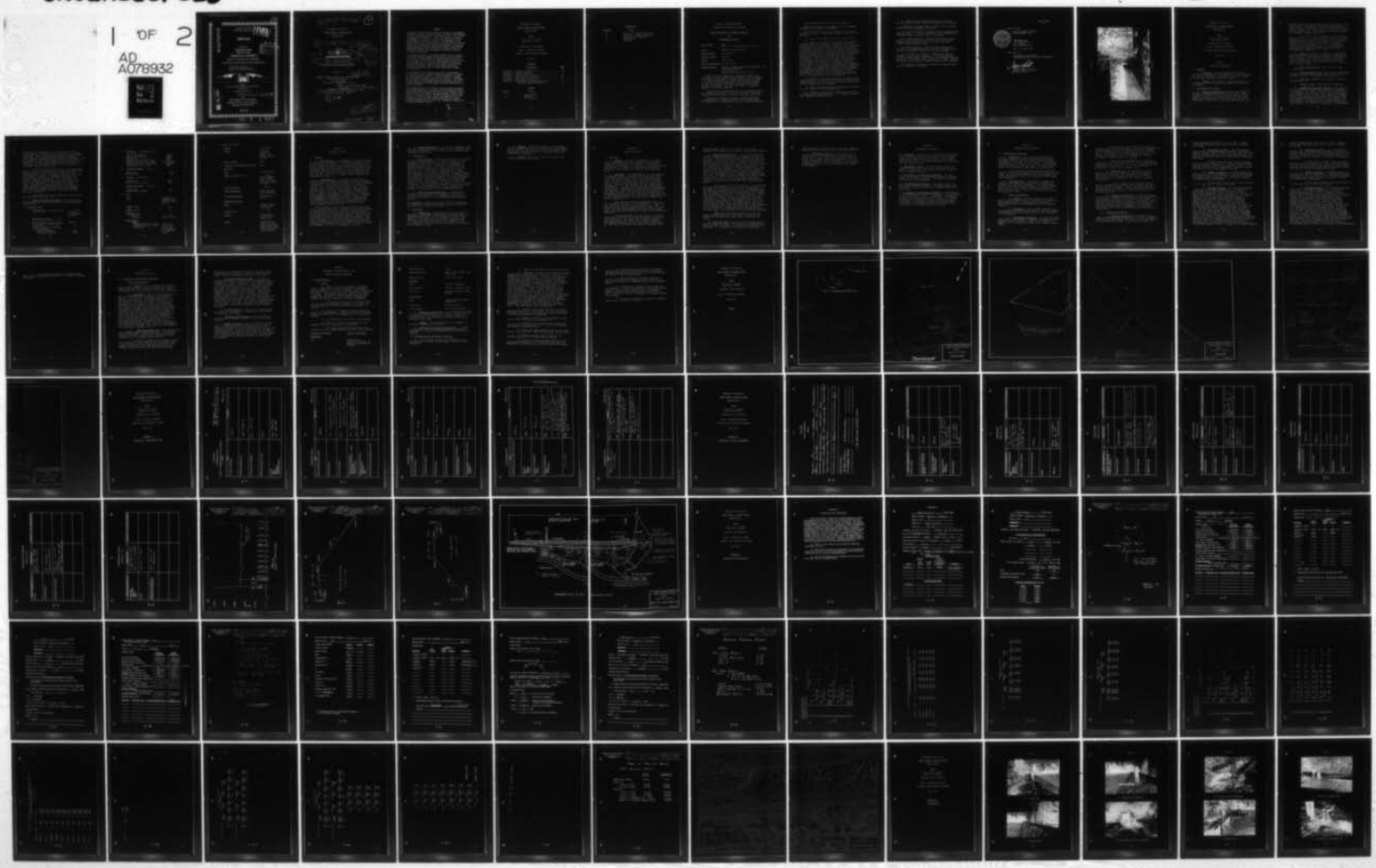
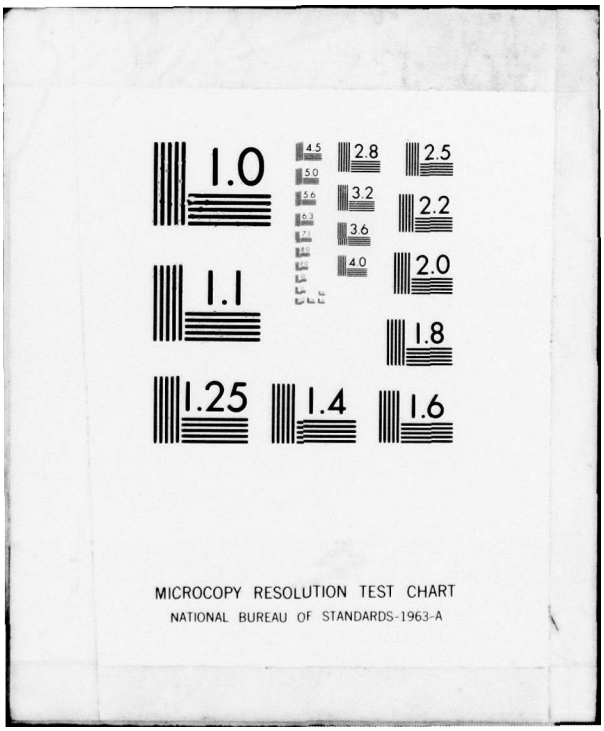
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DRECK CREEK, LUZERNE COUNTY

LEVEL II

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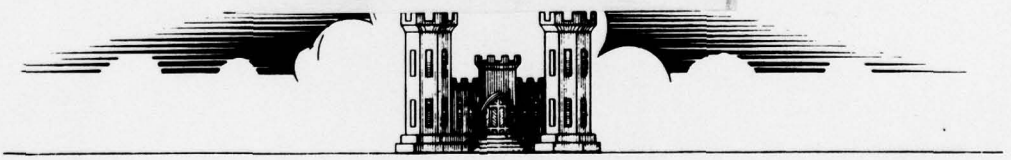
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HAZLETON CITY AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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Prepared by
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
Harrisburg, Pennsylvania 17105

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For

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

MAY 1979

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DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

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Delaware River Basin, Dreck Creek,
Luzerne County, Pennsylvania.

~~HAZLETON CITY AUTHORITY~~

PHASE I INSPECTION REPORT

Number

NATIONAL DAM INSPECTION PROGRAM

Prepared by

(12) 101

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
P.O. Box 1963
Harrisburg, Pennsylvania 17105

For (10) Albert Charles Hooke

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

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PREFACE

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

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

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

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

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DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

DAM G

NDI ID No. PA-00643
DER ID No. 40-14

HAZLETON CITY AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

MAY 1979

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2	Spillway.
3	Outlet Works.

APPENDICES

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A	Checklist - Engineering Data.
B	Checklist - Visual Inspection.
C	Hydrology and Hydraulics
D	Photographs.
E	Geology.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Dam G NDI ID No. PA-00643/DER ID No. 40-14
Owner:	Hazleton City Authority
State Located:	Pennsylvania
County Located:	Luzerne
Stream:	Dreck Creek
Date of Inspection:	10 April 1979
Inspection Team:	Gannett Fleming Corddry and Carpenter, Inc. Consulting Engineers P.O. Box 1963 Harrisburg, Pennsylvania 17105

Based on visual inspection, available records, calculations, and past operational performance, and according to criteria established for these studies, Dam G is judged to be unsafe, nonemergency, because the spillway capacity is rated as seriously inadequate. The existing spillway can pass 27 percent of the Probable Maximum Flood (PMF) without overtopping of the dam. As a whole, the dam is judged to be in fair condition.

If the dam were raised 0.6 foot to its design elevation, the spillway could pass 35 percent of the PMF. The spillway capacity would still be rated as seriously inadequate.

There is no evidence of serious stability problems on the embankment. However, because of the steep slopes, the stability of the embankment is only considered marginal.

The maintenance at the dam is only marginal.

There is no evidence to suggest that the emergency drawdown outlet works is operational.

The following measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Remove the sandbags from the spillway crest.

(2) Engage the services of a professional engineer experienced in the design and construction of dams to perform the following studies: a study to more accurately determine the spillway capacity required at the dam and to determine the measures required to make the spillway hydraulically adequate, a study to determine the structural factors of safety for the embankment and the best means to raise the embankment to its design elevation, a study to determine the best means of making the outlet works operational, a study to repair the deficiencies in the spillway area, and a study to determine the best means of continually monitoring the wet areas at the dam. These studies will require, as a minimum, installation of observation wells or other instrumentation to determine water levels in the embankment, an exploration program to determine the engineering properties of the embankment and foundation materials, a complete survey of the embankment and adjacent area, and grading of the area downstream of the toe to more accurately assess the wet areas. Take appropriate action as required.

(3) Provide closure facilities for the outlet works pipes upstream of the concrete core wall for periodic inspection and for use in the event the pipes leak severely, thereby endangering the embankment.

(4) Remove the brush from the embankment slopes and the trees from near the downstream toe.

(5) Monitor by any suitable means the heave and depression on the downstream slope. If conditions change, take immediate remedial action.

(6) Remove the pipe passing through the core-wall near the top of the dam. Repair the core-wall in this area.

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

(1) Develop a detailed emergency operation and warning system for Dam G. A similar system has been recommended in a separate report for Dam F, which is upstream.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Dam G and have personnel available as necessary to remove any debris that may collect at the spillway bridge.

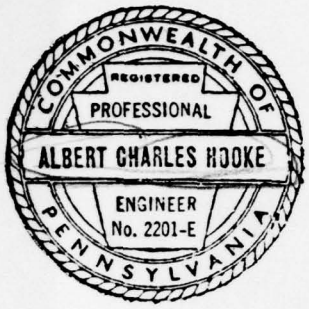
(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) Institute an inspection program such that the embankment is inspected frequently. The program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the results to determine if remedial measures are necessary.

(5) Institute a maintenance program to properly maintain all features of the dam.

Dreck Creek
Dam G

Submitted by:



GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

A. C. HOOKE
Head, Dam Section

Date: 22 June 1979

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

DAM G



Overview

DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

DAM G

NDI ID No. PA-00643
DER ID No. 40-14

HAZLETON CITY AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

MAY 1979

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

1.2 Description of Project.

ABSTRACT

a. Dam and Appurtenances. Dam G is a homogeneous earthfill embankment with a concrete core-wall. The embankment is 490 feet long and 19 feet high at maximum section. There are two outlet works at the dam. The first outlet works, which is near the right end of the embankment, consists of a concrete intake structure, two

CONT'

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24-inch diameter cast-iron pipes, and a valve house. This outlet works is connected to the water supply system. The second outlet works, which is near the left end of the dam, is similar to the first except it consists of a single 24-inch diameter pipe. The second outlet works provides the emergency drawdown capability.

The concrete chute spillway is at the left abutment of the dam. Its crest is 3.0 feet below the design elevation of the top of the dam and is 75 feet long. The approach channel is short and concrete paved. The exit channel is a continuation of the chute. A bridge extends across the spillway crest. It is supported by two piers. The various features of the dam are shown on the Plates at the end of the report and on the Photographs in Appendix D.

ABSTRACT

b. Location. The dam is located on Dreck Creek, approximately 3.9 miles east of Hazleton, Pennsylvania. Dam G is shown on USGS Quadrangle, Hazleton, Pennsylvania, with coordinates N40°57'00" and W75°54'15" in Luzerne County, Pennsylvania. Dam F is located upstream of Dam G on Dreck Creek 0.3 mile west of Dam G. A location map is shown on Plate 1.

c. Size Classification. Small (19 feet high, 179 acre-feet).

d. Hazard Classification. High hazard. Downstream conditions indicate that a high hazard classification is warranted for Dam G (Paragraphs 3.1e and 5.1c.).

e. Ownership. Hazleton City Authority, Hazleton, Pennsylvania.

f. Purpose of Dam. Water Supply for Hazleton.

g. Design and Construction History. Dam G was constructed between 1910 and 1916. The dam was designed by S.D. Warriner, A.B. Jessup, Edgar Kudlich, W.H. Davies, J.H. Humphrey, and A.H. Lewis. All these gentlemen were staff members of the Hazleton Water Company, the original owner. The contractor was the Read Contracting Company. As originally designed, the dam had two spillways. One was located at the right abutment and the other at the left abutment. The spillway at the right abutment had a crest length of 21 feet and its crest was 1.75 feet below

top of dam. The spillway at the left abutment also had a crest length of 21 feet and its crest was 3.0 feet below top of dam. The Pennsylvania Water Supply Commission concluded that these spillways were apparently inadequate, as the dam was overtopped during construction in January, 1914. J.W. Ledoux, a consulting engineer of Philadelphia, was retained by the water company when the dam was under construction. He recommended modifying the left spillway to its present design configuration.

The dam was almost complete when the Commonwealth enacted the permit requirement for constructing dams. The dam was studied, when still under construction, by the Pennsylvania Water Supply Commission as part of their 1914 dam inspection program. As originally designed, the lower part of the upstream slope was 1V on 1.25H. The report recommended changing the 1V on 1.25H slope to 1V on 2.5H. The permit to continue construction was issued without the requirement to flatten the 1V on 1.25H slope. The permit did require that any indication of slope movement be reported immediately to the Commission. The report analyzed the hydraulics of the dam assuming that it had two spillways; however, the right spillway was never constructed.

The bridge across the spillway was constructed at some time between 1928 and 1931.

h. Normal Operational Procedure. The pool is maintained at spillway crest with excess inflow discharged over the spillway.

1.3 Pertinent Data.

a. Drainage Area. (square miles.) 2.8 of which 2.4 is controlled by Dam F.

b. Discharge at Damsite. (cfs.)

Maximum known flood at damsite	Unknown
Outlet works at maximum pool elevation	64
Spillway capacity at maximum pool elevation	
Design conditions	1,170
Existing conditions	800

c. Elevation. (feet above msl.)

Top of dam (design)	1587.0
Top of dam (existing)	1586.4
Maximum pool	1586.4
Normal pool (spillway crest)	1584.0
Upstream invert outlet works	Not available
Downstream invert outlet works	1568.4
Streambed at toe of dam	1568.0

d. Reservoir Length. (miles.)

Normal pool	0.30
Maximum pool	0.30

e. Storage. (acre-feet.)

Normal pool	138
Maximum pool (design)	179

f. Reservoir Surface. (acres.)

Normal pool	13
Maximum pool (design)	14

g. Dam.

