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NATIONAL DAM SAFETY PROGRAM. WILLIAMS POND DAM (DE00064), NANTI--ETC(U)
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NANTICOKE RIVER BASIN
CLEAR BROOK, SUSSEX COUNTY
DELAWARE

WILLIAMS POND DAM
DE 00064

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

April, 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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READ INSTRUCTIONS BEFORE COMPLETING FORM

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National Dam Inspection Act Report
Williams Pond Dam, Del.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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PHILADELPHIA, PENNSYLVANIA 19106

REPLY REFER TO
NAPEN-D

Honorable Pierre S. DuPont
Governor of Delaware
Dover, Delaware 19901

Dear Governor DuPont:

Inclosed is the Phase I Inspection Report for Williams Pond Dam in Sussex County, Delaware which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Williams Pond Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition. However, the dam's spillway is considered inadequate since 11 percent of the 100 year Flood would overtop the dam. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. For the same reasons no further studies or increase of spillway capacity are recommended. To assure continued functioning of the dam and its impoundment, the following actions could be undertaken by the owner:

(1) Regrade and provide slope protection for the eroded embankment areas.

(2) An annual inspection visit should be initiated using a visual check list similar to the one enclosed in this report. All drawings and computations relating to repair, renovation and maintenance of the dam should be kept as a matter of record. All visits to the dam for operation and maintenance should be logged as a matter of record.

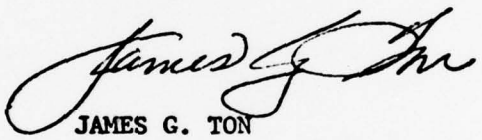
NAPEN-D
Honorable Pierre S. DuPont

A copy of the report is being furnished to Mr. Austin P. Olney, Delaware Department of Natural Resources and Environmental Control, the designated State Office contact for this Program. Within five days of the date of this letter, a copy will also be sent to Congressman Thomas B. Evans. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, thirty days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Cy furn:
Mr. Austin P. Olney, Secretary
Department of Natural Resources and
Environmental Control

WILLIAMS POND DAM (DE00064)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 7 December 1978 by Thomas Tyler Moore and Lippincott Engineering Associates, joint venture under contract to the U. S. Army Engineer District, Philadelphia, in accordance with the National Dam Inspection Act, Public Law 92-367.

Williams Pond Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition. However, the dam's spillway is considered inadequate since 11 percent of the 100 year Flood would overtop the dam. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. For the same reasons no further studies or increase of spillway capacity are recommended. To assure continued functioning of the dam and its impoundment, the following actions could be undertaken by the owner:

(1) Regrade and provide slope protection for the eroded embankment areas.

(2) An annual inspection visit should be initiated using a visual check list similar to the one enclosed in this report. All drawings and computations relating to repair, renovation and maintenance of the dam should be kept as a matter of record. All visits to the dam for operation and maintenance should be logged as a matter of record.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 11 June 1979

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Williams Pond Dam ID # DE 00064
State Located:	Delaware
County Located:	Sussex
Stream:	Clear Brook & Herring Run
Date of Inspection:	7 December 1978

Brief Assessment of General Condition:

Based on visual inspection, available records, calculations and past operational performance, Williams Pond Dam is considered to be in good overall condition. The existing spillway has a hydraulic capacity equal to 10% of the peak SDF outflow before the low point of the embankment is overtopped, and is therefore considered hydraulically inadequate.

No serious deficiencies that affect public safety were noted during inspection. Some erosion of the earthfill embankment has been noted in this report, which can easily be rectified by implementing minor grading and riprap, in the future.

Based upon our visual inspection downstream of Williams Pond Dam, the hazard potential classification has been downgraded from "High Hazard Potential" to "Low Hazard Potential". In our judgement failure of the dam would not result in the loss of life or substantial property damage downstream.

MOORE & LIPPINCOTT - ENGINEERS

I. Wayne Lippincott, P.E., P.P.
Project Manager

IWL:bc

OVERALL VIEW
OF
DAM

DEC. 7, 1978

WILLIAMS POND DAM

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

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WILLIAMS POND DAM

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Dam Inspection Act, Punlic Law 92-367, dated August 8, 1972, provides for the report herein. The inspection of Williams Pond Dam was initiated under Contract DACW61-79-C-006 with the Department of the Army, Philadelphia District, Corps of Engineers by the engineering firms of Thomas Tyler Moore Associates and Lippincott Engineering Associates under a joint venture.

b. Purpose of Inspection

The purpose of the inspection is to evaluate the general condition of Williams Pond Dam and bring to the attention of the owner those conditions which are a threat to public safety. The National Inventory of Dams will be updated by the data accumulated during this inspection.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Williams Pond Dam consists of an overflow structure located within an earth-fill embankment dam. The overflow structure consists of gates with wooden stoplogs five feet long, forming twelve spillway overflow drops. Each overflow drop can be individually opened or closed by removing the individual stoplogs.

The roadway embankment on either side of the overflow spillway is approximately five feet higher in elevation at crest than the crest of the overflow spillway.

Williams Pond varies in depth, but soundings taken during our survey indicate a maximum depth of 8 feet immediately upstream of the dam structure and embankment.

Williams Pond extends 4000 feet upstream of the dam axis. The banks of the lake are low sloping and well vegetated.

Route 535, a roadway bridge, is located 400 feet downstream of Williams Pond Dam. The top of the roadway bridge deck is at elevation 11.8 M.S.L., being approximately 4 feet above Williams Pond normal lake elevation. The effective area beneath the Route 535 Bridge is 1429 square feet. Five hundred feet downstream of the Williams Pond Dam and one hundred feet below the Route 535 bridge, the channel discharges into the Nanticoke River in Sussex County. Between Route 535 and the Nanticoke River are approximately six residences, visually judged to be located 5 feet above the downstream channel at that point. The approximate high tide elevation of the downstream channel at this point is 2.5 feet $\pm$ M.S.L., five feet below normal lake elevation.

b. Location

Williams Pond Dam is downstream of two tributaries, Herring Run to the west and Clear Brook to the north. Clear Brook Tributary connects the Hearns Pond Reach to Williams Pond. Hearns Pond is located approximately 7100$^{\pm}$ feet upstream; its normal lake elevation is approximately 27 M.S.L., and the storage of Hearns Pond at normal pool elevation is 298 $\pm$ acre-feet. The Williams Pond Dam is approximately 500 feet northeast of its confluence with the Nanticoke River in Sussex County, Delaware.

c. Size Classification

The maximum height of the dam is nineteen (19) feet. The maximum reservoir volume is 800 acre-feet. Therefore, the size category of the dam is small, i.e., the height is less than forty feet and the storage volume is less than 1000 acre-feet.

d. Hazard Classification

Immediately downstream of Williams Pond Dam is located a Delaware State Highway Bridge Structure, Route 535. The bridge roadway is approximately four (4) feet above normal lake elevation and the effective orifice under the bridge is equal to 1429 square feet. One hundred feet downstream of Route 535 is located the Nanticoke River in Sussex County. The downstream channel averages approximately 150 feet in width, its most narrow point being at the bridge structure. Between the bridge and the river are located approximately six homes judged to be five feet above the normal downstream channel.

In our judgement, failure of the dam would not result in the loss of life or substantial property damage downstream. Therefore, Williams Pond Dam is hereby downgraded from a High Hazard Potential Dam to a Low Hazard Potential Dam.

e. Ownership

Delaware Department of Transportation, Dover, Delaware.

f. Purpose of Dam

The purpose of Williams Pond Dam is to impound water for recreational and aesthetic purposes. There are a significant number of residential property owners along the upstream lake shore.

1.3 PERTINENT DATA

a. Drainage Area

23.23 square miles (combined areas of Hearns & Williams Pond).

b. Discharge At Damsite

Maximum known flood at damsite is unknown.

Warm water outlet at pool elevation:	None
Diversion tunnel low pool outlet at pool elevation:	N/A

Diversion tunnel outlet at pool elevation:	None
Gated spillway capacity normal pool elevation 7.5 M.S.L.:	100 CFS
Gated spillway capacity at maximum pool elevation 12.0 M.S.L. Gates at Elevation 7.5 M.S.L.:	618 CFS
Ungated culvert capacities at maximum pool elevation, Gates Pulled:	2916 CFS
Total spillway capacity at maximum pool elevation:	642 CFS

c. Elevation (Feet Above Mean Sea Level [M.S.L.])

Top Dam:	12' MSL ±
Maximum pool-design surcharge:	14.3' MSL ±
Full flood control pool:	N/A
Normal Pool:	7.5' MSL ±
Spillway Crest (gated):	7.5' MSL ±
Upstream portal invert diversion tunnel:	N/A
Downstream portal invert diversion tunnel:	N/A
Streambed at centerline of dam:	1' MSL ±
Maximum tailwater:	2.76' MSL (Mean High Tide)

d. Reservoir (Feet)

Length of maximum pool:	6000
Length of normal pool:	4000
Length of flood control pool:	N/A

e. Storage (Acre-Feet)

Normal pool:	425
Flood control pool:	N/A
Top of dam:	800
Design surcharge:	800

f. Reservoir Surface (Acres)

Normal pool:	35 Ac
Top of dam:	47 Ac

Flood control pool:	N/A
Maximum pool:	49 Ac
Recreational pool:	N/A

g. Dam

Type:	Bridge with center pier 60 feet total span by 40 feet wide, set within a 15 foot high earth fill embankment. Twelve (12) overflow spillways regulated by stoplogs (nine [9] 5 foot long, 3" x 12" stoplogs). Total width between abutments is 60 feet.
Length:	Concrete bridge deck, 60 feet between abutments. Earth embankment 567 feet.
Height:	The maximum height of the embankment is 19 feet at the extreme ends. The minimum height is 13 feet at the bridge deck surface. The average M.S.L. elevation is 12 feet.
Top Width:	At the bridge deck - 40 feet. At the widest point - 75 to 100 feet.
Embankment Slopes:	Upstream - 2:1
	Downstream - 2:1
Lake Slopes:	North side - 10:1
	South side - 2:1
Downstream Channel:	North side - 2:1
	South side - 8:1
Impervious Core:	Unknown
Cutoff:	Unknown
Grout Curtain:	Unknown

h. Spillway

Type:	Wooden stoplog gates @ bridge with center pier, 12 gated inlets, 5 feet long, each composed of nine (9) 5 foot long, 3" x 12" stoplogs.
Length of Weir:	60 feet

Crest Elevation: 7.5 feet M.S.L.

Downstream Channel: Bridge consisting of two (2) 30 foot wide channels between abutments and center pier discharges to a 150 foot wide pond subject to tidal influence, located between Williams Pond Dam and Route 535. Route 535 inlet is 135 feet wide and is located 400 feet downstream.

i. Regulating Outlets

None other than the stoplog gates.

SECTION 2 - ENGINEERING

2.1 DESIGN

Drawings were provided by the Delaware Department of Transportation, entitled Plans For Contract No. 1312. Signatures noted on the drawings indicate approval by the bridge engineer, construction engineer and the chief engineer, in October, 1953.

Drawing #1

This drawing, being primarily a Title Sheet, provides some basic summary data and provides information regarding prior site conditions. This drawing does not show the existence of a prior dam.

Drawing #2

Drawing #2 is more definitive in showing topography at the embankment breach. It also provides boring locations and logs taken for the reconstruction of the dam. A roadway profile showing existing and proposed centerline grades is provided. The limits and extent of the embankment fill are noted, but no material or construction specifications are called.

Drawings #3, #4 & #6

The above drawings contain plan provisions for construction of the foundation, abutment, center pier and beams, dikes and other miscellaneous details for structure.

Drawing #5

This drawing shows the limits and extent of the proposed sheet piling cut-off wall. Across the spillway steel sheeting was called while at the wingwalls, timber sheeting was noted. It appears from the information provided on the boring logs that the sheeting was to be driven into the sand and gravel stratum.

No hydraulic computations were uncovered at the time of this investigation. It is not known if a stability analysis was

performed for the reconstructed embankment within the old channel.

A preliminary "as built" survey is provided for orientation and to check against the construction drawings.

2.2 CONSTRUCTION

The Delaware Department of Transportation was contacted for as-built plans. According to phone conversations with Dover, records were kept regarding pile cutoff and concrete cylinder breaks. It is doubtful whether more complete information exists. Hydraulic calculations were unobtainable.

2.3 OPERATION

No data pertaining to the operation of the structure prior to reconstruction was discovered. Presently the dam is operated by the Delaware Department of Transportation. Stoplogs are pulled by the maintenance personnel in anticipation of and during rainstorms with any significant accumulation of precipitation.

2.4 EVALUATION

a. Availability

Engineering data is not considered fully adequate to assess the safety of the structure for Phase I Inspection. Data missing pertains to the engineering properties and soil parameters of the embankment, method of construction, zoning and phreatic surfaces. Since no embankment settlements were observed within the old channel, it is presumed that consolidating soils were removed prior to embankment construction.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Williams Pond Dam was found to be in good overall condition at the time of the inspection. The problems noted during the visual inspection are considered minor and do not require immediate remedial attention. Noteworthy deficiencies are described briefly in the following paragraphs. The complete visual inspection check list is given in Appendix A.

b. Dam

Earthfill

No visible signs of movement either vertically or horizontally were evident. Erosion to the embankment has occurred adjacent to the downstream wingwalls, apparently occurring from poor control of road surface run-off. The total depth of the eroded channels approaches 3 feet. Further, slight erosion is occurring on the upstream side of the embankment at its junction with the dam structure. No seepage was observed in the embankment.

Overflow Dam

The concrete abutments and center pier bridge superstructure are in good overall condition. The wooden stoplogs have been slightly damaged by debris impact or water damage and are leaking at the edges where the boards meet. A guard rail post on the top of the embankment has been partially undermined by erosion and there is some slight hairline cracking of bituminous pavement. This would indicate some settlement. Both downstream wingwalls are tilting back into the bank and the bottoms appear to be deflected out. At the northernmost wingwall the wall has been displaced at the top as much as seven inches. However, at present the wingwall appears to be in stable condition. The rotation of the wingwall may be attributed to settlements.

c. Appurtenant Structures

N/A

d. Reservoir Area

The reservoir area of Williams Pond Dam as viewed from the roadway embankment atop the dam appears to have been residentially developed and is under private ownership. The banks are nearly level to gently sloping. Wooded lots and lawns comprise much of the upstream bank. There is no evidence of erosion or steep embankment conditions.

e. Downstream Channel

At the outlet of the Williams Pond Dam the downstream channel is more than 150 feet wide with sharply sloping banks on the north side, approximately 2:1, and gently sloping banks on the south side, approximately 8:1. The wide channel narrows slightly to the entrance beneath Route 535, 400 feet downstream.

f. Evaluations

1. Spillway - The stability of the tilting wingwalls will be discussed in Section 7.

2. Embankment - The effect of road surface runoff on the embankment will be discussed in Section 7.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Williams Pond Dam is owned and operated by the Delaware Department of Transportation, Bridge Management Division. The lake level is controlled by removing the stoplogs which comprise the spillway. When the upstream residents experience flooding conditions, the Gravel Hill Section of the Delaware Department of Transportation Maintenance Division is contacted. Maintenance is responsible for the opening of the lake outlets.

4.2 MAINTENANCE OF DAM

In conversations with James Moore, Delaware Department of Transportation, Bridge Department, it was determined that the State Department of Transportation inspects the roadway, bridge and earth embankments once every two years. Damage or failure is then reported to the Gravel Hill Maintenance Division of the Delaware Department of Transportation, who effectuates the maintenance.

4.3 MAINTENANCE OF OPERATING FACILITIES

In a conversation with Willard Griffith, Superintendent of the Gravel Hill Maintenance Department, it was determined that maintenance occurs on an as-needed basis, as well as in response to the bi-yearly inspection and evaluation of the dam structure.

4.4 DESCRIPTION OF A WARNING SYSTEM

Conversation with the Gravel Hill Superintendent indicates that the only warning system in effect for Williams Pond Dam is activated by the upstream residents who call Gravel Hill in the event of their rear yards flooding. According to Mr. Griffith, no flooding has overtopped either the Williams Pond Dam or the nearest downstream channel restriction being the Route 535 overpass.

4.5 EVALUATION

The need for annual inspections and a formal warning system will be discussed in Section 7.

SECTION 5 - HYDRAULIC/HYDROLOGY

5.1 EVALUATION OF FEATURES

a. Design Data

Hydraulic and hydrologic features of Williams Pond Dam were predicated upon the Corps of Engineer Guidelines and assistance provided by the Philadelphia District, Corps of Engineers.

Readily available data of the area was not obtainable. Hydraulic capacity of the Williams Pond Dam was assessed using the following data:

Plans obtained from the Delaware Department of Transportation Contract #1312 dated October, 1953.

Field survey of preliminary "as-built" conditions by Thomas Tyler Moore and Lippincott Engineering Associates.

Standard engineering procedures and methods used to compute spillway capacity both in the gated and in the open (gates removed) conditions.

Hydrologic evaluations were based on the following data:

Watershed areas obtained from the U.S.G.S. 7.5 minute quadrangles.

Snyder coefficients and infiltration loss rate coefficients.

The HEC-1 DB program was used to calculate inflows and routing.

Based on the size and hazard potential classification for this dam, the recommended spillway design flood is 50 years to 100 years. For evaluating the adequacy of the spillway,

100 year flood was used as the SDF.

b. Experience Data

No measurements of outflows from the dam or flows within the watershed of the dam are available. However, conversations with State Department of Transportation officials indicate that there is no record of any flood condition overtopping the roadway embankment.

c. Overtopping Potential

Williams Pond Dam has been classified as a "low" hazard, "small" dam. The S.D.F. is therefore a 100 year storm. The total discharge of the S.D.F. through Williams Pond Dam is 5435 C.F.S. This would overtop the embankment crest by 2.34 feet. The total duration of overtopping is 26 hours.

