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NATIONAL DAM INSPECTION PROGRAM. MIDDLE CREEK DAM, CLARENCE F. --ETC(U)
APR 79 DACW31-79-C-0009
UNCLASSIFIED NL

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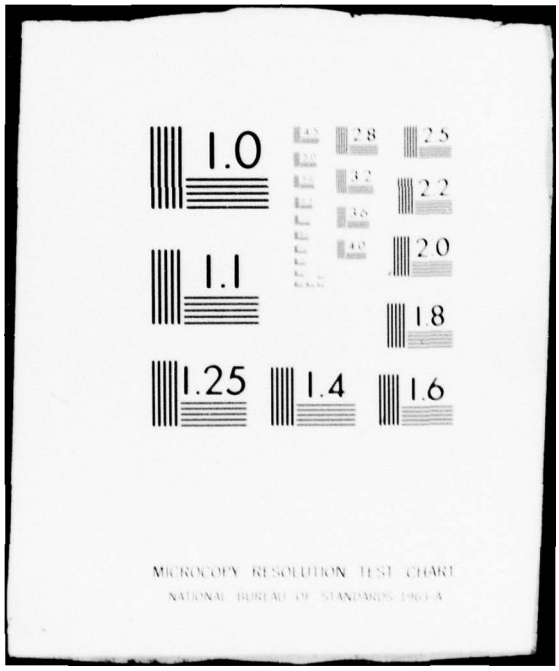
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NATIONAL BUREAU OF STANDARDS 1963-A

SUSQUEHANNA RIVER BASIN

MIDDLE CREEK, SNYDER COUNTY

B.S.1

PENNSYLVANIA

MIDDLE CREEK DAM
CLARENCE F. WALKER LAKE

NDS ID NO. PA-00918

DER ID NO. 55-45

SCS ID NO. PA 637

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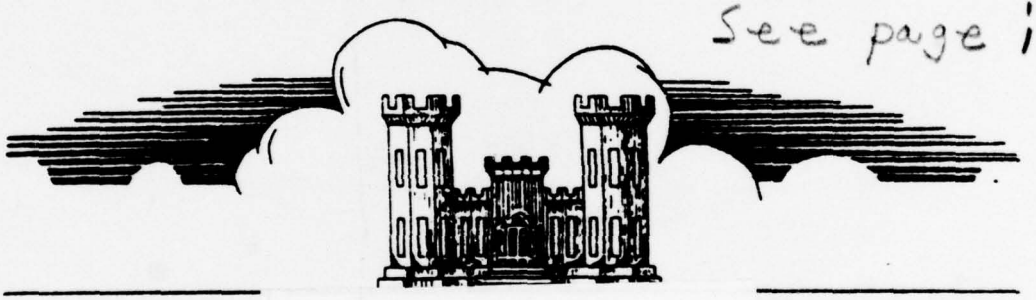
LEVEL II

PENNSYLVANIA FISH COMMISSION

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

See page ii.



Prepared By

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG, PENNSYLVANIA
15931

FOR

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

ORIGINAL CONTAINS COLOR PLATES: ALL DDC REPRODUCTIONS WILL BE IN BLACK AND WHITE.

APRIL, 1979

SUSQUEHANNA RIVER BASIN

MIDDLE CREEK, SNYDER COUNTY

PENNSYLVANIA
MIDDLE CREEK DAM
CLARENCE F. WALKER LAKE

NDS ID NO. PA-00918

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PENNSYLVANIA FISH COMMISSION

PHASE I INSPECTION REPORT

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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 topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

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

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

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

PHASE I REPORT
NATIONAL DAM INSPECTION REPORT

(6) National Dam Inspection Program. Middle Creek Dam, Clarence F. Walker Lake (NDS ID Number PA-00918, DER ID Number 55-45, SCS ID Number PA-637), Susquehanna River Basin, Middle Creek, Snyder County, Pennsylvania. Phase I Inspection Report.

NAME OF DAM: Middle Creek Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Snyder
STREAM: North Branch of Middle Creek
DATE OF INSPECTION: November 9, 1978

(11) Apr 79

ASSESSMENT

The assessment of Middle Creek Dam is based upon visual observations made at the time of inspection, review of available records and data, hydrologic and hydraulic computations, and past operational performance.

(12) 97 P'

The embankment and appurtenant structures appear to be in good condition and well maintained. However, the presence of the seepage zones and wet areas are of concern. The long term effect of these areas on the stability of the embankment is unknown.

CONT'D FROM P. 1

The existing spillways and reservoir are capable of controlling the PMF (probable maximum flood). Based upon criteria established by the Corps of Engineers, the spillway is termed adequate.

The following recommendations should be instituted immediately:

1. The wet areas and seeps should be surveyed for location and elevation at regular intervals. Weirs should be installed to measure the quantity of flow. Water samples of the seepage should be tested for turbidity at regular intervals. If flow increases, water is turbid, or size and location changes, a detailed study should be made at once and remedial measures taken.

(15) DACW 31-79-C-0009

The services of a professional engineer knowledgeable in dam design should be retained to evaluate the effect of the seepage. During the study the use of piezometers may be warranted to verify the phreatic surface.

2. A warning system should be developed to warn downstream residents of large spillway discharges or failure of the dam and during periods of heavy rainfall or high runoff.

3. Access to the dam should be improved so the dam is accessible during periods of flooding.

 441059 slt

SUBMITTED BY: L. ROBERT KIMBALL AND ASSOCIATES
CONSULTING ENGINEERS AND ARCHITECTS

R. Jeffrey Kimball

R. Jeffrey Kimball, P.E.

4/18/79
Date

K. Chuang

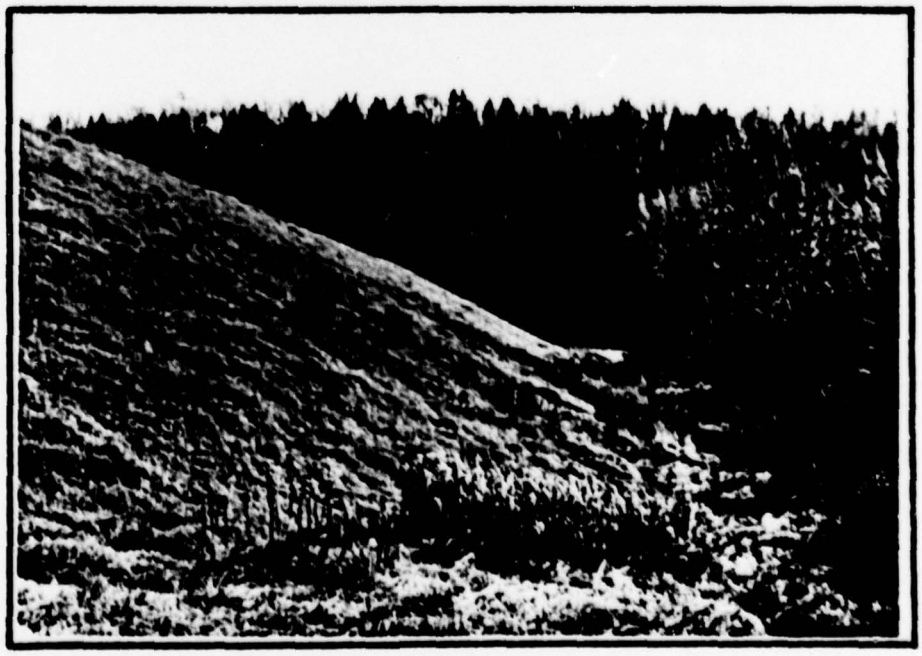
Kuang-hwei Chuang, P.E.

APPROVED BY:

17 May 79
Date

C. R. WITHERS
Colonel, Corps of Engineers
District Engineer

Overview of upstream slope.



Overview of downstream slope.

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APPENDICES

PHASE I
NATIONAL DAM INSPECTION PROGRAM
MIDDLE CREEK DAM
NDI I.D. NO. PA 918
DER I.D. NO. 55-45

SECTION 1
PROJECT INFORMATION

1.1 General.

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

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

1.2 Description of Project.

a. Dam and Appurtenances. Middle Creek Dam (Clarence F. Walker Lake) is a zoned earthfill dam. The embankment is 53 feet high and 1360 feet long. The axis of the dam has a 137° bend in the upstream direction 860 feet from the left abutment. The upstream slope is 3H:1V and has two benches. Riprap is present only on the middle portion of the upstream slope (See Figure 4, Appendix E). The downstream slope is 2H:1V. The cutoff trench averages 25 feet wide and is carried to rock. On both abutments, the trench narrows and is not carried to rock. In the center portion of the cutoff trench, there is a perforated drain pipe (See Figures 7 and 8, Appendix E). The embankment contains three zones of material: clay, gravely silt or clay and siltstone or shale. The emergency spillway is located on the right (north) abutment. The spillway is 170 feet wide and is open cut in shale and weathered shale. The approach channel is 400 feet long and the discharge channel is 330 feet long. The left side slope is 2H:1V and has a separator dike so that discharges from the spillway are deflected away from the toe of the dam embankment. The separator dike also serves as an access road to the top of the dam embankment. The principal spillway consists of 48 inch concrete pipe with a reinforced concrete riser inlet. Extending upstream of the riser is a 36 inch concrete pipe with a reinforced concrete reservoir drain inlet at the upstream toe of the embankment. At the downstream end of the 48 inch diameter pipe is a concrete impact stilling basin. (CONT'D ON P. 1-2)

b. Location. The dam is located on the North Branch of Middle Creek, approximately 1/2 mile southeast of Troxelville, Snyder County, Pennsylvania. Middle Creek Dam can be located on the Beavertown, Pennsylvania, U.S.G.S. 7.5 minute quadrangle.

c. Size Classification. Middle Creek Dam is an intermediate size structure (53 feet high, 11,600 acre-feet).

d. Hazard Classification. Middle Creek Dam is a high hazard dam. Downstream conditions indicate that loss of more than a few lives is probable should the structure fail.

e. Ownership. Middle Creek Dam is owned by the Commonwealth of Pennsylvania. Correspondence should be addressed to:

Bureau of Fisheries and Engineering
Pennsylvania Fish Commission
Commonwealth of Pennsylvania
Robinson Lane
Bellfonte, Pennsylvania 16823

f. Purpose of Dam. Middle Creek Dam is used for recreation and flood control.

g. Design and Construction History. The dam was designed and constructed by the United States Department of Agriculture, Soil Conservation Service. Construction was initiated in 1969 and completed in 1970 by Trindle Construction, Inc. of Carlisle, Pennsylvania.

h. Normal Operating Procedure. Middle Creek Dam is designed to control flow automatically. The principal spillway is a rectangular shaped reinforced concrete vertical riser, 12 x 4 feet, with a crest elevation of 634.90. During normal flows, a conservation pool elevation of approximately 635.4 will be automatically maintained. It is not possible to manually control flows through the principal spillway; therefore, a resident dam tender is unnecessary.

1.3 Pertinent Data.

a. Drainage Area. 17.6 square miles

b. Discharge at Dam Site (cfs).

Maximum known flood at dam site	June 1972, level unknown
Warm water outlet at pool elevation	Variable
Drain line (36") low pool outlet at pool elevation	Unknown
Gated spillway capacity	N/A
Principal spillway capacity at top of dam elevation	406
Emergency spillway capacity at top of dam elevation	28,574
Total spillway capacity at top of dam elevation	28,980

c. Elevation (U.S.G.S. Datum) (Feet).

Top of dam - Field Survey	657.6
Design top of dam	657.1
Maximum pool - design surcharge	656.0

Full flood control pool	657.1
Recreational pool	Approximately 635.4
Principal spillway crest	634.9
Emergency spillway crest	643.6
Upstream portal-36" drain line	607.5
Downstream portal-48" principal spillway line	602.5
Streambed at centerline of dam	602.5
Maximum tailwater	None

d. Reservoir (feet).

Length of maximum pool	17,000
Length of normal pool	13,000
Length of flood control pool	17,000

e. Storage (acre-feet).

Normal pool	2753
Flood control pool	11,600
Design surcharge	10,000
Top of dam	11,600

f. Reservoir Surface (acres).

Top of dam	615
Maximum pool	615
Flood control pool	615
Normal pool	239
Emergency spillway crest	370

g. Dam.

Type	Earthfill
Length	1360 feet
Height	53 feet
Top width	18 feet
Side slopes	Upstream 3H:1V Downstream 2H:1V
Zoning	Yes
Impervious core	None
Cutoff	Yes, core trench
Grout curtain	None

h. Reservoir Drain.

Type	36" concrete pipe
Length	264 feet
Closure	Sluice gate
Access	Only when reservoir is drained
Regulating facilities	Screw stem on upstream slope

i. Emergency spillway.

Type	Open channel
Length	170 feet
Crest elevation	643.6
Gates	None
Upstream channel	400' open cut channel
Downstream channel	330' open cut channel

SECTION 2
ENGINEERING DATA

2.1 Design. Review of information in the files of the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER); the Pennsylvania Fish Commission; and the U.S. Department of Agriculture, Soil Conservation Service (SCS) revealed that considerable engineering data are available for review. The majority of the design data were obtained from the SCS. The information reviewed for this study included hydraulics and hydrology, filter design, seepage analysis, geologic reports, and summary of stability analyses.

2.2 Construction. The SCS files contain detailed data on the construction of the dam.

2.3 Operation. No formal operating records are maintained.

2.4 Evaluation.

a. Availability. Engineering data were provided by PennDER, Bureau of Dam Safety, Obstructions and Storm Water Management; the Pennsylvania Fish Commission; and the SCS. Three representatives of the Pennsylvania Fish Commission accompanied the inspection team.

b. Adequacy. The type and amount of design data and other engineering information is substantial. The information available is sufficient to complete a Phase I Report.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The onsite inspection of Middle Creek Dam was conducted by personnel of L. Robert Kimball and Associates accompanied by Fish Commission staff on November 9, 1978. The inspection consisted of:

1. Visual inspection of the retaining structure, abutments and toe.
2. Examination of the spillway facilities, exposed portions of any outlet works, and other appurtenant works.
3. Observations affecting the runoff potential of the drainage basin.
4. Evaluation of the downstream area hazard potential.

b. Dam. The dam appears to be in good condition. The dam appears to conform closely to the construction drawings. From a brief on site survey it was determined that no low spots below the design top of dam were present. Both the upstream and downstream slopes appeared to be in good condition. The upstream slope had riprap to approximately elevation 639.5. Above the riprap the slope was grassed. The downstream slope was entirely grassed. Several seepage zones were noted on the downstream slope. One zone is located approximately 30 feet left of the impact basin. This area is approximately 7 feet wide at the top (elevation 617.7) and 10 feet wide at the toe. The second area is 122 feet right of the impact basin and 14 feet wide at the top (elevation 617.7) and 33 feet wide at the toe. Minimal flow was noted at each area. See page A-12 for location.

Beyond the toe of embankment near the left abutment there are several wet areas and seepage area. Water was bubbling from the ground in one area. No soil particles were noted in the bubbling water. At a location where the seepage is confined in a channel it was determined that 28 gpm was discharging from the seepage zones.

The perforated drain pipe in the cutoff trench discharges through the side walls of the impact basin. The left drain was producing approximately 10 gpm while the right one was producing less than 1 gpm.

c. Appurtenant Structures. The reservoir level at the time of inspection was approximately 635.4. About 6 inches of water was discharging over the principal spillway. The inlet structure appeared to be in very good condition. During the inspection the sluice gate on the 36 inch drain was opened for several minutes. The condition of the 36 inch and 48 inch conduits was unobserved. The impact basin was in good condition.

The emergency spillway was in good condition. The bottom and side slopes were grassed. The concrete sill was in good condition.

d. Reservoir Area. The watershed is predominantly woodland and farmland. The reservoir slopes are not considered to be susceptible to massive landslides which would affect storage volume of the reservoir or overtopping of the dam by displacing water.

e. Downstream Channel. North Branch has a moderately wide channel before entering Middle Creek. The floodplain supports farming with a considerable amount of woodland present. The first downstream residence is about 700 feet beyond the toe of the embankment. This residence would be affected by large discharges from the emergency spillway. Approximately 3000 feet downstream are a group of eight residences which are along the stream channel.

3.2 Evaluation. The visual inspection did not reveal any serious and immediate concerns. In general, the embankment and appurtenant structures appear to be in very good condition and well maintained. The seepage and wet areas should be further investigated to determine their long term effect.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures. The reservoir is maintained at a minimum water level of 634.9 (principal spillway crest). Excess inflow is discharged through the emergency spillway automatically. The drain line is opened twice a year. The spillway channel is mowed twice each year. No other operational procedures are conducted.

4.2 Maintenance of the Dam. No planned maintenance schedule is utilized. All maintenance is performed on an as-needed basis. Minor work such as mowing grass is performed by Fish Commission staff. Major work is contracted. Maintenance of the dam is considered good.

4.3 Maintenance of Operating Facilities. Maintenance of the operating facilities are performed by Fish Commission staff. The drain line and mowing of the spillway channel grass is performed twice a year. The Commonwealth of Pennsylvania has an Operation and Maintenance Manual for Middle Creek Dam.

4.4 Warning System in Effect. There is no formal warning system in effect to warn downstream residents of high discharges or failure of the dam. The Fish Commission does have an emergency plan for the dam.

4.5 Evaluation. The operational procedures for the dam and appurtenant structures is considered good. There is no warning system in effect for the dam. The dam is essentially inaccessible by automobile during flooding.

SECTION 5
HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. Hydrology and hydraulic information contained in the SCS files is considerable. The principal spillway, emergency spillway, and freeboard hydrographs were routed using the SCS method (25 inches of rain in a 6 hour duration). A peak discharge of 25,000 cfs was calculated at a maximum water level of 656 (top of dam is 657.6).

b. Experience Data. No rainfall, runoff or reservoir level data were available. The spillway has reportedly functioned adequately in the past. There was some erosion in the spillway channel from the June, 1972 discharge.

c. Visual Observations. Both the principal and emergency spillways are in good condition and well maintained.

d. Overtopping Potential. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

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

5.2 Evaluation Assumptions. To enable us to complete the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. The initial water level before flood is elevation 634.9 (principal spillway crest).

2. Flow through both the principal spillway and emergency spillway is maintained.

5.3 Summary of Overtopping Analysis. Complete summary sheets from the computer output are presented in Appendix D.

Peak Inflow	20,215 cfs
Spillway Capacity	94,962 cfs

a. Spillway Adequacy Rating. The Spillway Design Flood (SDF) for this dam is the PMF. The SDF is based upon the hazard and size classification. Based on the following definition provided by the Corps of Engineers the spillway for this dam is rated as adequate as a result of our hydrologic analysis.

> Adequate - For intermediate size dams the spillway and reservoir can safely pass the PMF.

Middle Creek Dam's spillway and reservoir are capable of controlling the PMF (4.85' of freeboard remaining).

Note: Future development within the watershed, at the dam, or downstream may change the characteristics and assumptions made for this study and different results are likely. Future development downstream may also greatly increase the potential for loss of life due to failure of the structure.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual inspection did not reveal any signs of immediate instability. However, the wet areas and seeps if untreated may become more serious with time. The long term effect of these features is uncertain. The dam appears to conform to the construction drawings.

b. Design and Construction Data. The embankment stability was calculated by the SCS with a circular arc and sliding block method. The analyses reportedly revealed sufficient safety factors. No safety factors were available for review.

c. Operating Records. There are no operating records of the dam.

d. Past-Construction Changes. There have been no post-construction changes to the dam or appurtenant structures.

e. Seismic Stability. The dam is located in seismic zone 1. No seismic stability analysis has been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The dam appears to be in good condition. The visual observations, review of available information, hydrologic calculations, and past operational performance indicate that Middle Creek Dam's spillway is adequate. The spillway is capable of handling the PMF without overtopping. The long term effect of the seepage zones and wet areas on the stability of the structure is uncertain.

b. Adequacy of Information. Sufficient information is available to complete a Phase I Report.

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

d. Necessity for Further Investigations. In order to accomplish some of the recommendations/remedial measures outlined below, further investigations will be required.

7.2 Recommendations/Remedial Measures.

1. The wet areas and seeps should be surveyed for location and elevation at regular intervals. Weirs should be installed to measure the quantity of flow. Water samples of the seepage should be tested for turbidity at regular intervals. If flow increases, water is turbid, or size and location changes a detailed study should be made at once and remedial measures taken.

The services of a professional engineer knowledgeable in dam design should be retained to evaluate the effect of the seepage. During the study the use of piezometers may be warranted to verify the phreatic surface.

2. A warning system should be developed to warn downstream residents of large spillway discharges or failure of the dam and during periods of heavy rainfall or high runoff.

3. Access to the dam should be improved so the dam is accessible during periods of flooding.

APPENDIX A

CHECKLIST, VISUAL INSPECTION, PHASE I

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Middle Creek Dam COUNTY Snyder STATE Pennsylvania ID# PA 918

TYPE OF DAM Earthfill HAZARD CATEGORY High

DATE(s) INSPECTION November 9, 1978 WEATHER Clear, cool windy TEMPERATURE 60°F

POOL ELEVATION AT TIME OF INSPECTION 635.4 approx M.S.L. TAILWATER AT TIME OF INSPECTION None M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - L. Robert Kimball and Associates

James T. Hockensmith - L. Robert Kimball and Associates

James A. Kuncelman - L. Robert Kimball and Associates

E. Jon Grindall, P.E. - Senior Project Engineer Fish Commission

Danny O'Neill - Chief Property Maintenance, Pennsylvania Fish Commission

Charles Hess - Area Maintenance Manager, Pennsylvania Fish Commission

James T. Hockensmith RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None noted.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None noted.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical and horizontal good. Axis has a 137^{o} bend.	
RIPRAP FAILURES	None.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Grasses and crown vetch. Wet areas have high grass and cattails.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good.	
ANY NOTICEABLE SEEPAGE	Two wet areas at elevation 617.7 on downstream slope (flow minimal). Several seepage zones and boils at/ir beyond downstream toe (28 gpm).	
STAFF GAUGE AND RECORDER	None.	
DRAINS	Both key trench drains producing water. Left drain (10 gpm), Right drain (1 gpm).	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	
STAFF GAUGE OR RECORDER	N/A	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Unobservable.	
INTAKE STRUCTURE	In good condition (principal spillway). Inlet or drain unobserved but operated.	
OUTLET STRUCTURE	Impact basin in good condition.	
OUTLET CHANNEL	Good condition. Riprap immediately below impact basin.	
EMERGENCY GATE	Reservoir drain 36" pipe with sluice gate.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Broad crested weir with a 3' wide concrete sill flush with the earth.	
APPROACH CHANNEL	400' long open cut channel - good condition, grassed.	
DISCHARGE CHANNEL	330' long open cut channel - good condition, grassed.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

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

DOWNSTREAM CHANNEL

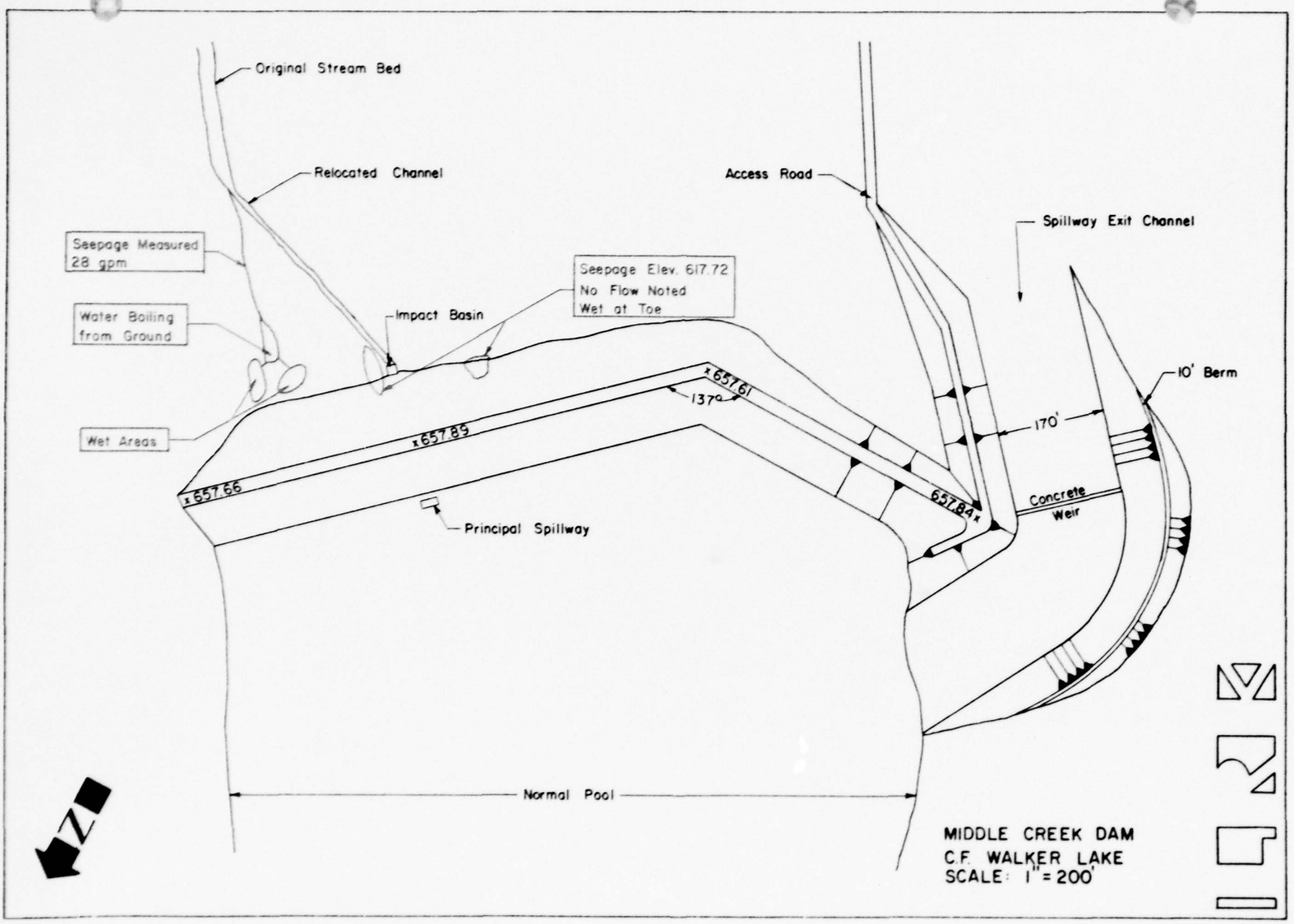
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Natural stream. Moderately wide floodplain. Farming and woodland.	
SLOPES	Gentle to moderate.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately 10 homes (40 people).	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderately steep. Stable.	
SEDIMENTATION	Does not appear to be excessive.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Monument on each abutment.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER		


Original Stream Bed
Relocated Channel
Access Road
Spillway Exit Channel
Seepage Measured
28 gpm
Seepage Elev. 617.72
No Flow Noted
Wet at Toe
Water Boiling
from Ground
Impact Basin
10' Berm
657.61
137°
170'
Wet Areas
657.89
657.66
657.84
Concrete
Weir
Principal Spillway
Normal Pool
MIDDLE CREEK DAM
C.F. WALKER LAKE
SCALE: 1" = 200'

APPENDIX B

CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION, PHASE I

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Middle Creek Dam

ID# PA 918

ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	On construction drawings.
CONSTRUCTION HISTORY	SCS files.
TYPICAL SECTIONS OF DAM	Construction drawings.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	 Construction drawings. SCS files None.

ITEM	REMARKS
DESIGN REPORTS	SCS files.
GEOLOGY REPORTS	SCS files.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	SCS files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Construction drawings. SCS files
POST-CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Construction drawings.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None.
MAINTENANCE OPERATION RECORDS	None.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	Construction drawings.
OPERATING EQUIPMENT PLANS & DETAILS	Construction drawings.

APPENDIX C

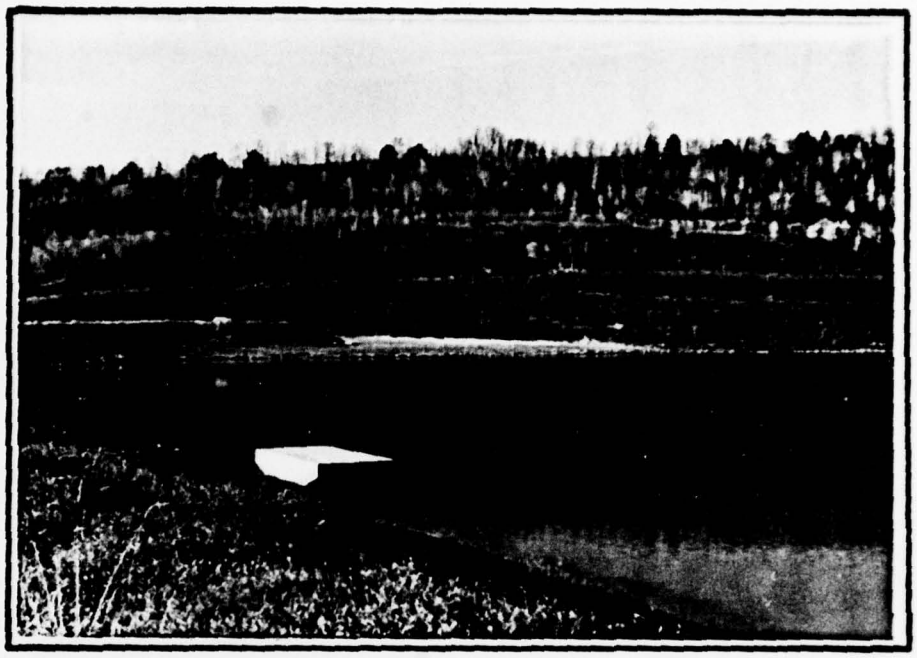
PHOTOGRAPHS

Photograph No. 1

Downstream slope. Top of wet area where men are standing.

Photograph No. 2

Downstream slope. Wet in high grassed areas.



Photograph No. 3

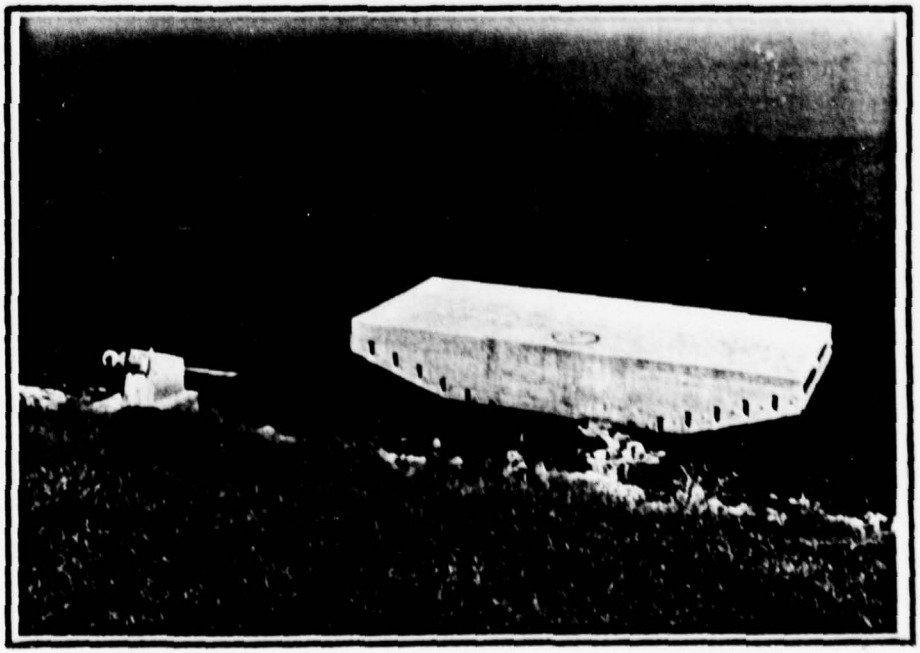
Emergency spillway entrance.

Photograph No. 4

Weir and control section in emergency spillway.

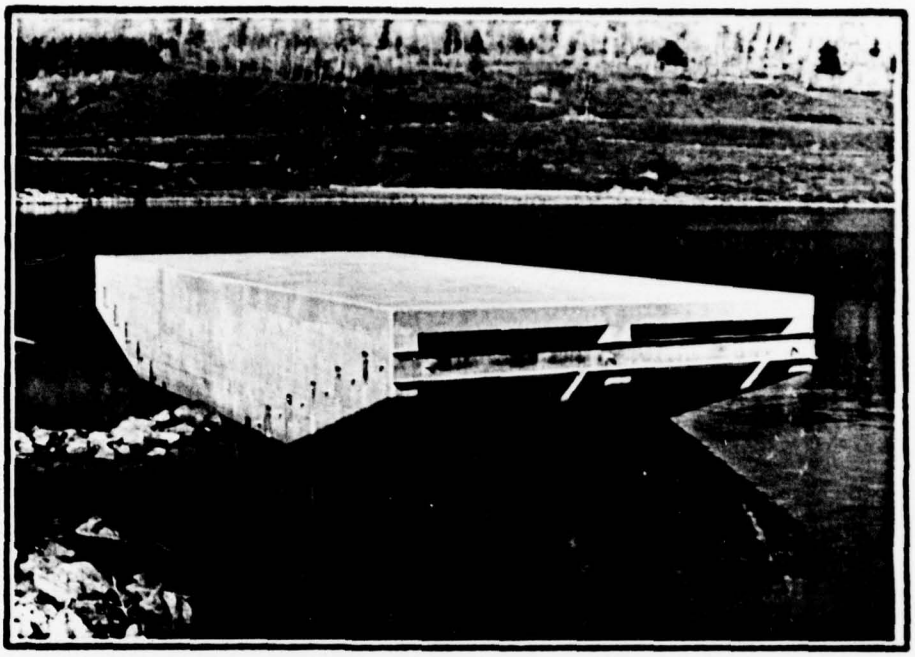
Photograph No. 5

Spillway exit channel.



