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NATIONAL DAM INSPECTION PROGRAM. INDIAN RUN DAM (PA-00696), SCH--ETC(U)
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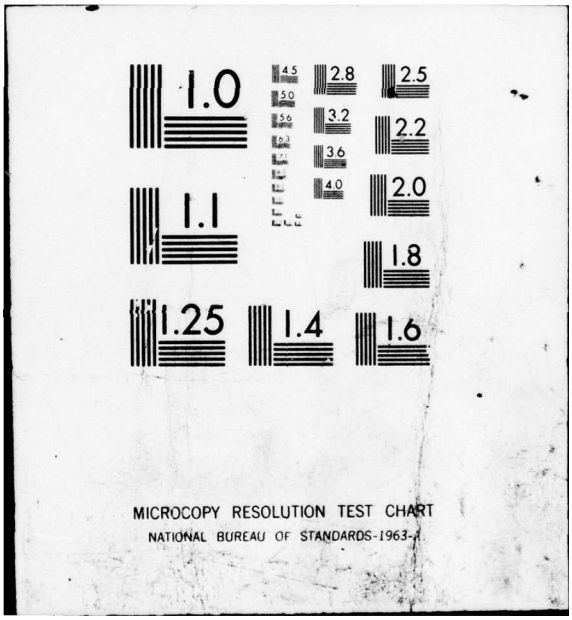
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SCHUYLKILL RIVER BASIN
INDIAN RUN CREEK, SCHUYLKILL COUNTY
PENNSYLVANIA
ID NO. PA. 00696

INDIAN RUN DAM

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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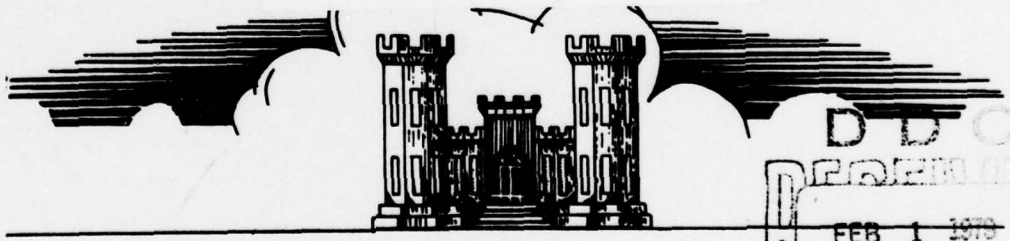


DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

JULY 1978

SCHUYLKILL RIVER BASIN

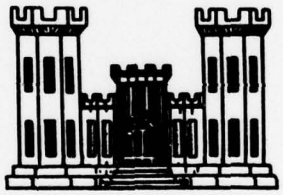
INDIAN RUN DAM
SCHUYLKILL COUNTY, PENNSYLVANIA
NATIONAL I.D. NO. PA 00696

LEVEL

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

(6) National Dam Inspection Program. Indian Run Dam (ID Number (PA-00696), Schuylkill River Basin, Indian Run Creek, Schuylkill County, Pennsylvania. Phase I Inspection Report.

(15) DACW31-78-C-0048



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Prepared by:

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Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(11) JULY 1978

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Indian Run Dam
County Located: Schuylkill County
State Located: Pennsylvania
Stream: Indian Run Creek
Coordinates: Latitude 40° 39.3' Longitude 76° 14.1'
Date of Inspection: 3 July 1978

Indian Run Dam was constructed in 1924 and the spillway was reconstructed in 1935. It has been classified as a "High" hazard potential dam because of the potential hazard to residential dwellings along the downstream channel and in the community of Beckville, Pennsylvania which is located on the West Branch of the Little Schuylkill River. Based on the visual inspection, evaluation of available records and past operational performance, the dam and appurtenant facilities are judged to be in fair condition. The visual inspection revealed no evidence to indicate potential stability problems.

Seepage was noted along the downstream toe and along the right abutment. This seepage was cited by Department of Environmental Resources personnel during their periodic inspections. Flows have apparently never been monitored and, therefore, changes in the rate of flow were unavailable. The current Owner excavated these areas, placed gravel and installed pipes to drain the water into the small reservoir immediately downstream. The discharge was observed to be clear.

The spillway was inspected and found to be in fair condition. Seepage was noted through the left and right spillway walls together with leakage at the abutment between the ogee crest and the retaining wall. The spillway was cracked with seepage flowing through several of the cracks. The water flowed into construction joints beneath the chute slab. The chute was spalled and, in several locations, reinforcing steel was exposed and completely deteriorated. Erosion was noted at the end of the chute where water discharges into the lower reservoir.

Erosion and settlement were noted at the top of the dam adjacent to the spillway. The erosion continued down the slope immediately adjacent to the spillway retaining wall.

The spillway was computed to be capable of discharging 4,970 cfs with the water level at the top of the dam when the embankment is at the design elevation. However, erosion was noted adjacent to the spillway which reduces the effective height of the embankment, reducing the maximum discharge to 4,060 cfs. The peak inflow was computed to be 4,070 cfs. Since the peak discharge capacity is significantly greater than the peak inflow rate, the spillway is considered "Adequate". The spillway passes the probable maximum flood (PMF) without overtopping.

The following measures are recommended in order of importance but does not infer the latter recommendations are not important. All recommendations should be implemented as soon as practical.

1. The spalled concrete along the spillway chute and retaining walls should be repaired. All leakage should be sealed.

2. The intake tower should be drained and inspected to evaluate the condition of the tower.

3. The end of the chute spillway should be inspected for undermining. If excessive undermining has occurred as assessed by a professional engineer, the chute foundation should be repaired.

4. The embankment should be reconstructed to the design crest elevation using impervious materials and revegetated.

5. Seepage from the gravel drains should be monitored periodically and checked for increasing flows or turbidity changes.

6. The wet area at the base of the dam should be regraded and drained. If seepage is observed after a reasonable period, an inverted filter or an equivalent seepage control system should be installed. Seepage and turbidity should be minitored.

7. Drain holes should be cleaned or new drain holes installed.

8. All trees and woody vegetation should be cut and removed from the downstream slope.

9. Vegetation should be removed from the spillway.

An inspection program and maintenance checklist should be formulated. The dam, appurtenant structures and seepage should be inspected and monitored on a regular basis. Because of the location of the dam upstream from populated areas, a formal procedure of observation and warning during periods of high flow or the development of potentially hazardous conditions should be developed and implemented. An alternative means of access to the intake tower should be developed since the current access road is rutted, washed and crosses the downstream channel.

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16 AUG 78
Date

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Date

APPROVED BY:

John H Kenworthy

JOHN H. KENWORTHY
LTC, Corps of Engineers
Acting District Engineer

DATE: 25 August 1978

OVERVIEW
INDIAN RUN DAM, SCHUYLKILL COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
INDIAN RUN DAM
NATIONAL ID #PA 00696
DER #54-109

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Indian Run Dam is a rolled earth dam with a concrete core wall that extends from the rock foundation to the crest of the dam. The structure is 700 feet long with a height of 94 feet above the original stream bed. The dam contains a coarse rock toe both on the upstream and downstream sections. The downstream section is augmented with a riprapped rock toe drain which is 10 feet wide and varies in depth. The upstream slope is covered with a four foot thick layer of rock.

The principal intake tower was constructed within the embankment immediately downstream ot the centerline and the core wall. The intakes consist of three pipes embedded in the embankment with a wing wall intake on the embankment slope. The upper two intake pipes are 20 inches in diameter and located at elevations 733.8 and 753.8 respectively. The lower intake, which is used as a pond drain, is a 36-inch cast iron pipe located at elevation 689.6. Water enters the tower and discharges via twin 24-inch cast iron pipes located at the base of the dam. The emergency spillway is located on the left abutment and consists of a concrete ogee section 60 feet wide.

b. Location. Indian Run Dam is located on Indian Run which is a small tributary of the West Branch of the Schuylkill River. The site is approximately 2,000 feet from the confluence of Indian Run and the West Branch of the Little Schuylkill River, about 1,700 feet above the Lehigh Valley Railroad and immediately upstream of a small, older reservoir. The dam is located off of State Route 901, near Pottsville, Berks County, Pennsylvania.

The dam site and reservoir are shown on USGS Quadrangle titled, "Pottsville, Pennsylvania", at coordinates N40° 39.3', W76° 14.1' A Regional Location Plan of Indian Run Dam and Reservoir is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as "Intermediate" by virtue of its 94 foot height and 1498 acre-feet normal storage capacity.

d. Hazard Classification. A "High" hazard classification has been assigned to this dam because of the residential dwellings located downstream to include the community of Beckville, Pennsylvania.

e. Ownership. Schuylkill County Municipal Authority, Pottsville, Pennsylvania.

f. Purpose of Dam. Water supply for Pottsville and immediately surrounding areas.

g. Design and Construction History. The "Report Upon the Application for Indian Run Dam" was made February 9, 1924, by the State of Pennsylvania and a permit issued that month. Stripping commenced on June 28, 1924 by the T. Stewart & Sons, Contractor Company.

The foundation was grouted with a single-line grout curtain with pressures ranging up to 75 pounds per square inch. Grout holes were placed 15 feet on-center and were drilled 24 feet below the rock surface. The largest grout take was experienced on the right side where 32 cubic yards of material were injected. The average grout take per hole was 3-1/2 cubic yards. The concrete core wall was founded over the centerline of the grout holes.

By August 26, 1924, embankment placement commenced and the core wall construction was well underway. By June 3, 1925, all but approximately 250,000 cubic yards of material was placed. Embankment fill was being placed

at a rate of 29,000 cubic yards per month. On August 21, 1925, the Owner adjusted the riprap design increasing the maximum thickness of riprap from two feet to four feet on the upstream slope. By November 16, 1925, the embankment was within 25 feet of the crest, requiring approximately 45,000 cubic yards to complete. Records do not indicate the exact date of completion, but it is probable that the dam was completed in the Spring of 1926. In 1935, the original spillway was replaced with the present spillway. The major change was that the new spillway slope was decreased. The spillway reconstruction work was completed in late summer 1935.

The original design included options for a gatehouse about 100 feet below the downstream toe or an intake tower within the embankment. On February 26, 1924, it was decided to construct an intake tower at the crest of the dam. The approval of this change was made by the Water and Resources Bureau in Harrisburg, Pennsylvania, on March 4, 1924. The design included the reinforcement of the tower at the junction of the pipes to preclude pipe cracking once the embankment settled after construction. This accomodation was made by reinforcing the tower and adding "sliding vertical joints" between the tower and the intake pipes.

An inspection of the dam performed on December 12, 1929 indicated one foot of settlement of the embankment. At the request of the State of Pennsylvania, the embankment was regraded to the design elevation (December 17, 1929). The dam was re-inspected approximately two days later by the State.

Construction photographs provided with the DER files show that both spillways were founded on rock and that the dam and core wall were also founded on rock.

h. Normal Operation Procedure. Under normal operating procedures, the 36-inch drain pipe at the base of the intake tower is in the closed position. It was reported by the Owner's representative that the drain valve is operated at least once a year. The upper two intakes are open and the tower is filled with water. Water fills the twin 24-inch cast iron pipes which lead to the pumphouse at the valley bottom, leaving the entire system under the full hydrostatic head of the reservoir. At night, water is pumped into two steel holding tanks located across the valley near the top of a hill. During the day, water is supplied by gravity to the residents of Pottsville and surrounding areas. Under high demand situations, the water tanks are refilled during the day.

The quantity of stored water in the reservoir is determined by measuring the slope distance from the normal pool elevation to the water's edge and the use of a rating curve. These records are maintained at the pumphouse downstream or at the main office in Pottsville, Pennsylvania.

1.3 Pertinent Data:

Pertinent data for Indian Run Reservoir is summarized as follows:

a.	Drainage Area (sq. miles)	2.35
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood at Site (Agnes, June 1972)	1140 ±
	Maximum Design Flow (Elev 777.5)	2090 ±
	Top of Dam (Maximum Discharge)	4970
c.	Elevations (feet above MSL)	
	Top of Dam	781.0
	Top of Spillway	773.0
	Normal Pool	773.0
	Maximum Design Pool	777.5
	Maximum Recorded Pool	
	Intake Tower	
	Upper Intake	753.8
	Middle Intake	733.8
	Pond Drain	689.6
d.	Reservoir (miles)	
	Length at Normal Pool	0.7
	Fetch at Normal Pool	0.7
e.	Storage (acre-feet)	
	Normal Pool	1498
	Top of Dam	1943
f.	Reservoir Surface (acres)	
	Normal Pool	49.5
	Maximum Pool (Top of Dam)	61.9

g. Dam Data

Type	Rolled earth with core wall
Length	700 feet
Maximum Height	94 feet
Top Width	20 feet
Side Slopes-Upstream	
Crest to Elev. 751.0	2H:1V
Elev. 751 to Elev. 743.0	2.5H:1V
Elev. 743 to Toe	3H:1V
Side Slopes-Downstream	
Crest to Elev. 748.5	2H:1V
Bench Width at Elev. 748.5	10 feet
Elev. 748.5 to Elev. 719.5	2.5H:1V
Bench Width at 719.5	10 feet
Elev. 719.5 to Elev. 702.0	2.5H:1V
Bench Width at 702.0	6 feet
Elev. 702.0 to Toe	2H:1V
Cutoff	Core wall embedded into rock foundation
Grout Curtain	Single line grout curtain at 15 feet on center (average)

h. Diversion and Regulating Tunnels — None

i. Spillway

Type	Concrete ogee section
Elev. (feet above MSL)	773
Length of Weir	60 feet
Chute Spillway	Reinforced concrete chute spillway with concrete walls. Channel contains steps and progressively steepens down slope
Discharge	The flow discharges into a 3 1/2 acres holding pond. The pond is abandoned and is currently used as a stilling basin

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. There were no design calculations available for review. A summary of the data available in the files is presented in the checklist, attached as Appendix A. Engineering documentation available for review was contained primarily in a 10-sheet set of blueprints dated 1924 and 1935. A set of these drawings is in the Owner's possession and is also located at the Commonwealth of Pennsylvania, Department of Environmental Resources main office in Harrisburg, Pennsylvania. Other documentation included the "Report Upon the Application of the Pottsville Water Company", dated February 9, 1924, together with several construction progress report submitted by the State of Pennsylvania and a 63-page set of "Specifications for Construction of Indian Run Reservoir and Miscellaneous Work". It is not known who designed this structure, but files indicate that it was most probably designed by the Pottsville Water Company or the Municipal Authority of Pottsville. Other documentation included a series of letters and memoranda between the Pottsville Water Company and the State of Pennsylvania, from which the construction history summarized in Section 1 was reconstructed.

b. Design Features. The principal design features of Indian Run Dam are illustrated on the plan, profile and cross-sections that are enclosed in Appendix E as Plates 2 through 5, and described in Section 1.2, paragraph a. These plates were reproduced from the 1924 and 1935 design drawings prepared by the Pottsville Water Company.

The upstream slope is inclined from the crest to elevation 751 at a slope of 2H:IV; from elevation 751 to elevation 743, the slope is 2.5H:IV. From elevation 743 to the toe, the slope is inclined at a slope of 3H:IV.

The downstream slope contains two berms at elevations 748.5 and 719.5, respectively. Each berm is six feet wide with a four foot trench adjacent to the slope. The trench depth on both berms is one foot. Immediately above each berm trench is a riprap slope approximately 5 to 10 feet long. The downstream slope from the crest to the first berm is inclined at 2H:1V. From the first berm

to the lower berm, the slope is inclined at 2.5H:1V. Thereafter, the slope is inclined at a slope of 2.5H:1V. A third six-foot wide berm has been constructed at the top of the coarse rock drainage fill and the drainage toe is inclined at a slope of 2H:1V to the existing ground surface.

The grout curtain was originally designed with holes spaced 20 feet on-center; however, correspondence indicates that the spacing was reduced to 15 feet on-center. Hole depths averaged 24 feet into rock, or 24 feet below the concrete core wall.

