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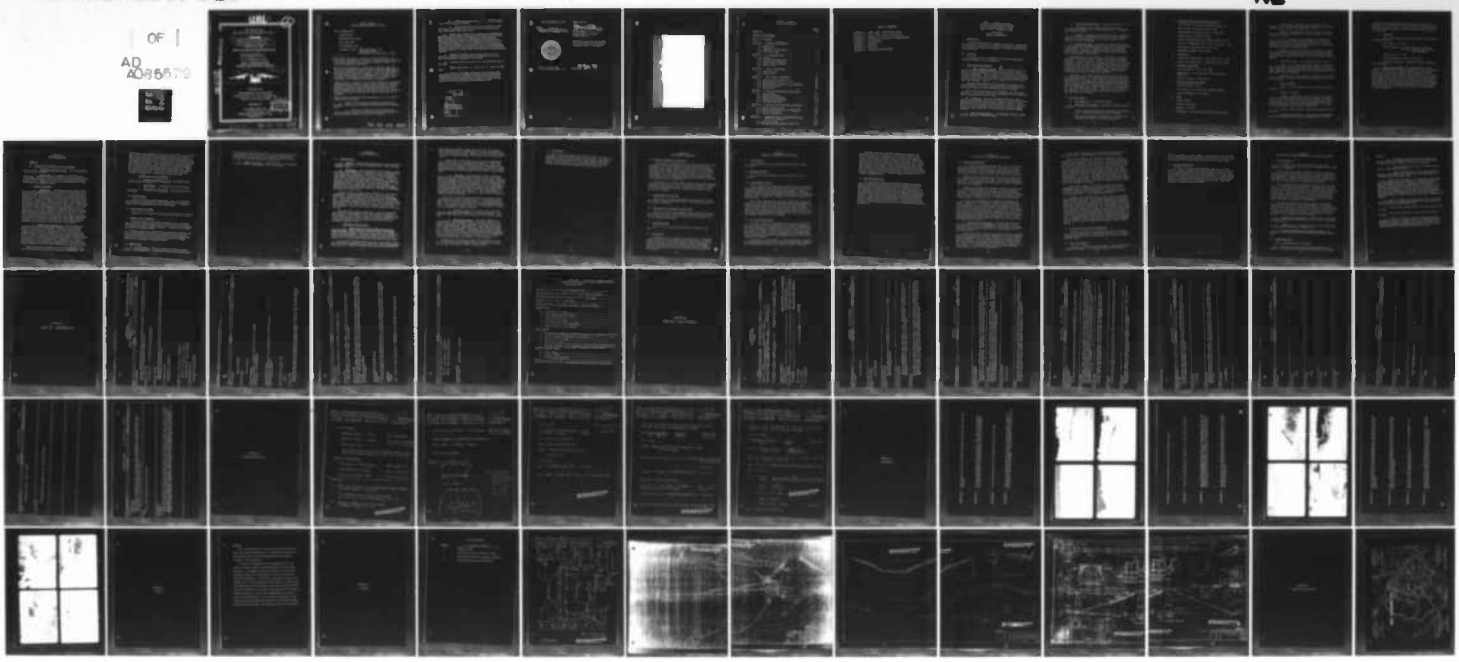

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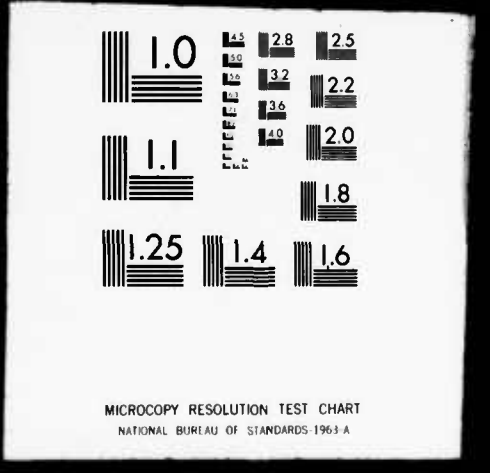

LEVEL II

OHIO RIVER BASIN
WEST PENN RUN, WESTMORELAND COUNTY

PENNSYLVANIA

(6) National Dam Safety Program. West Leechburg Reservoir Dam (NDI-Pa.-452), Ohio River Basin, West Penn Run, Westmoreland County, Pennsylvania.

NDI No. Pa. - 452

WEST LEECHBURG RESERVOIR DAM

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Contract No. (15) DACW31-78-C-0052

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

(11) Oct 78 (12) 67 p.

PREPARED FOR

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

PREPARED BY

GAI CONSULTANTS, INC.
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146

OCTOBER 1978

411002

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

West Leechburg Dam

Pennsylvania

Westmoreland County

West Penn Run

27 September 1978

Inspection Team - GAI Consultants, Inc.
570 Beatty Road
Monroeville, Pennsylvania 15146

(cont'd p2)

The visual inspection, records of past performance, and hydrologic and hydraulic analysis indicate that the facility is in fair condition and in need of remedial repair and further engineering evaluation.

Hydrologic and hydraulic calculations indicate that the facility is capable of passing and/or storing 43% of the runoff associated with a storm of PMF intensity without overtopping the spillway wingwalls. Based on screening criteria established by the Department of the Army, Office of Chief of Engineers, the spillway, in its present configuration, is considered seriously inadequate.

Seepage flow was observed in the lower portion of the embankment behind the treatment plant. This condition requires further evaluation and its effect on the stability of the embankment should be considered particularly since additional material was added to the crest in 1963 and the upper portions of both the upstream and downstream slopes were steepened.

Based on the above-mentioned considerations, it is recommended that the owner:

a. Retain a registered professional geotechnical engineer, experienced in design and construction of earthen dams to:

1. Undertake a subsurface investigation and testing program to determine the nature and suitability of the mine refuse added to the crest of the dam.

2. Install observation wells to establish and monitor the phreatic surface.

3. Assess the stability of the structure considering the seepage near the toe and the modifications that were made to the dam crest.

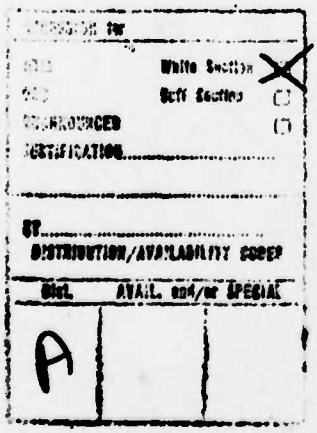
b. Retain the services of a registered professional engineer experienced in hydrology and hydraulic design to more accurately assess the adequacy of the spillway. Measures should be taken to preclude the possibility of spillway discharge from further eroding the right side of the spillway channel, so as to insure that flow does not pass over the abutment and erode the toe of the embankment. The owner should also be required to make any modifications deemed necessary to insure that the facility is hydraulically adequate.

c. Modify or repair the outlet system so as to provide a method for controlling discharge at the inlet end of the 24-inch diameter outlet pipe.

d. Provide riprap protection on the upstream face of the dam.

e. Remove the growth of trees from the slopes of the dam.

f. Develop a warning system to notify downstream inhabitants and steel company employees should hazardous conditions develop. Included in the plan should be provisions for round-the-clock surveillance of the facility during periods of unusually heavy precipitation.



GAI Consultants, Inc.

Bernard M. Mihalcin, P.E.

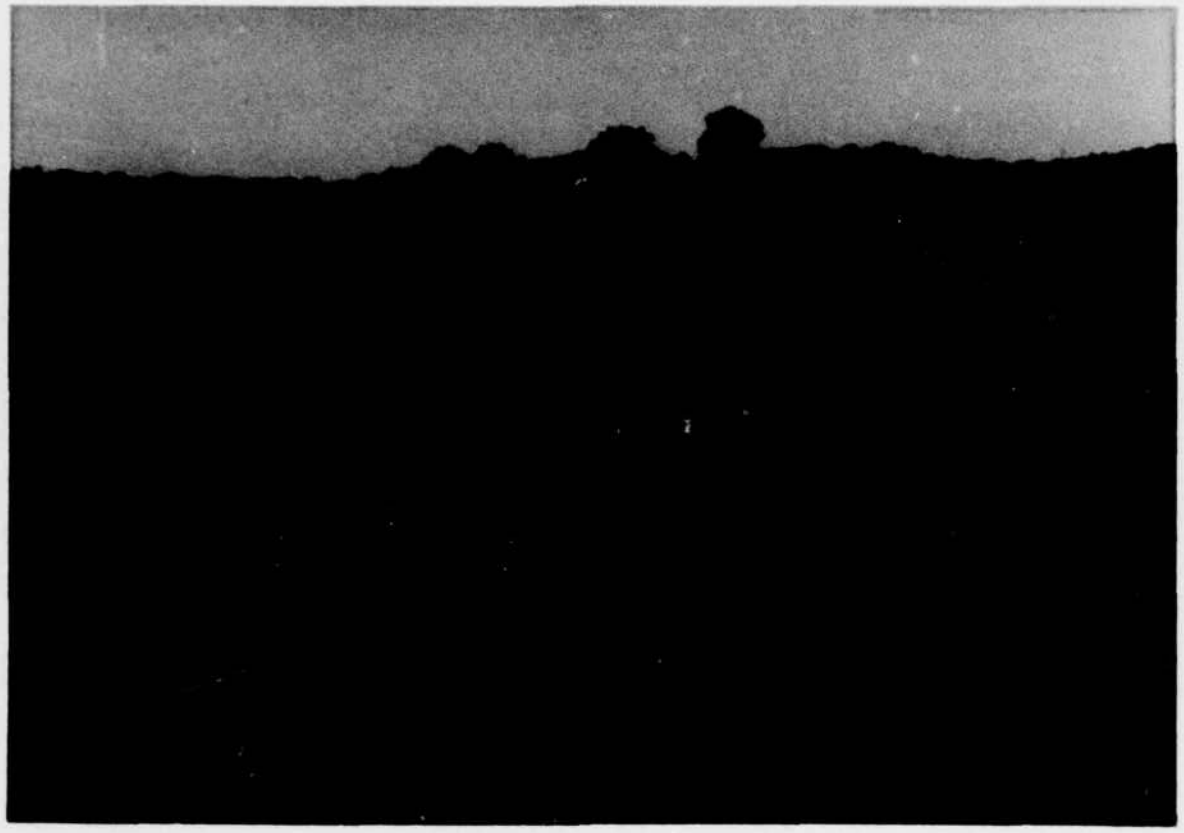
Date 21 Nov 78

Approved by:

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

Date 18 Dec 78

Under the recently revised spillway evaluation guidelines, this dam is considered unsafe, non-emergency.



OVERVIEW PHOTOGRAPH OF WEST LEECHBURG RESERVOIR DAM

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
WEST LEECHBURG RESERVOIR DAM
NDI# PA-452, PENNDER# 65-108

SECTION 1
GENERAL INFORMATION

1.0 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.

1.1 Purpose.

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

1.2 Description of Project.

a. Dam and Appurtenances. West Leechburg Reservoir Dam is an earth embankment approximately 406 feet long reaching a maximum height of about 60 feet near the center of the embankment. The structure is provided with a cutoff trench, excavated to rock, as well as a concrete cutoff wall extending two feet into rock and extending five feet above the rock surface. (cont on p. 2)

The dam is provided with an ungated rectangular concrete spillway at the left abutment which discharges over a rock cliff and into the natural downstream drainage.

The outlet works consist of a 24-inch cast iron pipe (encased in concrete beneath the embankment) which serves as both a supply and blow-off line.

b. Location. The West Leechburg Reservoir Dam is located on West Penn Run in the community of West Leechburg, Westmoreland County, Pennsylvania. Dam, reservoir, and watershed are contained on the Leechburg, Freeport, Vandergrift, and New Kensington East U.S.G.S. 7.5-minute quadrangles. The coordinates of the dam are N40°38.5' and W 79°37.1'.

c. Size Classification. Intermediate (60 feet high; storage capacity - 200 acre-feet).

d. Hazard Classification. High (see Section 3.1.c.4).

e. Ownership. West Leechburg Water Authority, Mr. Ralph Wilps (Engineer), 449 College Avenue, Greensburg, Pennsylvania, 15601.

f. Purpose. Supplies untreated water for industrial use to Allegheny Ludlum Steel Corporation located approximately 1/4 mile downstream. Also, water supply to the community of West Leechburg.

g. Historical Data. According to records contained in PennDER files, construction was initiated at the facility in the summer of 1949 by Zambano Brothers of Greensburg, Pennsylvania. Work was completed in June 1950 although water was impounded before that date and supplied to Allegheny Ludlum Steel Corporation.

