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D'APPOLONIA CONSULTING ENGINEERS PITTSBURGH PA
NATIONAL DAM INSPECTION PROGRAM. SUGAR RUN DAM. (NDS ID NUMBER --ETC(U)
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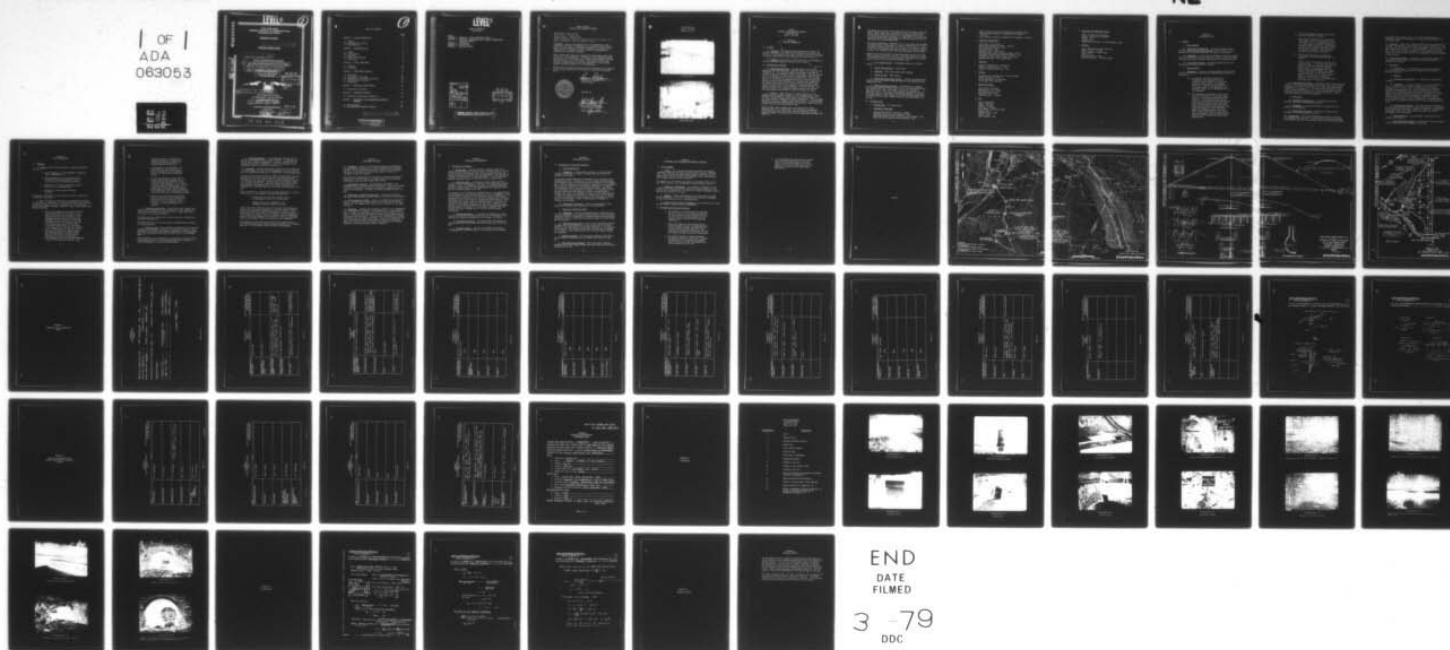
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LEVEL I

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OHIO RIVER BASIN
UNNAMED TRIBUTARY OF CONEMAUGH RIVER
WESTMORELAND COUNTY

PENNSYLVANIA

ORIGINAL CONTAINS COLOR PLATES: ALL DDC
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SUGAR RUN DAM

(WDS ID Number 464)

PHASE I INSPECTION REPORT

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NATIONAL DAM INSPECTION PROGRAM

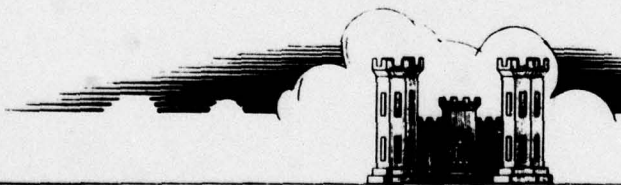
Sugar Run Dam, Ohio River Basin, Unnamed
Tributary of Conemaugh River, Westmoreland
County, Pennsylvania. Phase I Inspection
Report.

DISTRIBUTION STATEMENT A

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⑩ Lawrence D. Andersen

PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

BALTIMORE, MARYLAND 21203

⑮ DACW 31-78-C-0049

BY

D'APPOLONIA CONSULTING ENGINEERS

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PITTSBURGH, PA. 15235

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

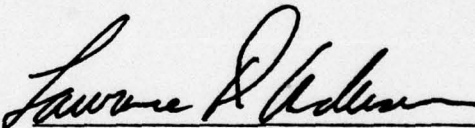
NAME OF DAM: Sugar Run Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Westmoreland
STREAM: Unnamed tributary of Conemaugh River (Little Sugar Run)
DATE OF INSPECTION: April 26 and May 4, 1978

ASSESSMENT: Based on the evaluation of the conditions as they existed on the dates of inspection, as revealed by visual observations, and the review of available information, the condition of Sugar Run Dam is assessed to require further investigation to determine its structural stability.

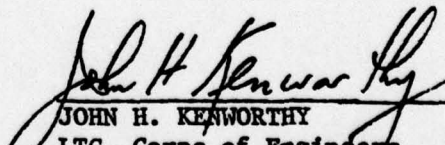
Field observations show that extensive wet and seepage areas exist at the toe of the embankment. Comparison of the estimated seepage quantities with the reported past seepage amount suggests that the seepage quantity may be increasing. The presence of wet areas and slope irregularities on the downstream face of the dam also suggest potential instability of the embankment.

Based on the recommended spillway evaluation procedure, the capacity of the spillway was found to be adequate to pass the recommended flow.




Lawrence D. Andersen, P.E.
Vice President

APPROVED BY:


JOHN H. KENWORTHY
LTC, Corps of Engineers
Acting District Engineer
DATE: 14 June 1978

SUGAR RUN DAM
NDS I.D. NO. 460
APRIL 26, 1978



Upstream Face



Downstream Face

PHASE I
NATIONAL DAM INSPECTION PROGRAM
SUGAR RUN DAM
NDS I.D. NO. 460

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 hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. The dam consists of an earth embankment 900 feet long, with a maximum height of 60 feet from the downstream toe. The combined primary and emergency spillway is located on the left abutment (looking downstream). The flow through the chute spillway is controlled by a broad-crested weir 12 feet wide at an elevation four feet below the dam crest. The spillway chute is a 4-foot-deep rectangular channel with masonry walls and concrete bottom which discharges into a semicircular plunge pool. The outlet works consist of a 24-inch cast-iron "blow-off" pipe located 250 feet from the left abutment. Discharge through the pipe is controlled by a valve located at the toe of the dam. The "blow-off" pipe is the emergency drawdown facility for the dam. The dam impounds 380 acre-feet of water at normal pool level.

b. Location. Sugar Run Dam is located (Plate 1) at the headwaters of an unnamed tributary to the Conemaugh River, locally known as Little Sugar Run, three miles east of New Florence in St. Clair Township, Westmoreland County, Pennsylvania. The impounded reservoir serves as a domestic water supply source. It feeds a small distribution reservoir (approximately 15 acre-feet storage capacity) located 1/2 mile downstream from the dam.

Sugar Run Dam, with a surface area of 22 acres, has a small watershed area of 0.3 square mile. The reservoir also receives flow diverted through two 30-inch cast-iron pipelines from two adjacent streams: the main branch of Little Sugar Run and Poplar Run (Plate 1).

Downstream from the dam, Little Sugar Run flows through a steep and narrow wooded valley over a distance of about one mile where the stream valley widens and merges with the Conemaugh River valley. The stream flows under State Route 711 (Photograph 15) and the Penn Central Railroad tracks (Photograph 16) 500 feet upstream from its confluence with the Conemaugh River.

The railroad embankment, estimated to be 37 feet above the streambed and approximately 15 feet above the level of State Route 711, will constitute a major constriction to the flow in the event of failure of the dam, and backwater may cause flooding in the nearby community of Robb. The village of Robb contains approximately 20 dwellings.

Because the storage capacity of the distribution reservoir is very small compared to the main reservoir, the flood flow due to failure of Sugar Run Dam would not be significantly increased by the subsequent failure of the distribution reservoir dam.

c. Size Classification. Intermediate (based on a 60-foot height).

d. Hazard Classification. Significant.

e. Ownership. High Ridge Water Supply Company.

f. Purpose of Dam. Water supply.

g. Design and Construction History. The dam was designed and constructed by the American Pipe and Manufacturing Company and was completed in 1907.

h. Normal Operating Procedure. The reservoir is normally maintained at Elevation 1612.5, the level of the uncontrolled spillway, leaving four feet of freeboard to the top of the dam at Elevation 1616.5. The inflow occurring when the reservoir is at or above the spillway crest level is discharged through the spillway. The supply water is taken through the 20-inch-diameter supply line controlled from the valve chamber located at the downstream toe of the dam.

1.3 Pertinent Data

a. Drainage Area - 0.3 square mile.

b. Discharge at Dam Site

Maximum known flood at dam site - Unknown.

Warm water outlet at pool elevation - N/A.

Diversion tunnel low pool outlet at pool elevation - N/A.

Gated spillway capacity at pool elevation - N/A.

