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D'APPOLONIA CONSULTING ENGINEERS INC PITTSBURGH PA
NATIONAL DAM INSPECTION PROGRAM. MILL CREEK NUMBER 2 DAM (NDI-7--ETC(U)
SEP 78

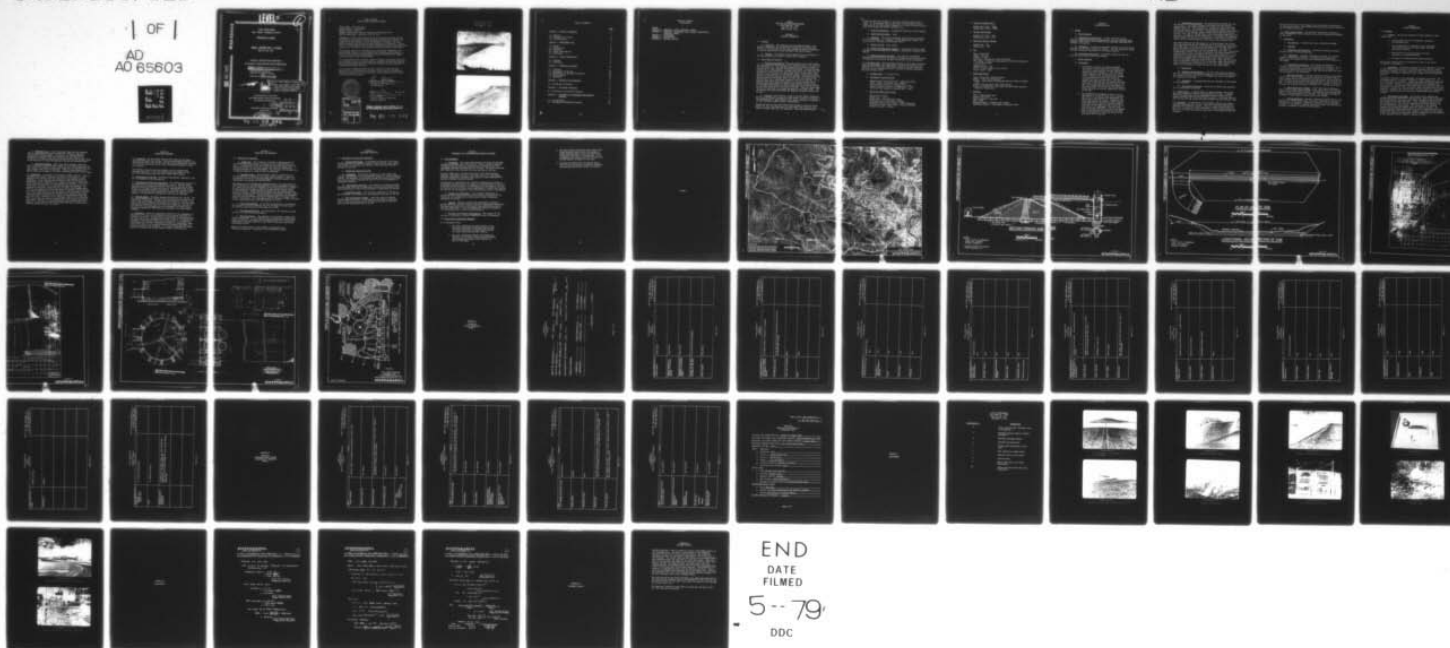
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OHIO RIVER BASIN
MILL CREEK, CAMBRIA COUNTY

PENNSYLVANIA

MILL CREEK NO. 2 DAM
NDI I.D. NO: 735

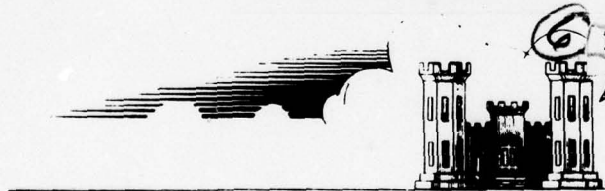
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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National Dam Inspection Program.

Mill Creek Number 2 Dam (NDI-735),
Ohio River Basin, Mill Creek,
Cambria County, Pennsylvania.
Phase I Inspection Report.

PREPARED FOR

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

BY

1296 p.

D'APPOLONIA CONSULTING ENGINEERS

10 DUFF ROAD
PITTSBURGH, PA. 15235

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Mill Creek No. 2
 STATE LOCATED: Pennsylvania
 COUNTY LOCATED: Cambria
 STREAM: Mill Creek, tertiary tributary of Conemaugh River
 DATE OF INSPECTION: September 1 and 8, 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 Mill Creek No. 2 Dam is assessed to be good. The dam tender reported that the outlet works system is not functional. Therefore, it is recommended that the owner immediately evaluate the functional condition of the outlet works system and perform necessary maintenance.

The spillway capacity is classified to be "seriously inadequate" (16 percent PMF), because it is estimated that overtopping would result in failure of the dam and damage potential would be significantly higher than would exist prior to overtopping.

It is recommended that the owner initiate immediate additional hydrologic and hydraulic studies to more accurately ascertain the spillway capacity and to determine the nature and extent of remedial measures required to increase the spillway capacity.

It is further recommended that the owner develop a formal warning system to alert the downstream residents in the event of an emergency and provide around-the-clock surveillance during unusually heavy runoff to detect possible problems.



Lawrence D. Andersen

 Lawrence D. Andersen, P.E.
 Vice President

G. K. Withers 30 Nov 78

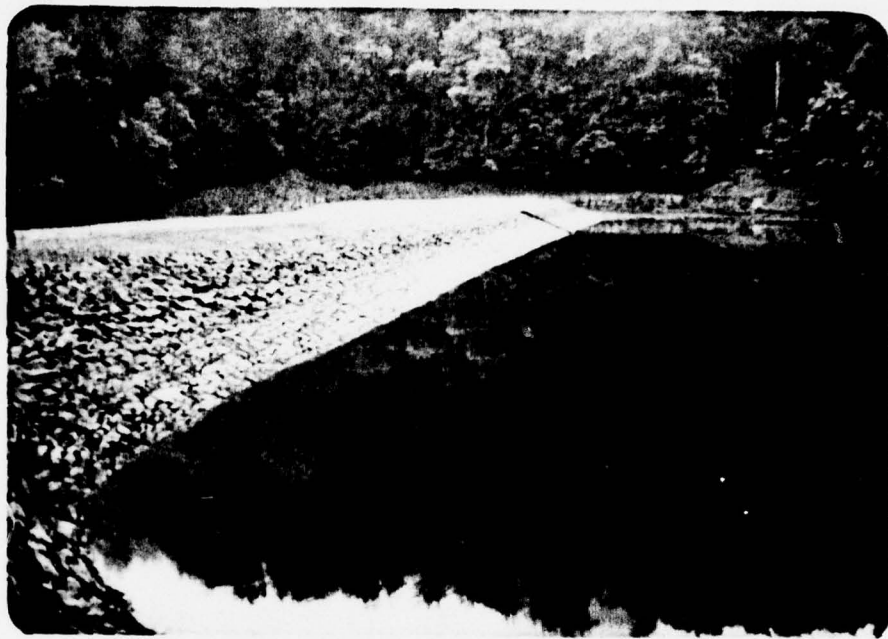
 G. K. WITHERS
 Colonel, Corps of Engineers
 District Engineer

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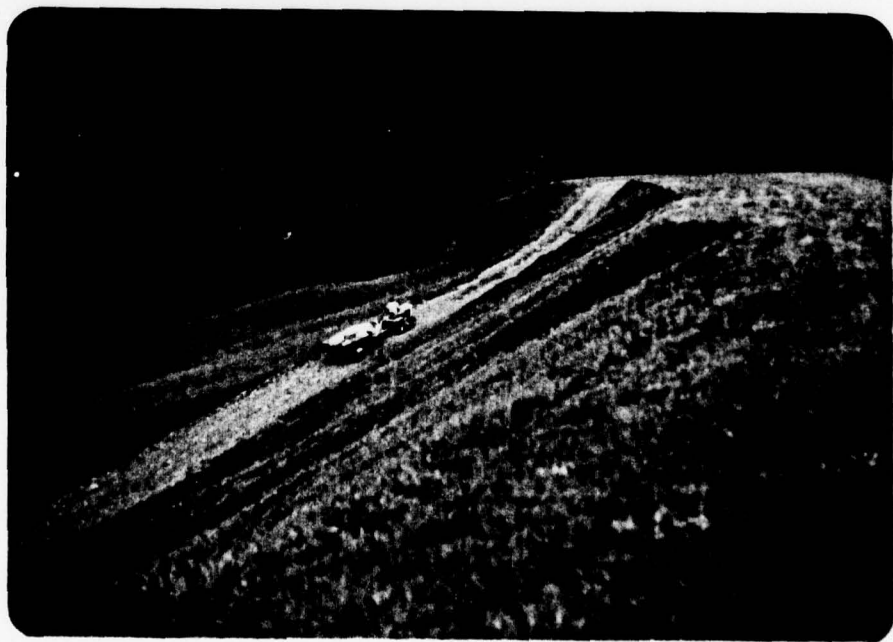
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MILL CREEK NO. 2 DAM
NDI I.D. NO. 735
SEPTEMBER 1, 1978



Upstream Face



Downstream Face

TABLE OF CONTENTS

	<u>PAGE</u>
SECTION 1 - PROJECT INFORMATION	1
1.1 General	1
1.2 Description of Project	1
1.3 Pertinent Data	2
SECTION 2 - ENGINEERING DATA	5
2.1 Design	5
2.2 Construction	6
2.3 Operation	6
2.4 Other Investigations	7
2.5 Evaluation	7
SECTION 3 - VISUAL OBSERVATIONS	8
3.1 Findings	8
3.2 Evaluation	9
SECTION 4 - OPERATIONAL FEATURES	10
4.1 Procedure	10
4.2 Maintenance of the Dam	10
4.3 Maintenance of Operating Facilities	10
4.4 Warning System	10
4.5 Evaluation	10
SECTION 5 - HYDRAULICS AND HYDROLOGY	11
5.1 Evaluation of Features	11
SECTION 6 - STRUCTURAL STABILITY	12
6.1 Evaluation of Structural Stability	12
SECTION 7 - ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES	13
7.1 Dam Assessment	13
7.2 Recommendations/Remedial Measures	13

TABLE OF CONTENTS
(Continued)

PLATES

APPENDIX A - CHECKLIST, VISUAL INSPECTION, PHASE I

APPENDIX B - CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION,
OPERATION, PHASE I

APPENDIX C - PHOTOGRAPHS

APPENDIX D - CALCULATIONS

APPENDIX E - REGIONAL GEOLOGY

PHASE I
NATIONAL DAM INSPECTION PROGRAM
MILL CREEK NO. 2 DAM
NDI I.D. NO. 735
DER I.D. NO. 11-15

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 dam consists of an earth embankment approximately 520 feet long with a maximum height of 45 feet from the downstream toe. The combined primary and emergency spillway is located on the right abutment (looking downstream). The flow through the spillway is controlled by a broad-crested weir 82.5 feet wide and located at a level three feet nine inches below the dam crest. The spillway chute consists of a rectangular masonry channel which terminates in a stilling basin at the toe of the dam. The outlet works for the dam consist of an intake tower, 36-inch cast-iron blow-off and supply lines, and a valve house located at the toe of the dam. It is reported that these pipes were placed in a trench excavated into natural ground and encased in concrete with masonry cutoff collars. Flow through these pipes is normally controlled by the valves located at the valve house at the toe level of the dam. Flow into these pipes can also be controlled by closing the gates at the intake tower. The 36-inch blow-off pipe constitutes the emergency drawdown facility for the dam.

b. Location. Mill Creek No. 2 Dam is located (Plate 1) approximately two miles above the mouth of Mill Creek, a tertiary tributary of the Conemaugh River, approximately three miles southwest of Johnstown in Yoder Township, Cambria County, Pennsylvania.