PennDER files contain numerous references to leakage problems at the site as well as pool level data and weir readings. A letter of May 1, 1951, directed to the Water Authority, makes reference to leakage at the left end of the downstream toe, at the right hillside and also through the earthfill above the toe. Seepage in these areas was also observed at the time of this inspection. Drains were installed to collect and divert the seepage flow into the stream channel just downstream of the dam.

According to Mr. Wilps (dam designer and engineer for the Water Authority), the embankment was raised in 1963 by approximately five feet. This modification reportedly was performed after the embankment nearly overtopped following a heavy storm. No record of this modification is contained within PennDER files and the spillway was not altered at the time the embankment was raised. However, at a later date, two feet of concrete was added to the ogee crest section of the spillway. The date of this modification cannot be recalled with any certainty.

1.3 Pertinent Data.

a. Drainage Area. 1.25 square miles.

b. Discharge at Dam Site. Discharge records are not available.

Outlet Conduit Discharge at Operating Pool Elevation - Discharge records are not available.

Spillway Discharge at Maximum Pool ≈ 1010 cfs at elevation 853 (top of spillway wingwall).

c. Elevation (feet above mean sea level).

Top of Dam ≈ 853 (top of spillway wingwall).

Top of Dam ≈ 858 Actual crest level.

Maximum Pool Design Surcharge - Not known.

Maximum Pool of Record ≈ 851.5.

Invert of Upstream End of Outlet Conduit ≈ 799.

Invert of Downstream end of Outlet Conduit ≈ 796.

Streambed at Centerline of Dam ≈ 795.

Maximum Tailwater - Not known.

d. Reservoir.

Length of Maximum Pool ≈ 1,400 feet (elev. 853).

Length of Normal Pool ≈ 1,400 feet (elev. 850).

e. Storage (acre feet).

Spillway Crest ≈ 170 (elev. 850).

Top of Dam ≈ 200 (elev. 853 Top of Spillway Wingwall).

Design Surcharge - Not known.

f. Reservoir Surface (acres).

Spillway Crest ≈ 9.4.

Top of Dam ≈ 9.5 (Top of Spillway Wingwall).

Design Surcharge - Not known.

g. Dam.

Type - Earth

Length - 406 feet.

Height - 60 feet.

Top Width ≈ 35 feet (varies from 34 to 43 feet).

Side Slopes - Upstream (originally) 2.5 H:1V between top of dam and elevation 823. Between the upstream toe and elevation 823, the slope is 2.75 H:1V.

Downstream (originally) 2H:1V between top of dam and elevation 835. Between the toe and elevation 835 the slope is 2.75 H:1V.

Note: In recent years, additional material has been placed on the crest of the embankment resulting in raising the height of the crest by 5 to 9 feet. This has changed the upstream and downstream slopes to 1.5 H:1V over the upper portion of the embankment.

Zoning - The interior part of the dam was reportedly constructed of select clay rolled in six-inch layers (see Figure 4). The upstream face was provided with three feet of riprap covering a six-inch layer of crushed stone or gravel.

Impervious Core - See zoning above and Figure 4.

Cutoff - A 17-foot wide cutoff trench, reportedly carried to rock, was provided along the centerline of the dam. Along the centerline of the cutoff trench, a concrete cutoff wall was carried two feet into rock and extended five feet above the rock surface.

Grout Curtain - According to PennDER files, grout holes were drilled on 20-foot centers penetrating rock from 9 to 12 feet.

h. Outlet Conduit.

Type - 24-inch diameter cast iron pipe encased in concrete.

Length ≈ 375 feet.

Closure - Gate valve at tee on inlet end. Five sluice gate type openings along the riser pipe at heights of 5, 15, 25, 35, and 43 feet above the centerline of the outlet pipe (see Figure 4). The outlet pipe is also gated at its outlet end. All of the sluice gates in the riser pipe are reported to be currently inoperable.

Access - Left reservoir shoreline upstream of the spillway.

Regulating Facilities - The sluice gate openings on the riser pipe are open and are inoperable. The gate

valve on the upstream end of the 24-inch outlet pipe is connected to the outside of the riser pipe but has not been operated in recent years. The gate valve on the downstream end of the 24-inch outlet pipe is closed and reportedly is not operated.

i. Spillway.

Type - Rectangular concrete channel with modified ogee-shaped crest.

Weir Length - 50 feet.

Channel Length ≈ 130 feet (concrete section).
125 feet (section over rock on left abutment).

Crest Elevation ≈ 850.

Upstream Channel - Hand placed rock.

Downstream Channel - Irregular bedrock channel on left abutment.

j. Regulating Outlets. Flow through the 24-inch diameter outlet pipe is currently regulated at the treatment plant. According to Mr. Wilps, Engineer for the Water Authority, the 24-inch diameter pipe branches at a tee downstream of the dam. The main pipe continues to a 24-inch gate valve and can be used as a blow-off. A 12-inch diameter branch line is gated within a valve pit to the left of the treatment facility. This 12-inch diameter pipe conveys water directly to Allegheny Ludlum Steel. A 4-inch diameter branch off the 12-inch diameter pipe supplies water to the treatment plant for use as potable water for the community of West Leechburg.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources.

1. Hydrology and Hydraulics. No design calculations are available.

2. Embankment. No design calculations are available. Contract drawings containing some information on subsurface conditions are available from PennDER and the owners files. Numerous construction photographs are also available from PennDER files.

b. Design Features.

1. Embankment. Contract drawings, specifications, and correspondence are available from PennDER files. These sources indicate that the dam is a rolled earth embankment with a clay core. The dam is zoned such that the materials are less pervious both upstream and downstream of the core. A cutoff trench (17 feet wide at the base) was carried to rock and a concrete cutoff wall constructed that extends two feet below and five feet above rock. The original slopes were as shown on Figure 4; however, in 1963 the authority raised the embankment by approximately five to nine feet. The crest width was increased from 20 feet to approximately 35 feet, thereby increasing the upper slopes, both upstream and downstream, to about 1.5H to 1V. It should be noted that while the crest was raised, the spillway wingwalls were not. Furthermore, the owners decreased the spillway capacity by adding a two-foot high concrete addition to the crest of the spillway (see Photograph 6). The date of this latter modification is not known.

2. Appurtenant Structures. The spillway is a rectangular concrete chute with a modified ogee shaped crest. Details of the original spillway are shown on Figure 3. The concrete portion of the spillway extends approximately 130 feet downstream of the crest before discharging into a rocklined channel with concrete sidewalls. At the time of inspection, the spillway outlet channel below the concrete section consisted of a channel eroded into bedrock on the left abutment (see Photograph 7). This is inconsistent with construction drawings that indicate concrete wingwalls and rock lining extending to the stream bed.

The outlet works consists of a 24-inch diameter cast iron pipe encased in concrete beneath the embankment. The

inlet end of the system (as shown on Figure 4) was provided with a tee. The straight section of the tee is valved whereas the section at right angles was provided with a 24-inch steel riser pipe that rested on the left abutment and protruded from the water at a point above 175 feet upstream of the dam centerline. The riser pipe was equipped with five openings, thus allowing the water authority to decant water from several elevations within the reservoir. The gate controls for these openings are presently open and are no longer functioning. Thus, flow through the 24-inch outlet pipe cannot be controlled at the inlet end.

c. Design Data and Procedures.

1. Hydrology and Hydraulics. No design calculations are available.

2. Embankment. No design data are available.

3. Appurtenant Structures. No design data are available.

2.2 Construction

Contract drawings, specifications, and a few construction reports are available from PennDER files. Numerous construction photographs are also available.

2.3 Operational Records.

Operational records are not kept concerning the facility.

2.4 Other Investigations.

A preconstruction hydrological report (water balance) was prepared on the feasibility of the structure for meeting industrial and potable water demands. A copy of this report is available from the owner.

Several inspection reports were prepared by PennDER and their predecessors, the latest of which is dated 6/16/71. The Corps of Engineers (Pittsburgh District) also prepared a Deposition Form concerning the facility in 1971. These reports are available in PennDER files.

2.5 Evaluation

a. Availability. General engineering data, in the form of contract drawings, specifications and correspondence

are available from PennDER files. No specific design data are available from any source. Numerous construction photographs are available in PennDER files which tend to varify the available construction drawings.

b. Adequacy of Data. Sufficient data are available to make a Phase I assessment of the facility.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the structure suggests that it is in fair condition and in need of some remedial repair.

b. Embankment. The embankment was modified in 1963 resulting in an increase in crest width and a steepening of the embankment slopes near the crest. This action was reportedly taken following a storm event which raised the pool level to within one foot of overtopping. The flow level at the spillway crest could not be recalled with any certainty and it is possible that low spots existed in the embankment crest at the time it nearly overtopped. It appears that mine refuse was used to raise the embankment, but the exact nature of the material or method of placement could not be ascertained.

Several zones of seepage were observed at the time of inspection. The downstream dam face, near the toe and behind the treatment plant, was saturated (see Photograph 11). Water was also observed issuing from the right abutment just above the embankment toe and from a four-inch tile drain protruding through a masonry wall in the old West Penn Run channel. The total amount of seepage flow from the right abutment and the tile drain was estimated at less than 0.1 cfs.

The downstream slope of the dam is heavily vegetated and contains some moderate sized pine trees as shown on Photograph 3. The upstream face is similarly vegetated and is not protected by riprap (the mine refuse placed to increase the height of the dam apparently covers the old riprapped upstream face).

c. Appurtenant Structures.

1. Outlet Pipe, 24-inch Diameter Supply and Blow-off Pipe. West Leechburg Reservoir Dam is provided with a 24-inch diameter cast iron pipe encased in concrete beneath the embankment. Through a system of gate valves and trunk lines the water authority utilizes the pipe as the supply line serving both industrial and potable water needs.

A steel pipe protrudes from the water on the left reservoir shore just upstream of the spillway. This pipe encloses controls for a system of sliding gates which once permitted

the authority to decant water from five (5) elevations within the reservoir. Reportedly, the gates are corroded open and cannot be closed. Because of this condition, there is no way to regulate flow on the intlet end of the outlet works.

A gate valve is located at the toe of the embankment just to the left of the treatment buildling. This valve serves as the control for the 24-inch diameter pipe, permitting it to be used as a blow-off line. According to the water authority engineer, the downstream valve is no longer operated for fear that they might not be able to close the line.

2. Spillway. The spillway at West Leechburg Reservoir Dam is a rectangular concrete chute with a modified ogee-shaped crest located on the left abutment. Ungated flow is conveyed through the structure before discharging in a bedrock channel on the left abutment. At the junction of the spillway apron and the bedrock channel (see Photograph 7) erosion is taking place which could eventually allow water to be discharged over the natural bedrock dike between the spillway and the dam (see Figure 1). This condition is considered unsatisfactory since this water could conceivably erode the toe of the dam.

The crest of the spillway was modified sometime after construction as shown on Photograph 6. A concrete cap was added which raised the spillway crest by approximately two feet. This increased the reservoir storage capabilities but since the wingwalls were not raised, it resulted in a reduction in spillway discharge capacity.

3. Reservoir Area. The slopes adjoining West Leechburg Reservoir are moderate to steep and wooded. No signs of slope distress were observed at the time of inspection.

4. Downstream Channel. The area immediately downstream of West Leechburg Dam is characterized as a confined valley (see Appendix G, Regional Vicinity Map) with brush covered slopes. Approximately 1,000 feet downstream of the dam, flow from West Penn Run passes beneath a road and a railroad embankment. Allegheny Ludlum Steel Corporation facilities are located just beyond the railroad embankment. Part of the area adjoining West Penn Run, between the railroad and the dam, is used as a parking lot for steel corporation employees that number in the hundreds.

Because of the above-mentioned considerations as well as the fact that the treatment plant is located at the dam toe, the dam was given a "high" hazard rating.

