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AD A108947

5 NORTH BRANCH BLACKLICK CREEK, CAMBRIA COUNTY

6 PENNSYLVANIA

COLVER DAM

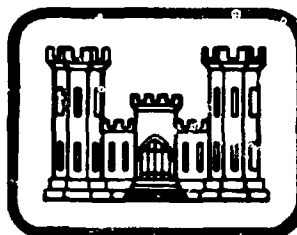
NDI I.D. PA- 0437

DER I.D. 11-20

OWNER: CAMBRIA TWP. WATER AUTHORITY

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DACW31-81-C-0014



PREPARED FOR

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

BY

D'APPOLONIA CONSULTING ENGINEERS
10 DUFF ROAD

PITTSBURGH, PA. 15235

AUGUST 1981

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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 investigations 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.

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Colver Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Cambria
STREAM: North Branch of Blacklick Creek, a secondary tributary of the
Conemaugh River
SIZE CLASSIFICATION: Small
HAZARD CLASSIFICATION: Significant
OWNER: Cambria Township Water Authority
DATE OF INSPECTION: July 16, 1981 and July 31, 1981

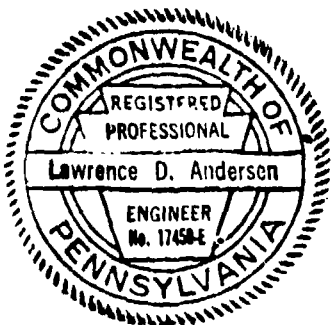
ASSESSMENT: Based on the evaluation of the existing conditions, the structural condition of Colver Dam is considered to be good.

The dam is classified as a small dam in the significant hazard category. According to the recommended criteria, small dams in the significant hazard category are required to pass a flood whose magnitude ranges between the 100-year flood and 50 percent of the Probable Maximum Flood (PMF). In view of the size of the dam which is closer to the lower limit of the small size classification, the 100-year flood was selected as the spillway design flood. The 100-year flood peak was determined according to the recommended procedure and was found to be in excess of the spillway capacity. Therefore, the capacity of the spillway is classified as inadequate.

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

- (1) The owner should determine the nature and extent of modifications needed and implement these measures to provide adequate spillway capacity.
- (2) Around-the-clock surveillance should be provided during unusually heavy rainfall and/or runoff. In addition, a formal warning system should be developed to alert downstream residents in the event of an emergency.
- (3) The owner should develop and follow a formal operating and maintenance plan and should inspect the dam regularly.

Assessment - Colver Dam



Lawrence D. Andersen

Lawrence D. Andersen, P.E.
Vice President

August 26, 1981

Date

Approved by:

James W. Peck

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

18 Sep 1981

Date

COLVER DAM
NO: I.D. PA-0437
DER I.D. 011-020
JULY 16, 1981



Downstream Face



Upstream Face

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
COLVER DAM
NDI I.D. PA-0437
DER I.D. 011-020

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 Colver Dam, also known as Vetera Dam, consists of an earth embankment approximately 490 feet long with a maximum height of 13 feet from the downstream toe. The embankment crest width varies between about 38 feet near the left abutment (looking downstream) and about 110 feet near the right abutment. The downstream embankment slope for a distance of approximately 150 feet near the left abutment is approximately 3 horizontal to 1 vertical. The slope is flatter along the remaining embankment portions, in the range of 6 horizontal to 1 vertical. The downstream face of the dam is covered with grass. The upstream embankment slope above normal pool level is approximately 2 horizontal to 1 vertical and is partially covered with riprap.

The spillway of the dam consists of an 85-foot-wide open channel located at the right abutment. A three-foot-high masonry wall is located on the embankment side of the spillway. The spillway discharge channel is partially paved with concrete. The concrete slab terminates approximately 100 feet downstream from the control section of the spillway. The downstream end of the paved discharge channel is protected with grouted riprap.

The low level outlet of the dam consists of a 24-inch-diameter cast iron pipe located through the dam near the left abutment. Flow through this pipe is controlled by a valve which is located along the center line of the embankment crest alignment. Flow through the cast iron pipe discharges into a 24-inch-diameter corrugated metal pipe which apparently runs from the left to the right abutment and discharges into the unpaved portion of the spillway discharge channel. This outlet constitutes the emergency drawdown facility of the dam.

b. Location. The dam is located near the headwaters of the North Branch of Blacklick Creek, approximately two miles north of Colver in Cambria and West Carroll Townships, Cambria County, Pennsylvania (N40° 34.2', W78° 46.9'). Plate 1 illustrates the location of the dam.

c. Size Classification. Small (based on 13-foot height and approximately 120 acre-feet storage capacity).

d. Hazard Classification. The dam is classified to be in the significant hazard category. A mobile home is located along the North Branch of Blacklick Creek approximately 1,000 feet downstream from the dam, at a level of about 5 to 10 feet above the stream bed. Further downstream, the stream flows through an uninhabited valley for approximately three miles. At the end of this reach, one residence and a commercial building are located in the vicinity of the stream. It is estimated that failure of the dam would cause loss of a few lives and some property damage. Based on this damage estimate, the dam is considered to be a significant hazard.

e. Ownership. Cambria Township Water Authority (Address: Mr. Charles Motrenick, Cambria Township Water Authority, P.O. Box 23, Colver, Pennsylvania 15927).

f. Purpose of Dam. Water supply.

g. Design and Construction History. The dam was constructed prior to 1913. In 1913, the dam was enlarged by the addition of fill to its upstream slope and the existing spillway and portions of the existing outlet facilities were constructed. In 1972, additional fill was placed on the downstream slope and the outlet pipe was extended from the left to the right abutment, providing for discharge into the unpaved portion of the spillway discharge channel.

h. Normal Operating Procedure. The reservoir is normally maintained at Elevation 1812, the spillway crest level. Excess inflow into the reservoir is discharged through the spillway.

1.3 Pertinent Data. Elevations referred to in this and subsequent sections of the report were calculated based on field measurements assuming the spillway crest to be at Elevation 1812 (USGS Datum). Elevation 1812 was given as the normal pool elevation on the USGS 7.5-minute Colver quadrangle. The available design drawings show the pool level to be at Elevation 1814.

a. Drainage Area

5.3 square miles⁽¹⁾

⁽¹⁾Planimetered from the appropriate USGS topographic map. No data are available in the state files.

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site	Dam overtopped in 1972 and in 1977, flows not known
Outlet conduit at maximum pool	10 ⁺
Gated spillway capacity at maximum pool	Not applicable
Ungated spillway capacity at maximum pool	1235
Total spillway capacity at maximum pool	1235

c. Elevation (USGS Datum) (feet)

Top of dam	1814.8 (measured low spot)
	1815.0 (as designed)
Maximum pool	1814.8
Normal pool	1812.0
Upstream invert/outlet works	Unknown
Downstream invert/outlet works	1800.0 ⁺
Maximum tailwater	Unknown
Toe of dam	1802.0

d. Reservoir Length

Normal pool level	1,300 feet
Maximum pool level	1,500 ⁺ feet

e. Storage (acre-feet)

Normal pool level	80 ⁺ (2)
Maximum pool level	120 ⁺

f. Reservoir Surface (acres)

Normal pool level	12
Maximum pool level	19 ⁺

g. Dam

Type	Earth embankment
Length	490 feet
Height	13 feet
Top width	Variable 38 to 110 feet

(2) Estimate. No data available.

Side slopes

Downstream: Varies,
3H-6H:1V

Zoning
Impervious core
Cutoff
Grout curtain

Upstream: 2H:1V
No
No
Yes
No

h. Regulating Outlet

Type

24-inch-diameter cast
iron pipe

Length

500[±] feet

Access

Valve located on dam
crest near left abutment

Closure

Manually operated valve

i. Spillway

Type

Partially concrete paved
open channel

Length

85 feet (perpendicular
to flow)

Crest elevation

1812.0

Upstream channel

Lake

Downstream channel

Earth channel

SECTION 2 DESIGN DATA

2.1 Design

a. Data Available. The available data consist of files provided by the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER), which contain design drawings only.

(1) Hydrology and Hydraulics. No information is available.

(2) Embankment. Available information consists of various design drawings.

