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NATIONAL DAM INSPECTION PROGRAM. NEW HOLLAND RESERVOIR DAM (NDI--ETC(U)
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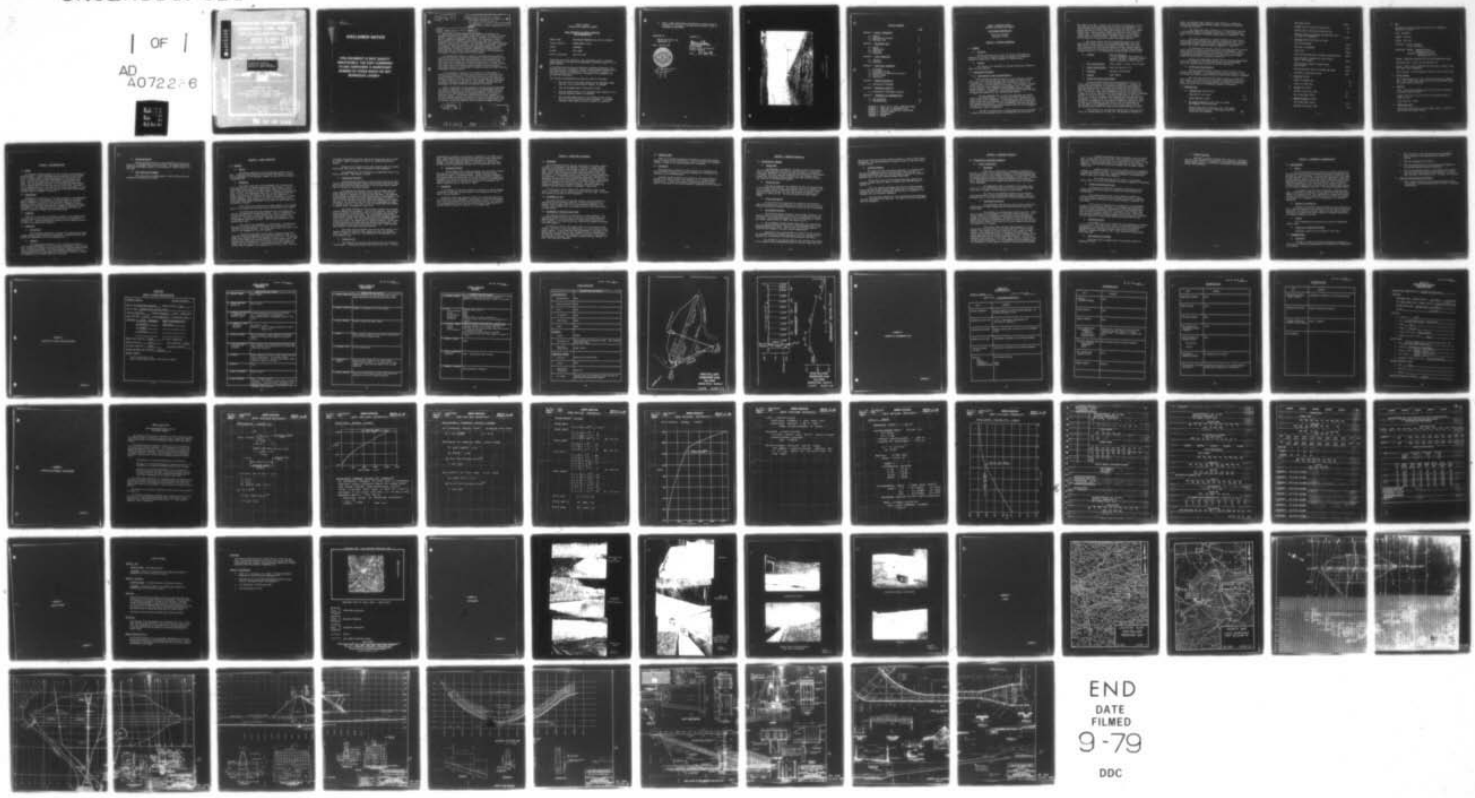

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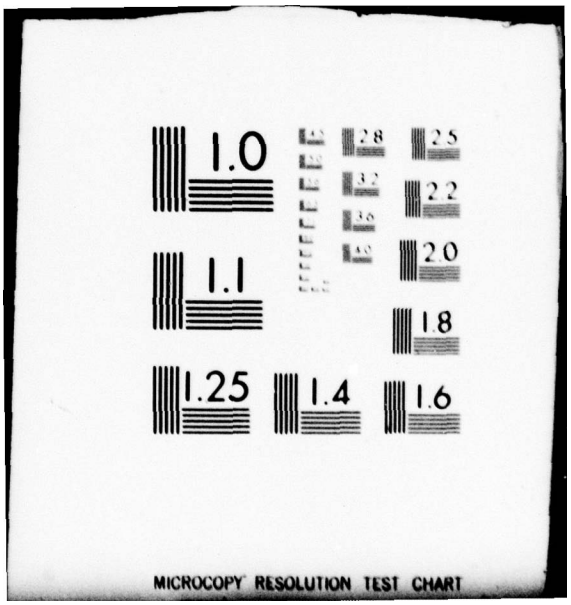
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PENNSYLVANIA RIVER BASINS
NEW HOLLAND RESERVOIR DAM
NDI NO. PA-00346
DER NO. 36-241
LANCASTER COUNTY, PENNSYLVANIA

LEVEL II

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

BY
Gerger Associates, Inc.
Harrisburg, Pennsylvania
July 1979

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(11) May 79

(6) National Dam Inspection Program.
New Holland Reservoir Dam (NDI Number [redacted]
PA-00346, DER Number 36-241),
Susquehanna River Basin, Lancaster County,
Pennsylvania. Phase I Inspection Report

PREFACE

(15) DACW31-79-C-0012

This report has been 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 evoluntionary 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.

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITIONS AND RECOMMENDATIONS

Name of Dam:	NEW HOLLAND RESERVOIR DAM, NDI NO. PA-00346
State & State No.	PENNSYLVANIA, 36-241
County:	LANCASTER
Stream:	MILL CREEK
Date of Inspection:	April 10, 1979

Based upon the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in good condition.

In accordance with the Corps of Engineers' evaluation guidelines, the spillway capacity is inadequate to pass the PMF (Probable Maximum Flood) peak inflow without overtopping the dam. The project is capable of passing 63 percent of the PMF and is considered to be inadequate, but not seriously inadequate.

The following recommendations are made for action by the owner:

1. That the trees at the right abutment of the embankment slope, adjacent to the spillway outlet channel, be removed.

2. That the groundhog hole be sealed and covered.

3. That the eroded portion of the upstream slope, adjacent to the spillway approach channel, be repaired.

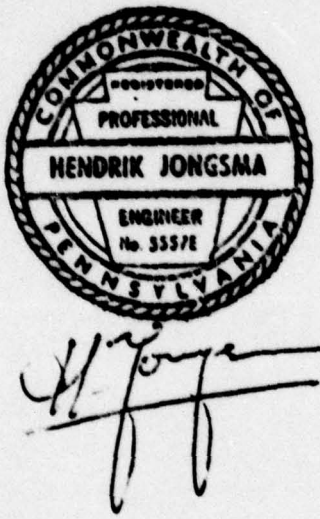
4. That the distressed section of the spillway outlet channel wall be closely observed for further movement. If movement continues, take remedial action to arrest the condition.

5. That a formal surveillance and downstream warning system be developed by the owner to be used during periods of high or prolonged precipitation.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PA

DATE: May 29, 1979



APPROVED BY:

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

DATE 27 Jun 79

OVERVIEW

NEW HOLLAND RESERVOIR DAM

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NEW HOLLAND RESERVOIR DAM

NDI-ID NO. PA-00346
DER-ID NO. 36-241

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

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

B. Purpose

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

1.2 DESCRIPTION OF PROJECT

A. Desctiption of Dam and Appurtenances

The New Holland Reservoir Dam is a zoned earthfill structure with a 28.5 foot long concrete ogee type spillway (see Plate IV and V, Appendix F). The dam embankment has a top width of 20 feet, an overall length of 510 feet and is 38 feet high. The spillway is located at the right end of the embankment and discharges into a "U" shaped concrete channel. This channel has varying widths along its length (Refer to Plate IV, Appendix F). The spillway channel is about 300 feet in length and terminates at the existing stream channel.

The dam embankment has a select fill impervious core which rests on the bedrock surface. A concrete cutoff wall extends over the entire length of the embankment. It extends two feet into the rock and varies in the vertical dimension into the embankment core, according to the original ground contour. The rock foundation, below the core wall, was grouted to provide an impervious curtain within the rock mass. (Refer to Plate Nos. V and VI, Appendix F).

The dam is provided with a concrete intake structure situated at the toe of the upstream slope of the embankment near the center of

the length of the dam. Access to the structure is provided for by a 62 foot long steel truss footbridge from the top of the embankment. The intake includes two 16-inch sluice gate controls for 12-inch C.I. water supply lines and one 20-inch sluice gate control for the 42-inch C.M.P. blowoff line. Concrete cutoff collars are provided on the concrete encased pipes. The blowoff pipe discharges into the spillway outlet channel near the channel terminus. The water supply line is reduced from 16 inches to 12 inches as it leaves the intake structure.

The 12-inch supply line has a downstream control at a valve house located beyond the toe of the downstream embankment slope and about 50 feet to the right of the center of the dam. The valve house lies below grade and is accessible through a 30-inch diameter manhole. Outlet from the valve house goes either to the spillway channel through a 6-inch CI pipe or to the Borough water supply through a 12-inch pipe.

B.	Location:	East Earl Township U.S.G.S. Quadrangle, New Holland, PA Latitude: 40°-05.1', Longitude: 76°-01.9' (Refer to Appendix F, Plate I and II
C.	Size Classification:	Small, Height - 38 feet, 153 acre-feet
D.	Hazard Classification:	High (See Section 3.1.E)
E.	Ownership:	Borough of New Holland
F.	Purpose:	Water Supply

G. Design and Construction History

The New Holland Reservoir Dam was designed in 1951 by I. M. Glace, Consulting Engineer of Harrisburg, Pennsylvania. A permit for construction was issued by the Pennsylvania Water and Power Resources Board the same year and the contract for construction was awarded to Jack and Jim Masor, Inc. The construction of the dam was completed in 1953. The dam is a zoned earth embankment structure. The center core is made up of select impervious soil and extends from the bedrock foundation surface to the top of the dam. A concrete cutoff wall is set 3 feet into the rock and the underlying rock foundation has been grouted (Refer to Appendix F, Plates V and VI). The shell material, forming the outer portion of the embankment, is described as random fill and forms a 3H to 1V slope on the upstream side and 2.5H to 1V on the downstream side. The top width of the embankment is 20 feet and has a gravel surface. The upstream slope surface is riprap and the downstream slope is grass.

The spillway is a concrete ogee section with a length of 28.5 feet, and a design capacity of 1,866 cfs. The spillway is founded on

rock. The spillway outlet channel is about 300 feet in length and consists of concrete slabs and walls (Refer to Appendix F, Plate VIII for plan and sections).

The intake and control consists of a 42-inch blowoff pipe and a 12-inch water supply line encased in concrete. Cutoff collars are used on this encasement to minimize seepage (Refer to Appendix F, Plate V).

The intake structure is a concrete headwall with two 16-inch sluice gates and one 20-inch sluice gate on the upstream side. The two 16-inch gates provide control for water supply while the 20-inch gate controls the blowoff capability (Refer to Appendix F, Plate VII).

An additional 8-inch pipe, encased in concrete and with concrete cutoff collars is located on the right side of the embankment. This pipe serves a leaf trap located in the reservoir area. Its purpose is to provide for taking water from the trap, thus by-passing the other intake facilities (Refer to Appendix F, Plate IV).

Construction memorandums indicate that the dam and appurtenances were built according to the 1951 plans, except that the footbridge across the spillway shown on Plate VII was not constructed.

H. Normal Operating Procedures

The New Holland Reservoir provides a source of water for the Borough of New Holland. It is operated solely for this purpose. Access to the area is through two gates which are locked when the dam is unattended.

One of the two 16-inch sluice gates is open at all times for water supply. The selection of the water level determines which gate is used. The lowest gate, the 20-inch blowoff, is operated at least once yearly and can be used as the emergency drawdown if necessary.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

Computed for this report	1.1
Design Engineer's Value	1.05

B. Discharge at Dam Site (cubic feet per second)
See Appendix C for calculations

Maximum known flood at dam site, June, 1972 (Agnes) Inflow estimated on basis of USGS gage records for Stoney Run near Reamstown	390

	Warm water outlet	None
	Blowoff pipe at low pool elevation 638	28
	Blowoff pipe at normal pool elevation 658	55
	Spillway capacity at maximum pool elevation 664.2 (low point of embankment)	1,725
C.	Elevation (feet above mean sea level)	
	Top of dam (design)	664.5
	Low point in embankment	664.2
	Normal pool	658.0
	Leaf trap upstream invert elevation (approximately)	665.0
	Upstream portal centerline of outlet supply pipes: about (upper)	646.0
	Upstream portal invert of blowoff pipe: about (lower)	630.5
	Downstream portal invert of blowoff pipe about	621.0
	Streambed at centerline of dam	628
D.	Reservoir (miles)	
	Length of maximum pool	.20
	Length of normal pool	.15
E.	Storage (acre-feet)	
	Spillway crest (Elev. 658)	92
	Top of dam (Elev. 664.2)	153
F.	Reservoir Surface (acres)	
	Top of dam (Elev. 664.2)	11.3
	Spillway crest (Elev. 658)	8.3

G. Dam

For general plan and typical sections refer to Appendix F, Plates III, IV and V.

Type: Earthfill.

Length: 558 feet.

Height: 38.0 feet.

Top Width: 20 feet (design).
24 feet (surveyed).

Side Slope: Design - Upstream 3H to 1V.
Downstream 2.5H to 1V.
Surveyed - Upstream 2.5H to 1V.
Downstream 3.3H to 1V.

Zoning: Impervious selected fill core with random soil shell.

Impervious Core: Center core of selected fill.

Cutoff: Cutoff trench excavated into rock and a concrete cutoff wall under entire embankment.

Grout Curtain: In rock foundation beneath concrete cutoff wall.

H. Outlet Conduit

One 42-inch blowoff pipe with a 20-inch gate under the embankment. One 12-inch water supply line, both with upstream control. All pipes encased in concrete.

I. Spillway

Type: Uncontrolled standard ogee weir with chute constructed of concrete slabs and walls.

Length: 28.5 feet at crest with vertical abutment walls at right and left.

Crest elevation: 658.0.

J. Regulating Outlet

Two 16-inch sluice gates for water supply control. One 20-inch sluice gate for blowoff control.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The available engineering data for this facility include sheets of design drawings. As-built drawings were not available in the PennDER files or from the owner. Design calculations were not found in the files. Although some notes and random hydraulic calculations were noted, they are not identified as to source or application in most cases. The correspondence did refer to the maximum discharge capacity of the spillway which was 1,866 cfs with a 6.5 foot head. The check list of engineering data is included in this report as Appendix B. Test boring information along the axis of the dam is included in the design drawings (Refer to Appendix F, Plate III).

2.2 CONSTRUCTION

Information on construction of the dam is limited to the memorandum reports prepared by staff engineers of the Department of Forest and Waters (PennDER) as a result of their periodic inspection of work. Progress reports, submitted for the owner by his engineers, included percentage of work items completed and a summary of quantities of items and materials. The reports on file did not indicate any major construction problems or changes from the design plans.

2.3 OPERATION

There are no operation or maintenance records in the PennDER files. The owner did not have formal records of flow over the spillway on a regular basis. Records available are related to use of water and are of no value to an engineering evaluation.

2.4 EVALUATION

A. Availability

The engineering information available for examination includes design drawings, random hydraulic calculations, inspection reports, and general correspondence; all in the PennDER files.

B. Adequacy

The engineering information is not of sufficient detail to make a detailed evaluation of the structural and hydraulic design of this dam. The missing information includes detailed calculations and criteria used to prepare the design. The design drawings, together with the observed conditions are considered to be sufficiently complete to permit an assessment of the overall condition of the dam.

C. Operating Records

Formal operating records are not maintained and there is no report on the maximum flow over the spillway. The design information indicated a discharge capacity of the spillway of 1,866 cfs with a 6.5 foot head.

D. Post Construction Changes

There have been no modifications to this facility since the completion of construction in 1953.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of the New Holland Reservoir Dam is good. Conditions which need attention include improvements to eroded area of embankment at the spillway, removal of trees and the filling of a groundhog hole.

B. Embankment

The visual inspection of the embankment did not reveal any structural distress or seepage conditions on this structure. The upstream slope cover consists of dumped riprap, about 12-inch maximum size. With the exception of two small trees or bushes on this area, the slope is clear. The downstream slope cover is field grass, weeds and brush. The brush was not dense at the time of this inspection. A moderate stand of trees, 6 inches to 8 inches in diameter, is situated on the embankment slope adjacent to the left spillway channel wall. These trees could become troublesome to the walls as well as the slope and should be removed.

Some erosion was observed at the right abutment of the embankment at its jointure with the left wall of the spillway outlet channel.

The downstream slope was essentially dry, even though some moisture was detected at the grassed surface. This is considered to be a normal condition as the result of heavy rains the day before this inspection. Low spots in the surface drainage swale along the toe of the embankment held some free water. This is also attributed to the previous day's rain.

The crest of the embankment is covered with 1" crushed stone. This surface provides access to the intake tower bridge and to the spillway at the left abutment. The access road to the site leads to the crest of the embankment at its left abutment.

The profile and cross section survey conducted during this inspection showed an embankment crest elevation within 0.3 foot of the design crest elevation 664.5 (see Appendix A, Plate A-II). The selected cross section showed slope ratios different than the design plans. The upstream slope was measured as 2.5H to 1.0V to the water's edge; the design slope was 3.0H to 1.0V. The downstream slope was measured as 3.3H to 1.0V as compared to the design slope of 2.5H to 1.0V. Also the

top width was measured at 24 feet whereas the design plans show a width of 20 feet. Refer to Appendix A, Plate A-II, surveyed profile and section.

Except for the erosion at the right abutment with the spillway outlet wall, there are no signs of distress on this embankment.

One groundhog hole was observed on the downstream slope in the area of the trees. This should be filled.

C. Appurtenant Structures

The appurtenant structures for this facility include an uncontrolled concrete ogee spillway, intake structure with three sluice gates and an outlet from the intake structure to the spillway outlet channel near its terminus at the natural stream.

The spillway was observed to be in good condition with only slight deterioration of the concrete surface noticed. The spillway outlet channel is composed of a concrete slab and walls. The approach to the spillway is directly from the reservoir and is unobstructed. The spillway outlet slab and walls show slight weathering as a result of time. A few of the keys at the wall joints were observed to be cracked and broken. One section of the left wall has a displacement of about 3.5 inches at the top. The trees, in the area behind both walls should be removed (Refer to Appendix A, Plate A-1).

The intake structure for this facility consists of a vertical concrete headwall with wingwalls. There is no enclosure. Three sluice gates are mounted on the upstream side of the headwall and include two 16-inch gates and one 20-inch gate. The 16-inch gates control water supply and the 20-inch gate controls the blowoff and emergency discharge to the outlet channel. The water supply gates are used alternately about once a week. The blowoff gate is operated annually. At the time of this inspection the blowoff gate was operated satisfactorily. One 16-inch gate was open and one was closed at this time. These features were observed to be in good operating condition.