3.2 Evaluation.

Areas of seepage were observed near the toe of the embankment requiring additional investigation. The spillway discharges into a bedrock channel where erosion problems require some remedial work. The condition of the outlet system is unsatisfactory since flow through the 24-inch outlet can no longer be regulated at the inlet end.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operational Procedure.

According to representatives of the water company, the openings in the riser portion of the outlet system are corroded open. Water currently flows through the 24-inch diameter outlet pipe before branching into a 12-inch diameter supply pipe while the remaining portion of the line is terminated at a gate valve located at the toe of the dam. The supply pipe is gated but under normal operating conditions remains open. Allegheny Ludlum Steel Corporation uses the water on an as-needed basis.

According to Mr. Wilps (dam designer and water authority engineer), the blow-off line has not been operated in years, basically because of its age. They plan to install a new gate valve just downstream of the existing blow-off valve in the near future.

4.2 Maintenance of the Dam.

There are no formal maintenance procedures at the dam. Trees have become established both on the embankment and in the spillway channel.

4.3 Maintenance of Operating Facilities.

There is no formal maintenance of the operating facilities serving the dam. The intake portals on the riser pipe are corroded and the valves on the blow-off pipe are no longer opened periodically.

4.4 Warning System.

There is no formal warning system in effect at the site.

4.5 Evaluation.

According to water authority personnel, the embankment receives no regular maintenance such as mowing or clearing trees and brush. A tree has grown in the spillway outlet channel suggesting that little maintenance is provided. Part of the outlet system no longer functions as designed and the operability of the blow-off pipe could not be substantiated.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No design data are available for any aspect of the facility.

5.2 Experience Data.

No records of discharge data are available at the facility.

5.3 Visual Observations.

Visual inspection indicates that since initial construction, the spillway crest has been raised by two feet and the embankment crest by approximately 5 to 9 feet. As the spillway wingwalls were not altered accordingly (see Photograph 6) the net effect has been an increase in total storage capacity but a substantial decrease in discharge capacity of the facility.

At a point approximately 130 feet downstream of the dam centerline, the concrete spillway terminates and a bedrock channel conveys water over a cliff on the left abutment. At the junction between the spillway and the bedrock channel, there has been erosion of the right side of the channel which (see area covered by brush on Photograph 7), if allowed to continue, might present a problem, since this water could conceivably erode the toe of the dam.

5.4 Overtopping Potential.

The ratio "PMF Peak Flow/Drainage Area" was determined from an empirical curve supplied by the Corps of Engineers, Baltimore District. Based on this curve and a drainage area of 1.25 square miles, Peak PMF Q/A = 1950 cfs/sq. mi., and Peak PMF Q = 2438 cfs. The size category is "intermediate" and the hazard rating "high". Consequently, the SDF used in this analysis is the PMF ("Recommended Guidelines for Safety Inspection of Dams").

Calculations (see Appendix C) were performed to evalute the overtopping potential of the dam during the PMF in which an inflow volume, based on 26 inches of runoff, was used.

The spillway has a maximum discharge capacity of approximately 1010 cfs which is less than the PMF Peak inflow of 2438 cfs. Excess inflow must be stored while being discharged if the dam is not to overtop. Based on normal pool elevation 850 (spillway crest) and top of dam elevation 853 (top of spillway retaining wall), the available storage at elevation 853 is calculated to equal approximately 28 acre-feet. This is considerably less than the computed storage volume required of 1005 acre-feet and thus it can be concluded that flow will overtop the spillway wingwall adjacent to the embankment when subjected to a storm of PMF magnitude.

5.5 Spillway Adequacy.

The discharge facilities at West Leechburg Reservoir Dam are capable of passing and storing 43 percent of the runoff associated with a storm of PMF intensity without overtopping the spillway wingwalls. The hazard rating for the facility is high and it is thought that overtopping of the spillway wingwalls adjacent to the embankment will cause erosion of the crest and could lead to eventual embankment failure. Furthermore, overtopping failure would significantly increase the potential hazard to downstream persons and improvements from that which would exist just prior to failure. Consequently, the spillway is considered "seriously inadequate".

SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Seepage was observed above the toe of the embankment behind the treatment facility. According to water authority personnel, french drains were installed in this area some time ago and it is their contention that the drains have become clogged causing the condition to worsen.

Seepage was also observed issuing from the right abutment (about 15 feet above the toe). This condition was reported in early inspection reports and is not considered serious in its present state (less than 30 GPM is discharging from the hillside).

Seepage also discharges through a four-inch tile drain in the old stream channel to the left of the treatment facility. Two tile drains are shown on Figure 2 and are referred to in PennDER reports. The owner claimed that this seepage passes through the left abutment and issues from a spring that was located prior to, or during construction.

In 1963, the embankment was raised by approximately five to nine feet following an instance when the dam was nearly overtopped. It appears that mine spoil was added to the embankment. Details of methods of placement are not known but the change resulted in an increase in crest width from 20 to 35 feet (actual width varies from 34 to 43 feet). The increase in crest width was accompanied by a change in the dam slopes near the crest to the point where the present upstream and downstream slopes approximate 1.5H:1V. The riprap protection on the upstream slope was also covered by the additional material.

b. Appurtenant Structures. The spillway sidewalls were not raised with the embankment. Furthermore, a two-foot high concrete cap (Photograph 6) was added to the ogee-shaped spillway crest, resulting in a considerable loss in spillway capacity.

At the end of the concrete rectangular spillway channel flow is directed into a bedrock channel on the left abutment before discharging over a cliff and entering the old West Penn Run channel. At the location where the concrete spillway and bedrock channel meet (see Photograph 7 and Figure 1), there has been considerable erosion of the right side of the channel. If allowed to persist, spillway discharge could erode the toe of the embankment.

Part of the spillway outlet channel is overgrown with brush and trees. These should be cleared periodically.

The outlet works at the facility consist of a tee connection on a 24-inch cast iron pipe, encased in concrete beneath the embankment (see Figure 4). The straight section of the tee is gated at the inlet end and rests on the bottom of the reservoir acting as a blow-off. The 90°-section of the tee is connected to a riser pipe containing five gated portal openings at different elevations within the reservoir. This riser pipe protrudes from the reservoir upstream of the spillway along the left bank of the reservoir (see Photographs 1, 4, and 8). Controls for both the gate valve on the blow-off pipe and slide gates on the riser pipe, were operated from this point. According to water company personnel, none of these controls are now functional and all riser gates are thought to be open.

The 24-inch diameter outlet pipe passes beneath the embankment and is gated in the area to the left of the treatment building (see Photograph 9). According to the authority engineer, a tee connection upstream of the gate valve conveys water to the distribution system.

PennDER files indicate that in 1971, a boil developed near the downstream gate valve which emitted 20 to 30 thousands gallons per hour. The Corps of Engineers (Pittsburgh District) inspected the facility and made recommendations to determine the origin and severity of the problem. Mr. Wilps (Authority Engineer) claims that the problem was solved when they excavated upstream of the gate valve and found that the last section of pipe (not encased in concrete) had corroded. Sandbags were used to block-off the inlet portals on the riser pipe so that the remedial work could be performed. It is our understanding that the pipe was sleeved and provided with a concrete jacket. The Corps of Engineers recommended the installation of permanent gates in their memo of November 29, 1971, a copy of which is contained within PennDER files.

6.2 Design and Construction Techniques.

Actual design data, design computations, or reports were not available for any aspect of the facility. Specifications and construction photographs are contained within PennDER files.

6.3 Past Performance.

Reservoir levels are not available. The facility has a history of seepage. No programs have been initiated to

reduce or eliminate the problem. A boil formed near the toe of the embankment which proved to be the result of corrosion of the cast iron outlet pipe upstream of the gate valve.

6.4 Seismic Stability.

The dam is located within Seismic Zone No. 1 and is subject to minor earthquake induced dynamic forces. Due to the saturated conditions near the embankment toe, the lack of internal drainage, and the addition of fill at the crest level, the static stability of the structure is questionable and thus even minor earthquake forces could be significant. However, no calculations, investigations, etc., were performed to confirm this statement.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The visual inspection, operational history, and available engineering data suggest that the dam is in fair condition.

The facility is capable of passing and/or storing 43 percent of the runoff associated with a storm of PMF intensity without overtopping the spillway wingwalls adjacent to the embankment. Based on screening criteria supplied by the Department of the Army, Office of Chief of Engineers, the spillway is classified as "seriously inadequate".

The area behind the treatment building, above the dam toe, is saturated in several places. According to representatives of the water authority, the condition has worsened recently possibly due to clogging of french drains installed in the area. Accompanying this problem the authority has added several feet of material to the dam crest and has oversteepened the upper portions of both the upstream and downstream slopes. Possible implications concerning dam stability must, therefore, be considered.

Discharge through the 24-inch diameter outlet pipe cannot be controlled from the upstream end, as designed. Consequently, the pipe is under full hydrostatic head at all times. It is desirable to be able to control discharge from the inlet end so that maintenance or remedial work can be performed on the outlet structure without requiring bulkheading of the openings on the riser pipe.

b. Adequacy of Information. The available data were considered sufficient to make an accurate Phase I assessment of the facility.

c. Urgency. It is suggested that the recommendations listed below be implemented immediately.

d. Necessity for Additional Investigations. The additional investigations listed below are considered necessary.

7.2 Recommendations.

It is recommended that the owner:

a. Retain a registered professional geotechnical engineer, experienced in design and construction of earthen

dams to:

1. Undertake a subsurface investigation and testing program to determine the nature and suitability of the mine refuse added to the crest of the dam.

2. Install observation wells to establish and monitor the phreatic surface.

3. Assess the stability of the structure considering the seepage near the toe and the modifications that were made to the dam crest.

b. Retain the services of a registered professional engineer experienced in hydrology and hydraulic design to more accurately assess the adequacy of the spillway. Measures should be taken to preclude the possibility of spillway discharge from further eroding the right side of the spillway channel so as to insure that flow does not pass over the abutment and erode the toe of the embankment. The owner should be required to make any modifications deemed necessary to insure that the facility is hydraulically adequate.

c. Modify or repair the outlet system so as to provide a method for controlling discharge at the intlet end of the 24-inch diameter outlet pipe.

d. Provide riprap protection on the upstream face of the dam.

e. Remove the growth of trees from the slopes of the dam.

f. Develop a warning system to notify downstream inhabitants and steel company employees should hazardous conditions develop. Included in the plan should be provisions for round-the-clock surveillance of the facility during periods of unusually heavy precipitation.

APPENDIX A

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM West Leechburg Reservoir Dam

ID # PA-452; PennDER #65-108

ITEM	REMARKS	SHEET 1

AS-BUILT DRAWINGS

Drawings available from the owner and PennDER files appear to be pre-construction drawings with some post-construction modifications.

REGIONAL VICINITY MAP

See U.S.G.S., 7.5 minute Leechburg Quadrangle.

CONSTRUCTION HISTORY

Compiled from the designers comments as well as information from PennDER files. Good construction photographs in PennDER files.

TYPICAL SECTIONS OF DAM

See Figure 4, Appendix F

OUTLETS - PLAN See Figure 2, Appendix F

- DETAILS See Figure 4, Appendix F

- DISCHARGE RATINGS None available.

RAINFALL/RESERVOIR RECORDS

Not kept at the facility.

DESIGN REPORTS

None available.

GEOLOGY REPORTS

None available.

DESIGN COMPUTATIONS
HYDROLOGY & HYDRAULICS - Water balance study by R. B. Adams
DAM STABILITY - Not available
SEEPAGE STUDIES - Not available

MATERIALS INVESTIGATIONS
BORING RECORDS - Eighteen test pits indicated on subsurface profile on Figure 3.
LABORATORY - None available
FIELD - None available

POST-CONSTRUCTION SURVEYS OF DAM

None

BORROW SOURCES

Materials from within the reservoir area were used to construct the original embankment. Mine spoil was used to raise the embankment in 1963.

MONITORING SYSTEMS

None in embankment or reservoir. Flow meter at treatment plant.

MODIFICATIONS

1) Raised dam crest in 1963 by approximately 5 feet but not the spillway wingwalls.
2) Raised spillway crest about 2 feet - date unknown

HIGH POOL RECORDS

According to Mr. Wilps, the water once rose to within one foot of overtopping the dam. Shortly thereafter, the embankment was raised. The water level elevation could not be recalled with any certainty, however, the owners representative claimed that maximum flow through the spillway was 1.5 feet.

