CARBON COUNTY, PENNSYLVANIA.

PHASE I INSPECTION REPORT,

NATIONAL DAM INSPECTION PROGRAM.

PREPARED FOR

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland 21203

BY

Berger Associates

Harrisburg, Pennsylvania 17105

FEBRUARY 1981

DISTRIBUTION STATEMENT A

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PREFACE

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

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.
Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in poor condition.

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

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

1. That measures shall be taken to provide an adequate spillway capacity, which shall include the raising of the embankment profile to at least the design crest elevation.

2. That the embankment be cleared of all trees, brush and weeds under the direction of a professional engineer, experienced in the design and construction of earthfill dams.

3. That access above the floodplain be provided for surveillance.

4. That either a method be developed for opening the sluice gate in an emergency or the opening be permanently closed off.
5. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

6. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures. The operational manual shall include regular maintenance of the embankment.

SUBMITTED BY: BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

DATE: February 9, 1981

APPROVED BY: JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

DATE: March 81
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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

HEILMAN DAM
NDI-ID NO. PA-00612
DER-ID NO. 13-005

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

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

B. Purpose

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

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Heilman Dam is a concrete weir in the Mahoning Creek with a low earthfill embankment on each side. The concrete weir is 125 feet long and is at an elevation 7 feet below the design crest elevation of the embankment. The right embankment is 125 feet long and the left embankment is about 150 feet long. The left abutment wall of the spillway contains an inoperable sluice gate as a drawdown facility. The reservoir was used as a water supply for the nearby Lehigh Valley Railroad Company facilities. A 16-inch intake pipe is located adjacent to the sluice gate. The present condition and control facilities on this pipe are unknown.

B. Location:

Borough of Lehighton, Carbon County
U.S.G.S. Quadrangle - Lehighton, PA
Latitude 40°-49.5', Longitude 75°-42.3'
Appendix E, Plates I & II

C. Size Classification:

Small: Height - 15 feet
     Storage - 117 acre-feet

D. Hazard Classification:

Significant (Refer to Section 3.1.E.)
E. **Ownership:**
Borough of Lehighton
Mr. Mortimer L. Smedley
Borough Manager
Municipal Building
Lehighton, PA 18235

F. **Purpose:**
Recreation

G. **Design and Construction History**

A permit to rebuild the Old Facing Mill Dam at this site was issued to the Lehigh Valley Railroad Company on February 26, 1914. Construction was to be in accordance with the plans as shown on Plate III, Appendix E. A letter, dated May 26, 1914, from the owner to the Water Supply Commission requested a change in foundation elevation. The excavation showed that the foundation could be two feet higher. The downstream crib was raised two feet, providing a downstream pool two feet higher. The top of spillway and the embankment were maintained at the original elevation. The concrete weir section was reduced two feet in height.

H. **Normal Operating Procedures**

Requests were made to lower the pool in 1939, 1940 and 1946 to remove siltation in the reservoir. On April 26, 1951, ownership of the dam was transferred to the Borough of Lehighton. All inflow is discharged over the spillway and there are no operating procedures at the present time.

1.3 **PERTINENT DATA**

A. **Drainage Area** (square miles)

From files: 39.1
Computed for this report: 38.5
Use: 38.5

B. **Discharge at Dam Site** (cubic feet per second)

See Appendix D for hydraulic calculations.

Maximum known flood (estimated from records of U.S.G.S. gage on nearby Wild Creek): 4582

Outlet works at normal pool Elev. 456.0: 172
Outlet works at low pool Elev. 453.5: 122

Spillway capacity at pool Elev. 458.9 (low point of dam): 2037
Spillway capacity at design crest Elev. 463.0 7640

C. **Elevation** (feet above mean sea level)

<table>
<thead>
<tr>
<th>Description</th>
<th>Elevation (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of dam (low point)</td>
<td>458.9</td>
</tr>
<tr>
<td>Top of dam (design crest)</td>
<td>463.0</td>
</tr>
<tr>
<td>Spillway crest</td>
<td>456.0</td>
</tr>
<tr>
<td>Upstream portal invert</td>
<td>449.0</td>
</tr>
<tr>
<td>Downstream portal invert</td>
<td>449.0</td>
</tr>
<tr>
<td>Streambed at downstream toe of dam (estimate)</td>
<td>448.0</td>
</tr>
</tbody>
</table>

D. **Reservoir** (miles)

<table>
<thead>
<tr>
<th>Description</th>
<th>Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of normal pool (Elev. 456.0)</td>
<td>.6</td>
</tr>
<tr>
<td>Length of maximum pool (Elev. 458.9)</td>
<td>.7</td>
</tr>
</tbody>
</table>

E. **Storage** (acre-feet)

<table>
<thead>
<tr>
<th>Description</th>
<th>Storage (acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spillway crest (Elev. 456.0)</td>
<td>76.7</td>
</tr>
<tr>
<td>Top of dam (Elev. 458.9)</td>
<td>117</td>
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F. **Reservoir Surface** (acres)

<table>
<thead>
<tr>
<th>Description</th>
<th>Surface (acres)</th>
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<tbody>
<tr>
<td>Spillway crest (Elev. 456.0)</td>
<td>4.6</td>
</tr>
<tr>
<td>Top of dam (Elev. 458.9)</td>
<td>29.9</td>
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G. **Dam**

Refer to Plate III in Appendix E for plan and section.