Tidal variations fluctuate from $-1.8^{\pm}$ feet M.S.L. to $+2.76^{\pm}$ feet M.S.L. This would generate a slight tailwater condition having little or no effect on the discharge rate of the S.D.F.

The evaluation presented above reflects present day conditions. It does not consider future development or its effect on the hydrology.

d. Emergency Drawdown

Williams Pond can be emptied by the removal of the wooden stoplog gates. The maximum drawdown potential of the open culvert with a maximum head at an approximate elevation 12 feet M.S.L. would be 2916 C.F.S. Flows of this magnitude could be significant during peak inflows. With no-to-slight inflow it would take approximately 10 hours to drain the reservoir. The current practice is to open the gates during rainstorms to prevent yard flooding upstream and overtopping of the roadway.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Except for the tilting downstream wingwalls, the surface erosion and slightly damaged stoplogs, no significant structural inadequacies were noted during the visual inspection phase of our analysis. No seepage below or around the spillway or embankment was noted. It does not appear that the tilting wingwalls nor the erosion pose a serious structural threat at this time.

b. Design and Construction Data

Calculations for embankment slope and foundation stability were not available for our review. General experience with similar slopes, heights, inclinations, materials and hydraulic conditions similar to those of Williams Pond Dam embankment slopes indicates that this dam can be shown to satisfy the stability requirements of "The Recommended Guidelines For Safety Inspection of Dams". This inference is based on stable slope inclinations given by the U.S. Bureau of Reclamation (1960) Design of Small Dams, first edition, pp 195 to 201. In view of the moderate heights and inclinations of the dam slopes, their history of satisfactory performance, and the fact that no indications of instability were observed during the field inspection of December 7, 1978, no further stability assessments are necessary for this Phase I Inspection Report.

c. Operating Records

Operating records have not been kept for Williams Pond Dam. No mechanical methods are associated with this dam and the overflow spillway. The lake level is controlled by the stoplog gates at the bridge inlets. Maintenance records are kept by the Delaware State Department of Transportation.

d. Post Construction Changes

Normal maintenance procedures are accomplished on a bi-annual inspection and repair basis, scheduled by the Delaware Department of Transportation, the only changes, visually observed, are erosion control techniques used to stabilize the earth embankment.

e. Seismic Stability

Williams Pond Dam is located in Zone 1 on the Seismic Zone Map of the United States. Experience has shown that structures having adequate stability under static loading conditions will also have adequate stability under Zone 1 level seismic activity. Since this dam demonstrates stability for static loads, no further consideration of seismic stability is necessary.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS & PROPOSED REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

The dam has been inspected visually, in accordance with procedures by the Corps of Engineers for a Phase I Report. Since no engineering data was available for review, our assessment is subject to those limitations inherent in a visual inspection.

The "hazard classification" has been down-graded from "High Hazard Potential" to "Low Hazard Potential". In our judgement loss of life or substantial property damage would not result in the event of dam failure.

Annual inspections are recommended in order to enable the owner to notice variations in appearance of specific portions of the dam.

The spillway has a hydraulic capacity equal to 10% of the peak S.D.F. outflow. The low point of the dam will be overtopped by 2.34 feet during the S.D.F.

Some tilting of the embankment wingwalls was noted. Although movement has occurred, the wall does not appear to be unstable at this time. No cracking is apparent that would indicate an impending structural failure.

No seepage or slope failures were noted during inspection that would indicate potential piping or embankment failure.

No cracking or movement of the concrete spillway structure or timber stoplogs was noted that would indicate a potential structural failure.

Erosion along the earthfill embankment can be prevented by implementing proper grading, seeding and/or riprap.

b. Adequacy of Information

No additional information is required to complete an assessment of the safety of the dam.

c. Urgency

The erosion occurring at the earthfill embankments should be repaired in the future.

d. Necessity for Additional Data

As demonstrated in Section 7.1 a & b, additional data and evaluation is not required.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Alternative

No alternatives are necessary.

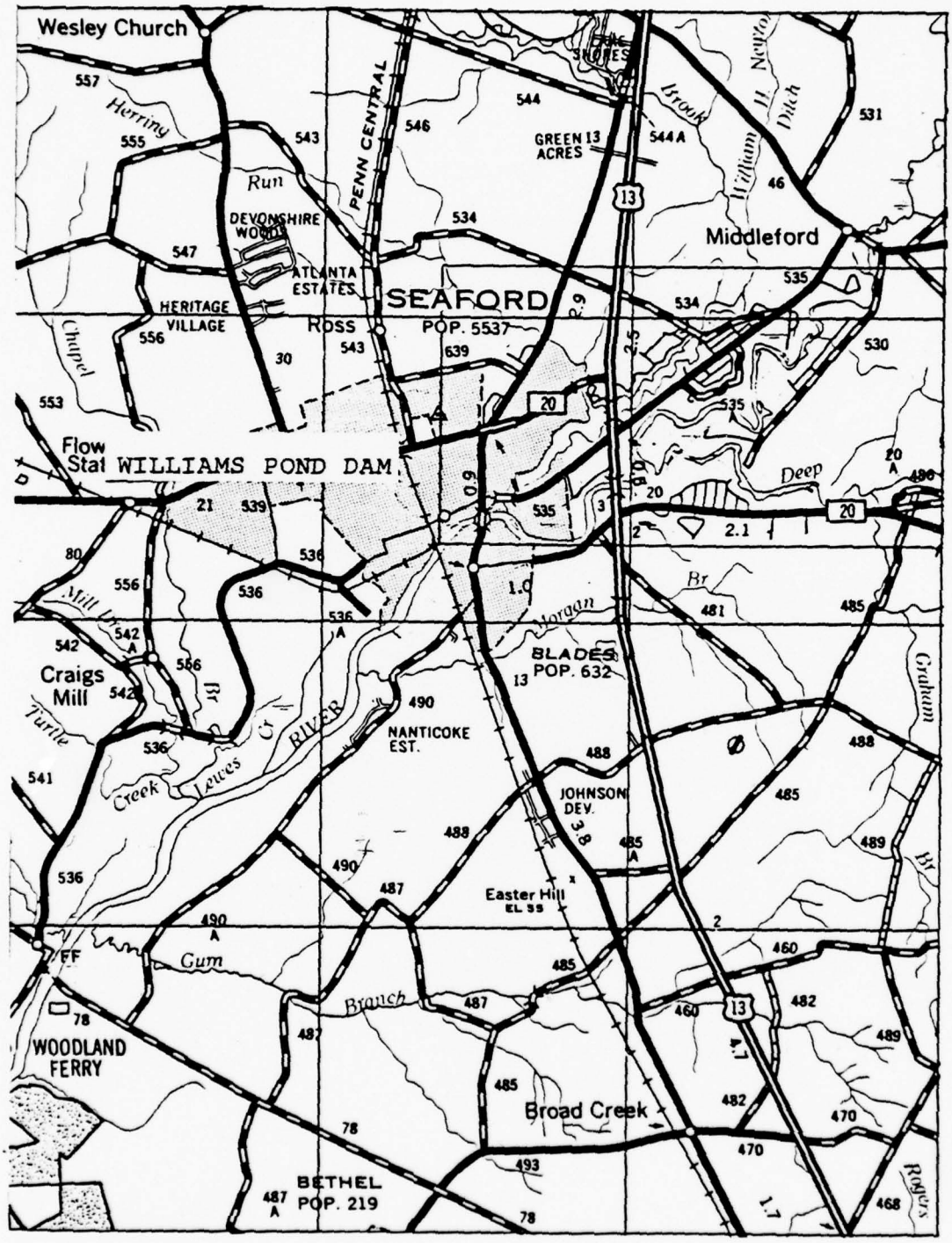
b. O & M Maintenance Procedures

An annual inspection visit should be initiated using a visual check list similar to the one enclosed in this report.

All drawings and computations relating to repair, renovation and maintenance of the dam should be kept as a matter of record.

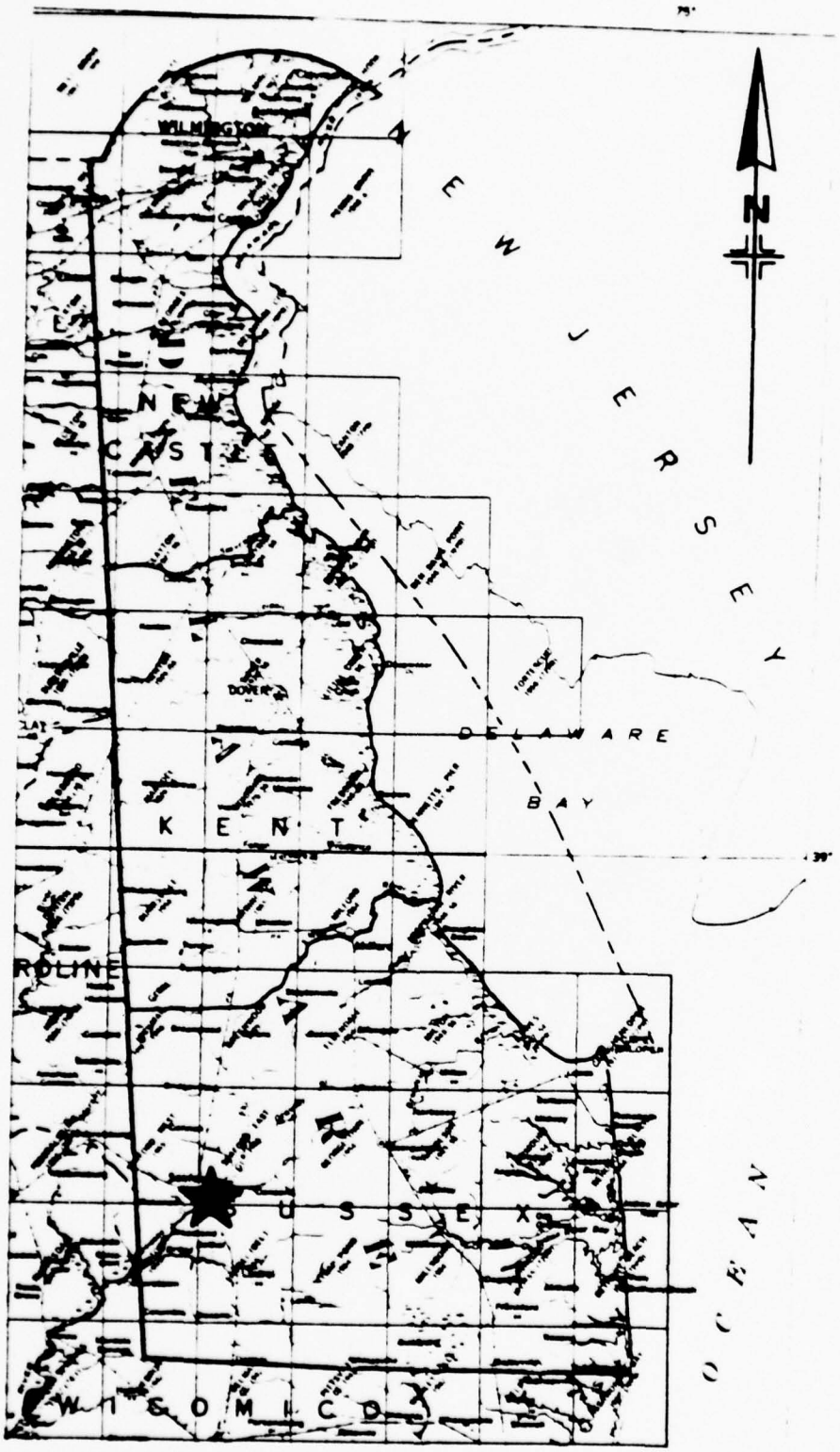
All visits to the dam for operation and maintenance should be logged as a matter of record.