POST CONSTRUCTION ENGINEERING
STUDIES AND REPORTS

PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS

A leak in the 24-inch CIP outlet pipe in 1971. The leak apparently developed just upstream of the gate control on the blow-off line and the pipe was sleeved and encased in concrete.

MAINTENANCE
OPERATION
RECORDS

None. Little if any maintenance is performed on the dam and its appurtenances.

ITEM	REMARKS	ID # PA-452	SHEET 4

SPILLWAY PLAN See Figure 2 and 3, Appendix F

SECTIONS See Figure 3, Appendix F

DETAILS See Figure 3, Appendix F

OPERATING EQUIPMENT
PLANS & DETAILS See Figure 3, Appendix F

CHECK LIST ID #PA-452; PennDER 65-108
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.25 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): ≈ 850 (170 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not known

ELEVATION MAXIMUM DESIGN POOL: Not known

ELEVATION TOP DAM: ≈ 853 (200 acre-feet - top of wingwall)

SPILLWAY DATA:

a. Crest Elevation ≈ 850
b. Type Concrete Ogee-crested
c. Weir Length 50'
d. Channel Length ≈ 130'
e. Location Spillover Left abutment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 24-inch combination blow-off-supply pipe encased in concrete
b. Location Left of dam center (see Figure 2)
c. Entrance Inverts ≈ 799
d. Exit Inverts ≈ 796
e. Emergency Draindown Facilities Valved at inlet and at downstream toe of dam; however, inlet valves thought to be inoperable.

HYDROMETEOROLOGICAL GAGES:

a. Type None
b. Location N/A
c. Records None available

MAXIMUM NON-DAMAGING DISCHARGE: 1.5 feet over spillway crest (estimated)

APPENDIX B

CHECK LIST - VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE 1

DAM NAME West Leechburg Reservoir Dam COUNTY Westmoreland STATE PA ID # NDI #PA-452

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION (1) 27 September 1978 (2) 3 October 1978 WEATHER Sunny TEMPERATURE 70°

POOL ELEVATION AT TIME OF INSPECTION ≈848.5 M.S.L. TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL:

Sept. 27, 1978

J. P. Nairn — West Leechburg Water Authority

(1) S. R. Michalski — Ralph Wilps (Eng.)

D. L. Bonk — Mr. Hohos (Superintendent)

Mr. Liptak (Sec.-Treas.)

Oct. 3, 1978

D. L. Bonk RECORDER

(2) J. P. Nairn

B. M. Mihalcin

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	The mine spoil, added to the embankment after construction, is sloughing over the entire downstream face.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Crest of embankment slopes from right to left. Maximum measured vertical differential equals approximately four feet (high on right, low on left). The crest of the embankment varies in width from about 34 to 43 feet.	
RIPRAP FAILURES	No riprap was visible above the water level during inspection. Riprap was observed below pool level at the change in slope. Apparently much of the upper portion of the upstream slope was covered by fill when the embankment was raised. No provision was made to replace the riprap covered and displaced at that time.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS

JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM

Some erosion on right side of spillway at the end of the concrete apron. Good junction of embankment to right abutment. Embankment to spillway junction also good; however, spillway wingwalls are much lower than crest thereby reducing safe discharge capacity.

ANY NOTICEABLE SEEPAGE

Seepage noted above the toe of the dam behind the treatment plant. Flow could not be measured; however, a large area (see sketch in Appendix F) was saturated. Seepage was also observed emanating from the right abutment hillside downstream of the dam and from a tile drain in the stream channel to the left of the treatment plant.

STAFF GAGE AND RECORDER

None observed.

DRAINS

Tile drains observed adjacent to the discharge of the blow-off conduit located approximately 25 feet to the left of the treatment facility at the toe of the embankment. The location of the drain lines are shown on design drawings (see Figure 2, Appendix F).

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	No concrete surfaces are associated with the visible portions of the outlet conduit.	
INTAKE STRUCTURE	The low level intake located at the base of the upstream embankment toe was submerged during the inspection and could not be observed. Four additional intakes are located along a conduit which ascends the reservoir slope along the left shoreline approximately 175 feet upstream of the embankment and can be observed as it juts out from below pool level. All intakes are reportedly open and inoperable. The visible portion of the conduit is corroded.	
OUTLET STRUCTURE	24-inch diameter blow-off incased in concrete beneath the embankment and valved at the dam toe just left of the treatment plant and at the inlet (see emergency gate, below).	
OUTLET CHANNEL	Natural unlined channel located along the left side of the valley downstream of the embankment.	
EMERGENCY GATE	The blow-off conduit is gated at both its upstream and downstream ends. The condition of both gates is in doubt and, consequently, neither is operated.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	An ogee-shaped weir is located at the entrance of concrete rectangular channel spillway located at the left abutment. Some minor cracking and scaling are evident. The left side wall is rotated four inches at the top.	
APPROACH CHANNEL	Rocklined.	
DISCHARGE CHANNEL	Concrete rectangular channel extends ≈ 130 feet beyond the crest. At this point, flow is discharged over a cliff and into the stream approximately 100 feet downstream of the embankment toe.	
BRIDGE AND PIERS	None observed.	

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	

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None. Those shown on Figure 2 are no longer operable.	
PIEZOMETERS	None.	
OTHERS	N/A	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate to steep, urban to wooded.	
SEDIMENTATION	No surveys were performed to gage the actual amount.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS

CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)

Stone culvert beneath Penn Central Railroad tracks approximately 1,000 feet downstream of the dam crest. From that point, water apparently passes beneath Allegheny Ludlum Steel Corporation and enters the Kiskiminetas River.

SLOPES

Steep, brush covered and partially wooded.

APPROXIMATE NO. OF HOMES AND POPULATION

Improvements located within the area which could be affected by a dam breach include a treatment plant, railroad tracks, and an Allegheny Ludlum Steel Corporation plant which employs hundreds of persons. A parking area for plant workers is also located adjacent to the stream channel about 500 feet downstream of the dam. During Tropical Storm Agnes (June 1972), considerable damage to parked vehicles occurred when the culvert at the railroad tracks became clogged.

APPENDIX C

HYDROLOGY/HYDRAULICS

SUBJECT DAM SAFETY INSPECTION
WEST LEECHBURG RESERVOIR DAM

BY D.L.P. DATE 9-29-78 PROJ. NO. 79-501-452

CHKD. BY EJM DATE 10-30-78 SHEET NO. 1 OF 5

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Environmental Specialists

DAM STATISTICS

MAXIMUM HEIGHT - 60 FEET (FIELD MEASURED)

DRAINAGE AREA - 1.25 SQ. MI. (PLANIMETERED OFF U.S.G.S. 7.5 MINUTE MAP QUADRANGLES)

STORAGE CAPACITY -

@ SPILLWAY CREST (ELEVATION 850) ≃ 170 AC-FT (REF 1, PG 1)
@ TOP OF WINGWALL (ELEVATION 853) ≃ 200 AC-FT (SHEET 4)

SIZE CLASSIFICATION

DAM SIZE - INTERMEDIATE (REF 2: TABLE 1)

HAZARD RATING - HIGH (FIELD OBSERVATION)

REQUIRED SDF - PMF (REF 2: TABLE 3)

REFERENCES

1: "REPORT UPON THE APPLICATION OF THE WEST LEECHBURG WATER AUTHORITY," HARRISBURG, PENNA., JULY 11, 1949

2: "RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS". DEPT. OF THE ARMY - OFFICE OF CHIEF ENGINEER, APPENDIX D

3: STANDARD HANDBOOK FOR CIVIL ENGINEERS F. S. MERRITT, MCGRAW-HILL 1976

SUBJECT DAM SAFETY INSPECTION
WEST LEECHBURG RESERVOIR DAM
BY DLB DATE 9-29-78 PROJ. NO. 78-501-452
CHKD. BY EJM DATE 10-30-78 SHEET NO. 2 OF 5

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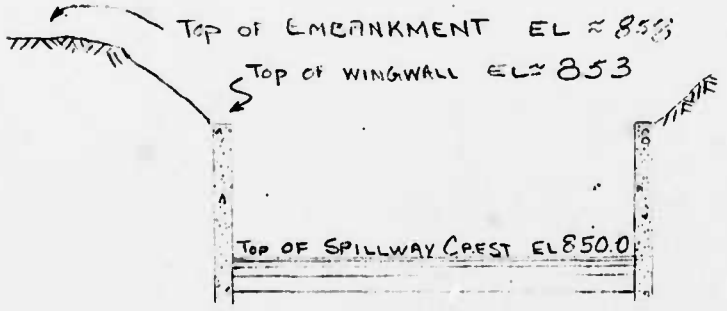
Environmental Specialists

PMF (PEAK FLOW)/AREA = 1950 CFS/SQ MI. (REF: C OF E CURVE, OHIO RIVER BASIN)

PMF = (1950 CFS/SQ. MI.)(1.25 SQ. MI.) = 2438 CFS

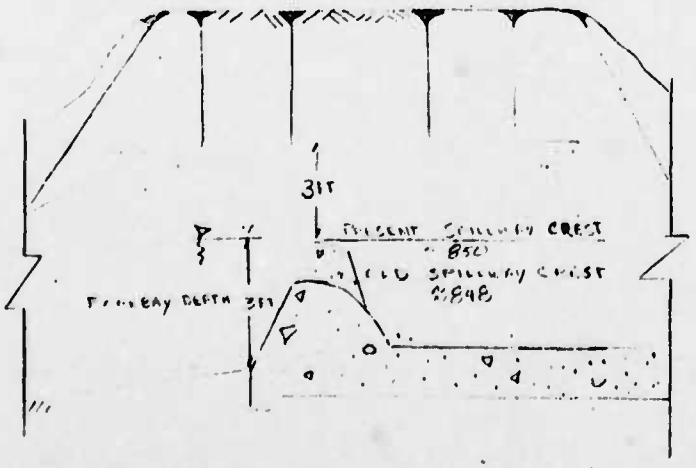
PEAK PMF Q = 2438 CFS = Q_{IMAX}

SPILLWAY CAPACITY



NOT TO SCALE

NOTE: ALL DIMENSIONS ARE BASED ON FIELD MEASUREMENTS AND OBSERVATIONS. ELEVATIONS ARE TAKEN FROM AVAILABLE DRAWINGS DATED MAY 1, 1949 BY RALPH F. WILEY.



NOT TO SCALE

SUBJECT DAM SAFETY INSPECTION
WEST LITCHFIELD RESERVOIR DAM

BY DLP DATE 9-1-78 PROJ. NO. 78-501-457

CHKD. BY EJM DATE 10-30-78 SHEET NO. 3 OF 5

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$Q = C L H^{3/2}$ (REF 3, EQ 21-121)

L = LENGTH OF SPILLWAY CREST = 50 FEET (SHEET 2)
H = WINGWALL HEIGHT = 3 FEET

C = COEFFICIENT OF DISCHARGE

(FROM REF 3; FIGURE 21-67)

P/H_d = FOREBAY DEPTH / WINGWALL HEIGHT

= 3 FEET / 3 FEET = 1

$\therefore C \simeq 3.9$

$Q = (3.9)(50 \text{ FEET})(3 \text{ FEET})^{1.5} = 1013 \text{ CFS}$

PEAK PMF Q (2438 CFS.) > MAXIMUM DISCHARGE (1013 CFS)

SUBJECT DAM SAFETY INSPECTION
WEST LEECHBURG RESERVOIR DAM
BY DLP DATE 9-29-78 PROJ. NO. 78-501-4152
CHKD. BY EJM DATE 10-30-78 SHEET NO. 4 OF 5

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CONSIDER INFLOW RELATIVE TO BOTH OUTFLOW AND STORAGE USING THE SHORT CUT METHOD AS RECOMMENDED BY NAD.