<table>
<thead>
<tr>
<th>Type</th>
<th>Earthfill.</th>
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<tbody>
<tr>
<td>Length:</td>
<td>385 feet, including 125 foot long spillway.</td>
</tr>
<tr>
<td>Height:</td>
<td>15 feet.</td>
</tr>
<tr>
<td>Top Width:</td>
<td>Design – 12 feet; Survey – 8 feet.</td>
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**Side Slopes:**

<table>
<thead>
<tr>
<th>Slope</th>
<th>Design</th>
<th>Surveyed</th>
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</thead>
<tbody>
<tr>
<td>Upstream</td>
<td>2H to 1V</td>
<td>2.5H to 1V</td>
</tr>
<tr>
<td>Downstream</td>
<td>1.5H to 1V</td>
<td>2.5H to 1V</td>
</tr>
</tbody>
</table>

-3-
Zoning: None.
Cutoff: None.
Grouting: None.

H. Outlet Facilities
Type: 4 feet x 4 feet sluiceway closed with a 48-inch sluice gate.
Inlet: Elevation 449.0.
Location: Left spillway abutment.

I. Spillway
Type: Concrete broad crested weir.
Length of Weir: 125 feet.
Crest Elevation: 456.0
Location: Center of dam.

J. Regulating Outlets
See Section 1.3.H. above.
SECTION 2 - ENGINEERING DATA

2.1 DESIGN

A. Hydrology & Hydraulics

Engineering data on the hydrologic and hydraulic design for the Long Run Reservoir No. 1 Dam are not available. The dam was designed and constructed prior to the requirements for a permit. The files of the Pennsylvania Department of Environmental Resources (PennDER) indicate a drainage area of 2.7 square miles. The spillway has a design width of thirty feet, and the design crest is three feet below the top of dam (Plate III, Appendix E).

B. Embankment and Appurtenant Structures

Design data for the embankment and appurtenant structures are not available, except two drawings indicating typical sections and elevation of the reconstruction in 1911 and 1914 (Plates III & IV, respectively, Appendix E).

2.2 CONSTRUCTION

Available construction data is limited to five Progress Reports by PennDER during the reconstruction of the dam in 1914. These reports indicate that serious leakage occurred after the dam was increased in height in 1911. This leakage was noticeable at both abutments and near the valve house. Plans were submitted for remedial measures in 1914 and were approved on June 23, 1914. These plans indicate a trench excavation along the upstream toe. The trench was to be filled with concrete. The face of the wall was to be sealed with a one foot thick facing over the upper part of the wall. Additional fill was obtained from the upstream end of the reservoir and placed on the downstream embankment.

The construction reports indicate that the trench was excavated to a depth varying from 5 to 12 feet into a red sandstone or shale. Fissured sandstone in the south (left) abutment was grouted through pipes placed in the concrete cutoff wall. The trench excavation revealed that the original dam was placed on a gravel and sand mixture layer over the shale varying in depth from one to five feet. Construction was stopped in November, 1914, and was not completed until 1919. The cutoff wall was made at least two feet thick, and the wall facing was anchored into the old wall.

Letters indicate that the spillway deteriorated seriously in the 1930's and that spillway walls and slab were repaired in 1941. The cement mortar slab showed deterioration again in 1946.
C. Operating Records

Operating records, including maximum pool levels, have not been maintained by the owner.

D. Post Construction Changes

The visual inspection does not indicate that post construction changes have been made.
SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of Heilman Dam is poor. The concrete spillway weir has deteriorated, exposing the aggregate. This condition does not affect the structural integrity at the present time. The embankments show signs of no maintenance and are overgrown with trees and brush. Considerable erosion adjacent to the spillway abutment walls has occurred.

The visual inspection check list and sketches of the general plan and profile of the dam, as surveyed during the inspection, are presented in Appendix A of this report. The Borough Manager, Mr. Mort Smedley, accompanied the inspectors during the field inspection.

Photographs taken on the day of inspection are reproduced in Appendix C.

B. Embankment

The embankment fills at each side of the spillway weir have not been maintained during the recent years. They are overgrown with trees and brush (Photographs No. 2 and No. 3). The embankment profile on Plate A-II, Appendix A, indicates that a considerable length of the embankment is below the design crest elevation, with deep erosions (up to 4 feet) adjacent to the spillway abutment walls. The downstream slopes at Sta. 0+30 are flatter than the design slopes. There were no signs of upstream slope protection.

C. Appurtenant Structures

The spillway is located in the center of the dam and has a length of 125 feet. All inflow is discharged over the weir. The concrete of the weir has exposed aggregate, but there were no signs of cracks or structural instability. A constant flow over the weir and the downstream pool prevented close observation. Downstream from the weir is a submerged timber cribbing filled with stone.

The weir has concrete abutments at each side. The left abutment contains a 4' x 4' opening, closed with a sliding gate. The gate stand and stem are broken and the gate is inoperable at the present time.

Debris prevented observation of the upstream end of a 16-inch outlet pipe located adjacent to the gate. Present owners are not familiar with this outlet, which originally supplied water to the nearby railroad yards.
D. Reservoir Area

The reservoir is for a large part filled with sedimentation and considerable weed growth is in evidence. The reservoir is used for fishing and the reported depth varies, with a maximum of five or six feet. There are no upstream reservoirs located in the drainage basin.

E. Downstream Channel

The immediate downstream channel is wide and flat with only a small vertical drop. About 500 feet downstream from the dam is the Borough Sewage Treatment Plant. This plant is located in the floodplain and has been "floodproofed" with the necessary closure features. Immediately downstream from the plant is a four arch stone bridge carrying the railroad over the valley. Each arch opening is 17.5 feet wide and 11.5 feet high. The Mahoning Creek joins the Lehigh River immediately downstream of the railroad bridge. The limited openings in this bridge and the high railroad embankment would prevent a hazard further downstream.