The reinforced concrete intake tower described in Section 1.2, paragraph a, is founded into rock with the base elevation at 684.1 ±. The 36-inch cast iron pipe founded at elevation 389.6 was used as a diversion pipe during construction and can be used as a reservoir drain. In addition to the twin 24-inch discharge pipes, the intake tower also contains a six inch cast iron drain pipe which can drain the intake tower completely.

The emergency spillway is located in the left abutment of the dam. It contains an ogee concrete spillway 60 feet wide. The spillway discharges water downslope over several steps and grade changes within the spillway. The water ultimately discharges into a 3-1/2 acre pond immediately below the toe of the dam. Originally, water was drawn-off from the pond for use in Pottsville. Since then (date unknown), the pond was abandoned and water is now supplied directly to a pumphouse which pumps water to two holding tanks on the other side of the valley.

2.2 Construction.

Available data pertaining to the construction history of this dam was scattered in various documents and pieced together to provide a construction history. This history was described in Section 1.2, paragraph g. Generally, it appears that reasonable care was exercised in construction of Indian Run Dam. Photographic documentation of the dam and spillway foundations indicates that the rock was broom-cleaned and washed prior to fill placement and concrete construction. Reasonable efforts were made to grout the foundation rock to minimize underseepage. Construction photographs also indicate that topsoil was removed before embankment materials were placed and that

organic materials were removed from the borrow pit prior to use for embankment construction. The photographs also indicate relatively good quality rock used for riprap sections and the toe drains. Visual inspection of the exposed rock indicates that the integrity of the rock is still very good. Construction memoranda and correspondence indicates that earthworks and the associated compaction was satisfactory. There were some problems noted regarding sprinkling the material with water to optimize compaction. Apparently, this problem was discussed with the Contractor, and appropriate corrective action was taken. Construction records also indicate that the quality of the concrete, for the most part, was very good and that placement techniques, including form work, were better than average.

2.3 Operation.

During the evening, the caretaker fills the water storage tanks. During unusually high usage days, the tanks are re-filled during the day. Otherwise, no other operational records were available.

2.4 Evaluation.

a. Availability. Engineering data was provided by the Division of Dams and Encroachments, Bureau of Water Quality Management, Department of Environmental Resources, Commonwealth of Pennsylvania, and by the Owner, Schuylkill County Municipal Authority. The Owner made available his files for review. However, documentation regarding the construction history and design calculations could not be located. The Owner also researched his files and did not find additional data.

b. Adequacy. Since the type and amount of design data and other engineering data are limited, the assessment was based on a combination of this limited available data, visual inspection, performance history, hydrologic and hydraulic assumptions and calculations. Calculations are presented in Appendix C.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The observations and comments of the field inspection team are enclosed herein as Appendix B and are summarized and evaluated as follows. In general, the appearance of the facility indicates that the dam and appurtenances were properly constructed and are generally maintained to provide water as necessary for the town of Pottsville.

b. Dam. During the visual survey, there were no indications or evidence observed of distortions in alignment or grade that would be indicative of movement of the embankment or the foundation. A careful inspection of the dam disclosed some seepage at the toe and along the right abutment, as shown in Appendix B, Sheet 5a. This seepage was observed during all previous inspections. During this inspection, it was noted that since the last inspection, the seepage zones were excavated and filled with gravel. Pipes now lead from the primary seepage zones into the lower reservoir. The discharge from these pipes was inspected and found to be clear. Some standing water was observed between the toe of the dam and the lower reservoir. However, this appears to be a topographic low and contains standing water associated with rainfall runoff.

As shown on Photograph No. 8, erosion and settlement of the embankment was noted adjacent to the spillway wall. This settlement feathered out about 40 feet from the wall. This settlement has lowered the embankment crest by at least 9 inches and, correspondingly, reduces the flood storage capacity.

c. Appurtenant Structures. At the time of the inspection, the water level was just below the crest of the spillway. Significant spalling and cracking of the ogee spillway was observed together with cracks, spalling and general deterioration of the retaining walls adjacent to the ogee spillway. Seepage was discharging through the cracks running down the spillway face and entering an eroded construction joint at the base of the ogee section. This water was apparently running beneath the spillway. Clear water was observed discharging from the drain pipe at the first step in the spillway chute floor. This water could be the seepage noted further upstream but could not be confirmed without a tracer dye.

The spillway chute showed severe spalling with reinforcing steel exposed, especially at the stepped sections. Some of this reinforcement has deteriorated and is not longer functioning as designed. The spillway chute retaining walls are in somewhat better condition with less spalling and deterioration. However, there are several

cracks along both sides of the retaining wall which permit discharge of water. Photographs of the spillway are included in Appendix D as Photograph Nos. 2 through 4. At the end of the chute spillway, where the chute enters the lower reservoir, some undermining of the chute foundation was observed. However, the water was relatively deep and the extent of the undermining could not be determined. There were no signs of cracks at the end of the spillway indicative of a loss of significant support beneath the chute. In general, the emergency spillway and chute are in need of a significant amount of repair.

The intake tower was found to be in generally fair condition. All valves were exercised except the blow-off valve at the base of the dam. There were no plans available showing details of the valve control mechanism. Since the intake tower is a wet tower, the valves and the interior sections of the tower could not be inspected. Sections that were exposed were in fair condition. Since the 24-inch cast iron discharge pipes are buried to the pumphouse and pond, they could not be inspected, nor could the six-inch cast iron pipe located at the base of the tower be inspected or the outlet located.

d. Reservoir. Reconnaissance of the reservoir indicated very little evidence of siltation, no evidence of slope instability or other features that would significantly affect flood storage capacity of the reservoir. The reservoir and drainage area are owned solely by the Schuylkill County Municipal Authority and the Commonwealth. The entire area is heavily forested and it is unlikely that urbanization will occur within the foreseeable future.

e. Downstream Channel. Water from the emergency spillway is discharged into a 3-1/2 acre reservoir immediately downstream from the dam. The water discharges over a small concrete spillway at the end of the pond. This spillway is cracked and deteriorated. Thereafter, the water flows into the natural stream channel which empties into the West Branch, approximately 2,000 feet downstream. The channel bottom between the lower reservoir and the confluence with the West Branch is rocky with stable side slopes. The flood plain downstream of the reservoir is densely wooded with many rock outcrops. The West Branch flood plain is also densely wooded.

3.2 Evaluation.

a. Dam. The exposed sections of the dam are in generally good condition. The downstream slope is covered with dense woody vegetation which should be removed. There was no exterior evidence observed to indicate any interior malfunctions of the embankment or the drainage systems therein. As previously noted, some seepage was observed during this and previous inspections. Since seepage rates were not recorded during previous inspections, there is no baseline for determining changes in rates of seepage with time. Seepage should be monitored.

Some erosion was noted at the junction between the embankment and the emergency spillway. This erosion has effectively reduced the crest height of the dam by approximately one foot. The crest should be restored to the design elevation.

b. Appurtenant Structures. Considering the age of the spillway section (constructed in 1935), the degree of spalling and cracking of the structure is to be expected. Undesirable seepage is occurring and running beneath the chute spillway. This seepage is deteriorating the foundation support of the chute spillway and could result in failure of the spillway. The conditions observed within the discharge chute do not appear to represent an immediate hazard to the integrity of the dam, but they should be repaired within the near future.

The valve control mechanisms in the tower are relatively old and rusted. Although the valves that were operated, operated easily during the inspection, the rust on the gears is undesirable.

The access road to the dam is adjacent to, and crosses the emergency spillway discharge channel. Therefore, access to the control structure would probably not be possible during periods of high discharge. In the event of an extreme rainfall, access to the dam is probably limited to crossing a snake-infested wooded area.

c. Reservoir Area. No conditions were observed in the reservoir that might present significant hazard to the dam.

d. Downstream Channel. No conditions were observed in the downstream channel that may present significant hazard to the dam. Additional discussions on downstream conditions are presented in Section 5.1, paragraph f.

SECTION 4
OPERATION PROCEDURES

4.1 Procedures.

The maximum reservoir level is regulated by the ogee spillway at the left abutment constructed to elevation 773.0. Water for public consumption is drawn-off through a buried 24-inch cast iron pipe which is connected to the pumphouse. The intake valves are open and the pipe and intake tower experience the full head of the reservoir. It is reported that these valves are operated at least yearly and generally once per month for the upper two valves. The Owner's representative stated that no written procedures exist for operation of Indian Run Dam.

4.2 Maintenance of Dam.

The dam is maintained by the Municipal Authority. Representatives periodically check the structure and perform minor repairs.

4.3 Maintenance of Operating Facilities.

The valve mechanisms in the control house are rusted and not well lubricated, although easily operated. The valve mechanism should be periodically checked and lubricated to assure they will operate in times of need. As reported by the Owner, there is no recollection of, nor were there records available, indicating that the tower has been periodically drained and inspected.

4.4 Warning Systems.

There are no formal warning systems or procedures established to be followed during periods of exceedingly heavy rainfall. The pumphouse operator/dam caretaker live near the pumphouse at the base of the valley and he is aware of the proper authority to contact in the event that a hazardous condition develops. In the event of a large storm, it is unlikely the access road between the caretaker's house and the dam would be passable. Presently, it is rutted, unpaved, and crosses the channel.

4.5 Evaluation.

Although there are no written operating procedures, it is believed that the current procedures are a reasonable and realistic means of operating the relatively simple control facility at Indian Run Dam. A maintenance procedure should be formulated and implemented by the Owner. A formal warning procedure and surveillance program should be implemented during periods of extreme rainfall or during the development of a hazardous condition, so that residents downstream could be warned of possible high volumes of flow in the West Branch and Little Schuylkill River.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. Original hydrologic/hydraulic data is limited to statements on the 1924 set of plans. These statements are listed in Appendix C. Watershed characteristics were mentioned in the Application Report, dated February 9, 1924.

The watershed characteristics have not changed significantly since 1924 and, as the Water Authority owns most of the watershed, conditions are not expected to change. The watershed is predominantly tree-covered mountains surrounding the valley with elevations ranging from 1440 feet to 686 feet at the upstream toe of the dam. The drainage area is 2.35 square miles. There are no upstream ponds.

The original design criteria assumed a maximum rainfall of six inches in 3-1/2 hours, which according to current standards, corresponds to approximately 30 percent of the probable maximum precipitation (PMP). The assumed maximum outflow over the spillway was 1065 cfs per square mile (2500 cfs) and a computed spillway outflow under assumed maximum head (Elev. 777.5) was given as 1870 or 2090 cfs (See Appendix C).

In accordance with the criteria established by the Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam with a "High" hazard potential classification is the probable maximum flood (PMF).

b. Experience Data. Water levels in the reservoir are recorded and weekly records are maintained. Water levels are measured from a fixed point along the slope rather than the vertical distance above or below the spillway crest. Available records reviewed indicated a maximum reservoir level of six feet (measured up slope on November 24, 1972). This corresponds to an estimated spillway discharge of 965 cfs. The dam superintendent reported that Hurricane Agnes (June 1972) produced a maximum height of flow over the spillway of 2 to 3 feet. This corresponds to an estimated discharge of 620 to 1140 cfs. Indian Run Dam received a total rainfall from Agnes of somewhere between 12 and 14 inches according to climological data publised by NOAA. The maximum rainfall in Pennsylvania from Agnes was recorded to be 18 inches.

c. Visual Observations. On the date of the inspection, no conditions were observed that would indicate that the outlet capacity would be significantly reduced during a flood occurrence. Observations regarding the downstream channel, spillway conditions and reservoir are located in Appendix C.

d. Overtopping Potential. The PMF peak inflow is estimated to be 4,070 cfs (See Appendix C, Sheet 5). Spillway discharge capacity was computed according to current accepted practice and compared with the estimated PMF peak inflow for both design and existing conditions. For the design conditions (Crest Elev. 781.0), the spillway would discharge 4970 cfs which is greater than the estimated PMF inflow. For existing conditions (Crest Elev. 780.2±) the discharge rate is approximately 4056 cfs which is approximately equal to the estimated PMF inflow. Therefore, no further overtopping analysis was performed.

e. Spillway Adequacy. The spillway is capable of discharging 4,970 cfs with the water level at the top of the dam. This peak discharge is greater than the estimated PMF inflow rate of 4,070 cfs. Therefore, the spillway is considered "Adequate". The spillway will discharge 4,070 cfs with a head of seven feet, leaving one foot of freeboard. The tailwater is estimated to be 70 feet or more below the top of the dam during the PMF.

f. Downstream Conditions. Indian Run Dam is located approximately 2,500 feet above the confluence of Indian Run at the West Branch of the Schuylkill River. As the Water Authority owns all of the land downstream to the West Branch, no homes or buildings are subject to damage. Immediately below the confluence of these two streams, homes are built adjacent to the West Branch. Approximately 2.5 miles downstream of the confluence is the village of Beckville which would be subject to damage from large flows or dam failure. As the West Branch drainage area is many times larger than Indian Run drainage area, the discharge from the West Branch controls the flow through the bridges into Beckville. No attempt has been made to determine the discharge which would flood these bridges. Considering the elevation of the water behind Indian Run Dam and the expected difference in elevation between the reservoir water level and the tailwater level, considerably more damage and loss of life would result from the flood wave as a result of dam failure then that would result from the passage of large flows in the West Branch of the Schuylkill River.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. The visual observations do not indicate any existing embankment stability problems. Seepage was observed at several locations downstream adjacent to the right abutment and near the toe of the dam. The clarity of the seepage indicates that piping or erosion within the dam is not occurring. It is understood that the drainage blankets installed at the seepage locations were placed only a few years ago. There are no records of past seepage rates to give a basis for judging whether changes have or have not occurred.

The visual inspection of the spillway did not reveal any evidence of instability in the ogee weir. However, cracking of the weir and the chute, as well as the retaining walls, was observed throughout the discharge chute. The concrete is deteriorating and should be repaired before unstable conditions develop. Woody vegetation, which is beginning to grow in the cracks and joints of the spillway chute should be removed to minimize the rate of deterioration.

The intake tower was observed to be in fair condition. There were no significant signs of spalling or cracking. The gate valves need to be lubricated. The intake tower should be drained and inspected periodically.

b. Design and Construction Data. Since there is no evidence that a formal stability or seepage analyses were ever conducted for this dam, the evaluation of the structural stability can be based only on a review of the design drawings and the results of the visual inspection. The visual inspection and past performance indicate that the dam is presently stable. Soils data relevant to the embankment was not available in the files reviewed. The embankment configuration for the types of soil available in this area is a reasonable one assuming that the soils were compacted at a reasonable moisture content and to a reasonable dry density.

Although there are no direct references, inferences in the documentation indicate that the borrow source and quarry sites noted in the design documents were used during construction. Photographs of the construction confirmed that the dam was founded on rock and that the chute spillway was also founded on rock.

Construction documents and inspection memoranda indicate that the construction was generally very good. There are several positive comments throughout the construction documentation indicating that the Contractor performed the work in a highly satisfactory manner. There was no documentation regarding the degree of compaction required or the quality of concrete and reinforcing steel required.

c. Operating Records. There is no evidence that any stability problems have occurred during the operational history of the dam.

d. Post-Construction Changes. In 1935, the principal spillway was reconstructed and the slope of this chute was lessened. Since 1935, there is no record of any modifications or alterations made to the dam.

e. Seismic Stability. The dam is located in Seismic Zone I. Normally, it can be considered that if the dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading. Since there are no formal static stability analyses, the theoretical seismic stability of the dam could not be assessed.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. The visual inspection and long-term performance of Indian Run Dam indicates that the dam and foundation has and is performing satisfactorily and is in fair condition. The spillway is considered "Adequate" in that it is capable of passing the estimated PMF. The clear seeps noted along the right abutment and seepage observed emanating from the pipes in the downstream drains have not been monitored for seepage rate changes or turbidity. Therefore, seepage should be monitored to evaluate if seepage rates increase or if turbid conditions develop.