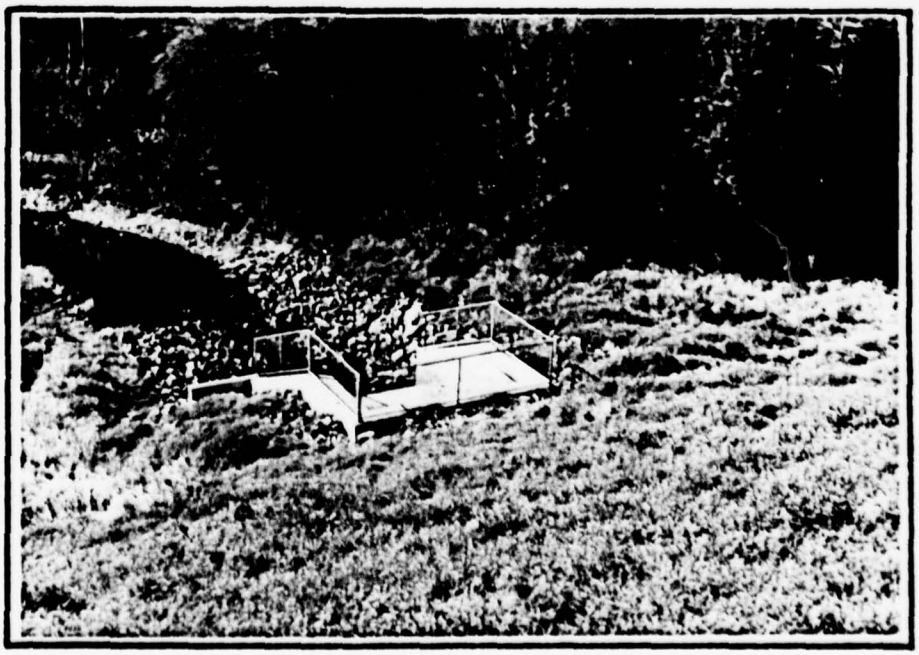
Photograph No. 6

Principal spillway and controls.



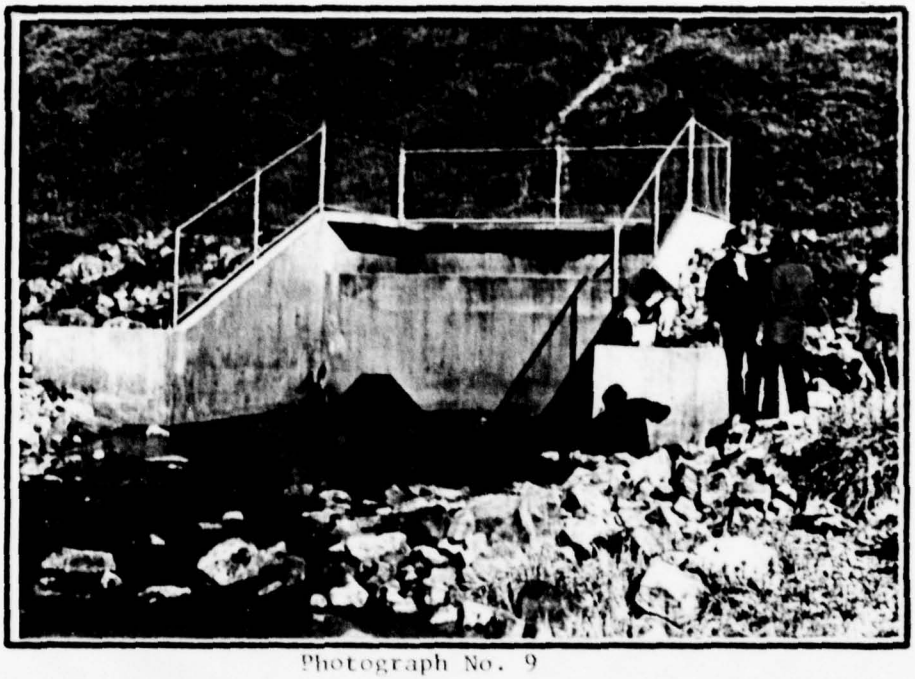
Photograph No. 7

Principal spillway inlet.



Photograph No. 8

Impact basin.



Photograph No. 9

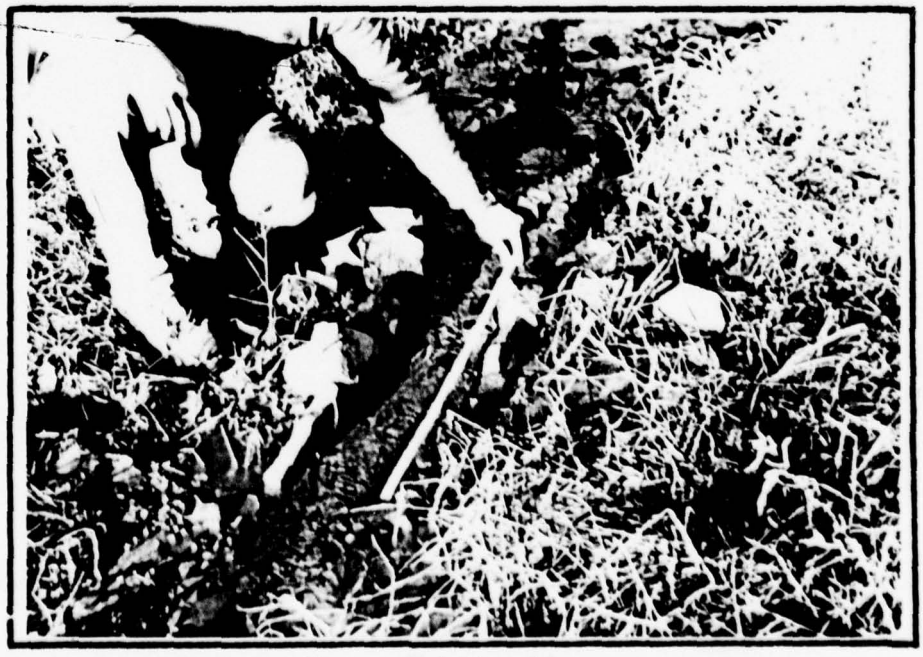
Impact basin.

Photograph No. 10

Wet area at toe near left abutment. Water boiling at tip of rule.

Photograph No. 11

Wet area at toe immediately adjacent to downstream toe.

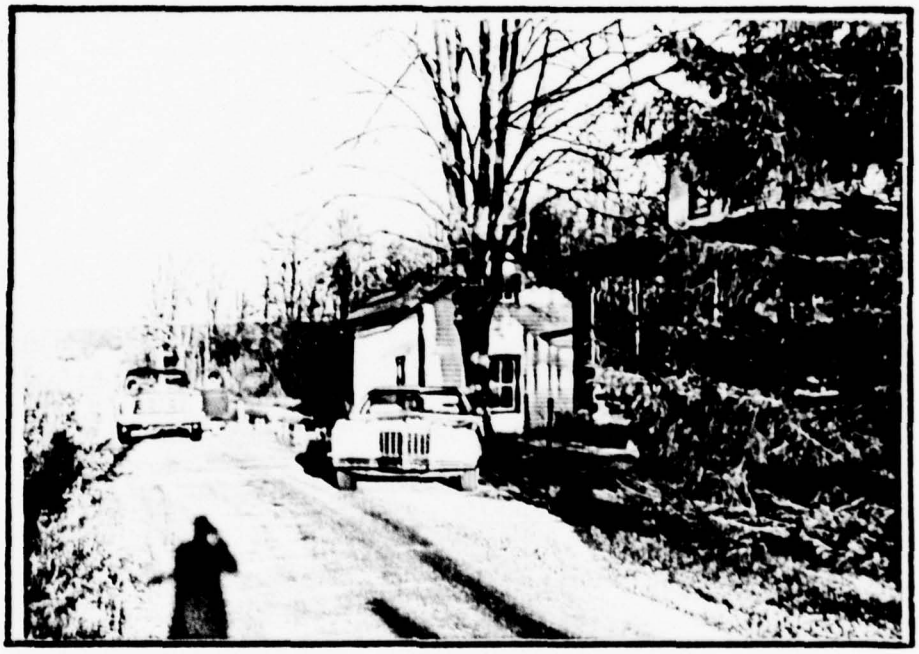


Photograph No. 12

Measuring seepage below boils.

Photograph No. 13

Dwellings along road adjacent to Middle Creek downstream.



Photograph No. 14

First dwelling downstream - right section of dam visible in background.

APPENDIX D

HYDROLOGY AND HYDRAULICS

APPENDIX D
HYDROLOGY AND HYDRAULICS

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

1. Precipitation. The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 40 prepared by the National Weather Service.

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

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

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

Parameter	Definition	Where Obtained
C_t	Coefficient representing variations of watershed slope and storage	From Corps of Engineers*
L	Length of main stream channel, miles	From U.S.G.S. 7.5 minute topographic
L_{ca}	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
C_p	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

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

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

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

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

4. Dam Overtopping. Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

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CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME MIDDLE CREEK DAM
I.D. NUMBER PA. 55-45
SHEET NO. 1 OF 3
BY DTM DATE 2-15-79

MIDDLE CREEK DAM

DRAINAGE AREA

AREA = 17.6 SQ. MI. {FROM U.S.G.S. QUADS.}

UNIT HYDROGRAPH PARAMETERS

DAMSITE LOCATED IN ZONE 18, SUSQUEHANNA RIVER BASIN. FROM CORPS. OF ENGINEERS, BALTIMORE DISTRICT REGIONAL STUDY.

$C_p = 0.50$, $C_t = 2.10$, $L = 6.8$ MILES, $L_{CA} = 3.8$ MILES

$t_p = C_t (L \times L_{CA})^{0.3} = 2.10 (6.8 \times 3.8)^{0.3}$

$t_p = 2.1(2.65) = 5.57$ HRS. (SNYDERS LAG(t_p) IN HRS.)

LOSS RATE AND BASE FLOW PARAMETERS

AS RECOMMENDED BY CORPS. OF ENGINEERS, BALTIMORE DISTRICT.

STRTL = 1 INCH
CNSTL = 0.05 IN./HR.
STRTQ = 1.50 cfs/Sq Mi
QRCSN = 0.05 (5% OF PEAK FLOW)
RTIOR = 2.00

PROBABLE MAXIMUM STORM

FROM H.R. No. 40

P.M.P. INDEX RAINFALL = 22.2(1.03) = 22.8 INCHES

$R_6 = 111\%$, $R_{12} = 121\%$, $R_{24} = 130\%$, $R_{48} = 137\%$, $R_{72} = 140\%$

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME MIDDLE CREEK DAM
I.D. NUMBER PA. 55-45
SHEET NO. 2 OF 3
BY DYM DATE 2-15-79

ELEVATION-AREA-CAPACITY RELATIONSHIPS

PRINCIPAL SPILLWAY
CREST ELEVATION 634.9' - AREA = 239 ACRES
INITIAL STORAGE = 2,753 AC.FT
DATA FROM DESIGN PLAN, D.E.R. FILE

FROM U.S.G.S. QUAD.
ELEVATION 640', AREA = 312 ACRES
ELEVATION 660', AREA = 680 ACRES
THIS DATA COMPARED WITH AREA-CAPACITY CURVE FROM D.E.R. FILE. DATA AGREED WITH GIVEN INFORMATION.

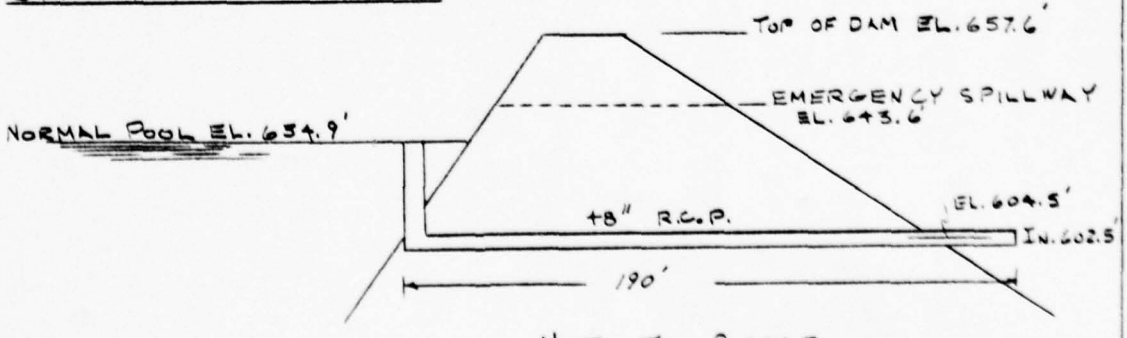
FROM CONIC METHOD FOR RESERVOIR VOLUME. FLOOD HYDROGRAPH PACKAGE (HEC-1). DAM SAFETY VERSION (USERS MANUAL).

$H = 3V/A = 3(2{,}753\ \text{AC.FT})/239\ \text{AC} = 34.56'$

ELEVATION AT CAPACITY EQUALS ZERO,
634.9' - 34.56' = 600.34'

ELEV. (FT)	600.3	634.9	637	640	643	645	647	650	660
AREA. (AC)	0	239	270	312	360	400	440	500	680

SPILLWAY DISCHARGE



NOT TO SCALE

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME MIDDLE CREEK DAM
I.D. NUMBER PA. 55-45
SHEET NO. 3 OF 3
BY OTM DATE 2-19-79

DISCHARGE

ELEV. (FT.)	PRINCIPAL SPILLWAY				EMERGENCY SPILLWAY		DISCHARGE
	WEIR FLOW		FULL FLOW				
	H_1 (Ft.)	Q_1 (cfs)	H_2 (FT.)	Q_2 (cfs)	H_3 (FT)	Q_3 (cfs)	(cfs)
634.9	0	0					
635.4	0.5	26					26
636.4	1.5	136					136
637.5	2.5	292					292
637.9			33.4	324			324
643.6			39.1	350			350
644.6			40.1	355	1	504	859
645.6			41.1	359	2	1440	1799
646.6			42.1	363	3	2671	3034
647.6			43.1	368	4	4152	4520
648.6			44.1	372	5	5858	6230
649.6			45.1	376	6	7773	8149
651.6			47.1	384	8	12193	12577
653.6			49.1	392	10	17358	17750
655.6			51.1	400	12	23237	23637
657.6			53.1	408	14	29812	30220
659.6			55.1	416	16	37074	37490
661.6			57.1	423	18	45017	45440
666.6			62.1	441	23	67849	68290
671.6			67.1	459	28	94962	95421

PRINCIPAL SPILLWAY

A) WEIR FLOW $Q_1 = C L H^{3/2}$ (USE $C = 3.3$)

B) FULL FLOW $Q_2 = a\sqrt{\dfrac{2gH}{1 + Ke + Kb + KpL}}$

EMERGENCY SPILLWAY

A) TRAPEZOIDAL $Q_3 = 8.03\, C' h_v^{1/2}(H - h_v)\left[B + Z(H - h_v)\right]$

(USE $C' = 0.95$) WHERE $h_v = \dfrac{3(2ZH + B) - (16Z^2H^2 + 16ZBH + 9B^2)^{1/2}}{10Z}$

C' = ENTRANCE COEFFICIENT

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 17.6 square miles(farmland & woodland)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 635.4 (2753 Ac-ft)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 657.1 (11,600 Ac-ft)

ELEVATION MAXIMUM DESIGN POOL: 656.0

ELEVATION TOP DAM: 657.1

SPILLWAY CREST:

a. Elevation 643.6
b. Type Broad crested weir
c. Width 30'
d. Length 170'
e. Location Spillover Right abutment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 48" conduit with concrete intake tower - uncontrolled
b. Location In lake near upstream slope
c. Entrance inverts 634.9
d. Exit inverts 602.5
e. Emergency draindown facilities 36" sluice gate and conduit

HYDROMETEOROLOGICAL GAUGES:

a. Type None
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION       JULY 1978
  LAST MODIFICATION  11 JAN 79
**********
    1          A1       ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
    2          A2       HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF MIDDLE CREEK DAM
    3          A3       RATIOS OF PMF ROUTED THROUGH THE RESERVOIR  PA. ID NO 55-45
    4          B   288       0      15       0       0       0       0       0      -4       0
    5          B1    5
    6          J     1       6       1
    7          J1  0.2     0.3     0.4     0.5    0.75       1
    8          K     0       1                                  1
    9          K1       INFLOW TO RESERVOIR
   10          M     1       1    17.6              17.6                                   1
   11          P           22.8     111     121     130     137     140
   12          T                                                  1.0    0.05
   13          W  5.57    0.50
   14          X  -1.5    -.05     2.0
   15          K     1       2                                          1
   16          K1       ROUTE THRU RESERVOIR
   17          Y                                  1       1
   18          Y1    1                                                -634.9      -1
   19          Y4 634.9   635.4   636.4   637.5   637.9   643.6   644.6   645.6   646.6   647.6
   20          Y4 648.6   649.6   651.6   653.6   655.6   657.6   659.6   661.6   666.6   671.6
   21          Y5    0      26     136     292     324     350     859    1800    3034    4520
   22          Y5 6230    8149   12577   17750   23637   30220   37490   45440   68290   95421
   23          $A    0     239     270     312     360     400     440     500     595     680
   24          $E600.34   634.9     637     640     643     645     647     650     655     660
   25          $$ 643.6
   26          $D 657.6    3.05     1.5    1360
   27          K    99
```

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 11 JAN 79
****

RUN DATE 79/03/19.
TIME 14.06.25.

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF MIDDLE CREEK DAM
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR PA. ID NO 55-45

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 6 LRTIO= 1

RTIOS=	.20	.30	.40	.50	.75	1.00

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

SUB-AREA RUNOFF COMPUTATION

INFLOW TO RESERVOIR

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	17.60	0.00	17.60	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.80	111.00	121.00	130.00	137.00	140.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .819

LOSS DATA

LROPT	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= 5.57 CP= .50 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 5.57 HOURS, CP= .50 VOL= .95

9.	36.	74.	121.	173.	231.	292.	357.	426.	497.
570.	645.	717.	784.	844.	896.	943.	982.	1013.	1038.
1053.	1060.	1054.	1030.	997.	964.	933.	903.	873.	845.
817.	790.	765.	740.	716.	692.	670.	648.	627.	606.
586.	567.	549.	531.	514.	497.	481.	465.	450.	435.
421.	407.	394.	381.	369.	357.	345.	334.	323.	312.
302.	292.	283.	274.	265.	256.	248.	240.	232.	224.
217.	210.	203.	196.	190.	184.	178.	172.	166.	161.
156.	151.	146.	141.	136.	132.	128.	123.	119.	115.
112.	108.	105.	101.	98.	95.	92.	89.	86.	83.

Q END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	26.14	23.42	2.73	1006698.
										(664.)(595.)(69.)(25606.51)			

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

HYDROGRAPH ROUTING

ROUTE THRU RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	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	-635.	-1

STAGE	634.90	635.40	636.40	637.50	637.90	643.60	644.60	645.60	646.60
647.60	648.60	649.60	651.60	653.60	655.60	657.60	659.60	661.60	666.60
671.60									
FLOW	0.00	26.00	136.00	292.00	324.00	350.00	859.00	1800.00	3034.00
4520.00	6230.00	8149.00	12577.00	17750.00	23637.00	30220.00	37490.00	45440.00	68290.00
95421.00									
SURFACE AREA=	0.	239.	270.	312.	360.	400.	440.	500.	595.	680.
CAPACITY=	0.	2753.	3287.	4160.	5167.	5926.	6766.	8175.	10909.	14094.
ELEVATION=	600.	635.	637.	640.	643.	645.	647.	650.	655.	660.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL

643.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
657.6	3.1	1.5	1360.

PEAK OUTFLOW IS 964. AT TIME 57.00 HOURS

PEAK OUTFLOW IS 2682. AT TIME 52.50 HOURS

PEAK OUTFLOW IS 4451. AT TIME 50.75 HOURS

PEAK OUTFLOW IS 6271. AT TIME 49.75 HOURS

PEAK OUTFLOW IS 10918. AT TIME 48.50 HOURS

PEAK OUTFLOW IS 15540. AT TIME 48.00 HOURS

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

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 .75	RATIO 6 1.00
HYDROGRAPH AT	1	17.60	1	4043.	6065.	8086.	10108.	15162.	20215.
		(45.58)		(114.49)(	171.73)(	228.97)(	286.22)(	429.33)(	572.44)(
ROUTED TO	2	17.60	1	964.	2682.	4451.	6271.	10918.	15540.
		(45.58)		(27.29)(	75.96)(	126.05)(	177.59)(	309.17)(	440.04)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	634.90	643.60	657.60
STORAGE	2753.	5386.	12512.
OUTFLOW	0.	350.	30220.

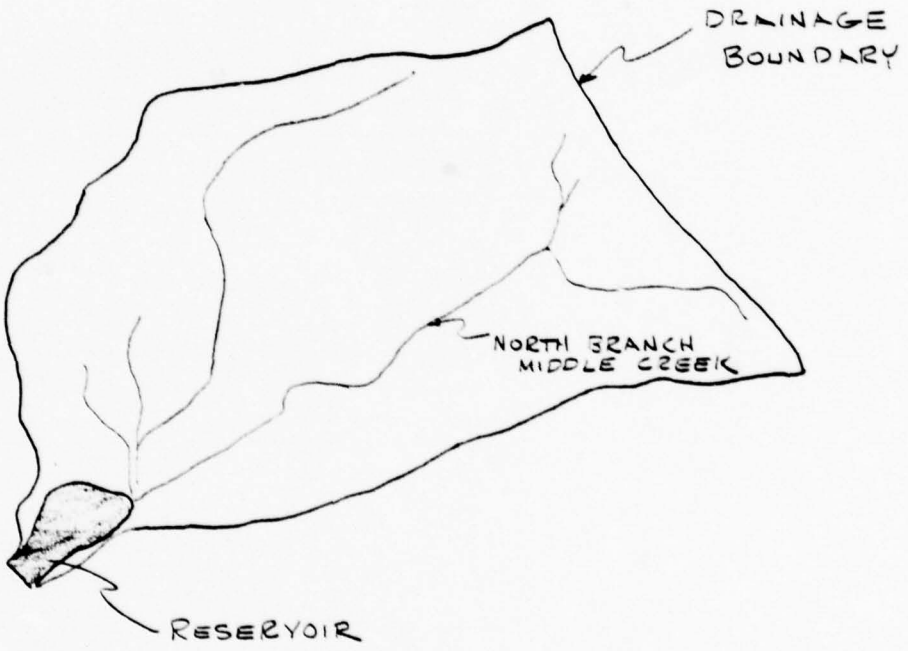
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	644.71	0.00	5812.	964.	0.00	57.00	0.00
.30	646.32	0.00	6470.	2682.	0.00	52.50	0.00
.40	647.55	0.00	7013.	4451.	0.00	50.75	0.00
.50	648.62	0.00	7505.	6271.	0.00	49.75	0.00
.75	650.85	0.00	8607.	10918.	0.00	48.50	0.00
1.00	652.75	0.00	9618.	15540.	0.00	48.00	0.00

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME MIDDLE CREEK DAM
I.D. NUMBER PA. 55-45
SHEET NO. 1 OF 1
BY DTM DATE 4-12-79

SHAPE OF DRAINAGE AREA

(FROM D.E.R. FILE)



SCALE: 1" = 1.5 MILES

APPENDIX E

DRAWINGS

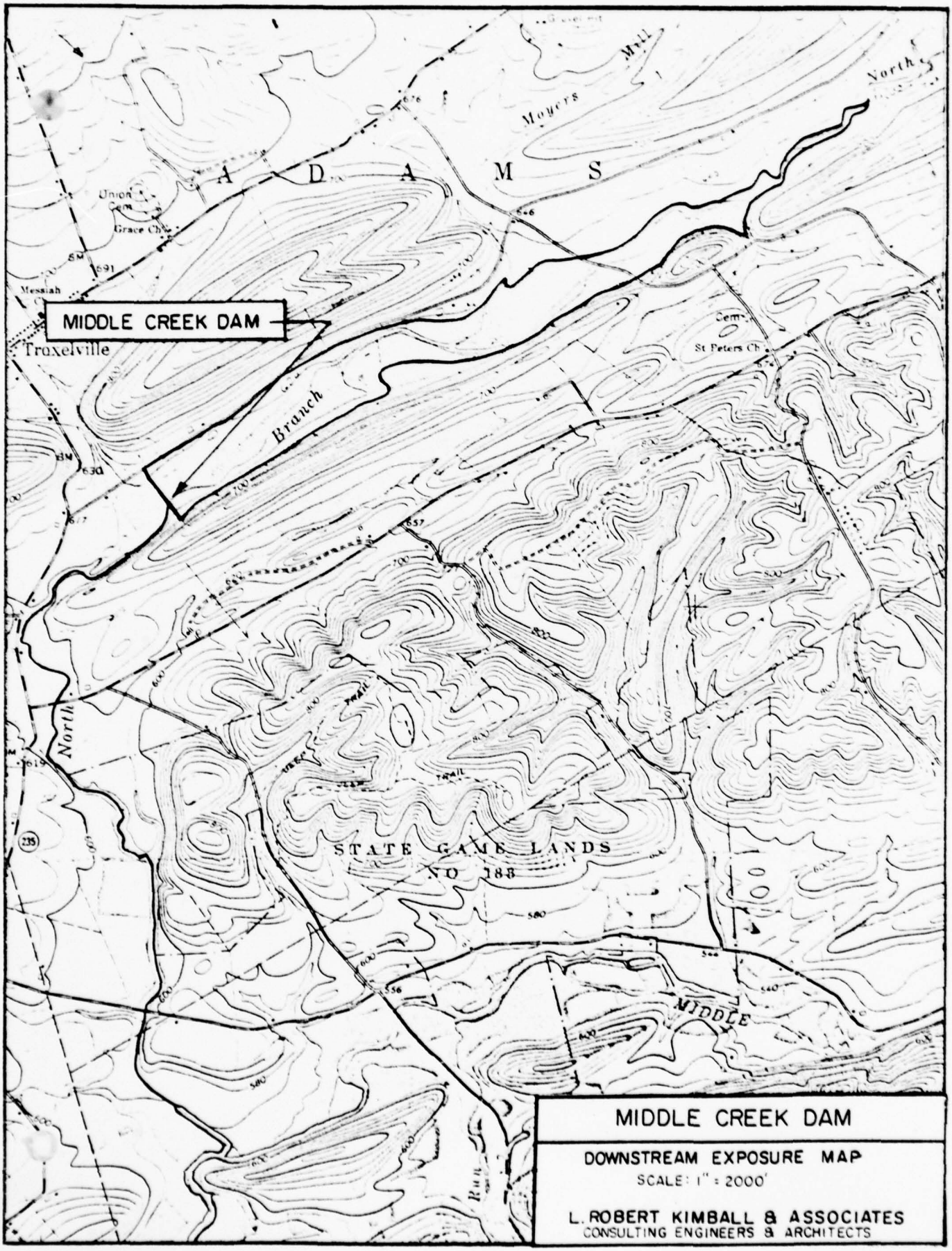
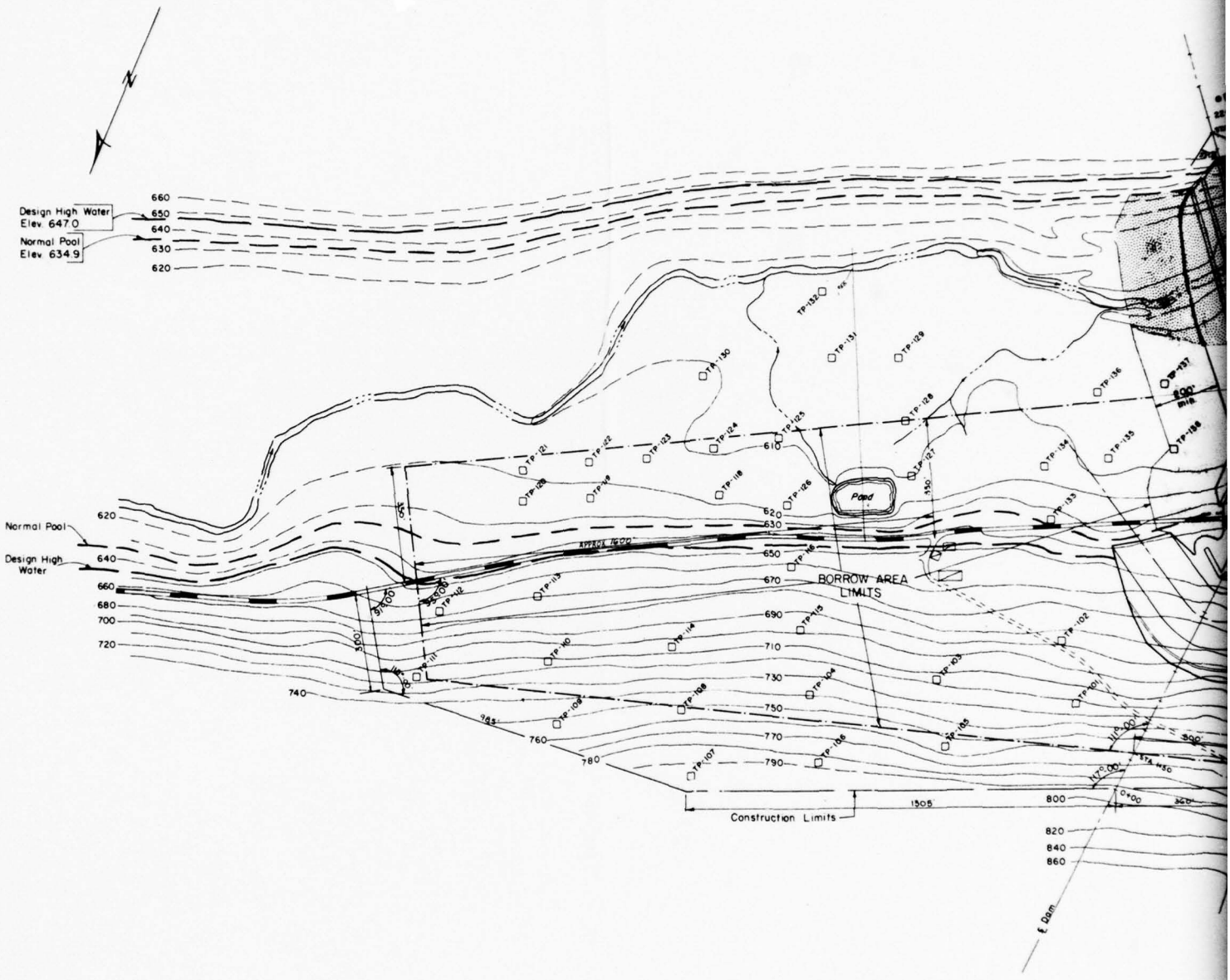
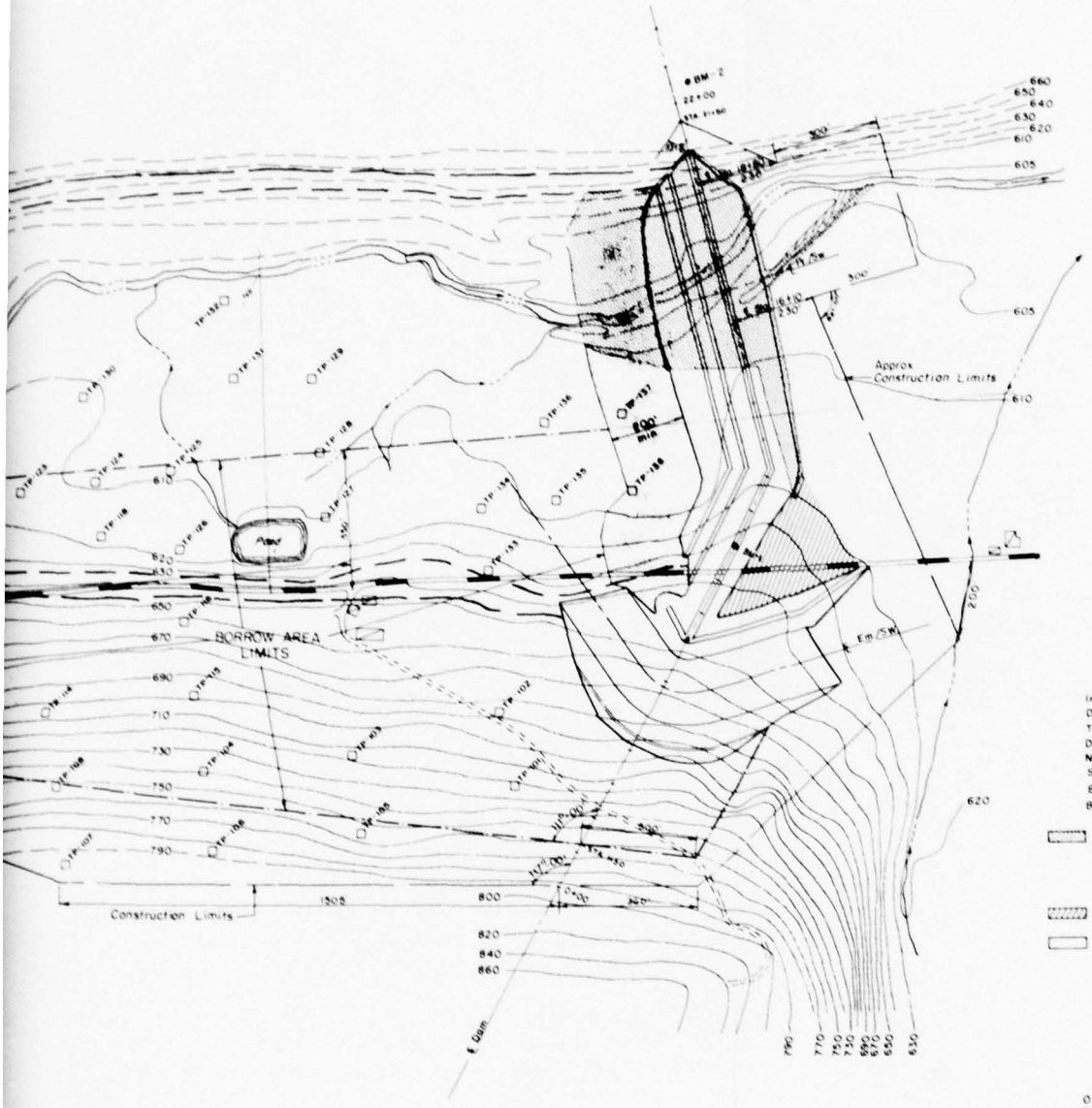

MIDDLE CREEK DAM
Traxelville
A D A M S
Union
Grace Ch
Messiah
Meyers
Mill
North
St Peters Ch
Cem
Branch
STATE GAME LANDS
NO 183
North
MIDDLE
MIDDLE CREEK DAM
DOWNSTREAM EXPOSURE MAP
SCALE: 1" = 2000'
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 1



1. For log
2. No bor
upstrea
3. No pay
grubbi
area e



NOTES

1. For logs of test holes see sheets 25 thru 28.
2. No borrow shall be obtained within 200' of the upstream toe.
3. No payment shall be made for any clearing & grubbing that may be required in the borrow area or em./sw. area.

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
PLAN OF BORROW AREA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

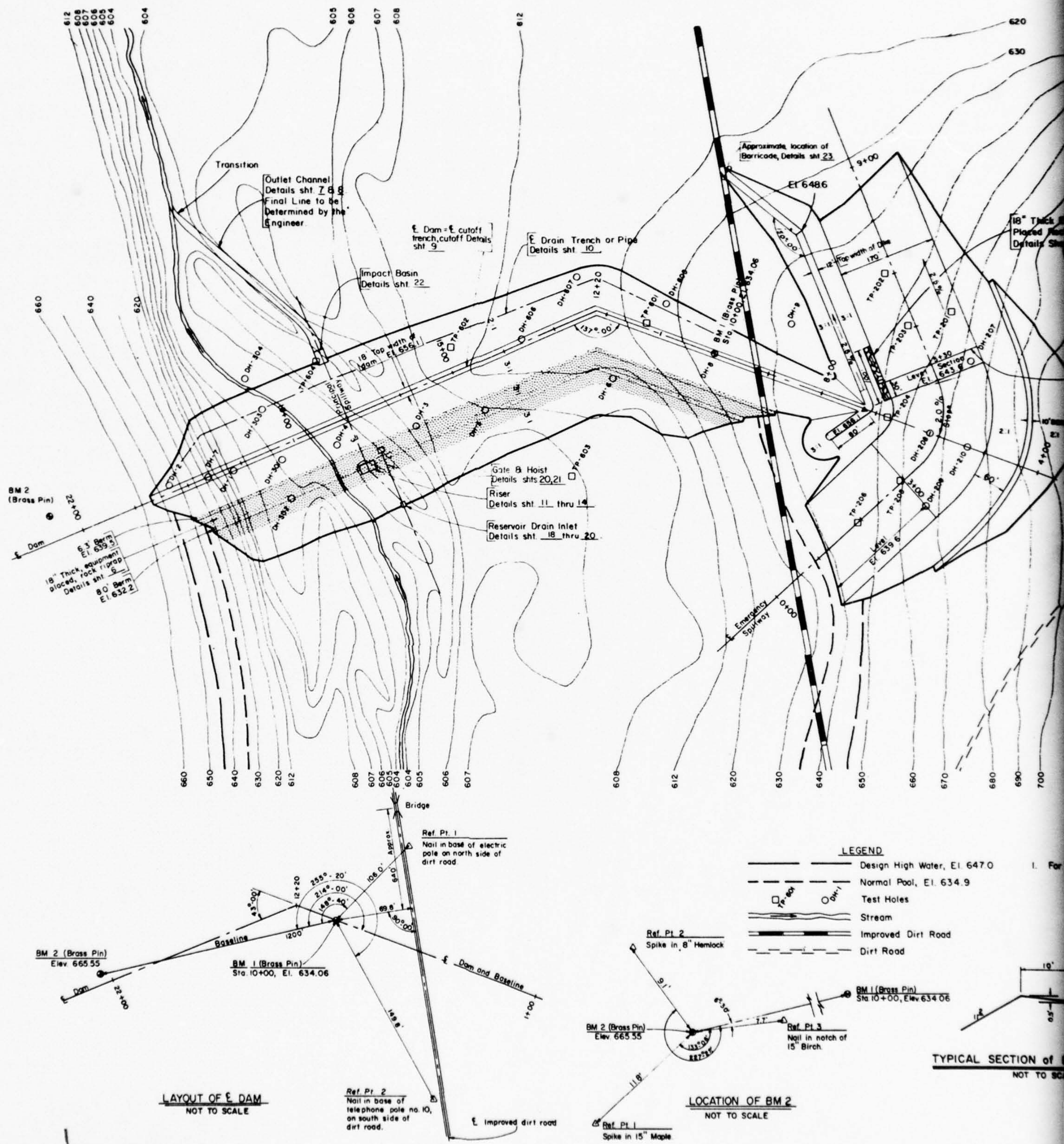
Designed Donald C. Hubley	Date 3-67	Approved by	
Drawn C. Crise	3-67	Title	
Traced		Title	
Checked L. Robert Kimball	6-67	Sheet No. 4 of 29	Drawing No. PA-637-P

A55:(

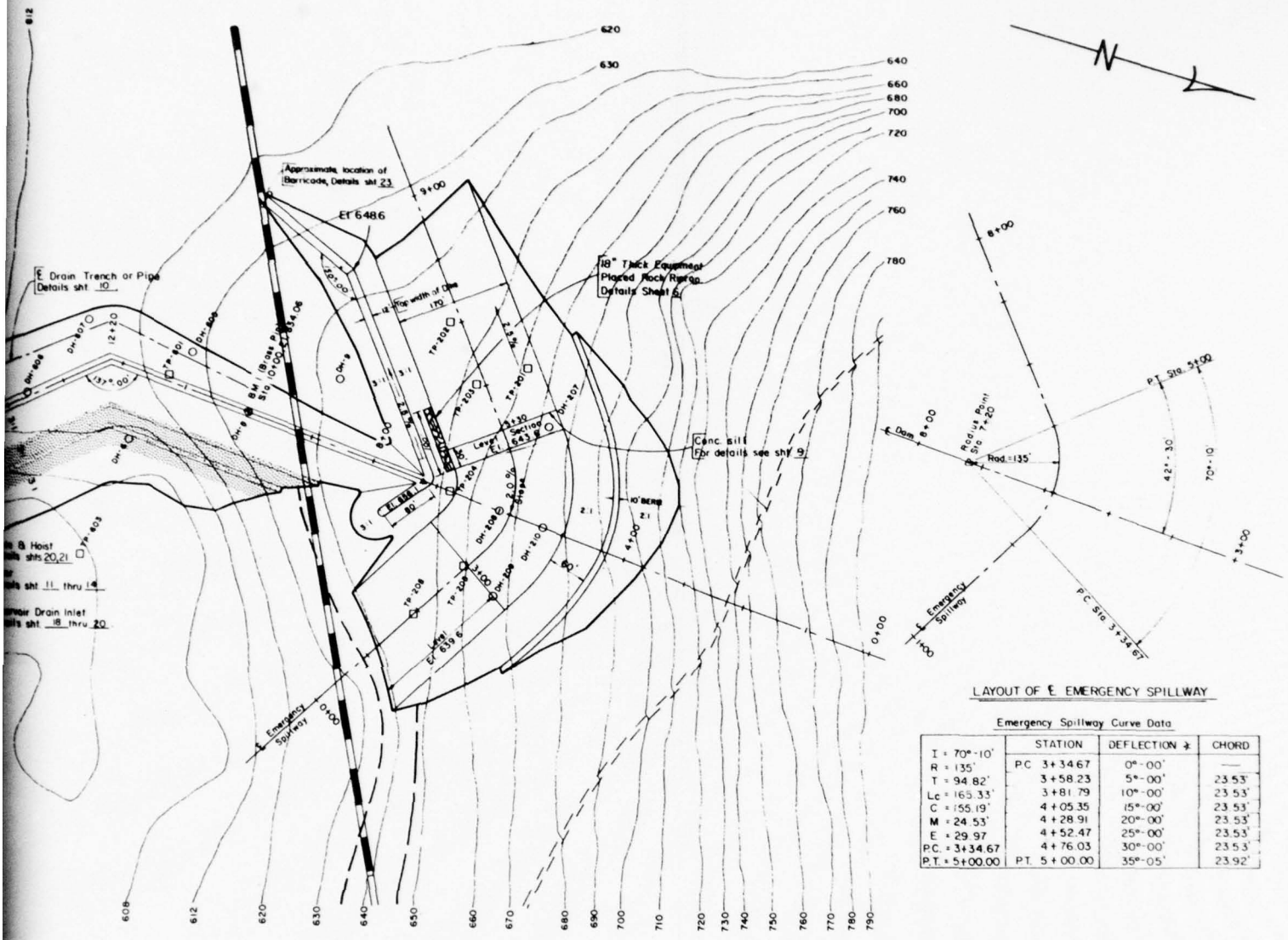
SCS-313B (APRIL 1960)

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 2



Transition
Outlet Channel Details sht. 7 & 8 Final Line to be Determined by the Engineer.
℄ Dam = ℄ cutoff trench, cutoff Details sht. 9
℄ Drain Trench or Pipe Details sht. 10
Impact Basin Details sht. 22
Approximate location of Barricade, Details sht. 23
El. 648.6
18' Top width of dam El. 656.1
Gate & Hoist Details shts 20,21
Riser Details sht. 11 thru 14
Reservoir Drain Inlet Details sht. 18 thru 20
BM 2 (Brass Pin)
BM 1 (Brass Pin) Sta. 10+00, El. 634.06
18" Thick, equipment placed, rock riprap Details sht. 6
E.3' Berm El. 639.5
8.0' Berm El. 632.2
Level Section El. 643.6
Level El. 639.6
℄ Emergency Spillway
Bridge
Ref. Pt. 1
Nail in base of electric pole on north side of dirt road.
Ref. Pt. 2
Nail in base of telephone pole no. 10, on south side of dirt road.
BM 2 (Brass Pin) Elev. 665.55
BM 1 (Brass Pin) Sta. 10+00, El. 634.06
Baseline
℄ Dam and Baseline
℄ Improved dirt road
LAYOUT OF ℄ DAM
NOT TO SCALE
Ref. Pt. 2
Spike in 8" Hemlock
BM 1 (Brass Pin) Sta. 10+00, Elev. 634.06
BM 2 (Brass Pin) Elev. 665.55
Ref. Pt. 3
Nail in notch of 15" Birch.
Ref. Pt. 1
Spike in 15" Maple
LOCATION OF BM 2
NOT TO SCALE
LEGEND
Design High Water, El. 647.0
Normal Pool, El. 634.9
Test Holes
Stream
Improved Dirt Road
Dirt Road
TYPICAL SECTION of
NOT TO SC



LAYOUT OF ℄ EMERGENCY SPILLWAY

Emergency Spillway Curve Data

	STATION	DEFLECTION ∠	CHORD
I = 70°-10'	P.C. 3+34.67	0°-00'	—
R = 135'	3+58.23	5°-00'	23.53'
T = 94.82'	3+81.79	10°-00'	23.53'
Lc = 165.33'	4+05.35	15°-00'	23.53'
C = 155.19'	4+28.91	20°-00'	23.53'
M = 24.53'	4+52.47	25°-00'	23.53'
E = 29.97	4+76.03	30°-00'	23.53'
P.C. = 3+34.67	P.T. 5+00.00	35°-05'	23.92'
P.T. = 5+00.00			

LEGEND

- Design High Water, El. 647.0
- Normal Pool, El. 634.9
- Test Holes
- Stream
- Improved Dirt Road
- Dirt Road

CONSTRUCTION NOTES

1. For logs of test holes see sht. 25 thru 28

0 20 50 100 200
SCALE in FEET

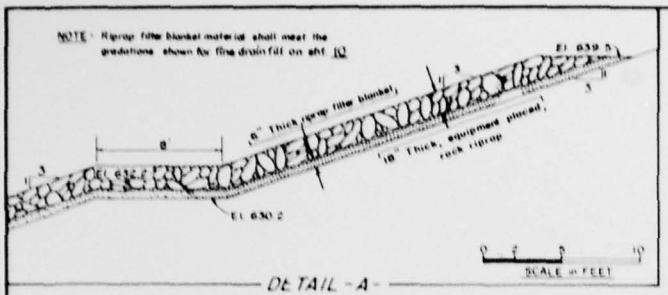
MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
PLAN OF STRUCTURAL WORKS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

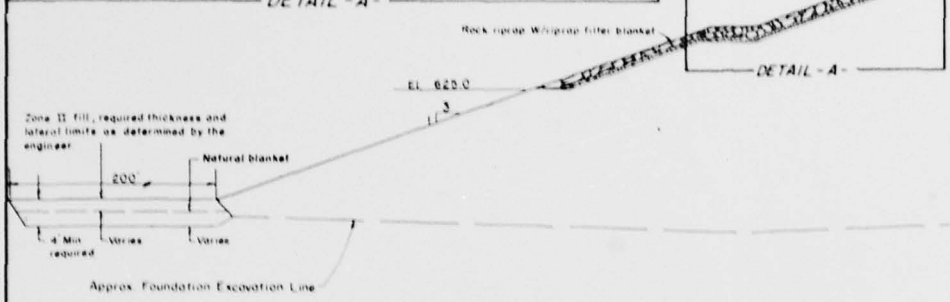
Designed Donald R Shubby	Date 3-67	Approved by	
Drawn C. CRISE	3-'67	Title	
Traced		Title	
Checked Alfred A Snyder	6-67	Sheet No 5 of 29	Drawing No PA-637-P

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

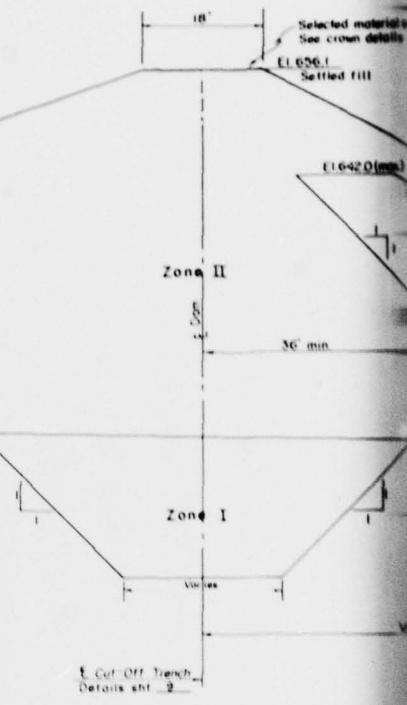
FIGURE 3



DETAIL - A -



DETAIL - A -



TYPICAL SECTION OF EMBANKMENT

0 2 6 12 24
SCALE in FEET

TYPICAL CROWN DETAILS
For embankment and dike

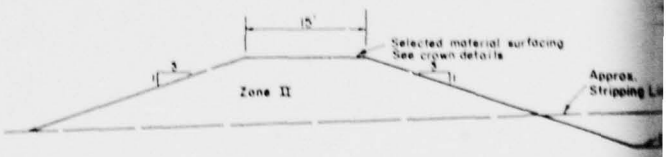
EARTH FILL REQUIREMENTS

ZONE	MATERIAL	MAX ROCK [1] SIZE	MAX. LIFT [2] THICKNESS	REQUIRED [3] WATER CONTENT	COMPACTION [4] CLASS	COMPACTION [4] DEFINITION
I	Material as represented by TP-137.1, depth 1 to 15' classified as CL	6"	9"	Optimum to +3%	A	100% max. density by ASTM D698 method A
II	Material as represented by TP-202.1, depth 1' to 6' classified as CL, or by TP-103.1, depth 1' to 6' classified as GC-GM	6"	9"	-1% Optimum to +3%	A	95% max. density by ASTM D698 method A
III	Siltstone and/or shale	8"	12"	See subsection 30.11 of special requirements		

[1] For fill adjacent to structures, max. rock size 3"
[2] Maximum permissible lift thickness before compaction
[3] Water content of fill matrix at time of compaction
[4] For typical compaction curves see sheet 29

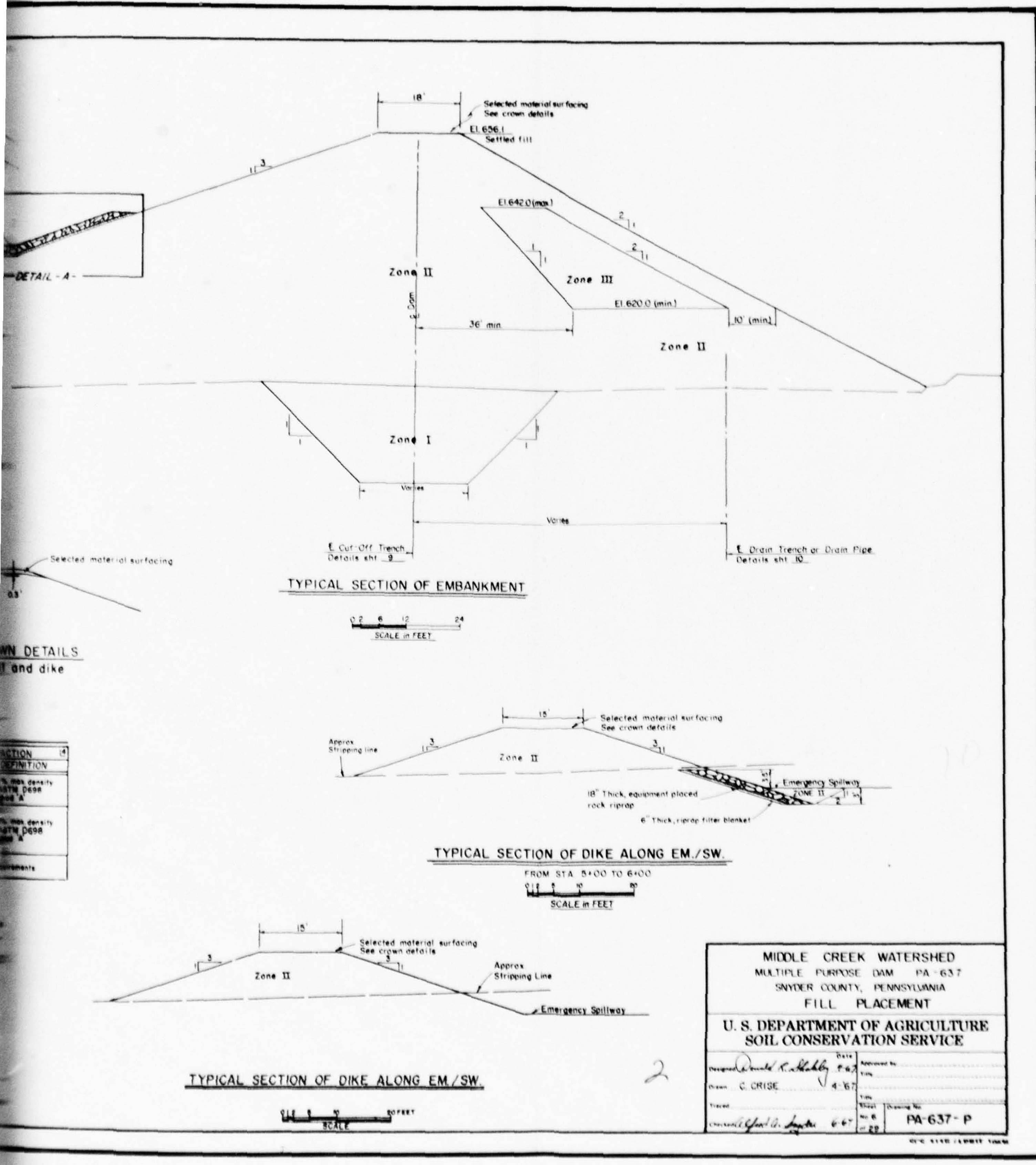
TYPICAL SECTION

FRO



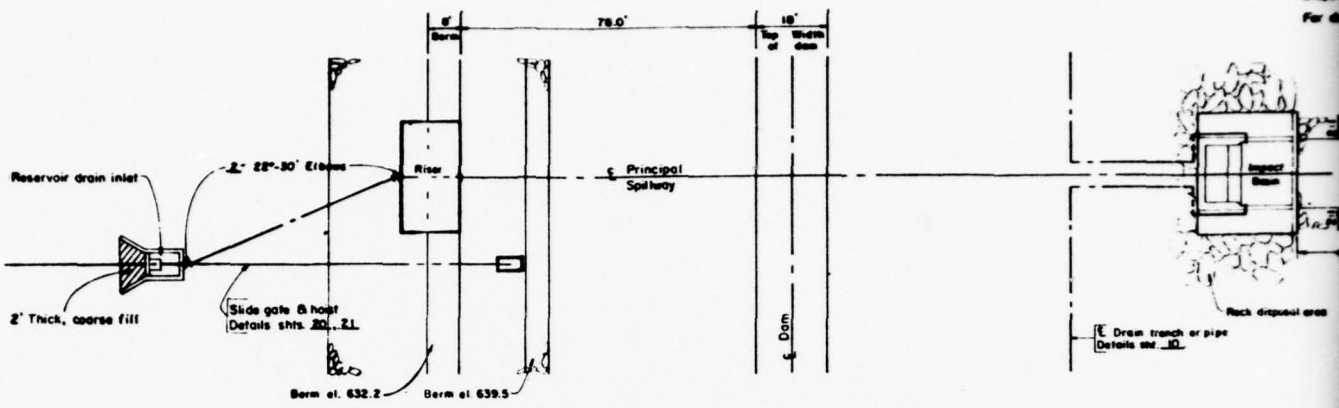
TYPICAL SECTION OF DIKE ALONG EM/SW

SCALE



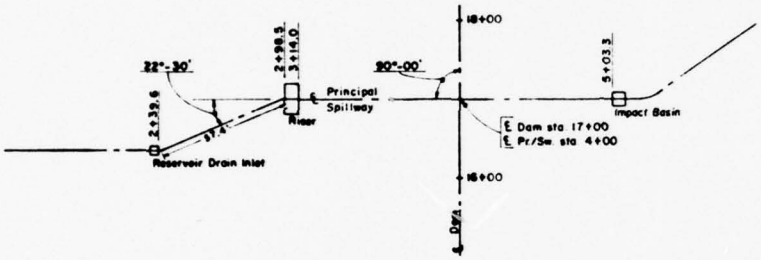
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 4



PLAN VIEW OF PRINCIPAL SPILLWAY

0 5 10 20 40
SCALE in FEET

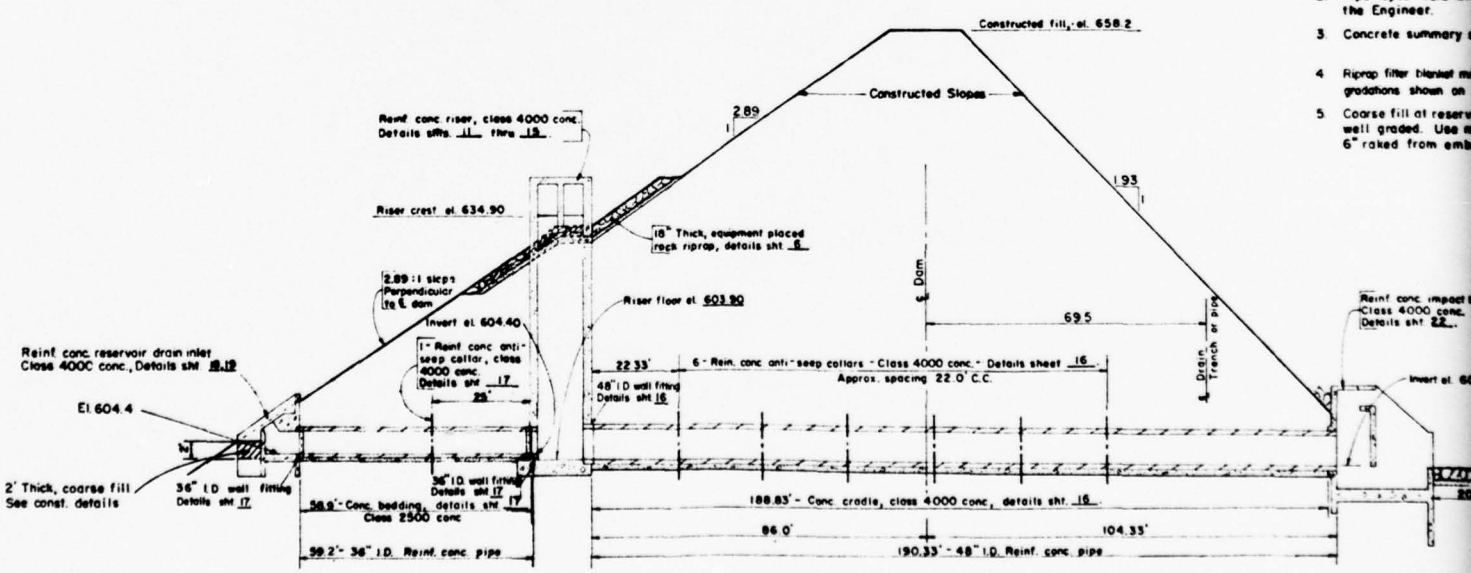


LAYOUT OF PRINCIPAL SPILLWAY

NOT TO SCALE

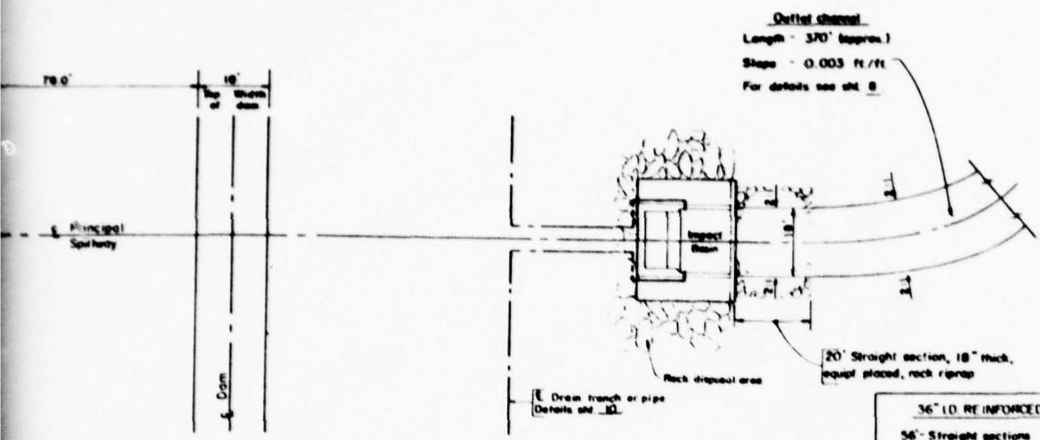
CONSTRUCTION DE

1. Outlet end of 48" pi so ft.at no metal is e
2. Pipe layout data will the Engineer.
3. Concrete summary s
4. Riprap filter blanket ma gradations shown on
5. Coarse fill at reservo well graded. Use m 6" raked from emba



PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY

0 5 10 20 40 0 2 5 10 20
HORIZ. VERT.
SCALE in FEET



PLAN VIEW OF PRINCIPAL SPILLWAY

0 5 10 20 40
SCALE in FEET

36" I.D. REINFORCED CONCRETE PRESSURE PIPE SPILLWAY CONDUIT

56' - Straight sections
2 - 22½° - 30' Elbows
1 - Bell ring wall fitting (for 21" wall)
1 - Spigot ring wall fitting (for 12" wall)
Pressure head = 52'
Load = 23,326 Lbs. per lin. ft., based on O.D. of 3.52'
Min. 3 edge bearing strength for:
0.001" Crack prestressed pipe = 8,753 lbs. per lin. ft.
59.2' Total length

48" I.D. REINFORCED CONCRETE PRESSURE PIPE SPILLWAY CONDUIT

190' - Straight sections
1 - Spigot ring wall fitting (for 21" wall)
Pressure head = 43'
Load = 70,668 lbs. per lin. ft., based on O.D. of 4.79'
Min. 3 edge bearing strength for:
0.001" Crack prestressed pipe = 17,186 lbs. per lin. ft.
190.3' Total length

CONSTRUCTION DETAILS

1. Outlet end of 48" pipe to be finished so that no metal is exposed
2. Pipe layout data will be furnished by the Engineer
3. Concrete summary see sht 21.
4. Riprap filter blanket material shall meet gradations shown on sht 10 (Fine drain fill)
5. Coarse fill at reservoir drain shall be well graded. Use material larger than 6" raked from embankment

PIPE JOINT DATA (AS BUILT)

FOR 36" I.D. PIPE

JOINT	DIST. FROM RISER WALL	INVERT EL.

FOR 48" I.D. PIPE

JOINT	DIST. FROM RISER WALL	INVERT EL.

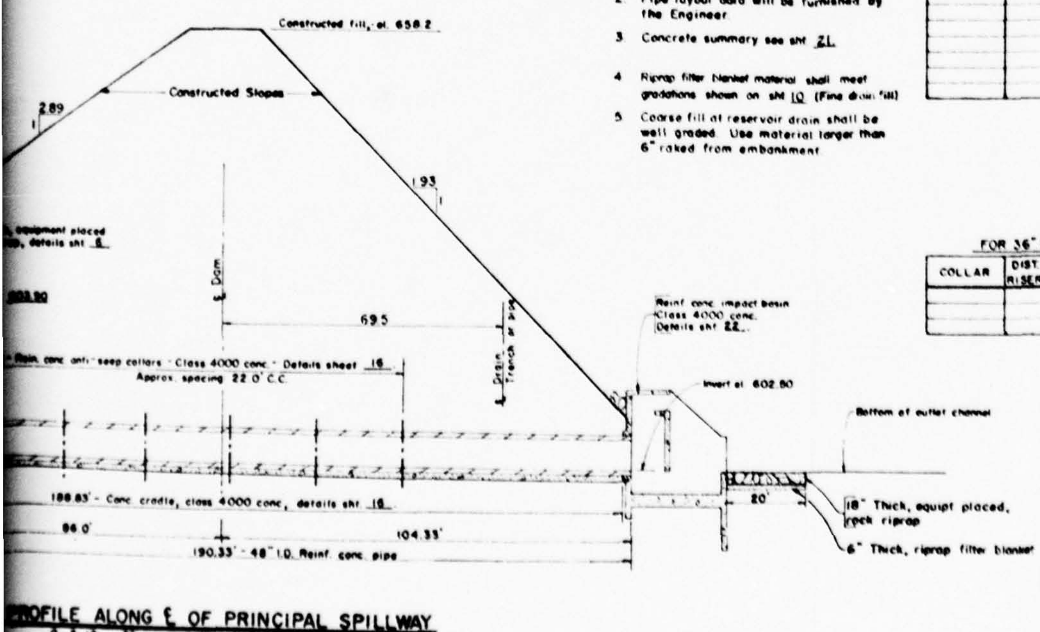
COLLAR DATA (AS BUILT)

FOR 36" I.D. PIPE

COLLAR	DIST. FROM RISER WALL	INVERT EL.

FOR 48" I.D. PIPE

COLLAR	DIST. FROM RISER WALL	INVERT EL.



PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY

0 5 10 20 40 HORIZ. — 0 2 5 10 20 VERT.
SCALE in FEET

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
PRINCIPAL SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed Donald ... 5-67	Approved by	Sheet No. 7 of 29	Drawing No. PA-637-P
Drawn C. ORISE 5-'67	Title		
Traced	Title		
Checked Alfred G. Snyder 6-67			

2

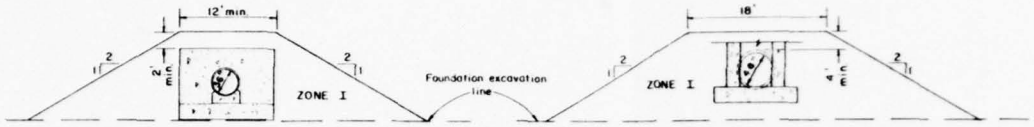
ASB: 1 SCS-313B (APRIL 1960)

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 5

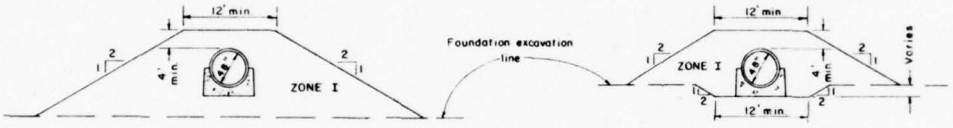
RESERVOIR DRAIN INLET

CONCRETE BEDDING



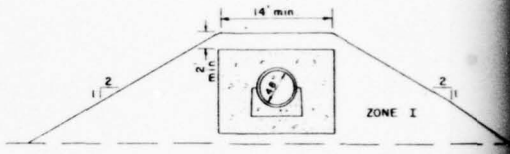
RESERVOIR DRAIN ANTI-SEEP COLLAR

RISER

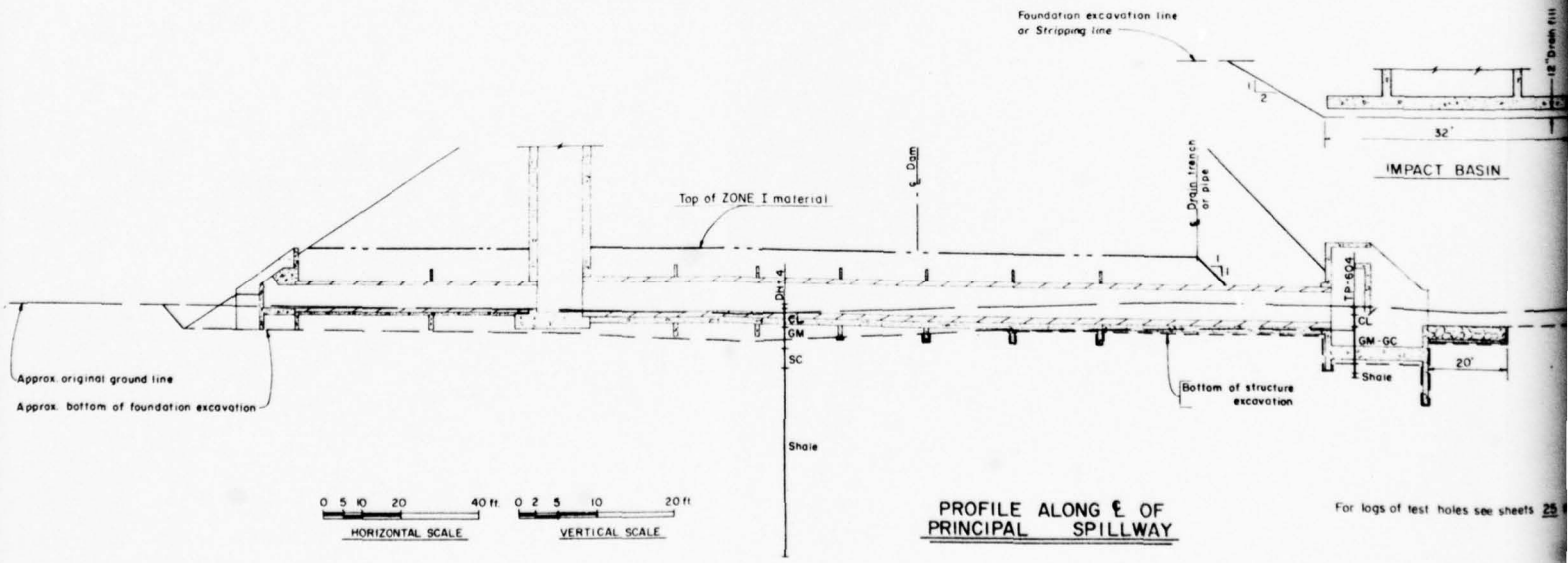


CRADLE

CRADLE

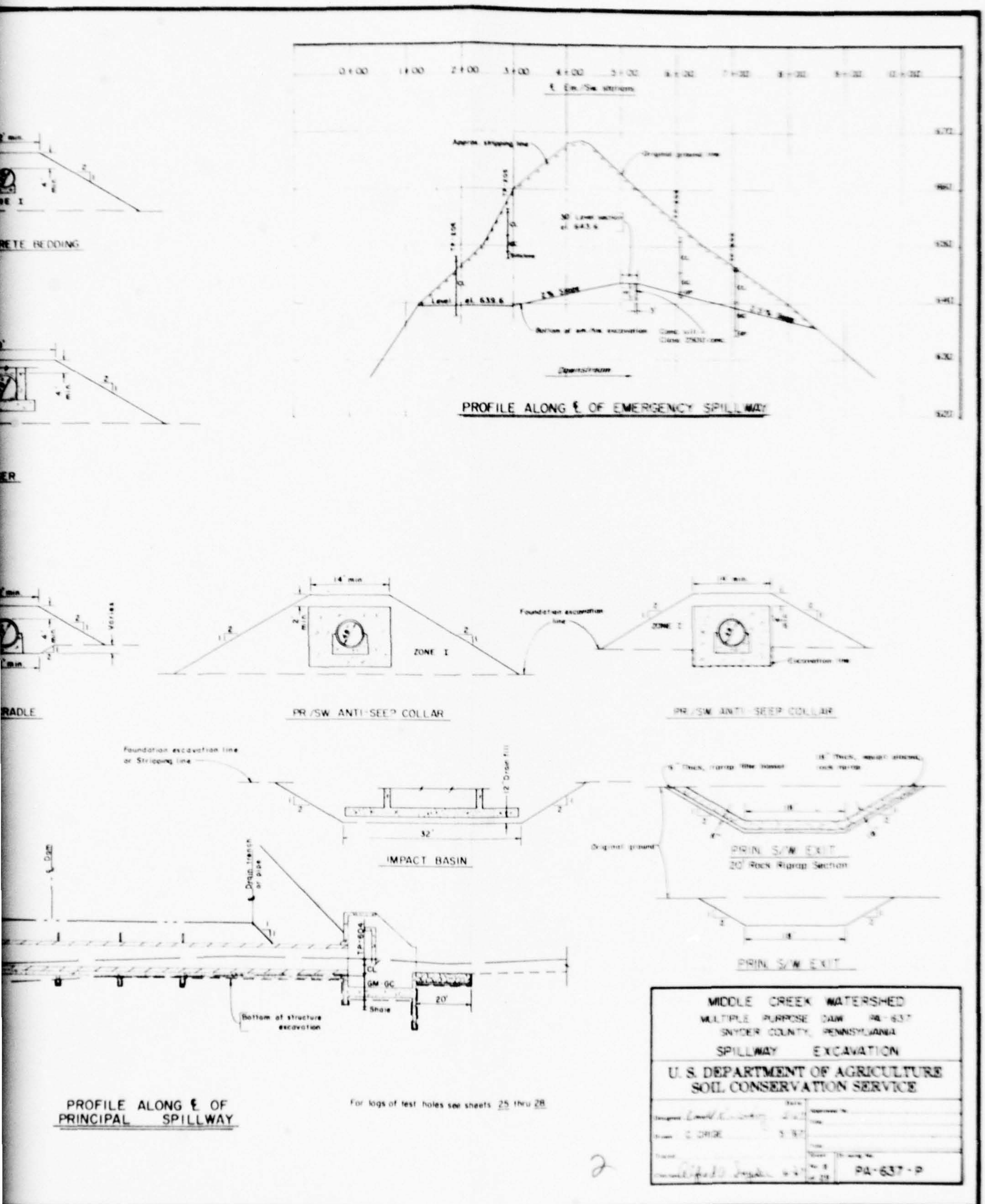


PR/SW ANTI-SEEP COLLAR



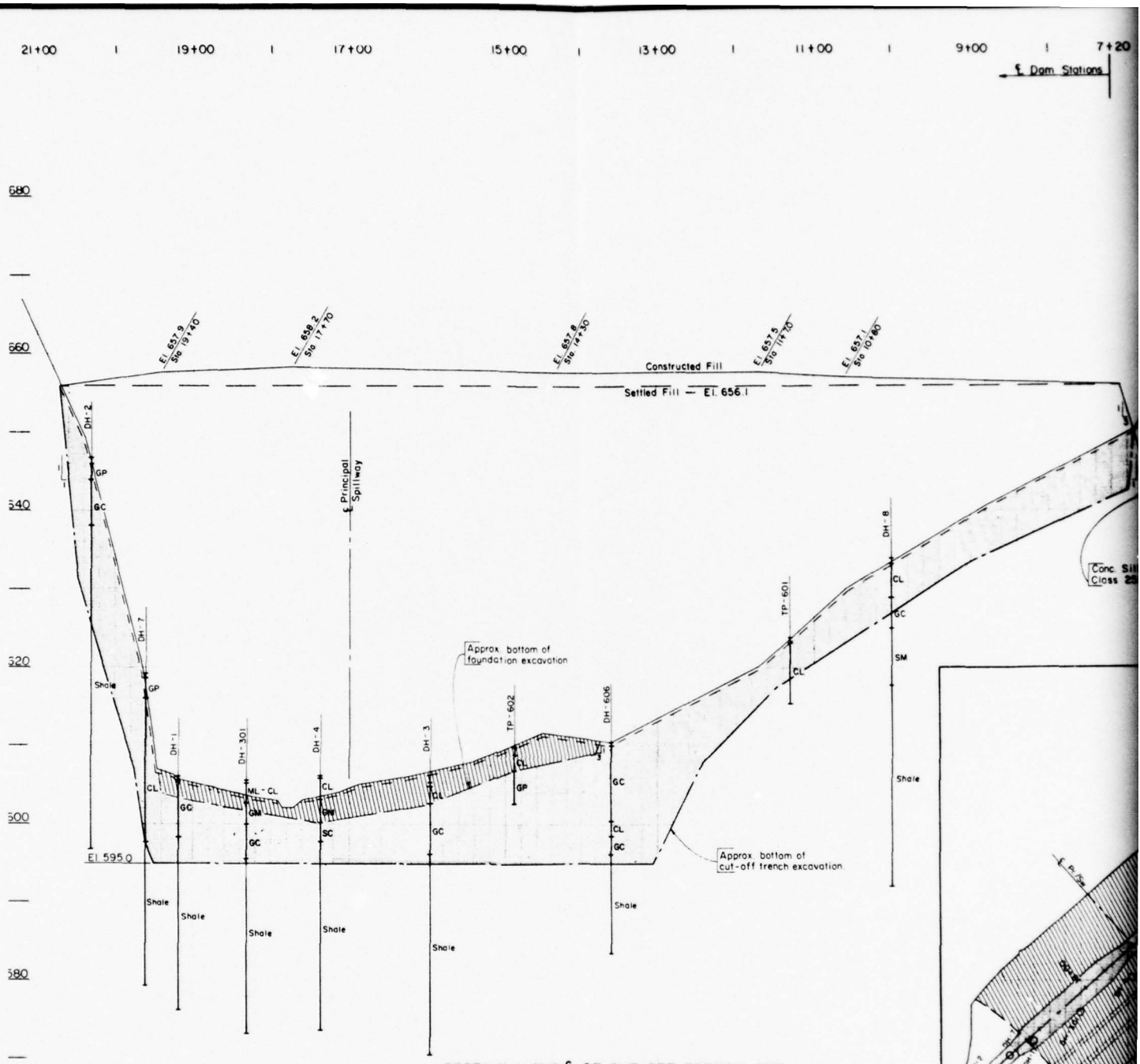
PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY

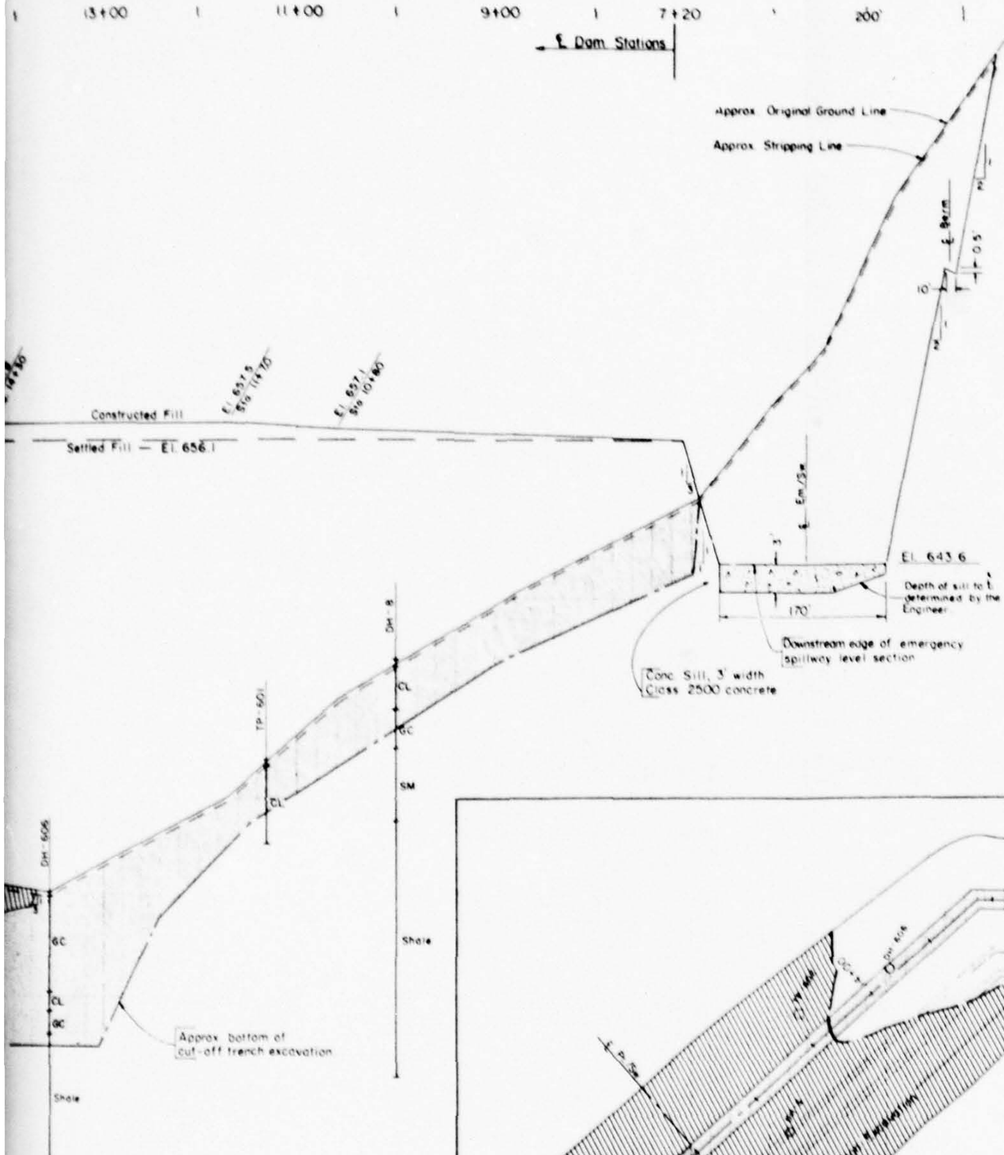
For logs of test holes see sheets 25



L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 6

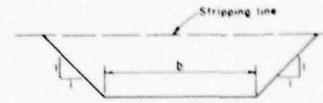

21+00
19+00
17+00
15+00
13+00
11+00
9+00
7+20
℄ Dam Stations
680
660
640
620
600
580
El. 657.9 Sta 19+40
El. 658.2 Sta 17+70
El. 657.8 Sta 14+30
El. 657.5 Sta 11+70
El. 657.1 Sta 10+80
Constructed Fill
Settled Fill — El. 656.1
DH-2
DH-7
DH-1
DH-301
DH-4
DH-3
TP-602
DH-606
TP-601
DH-8
℄ Principal Spillway
Approx. bottom of foundation excavation
Approx. bottom of cut-off trench excavation
Conc. Sill Class 2
GP
GC
CL
ML-CL
GW
SC
SM
Shale
El. 595.0
PROFILE ALONG ℄ OF CUT-OFF TRENCH AND UPSTREAM EDGE OF LEVEL SECTION
CONSTRUCTION OF:
1. For logs of test holes see sheets 25 thru
2. Foundation excavation shall consist of the soft, we
Sta. 20+70
℄ Dam
℄ Cut-Off Trench
Appres.
PL



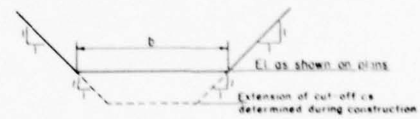
... OF CUT-OFF TRENCH AND
...GE OF LEVEL SECTION

CONSTRUCTION ...
... see sheets 25 thru
...shall consist of the soft, we...

STATION	BOTTOM WIDTH (b)
6+85 to 9+70	12'
9+70 to 9+90	Transition (12' to 24')
9+90 to 17+20	24'
17+20 to 17+60	Transition (24' to 40')
17+60 to 19+20	40'
19+20 to 19+50	Transition (40' to 24')
19+50 to 19+93	24'
19+93 to 20+13	Transition (24' to 12')
20+13 to 20+70	12'

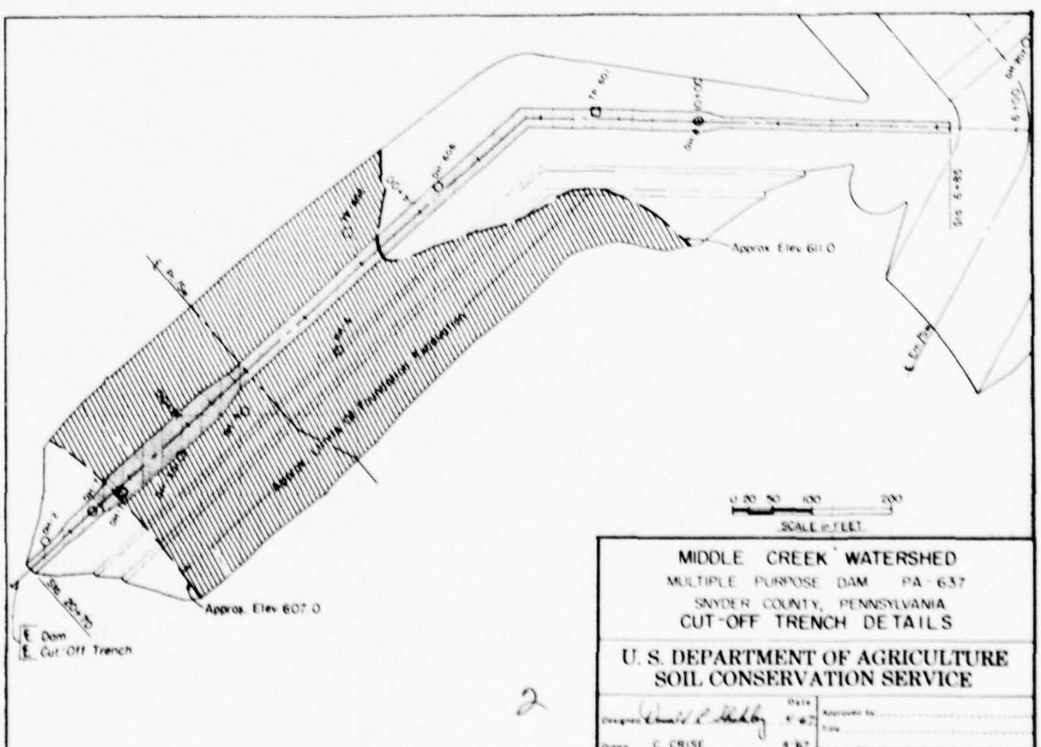


Typical from sta. 6+85 to 13+00,
and sta. 19+50 to 20+70



Typical from sta. 13+00 to 19+50

SECTIONS THRU CUT-OFF TRENCH



PLAN VIEW OF CUT-OFF TRENCH

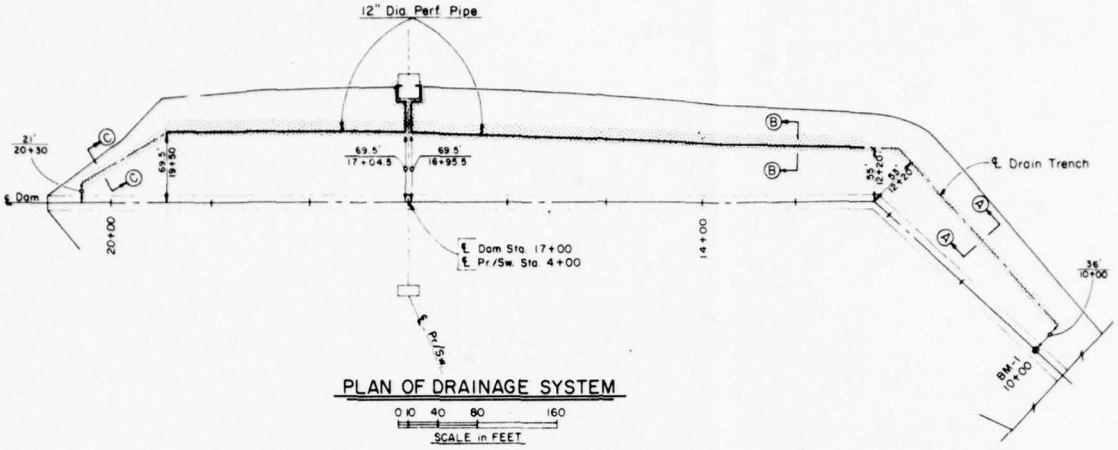
MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
CUT-OFF TRENCH DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

2

Designed [signature]	4-67	Approved by	
Drawn C. CRISE	4-67	Title	
Traced		Sheet No. 9 of 29	Drawing No. PA-637-P
Checked Alfred A. Snyder	6-67		

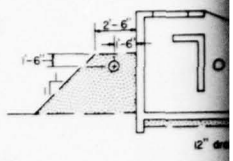
A 55.1
FORM SCS-316 (APRIL 1963)



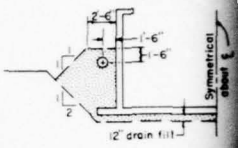
PLAN OF DRAINAGE SYSTEM

0 10 40 80 160

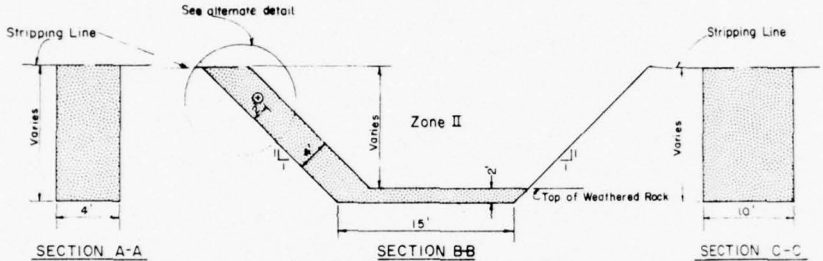
SCALE in FEET



SECTION I-I



SECTION H-H



SECTION A-A

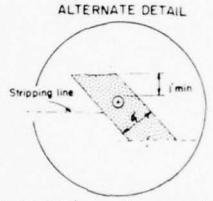
Typical from Sta. 10+00 to 12+25

SECTION ~~B-B~~

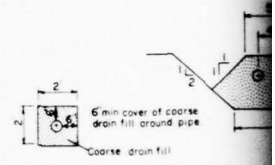
Typical from Sta. 12+35 to 16+85 and 17+15 to 19+45

SECTION C-C

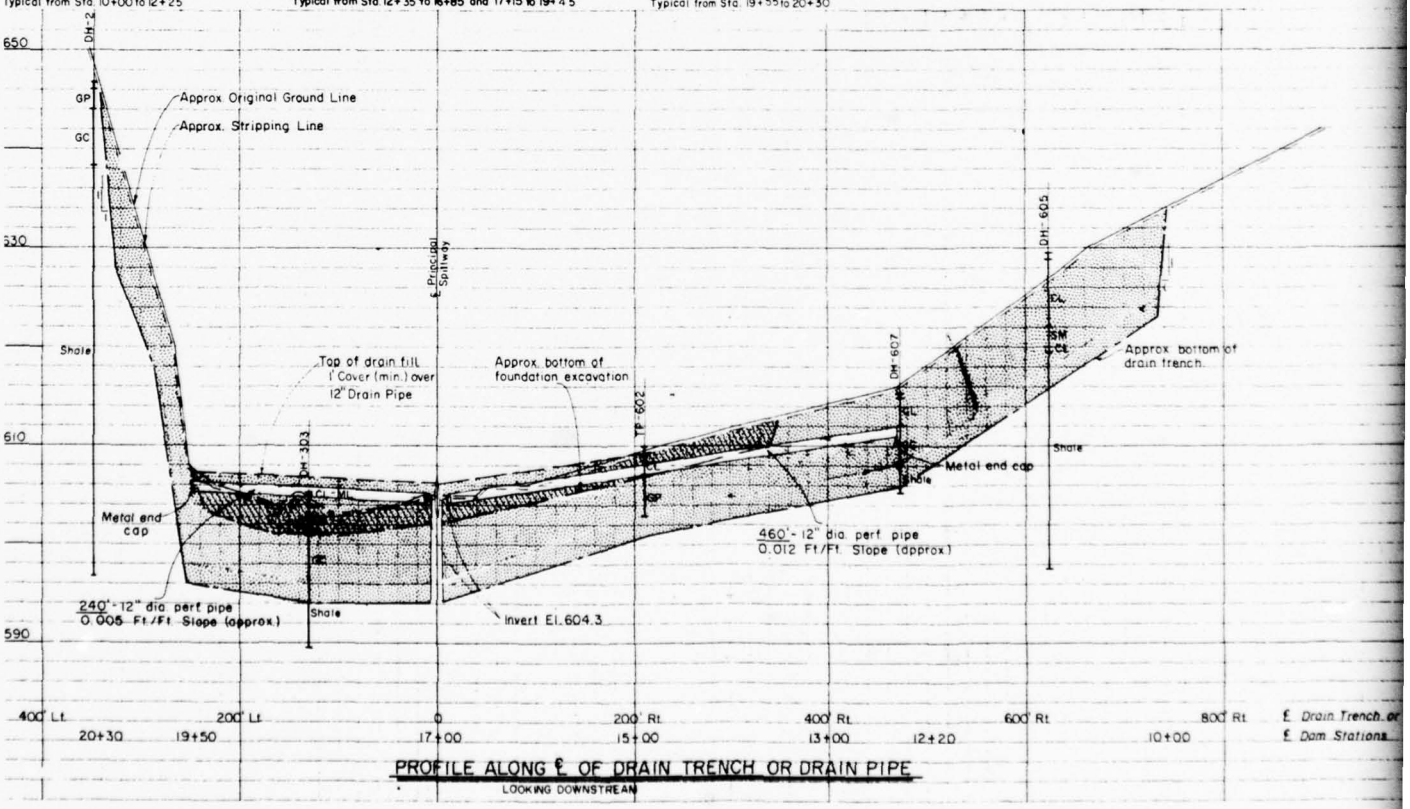