Downstream from the dam, Mill Creek flows through a steep and narrow valley for about two miles where it joins Bens Creek, which in turn flows to Stoney Creek south of Johnstown. There are approximately

50 mobile homes and 30 homes in the lower one-mile reach of Mill Creek. It is estimated that in the event of failure there would be large loss of life and property damage, both in Mill Creek Valley and Bens Creek Valley and further downstream.

c. Size Classification. Intermediate (based on 45-foot height).

d. Hazard Classification. High.

e. Ownership. The Greater Johnstown Water Authority (address: Mr. Charles Kunkle, Jr., President, Laurel Management Company, 333 Locust Street, Johnstown, Pennsylvania 15907).

f. Purpose of Dam. Water supply.

g. Design and Construction History. The dam was built in 1898 and 1899 by the Johnstown Water Company, a subsidiary of Cambria Steel Company.

h. Normal Operating Procedure. The reservoir is normally maintained at the level of the spillway leaving three feet nine inches of freeboard to the top of the dam, as measured in this inspection.

1.3 Pertinent Data. The elevations referred to below were calculated based on approximate field measurements assuming the spillway crest elevation to be 1424 feet (USGS Datum), which is the pool elevation shown in the U.S. Geological Survey 7.5-minute Johnstown quadrangle map (photorevised 1972).

a. Drainage Area - 6.1 square miles

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - 1600 (June 1929)

Outlet conduit at maximum pool - Unknown

Gated spillway capacity at maximum pool - N/A

Ungated spillway capacity at maximum pool - 1600

Total spillway capacity at maximum pool - 1600

c. Elevation (USGS Datum) (feet)

Top of dam - 1427.8

Maximum pool - 1427.8

Normal pool - 1424 (spillway crest)

Upstream invert outlet works - Unknown

Downstream invert outlet works - 1375+ (estimated)

Streambed at center line of dam - 1375+ (estimated)

Maximum tailwater - Unknown

d. Reservoir Length (feet)

Normal pool level - 2000+
Maximum pool level - 2200+

e. Storage (acre-feet)

Normal pool level - 298
Maximum pool level - 356

f. Reservoir Surface (acres)

Normal pool - 14+
Maximum pool - 17+

g. Dam

Type - Earth fill
Length - 520 feet
Height - 45 feet
Top width - Variable (34 feet to 78 feet)
Side slopes - Irregular, approximately 1-3/4H:1V downstream;
2-1/2H:1V upstream
Zoning - Yes
Impervious core - Yes
Cutoff - Cutoff trench to top of rock
Grout curtain - None

h. Regulating Outlet

Type - Two 36-inch cast-iron pipes
Length - 250+ feet (estimated)
Closure - Gate valves at downstream end and valves at intake tower
Access - Through intake tower when drained
Regulating facilities - Gate valves at valve house and gate valves at intake tower.

i. Spillway

Type - Broad-crested weir
Length - 82.5 feet
Crest elevation - 1424 feet
Gate - None
Upstream channel - Shallow earth channel
Downstream channel - Stone-paved rectangular chute

SECTION 2
ENGINEERING DATA

2.1 Design

a. Data Available

(1) Hydrology and Hydraulics. A state inspection report entitled, Report Upon the Mill Creek Dam No. 2 of the Johnstown Water Company, dated June 8, 1914, summarizes the available hydrology and hydraulic information.

(2) Embankment. Available information consists of various design drawings and past state inspection reports. The 1914 inspection report includes a detailed description of the design features.

(3) Appurtenant Structures. Structural design data for the appurtenant structures were not available.

b. Design Features

(1) Embankment

- a. As designed, the dam is a zoned embankment consisting of select material with puddle-clay core and a coarse material section forming the downstream section (Plate 2). The 1914 state report indicates that the design also incorporated a six-foot-wide puddle-clay core located at the upstream toe of the dam, which was extended into the "natural clay." The state report also indicates that the puddle-clay core, which was 17 feet wide at the base level of the dam, was extended two feet into the bedrock at the valley floor and 25 feet into the abutments. Plate 3 presents a plan and longitudinal section of the dam.
- b. The embankment was designed to have a 2.5 to 1 (horizontal to vertical) slope on the upstream face and a 2 to 1 slope on the downstream face with a crest width of 30 feet. Presently, the downstream face of the dam is irregular and the crest width varies from 34 feet at the middle to 62 feet on the right side and 78 feet on the left side of the embankment. The 1914 state report indicates that material which was removed from the landslide which occurred on the right side of the spillway in 1909 was placed on the downstream face of the dam.

c. Appurtenant Structures. The appurtenant structures for the dam consist of a combined emergency and primary spillway and the outlet works. The primary spillway is located in a cut on the right abutment (Plate 4). The spillway is a rectangular channel 82.5 feet wide at the control section with a stone-paved bottom and masonry walls. The profile of the spillway shows a broad-crested hydraulic control section. The crest of the spillway is three feet nine inches below the dam crest, as measured in this inspection. As designed, the approach channel rises 1:35 (vertical to horizontal) to the control section and falls 1:20 from control section to the start of the spillway chute.

The outlet works for the dam consist of an intake tower, two 36-inch cast-iron pipes through the embankment and to a downstream valve house. The intake tower is located on the upstream toe of the dam, approximately 200 feet from the spillway end of the dam. The tower is isolated from the embankment and is accessible by boat only. The access bridge shown in Plate 2 was not constructed. The tower consists of a circular shell 16 feet in diameter and 46 feet high (Plate 5). It is lined with a two-foot-thick masonry on the inside and on the bottom. Flow into the intake tower is controlled by four gates located at various elevations along the side of the tower. Flow into the intake tower is discharged through two 36-inch cast-iron pipes controlled by valves located at the downstream toe of the dam. When required, the pipes can be drained by closing the gates at the intake tower.

d. Design Data

(1) Hydrology and Hydraulics. The 1914 state report indicates that the spillway for the dam was designed for a flow of 340 cubic feet per second (cfs) per square mile of drainage area, which corresponds to a capacity of 1700 cfs.

(2) Embankment. No engineering data are available on the design of the embankment.

(3) Appurtenant Structures. There are no design data available for the appurtenant structures.

2.2 Construction. A limited number of design drawings and various past state inspection reports were available for review. Available information indicated that the embankment had been placed in thin layers, sprinkled and rolled with horse rollers. It was also reported that the clay for the cutoff wall was obtained from the reservoir area.

2.3 Operation. As reported by the dam tender, there are no formal operating procedures for the dam. The pool is normally maintained at spillway crest elevation, which is three feet nine inches below the dam crest, as measured in this inspection. Inflow occurring when the pool is at or above the spillway crest level is discharged through the spillway.

The two 36-inch blow-off and supply lines are normally controlled by the downstream valves. Flow through these pipes can also be controlled by the intake tower gates.

2.4 Other Investigations. The available information indicated no other investigation than the reports of periodic inspections conducted by the state.

2.5 Evaluation

a. Availability. Available data were provided by PennDER.

b. Adequacy

(1) Hydrology and Hydraulics. Available information includes design capacity of the spillway only.

(2) Embankment. Available information consists of a limited number of construction drawings. No quantitative geotechnical information is available to aid in the assessment of the adequacy of the design.

(3) Appurtenant Structures. Very limited information is available on the design of the outlet works and the spillway. As far as can be assessed from the available information, in general, no significant design deficiencies were found that would affect the overall performance of the structures.

c. Operating Records. No formal operating records are available for the dam. The dam tender, who has been at the site more than 25 years, stated that to his knowledge the highest pool level occurred in July 1977 when the pool level was within one foot of the crest of the dam. A record in the state files indicates that on June 21, 1929, the spillway was flowing full after a rainfall of 1.2 inches in one hour.

d. Post-Construction Changes. A 1914 state report indicates that in 1909 a large slide occurred on the right side of the spillway, nearly filling the spillway channel. The material from the slide was placed on the downstream face of the dam. The available information includes no other reports of post-construction changes.

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

SECTION 3
VISUAL OBSERVATIONS

3.1 Findings

a. General. The on-site inspection of Mill Creek No. 2 Dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.
2. Visual examination of spillway and its components, the downstream end of the outlet pipe, and other appurtenant features.
3. Observation of factors affecting the runoff potential of the drainage basin.
4. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 6 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.

The general condition of the embankment is assessed to be good. The downstream slope of the dam was measured to range between 2 to 1 to 1.5 to 1 (horizontal to vertical). A minor wet area was observed below the toe of the dam. However, no seepage appeared to be associated with this wet area. The hillside on the right side of the spillway, where a landslide is reported to have occurred in 1909, was found to be wet and irregular. However, the trees in this area were found to be essentially vertical, indicating that no significant land movement has occurred recently.

c. Appurtenant Structures. The spillway crest channels and stilling basin were examined for deterioration, other signs of distress, and any obstruction that would limit flow. In general, the structures were found to be in good condition. A minor seepage was observed in the stilling basin. The flow is estimated to be in the range of two to four gallons per minute (gpm). The condition of the spillway channel stone paving and masonry walls was found to be good. The spillway approach channel was found to be free of debris and any other obstructions that would limit flow. However, the depth of the approach channel was found to be relatively shallow, indicating that the capacity of the spillway would be reduced by approach losses.

d. Reservoir Area. A map review indicates that the watershed area is predominantly covered by woodlands. However, some minor portions have been developed. A review of the regional geology (Appendix E) indicates that the shorelines are not likely to be susceptible to massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displaced water.

e. Downstream Channel. Mill Creek flows through a steep and narrow valley and joins Bens Creek about two miles downstream from the dam. Below the confluence, Bens Creek flows east for one-half mile and joins Stoney Creek south of Johnstown. There are approximately 50 mobile homes and 30 homes in the lower one-half-mile reach of Mill Creek.

3.2 Evaluation. In general, the condition of Mill Creek No. 2 Dam is considered to be good. However, the review of the reports of past spillway flows suggests that the capacity of the spillway could be inadequate. It is reported that on June 21, 1929, the spillway was flowing full after a rainfall of 1.2 inches in one hour. In the 1936 flood, the depth of water over the spillway was recorded to be nine inches when a rainfall of 4.5 inches in 12 hours was recorded. As reported to the state, during the July 1977 flood, the maximum water level in the reservoir was 2.05 feet above the spillway crest, leaving 1.5 feet of freeboard to the top of the dam. The dam tender reported that a rain gauge located at his residence about one-half mile downstream from the dam recorded five inches of precipitation during the July 1977 flood. However, east of Johnstown, about five to ten miles from the dam site ten inches of precipitation was reported during the same storm. Therefore, it is probable that the dam would have overtopped if it had received the same precipitation that occurred east of Johnstown during the July 1977 flood.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. The dam tender reported that there are no formal operating procedures for the dam. The only operational feature of the dam which may affect the safety of the dam is the operational condition of the outlet pipe valves in the event it becomes necessary to lower the reservoir.

