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TRIBUTARY TO PETERS CREEK
WASHINGTON COUNTY

PENNSYLVANIA

NDI No. PA 00131
PENN DER No. 63-96

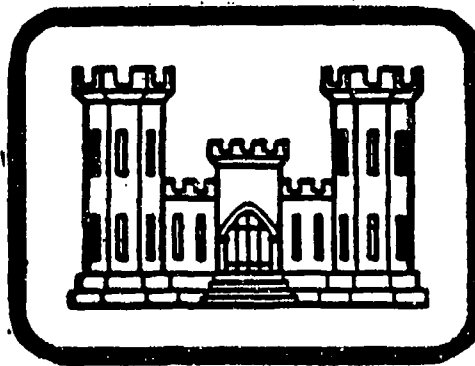
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TRAX FARM DAM

~~TRAX FARMS, INC.~~

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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PREPARED FOR

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

BY

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CONSULTING ENGINEERS
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JULY 1981

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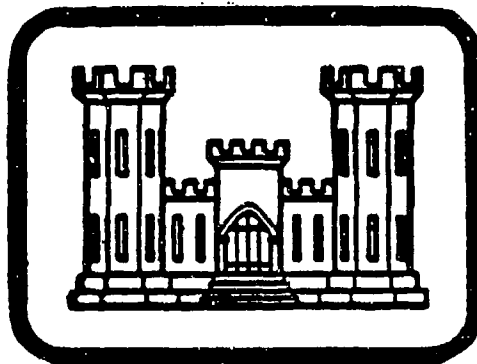
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OHIO RIVER BASIN

TRAX FARM DAM
WASHINGTON COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI NO. PA 00131
PennDER NO. 63-96

TRAX FARMS, INC.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DACW31-81-C-0027

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

Prepared by: ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
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1000 Banksville Road
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Date: July 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, materials testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some time in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Design Flood is based on the estimated "Probable Maximum Flood" (PMF) for the region (greatest reasonably possible storm runoff), or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM: Trax Farm Dam
STATE LOCATION: Pennsylvania
COUNTY LOCATION: Washington
STREAM: Unnamed Tributary
to Peters Creek
DATE OF INSPECTION: 24 April 1981
COORDINATES: Lat. 40°16'42"
Long. 80°02'07"

ASSESSMENT

Based on a review of available design information, visual observations of conditions as they existed on the date of the field inspection, and supporting engineering calculations, the general condition of the Trax Farm Dam is considered to be fair.

This assessment is based primarily on visual observations of the principal and emergency spillway deficiencies and hydrologic/hydraulic calculations of reservoir/spillway performance.

Trax Farm Dam is a "small" size, "high" hazard structure. Corps of Engineers guidelines recommend the one half to one times the Probable Maximum Flood (PMF) as the Spillway Design Flood for a "small" size, "high" hazard dam. Trax Farm Dam's Spillway Design Flood is one half the Probable Maximum Flood. Spillway capacity is "inadequate" because the non-overtopping flood discharge was found, by using the HEC-1 computer program, to be 10 percent of the PMF.

The visual inspection indicated several deficiencies. The deficiencies can be corrected or improved through implementation of the following recommendations.

RECOMMENDATIONS

1. Remove Emergency Spillway Obstructions: Immediately remove the mobile pump and pipeline and the tree from the emergency spillway approach channel.
2. Additional Investigations: It is recommended that the owner retain the services of a registered professional engineer, knowledgeable in the design and construction of earth dams, to study and provide conclusions and/or recommendations on the following:

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D)
Trax Farm Dam

a. The condition and operability of the outlet works facility.

b. Increasing spillway and/or reservoir capacity(s) to accommodate the appropriate design storm.

c. Improvement of emergency spillway drainage conditions.

d. The structural condition of the principal spillway conduit.

3. Emergency Operation and Warning Plan: The owner should develop an Emergency Operation and Warning Plan including:

a. Guidelines for evaluating inflow during periods of heavy precipitation or runoff.

b. Procedures for around-the-clock surveillance during periods of heavy precipitation or runoff.

c. Procedures for drawdown of the reservoir under emergency conditions.

d. Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.

4. Remedial Work. The Phase I investigation of Trax Farm Dam disclosed other minor deficiencies which should be corrected. The recommended remedial work should include:

(1) Improving the embankment crest and groins to remove vehicle ruts and standing water and to provide adequate drainage and erosion protection.

(2) Constructing and installing a larger trash cage on the principal spillway to permit unrestricted flow to the drop inlet even if the cage is partially blocked by debris. Anti-vortex devices should also be provided.

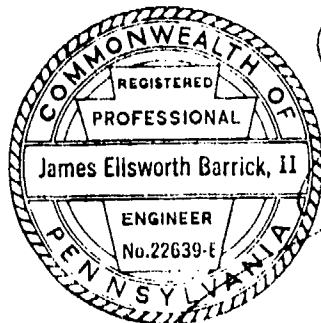
(3) Removal of the trees from the embankment slopes.

5. Maintenance and Inspection Procedures: The owner should develop written maintenance and inspection procedures in the form of checklists and step-by-step instructions.

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D)
Trax Farm Dam

Samuel G. Mazzella 17 July 1981
Samuel G. Mazzella Date
Project Engineer

James P. Hannan 17 July 1981
James P. Hannan Date
Project Engineer

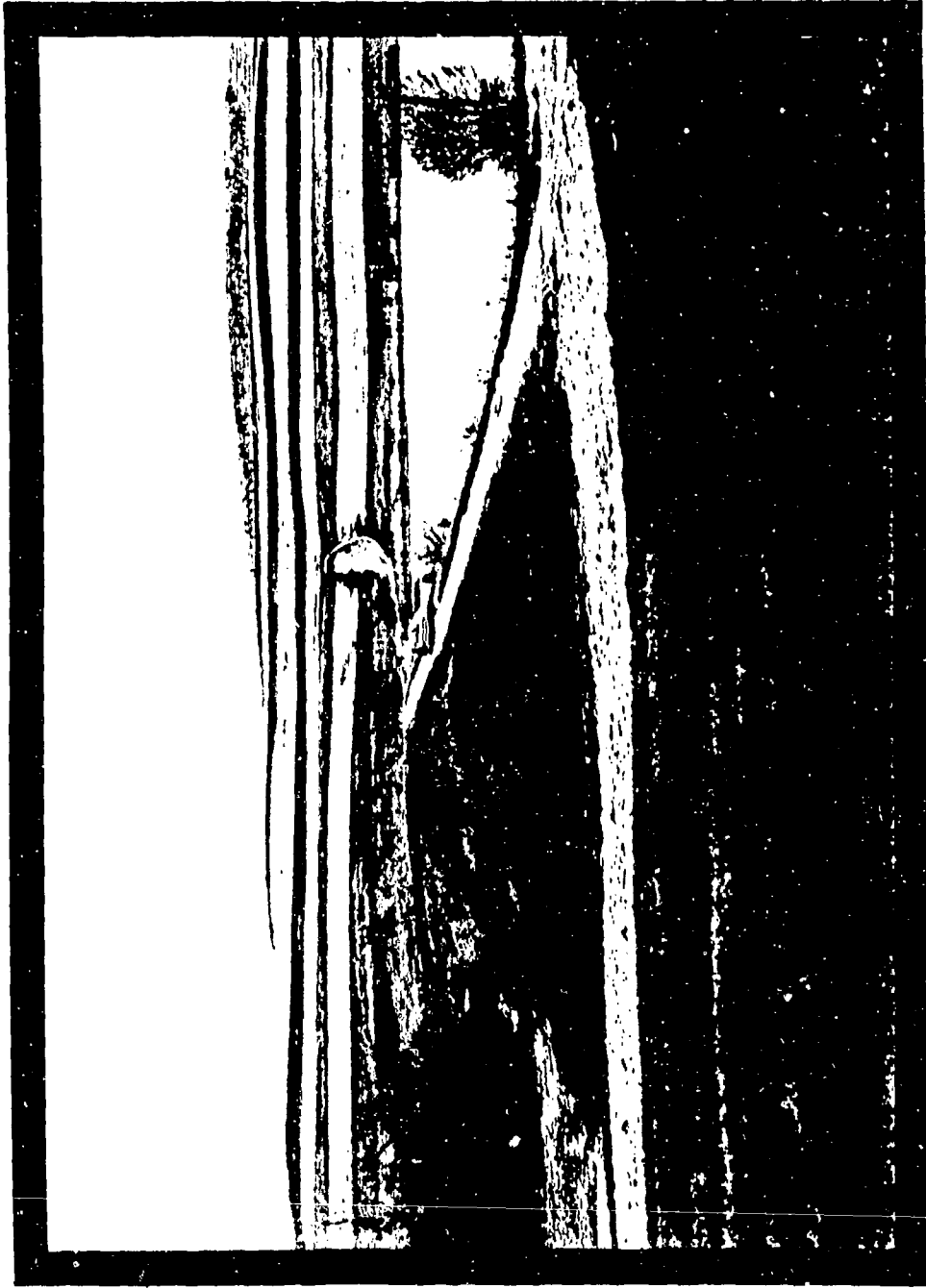


James E. Barrick 17 July 1981
James E. Barrick, P.E. Date
PA Registration No. 022639-E

Approved by:

James W. Peck 11 Aug 81
JAMES W. PECK Date
Colonel, Corps of Engineers
District Engineer

TRAX FARM DAM



OVERVIEW

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
TRAX FARM DAM
NATIONAL I. D. NO. PA 00131
PennDER No. 63-96

SECTION 1
PROJECT INFORMATION

1.1 GENERAL

a. Authority: This Phase I investigation was performed pursuant to authority granted by Public Law 92-367 (National Dam Inspection Act) to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose: The purpose of the investigation is to make a determination on whether or not the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances:

(1) Embankment: The Trax Farm Dam was designed and constructed as a earthfill structure. The embankment (excluding spillway) is 340 feet long and has a maximum toe to crest height of 25.8 feet and a crest width of 10 feet. The embankment's upstream slope was measured to be 5.1H:1V above the waterline; the downstream slope varied between 3.4H:1V and 4.3H:1V.

(2) Principal Spillway: The principal spillway is a drop inlet type steel pipe structure that passes through the embankment near the right central portion of the dam. The intake structure is located just offshore of the upstream slope and consists of a 20 inch diameter (nominal) steel pipe placed vertically into the embankment slope. The inlet is protected by a steel bar trash cage.

(3) Outlet Works: The outlet works or pond drain facility reportedly consists of a low level inlet to the principal spillway conduit which is controlled by a hand operated valve stem.

(4) Emergency Spillway: The emergency spillway is a 20 foot wide, grass lined, trapezoidal, open channel excavated into the right abutment. The overflow section of the spillway consists of a raised area adjacent to the embankment crest that contains an access road.

(5) Downstream Channel: The unnamed tributary to Peters Creek, below Trax Farm Dam, flows through a wide, moderately sloped valley for about three miles to its confluence with Peters Creek east of Finleyville, Pennsylvania. Peters Creek flows about seven miles to a confluence with the Monongahela River at Clairton, Pennsylvania. In the first mile below Trax Farm Dam, at least five inhabited dwellings lie on the floodplain at elevations low enough to possibly be imperiled by high flows.

(6) Freeboard Conditions: Freeboard between the principal spillway crest and the minimum observed elevation of the embankment crest was 1.8 feet on the date of the field inspection.

(7) Reservoir: Trax Farm Dam's lake is about 950 feet long at the operating pool elevation and has a surface area of 4.2 acres. When the pool is at the crest of the dam, the reservoir length increases to 1,100 feet and the surface area is about 5.9 acres.

(8) Watershed: The watershed contributing to Trax Farm Dam's lake consists mostly of agricultural land and woodland. There is also some residential development. The watershed above the dam is 0.24 square mile.