Typical from Sta. 19+55 to 20+30



Note A 10' transition is required between each typical section

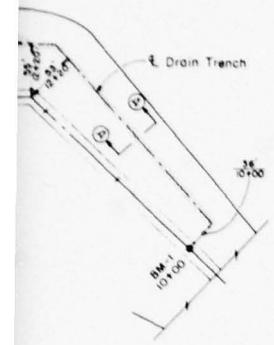


TYPICAL SECTION PERFORATED PIPE

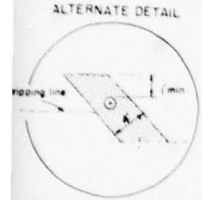


PROFILE ALONG ℄ OF DRAIN TRENCH OR DRAIN PIPE

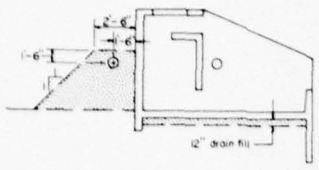
LOOKING DOWNSTREAM



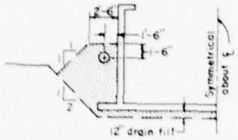
ALTERNATE DETAIL



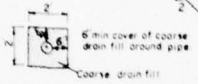
te. A 10' transition is required between each typical section.



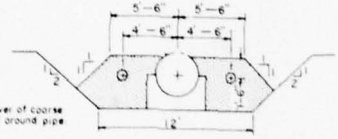
SECTION I-I



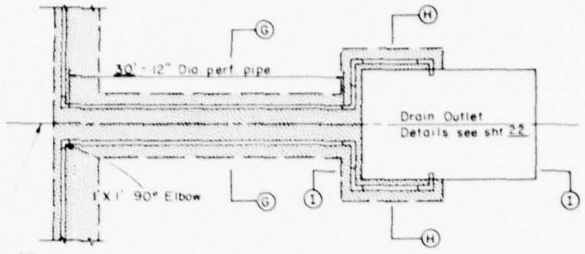
SECTION H-H



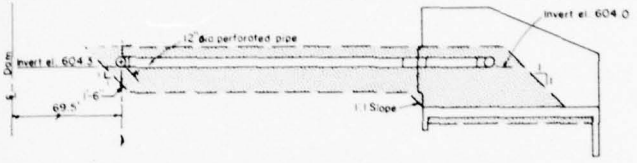
TYPICAL SECTION PERFORATED PIPE



SECTION G-G



PLAN OF OUTLET DRAIN

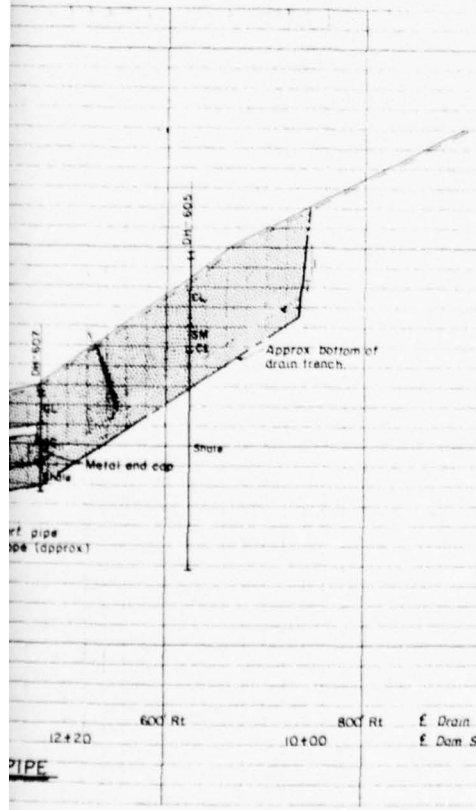


TYPICAL SECTION ALONG OUTLET DRAIN

FOUNDATION EXCAVATION
DRAIN FILL

CONSTRUCTION NOTES

1. All drain pipe shall conform to material specification 110, and shall be 12" dia., 16 gauge, shape I, class I, type D, perforated pipe.
2. Bottom of the drain trench to be 2' in weathered rock for the entire length.
3. For logs of test holes, see sheets 25, 26, 27, 28.
4. Riprap filter blanket material shall meet fine drain fill gradation limits.



QUANTITY SUMMARY

12" Dia. Perforated Pipe
37 — 20' Sections
4 — 10' Sections
2 — 1'x1' Elbows-90°
2 — 3'-5"x1'-4" Elbows-90°
2 — 3'-4"x2'-0" Elbows-90°
2 — 3'-0"x1'-8" Elbows-90°
2 — Metal End Caps
2 — Small Animal Guards (Details sh 15)
81'-6" Total (Use standard coupling bands)

GRADATION LIMITS
FINE DRAIN FILL

Sieve No.	% Passing
3/8	100
No. 4	90 - 100
No. 8	70 - 92
No. 16	50 - 80
No. 30	35 - 65
No. 50	10 - 30
No. 100	1 - 8

GRADATION LIMITS
COARSE DRAIN FILL

Sieve No.	% Passing
1"	100
3/4"	90 - 100
3/8"	20 - 55
#4	0 - 10
#8	0 - 5

Note: Percentage based on dry weight

600' Rt 12+20
800' Rt 10+00
℄ Drain Trench or Drain Pipe Stations
℄ Dam Stations

PIPE

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
DRAINAGE DETAILS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

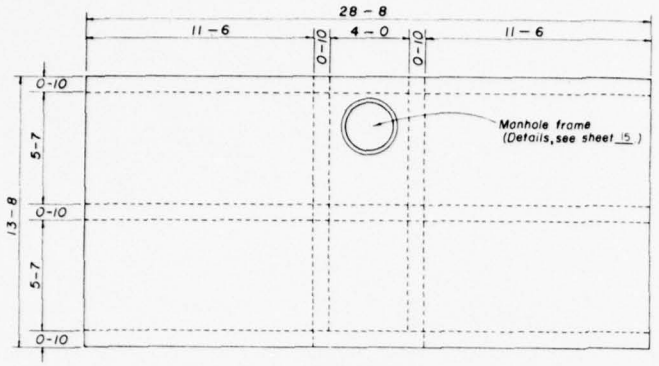
Designed	Date	Approved by
	3-67	Title
Drawn R. J. MAYS	4-'67	
Traced		Title
Checked		Sheet No. 10 of 29 — Drawing No. PA-637-P

A55:1 Form SCS-317 (November 1955)

2

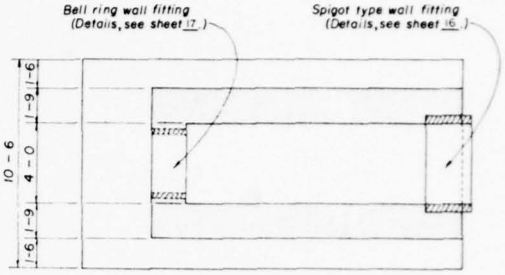
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 8



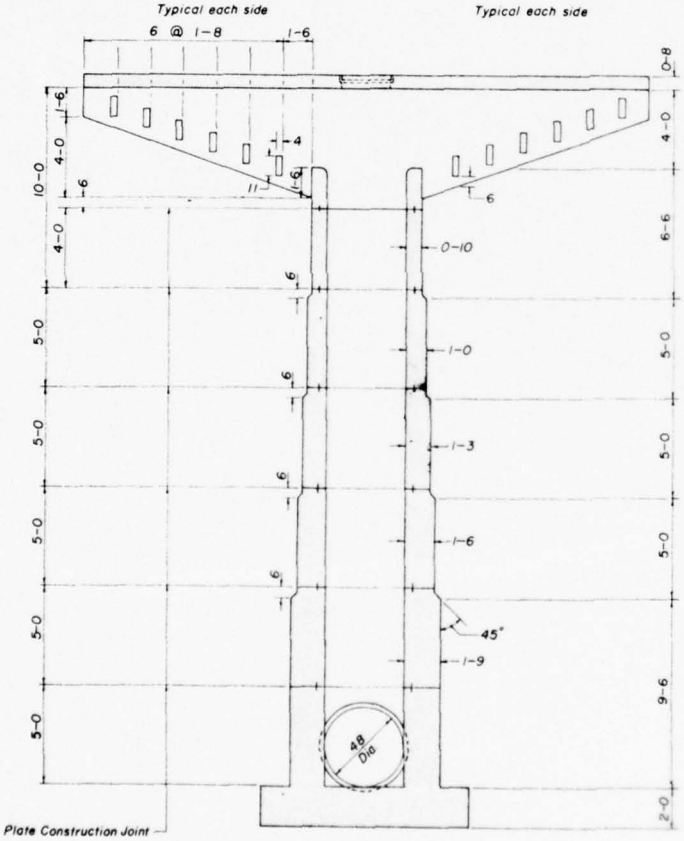
TOP PLAN

Trash rack
(Details, see sheet 15)

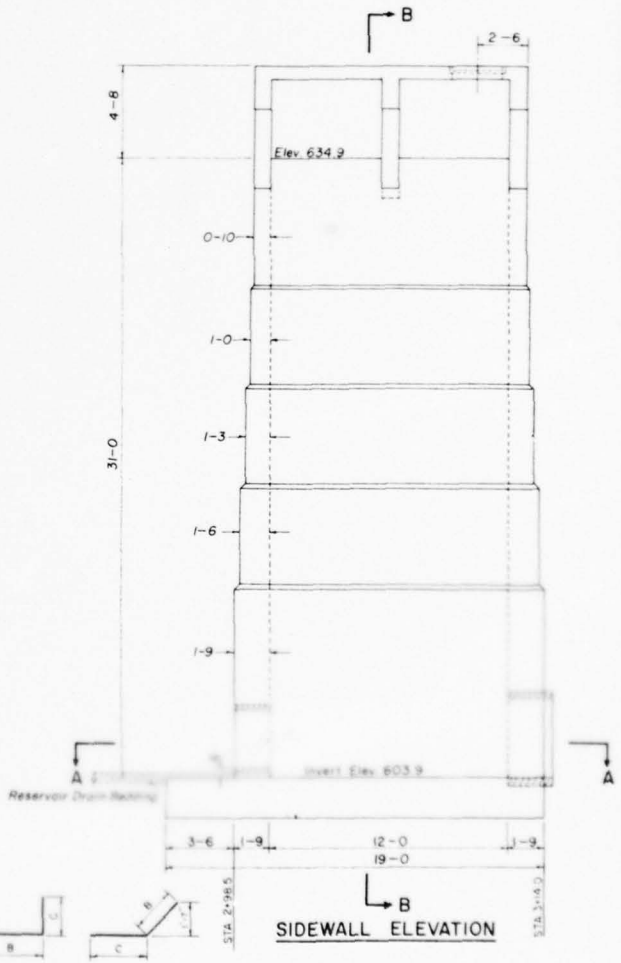


SECTION A-A

NOTE
Construction Details
see sheet 13 .



SECTION B-B



SIDEWALL ELEVATION

1/4" x 6" Steel Plate, ASTM A36 or A7,
Continuous thru Const'r. Joint.
Splices shall be either:
1. Butt Welded
2. Lapped 3" and Bolted
3. Lapped 3" and Fillet Welded

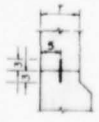
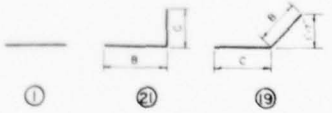
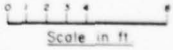
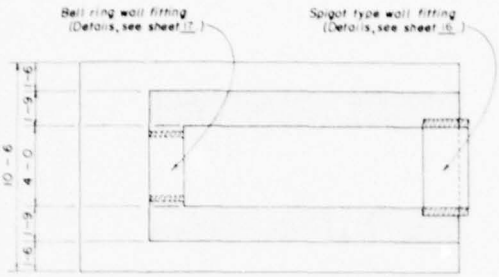


PLATE CONSTRUCTION JOINT



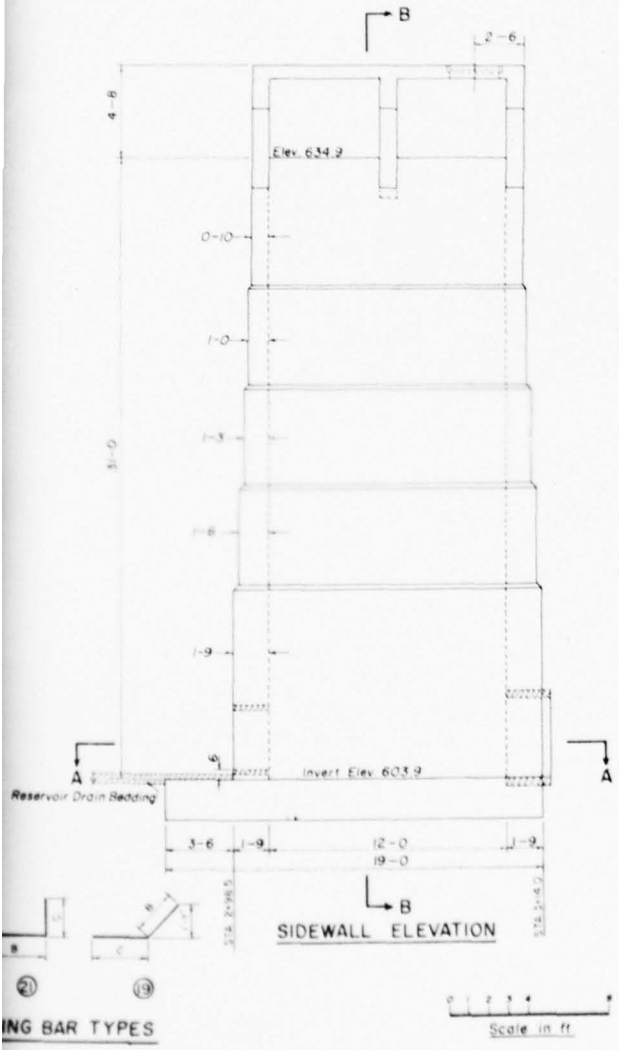
REINFORCING BAR TYPES





SECTION A-A

Construction Details
see sheet 13



ING BAR TYPES

STEEL SCHEDULE

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
B-1	6	27	10-2	1			274.50
B-2	6	32	18-8	1			597.33
B-3	9	62	15-7	21	10-7	5-0	966.16
B-4	7	6	11-3	21	9-0	2-3	67.50
B-5	7	2	4-6	21	2-3	2-3	9.00
B-6	7	3	4-3	21	2-0	2-3	12.75
B-7	7	2	4-3	21	3-1	1-2	8.50
B-8	7	11	3-9	1			41.25
B-9	7	28	14-10	21	7-6	7-4	415.33
B-10	6	4	10-3	21	1-9	8-6	41.00
B-11	6	4	9-9	21	1-3	8-6	39.00
B-12	6	8	9-6	21	1-0	8-6	76.00
B-13	6	2	11-0	21	2-6	8-6	22.00
B-14	6	10	15-0	21	4-6	8-6	150.00
B-15	6	4	10-9	21	2-3	8-6	43.00
B-16	6	8	10-3	21	1-9	8-6	82.00
B-17	6	20	12-9	1			255.00
B-18	6	6	4-9	1			28.50
B-19	7	2	2-9	21	0-6	2-3	5.50
B-20	7	2	3-6	21	1-3	2-3	7.00
B-21	7	3	3-9	21	2-7	1-2	11.25
B-22	6	8	4-0	1			32.00
R-1	7	50	4-6	1			225.00
R-2	7	36	7-3	1			261.00
R-3	7	46	5-0	1			230.00
R-4	6	46	4-6	1			207.00
R-5	6	36	7-0	1			252.00
R-6	6	40	4-4	1			173.33
R-7	6	40	4-6	1			180.00
R-8	6	36	7-0	1			252.00
R-9	6	44	4-4	1			190.67
R-10	5	44	4-6	1			198.00
R-11	5	36	6-7	1			237.00
R-12	5	36	3-10	1			138.00
R-13	6	36	13-0	21	8-6	4-6	468.00
R-14	6	40	12-6	21	8-3	4-3	500.00
R-15	6	40	12-0	21	8-0	4-0	480.00
R-16	6	40	11-6	21	7-9	3-9	460.00
R-17	6	4	11-2	21	7-7	3-7	44.67
R-18	6	80	4-9	1			380.00
R-19	6	80	12-9	1			1020.00
M-1	5	14	8-0	21	6-6		91.00
M-2	5	58	5-9	1			333.50
M-3	5	12	6-5	1			77.00
M-4	5	14	6-4	21	6-4		88.66
M-5	5	8	2-2	1	2-2		17.33
M-6	5	8	2-6	1	2-6		20.00
M-7	5	8	2-9	1	2-9		22.00
M-8	5	8	3-0	1	3-0		24.00
M-9	5	8	3-4	1	3-4		26.66
M-10	5	8	3-8	1	3-8		29.33
M-11	5	8	4-0	1	4-0		32.00

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
M-12	5	8	4-3	1	4-3		34.00
M-13	5	8	4-6	1	4-6		36.00
M-14	5	8	4-10	1	4-10		38.00
M-15	5	8	5-0	1	5-0		40.00
M-16	5	8	5-4	1	5-4		42.66
M-17	5	8	5-8	1	5-8		45.33
M-18	5	4	5-8	1			22.67
M-19	5	4	5-4	1			21.33
M-20	5	4	5-0	1			20.00
M-21	5	4	4-10	1			19.33
M-22	5	4	4-6	1			18.00
M-23	5	4	4-3	1			17.00
M-24	5	4	4-0	1			16.00
M-25	5	4	3-8	1			14.67
M-26	5	4	3-4	1			13.33
M-27	5	4	3-0	1			12.00
M-28	5	4	2-9	1			11.00
M-29	5	4	2-6	1			10.00
M-30	5	4	2-2	1			8.67
M-31	5	12	14-4	19	1-8	12-8	172.00
M-32	6	40	11-2	21	7-7	3-7	446.67
M-33	6	4	14-5	21	7-7	6-10	57.67
M-34	6	4	15-10	21	7-7	8-3	63.33
M-35	5	2	17-0	1			34.00
M-36	5	2	22-8	1			45.33
M-37	5	4	28-4	1			113.33
M-38	6	2	9-0	1			18.00
M-39	6	2	11-4	1			22.67
M-40	5	2	17-0	1			34.00
M-41	5	2	22-8	1			45.33
M-42	5	4	28-4	1			113.33
M-43	5	2	5-8	1			11.33
M-44	5	2	11-4	1			22.67
M-45	5	2	17-0	1			34.00
M-46	5	2	22-8	1			45.33
M-47	5	4	28-4	1			113.33
M-48	6	24	12-8	1			304.00
M-49	6	20	4-8	1			93.33
M-50	5	5	9-9	1			48.75
M-51	5	52	12-9	1			663.00
M-52	4	11	28-4	1			311.67
M-53	4	6	12-9	1			76.50
M-54	5	3	9-9	1			29.25
M-55	5	26	13-4	1			346.67
M-56	4	11	28-4	1			311.67
M-57	4	6	12-9	1			76.50
M-58	5	26	5-9	1			149.50
M-59	5	2	5-2	1			10.33

Note: Concrete summary see sht 21

QUANTITIES (Riser only)

CONCRETE Class 4000; 902.3 Cu Yds

STEEL

No 4 Bars — 776.33 ft, 518.6 lbs
No 5 Bars — 2806.61 ft, 3,970.2 lbs
No 6 Bars — 7233.67 ft, 10,865.0 lbs
No 7 Bars — 1294.08 ft, 2,855.1 lbs
No 9 Bars — 966.16 ft, 3291.9 lbs
Total — 21,283.8

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
RISER STRUCTURAL DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

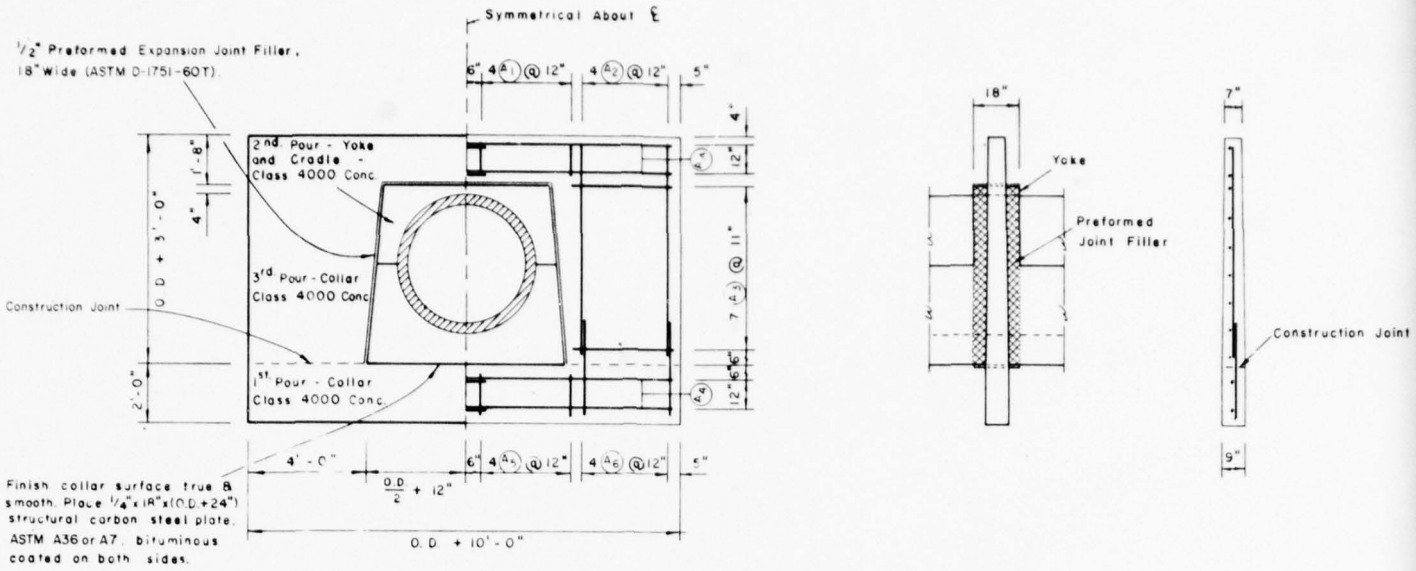
Designed	Geo VanBuskirk	Date Jan 67	Approved by
Drawn	R.J. MAYS	4-67	Title
Traced			Title
Checked			Sheet No. 52
			Drawing No. PA-637-P

A55-1

SCS-313B (APRIL 1963)

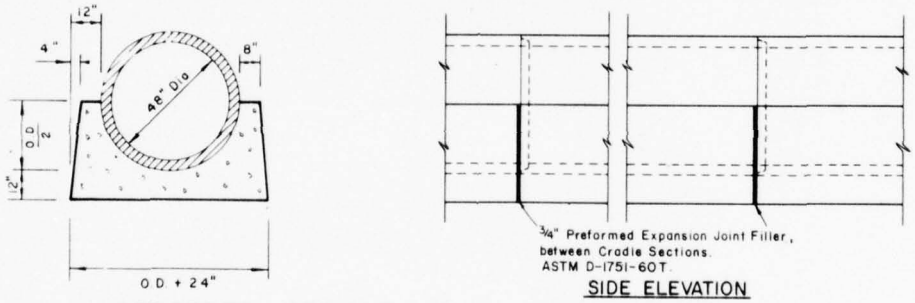
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 9



REINFORCED CONCRETE ANTI-SEEP COLLAR

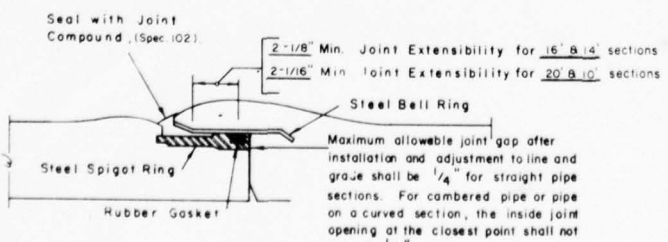
6 -Req'd



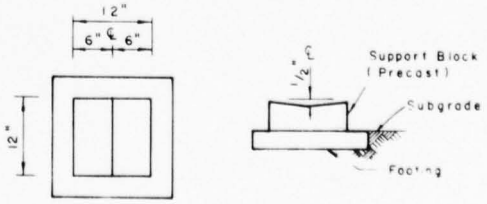
CONCRETE CRADLE

(Class 4000 Conc)

SIDE ELEVATION



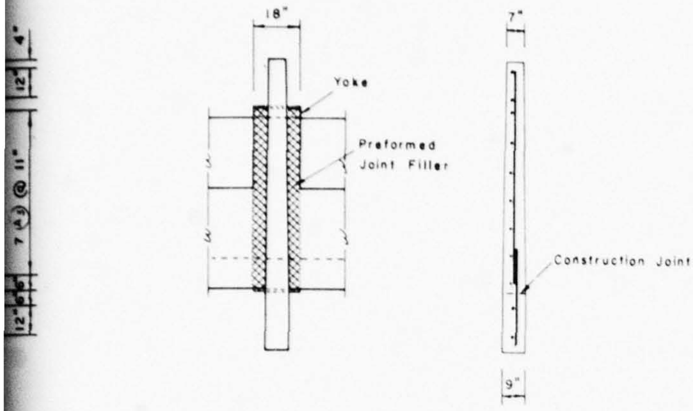
REINFORCED CONCRETE WATER PIPE JOINT



PLAN FRONT ELEV.

SUGGESTED SUPPORT BLOCK

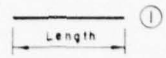
NOTE: The contractor shall determine the number and size of the blocks.



ANTI - SEEP COLLAR

6 -Req'd

BAR TYPE



ANTI SEEP COLLAR STEEL SCHEDULE

Mark	Size	Length	Type	Quan. / Collar	Total Quan.	Total Length
A-1	4	1-3	1	8	48	60.00
A-2	4	7-3	1	8	48	348.00
A-3	4	3-6	1	14	84	294.00
A-4	4	8-0	1	8	48	384.00
A-5	4	1-6	1	8	48	72.00
A-6	4	3-9	1	8	48	180.00

NOTE:

Bar lengths do not change with changes in outside diameter of pipe.

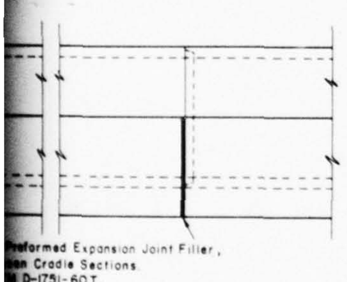
QUANTITIES (This Sheet Only)

STEEL

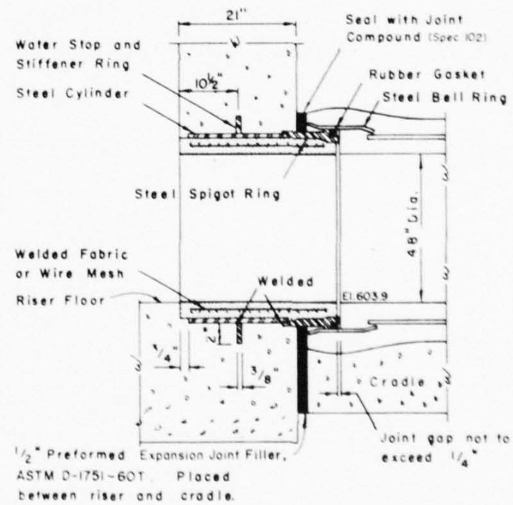
No. 4 Bar 1338.00 = 893.8 Lbs.

CONCRETE

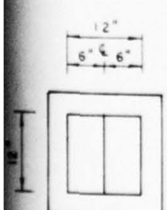
Class 4000 108.86 Cu. Yds.

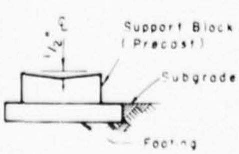


SIDE ELEVATION



SPIGOT RING WALL FITTING





PLAN FRONT ELEV.

SUGGESTED SUPPORT BLOCK

NOTE:

The contractor shall determine the number and size of the blocks.

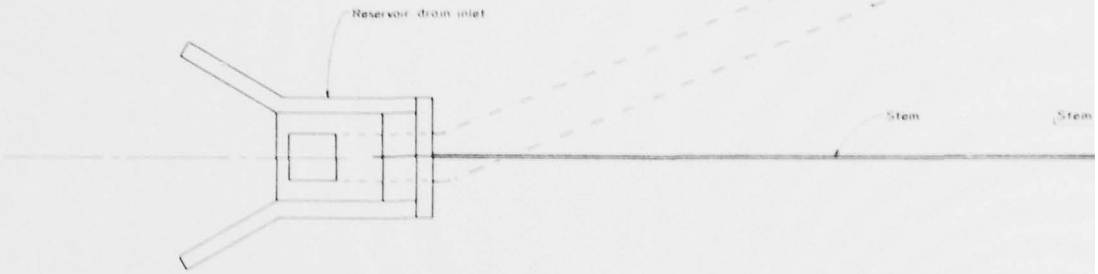
MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
CONDUIT DETAILS
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed Donald R. Shockley	Date 3-67	Approved by
Drawn C. Crise & R. J. Mays	Apr. '67	Title
Traced		Title
Checked Alfred A. Snyder	5-67	Sheet No. 16 of 29 — Drawing No. PA-637-P

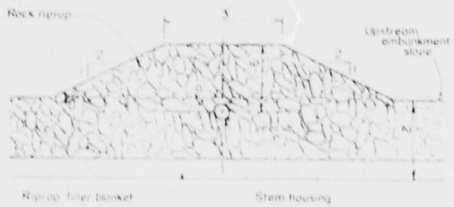
2

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

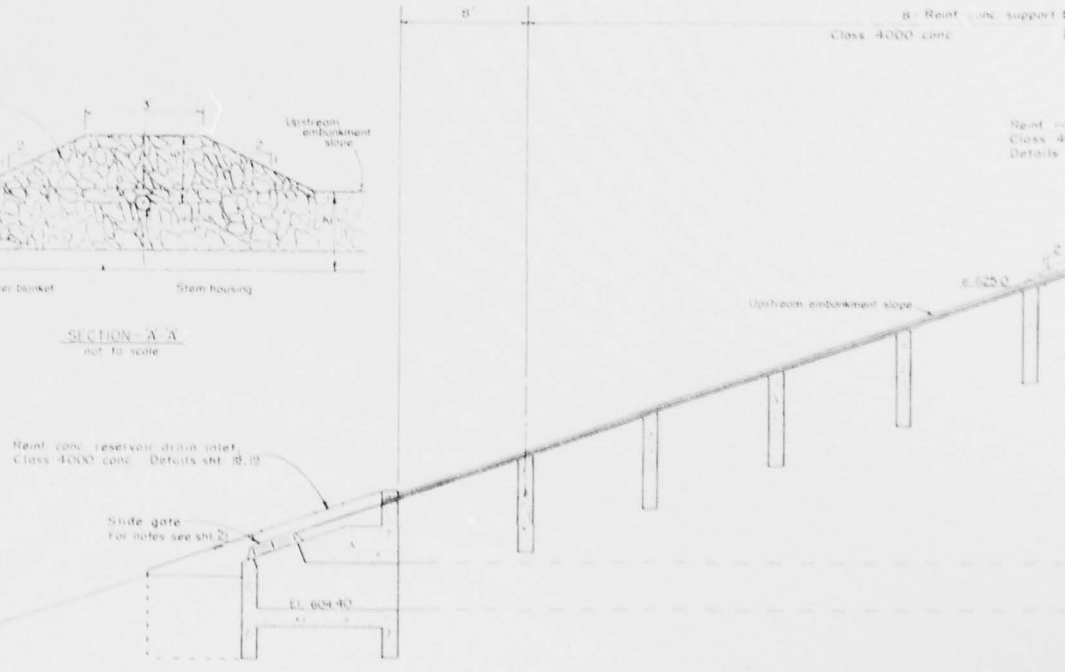
FIGURE 10



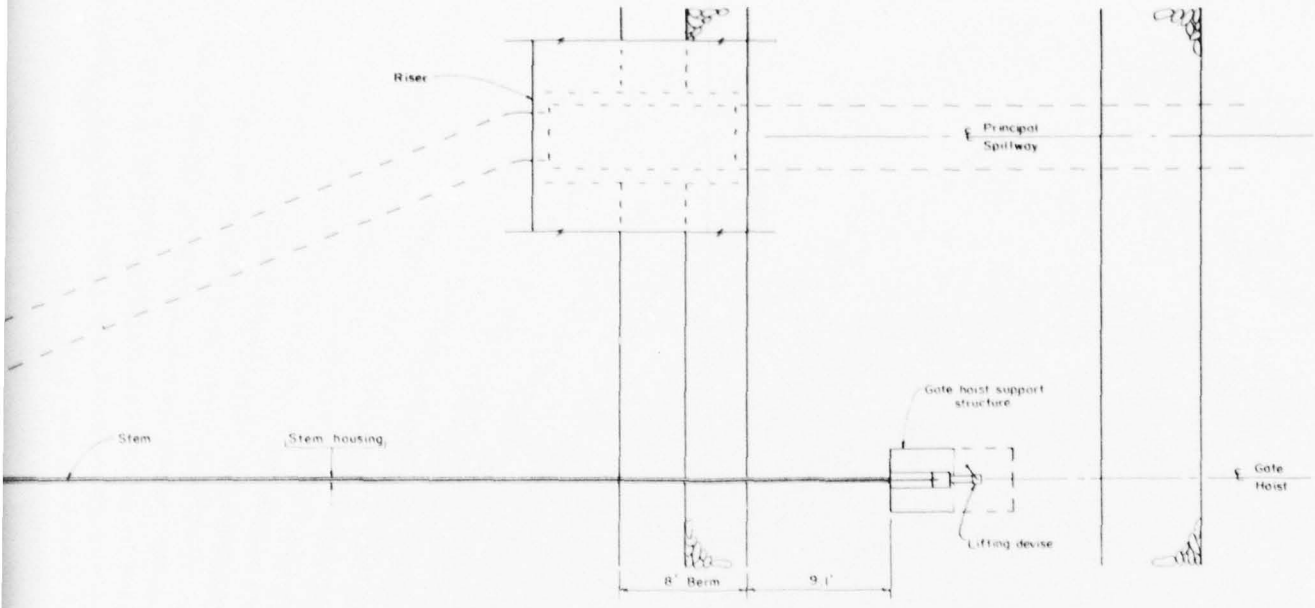
PLAN VIEW



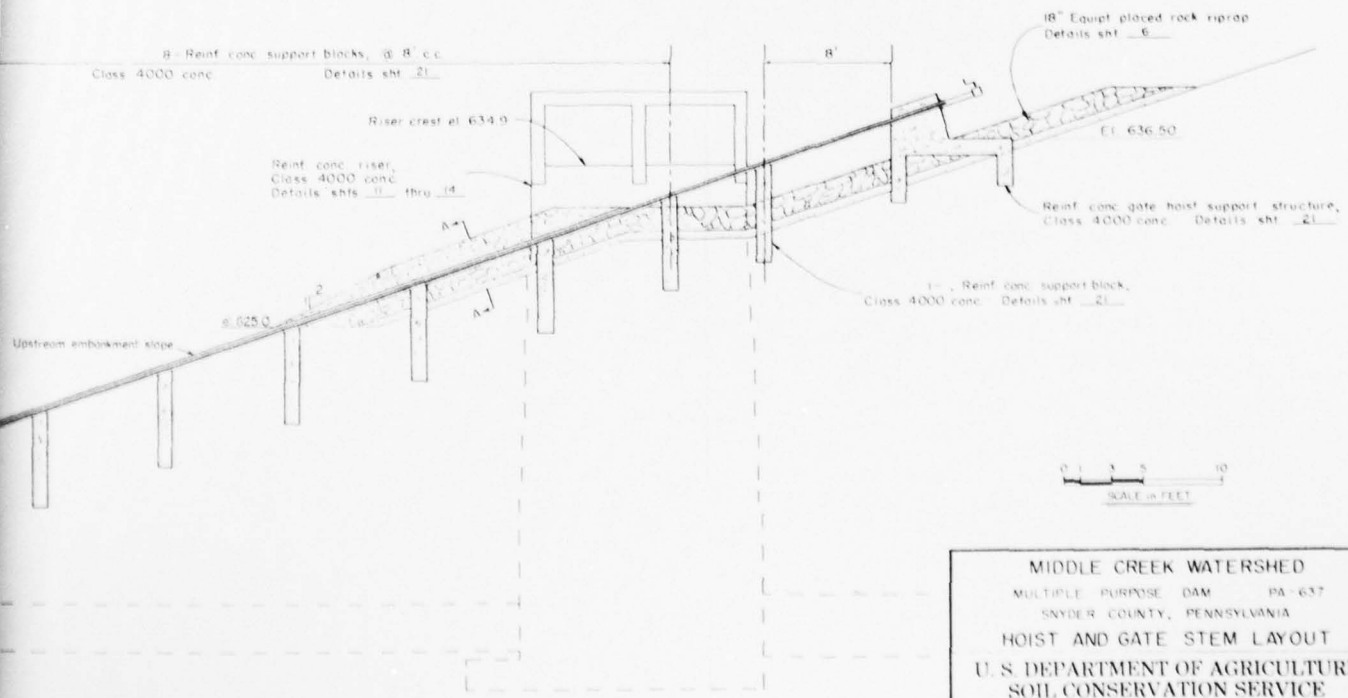
SECTION 'A'-'A'
not to scale



PROFILE ALONG ℄ OF GATE HO



PLAN VIEW



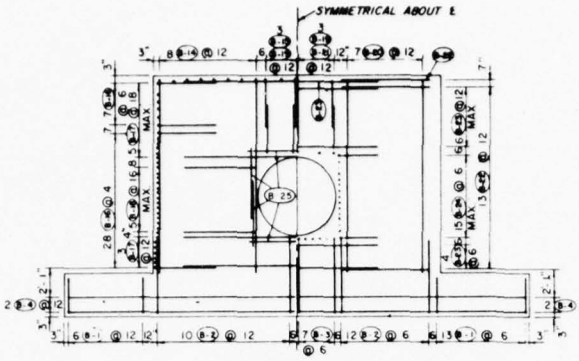
PROFILE ALONG ℄ OF GATE HOIST

MIDDLE CREEK WATERSHED	
MULTIPLE PURPOSE DAM PA-637	
SNYDER COUNTY, PENNSYLVANIA	
HOIST AND GATE STEM LAYOUT	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
C. CRISE 5-67	
	PA-637-P

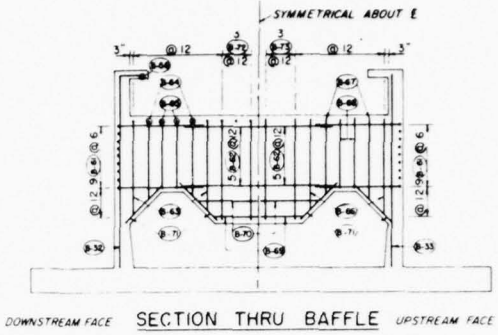
2

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

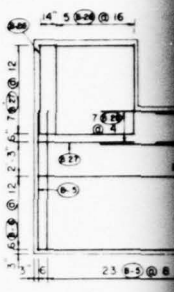
FIGURE 11



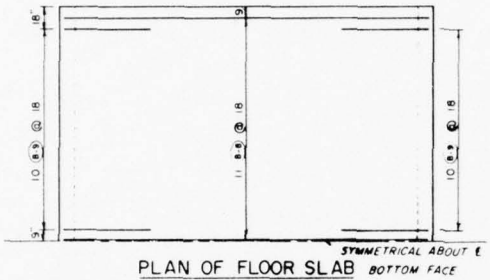
UPSTREAM FACE **SECTION D-D** DOWNSTREAM FACE



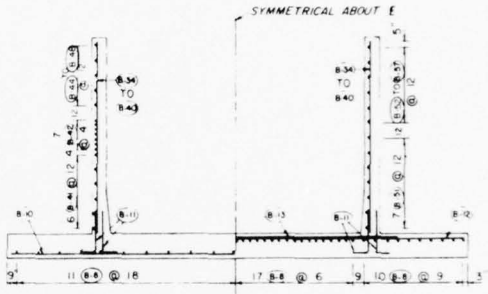
DOWNSTREAM FACE **SECTION THRU BAFFLE** UPSTREAM FACE



DOWNSTREAM FAC



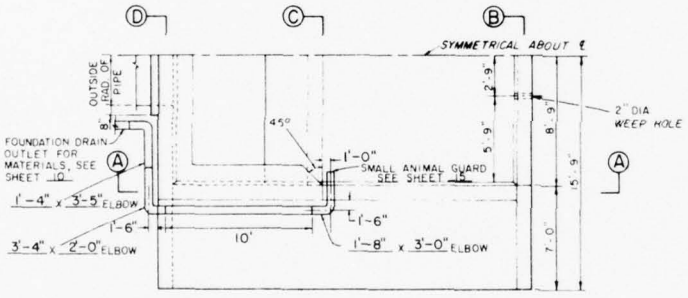
PLAN OF FLOOR SLAB



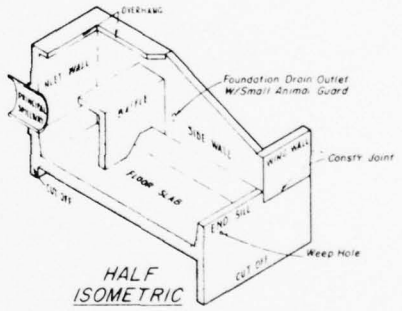
OUTSIDE FACE **SECTION C-C** INSIDE FACE

FOUNDATION DRAIN PIPE

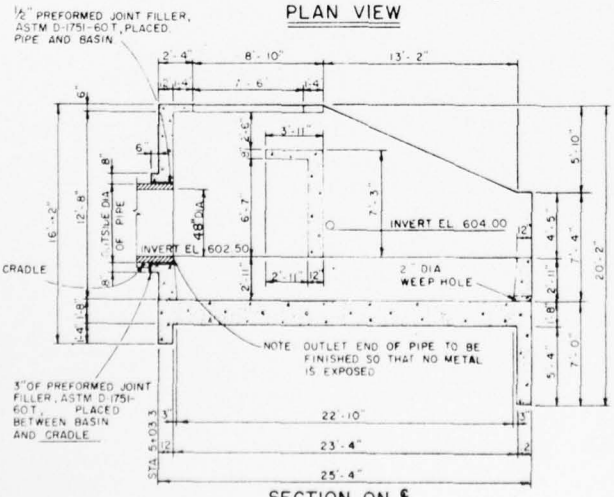
Bend reinforcing steel for installation as necessary



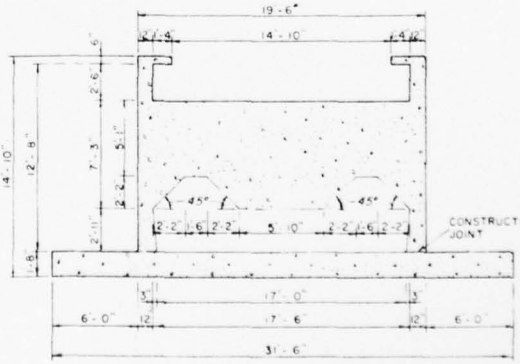
PLAN VIEW



HALF ISOMETRIC



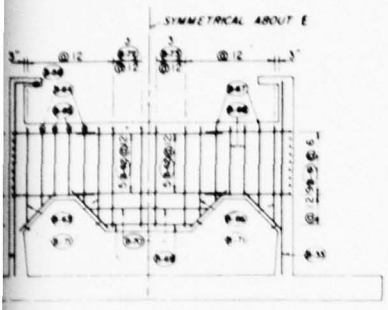
SECTION ON ℄



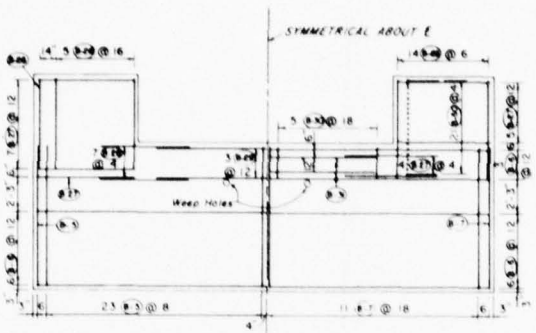
SECTION THRU BAFFLE

NOTES

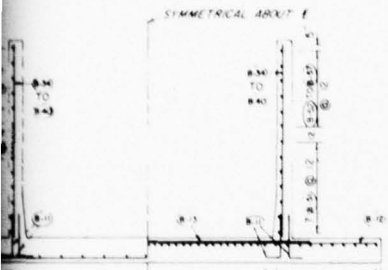
1. For impact basin fence details see sht 23
2. For concrete summary see sht 21
3. For construction details, see sheet 13



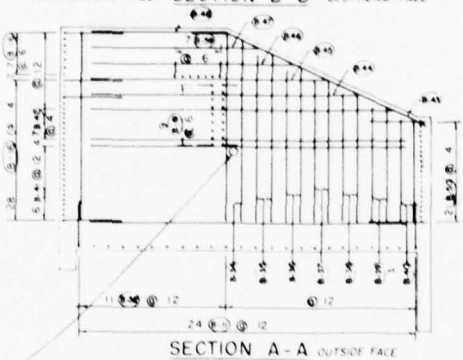
SECTION THRU BAFFLE UPSTREAM FACE



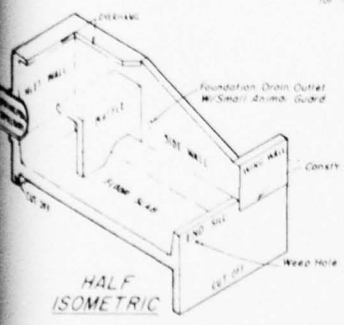
DOWNSTREAM FACE SECTION B-B UPSTREAM FACE



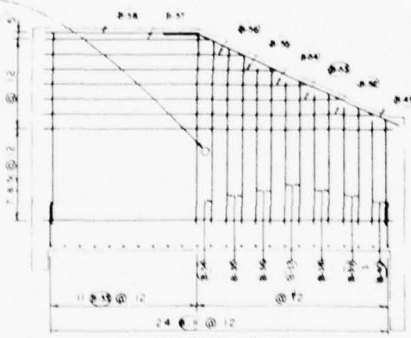
INSIDE FACE SECTION C-C INSIDE FACE FOUNDATION DRAIN PIPE



SECTION A-A OUTSIDE FACE

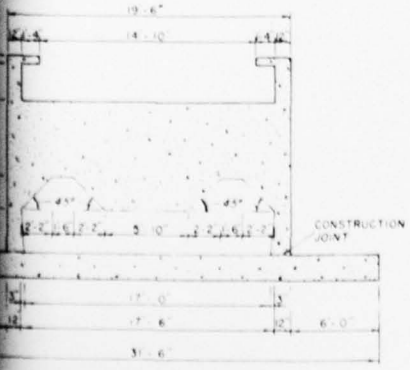


Bend reinforcing steel for installation as necessary



SECTION A-A INSIDE FACE

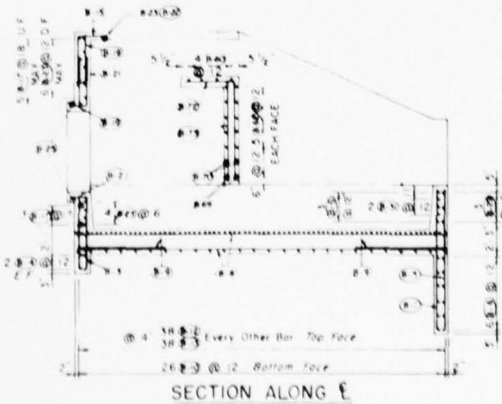
BAR TYPES



SECTION THRU BAFFLE

NOTES

1. For impact basin fence details see sht 23
2. For concrete summary see sht 21
3. For construction details, see sheet 13



SECTION ALONG ℄

STEEL SCHEDULE

MARK	LOCATION	QUAN	SIZE	LENGTH	TYPE	A	B	TOTAL FT
B-1	CUT-OFF	38	5	2-6	1			95.00
2		44	5	5-0	1			220.00
3		13	5	6-0	21	5-0	1-0	78.00
4		4	5	31-0	1			124.00
B-5	CUT-OFF	48	5	9-6	1			456.00
6		15	5	31-0	1			465.00
7		23	6	9-6	1			218.50
8	FLOOR SLAB	74	6	25-0	1			1850.00
9		40	6	6-0	1			240.00
B-10		26	5	31-0	1			806.00
11		96	5	4-0	21	3-0	1-0	384.00
12		38	8	31-0	1			1178.00
13		38	8	22-0	1			836.00
14	INLET WALL	16	5	14-6	21	12-9	1-9	232.00
B-15		5	5	5-0	21	3-3	1-9	25.00
16		70	7	8-0	21	4-0	4-0	560.00
17		8	7	15-6	1			124.00
18		10	7	5-0	1			50.00
19		10	7	3-11	1			32.75
B-20		14	5	12-9	1			178.50
21		5	5	4-3	21	3-3	1-0	21.25
22		28	5	6-0	1			168.00
23		11	8	9-9	1			107.25
24		30	8	3-6	21	2-6	1-0	105.00
B-25		8	5	3-9	1			30.00
26	WING WALL	40	6	6-6	1			260.00
27		34	5	6-1	1			221.00
28	END SILL	14	7	6-0	1			84.00
29		3	7	15-0	1			45.00
B-30		10	5	2-9	1			27.50
31		2	6	15-0	1			30.00
32	SIDE WALLS	22	5	14-9	21	13-0	1-9	324.50
33		22	5	13-0	1			286.00
34		4	5	12-6	1			50.00
B-35		8	5	11-6	1			92.00
36		8	5	10-6	1			84.00
37		8	5	9-6	1			76.00
38		8	5	9-0	1			72.00
39		8	5	8-0	1			64.00
B-40		8	5	7-0	1			56.00
41		12	8	21-0	1			252.00
42		14	8	21-0	1			294.00
43		2	8	17-6	1	15-0	2-6	35.00
44		2	8	18-3	1			36.50
B-45		2	8	16-0	1			32.00
46		2	8	13-9	1			27.50
47		2	8	11-6	1			23.00
48		2	8	9-6	1			19.00
49		2	6	17-0	22	15-0	2-0	34.00
B-50		42	7	6-3	21	4-0	2-3	262.50
51		14	6	23-9	1			332.50
52		2	6	22-9	1			45.50
53		2	6	20-6	1			41.00
B-54		2	6	18-3	1			36.50
55		2	6	16-0	1			32.00
56		2	6	13-9	1			27.50
57		2	6	11-6	1			23.00
58		2	6	9-6	1			19.00
59	BAFFLE	4	4	6-9	21	5-9	1-0	54.50
B-60		4	4	10-0	1			40.00
61		36	5	6-9	21	5-9	1-0	243.00
62		10	5	10-8	1			106.67
63		4	5	9-9	21	6-3	3-6	39.00
64		4	5	8-9	21	5-3	3-6	35.00
B-65		4	5	8-0	21	4-6	3-6	32.00
66		4	5	6-3	1			25.00
67		4	5	5-0	1			21.00
68		4	5	4-6	1			18.00
69		2	5	6-0	1			12.00
B-70		2	5	8-0	1			16.00
71		8	5	3-6	1			28.00
72		6	5	10-3	21	6-9	3-6	61.50
73		6	5	6-9	1			40.50

QUANTITIES

REINFORCING STEEL BARS

NO. 4 BARS	134.50 LIN FT	89.85 LBS	
NO. 5 BARS	5313.42 LIN FT	5536.68 LBS	TOTAL
NO. 6 BARS	3189.50 LIN FT	4790.63 LBS	12,734.9 LIN FT
NO. 7 BARS	1452.25 LIN FT	2968.40 LBS	20,464.4 LBS
NO. 8 BARS	2651.25 LIN FT	7078.84 LBS	

CONCRETE CLASS 4000 99.4 CU YDS

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
IMPACT BASIN DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

W.R. Lemming 8/65
M. NIKOLICH
T.O. PURKEY
F.M. WYSONG

PA-637-P

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 12

DH 1, ELEV. 606.1, 18+67, Centerline
Logged by: C. C. Johnson 2/23-25/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.8	Forest litter, roots, etc.		SpT	1-3-7	1	Jar	0.0	1.5	35
0.8	7.8	Gravel, sandy & clayey; brn, moist, wet below 1.0', 45% gravel, 35% sand, 20% plastic fines, Coarse particles are subround to angular.	GC (MSC)	"	5-7-12			1.5	3.0	0
				"	12-15-20	2	"	3.0	4.5	55
				"	27-31-37	3	"	4.5	6.0	45
				"	40-26-21	4	"	6.0	7.5	55
				"	20-27-33	5	"	7.5	9.0	75
7.8	11.0	Shale, highly weathered, dk. gry with brn stains in bedding, planes, clayey.		"	17-24-29/0.3	6	"	9.0	10.3	70
				NXM				10.3	15.3	65
				"				15.3	20.3	82
11.0	30.0	Shale, weathered, blk, dk. gry on dry surface, moderately soft, largest piece of core 2.5'		"				20.3	25.3	100
				"				25.3	30.0	100
30.0		Bottom of boring WL (2-25-66) 1.7'								

DH 2, ELEV. 606.8, 19+81, Centerline
Logged by: C. C. Johnson 2/25-41/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.8	Forest litter, roots, small sandstone cobbles, etc.		SpT	1-3-3	1	Jar	0.0	1.5	25
				"	2-4-8	2	"	1.5	3.0	25
0.8	2.8	Recovered only rock fragments, poor sample recovery - trace of nonplastic fines.	GP?	"	10-7-05	3	"	3.0	4.5	10
				"	8-18-27	4	"	4.5	6.0	35
				"	18-18-20	5	"	6.0	7.5	25
2.8	8.5	Gravel, sandy & clayey; brn; moist, very poor samples about 60% gravel, 25% sand, 15% low plastic fines. Coarse particles angular, med. to fine grained sandstone.	GC	"	28-60	6	"	7.5	8.5	50
				NX1				8.5	12.3	30
				"				12.3	17.3	76
				"				17.4	20.2	70
				"				20.2	24.5	40
				"				23.5	26.8	70
8.5	31.0	Shale, highly weathered, dk. gry with brn in bedding planes, largest piece of core is 0.1' long, moderately soft, 26.0-29.0' contains mostly very soft, clayey shale.		"				26.8	30.0	50
				"				30.0	31.7	100
				"				31.7	35.8	100
				"				35.8	38.6	32*
				NX				32+	39.5	-
				NX1				38.6	45.0	70
31.0	40.0	Shale same as above only in larger pieces (up to 0.4') and less weathered dip = 55°		"				45.0	50.0	100
40.0	50.0	Shale, dk. gry, black on wet surface, hard to moderately hard, pieces of core up to 0.7' long, some brn stains in bedding planes.								
50.0		Bottom of boring (hole closed at 9.0', (1/31/66) no water) *Lost diamond on bringing this core to surface WL (3/7/66) 19.1' hole plugged at 28.0'								

DH 3, ELEV. 605.4, 15+80, Centerline
Logged by: C. C. Johnson 4/1/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Topsoil, roots, etc.		SpT	1-2-3	1	Jar	0.0	1.5	60
0.5	2.5	Clay, silty; brn with gry mottles, moist, trace of sand & gravel.	CL	"	5-4-7	2	"	1.5	3.0	60
				"	8-7-15	3	"	3.0	4.5	60
				"	21-23-19	4	"	4.5	6.0	40
2.5	9.0	Gravel, sandy & clayey; brn to 5.0'; gry with red & grn fragments, wet, compact, 60% gravel, 25% sand, 15% low plastic fines, see TP #8.	GC	"	10-17-15	5	"	6.0	7.5	80