The clearing of debris from the spillway as it is required and continued inspection of the facilities by the dam tender are the principal maintenance operations which would affect safety.

4.2 Maintenance of the Dam. The general maintenance condition of the dam is considered to be satisfactory.

4.3 Maintenance of Operating Facilities. The maintenance condition of the operating facilities is considered to be poor. The dam tender reported that the downstream blow-off valve for the dam has not been operated in the past 25 years and only two intermediate level intake valves in the intake tower are functional. The upper and lower intake valves are closed and their operational condition is reported to be unknown. The operation of the blow-off valve was not observed.

4.4 Warning System. No formal warning system exists for the dam. The dam tender resides about one-half mile downstream from the dam on the access road to the site. The dam tender's residence is located on the side of the valley opposite the access road to the dam. The dam tender reported that during the July 1977 flood the bridge over Mill Run to his residence was overtopped and was not passable for several hours. Telephone communication facilities are available at the dam tender's residence.

4.5 Evaluation. While the maintenance condition of the embankment is considered to be good, the condition of the operating facilities is assessed to be poor. The dam tender reported that the downstream blow-off valve has not been operated in the past 25 years. The operational condition of the blow-off valves was not observed. It is therefore recommended that the owner immediately evaluate the operational condition of the outlet works system and perform necessary maintenance to adequately maintain the equipment. It is also recommended that better access be provided from the dam tender's house to the dam site.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Mill Creek No. 2 Dam has a watershed area of 6.1 square miles and impounds a reservoir with a surface area of 14 acres. A spillway 82.5 feet wide, with its crest elevation three feet nine inches below the dam crest, constitutes both the primary and emergency spillway for the impoundment. As it exists, the spillway has a discharge capacity of 1600 cfs with no freeboard.

b. Experience Data. Mill Creek No. 2 Dam is classified to be an "intermediate" size dam in the "high" hazard category. Under the recommended criteria for evaluating emergency spillway capacity, such impoundments are required to pass the PMF.

The adequacy of the spillway was analyzed based on the simplified procedure developed by the Baltimore District, Corps of Engineers (Appendix D). Based on this analysis procedure, it was determined that the PMF inflow hydrograph will have a peak of 10,400 cfs and a total volume of 8500 acre-feet. These values are greater than the maximum spillway discharge capacity of 1600 cfs and 58 acre-feet surcharge storage volume of the dam, respectively. Further analysis, according to the procedure, indicates that the spillway can pass a maximum flow of 16 percent PMF without overtopping. It is calculated that in the event of PMF, the depth of flow across the entire crest dam would be 2.9 feet.

c. Visual Observations. On the date of inspection, no conditions were observed that would indicate that the spillway of the dam could not function satisfactorily in the event of a flood.

d. Overtopping Potential. As stated above, the spillway can pass 16 percent of PMF without overtopping.

e. Spillway Adequacy. The capacity of the spillway is much less than 50 percent PMF. It is estimated that overtopping of the dam would result in failure of the dam, and the potential for loss of life would significantly increase compared to that which would exist just before overtopping failure.

Based on the above results, the spillway is classified to be "seriously inadequate" according to the recommended criteria.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the stability of the dam at this time and none were reported in the past.

b. Design and Construction Data

(1) Embankment. The dam was designed at a time (1898) when limited understanding of the geotechnical behavior of earth structures existed. Consequently, the available design and construction information includes limited quantitative data to aid in the assessment of embankment stability.

(2) Appurtenant Structures. The review of the design drawings indicates that there are no significant structural deficiencies that would significantly affect the performance of appurtenant structures.

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 modifications to the dam. It was reported that material excavated from a landslide which partially blocked the spillway in 1909 was placed on the downstream face of the dam.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations and review of available information indicate that Mill Creek No. 2 Dam is in good condition. It appears that the dam was constructed with reasonable care and reportedly performed satisfactorily in the past. No signs of distress were observed at this time and none were reported in the past.

The most significant condition at the dam is the small spillway capacity. Especially in view of the large loss of life and damage potential downstream, necessary steps should be taken immediately to provide sufficient spillway capacity.

The spillway is classified to be "seriously inadequate" according to recommended criteria because its capacity (16 percent PMF) is less than 50 percent PMF and because it is estimated that overtopping of the dam would result in failure which would significantly increase the potential for loss of life as compared to that existing just prior to overtopping.

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

c. Urgency. Necessary studies and improvements required to provide sufficient spillway capacity should be implemented immediately. The operational condition of the blow-off pipe valve should also be evaluated immediately. Other recommendations should be considered on a continuing basis or as soon as practicable.

d. Necessity for Further Investigation. The capacity of the spillway is considered to require immediate further investigation.

7.2 Recommendations/Remedial Measures

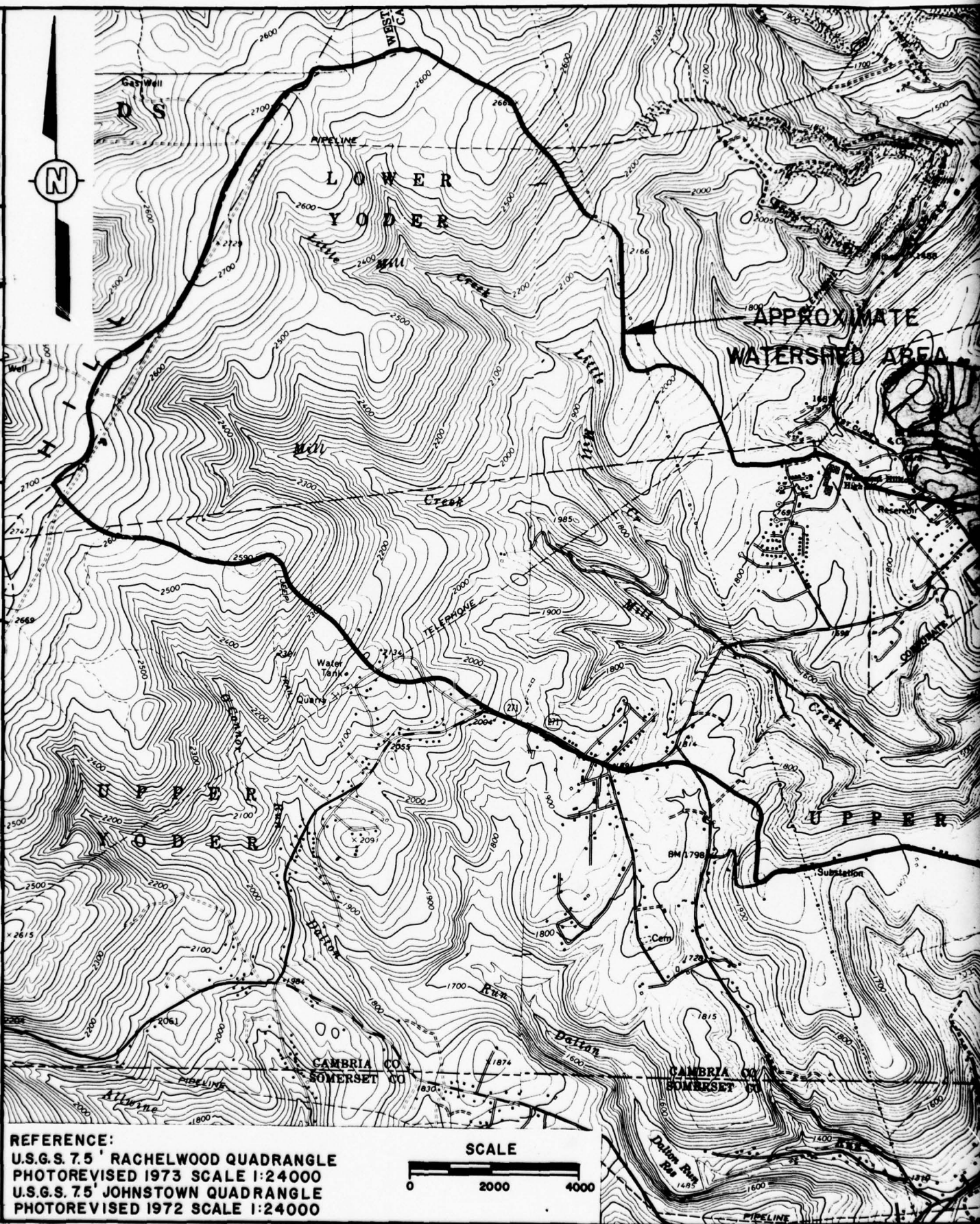
It is recommended that:

1. The owner immediately initiate studies to more accurately ascertain the spillway capacity and the nature and extent of improvements required to provide sufficient spillway capacity.
2. The owner immediately evaluate the operational condition of the outlet works system and perform any necessary maintenance and/or repairs to make it functional.

3. The owner provide around-the clock surveillance during unusually heavy runoff and develop a formal warning system to alert the downstream residents in the event of an emergency. It is recommended that better access be provided from the dam tender's residence to the site.
4. The owner be advised that the dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.

PLATES

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 CHECKED BY BE
 9-5-78 APPROVED BY JHP
 9-6-78 DRAWING 7L
 9-6-78 NUMBER 4-B168



REFERENCE:
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 U.S.G.S. 7.5' JOHNSTOWN QUADRANGLE
 PHOTOREVISED 1972 SCALE 1:24000

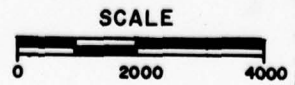
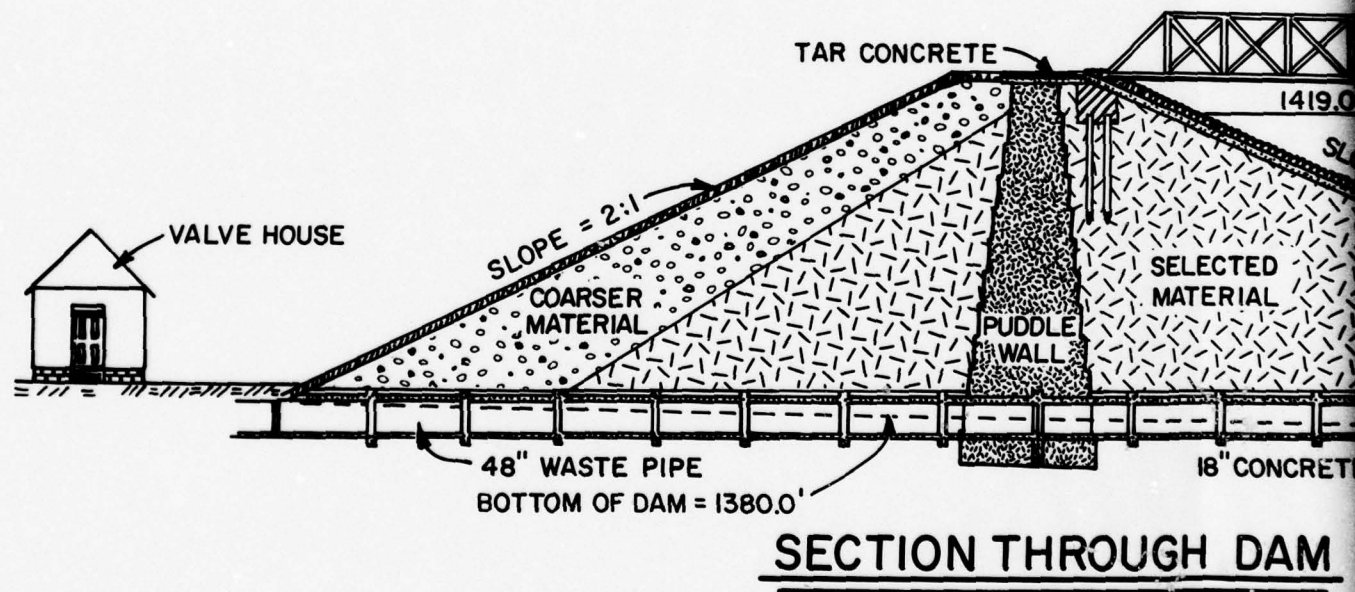


