for the 100-year flood was calculated to be 1070 c.f.s. The run-off hydrograph for this event was then established using the Soil Conservation Service's (SCS) dimensionless unit hydrograph approach. For a curve number of 73, a peak inflow of 1043 c.f.s. was obtained for the 100-year flood. This peak flow is within 3 percent of the peak flow computed previously; therefore, this hydrograph was used for the hydrologic analysis.

The hydraulic capacity of the dam, reservoir, and spillway was then assessed by utilizing the U.S. Army Corps of Engineers Flood Hydrograph Package, HEC-1 DB.

Analyses of the dam and spillway shows that the dam will be overtopped by a maximum of 0.61 foot for a duration of 1.50 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 - There were no structural inadequacies noted during the visual inspection that cause immediate concern for the structural stability of the dam. The localized sloughing and erosion adjacent to the spillway structure can be decreased or stopped by cutting back the slope in this immediate area. This would also reduce the pressure on the spillway wall which has become slightly tilted at this location. The two depressions on the dam do not cause immediate concern for the structural stability because there is no evidence that piping was the cause. It is recommended that these depressions be properly filled and observed periodically in the future to determine if they will reoccur.

b. Design and Construction Data - No design or construction data were available for review. Although it is difficult to assess the structural stability of the embankment without any knowledge of the construction materials and methods, for this particular dam, with the 4H:1V downstream slope and history of satisfactory performance of the upstream slope under previous reservoir drawdowns and the fact that no indications of instability were observed during the field inspection; further assessments of the stability are not considered necessary for this Phase I Inspection Report. However, should future inspections observe signs of distress or seepage which would affect the structural stability of the dam, additional evaluations and corrective measures may become necessary.

c. Operating Records - No operating records are available. Nothing in the procedures described by the owner's representative indicate concern relative to 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 I 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 - Polk Dam was found to be in fair overall condition at the time of inspection. Polk 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. 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 of 0.61 foot for a duration of 1.50 hours. Therefore, the spillway is considered "inadequate."

The depressions and localized sloughing do not indicate immediate concern for the continued structural stability of the dam. It is recommended that the depressions be properly filled and the downstream slope adjacent to the spillway be slightly cut back at the slough. All three areas should be examined in future inspections and their condition recorded.

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

c. Urgency - The owner should initiate the action discussed in paragraph 7.2 without delay and 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 immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

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 by a qualified pro-

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fessional engineer experienced in the design of hydraulic and appurtenant structures for earth dams. These include:

1) The owner should immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

2) Fill the two depressions on the downstream slope of the dam and monitor these areas in future inspections to determine if additional remedial work is necessary.

3) The sloughing and erosion of the downstream slope adjacent to the spillway structure should be repaired. It is recommended that the slope be partially cut back in this area so as to decrease or stop the sloughing and erosion.

4) After the sloughing and erosion noted in item 2 is repaired, the slightly tilted spillway wall should be repaired.

5) The masonry in the spillway structure should be repointed to prevent the migration of embankment material into the spillway and the infiltration of water from the spillway into the embankment.

6) Remove the silt and trash at the entrance to the spillway.

7) Fill the rodent/animal burrow in the embankment.

8) The condition and operability of the outlet works should be examined and any necessary repairs performed.

9) The tree to the right of the spillway on the upstream slope should be removed and the excavated area regraded and compacted.

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, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented.
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  Folk Dam  County  Venango  State  PA  Coordinates  Lat. N 41° 22.5'
            Long. W 79° 55.8'
NDI # PA 00253
PennDER # 61-7

Date of Inspection  10 December 1979  Weather Sunny, mild*  Temperature 35-40° F.
*A light dusting of snow occurred on the weekend before the inspection but most of this had
melted prior to the inspection.

Pool Elevation at Time of Inspection  1093.4** ft.  M.S.L.  Tailwater at Time of Inspection  1074.4** M.S.L.
**All elevations referenced to bridge deck over spillway, Elevation 1100.0 ft.

Inspection Personnel:  
Michael Baker, Jr., Inc.:  
James G. Ulinski
Wayne D. Lasch
Larry A. Diday

Owner's Representatives:
Mr. Adam Gazek (part-time)
Mr. Harry Daye (part-time)

________ James G. Ulinski ________ Recorder
CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: POLK DAM
NDI #: PA 00253

<table>
<thead>
<tr>
<th>VISUAL EXAMINATION OF</th>
<th>OBSERVATIONS</th>
<th>REMARKS OR RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEAKAGE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS |              |
|                                            |              |

| DRAINS | |
|--------||

| WATER PASSAGES | |
|----------------||

| FOUNDATION | |
|------------||
## EMBANKMENT

<table>
<thead>
<tr>
<th>Name of Dam</th>
<th>POLK DAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDI #</td>
<td>PA 00253</td>
</tr>
</tbody>
</table>

### VISUAL EXAMINATION OF SURFACE CRACKS
- None observed

### UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE
- None observed

### SLoughing or erosion of embankment and abutment slopes
- A depression 12 in. deep in the embankment was observed at Station 1+40 (see Field Sketch) on the downstream slope. There are several possible reasons for this: (1) A waterline valve was removed from this location, (2) A void was left in the slope flattening fill in 1965, (3) A hole was left in the abandoned waterline in the embankment.