				"	12-22-19	6	"	7.5	9.0	25
				NX1	24-57-8	7	"	9.0	10.0	70
				"				10.0	13.8	90
				"				13.8	17.5	100
9.0	10.0	Shale, highly weathered, soft black.		"				17.5	20.3	100
				"				20.3	25.0	100
10.0	25.0	Shale, weathered, blk on moist surface, dk. gry on dry surface, largest piece of core is 0.2' long, moderately soft to moderately hard.								
25.0	35.0	Same as above only less weathered, pieces of core up to 0.6' long.								
35.0		Bottom of boring WL (4/5/66) 0.0								

DH 4, ELEV. 606.3, 15+80, Centerline
Logged by: C. C. Johnson 4/5/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.4	Topsoil, roots, etc.		SpT	1-1-2	1	Jar	0.0	1.5	65
0.4	3.0	Clay, silty; brn with gry mottling, wet, 15% very fine sand.	CL	"	1-2-2	2	"	1.5	3.0	35
				"	24-24-12	3	"	3.0	4.5	20
				"	14-11-16	4	"	4.5	6.0	20
3.0	6.0	Gravel, sandy & silty; brn & gry; 60% gravel, 25% sand, 15% low plastic fines.	GM	"	9-13-20	5	"	6.0	7.5	60
				"	13-22-60/0.4	6	"	7.5	8.9	50
				NX1				8.9	10.2	100
6.0	8.4	Sand, gravely & clayey; gry, wet, compact, 40% gravel, 45% sand, 15% plastic fines, coarse particles are several colors.	SC	"				10.2	13.8	100
				"				13.8	27.0	100
				"				27.0	32.0	100
8.4	8.9	Shale, weathered, soft, black								
8.9	32.0	Shale, slightly weathered, blk on wet surface, dk. gry on dry surface, moderately hard,								
32.0		Bottom of boring WL (5/9/66) 0.0'								

DH 5, ELEV. 609.3, 14+10, Centerline
Logged by: C. C. Johnson 3/4/66
Drilling Equipment: Sprague & Henwood 30C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Topsoil, roots, etc.		SpT	1-1-1	1	Jar	0.0	1.5	35
0.5	2.8	Clay, silty; gry with brn mottles, wet, 15% very fine sand.	CL (MMH)	"	2-3-7	2	"	1.5	3.0	0
				"	5-7-9	3	"	3.0	4.5	55
				"	13-16-25	4	"	4.5	6.0	45
2.8	7.3	Gravel, sandy & clayey; gry, wet, compact, 55% gravel, 30% sand, 15% plastic fines, coarse particles are many colors and subround.	GC	"	16-20-26	5	"	6.0	7.5	55
				"	32-60/0.4	6	"	7.5	8.4	75
				NXM				8.4	11.2	10
				"				11.2	17.5	10
				"				17.5	23.1	10
				"				23.1	30.0	10
7.3	8.4	Shale, black, very soft, weathered.						*SA.1 Shel. 1.0		2.5
8.4	20.0	Shale, dk. gry, weathered, moderately soft, pieces up to 0.3' long in bottom part, gravel size in top part.						*SA offset from DH 5		
20.0	30.0	Same as above with pieces of core up to 0.4' long.								
30.0		Bottom of Boring			WL (3/7/66) +0.5'					

DH 6, ELEV. 602.6, 11+80, Centerline
Logged by: C. C. Johnson 4/8/66
Drilling Equipment: Sprague & Henwood 30C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Topsoil, roots, etc.		SpT	1-2-3	1	Jar	0.0	1.5	30
0.5	5.9	Clay, silty & gravelly; brn & mottled to 4.0', wet & gry-brn mottled below 4.0', 25% angular chert gravel, 15% fine sand.		"	3-4-4	2	"	1.5	3.0	40
				"	3-5-6	3	"	3.0	4.5	50
				"	7-7-7	4	"	4.5	6.0	50
				"	9-15-18	5	"	6.0	7.5	50
				"	17-16-60/0.4	6	"	7.5	8.9	0
5.9	8.7	Gravel, sandy & clayey brn & gry mottled, wet (compact) 60% gravel, 25% sand, 15% low plastic fines, coarse particles are subround to subangular & many colors.		NX1				8.9	10.7	
				"				10.7	17.2	10
				"				17.2	25.0	10
				"				25.0	30.0	20
8.7	10.7	Shale, highly weathered, very soft, black with brn stains.								
10.7	30.0	Shale, slightly weathered, dk. gry, pieces of core up to 0.4' long, no iron stains in fractures or bedding planes.								
30.0		Bottom of boring WL (3/9/66) slight flow								

DH 7, ELEV. 613.2, 10+10, Centerline
Logged by: C. C. Johnson 4/8-9/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.6	Forest litter, roots, etc.		SpT	5-6-8	1	Jar	0.0	1.5	
0.6	3.0	Recovered only fine grained sandstone & shale gravel.	GP	"	7-6-10	2	"	1.5	3.0	
				"	13-10-21	3	"	3.0	4.5	
				"	20-17-13	4	"	4.5	6.0	
3.0	21.5	Clay, sandy & gravelly; brn, moist, 20% fine gravel, 20% well graded sand, fines are low to moderately plastic, coarse particles are subround to subangular shale.	CL	"	11-20-24	5	"	6.0	7.5	
				"	22-28-57/0.4	6	"	7.5	8.9	
				NX1				8.9	13.0	
				SpT	9-10-10	7	"	13.0	15.4	
				"	8-9-12	8	"	15.4	16.9	
				"	5-6-6			16.9	18.4	
				"	6-7-5	9	"	18.4	19.9	
				"	7-8-6	10	"	19.9	21.4	
21.5	23.5	Shale, weathered, soft, brn & gry, wet compact.		Tri				21.4	21.5	
23.5	30.0	Shale, weathered, black on wet surface, dk. gry on dry surface, brn on bedding & fracture planes. All pieces of core 0.1' or less.		SpT	20-23-02			21.5	23.0	
				NX1				23.0	26.5	
				"				26.5	28.7	
				"				28.7	33.0	
								33.0	40.0	
30.0	40.0	Same as above - less weathered pieces up to 0.3', no iron stains below 34.0'								
40.0		Bottom of Boring WL (1/10/66) 16.0'								

All st

See n

DH 5, ELEV. 609.3, 14+10, Centerline
Logged by: G. C. Johnson 1/4/66
Drilling Equipment: Sprague & Henwood 30C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Topsoil, roots, etc.		SpT	1-1-1	1	Jar	0.0	1.5	60
0.5	2.8	Clay, silty, gry with brn mottles, wet, 15% very fine sand.	CL (MH)	"	2-3-7	2	"	1.5	3.0	75
				"	5-7-9	3	"	3.0	4.5	45
				"	13-16-25	4	"	4.5	6.0	65
2.8	7.3	Gravel, sandy & clayey; gry, wet, compact, 55% gravel, 30% sand, 15% plastic fines, coarse particles are many colors and subround.	GC	"	16-20-26	5	"	6.0	7.5	65
				"	32-60/0.4	6	"	7.5	8.4	75
				NXM				8.4	11.2	100
				"				11.2	17.5	100
				"				17.5	24.1	100
								24.1	30.0	100
7.3	8.4	Shale, black, very soft, weathered.				*SA.1	Shel.	1.0	2.5	65
8.4	20.0	Shale, dk. gry, weathered, moderately soft, pieces up to 0.3' long in bottom part, gravel size in top part.				*SA offset from DH 5				
20.0	30.0	Same as above with pieces of core up to 0.4' long.								
30.0		Bottom of Boring		WL (3/7/66) +0.5'						

DH 6, ELEV. 603.6, 11+80, Centerline
Logged by: G. C. Johnson 1/8/66
Drilling Equipment: Sprague & Henwood 30C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Topsoil, roots, etc.		SpT	1-2-3	1	Jar	0.0	1.5	25
0.5	5.0	Clay, silty & gravelly brn & moist to 4.0', wet & gry-brn mottled below 4.0', 20% angular chert gravel, 15% fine sand.		"	3-4-4	2	"	1.5	3.0	45
				"	3-5-6	3	"	3.0	4.5	40
				"	5-6-7	4	"	4.5	6.0	60
				"	9-15-18	5	"	6.0	7.5	25
				"	17-18-60/0.4	6	"	7.5	8.9	70
5.0	8.7	Gravel, sandy & clayey brn & gry mottled, wet (compact) 60% gravel, 25% sand, 15% low plastic fines, coarse particles are subround to subangular & many colors.		NXI				8.9	10.7	0
				"				10.7	17.2	100
				"				17.2	25.0	100
								25.0	30.0	100
8.7	13.7	Shale, highly weathered, very soft, black with brn stains.								
10.7	30.0	Shale, slightly weathered, dk. gry, pieces of core up to 0.4' long, no iron stains in fractures or bedding planes.								
30.0		Bottom of boring WL (3/9/66) slight flow								

DH 7, ELEV. 613.2, 10+10, Centerline
Logged by: G. C. Johnson 1/8/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.4	Forest litter, roots, etc.		SpT	5-6-8	1	Jar	0.4	1.5	15
0.4	3.0	Recovered only fine grained sandstone & shale gravel.	(FI)	"	7-8-10	2	"	1.5	3.0	15
				"	13-20-21	3	"	3.0	4.5	25
				"	20-27-13	4	"	4.5	6.0	45
3.0	21.5	Clay, sandy & gravelly; brn, moist, 20% fine gravel, 20% well graded sand, fines are low to moderately plastic, coarse particles are subround to subangular shale.	CL	"	12-20-24	5	"	6.0	7.5	70
				"	22-28-57/0.9'	6	"	7.5	8.9	50
				NXI				8.9	13.0	18
				SpT	9-10-10	7	"	13.0	15.4	60
				"	8-9-12	8	"	15.4	16.9	20
				"	5-6-6		"	16.9	18.4	0
				"	6-7-5	9	"	18.4	19.9	45
21.5	24.5	Shale, weathered, soft, brn & gry, wet compact.		"	7-8-6	10	"	19.9	21.4	25
								21.4	21.5	0
24.5	40.0	Shale, weathered, black on wet surface, dk. gry on dry surface, brn on bedding & fracture planes, All pieces of core 0.1' or less.		Tri				21.5	23.0	65
				SpT	21-23-42			23.0	26.5	70
				NXI				26.5	28.7	65
				"				28.7	33.0	100
				"				33.0	40.0	100
30.0	40.0	Same as above - less weathered pieces up to 0.3', no iron stains below 34.0'								
40.0		Bottom of Boring WL (3/10/66) 16.0'								

DH 8, ELEV. 634.1, 10+00, Centerline
Logged by: G. C. Johnson 3/9/66
Drilling Equipment: Sprague & Henwood 30C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Topsoil, roots, etc.		SpT	1-1-2	1	Jar	0.0	1.5	20
0.5	5.0	Clay, silty & gravelly; brn, moist, 20% med. to fine gravel, 15% sand, coarse particles are subround to subangular.	CL	"	5-9-12	2	"	1.5	3.0	80
				"	9-12-18	3	"	3.0	4.5	75
				"	15-19-26	4	"	4.5	6.0	55
				"	12-18-18	5	"	6.0	7.5	45
5.0	9.0	Gravel, sandy & clayey; lt. red-brn, moist, 45% gravel, 30% sand, 25% plastic fines, coarse particles are subround to subangular & several colors.	GC	"	18-21-19	6	"	7.5	9.0	55
				"	9-9-12	7	"	9.0	10.5	65
				"	12-9-11	8	"	10.5	12.0	75
				"	3-5-8			12.0	13.5	0
				"	5-8-11			13.5	15.0	0
9.0	16.2	Sand, silty & clayey; lt. red-brn, wet (compact), 15% gravel 50% sand, 45% low plastic fines coarse particles many colors, subround to subangular.	SM	"	12-23-50/0.3	9	"	15.0	16.3	25
				NXM				16.3	20.7	75
				"				20.7	23.8	100
				"				23.8	26.4	85
				"				26.4	28.0	100
16.2	28.5	Shale, dk. gry on dry surface, black on wet surface, weathered (1st core run mostly gravel size pieces) thin bedded with brn stains in bedding planes & fractures, moderately soft.						28.0	31.4	100
								31.4	37.6	100
								37.6	42.0	100
28.5	42.0	Same as above with brn stains slightly larger pieces of core.								
42.0		Bottom of Boring WL (3/10/66) 12.5'								

DH 9, ELEV. 641.8, 8+40, 25' Rt.
Logged by: G. C. Johnson 3/10/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	1.0	Topsoil, roots, etc.		SpT	0-0-3	1	Jar	0.0	1.5	
1.0	13.0	clay, sandy & gravelly; lt. red-brn, moist, 25% chert gravel, 15% fine sand.	CL	"	5-7-11	2	"	1.5	3.0	
				"	13-18-20	3	"	3.0	4.5	
				"	15-16-22	4	"	4.5	6.0	
13.0	22.5	Sand, gravelly & clayey; brn wet, 45% sand, 40% gravel, 15% low plastic fines, coarse particles subround & several rock types & colors.	SC	"	10-10-10	5	"	6.0	7.5	
				"	10-12-16	6	"	7.5	9.0	
				"	9-11-19	7	"	9.0	10.5	
				"	12-15-19	8	"	10.5	12.0	
				"	12-22-25			12.0	14.5	0
22.5	22.9	Shale, black, highly weathered, very soft.		"	21-25-18	9	"	14.5	15.0	
				"	16-42-30/0.1'	10	"	15.0	16.1	55
22.9	35.0	Shale, black, moderately soft, trace of brn stains in top 2.0', largest piece of core is 0.5' long.		Tri				16.1	17.0	0
				SpT	10-15-15-17	11	"	17.0	19.0	35
				"	9-10-10-11			19.0	21.0	0
					10-12			21.0	22.0	0
35.0		Bottom of Boring WL (3/11/66) 18.2'			12-50/0.9	12	"	22.0	22.9	100
				NXI				22.9	26.0	95
				"				26.0	29.7	70
				"				29.7	35.0	55

DH 101, ELEV. 605.8, 1+80, Centerline
Logged by: G. C. Johnson 2/2/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Topsoil, roots, etc. Frozen		SpT	1-1-2	1	Jar	0.0	1.5	75
0.5	3.0	Silt, sandy; lt. brn, moist, 30% fine to v. fine sand	ML-CL	"	3-2-8	2	"	1.5	3.0	95
				"	3-11-8	3	"	3.0	4.5	50
3.0	5.8	Gravel, sandy & silty; brn, wet, 50% gravel, 35% sand, 15% nonplastic fines, coarse particles are rounded to angular	GM	"	7-7-8	4	"	4.5	6.0	40
				"	9-9-6	5	"	6.0	7.5	40
				"	11-17-17	6	"	7.5	9.0	30
				"	14-17-39	7	"	9.0	10.5	20
					53	8	"	10.5	11.0	100
5.8	10.3	Gravel, sandy & clayey; gry, wet, 50% gravel, 35% sand, 15% low plastic fines. SEE TP 601 & 602 for log of this soil material	GC	NXI				11.0	14.8	75
				"				14.8	18.3	100
				"				18.3	22.2	100
				"				22.2	27.3	100
				"				27.3	33.0	97
10.3	17.0	Shale, weathered, blk when wet dk. gry on dry durface, core is in pieces of 0.05' or less thick plates hard & brittle, dip = 30-60°								
17.0	33.0	Same as above with pieces of core up to 1.0' long, some calcite filled fractures from 17.3-18.0'								
33.0		Bottom of Boring WL (2/20/66) 2.1'								

All stations are referenced to the baseline

See note on sheet 29

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
LOGS OF DRILL HOLES AND TEST PITS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed — Date — Approved by
Drawn — Title
Traced — Title
Checked — Sheet No. 25 of 29 — Drawing No. PA-637-P

2

DH 302, ELEV. 604.9, 17+80, 70' D.S.
Logged by: G. C. Johnson 2/24/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Forest litter, roots, etc.		SpT	1-1-1	1	Jar	0.0	1.5	70
0.5	4.0	Clay, silty & sandy; brn with gry mottling, wet, trace fine gravel, 25% well graded sand.	CL	"	1-1-3	2	"	1.5	3.0	55
				"	4-4-6	3	"	3.0	4.5	20
				"	11-16-17	4	"	4.5	6.0	45
4.0	8.7	Gravel, sandy & clayey; gry, wet, 60% gravel, 25% sand, 15% low plastic fines.	GM	"	14-18-15	5	"	6.0	7.5	60
				"	20-20-29	6	"	7.5	9.0	60
				"	21-45/0.3'	7	"	9.0	9.8	95
8.7	15.0	Shale, weathered, black, dk. gry on dry surface, moderately soft.		NXH				9.8	11.6	100
				"				11.6	15.0	100

WL (2/25/66) 0.3' WL (3/1/66) 0.0' flood conditions

DH 303, ELEV. 605.6, 17+45, 90' D.S.
Logged by: G. C. Johnson 2/25/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.3	Forest litter, roots, etc.		SpT	1-1-2	1	Jar	0.0	1.5	85
0.3	1.2	Clay, silty & sandy; brn, wet, 25% mostly fine, sand	CL-ML	"	1-2-2	2	"	1.5	3.0	55
1.2	4.3	Sand, silty; brn, wet, 90% low plastic fines. Sand is mostly fine & very fine.	SM	"	1-1-8	3	"	3.0	4.5	25
				"	12-11-11	4	"	4.5	6.0	70
				"	15-12-11	5	"	6.0	7.5	80
				"	14-20-15	6	"	7.5	9.0	60
4.3	9.3	Gravel, sandy & clayey; gry & brn with grn & red particles, wet, 60% gravel, 25% sand, 15% low plastic fines, coarse particles are subround to angular (shale & chert)	GC	"	14-22-23	7	"	9.0	10.5	60
				"	55	8	"	10.5	11.0	100
								11.0	14.1	75
								14.1	16.0	65
								3-3A.1* Shel.	1.0	2.5	100
9.3	11.0	Shale, weathered, black, very soft									
11.0	16.0	Shale, weathered, dk. gry to blk, moderately soft.									

*Sample 303A.1 taken from offset hole.

WL (2/28/66) 2.5' WL (3/1/66) 1.5' flood stage

DH 304, ELEV. 605.2, 18+10, 150' D.S.
Logged by: G. C. Johnson 2/28 - 3/1/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Forest litter, etc.		SpT	1-1-2	1	Jar	0.0	1.5	45
0.5	1.5	Clay, silty; brn, wet	CL	"	2-2-2	2	"	1.5	3.0	60
1.5	4.0	Sand, silty & clayey; brn, wet, 55% sand, trace gravel, fines are low plastic.	SC	"	3-8-10	3	"	3.0	4.5	55
				"	7-13-21	4	"	4.5	6.0	80
				"	21-24-37	5	"	6.0	7.5	60
4.0	9.1	Gravel, sandy & clayey; gry with brn & red particles, wet, compact, 60% gravel, 25% sand, 15% low plastic fines - See log of TP 604.	GC	"	21-42-50	6	"	7.5	9.0	20
				"	18-21-46	7	"	9.0	10.5	40
				"	41-60/0.0	8	"	10.5	11.4	40
				NXH				11.4	17.0	95
9.1	11.4	Shale, highly weathered, black, soft, very thin beds.									
11.4	17.0	Shale, weathered slightly blk. on moist surface, dk. gry on dry surface, core in pieces up to 0.2'. Dip = 80° moderately soft									
17.0		Bottom of Boring WL (3/2/66) 2.0'									

TP 601, ELEV. 621.0, 11+00, 80' D.S.

			SAMPLES No.	Type	From Ft.	To Ft.
0.0	0.7	Topsoil, roots, etc.				
0.7	9.0	Clay, sandy & gravelly; lt. red-brn, moist, trace of cobbles (max. size 10"), 15% gravel, 20% sand, coarse particles are angular to subround, quartzite, sandstone and shale, soil is stiff. CL	1	Bag	1.0	9.0
9.0		Shale weathered, dk. gry Bottom of Pit.				

TP 602, ELEV. 620.0, 10+50, 12' D.S.

0.0	0.6	Topsoil, roots, etc.				
0.6	3.0	Clay, silty, sandy & gravelly; brn, moist (frozen) trace of small cobbles, 20% gravel, 20% sand, coarse particles rounded. CL	1	Bag	1.0	3.0
3.0	7.0	Cobbles & gravel, brn, wet, 50% cobbles, 40% gravel, 10% sand, trace of fines. Maximum size = 10", coarse particles subround GP	2	Bag (-20# + 6")	3.0	7.0
7.0		Bedrock? Hole nearly full of water WL (2/14/66) 3.5'±				

TP 603, ELEV. 606.0, 12+90, 150' D.S.

0.0	1.0	Topsoil, roots, etc.	
1.0	2.0	Clay, silty, brn with some gry mottling, moist, 15% sand,	CL
2.0	4.0	Gravel, sandy & clayey; brn with gry mottling, moist, trace of small cobbles (max. size 6") 45% gravel, 30% sand, 25% plastic fines with coarse particles angular and durable.	GC