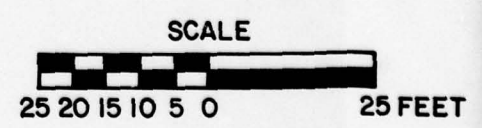


PLATE I
MILL CREEK DAM
VICINITY, FLOOD PLAIN AND WATERSHED MAP
D'APPOLONIA

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 CHECKED BY: HE 9-6-78
 APPROVED BY: JHP 9-6-78
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SECTION THROUGH DAM



- NOTE:**
1. THIS PLATE IS REDRAWN FROM AN ORIGINAL DESIGN DRAWING.
 2. AS BUILT SUPPLY AND WASTE PIPES ARE Ø 36" C.I.

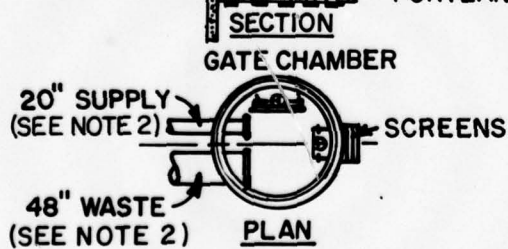
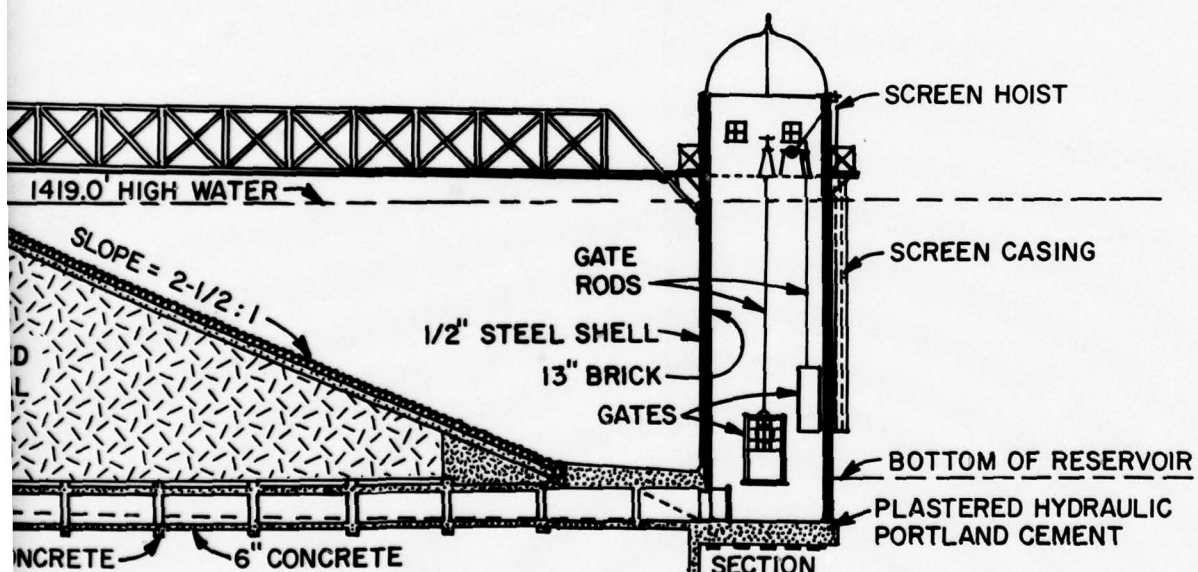
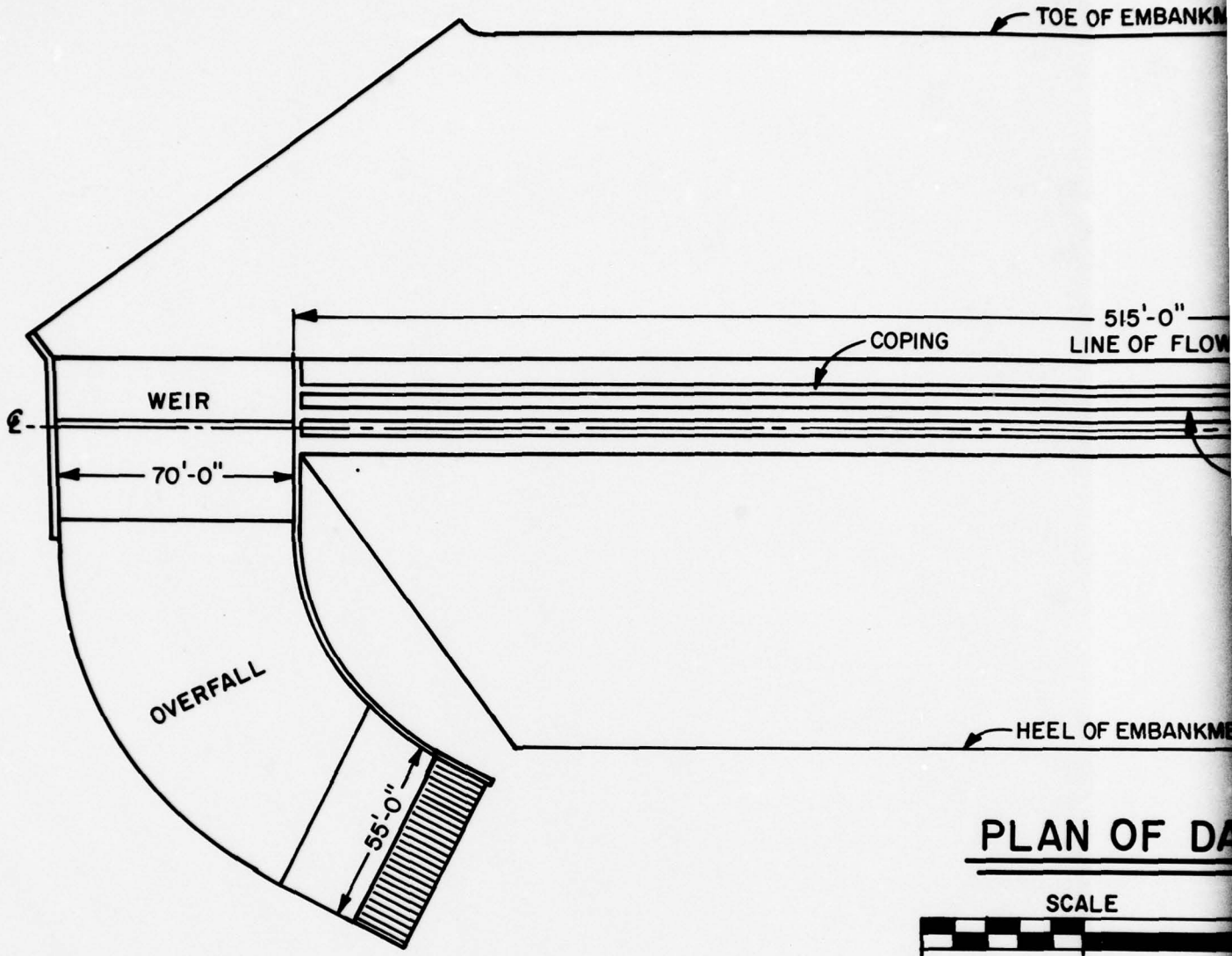


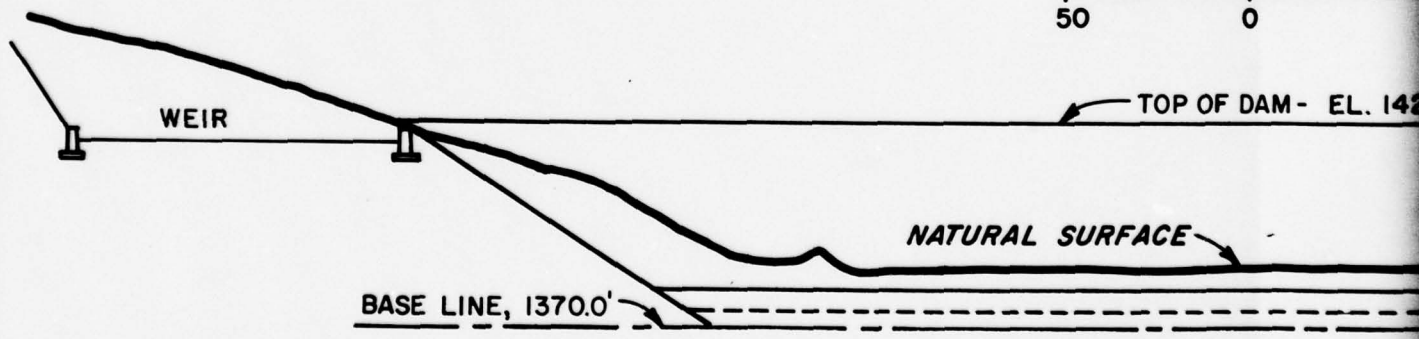
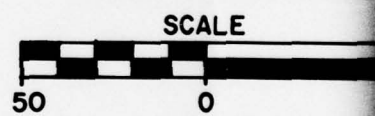
PLATE 2

D'APPOLONIA

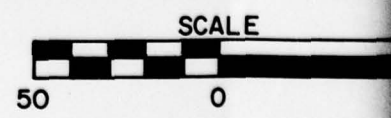
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PLAN OF DAM



LONGITUDINAL SECTION



NOTE:
 THIS PLATE IS REDRAWN
 FROM AN ORIGINAL
 DESIGN DRAWING

OF EMBANKMENT

515'-0"
LINE OF FLOW

TAR CONCRETE WALK
8'-0" WIDE

OF EMBANKMENT

OF DAM

50 FEET

EL. 1423.0'

MILL CREEK

BOTTOM OF DAM, 1380.0'

BOTTOM OF PUDDLE WALL, 1374.0'