Type	Homogeneous earthfill with concrete corewall.
Length (feet)	490
Height (feet)	19
Topwidth (feet)	
Design	10
Existing	varies, 6 to 8
Side Slopes	
Design	
Upstream above El. 1578.0	1V on 2H
Upstream below El. 1578.0	1V on 1.25H
Downstream	1V on 1.5H
	See Appendix B for existing slopes.

g.	Dam. (Continued)	
	Zoning	Core-wall.
	Cutoff	Core-wall founded in trench with timber sheeting beneath.
	Grout Curtain	None.
h.	Diversion and Regulating Tunnel.	None.
i.	Spillway.	
	Type	Concrete chute.
	Length of Weir (feet.)	75.0 Two triangular-nosed bridge piers, 1.5 feet wide, are located at crest.
	Crest Elevation	1584.0
	Upstream Channel	Short concrete-paved approach
	Downstream Channel	Continuation of chute.
j.	Regulating Outlets.	
	Type	Single-24-inch diameter cast iron pipe.
	Length (feet.)	80
	Closure	24-inch gate valve at downstream toe.
	Access	Valve house at downstream toe. Also two 24-inch water supply lines connect to water supply system.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. No engineering data were available for review for the structure as originally designed or as modified during construction. In a study performed in 1914 by the Pennsylvania Water Supply Commission, an account of design concepts, geology, construction materials and methods, and design features was prepared for the components of the dam from interviews with the Owner, visual inspection, and other sources. The 1914 study also included analyses for hydrology and hydraulics. A summary of the results of the analyses is on file.

b. Design Features. The project is described in Paragraph 1.2g. The various features of the dam are shown on the Plates at the end of the Report and on the Photographs in Appendix D. The drawings available for the dam are limited. The spillway is shown on Plate 2 and on Photographs F and I. The water supply outlet works is shown on the upper half of Plate 3. The emergency drawdown outlet works is shown on the lower half of Plate 3. The valve house is shown on Photograph D. No plan or cross sections of the embankment are available in the records. A plan of the embankment is sketched on Plate B-1. Cross sections of the embankment obtained from a survey performed for this inspection are in Appendix B. A description of the core-wall, excerpted from the 1914 Pennsylvania Water Supply Commission Report, follows:

"The core-wall, of 1-2-4 concrete, is 18 inches thick on top, and the plans show it to be 4 feet thick at the base. In building the core wall a trench was excavated from 4 to 5 feet deep, in which a double row of 2" yellow pine sheet piling was driven to an additional depth of from 4 to 5 feet in the gravelly clay. The sheet piling was allowed to project about 3 feet into the base of the concrete wall. The crest of the wall is 3 feet above the flow line of the reservoir, extending to the top of the embankment, which has a downward slope toward the upstream edge of 1 foot in 8 feet." The embankment is shown on Photographs A, B, and C.

c. Design Considerations. As noted in Paragraph 1.2g, the staff of the Water Supply Commission was concerned about the steep upstream slope. The slopes of the embankment are discussed in Section 6.

2.2 Construction.

a. Data Available. Construction data for the original structure that are available for review, consist of the information contained in the 1914 report prepared by the Pennsylvania Water Supply Commission. Site geology is discussed in Appendix E. The Report indicates that the embankment was constructed of a sandy and gravelly clay, with all stones larger than 6 inches removed. It was placed in 6 to 12 inch layers, sprinkled when necessary, and compacted by earth-hauling equipment. Core-wall foundation conditions have been previously noted in Paragraph 2.1b. The report also notes that the outlet pipes were originally laid directly on the earth foundation. A leak developed along one pipe. The pipe was excavated and found to be broken in two or three places. All the lines were then relaid on a concrete foundation and encased in 8 to 12 inches of concrete. The report did note that no expansion or contraction joints were provided in the spillway walls or paving; it was anticipated that cracking would occur.

b. Construction Considerations. It appears that reasonable care was used in the construction of Dam G. Although the compaction of the embankment might have been better, it has existed for 63 years without any reported problems.

2.3 Operation. There are no formal records of operation. The Owner did not report any problems having occurred over the operational history of the dam.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dam Safety, Obstructions, and Storm Water Management, Department of Environmental Resources, Commonwealth of Pennsylvania, and by the Owner, Hazleton City Authority. The Owner made available The General Manager for information during the week of the inspection. He also researched his files for additional data at the request of the inspection team.

b. Adequacy. The type and amount of design data and other engineering data are limited, and the assessment must be based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

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

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam is fair. Some deficiencies were observed as noted below. A sketch of the dam with the location of deficiencies is presented in Appendix B on Plate B-1. Survey information acquired for this report is summarized in Appendix B. On the day of the inspection, the pool was at spillway crest.

b. Embankment. The embankment is in fair condition. The downstream slope is thickly covered with low brush. A few mature trees are growing on the embankment at the toe of the slope. There is also brush on the upstream slope. It is thick but very low. The top of the concrete core-wall is exposed along almost the entire top of the dam. The top of the core-wall is very deteriorated (Photograph A). To the right of the water supply outlet works, a 6-inch diameter pipe extends across the embankment (Photograph C). The Owner did not know what function, if any, the pipe serves. The core-wall was chipped away to accommodate the pipe, which is covered with loose rock fill. On the downstream slope, there is a 0.5-foot high heave and a 1-foot deep depression. The approximate locations are shown on Plate B-1.

There are some wet areas downstream from the dam as shown on Plate B-1 and on Photograph F. This plate also shows the location of a 2-foot deep ditch. The water in the ditch was flowing at about 10 gpm. The Owner stated that this was discharge from a sump in the pump-house. The area downstream from the dam is poorly graded in many areas.

A survey performed for this inspection revealed that almost the entire top of the embankment is below its design elevation. The lowest area, directly above the left outlet works, is 0.6 foot below design elevation. The downstream design slope is 1V on 1.5H; it measured 1V on 1.28H and 1V on 1.33H at two separate locations. The

upstream design slope is 1V on 2H above normal pool. It measured 1V on 2.4H and 1V on 2.86H at two separate locations.

c. Appurtenant Structures. The right outlet works is used for water supply and it is in apparently good condition. Two pipes extend under the embankment at this outlet works. The valve house had previously deteriorated and was rebuilt with concrete block. No deficiencies were observed. The Owner stated that the valves on these two lines were adjusted as necessary for water supply purposes. The left outlet works is used for emergency drawdown and it is in poor condition (Photograph D). The concrete valve house had previously deteriorated and was rebuilt with timber. Access to the valve within would be gained by removing the roof. The roof appeared to be permanently attached to the structure. The Owner declined to operate this outlet works, out of concern that the valve would remain in the open position. The walls of the stilling basin downstream of this outlet works are so deteriorated that they are beyond repair.

The spillway is in fair condition. A few sandbags are placed sporadically across the crest (Photograph F). The remnants of others are at the toe of the spillway chute. The right spillway approach wall is peeling badly in areas. The left approach wall is spalled and peeling. The entire slab of the chute is scoured. One area is scoured 1.5 feet deep and the adjacent left wall is undermined for 2 feet (Photograph H). Where the wall is undermined, a 25-foot length of the wall has a near-horizontal crack with a 0.2-foot offset (Photograph G). The right wall of the chute is spalled and peeling. Trees are growing behind this wall. At the spillway crest, the bridge piers are in good condition. The low steel of the bridge is at the design elevation of the top of the dam. The bridge deck is missing for about a 4-foot length. The remainder of the deck is deteriorating.

Immediately downstream from the spillway, the channel crosses under the access road to the toe of the dam in two oblong culverts, each about 48 inches by 60 inches.

d. Reservoir Area. Dam F is at the upstream end of the reservoir. All of the watershed that is downstream from Dam F is steep and wooded. It is also undeveloped and uninhabited. It is owned and controlled by the Hazleton

City Authority. The access road to the dam, from Dam F, generally parallels the reservoir and is high above it.

e. Downstream Conditions. From Dam G, the stream flows for 1.2 miles, along an uninhabited and wooded reach, to its confluence with Hazle Creek. In this reach it crosses under what apparently is a low railroad embankment. Hazle Creek flows for 4.3 miles, along an uninhabited and wooded reach, to the community of Weatherly, where at least 40 dwellings are within the floodplain.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at spillway crest, Elevation 1584.0, with excess inflow discharging over the spillway and into Dreck Creek. Water supply lines at the dam are connected directly to the Owner's distribution system. The emergency drawdown outlet works valve is normally closed.

4.2 Maintenance of Dam. The dam is visited daily by a caretaker who adjusts the water supply valves, if necessary. Inspections of the dam are not made. Brush is cut at irregular intervals.

4.3 Maintenance of Operating Facilities. The water supply outlet works is operated when required, and maintenance is performed as needed. The emergency drawdown outlet works is not maintained.

4.4 Warning Systems in Effect. The Owner stated that there is no emergency operation and warning system. He stated that, should the dam fail, no damage would result downstream.

4.5 Evaluation of Operational Adequacy. The maintenance of the embankment and spillway is marginal. The maintenance of the outlet works is poor. Inspections are necessary to detect hazardous conditions at the dam. As described hereafter, if the dam were to fail, damage would result downstream. An emergency operation and warning system is necessary to mitigate the hazards downstream, should evidence of stress become evident at the dam.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The Pennsylvania Water Supply Commission prepared a report upon the application of the Owner, prior to issuing a permit for the continued construction of the dam. In that report, they estimated the design spillway capacity at 1,300 cfs. This was the combined capacity of both spillways. As noted in Paragraph 1.2g, the right spillway was never constructed.

For the existing spillway located at the left abutment, a design discharge of 1,170 cfs was used for this study. The existing spillway capacity was estimated including the effects of the low top of dam and the bridge piers (Appendix C).

b. Experience Data. No hydraulic problems were reported by the Owner. He stated that no records of maximum pool levels were available. The flood of record for Dam F, located upstream of Dam G, is Tropical Storm Agnes in June, 1972. This is probably the flood of record for Dam G also. There is no information available to estimate the flow.

c. Visual Observations.

(1) General. The visual inspection of Dam G, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.

(2) Embankment. The low areas along the top of the dam reduce the spillway capacity. The pipe through the embankment serves no purpose and provides a low area in the core-wall.

(3) Appurtenant Structures. All the outlet works pipes extend under pressure through the embankment without upstream closure facilities. There is no evidence to suggest that the emergency drawdown outlet works is operational.

The Owner has used sandbags to increase the storage at other dams in his system. As noted in Paragraph 3.1c, a few sandbags are on the spillway crest and the remains of other sandbags are at the downstream end of the spillway chute. It is surmised that these sandbags are used to increase the storage. The use of sandbags on the spillway crest is a serious hazard to the dam.

Large spillway discharges would obviously overtop the access road along the toe. The spillway bridge would then be the only access to the dam. The deteriorating bridge deck is therefore of concern. The bridge has a potential to collect debris during a flood.

(4) Reservoir Area. No conditions were observed in the reservoir area that might present significant hazard to the dam. The assessment of the dam is based on existing conditions and the effects of future development are not considered. The access to the damsite is good.

A Phase I Report for the National Dam Inspection Program is concurrently being prepared for Dam F, which is upstream of Dam G. Dam F is of small size and categorized as high hazard. It has a seriously inadequate spillway capacity. A failure of Dam F would cause the failure of Dam G.

(5) Downstream Conditions. No conditions that would present a hazard to the dam were observed downstream. The downstream conditions indicate that a high hazard classification is warranted for Dam G. The stream crossing under the railroad along the downstream channel was not observed on the day of the inspection. The available information indicates that the embankment is relatively low; it would not provide significant mitigating effects to floodflows.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (Small) and hazard potential (High) of Dam G varies between the

Probable Maximum Flood (PMF) and the 1/2 PMF. Because of the large downstream population, the PMF is selected as the SDF.

(2) Description of Model. The watershed was modelled with the HEC-1DB computer program. The HEC-1DB computer program computes a PMF runoff hydrograph and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure.

The PMF inflow component to Dam F was computed and routed through the dam. The outflow was combined with the uncontrolled PMF inflow component to Dam G. The combined flow was routed through Dam G. Identical methods were used for various percentages of the PMF.

(3) Summary of Results. Pertinent results are tabularized at the end of Appendix C. The analysis reveals that Dam F can pass 29 percent of its component of the PMF. The analysis also reveals that Dam G can pass 27 percent of the PMF without overtopping.

If Dam G were raised to its design elevation, it could pass about 35 percent of the PMF.

(4) Spillway Adequacy. The criteria for rating a spillway is presented in Appendix C. Since the dam cannot pass the 1/2 PMF, without failure a further analysis was performed. For the occurence of the 1/2 PMF, it was assumed that Dam F would not fail. It was also assumed that no inflow occured downstream of Dam G. In addition, it was assumed that Dam G would develop a breach 80 feet wide and 18 feet high 0.1 hour after being overtopped by 0.1 foot. A breach of this size results in an outflow of 16,600 cfs. The resulting outflow was routed downstream to Weatherly. The locations of cross sections used for routing are shown on Plate C-1. The water surface in Weatherly would increase 0.8 foot over the water surface that would occur if the dam did not fail. Although this increase would cause damage, it is not certain it would cause loss of life. When the effects of a failure of Dam F, as described in its Phase I Report, are included, the water surface increases by 8.6 feet. Dam F and Dam G are considered to be a system for hydraulic purposes. There is an increased hazard to loss of life because of the combined failure of Dam F and Dam G. The spillway capacity of Dam G is rated as seriously inadequate.

Probable Maximum Flood (PMF) and the 1/2 PMF. Because of the large downstream population, the PMF is selected as the SDF.

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If the dam were raised to its design elevation, the spillway capacity would still be rated as seriously inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Dam G, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for the various features.

(2) Embankment. Brush and trees growing on or near the embankment are undesirable. The concrete at the top of the core-wall is deteriorated because of exposure to the weather. The deterioration is not of major concern; however, as discussed in Section 5, the low areas at the top are of concern. The heave and depression on the downstream slope could be caused by poor construction grading. As they could also indicate more serious problems, careful monitoring of the areas is warranted. Although heavy rains two days before the inspection could have contributed to the wet areas, it is certain that the reservoir was also contributing to them. The periodic inspections by the Commonwealth note wet areas along the toe of the dam; they were first noted immediately after the dam was first filled. The flow emanating from the pumphouse sump is not considered a deficiency; however, the ditch could have been intercepting seepage, which would have been obscured by the flow from the sump. The slopes of the embankment are discussed in Paragraph 6.1b.

(3) Appurtenant Structures. The conditions at the emergency drawdown outlet works are an indication of lack of maintenance. Although the valve house has been repaired, the lack of ready access indicates a lack of concern for the functioning of this feature.

The lack of contraction or expansion joints has contributed to the conditions in the spillway. Most of the conditions are an indication of the lack of maintenance. The crack, scour, and undermining near the left wall indicate that the wall may be near failure.

This would not be an immediate hazard to the dam, except it might cause the hillside to partially slide into the chute. This could interfere with flow in the chute.

b. Design and Construction Data. No record of design data or stability analysis for the embankment was available for review. Analysis of the embankment stability is beyond the scope of this study. Also, sufficient data on the engineering properties of the embankment material would have to be acquired before the analysis could be performed. No evidence of stability problems presently threatening the embankment were observed. However, the slopes of the embankment are much steeper than present standard practice would allow. The lower part of the upstream slope is 1V on 1.25H. As noted in Paragraph 1.2g, the Pennsylvania Water Supply Commission staff was concerned about the steepness of this slope. The design downstream slope is 1V on 1.5H. The slope is actually closer to 1V on 1.25H. Even with a core-wall, the stability of the embankment is considered marginal for any operating condition.

c. Operating Records. There are no formal records of operation. No evidence of instability on any feature of the dam has been noted.

d. Postconstruction Changes. There have been no postconstruction changes to Dam G that would affect its stability.

e. Seismic Stability. Dam G is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone has adequate factors of safety under static loading conditions, it can be assumed safe for any expected earthquake loading. However, since there are no formal static stability analyses, and since there is the potential of earthquake forces moving or cracking the concrete core-wall, the theoretical seismic stability of Dam G cannot be assessed.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND

PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on the visual inspection, available records, calculations, and past operational performance, Dam G is judged to be in fair condition. The existing spillway will pass 27 percent of the PMF without overtopping of the dam. The spillway capacity is rated as seriously inadequate. According to criteria established for these studies, the dam must be rated as unsafe, nonemergency, because the spillway capacity is seriously inadequate.

If the dam were raised to its design elevation, the spillway could pass 35 percent of the PMF. The spillway capacity would still be rated as seriously inadequate.

(2) There is no evidence of serious stability problems at the embankment. However, because of the steep slopes, the stability of the embankment is only considered marginal.

(3) The maintenance at the dam is only marginal.