4.0	8.5	Gravel, sandy & silty; brn & gry mottled, wet, trace small cobbles (max. size 5"), 50% gravel, 35% sand, 15% nonplastic fines, coarse particles angular to subround and durable.	GM
8.5		Bottom of pit - Bedrock? WL (2/22/66) 4.0'±	

TP 604, ELEV. 604.8, 16+80, 150' D.S.

0.0	1.0	Topsoil, roots, etc.	
1.0	2.5	Clay, silty; dk. brn, moist, 15% sand - See sample #137.1	
2.5	8.5	Gravel, sandy & silty; brn to 5.0', gry below 5.0', wet but very impervious & dense, 10% small cobbles (max. size 5"), 55% gravel, 30% sand, 15% low plastic fines. Water enters pit rapidly at top of this horizon.	
8.5	9.0	Shale, weathered, blk, beds vertical? beds 1/8-1/4" thick, hard & brittle.	
9.0		Bottom of pit WL (2/22/66) 2.5'±	

DH 605, ELEV. 629.6, 10+60, 105' D.S.
Logged by: G. C. Johnson 3/10&11/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Topsoil, roots, etc.		SpT	2-4-4	1	Jar	0.0	1.5	1
0.5	7.5	Clay, silty, sandy & gravelly; lt. red-brn, moist, 25% gravel, 15% sand, coarse particles are angular & many colors.	CL	"	4-5-7	2	"	1.5	3.0	3
				"	5-7-9	3	"	3.0	4.5	4
				"	9-12-13	4	"	4.5	6.0	6
				"	15-13-19	5	"	6.0	7.5	7
				"	15-12-24	6	"	7.5	9.0	9
7.5	9.5	Sand, silty; brn, wet, 25% low plastic fines, trace of gravel, sand is mostly med. to very fine	SM	"	27-53	7	"	9.0	10.0	10
				Trf				10.0	10.5	10
				SpT	16-62-43/0.3'	8	"	10.5	11.5	11
				NXH				11.7	18.5	18
9.5	10.0	Same as from 0.5-7.5'	CL	"				18.5	22.0	22
10.0	10.5	Cobble?		"				22.0	28.0	28
10.5	11.7	Shale, highly weathered, very soft, brn with blk & other colors.		"				28.0		32
11.7	13.0	Shale, weathered, soft, brn with blk & other colors								
13.0	21.0	Shale, weathered, dk. gry to blk, moderately soft, brn stains in bedding planes, largest piece of core is 0.3', moist pieces are 1/4"								
21.0	32.3	Same as above with no brn stains								
32.2		Bottom of Boring WL (3/14/66) 16.8'								

DH 606, ELEV. 610.6, 13+20, 105' D.S.
Logged by: G. C. Johnson 3/14/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.3	Topsoil, roots, etc.		SpT	4-4-5	1	Jar	0.0	1.5	1
0.3	10.2	Gravel, sandy & clayey; brn, moist, 40% gravel, 35% sand, 25% plastic fines, coarse particles are of many colors & subround to subangular. Becomes gry & grn-gry at 9.0'	GC	"	17-16-29			1.5	3.0	3
				"	12-12-14	2	"	3.0	4.5	4
				"	15-17-21	3	"	4.5	6.0	6
				"	16-14-12	4	"	6.0	7.5	7
				"	19-28-28	5	"	7.5	9.0	9
				"	15-17-19	6	"	9.0	10.5	10
				"	23-47-63	7	"	10.5	12.0	12
10.2	12.0	Clay, silty; grn-gry, wet (compact) varved, trace of fine gravel & sand.	CL	"	22-47-32	8	"	12.0	13.5	13
				"	16-43-47/0.2'	9	"	13.5	14.7	14
				NXH				14.7	20.5	27
12.0	14.5	Gravel, sandy & clayey; grn-gry, wet (compact) 40% gravel, 35% sand, 25% plastic fines, coarse particles are many colors and angular (chert & shale) to subround (shale & sandstone)	GC							
14.5	14.7	Shale, weathered, blk, soft.								
14.7	27.0	Shale, blk on wet surface, dk. gry on dry surface, moderately soft, largest piece of core is 0.1', few stains in bedding planes or fractures, dip = 85°								
27.0		Bottom of Boring WL (3/15/66) 5.1'								

DH 607, ELEV. 615.2, 12+00, 185' D.S.
Logged by: G. C. Johnson 3/15/66
Drilling Equipment: Sprague & Henwood 40C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	From Ft.
0.0	0.5	Topsoil, roots, etc.		SpT	1-1-3	1	Jar	0.0
0.5	3.0	Clay, silty; brn, moist, 10% fine sand.	CL	"	4-5-7	2	"	1.5
				"	17-20-47	3	"	3.0
3.0	7.0	Gravel, sandy & clayey brn, moist, 50% gravel, 35% sand, 15% plastic fines, coarse particles are subangular to subround and many colors. Some thin lenses of sandy CL	GC	"	26-05-36	4	"	4.5
				"	16-17-27	5	"	6.0
				"	23-26-45	6	"	7.5
				"	57-79	7	"	9.0
7.0	10.0	Shale, dk. brn to blk, weathered, soft.						
10.0		Bottom of Boring WL (3/16/66) 2.7'						

04, ELEV. 604.8, 16+80, 150' D.S.

1.0	Topsoil, roots, etc.	
2.5	Clay, silty; dk. brn, moist, 15% sand - See sample #147.1	CL
8.5	Gravel, sandy & silty; brn to 5.0', gry below 5.0', wet but very impervious & dense, 10% small cobbles (max. size 5"), 55% gravel, 30% sand, 15% low plastic fines. Water enters pit rapidly at top of this horizon.	GM-GC
9.0	Shale, weathered, blk, beds vertical? beds 1/8-1/4" thick, hard & brittle.	
	Bottom of pit WL (2/22/66) 2.5'±	

05, ELEV. 629.6, 10+80, 105' D.S.
ged by: C. E. Johnson 3/10&11/66
lling Equipment: Sprague & Henwood 40C

le Depth			Unif. Soil Class	STANDARD PENETRATION Type & ft				SAMPLES			
From	To	Description of Materials	Symb.	Used	Blows Per 6"	No.	Type	From Ft.	To Ft.	% Rec.	
	0.5	Topsoil, roots, etc.		SpT	2-4-4	1	Jar	0.0	1.5	65	
	7.5	Clay, silty, sandy & gravelly; lt. red-br., moist, 25% gravel, 15% sand, coarse particles are angular & many colors.	CL	"	4-5-7	2	"	1.5	3.0	70	
				"	5-7-9	3	"	3.0	4.5	60	
				"	9-12-13	4	"	4.5	6.0	55	
				"	15-13-19	5	"	6.0	7.5	35	
				"	15-12-24	6	"	7.5	9.0	45	
	9.5	Sand, silty; brn, wet, 25% low plastic fines, trace of gravel, sand is mostly med. to very fine	SM	"	27-53	7	"	9.0	10.0	25	
				Trt				10.0	10.5	0	
				SpT	16-62-43/0.3'	8	"	10.5	11.7	100	
				NXI				11.7	18.5	100	
	10.0	Same as from 0.5-7.5'	CL	"				18.5	22.0	100	
	10.5	Cobble?		"				22.0	28.0	100	
	11.7	Shale, highly weathered, very soft, brn with blk & other colors.		"				28.0	42.3	100	
	13.0	Shale, weathered, soft, brn with blk & other colors									
	21.0	Shale, weathered, dk. gry to blk, moderately soft, brn stains in bedding planes, largest piece of core is 0.3', moist pieces are 1/4"									
	42.3	Same as above with no brn stains									
		Bottom of Boring WL (3/14/66) 16.8'									

606, ELEV. 610.6, 13+20, 105' D.S.
gged by: C. E. Johnson 3/10/66
lling Equipment: Sprague & Henwood 40C

le Depth			Unif. Soil Class	STANDARD PENETRATION Type & ft				SAMPLES			
From	To	Description of Materials	Symb.	Used	Blows Per 6"	No.	Type	From Ft.	To Ft.	% Rec.	
0	0.3	Topsoil, roots, etc.		SpT	4-4-5	1	Jar	0.0	1.5	20	
3	10.2	Gravel, sandy & clayey; brn, moist, 40% gravel, 35% sand, 25% plastic fines, coarse particles are many colors & sub-round to subangular. Be-comes gry & grn-gry at 9.0'	GC	"	17-16-29			1.5	3.0	0	
				"	12-12-14	2	"	3.0	4.5	30	
				"	15-17-21	3	"	4.5	6.0	55	
				"	16-13-12	4	"	6.0	7.5	60	
				"	19-28-28	5	"	7.5	9.0	75	
				"	15-17-19	6	"	9.0	10.5	85	
				"	23-47-63	7	"	10.5	12.0	45	
2	12.0	Clay, silty; grn-gry, wet (compact) varved, trace of fine gravel & sand.	CL	"	22-47-32	8	"	12.0	13.5	30	
				"	16-43-47/0.2'	9	"	13.5	18.7	80	
				NXI				18.7	20.5	100	
				"				20.5	27.0	100	
0	18.5	Gravel, sandy & clayey; grn-gry, wet (compact) 40% gravel, 45% sand, 25% plastic fines, coarse particles are many colors and angular (chert & shale) to subround (shale & sandstone)	GC								
5	18.7	Shale, weathered, blk, soft.									
7	27.0	Shale, blk on wet surface, dk. gry on dry surface, moderately soft, largest piece of core is 0.1', few stains in bedding planes or fractures, dip = 35°									
0		Bottom of Boring WL (3/1/5&6) 5.1'									

607, ELEV. 615.2, 12+00, 185' D.S.
gged by: C. E. Johnson 3/15/66
lling Equipment: Sprague & Henwood 40C

le Depth			Unif. Soil Class	STANDARD PENETRATION Type & ft				SAMPLES			
From	To	Description of Materials	Symb.	Used	Blows Per 6"	No.	Type	From Ft.	To Ft.	% Rec.	
0	0.5	Topsoil, roots, etc.		SpT	1-1-1	1	Jar	0.0	1.5	65	
5	3.0	Clay, silty; brn, moist, 10% fine sand.	CL	"	4-5-7	2	"	1.5	3.0	55	
				"	17-20-47	4	"	3.0	4.5	65	
0	7.0	Gravel, sandy & clayey brn, moist, 50% gravel, 35% sand, 15% plastic fines, coarse particles are subangular to subround and many colors. Some thin lenses of sandy CL	GC	"	26-45-36	5	"	4.5	6.0	40	
				"	15-17-27	5	"	6.0	7.5	70	
				"	21-26-45	6	"	7.5	9.0	95	
				"	57-70	7	"	9.0	10.0	80	
0	10.0	Shale, dk. brn to blk, weathered, soft.									
0		Bottom of Boring WL (3/16/66) 2.7'									

Summary of Field Permeability Tests

Hole No.	Type of Test	Depth of Test (ft.)	Permeability (ft./day)
1	Packer	4.5- 6.0	Essentially zero
	"	6.0- 7.5	Essentially zero
	Pressure	11.0-16.0	45.0*
	"	15.0-20.0	2.2
	Holding	20.0-25.0	Essentially zero
2	Packer	6.0- 7.5	1.1
	"	7.5- 8.5	0.2**
	"	8.5-17.3	5.6
	Pressure	9.0-14.0	24.1*
	"	14.0-19.0	16.4*
	"	19.0-24.0	8.6
	"	24.0-29.0	7.7
	"	29.0-34.0	17.0*
	"	34.0-39.0	0.4
3	Packer	3.0-10.0	Essentially zero
	"	10.0-35.0	0.3
	Pressure	13.0-18.0	0.3
	"	18.0-23.0	1.1
	"	23.0-28.0	0.6
	Holding	28.0-33.0	Essentially zero
4	Packer	3.0- 4.5	19.0
	"	4.5- 6.0	0.4
	"	6.0- 7.5	Essentially zero
	Pressure	9.5-14.5	Essentially zero
	"	12.0-17.0	0.2
	"	17.0-22.0	0.2
	"	22.0-27.0	0.9
	"	27.0-32.0	0.6
5	Packer	3.0- 6.0	Essentially zero
	"	6.0- 8.4	0.3**
	Pressure	9.0-14.0	5.0
	"	13.5-18.5	7.1
	"	18.5-23.5	2.5
	"	23.5-28.5	0.01
6	Packer	3.0- 4.5	Essentially zero
	"	3.0- 6.0	Essentially zero
	"	6.0- 7.5	Essentially zero
	"	6.0- 8.9	Essentially zero
	"	9.5-14.5	0.2
	"	14.0-19.0	0.01
	"	19.0-24.0	24.2
	"	24.0-29.0	0.4
7	Packer	6.0- 7.5	Essentially zero
	"	8.9-13.9	2.8
	"	13.9-15.4	Essentially zero
	"	16.9-18.4	1.1
	"	21.5-23.0	0.1
	Pressure	23.0-28.0	24.8
	"	28.0-33.0	3.1
	"	33.0-38.0	0.5
8	Packer	3.0-16.3	Essentially zero
	"	16.3-20.7	0.6
	"	20.7-26.4	0.3
	Pressure	16.5-21.5	1.6
	"	20.5-25.5	0.2
	"	25.5-30.5	0.2
	"	30.5-35.5	2.0
	"	35.5-40.5	1.1
9	Packer	3.0- 6.0	Essentially zero
	"	9.0-12.0	Essentially zero
	"	12.0-19.0	Essentially zero
	"	22.9-35.0	2.1
301	Packer	6.0- 7.5	0.6
	"	7.5- 9.0	0.5
	"	9.0-10.5	1.3**
	"	11.2-12.0	Essentially zero
	Pressure	12.0-17.0	6.8*
	"	16.5-21.5	20.8*
	"	22.0-27.0	0.6
	Holding	27.0-32.0	Essentially zero
302	Packer	6.0- 7.5	Essentially zero
	"	7.5- 9.0	Essentially zero
	"	9.8-15.0	Essentially zero
303	Packer	6.0- 9.0	0.3**
	"	9.0-10.5	Essentially zero
	"	11.0-16.0	1.8
605	Packer	4.5- 6.0	Essentially zero
	"	7.5- 9.0	Essentially zero
	"	10.0-11.7	0.3
	Pressure	12.0-17.0	0.1
	"	16.0-21.0	1.2
	"	21.0-26.0	3.4
	"	26.0-31.0	1.3
606	Packer	4.5- 6.0	Essentially zero
	"	7.5- 9.0	1.4
	"	9.0-10.5	Essentially zero
	"	10.5-12.0	Essentially zero
	"	12.0-13.5	0.6
	"	13.5-14.7	Essentially zero
	Pressure	16.0-21.0	21.6
	"	21.0-26.0	0.1

*Apparent leak in system **Test does not meet all requirements for accurate determination of permeability.

All stations are referenced to the baseline.

See note on sheet 29

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
LOGS OF DRILL HOLES AND TEST PITS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by	
Drawn		Title	
Traced		Title	
Checked		Sheet 26 of 29	Drawing No. PA-637-P

2

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 14

TP 101, ELEV. 724.6, 1+80, 225' U.S.

0.0	0.7	Topsoil, roots, etc.	
0.7	8.0	Clay, gravelly & sandy; lt. brn, moist, trace of cobbles (max. size 5"), 30% gravel, 15% sand, 55% plastic fines, coarse particles are angular chert & some sandstone (durable) bottom two feet excavated with some difficulty.	CL
8.0		Bottom of pit - dry hole - bedrock?	

TP 102, ELEV. 686.0, 3+80, 380' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	5.0	Clay, gravelly and sandy; lt. brn, moist, trace of cobbles (max. size 6") 30% gravel, 15% sand, 55% plastic fines, coarse particles are angular chert & some sandstone (durable).	CL
5.0	8.5	Shale, weathered, soft, gry with several other colors. Excavates easily as about 50% gravel, 50% sand & a trace of plastic fines. Particles are nondurable.	GP
8.5		Bottom of pit - dry hole	

TP 103, ELEV. 720.5, 9+50, 630' U.S.

				SAMPLES Type	From Ft.	To Ft.
0.0	1.1	Topsoil, roots, etc. (not very organic)				
1.1	6.0	Clay, gravelly & sandy; lt. brn, moist, 30% gravel, 15% sand, CL (*GC-GM) coarse particles are angular chert & some sandstone (durable).		250#	1.1	6.0
6.0	10.0	Gravel, sandy & clayey; tan, wet, 5[illegible] gravel, 30% sand, 2[illegible] plastic fines, coarse particles are angular chert (durable) WL (2/15/66) 9.5' after 7 hours WL (2/16/66) 6.0'	GC			

TP 104, ELEV. 749.3, -1+55, 985' U.S.

0.0	0.6	Topsoil, roots, etc.	
0.6	3.5	Clay, gravelly & sandy; lt. brn, moist, trace of small cobbles, 30% gravel, 15% sand, 55% plastic fines, coarse particles are angular, durable chert.	CL
3.5	11.0	Sand, gravelly & silty; lt. brn, moist, trace of small cobbles (max. size 4"), 10% gravel, 10% low plastic fines, sand is mostly medium to fine.	SM
11.0		Bottom of pit - dry hole.	

TP 105, ELEV. 667.5, -1+10, 510' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	8.0	Clay, gravelly, sandy & cobbly; lt. brn, moist, 5% small cobbles (max. size 6"), matrix is 30% gravel, 15% sand, 55% plastic fines, coarse particles are angular durable chert.	C[illegible]
8.0		Bottom of pit - bedrock? seen at base of pit. WL (2/15/66) 7.5' (after 6 hours)	

TP 106, ELEV. 793.[illegible], -3+25, 830' U.S.

0.0	0.7	Topsoil, roots, etc.	
0.7	1.5	Clay, gravelly & sandy; brn, moist; 30% gravel, 15% sand, 55% plastic fines, coarse particles are angular, durable chert.	C[illegible]
1.5	3.5	Gravel, brn with gry & black, all angular & durable, trace of fines, 20% sand, gravel is mostly med. to fine, trace of small cobbles.	GP
3.5	9.0	Shale, weathered, very soft, gry with several other colors, dipping approximately 45° downhill, wet in bottom 4', seeping very slightly.	
9.0		Bottom of pit WL (2/15/66) 5.0'±	

TP 107, ELEV. 787.5, -5+85, 1160' U.S.

0.0	0.7	Topsoil, roots, etc.	
0.7	6.0	Sandstone, weathered, hard lt. brn, moist with layers of chert (very hard) up 3" thick excavated with difficulty as angular cobbles and gravel, fossiliferous.	
6.0		Bottom of pit - dry hole.	

TP 108, ELEV. 755.[illegible], -3+75, 1245' U.S.

0.0	0.5	Topsoil, roots, etc.	
0.5	3.5	Clay, gravelly & sandy; lt. brn, moist, trace of small cobbles (max. size 6") 30% gravel, 15% sand, 55% plastic fines, coarse particles are angular chert (durable).	C[illegible]
3.5	10.5	Sand, gravelly & silty; brn with some red-brn strata, trace of soft sandstone cobbles (max. size 5") 10% soft sandstone gravel, 10% nonplastic fines, sand is mostly med. to fine quartz (subround)	S[illegible]
10.5		Bottom of pit - dry hole.	

TP 109, ELEV. 760.1, -5+55, 1605' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	6.0	Clay, gravelly & sandy; lt. brn, moist, trace of small cobbles, 30% gravel, 15% sand, 55% plastic fines. Coarse particles are angular, durable chert.	C
6.0		Sandstone, weathered, hard, lt. brn fossiliferous. Bottom of pit - dry hole.	

TP 110, ELEV. 717.3, -8+80, 1715' U.S.

0.0	0.5	Topsoil, roots, etc.	
0.5	4.0	Gravel, sandy & clayey; lt. brn, moist, trace of small cobbles, 50% gravel, 15% sand, 35% plastic fines, coarse particles are angular and durable chert and sandstone.	GC
4.0	6.0	Gravel, brn, moist, 10% cobbles (max. size 6"); matrix is 55% well graded gravel, 10% sand, trace of plastic fines, coarse particles are angular, durable chert & sandstone.	GP
6.0	8.0	Sandstone, weathered, hard, lt. brn, excavates as gravel & cobbles, 50% gravel and 50% small cobbles.	
8.0		Bottom of pit - dry hole.	

TP 111, ELEV. 722.9, -6+60, 2050' U.S.

0.0	0.8	Topsoil, roots, etc.
0.8	2.5	Gravel, sandy & clayey; lt. brn, moist, 10% cobbles (max. size 6" 50% gravel, 20% sand, 30% plastic fines, coarse particles are ang durable chert & sandstone.
2.5	8.5	Clay, gravelly; lt. brn, moist, 10% cobbles (max. size 6") 20% g 15% sand, 65% plastic fines, coarse particles are angular, durabl
8.5		Bottom of pit - bedrock?

TP 112, ELEV. 665.9, -4+55, 2085' U.S.

0.0	0.7	Topsoil, roots, etc.
0.7	3.0	Gravel, sandy & clayey; lt. brn, moist, trace of small cobbles (m size 4") 45% gravel, 20% sand, 35% plastic fines, coarse particle angular & durable sandstone & chert.
3.0	9.0	Sand, gravelly & clayey; lt. brn, moist, 10% durable chert gravel, 20% plastic fines.
9.0		Bottom of pit - dry hole.

TP 113, ELEV. 670.9, -2+75, 1835' U.S.

0.0	0.8	Topsoil, roots, etc.