$P = \frac{\text{MAXIMUM DISCHARGE}}{\text{PEAK PMF Q}} = \frac{1013 \text{ CFS}}{2438 \text{ CFS}}$ (SHEET 3) (SHEET 2)

$P = 0.42$

$(1-P) = \frac{\text{REQUIRED RESERVOIR STORAGE}}{\text{INFLOW VOLUME}} = 0.58$

INFLOW VOLUME (BASED ON 26 INCHES OF RUNOFF) $= \frac{(26 \text{ INCHES})(1.25 \text{ SQ. MI.})}{(1 \text{ SQ. MI.}/640 \text{ ACRES})(12 \text{ IN/FT})}$

$= 1733$ AC-FT

REQUIRED STORAGE $= (0.58)(1733 \text{ AC-FT}) = 1005$ AC-FT

CALCULATE AVAILABLE STORAGE

SURFACE AREA OF POND = 9.4 ACRES (REF 1, PG 1)
AVAILABLE FREEBOARD = 3.0 FEET (SHEET 2)

STORAGE AVAILABLE $= (3.0 \text{ FEET})(9.4 \text{ ACRES}) \simeq 28$ ACRE-FEET

STORAGE REQUIRED (1005 AC-FT) >> STORAGE AVAILABLE (28 AC-FT)

SUBJECT DAM SAFETY INSPECTION
WEST LEECHBURG RESERVOIR DAM
BY TLC DATE 9-29-78 PROJ. NO. 78-501-452
CHKD. BY EVM DATE 10-30-78 SHEET NO. 5 OF 5

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ESTABLISH WHAT PERCENTAGE OF THE PMF IS DISCHARGED AND/OR STORED BY THE PRESENT FACILITY

SOLVE FOR Q_{IMAX}

$$P = \frac{\text{MAXIMUM DISCHARGE}}{Q_{IMAX}} = \frac{1013 \text{ CFS}}{Q_{IMAX}} \quad \text{(SHEET 3)}$$

$$(1-P) = \frac{\text{AVAILABLE STORAGE}}{\text{INFLOW VOLUME}} = \frac{(28 \text{ AC-FT})}{\frac{1}{2}(Q_{IMAX})(\text{TIME})}$$

DETERMINE THE DURATION TIME BASED ON V = 1733 AC-FT (SHEET 4), AND Q_{IMAX} = 2438 CFS (SHEET 2).

$$\text{TIME} = (1733 \text{ AC-FT})(2)(43{,}560 \text{ SQ.FT/AC})(1 \text{ HR}/3600 \text{ SEC})/(2438 \text{ CFS})$$

$$\text{TIME} = 17.2 \text{ HRS}$$

$$\therefore \quad 1 - \frac{1013}{Q_{IMAX}} = \frac{28}{\frac{1}{2}(Q_{IMAX})(17.2 \text{ HRS})(1 \text{ AC}/43{,}560 \text{ SQ.FT})(3600 \text{ SEC/HR})}$$

$$1 - \frac{1013}{Q_{IMAX}} = \frac{28}{0.71 Q_{IMAX}}$$

$$0.71 Q_{IMAX} - 719 = 28$$

$$Q_{IMAX} = 1052 \text{ CFS}$$

PEAK PMF Q = 2438 CFS (SHEET 2)

Q_{IMAX} = 43.2% PEAK PMF Q

APPENDIX D

PHOTOGRAPHS

PHOTOGRAPH 1 View along the crest of the West Leechburg Dam taken from the right abutment.

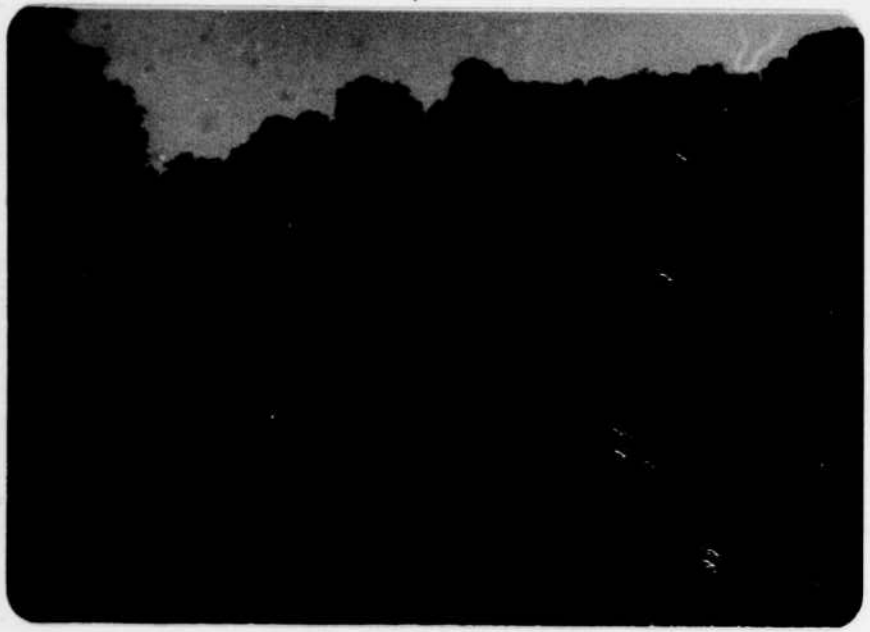
PHOTOGRAPH 2 View of the treatment facility and dam from a point approximately 200 yards downstream of the embankment. The spillway discharges over the rock cliff on the extreme right side of the photograph.

PHOTOGRAPH 3 View looking upstream of the downstream slope of the dam.

PHOTOGRAPH 4 View of the upstream slope of the dam. The intake system which once permitted the decanting of water from different reservoir levels, is visible in the left background. (see Photograph 8 for detailed view)

1

2



3

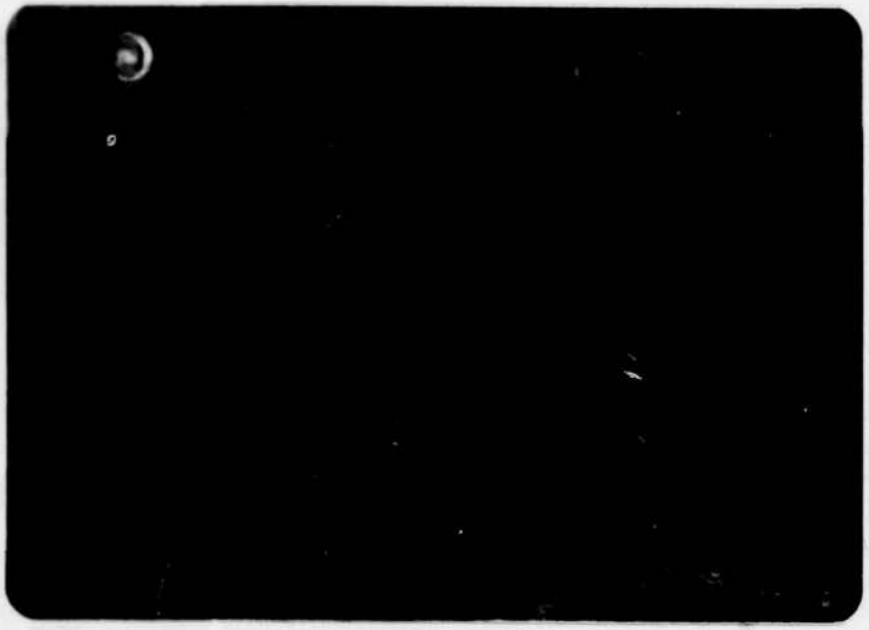
4

PHOTOGRAPH 5 View of the reservoir area and surrounding slopes.

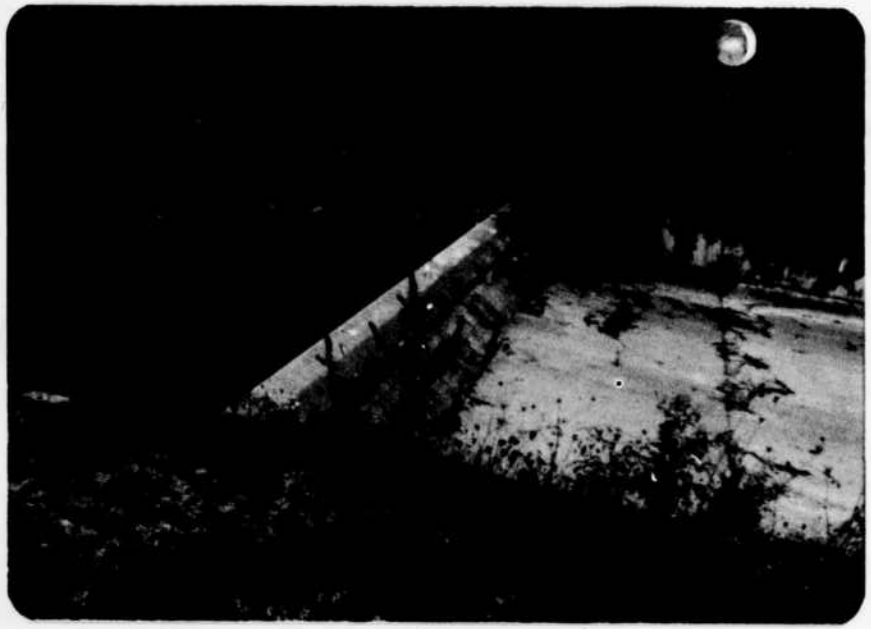
PHOTOGRAPH 6 View of the modified ogee crested weir at the spillway entrance.

PHOTOGRAPH 7 View looking upstream from a point just downstream of the concrete portion of the spillway outlet channel. The railroad tie was fastened to the spillway apron to prevent further erosion of the natural slope on the left side of the photo (beneath the brush).

PHOTOGRAPH 8 Closeup view of the intake system located upstream of the spillway. The valve stem on the outside of the pipe is connected to a gate on the blow-off line.



5



6

7

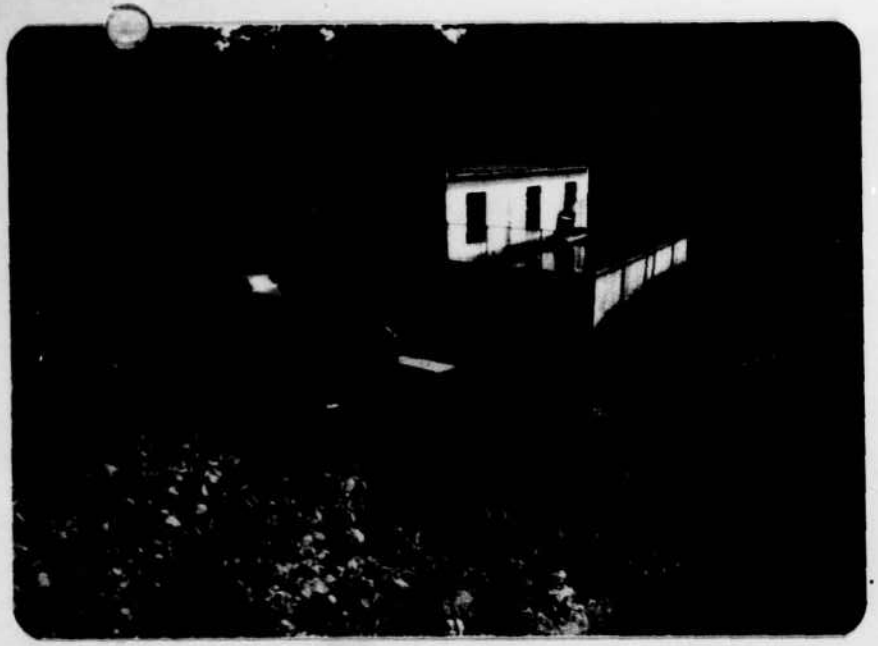
8

PHOTOGRAPH 9 View of treatment plant showing location of the gate valve control (left center) on the 24-inch diameter pipe, passing through the embankment.

PHOTOGRAPH 10 View of West Penn Run stream channel just downstream of the dam. Most of the stream flow was discharging from a tile pipe in right side of the stone headwall.

PHOTOGRAPH 11 View of the saturated zone above the toe of the embankment just upstream of the treatment facility.

