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D'APPOLONIA CONSULTING ENGINEERS INC PITTSBURGH PA
NATIONAL DAM INSPECTION PROGRAM. JOHN C. SMITH DAM (NDI ID 238)--ETC(U)
SEP 78

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SUSQUEHANNA RIVER BASIN
UNNAMED TRIBUTARY OF RAYSTOWN BRANCH JUNIATA RIVER

PENNSYLVANIA

⑥

JOHN C. SMITH DAM

NDI ID NO: 238

National Dam Inspection Program. John C. Smith Dam (NDI ID 238), Susquehanna River Basin, Unnamed Tributary of Raystown Branch Juniata River, Pennsylvania.

PHASE I INSPECTION REPORT.

NATIONAL DAM INSPECTION PROGRAM

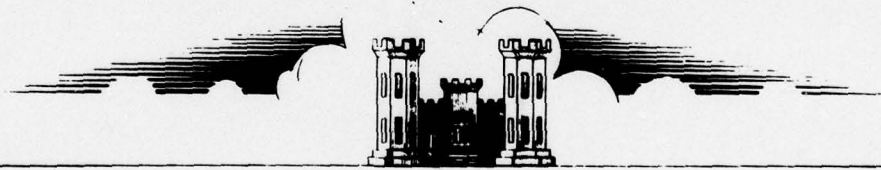
ORIGINAL CONTAINS COLOR PLATES: ALL DDC REPRODUCTIONS WILL BE IN BLACK AND WHITE.

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

BY

D'APPOLONIA CONSULTING ENGINEERS
10 DUFF ROAD
PITTSBURGH, PA. 15235
SEPTEMBER 1978

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: J. C. Smith Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Bedford
STREAM: Unnamed tributary of the Raystown Branch of the Juniata River
DATE OF INSPECTION: August 30 and September 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 J. C. Smith Dam is assessed to be fair. On the dates of inspection, the pool level was 10 feet below the uncontrolled spillway crest level which is 4 feet below the dam crest. Under these conditions, only minor seepage areas were observed. However, it was reported by borough personnel that more noticeable seepage occurs when the pool is four to six feet above the pool level that existed on the date of inspection. The owner reported that, while the downstream valve on the blow-off pipe is functional, the upstream valve has not been operated in the recent past. Therefore, it is recommended that the owner immediately evaluate the functional condition of the upstream valve on the blow-off pipe and perform necessary maintenance.

The barbed wire fence across the crest of the spillway and the bridge across the discharge channel are considered to pose a potential for blockage of the spillway with debris in the event of a flood. It is therefore recommended that the barbed wire fence be immediately removed and the need for enlarging the bridge span should be investigated.

In view of the reported seepage condition through the left abutment, it is recommended that further studies be undertaken to assess the effect of this seepage condition on the performance of the embankment, in the event it is required to raise the operating pool level above the normal pool level (approximately Elevation 1330) which has existed in the recent past.

Based on the recommended analysis procedure, the spillway capacity was found to be 40 percent of probable maximum flood (PMF), indicating that the dam would be overtopped in the event of full PMF. Therefore, according to the recommended criteria, the spillway is classified to be "inadequate." However, it is not considered to be "seriously inadequate" because it is estimated that the limited overtopping predicted by the analysis used in this investigation would not result in failure of the dam.

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



Lawrence D. Andersen

Lawrence D. Andersen, P.E.
Vice President

G. K. Withers

29 Nov 78

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

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J. C. SMITH DAM
NDI I.D. NO. 238
AUGUST 30, 1978



Upstream Face



Downstream Face

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
J. C. SMITH DAM
NDI I.D. NO. 238
DER I.D. NO. 5-50

ABSTRACT

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 900 feet long with a maximum height of 59 feet from the downstream toe and a crest width of 12 feet. The embankment impounds an unnamed tributary of the Raystown Branch of the Juniata River, locally known as Pigeon Run. While the outlet works for the dam discharge into the course of Pigeon Run, the spillway channel is cut across a drainage divide and discharges into the drainage basin north of Pigeon Run. The combined primary and emergency spillway for the dam is located on the left abutment (looking downstream). A 31-foot-wide concrete overflow section at the bottom of the trapezoidal spillway channel constitutes the hydraulic control section for the spillway. The spillway discharges into a natural ravine. The spillway channel is spanned by a small bridge located approximately 50 feet downstream from the control section of the spillway with an 8-foot by 11-foot opening. The outlet works for the dam consist of a 230-foot-long, 18-inch combined blow-off and supply line and a valve house located at the toe of the dam. It is reported that the pipe was placed in a trench excavated into natural ground, encased in concrete with concrete cutoff collars. Flow through this pipe is presently controlled by a valve located at the valve house at the toe of the dam. The owner reported that there is an upstream valve on this pipe, however, it is presently not functional. The 18-inch pipe through the embankment constitutes the emergency drawdown facility for the dam.

b. Location. J. C. Smith Dam is located (Plate 1) about one mile upstream of Pigeon Run and about 1.5 miles northwest of Bedford in Bedford Township, Bedford County, Pennsylvania.

Downstream from the dam, Pigeon Run flows northwest about 2000 feet where it crosses the U.S. Route 30 bypass and joins the Raystown Branch of the Juniata River north of Bedford. There are approximately six homes within the first 2000-foot reach of Pigeon Run. It is estimated that in the event of failure there would be loss of life and property damage.

c. Size Classification. Intermediate (based on 59-foot height).

d. Hazard Classification. High.

e. Ownership. Bedford Borough (address: Mr. F. L. Lynaugh, Borough Superintendent, Bedford Borough, 244 West Tenth Street, Bedford, Pennsylvania 16522).

f. Purpose of Dam. Water supply.

g. Design and Construction History. The dam was designed by Mr. Shirley C. Haulse and constructed by McGrady Construction Company of Pittsburgh, Pennsylvania. The dam was completed in 1932.

h. Normal Operating Procedure. The Bedford borough manager reported that the reservoir is normally maintained four to six feet below the uncontrolled spillway crest level to avoid excessive seepage losses from the reservoir. However, there is no positive means of controlling this level, such as a spillway. The spillway crest elevation, which is four feet below the dam crest, is the intended normal pool level for the reservoir.

1.3 Pertinent Data

a. Drainage Area - 0.6 square miles

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - Estimated outflow: 10 cfs
(about two inches over spillway crest)

Outlet conduit at maximum pool - Unknown

Gated spillway capacity at maximum pool - N/A

Ungated spillway capacity at maximum pool - 850

Total spillway capacity at maximum pool - 850

c. Elevation (USGS Datum) (feet)

Top of dam - 1344

Maximum pool - 1344

Normal pool - 1340 (as designed), 1334 to 1336 (as operated)

Upstream invert outlet works - 1300 (estimated)

Downstream invert outlet works - 1280 (estimated)

Streambed at center line of dam - No defined streambed
Maximum tailwater - N/A

d. Reservoir Length (feet)

Normal pool level - 600 at Elevation 1340
Maximum pool level - 800

e. Storage (acre-feet)

Normal pool level - 138
Maximum pool level - 166

f. Reservoir Surface (acres)

Normal pool - 7
Maximum pool - 7+

g. Dam

Type - Earth
Length - 900 feet
Height - 59 feet
Top width - 12 feet
Side slopes - 2H:1V and 2.5H:1V
Zoning - No
Impervious core - No
Cutoff - Cutoff trench to top of rock
Grout curtain - Yes

h. Regulating Outlet

Type - 18-inch cast-iron pipe
Length - 230+ feet
Closure - Gate valve (downstream)
Access - N/A
Regulating facilities - gate valve at valve house

i. Spillway

Type - Concrete overflow section
Length - 31 feet
Crest elevation - 1340
Gate - None
Upstream channel - Trapezoidal riprapped channel
Downstream channel - Natural ravine as exists (25-foot-wide
earth channel as designed)

SECTION 2
ENGINEERING DATA

2.1 Design

a. Data Available

(1) Hydrology and Hydraulics. A state report entitled, Report Upon the Application of the Borough of Bedford, dated March 29, 1932, summarizes the available hydrologic and hydraulic information.

(2) Embankment. Available information consists of various design drawings, boring logs, construction progress reports, and state inspection reports. The 1932 state report includes a description of the design features.

(3) Appurtenant Structures. Available information includes design drawings.

b. Design Features. A review of the design drawings show the following main features of the project:

1. As designed, the dam is a homogeneous embankment with a 12-foot-wide cutoff trench located on the center line of the embankment extending to the foundation rock (Plate 2). The cutoff trench incorporates a 2-foot-high concrete cutoff wall through which the foundation rock was drilled and grouted.
2. The embankment was designed to have a 2.0 to 1 (horizontal to vertical) slope on the downstream face between crest level (Elevation 1344) and Elevation 1300 and a 2.5 to 1 slope below Elevation 1300. The upstream face was designed to have a 2 to 1 slope from crest level to Elevation 1314 and 2.5 to 1 below Elevation 1314.
3. Available boring logs indicate that 14 borings were drilled to investigate the subsurface conditions. Plate 3 illustrates the subsurface conditions at the site. Boring locations are shown on Plate 4. The profile consists of 10 to 20 feet of overburden underlain by sandy shale and sandstone. The permeability of the foundation rock was qualitatively evaluated by observing the rate at which the groundwater rose in the drill casing after the casing had been bailed

or by filling the casing with water and observing the rate at which the water level fell. The boring logs indicate that in several borings the water in the drill casing rose as fast as two to three feet in one-half hour.

c. Appurtenant Structures. The appurtenant structures consist of a combined emergency and primary spillway located on the left abutment and outlet works (Plate 5). The spillway is comprised of a riprapped approach channel, a concrete overflow section, and an earth spillway discharge channel. The 31-foot-wide concrete spillway control section is four feet below the dam crest and constitutes a sharp-crested hydraulic control section. As it presently exists, the spillway discharge channel is a natural ravine and discharging into a drainage basin north of Pigeon Run Valley.