Gated spillway capacity at maximum pool elevation - N/A.
Ungated spillway capacity at maximum pool elevation -
240 cfs.
Total spillway capacity at maximum pool elevation - 240 cfs.

c. Elevation (USGS Datum)

Top of dam - 1616.5 feet.
Maximum pool-design surcharge - Unknown.
Full flood control pool - N/A.
Recreation pool - N/A.
Spillway crest - 1612.5 feet.
Upstream portal invert diversion tunnel - N/A.
Downstream portal invert diversion tunnel - N/A.
Streambed at center line of dam - 1554 feet.
Maximum tailwater - 1554 (estimated).

d. Reservoir

Length of maximum pool - 1600 feet.
Length of recreation pool - N/A.
Length of flood control pool - N/A.

e. Storage

Recreation pool (normal pool) - 380 acre-feet.
Flood control pool - N/A.
Design surcharge - 87 acre-feet.
Top of dam - 467 acre-feet.

f. Reservoir Surface

Top of dam - 22+ acres.
Maximum pool - 22+ acres.
Flood control pool - N/A.
Recreation pool - N/A.
Spillway crest - 22 acres.

g. Dam

Type - Earth fill.
Length - 900 feet.
Height - 60 feet.
Top width - 20 feet.
Side slopes - 2H:1V both faces.
Zoning - N/A.
Impervious core - N/A.
Cutoff - Yes.
Grout curtain - N/A.

h. Diversion and Regulating Tunnel

Type - 24-inch cast-iron pipe.

Length - 312 feet (as designed).

Closure - N/A.

Access - N/A.

Regulating facilities - 24-inch-diameter valve.

i. Spillway

Type - Broad-crested weir and chute.

Length of weir - 12 feet.

Crest elevation - 1612.5 feet.

Gates - N/A.

Upstream channel - Lake.

Downstream channel - Natural stream.

SECTION 2
ENGINEERING DATA

2.1 Design

a. Data Available

(1) Hydrology and Hydraulics. A state inspection report entitled, Report Upon the Sugar Run Dam, dated October 23, 1914, summarized the available hydrology and hydraulic information.

(2) Embankment. The 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 Features. Structural design data for the appurtenant structures were not available.

b. Design Features

(1) Embankment. A review of design drawings and the correspondence files for the dam show the following main features of the project:

- (a) As designed, the dam is essentially a homogeneous earth embankment with an upstream concrete lining. Two different zones were identified on the drawings (Plate 2): "selected material rolled" in the upstream half of the embankment, and "material rolled" in the downstream half of the embankment.
- (b) The embankment was designed to have two to one (2:1) (horizontal to vertical) slopes on both the upstream and downstream faces (Plate 2). The downstream face and the crest were protected by 12-inch hand-placed riprap with the surface broken to 3-inch size. The upstream face was lined with a 12-inch-thick concrete slab starting 4 feet below the normal pool level (Elevation 1608.5) and extending down to the toe to join a 2-foot-thick concrete cutoff wall. Above the concrete slab, the upstream face was protected by an 18-inch-thick rubble-masonry slab.

- (c) In the 1914 inspection report, the cutoff wall was described as follows:

"The writer's understanding is that this cutoff wall, with its clay puddle backing, was carried down to a maximum depth of 25 to 30 feet, and in all cases to impervious material being extended into each hillside at the end of the dam to that point where the impervious material is on the same elevation as the crest of the dam."

- (d) In the same reference, the subsurface investigation of the dam was described as follows:

"Prior to the construction of the dam, test pits were sunk. . . The test pits indicated strata of shale and hard gray sandstone. Slight traces of coal were also found. Before placing the embankments the loose boulders and vegetable matter were removed from the dam site. At the upstream toe of the dam a concrete cut-off wall, 2 feet thick, was carried down to impervious material. The cut-off wall is backed with a clay puddle wall, 6 feet thick."

(2) Appurtenant Structures. Appurtenant structures for the dam consist of an uncontrolled spillway and outlet works. The spillway structures consist of a broad-crested weir and a discharge channel terminating at a plunge pool. The outlet works include a 24-inch cast-iron pipe embedded in a 3-foot, 6-inch square concrete casing extending through the embankment at the base elevation. Invert elevations were not noted on the drawings.

c. Design Data

(1) Hydrology and Hydraulics. No engineering data are available related to hydrology and hydraulics.

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

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

2.2 Construction. Very limited information was found concerning the construction of the dam. The 1914 inspection report stated that the embankment was said to have been placed in thin layers sprinkled

and rolled with a horse roller. It is also reported that the embankment foundation was cleared of boulders and vegetation prior to construction.

2.3 Operation. There are no formal operating records available for this dam. As designed, the dam serves as a storage reservoir for the small distribution reservoir 1/2 mile downstream. The water from the main reservoir was designed to discharge through a 24-inch outlet pipe, controlled by a valve located in a valve chamber at the downstream toe of the dam and flow into the distribution reservoir through an open channel.

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

2.5 Evaluation

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

b. Adequacy

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

(2) Embankment. In view of the age of the dam, completed in 1907, it is clear that the design approach and construction techniques are not likely to be in conformance with currently accepted engineering practices. Design documents lack such considerations as embankment slope stability and seepage analysis. However, the design incorporated such basic components as a cutoff trench through the foundation extending to impervious layers, a concrete upstream slope lining (assumed to have been designed as an impervious lining to control seepage and to provide erosion protection), and riprap protection of the crest and the downstream slope.

(3) Appurtenant Structures. The available design drawings do not include sufficient details to assess the adequacy of the design of the appurtenant structures. However, in general, no significant design deficiencies were found that would affect the overall performance of the structures.

c. Operating Records. No information is available on the operation of the dam.

d. Post-Construction Changes. Available information indicates that no post-construction changes have been made.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of Sugar Run Dam consisted of:

1. Visual inspection of the embankment, abutments, and the embankment toe.
2. Visual examination of the 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 3 and in the photographs in Appendix C.

b. Dam. 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.

1. Most of the downstream toe area was wet and swampy (Photographs 9, 10, and 11). Two main seepage areas were observed. One was located to the left of the center of the embankment and was being fed by water discharging directly from the toe of the dam (Photograph 11) and by discharge from two 4-inch pipes whose source is not known. The second seepage area was to the right of the center line of the dam and was being fed by a swampy area near the toe. Both seeps were collected in a single channel and discharged through a sharp-crested weir into the stream. The weir was not functional at the time of inspection. Total seepage flow at the weir was estimated to be 15 to 20 gallons per minute. The

seeps were clear; no indication of boiling was observed. However, all seepage areas were saturated with ferric-hydroxide (yellow boy).

2. At midheight of the embankment, the downstream face was observed to be moist (an indication of the phreatic surface intercepting the downstream slope).
3. An area approximately 10 feet high by 50 feet long at about midheight of the downstream slope was measured to have a slope of approximately 1.5 to 1, which is steeper than the design slope of 2 to 1. Various other slope irregularities and bulges were also noted. Those irregularities correspond to the elevation of the wet conditions observed on the embankment slopes.
4. Riprap on the crest and the downstream face was observed to have weathered substantially, but the extent of riprap weathering is not considered to be significant. No erosion problems were observed.

c. Appurtenant Structures. The spillway crest, channel, and plunge pool were examined for deterioration or other signs of distress and obstructions that would limit flow. These structures were found to be in good condition.

The plunge pool was examined and no major scouring or erosion was observed (Photograph 4).

The downstream end of the outlet pipe was examined and was found to be in good condition.

d. Reservoir Area. The watershed is predominantly covered with woodlands and infiltration capacity is estimated to be good. There appeared to be no major land clearing activities or other operations that would significantly increase the runoff rate of the drainage basin.

The shorelines are not considered 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. Little Sugar Run, for most of its course, flows through a rocky, steep streambed. The bridges over the stream are shown in Photographs 15 and 16. Sketches of the bridges are included in Appendix A. Further description of the downstream channel is included in Section 1.2.

3.2 Evaluation. The most significant condition at the dam appears to be the seepage noted both on the embankment face and at the toe and the associated accumulation of "yellow boy" in the seepage areas.

A review of the previous inspection reports revealed that the seepage condition was first reported in 1919, and the quantity was estimated to be in the range of 5000 to 10,000 gallons per day (3.5 to 7.0 gallons per minute). Although none of the previous inspections between 1919 and 1971 report any significant change in the total seepage, the seepage at the time of this inspection was estimated to be somewhat higher (15 to 20 gpm) than reported in the past.

From the review of the regional site geology (Appendix E), two possible sources of the apparent acid mine drainage exist:

1. Seepage from the reservoir passing through the abutments at the top of a coal seam.
2. Seepage through the embankment if the embankment contains sulfur-rich shales.

In the first case, potential exists for the acid mine drainage to interact with calcareous sandstones, if present, possibly causing joint solutioning and subsequent development of piping. In the second case, the "yellow boy" can be deposited in the embankment in a zone where the phreatic surface fluctuates, thereby introducing zones of differing permeability and strength within the embankment which could adversely affect the stability of the embankment.

The presence of moist areas and various slope irregularities on the downstream slope also suggest possible instability of the embankment due to a high phreatic surface through the embankment.

SECTION 4 OPERATIONAL FEATURES

4.1 Procedures. Review of the design drawings and field observations indicates that there are no formal procedures for operating the dam. The only operational feature of the dam which may affect the safety of the dam is the outlet pipe valve, in case it is required to lower the reservoir.

The clearing of debris from the spillway as 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 maintenance condition of the embankment and the spillway appears satisfactory. However, the sharp-crested weir installed to measure the amount of seepage from the dam was not functional. The water was flowing around and under the weir.

