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NATIONAL DAM INSPECTION PROGRAM. RIDGEBURY LAKE DAM, (NDI I.D. --ETC(U)
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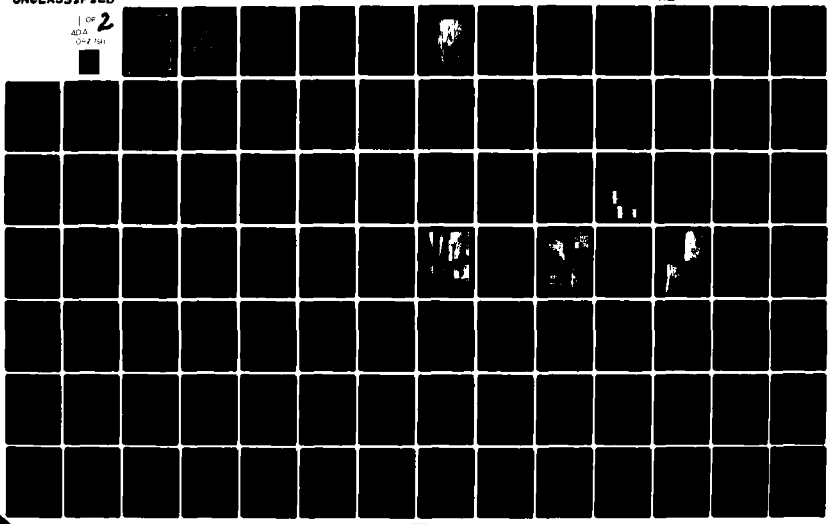

LEVEL II

SUSQUEHANNA RIVER BASIN
TRIBUTARY TO FALL CREEK, BRADFORD COUNTY

PENNSYLVANIA

RIDGEBURY LAKE DAM

(NDI I.D. No. PA-00727
PENNDER I.D. No. 8-57)

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PREPARED FOR

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

PREPARED BY

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

JULY 1980

GAI CONSULTANTS, INC.
DACW31-80-C-0016

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DISCLAIMER NOTICE

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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 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 topograhic 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.

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 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

Ridgebury Lake Dam: NDI I.D. No. PA-00727

Owner:	Barry Hafer
State Located:	Pennsylvania (PennDER I.D. No. 8-57)
County Located:	Bradford
Stream:	Unnamed Tributary to Fall Creek
Inspection Date:	22 April 1980
Inspection Team:	GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146

Based on a visual inspection, operational history, and available engineering data, the facility is considered to be in good condition.

The size classification of the facility is intermediate and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility is the PMF (Probable Maximum Flood). Results of the hydrologic and hydraulic analysis indicate the facility will pass and/or store only about 45 percent of the PMF prior to embankment overtopping. A breach analysis indicates that failure under less than 1/2 PMF conditions could lead to increased downstream damage and potential for loss of life. Thus, based on screening criteria provided in the recommended guidelines, the spillway is considered to be seriously inadequate and the facility unsafe, non-emergency.

Calculations also indicate that if the spillway were constructed in accordance with available design drawings, the facility could pass and/or store approximately 63 percent of the PMF.

It is recommended that the owner immediately:

a. Develop a formal warning system to notify downstream inhabitants should hazardous embankment conditions

develop. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

b. Construct the spillway in accordance with the original design under the direction of a registered professional engineer experienced in the construction of earth dams or retain the services of a registered professional engineer experienced in hydrology and hydraulics to further assess the adequacy of the emergency spillway and prepare recommendations for remedial measures deemed necessary to make the facility hydraulically adequate.

c. Develop formal manuals of operation and maintenance to ensure the continued proper care of the facility. Included in these manuals should be provisions for the regular removal and disposal of accumulated debris from within the emergency spillway channel immediately below the roadway culvert and observation of the emergency spillway sidewalls particularly after discharge.

GAI Consultants, Inc.

Bernard M. Mihalcin

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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
BERNARD M. MIHALCIN
ENGINEER
20371-E

Date 10 July 1980

Approved by:

James Peck

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date 31 July 1980

OVERVIEW PHOTOGRAPH

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
RIDGEBURY LAKE DAM
NDI# PA-00727, PENNDER# 8-57

SECTION 1
GENERAL INFORMATION

1.0 Authority.

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

1.1 Purpose.

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

1.2 Description of Project.

a. Dam and Appurtenances. Ridgebury Lake Dam is an earth embankment approximately 35 feet high and 535 feet long excluding spillway and west dike extension. The earth dike that spans a low area at the right abutment is about 385 feet long. The total crest length of fill across the valley is about 920 feet. A trapezoidal shaped, emergency spillway is cut into natural earth through the left abutment and is completely detached from the embankment. The facility is also equipped with a drop inlet type service spillway consisting of a reinforced concrete riser with a 42-inch diameter inlet and a 36-inch diameter discharge conduit. Drawdown control is provided by an 18-inch diameter concrete pipe with inlet at the upstream embankment toe and outlet at the base of the riser.

b. Location. Ridgebury Lake Dam is located on an unnamed tributary to Fall Creek in Ridgebury Township, Bradford County, Pennsylvania approximately three miles upstream of Bentley Creek and about two miles east of the community of Middletown, Pennsylvania. The site is adjacent to LR 08065, a highway extending from Greenes Landing to Middletown, and near its junction with Township Road 690. The dam, reservoir and watershed are contained within the Bentley Creek, Pennsylvania U.S.G.S. 7.5 minute topographic quadrangle (see Figure 1, Appendix E). The coordinates of the dam are N41° 56.1' and W76° 39.4'.

c. Size Classification. Intermediate (35 feet high, 1230 acre-feet storage capacity at top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Barry Hafer
Box 457-B
R.D. #2
Sayre, Pennsylvania

f. Purpose. Private Recreation.

g. Historical Data. Ridgebury Lake Dam was constructed between 1968 and 1973 for Timberstand, Inc., (originally known as Timberstand Dam No. 3) as the centerpiece of a planned real estate development. Barry O. Hafer, who currently resides within the development, served as president of Timberstand, Inc. during construction of the facility. Mr. Hafer is currently majority owner of Ridgebury Lake Estates, the successor to Timberstand, Inc. The facility was designed by Herluf T. Larsen (Consulting Soils and Foundation Engineer) from Harrisburg, Pennsylvania and David C. Meyer, P.E., of Sayre, Pennsylvania. Correspondence indicates that construction of the facility was started by Cummings Excavating, Inc., of Mansfield, Pennsylvania and was completed by Walcott Construction of Big Flat, New York. Construction inspection was provided by Herluf T. Larsen personnel.

1.3 Pertinent Data.

a. Drainage Area (square miles). 2.2

b. Discharge at Drain Site.

Discharge Capacity of Outlet Conduit - Discharge curves are not available.

Discharge Capacity of Service Spillway at Maximum Pool ≈ 180 cfs (see Appendix D, Sheet 7).

Discharge Capacity of Emergency Spillway at Maximum Pool ≈ 1610 cfs (see Appendix D, Sheet 11).

c. Elevation (feet above mean sea level). The following elevations were obtained from available drawings and through field measurements that were based on the elevation of the service spillway crest at 1485.0 feet (see Appendix D, Sheet 1).

Top of Dam	1496.3 (field). 1497.0 (design).
Maximum Design Pool	Not known.
Maximum Pool of Record	1489.0 (October, 1975).
Normal Pool	1485.0
Service Spillway Crest	1485.0
Emergency Spillway Crest	1490.3 (field). 1491.0 (design).
Upstream Inlet Invert	1463.0
Downstream Outlet Invert	1462.7
Service Spillway Outlet Invert	1461.5
Streambed at Dam Centerline	1459.9
Maximum Tailwater	Not known.

d. Reservoir Length (feet).

Top of Dam	5000
Normal Pool	4800

e. Storage (acre-feet).

Top of Dam	1230
Normal Pool	460
Design Surcharge	Not known.

f. Reservoir Surface (acres).

Top of Dam	78
Normal Pool	58
Maximum Design Pool	Not known.

g. Dam.

Type	Homogeneous earth.
Length	920 feet (including adjacent dike, excluding spillway).
Height	35 feet (embankment crest to invert of service spillway outlet).
Top Width	18 feet (field). 17.4 feet (design).

Upstream Slope	2H:1V
Downstream Slope	1.7H:1V to 2H:1V (field). 2H:1V (design).
Zoning	Homogeneous earth (see Figure 5).
Impervious Core	None indicated.
Cutoff	Cutoff trench constructed along embankment centerline with 1H:1V side slopes and a 10-foot bottom width. Cutoff trench beneath dike is slightly larger (see Figure 5).
Grout Curtain	None indicated.

h. Diversion Canal and Regulating Tunnels. — None.

i. Emergency Spillway.

Type	Uncontrolled, trapezoidal shaped earth cut channel.
Crest Elevation	1490.3 feet.
Crest Length	67 feet (design). 27 feet (field; see Appendix D, Sheet 8).
Crest Breadth	180 feet.

j. Service Spillway.

Type	21-foot high reinforced concrete riser with a 42-inch

	diameter drop inlet and a 36-inch diameter discharge conduit.
Crest Elevation	1485.0 feet.
Upstream Channel	Not applicable.
Downstream Channel	Rock lined, trapezoidal shaped channel to natural stream about 150 feet beyond outlet.

k. Reservoir Drain.

Type	18-inch diameter concrete pipe encased in reinforced concrete with inlet at upstream embankment toe and outlet at base of riser.
Length	26 feet.
Closure and Regulating Facilities	Flow through drain is regulated via 18-inch diameter gate valve manually controlled from atop the riser.
Access	The control mechanism atop the riser is accessible by a footbridge from the upstream embankment slope.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources. No formal design reports for the embankment and/or appurtenances are available. A report dated July 1968 by Herluf T. Larsen of Harrisburg, Pennsylvania entitled, "Soils and Foundation Report on Site of Proposed Timberstand Dam No. 3" is contained in PennDER files. Included in this report are profile drawings of foundation conditions as well as a narrative description of the various topographic, geologic and other pertinent factors noted during the investigation. The report contains details of the stability analyses performed, and includes recommendations covering design and construction of those factors within the project attributable to soil and/or foundation conditions. Also contained in PennDER files are design drawings, contract specifications, construction photographs, several construction progress reports and miscellaneous correspondence. Included with this data are several pages of hydraulic design calculations by the design engineer, David C. Meyer. A state report prepared subsequent to the owner's application for a construction permit, dated September 30, 1968, provides a good brief description of the design particulars of the project.

b. Design Features.

1. Embankment. The embankment is a homogeneous earthfill structure designed with 2H:1V side slopes and a crest width of 17.4 feet. Field measurements indicate the downstream slope varies from 2H:1V to 1.7H:1V (steeper near crest) and the crest is 18 feet wide. The dam is extended by an earth dike to the northwest or right abutment. The dike extends to the north on an angle of 52 degrees from the axis of the dam. A cutoff trench is provided by the design to ensure a relatively impervious zone between the underlying till and the embankment. Available drawings indicate the trench beneath the dam has a 10-foot bottom width with 1H:1V side slopes and is somewhat larger beneath the dike (see Figure 5). Seepage through the embankment was not expected to be significant due to the nature of the fill material utilized. Nevertheless, a gravel filter was placed beneath the downstream embankment toe to protect the embankment from the effects of heavy springs and an artesian condition noted in the soils and foundation report.

2. Appurtenant Structures.

a) Emergency Spillway. The design calls for the emergency spillway to be a trapezoidal shaped channel excavated in natural ground at the south or left abutment. Available drawings indicate the bottom width of the channel at the control section to be 67 feet with 3H:1V side slopes and an exit channel slope of 10 percent (see Figure 3). Field measurements indicate the actual dimensions of the channel vary significantly from the design (see Appendix D, Sheet 8).

b) Service Spillway. The service spillway consists of a reinforced concrete riser structure and 36-inch diameter reinforced concrete outlet conduit. A 42-inch diameter opening is provided in the riser along with a trash rack and anti-vortex device (see Figures 5 and 6).

c) Reservoir Drain. The capacity to drawdown the reservoir is provided by an 18-inch diameter concrete pipe encased in reinforced concrete with inlet at the upstream embankment toe and outlet at the base of the service spillway riser. Flow through the conduit is regulated by means of an 18-inch diameter gate valve installed along the upstream face of the riser and manually operated from atop the riser (see Figures 5, 6 and 7).

c. Specific Design Data and Criteria.

1. Embankment. Although no formal design reports by the designer, David C. Meyer, are available, it is apparent that the embankment design was based largely upon the recommendations contained in the soils and foundation report prepared by H. T. Larsen. Specific recommendations were presented concerning the cutoff trench, embankment slopes (including soils parameters and stability analyses), filter blanket, outlet pipes, spillway cut, borrow area, and site stripping.

2. Appurtenant Structures. No design data are available that pertain to the appurtenant structures of the facility, other than the soils and foundation information contained in the report by H. T. Larsen.

3. Hydraulics and Hydrology. Information contained in PennDER files indicates the spillways were designed to meet the requirements established by the Pennsylvania "C" Curve. That is, based on a drainage area of 2.07 square miles, the spillway facilities were designed to have sufficient capacity to discharge a flow of 2550 cfs.

The design engineer was provided technical assistance on the hydrologic analysis of this project by the U.S.D.A., Soil Conservation Service. The emergency spillway elevation was selected to provide sufficient storage between the service spillway and the emergency spillway crests to contain the 100-year, 6-hour point rainfall determined by the SCS methods.

2.2 Construction Records.

PennDER files contain various construction related data including design drawings, contract specifications, construction photographs, several construction progress reports and miscellaneous correspondence. Available data and correspondence indicate that the construction period was lengthy for various reasons but, in general, compliance to contract specifications was achieved. Correspondence and photographs also indicate that a substantial slide developed in the emergency spillway cut during construction.

2.3 Operational Records.

No records of the present day-to-day operation of this facility are maintained. Reportedly, the emergency spillway has never discharged.

2.4 Other Investigations.

Aside from the preliminary design investigation performed by H. T. Larsen in 1968, there are no records of other formal investigations of the facility.

2.5 Evaluation.

The data available is considered adequate to make a reasonable Phase I assessment of the facility.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the facility suggests the dam and its appurtenances are in good condition.

b. Embankment. Observations made during the visual inspection indicate the embankment and adjacent dike are in good condition and appear adequately maintained. No evidence of seepage through the downstream embankment face was observed, other than discharge through the 4-foot thick toe drain. The area along the base of the toe to the right of the outlet conduit is saturated as the result of poorly drained discharge from the gravel filter. The condition is not considered significant. No other deficiencies such as sloughing, erosion, excessive settlement or animal burrows were observed by the inspection team (see Photographs 1, 4 and 9).

c. Appurtenant Structures.

1. Emergency Spillway. The visual inspection revealed the emergency spillway is in fair condition. Field measurements compiled by the inspection team indicate the channel is inadequately sized and not constructed in accordance with the design drawings. An accumulation of mud and debris within the channel, that appears to be outwash from a nearby roadway culvert (see Photograph 10), and surface sloughing of soils along the left sidewall upstream of the debris area were observed.

2. Service Spillway. The service spillway is considered to be in good condition. Minor surface corrosion was observed on all metal surfaces associated with the structure (see Photographs 3, 5, 6 and 8).

3. Reservoir Drain. The reservoir drain was operated in the presence of the inspection team and is considered to be in good condition. Evidence of minor surface corrosion was observed on the manual operator and gate stem (see Photograph 6).

d. Reservoir Area. The general area surrounding the reservoir is composed of moderate slopes that are primarily forested with about 25 percent cleared areas. No signs of slope distress were observed (see Photographs 1, 2, 6 and 9).

e. Downstream Channel. Discharge from Ridgebury Lake Dam flows through a steep, narrow and heavily forested valley with steep confining slopes. The first structures situated near the streambed below the dam are located between two and three miles downstream at the community of Middletown. Within four miles of the embankment, at least 12 homes are situated sufficiently near the stream to possibly be affected by the floodwaters associated with an embankment breach. It is estimated that 25 to 50 lives could be lost and significant damage incurred in this area as the result of such an event.

3.2 Evaluation.

The overall condition of the facility is considered to be good. The construction of the emergency spillway is questionable based upon field measurements. Outwash from a roadway culvert is also accumulating in the spillway and should be removed. The sloughing of the left spillway cut slope should be observed regularly especially after spillway discharge.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operating Procedures.

Ridgebury Lake Dam is essentially a self-regulating facility. Inflows in excess of the capacity of the service spillway are stored and/or discharged through the emergency spillway. The reservoir drain was observed by the inspection team to be fully operational; however, under normal operating conditions, the valve is closed. No formal operations manual is available.

4.2 Maintenance of Dam.

The facility is maintained on an unscheduled basis as needed. No formal maintenance manual outlining maintenance procedures is available.

4.3 Maintenance of Operating Facilities.

See Section 4.2 above.

4.4 Warning System.

No formal warning system is in effect.

4.5 Evaluation.

No formal operations or maintenance manuals are available, but, are recommended to ensure the continued proper care and maintenance of the facility. Included in these manuals should be a formal warning system to notify downstream residents should hazardous conditions develop. The plan should include provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

Information contained in PennDER files indicates the spillways were designed to meet the requirements established by the Pennsylvania "C" Curve. That is, based on a drainage area of 2.07 square miles, the spillway facilities were designed to have sufficient capacity to discharge a flow of 2550 cfs.

The design engineer was provided technical assistance on the hydrologic analysis of this project by the U.S.D.A., Soil Conservation Service.

5.2 Experience Data.

No data pertaining to emergency spillway performance is available as it is reported that the emergency spillway has never discharged. The owner stated that the largest flood he could recall at this facility occurred in October 1975 when the reservoir rose about 1-foot above normal pool. The general appearance of the facility indicates adequate past performance of the service spillway.

5.3 Visual Observations.

Field measurements compiled by the inspection team indicate the channel is inadequately sized and not constructed in accordance with design drawings. An accumulation of debris from a highway culvert partially obstructs the spillway channel and there is surface sloughing evident along the left sidewall upstream of the dam centerline.

5.4 Method of Analysis.

The facility has been analyzed in accordance with procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U.S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Analytical capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis

a. Spillway Design Flood (SDF). In accordance with procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Ridgebury Lake Dam is the Probable Maximum Flood (PMF). This classification is based on the relative size of the dam (intermediate) and the potential hazard of dam failure to downstream developments (high).

b. Results of Analysis. Ridgebury Lake Dam was evaluated under near normal operating conditions. That is, the reservoir was assumed to initially be at its normal pool or service spillway elevation of 1485.0 feet, and the low level blowoff line was assumed to be closed. However, the usually functioning service spillway, which consists of a 42-inch diameter vertical concrete shaft and a 36-inch diameter concrete outlet pipe, was assumed to be non-functional, for the purpose of analysis, due to the possibility of at least partial clogging during large floods. The unobstructed emergency spillway is a trapezoidal shaped, vegetated, earth cut chute channel, with discharges dictated by critical depth at the control section. All necessary downstream channel routing was done under the assumption that the routing streams were dry prior to the inflow of the dam outflows. In addition, the small 5-acre upstream impoundment located in the northeastern corner of the Ridgebury Lake drainage basin (Appendix E, Figure 1) was ignored in the analysis since its impact on Ridgebury Lake Dam was not expected to be significant. All pertinent engineering calculations relative to the evaluation of this facility are provided in Appendix D.

Overtopping analysis (using the Modified HEC-1 Computer Program) indicated that the discharge/storage capacity of Ridgebury Lake Dam can accommodate only about 45 percent of the PMF (SDF) prior to the overtopping of the embankment (Appendix D, Summary Input/Output Sheets, Sheet J). The low top of dam was inundated by depths of water of 0.5 and 2.1 feet under the 1/2 PMF and PMF events, respectively (Summary Input/Output Sheets, Sheet J). Therefore, since the SDF for this facility is the PMF, Ridgebury Lake Dam has a high potential for overtopping, and thus, for breaching under floods of less than SDF magnitude.

Since Ridgebury Lake Dam cannot safely accommodate a flood of at least 1/2 PMF magnitude, the possibility of embankment failure under floods of 1/2 PMF intensity or less was investigated (in accordance with Corps directive ETL-1110-2-234). Several feasible alternatives were analyzed since it is difficult, if not impossible, to determine exactly how or if a specific dam will fail. The major concern of the breaching evaluations is with the impact of the various breach discharges on increasing downstream water surface elevations above those to be expected if breaching did not occur.

The Modified HEC-1 Computer Program was used to conduct the breaching analysis with the assumption that the breaching of an earth dam would begin once its reservoir's water level reached the low top of dam elevation.

Two sets of breach geometry were evaluated for Ridgebury Lake Dam for each of two failure times (Appendix D, Sheet 20). The two breach sections chosen were considered to be the minimum and maximum probable failure sections. The two failure times (total time for each breach section to reach its final dimensions), under which the two breach sections were investigated were assumed to be a rapid time (0.5 hour), and a prolonged time (4.0 hours), so that a range of this most sensitive variable might be examined. In addition, an average set of breach conditions was analyzed, with a failure time of 2.0 hours.

The peak breach outflows (resulting from a 0.46 PMF overtopping) ranged from about 4420 cfs for the minimum section - maximum fail time scheme to about 46,370 cfs for the maximum section - minimum fail time scheme (Appendix D, Sheet 22). The peak outflow from the average breach scheme was about 12,620 cfs, compared to the non-breach 0.46 PMF peak outflow of about 1690 cfs (Summary Input/Output Sheets, Sheets R and J). At Section 4 (see Figure 1), located about 11,460 feet downstream from the dam, the maximum water surface elevation resulting from the average breach scheme was about 11.7 feet above the 0.46 PMF non-breach peak elevation, and above the damage level of the nearby residence. At Sections 6, 8, and 9 (see Figure 1), located approximately 14,000 to 20,000 feet downstream from the dam, the peak water levels resulting from the average breach scheme were about 7.4 feet, 8.3 feet, and 7.1 feet, respectively, above those levels resulting from non-breach conditions. At each of these sections, the water surface elevation corresponding to the peak breach outflow was above the damage level of the nearby residences (see Appendix D, Sheets 23, 24).

The consequences of dam failure can be better envisioned if not only the increase in the height of the floodwave is considered, but, also the great increase in the momentum of the larger and probably swifter moving volume of water. Therefore, the failure of Ridgebury Lake Dam is quite possible, and will most probably lead to increased property damage and possibly to increased loss of life in the downstream community.

5.6 Spillway Adequacy.

As presented previously, under existing conditions, Ridgebury Lake Dam can accommodate only about 45 percent of the PMF (SDF) prior to embankment overtopping. If the emergency spillway had been constructed as originally designed, the facility would have been able to accommodate approximately 63 percent of the PMF. Nevertheless, should a 0.46 PMF or larger event occur (under existing conditions) the dam would be overtopped and could possibly fail, endangering residences downstream and increasing the potential for loss of life in the downstream community. Therefore, the spillway is considered to be seriously inadequate.

SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Visual observations indicate the embankment is in good condition. Saturation observed along the downstream embankment toe is the apparent result of poor drainage and is not considered to be significant at present. No other deficiencies were noted.

b. Appurtenant Structures.

1. Emergency Spillway. The emergency spillway is in fair condition. Debris accumulating within the spillway channel should be removed regularly and sloughing of the left sidewall upstream of the dam centerline should be observed periodically and after all spillway discharges. It was also noted that the spillway is inadequately sized relative to available design drawings.

2. Service Spillway. The service spillway was observed to be in good condition and fully functional. Minor surficial corrosion is characteristic of all metal associated with the structure, but, is not considered significant at this time.

3. Reservoir Drain. The reservoir drain was operated in the presence of the inspection team and observed to be fully functional and in good condition.

6.2 Design and Construction Techniques.

No formal design reports are available. Design information contained in PennDER files suggests, however, that the facility was designed in accordance with modern accepted engineering practice.

Available construction records indicate that the construction period of the facility was lengthy and beset with various problems. The good condition of the embankment, adjoining dike and service spillway suggests that adequate construction control was provided for the main part of the facility. In contrast, the dimensions of the inadequately sized emergency spillway suggest that it was not constructed as designed.

6.3 Past Performance.

No formal records of the day-to-day operation of the facility are maintained. The facility has reportedly functioned without any significant problems since its completion in 1973. It was noted that the emergency spillway has never discharged.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. As the facility appears well constructed and sufficiently stable, it is believed that it can withstand the expected dynamic forces; however, no calculations and/or investigations were performed to confirm this belief.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. Based on a visual assessment and available engineering data, the facility is considered to be in good condition.

The size classification of the facility is intermediate and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility is the PMF (Probable Maximum Flood). Results of the hydrologic and hydraulic analysis indicate the facility will pass and/or store only 45 percent of the PMF prior to embankment overtopping. A breach analysis indicates that failure under less than 1/2 PMF conditions could lead to increased downstream damage and potential for loss of life. Thus, based on screening criteria provided in the recommended guidelines, the spillway is considered to be seriously inadequate and the facility unsafe, non-emergency.

Calculations also indicate that if the spillway were constructed in accordance to available design drawings, the facility could pass and/or store approximately 63 percent the PMF.

b. Adequacy of Information. The available data is considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. The recommendations listed below should be implemented immediately.

d. Necessity for Additional Investigations. Additional investigations are considered necessary to further assess the spillway adequacy unless remedial measures are taken to reconstruct the spillway to its design configuration.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner immediately:

a. Develop a formal warning system to notify downstream inhabitants should hazardous embankment conditions develop. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

b. Construct the spillway in accordance with the original design under the direction of a registered professional engineer experienced in the construction of earth dams or retain the services of a registered professional engineer experienced in hydrology and hydraulics to further assess the adequacy of the emergency spillway and prepare recommendations for remedial measures deemed necessary to make the facility hydraulically adequate.

c. Develop formal manuals of operation and maintenance to ensure the continued proper care of the facility. Included in these manuals should be provisions for the regular removal and disposal of accumulated debris from within the emergency spillway channel immediately below the roadway culvert and observation of the emergency spillway sidewalls particularly after discharge.

APPENDIX A

VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM Ridgebury Lake Dam STATE Pennsylvania COUNTY Bradford

NDI # PA — 00727 PENNDER # 8-57

TYPE OF DAM Earth SIZE Intermediate HAZARD CATEGORY High

DATE(S) INSPECTION 22 April 1980 WEATHER Clear & Cool TEMPERATURE 30° @ 10:00 a.m.

POOL ELEVATION AT TIME OF INSPECTION 1485.2 feet M.S.L.

TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	*OTHERS*
B. M. Mihalcin	Barry O. Hafer	
D. J. Spaeder	Don Hafer	
W. J. Veon		

RECORDED BY B. M. Mihalcin

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00727
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	Vertical - adequate (see Appendix A, Profile of Dam Crest). Horizontal - good.
RIPRAP FAILURES	None observed. Durable well graded sandstone on main embankment. Dike is not protected with riprap; however, the natural soil at pool level appears very rocky and no erosion is evident.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition.

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00727
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	Damp area along base of downstream embankment toe between dike and outlet conduit. Appears to be drainage through 4-foot thick gravel blanket. Swamplike vegetation throughout the downstream embankment toe area.
ANY NOTICEABLE SEEPAGE	Minor seepage along downstream embankment toe, apparently through gravel underdrain. Not detrimental to dam (design feature). Wetness extends about 4 feet above toe.
STAFF GAGE AND RECORDER	None.
DRAINS	No drainage conduits. Blanket drain discharges along entire toe.