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

b. Design Features

(1) Embankment. As shown in Plate 2, the composition of the embankment which existed prior to 1913 is not identified. In 1913, a clay fill was placed on the upstream side of the dam which incorporated a concrete core wall at the upstream toe of the existing dam. Plate 3 shows the plan of the dam, spillway, and outlet facilities and a typical cross section of the embankment. In 1979, the reservoir was dredged and the waste material was placed on the downstream slope of the dam, further enlarging the embankment.

(2) Appurtenant Structures. The appurtenant structures consist of an open-channel spillway (see Plate 4) located at the right abutment and a low level outlet (see Plate 3) located near the left abutment. The spillway is 85 feet wide. A three-foot-high masonry wall is located on the left side of the spillway channel at the spillway embankment junction. According to the 1913 design drawings, the low level outlet consisted of a 24-inch-diameter pipe located through the embankment near the left abutment. According to the dam tender, in 1979 the outlet pipe was extended by approximately 400 feet by a corrugated metal pipe to discharge into the spillway discharge channel at the right abutment.

c. Design Data

(1) Hydrology and Hydraulics. No design information is available.

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

(3) Appurtenant Structures. No design information is available other than the design drawings.

2.2 Construction. No information is available concerning the construction of the dam. As previously noted, the dam was originally built prior to 1913 and was modified in 1913 and again in 1979.

2.3 Operation. There are no formal operating records maintained for the dam. According to the dam tender, the dam may have overtopped in 1972 and in 1977.

2.4 Other Investigations. None reported.

2.5 Evaluation

a. Availability. The available information is limited. However, it is considered to be sufficient for Phase I Inspection purposes.

b. Adequacy.

(1) Hydrology and Hydraulics. No information is available to assess the adequacy of the spillway.

(2) Embankment. Other than design drawings, no other design information is available to determine the adequacy of the design.

(3) Appurtenant Structures. No quantitative data are available to assess the adequacy of appurtenant structures.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The onsite inspection of the Colver Dam consisted of:

1. The visual inspection of the embankment, abutments, and embankment toe.
2. The visual examination of the spillway and reservoir portions of the outlet works.
3. The evaluation of the downstream area hazard potential.

The specific observations are illustrated on Plate 5.

b. Embankment. In general, the 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. No signs of distress or seepage were noted. The downstream embankment slope and crest are covered with grass and were found to be adequately maintained.

The dam crest was surveyed relative to the spillway crest elevation and the lowest area was found to be within 0.2 foot of the design crest level. The dam crest profile, according to the field measurements, is illustrated in Plate 6.

c. Appurtenant Structures. The appurtenant structures were examined for deterioration or other signs of distress and for obstructions that could limit flow. The spillway structure was found to be in fair condition. The spillway slab was found to have cracked and deteriorated in some areas. Some maintenance may be required to prevent further deterioration. Only the downstream end of the outlet pipe was visible. The outlet pipe valve was operated by the dam tender and was observed to be functional.

d. Reservoir Area. A map review indicates that the watershed is predominantly covered by farmlands and woodlands. No signs of any landslide activity were found in the vicinity of the reservoir. Review of the regional geology is included in Appendix F.

e. Downstream Channel. The downstream channel was found to be stable within the vicinity of the dam. A further description of the downstream conditions is included in Paragraph 1.2 d.

3.2 Evaluation. The Colver Dam was found to be in good condition and adequately maintained. No conditions were observed that would require remedial action at this time. The owner should consider repairing the spillway concrete to avoid further deterioration.

SECTION 4 OPERATIONAL FEATURES

4.1 Procedure. There are no formal operating procedures for the dam. The reservoir is normally maintained at the spillway crest level with excess inflow discharged through the spillway channel.

4.2 Maintenance of the Dam. The maintenance of the dam is considered to be good. The crest and slopes of the dam are covered with grass and are adequately maintained.

4.3 Maintenance of Operating Facilities. The only operable facility of the dam is the low-level outlet pipe valve. The valve was operated by the dam tender, and was observed to be functional.

4.4 Warning System. No formal warning system exists for the dam. Telephone communication facilities are available via residences in the vicinity of the dam.

4.5 Evaluation. The maintenance condition of the dam is considered to be good. Development of a formal warning system to alert downstream residents in the event of an emergency is recommended.

SECTION 5 HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. The Colver Dam drains a watershed area of 5.3 square miles and impounds a reservoir with a surface area of 11.9 acres at normal pool level. The spillway structure consists of an 85-foot-wide open channel located at the right abutment. The capacity of the spillway, based on the available freeboard relative to the low spot on the crest of the dam, is estimated to be 1235 cfs.

b. Experience Data. As previously stated, Colver Dam is classified as a small dam in the significant hazard category. Under the recommended criteria for evaluating spillway discharge capacities, such impoundments are required to pass from the 100-year flood to one-half Probable Maximum Flood (PMF). In view of the low downstream damage potential, the 100-year flood was selected as the spillway design flood.

The peak flow of the 100-year flood was calculated according to the recommended procedure and was found to be 2200 cfs. The 100-year flood calculations are 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 during the passage of a large flood.

d. Overtopping Potential. The available spillway capacity of 1227 cfs is less than the 100-year flood peak of 2200 cfs. Therefore, the dam will be overtopped during floods with peak flows in excess of the spillway capacity.

e. Spillway Adequacy. The spillway capacity is less than the recommended spillway design capacity of the 100-year flood. Therefore, the spillway is classified to be inadequate.

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 at this time. In addition, no unsatisfactory conditions have been reported in the past.

(2) Appurtenant Structures. No conditions were observed that would affect the structural performance of the appurtenant structures.

b. Design and Construction Data.

(1) Embankment. The available design and construction information does not provide quantitative data which might aid in the assessment of the embankment stability. However, as previously noted, the field observations did not reveal any signs of distress which would significantly affect the stability of the dam at this time, and none were reported in the past. Therefore, based on visual observations, the structural stability of the dam is considered to be adequate.

(2) Appurtenant Structures. The review of available information indicates that there are no apparent structural deficiencies that would significantly affect the performance of the appurtenant structures.

c. Operating Records. Not maintained.

d. Postconstruction Changes. The embankment was enlarged in 1913 and again in 1979. Further description of the postconstruction modifications are included in Section 2.1 b (1).

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

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that the condition of Colver Dam is good. At this time, no conditions were observed that would significantly affect the structural performance of the dam.

The dam is classified as a small dam in the significant hazard category. According to the recommended criteria, small dams in the significant hazard category are required to pass a flood whose magnitude ranges between the 100-year flood to 50 percent of the PMF. In view of the size of the dam, which is closer to the lower limit of the small size classification, the 100-year flood was selected as the spillway design flood. The spillway capacity was evaluated according to the recommended procedure and was found to be less than the peak value of the 100-year flood which was selected as the spillway design flood relative to the size and hazard classification of the dam. Therefore, the spillway is considered to be inadequate.

b. Adequacy of Information. The available information, in conjunction with the visual observations, is considered to be sufficient for a Phase I evaluation.

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

d. Necessity for Additional Investigations. No additional investigations are considered to be required at this time.

7.2 Recommendations/Remedial Measures. It is recommended that:

1. The owner should determine the nature and extent of modifications needed and implement these measures to provide adequate spillway capacity.
2. Around-the-clock surveillance should be provided during unusually heavy rainfall and/or runoff. In addition, a formal warning system should be developed to alert downstream residents in the event of an emergency.
3. The owner should develop and follow a formal operating and maintenance plan and should inspect the dam regularly.

APPENDIX A
CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A
CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Colver Dam COUNTY Cambria STATE Pennsylvania ID# NDI: PA-0437
 TYPE OF DAM Earth HAZARD CATEGORY Significant DER: 011-020
 DATE(S) INSPECTION July 16, 1981 WEATHER Sunny and Warm TEMPERATURE 85
 POOL ELEVATION AT TIME OF INSPECTION 1812⁺ M.S.L. TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL:

Wah-Tak Chan, P.E.

Bilgin Erel, P.E.

REVIEW INSPECTION PERSONNEL:
(July 31, 1981)

Lawrence D. Andersen, P.E.

James H. Poellot, P.E.

Wah-Tak Chan, P.E.