The spalling of the concrete within the weir section, chute section and retaining walls is expected for this 43-year old structure. The cracking is considered significant and seepage emanating from the cracks is most undesirable. In most cases, the seepage along the upper portions of the chute and ogee sections are entering eroded construction joints of the chute channel and flowing underneath the concrete, as described in Section 3.1, paragraph c. This spalling and cracking should be repaired and the vegetation removed from the channel. The channel walls should be repaired and the vegetation removed to lessen the rate of deterioration.

The intake tower exposed above the embankment was inspected and observed to be in fair condition. However, the valve control mechanisms within the tower are old, rusted, and marginally maintained in that they are coated with rust and there are only traces of grease for the systems being maintained on a regular basis. Since there was no evidence or documentation indicating that the tower is periodically drained and inspected, it is recommended that the tower be sealed off, drained and inspected to determine the condition of the structure, the operating gates, and the water supply pipes.

b. Adequacy of Information. The information available is such that the assessment of the safety of the dam embankment is based primarily on visual inspection, available hydrologic and hydraulic data, design drawings, miscellaneous construction documentation and calculations summarized in Appendix C. Past performance of the structure played a key factor in the evaluation of the stability of the system.

c. Urgency. The recommendations in Paragraph 7.2, should be implemented soon.

d. Necessity for Additional Studies. Although the data did not include summaries of stability analysis of the embankment, the dam configuration is considered reasonable by current standards. However, the seepage should be evaluated by a professional Engineer. Additional studies should be performed as needed to implement the remedial measures listed as follows.

7.2 Remedial Measures.

a. Facilities. The following measures are recommended to be undertaken by the Owner in order of priority. This does not infer that the latter recommendations are unnecessary.

1. The intake tower should be drained and inspected to evaluate the condition of the tower and gates;

2. All seepage downstream should be monitored periodically and checked for increasing rates and turbidity;

3. The wet area at the base of the dam should be regraded and drained. If seepage continues to flow from this area, after a reasonable period, an inverted filter or equivalent seepage control system should be installed;

4. The end of the chute spillway should be inspected immediately for undermining. If detrimental conditions are observed, appropriate remedial measures should be taken;

5. The spalled concrete, including the spillway crest, should be repaired;

6. The embankment should be regraded to the design elevation along the entire crest;

7. All woody vegetation should be cut and removed from the downstream slope; and

8. All vegetation should be removed from the emergency spillway.

b. Operation and Maintenance Procedures. A maintenance inspection checklist should be developed to help insure that all critical items are regularly inspected and maintained.

Because of the location of the dam upstream from populated areas, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. Alternate means of obtaining access to the intake tower should be developed since the current road is rutted, washed and crosses the downstream channel.

APPENDIX

A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *Indian Run Dam*

ID # *PA 00696*

ITEM	REMARKS
AS-BUILT DRAWINGS	*No. Design drawings were available including drawings which show the borrow sources and revised spillway plan.*
REGIONAL VICINITY MAP	*The dam is located on USGS QUAD sheet entitled," Pottsville, Pennsylvania", 1968.*
CONSTRUCTION HISTORY	*There was no data readily avialable, however, Mr. Dave Holley, Manager of the Municipal Authority, did furnish some data. The inspection team reviewed the archives at the Municipal Authority office but records were difficult to locate. DER files contain 23 B&W photographs.*
TYPICAL SECTIONS OF DAM	*Sections are located on the design drawings*
OUTLETS - PLAN	*Plans and details of the outlet system were included with the design drawings.*
DETAILS	
CONSTRAINTS	*This data was unavailable and could not be located in the Municipal Authority files.*
DISCHARGE RATINGS	
RAINFALL/RESERVOIR RECORDS	*Data was not available for this area.*

ITEM	REMARKS
DESIGN REPORTS	*None available.*
GEOLOGY REPORTS	*No data in DER files but a geologic description has been formulated and is enclosed in Appendix F.*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	*No data available. Municipal Authority files were researched.*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*No data available. Municipal Authority files were researched.*
POST-CONSTRUCTION SURVEYS OF DAM	*None*
BORROW SOURCES	*Borrow materials were retrieved from the reservoir area.*

ITEM	REMARKS
MONITORING SYSTEMS	*None*
MODIFICATIONS	*The spillway was reconstructed in 1935. The major modification was the reduction in the spillway slope.*
HIGH POOL RECORDS	*None available.*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*None.*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None.*
MAINTENANCE OPERATION RECORDS	*None.*

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	*Data is included with the design drawings.*
OPERATING EQUIPMENT PLANS & DETAILS	*None available*

MISCELLANEOUS DOCUMENTS

1. *"Report Upon the Application of the Pottsville Water Company" for Indian Run Dam dated Feb. 9, 1924.*
2. *Miscellaneous letters.*
3. *Miscellaneous Progress Reports during construction prepared by the State.*
4. *Various inspection reports prepared by the State.*
5. *"Bid Document" for Indian Run Reservoir and Miscellaneous Work. 63 pages.*

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *Indian Run Dam* County *Schuylkill* State *Pennsylvania* National ID # *PA00696*

Type of Dam *Rolled Earth* Hazard Category *I (High)*

Date(s) Inspection *3 July 1978* Weather *Light Rain* Temperature *65°F*

Pool Elevation at Time of Inspection *772* M.S.L. Tailwater at Time of Inspection *678* M.S.L.

Inspection Personnel:

Mary Beck (Hydrologist)

John Boschuk, Jr. (Geotechnical/Civil

Vince McKeever (Hydrologist)

John Boschuk Jr. Recorder

Remarks:

Mr. Dave Holly (Manager) and Mr. Frank Rosco (Superintendant) were on site for the Owner and provided information.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	*N/A*	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	*N/A*	
DRAINS	*N/A*	
WATER PASSAGES	*N/A*	
FOUNDATION	*N/A*	

CONCRETE/MASONRY DAMS

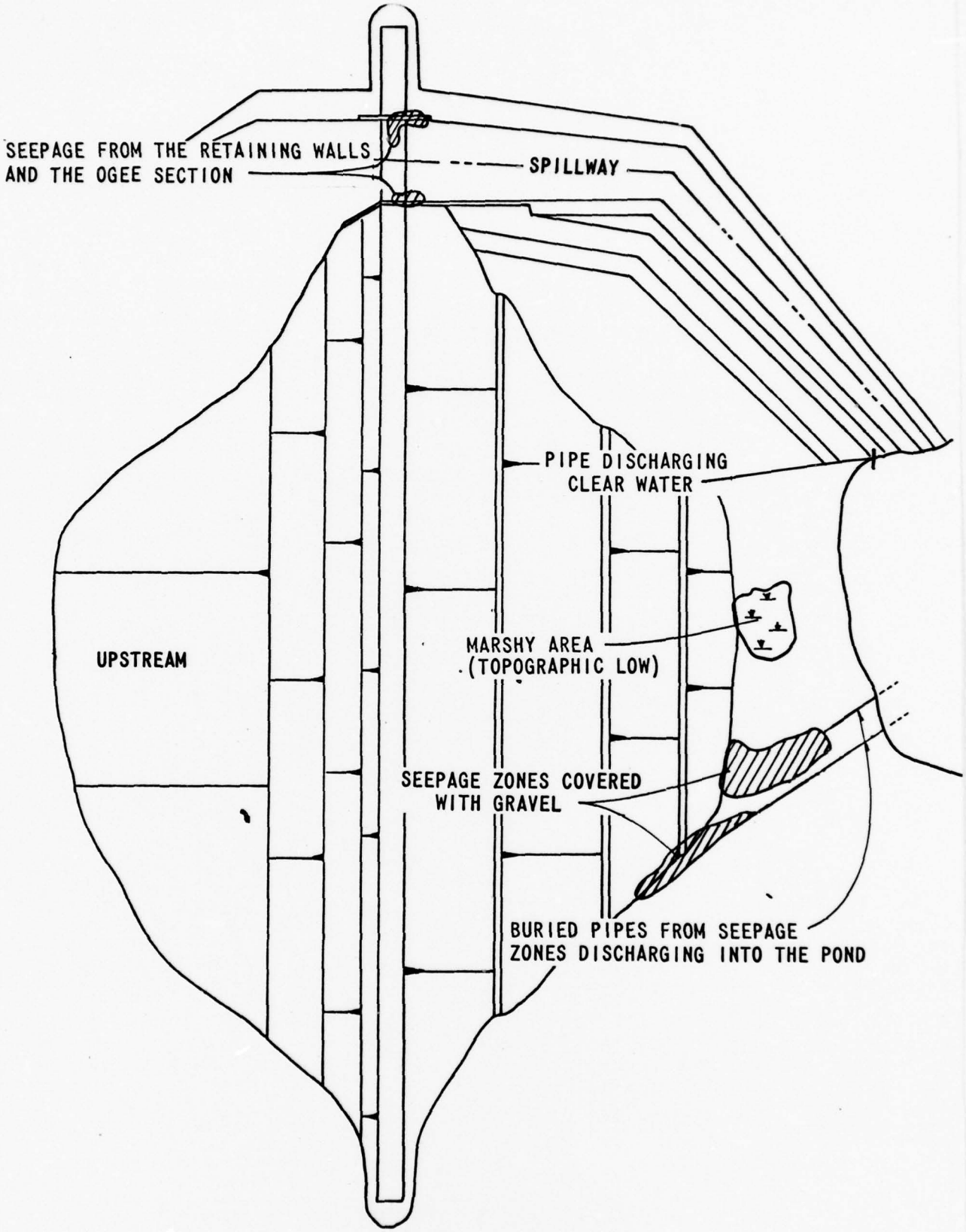
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	*N/A*	
STRUCTURAL CRACKING	*N/A*	
VERTICAL AND HORIZONTAL ALIGNMENT	*N/A*	
MONOLITH JOINTS	*N/A*	
CONSTRUCTION JOINTS	*N/A*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*None Observed*	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*None Observed*	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*No erosion or sloughing, but some riprap was noted on the upstream slope. The Owner attributes this to illegal fisherman who adjust the rock to provide a place to fish. The downstream slope is densely vegetated and should be cleaned.*	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*None observed, but some settlement was noted (≈9 inches), adjacent to the emergency spillway. The settlement feathered out about 40 feet from the wall. This area should be filled with impervious material.*	
RIPRAP FAILURES	*None observed.*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	*The top 25% of the downstream slope was cleared recently, but the remaining portion of the slope is covered with dense vegetation and trees. All woody vegetation should be removed and wasted.*	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*Approximately 9 inches of material has been lost near the left abutment of the dam adjacent to the spillway wall. This area should be refilled with impervious materials.*	
ANY NOTICEABLE SEEPAGE	*Some seepage was observed along the right abutment of the dam approximately two thirds of the way down the slope. Seepage zones noted in the DER files were found, and observed. They have been excavated; filled with gravel, and drainage pipes now lead to the lower pond. See sheet 5a.*	
STAFF GAGE AND RECORDER	*None, but the water elevation is read at least weekly by measuring the slope distance from a none reference point (Normal Pool Elev.) to the water surface. Records are maintained in the main office.*	
DRAINS	*Three drain pipes were noted as shown on sheet 5a.*	



SEEPAGE LOCATION PLAN
INDIAN RUN DAM

SHEET 5a OF 11

OUTLET WORKS
(INTAKE TOWER)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*The tower is a wet tower and the pipes are buried all the way to the pumphouse. They could not be inspected.*	
INTAKE STRUCTURE	*The exposed portion of the tower was observed to be in good condition for its age. All control valves were operated and observed to be in fair condition. They do need some grease and minor maintenance.*	
OUTLET STRUCTURE	*All water is supplied to a pumphouse downstream which pumps the water on demand to two storage tanks located on the adjacent hill. All pipes are buried and could not be inspected.*	
OUTLET CHANNEL	*NONE*	
EMERGENCY GATE	*This gate was exercised and can be used in conjunction with 2-24 inch pipes to drain the reservoir. One of the 24 inch pipes leads to the pump house and the other empties into a 3 1/2 acre pond immediately downstream.*	

UNGATED SPILLWAY

(EMERGENCY SPILLWAY)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	*60 ft. X 8 ft. concrete O.G. section with a height of 17 feet. The weir and concrete walls as well as the channel are cracked with considerable spalling. Rebars are exposed along the channel floor and several seeps were noted through the wall. Near the left abutment of the weir, seepage flows through the weir and wall down the spillway and under the channel slab. The spillway channel and walls need to be repaired.*	
APPROACH CHANNEL	*NONE*	
DISCHARGE CHANNEL	*The chute spillway gradually increases in grade and empties into a 3 1/2 acre pond at the base of the dam. This small pond empties into the natural stream channel below. This smaller pond will overtop during low frequency storms.*	
BRIDGE AND PIERS	*NONE*	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	*NONE*	
APPROACH CHANNEL	*NONE*	
DISCHARGE CHANNEL	*NONE*	
BRIDGE AND PIERS	*NONE*	
GATES AND OPERATION EQUIPMENT	*NONE*	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	*NONE*	
OBSERVATION WELLS	*NONE*	
WEIRS	*NONE*	
PIEZOMETERS	*NONE*	
OTHER	*There is a standard rainfall gauge at the pumphouse. Reservoir water levels are determined by measuring the slope distance from the normal pool level to the wate surface.*	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	*Reservoir slopes are steep to moderate and stable. Vegetation is very dense and the drainage area is either owned by the State or the Owner.*	
SEDIMENTATION	*A bathymetric survey was taken a few years ago to determine the depth of sediment. The date of this inspection is unknown and very little sediment was noted as per the Owners representative. No significant sediment was noted around the waters edge during the the inspection.*	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*The channel is rocky and vegetated to the waters edge along the West Branch.*	
SLOPES	*The side slopes are steep and stable. The channel (Indian Run) has an average grade of 3/4% from the dam to the confluence with the West Branch.*	
APPROXIMATE NO. OF HOMES AND POPULATION	*Beckville is located downstream of the dam where there are approximately 25 to 30 homes. Schuylkill Haven is located further downstream where major damage and large loss of life could occur in the event of failure of the dam.*	

APPENDIX

C

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: *Wooded mountain valley*

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): *773 (1498 Ac-Ft.)*

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): *781 top of dam (1943 Ac-Ft.)*

ELEVATION MAXIMUM DESIGN POOL: *777.5*

ELEVATION TOP DAM: *781*

SPILLWAY CREST

a. Elevation *773 .*

b. Type *Concrete ogee weir*

c. Width *60 feet*

d. Length *NA*

e. Location Spillover *Left abutment*

f. Number and Type of Gates *None*

OUTLET WORKS:

a. Type *2 pipe intake tower with single pipe gravity feed to pumphouse*

b. Location *Tower embedded in embankment. Pumphouse located in valley*

c. Entrance inverts *753.8 and 733.8*

d. Exit inverts *689.6 at base of tower*

e. Emergency draindown facilities *36" pipe at base of tower with a 24" pipe outlet into downstream channel*

HYDROMETEOROLOGICAL GAGES:

a. Type *None*

b. Location -----

c. Records -----

MAXIMUM NON-DAMAGING DISCHARGE: *Not determined*

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: 7/17/78
By: MFB
Sheet 2 of 5

DAM Indian Run Dam Nat. ID No. PA00696 DER No. 54-109

	ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1.	Min. Crest Elev., ft.	781.0 ft		780 ± ft
2.	Freeboard, ft.	3.5 ft		
3.	Spillway(1) Crest Elev, ft.	773.0 ft		
3a.	Secondary(2) Crest Elev, ft.	NA		
4.	Max. Pool Elev., ft.	777.5 ft.		
5.	Max. Outflow(3), cfs	1870/2090cfs		
6.	Drainage Area, mi^2	2.35 $mile^2$		2.26 $mile^2$
7.	Max. Inflow(4), cfs	1700cfs/$mile^2$		
8.	Reservoir Surf. Area	49.5 Ac		49.9 Ac.
9.	Flood Storage(5), ft^3			
10.	Inflow Volume, ft^3			

Reference all figures by number or calculation on attached sheets:

Example: 3A - Drawing No. xxx by J. Doe, Engr., in State File No. yyyy.

NOTES:

(1) Main emergency spillway.

(2) Secondary ungated spillway.