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00727
INTAKE STRUCTURE	18-inch diameter concrete pipe with inlet at upstream embankment toe and outlet at the base of the service spillway riser. Submerged and not observed.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	Submerged and not observed.
OUTLET STRUCTURE	The outlet conduit discharges at the base of the service spillway riser and into a 36-inch diameter horizontal conduit that empties at the downstream embankment toe. The service spillway was discharging on the day of the inspection; thus, the conduit was not entered.
OUTLET CHANNEL	Rock lined, trapezoidal shaped channel. Large rocks for ≈ 75 feet beyond the outlet (replaced after October 1975 flood). Channel is unobstructed and in good condition.
GATE(S) AND OPERATIONAL EQUIPMENT	18-inch diameter gate valve at outlet end of reservoir drain and operated from atop the service spillway trash rack. Valve was successfully opened and closed by the owner for the inspection team on the day of inspection.

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00727
TYPE AND CONDITION	Trapezoidal shaped channel cut through soil in the left abutment. Completely detached from embankment. Channel is not constructed in accordance with the design drawings; however, its condition is good.
APPROACH CHANNEL	180 feet of channel prior to reaching control section.
SPILLWAY CHANNEL AND SIDEWALLS	Vegetated sidewalls. Minor sloughing observed along left sidewall due to spring flow. May be unstable when experiencing flow - should observe. Channel floor is flat and poorly drained. Not in accordance with design drawings.
STILLING BASIN PLUNGE POOL	None. Highway cross-drain empties into emergency spillway causing an accumulation of sediment and debris. Should be periodically cleaned.
DISCHARGE CHANNEL	Natural stream channel. Highway bridge located approximately 650 feet downstream of emergency spillway entrance.
BRIDGE AND PIERS EMERGENCY GATES	None.

SERVICE SPILLWAY

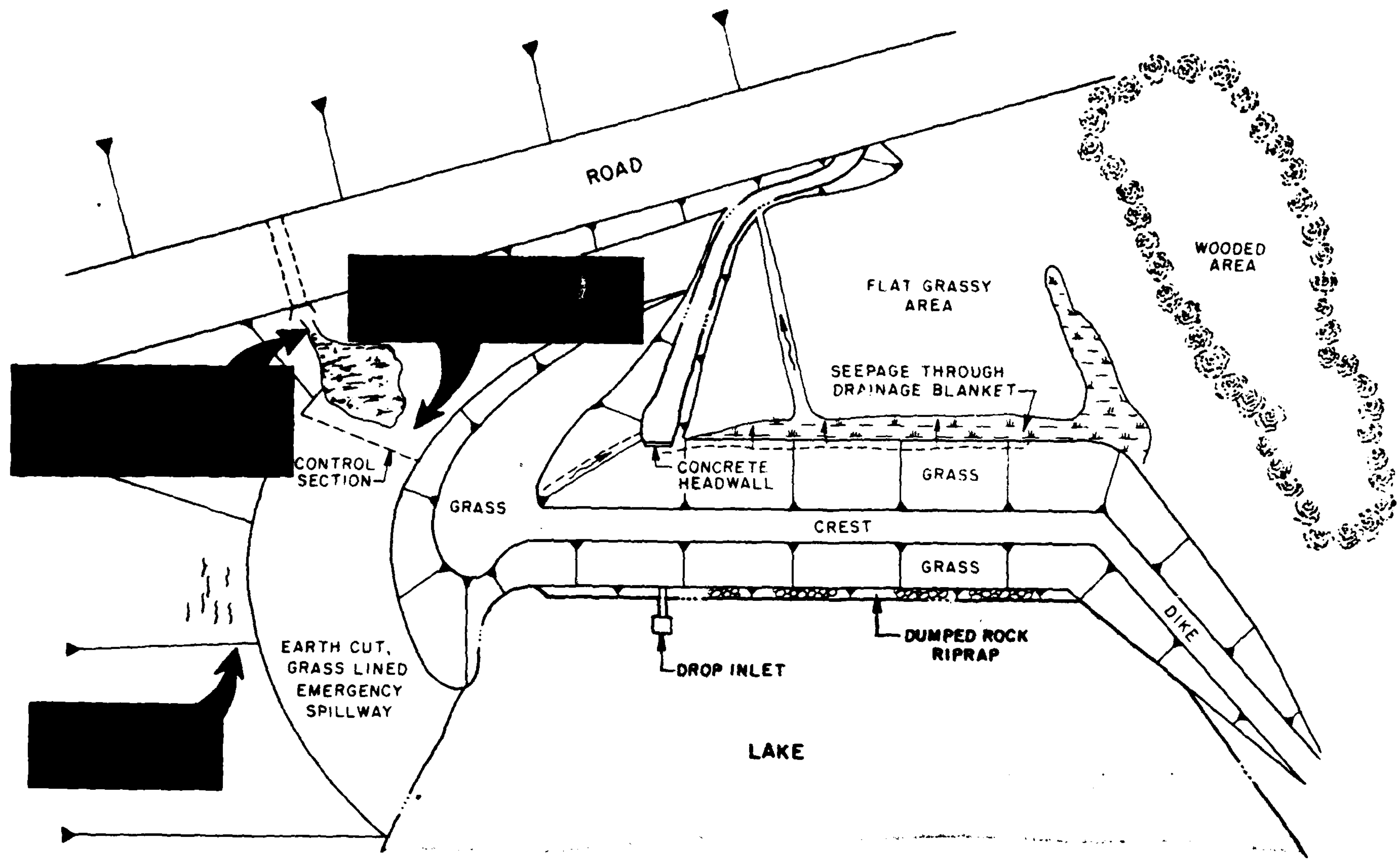
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00727
TYPE AND CONDITION	42-inch diameter drop inlet with steel trash rack. Good condition. Surface corrosion observed on all metal surfaces associated with the structure.
APPROACH CHANNEL	N/A.
OUTLET STRUCTURE	Concrete headwall and 36-inch diameter discharge conduit at downstream embankment toe in good condition.
DISCHARGE CHANNEL	Rock lined channel to natural stream about 150 feet beyond outlet. 25 feet of channel relined after flood in October, 1975.

INSTRUMENTATION

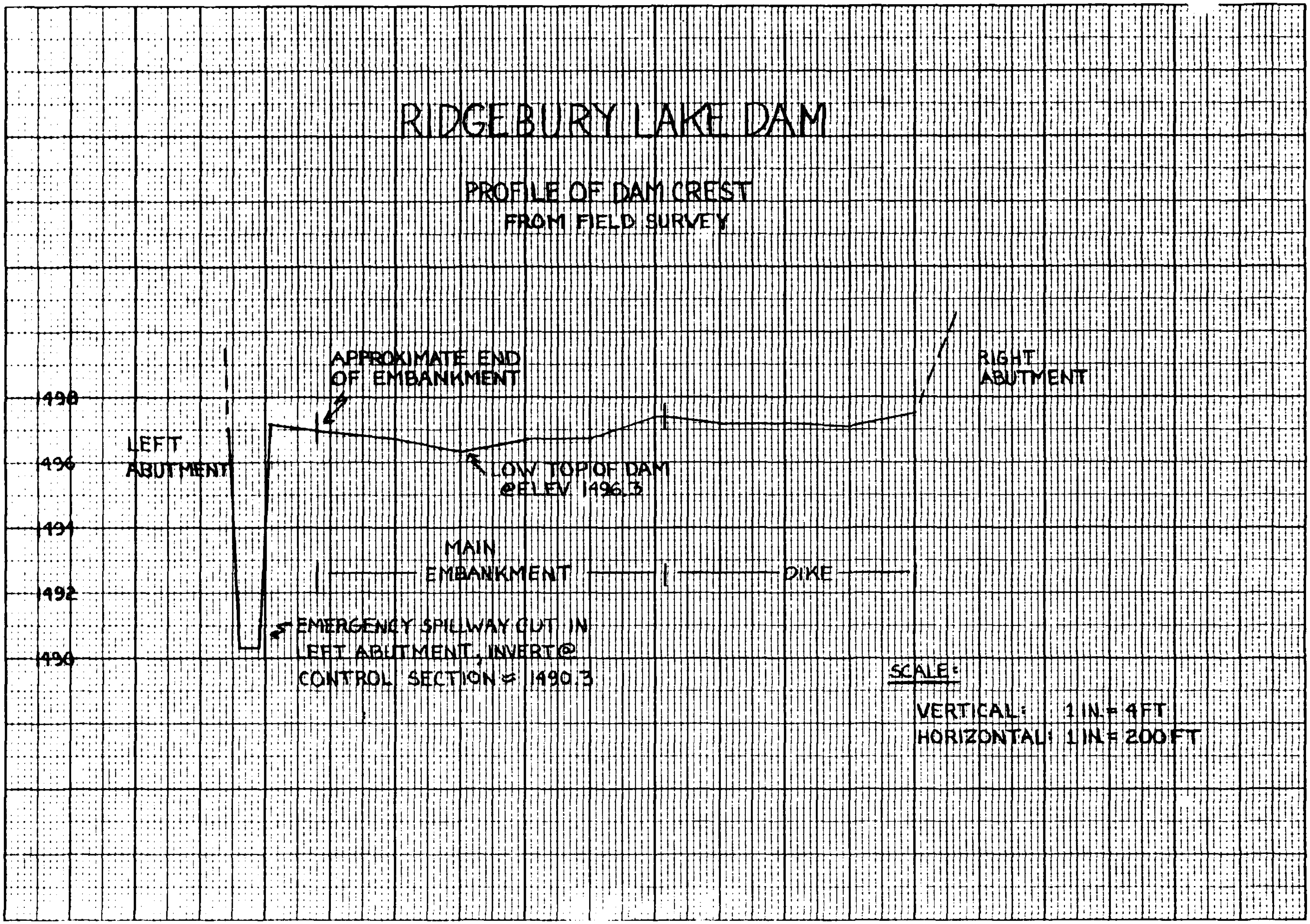
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00727
MONUMENTATION SURVEYS	Survey point on highway bridge immediately below embankment. Mark on upstream left corner of service spillway.
OBSERVATION WELLS	None.
WEIRS	None.
PIEZOMETERS	None.
OTHERS	

RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00727
SLOPES: RESERVOIR	Moderate surrounding slopes. Primarily forested with about 25 percent cultivated or cleared areas.
SEDIMENTATION	None observed.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Highway culvert located immediately downstream of embankment.
SLOPES: CHANNEL VALLEY	Steep, narrow and heavily forested valley with steep confining slopes.
APPROXIMATE NUMBER OF HOMES AND POPULATION	At least 12 homes are located within 4 miles downstream of the dam sufficiently near the stream to possibly be affected by the floodwaters associated with an embankment. 25 to 50 lives could be lost in this area as the result of such an event.



RIDGEBURY LAKE DAM
GENERAL PLAN - FIELD INSPECTION NOTES


RIDGEBURY LAKE DAM
PROFILE OF DAM CREST
FROM FIELD SURVEY
APPROXIMATE END
OF EMBANKMENT
RIGHT
ABUTMENT
1498
1496
1494
1492
1490
LEFT
ABUTMENT
LOW TOP OF DAM
@ELEV 1496.3
MAIN
EMBANKMENT
DIKE
EMERGENCY SPILLWAY CUT IN
LEFT ABUTMENT, INVERT @
CONTROL SECTION ≈ 1490.3
SCALE:
VERTICAL: 1 IN = 4 FT
HORIZONTAL: 1 IN = 200 FT

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
PHASE I

NAME OF DAM Ridgebury Lake Dam

ITEM	REMARKS NDI# PA- 00727
PERSONS INTERVIEWED AND TITLE	Barry O. Hafer - Majority owner of Ridgeway Lake Estates.
REGIONAL VICINITY MAP	See Figure 1, Appendix E.
CONSTRUCTION HISTORY	Designed by David C. Meyer, P. E. of Sayre, Pennsylvania. Construction control by H. T. Larsen of Harrisburg, Pennsylvania. Cummings Excavating, Inc., of Mansfield, Pennsylvania (original contractor). Walcott Construction of Big Flat, New York (final contractor).
AVAILABLE DRAWINGS	Complete set of 6 design drawings by David C. Meyer are contained in PennDER files.
TYPICAL DAM SECTIONS	See Figure 5, Appendix E.
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	See Figures 3, 5, 6 and 7, Appendix E. Discharge rating curves are not available.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA- 00727
SPILLWAY: PLAN SECTION DETAILS	Service and emergency spillways. See Figures 3, 4, 5, 6 and 7, Appendix E.
OPERATING EQUIPMENT PLANS AND DETAILS	See Figures 5 and 6, Appendix E.
DESIGN REPORTS	No formal design report available. Report by H. T. Larsen of Harrisburg, Pennsylvania dated July 1968, entitled "Soils and Foundation Report on Subsurface Explorations of Site for the Proposed Timberstand Dam No. 3" is contained in PennDER files.
GEOLOGY REPORTS	Limited geological data contained in H. T. Larsen report.
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	Technical assistance provided by the U.S.D.A., Soil Conservation Service on the hydrologic analysis of this project. No data available. Seepage and stability analyses are contained in H. T. Larsen report.
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	Contained in H. T. Larsen report. No field testing data available.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA - 00727
BORROW SOURCES	Majority of material was borrowed from the left abutment hillside above the pool level.
POST CONSTRUCTION DAM SURVEYS	Survey completed in 1974. Data available from H. T. Larsen.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
HIGH POOL RECORDS	October 1975 - pool approximately 1-foot below emergency spillway entrance. Emergency spillway has never discharged.
MONITORING SYSTEMS	None.
MODIFICATIONS	None.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA - 00727
PRIOR ACCIDENTS OR FAILURES	None.
MAINTENANCE: RECORDS MANUAL	None.
OPERATION: RECORDS MANUAL	None.
OPERATIONAL PROCEDURES	Self-regulating.
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None.
MISCELLANEOUS	

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CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-00727
PENNDER ID # 8-57

SIZE OF DRAINAGE AREA: 2.2 square miles.

ELEVATION TOP NORMAL POOL: 1485.0 STORAGE CAPACITY: 460 acre-feet.

ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -

ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -

ELEVATION TOP DAM: 1496.3 STORAGE CAPACITY: 1230 acre-feet.

SPILLWAY DATA

CREST ELEVATION: Service - 1485.0 feet; Emergency - 1490.3 feet.

TYPE: Service - drop inlet; Emergency - trapezoidal, earth channel.

CREST LENGTH: Service - N/A; Emergency - 27 feet.

CHANNEL LENGTH: Service - N/A; Emergency ≈ 480 feet.

SPILLOVER LOCATION: Service - embankment center; Emergency - left abutment.

NUMBER AND TYPE OF GATES: None.

OUTLET WORKS

TYPE: 18-inch diameter concrete pipe encased in concrete.

LOCATION: Upstream embankment toe to base of riser.

ENTRANCE INVERTS: 1463.0 feet.

EXIT INVERTS: 1462.7 feet.

EMERGENCY DRAWDOWN FACILITIES: 18-inch diameter gate valve operated from atop riser.

HYDROMETEOROLOGICAL GAGES

TYPE: None.

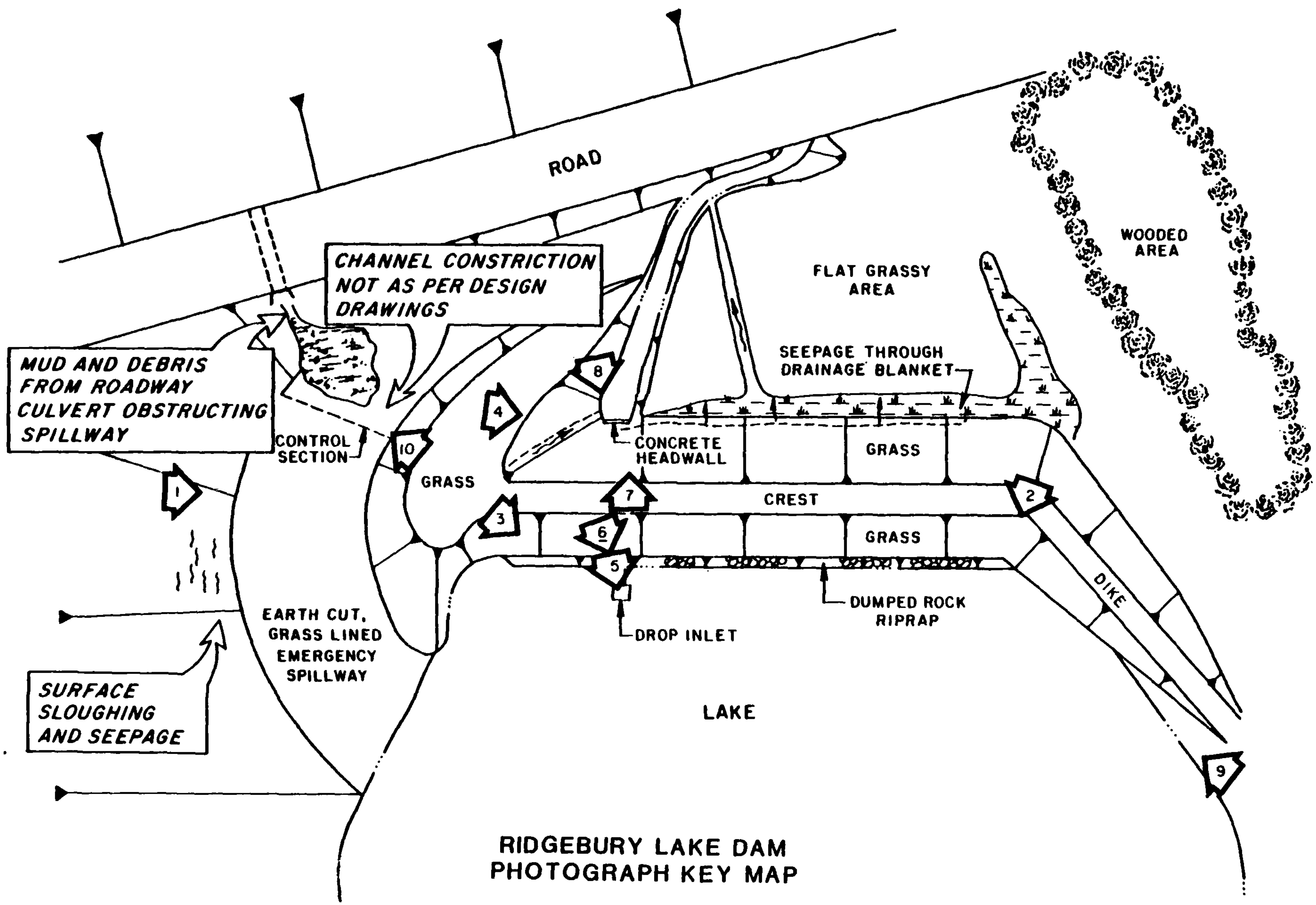
LOCATION: -

RECORDS: -

MAXIMUM NON-DAMAGING DISCHARGE: Emergency spillway has never discharged.

APPENDIX C

PHOTOGRAPHS



RIDGEBURY LAKE DAM
PHOTOGRAPH KEY MAP

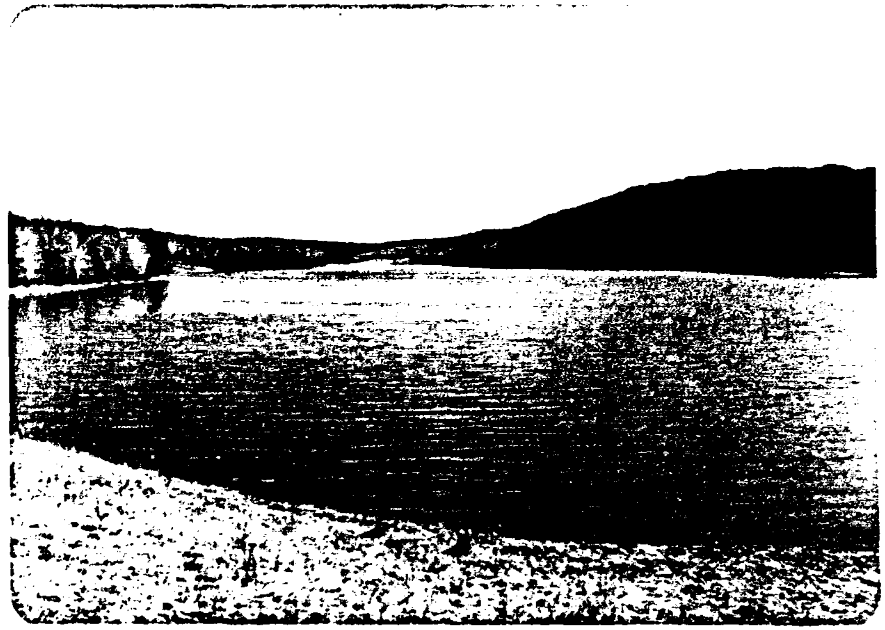
PHOTOGRAPH 1 View across the spillway and embankment crest as seen from the left abutment.

PHOTOGRAPH 2 View of Ridgebury Lake and its surrounding watershed as seen from the embankment crest.

PHOTOGRAPH 3 View of service spillway and riprap on the upstream embankment face.

PHOTOGRAPH 4 View of the downstream embankment face and toe area as seen from the earth dike between the spillway and dam.

1



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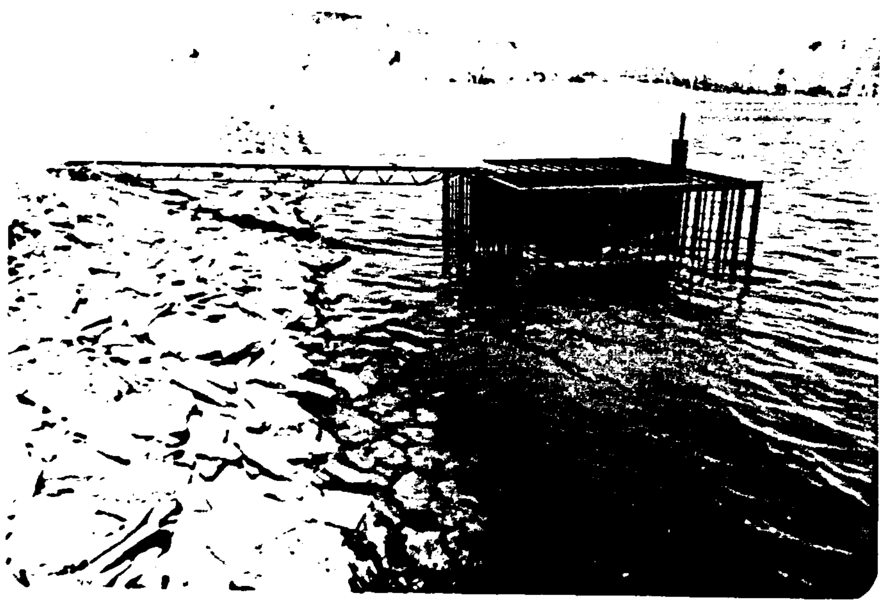

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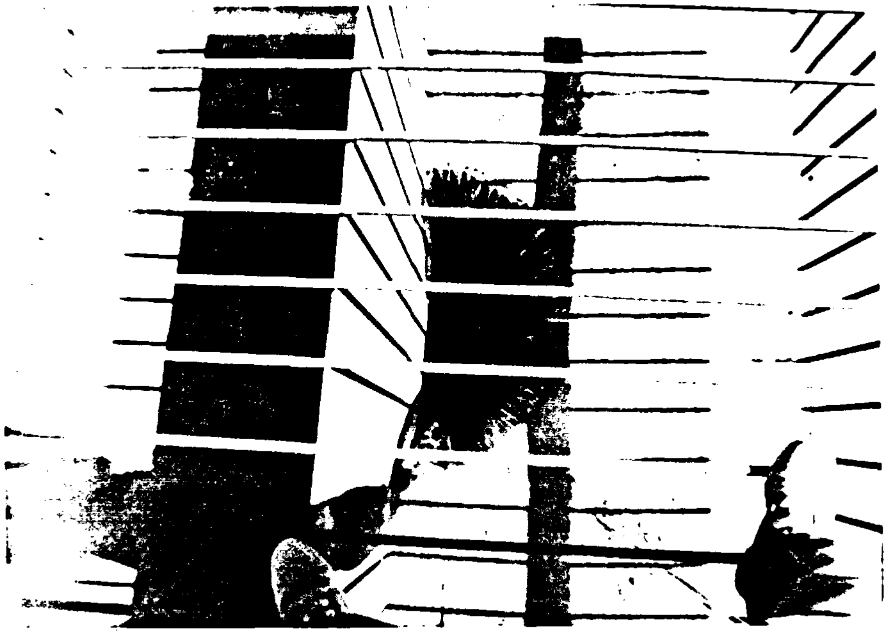
4

PHOTOGRAPH 5	Close-up view of the drop inlet service spillway.
PHOTOGRAPH 6	View of the service spillway and protective trash rack. The men in the view are operating the outlet conduit control valve.
PHOTOGRAPH 7	View of the area immediately downstream of the embankment as seen from the crest.
PHOTOGRAPH 8	View of the discharge end of the outlet conduit at the downstream embankment toe.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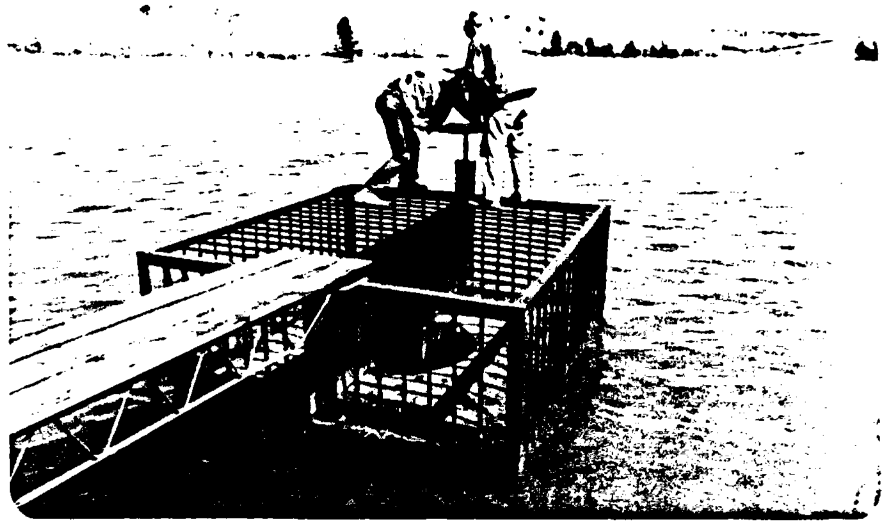
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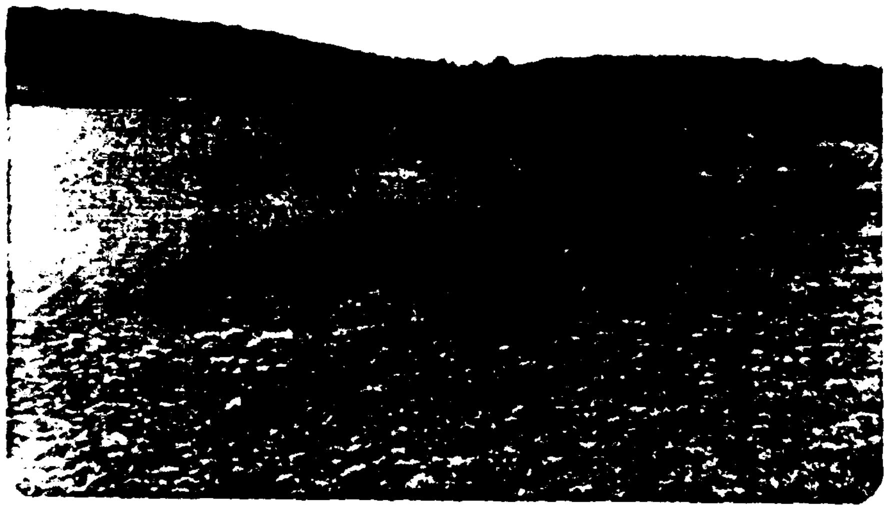
7


8

PHOTOGRAPH 9 View of the embankment and adjacent dike as seen from the right abutment.