(4) There is no evidence to suggest that the emergency drawdown outlet works is operational.

The visual inspection revealed some deficiencies, which are summarized below for the various features.

Feature and Location	Observed Deficiency
Embankment	
Top	Deteriorated concrete core-wall, low areas, pipe through embankment.

Upstream slope	Brush.
Downstream slope	Brush, trees, heave, and depression.
Downstream toe	Trees, wet areas.
Spillway:	
Crest	Scattered sandbags.
Slab and walls	Peeling, spalling, scour.
Left wall	Relative movement, undermining.
Outlet Works:	
Pipes	Under pressure through embankment.
Valve house	No ready access.
Stilling basin	Total deterioration.

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented immediately.

d. Necessity for Further Investigations. In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations by the Owner will be required.

7.2 Recommendations and Remedial Measures.

a. The following measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Remove the sandbags from the spillway crest.

(2) Engage the services of a professional engineer experienced in the design and construction of dams to perform the following studies: a study to more accurately determine the spillway capacity required at the dam and to determine the measures required to make the spillway hydraulically adequate, a study to determine the structural factors of safety for the embankment and the best means to raise the embankment to its design elevation, a study to determine the best means of making the outlet works operational, a study to repair the deficiencies in the spillway area, and a study to determine the best means of continually monitoring the wet areas at the dam. These studies will require, as a minimum, installation of observation wells or other instrumentation to determine water levels in the embankment, an exploration program to determine the engineering properties of the embankment and foundation materials, a complete survey of the embankment and adjacent area, and grading of the area downstream of the toe to more accurately assess the wet areas. Take appropriate action as required.

(3) Provide closure facilities for the outlet works pipes upstream of the concrete core wall for periodic inspection and for use in the event the pipes leak severely, thereby endangering the embankment.

(4) Remove the brush from the embankment slopes and the trees from near the downstream toe.

(5) Monitor by any suitable means the heave and depression on the downstream slope. If conditions change, take immediate remedial action.

(6) Remove the pipe passing through the core-wall near the top of the dam. Repair the core-wall in this area.

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

(1) Develop a detailed emergency operation and warning system for Dam G. A similar system has been recommended in a separate report for Dam F, which is upstream.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Dam G and have personnel available as necessary to remove any debris that may collect at the spillway bridge.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) Institute an inspection program such that the embankment is inspected frequently. The program should include a formal annual inspection by a professional Engineer experienced in the design and construction of dams. Utilize the results to determine if remedial measures are necessary.

(5) Institute a maintenance program to properly maintain all features of the dam.

DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

DAM G

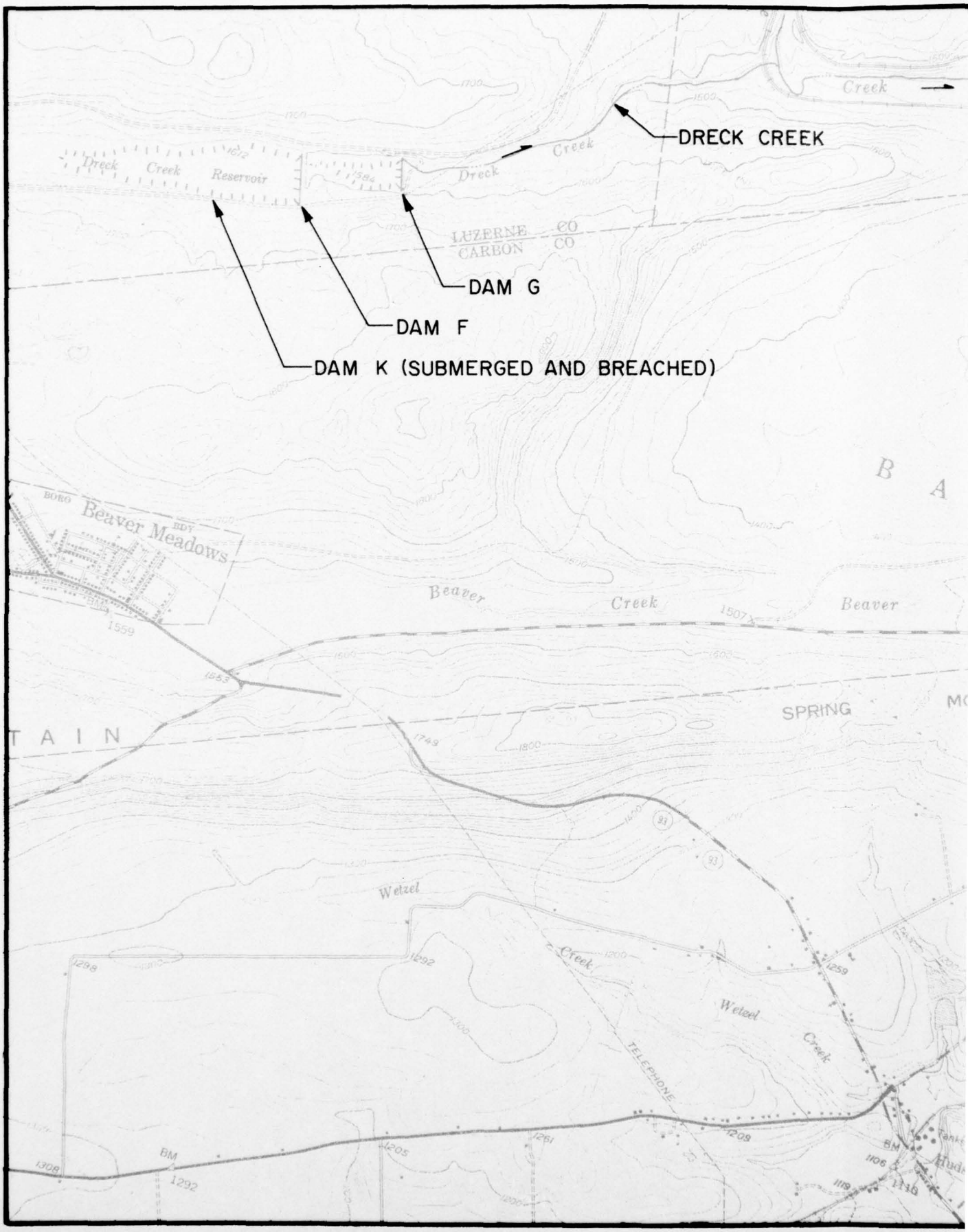
NDI ID No. PA-00643
DER ID No. 40-14

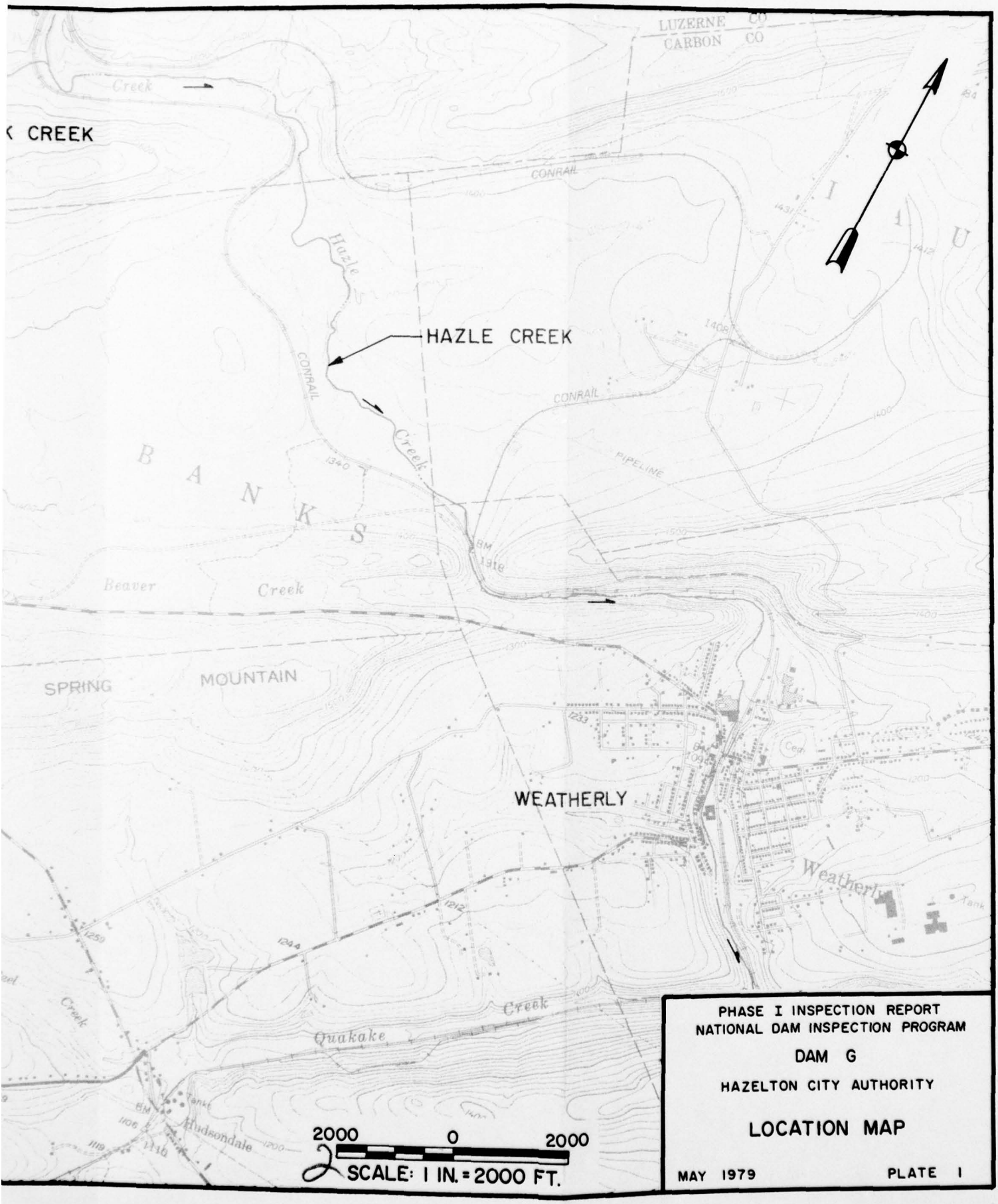
HAZLETON CITY AUTHORITY

PHASE I INSPECTION PROGRAM

MAY 1979

PLATES


DRECK CREEK
DAM G
DAM F
DAM K (SUBMERGED AND BREACHED)
Dreck Creek Reservoir
Dreck Creek
Creek
LUZERNE CO
CARBON CO
Beaver Meadows
Beaver Creek
Beaver
SPRING
Wetzel Creek
Wetzel
Creek
TELEPHONE
BM
1672
1584
1559
1553
1507
1749
1298
1292
1259
1308
1205
1261
1209
1106
1119
1110



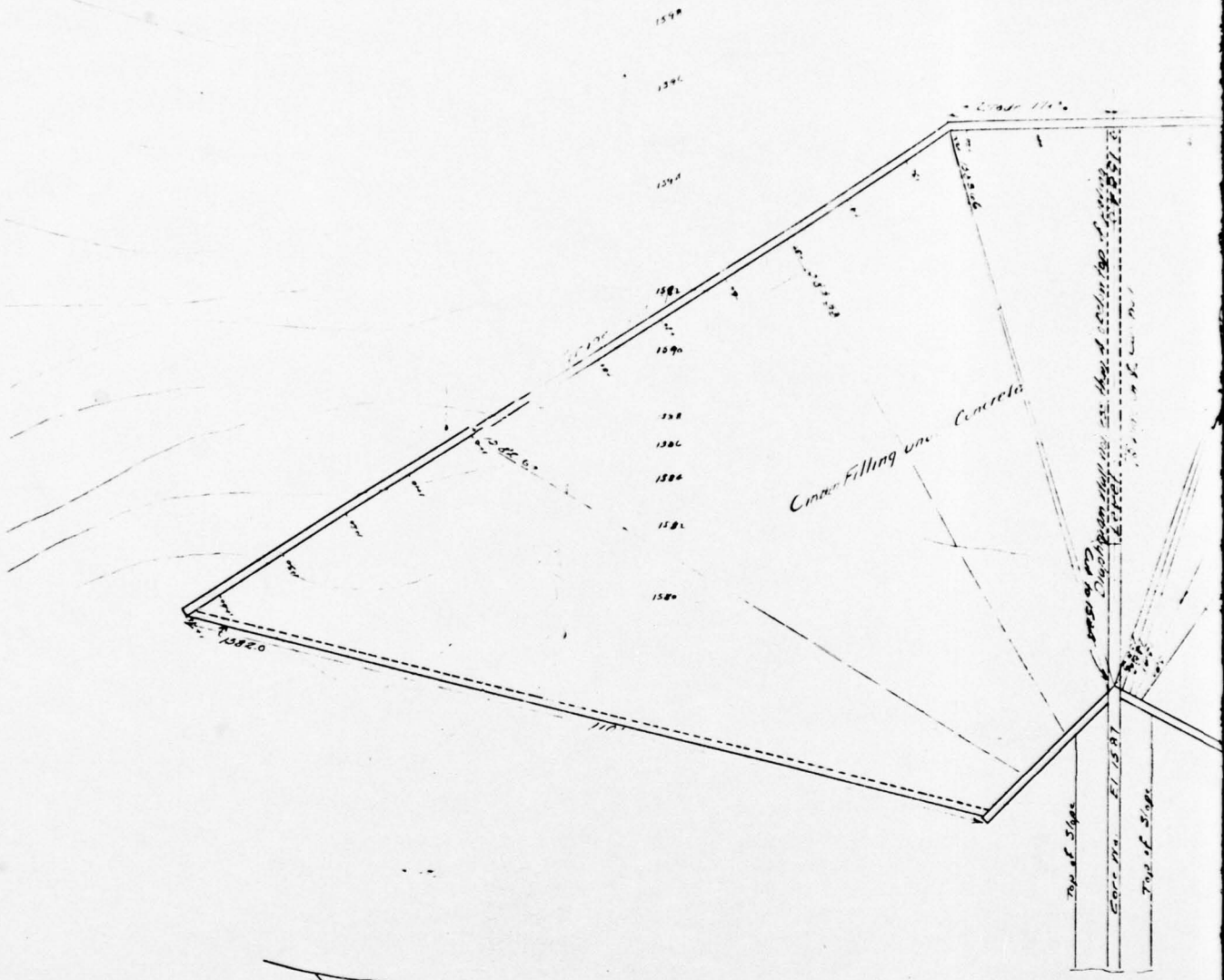
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

