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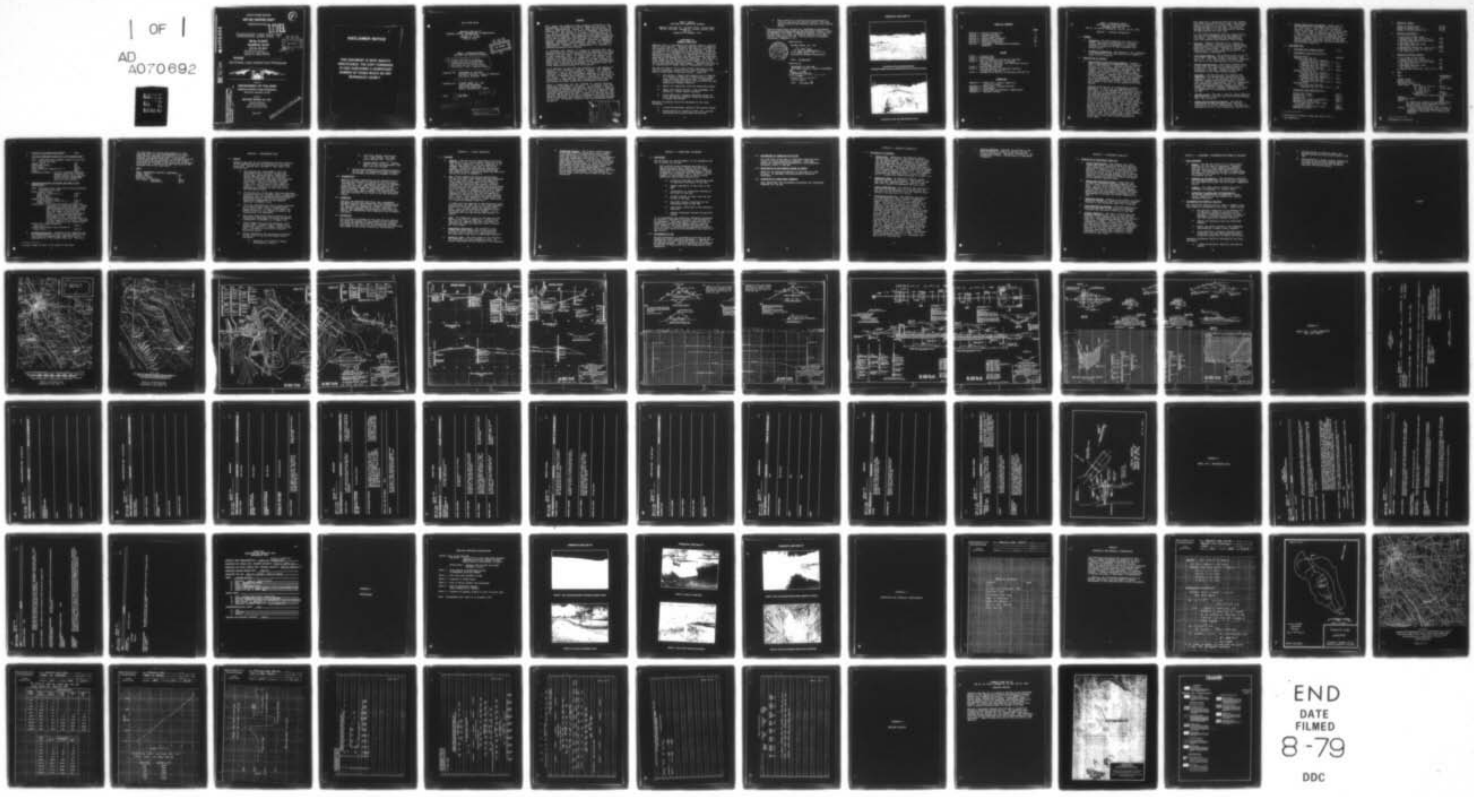

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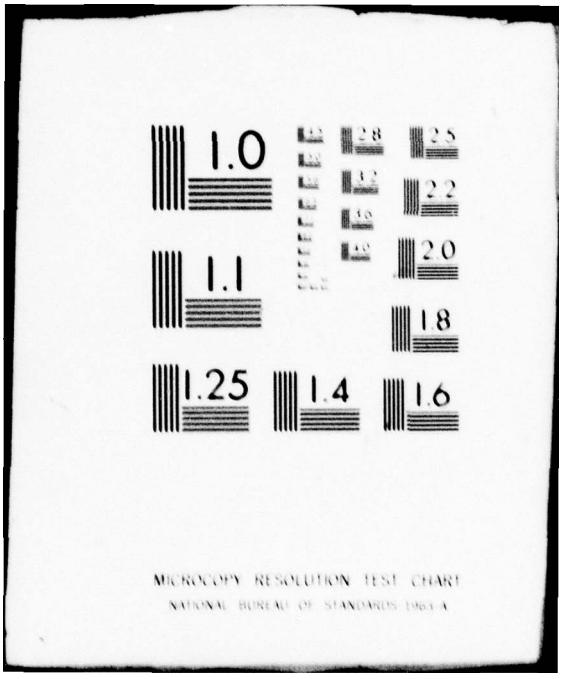
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OHIO RIVER BASIN

MUD RUN, CRAWFORD COUNTY

PENNSYLVANIA

LEVEL II

TAMARACK LAKE DAM "B"

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NDI No. PA 00746

PennDER No. 20-47B

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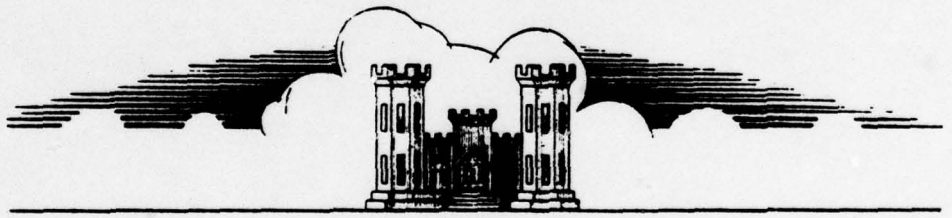
PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM



prepared for

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland 21203

prepared by

MICHAEL BAKER, JR., INC.

Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

May 1979

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OHIO RIVER BASIN

TAMARACK LAKE DAM "B"
CRAWFORD COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00746
PennDER No. 20-47B
SCS No. 461B

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

(6) National Dam Inspection Program. Tamarack Lake Dam 'B' (NDI-PA-00746, PennDER-20-47B, SCS-PA-461B), Ohio River Basin, Mud Run, Crawford County, Pennsylvania. Phase I Inspection Report,

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

(10) C. Y. Chen

Prepared by: MICHAEL BAKER, JR., INC.
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4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

(12) '79p.

Date: (11) May 1979

(15) DACW 31-79-C-0011

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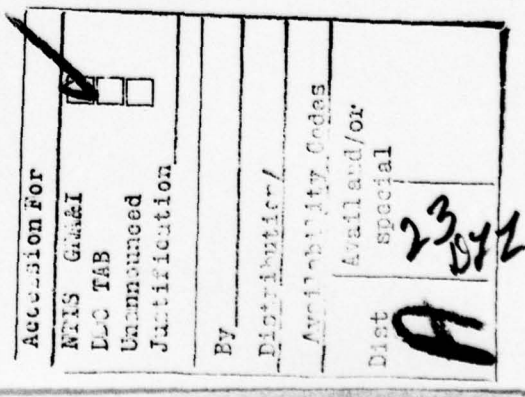
PREFACE

This report was 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 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 available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

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 a dam depends on numerous and constantly changing internal and external conditions, and is 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 point 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 Inspections 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" 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 REPORT
NATIONAL DAM INSPECTION PROGRAM

Tamarack Lake Dam "B", Crawford County, Pennsylvania
NDI No. PA 00746, PennDER No. 20-47B, SCS No. 461B
Mud Run
Inspected 29 November 1978

ASSESSMENT OF GENERAL CONDITIONS

Tamarack Lake is impounded by two separate dams at opposite ends of the reservoir. Tamarack Lake Dam "B" is located at the southern end of the reservoir and Tamarack Lake Dam "A" is located at the northern end of the reservoir. Tamarack Lake Dam "B" is a homogeneous earth dam designed by the Soil Conservation Service (SCS), U.S. Department of Agriculture. This multi-purpose reservoir and dam is presently owned and operated by the Pennsylvania Fish Commission. The dam has a crest length of 425 feet and a maximum height of 21 feet. A 6-foot-high dike was constructed in a saddle area to the left of the emergency spillway channel. Tamarack Lake Dam "B" is classified as a "High" hazard-"Intermediate" size dam.

The dam was found to be in good overall condition at the time of inspection. Several minor items of remedial work should be performed in the near future. These are:

1) Periodically inspect the seepage area to identify if a change in quantity or the exiting of muddy water from this area occurs and, if necessary, conduct a detailed study of the situation and take appropriate remedial measures.

2) Remove the vegetation from the downstream channel.

3) Repair the animal burrows in the embankment and establish a rodent control program.

4) Place additional, properly designed riprap (or other appropriate measure) along the plunge pool to reduce the erosion.

Emergency procedures should be developed by the owner including:

1) A detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillways will pass the Probable Maximum Flood (PMF) without overtopping the dam. The spillways are therefore considered "adequate."

Submitted by:

MICHAEL BAKER, JR., INC.

C. Y. Chen, Ph.D., P.E.
Engineering Manager-Geotechnical

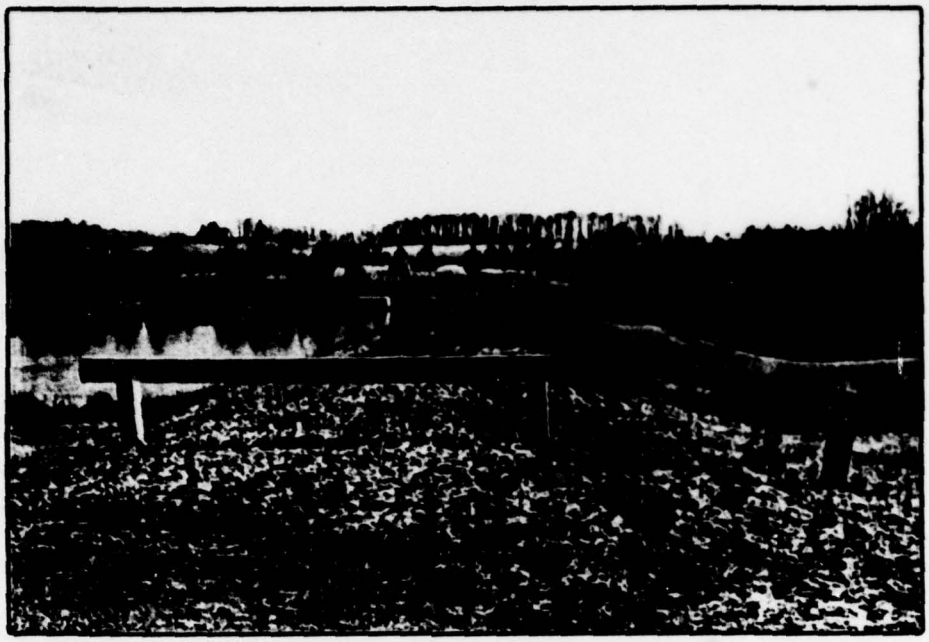
Date: 25 May 1979

Approved by:

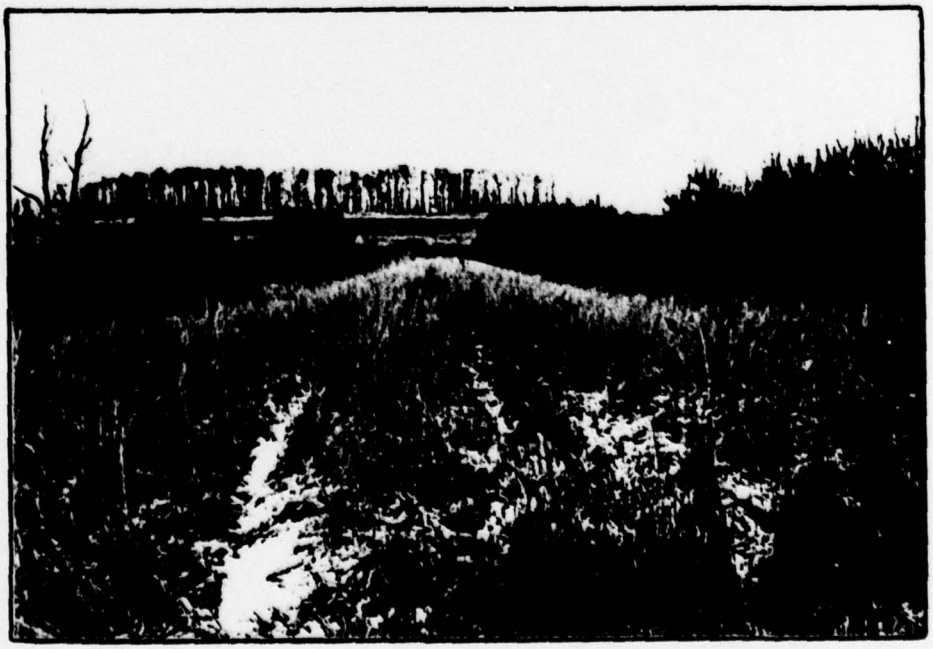
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

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

Date: 17 Jun 79



Overall View of Dam from Right Abutment
(Emergency Spillway Channel Located behind Trees in Left-Center of Photo)



Overall View of Dike from Right Abutment of Dike

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NATIONAL DAM INSPECTION PROGRAM
TAMARACK LAKE DAM "B"
NDI No. PA 00746, PennDER No. 20-47B, SCS No. 461B

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

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

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

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances - Tamarack Lake is impounded by two separate dams at opposite ends of the reservoir. Tamarack Lake Dam "B" is located at the southern end of the reservoir and consists of a main embankment, emergency spillway channel, riser intake and outlet conduit, and a saddle dike located to the left of the emergency spillway channel. Tamarack Lake Dam "A" is located at the northern end of the reservoir and consists of a main embankment, emergency spillway channel, riser intake and outlet conduit, and a diversion dam located to the left of the emergency spillway channel.

Tamarack Lake Dam "B" is a homogeneous earthfill embankment, 21 feet high and approximately 425 feet long. A filter blanket with two drain outlets was installed in the downstream embankment below the berm and downstream toe. Both Dam "A" and "B" are constructed with a two-stage inlet riser unit and 30-inch reinforced concrete outlet pipe. The riser unit for Dam "B" consists of a first stage inlet (1.75 feet by 2.5 feet) with a crest elevation of 1216.0 feet (normal pool). The second stage opening for the Dam "B" riser unit is an overflow weir on the side walls of the unit. The crest elevation is 1218.0 feet and is 15 feet long. The riser unit for Dam "A" consists of a first stage orifice (1 foot by 1.5 feet) with a crest elevation of 1216.0 feet. The second stage orifice is 2 feet by 2.5 feet with a crest elevation of 1218.0 feet.

Both dams have a vegetated earth spillway channel with crest elevation of 1220.0 feet. The spillway channel for Dam "B" is 150 feet wide at the base and approximately 500 feet long. The spillway channel for Dam "A" is 188 feet wide at the base and approximately 600 feet long.

A 6-foot-high homogeneous dike was constructed to the left of the emergency spillway channel in a low saddle. This dike does not impound water until the reservoir gets above El. 1219.0 feet.

b. Location - Tamarack Lake Dam "B" is located in Fairfield Township, Crawford County, Pennsylvania approximately 5.5 miles southeast of the center of Meadville, Pennsylvania. The dam is located approximately 3.5 miles south of PA Route 27 and 5 miles east of Interstate 79.

c. Size Classification - The maximum height of Dam "B" is 21 feet. The lake volume to the top of the dam at El. 1223.0 feet is 8150 acre-feet. Therefore, the dam is in the "Intermediate" size category.

d. Hazard Classification - Many lives could be lost in the event of a failure of Tamarack Lake Dam "B" because of a few homes located along Mud Run downstream of the dam. Therefore, this dam is considered in the "High" hazard category.

e. Ownership - The dam and lake are owned by the Commonwealth of Pennsylvania, Pennsylvania Fish Commission. Mr. E. Jon Grindall, Senior Project Engineer, Pennsylvania Fish Commission, Robison Lane, Bellefonte, Pennsylvania 16823 is responsible for engineering aspects of the dam. Mr. Melvin Dinger, Maintenance Foreman, Pennsylvania Fish Commission, Box 408, Tionesta, Pennsylvania 16353 is responsible for maintenance and operation of the dam.

f. Purpose of Dam - The dam is used for flood detention. The reservoir is used for fish and wildlife development, and recreation.

g. Design and Construction History - The dam was constructed in 1961 and 1962 by Bell and Bell Contractors of Eldred, Pennsylvania. The dam was designed by the U.S. Soil Conservation Service (SCS).

h. Normal Operational Procedures - Normal pool is controlled by two low stage riser orifices at El. 1216.0 feet. (One riser orifice each at Tamarack Lake Dams "A" and "B".) The second stage at El. 1218.0 feet is controlled by an orifice 2 feet by 2.5 feet at Tamarack Lake Dam "A" and by a 15-foot-wide overflow weir at Tamarack Lake Dam "B". Excess flows are diverted through side-channel emergency spillways at both of the dams. The drawdown facilities are operated biannually to insure proper operation.

