OHIO RIVER BASIN
BRANCH OF PETERS CREEK, WASHINGTON COUNTY
PENNSYLVANIA

LAKE JO-ANN DAM
NDI No. PA 00504
PennDER No. 63-60

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MICHAEL BAKER, JR., INC.

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

May 1980
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Verified by:
Mr. C. V. H. P.
OHIO RIVER BASIN

LAKE JO-ANN DAM (BRACCO DAM)
WASHINGTON COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00504
PennDER No. 63-60

PHASE I INSPECTION REPORT
NATIONAL DAM PROGRAM

Lake Jo-Ann Dam (BRACCO DAM)
NDI Number PA 00504, PennDER No. 63-60
Ohio River Basin Branch of Peters Creek, Washington County, Pennsylvania

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

By: John A. Dziubek

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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

Lake Jo-Ann Dam, Washington County, Pennsylvania
NDI No. PA 00504, PennDER No. 63-60
Inspected 28 March 1980

ASSESSMENT OF GENERAL CONDITIONS

Lake Jo-Ann Dam, formerly known as Bracco Dam, is classified as a "High" hazard - "Small" size dam. The dam and reservoir, owned by Mr. Daniel Carapellucci, Sr., are used for recreational purposes. The dam was found to be in fair overall condition at the time of the 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 pass 27.5 percent of the Probable Maximum Flood (PMF) before overtopping of the dam occurs. A spillway design flood (SDF) in the range of the 1/2 Probable Maximum Flood (1/2 PMF) to the PMF is required for Lake Jo-Ann Dam. Because the dam is on the low end of the "Small" size category, the 1/2 PMF was selected as the SDF. It was determined that during the 1/2 PMF the embankment would be overtopped by a maximum depth of 0.89 foot and a total duration of 5.00 hours. Because a limiting criteria of one foot or greater of overtopping and duration in excess of 2 hours was estimated for this dam, it was concluded that a dam failure during the 1/2 PMF is unlikely to occur. Therefore, the spillway is considered to be "inadequate" but not "seriously 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.

The inspection and review of information revealed certain items of work which should be performed without delay by the owner. Items 1 through 5 should be completed under the direction of a qualified professional engineer experienced in the design of hydraulic and appurtenant structures for earth dams.

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

3) Repair the left spillway training wall immediately downstream from the spillway weir where it is being undermined.

4) Remove the tree growing on the right side of the discharge channel immediately downstream from the weir which is pushing the discharge channel training wall out of place. The training wall should also be repaired and the clear seepage flow at this point should be monitored.

5) Remove the trees which are growing within 20 feet of the spillway structure. Trees outside of this area do not present any problems because of the large crest width of the dam, making their removal unnecessary.

6) Repair the spalled areas on the spillway weir.

7) The spillway discharge channel should be cleared of debris and vegetation and repaired. The undermined area at the downstream end of the channel should be filled and repaired.

8) The eroded area at the junction of the embankment and the right spillway training wall should be filled. In addition, it is advisable that the owner attempt to maintain a cover of grass or crushed stone on the upstream face of the embankment to prevent the minor erosion presently occurring.

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 rainfall, 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, operation, and record-keeping procedures be developed and implemented.
LAKE JO-ANN DAM

Submitted by:

MICHAEL BAKER, JR., INC.

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

Date: 8 May 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer
Date: 28 May 1980
LAKE JO-ANN DAM

View of the Upstream Face of the Embankment Looking from the Center of the Dam to the Left Abutment

View of the Upstream Face of the Embankment Looking from the Spillway to the Right Abutment
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1 - Project Information</td>
<td>1</td>
</tr>
<tr>
<td>Section 2 - Engineering Data</td>
<td>6</td>
</tr>
<tr>
<td>Section 3 - Visual Inspection</td>
<td>8</td>
</tr>
<tr>
<td>Section 4 - Operational Procedures</td>
<td>10</td>
</tr>
<tr>
<td>Section 5 - Hydraulic/Hydrologic</td>
<td>11</td>
</tr>
<tr>
<td>Section 6 - Structural Stability</td>
<td>13</td>
</tr>
<tr>
<td>Section 7 - Assessment, Recommendations/Remedial Measures</td>
<td>14</td>
</tr>
</tbody>
</table>

## APPENDICES

- **Appendix A** - Visual Inspection Check List, Field Sketch, Top of Dam Profile, and Typical Cross-Section
- **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  
LAKE JO-ANN DAM (BRACCO DAM)  
NDI No. PA 00504, PennDER No. 63-60  

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 - Lake Jo-Ann Dam, formerly known as Bracco Dam, is an earthfill embankment 515 feet long. The height of the dam is 15.6 feet, measured from the minimum crest elevation to the streambed at the downstream end of the spillway. The crest width of the embankment ranges from a minimum of 100 feet to as much as 200 feet. Because the crest of the embankment extends for such a long distance downstream, there is no distinguishable downstream toe or face to the dam. The slope of the upstream face is 4H:1V (Horizontal to Vertical).  

The spillway, located approximately 120 feet from the left abutment, consists of a sandstone block weir 52.5 feet wide (see Appendix D, Sheet 5, for spillway profile). The top width of the weir, parallel to the direction of flow, is 2.5 feet. The upstream face of the weir is vertical and approximately 13 feet high. The downstream face is slightly rounded with an overall slope of 4H:1V. There is a 3.5 foot drop from the crest of the weir to the discharge channel on the downstream side of the weir.  

The spillway training walls are an average of 2.5 feet thick and are constructed of rough sandstone blocks mortared together. These walls extend a minimum of 3.6 feet above the crest of the weir.  

1
A grouted rock discharge channel with a 13 percent slope extends 45 feet downstream from the crest of the weir. Sandstone blocks, with some concrete block additions, form the training walls for the discharge channel. At the end of the discharge channel, there is a 3 foot drop to an earth-lined trapezoidal channel which extends 200 feet downstream. At that point, flow passes through a 48 inch corrugated metal pipe under a small bridge and on to the natural stream channel.