The outlet from the blowoff line (42-inch CMP) consists of an opening through the spillway outlet channel wall near its terminus. Refer to Appendix F, Plate IV. The condition of the discharge outlet in the wall is good.

D. Reservoir Area

The reservoir is used for water supply and is not accessible to the public. Locked gates prevent entrance into this area. The area

surrounding the reservoir is described as timberland to the edge of the lake. Some sedimentation occurred during the first several years after construction, until vegetation matured sufficiently to control the erosion. The owner indicated removal of sediment that had taken place in 1957 and that sedimentation has not been a problem since that time.

E. Downstream Channel

The spillway outlet channel discharges into the natural stream. This stream, for the most part, meanders through farmlands having overbanks in brush or cultivated fields. Several farms and residences are located within the flood plain of the stream and would be subject to flooding in the event of a breach of the dam. Because of the additional hazard to loss of life in this area in the event of a dam break, the Hazard Classification for this dam is "High".

3.2 EVALUATION

In the absence of any major evidence of distress or serious seepage conditions at this dam, the conclusion of this inspection is that the dam is in good condition.

Conditions which need attention involve the corrective measures to the eroded area of the embankment, the removal of trees from the embankment in the area adjacent to the spillway outlet channel, the filling-in of a groundhog hole in this tree area, and possibly future measures to prevent further tilting of a portion of the spillway wall.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The New Holland Reservoir Dam was constructed to provide a supply of water to the Borough of New Holland. The water is taken from the reservoir and delivered to New Holland by means of a 12-inch diameter pipe. Two 16-inch diameter non-rising stem sluice gates control the water intake. They are mounted on the intake structure 10 feet apart vertically. This arrangement permits the selection of water supply from two elevations. A third, 20-inch diameter, sluice gate controls the discharge, through the 42-inch diameter CMP blowoff pipe. A steel plate is mounted on the control structure at the intake of the 42-inch pipe in order to accommodate the 20-inch sluice gate. The blowoff pipe is located at the bottom of the intake structure and can be used as an emergency drawdown control (Refer to Appendix F, Plate VII).

At least one of the two upper water supply gates is open at all times. The blowoff gate is operated at least once each year. This gate was operated at the time of this inspection.

4.2 MAINTENANCE OF DAM

The visual inspection of this dam indicates that the facility is maintained in good operating condition. With the exception of the moderate stand of small trees at the right abutment adjacent to the spillway outlet channel wall, the slopes are free of any sizable brush or heavy growth.

4.3 MAINTENANCE OF OPERATING FACILITIES

The operating facilities at this dam are in good condition. The footbridge leading from the crest of the dam to the intake structure appears sound. It is in the process of being painted on the date of this inspection. The three sluice gate controls are operable and appear to be well greased.

The discharge point of the blowoff pipe is in the spillway outlet channel. The area is clean and unobstructed, as is the entire spillway outlet channel. It was noted that some displacement of one panel of the channel wall has occurred, and that a number of the keys between wall sections have cracked. These conditions do not appear to have impact on the stability of the dam. They should be watched closely, however, to detect any progressive movement.

4.4 WARNING SYSTEM

There is no formally organized surveillance or downstream warning system in operation for this facility. Daily visitation by an employee, however, is made in the routine operation of the system.

4.5 EVALUATION

The operational procedures at this facility are considered good. This conclusion is based on the general appearance of the dam and the condition of the operating gates.

Attention should be given to the removal of the trees presently growing on the right abutment slope adjacent to the spillway outlet channel wall. A formal surveillance and downstream warning system should be developed for use during periods of prolonged or heavy rainfall.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

The hydrologic and hydraulic analyses available from PennDER for New Holland Reservoir Dam were not very extensive. No frequency curve, unit hydrograph, nor flood routings were submitted by the designer to PennDER. The file contained computations by the designer which stated that the maximum spillway capacity was 1,866 cfs over the weir and 1,850 cfs in the downstream channel.

B. Experience Data

The dam and reservoir was completed in 1953 and supplies water to the Borough of New Holland. Calculations based on the records of the U.S.G.S. gaging station at Reamstown indicate that the greatest flood since 1953 occurred on June 22, 1972, and produced an inflow to the reservoir of about 390 cfs. The project passed that flood without damage.

C. Visual Observations

On the date of the inspection, no conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event, until the dam is overtopped.

D. Overtopping Potential

New Holland Reservoir Dam has a total storage capacity of 153 acre-feet and an overall height of 38 feet, both referenced to the top of the dam. These dimensions indicate a size classification of "Small". The hazard classification is "High" (see Section 3.1.E).

The recommended Spillway Design Flood (SDF) for a dam having the above classifications is one-half the Probable Maximum Flood to the Probable Maximum Flood (PMF). For this dam, the PMF peak inflow is 2,755 cfs (see Appendix C for HEC-1 inflow computations).

Comparison of the estimated PMF peak inflow of 2,755 cfs with the estimated spillway discharge capacity of 1,725 cfs indicates that a potential for overtopping of the New Holland Reservoir Dam exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this

dam does not have the necessary storage available to pass the PMF without overtopping. The spillway-reservoir system can pass a flood event equal to 63% of a PMF.

E. Spillway Adequacy

The small size and high hazard categories, in accordance with the Corps of Engineers criteria and guidelines, indicates that the Spillway Design Flood (SDF) for this dam sould be one-half the Probable Maximum Flood to the full Probable Maximum Flood (PMF).

Calculations show that the spillway discharge capacity and reservoir storage capacity combine to handle 63% of the PMF (Refer to Appendix C).

Since the spillway discharge and reservoir storage capacity cannot pass the full PMF without overtopping, but can pass more than one-half the PMF without overtopping, the spillway is considered to be inadequate but not seriously inadequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

There were no indications of embankment instability or distress as a result of the visual inspection. The surveyed profile and cross section show a crest elevation variation of 0.3 foot maximum from the design elevation of 664.5 (Refer to Appendix A, Plate A-II). Erosion of the embankment was observed immediately adjacent to the spillway wall. This condition can be repaired and does not affect the stability of the embankment.

The embankment slopes, as measured in the field, were 2.5H to 1V on the upstream side and 3.3H to 1V on the downstream side. There were no sloughs or slides observed on these slopes.

The trees on the embankment adjacent to the spillway walls could present a future problem and should be removed. Also one groundhog hole in this same area should be filled or otherwise blocked.

2. Appurtenant Structures

The appurtenant structures for this facility include the spillway and its outlet channel and the intake structure, gates and outlet pipes.

The spillway is a concrete ogee section type weir. There was no evidence of displacement or settlement of this structure. The surface condition is considered good with only slight deterioration evident as a result of weathering. One section of the left spillway channel wall has been displaced inward about 3.5 inches at the top (see Plate E-II) and several of the keys at the joints between wall sections were observed to be cracked.

The section where the wall tipped forward is a U-type section with the walls tied to the bottom slab with #3 bars at 9-inch centers. The tipping of the 8-in thick wall can be caused by either failure of the reinforcing steel or flexing of the bottom slab. The visual inspection did not reveal any deformation of the slab and if the rebars would have failed, the wall would have toppled. The wall was measured in the field as 4.5 feet high, rather than the 4-feet as shown on the construction drawing. It also appeared that the weepholes were not installed at 10-foot centers as shown on the construction drawings.

Assuming reinforcement with an allowable stress of 18,000 psi, a 3-inch cover on the steel and a fully saturated fill behind the wall, an overstress of 30 percent of the steel would occur with a 4.5 foot high wall. This overstress would not be sufficient to cause failure. However, if steel was not placed in accordance with the plans, failure could occur.

Complete failure of this wall section would not immediately endanger the safety of the dam. It is recommended that close observation be maintained by the owner and if movement continues, that measures be taken at that time to repair the condition.

The intake structure and the outlet in the spillway outlet channel do not show any evidence of distress, seepage, or instability.

B. Design and Construction Data

The design and construction information available from the PennDER files and from the owner are limited to design drawings and correspondence.

The records indicate that several plans and schemes were considered between 1946 and 1951 when a permit was issued to construct the present dam as reflected by the selected drawings in Appendix F of this report.

The records of construction are contained in the memorandums prepared by the inspection engineers of the Pennsylvania Department of Forests and Waters (PennDER). Examination of these memorandums shows that the construction was completed in February, 1953, and that there were no serious problems during the construction period. Indications were that the foundation grouting program was very effective as evidenced by the "drying-up" of some visible springs downstream from the dam.

C. Operating Records

The PennDER files do not contain any data regarding the operation of the facility. The owner did not offer any information regarding the performance of the dam except that they did not have any problems. Sedimentation was a problem for several years after construction. Removal of sediments was made in 1957. There has been no such problem since that time.

D. Post Construction Changes

There have been no changes made to this facility since its completion in 1953.

E. Seismic Stability

This dam is located in Seismic Zone 1 and it is considered that the static stability is sufficient to withstand minor earthquake induced dynamic forces. No studies or calculations have been made to confirm this assumption.

SECTION 7 - ASSESSMENT & RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection, the review of the design drawings and the historical records of the development and operation indicates that this dam is in good condition. The inspection did not detect any signs of major distress on or in the vicinity of the embankment. There were also no signs of seepage. There were several items noted which require maintenance attention. These include removal of trees, filling of at least one groundhog hole, the correction of the slightly displaced spillway outlet channel wall, and the repair of a small eroded portion of the upstream embankment slope next to the spillway approach channel.

In accordance with the Corps of Engineers evaluation guidelines, the spillway is inadequate for passing the full PMF peak inflow without overtopping the dam. The combination of storage and spillway capacity is sufficient for passing 63 percent of the PMF and although the spillway is not adequate, it is not considered to be seriously inadequate.

B. Adequacy of Information

Although the available engineering data are not sufficient to make a detailed analysis of the stability of the dam and its appurtenant structures, the available drawings, reports and the observed physical conditions are judged sufficient for making a reasonable assessment of the overall condition of the dam.

C. Urgency

The recommendations presented below should be implemented without delay.

D. Necessity for Additional Studies

Additional studies are not required at this time.

7.2 RECOMMENDATIONS

A. Facilities

In order to assure the continued satisfactory operation of this dam, the following recommendations are presented for implementation by the owner:

1. That the trees at the right abutment of the embankment slope, adjacent to the spillway outlet channel, be removed.

2. That the groundhog hole be filled.

3. That the eroded portion of the upstream slope adjacent to the spillway approach channel be repaired.

4. That the distressed section of the spillway outlet channel wall be closely observed for further movement. If movement continues, take remedial acti to arrest the condition.

B. Operation and Maintenance Procedures

1. That a formal surveillance and downstream warning system be developed to be used during periods of heavy or prolonged precipitation.

APPENDIX A

CHECKLIST OF VISUAL INSPECTION REPORT

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 36-241 NDI NO. PA-00 346

NAME OF DAM New Holland Reservoir HAZARD CATEGORY High

TYPE OF DAM Earthfill with concrete cutoff.

LOCATION East Earl TOWNSHIP Lancaster COUNTY, PENNSYLVANIA

INSPECTION DATE 4/10/79 WEATHER Sunny-Cool TEMPERATURE 40's

INSPECTORS: R. Houseal (Recorder) OWNER'S REPRESENTATIVE(s):

R. Shireman Clint Stone

H. Jongsma

A. Bartlett

NORMAL POOL ELEVATION: 658.0 AT TIME OF INSPECTION:

BREAST ELEVATION: 664.5 POOL ELEVATION: 658.0+

SPILLWAY ELEVATION: 658.0 TAILWATER ELEVATION:

MAXIMUM RECORDED POOL ELEVATION: Unknown

GENERAL COMMENTS:

U.S.G.S. Pool Elev. = 654
Project Datum Spillway Crest = 658 (used in report)

NDI NO. PA-00 346

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None evident.
B. UNUSUAL MOVEMENT BEYOND TOE	None evident.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	Erosion adjacent to left wall of spillway, i.e., right abutment of embankment. One groundhog hole in downstream slope in tree area.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	Horizontal: Good. Vertical: Refer to surveyed profile of crest. (Plate A-II).
E. RIPRAP FAILURES	None noticeable, except adjacent to spillway. Riprap is 12-inch stone dumped on upstream slope.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Left abutment with natural ground appears sound. Right abutment with spillway wall is eroded and needs some attention.
G. SEEPAGE	Moist condition on some of slope (heavy rain day before inspection). No constant seepage condition observed. Surface swales had a small amount of water in low spots.
H. DRAINS	None.
J. GAGES & RECORDER	None on site.
K. COVER (GROWTH)	Top: 1" stone surface. Upstream: 12" riprap to water's edge (2 bushes). Downstream: Weeds and brush, some small trees. Moderate stand of 6" - 8" trees adjacent to spillway outlet channel.

NDI NO. PA-00 346

VISUAL INSPECTION
OUTLET WORKS

	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	Concrete headwall on upstream side with a steel frame supporting operating platform and bridge.
B. OUTLET STRUCTURE	Endwall in spillway for 42-inch conduit.
C. OUTLET CHANNEL	Natural stream with heavy brush.
D. GATES	Three operator stands for two 16-inch intake gates and one 20-inch drawdown gate.
E. EMERGENCY GATE	20-inch sluice gate.
F. OPERATION & CONTROL	Gates operated frequently for water supply. Blowoff seldom opened. It was operated for this inspection. Gate controls appear to be in good condition.
G. BRIDGE (ACCESS)	Steel truss footbridge as access from the top of the dam to the top of intake structure.

NDI NO. PA-00 346

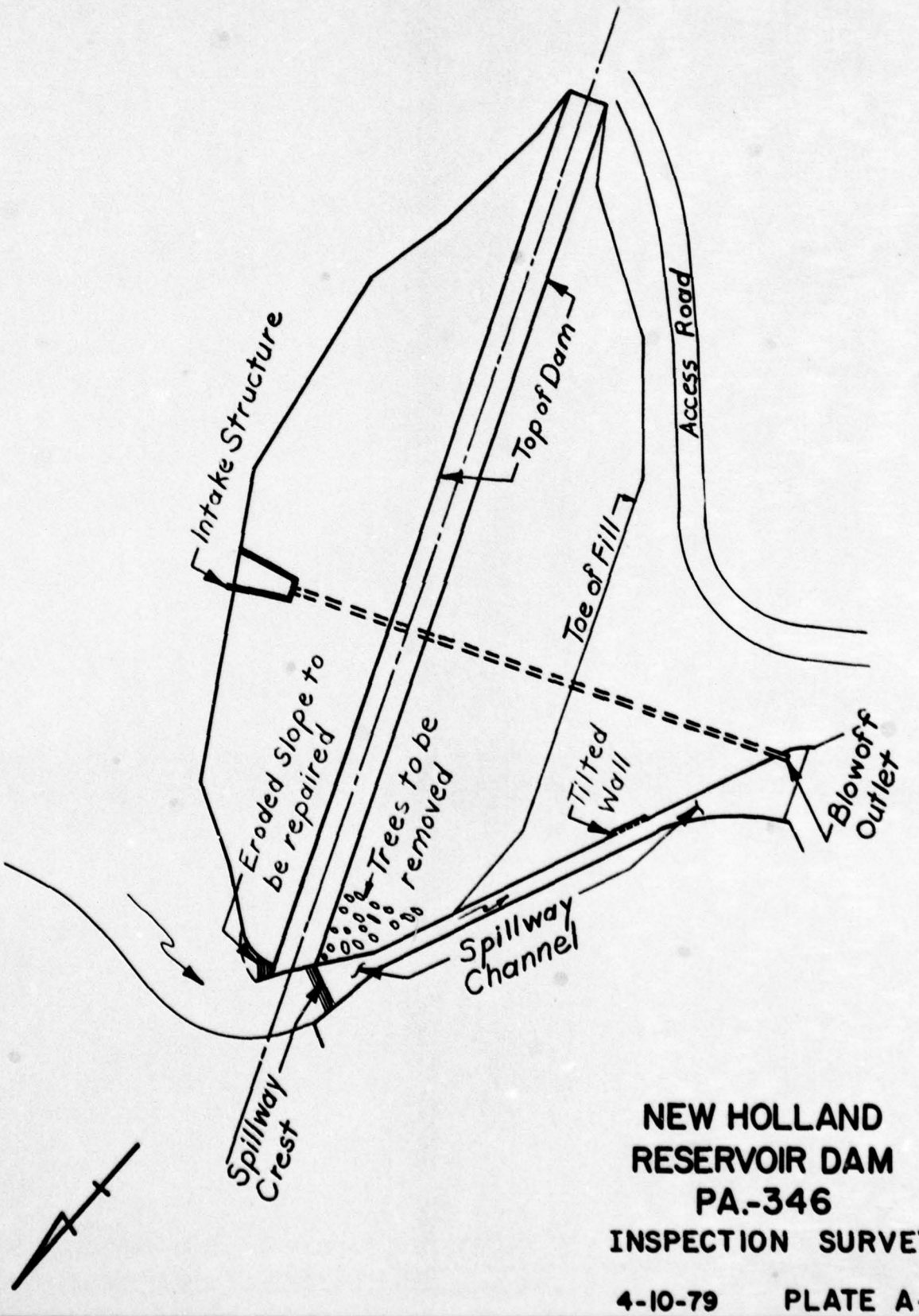
VISUAL INSPECTION
SPILLWAY

	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	Approach channel directly from reservoir. Approach is unobstructed and at least 2 feet deep.
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Concrete ogee section Good Minor Minor Unknown (Refer to Plans, Appendix F) Left wall needs some fill to bring embankment to grade. Right wall abuts natural ground - appears o.k.
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	Concrete channel with slab and training walls. Concrete appears to be in good condition. Some keys at the joints between wall section have cracked and failed. Trees behind the wall should be removed. One section of left wall has tipped 3.5 inches at top.
D. BRIDGE & PIERS	None.
E. GATES & OPERATION EQUIPMENT	None - Uncontrolled ogee section.
F. CONTROL & HISTORY	None recorded or reported.