(3) At maximum pool, with freeboard, ungated spillways only.

(4) For B, C, use PMF.

(5) Between lowest ungated spillway and maximum pool.

Date: 7/17/78
By: MFB
Sheet 3 of 5

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from sheet 2)	Source
1A, 3A, 5A, 6A, 7A	From drawings dated 1924
2A, 8A	Application Report dated Feb. 9, 1924
4A	From items 2A and 3A
1C	Field observation, see sheet
6C, 8C	USGS Maps Pottsville (1968) Minersville (1976)

Classification (Ref. Recommended Guidelines for Safety Inspection of Dams)

1. The hazard potential is rated as High as there would be loss of life if the dam failed.

2. The size classification is intermediate based on its height of 94 ft. and total storage of 1943 Ac-Ft. (to the top of the dam).

3. Spillway design flood, based on size and hazard classification, is probable maximum flood (PMF).

Hydrology and Hydraulics Analysis

1. Original Data (Taken from Drawing dated 1-9-24, file 1004)

Drainage Area = 2.35 sq. miles
Assumed Max. Precipitation 6 inches in 3½ hr.
Assumed Max. Inflow to Reservoir 1700 cfs/sq. mile
Assumed Max. Outflow over Spillway 1065 cfs/sq. mile
Assumed Max. Height of water surface over spillway - 4.5 ft.
$Q = 3.33(60 - 0.2 \times 4.5)\ 4.5^{3/2} = 1870$ cfs
$Q = 3.66 \times 60 \times 4.5^{3/2} = 2090$ cfs

2. Evaluation of Original Data

Drainage Area value is supported by current USGS maps
Max. Precipitation
PMP (from TP-40) = 25.5 inches in 6-hours
78% of PMP in first 3½ hr. (SCS NEH-4, ES4003)

6 inches ≠ $0.78 \times 25.5 = 19.9$ inches
therefore: original design was for approximately 30 % PMP
Max. Inflow to Reservoir = $2.35 \times 1200 = 3995$ cfs
SAY 4000 cfs
Information from C of E, Balt Dist gives a comparable watershed to be West Branch of Little Schuylkill, drainage area 4.8 sq. miles, estimated peak PMF inflow 7200 cfs

PMF peak inflow $Q = \left(\frac{2.35}{7.8}\right)^{0.8} 72.00$

$= 4066$ cfs

therefore, orginal inflow approximates peak PMF as currently estimated

Max. Outflow - $1065 \times 2.35 = 2500$ cfs (original data) a value greater than the given spillway capacity under given max. head (4.5 ft)

Spillway Capacity - original information indicates two possible spillway discharges under same head.
$Q = C L H^{3/2}$

a. One calculation used a reduced C value with the effective weir length
b. the other calculation used a higher C value with the total weir length.

However, a reduced C value should not be used with effective weir length (Chow, Open Channel Hydraulics).

USE C = 3.66 as being a reasonable, conservative value for ogee weir

USE L = effective length as given in original design - judged a reasonable approximation

3. Evaluation of Present Conditions - a field check disclosed a vertical distance between spillway crest and top of spillway wall of 8 ft. However, the embankment adjacent to the spillway wall was approximately 1 ft. lower than the top of the wall, making the min. distance between spillway crest and embankment crest = 7 ft.

$Q = 3.66(60 - 0.2 \cdot 7.1)7.1^{3/2} = 4036$ cfs ~ PMF inflow as C increases with increasing head.

$Q = 3.76(60 - 0.2 \cdot 8)8^{3/2} = 4970$ cfs - max. capacity of spillway

THE PRESENT CONDITIONS WILL PASS THE PMF w/o OVERTOPPING AND THE SPILLWAY IS "ADEQUATE".

A routing of the PMF would indicate some freeboard, greater than 1 ft. if the embankment is raised to top of spillway wall.

APPENDIX

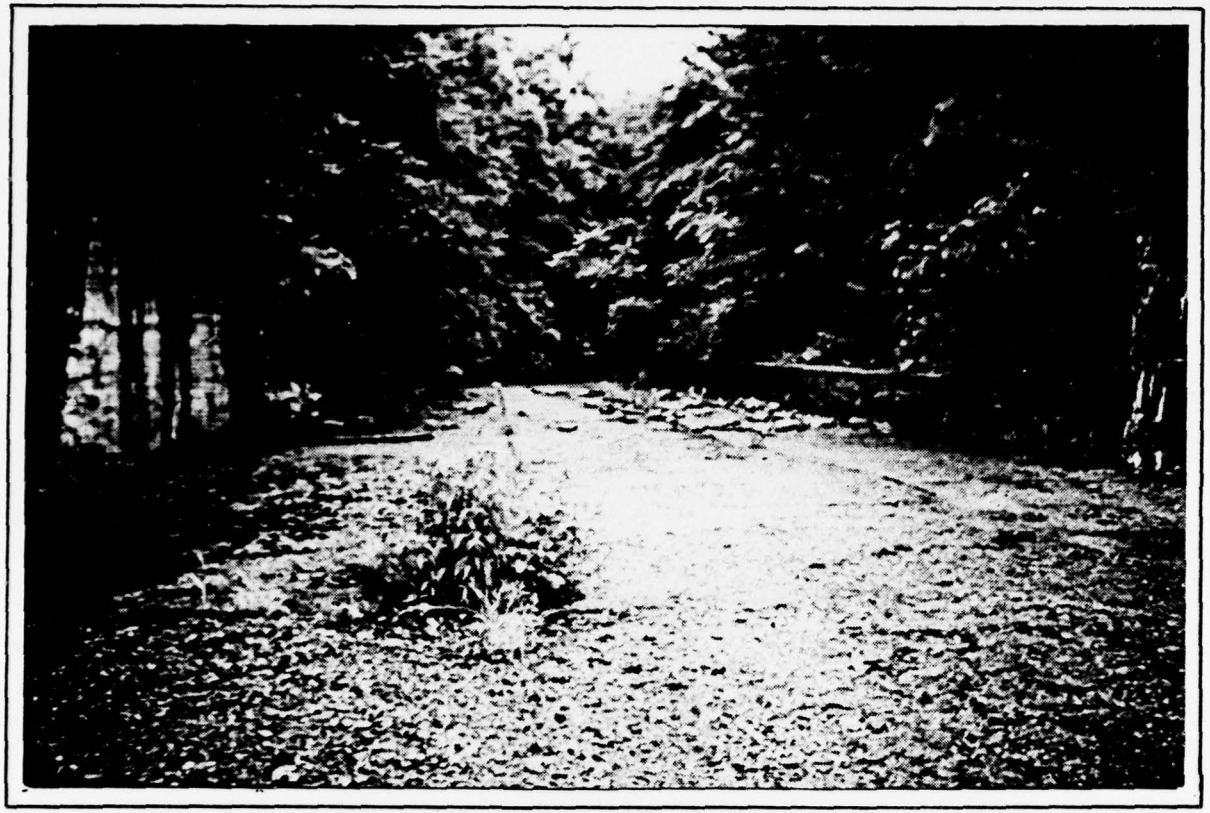
D

INTAKE TOWER LOCATED AT TOP OF SLOPE
ON UPSTREAM SIDE.

PHOTOGRAPH NO. 1

PRINCIPAL SPILLWAY. NOTE SEEPAGE
ADJACENT TO AND ON LEFT ABUTMENT.

PHOTOGRAPH NO. 2

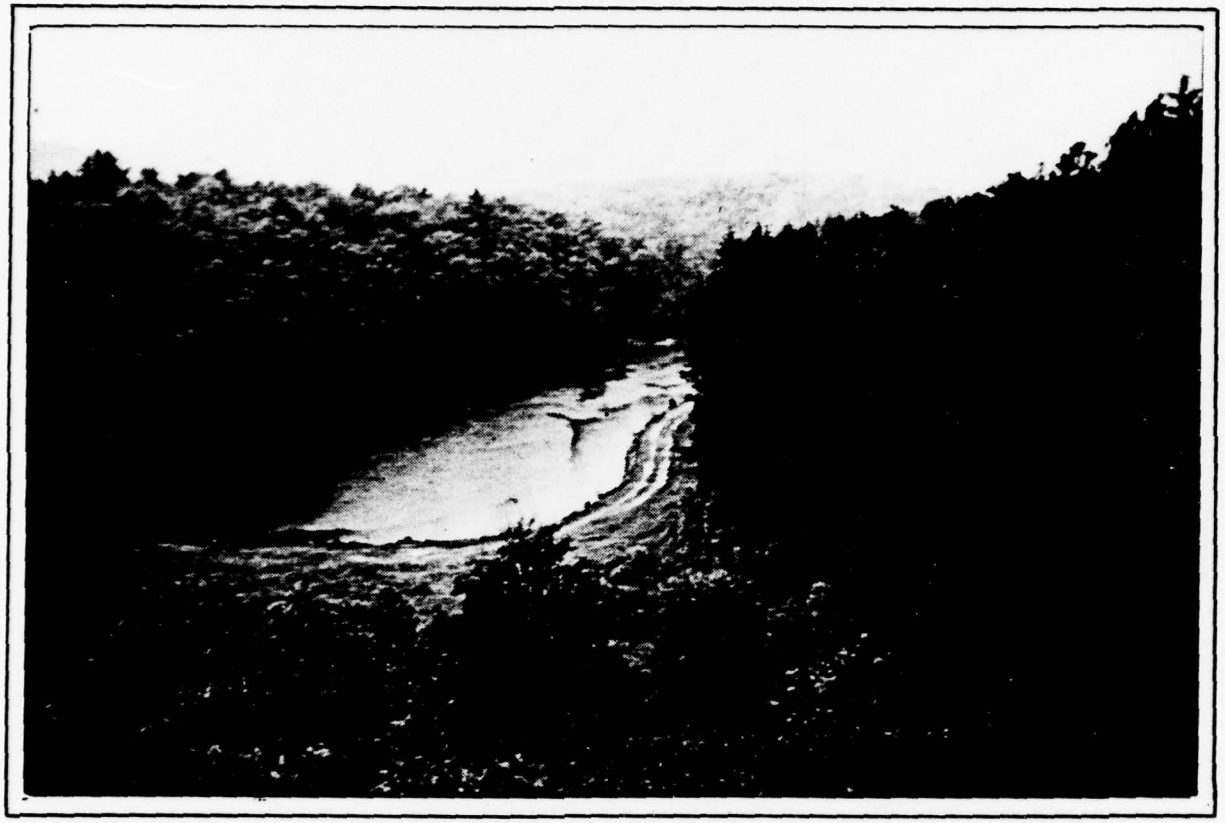


VIEW LOOKING DOWNSTREAM OF PRINCIPAL SPILLWAY FROM OVERFLOW WEIR. NOTE SPALLING CONCRETE.

PHOTOGRAPH NO. 3

VIEW LOOKING DOWNSTREAM INTO STILLING POND. NOTE CONDITION OF CONCRETE CHANNEL.

PHOTOGRAPH NO. 4

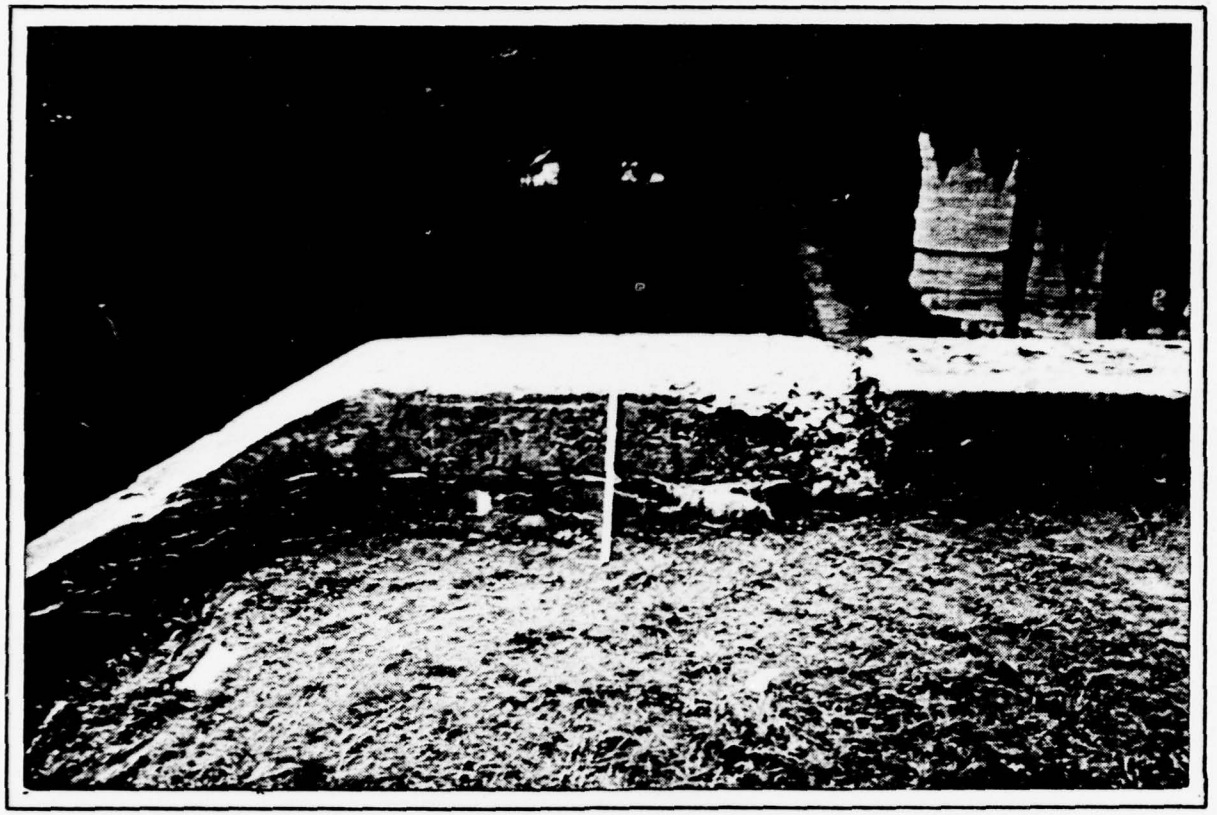


DOWNSTREAM VIEW FROM CREST OF DAM.
NOTE TREES ON SLOPE AND ABANDONED
3-1/2 ACRE RESERVOIR.

PHOTOGRAPH NO. 5

DOWNSTREAM RESERVOIR SPILLWAY. PRIMARY SPILLWAY CHANNEL IS SIX FEET WIDE.