1.3 PERTINENT DATA

a. Drainage Area (square miles) - 4.99

b. Discharge at Dam Site (c.f.s.) -

Maximum Flood -	Unknown
Tamarack Lake Dam "B"	
Principal Spillway Capacity (Maximum Pool El. 1223.3 ft.[1]) -	97.1
Emergency Spillway Capacity (Maximum Pool El. 1223.3 ft.) -	2368
Total Spillway Capacity (Maximum Pool El. 1223.3 ft.) -	2465.1
Tamarack Lake Dam "A"	
Principal Spillway Capacity (Maximum Pool El. 1223.3 ft.) -	79.6
Emergency Spillway Capacity (Maximum Pool El. 1223.3 ft.) -	3047
Total Spillway Capacity (Maximum Pool El. 1223.3 ft.) -	3126.6
Tamarack Lake	
Total Spillway Capacity (Maximum Pool El. 1223.3 ft.) -	5592

c. Elevation (feet above M.S.L.) -

Design Top of Dam -	1223.0
Minimum Top of Dam -	1223.3
Normal Pool -	1216.0
Maximum Pool (Phase I Analysis[2]) -	1222.9
Emergency Spillway Crest -	1220.0
Second Stage Overflow Weir Crest on Intake Riser -	1218.0
Streambed at Centerline of Dam -	1202.0
Maximum Tailwater -	Unknown

---

[1] Elevations are based on Mean Sea Level (M.S.L.).

[2] See Appendix D.

d. Reservoir (feet) -

Length of Maximum Pool -	18,000
Length of Normal Pool -	18,000
Length of Flood Control Pool -	18,000

e. Storage (acre-feet) -

At Low Stage Orifice Crest (Normal Pool) (El. 1216.0 ft.) -	3850
At Second Stage Overflow Weir Crest (El. 1218.0 ft.) -	5000
At Emergency Spillway Crest (El. 1220.0 ft.) -	6200
At Design Top of Dam (El. 1223.0 ft.) -	8150
At Minimum Top of Dam (at Dam "A") (El. 1223.2 ft.) -	8270

f. Reservoir Surface (acres) -

At Low Stage Orifice Crest (Normal Pool) (El. 1216.0 ft.) -	556
At Second Stage Overflow Weir Crest (El. 1218.0 ft.) -	591
At Emergency Spillway Crest (El. 1220.0 ft.) -	620
At Design Top of Dam (El. 1223.0 ft.) -	670

g. Dam -

Type -	Homogeneous earthfill
Length (feet) -	425
Height (feet) -	21
Top Width (feet) -	12
Side Slopes - Upstream	
El. 1223 to 1216 ft. -	3H:1V*
El. 1216 ft. -	15 ft. berm
El. 1216 ft. to ground line -	4H:1V
Downstream -	2.5H:1V
(with 10-foot berm at El. 1212.0 ft.)	
Zoning -	None
Impervious Core -	None
Cutoff -	None

[An impervious blanket was installed along the left side of the upstream original stream channel (see Plate 3).]

Drains - A filter blanket with two drain outlets is located in the downstream portion of the embankment (see Plate 7 for location and details).

---

* Horizontal to Vertical.

h. Diversion and Regulating Tunnel - None

i. Spillway (Emergency Spillway in SCS Terminology) -

Type - Vegetated earth channel located to the left end of main dam.
Length (feet) - 500
Base Width (feet) - 150
Side Slopes - 3H:1V
Crest Elevation (feet M.S.L.) - 1220.0
Gates - None
Downstream Channel - The well vegetated discharge channel exits into a heavily wooded natural valley approximately 350 feet downstream from the level section.

j. Regulating Outlets (Principal Spillway in SCS Terminology) -

Type - Two-stage inlet riser and 30-inch reinforced concrete outlet pipe.
First Stage Orifice
Crest El. (feet M.S.L.) - 1216.0
Width (feet) - 2.5
Height (feet) - 1.75
Second Stage Overflow Weir
Crest Elevation (feet M.S.L.) - 1218.0
Length (feet)* - 15.0
Outlet Pipe - A 30-inch reinforced concrete pipe supported on a concrete cradle. Three reinforced concrete anti-seep collars were provided at non-uniform spacing near the center of the dam (see Plate 6). The remaining sections of outlet pipe were not provided with anti-seep collars. The pipe was installed in 16-foot-long sections for a total length of 113.3 feet (including the wall section at the intake riser).
Riser Floor Invert Elevation (feet M.S.L.) - 1201.8
Outlet Conduit Exit Invert Elevation (feet M.S.L.) - 1200.75

k. Drawdown Facilities - Drawdown of the reservoir can be accomplished by a 21-inch asbestos bonded bituminous coated corrugated metal pipe entering the upstream face of the intake riser unit. The inlet

---

* 15-foot length on each of two sides of the riser.

for this drain is located approximately 45 feet upstream from the riser and consists of a 6-foot-high vertical standing half-section of 38-inch diameter corrugated metal pipe. A galvanized grating is provided over the upstream half of the intake. Flow from the drainpipe to the riser unit is manually controlled by a 24-inch slide gate and valve on the upstream face of the riser unit.

1. Dike -

Type - Homogeneous earthfill embankment	
Length (feet) -	300
Height (feet) -	6
Top Width (feet) -	10
Side Slopes - Upstream -	3H:1V
Downstream -	3H:1V

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Tamarack Lake Dam "B" was designed by the SCS according to its standard practice for structures of this type, circa 1960. Design data included in this report were obtained from:

1) SCS Drawings No. PA-461-A&B-P, "Mill Run Watershed Project, Multiple Purpose Dam PA-461-A&B, Crawford County, Pennsylvania." Design drawings dated May and June 1961. "As built" drawings (with major modifications incorporated into the drawings) are dated April 1962. Copies of "as built" sheets 3 and 11-14 are included in this report as Plates 3-7. Prints of all the "as built" drawings are available in the files of the SCS Harrisburg Office.

2) SCS Drawings No. PA-461-A&B, "Mill Run Watershed Protection Project, Crawford County, Pennsylvania," dated May 1961, Design Hydrograph and Freeboard Hydrograph sheets. Prints are available in Pennsylvania Department of Environmental Resource's (PennDER) files.

3) "Mill Run Watershed Work Plan," report prepared by Crawford County Board of Commissioners, et al, March 1960. A copy of the report was made available to the inspection team by the Pennsylvania Fish Commission.

4) Dam Permit Application Report prepared by the Pennsylvania Department of Forests and Waters (predecessor of PennDER) on 2 August 1961.

5) "Design Report for Mill Run Watershed, site PA-461 (A&B), Crawford County, Pennsylvania, Drawing No. PA-461-R, 4 sheets, dated 15 June 1961. Available in the files of the SCS Harrisburg office.

6) Design information and calculations available in the files of the SCS Harrisburg Office, including:

    a) Hydrologic and hydraulic design calculations, (24 pp.).

b) Structural design calculations, i.e., riser design, anti-seep collar design, etc. (18 pp.).

c) Geology Report PA-461-G. Summary report of site reconnaissance, test pits, and soil borings.

7) Various post-construction inspection reports by the SCS, the Pennsylvania Fish Commission, and PennDER (available in PennDER's files).

2.2 CONSTRUCTION

Readily available information on the construction of this dam was reviewed in connection with this Phase I Investigation. This information consisted of PennDER's files for this dam. Many design and construction modifications recorded were incorporated into the "as built" drawings. Most of these drawings have been included in this report; however, all additional drawings are available in the files of the SCS Harrisburg office.

2.3 OPERATION

The Mill Run Watershed Work Plan, and a subsequent agreement between the Pennsylvania Fish Commission and the SCS, dated 21 August 1961, details the provisions for operation and maintenance of this structure. A copy of this agreement was provided to the inspection team by the Pennsylvania Fish Commission and is readily available.

2.4 EVALUATION

The information reviewed for this dam did not indicate any cause for concern for the safety of the structure. It should be noted that several construction changes were noted on the "as built" plans revising the elevations and length of the outlet conduit for the structure.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The dam and its appurtenant structures were found to be in good overall condition at the time of the inspection, with the exception of a seepage area noted to the left of the outlet conduit. Noteworthy deficiencies observed are described briefly in the following paragraphs. The complete visual inspection check list and field sketch are given in Appendix A.

b. Dam - Minor seepage was exiting approximately 20 feet left and 3 feet higher than the downstream end of the outlet pipe. A 4-inch diameter by 1-foot-deep hole was present at this location. Although this indicates that piping (internal migration of fine soil particles) may be occurring, no fine material was observed being transported by the minor amount of seepage at the time of inspection. It could not be determined how long this seepage has been occurring, but the vegetation indicates it may be of relatively recent development. (Note: The vegetation was green and lush and did not contain cattails or other identifiers of a long-term seepage condition.)

A rodent hole was observed on the downstream slope approximately 200 feet left of the right abutment. Erosion is occurring around the outlet plunge pool. Also, a small spring was observed on the downstream bank of the outlet channel. It is estimated that this spring has been present for awhile.

c. Dike - The vegetative cover on the dike was very thick at the time of inspection. Normally the dike does not impound water but only serves to impound water when the reservoir level is above El. 1219.0 feet.

d. Appurtenant Structures - The concrete in the intake and outlet structures of the principal spillway (outlet works) is in good condition. The pond drain slide gate is reportedly operative.

e. Reservoir Area - The side slopes of the reservoir are steep but with good vegetative cover. No unusual sedimentation has occurred in the reservoir.

f. Downstream Channel - The original stream channel of Mud Run forms the downstream outlet channel. Some vegetation is located in the channel just below the plunge pool (see Photo 5). Approximately 1500 feet downstream from the dam are a roadway embankment and culvert. Mud Run flows into Little Sugar Creek approximately 1.5 miles below the dam. Approximately three homes are located along Mud Run between the dam and Little Sugar Creek. Little Sugar Creek flows approximately 6.5 miles down a relatively uninhabited reach before entering the Borough of Cochranton. The confluence of Little Sugar Creek and French Creek is just below Cochranton.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The following is a brief summary of the emergency plan now in effect for the dam:

> The Crawford County waterways patrolman or a deputy patrolman shall observe the structure during periods of heavy precipitation. They are instructed to notify the PennDER Regional Office at Meadville [telephone (814) 724-8550, a 24-hour number] if they observe any of the following conditions during these observations:
>
> 1) Sliding of upstream or downstream slopes or abutments contiguous to the dam;
>
> 2) sudden subsidence of the crest of the dam;
>
> 3) longitudinal or transverse cracking of the crest of the dam;
>
> 4) unusual release of water from the face or toe of the dam;
>
> 5) any other unusual conditions at the downstream slope of the dam;
>
> 6) significant landslides in the reservoir area and;
>
> 7) unusual discharges through the spillway system.

It is recommended that additional emergency procedures be prepared, prominently displayed, and furnished to all personnel. The owner should coordinate with the Pennsylvania Emergency Management Agency (formerly Civil Defense), and other appropriate agencies and civil officials in developing an emergency evacuation plan for areas which will be affected in the event of a dam failure.

4.2 MAINTENANCE OF DAM

Routine maintenance is performed periodically by the Pennsylvania Fish Commission personnel. Inspections of the dam are routinely performed weekly by the area maintenance manager. Annual inspections are performed by the SCS in conjunction with the Pennsylvania Fish Commission.

4.3 MAINTENANCE OF OPERATING FACILITIES

The pond drain slide gate is reportedly operated twice a year to verify operational adequacy. Trash and debris are removed during Pennsylvania Fish Commission personnel visits to the dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There are no warning procedures in the event of a dam failure. An emergency warning procedure should be developed.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

Both operational and maintenance procedures are considered adequate for the dam.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data - Hydrologic and hydraulic design calculations for Tamarack Lake were obtained from the SCS Design Report. According to SCS criteria, the emergency spillway and freeboard hydrographs were developed and routed through the reservoir to establish the elevations of the design high water and crest of dam. The emergency spillway hydrograph was developed using a 6-hour rainfall of 8.8 inches with a peak discharge of 8366 c.f.s. The freeboard hydrograph was developed using a 6-hour rainfall of 17.7 inches with a peak discharge of 16,394 c.f.s.

b. Experience Data - No detailed reservoir stage/rainfall records are available. The owners of the dam, however, reported that the reservoir level has never reached the emergency spillway crest.

c. Visual Observations - No condition was observed at the time of the inspection to indicate that the spillway and outlet works could not operate satisfactorily in the event of a flood.

d. Overtopping Potential - The Tamarack Lake Dam "B" is classified as a "High" hazard-"Intermediate" size dam requiring evaluation for a spillway design flood equal to the Probable Maximum Flood (PMF). The spillways consist of a typical SCS concrete riser and vegetated earth channel. The hydrologic and hydraulic capabilities of the reservoir and spillways were evaluated by routing the PMF through the reservoir with the aid of the U.S. Army Corps of Engineer's Flood Hydrograph Package, HEC-1. The PMF hydrograph developed as part of this analysis had a peak discharge of 9980 c.f.s. based on a 6-hour rainfall of 21.9 inches. Discharges from the outlet works located at both Dam "B" and Dam "A" were considered in the flood routing. The results of this routing indicate that the reservoir is capable of passing the PMF with a corresponding maximum reservoir level of El. 1222.9 feet, which is 0.4 foot below the minimum crest of dam of 1223.3 feet. The maximum discharge from the reservoir is 4609 c.f.s. of which approximately 2030 c.f.s. discharges from dam site "B" into Mud Run.

e. Spillway Adequacy - The dam, as outlined in the above analysis is capable of passing the PMF without overtopping. Therefore, according to the recommended criteria, the spillway is considered "adequate."

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - The seepage area noted during the visual inspection should be periodically examined in the future to verify that the quantity of seepage is not increasing and transportation of fine material is not occurring. Should the extent of the seepage area or characteristics of the seepage increase with time, the condition should be studied in detail and appropriate remedial measures taken.

b. Design and Construction Data - Based upon the information reviewed concerning Tamarack Lake Dam "A" (where similar embankment materials were used), and the visual observations during the field inspection; it is concluded that Tamarack Lake Dam "B" could be shown to satisfy the recommended stability requirements presented in the "Recommended Guidelines for Safety Inspection of Dams."

c. Operating Records - Nothing in the readily available operating information indicates cause for concern relative to the structural stability of the dam.

d. Post-Construction Changes - The post-construction modifications made to the dam do not adversely influence the structural stability of the dam.

e. Seismic Stability - The dam is located near the boundary between Zones 1 and 2 of the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended Guidelines for Safety Inspections of Dams." Both of these zones are considered to present no hazard from earthquakes provided static stability conditions are satisfied and conventional safety margins exist. Tamarack Lake Dam "B" could be shown to meet the static stability requirements and, therefore, further consideration of the seismic stability is not warranted at this time.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety - The dam was found to be in good overall condition at the time of inspection. Tamarack Lake Dam "B" is a "High" hazard-"Intermediate" size dam requiring a spillway capacity equal to the PMF. As presented in Section 5, the spillways and reservoir are adequate to pass the PMF without overtopping the dam.

b. Adequacy of Information - The information available and the observations made during the field inspection are considered sufficient for this Phase I Inspection Report.

c. Urgency - The owner should initiate the action discussed in paragraph 7.2. without delay.

d. Necessity for Additional Data/Evaluation - No further investigation is necessary, unless future inspections of the seepage area indicate changing conditions.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed certain items of remedial work which should be performed by the owner. These include:

1) The periodic inspection of the seepage area to identify a change in quantity or the exiting of muddy water from this area and, if necessary, to study the situation in detail and take appropriate remedial measures.

2) Remove the vegetation from the downstream channel.

3) Repair the animal burrows in the embankment and establish a rodent control program.

4) Place additional, properly designed riprap protection (or other appropriate measure) along the plunge pool to reduce the erosion.