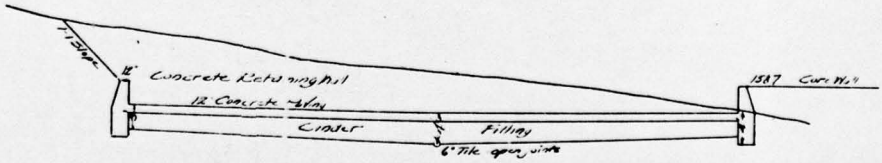
DAM G

HAZELTON CITY AUTHORITY

LOCATION MAP

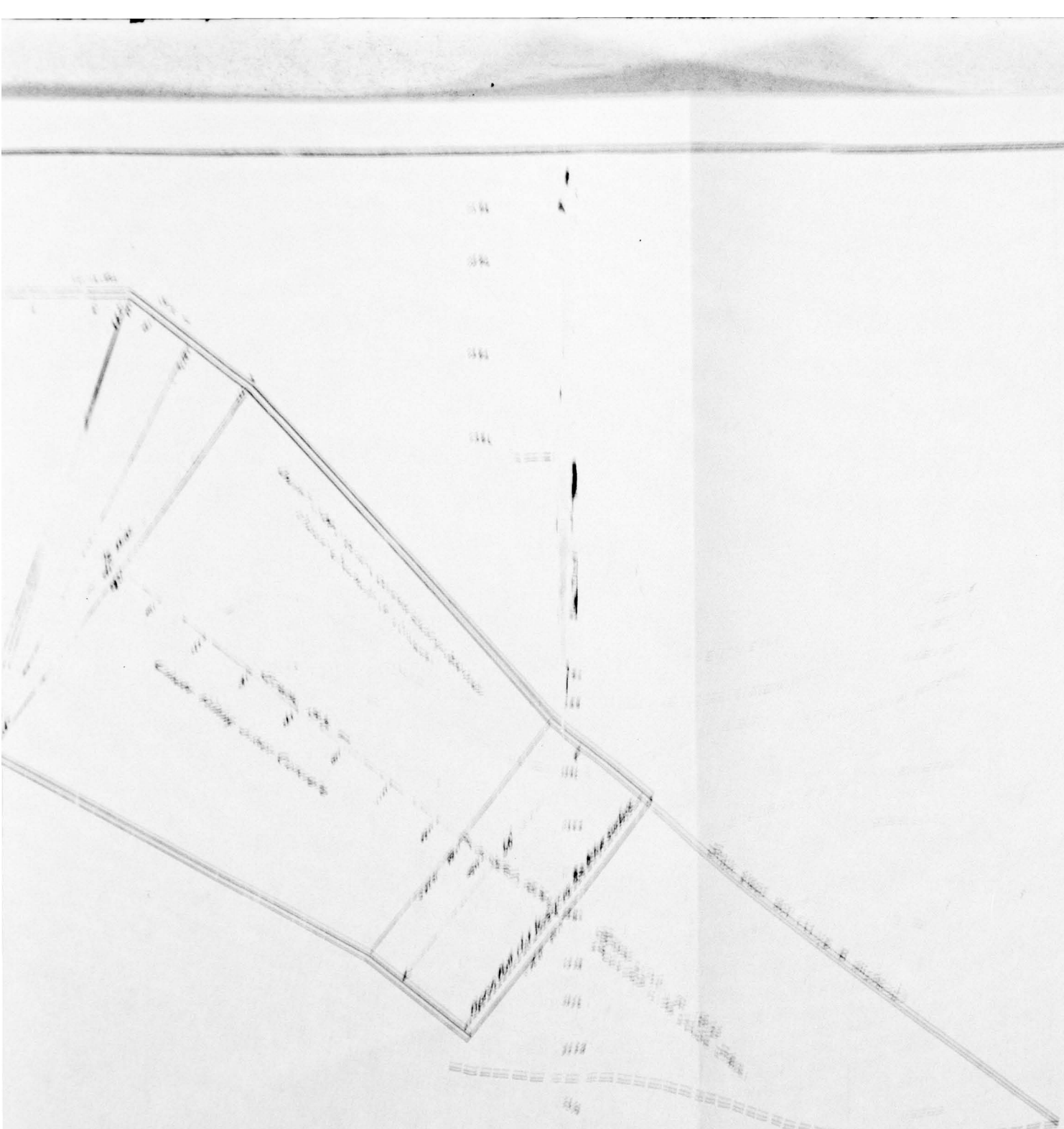
MAY 1979 PLATE 1





Typical Section on E. Curb Wall.

1



Huntington Unit Ch
Wyoming State Water Supply Co Leased
Huntington District
Creek Creek Reservoir 6
Proposing Change North Overflow
Scale 1 inch = 400 ft

2



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DAM G

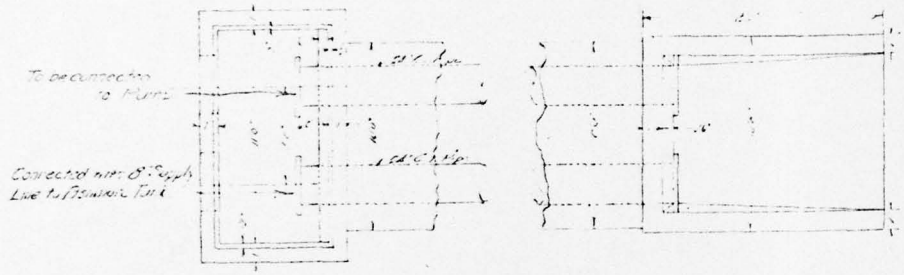
HAZELTON CITY AUTHORITY

SPILLWAY

MAY 1979

PLATE 2

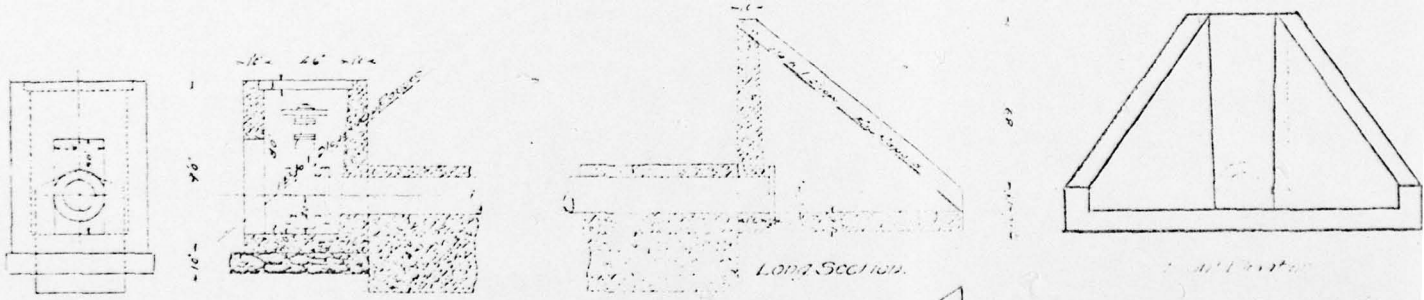


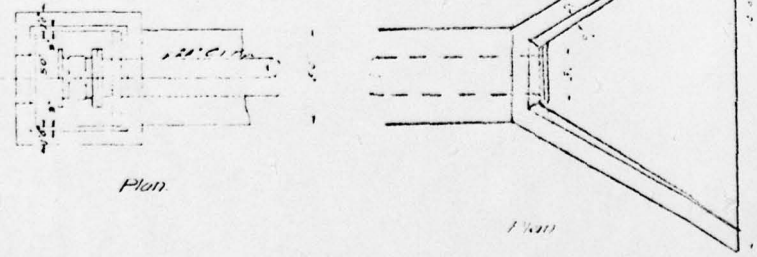


Valve Box Details

Head Wall Details

PUMP SUCTION & TANK SUPPLY PIPES





Valve Box Details

Head Wall Details

SINGLE DRAIN PIPE.

Hazleton Water Co.,

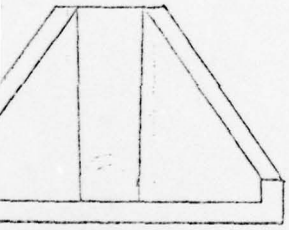
Lessee,

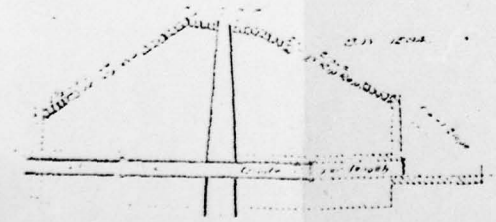
DRAIN[illegible]UCTION & SUPPLY P[illegible]

HEAD[illegible]WALL & VALVE BOX D[illegible]

1







Water Co.,

Lessee,

JCTION & SUPPLY PIPES.

ALL & VALVE BOX DETAILS.

2

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DAM G

HAZELTON CITY AUTHORITY

OUTLET WORKS

MAY 1979 PLATE 3

DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

DAM G

NDI ID No. PA-00643
DER ID No. 40-14

HAZLETON CITY AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

MAY 1979

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: G
I PA-00643
NDS ID NO.: _____ DER ID NO.: 40-14

Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	NONE
REGIONAL VICINITY MAP	See PLATE 1.
CONSTRUCTION HISTORY	BUILT 1910-1916
TYPICAL SECTIONS OF DAM	NONE
OUTLETS: Plan Details Constraints Discharge Ratings	SEE PLATE 3 NO RATINGS

A-1

ENGINEERING DATA

Sheet 2 of 4

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NONE
DESIGN REPORTS	1914 PENNSYLVANIA WATER SUPPLY COMMISSION REPORT
GEOLOGY REPORTS	1914 PENNSYLVANIA WATER SUPPLY COMMISSION REPORT
DESIGN COMPUTATIONS: Hydrology and Hydraulics (H&H) Dam Stability Seepage Studies	1914 PENNSYLVANIA WATER SUPPLY COMMISSION REPORT FOR H&H NO OTHER DATA
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	NONE
POSTCONSTRUCTION SURVEYS OF DAM	NONE

A-2

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	NOT NOTED
MONITORING SYSTEMS	NONE
MODIFICATIONS	SPILLWAY BRIDGE
HIGH POOL RECORDS	NONE
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	NONE

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	NONE
SPILLWAY: Plan Sections Details	See PLATE 2.
OPERATING EQUIPMENT: Plans Details	See PLATE 3.
PREVIOUS INSPECTIONS Dates Deficiencies	1915 - SMALL STREAMS ALONG TOE. 1920 - SWAMPY below dAM. TOP OF dAM HAS SETTLED, EXPOSING CORE-WALL, WHICH IS dISINTEGRATED. 1923 - SLIGHT SEEPAGE, SOIL UNDER UPSTREAM RIPRAP HAS SETTLED, SO RIPRAP IS HACHED. CORE-WALL PER 1920. 1924 - (BY OWNER) SETTLEMENT ALONG TOP OF dAM, SPALLING OF CORE-WALL AND SPILLWAY AND VALVE HOUSE CONCRETE.
(CONTINUED)	1925 - PER 1923 EXCEPT NO SEEPAGE. 1928. NO deficiencies, UPSTREAM RIPRAP RELAID.

4-4

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

ENGINEERING DATA

ITEM	REMARKS
PREVIOUS INSPECTIONS (CONTINUED).	1931- SLIGHT SEEPAGE, TWO BRIDGE PIERS IN SPILLWAY, HORIZONTAL CRACK IN LEFT SPILLWAY WALL.
	1934- SMALL FLOW FROM DRAIN AT LOWER END OF SPILLWAY, WHICH HAS 2 PIERS. SOME CRACKS IN SPILLWAY SIDEWALLS.
	1938- PER 1934 EXCEPT SEEPAGE NOTED AT EACH SIDE OF BLOWOFF AND AT VALVE HOUSE.
	1944- LEAKAGE AT RIGHT ABUTMENT DUE TO DETERIORATED SPILLWAY SLAB, WHICH IS BADLY HEAVED AND CRACKED.
	1965- NO DEFICIENCIES.

A-5

DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

DAM G

NDI ID No. PA-00643
DER ID No. 40-14

HAZLETON CITY AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

MAY 1979

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: G County: LUZERNE State: PENNSYLVANIA

NDI ID No.: PA-00643 DER ID No.: 40-14

Type of Dam: EARTHFILL W/CORE-WALL Hazard Category: HIGH

Date(s) Inspection: 10 APRIL 1979 Weather: CLEAR-WINDY Temperature: 45°F

SOIL CONDITIONS: VERY MOIST

Pool Elevation at Time of Inspection: 1584.0 msl/Tailwater at Time of Inspection: N/A msl

Inspection Personnel:

D. WOLF (GFCC) R. ZIENTUK (HCA)

D. EBERSOLE (GFCC)

A. WHITMAN (GFCC) Recorder

B-1

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	NONE	
CREST ALIGNMENT: Vertical Horizontal	HORIZONTAL - NO DEFICIENCIES VERTICAL - SEE SURVEY DATA FOLLOWING INSPECTION FORMS.	
RIPRAP FAILURES	6" HIGH HEAVE IN DOWNSTREAM SLOPE	

B-2

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	No deficiencies except wet area at left abutment see below	
ANY NOTICEABLE SEEPAGE	Wet areas as shown on Plate B-1	
STAFF GAGE AND RECORDER	None	
DRAINS	None	
Brush	Brush on slopes. Trees at toe and in embankment.	

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	CAST IRON PIPES	
INTAKE STRUCTURE	SUBMERGED	
OUTLET STRUCTURE	RIGHT OUTLET WORKS REBUILT VALVE HOUSE LEFT OUTLET WORKS REBUILT VALVE HOUSE	LEFT OUTLET WORKS STILLING BASIN WALLS TOTALLY DETERIORATED.
OUTLET CHANNEL	MUCK - obviously NOT USED RECENTLY	
EMERGENCY GATE	OWNER declined TO OPERATE, CONCERNED THAT IT WOULD REMAIN OPEN	

B-14

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	SCATTERED SANDBAGS 2-1.5' BRIDGE PIERS	
APPROACH CHANNEL	WALLS PEELING	
DISCHARGE CHANNEL	SCOUR ALL ALONG SLAB. RIGHT WALL PEELING AND SPALLING	LEFT WALL - HORIZONTAL CRACK AND 2' UNDERMINING AT 1.5' deep SCOUR HOLE
BRIDGE AND PIERS	BRIDGE DECK deteriorated.	

B-5

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE	
OBSERVATION WELLS	NONE	
WEIRS	NONE	
PIEZOMETERS	NONE	
OTHER	NONE	

RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	STEEP LEFT SHORE GENTLE RIGHT SHORE	
SEDIMENTATION	NO REPORTED OR OBSERVED PROBLEMS.	
WATERSHED DESCRIPTION	DAM F IMMEDIATELY UPSTREAM. UNCONTROLLED DRAINAGE AREA WOODED & UNINHABITED.	