Due to the presence of the sewage treatment plant, the hazard category for Heilman Dam is considered to be "significant."

3.2 EVALUATION

The overall visual evaluation of Heilman Dam indicates that the dam is in poor condition. It is recommended that all trees and brush be removed from the embankment. A protective cover should be provided on the embankment to prevent erosion.
SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Operational procedures for Heilman Dam do not exist at the present time. All inflow is discharged over the spillway.

4.2 MAINTENANCE OF EMBANKMENT

Trees and brush have been permitted to grow on the embankment and there are no indications of recent maintenance. The embankment has settled and/or eroded, lowering the profile below its design crest elevation (top of spillway abutments). An increase of three feet above the normal pool elevation would cause overtopping.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facility is a four foot sluice gate for drawdown. This gate is in the closed position, and is inoperative due to a broken stem and gate stand.

4.4 WARNING SYSTEM

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

4.5 EVALUATION

There are no operational procedures for Heilman Dam at the present time. It is recommended that procedures be developed to include regular maintenance of the embankment and operation of the sluice gate. A formal surveillance and downstream warning system should be developed for implementation during periods of high or prolonged rainfall. An access road located above the floodplain elevation should be provided for this surveillance.
SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

The hydrologic and hydraulic analysis available from PennDER for Heilman Dam was not very extensive. No area-capacity curve, frequency curve, unit hydrograph, design storm, design flood hydrograph, or flood routings were available.

B. Experience Data

There are no records of flood levels at Heilman Dam. Based on records of the U.S.G.S. stream gage on Wild Creek at nearby Hatchery, Pennsylvania, the maximum inflow to Heilman Dam is estimated to be 4582 cfs. This flood was passed without reported difficulties.

C. Visual Observations

It was noted that the 48-inch gate on the sluiceway was inoperative. No other condition were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event until the dam is overtopped.

D. Overtopping Potential

Heilman Dam has a total storage capacity of 117 acre-feet and the overall height is 15 feet above the streambed. These dimensions indicate a size classification of "small." The hazard classification for this dam is "Significant" (see Section 3.1.E.).

The Spillway Design Flood (SDF) for a dam having the above classifications should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). Since the downstream area is not populated, the recommended SDF for this dam is the 100 year flood. For this dam the SDF peak inflow is 7,886 cfs (see Appendix D for hydraulic calculations).

Comparison of the estimated SDF peak inflow of 7,886 cfs with the estimated total discharge capacity of 2037 cfs indicates that a potential for overtopping of the Heilman Dam exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam does not have the necessary storage available to pass the SDF without overtopping. The spillway-reservoir system passes the SDF with about
4.1 feet of overtopping based on the present low point in the crest profile. If the crest would be made uniform at the design elevation of 463, the project would pass the SDF with about 0.1 foot of overtopping.

E. Spillway Adequacy

The small size and significant hazard categories, in accordance with the Corps of Engineers criteria and guidelines, indicates that the SDF for this dam should be in the range of the 100 year flood to one-half PMF. The recommended SDF is the 100 year flood.

Calculations show that the total spillway discharge capacity and reservoir storage capacity, based on the present low point of the dam profile, cannot pass the SDF without overtopping to a depth of about 4.1 feet at the low point in the dam (refer to Appendix D).

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

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.
SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of Heilman Dam did not detect any signs of embankment instability. The field survey indicates that the slopes are flatter than the proposed slopes on the design drawings. The profile of the dam indicates that the crest is uneven with very low points near the abutments of the spillway.

2. Appurtenant Structures

The concrete weir is 66 years old and shows signs of deterioration. Aggregate has been exposed. However, there are no signs of structural instability. The drawdown sluice gate is not operable.

B. Design and Construction Data

1. Embankment

The design data for the embankment is limited to one cross section on Plate III, Appendix A. The existing embankment at the site was incorporated in the design of the present dam. The centerline of the dam was moved 12 feet downstream, which means that the old dam is located at the upstream side. Photographs indicate that riprap was placed on the upstream side. Visual inspection did not detect this protection and the slope is flatter than the designed slope.

2. Appurtenant Structures

The design drawing indicates a construction height of 12.5 feet for the weir. PennDER files indicate that the footing elevation was raised two feet, giving a structural height of 10.5 feet. The base width is shown as 9.83 feet.

C. Operating Records

Operating records for this dam have not been maintained by the owners. There are no indications of stability problems.

D. Post Construction Changes

There are no records of changes to the embankment or its appurtenant structures.
E. **Seismic Stability**

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

A. Safety

The visual inspection and the review of the construction drawings indicate that Heilman Dam is in poor condition. The dam has been constructed in accordance with acceptable engineering practices. The field inspection did not detect any signs of instability. The crest profile of the dam is irregular and below design crest elevation. The trees and brush growth on the embankment is detrimental to the safety of the embankment.

The hydrologic and hydraulic computations indicate that the combination of storage capacity and the spillway discharge capacity are not able to pass the SDF without overtopping the dam. The spillway is considered inadequate but not seriously inadequate.

B. Adequacy of Information

The design information contained in the files combined with the visual inspection are considered sufficiently adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations presented below should be implemented immediately.

D. Additional Studies

Additional investigations are required to determine measures necessary to provide an adequate spillway capacity unless the crest of the dam is restored to its original design crest elevation.

7.2 RECOMMENDATIONS

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

1. That measures shall be taken to provide an adequate spillway capacity, which shall include the raising of the embankment profile to at least the design crest elevation.

2. That the embankment be cleared of all trees, brush and weeds under the direction of a professional engineer, experienced in the design and construction of earthfill dams.
3. That access above the floodplain be provided for surveillance.