PHOTOGRAPH NO. 6

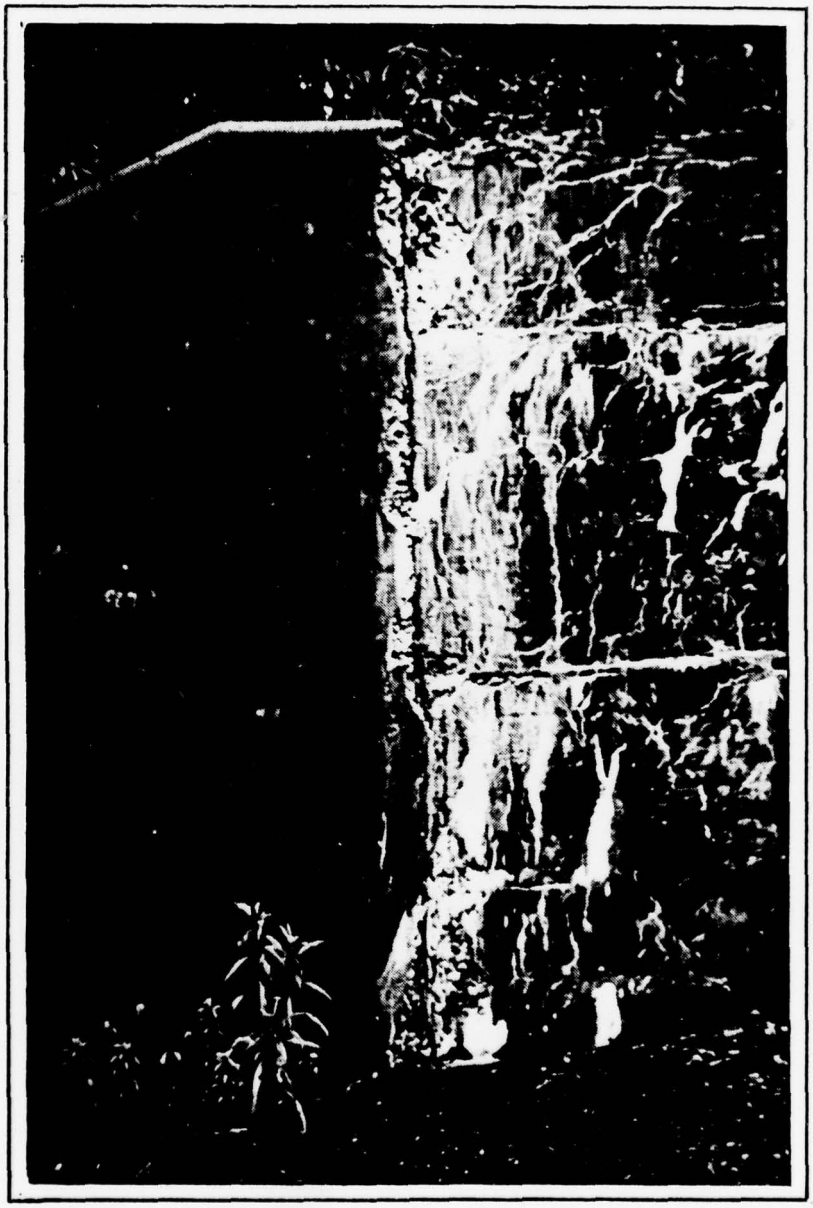


SPALLED CONCRETE OF SPILLWAY WALLS.
NOTE SETTLEMENT OF EMBANKMENT ADJACENT
TO WING WALLS.

PHOTOGRAPH NO. 7

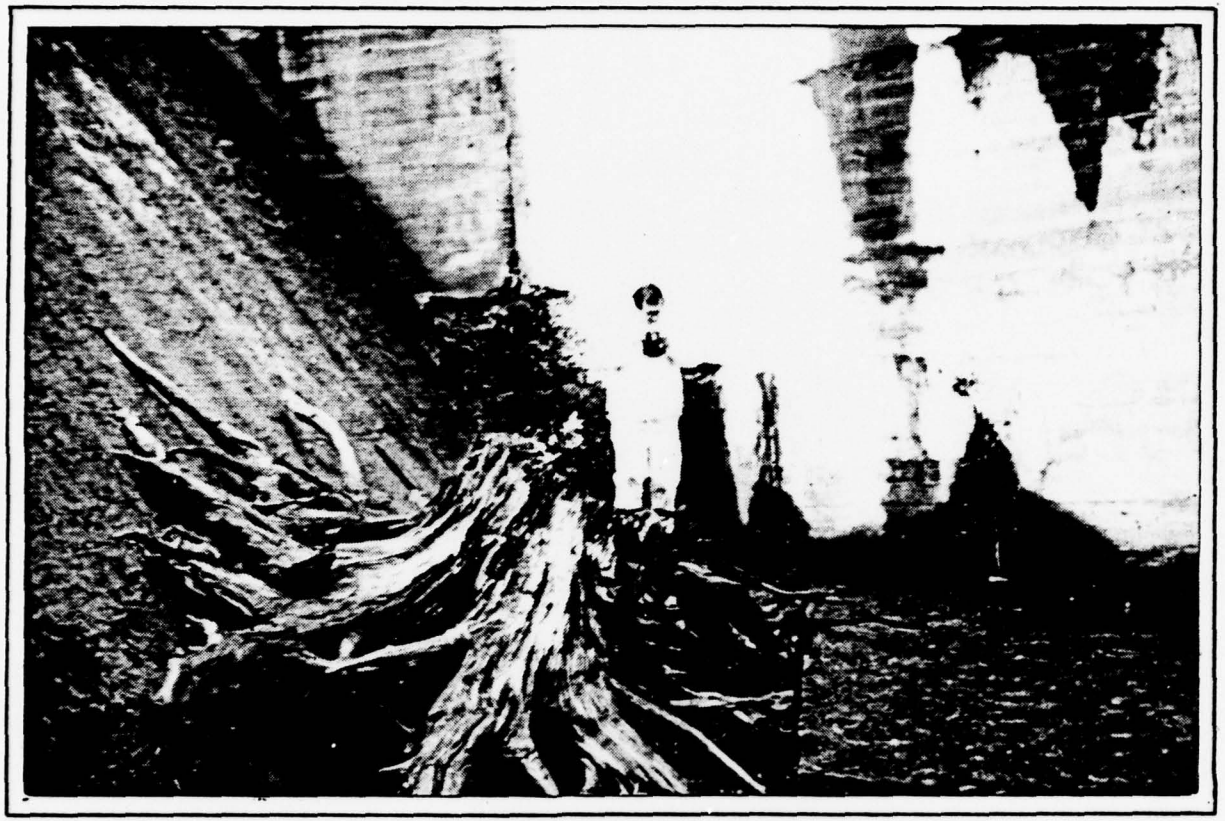
PRINCIPAL SPILLWAY. NOTE CONCRETE DETERIORATION AND EROSION ADJACENT TO WING WALLS. DESIGN CALLED FOR FILL TO TOP OF WALLS.

PHOTOGRAPH NO. 8



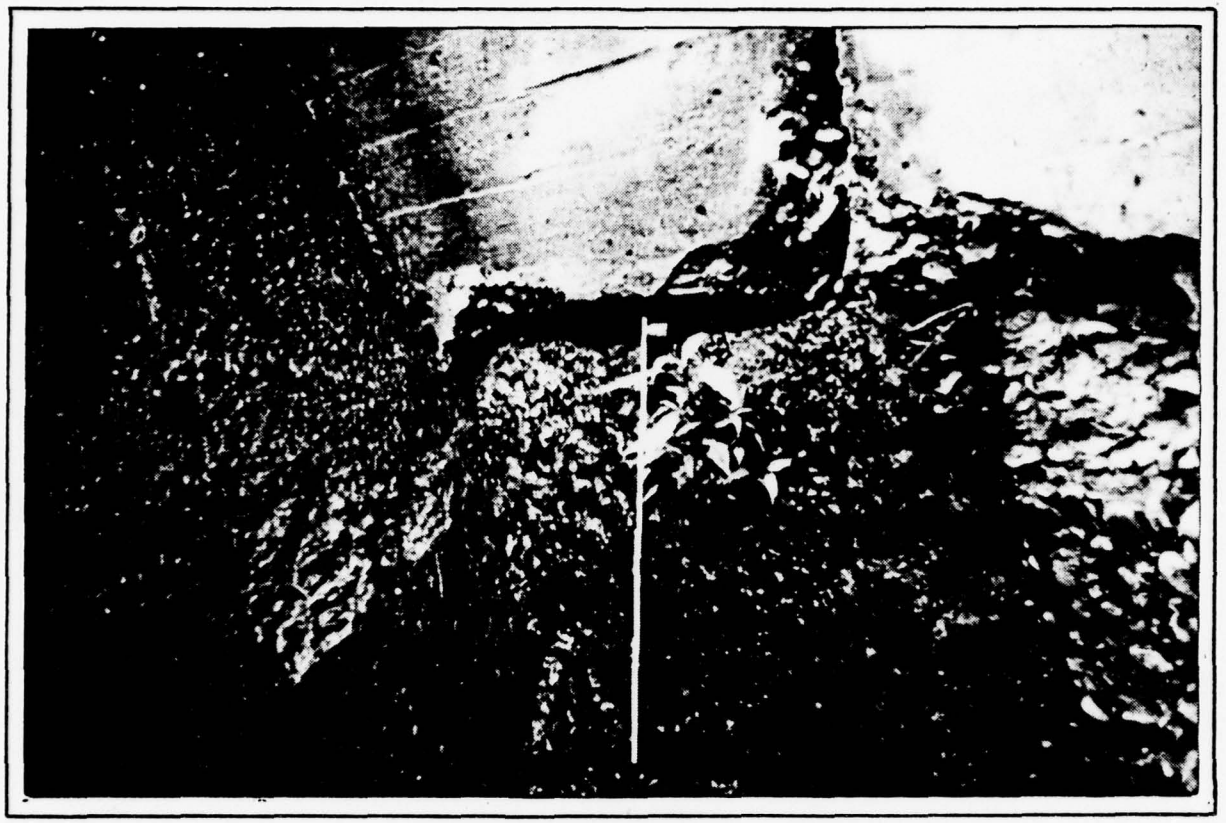
DETERIORATED RIGHT WALL
OF PRINCIPAL SPILLWAY.

PHOTOGRAPH NO. 9



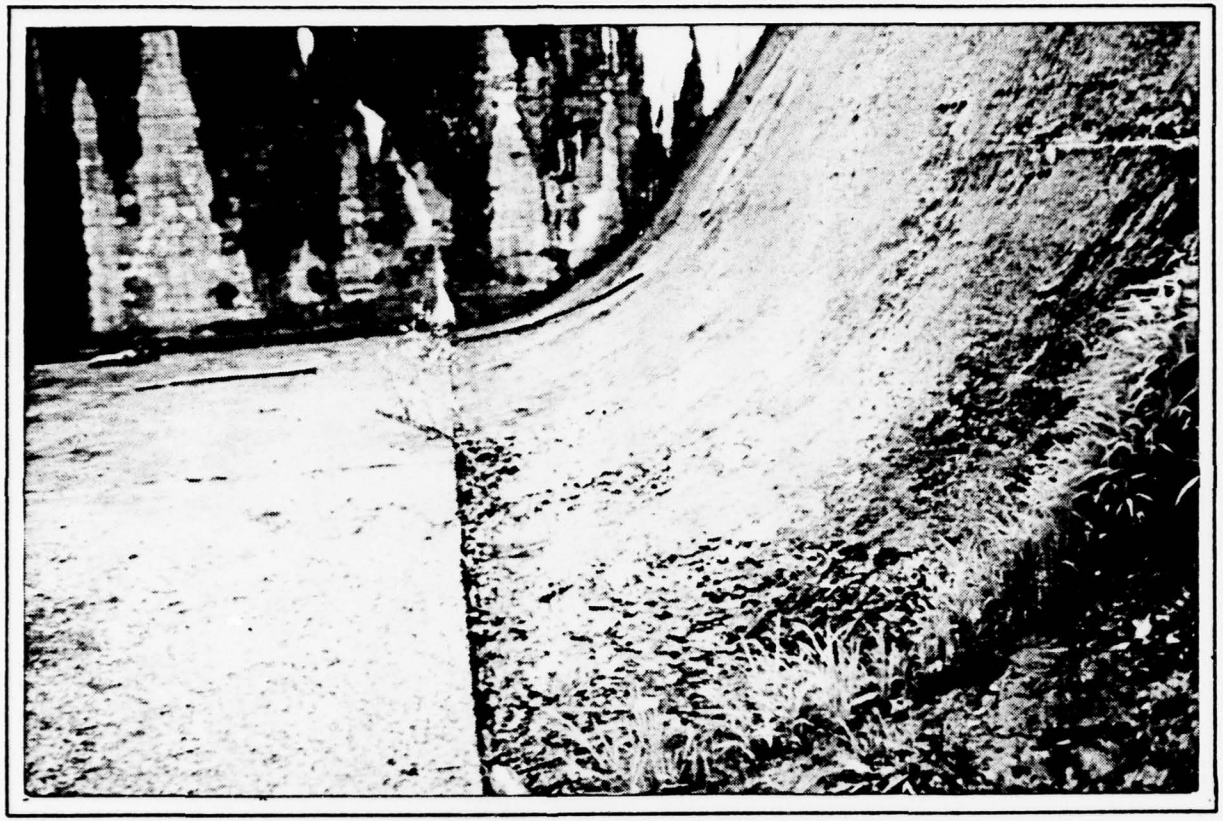
PRINCIPAL SPILLWAY. NOTE DETERIORATION ON LEFT WALL, SEEPAGE THROUGH WALL AND DEBRIS IN CHANNEL. SEEPAGE THROUGH SPILLWAY AND PORTIONS OF THE WALL FLOWS UNDER SLAB AT THE CONSTRUCTION JOINT.

PHOTOGRAPH NO. 10



CLOSE-UP VIEW OF LEFT SPILLWAY WALL
DETERIORATION.

PHOTOGRAPH NO. 11



VIEW OF CONSTRUCTION JOINT AT BASE
OF OGEE SPILLWAY WHERE SEEPAGE ENTERS
AND FLOWS UNDER THE SLAB.

PHOTOGRAPH NO. 12

VIEW OF DETERIORATED CONCRETE ALONG CHUTE SPILLWAY. NOTE EXPOSED AND RUSTED REINFORCING STEEL.

PHOTOGRAPH NO. 13

VEGETATION INCLUDING TREES ON DOWNSTREAM SLOPE.

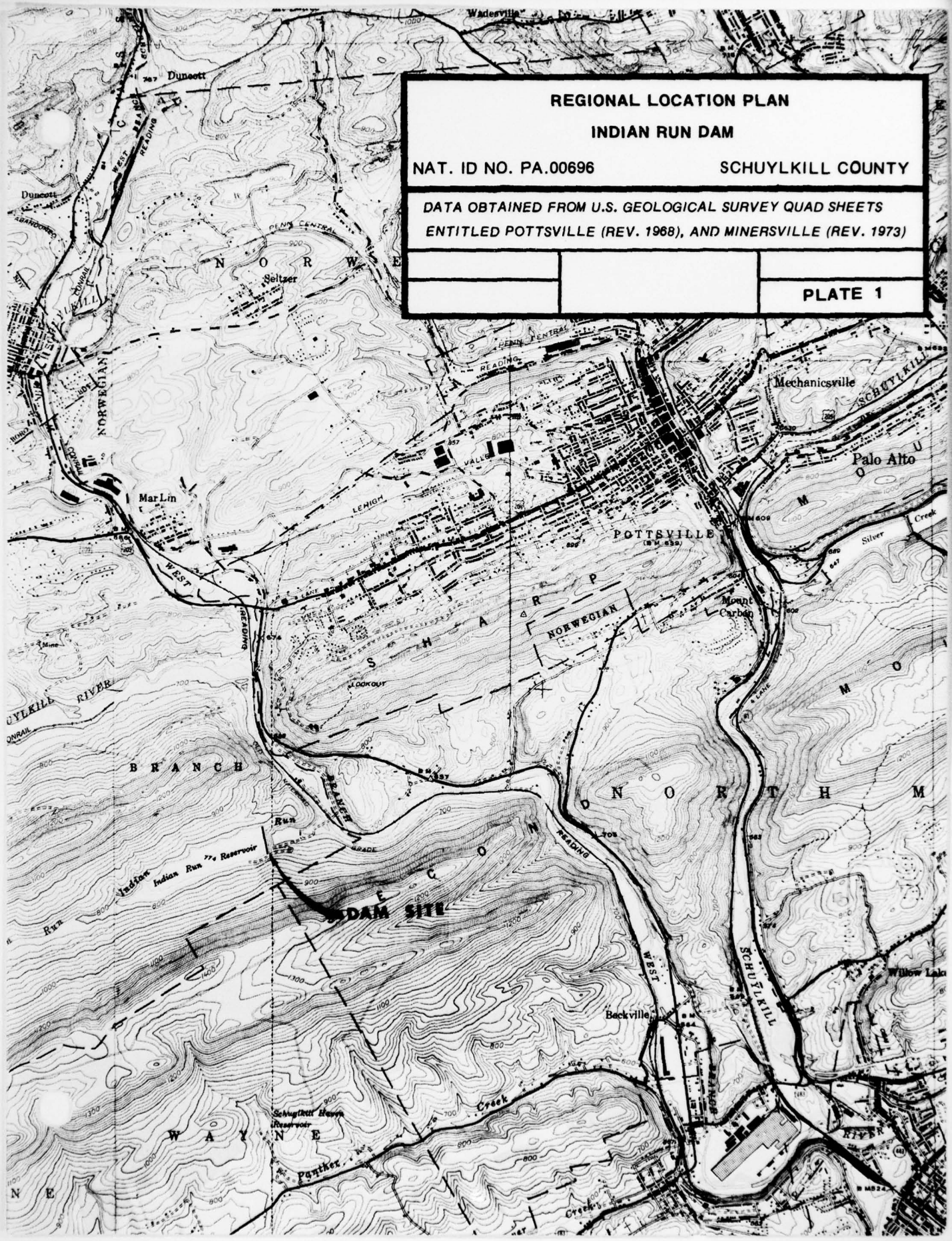
PHOTOGRAPH NO. 14

TYPICAL SEEPAGE AREA ON RIGHT SIDE OF DAM (DOWNSTREAM SLOPE) WHICH WAS EXCAVATED AND REPLACED WITH GRAVEL. PIPES LEAD FROM THE GRAVEL INTO THE LOWER POND.