0.8	8.0	Shale, weathered, soft, black on fresh surface, brn coating that gradually disappears with depth. excavates as gravel and trace of angular. nondurable. Dip is difficult to determine, mostly vertic some beds dipping steeply into hillside.
8.0		Bottom of pit - dry hole.

TP 114, ELEV. 704.6, -2+20, 1390' U.S.

0.0	1.1	Topsoil, roots, etc.
1.1	6.5	Clay, sandy & gravelly; lt. brn with some lt. gry, moist, 25% sha angular, nondurable gravel, 15% slaley sand, 60% plastic fines.
6.5	9.0	Siltstone, grn-gry (brn on weathered surface) moist, soft, excava as angular cobbles & gravel (max. size 8") 25% cobbles, 75% gravel
9.0		Bottom of pit - dry hole

TP 115, ELEV. 696.0, 0+95, 1065' U.S.

0.0	0.6	Topsoil, roots, etc.
0.6	8.0	Clay, gravelly & sandy; lt. brn, moist, trace of small cobbles, 3 gravel, 15% sand, coarse particles are angular, durable, chert an sandstone.
8.0	10.0	Shale, weathered, soft, black on fresh surface. brn & gry on weath surface, excavates as gravel with about, 15% sand, trace of fines.
10.0		Bottom of pit - dry hole.

TP 116, ELEV. [illegible].0, 3+60, 1175' U.S.

0.0	0.8	Topsoil, roots, etc.
0.8	6.0	Clay, gravelly & sandy; lt. brn, moist, trace of small cobbles, 2 gravel, 20% sand, 55% plastic fines. coarse particles are shale, nondurable.
6.0	10.0	Shale, weathered, soft, grn-gry, wet, excavates as cobbles & grav 50% each. (max. size [illegible]), water seeping from shale.
10.0		Bottom of pit WL (2/17/66) 6.0'±

TP 118, ELEV. [illegible].1, 12+2[illegible], [illegible] U.S.

0.0	0.8	Topsoil, roots, etc.
0.8	6.0	Clay, sandy & gravelly; lt. brn, moist, 20% gravel, 15% sand, 65% p tic fines, coarse particles are angular to subrounded, durable cher sandstone fragments.
6.0	9.0	Gravel, sandy & clayey; brn with some gry, moist above 6.0', wet 6.0', 5% cobbles (max. size 10"); matrix is 50% gravel, 25% sand, 25% plastic fines, coarse particles are durable, angular chert an stone fragments.
9.0	10.0	Clay, silty, gry, wet, very plastic, weathered shale.
10.0		Bottom of pit WL (2/18/66) 6.0±

TP 119, ELEV. [illegible]28.2, 12+60, 2050' U.S.

0.0	0.8	Topsoil, roots, etc.
0.8	3.0	Clay, sandy & gravelly; lt. brn, moist, 20% gravel, 15% sand, 65% plastic fines, coarse particles are angular, durable chert.
3.0	7.0	Gravel, sandy & clayey; brn, moist, 5% cobbles (max. size 6"); m 50% gravel, 25% sand, 25% plastic fines, coarse particles are ang and durable chert and sandstone fragments.
7.0	7.5	Siltstone, dk. gry to black on fresh surface, lt. gry on weathere
7.5		Bottom of pit WL (2/18/66) 7.0'±

TP 120, ELEV. [illegible]25.0, 12+55, 2245' U.S.

0.0	0.7	Topsoil, roots, etc.
0.7	7.5	Gravel, sandy & clayey; lt. brn with some gry above 3.5', brn bel moist, 50% gravel, 25% sand, 25% plastic fines, coarse particles durable sandstone and chert, some nondurable shale.
7.5		Bedrock Bottom of pit WL (2/18/66) 7.0'±

TP 111, ELEV. 722.9, -0+80, 2050' U.S.

0.8		Topsoil, roots, etc.	
2.5		Gravel, sandy & clayey; lt. brn, moist, 10% cobbles (max. size 6") 50% gravel, 20% sand, 30% plastic fines, coarse particles are angular durable chert & sandstone.	GC
8.5		Clay, gravelly; lt. brn, moist, 10% cobbles (max. size 6") 20% gravel, 15% sand, 65% plastic fines, coarse particles are angular, durable chert.	CL
		Bottom of pit - bedrock?	

TP 112, ELEV. 665.9, -0+55, 2085' U.S.

0.7		Topsoil, roots, etc.	
3.0		Gravel, sandy & clayey; lt. brn, moist, trace of small cobbles (max. size 8") 55% gravel, 20% sand, 15% plastic fines, coarse particles are angular & durable sandstone & chert.	C
9.0		Sand, gravelly & clayey; lt. brn, moist, 10% durable chert gravel, 20% plastic fines.	SC
		Bottom of pit - dry hole.	

TP 113, ELEV. 670.9, -2+75, 1835' U.S.

0.8		Topsoil, roots, etc.	
8.0		Shale, weathered, soft, black on fresh surface, brn coating that gradually disappears with depth, excavates as gravel and trace of sand, angular, nondurable. Dip is difficult to determine, mostly vertical, some beds dipping steeply into hillside.	GP
		Bottom of pit - dry hole.	

TP 114, ELEV. 709.6, -2+20, 1390' U.S.

1.1		Topsoil, roots, etc.	
6.5		Clay, sandy & gravelly; lt. brn with some lt. gry, moist, 25% shaley angular, nondurable gravel, 15% shaley sand, 60% plastic fines.	CL
9.0		Siltstone, grn-gry (brn on weathered surface) moist, soft, excavates as angular cobbles & gravel (max. size 8") 25% cobbles, 75% gravel.	
		Bottom of pit - dry hole	

TP 115, ELEV. 699.3, 0+75, 1764' U.S.

0.6		Topsoil, roots, etc.	
8.0		Clay, gravelly & sandy; lt. brn, moist, trace of small cobbles, 40% gravel, 15% sand, coarse particles are angular, durable, chert and sandstone	CL
10.0		Shale, weathered, soft, black on fresh surface, brn & gry on weathered surface, excavates as gravel with about, 15% sand, trace of fines.	GP
		Bottom of pit - dry hole.	

TP 116, ELEV. [illegible], 1+60, 1173' U.S.

0.8		Topsoil, roots, etc.	
6.0		Clay, gravelly & sandy; lt. brn, moist, trace of small cobbles, 25% gravel, 20% sand, 55% plastic fines, coarse particles are shale, angular nondurable.	CL
10.0		Shale, weathered, soft, grn-gry, wet, excavates as cobbles & gravel, 55% rock, [illegible] water seeping over shale.	
		Bottom of pit [illegible] 10.0'±	

TP 117, ELEV. [illegible], 12+2, [illegible] U.S.

0.8		Topsoil, roots, etc.	
8.0		Clay, sandy & gravelly; lt. brn, moist, 20% gravel, 15% sand, 65% plastic fines, coarse particles are angular to subround, durable chert & sandstone fragments.	CL
9.0		Gravel, sandy & clayey; brn with some gry, moist above 6.5', wet below 6.5', 5% cobbles (max. size 10"); matrix is 50% gravel, 20% sand, and 25% plastic fines, coarse particles are durable, angular chert and sandstone fragments.	GC
10.0		Clay, silty, gry, wet, very plastic, weathered shale.	CL
		Bottom of pit 7L (2/18/66) 6.0'±	

TP 118, ELEV. [illegible], 12+60, 2050' U.S.

0.8		Topsoil, roots, etc.	
3.0		Clay, sandy & gravelly; lt. brn, moist, 20% gravel, 15% sand, 65% plastic fines, coarse particles are angular, durable chert.	CL
7.0		Gravel, sandy & clayey; brn, moist, 5% cobbles (max. size 6"); matrix is 55% gravel, 20% sand, 25% plastic fines, coarse particles are angular and durable chert and sandstone fragments.	GC
7.5		Siltstone, dk. gry to black on fresh surface, lt. gry on weathered surface	
		Bottom of pit 7L (2/18/66) 7.0'±	

TP 119, ELEV. [illegible], 12+45, 2285' U.S.

0.7		Topsoil, roots, etc.	
7.5		Gravel, sandy & clayey; lt. brn with some gry above 4.5', brn below 4.5', moist, 50% gravel, 25% sand, 25% plastic fines, coarse particles are mostly durable sandstone and chert, some nondurable shale.	GC
		Bedrock Bottom of pit 7L (2/18/66) 7.5'±	

TP 121, ELEV. 619.0, 13+70, 2240' U.S.

0.0	0.7	Topsoil, roots, etc.	
0.7	5.0	Clay, sandy & gravelly; lt. brn with some gry, 25% gravel, 15% sand, 60% plastic fines, coarse particles are angular and durable.	CL
5.0	8.0	Gravel, sandy & clayey; brn, moist above 6.5', wet below 6.5', 50% gravel, 25% sand, 25% plastic fines, coarse particles are mostly durable.	GC
8.0		Bottom of pit, bedrock? 7L (2/18/66) 6.5'±	

TP 122, ELEV. 614.7, 13+70, 2040' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	3.5	Clay, gravelly & sandy; lt. brn with some lt. and dk. gry, moist, 30% gravel, 15% sand, coarse particles angular and durable.	CL
3.5	8.5	Gravel, sandy and clayey; brn, moist above 5.0', wet below 5.0', 50% gravel, 25% sand, 25% plastic fines, coarse particles angular and durable.	GC
8.5		Bedrock? Bottom of pit 7L (2/18/66) 5.0'±	

TP 123, ELEV. 611.3, 13+70, 1850' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	3.0	Clay, gravelly and sandy; lt. brn with some gry mottling, moist, 30% gravel, 15% sand, coarse particles are angular and durable.	CL
3.0	8.0	Gravel, sandy and clayey; brn, moist, wet below 5.0', 50% gravel, 25% sand, 25% plastic fines, coarse particles are angular and durable.	GC
8.0	8.5	Shale, poor samples	
8.5		Bottom of pit.	

TP 124, ELEV. 609.7, 13+70, 1680' U.S.

0.0	0.7	Topsoil, roots, etc.	
0.7	5.0	Gravel, sandy and clayey; brn, moist, 55% gravel, 45% sand, 15% plastic fines, coarse particles are angular and durable.	GC
5.0	7.5	Gravel, sandy and silty; brn, wet, 50% gravel, 45% sand, 15% nonplastic fines, trace of small cobbles (max. size 8"), coarse particles are subround and durable (mostly sandstone)	GM
7.5		Bottom of pit, bedrock 7L (2/18/66) 5.0'±	

TP 125, ELEV. 609.6, 13+70, 1490' U.S.

0.0	0.7	Topsoil, roots, etc.	
0.7	2.5	Gravel, sandy and clayey; brn, moist, 50% gravel, 45% sand, 15% plastic fines, coarse particles are durable and angular.	GC
2.5	7.5	Gravel, sandy & silty; brn, wet, trace small cobbles, coarse particles are subround and durable.	GM
7.5		Bottom of pit, bedrock 7L (2/18/66) 2.5'±	

TP 126, ELEV. [illegible], 12+2, 1490' U.S.

0.0	1.6	Topsoil, roots, etc.	
1.6	6.0	Clay, silty and sandy; brn and gry, wet, 15% mostly fine sand,	CL
6.0	7.0	Gravel, sandy and silty; brn, wet, 55% gravel, 30% sand, 15% nonplastic fines, coarse particles are round and durable.	GM
7.0		Bottom of pit 7L (2/18/66) 7.0'±	

TP 127, ELEV. [illegible], 11+70, 1065' U.S.

0.0	1.0	Topsoil, roots, etc. Top 0.6' frozen	
1.0	5.0	Clay, silty and sandy; brn with some gry mottling, moist, 15% sand, mostly fine.	CL
5.0	7.0	Gravel, sandy and silty; brn, wet, trace of cobbles (max. size 8"), 50% gravel, 25% sand, 15% nonplastic fines, coarse particles rounded and durable.	GM
7.0		Bottom of pit, black platy shale 7L (2/21/66) 7.0'±	

TP 128, ELEV. [illegible], 11+70, 1065' U.S.

0.5	1.0	Topsoil, roots, etc. Top 0.5' frozen	
1.0	5.0	Gravel, sandy & clayey; brn, moist, 50% gravel, 30% sand, 20% plastic fines, coarse particles subround to subangular, durable.	GC
5.0	7.0	Gravel, sandy and silty; gry, wet, 5% small cobbles (max. size 6") matrix is 50% gravel, 35% sand, 15% nonplastic fines, coarse particles rounded and durable.	GM
7.0		Bottom of pit 7L (2/21/66) 7.0'±	

All stations are referenced to the baseline.

See note on sheet 29

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
LOGS OF DRILL HOLES AND TEST PITS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed D. C. Johnson	Date 4-27-66	Approved by	
Drawn Lockport		Title	
Traced		Title	
Checked		Sheet No. 27 of 29	Drawing No. PA-637-P

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L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 15

TP 129, ELEV. 608.6, 15+60, 1045' U.S.

0.0	1.0	**Topsoil, roots, etc. Top 0.6' frozen**	
1.0	3.5	Gravel, sandy and clayey; brn, some gry coloring, moist, 50% gravel, 25% sand, 25% plastic fines, coarse particles subangular to subround, durable.	GC
3.5	6.5	Gravel, sandy and silty; gry, wet, 10% small cobbles (max. size 6"); matrix is 60% gravel, 25% sand, 15% *nonplastic fines*, coarse particles subround and durable.	GM
6.5		Bottom of pit WL (2/21/66) 3.5'±	

TP 130, ELEV. 611.2, 15+90, 1040' U.S.

0.0	1.0	Topsoil, roots, etc.	
1.0	2.7	Gravel, sandy and clayey; brn, some lt. gry coloring, moist, 50% gravel, 25% sand, 25% plastic fines, coarse particles angular to round durable.	GC
2.7	7.0	Gravel, sandy and silty; gry, wet, 10% small cobbles, (max. size 6"); matrix is 50% gravel, 35% sand, 15% nonplastic fines, coarse particles mostly rounded and durable.	GM
7.0		Bottom of pit WL (2/21/66) 2.7'±	

TP 131, ELEV. 609.6, 15+90, 1250' U.S.

0.0	1.0	Topsoil, roots, etc.	
1.0	2.0	Gravel, sandy and clayey; brn with gry mottles, 45% gravel, 25% sand, 30% plastic fines, coarse particles.	GC
2.0	6.5	Gravel, sandy and silty; gry, wet, 10% small cobbles (max. size 7"); matrix is 50% gravel, 35% sand, 15% nonplastic fines, coarse particles rounded and durable.	GM
6.5		Bottom of pit WL (2/21/66) 2.5'±	

TP 132, ELEV. 610.3, 17+90, 1250' U.S.

0.0	0.7	Forest litter, etc.	
0.7	3.0	Gravel, sandy and clayey; brn with gry mottles, moist, 30% gravel, 30% sand, 40% plastic fines, coarse particles are subround to angular and durable.	GC
3.0	10.5	Gravel, sandy and silty; gry, wet, 10% small cobbles (max. size 6"); matrix is 60% gravel, 25% sand, 15% nonplastic fines, coarse particles are mostly rounded and durable.	GM
10.5		Bottom of pit WL (2/21/66) 3.0'±	

TP 133, ELEV. 634.3, 10+05, 645' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	8.0	Gravel, sandy and clayey; brn to 5.0', lt. brn below 5.0', moist to 7.0', wet below 7.0', trace of small cobbles (max. size 4") 45% gravel, 30% sand, 25% plastic fines, coarse particles are angular chert and sandstone	GC
8.0		Bottom of pit bedrock? WL (2/22/66) 7.0'±	

TP 134, ELEV. 618.0, 11+75, 605' U.S.

0.0	0.9	Topsoil, roots, etc.	
0.9	6.5	Gravel, sandy and clayey; brn, moist, trace of small cobbles, 45% gravel, 30% sand, 25% plastic fines, most course particles angular and durable, trace of shale.	GC
6.5	8.5	Clay, sandy and gravelly; gry wet, 15% gravel, 30% sand, 55% plastic fines, coarse particles are subround to angular.	CL
8.5		Bottom of pit- bedrock? WL(2/22/66) 6.5'±	

TP 135, ELEV. 609.5, 11+80, 605' U.S.

0.0	1.1	Topsoil, roots, etc.	
1.1	3.5	Clay, silty; gry, slightly organic, moist, 10% sand	CL
3.5	5.0	Gravel, sandy and clayey; brn, moist, wet and gry below 5.0' (pit caved in to 5.0' from top before depth could be measured), 45% gravel, 30% sand, 25% plastic fines, coarse particles are angular and durable.	GC
10.0		Approximate bottom of pit WL (2/22/66) 5.0'±	

TP 136, ELEV. 607.7, 13+70, 450' U.S.

0.0	0.7	Topsoil, roots, etc.	
0.7	3.0	Clay, silty; brn with some lt. gry mottling, moist, 15% sand	CL
3.0	5.0	Gravel, sandy and clayey; brn with gry mottling, moist, trace of small cobbles, (max. size 4") 45% gravel, 25% sand, 30% plastic fines, coarse particles are angular and durable, chert and sandstone	GC
5.0	8.5	Gravel, sandy and silty; gry, wet, 50% gravel, 35% sand, 15% nonplastic fines	GM
8.5		Bottom of pit - bedrock WL (2/22/66) 5.0'±	

TP 137, ELEV. 607.4, 13+75, 250' U.S.

				SAMPLES			
				No.	Type	From Ft.	To Ft.
0.0	0.6	Topsoil, roots, etc.					
0.6	1.5	Clay, silty; brn with some gry mottling, moist, 15% sand	CL (*CL)	1	Bag	1.0	1.5
1.5	5.0	*Gravel, sandy and clayey; brn and gry mottled, moist to 3.5', wet* below 3.5', trace of small cobbles, 45% gravel, 25% sand, 30% plastic fines, coarse particles angular and durable.	GC				
5.0	7.5	Gravel, sandy and silty; gry, wet, 10% small cobbles, (max. size 5"), matrix is 50% gravel, 35% sand, 15% nonplastic fines, coarse particles angular to subround.	GM				
7.5		Bottom of pit - bedrock WL (2/22/66) 4.5'±					

TP 138, ELEV. 607.8, 11+80, 250' U.S.

0.0	1.0	Topsoil, roots, etc.	
1.0	3.0	Clay, silty; brn with gry mottling, moist, 15% sand.	CL
3.0	7.5	Gravel, sandy and clayey; brn with gry mottling, wet, trace of small cobbles, 45% gravel, 25% sand, 30% plastic fines, coarse particles angular and durable.	GC
7.5	8.5	Gravel, sandy and silty; gry, wet, 10% small cobbles (max. size 6"); matrix is 50% gravel, 35% sand, 15% nonplastic fines.	GM
8.5		Bottom of pit - bedrock WL (2/22/66) 3.0'±	

TP 201, ELEV. 659.5, 6+40, 210' U.S.

0.0	1.2	Topsoil (plow-layer) roots, etc. not very organic	
1.2	6.5	Clay, sandy and gravelly; lt. brn, moist, trace of cobbles 15% gravel, 20% sand, 65% very plastic fines, coarse parti sandstone, chert and some shale, durable for the most part	
6.5	11.5	Shale, weathered, gry with many other colors present, exce gravel and sand and trace of plastic fines, moist, 50% pla 50% platy sand, particle strength soft, definitely nondura easily with backhoe.	
11.5		Bottom of pit - shale dips about 45°± downhill - Dry	

TP 202, ELEV. 646.4, 7+70, 235' U.S.

0.0	0.7	Topsoil, roots, etc.	
0.7	6.0	Clay, sandy and gravelly; lt. brn, moist, 15% gravel, 20% sand, coarse particles are soft to very soft, angular, nondurable shale fragment, some coarse particles are lumps of shale that can be crushed to a CL in fingers.	CL (*CL)