4.3 Maintenance of Operating Facilities. The blow-off pipe was operated by water company personnel and was observed to be functional.

4.4 Warning System in Effect. There is no formal warning system in effect. The dam tender resides about 4 miles south at the site of Tubmill Dam. No communication facilities are available at the Sugar Run site.

4.5 Evaluation. Although the maintenance condition of the embankment and the spillway is considered to be satisfactory, it was observed that no attempt is being made to monitor the various seeps at the toe level. An existing weir installed to measure total seepage from the toe area was not functional. The dam is not considered to be readily accessible under all weather conditions. Due to the presence of tall trees along the two narrow access roads to the dam, the potential exists for roadblocks that may prevent the inspection of the dam or emergency action during severe weather conditions.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Sugar Run Dam has a watershed area of 0.3 square mile and impounds a reservoir with a surface area of 22 acres. A 12-foot-wide by 4-foot-deep chute spillway constitutes both the primary and emergency spillway for the impoundment. Flow through the spillway is controlled by a broad-crested weir. The spillway has a maximum discharge capacity of 240 cubic feet per second (cfs).

b. Experience Data. As previously stated, Sugar Run Dam is classified as an "intermediate" size dam in the "significant" hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass half the probable maximum flood (PMF).

The adequacy of the spillway was analyzed based on the simplified procedure developed by the Baltimore District, Corps of Engineers. Based on this analysis procedure, it was determined that the PMF inflow hydrograph will have peak flow of 670 cfs, including flow from diversion pipes, and a total volume of approximately 681 acre-feet. Both these values are greater than the spillway capacity of 240 cfs and the dam's flood storage volume of 87.2 acre-feet. Therefore, the spillway is not capable of passing the PMF flow without overtopping. Further analysis, according to the procedure, indicated that the spillway can pass a maximum flow of one half the PMF without overtopping.

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

d. Overtopping Potential. As stated above, the dam will be overtopped during a flood whose magnitude exceeds about 50 percent PMF.

e. Spillway Adequacy. Because the spillway can pass the recommended flow of half the PMF, it is classified to be adequate.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, the field observations revealed various signs of distress that may affect the stability of the dam.

The seepage observed immediately downstream of the dam toe and the apparent high level of saturation (or high phreatic surface) within the embankment create two concerns about the stability of the embankment. The most obvious is the potential instability of the embankment. This concern is supported by the apparent slumping of a portion of the downstream slope at the apparent phreatic level. Less obvious is the potential for instability or piping of the foundation if the observed ferric-hydroxide deposits are due to seepage along or through a coal seam. The possibility exists for the acidic drainage to react with calcareous sandstone, if present over the coal seam, to create solutioning and cause piping or the development of a weak zone in the foundation. Further investigation is required to evaluate these problems.

(2) Appurtenant Structures. Structural performance of the appurtenant structures are considered to be satisfactory.

b. Design and Construction Data

(1) Embankment. The dam was designed prior to 1906 when very limited understanding of the geotechnical behavior of earth retention structures existed. Consequently, available design and construction information does not provide any quantitative data to aid the assessment of stability.

(2) Appurtenant Structures. The review of the design drawings indicates that the drainpipe of the dam is controlled by a valve located at the downstream toe of the dam; therefore, it is constantly under pressure. The design drawings show that the pipe is encased in a 3-foot by 3-foot concrete block for its entire length through 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 modifications to the original design that would affect the structural stability of the dam.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety. The visual observations and review of available information indicate that Sugar Run Dam requires further investigation. The field observations revealed various conditions, such as seepage which may be increasing and embankment slope irregularities which suggest potential slope instability.

The capacity of the spillway was found to be adequate (about 50 percent PMF) relative to the recommended spillway capacity criteria.

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

c. Urgency. Further investigation of the dam should be implemented immediately. The other recommendations should be considered as soon as practicable or on a continuing basis.

d. Necessity for Further Investigation. The condition of the dam is considered to require further investigation.

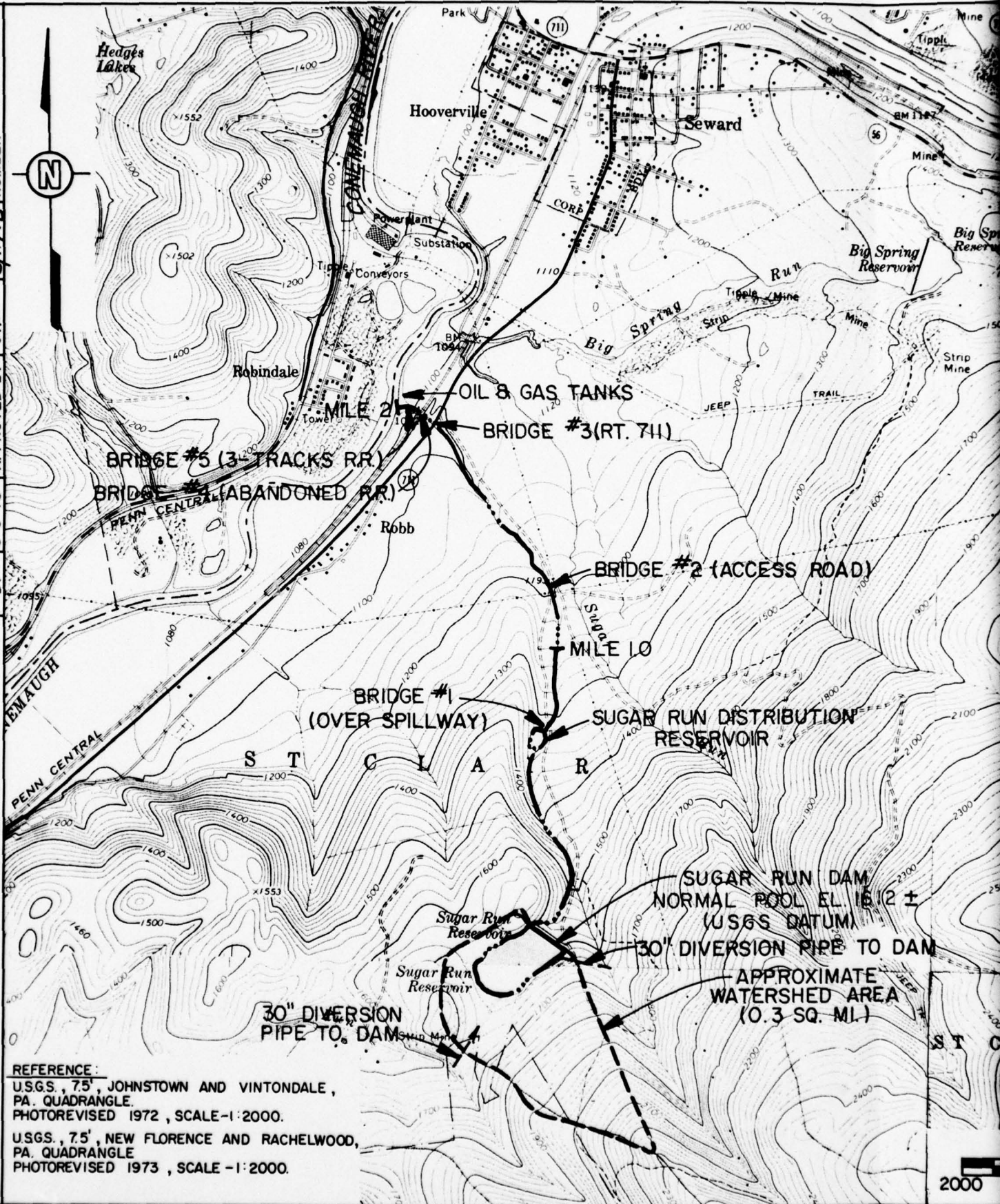
7.2 Recommendations/Remedial Measures

1. The stability of the dam should be evaluated further in view of the following conditions:
(a) the presence of slope irregularities and wet areas on the downstream slope, and (b) numerous seeps at the toe level containing "yellow boy."
2. Since the adequacy of the concrete casing around the pipes through the embankment could not be reliably assessed, the owner should evaluate the structural integrity of the pipes and the casing and investigate the need for placing upstream controls on these pipes.
3. The owner be advised to repair the sharp-crested weir which was constructed to measure the seepage from the dam and keep seepage records to aid in further investigation and future evaluations of the dam.

4. It is recommended that the owner be advised that the dam and appurtenant structures should be inspected regularly by the dam tender and any unusual conditions should be immediately reported to the appropriate authorities.