PHOTOGRAPH NO. 15

APPENDIX

E



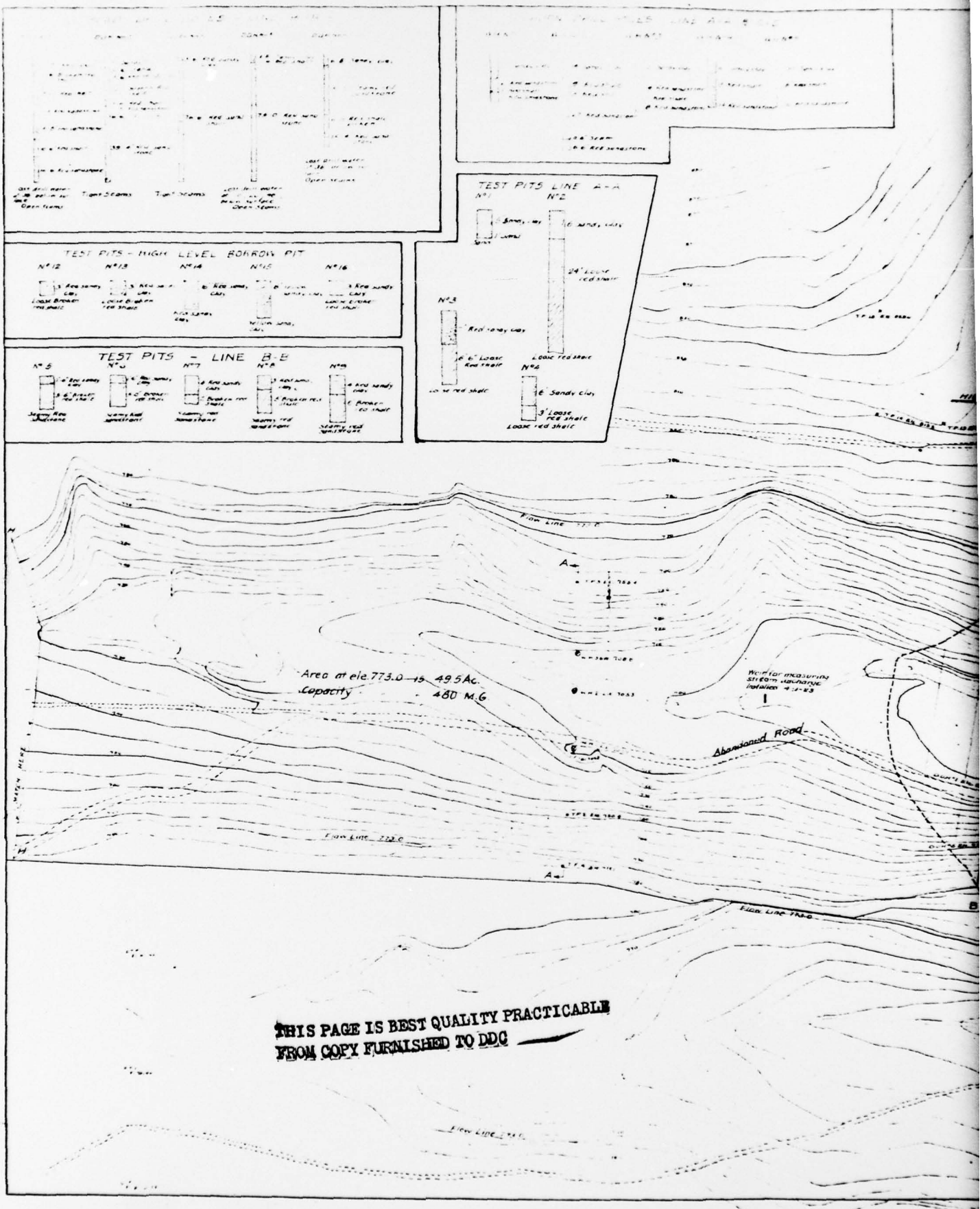
REGIONAL LOCATION PLAN

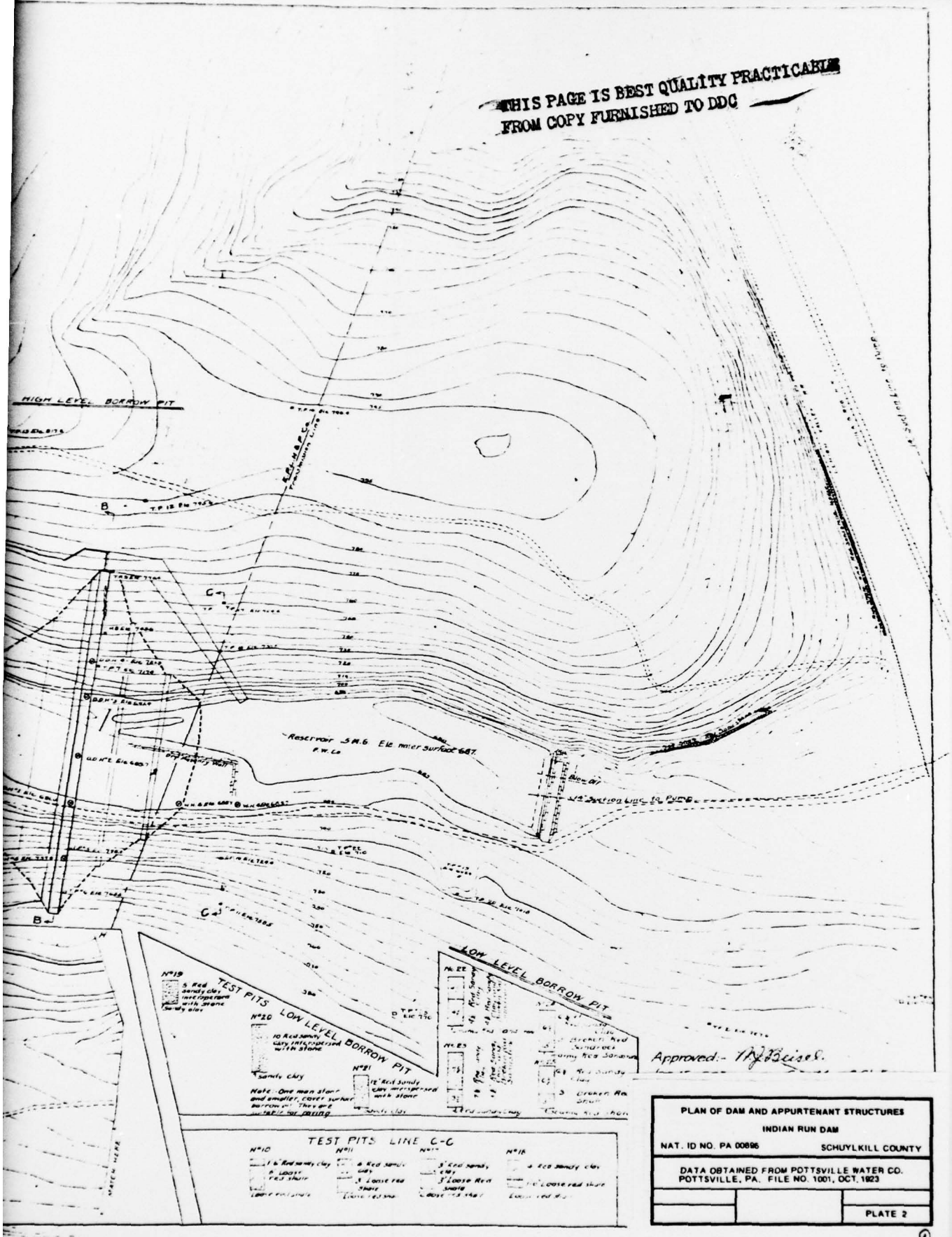
INDIAN RUN DAM

NAT. ID NO. PA.00696 SCHUYLKILL COUNTY

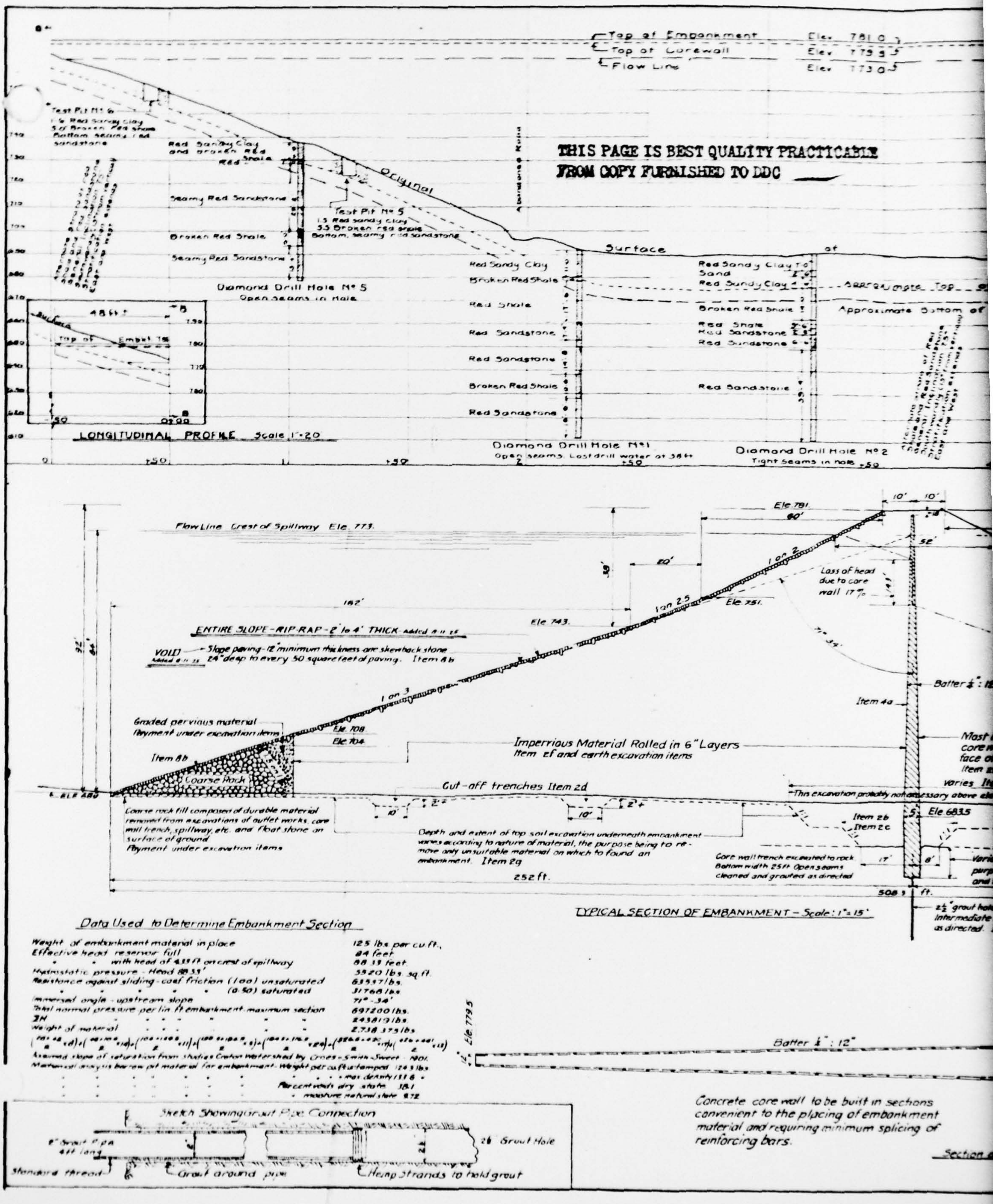
DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD SHEETS ENTITLED POTTSVILLE (REV. 1968), AND MINERSVILLE (REV. 1973)

