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NATIONAL DAM INSPECTION PROGRAM. CHERRY VALLEY DAM (NDI-PA-508,--ETC(U)
MAR 79 L D ANDERSEN DACW31-79-C-0014

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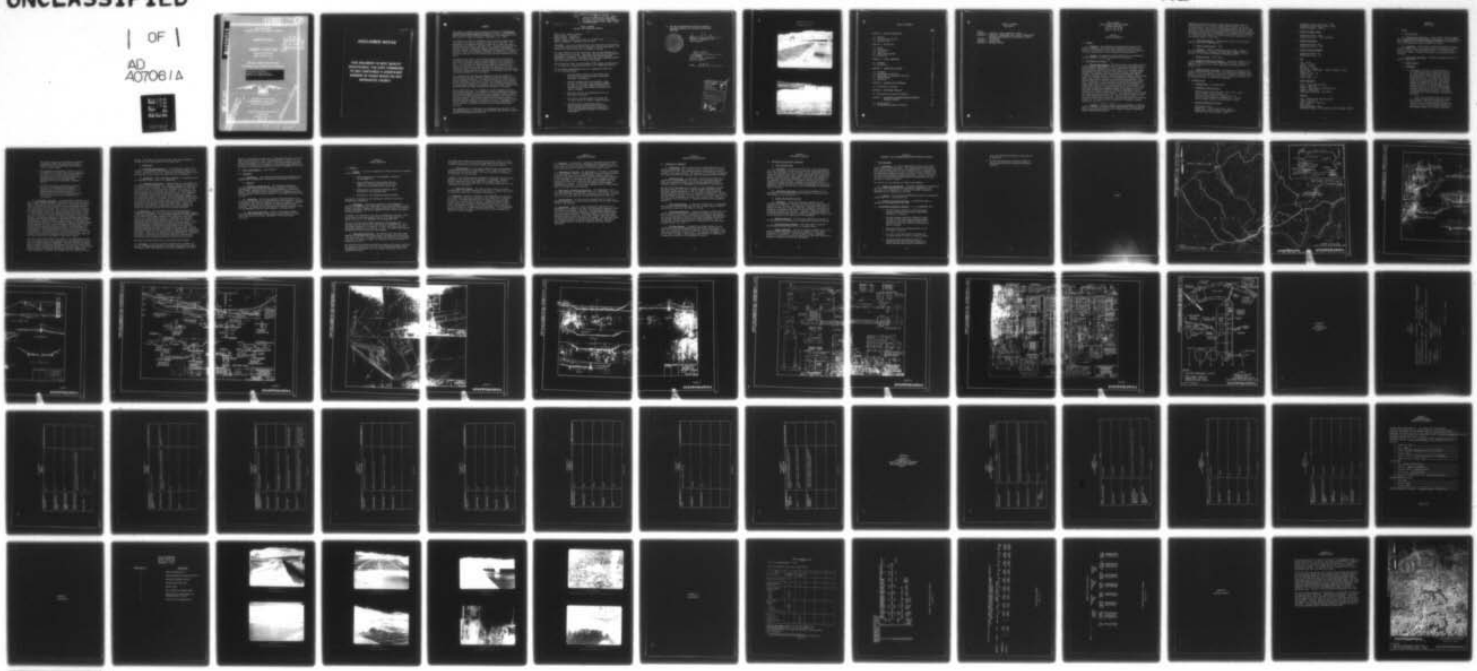

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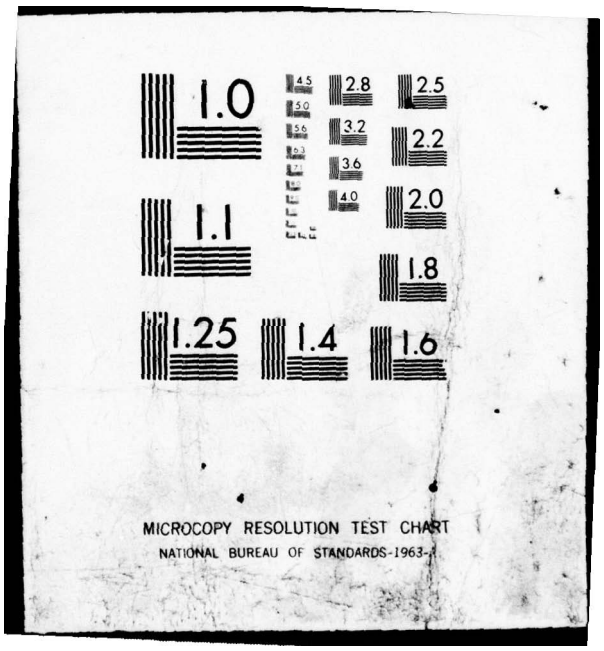
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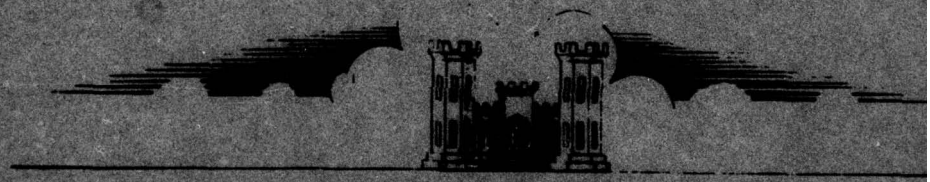

PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

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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 Department of the Army, 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 visual observations and review of available data. Detailed investigation and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

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 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 the dam depends on numerous and constantly changing internal and external factors which are 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.

The assessment of the conditions and recommendations was made by the consulting engineer in accordance with generally and currently accepted engineering principles and practices.

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Cherry Valley Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Washington
STREAM: Raccoon Creek, a tributary of the Ohio River
DATE OF INSPECTION: December 4 and 21, 1978

ASSESSMENT: Based on the evaluation of the conditions as they existed on the dates of inspection and as revealed by visual observations, the condition of Cherry Valley Dam is assessed to be good.

The owner reported that the outlet valve has not been operated since the construction of the dam. Therefore, the owner should evaluate the operational condition of the outlet valve and perform necessary maintenance if required. The dike across the outlet discharge channel should be removed to drain the pond in the channel.

The spillway was found to pass 80 percent PMF without overtopping and it is classified as adequate according to the recommended criteria.

The following recommendations should be implemented immediately or on a continuing basis:

1. The operational condition of the outlet valve should be evaluated and necessary maintenance performed, if necessary.

2. Adequate drainage should be provided to drain the pond in the outlet works discharge channel. The water in the valve chamber should also be drained and these areas should be inspected for signs of seepage.

3. Brush and trees on the downstream face of the dam should be removed.

4. The crest of the dam should be surveyed and low spots should be filled to design elevation.

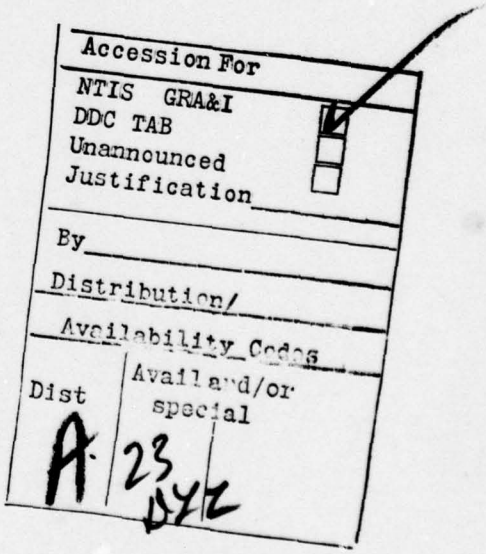
5. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system should be developed to alert the downstream residents in the event of an emergency.

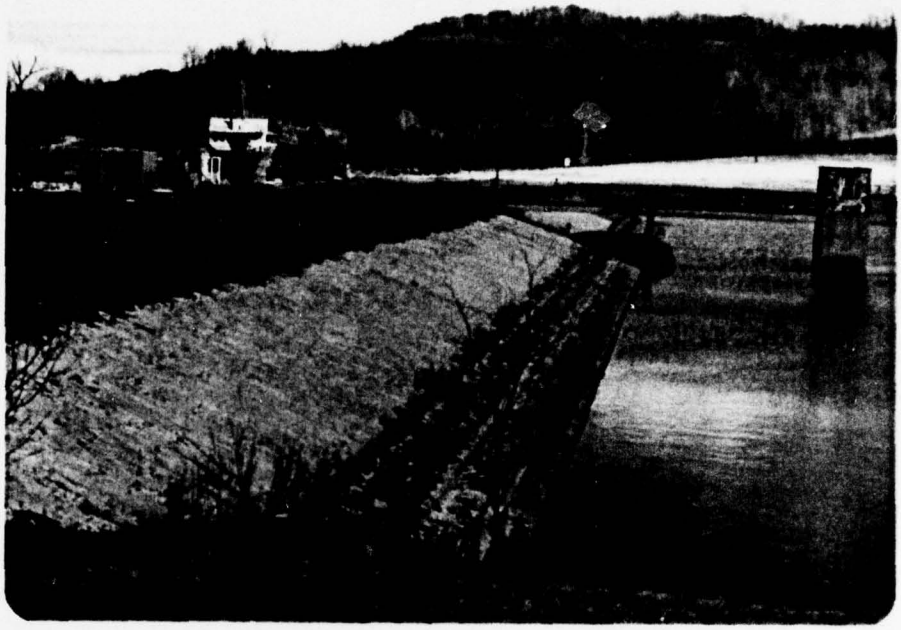
6. The dam and appurtenant structures should be inspected regularly and necessary maintenance performed.

Lawrence D. Andersen, P.E.
Vice President

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE: 22 Apr 79





Upstream Face

Downstream Face

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
CHERRY VALLEY DAM
NDI I.D. NO. PA-508
DER I.D. NO. 63-56

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct 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 or property.

1.2 Description of Project

a. Dam and Appurtenances. The Cherry Valley Dam consists of an earth embankment approximately 475 feet long, with a maximum height of 33 feet from the downstream toe, and a crest width of 10 feet. The flood discharge facilities for the dam consist of a combined primary and emergency spillway located on the right abutment (looking downstream). The spillway structures consist of an approach channel, a concrete overflow section, a spillway discharge channel, and stilling basin. The overflow structure of the spillway is a 130-foot-long concrete ogee section located at an elevation approximately 7.5 feet below the dam crest. The flow from the overflow section discharges into a trapezoidal concrete discharge channel which terminates at a plunge pool at the toe level of the dam near the right abutment. The outlet works consist of a concrete intake tower and two 24-inch cast-iron pipes through the embankment located at the center of the dam. The pipes are encased in concrete through the embankment and are equipped with concrete cutoff collars. The pipes receive flow from the wet intake tower and discharge into the outlet works discharge channel near the downstream toe of the dam. Flow through the pipes is controlled by gate valves located in a concrete valve chamber at the downstream end. This outlet system constitutes the emergency drawdown facility for the dam.

b. Location. The dam is located near the headwaters of Raccoon Creek, a tributary of the Ohio River, approximately one mile upstream from the town of Cherry Valley in Mt. Pleasant Township, Washington County, Pennsylvania (Plate 1).

Downstream from the dam, Raccoon Creek meanders through a 500- to 600-foot-wide valley, initially flowing north then west to the town of Cherry Valley. South of the town of Cherry Valley, the stream turns north where the valley narrows to approximately 200 to 300 feet. Near the town of Cherry Valley, approximately 15 residential and 5 commercial buildings are considered to be within the flood plain of Raccoon Creek. It is estimated that failure of the dam would cause large loss of life and property damage in this reach.

c. Size Classification. Intermediate (based on 33-foot height and 1150 acre-feet storage capacity).

d. Hazard Classification. High.

e. Ownership. Western Pennsylvania Water Company (address: Mr. William Kelvington, Manager, West Penn Water Company, McDonald District, 301 Barr Street, McDonald, Pennsylvania 15057).

f. Purpose of Dam. Water supply.

g. Design and Construction History. The dam was designed by The Chester Engineers of Pittsburgh, Pennsylvania in 1945. The dam was apparently constructed by a local contractor with completion in February, 1947.

h. Normal Operating Procedure. The reservoir is normally maintained at Elevation 1064, the level of the uncontrolled spillway crest, leaving 7.5 feet of freeboard to the top of the dam at Elevation 1071.5. Inflow occurring when the lake level is at or above the spillway level is discharged through the uncontrolled spillway.

1.3 Pertinent Data

a. Drainage Area - 5.8 square miles.