Emergency procedures should be developed by the owner including:

1) A detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

PLATES

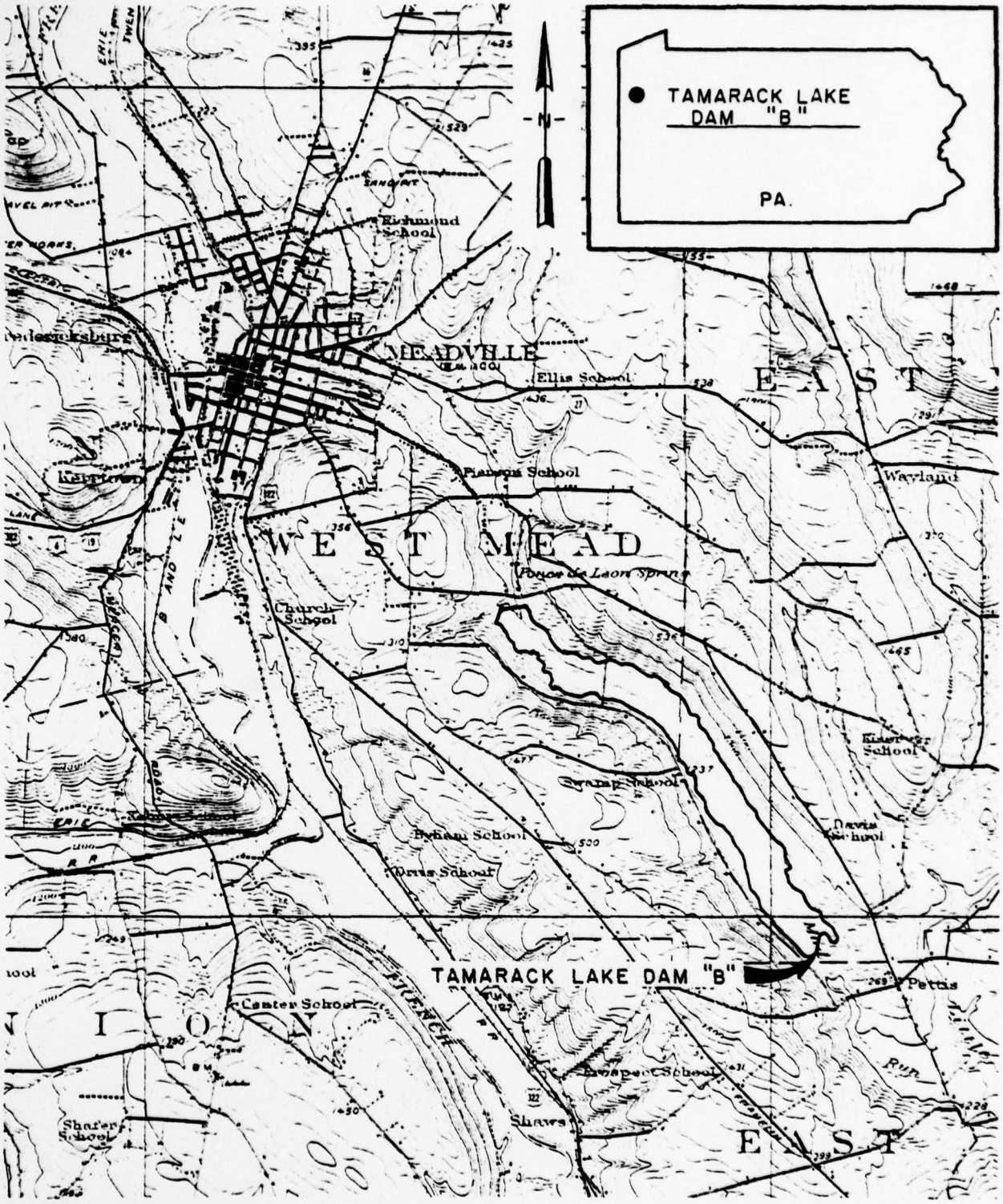


PLATE 1 LOCATION PLAN

TAMARACK LAKE DAM "B"

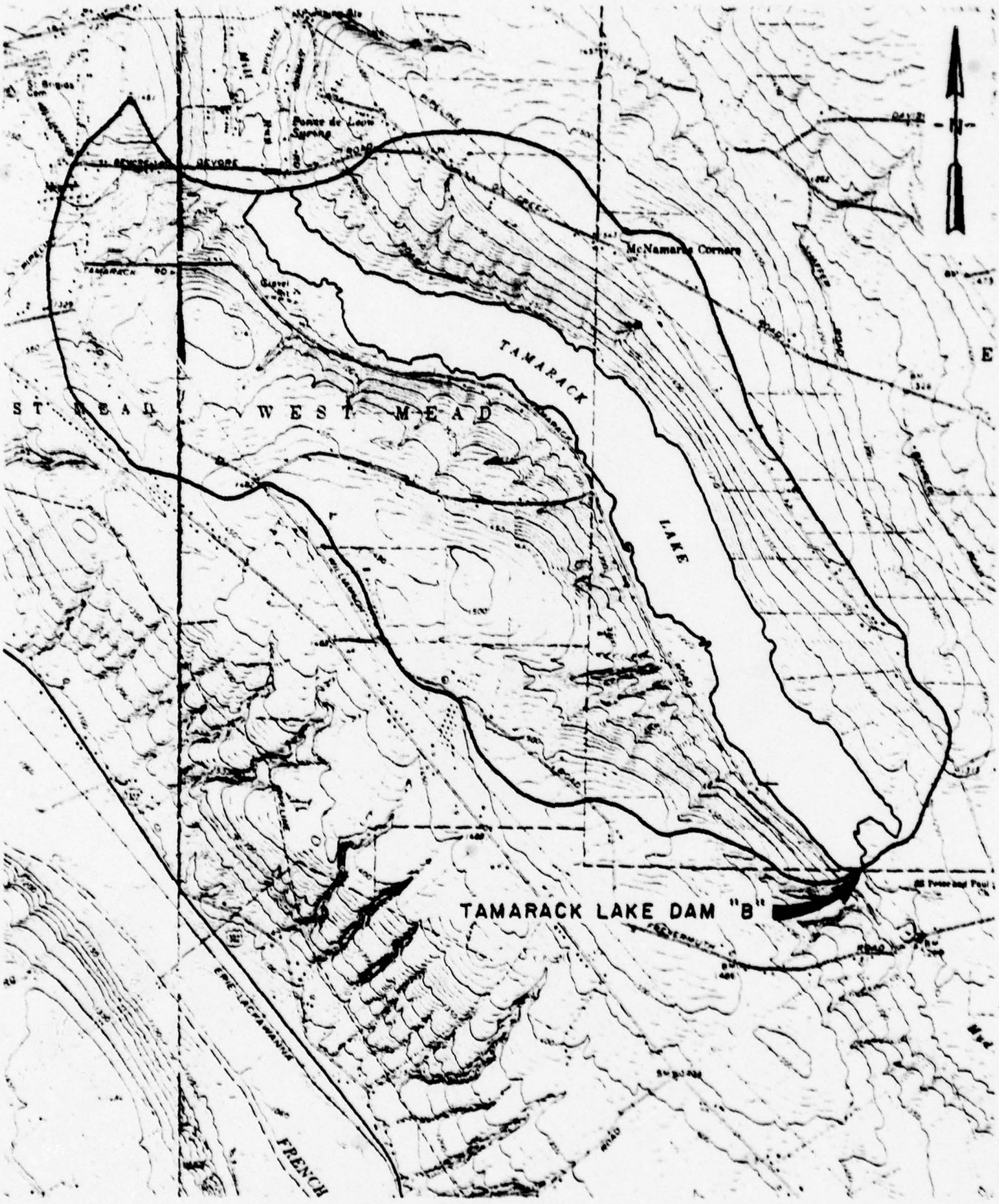
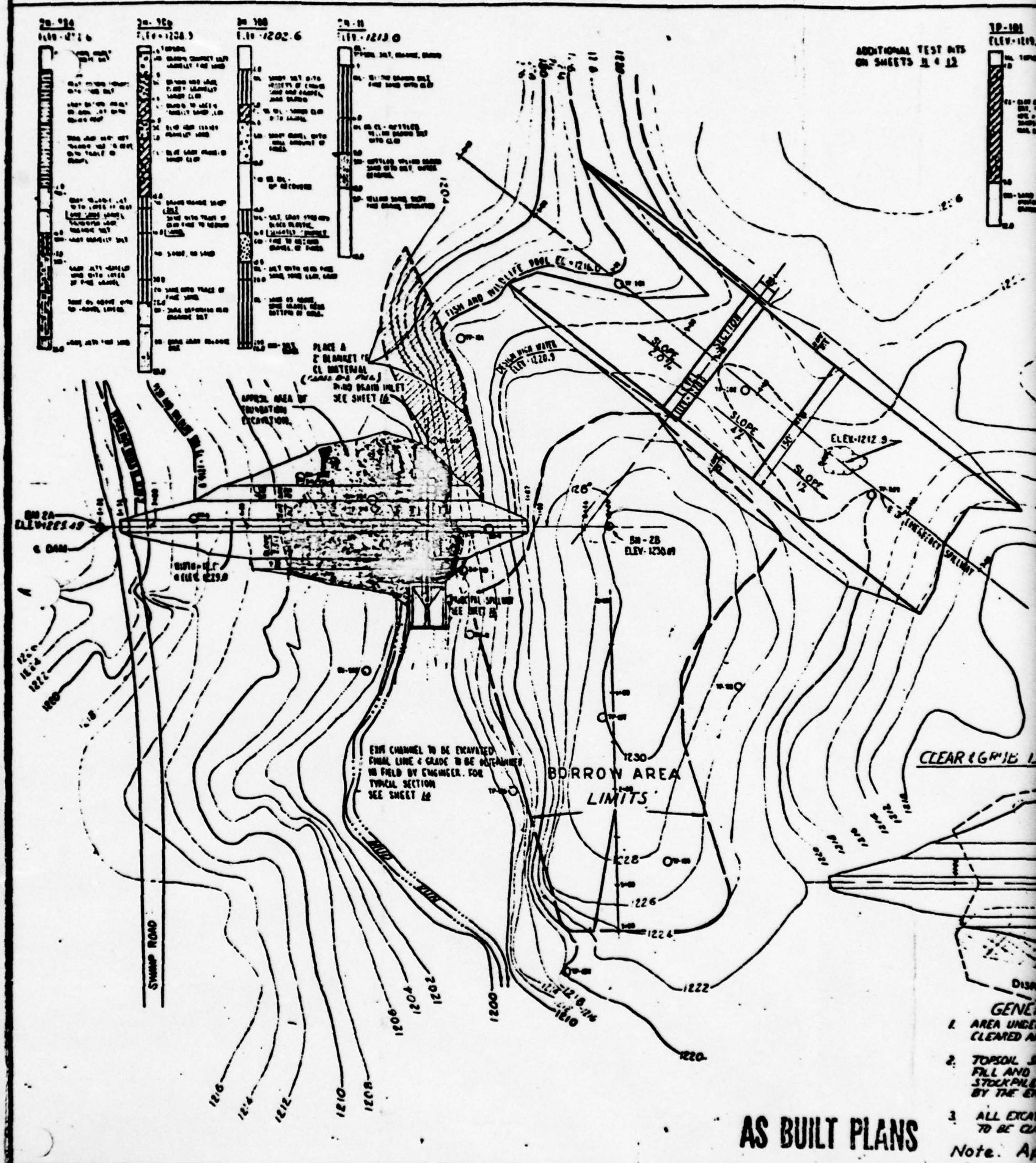


PLATE 2 WATERSHED MAP

TAMARACK LAKE DAM "B"



ADDITIONAL TEST PITS ON SHEETS 11 & 12
FISH AND WILDLIFE POOL EL.-1216.0
SLOPE 2.0%
SLOPE 4%
SLOPE 12
ELEV-1212.9
EMERGENCY SPILLWAY
BH-2A ELEV-1225.49
BH-2B ELEV-1230.89
DAM
PLACE A 2' BLANKET OF CL MATERIAL
APPROX. AREA OF FOUNDATION EXCAVATION
PRINCIPAL SPILLWAY SEE SHEET 15
EXIT CHANNEL TO BE EXCAVATED. FINAL LINE & GRADE TO BE DETERMINED IN FIELD BY ENGINEER. FOR TYPICAL SECTION SEE SHEET 16
BORROW AREA LIMITS
SWAMP ROAD
1230
1228
1226
1224
1222
1220
1216
1214
1212
1210
1208
1206
1204
1202
1200
AS BUILT PLANS

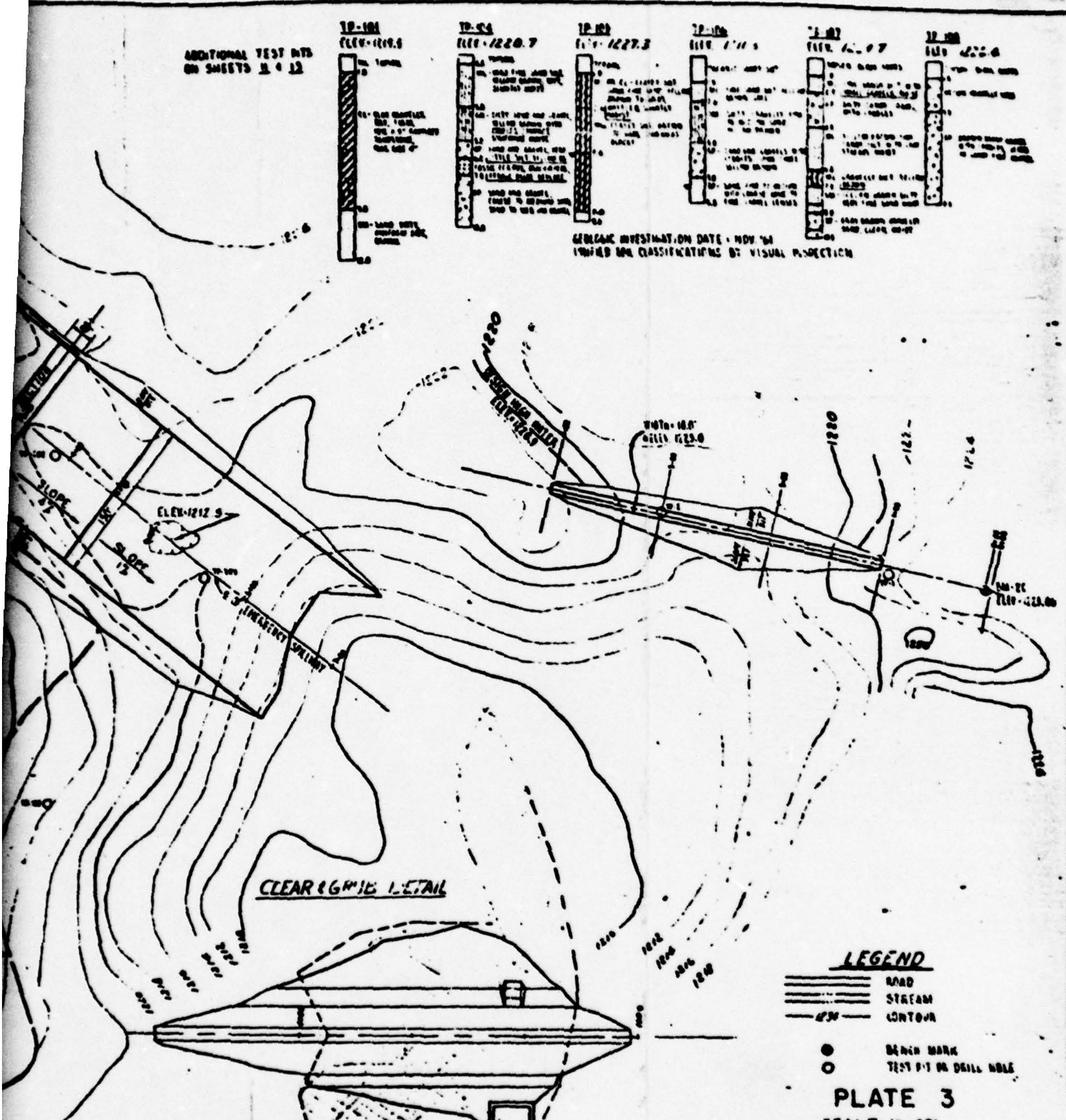


PLATE 3

SCALE: 1" = 60'

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
MULTIPLE PURPOSE DAM PA-461-B
CRAWFORD COUNTY
DAMSITE-"B"

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed: E. SCOTT	5/61	Approved by	
Drawn: E. SCOTT	5/61		
Traced			
Checked: S. J. MERCER	JUNE '61	Sheet 11 of 20	PA-461-B-P

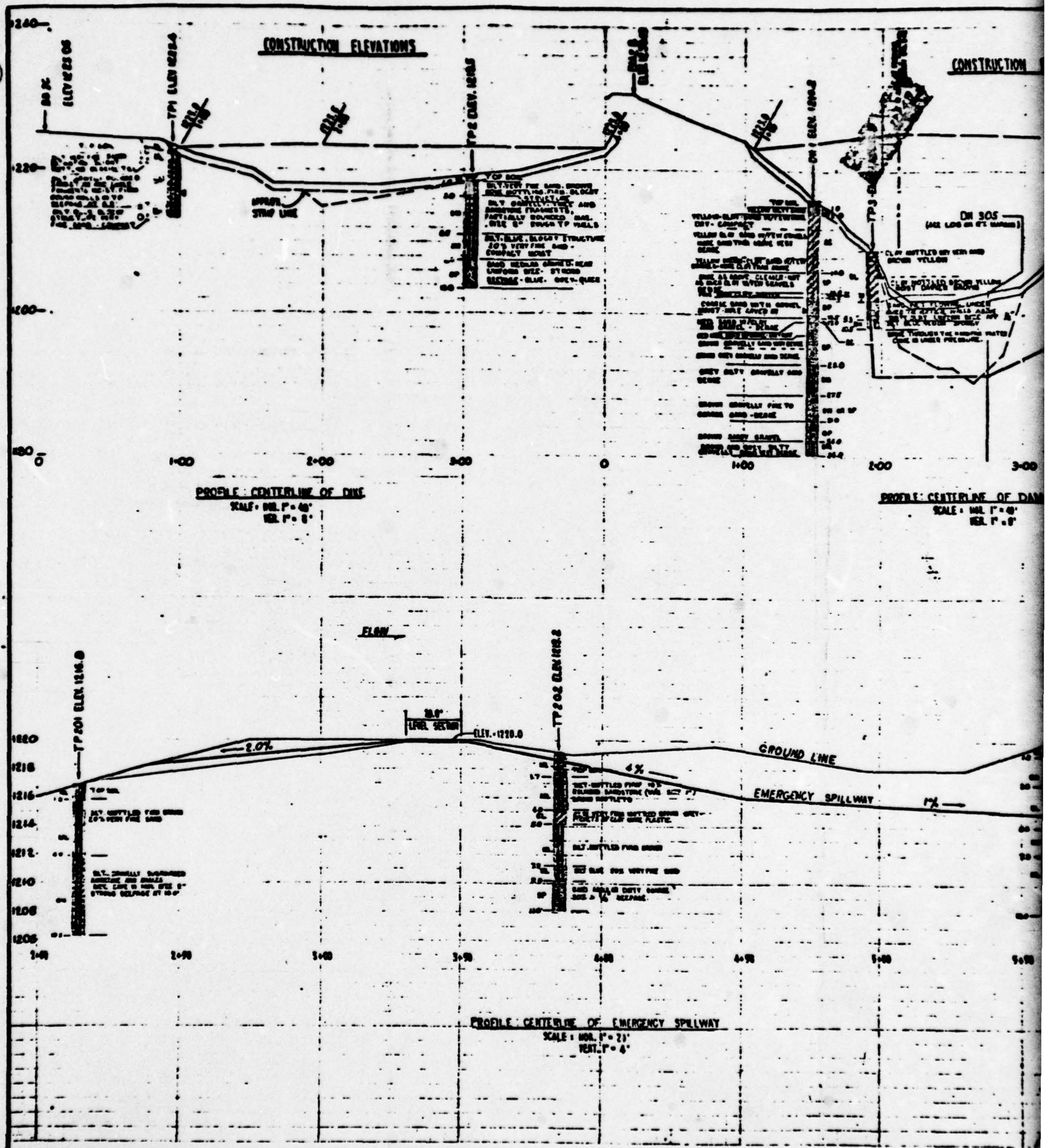
GENERAL NOTES (SITE "B")

1. AREA UNDER FILL AS SHOWN ON DRAWING, TO BE CLEARED AND GRUBBED SPEC. 2-58
2. TOPSOIL SHALL BE REMOVED FROM AREA UNDER FILL AND THE EMERGENCY SPILLWAY AND STOCKPILED OR DISPOSED OF AS DIRECTED BY THE ENGINEER SPEC. 4-58
3. ALL EXCAVATION SHOWN ON THESE DRAWINGS TO BE CLASSIFIED AS COMMON. SPEC. 4-58.