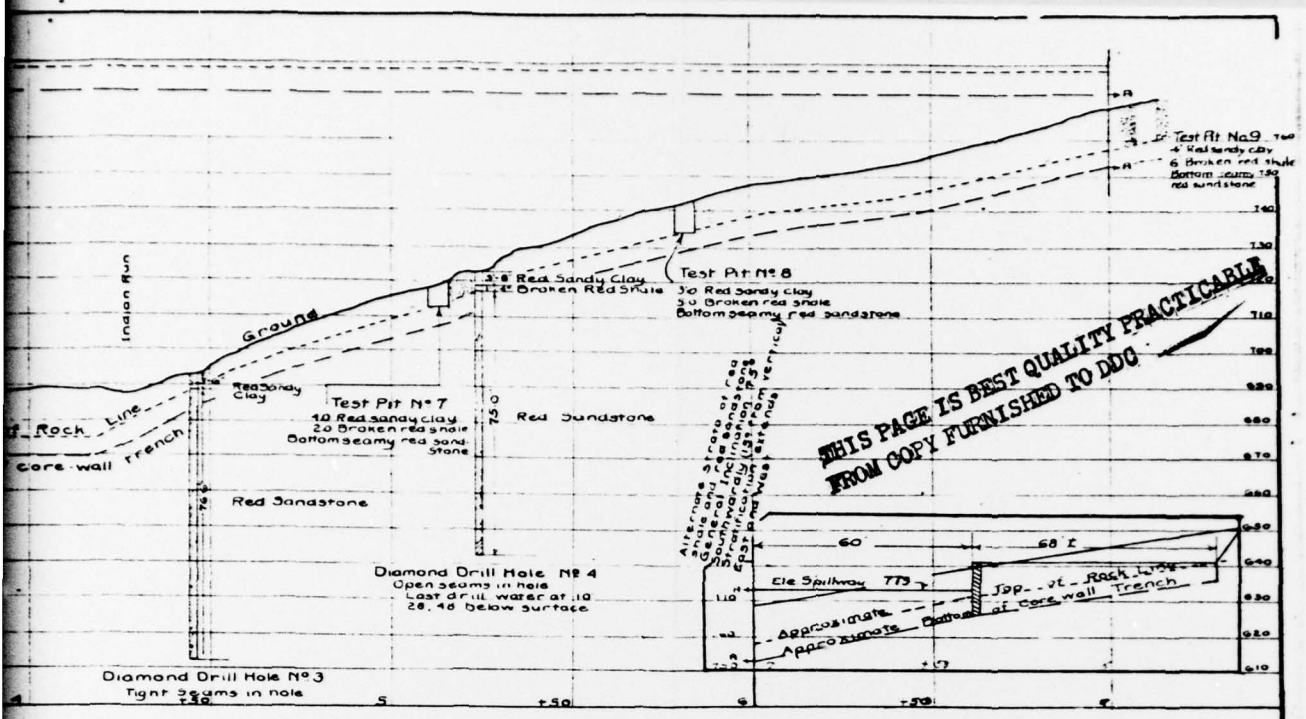
PLATE 1

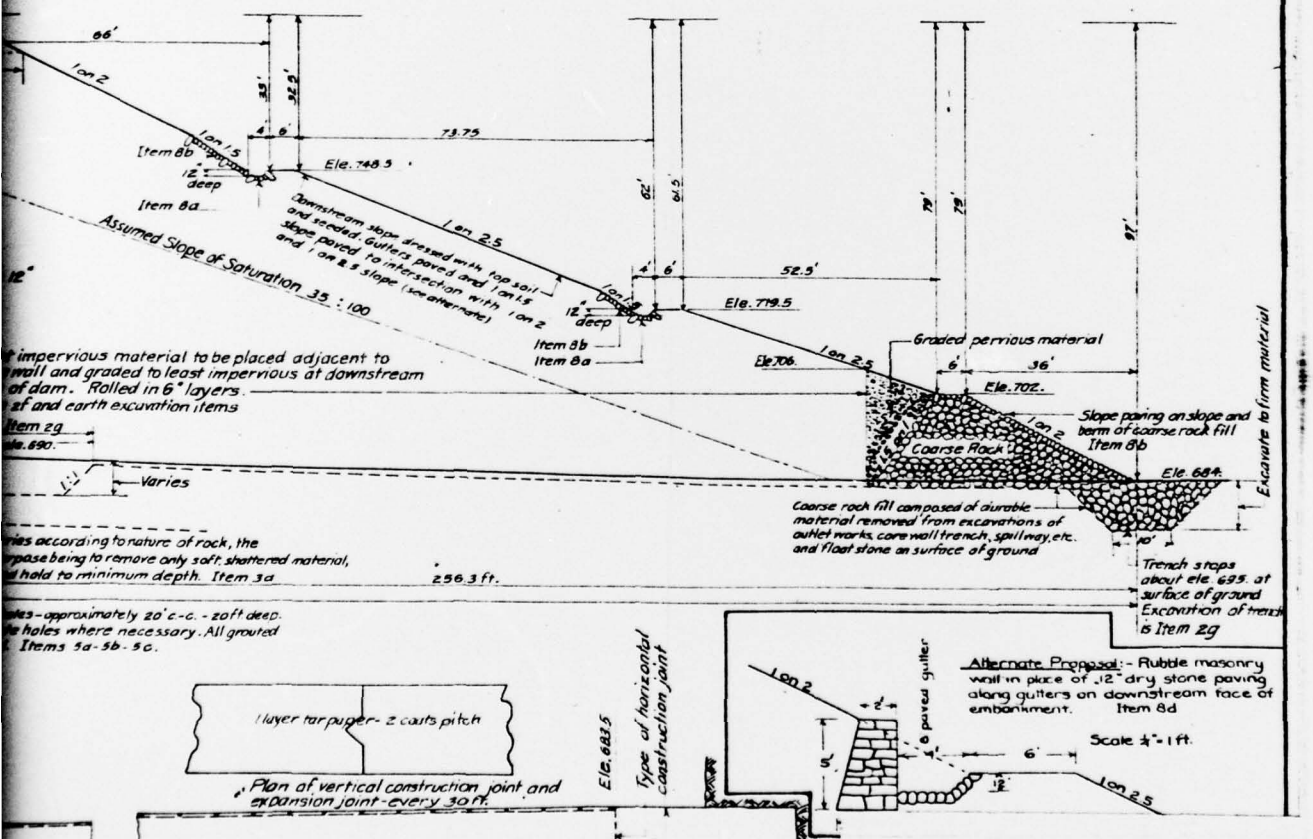


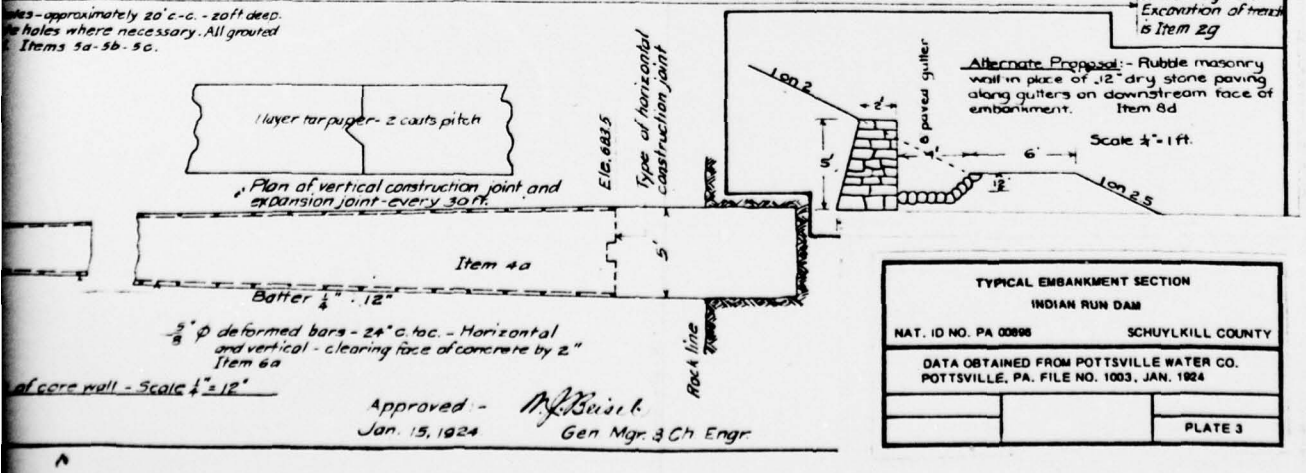


PLAN OF DAM AND APPURTENANT STRUCTURES		
INDIAN RUN DAM		
NAT. ID NO. PA 00896		SCHUYLKILL COUNTY
DATA OBTAINED FROM POTTSVILLE WATER CO. POTTSVILLE, PA. FILE NO. 1001, OCT. 1923		
		PLATE 2









Approved - M. J. Boisch
Jan. 15, 1924 Gen Mgr & Ch Engr

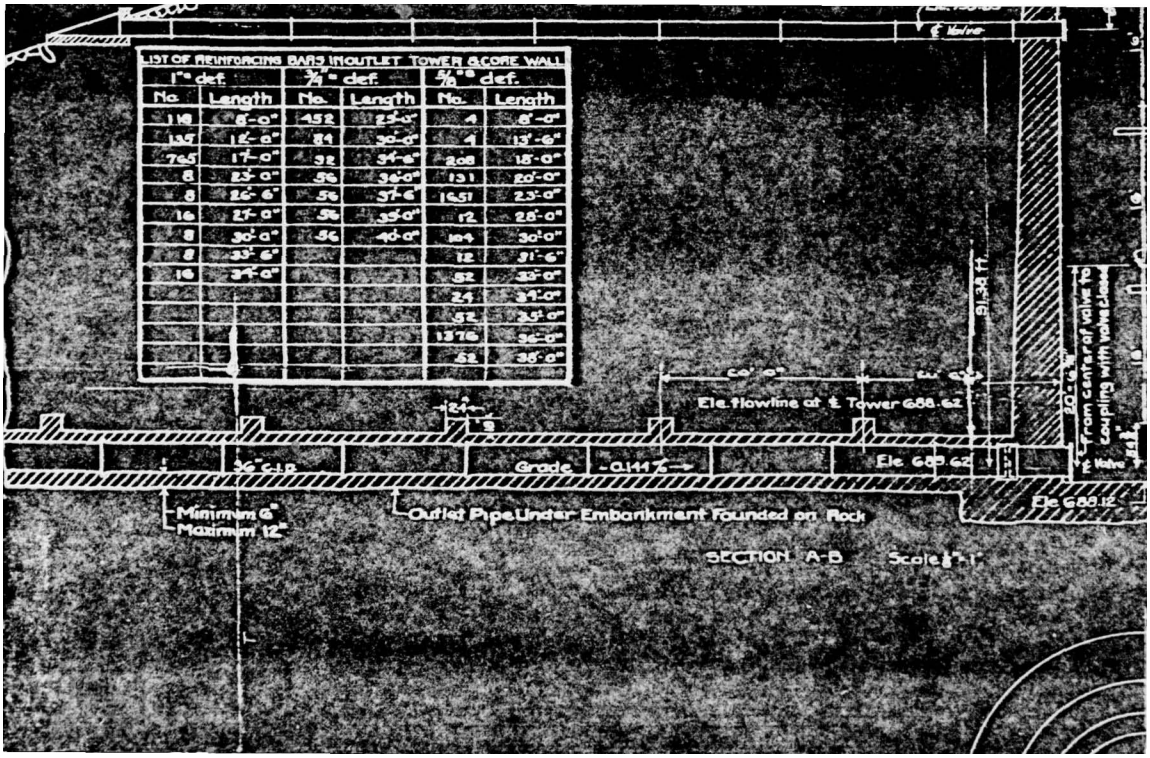
TYPICAL EMBANKMENT SECTION

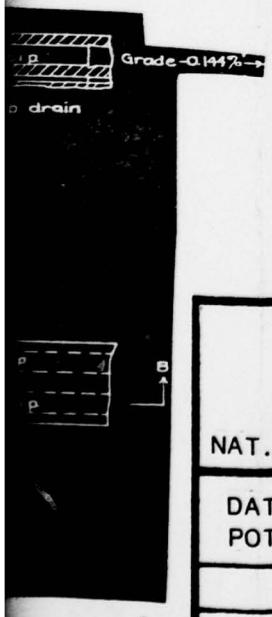
INDIAN RUN DAM

NAT. ID NO. PA 00898 SCHUYLKILL COUNTY

DATA OBTAINED FROM POTTSVILLE WATER CO.
POTTSVILLE, PA. FILE NO. 1003, JAN. 1924

PLATE 3


LIST OF REINFORCING BARS IN OUTLET TOWER & CORE WALL
1" ø def.
No. Length
118 8'-0"
137 12'-0"
765 17'-0"
8 23'-0"
8 26'-6"
16 27'-0"
8 30'-0"
8 33'-6"
16 34'-0"
3/4" ø def.
No. Length
452 23'-6"
89 30'-0"
98 34'-6"
96 36'-0"
56 37'-6"
54 38'-0"
36 40'-0"
5/8" ø def.
No. Length
4 8'-0"
4 13'-6"
208 18'-0"
131 20'-0"
1451 23'-0"
12 25'-0"
104 30'-0"
12 31'-6"
82 33'-0"
24 34'-0"
32 35'-0"
1376 36'-0"
52 38'-0"
Ele. flowline at ℄ Tower 688.62
Grade -0.111 %
Ele. 689.62
Ele 688.12
Minimum 6"
Maximum 12"
Outlet Pipe Under Embankment Founded on Rock
SECTION A-B Scale 1"=1'



