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WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA
NATIONAL DAM INSPECTION PROGRAM. LEASER LAKE DAM (JACKSONVILLE --ETC(U)
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**SCHUYLKILL RIVER BASIN
JACKSONVILLE BRANCH, ONTELAUNEE CREEK
LEHIGH COUNTY**

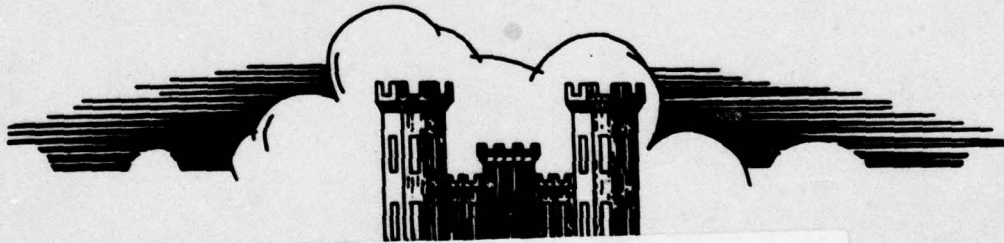
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**LEASER LAKE DAM
(JACKSONVILLE LAKE)**

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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

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SCHUYLKILL RIVER BASIN

JACKSONVILLE DAM
LEHIGH COUNTY, PENNSYLVANIA
NATIONAL I.D. NO. PA 00787

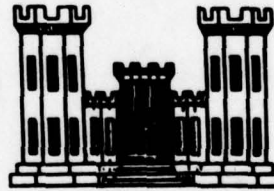
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National Dam Inspection Program.
Leaser Lake Dam (Jacksonville Lake)
(ID PA 00787), Schuylkill River Basin,
Jacksonville Branch, Ontelaunee Creek,
Lehigh County, Pennsylvania.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DACW31-78-C-0048



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Prepared by:

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DEPARTMENT OF THE ARMY
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Baltimore, Maryland 21203

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JUL 1978

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Leaser Lake Dam
County Located: Lehigh County
State Located: Pennsylvania
Stream: Jacksonville Branch of Ontelaunee Creek
Coordinates: Latitude 40° 40' Longitude 75° 50.2'
Date of Inspection: 19 July 1978

Abstract ↓
Leaser Lake Dam is owned by the Pennsylvania Fish Commission and was designed by the G. Edwin Pidcock Company of Allentown, Pennsylvania. Leaser Lake Dam was constructed on the Jacksonville Branch of Ontelaunee Creek approximately 1/2 mile above its confluence of Ontelaunee in Lehigh County, Lynn Township, Pennsylvania. The facility is considered to be in good condition and reasonably well maintained. The dam is considered a "High" hazard potential structure consistent with its potential for extensive property damage and of possible loss of life downstream.

The design data and other supplemental information pertinent to this dam were sufficient to evaluate the embankment and appurtenant structures. Leaser Lake Dam was evaluated to pass the probable maximum flood (PMF) without overtopping. Therefore, the spillway is considered "Adequate". *Assumed*

A visual inspection of the dam and reservoir facilities detected no deterioration of the embankment or its appurtenant facilities to suggest an impending hazardous condition. However, seepage was observed emanating from the downstream slope adjacent to the spillway chute. The seepage was observed to be clear with no signs of potential piping as evidenced by concentrated flows and movement of fines.

Some embankment settlement was noted along the crest adjacent to the emergency spillway. It is possible that the seepage noted lower on the downstream slope and insufficient compaction may have contributed to this settlement. This would have to be confirmed by additional field evaluations and sampling. A low area was also noted

on the right abutment of the spillway between the natural ground and the spillway wall. This effectively reduces the storage capacity of the reservoir as discussed in Section 5.

Considering the adjudged good condition of the dam, the recommendations presented below are suggested to assure that the dam continues to function as designed and to assure that residents downstream are notified when impending flows are expected along the creek.

1. It is recommended that the embankment crest be regraded to the design elevation.
2. It is recommended that a trainer dike be constructed between the right spillway wall and the natural ground to at least the crest elevation of the dam.
3. The downstream seepage should be evaluated by a registered professional Engineer to determine if potentially hazardous conditions are developing. Appropriate remedial measures should be performed pending the results of the Engineer's evaluation.

Recommendations concerning operation and maintenance of the dam are presented as follows:

1. The owner should develop an operation and maintenance procedure together with an inspection checklist to insure that all items are inspected, operated and maintained on a regular basis and in accordance with the designer's recommendations.
2. A formal procedure of observation and warning during periods of high precipitation should also be developed and implemented because of the possibility of extensive property damage downstream during periods of high flow. In the event of dam failure, loss of life is also probable. This procedure should include methods of warning and possibly evacuating residents along the creek.

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District Engineer

10 Sep 78
Date



OVERVIEW
LEASER LAKE, LEHIGH COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
LEASER LAKE DAM
NATIONAL ID #PA 00787
DER ID #39-93

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorizes 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. Leaser Lake Dam is a 53-foot high rolled earth embankment which has been constructed across the Jacksonville Branch of Ontelaunee Creek. The dam has an embankment length of 453 feet and impounds a 117-acre lake. The dam contains a downstream drainage blanket and drainage trench together with a 17-foot deep and 12-foot wide cutoff trench located at the base of the dam. The embankment materials consist of silty clays and clayey silts classified by the Unified Soil Classification System as ML and CL. This material is a product of the residual weathering of the Martinsburg shale formation. The upstream slope is protected with riprap which is seated on a 10-foot bench at elevation 475. Riprap extends to the top of the embankment (crest elevation 488.0).

The dam was designed with a standard Pennsylvania Fish Commission Intake Tower located within the embankment immediately upstream of the centerline. The tower contains an interior overflow weir formed by stop logs. A 30-inch conduit at the base of the tower discharges flow through the embankment to a fish catch basin. A 30-inch conduit extends from the reservoir to the tower. The stop log weir may be bypassed by opening a 30-inch sluice gate between the two conduits. Normal pool elevations are regulated by means of the

stop log weir system. The emergency spillway is located on the right abutment and consists of a 61-foot wide trapezoidal concrete weir, concrete chute and stilling basin. Water discharges into a 85-foot long rock-lined channel before entering the natural stream channel. The emergency spillway has a crest elevation of 480.0. There are no minimum flow requirements downstream of this structure.

b. Location. Leaser Lake Dam was constructed on the Jacksonville Branch of Ontelaunee Creek, approximately 1/2 mile above its confluence with Ontelaunee Creek in Lehigh County, Lynn Township, Pennsylvania. The dam and reservoir are located near Wanamakers, Pennsylvania, north of legislative route LR 285. The dam site and reservoir are shown on USGS Quadrangle entitled, "New Tripoli, Pennsylvania", at coordinates N 40° 40', W 75° 50.2'. A regional location plan of Leaser Lake Dam and Reservoir is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" dam by virtue of its 53-foot height and 1657 acre-feet normal storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and loss of life downstream along the Jacksonville Branch of Ontelaunee Creek and further downstream along Ontelaunee Creek.

e. Ownership. The dam is owned by the Pennsylvania Fish Commission. The dam is maintained by the Lehigh County.

f. Purpose of the Dam. The reservoir is used solely for recreation.

g. Design and Construction History. A feasibility study was prepared by G. Edwin Pidcock Company of Allentown, Pennsylvania, at the request of the Pennsylvania Fish Commission. Final design computations were performed by the G. Edwin Pidcock Company including stability analysis, hydraulic analysis and general specifications for the embankment. They also served as general construction supervisor for the Pennsylvania Fish Commission. Mr. Richard Muller served as the construction supervisor for the G. Edwin Pidcock Company. The general contractor for construction was McMinn's Road Materials, Inc. of Lancaster, Pennsylvania. Mr. Charles Hicks served as the construction superintendent for the general contractor.

Construction documentation contained in the Department of Environmental Resources (DER) files in Harrisburg, Pennsylvania, was supplemented with information supplied by Mr. Ray Stickler, representing the Pennsylvania Fish Commission during the visual inspection.

The State of Pennsylvania issued a permit to construct the dam on 23 April 1969. The "Report Upon the Application of the Pennsylvania Fish Commission" was prepared by Mr. Joseph J. Ellam, Hydraulic Engineer for DER, dated 29 May 1969. The notice to proceed was issued on 24 July 1969 and clearing and grubbing the reservoir and dam foundation started on 25 July 1969. By 18 August 1969, abutment excavation had commenced. Stream diversion work began 5 September 1969 and was completed by 16 September 1969. The foundation was completely exposed by late September, 1969. On 1 November 1969, the resident engineer determined that grouting, previously recommended by the Designer, was unnecessary.

Earthworks were terminated during the winter of 1969-1970 and resumed early in the spring of 1970. By 7 October 1970, the embankment was within 6 feet of the crest. The dam was officially completed on 13 January 1971, and the final inspection was performed by DER on 14 January 1971. On 23 February 1971, a dam completion report was issued by the Design Engineer on behalf of the Pennsylvania Fish Commission. This report indicated that all essential features of the dam were completed, and attached to this report was a one-page list of cosmetic work required to complete construction. The remaining work, scheduled for the spring of 1971, consisted primarily of seeding, dressing slopes, dressing roadways, and general cleanup of the area.

Throughout the construction work, periodic inspections were made by representatives of the DER. During their inspections, a series of 42 black and white photographs were taken of various stages of construction from foundation preparation to final dressing of embankment slopes. The photographs are located in DER files.

h. Normal Operating Procedures. Under normal conditions reservoir outflow is controlled by a stop log weir system located within the intake riser. The riser is located in the embankment just upstream of the centerline. Stop logs are inserted in tracks inside the tower and the number of stop logs determines the reservoir level. During the time of this inspection all but one of the stop logs were in place. This brought the water elevation within 7 inches of the emergency spillway crest. Flows over and above the capacity of the stop

log weir are discharged over the emergency spillway located on the right abutment at elevation 480.0.

Should it be necessary to lower the reservoir, the normal procedure is to remove stop logs in the intake tower by use of a hoist. Once the water level is lowered substantially, the sluice gate is opened. According to Mr. Ray Stickler, the sluice gate is operated every 6 months, usually during the months of April and October or November. At this time, the gate is opened for approximately one hour to drain silt accumulations from the base of the reservoir. The sluice gate is cleaned, greased and painted, if necessary. There are no minimum flow requirements downstream for this dam.

1.3 Pertinent Data.

A summary of pertinent data for Leaser Lake Dam is presented as follows:

a.	Drainage Area (sq. miles)	2.9
b.	Discharge at Dam Site (cfs)	
	Max. Known Flood	Unknown
	Design High Water (2 foot Freeboard)	3500
	Max. Discharge at Top of Dam	5315
	Minimum Required Flow	None
c.	Elevation (feet above MSL)	
	Top of Dam	488.0
	Emergency Spillway Crest	480.0
	Emergency Spillway Stilling Basin End Sill	438.6
	Invert of Conduit Entrance	434.0
	Invert of Conduit Discharge	433.8
	Normal Pool Elevation	480.0
d.	Reservoir (miles)	
	Length at Normal Pool	0.9
	Fetch at Normal Pool	0.7
e.	Storage (acre-feet)	
	Normal Pool	1657
	Design Maximum Flood	2428
	Top of Dam	2685
f.	Reservoir Surface Area (acres)	
	Normal Pool	117

g.	Dam Data	
	Type	Rolled earth with blanket drain and drainage trench
	Length	453 feet
	Height	53 feet
	Crest Width	24 feet
	Freeboard at Normal Pool	8 feet
	Volume of fill	Approx. 112,000 cubic yards
	Side Slope	
	Upstream	3:1 (H:V) with waste berm below elev. 458.0 berm slope unspecified
	Downstream	2.5:1 (H:V)
	Cutoff	17 feet deep, 12 feet base width with 1:1 slopes into shale
	Grout Curtain	None
h.	Diversion and Intake Riser	
	Type	
	Pond Drain Gate	30-inch sluice gate
	Discharge Pipe	
	Type	Prestressed Concrete
	Length	148± feet
	Diameter (ID)	30 inches
	Discharge Basin	26 feet x 40 feet fish catch basin
i.	Emergency Spillway	
	Type	Trapezoidal concrete weir
	Length	61 feet
	Discharge Chute	Concrete with 20 percent slope
	Discharge Channel	Rock lined for 85 feet

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of engineering data on Leaser Lake Dam is presented on the check list attached as Appendix A. Principal documents containing pertinent data used for this report are as follows:

1. "Report Upon the Application of the Pennsylvania Fish Commission," by Joseph J. Ellam, Hydraulic Engineer, dated May 29, 1969.
2. "Engineering Report on the Feasibility of Construction of a Dam and Fishing Lake on the Jacksonville Branch of Ontelaunee Creek," by G. Edwin Pidcock Company, Allentown, Pennsylvania, dated December, 1966.
3. "Soils Computations," Project No. FC-194L (396-2), Dam and Fishing Lake, Jacksonville Branch of Ontelaunee Creek, prepared by G. Edwin Pidcock Company, December, 1966.
4. "Hydraulic Design," Project No. FC-194L (396-2), Dam and Fishing Lake, Jacksonville Branch of Ontelaunee Creek; prepared by G. Edwin Pidcock Company, dated December, 1966.
5. "General Construction of a Dam, Fishing Lake, and Appurtenances on the Jacksonville Branch of Ontelaunee Creek," Project No. FC-194L (396-2), prepared for the Pennsylvania Fish Commission by G. Edwin Pidcock Company, dated December, 1966.
6. "As-Built Plans" prepared by G. Edwin Pidcock Company, a 23-sheet set of drawings for Project No. FC-194L (396-2); dated May, 1969.
7. Miscellaneous letters, correspondence, memos, inspection reports, construction progress reports located in the DER main office in Harrisburg, Pennsylvania.

The data available was comprehensive and included computer printouts for slope stability and calculations for seepage analysis, hydraulics, and other pertinent design calculations. It is noted that structural calculations were limited and were only submitted in the preliminary documents. Also included in these documents was a summary of the input parameters used for all calculations.

b. Design Features. The principal design features of the embankment and appurtenant structures are illustrated on the plan, profiles, and cross-section plates enclosed in Appendix E as Plates 2 through 7. A description of the features is also discussed in Section 1.2, "Description of Project."

The earth embankment was designed as a homogeneous structure with a cutoff trench founded within the Martinsburg shales. The trench was designed and constructed 17 feet below the original streambed with a 12-foot width base and 1 to 1 side slopes. The embankment was constructed with a 3 to 1 upstream slope, protected by riprap from the crest to elevation 475, 5 feet below normal pool level. The downstream section, slope 2.5H:1V, contains a variable length drainage blanket and drainage trench. The crest has a width of 24 feet and is covered with grass. The downstream slope is covered with Crownvetch.

The intake tower is shown on Plate 5, Appendix E. Water enters at the upstream toe and flows through a 30-inch prestressed concrete conduit to the control tower. Stop logs form a weir inside the tower. The elevation of the weir is determined by the number of logs used. Water rises and flows over the stop logs, leaving the tower through 155± feet of 30-inch prestressed concrete pipe and discharging into a 26 by 40 foot fish catch basin. The stop log weir can be by-passed by opening a 30-inch sluice gate located below the stop logs. The fish catch basin was designed to be used if the reservoir is drawn down and has provisions for screens permitting a discharge of 20 cfs. However, it is understood that these screens were never used.

The emergency spillway is located in the right abutment with a trapezoidal concrete weir at elevation 480. Discharge flows down a concrete chute into a stilling basin and, thereafter, into the natural streambed.

2.2 Construction.

Based on documentation in the DER files and "as-built" drawings, supplemented by discussions with Pennsylvania Fish Commission representatives, it is concluded that the

dam was constructed as designed. The 42 construction photographs also verify that details which could not be observed during the visual inspection, were constructed at the locations and with basically the same materials as specified on the drawings.

2.3 Operation Data.

There are no minimum flow requirements downstream. The dam and appurtenant facilities were designed to be operated without a dam tender and no operational data are available. It is understood that the sluice gate is opened twice a year, primarily to drain silt from the reservoir. During this bi-yearly operation, the sluice gate is greased, cleaned and painted, if necessary.

2.4 Evaluation.

a. Availability. All engineering data reproduced in this report and studied for this investigation were provided by the DER and supplemented by conversations with the Pennsylvania Fish Commission representatives.

b. Adequacy. The design data provided was comprehensive and well documented. Construction data consisted of several inspection reports by DER and progress reports prepared by the Designer. This data coupled with the photographic documentation was adequate to verify that construction was in general accordance with the construction drawings. In conclusion, both design and construction data is considered adequate to evaluate the dam and appurtenant structures.

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

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B and are summarized and evaluated as follows. In general, the appearance of the facility indicates that the dam and its appurtenances were properly constructed, reasonably maintained, and in relatively good condition.

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. The riprap was observed to be in good condition and stable. Some settlement was observed along the crest near the emergency spillway retaining wall exposing the wall's anti-seep fins. The maximum settlement below the existing crest grade appeared to be about 10 inches, decreasing along the crest with distance from the spillway wall. The downstream slope was well vegetated with little woody vegetation growing on the slope.