AS BUILT PLANS

Note. Approx. Half Scale

1 2


CONSTRUCTION ELEVATIONS
CONSTRUCTION
PROFILE: CENTERLINE OF DIKE
PROFILE: CENTERLINE OF DAM
DH 305
FLOW
LEVEL SECTION
ELEV.-1220.0
2.0%
4%
1%
GROUND LINE
EMERGENCY SPILLWAY
PROFILE: CENTERLINE OF EMERGENCY SPILLWAY

2

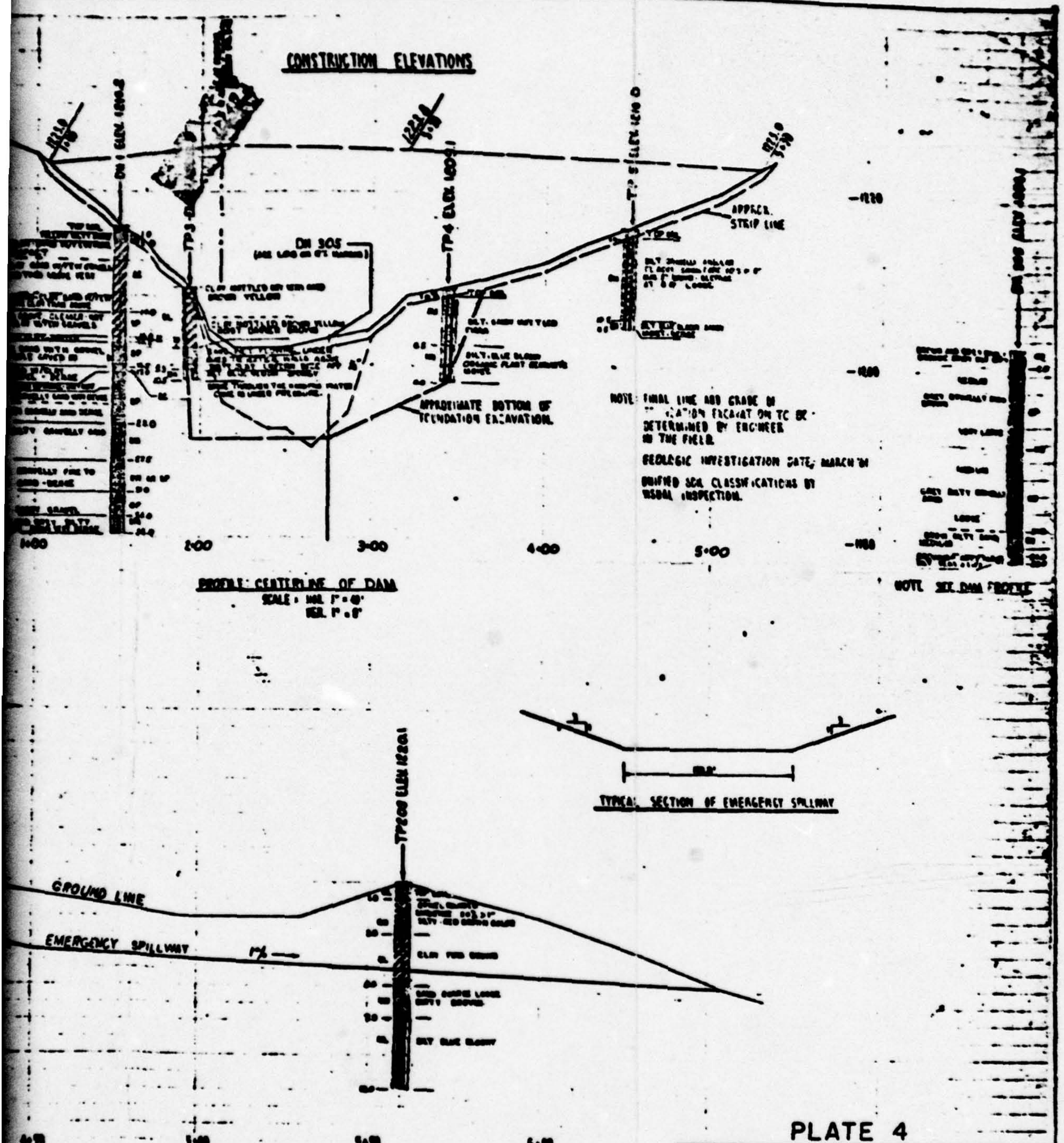


PLATE 4

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
MULTIPLE PURPOSE DAM PA-461-B
CRAWFORD COUNTY
PROFILES-"B"

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

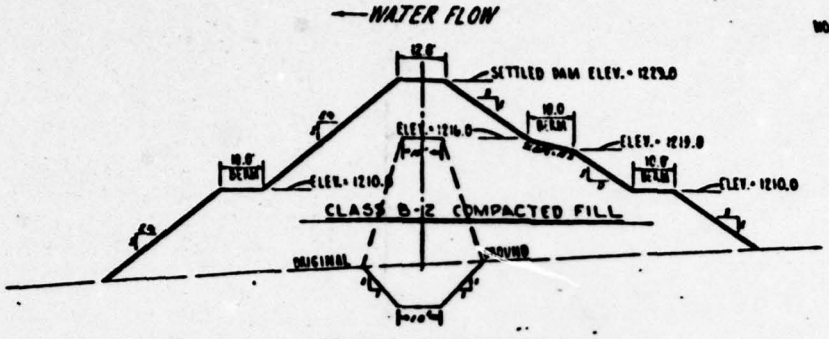
Designed	Date	Approved by
E. SCOTT	MAY '61	Title
Drawn E. SCOTT	5-5-61	Title
Traced		
Checked Fred D. Theurer 6/61	Sheet 8 of 10	Drawing No. PA-461-B-H

AS BUILT PLANS

Note: Approx. Half Scale

1

2



TYPICAL SECTION, DAM "A"

NOTE:

EMBANKMENT OF ALL "A" & "B" WILL BE CONSTRUCTED SIMULTANEOUSLY, WITH THE CONSTRUCTION SURFACES BEING MAINTAINED AT APPROXIMATELY THE SAME ELEVATION AT ALL TIMES, NOT TO EXCEED PLUS OR MINUS 18 INCHES

NOTE:

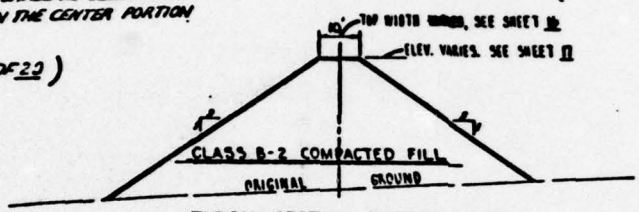
FILL MATERIAL AS REPRESENTED ON THE LOG OF TEST PIT 112 SHALL BE SELECTIVELY PLACED WITH CLAY IN THE CENTER PORTION OF THE FILL.

(SEE SHEET 17 OF 22)

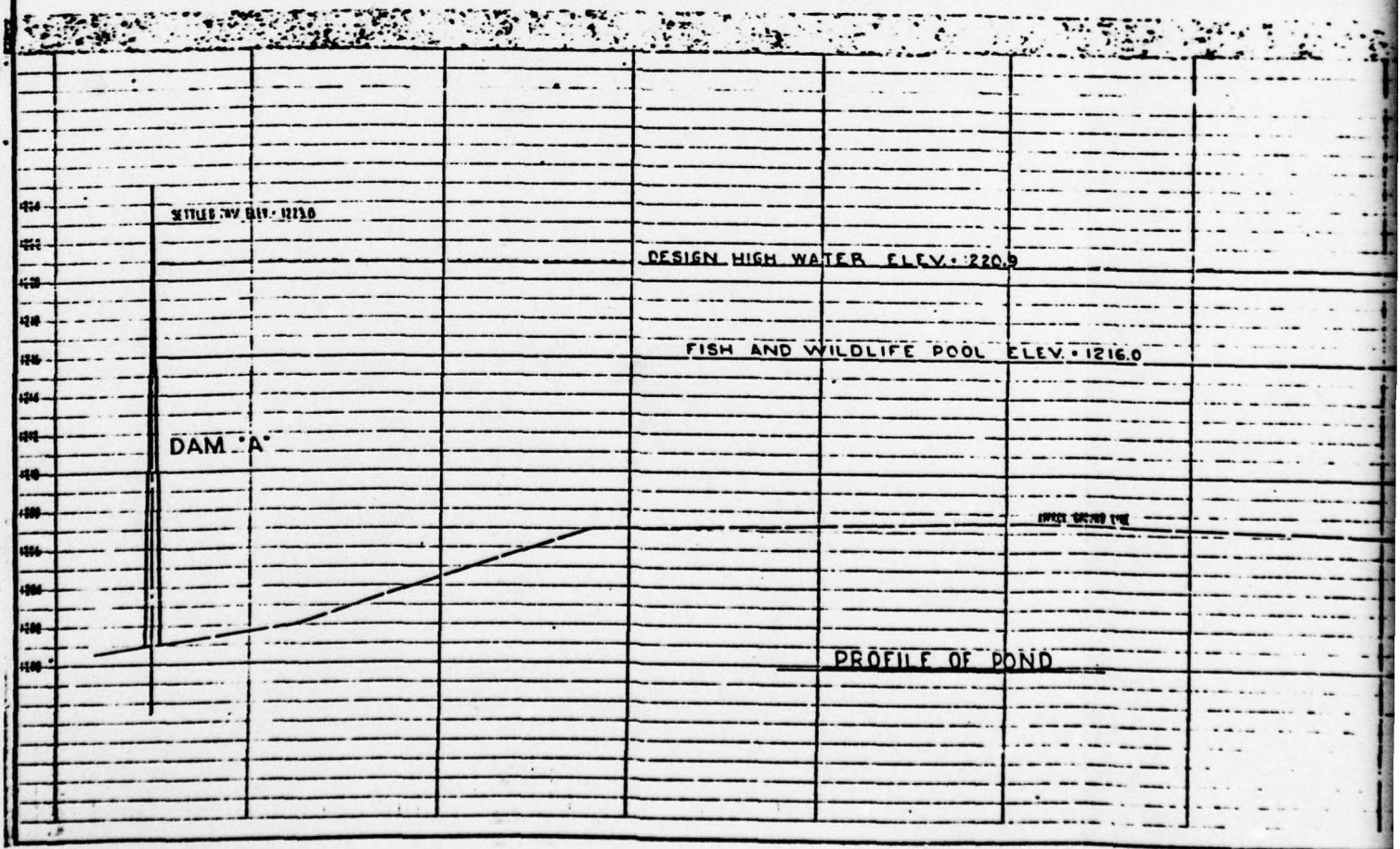
NOTE:

FILL MATERIAL SHALL BE S
WITH CLAYEY SILT AS REPRES
TEST PIT 103 FROM 1' TO
PORTION OF THE FILL.

SILTY GRAVEL AS REPRESENT
TEST PIT 107 (FROM 2' TO
AS REPRESENTED ON T
SHALL BE PLACED IN
PORTION OF THE FILL.

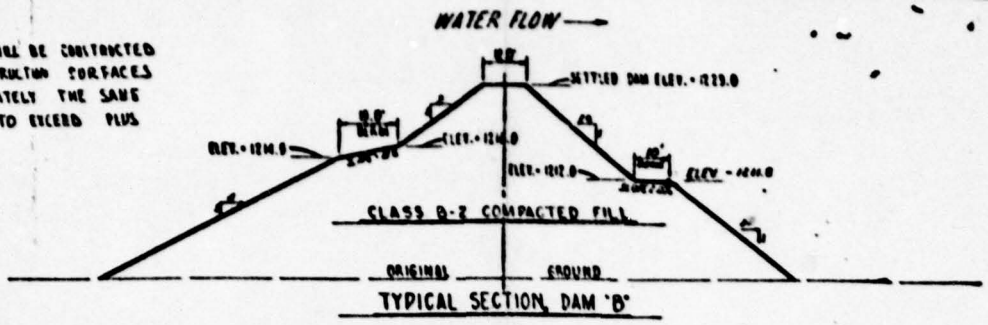


TYPICAL SECTION, DIVERSION DAM



NOTE:

EMBANKMENT OF DAM "A" & DAM "B" WILL BE CONSTRUCTED SIMULTANEOUSLY, WITH THE CONSTRUCTION SURFACES BEING MAINTAINED AT APPROXIMATELY THE SAME ELEVATION AT ALL TIMES, NOT TO EXCEED PLUS OR MINUS 18 INCHES

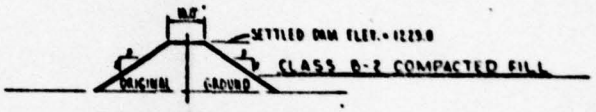


TYPICAL SECTION, DAM "B"

NOTE:

FILL MATERIAL SHALL BE SELECTIVELY PLACED WITH CLAYEY SILT AS REPRESENTED ON THE LOG OF TEST PIT 103 FROM 1' TO 9.0' IN THE CENTER PORTION OF THE FILL.

SILTY GRAVEL AS REPRESENTED ON THE LOG OF TEST PIT 107 (FROM 2' TO 6') AND SANDY GRAVEL AS REPRESENTED ON THE LOG OF TEST PIT 120 SHALL BE PLACED IN THE DOWNSTREAM PORTION OF THE FILL



TYPICAL SECTION "DIKE"

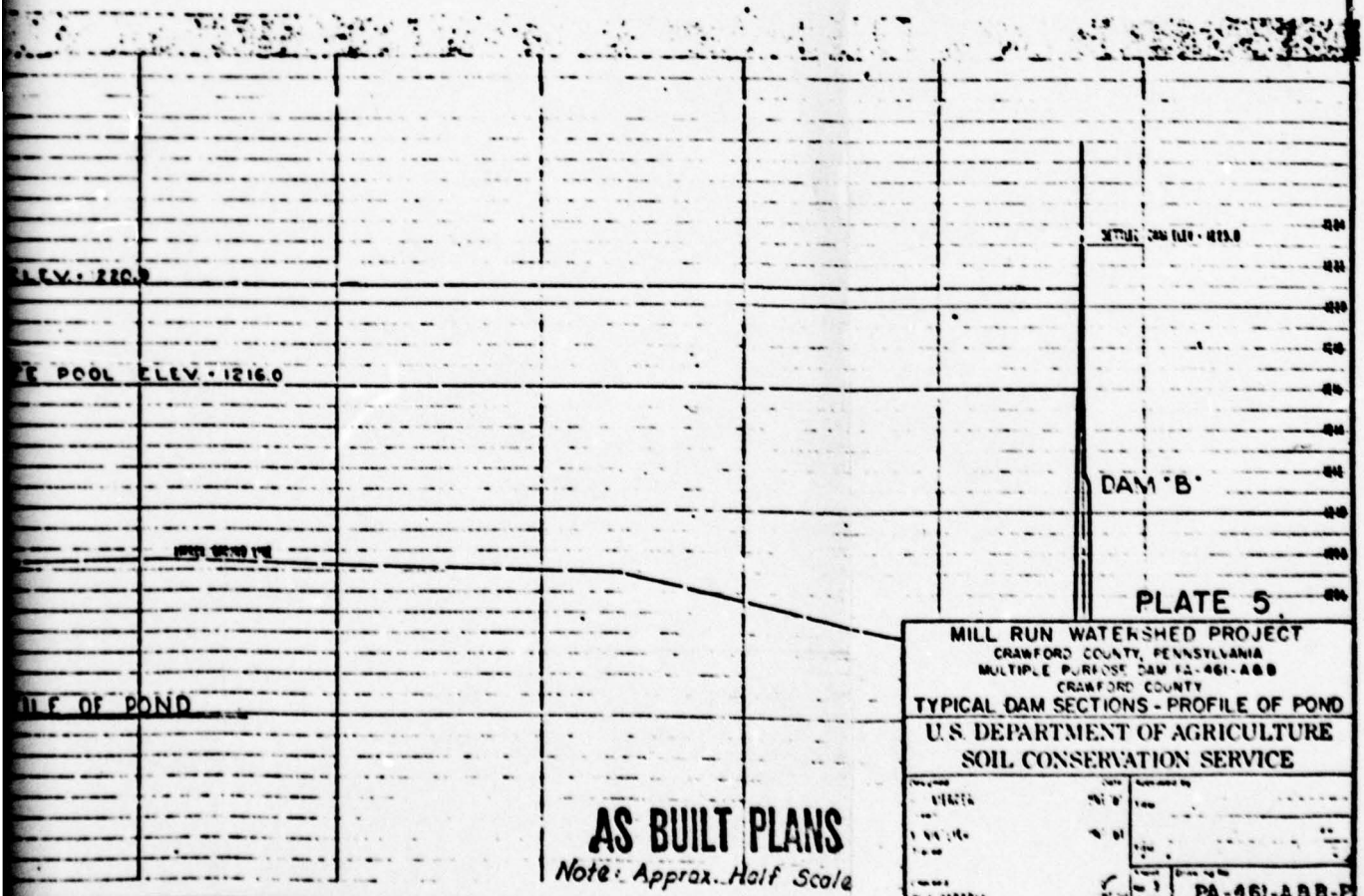


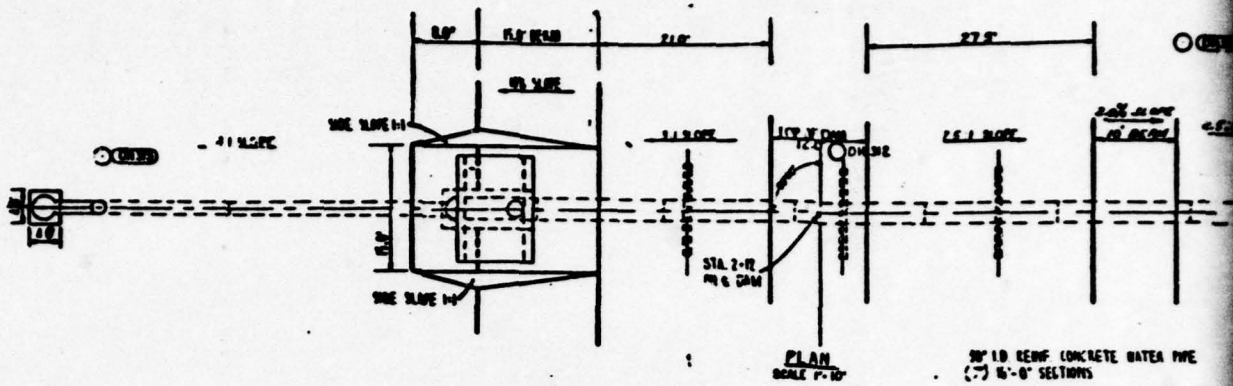
PLATE 5

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
MULTIPLE PURPOSE DAM PA-461-A&B
CRAWFORD COUNTY
TYPICAL DAM SECTIONS - PROFILE OF POND
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PA-461-A&B-P