PLATES



ROAD MAP

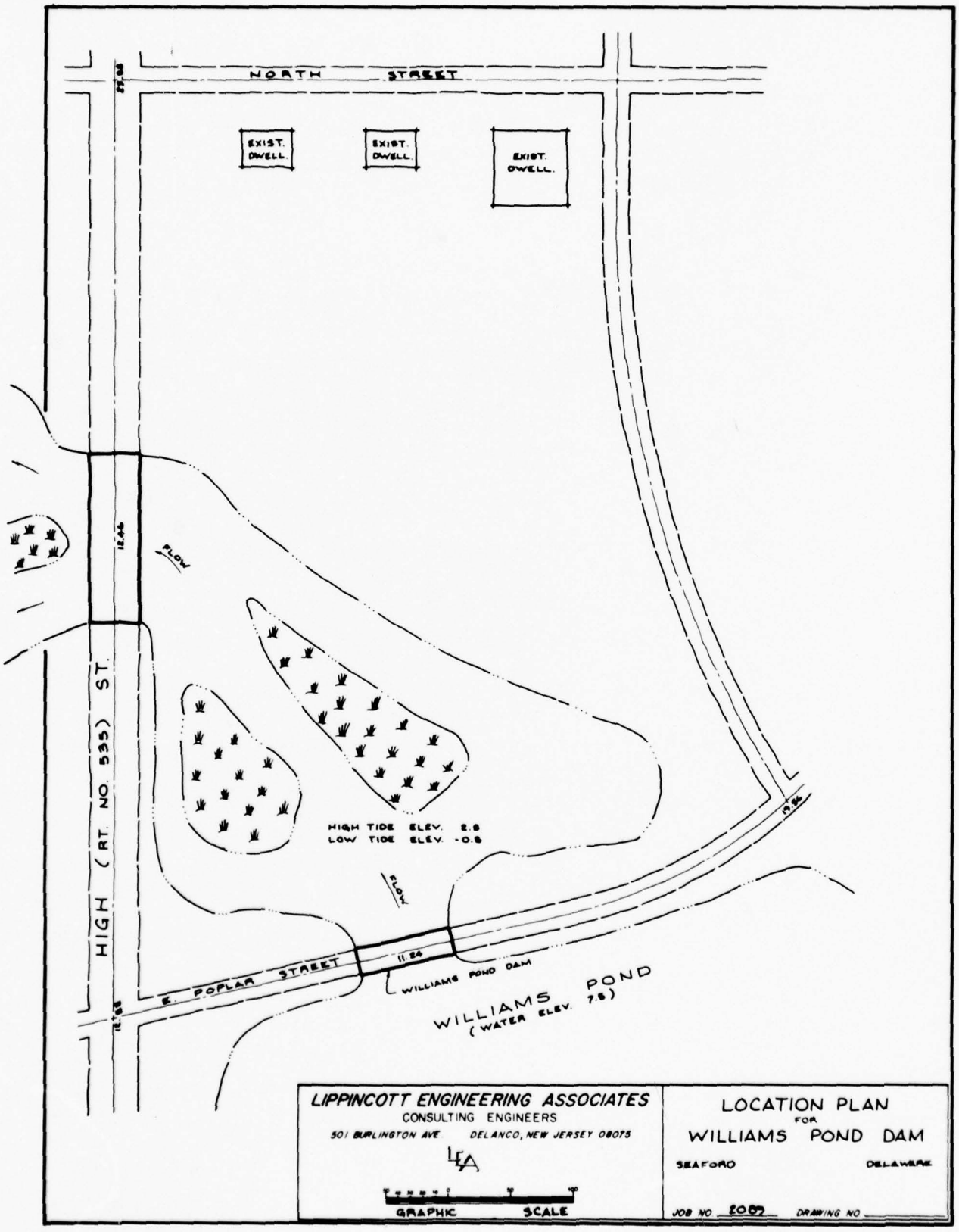
PLATE #1

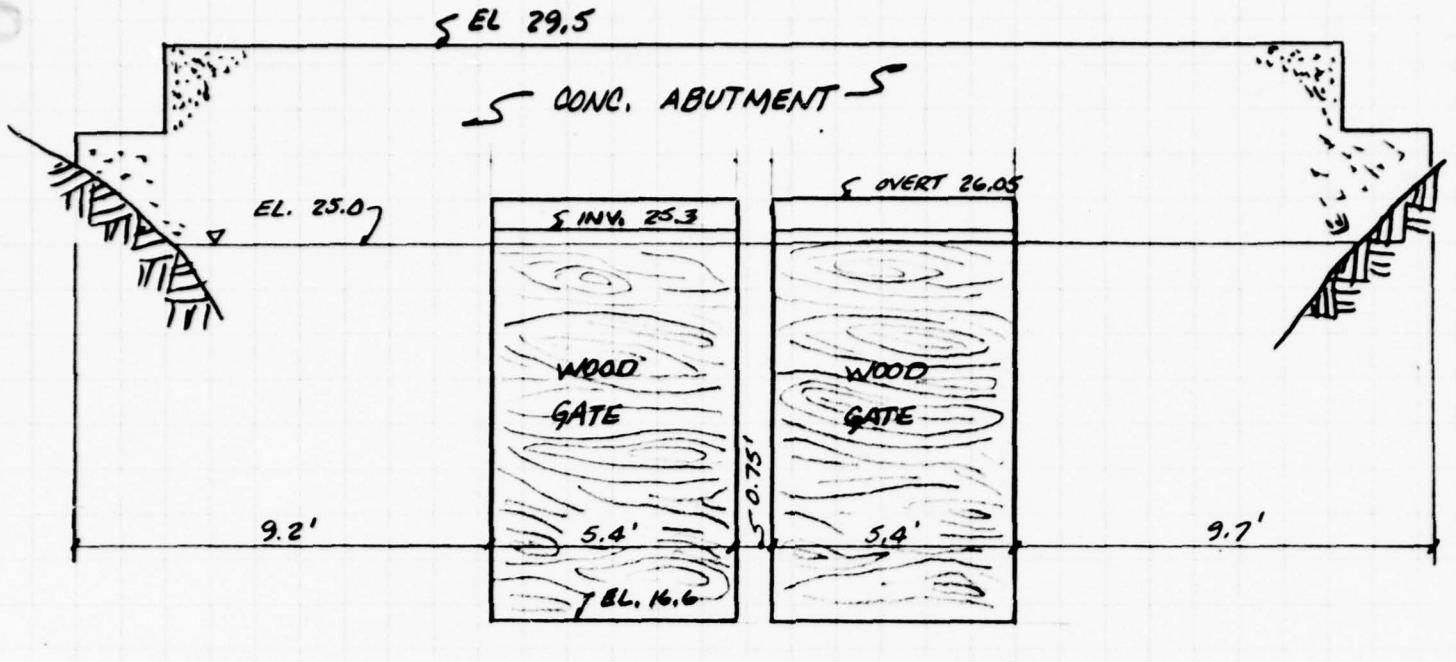


LOCATION MAP

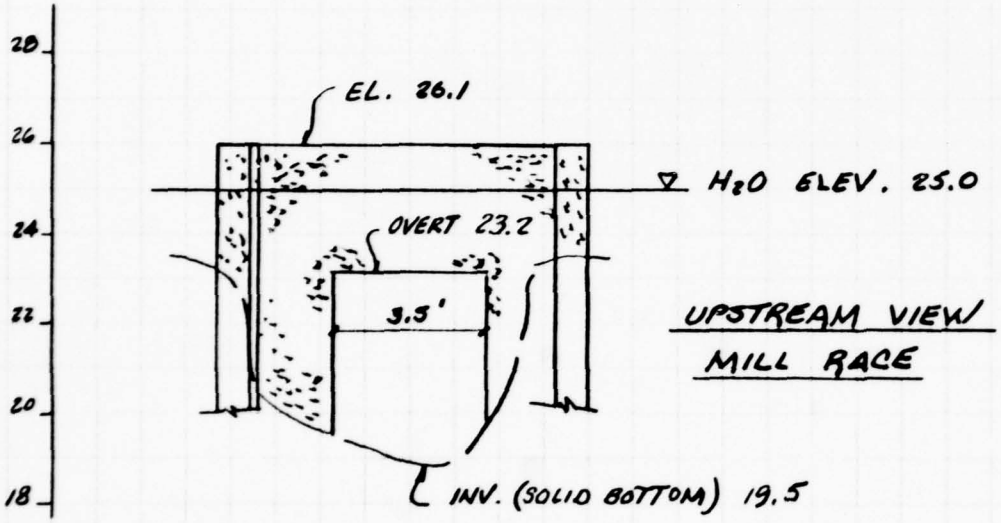
WILLIAMS POND DAM

PLATE #2


NORTH STREET
EXIST. DWELL.
EXIST. DWELL.
EXIST. DWELL.
HIGH (RT. NO. 535) ST.
FLOW
FLOW
HIGH TIDE ELEV. 2.8
LOW TIDE ELEV. -0.8
E. POPLAR STREET
11.24
WILLIAMS POND DAM
WILLIAMS POND
(WATER ELEV. 7.5)
LIPPINCOTT ENGINEERING ASSOCIATES
CONSULTING ENGINEERS
501 BURLINGTON AVE. DELANCO, NEW JERSEY 08075
LEA
GRAPHIC SCALE
LOCATION PLAN
FOR
WILLIAMS POND DAM
SEAFORD DELAWARE
JOB NO 8007 DRAWING NO



UPSTREAM VIEW - HEARNS POND DAM

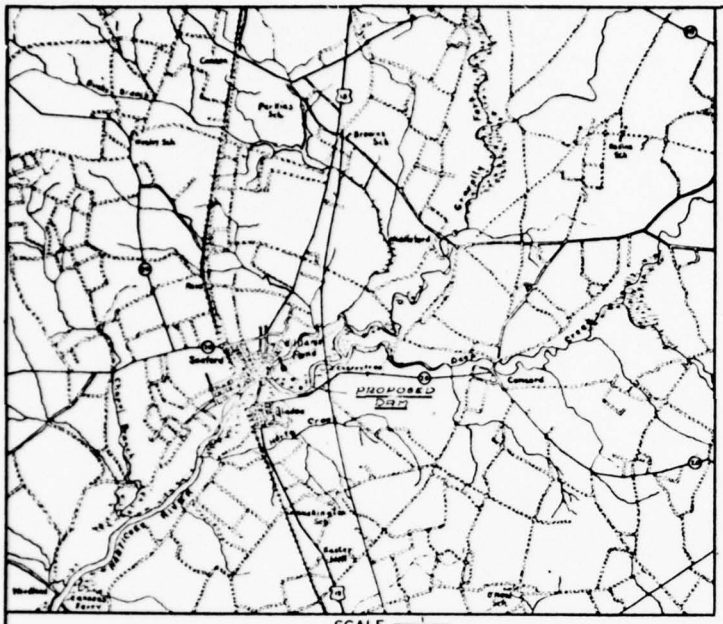


UPSTREAM VIEW
MILL RACE

SCALE: HORIZ. 1"=4'
VERT. 1"=4'

Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
Area Code (609) 461-1239

SHEET NO. _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____



SCALE 1/62,500

THE STATE OF DELA

State of Delaware

STATE HIGHWAY DEPA

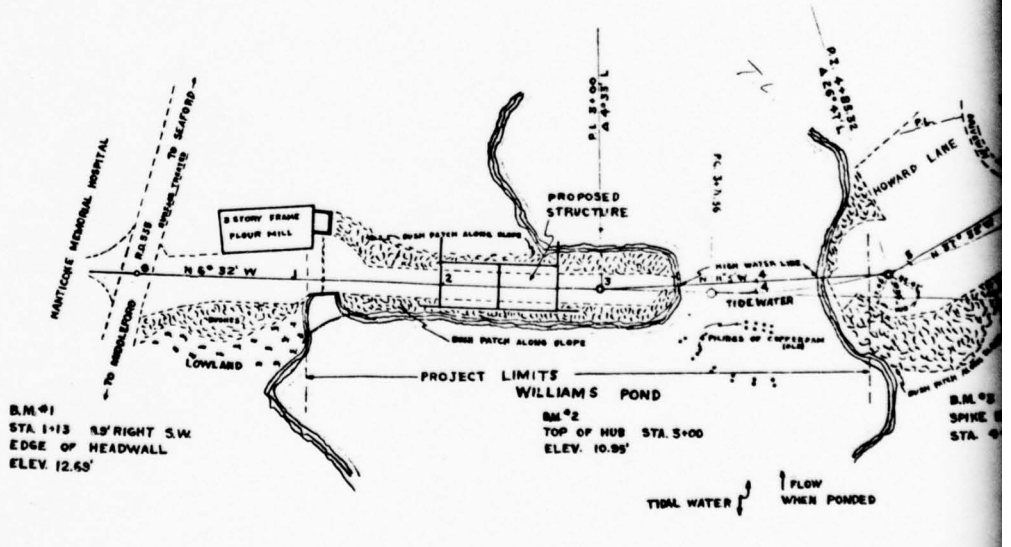
PLAN
FOR
CONSTRUCTION OF CONTRA

STA. TO STA.

FEET: MILES

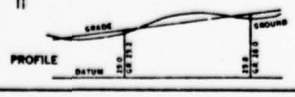
SCALE: PLAN: 1 IN.= 50 FT.
PROFILE: HOR. 1 IN.= 50 FT.
VERT. 1 IN.= 10 FT.

~~FEDERAL AID PROJECT N~~



CONVENTIONAL SIGNS

COUNTY LINE		WIRE FENCE	
CITY OR TOWN LINE		PRESENT CULVERT	
RIGHT OF WAY LINE		PROPOSED CULVERT	
CENTRE LINE, PROPOSED ROAD		TELEGRAPH POLE	
MACADAM, TRAVELLED ROAD		TREE	
TROLLEY OR RAILROAD			



INDEX OF SHEETS

SHEET Nº	1	TITLE SHEET
	5	TYPICAL SECTION
	2	PLAN AND PROFILE
	3, 4, 5	~~BRIDGES~~ STRUCTURES
	5	QUANTITIES
		~~STANDARDS~~

TE OF DELAWARE

State of Delaware

HWAY DEPARTMENT

PLAN
FOR

ION OF CONTRACT Nº 1312
TO STA.

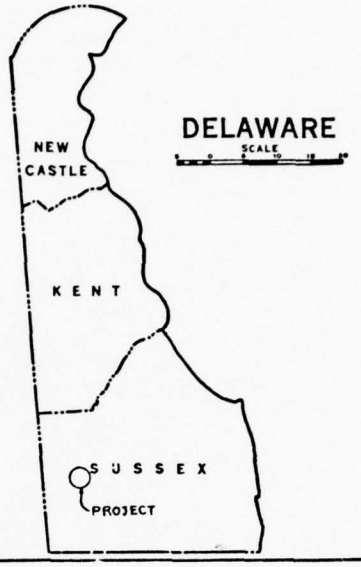
ET: MILES

50 FT.
OR. 1 IN.= 50 FT.
RT. 1 IN.= 10 FT.

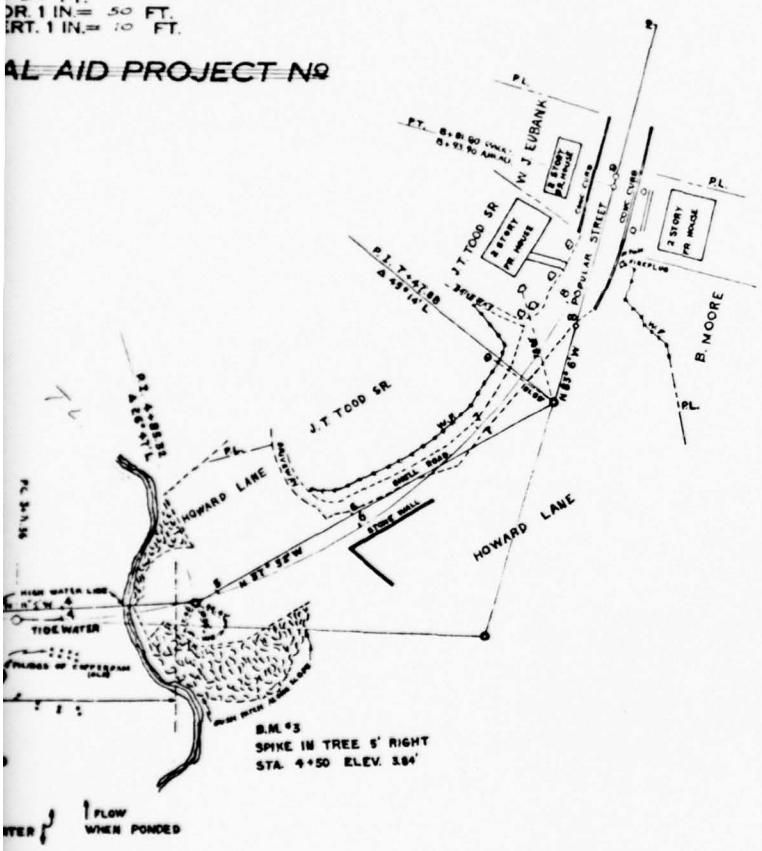
AL AID PROJECT Nº

COUNTY	CONTRACT	F.A.P. DIV. NO	STATE	FED AID PROJ NO	FISCAL YEAR	SHEET NO	TOTAL SHEETS
SUSSEX	1312	2	DEL.			1	5

WILLIAMS POND DAM



BOOK NUMBER 3045



B.M. #4
SPIKE IN POLE 163' RIGHT
STA. 8+54 ELEV. 30.02'

EXAMINED 10/27 1953 Jac S. Robinson
BUREAU ENGINEER

APPROVED 10-28 1953 John B. Larson
CONSTRUCTION ENGINEER

APPROVED 10-28 1953 W. H. Williams
CHIEF ENGINEER

DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

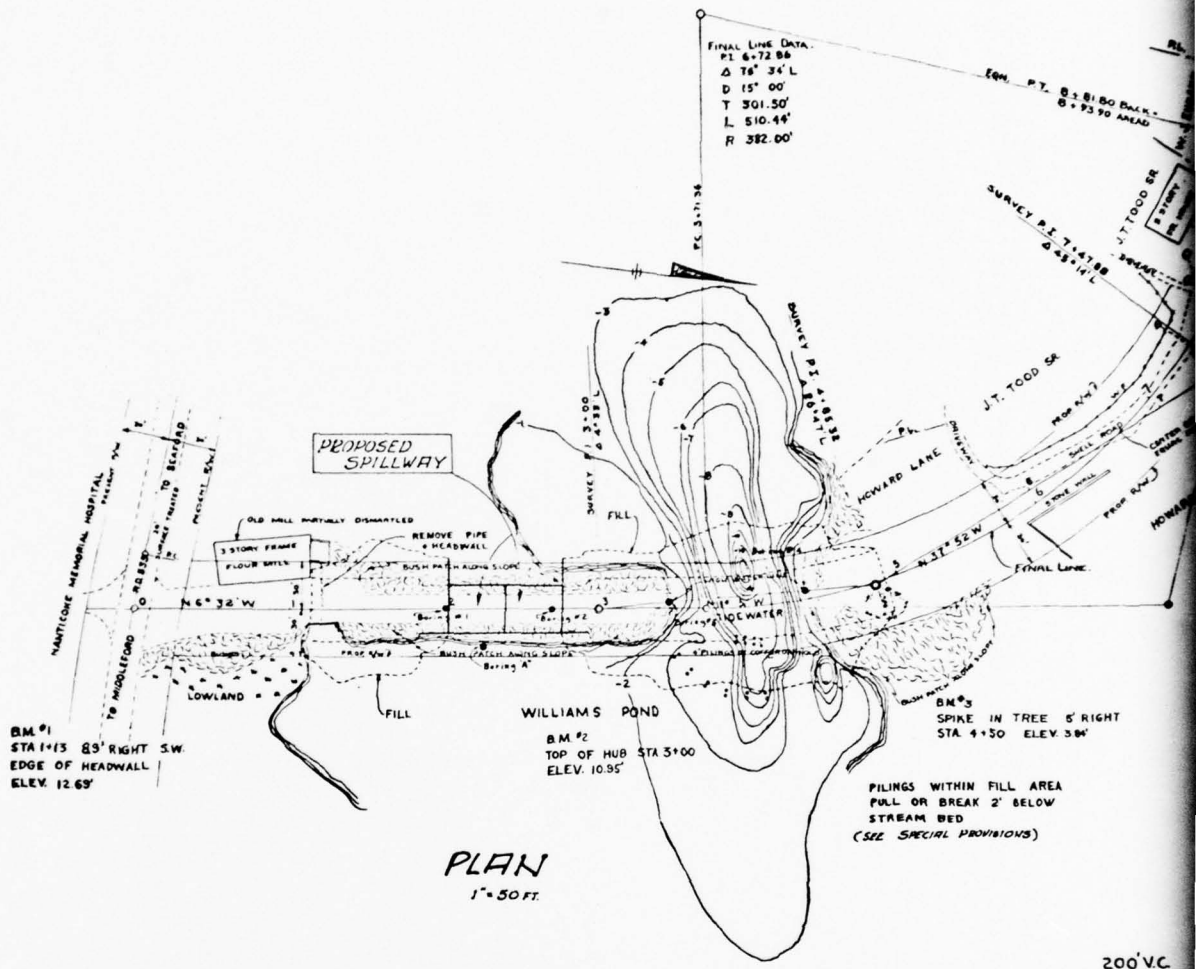
RECOMMENDED FOR APPROVAL:

DISTRICT ENGINEER DATE

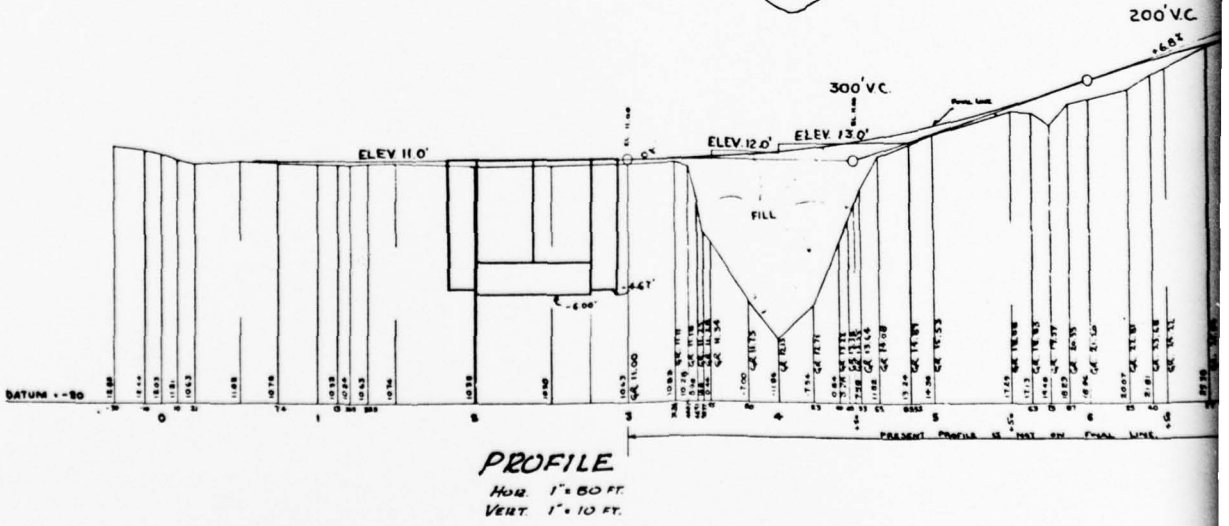
APPROVED:

DIVISION ENGINEER DATE

2



PLAN
1" = 50 FT.