As delineated on Sheet 5a, Appendix B, a moderate seepage volume was noticed emanating from the downstream slope near the right abutment. Initially, seepage was noted to exit the embankment as sheet flow, subsequently concentrating into several small channels as shown in Photo 8. Weep holes in the adjacent spillway were noted to be discharging clear water at approximately the same elevation as the seepage noted on the embankment slope. There was no significant distortion, misalignment or bulging of the slope observed. However, the heavy growth on the slope could be masking slight bulging of the embankment. In summary, with the exception of the embankment seepage, the embankment is functioning as designed.

c. Appurtenant Structures.

1. Intake Tower. Since the intake conduit, discharge conduit and most of the intake riser are buried, the only portions that could be inspected were the top of the tower and the discharge outlet system. These two features were inspected and found to be in good condition with no significant spalling, cracking or concrete deterioration. The ARMCO valve,

LO-81, was exercised and operated properly. The valve was painted, greased and in good working order. An attempt was made to enter the downstream portion of the intake tower but the stop logs dividing the tower were leaking and did not permit safe entry into the chamber. Most of the flow was discharging between the cracks of the stop logs. The discharge wing walls and fish catch basin were inspected and found to be in good condition.

2. Emergency Spillway. The exposed portions of the emergency spillway were inspected. The left bank of the approach channel, contiguous with the embankment, is riprapped and stable. The right bank, cut from natural ground, is not riprapped and has experienced some erosion. The erosion is minor and is associated with foot traffic and lack of a good vegetative cover. The top of the right bank, adjacent to the wing wall, is about one foot lower than the top of the embankment.

The trapezoidal concrete control weir is in good condition with no signs of cracking, distortions, or spalling. Similarly, the concrete discharge chute is also in good condition. The chute walls on both sides of the channel were observed and there were no signs of significant misalignment, wall rotation or other forms of distress. There were some zones of concrete spalling noted, particularly at construction joints. In several cases, as shown in Photo 9, this spalling has exposed portions of the metal water stop and reinforcing steel. Since the structure is relatively new, the steel has not deteriorated to any significant extent but the concrete should be repaired before the steel deteriorates. The stilling basin was also inspected and observed to be in good condition. The weep holes were inspected and several were flowing (See Photo 6). The flow (≈ 5 to 10 gpm) through these weep holes was clear with no significant signs of turbidity. The discharge channel immediately below the stilling pool was riprapped lined for approximately 85 feet. This channel appears to be stable and in good condition.

d. Reservoir. Reconnaissance of the reservoir disclosed no evidence of significant siltation, slope instability, or other features that would significantly affect the flood storage capacity of the reservoir. All slopes were well vegetated, and in some cases trees were growing to the water's edge, particularly on the right side of the reservoir. The surrounding drainage basin was also inspected. In general, the area adjacent to the reservoir is densely vegetated with an assortment of hard wood and soft wood trees. There are three streams entering the reservoir. The streambeds are

stable with rocky bottoms. The reservoir is very clear, indicative of little silt inflow from the drainage area.

e. Downstream Channel. Immediately downstream of the fish catch basin and emergency spillway stilling basin, the two discharge channels converge and flow through a culvert under a private road 300 feet downstream. Thereafter, water flows downstream under legislative route LR 285, then, under an abandoned railroad embankment and discharges into Ontelaunee Creek. The flood plain between the dam and Ontelaunee Creek is approximately 300 feet wide, well vegetated with stable slopes. The channel is stable with a predominantly rocky bottom. There are few obstructions downstream, although the private road floods several times a year.

3.2 Evaluation.

In summary, the visual survey of the dam disclosed no evidence of apparent past or present movements, with the exception of the settlement noted on the dam crest near the emergency spillway. Seepage emergence was noted adjacent to the right abutment and on the downstream slope next to the emergency spillway. This seepage was noted as early as 6 October 1972, during a routine DER inspection. There is no evidence to indicate an imminent potential for piping or slope instability. However, as the dam consists of a homogeneous embankment containing ML soils and the zone of seepage emergence is relatively high on the downstream slope, a more detailed evaluation is believed necessary. The emergency spillway was noted to be in good condition with no significant signs of deterioration. The intake tower was also inspected and the portions that could be inspected were observed to be in good condition.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures.

Normal operating procedure does not require a dam tender. The water level is maintained by the stop log weir system located inside the control tower. Water enters the tower through the pond drain inlet pipe and rises up the tower and over the wooden stop logs. Water then discharges through a 30-inch concrete pipe and flows directly into the natural stream channel. Under normal conditions, the reservoir is approximately at the emergency spillway crest elevation, 480.0.

Should it be necessary to lower the reservoir, Mr. Stickler, Pennsylvania Fish Commission, indicated that the procedure, in theory, is to remove stop logs until the reservoir reaches a desired water elevation. Thereafter, the 30-inch sluice gate is opened and water drained from the base of the reservoir. The normal means of lowering the reservoir is to just open the sluice gate.

It is noted that this fish catch basin, located immediately downstream of the outlet pipe, was designed to contain stop logs and screens to contain fish which would be caught if the reservoir were drained. Mr. Stickler indicated that these screens were never installed and that the catch basin was never used as designed.

4.2 Maintenance of the Dam.

Although the dam is owned by the Pennsylvania Fish Commission, the Lehigh County maintains the facilities. This maintenance normally consists of cutting grass and repairing the recreational facilities along the edge of the reservoir. As necessary, trash and other floating debris is removed from the shoreline. It is not known how often or when this maintenance is performed. Representatives of the Pennsylvania Fish Commission normally inspect the dam and reservoir 2 to 4 times per year.

4.3 Maintenance of Operating Facilities.

Maintenance of the operating facilities, which include the intake tower and spillway, is performed by the

Lehigh County representatives. It is not known how often the County performs these maintenance functions. It is apparent that the control tower is inspected periodically. The valve was painted, lubricated, and functioned properly. The intake tower was clean, well maintained, and all equipment was operational. The overhead hoist which is used to remove logs was not in the tower during the field inspection because it was being repaired. It is understood from Mr. Stickler that during the bi-annual exercising of the drain valve, he inspects the system. If maintenance is necessary, the Pennsylvania Fish Commission either performs the maintenance itself or contacts the County.

4.4 Warning Systems in Effect.

There are no formal warning systems or procedures established to be followed during exceedingly heavy rainfalls. There are no park representatives or County representatives at the dam during periods of heavy rainfall. The Pennsylvania Fish Commission normally inspects the dam after a large storm has passed through the area. One fish commission representative is responsible for several dams and it often takes several days to make these rounds. County representatives do not inspect the dams after periods of heavy rainfall. Downstream flows are never monitored.

4.5 Evaluation.

There are no written operating procedures nor are there any warning systems or procedures established to be followed during periods of exceedingly heavy rainfall. Commensurate with the possibility of loss of life and extreme property damage immediately downstream in the event of failure or the passing of exceedingly high flows, a formal warning procedure should be implemented.

An operating procedure, together with an inspection checklist should also be formulated and implemented by either the Pennsylvania Fish Commission or the County. The operating procedures should include a detailed description as to how and when the valves should be operated and also when and how stop logs should be removed to lower the reservoir. Coupled with this operational manual, should be a maintenance manual and a maintenance inspection checklist. The listing should include all critical items of the facilities and should be performed either by representatives of the Pennsylvania Fish Commission or the County.

The warning procedure should delineate steps on how and when to monitor flow over the structure. Methods of warning downstream residents that high flows are expected and ways of evacuating these people should be formulated. It is noted that the home immediately downstream often loses access to the main road because of flooding of the bridge. An alternate means should be prepared to evacuate these people in a time of an emergency.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. A detailed hydrologic study was not included in the scope of the original Feasibility Study for the dam. Part of the hydraulic design was included in the DER files and was reviewed for this investigation.

The watershed shape is roughly square, 2.9 square miles in area, and with elevations ranging from about 1520 in the upper reaches to 480 at normal pool elevation. The watershed is over half wooded, the rest open/farm land with little residential development. There are no upstream dams or lakes. About 313 acres were acquired by the State for this project.

The spillway was designed to have a maximum discharge capacity of not less than 3500 cfs, the value required by the "c" curve of the Department of Forests and Waters. This discharge was provided at a head of six feet and with two feet of freeboard.

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

b. Experience Data. No records are kept of reservoir water elevations or rainfall amounts. The storm of record in Pennsylvania is often Tropical Storm Agnes, June, 1972, and there are no estimates of the depth of flow over the spillway during this storm from either the Fish Commission representative or a nearby resident.

c. Visual Observations. On the date of the inspection, the only condition observed that would indicate that the outlet capacity could be reduced during a flood occurrence is that the ground surface on the right side of the spillway is about 0.8 feet below the embankment crest, thus reducing the minimum distance between the spillway crest and the minimum crest elevation. Observations regarding the condition of the downstream channel, spillway conditions, and reservoir are located in Appendix B.

d. Overtopping Potential. The design data included in DER files did not contain calculations for the rating curve for the spillway or flood routing of the PMF through the reservoir. Therefore, the dam was evaluated for overtopping potential by approximate methods (See Appendix C). Under existing conditions, reservoir water level at the low point on the right abutment, the maximum spillway capacity was estimated to be approximately 4540 cfs, less than the estimated peak PMF inflow (4770 cfs). The flood water storage required to prevent overtopping was estimated and found to be less than available flood storage.

Under design conditions, reservoir water level at the top of the dam, the maximum spillway capacity was estimated to be 5315 cfs, greater than the estimated peak PMF inflow. Therefore, no further analysis was required.

e. Spillway Adequacy. Under both design and existing conditions, the spillway discharges the PMF without overtopping, therefore the spillway is "Adequate". From the original design information, the tailwater elevation is computed to be approximately 440, or 48 feet below the top of the dam during passing of the PMF.

f. Downstream Conditions. Approximately 200 feet downstream of the toe of the dam, the spillway discharges into the natural stream channel. The channel flows through a 300-foot wide flood plain which has a valley gradient of approximately 0.3 percent. About 500 feet downstream of the dam a private road crosses the stream. This road is frequently flooded out and the tailwater rating curve is based on the discharge over the road rather than through the 52-inch culvert. About 1700 feet below the dam, the channel passes under LR 285 through a 6 by 33 foot opening. This bridge is expected to flood out at discharges greater than about 2000 cfs. About 2000 feet below the dam, Jacksonville Branch enters Ontelaunee Creek. Immediately downstream of the dam is one house subject to flooding during high flows and damage in case of dam failure. About five homes are expected to be damaged or destroyed, including loss of life, if the dam fails. Therefore, a "High" hazard potential rating is justified.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. There were no indications observed during the field inspection to indicate that the embankment or its components are in an unstable condition. The embankment slopes are reasonably uniform with no signs of slope instability or sloughing. Possible slight slope bulging in the seepage zone could be masked by dense Crownvetch. The riprap protection on the upstream slope appeared to be stable and in relatively good condition. Some woody vegetation is beginning to develop between the rocks and on the downstream slope. This should be removed.

As previously described in Section 3, settlement was noted on the right portion of the embankment crest next to the emergency spillway. Immediately downstream of this area, seepage was observed emanating from the slope, causing some minor gullying.

As shown on Sheet 5a of Appendix B, the seepage zone extends well above the toe and covers a fairly significant area. Previous inspections by the State also reported this seepage. The first State inspection to note this was performed on 6 October 1972, by the DER, but the quantity of flow was not determined. Any changes in flow since that time were not determined. This flow was observed to be clear. The cause and future risk potential can not be properly assessed without more detailed study.

The intake tower structure was inspected and there were no signs of distress, spalled concrete or other conditions to indicate a potentially unstable structure. The downstream catch basin was also inspected and observed to be in good condition with no signs of structural instability.

The emergency spillway was also inspected and found to be in good condition. The few spalled areas on the walls and spillway chute should be patched.

The downstream channels of both structures were inspected and found to be stable with no signs of excessive erosion or riprap instability.

b. Design and Construction Data. All available design documentation, calculations and other data were reviewed and assessed for completeness. A detailed listing of this data is included herein as Appendix A and discussed in Section 2.

The design documentation was, for the most part, considered complete. The plans and specifications were reviewed and there were no noted deficiencies in the structural design of the intake tower and emergency spillway. Construction photographs taken by DER inspectors indicate that the construction of these systems was performed in general accordance with the drawings. It is judged that the construction documentation including DER photographs, inspection memorandums, and G. Edwin Pidcock Company's progress reports were sufficient to conclude that the embankment was constructed in general accordance with the design criteria. Construction records indicate that the embankment materials were constructed to at least 95 percent of the maximum density as defined by ASTM D-698, Method "A". As previously discussed in Section 6.1 (a) the cause for the unusual seepage at the right side of the embankment is unknown. Without further evaluation, which includes test borings, the cause for this seepage cannot be determined.

c. Operating Records. There are no operating records maintained for this structure. There are no minimum flow requirements required downstream of this structure. There are no high and low water level records maintained. There is no maintenance checklist or maintenance records kept.

d. Post-Construction Changes. There are no reports nor is there any evidence that modifications were made for this dam.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. The static stability analyses indicate that steady state seepage conditions have a factor safety of at least 1.61 for the most critical circle of failure. Therefore, by definition of the Corps of Engineers criteria, a seismic stability of the dam is adequate. The soil properties used for these analyses were a ϕ of 11° with a cohesion of 660 pounds per square foot. These strength parameters appear to be reasonable values.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. The visual inspection and review of the design and As-Built documentation indicates that the dam, foundation and appurtenant structures of Leaser Lake Dam are in good condition. However, the seepage is undesirable and should be evaluated. The hydrologic/hydraulic computations presented in Appendix C indicate that the dam will pass the PMF. Therefore, the spillway system of the structure is considered to be "Adequate". It is noted that although the structure has been designed to pass the PMF, significant property damage is likely to occur downstream during high rates of discharge. In particular, damage to the bridges immediately downstream is likely together with damage to the houses located near the intersection of Route LR 285 and the stream. In the event of failure of the dam, the home located immediately downstream on the right hill side of the flood plain is expected to be damaged or destroyed, and loss of life is likely to occur.

The seepage noted on the downstream slope does not appear to represent imminent instability but it is concluded that corrective action should be taken based on a more detailed evaluation of this zone.

b. Adequacy of Information. The design information available for this inspection was adequate and of sufficient degree of completeness to evaluate the structure. Construction data was also considered adequate for this evaluation.

c. Urgency. It is concluded that the recommendation presented in Section 7.2 be implemented as soon as practical.

7.2 Remedial Measures.

a. Facilities. The following recommendations are presented in order of priority but does not infer that the latter recommendations are unimportant.

1. The top of the embankment, adjacent to the spillway wall, should be regraded and brought back to design elevation.
2. The low area located to the right of the emergency spillway should be regraded to prevent water from going around the wall and eroding the embankment.

This can be accomplished by constructing an earthen training dike or extending the concrete retaining wall. The dike or wall should be constructed to at least the same elevation as the dam.

3. Further evaluation of the downstream slope seepage should be performed as soon as possible. This evaluation should include cutting the vegetation on the slope and delineating the exact extent of the seepage zone. In addition, the phreatic line should be delineated and the embankment materials investigated with regard to the causal features of the seepage emergence. Pending the results of this investigation, corrective measures should be provided to control the seepage.
4. The spalled concrete on the channels should be repaired and packed with an epoxy grout or similar material to protect the reinforcing steel.

b. Operation and Maintenance Procedures. Because of the location of the dam upstream of a populated area and a potential for extreme property damage and possible loss of life, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should also include a method of warning downstream residents that high flows are expected, together with a method of evacuating these people.

The Pennsylvania Fish Commission or the County should develop an inspection checklist and develop a maintenance procedure which would be used to regularly inspect and maintain all items of this structure.

APPENDIX

A

NAME OF DAM Leaser Dam
 ID # PA 00787

CHECK LIST
 ENGINEERING DATA
 DESIGN, CONSTRUCTION, OPERATION
 PHASE I

Sheet 1 of 4

REMARKS

None. However, several of the design drawings were marked As-Built.
 19 sheets of a 21 sheet set of drawings were provided.

ITEM

AS-BUILT DRAWINGS

REGIONAL VICINITY MAP

The dam site is located on the USGS Quadrangle entitled "New Tripoli, Pennsylvania." See Plate 1, Appendix E of the report.

CONSTRUCTION HISTORY

None. However, Mr. Richard A. Muller was the resident engineer for construction for the G. Edwin Pidcock Company. Notice to proceed was issued on 7/24/69. Work began in the summer of 1969 (7/25/78). Earth works began in November, 1969 but was delayed shortly thereafter due to inclement weather. McMin Asphalt Co. of Lancaster, Penna. was the General Constructor.

TYPICAL SECTIONS OF DAM

Typical sections are located in the design drawings.

OUTLETS - PLAN

DETAILS

Data is presented on the design drawings.

CONSTRAINTS

DISCHARGE RATINGS

Not available.

RAINFALL/RESERVOIR RECORDS

None

REMARKS

ITEM

DESIGN REPORTS 1. " Engineering Report on the Feasibility of Construction of a Dam and Fishing Lake," prepared by G. Edwin Pidcock & Co., Allentown, Penna., December 1966.