- The depression should be filled in and graded level with the rest of the slope and observed in the future to see if the depression reoccurs.
**EMBANKMENT**

**Name of Dam**  POLK DAM

**NDI #**  PA 00253

<table>
<thead>
<tr>
<th>VISUAL EXAMINATION OF</th>
<th>OBSERVATIONS</th>
<th>REMARKS OR RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST</td>
<td>The vertical and horizontal alignment of the crest was acceptable. The lowest spot (El. 1099.7 ft.) on the crest was at approximate Station 2+00 (see Field Sketch). This is only 0.3 ft. below the rest of the top of dam.</td>
<td>No recommended action.</td>
</tr>
</tbody>
</table>

| RIPRAP FAILURES | The sandstone rock riprap on the upstream crest has become partially reworked and covered. The upstream slope has some minor erosion; however, this is thought to be the result of slope angle and not the riprap. | No recommended action. |

| RODENT HOLES/ANIMAL BURROWS | A rodent hole/animal burrow was observed on the upstream slope to the right of the valve box and under a bush (see Field Sketch). | The rodent hole/animal burrow should be filled. |
**EMBANKMENT**

**Name of Dam**  POLK DAM  
**NDI #**  PA 00253  

<table>
<thead>
<tr>
<th>VISUAL EXAMINATION OF</th>
<th>OBSERVATIONS</th>
<th>REMARKS OR RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM</td>
<td>No problems were observed on the left and right abutments. Some erosion has occurred along the junction of the right downstream spillway training wall and the embankment (see Field Sketch for location).</td>
<td>The eroded areas should be filled/repai red.</td>
</tr>
<tr>
<td>ANY NOTICEABLE SEEPAGE</td>
<td>None observed</td>
<td></td>
</tr>
<tr>
<td>STAFF GAGE AND RECORDER</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>DRAINS</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>VISUAL EXAMINATION OF</td>
<td>OBSERVATIONS</td>
<td>REMARKS OR RECOMMENDATIONS</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>CRACKING AND SPALLING OF</td>
<td>The 16 in. C.M.P. outlet pipe exiting into the downstream channel was in</td>
<td></td>
</tr>
<tr>
<td>CONCRETE SURFACES IN</td>
<td>good condition. The condition of the 8 or 10 in. cast-iron pipe through</td>
<td></td>
</tr>
<tr>
<td>OUTLET CONDUIT</td>
<td>the embankment is not known.</td>
<td></td>
</tr>
<tr>
<td>INTAKE STRUCTURE</td>
<td>Submerged - no information available</td>
<td></td>
</tr>
<tr>
<td>OUTLET STRUCTURE</td>
<td>No outlet structure as such, the 16 in. C.M.P. exits through the masonry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>stone wall of the downstream channel. No problems observed at this location.</td>
<td></td>
</tr>
<tr>
<td>OUTLET CHANNEL</td>
<td>No outlet channel, the pipe discharges into the downstream channel.</td>
<td></td>
</tr>
<tr>
<td>EMERGENCY GATE</td>
<td>The valve box on the upstream slope was not in a condition where the</td>
<td>The owner should check the operability of the valve and perform any</td>
</tr>
<tr>
<td></td>
<td>inspection plate could be opened. The valve has reportedly not been used</td>
<td>necessary maintenance.</td>
</tr>
<tr>
<td></td>
<td>since the last drawdown of the reservoir in 1963.</td>
<td></td>
</tr>
</tbody>
</table>
## UNGATED SPILLWAY