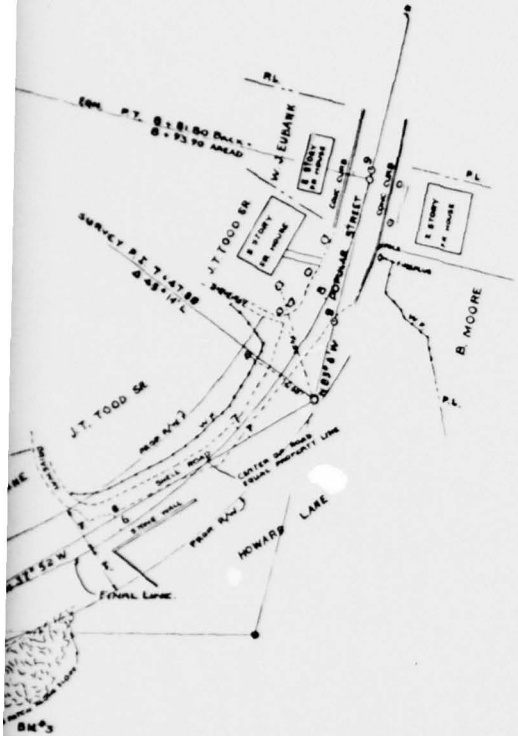
PROFILE
HOR. 1" = 50 FT.
VERT. 1" = 10 FT.

REVISIONS
GRADE & Rdwy 1-7-22

GRADE
BEARINGS
TIE POINTS
BENCH MARKS
EARTHWORK
DRAINAGE

COUNTY	CONTRACT	F. A. P. NO.	STATE	FED. AID PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SUSSEX	1312	3	DEL.			2	5

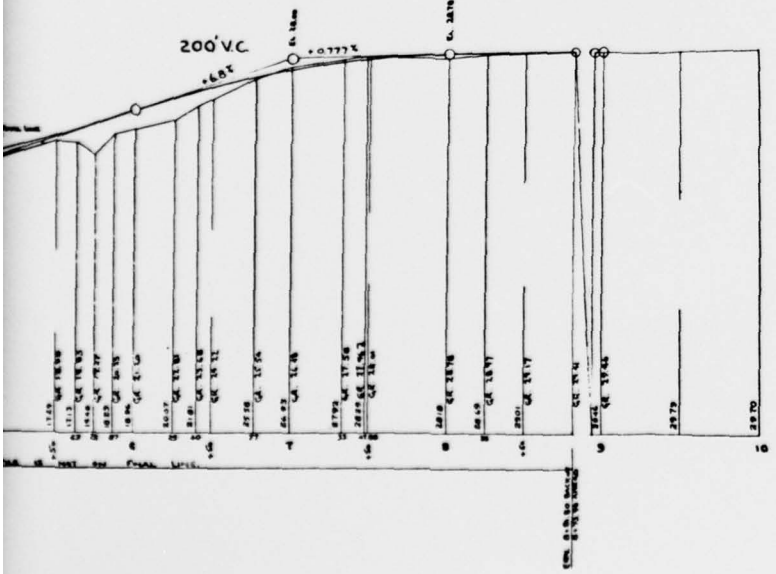
WILLIAM S. POND DAM
PLAN - PROFILE - BORINGS

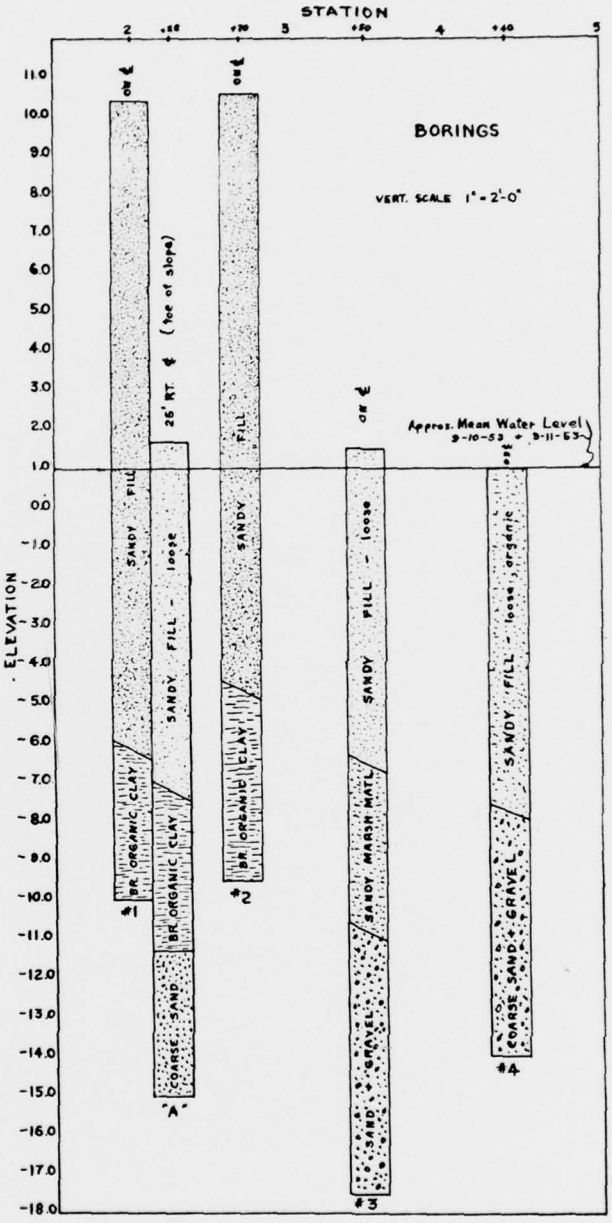


B.M. #4
SPIKE IN POLE 16.5' RIGHT
STA. 8+54 ELEV. 30.02'

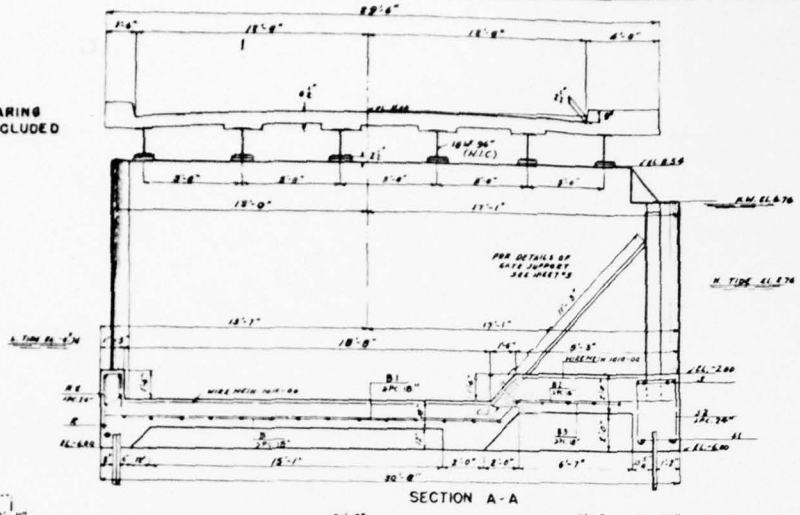
B.M. #3
SPIKE IN TREE 5' RIGHT
STA. 4+50 ELEV. 3.84'

WITHIN FILL AREA
BREAK 2' BELOW
BED
PROVISIONS)

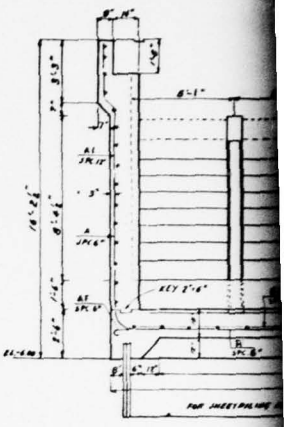


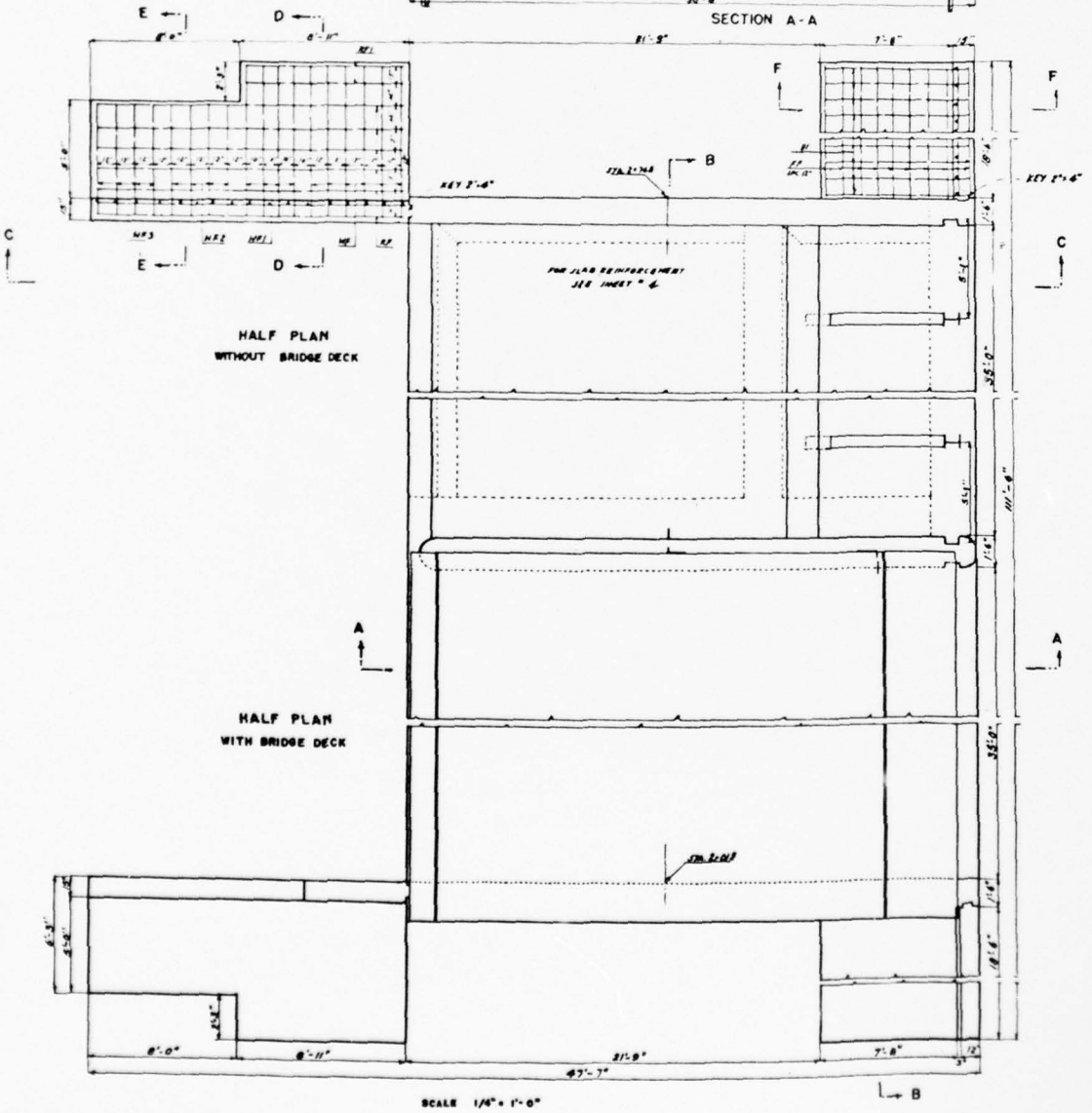


NOTE.
BRIDGE DECKAND BEARING
PLATES ARE NOT INCLUDED
IN CONTRACT " 1312



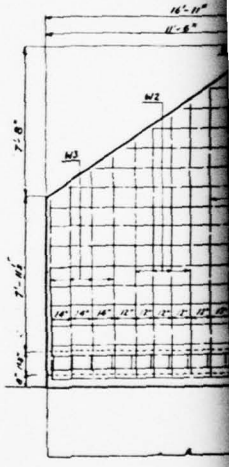
SECTION A-A

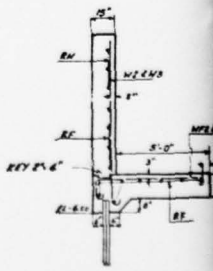




HALF PLAN
WITHOUT BRIDGE DECK

HALF PLAN
WITH BRIDGE DECK





SECTION E-

SCALE 1/16" = 1'-0"

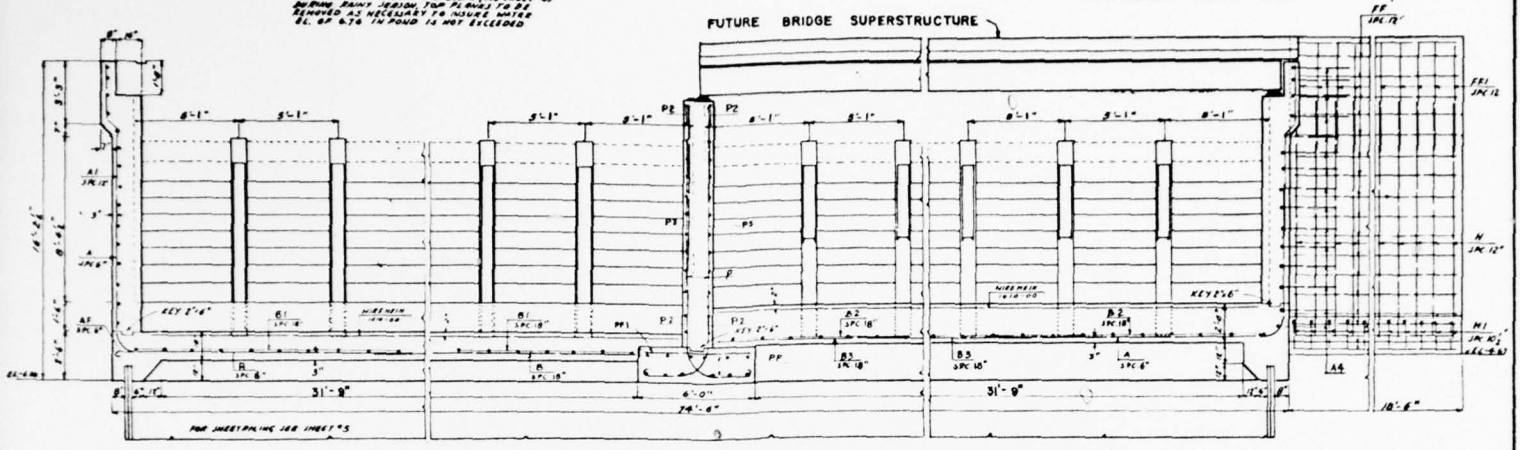
REVISIONS

BEARINGS
TIE POINTS
BENCH MARKS
EARTHWORK
DRAINAGE

COUNTY	CONTRACT	F.A.P. NO.	STATE	FED. AID PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SUSSEX	1312		DEL.			3	5

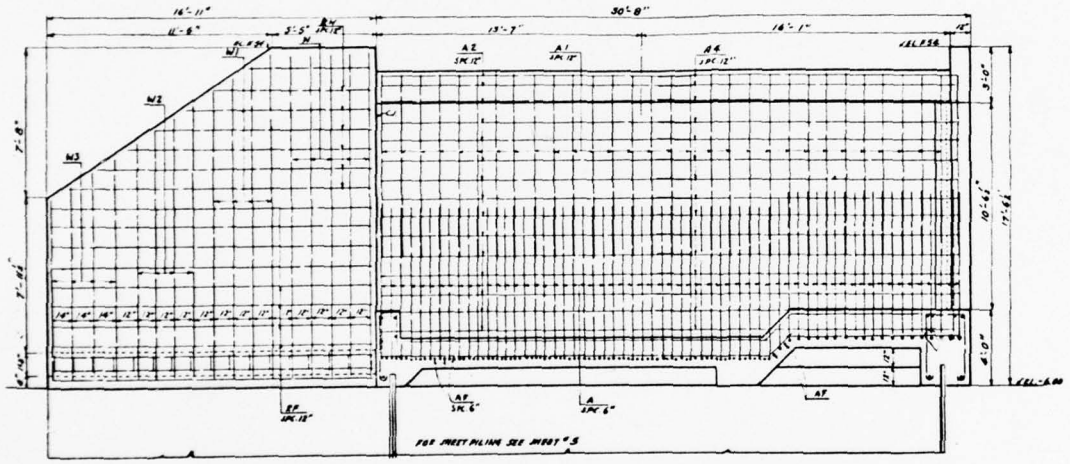
WILLIAMS POND DAM

NOTE
FOUR TOP EDGES OF GATE PLANKS ARE TO BE PROVIDED WITH GALVANIZED LOOPS (SEE SHEET NO) DURING RAINY SEASON, FOUR PLANKS TO BE REMOVED AS NECESSARY TO INSURE WATER EL. OF 6.10 IN POND IS NOT EXCEEDED



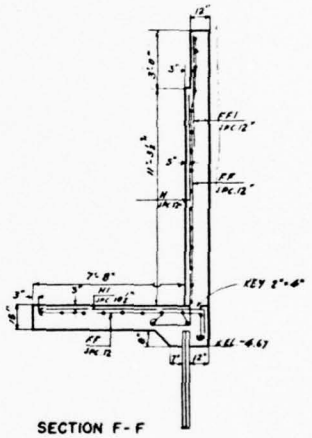
SECTION B-B

SCALE 1/4" = 1'-0"

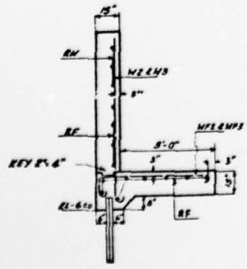


SECTION C-C

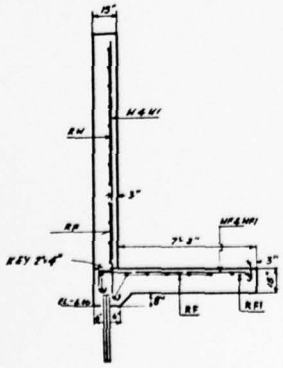
SCALE 1/8" = 1'-0"