GEOLOGY REPORTS None. A one paragraph section was included with the " Report upon the Application Form."

DESIGN COMPUTATIONS A letter dated 5/19/69 to Mr. Lunetta indicated that a copy of all hydraulic
 HYDROLOGY & HYDRAULICS and slope stability analyses were transmitted. Hydraulic and stability
 DAM STABILITY calculations by G. Edwin Pidcock were reviewed.
 SEEPAGE STUDIES

MATERIALS INVESTIGATIONS Test boring data was presented on the design drawings but no other data
 BORING RECORDS was found.
 LABORATORY
 FIELD

POST-CONSTRUCTION SURVEYS OF DAM None known.

BORROW SOURCES The use of the proposed borrow sources could not be confirmed.

ITEM REMARKS

MONITORING SYSTEMS *None.*

MODIFICATIONS *As per an 11/1/69 status report prepared by Richard Muller, Resident Engineer, it was decided to eliminate the cutoff trench.*

HIGH POOL RECORDS *None*

POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS *None.*

PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS *None.*

MAINTENANCE OPERATION RECORDS *None*

ITEM	REMARKS
SPILLWAY PLAN	Details are presented on the design drawings.
SECTIONS DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Design drawings contained most of the operating details for the facilities.
SPECIFICATIONS	" General Construction of Dam, Fishing Lake and Appurtenances on the Jacksonville Branch of Ontelaunee Creek " prepared by G. Edwin Fidcock, Co. Allentown, Pennsylvania, Project FC-194L(396-2).
MISCELLANEOUS	<ol style="list-style-type: none">1. Application Report to construct a dam2. Application Permit dated 23 April 19693. "Report upon the Application of the Pennsylvania Fish Commission" dated May 29, 1969

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam Leaser Dam County Lehigh State Pennsylvania National ID # PA 00787

Type of Dam Rolled Earth Hazard Category I (High)

Date(s) Inspection 19 July 1978 Weather Clear, Hot, Humid Temperature 80-90 F

Pool Elevation at Time of Inspection 479.8 M.S.L. Tailwater at Time of Inspection 434.0 M.S.L.

Inspection Personnel:

Brady Bisson Sat P. Gulati John Boschuk, Jr.
Mary Beck Vince McKeever John H. Frederick, Jr.
John Boschuk, Jr. Recorder

Remarks:

Mr. Ray Stickler, Pennsylvania Fish Commission representative, was on site; exercised the control valve; and, provided information and assistance during the inspection.

CONCRETE/MASONRY DAMS

Sheet 2 of 11

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

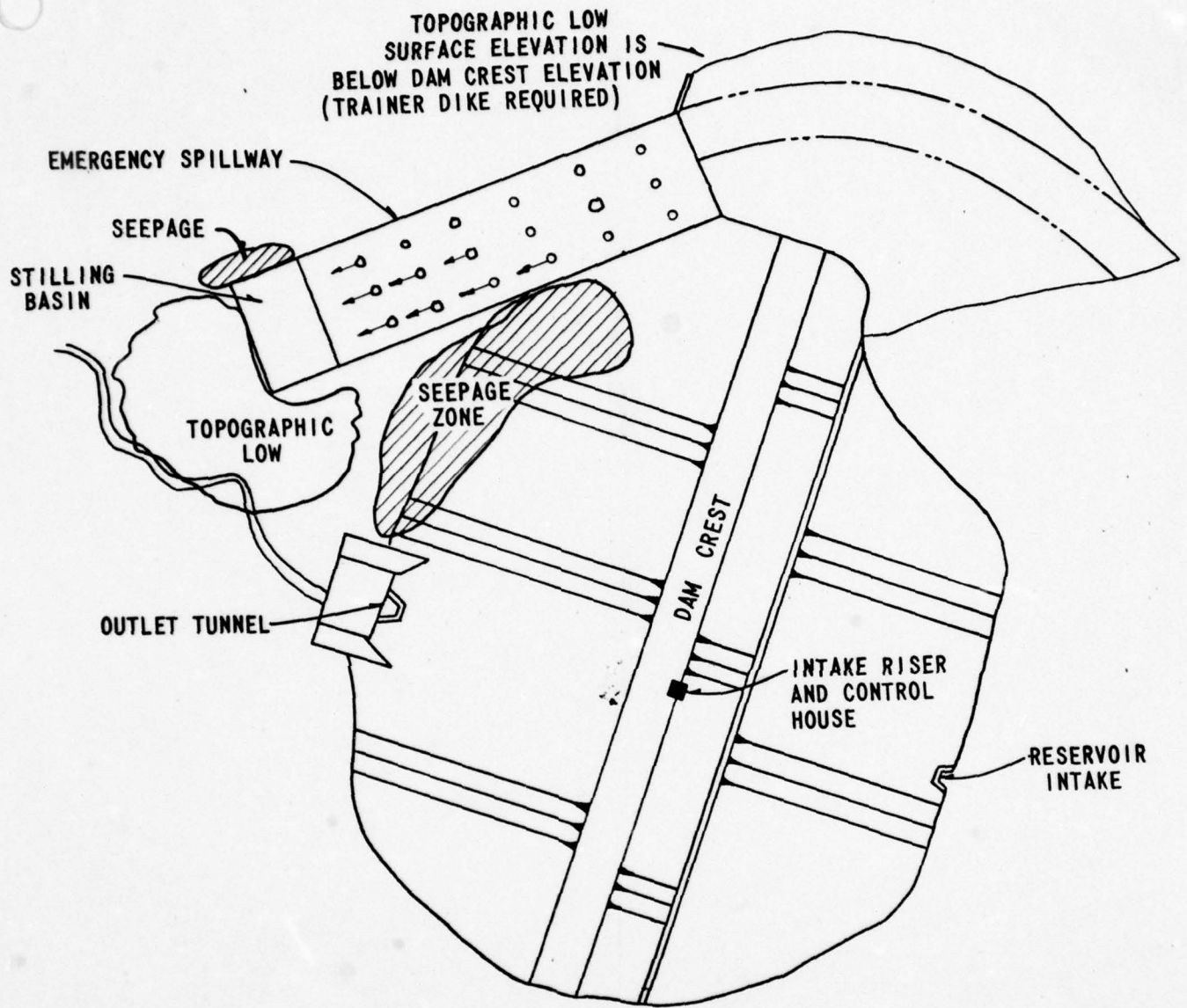
Sheet 3 of 11

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

Sheet 5 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SETTLEMENT	Settlement was observed on the embankment crest especially adjacent to the spillway. Settlement at the right abutment was observed to be 0.3 feet below the counterforts.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No distortions, excessive erosion or settlement observed.	
ANY NOTICEABLE SEEPAGE	Yes. See sheet 5 a. Most of the seepage was observed on the left side of the pond drain and the emergence was as high as halfway up the slope. Seepage at these same levels were observed through the chute spillway weep holes. All seepage was clear. See photographs Nos. 6 and 8.	
STAFF GAGE AND RECORDER	None	
DRAINS	Yes. Flow was observed to be clear.	



Note: Due to the type of seepage occurring (sheet flow), the quantity of flow could not be accurately estimated.

SEEPAGE LOCATION PLAN
LEASER LAKE DAM
SHEET 5a OF 11

OUTLET WORKS

(Pond Drain)

Sheet 6 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

CRACKING AND SPALLING OF
CONCRETE SURFACES IN
OUTLET CONDUIT

Since the conduit is buried in the embankment it could not be inspected.

INTAKE STRUCTURE

The structure was judged to be in good condition with no noticeable cracks or spalling of the concrete. The Armo gate valve was exercised and increase flow was noted and heard at the base of the tower. The vertical riser could not be inspected safely because the stop logs in the tower were leaking.

OUTLET STRUCTURE

This structure was judged to be in good condition with no significant spalling or cracking.

OUTLET CHANNEL

The channel was stable and in good condition.

EMERGENCY GATE

N/A

UNGATED SPILLWAY

Sheet 7 of 11

VISUAL EXAMINATION OF CONCRETE WEIR OBSERVATIONS REMARKS OR RECOMMENDATIONS

CONCRETE WEIR

The weir and adjacent retaining wall were judged to be in good condition.

APPROACH CHANNEL

The channel bottom was judged to be in good condition as well as the left side. On the right side, some bank erosion was noted which can be repaired with riprap. It is noted that the training wall on the right side is tied into the natural ground which is slightly below the dam crest. Therefore, overtopping (21 feet) would occur prior to dam overtopping. This would erode the wall on the right side. A training dike should be constructed to prevent this.

DISCHARGE CHANNEL

The chute spillway and downstream channel was judged to be in good condition. Some hairline cracking was observed, but it is not judged to be a hazardous condition. Most cracks are judged to have been caused by temperature variations.

BRIDGE AND PIERS

None.

GATED SPILLWAY

Sheet 8 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

Sheet 9 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION

MONUMENTATION/SURVEYS

None. The original design had two monuments (one at each end of the dam) along the centerline and on natural materials to be used to monitor construction. These monuments could not be located.

OBSERVATION WELLS

None

WEIRS

None

PIEZOMETERS

None

OTHER

None

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	<i>Two private bridges, one highway bridge and abandoned railroad bridge piers. The private bridge would be washed out but the 1926 vintage concrete highway bridge would probably remain intact.</i>	
SLOPES	<i>Channel gradient from the dam to the confluence of Ontelaunee Creek (1/3 mile) is approximately 0.2 percent. The channel slopes range from near vertical to 2H:1V with a rocky bottom. The flood plain is approximately 225 to 250 feet wide to Ontelaunee Creek.</i>	
APPROXIMATE NO. OF HOMES AND POPULATION	<i>Five homes plus several attendant farm structures would be damaged together with possible loss of life. Damage centers are concentrated within the first 3/4 of a mile downstream. Thereafter, the flood plain widens and the creek enters Ontelaunee Creek.</i>	

APPENDIX

C

LEASER LAKE DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: More than 50% wooded, about 5% residential,
remainder, open farm land.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 480.0 (1657 Acre-Feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 488.0 (2685 Acre Feet)

ELEVATION MAXIMUM DESIGN POOL: 486.0

ELEVATION TOP DAM: 488.0

EMERGENCY SPILLWAY

a. Elevation 480.0

b. Type Trapezoidal concrete weir.

c. Width 61 feet

d. Length Concrete chute. 260 feet long.

e. Location Spillover Right abutment.

f. Number and Type of Gates None

OUTLET WORKS:

a. Type Concrete tower with interior stop log weir.

b. Location 180 feet from left abutment.

c. Entrance inverts 434.0

d. Exit inverts 433.85

e. Emergency drawdown facilities Through tower.

HYDROMETEOROLOGICAL GAGES:

a. Type None.

b. Location _____

c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: About 200 cfs will flood private road
downstream. Downstream highway bridge is
expected to flood out at about 2000 cfs.

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: 8/11/20
By: MFB
Sheet: 2 of 9

DAM Leaser Lake Nat. ID No. PA 00787 DER No. 99-93

ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1. Min. Crest Elev., ft.	<u>4800</u>		
2. Freeboard, ft.	<u>2</u>		
3. Spillway ⁽¹⁾ Crest Elev, ft.	<u>480.0</u>		
3a. Secondary ⁽²⁾ Crest Elev, ft.	<u>-</u>		
4. Max. Pool Elev., ft.	<u>486.0</u>		
5. Max. Outflow ⁽³⁾ , cfs	<u>9500</u>		
6. Drainage Area, mi ²	<u>2.9</u>		<u>2.0</u>
7. Max. Inflow ⁽⁴⁾ , cfs	<u>-</u>		
8. Reservoir Surf. Area, Acre	<u>117</u>		
9. Flood Storage ⁽⁵⁾ , Acre-Feet	<u>-</u>		
10. Inflow Volume, ft ³	<u>-</u>		

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 columns B, C, use PMF.
- (5) Between lowest ungated spillway and maximum pool.

Date: 8/11/70
By: MFB
Sheet: 3 of 9

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from Sheet 2)

Source

1A, 3A, 6A, 8A

"As-Built" drawings prepared by
G. E. Win Pidcock, Co., May 1969.

2A, 4A, 5A

"Application Report" dated May 29, 1969

6C

USGS May
New Tripoli, Pa (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 53 ft. and normal storage of 1657 Ac-Ft.
3. The spillway design flood, based on size and hazard classification, is the probable maximum flood (PMF).

Hydrology and Hydraulic Analysis

1. Hydrology was limited to providing spillway capacity as required by the Dept. of Forests & Waters, Water & Power Resources Board - Form FWWR-23(1961).

$$\begin{aligned} \text{Spillway design flood} &= 1150 \text{ cfs/mi}^2 \times 3 \text{ mile}^2 \\ &= 3450 \text{ cfs} \end{aligned}$$

$$\text{Design Fractboard} = 2 \text{ ft} \quad \text{Design Head} = 6 \text{ ft}$$

2. Probable maximum Flood
 Information from Col. E. Balt. District gives a comparable watershed to be a tributary to Ontonagon Creek
 Drainage Area = 3.7 sq. miles
 Estimated PMF = 5000 cfs

Estimated Leaser Lake PMF

$$\left(\frac{2.9}{3.7}\right)^{0.8} 5000 = 4729 \text{ cfs}$$

3. Spillway Capacity

$$\begin{aligned} Q &= C L H^{3/2} \\ L &= 61 \text{ ft} \\ H &= 8 \text{ ft (max)} \\ C &= 3.05 \end{aligned}$$

$$Q = 3.05 \cdot 61 \cdot 8^{3/2} = 5315 \text{ cfs as designed}$$

Minimum distance between weir crest and top of dam was field checked and is 7.2 ft

$$Q = 3.85 \cdot 61 \cdot 7.2^{3/2} = 4537 \text{ cfs under existing conditions}$$

4. Overtopping Potential

As designed: spillway capacity is greater than estimated peak in flow, therefore the spillway is adequate.

Existing conditions: spillway capacity is less than peak inflow, therefore, check overtopping potential using the approximate method shown on sheets 8 & 9

$$PMP \approx 25.5 \text{ inches} \cdot \text{from TP-40} \\ (6 \text{ hr} - 10 \text{ sq miles})$$

Assume 90% runoff

$$V_f = \text{Volume of runoff} \\ = \frac{25.5 \cdot 0.9}{12} \cdot 2.9 \text{ mile}^2 \cdot 640 \text{ Ac/mile}^2 \\ = 3550 \text{ Ac} \cdot \text{Ft.}$$

Required Flood Storage =

$$(1 - \frac{4537}{9773}) 3550 \\ = 175 \text{ Ac} \cdot \text{Ft. which is less than} \\ \text{available storage of } 920 \text{ Ac} \cdot \text{Ft.} \\ \text{at elev. } 487.2$$

Therefore, the spillway is "Adequate"

5. Downstream Bridge under LR 285

Measured bridge opening 33 ft. x 6 ft.
Distance between bottom of bridge and roadway = 3 ft
 $S_0 = 0.003$ - estimated from USGS Map

$S_0 = 0.002$ in Ontelaunee Creek - estimated from
USGS Map

Flow through bridge estimated by orifice flow equation

$$Q = CA\sqrt{2gH} \quad \text{Ref. National Engineering Hand book, Section 4 Eq. 14-25}$$