PHOTOGRAPH 10 View of mud and debris being deposited in the emergency spillway channel through a roadway cross drain.



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10

APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failure of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), and time(s) of the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevations of failure hydrographs for each location.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: RIDGEBURY LAKE DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 21.5 INCHES/24 HOURS (1)

STATION	1	2	3
STATION DESCRIPTION	Ridgebury Lake Dam		
DRAINAGE AREA (SQUARE MILES)	2.2		
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	-		
ADJUSTMENT OF PMF FOR DRAINAGE AREA LOCATION (%) (1)			
6 HOURS	117.5		
12 HOURS	127.0		
24 HOURS	136.0		
48 HOURS	142.5		
72 HOURS	145.0		
SNYDER HYDROGRAPH PARAMETERS			
ZONE (2)	16A		
C_p (3)	0.52		
C_t (3)	0.69		
L' (MILES) (4)	1.2		
$t_p = C_t (L')^{0.6}$ (HOURS)	0.77		
SPILLWAY DATA (5)			
CREST LENGTH (FEET)	27		
FREEBOARD (FEET)	6.0		

(1) HYDROMETEOROLOGICAL REPORT 40, U.S. WEATHER BUREAU, 1965.

(2) HYDROLOGIC ZONE DEFINED BY CORPS OF ENGINEERS, BALTIMORE DISTRICT, FOR DETERMINATION OF SNYDER COEFFICIENTS (C_p AND C_t).

(3) SNYDER COEFFICIENTS

(4) L' = LENGTH OF LONGEST WATERCOURSE FROM RESERVOIR INLET TO BASIN DIVIDE.

(5) EARTH EMERGENCY SPILLWAY, CUT INTO LEFT ABUTMENT.

UBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY WJV DATE 5-1-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-6-80 SHEET NO. 1 OF 24

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DAM STATISTICS

- HEIGHT OF DAM ≈ 35 FT (FIELD MEASURED FROM INVERT OF SERVICE SPILLWAY OUTLET TO LOW TOP OF EMBANKMENT)

- NORMAL POOL STORAGE CAPACITY ≈ 460 AC-FT (SEE NOTE 1)

- MAXIMUM POOL STORAGE CAPACITY ≈ 1230 AC-FT (HEC-1)
  (@ LOW TOP OF DAM)

- DRAINAGE AREA ≈ 2.2 SQ. MI. [PLANIMETERED ON USGS 7.5 MINUTE BENTLEY CREEK, PA QUAD]

- ELEVATION OF LOW TOP OF DAM ≈ 1496.3 FT (FIELD)
  ≈ 1497.0 FT (DESIGN, FIGURE 5)

- NORMAL POOL ELEVATION ≈ 1485.0 FT (FIGURE 5)
  (ALSO SERVICE SPILLWAY ELEVATION)

- EMERGENCY SPILLWAY ELEVATION ≈ 1490.3 FT (FIELD)
  (@ CONTROL SECTION) ≈ 1491.0 FT (DESIGN, FIGURE 4)

- UPSTREAM INLET INVERT ELEVATION ≈ 1463.0 FT (FIGURE 5)
  (RESERVOIR DRAIN)

- DOWNSTREAM RESERVOIR DRAIN OUTLET ELEVATION ≈ 1462.7 FT (FIGURE 5)
  (OUTLET INTO BOTTOM OF SERVICE SPILLWAY RISER)

- SERVICE SPILLWAY OUTLET INVERT ELEVATION ≈ 1461.5 FT (DESIGN, FIG 5)
  1461.5 FT (FIELD)

SUBJECT	DAM SAFETY INSPECTION RIDGEBURY LAKE DAM		
BY WJV	DATE 5-1-80	PROJ. NO. 79-203-727	
CHKD. BY DJS	DATE 6-6-80	SHEET NO. 2	OF 24

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- STREAMBED AT DAM CENTERLINE ≈ 1459.9 FT (FIGURE 3)

NOTE 1: INFORMATION OBTAINED FROM "REPORT UPON THE APPLICATION OF TIMBERSTAND, INC. TO CONSTRUCT AND MAINTAIN A DAM ACROSS AN UNNAMED TRIBUTARY TO FALL CREEK IN RIDGEBURY TOWNSHIP, BRADFORD COUNTY.", AS FOUND IN PennDER FILES.

DAM CLASSIFICATION

DAM SIZE: INTERMEDIATE (REF 1, TABLE 1)
(BASED ON MAXIMUM STORAGE)

HAZARD CLASSIFICATION: HIGH (FIELD OBSERVATION)

REQUIRED SDF: PMF (REF 1, TABLE 3)

HYDROGRAPH PARAMETERS

LENGTH OF LONGEST WATERCOURSE (L) ≈ 2.2 MI

LENGTH OF LONGEST WATERCOURSE FROM DAM TO A POINT OPPOSITE THE BASIN CENTROID (L_{CA}) ≈ 0.8 MI

NOTE 2: VALUES OF L AND LCA WERE MEASURED ON THE 7.5 MINUTE USGS BENTLEY CREEK, PA QUAD. ALL HYDROGRAPH PARAMETERS ARE DEFINED IN REFERENCE 3 IN THE SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH".

$C_t \approx 0.69$
$C_p \approx 0.52$

[SUPPLIED BY C.E.; ZONE 16A SUSQUEHANNA RIVER BASIN]

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SINCE L_{CA} < LENGTH OF RESERVOIR ⇒ LENGTH OF LONGEST WATERCOURSE FROM END OF RESERVOIR TO DRAINAGE DIVIDE (L') ≈ 1.2 MI

SNYDER'S STANDARD LAG $(t_p) \approx C_t (L')^{0.6}$ (AS PER COE FOR CASES WITH L_{CA} < RESERVOIR LENGTH)

$\therefore\ t_p \approx 0.69(1.2)^{0.6} \approx 0.77$ HR

RESERVOIR SURFACE AREAS

SURFACE AREA (SA) @ NORMAL POOL ELEVATION 1495.0 ≈ 58 AC

SA @ EL 1490 ≈ 67 AC
SA @ EL 1495 ≈ 76 AC
SA @ EL 1500 ≈ 84 AC
} PLANIMETERED ON FIGURE 2

ELEVATION OF LOW TOP OF DAM ≈ 1496.3 FT

INCREASE IN RESERVOIR SURFACE AREA PER FOOT OF RESERVOIR RISE BETWEEN ELEVATIONS 1495 AND 1500 ≈ (84-76) AC/(1500-1495) FT
≈ 1.6 AC/FT

∴ SA @ LOW TOP OF DAM LEVEL ≈ 76 AC + [1.6 AC/FT (1496.3-1495) FT]
≈ 78 AC

RESERVOIR ELEVATION @ "0" STORAGE

STORAGE @ NORMAL POOL ELEVATION 1495 ≈ 460 AC-FT

ASSUME NORMAL POOL VOLUME CAN BE ESTIMATED VIA THE CONIC METHOD ⇒ $V \approx \frac{1}{3} HA$ (REF 14, PG 16)

SINCE SA @ NORMAL POOL ≈ 53 AC ⇒

$$H \approx 3V/A \approx 3\,(460\text{ AC-FT})/53\text{ AC} \approx 23.3\text{ FT}$$

∴ ZERO VOLUME ELEVATION ≈ 1485 FT − 23.8 FT ≈ 1461.2 FT

NOTE 3: ALTHOUGH THE MINIMUM RESERVOIR ELEVATION IS ACTUALLY AROUND 1460.4 FT (FIGURE 3), IN ORDER TO CALCULATE AN ELEVATION-STORAGE RELATIONSHIP AND STILL MAINTAIN A STORAGE OF 460 AC-FT @ NORMAL POOL EL 1485 FT, THE ABOVE COMPUTED "0" STORAGE ELEVATION MUST BE INPUT INTO THE HEC-1 MODEL.

RESERVOIR ELEVATION-STORAGE RELATIONSHIP

COMPUTED INTERNALLY BY THE HEC-1 MODEL, BASED ON GIVEN ELEVATION VS SURFACE AREA INFORMATION AS PREVIOUSLY PRESENTED (SEE SUMMARY INPUT/OUTPUT SHEETS).

PMP CALCULATIONS

- STANDARD RAINFALL INDEX = 22.2 IN (REF 9, FIG 2)
(CORRESPONDING TO A DURATION OF 24 HR AND AN AREA OF 200 SQ MI)

UBJECT	DAM SAFETY INSPECTION
	RIDGEBURY LAKE DAM
BY WJV	DATE 5-2-80	PROJ. NO. 79-203-727
CHKD. BY DJS	DATE 6-6-80	SHEET NO. 5 OF 24

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- GEOGRAPHIC ADJUSTMENT FACTOR ≈ 97 % (REF 9, FIG 1)
  (CORRESPONDING TO A LONGITUDE OF 76° 39′ AND A LATITUDE OF 41° 56′)

- CORRECTED RAINFALL INDEX ≈ (22.2 IN)(0.97) ≈ 21.5 IN

- RAINFALL DISTRIBUTION OVER THE 2.2 SQ MI BASIN:

DURATION (HR)	PERCENT OF INDEX RAINFALL (%)
6	117.5
12	127.0
24	136.0
48	142.5
72	145.0

- HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE AS WELL AS FOR THE LESSER LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALLER BASIN) CORRESPONDING TO A DA < 10 SQ MI ⇒ 0.80 (REF 4 PG

SERVICE SPILLWAY CAPACITY

- THE SERVICE SPILLWAY IS AN SCS RISER-TYPE WITH A 42-IN DIAMETER VERTICAL SHAFT AND A 36-IN DIAMETER OUTLET PIPE (SEE FIGURE 5). ASSUMING FULL BARREL FLOW BY THE TIME THE RESERVOIR LEVEL REACHES THE LOW TOP OF DAM ELEVATION (1496.3 FT), THE FLOW CAPACITY CAN BE ESTIMATED VIA AN ENERGY BALANCE BETWEEN A POINT ON THE RESERVOIR WATER SURFACE (EL 1496.3) AND A POINT ON THE TAILWATER SURFACE (ESTIMATED TO BE @ 1 FT ABOVE THE TOP OF CULVERT ⇒ EL 1465.5 FT). THE ENERGY BALANCE IS THEN (REF 13, PG 26):

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY WJV DATE 5-7-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-6-80 SHEET NO. 6 OF 24

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$$P_R/\gamma + v_R^2/2g + z_R = P_{TW}/\gamma + v_{TW}^2/2g + z_{TW} + H_L$$

WHERE $P_R/\gamma \approx P_{TW}/\gamma$ = ATMOSPHERIC PRESSURE HEAD @ THE RESPECTIVE WATER SURFACES ≈ 0 FT ;

$v_R^2/2g$ = VELOCITY OF RESERVOIR FLOW ≈ 0 FPS ;

z_R = ELEVATION OF RESERVOIR WATER SURFACE ≈ 1496.3 FT ,

z_{TW} = ELEVATION OF TAILWATER SURFACE ≈ 1465.5 FT ;
(ESTIMATED FROM DISCHARGE CHANNEL GEOMETRY AND MANNING'S EQUATION, SEE NOTE 4)

v_{TW} = VELOCITY OF TAILWATER @ CULVERT BARREL OUTLET ≈ VELOCITY OF WATER WITHIN CULVERT BARREL, IN FPS ;

H_L = TOTAL LOSS OF ENERGY BETWEEN THE TWO REFERENCE POINTS = LOSS DUE TO ENTRANCE CONDITIONS INTO THE RISER, LOSS DUE TO THE ABRUPT TRANSITION BETWEEN THE RISER AND CULVERT BARREL, AND LOSS DUE TO FRICTIONAL RESISTANCE IN BOTH THE RISER AND CULVERT BARREL, IN FT.

$$\therefore\ z_R - z_{TW} \approx 30.8 \text{ FT} \approx v_{TW}^2/2g + H_L$$

- HEAD LOSS : ENTRANCE LOSS ≈ $0.5\ v_{RISER}^2/2g$ ⇒ ASSUME ENTRANCE TO RISER IS LIKE ENTRANCE TO PIPE PROJECTING FROM FILL (REF 15, PG 3-35) ; ALSO, $A_{RISER}\, v_{RISER} = A_{CULVERT}\, v_{CULVERT}$ (REF 13 PG
$\therefore\ v_{RISER} = \frac{A_{CULVERT}}{A_{RISER}} v_{CULVERT}$ (w/ $v_{CULVERT}$ ≈ v_{TW} AS STATED ABOVE) ⇒ ENTRANCE LOSS ≈ $0.5 \left(\frac{A_{CULVERT}}{A_{RISER}}\right)^2 v_{TW}^2/2g$

BEND LOSS ≈ $1.1\ v_{TRANSITION}^2/2g$ ⇒ ASSUME 90° "MITER BEND" w/ NO APPARENT GUIDE VANES (SEE NOTE 4, AND FIGURE 6) ; ALSO, ASSUME $v_{TRANSITION}$ IS THE AVERAGE VELOCITY OF THE RISER AND CULVERT ⇒ $v_{TRANSITION} \approx \frac{v_{RISER} + v_{CULVERT}}{2}$

UBJECT DAM SAFETY INSPECTION

RIDGEBURY LAKE DAM

BY WJV DATE 5-7-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-6-80 SHEET NO. 7 OF 24

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$$\approx \left[\left(\frac{A_{CULVERT}}{A_{RISER}} \times v_{TW}\right) + v_{TW}\right] / 2 \quad , w/\ v_{CULVERT} = v_{TW}$$

$$\approx \left[\left(\frac{A_{CULVERT}}{A_{RISER}} + 1\right) / 2\right] \times v_{TW}$$

$$\Rightarrow \text{BEND LOSS} \approx 1.1 \left[\left(\frac{A_{CULVERT}}{A_{RISER}} + 1\right) / 2\right]^2 \ v_{TW}^2/2g$$

$$\text{FRICTION LOSS} \approx \left[0.00589\ L_{RISER} \frac{v_{RISER}^2}{2g}\right] + \left[0.00723\ L_{CULVERT} \frac{v_{CULVERT}^2}{2g}\right]$$

(REF 15, PGS 3-35 AND 3-75) $\Rightarrow L_{RISER} \approx 21$ FT, AND $L_{CULVERT} \approx 116$ FT. (FIGURE 5) $\Rightarrow$ FRICTION

$$\text{LOSS} \approx \left\{\left[0.00589 \times 21 \times \left(\frac{A_{CULVERT}}{A_{RISER}}\right)^2\right] + \left[0.00723 \times 116\right]\right\} v_{TW}^2/2g$$

$\therefore$ SINCE $A_{CULVERT} \approx \pi (3\text{FT})^2/4 \approx 7.07\ \text{FT}^2$, AND

$$A_{RISER} \approx \pi (3.5\text{FT})^2/4 \approx 9.62\ \text{FT}^2$$

$$\Rightarrow H_L \approx \left\{\left[0.5 \times \left(\frac{7.07\text{FT}^2}{9.62\text{FT}^2}\right)^2\right] + 1.1\left[\left(\frac{7.07\text{FT}^2}{9.62\text{FT}^2} + 1\right)/2\right]^2 + \left[0.00589 \times 21\text{FT} \times \left(\frac{7.07\text{FT}^2}{9.62\text{FT}^2}\right)^2\right] + \left[0.00723 \times 116\text{FT}\right]\right\} v_{TW}^2/2g$$

$$H_L \approx 2.0\ v_{TW}^2/2g$$

$$\therefore \quad 30.8\text{FT} \approx v_{TW}^2/2g + \left(2.0\ v_{TW}^2/2g\right)$$

$$v_{TW} \approx 25.7\ \text{FPS}$$

$$\therefore \quad Q_{CAPACITY} \approx v_{TW}\ A_{CULVERT} \approx (25.7\ \text{FPS})(7.07\ \text{FT}^2)$$

$$\approx 182\ \text{CFS}, \quad \text{SAY } 180\ \text{CFS}$$

NOTE 4: REFERENCE $\Rightarrow$ VENNARD, J.K., ELEMENTARY FLUID MECHANICS 4TH EDITION, JOHN WILEY AND SONS INC NEW YORK, NEW YORK, 1961, PG 318.

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY WJV DATE 5-7-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-6-80 SHEET NO. 8 OF 24

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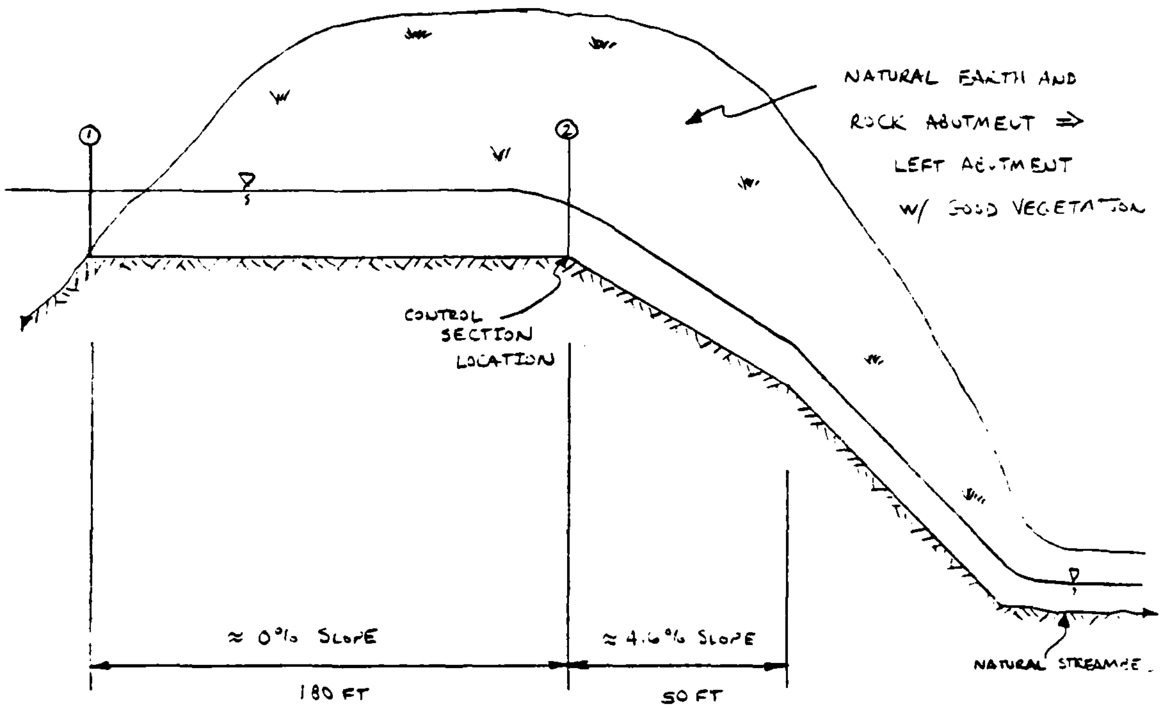
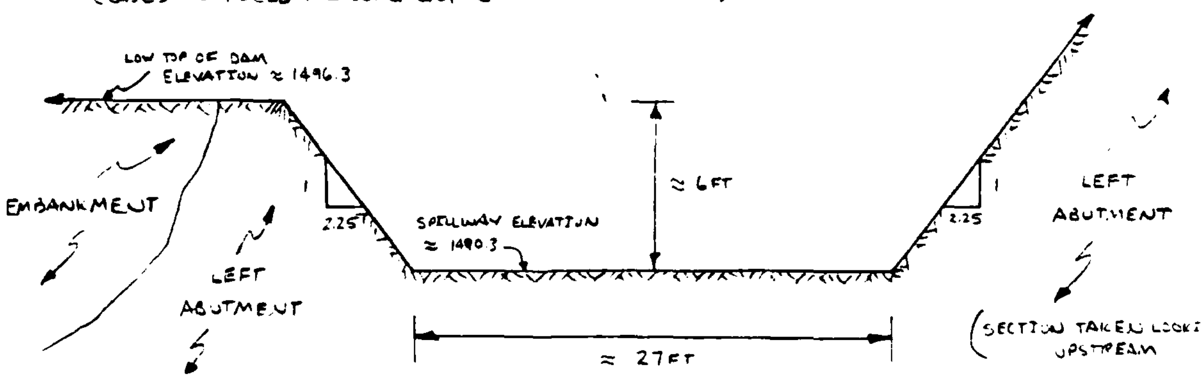
EMERGENCY SPILLWAY CAPACITY

- PROFILE OF SPILLWAY : (NOT TO SCALE)
(BASED ON FIELD MEASUREMENT)



- CROSS-SECTION OF SPILLWAY : (NOT TO SCALE)
(BASED ON FIELD MEASUREMENT @ CONTROL SECTION)



SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY WJV DATE 5-7-80 PROJ. NO. 79-203-727
CHKD. BY DJS DATE 6-6-80 SHEET NO. 9 OF 24

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- THE SPILLWAY IS A TRAPEZOIDAL-SHAPED CHUTE CHANNEL CUT INTO THE LEFT ABUTMENT, WITH DISCHARGES CONTROLLED BY CRITICAL DEPTH @ THE CONTROL SECTION. CRITICAL FLOW IN A TRAPEZOIDAL CHANNEL IS DEFINED BY THE RELATIONSHIP:

$$Q_c \approx \sqrt{g A_c^3 / T_c} \qquad \text{(REF 13, PG 141)}$$

WHERE Q_c = CRITICAL DISCHARGE, IN CFS;
A_c = AREA OF CRITICAL FLOW, IN FT^2;
T_c = TOP WIDTH OF CRITICAL FLOW AREA, IN FT; AND
g = 32.2 FT/SEC^2

- BALANCING THE ENERGY EQUATION BETWEEN SECTIONS AT ① AND ② ON SHEET 8:

$$Y_1 + v_1^2/2g + z_1 \approx Y_2 + v_2^2/2g + z_2 + H_L \qquad \text{(REF 7, PG 40)}$$

WHERE Y_1 = DEPTH OF WATER @ ENTRANCE TO APPROACH CHANNEL ≈ 1496.3 − 1490.3 ≈ 6.0 FT FOR SPILLWAY CAPACITY COMPUTATION;
v_1 = VELOCITY OF WATER @ ENTRANCE TO APPROACH CHANNEL, IN FPS
z_1 = DATUM ELEVATION ≈ 1490.3;
Y_2 = Y_c = CRITICAL DEPTH OF FLOW, IN FT;
v_2 = v_c = CRITICAL VELOCITY, IN FPS;
z_2 = DATUM ELEVATION ≈ 1490.3; AND
H_L = TOTAL LOSSES IN APPROACH CHANNEL = LOSS @ ENTRANCE + LOSS DUE TO FRICTION.

$$\therefore \quad Y_1 + v_1^2/2g \approx 6.0\,FT + v_1^2/2g \approx Y_c + v_c^2/2g + H_L$$

- THE APPROACH CHANNEL VARIES IN SECTION FROM A 53 FT WIDE SECTION, w/ SIDESLOPES OF 3H TO 1V AND 4H TO 1V @ THE ENTRANCE

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TO THE SECTION @ THE CONTROL (SHEET 9). ASSUME THAT THE ENTRANCE SECTION IS REPRESENTATIVE FOR THE FIRST 120 FT OF THE APPROACH CHANNEL, AND THAT THE VARIATION OCCURS WITHIN THE FINAL 60 FT.