4. That either a method be developed for opening the sluice gate in an emergency or the opening be permanently closed off.

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

6. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures. The operational manual should include regular maintenance of the embankment.
APPENDIX A

CHECK LIST OF VISUAL INSPECTION REPORT
CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 13-005

NAME OF DAM: Heilman Dam
HAZARD CATEGORY: Significant

TYPE OF DAM: Concrete weir with short embankment sections at both sides.

LOCATION: Borough of Lehighton, TOWNSHIP Carbon COUNTY, PENNSYLVANIA

INSPECTION DATE: 10/22/80
WEATHER: Clear, Sunny
TEMPERATURE: 40-50°

INSPECTORS: R. Houseal (Recorder)

OWNER'S REPRESENTATIVE(s):

H. Jongsma
R. Shireman
A. Bartlett

Mort Smedley
Clint Williams

NORMAL POOL ELEVATION: 456.0
AT TIME OF INSPECTION:

BREAST ELEVATION: 463.0 (Design)
POOL ELEVATION:

SPILLWAY ELEVATION: 456.0
TAILWATER ELEVATION: 448.3

MAXIMUM RECORDED POOL ELEVATION:

GENERAL COMMENTS:

The dam appears to be in poor condition. Concrete spillway is weathered so that the aggregate is exposed over the entire visible surface. The embankment abutments with the concrete spillway are severely eroded. The embankment behind the spillway walls is about 4 feet below the top of the wall.

The embankment portions of the dam, both left and right, have trees and brush growing on upstream and downstream slopes.
| A. SURFACE CRACKS | None detectable. |
| B. UNUSUAL MOVEMENT BEYOND TOE | None observed. |
| C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES | None observed. Tree growth on upstream and downstream slopes, also brush. Abutments with spillway are eroded. |
| D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL: | Horizontal appears good. Vertical - refer to profile Plate A-II. |
| E. RIPRAP FAILURES | Riprap not visible. |
| F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY | Abutments with spillway walls are eroded to about 4 feet below top of wall. Abutments with natural ground appear to be sound. |
| G. SEEPAGE | None observed. |
| H. DRAINS | None. |
| J. GAGES & RECORDER | None. |
| K. COVER (GROWTH) | Trees, brush and weeds over entire embankment. |
### Visual Inspection

#### Outlet Works

<table>
<thead>
<tr>
<th>A. Intake Structure</th>
<th>None.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Outlet Structure</td>
<td>None.</td>
</tr>
<tr>
<td>C. Outlet Channel</td>
<td>N/A.</td>
</tr>
<tr>
<td>D. Gates</td>
<td>48&quot; slide gate inoperable. Gate stand and stem broken.</td>
</tr>
<tr>
<td>E. Emergency Gate</td>
<td>N/A.</td>
</tr>
<tr>
<td>F. Operation &amp; Control</td>
<td>N/A.</td>
</tr>
<tr>
<td>G. Bridge (Access)</td>
<td>N/A.</td>
</tr>
</tbody>
</table>
## Visual Inspection

### Spillway

<table>
<thead>
<tr>
<th>A. Approach Channel</th>
<th>Observations and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>The dam spans the width of creek forming a ponded area upstream from the weir and embankment. All stream flow passed directly over the weir.</td>
<td></td>
</tr>
</tbody>
</table>

| B. Weir: |
| Crest Condition |
| Cracks |
| Deterioration |
| Foundation |
| Abutments |
| Crest and entire surface is weathered. Structure appears to be sound otherwise. |

| C. Discharge Channel: |
| Lining |
| Cracks |
| Stilling Basin |
| The channel below the weir is the continuation of the stream and is made up of rocky bottom and flat overbanks with moderate tree growth and brush. The stilling basin is a timber cribbing filled with stone. |

| D. Bridge & Piers |
| None. |

| E. Gates & Operation Equipment |
| One slide gate is located at the left end of the weir. The lift control is badly damaged. The gate cannot be operated. |

| F. Control & History |
| The dam was acquired by the Borough in the 1950's. There is no plan of operation or maintenance. |
### Visual Inspection

<table>
<thead>
<tr>
<th>Instrumentation</th>
<th>Observations and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monumentation</td>
<td>None.</td>
</tr>
<tr>
<td>Observation Wells</td>
<td>None.</td>
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<tr>
<td>Weirs</td>
<td>None.</td>
</tr>
<tr>
<td>Piezometers</td>
<td>None.</td>
</tr>
<tr>
<td>Staff Gauge</td>
<td>None.</td>
</tr>
<tr>
<td>Other</td>
<td>None.</td>
</tr>
</tbody>
</table>

### Reservoir

| Slopes                | Mountainside on right. Left side flat.                        |
| Sedimentation         | Sediment upstream from the spillway is heavy. The Borough is seeking federal help to clear the creek. |
| Watershed Description | Mostly wooded and farmland.                                   |

### Downstream Channel

| Condition             | Natural stream.                                               |
| Slopes                | Woodlands and highway.                                         |
| Approximate Population| Sewage Treatment Plant, R.R. Bridge.                           |
| No. Homes             | None.                                                          |
APPENDIX B