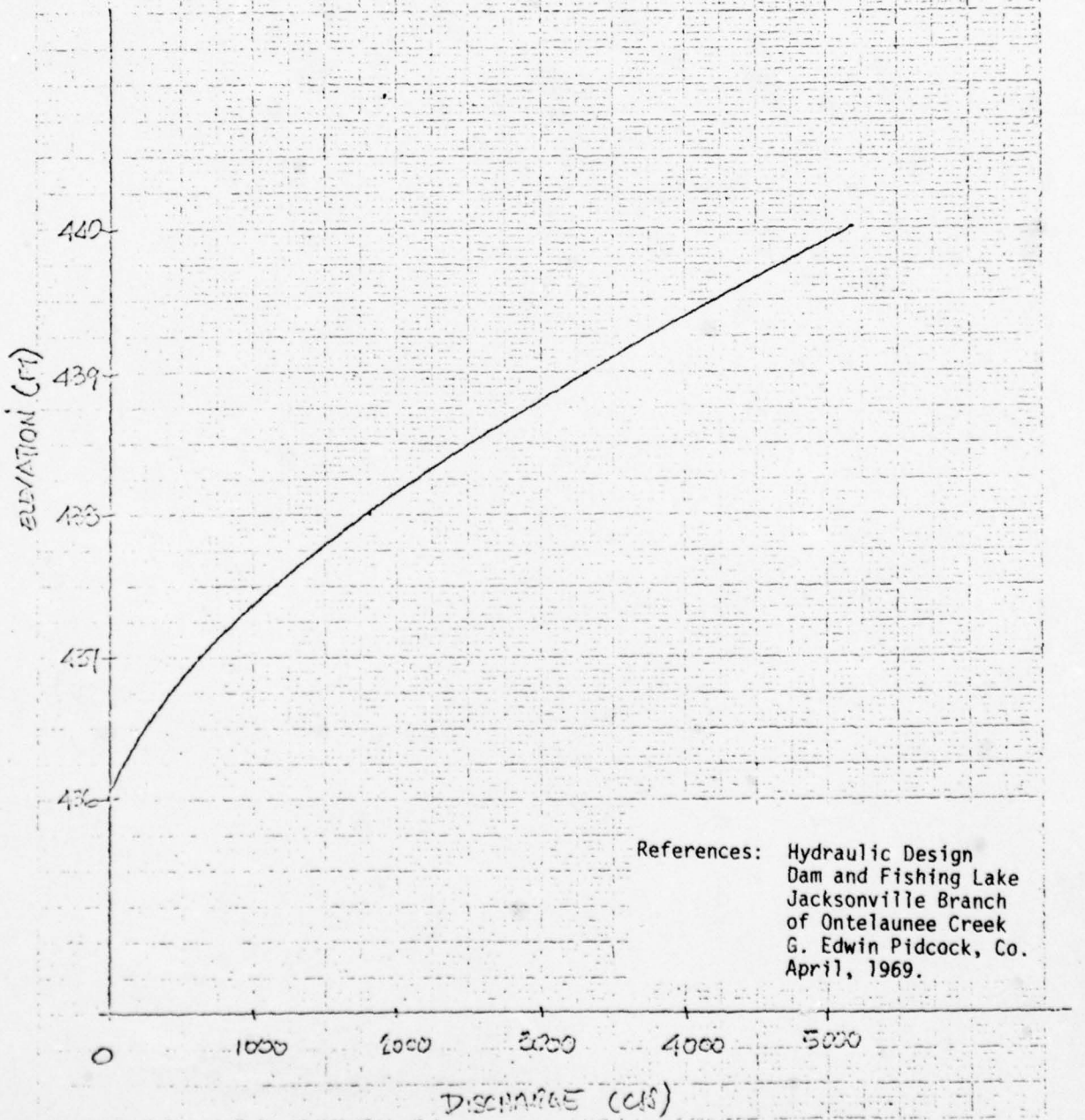
C ranges from 0.7 to 0.9, use 0.8
A = area under bridge

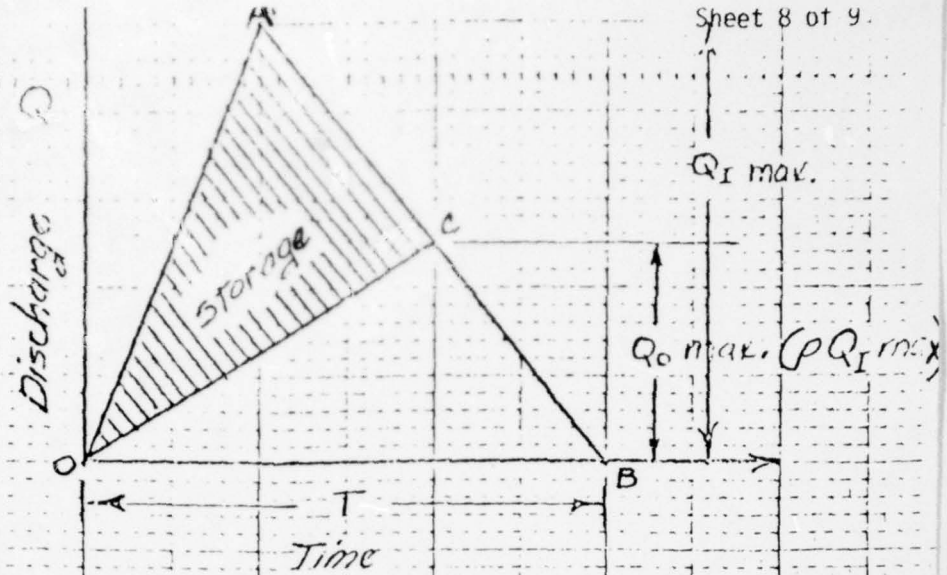
Assume that water downstream of the bridge is backed by flow in Ontelaunee Creek so that H is equal to 3 ft. the distance between the top and bottom of the bridge

$$Q = 0.8 \cdot 198 \sqrt{2g \cdot 3}$$
$$= 2200 \text{ cfs}$$

Note: H is defined as "the difference in water surface elevation between head-water and tail water, in feet"

TAILWATER DATING CURVE - BASED ON
CONTROL CREATED BY ROAD DOWNSTREAM
OF DAM





PURPOSE: Establish relationship between maximum spillway discharge and storage required to pass flood hydrograph without exceeding maximum pool level.

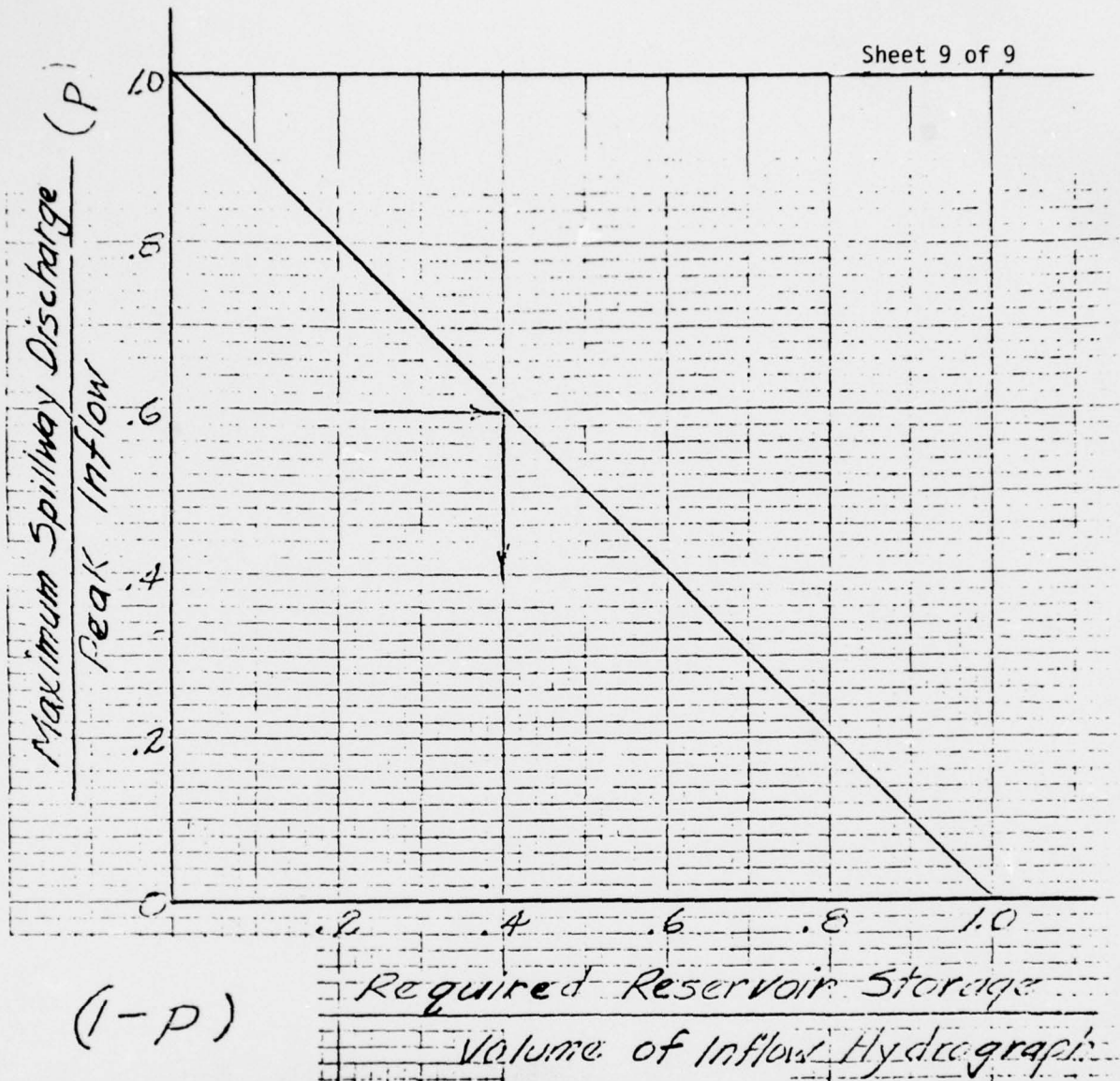
$$\frac{\Delta AOC}{\Delta AOB} = \frac{\Delta AOB - \Delta COB}{\Delta AOB} = 1 - \frac{\Delta COB}{\Delta AOB}$$

$$\frac{\Delta AOC}{\Delta AOB} = 1 - \frac{T p Q_{I \max} / 2}{T Q_{I \max} / 2} = 1 - p$$

$$\Delta AOC = (1-p) \Delta AOB \text{ where } 0 \leq p \leq 1.0$$

REFERENCE
 PRELIMINARY
 ENGINEER TECHNICAL
 LETTER NO. 1110-2-
 25 January 1978

p	ΔAOC
1.00	0
0.75	0.25 ΔAOB
0.50	0.50 ΔAOB
0.25	0.75 ΔAOB
0	1.00 ΔAOB

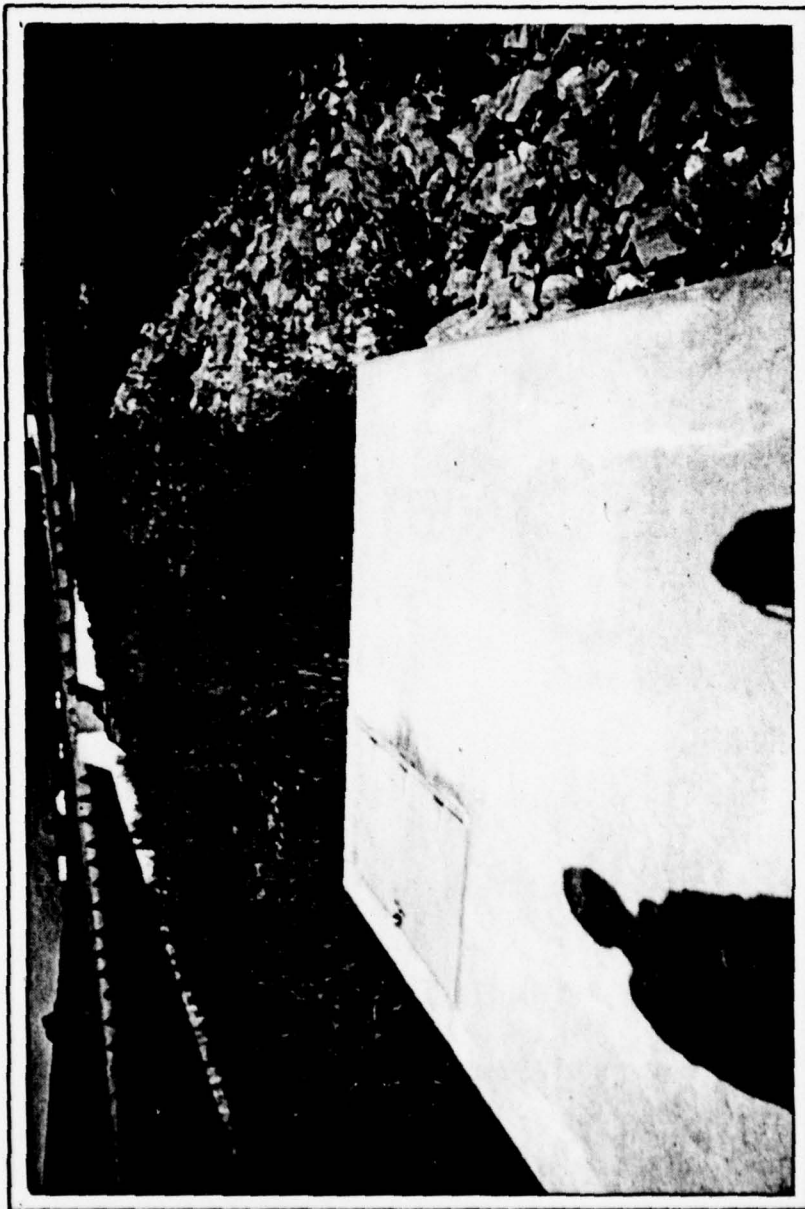


Steps to obtain required reservoir to pass inflow hydrograph without overtopping dam.

1. Obtain maximum spillway discharge
2. Develop inflow hydrograph
3. Compute relationship of maximum spillway capacity to peak inflow
4. Read relationship of required reservoir storage to volume of inflow hydrograph from curve

APPENDIX

D



VIEW OF CONCRETE BOX ENCASING INTAKE TOWER
CONTROL ROOM WHICH HOUSES THE POND DRAIN VALVE.

PHOTOGRAPH NO. 1

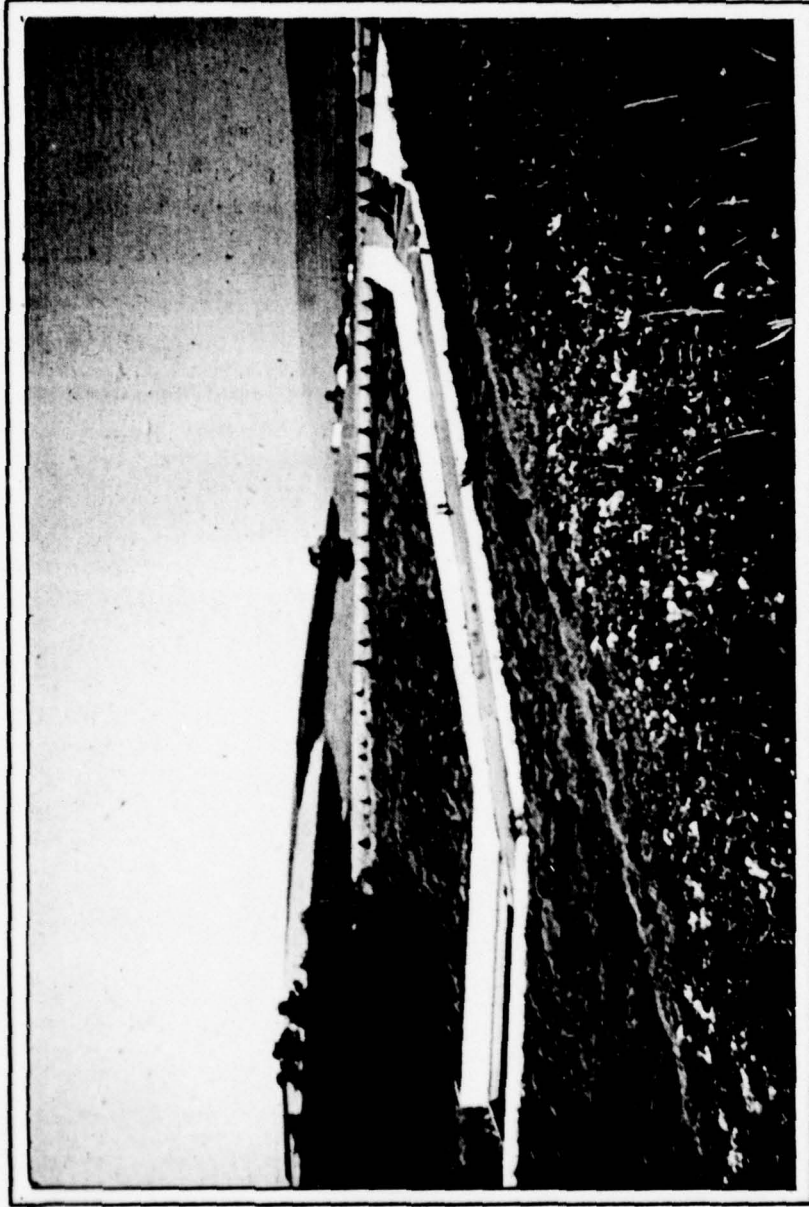


VIEW FROM DAM CREST LOOKING AT DOWNSTREAM
CHANNEL AND VALLEY.

PHOTOGRAPH NO. 2



VIEW OF STILLING BASIN AT POND DRAIN OUTFALL.
NOTE COLUMNS TO HOUSE STOP LOGS FOR STILLING
BASIN.