The outlet works for the dam consist of an 18-inch cast-iron combined supply and blow-off line and the valve house located at the toe level of the dam. Design drawings (Plate 2) indicate that the pipe is encased in concrete with four concrete cutoff collars. Flow through this pipe is presently controlled by a valve located in the valve house. The 1932 state report indicates that an upstream valve was to be installed on this pipe. The owner reported that this valve has not been used in the recent past and presently is not functional.

d. Design Data

(1) Hydrology and Hydraulics. The 1932 state report indicates that the spillway for the dam was designed for a flow of 1300 cubic feet per second (cfs) per square mile of drainage area, which corresponded to a total capacity of 720 cfs.

(2) Embankment. Other than design drawings, 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. Available information includes various construction memorandums prepared by state engineers describing the progress of the project. The progress reports indicate that as of August 1932 the cutoff trench was being excavated and that the dam was essentially completed in December 1932. It is reported that the cutoff trench was about 15 feet wide and was excavated to a depth varying between 15 to 35 feet. The cutoff trench excavation was inspected by the state engineer and only upon the approval of the engineer was the concrete cutoff wall constructed. The concrete cutoff wall was constructed on a concrete footing which covered the entire width of the cutoff trench. The

rock joints in the cutoff trench in the left abutment are described as "unusually open." It was reported that a considerable amount of grout was consumed in this area. In November 1932, the site was visited by a state geologist and a fault was uncovered on the left abutment. The fault was oriented at a right angle to the axis of the dam. The owner was advised to grout this area to a depth of 60 feet. Further reports indicate that additional grouting was done in the fault area. A construction memorandum dated December 1932 indicates that one of the grout holes on the left abutment took as much as 400 bags of cement.

It is reported that the reservoir reached the spillway crest level in March 1933. During the filling of the reservoir, several seepages were observed on the left one quarter of the embankment. It was suspected that the fault located on the left abutment was contributing to the seepage on the left abutment. In November 1933, the reservoir was lowered and a six-foot-thick clay blanket was placed in this area. Further reports indicate that seepage through the embankment was significantly reduced after the construction of the clay blanket. A state inspection report dated June 18, 1935, indicates that additional grouting was done on the left abutment during 1935. The 1938 and 1942 state inspection reports also refer to the seepage through the left abutment.

On the date of this inspection, the borough manager reported that additional grouting was done on the left abutment in 1961. He further stated that in spite of this recent grouting program some seepage occurs through the left abutment when the reservoir level is four to six feet below the spillway crest.

2.3 Operation. It is reported that there are no formal operating procedures for the dam. The pool is normally maintained four to six feet below the spillway crest level to avoid seepage losses through the left abutment. Flow through the 18-inch supply and blow-off line is normally controlled by downstream valves.

2.4 Other Investigations. The available information indicated no investigations other than the reports referred to previously.

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 construction drawings and boring logs. No quantitative geotechnical information is available to aid the assessment of the adequacy of the design.

(3) Appurtenant Structures. As far as can be assessed from the review of available information, no significant design deficiencies were found that would affect the overall performance of these structures.

c. Operating Records. No formal operating records are available for the dam. The borough manager reported that, to his best knowledge, the maximum pool level was about one to two inches above the spillway crest.

d. Post-Construction Changes. As discussed in Section 2.2, the left abutment of the dam was grouted in 1935 and 1961 to control seepage through this area. 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 J. C. Smith Dam consisted of:

1. Visual inspection of the embankment, abutments, and the embankment toe.
2. Visual examination of the spillway and its appurtenances, outlet works, and other appurtenant features.
3. Observation of factors affecting the runoff potential of the drainage basin.
4. Evaluation of downstream 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 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. A portion of the downstream slope in line with the valve house was found to be irregular, indicating that this section of the downstream slope may have moved in the past. However, presently, no signs of distress or movement were observed. Similarly, a shoreline irregularity located near the spillway approach channel suggested a past movement on the upstream slope. However, upon further observations, the condition was attributed to a construction irregularity rather than a post-construction movement. One wet area and two seepage points were observed along the toe of the dam. The wet area was located about 200 feet from the left abutment along the access road ditch. However, borough personnel reported that a noticeable seepage exists at this point when the pool level is within four to six feet of spillway crest elevation. Seepage was observed on the right side of the valve house. The quantity of flow was estimated to be 2 to 3 gallons per minute (gpm). The second seepage point was located about 50 feet downstream from the valve house on the left side of the access road. A large swampy area covered with acid mine precipitate (yellow-boy) was associated with this seepage. Total flow from this area is estimated to be five gpm.

c. Appurtenant Structures. The spillway crest, approach and discharge channels were examined for signs of distress and obstructions that would limit flow. The barbed wire fence across the spillway crest is considered to constitute a potential for blockage of the spillway with debris in the event of a major flood. A bridge across the spillway discharge channel located about 50 feet downstream from the spillway crest with an opening of 11 by 8 feet might also be blocked by debris during a major flood.

d. Reservoir Area. A map review indicates that the watershed area is predominantly covered by woodlands. Visual observations and a review of the regional geology (Appendix E) indicate that the shorelines are probably susceptible to landslides; however, massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displaced water are not considered to be likely.

e. Downstream Channel. Since no water is discharged from the dam into Pigeon Run Valley, there is no defined stream channel below the dam. Flow from a seepage area on the left side of the access road follows the access road ditch and then forms a small creek which discharges into a fishing pond about 2000 feet downstream from the dam. The stream then flows under the U.S. Route 30 bypass and joins the Raystown Branch of the Juniata River north of Bedford. It is estimated that approximately six homes located within the first 2000-foot reach below the dam would be affected in the event of a flood due to a dam failure.

3.2 Evaluation. In general, the condition of J. C. Smith dam is considered to be good. Since the pool level on the date of inspection was significantly lower than the normal pool level, the seepage conditions on the left abutment, which were referred to in past state inspection reports, could not be observed. A barbed wire fence across the spillway crest and a bridge across the spillway discharge channel are considered to pose a potential for blockage of the spillway with debris during a major flood.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. The borough manager 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 outlet pipe valve if it is required 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 fair. The operation of the blow-off valve was not observed. However, subsequent to the field inspection, borough personnel reported that the blow-off valve was operated and observed to be functional. Borough personnel reported that one of the three abandoned steel pipes located on the upstream face of the dam contains the stem of the upstream control valve for the outlet pipe. However, no hoist mechanism exists for this gate and it is reported that it has not been operated in the recent past.

4.4 Warning System. No formal warning system exists for the dam. The dam is maintained by the borough water department personnel operating from Bedford about two miles from the dam site. Telephone communication facilities are available via the residences downstream from the dam.

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 fair. The barbed wire fence across the spillway is considered to pose a potential for blockage of the spillway with debris. Therefore, it should be immediately removed. The bridge across the spillway discharge channel also constitutes a potential for blockage of the spillway. It is recommended that necessary steps be taken to repair the valve located on the upstream end of the outlet pipe.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. The J. C. Smith Dam has a watershed of 0.6 square miles and impounds a reservoir with a surface area of seven acres at spillway crest level. A 31-foot-wide concrete overflow section located at a level four feet below the dam crest constitutes both the primary and emergency spillway for the impoundment. As it exists, the spillway has a discharge capacity of 850 cubic feet per second (cfs) with no freeboard.

b. Experience Data. The J. C. Smith 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 procedure, it was determined that the PMF inflow hydrograph would have a peak of 2400 cfs and a total volume of 850 acre-feet. These values are greater than the maximum spillway discharge capacity of 850 cfs and surcharge storage volume of 28 acre-feet, respectively. Further analysis, according to the procedure, indicated that the spillway can pass a maximum flow of 40 percent PMF without overtopping. It was calculated that in the event of PMF the depth of overflow across the entire crest of the dam would be eight inches.

c. Visual Observations. A barbed wire fence across the crest of the spillway and the bridge across the spillway discharge channel is considered to pose a potential blockage of the spillway with debris during a major flood.

d. Overtopping Potential. As stated above, the spillway can pass 40 percent PMF without overtopping and the dam would be overtopped by eight inches in the event of full PMF.

e. Spillway Adequacy. Since the spillway capacity (40 percent PMF) was found to be less than the recommended capacity (full PMF), the spillway is classified to be "inadequate" according to the recommended criteria. However, it is not judged to be "seriously inadequate" because it is estimated that the limited overtopping of the dam predicted by the analysis used in this investigation would not result in a failure. The watershed is small so the overtopping duration would be short. In addition, the calculated depth of overtopping is only 8 inches, which is not considered to be a large enough flow to cause rapid erosion of the embankment.

Based on the above results, the spillway is classified to be "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. On the dates of inspection, the pool level was about four to six feet below the pool level at which it is reported that significant seepage occurs through the left abutment. Therefore, the full extent of the seepage conditions through the dam could not be observed. However, in the past state inspection reports, the seepage condition through the left abutment was not considered to be a threat to the structural integrity of the dam.

b. Design and Construction Data

(1) Embankment. Available information did not include any stability calculations, and no reference to any calculations was found. Review of construction progress reports indicates that the dam was built with reasonable care. During the construction of the dam, some concern was raised as to the lifts being too thick for obtaining adequate compaction of the embankment material. Review of the design drawings indicated that the design did not incorporate an internal drainage system for controlling the seepage through the embankment. However, significant wet areas or seepage areas that would suggest that the phreatic line is daylighting on the downstream slope were not found along the toe of the dam. No such conditions were reported in the past.

(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 operational features of the dam.

d. Post-Construction Changes. After completion of the dam, the left abutment was grouted in 1935 and again in 1961 to control seepage through this abutment. No reference was found to indicate that this seepage condition affected the stability of the embankment.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations and review of available information indicate that J. C. Smith Dam is in fair condition. It appears that the dam was constructed with reasonable care and has reportedly performed satisfactorily in the past, except for the persistent seepage condition around the left abutment. Past reports indicate that the seepage condition through the left abutment was not considered to be relevant to the stability of the embankment. On the dates of this inspection, the reservoir was below the normal pool level; therefore, the full extent of the seepage conditions could not be observed.

The most significant condition at the dam is found to be potential blockage of the spillway with debris due to the presence of a barbed wire fence across the spillway crest and a small bridge spanning the spillway discharge channel.

Based on the recommended analysis procedure, the spillway capacity was found to be 40 percent of probable maximum flood (PMF), indicating that the dam would be overtopped in the event of full PMF. Therefore, according to the recommended criteria, the spillway is classified to be "inadequate." However, it is not considered to be "seriously inadequate" because it is estimated that the limited overtopping predicted by the analysis used in this investigation would not result in failure of the dam.