CHECK LIST OF ENGINEERING DATA
## CHECK LIST

### ENGINEERING DATA

**PA DER # 13-005**

**NDI NO. PA-00612**

**NAME OF DAM** Heilman Dam

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>AS-BUILT DRAWINGS</td>
<td>Not available.</td>
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<tr>
<td>REGIONAL VICINITY MAP</td>
<td>U.S.G.S. Quadrangle - Lehighton, Pa. See Plate II, Appendix E</td>
</tr>
<tr>
<td>CONSTRUCTION HISTORY</td>
<td>Dam constructed in 1914-1915 by Lehigh Valley Railroad Company at the site of an existing mill dam. Concrete spillway was founded 2 feet above elevation shown on plans.</td>
</tr>
<tr>
<td>GENERAL PLAN OF DAM</td>
<td>Plate III, Appendix E.</td>
</tr>
<tr>
<td>TYPICAL SECTIONS OF DAM</td>
<td>Plate III, Appendix E.</td>
</tr>
<tr>
<td>OUTLETS:</td>
<td>Plate III, Appendix E.</td>
</tr>
<tr>
<td>PLAN</td>
<td>4'-0&quot; x 4'-0&quot; opening in left abutment with sluice gate.</td>
</tr>
<tr>
<td>DETAILS</td>
<td></td>
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<tr>
<td>CONSTRAINTS</td>
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<tr>
<td>DISCHARGE RATINGS</td>
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</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>---------------</td>
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<tr>
<td>RAINFALL &amp; RESERVOIR RECORDS</td>
<td>No records.</td>
</tr>
<tr>
<td>DESIGN REPORTS</td>
<td>None.</td>
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<td>GEOLOGY REPORTS</td>
<td>None.</td>
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<tr>
<td>DESIGN COMPUTATIONS:</td>
<td>None.</td>
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<tr>
<td>HYDROLOGY &amp; HYDRAULICS</td>
<td></td>
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<tr>
<td>DAM STABILITY</td>
<td></td>
</tr>
<tr>
<td>SEEPAGE STUDIES</td>
<td></td>
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<td>MATERIALS INVESTIGATIONS:</td>
<td>None.</td>
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<td>BORING RECORDS</td>
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<tr>
<td>LABORATORY FIELD</td>
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<tr>
<td>POST CONSTRUCTION SURVEYS OF DAM</td>
<td>None.</td>
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<tr>
<td>BORROW SOURCES</td>
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### Engineering Data

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<td>Monitoring Systems</td>
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<td>Modifications</td>
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<td>High Pool Records</td>
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<td>Post Construction Engineering Studies &amp; Reports</td>
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<tr>
<td>Prior Accidents or Failure of Dam</td>
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<tr>
<td>Description:</td>
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<td>Reports:</td>
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<tr>
<td>Maintenance &amp; Operation Records</td>
<td>No records.</td>
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<td>Spillway Plan, Sections and Details</td>
<td>Plate III, Appendix E.</td>
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### ENGINEERING DATA

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<tbody>
<tr>
<td>OPERATING EQUIPMENT, PLANS &amp; DETAILS</td>
<td>One unoperable gate.</td>
</tr>
<tr>
<td>CONSTRUCTION RECORDS</td>
<td>None, except photographs in PennDER files.</td>
</tr>
<tr>
<td>PREVIOUS INSPECTION REPORTS &amp; DEFICIENCIES</td>
<td>Some letters from PennDER indicating settlement or erosion of fill adjacent to spillway. Trees and brush reported since 1925.</td>
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<tr>
<td>MISCELLANEOUS</td>
<td></td>
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</table>
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 40% woodland, 60% farmland

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 456 Acre-Feet 76.7
TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 458.9 Acre-Feet 117
MAXIMUM DESIGN POOL: Elev. 463
TOP DAM: Elev. 458.9

SPILLWAY:

a. Elevation 456
b. Type Concrete broad crested weir.
c. Width 125

d. Length ---
e. Location Spillover Center of dam.
f. Number and Type of Gates None.

OUTLET WORKS:

a. Type 4' x 4' sluiceway.
b. Location Left of spillway.
c. Entrance inverts 449
d. Exit inverts 449
e. Emergency drawdown facilities 48" gate.

HYDROMETEOROLOGICAL GAGES:

a. Type None.
b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 2037 cfs.
HEILMAN DAM
PA-00612
KEY MAP OF PHOTOGRAPHS
PLATE C-1
DOWNSTREAM FACE OF WEIR - NO. 4

DOWNSTREAM SIDE OF OUTLET IN LEFT ABUTMENT WALL - NO. 5
LEFT SIDE OF SPILLWAY AND ABUTMENT - NO. 6

DOWNSTREAM CHANNEL - NO. 7
APPENDIX D

HYDROLOGY AND HYDRAULIC CALCULATIONS
SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

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

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

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

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

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

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

\[ Q = C L H^{3/2} \]

\[ H = 458.9 - 456 = 2.9' \]

\[ Q = 33 \times 125 \times (2.9)^{1.5} \]

\[ = 2037 \text{ cfs} \]
SPILLWAY RATING CURVE

- 463

462

461

460

ELEV.

459

458

457

456

0 2 4 6 8

DISCHARGE - 1000 CFS

TOP OF DAM - DESIGN

TOP OF DAM - LOW POINT

HECKMAN DAM
DISCHARGE THROUGH OUTLET WORKS

9' x 4' sluiceway with 48" gate

INVERT ELEV. = 449

C = 0.6  (King; HSK)

Q = CA \sqrt{2gyH}

AT POOL ELEV 456

H = 456 - 451 = 5'

Q = 0.6 \times 4 \times 4 \times (2 \times 32.2 \times 5)^{0.5}

= 172 \text{ CFS}

AT LOW POOL ELEV 453.5

H = 453.5 - 451 = 2.5'

Q = 0.6 \times 4 \times 4 \times (2 \times 32.2 \times 2.5)^{0.5}

= 122 \text{ CFS}
EMBANKMENT RATING

Q = CLH^{3/2} 
C = 2.7 (RINGS HOOK) 