SECTION OF DAM

50 FEET

PLATE 3

D'APPOLONIA

DRAWN BY

ITS

CHECKED BY

9-5-78

APPROVED BY

9-6-73

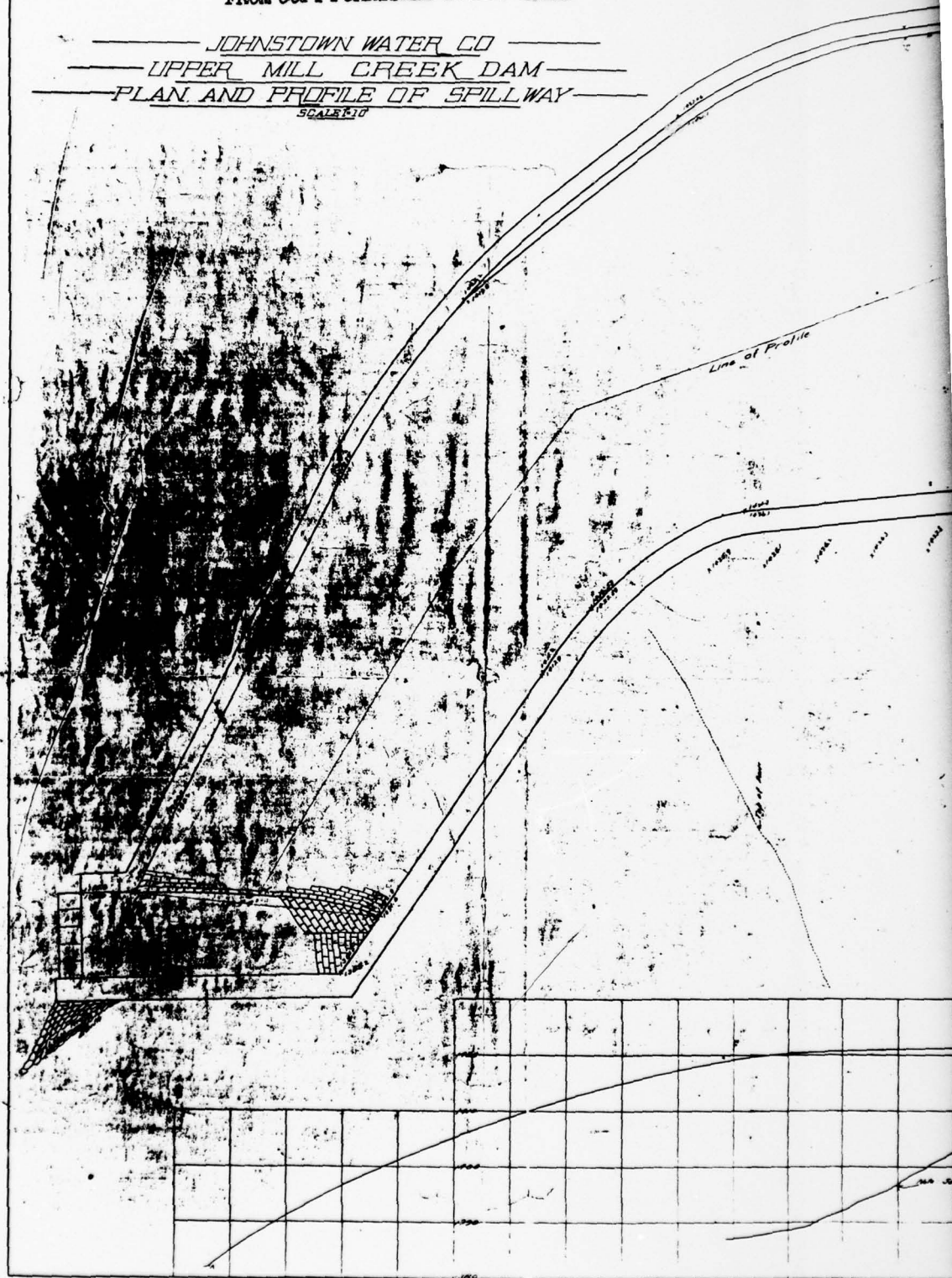
DRAWING NO.

14-B156

NUMBER

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FROM COPY FURNISHED TO DDC

JOHNSTOWN WATER CO
UPPER MILL CREEK DAM
PLAN AND PROFILE OF SPILLWAY
SCALE 1/10



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FROM COPY FURNISHED TO DDC

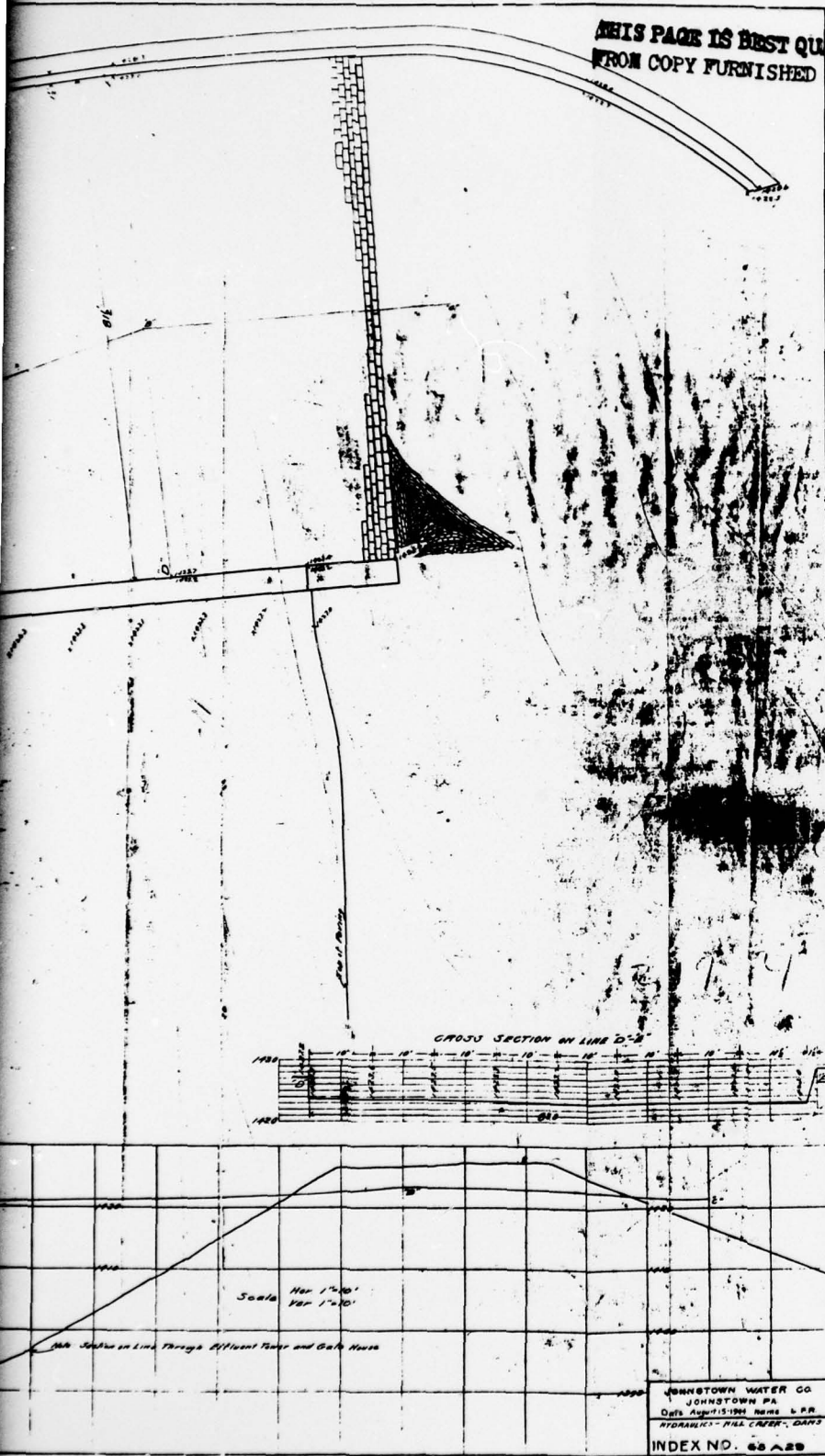
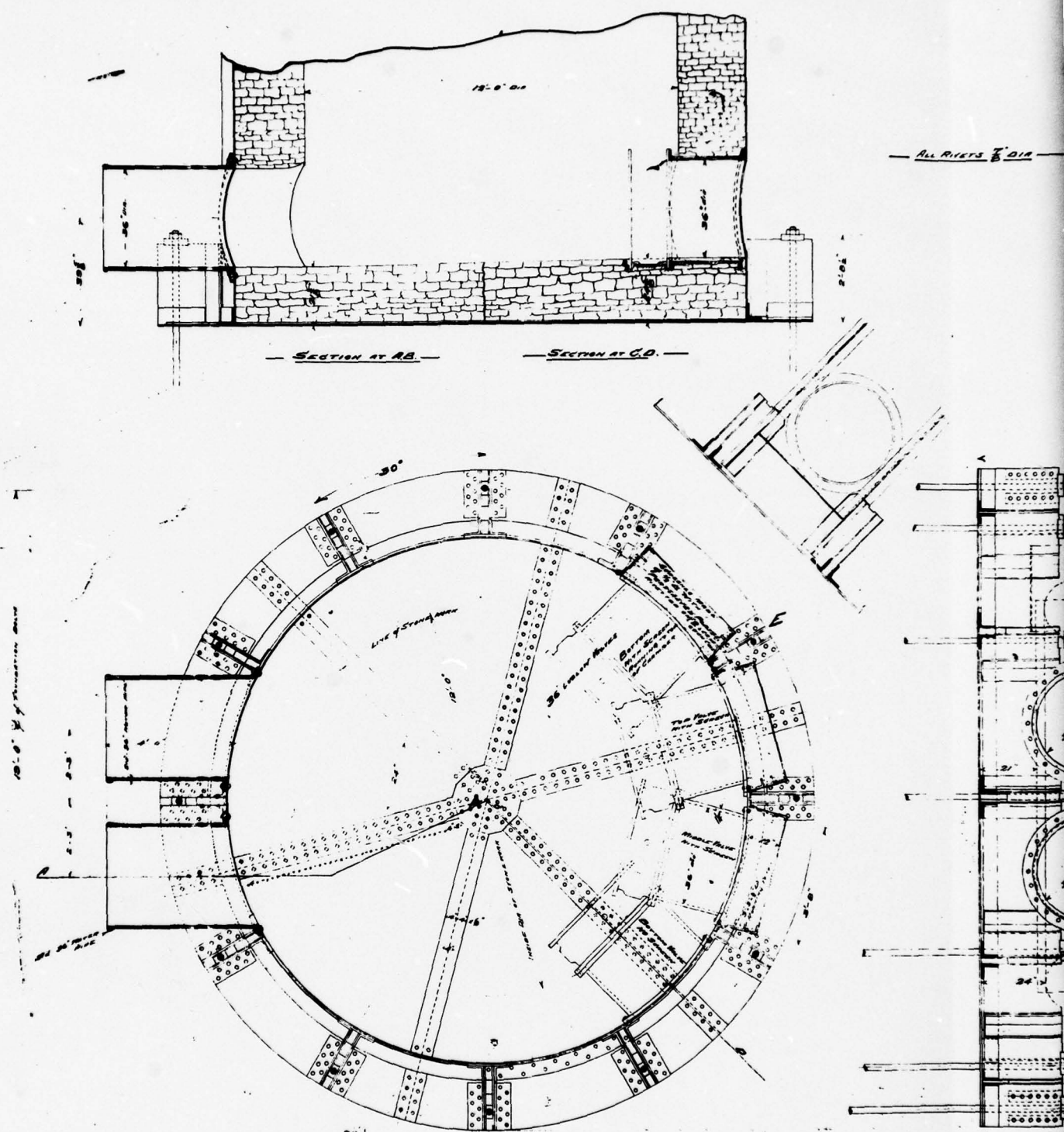