Owner's Representatives:

Mr. Kenneth Taylor
(Dam Tender)

Wah-Tak Chan, P.E. RECORDER

**VISUAL INSPECTION
PHASE I
EMBANKMENT**

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	See Plate 6 for dam crest profile.	
RIPRAP FAILURES	None observed.	

**VISUAL INSPECTION
PHASE I
EMBANKMENT**

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems observed.	
ANY NOTICEABLE SEEPAGE	None observed.	
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	Outlet conduit is a cast iron pipe.	
INTAKE STRUCTURE	Submerged, not visible.	
OUTLET STRUCTURE	None. Outlet pipe discharges into spillway discharge channel.	
OUTLET CHANNEL	Same as spillway discharge channel.	
EMERGENCY GATE	24-inch-diameter blowoff valve.	

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Open channel with partial concrete paving. Concrete is deteriorating in areas.	
APPROACH CHANNEL	Lake	
DISCHARGE CHANNEL	Concrete pavement extends about 100 feet downstream from the spillway control section. Then channel is formed in earth.	
BRIDGE AND PIERS	None	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	The dam has 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

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	The dam has no instrumentation.	
OBSERVATION WELLS	N/A	
WEIRS	N/A	
PIEZOMETERS	N/A	
OTHER	N/A	

VISUAL INSPECTION
PHASE I
RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate to mild slope in the reservoir area. No problems observed.	
SEDIMENTATION	Reservoir was dredged in 1979.	
UPSTREAM RESERVOIRS	None	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No problems observed.	
SLOPES	No problems observed.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	A mobile home is located about 1000 feet downstream and a house and a commercial building are located about three miles downstream from the dam. Population: approximately 10.	

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

APPENDIX B

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION

PHASE I

NAME OF DAM Colver Dam

ID# NDI: PA-0437

DER: 011-020

ITEM	REMARKS
AS-BUILT DRAWINGS	Some design drawings are available in state files.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	Constructed prior to 1913. Enlarged in 1913 and again in 1979.
TYPICAL SECTIONS OF DAM	See Plate 3.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plate 3.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	None recorded.
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	Unknown
BORROW SOURCES	Unknown
MONITORING SYSTEMS	None
MODIFICATIONS	It is reported that 80,000 cu. yds. of material were dredged from the reservoir in 1979. The material was placed on the downstream slope of the dam.
HIGH POOL RECORDS	Not recorded. Reportedly the dam was overtopped in 1972 and in 1977.

**CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I**

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Unknown
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Dam was reportedly overtopped in 1972 and in 1977. The 1977 overtopping caused damage to the embankment crest and to the spillway.
MAINTENANCE OPERATION RECORDS	None recorded.
SPILLWAY PLAN SECTIONS DETAILS	See Plate 4.
OPERATING EQUIPMENT PLANS AND DETAILS	See Plate 3.

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 5.30 square miles, partially wooded
and partially farmed watershed.
ELEVATION, TOP OF NORMAL POOL AND STORAGE CAPACITY: 1812.0 (80 acre-feet,
estimated)
ELEVATION, TOP OF FLOOD CONTROL POOL AND STORAGE CAPACITY: 1814.8 (120 acre-feet,
estimated)
ELEVATION, MAXIMUM DESIGN POOL: N/A
ELEVATION, TOP OF DAM: 1814.8 (measured low spot)

SPILLWAY:

- a. Elevation 1812
- b. Type Open channel with partial concrete paving.
- c. Width 85 feet (Perpendicular to flow)
- d. Length 100[±] feet
- e. Location Spillover Right abutment
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type 24-inch-diameter cast iron and corrugated metal pipe
- b. Location Intake at left abutment
- c. Entrance Inverts Unknown
- d. Exit Inverts 1800.0[±]
- e. Emergency Drawdown Facilities 24-inch-diameter pipe

HYDROMETEOROLOGICAL GAGES:

- a. Type N/A
- b. Location N/A
- c. Records N/A

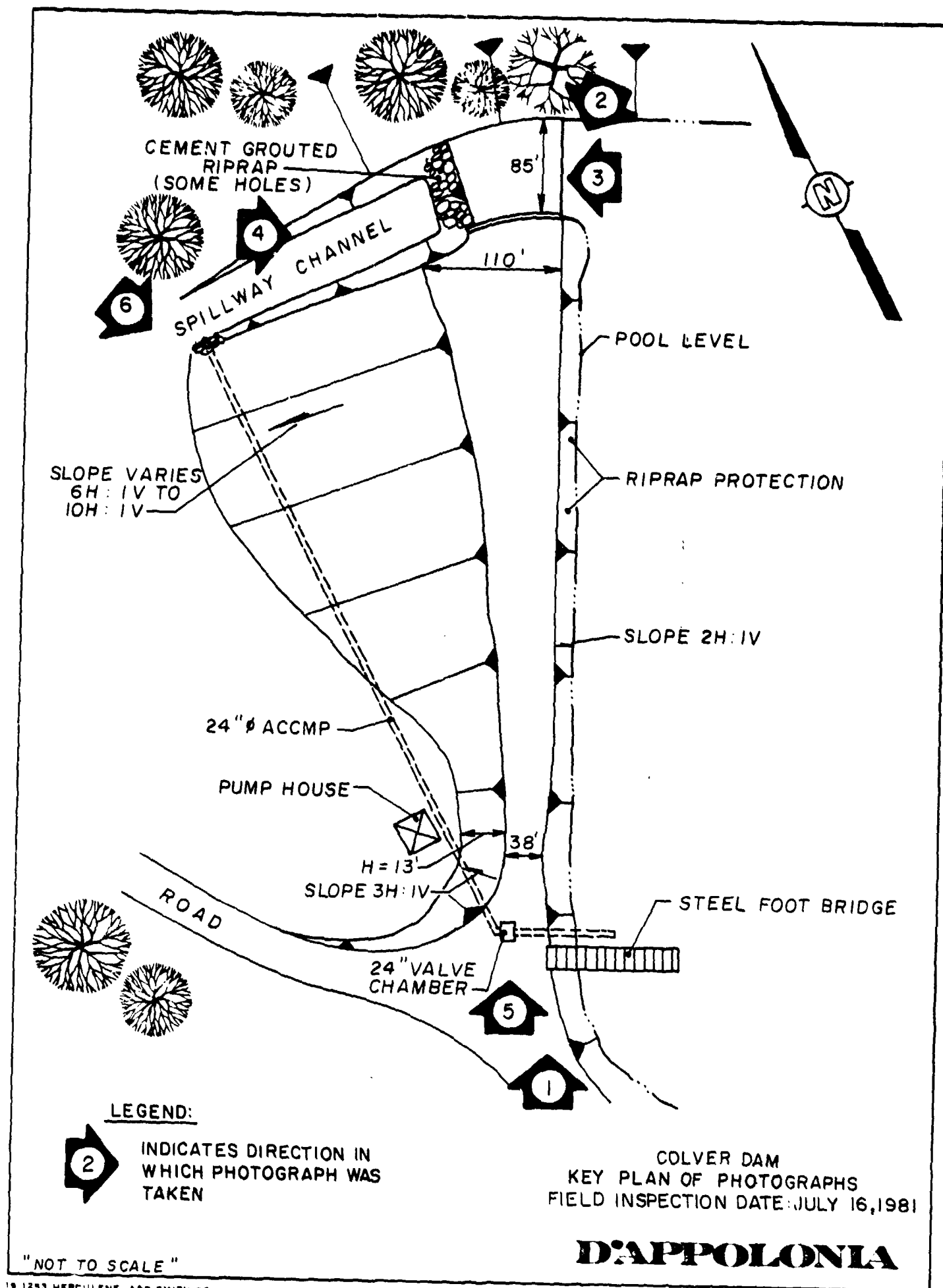
MAXIMUM NONDAMAGING DISCHARGE: 1200[±] cfs (spillway capacity)

Note: Elevation Datum, USGS.

APPENDIX C
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
COLVER DAM
NDI I.D. NO. PA-0437
JULY 16, 1981

<u>PHOTOGRAPH NO.</u>	<u>DESCRIPTION</u>
1	Dam crest (looking north).
2	Spillway crest (looking south).
3	Spillway discharge channel (looking downstream). Note concrete spalling on the spillway slab.
4	Spillway channel (looking upstream).
5	Outlet pipe valve chamber.
6	24-inch-diameter corrugated metal outlet pipe.
7	Bridge on Route 271 across the North Branch of Blacklick Creek (2.5 miles downstream from the dam).