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 barbed wire fence across the spillway crest should also be removed immediately. Other recommendations should be continued on a continuing basis or as soon as practicable.

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

7.2 Recommendations/Remedial Measures. It is recommended that:

1. The owner should initiate additional studies to more accurately ascertain the spillway capacity and the nature and extent of improvements required to provide sufficient spillway capacity.

2. The barbed wire fence across the spillway crest should be immediately removed and the need for enlarging the span of the bridge across the spillway discharge channel should be investigated.
3. The owner should take necessary steps to repair the valve located on the upstream end of the drainpipe.
4. In view of the reported seepage condition through the left abutment, it is recommended that further studies be undertaken to assess the effect of this seepage condition on the performance of the embankment, in the event it is required to raise pool level above the normal pool elevation (approximately Elevation 1330) that has existed in the recent past.
5. The owner should 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.
6. Brush and trees at the swampy areas located on the left side of the access road (looking downstream) should be removed to facilitate adequate inspection of this area. Seepage from this area should be monitored and recorded.
7. The owner should be advised that the dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.

PLATES

DRAWN BY
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REFERENCE:
U.S.G.S. 7.5' BEDFORD QUADRANGLE
PHOTOREVISED 1973, SCALE 1:24000

SCALE
1000 0 2000 FT.

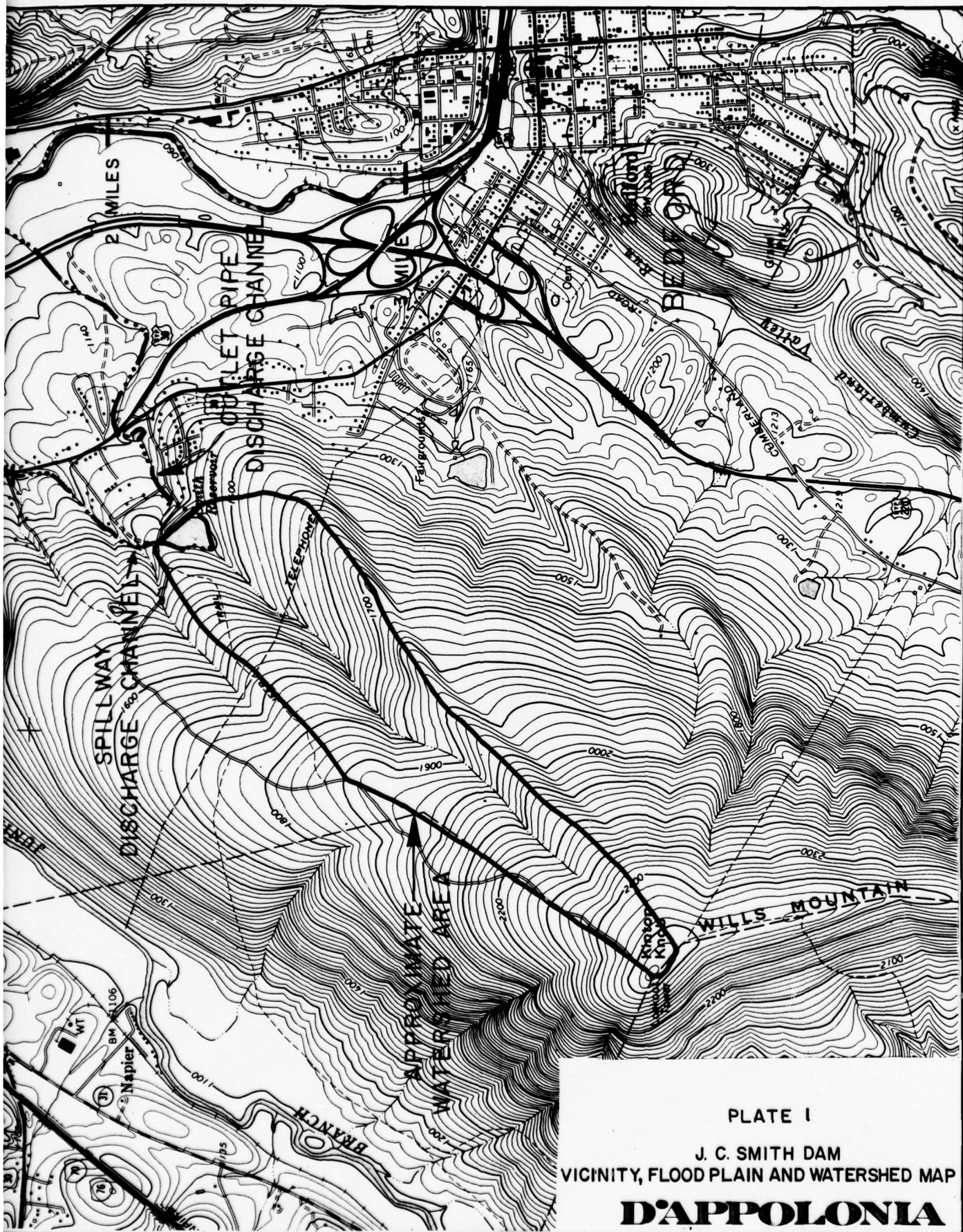
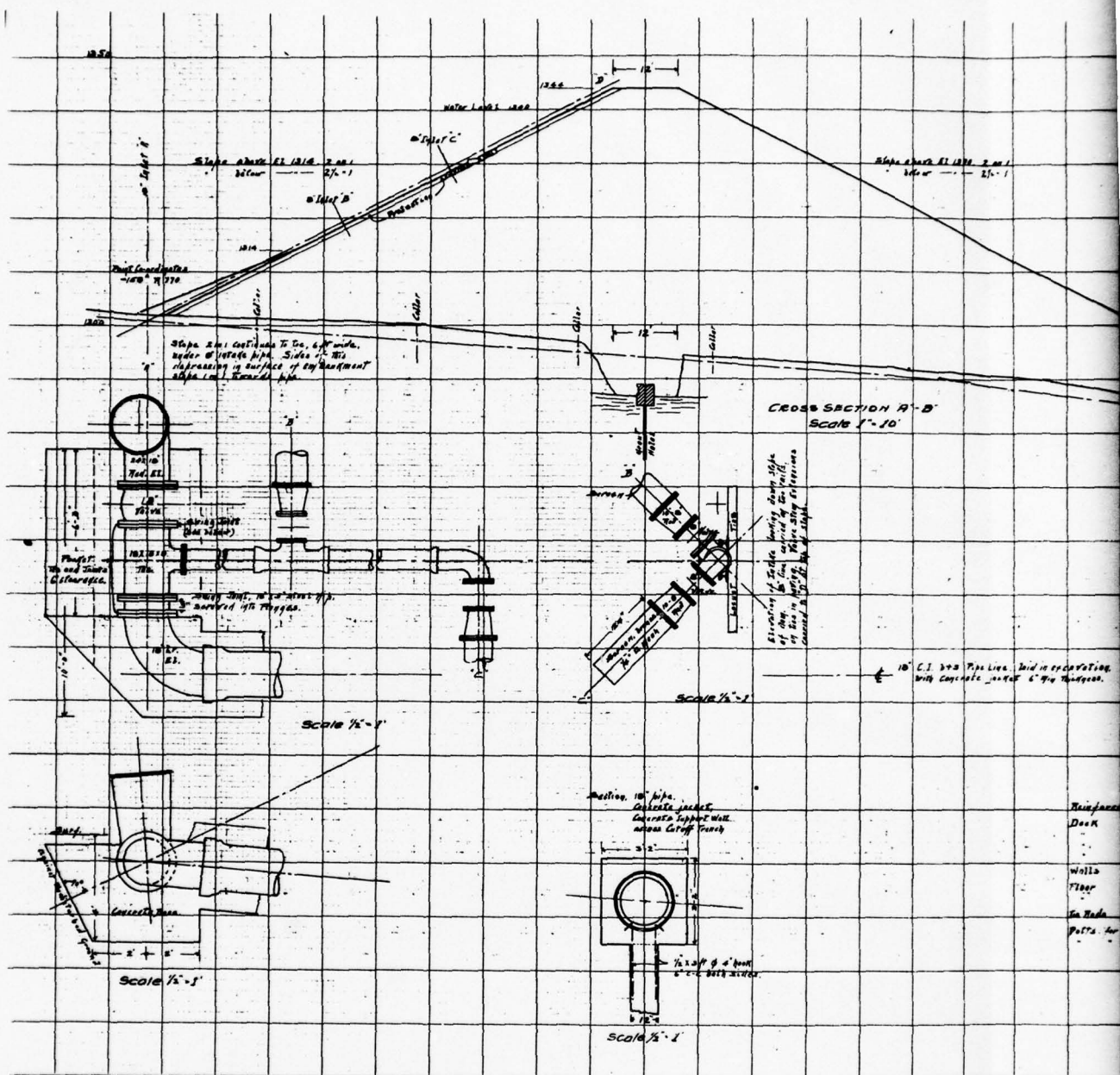
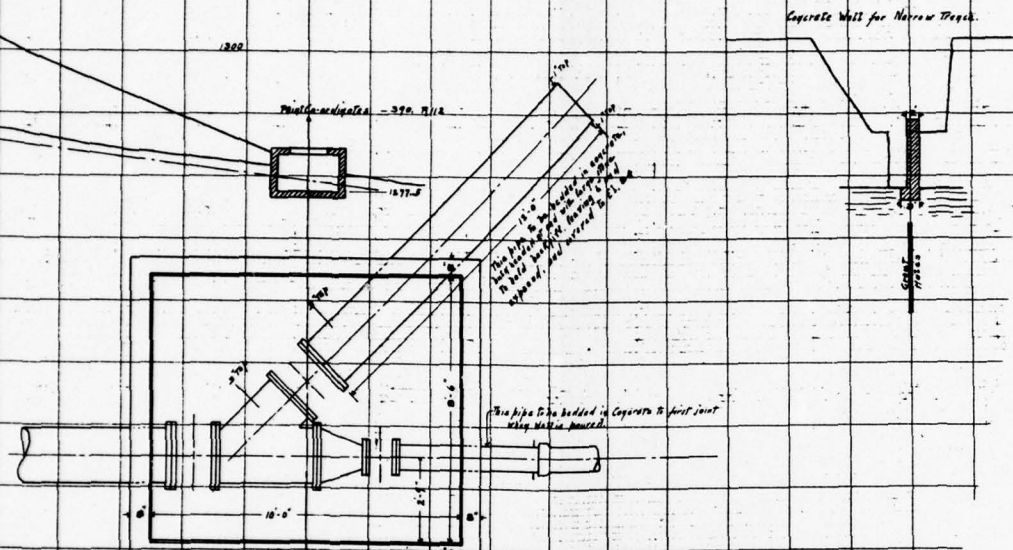