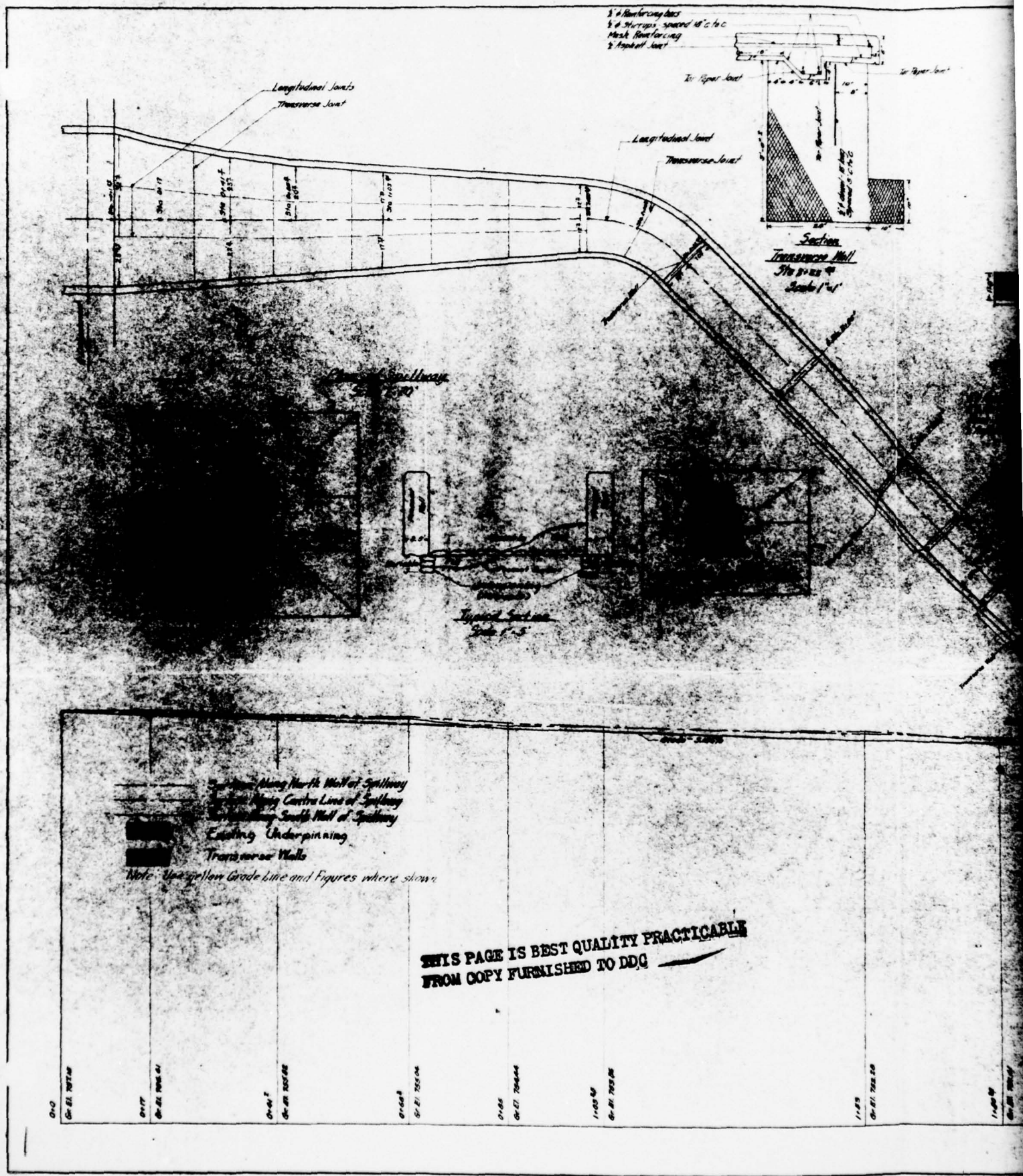
SECTION OF INTAKE TOWER

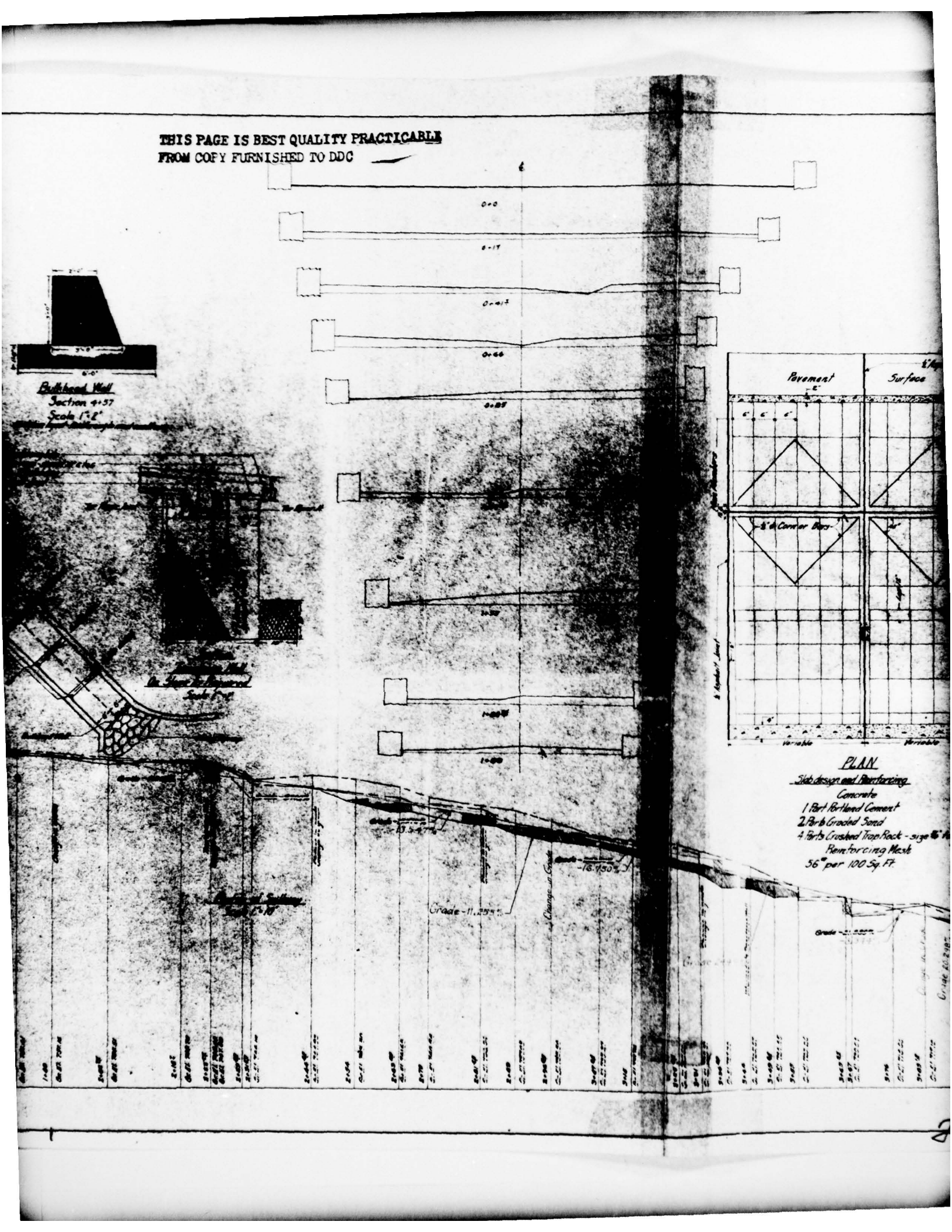
INDIAN RUN DAM

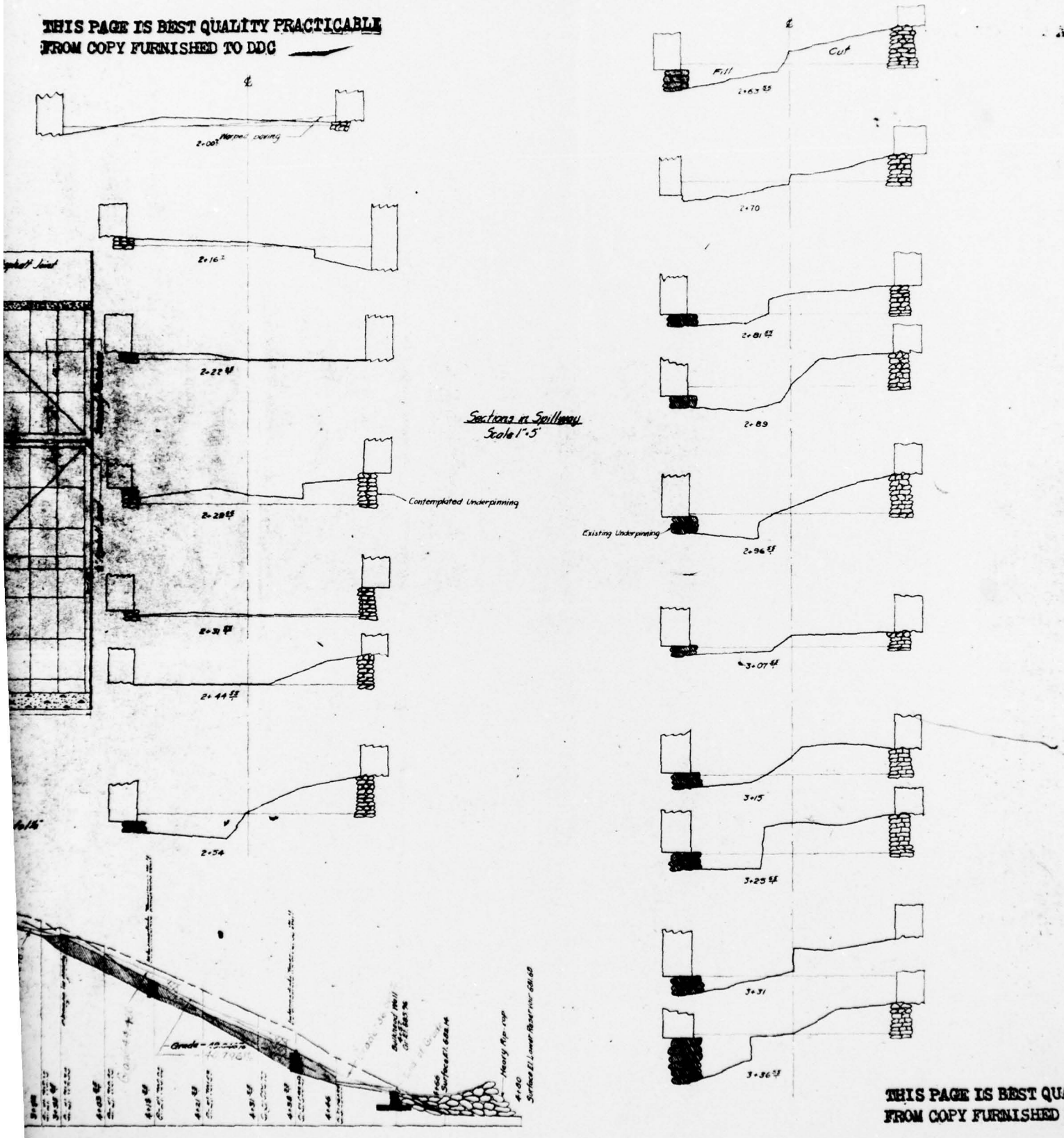
NAT. ID NO. PA.00696 BERKS COUNTY

DATA OBTAINED FROM POTTSVILLE WATER COMPANY
POTTSVILLE, PA. FILE NO.1008 DATED APRIL, 1924

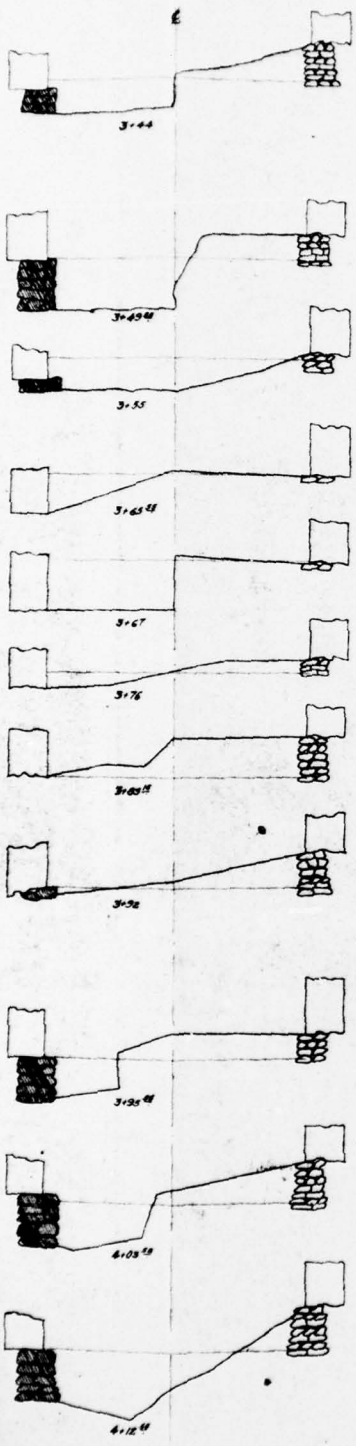
PLATE 4

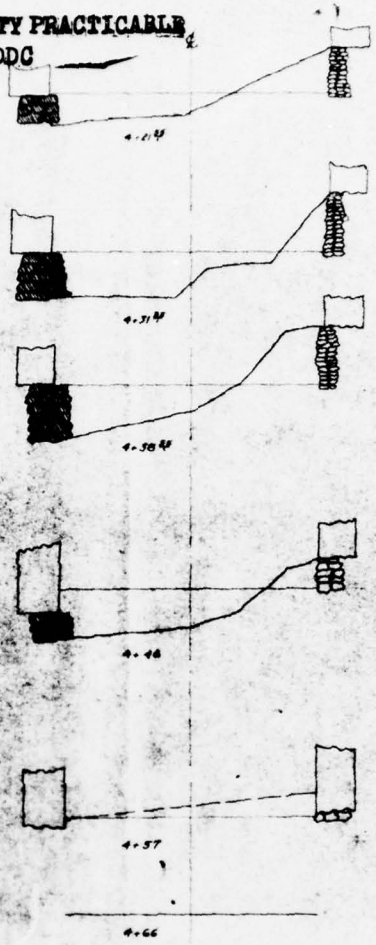






Sections on Spillway
Scale 1"=5'





Approximate Quantities of Materials Required

Rock excavation in Spillway Channel	320 Cu. Yds.
Stone fill in Spillway Channel	110 " "
Underpinning North and South Walls	50 " "
Transverse Wall (1.8 × 21.4 × 3.75) Sta 2+22.5	50 " "
Capstone for Transverse Wall Sta 2+22.5	2 " "
Intermediate Transverse Walls (1.75 × 18 × 4)	14 " "
*Stone paving of Spillway	1307 Sq. Yds.
Bulkhead Apron	4 Cu. Yds.
Bulkhead	5 " "
Grouting approx. 2½" thick	100 " "

Alternate Proposal omitting paving and other work between Spillway and 2+22.5 but including transverse walls, 0+0 to 2+22.5

Rock excavation in Spillway Channel	190 Cu. Yds.
Stone fill in Spillway Channel	4 " "
Stone paving of Spillway	327.2 Sq. Yds.

** Concrete Bulkhead

RECONSTRUCTED EMERGENCY SPILLWAY
INDIAN RUN DAM
NAT. ID NO. PA 00696 SCHUYLKILL COUNTY
DATA OBTAINED FROM POTTSVILLE WATER CO.
POTTSVILLE, PA. DRAWING NO. 1, JUNE 1935
PLATE 5

APPENDIX

F

SITE GEOLOGY
INDIAN RUN RESERVOIR DAM

The Indian Run Reservoir is located in the Appalachian Mountain Section of the Valley and Ridge Province. Regional mapping performed prior to dam construction shows the site to have been covered with Quaternary talus deposits (See Plate F-1). Bedrock underlying the talus is composed of the red and brown sandstones, siltstones, and shales of the Mississippian Mauch Chunk Formation. In the vicinity of the dam the Mauch Chunk Formation is bounded on the northeast by the sandstones, shales, and coal of the Llewellyn and Pottsville Formations of Pennsylvanian age, and to the southeast by the sandstones, siltstones, and shales of the Catskill Formation of Devonian age. Bedding is overturned, striking to the east-northeast and dipping steeply to the south-southeast (Wood, 1973). Two dominant sets of open, variably spaced joints were reported by Sevon (Ref. 1) in the vicinity of the dam. One set is oriented along the strike of bedding, dipping gently to the northwest, and a second set was mapped striking north-northwest, and dipping steeply to the west. There are no records of faults beneath the dam, although two faults, one on either side of the reservoir, were observed striking parallel to the reservoir.

Pleistocene deposits are very limited in the dam site area, and mainly consist of periglacial talus deposits that cover much of the Indian Run stream valley (Wood, 1973).

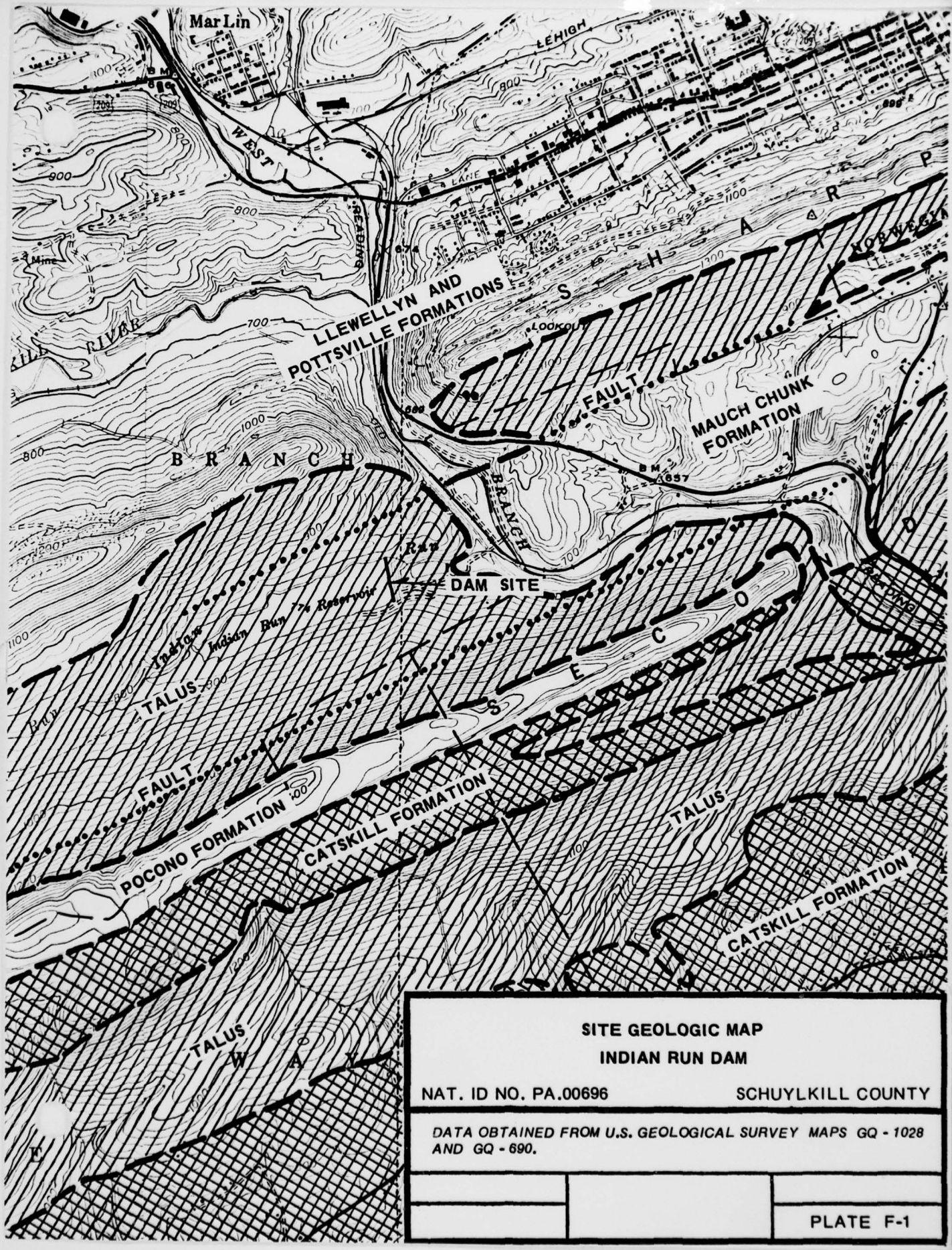
References:

1. *Sevon, W.D., 1975, Geology and Mineral Resources of the Christmans and Pohopoco Mountain Quadrangles, Carbon and Monroe Counties, Pennsylvania: Pa. Geol. Survey Atlas 195 ab, Plate 1, 1:24,000.*

2. *Willard, Bradford, 1939, Guide to the Geology of the Upper Schuylkill Valley: Pa. Geol. Survey, 4th series, Bull. 1939, 24 p.*

3. *Wood, G.H., 1973, Geologic Map of the Pottsville Quadrangle, Schuylkill County, Pennsylvania: USGS Geologic Map GQ 1028.*

4. *Wood, G.H., Trexler, J.P., Yelenosky, A., 1968, Geologic Map of the Minersville Quadrangle, Schuylkill County, Pennsylvania, USGS Geologic Map GQ-690.*



SITE GEOLOGIC MAP

INDIAN RUN DAM

NAT. ID NO. PA.00696 SCHUYLKILL COUNTY

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY MAPS GQ - 1028 AND GQ - 690.

PLATE F-1