The outlet works for the dam consist of a 24 inch corrugated metal pipe located at the base of the upstream face of the spillway weir. A 24 inch slide gate located on the upstream face of the weir controls the outlet works. The pipe was intended to discharge into the spillway discharge channel; however, modifications made to the discharge channel have blocked the outlet of the pipe.

b. Location - Lake Jo-Ann Dam is located in Peters Township, Washington County, Pennsylvania, on an unnamed tributary to Peters Creek. The structure is located approximately 3800 feet upstream of Venetia, Pennsylvania. The coordinates of the dam are N 40° 15.4' and W 80° 02.8'. The dam and reservoir can be located on the USGS 7.5 minute topographic quadrangle, Bridgeville, Pennsylvania.

c. Size Classification - The height of the dam is 15.6 feet and the reservoir volume at the top of the dam is 187 acre-feet. The dam is therefore in the "Small" size category.

d. Hazard Classification - Loss of life and moderate economic damage is likely to result from a failure of the dam since there are several residential structures located immediately downstream. The dam is therefore considered to be in the "High" hazard category.

e. Ownership - The dam and reservoir are owned by Mr. Daniel Carapellucci, Sr., 1827 Ridge Road, Library, Pennsylvania 15129.

f. Purpose - The reservoir is used for fishing and other recreational purposes.

g. Design and Construction History - The dam was designed and built for Joseph Bracco in 1950. Mr. Mose Smith, P.E., of Pittsburgh, Pennsylvania, performed the design work for the dam. The design
plan, included as Plate 3 in the report, is the only information available concerning the dam. Modifications made to the design plan are discussed in Section 2.

h. Normal Operational Procedures - The present owner of the dam has not attempted to operate the outlet works since he purchased the dam 10 to 12 years ago. The reservoir is typically at the spillway crest elevation (Elevation 1033.0 feet Mean Sea Level [M.S.L.]).

The owner maintains a small office and store at the site of the dam. As a result, he frequently inspects the embankment and spillway.

1.3 PERTINENT DATA

a. Drainage Area (square miles) - 1.62

b. Discharge at Dam Site (c.f.s.) -

Spillway Capacity at Minimum Top of Dam (El. 1036.4 ft. M.S.L.) 988

c. Elevation (feet above M.S.L.) -

Design Top of Dam - 1037.0¹
Minimum Top of Dam - 1036.4
Average Top of Dam - 1036.8
Maximum Design Pool - Unknown
Normal Pool - 1033.0
Crest of Weir - 1033.0
Maximum Tailwater - Unknown

d. Reservoir (feet) -

Length of Maximum Pool - 1720
Length of Normal Pool - 1670

e. Storage (acre-feet) -

Normal Pool (El. 1033.0 ft. M.S.L.) - 125
Top of Dam (El. 1036.4 ft. M.S.L.) - 187

¹Elevations shown on the design plan for the dam are 112 feet higher than those estimated on the USGS quadrangle for the area. All elevations listed in this report are referenced to the spillway crest elevation of 1033.0 feet M.S.L. measured on the USGS quad.
f. Reservoir Surface (acres) -
   Top of Dam (El. 1036.4 ft. M.S.L.) - 24.1
   Normal Pool (El. 1033.0 ft. M.S.L.) - 13.8

   g. Dam -
      Type - Earthfill
      Length (feet) - 515
      Height (feet) - 15.6
      Crest Width (feet) - Ranges from 100 to 200
      Side Slopes - Upstream - 4H:1V
                     Downstream - No definite downstream face
      Zoning - No information on zoning available.
      Impervious Core - The design plans show that a clay core with 1H:1V side slopes and a 6 foot top width extends to within two feet of the crest of the embankment. This core is included in only 250 feet of the embankment, from Stations 0+90 to 3+40.
      Cut-off - The design plans show that a clay-filled cut-off trench was constructed below the clay core. The trench has a bottom width of 10 feet and 1H:1V side slopes.

   h. Diversion and Regulating Tunnel - None

   i. Spillway -
      Type - Sandstone block, broad-crested weir with a vertical upstream face and slightly rounded downstream face.
      Location - Approximately 120 feet from the left abutment.
      Length of Crest (perpendicular to the direction of flow) - 52.5 feet
      Top Width of Crest (parallel to the direction of flow) - 2.5 feet
      Crest Elevation (feet M.S.L.) - 1033.0
      Gates - None
      Downstream Channel - A grouted rock discharge channel with a 13 percent slope extends 45 feet downstream from the crest of the weir. Sandstone blocks, with some concrete block additions, form the training walls for the discharge channel. At the end of the channel, there
is a 3 foot drop to an earth-lined trapezoidal channel which extends 200 feet downstream.

j. Outlet Works - The outlet works for the dam consist of a 24 inch corrugated metal pipe controlled by a 24 inch sliding gate. The entrance to the outlet is located at the base of the upstream face of the weir. The invert at the entrance is, according to the design plans, at Elevation 1020.0 feet M.S.L. or 13 feet below the crest of the weir. The outlet of the pipe is located in the spillway discharge channel approximately 24 feet downstream of the crest of the weir. The outlet has been buried by material used to fill in the discharge channel and could not be inspected. The controls for the outlet works are located on the upstream face of the weir at the entrance to the outlet pipe. The controls have not been operated in the past 10 to 12 years. A heavy coating of rust has also developed on the controls for the gate.
SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Lake Jo-Ann Dam was designed in 1950 by Mr. Mose Smith, P.E., of Pittsburgh, Pennsylvania, for Mr. Joseph Bracco. A set of design plans is available in the Pennsylvania Department of Environmental Resources' (PennDER) File No. 63-60. No other information pertaining to the design of the structure is available.

2.2 CONSTRUCTION

The dam was originally built for Mr. Joseph Bracco to be used for recreational purposes. No detailed information on the construction history of the dam could be obtained. However, the present owner of the dam, Mr. Carapellucci, stated that a small coal strip mine was operated on the current site of the dam and impoundment. Material was excavated from the impoundment area and placed at the embankment location.

The design plans show the length and crest width of the embankment to be 250 feet and 16 feet, respectively, while the length and crest width measured during the field inspection were 515 feet and over 100 feet, respectively. The 250 feet of embankment to be built corresponds to the portion of embankment extending from Station 0+90 to 3+40 on the top of dam profile included in Appendix D. Outside of these stations, the embankment appears to be overburden material from the old strip mine and may explain the crest width of over 100 feet.

The design plans show a clay core and cut-off trench included in the embankment. This information could not be verified.

There are also several discrepancies between information shown on the design plans and that obtained during the field inspection. These discrepancies include the following:

1) The upstream face of the embankment was supposed to be covered with riprap on a 6 inch gravel base. No riprap was observed.

2) The designed spillway was 55 feet wide. The measured width was 52.5 feet.
3) The design plans show that flow through the spillway would fall approximately 13 feet after passing over the crest of the weir. It appears that after the weir was built additional rock fill material was grouted in place in the discharge channel. This material decreased the fall over the weir to 3.5 feet and created a 13 percent slope in the discharge channel which had a flat design slope. This material also covered the outlet of the 24 inch corrugated metal pipe which served as the outlet works for the dam.

The grout used in the discharge channel was also applied to the downstream face of the weir, rounding it off slightly.

2.3 OPERATION

The present owner of the dam and impoundment, Mr. Daniel Carapellucci, is responsible for the operation and maintenance of the structure.