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - 770 (July 5, 1950)
Outlet conduit at maximum pool - 65
Gated spillway capacity at maximum pool - N/A
Ungated spillway capacity at maximum pool - 10,030
Total spillway capacity at maximum pool - 10,030

c. Elevation (USGS Datum) (feet)

Top of dam - 1071.5
Maximum pool - 1071.2 (low spot on crest)
Normal pool - 1064 (spillway crest elevation)
Upstream invert outlet works - 1,038.5

Downstream invert outlet works - 1038
Streambed at center line of dam - 1040±
Maximum tailwater - Unknown

d. Reservoir Length (feet)

Normal pool level - 5500
Maximum pool level - 7000 (estimated)

e. Storage (acre-feet)

Normal pool level - 604
Maximum pool level - 1150

f. Reservoir Surface (acres)

Normal pool level - 55
Maximum pool level - 92

g. Dam

Type - Earth
Length - 475 feet
Height - 33 feet
Top width - 10 feet
Side slopes - Downstream: 2.5H:1V; Upstream: 3H:1V
Zoning - Yes
Impervious core - No
Cutoff - Yes
Grout curtain - No

h. Regulating Outlet

Type - 24-inch cast-iron pipe
Length - 180± feet
Closure - Gate valves at downstream end
Access - Intake tower
Regulating facilities - Gate valves

i. Spillway

Type - Concrete ogee overflow section
Length - 130 feet
Crest elevation - 1064 feet
Gate - None
Upstream channel - Lake
Downstream channel - Trapezoidal concrete discharge channel

SECTION 2
DESIGN DATA

2.1 Design

a. Data Available

(1) Hydrology and Hydraulics. A state report entitled, Report Upon the Application of the West Penn Water Company, dated November 20, 1945, summarizes the available hydrologic and hydraulic information. Design calculations were also available for review.

(2) Embankment. The available information consists of various design drawings, construction specifications, construction progress reports, and past state inspection reports. In the 1945 permit application report, a detailed description of the design features is included.

(3) Appurtenant Structures. Available information consists of design drawings only.

b. Design Features

(1) Embankment

a. As designed, the dam is a zoned embankment, the upstream zone being "selected fill rolled in 4-inch layers" (Class A material) and the downstream zone being "rolled fill" (Class B material)(Plate 2). A 27-inch-thick concrete cutoff wall at the center line of the cutoff trench was constructed from the left abutment through the embankment and the crest of the spillway (Plate 3). The cutoff wall extends from the bottom of the cutoff trench through sandstone and shale to the top of "hard shale" at approximately Elevation 1030. In the specifications, the Class A material was described as follows:

> "This selected material shall be of clay taken from the spillway or borrow pits inside the reservoir. The clay selected material shall be of such consistency that when damp and spread in 2-inch to 4-inch layers it will be suffuciently compact as to become impervious."

The Class B material was described as materials consisting of shale and rocks not over four inches and not to be impervious when compacted in 2- to 4-inch layers.

b. The embankment was designed to have a 2.5 to 1 (horizontal to vertical) slope on the downstream face and a 3 to 1 slope on the upstream face. The upstream face of the dam was protected by grouted concrete blocks extending from Elevation 1055 to the crest level (Elevation 1071.5).

c. Available information indicates that several test pits were excavated for subsurface exploration. As illustrated in Plate 3, the typical subsurface profile consists of approximately 10 feet of overburden underlain by "soft blue shale" which is underlain by "hard shale."

(2) Appurtenant Structures. The appurtenant structures of the dam include a combined emergency and primary spillway and the outlet works. The spillway structures consist of an earth approach channel, concrete overflow section, trapezoidal concrete discharge channel, and a concrete lined stilling basin. Plate 4 illustrates the layout of the appurtenant structures. The typical sections of the spillway discharge channel and concrete overflow structure are shown on Plate 5. The 130-foot concrete ogee overflow section is located at Elevation 1064, leaving 7.5 feet of freeboard as designed to the top of the dam. The approach channel is a partially concrete-lined channel excavated into the right abutment. The bottom of the approach channel as designed is located at Elevation 1058, leaving a 6-foot approach depth at normal pool level. The trapezoidal concrete discharge channel is approximately 150 feet long and converges uniformly from a width of 106 feet at the overflow section to 90 feet at the downstream end. A 90-foot-wide, 50-foot-long stilling basin is also trapezoidal in cross section. The minimum depth of the water in the stilling basin is maintained at four feet by a sill at the downstream end. The slab sections of the spillway discharge channel and the stilling basin are 10 inches thick and are underlain by a pipe drain system.

The outlet works are located at the center of the embankment and consist of an intake tower at the upstream toe of the dam and two 24-inch cast-iron pipes through the embankment. The pipes through the embankment are encased in concrete and equipped with concrete cutoff collars. Plates 6 and 7 illustrate the details of the outlet works. Flow through the outlet pipes is normally controlled by manually operated gate valves located in a concrete valve chamber near the downstream toe of

the dam. The intake tower and the outlet pipes can be drained by closing the inlet sluice gates at the intake tower.

c. Design Data

(1) Hydrology and Hydraulics. In the 1945 state report, the capacity of the spillway was assessed to be adequate relative to the criteria applicable at the time. Available calculations indicate that the capacity of the spillway is 10,030 cfs with no freeboard.

(2) Embankment. Other than design drawings, no engineering data are available on the design of the embankment.

(3) Appurtenant Structures. Undated stability calculations for the gravity overflow section of the spillway indicate the stability of the structure to be marginal. For a loading condition of three feet of overflow depth, the resultant was calculated to be only 0.1 foot within the base of the structure from the toe. It also appears that the calculations did not include any uplift forces. The comparison of the typical cross section of the overflow weir shown on Plate 3 with the typical cross section used in the calculations suggests that the design was modified. It appears that the thickness of the base of the structure was increased from 4 feet to approximately 8 feet, and a portion of the base was designed monolithic with a 27-inch-wide cutoff wall which extends to the top of hard shale. However, no indication was found that reinforcement was provided between the cutoff wall concrete and the base of the overflow structure.

2.2 Construction. The construction of the dam was apparently conducted in accordance with the drawings and specifications prepared by The Chester Engineers. A state letter dated May 23, 1946, addressed to West Penn Water Company indicates that during the state field inspection of construction progress, a discrepancy was observed between the specifications submitted to the state for the permit application and the specifications provided to the contractor. While the specifications accompanying the permit application required a rolled embankment, the specifications provided to the contractor permitted compaction by means of bulldozers and carry-alls. Further correspondence indicates that the method of compaction was immediately modified to conform to the provisions of the specifications accompanying the permit. Other than the above-referenced conditions, no references were found to indicate that any unusual problems or construction difficulties were encountered during the construction of the dam.

Available information indicates no post-construction changes.

2.3 Operation. No formal records of operation were available for review. Correspondence indicates that after inspection of the dam by the state in 1961, the condition of the dam was assessed to be good.

Based on correspondence in DER files, the maximum discharge at the dam site occurred on July 5, 1950. The maximum depth of water over the spillway was reported to be 20 inches. Several photographs available in the files suggest that two panels of the spillway slab immediately upstream of the plunge pool washed away during the passage of this flow.

2.4 Other Investigations. None reported.

2.5 Evaluation

a. Availability. The available information was provided by the Commonwealth of Pennsylvania, Department of Environmental Resources.

b. Adequacy

(1) Hydrology and Hydraulics. The available information indicates that the spillway was apparently designed in conformance with PennDER's spillway design criteria applicable at the time of design. This information is not considered to be adequate to assess the conformance of the spillway capacity to the current spillway design criteria.

(2) Embankment. The dam was apparently designed based on the evaluation of the subsurface conditions and borrow materials. However, no references were found to indicate that any soil testing or engineering analyses, such as slope stability or seepage analyses, were conducted. The design did not incorporate an internal drainage system for the embankment, such as filter blankets or chimney drains.

(3) Appurtenant Structures. Review of the design drawings indicates that as designed no significant design deficiencies exist that should affect the overall performance of the appurtenant structures.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of Cherry Valley Dam consisted of the following:

1. Visual inspection of the embankment, abutments, and embankment toe.

2. Visual examination of the spillway and its components, the downstream end of the outlet conduit, and the outlet works intake tower.

3. Observations of the factors affecting runoff potential for the drainage basin.

4. Evaluation of the downstream hazard potential.

The specific observations are illustrated in Plate 8 and in the photographs in Appendix C.

b. Embankment. The general inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

In general, the condition of the dam is considered to be good. There are patches of brush and several trees up to 10 feet high on the middle one-third of the embankment on the downstream face.

The top of the dam was surveyed relative to the spillway crest elevation and was found to have some vertical irregularities. While the design freeboard of the dam was 7.5 feet, the survey indicated freeboards ranging from 7.2 feet to 7.6 feet. The lowest area occurred approximately 150 feet from the left abutment.

c. Appurtenant Structures. The spillway and outlet works were examined for deterioration, other signs of distress, and obstructions that would limit flow. In general, while the condition of the spillway structures was found to be good, the condition of the outlet works is assessed to be poor.

The concrete and spillway structures were found to be in good condition. Two seeps were observed on the side of the spillway discharge channel discharging approximately one to two gallons per minute through the construction joints.

The outlet valve chamber was inspected and found to be full of water. The downstream end of the outlet pipe was below the surface of a pond formed by a dike across the outlet channel and was not visible.

d. Reservoir Area. A map review indicates that the watershed is predominantly covered with pasturelands. Only a small portion of the drainage area has been developed. The town of Hickory is located at the headwaters of Raccoon Creek.

A review of the regional geology (Appendix E) indicates that the slopes adjacent to the reservoir are susceptible to landslides. However, massive landslides which might affect the storage volume of the reservoir and would cause overtopping of the dam by displaced water are considered to be unlikely.

e. Downstream Channel. The town of Cherry Valley is located approximately 1-1/2 miles downstream from the dam. Further description of downstream conditions is included in Section 1.2b.

3.2 Evaluation. While the condition of the embankment is considered to be good, the maintenance condition of the outlet works is assessed to be poor. The owner reported that the outlet valve has not been operated since construction of the dam. Although the water ponding in the outlet works discharge channel appears to be due to surface runoff, the presence of water in the valve chamber raises some concern as to the presence of seepage along the outlet pipe. It is considered advisable to drain the water in the pond and the valve chamber and inspect the area for seepage.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. The reservoir is normally maintained at the spillway crest level with excess inflow discharging over the spillway. The sluice gates in the intake tower are operated as needed to change the water intake elevation. The outlet valve is normally closed.

4.2 Maintenance of the Dam. The maintenance of the dam is considered to be satisfactory. Most of the downstream face of the dam is covered with grass and appears to be annually mowed. However, there are patches of brush and trees up to 10 feet high on the middle one-third of the embankment on the downstream slope. Water company personnel reported that there is no full-time dam tender responsible for the maintenance of the dam. The dam is maintained by water company personnel as required. It was further reported that no formal inspections of the dam are being conducted.

4.3 Maintenance of Operating Facilities. The maintenance of the operating facilities is considered to be poor. Reportedly, the outlet valve has never been operated since construction of the dam. The operation of the outlet valve was not observed during this inspection.

4.4 Warning System. No formal warning system exists for the dam. Telephone communication facilities are available via the water company office at the dam site.

4.5 Evaluation. While the overall maintenance condition of the embankment is considered to be good, the maintenance condition of the outlet works is assessed to be poor. The operational condition of the outlet valve should be immediately assessed and necessary maintenance performed as required. The ponded water in the outlet works discharge channel and in the outlet valve chamber should be drained, and these areas should be inspected for seepage. The brush and trees on the downstream face of the dam should be removed. The dam and appurtenances should be regularly inspected and formal reports maintained.

SECTION 5
HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features

a. Design Data. Cherry Valley Dam has a watershed area of 5.8 square miles and impounds a reservoir with a surface area of 55 acres at normal pool level. The combined emergency and primary spillway is located on the right abutment. The capacity of the spillway is reported to be 10,030 cfs with no freeboard based on design dam crest elevation.

b. Experience Data. As previously stated, Cherry Valley Dam is classified as an intermediate size dam in the high hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass full PMF.

The PMF inflow hydrograph for the reservoir was determined using the Dam Safety Version of the HEC-1 computer program developed by the Hydrologic Engineering Center of the U.S. Army, Corps of Engineers. The data used for computer input are presented in Appendix D. The PMF inflow hydrograph was found to have a peak flow of 11,605 cfs, while the half PMF inflow hydrograph was found to have a peak flow of 5802 cfs. The computer input and summary of computer output are also included in Appendix D.

c. Visual Observations. On the date of inspection, no conditions were observed that would indicate that the spillway capacity would be significantly reduced in the event of a flood.

d. Overtopping Potential. Various percentages of PMF inflow were routed through the reservoir to determine the percent of PMF inflow that the dam can pass without significantly overtopping the embankment and causing breaching of the dam. The computer outputs indicate that the spillway can pass 80 percent PMF without overtopping. For 100 percent PMF, the dam would overtop for a duration of 3.00 hours with a maximum depth of 0.7 foot.

e. Spillway Adequacy. Although the spillway capacity is not sufficient to pass the recommended full PMF without overtopping, in view of the fact that the dam is marginally into the intermediate size range and overtopping of the dam by 0.7 foot during the passage of PMF is not likely to cause a rapid failure, the spillway is classified to be adequate according to the recommended criteria.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the performance of the structure, and no unsatisfactory conditions were reported in the past. Since the design lacks a positive internal drainage system, some concern exists as to the location of phreatic line through the embankment as it affects the stability of the embankment and potential for internal erosion in the event a concentrated seepage develops. However, at the present time, no evidence of seepage was observed along the downstream toe of the dam, indicating that the phreatic line is not intersecting the downstream slope of the dam.