PLATES

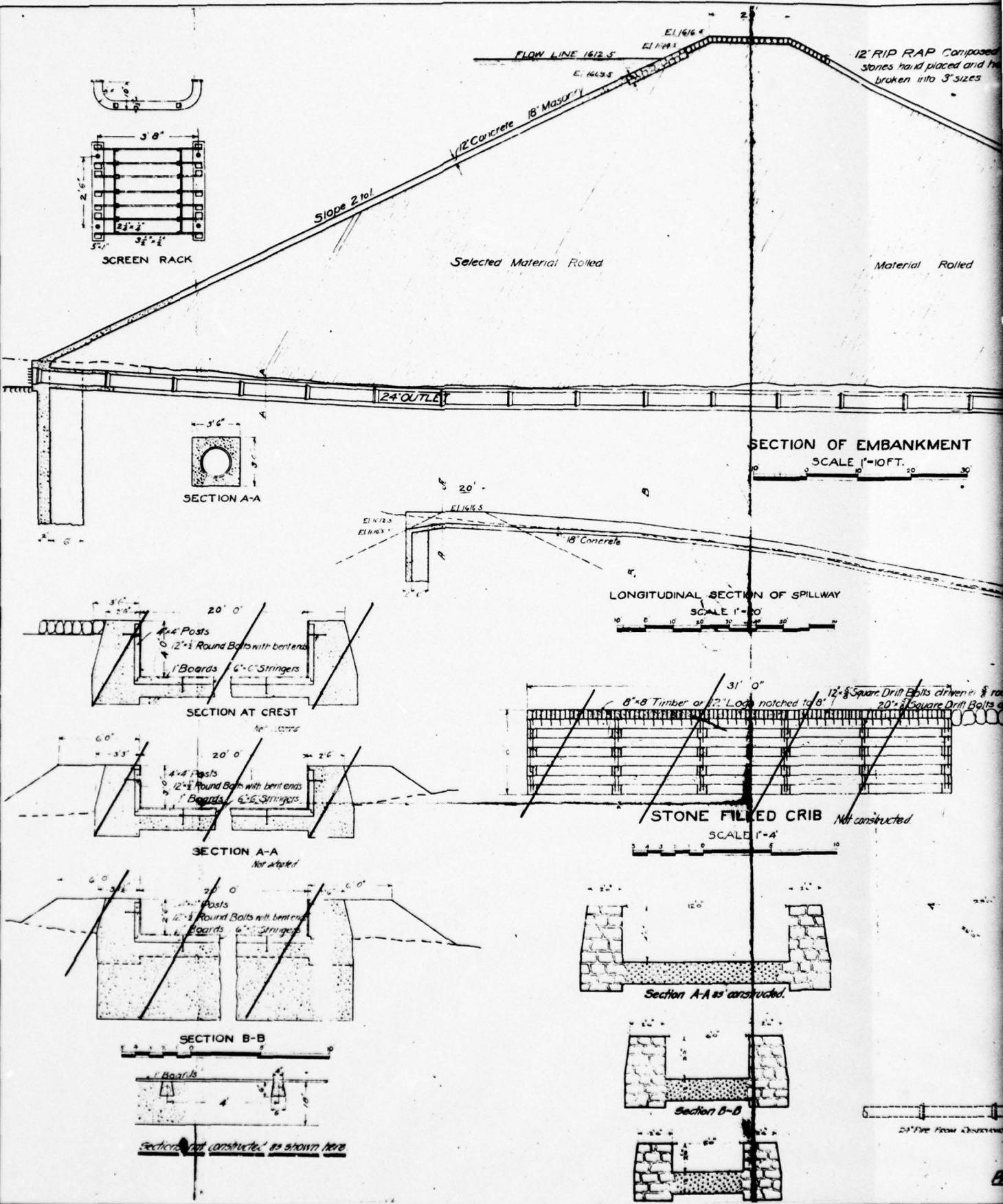
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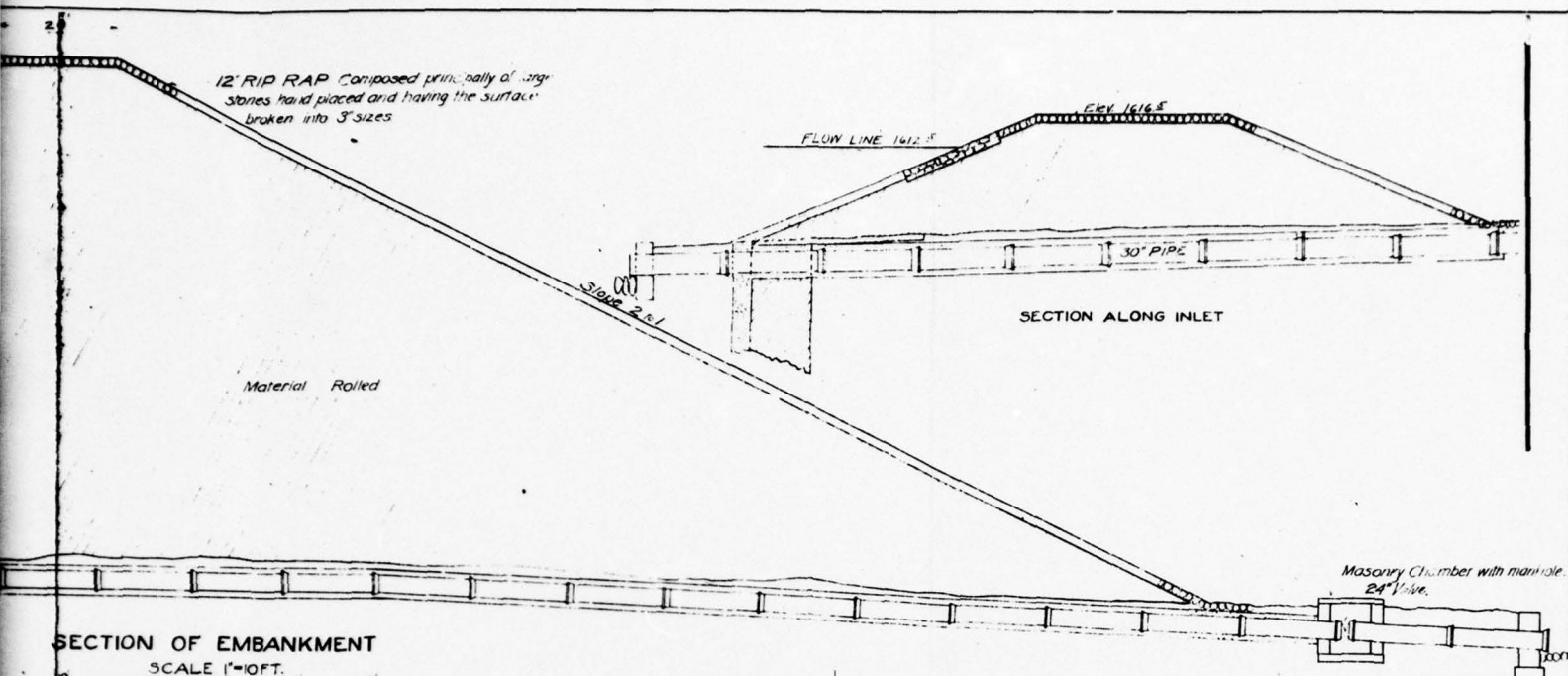


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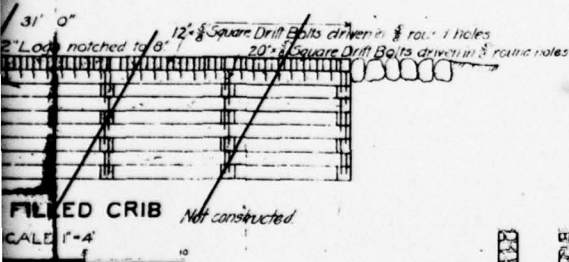
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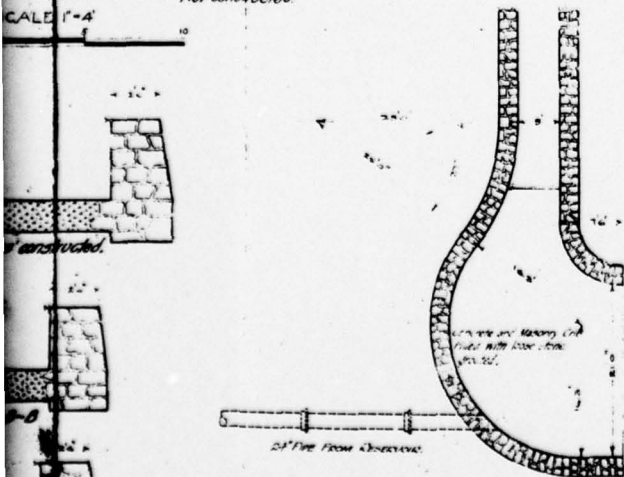


SECTION OF EMBANKMENT
SCALE 1"=10 FT.

SECTION OF SPILLWAY
SCALE 1"=10'



FILLED CRIB
SCALE 1"=4'



Plan of Masonry Crib as constructed.

HIGH RIDGE WATER SUPPLY CO.
DETAILS OF DAM & SPILLWAY
ON LITTLE SUGAR RUN
STORAGE RESERVOIR
CAPACITY 124,200,000 GALS.
ST. CLAIR TWP., WESTMORELAND CO., PA.
1906.