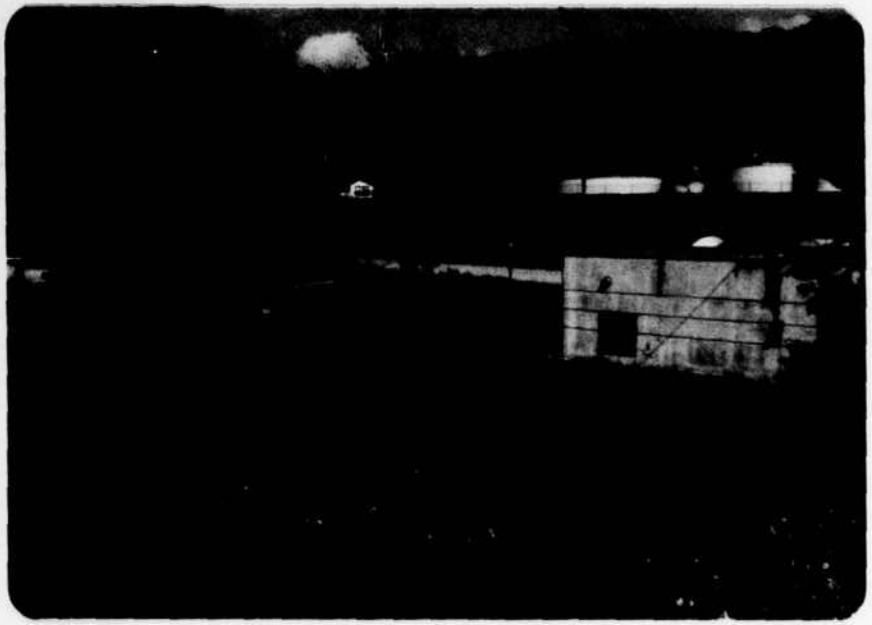
PHOTOGRAPH 12 View of the first downstream obstruction, consisting of a road and railroad crossing about 300 feet downstream of the dam. Note the parked cars and steel mill facility in the background.



9

10

11



12

APPENDIX E

GEOLOGY

Geology

West Leechburg Dam is located in the Pittsburgh Plateaus Province of Pennsylvania. Structurally, the area is characterized as flat lying sedimentary rocks dipping slightly to the northwest.

The dam is underlain by the interbedded shale and massive sandstone beds of the Pennsylvanian age Allegheny Formation. The Upper Freeport coal marks the top of the Allegheny Formation and separates it from the overlying Conemaugh Formation. At the site, the Upper Freeport coal crops out on the left abutment approximately at normal pool. The sandstone strata that make up the rock cliff over which spillway discharge is conveyed is believed to be the Butler Sandstone which, in this area is described as a massive, well jointed sandstone. It is probable that much of the seepage passing through the abutments is permeating along bedding plane and other joints within the Butler Sandstone.

APPENDIX F

FIGURES

LIST OF FIGURES

SUBJECT Field Sketch
West Lecanburg Dam

BY JDN DATE 10-16-78 PROJ. NO. 78-501-152

CHKD. BY DLB DATE 11-20-78 SHEET NO. 1 OF 1

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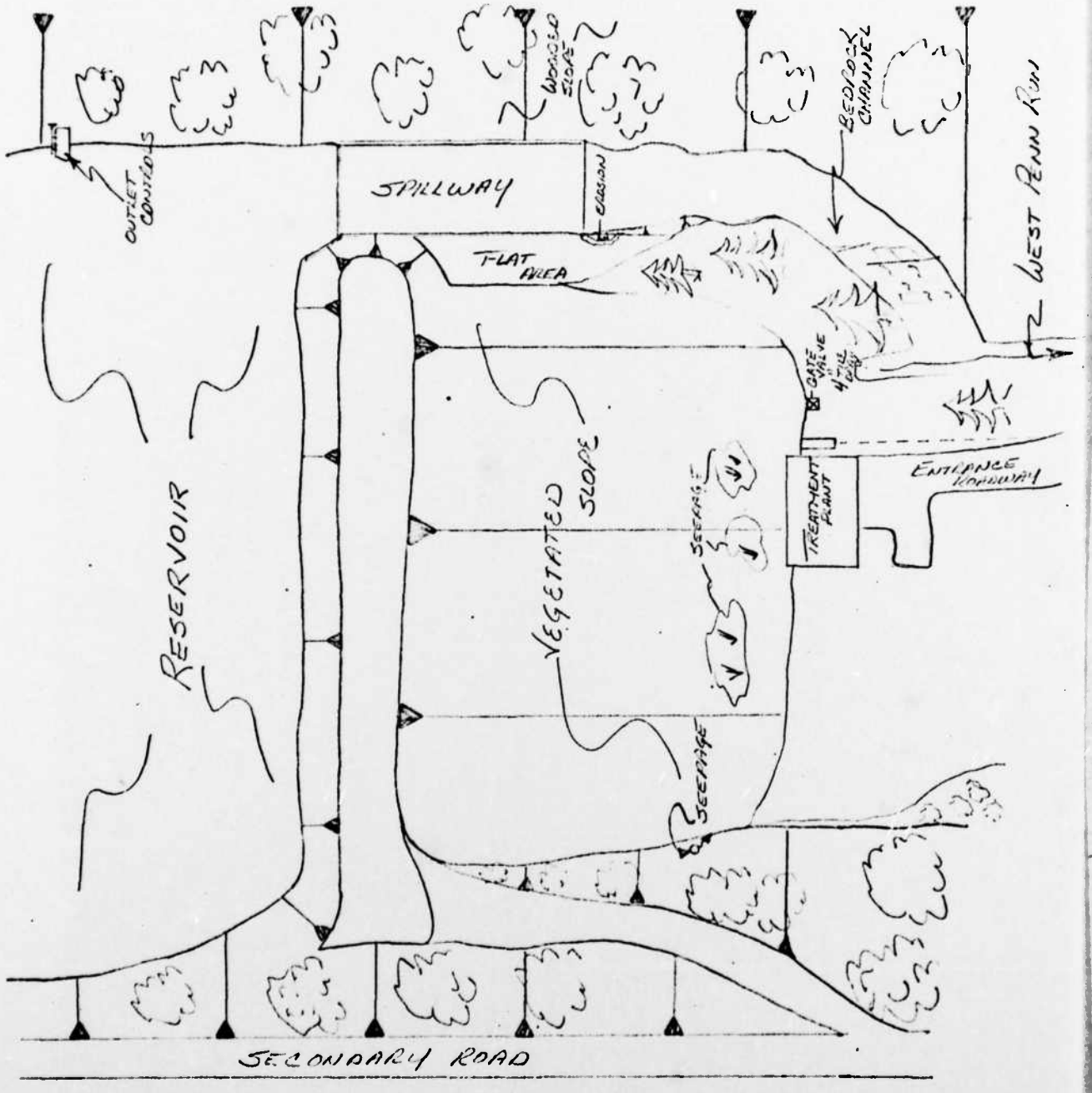
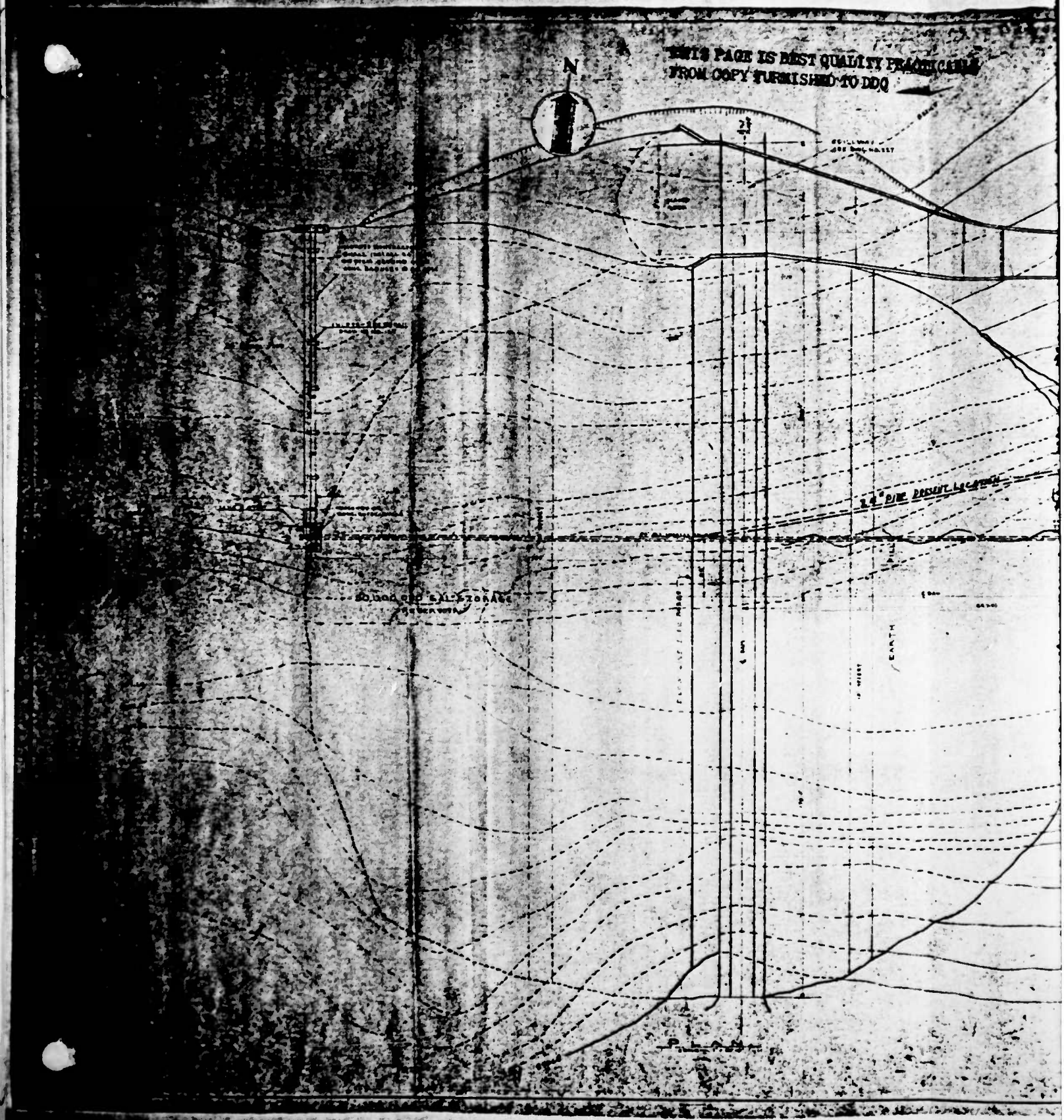
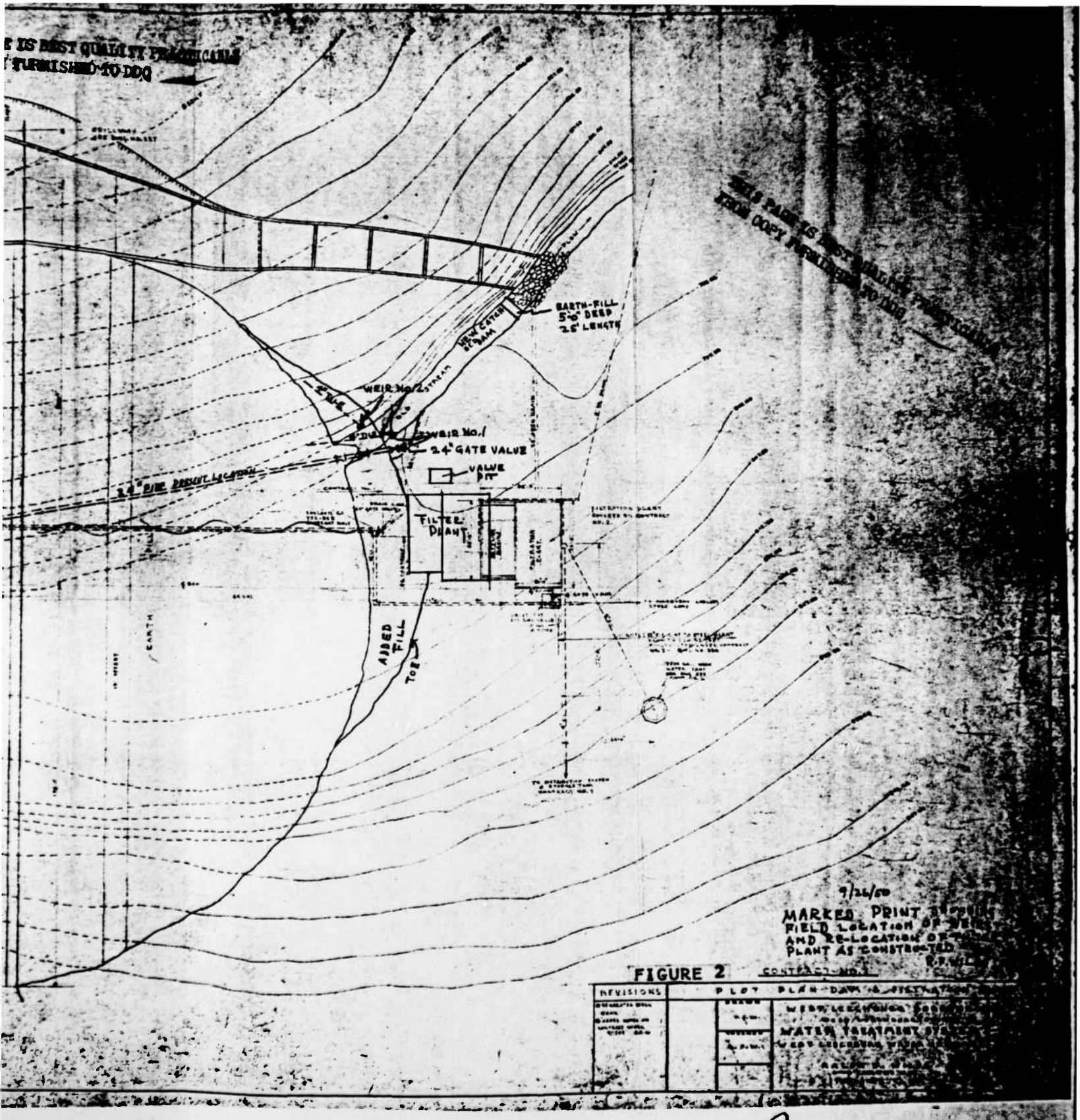
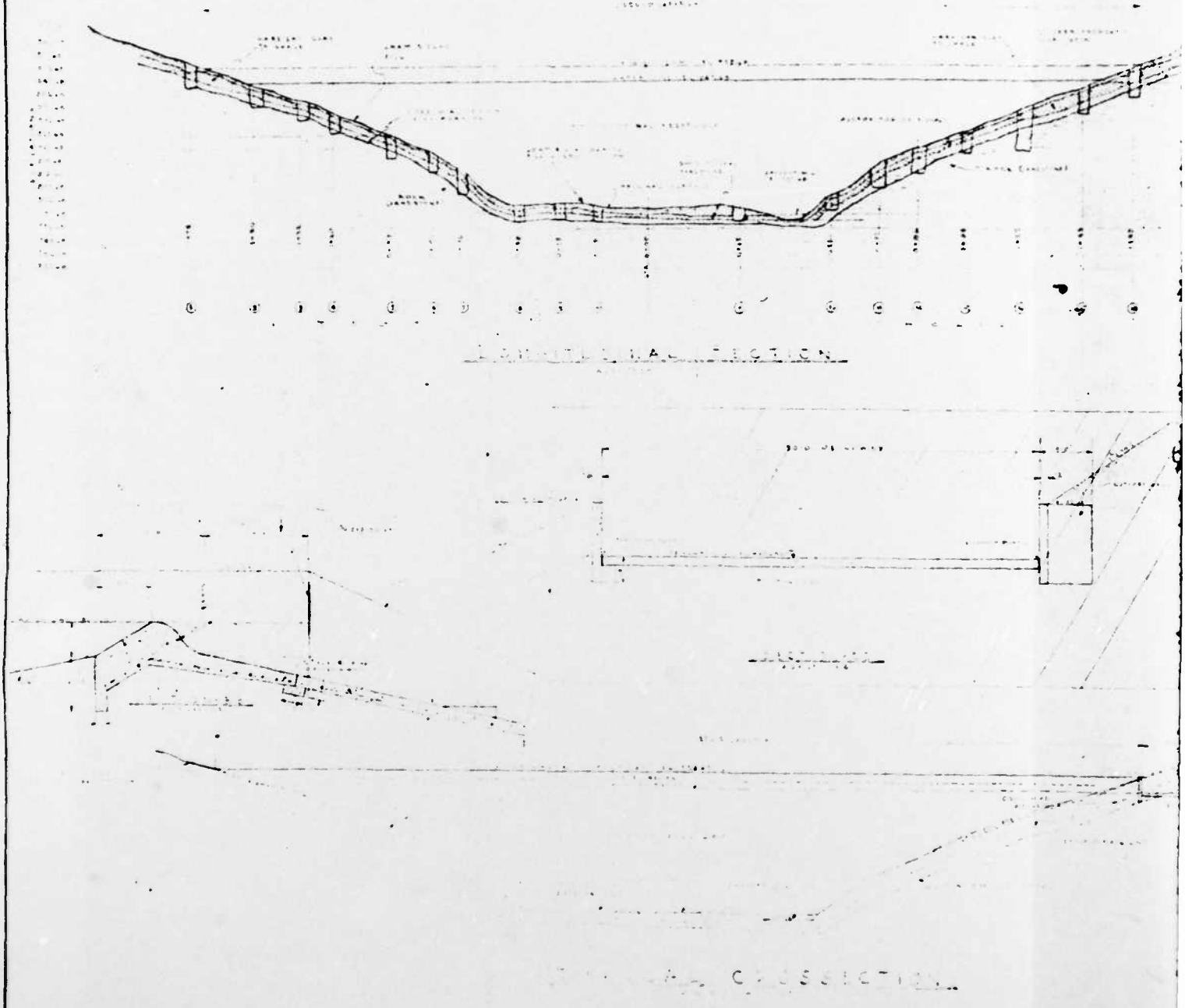