2.4 EVALUATION

a. Availability - A set of design plans in the PennDER file for the dam is the only information available.

b. Adequacy - The information available and that collected during the course of this inspection is adequate for a Phase I Inspection of the dam.

c. Validity - There are many important discrepancies between the design plans and the present conditions of the dam. Therefore, the design plans are not indicative of actual conditions at the dam site.
SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The inspection was performed on 28 March 1980. No unusual weather conditions were experienced and the lake was 0.2 foot above normal pool. The dam and appurtenant structures were found to be in fair overall condition. Noteworthy deficiencies observed during the visual inspection are described in the following paragraphs. The complete visual inspection check list, field sketch, top of dam profile, and typical cross-section are presented in Appendix A.

b. Dam - No serious deficiencies were noted during the visual inspection of the embankment. There is some minor erosion of the upstream face of the embankment. The embankment is so wide, however, that this is only a problem at the junction of the embankment and the right spillway training wall. At this point, erosion has moved the crest back several feet, exposing a portion of the wall (see Top Overall Photo). There are also a number of large trees growing on the embankment. However, this does not represent a problem due to the extreme width of the dam crest.

c. Appurtenant Structures - The deficiencies observed are as follows:

1) The controls for the outlet works are heavily coated with rust and have not been operated for at least 10 to 12 years. The exit of the outlet conduit has also been buried by modifications made to the spillway discharge channel. It is extremely doubtful that the outlet works, in their present condition, are functional.

2) The grouted rock spillway discharge channel has badly deteriorated, leaving many large cracks and openings. Some debris and vegetation have also accumulated in the channel. The downstream end of the channel is being undermined and is also deteriorating. There is some flow from underneath the discharge channel (see Photo 8) which is probably a result of water entering cracks and holes in the upper portions of the channel.
3) A tree growing on the right side of the discharge channel, immediately downstream from the weir, is pushing the discharge channel training wall out of place (see Photo 6). There is also some clear seepage (approximately 2 g.p.m.) at the base of the wall.

4) The left training wall of the discharge channel has been undermined immediately downstream from the weir.

5) There is some minor spalling on the downstream face of the weir.

6) There is a 1 foot high fish screen at the crest of the spillway weir. A small amount of trash has accumulated in front of the screen; however, this debris is not significantly reducing flow over the weir.

d. **Reservoir Area** - The slopes of the reservoir and watershed are moderate. The area to the east of the reservoir is primarily farmland; the areas to the west and north are forested. No significant sediment accumulation in the reservoir was observed. The original depth of the reservoir is unknown and the current depth averages 10 feet according to the owner.

e. **Downstream Channel** - The downstream channel is mildly sloping and tree-lined. There are no obstructions in the channel except for a 48 inch corrugated metal pipe culvert located approximately 200 feet downstream from the spillway. Five residential structures are located approximately 1500 feet downstream from the dam. A small fishing pond is also located approximately 250 feet downstream from the dam and to the left of the stream channel.
SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

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

4.2 MAINTENANCE OF DAM

The owner of the dam, Mr. Daniel Carapellucci, is responsible for maintenance of the structure. Generally, the maintenance procedures for the embankment are considered adequate. However, a more conscientious program to prevent erosion of the embankment, especially around the spillway, should be adopted.

4.3 MAINTENANCE OF OPERATING FACILITIES

The spillway and outlet works have been poorly maintained. Both have badly deteriorated and are in need of extensive repairs. A more rigorous maintenance program to prevent this from continuing should be adopted.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning system in effect in the event of a dam failure. An emergency warning system should be developed.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

The outlet works and spillway require relatively extensive repairs as a result of poor maintenance and post-construction modifications made to the dam. The outlet works are not functional at this time and should be restored to an operational condition as soon as possible.
5.1 EVALUATION OF FEATURES

a. Design Data - There is no detailed hydrologic or hydraulic design information available for Lake Jo-Ann Dam.

b. Experience Data - No records concerning the effects of significant floods on the dam and spillway are available.

c. Visual Observation - The area downstream of the dam has been filled in to approximately the same elevation as the average top of dam elevation. As a result, the crest of the dam ranges from a minimum of 100 feet to almost 200 feet wide. A parking lot and several structures have been constructed on this fill.

No conditions were observed at the time of the inspection that would indicate the dam and spillway could not operate satisfactorily in the event of a flood. However, as noted in previous sections, both the spillway and outlet works are in need of repair. The outlet works are inoperable at this time and cannot be used to draw down the reservoir.

d. Overtopping Potential - Lake Jo-Ann Dam is a "Small" size - "High" hazard dam requiring evaluation for a spillway design flood (SDF) in the range of the 1/2 Probable Maximum Flood (1/2 PMF) to the Probable Maximum Flood (PMF). Because the dam is on the low end of the "Small" size category, the 1/2 PMF was selected as the SDF.

The hydraulic capacity of the dam, reservoir, and spillway was assessed by utilizing the U.S. Army Corps of Engineers' Flood Hydrograph Package, HEC-1 DB. The hydrologic characteristics of the drainage basin, specifically, the Snyder's unit hydrograph parameters, were obtained from a regionalized analysis conducted by the Baltimore District of the Corps of Engineers.

Analysis of the dam and spillway show that the dam would be overtopped by the SDF. The depth and duration of overtopping are 0.89 foot and 5.00 hours, respectively. The spillway is capable of passing approximately 27.5 percent of the PMF before overtopping begins.
e. **Spillway Adequacy** - As outlined in the above analysis, the dam would be overtopped by the SDF. The next criteria for determining spillway adequacy requires an estimate of whether the dam will fail during the 1/2 PMF. The following conditions, as well as the overall state of the dam, were estimated as the limiting criteria which are likely to cause failure of the dam.

1) Depth of overtopping of 1.0 foot or greater.

2) Duration of overtopping in excess of 2.0 hours.

The overtopping analysis of the dam yielded the following values for the 1/2 PMF.

1) Depth of overtopping equal to 0.89 feet.

2) Duration of overtopping equal to 5.00 hours.

Based on these criteria and the overall state of the dam, it is estimated that failure is not likely to occur during the 1/2 PMF. The spillway is therefore rated as "inadequate" but not "seriously inadequate."
SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - No signs of distress were observed on the embankment during the visual inspection. However, clear seepage (approximately 2 g.p.m.) was observed at the base of the right spillway training wall. Erosion of the upstream face of the embankment has moved the crest of the dam back several feet, exposing a portion of the right spillway training wall. Neither of these conditions represents a threat to the continued structural stability of the training wall at this time.