AREA @ ENTRANCE $\approx (53\,FT \times Y_1) + (\tfrac{1}{2} \times 3 \times Y_1^2) + (\tfrac{1}{2} \times 4 \times Y_1^2)$

$A_1 \approx 53Y_1 + 3.5Y_1^2$, w/ $Y_1 \approx 6.0\,FT \Rightarrow A_1 \approx 474\,FT^2$

AREA @ CONTROL $\approx (27\,FT \times Y_c) + (\tfrac{1}{2} \times 2.25 \times Y_c^2) + (\tfrac{1}{2} \times 2.25 \times Y_c^2)$

$A_c \approx 27Y_c + 2.25\,Y_c^2$

$\Rightarrow v_1 \approx Q/A_1$; $v_c \approx Q_c/A_c$, w/ $Q = Q_c$

$v_1 \approx Q_c/474\,FT^2$; $v_c \approx Q_c/(27Y_c + 2.25\,Y_c^2)$

- THE ENTRANCE LOSS IS ASSUMED TO BE 0.1 × ENTRANCE VELOCITY HEAD (REF 4, PG 379) $\Rightarrow 0.1\ v_1^2/2g \approx 0.1\ Q_c^2/2g\,(474\,FT^2)^2$
$\approx 6.9 \times 10^{-9}\,Q_c^2$

THE FRICTION LOSS CAN BE DEFINED BY: $h_f \approx S_{f_3}L_3 + S_{f_4}L_4$
w/ $S_{f_3}L_3 \approx$ FRICTION LOSS IN THE FIRST 120 FT OF CHANNEL ($L_3 \approx 120\,FT$)
AND $S_{f_4}L_4 \approx$ FRICTION LOSS IN THE REMAINING 60 FT ($L_4 \approx 60\,FT$)

$$S_{f_i} \approx \left(Q_c\, n / 1.49\, A_i R_i^{2/3}\right)^2$$ (REF 4, PG 3[illegible]

WHERE n = ROUGHNESS COEFFICIENT ≈ 0.04 (REF 7 PG [illegible]),
A_i = FLOW AREA $\Rightarrow A_3 \approx A_1 \approx 474\,FT^2$, AND
$A_4 \approx \{A_1 + [(27\,FT \times Y_1) + (2.25 \times Y_1^2)]\}/2$, w/ $Y \approx 6.0\,FT$
AND $A_1 \approx 474\,FT^2 \Rightarrow A_4 \approx 359\,FT^2$; AND
R_i = HYDRAULIC RADIUS $\Rightarrow R_3 \approx A_3/[53 + \sqrt{(3 \times Y_1)^2 + Y_1^2} + \sqrt{(4 \times Y_1)^2 + Y_1^2}\,]$
w/ $Y_1 \approx 6.0\,FT$ AND $A_3 \approx 474\,FT^2 \Rightarrow R_3 \approx 474\,FT^2/[illegible]\,FT \approx 4.6\,FT$
AND $R_4 \approx \{R_3 + [(27Y_1 + 2.25\,Y_1^2)/(27 + 2\sqrt{(2.25\,Y)^2 + (Y)^2})]\}/2$
w/ $R_3 \approx 4.6\,FT$ AND $Y_1 \approx 6.0\,FT \Rightarrow R_4 \approx (4.6\,FT + \frac{243\,FT^2}{5[illegible]\,FT})/2 \approx 4.[illegible]$

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$$\therefore \quad h_f \approx \left\{\left[\frac{Q_c \times 0.04}{1.49 \times 474 \times (4.0)^{2/3}}\right]^2 \times 120\right\} + \left\{\left[\frac{Q_c \times 0.04}{1.49 \times 357 \times (4.5)^{2/3}}\right]^2 \times 60\right\}$$

$$h_f \approx (5.03 \times 10^{-8}\, Q_c^2) + (4.52 \times 10^{-8}\, Q_c^2) \approx 9.55 \times 10^{-8}\, Q_c^2$$

$$\therefore \quad H_L \approx (9.55 \times 10^{-8}\, Q_c^2) + (6.9 \times 10^{-9}\, Q_c^2) \approx 1.02 \times 10^{-7}\, Q_c^2$$

$$\Rightarrow \quad 6.0 + v^2/2g \approx 6.0 + Q_c^2/2g(474)^2 \approx Y_c + \left[Q_c^2/2g(27Y_c + 2.25Y_c^2)^2\right] + (1.02 \times 10^{-7}\, Q_c^2)$$

$$\text{ALSO,} \quad Q_c \approx \sqrt{g\,(27Y_c + 2.25Y_c^2)^3 / [27 + (2 \times 2.25 \times Y_c)]} \qquad \text{(SHEET 9)}$$

– BY TRIAL AND ERROR : $Y_c \approx 4.23$ FT $\Rightarrow Q_c \approx 1610$ CFS

EMERGENCY SPILLWAY RATING CURVE

THE RATING CURVE COMPUTATIONS ARE BASED ON THE PROCEDURE FOR CALCULATING THE CAPACITY AS OUTLINED ON SHEETS 9-11. THE FOLLOWING RELATIONSHIPS WILL BE USED TO DEFINE THE DISCHARGES :

$$Y_1 + \left[Q_c^2/2g\,(58Y_1 + 3.5Y_1^2)^2\right] \approx Y_c + \left[Q_c^2/2g\,(27Y_c + 2.25Y_c^2)^2\right] + \underbrace{\left[(Y_1/6.0) \times 0.26\text{ FT}\right]}_{H_L}$$

AND ;

$$Q_c \approx \sqrt{g\,(27Y_c + 2.25Y_c^2)^3 / [27 + (2 \times 2.25 \times Y_c)]}$$

AS CAN BE SEEN IN THE FIRST EQUATION, A LINEAR HEAD LOSS RELATIONSHIP IS ASSUMED AND COMPUTED AS A PROPORTION TO THE HEAD LOSS CALCULATED FOR $Y_1 \approx 6.0$

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY WJV DATE 5-8-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-6-80 SHEET NO. 12 OF 24

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	ELEVATION (FT)	Y_1 (FT)	FINAL ASSUMED Y_c (FT)	FINAL ASSUMED Q_c (FT)
	1490.3	0	0	0
	1491.3	1.0	0.66	80
	1492.3	2.0	1.36	260
	1493.3	3.0	2.07	500
	1494.3	4.0	2.77	800
	1495.3	5.0	3.50	1170
LOW TOP OF DAM	1496.3	6.0	4.23	1610
	1497.3	7.0	4.97	2110
	1498.3	8.0	5.74	2710
	1499.3	9.0	6.49	3360

ROUNDED VALUES

EMBANKMENT RATING CURVE

- LENGTH OF EMBANKMENT SUBMERGED VS RESERVOIR ELEVATION (BASED ON FIELD MEASUREMENTS)

RESERVOIR ELEVATION (FT)	EMBANKMENT LENGTH (FT)
1496.3	0
1496.7	300
1496.9	430
1497.0	460
1497.1	520
1497.2	790
1497.4	970
1497.5	1000
1498.3	1020
1499.3	1040

RIGHT ABUTMENT SIDESLOPE ESTIMATED TO BE 20H:1V FROM FIGURE 2

SUBJECT	DAM SAFETY INSPECTION				
	RIDGEBURY LAKE DAM				
BY	WJV	DATE	5-3-80	PROJ. NO.	79-203-727
CHKD. BY	DJS	DATE	6-6-80	SHEET NO.	13 OF 24

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- ASSUME THAT THE EMBANKMENT ACTS ESSENTIALLY AS A BROAD-CRESTED WEIR WHEN OVERTOPPED. THUS, THE DISCHARGE CAN BE ESTIMATED BY THE RELATIONSHIP:

$$Q = CLH^{3/2} \qquad \text{(REF 5, PG 5-23)}$$

WHERE
Q = DISCHARGE OVER EMBANKMENT, IN CFS;
L = LENGTH OF EMBANKMENT OVERTOPPED, IN FT;
H = HEAD ON WEIR; IN THIS CASE, IT IS THE AVERAGE "FLOW-AREA WEIGHTED" HEAD ABOVE THE CREST, USING THE LOW TOP OF DAM AS THE DATUM;
C = COEFFICIENT OF DISCHARGE $\approx f$ (H/l WHERE $l \approx$ BREADTH OF CREST $\approx$ 18 FT).

- ASSUME THAT INCREMENTAL DISCHARGES FOR SUCCESSIVE RESERVOIR ELEVATI[ONS] ARE APPROXIMATELY TRAPEZOIDAL IN CROSS-SECTIONAL FLOW AREA. THEN ANY INCREMENTAL AREA OF FLOW (BETWEEN SPECIFIED RESERVOIR ELEVATION[S]) IS APPROXIMATELY EQUAL TO $H_i\,[(L_1+L_2)/2]$, WHERE L_1 = LENGTH OF OVERTOPPED EMBANKMENT AT HIGHER ELEVATION, L_2 = LENGTH AT LOWER ELEVATION, H_i = DIFFERENCE IN ELEVATIONS. THUS, THE TOTAL AVERAGE "FLOW AREA WEIGHTED" HEAD, H_w, IS APPROXIMATELY EQUAL TO (TOTAL FLOW AREA/L[ENGTH]). FLOWS ARE TABULATED ON THE FOLLOWING SHEET.

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY WJV DATE 5-8-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-6-80 SHEET NO. 14 OF 24

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RESERVOIR ELEVATION (FT)	① LENGTH OVERTOPPED L_1 (FT)	L_2 (FT)	INCREMENTAL HEAD H_i (FT)	② INCREMENTAL FLOW AREA A_i (FT)	③ TOTAL FLOW AREA A_T (FT)	④ WEIGHTED HEAD H_w (FT)	H_w/ℓ (FT/FT)	⑤ C	⑥ Q (CFS)
1496.3	0	0	0	0	0	0	0	–	0
1496.7	300	0	0.4	60	60	0.2	0.01	2.97	30
1496.9	430	300	0.2	73	133	0.3	0.02	2.99	210
1497.0	460	430	0.1	45	178	0.4	0.02	3.01	350
1497.1	520	460	0.1	49	227	0.4	0.02	3.01	400
1497.2	790	520	0.1	66	293	0.4	0.02	3.01	600
1497.4	970	790	0.2	176	469	0.5	0.03	3.02	1040
1497.5	1000	970	0.1	99	568	0.6	0.03	3.03	1410
1498.3	1020	1000	0.8	808	1376	1.3	0.07	3.04	4600
1499.3	1040	1020	1.0	1030	2406	2.3	0.13	3.05	11060

① FROM SHEET 12

② $A_i \approx H_i \times \left(\frac{L_1 + L_2}{2}\right)$

③ $A_T = \Sigma A_i$

④ $H_w \approx A_T / L_1$

⑤ C-VALUES OBTAINED FROM REFERENCE 12, FIG 24, BASED ON H_w/ℓ

⑥ $Q \approx C L_1 H_w^{3/2}$

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY WJV DATE 5-9-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-6-80 SHEET NO. 15 OF 24

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TOTAL FACILITY RATING CURVE

TOTAL DISCHARGE ≈ EMERGENCY SPILLWAY Q + EMBANKMENT Q

NOTE 5: THE SERVICE SPILLWAY FLOWS ARE NOT CONSIDERED HERE SINCE THEY ARE CONSIDERED INSIGNIFICANT WITH RESPECT TO THE EXPECTED PMF, AND SINCE THERE IS THE POSSIBILITY OF AT LEAST A PARTIAL CLOGGING OF THE INLET BY DEBRIS DURING MAJOR FLOODS.

	RESERVOIR ELEVATION (FT)	EMERGENCY SPILLWAY Q (CFS)	EMBANKMENT Q (CFS)	TOTAL Q (CFS)
	1490.3	0	–	0
	1491.3	80	–	80
	1492.3	260	–	260
	1493.3	500	–	500
	1494.3	800	–	800
	1495.3	1170	–	1170
LOW TOP OF DAM	1496.3	1610	0	1610
	1496.7	*1810	80	1890
	1496.9	*1910	210	2120
	1497.0	*1960	350	2310
	1497.1	*2010	400	2410
	1497.2	*2060	600	2660
	1497.4	*2170	1040	3210
	1497.5	*2230	1410	3640
	1498.3	2710	4600	7310
	1499.3	3360	11060	14420

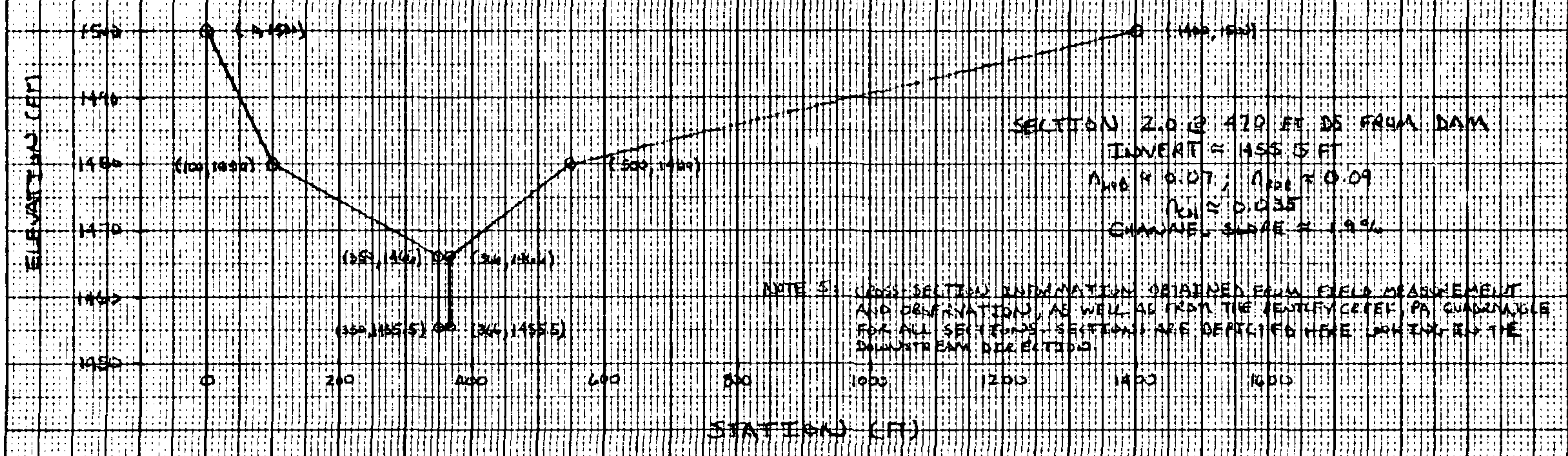
* STRAIGHT-LINE INTERPOLATION

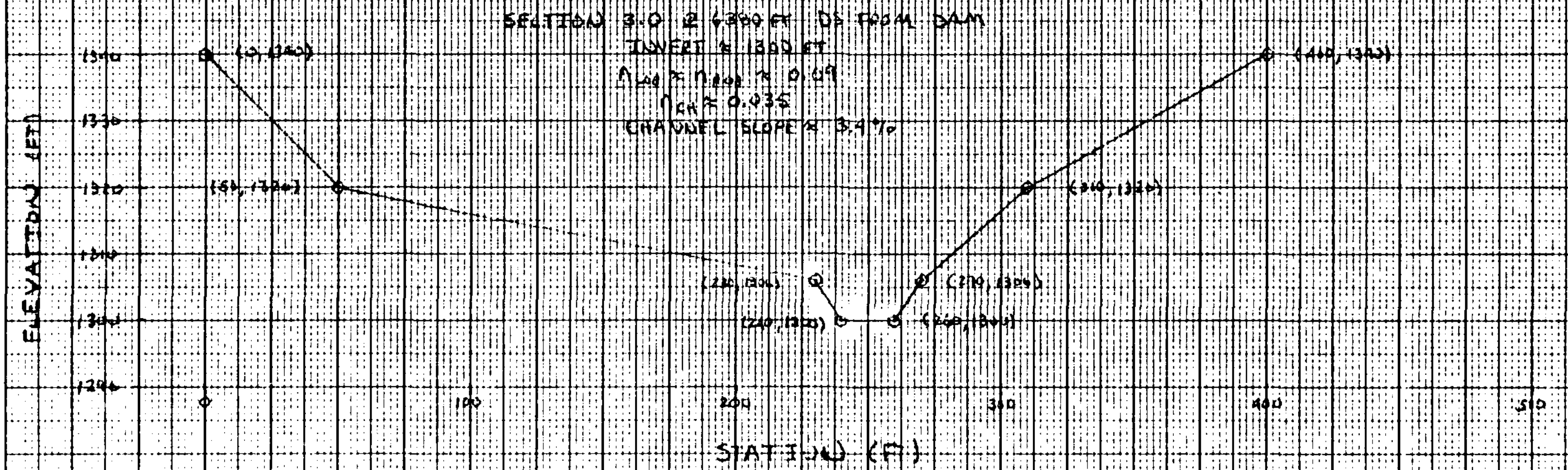
SUBJECT DOWNSTREAM ROUTING - RIDGEFRONT LAKE

BY WJV DATE 6-10-80 SHEET NO 14 OF

CHKD BY RJS DATE 6-12-80 PROJECT NO 71-203-727

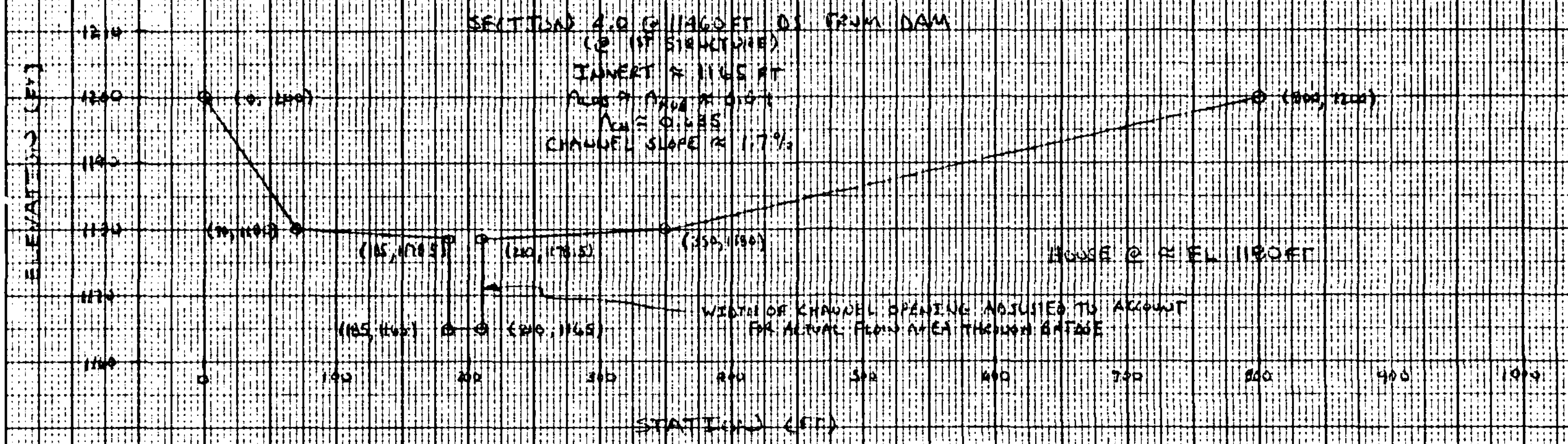
DOWNSTREAM ROUTING SECTIONS

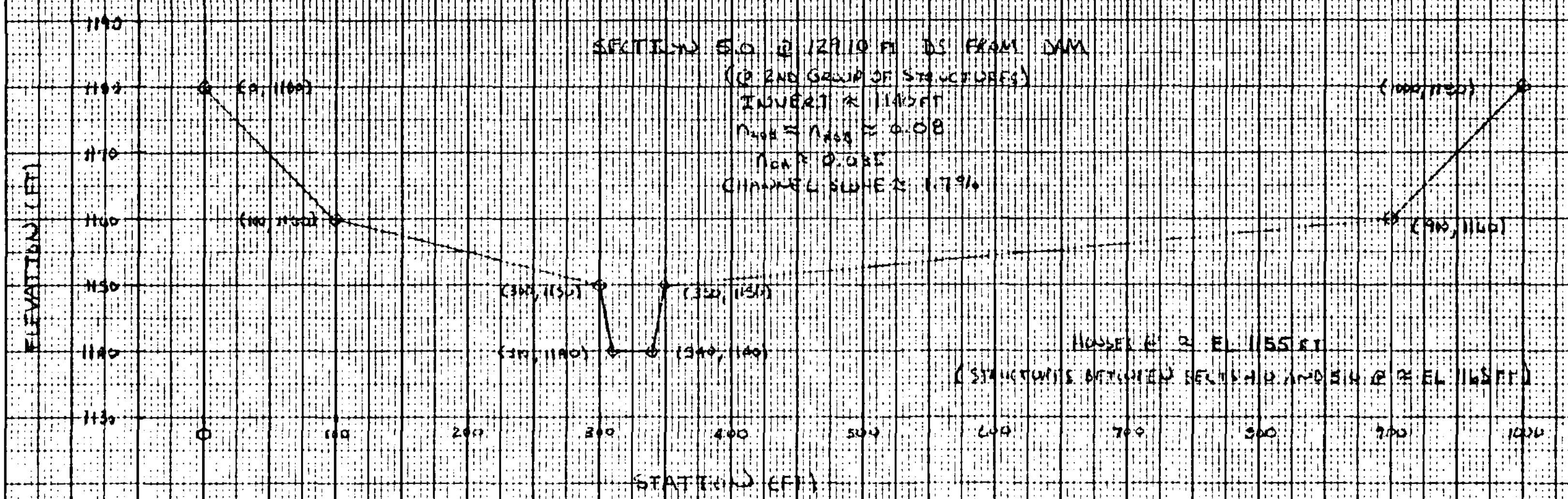




SUBJECT Downstream Routing - [illegible] Dam
BY WJV DATE 6-10-80 SHEET NO 17 OF
CHKD BY ZZS DATE 6-10-80 PROJECT NO [illegible]-727

DOWNSTREAM ROUTING SECTIONS

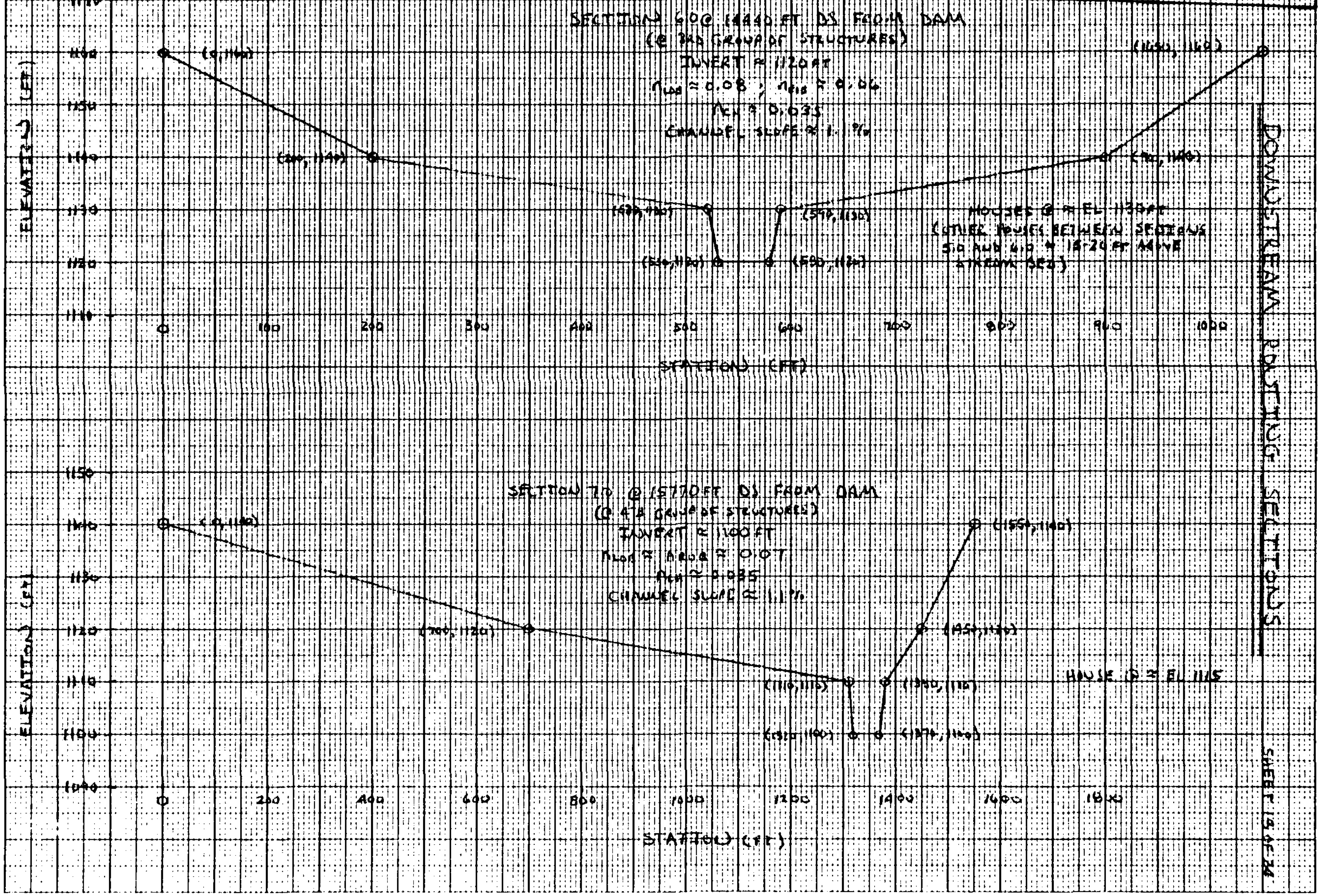




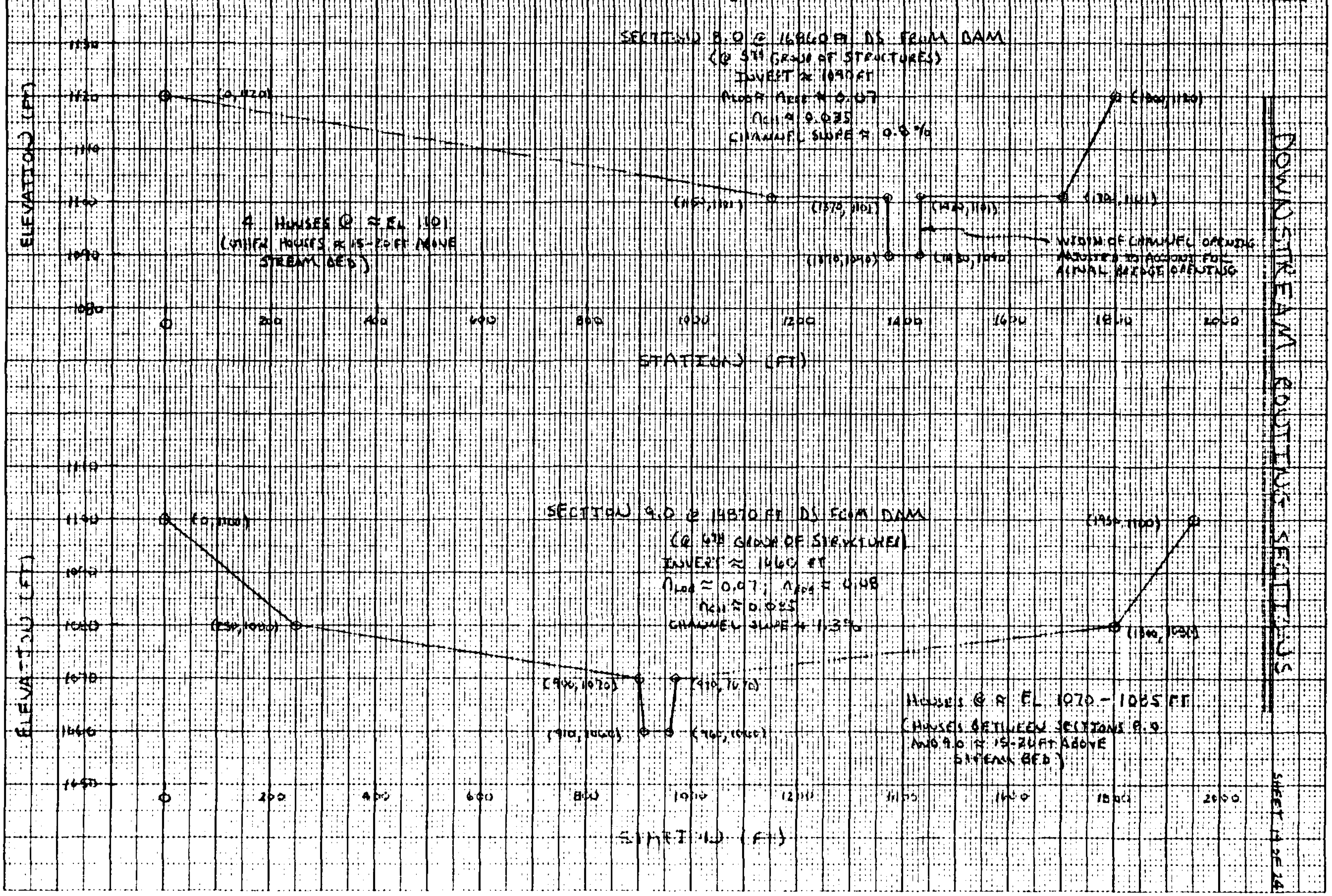
SUBJECT DOWNSTREAM ROUTING - RIDGEBURY LAKE L.