SECTION F-F

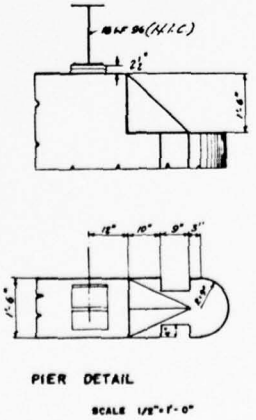


SECTION E-E



SECTION D-D

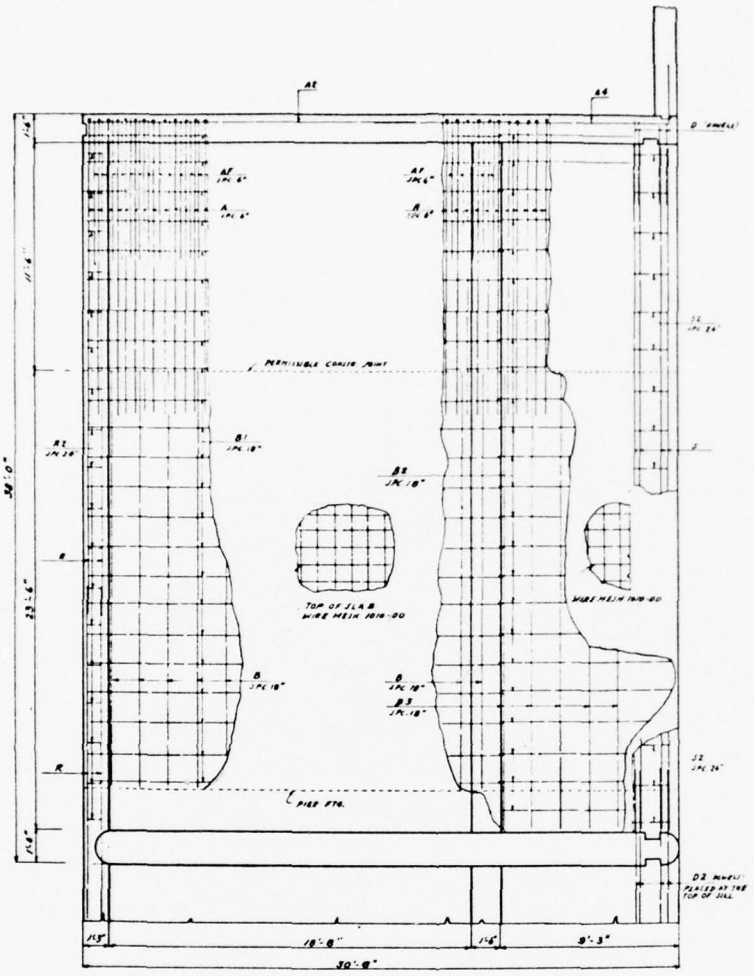
SCALE 1/4" = 1'-0"



PIER DETAIL

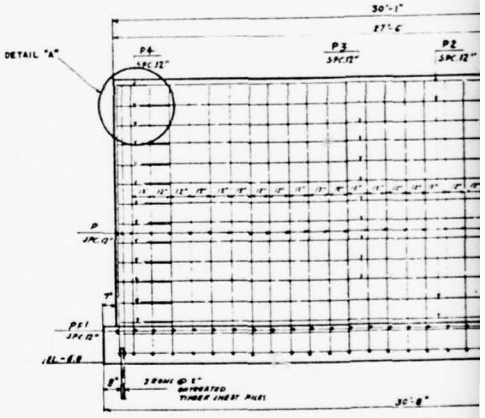
SCALE 1/8" = 1'-0"

DELAWARE STATE HIGHWAY DEPARTMENT		
WILLIAMS POND DAM		
D. K.R. 9/30/60 T. K.R. 10/1/63 CH.	SCALE AS SHOWN	APPROVED BY Jas S Rahman BRIDGE ENGR.

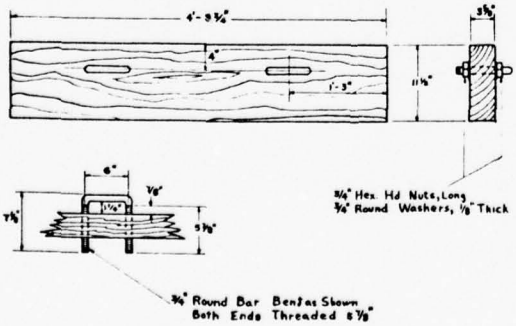


SPILLWAY SLAB REINFORCEMENT

SCALE 1/4" = 1'-0"



PIER ELEVATION



GATE PLANK DETAIL

SCALE 1" = 1'-0"

PIER PLAN

SCALE 1/4" = 1'-0"

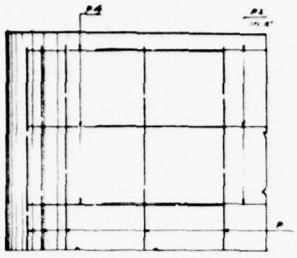
NOTE:
FOUR TOP ROWS OF PLANKS SHALL HAVE LOOPS AS SHOWN. 112 LOOPS REQUIRED.
ALL HARDWARE TO BE GALVANIZED AND SHALL BE PAID UNDER ITEM 20.

REVISIONS

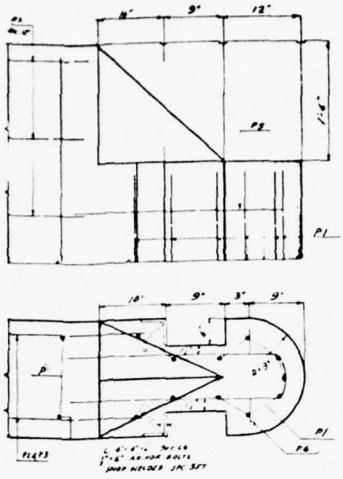
GRADE
BEARINGS
TIE POINTS
BENCH MARKS
EARTHWORK
DRAINAGE

COUNTY	CONTRACT	F.A.P. NO.	STATE	FED. AID PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SUSSEX	1312	2	DEL.			4	5

WILLIAMS' POND DAM

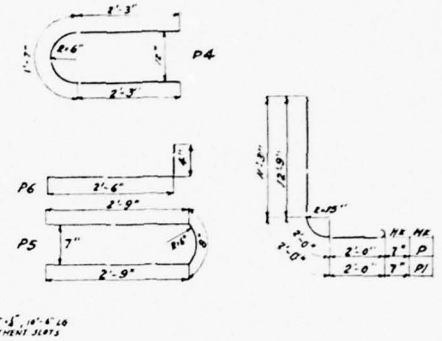


DETAIL "A"
SCALE 1" = 1'-0"

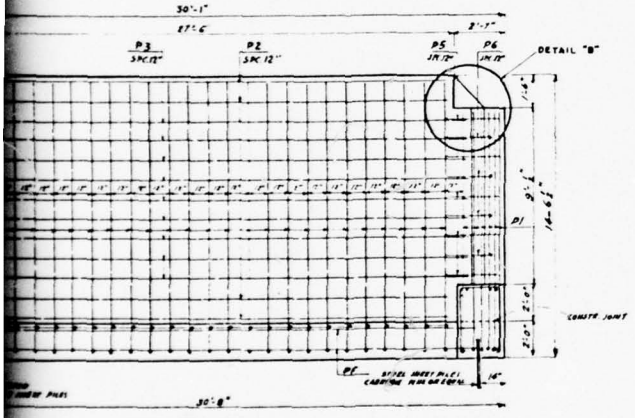


DETAIL "B"
SCALE 1" = 1'-0"

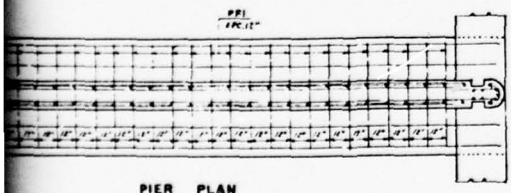
PIER REINFORCEMENT BENDING DETAIL



NOTE
USE L 4"-4"-⅝", 10'-6" LG FOR ABUTMENT SLOTS



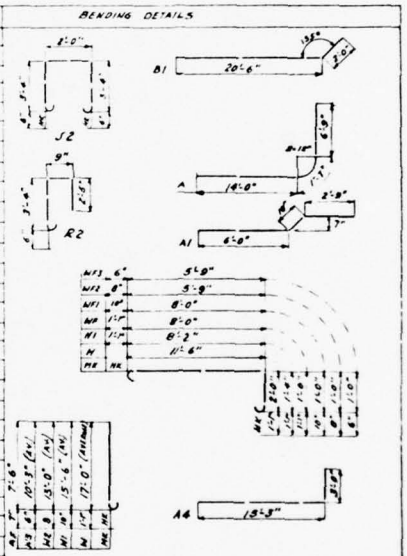
PIER ELEVATION



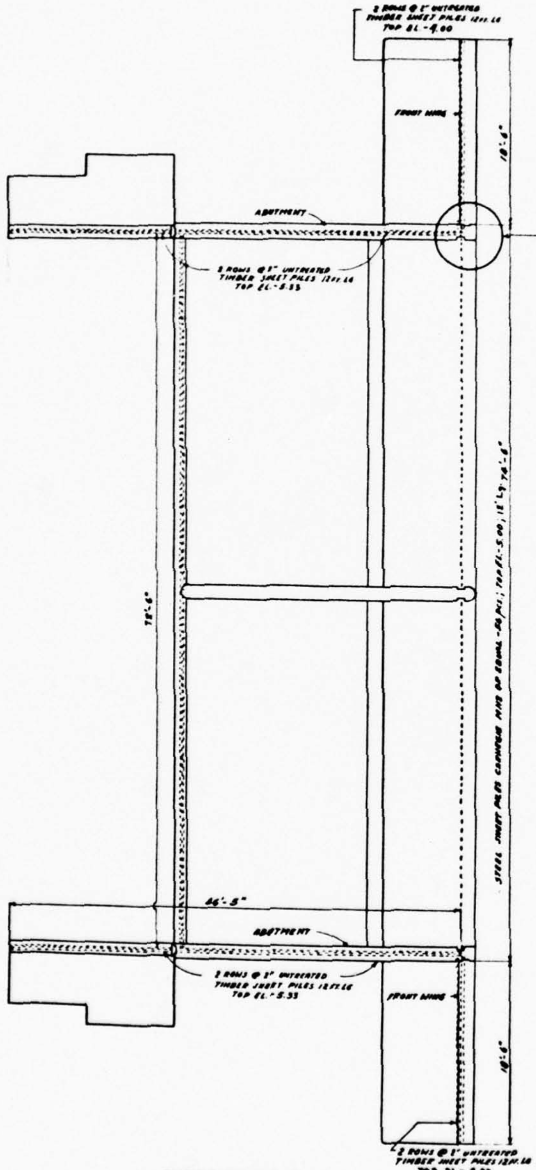
PIER PLAN
SCALE 1/4" = 1'-0"

LOCATION	STRAIGHT BARS NO	SIZE	LENGTH	MK	BENT BARS NO	SIZE	LENGTH	MK
FRONT SILL	8	#8	14'-6"	S	56	#4	9'-8"	S2
	4	#6	14'-6"	S1				
SPILLWAY (TOP)	NINE	HIGH		W	10			
" (BOTTOM)	28	#4	21'-0"	B	46	#4	22'-6"	B1
" "	48	#4	9'-0"	B2				
	10	#4	23'-0"	B3				
REAR SILL	15	#6	25'-9"	R	56	#4	7'-0"	R2
ABUTMENTS	30	#4	16'-0"	RF	122	#8	22'-4"	A
					60	#6	9'-7"	A1
ABUTMENT FTG'S	8	#8	4'-0"	AA	30	#4	18'-3"	A4
					94	#5	8'-1"	A5
FRONT WING FTG'S	24	#4	18'-0"	FF	42	#8	11'-8"	H1
" "	30	#4	18'-0"	FF	38	#8	14'-7"	H
" "	38	#4	5'-0"	FF1				
REAR WING FTG'S	16	#4	16'-5"	RF	12	#8	11'-2"	HF
" " "	4	#4	8'-5"	RF1	8	#7	10'-8"	WF1
" " "					8	#6	8'-1"	WF2
" " "					8	#4	7'-9"	WF3
" "	16	#4	16'-5"	RF	16	#8	18'-7¾"	W
" "	14	#4	11'-0¾"	RW	8	#7	16'-4¾"	W1
" "					8	#6	13'-8¾"	W2
					8	#4	8'-9¾"	W3
PIER FTG.	12	#4	28'-6"	PF				
" "	28	#4	5'-6"	PF1				
"	8	#4	25'-9"	P2	11	#5	15'-10"	P1
"	10	#4	26'-9"	P3	57	#5	17'-4"	P
"					13	#4	6'-1"	P4
"					5	#4	6'-2"	P5
"					8	#4	2'-10"	P6
"	4	#8	8'-0"	D2				

BENDING DETAILS

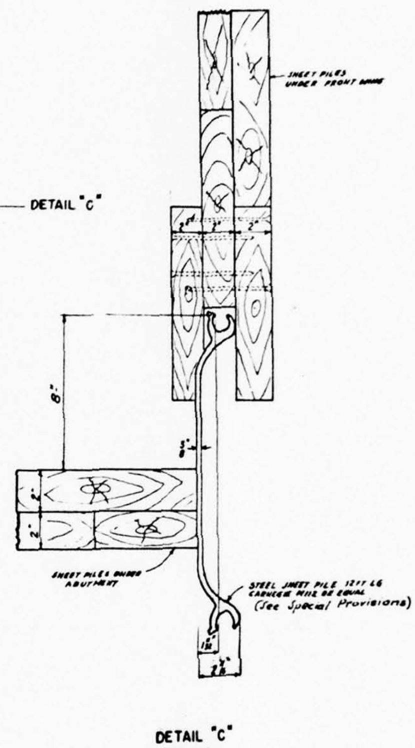


DELAWARE STATE HIGHWAY DEPARTMENT		
CONTRACT 1312 WILLIAMS' POND DAM		
D. E. R. 1973 T. E. R. 1973 Checked 1973	SCALES AS SHOWN	APPROVED BY Jas. S. Robinson BRIDGE ENGINEER



SHEET PILING PLAN

1/8" = 1'-0"



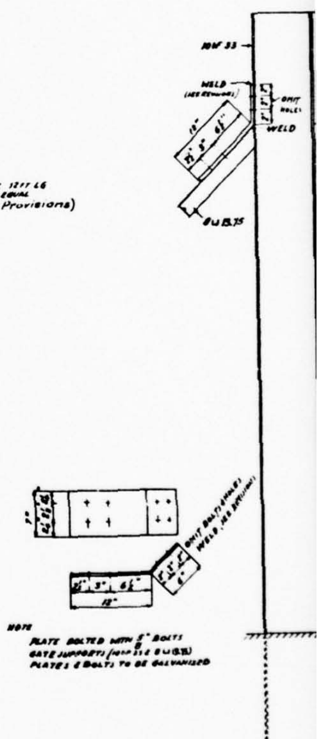
DETAIL "C"

3" = 1'-0"

GENERAL NOTES

THIS STRUCTURE IS L
CREEK NEAR SEAFORD
THE SPECIFICATIONS A
AND ADDENDA DATED M
WATERPROOFING (SUR
TO THE VERTICAL SURF
MENTS IN CONTACT WIT
FOOTINGS)
REINFORCING STEEL
FOR CONSTRUCTION SE
SEE SPECIAL PROVISIO

DRAINAGE
MAX Q
25YE



GATE

12 REQUI

REVISIONS	
BEARINGS	
TIE POINTS	
BENCH MARKS	
EARTHWORK	
DRAINAGE	

COUNTY	CONTRACT	F.A.S. OR S.H. NO.	STATE	FED. AID PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SUSSEX	1312	8	DEL.			5	5

WILLIAMS POND DAM

GENERAL NOTES

THIS STRUCTURE IS LOCATED ON NORTH FORK CREEK NEAR SEAFORD (SEE TITLE SHEET). THE SPECIFICATIONS ARE DATED APRIL 1, 1941 AND ADDENDA DATED MARCH, 1947

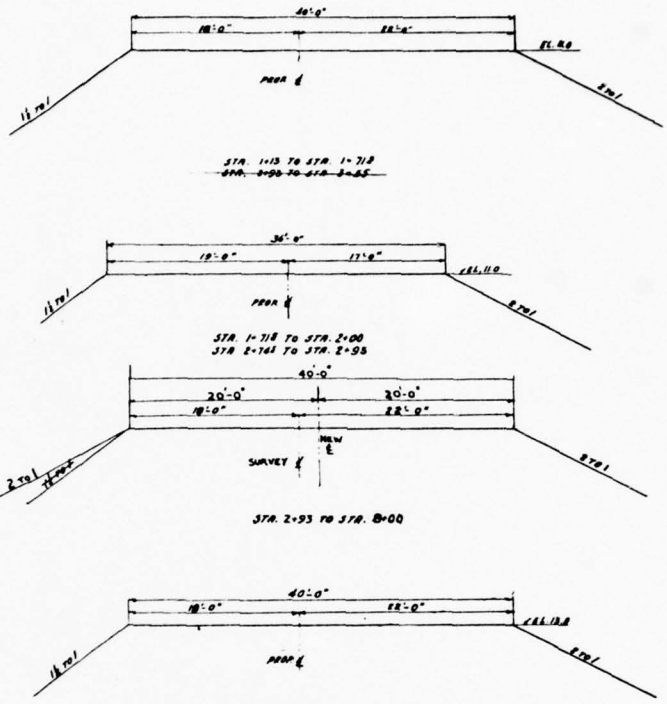
WATERPROOFING (SUPERFICIAL) TO BE APPLIED TO THE VERTICAL SURFACE OF WINGS AND ABUTMENTS IN CONTACT WITH EARTH BACKFILL (EXCEPT FOOTINGS)

REINFORCING STEEL SPACING C. TO C. BAR.