Two small farm ponds are located in the watershed above Trax Farm Dam. Their small size, freeboard and drainage area indicate a very limited effect on the inflows to Trax Farm Dam.

b. Location: Trax Farm Dam is located across an unnamed tributary to Peters Creek in Peters Township, Washington County, Pennsylvania, approximately 2.5 miles northwest of Finleyville, Pennsylvania.

c. Size Classification: The reservoir has a maximum storage capacity of 41 acre-feet and the dam has a toe-to-crest height of 25.8 feet. Based on the Corps of Engineers guidelines, Trax Farm Dam is classified as a "small" size structure.

d. Hazard Classification: Trax Farm Dam is classified as a "high" hazard dam. In the event of a dam failure, at least five inhabited dwellings could be subjected to substantial damage and loss of more than a few lives could result.

e. Ownership: Trax Farm Dam is owned by Trax Farms, Inc. Correspondence can be addressed to:

Trax Farms, Inc.
Route 88
Finleyville, Pennsylvania 15332
Attention: Mr. Alan Trax
(412) 835-3246

f. Purpose of Dam: Trax Farm Dam was constructed to provide a water supply for irrigation.

g. Design and Construction History: The dam was designed by the Soil Conservation Service and was reportedly constructed in 1963 or 1964.

h. Normal Operating Procedure: Trax Farm Dam was designed to operate as an uncontrolled structure. Under normal operating conditions, the pool level is maintained by the inlet crest of the principal spillway.

1.3 PERTINENT DATA

a.	<u>Drainage Area</u>	0.24 sq. mi.
b.	<u>Discharge</u>	
	Maximum Flood at Dam	Unknown
	Emergency Spillway	
	Capacity at Current Top of Dam	71 cfs
c.	<u>Elevation (feet above MSL)**</u>	
	Design Top of Dam	Unknown*
	Current Top of Dam (low point)	1131.5
	Emergency Spillway Overflow Crest	1130.4
	Pool at Time of Inspection	1128.9
	Principal Spillway Overflow Crest	1128.6
	Operating Pool	1128.6
	Principal Spillway Outlet	1105.7
	Embankment Downstream Toe	1105.7
d.	<u>Reservoir Length</u>	
	Maximum Pool	1100 feet
	Normal Pool	950 feet
e.	<u>Reservoir Storage</u>	
	Design Top of Dam	Unknown
	Current Top of Dam	41 acre-feet
	Emergency Spillway Crest	30 acre-feet
	Principal Spillway Crest	21 acre-feet

**Elevations based on USGS topographic map.

f. Reservoir Surface

Design Top of Dam	Unknown
Current Top of Dam	5.9 acres
Emergency Spillway Crest	5.2 acres
Principal Spillway Crest	4.2 acres
Normal Pool	4.2 acres

g. Embankment

Type	Earth
Length (without spillway)	340 feet
Height	25.8 feet
Crest Width	10 feet
Slopes	
Downstream	3.4H:1V to 4.3H:1V
Upstream	5.1H:1V
Zoned Embankment	Unknown
Foundation Cutoff	Unknown
Grout Curtain	Unknown

h. Principal Spillway

Type	20 inch diameter Steel Pipe Conduit
Flow Control	Sharp Crested Weir Drop Inlet
Location	Near center of embankment

i. Outlet Works

Type	Valve*
Location	Low Level Inlet to Principal Spillway
Inlet Invert Elevation	Unknown
Trash Screen	Unknown
Conduit Length	Unknown

j. Emergency Spillway

Type	Trapezoidal, Grass Lined Open Channel
Flow Control	Broad Crested Weir
Location	Right Abutment
Weir Crest Width	20 feet
Weir Crest Length	10 feet

*Information provided by owner's representative.

SECTION 2 ENGINEERING DATA

2.1 DESIGN

a. Data Available: The files of the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER), were reviewed; but no engineering data relating to the original design of the facility were found. Some information was obtained by telephone interviews with a representative of the owner.

b. Design History: The dam was designed by the Soil Conservation Service.

2.2 CONSTRUCTION

Trax Farm Dam was constructed in 1963 or 1964 by an unknown contractor.

2.3 OPERATION

The dam is designed to operate without a dam tender. The principal spillway is a 20 inch diameter steel pipe with a drop inlet through the embankment. A pond drain is reported to be part of the principal spillway facility. The emergency spillway is a 20 foot wide trapezoidal open channel in the right abutment. A deep well passes through the embankment and ground water for farm water supply is pumped from the dam's foundation by an electric motor driven pump located in a pumphouse on the embankment's upstream slope. The well is 180 feet deep and reportedly predates the dam.

2.4 EVALUATION

a. Availability: There were no engineering data available in the files of PennDER, Bureau of Dams and Waterway Management.

b. Adequacy: The lack of available engineering information was mitigated by field inspection and supporting engineering analyses, which are considered adequate for the purpose of this Phase I Inspection Report.

SECTION 3 VISUAL INSPECTION

3.1 FINDINGS

a. General: The field inspection of Trax Farm Dam was performed on 24 April 1981 and consisted of:

(1) Visual observations of the embankment crest and slopes, groins and abutments;

(2) Visual observations of the principal (and emergency) spillways, including intake structures, outlet structures and approach and discharge channels;

(3) Visual observations of the embankment's downstream toe area, including drainage channels and surficial conditions;

(4) Transit stadia field measurements of relative elevations along the embankment crest centerline, spillway and across the embankment slopes;

(5) Visual observations of the reservoir shoreline and watershed;

(6) Visual observations of downstream conditions and evaluation of downstream hazard potential. The visual observations and measurements were made during periods when the reservoir and tailwater were at normal operating levels.

The visual observations checklist, field sketch and field sections and profiles including the observations and comments of the field inspection team are contained in Appendix A. Specific observations are illustrated on photographs in Appendix C. Detailed findings of the field inspection are presented in the following sections.

b. Embankment:

(1) Crest: On the date of the inspection, the crest of Trax Farm Dam was slightly higher near the central portion of the dam than at either abutment. On the right, the crest dropped as it approached the emergency spillway channel, and on the left it dropped as it approached the access road across the left abutment.

The horizontal alignment of the crest was slightly convex (bowed) in the downstream direction. However, there were no offsets, cracks or other indications of anomalous movement of the embankment. The bowed conditions appeared to be longstanding.

(2) Upstream Slope: The upstream face of the embankment was generally uniform and contained a dense covering of grass and small brush. A few small trees and a considerable growth of cattails were observed at the waterline. There were no signs of cracking, bulging or other movements indicative of embankment distress.

(3) Downstream Slope: The downstream face was completely covered with a thick stand of grass. The slope was generally uniform from toe to crest and from abutment to abutment and no sloughs, scarps, or significant bulges were observed.

The embankment groins (junction of embankment and abutment) were in fair to good condition. They were vegetated and showed no signs of instability. However, the left groin contained noticeable erosion and some sediment deposits, apparently the result of surface runoff, flows from the upper left abutment. Some wheel rutting was also noted in and about the left groin.

The immediate downstream toe of the embankment contained some minor wheel rutting and some minor erosion, apparently as a result of wheel rutting. A swampy area was noted at the base of the embankment but the origin of the water could not be determined. No open seeps or water related vegetation were observed in the vicinity of the wet area.

c. Abutments:

(1) Left: The left abutment was cleared of trees and contained only grassed land and recently plowed fields. There was no sign of slope instability, seepage or significant erosion anywhere on the abutment. Some minor erosion was observed in the vicinity of the access road from Township Road 832.

(2) Right: The right abutment, immediately above the downstream slope of the dam, was cleared of trees and contained grassed land and the emergency spillway discharge channel. There was no sign of slope instability anywhere on this portion of the abutment.

Wet, swampy conditions were observed in the emergency spillway discharge channel bottom and on the abutment slope below the discharge channel outlet. It could not be determined whether the water was the result of seepage or poor surface drainage. However, the condition appeared to be longstanding and may be the result of seepage from the right abutment above. In the upper portion of the discharge channel, the wet areas appeared to exist at elevations above the observed reservoir pool level.

Below the discharge outlet, the hillside contained wet, swampy conditions with flowing water. Some erosion has occurred at the end of the discharge channel and down the hillside below to a point where the flow would enter the channel at the downstream toe of the embankment.

Considerable wheel rutting was observed along the length of the spillway discharge channel.

The lower right abutment consists of a relatively steep wooded slope that lies along the channel below the toe of the embankment.

d. Principal Spillway:

(1) Configuration: The principal spillway consists of a steel pipe conduit with steel pipe drop inlet structure.

(2) Inlet: The inlet consists of a 20 inch diameter (nominal) steel pipe placed vertically into the upstream slope of the embankment. The inlet was located approximately five feet offshore of the upstream slope and was protected by a steel bar trash cage. On the date of inspection, the trash cage contained considerable vegetal debris that had raised the reservoir pool level approximately 4 inches above normal. Because of the water level, the condition of the pipe could not be observed.

(3) Conduit: The only visible portion of the conduit that could be inspected was at the immediate downstream toe of the embankment where the conduit discharges to the downstream channel. The conduit was measured to be 20 inch diameter (nominal) steel pipe that was generally rusted and deteriorated; the original pipe thickness could not be determined.

On the date of inspection, the depth of flowing water at the outfall was 0.3 foot.

(4) Discharge Channel: The conduit discharges directly to the downstream channel below the dam.

e. Emergency Spillway:

(1) Approach Channel: On the date of inspection, the approach channel to the emergency spillway contained two obstructions that might reduce the capacity of the spillway. The obstructions were a tree at the reservoir shoreline and a mobile pump unit located approximately five feet from the shoreline near the right spillway slope. Otherwise, the approach channel was generally grass and brush lined. Some cattail growth was noted at the shoreline.

(2) Overflow Crest: The emergency spillway overflow crest appeared to be located along the access road that crosses the spillway. In this area, the roadway is raised slightly and is generally flat, resulting in a broad-crested weir flow control.

On the date of inspection, the roadway was deeply wheel rutted and muddy. Many of the ruts contained standing water. No vegetation was observed anywhere on the overflow crest.

(3) Discharge Channel: The discharge channel is a grass lined excavation in the right abutment that discharges to the right abutment slope directly above the downstream toe of the embankment. On the date of inspection, the base of the discharge channel was extremely wet and surface soils were very soft; numerous wheel ruts were observed along the length of the discharge channel. The origin of the wet conditions could not be determined but the upper portion of the wet area appeared to exist at elevations above the reservoir pool level.

At the downstream end of the discharge channel, an eroded area has developed, apparently as a result of flows leaving the discharge channel.

Slope erosion and wet conditions were also observed on the right abutment below the discharge channel outlet. These are described in Section 3.1-c.(2) above.

f. Outlet Works: The only visible evidence of an outlet works facility was a valve stem located inside a vertical steel pipe immediately behind the principal spillway inlet. The operability of the stem was not tested on the date of inspection.

g. Water Supply Facility: A water supply pump was observed inside a concrete block pump house on the embankment's upstream slope at approximately the center of the dam. The location and alignment of the discharge line were not observed. The pump lifts water from a deep well in the dam's foundation. The well is reportedly 180 feet deep and cased through the embankment. The well predates the dam.

h. Instrumentation: No instrumentation was observed on the date of inspection.

i. Reservoir:

(1) Slopes: The slopes above the reservoir shoreline were generally mild around the entire perimeter of the reservoir. The slopes were either grass covered or recently tilled farmland. There were no indications of erosion or slope instability anywhere along the perimeter of the reservoir.

(2) Inlet Stream: The inlet stream enters the reservoir through a natural tree lined valley. Generally, the inlet stream channel was moderately sloped and appeared to sustain only intermittent flows.

(3) Sedimentation: Some minor deltaic development was noted at the point where the inlet stream entered the reservoir, but the sediment deposits were heavily vegetated. No recent sedimentation activity was noted.

(4) Watershed: The watershed contributing to Trax Farm Lake was generally as indicated by the most recent USGS topographic map. Ground cover consists primarily of grass and pastureland, recently tilled fields and woodland. A few residential structures exist within the watershed. There was no indication of significant new construction or mining activity within the watershed on the date of inspection.

Two impoundments are located in the watershed above Trax Farm Dam. Both structures are earthfill embankments of a design similar to the Trax Farm Dam facility.