PLATE I
 J. C. SMITH DAM
 VICINITY, FLOOD PLAIN AND WATERSHED MAP
D'APPOLONIA

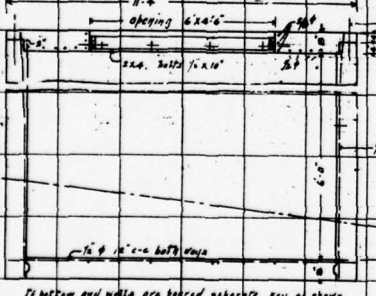
DRAWN BY [Blank] CHECKED BY **BE** DRAWING NUMBER **14-B170**
 9-5-78 APPROVED BY **JMP** 9-6-78





Replacement of

Door	4'0" x 10'-0"	6'00
	1'0" x 10'-0"	10'00
	1'0" x 10'-0"	10'00
Walls	7'0" x 7'0"	49'00
Floor	7'0" x 11'-0"	77'00
	7'0" x 9'-0"	63'00
Roof	7'0" x 10'-0"	70'00
Partia. for walls	1'0" x 11'-0"	11'00
	1'0" x 11'-0"	11'00



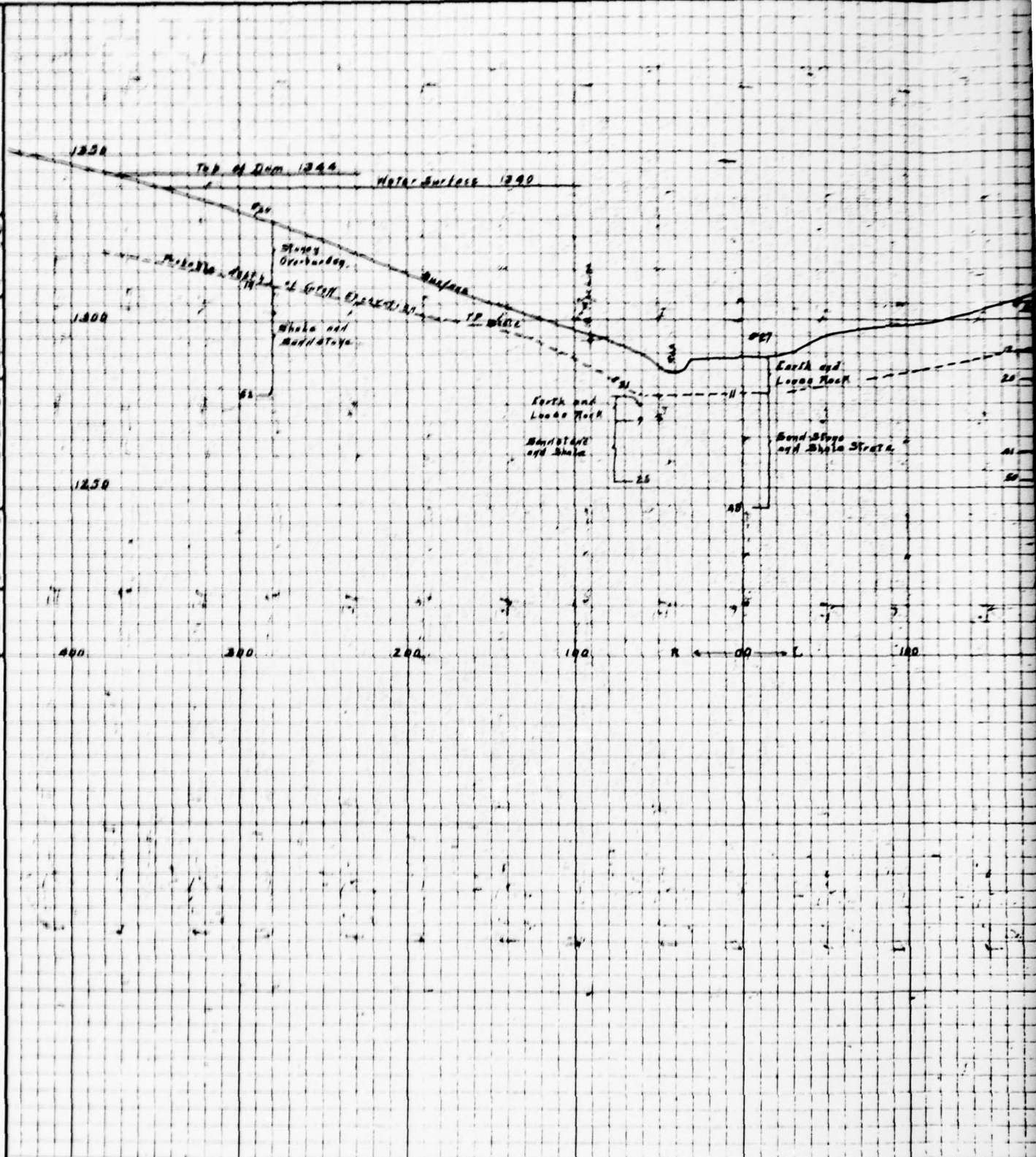
CROSS SECTION
 A-B
 INTAKE, BLow OFF & VALVE BOX
 PROPOSED
 PIGEON RUN RESERVOIR
 OF THE
 BOROUGH OF BEDFORD
 2000 - 2001 - Bedford, Pa. 15012
 SHEET No. 4