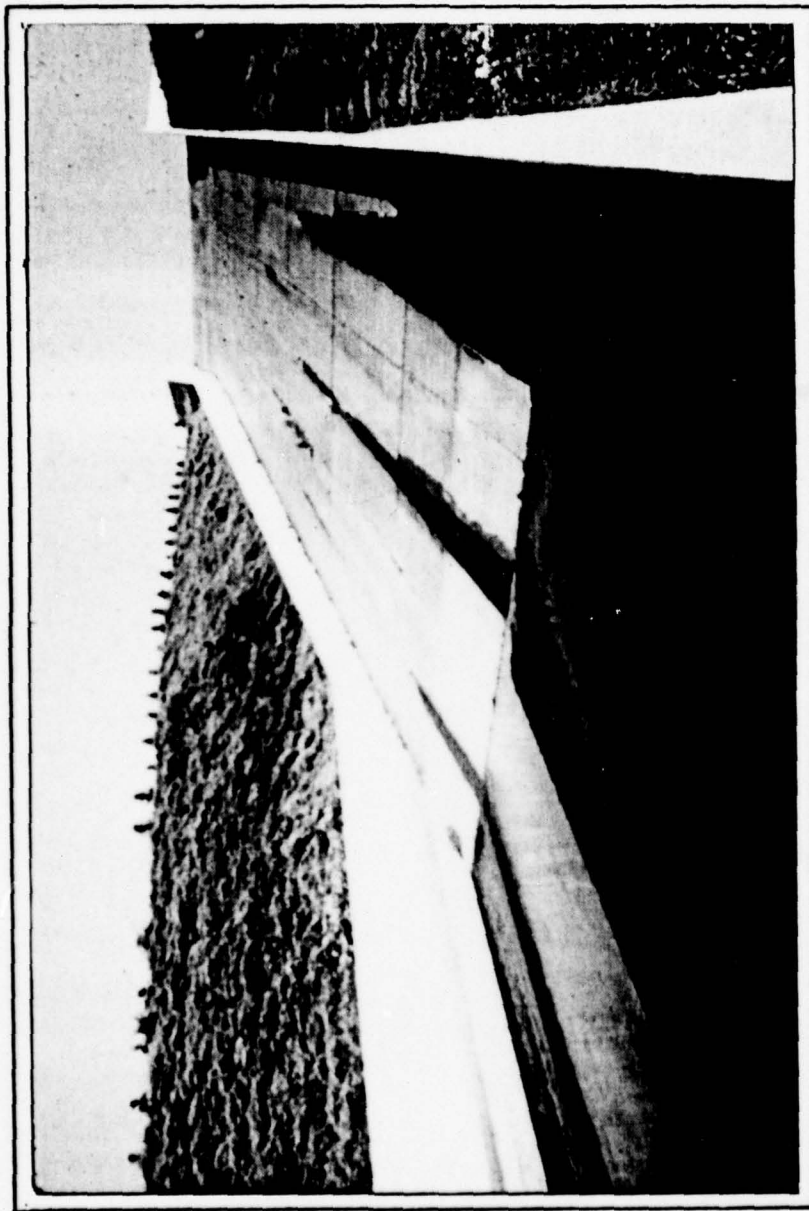


OVERVIEW OF EMERGENCY SPILLWAY

PHOTOGRAPH NO. 4



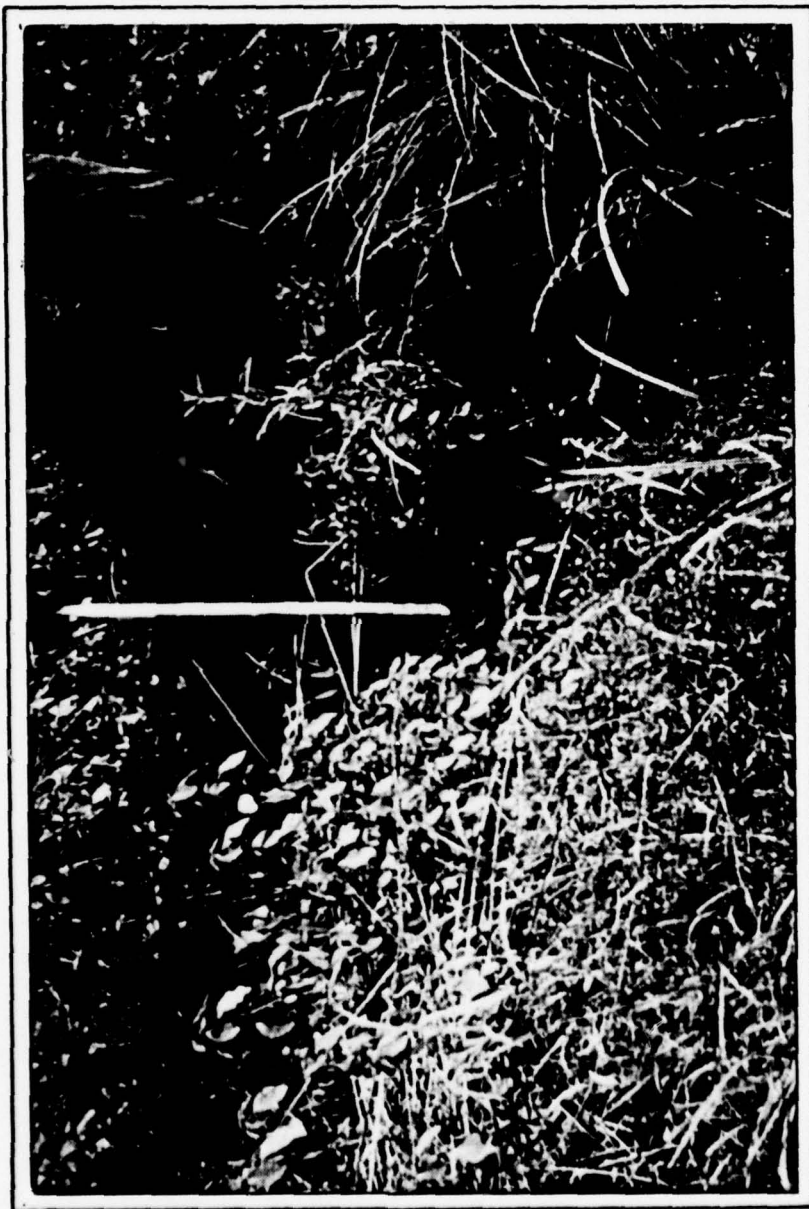
VIEW OF EMERGENCY SPILLWAY WEIR LOOKING
FROM LEFT ABUTMENT OF STRUCTURE



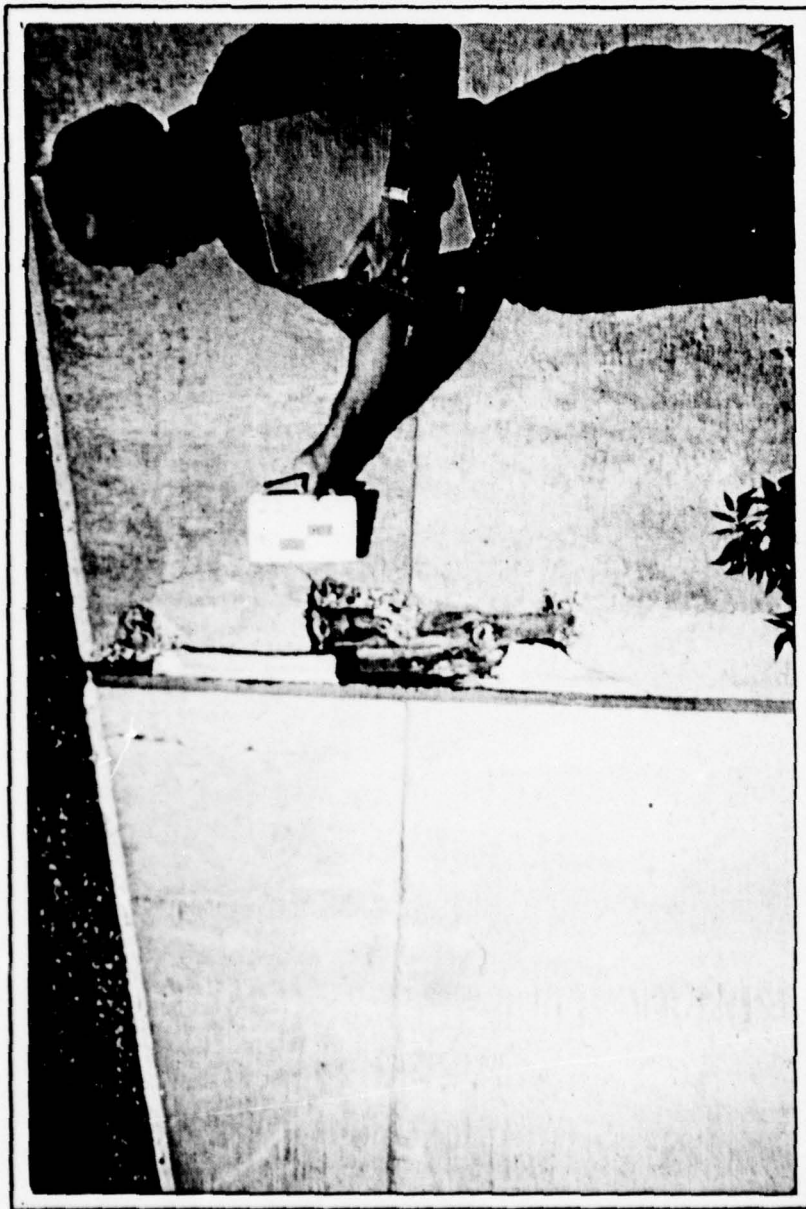
LOOKING UP THE SPILLWAY CHUTE. NOTE SEEPAGE
THROUGH DRAIN HOLES AND HIGH WATER MARK ON
WING WALLS.



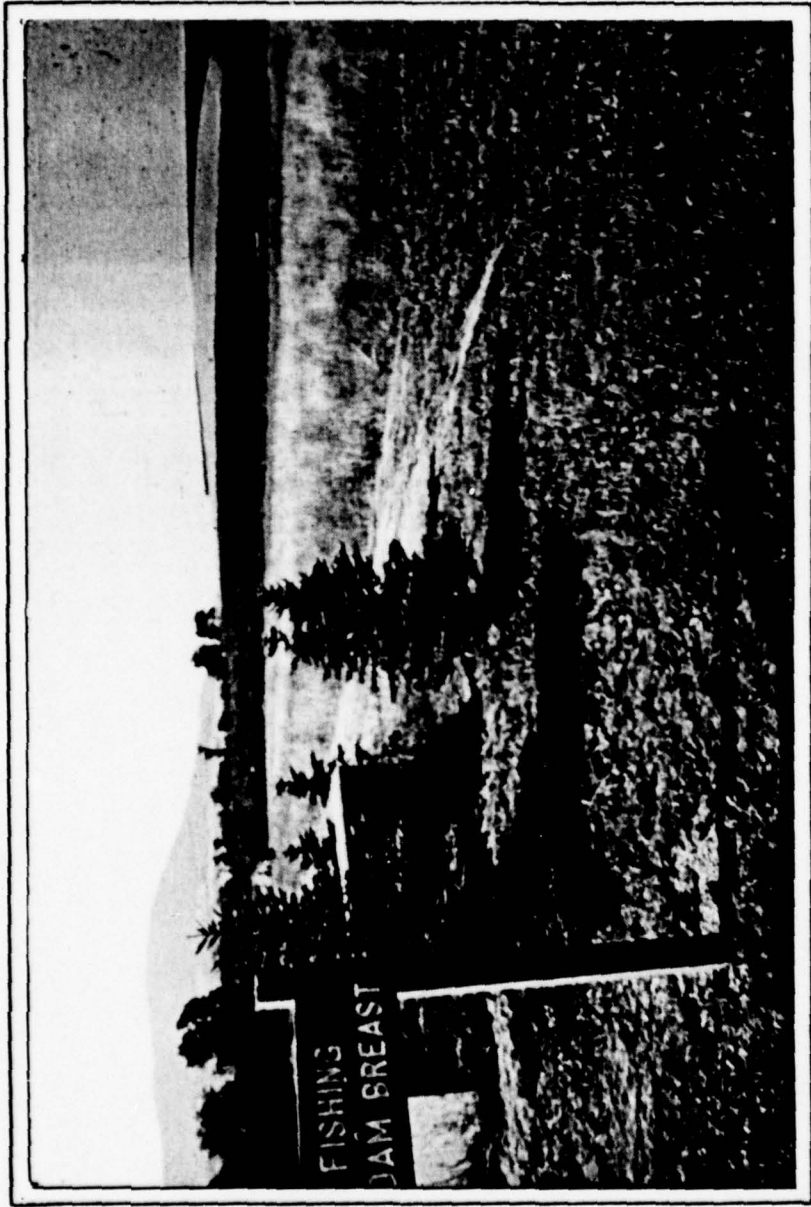
VIEW OF DRAINAGE OUTFALL PIPE DISCHARGING
FROM DRAINAGE BLANKET.



TYPICAL STREAM OF EMBANKMENT SEEPAGE FLOWING
DOWN THE LEFT SIDE OF THE EMBANKMENT RIGHT
OF THE EMERGENCY SPILLWAY.



SPALLING NOTED AT SEVERAL LOCATIONS
ALONG THE INSIDE CHANNEL OF THE EMER-
GENCY SPILLWAY. SPALLING WAS CONCENTRATED
NEAR CONSTRUCTION JOINTS.



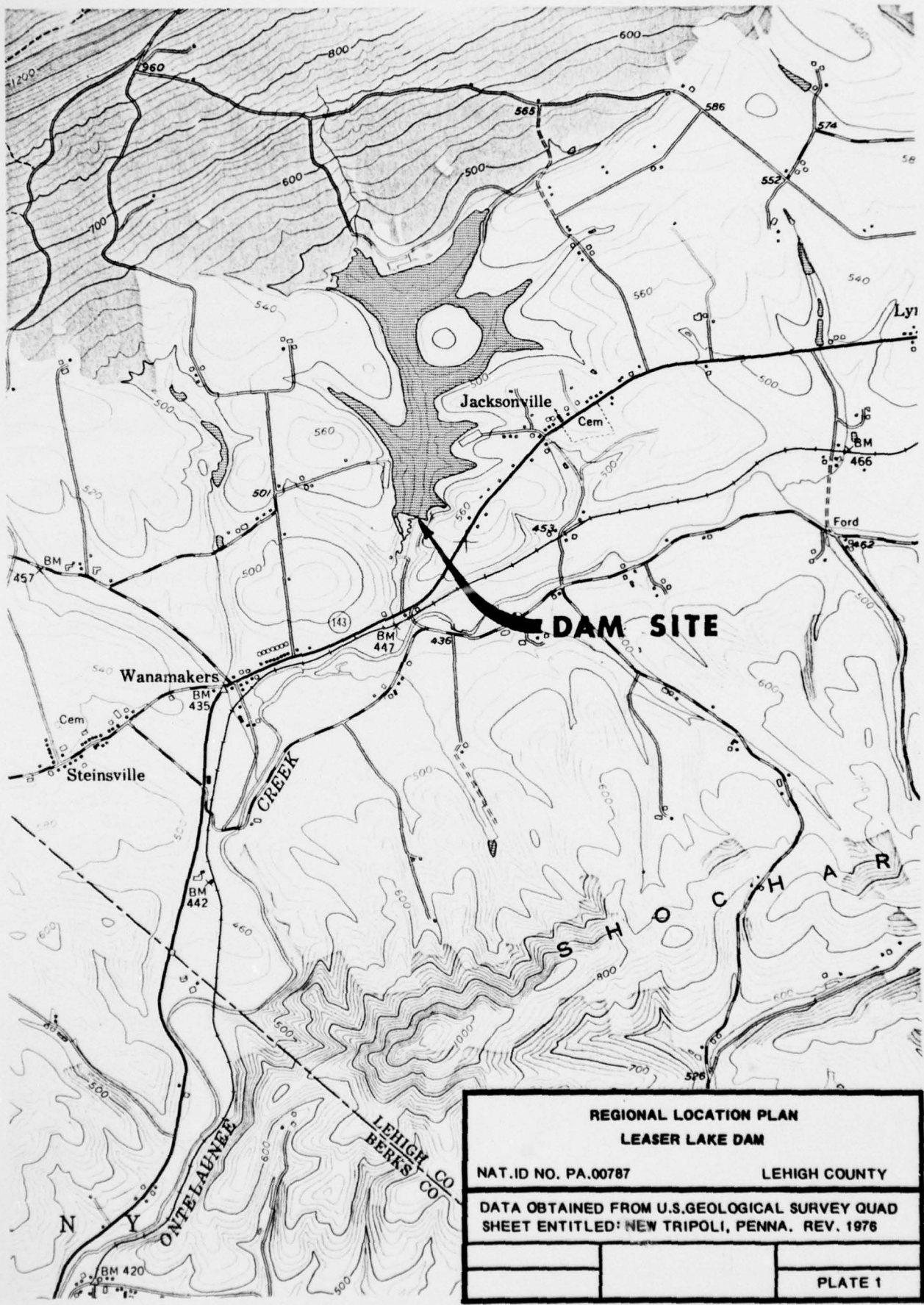
LOW AREA RIGHT OF EMERGENCY SPILLWAY
WHERE WATER WOULD PASS BEFORE OVER-
TOPPING THE DAM. FLOW WOULD TURN LEFT
BEHIND THE WALL.



VIEW OF TYPICAL ROCK OUTCROP ON LEFT ABUTMENT. RESERVOIR IS TO THE LEFT OF THE PHOTOGRAPH.