PLATE 2

D'APPOLONIA

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BE
JHP

CHECKED BY
APPROVED BY

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5-1-78

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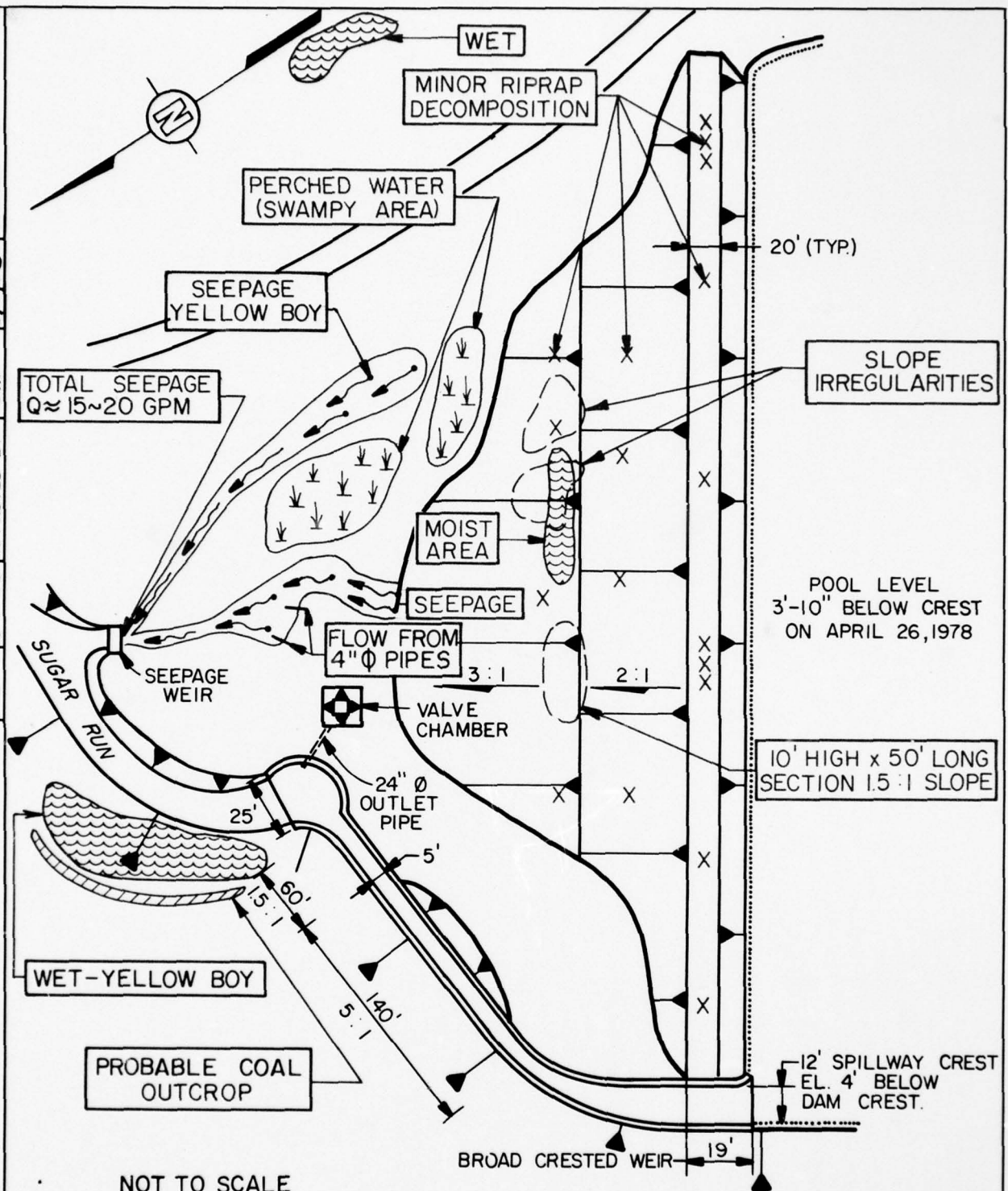


PLATE 3

SUGAR RUN DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE : APRIL 26, 1978

D'APPOLONIA

APPENDIX A
CHECKLIST, VISUAL INSPECTION
PHASE I

CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM SUGAR RUN DAM COUNTY WESTMORELAND STATE PA. ID# NDS: 460 DER: 65-3

TYPE OF DAM EARTH FILL HAZARD CATEGORY _____

DATE(S) INSPECTION 4/26/78 WEATHER PT. CLOUDY TEMPERATURE 50's

POOL ELEVATION AT TIME OF INSPECTION ~1612 M.S.L. TAILWATER AT TIME OF INSPECTION ~1552 M.S.L.

INSPECTION PERSONNEL:

BILGIN EREL REVIEW INSPECTION BY: ELIO D'APOLONIA.

WAH-TAK CHAN (5-4-78) LAWRENCE ANDERSEN

JAMES POELLOT

BILGIN EREL RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

NAME OF DAM SUGAR RUN DAM

ID# NDS: 460 DER: GS-3

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	AN ISOLATED AREA APPROXIMATELY 10 FT BY 50 FT ON THE DOWNSTREAM SLOPE, IS ON A STEEPER SLOPE THAN THE REST OF THE DOWNSTREAM SLOPE (SEE PLATE - 3)	THE OBSERVED SLOPE IRREGULARITIES ARE CONSIDERED TO BE SIGNS OF SLOPE MOVEMENT.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	NO PERCEIVABLE MISALIGNMENT.	
RIPRAP FAILURES	SANDSTONE RIPRAP ON CREST AND DOWNSTREAM SLOPE. SOME IS <u>DECOMPOSING</u>	CONSIDERED ADEQUATE FOR EROSION PROTECTION.

VISUAL INSPECTION
 PHASE I
 EMBANKMENT

NAME OF DAM SUGAR RUN DAM
 ID# NDS:460 DER: GS-3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	NO VISUAL SIGNS OF DISTRESS, OR SEEPAGE	
ANY NOTICEABLE SEEPAGE	① MOIST AREA ON EMBANKMENT ② SEEPAGE ALONG THE TOE ③ SWAMPY AREAS AND SEEPAGE BEYOND THE TOE. (SEE PLATE-3 FOR LOCATION AND EXTENT OF SEEPAGE)	TOTAL SEEPAGE IS ESTIMATED TO BE SEVERAL G.P.M. NOT AN IMMINENT HAZARD. FUTURE CLOSE MONITORING <u>RECOMMENDED</u> .
STAGE GAGE AND RECORDER	NONE	
DRAINS	NONE FOUND.	
OTHERS	ALL SEEPAGE AREAS SATURATED WITH "YELLOW BOY".	SOURCE OF THIS ACID MINE DRAINAGE SHOULD BE INVESTIGATED.

VISUAL INSPECTION
PHASE I
CONCRETE/MASONRY DAMS

NAME OF DAM SUGAR RUN DAM
ID# NDS:460 DER:CS-3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	(EARTHFILL 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 SUGAR RUN DAM
ID# NDS:460 DER:GS-3

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 SUGAR RUN DAM
ID# NDS: 460, DER: 65-3

VISUAL EXAMINATION OF CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	OUTLET PIPE 24" ϕ CAST IRON - ONLY OUTLET END VISIBLE.	
INTAKE STRUCTURE	SUBMERGED NOT VISIBLE.	
OUTLET STRUCTURE	OUTLET PIPE DISCHARGES INTO UNGATED SPILLWAY PLUNGE POOL.	
OUTLET CHANNEL	NATURAL STREAM BED. SOME FALLEN TREES.	
EMERGENCY GATE	"BLOW-OFF" VALVE WAS OPERATED BY WATER COMPANY PERSONNEL. OBSERVED TO BE FUNCTIONAL.	

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

NAME OF DAM SUGAR RUN DAM
ID# NDS: 460 DER: 65-3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	BROAD CRESTED WEIR . GOOD CONDITION CONTROL SECTION 4 FT BELOW DAM CREST.	
APPROACH CHANNEL	FREE OF DEBRIS . GOOD CONDITION .	
DISCHARGE CHANNEL	MASONARY SIDE WALLS , WITH CONCRETE FLOOR . GOOD CONDITION .	
BRIDGE AND PIERS	NONE .	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

NAME OF DAM SUGAR RUN DAM
ID# NDS:460 DER: GS-3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	(NO GATED SPILLWAY) ∴ 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		NAME OF DAM <u>SUGAR RUN DAM</u> ID# <u>NDS:460, DER: 65-3</u>	
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS	
MONUMENTATION/SURVEYS	NONE FOUND.		
OBSERVATION WELLS	NONE FOUND		
WEIRS	A SHARP CRESTED WEIR, INSTALLED TO MEASURE SEEPAGE FLOW FROM THE DAM. APPROXIMATELY 200 FT DOWNSTREAM FROM THE TOE. NOT FUNCTIONAL.	REPAIR IS RECOMMENDED.	
PIEZOMETERS	NONE FOUND		
OTHER	NONE FOUND.		

VISUAL INSPECTION
 PHASE I
 RESERVOIR

NAME OF DAM SUGAR RUN DAM
 ID# NDS:460, DER: 65-3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	GENTLE SLOPES , WOODED .	
SEDIMENTATION	LAKE IS CLEAR . NO INDICATION OF UNUSUAL RATE OF SEDIMENTATION .	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

NAME OF DAM SUGAR RUN DAM
ID# NDS: 460, DER: 65-3

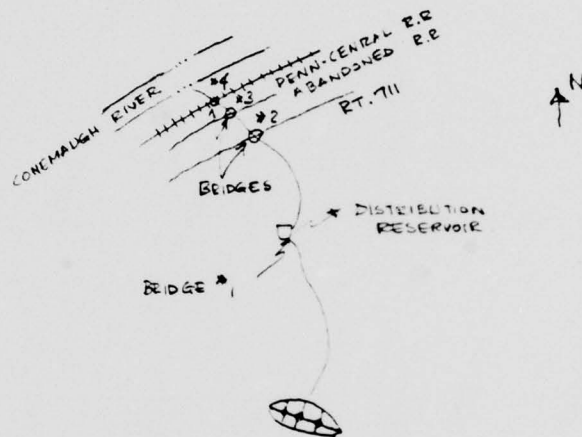
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	TYPICAL MOUNTAIN STREAM CHANNEL OCCASIONAL FALLEN TREES.	
SLOPES	ROCKY NO SIGNIFICANT EROSION	
APPROXIMATE NUMBER OF HOMES AND POPULATION	NO HOMES ON THE FLOOD PLAIN. STREAM CROSSES A STATE ROUTE. (RT. 711). HOWEVER, BACKWATER FROM BRIDGE ON ROUTE 711, R.R. MAY FLOOD VILLAGE OF ROBB. (ABOUT 20 HOMES)	