NDI NO. PA-00 346

VISUAL INSPECTION

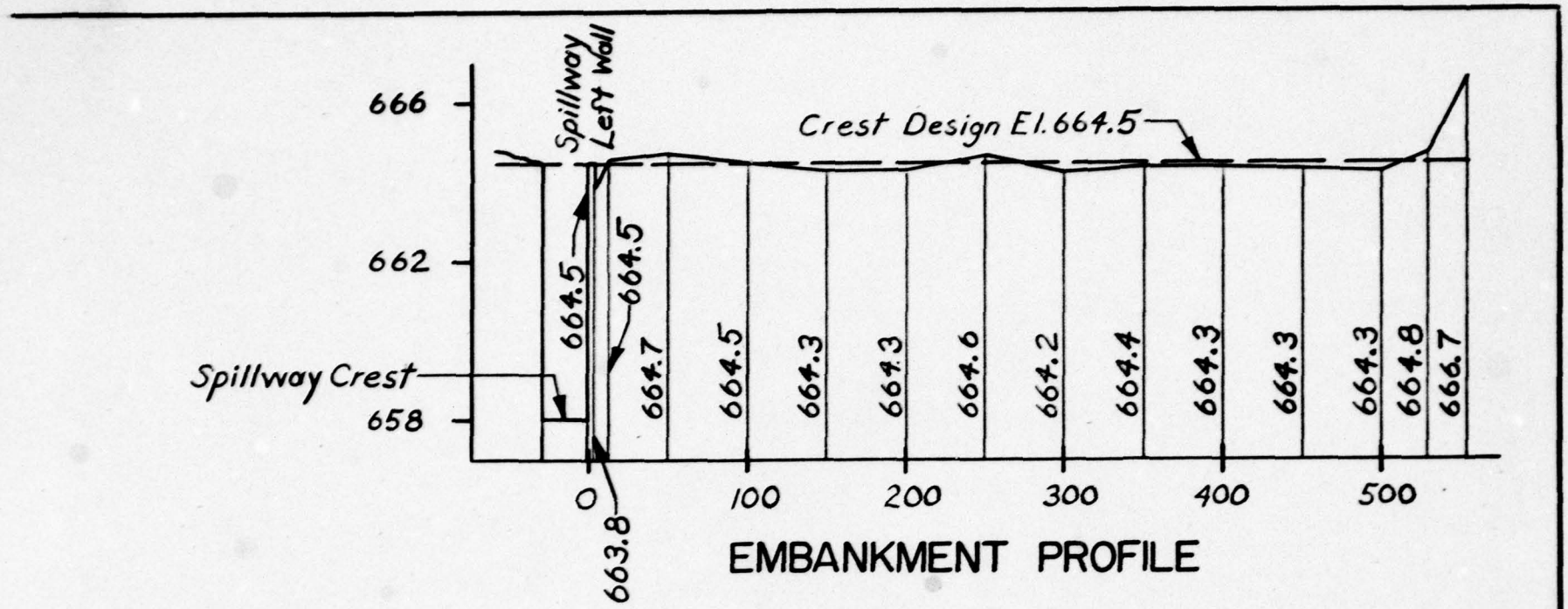
	OBSERVATIONS AND REMARKS
INSTRUMENTATION	
Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	None.
RESERVOIR	
Slopes	Timber
Sedimentation	Some sedimentation removed in 1957. None reported since that time.
Watershed Description	Light forest.
DOWNSTREAM CHANNEL	
Condition	Natural with heavy brush.
Slopes	Flat.
Approximate Population	About 30
No. Homes	Several farms and residences within one mile of dam along the downstream channel.



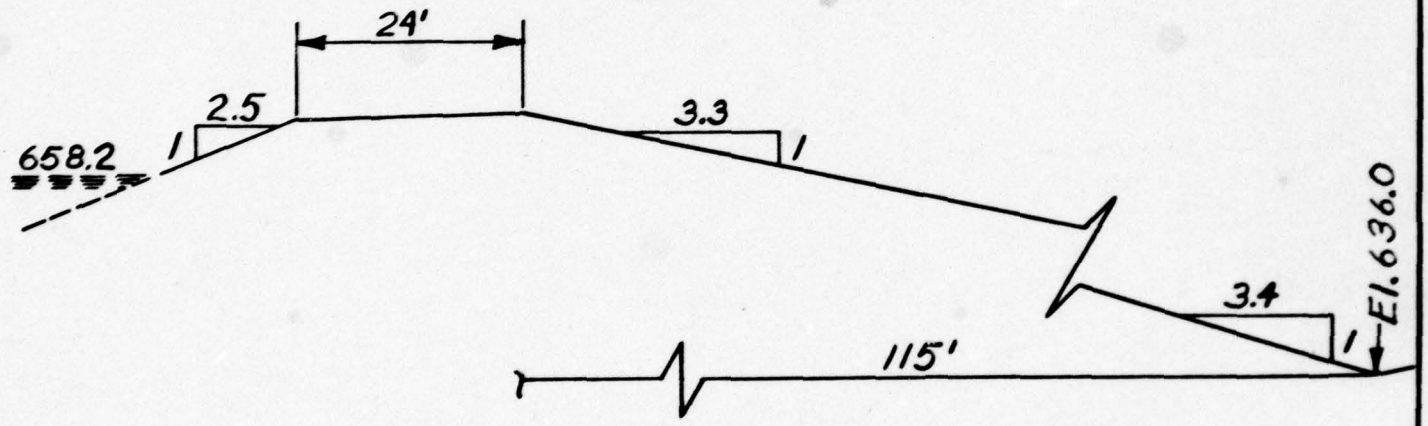
NEW HOLLAND RESERVOIR DAM PA.-346

INSPECTION SURVEY

4-10-79 PLATE A-I



EMBANKMENT PROFILE



EMBANKMENT SECTION STA. 2+00

NEW HOLLAND RESERVOIR DAM
PA-346
INSPECTION SURVEY
4-10-79 PLATE A-II

APPENDIX B

CHECKLIST OF ENGINEERING DATA

CHECK LIST
ENGINEERING DATA

PA DER # 36-241 NDI NO. PA-00 346

NAME OF DAM New Holland Reservoir

ITEM	REMARKS
AS-BUILT DRAWINGS	Sixteen sheets of the 1951 design drawings - no as-built drawings on file.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle, New Holland, PA See Plate II, Appendix F
CONSTRUCTION HISTORY	Monthly construction reports are in the PennDER files.
GENERAL PLAN OF DAM	Information contained in the design drawings.
TYPICAL SECTIONS OF DAM	Information contained in the design drawings.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	See Design Drawings. None. None.

NDI NO. PA-00 346

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	None.
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Random notes, tabulations and calculations regarding hydraulic design. No formal calculations. No stability or seepage study data.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	Test borings plotted on design drawings.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown.

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None.
MAINTENANCE & OPERATION RECORDS	No formal plan or records.
SPILLWAY PLAN, SECTIONS AND DETAILS	Information contained in the design drawings. Bridge across spillway not constructed.

NDI NO. PA-00 346

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	Information contained in the design drawings.
CONSTRUCTION RECORDS	Monthly construction reports.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	State - annually.
MISCELLANEOUS	

NDI NO. PA-00 346

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Woodland and agriculture.

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 658.0 92 Acre-Feet

TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev 664.50 153 Acre-Feet

MAXIMUM DESIGN POOL: Spillway Crest Elev. 658.0

TOP DAM: Elev. 664.5

SPILLWAY:

a. Elevation 658.0

b. Type Concrete Ogee Section - Uncontrolled.

c. Width 28.5

d. Length 300 Feet.

e. Location Spillover Right Abutment

f. Number and Type of Gates None.

OUTLET WORKS:

a. Type Concrete headwall with one 12-inch supply line and one 42-inch CMP blowoff line.

b. Location Upstream toe of embankment

c. Entrance inverts Supply - 645.5 and 635.5
Blowoff - 630.0

d. Exit inverts Supply - 621.5 and 621.5
Blowoff - 621.0

e. Emergency drawdown facilities 42-inch blowoff pipe

HYDROMETEOROLOGICAL GAGES:

a. Type None.

b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: Unknown.

APPENDIX C

HYDROLOGY AND HYDRAULIC CALCULATIONS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge, time of the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

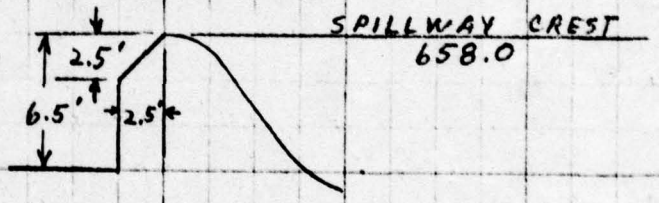
The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U. S. Army Corps of Engineers, Davis, California.

BY RLS DATE 4/12/79 BERGER ASSOCIATES SHEET NO. 1 OF
CHKD. BY DATE PROJECT D849C
SUBJECT NEW HOLLAND RESERVOIR

SPILLWAY CAPACITY

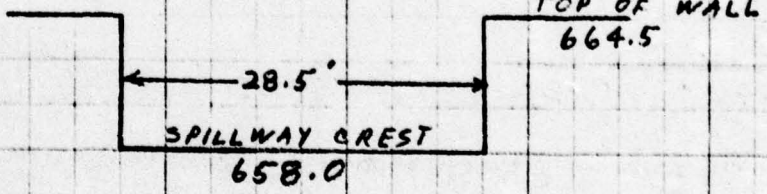
OGEE SECTION



(FROM SMALL DAMS, FIG. 249 + 251)

$C = 3.88 \times 1.01$

$= 3.92$



LOW POINT TOP OF DAM = 664.2

$C = 3.92$

$L = 28.5$

$H = 664.2 - 658 = 6.2'$

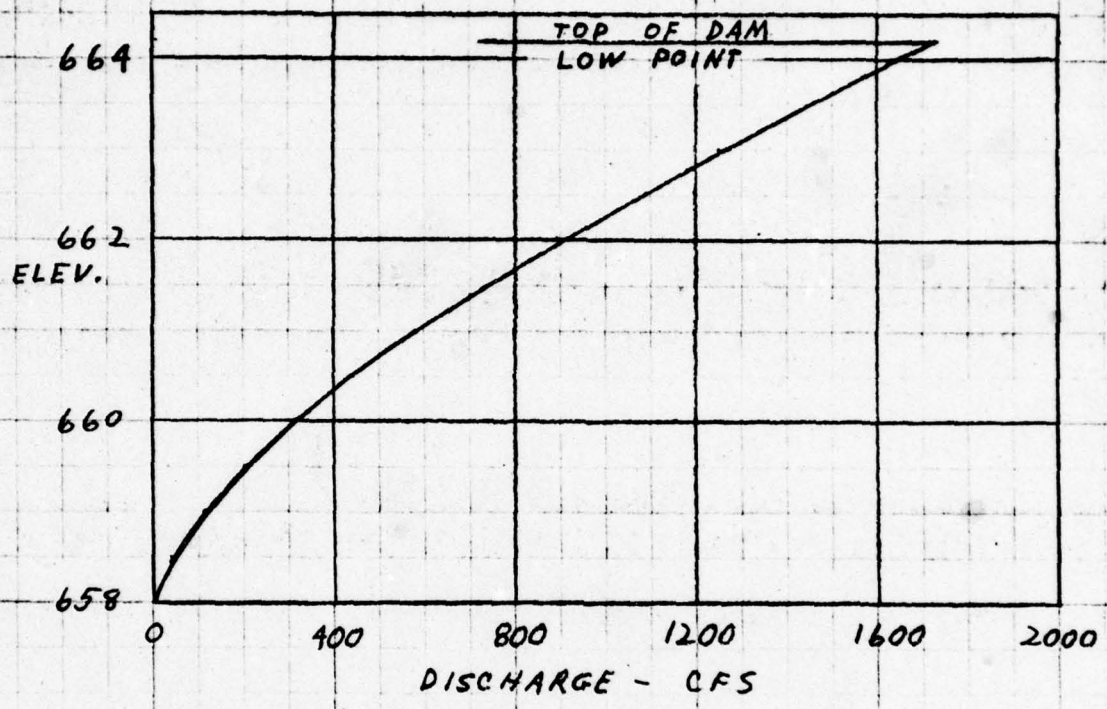
$Q = C L H^{3/2}$

$= 3.92 \times 28.5 \times (6.2)^{3/2}$

$= 1725$ CFS

BY RLS DATE 4/20/79 | BERGER ASSOCIATES | SHEET NO. 2 OF
CHKD. BY DATE | PROJECT D-8490
SUBJECT NEW HOLLAND RESERVOIR

SPILLWAY RATING CURVE



MAXIMUM KNOWN FLOOD AT DAMSITE

NO INFORMATION AVAILABLE ON WATER LEVEL IN RESERVOIR. MAXIMUM INFLOW ESTIMATED BASED ON NEARBY STONEY RUN GAGING STATION, NEAR REAMSTOWN. FOR THE PERIOD OF RECORD FROM 1964 TO 1978 THE MAXIMUM DISCHARGE AT THE GAGE WAS 995 CFS ON JUNE 22, 1972. DRAINAGE AREA IS 3.55 SQ. MI.

MAXIMUM INFLOW TO NEW HOLLAND RESERVOIR =

$$\left(\frac{1.1}{3.55}\right)^{.8} \times 995 = 390 \text{ CFS}$$

BY RLS DATE 4/23/79 BERGER ASSOCIATES SHEET NO. 3 OF
CHKD. BY DATE PROJECT D8490
SUBJECT NEW HOLLAND RESERVOIR

DISCHARGE THROUGH OUTLET WORKS

20" DIAMETER SLUICE GATE CENTER LINE ELEV = 630.8

$Q = CA\sqrt{2gH}$ $C = 0.6$

DISCHARGE AT NORMAL POOL ELEV. 658

$H = 658 - 630.8 = 27.2'$

$A = \pi D^2/4 = 2.18$

$Q = 0.6 \times 2.18 \times (2 \times 32.2 \times 27.2)^{1/2}$

$= 55$ CFS

DISCHARGE AT LOW POOL ELEV 638

$H = 638 - 30.8 = 7.2'$

$Q = 0.6 \times 2.18 \times (2 \times 32.2 \times 7.2)^{1/2}$

$= 28$ CFS

BY RLS DATE
CHKD. BY DATE
SUBJECT NEW HOLLAND RESERVOIR

BERGER ASSOCIATES

SHEET NO. 4 OF
PROJECT D8490

EMBANKMENT RATING

ELEV. 664.3

$2.7 \times 38 \times .05^{3/2} = 1$ CFS

ELEV. 664.4

$2.7 \times 75 \times .1^{3/2} = 6$
$2.7 \times 150 \times .1^{3/2} = 13$
$2.7 \times 95 \times .05^{3/2} = 3$ $\Sigma = 22$ CFS

ELEV. 664.5

$2.7 \times 200 \times .2^{3/2} = 48$
$2.7 \times 99 \times .1^{3/2} = 8$
$2.7 \times 87 \times .15^{3/2} = 14$ $\Sigma = 70$ CFS

ELEV. 664.6

$2.7 \times 200 \times .3^{3/2} = 89$
$2.7 \times 100 \times .2^{3/2} = 24$
$2.7 \times 50 \times .25^{3/2} = 17$
$2.7 \times 68 \times .15^{3/2} = 11$
$2.7 \times 46 \times .05^{3/2} = 1$
$2.7 \times 25 \times .1^{3/2} = 2$ $\Sigma = 144$ CFS

ELEV. 664.8

$2.7 \times 200 \times .5^{3/2} = 191$
$2.7 \times 100 \times .4^{3/2} = 68$
$2.7 \times 25 \times .3^{3/2} = 11$
$2.7 \times 92 \times .2^{3/2} = 22$
$2.7 \times 50 \times .45^{3/2} = 41$
$2.7 \times 50 \times .35^{3/2} = 28$
$2.7 \times 30 \times .25^{3/2} = 10$ $\Sigma = 371$ CFS

ELEV. 665 $\Sigma = 678$ CFS

ELEV. 665.4 $\Sigma = 1462$ CFS

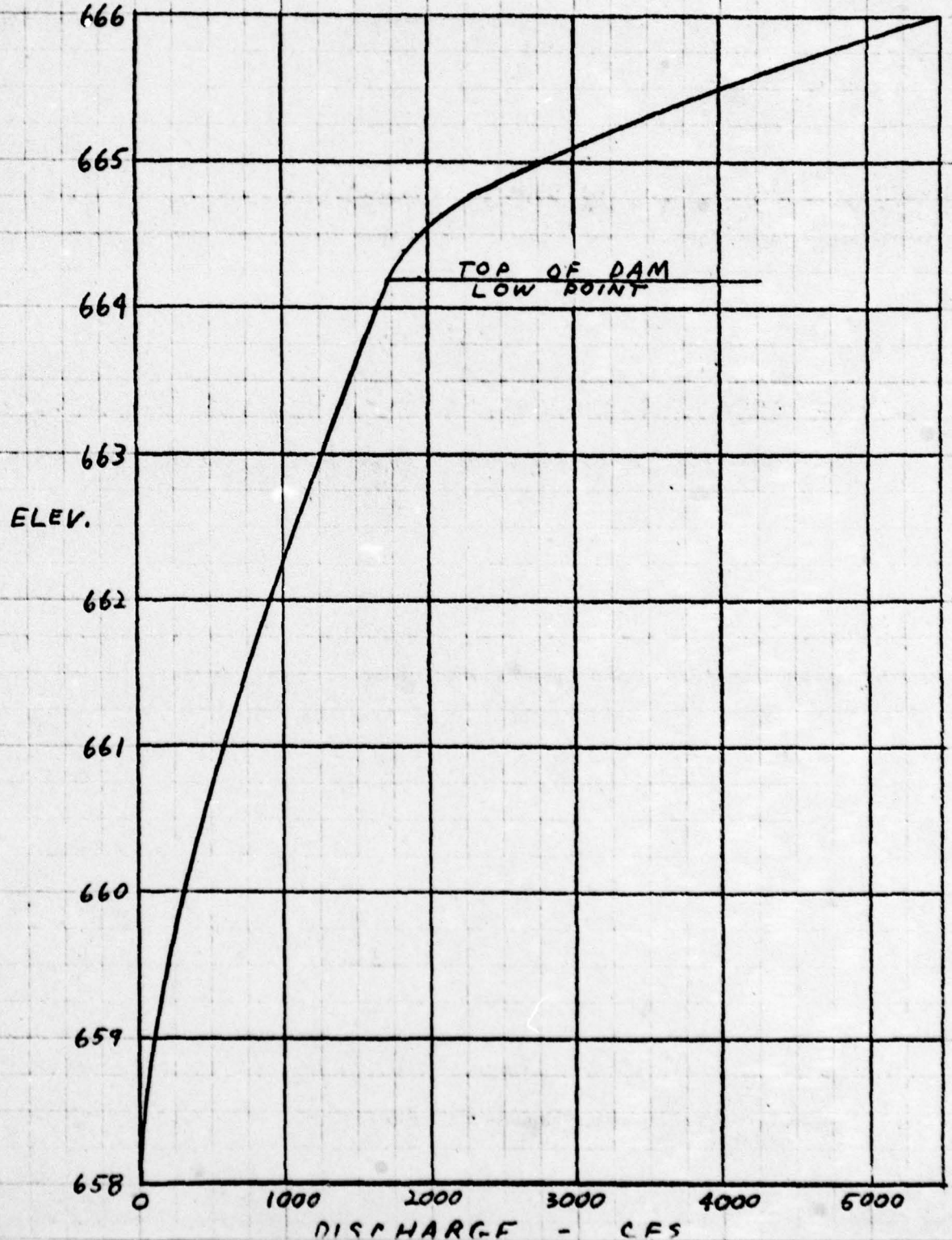
ELEV. 666 $\Sigma = 2967$ CFS

BY RLS DATE 9/20/79 | BERGER ASSOCIATES | SHEET NO. 5 OF

CHKD. BY DATE | PROJECT D8490

SUBJECT NEW HOLLAND RESERVOIR

DISCHARGE RATING CURVE



BY RLS DATE 4/23/79 BERGER ASSOCIATES SHEET NO. 6 OF
CHKD. BY DATE PROJECT D8490
SUBJECT NEW HOLLAND RESERVOIR

SIZE CLASSIFICATION

MAXIMUM STORAGE = 153 ACRE-FEET
MAXIMUM HEIGHT = 36.5 FEET
SIZE CLASSIFICATION IS SMALL

HAZARD CLASSIFICATION

SEVERAL FARMS AND HOMES LOCATED ALONG DOWNSTREAM CHANNEL.
USE "HIGH"

RECOMMENDED SPILLWAY DESIGN FLOOD

THE ABOVE CLASSIFICATIONS INDICATE USE OF AN SDF EQUAL TO ONE-HALF PMF TO THE PMF.