BY WJV DATE 6-10-80 SHEET NO. 18 OF

CHKD BY ZZS DATE 6-10-80 PROJECT NO. 79-203-727



SUBJECT Downstream Routing - Ridgeway Lake
BY WJV DATE 6-10-80 SHEET NO. 19 OF
CHKD. BY AJJ DATE 6-10-80 PROJECT NO. 79-203-727



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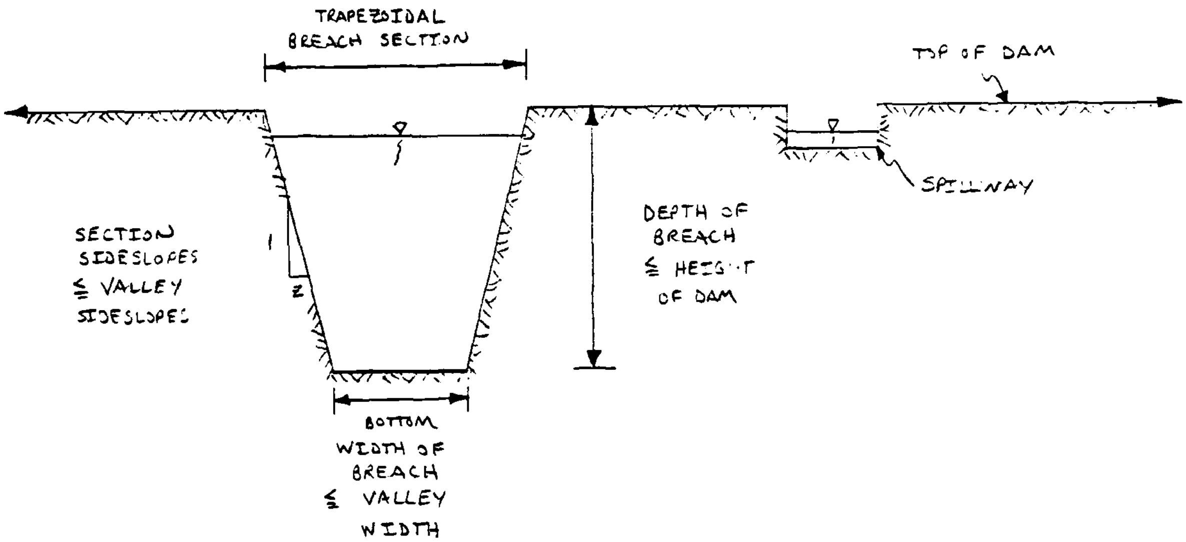
BREACH ASSUMPTIONS

- TYPICAL BREACH SECTION :



- HEC-1 BREACHING ANALYSIS INPUTS :

(BREACHING WILL COMMENCE WHEN THE RESERVOIR LEVEL REACHES THE TOP OF DAM ELEVATION)

PLAN NUMBER AND DESCRIPTION	BREACH BOTTOM WIDTH (FT)	MAX BREACH DEPTH (FT)	SECTION SIDESLOPES	BREACH * TIME (HR)	WSEL @ START OF FAILURE (FT)
MIN BREACH SECT; MIN FAIL TIME	0	35	0.5H TO 1V	0.5	14[illegible].3
MAX BREACH SECT; MIN FAIL TIME	100	35	6H TO 1V	0.5	14[illegible].3
MIN BREACH SECT; MAX FAIL TIME	0	35	0.5H TO 1V	4.0	14[illegible].3
MAX BREACH SECT; MAX FAIL TIME	100	35	6H TO 1V	4.0	1496.3
AVERAGE POSSIBLE CONDITIONS	50	35	2H TO 1V	2.0	1496.3

* MAXIMUM TIME FOR BREACH SECTION TO REACH ITS FINAL DIMENSIONS

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- THE BREACH ASSUMPTIONS LISTED ON SHEET 20 ARE BASED SOMEWHAT ON INFORMATION CONCERNING EARTH DAM BREACHING PROVIDED BY THE COE, BALTIMORE DISTRICT; AND ALSO ON THE PHYSICAL CONSTRAINTS OF THE DAM AND SURROUNDING TERRAIN:

CONSTRAINT	VALUE	
HEIGHT OF DAM	≈ 35 FT	(FIELD MEAS…)
EMBANKMENT CREST LENGTH:		
MAIN EMBANKMENT PORTION	≈ 535 FT	FIELD MEASURE
DIKE PORTION	≈ 385 FT	
TOTAL	≈ 920 FT	
VALLEY BOTTOM WIDTH	≈ 100 FT	(FIG 3)
VALLEY SIDESLOPES ADJACENT TO DAM:		
LEFT WALL	7H:1V	FIG 3
RIGHT WALL	6H:1V	

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY WJV DATE 6-13-80 PROJ. NO. 79-203-727
CHKD. BY DJS DATE 6-19-80 SHEET NO. 22 OF 24

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- HEC-1 BREACHING ANALYSIS OUTPUT :

RESERVOIR DATA

UNDER 0.46 PMF CONDITIONS -

* PLAN NUMBER	VARIABLE BREACH BOTTOM WIDTH (FT)	ACTUAL MAX FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF FLOW (HR)	INTERPOLATED OR HEC-1 ROUTED MAX FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF FLOW (HR)	ACTUAL PEAK FLOW THROUGH DAM (CFS)	CORRESPONDING TIME OF PEAK (HR)	TIME OF INITIAL BREACH (HR)
1	0	9289	42.50	9289	42.50	9289	42.50	42.00
2	100	46368	42.44	42251	42.50	46368	42.44	42.00
3	0	4417	46.00	4417	46.00	4417	46.00	42.00
4	100	7374	43.67	7374	43.67	7374	43.67	42.00
5	50	12615	43.50	12615	43.50	12615	43.50	42.00

* SEE TABLE ON SHEET 20

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM
BY WJV DATE 6-13-80 PROJ. NO. 79-203-727
CHKD. BY DJS DATE 6-19-80 SHEET NO. 23 OF 24

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- HEC-1 BREACH ANALYSIS OUTPUT :

DOWNSTREAM ROUTING DATA

UNDER 0.45 PMF BASE FLOW CONDITIONS -

PLAN[1] NUMBER	VARIABLE BREACH BOTTOM WIDTH (FT)	OUTPUT @ SECTION 4 LOCATED 11460 FT DS FROM DAM: PEAK FLOW (CFS)	CORRESPONDING WSEL[2] (FT)	WSEL[3] W/O BREACH (FT)	Δ ELEV[4] (FT)	OUTPUT @ SECTION 5 LOCATED 12910 FT DS FROM DAM: PEAK FLOW (CFS)	CORRESPONDING WSEL[2] (FT)	WSEL[3] W/O BREACH (FT)	Δ ELEV[4] (FT)
1	0	7972	1179.8	1170.1	+9.7	7906	1149.8	1144.0	+5.8
2	100	31582	1186.6	1170.1	+16.5	32926	1156.9	1144.0	+12.9
3	0	4290	1174.9	1170.1	+4.8	4297	1146.9	1144.0	+2.9
4	100	7294	1179.2	1170.1	+9.1	7295	1149.4	1144.0	+5.4
5	50	12124	1181.8	1170.1	+11.7	12024	1151.9	1144.0	+7.9

PLAN[1] NUMBER	VARIABLE BREACH BOTTOM WIDTH (FT)	OUTPUT @ SECTION 6 LOCATED 14410 FT DS FROM DAM: PEAK FLOW (CFS)	CORRESPONDING WSEL[2] (FT)	WSEL[3] W/O BREACH (FT)	Δ ELEV[4] (FT)	OUTPUT @ SECTION 7 LOCATED 15770 FT DS FROM DAM: PEAK FLOW (CFS)	CORRESPONDING WSEL[2] (FT)	WSEL[3] W/O BREACH (FT)	Δ ELEV[4] (FT)
1	0	7701	1129.5	1123.3	+5.2	7923	1109.5	1103.3	+5.2
2	100	32103	1136.2	1123.3	+12.9	30470	1115.8	1103.3	+12.5
3	0	4297	1125.9	1123.3	+2.6	4292	1105.9	1103.3	+2.6
4	100	7304	1128.1	1123.3	+4.8	7308	1108.1	1103.3	+4.8
5	50	11997	1130.7	1123.3	+7.4	12017	1110.7	1103.3	+7.4

SUBJECT: DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY: WJV DATE: 6-12-80 PROJ. NO. 79-303-727
CHKD. BY: DJS DATE: 6-19-80 SHEET NO. 24 OF 24

GAI CONSULTANTS, INC.
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DOWNSTREAM ROUTING DATA (CONT'D)

PLAN[1] NUMBER	VARIABLE BREACH BOTTOM WIDTH (FT)	OUTPUT @ SECTION 8 LOCATED 16860 FT DS FROM DAM: PEAK FLOW (CFS)	CORRESPONDING WSEL[2] (FT)	WSEL[3] W/O BREACH (FT)	Δ ELEV[4] (FT)	OUTPUT @ SECTION 9 LOCATED 19870 FT DS FROM DAM: PEAK FLOW (CFS)	CORRESPONDING WSEL[2] (FT)	WSEL[3] W/O BREACH (FT)	Δ ELEV[4] (FT)
1	0	7946	1099.4	1093.4	+6.0	7940	1068.1	1063.1	+5.0
2	100	28961	1105.2	1093.4	+11.8	28225	1074.4	1063.1	+11.3
3	0	4283	1096.3	1093.4	+2.9	4250	1065.5	1063.1	+2.4
4	100	7307	1098.9	1093.4	+5.5	7301	1067.7	1063.1	+4.6
5	50	11993	1101.7	1093.4	+8.3	11968	1070.2	1063.1	+7.1

1. SEE TABLE ON SHEET 20;
2. WATER SURFACE ELEVATIONS CORRESPONDING TO BREACH FLOWS (SUMMARY INPUT/OUTPUT SHEETS, SHEETS R,S);
3. BASE FLOW ELEVATIONS CORRESPONDING TO THE PEAK 0.15 PMF AS INTERPOLATED FROM SHEETS J, K; AND
4. Δ ELEV = CORRESPONDING WSEL − WSEL W/O BREACH

APPROXIMATE DAMAGE ELEVATIONS:

SECT 4 ⇒ HOUSE @ EL 1180 FT
SECT 5 ⇒ HOUSES @ EL 1155 FT
SECT 6 ⇒ HOUSES @ EL 1130 FT
SECT 7 ⇒ HOUSE @ EL 1115 FT
SECT 8 ⇒ HOUSES @ EL 1101 FT
SECT 9 ⇒ HOUSES @ EL 1070-1085 FT

P[illegible] BETWEEN SECTIONS 5 AND 6, 7 AND 8, AND 8 AND 9 ≈ 15-20 FT ABOVE STREAM

SUBJECT Dam Safety Inspection
Ridgebury Lake Dam

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-19-80 SHEET NO. A OF 5

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– SUMMARY INPUT/OUTPUT SHEETS –

OVERTOPPING ANALYSIS

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DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM  *** OVERTOPPING ANALYSIS ***
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

                              JOB SPECIFICATION
   NQ      NHR     NMIN     IDAY      IHR     IMIN   METRC    IPLT     IPRT    NSTAN
  288        0       10        0        0        0       0       0        0        0
                           JOPER      NWT    LRUPT   TRACE
                               5        0        0       0

                     MULTI-PLAN ANALYSES TO BE PERFORMED
                       NPLAN= 1 NRTIO= 5 LRTIO= 1
   RTIOS=      .20      .30      .40      .50    1.00

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

                          SUB-AREA RUNOFF COMPUTATION

  RESERVOIR INFLOW HYDROGRAPH

            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     2.20     0.00     2.20     0.00    0.000        0        1        0

                                 PRECIP DATA
            SPFE      PMS       R6      R12      R24      R48      R72      R96
            0.00    21.50   117.50   127.00   136.00   142.50     0.00     0.00
TRSPC COMPUTED BY THE PROGRAM IS  .800

                                  LOSS DATA
  LRUPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
      0     0.00     0.00     1.00     0.00     0.00     1.00     1.00      .05     0.00     0.00

                             UNIT HYDROGRAPH DATA
                          TP=   .77      CP= .52      NTA=  0

                                RECESSION DATA
                     STRTQ=   -1.50    QRCSN=    -.05    RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 4.97 AND R= 6.01 INTERVALS

      UNIT HYDROGRAPH 35 END-OF-PERIOD ORDINATES, LAG=    .77 HOURS, CP=  .52  VOL= 1.00
    83.       307.       599.       845.       946.       881.       746.       631.       534.       452.
   383.       324.       274.       232.       196.       166.       141.       119.       101.        85.
    72.        61.        52.        44.        37.        31.        27.        22.        19.        16.
    14.        12.        10.         8.         7.
```

(INITIAL & CONSTANT RAINFALL LOSS C.O.E.)

BASE FLOW PARAMETERS (C.O.E.)

SUBJECT Dam Safety Inspection
RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-19-80 SHEET NO. B OF 5

GAI CONSULTANTS, INC.
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NO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q NO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q

SUM 24.51 22.23 2.28 187806.
(623.)(565.)(58.)(5318.07)

RESERVOIR INFLOW HYDROGRAPHS

0.4 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3288.	1724.	520.	261.	75093.
CMS	93.	49.	15.	7.	2126.
INCHES		7.29	8.80	8.82	8.82
MM		185.19	223.57	224.03	224.03
AC-FT		855.	1032.	1034.	1034.
THOUS CU M		1055.	1273.	1276.	1276.

0.5 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4110.	2155.	651.	326.	93866.
CMS	116.	61.	18.	9.	2658.
INCHES		9.11	11.00	11.02	11.02
MM		231.49	279.46	280.03	280.03
AC-FT		1069.	1290.	1293.	1293.
THOUS CU M		1318.	1592.	1595.	1595.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8221.	4311.	1301.	652.	187732.
CMS	233.	122.	37.	18.	5316.
INCHES		18.23	22.00	22.05	22.05
MM		462.98	558.93	560.06	560.06
AC-FT		2138.	2581.	2586.	2586.
THOUS CU M		2637.	3183.	3190.	3190.

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HYDROGRAPH ROUTING

ROUTE INFLOW HYDROGRAPH THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
101	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1485.	-1

STAGE	1490.30	1491.30	1492.30	1493.30	1494.30	1495.30	1496.30	1496.70	1496.90
	1497.10	1497.20	1497.40	1497.50	1498.30	1499.30			
FLOW	0.00	80.00	260.00	500.00	800.00	1170.00	1610.00	1890.00	2120.00
	2410.00	2660.00	3210.00	3640.00	7310.00	14420.00			

SURFACE AREA=	0.	58.	67.	76.	78.	84.
CAPACITY=	0.	460.	772.	1130.	1210.	1529.
ELEVATION=	1461.	1485.	1490.	1495.	1496.	1500.

UBJECT Dam Safety Inspection
Ridgebury Lake Dam

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY ZWJ DATE 6-19-80 SHEET NO. C OF 5

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CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1490.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1496.3	0.0	0.0	0.

RESERVOIR OUTFLOW HYDROGRAPHS

PEAK OUTFLOW IS 1313. AT TIME 42.67 HOURS

0.4 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1313.	944.	268.	134.	38628.
CMS	37.	27.	8.	4.	1094.
INCHES		3.99	4.54	4.54	4.54
MM		101.38	115.24	115.24	115.24
AC-FT		468.	532.	532.	532.
THOUS CU M		577.	656.	656.	656.

PEAK OUTFLOW IS 2034. AT TIME 42.33 HOURS

0.5 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2034.	1363.	389.	194.	55946.
CMS	58.	39.	11.	6.	1584.
INCHES		5.76	6.57	6.57	6.57
MM		146.35	166.90	166.90	166.90
AC-FT		676.	771.	771.	771.
THOUS CU M		833.	951.	951.	951.

PEAK OUTFLOW IS 7673. AT TIME 40.67 HOURS

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7673.	3609.	1021.	511.	147091.
CMS	217.	102.	29.	14.	4165.
INCHES		15.26	17.28	17.28	17.28
MM		387.61	438.82	438.82	438.82
AC-FT		1790.	2026.	2026.	2026.
THOUS CU M		2207.	2499.	2499.	2499.

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HYDROGRAPH ROUTING

ROUTE FROM DAM TO SECTION 2.0: 470 FT D.S. FROM DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
102	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

JBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY DJJ DATE 6-19-80 SHEET NO. D OF 5

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NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0350	.0900	1455.5	1500.0	470.	.01900

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1500.00 100.00 1480.00 350.00 1466.00 350.00 1455.50 366.00 1455.50
366.00 1466.00 550.00 1480.00 1400.00 1500.00

STORAGE	0.00	.40	.81	1.21	1.62	2.27	4.54	8.64	14.58
	31.96	43.55	57.84	74.95	94.87	117.59	143.13	171.48	202.65
OUTFLOW	0.00	326.80	905.51	1589.72	2331.37	3285.44	5155.14	8619.12	14267.54
	34117.12	48860.98	68338.82	93219.75	123836.95	160625.19	204040.42	254537.70	312564.54
STAGE	1455.50	1457.84	1460.18	1462.53	1464.87	1467.21	1469.55	1471.89	1474.24
	1478.92	1481.26	1483.61	1485.95	1488.29	1490.63	1492.97	1495.32	1497.66
FLOW	0.00	326.80	905.51	1589.72	2331.37	3285.44	5155.14	8619.12	14267.54
	34117.12	48860.98	68338.82	93219.75	123836.95	160625.19	204040.42	254537.70	312564.54

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HYDROGRAPH ROUTING

ROUTE FROM SECTION 2.0 TO SECTION 3.0, 6380 FT D.S. FROM DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
203	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0900	.0350	.0900	1300.0	1340.0	5910.	.03400

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1340.00 50.00 1320.00 230.00 1306.00 240.00 1300.00 260.00 1300.00
270.00 1306.00 310.00 1320.00 400.00 1340.00

STORAGE	0.00	6.71	15.43	26.24	43.81	70.83	107.29	153.21	208.57
	347.00	425.47	508.15	595.05	686.15	781.46	880.98	984.71	1092.65
OUTFLOW	0.00	565.48	1909.93	4089.40	7641.63	12489.80	18847.75	26902.91	36828.93
	63416.45	80754.09	100291.17	122013.83	145922.73	172027.95	200346.02	230898.09	263708.79

SUBJECT: DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY: DLB DATE: 6-18-80 PROJ. NO.: 79-203-727

CHKD. BY: DJS DATE: 6-19-80 SHEET NO.: E OF: S

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STAGE     1300.00   1302.11   1304.21   1306.32   1308.42   1310.53   1312.63   1314.74   1316.84
          1321.05   1323.16   1325.26   1327.37   1329.47   1331.58   1333.68   1335.79   1337.89

FLOW         0.00    565.48   1909.93   4089.40   7641.63  12489.80  18847.75  26902.91  36828.93
         63416.45  80754.09 100291.17 122013.83 145922.73 172027.95 200346.07 230898.09 263708.79


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

                                     HYDROGRAPH ROUTING

                  ROUTE FROM SECTION 3.0 TO SECTION 4.0; 11,460 FT U.S. FROM DAM

                     ISTAQ   ICOMP   IECON   ITAPE   JPLT   JPRT   INAME  ISTAGE   IAUTO
                       304       1       0       0      0      0       1       0       0
                                            ROUTING DATA
             QLOSS   CLOSS     AVG    IRES   ISAME   IOPT   IPMP           LSTR
               0.0   0.000    0.00       1       1      0      0              0

                     NSTPS   NSTDL     LAG   AMSKK      X    TSK   STORA  ISPRAT
                         1       0       0   0.000  0.000  0.000     -1.      0


NORMAL DEPTH CHANNEL ROUTING
----------------------------

     QN(1)   QN(2)   QN(3)   ELNVT   ELMAX   RLNTH     SEL
     .0900   .0350   .0900  1165.0  1200.0   5080.  .01700


     CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
        0.00 1200.00   70.00 1180.00  185.00 1178.50  185.00 1165.00  210.00 1165.00
      210.00 1178.50  350.00 1180.00  800.00 1200.00

STORAGE      0.00      5.37     10.74     16.11     21.48     26.85     32.22     37.59     58.13
           195.49    279.90    374.59    479.57    594.84    720.40    856.26   1002.39   1158.82

OUTFLOW      0.00    350.49   1026.60   1877.92   2842.74   3886.72   4988.53   6134.06   7747.37
         17049.64  24559.86  33986.11  45407.30  58915.50  74608.40  92586.09 112949.32 135798.73

STAGE     1165.00   1166.84   1168.68   1170.53   1172.37   1174.21   1176.05   1177.89   1179.74
          1183.42   1185.26   1187.11   1188.95   1190.79   1192.63   1194.47   1196.32   1198.16

FLOW         0.00    350.49   1026.60   1877.92   2842.74   3886.72   4988.53   6134.06   7747.37
         17049.64  24559.86  33986.11  45407.30  58915.50  74608.40  92586.09 112949.32 135798.73
```

SUBJECT: DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY: DLB DATE: 6-18-80 PROJ. NO.: 79-203-727
CHKD. BY: ZJJ DATE: 6-19-80 SHEET NO.: F OF S

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

                              HYDROGRAPH ROUTING

            ROUTE FROM SECTION 4.0 TO SECTION 5.0; 12,910 FT D.S. FROM DAM

                  ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                    405       1       0       0       0       0       1       0       0
                                        ROUTING DATA
          QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
            0.0   0.000    0.00       1       1       0       0               0

                  NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                      1       0       0   0.000   0.000   0.000     -1.       0


NORMAL DEPTH CHANNEL ROUTING
----------------------------

   QN(1)   QN(2)   QN(3)   ELNVT   ELMAX   RLNTH     SEL
   .0800   .0350   .0800  1140.0  1180.0   1450.  .01700


   CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
      0.00 1180.00  100.00 1160.00  300.00 1150.00  310.00 1140.00  340.00 1140.00
    350.00 1150.00  900.00 1160.00 1000.00 1180.00

STORAGE       0.00       2.25       4.79       7.63      10.77      14.54      26.34      49.21      83.14
            183.00     240.54     299.55     360.04     422.01     485.45     550.36     616.75     684.62

OUTFLOW       0.00     571.45    1820.95    3618.62    5937.66    8926.85   13637.19   21035.25   32136.65
          70385.88   99892.84  134354.56  173532.72  217261.64  265422.04  317926.40  374710.10  435725.71

STAGE      1140.00    1142.11    1144.21    1146.32    1148.42    1150.53    1152.63    1154.74    1156.84
           1161.05    1163.16    1165.26    1167.37    1169.47    1171.58    1173.68    1175.79    1177.89

FLOW          0.00     571.45    1820.95    3618.62    5937.66    8926.85   13637.19   21035.25   32136.65
          70385.88   99892.84  134354.56  173532.72  217261.64  265422.04  317926.40  374710.10  435725.71


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

                              HYDROGRAPH ROUTING

            ROUTE FROM SECTION 5.0 TO SECTION 6.0; 14,440 FT D.S. FROM DAM

                  ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                    506       1       0       0       0       0       1       0       0
                                        ROUTING DATA
          QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
            0.0   0.000    0.00       1       1       0       0               0

                  NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                      1       0       0   0.000   0.000   0.000     -1.       0
```

SUBJECT: DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY: DLB DATE: 6-18-80 PROJ. NO.: 79-203-727
CHKD. BY: DJS DATE: 6-19-80 SHEET NO.: G OF: S

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NORMAL DEPTH CHANNEL ROUTING
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        QN(1)   QN(2)   QN(3)   ELNVT   ELMAX   RLNTH     SEL
        .0800   .0350   .0600  1120.0  1160.0   1530.   .01100

        CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
           0.00 1160.00  200.00 1140.00  520.00 1130.00  530.00 1120.00  580.00 1120.00
         590.00 1130.00  900.00 1140.00 1050.00 1160.00

STORAGE       0.00       3.85       8.02      12.49      17.28      22.67      35.21      57.55      89.69
            182.52     237.01     294.22     354.15     416.81     482.20     550.30     621.13     694.69

OUTFLOW       0.00     767.19    2432.27    4791.66    7779.14   11509.56   16866.59   24534.78   35303.03
          69779.55   95126.36  124644.71  158253.32  195918.20  237634.94  283418.86  333299.00  387314.26

STAGE      1120.00    1122.11    1124.21    1126.32    1128.42    1130.53    1132.63    1134.74    1136.84
           1141.05    1143.16    1145.26    1147.37    1149.47    1151.58    1153.68    1155.79    1157.89

FLOW          0.00     767.19    2432.27    4791.66    7779.14   11509.56   16866.59   24534.78   35303.03
          69779.55   95126.36  124644.71  158253.32  195918.20  237634.94  283418.86  333299.00  387314.26


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

                                        HYDROGRAPH ROUTING

                 ROUTE FROM SECTION 6.0 TO SECTION 7.0: 15,770  FT D.S. FROM DAM
                 ---------------------------------------------------------------
                              ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                                607       1       0       0       0       0       1       0       0
                                                     ROUTING DATA
                      QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                        0.0   0.000    0.00       1       1       0       0               0

                              NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                                  1       0       0   0.000   0.000   0.000     -1.       0
```

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727
CHKD. BY DJS DATE 6-19-80 SHEET NO. H OF S

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NORMAL DEPTH CHANNEL ROUTING
----------------------------

       QN(1)    QN(2)    QN(3)    ELNVT    ELMAX    RLNTH     SEL
       .0700    .0350    .0700   1100.0   1140.0    1330.   .01100

       CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
          0.00 1140.00  700.00 1120.00 1310.00 1110.00 1320.00 1100.00 1370.00 1100.00
        1380.00 1110.00 1450.00 1120.00 1550.00 1140.00

STORAGE        0.00       3.35       6.97      10.86      15.02      19.73      31.13      51.74      81.54
             168.28     221.91     280.94     345.39     415.25     490.53     571.21     657.31     748.83

OUTFLOW        0.00     767.19    2432.27    4791.66    7779.14   11510.04   16901.88   24704.00   35754.17
           70974.64   96557.23  127017.08  162554.44  203384.68  249729.85  301814.36  359862.71  424098.77

STAGE       1100.00    1102.11    1104.21    1106.32    1108.42    1110.53    1112.63    1114.74    1116.84
            1121.05    1123.16    1125.26    1127.37    1129.47    1131.58    1133.68    1135.79    1137.89

FLOW           0.00     767.19    2432.27    4791.66    7779.14   11510.04   16901.88   24704.00   35754.17
           70974.64   96557.23  127017.08  162554.44  203384.68  249729.85  301814.36  359862.71  424098.77

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

                                        HYDROGRAPH ROUTING

                     ROUTE FROM SECTION 7.0 TO SECTION 8.0: 16,860 FT D.S. FROM DAM

                               ISTAQ    ICOMP    IECON    ITAPE    JPLT     JPRT    INAME   ISTAGE   IAUTO
                                 708        1        0        0       0        0        1        0       0
                                                     ROUTING DATA
                      QLOSS    CLOSS      AVG     IRES    ISAME     IOPT     IPMP             LSTR
                        0.0    0.000     0.00        1        1        0        0                0

NORMAL DEPTH CHANNEL ROUTING   NSTPS    NSTDL      LAG    AMSKK        X      TSK    STORA   ISPRAT
----------------------------       1        0        0    0.000    0.000    0.000      -1.        0

       QN(1)    QN(2)    QN(3)    ELNVT    ELMAX    RLNTH     SEL
       .0700    .0350    .0700   1090.0   1120.0    1090.   .00800

       CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
          0.00 1120.00 1150.00 1101.00 1370.00 1101.00 1370.00 1090.00 1430.00 1090.00
        1430.00 1101.00 1700.00 1101.00 1800.00 1120.00

STORAGE        0.00       2.37       4.74       7.11       9.48      11.85      14.22      17.24      41.16
             101.31     137.54     177.88     222.12     270.87     323.51     380.27     441.13     506.09

OUTFLOW        0.00     472.69    1452.67    2768.11    4340.55    6119.82    8070.28   10180.68   14914.53
           33105.30   46411.92   62659.68   81984.21  104529.79  130444.18  159876.17  192974.28  229886.11

STAGE       1090.00    1091.58    1093.16    1094.74    1096.32    1097.89    1099.47    1101.05    1102.63
            1105.79    1107.37    1108.95    1110.53    1112.11    1113.68    1115.26    1116.84    1118.42