(2) Appurtenant Structures. Structural performance of the components of the spillway and visible portions of the outlet works is considered to be satisfactory.

b. Design and Construction Data

(1) Embankment. The dam was apparently designed on the evaluation of subsurface conditions, as revealed by several test pits excavated at the dam site. No references or documents were found to indicate whether any laboratory tests were conducted. Similarly, no documents or references were found to indicate whether any stability or seepage analyses were conducted. Therefore, available design and construction information does not provide any quantitative data to aid in the assessment of the stability of the embankment.

c. Operating Records. The structural stability of the dam is not considered to be affected by the operational features of the dam.

d. Post-Construction Changes. There have been no reported post-construction modifications to the original design.

e. Seismic Stability. The dam is located in Seismic Zone 1, and based on visual observations, the static stability of the dam is considered to be adequate. Therefore, based on the recommended criteria for evaluation of seismic stability of dams, the structure is presumed to present no hazard from earthquakes.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that Cherry Valley Dam is in good condition. No conditions were observed that would significantly affect the overall performance of the structure and none were reported in the past. However, it is recommended that the operational condition of the outlet valve should be immediately evaluated and necessary maintenance performed. Further, the pond in the outlet works discharge channel should be drained and the area examined for signs of seepage.

The capacity of the spillway was found to be adequate.

b. Adequacy of Information. Available information in conjunction with the visual observations and the previous experience of the inspectors are considered to be sufficient to make a reasonable assessment of the conditions of the dam.

c. Urgency. The following recommendations should be implemented immediately or on a continuing basis.

d. Necessity for Additional Data. No additional data is considered to be required at this time.

7.2 Recommendations/Remedial Measures. It is recommended that:

1. The operational condition of the outlet valve should be evaluated and necessary maintenance performed, if necessary.

2. Adequate drainage should be provided to drain the pond in the outlet works discharge channel. The water in the valve chamber should also be drained and these areas should be inspected for signs of seepage.

3. Brush and trees on the downstream face of the dam should be removed.

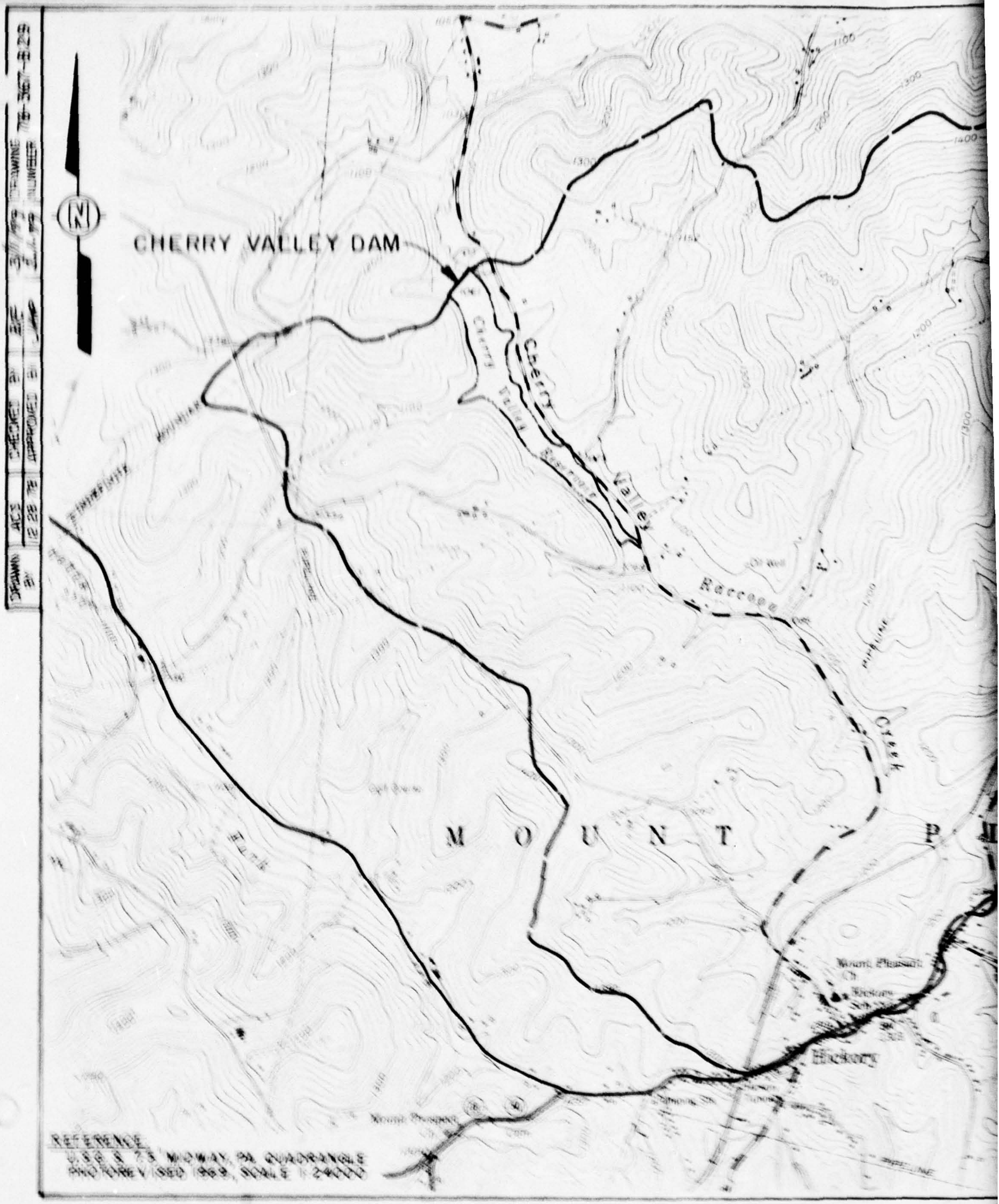
4. The crest of the dam should be surveyed and low spots should be filled to design elevation.

5. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system should be developed to

alert the downstream residents in the event of an emergency.

6. The dam and appurtenant structures should be inspected regularly and necessary maintenance performed.

PLATES


CHERRY VALLEY DAM
Cherry Valley
Raccoon Creek
Hickory
REFERENCE:
U.S.G.S. 7.5' MIDWAY, PA. QUADRANGLE
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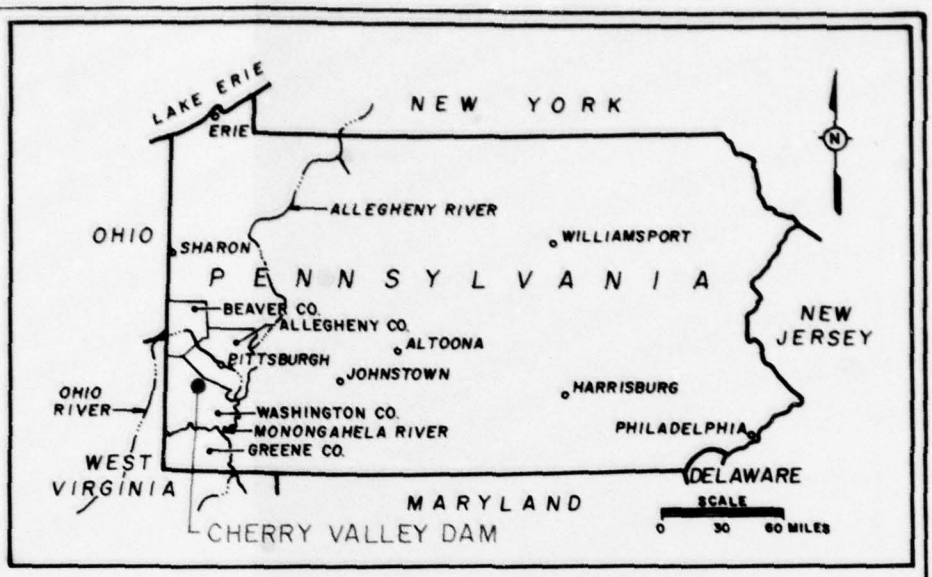

KEY PLAN

APPROXIMATE WATERSHED AREA

SCALE
0 1000 2000 3000 4000 FEET

PLATE I

CHERRY VALLEY DAM
VICINITY, FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

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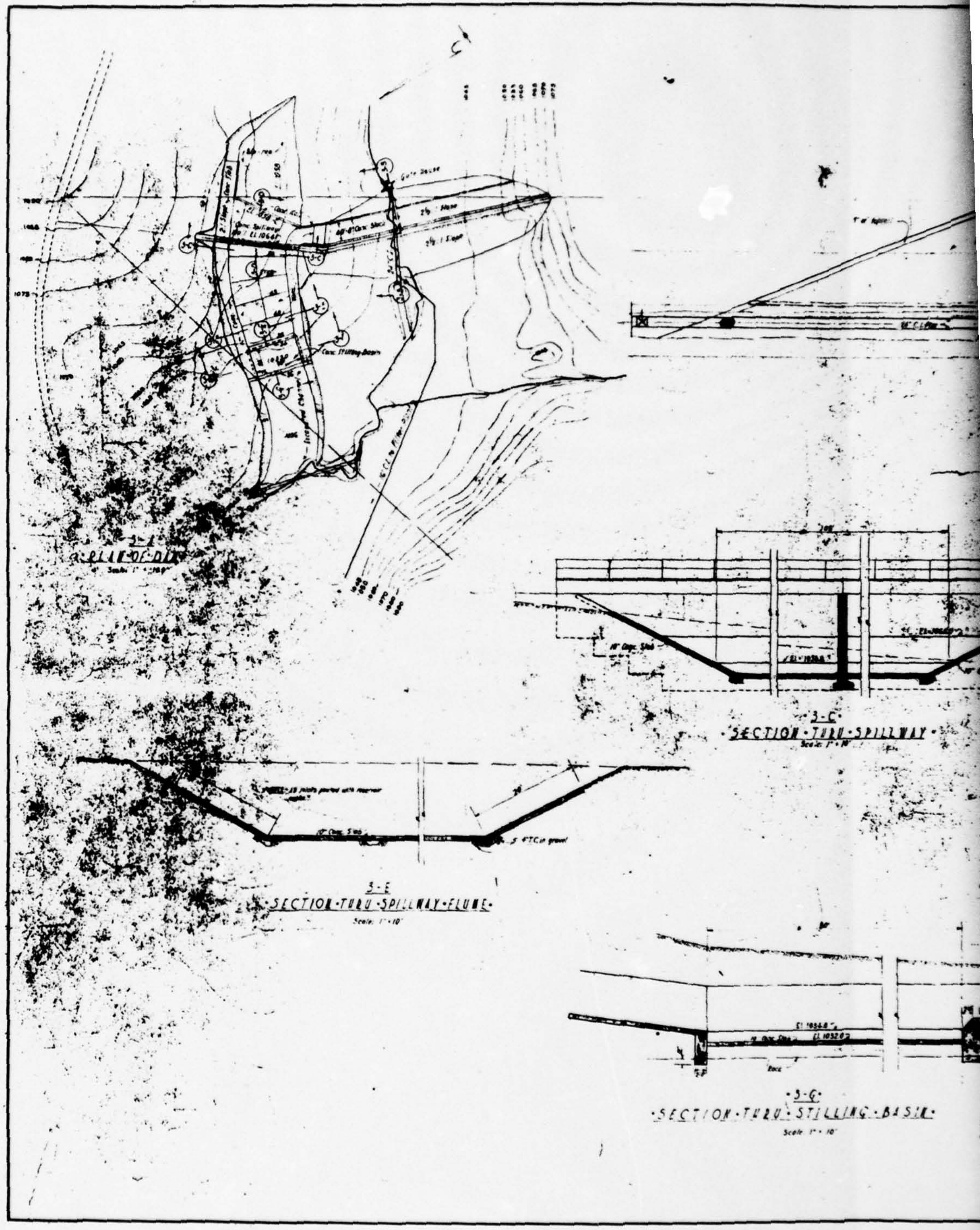

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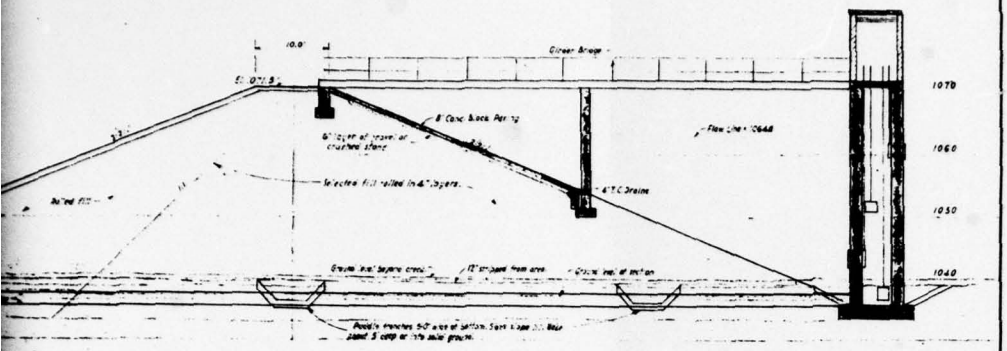
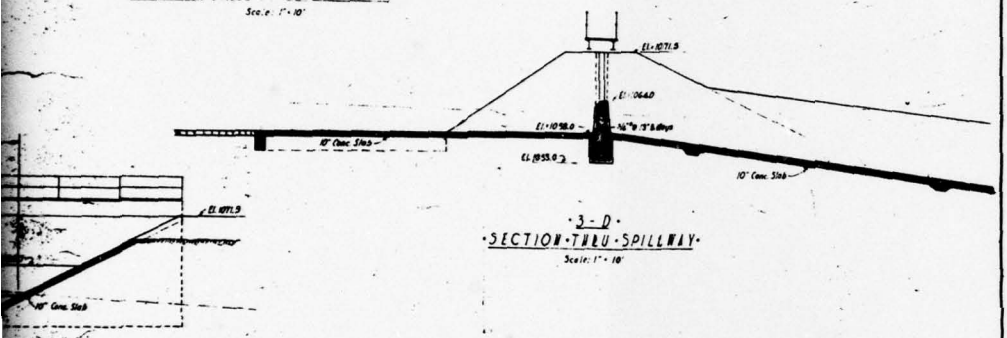