BY RLS DATE 9/23/79 | BERGER ASSOCIATES | SHEET NO. 7 OF
CHKD. BY DATE | PROJECT 08490
SUBJECT NEW HOLLAND RESERVOIR

HEC-1 DATA

DRAINAGE AREA = 1.1 SQ. MI.

SUSQUEHANNA BASIN REGION 15C
$C_P = 0.82$
$C_T = 2.78$
LONGEST WATERCOURSE = 1.89 MI.
LENGTH TO CENTROID = 1.02 MI.

$T_P = C_T (L \times L_{CA})^{.3}$
$T_P = 3.39$

RAINFALL (HMR-33)
INDEX = 23.4 IN.

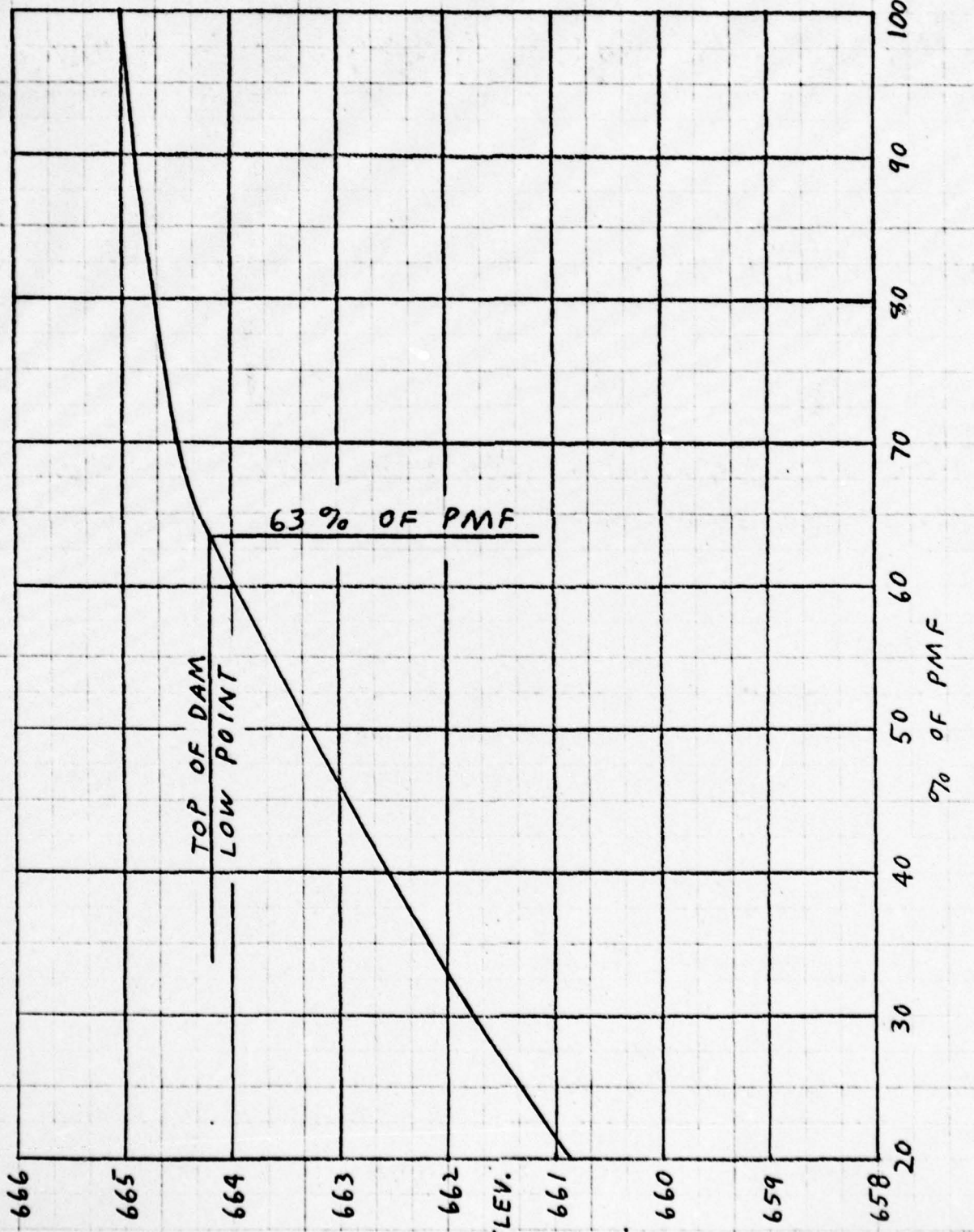
ZONE 6
INCREMENTAL RAINFALL
6 HR = 113 %
12 HR = 123 %
24 HR = 132 %
48 HR = 143 %

PLANIMETERED AREAS (FROM QUAD SHEET)
ELEV: 654 = 8.3 ACRES (EL = 658)
660 = 11.2 ACRES (EL = 664)
680 = 20.9 ACRES (EL = 684)
(ELEVATIONS ADJUSTED TO MATCH DESIGN DRAWINGS)

ZERO STORAGE ELEVATION
ELEV = 658 - (STORAGE X 3/AREA)
= 624.7

BY RLS DATE 7/20/79 BERGER ASSOCIATES SHEET NO. 8 OF
CHKD. BY DATE PROJECT D8490
SUBJECT NEW HOLLAND RESERVOIR

SPILLWAY CAPACITY CURVE



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

```
   1          A1     NEW HOLLAND RESERVOIR DAM  ****  MILL CREEK
   2          A2     EAST EARL TWP., LANCASTER COUNTY, PA.
   3          A3     NDI # PA-00346    PA DER # 36-241
   4          B  300     0     15      0      0      0      0      0     -4      0
   5          B1   5
   6          J    1     9     1
   7          J1   1    .9    .8     .7     .6     .5    .35    .25    .15
   8          K              1                                  1
   9          K1                  INFLOW HYDROGRAPH
  10          M    1     1    1.1                                        1
  11          P         23.4   113    123    132    143
  12          I                                                  1     .05
  13          W  3.39   .82
  14          X  -1.5  -.05     2
  15          K    1     2                                       1
  16          K1                 RESERVOIR ROUTING
  17          Y                        1
  18          YI   1                                          92.1    -1
  19          Y4 658   658.5   659   659.5   660   660.5    661    662   663   664
  20          Y4 664.2 664.4 664.5   664.6 664.8   665    665.4   666
  21          Y5   0    39    112    205    316    442    581    894  1249  1642
  22          Y5 1725 1830  1921   2038   2352   2747   3711   5495
  23          $A   0   8.3   11.2   20.9
  24          $E 624.7 658   664    684
  25          $$ 658
  26          $D 664.2
  27          K   99
```

1 PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT 1
ROUTE HYDROGRAPH TO 2
END OF NETWORK

1**********************************

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

RUN DATE# 79/04/20.
TIME# 06.41.24.

NEW HOLLAND RESERVOIR DAM **** MILL CREEK
EAST EARL TWP., LANCASTER COUNTY, PA.
NDI # PA-00346 PA DER # 36-241

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	15	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED

NEW HOLLAND RESERVOIR DAM **** MILL CREEK
EAST EARL TWP., LANCASTER COUNTY, PA.
ND1 # PA-00346 PA DER # 36-241

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	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= 9 LRTIO= 1
RTIOS= 1.00 .90 .80 .70 .60 .50 .35 .25 .15

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

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.10	0.00	1.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.40	113.00	123.00	132.00	143.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

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= 3.39 CP= .82 NTA= 0

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

UNIT HYDROGRAPH 38 END-OF-PERIOD ORDINATES, LAG= 3.37 HOURS, CP= .81 VOL= 1.00

5.	17.	32.	50.	68.	86.	103.	120.	136.	151.
163.	171.	175.	176.	173.	168.	160.	149.	133.	112.
92.	74.	61.	49.	40.	33.	27.	22.	18.	14.
12.	9.	8.	6.	5.	4.	3.	3.		

0 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	26.77	24.35	2.42	69819.
										(680.)(619.)(61.)(1977.05)			

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

HYDROGRAPH ROUTING

RESERVOIR ROUTING

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	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	92.	-1

STAGE	658.00	658.50	659.00	659.50	660.00	660.50	661.00	662.00	663.00	664.00
	664.20	664.40	664.50	664.60	664.80	665.00	665.40	666.00		
FLOW	0.00	39.00	112.00	205.00	316.00	442.00	581.00	894.00	1249.00	1642.00
	1725.00	1830.00	1921.00	2038.00	2352.00	2747.00	3711.00	5495.00		
SURFACE AREA=	0.	8.	11.	21.						
CAPACITY=	0.	92.	150.	466.						
ELEVATION=	625.	658.	664.	684.						

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
658.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
664.2	0.0	0.0	0.

PEAK OUTFLOW IS 2753. AT TIME 42.75 HOURS

PEAK OUTFLOW IS 2477. AT TIME 42.75 HOURS

PEAK OUTFLOW IS 2200. AT TIME 42.75 HOURS

PEAK OUTFLOW IS 1920. AT TIME 43.00 HOURS

PEAK OUTFLOW IS 1633. AT TIME 43.00 HOURS

PEAK OUTFLOW IS 1361. AT TIME 43.00 HOURS

PEAK OUTFLOW IS 951. AT TIME 43.00 HOURS

PEAK OUTFLOW IS 678. AT TIME 43.00 HOURS

PEAK OUTFLOW IS 405. AT TIME 43.25 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)

				RATIOS APPLIED TO FLOWS								
OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				1.00	.90	.80	.70	.60	.50	.35	.25	.15
HYDROGRAPH AT	1	1.10	1	2755.	2479.	2204.	1928.	1653.	1377.	964.	689.	413.
	(	2.85)	(	78.01)(	70.21)(	62.41)(	54.61)(	46.81)(	39.01)(	27.30)(	19.50)(	11.70)
ROUTED TO	2	1.10	1	2753.	2477.	2200.	1920.	1633.	1361.	951.	678.	405.
	(	2.85)	(	77.96)(	70.15)(	62.30)(	54.38)(	46.23)(	38.54)(	26.92)(	19.19)(	11.46)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	657.99	658.00	664.20
STORAGE	92.	92.	153.
OUTFLOW	0.	0.	1725.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	665.00	.80	162.	2753.	4.00	42.75	0.00
.90	664.86	.66	160.	2477.	3.50	42.75	0.00
.80	664.70	.50	158.	2200.	2.75	42.75	0.00
.70	664.50	.30	156.	1920.	2.00	43.00	0.00
.60	663.98	0.00	150.	1633.	0.00	43.00	0.00
.50	663.28	0.00	143.	1361.	0.00	43.00	0.00
.35	662.16	0.00	131.	951.	0.00	43.00	0.00
.25	661.31	0.00	122.	678.	0.00	43.00	0.00
.15	660.35	0.00	113.	405.	0.00	43.25	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****
EOI ENCOUNTERED.
N>

APPENDIX D

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam

Formation Name: Antietam Quartzite.

Lithology: Light gray quartz-schist and light gray quartzite. Weathers tan to buff, in slabs or blocks.

Bedrock - Reservoir

Formation Names: Antietam Quartzite and Harpers Phyllite.

Lithology: The Harpers Phyllite is grayish green phyllite to greenish gray silty chloritic schist.

Structure

The dam is located on the north flank of an overturned anticline which is part of the Welsh Mountain anticlinorium. Dip and strike of bedding and cleavage at the dam is not available. Regional strike is approximately at right angles to the dam axis. The contact between the Harpers Phyllite and the Antietam Quartzite may be a fault, but no more than normal fracturing was noted in the Antietam Quartzite during excavation for the cutoff trench.

Air Photo fracture traces trend N40°-50°E, N90°E and N40°W.

Overburden

Core borings at the dam indicate the overburden was 10 to 12 feet thick on the valley sides and 15 feet thick near the center of the dam. The overburden is not described, but probably consisted of colluvium derived from the quartzite and schist underlying the valley sides.

Aquifer Characteristics

The Antietam Quartzite is an essentially impermeable rock and all ground water movement is on bedding planes and fractures. Movement is greatest in the weathered zone near the top of the rock surface and decreases with depth.

Discussion

This dam was constructed with a cutoff wall set three feet into rock. Grouting was carried out near the center of the dam where fracturing was more intense. The Antietam is composed of insoluble materials and is an excellent foundation rock.

Sources of Information

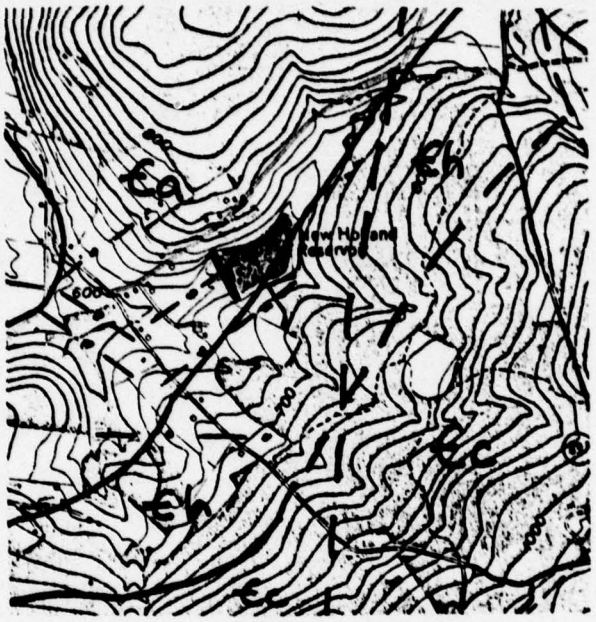
1. Jones, A.I., and Stose, G.W. (1926), "Geology and Mineral Resources of the New Holland Quadrangle, Pa.".

2. Geologic Map of the New Holland Quadrangle (1977) in open file, Pa. Geological Survey, Harrisburg, Pa.

3. Air Photograph, 1:20,000 dated 1969.

4. Core boring data in file.

GEOLOGIC MAP - New Holland Reservoir Dam



(geology from Pa. Geol. Surv. - open file)

€a	Antietam Quartzite
€h	Harpers Phyllite
€c	Chickies Quartzite
- - - -	fault
-·-·-	air photo fracture trace

SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

APPENDIX E

PHOTOGRAPHS

Upstream Slope
and
Intake Tower

Footbridge
to
Intake Structure

Downstream
Slope

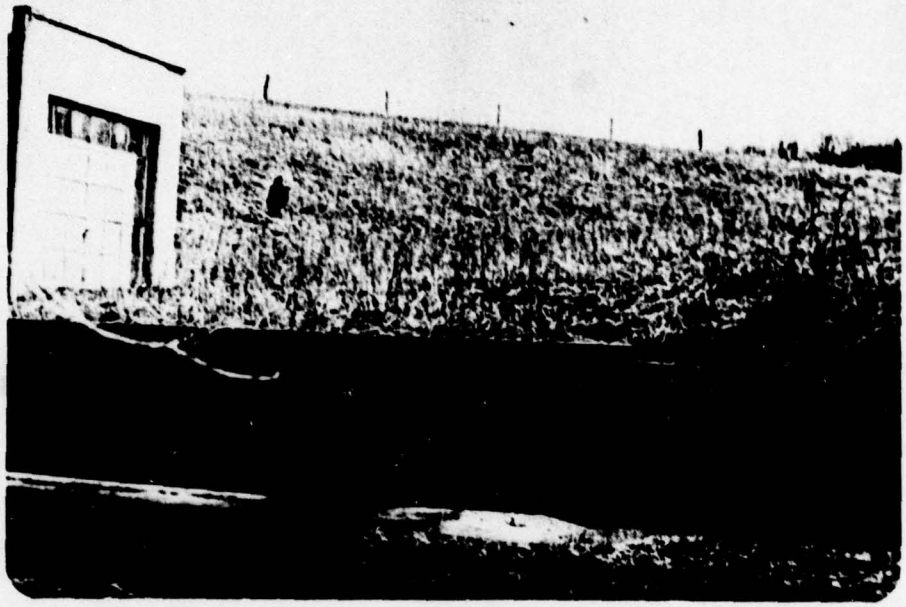
PA-346
PLATE E-1

Spillway

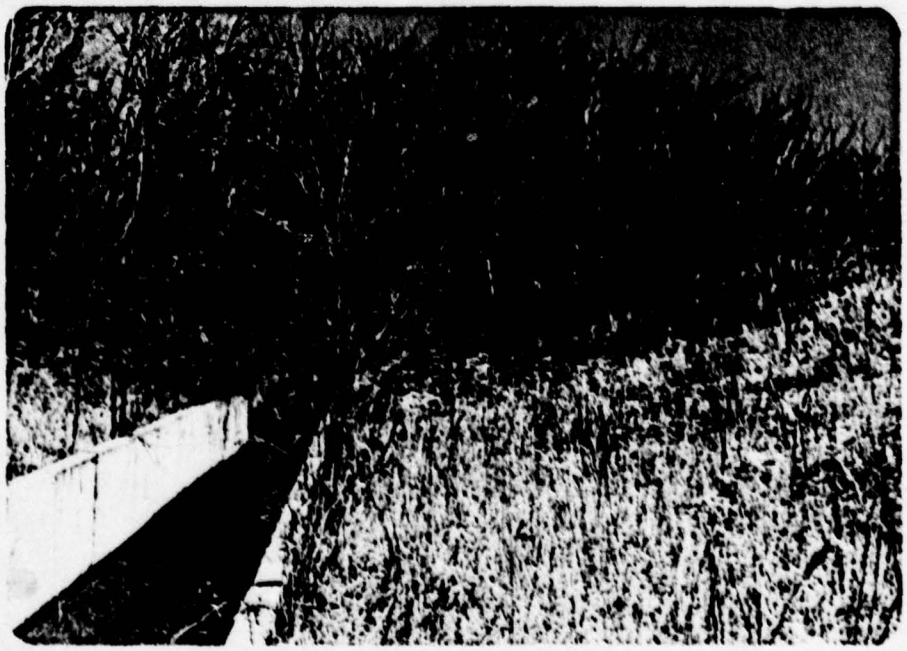
Right Wall
Spillway Chute

Spillway Chute
(Note tilted left
wall and trees
close to wall)