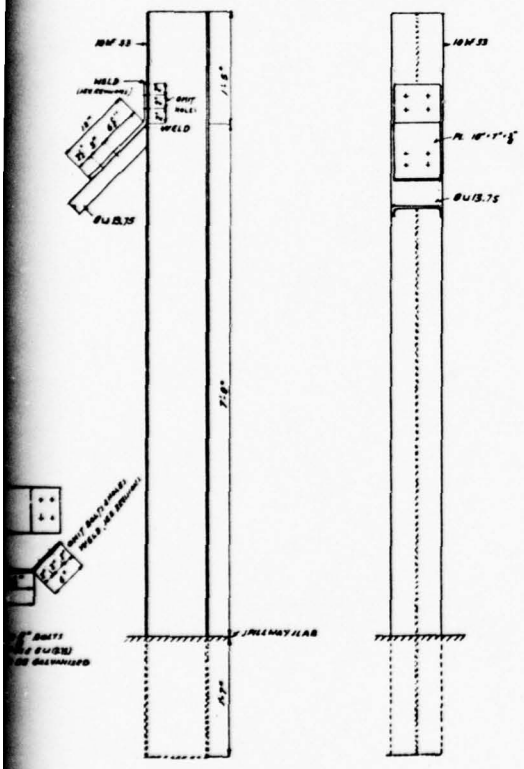
FOR CONSTRUCTION SEQUENCE AND METHODS, SEE SPECIAL PROVISIONS

DRAINAGE AREA = 23.31 SQ. MI
MAX Q = 1300 C.F.S.
25 YEAR FR.

FILL SECTIONS



1" = 1'-0"



GATE SUPPORT
1"=1'-0"
12 REQUIRED

QUANTITIES

ITEM	DESCRIPTION	UNIT	TOTAL	PROPOSAL		
102	CLEARING AND GRUBBING			L.S.		
6	EXCAVATION FOR STRUCTURES	C. Y.	1421	1600	TOTAL	PROP
7	BORROW	C. Y.	8720	9000	9840	10,500
20	CREOSOTED TIMBER STRUCTURES	M. FT. B.M.	2.434	2.50		
21	CEMENT CONC. MASONRY	C. Y.	322.0	330.0		
23	WATERPROOFING (SUPERFICIAL)	SQ. Y.	228	230		
24	REINFORCING STEEL (INCL. WIRE MESH)	LBS.	21,540	22,000		
26	STRUCTURAL STEEL	LBS.	6257	6300		
41	SHEET PILES (LEFT IN PLACE)	M. FT. B.M.	9,712	10.00		
	STEEL SHEET PILES	LBS	20,630	21,000		
	REMOVAL OF STRUCTURES AND OBSTRUCTIONS			L.S.		
4	EXCAVATION	C. Y.	295	350	364	420

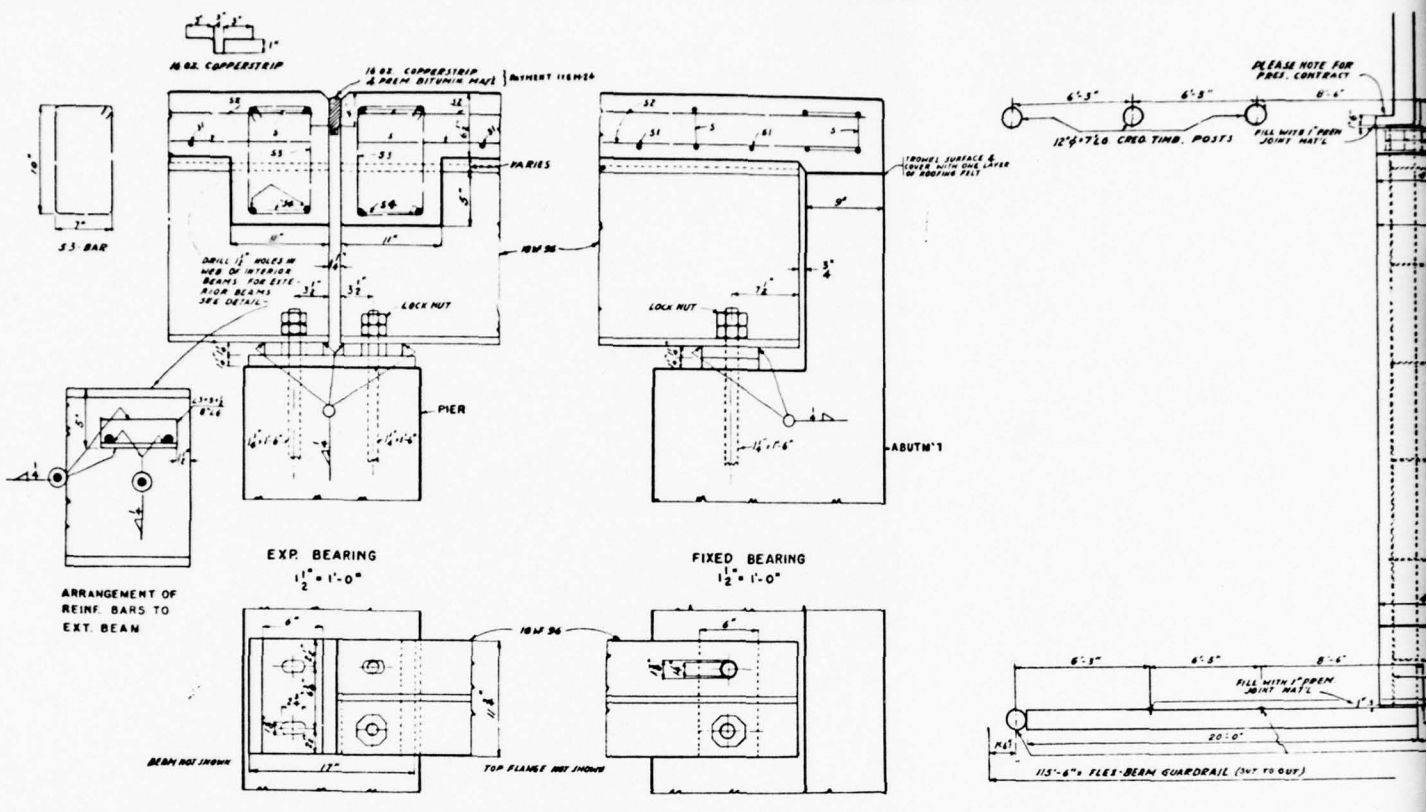
DELAWARE
STATE HIGHWAY DEPARTMENT

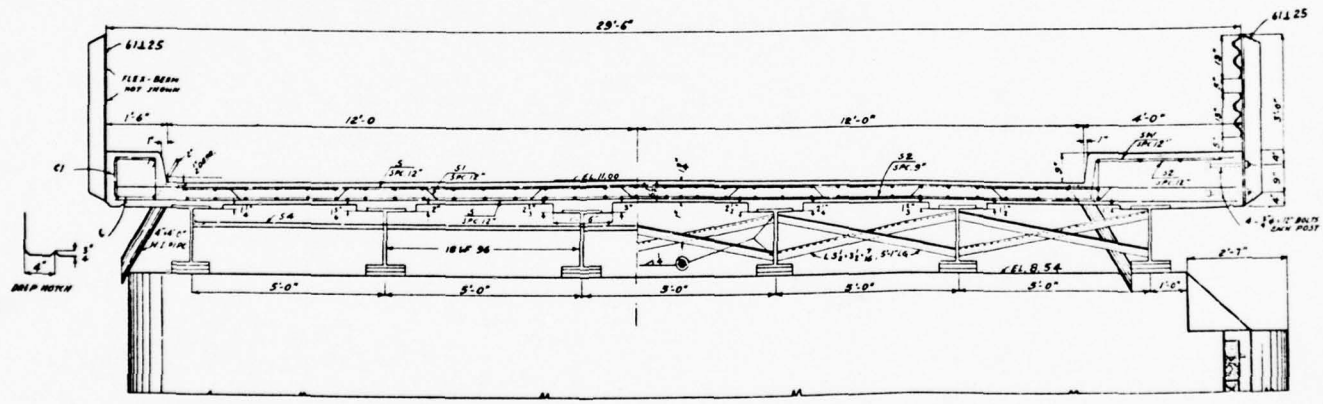
WILLIAMS POND DAM

D. f.s. lb/ft
T. f.s. lb/ft
CH.

SCALE
AS SHOWN

APPROVED BY
Jas S. Robinson
BRIDGE ENGR.





SECTION A-A
1" = 1'-0"

REVISIONS

BEARINGS TIE POINTS BENCH MARKS EARTH WORK DRAINAGE

REINFORCING STEEL

LOCATION	STRAIGHT BARS				BENT BARS			
	NO	SIZE	LENGTH	MK	NO	SIZE	LENGTH	MK
SLAB (TOP)	78	#5	29'-2"	S				
" (BOTTOM)	74	#5	29'-2	S	78	#5	30'-5"	S1
" (SPL. T & B)	248	#4	19'-6"	S2				
" (AT EXP. BEAM)	4	#8	24'-10"	S4	30	#4	6'-0	S3
CURB (SPL.)	16	#5	19'-6"	C1	76	#4	5'-0"	C
SIDE WALK (SPL.)	24	#4	19'-6"	S2	76	#4	6'-5"	SW

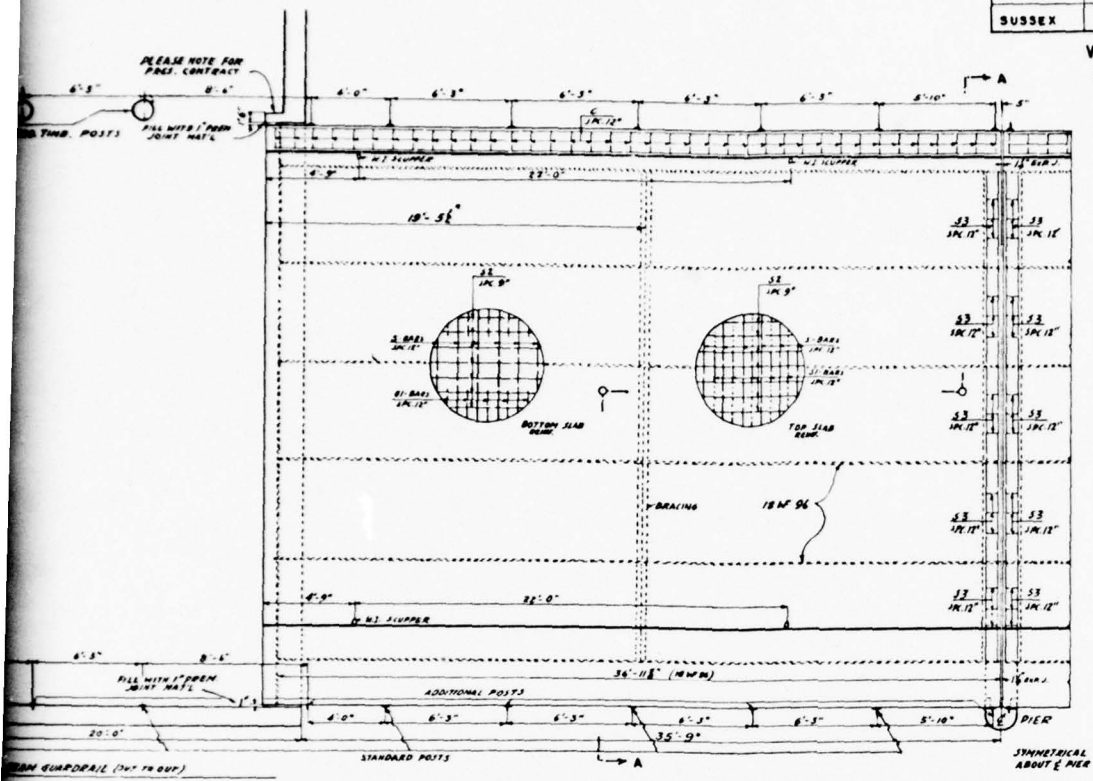
QUANTITIES

ITEM	DESCRIPTION	UNIT	TOTAL
21	CEM. CONC. MASONRY	C.Y.	618
24	REINF. STEEL	LBS.	11,593
26	STRUCTURAL STEEL (INCL. BEARING & ANCHOR BOLTS)	LBS.	45,273
	FLEX-BEAM GUARDRAIL (INCL. CREO TIMB & STR. STEEL POSTS)	L.F.	231.0

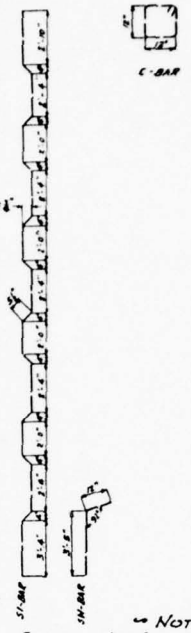
APPROVED: W. A. Mc Williams
By. J. B. Larson CHIEF ENGINEER

COUNTY	CONTRACT	F.A.P. OR S.H. NO.	STATE	FED. AID PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SUSSEX	1312 ADDITION		DEL.			6	6

WILLIAMS POND DAM
BRIDGE SUPERSTRUCTURE
ADDITION TO CON. 1312



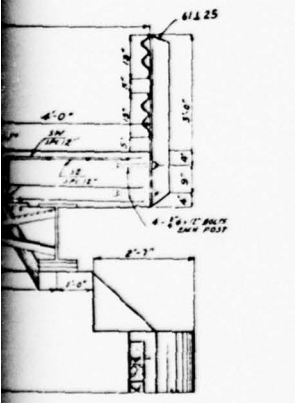
HALF PLAN
1" = 1'-0"

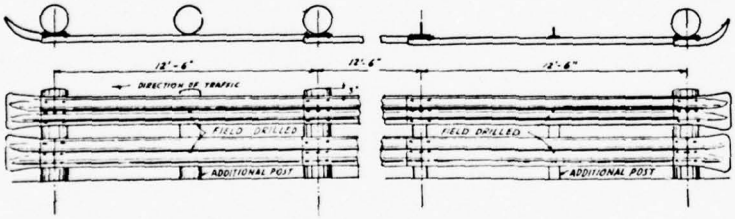


NOTES

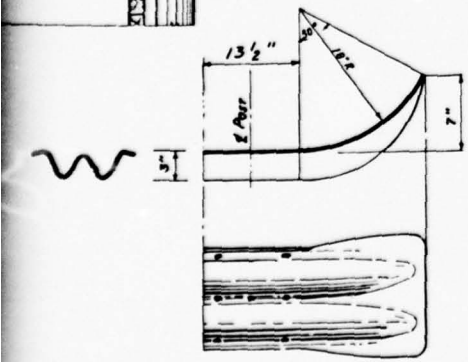
For general notes, refer to sheet 95.

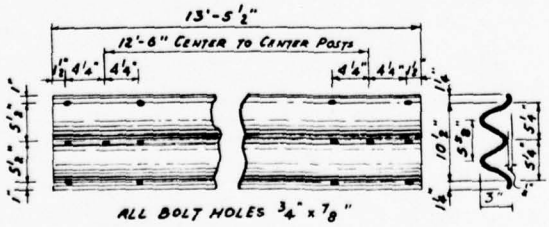
FLEX-BEAM GUARDRAIL





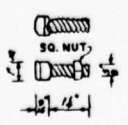
ELEVATION



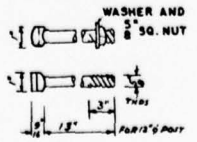


ALL BOLT HOLES ¾" x ⅞"

TYPICAL SECTION GUARDRAIL



SIX (6) REQD. PER SECTION AS SHOWN



BOLT - 1 REQD. PER SECTION

Flex-beam guard rail shall conform with current "Armco" specifications. Paint and painting shall be as specified for structural steel. Payment for guard rail complete in place shall include creosoted timber and structural steel posts, attachments, and incidentals, as well as all painting specified.

Please note spacing of guard rail posts. Use standard 12'-6" lengths of "Flex-beam", and drill holes for additional posts in the field.

Concrete in the roadway slab shall meet the requirements of Item 16 - Cement Concrete Pavement, as regards screeding by hand methods, finishing, straight-edging, floating, finishing with burlap, curing, and sealing of joints and cracks. Payment for wrought-iron scuppers shall be included in the price submitted for "Concrete Deck".

Structural Steel shall conform with requirements of Item 26 of the Standard Specifications, with the following exceptions noted.

Paragraphs 26.3 and 26.4 are deleted.

Paint and painting shall conform with the standard paint specifications of the State Highway Department currently in use.

Welding shall conform with the Standard Specifications for Welded Highway and Railway Bridges of the American Welding Society, dated 1947, with current addenda.

DELAWARE
STATE HIGHWAY DEPARTMENT

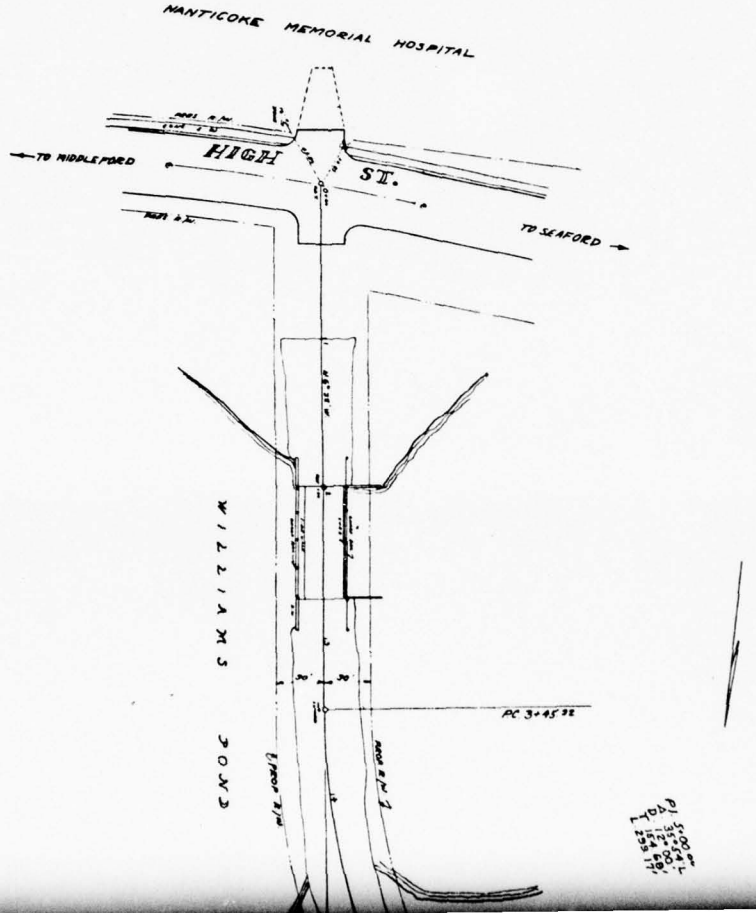
WILLIAMS POND DAM
BRIDGE SUPERSTRUCTURE

DR. K.R. 12/9/53 TR. K.R. 12/14/53 CH. K.A.J.R. 12/16/53	SCALE AS SHOWN	APPROVED BY Joe S. Robinson BRIDGE ENGR.