**Name of Dam:** POLK DAM  
**NDI #: PA 00253**

<table>
<thead>
<tr>
<th>VISUAL EXAMINATION OF</th>
<th>OBSERVATIONS</th>
<th>REMARKS OR RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONCRETE WEIR</strong></td>
<td>The spillway structure consists of masonry stone (sandstone) blocks.</td>
<td>Repoint the joints of the spillway structure.</td>
</tr>
<tr>
<td><strong>APPROACH CHANNEL</strong></td>
<td>A small amount of silt and trash was present at the entrance to the spillway.</td>
<td>Remove the silt and trash at the entrance to the spillway.</td>
</tr>
<tr>
<td><strong>DISCHARGE CHANNEL</strong></td>
<td>A relatively insignificant amount of debris and silt has collected in the discharge channel.</td>
<td></td>
</tr>
<tr>
<td><strong>BRIDGE AND PIERS</strong></td>
<td>A two lane road constructed on a concrete bridge deck runs over the spillway. The bridge deck is in good overall condition. The masonry blocks forming the bridge piers and spillway walls have undergone some minor shifts but the overall alignment and condition is good.</td>
<td></td>
</tr>
</tbody>
</table>
**Name of Dam:**  POLK DAM  

**NDI #:** PA 00253  

---

### VISUAL EXAMINATION OF

<table>
<thead>
<tr>
<th>CONCRETE SILL</th>
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<table>
<thead>
<tr>
<th>APPROACH CHANNEL</th>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>DISCHARGE CHANNEL</th>
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<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>BRIDGE AND PIERS</th>
</tr>
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<tr>
<td></td>
</tr>
<tr>
<td>MONUMENTATION/SURVEYS</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>OBSERVATION WELLS</strong></td>
</tr>
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<td></td>
</tr>
<tr>
<td><strong>WEIRS</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>PIEZOMETERS</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>OTHER</strong></td>
</tr>
<tr>
<td>VISUAL EXAMINATION OF</td>
</tr>
<tr>
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</tr>
<tr>
<td>SLOPES</td>
</tr>
<tr>
<td>SEDIMENTATION</td>
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</table>
**DOWNSTREAM CHANNEL**

<table>
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<tr>
<th>Name of Dam:</th>
<th>POLK DAM</th>
</tr>
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<tr>
<td>NDI #: PA 00253</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition (Obstructions, Debris, Etc.)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>The masonry stone discharge channel</td>
<td>The masonry stone discharge channel from the spillway continues for approximately 270 ft. straight in plan view from the 8 ft. drop before turning downstream. At this approximate location, the masonry stone lining stops and the natural streambed begins. An additional 700 ft. downstream is a stone arch culvert which is capable of passing the flows from the dam.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SLOPES</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>The side slopes are relatively flat and the channel slope is mild.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approximate No. of Homes and Population</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximately 2300 ft. downstream from the dam there are approximately 25 homes which may suffer economic damage in the event of a dam failure; however, loss of life due to the dam failure is unlikely. These homes also appear to be located within the floodplain of Little Sandy Creek.</td>
<td></td>
</tr>
</tbody>
</table>
FIELD SKETCH
POLK DAM
NDI NO. PA 00253
PennDER NO. 61-7
INSPECTED 10 DECEMBER 1979
SCHEMATIC - NOT TO SCALE
POLK DAM
TOP OF DAM PROFILE
TYPICAL CROSS-SECTION

DATE OF INSPECTION - 10 December 1979

Crest Profile

Bridge Deck over Spillway (EL. 1100.0 ft)

Minimum Crest Elevation = 1099.7 ft

Note: Spillway Dimensions are given for center section located on upstream side of bridge deck

Elevation (ft)

1100

1075

1090

0+00 1+00 2+00 3+00 4+00
Station (ft)

Cross Section at Station 2+00

Average Slope = 3V:5H

Average Slope = 4V:4H

Elevation (ft)