PLATE 4

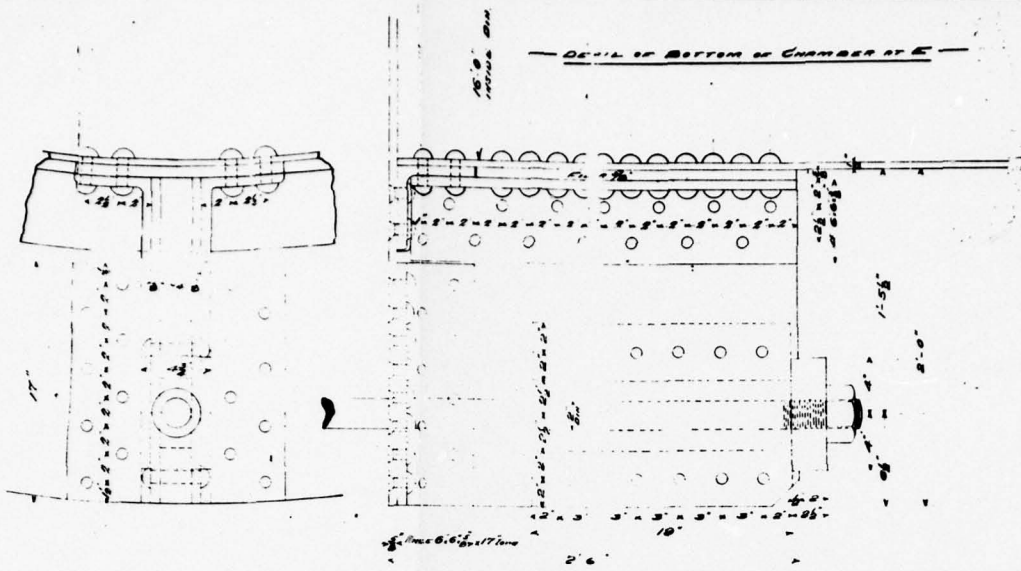
D'APPOLONIA

2

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	9-5-78	APPROVED BY	JHP	9-6-78	

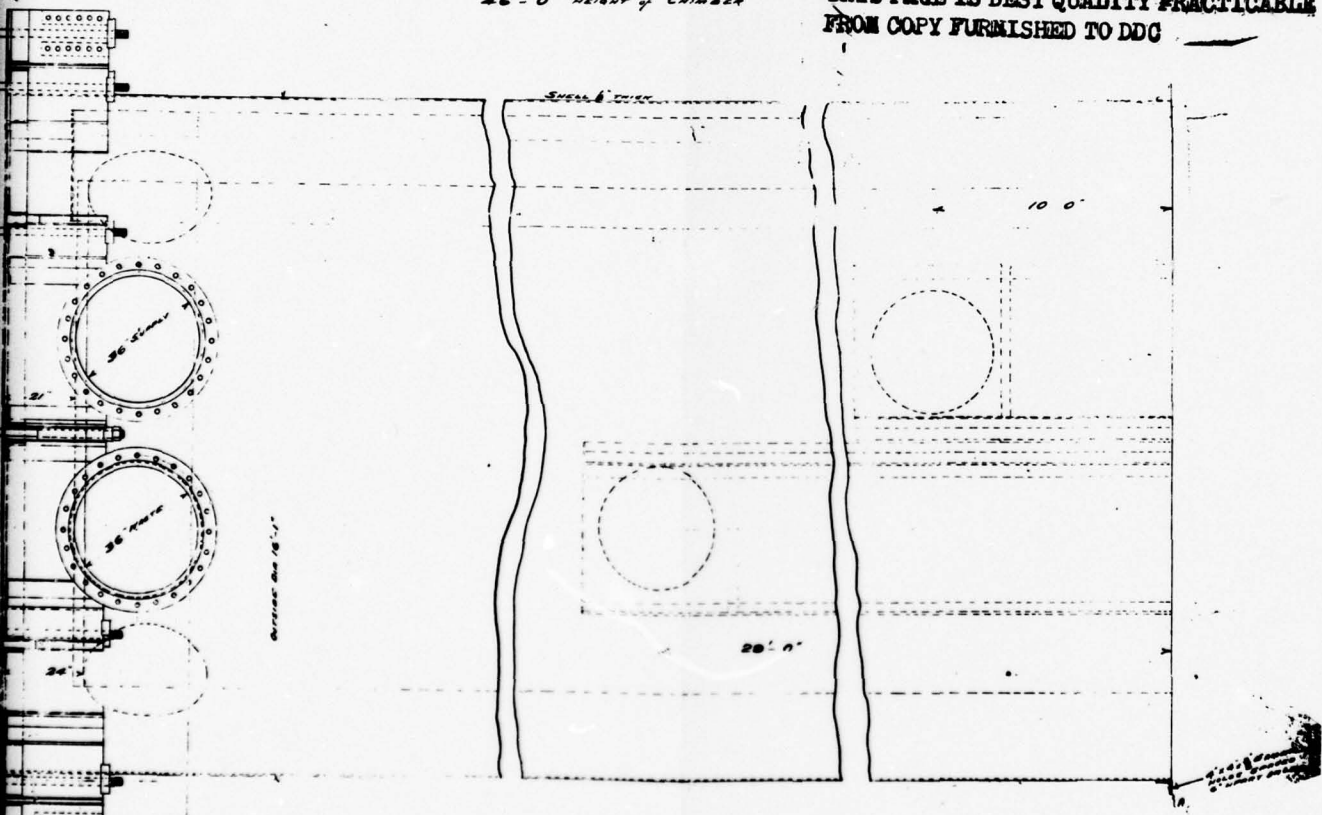


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46'-0" HEIGHT OF CHAMBER

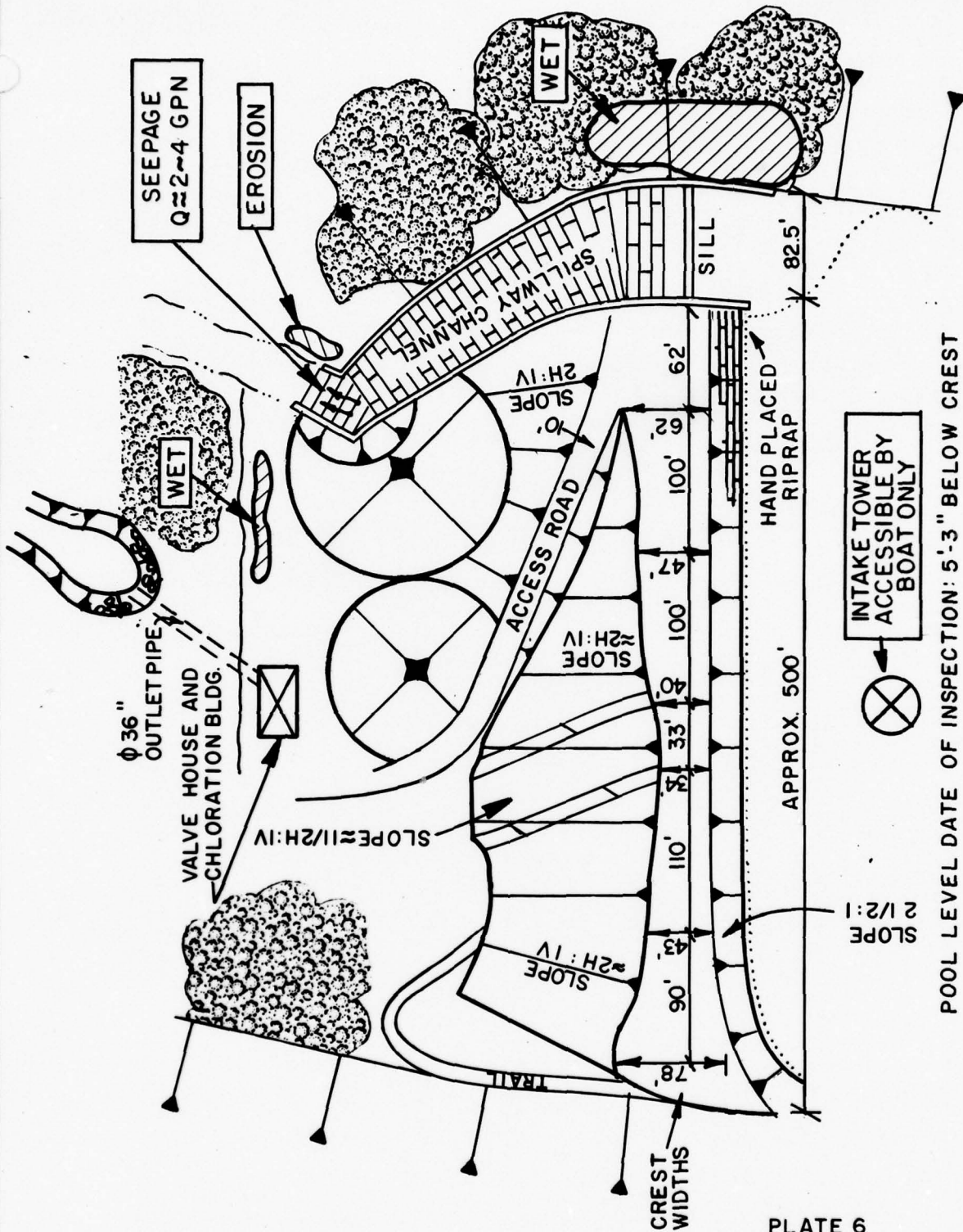
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— WATERWORKS —
 — MILL CREEK DAM N° 2 —
 — DETAIL OF GATE CHAMBER —
 — JENNIFER MAYER CO. —
 — 5010 N. 12th St. —

2

DRAWN BY	Trs	CHECKED BY	9-6-78	DRAWING NUMBER	78-114-A31
	9-8-78	APPROVED BY	JHP	9-6-78	



POOL LEVEL DATE OF INSPECTION: 5'3" BELOW CREST

PLATE 6

MILL CREEK NO. 2 DAM
 GENERAL PLAN
 FIELD INSPECTION NOTES
 FIELD INSPECTION DATE: 9-1-78

D'APPOLONIA

NOT TO SCALE

APPENDIX A
CHECKLIST
VISUAL INSPECTION
PHASE I

CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Mill Creek No. 2 COUNTY Somerset STATE Pennsylvania ID# NDI 735
TYPE OF DAM Earth fill HAZARD CATEGORY High DER 11-15
DATE(S) INSPECTION September 1, 1978 WEATHER Cloudy TEMPERATURE 80's
POOL ELEVATION AT TIME OF INSPECTION 1419 M.S.L. TAILWATER AT TIME OF INSPECTION 1375+ M.S.L.