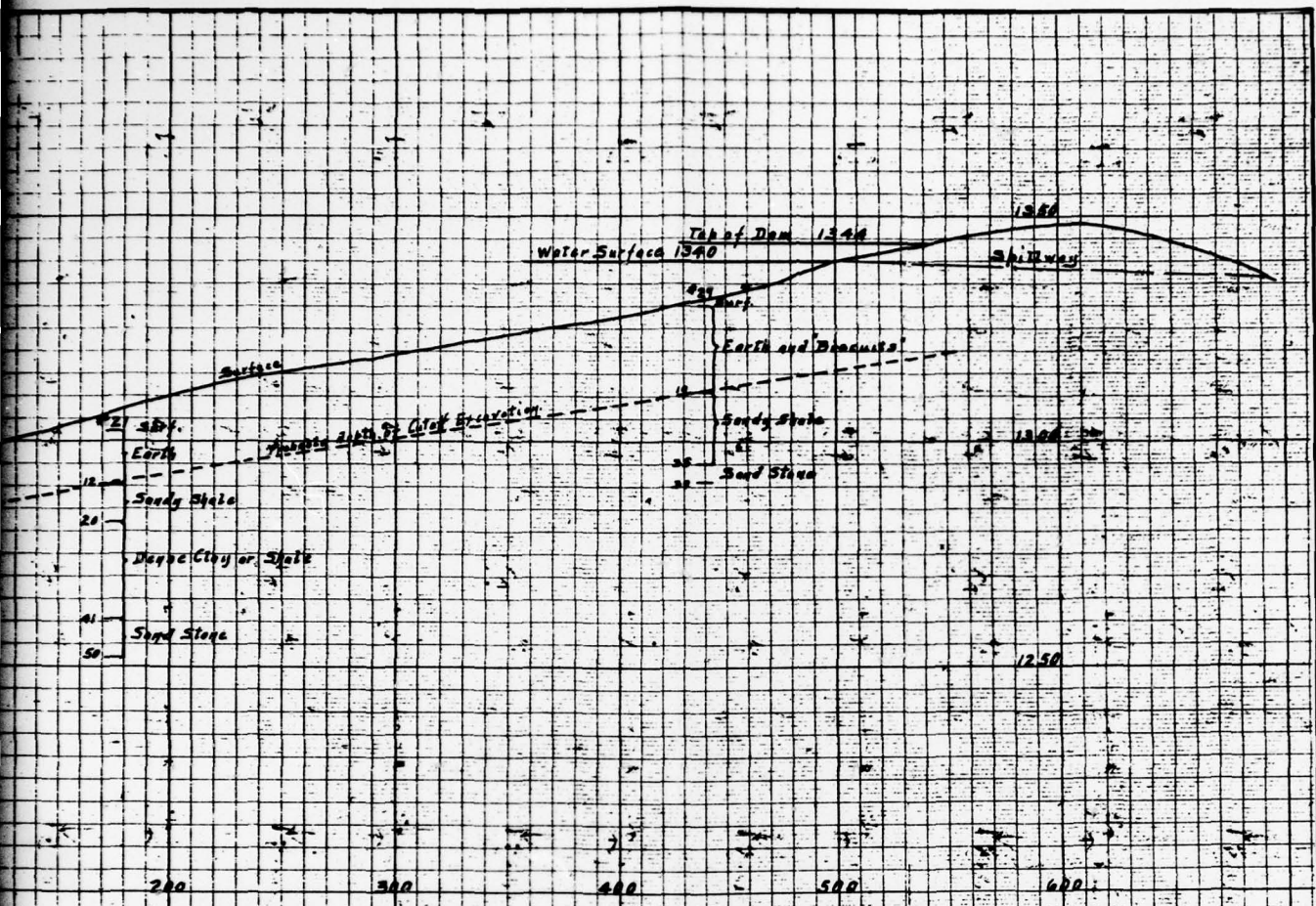
R. L. H. A. L. A. N.
 ENGINEER

PLATE 2

D'APPOLONIA

DRAWN BY: []
 CHECKED BY: []
 APPROVED BY: []
 9-5-78
 9-6-78
 DRAWING NUMBER: 14-5171

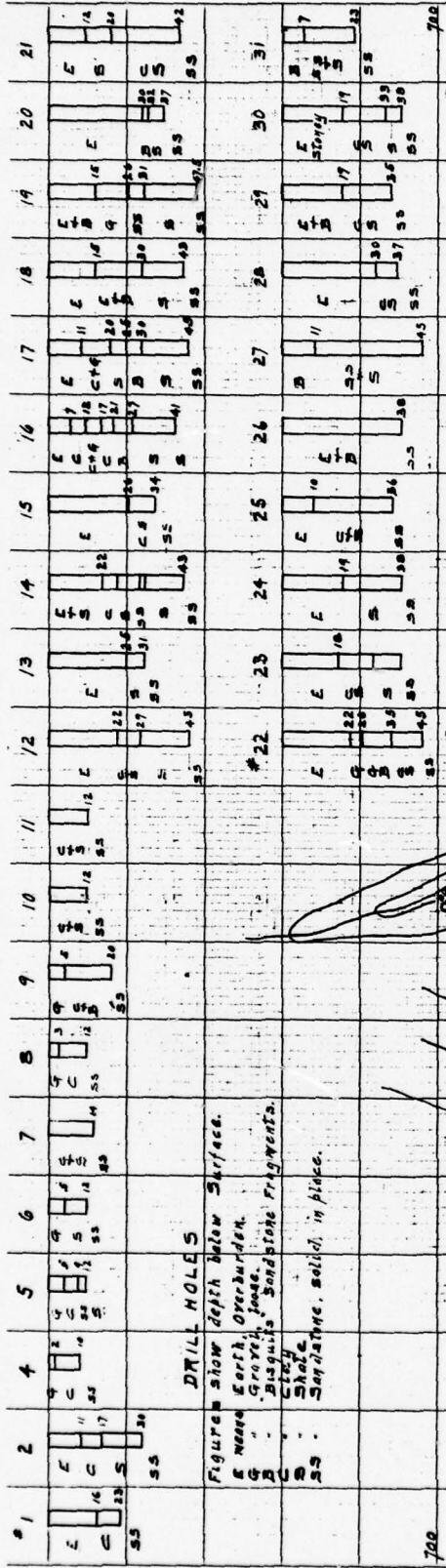




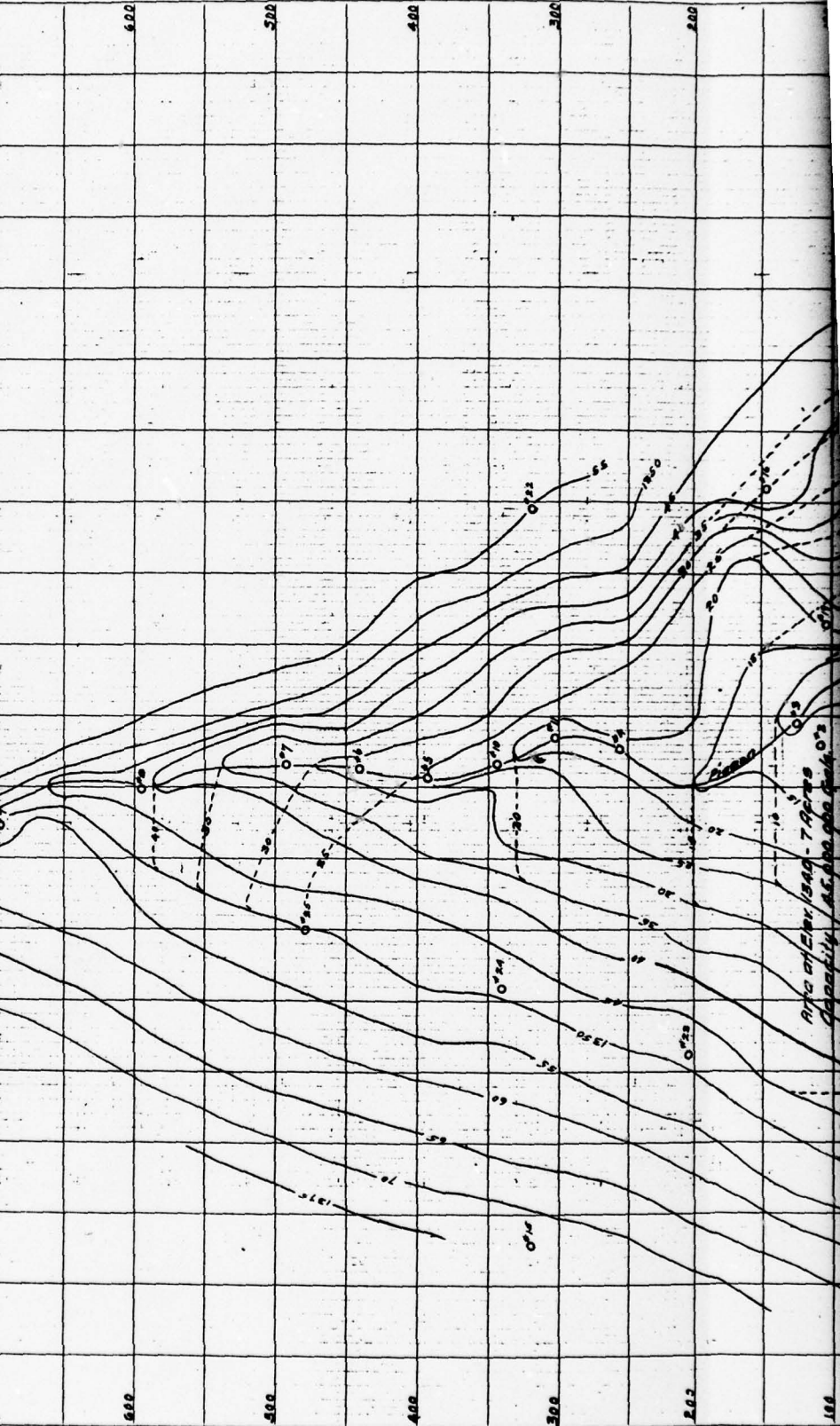
LONGITUDINAL SECTION
 PROPOSED
 PIGEON RUN RESERVOIR
 OF THE
 BOROUGH OF BEDFORD
 SCALE 1/2" = 1'-0" Bedford Pa. 3-15-22

SHEET No. 2

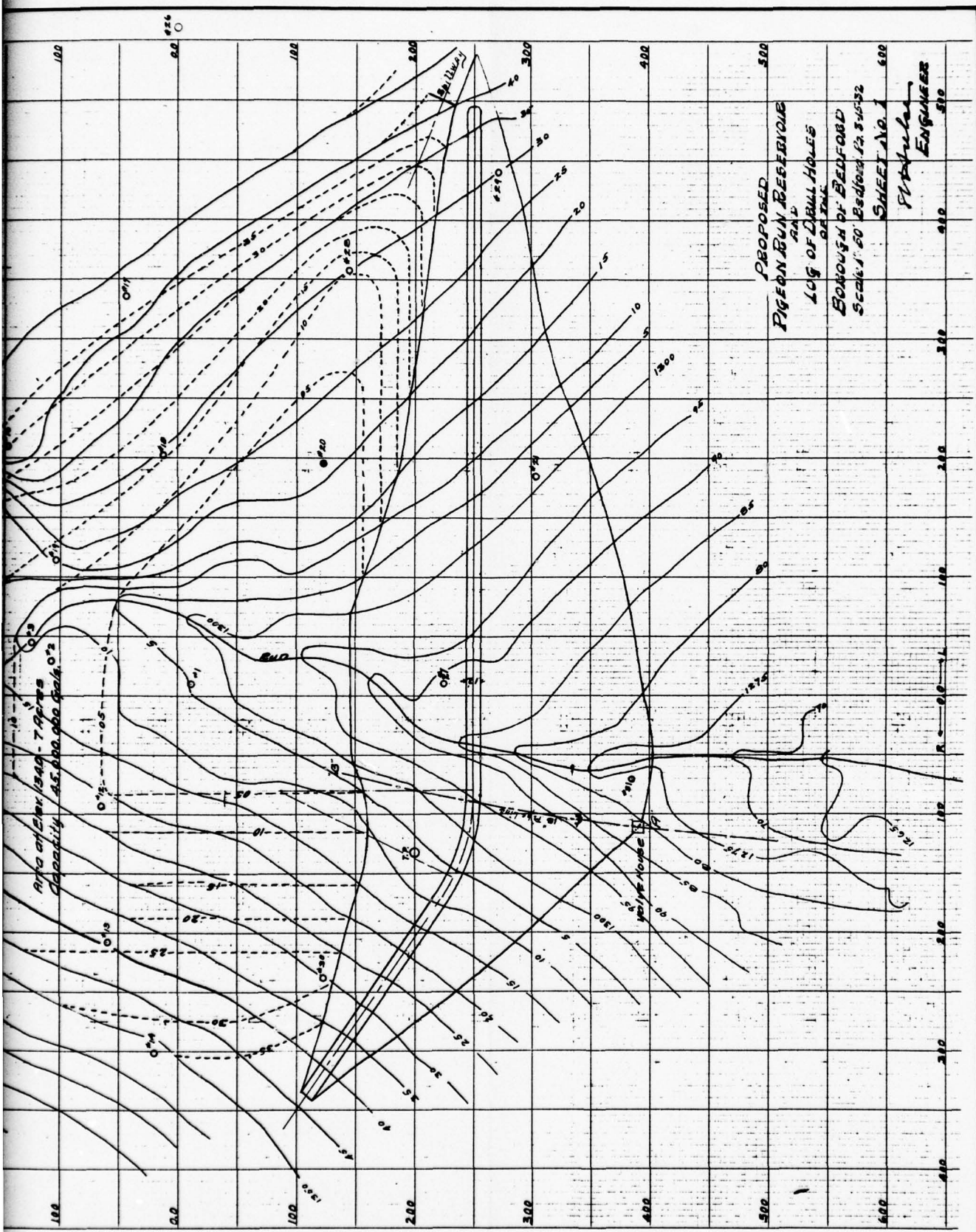
F. Appolonia
 ENGINEER



DRILL HOLES
 Figures show depth below surface.
 E: Loose Earth, Overburden.
 C: Gravelly Sand.
 S: Sandstone Fragments.
 G: Shale.
 S: Sandstone, solid in place.