AT ELEV. 460
2.7 \times 4 \times (0.95)^{1.5} = 10 
2.7 \times 1 \times (0.4)^{1.5} = 1 
\varepsilon = 11 \text{ cfs}

AT ELEV. 461
2.7 \times 4 \times (0.95)^{1.5} = 29 
2.7 \times 2 \times (0.9)^{1.5} = 5 
2.7 \times 2 \times (0.25)^{1.5} = 1 
\varepsilon = 35 \text{ cfs}

AT ELEV. 462
2.7 \times 4 \times (2.95)^{1.5} = 55 
2.7 \times 3 \times (1.7)^{1.5} = 18 
2.7 \times 5 \times (1.3)^{1.5} = 2 
2.7 \times 5 \times (0.75)^{1.5} = 9 
\varepsilon = 84 \text{ cfs}

AT ELEV. 463
2.7 \times 4 \times (3.95)^{1.5} = 85 
2.7 \times 3 \times (2.7)^{1.5} = 36 
2.7 \times 10 \times (1)^{1.5} = 27 
2.7 \times 25 \times (0.25)^{1.5} = 7 
2.7 \times 25 \times (0.2)^{1.5} = 6 
2.7 \times 19 \times (0.15)^{1.5} = 3 
2.7 \times 10 \times (0.25)^{1.5} = 3 
2.7 \times 15 \times (0.15)^{1.5} = 16 
2.7 \times 21 \times (0.1)^{1.5} = 2 
2.7 \times 5 \times (1.7)^{1.5} = 20 
2.7 \times 17 \times (0.3)^{1.5} = 16 
2.7 \times 25 \times (0.1)^{1.5} = 2 
2.7 \times 5 \times (0.1)^{1.5} = \varepsilon = 272 \text{ cfs}

AT ELEV. 464
\varepsilon = 1081 \text{ cfs}

AT ELEV. 466
\varepsilon = 4284 \text{ cfs}

AT ELEV. 468
\varepsilon = 9268 \text{ cfs}
MAXIMUM KNOWN FLOOD AT DAM SITE

THERE ARE NO RECORDS OF POOL LEVELS FOR THIS DAM. BASED ON THE RECORDS OF THE GAGING STATION FOR WILD CREEK AT NEARBY HATCHERY, PA. (D.A. = 16.8 ft. SL) THE MAXIMUM DISCHARGE AT THE GAGE OCCURRED IN MAY 1942 WHEN A DISCHARGE OF 2360 cfs WAS OBSERVED. THE MAXIMUM INFLOW TO HEILMAN DAM IS ESTIMATED TO BE:

\[ Q = \left( \frac{38.5}{16.8} \right)^{0.8} \times 2360 \]

\[ = 4582 \text{ cfs} \]

DESIGN FLOOD

SIZE CLASSIFICATION
MAXIMUM STORAGE = 117 ACRE-Feet
MAXIMUM HEIGHT = 15 FEET
SIZE CLASSIFICATION IS "SMALL"

HAZARD CLASSIFICATION
SEWAGE TREATMENT PLANT IS LOCATED DOWNSTREAM OF THE DAM.
USE "SIGNIFICANT"

RECOMMENDED SPILLWAY DESIGN FLOOD
THE ABOVE CLASSIFICATIONS INDICATE USE OF AN SRK EQUAL TO THE 100-YR FLOOD TO ONE-HALF THE PROBABLE MAXIMUM FLOOD.
100 YR FLOOD

REF: "REGIONAL FREQUENCY STUDY, UPPER DELAWARE AND HUDSON RIVER BASINS, NEW YORK DISTRICT U.S. ARMY, CORPS OF ENGINEERS, N.Y.C."

HEILMAN DAM D.A. = 38.5 SQ.MI.

(Fig. 2) CM = 1.65

\[
\log (Q_m) = CM \times 0.87 \log(A)
\]

\[
= 1.65 \times 0.87 \log(38.5)
\]

\[
= 3.0294
\]

(110.3) \( c_s = 0.91 \)

\[
S = c_s - 0.05 \log(A)
\]

\[
= 0.91 - 0.05 \log(38.5)
\]

\[
= 0.331
\]

(Fig. 3) SKEW = +0.45

(TABLE 10) STANDARD DEVIATION = 2.6506

\[
\log (Q(p)) = \log (Q_m) + K(p, q)S
\]

\[
= 3.0294 + (2.6506)(0.331)
\]

\[
= 3.9067
\]

\[
Q_1 = 8067 \text{ CF5}
\]
### Total Rainfall (From TP-4G)

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<thead>
<tr>
<th>Duration (HR)</th>
<th>Depth (IN)</th>
</tr>
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<td>0.5</td>
<td>2.22</td>
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<td>2</td>
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<td>3</td>
<td>3.85</td>
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<tr>
<td>6</td>
<td>4.72</td>
</tr>
<tr>
<td>12</td>
<td>5.72</td>
</tr>
<tr>
<td>24</td>
<td>6.67</td>
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</tbody>
</table>

![Graph showing flood depth over time](image)

\( Q_{100} = \text{7886 cfs} \)
Spillway Capacity Curve

ELEV.