NOTE: SKETCH NOT TO SCALE

FIGURE 1




EARTH-FILL
5'-0" DEEP
25' LENGTH
WEIR No. 2 STREAM
WEIR No. 1
24" GATE VALVE
VALVE PIT
24" PIPE RESULT LOCATION
FILTER PLANT
ADDED FILL
TOE
EARTH
9/26/50
MARKED PRINT
FIELD LOCATION OF
AND RE-LOCATION OF
PLANT AS CONSTRUCTED
FIGURE 2
CONTRACT NO.
REVISIONS
PLOT PLAN
WATER TREATMENT



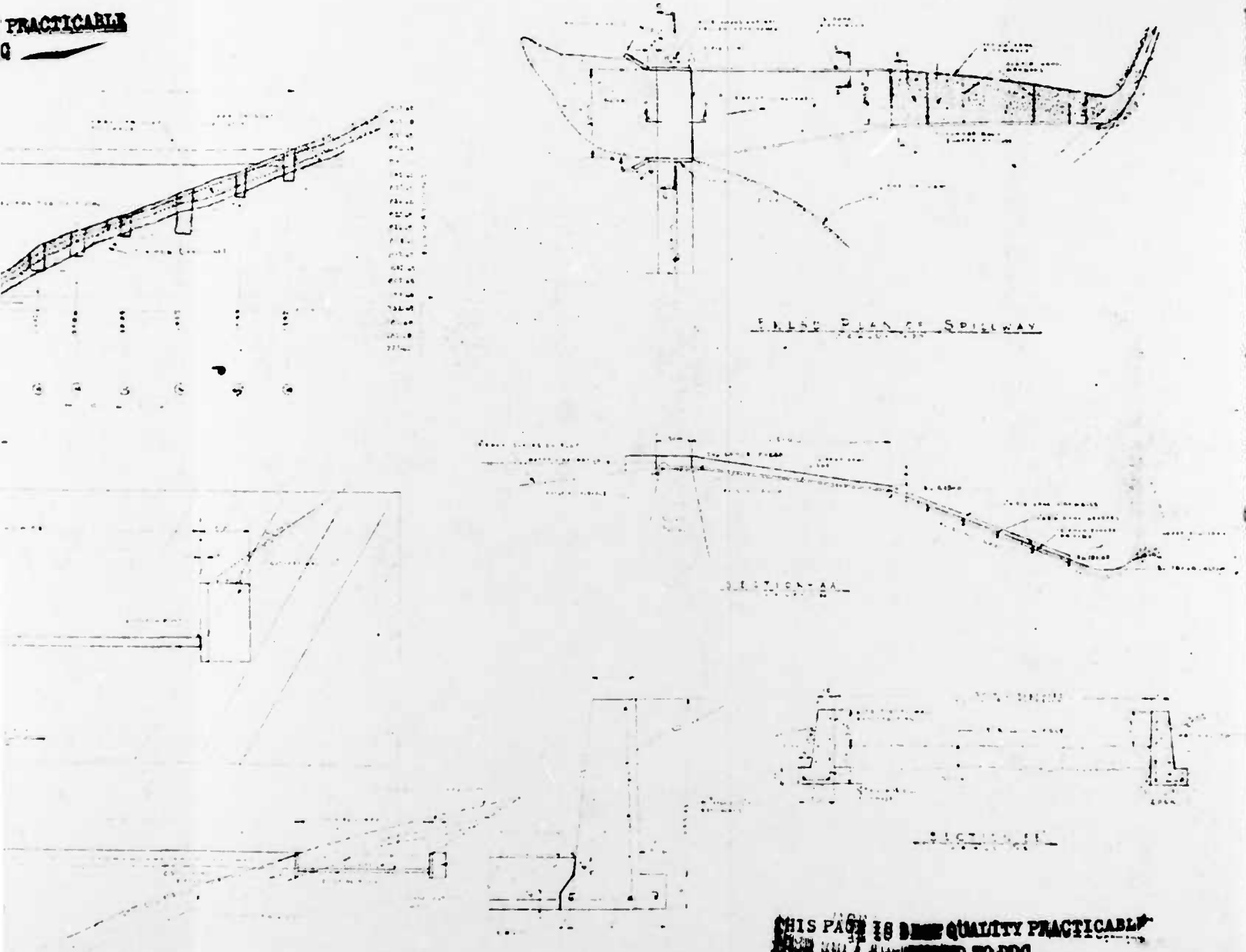
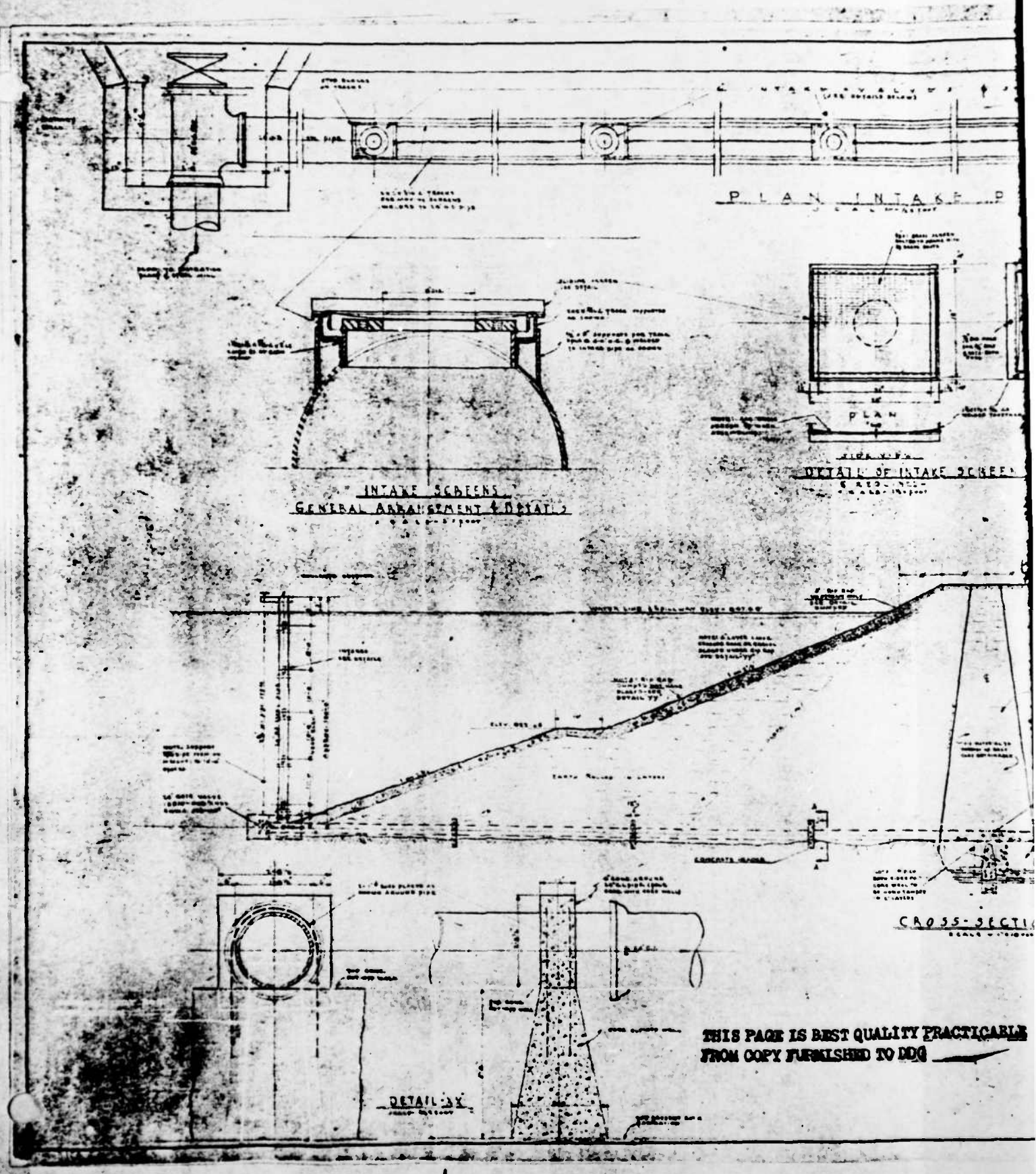
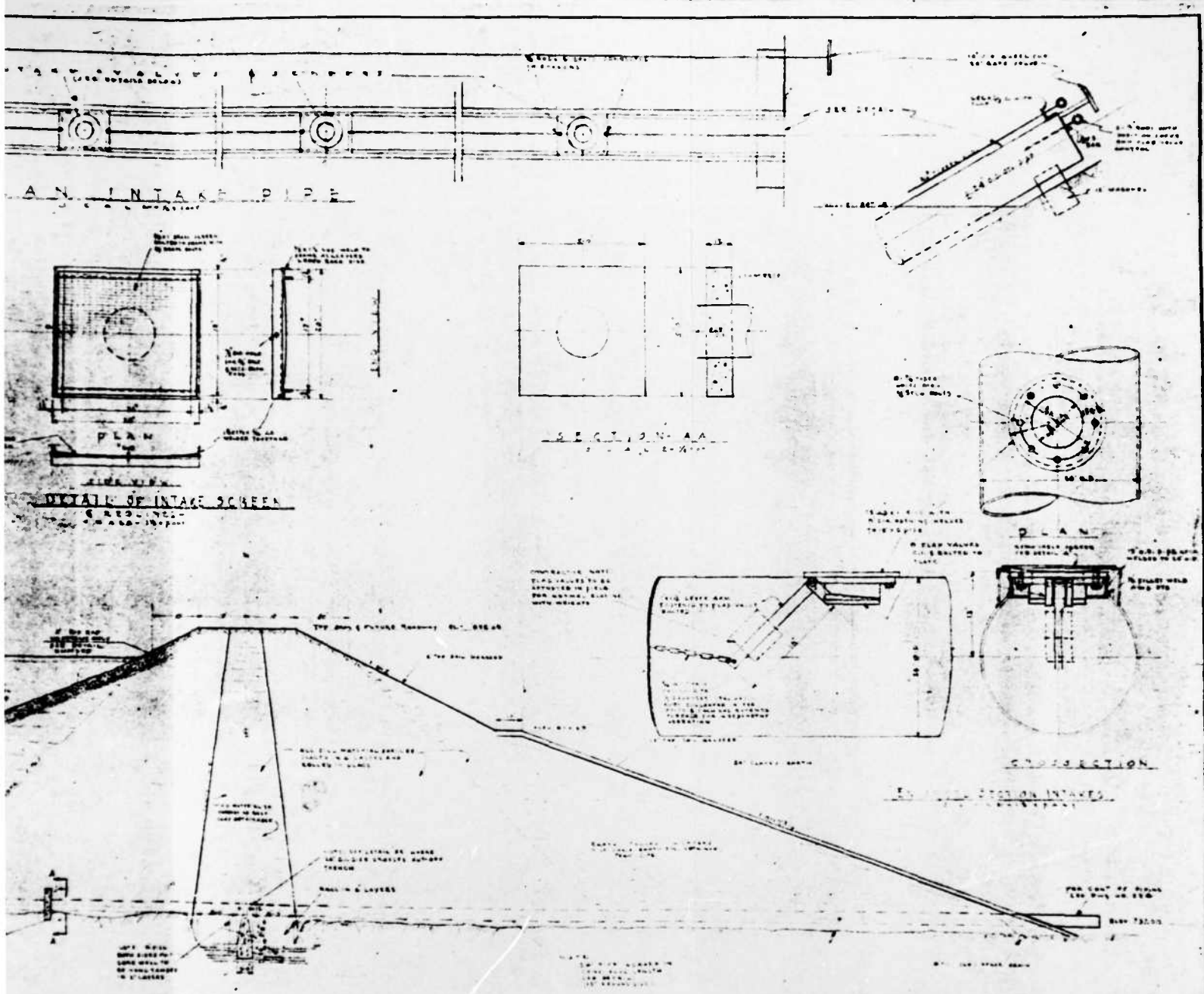