Area of Elev. 1340 - 7 Acres
 Capacity 85,000 gal. 0.75

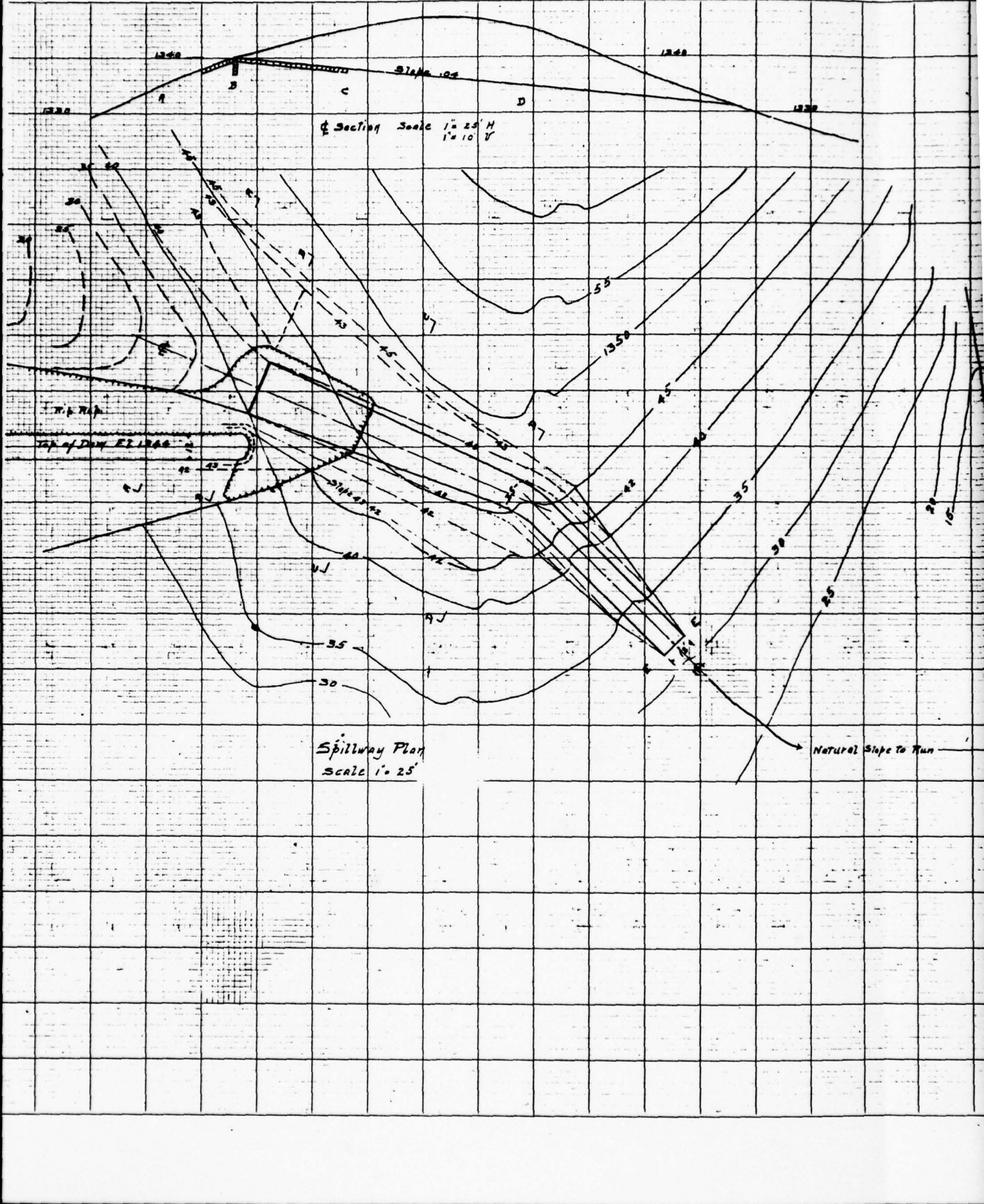


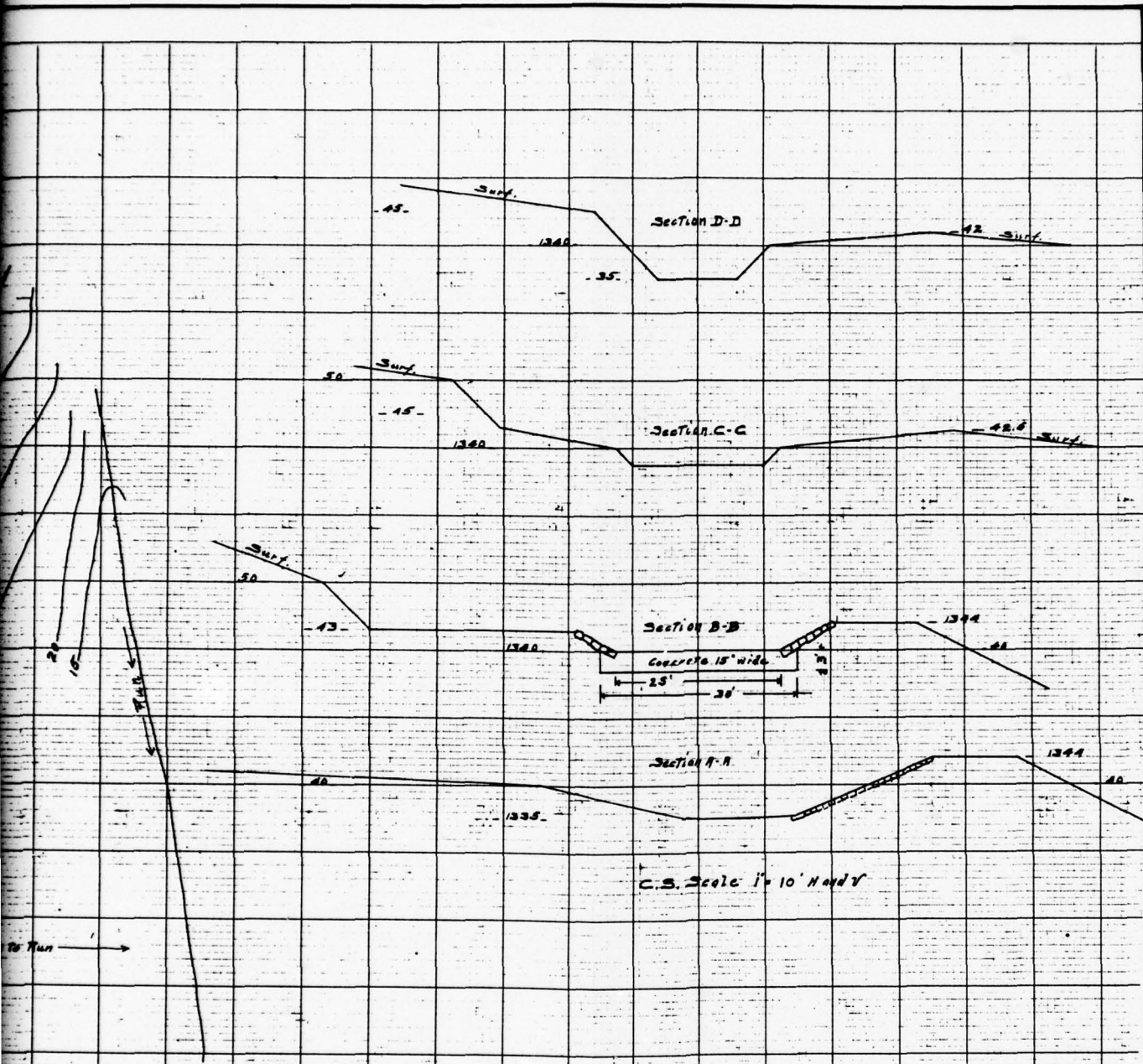
PROPOSED
PIGEON RUN BEEHIVE
ROAD
LOG OF DRILL HOLES
BOROUGH OF BEDFORD
SCALE: 50' BEDROCK 1/2" 3/4" 5/8" 3/2"
SHEET NO. 1
P. Appolonia
ENGINEER