Discharge - 1000 cfs

Top of Dam
Low Point

100 yr flood

By: K.E.  Date: 2/3/81
Check by:  Date:

Berger Associates

Sheet No. 8 of 9

Heilman Dam

Project: 00590
Spillway Capacity Curve (Design)
HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Heilman Dam  RIVER BASIN: Delaware

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.6 INCHES/24 HOURS

(FOOTNOTES SEE NEXT PAGE)

<table>
<thead>
<tr>
<th>STATION</th>
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<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>STATION DESCRIPTION</td>
<td>Reservoir</td>
<td>Dam</td>
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<td>DRAINAGE AREA (SQUARE MILES)</td>
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<tr>
<td>CUMULATIVE DRAINAGE AREA (SQUARE MILES)</td>
<td>38.5</td>
<td>38.5</td>
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<tr>
<td>ADJUSTMENT FOR PMP FOR DRAINAGE AREA (%)</td>
<td>6 HOURS</td>
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<tr>
<td></td>
<td>12 HOURS</td>
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<td>AREA (ACRES)</td>
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<td>157.9</td>
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<td>NORMAL POOL (ft.)</td>
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<td>STORAGE (ACRE-FOOT)</td>
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(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

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

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

(4) Snyder's Coefficients.

(5) $L$ = Length of longest water course from outlet to basin divide.

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

(6) Planimetered area encompassed by contour upstream of dam.

(7) PennDER files.

(8) Computed by conic method.

(9) Snyder Equation.
HEILMAN DAM  
MAHONING CREEK  
BOROUGH OF LEHIGHTON, DAUPHIN COUNTY, PA.  
NO. PA-00612  
PA DRI. 13-5

JOB SPECIFICATION

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<th>IMIN</th>
<th>MTAC</th>
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JOPEK  
NUT  
LDEP  
TRACE

5 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED

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RTID= 1.00

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

SUB-AREA, RUNOFF COMPUTATION

INFLOW HYDROGRAPH

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<th>IECON</th>
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<th>JFAT</th>
<th>IHMRE</th>
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HYDROGRAPH DATA

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<th>TAREA</th>
<th>SWAP</th>
<th>TRSDE</th>
<th>TRSFC</th>
<th>RATIO</th>
<th>ISHOW</th>
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LOSS DATA

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<th>RTOIK</th>
<th>STRPL</th>
<th>CNSTL</th>
<th>ALEMK</th>
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UNIT HYDROGRAPH DATA

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UNIT HYDROGRAPH 100 END-CF-PERIOD ORGACINATES+ LAG= 7.85 HOURS CP= .45 VOL=.82

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END-CF-PERIOD FLOW

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<th>SUM</th>
<th>6.87</th>
<th>6.42</th>
<th>.25</th>
<th>523144.</th>
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<tr>
<td>(167.1)</td>
<td>(163.1)</td>
<td>(67.1)</td>
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<td>(14812.79)</td>
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</tbody>
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HYDROGRAPH ROUTING

RESERVOIR ROUTING

ISTAG  ICOMP  IECON  ITAPE  IJPLT  JFRT  IWMAE  JSTAGE  INITIO
2     1      0      0      0     0     1      0      0

ROUTING DATA

GLOSS  CLOSU  AVG  IRES  ISAME  IOPT  IPMP  LSTR
0.0    0.000   0.00  1      0      0      0      0

NSTFS  NSTEL  LAG  AMENK  X  TSK  STORR  ISFRAT
1     0      0      0.000   0.000  0.000  77     -1

STAGE  458.00  456.50  457.00  457.50  458.00  458.50  459.00  460.00  461.00
462.00  463.00  464.00

FLOW    0.00  146.00  412.00  758.00  1167.00  1631.00  2037.00  2724.00  3311.00  4647.00
6146.00  7857.00  10414.00

SURFACE AREA= 0.09  5.00  40.00  138.09
CAPACITY= 0.00  77.00  153.00  199.00
ELEVATION= 406.00  456.00  460.00  480.00

CREL  SFHID  CDAM  EXPW  ELEV  CDUE  CAGEA  EXPL
456.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00

DAM DATA

TOPEL  CDAM  EXPD  DAMHID
456.90  0.00  0.00  0.00

PEAK OUTFLOW IS 7852. AT TIME 20.00 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)

RATIOS APPLIED TO FLOWS

OPERATION  STATION  AREA  PLAN RATIO  1
1.00

HYDROGRAPH AT 1 38.50 1 7836.
( 99.71)  ( 223.31)

ROUTED TO 2 38.50 1 7852.
( 99.71)  ( 222.30)

SUMMARY OF DAM SAFETY ANALYSIS
### 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>
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<tr>
<td>HYDROGRAPH AT</td>
<td>1</td>
<td>38.50</td>
<td>1</td>
<td>7386.</td>
<td>(99.71)</td>
</tr>
<tr>
<td>ROUTED TO</td>
<td>2</td>
<td>38.50</td>
<td>1</td>
<td>7852.</td>
<td>(99.71)</td>
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### SUMMARY OF DAM SAFETY ANALYSIS

**PLAN 1***************

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Initial Value</th>
<th>Spillway Crest</th>
<th>Top of Dam</th>
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<tr>
<td>456.00</td>
<td>456.00</td>
<td>456.90</td>
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<tr>
<td>Storage</td>
<td>77.00</td>
<td>77.00</td>
<td>217.00</td>
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<tr>
<td>Outflow</td>
<td>1.00</td>
<td>0.00</td>
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</table>

<table>
<thead>
<tr>
<th>Ratio of Reservoir Depth</th>
<th>Maximum Storage</th>
<th>Maximum Outflow</th>
<th>Duration</th>
<th>Time of Failure</th>
<th>Time of Failure</th>
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<tr>
<td>PMF</td>
<td>W.ELEV</td>
<td>AF-FT</td>
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<td>1.00</td>
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<td>290.00</td>
<td>7582.00</td>
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HEILMAN DAM  ****  MANDING CREEK
BOROUGH OF LEHIGHTON, CARBON COUNTY, PA.
NDI #: PA-00612  PA DER #: 13-5