PA-346
PLATE E-II

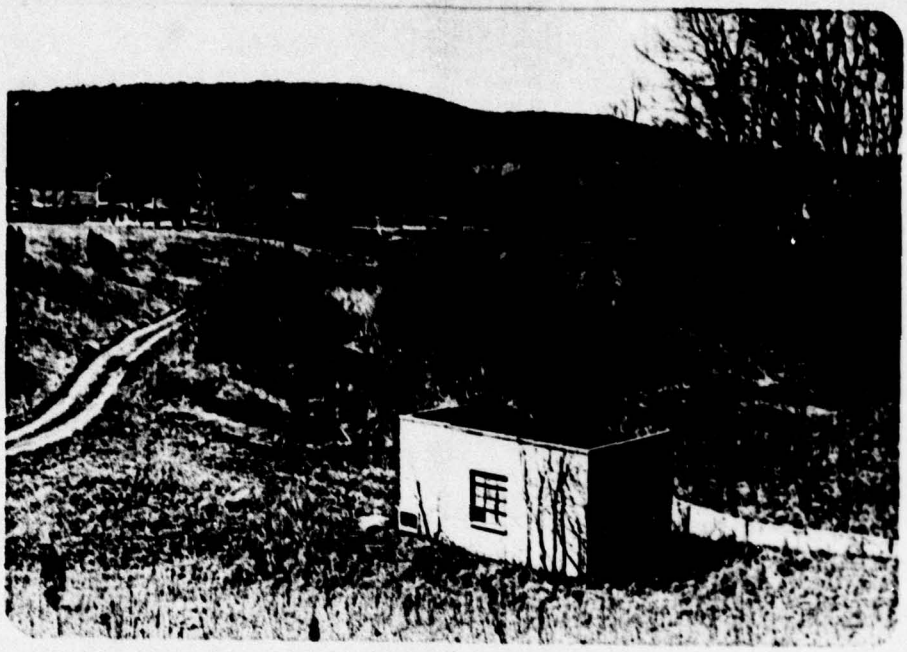


Drawdown Pipe Outlet

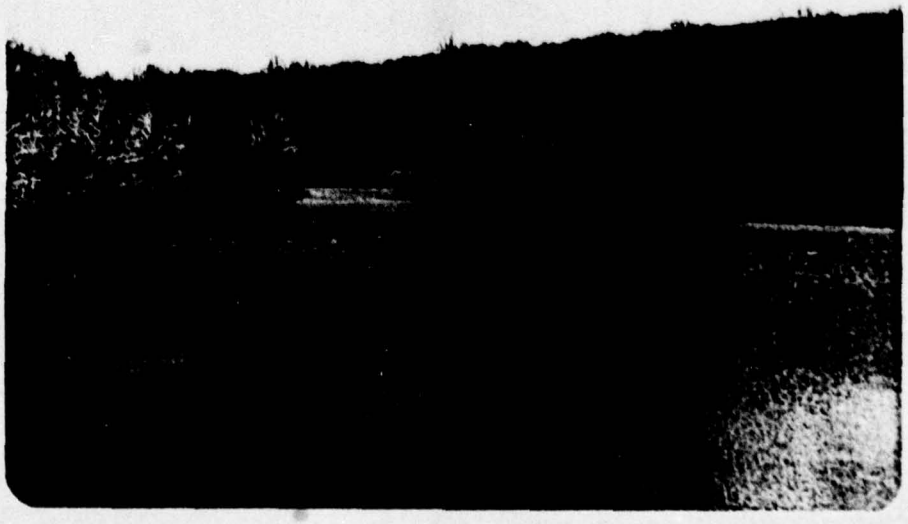


Spillway Chute Looking Upstream
Note trees on Embankment

PA-346
PLATE E-III



Downstream Channel & Valve House

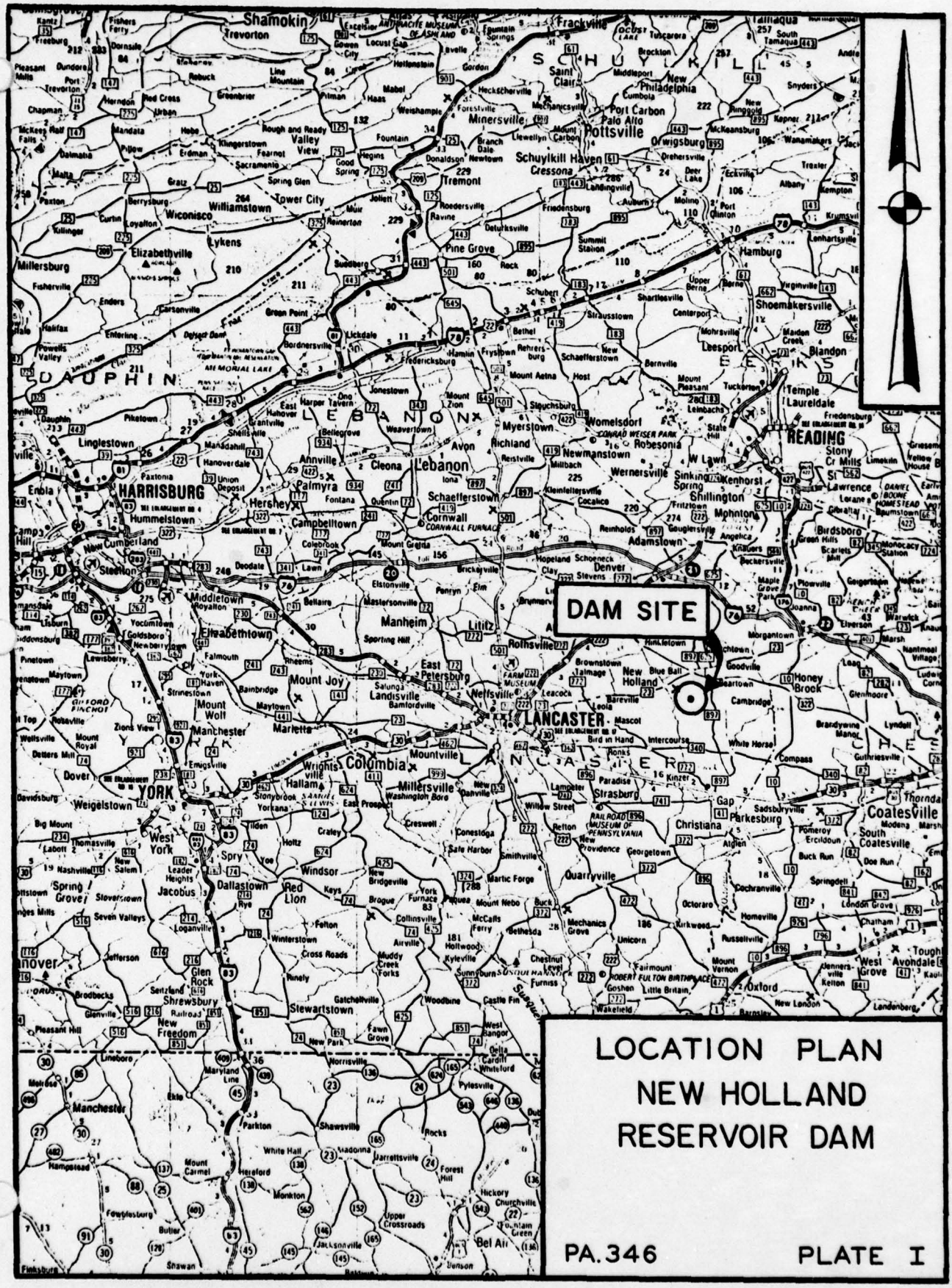


Reservoir

PA-346
PLATE E-IV

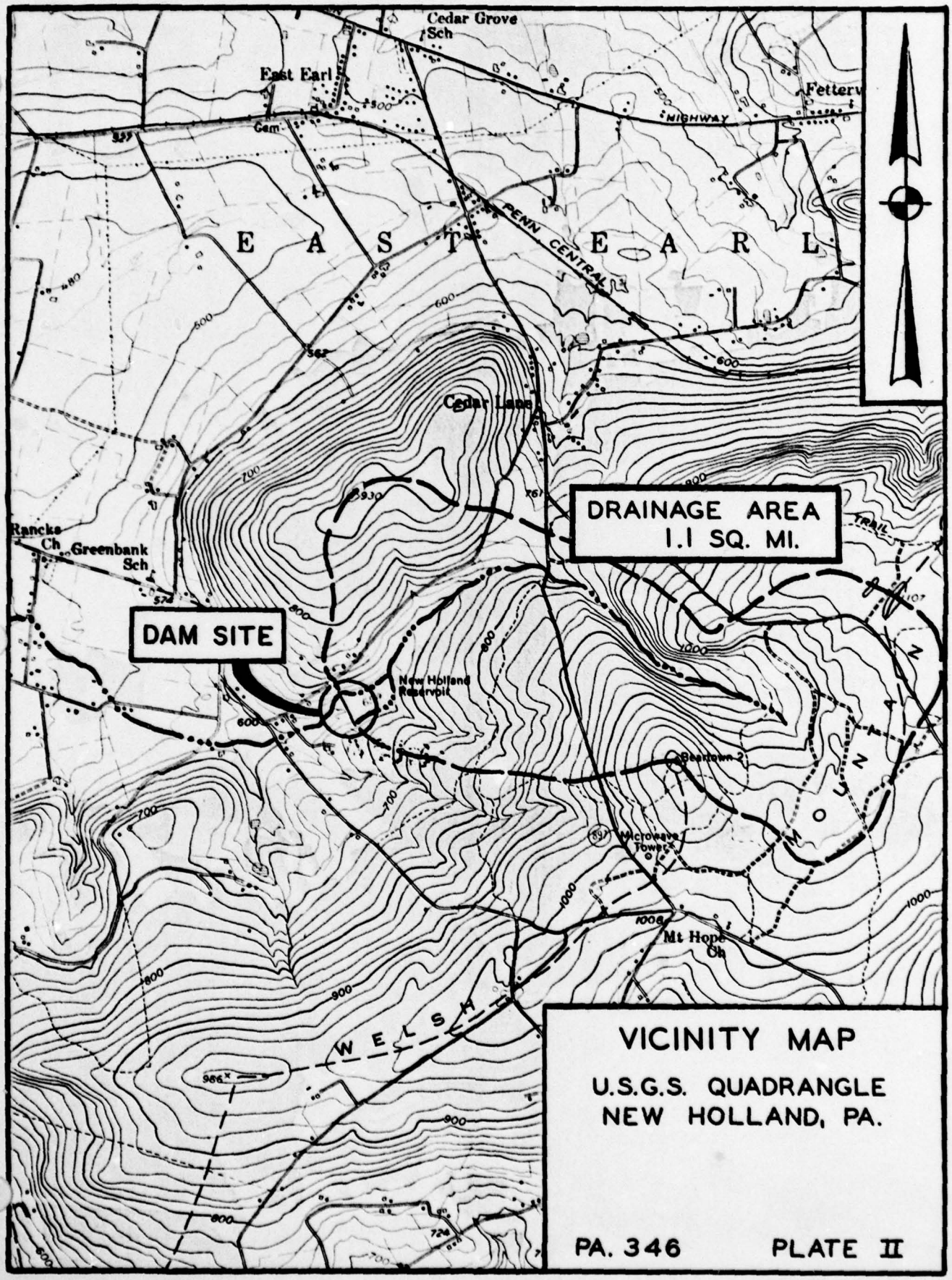
APPENDIX F

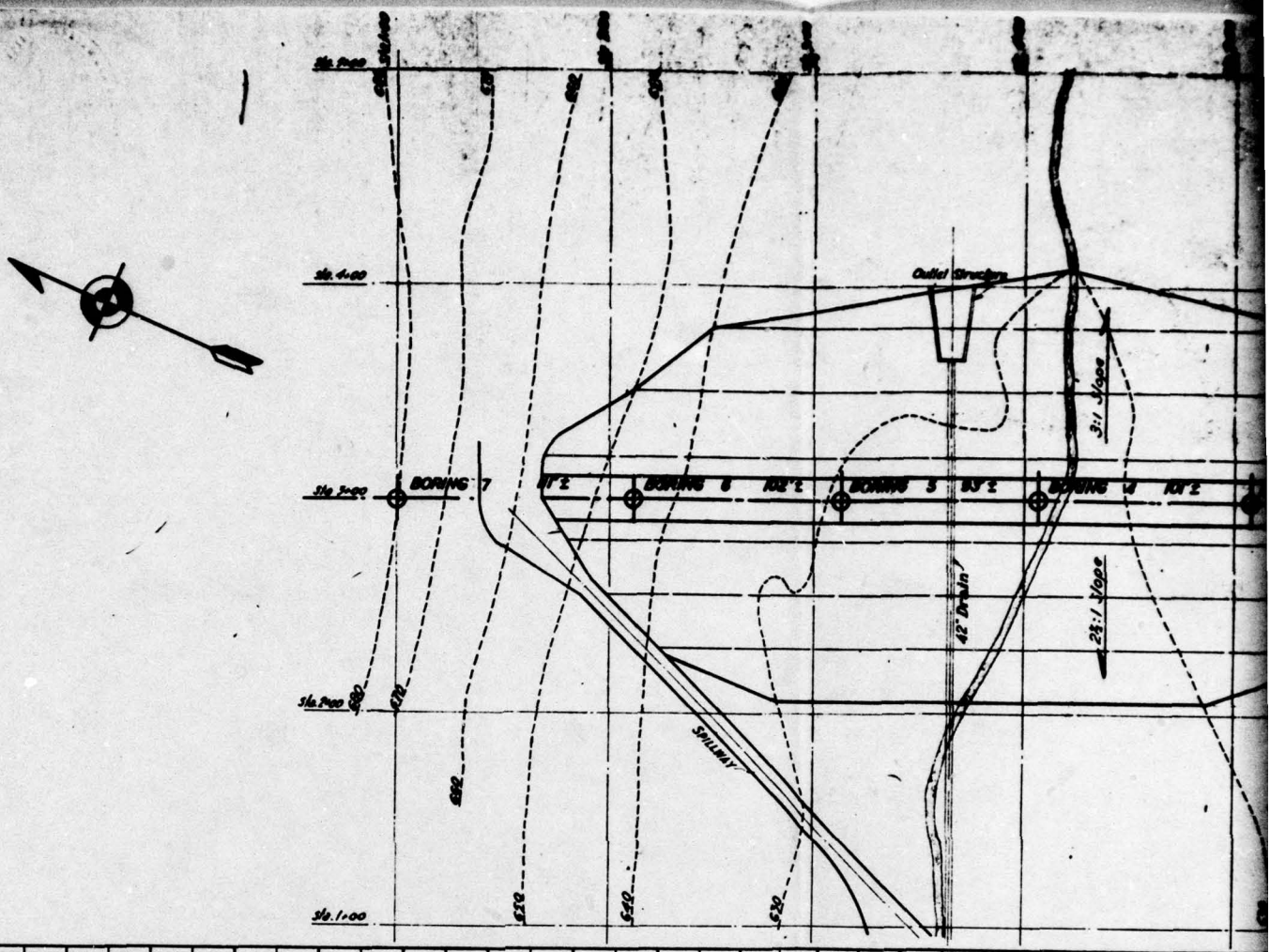
PLATES

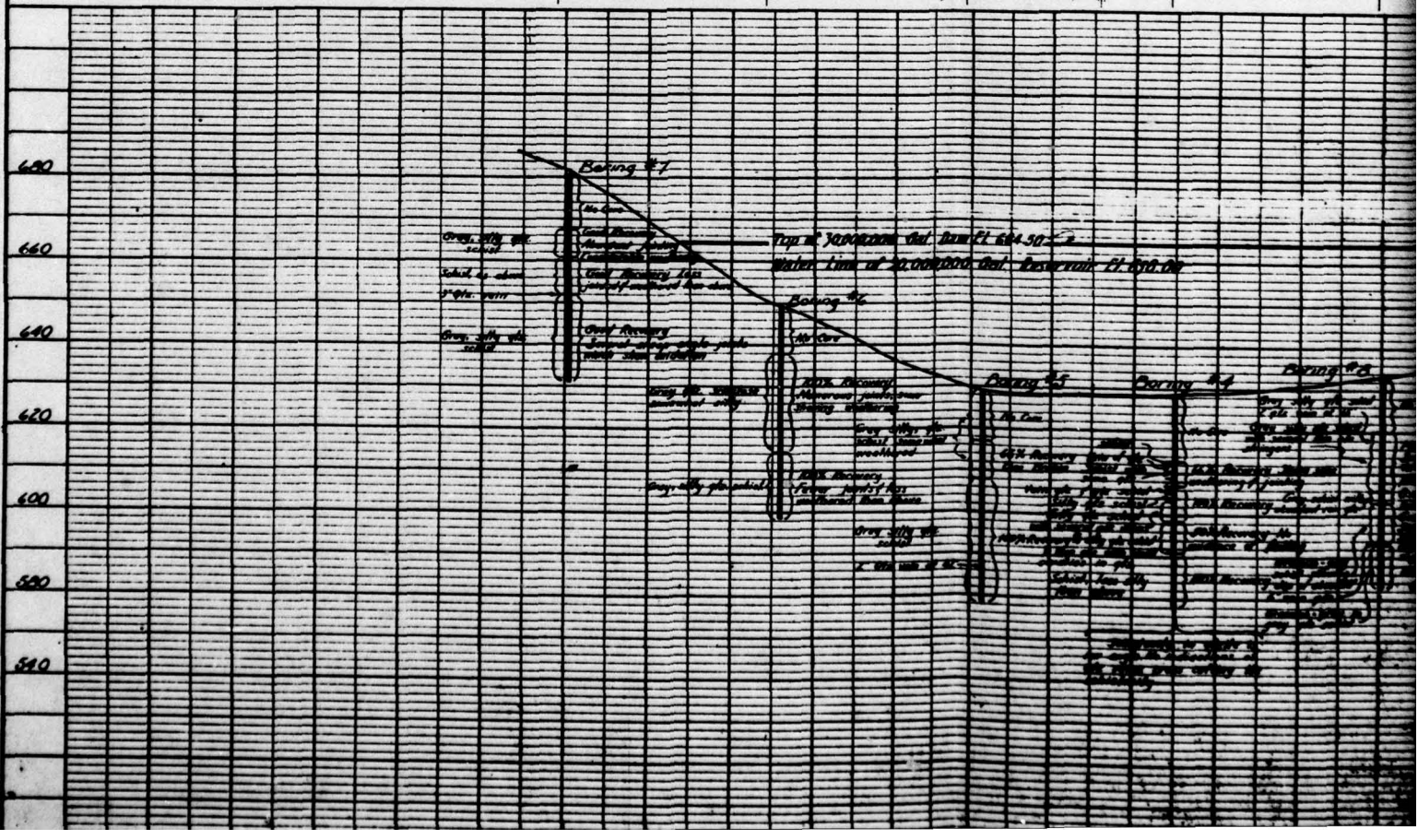


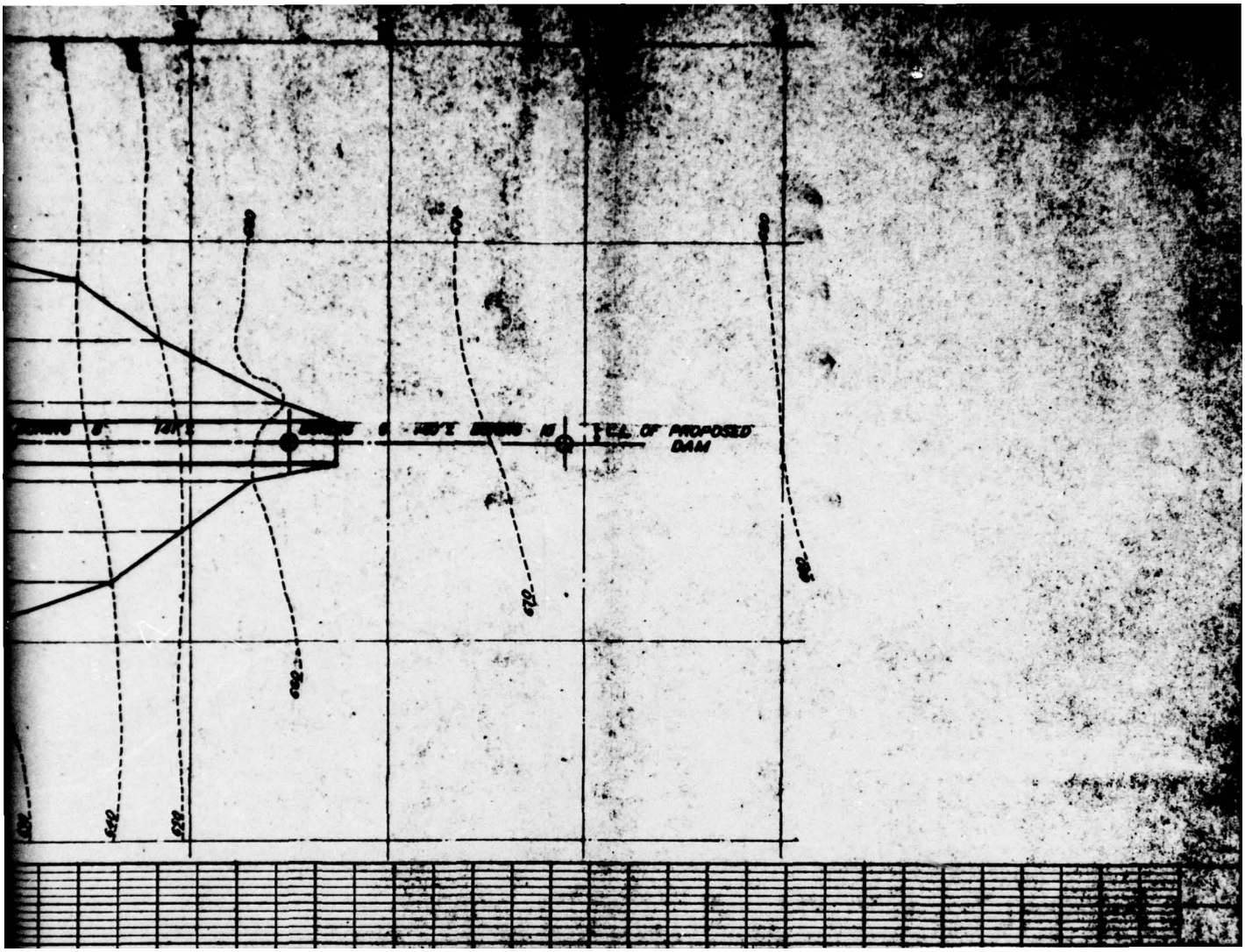
LOCATION PLAN
NEW HOLLAND
RESERVOIR DAM

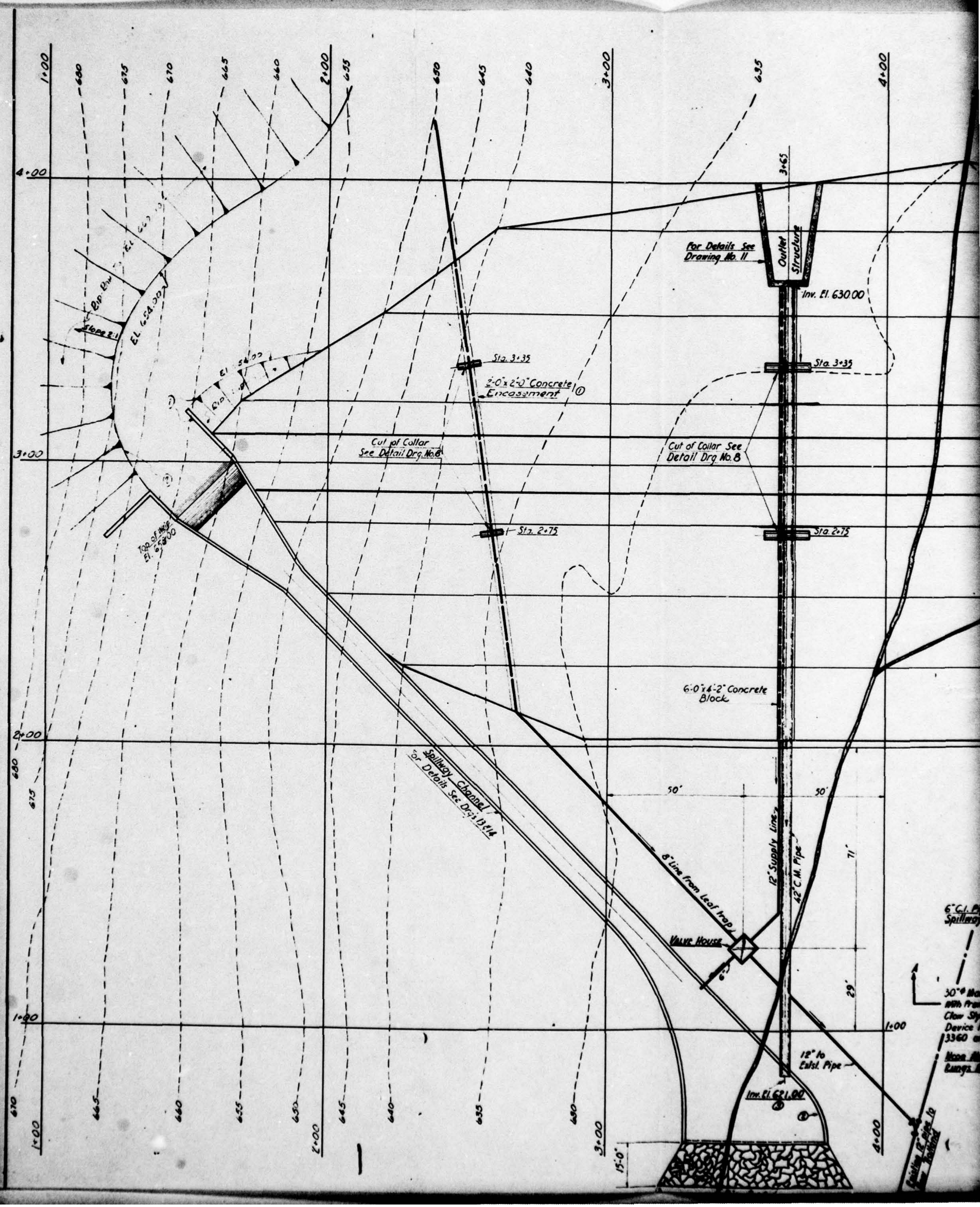
PA. 346 PLATE I


Cedar Grove Sch
East Earl
Fetterv
HIGHWAY
Cem
E A S T E A R L
PENN CENTRAL
Cedar Lane
DRAINAGE AREA
1.1 SQ. MI.
Rancks Ch
Greenbank Sch
DAM SITE
New Holland Reservoir
Trail
Beadown
Microwave Tower
Mt Hope Ch
W E L S H
986
724
VICINITY MAP
U.S.G.S. QUADRANGLE
NEW HOLLAND, PA.
PA. 346
PLATE II

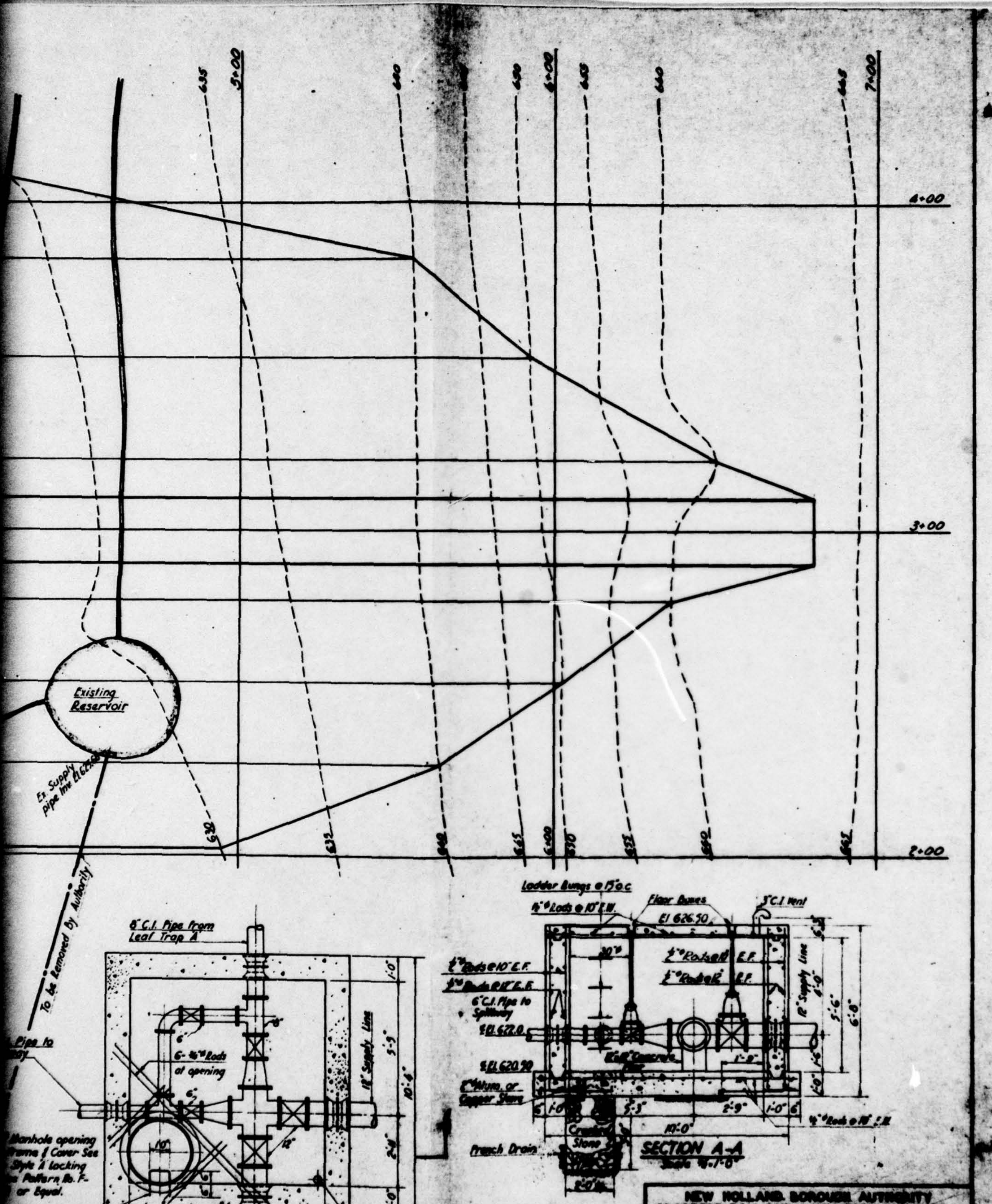

Sta 2+00
Sta 1+00
Sta 0+00
Sta -1+00
BORING 7
BORING 6
BORING 5
BORING 4
Outlet Structure
3:1 Slope
2:1 Slope