FLOW           0.00     472.69    1452.67    2768.11    4340.55    6119.82    8070.28   10180.68   14914.53
           33105.30   46411.92   62659.68   81984.21  104529.79  130444.18  159876.17  192974.28  229886.11
```

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-19-80 SHEET NO. I OF 5

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

HYDROGRAPH ROUTING

ROUTE FROM SECTION 8.0 TO SECTION 9.0; 19.870 FT D.S. FROM DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
809	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0350	.0800	1060.0	1100.0	3010.	.01300

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1100.00 250.00 1080.00 900.00 1070.00 910.00 1060.00 960.00 1060.00
970.00 1070.00 1800.00 1080.00 1950.00 1100.00

STORAGE	0.00	7.58	15.77	24.58	33.99	45.42	89.60	179.11	313.94
	714.68	946.29	1184.02	1427.88	1677.87	1933.98	2196.22	2464.58	2739.06
OUTFLOW	0.00	834.03	2644.15	5209.08	8456.81	12522.35	19077.29	30226.51	47854.63
	111656.54	162179.86	221549.69	289347.34	365285.53	449160.70	540826.61	640178.24	747141.41
STAGE	1060.00	1062.11	1064.21	1066.32	1068.42	1070.53	1072.63	1074.74	1076.84
	1081.05	1083.16	1085.26	1087.37	1089.47	1091.58	1093.68	1095.79	1097.89
FLOW	0.00	834.03	2644.15	5209.08	8456.81	12522.35	19077.29	30226.51	47854.63
	111656.54	162179.86	221549.69	289347.34	365285.53	449160.70	540826.61	640178.24	747141.41

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY RJS DATE 6-19-80 SHEET NO. J OF S

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SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1485.00	1490.30	1496.30
STORAGE	460.	793.	1230.
OUTFLOW	0.	0.	1610.

RIDGEBURY LAKE DAM;
OVERTOPPING OCCURS
@ ≈ 0.45 PMF

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
.20	1492.13	0.00	919.	229.	0.00	43.83	0.00
.30	1494.08	0.00	1061.	734.	0.00	43.00	0.00
.40	1495.63	0.00	1177.	1313.	0.00	42.67	0.00
.50	1496.83	.53	1271.	2034.	2.00	42.33	0.00
1.00	1498.35	2.05	1393.	7673.	4.50	40.67	0.00

PLAN 1 STATION 102

SECTION 2
@ ≈ 470 FEET
DS. FROM DAM

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	230.	1457.1	43.83
.30	735.	1459.5	43.00
.40	1314.	1461.6	42.67
.50	2034.	1463.9	42.33
1.00	7722.	1471.3	40.67

PLAN 1 STATION 203

SECTION 3
@ ≈ 6380 FEET
D.S. FROM DAM

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	229.	1300.9	44.00
.30	734.	1302.4	43.00
.40	1312.	1303.3	42.67
.50	2034.	1304.3	42.33
1.00	7665.	1308.4	40.67

PLAN 1 STATION 304

SECTION 4
@ ≈ 11,460 FEET
D.S. FROM DAM

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	228.	1166.2	44.17
.30	733.	1167.9	43.17
.40	1310.	1169.3	42.83
.50	2030.	1170.8	42.33
1.00	7474.	1179.4	40.83

PLAN 1 STATION 405

SECTION 5
@ ≈ 12,910 FEET
DS FROM DAM

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	228	1140.8	44.17
.30	733.	1142.4	43.17
.40	1311.	1143.4	42.83
.50	2029.	1144.5	42.33

SUBJECT DAM SAFETY INSPECTION

RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-19-80 SHEET NO. K OF S

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SECTION 6
@ ≈ 14,440 FEET
D.S. FROM DAM

PLAN 1 STATION 506

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	228.	1120.6	44.33
.30	732.	1122.0	43.17
.40	1310.	1122.8	42.83
.50	2030.	1123.7	42.50
1.00	7454.	1128.2	40.83

SECTION 7
@ ≈ 15,770 FEET
D.S. FROM DAM

PLAN 1 STATION 607

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	228.	1100.6	44.33
.30	732.	1102.0	43.33
.40	1310.	1102.8	42.83
.50	2031.	1103.7	42.50
1.00	7434.	1108.2	41.00

SECTION 8
@ ≈ 16,860 FEET
D.S. FROM DAM

PLAN 1 STATION 708

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	228.	1090.8	44.33
.30	732.	1092.0	43.33
.40	1309.	1092.9	42.83
.50	2032.	1093.9	42.50
1.00	7457.	1099.0	41.00

SECTION 9
@ ≈ 19,870 FEET
D.S. FROM DAM

PLAN 1 STATION 809

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.20	228.	1060.6	44.50
.30	730.	1061.8	43.50
.40	1309.	1062.7	43.00
.50	2028.	1063.5	42.50
1.00	7464.	1067.8	41.00

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

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BREACHING ANALYSIS (INPUT DATA IS SAME AS THAT FOR OVERTOPPING ANALYSIS WITH THE ADDITION OF THE BREACH DATA GIVEN HERE)

```
                 DAM SAFETY INSPECTION
                 RIDGEBURY LAKE DAM  *** BREACHING   ANALYSIS ***
                 10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

                                    JOB SPECIFICATION
      NQ      NHR     NMIN     IDAY      IHR     IMIN   METRC     IPLT     IPRT    NSTAN
     288        0       10        0        0        0       0        0        0        0
                                JOPER      NWT    LROPT   TRACE
                                    5        0        0       0

                         MULTI-PLAN ANALYSES TO BE PERFORMED
                              NPLAN= 5 NRTIO= 1 LRTIO= 1
                 RTIOS=    .46

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

                                  HYDROGRAPH ROUTING

                                                DAM DATA
 ROUTE INFLOW HYDROGRAPH THROUGH RESERVOIR   TOPEL    COQD    EXPD   DAMWID
                                            1496.3     0.0     0.0       0.

PLAN 1                                         DAM BREACH DATA
                                     BRWID       Z    ELBM   TFAIL    WSEL  FAILEL
                                        0.     .50 1461.30     .50 1485.00 1496.30

                                           STATION    101, PLAN 1, RATIO 1

  BEGIN DAM FAILURE AT 42.00 HOURS

           PEAK OUTFLOW IS     9289. AT TIME  42.50 HOURS

                                                DAM BREACH DATA
PLAN 2                               BRWID       Z    ELBM   TFAIL    WSEL  FAILEL
                                      100.    6.00 1461.30     .50 1485.00 1496.30