INFLOW HYDROGRAPH

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT
ROUTE HYDROGRAPH TO
END OF NETWORK
HEILMAN DAM  MAMMING CREEK
BOROUGH OF LEHIGHTON, Carbon COUNTY, Pa.
NDI # PA-00612  PA DER # 13-S

JOB SPECIFICATION

NO  NHID  MHID  IDAY  IHR  IMIN  METRC  IFLT  IPRT  NPLAN
300  0  15  0  0  0  0  -4  0

USER  NAT  LAEPT  TRACE
5  0  0  3

MULTI-PHASE ANALYSIS TO BE PERFORMED
NPLAN= 1  NRTIO= 1  LRTIO= 1

RTIOS= 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAD  ICORP  IECOF  IAFPE  JPLT  JPRT  INAME  ISTAGE  IPMTD
1  0  0  0  0  1  0  0  0

HYDROGRAPH DATA

HYDG  IUHS  TAREA  SNAP  TREC  TREC  RATIO  ISHOW  ISAME  LOCAL
0  1  38.50  0.00  38.50  0.00  0.000  0  0  0

LOSS DATA

LAEPT  STRR  DLTR  RTQD  EKAIN  STARS  RTICD  STRATL  CISTL  ACRW  RTIF
0  0.00  0.00  1.00  0.00  0.00  1.00  .01  .01  .00  .00

UNIT HYDROGRAPH DATA

TP= 7.80  CF= .45  NTA= 0

RECESSION DATA

STRTD= -1.50  GCRN= -.05  RTICR= 2.00

UNIT HYDROGRAPH EN EN-D-OF-PERIOD ORDINGE;  LAD= 7.80  NOHR= 7.80  CF= .45  VOL= .82

9.  30.  496.  1192.  1493.  1241.  1013.  826.  574.  550.  449.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.
146.  192.  139.  1412.  1403.  1168.  973.  794.  647.  537.  431.

ENG-D-OF-PERIOD FLOW

MDIA  HR-MN  PERIOD  RAIN  EXCS  LOSS  CLF  Q  MDIA  HR-MN  PERIOD  RAIN  EXCS  LOSS  COMP  Q

SUM  6.87  8.42  .25  993.44
( 129. )  (63.74)  (6.77)  (153.79)

COUNTY
RESERVOIR ROUTING

ISTAG  ICIMP  IECCN  ITAPE  JPLT  JFRT  IAMAE  ISTAGE  IAUTO
    2    1    0    0    0    0    1    0    0

ROUTING DATA
GLOSS  CLOSS  RVG  IRES  ISAME  ISFT  IPTP  LSTP
    0.0    0.000    0.00    1    0    0    0    0

NSTPS  NSTDL  X  ANSKK  ISK  STSTA  ISFRAT
    1    0    0.000    0.000    0.000    77.0

SURFACE AREA=  0.4  5.  40.  15.8.
CAPACITY=  0.77  15.3  1996.
ELEVATION=  406.  456.  460.  460.
CREL  SPWID  COW  EXPW  ELEV  COOL  AREA  EXPL
455.0  125.0  3.0  1.5  0.0  0.0  5.0  0.0

DAM DATA
TGREL  COAD  EXPD  DANWID
465.0  2.7  1.5  26.0.

PEAK OUTFLOW IS  7857. AT TIME  20:00 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)

OPERATION  STATION  AREA  PLAN  RATIO  1
1.00

HYDROGRAPH AT
1  38.50  1  7886.
( 99.71) (223.31)

ROUTED TO
2  38.50  1  7857.
( 99.71) (222.48)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

INITIAL VALUE  SPILLWAY CREST  TOP OF DAM
ELEVATION  406.00  456.00  463.00
STORAGE  77.0  77.0  27.0
OUTFLOW  0.0  0.0  7840.

RATIO  MAXIMUM  MAXIMUM  MAXIMUM  MAXIMUM  DURATION  TIME OF  TIME OF
OF RESERVOIR  DEPTH  STORAGE  OUTFLOW  OVER TOP  MAX OUTFLOW  FILLING
FH  M.S.ELEV  OVER 1:1:K  AG-FT  CFS  HOURS  HOURS  HOURS
1.00  463.12  .12  297.  7857.  2.00  20.00  0.00

FDI ENCOUNTERED.
GENERAL PLAN

TYPICAL SECTION OF EMBANKMENT
This area overlies two formations; the Mahantango and Trimmers Rock Formations. The majority of the dam covers the Trimmers Rock Formation which consists of massive and fissile siltstones and shales.

**STRUCTURE**

There is an apparent minor fault striking the SE corner of the dam approximately 15 feet. This follows the average structural grain trend of N70°E. Structures and joints are well developed and closely spaced in the siltstones. The dip ranges between 45° vertical.

**OVERBURDEN**

The overburden in this area consists primarily of alluvium and floodplain deposits originating from the Lehigh River and Mahoning Creek. Silts, sands and gravels are common.

**AQUIFER CHARACTERISTICS**

The Trimmers Rock Formation is a fair to good aquifer with a low interstitial porosity in the coarser rocks. The possibility of subsurface seepage exists, but the extent depends on the localized lithology and if the fault actually exists.

**DISCUSSION**

According to available construction plans, the dam rests on bedrock. If such is the case, the Trimmers Rock Formation should provide a good quality foundation for heavy structures.

**SOURCES OF INFORMATION**


GEOLOGIC MAP - HEILMAN DAM

SCALE 1:24000

LEGEND

Dtr Trimmers Rock Formation
Dmh Mahantango Formation

Apparent Minor Fault