PHOTOGRAPH NO. 2



PHOTOGRAPH NO. 4



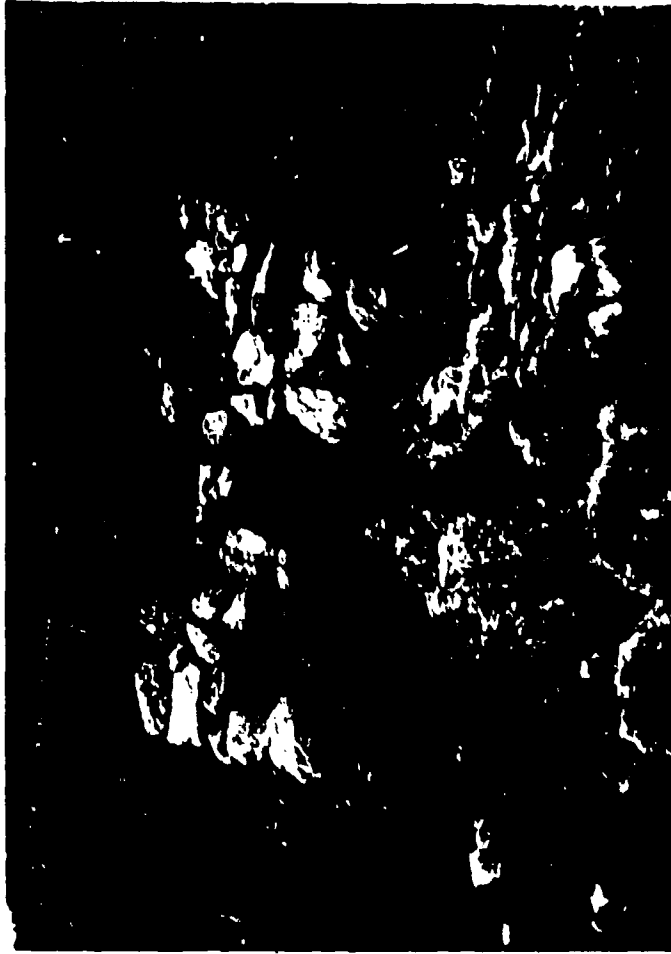
PHOTOGRAPH NO. 1



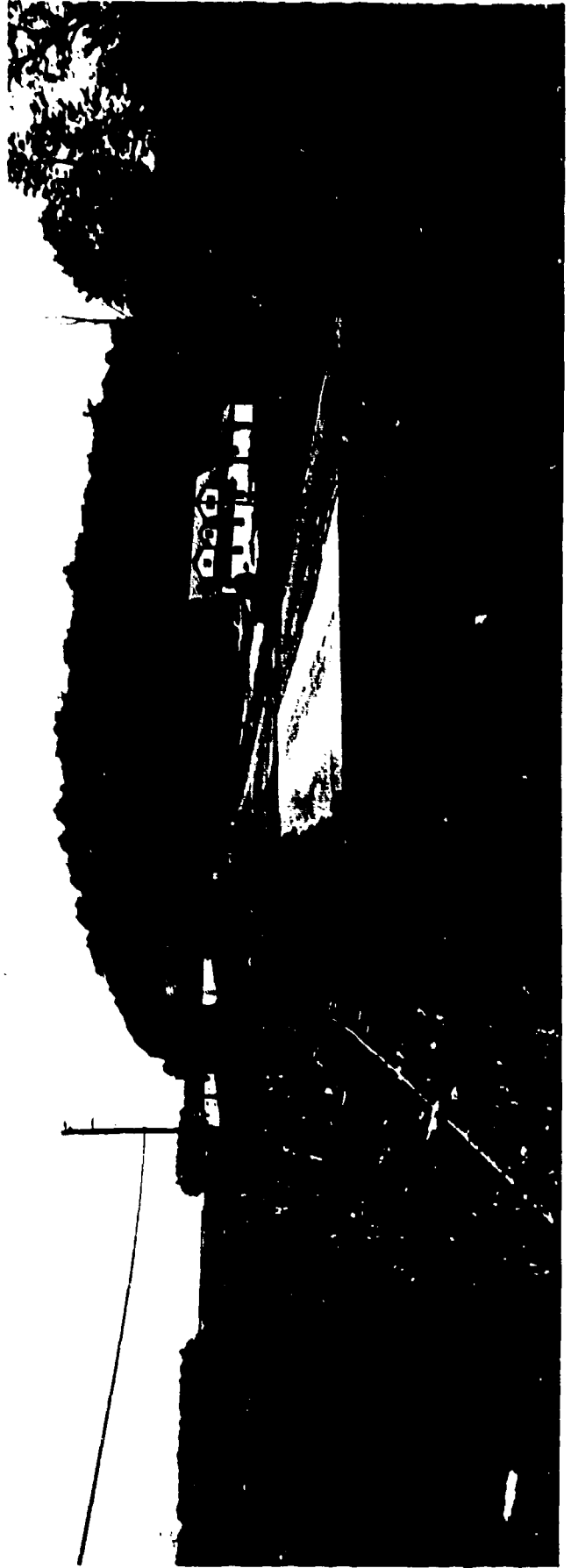
PHOTOGRAPH NO. 3



PHOTOGRAPH NO 5



PHOTOGRAPH NO. 6



PHOTOGRAPH NO.7

APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

D'APPOLONIA

CONSULTING ENGINEERS, INC.

By BE Date 8/21/81 Subject CLOVER DAM Sheet No. 1 of 1
Chkd. By WTC Date 8/21/81 SPILLWAY CAPACITY & 100-YR FLOOD Proj. No. 80-556

SPILLWAY CAPACITY:

ACCORDING TO FIELD MEASUREMENTS & OBSERVATION:

- a) SPILLWAY WIDTH (L) : 85'
- b) AVAILABLE HEAD (H) : 2.8' (RELATIVE TO LOW SPOT ON DAM)
- c) SPILLWAY COEFF (C) : 3.1 (CRITICAL FLOW CONTROL)

$$\therefore Q = C L H^{1.5} = 3.1 \times 85 \times 2.8^{1.5} = \underline{\underline{1235 \text{ cfs.}}}$$

100-YR FLOOD (OHIO RIVER BASIN)

PER COE FOR OHIO RIVER BASIN

$$Q_{100} = 120.38 (DA \times S^{\frac{1}{2}})^{0.744}$$

WHERE

Q_{100} = 100-YR FLOOD PEAK IN CFS

DA = DRAINAGE AREA IN SQ. MI

S = SLOPE OF STREAM FT/MI

DA : 5.3 SQ. MILES

$$S : \frac{\Delta R}{L} = \frac{(2125 - 1815) \text{ ft}}{3.5 \text{ miles}} = 88.6 \text{ ft/mile}$$