PLATE 4

D'APPOLONIA

DRAWN BY ITS CHECKED BY 13E 7-6-78 DRAWING NUMBER 14-B172
BY 9-5-78 APPROVED BY JHP 9-6-78 NUMBER



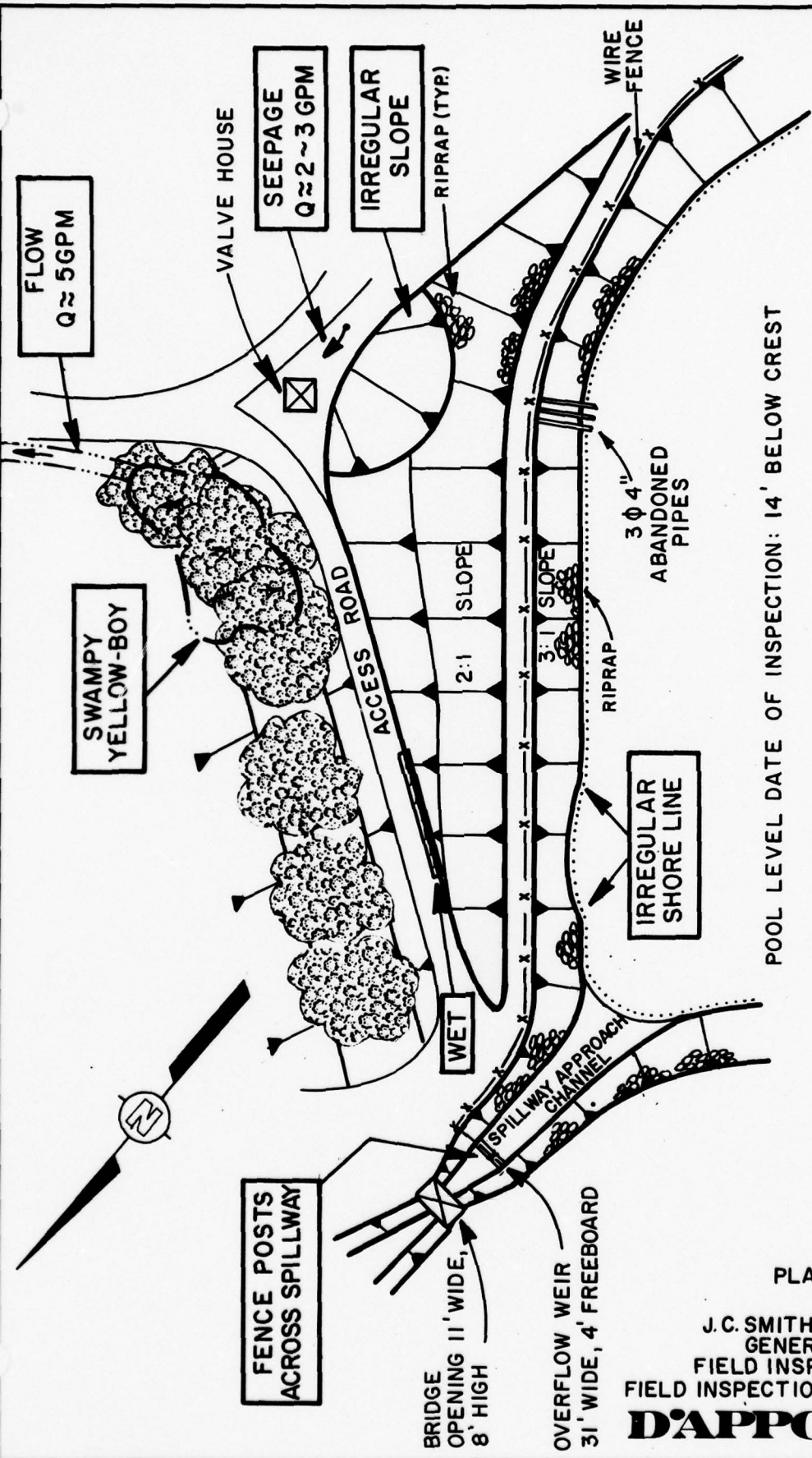


SPILLWAY
 PROPOSED
 PIGEON RUN RESERVOIR
 OF THE
 BOROUGH OF BEDFORD
 Scale As Shown Bedford, Pa. 3-16-32

SHEET NO. 3
 F. A. Fisher
 ENGINEER

PLATE 5
D'APPOLONIA

DRAWN BY	Trs	CHECKED BY	BE	9-6-78	DRAWING NUMBER	78-14-A26
BY	9-5-78	APPROVED BY	JHP	9-6-78	NUMBER	



POOL LEVEL DATE OF INSPECTION: 14' BELOW CREST

NOT TO SCALE

PLATE 6

J.C. SMITH DAM NDI: 238
 GENERAL PLAN
 FIELD INSPECTION NOTES
 FIELD INSPECTION DATE: 8-30-78

D'APPOLONIA

APPENDIX A
CHECKLIST
VISUAL INSPECTION
PHASE I

CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM J. C. Smith Dam COUNTY Bedford STATE Pennsylvania ID# NDI 238, DER 5-50

TYPE OF DAM Earthfill HAZARD CATEGORY High

DATE(S) INSPECTION August 30, 1978 WEATHER Sunny TEMPERATURE 80's

POOL ELEVATION AT TIME OF INSPECTION 1320 M.S.L. TAILWATER AT TIME OF INSPECTION 1290 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 I
 EMBANKMENT

NAME OF DAM J. C. Smith Dam

ID# NDI 238, DER 5-50

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None found	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	A general depression exists on the upstream face near the spillway approach channel. However, no signs of distress were observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None found	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No perceivable misalignment	
RIPRAP FAILURES	None	

VISUAL INSPECTION

NAME OF DAM J. C. Smith Dam

PHASE 1

ID# NDI 238, DER 5-50

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No signs of distress or seepage observed. It is reported that there is a seepage around the left abutment when the pool level is within 4 to 6 feet of spillway crest level.	
ANY NOTICEABLE SEEPAGE	Two seeps at toe level. See Plate 6 for location.	
STAFF GAGE AND RECORDER	None	
DRAINS	None	

VISUAL INSPECTION

PHASE 1

CONCRETE/MASONRY DAMS

NAME OF DAM J. C. Smith Dam

ID# NDI 238, DER 5-50

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 J. C. Smith Dam
 ID# NDI 238, DER 5-50

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	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 J. C. Smith Dam
 ID# NDI 238, DER 5-50

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The downstream end of the 18-inch outlet pipe could not be located.	
INTAKE STRUCTURE	Submerged, not visible	
OUTLET STRUCTURE	None. End of the outlet pipe could not be located.	
OUTLET CHANNEL	None	
EMERGENCY GATE	Bedford borough personnel reported that the outlet pipe gate is functional.	

VISUAL INSPECTION
 PHASE I
 UNGATED SPILLWAY

NAME OF DAM J. C. Smith Dam
 ID# NDI 238, DER 5-50

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete overflow section. There is a barbed wire fence across the spillway crest.	
APPROACH CHANNEL	Trapezoidal ripped channel	
DISCHARGE CHANNEL	Natural ravine	
BRIDGE AND PIERS	There is a bridge across the discharge channel of the spillway approximately 50 feet downstream from the crest of the spillway.	This bridge constitutes a potential for blockage of the spillway.

VISUAL INSPECTION
 PHASE I
 GATED SPILLWAY

NAME OF DAM J. C. Smith Dam
 ID# NDI 238, DER 5-50

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 J. C. Smith Dam

ID# NDI 238, DER 5-50

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

VISUAL INSPECTION
 PHASE I
 RESERVOIR
 OBSERVATIONS

NAME OF DAM J. C. Smith Dam
 TD# NDI 238, DER 5-50

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Wooded. No signs of instability.	
SEDIMENTATION	Unknown	

VISUAL INSPECTION
 PHASE I
 DOWNSTREAM CHANNEL

NAME OF DAM J. C. Smith Dam
 ID# NDI 238, DER 5-50

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No defined downstream channel	
SLOPES	N/A	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Six homes Population: 24 (approximately)	

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

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM J. C. Smith Dam
ID# NDI 238, DER 5-50

ITEM	REMARKS
AS-BUILT DRAWINGS	Available in state files
REGIONAL VICINITY MAP	See Plate 1
CONSTRUCTION HISTORY	Designed by Mr. Shirley C. Haulse Constructed by McGrady Construction Company of Pittsburgh The dam was completed in 1932.
TYPICAL SECTIONS OF DAM	See Plate 2
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plate 2

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM J. C. Smith Dam

ID# NDI 238, DER 5-50

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Not available
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Available in state files

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM J. C. Smith Dam
ID# NDI 238, DER 5-50

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported
BORROW SOURCES	Unknown
MONITORING SYSTEMS	None
MODIFICATIONS	None reported
HIGH POOL RECORDS	Not recorded Bedford borough personnel estimated that the maximum pool level was approximate two to three inches over the spillway crest.

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

NAME OF DAM J. C. Smith Dam
ID# NDI 238, DER 5-50

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None found
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported
MAINTENANCE OPERATION RECORDS	Not available
SPILLWAY PLAN SECTIONS DETAILS	See Plate 5
OPERATING EQUIPMENT PLANS AND DETAILS	See Plate 2

NAME OF DAM J. C. Smith Dam

ID# NDI 238, DER 5-50

CHECKLIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.6 square miles, wooded
ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 138 acre-feet at El. 1340
ELEVATION; TOP FLOOD CONTROL POOL AND STORAGE CAPACITY: Same as above
ELEVATION; MAXIMUM DESIGN POOL: 1340
ELEVATION; TOP DAM: 1344

CREST: (Spillway)

- a. Elevation 1340
- b. Type Overflow weir
- c. Width 31 feet
- d. Length N/A
- e. Location Spillover Left abutment
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type 18-inch cast-iron pipe
- b. Location Middle of dam
- c. Entrance Inverts El. 1300 (estimated)
- d. Exit Inverts El. 1280 (estimated)
- e. Emergency Draindown Facilities 18-inch cast-iron pipe

HYDROMETEOROLOGICAL GAGES:

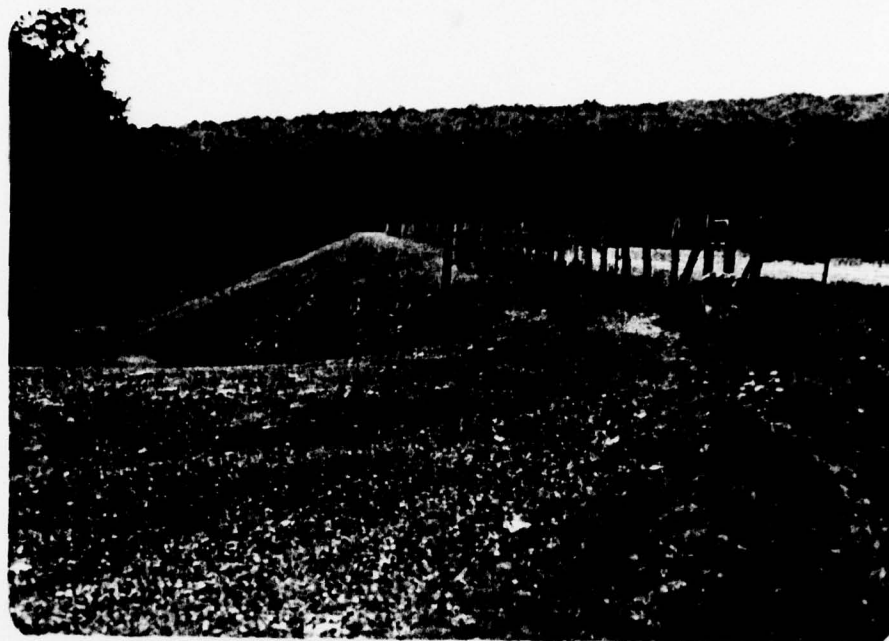
- a. Type None
- b. Location None
- c. Records None

MAXIMUM NONDAMAGING DISCHARGE: N/A

APPENDIX C
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
J. C. SMITH DAM
NDI I.D. NO. 238
AUGUST 30, 1978

<u>PHOTOGRAPH NO.</u>	<u>DESCRIPTION</u>
1	Crest (looking east).
2	Spillway approach channel.
3	Spillway crest.
4	Bridge over spillway discharge channel (about 50 feet downstream from the spillway crest).
5	Outlet pipe valve at valve house.
6	Minor depression on upstream face.
7	Downstream condition.
8	Fishing pond (one-half mile downstream).