1100

1070

1080

0+00 0+50 1+00 1+50
Station (ft)
APPENDIX B

ENGINEERING DATA CHECK LIST
**CHECK LIST**
**ENGINEERING DATA**
**DESIGN, CONSTRUCTION, OPERATION**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLAN OF DAM</strong></td>
<td>See Plate 3 and the Field Sketch of this report.</td>
</tr>
<tr>
<td><strong>REGIONAL VICINITY MAP</strong></td>
<td>The USGS 7.5 minute topographic quadrangles, Polk and Utica, Pennsylvania, where used to prepare the vicinity map which is enclosed in this report as the Location Plan (Plate 1).</td>
</tr>
<tr>
<td><strong>CONSTRUCTION HISTORY</strong></td>
<td>No construction history is known. The state facilities at the site were constructed circa 1895 and it is possible that the dam was constructed for water supply at that time.</td>
</tr>
<tr>
<td><strong>TYPICAL SECTIONS OF DAM</strong></td>
<td>See Appendix A for typical cross-section.</td>
</tr>
<tr>
<td><strong>HYDROLOGIC/HYDRAULIC DATA</strong></td>
<td>No information available</td>
</tr>
<tr>
<td><strong>OUTLETS - PLAN</strong></td>
<td>See Field Sketch for location</td>
</tr>
<tr>
<td><strong>DETAILS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>CONSTRAINTS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>DISCHARGE RATINGS</strong></td>
<td>No information available</td>
</tr>
<tr>
<td><strong>RAINFALL/RESERVOIR RECORDS</strong></td>
<td>None available</td>
</tr>
</tbody>
</table>
**Name of Dam:** POLK DAM
**NDI #: PA 00253**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
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</thead>
<tbody>
<tr>
<td>DESIGN REPORTS</td>
<td>None available</td>
</tr>
<tr>
<td>GEOLoGY REPORTS</td>
<td>None available, see Appendix F for regional geology.</td>
</tr>
<tr>
<td>DESIGN COMPUTATIONS</td>
<td>None available</td>
</tr>
<tr>
<td>HYDROLOGY &amp; HYDRAULICS</td>
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<tr>
<td>DAM STABILITY</td>
<td></td>
</tr>
<tr>
<td>SEEPAGE STUDIES</td>
<td></td>
</tr>
<tr>
<td>MATERIALS INVESTIGATIONS</td>
<td>None available</td>
</tr>
<tr>
<td>BORING RECORDS</td>
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<td>LABORATORY</td>
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<td>FIELD</td>
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<tr>
<td>POST-CONSTRUCTION SURVEYS OF DAM</td>
<td>None available</td>
</tr>
<tr>
<td>BORROW SOURCES</td>
<td>No information available</td>
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</table>
Name of Dam: POLK DAM
NDI 0 PA 00253

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITORING SYSTEMS</td>
<td>None</td>
</tr>
<tr>
<td>MODIFICATIONS</td>
<td>The road which is located on the crest of the dam was originally brick or block-lined; the road currently consists of oil and chip. The downstream slope was flattened in 1965. In 1970 a waterline which runs parallel to the crest in the downstream slope was replaced by a waterline downstream from the toe. The pool was partially drawdown in 1946 or 1947. The reservoir was dredged by Hasbrook Construction Company in the summer of 1963.</td>
</tr>
<tr>
<td>HIGH POOL RECORDS</td>
<td>No information available</td>
</tr>
<tr>
<td>POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS</td>
<td>Inspections of the dam were performed on (1) 20 August 1919, (2) 2 May 1924, (3) 4 August 1925, (4) 6 October 1965, and (5) 19 January 1966. These inspection reports are available in the PennDER file.</td>
</tr>
<tr>
<td>PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS</td>
<td>None</td>
</tr>
<tr>
<td>MAINTENANCE OPERATION RECORDS</td>
<td>The engineering department of the state hospital has maintained the dam on an as-needed basis. Formal records of the maintenance are not available.</td>
</tr>
</tbody>
</table>
Name of Dam: POLK DAM
NDI #: PA 00253

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>SPILLWAY PLAN</td>
<td>See Field Sketch and Plate 3.</td>
</tr>
<tr>
<td>SECTIONS and DETAILS</td>
<td>No information available</td>
</tr>
<tr>
<td>OPERATING EQUIPMENT</td>
<td>No information available</td>
</tr>
<tr>
<td>PLANS &amp; DETAILS</td>
<td></td>
</tr>
</tbody>
</table>
CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.43 sq.mi. (primarily forests and pastures)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1093.0 ft. (51.6 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1099.7 ft. (115.0 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1099.7 ft. (minimum crest elevation)

SPILLWAY: Principle
   a. Crest Elevation 1093.0 ft.
   b. Type Open channel
   c. Width of Crest Parallel to Flow 25 ft.
   d. Length of Crest Perpendicular to Flow 10.5 ft.
   e. Location Spillover Left abutment
   f. Number and Type of Gates None

OUTLET WORKS: Facilities for dewatering reservoir
   a. Type 8 or 10 in. cast-iron pipe; 16 in. C.M.P. at exit
   b. Location Station 3+08 on Field Sketch
   c. Entrance Inverts Unknown
   d. Exit Inverts El. 1079.68 ft.
   e. Emergency Drawdown Facilities Valve located inside 3 ft. x 3 ft. concrete box on upstream slope

HYDROMETEOROLOGICAL GAGES: None
   a. Type
   b. Location
   c. Records

MAXIMUM NON-DAMAGING DISCHARGE No records available
APPENDIX C

PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS
DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View - View of the Dam from the Right Abutment. The Spillway is Located at the Left Abutment.