CHIEF ENGINEER

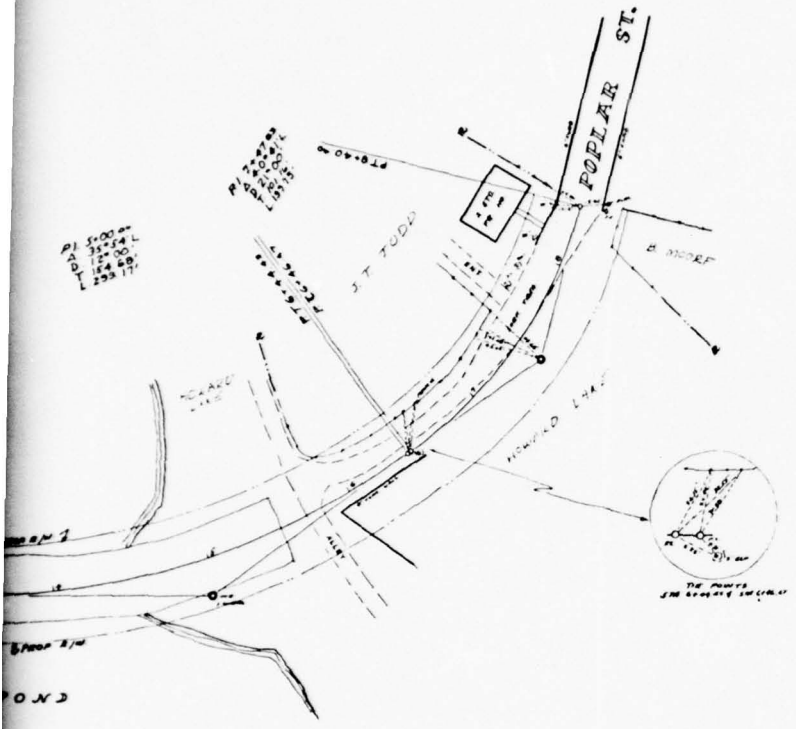
REVISIONS

CHECKED	
GRADE	
BEARINGS	
TIE POINTS	
BENCH MARKS	
EARTHWORK	
DRAINAGE	



COUNTY	CONTRACT	P. & S. SHT. NO.	STATE	FED. AID PROJECT NO.	FINAL TOTAL	SHEET NO.	TOTAL SHEETS
SUSSEX	13/2	2	DEL.				

POPLAR STREET EXT. (Seaford)



Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
Area Code (609) 461-1239

SHEET NO _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____

RT. 535 BRIDG AND CULVERT DETAIL

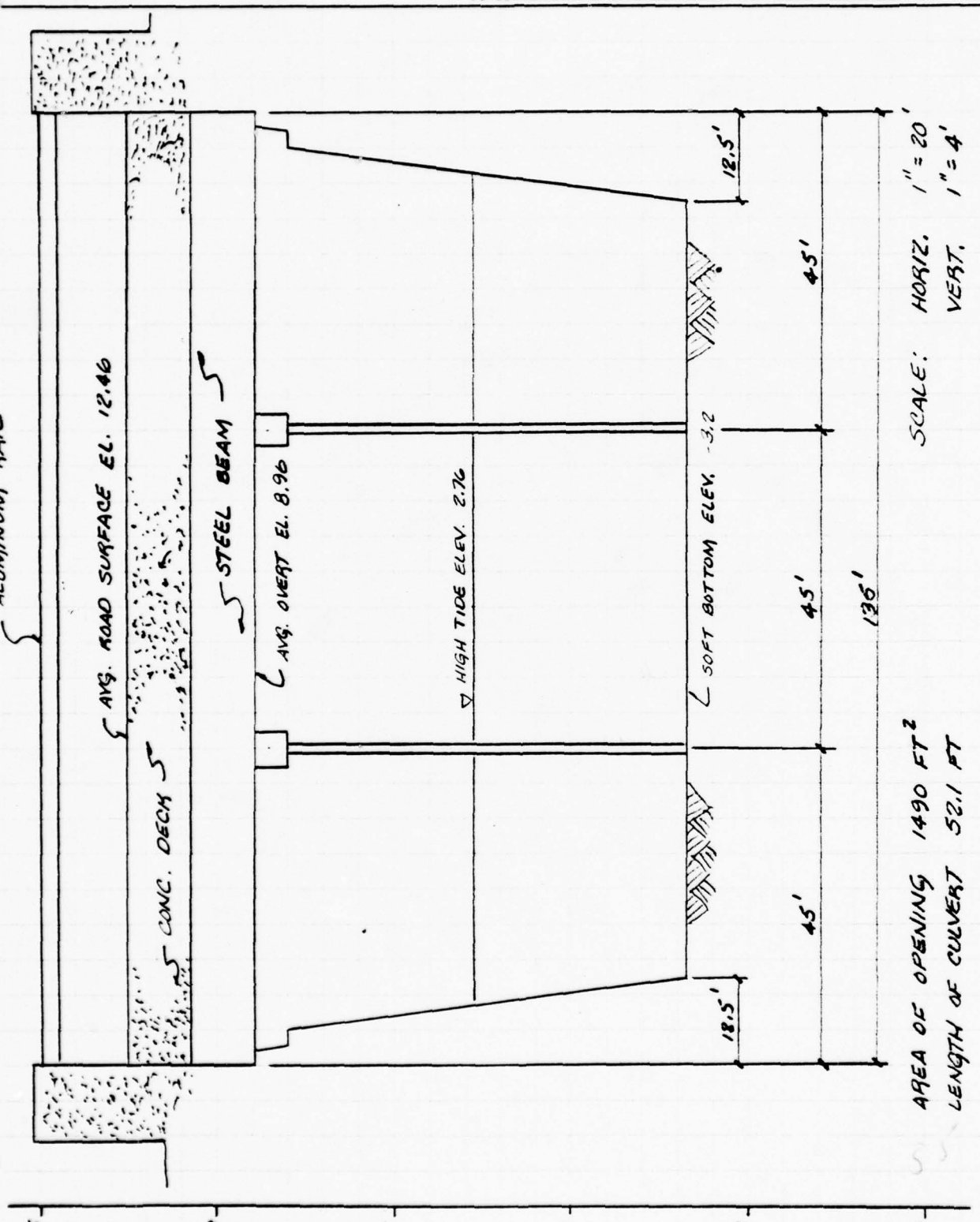


PLATE #14

GEOLOGY

According to our phone conversations with Mr. Robert R. Jordan, State Geologist with Delaware Geological Surveys, the geology of the Williams Pond area has not been mapped for publication as of this writing. In lieu of geologic maps, a copy of the Sussex County Soil Conservation Map has been enclosed. Mapping is as shown on the plan with descriptions as noted below. Copies of the boring logs of the dam site are provided in the dam construction drawings, Sheet numbers 6 through 13 listed in "Plates".

Soil Descriptions

EsD - Evesboro loamy sand - 5 to 15% slopes -> 95+% of lake shores (north side embankment)

Tf - Tidal marsh - fresh water - downstream channel

EvB - Evesboro loamy sand and loamy substratum - 0 to 5% slopes one side of embankment (south) - < 5% lake shores.

PLATE #15


EvA
RuA
Os
KI
EvB
Wo
EoD
Fa
Ry
Pm
Nanticoke Acres
DUPONT PARKWAY
MEMORIAL

APPENDIX A

Check List
Visual Inspection
Phase 1

Name Dam Williams Pond County Sussex State Delaware Coordinators Krishna A. Patel
Div. Engr. Del.
Dept. of Natural
Resources &
Environmental
Control

Date(s) Inspection 7 December 1978 Weather Clear Temperature 45°

Pool Elevation at Time of Inspection 7.5' M.S.L. Tailwater at Time of Inspection + 0.6 M.S.L.

Inspection Personnel:

Daniel W. Jacobs, P.E.

Joseph Mahan, P.E.

Daniel W. Jacobs, P.E. Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE	None observed.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Minor erosion upstream side from surface water flowing off roadway. Minor erosion downstream side from surface water flowing off roadway and effect of tide.	Consider riprap and/or paving upstream and downstream to repair and stabilize erosion.
DRAINS	Road drains are functining well No problems observed.	
WATER PASSAGES	Clear and free flowing.	
FOUNDATION	North downstream bridge wingwall tilting backward into bank by approximately 7". Appears that bottom has slid out at water line by 1"-no other signs of movement.	
	Wingwall appears stable.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Concrete good condition - egg shell cracking in bridge deck surface	A surface treatment may be considered
STRUCTURAL CRACKING	None observed	
VERTICAL AND HORIZONTAL ALIGNMENT	No problems observed.	
MONOLITH JOINTS	No problems observed.	
CONSTRUCTION JOINTS	No problems observed.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Downstream behind wings, soil erosion See photos - eroded approximately 2 to 3 feet deep.	Consider riprap for upstream & downstream embankments adjacent to each side of the bridge to stabilize these slopes.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No problems observed.	
RIPRAP FAILURES	None observed.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Minor erosion up and downstream each side of bridge.	Consider stabilization using riprap.
ANY NOTICEABLE SEEPAGE	None observed	
STAFF GAGE AND RECORDER	None observed.	
DRAINS	Appeared clean and clear.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed	
INTAKE STRUCTURE	Minor damage between stoplogs but are not tight.	Consider replacement of damaged stoplogs.
OUTLET STRUCTURE	No problems observed.	
OUTLET CHANNEL	No problems observed.	
EMERGENCY GATE	None.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	None.	
APPROACH CHANNEL	No problems observed.	
DISCHARGE CHANNEL	No problems observed.	
BRIDGE AND PIERS	See comments on downstream wingwalls.	Wingwalls appear to be stable.
GATES AND OPERATION EQUIPMENT		

INSTRUMENTATION

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

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	No problems observed.	
SEDIMENTATION	N o problems observed.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No large deposits of debris observed. No problems observed.	
SLOPES	No problems observed.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately 6 homes between dam and the Nanticoke River. Population estimated @ 30 ±. See Photos	Homes are located on high ground ranging from 5' to 10' above the downstream channel. Failure of the dam would not appear to result in damage to homes.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	A set of construction drawings is available from the Delaware State Highway Department, titled, Plans For Contract 1312, Dated Oct. 27, 1953. As-built survey of January, 1979, showing centerline profiles and bridge inlet area included in this report.
REGIONAL VICINITY MAP	See location plan included in this report. Dam was constructed in 1954 under contract to the Delaware State Highway Department.
CONSTRUCTION HISTORY	Dam was constructed in 1954 under contract to the Delaware State Highway Department.
TYPICAL SECTIONS OF DAM	The structural aspects of the bridge - some data was available from the Highway Department. Plans as referenced above - sections on the earth embankment were not available.
HYDROLOGIC/HYDRAULIC DATA	- See hydrologic and hydraulic data check list.
OUTLETS - PLAN	- Plans above referenced indicated the size of type of outlet control section.
- DETAILS	- included in Delaware State Highway Plans
- CONSTRAINTS	
- DISCHARGE RATINGS	- The only data available was derived from the HEC-1 DB program using data input from L.E.A. which was derived using standard engineering methods.
RAINFALL/RESERVOIR RECORDS	- None in immediate vicinity of dam.

ITEM	REMARKS

DESIGN REPORTS N/A

GEOLOGY REPORTS - None available - see section in Plate Section of Appendix.

DESIGN COMPUTATIONS - N/A
HYDROLOGY & HYDRAULICS - N/A
DAM STABILITY - N/A
SEEPAGE STUDIES - N/A

MATERIALS INVESTIGATIONS - N/A
BORING RECORDS - Shown on Sheet 2 of Highway Plans as previously referenced.
LABORATORY - N/A
FIELD

POST-CONSTRUCTION SURVEYS OF DAM - Completed as a part of the Phase I Inspection, January1, 1979.

BORROW SOURCES - Not shown on engineering drawings from Delaware State Highway Department - unknown.

ITEM	REMARKS
SPILLWAY PLAN	- Delaware State Highway Department Plans - 7 Sheets.
SECTIONS	- Same as above.
DETAILS	- Same as above.
OPERATING EQUIPMENT PLANS & DETAILS	- Original installation plans available for gates. Visual observation indicates as-built condition similar to design drawings.

ITEM	REMARKS

MONITORING SYSTEMS - None observed.

MODIFICATIONS - Slight improvements to both side of embankment to halt surface erosion condition.

HIGH POOL RECORDS N/A

POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS N/A

PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS - Willard Griffith, Superintendent, Gravel Hill Maintenance Division, Delaware State Highway Department reports that there are none.

MAINTENANCE OPERATION RECORDS - Bi-annual inspection reports are kept by Delaware State Highway Department, Bridge Division, at Dover. No records of actual maintenance operations are kept.

Appendix B

PHOTOGRAPHIC INDEX

Photo 1 - View of Poplar Street Bridge over Williams Pond Dam. Shot taken from south side of embankment.

Photo 2 - Closeup of Photo 1 showing the west side rail and road drainage discharge pipe on the downstream side.

Photo 3 - Wide angle view of upstream homes along the south side of the lake shore.

Photo 4 - Right side angle view from downstream of Williams Pond Dam - wide angle view - note eroded condition on the north side embankment.

Photo 5 - Full front view of Williams Pond Dam from downstream.

Photo 6 - Left side angle view of Williams Pond Dam from downstream.

Photo 7 - Closeup view of stoplog inlets and gate supports. Note damaged condition of stoplogs.

Photo 8 - Closeup view of eroded embankment condition upstream side, Williams Pond Dam.

Photo 9 - Closeup view of erosion control measures on upstream side of Williams Pond Dam embankment.

Photo 10 - View of Hearns Pond embankment roadway located 7140 feet upstream of Williams Pond Dam.

Photo 11 - View of Mill Race inlet structure, Hearns Pond upstream side of dam embankment.

Photo 12 - Mill buildings located over top Mill Race sluice through Hearns Pond embankment.

Photo 13 - Side view of Hearns Pond Dam - main road dam inlet area.

Photo 14 - Closeup of upstream inlet control at Hearns Pond main road dam structure.

Note: All photographs taken 12-7-78.