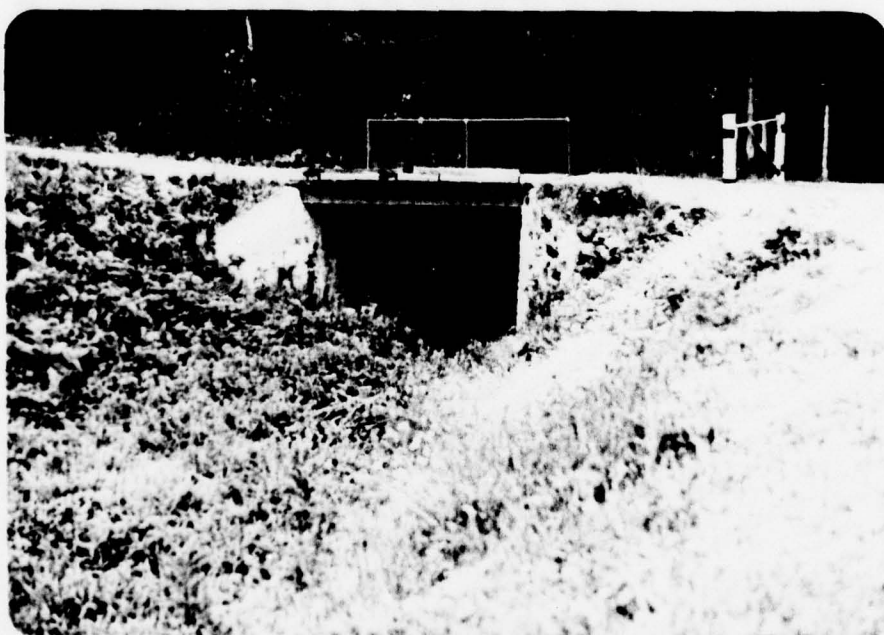
Photograph No. 1
Crest (looking east).



Photograph No. 2
Spillway approach channel.



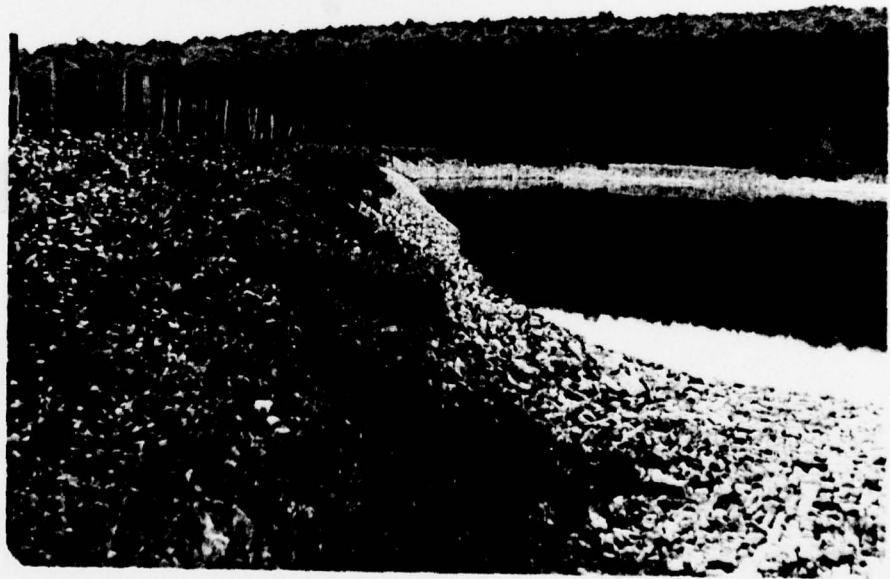
Photograph No. 3
Spillway crest.



Photograph No. 4
Bridge over spillway discharge channel
(about 50 feet downstream from the
spillway crest).



Photograph No. 5
Outlet pipe valve at valve house.



Photograph No. 6
Minor depression on upstream face.



Photograph No. 7
Downstream condition.



Photograph No. 8
Fishing pond (one-half mile downstream).

APPENDIX D
CALCULATIONS

ID:MP:DI:DNLA
CONSULTING ENGINEERS, INC

By CMS Date 9/19/78 Subject J. C. SMITH DAM, Sheet No. 1 of 1
Chkd. By WJC Date 9/14/78 BEDFORD, PA Proj. No. 78-114-27
0.5cm. X 0.5cm.

WATERSHED AREA

REF. U.S.G.S. BEDFORD, PA. QUADRANGLE 7.5 MIN

A.) WATERSHED AREA = 4.27 IN^2
= $4.27 \times \left(\frac{2000}{5280}\right)^2$
= 0.61 SQ. MILES

SAY 0.6 SQ MILE

B) LAKE AREA (EL. 1340) *
 $A_L = 0.08 \text{ IN}^2$
= $.08 \times \left(\frac{2000}{5280}\right)^2 \times 640$
= 7.3 ACRES

SAY 7 ACRES

C) SURCHARGE VOLUME BETWEEN CREST OF DAM (EL. 1399)
AND NORMAL POOL (1340)

$UOL \approx (4) 7$
 $\approx 28 \text{ AC-FT}$

SAY 30 AC-FT

* U.S.G.S. SHOWS LAKE ELEVATION LESS THAN 1340, SO
EL 1340 CONTOUR LINE USED TO OBTAIN AREA.

IDA ENGINEERS, INC.

CONSULTING ENGINEERS, INC.

By WTC Date 9-19-78 Subject J. C. SMITH DAM Sheet No. 1 of 3
 Chkd. By CMS Date 9/25/78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-27

DAM: J. C. SMITH DAM (BEDFORD, PA)

BASIN: SUSQUEHANNA - REGION #1, PIGEON RUN Near
 BEDFORD, PA

WATERSHED AREA $A = 0.6$ SQ MILE

ACCORDING TO THE HYDROLOGICAL CHARTS PROVIDED BY
 COE BALTIMORE DIST.

PMF PEAK INFLOW $q = 4000$ cfs/SQ MILE

$$Q = 2400 \text{ cfs}$$

Say 2400 cfs

$$26" \text{ RUNOFF } V_2 = \frac{26}{12} \times 0.6 \times 640$$

$$= 832 \text{ AC-FT}$$

ca 830 ac-ft

SPILLWAY

BOARD CREST WEIR w/ 1' CONCRETE CONTROL WEIR

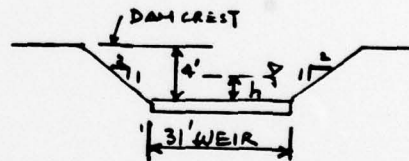
ASSUME CRITICAL DEPTH @ CONTROL

$$\frac{Q^2}{g} = \frac{a^3}{T}$$

$$a = (31 + 2h)(h) \text{ (AREA)}$$

$$T = 31 + 4h \text{ (TOP WIDTH)}$$

$$\text{LAKE LEVEL} = h + \frac{V^2}{2g}$$



(FROM FIELD NOTES)

ID: AIP: DIONIA

CONSULTING ENGINEERS, INC

By WTC Date 9-19-78 Subject J. C. SMITH DAM Sheet No. 2 of 3
 Chkd. By CRB Date 9/25/78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-27

h	a	T	Q ₁	V	$\frac{V^2}{2g}$	$h + \frac{V^2}{2g}$ (RESERVOIR WATER LEVEL)
FT	FT ²	FT	cfs	fps	ft	ft
1	33	35	182	55	0.5	1.5
2	70	39	532	7.6	0.9	2.9
2.8	102.5	42.2	906.2	8.8	1.2	4.0 (Dam LEVEL)
3	111	43	1012	9.1	1.3	4.3
3.17	118.4	43.7	1105.7	9.3	1.4	4.52
3.25	121.9	44.0	1150.9	9.4	1.38	4.63

MAX. DISCHARGE WITHOUT OVERTOP DAM = 855 cfs

Say 850 cfs

SURCHARGE STORAGE Volume

LAKE AREA = 7⁺ ac/ft

Vol = 7 x 4 = 28 ac-ft

Say 30 ac-ft

PERCENT OF PMF WITHOUT OVERTOPPING

$$= \left(\frac{850}{2400} + \frac{30}{830} \right) 100\%$$

$$= (0.35 + 0.04) 100\%$$

$$= 39.03\%$$

Say 40% PMF

DIAMOND
CONSULTING ENGINEERS, INC

By LTC Date 9-19-78 Subject J.C. SMITH DAM Sheet No. 3 of 3
 Chkd. By ms Date 9/25/78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-27

ESTIMATE WATER DEPTH OVER DAM DURING PMF

$$Q_2 = (2.6)(900) \left[h + \frac{V_1^2}{2g} - 4 \right]^{1.5} \text{ OVER DAM SECTION}$$

TRY $h = 3.25'$
 $h = \text{depth of flow over spillway}$

$$Q_1 = 1150 \text{ cfs}$$

$$V_1 = 9.4 \text{ fps}$$

$$h + \frac{V_1^2}{2g} = \underline{4.63 \text{ ft}} \text{ (LAKE LEVEL ABOVE SPILLWAY CREST EL)}$$

$$Q_2 = 1170 \text{ cfs}$$

$$Q_1 + Q_2 = 2320 \text{ cfs}$$

$$V_{\text{storage}} = 4.63 \times 7 = 32.4 \text{ ac-ft}$$

$$\frac{2320}{2400} + \frac{32.4}{830} = 0.967 + 0.039 \approx 1 \text{ OK}$$

Say LAKE LEVEL is 4.6 FT ABOVE SPILLWAY CREST, OR 8" ABOVE DAM CREST

APPENDIX E
REGIONAL GEOLOGY

APPENDIX E
REGIONAL GEOLOGY

The J. C. Smith Dam is located on rock strata of Silurian Age. The dam and reservoir is located on the boundary of the Rose Hill Formation (Clinton Group) and the overlying Tuscarora Formation. The dam is located on the east flank of the Wills Mountain Anticline, a feature which trends and plunges to the northeast. The rock strata dip approximately 15 degrees to the southeast. The Rose Hill Formation is a greenish-gray thin to medium bedded shale with interbedded siltstone and sandstone layers. The overlying Tuscarora Formation consists of gray, hard, massive quartzitic sandstone layers. These strata are resistant to weathering.

The slopes around the reservoir are 15 to 20 degrees or flatter and appear to be susceptible to sliding.