The nearer structure is located in a tributary valley just upstream of the upper end of the lake. The dam is approximately 25 feet high, has a crest length of approximately 375 feet and an emergency spillway excavated into the right abutment. The embankment and spillway were well vegetated on the date of inspection. The reservoir pool surface area was estimated to be approximately one acre and the freeboard on the date of inspection was estimated to be three feet.

The second structure is in a tributary valley approximately 1,000 feet upstream of the upper end of the reservoir. This facility is approximately 30 feet high, has a crest length of approximately 315 feet and an open channel emergency spillway excavated into the right abutment. The structure and spillway were well vegetated on the date of inspection. The reservoir pool surface area was estimated to be approximately two acres and the freeboard on the date of inspection was approximately 2.6 feet.

i. Downstream Conditions:

(1) Downstream Channel: The downstream channel below the principal spillway outlet is a natural creek channel that is tree lined for approximately 500 feet below the dam. In this reach, the channel is generally straight, two to three feet deep and five to eight feet wide. The capacity of the downstream channel appeared to be more than adequate to carry away flows from the principal spillway conduit.

Approximately 800 feet below the dam, an inhabited residential dwelling lies on the floodplain immediately adjacent to the creek channel. Immediately beyond the dwelling, the channel passes beneath Township Road 755.

(2) Floodplain Development: In the first mile below the dam, there are at least five inhabited dwellings on the floodplain at elevations low enough to possibly be affected by high flows.

3.2 EVALUATION

The following evaluations are based on the visual inspections performed on 24 April 1981.

a. Embankment: The condition of Trax Farm Dam embankment was good. Only minor deficiencies of the embankment were observed. These included:

(1) An uneven vertical crest profile and considerable disturbance of the crest by vehicular traffic. Wheel ruts containing standing water were observed at locations.

(2) Erosion and sediment in the left groin of the embankment resulting from runoff from the upper left abutment.

(3) Wheel rutting of the left groin and embankment toe area.

(4) A wet spot in the embankment's downstream slope immediately above the discharge channel.

(5) Small trees growing on the upstream slope of the embankment.

b. Principal Spillway: The condition of the principal spillway was fair. This is based on observed partial clogging of the trash cage at the intake and observed deterioration of the conduit at the downstream toe. In spite of the deficiencies, the principal spillway facility appeared to be operating properly.

c. Emergency Spillway: The condition of the emergency spillway was poor on the date of inspection. This is based on observations of:

(1) Two significant obstructions in the emergency spillway approach channel.

(2) A muddy, rutted overflow crest that would be easily eroded by flows in the spillway.

(3) Wet, swampy conditions in the discharge channel that would promote erosion of the spillway in the event of high flows.

(4) A discharge channel alignment that would permit spillway discharge to flow into the right groin of the embankment near the downstream toe.

(5) Erosion of the right abutment slope below the discharge channel outlet.

d. Outlet Works: The condition of the outlet works facility could not be determined. An apparent valve stem was observed but its function could not be determined and its operability was not tested.

e. Hazard Potential: Based upon the observed height of the dam and downstream floodplain conditions, Trax Farm Dam was assigned a "high" hazard potential rating.

SECTION 4 OPERATIONAL FEATURES

4.1 PROCEDURE

Reservoir pool level is maintained by the crest of the principal spillway. Normal operating conditions do not require a dam tender.

A possible outlet works control was observed, but its function and condition were not determined during the field inspection.

4.2 MAINTENANCE OF DAM

The embankment and appurtenances are maintained by Trax Farms. Maintenance reportedly consists of periodically repairing eroded areas and making miscellaneous repairs as necessary.

4.3 INSPECTION OF DAM

Trax Farms, Inc., is required by the State of Pennsylvania to inspect the dam annually and make needed repairs.

4.4 WARNING PROCEDURE

There is no warning system and no formal emergency procedure to alert or evacuate downstream residents upon the threat of a dam failure.

4.5 EVALUATION

The maintenance program should be continued and improved. However, there are no written operation, maintenance or inspection procedures, nor is there a warning system or formal emergency procedure for this dam. These procedures should be developed in the form of checklists and step by step instructions and should be implemented as necessary.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

a. Design Data: The Trax Farm Dam has a watershed of 154 acres which is vegetated primarily by agricultural lands and woodland. The watershed is about 3,500 feet long and 2,500 feet wide and has a maximum elevation of about 1,270 feet (MSL). At normal pool, the dam impounds a reservoir with a surface area of about 4.2 acres and a storage volume of about 21 acre-feet. Normal pool level is maintained at about Elevation 1128.6 by the overflow crest of the principal spillway.

No calculation or information was available on the design spillway capacity and/or embankment freeboard requirement for this structure and watershed at its time of design. Trax Farm Dam's spillway capacity for the observed cross-section and existing freeboard condition was computed to be 71 cfs.

No additional hydrologic calculations were found relating reservoir/spillway performance to the Probable Maximum Flood (PMF) or fractions thereof.

b. Experience Data: Records are not kept of reservoir level or rainfall amounts. There is no record or report of the embankment ever being overtopped.

c. Visual Observations: On the date of the field inspection, no serious deficiencies were observed that would prevent the emergency spillway from functioning. However, a mobile pump and tree were partially blocking the spillway's approach channel, reducing the spillway's flood discharge capacity. This condition was not considered in the following analyses and should be corrected as soon as possible.

The watershed above Trax Farm Dam contained two farm ponds off stream of the main channel. These two facilities would not have a significant impact on Trax Farm Dam during a one half PMF event due to their small drainage area, storage capacity and limited freeboard.

d. Overtopping Potential: Overtopping potential was investigated through the development of the Probable Maximum Flood for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway. The Corps of Engineers guidelines recommend 0.5 to one times the Probable Maximum Flood (PMF) for "small" size, "high" hazard dams. Because the dam's storage capacity places it at the low end of the "small" size category, Trax Farm Dam was assigned a Spillway Design Flood (SDF) of one-half the PMF.

Hydrometeorological Report No. 33 indicates the adjusted 24 hour Probable Maximum Precipitation (PMP) for the subject site is 19.3 inches.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U. S. Army Corps of Engineers, Davis, California, July 1978. The major methodologies and key input data for this program are discussed briefly in Appendix D.

The peak inflow to the Trax Farm Dam was determined by HEC-1 to be 763 cfs for the PMF AND 382 for the SDF.

An initial pool elevation of 1128.6 was assumed prior to commencement of the storm but the spillway's capacity was ignored because of the high clogging potential of the inlet.

e. Spillway Adequacy: The capacity of the combined reservoir and spillway system was determined to be 10 percent of the PMF by HEC-1. According to Corps of Engineers' guidelines, Trax Farm Dam's spillway is "inadequate".

At 0.50 PMF, Trax Farm Dam would be overtopped by a maximum 0.91 foot of water for 7 hours and 10 minutes. In the opinion of the evaluating engineer, this overtopping would not cause failure of the embankment. This is based on the observation that the maximum overtopping depth is limited to a very small segment of the dam crest adjacent to the emergency spillway overflow crest. The average overtopping depth, duration, and crest length are much smaller than the indicated maximum. The well vegetated upstream and downstream slopes should effectively mitigate the overtopping conditions. Consequently, a breach analysis and downstream routing were not performed.

Therefore, in accordance with Corps of Engineers guidelines, Trax Farm Dam's spillway is rated as "inadequate", but not "seriously inadequate".

SECTION 6 STRUCTURAL STABILITY

6.1 AVAILABLE INFORMATION

a. Design and Construction Data: No design documentation or calculations were available for review.

b. Operating Records: There are no written operating records or procedures for this dam.

c. Mining Activity: The Pittsburgh Coal Seam lies approximately 180 feet beneath the dam and impoundment and has been extensively deep mined in the vicinity. The Waynesburg Coal Seam outcrops in adjacent hillsides but is unmined in the vicinity of the dam.

d. Visual Observations:

(1) Embankment: The field inspection disclosed no evidence of a high ground water level in the embankment. There was no pronounced "line of seepage", and no significant bulges, surface sloughs, or cracking were observed. A swampy area was noted at the base of the embankment and the origin of the water could not be determined. However, there was no surface indication of long term wetness. Field measurements indicated a relatively flat downstream slope varying from 3.4H:1V near the crest to 4.3H:1V near the toe.

The embankment's upstream slope was densely vegetated with grass and brush. There was no indication of erosion or slope instability.

(2) Principal Spillway: The principal spillway inlet was clogged with debris and the outlet was deteriorated and rusted over the entire visible portion.

(3) Emergency Spillway: The emergency spillway was partially vegetated with grass and brush and side slopes appeared to be stable. Standing water and soft soils were observed on the overflow crest and discharge channel base.

(4) Evidence of Mine Subsidence: None.

e. Performance: No information was available on performance of Trax Farm Dam since its construction.

6.2 EVALUATION

a. Design Documents: No design documentation was available to evaluate the structure.

b. Embankment: Based on the results of the visual observations of embankment slopes, materials and seepage conditions, Trax Farm Dam appears to have an adequate margin of safety against sliding.

c. Principal Spillway: The principal spillway appeared to be functional, but is considered to be in poor condition. This is based on observed debris clogging of the inlet and deterioration of the conduit at the outlet.

d. Emergency Spillway: The emergency spillway is considered to be in poor condition. This is based on observed obstructions in the approach channel and soft soils (potentially erodable) on the overflow crest and discharge channel base. Channel side slopes appeared to be stable.

e. Seismic Stability: According to the Seismic Risk Map of the United States, Trax Farm Dam is located in Zone 1 where damage due to earthquakes would most likely be minor.

A dam located in Seismic Zone 1 may be assumed to present no hazard from an earthquake provided static stability conditions are satisfactory and conventional safety margins exist. No calculations were developed to verify this assessment, however.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Evaluation:

(1) Embankment: Trax Farm Dam's embankment is considered to be in good condition. This assessment is based on visual observations that revealed only minor deficiencies.

(2) Principal Spillway: The condition of the principal spillway is considered to be poor. This assessment is based on visual observations of structural and operational deficiencies.

(3) Outlet Works: The outlet works facility could not be evaluated to determine its condition.

(4) Emergency Spillway: The emergency spillway is considered to be in poor condition. This assessment is based on visual observations of channel obstructions, alignment, wetness conditions, and an "inadequate" capacity rating as determined using HEC-1.

(5) Emergency, Maintenance, and Inspection Plans: The lack of a documented emergency operation and warning plan, and maintenance and inspection procedures is considered to be a deficiency.

b. Adequacy of Information: The information available on design, construction, operation and performance history in combination with visual observations and hydrology and hydraulic calculations was sufficient to evaluate the embankment and appurtenant structures in accordance with the Phase I investigation guidelines.

c. Urgency: The recommendations presented in Section 7.2 should be implemented immediately.

d. Necessity for Further Studies: Additional engineering information should be developed to improve the condition of the emergency spillway and to evaluate the condition and operability of the outlet works facility.

7.2 RECOMMENDATIONS

a. Remove Emergency Spillway Obstructions: Immediately remove the mobile pump and pipeline and the tree from the emergency spillway approach channel.

b. Additional Investigations: It is recommended that the owner retain the services of a registered professional engineer, knowledgeable in the design and construction of earth dams, to study and provide conclusions and/or recommendations on the following:

- (1) The condition and operability of the outlet works facility.
- (2) Increasing spillway and/or reservoir capacity(s) to accommodate the appropriate design storm.
- (3) Improvement of emergency spillway drainage conditions.
- (4) The structural condition of the principal spillway conduit.

c. Emergency Operation and Warning Plan: The owner should develop an Emergency Operation and Warning Plan including:

- (1) Guidelines for evaluating inflow during periods of heavy precipitation or runoff.
- (2) Procedures for around-the-clock surveillance during periods of heavy precipitation or runoff.
- (3) Procedures for drawdown of the reservoir under emergency conditions.
- (4) Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.

d. Remedial Work: The Phase I investigation of Trax Farm Dam disclosed other minor deficiencies which should be corrected. The recommended remedial work should include:

- (1) Improving the embankment crest and groins to remove vehicle ruts and standing water and to provide adequate drainage and erosion protection.
- (2) Constructing and installing a larger trash cage on the principal spillway to permit unrestricted flow to the drop inlet even if the cage is partially blocked by debris. Anti-vortex devices should also be provided.
- (3) Removal of trees from the embankment slopes.

e. Maintenance and Inspection Procedures: The owner should develop written maintenance and inspection procedures in the form of checklists and step-by-step instructions.