INSPECTION PERSONNEL:

Bilgin Erel Review Inspection by: Elio D'Appolonia
Wah-Tak Chan (September 8, 1978) L. D. Andersen
J. H. Poellot

Bilgin Erel RECORDER

VISUAL INSPECTION
 PHASE 1
 EMBANKMENT

NAME OF DAM Mill Creek No. 2
 ID# NDI 735, DER 11-15

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None Found	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None Found	
SLOUCHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None Found	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No perceivable misalignment	
RIPRAP FAILURES	None Found	

VISUAL INSPECTION
 PHASE I
 EMBANKMENT
 OBSERVATIONS

NAME OF DAM MILL Creek No. 2
 ID# NDI 735, DER 11-15

VISUAL EXAMINATION OF	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No visual signs of distress; no seepage
ANY NOTICEABLE SEEPAGE	A wet area about 60 feet downstream from the toe. No measureable seepage.
STAFF GAGE AND RECORDER	None
DRAINS	None

VISUAL INSPECTION
 PHASE I
 CONCRETE/MASONRY DAMS

NAME OF DAM MILL CREEK No. 2

ID# NDI 735, DER 11-15

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	(Earth-fill dam) N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

VISUAL INSPECTION
 PHASE I
 CONCRETE/MASONRY DAMS

NAME OF DAM MILL Creek No. 2

ID# NDI 735, DER 11-15

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	(Earth-fill dam) N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS STAFF GAGE OF RECORDER:	N/A	

VISUAL INSPECTION
 PHASE I
 OUTLET WORKS

NAME OF DAM MILL CREEK No. 2

ID# NDI 735, DER 11-15

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	36-inch cast-iron pipe. Only downstream end is visible.	
INTAKE STRUCTURE	Intake tower at the upstream toe of the dam. (Tower is accessible by boat only.)	
OUTLET STRUCTURE	Riprapped plunge pool	
OUTLET CHANNEL	Earth channel.	
EMERGENCY GATE	Dam tender reported that blow-off pipe valve is not functional.	

VISUAL INSPECTION
 PHASE I
 UNGATED SPILLWAY

NAME OF DAM Mill Creek No. 2
 ID# NDI 735, DER 11-5

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Masonry broad-crested weir. In good condition.	
APPROACH CHANNEL	Shallow earth channel	
DISCHARGE CHANNEL	Rectangular masonry channel	
BRIDGE AND PIERS	None	

VISUAL INSPECTION
 PHASE I
 GATED SPILLWAY

NAME OF DAM Mill Creek No. 2

ID# NDI 735, DER 11-15

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A (No gated spillway)	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

VISUAL INSPECTION
 PHASE I
 INSTRUMENTATION

NAME OF DAM Mill Creek No. 2

ID# NDI 735, DER 11-15

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

VISUAL INSPECTION
 PHASE I
 RESERVOIR
 OBSERVATIONS

NAME OF DAM MILL CREEK No. 2
 ID# NDI 735, DER 11-15

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Wooded and steep	
SEDIMENTATION	Unknown	

VISUAL INSPECTION
 PHASE I
 DOWNSTREAM CHANNEL

NAME OF DAM Mill Creek No. 2
 ID# NDI 735, DER 11-15

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No visible obstructions	
SLOPES	No apparent erosion	
APPROXIMATE NUMBER OF HOMES AND POPULATION	30 homes and 50 mobile homes one mile downstream. Population: 250 (approximately) Life loss and property damage is also likely further downstream.	

APPENDIX B
CHECKLIST
ENGINEERING DATA, DESIGN,
CONSTRUCTION, OPERATION
PHASE I

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Mill Creek No. 2

ID# NDI 735, DER 11-15

ITEM	REMARKS
AS-BUILT DRAWINGS	Limited number of drawings are available in state files.
REGIONAL VICINITY MAP	See Plate 1
CONSTRUCTION HISTORY	The dam was built in 1898 and 1899 by Johnstown Water Company, a subsidiary of Cambria Steel Company.
TYPICAL SECTIONS OF DAM	See Plate 2
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plate 5

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Mill Creek No. 2

ID# NDI 735, DER 11-15

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	The rainfall records are kept by the dam tender. The rain gage is located one-half mile downstream at the dam tender's residence.
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not available

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Mill Creek No. 2

ID# NDI 735, DER 11-15

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported
BORROW SOURCES	Unknown
MONITORING SYSTEMS	None
MODIFICATIONS	In 1909, material excavated from a landslide that occurred on the right side of the spillway was placed on the downstream toe of the dam.
HIGH POOL RECORDS	Not formally recorded. A state report indicates that on June 21, 1929, the spillway was running full.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Mill Creek No. 2

ID# NDI 735, DER 11-15

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	Not available

NAME OF DAM Mill Creek No. 2

ID# NDI 735, DER 11-15

CHECKLIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Wooded 6.1 square miles
ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 298 acre-feet at El. 1424
ELEVATION; TOP FLOOD CONTROL POOL AND STORAGE CAPACITY: Same as above
ELEVATION; MAXIMUM DESIGN POOL: El. 1427.8 (top of dam)
ELEVATION; TOP DAM: 1427.8

CREST: (Spillway)

- a. Elevation 1424
- b. Type Broad-crested weir
- c. Width 82-1/2 feet
- d. Length Not applicable
- e. Location Spillover Adjacent to spillwy
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type 36-inch cast-iron pipe
- b. Location Middle of dam
- c. Entrance Inverts Unknown
- d. Exit Inverts 1375+ (estimated)
- e. Emergency Draindown Facilities 36-inch blow-off pipe

HYDROMETEOROLOGICAL GAGES:

- a. Type Rain gage
- b. Location 0.5 mile downstream at dam tender's residence
- c. Records Maintained by the water company

MAXIMUM NONDAMAGING DISCHARGE: Unknown

APPENDIX C
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
MILL CREEK NO. 2 DAM
NDI I.D. NO. 735
SEPTEMBER 1, 1978

<u>PHOTOGRAPH NO.</u>	<u>DESCRIPTION</u>
1	Crest (looking east) (spillway crest in foreground).
2	Spillway approach channel (looking upstream).
3	Spillway discharge channel.
4	Spillway stilling basin.
5	Intake tower (accessible by boat only).
6	Gate controls at intake tower.
7	Blow-off valve at valve house.
8	Blow-off pipe.
9	Mobile home park (1-1/2 miles downstream).
10	Bridge over Mill Creek (two miles downstream).



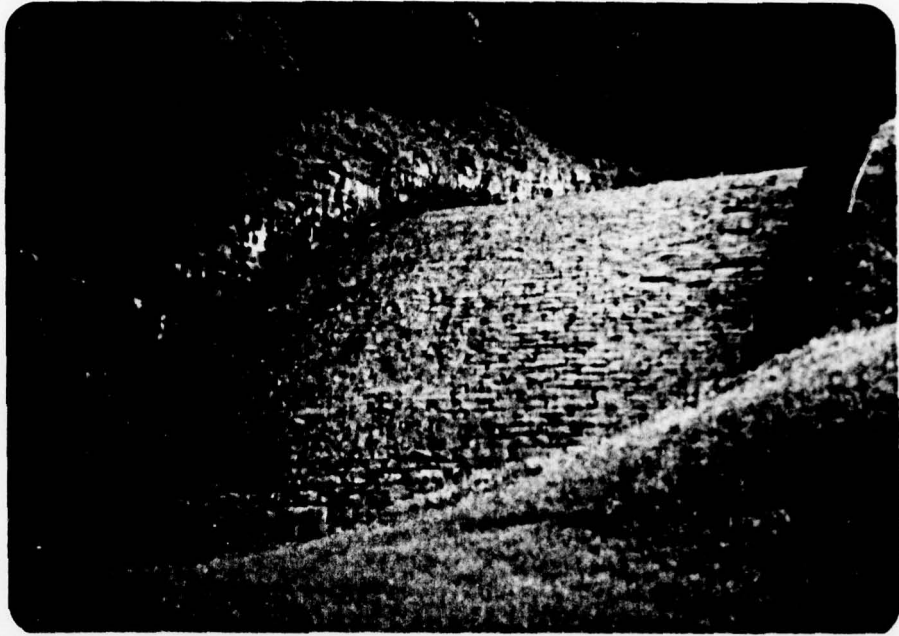
Photograph No. 1

Crest (looking east) (spillway crest
in foreground).

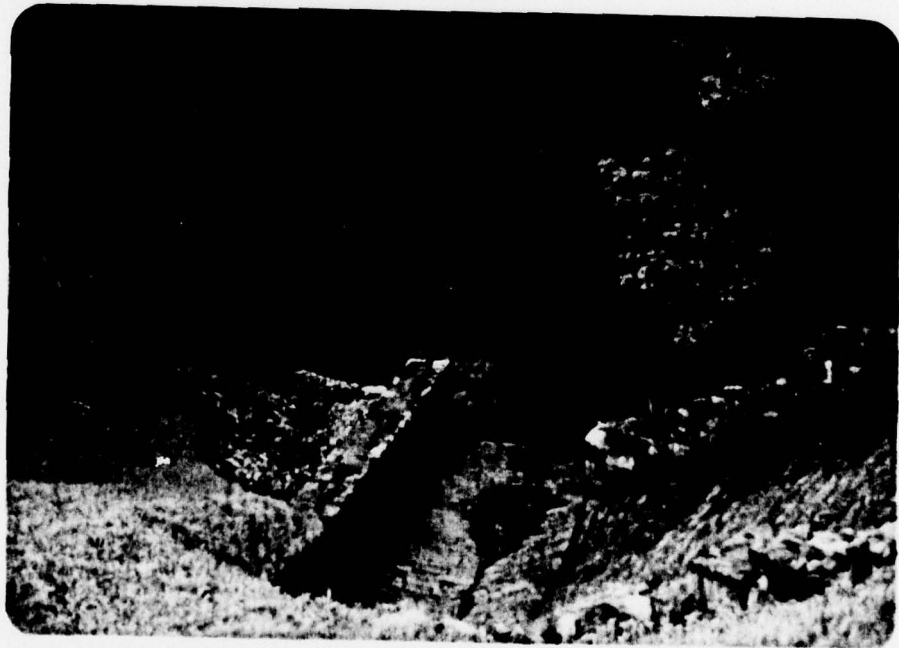


Photograph No. 2

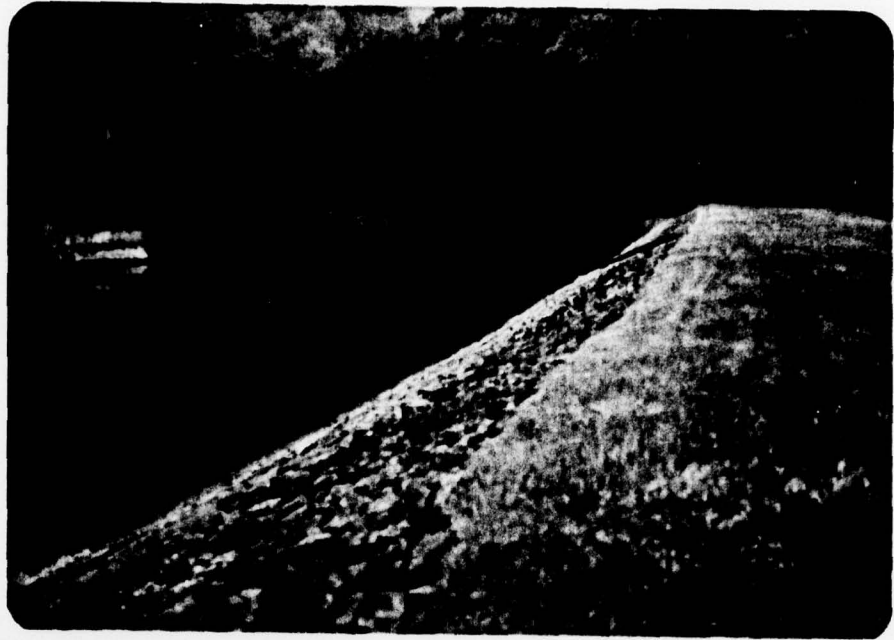
Spillway approach channel (looking upstream).