Photograph Location Plan

Photo 1 - View of the Upstream Slope of Dam from the Right Shoreline

Photo 2 - View of the Downstream Slope of Dam from the Right Abutment

Photo 3 - View of the Entrance to the Spillway

Photo 4 - View of the Spillway and Bridge Looking Upstream

Photo 5 - View of the Spillway Discharge Channel Looking Upstream

Photo 6 - View of the Discharge Channel Looking Upstream (Note: Blow-off valve in left of photo is the same as shown in Photo 8)

Photo 7 - View of Outlet Works Valve Box on Upstream Slope

Photo 8 - View of Outlet Pipe Discharge Location into Downstream Channel (Note: The corrugated metal pipe exiting through the channel wall. The blow-off at the left of the photo is for a water supply pipe which passes downstream from the dam)

Photo 9 - View of Eroded Area on the Right Downstream Side of the Spillway Structure

Photo 10 - View of Sinkhole on the Right Side of the Spillway Training Wall

Photo 11 - View of Depression on the Downstream Slope (Note: cast-iron pipe exiting at base of wall where the ruler is located)

Photo 12 - Another View of the Depression on the Downstream Slope (Where ruler is located)

Note: Photographs were taken on 10 December 1979.
POLK DAM

PHOTO 1. View of the Upstream Slope of Dam from the Right Shoreline

PHOTO 2. View of the Downstream Slope of Dam from the Right Abutment
POLK DAM

PHOTO 3. View of the Entrance to the Spillway

PHOTO 4. View of the Spillway and Bridge Looking Upstream
PHOTO 5. View of the Spillway Discharge Channel Looking Upstream

PHOTO 6. View of the Discharge Channel Looking Upstream
PHOTO 7. View of Outlet Works Valve Box on Upstream Slope

PHOTO 8. View of Outlet Pipe Discharge Location
(The outlet pipe is the corrugated metal pipe exiting through the channel wall)
PHOTO 9. View of Eroded Area on the Right Downstream Side of the Spillway Structure

PHOTO 10. View of the Sinkhole on the Right Side of the Spillway Training Wall
PHOTO 11. View of Depression on the Downstream Slope (Note cast-iron pipe exiting at base of wall where the ruler is located.)

PHOTO 12. Second View of the Depression on the Downstream Slope (where ruler is located)
APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS
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<thead>
<tr>
<th>SUBJECT</th>
<th>PAGE</th>
</tr>
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<tr>
<td>PREFACE</td>
<td>6</td>
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<tr>
<td>HYDROLOGY AND HYDRAULIC DATA BASE</td>
<td>1</td>
</tr>
<tr>
<td>HYDRAULIC DATA</td>
<td>2</td>
</tr>
<tr>
<td>DRAINAGE AREA AND CENTROID MAP</td>
<td>3</td>
</tr>
<tr>
<td>DAM CREST PROFILE AND CROSS SECTION</td>
<td>4</td>
</tr>
<tr>
<td>SPILLWAY PROFILE AND DISCHARGE RATING</td>
<td>5</td>
</tr>
<tr>
<td>100-YEAR STORM DISTRIBUTION</td>
<td>6</td>
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<tr>
<td>100-YEAR PEAK FLOW CALCULATION</td>
<td>7</td>
</tr>
<tr>
<td>HEC-1 COMPUTER ANALYSIS</td>
<td>9</td>
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</tbody>
</table>
PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.
NAME OF DAM: POLK DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 23.2 INCHES/24 HOURS(1)

<table>
<thead>
<tr>
<th>STATION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station Description</td>
<td>POLK DAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage Area (square miles)</td>
<td>1.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative Drainage Area (square miles)</td>
<td>1.43</td>
<td></td>
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</tr>
</tbody>
</table>

Adjustment of PMF for Drainage Area (%) Note: 100-year rainfall was obtained from TP-40(3)
- 6 Hours: 117
- 12 Hours: 127
- 24 Hours: 141
- 48 Hours: 151
- 72 Hours: 153

Soil Conservation Service

Hydrograph Parameters
- Tc (hours): 73
- Lag (hours)
- Curve Number: 1,043
- Peak Discharge (cfs)
- Estimated Peak Discharge by the Pittsburgh District Method (cfs): 1,070

Spillway Data
- Crest Length (ft): 10.5
- Freeboard (ft): 5.3
- Discharge Coefficient
- Exponent (Spillway discharge rating developed on sheet 5)

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.
(2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.
(3) TP-40 Rainfall Frequency Atlas of the United States (Table 3 and Charts 1-49), United States Weather Bureau, 1963.
**STORAGE CALCULATIONS:**

**AREA VS ELEVATION DATA:** (MEASURED FROM QUADS)

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>SURFACE AREA (ACRES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1093.0</td>
<td>7.65</td>
</tr>
<tr>
<td>1100.0</td>
<td>11.63</td>
</tr>
<tr>
<td>1120.0</td>
<td>11.57</td>
</tr>
</tbody>
</table>