APPENDIX A
VISUAL INSPECTION CHECKLIST

VISUAL OBSERVATIONS CHECKLIST I
(NON-MASONRY IMPOUNDING STRUCTURE)

Name of Dam Trax Farm County Washington State Pennsylvania National ID # PA 00131

Type of Dam Earth Hazard Category High

Dates of Inspection 24 April 1981 Weather Cloudy, cool, light rain temperature 40°F

Pool Elevation at Time of Inspection 1128.9 (MSL)

Tailwater at Time of Inspection 1105.7 (MSL)

Inspection Personnel: J. E. Barrick, P.E. Ackenheil & Associates, Project Manager
and Hydrologist
J. P. Hannan Ackenheil & Associates, Geotechnical Engineer
S. G. Mazzella Ackenheil & Associates, Civil Engineer

Recorder J. E. Barrick

GEO Project G80138-I
PENNDER I.D. No. 63-96

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	No sloughing or erosion of the embankment slopes was observed. Some erosion of both embankment groins and the right abutment area below the spillway was observed. The erosion appeared to be the result of surface runoff. The most significant erosion was on the right abutment immediately below the discharge point for the emergency spillway discharge channel.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The vertical alignment of the crest was slightly uneven. The high point of the crest was observed to be approximately at the center of the embankment and the crest dipped toward both abutments. The horizontal alignment of the embankment was slightly bowed in the downstream direction. However, there were no offsets or indications of post-construction alignment changes.	
RIPRAP FAILURES	None observed.	
SETTLEMENT	None observed.	

EMBANKMENT (CONTINUED)

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
JUNCTION OF EMBANKMENT AND ABUTMENT	<p>The junction of the embankment and left abutment contained an ill defined surface drainage channel that has caused minor erosion and subsequent deposition of sediment. Wheel ruts were noted in the general vicinity. The condition did not appear to be serious. There was no seepage or indication of slope instability in the vicinity of the left groin.</p> <p>The junction of the embankment and the left groin gave no indication of seepage or swampy conditions and contained only very minor erosion in the lower reaches. There was no indication of slope instability anywhere in the vicinity of the right groin.</p>	
JUNCTION OF EMBANKMENT AND EMERGENCY SPILLWAY	<p>The junction of the embankment and the emergency spillway contained some barren areas and had wheel ruts with standing water.</p>	
ANY NOTICEABLE SEEPAGE	<p>Wet swampy conditions were observed generally through the length of the emergency spillway discharge channel and on the hillside below the discharge point of the discharge channel. The origin of the water could not be determined but did not appear to be the result of poor surface drainage. Soft soils in the spillway and eroded conditions in the abutment below the spillway were observed. Portions of the wet zones in the upper discharge channel were at elevations above the reservoir pool level.</p> <p>Some wet soil conditions were noted at the immediate downstream toe of the embankment but it could not be determined whether this was the result of seepage or surface drainage from recent rains in the area.</p>	

EMBANKMENT (CONTINUED)

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
DRAINS	None observed.	
STAFF GAUGE AND RECORDER	None observed.	
SURFICIAL CONDITIONS	<p>The embankment crest was partially vegetated with grass but contained considerable barren areas as a result of an access road across the embankment crest. Numerous wheel ruts were observed, many of which contained standing water.</p> <p>The upstream slope of the embankment was densely vegetated with grass and brush. Several small trees were noted at the waterline and considerable cattails were observed. There were no signs of erosion or instability of the upstream slope.</p> <p>The downstream slope was generally uniform from toe to crest and abutment to abutment. Some local unevenness was noted, but there were no indications of anomalous movement of the embankment. Some wheel rutting was observed in the lower portion of the embankment's downstream slope. No scarps or indications of sloughing or indications of a high groundwater level were observed anywhere on the downstream slope.</p>	

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONFIGURATION	<p>The principal spillway is a drop inlet type steel pipe structure that passes through the embankment near the right central portion of the dam.</p>	
INTAKE	<p>The principal spillway intake structure is located just off shore of the upstream slope and consists of a 20 inch diameter (nominal) steel pipe placed vertically into the embankment slope. The inlet is protected by a steel bar trash cage which was clogged to a depth of approximately 4 inches by brush, weeds and other vegetal matter. Because of the depth of flow, the condition of the steel pipe could not be observed.</p>	
CONDUIT	<p>The principal spillway conduit could not be observed except at the immediate downstream toe of the embankment where it discharges to the downstream channel. The pipe was observed to be a 20 inch (nominal) diameter steel pipe which showed signs of significant deterioration.</p> <p>At the outfall, the discharging water depth was approximately 0.3 foot.</p> <p>No strong indications of seepage were observed in the immediate vicinity of the pipe at the downstream toe.</p>	

EMERGENCY SPILLWAY

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
APPROACH CHANNEL	<p>The approach channel to the emergency spillway contained two obstructions that could hinder the performance of the spillway during high flows. The obstructions were a small tree at the reservoir waterline and a mobile pump unit just above the waterline.</p>	
OVERFLOW SECTION	<p>The overflow section of the emergency spillway consists of a raised area that contains the access road that crosses the crest of the dam. The overflow crest was barren, wheel rutted and generally wet and muddy on the date of observation.</p>	
DISCHARGE CHANNEL	<p>The discharge channel of the emergency spillway is an open channel that crosses the right abutment and discharges to the hillside above the toe of the dam. The channel was vegetated on the date of inspection but contained considerable wet, swampy areas. The origin of the water causing these conditions could not be determined. Some water related vegetation was noted in and just immediately below the emergency spillway discharge channel. Numerous wheel ruts containing standing water and some barren and eroded areas were observed near the lower end of the discharge channel.</p> <p>No sign of significant erosion or instability of emergency spillway side slopes was observed.</p>	

OUTLET WORKS

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONTROL	The only indication of an outlet works or pond drain facility was a vertical pipe containing a control stem located immediately behind the drop inlet to the principal spillway. The mode of operation of the stem could not be determined and the performance of the facility was not evaluated during inspection.	

WATER SUPPLY FACILITY

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
PUMP HOUSE	A concrete block pump house is located on the upstream slope of the embankment and contains an electric motor operated pump. The pump reportedly is part of a ground water well water supply system.	

INSTRUMENTATION

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
MONUMENTATION SURVEYS	None observed.	
WEIRS	None observed.	
PIEZOMETERS	None observed.	
OBSERVATION WELLS	None observed.	

RESERVOIR

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SLOPES	<p>The reservoir slopes were mild to moderate and were generally grass covered in the lower reaches. Portions of the reservoir slopes had recently been plowed for agricultural cultivation. There were no signs of significant slope instability or significant erosion of reservoir slopes within the limits of the impoundment.</p>	
SEDIMENTATION	<p>No significant sedimentation was observed, although some deltaic development was noted at the inlet stream. The deltaic development was heavily vegetated and appeared to be a long standing phenomenon.</p>	
INLET STREAM	<p>The inlet stream approaches the reservoir through a natural gently sloping, wooded valley. Because of the reservoir's location high in the watershed, the inlet stream is intermittent.</p>	
WATERSHED	<p>The watershed consists generally of woodland, pasture and cultivated fields. Some residential development was noted. The watershed appeared to be generally as indicated on the most recent USGS topographic map.</p> <p>Two smaller reservoirs were noted in the watershed above Trax Farm Dam. The closer reservoir consisted of an earthen dam approximately 25 feet high and having a surface area of one acre. The crest length was estimated to be 375 feet. The upper impoundment was formed by an earthen dam that was estimated to be 30 feet high, 315 feet long and the impoundment was estimated to have a surface area of two acres.</p>	

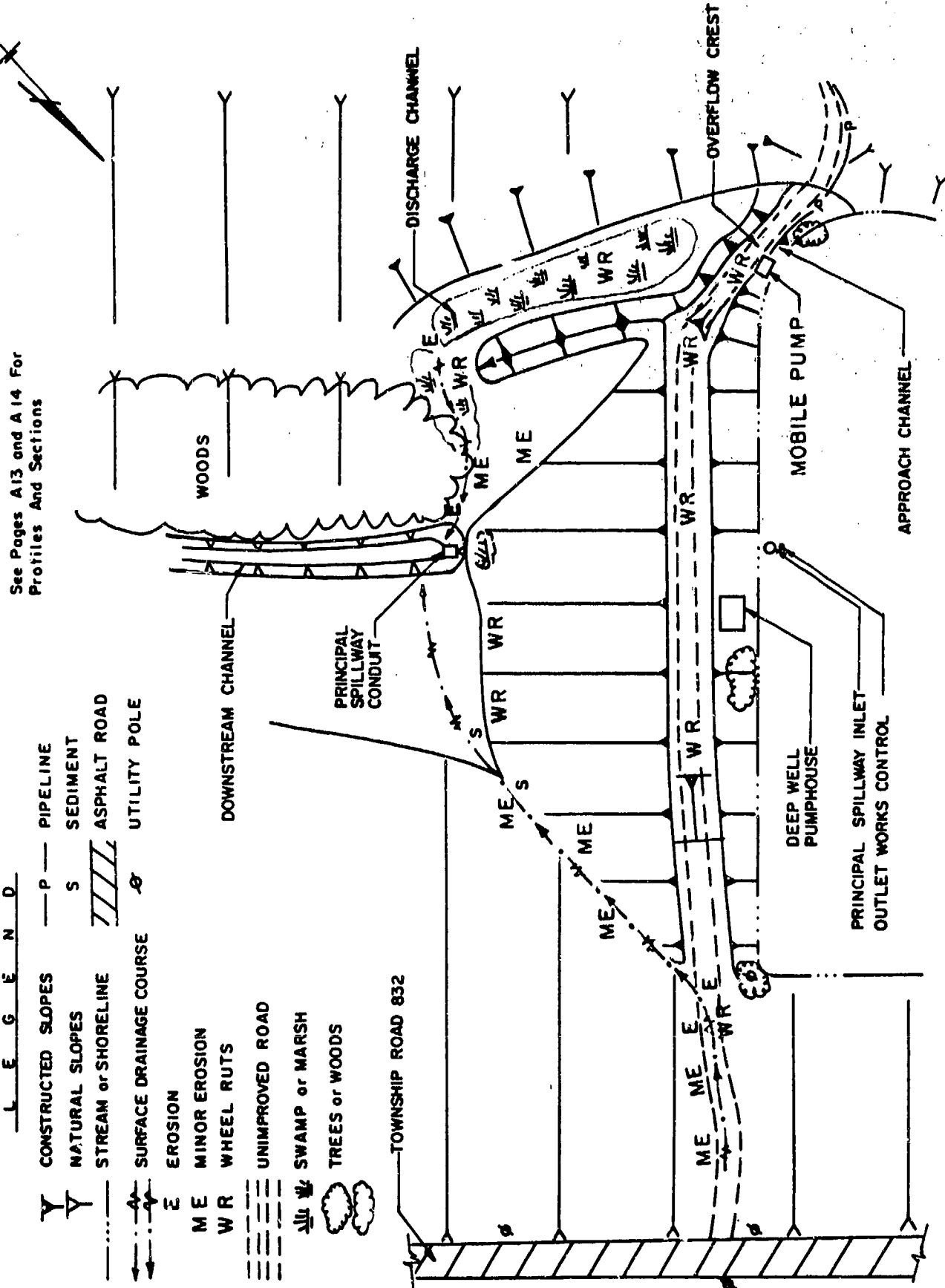
DOWNSTREAM CONDITIONS

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	<p>The downstream channel below the toe of the embankment was generally straight and was tree lined on both sides for a distance of approximately 500 feet below the toe of the dam. The channel appeared to have sufficient capacity to carry off flows that might be discharged from the principal spillway conduit.</p> <p>At approximately 800 feet below the toe of the dam, an inhabited dwelling lies on the floodplain adjacent to the creek. Immediately below, the downstream channel passes beneath Township Road 755.</p>	
APPROXIMATE NUMBER OF HOMES AND POPULATION	In the first 5,000 feet below Trax Farm Dam, there are at least five inhabited dwellings on the floodplain at elevations low enough to possibly be imperiled by high flows.	