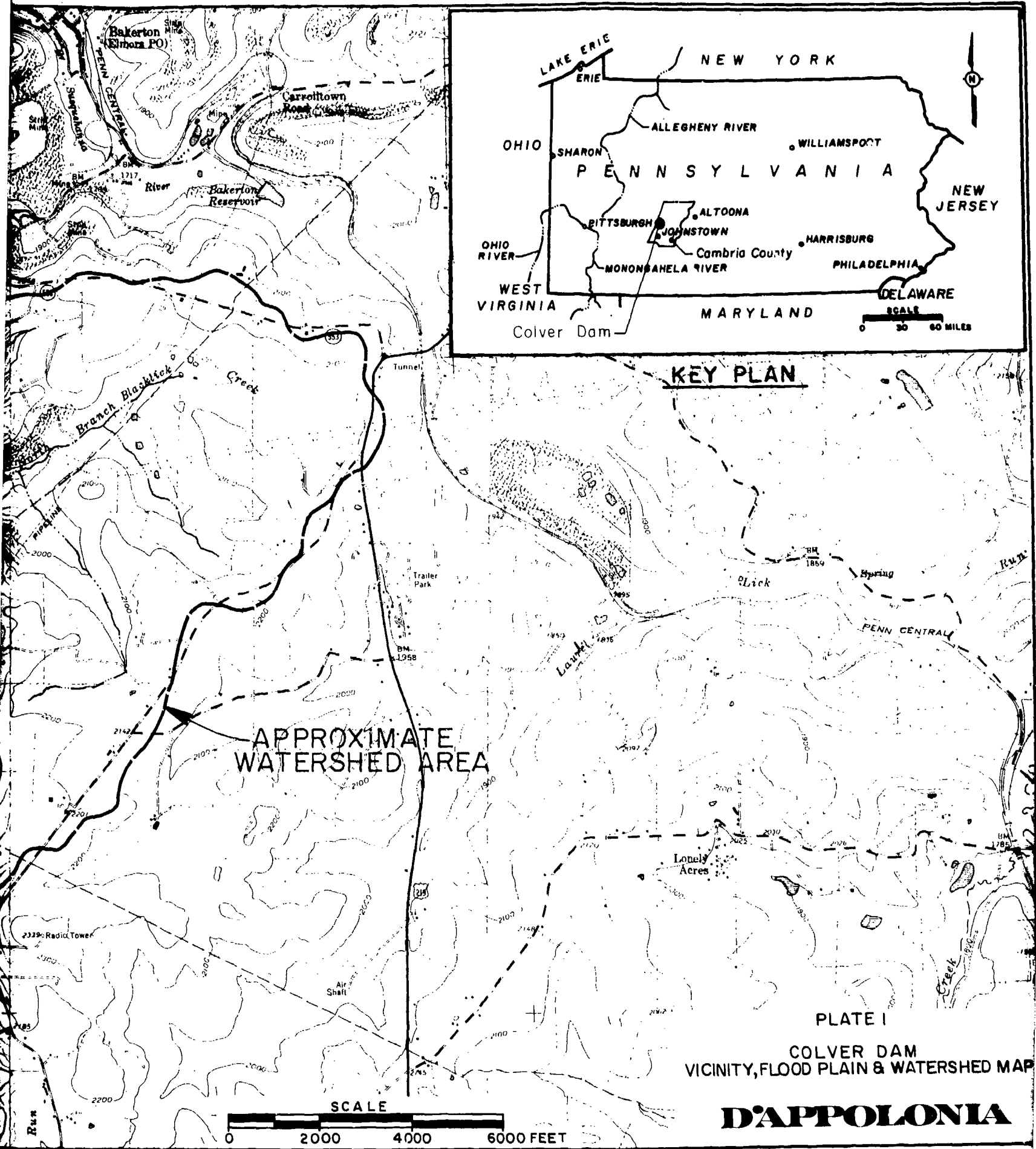
Δh & L MEASURE FROM PLATE 1.

$$\begin{aligned} Q &= 120.38 (5.3 \times 88.6^{\frac{1}{2}})^{0.744} \\ &= 120.38 (49.9)^{0.744} \\ &= 2207 \text{ cfs} \quad \underline{\underline{\text{SAY } 2200 \text{ cfs}}} \end{aligned}$$

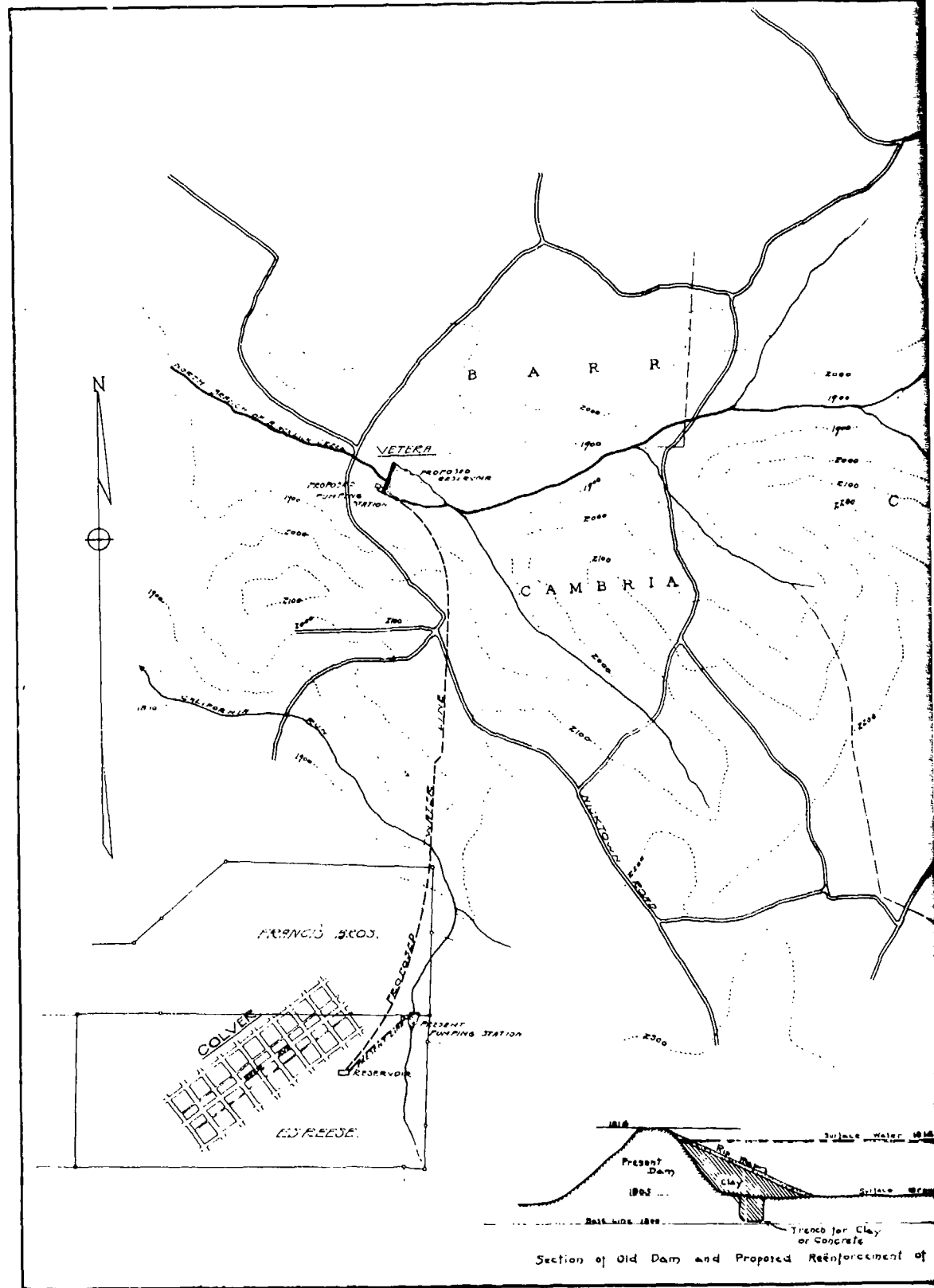
$\therefore$ SPILLWAY CAPACITY IS INADEQUATE