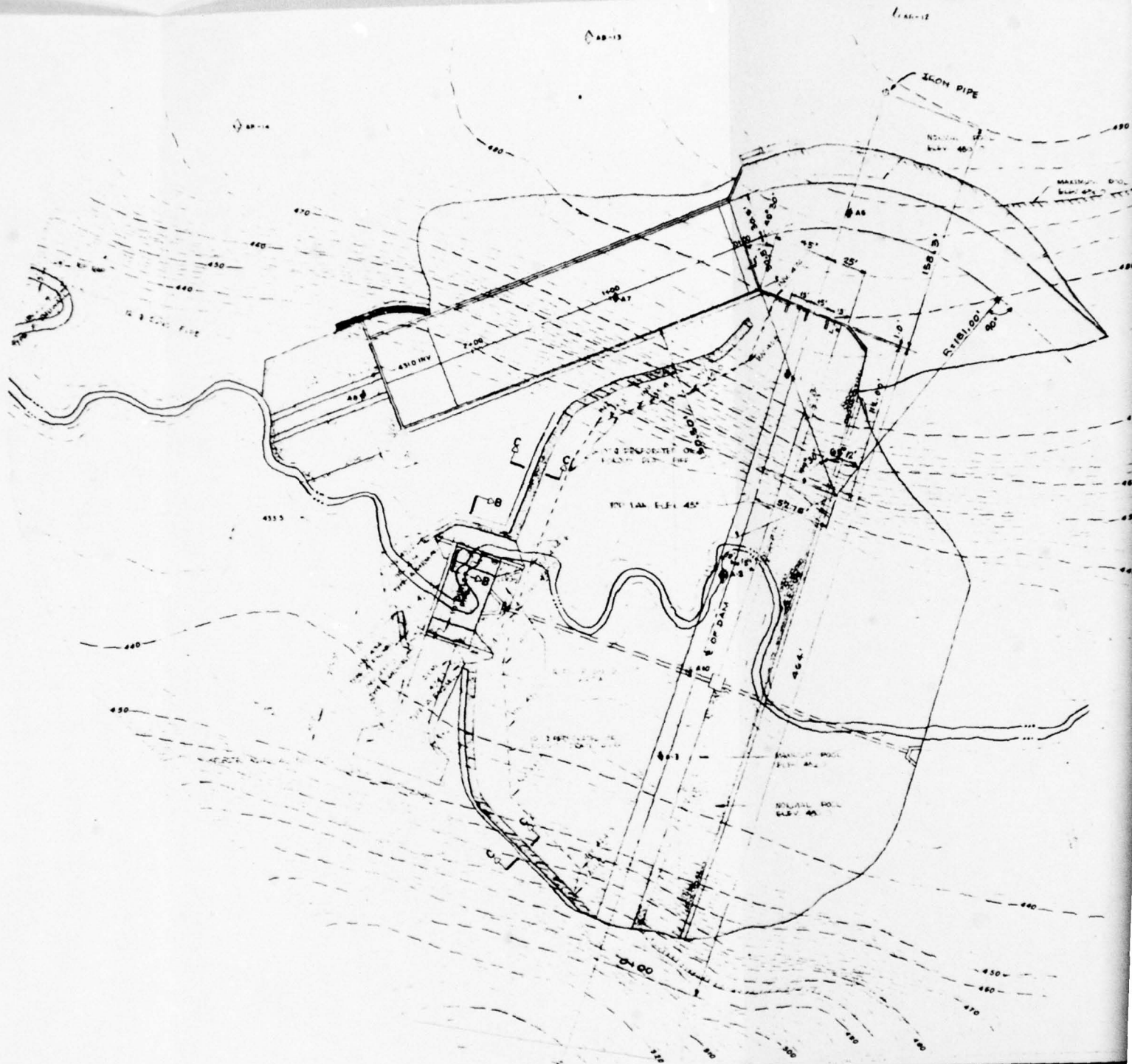
APPENDIX

E



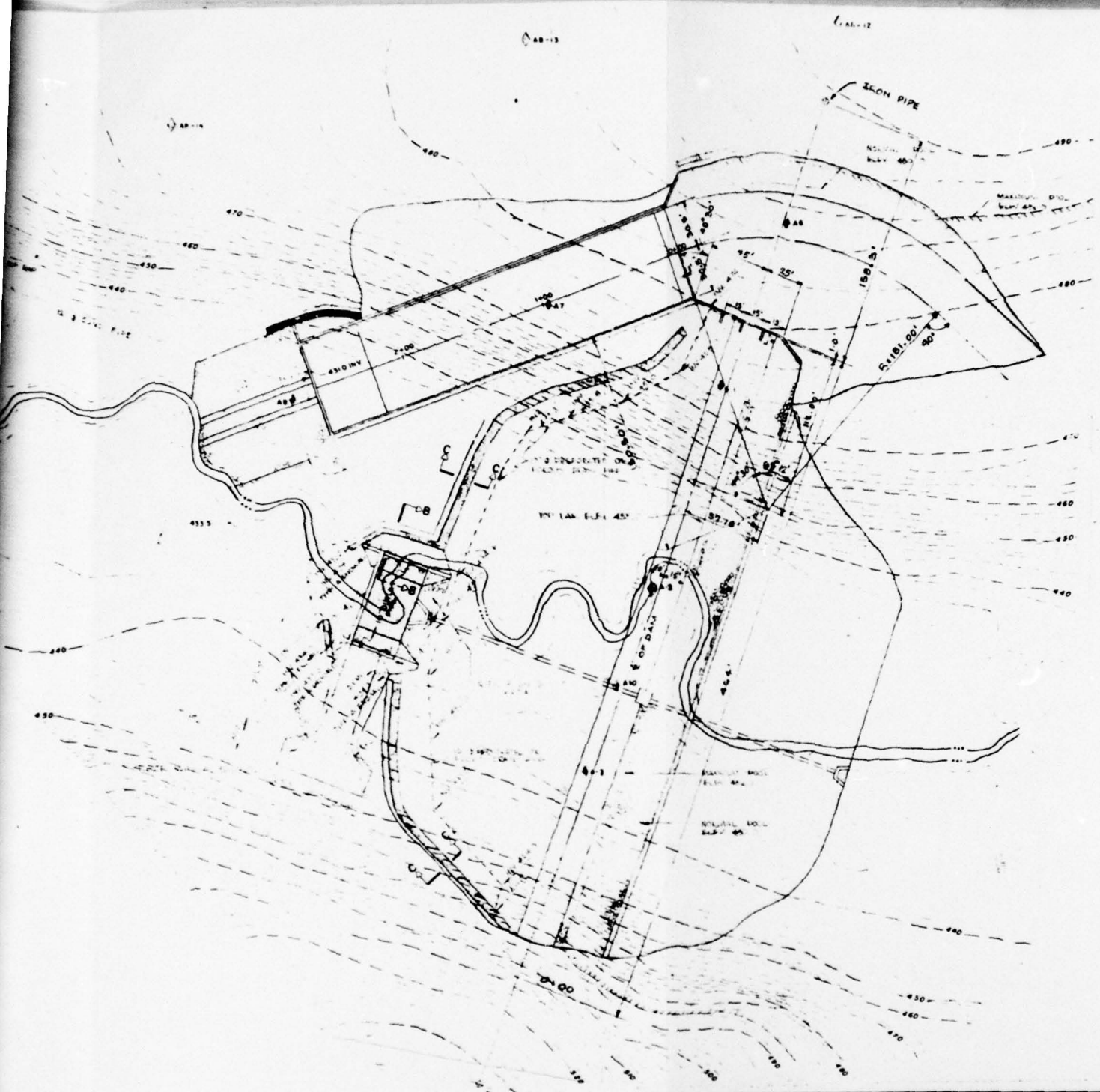
70-510387

REGIONAL LOCATION PLAN		
LEASER LAKE DAM		
NAT. ID NO. PA.00787		LEHIGH COUNTY
DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD SHEET ENTITLED: NEW TRIPOLI, PENNA. REV. 1976		
		PLATE 1



PLAN OF DAM AND APPURTENANCES
LEASER LAKE DAM
(JACKSONVILLE LAKE)
 NAT. ID NO. PA.00787

DATA OBTAINED FROM G. EDWIN PIERCE
 ALLENTOWN, PA. SHEET 3 OF 21, DATE

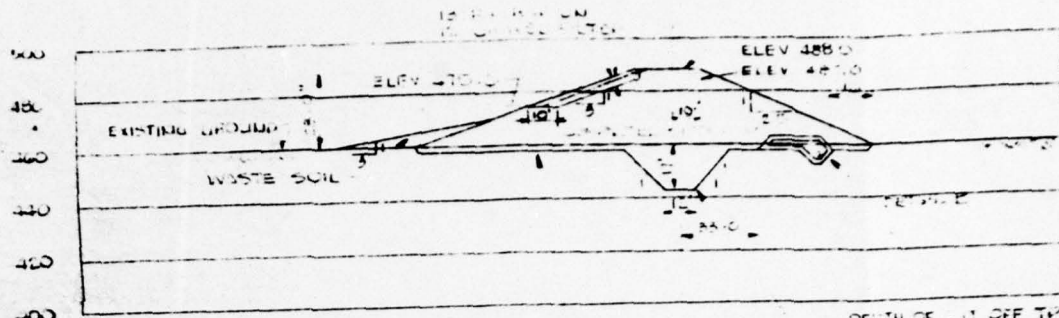


PLAN OF DAM AND APPURTENANCES
LEASER LAKE DAM
(JACKSONVILLE LAKE)

NAT. ID NO. PA.00787 LEHIGH COUNTY

DATA OBTAINED FROM G. EDWIN PIDCOCK CO.
 ALLENTOWN, PA. SHEET 3 OF 21, DATED MAY 1969.

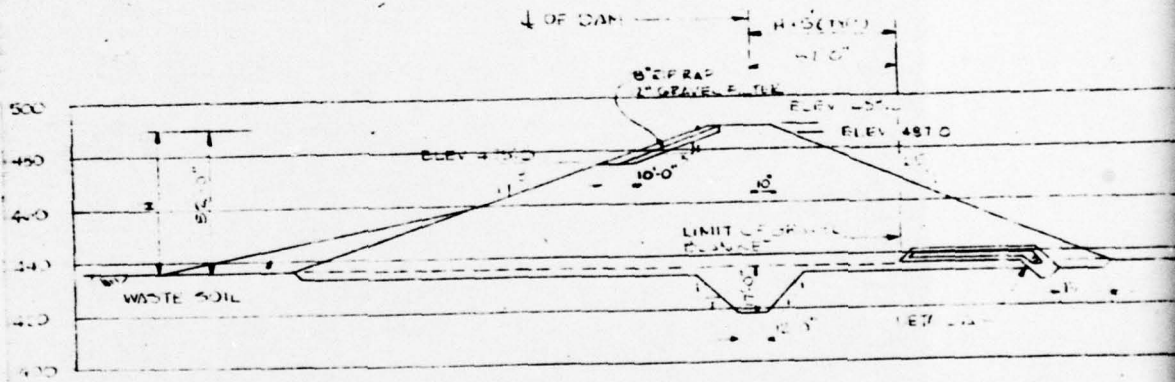
	PLATE 2



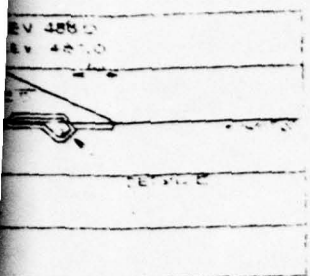
TOP SOILS SUITABLE FOR TO BE REMOVED FROM ENTIRE WIDTH OF TRENCH. DEPTH OF REMOVAL TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

DEPTH OF CUT OFF TRENCH TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

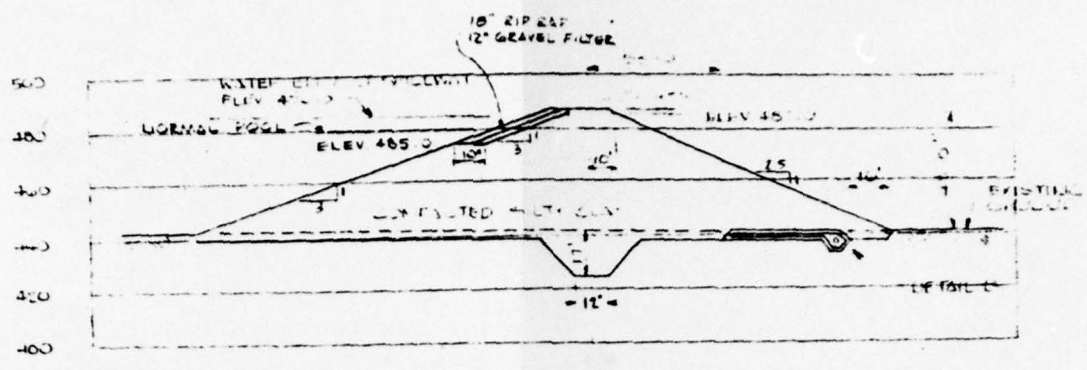
SECTION +50
SCALE 1" = 40'



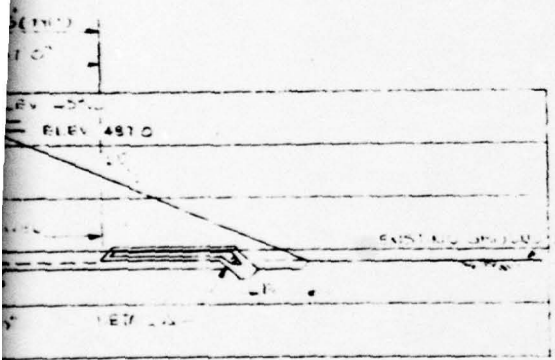
SECTION AT 1+50 FT. & AT 2+50 FT.
SCALE 1" = 40'



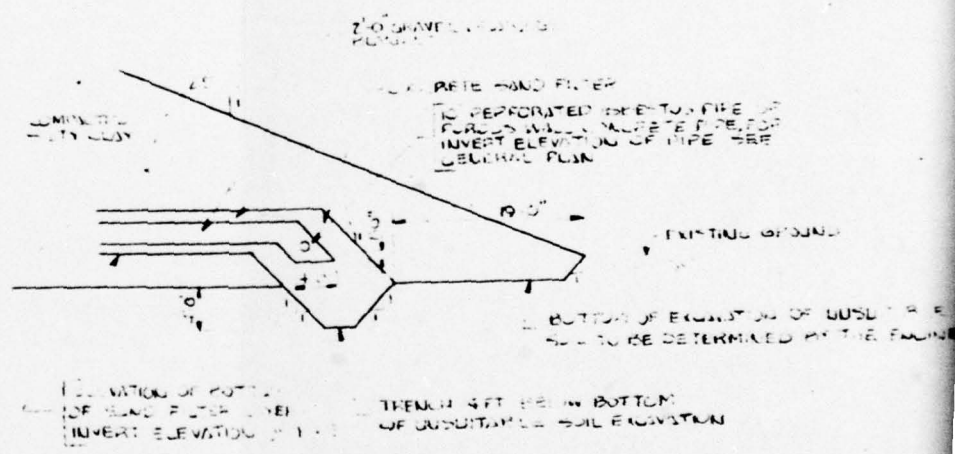
DEPTH OF CUT OFF TRENCH TO BE DETERMINED IN THE FIELD BY THE ENGINEER



SECTION 3+50
SCALE 1" = 40'

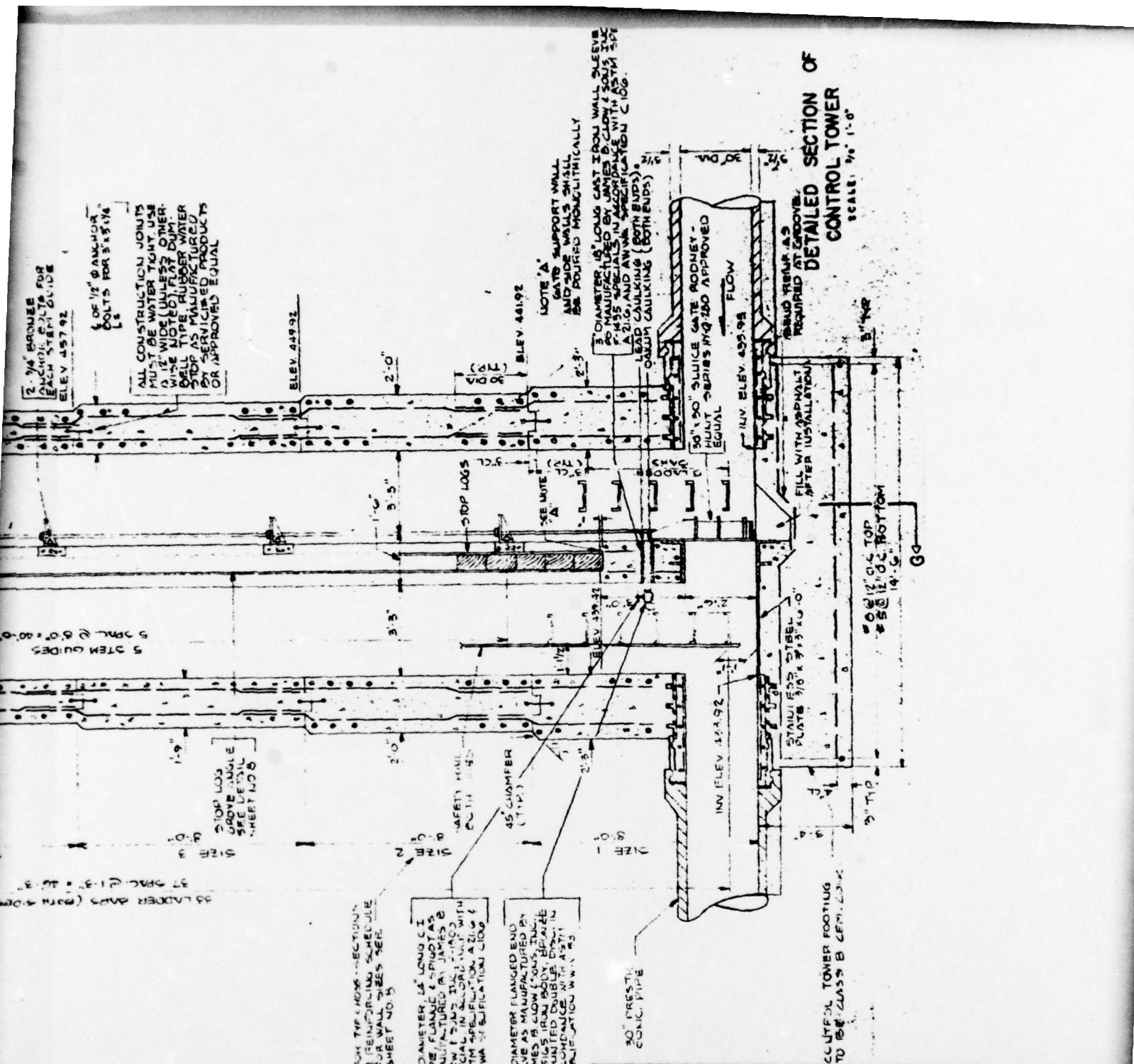


T. & AT 2+50 FT.
SCALE 1" = 40'



DETAIL A
SCALE 1" = 10'

TYPICAL EMBANKMENT SECTIONS LEASER LAKE DAM (JACKSONVILLE LAKE)		
NAT. ID NO. PA.00787		LEHIGH COUNTY
DATA OBTAINED FROM G. EDWIN PIDCOCK CO. ALLENTOWN, PA. SHEET 4 OF 21, DATED MAY 1969.		
		PLATE 3



2. 3/4" BRONZE ANCHOR BOLTS FOR EACH STEM GUIDE ELEV. 457.92

1/2 OF 1/2" ANCHOR BOLTS FOR 3" x 3/4" L.S.