AS BUILT PLANS
Note: Approx. Half Scale

2 1 2

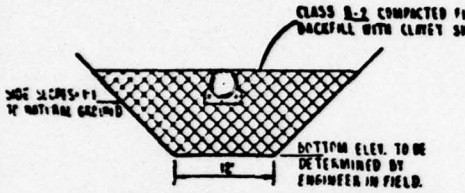


PLAN
SCALE 1"=10'

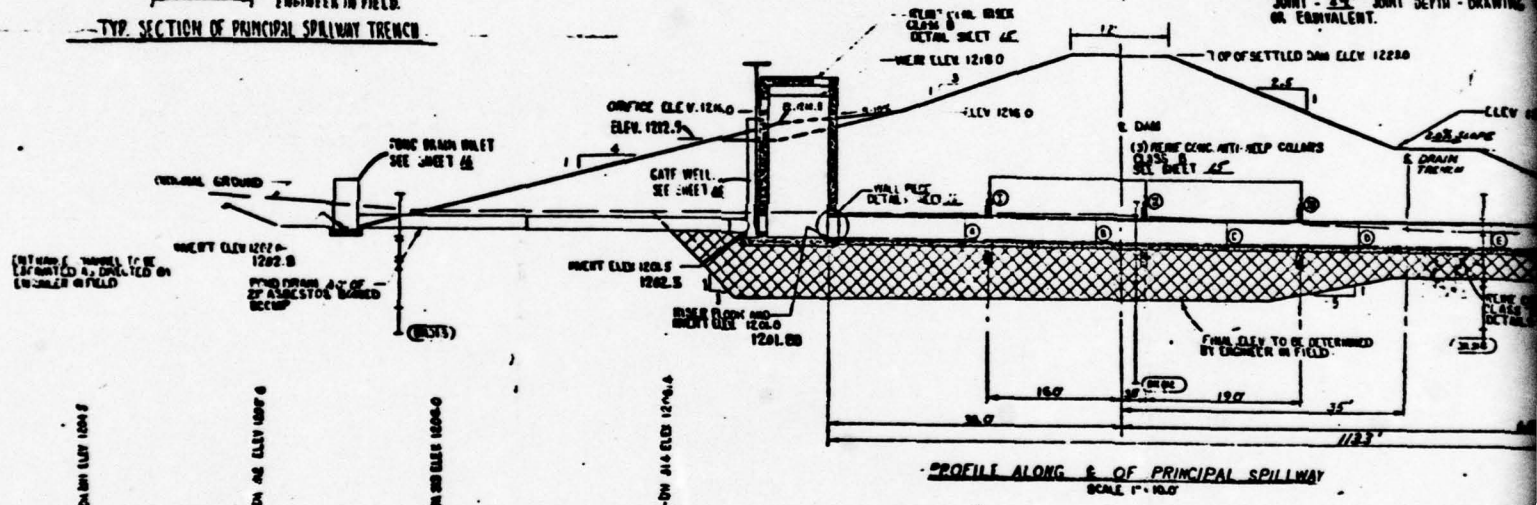
36" I.D. REINF. CONCRETE WATER PIPE
(-) 16'-0" SECTIONS

@ WALL PIECE FOR 12' WALL
TOTAL = 199.9'
PRESSURE HEAD = 70.0 FT
LOAD 1795 LBS. PER LIN FT. BASED ON O.D.
MIN. 3 EDGE BEARING STRENGTH FOR O.D.
PRESTRESSED PIPE) = 5694 LBS. PER LIN
CRACK (PRESTRESSED PIPE) = 4281

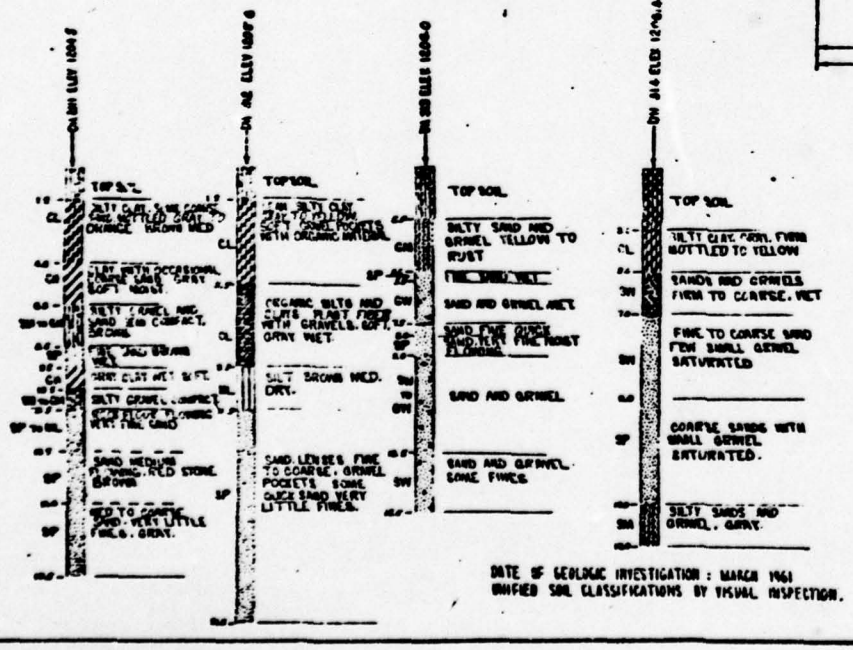
NOTE:
MIN. PERMISSABLE PIPE AND WALL PIECE
SHALL BE 1/4" WITHOUT LOSING COMPLE
RUBBER GASKET. (LOCK JOINT PIPE COUP
JOINT - 4 1/2" JOINT DEPTH - DRAWING
OR EQUIVALENT.



TYP. SECTION OF PRINCIPAL SPILLWAY TRENCH



PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY
SCALE 1"=10.0'



DATE OF GEOLOGIC INVESTIGATION : MARCH 1961
UNIFIED SOIL CLASSIFICATIONS BY VISUAL INSPECTION.

POINT	DISTANCE FROM RISER WALL PIECE
RISER	0.0
A	16.0
B	32.0
C	48.0
D	64.0
E	80.0
F	96.0
	112.0

NOTE: PIPE LENGTH
AND DO NOT INCLU

AS BUILT PLANS

Note: A

1

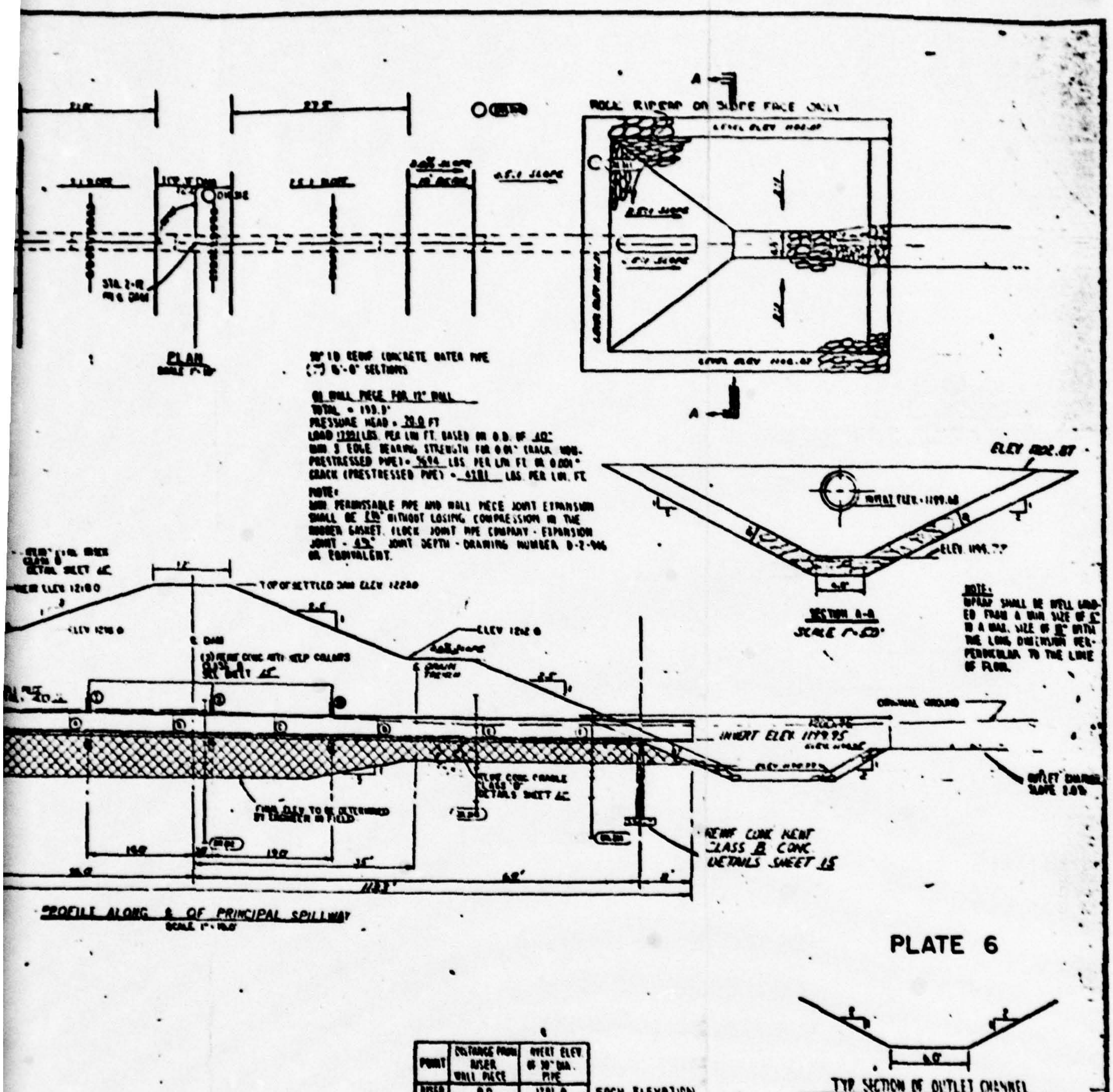


PLATE 6

POINT	DISTANCE FROM RISER WALL PIECE	INVERT ELEV. OF 30" DIA. PIPE
RISER	0.0	1201.0
[illegible]	16.0	1201.0
[illegible]	32.0	1201.0
[illegible]	48.0	1200.79
[illegible]	64.0	1200.58
[illegible]	80.0	1200.37
[illegible]	96.0	1200.16
[illegible]	112.0	1199.95

EACH ELEVATION INCREASED BY 0.40'

[illegible]	[illegible]	1201.0
[illegible]	32	1199.92
[illegible]	[illegible]	1199.57

NOTE: PIPE LENGTHS ARE NOMINAL AND DO NOT INCLUDE CREEP.

AS BUILT PLANS

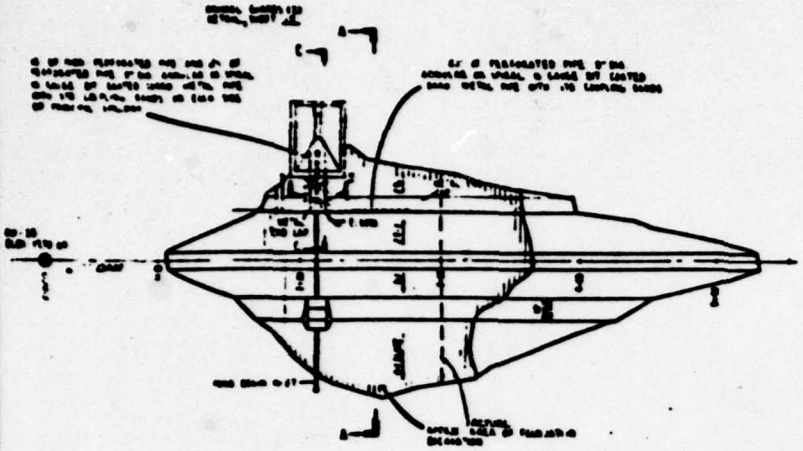
Note: Approx. Half Scale

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
MULTIPLE PURPOSE DAM PA-461-B
CRAWFORD COUNTY
PLAN, PROFILE OF PRINCIPAL SPILLWAY-"B"

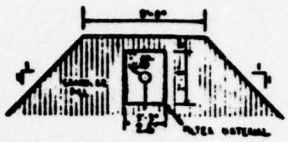
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed: T. SCOTT — MAY '64
Checked: S. J. MENKES — JUNE '64
PA-461-B-P

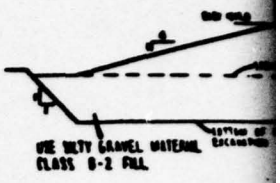
1 1 2



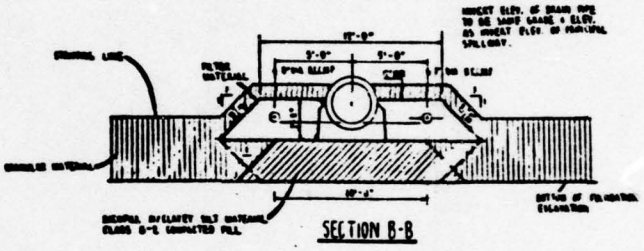
PLAN VIEW
SCALE: 1" = 60'



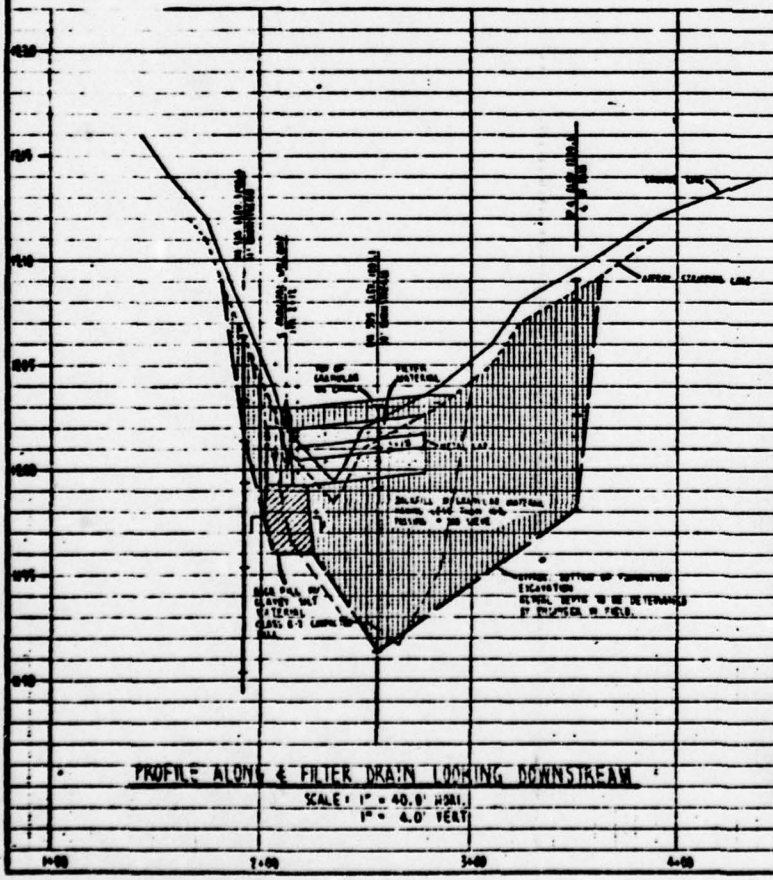
DETAIL I



USE SILTY GRAVEL MATERIAL
CLASS B-2 FILL

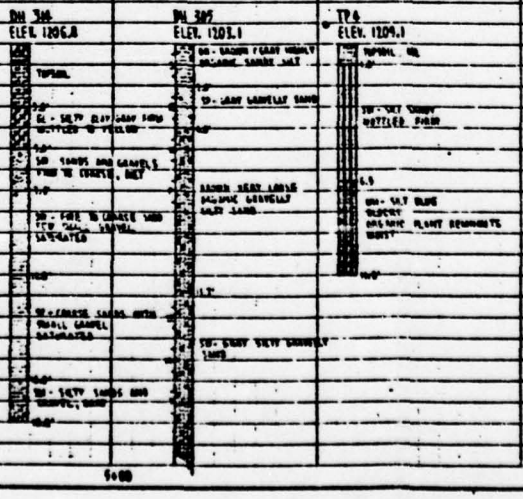


SECTION B-B

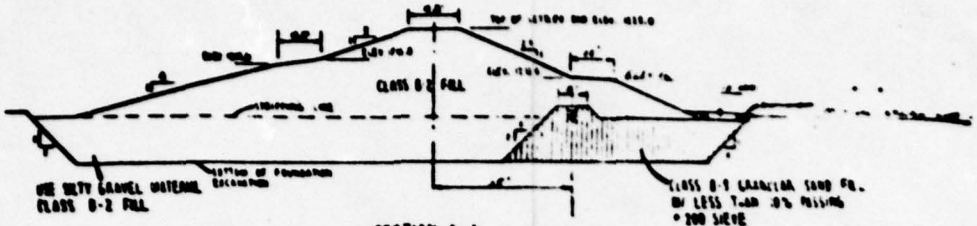


PROFILE ALONG ℄ FILTER DRAIN LOOKING DOWNSTREAM
SCALE: 1" = 40.0' HORI.
1" = 4.0' VERT.