APPENDIX E

PLATES



DRAWN BY	ACS E. G. H.	CHECKED BY JSE	APPROVED BY JHP	8-10-57	DRAWING NUMBER
				8/11/57	



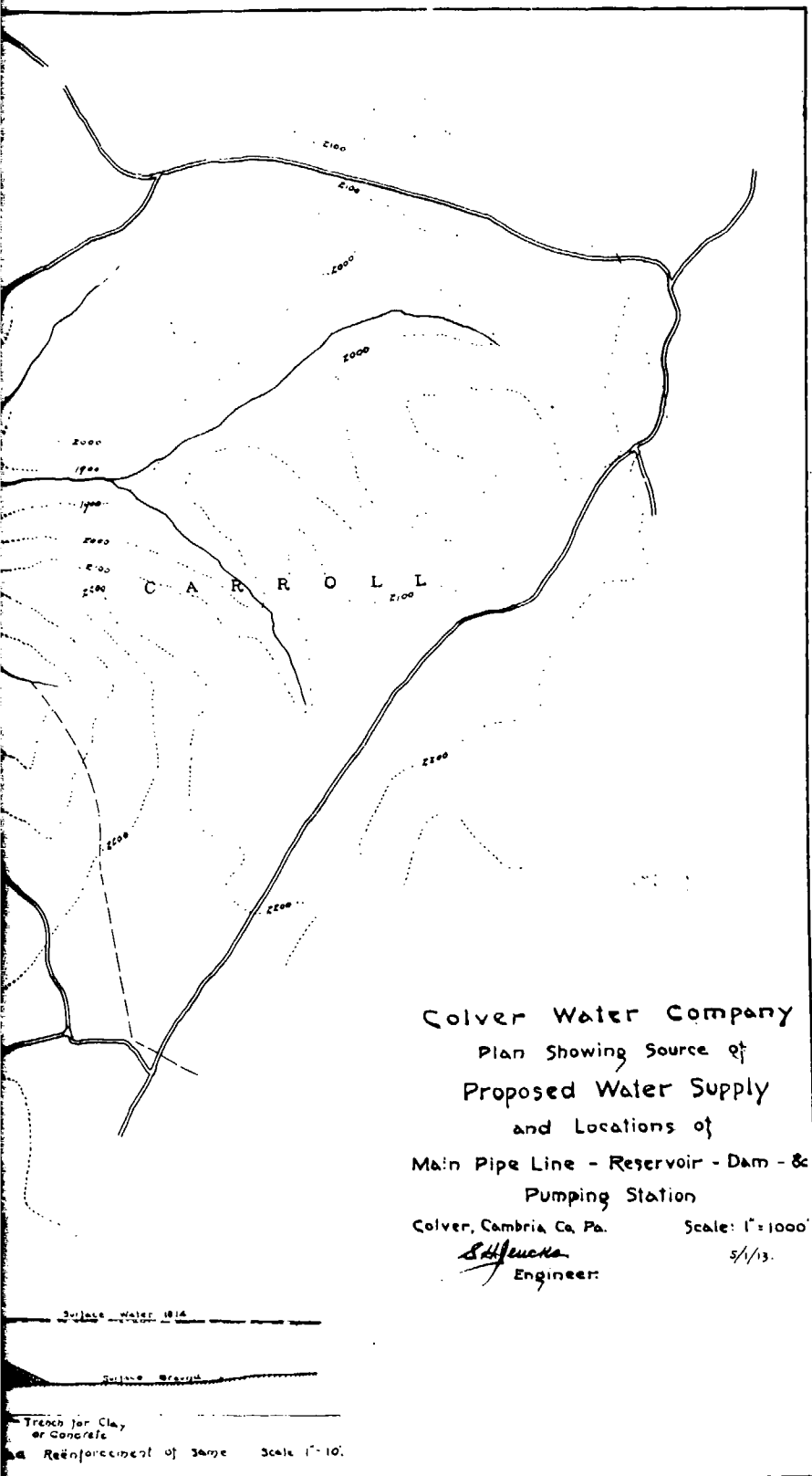
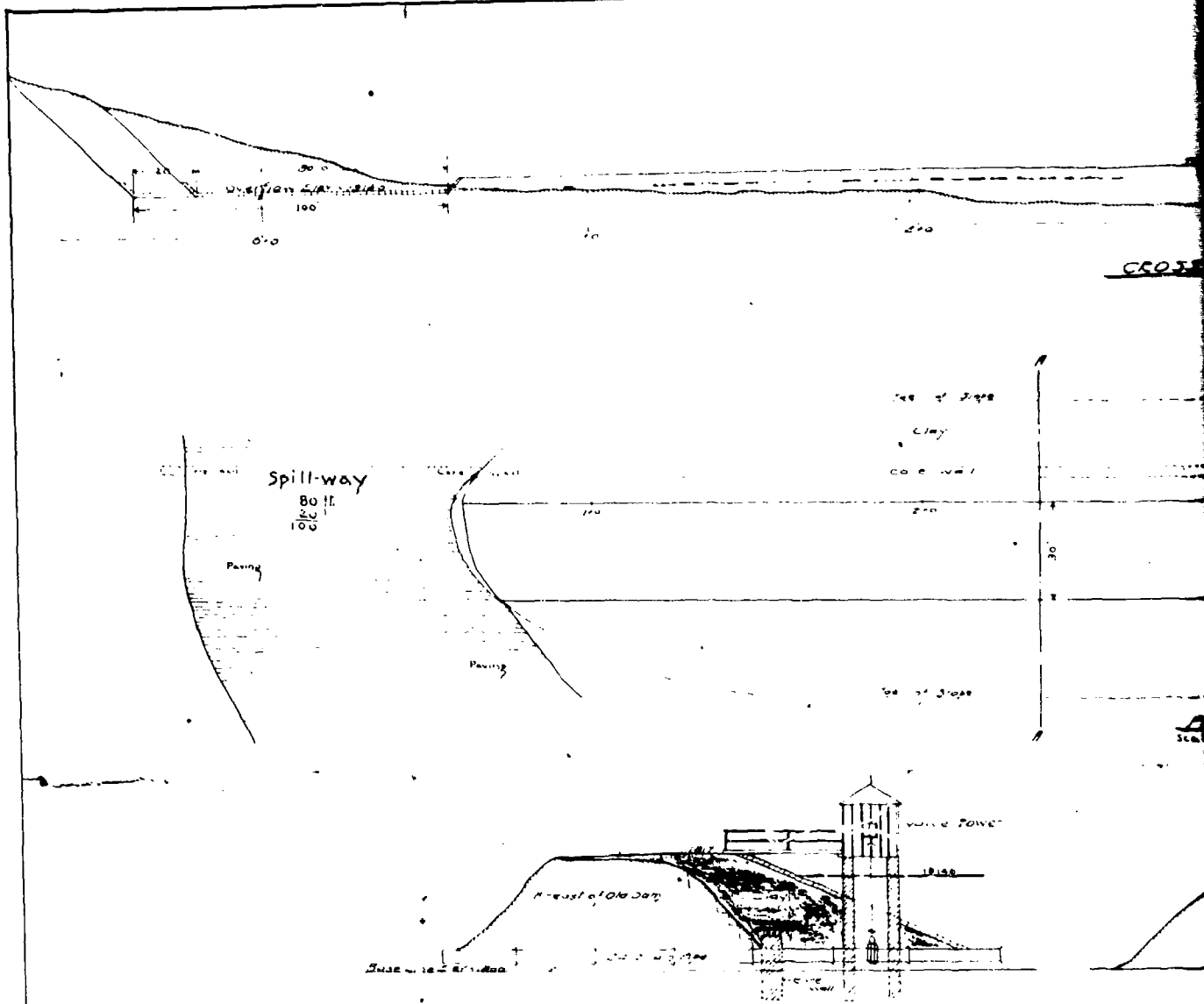


PLATE 2

D'APPOLONIA

DRAWN BY ACS
 CHECKED BY JAC
 APPROVED BY JHP
 8-6-81
 8-6-81
 8-10-81
 DRAWING 80-556-B48
 NUMBER 8-10-81



Colver Water Company
 Plan showing Proposed Layout of Vetera
 On Waters of North Fork of Blacklick Creek
 Cambria Township, Cambria County, Penna.