D'APOLONIA

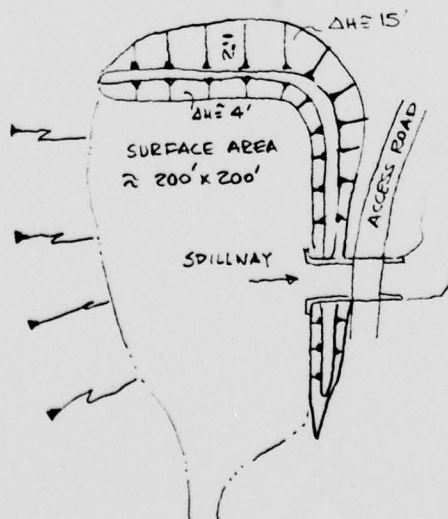
CONSULTING ENGINEERS, INC

By BE Date 4-26-78 Subject SUGAR RUN DAM NDS ID: 460 Sheet No. 1 of 2
 Chkd. By WTC Date 4-26-78 FIELD INSPECTION SKETCH Proj. No. 75-114-04

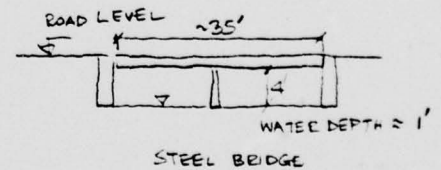
STREAM CROSS SECTIONS & BRIDGE LOCATIONS:



DISTRIBUTION RESERVOIR PLAN



SPILLWAY X-SECTION
 (BRIDGE #1)



DIAPOLONIA

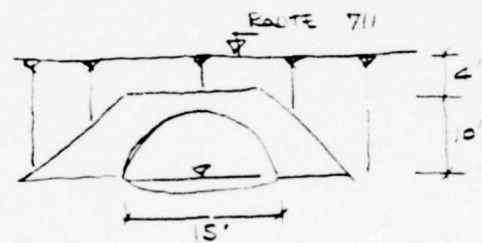
CONSULTING ENGINEERS, INC.

By PE Date 4-26-78 Subject SUGAR EUN DAN NDC ID: 463 Sheet No. 2 of 2
 Chkd. By WTC Date 4-26-78 Proj. No. 73-114-04

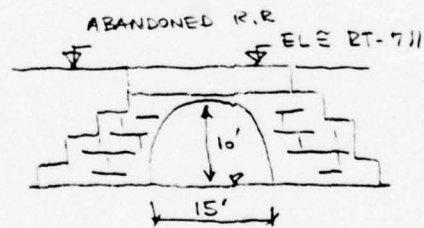
BRIDGE # 2
 (CMP. CULVERT)
 4' x 8'



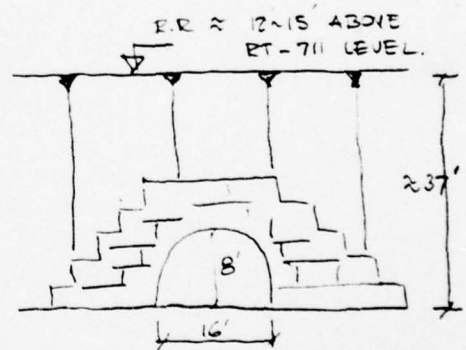
BRIDGE # 3



BRIDGE # 4



BRIDGE # 5



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

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM SUGAR RUN DAM
ID# NDS:460, DER:65-3

ITEM	REMARKS
AS-BUILT DRAWINGS	NOT AVAILABLE .
REGIONAL VICINITY MAP	SEE PLATE 1
CONSTRUCTION HISTORY	NOT AVAILABLE - LIMITED INFORMATION IS GIVEN IN A STATE REPORT DATED, OCT 23, 1914.
TYPICAL SECTIONS OF DAM	SEE PLATE 2
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	} SEE PLATE - 2 NOT AVAILABLE

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM SUGAR RUN DAM
ID# NDS: 460, DER: 65-3

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NOT AVAILABLE.
DESIGN REPORTS	NONE FOUND
GEOLOGY REPORTS	NONE FOUND.
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 SUGAR RUN DAM
ID# NDS:460, DER:CS-3

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	NONE FOUND.
BORROW SOURCES	UNKNOWN
MONITORING SYSTEMS	NONE
MODIFICATIONS	NONE
HIGH POOL RECORDS	NOT AVAILABLE.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM SUGAR EUN DAM
ID# NDS : 460, DER: 65-3

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE FOUND OTHER THAN STATE INSPECTION REPORTS ON FOLLOWING YEARS ; 1914, 1919, 1923, 1927, 1930, 1933, 1936, 1948, 1964, 1974
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	NONE REPORTED. (THE DAM WAS INSPECTED ON MAY 14, 1936 SUBSEQUENT TO RECENT FLOODS AT THE TIME, NO DAMAGE WAS REPORTED). STARTING FROM 1919 ALL INSPECTION REPORTS REPORTED SEEPAGE AT THE TOE.
MAINTENANCE OPERATION RECORDS	NOT AVAILABLE.
SPILLWAY PLAN SECTIONS DETAILS	SEE PLATE 2
OPERATING EQUIPMENT PLANS AND DETAILS	SEE PLATE 2 FOR PLAN, DETAILS NOT AVAILABLE.

NAME OF DAM SUGAR RUN DAM

ID# NDS: 460, DER: 65-3

CHECKLIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: WOODLAND (0.3 SQ. MILES)
ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 381 ACRE-FT @ EL 1612.5
ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): SAME AS ABOVE.
ELEVATION MAXIMUM DESIGN POOL: 1612.5' (USGS DATUM - AS DESIGNED)
ELEVATION TOP DAM: 1616.5' (USGS DATUM - AS DESIGNED)

CREST:

- a. Elevation 1616.5 FT.
- b. Type RIPRAP (APPROX 6" TO 8" STONES)
- c. Width 20 FT.
- d. Length 900 FT
- e. Location Spillover NO VISIBLE LOW SPOTS.
- f. Number and Type of Gates NONE.

OUTLET WORKS:

- a. Type 24" ϕ CAST IRON BLOW-OFF PIPE.
- b. Location THROUGH THE EMBANKMENT ~ 250 FT FROM LEFT
- c. Entrance Inverts UNKNOWN - ESTIMATED: 1555 FT (ABUTMENT)
- d. Exit Inverts UNKNOWN - ESTIMATED 1552 FT
- e. Emergency Draindown Facilities 24" ϕ BLOW-OFF PIPE

HYDROMETEOROLOGICAL GAGES:

- a. Type NONE
- b. Location N/A
- c. Records N/A.

MAXIMUM NONDAMAGING DISCHARGE: ~ 1500 CFS >> SPILLWAY CAPACITY
(240 CFS)

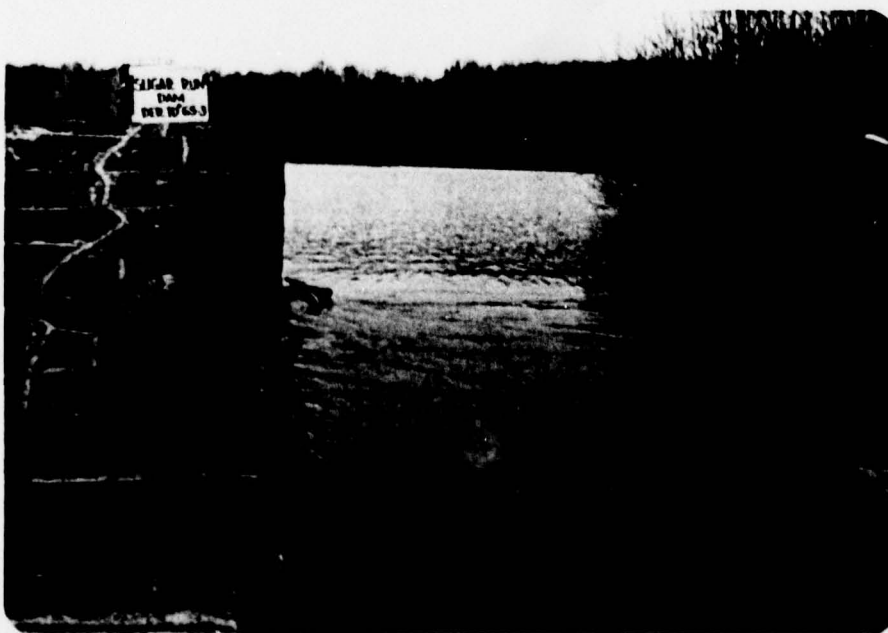
APPENDIX C
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
SUGAR RUN DAM
NDS I.D. NO. 460
APRIL 26, 1978