The left spillway training wall is being undermined immediately downstream from the spillway weir. While this undermining is not serious at this time, it may eventually jeopardize the stability of the wall if allowed to continue.

b. Design and Construction Data - Calculations of structural stability were not available for review. No information concerning the dam foundation materials or conditions is available. It is estimated that because of the extremely large crest width of this dam, its history of satisfactory slope performance, and no indications of embankment instability; further assessments of the stability of the structure are not necessary for this Phase I Inspection Report.

c. Operating Records - No operating records are available for Lake Jo-Ann Dam. Nothing in the operational information available indicates concern relative to the structural stability of the dam.

d. Post-Construction Changes - No known 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 the 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 - Lake Jo-Ann Dam, formerly known as Bracco Dam, was found to be in fair overall condition at the time of inspection. The dam is a "High" hazard - "Small" size dam requiring a spillway capacity in the range of the 1/2 PMF to PMF. The 1/2 PMF was chosen as the SDF because the dam is on the low end of the "Small" size category. As presented in Section 5, the spillway is capable of passing 27.5 percent of the PMF without overtopping the dam. During the 1/2 PMF, the depth and duration of overtopping are 0.89 foot and 5.00 hours, respectively. Because a limiting criteria of one foot or greater of overtopping and duration in excess of 2 hours was estimated for this dam, it was concluded that a dam failure during the 1/2 PMF is unlikely to occur. Therefore, the spillway is considered to be "inadequate" but not "seriously 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 initiate the action discussed in paragraph 7.2 without delay and immediately initiate the further investigation 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 of Lake Jo-Ann Dam immediately initiate an engineering study to further evaluate the spillway capacity in order to develop recommendations for remedial measures to reduce the overtopping potential of the dam.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection and review of information revealed certain items of work which should be performed without delay by the owner. Items 1 through 5 should be completed under the direction of a qualified professional engineer experienced in the design of hydraulic and appurtenant structures for earth dams.
1) The owner should immediately initiate an engineering study to further evaluate the spillway capacity in order to develop recommendations for remedial measures to reduce the overtopping potential of the dam.

2) Repair and reconstruct the outlet works.

3) Repair the left spillway training wall immediately downstream from the spillway weir where it is being undermined.

4) Remove the tree growing on the right side of the discharge channel immediately downstream from the weir which is pushing the discharge channel training wall out of place. The training wall should also be repaired and the clear seepage flow at this point should be monitored.

5) Remove the trees which are growing within 20 feet of the spillway structure. Trees outside of this area do not present any problems because of the large crest width of the embankment, making their removal unnecessary.

6) Repair the spalled areas on the spillway weir.

7) The spillway discharge channel should be cleared of debris and vegetation and repaired. The undermined area at the downstream end of the channel should be filled and repaired.

8) The eroded area at the junction of the embankment and the right spillway training wall should be filled. In addition, it is advisable that the owner attempt to maintain a cover of grass or crushed stone on the upstream face of the embankment to prevent the minor erosion presently occurring.

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 rainfall, 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, operation, and record-keeping procedures 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 Lake Jo-Ann Dam County Washington State PA Coordinates Lat. N 40° 15.4'
(Bracco Dam) Long. W 80° 02.8'
NDI # PA 00504 PennDER # 63-60
Date of Inspection 28 March 1980 Weather Cloudy Temperature 45° F.

Pool Elevation at Time of Inspection 1033.2 ft.* M.S.L. Tailwater at Time of Inspection 1021.0 ft.* M.S.L.

*All elevations referenced to spillway crest, El. 1033.0 ft. M.S.L. Elevations shown on design plans are 112 feet higher than those cited in this report.

Inspection Personnel:
Michael Baker, Jr., Inc.:
Jeffrey A. Quay
Wayne D. Lasch
Jeffrey S. Maze

Field Review (23 April 1980)
John A. Dziubek
James G. Ulinski

Jeffrey A. Quay Recorder

Owner's Representatives:
Daniel Carapellucci, Sr.
CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: LAKE JO-ANN DAM
NDI #: PA 00504

<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>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DRAINS</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>WATER PASSAGES</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>FOUNDATION</th>
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</table>
Name of Dam: **LAKE JO-ANN DAM**  

NDI #: PA 00504  

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<th>REMARKS OR RECOMMENDATIONS</th>
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</thead>
<tbody>
<tr>
<td>SURFACE CRACKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONCRETE SURFACES</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STRUCTURAL CRACKING**

**VERTICAL AND HORIZONTAL ALIGNMENT**

**MONOLITH JOINTS**

**CONSTRUCTION JOINTS**
EMBANKMENT

<table>
<thead>
<tr>
<th>Name of Dam</th>
<th>LAKE JO-ANN DAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDI #: PA 00504</td>
<td></td>
</tr>
</tbody>
</table>

**VISUAL EXAMINATION OF**

| SURFACE CRACKS | None observed |

**REMARKS OR RECOMMENDATIONS**

| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | None were observed. The embankment is so wide that it does not have a distinct toe or downstream face. |

| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | There is some erosion of the upstream embankment but the embankment is so wide that this does not present a problem. |
## EMBANKMENT

**Name of Dam** | **Lake Jo-Ann Dam**  
**NDI #:** | **PA 00504**

### VISUAL EXAMINATION OF EMBANKMENT

<table>
<thead>
<tr>
<th><strong>VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST</strong></th>
<th><strong>OBSERVATIONS</strong></th>
<th><strong>REMARKS OR RECOMMENDATIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No problems observed in either the vertical or horizontal alignment.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### RIPRAP FAILURES

No riprap was used on the dam.

### VEGETATION

There is only a very sparse growth of short grass on the embankment. Medium size trees are growing along the crest of the embankment and along the side of the discharge channel.

The owner said it is difficult to maintain grass on the embankment; people walking over the embankment to use the lake tend to kill any grass which may be growing. Because of the large crest width of the dam, it is not necessary to remove all of the trees on the embankment. The trees growing within 20 feet of the spillway structure should be removed; this is the only area where the trees may present a problem.
## EMBANKMENT

Name of Dam  **LAKE JO-ANN DAM**  
NDI #: PA 00504  

<table>
<thead>
<tr>
<th>VISUAL EXAMINATION OF</th>
<th>OBSERVATIONS</th>
<th>REMARKS OR RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM</strong></td>
<td>The junctions of the embankment and the abutments are ill-defined but no problems were observed in these areas. The junctions of the spillway and dam are in good condition except that erosion of the embankment on the right side of the spillway has moved the crest of the dam back several ft., exposing a portion of the right spillway training wall.</td>
<td>The eroded area by the right spillway training wall should be repaired.</td>
</tr>
<tr>
<td><strong>ANY NOTICEABLE SEEPAGE</strong></td>
<td>Clear seepage estimated at 2 g.p.m. was observed exiting beneath the tree at the end of the right spillway training wall.</td>
<td>This seepage should be monitored in future inspections for turbidity or increase in quantity of flow.</td>
</tr>
<tr>
<td><strong>STAFF GAGE AND RECORDER</strong></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><strong>DRAINS</strong></td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
# OUTLET WORKS

**Name of Dam:**  LAKE JO-ANN DAM  
**NDI #:** PA 00504

<table>
<thead>
<tr>
<th>VISUAL EXAMINATION OF</th>
<th>OBSERVATIONS</th>
<th>REMARKS OR RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>INTAKE STRUCTURE</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>OUTLET STRUCTURE</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>OUTLET CHANNEL</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>EMERGENCY GATE</td>
<td>Controls for a 24 in. slide gate are located on the right side of the spillway immediately upstream of the weir. The gate was submerged at the time of the inspection. The owner of the dam said that the gate has not been operated since he bought the dam 10 to 12 years ago. The controls are covered with an extremely heavy coat of rust and appeared to be inoperable.</td>
<td>A detailed inspection of the gate to determine how it can be made functional should be made.</td>
</tr>
</tbody>
</table>
**UNGATED SPILLWAY**