ALL CONSTRUCTION JOINTS MUST BE WATER TIGHT. USE 3/4" WIDE (UNLESS OTHERWISE NOTED) FLAT O-RING WELL TYPE RUBBER WATER STOP AS FURNISHED BY PRODUCER OR APPROVED EQUAL.

NOTE: A. GATE SUPPORT WALL AND GATE WALLS SHALL BE POURED MONOLITHICALLY.

3" DIAMETER 15' LONG CAST IRON WALL SLEEVE AS MANUFACTURED BY JAMES B. CLON / SOLIS IUC P. 455 SPECIALS IN ACCORDANCE WITH ASTM SPEC. A 210.6, AND AN AWS SPECIFICATION C 108. LEAD CAULKING (BOTH ENDS) OR BUTY CAULKING (BOTH ENDS)

DETAILED SECTION OF CONTROL TOWER

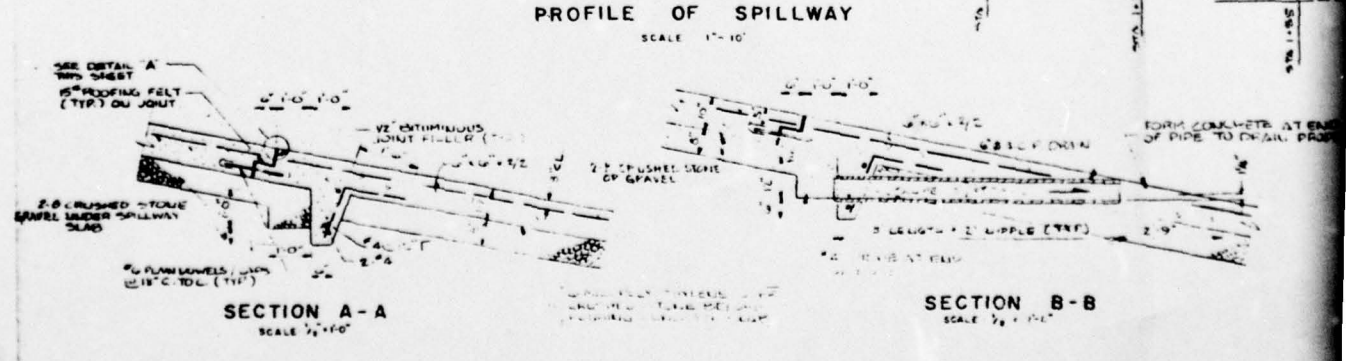
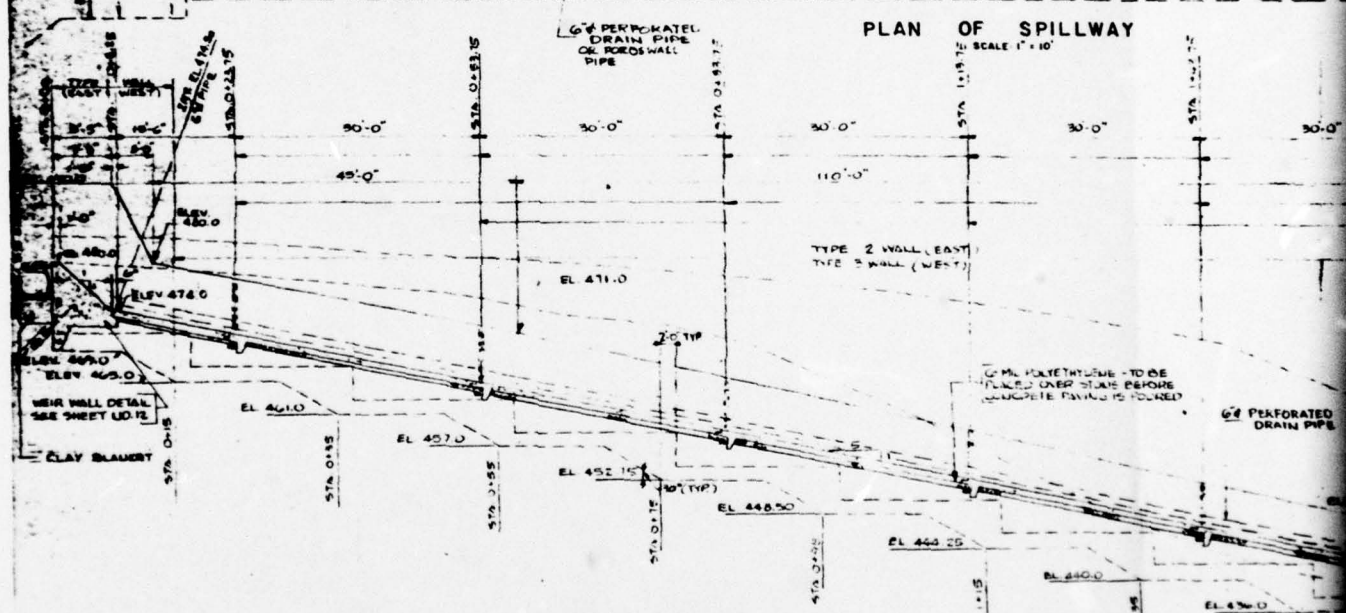
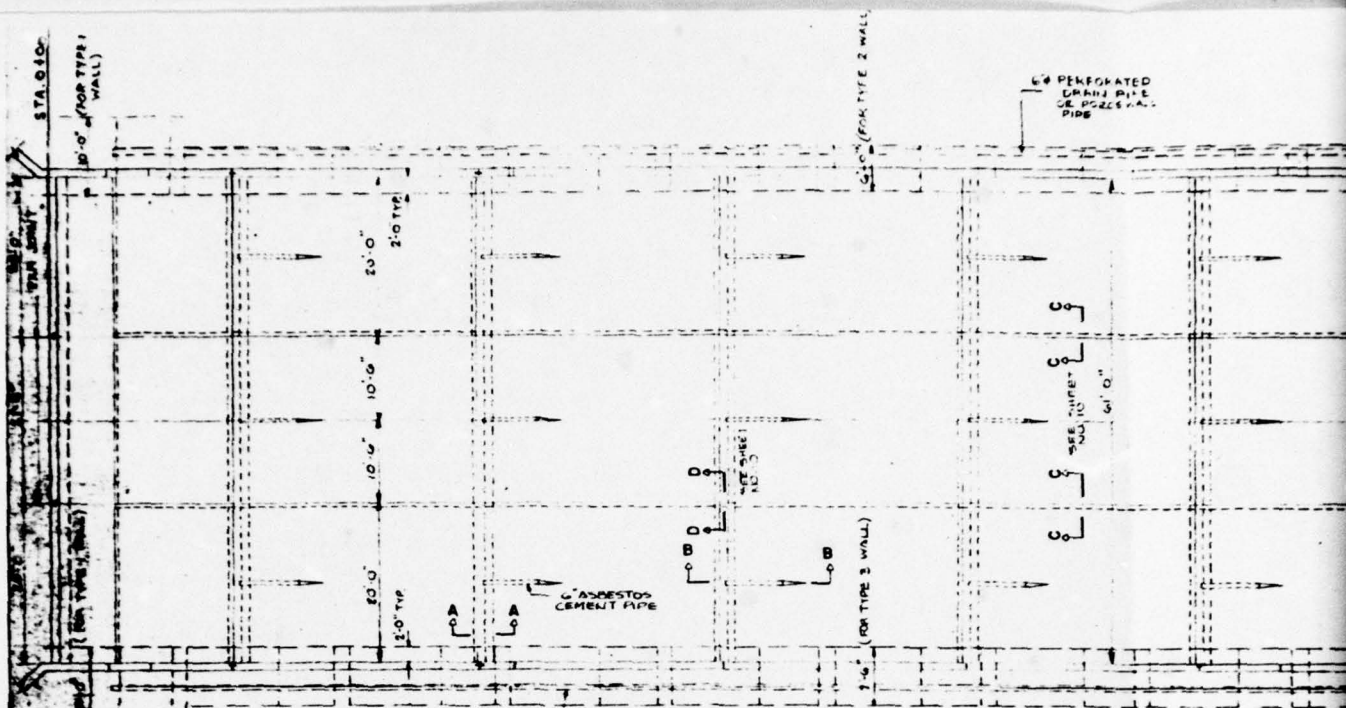
SCALE: 1/4" = 1'-0"

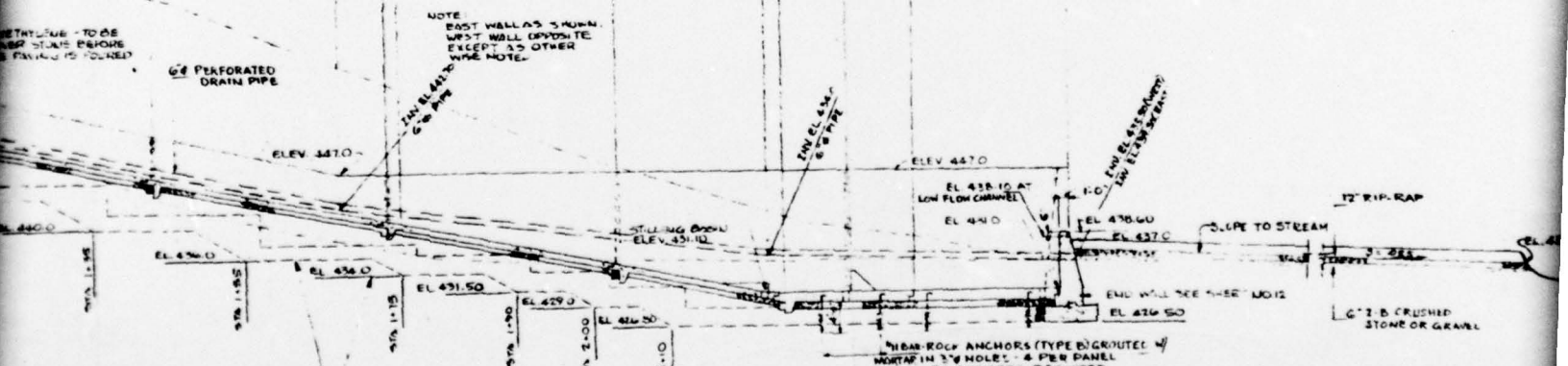
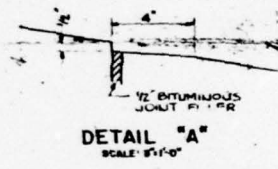
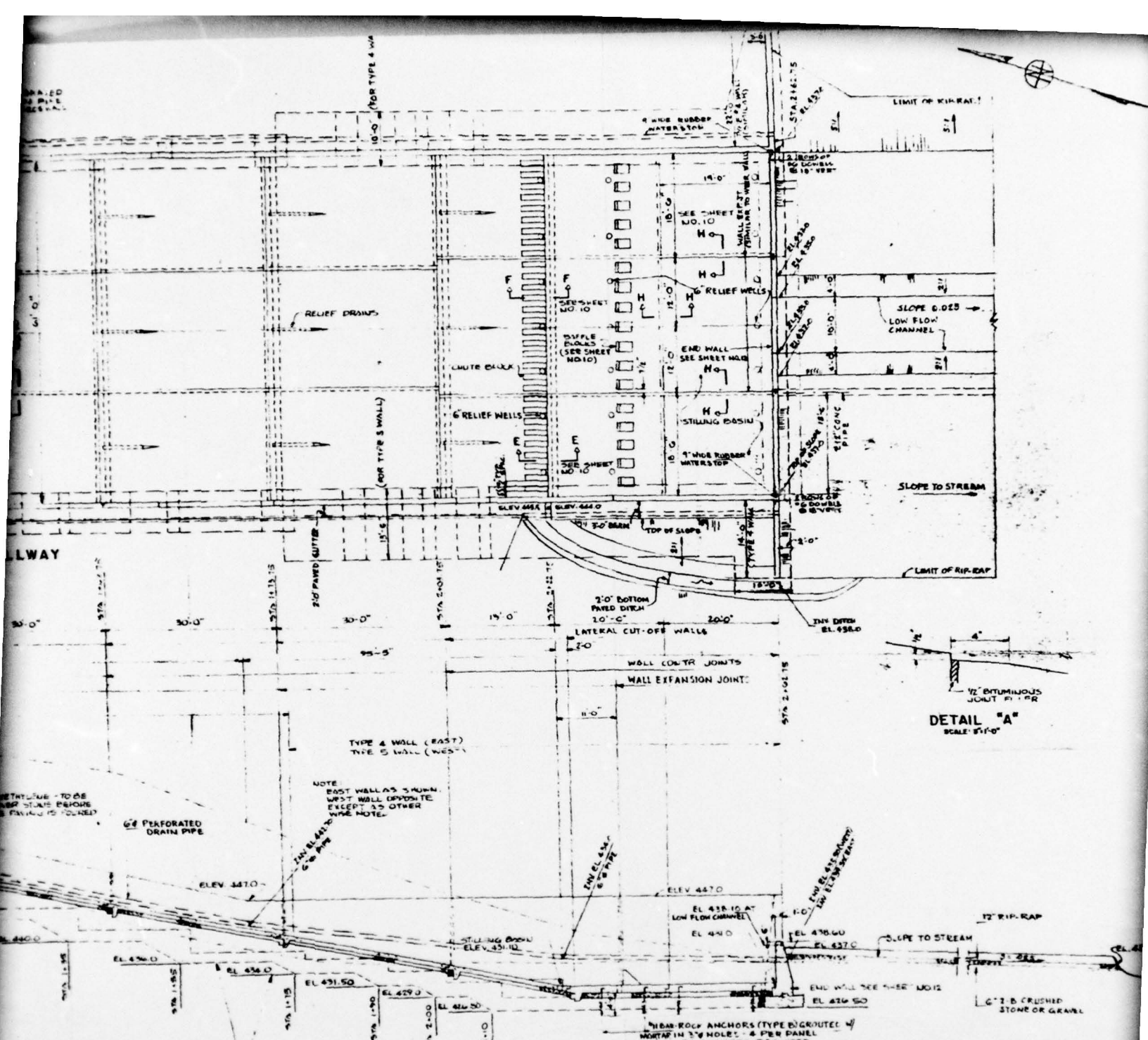
FOR TOP & CROSS-SECTION, REFER TO DRAWING SCHEDULE FOR WALL THICKNESS SEE SHEET NO. 5

2" DIAMETER 15' LONG CAST IRON WALL SLEEVE AS MANUFACTURED BY JAMES B. CLON / SOLIS IUC P. 455 SPECIALS IN ACCORDANCE WITH ASTM SPECIFICATION A 210.6 AND AN AWS SPECIFICATION C 108.

2" DIAMETER FLANGED END VALVE AS MANUFACTURED BY JAMES B. CLON / SOLIS IUC P. 455 SPECIALS IN ACCORDANCE WITH ASTM SPECIFICATION A 210.6 AND AN AWS SPECIFICATION C 108.