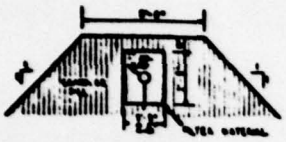
SOILS DATA



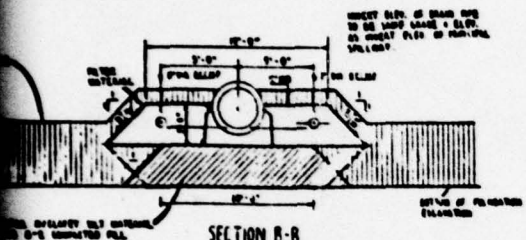
1



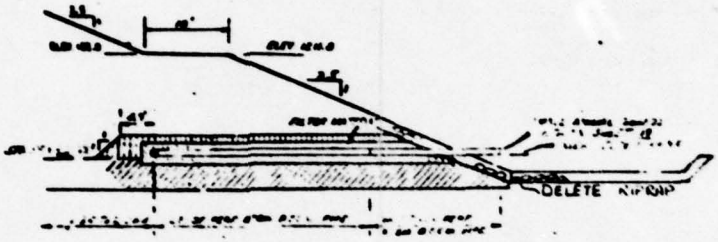
SECTION A-A
SCALE 1" = 20'



DETAIL I

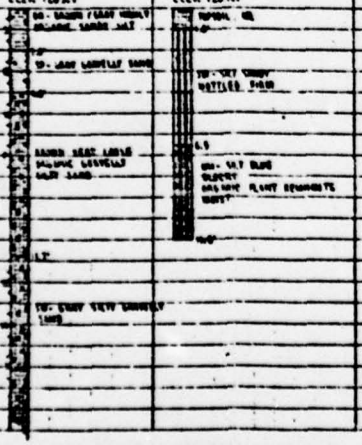


SECTION B-B



SECTION C-C
SCALE 1" = 10'

SOILS DATA



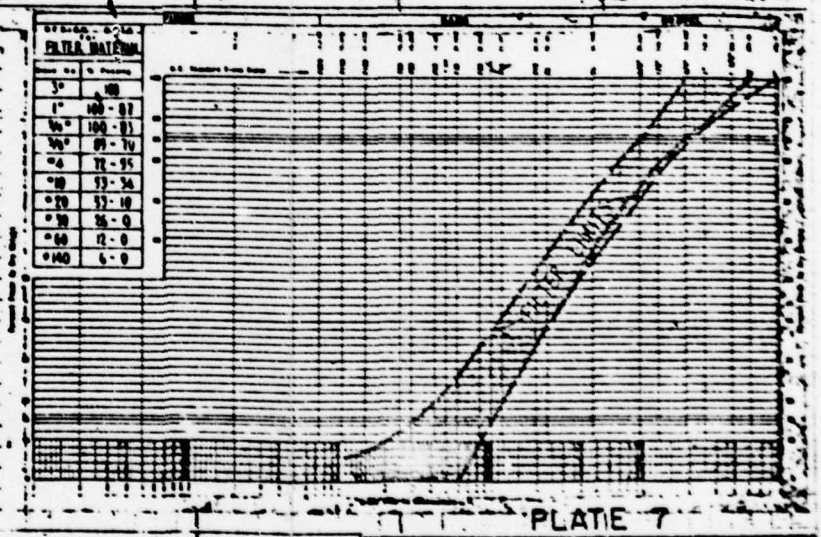


PLATE 7

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
MULTIPLE PURPOSE DAM PA-461-B
CRAWFORD COUNTY
SEEPAGE DRAIN DETAILS "B"
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed Fred A Thaurer 4/61
Drawn W H MORGAN JUNE 61
Traced
Checked S. C. ROBBIER 4/61

PA-461-B-R

AS BUILT PLANS

Note: Approx. Half Scale

1 1 2

APPENDIX A

CHECK LIST - VISUAL INSPECTION AND FIELD SKETCH

Check List
Visual Inspection
Phase 1

Name of Dam Tamarack Lake Dam "B" County Crawford State PA Coordinates Lat. 41° 34.7' Long. 80° 04.6'

NDI # PA 00746
PennDER # 20-47B
SCS # PA 461B

Date of Inspection 29 Nov. 1978 Weather Overcast, windy Temperature 30°F.

Pool Elevation at Time of Inspection 1216.6 ft.* M.S.L. Tailwater at Time of Inspection 1201.2 ft.* M.S.L.

*All elevations are referenced to the elevation of the principal spillway crest (El. 1216.0 ft.)

Inspection Personnel:

Michael Baker, Jr., Inc.:
David F. Johns
Rodney E. Holderbaum
James G. Ulinski

Owner's Representatives
Pennsylvania Fish Commission:

E. Jon Grindall, Senior Project Engineer
Bureau of Fisheries and Engineering

Melvin W. Dinger, Maintenance Foreman
Region I

James G. Ulinski Recorder

Name of Dam: Tamarack Lake Dam "B"
NDI # PA 00746

CONCRETE/MASONRY DAMS - Not Applicable

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: Tamarack Lake Dam "B"
NDI # PA 00746

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

Name of Dam: Tamarack Lake Dam "B"

EMBANKMENT

NDI # PA 00746

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	None observed	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No problem observed	
RIPRAP FAILURES	Erosion appears to be occurring around the outlet conduit plunge pool. The riprap at the upstream end of the pool appears to be eroding into the pool.	Repair with additional properly designed riprap.

Name of Dam: Tamarack Lake Dam "B"

EMBANKMENT

NDI # PA 00746

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RODENT HOLES	A small rodent hole was observed about 200 ft. left of the right abutment in the downstream embankment.	The hole should be repaired and a rodent control program should be implemented.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems observed	
ANY NOTICEABLE SEEPAGE	Minor seepage was flowing from a location approximately 20 ft. to the left of the outlet pipe and approximately 3 ft. higher. The seepage did not appear to be carrying any fine material; however, a 4-in. diameter hole approximately 1 ft. deep was present at the time of inspection.	The seepage area should be visually monitored frequently in the future. If conditions indicate the necessity, appropriate action should be taken.
STAFF GAGE AND RECORDER	None	
DRAINS	The two drain outlets were partially submerged under the tailwater. Their effectiveness should be examined in the future when the tailwater is lower.	

Name of Dam: Tamarack Lake Dam "B"
NDI # PA 00746

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION OF CONCRETE SURFACES IN OUTLET CONDUIT	The outlet conduit, at its exit, is in very good condition.	
INTAKE STRUCTURE	No deterioration of the structure was observed.	
OUTLET STRUCTURE	The outlet conduit exits directly into a natural stilling pool. Both the outlet pipe and stilling pool are in very good condition.	
OUTLET CHANNEL	The mildly sloping outlet channel is relatively free of debris and other obstructions. Some vegetation is growing in the channel just below the stilling basin.	The vegetation should be removed from the channel.
EMERGENCY GATE	A visual inspection of the emergency gate was not possible. The owner reported that the gate is operable.	The emergency gate is opened biannually to check its operation.

Name of Dam: Tamarack Lake Dam "B"
NDI # PA 00746

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTION	The horizontal and vertical alignment of the control section was fairly uniform. This control section is well vegetated and free of erosion.	
APPROACH CHANNEL	The approach channel is uniformly sloping and well vegetated. No erosion or obstructions were observed.	
DISCHARGE CHANNEL	The well-vegetated discharge channel is free of erosion and obstructions. It exits into a heavily wooded natural valley approximately 350 ft. downstream from the level section.	
BRIDGE AND PIERS	Not Applicable	

Name of Dam: Tamarack Lake Dam "B"
NDI # PA 00746

GATED SPILLWAY - Not Applicable

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

Name of Dam: Tamarack Lake Dam "B"

INSTRUMENTATION

NDI # PA 00746

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

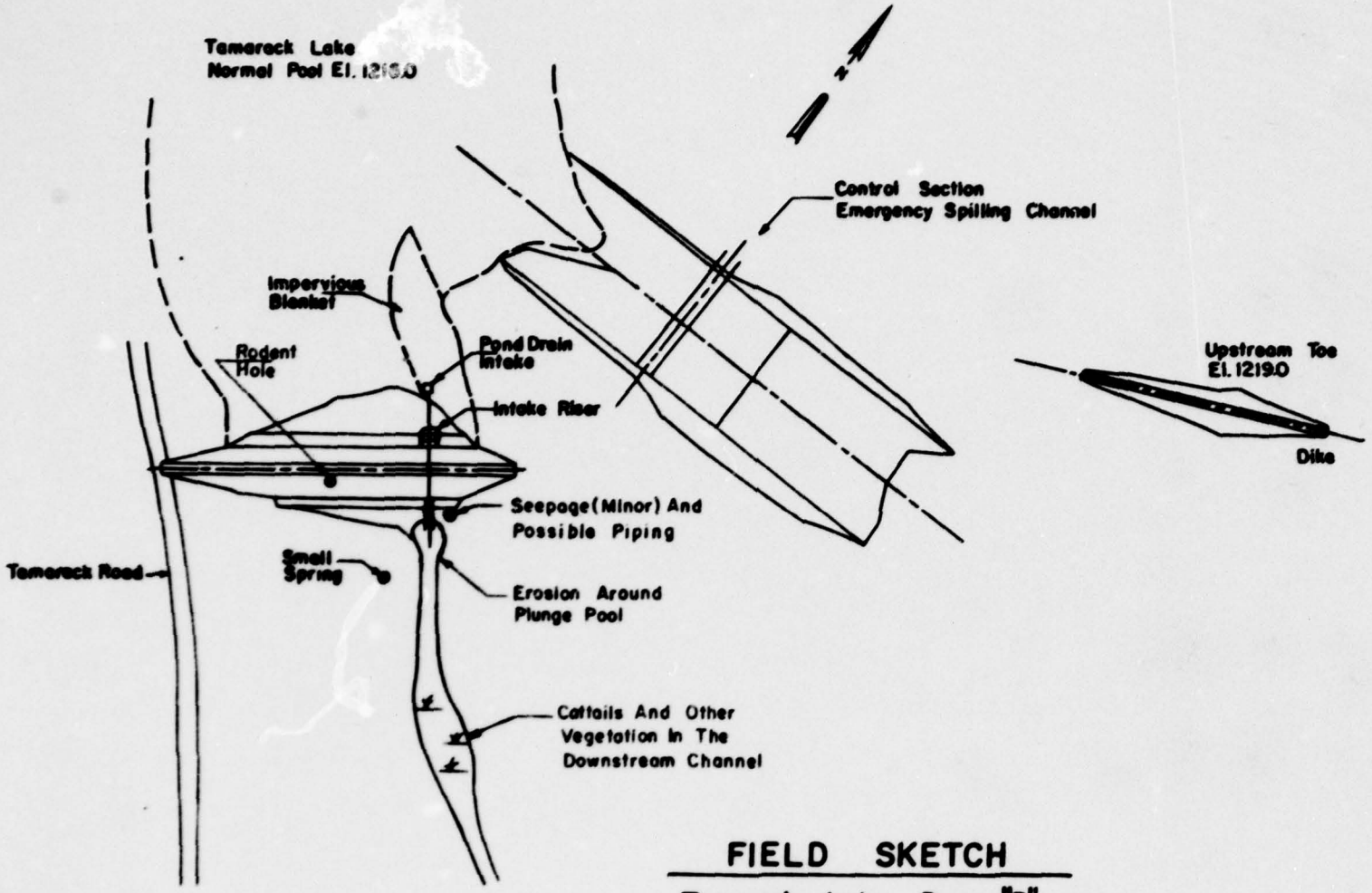
Name of Dam: Tamarack Lake Dam "B" RESERVOIR
NDI # PA 00746

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The reservoir slopes are relatively steep. Although some of the watershed is developed, the slopes are primarily wooded or grass covered.	
SEDIMENTATION	Because of the age of the structure and the watershed cover, sedimentation should not present a problem at this time.	

Name of Dam: Tamarack Lake Dam "B"
NDI # PA 00746

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No serious erosion or debris was noted in the downstream channel. There is, however, some vegetation located in the channel just below the stilling basin.	The downstream channel should be checked periodically for debris or other obstructions. The vegetation should be removed from the channel immediately downstream of the outlet pipe to minimize restriction of flood flows.
SLOPES	The slope of the downstream channel is mild, averaging approximately 0.3% from the dam to the confluence with Little Sugar Creek.	
APPROXIMATE NO. OF HOMES AND POPULATION	There are only a few homes located between the dam and the confluence of Mud Run and Little Sugar Creek, a distance of approximately 1.5 mi. The Little Sugar Creek floodplain is relatively uninhabited along its approximately 6.5 mi. course to the Borough of Cochranton.	



FIELD SKETCH

Tamarack Lake Dam "B"
N.D.I. No. PA 00746
PennDER No. 20 - 47B

NOT TO SCALE

APPENDIX B

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: Tamarack Lake Dam "B"
NDI # PA 00746

ITEM	REMARKS
PLAN OF DAM	See Plate 3.
REGIONAL VICINITY MAP	A USGS 7.5 minute topographic quadrangle, Cochranton, Pennsylvania, was used to prepare the vicinity map which is enclosed in this report as the Location Plan (Plate 1).
CONSTRUCTION HISTORY	The dam and appurtenant structures were designed by the Soil Conservation Service (SCS). The dam was constructed by Bell and Bell Contractors of Eldred, Pennsylvania. The dam was constructed in 1961 and 1962.
TYPICAL SECTIONS OF DAM	See Plate 5.
HYDROLOGIC/HYDRAULIC DATA	Some hydrologic/hydraulic data are included in the "Mill Run Watershed Work Plan" report prepared by the Mercer County Commissioners, et. al., March, 1960. Other information is included in the Dam Permit Application Report prepared by the Pennsylvania Department of Forests and Waters on 2 August 1961 (in the PennDER files). Prints of the SCS drawings "Freeboard Hydrograph" and "Spillway Hydrograph," dated May 1961, are also in the PennDER files. A summary design report (PA-461-R) contains additional hydrologic and hydraulic information. Design calculations and the design report are available in the SCS Harrisburg office files.
OUTLETS - PLAN AND DETAILS	See Plate 6. Additional structural details are shown on sheets 15 and 16 of the "as built" drawings available in the SCS Harrisburg office files.
- CONSTRAINTS	None
- DISCHARGE RATINGS	are available in the SCS design files and included as part of Appendix D of this report.
RAINFALL/RESERVOIR RECORDS	No rainfall or reservoir level records are available.

ITEM	REMARKS
DESIGN REPORTS	Available in the files of the SCS Harrisburg office.
GEOLOGY REPORTS	Geology information is included in the "Mill Run Watershed Work Plan," PennDER's permit application report, the files of the SCS Harrisburg office, and various Pennsylvania Geological Survey publications.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS	Available in the SCS Harrisburg office files.
DAM STABILITY SEEPAGE STUDIES	Unlike Tamarack Lake Dam "A," information was not readily available concerning these subjects in the SCS Harrisburg office files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Information concerning the soil boring profiles and the site reconnaissance performed are available in the SCS Harrisburg office files. No information concerning the laboratory testing was readily available.
POST-CONSTRUCTION SURVEYS OF DAM	was performed to prepare the "as built" drawings of the dam. Most of these drawings are included as Plates 3-7 of this report; however, all the sheets are available in the SCS Harrisburg office files.
BORROW SOURCES	See Plate 3 for the limits of the borrow area at the dam site.

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Changes were made during construction to the elevation and length of the outlet conduit. These changes have been recorded on the "as built" drawings. Additional riprap was placed on the upstream face to protect the embankment from wave action.
HIGH POOL RECORDS	No reservoir level or high pool records are kept for Tamarack Lake.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	The dam is inspected yearly by personnel from the SCS and the Pennsylvania Fish Commission.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	Yearly inspections are made by the SCS along with the Pennsylvania Fish Commission. Maintenance and operation are reviewed as a part of the inspections and recommendations for corrective action are made if necessary. Yearly summaries of the maintenance performed and schedules for future maintenance are forwarded to the SCS district conservationist at Clarion, Pennsylvania.