·3-B·

·TYPICAL·SECTION·THRU·DAM·

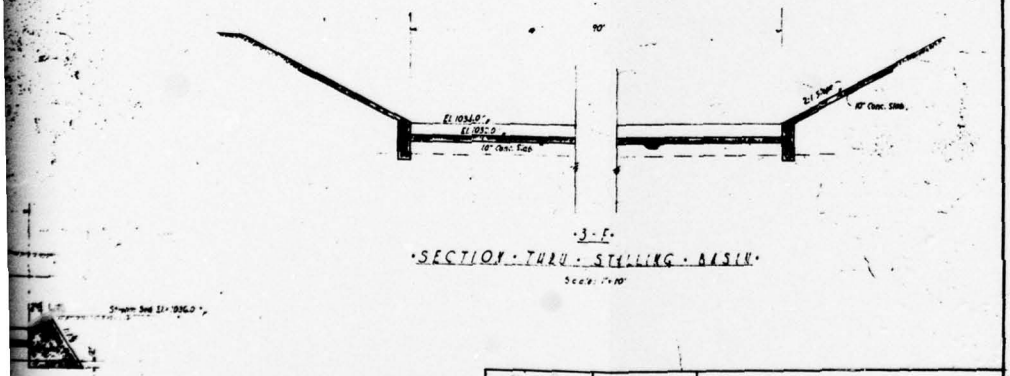
Scale: 1" = 10'



·3-D·

·SECTION·THRU·SPILLWAY·

Scale: 1" = 10'



·3-F·

·SECTION·THRU·STILLING·BASIN·

Scale: 1" = 10'

REVISIONS	APPROVAL

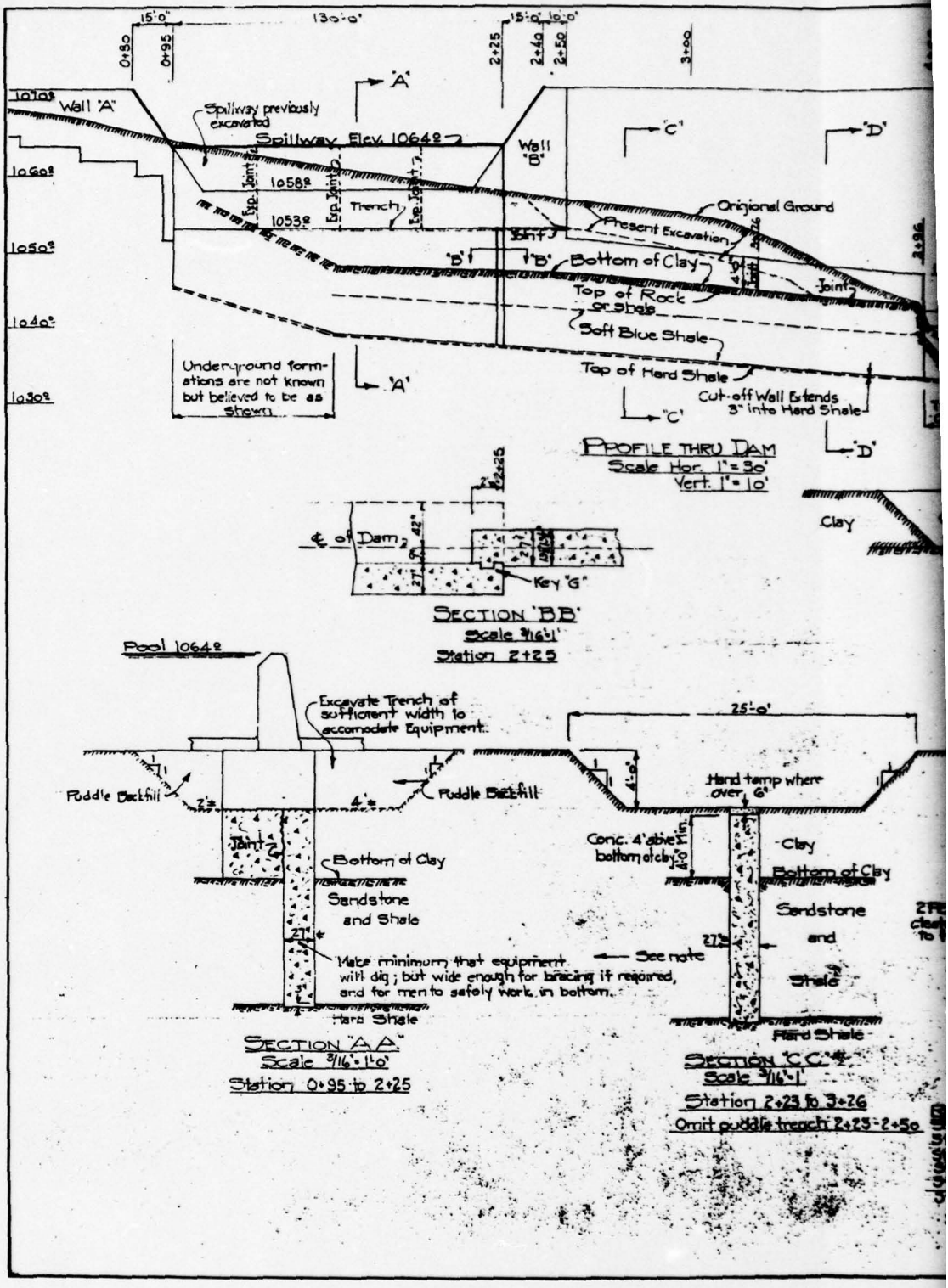
WEST PENN WATER CO.
Mc DONALD, PA.
PROPOSED IMPOUNDING DAM ON
RACCOON CREEK
Scales As noted April 1945
The Chester Engineers
Pittsburgh, Pa.
2206-3

PLATE 2

D'APPOLONIA

2

DRAWN BY	c/b	CHECKED BY	BC	3/1/79	DRAWING
	12-20-78	APPROVED BY	JHD	3.1.79	NUMBER 78-367-B 31



1

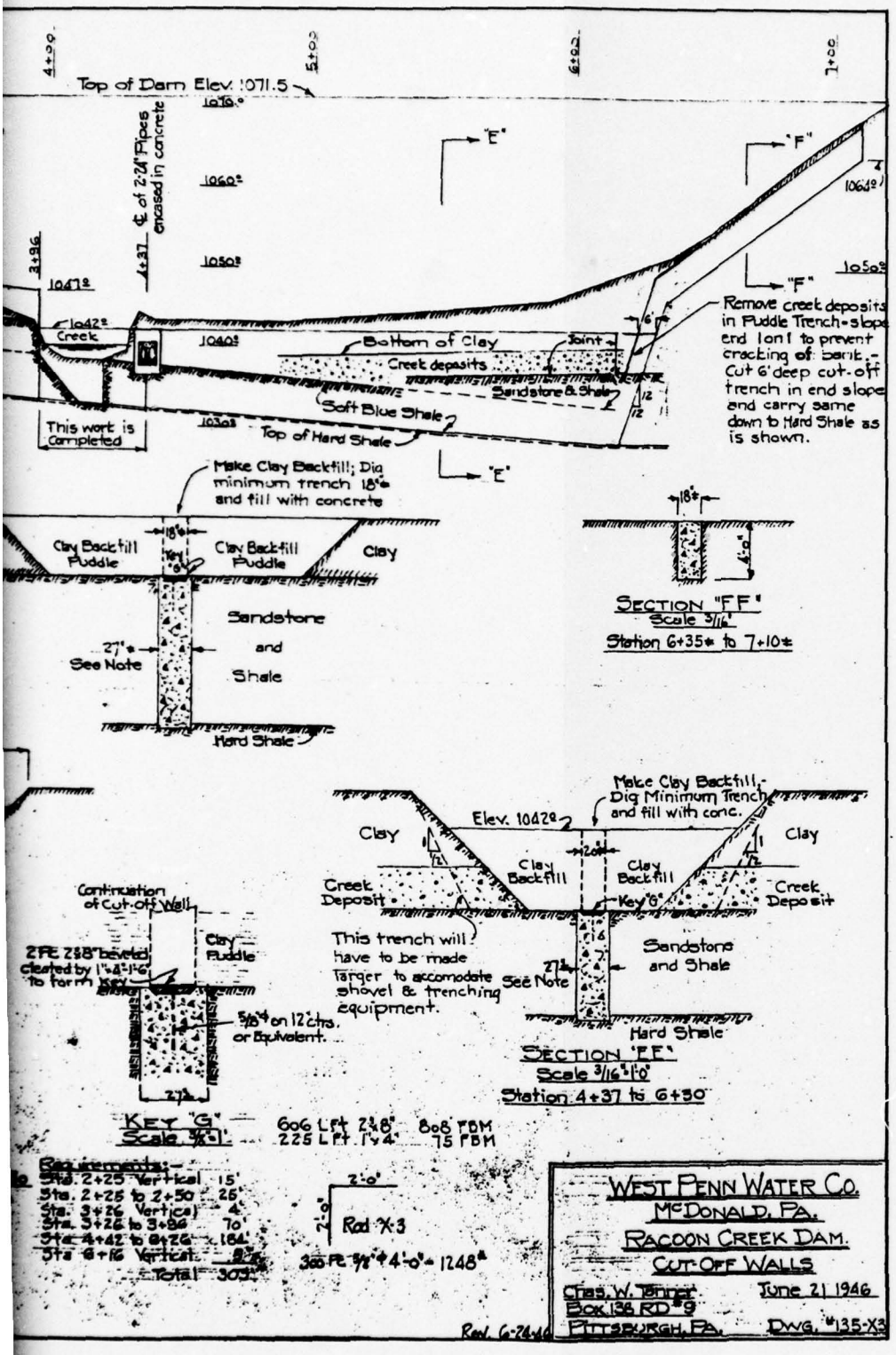
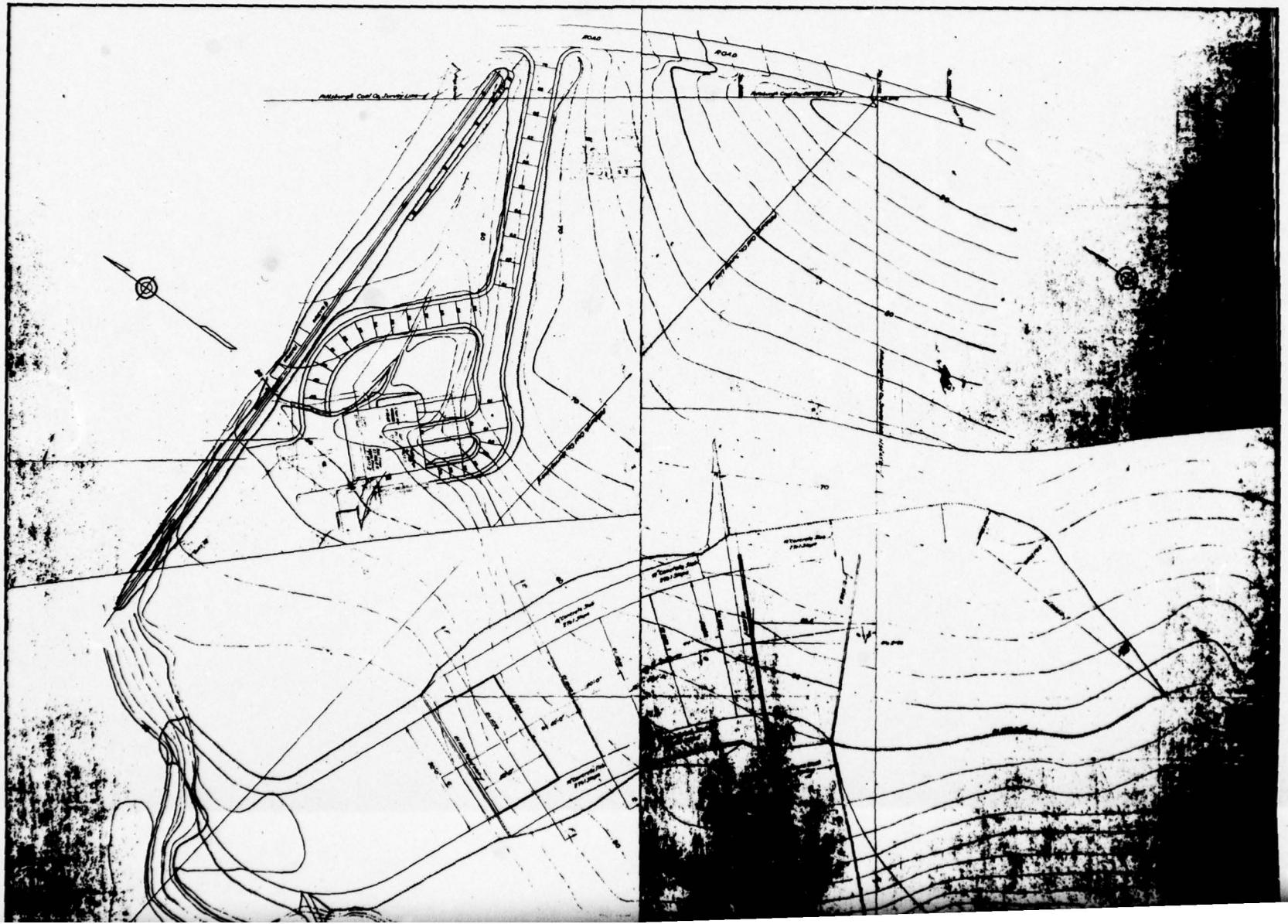