See Pages A13 and A14 For
Profiles And Sections

L E G E N D

- Y Y CONSTRUCTED SLOPES — P — PIPELINE
 NATURAL SLOPES S SEDIMENT
 STREAM or SHORELINE // ASPHALT ROAD
 SURFACE DRAINAGE COURSE Ø UTILITY POLE
 E EROSION
 ME MINOR EROSION
 WR WHEEL RUTS
 UNIMPROVED ROAD
 SWAMP or MARSH
 TREES or WOODS



PLAN
No Scale

DATE: JULY 1981

SCALE: NONE

DR: JF CK: JEB

DWG. NO. 80138 I-1

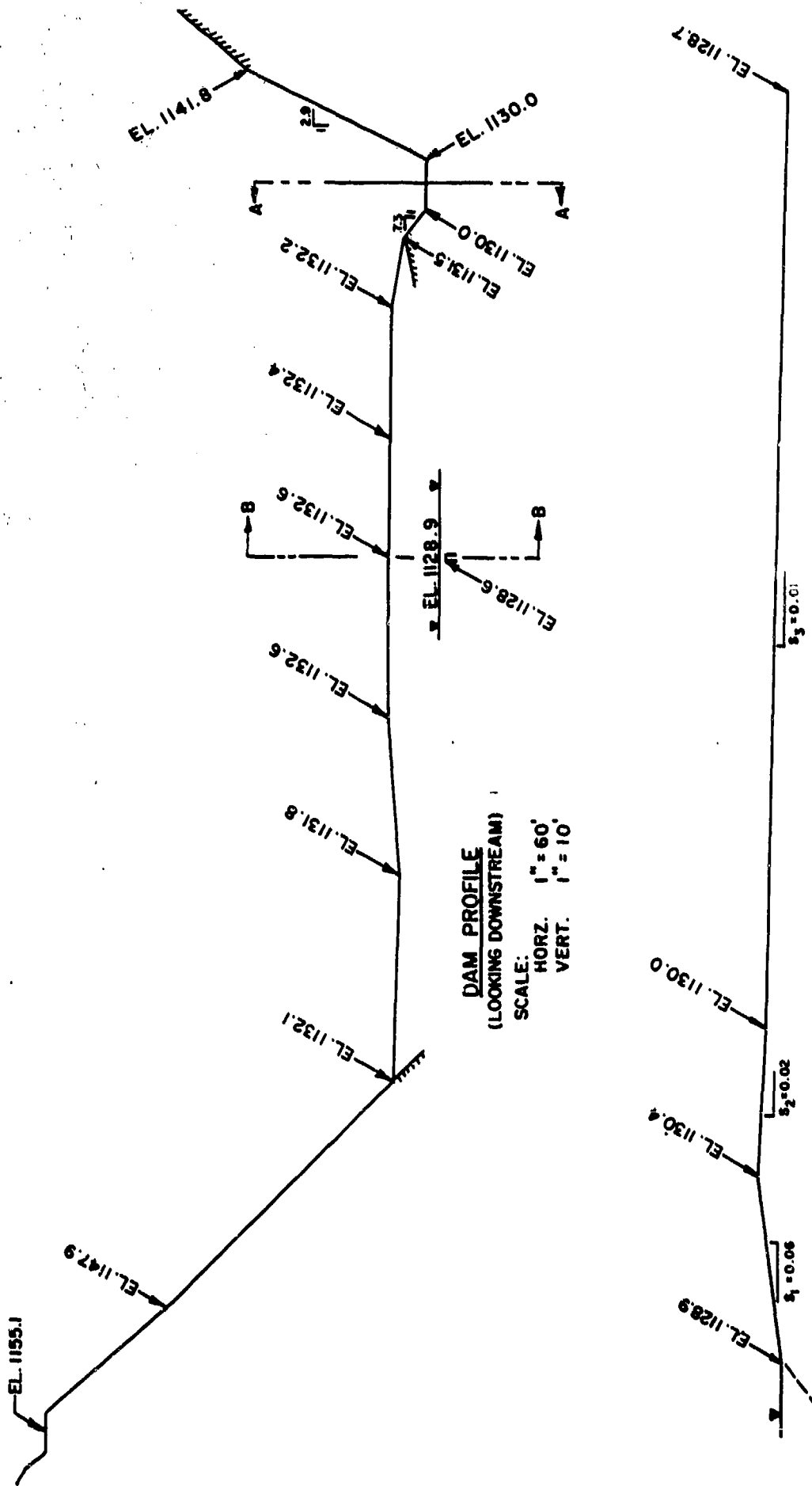
TRAX FARM DAM

NATIONAL DAM INSPECTION PROGRAM

A. C. ACKENHEIL & ASSOCIATES, INC.
CONSULTING ENGINEERS

PITTSBURGH, PA., CHARLESTON, W. VA. & BALTIMORE, MD.

FIELD SKETCH



DAM PROFILE

(LOOKING DOWNSTREAM)

SCALE:
HORZ. 1" = 60'
VERT. 1" = 10'

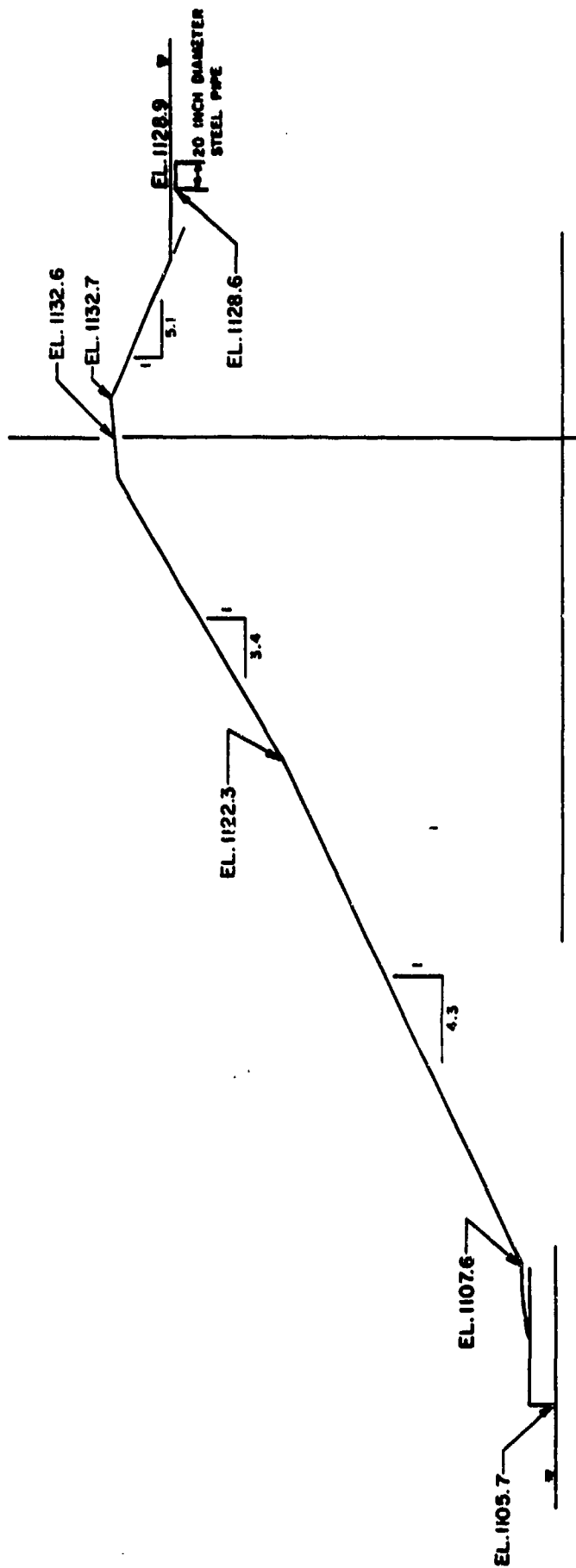
SECTION A-A

EMERGENCY SPILLWAY PROFILE

SCALE:

HORZ. 1" = 20'
VERT. 1" = 10'

DATE: JULY 1981		TRAX FARM DAM		FIELD PROFILE AND SECTION A-A
SCALE: AS SHOWN		NATIONAL DAM INSPECTION PROGRAM		
DR: JF	CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216		
DWG. NO. 80138 I-2				



SECTION B-B
EMBANKMENT CROSS SECTION
SCALE:

HORZ. 1" = 20'
 VERT. 1" = 10'

DATE:	JULY 1981
SCALE:	AS SHOWN
DR:	JF
CK:	JEB
DWG. NO.	80138 I - 3

TRAX FARM DAM
NATIONAL DAM INSPECTION PROGRAM
ACKENHEIL & ASSOCIATES CONSULTING
GEO SYSTEMS, INC. ENGINEERS
1000 BANKSVILLE RD./PITTSBURGH, PA. 15216

FIELD SECTION B-B

APPENDIX B
ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Trax Farm Dam
NDI No. PA 00131

ITEM	REMARKS
Design Drawings	None available.
As-Built Drawings	None available.
Regional Vicinity Map	USGS 7-1/2 minute Bridgeville, Pennsylvania Quadrangle Map.
*Construction History	Constructed in 1963 or 1964. Contractor unknown.
Typical Sections of Dam	None available.
Outlets-Plan Details Constraints Discharge Ratings	None available.
Rainfall/Reservoir Records	None available.

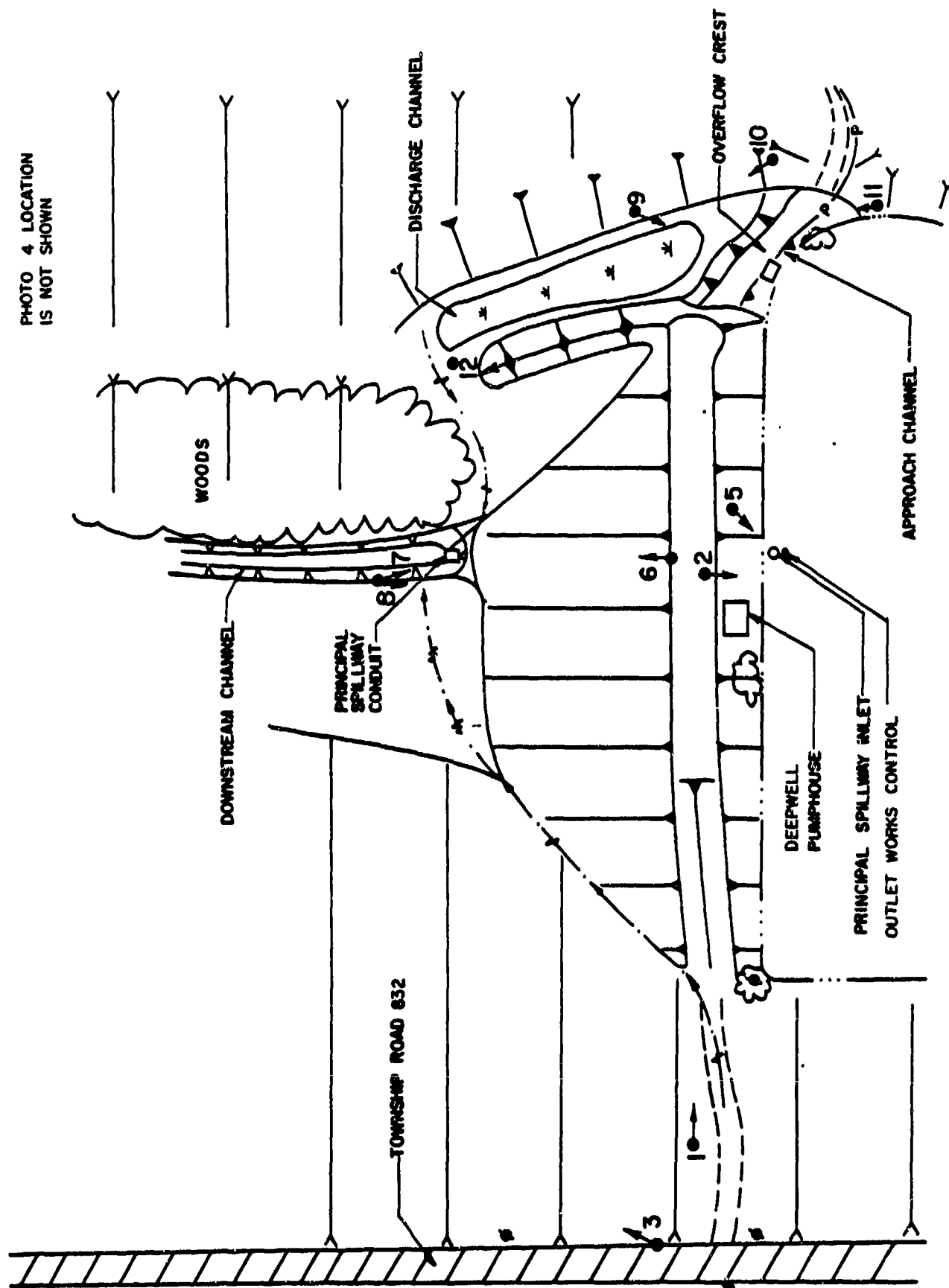
ITEM	REMARKS
*Design Reports	None available. Structure designed by SCS.
Geology Reports	None available.
Design Computations	None available.
Hydrology and Hydraulics	None available.
Dam Stability	None available.
Seepage Studies	None available.
Materials Investigations, Boring Records, Laboratory, Field	None available.
Post-Construction Surveys of Dam	None available.
Borrow Sources	Data not available.
Monitoring Systems	None available.
Modifications	None reported.