ITEM	REMARKS
(EMERGENCY) SPILLWAY PLAN	See Plates 3 and 4.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS (POND DRAIN)	See sheets 15 and 16, plus an unnumbered sheet of the "as built" drawings available in the SCS Harrisburg office files.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 4.99 sq. mi. (primarily farmland and forested areas)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1216.0 ft. (3850 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1223.2 ft. (8270 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 1220.9 ft.

ELEVATION TOP DAM: 1223.3 ft. (minimum), 1223.0 ft. (design)

CREST: Emergency Spillway

a. **Elevation** 1220.0 ft. (control section)
b. **Type** Vegetated earth channel
c. **Width** 150 ft.
d. **Length** approximately 500 ft.
e. **Location Spillover** Several hundred ft. north of east abutment of dam
f. **Number and Type of Gates** None

OUTLET WORKS:

a. **Type** Concrete riser and 30 in. outlet pipe
b. **Location** Approximately 330 ft. from right abutment.
c. **Entrance inverts** El. 1216.0 ft. (low stage), El. 1216.8 ft. (high stage)
d. **Exit inverts** El. 1201.2 ft.
e. **Emergency draindown facilities** 21 in. gated C.M.P.

HYDROMETEOROLOGICAL GAGES: None

a. **Type**
b. **Location**
c. **Records**

MAXIMUM NON-DAMAGING DISCHARGE Unknown

APPENDIX C

PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View of Dam and Dike

Top Photo - Overall View of Dam from Right Abutment (Emergency Spillway Channel Located behind Trees in Left-Center of Photo)

Bottom Photo - Overall View of Dike from Right Abutment of Dike

Photo 1 - View Looking at Downstream Portion of Emergency Spillway Channel

Photo 2 - View from Left Abutment of Dam

Photo 3 - Close-up of Intake Riser

Photo 4 - View of Outlet Conduit and Drainpipes

Photo 5 - View of Downstream Channel (Note Vegetation in Channel)

Photo 6 - Close-up of Seepage Located to Left of Outlet Pipe

Note: Photographs were taken on 29 November 1978.

TAMARACK LAKE DAM "B"

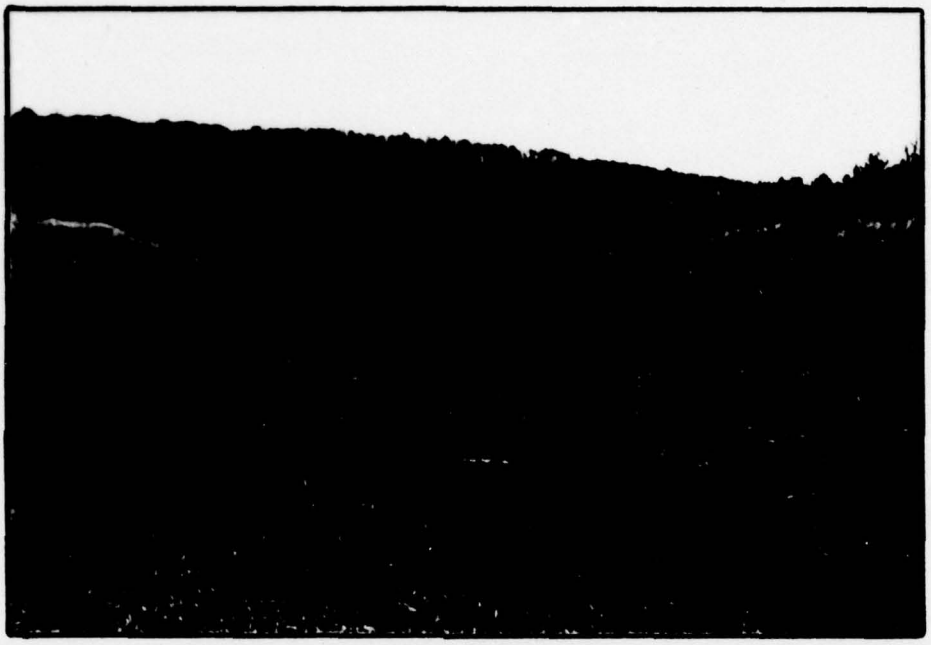


PHOTO 1. View Looking Downstream of Emergency Spillway Channel

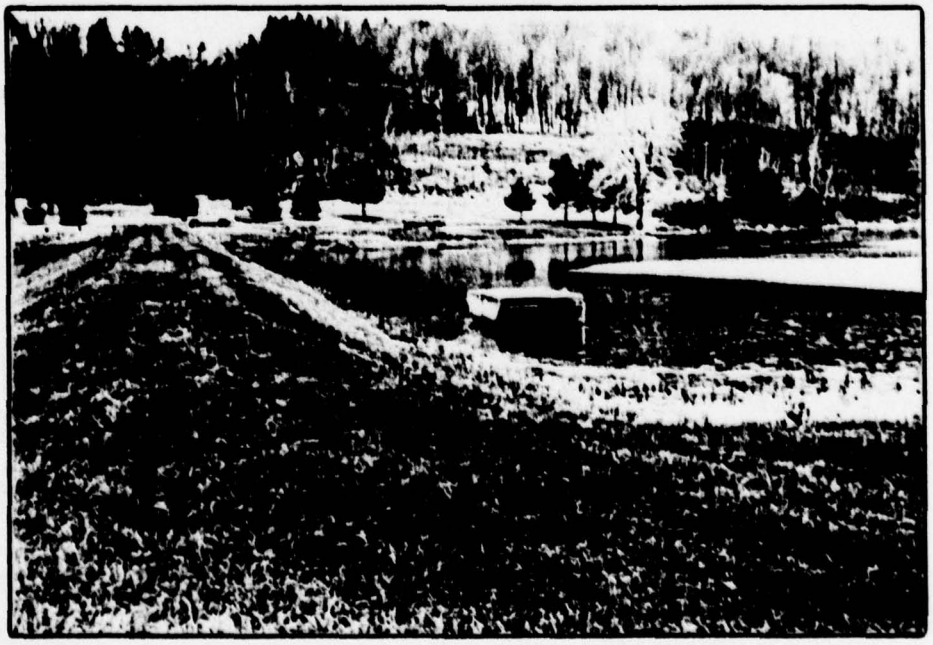


PHOTO 2. View from Left Abutment of Dam

PHOTO 3. Close-up of Intake Riser

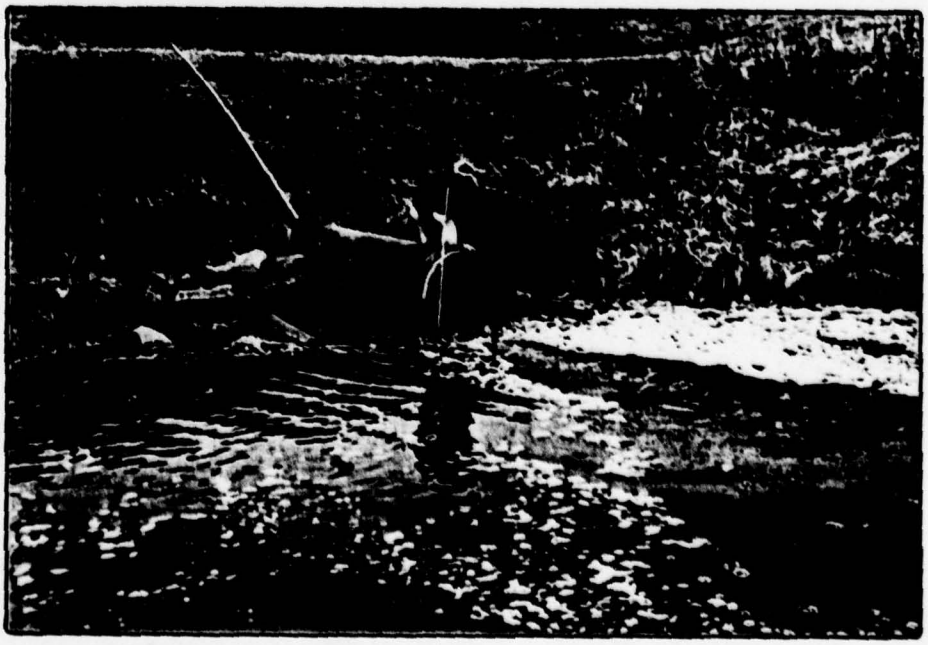


PHOTO 4. View of Outlet Conduit and Drainpipes

PHOTO 5. View of Downstream Channel (Note Vegetation in Channel)

PHOTO 6. Close-up of Seepage Located to Left of Outlet Pipe

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Tamarack Lake Dam "B" S.O. No.

Sheet No. of

Drawing No.

Computed by Checked by Date

Table of Contents

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The hydrologic determinations presented in this Phase I Inspection Report are based on the use of a Snyder's unit hydrograph developed by the U.S. Army Corps of Engineers. Due to the limited number of gaging stations available in this hydrologic region and the wide variation of watershed slopes, the Snyder's coefficients may yield results of limited accuracy for this watershed. As directed however, a further refinement of these coefficients is beyond the scope of this Phase I Investigation.

In addition, the conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Tamarack Lake Dam B — S.O. No.
Rainfall and Hydrograph Data — Sheet No. 1 of 11 — Drawing No.
Computed by GJS — Checked by REH — Date 3-5-79

Rainfall: (from HMR-33, all season)

PMP (24 hr. - 200 mi.²) = 23.4 inches
Drainage Area = 4.99 Sq. Mi. (Zone 2)
P(6 hr.) = 1.17 PMP
P(12 hr.) = 1.27 PMP
P(24 hr.) = 1.41 PMP
P(48 hr.) = 1.51 PMP

Hydrograph Coefficients

Drainage basin is located in zone 23 (Ohio River Basin)

$T_p = C_T (L^{0.6})$* $C_T = 3.3$

$L = 4800$ ft. = 0.91 mile.

note: L (length of watercourse) was determined by measuring the lengths of 14 watercourses tributary to the reservoir and using the average of these lengths.

$T_p = 3.3 (0.91)^{0.6} = 3.12$

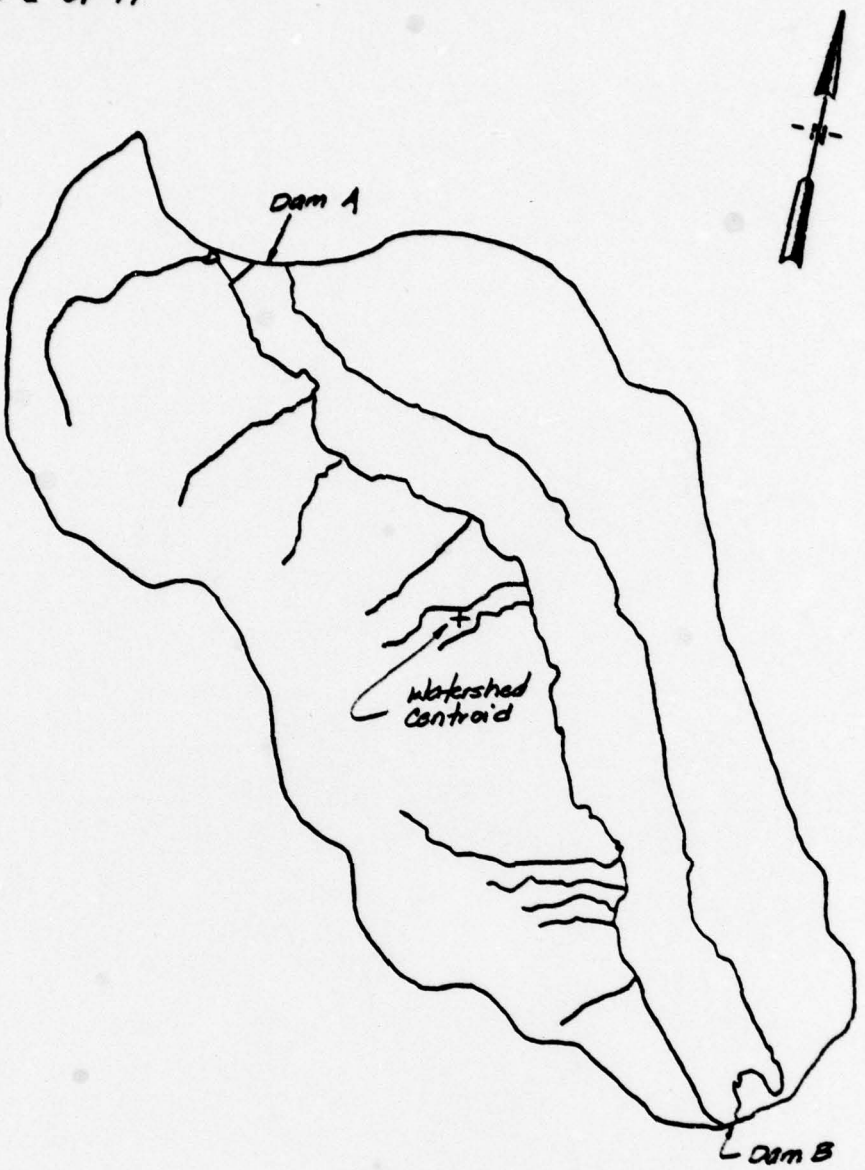
for duration = $3.12/5.5 = 0.57$ hour

For duration = 20 min $T_p = 3.12 + 0.25(0.33 - 0.57)$

$T_p = \underline{3.06}$ hours

$C_p = \underline{0.55}$

* This method of analysis was used since the reservoir is longer than the longest watercourse.



0 4000 8000

SCALE IN FEET

U.S.G.S. Quads:
Cochranton
Geneva

D.A. = 4.99 sq. mi.

DATE: 3-29-79

Tamarack Lake Watershed

MICHAEL BAKER JR. INC.
Consulting Engineers & Surveyors

SCALE 1:62500

1 ½ 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

Sheet 3 of 11

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Tamarack Lake Dam — S.O. No.
Stage vs. Discharge — Sheet No. 4 of 11
Drawing No.
Computed by GAS — Checked by REH — Date 3-5-79

The following data was taken from the SCS Design Report for Tamarack Lake.

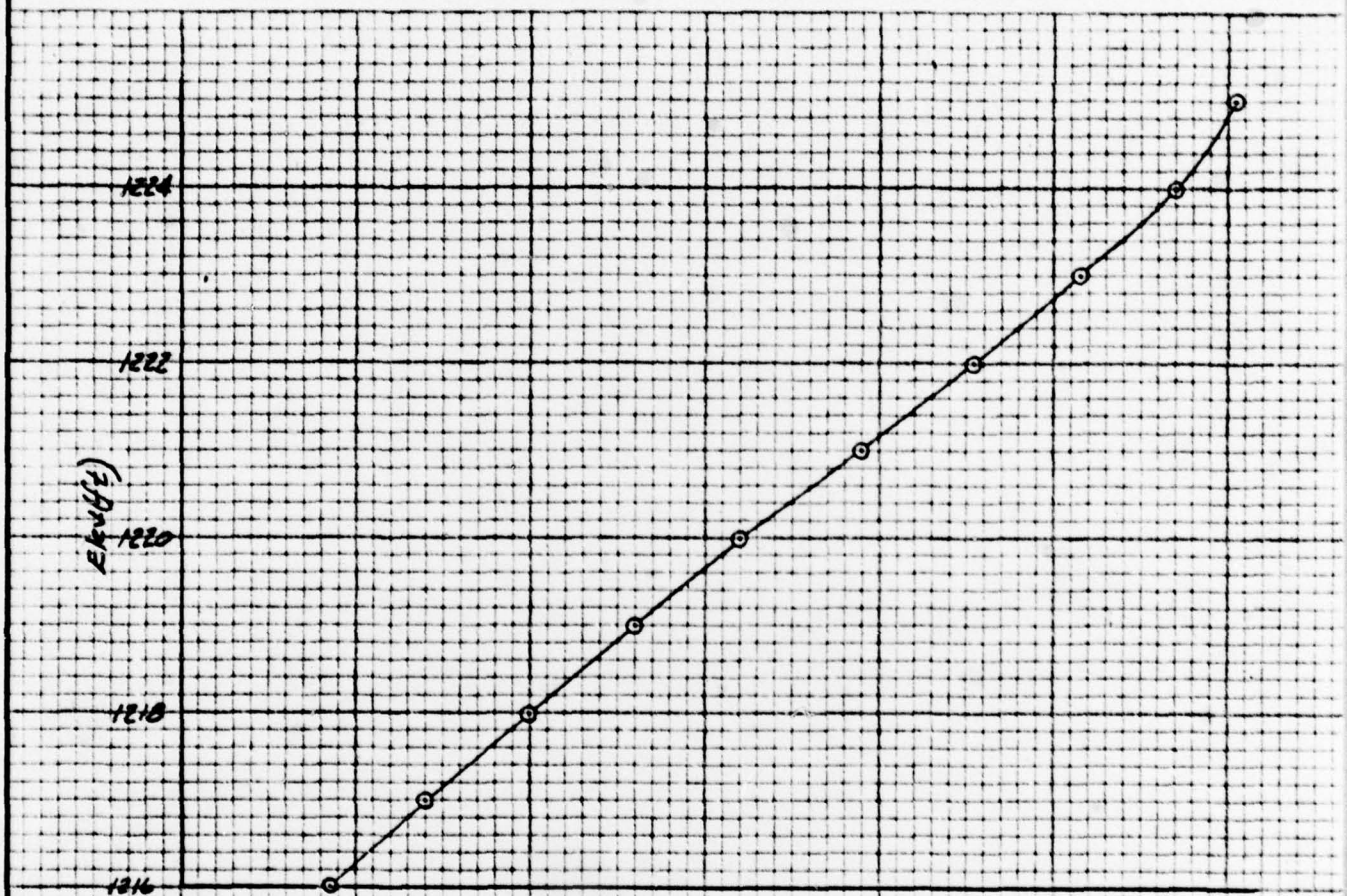
Stage (feet)	Discharge (cfs.) Princ. Spwy. A	Princ. Spwy B	EMS. A & B	EMS A	EMS B
1216	0	0			
1217	6.2	8			
1218	11.0	24			
1219	20.8	84			
1220	48.7	90	0	0	0
1220.9	55.5	91.9	620	330	290
1221.71	65.9	93.7	1775	999	776
1222.57	72.6	95.7	3390	2020	1570
1223.3	79.6	97.1	5415	3047	2368
1223.91	83.4	98.5	7280	4096	3184