PLATE 3

D'APPOLONIA

DRAWN BY	ACS	CHECKED BY	BE	3/1/79	DRAWING NUMBER 78-367-B32
	12-28-78	APPROVED BY	JAP	3.1.79	



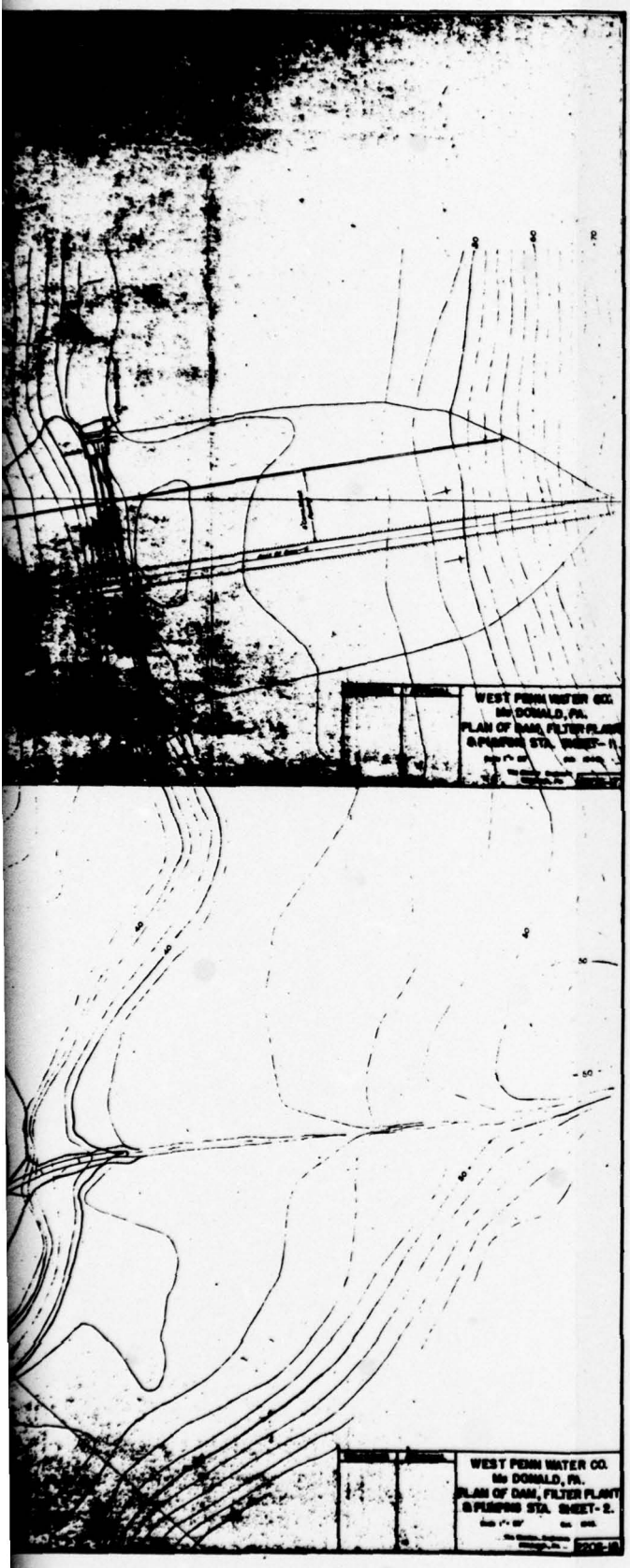
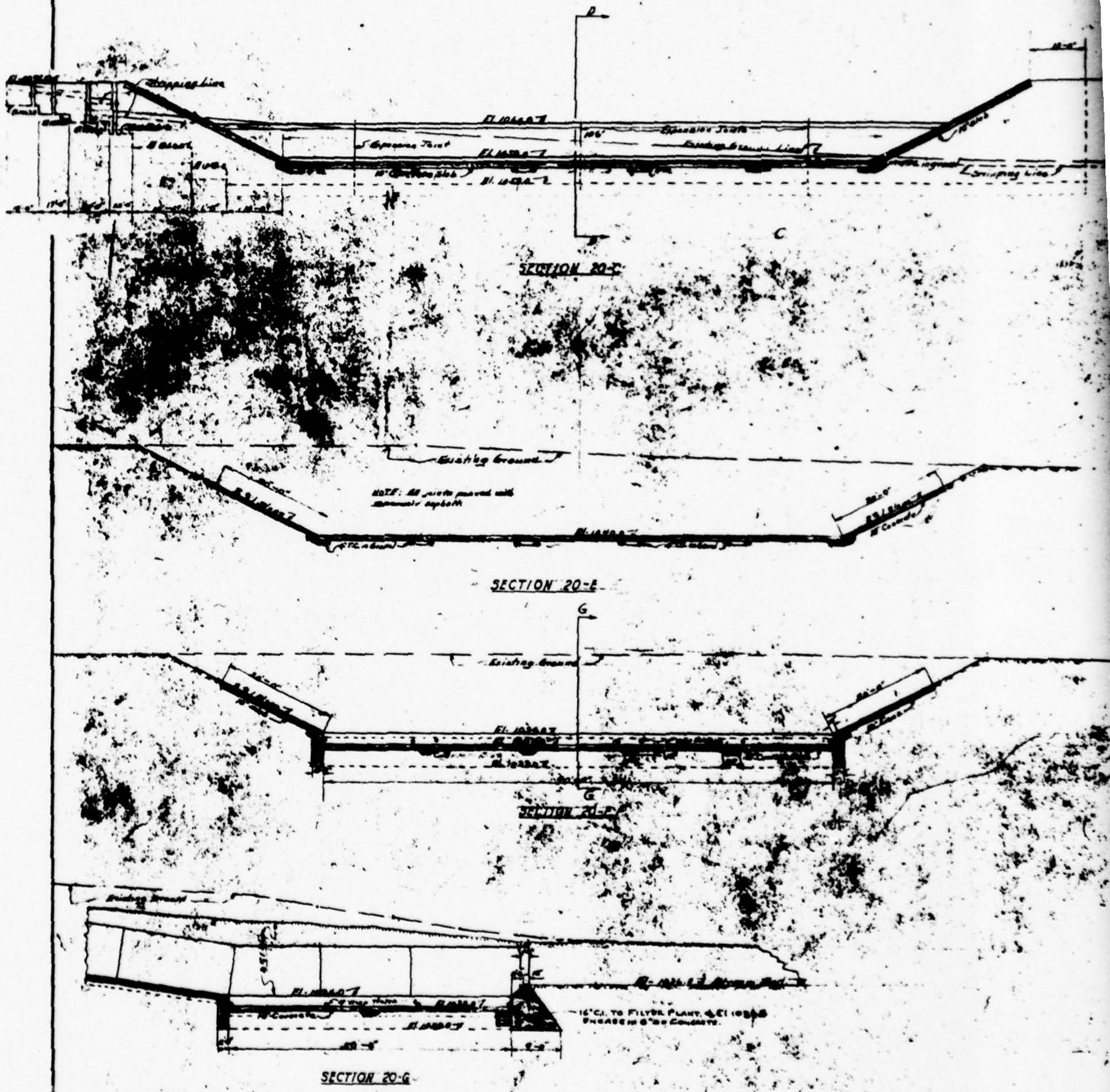


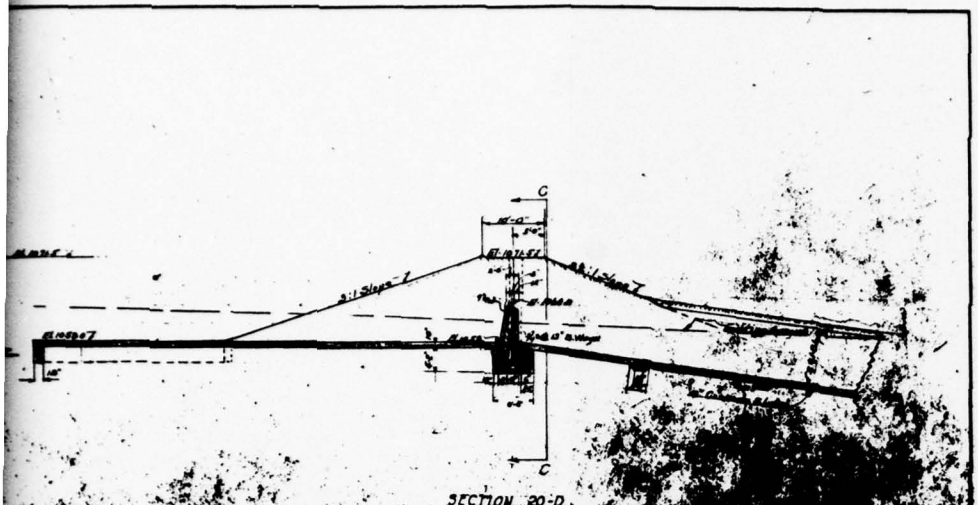
PLATE 4

D'APPOLONIA

2

DRAWN BY	cjb 12-20-78	CHECKED BY	BE 3/1/79	DRAWING NUMBER 78-5?7-B33
		APPROVED BY	JMP 3.1.79	





SECTION 20-D

REVISIONS	APPROVAL

WEST PENN WATER CO.
Mc DONALD, PA.
IMPOUNDING DAM
SPILLWAY — SECTIONS.

Scale 1" = 10' Oct. 1948.

The Chester Engineers
Pittsburgh, Pa.

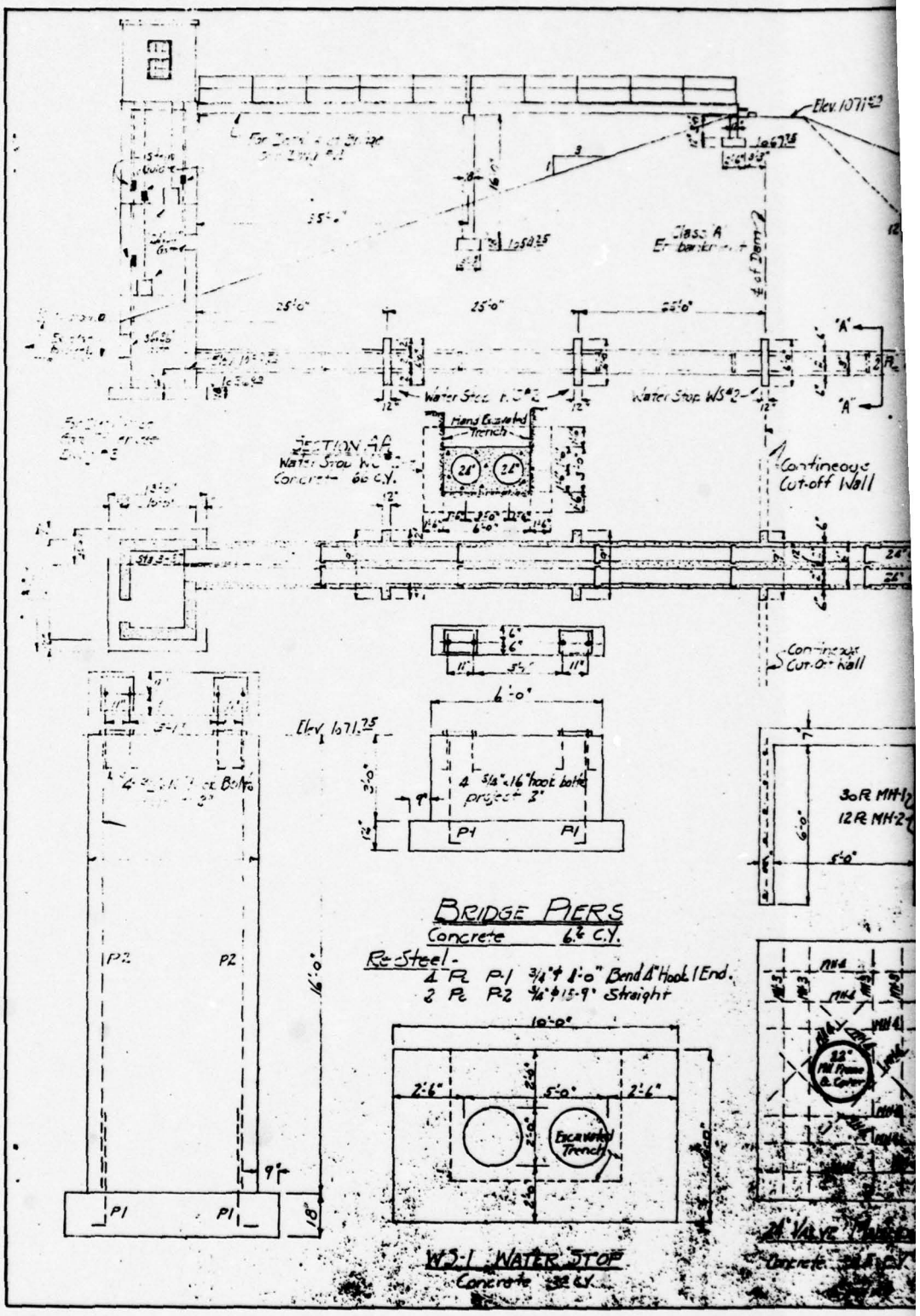
2206-20

PLATE 5

D'APPOLONIA

2

DRAWN BY	cjb	CHECKED BY	AE	3/11/77	DRAWING NUMBER 78-307-B34
	12-20-78	APPROVED BY	JMP	3.1.79	



1

Pour concrete in buttress:

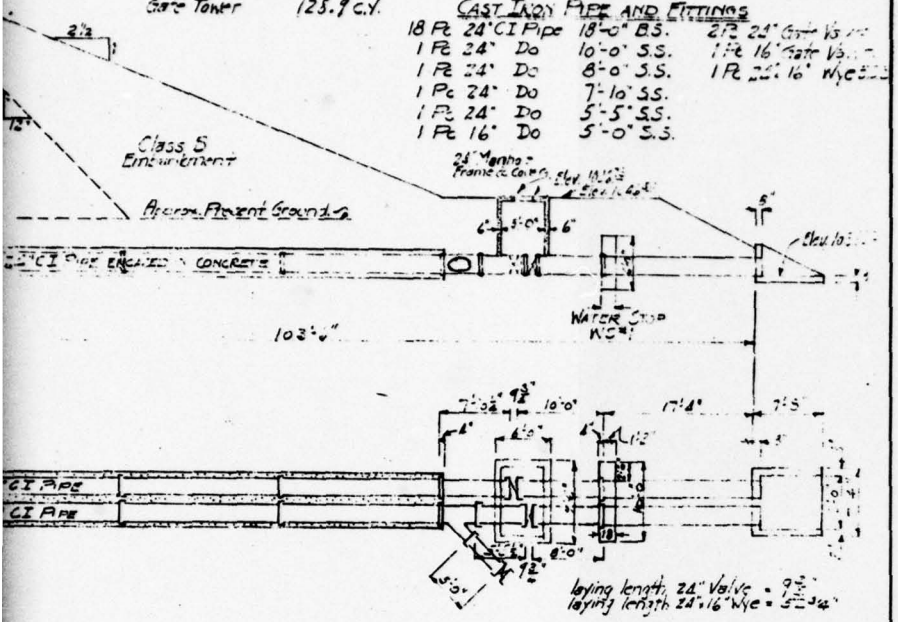
Headwall	2.8 C.Y.
Waterstop #1	3.0 C.Y.
Valve Manhole	4.5 C.Y.
Encase 24" Pipes	66.0 C.Y.
Gate Tower	125.9 C.Y.

Material to Perform

900 Bbls Cement
145 Tons Sand
264 Tons Gravel

CAST IRON PIPE AND FITTINGS

18 Pc 24" CI Pipe	18'-0" B.S.	2 Pc 24" Gate Valves	
1 Pc 24" Do	10'-0" S.S.	1 Pc 16" Gate Valve	
1 Pc 24" Do	8'-0" S.S.	1 Pc 24"-16" Wye	
1 Pc 24" Do	7'-10" S.S.		
1 Pc 24" Do	5'-5" S.S.		
1 Pc 16" Do	3'-0" S.S.		



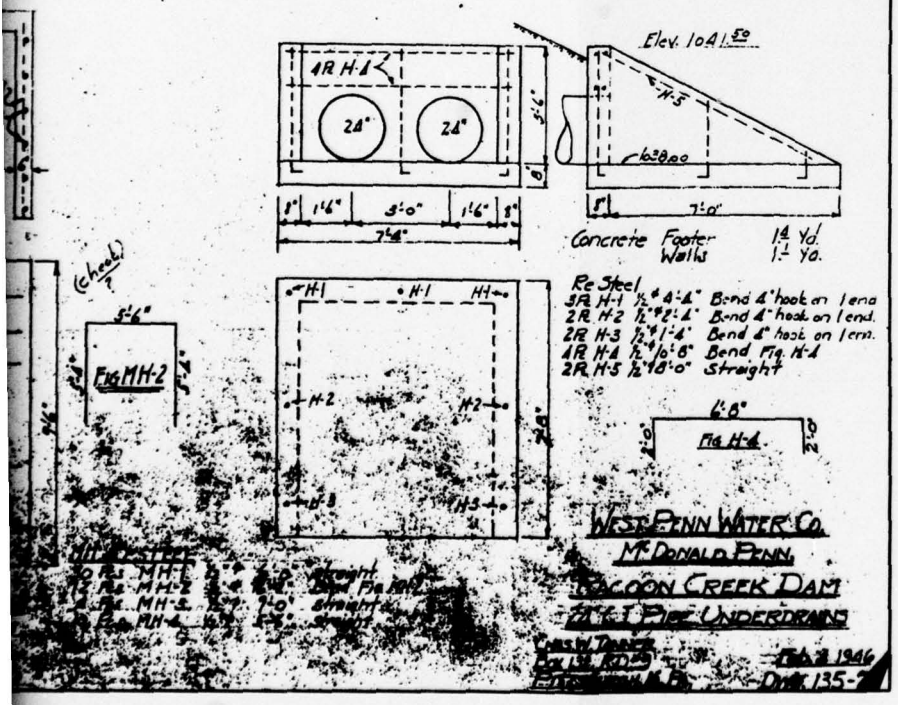
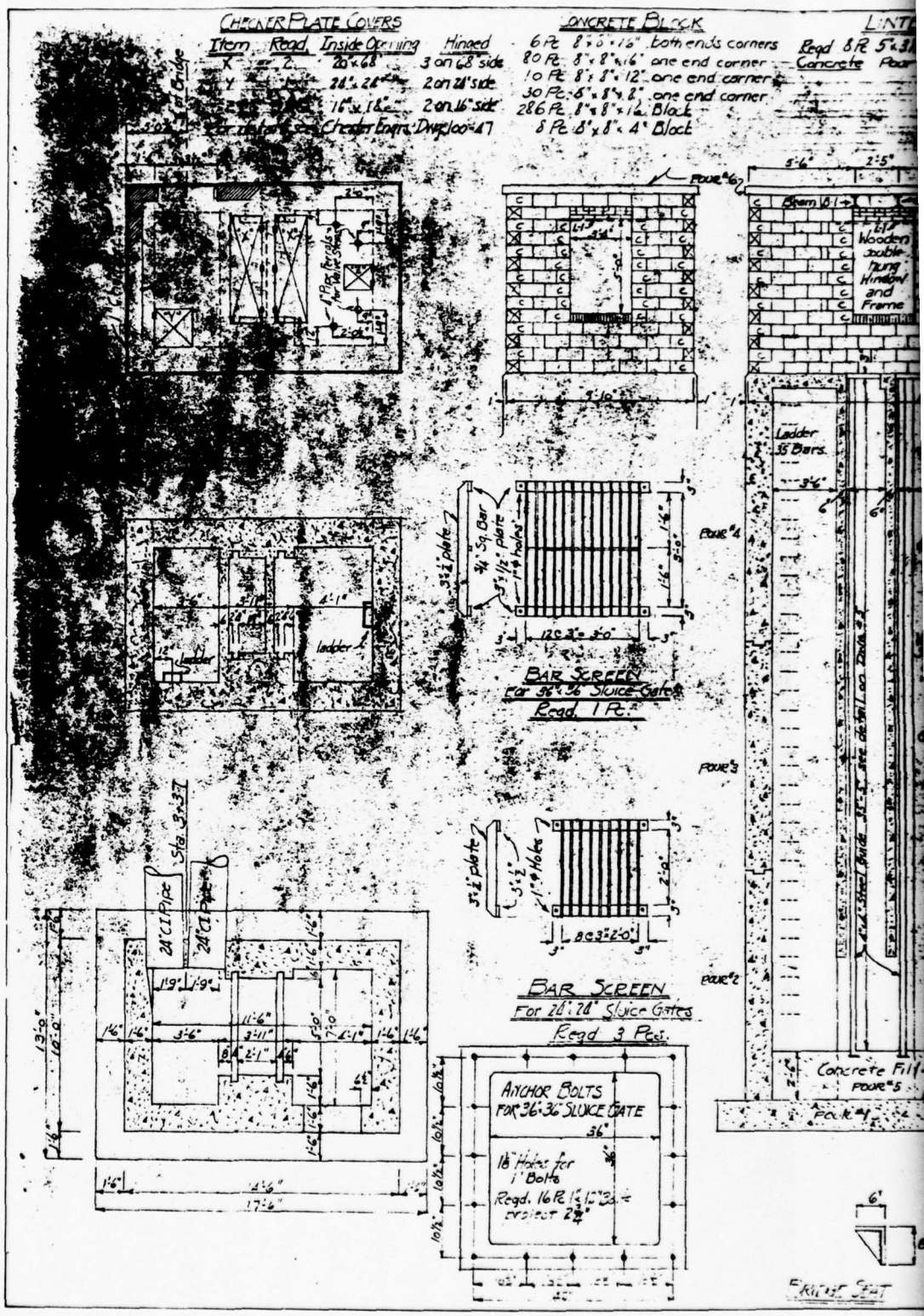


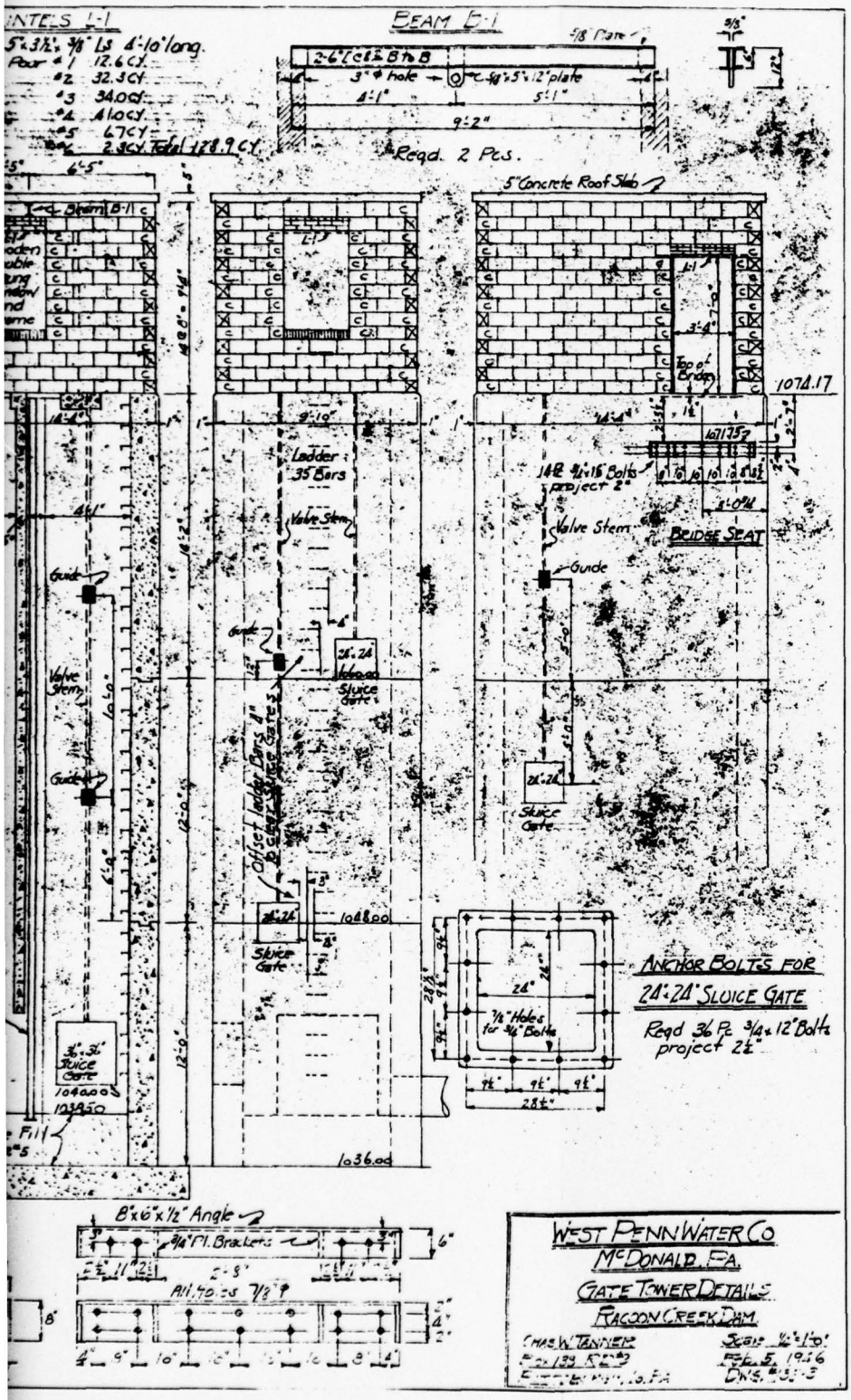
PLATE 6

D'APPOLONIA

2

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
cjb 12-20-78	BE	JHD	3/1/79
			3.1.79
			78-367-B35