B-7

DOWNSTREAM CHANNEL

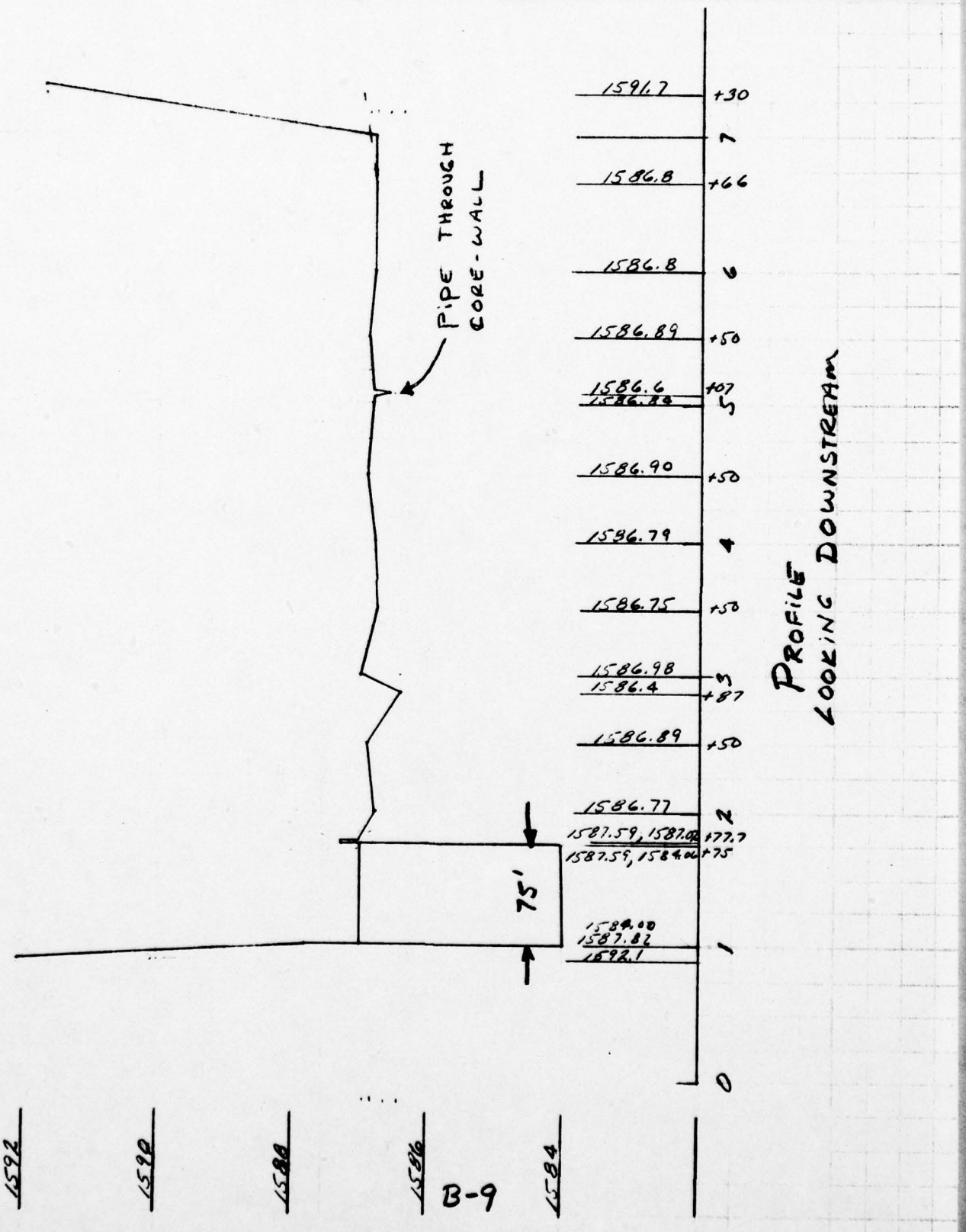
Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	2 - 48"×60" CULVERTS UNDER ACCESS ROAD. REMAINS OF SANDBAGS	
SLOPES	GENTLE AT DAM	
APPROXIMATE NUMBER OF HOMES AND POPULATION	40+ dwellings in WEATHERLY.	

B-8

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT DAM G — FILE NO. 7832
PROFILE - TOP of DAM — SHEET NO. 1 OF ____ SHEETS
FOR USCE - DAM INSPECTIONS
COMPUTED BY DRE — DATE 4-16-79 — CHECKED BY ____ — DATE ____

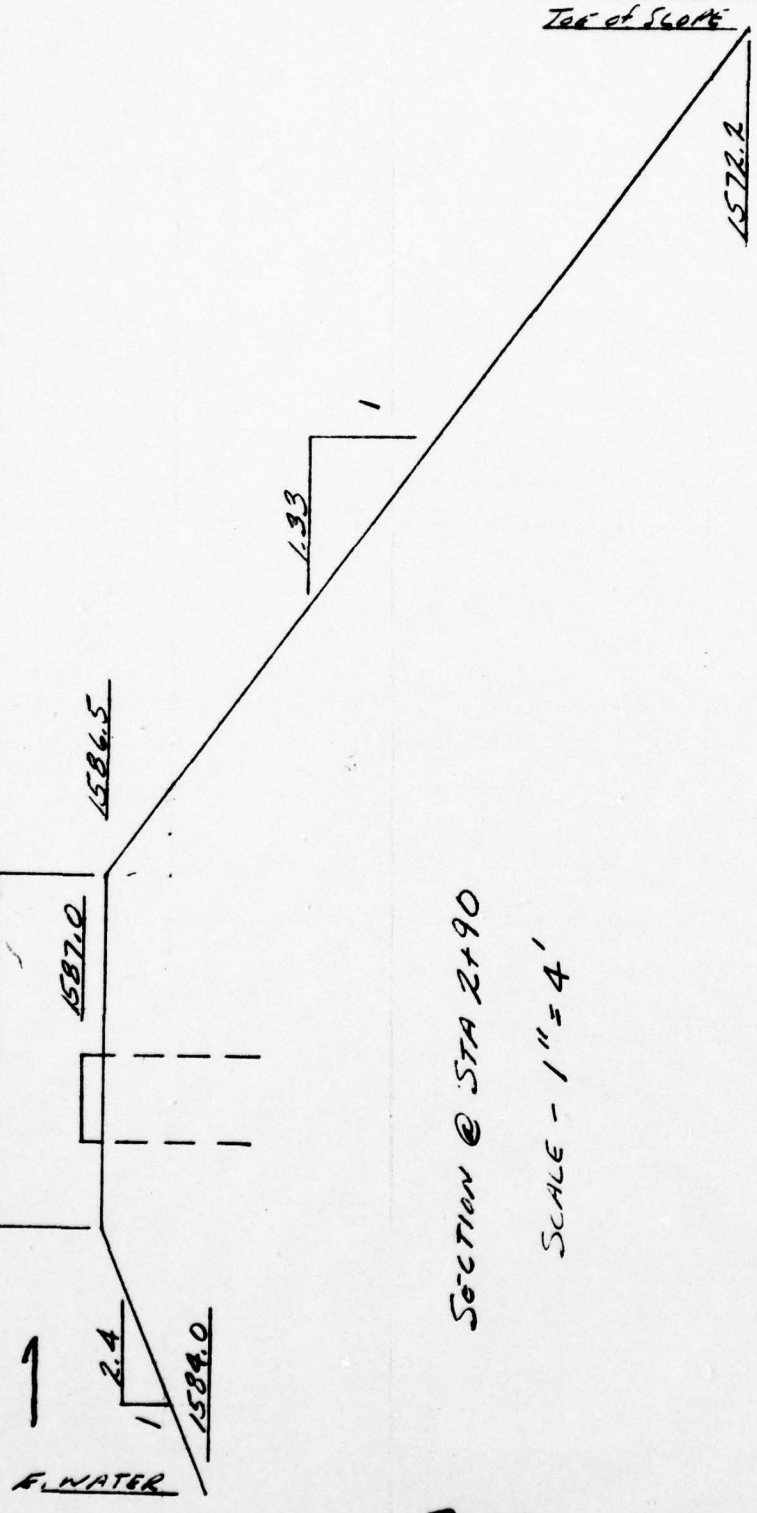


B-9

6313

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT DAM G — FILE NO. 7032
EMBANKMENT SECTIONS — SHEET NO. 2 OF ____ SHEETS
FOR USCE - DAM INSPECTION
COMPUTED BY DRE DATE 4-16-79 CHECKED BY ____ DATE ____



SECTION @ STA 2+90

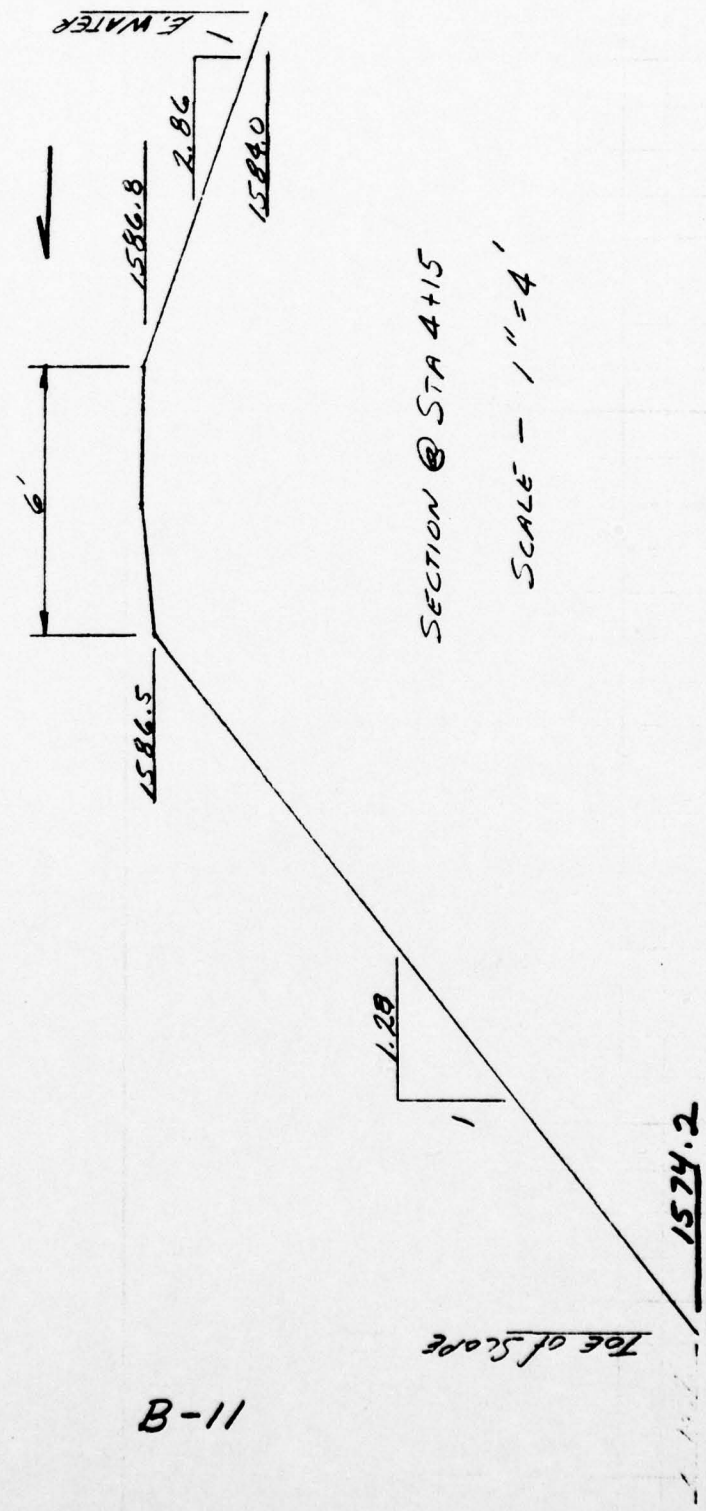
SCALE - 1" = 4'

B-10

8313

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

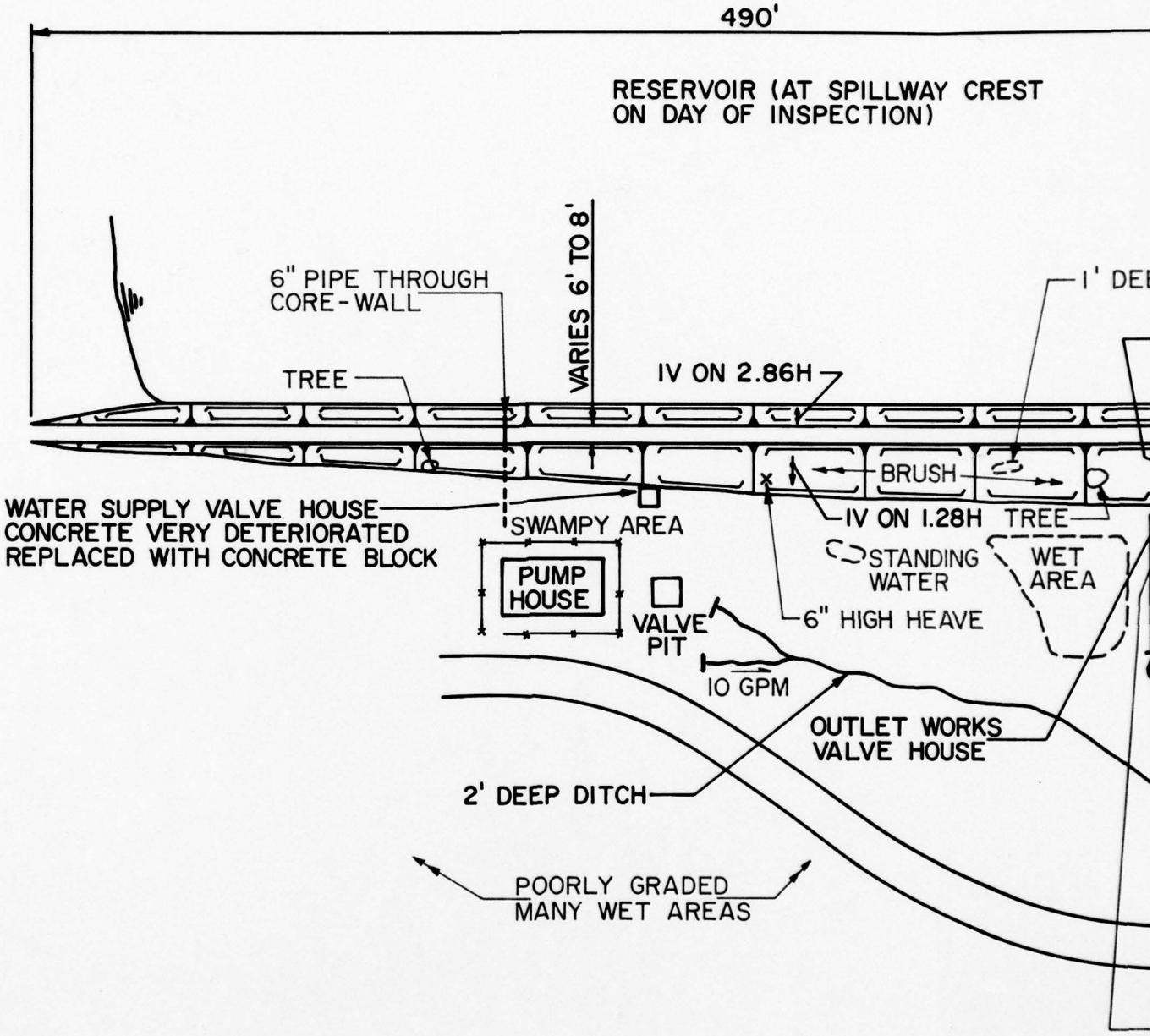
SUBJECT DAM G FILE NO. 7832
EMBANKMENT SECTION SHEET NO. 1 OF ___ SHEETS
FOR USCE - DAM INSPECTIONS
COMPUTED BY DRE DATE 4-16-79 CHECKED BY ___ DATE ___



SECTION @ STA 4+15
SCALE - 1" = 4'