**NOTE:** NORMAL POOL ASSUMED TO BE AT ELEVATION OF CONTROL SECTION IN SPILLWAY CREST (1093.0 ft)

**NORMAL POOL STORAGE:**

\[
V_{np} = \frac{1}{3} \left( A_1 + A_2 + \sqrt{A_1 A_2} \right)
\]

\[
V = \text{ESTIMATED AVERAGE DEPTH} = 7.03 \text{ ft}
\]

\[
A_1 = \text{SURFACE AREA OF NORMAL POOL} = 7.65 \text{ Ac}
\]

\[
A_2 = \text{SURFACE AREA OF RESERVOIR BOTTOM} = 7.10 \text{ Ac}
\]

\[
A_2 = \text{ESTIMATED FROM AVERAGE DEPTH AND RESERVOIR SIDE SLOPES}
\]

**NORMAL POOL STORAGE**

\[
V_{np} = \frac{7}{3} \left( 7.65 + 7.10 + \sqrt{(7.65)(7.10)} \right)
\]

\[
V_{np} = 51.61 \text{ Ac} \text{ ft}^3
\]

**TOP OF DAM STORAGE**

115.0 Ac ft³ (FROM HEC-1 ANALYSIS)
Crest Profile

Bridge deck over spillway (Elev. 1100.0')

Minimum crest elev. = 1097.7'

Note: Spillway dimensions are given for control section located on upstream face of bridge deck.

Elevation (ft)

Cross Section at Station 2+00

El. 1097.7'

Average slope = 3V:5H

Average slope = 1V:4H

Elevation (ft)

Station (ft)
**Spillway Profile**

For open channel flow under bridge deck, calculate discharge rating assuming center flow at control section (from Chow, Open Channel Hydraulics, P.43):

\[ V = \sqrt{\frac{q}{D}} \]

\[ D = \text{mean hydraulic depth} = \frac{\text{flow area}}{\text{width}} \]

\[ q = 32.2 \text{ ft}^3/\text{sec} \]

\[ Q = VA \]

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elevation (ft)</th>
<th>F^2/Fc</th>
<th>A (ft²)</th>
<th>Q (cfs)</th>
<th>V²/F²</th>
<th>E (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>1093.1</td>
<td>1.79</td>
<td>1.05</td>
<td>1.88</td>
<td>0.05</td>
<td>1093.15</td>
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<td>0.5</td>
<td>1093.5</td>
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<td>21.05</td>
<td>0.25</td>
<td>1093.75</td>
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<tr>
<td>1.0</td>
<td>1094.0</td>
<td>5.67</td>
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<td>51.54</td>
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<td>1094.50</td>
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<tr>
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<tr>
<td>5.0</td>
<td>1098.0</td>
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<td>52.50</td>
<td>646.23</td>
<td>2.50</td>
<td>1100.50</td>
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</tbody>
</table>
Subject: **Rock Dam**  
100-Year Storm Distribution  
Sheet No. 6 of 13

Computed by: WDL  
Checked by:  
Date: 3-3-80

**100-Year Rainfall Amounts from TP-40:**

- 30 min.: 1.9 in.
- 1 hr.: 2.4 in.
- 2 hr.: 2.9 in.
- 3 hr.: 3.2 in.
- 6 hr.: 3.8 in.
- 12 hr.: 4.6 in.
- 24 hr.: 4.9 in.

**Hyetograph for 100-Year Rainfall:**

**Rainfall Distribution:**

<table>
<thead>
<tr>
<th>Rainfall Intervals (30 min.)</th>
<th>% Total of Occurrence in Each Interval</th>
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</thead>
<tbody>
<tr>
<td>1 - 17</td>
<td>0.3</td>
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<tr>
<td>18 - 25</td>
<td>1.4</td>
</tr>
<tr>
<td>26 - 29</td>
<td>2.0</td>
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<tr>
<td>30</td>
<td>3.1</td>
</tr>
<tr>
<td>31</td>
<td>5.1</td>
</tr>
<tr>
<td>32</td>
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<td>33</td>
<td>38.1</td>
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<tr>
<td>34</td>
<td>5.1</td>
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<td>35</td>
<td>3.1</td>
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<tr>
<td>36 - 37</td>
<td>2.0</td>
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<tr>
<td>38 - 41</td>
<td>1.4</td>
</tr>
<tr>
<td>42 - 48</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Total = 100%
THE INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD WAS CALCULATED USING MATERIAL DEVELOPED BY THE PITTSBURGH DISTRICT OF THE CORPS OF ENGINEERS FOR THE OHIO RIVER BASIN.

\[
Q_{100} = 120.38 \left( \frac{D.A.}{3.14} \right)^{0.74410}
\]

\[D.A. = \text{Drainage Area} = 1.43 \text{ m}^2\]

\[S = \text{Channel slope for the lower 0.7 of the watershed}\]
\[S = 174.6 \text{ ft/m} \]

\[
Q_{100} = 120.38 \left[ (1.43)(174.6)^{0.74410} \right]
\]

\[
Q_{100} = 1072 \text{ cfs}
\]

Using design loss rates, a peak flow of only 478 cfs was obtained in the recession analysis of the Snyder's Unit Hydrograph parameters originally derived for this basin were used.