**Name of Dam:** LAKE JO-ANN DAM  
**NDI # PA 00504**

<table>
<thead>
<tr>
<th><strong>VISUAL EXAMINATION OF</strong></th>
<th><strong>OBSERVATIONS</strong></th>
<th><strong>REMARKS OR RECOMMENDATIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONCRETE WEIR</strong></td>
<td>The weir is in fair condition. There are some surface irregularities and minor spalling on the downstream face of the weir.</td>
<td>Repair the spalled areas.</td>
</tr>
<tr>
<td><strong>APPROACH CHANNEL</strong></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><strong>DISCHARGE CHANNEL</strong></td>
<td>A grouted rock discharge channel extends 45 ft. downstream from the weir. The channel has been washed out (broken out) in several areas. Some debris and vegetation has also accumulated in the channel. A tree growing on the right side of the channel, immediately downstream from the weir, is pushing the discharge channel training wall into the channel. At the downstream end of the channel there is a 3 ft. drop to a natural earth channel. The discharge channel is being undermined at this point. Some water is flowing from underneath the discharge channel. The left training wall has been undermined immediately downstream from the weir.</td>
<td>The discharge channel should be cleared of debris and vegetation and the entire channel repaired. The tree growing on the right side of the channel, immediately downstream from the weir, should be removed and the training wall repaired.</td>
</tr>
<tr>
<td><strong>BRIDGE AND PIERS</strong></td>
<td>A wooden footbridge has been constructed over the crest of the spillway. There is also an abandoned vehicle bridge over the spillway discharge channel approximately 30 ft. downstream from the spillway weir. Neither bridge should have a significant effect on flow through the spillway channel.</td>
<td></td>
</tr>
<tr>
<td>Instrumentation</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Name of Dam:</td>
<td>LAKE JO-ANN DAM</td>
<td></td>
</tr>
<tr>
<td>NDI #:PA 00504</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Visual Examination</th>
<th>Observations</th>
<th>Remarks or Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONUMENTATION/SURVEYS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Observation Wells | |
|-------------------||

| Weirs | |
|-------||

| Piezometers | |
|-------------||

| Other | |
|-------||
### RESERVOIR

**Name of Dam:** LAKE JO-ANN DAM  
**NDI #:** PA 00504  

<table>
<thead>
<tr>
<th>VISUAL EXAMINATION OF</th>
<th>OBSERVATIONS</th>
<th>REMARKS OR RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SLOPES</strong></td>
<td>Slopes are mild to moderate. The area to the east of the reservoir is primarily farmland; the area to the west and north is forested.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SEDIMENTATION</strong></th>
<th>There is no evidence that a significant amount of sediment has accumulated in the reservoir. The original depth of the reservoir is unknown and the current depth averages 10 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Name of Dam: **LAKE JO-ANN DAM**

<table>
<thead>
<tr>
<th>CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)</th>
<th>OBSERVATIONS</th>
<th>REMARKS OR RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>The downstream channel is mildly sloping and tree-lined. There are no obstructions in the channel except for a 48 in. C.M.P. culvert approximately 200 ft. downstream from the spillway.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| SLOPES | Channel slopes are mild. |

| APPROXIMATE NO. OF HOMES AND POPULATION | |
|-----------------------------------------| Five residential structures are located approximately 1500 ft. downstream from the dam. A small fishing pond is also located approximately 250 ft. downstream from the dam. |
FIELD SKETCH
LAKE JO-ANN DAM
NDI No. PAO0504
PennDER No. 83-60
INSPECTED 28 MARCH 1980
SCHEMATIC - NOT TO SCALE
LAKE JO-ANN DAM
TOP OF DAM PROFILE
TYPICAL CROSS-SECTION

DATE OF INSPECTION - 28 March 1980

**Top of Dam Profile**

Elevation, ft.
1040

Maximum crest El. = 1086.4 ft.

1030

Average crest elevation = 1037.2 ft.

Elevation, ft.
1020

EXTENT OF ENFORCEMENT SHOWN ON DESIGN PLANS

Station, ft.
0+00 1+00 2+00 3+00 4+00 5+00

**Cross-section at Sta. 4+00**

Elevation, ft.
1025

Parking area, El. 1030.8 ft.

1030

Station, ft.
0+00 0+50 1+00
APPENDIX B

ENGINEERING DATA CHECK LIST
<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN OF DAM</td>
<td>See Plate 3 and field sketch included in this report.</td>
</tr>
<tr>
<td>REGIONAL VICINITY MAP</td>
<td>The USGS 7.5 minute topographic quadrangle, Bridgeville, Pennsylvania,</td>
</tr>
<tr>
<td></td>
<td>was used to prepare the vicinity map which is enclosed in this report</td>
</tr>
<tr>
<td></td>
<td>as the Location Plan (Plate 1).</td>
</tr>
<tr>
<td>CONSTRUCTION HISTORY</td>
<td>The dam was designed and built for Joseph Bracco in 1950. No detailed</td>
</tr>
<tr>
<td></td>
<td>construction information is available. A presentation of the limited</td>
</tr>
<tr>
<td></td>
<td>information available is given in Section 2.2.</td>
</tr>
<tr>
<td>TYPICAL SECTIONS OF DAM</td>
<td>See Appendix A for typical cross-section of dam.</td>
</tr>
<tr>
<td>HYDROLOGIC/HYDRAULIC DATA</td>
<td>No information available</td>
</tr>
<tr>
<td>OUTLETS - PLAN</td>
<td>See field sketch for location of emergency gate.</td>
</tr>
<tr>
<td>and DETAILS</td>
<td></td>
</tr>
<tr>
<td>- CONSTRAINTS</td>
<td></td>
</tr>
<tr>
<td>and DISCHARGE RATINGS</td>
<td>No information available</td>
</tr>
<tr>
<td>RAINFALL/RESERVOIR RECORDS</td>
<td>None available</td>
</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>DESIGN REPORTS</td>
<td>None available</td>
</tr>
<tr>
<td>GEOLOGY REPORTS</td>
<td>None are 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>
<td>None available</td>
</tr>
<tr>
<td>DAM STABILITY</td>
<td>None available</td>
</tr>
<tr>
<td>SEEPAGE STUDIES</td>
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<tr>
<td>MATERIALS INVESTIGATIONS</td>
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<tr>
<td>BORING RECORDS</td>
<td>None available</td>
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<td>LABORATORY</td>
<td>None available</td>
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<tr>
<td>FIELD</td>
<td>None</td>
</tr>
<tr>
<td>POST-CONSTRUCTION SURVEYS OF DAM</td>
<td>None</td>
</tr>
<tr>
<td>BORROW SOURCES</td>
<td>No information is available. It appears that a great deal of the embankment material came from the refuse generated by the coal mining activities previously conducted at the site of the impoundment.</td>
</tr>
</tbody>
</table>
OPERATION