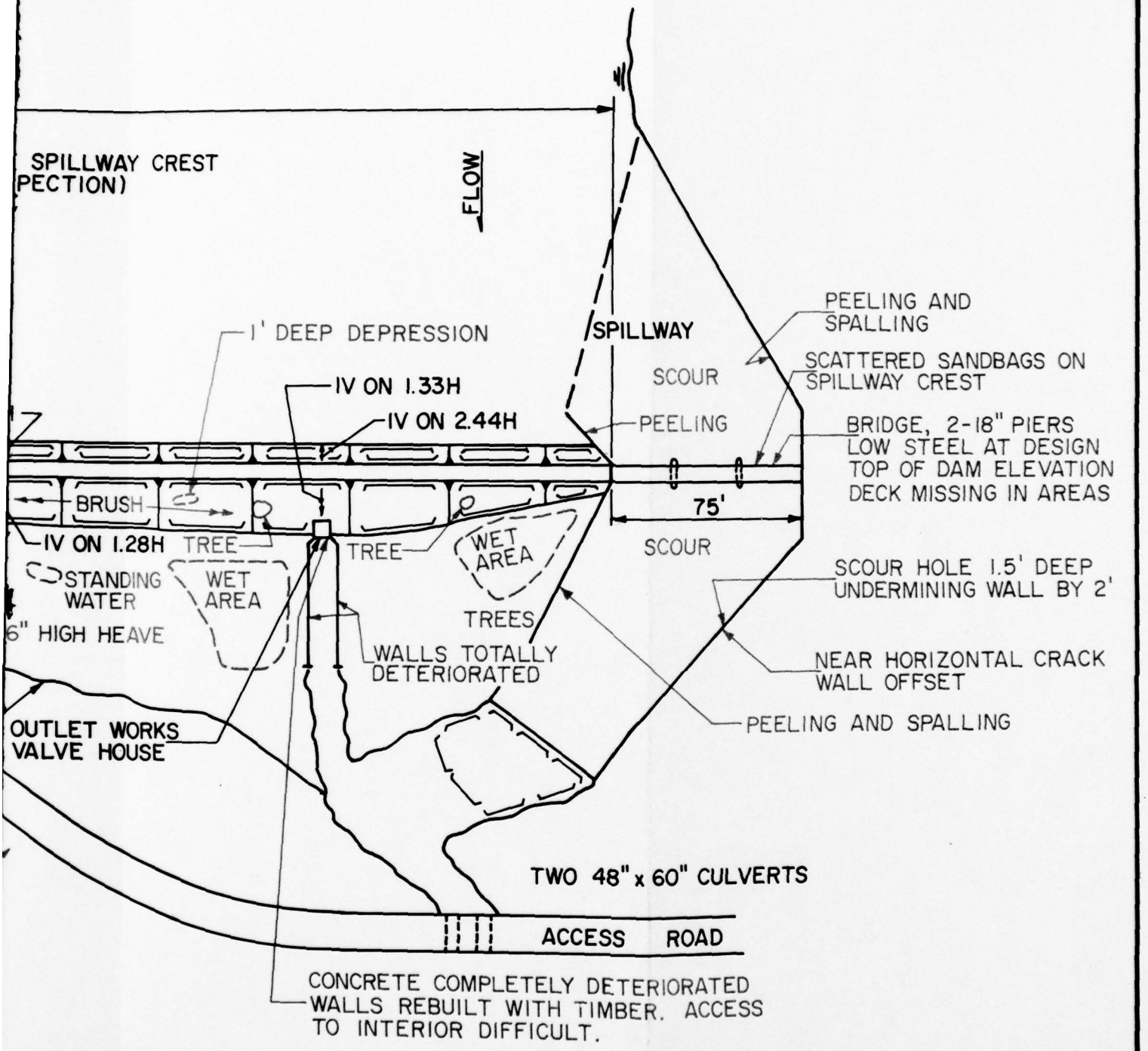
B-11

8313



APPROXIMATE SCALE: 1 IN. = 50 FT.

1



MATE SCALE: 1 IN. = 50 FT.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DAM G

HAZELTON CITY AUTHORITY

RESULTS OF VISUAL INSPECTION

MAY 1979 PLATE B-1

2

DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

DAM G

NDI ID No. PA-00643
DER ID No. 40-14

HAZLETON CITY AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

MAY 1979

APPENDIX C

HYDROLOGY AND HYDRAULICS

APPENDIX C

HYDROLOGY AND HYDRAULICS

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

APPENDIX C

DELAWARE River Basin

Name of Stream: DRECK CREEK

Name of Dam: G

NDI ID No.: PA-00643

DER ID No.: 40-14

Latitude: N 40°57'00" Longitude: W 75°54'15"

Top of Dam (~~low spot~~) Elevation: 1587.0

Streambed Elevation: 1568± Height of Dam: 19 ft

Reservoir Storage at Top of Dam Elevation: 179 acre-ft

Size Category: SMALL

Hazard Category: HIGH (see Section 5)

Spillway Design Flood: VARIES 1/2 PMF TO PMF
MORE THAN 40 DWELLINGS IN WEATHERLY DOWNSTREAM
USE PMF

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
DAM F	0.3	31	885	PA-00642 DER 40-13

DOWNSTREAM DAMS

NONE				

DELAWARE River Basin

Name of Stream: DRECKS CREEK

Name of Dam: G

~~NDS ID No.~~: _____

~~DER ID No.~~: _____

Latitude: N 40° 56' 55" Longitude: W 75° 54' 35"

DETERMINATION OF PMF RAINFALL

For Area A

which consists of Subareas		of		sq. mile
	A1		2.43	
	A2		.39	

Total Drainage Area 2.82 sq. mile

PMF Rainfall Index = 22.5 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone	N/A	6
Geographic Adjustment Factor	N/A	1.0
Revised Index Rainfall	N/A	22.5

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	113
12 hours	124
24 hours	132
48 hours	143
72 hours	N/A
96 hours	N/A

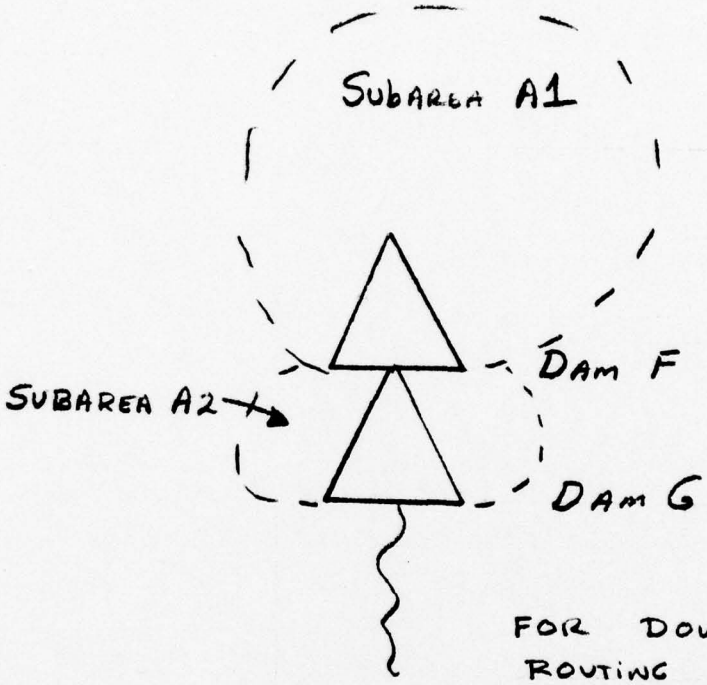
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SUBJECT _____ FILE NO. _____

_____ SHEET NO. ____ OF ____ SHEETS

FOR _____

COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____



FOR DOWNSTREAM ROUTING SECTIONS, SEE PLATE C-1

SKETCH OF SYSTEM

8313

Data for Dam at Outlet of Subarea A1
(see Sketch on Sheet C-4)

Name of Dam: F Sheet 1 of __

Height: 30 FT (~~existing~~)

Spillway Data: FROM PHASE I REPORT

	Existing Conditions	Design Conditions
Top of Dam Elevation	1614.9	1614.5
Spillway Crest Elevation	1610.0	1610.0
Spillway Head Available (ft)	4.9	4.5
Type Spillway	CONCRETE CHUTE WITH CONTROL SECTION	
"C" Value - Spillway	3.0	3.0
Crest Length - Spillway (ft)	29.0	29.0
Spillway Peak Discharge (cfs)	944	860
Auxiliary Spillway Crest Elevation	NONE	NONE
Auxiliary Spillway Head Available (ft)	—	—
Type Auxiliary Spillway	—	
"C" Value - Auxiliary Spillway	—	—
Crest Length - Auxiliary Spillway (ft)	—	—
Auxiliary Spillway Peak Discharge (cfs)	—	—
Combined Spillway Discharge (cfs)	≈ 940*	≈ 860

Spillway Rating Curve: * ≈ 830 CFS AT DESIGN HEAD.

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)

Data for Dam at Outlet of Subarea A1

Name of Dam: F Sheet 3 of __

Storage Data: FROM PHASE I REPORT

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1582.4 = ELEVO*	0	0	0	
1610.0 = ELEV1	64 = A1	192	589 = S1	
1614.5	67.6		885	
1620.0**	72.2			
**				

* ELEVO = ELEV1 - $(3S_1/A_1)$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Top of Dam is 4 percent of watershed.

Remarks: _____

DELAWARE River Basin

Name of Stream: DEER CREEK

Name of Dam: G

~~NDS ID No.~~: _____

~~DER ID No.~~: _____

Latitude: N 40° 57' 00" Longitude: W 75° 54' 15"

Drainage Area: 2.82 sq. mile

Data for Subarea: A1 (see Sketch on Sheet C-4)

Name of Dam at Outlet of Subarea: F

Drainage Area of Subarea: 2.43 sq. mile

Subarea Characteristics:

Assumed Losses: 1.0-inch initial abstraction + 0.05 in/hr

The following are measured from outlet of subarea to the point noted:

L = Length of Main Watercourse extended to the divide = 2.42 mile

L_{CA} = Length of Main Watercourse to the centroid = 1.14 mile

From NAB Data: AREA 2, PLATE 2

Cp = 0.45

C_T = 2.10

$Tp = C_T \times (L \times L_{CA})^{0.3}$ = 2.547 (hrs)

Flow at Start of Storm = 1.5 cfs/sq. mile x Subarea D.A = 3.65 cfs

Computer Data:

QRCSN = -0.05 (5% of peak flow)

RTIOR = 2.0

Remarks: _____

Data for Dam at Outlet of Subarea A2
(see Sketch on Sheet C-4)

Name of Dam: G Sheet 1 of ___

Height: 19 FT. (existing)

Spillway Data:	Existing Conditions	Design Conditions
Top of Dam Elevation	1586.4	1587.0
Spillway Crest Elevation	1584.0	1584.0
Spillway Head Available (ft)	2.4	3.0
Type Spillway	CONCRETE CHUTE WITH CONTROL SECTION	
"C" Value - Spillway	3.0	3.0
Crest Length - Spillway (ft)	71.8 ★	75
Spillway Peak Discharge (cfs)	801	1169
Auxiliary Spillway Crest Elevation	NONE	NONE
Auxiliary Spillway Head Available (ft)	—	—
Type Auxiliary Spillway	—	
"C" Value - Auxiliary Spillway	—	—
Crest Length - Auxiliary Spillway (ft)	—	—
Auxiliary Spillway Peak Discharge (cfs)	—	—
Combined Spillway Discharge (cfs)	≈ 800	≈ 1170

Spillway Rating Curve: ★ 2-1.5' PIPES SEE NEXT SHEET

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)

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SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

DAM
G

EFFECTIVE SPILLWAY LENGTH

$L = L' - 2(N K_p + K_a) \times H_e$

N = NUMBER OF PIERS

FROM WES-III-5 FOR POINTED NOSE PIERS $K_p = 0.0$

FROM WES-III-3 FOR ABUTMENTS NOT ROUNDED $K_a = 0.1$

SINCE ONLY ONE ABUTMENT WILL HAVE EFFECT, USE $K_a = 0.05$

$L = (75 - 2 \times 1.5) - 2(2 \times 0 + 0.05) \times 2.4$

$= 71.76$ USE 71.8'

LOW CHORD OF SPILLWAY GATE AT ELEVATION 1580.0

ASSUMING NO DEBRIS GATE SHOULD NOT INTERFERE WITH FLOW UP TO TOP OF DAM.

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8813

Data for Dam at Outlet of Subarea A2

Name of Dam: G Sheet 2 of __

Outlet Works Rating:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	1568.4		
Invert of Inlet	NOT AVAILABLE		
Type	CIP		
Diameter (ft) = D	2		
Length (ft) = L	80±		
Area (sq. ft) = A	3.142		
N	.013		
K Entrance	0.5		
K Exit	1.0		
K Friction* = $29.1_N{}^2L/R^{4/3}$	1.25		
Sum of K	2.75		
$(1/K)^{0.5}$ = C	0.60		
Maximum Head (ft) = HM	18		
Q = C A $\sqrt{2g(HM)}$ (cfs)	64		
Q Combined (cfs)	64		

* R = Hydraulic Radius = (Area/Wetted Perimeter) = D/4 for Circular Conduits.

Data for Dam at Outlet of Subarea A2

Name of Dam: G Sheet 3 of ___

Storage Data:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1552.1 = ELEVO*	0	0	0	
1584.0 = ELEV1	13 = A1	45	138 = S1	
1586.4	13.8		170	INTERPOLATED
1587.0	14.0		179	INTERPOLATED
1600.0**	19			
**				

* ELEVO = ELEV1 - $(3S_1/A_1)$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at ~~Top of Dam~~ NORMAL POOL is 5 percent of UNCONTROLLED watershed.

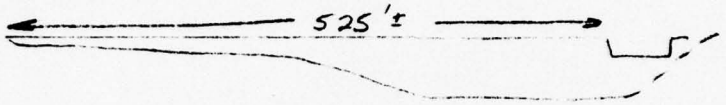
Remarks: ___

Data for Dam at Outlet of Subarea A2

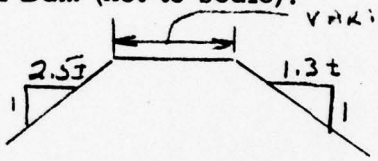
Name of Dam: G Sheet 4 of __

Breach Data:

Sketch of Dam Profile (not to scale):



Sketch of Top of Dam (not to scale):



Soil Type from Visual Inspection: SANDY SILT

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) 1.8 fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) $A = L \cdot d$

HMAX = $(4/9\ V^2/C^2)$ = .149 ft., C = 3.1

0.1 1586.4
HMAX + Top of Dam Elev. = 1586.5 = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = 80 ft (width of bottom of breach)

Z = 2 (side slopes of breach)

ELBM = 1568.0 (bottom of breach elevation, minimum of zero storage elevation)

WSEL = 1584.0 (normal pool elevation)

T FAIL = 6 mins

= 0.1 hrs (time for breach to develop)

DELAWARE River Basin

Name of Stream: DRECKS CREEK

Name of Dam: G

~~NDS ID No.~~: _____

~~DER ID No.~~: _____

Latitude: N 40° 57' 00" Longitude: W 75° 54' 15"

Drainage Area: 2.82 sq. mile

Data for Subarea: A2 (see Sketch on Sheet C-4)

Name of Dam at Outlet of Subarea: G

Drainage Area of Subarea: 0.39 sq. mile

Subarea Characteristics:

Assumed Losses: 1.0-inch initial abstraction + 0.05 in/hr

The following are measured from outlet of subarea to the point noted:

L = Length of Main Watercourse extended to the divide = 1.14 mile

L_{CA} = Length of Main Watercourse to the centroid = 0.11 mile

From NAB Data: AREA 2, PLATE B

Cp = 0.45

C_T = 2.10

$Tp = C_T \times (L \times L_{CA})^{0.3}$ = 1.126 (hrs)

Flow at Start of Storm = 1.5 cfs/sq. mile x Subarea D.A = 0.6 cfs

Computer Data:

QRCSN = -0.05 (5% of peak flow)

RTIOR = 2.0

Remarks: _____

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_____ SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