The 100-year flood hydrograph is therefore computed using the SCS, dimensionless unit hydrograph approach. Time of Concentration and lag time are computed as follows:

\[
T^* = \text{Time of Concentration} = \text{Overland Flow Time} + \text{Channel Flow Time}
\]

\[
\text{Overland Flow Time} = \\
\text{Distance} = 1700 \text{ ft} \]
\[
\text{Slope} = 0.018
\]
\[
\text{Average Flow Velocity} = 0.76 \text{ ft/sec} \]

(From Fig. 3.1, TR. No. 35, Urban Hydrology for Small Watersheds, SCS.)

\[
\text{Travel Time} = 2500 \text{ sec}
\]
CHANNEL FLOW TIME:

DISTANCE = 6600 ft
SLOPE = 0.048

ASSUME AVERAGE CHANNEL STEE = 1.5

\[ \frac{1}{n} = \frac{1}{3} \]

\[ n = 0.75 \]

AVERAGE FLOW VELOCITY, \( V \) : \[ \frac{1}{V} = \frac{1.99}{0.048} \left( \frac{(3+3)^{1/2}}{3+4(1+9)} \right) (0.048)^{1/2} \]

\[ V = 0.35 \text{ ft/sec} \]

TRAVEL TIME, \( T \) : \[ T = 1039 \text{ sec} \]

TOTAL TRAVEL TIME, \( T_r \) : \[ T_r = 1039 + 3500 \times 3539 \text{ sec} \]

\[ T_r = 0.98 \text{ hrs} \]

LAG TIME, \( t_l \) : \[ t_l = 0.6 T_r = 0.59 \text{ hrs} \]

WITH THE SCS PROCEDURE, A CURBIE NUMBER OF 73 PRODUCED A PEAK FLOW OF 10565. THIS VALUE IS WITHIN 3% OF THE PREVIOUSLY COMPUTED PEAK FLOW OF 1076 AND IS WITHIN THE 10% LIMIT SUGGESTED BY CORPS GUIDELINES.
FLUID HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 JUN 79
MAJ UPDATE 04 JUN 79

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSES OF PULP DAM
UNIT HYDROGRAPH BY SCS METHOD

SUB SPECIFICATION
NQ NH X NMIN EDAY LHMIN LMIN METAL JPLT JPR 1 NSTM
300 0 30 0 0 0 0 0 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NLX= 1 LRIG= 1

RITUS= 1.00

SUB-AREA RUNOFF COMPUTATION

RUNOFF HYDROGRAPH TO DAM
ISTAQ ICMP ICOD ITAPE JPLT JPR 1 INAME ISAME IAUTO
1 0 0 0 0 1 1 0 0

HYDROGRAPH DATA
IMDG ITUG TAREA SNAP TRSA TRSPC KATIO 15NUM ISAME ILOCAL
0 2 1.43 0.0 1.43 0.0 0.0 0.0 1 0 1 0

LOSS DATA
LRRP SIRK DLTR RTIG ERTN REFERENCES SMRT LRST LRMN ALMR KMTR
0 0.0 0.0 1.00 0.0 0.0 1.00 -1.00 -73.00 0.0 0.0

CURVE NO = -73.00 WRENESS = -1.00 EFFECT CN = 0.50

UNIT HYDROGRAPH DATA
TC= 0.9 146= 0.54

RECESSION DATA
STR= 0.5 MRTC= 0.05 KMTR= 2.00

END-OF-PERIOD FLOW
Q MO DA HR MM PERIOD .RAIN EXCS LOSS LUMP Q MO DA HR MM PERIOD .RAIN EXCS LOSS LUMP Q

SUM 9.90 2.20 2.20 0.00
1 124.34 60.14 60.14 136.14
**HYDROGRAPH ROUTING**

**RUNOUT FOR PUMA DAM**

<table>
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<tr>
<th>STAGE</th>
<th>1095.00</th>
<th>1095.15</th>
<th>1095.75</th>
<th>1096.50</th>
<th>1097.00</th>
<th>1097.50</th>
<th>1098.00</th>
<th>1099.00</th>
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<td>FLOW</td>
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<td>1.88</td>
<td>21.65</td>
<td>59.94</td>
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<td>SURFACE AREA</td>
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<td>1093.4</td>
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**DAM DATA**