ITEM	REMARKS
High Pool Records	None reported.
Post-Construction Engineering Studies and Reports	None available.
Maintenance/Operation Records	None available.
Spillway - Plan Sections Details	None available.
Operating Equipment Plans and Details	None available.
Specifications	None available.
Miscellaneous	No additional information available.
Prior Accidents or Failure of Dam, Description Reports	None.

* Information obtained by telephone conversation with owner's representative.

APPENDIX C
PHOTOGRAPHS

PHOTO 4 LOCATION
IS NOT SHOWN



DATE: JULY 1981

SCALE: NONE

DR: JF CK: JEB

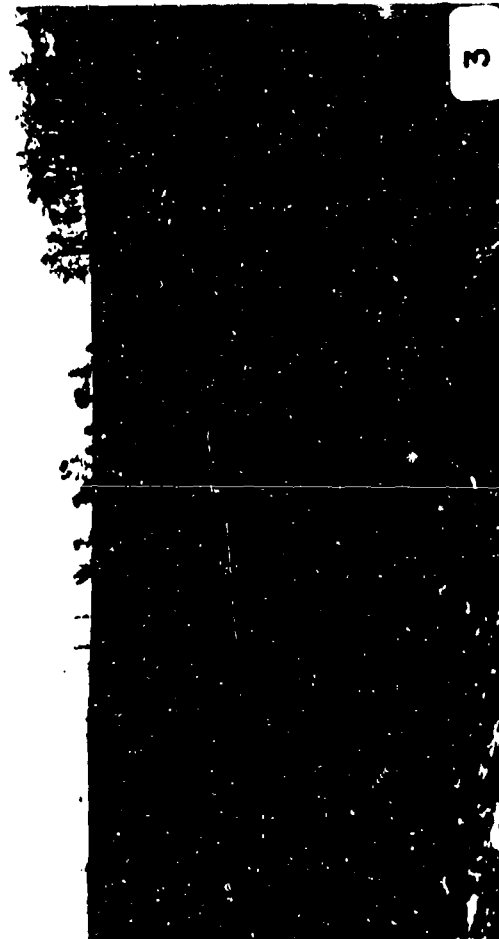
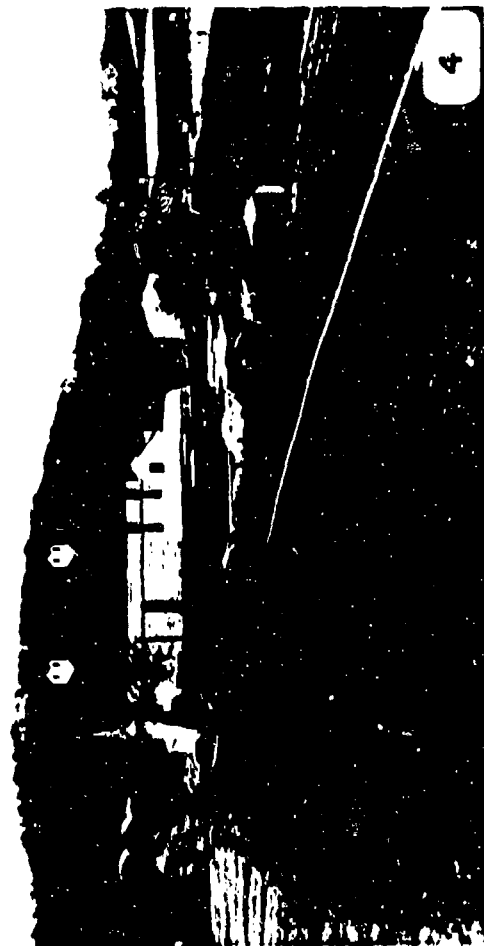
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TRAX FARM DAM
NATIONAL DAM INSPECTION PROGRAM

A. C. ACKENHEIL & ASSOCIATES, INC.
CONSULTING ENGINEERS
PITTSBURGH, PA., CHARLESTON, W. VA. & BALTIMORE, MD.

PHOTO KEY MAP

TRAX FARM DAM



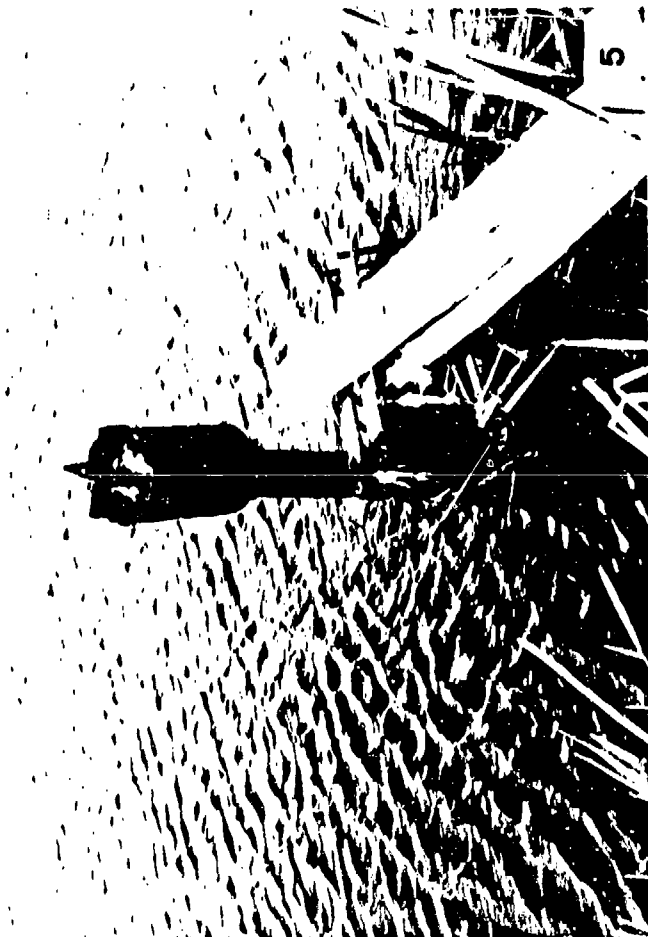
TRAX FARM DAM



6



8



5



7

TRAX FARM DAM



PHOTO DESCRIPTIONS

- Photo 1 Embankment Overview from left abutment.
- Photo 2 Reservoir Overview from embankment crest.
- Photo 3 Downstream Hazards. Inhabited dwelling and Township Route 755.
- Photo 4 Downstream Hazard.
- Photo 5 Principal Spillway Intake Facility. Cap covers outlet works valve control stem.
- Photo 6 Principal Spillway Discharge Channel.
- Photo 7 Principal Spillway Conduit at outlet.
- Photo 8 Downstream Slope. Truck is on embankment crest.
- Photo 9 Emergency Spillway. Note pump and water supply pipeline across approach channel.
- Photo 10 Emergency Spillway Discharge Channel.
- Photo 11 Emergency Spillway Overflow Crest.
- Photo 12 Wet Condition at Emergency Spillway Discharge Channel Outlet. Note water flowing from wet area in discharge channel.

APPENDIX D
HYDROLOGY AND HYDRAULICS
ANALYSES

APPENDIX D HYDROLOGY AND HYDRAULICS ANALYSES

Methodology: The dam overtopping analysis was accomplished using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation: The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 33" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph: The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters, their definition and how they were obtained for these analyses.

<u>Parameter</u>	<u>Definition</u>	<u>Where Obtained</u>
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel	From USGS 7.5 minute topographic map
Lca	Length on main stream to centroid of watershed	From USGS 7.5 minute topographic map
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From USGS 7.5 minute topographic map

3. Routing: Reservoir routing is accomplished by using Modified Puls routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the spillway and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of an outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation-discharge relationship.

Storage in the pool area is defined by an area-elevation relationship from which the computer calculates storage. Surface areas are either planimeted from available mapping or USGS 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping: Using given percentages of the Probable Maximum Flood (PMF)** the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

**Runoff estimated to occur as the result of a PMP.

HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominately agricultural land
and woodland.

ELEVATION-TOP NORMAL POOL
(STORAGE CAPACITY): 1128.6 (24 acre-feet)

ELEVATION-TOP FLOOD CONTROL POOL
(STORAGE CAPACITY): 1131.5 (41 acre-feet)

ELEVATION-MAXIMUM DESIGN POOL: 1128.6

ELEVATION-TOP DAM: 1131.5 (minimum)

OVERFLOW SECTION

- a. Elevation 1130.4
- b. Type Broad-crested weir
- c. Width 20 feet
- d. Length 10 feet
- e. Location Spillover Right Abutment
- f. Number and Type of Gates None

OUTLET WORKS AND DRAWDOWN FACILITY

- a. Type Gate Valve
- b. Location Behind principal spillway
- c. Entrance Invert Unknown
- d. Exit Invert Unknown

PRINCIPAL SPILLWAY

- a. Type 20 inch diameter steel pipe with drop inlet
- b. Location Through right central portion of embankment
- c. Entrance Invert 1128.6
- d. Exit Invert 1105.7

HYDROMETEOROLOGICAL GAGES

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

MAXIMUM REPORTED NON-DAMAGING
DISCHARGE None reported

HEC-1 DAM SAFETY VERSION
HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Trax Farm Dam	NDI ID NO. PA 00131
Probable Maximum Precipitation (PMP)	24.1*
Drainage Area	0.24 sq. mi.
Reduction of PMP Rainfall for Data Fit	0.8 (24.0)
Reduce by 20%, therefore PMP rainfall =	19.3 inches
Adjustments of PMF for Drainage Area (Zone 7)	
6 hrs.	102%
12 hrs.	120%
24 hrs.	130%
48 hrs.	140%
Snyder Unit Hydrograph Parameters	
Zone	29**
C _p	0.5
C _t	1.6
L	0.66 mile
L _{ca}	0.28 mile
$t_p = C_t (L \cdot L_{ca})^{0.3} =$	0.96 hours
Loss Rates	
Initial Loss	1.0 inch
Constant Loss Rate	0.05 inch/hour
Base Flow Generation Parameters	
Flow at Start of Storm	1.5 cfs/sq.mi=0.36 cfs
Base Flow Cutoff	0.05 x Q peak
Recession Ratio	2.0
Overflow Section Data	
Crest Width	20 feet
Freeboard	1.1 feet
Discharge Coefficient	3.09
Exponent	1.5
Discharge Capacity	71 cfs

* Hydrometeorological Report 33

**Hydrological zone defined by Corps of Engineers,
Baltimore District, for determining Snyder's Coefficients
(C_p and C_t).