SELECTED COMPUTER OUTPUT

ITEM	PAGE
MULTI-RATIO ANALYSIS	
INPUT	C-15
SYSTEM PEAK FLOWS	C-16
DAM F	C-17
DAM G	C-18
DAM BREAK ANALYSIS	
NOTES: 1. FOR ½ PMF	
2. PLAN 1 - NO dam break	
PLAN 2 - ONLY DAM G FAILS	
INPUT	C-19 TO C-20
SYSTEM PEAK FLOWS	C-21 TO C-22
DAM F (ASSUMED NOT TO FAIL)	C-23
DAM G	C-24
DOWNSTREAM SECTIONS	C-24 TO C-26

```
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
```

```
  1  A                                NATIONAL DAM INSPECTION PROGRAM
  2  A                                      DRECK CREEK
  3  A                                       DAM G
  4  R    300       0      15       0       0       0       0       0      -4       0
  5  B1     5
  6  J      1       6       1
  7  J1     1      .5      .4      .3      .2      .1
  8  K      0       1                                               1
  9  K1       RUNOFF INTO DAM F
 10  M      1       1    2.43                   2.82                                1
 11  P             22.5     113      124      132      143
 12  T
 13  M  2.847    0.45                                               1     .05              .04
 14  X   -1.5    -.05     2.0
 15  K      1       2                                               1
 16  K1       ROUTE THROUGH DAM F
 17  Y                                1
 18  Y1     1                                                    -1610       0
 19  SA     0      64    72.2
 20  SE1582.4    1610    1620
 21  SS  1610      29     3.0     1.5
 22  SD1614.5     3.1     1.5     R30
 23  K      0       2                                               1
 24  K1       UNCONTROLLED RUNOFF INTO DAM G
 25  M      1       1    0.39                   2.82                                1
 26  P             22.5     113      124      132      143
 27  T
 28  M  1.126    0.45                                               1     .05              .05
 29  X   -1.5    -.05     2.0
 30  K      2       2                                               1
 31  K1       COMBINE INFLOW TO DAM G
 32  K      1       2                                               1
 33  K1       ROUTE THROUGH DAM G
 34  Y                                1
 35  Y1     1                                                    -1584       0
 36  SA     0      13      19
 37  SE1552.1    1584    1600
 38  SS  1584    71.8     3.0     1.5
 39  SD1586.4
 40  SL     1      20      75     495     560
 41  SV1586.4  1586.6  1586.8  1586.9  1591.7
 42  K     99
```

C-15

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 .50	RATIO 3 .40	RATIO 4 .30	RATIO 5 .20	RATIO 6 .10
HYDROGRAPH AT	1	2.43	1	4068.	2034.	1627.	1220.	814.	407.
	(	6.29)	(	115.20)(	57.60)(	46.08)(	34.56)(	23.04)(	11.52)(
ROUTED TO	2	2.43	1	4052.	1985.	1501.	852.	528.	234.
	(	6.29)	(	114.74)(	56.22)(	42.51)(	24.13)(	14.94)(	6.62)(
HYDROGRAPH AT	2	.39	1	1100.	550.	440.	330.	220.	110.
	(	1.01)	(	31.15)(	15.57)(	12.46)(	9.34)(	6.23)(	3.11)(
2 COMBINED	2	2.82	1	4792.	2305.	1688.	916.	567.	249.
	(	7.30)	(	135.68)(	65.26)(	47.80)(	25.93)(	16.06)(	7.05)(
ROUTED TO	2	2.82	1	4785.	2306.	1691.	911.	565.	248.
	(	7.30)	(	135.50)(	65.30)(	47.60)(	25.79)(	16.00)(	7.02)(

C-16

SUMMARY OF DAM SAFETY ANALYSIS

DAM F

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1610.00	1610.00	1614.50
STORAGE	589.	589.	885.
OUTFLOW	0.	0.	830.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1615.58	1.08	959.	4052.	11.50	42.75	0.00
.50	1615.03	.53	921.	1985.	6.75	43.00	0.00
.40	1614.87	.37	910.	1501.	4.75	43.75	0.00
.30	1614.53	.03	887.	852.	1.25	45.25	0.00
.20	1613.33	0.00	806.	528.	0.00	45.50	0.00
.10	1611.93	0.00	714.	238.	0.00	46.25	0.00

C-17

SUMMARY OF DAM SAFETY ANALYSIS

DAM G

PLAN 1 ..... INITIAL VALUE SPILLWAY CREST TOP OF DAM

ELEVATION	1584.00	1594.00	1596.40
STORAGE	138.	138.	170.
OUTFLOW	0.	0.	801.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1588.32	1.92	198.	4785.	13.75	42.50	0.00
.50	1587.51	1.11	186.	2306.	9.25	43.00	0.00
.40	1587.24	.84	182.	1681.	7.25	43.75	0.00
.30	1586.61	.21	173.	911.	4.25	45.25	0.00
.20	1585.90	0.00	164.	565.	0.00	45.25	0.00
.10	1585.10	0.00	153.	249.	0.00	46.00	0.00

C-18

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION  JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
     1  A    NATIONAL DAM INSPECTION PROGRAM
     2  A    BRECK CREEK
     3  A    DAM G
     4  B   300       0       6       0       0       0       0       0      -4       0
     5  B1    5
     6  J     3       1       1
     7  J1  0.5
     8  K     0       1                                               1
     9  K1      RUNOFF INTO DAM F
    10  M     1       1   2.43            2.82                                    1
    11  P             22.5     113     124     132
    12  T                                                             1    .05             .04
    13  W  2.847    0.45
    14  X  -1.5    -.05     2.0
    15  K     1       2                                               1
    16  K1      ROUTE THROUGH DAM F
    17  Y                                       1       1
    18  Y1    1                                                       -1610    0
    19  SA    0      44    72.2
    20  SE1582.4    1610    1620
    21  SS  1610      29     3.0     1.5
    22  SD1614.5     3.1     1.5    P30
    23  SR    85       2    1584     0.2    1610    1620
    24  SO    85       2    1584     0.2    1610    1620
    25  K     0       2                                               1
    26  K1      UNCONTROLLED RUNOFF INTO DAM G
    27  M     1       1    0.39            2.82                                    1
    28  P             22.5     113     124     132
    29  T                                                             1    .05             .05
    30  W  1.126    0.45
    31  X  -1.5    -.05     2.0
    32  K     2       2                                               1
    33  K1      COMBINE INFLOW TO DAM G
    34  K     1       2                                               1
    35  K1      ROUTE THROUGH DAM G
    36  Y                                       1       1
    37  Y1    1                                                       -1594    0
    38  SA    0      13      19
    39  SE1552.1    1584    1600
    40  SS  1584    71.8     3.0     1.5
    41  SD1586.4
    42  SL    1      20      75     495     560
    43  SV1586.4  1586.6  1586.8  1586.9  1591.7
    44  SR    80       2    1568     0.1    1584    1590
    45  SO    80       2    1568     0.1    1584  1586.5
    46  K     1       3                                               1
    47  K1      DOWNSTREAM DAM G
    48  Y                                       1       1
    49  Y1    1                                                       -1
    50  Y6  .09     .07     .09    1540    1600    3400   .0206
```

C-19