                                           STATION    101, PLAN 2, RATIO 1

  BEGIN DAM FAILURE AT 42.00 HOURS

           PEAK OUTFLOW IS    46368. AT TIME  42.44 HOURS
```

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PLAN
3

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
0.	.50	1461.30	4.00	1485.00	1496.30

STATION 101. PLAN 3, RATIO 1

BEGIN DAM FAILURE AT 42.00 HOURS

PEAK OUTFLOW IS 4417. AT TIME 46.00 HOURS

PLAN
4

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
100.	6.00	1461.30	4.00	1485.00	1496.30

STATION 101. PLAN 4, RATIO 1

BEGIN DAM FAILURE AT 42.00 HOURS

PEAK OUTFLOW IS 7374. AT TIME 43.67 HOURS

PLAN
5

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
50.	2.00	1461.30	2.00	1485.00	1496.30

STATION 101. PLAN 5, RATIO 1

BEGIN DAM FAILURE AT 42.00 HOURS

PEAK OUTFLOW IS 12615. AT TIME 43.50 HOURS

SUBJECT DAM SAFETY INSPECTION

RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY ZJJ DATE 6-19-80 SHEET NO. N OF 5

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THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .010 HOURS DURING BREACH FORMATION.
DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS.
THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH.
INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

PLAN 2

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	-	COMPUTED BREACH HYDROGRAPH (CFS)	=	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
42.000	0.000	1613.		1613.		0.	0.	0.
42.010	.010	2535.		1799.		736.	736.	1.
42.020	.020	3457.		2148.		1309.	2045.	2.
42.029	.029	4379.		2616.		1763.	3808.	3.
42.039	.039	5301.		3188.		2114.	5922.	5.
42.049	.049	6224.		3857.		2367.	8288.	7.
42.059	.059	7146.		4616.		2530.	10818.	9.
42.069	.069	8068.		5458.		2610.	13428.	11.
42.078	.078	8990.		6379.		2611.	16039.	13.
42.088	.088	9912.		7374.		2539.	18577.	15.
42.098	.098	10835.		8436.		2398.	20976.	17.
42.108	.108	11757.		9561.		2196.	23172.	19.
42.118	.118	12679.		10743.		1937.	25108.	20.
42.127	.127	13601.		11975.		1626.	26735.	22.
42.137	.137	14524.		13252.		1271.	28006.	23.
42.147	.147	15446.		14568.		878.	28884.	23.
42.157	.157	16368.		15915.		452.	29337.	24.
42.167	.167	17290.		17290.		-0.	29337.	24.
42.176	.176	18600.		18695.		-94.	29242.	24.
42.186	.186	19911.		20113.		-202.	29040.	24.
42.196	.196	21221.		21538.		-317.	28723.	23.
42.206	.206	22531.		22963.		-432.	28291.	23.
42.216	.216	23841.		24384.		-543.	27748.	22.
42.225	.225	25152.		25808.		-657.	27091.	22.
42.235	.235	26462.		27215.		-753.	26339.	21.
42.245	.245	27772.		28597.		-825.	25514.	21.
42.255	.255	29083.		29959.		-876.	24637.	20.
42.265	.265	30393.		31296.		-903.	23734.	19.
42.275	.275	31703.		32594.		-891.	22843.	19.
42.284	.284	33013.		33858.		-844.	21999.	18.
42.294	.294	34324.		35085.		-761.	21238.	17.
42.304	.304	35634.		36260.		-626.	20612.	17.
42.314	.314	36944.		37412.		-468.	20144.	16.
42.324	.324	38255.		38511.		-257.	19887.	16.
42.333	.333	39565.		39565.		0.	19887.	16.
42.343	.343	39723.		40571.		-848.	19040.	15.
42.353	.353	39881.		41506.		-1625.	17415.	14.
42.363	.363	40039.		42368.		-2329.	15085.	12.
42.373	.373	40197.		43156.		-2959.	12126.	10.
42.382	.382	40355.		43868.		-3513.	8613.	7.
42.392	.392	40513.		44502.		-3989.	4623.	4.
42.402	.402	40671.		45059.		-4388.	235.	0.
42.412	.412	40829.		45537.		-4708.	-4473.	-4.
42.422	.422	40987.		45937.		-4950.	-9423.	-8.
42.431	.431	41145.		46241.		-5097.	-14519.	-12.
42.441	.441	41303.		46368.		-5065.	-19584.	-16.
42.451	.451	41461.		46292.		-4831.	-24415.	-20.
42.461	.461	41619.		45996.		-4378.	-28793.	-23.
42.471	.471	41777.		45465.		-3688.	-32481.	-26.
42.480	.480	41935.		44679.		-2744.	-35225.	-29.
42.490	.490	42093.		[illegible]		-1523.	-36748.	-30.
42.500	.500	(42251.)		42251.		0.	[illegible]	[illegible]

SUBJECT: DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY: DLB DATE: 6-18-80 PROJ. NO.: 79-203-727

CHKD. BY: DJS DATE: 6-19-80 SHEET NO.: O OF 5

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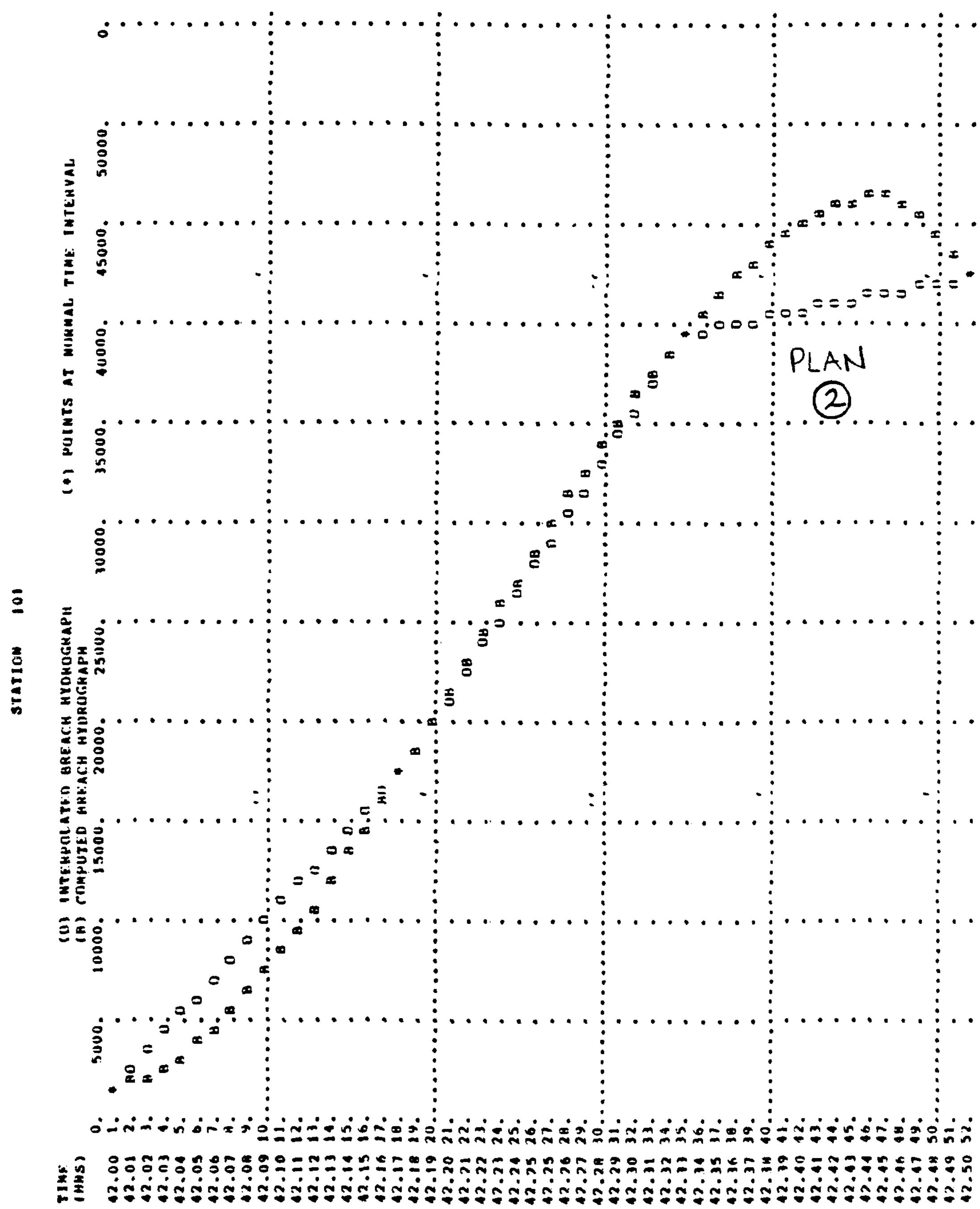

SUBJECT DAM SAFETY INSPECTION

RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-19-80 SHEET NO. P OF S

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PLAN 5

THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .042 HOURS DURING BREACH FORMATION.
DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS.
THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH.
INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	-	COMPUTED BREACH HYDROGRAPH (CFS)	=	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
42.000	0.000	1613.		1613.		0.	0.	0.
42.042	.042	1825.		1727.		98.	98.	0.
42.083	.083	2037.		1923.		114.	212.	1.
42.125	.125	2249.		2172.		77.	289.	1.
42.167	.167	2461.		2461.		-0.	289.	1.
42.208	.208	2829.		2788.		41.	330.	1.
42.250	.250	3197.		3147.		50.	380.	1.
42.292	.292	3564.		3530.		34.	415.	1.
42.333	.333	3932.		3932.		0.	415.	1.
42.375	.375	4358.		4348.		10.	425.	1.
42.417	.417	4785.		4774.		11.	436.	2.
42.458	.458	5212.		5205.		6.	443.	2.
42.500	.500	5638.		5638.		-0.	443.	2.
42.542	.542	6068.		6069.		-1.	442.	2.
42.583	.583	6498.		6506.		-7.	434.	1.
42.625	.625	6928.		6937.		-9.	425.	1.
42.667	.667	7358.		7358.		0.	425.	1.
42.708	.708	7752.		7764.		-13.	412.	1.
42.750	.750	8145.		8170.		-25.	387.	1.
42.792	.792	8539.		8562.		-23.	365.	1.
42.833	.833	8933.		8933.		0.	365.	1.
42.875	.875	9272.		9298.		-26.	339.	1.
42.917	.917	9611.		9644.		-33.	306.	1.
42.958	.958	9951.		9971.		-20.	286.	1.
43.000	1.000	10290.		10290.		0.	286.	1.
43.042	1.042	10584.		10583.		1.	287.	1.
43.083	1.083	10877.		10893.		-16.	271.	1.
43.125	1.125	11170.		11173.		-3.	268.	1.
43.167	1.167	11464.		11464.		0.	268.	1.
43.208	1.208	11672.		11721.		-49.	219.	1.
43.250	1.250	11880.		11946.		-66.	153.	1.
43.292	1.292	12088.		12137.		-49.	104.	0.
43.333	1.333	12296.		12296.		0.	104.	0.
43.375	1.375	12376.		12423.		-47.	57.	0.
43.417	1.417	12456.		12519.		-63.	-6.	-0.
43.458	1.458	12535.		12584.		-48.	-55.	-0.
43.500	1.500	12615.		12615.		0.	-55.	-0.
43.542	1.542	12459.		12580.		-121.	-176.	-1.
43.583	1.583	12302.		12467.		-164.	-340.	-1.
43.625	1.625	12146.		12272.		-126.	-466.	-2.
43.667	1.667	11990.		11990.		0.	-466.	-2.
43.708	1.708	11465.		11616.		-151.	-617.	-2.
43.750	1.750	10940.		11146.		-206.	-823.	-3.
43.792	1.792	10416.		10573.		-157.	-980.	-3.
43.833	1.833	9891.		9891.		0.	-980.	-3.
43.875	1.875	8883.		9092.		-209.	-1189.	-4.
43.917	1.917	7874.		8164.		-290.	-1479.	-5.
43.958	1.958	6865.		7094.		-229.	-1708.	-6.
44.000	2.000	5857.		5857.		0.	-1708.	-6.

SUBJECT DAM SAFETY INSPECTION
RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY DJJ DATE 6-19-80 SHEET NO. Q OF S

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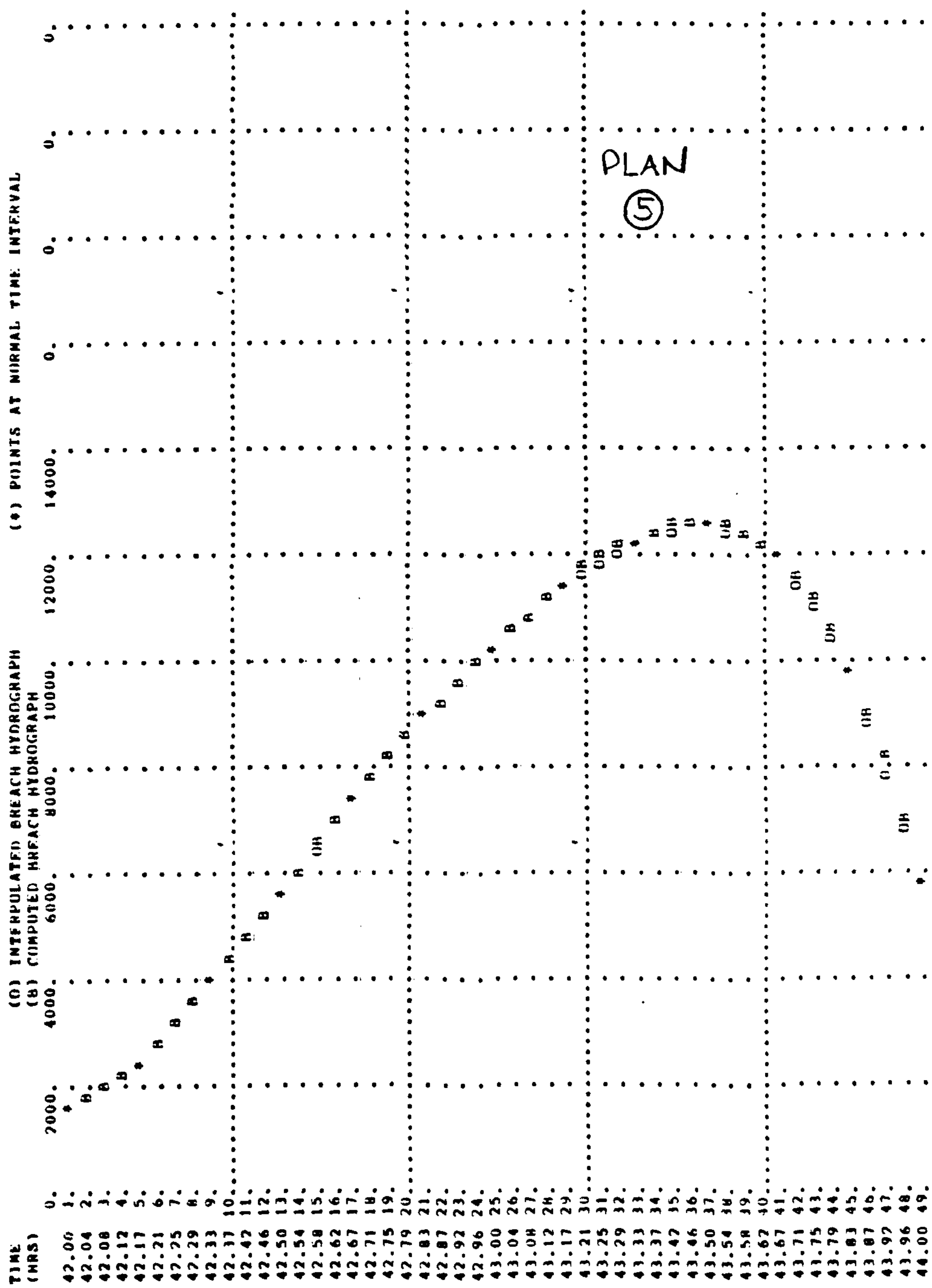