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Job TRAX FARM DAM Job No. 80138-I
Subject DATA INPUT
Made By SGM Date 6/16/81 Checked JEB Date 6/16/81

LOSS RATE AND BASE FLOW PARAMETERS

STRTL = 1 INCH
CNSTL = 0.05 IN. / HR.
STRTRQ = 1.5 CFS / SQ. MI.
QRCSN = 0.05 (5% OF PEAK FLOW)
RTIOR = 2.0

ELEVATION - STORAGE RELATIONSHIPS

THERE IS NO INFORMATION AVAILABLE CONCERNING THE STORAGE CAPACITY OF THIS FACILITY. THEREFORE A STAGE-STORAGE RELATIONSHIP WAS DEVELOPED USING A 1979 BRIDGEVILLE 7.5 MIN. QUADRANGLE.

ELEV.	AREA (ACRE)	ΔSTOR (AC.-FT)	STOR (AC.-FT)
1116.0	0		0
1120.0	0.9	1.2	1.2
1130.0	5.0	26.7	27.9
1140.0	12.4	84.2	112.1

\$S	STORAGE	0	1.2	27.9	112.1
\$E	ELEVATION	1116.0	1120.0	1130.0	1140.0

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Subject DATA INPUT
Made By SGM Date 8/24/81 Checked JEB Date 6/18/81

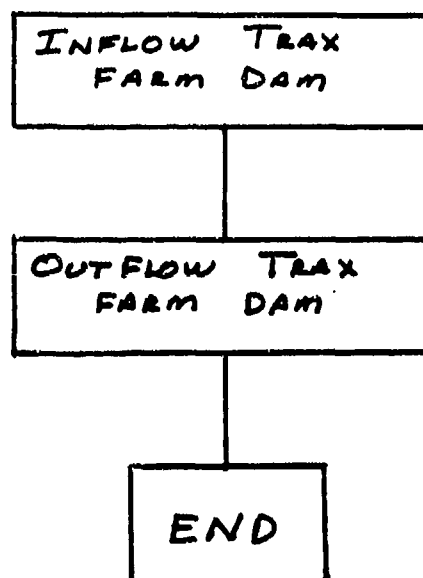
OVERTOP PARAMETERS

TOP OF DAM ELEVATION (MINIMUM)	1131.5
LENGTH OF EMBANKMENT	340.0 FEET
COEFFICIENT OF DISCHARGE	3.09

SPILLWAY PARAMETERS

CREST ELEVATION	1130.4
CREST LENGTH	20.0 FEET
SIDE SLOPES	ASSUMED RECTANGULAR
COEFFICIENT OF DISCHARGE	3.09

PROGRAM SCHEDULE



 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

1	A1	NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS									
2	A2	HYDROLOGIC AND HYDRAULIC ANALYSIS OF TRAX FARM DAM									
3	A3	PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD									
4	B	300	0	10	0	0	0	0	0	-4	0
5	B1	5									
6	J	1	3	1							
7	J1	1.	.5	.2							
8	K	0	1					1			
9	K1	INFLOW HYDROGRAPH FOR TRAX FARM DAM									
10	M	1	1	0.24	0.24					1	
11	P		24.1	102	120	130	140				
12	T							1.0	.05		
13	W	0.96	0.5								
14	X	-1.5	-0.05	2.0							
15	K	1	2							1	
16	K1	ROUTING AT TRAX FARM DAM									
17	Y			1	1						
18	Y1	1								-1128.6	
19	\$S	0.	1.2	27.9	112.1						
20	\$E	1116.0	1120.0	1130.0	1140.0						
21	\$I	1130.4	20.0	3.09	1.5						
22	\$D	1131.5	3.09	1.5	340.						
23	\$L	15.	87.	250.	347.	352.	358.	365.			
24	\$V	1131.5	1132.	1132.5	1133.	1134.	1135.	1136.			
25	K	99									
26	A										
27	A										
28	A										
29	A										
30	A										

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	2
END OF NETWORK	

 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

RUN DATE: 18 JUN 81
 RUN TIME: 9.24.16

NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS
 HYDROLOGIC AND HYDRAULIC ANALYSIS OF TRAX FARM DAM
 PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD

JOB SPECIFICATION									
NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NRTIO= 3 LRTIO= 1
 RTIOS= 1.00 0.50 0.20

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH FOR TRAX FARM DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	LAUTO	
1	0	0	0	0	0	1	0	0	
HYDROGRAPH DATA									
IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.24	0.0	0.24	0.0	0.0	0	1	0

PRECIP DATA
 SPFE PMS R6 R12 R24 R48 R72 R96
 0.0 24.10 102.00 120.00 130.00 140.00 0.0 0.0
 TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA
 LROPT STRKR DLTKR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIMP
 0 0.0 0.0 1.00 0.0 0.0 1.00 1.00 0.05 0.0 0.0

UNIT HYDROGRAPH DATA
 TP= 0.96 CP=0.50 NTA= 0

RECESSION DATA
 STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 46 END-OF-PERIOD ORDINATES, LAG= 0.97 HOURS, CP= 0.50 VOL= 1.00

5.	19.	38.	58.	74.	81.	78.	69.	61.	53.
47.	41.	36.	32.	28.	25.	22.	19.	17.	15.
13.	12.	10.	9.	8.	7.	6.	5.	5.	4.
4.	3.	3.	3.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.				

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
						SUM			26.99	24.57	2.42	22710.	
									(686.)	(624.)	(61.)	(643.08)	

HYDROGRAPH ROUTING

ROUTING AT TRAX FARM DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

CLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTD	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-1129.	0

CAPACITY= 0. 1. 28. 112.

ELEVATION= 1116. 1120. 1130. 1140.

CREL	SPWID	COQW	EXPW	ELEV	COQL	CAREA	EXPL
1130.4	20.0	3.1	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1131.5	3.1	1.5	340.

CREST LENGTH AT OR BELOW ELEVATION	15.	87.	250.	347.	352.	358.	365.
	1131.5	1132.0	1132.5	1133.0	1134.0	1135.0	1136.0

PEAK OUTFLOW IS 757. AT TIME 40.67 HOURS

PEAK OUTFLOW IS 373. AT TIME 40.67 HOURS

PEAK OUTFLOW IS 131. AT TIME 41.17 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

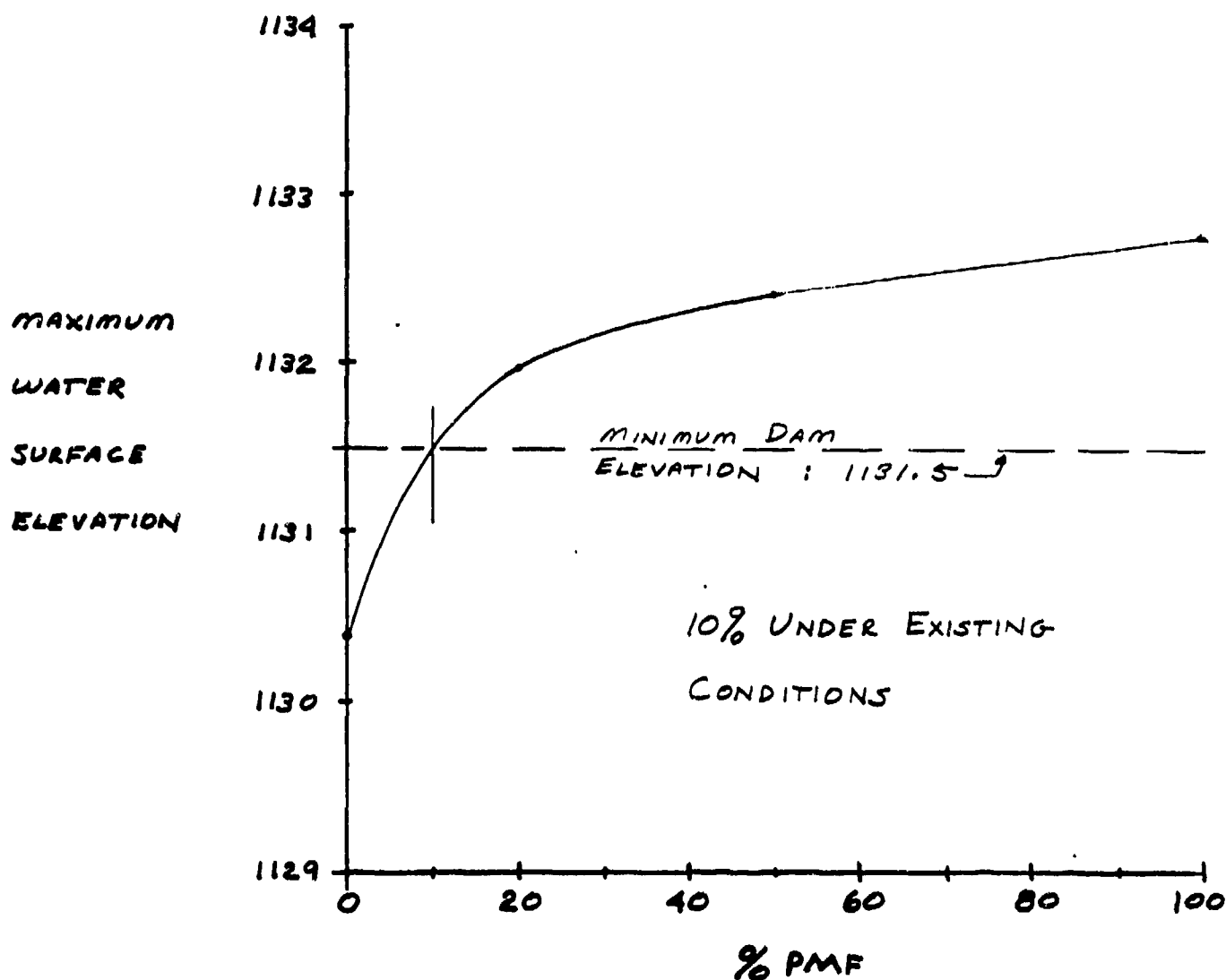
OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS		
				RATIO 1 1.00	RATIO 2 0.50	RATIO 3 0.20
HYDROGRAPH AT	1	0.24	1	763.	382.	153.
	(0.62)	(21.62)(10.81)(4.32)(
ROUTED TO	2	0.24	1	757.	373.	131.
	(0.62)	(21.45)(10.55)(3.71)(