6.0	11.0	Shale, highly weathered, soft, brn, moist, excavates as a GC with a trace of cobbles, 40% gravel, 25% sand, 35% plastic fines, coarse particles are angular and soft to very soft, nondurable.	GC
11.0	12.0	Shale, weathered, slightly harder than the shale described above, brn with black stains in bedding planes bedding is contorted but generally dip downhill at about 5	GP
12.0		Bottom of pit - dry hole.	

TP 203, ELEV. 651.8, 7+00, 160' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	6.0	Clay, sandy and gravelly; lt. brn, moist, 15% gravel, 20% fines, coarse particles are shale, soft, angular and nondu particles can be crushed to CL with fingers.	
6.0	9.5	Shale, highly weathered, soft, brn, moist, excavates as a of cobbles, 40% gravel, 25% sand, 35% plastic fines, coarse soft to very soft, angular nondurable.	
9.5	10.5	*Shale, weathered*, soft, gry-brn with black stains in beddi excavates as small cobbles and gravel, 50% each with a trac fines.	
10.5		Bottom of pit - dry hole.	

TP 204, ELEV. 652.4, 6+80, Centerline

0.0	0.8	Topsoil, roots, etc.	
0.8	8.5	Clay, gravelly and sandy; lt. brn, moist, 25% gravel, 20% plastic fines, coarse particles are angular, durable chert	
8.5	8.5	Siltstone, weathered, limestone in top 1.0', slightly limey excavates as cobbles (max. size 11") gry-brn.	
8.5		Bottom of pit - dry hole	

TP 205, ELEV. 656.1, 6+20, 95' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	8.5	Clay, gravelly and sandy; lt. brn, moist, trace of small cobbles (max. size 4") 25% gravel, 15% sand, 60% plastic fines, coarse particles are durable, angular chert and sandstone fragments.	CL
8.5	7.5	Gravel, sandy and clayey; brn, moist, 40% gravel, 25% sand, 35% plastic fines, coarse particles are nondurable, angular shale fragments.	GC
7.5	8.5	Siltstone, gry-brn, moderately soft, slightly limey excavates as cobbles (max. size 12")	
8.5		Bottom of pit - dry hole.	

TP 206, ELEV. 648.0, 6+65, 190' U.S.

0.0	0.8	Topsoil, roots, etc.	
0.8	10.5	Clay, gravelly and sandy; lt. brn, moist, trace of small co (max. size 6"), 30% gravel, 15% sand, 55% plastic fines, co ticles are angular and durable.	
10.5		Bedrock Bottom of pit - dry hole.	

DH 207, ELEV. 660.7, 5+25, 140' U.S.
Logged by: E. C. Johnson 3/14/66
Drilling Equipment: Sprague & Henwood 30"

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Soil Type Blt Used	Blows Per 0.5'	No.
0.0	1.5	Topsoil, roots, etc.		Spl	1-1-2-2	1
1.5	5.5	Clay, gravelly and sandy brn, moist, 20% gravel, 15% sand, coarse particles angular and durable.	CL	"	3-4-7-8	2
				"	11-13-14-12	3
				"	6-8-10-10	4
				"	11-14-25-33	5
5.5	10.0	Shale, weathered, grn-gry and brn, slightly moist, soft.	CL	BX		
10.0	17.0	Shale, weathered lt. gry with many brn stains, mostly moderately soft with some soft pieces, largest piece of core is 3.1' long, many gravel size pieces.		"		
17.0	25.0	Siltstone, lt. gry, moderately soft, pieces of core up to 0.6' long, average size about 0.2'. A few gravel size pieces dip = 35°				
25.0		Bottom of Boring WL (3/15/66) 12.3'				

TP 201, ELEV. 659.5, 6+40, 210' D.S.

From	To	Description	Class
0.0	1.2	Topsoil (plow-layer) roots, etc. not very organic	
1.2	6.5	Clay, sandy and gravelly; lt. brn, moist, trace of cobbles, (max. size 6") 15% gravel, 20% sand, 65% very plastic fines, coarse particles are angular sandstone, chert and some shale, durable for the most part.	CL
6.5	11.5	Shale, weathered, gry with many other colors present, excavates as: gravel and sand and trace of plastic fines, moist, 50% platy gravel, 50% platy sand, particle strength soft, definitely nondurable, excavates easily with backhoe.	GP
11.5		Bottom of pit - shale dips about 45° ± downhill - Dry hole	

TP 202, ELEV. 646.4, 7+70, 235' D.S.

From	To	Description	Class	Samples No.	Type	From Ft.	To Ft.
0.0	0.7	Topsoil, roots, etc.					
0.7	6.0	Clay, sandy and gravelly; lt. brn, moist, 15% gravel, 20% sand, coarse particles are soft to very soft, angular, nondurable shale fragment, some coarse particles are lumps of shale that can be crushed to a CL in fingers.	CL (*CL)	1	150#	1.0	6.0
6.0	11.0	Shale, highly weathered, soft, brn, moist, excavates as a GC with a trace of cobbles, 40% gravel, 25% sand, 35% plastic fines, coarse particles are angular and soft to very soft, nondurable.	GC				
11.0	12.0	Shale, weathered, slightly harder than the shale described above, brn with black stains in bedding planes bedding is contorted but generally dip downhill at about 55°.	GP				
12.0		Bottom of pit - dry hole.					

TP 203, ELEV. 651.8, 7+00, 160' D.S.

From	To	Description	Class
0.0	0.8	Topsoil, roots, etc.	
0.8	6.0	Clay, sandy and gravelly; lt. brn, moist, 15% gravel, 20% sand, 65% plastic fines, coarse particles are shale, soft, angular and nondurable, some particles can be crushed to CL with fingers.	CL
6.0	9.5	Shale, highly weathered, soft, brn, moist, excavates as a GC with a trace of cobbles, 40% gravel, 25% sand, 35% plastic fines, coarse particles are soft to very soft, angular nondurable.	GC
9.5	10.5	Shale, weathered, soft, gry-brn with black stains in bedding planes, moist excavates as small cobbles and gravel, 50% each with a trace of sand and fines.	GP
10.5		Bottom of pit - dry hole.	

TP 204, ELEV. 652.9, 6+80, Centerline

From	To	Description	Class
0.0	0.8	Topsoil, roots, etc.	
0.8	6.5	Clay, gravelly and sandy; lt. brn, moist, 25% gravel, 20% sand, 55% plastic fines, coarse particles are angular, durable chert and sandstone.	CL
6.5	8.5	Siltstone, weathered, limestone in top 1.0', slightly limey below 7.5', excavates as cobbles (max. size 11") gry-brn.	
8.5		Bottom of pit - dry hole	

TP 205, ELEV. 656.1, 6+20, 95' U.S.

From	To	Description	Class	Samples No.	Type	From Ft.	To Ft.
0.0	0.8	Topsoil, roots, etc.					
0.8	6.5	Clay, gravelly and sandy; lt. brn, moist, trace of small cobbles (max. size 9") 25% gravel, 15% sand, 60% plastic fines, coarse particles are durable, angular chert and sandstone fragments.	CL				
6.5	7.5	Gravel, sandy and clayey; brn, moist, 40% gravel, 25% sand, 35% plastic fines, coarse particles are nondurable, angular shale fragments.	GC	1	150#	6.5	7.5
7.5	8.5	Siltstone, gry-brn, moderately soft, slightly limey excavates as cobbles (max. size 12")					
8.5		Bottom of pit - dry hole.					

TP 206, ELEV. 698.0, 4+65, 190' D.S.

From	To	Description	Class
0.0	0.8	Topsoil, roots, etc.	
0.8	13.5	Clay, gravelly and sandy; lt. brn, moist, trace of small cobbles (max. size 6"), 30% gravel, 15% sand, 55% plastic fines, coarse particles are angular and durable.	CL
13.5		Bedrock! Bottom of pit - dry hole.	

DH 207, ELEV. 6[illegible].7, 5+75, 140' D.S.
Logged by: G. C. Johnson 3/14/66
Drilling Equipment: Sprague & Henwood 30C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	Standard Penetration: Type Bit Used	Blows Per 6"	No.	Type	Samples: From Ft.	To Ft.	% Rec.
0.0	1.5	Topsoil, roots, etc.		SpT	1-1-2-2	1	Jar	0.0	2.0	85
1.5	5.5	Clay, gravelly and sandy brn, moist, 20% gravel, 15% sand, coarse particles angular and durable.	CL	"	3-4-7-8	2	"	2.0	4.0	65
				"	11-13-13-12	3	"	4.0	6.0	75
				"	6-8-10-10	4	"	6.0	8.0	40
				"	11-13-25-63	5	"	8.0	10.0	30
5.5	10.0	Shale, weathered, grn-gry and brn, slightly moist, soft.	CL	NX				10.0	13.9	80
				"				13.9	18.1	90
				"				18.1	20.7	100
10.0	17.0	Shale, weathered lt. gry with many brn stains, mostly moderately soft with some soft pieces, largest piece of core is 0.1' long, many gravel size pieces.		"				20.7	25.0	95
17.0	25.0	Siltstone, lt. gry, moderately soft, pieces of core up to 0.6' long, average size about 0.2'. A few gravel size pieces dip = 35°								
25.0		Bottom of Boring WL (3/15/66) 12.3'								

DH 208, ELEV. 662.0, 6+00, Centerline
Logged by: G. C. Johnson 3/14/66
Drilling Equipment: Sprague & Henwood 30C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	Standard Penetration: Type Bit Used	Blows Per 6"	No.	Type	Samples: From Ft.	To Ft.	% Rec.
0.0	1.5	Topsoil, roots, etc.		SpT	0-0-0-3	1	Jar	0.0	2.0	45
1.5	14.0	Clay, silty, sandy & gravelly lt. brn, moist (weathered shale), 15% gravel (moderately hard shale) 15% fine sand.	CL	"	4-5-9-9	2	"	2.0	4.0	40
				"	9-8-11-16	3	"	4.0	6.0	55
				"	10-7-5-6	4	"	6.0	8.0	60
				"	4-5-5-6	5	"	8.0	10.0	35
14.0	16.5	Shale, brn and gry, moist, weathered mostly gravel size pieces in a CL matrix, pieces range from very soft to moderately soft.	GC	"	5-5-5-10	6	"	10.0	12.0	95
				"	11-16-23-38	7	"	12.0	14.0	45
				NXM				14.0	19.0	90
				"				19.0	22.0	100
				"				22.0	25.0	100
16.5	18.0	Shale, weathered, olive moderately soft, core is in 5 pieces ranging from 0.1-0.3' long with some sand, gravel and clay.								
18.0	19.0	Same as from 14.0-16.5'								
19.0	22.0	About the same as from 16.5-18.0, dip = 45°								
22.0	25.0	Shale, black, moderately soft, pieces of core up to 0.3' long, bottom 1.0' is more gry and brn.								
25.0		Bottom of Boring WL (3/15/66) 11.2' WL (3/16/66) 11.8'								

DH 209, ELEV. 663.4, 5+65, 125' U.S.
Logged by: G. C. Johnson 3/15/66
Drilling Equipment: Sprague & Henwood 30C

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	Standard Penetration: Type Bit Used	Blows Per 6"	No.	Type	Samples: From Ft.	To Ft.	% Rec.
0.0	1.0	Topsoil, roots, etc.		SpT	0-0-3-4	1	Jar	0.0	2.0	5
1.0	16.0	Clay, sandy and gravelly; brn, moist, 20% gravel, 15% sand, 65% plastic fines, coarse particles are moderately hard shale, weathered shale.	CL	"	5-5-7-12	2	"	2.0	4.0	30
				"	10-9-9-9	3	"	4.0	6.0	95
				"	8-7-9-9	4	"	6.0	8.0	90
				"	13-11-11-17	5	"	8.0	10.0	95
				"	10-9-11-13	6	"	10.0	12.0	75
16.0	20.5	Shale, same as above but with moderately hard zones up to 0.3'	GC	"	7-8-18-23	7	"	12.0	14.0	35
				"	23-35-26-48	8	"	14.0	16.0	40
20.5	25.0	Siltstone, slightly weathered, gry with some brn, pieces of core up to 0.7' long, average about 0.3', some gravel size pieces and a few clay seams, rock is moderately soft.						16.0	20.5	95
								20.5	25.0	85
25.0		Bottom of Boring WL (3/16/66) 3.5'								

DH 210, ELEV. 676.6, 5+30, Centerline
Logged by: G. C. Johnson 3/15/66
Drilling Equipment: Sprague & Henwood

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	Standard Penetration: Type Bit Used	Blows Per 6"	No.	Type	Samples: From Ft.	To Ft.	% Rec.
0.0	0.8	Topsoil, roots, etc.		SpT	1-1-2-2	1	Jar	0.0	2.0	40
0.8	3.0	Clay, sandy and gravelly; lt. brn, moist, 20% gravel, 15% sand, coarse particles are durable.	CL	"	4-5-5-6	2	"	2.0	4.0	40
				"	5-6-5-7	3	"	4.0	6.0	65
				"	8-10-12-14	4	"	6.0	8.0	75
				"	13-14-16-18	5	"	8.0	10.0	50
3.0	11.8	Clay, sandy & gravelly; gry-brn, moist (weathered shale), 10% fine gravel (moderately soft shale), 15% sand, becomes grayer with depth.	CL	"	15-20-23-45/0.3'	6	"	10.0	11.8	40
				NX				11.8	15.1	90
				"				15.1	18.0	100
				"				18.0	23.2	100
11.8	17.0	Siltstone, weathered, moderately soft, gry with brn stains in bedding planes, largest piece of core is 0.2' long, many gravel size pieces.	GC	"				23.2	29.6	100
				"				29.6	35.0	100
17.0	23.0	Siltstone, gry, moderately soft, pieces of core up to 0.3' long, average 0.1-0.2'.								
23.0	35.0	Same as above with pieces up to 1.1' long and average about 0.5', moderately soft to moderately hard.								
35.0		Bottom of Boring WL (3/16/66) 6.5'								

All stations are referenced to the baseline.

See note on sheet 29

MIDDLE CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-637
SNYDER COUNTY, PENNSYLVANIA
LOGS OF DRILL HOLES AND TEST PITS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. Johnson Date 4-20-66
Drawn Geologist
Approved by
Title
Traced
Checked
Sheet No. 28 of 29
Drawing No. PA-637-P

2

SCS-313B (APRIL 1963)

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

FIGURE 16

APPENDIX F

GEOLOGY

General Geology.

Middle Creek Dam lies in the Valley and Ridge Physiographic Province as described by Fennemann (1938). This province is typified by anticlinal and synclinal features with associated thrust faulting. Structurally, the dam lies in a synclinal trough between two anticlines. There is no major faulting in the area. The dam is situated in the midst of Lower and Middle Devonian aged rocks. A north-eastward trending, low, linear ridge lies to the south of the valley which encompasses Middle Creek Dam. The ridge is formed by resistant sandstones of the Mahantango Formation. This formation is underlain by the Marcellus and Onondago Formation which underlie the dam and form the valley of the North Fork of Middle Creek. These formations are underlain by the Oriskany Formation. The Ridgely Member of this formation is a highly resistant sandstone and forms the ridges lying to the north of the dam.

The dam is directly underlain by the Marcellus Formation and the Onondago Formation. The Marcellus Formation is a black fissile carbanoceous shale with a thick brown sandstone (Turkey Ridge). The Onondago Formation includes interbedded blue shales and dark blue to black cherty limestones.

AD-A070 834 KIMBALL (L ROBERT) AND ASSOCIATES EBENSBURG PA F/G 13/2
NATIONAL DAM INSPECTION PROGRAM. MIDDLE CREEK DAM, CLARENCE F. --ETC(U)
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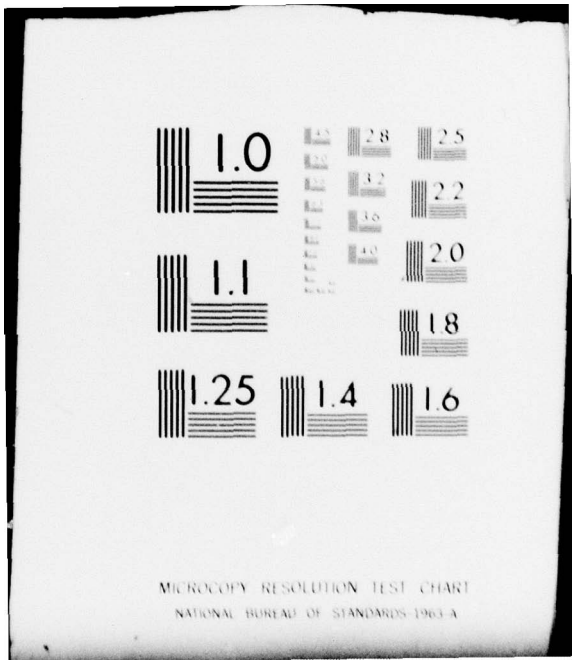
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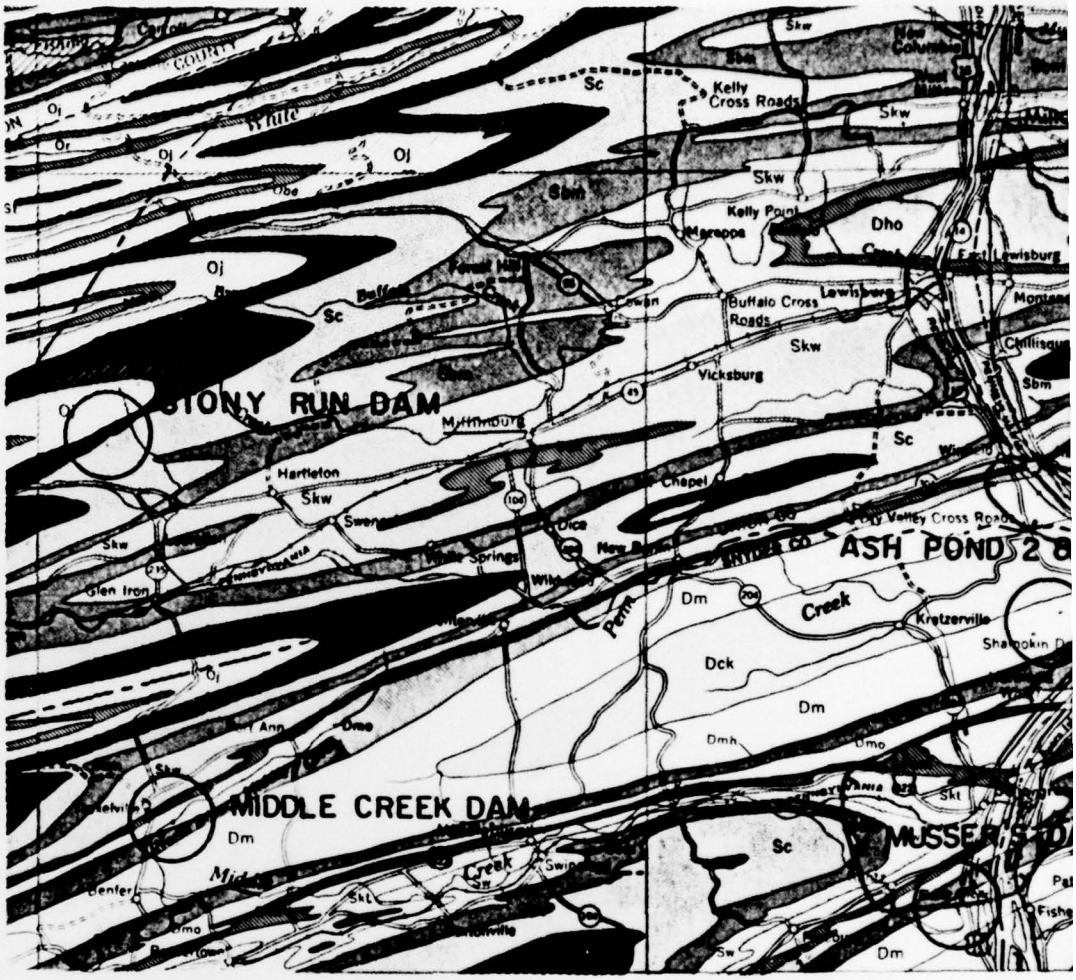
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



Geologic Map of: Stony Run, Middle Creek, Ash Ponds 2 and 3, and Musser's Dam Sites

SCALE: 1:250,000

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.

Marcellus Formation

Black, fissile, carbonaceous shale with thick brown sandstone (Turkey Ridge) in parts of central Pennsylvania.

Onondaga Formation

Greenish blue, thin bedded shale and dark blue to black, medium bedded limestone with shale predominant in most places; includes Selinsgrove Limestone and Needmore Shale in central Pennsylvania and Buttermilk Falls Limestone and Esopus Shale in easternmost Pennsylvania, in Lehigh Gap area includes Palmerton Sandstone and Bowmanstown Chert.

Dmo

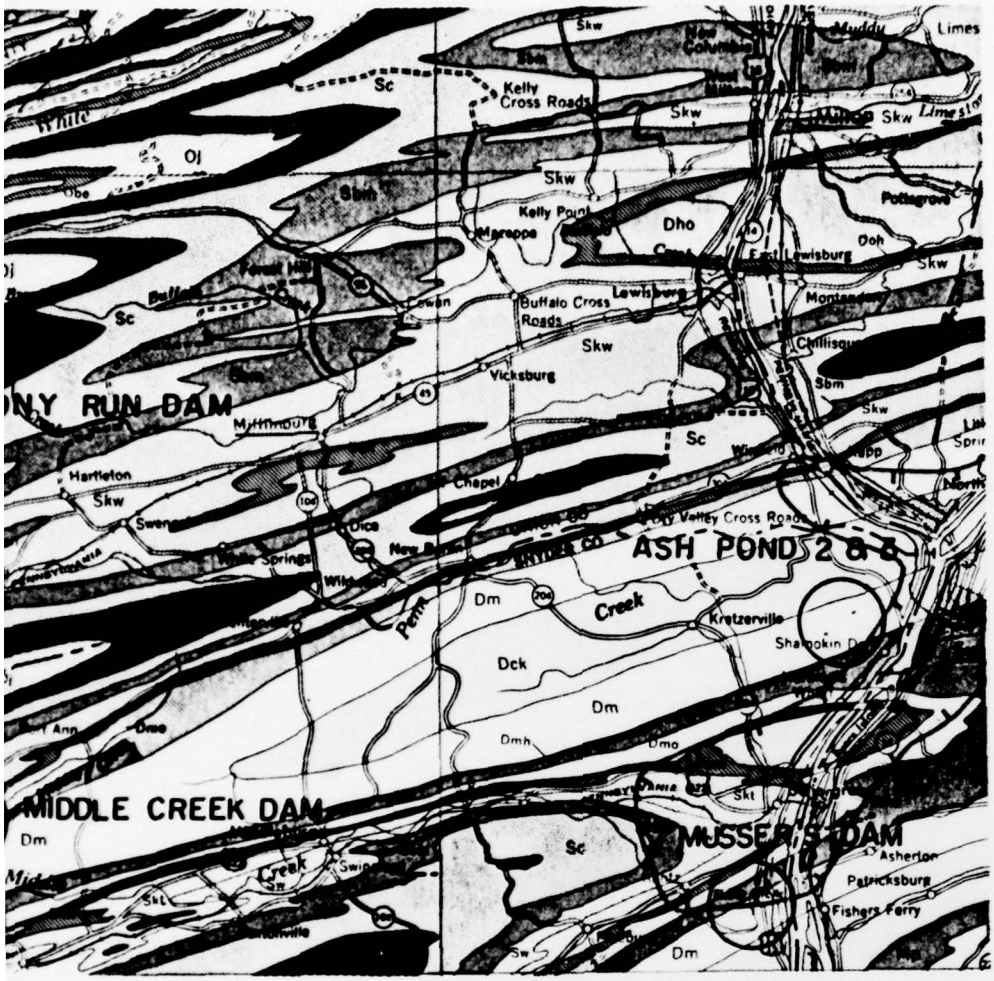
Sc

Clinton Group

Predominantly Rose Hi... Reddish purple to greenis... medium bedded, fossilife... intertonguing ...iron... sa... local gray, fossiliferous l... the Rose Hill in brown to ... sandstone (Keefer) interi... with dark gray shale (Roc...

Tuscarora Formation

White to gray, medium t... fine grained, quartzitic ... glomeratic in part.



ogic Map of: Stony Run, Middle Creek, Ash Ponds 2 and 3, and Musser's Dam Sites

SCALE: 1:250,000

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...e brown shales, graywackes, ...es, contains "Chemung" beds ... beds including Burket, ...rell, and Trimmers Rock, ...ne at base.

...Formation
...e, carbonaceous shale with ...sandstone (Turkey Ridge) in ...ral Pennsylvania.

...Formation
...e, thin bedded shale and dark ..., medium bedded limestone ...predominant in most places; ...nagoro Limestone and Need... in central Pennsylvania and ...Falls Limestone and Esopus ...eternmost Pennsylvania, in ... area includes Palmerton ...d Bowmanstown Chert.

Dmo

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Clinton Group
Predominantly Rose Hill Formation - Reddish purple to greenish gray, thin to medium bedded, fossiliferous shale with intertonguing "iron sandstones" and local gray, fossiliferous limestone, above the Rose Hill is brown to white quartzitic sandstone (Keefer) interbedded upward with dark gray shale (Rochester).

Tuscarora Formation
White to gray, medium to thick bedded, fine grained, quartzitic sandstone, conglomeratic in part.