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NATIONAL DAM INSPECTION PROGRAM. RIDGEBURY LAKE DAM, (NDI I.D. --ETC(U)
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SUBJECT DAM SAFETY INSPECTION

RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY DJS DATE 6-19-80 SHEET NO. R OF S

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SUMMARY OF DAM SAFETY ANALYSIS

RIDGEBURY LAKE DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1485.00	1490.30	1496.30
STORAGE	460.	793.	1230.
OUTFLOW	0.	0.	1610.

PLAN	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	.46	1496.35	.05	1233.	9289.	.39	42.50	42.00
2	.46	1496.31	.01	1230.	46368.	.20	42.44	42.00
3	.46	1496.41	.11	1238.	4417.	.92	46.00	42.00
4	.46	1496.33	.03	1232.	7374.	.33	43.67	42.00
5	.46	1496.33	.03	1232.	12615.	.33	43.50	42.00

SECTION 2 — STATION 102

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.46	8794.	1472.0	42.50
2	.46	42653.	1480.3	42.50
3	.46	4396.	1468.6	46.00
4	.46	7375.	1471.1	43.67
5	.46	12607.	1473.5	43.50

SECTION 3 — STATION 203

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.46	8890.	1309.0	42.67
2	.46	42013.	1317.8	42.50
3	.46	4316.	1306.5	46.00
4	.46	7352.	1308.2	43.83
5	.46	12484.	1310.5	43.50

SECTION 4 — STATION 304

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.46	7972.	1179.8	42.83
2	.46	31582.	1186.6	42.67
3	.46	4290.	1174.9	46.17
4	.46	7294.	1179.2	43.83
5	.46	12124.	1181.8	43.67

SECTION 5 — STATION 405

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.46	1906.	1149.8	42.83
2	.46	32926.	1156.9	42.67
3	.46	4297.	1146.9	46.17
4	.46	7295.	1149.4	44.00
5	.46	12024.	1151.9	43.67

SUBJECT	DAM SAFETY INSPECTION
	RIDGEBURY LAKE DAM

BY DLB DATE 6-18-80 PROJ. NO. 79-203-727

CHKD. BY BJS DATE 6-19-80 SHEET NO. 5 OF 5

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STATION 506

SECTION 6

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.46	7901.	1128.5	42.83
2	.46	32103.	1136.2	42.67
3	.46	4297.	1125.9	46.17
4	.46	7304.	1128.1	44.00
5	.46	11997.	1130.7	43.83

STATION 607

SECTION 7

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.46	7923.	1108.5	42.83
2	.46	30470.	1115.8	42.67
3	.46	4292.	1105.9	46.17
4	.46	7308.	1108.1	44.00
5	.46	12017.	1110.7	43.83

STATION 708

SECTION 8

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.46	7946.	1099.4	42.83
2	.46	28961.	1105.2	42.83
3	.46	4283.	1096.3	46.17
4	.46	7307.	1098.9	44.00
5	.46	11993.	1101.7	43.83

STATION 809

SECTION 9

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.46	7940.	1068.1	42.83
2	.46	28225.	1074.4	42.83
3	.46	4250.	1065.5	46.17
4	.46	7301.	1067.7	44.00
5	.46	11968.	1070.2	43.83

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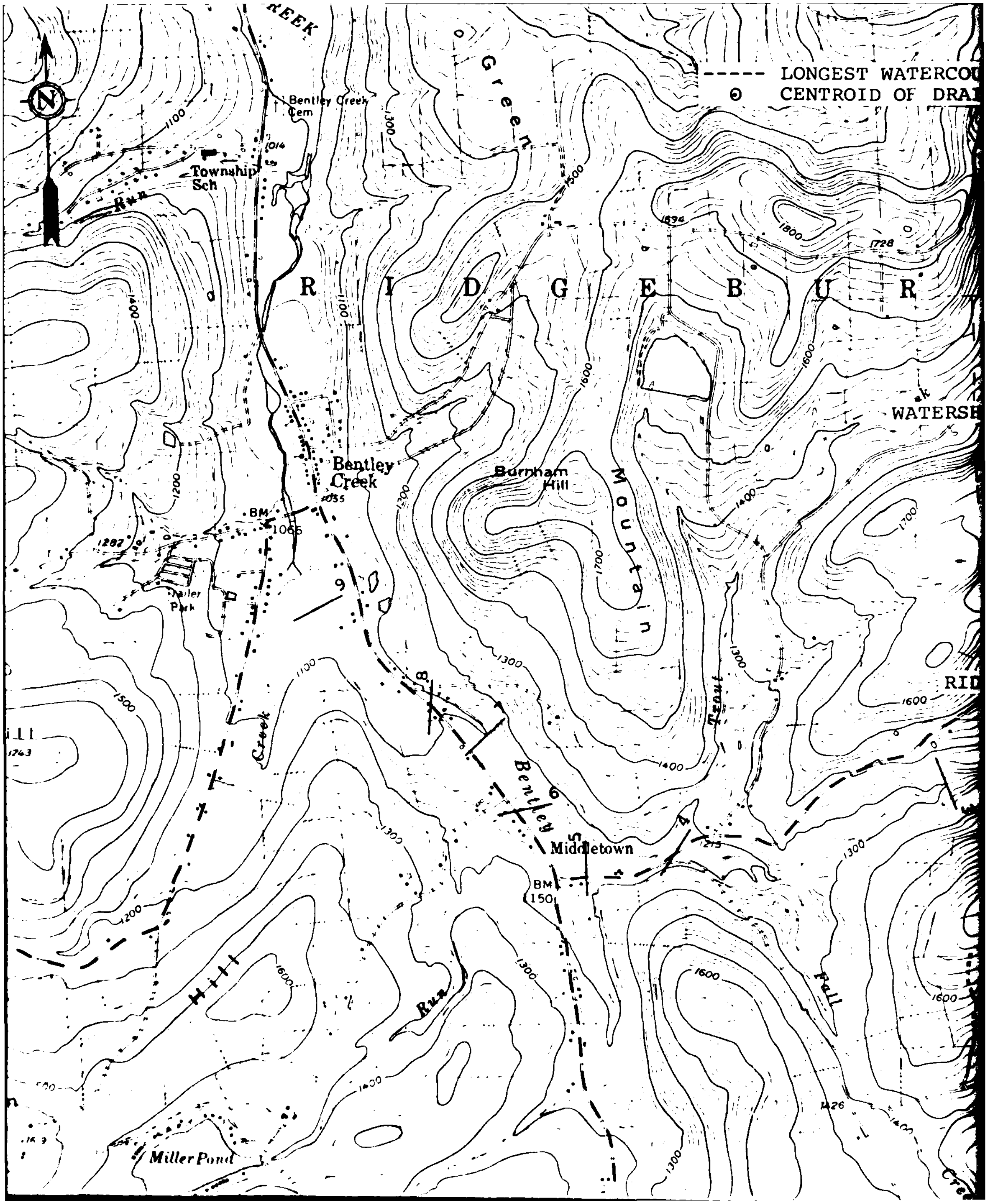
APPENDIX E

FIGURES

LIST OF FIGURES


LONGEST WATERCOU
CENTROID OF DRAI
N
Bentley Creek Cem
Township Sch
Run
R I D G E B U R
Green
Bentley Creek
Burnham Hill
Mountain
BM 1065
Trailer Park
WATERSE
Creek
Bentley
Trout
Middletown
BM 150
RID
Run
Fall
Miller Pond
1100
1014
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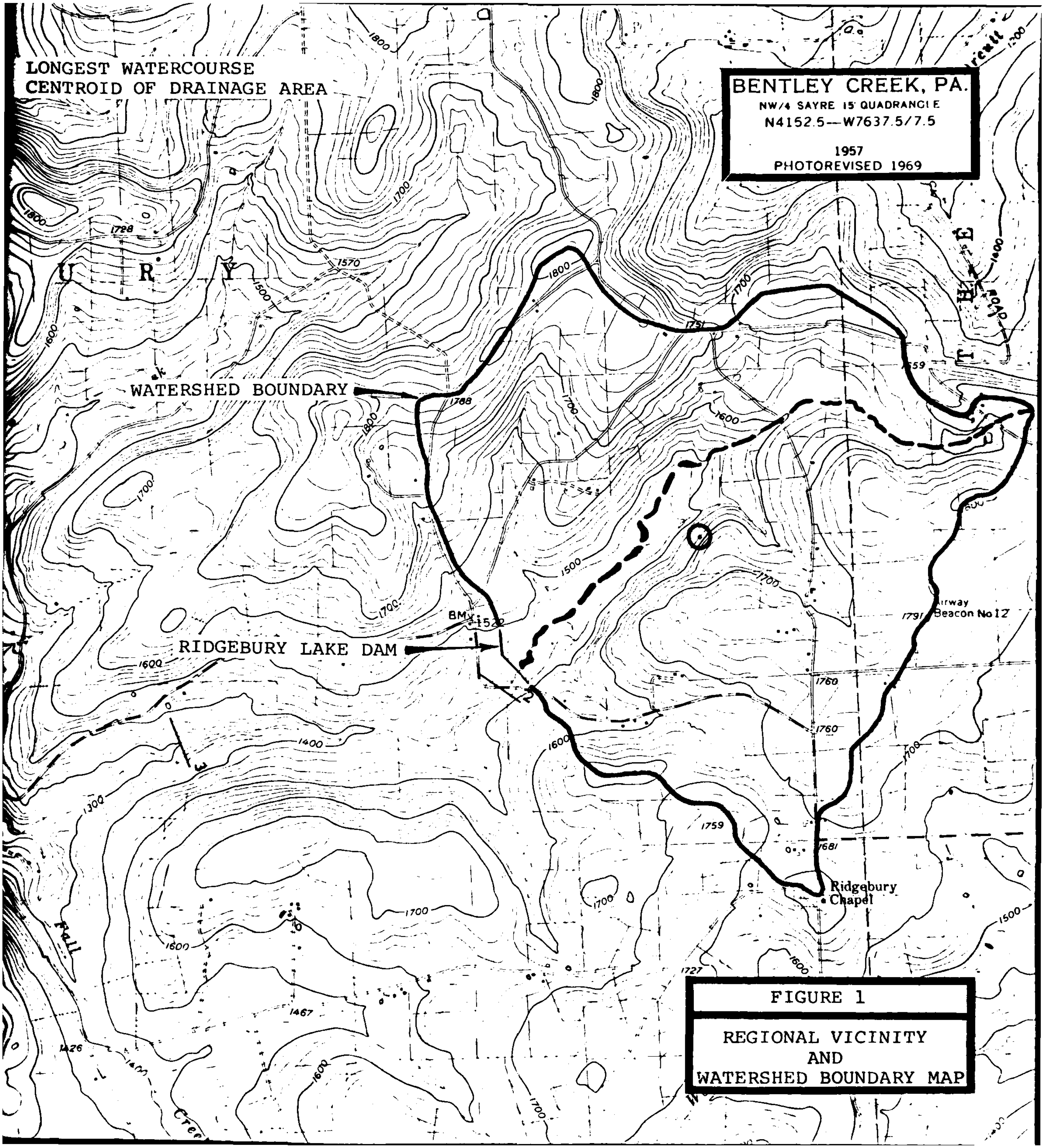
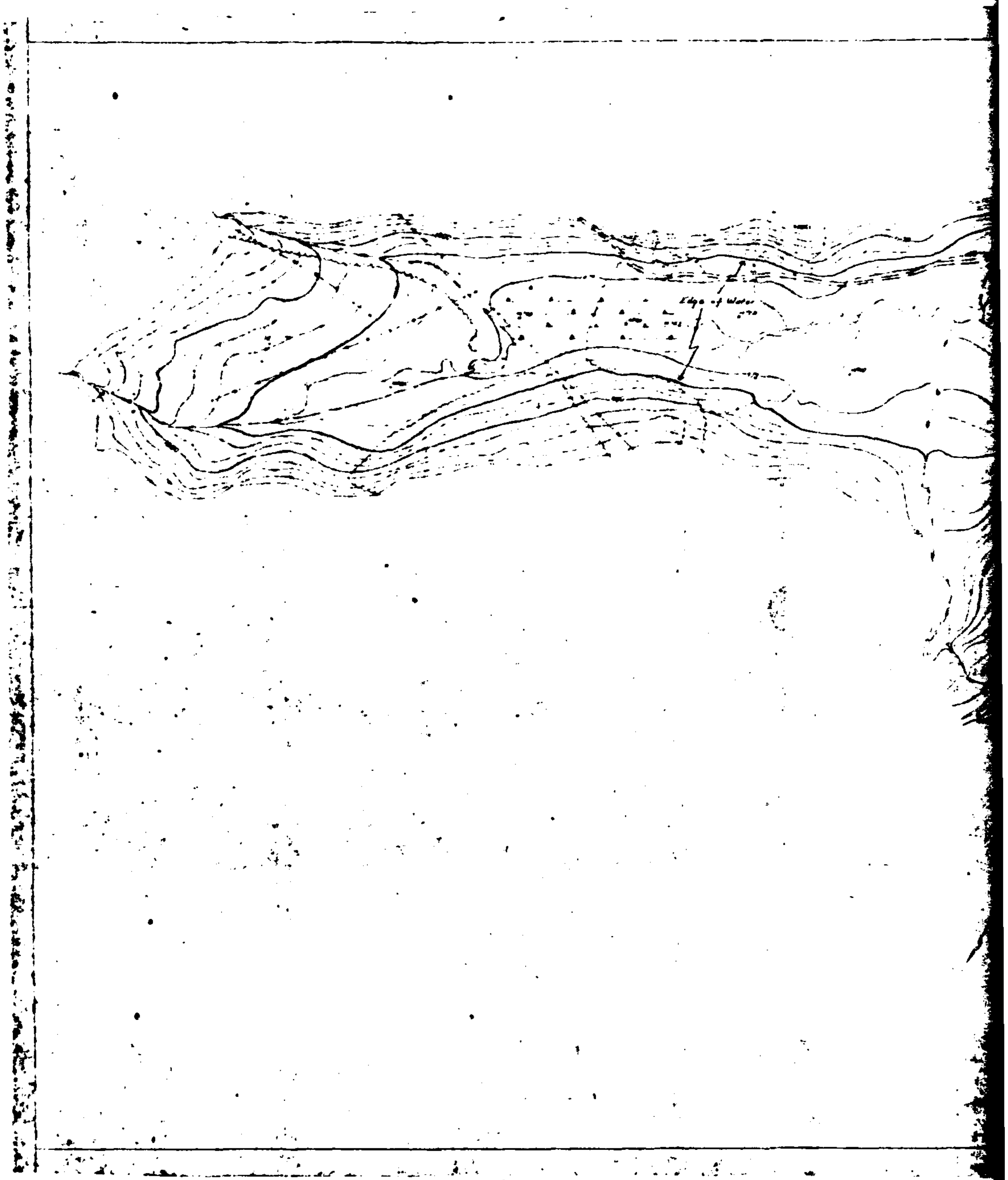


FIGURE 1

REGIONAL VICINITY
AND
WATERSHED BOUNDARY MAP


Edge of Water

2

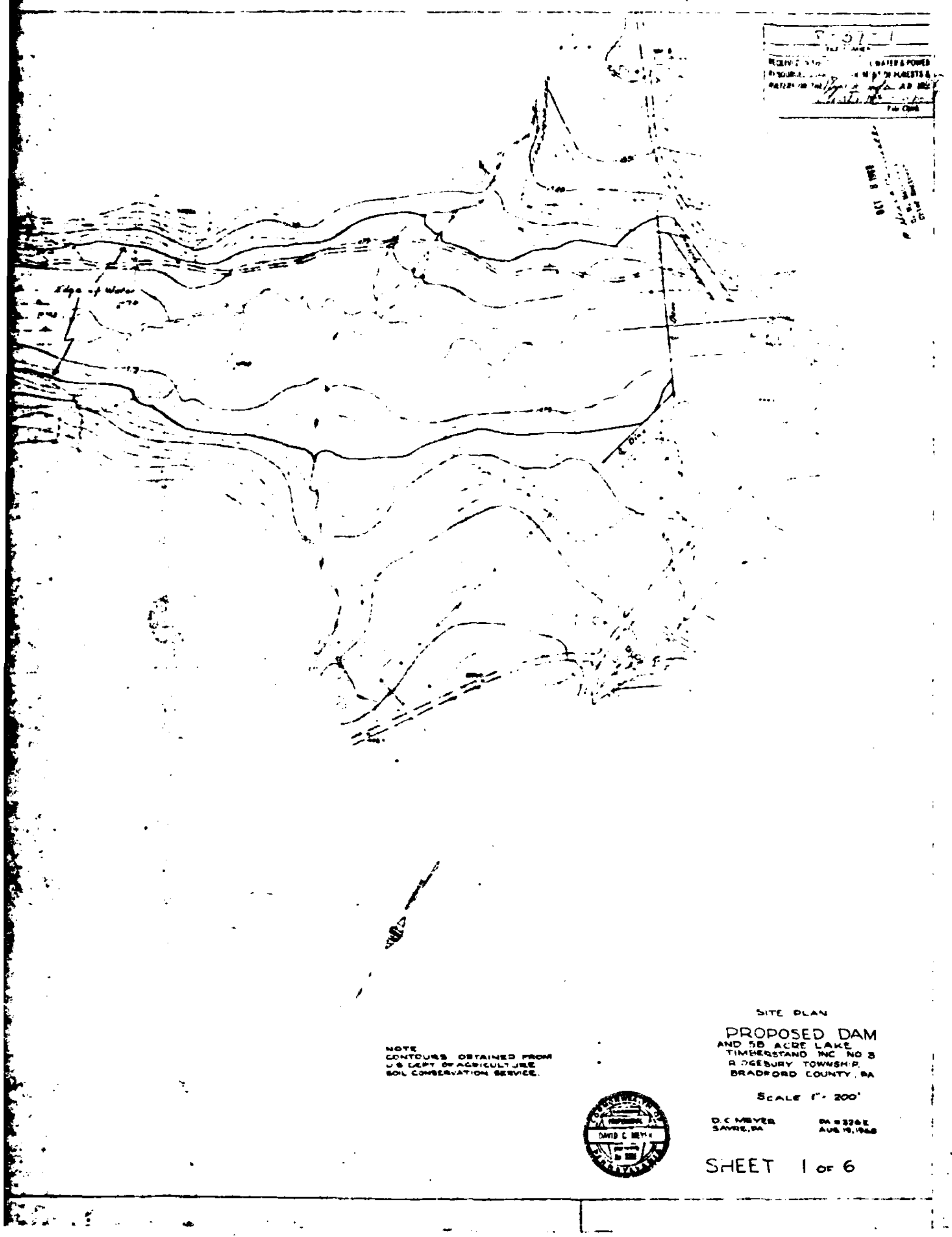


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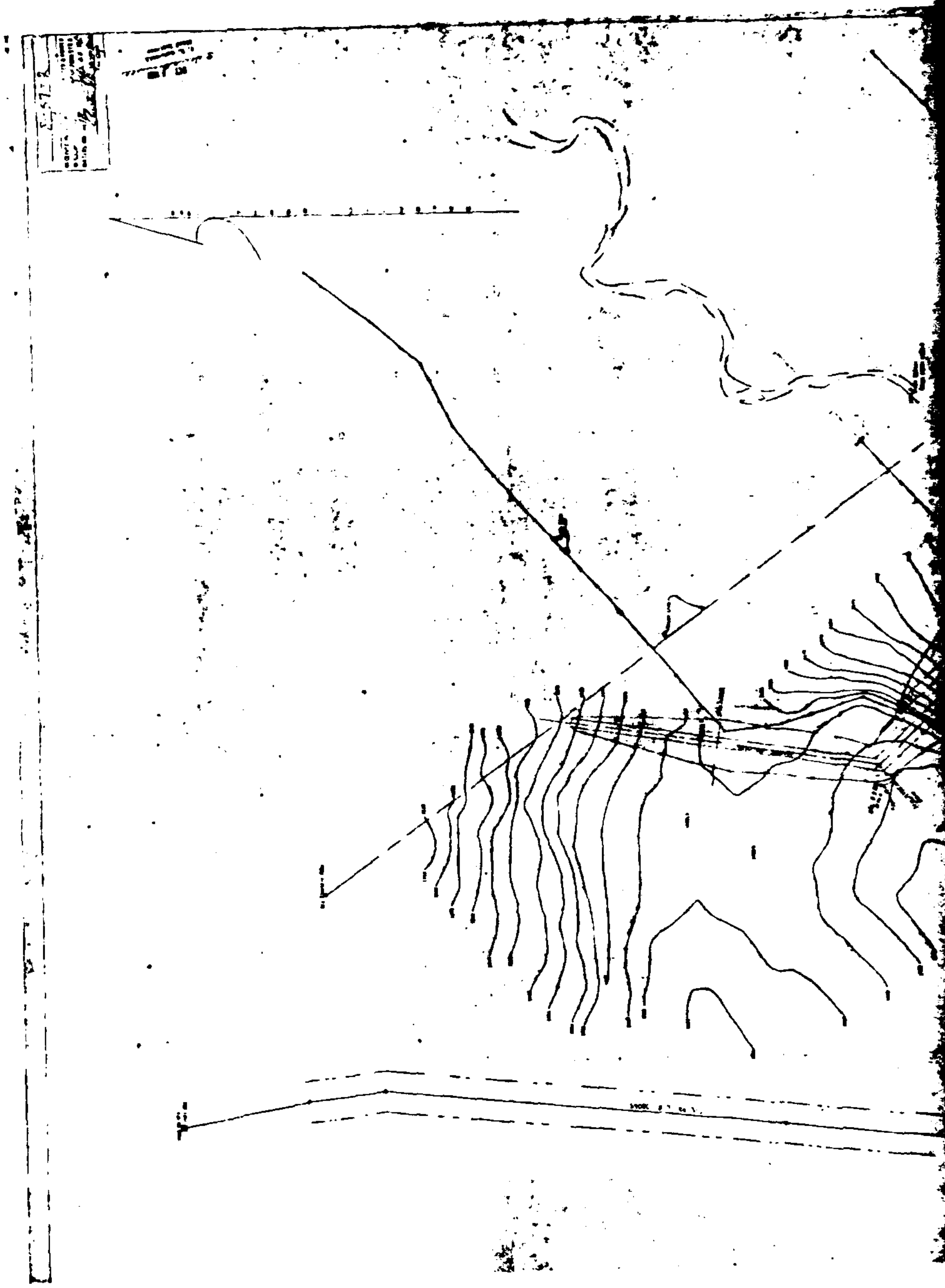
FIGURE 2



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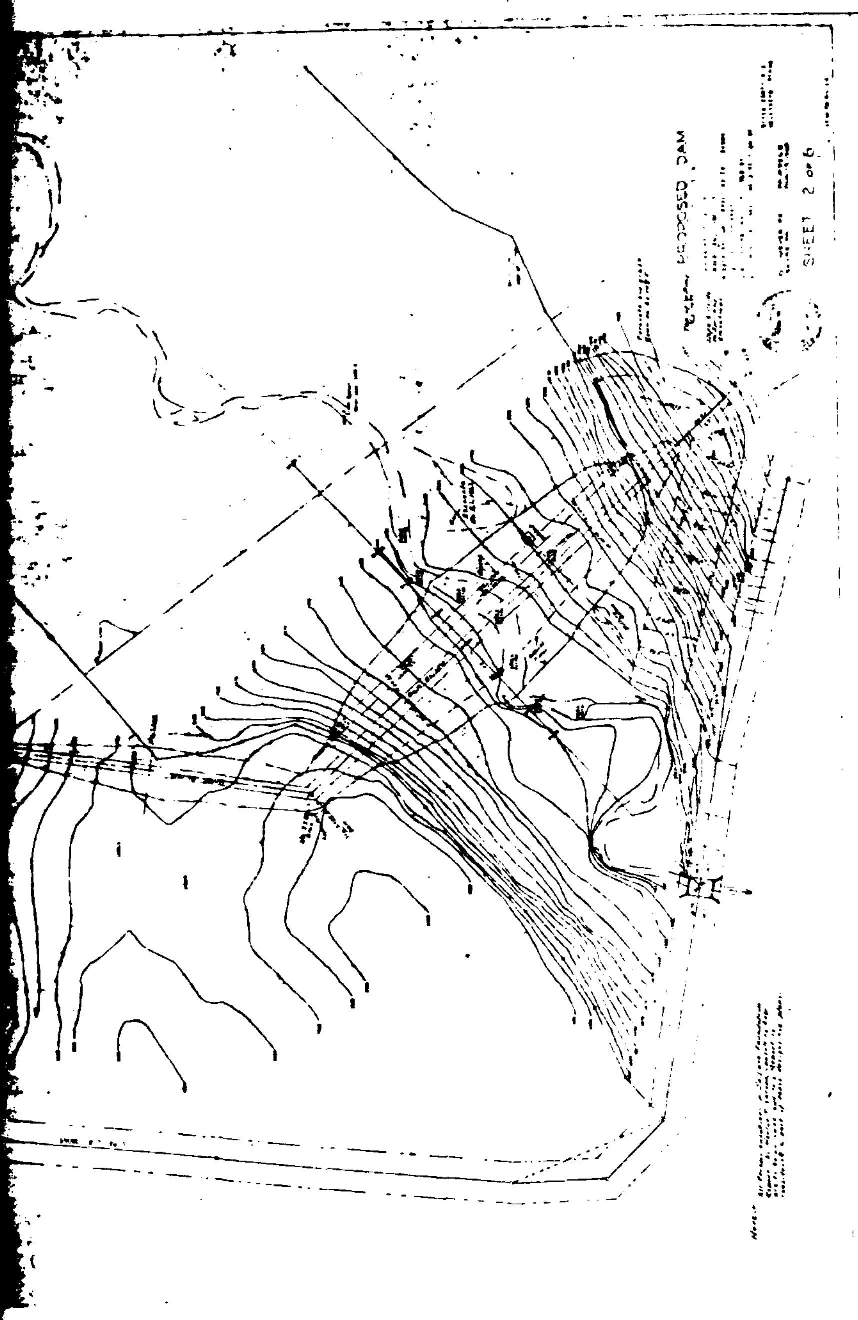

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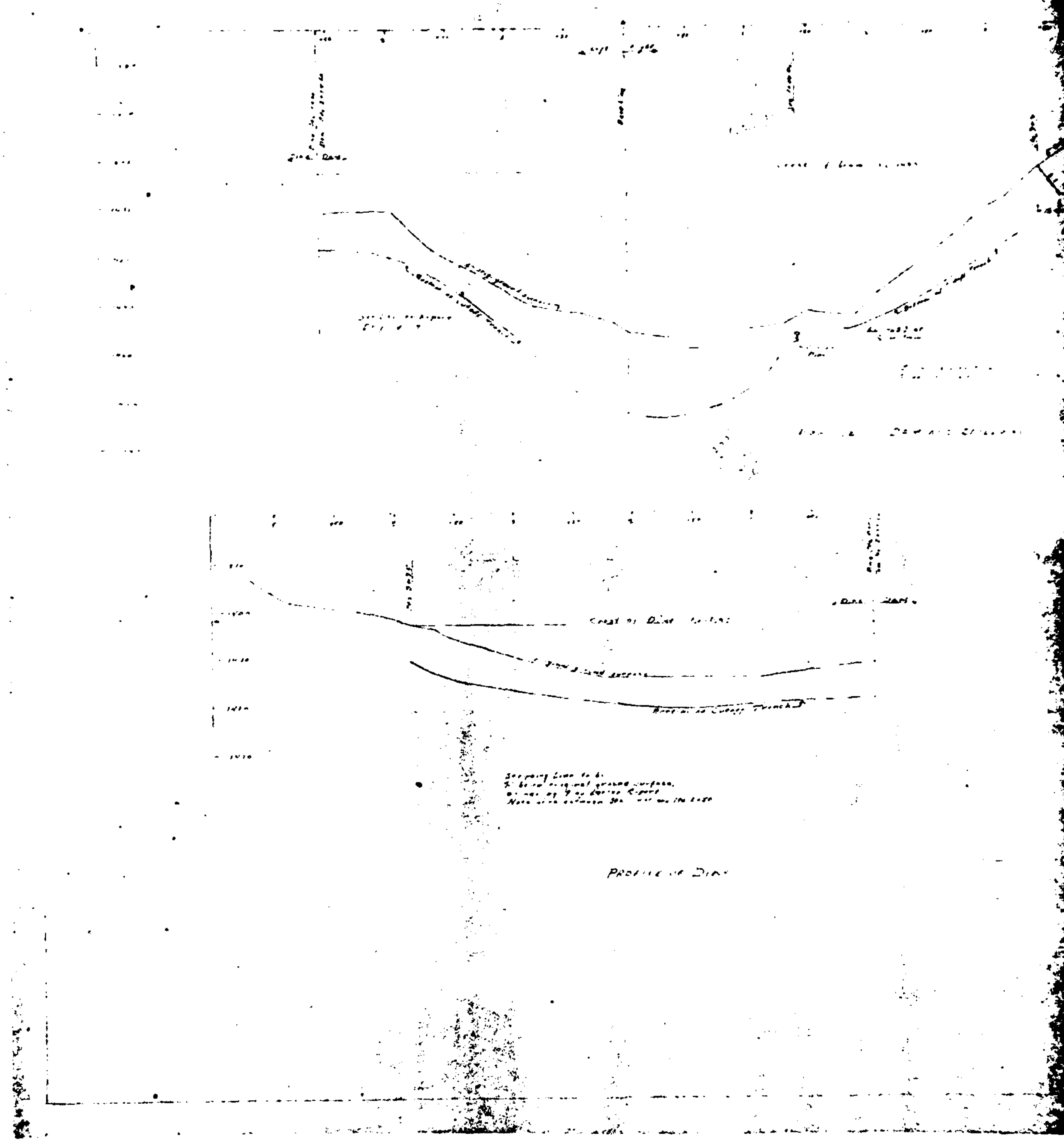
FIGURE 3


Crest of Dike

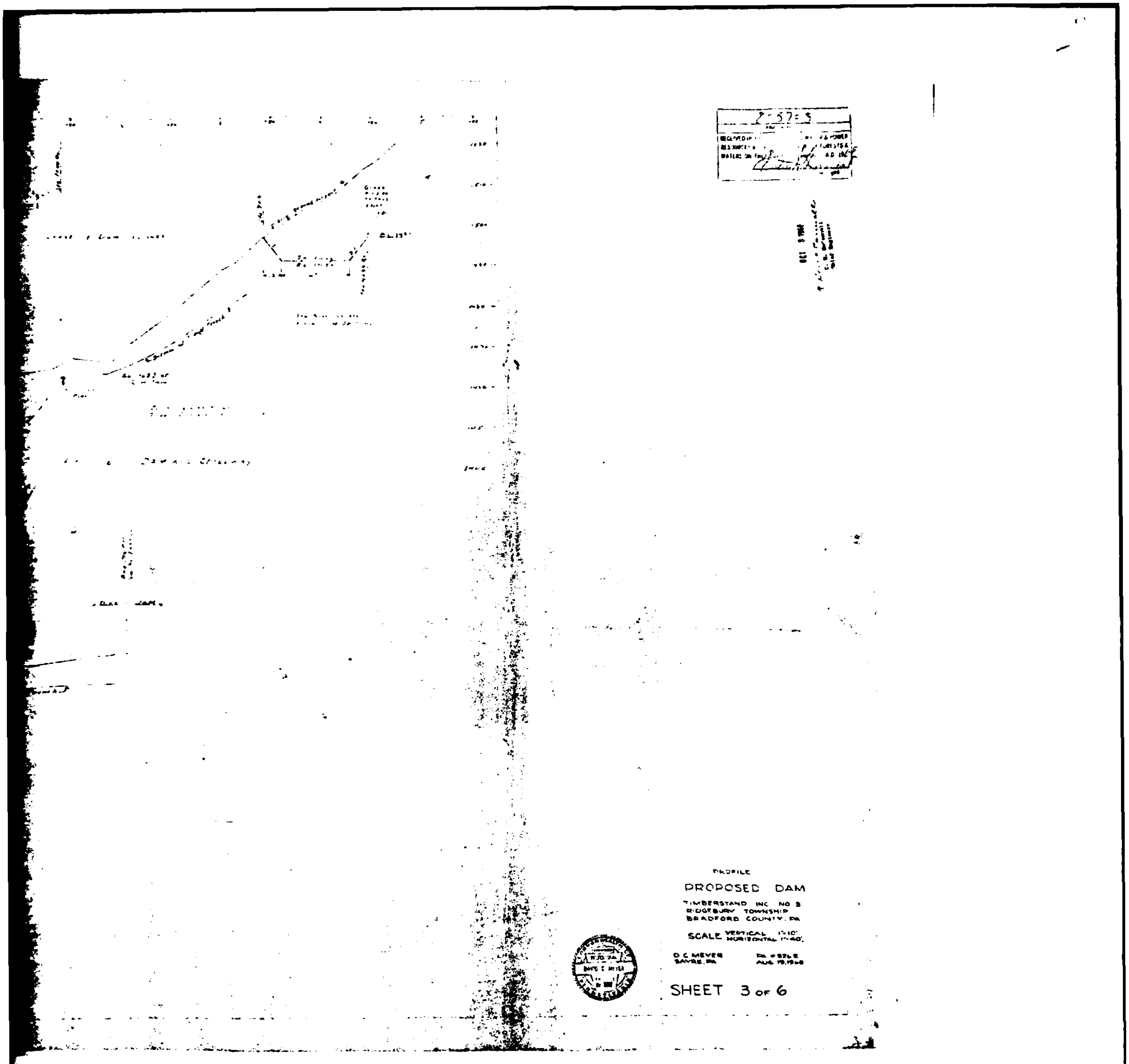


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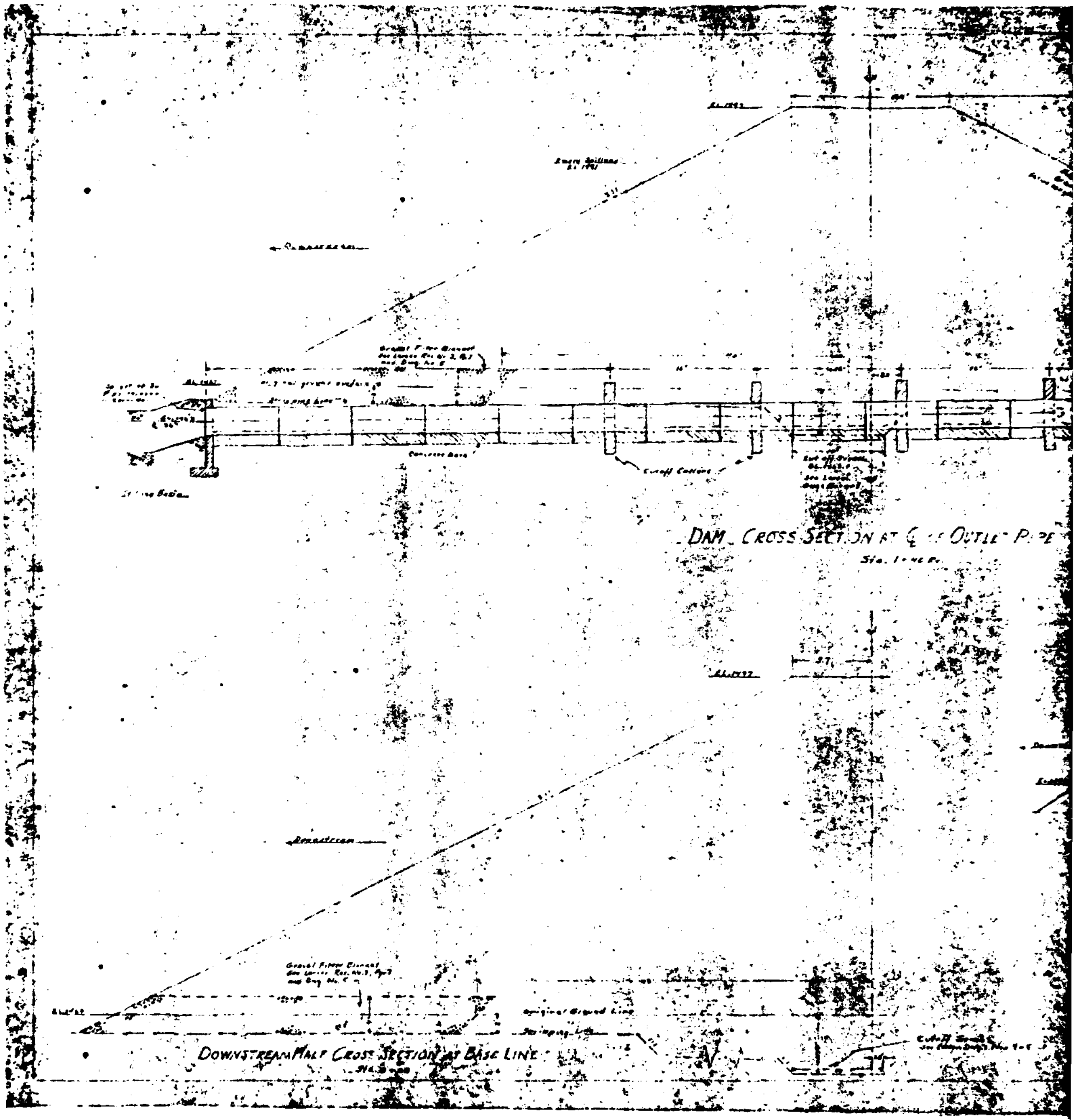
FIGURE 4



DAM CROSS SECTION AT ℄ OF OUTLET PIPE
Upstream
Concrete Base
Cutoff Collars
Original ground surface
Stripping Line
Downstream
Original Ground Line
Stripping Line
DOWNSTREAM HALF CROSS SECTION AT BASE LINE

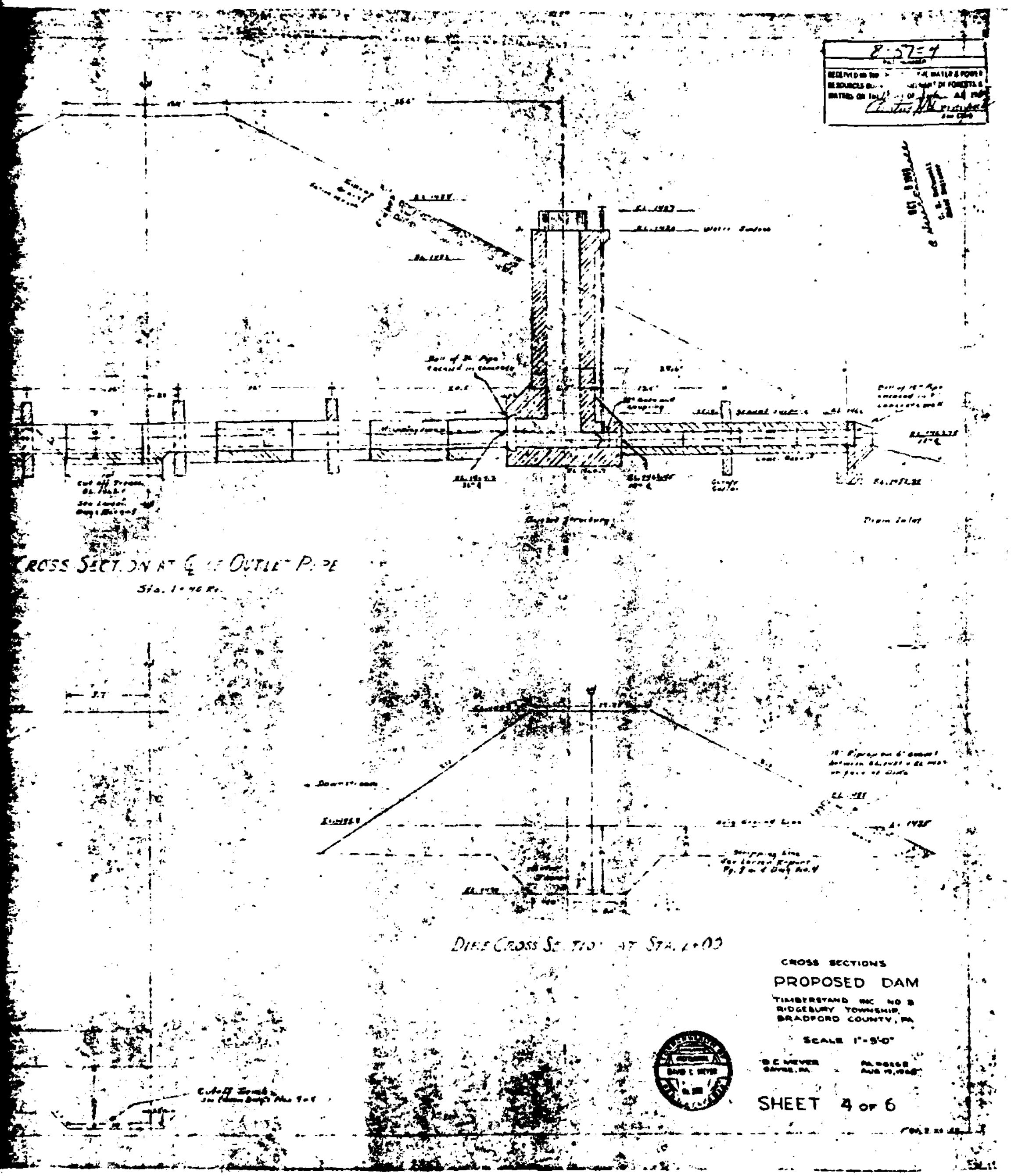


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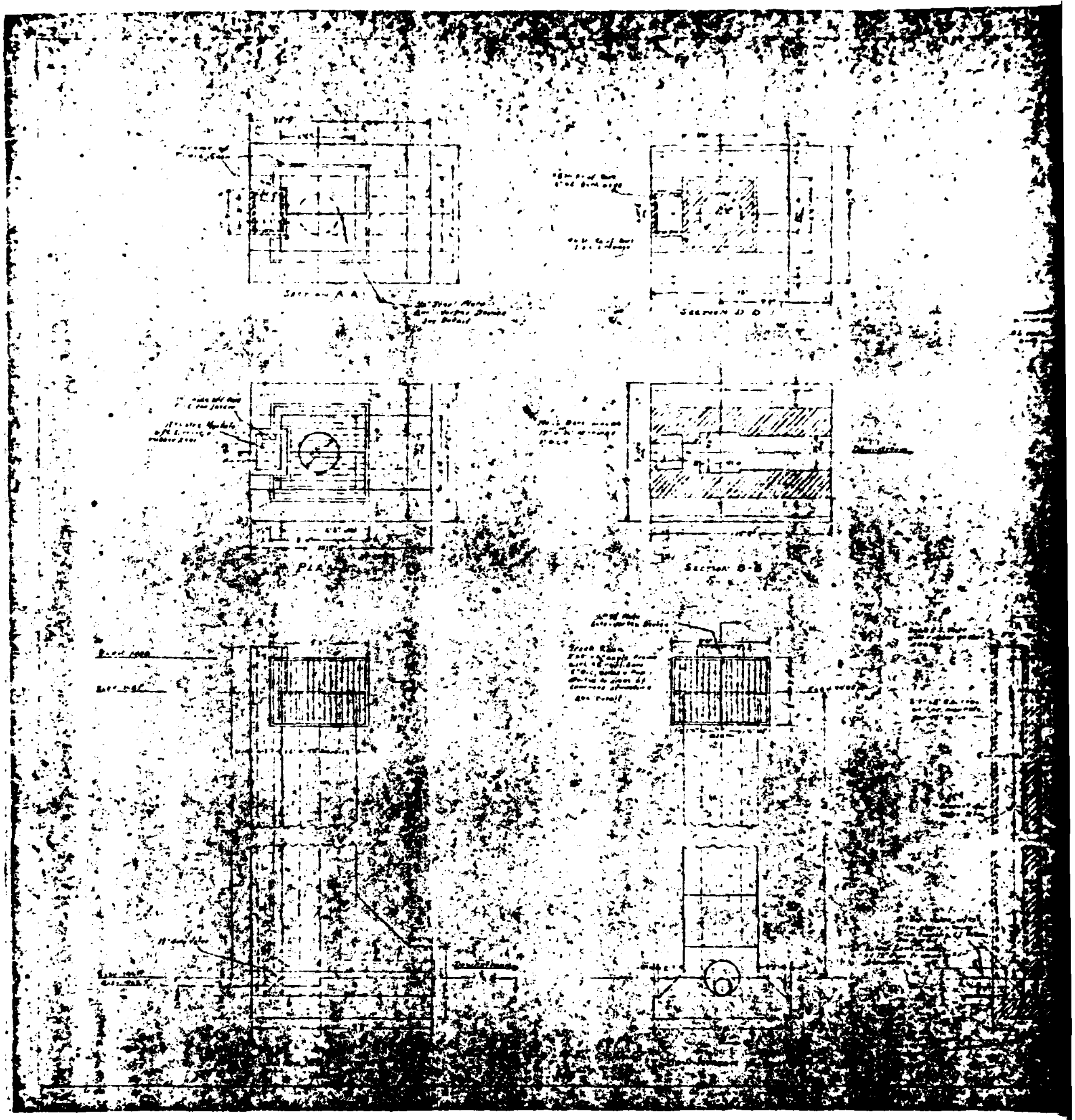
FIGURE 5


Section A-A
Section D-D
Section B-B

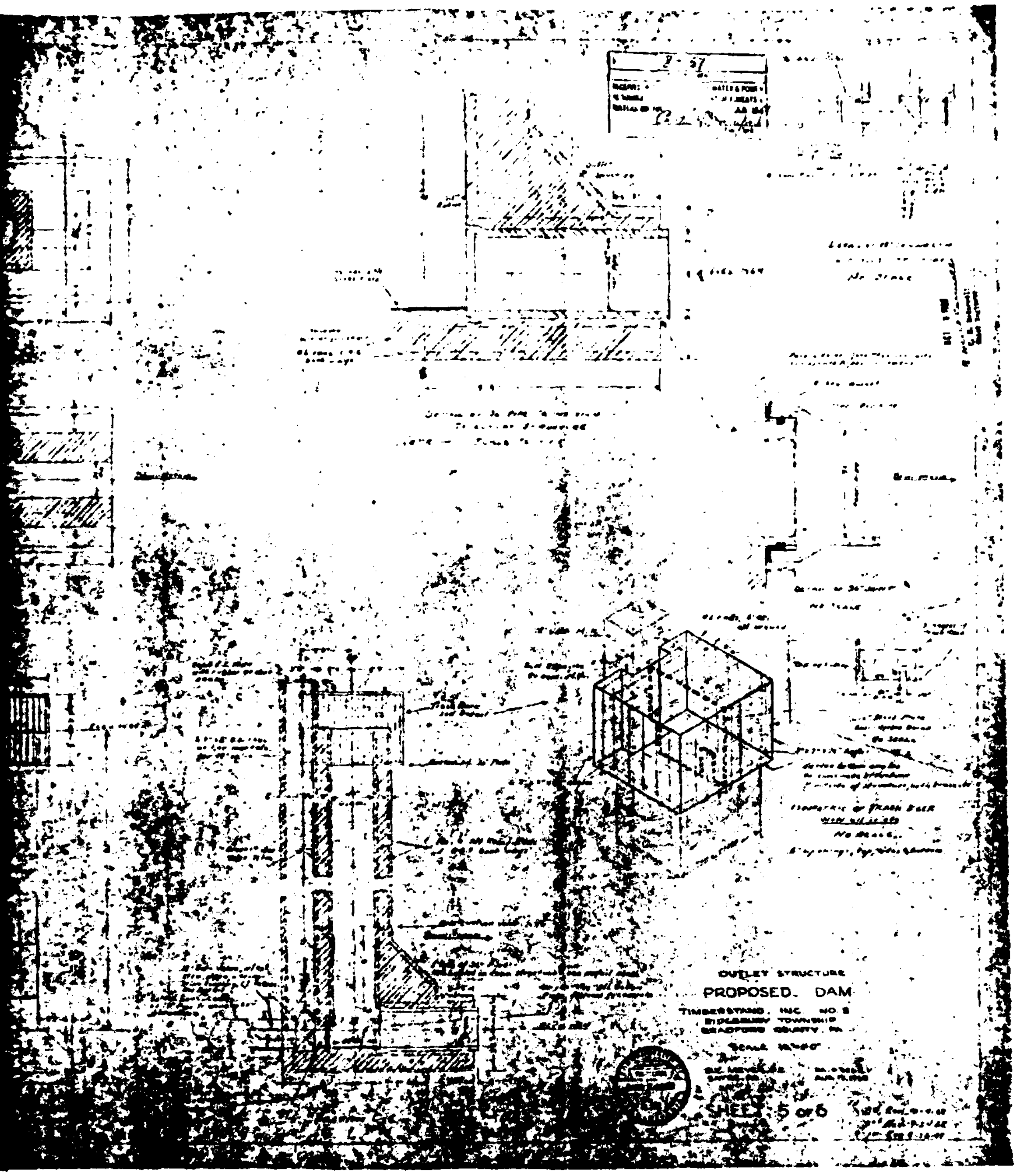


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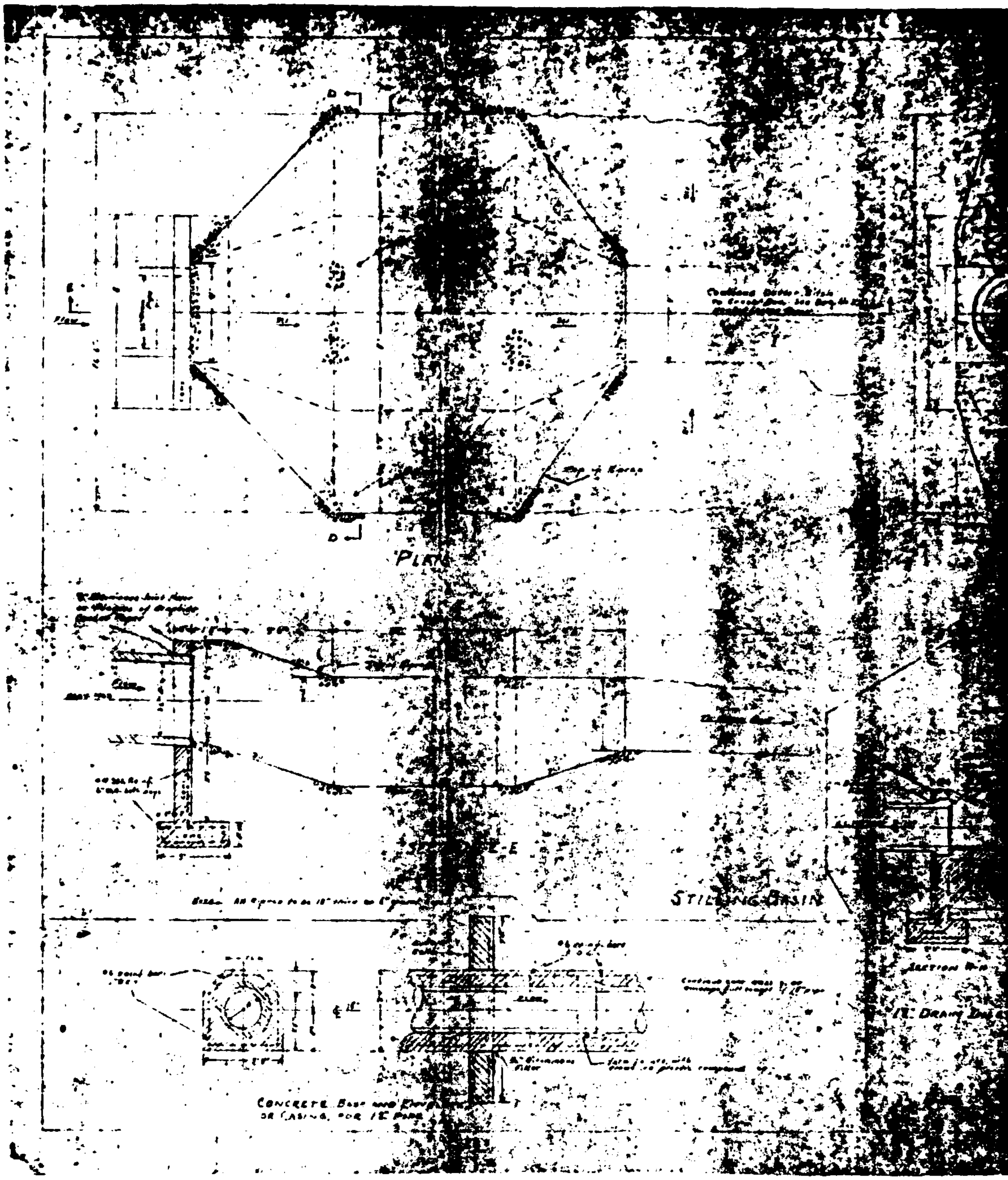
FIGURE 6



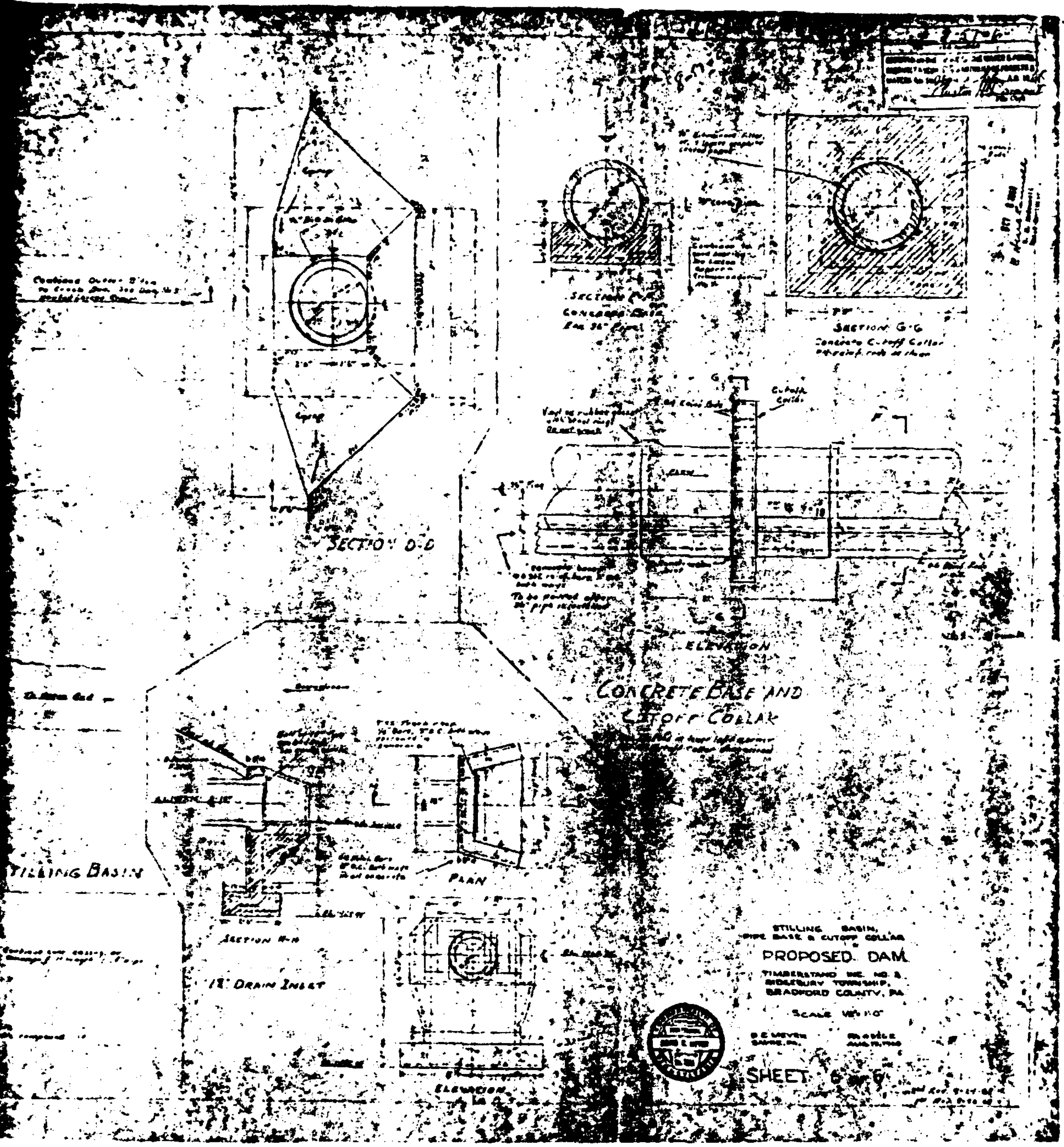


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FIGURE 7

APPENDIX F

GEOLOGY

Geology.

Ridgebury Lake Dam is located in Ridgebury Township, Bradford County, Pennsylvania, within the Low Plateaus section of the Appalachian Plateaus Physiographic Province of northeastern Pennsylvania. In this area, the Low Plateaus section is characterized by flat lying sedimentary rock strata of upper Devonian age, which is maturely disected, glaciated and of moderate relief. Overlying this strata is a variable thickness of glacial drift deposited during the Illinioan and Wisconsian Glacial Epochs. The general direction of ice movement in this area, was about S30°W.

From the "Soils and Foundation Report on Site of Proposed Timberstand Dam No. 3," information from 22 test pits and four borings indicate that "in general, the till sheet which underlies the area consists of a very dense mixture of gravel, sand and silt with an average of less than 10 percent clay. The till sheet materials classify as sandy silt to sandy clay with area of lean clay interbedded."

The sedimentary rock sequence underlying the glacial material in the area of the dam and reservoir are members of the Susquehanna Group of Upper Devonian age. These rocks are characterized by "red to brownish shales and sandstones; includes gray and greenish sandstone tongues."

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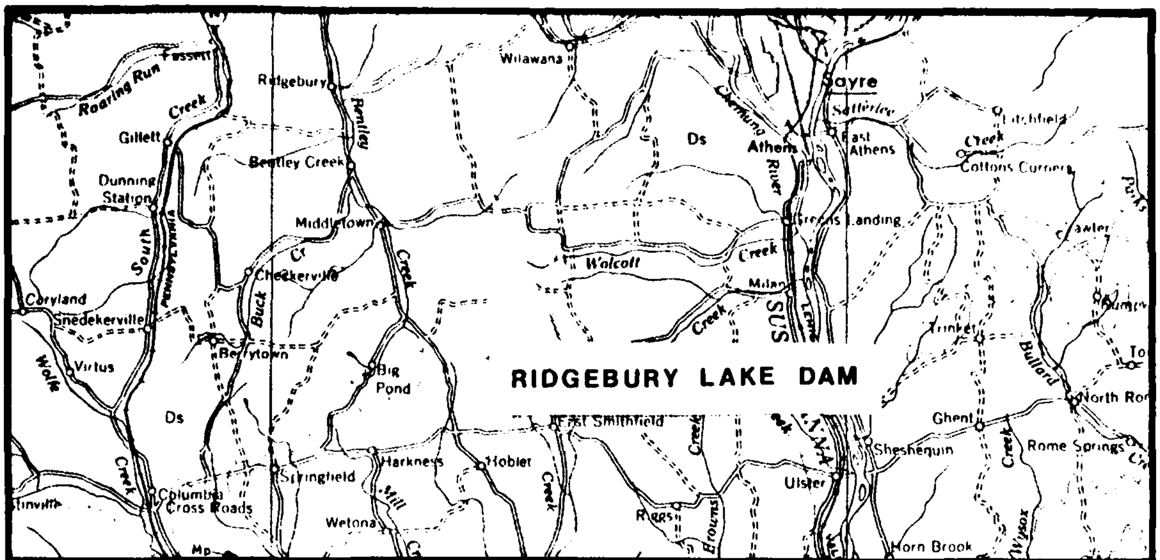

LEGEND

DEVONIAN

Oswayo Formation
Brownish and greenish gray, fine and medium grained sandstones with some shales and scattered calcareous lenses, includes red shales which become more numerous eastward. Relation to type Oswayo not proved.

Dck — **Catskill Formation**
Chiefly red to brownish shales and sandstones, includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east

Dm — **Marine beds**
Gray to olive brown shales, graywackes, and sandstones, contains "Chemung" beds and "Portage" beds including Burket, Brallier, Harrell, and Trimmers Rock; Tully Limestone at base

Ds — **Susquehanna Group**

barbed line is "Chemung-Catskill" contact of Second Pennsylvania Survey County reports; barbs on "Chemung" side of line.

Note:
The bedrock surface is covered with Pleistocene age Wisconsin and Illinoian till composed of sands, gravels and silty clays of variable thicknesses.

Scale

0 2 4 6 8 10 MILES

GEOLOGY MAP

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REFERENCE:
GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA. DEPT. OF INTERNAL AFFAIRS, DATED 1960, SCALE 1" = 4 MILES