42" Drain
SPILLWAY


620
660
640
620
600
580
540
Boring #7
Boring #6
Boring #5
Boring #4
Boring #3


PROPOSED
DAM



For Details See Drawing No. 11
Outlet Structure
3+65
Inv. El. 630.00
Sta. 3+35
2'-0"x2'-0" Concrete Encasement
Cut of Collar See Detail Drg. No. 8
Sta. 2+75
6'-0"x4'-2" Concrete Block
Spillway Channel For Details See Drg's 13 & 14
8" Line from Leaf trap
12" Supply Line
42" C.M. Pipe
Valve House
12" to Exist. Pipe
Inv. El. 621.00
Top of Weir El. 658.00
El. 654.00
Slope 2:1
1+00
2+00
3+00
4+00
15'-0"
50'
71'
29'

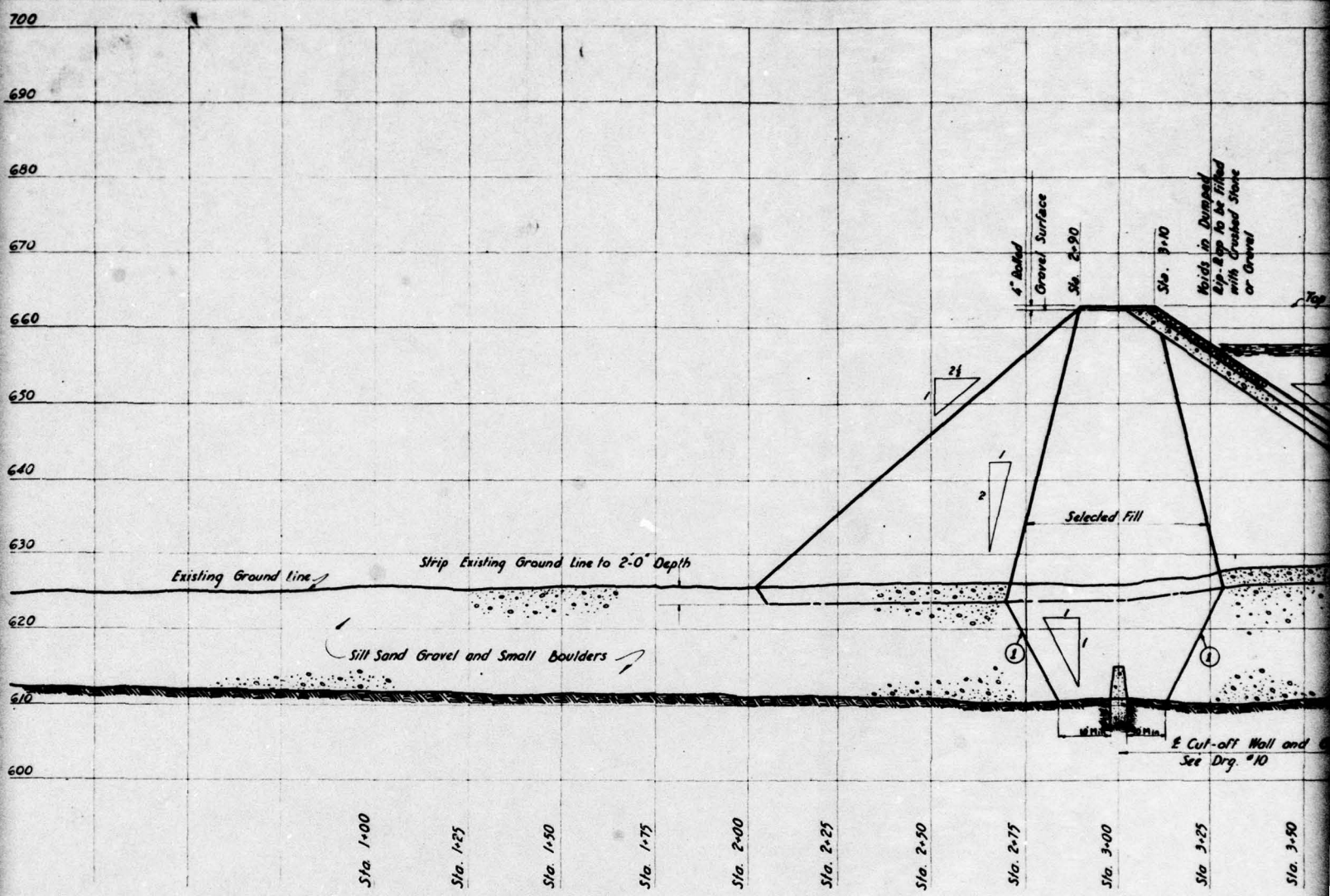


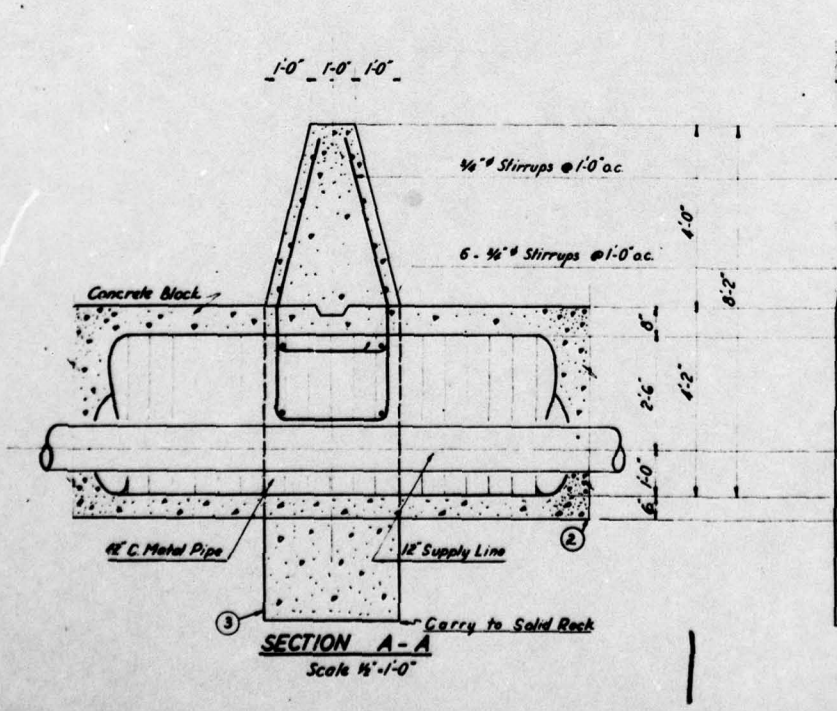
REVISIONS		
No.	Description	Date
1	Changed 6'-0" x 6'-0" Conc. Block to 6'-6" x 6'-0" Conc. Encasement	
2	Changed - Spillway and Grading as shown in Addendum No. 1	
3	Changed El. of 42" Conc. P. at Outlet	

NEW HOLLAND BOROUGH AUTHORITY
PROPOSED DAM AND IMPOUNDING RESERVOIR
PLAN OF
DAM AND APPURTENANCES
SCALE 1" = 20'

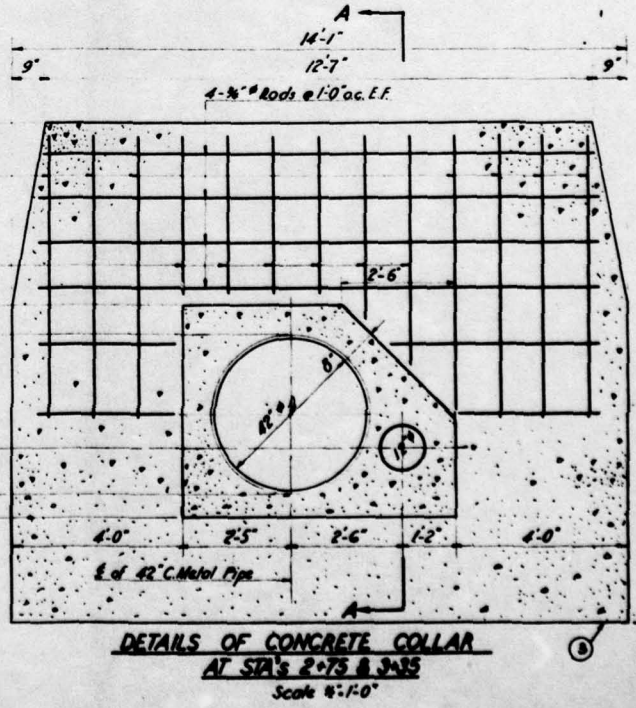
IVAN M. GLACE
CONSULTING ENGINEER
HARRISBURG, PENNSYLVANIA