Maintenance

REPORTS

Prior accidents or failure of dam

None

STUDIES AND REPORTS

Post-construction engineering

None available

MODIFICATIONS

No information available

DISCUSSION

Discussed in Section 2.2. Other departures from the design plans are

Note material was added to the spillway discharge channel and

None

MONITORING SYSTEMS

None

REMARKS

NAME: PA 00504

Name of dam: Lake J0-Ann Dam
Name of Dam: LAKE JO-ANN DAM  
NDI #: PA 00504

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPILLWAY PLAN</td>
<td>A spillway profile is included in Appendix D.</td>
</tr>
<tr>
<td>SECTIONS and DETAILS</td>
<td>No information available</td>
</tr>
<tr>
<td>OPERATING EQUIPMENT PLANS &amp; DETAILS</td>
<td>No information available</td>
</tr>
</tbody>
</table>
CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS:  1.62 sq.mi. (Primarily forests and farmland)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY):  1033.0 ft. M.S.L.
(125 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY):  1036.4 ft. M.S.L.
(187 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL:  Unknown

ELEVATION TOP DAM:  1036.4 ft. M.S.L. (minimum elevation)

SPILLWAY:

a. Crest Elevation  1033.0 ft. M.S.L.
b. Type Broad crested sandstone block with slightly rounded downstream face
c. Width of Crest Parallel to Flow  2.5 ft. (top width)
d. Length of Crest Perpendicular to Flow  52.5 ft.
e. Location Spillover 120 ft. from left abutment
f. Number and Type of Gates  None

OUTLET WORKS:

a. Type  24 in. C.M.P.
b. Location At base of spillway weir
c. Entrance Inverts  El. 1020.0 ft. M.S.L. (estimated from
d. Exit Inverts Exit of pipe is buried design plans)
e. Emergency Drawdown Facilities  No functional drawdown facil-
   ities at this time

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 of Dam
Top Photo (OV-T) - View of the Upstream Face of the Embankment Looking from the Center of the Dam to the Left Abutment (Note erosion pushing crest downstream, exposing the right spillway training wall)
Bottom Photo (OV-B) - View of the Upstream Face of the Embankment Looking from the Spillway to the Right Abutment

Photograph Location Plan
Photo 1 - Overall View of Embankment from Reservoir
Photo 2 - View of the Crest of the Dam from the Right Abutment
Photo 3 - View of the Upstream Side of the Spillway
Photo 4 - View of the Spillway Looking Upstream
Photo 5 - Undercutting of the Left Spillway Training Wall
Photo 6 - View of Tree Pushing Right Spillway Training Wall Out of Place (Arrow denotes location of clear seepage)
Photo 7 - Undermining of the Downstream End of the Spillway Discharge Channel
Photo 8 - View of Water Flowing Out from Beneath the Spillway Discharge Channel
Photo 9 - View of Downstream Channel Looking Upstream Towards the Spillway
Photo 10 - View of 48 Inch Corrugated Metal Pipe in the Downstream Channel

Note: Photographs were taken on 28 March 1980.
PHOTOGRAPH LOCATION PLAN
LAKE JO-ANN DAM
NDI No. 3AO0504
PenneDER No. 63-60
PHOTOGRAPHS TAKEN 28 MARCH 1980
LAKE JO-ANN DAM

PHOTO 1. Overall View of Embankment from Reservoir

PHOTO 2. View of the Crest of the Dam from the Right Abutment
PHOTO 3. View of the Upstream Side of the Spillway

PHOTO 4. View of the Spillway Looking Upstream
PHOTO 5. Undercutting of the Left Spillway Training Wall

PHOTO 6. View of Tree Pushing Right Spillway Training Wall Out of Place
(Arrow denotes location of clear seepage)
PHOTO 7. Undermining of the Downstream End of the Spillway Discharge Channel

PHOTO 8. View of Water Flowing Out from Beneath the Spillway Discharge Channel
PHOTO 9. View of Downstream Channel Looking Upstream Towards the Spillway

PHOTO 10. View of 48 Inch Corrugated Metal Pipe in the Downstream Channel
APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS
<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PAGE</th>
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<tbody>
<tr>
<td>PREFACE</td>
<td>1</td>
</tr>
<tr>
<td>HYDROLOGY AND HYDRAULIC ANALYSIS DATA BASE</td>
<td>1</td>
</tr>
<tr>
<td>DRAINAGE AREA AND CENTROID MAP</td>
<td>2</td>
</tr>
<tr>
<td>TOP OF DAM PROFILE AND CROSS-SECTION</td>
<td>3</td>
</tr>
<tr>
<td>HYDRAULIC DATA</td>
<td>4</td>
</tr>
<tr>
<td>SPILLWAY PROFILE AND CAPACITY ANALYSIS</td>
<td>5</td>
</tr>
<tr>
<td>HEC-1 ANALYSIS</td>
<td>6</td>
</tr>
</tbody>
</table>
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: LAKE JO-ANN DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 24.0 INCHES/24 HOURS

<table>
<thead>
<tr>
<th>STATION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>Station Description</td>
<td>LAKE JO-ANN DAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage Area (square miles)</td>
<td>1.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative Drainage Area (square miles)</td>
<td>1.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment of PMP for Drainage Area (%)</td>
<td>Zone 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Hours</td>
<td>102</td>
<td></td>
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<tr>
<td>12 Hours</td>
<td>120</td>
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<tr>
<td>24 Hours</td>
<td>130</td>
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<tr>
<td>48 Hours</td>
<td>140</td>
<td></td>
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<tr>
<td>72 Hours</td>
<td>--</td>
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</table>

Snyder Hydrograph Parameters

<table>
<thead>
<tr>
<th>Zone</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_p/C_t$</td>
<td>0.57/1.7</td>
</tr>
<tr>
<td>$L$ (miles)</td>
<td>2.08</td>
</tr>
<tr>
<td>$L_{ca}$ (miles)</td>
<td>1.06</td>
</tr>
<tr>
<td>$t_p = C_t (L-L_{ca})^{0.3}$ (hours)</td>
<td>2.16</td>
</tr>
</tbody>
</table>

Spillway Data

| Crest Length (ft) | 52.5 |
| Freeboard (ft) | 3.4 |
| Discharge Coefficient | 3.00 |
| Exponent | 1.5 |

(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) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients ($C_p$ and $C_t$).
(4) Snyder's Coefficients.
(5) $L =$ Length of longest water course from outlet to basin divide.