```
51    Y7     0    1700     750    1600     900    1560     890    1540     940    1540
52    Y7  1300    1560    1460    1580    1700    1600
53    K      1       4                                       1
54    K1        END BRECK CREEK
55    Y                                    1       1
56    Y1     1                                               -1
57    Y6  .09      .07     .09    1480    1520    3000    .0183
58    Y7     0    1550     550    1540     950    1500    1100    1480    1200    1480
59    Y7  1450    1500    1800    1540    2200    1580
60    K      1       5                                       1
61    K1        HAZLE CREEK-STEEP REACH
62    Y                                    1       1
63    Y1     1                                               -1
64    Y6  .09      .07     .09    1440    1480    5200    .0183
65    Y7     0    1560     400    1520     700    1480     900    1440    1200    1440
66    Y7  1520    1460    1750    1500    2200    1600
67    K      1       6                                       1
68    K1        HAZLE CREEK-FLAT REACH
69    Y                                    1       1
70    Y1     1                                               -1
71    Y6  .09      .07     .09    1340    1380    6800   .00588
72    Y7     0    1400    3600    1380    4900    1360    5250    1340    5680    1340
73    Y7  5950    1360    6420    1380    7080    1400
74    K      1       7                                       1
75    K1        HAZLE CREEK-NARROW APPROACH TO WEATHERLY
76    Y                                    1       1
77    Y1     1                                               -1
78    Y6  .09      .07     .09    1220    1280    6200    .029
79    Y7   320    1300     400    1260     450    1240     600    1220     620    1220
80    Y7   690    1240     770    1260     780    1300
81    K      1       8                                       1
82    K1        WEATHERLY
83    Y                                    1       1
84    Y1     1                                               -1
85    Y6   .1      .07      .1    1080    1120    4200    .0238
86    Y7     0    1160    1100    1100    1400    1086    1401    1080    1436    1080
87    Y7  1437    1086    1550    1100    2150    1200
88    K     99
```

C-20

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 .50
				RATIOS APPLIED TO FLOWS
HYDROGRAPH AT	1	2.43	1	2019.
	(	6.29)	(	57.16)(
			2	2019.
			(	57.16)(
ROUTED TO	2	2.43	1	1457.
	(	6.29)	(	41.27)(
			2	1457.
			(	41.27)(
HYDROGRAPH AT	2	.39	1	555.
	(	1.01)	(	15.72)(
			2	555.
			(	15.72)(
2 COMBINED	2	2.82	1	1589.
	(	7.30)	(	45.00)(
			2	1589.
			(	45.00)(
ROUTED TO	2	2.82	1	1589.
	(	7.30)	(	44.99)(
			2	16636.
			(	471.08)(
ROUTED TO	3	2.82	1	1588.
	(	7.30)	(	44.97)(
			2	9397.
			(	266.09)(
ROUTED TO	4	2.82	1	1588.
	(	7.30)	(	44.96)(
			2	6787.
			(	192.19)(
ROUTED TO	5	2.82	1	1582.
	(	7.30)	(	44.80)(
			2	4122.
			(	116.73)(
ROUTED TO	6	2.82	1	1551.
	(	7.30)	(	43.93)(
			2	2023.
			(	57.28)(
ROUTED TO	7	2.82	1	1550.
	(	7.30)	(	43.89)(

				2	1962.
				(	55.55)(
ROUTED TO	A	2.82	1		1549.
	(	7.30)	(		43.87)(
			2		1949.
			(		55.19)(

C-22

SUMMARY OF DAM SAFETY ANALYSIS

DAM F

PLAN 1 ••••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1610.00	1610.00	1614.50
STORAGE	589.	589.	885.
OUTFLOW	0.	0.	830.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1616.55	2.05	1025.	1457.	7.70	20.90	0.00

PLAN 2 ••••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1610.00	1610.00	1614.50
STORAGE	589.	589.	885.
OUTFLOW	0.	0.	830.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1616.55	2.05	1025.	1457.	7.70	20.90	0.00

SUMMARY OF DAM SAFETY ANALYSIS

DAM G

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1584.00	1584.00	1586.40
STORAGE	138.	138.	170.
OUTFLOW	0.	0.	801.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1587.19	.79	182.	1589.	9.60	20.50	0.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1584.00	1584.00	1586.40
STORAGE	138.	138.	170.
OUTFLOW	0.	0.	801.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1586.55	.15	172.	16636.	.32	17.00	16.90

C-24

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1588.	1543.3	20.60

PLAN 2 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	9397.	1547.6	17.10

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1588.	1482.5	20.70

PLAN 2 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	6787.	1485.7	17.20

PLAN 1 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1582.	1441.1	21.00

PLAN 2 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	4122.	1442.4	17.30

PLAN 1 STATION 6

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1551.	1341.3	21.80

PLAN 2 STATION 6

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	2023.	1341.7	17.80

PLAN 1 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1550.	1224.3	21.90

PLAN 2 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1962.	1224.8	18.10

PLAN 1 STATION 8 DAMAGE CENTER

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1549.	1085.1	22.00

PLAN 2 STATION 8 DAMAGE CENTER

MAXIMUM	MAXIMUM	TIME

C-25

RATIO	FLOW,CFS	STAGE,FT	HOURS	
.50	1940.	1085.9	18.20	DAMAGE CENTER

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

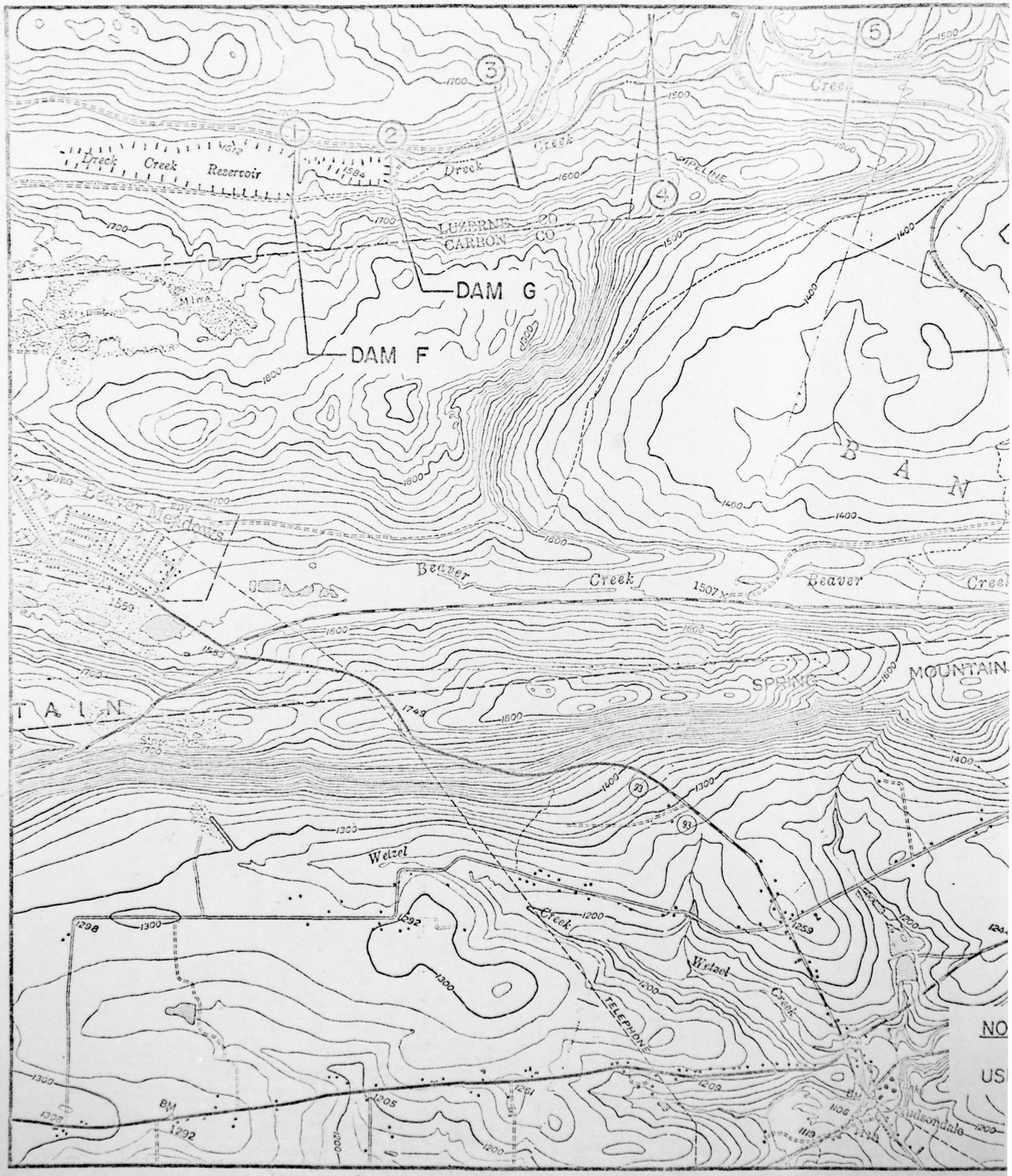
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SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

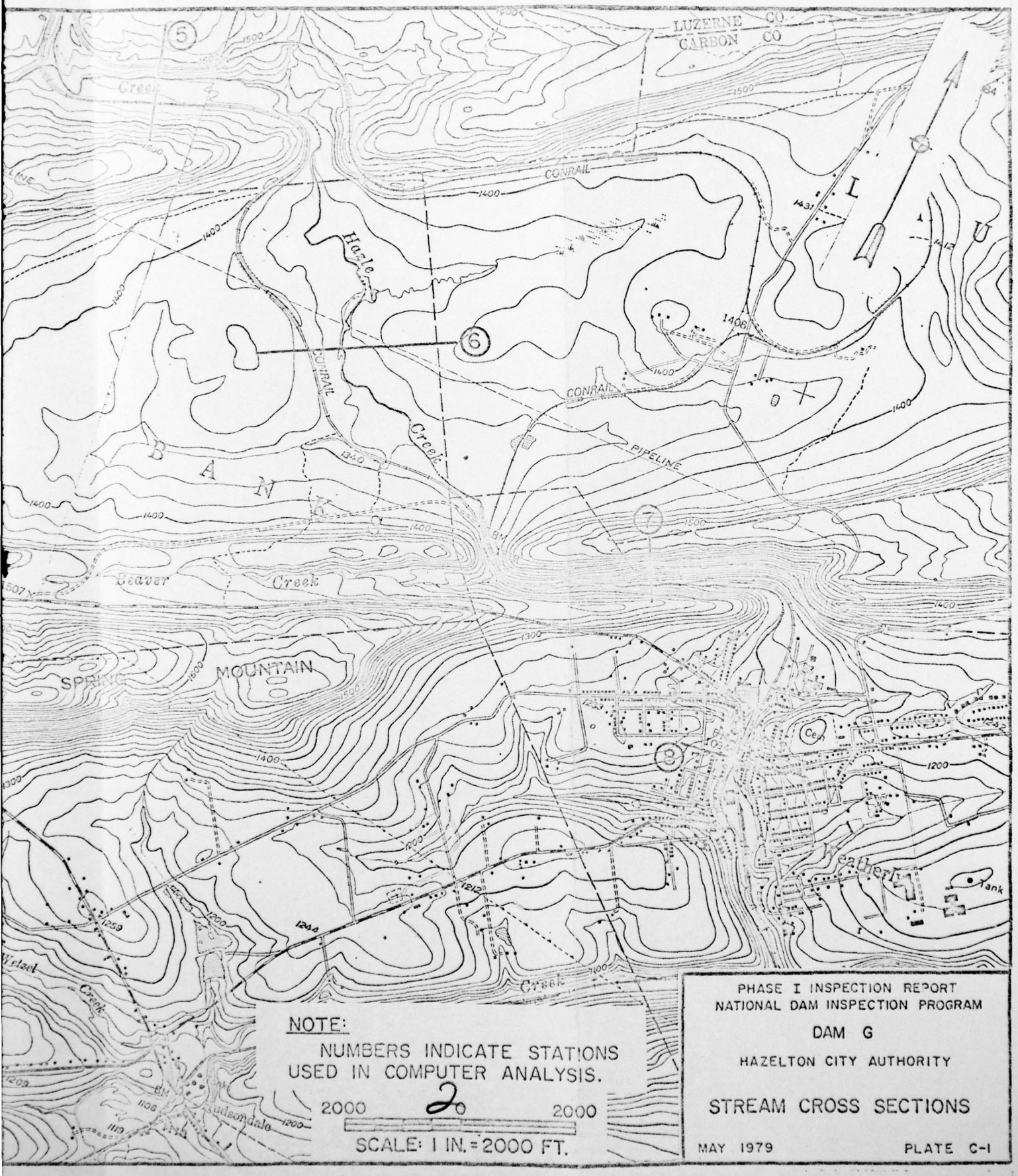
TABLE OF PERTINENT RESULTS

PMF RAINFALL = 25.74"

	PMF	½ PMF
RUNOFF (INCHES)	23.46	11.73
DAM F		
INFLOW (CFS)	4068	2034
OUTFLOW (CFS)	4052	1985
DAM G:		
INFLOW (CFS)	4792	2305
OUTFLOW (CFS)	4785	2306
HEIGHT OF OVERTOPPING (FT)	1.92	1.11
DURATION OF OVERTOPPING (HRS.)	13.75	9.25

6313


DAM G
DAM F
LUZERNE CO
CARBON CO
Beaver Meadows
Beaver Creek
Creek
Reservoir
MOUNTAIN
SPRING
Welzel
Creek
TELEPHONE
Mine
BM
1292
1298
1300
1259
1507
1584
1612
1749
1563
1205
1261
1208
1106
1113
Tr
Tr
Tr



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DAM G

HAZELTON CITY AUTHORITY

STREAM CROSS SECTIONS

MAY 1979 PLATE C-1

DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

DAM G

NDI ID No. PA-00643
DER ID No. 40-14

HAZLETON CITY AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

MAY 1979

APPENDIX D

PHOTOGRAPHS

DAM G



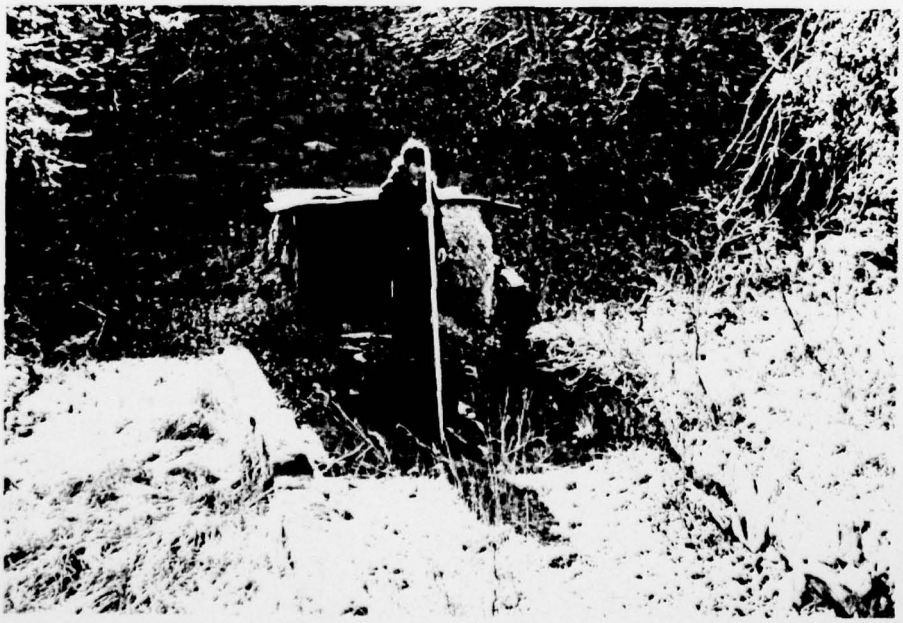
A. Top of Dam



B. Upstream Slope



C. Pipe through Embankment



D. Outlet Works at Toe of Embankment



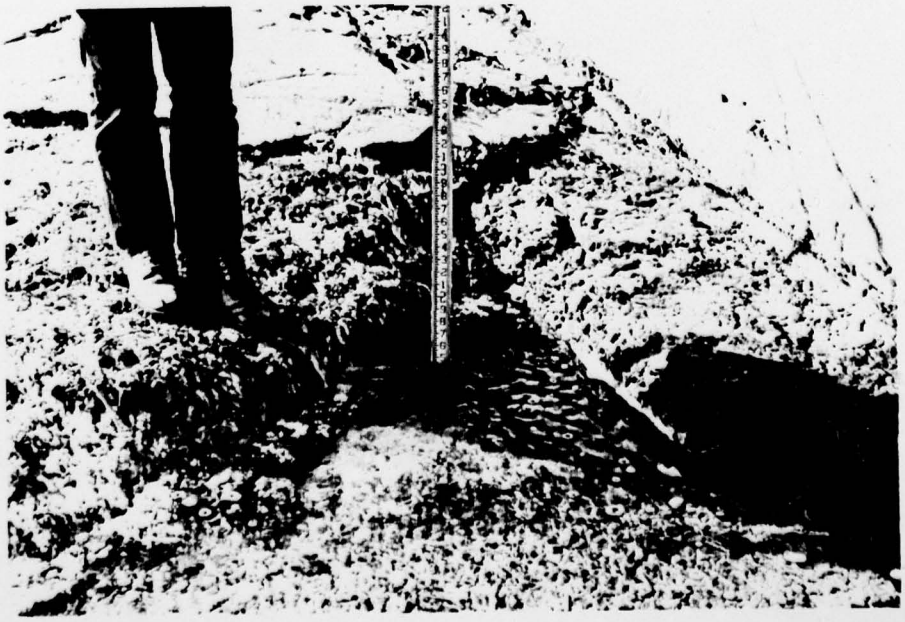
E. Wet Area at Toe of Embankment



F. Spillway Crest



G. Crack in Left Spillway Wall



H. Scour Hole at Left Spillway Wall

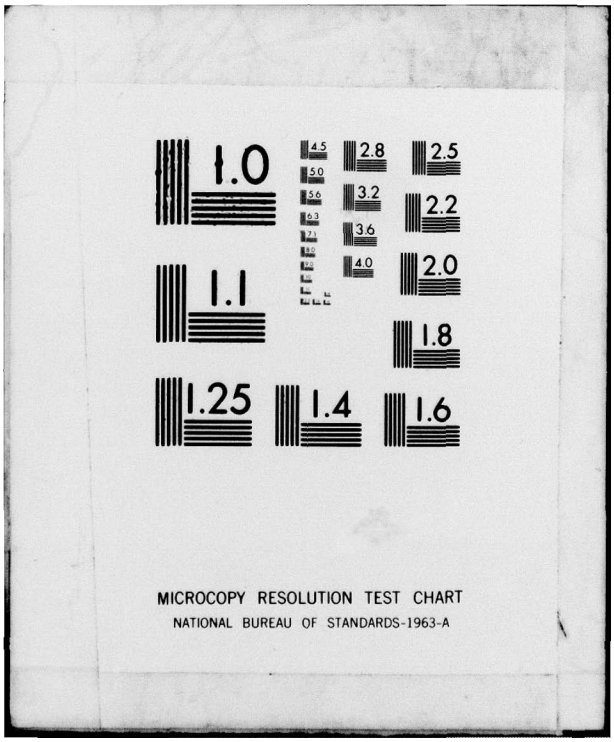
AD-A078 932 GANNETT FLEMING CORDDRY AND CARPENTER INC HARRISBURG PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. DAM G, (NDI ID NUMBER PA-00643--ETC(U)
MAY 79 A C HOOKE DACW31-79-C-0015

UNCLASSIFIED NL

2 OF 2
AD A078932

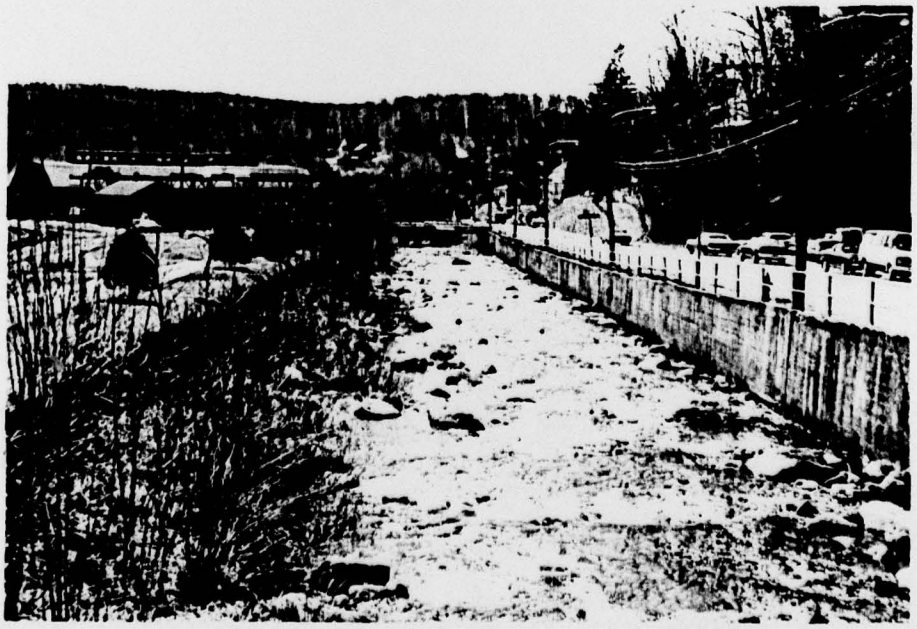


END
DATE FILMED
1-80
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
7.1
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



I. Spillway Chute



J. Weatherly - downstream of Dam G

DELAWARE RIVER BASIN

DRECK CREEK, LUZERNE COUNTY

PENNSYLVANIA

DAM G

NDI ID No. PA-00643
DER ID No. 40-14

HAZLETON CITY AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

MAY 1979

APPENDIX E

GEOLOGY

DAM G

APPENDIX E

GEOLOGY

1. General Geology. The damsite and reservoir are located in Luzerne County. The rock formations exposed in Luzerne County range from the Post-Pottsville formations, of Pennsylvanian Age, down to the Onondaga formation, of Middle Devonian Age. The Wisconsin terminal moraine crosses the southern part of the County, and the greater part of the County is covered by glacial drift. Extensive deposits of glacial outwash occur along the Susquehanna River and less extensive deposits along the smaller streams.

Nearly all of Luzerne County lies in the Valley and Ridge Province in which nearly all the rocks have been strongly folded. In going from north to south across the County, five major folds are encountered, all of which trend northeast. The first of these is a shallow syncline on the crest of North Mountain, forming the Mehoopnay coal basin. The second is the Milton Anticline, which exposes the Portage group in the northwestern part of the County and gradually flattens out toward the northeast. The third and most pronounced is the Lackawanna Syncline, which originates in Lackawanna County to the north, and has preserved the post-Pottsville formations throughout the Wyoming Valley. The maximum depth of this syncline is reached in the vicinity of Wilkes-Barre and Plymouth. The double rim of this syncline is formed by the resistant Pottsville formation and Pocono sandstone, separated by the less resistant Mauch Chunk shale. The fourth fold is the Berwick (Montour) Anticline, which exposes a few feet of the Onondag formation in the vicinity of Beach Haven. This fold reaches its maximum development farther west and only the eastern portion reaches Luzerne County. The fifth major fold comprises a series of anticlines and synclines forming the Eastern Middle Anthracite Field in the vicinity of Hazleton. The synclinal basins in this region are relatively shallow and there are large areas from which all coalbeds have been eroded.

The general dips of the region vary from 0° to 40°, and the maximum dips are found on the rims and within the synclinal coal basins. The relatively soft Post-Pottsville beds in their cores are severely folded and contorted with numerous minor faults. The northern and easternmost parts of the County border the Appalachian Plateau Province and are characterized by horizontal, or nearly horizontal strata. The Catskill continental group of rocks underlies those parts of Luzerne County that are outside of the five major folds.

2. Site Geology. Dam G is founded on the Pottsville sandstone of Pennsylvanian Age. The southern shore line of the reservoir delineates the contract between the Pottsville and Llewellym Formations. The Pottsville Formation is composed of hard coarse quartz conglomerate, sandstone, and a few thin shale and coal beds. This formation forms a ridge around the Wyoming Valley coal basin and is folded into a series of small anticlines and synclines striking east northeast in the extreme southeastern portion of Luzerne County. Bedding is generally well developed in the area with cross-bedding common in the sandstones. The sandstones and conglomerates of this formation are moderate to highly resistant to weathering.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DAM G

HAZELTON CITY AUTHORITY

GEOLOGIC MAP

MAY 1979 PLATE E-1