CONTROL TOWER - SECTION LEASER LAKE DAM (JACKSONVILLE LAKE)	
NAT. ID NO. PA.00787	LEHIGH COUNTY
DATA OBTAINED FROM G. EDWIN PIDCOCK CO. ALLENTOWN, PA. SHEET 7 OF 21, DATED MAY 1969.	
PLATE 5	





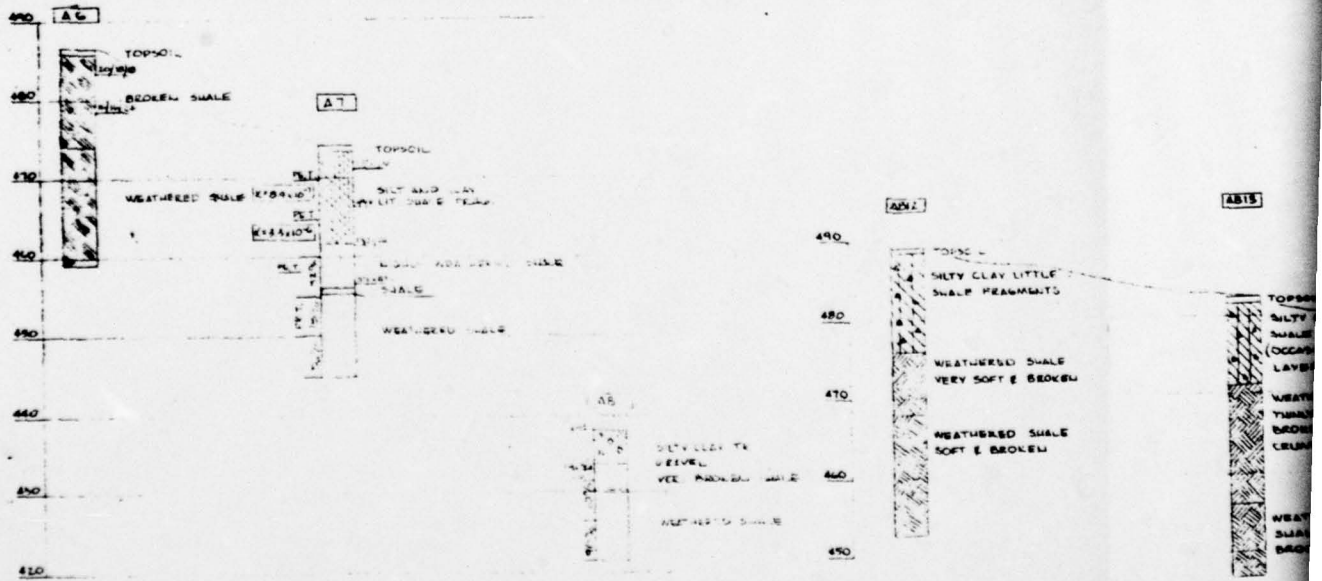
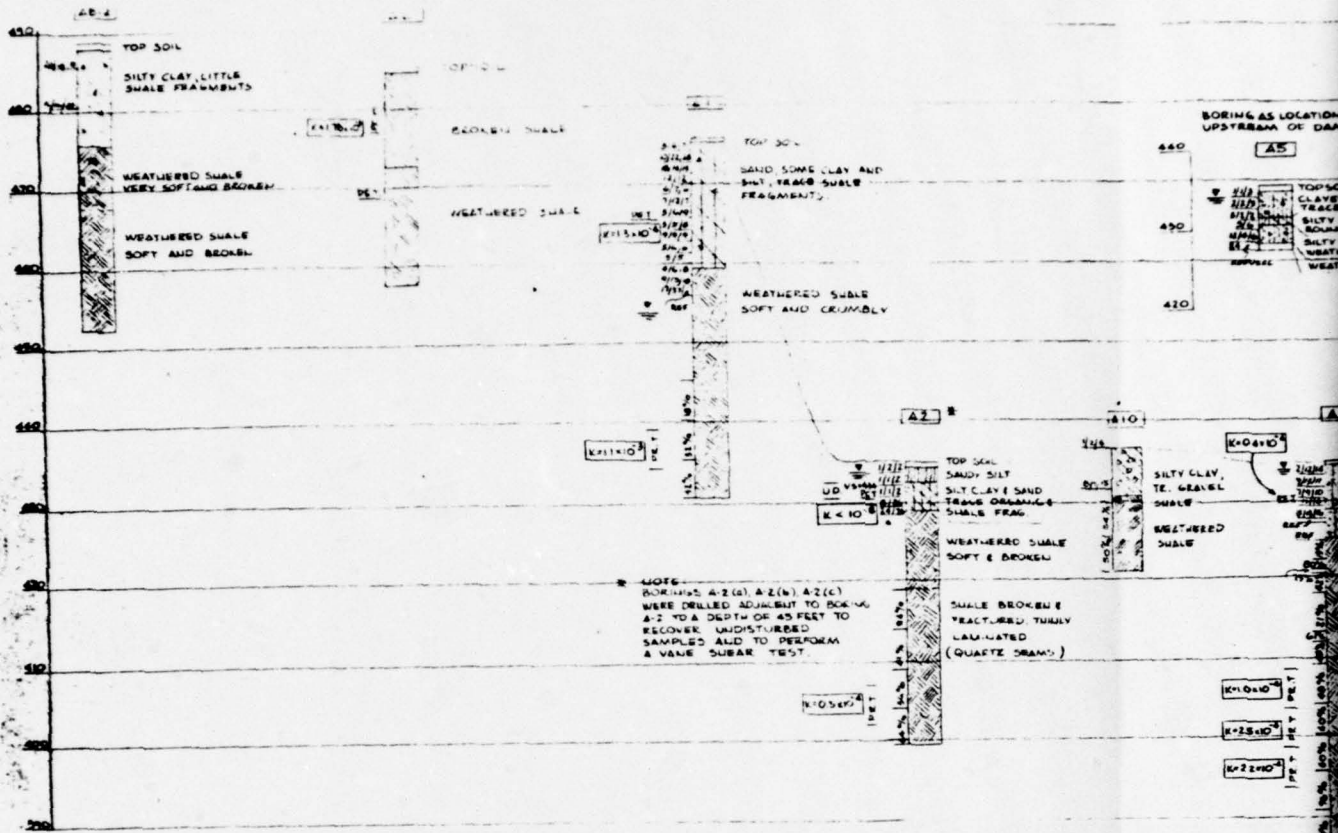
**PLAN AND PROFILE OF EMERGENCY SPILLWAY
LEASER LAKE DAM
(JACKSONVILLE LAKE)**

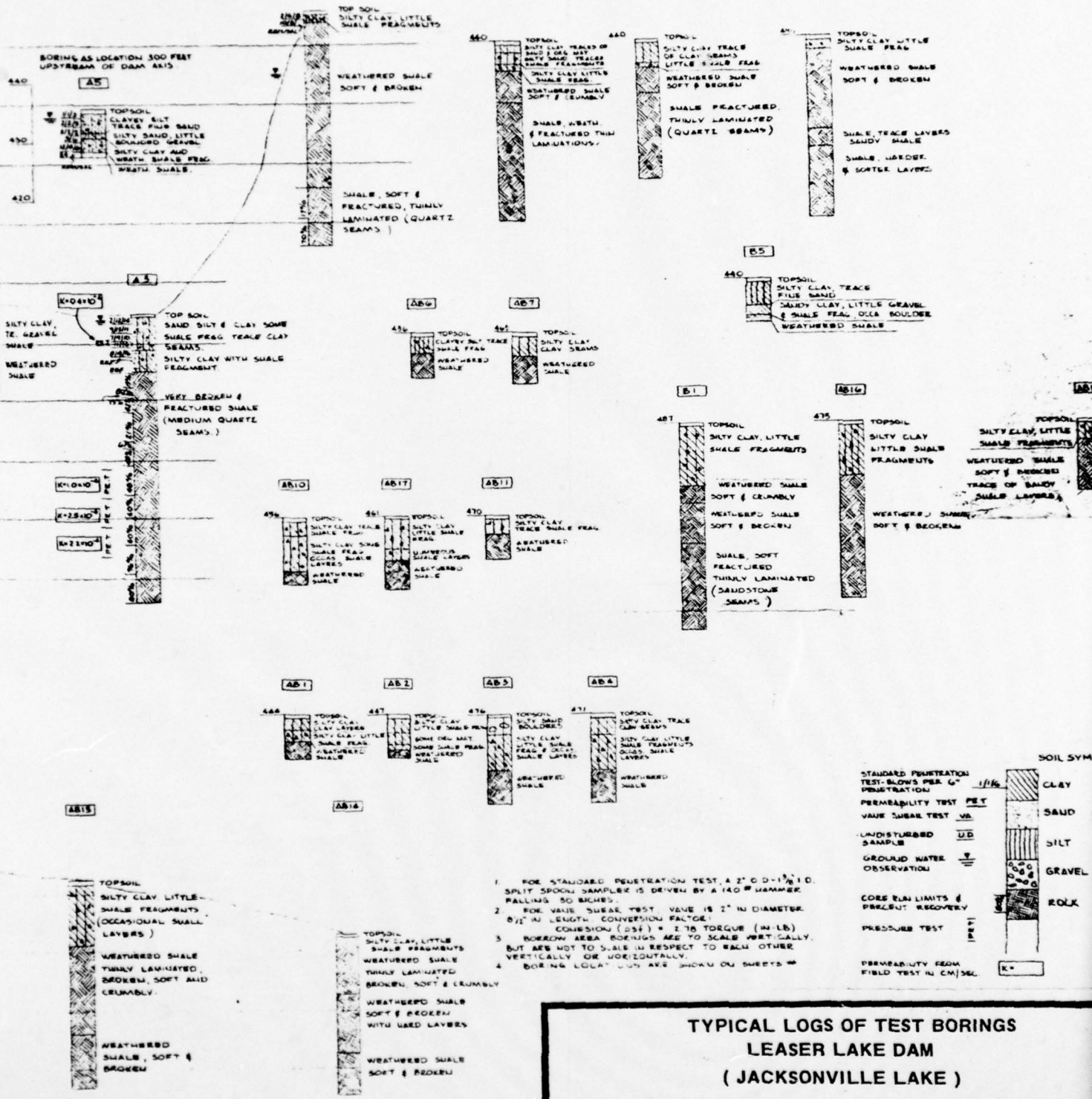
NAT. ID NO. PA.00787 LEHIGH COUNTY

DATA OBTAINED FROM G. EDWIN PIDCOCK CO.
ALLENTOWN, PA. SHEET 9 OF 21, DATED MAY 1969.

	PLATE 6

B-B





SOIL SYMBOLS

CLAY
SAID
SILT
GRAVEL
ROCK

STANDARD PENETRATION TEST - BLOWS PER 6" PENETRATION
 PERMEABILITY TEST
 VANE SHEAR TEST
 UNDISTURBED SAMPLE
 GROUND WATER OBSERVATION
 CORE ELIMINITS & PERCENT RECOVERY
 PRESSURE TEST
 PERMEABILITY FROM FIELD TEST IN CM/SEC

- FOR STANDARD PENETRATION TEST, A 2" O.D.-1 1/2" I.D. SPLIT SPOON SAMPLER IS DRIVEN BY A 140# HAMMER FALLING 50 INCHES.
- FOR VANE SHEAR TEST, VANE IS 2" IN DIAMETER 8 1/2" IN LENGTH. CONVERSION FACTOR: COMMISSION (CSA) = 1.75 TORQUE (IN LB.) BUT ARE NOT TO SCALE IN RESPECT TO EACH OTHER VERTICALLY OR HORIZONTALLY.
- BORING AREA BORINGS ARE TO SCALE VERTICALLY.
- BORING LOCATIONS ARE SHOWN ON SHEETS #

**TYPICAL LOGS OF TEST BORINGS
 LEASER LAKE DAM
 (JACKSONVILLE LAKE)**

NAT. ID NO. PA.00787 LEHIGH COUNTY

DATA OBTAINED FROM G. EDWIN PIDCOCK CO.
 ALLENTOWN, PA. SHEET 20 OF 21, DATED MAY 1969.

PLATE 7

APPENDIX

F

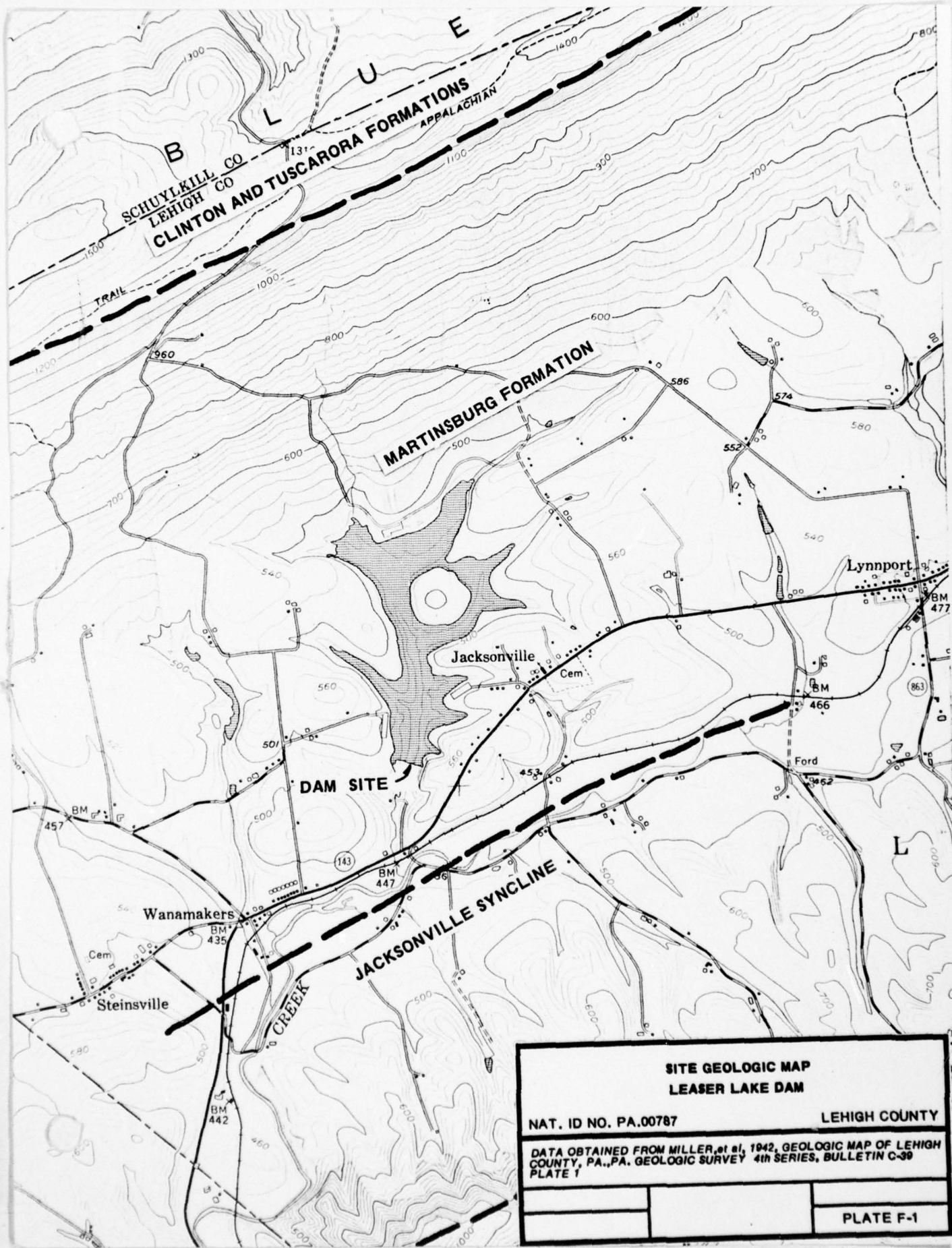
SITE GEOLOGY
LEASER LAKE DAM

The Jacksonville Dam is in the Great Valley Section of the Valley and Ridge Physiographic Province. The bedrock in the dam site is reported to consist of shales and some sandstones in the Martinsburg Formation (see Plate F-1). At the site, the Martinsburg Formation is bounded to the north-northwest by the sandstones and conglomerates of the Clinton and Tuscarora Formations. Bedding in the Martinsburg Formation is reported to be strongly deformed, forming a series of anticlines and synclines trending approximately east-west through the dam site (Miller, 1941). One prominent set of joints has been observed in the Martinsburg Formation, striking N70°E and dipping 60° to 70°SE; these joints are usually open and closely spaced, with spacing ranging from 1 inch to 2 feet. No significant faulting has been observed in the area.

Downstream seepage should be minimal due to the impervious nature of the rock; favorable bedding and jointing striking approximately parallel to the dam axis; and lack of faulting at the site.

References:

1. Baker, G., 1975, *Geology and Seismology*, Berne.
2. Miller, B.L., 1941, *Lehigh County, Pennsylvania; Geology and Geography: Pennsylvania Geologic Survey, 4th Series, Bull. C-39, 492 p.*



**SITE GEOLOGIC MAP
LEASER LAKE DAM**

NAT. ID NO. PA.00787

LEHIGH COUNTY

DATA OBTAINED FROM MILLER, et al, 1942, GEOLOGIC MAP OF LEHIGH COUNTY, PA., PA. GEOLOGIC SURVEY 4th SERIES, BULLETIN C-39 PLATE 1

PLATE F-1