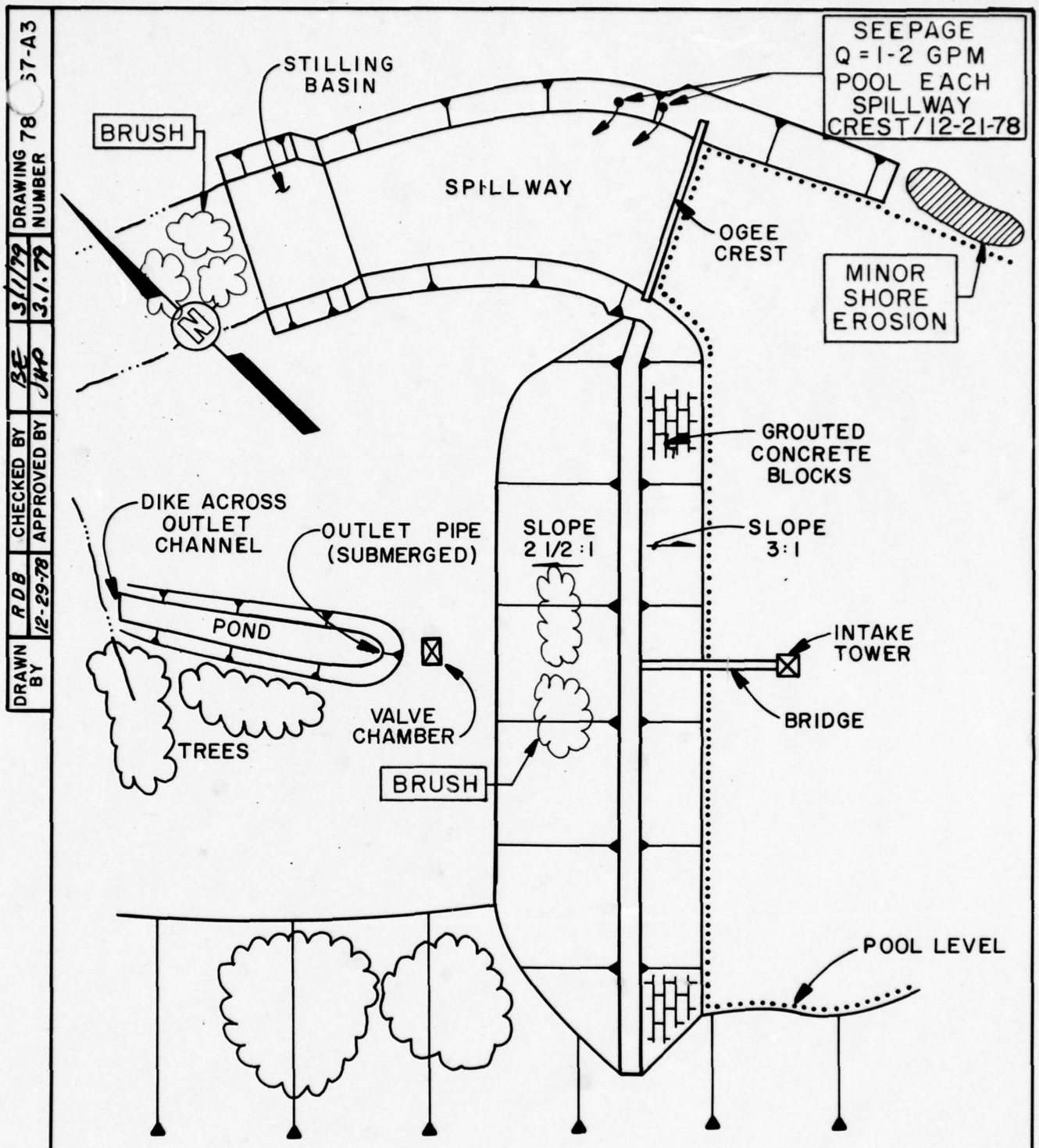


WEST PENN WATER CO
McDONALD, PA.
GATE TOWER DETAILS
RACCOON CREEK DAM

CHAS. W. TANNEHILL
Scale ½"=1'-0"
Feb. 5, 1916
Dwg. No. 3

PLATE 7

D'APPOLONIA



DRAWN BY	CHECKED BY		DRAWING NUMBER
RDB			78 37-A3
12-29-78	APPROVED BY		
		3/1/79	
	JWP	3.1.79	

NOTES:

1. SPILLWAY FREEBOARD = 7.5 FEET
2. POOL LEVEL DATE OF INSPECTION: 3.4 FEET BELOW SPILLWAY CREST.

NOT TO SCALE

PLATE 8

CHERRY VALLEY DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: DEC. 4, 1978

D'APPOLONIA

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Cherry Valley Dam COUNTY Washington STATE Pennsylvania ID# NDI I.D. NO. PA-508
DER I.D. NO. 63-56

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION December 4, 1978 WEATHER Cloudy TEMPERATURE 50s

POOL ELEVATION AT TIME OF INSPECTION 1060.6 M.S.L. TAILWATER AT TIME OF INSPECTION 1040.7 M.S.L.

INSPECTION PERSONNEL:	REVIEW INSPECTION PERSONNEL: (December 21, 1978)
Bilgin Erel	L. D. Andersen
Wah-Tak Chan	J. H. Poellot
	Bilgin Erel

Bilgin Erel RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Crest elevation in middle one-third of the embankment is 0.2 to 0.3 foot below design elevation relative to the spillway crest level.	
RIPRAP FAILURES	None.	

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No signs of distress.	
ANY NOTICEABLE SEEPAGE	None found. Ponded water in the outlet works discharge channel precluded the inspection of this area for signs of seepage.	The ponded water should be drained.
STAFF GAGE AND RECORDER	None.	
DRAINS	None.	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The visible portions of the outlet works intake tower are in good condition.	
INTAKE STRUCTURE	Submerged.	
OUTLET STRUCTURE	Most of the structure is submerged. Visible portions are in good condition.	
OUTLET CHANNEL	A dike across the outlet works discharge channel is ponding water in the channel.	Adequate drainage should be provided to drain the pond.
EMERGENCY GATE	Water company personnel reported that the blow-off valve has never been operated since the construction of the dam. The blow-off valve chamber is full of water.	The operational condition of the blow-off valve should be immediately evaluated. The water in the chamber should be drained.

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	130-foot-wide ogee weir. In good condition.	
APPROACH CHANNEL	Submerged. Appears to be free of debris.	
DISCHARGE CHANNEL	Trapezoidal concrete channel. In good condition.	
BRIDGE AND PIERS	None.	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

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

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

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

VISUAL INSPECTION
PHASE I
RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle. No signs of landslides.	
SEDIMENTATION	Unknown.	
UPSTREAM RESERVOIRS	None.	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No apparent obstructions immediately downstream from the dam that would affect the discharge capacity of the spillway.	
SLOPES	No apparent instability (immediately downstream from the dam).	
APPROXIMATE NUMBER OF HOMES AND POPULATION	15 homes and 5 commercial buildings in the town of Cherry Valley are considered to be within the flood plain of Raccoon Creek. Population: approximately 100.	

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
AND HYDROLOGIC AND HYDRAULIC
PHASE I

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Cherry Valley Dam
ID# NDI I.D. No. 508
DER I.D. No. 63-56

ITEM	REMARKS
AS-BUILT DRAWINGS	The drawings are available in state files.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	The dam was designed by The Chester Engineers of Pittsburgh, Pennsylvania in 1945. Construction of the dam was completed in February 1947.
TYPICAL SECTIONS OF DAM	See Plate 2.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plate 6.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Not available.
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Spillway design capacity calculations are available in state files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	See Plate 3 for typical subsurface profile.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported.
BORROW SOURCES	Unknown.
MONITORING SYSTEMS	None.
MODIFICATIONS	None reported.
HIGH POOL RECORDS	Not recorded (May 7, 1950, pool elevation - 20 inches above spillway crest).

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None reported.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Not available.
SPILLWAY PLAN SECTIONS DETAILS	See Plate 4.
OPERATING EQUIPMENT PLANS AND DETAILS	See Plates 6 and 7.

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 5.8 square miles (pastureland)

ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 1064 (604 acre-feet)

ELEVATION; TOP FLOOD CONTROL POOL AND STORAGE CAPACITY: 1071.5; storage 1150 acre-feet

ELEVATION; MAXIMUM DESIGN POOL: 1071.5

ELEVATION; TOP DAM: 1071.5 (as designed); 1071.2 (measured low spot)

SPILLWAY:

a. Elevation 1064

b. Type Ogee

c. Width 130 feet (perpendicular to flow direction)

d. Length N/A

e. Location Spillover Middle one-third of the embankment

f. Number and Type of Gates None

OUTLET WORKS:

a. Type 24-inch cast-iron pipe

b. Location Center of embankment

c. Entrance Inverts Elevation 1039.5

d. Exit Inverts Elevation 1038.5

e. Emergency Draindown Facilities 24-inch blow-off pipe

HYDROMETEOROLOGICAL GAGES:

a. Type None

b. Location None

c. Records None

MAXIMUM NONDAMAGING DISCHARGE: Spillway capacity (10,000± cfs)

APPENDIX C

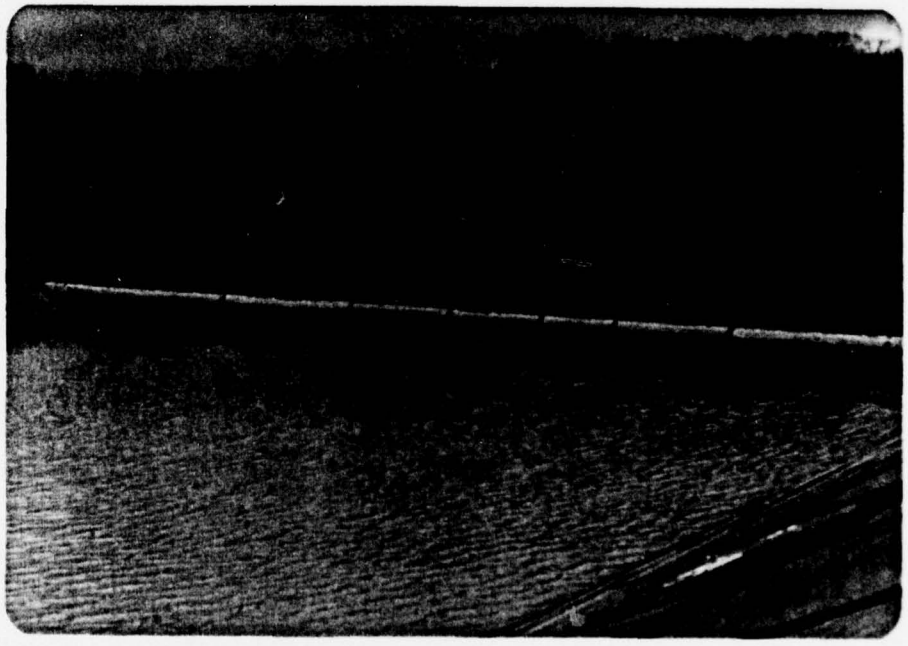
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
CHERRY VALLEY DAM
NDI I.D. NO. PA-508
DECEMBER 4, 1978

PHOTOGRAPH NO.	DESCRIPTION
1	Crest (looking west).
2	Spillway approach channel and crest.
3	Spillway discharge channel.
4	Spillway stilling basin.
5	Intake tower.
6	Gate controls at intake tower.
7	Blow-off pipe valve chamber (at downstream toe of dam).
8	Blow-off pipe discharge end.

Photograph No. 1

Crest (looking west).



Photograph No. 2

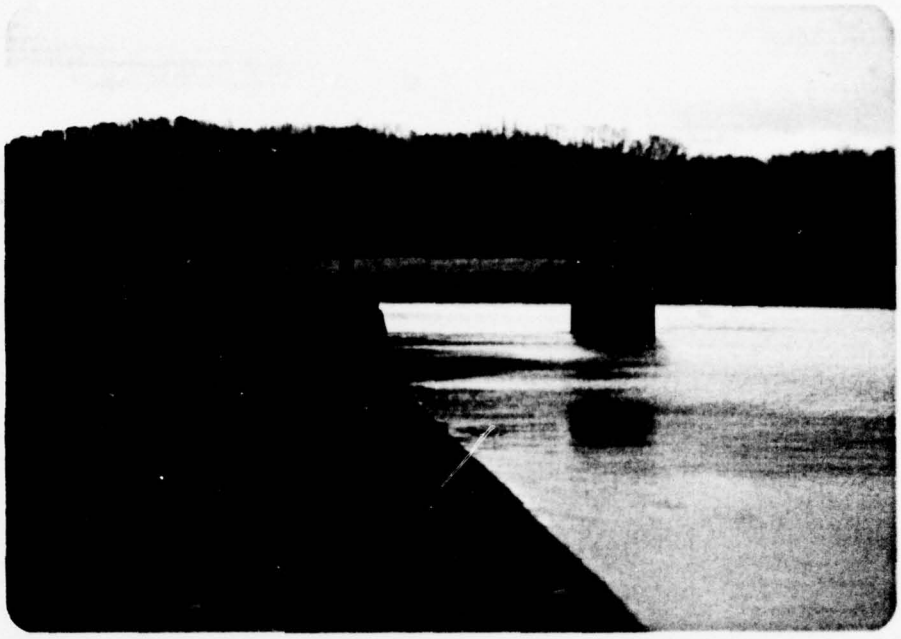
Spillway approach channel and crest.