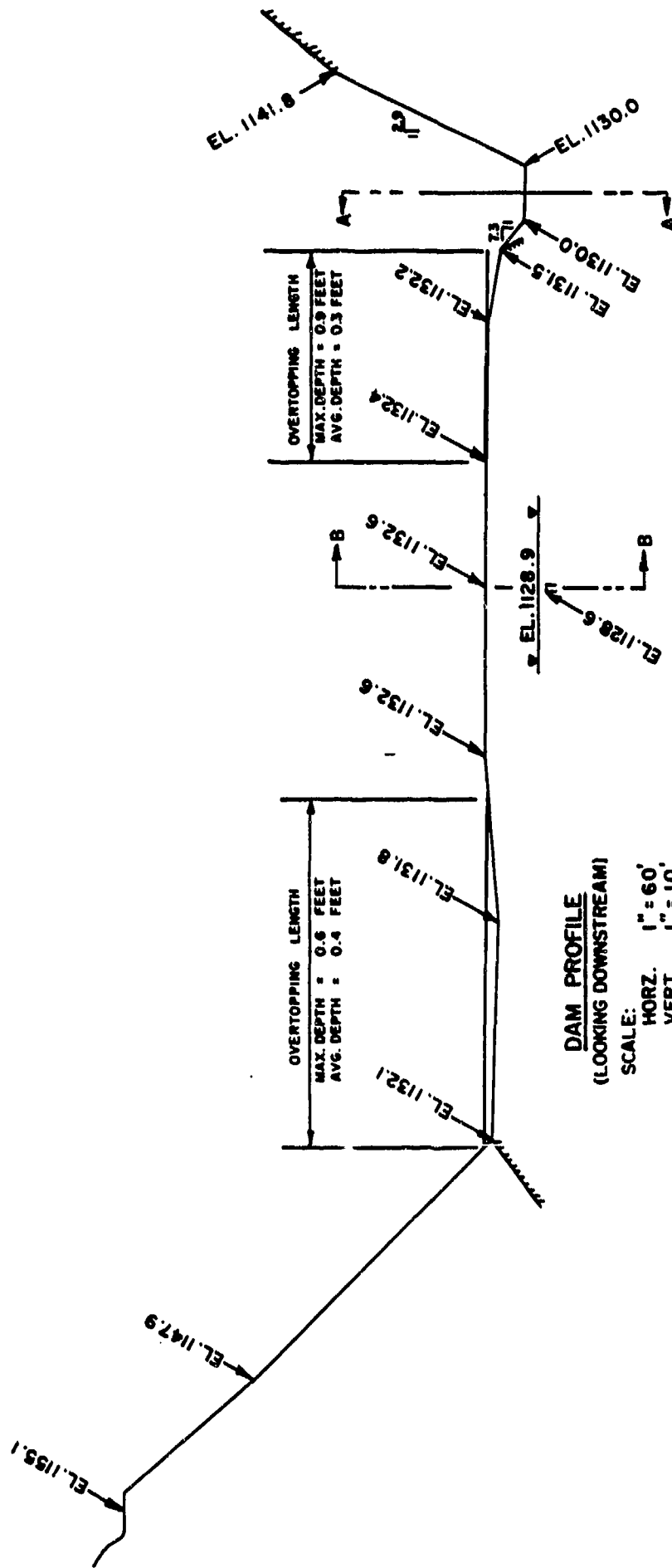
SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	INITIAL VALUE			SPILLWAY CREST		TOP OF DAM	
	ELEVATION	1128.60		1130.40		1131.50	
	STORAGE	24.		31.		41.	
	OUTFLOW	0.		0.		71.	
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TO" HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1132.80	1.30	51.	757.	11.33	40.67	0.0
0.50	1132.41	0.91	48.	373.	7.17	40.67	0.0
0.20	1131.86	0.36	44.	131.	3.50	41.17	0.0

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Job TRAX FARM DAM Job No. 80138-I
Subject HYDROLOGIC PERFORMANCE PLOT
Made By SGM Date 8/2/81 Checked JEB Date 6/18/81





DATE: JULY 1981		TRAX FARM DAM		OVERTOPPING CONDITIONS
SCALE: AS SHOWN		NATIONAL DAM INSPECTION PROGRAM		
DR: JF	CK:	<u>ACKENHEIL & ASSOCIATES</u> CONSULTING ENGINEERS		
DWG. NO. 80381		GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216		

APPENDIX E

PLATES

LIST OF PLATES

Plate I

Regional Vicinity Map.

APPENDIX F

GEOLOGY

GEOLOGY

Geomorphology

Trax Farm Dam is located with the Pittsburgh Plateau section of the Appalachian Plateau Physiographic Province. This area is characterized by gently folded sedimentary rocks which have been incised by streams to form steep sided valleys. The dam is located at the head of an unnamed tributary to Peters Creek. The valley bottom of the unnamed tributary is about 200 feet below the adjacent hilltops. These rounded hilltops are at Elevation 1200 to 1300 feet, and in a regional sense are part of a broad, undulating plateau.

Structure

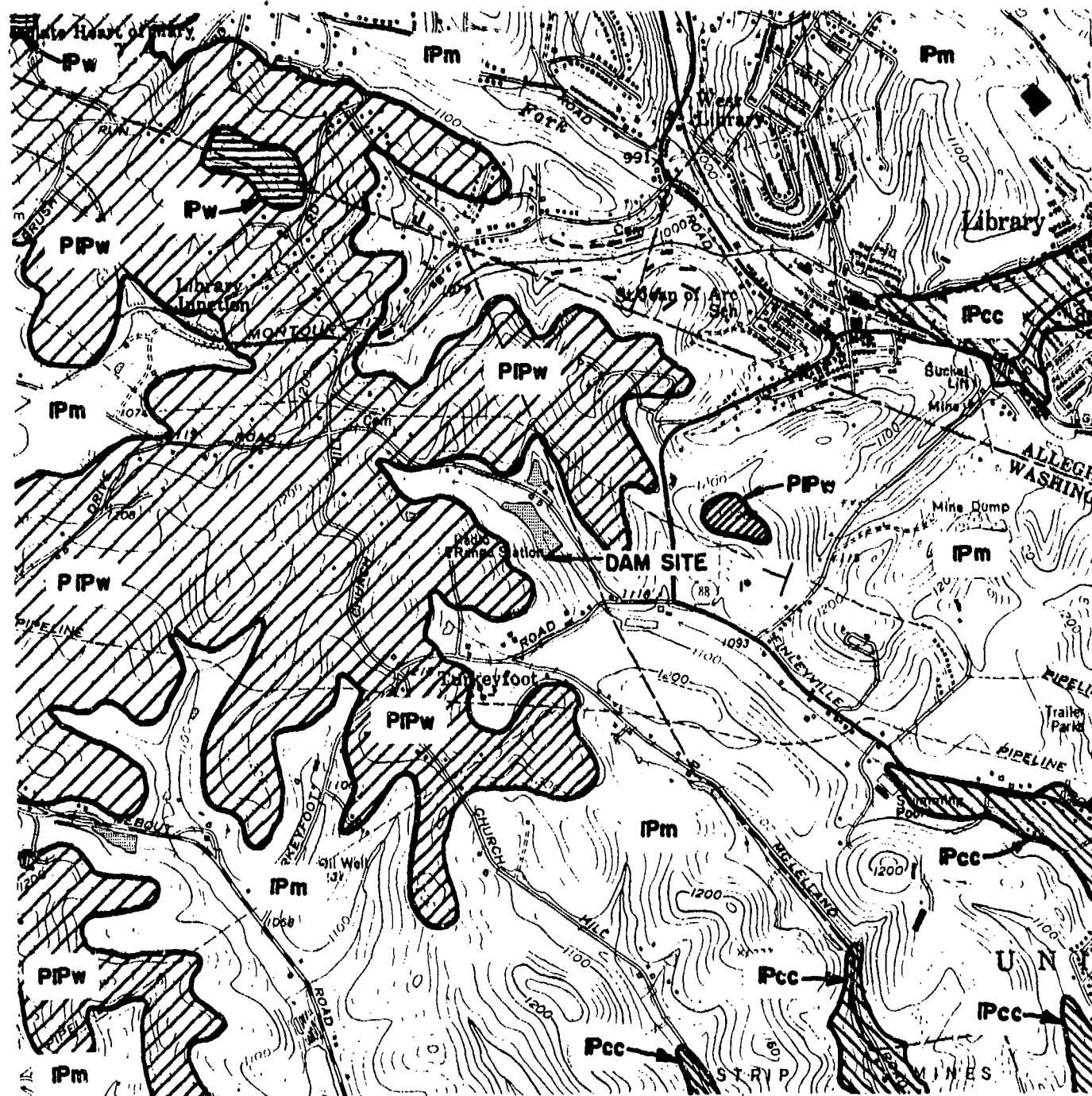
The site lies on the eastern flank of the Amity Anticline, the axis of which trends in a northeast to southwest direction, plunging to the southwest. Strata in the immediate vicinity of the dam dip to the northwest at a rate of about 1 degree. Faulting has not been documented in the area of the dam and no observations were made that would indicate faulting in the rocks outcropping around the dam.

Stratigraphy

Rocks outcropping in the immediate vicinity of the site belong to the Pennsylvania Age Casselman and Monongahela Formations and the Permian Age Waynesburg and Washington Formations. The major rock types in all these formations are cyclic sequences of shale, limestone, sandstone, and coal.

Mining Activity

The Pittsburgh Coal Seam, the lowermost unit of the Monongahela Formation, lies about 180 feet below the dam and has been extensively deep mined. The Waynesburg Coal Seam, which is the lowermost unit of the Waynesburg Formation, outcrops in the valley walls above the dam and is unaffected by mining.



BRIDGEVILLE QUADRANGLE, WASHINGTON COUNTY, PENNSYLVANIA

SCALE: 0 1/2 MILE

1:24000

CONTOUR INTERVAL 20 FT. DATUM IS MEAN SEA LEVEL

——— FORMATION CONTACT



DATA OBTAINED FROM PENNSYLVANIA TOPOGRAPHIC AND GEOLOGIC SURVEY GREATER PITTSBURGH REGION GEOLOGIC MAP AND CROSS SECTIONS, 1975 and GREATER PITTSBURGH REGION STRUCTURE CONTOUR MAP, 1975

DATE: JULY 1981

SCALE: 1"=2000'

DR: JF CK: JEB

TRAX FARM DAM
NATIONAL DAM INSPECTION PROGRAM

ACKENHEIL & ASSOCIATES CONSULTING
GEO SYSTEMS, INC. ENGINEERS
1000 BANKEVILLE RD./PITTSBURGH, PA. 15216

GEOLOGIC
MAP

AGE	WCSG	Z-1237	COLUMNAR SECTION	PROMINENT BEDS
QUATERNARY		Q1		PLEISTOCENE GLACIAL OUTWASH, RIVER TERRACE DEPOSITS AND ALLUVIUM
PERMIAN	DUNKARD (P4)	WASHINGTON (P4)		UPPER WASHINGTON LIMESTONE
		WASHINGTON (P4)		WASHINGTON COAL
		WAYNESBURG (P4)		WAYNESBURG SANDSTONE
		WAYNESBURG (P4)		WAYNESBURG COAL
PENNSYLVANIAN	MONROVIA (P3)	UNIONTOWN (P3)		UNIONTOWN SANDSTONE
		UNIONTOWN (P3)		UNIONTOWN COAL
		BENWOOD (P3)		BENWOOD LIMESTONE
		SEWICKLEY (P3)		SEWICKLEY COAL
	CONEMAUGH (P3)	PITTSBURGH (P3)		PITTSBURGH SANDSTONE
		PITTSBURGH (P3)		PITTSBURGH COAL
		CONNELLSVILLE (P3)		CONNELLSVILLE SANDSTONE
		MORGANTOWN (P3)		MORGANTOWN SANDSTONE
	GLITCH (P3)	AMES (P3)		AMES LIMESTONE
		PITTSBURGH (P3)		PITTSBURGH REDBEDS
		SALTSBURGH (P3)		SALTSBURGH SANDSTONE
		MAHONING (P3)		MAHONING SANDSTONE
MISSISSIPPIAN	ALLEGANY (P2)	UPPER FREEPORT (P2)		UPPER FREEPORT COAL
		UPPER KITTANNING (P2)		UPPER KITTANNING COAL
		WORTHINGTON (P2)		WORTHINGTON SANDSTONE
		LOWER KITTANNING (P2)		LOWER KITTANNING COAL
	PORTSMOUTH (P2)	HOMEWOOD (P2)		HOMEWOOD SANDSTONE
		MERCER (P2)		MERCER SANDSTONE, SHALE & COAL
		CONNOQUENESSING (P2)		CONNOQUENESSING SANDSTONE
	POCONO (P1)	BURGON (P1)		BURGON SANDSTONE
		GUYANOSA (P1)		GUYANOSA SHALE
DEVELOPMENTAL	POCONO (P1)	BEREA (P1)		BEREA SANDSTONE

DATE: JULY 1981

SCALE: 1" = 360'

DR: JF

CK: JEB

TRAX FARM DAM

NATIONAL DAM INSPECTION PROGRAM

ACKENHEIL & ASSOCIATES

CONSULTING
ENGINEERS

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GEOLOGIC
COLUMN