Colver
 Sept

S. J. J. J.
 Eng'r

MAD No 4

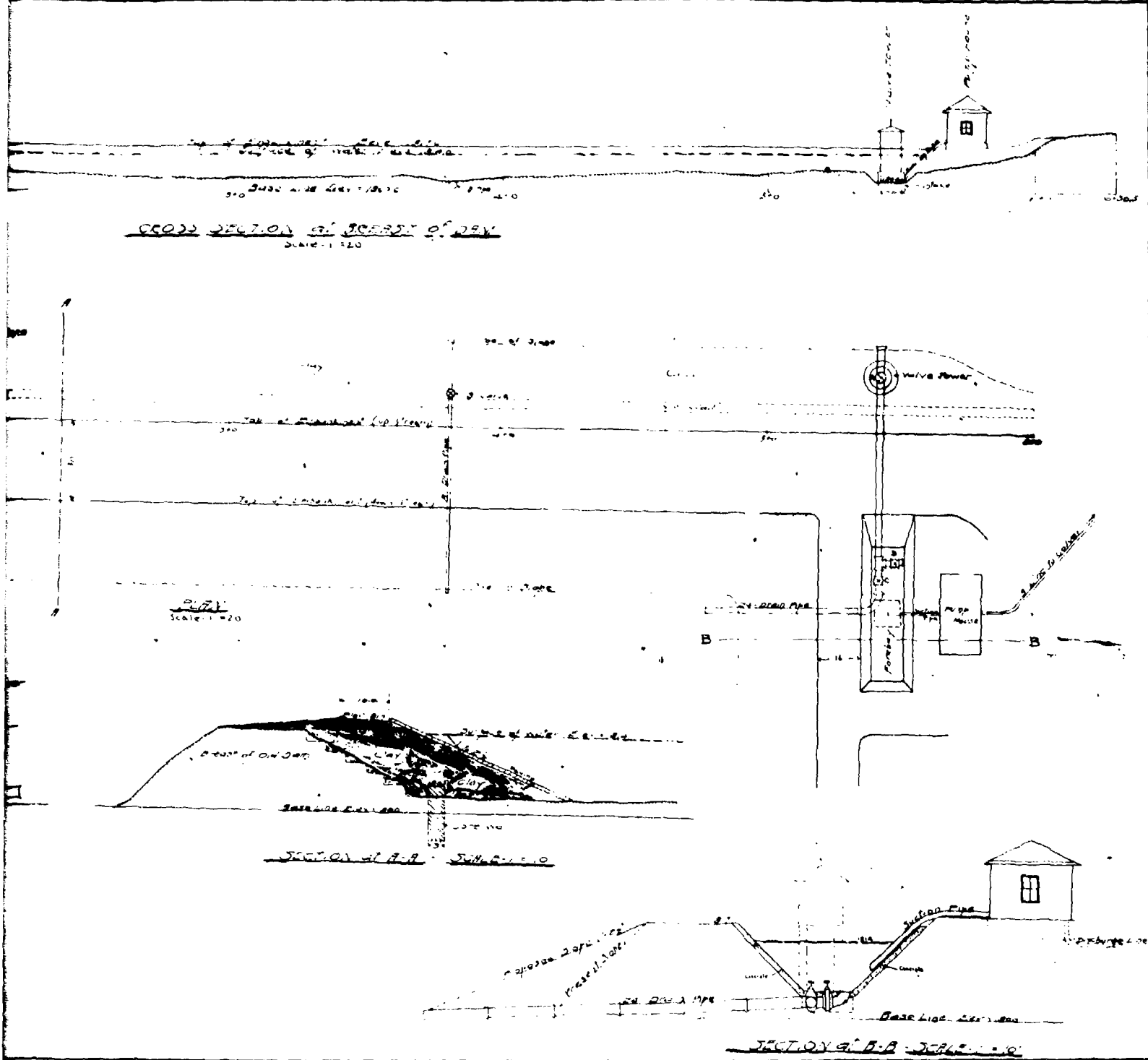
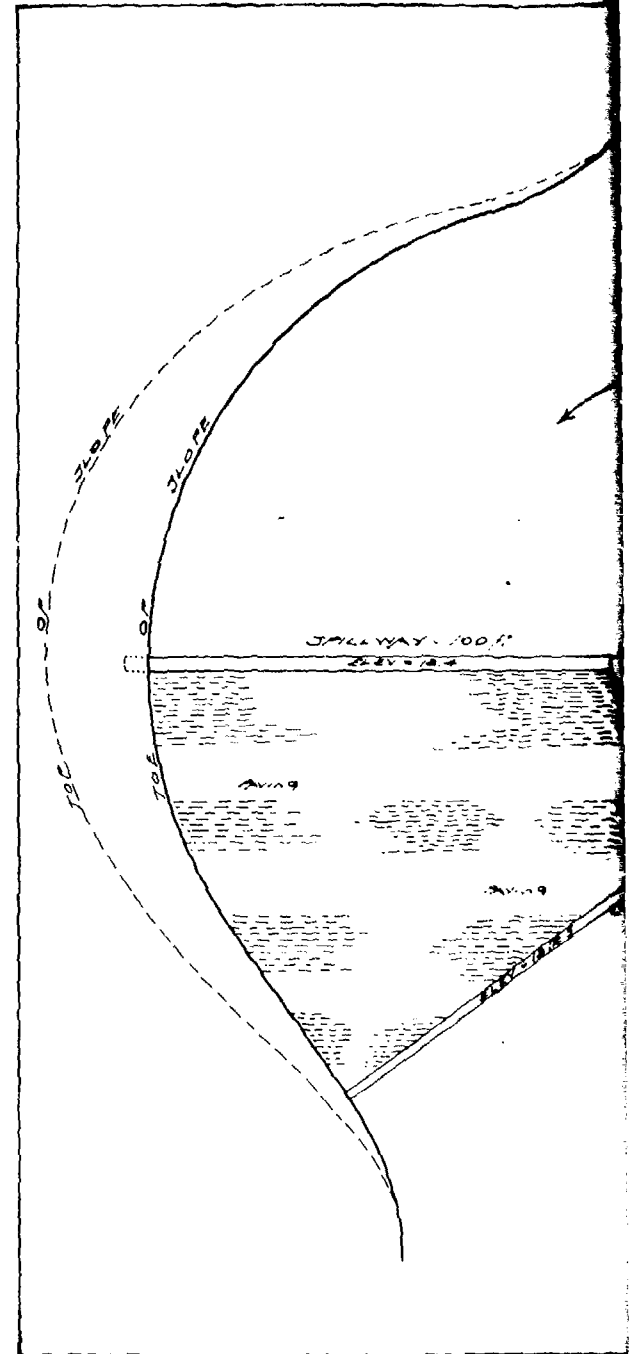