Stage (ft.)	Discharges Dam A	Dam B	Total
1216	0	0	0
1217	6.2	8	14
1218	11.0	24	35
1219	20.8	84	109
1220	48.7	90	139
1220.9	385.5	381.9	767
1221.71	1062.9	869.7	1933
1222.57	2092.6	1665.7	3758
1223.3	3126.6	2465.1	5592
1223.91	4179.4	3282.6	7462

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Tamarack Lake S.O. No.
Stage vs. Storage Sheet No. 5 of 11
Drawing No.
Computed by REH Checked by 995 Date 3-2-79



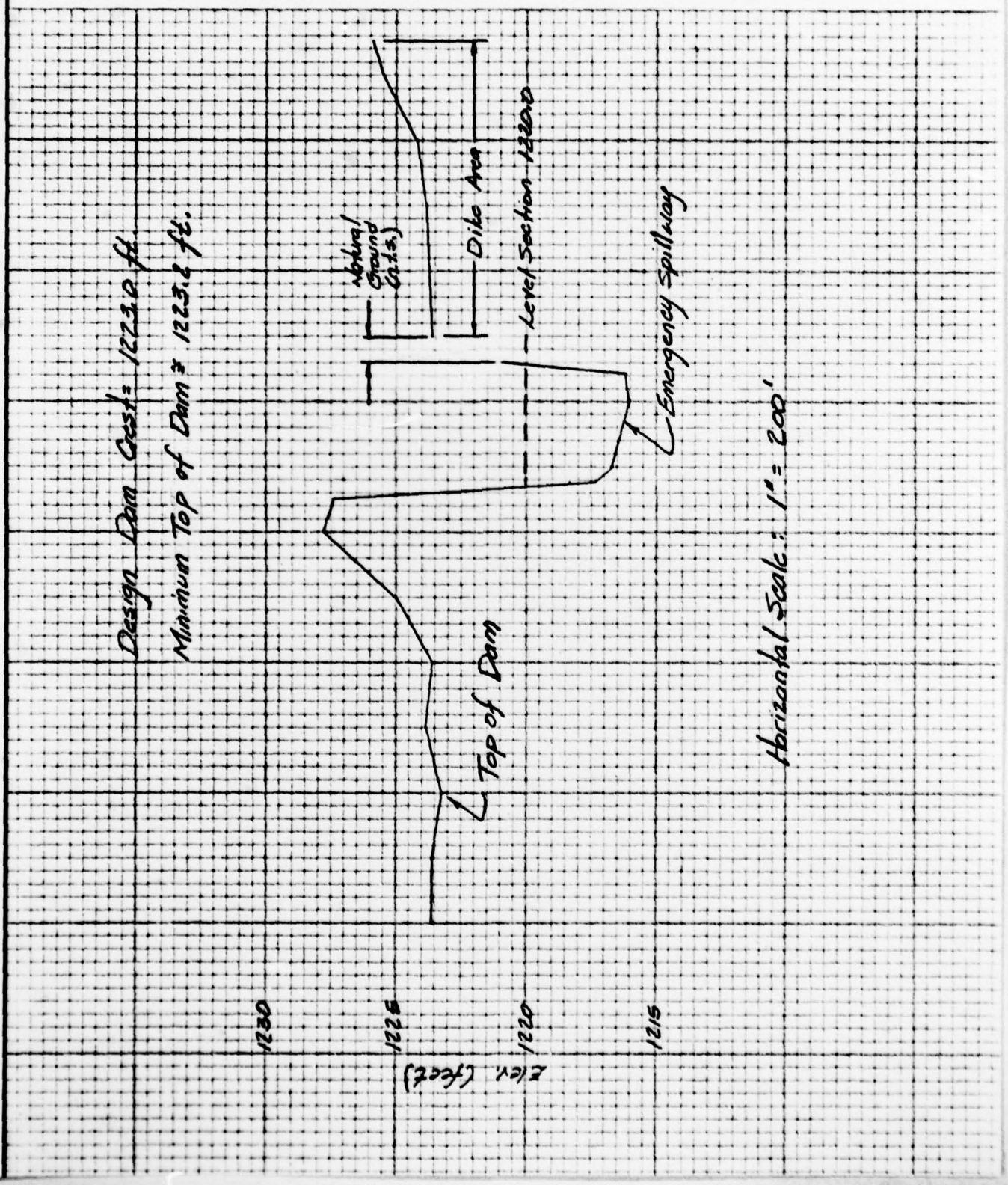
The following values were taken from the design data: (SCS Design Report)

Elev. (ft.)	Storage (A-F)
1216	3850
1217	4400
1218	5000
1219	5600
1220	6200
1223	8150
1225	9050

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Tamarack Lake Dam B — S.O. No. _____
Top of Dam Profile — Sheet No. 6 of 11
Drawing No. _____
Computed by G.A.S. Checked by _____ Date 3-1-79



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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  25 SEP 78
**********
    1                A1       NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
    2                A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF TAMARACK LAKE  A & B
    3                A3       PROBABLE MAXIMUM FLOOD PMF/UNIT GRAPH BY SNYDERS METHOD
    4                B    300      0       20        0        0        0        0        0       -4        0
    5                B1     5
    6                J      1       1        1
    7                J1   1.0
    8                K      0       1                                                  1
    9                K1             HYDROGRAPH FOR OVERLAND FLOW
   10                M      1       1     4.99                4.99
   11                P             23.4     117      127      141      151
   12                T                                                          1.0     0.05
   13                W    3.06    0.55
   14                X    -1.5   -0.05     2.0
   15                K      1     DAM                                                1
   16                K1             THIS IS A ROUTING FOR TAMARACK LAKE
   17                Y                                       1        1
   18                Y1                                                        -1216      -1
   19                Y4   1216    1217     1218     1219     1220  1220.90  1221.71  1222.57  1223.30  1223.91
   20                Y5      0      14       35      105      139      767     1933     3758     5592     7462
   21                $S   3850    4400     5000     5600     6200     6880     7530     8150     8700     9050
   22                $E   1216    1217     1218     1219     1220     1221     1222     1223     1224     1225
   23                $$   1216
   24                $D   1223    2.65      1.5     1800
   25                K      99
```

Sheet 7 of 11

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 25 SEP 78
****

RUN DATE 04/24/79
TIME 11.56

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSIS OF TAMARACK LAKE A & B
PROBABLE MAXIMUM FLOOD PMF/UNIT GRAPH BY SNYDERS METHOD

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	20	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

HYDROGRAPH FOR OVERLAND FLOW

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	4.99	0.0	4.99	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	23.40	117.00	127.00	141.00	151.00	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= 3.06 CP=0.55 NTA= 0

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

UNIT HYDROGRAPH 62 END-OF-PERIOD ORDINATES, LAG= 3.08 HOURS, CP= 0.55 VOL= 1.00

19.	72.	145.	231.	325.	418.	496.	551.	584.	588.
556.	506.	461.	420.	382.	348.	317.	289.	263.	240.
218.	199.	181.	165.	150.	137.	124.	113.	103.	94.
86.	78.	71.	65.	59.	54.	49.	44.	41.	37.

Sheet 8 of 11

13. 12. 11. 10. 9. 8. 8. 7. 6. 6.
5. 5.

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	28.27	25.83	2.44	251211.
										(718.)	(656.)	(62.)	(7113.51)

****

HYDROGRAPH ROUTING

THIS IS A ROUTING FOR TAMARACK LAKE

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

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	0	0	0.0	0.0	0.0	-1216.	-10

STAGE	1216.00	1217.00	1218.00	1219.00	1220.00	1220.90	1221.71	1222.57	1223.30	1223.91
FLOW	0.0	14.00	35.00	105.00	139.00	767.00	1933.00	3758.00	5592.00	7462.00
CAPACITY=	3850.	4400.	5000.	5600.	6200.	6880.	7530.	8150.	8700.	9050.
ELEVATION=	1216.	1217.	1218.	1219.	1220.	1221.	1222.	1223.	1224.	1225.

CREL	SPWID	COOW	EXPW	ELEVL	COQL	CAREA	EXPL
1216.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1223.0	2.6	1.5	1800.

PEAK OUTFLOW IS 4409. AT TIME 46.67 HOURS

****

Sheet 9 of 11

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
HYDROGRAPH AT	1	4.99 (12.92)	1	9978. (282.55)(
ROUTED TO	DAM	4.99 (12.92)	1	4609. (130.52)(

Sheet 10 of 11

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	DESIGN TOP OF DAM
ELEVATION	1214.00	1216.00	1223.00
STORAGE	3850.	3850.	8150.
OUTFLOW	0.	0.	4839.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1222.91	0.0	8093.	4609.	0.0	46.67	0.0

The maximum discharge from the reservoir is 4609 cfs. of which 44% or about 2030 cfs. discharges from dam site B. (Sec discharge ratings taken from SCS design report.)

Sheet 11 of 11

APPENDIX E

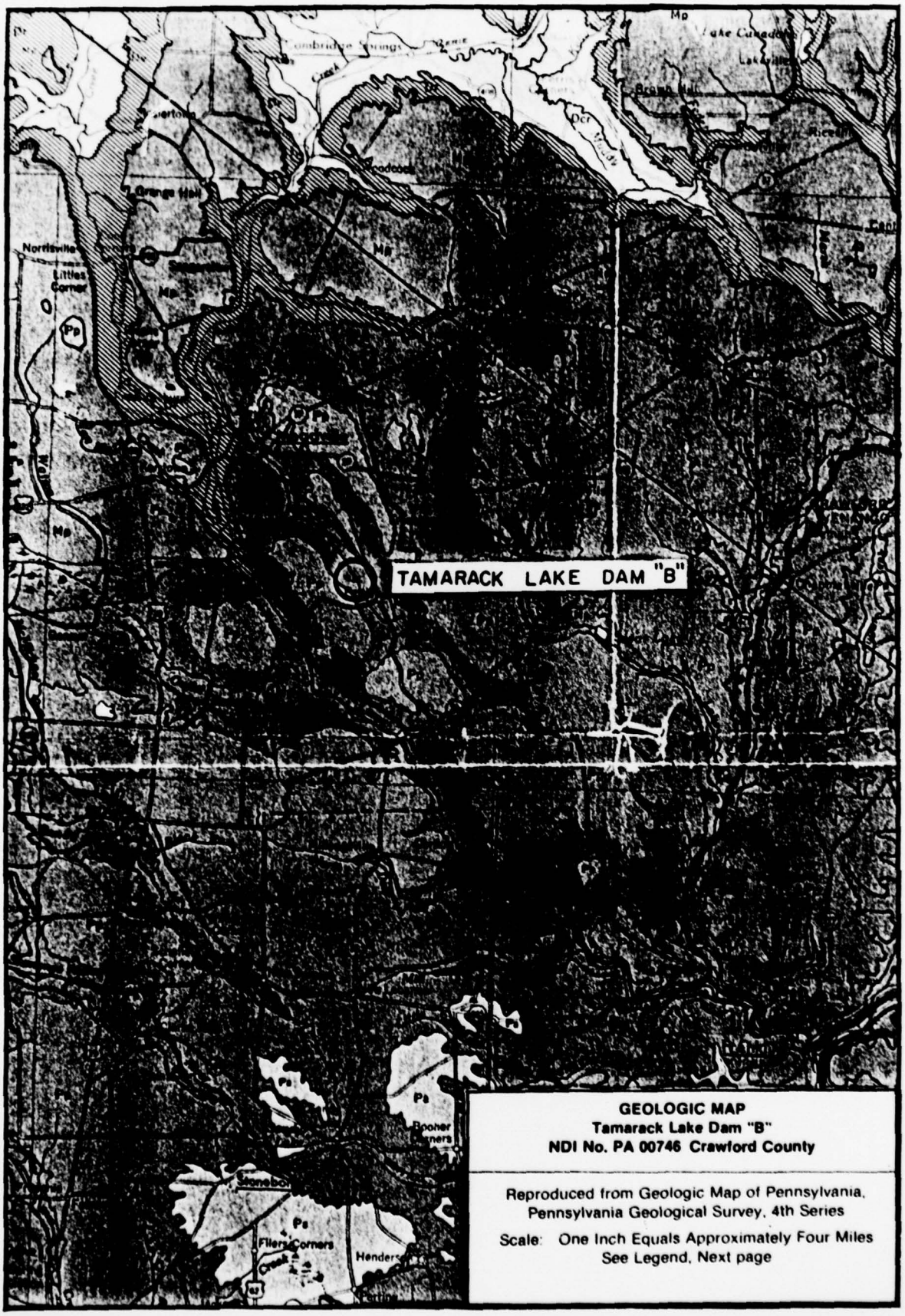
REGIONAL GEOLOGY

TAMARACK LAKE DAM "B"
NDI No. PA 00746, PennDER No. 20-47B, SCS No. 461B

REGIONAL GEOLOGY

Tamarack Lake Dam "B" is located on Mud Run in the glaciated section of the Appalachian Plateaus physiographic province. Bedrock units beneath the glacial till are members of the Pocono group, Pennsylvanian system. Regionally, these gently dipping strata are sandstone and conglomerates which are generally hard, gray and massive with shale seams. However, no bedrock was penetrated by test borings or pits made to obtain foundation data for design of the dam.

Geologic references indicate that the dam is located on Wisconsin stage Kent ground moraine. The reservoir area between Dam "A" and Dam "B" is a former swamp along the drainage divide between Mill Run and Mud Run. Dam foundation soils are mainly sands and silts with lesser amounts of clay and gravel. Some of these soils may be earlier glacial lake deposits.



GEOLOGIC MAP
Tamarack Lake Dam "B"
NDI No. PA 00746 Crawford County

Reproduced from Geologic Map of Pennsylvania, Pennsylvania Geological Survey, 4th Series

Scale: One Inch Equals Approximately Four Miles
See Legend, Next page

LEGEND

PERMIAN

Greene Formation

Cyclic sequences of sandstone, shale, red beds, limestone and coal; base at the top of the Upper Washington Limestone.

PERMIAN AND PENNSYLVANIAN

Washington Formation

Cyclic sequences of sandstone, shale, limestone and coal; some red shale; some mineable coal; base at the top of the Waynesburg Coal.

PENNSYLVANIAN

APPALACHIAN PLATEAU

Pm

Monongahela Formation

Cyclic sequences of sandstone, shale, limestone and coal; limestone prominent in northern outcrop areas; shale and sandstone increase southward; commercial coals present; base at the bottom of the Pittsburgh Coal.

Pc

Conemaugh Formation

Cyclic sequences of red and gray shales and siltstones with thin limestones and coals; massive Mahoning Sandstone commonly present at base; Ames Limestone present in middle of sections; Brush Creek Limestone in lower part of section.

Pa

Allegheny Group

Cyclic sequences of sandstone, shale, limestone and coal; numerous commercial coals; limestones thicken westward; Vanport Limestone in lower part of section; includes Freeport, Kittanning, and Clarion Formations.

Pottsville Group

Predominantly sandstones and conglomerates with thin shales and coals; some coals mineable locally.

ANTHRACITE REGION

Ppp

Post-Pottsville Formations

Brown or gray sandstones and shales with some conglomerate and numerous mineable coals.

Pottsville Group

Light gray to white, coarse grained sandstones and conglomerates with some mineable coal; includes Sharp Mountain, Schuylkill, and Tumbling Run Formations.

MISSISSIPPIAN

Mauch Chunk Formation

Red shales with brown to greenish gray flaggy sandstones; includes Greenbrier Limestone in Fayette, Westmoreland, and Somerset counties, Loyalhanna Limestone at the base in southwestern Pennsylvania.

Pocono Group

Predominantly gray, hard, massive, crossbedded conglomerate and sandstone with some shale; includes in the Appalachian Plateau Burgoon, Shenango, Cuyahoga, Cussewago, Corry, and Knapp Formations; includes part of "Oswayo" of M. L. Fuller in Potter and Tioga counties.

DEVONIAN

UPPER

WESTERN PENNSYLVANIA

Oswayo Formation

Greenish gray to gray shales, siltstones and sandstones becoming increasingly shaly westward; considered equivalent to type Oswayo. Riceville Formation of in Erie and Crawford Counties; probably not distinguishable north of Corry.

Dcr

Cattaraugus Formation

Red, gray and brown shale and sandstone with the proportion of red decreasing westward; includes Venango sands of drillers and Salamanca sandstone and conglomerate; some limestone in Crawford and Erie counties.

Conneaut Group

Alternating gray, brown, greenish and purplish shales and siltstones; includes "pink rock" of drillers and "Chemung" and "Girard" Formations of northwestern Pennsylvania.

Canadaway Formation

Alternating brown shales and sandstones; includes "Portage" Formation of northwestern Pennsylvania.