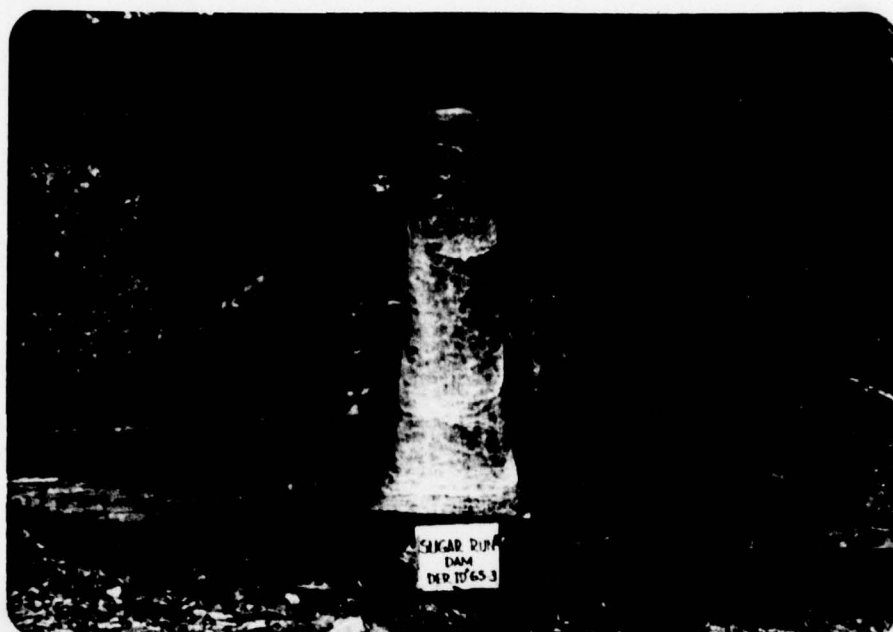
<u>PHOTOGRAPH NO.</u>	<u>DESCRIPTION</u>
1	Crest.
2	Spillway crest.
3	Spillway discharge channel.
4	Plunge pool.
5	Valve control chamber.
6	Blow-off pipe.
7	Moist area on embankment.
8	Decomposing riprap.
9	Seepage at the toe.
10	Seepage at toe (another view).
11	Seepage at the toe.
12	Sugar Run Distribution Reservoir (reservoir spillway at background).
13	Sugar Run Distribution Reservoir.
14	Culvert on access road to Sugar Run Dam.
15	Bridge on Route 711 (Bridge No. 3).
16	Bridge on abandoned railroad (Bridge No. 4). Bridge on Penn-Central Railroad in background (Bridge No. 5).



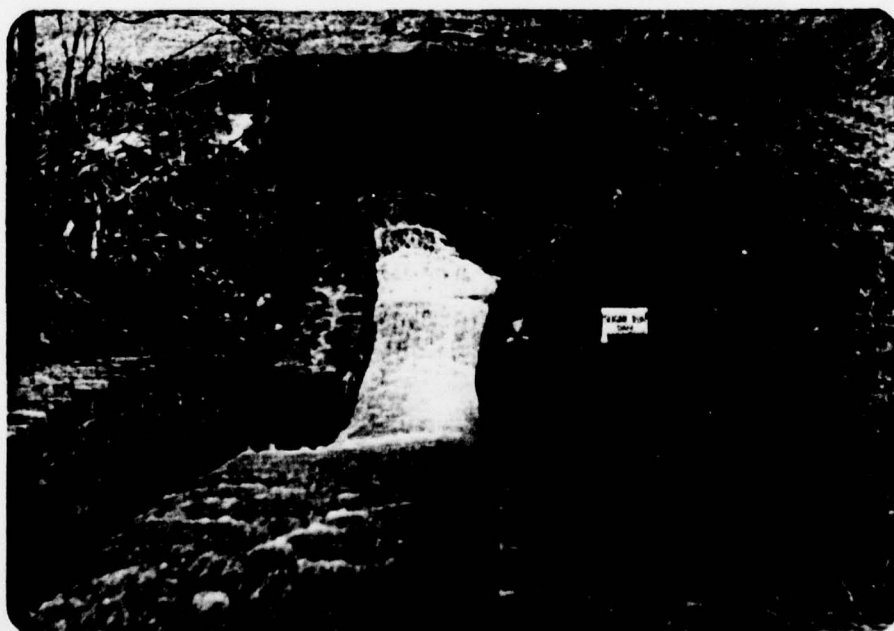
Photograph No. 1
Crest (looking east).



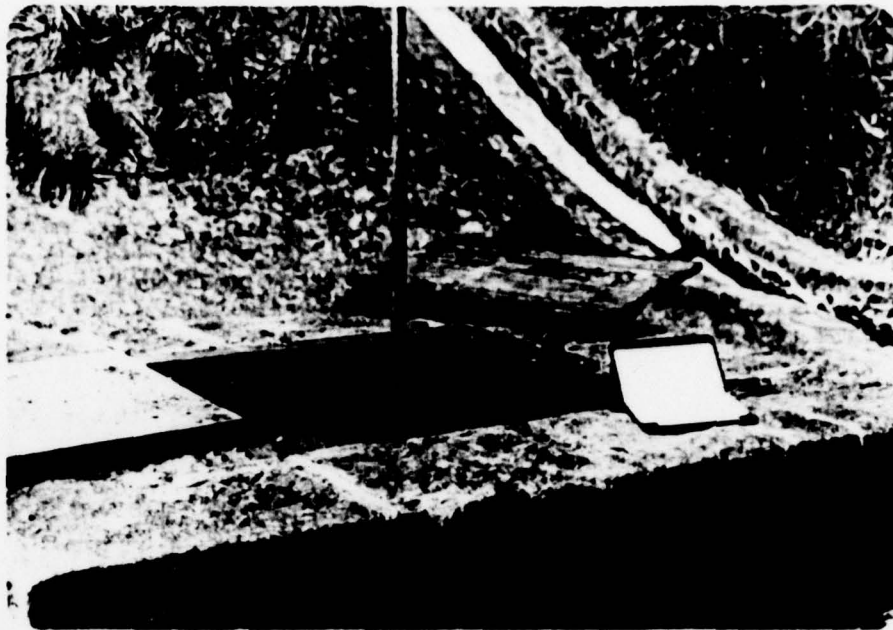
Photograph No. 2
Spillway crest.



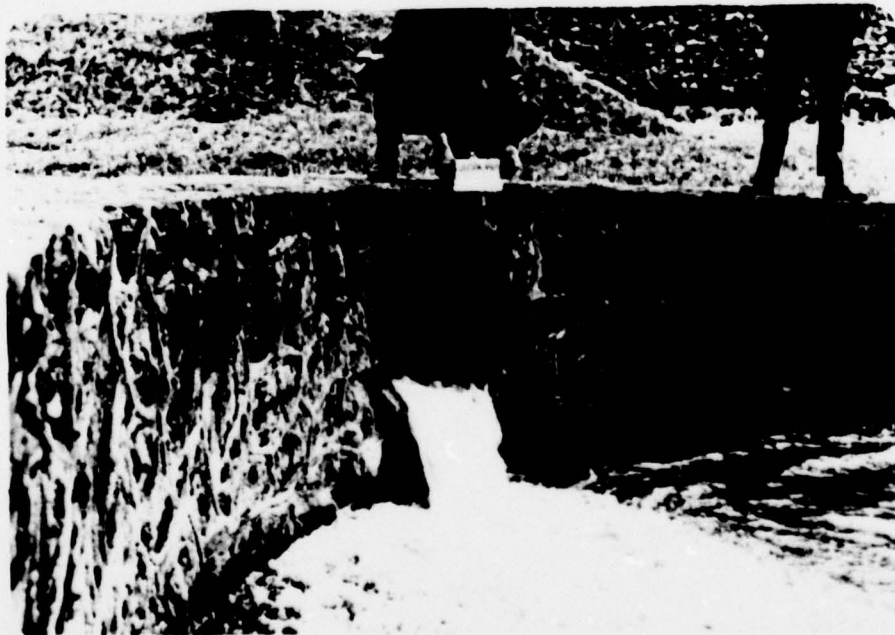
Photograph No. 3
Spillway discharge channel.



Photograph No. 4
Plunge pool.



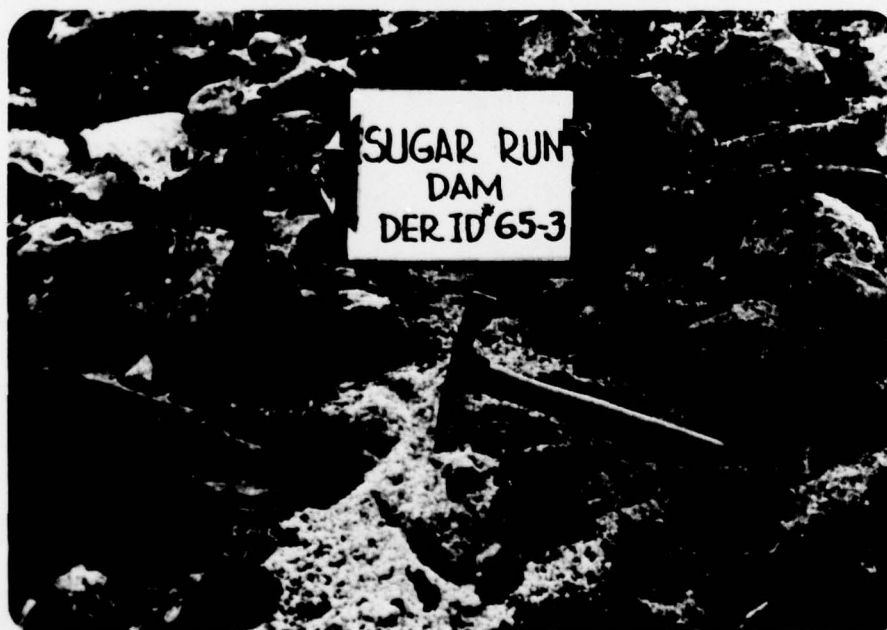
Photograph No. 5
Valve control chamber.



Photograph No. 6
Blow-off pipe.



Photograph No. 7
Moist area on embankment (see Plate 3).