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<tr>
<th>TIME</th>
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<td>CREST LENGTH AT OR BELOW</td>
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<td>1.5</td>
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<tr>
<td>CREST LENGTH</td>
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<td>1100.0</td>
</tr>
<tr>
<td>PEAK U/SFLOW IS</td>
<td>471.0</td>
<td>AT TIME 1800 HOURS</td>
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</table>

**NOTE:** A Dammed Value of 272.42 ft was used for the design analysis. This is the length of dam crest subject to active overtopping.
<table>
<thead>
<tr>
<th>OPERATION</th>
<th>STATION</th>
<th>AREA</th>
<th>PLAN RATIO</th>
<th>1.00</th>
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<tr>
<td>HYDROGRAPH AT</td>
<td>1</td>
<td>1.43</td>
<td>1043</td>
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</tr>
<tr>
<td>ROUTED TO</td>
<td>2</td>
<td>1.43</td>
<td>471</td>
<td>3.70</td>
</tr>
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</table>
**SUMMARY OF DAM SAFETY ANALYSIS**

<table>
<thead>
<tr>
<th>PLAN</th>
<th>**********</th>
<th>ELEVATION</th>
<th>INITIAL VALUE</th>
<th>SPILLWAY CREST</th>
<th>TOP OF DAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1093.00</td>
<td>1093.00</td>
<td>1097.10</td>
<td>1099.10</td>
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</table>

<table>
<thead>
<tr>
<th>RATIO OF RESERVOIR</th>
<th>MAXIMUM RESERVOIR DEPTH</th>
<th>MAXIMUM STORAGE</th>
<th>MAXIMUM OUTFLOWS</th>
<th>DURATION</th>
<th>TIME OF FAILURE</th>
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</thead>
<tbody>
<tr>
<td>PHB</td>
<td>M.S.ELEV. OVER DAM</td>
<td>AL-FI</td>
<td>LPS</td>
<td>HOURS</td>
<td>HOURS</td>
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<td>0.61</td>
<td>122</td>
<td>421</td>
<td>1.90</td>
</tr>
</tbody>
</table>
APPENDIX E

PLATES
CONTENTS

Plate 1 - Location Plan
Plate 2 - Watershed Map
Plate 3 - Relocation of Waterline
APPENDIX F

REGIONAL GEOLOGY
Polk Dam is located in the glaciated section of the Appalachian Plateaus Physiographic Province. Bedrock units below the glacial soils are members of the Pocono group, Pennsylvanian system. Regionally, these gently dipping strata are sandstone and conglomerates which are generally hard, gray, and massive with shale seams. However, no site exploration data, i.e., test pits or borings, were available for review.

Geologic references indicate that the dam is located on outwash deposits. An old well log record in the general vicinity of the dam indicates approximately 30 feet of sand and gravel overlying bedrock. The end of the Wisconsin advance is shown 1.5 miles to the west of the dam and the hills to the north and west of the dam are indicated as the inner phase ground moraine of the Illinoian stage.
LEGEND

PERMIAN

Greene Formation
Cyclic sequence of sandstone, shale, and coal; fractures and coal line at the top of the Upper Washington Formation.

PERMIAN AND PENNSYLVANIAN

Washington Formation
Cyclic sequence of sandstone, shale, limestone, and coal; sandstone massive in northern sections, shale and coal; limestone and coal present, base at the top of the Waynesburg Coal.

PENNSYLVANIAN

APPALACHIAN PLATEAU

Monongahela Formation
Cyclic sequence of sandstone, shale, and coal; sandstone massive in northern sections, shale and coal; limestone and coal present, base at the bottom of the Pittsburgh Coal.

Conemaugh Formation
Cyclic sequence of sandstone, shale, and coal; sandstone massive in northern sections, shale and coal; limestone and coal present, base at the bottom of the Pittsburgh Coal.

Allegheny Group
Cyclic sequence of sandstone, shale, and coal; sandstone massive in northern sections, shale and coal; limestone and coal present, base at the bottom of the Pittsburgh Coal.

Pottsville Group
Predominantly sandstone and conglomerate with thin shale and coal; some coal measure locally.

ANTHRACITE REGION

Pottsville Formation
Predominantly sandstone and conglomerate with thin shale and coal measure locally.

MISSISSIPPIAN

Mauch Chunk Formation
Rift shale with sandstone for greater part; sandstone, shale, and coal measure locally.

Pennsylvanian Group
Predominantly sandstone, shale, and coal measure locally. Includes the Allegheny, Monongahela, Conemaugh, and Waynesburg formations.
DATED
FILMED
-8