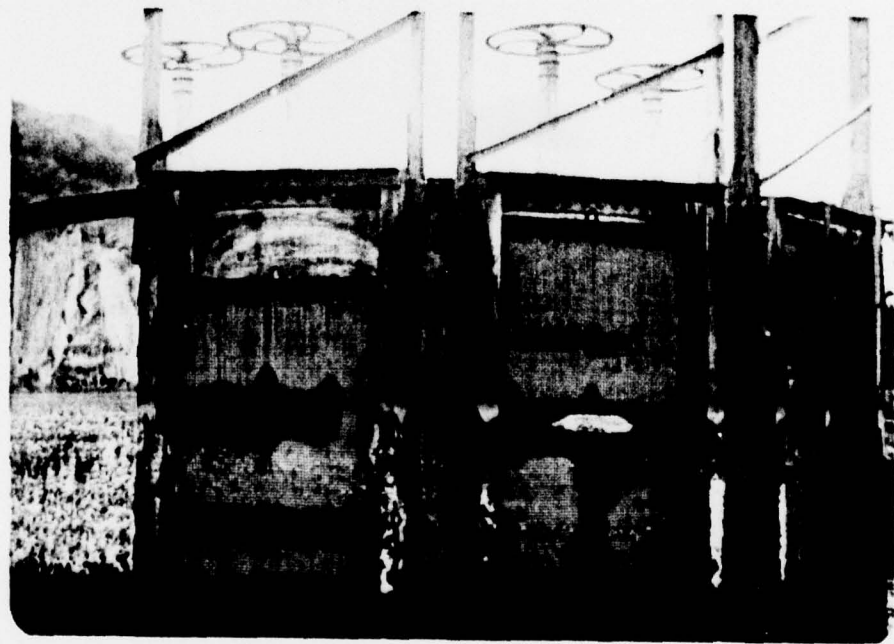
Photograph No. 3
Spillway discharge channel.



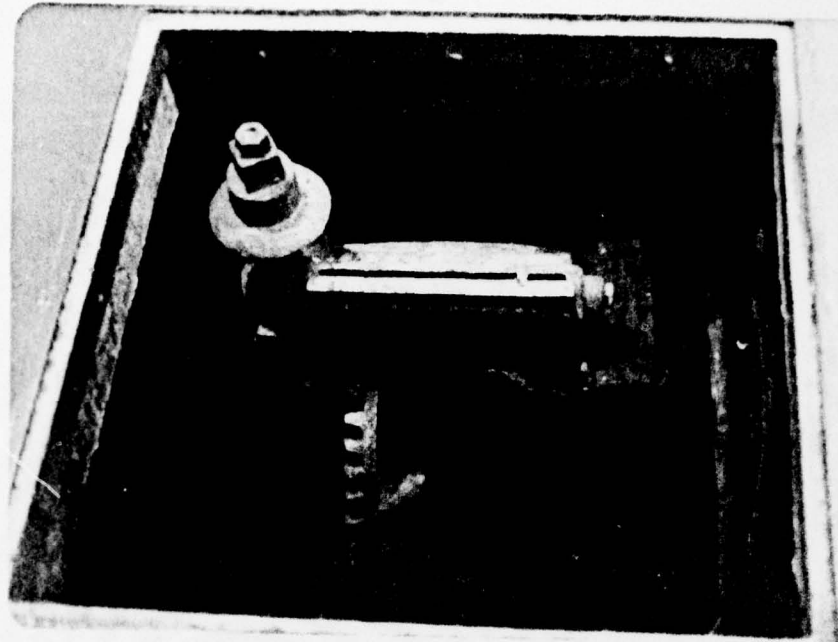
Photograph No. 4
Spillway stilling basin.



Photograph No. 5
Intake tower (accessible by boat only).



Photograph No. 6
Gate controls at intake tower.



Photograph No. 7
Blow-off valve at valve house.



Photograph No. 8
Blow-off pipe.



Photograph No. 9
Mobile home park (1-1/2 miles downstream).



Photograph No. 10
Bridge over Mill Creek (two miles downstream).

APPENDIX D
CALCULATIONS

D'AMPOLONA

CONSULTING ENGINEERS, INC

By WTC Date 9-20-78 Subject MILL CREEK NO 2 Sheet No. 1 of 1
Chkd. By MB Date 9/22/78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-29

WATERSHED AND LAKE AREA

REF U.S.G.S 7.5' Topo maps "JOHNSTOWN" & "RACHGLWOOD"
QUADRANGLE, PA

$$\begin{aligned}\text{WATERSHED AREA} &= 42.36 \text{ IN}^2 \\ &= 42.36 \times \left(\frac{2000}{5280}\right)^2 \\ &= 4.08 \text{ SQ. MILE}\end{aligned}$$

Say 6.1 AQ.MILE

LAKE AREA @ EL 1424.

$$\begin{aligned}\text{LAKE AREA} &= 0.15 \text{ IN}^2 \\ &= 0.15 \times (2000)^2 \times \frac{1}{43560} \\ &= 13.8 \text{ ACRES}\end{aligned}$$

Say 14 acrs LAKE

$$\begin{aligned}\text{AREA @ EL 1440} &= 0.28 \text{ IN}^2 \\ &= 0.28 \times (2000)^2 \times \frac{1}{43560} \\ &= 25.7 \text{ acre}\end{aligned}$$

DAM CREST @ EL 1428 ± (APPROXIMATELY)

$$\begin{aligned}\text{AREA} &= 13.8 + \frac{25.7 - 13.8}{1440 - 1424} \times (1428 - 1424) \\ &= 16.78 \text{ acre}\end{aligned}$$

Say 17 acre Dam LEVEL

DIAPOLONA

CONSULTING ENGINEERS, INC.

By LUTG Date 9-20-78 Subject MILL CREEK NO 2 DAM Sheet No. 1 of 2
Chkd. By MC Date 9/22/78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-29

DAM : MILL CREEK NO 2 DAM

BASIN : OHIO RIVER BASIN, MILL CREEK NEAR JOHNSTOWN, Pa
WATERSHED AREA, A = 6.1 SQ. MILE

ACCORDING TO THE HYDROLOGICAL CHARTS PROVIDED BY COE
BALTIMORE DIST.

$$\text{PMF PEAK INFLOW RATE } q = 1700 \text{ cfs/sq m.} =$$

$$Q = qA = 10370 \text{ cfs} \quad \boxed{\text{Say } 10400 \text{ cfs}}$$

$$26'' \text{ RUNOFF VOLUME} = \frac{26}{12} \times 6.1 \times 640 = 8459 \text{ ac-ft}$$

$$\boxed{\text{Say } 8500 \text{ ac-ft}}$$

Spillway

MASONRY LINED BROAD CREST OVERFLOW WEIR

$$L = 82.5 \text{ FT (FIELD MEASUREMENT)}$$

$$\Delta H = 3'-9'' \text{ (FIELD MEASUREMENT)}$$

$$Q_s = (2.6)(82.5)(3.75)^{1.5} = 1558 \quad \boxed{\text{say } 1600 \text{ cfs}}$$

SURCHARGE STORAGE

$$\text{LAKE AREA} = 14.2 \text{ ac-ft} \quad \text{Dam crest} = 17 \text{ ac-ft}$$

$$\text{VOLUME} = \frac{3.75}{3} (14 + 17 + \sqrt{(14)(17)}) = 58.0 \text{ ac-ft} \quad \boxed{\text{say } 58 \text{ ac-ft}}$$

D'AMICO & POLONIA

CONSULTING ENGINEERS, INC.

By WTC Date 9-20-78 Subject MILL CREEK NO 2 DAM Sheet No. 2 of 2
 Chkd. By MC Date 9/22/78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-29

PERCENT OF PMF WITHOUT OVERTOPPING

$$= \left(\frac{1600}{10400} + \frac{50}{8500} \right) 100\%$$

$$= (0.15 + 0.01) 100\%$$

$$= 16.1\% \text{ PMF}$$

say 16% PMF

ESTIMATE WATER DEPTH, h , OVERTOP DAM DURING PMF

$$\text{SPILLWAY } Q_s = (2.6)(82.5)(3.75 + h)^{1.5}$$

$$= 214.5 (3.75 + h)^{1.5}$$

$$\text{Dam } Q_D = (2.6)(500)(h)^{1.5}$$

↑ APPROXIMATE field measurement

$$= 1300 (h)^{1.5}$$

$$\text{STORAGE } V = (3.75 + h)(16 \text{ acre})$$

← assumed avg lake area

$$\text{then } \frac{214.5 (3.75 + h)^{1.5} + 1300 h^{1.5}}{10400} + \frac{(3.75 + h)(16)}{8500} = 1$$

$$h = 2.941'$$

Say 2.9 FT OVER DAM CREST

$$\left. \begin{array}{l} \text{Spillway } Q_s = 3712 \text{ cfs} \\ \text{Dam } Q_D = 6557 \text{ cfs} \end{array} \right\} Q_T = 10269 \text{ cfs} \text{ (99\% Peak inflow)}$$

MAXIMUM RECORD FLOOD

DATE	WATER DEPTH	ESTIMATED SPILLWAY FLOW
JUNE 21, 1929	3.6 FT	1465 cfs
JULY 20, 1977 (AH)	2.05 FT	630 cfs

APPENDIX E
REGIONAL GEOLOGY

APPENDIX E
REGIONAL GEOLOGY

The Mill Creek No. 2 Dam is located on strata of the middle portion of the Allegheny Group. The area is located west of the Johnstown Syncline and east of the Laurel Ridge Anticline. The strata dip relatively steeply for this region, approximately 300 to 400 feet to the southeast. The strata below the dam consist of interbedded massive gray sandstone layers and dark gray to black shale seams. There are four to five minable coal seams in the formation, three of which occur beneath the dam. The Upper Freeport coal seam, which marks the boundary between the Allegheny Group and the overlying Conemaugh Group, crops on the slopes above the dam and reservoir. The Conemaugh Group consists of fine-grained rocks, such as claystone and shale. These units are interbedded with sandstone layers and several thin coal seams. The Conemaugh Group rocks are relatively easily weathered compared to the more resistant rocks of the Allegheny Group.

The Lower Kittanning and Upper Kittanning coal seams have been mined by the Bethlehem Mine Company close to the boundaries of the reservoir and dam, but the coal has been left intact under the reservoir, as required by the Mine Safety Act.

The slopes are relatively steep above the reservoir and small slides and rock falls may be expected.