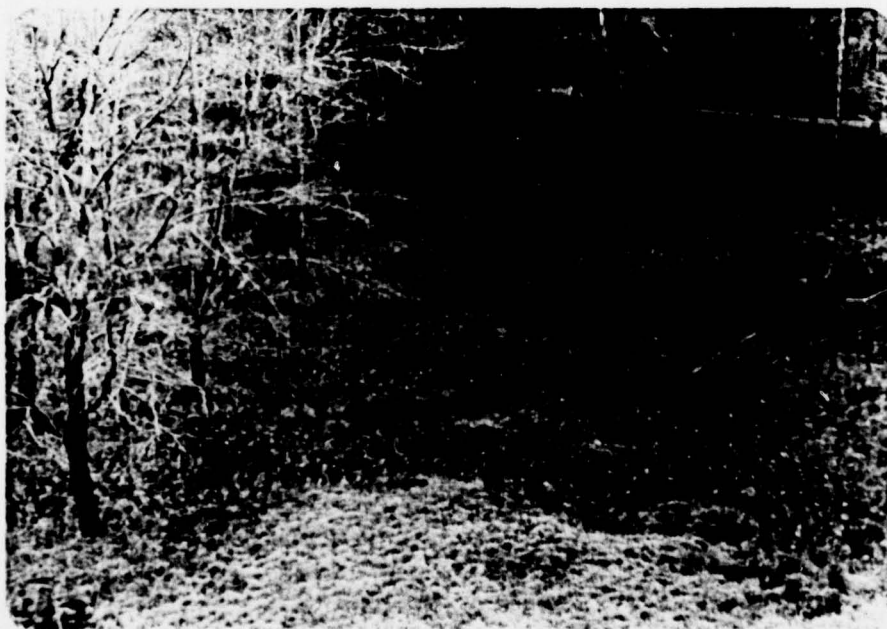


Photograph No. 8
Decomposing riprap.



Photograph No. 9

Seepage at the toe (to the right of center, see Plate 3).



Photograph No. 10

Seepage at toe (another view).



Photograph No. 11

Seepage at the toe (to the left of center, see Plate 3).



Photograph No. 12

Sugar Run Distribution Reservoir (reservoir spillway at background).



Photograph No. 13
Sugar Run Distribution Reservoir.



Photograph No. 14
Culvert on access road to Sugar Run Dam.



Photograph No. 15
 Bridge on Route 711 (Bridge No. 3).



Photograph No. 16
 Bridge on abandoned railroad (Bridge No. 4). Bridge on
 Penn-Central Railroad in background (Bridge No. 5).

APPENDIX D
CALCULATIONS

D'APPOLONIA

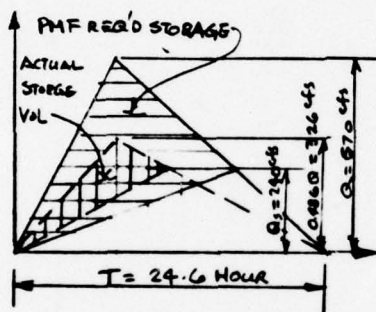
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1

By WTC Date 4/28/78 Subject SUGAR RUN DAM NDS ID #460 Sheet No. 1 of 3
Chkd. By BE Date 5-9-78 HYDROLOGY & HYDRAULIC Proj. No. TB-14-04

DAM : SUGAR RUN DAM, DER ID #65-3 NDS ID #460
WESTMORELAND COUNTY, ST. CLAIR TOWNSHIP, PENN
WATERSHED AREA, A: 0.3 SQ. MILE

INFLOW HYDROGRAPH : BASIN : OHIO RIVER BASIN. LITTLE SUGAR RUN OF CONEMAUGH RIVER



TOTAL TIME, $T_s = 24.6$ HOURS (ESTIMATED FROM PMF CHARTS)

PMF PEAK FLOW, $q = 1900$ cfs/mi²

PMF PEAK FLOW, $Q = ? \cdot A = 370$ cfs

PLUS TWO 30" DIVERSION PIPES = 100 cfs (ESTIMATED MAX.)

VOLUME OF INFLOW HYDROGRAPH

$$V_i = \frac{1}{2} T \times 3600 \times Q \quad \text{CF} \\ = 1800 T \times Q \times 10^{-6} \quad \text{MCF} \\ = 29.7 \quad \text{MCF}$$

SPILLWAY CAPACITY

TYPE : BOARD CRIST WEIR ; $C = 2.5$ (assumed)

LENGTH $L = 12$ FT

HEAD (MAX.) h , 4 FT (NORMAL POOL FREE BOARD)

$$Q_s = C L h^{1.5} \quad \text{cfs}$$

$$= 240 \quad \text{cfs}$$

RESERVOIR CAPACITY, $V_R = 21.8$ ACRES (NORMAL POOL AREA) \times 4' (NORMAL FREE BOARD)
 $= 87.2$ ACRES-FT $= 3.80$ MILLION CU. FT

REQ'D RESERVOIR CAPACITY = $\left(1 - \frac{\text{MAXI. SPILLWAY CAPACITY}}{\text{PMF PEAK FLOW}}\right)$ (VOLUME OF INFLOW)
TO STORE PMF

$$= \left(1 - \frac{Q_s}{Q}\right) (V_i) = \left(1 - \frac{240}{670}\right) (29.7 \text{ MCF})$$

$$= 19.1 \quad \text{MCF} > V_R = 3.80 \text{ MCF} \quad \text{NG}$$

DAI POLONIA

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2

By WTC Date 4/28/78 Subject SUGAR RUN DAM NDS ID # 460 Sheet No. 2 of 3
 Chkd. By BE Date 5-9-78 HYDROLOGY & HYDRAULIC Proj. No. 78-14-04

FOR 1/2 PMF

$$Q = \frac{670}{2} = 335 \text{ cfs}$$

$$V_i = 14.9 \times 10^6 \text{ cu ft}$$

$$\frac{\text{MAX. SPILLWAY FLOW}}{\text{PMF FLOW}} = 1 - \frac{\text{VOL of RESERVOIR}}{\text{VOL of INFLOW}}$$

$$= 1 - \frac{3.8 \times 10^6}{14.9 \times 10^6}$$

$$= 0.74$$

$$\begin{aligned} \text{MAX. SPILLWAY FLOW} &= 0.74 \times 335 \text{ cfs} \\ \text{@ 1/2 PMF} &= 248 \text{ cfs} \end{aligned}$$

$$Q_s = (2.5)(12)(H)^{1.5} = 248$$

$$H = 4.08 \approx 4'$$

PERCENT OF PMF WITHOUT OVERTOPPING

$$= \frac{(\frac{240}{670})(29.7 \times 10^6) + 3.8 \times 10^6}{29.7 \times 10^6} \times 100\% = 48.6\% \text{ PMF}$$

$$Q_s \approx 240 \text{ cfs}$$

D'APOLONIA

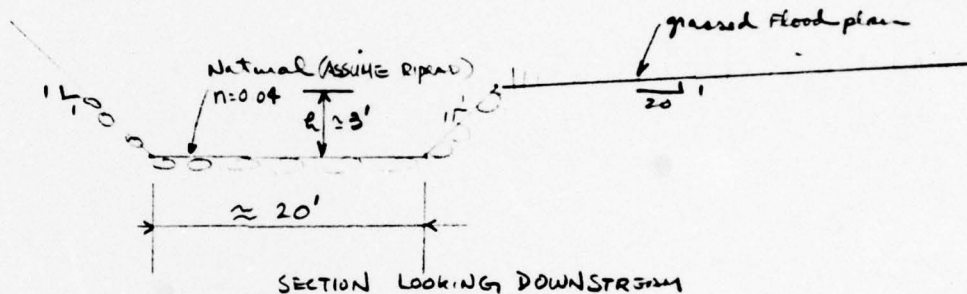
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3

By WTC Date 4/28/78 Subject SUGAR RUN DAM - NYS ID# 460 Sheet No. 3 of 3
 Chkd. By BE Date 5-9-78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-04

APPROXIMATE CROSS-SECTION OF FLOOD PLAIN @ 500 FT D/S

$$\text{CHANNEL SLOPE (FROM U.S.G.S)} \approx \frac{100'}{900'} = 0.11$$



DISCHARGE WITHIN CHANNEL $h \approx 3'$

$$A = (20 + 3)(3) = 69 \text{ SF}$$

$$P = 20 + 2\sqrt{2} \times 3 = 28.49 \text{ FT}$$

$$R = \frac{A}{P} = \frac{69}{28.49} = 2.42 \text{ FT}$$

$$V = \frac{1.486}{0.04} (2.42)^{2/3} (0.11)^{1/2} = 22.3 \text{ fps}$$

$$Q = 69 \times 22.3 = 1541 \text{ cfs} \gg 240 \text{ cfs}$$

FLOW WILL BE WITHIN THE STREAM BED
 WHEN SPILLWAY DISCHARGE FULL

APPENDIX E
REGIONAL GEOLOGY

APPENDIX E REGIONAL GEOLOGY

An independent review of regional site geology indicates that the site is located in the Allegheny Mountain section of the Appalachian Plateau province. The site is located midway between the Laurel Hill Anticline to the east and the Ligonier Syncline to the west. The bedrock in the area probably consists of the Clarion Sandstone of the Allegheny Series and the Homewood Sandstone of the Pottsville Series. Both are medium-grained thick-bedded sandstones. The rock strata in the area dip approximately 750 feet per mile to the east.

The Lower Kittanning rider, the Lower Kittanning, and the Brookville coal seams outcrop on the west side of the reservoir. Available records do not indicate any deep mining in the area. The Kittanning seam has been strip mined in an area south of the reservoir.