FIGURE 3

		WEST LEECHBURG BOROUGH WATER TREATMENT SYSTEM WEST LEECHBURG WATER AUTHORITY	227





CROSS-SECTION TYPICAL DAM

FIGURE 4

Contract No. 1

Cross Section of Dam and Details

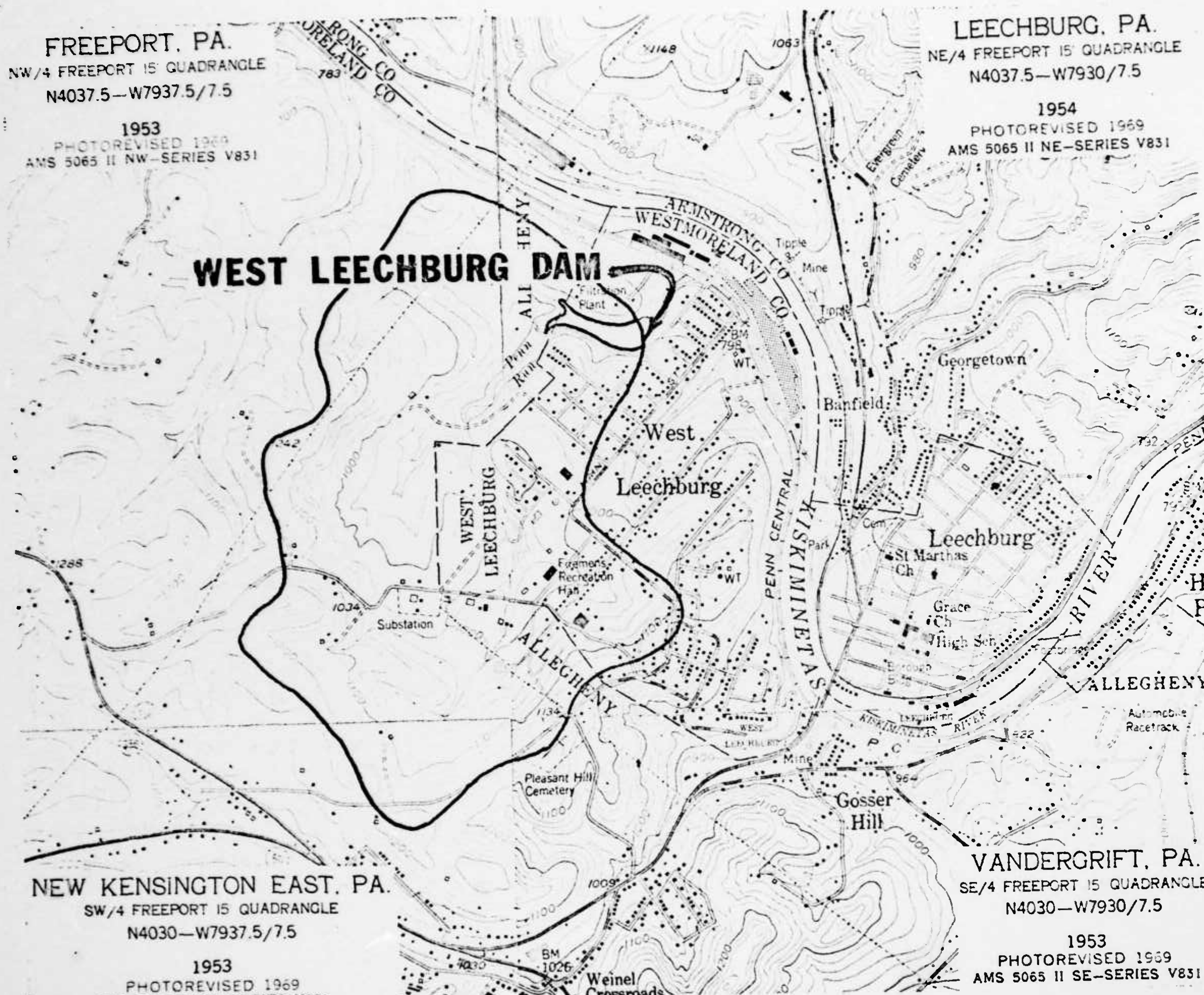
WEST LEECHBURG BOROUGH
WATER TREATMENT SYSTEM

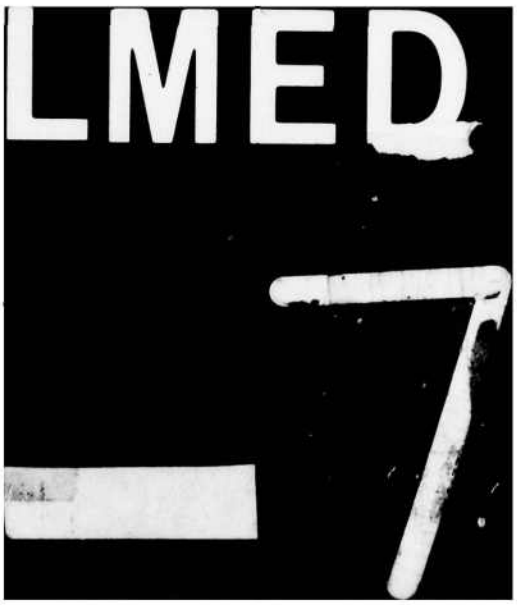
167

2

APPENDIX G

REGIONAL VICINITY MAP


FREEPORT, PA.
NW/4 FREEPORT 15' QUADRANGLE
N4037.5—W7937.5/7.5
1953
PHOTOREVISED 1969
AMS 5065 II NW–SERIES V831
LEECHBURG, PA.
NE/4 FREEPORT 15' QUADRANGLE
N4037.5—W7930/7.5
1954
PHOTOREVISED 1969
AMS 5065 II NE–SERIES V831
WEST LEECHBURG DAM
ARMSTRONG CO
WESTMORELAND CO
Filtration Plant
Penn Run
West Leechburg
WEST LEECHBURG
Firemen's Recreation Hall
Substation
ALLEGHENY
PENN CENTRAL
KISKIMINETAS
Georgetown
Banfield
Tipple
Mine
Evergreen Cemetery
Leechburg
St Marthas Ch
Grace Ch
High Sch
RIVER
ALLEGHENY
Automobile Racetrack
Pleasant Hill Cemetery
Gosser Hill
Weinel Crossroads
NEW KENSINGTON EAST, PA.
SW/4 FREEPORT 15' QUADRANGLE
N4030—W7937.5/7.5
1953
PHOTOREVISED 1969
AMS 5065 II SW–SERIES V831
VANDERGRIFT, PA.
SE/4 FREEPORT 15' QUADRANGLE
N4030—W7930/7.5
1953
PHOTOREVISED 1969
AMS 5065 II SE–SERIES V831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