PA. 346
PLATE IV

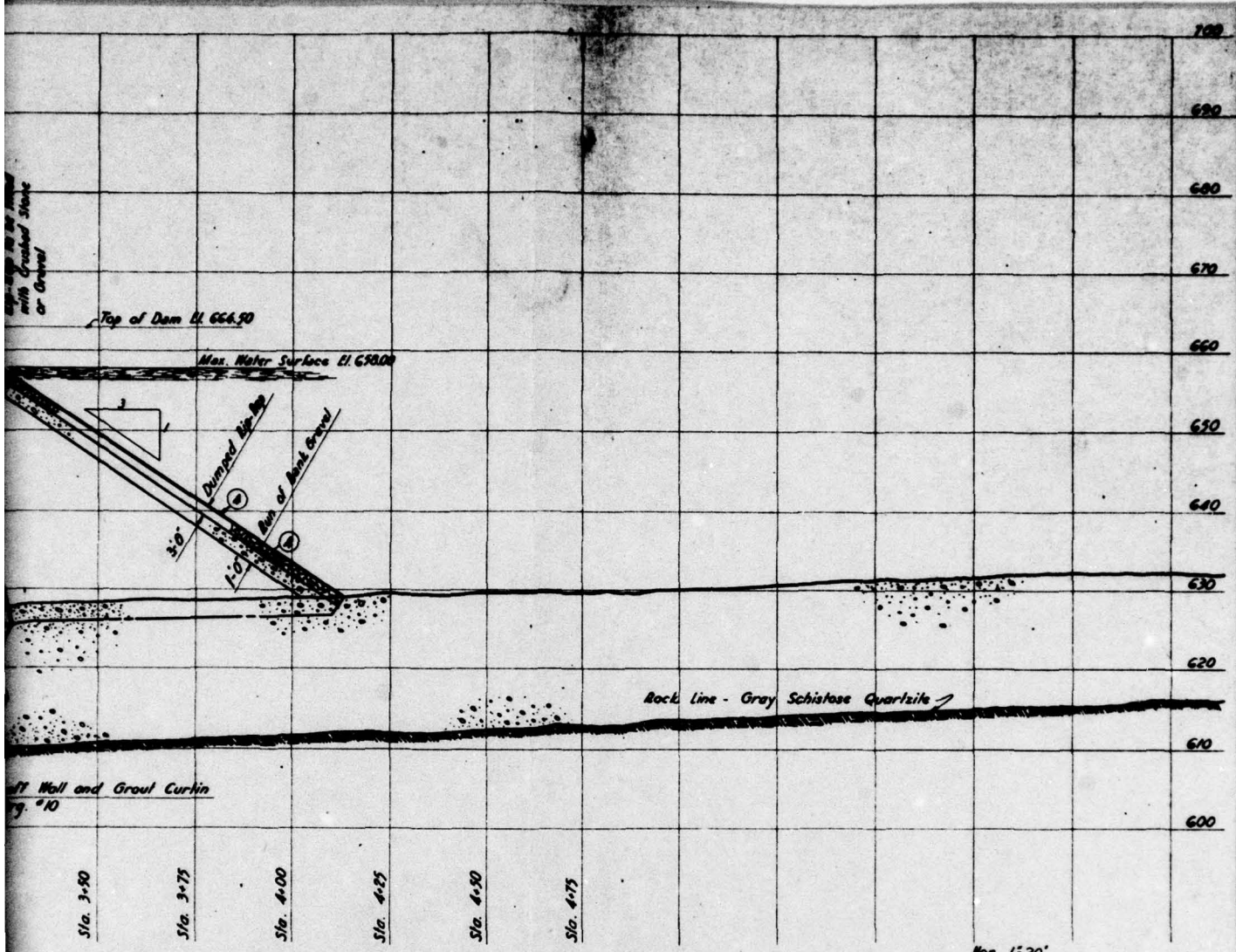


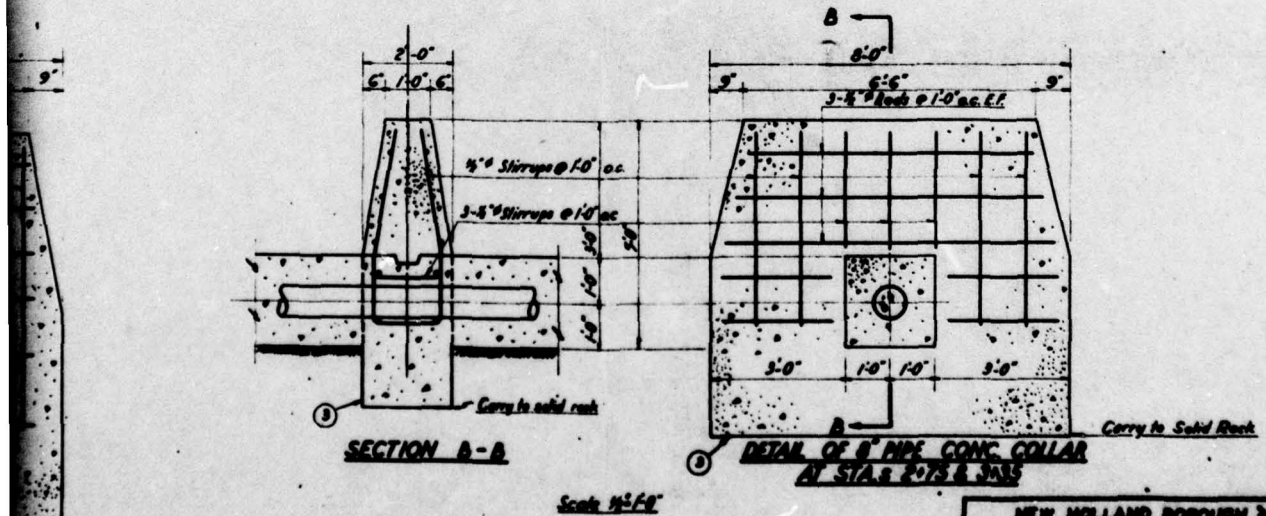


SECTION A-A
Scale ½"=1'-0"



DETAILS OF CONCRETE COLLAR
AT STA's 2+75 & 3+25
Scale ½"=1'-0"





No.		Date
1	Changed Saturated Fill Slope Lines	9-19-51
2	Added 6" of conc. Encasement Under 48" CMP.	9-19-51
3	Changed conc. Cutoff - Carried to Rock Foundation	9-19-51
4	Changed Rip-Rap to 3'-0"	9-19-51
	Bed of Bank Gravel to 1'-0"	9-19-51

NEW HOLLAND BOROUGH AUTHORITY
PROPOSED DAM AND IMPOUNDING RESERVOIR

SECTION AT STATION 4+00

SCALE AS SHOWN DATE MAR 13 1951

IVAN M. GLACE
CONSULTING SANITARY ENGINEER
HARRISBURG, PENNSYLVANIA

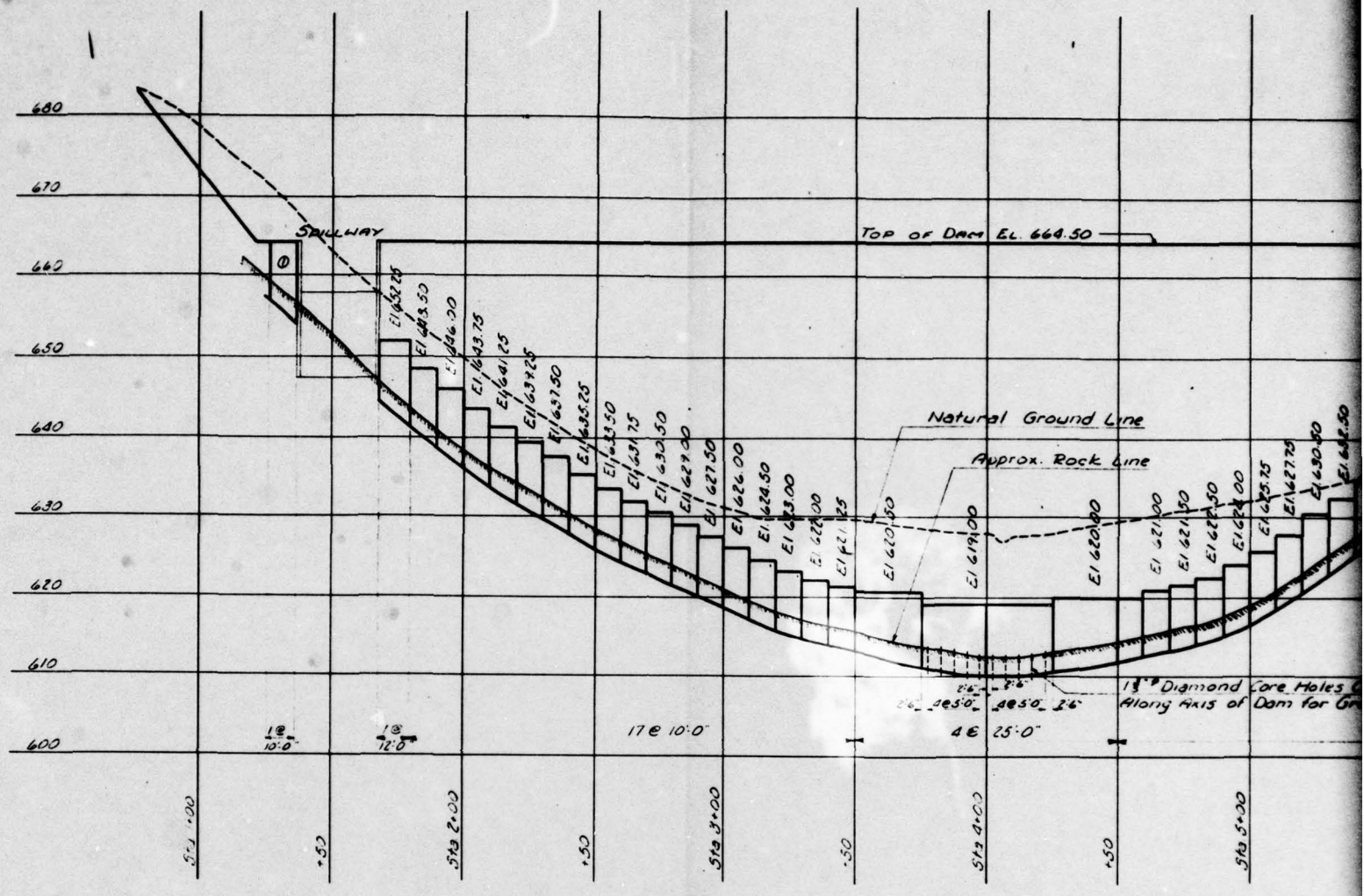
DRAWN BY J.E.B. CHECKED BY _____ JOB NO. 5047-3

APPROVED _____

TITLE _____ SHEET NO. 8 OF 16

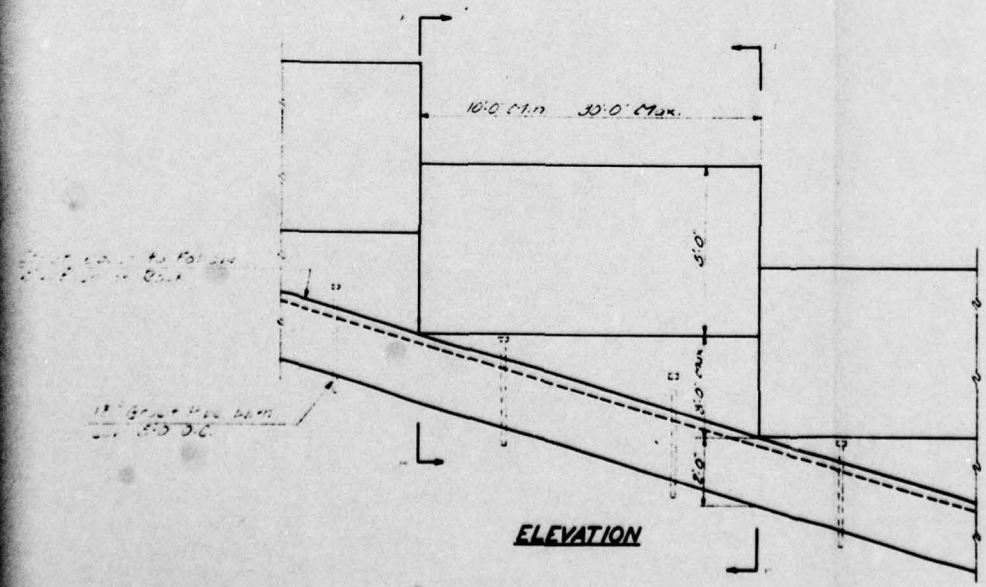
2

PA. 346
PLATE 7

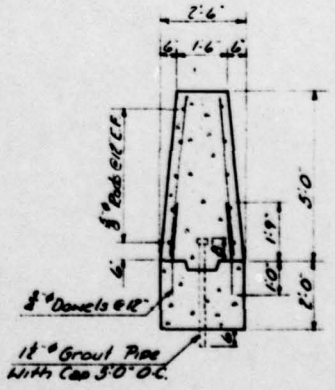


ELEVATION OF CUT-OFF WALL

Scale 1" = 30' Hor.
1" = 10' Vert.



ELEVATION



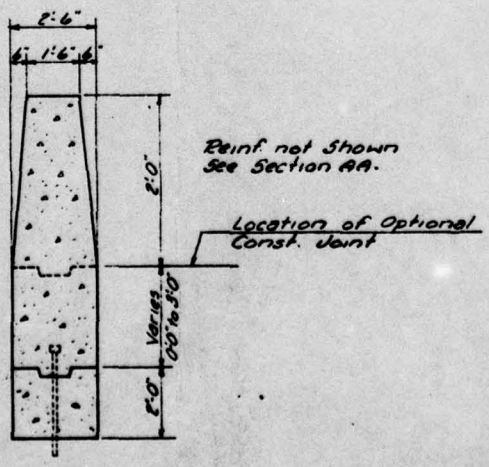
SECTION A-A

DETAIL OF CUT-OFF WALL

Scale 1" = 1'-0"

OFF WALL

30° Hor.
90° Vert.