Photograph No. 3

Spillway discharge channel.

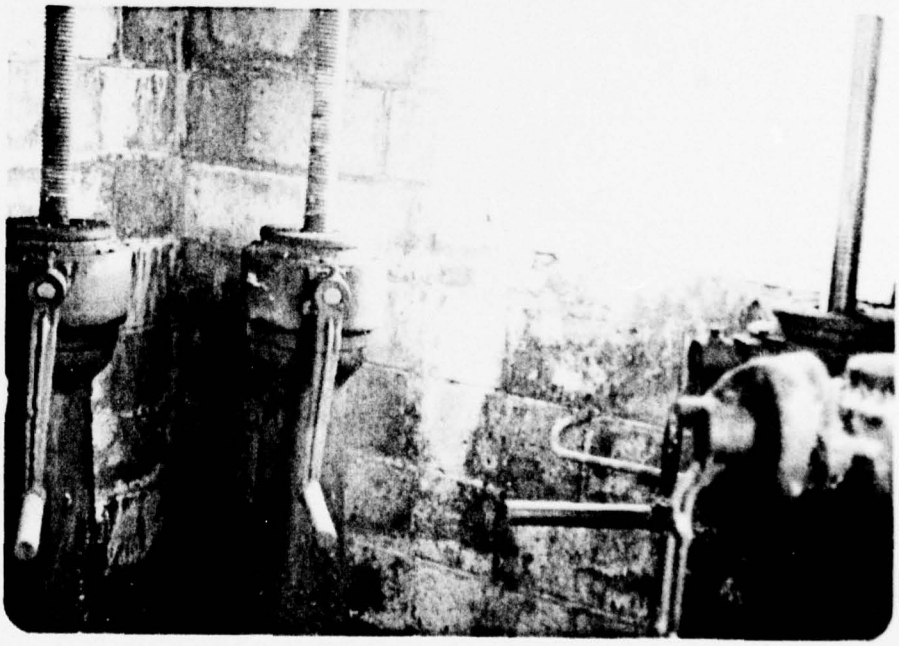
Photograph No. 4

Spillway stilling basin.



Photograph No. 5

Intake tower.



Photograph No. 6

Gate controls at intake tower.

Photograph No. 7

Blow-off pipe valve chamber (at downstream toe of dam).

Photograph No. 8

Blow-off pipe discharge end.

APPENDIX D

CALCULATIONS

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Cherry Valley Dam (NDI I.D. PA-508)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 24.2 INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	Cherry Valley Lake	Cherry Valley Dam			
Drainage Area (square miles)	5.8	-			
Cumulative Drainage Area (square miles)	5.8	5.8			
Adjustment of PMF for Drainage Area (%)[2]					
6 Hours	102	-			
12 Hours	120	-			
24 Hours	130	-			
48 Hours	140	-			
72 Hours	-	-			
Snyder Hydrograph Parameters					
Zone[3]	28B	-			
C_p/C_t[4]	0.57/1.7	-			
L (miles)[5]	3.0	-			
L_{ca} (miles)[5]	1.7	-			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	2.8	-			
Spillway Data					
Crest Length (ft)	-	130			
Freeboard (ft)	-	7.2			
Discharge Coefficient	-	3.65			
Exponent	-	1.5			

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

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

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

(4) Snyder's Coefficients.

(5) L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  11 JAN 79
**********
    1                 A1       SNYDER UNIT HYDROGRAPH,FLOOD ROUTING AND DAM OVERTOPPING ANALYSES
    2                 A2       CHERRY VALLEY DAM,WASHINGTON COUNTY,NDI-ID.PA508    PROJECT NO.78-367-03
    3                 A3       FOR 10%,20%,30%,40%,50%,60%,70%,80%,AND 100% PMF
    4                 B     300        0       10        0        0        0        0        0       -4        0
    5                 B1      5
    6                 J       1        9        1
    7                 J1   0.10     0.20     0.30     0.40     0.50     0.60     0.70     0.80     1.00
    8                 K       0        1                                           1
    9                 K1       CALCULATION OF INFLOW HYDROGRAPH TO CHERRY VALLEY DAM,NDI-ID.PA508
   10                 M       1        1      5.8                5.8                                1
   11                 P                24.2      102      120      130      140
   12                 T                                                    1.0      .05              0.0148
   13                 W   2.782     0.57
   14                 X    -1.0    -0.05      2.0
   15                 K       1        2                                           1
   16                 K1       ROUTING FLOW THROUGH CHERRY VALLEY DAM
   17                 Y                                 1        1
   18                 Y1      1                                           603.8
   19                 $S    0.0    0.921    399.9    548.8    603.8   1148.8   2099.6
   20                 $E 1039.0   1040.0   1060.0   1063.0   1064.0   1071.5   1080.0
   21                 $$ 1064.0    130.0     3.65      1.5
   22                 $D 1071.2     3.08      1.5    475.0
   23                 K      99
```

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 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50	RATIO 6 .60	RATIO 7 .70	RATIO 8 .80	RATIO 9 1.00
HYDROGRAPH AT	1	5.80	1	1173.	2347.	3520.	4693.	5867.	7040.	8213.	9387.	11733.
	(	15.02)	(	33.23)(	66.45)(	99.68)(	132.90)(	166.13)(	199.35)(	232.58)(	265.80)(	332.26)
ROUTED TO	2	5.80	1	1067.	2199.	3344.	4492.	5648.	6806.	7964.	9121.	11520.
	(	15.02)	(	30.21)(	62.26)(	94.69)(	127.20)(	159.95)(	192.73)(	225.52)(	258.28)(	326.20)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1064.00	1064.00	1071.20
STORAGE	604.	604.	1127.
OUTFLOW	0.	0.	9167.

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
.10	1065.72	0.00	729.	1067.	0.00	43.33	0.00
.20	1066.78	0.00	806.	2199.	0.00	43.00	0.00
.30	1067.68	0.00	871.	3344.	0.00	43.00	0.00
.40	1068.48	0.00	929.	4492.	0.00	42.83	0.00
.50	1069.21	0.00	983.	5648.	0.00	42.83	0.00
.60	1069.90	0.00	1033.	6806.	0.00	42.83	0.00
.70	1070.56	0.00	1080.	7964.	0.00	42.83	0.00
.80	1071.18	0.00	1125.	9121.	0.00	42.83	0.00
1.00	1071.93	.73	1197.	11520.	3.00	42.67	0.00

OVERTOPPING ANALYSIS SUMMARY

APPENDIX E

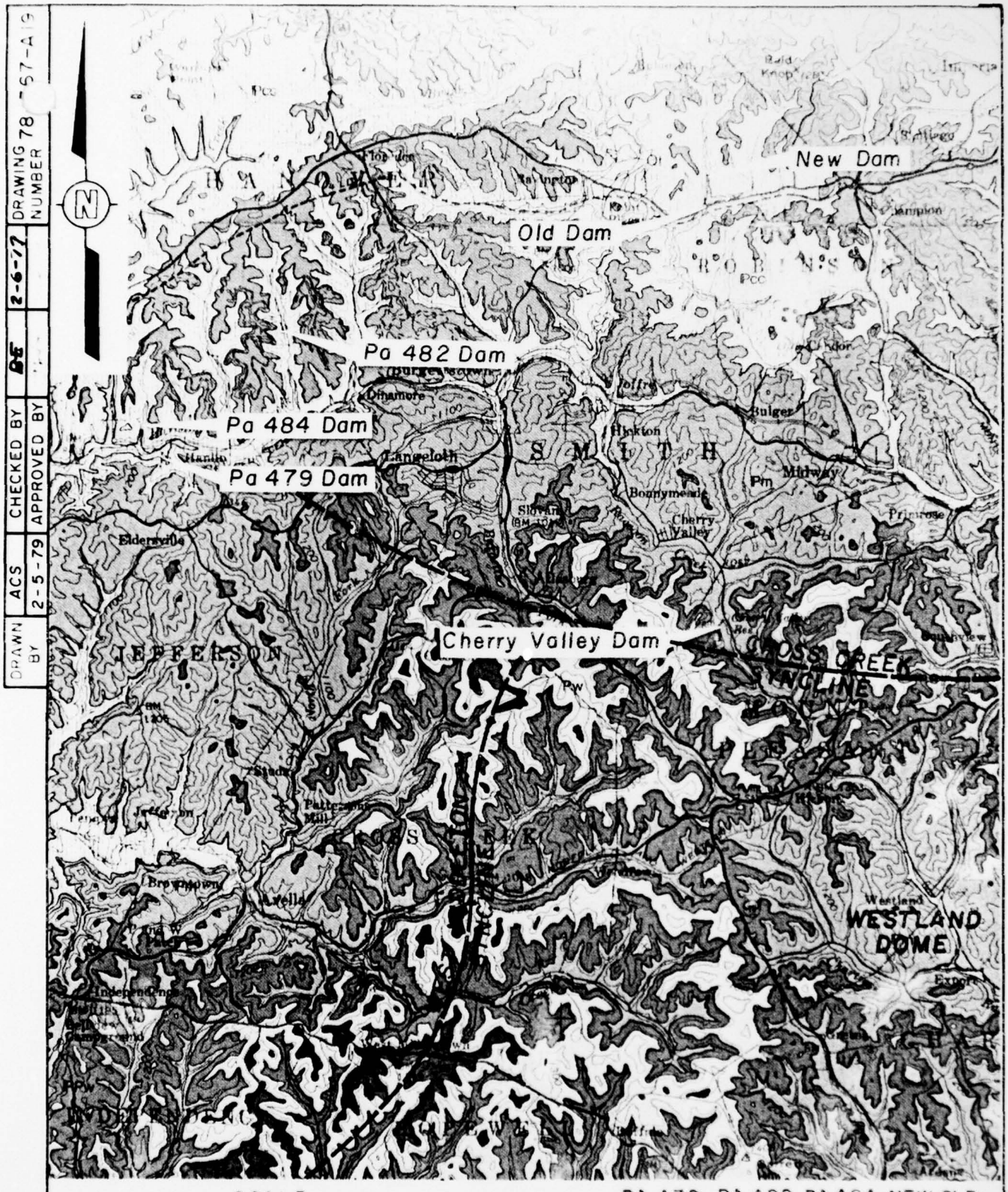
REGIONAL GEOLOGY

APPENDIX E
REGIONAL GEOLOGY

The Cherry Valley Dam is located on strata of the Monongahela Group (Pennsylvanian Age). In general, the rock strata consist of interbedded shale, claystone, sandstone, limestone and coal seams. The dam and reservoir are located on the north limb of the east-west trending Cross-Creek Syncline. The regional strike is east-west with a dip of approximately 80 feet per mile to the south.

The strata below the dam and in the slopes above the dam and reservoir are the Sewickley Member and Upper Member of the Pittsburgh Formation and the Uniontown Formation. The Sewickley Member is approximately 35 to 55 feet thick and consists of light gray argillaceous limestone interbedded with gray claystone and some carbonaceous shale. The overlying Upper Member consists of 55 to 80 feet of gray argillaceous limestone and interbedded green-gray shale, siltstone, and sandstone. The Uniontown Formation overlies the Upper Member and this formation consists of 50 to 85 feet of interbedded gray shale, siltstone, and sandstone seams. The dam is 220 feet above the Pittsburgh coal seam.

The type of strata present are considered to be susceptible to weathering and subsequent landslides. Approximately 20 percent of the area in the vicinity of the dam is covered by landslide deposits. There are recent landslides in the region but none are on the slopes of the dam and reservoir. However, there are older slides near the dam, including one adjacent to the east abutment and another on the west bank of the reservoir. These slides are probably relatively shallow and consist of slow creep movements rather than massive rapid slides.



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PA 479, PA 482, PA 484, NEW, OLD AND CHERRY VALLEY DAMS
GEOLOGY MAP

REFERENCE:
GREATER PITTSBURGH REGION GEOLOGIC MAP
COMPILED BY W.R. WAGNER, J.L. CRAFT, L. HEYMAN
AND J.A. HARPER, DATED 1975, SCALE 1:125000

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GROUP	FORMATION		DESCRIPTION
	Alluvium	Qt	Sand, gravel, clay.
	Terrace deposits		Sand, clay, gravel on terraces above present rivers; includes Carmichaels Formation.
DUNKARD	Greene		Cyclic sequences of sandstone, shale, red beds, thin limestones and coals.
	Washington	Pw	Cyclic sequences of sandstone, shale, limestone, and coal; contains Washington coal bed at base.
	Waynesburg		Cyclic sequences of sandstone, shale, limestone and coal; contains Waynesburg coal bed at base.
MONONGAHELA		Pm	Cyclic sequences of shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base.
CONEMAUGH	Casselman	Pcc	Cyclic sequence of sandstone, shale, red beds and thin limestone and coal.
	Ames		
	Glenshaw	Pcg	Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; several fossiliferous limestone; Ames limestone bed at top.
ALLEGHENY	Vanport	Pa	Cyclic sequences of shale, sandstone, limestone, and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals.

GEOLOGY MAP LEGEND

REFERENCE:

GREATER PITTSBURGH REGION GEOLOGIC MAP
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