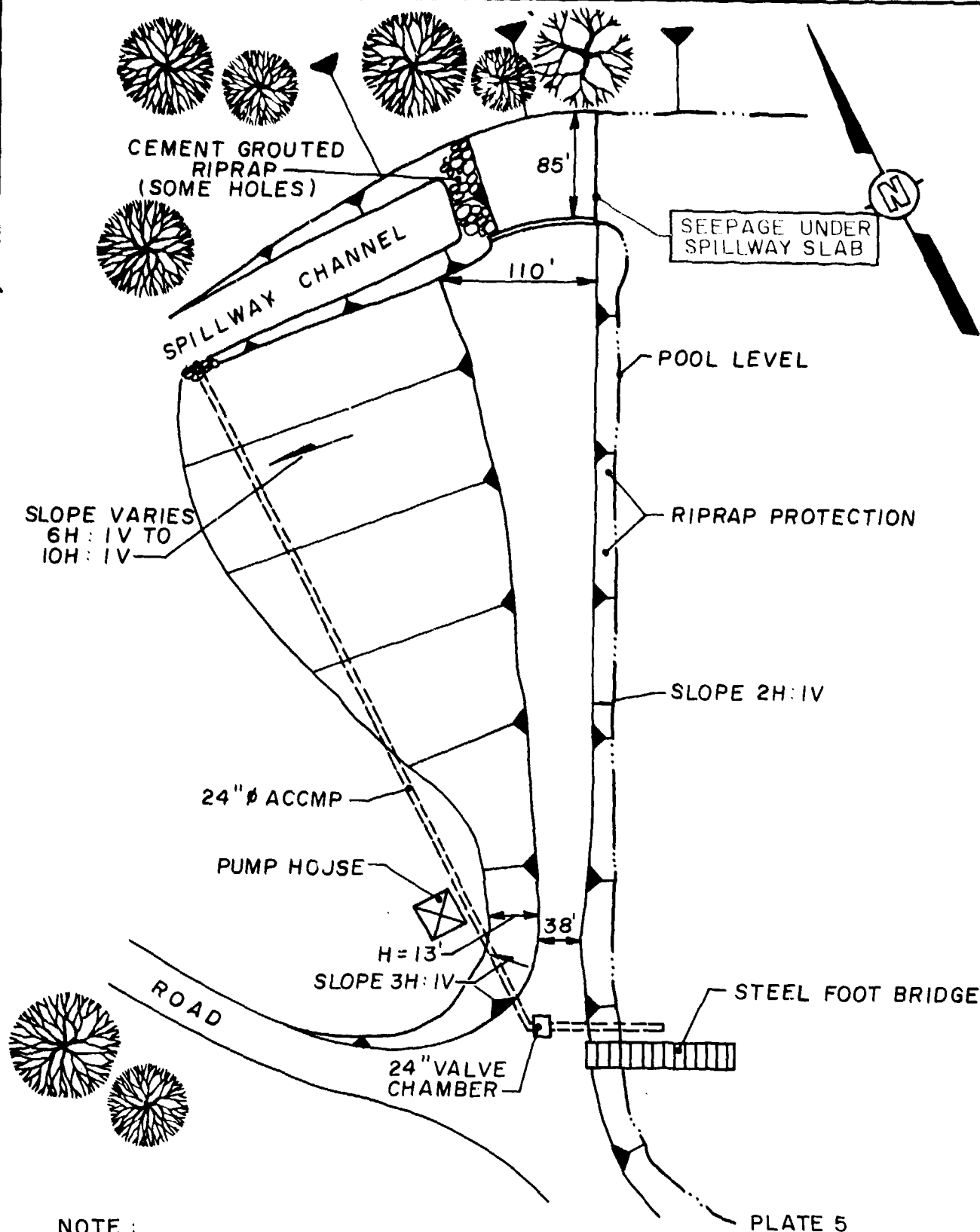
PLATE 3

D'ARTOLONIA

DRAWN BY	ACS	CHECKED BY	AC	8-10-81	DRAWING NUMBER 80-556-B49
	8-6-81	APPROVED BY	JHP	8/4/81	



DRAWING NUMBER 80-556-A39
 CHECKED BY
 APPROVED BY
 ACS 8-6-81
 DRAWN BY

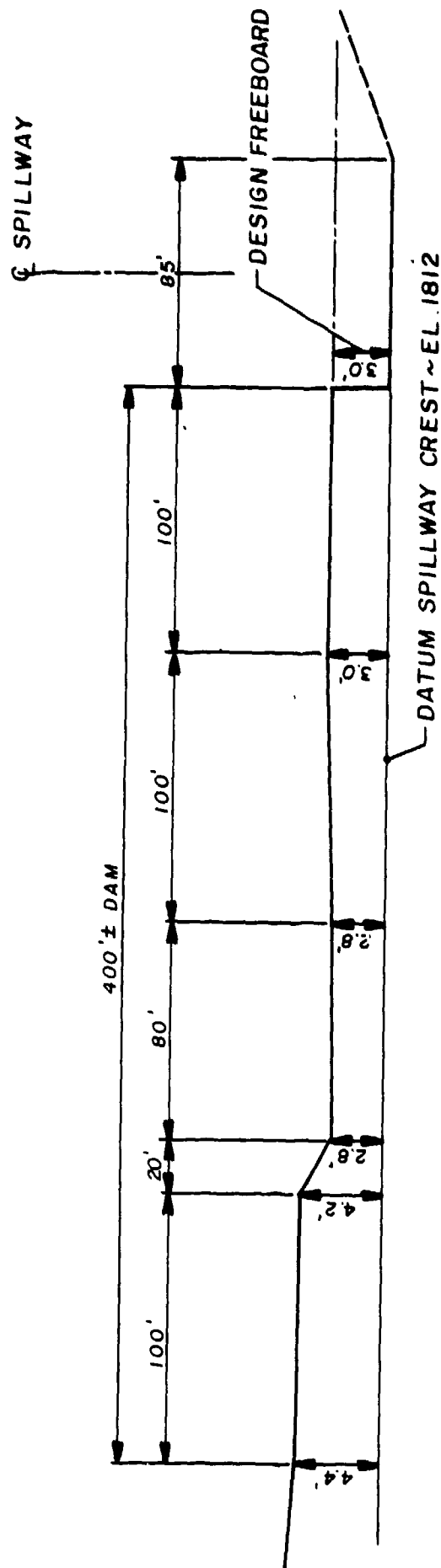


NOTE:
 POOL LEVEL AT DATE OF
 INSPECTION: AT SPILLWAY
 CREST.

COLVER DAM
 GENERAL PLAN
 FIELD INSPECTION NOTES
 FIELD INSPECTION DATE: JULY 16, 1981

D'APPOLONIA

DRAWN BY	ACS	CHECKED BY	8-7-81	APPROVED BY	8-7-81	DRAWING NUMBER	80-556-A40



DAM CREST PROFILE (LOOKING DOWNSTREAM)

NOTES:

1. DAM CREST WAS SURVEYED
RELATIVE TO SPILLWAY CREST
2. DATUM ELEVATION AS PER U.S.G.S.

PLATE 6
COLVER DAM
DAM CREST SURVEY
FIELD INSPECTION DATE: JULY 16, 1981

D'APPOLONIA

APPENDIX F
REGIONAL GEOLOGY

REGIONAL GEOLOGY COLVER DAM

Colver Dam physiographically lies within the Allegheny Mountains section of the Appalachian Plateau Province. The dam site is on the west flank of the Laurel Hill anticline, which coincides with the east flank of the Barnesboro syncline in this area. The strata dip approximately 150 feet per mile to the west. Bedrock at the site consists of sedimentary rock strata of the Middle to Lower Conemaugh Group of the Pennsylvania Series. In general, strata of the Conemaugh Group consist of interbedded shale, claystone, sandstone, and several thin coal seams. The underlying Allegheny Group consists of sandstone and shale strata along with several seams.

The slopes in the vicinity of the reservoir are relatively gentle, reflecting the ease of weathering of the fine-grained Conemaugh rock strata. No large slides should occur, although minor creep may be expected.

DRAWING NUMBER 80-556-A43

ACS CHECKED BY 8-6-81 APPROVED BY

DRAWN BY



REFERENCE:

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA. DEPARTMENT OF ENVIRONMENTAL RESOURCES, DATED: 1960 SCALE 1:250,000

GEOLOGY MAP

D'APOLONIA

DRAWING 80-556-A4
NUMBER 2-17-81

2-17-81

CHECKED BY
1-2-81

APPROVED BY

ACS

DRAWN BY

PENNSYLVANIAN

APPALACHIAN PLATEAU



Allegheny Group

Cyclic sequences of sandstone, shale, limestone and coal; numerous commercial coals; limestone thickens westward; Vespertine Limestone in lower part of section; includes Froopert, Kittanning, and Clarion Formations.



Pottsville Group

Predominantly sandstone and conglomerate with thin shale and coals; some coals mineable locally.

ANTHRACITE REGION



Post-Pottsville Formations

Brown or gray sandstone and shales with some conglomerate and numerous mineable coals.



Pottsville Group

Light gray to white, coarse grained sandstone and conglomerate with some mineable coal; includes Sharp Mountain, Schuylkill, and Tumbling Run Formations.

MISSISSIPPIAN



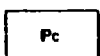
Mauch Chunk Formation

Red shales with brown to greenish gray fine-grained sandstone; includes Greenbrier Limestone in Fayette, Westmoreland, and Somerset counties; Loyalhanna Limestone at the base in southwestern Pennsylvania.



Pocono Group

Predominantly gray, hard, massive, cross-bedded conglomerate and sandstone with some shale; includes in the Appalachian Plateau Burgoyne, Shenango, Cayahoga, Cuyahoga, Curry, and Kuapp Formations; includes part of "Onaway" of M. L. Fuller in Potter and Tioga counties.



Conemaugh Formation

Cyclic sequences of red and gray shales and sandstone with thin limestone and coals; massive Mahoning Sandstone commonly present at base; Ames Limestone present in middle of section; Brush Creek Limestone in lower part of section.

DEVONIAN

UPPER

CENTRAL AND EASTERN PENNSYLVANIA



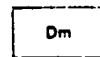
Onaway Formation

Brownish and greenish gray, fine and medium grained sandstone with some shales and scattered calcareous lenses; includes red shales which become more numerous eastward. Relation to type Onaway not proved.



Catskill Formation

Chiefly red to brownish shales and sandstone; includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east.



Marine beds

Gray to olive brown shales, graywackes, and sandstone; contains "Chernung" beds and "Forcing" beds including Burket, Brallier, Harrell, and Trimmers Rock; Tully Limestone at base.



Susquehanna Group

Barbed line is "Chernung-Catskill" contact of Second Pennsylvania Survey County reports; barbs on "Chernung" side of line.

GEOLOGY MAP LEGEND

REFERENCE:

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA., DEPARTMENT OF ENVIRONMENTAL RESOURCES, DATED: 1960
SCALE 1:250,000

D'APPOLONIA