SECTION B-B

2

No.	Description	Date
1	Added cut-off wall at spillway	3/16/51

NEW HOLLAND BOROUGH AUTHORITY
PROPOSED DAM AND IMPOUNDING RESERVOIR

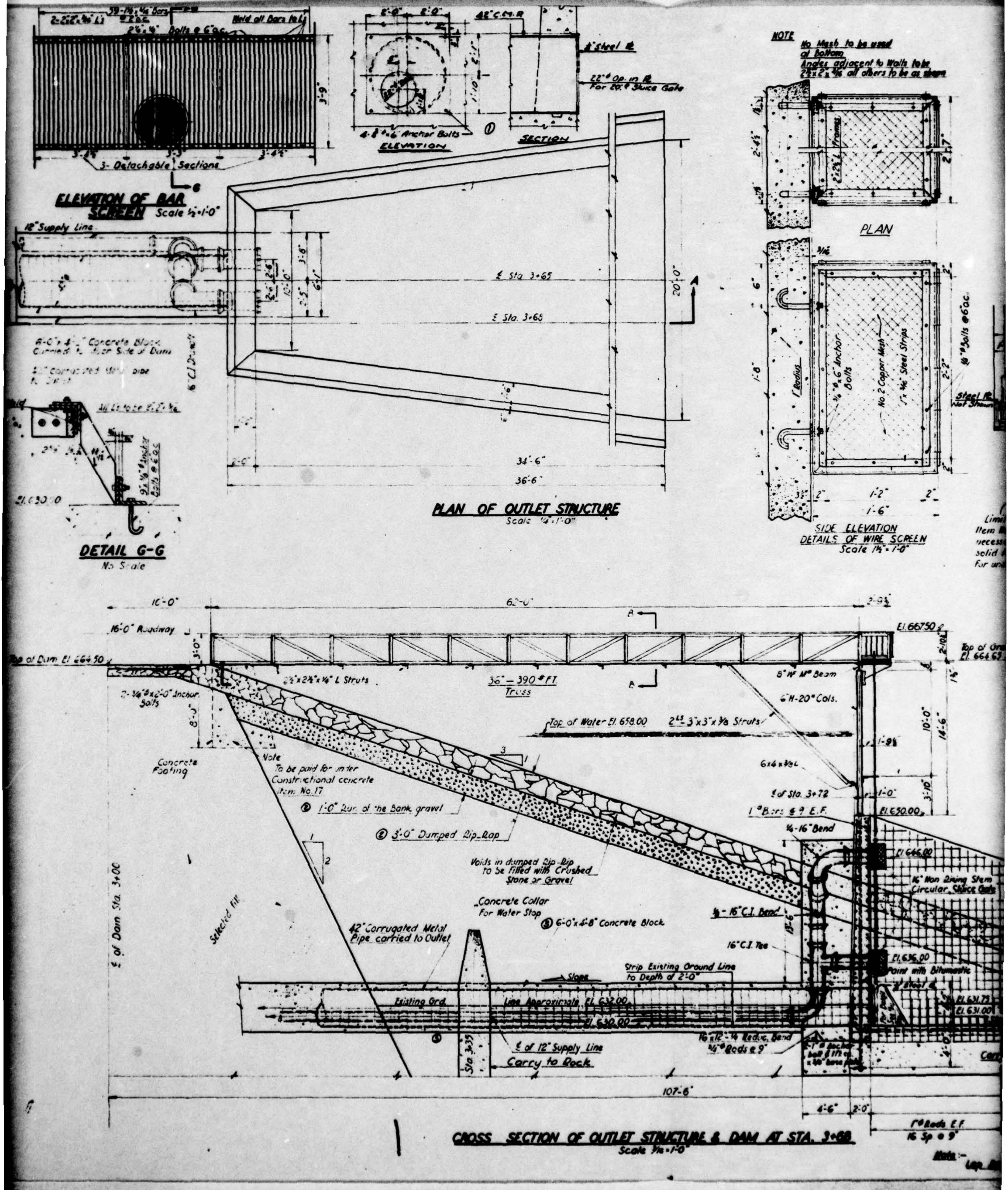
DETAILS OF CUT-OFF WALL

SCALE As Shown DATE MAR 15 1951

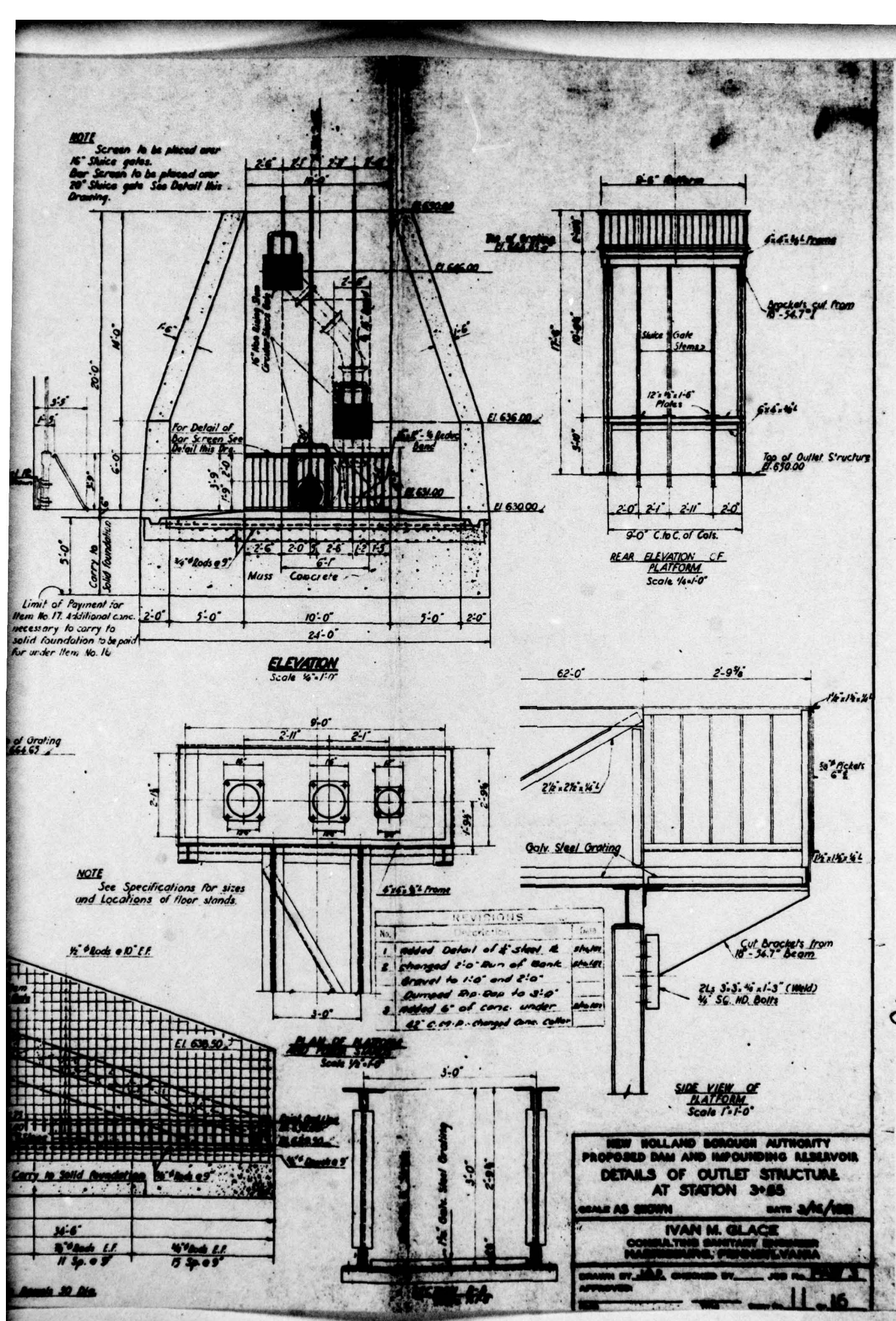
IVAN M. GLACE
CONSULTING SANITARY ENGINEER
HARRISBURG, PENNSYLVANIA

DRAWN BY ____ CHECKED BY ____ JOB No. 50-1
APPROVED
NAME ____ TITLE ____ Sheet No. 10 of 16

PA. 346
PLATE VI

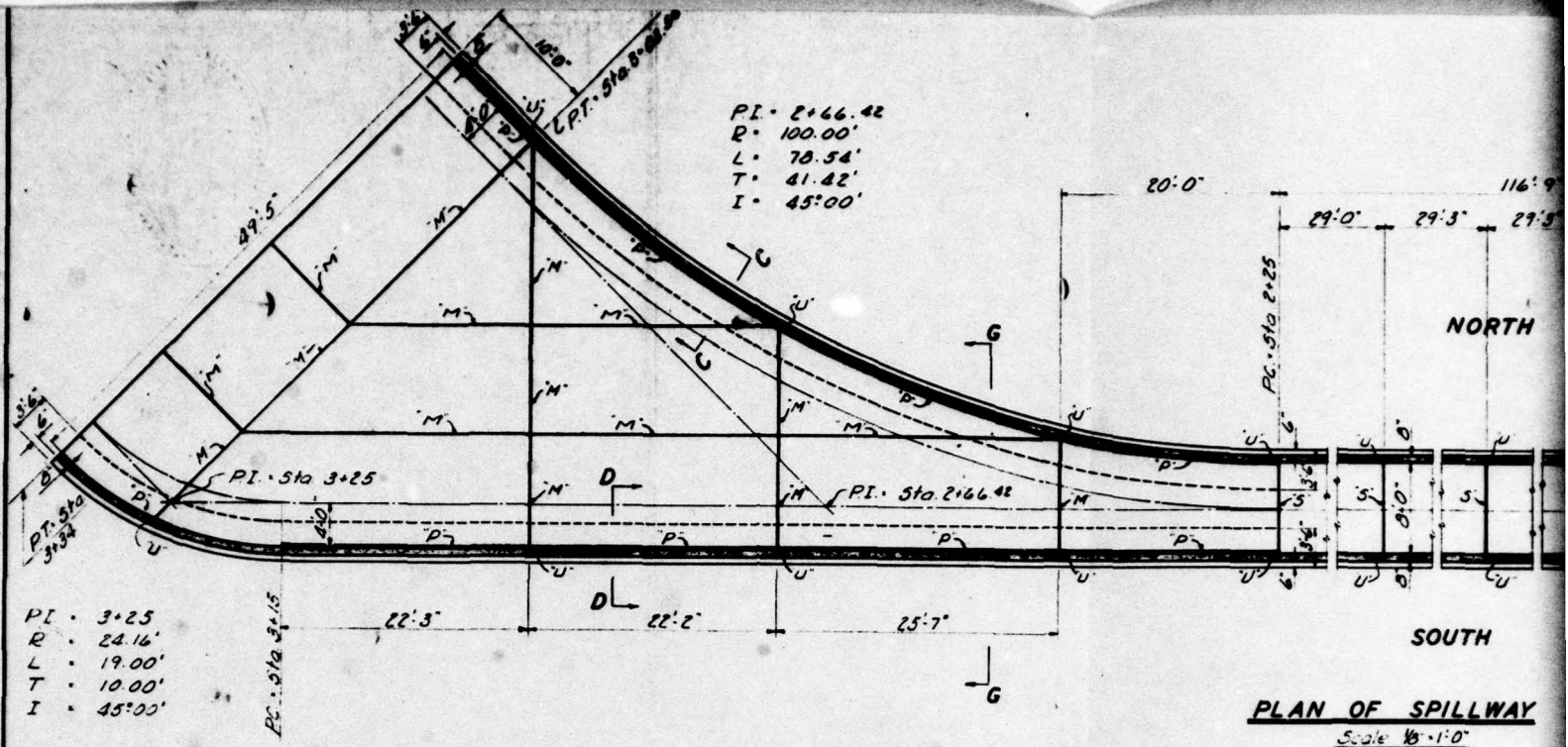


39-1½"x¼" Bars @ 1" o.c.
2-2½"x2"x¼" L's
Weld all Bars to L's
2½"x¼" Bolts @ 6" o.c.
3'-9"
3'-4½"
3'-3"
3'-4½"
3- Detachable Sections
ELEVATION OF BAR SCREEN Scale ½"=1'-0"
2'-0"
2'-0"
42" C.M.P.
⅝" Steel Pl.
22" Op. in Pl. For 20" Sluice Gate
4-⅞"x6" Anchor Bolts
ELEVATION
SECTION
NOTE
No Mesh to be used at Bottom
Angles adjacent to Walls to be 2½"x2"x¼" all others to be as shown
PLAN
12" Supply Line
℄ Sta. 3+65
℄ Sta. 3+68
20'-0"
10'-0"
6'-1"
3'-8"
2'-6"
34'-6"
36'-6"
2'-0"
PLAN OF OUTLET STRUCTURE
Scale ¼"=1'-0"
Detail G-G
El. 630.00
DETAIL G-G
No Scale
1" Radius
½"x6" Anchor Bolts
No. 2 Copper Mesh
1"x¼" Steel Strips
½" Bolts @ 6" o.c.
6"
1'-8"
1'-2"
1'-6"
2"
2"
SIDE ELEVATION
DETAILS OF WIRE SCREEN
Scale 1½"=1'-0"
10'-0"
62'-0"
16'-0" Roadway
El. 667.50
Top of Dam El. 664.50
3'-0"
2½"x2½"x¼" L Struts
36" - 390# FT. Truss
8" WF Beam
6" H-20# Cols.
2-¾"x2'-0" Anchor Bolts
8'-0"
Top of Water El. 658.00
2 Ls 3"x3"x⅜ Struts
Concrete Footing
Note
To be paid for under Constructional concrete Item No. 17
1'-0" Run of the Bank gravel
3'-0" Dumped Rip-Rap
Voids in dumped Rip-Rap to be filled with Crushed Stone or Gravel
℄ of Sta. 3+72
1" Bars @ 9" E.F.
El. 650.00
¼-16" Bend
El. 646.00
16" Non Rising Stem Circular Sluice Gate
10'-0"
14'-6"
3'-10"
Selected fill
℄ of Dam Sta. 3+00
Concrete Collar For Water Stop
6'-0"x4'-8" Concrete Block
¼-16" C.I. Bend
16" C.I. Tee
El. 636.00
Paint with Bitumastic
42" Corrugated Metal Pipe carried to Outlet
Strip Existing Ground Line to Depth of 2'-0"
Slope
Existing Grd. Line Approximate El. 632.00
El. 630.00
El. 631.00
℄ of 12" Supply Line
Carry to Rock
Sta. 3+35
¾" Rods @ 9"
107'-6"
4'-6"
2'-0"
1" Rods E.F.
16 Sp @ 9"
CROSS SECTION OF OUTLET STRUCTURE & DAM AT STA. 3+68
Scale 3/16"=1'-0"

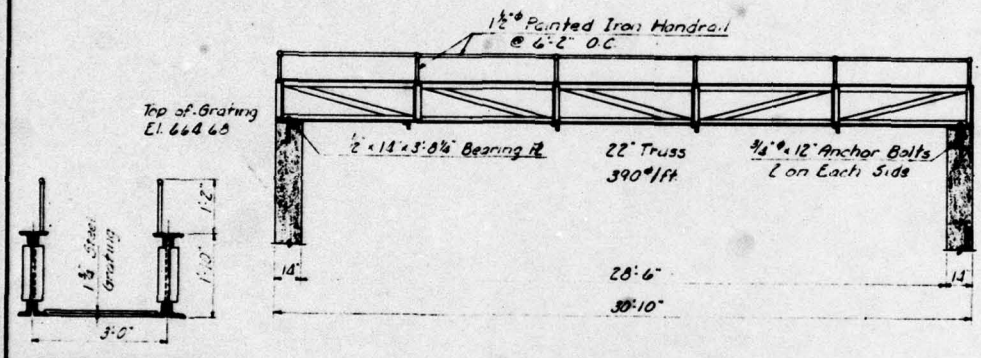


2

PA. 346
PLATE VII

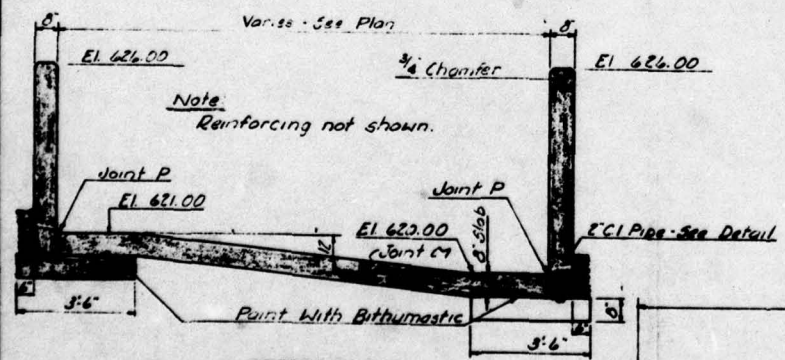


PLAN OF SPILLWAY
Scale 1/8" = 1'-0"

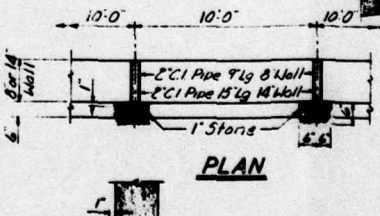


SECTION THROUGH BRIDGE
Scale ½" = 1'-0"

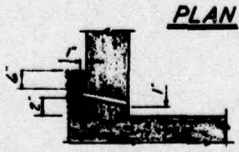
DETAIL OF BRIDGE OVER SPILLWAY
Scale ¼" = 1'-0"



SECTION G G
Scale ¼" = 1'-0"

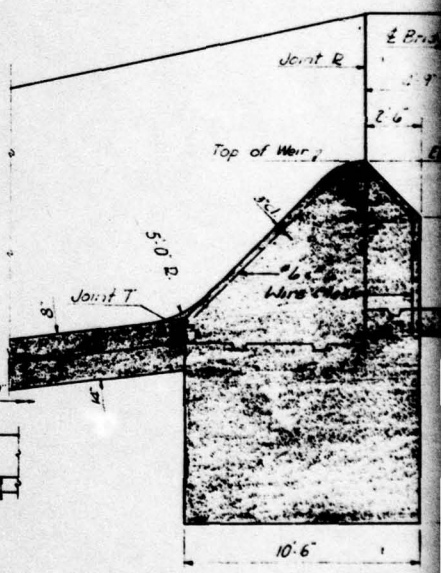


PLAN

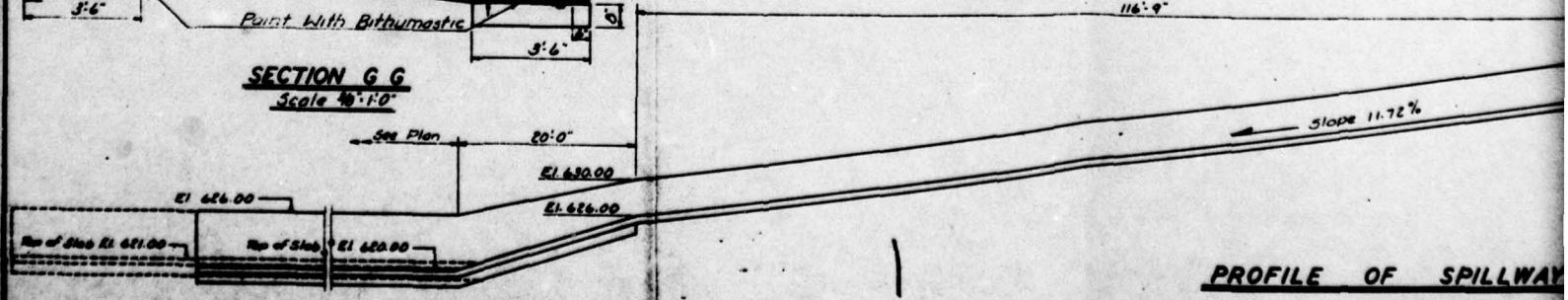


SECTION

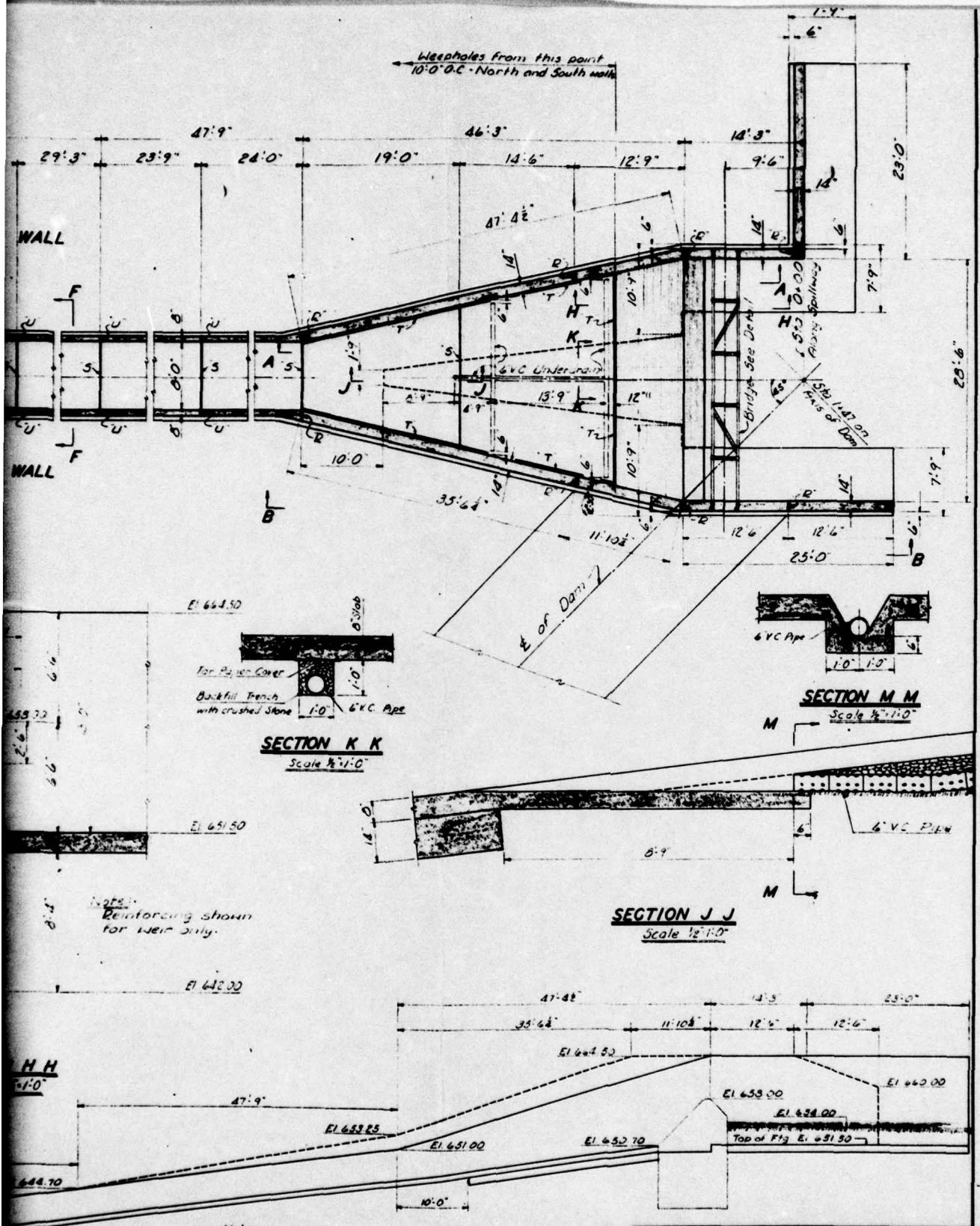
DETAIL OF WEEPHOLES
No Scale



SECTION
Scale



PROFILE OF SPILLWAY
Scale 1" = 10'



NEW HOLLAND BOROUGH AUTHORITY
PROPOSED DAM AND IMPOUNDING RESERVOIR
SPILLWAY
PLAN AND SECTIONS

SCALE AS SHOWN DATE MAR. 15, 1961

IVAN M. GLACE
CONSULTING SANITARY ENGINEER
HARRISBURG, PENNSYLVANIA

DRAWN BY B.D. CHECKED BY ____ JOB No. 5107.3
APPROVED:
NAME TITLE SHEET No. 13 OF 16

PA. 346
PLATE VIII