$L_{ca} =$ Length of water course from outlet to point opposite the centroid of drainage area.
Subject: LAKE JO-ANI DAM

Top of Dam Profile

Elevation, ft.
1040

EL. 1037.7 ft

Minimum Crest EL. = 1036.4 ft

Crest of Weir at EL. 1033.0 ft
K = 51.5' in

Average Crest Elevation = 1037.2 ft

EXTENT OF EMBANKMENT

Shown on Design Plans

1020

0+00 1+00 2+00 3+00 4+00 5+00
Station, ft

Cross-section at Station 4+00

EL. 1036.0 ft

PARKING AREA, EL. 1036.3 ft

EL. 1033.2 ft

Elevation, ft

1035

1030

0+00 0+50 1+00
Station, ft
STORAGE CALCULATIONS

ELEVATION VS. AREA DATA (MEASURED FROM QAD):

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>AREA, ACRES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1033.0</td>
<td>13.77</td>
</tr>
<tr>
<td>1050</td>
<td>34.9</td>
</tr>
<tr>
<td>1060</td>
<td>82.6</td>
</tr>
</tbody>
</table>

NOTE: NORMAL POOL ASSUMED TO BE AT EL. 1033.0 ft

NORMAL POOL STORAGE:

\[ V_{NP} = \frac{h}{3} \left( A_1 + A_2 - \sqrt{A_1 A_2} \right) \]

- \( h = \text{AVERAGE DEPTH} = 9.5 \text{ ft} \) (ESTIMATED DURING FIELD INVESTIGATION)
- \( A_1 = \text{NORMAL POOL SURFACE AREA} = 13.77 \text{ AC.} \)
- \( A_2 = \text{RESERVOIR BOTTOM SURFACE AREA} = 12.6 \text{ AC.} \)

\[ V_{NP} = \frac{9.5}{3} \left( 13.77 + 12.6 - \sqrt{(13.77)(12.6)} \right) \]

NORMAL POOL STORAGE = 125.22 AC-FT

TOP OF DAM STORAGE = 187 AC-FT (FROM HEC-1 ANALYSIS)
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject: LAKE JO-ANN DAM S.O. No. __________
SPILLWAY PROFILE AND Sheet No. 5 of 10
CAPACITY ANALYSIS

Drawing No. __________
Compared by LDL Checked by __________ Date 4-2-80

---

**SPILLWAY PROFILE**

Minimum Top of Dam Elevation = 1036.4 ft

---

**SPILLWAY CAPACITY ANALYSIS**

Minimum Top of Dam Elevation = 1036.4 ft

---

Diagram showing elevation and spillway profile with stations and levels marked.
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>HYDROLOGIC AND HYDRAULIC ANALYSES OF BRACCO DAM</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>UNIT HYDROGRAPH BY SNYDER'S METHOD</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>5</td>
<td>D1</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>D2</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>D3</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>K1</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>M1</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>P</td>
<td>5.0</td>
</tr>
<tr>
<td>11</td>
<td>T</td>
<td>1.0</td>
</tr>
<tr>
<td>12</td>
<td>W</td>
<td>-1.0</td>
</tr>
<tr>
<td>13</td>
<td>K1</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>T1</td>
<td>1.0</td>
</tr>
<tr>
<td>15</td>
<td>Y1</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>X1</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>X2</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>Y2</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>Z1</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>Z2</td>
<td>0</td>
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<tr>
<td>21</td>
<td>Z3</td>
<td>0</td>
</tr>
<tr>
<td>22</td>
<td>Z4</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>Z5</td>
<td>0</td>
</tr>
</tbody>
</table>

**FLUDD HYDROGRAPH PACKAGE SHEC-13**
**GAM SAFETY VERSION JULY 1979**
**LAST MODIFICATION 26 FEB 74**
**MRU UPDATE 04 JULY 79**
NATIONAL PROGRAM FOR INSPECTION OF RUN-OF-RIVER DAMS
HYDRAULIC AND HYDRAULIC ANALYSES OF BRACKLEY DAM
UNIT HYDROGRAPH BY SYNOVA METHOD

JOB SPECIFICATION
NO NHK NMIN IMIN PLK = 0.0 0.0 0.0 0.0 0.0 0.0 0.0
SPLK KMIN NLK LK MIN MIND
IPLK IKMIN NSLAN
JUPER NWT LRTLT TME
G

MULTI-PLAN ANALYSES TO BE PERFORMED
WPLAN = 1 NWTO = 4 LATU = 1
KTUS = 1.00 0.75 0.50 0.25

*************
SUDDEN RUNOFF COMPUTATION
FLOOD HYDROGRAPH TO DAM
ISTAG IGEMP IECOM ITAPE JPLK JPRK INAME ISTAGE IAJEU
1 0 0 0 0 0 0 0

HYDROGRAPH DATA
IHYDG IJHC ITAPA SNAP TRGDA HSMC LATII ISNAM ISAME LCMAL
1 1 1.67 0.0 0.0 0.0 0.0

PRECIP DATA
SPFE PME KRD KLD KND KRE KVD
0.0 0.0 0.0 102.00 120.00 140.00 0.0 0.0

LUSC DATA
LRUS STRAK LKIR RTILU ERUAN STRKS RTIKU STRUJ USL ILSMC KTIEN
0 0.0 0.0 0.0 1.00 0.0 0.0 1.00 0.0 0.0 0.0 0.0

UNIT HYDROGRAPH DATA
TP = 2.16 LP = 0.57 NIA = 0

RECREDENTIAL DATA
STRKU = -1.50 WRCMW = 0.00 RTIUK = 2.00

UNIT HYDROGRAPH TO END-THE-PLOSION 
UNIT HYDROGRAPH DATA
LAC = 2.16 LNUS = 0.57 VOL = 1.00
26 191 291 273 244 197 159 128 100
86 67 54 41 30 22 13 52 26
10 9 5 80 4 3 3 2

**HYDROGRAPH ROUTING**

<table>
<thead>
<tr>
<th>ROUTING FOR BRAGDO DAM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ISTAT</strong></td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ROUTING DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>QLGSS</strong></td>
</tr>
<tr>
<td>0.0</td>
</tr>
</tbody>
</table>

| **SURFACE AREA** | **0.0** | **14.0** | **35.0** | **63.0** |
| **CAPACITY** | **0.0** | **125.3** | **240.0** | **1431.0** |
| **ELEVATION** | **1024.0** | **1031.0** | **1040.0** | **1060.0** |

| **CREL** | **SPWID** | **CUQW** | **ERPW** | **ELEV** | **GUEL** | **AREA** | **EXPL** |
| 1033.0 | 52.5 | 3.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |

<table>
<thead>
<tr>
<th><strong>JAN DATA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TUPEL</strong></td>
</tr>
<tr>
<td>1034.4</td>
</tr>
</tbody>
</table>

| **CREST LENGTH** | **0.0** | **90.0** | **273.0** | **368.0** | **503.0** |
| **AT OR BELOW ELEVATION** | **1036.4** | **1036.7** | **1036.9** | **1037.1** | **1037.7** |

| **PEAK OUTFLOW** | **15.0** | **365.1** | **AT TIME** | **42.00 HOURS** |
| PEAK OUTFLOW | 2735.0 | **AT TIME** | **42.00 HOURS** |
| PEAK OUTFLOW | 1815.0 | **AT TIME** | **42.00 HOURS** |
| PEAK OUTFLOW | 866.0 | **AT TIME** | **42.50 HOURS** |
### 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)**

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>STATION</th>
<th>AREA</th>
<th>PLAN</th>
<th>RATIO 1</th>
<th>RATIO 2</th>
<th>RATIO 3</th>
<th>RATIO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDROGRAPH AT</td>
<td>1.62</td>
<td>1</td>
<td>3666.6</td>
<td>2750.9</td>
<td>1434.1</td>
<td>519.9</td>
<td>25.96</td>
</tr>
<tr>
<td></td>
<td>4.20</td>
<td>103.89</td>
<td>17.86</td>
<td>97.91</td>
<td>31.1</td>
<td>31.1</td>
<td>4.54</td>
</tr>
<tr>
<td>ROUTED TO</td>
<td>1.62</td>
<td>1</td>
<td>3651.0</td>
<td>2735.5</td>
<td>1415.9</td>
<td>509.0</td>
<td>25.55</td>
</tr>
<tr>
<td></td>
<td>4.20</td>
<td>103.89</td>
<td>17.86</td>
<td>97.91</td>
<td>31.1</td>
<td>31.1</td>
<td>4.54</td>
</tr>
</tbody>
</table>
### SUMMARY OF DAM SAFETY ANALYSIS

<table>
<thead>
<tr>
<th>PLAN</th>
<th>ELEVATION</th>
<th>INITIAL VALUE</th>
<th>SPILLWAY CREST</th>
<th>TOP OF DAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STORAGE</td>
<td>1033.00</td>
<td>1033.00</td>
<td>1036.40</td>
</tr>
<tr>
<td></td>
<td>OUTFLOW</td>
<td>0.0</td>
<td>125.0</td>
<td>187.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RATIO</th>
<th>MAXIMUM RESERVOIR DEPTH</th>
<th>MAXIMUM STORAGE</th>
<th>MAXIMUM INLET</th>
<th>DURATION</th>
<th>TIME OF MAX INFLOW</th>
<th>TIME OF FAIL</th>
<th>TIME OF FAILURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHI</td>
<td>M.S. LEVEL</td>
<td>OVER DAM</td>
<td>AC FT</td>
<td>GFS</td>
<td>HOURS</td>
<td>HOURS</td>
<td>HOURS</td>
</tr>
<tr>
<td>1.00</td>
<td>1039.06</td>
<td>1.66</td>
<td>679.0</td>
<td>3631.0</td>
<td>8.00</td>
<td>42.00</td>
<td>0.0</td>
</tr>
<tr>
<td>0.75</td>
<td>1037.23</td>
<td>1.55</td>
<td>226.0</td>
<td>734.0</td>
<td>7.00</td>
<td>42.00</td>
<td>0.0</td>
</tr>
<tr>
<td>0.50</td>
<td>1037.29</td>
<td>0.89</td>
<td>209.0</td>
<td>1415.0</td>
<td>5.00</td>
<td>44.00</td>
<td>0.0</td>
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<tr>
<td>0.25</td>
<td>1036.12</td>
<td>0.0</td>
<td>180.0</td>
<td>800.0</td>
<td>0.0</td>
<td>42.50</td>
<td>0.0</td>
</tr>
</tbody>
</table>
APPENDIX E

PLATES
CONTENTS

Plate 1 - Location Plan
Plate 2 - Watershed Map
Plate 3 - Original Design Drawings (1950)
NOTE:
This design drawing is not representative of the "as built" conditions. See the text and field sketch for "as built" conditions.
APPENDIX F

REGIONAL GEOLOGY
LAKE JO-ANN DAM
(Chacco Dam)
NDI No. PA 00504, PennDER No. 63-60

REGIONAL GEOLOGY

Lake Jo-Ann Dam is located in an unglaciated area of the Appalachian Plateaus Physiographic Province. Bedrock units below the dam are members of the Monongahela Group, Pennsylvanian System. Bedrock in this formation is typically cyclic sequences of shale, limestone, sandstone, and coal.

Coal of a currently mineable character located below the dam includes the Pittsburgh coal at approximately Elevation 930 feet M.S.L. (or approximately 100 feet below the dam). According to the "Greater Pittsburgh Region Maps of Mined-Out Pittsburgh Coal," compiled by S. E. Cortis and others, 1975, the Pittsburgh Coal Company - Montour Mine No. 4 currently holds mineral rights to the coal and has some headings in the right abutment area of the dam. According to the owner, the reservoir area was a former strip mine area. The coal mined by this operation was probably the Redstone coal or the Sewickley coal.
## GEOLOGY MAP LEGEND

<table>
<thead>
<tr>
<th>GROUP FORMATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alluvium</strong></td>
<td>Sand, gravel, clay.</td>
</tr>
<tr>
<td>Terrace deposits</td>
<td>Sand, clay, gravel on terraces above present rivers; includes Carmichaels Formation.</td>
</tr>
<tr>
<td><strong>Greene</strong></td>
<td>Cyclic sequences of sandstone, shale, red beds, thin limestones and coals.</td>
</tr>
<tr>
<td><strong>Washington</strong></td>
<td>Cyclic sequences of sandstone, shale, limestone, and coal; contains Washington coal bed at base.</td>
</tr>
<tr>
<td><strong>Waynesburg</strong></td>
<td>Cyclic sequences of sandstone, shale, limestone and coal; contains Waynesburg coal bed at base.</td>
</tr>
<tr>
<td><strong>MONONGAHELA</strong></td>
<td>Cyclic sequences of sandstone, shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base.</td>
</tr>
<tr>
<td><strong>Casselman</strong></td>
<td>Cyclic sequence of sandstone, shale, red beds and thin limestone and coal.</td>
</tr>
<tr>
<td><strong>Ames</strong></td>
<td>Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; several fossiliferous limestone; Ames limestone bed at top.</td>
</tr>
<tr>
<td><strong>Glenshaw</strong></td>
<td>Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals.</td>
</tr>
<tr>
<td><strong>Vanport</strong></td>
<td>Sandstone and shale; contains some conglomerate and locally mineable coal.</td>
</tr>
<tr>
<td><strong>POTTSVILLE</strong></td>
<td>Red and green shale with some sandstone; contains Wyampa Gap and Loyalhanna limestones.</td>
</tr>
<tr>
<td><strong>Pocono</strong></td>
<td>Sandstone and shale with Burgoo sandstone at top.</td>
</tr>
</tbody>
</table>