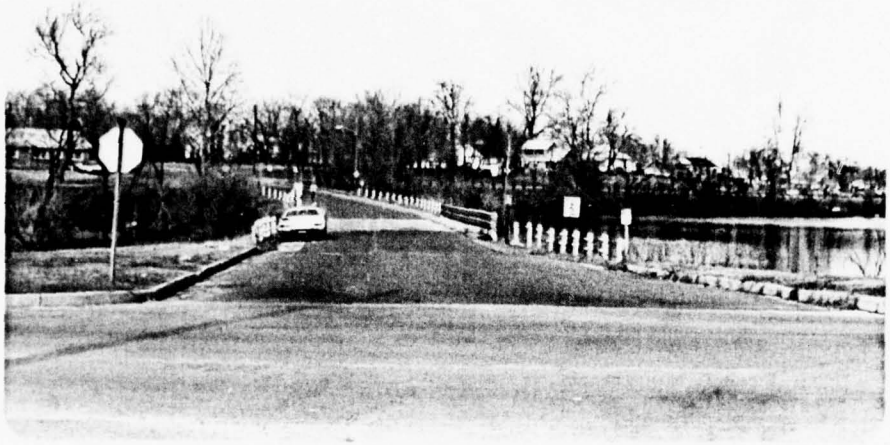


PHOTO 1

Poplar Street Over Williams
Pond Dam

PHOTO 2

Closeup of Above Showing Railroad
Drainage Discharge Pipe-Downstream

PHOTO 3

Williams Pond - Upstream Homes

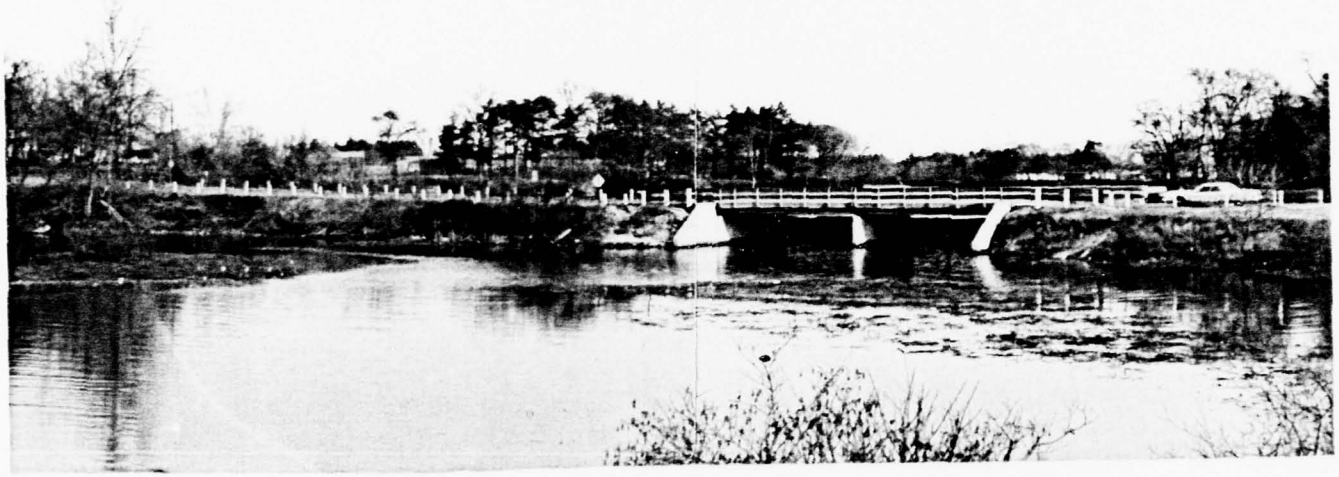


PHOTO 4
Downstream View - Williams Pond
and Embankment

PHOTO 5

Downstream View-Williams Pond Dam

PHOTO 6

Downstream View-Williams Pond Dam

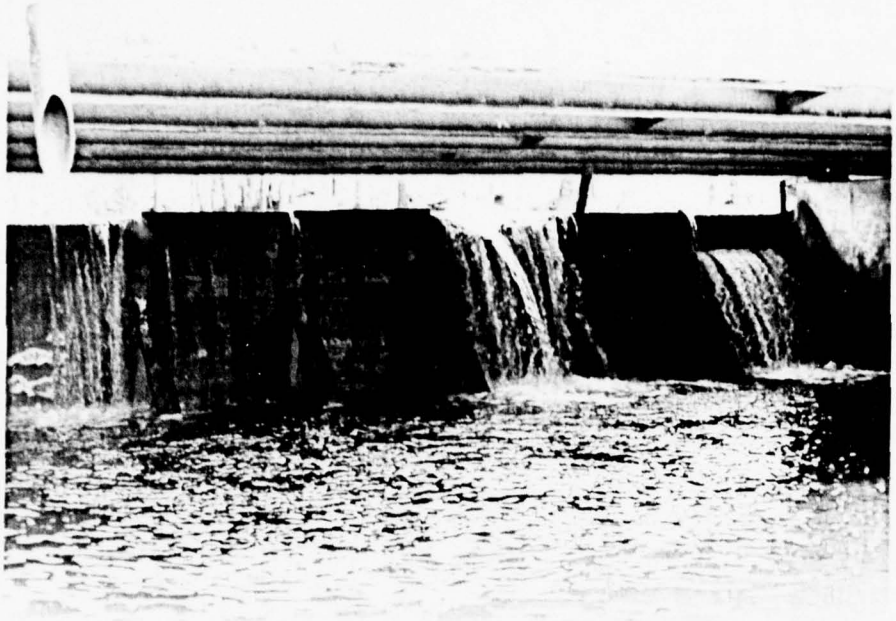


PHOTO 7
Closeup of Stoplogs & Gate Support
System-Downstream-Williams Pond Dam

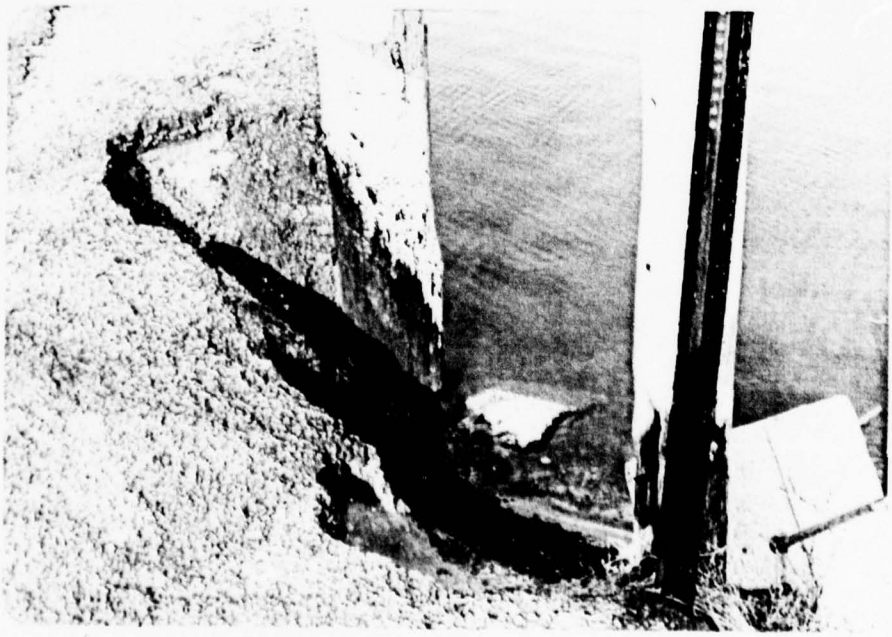


PHOTO 8

Eroded Upstream Embankment
Williams Pond

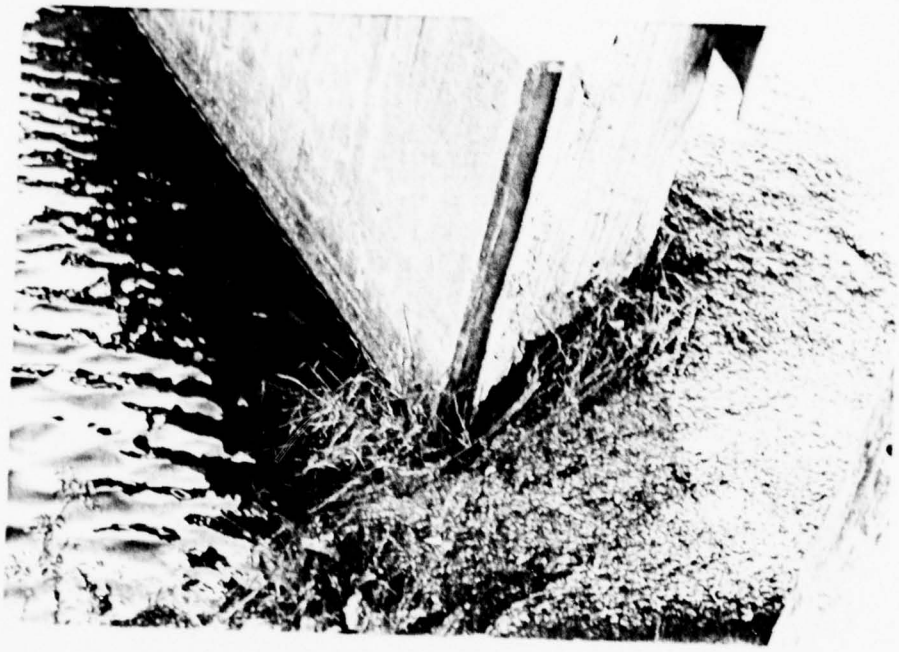


PHOTO 9
Bituminous Paving Installed To
Correct/Prevent Erosion-Williams
Pond

PHOTO 10
Hearns Pond Mill Road Over
Embankment and Dams - 7140 Feet
Upstream of Williams Pond

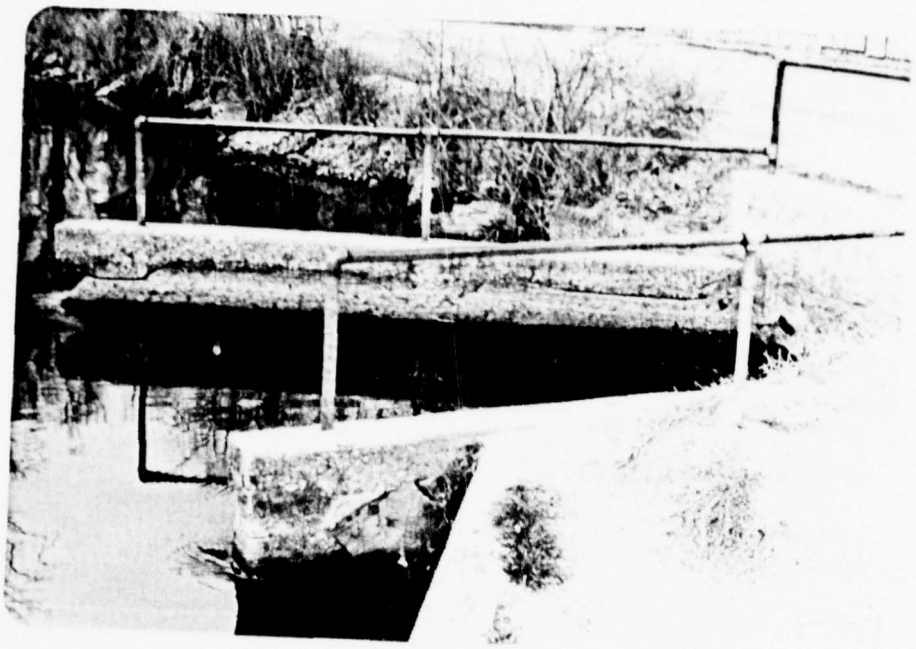


PHOTO 11

Hearns Pond Mill Inlet

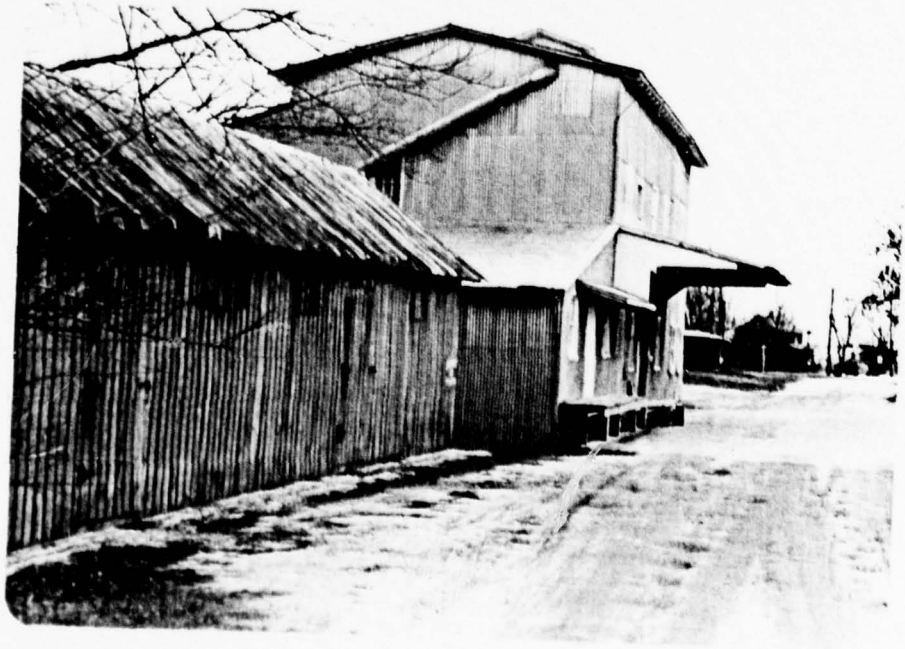


PHOTO 12

Hearns Pond Mill Building

PHOTO 13

Upstream View-Hearns Pond & Dam

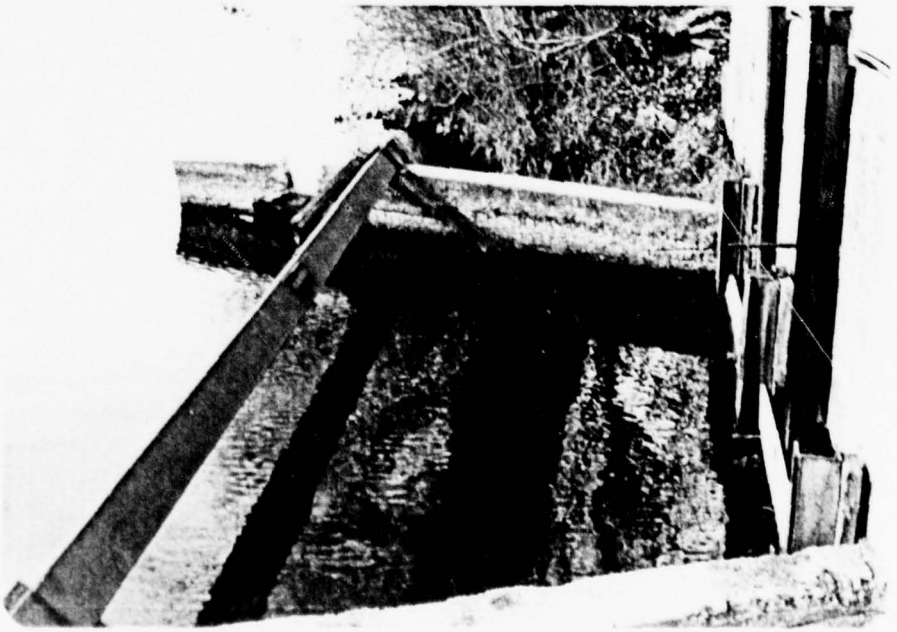


PHOTO 14

Upstream View - Hearns Pond Dam

APPENDIX C

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 13.40 + 9.83 = 23.23 Square Miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 425 Acre-Feet

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 800 Acre-Feet

ELEVATION MAXIMUM DESIGN POOL: 14.3 ± feet M.S.L.

ELEVATION TOP DAM: 12.0 ± feet M.S.L.

CREST: Gate (stoplogs @ bridge)

a. Elevation 7.5 M.S.L.
b. Type Wood
c. Width 3 inches -negligible
d. Length 12 sections - 5 ft. wide = 60 ft; 9 stoplogs per section
e. Location Spillover None
f. Number and Type of Gates SEE BELOW

OUTLET WORKS: None

a. Type
b. Location
c. Entrance inverts
d. Exit inverts
e. Emergency draindown facilities

HYDROMETEOROLOGICAL GAGES: None

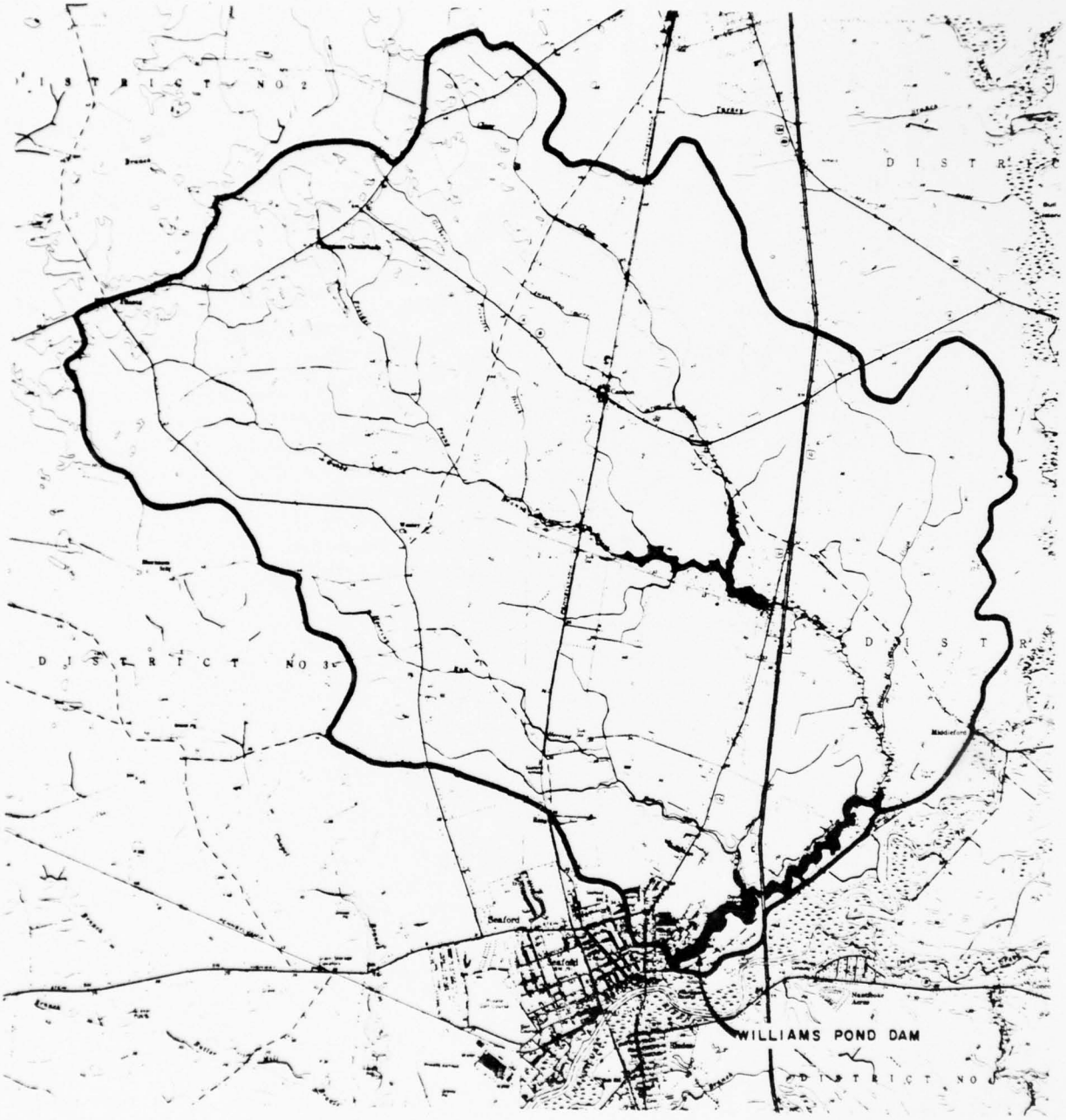
a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE:

CREST:

f. 12 sections, 4 removable (top-most) stoplogs per section, thus a total of 48 removable stoplogs. The remaining stoplogs (approx. 60) do not have hooks attached for them to be removable.

Appendix D



WATERSHED MAP

WILLIAMS POND DAM

Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
Area Code (609) 461-1239

JOB 2089 HEARN POND DAM
SHEET NO _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____

HEARNS POND

$$T.P. = C_t (L \times L_{CA})^{0.3}$$

$$= 3.0 (5.49 \times 2.37)^{0.3}$$

$$= 6.5 \text{ HRS}$$

WATER SURFACE AREA = 2,600,000 FT^2

AREA WITHIN ELEV. 30 = 7,680,000 FT^2

Lippincott Engineering Associates
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DELANCO, NEW JERSEY 08075
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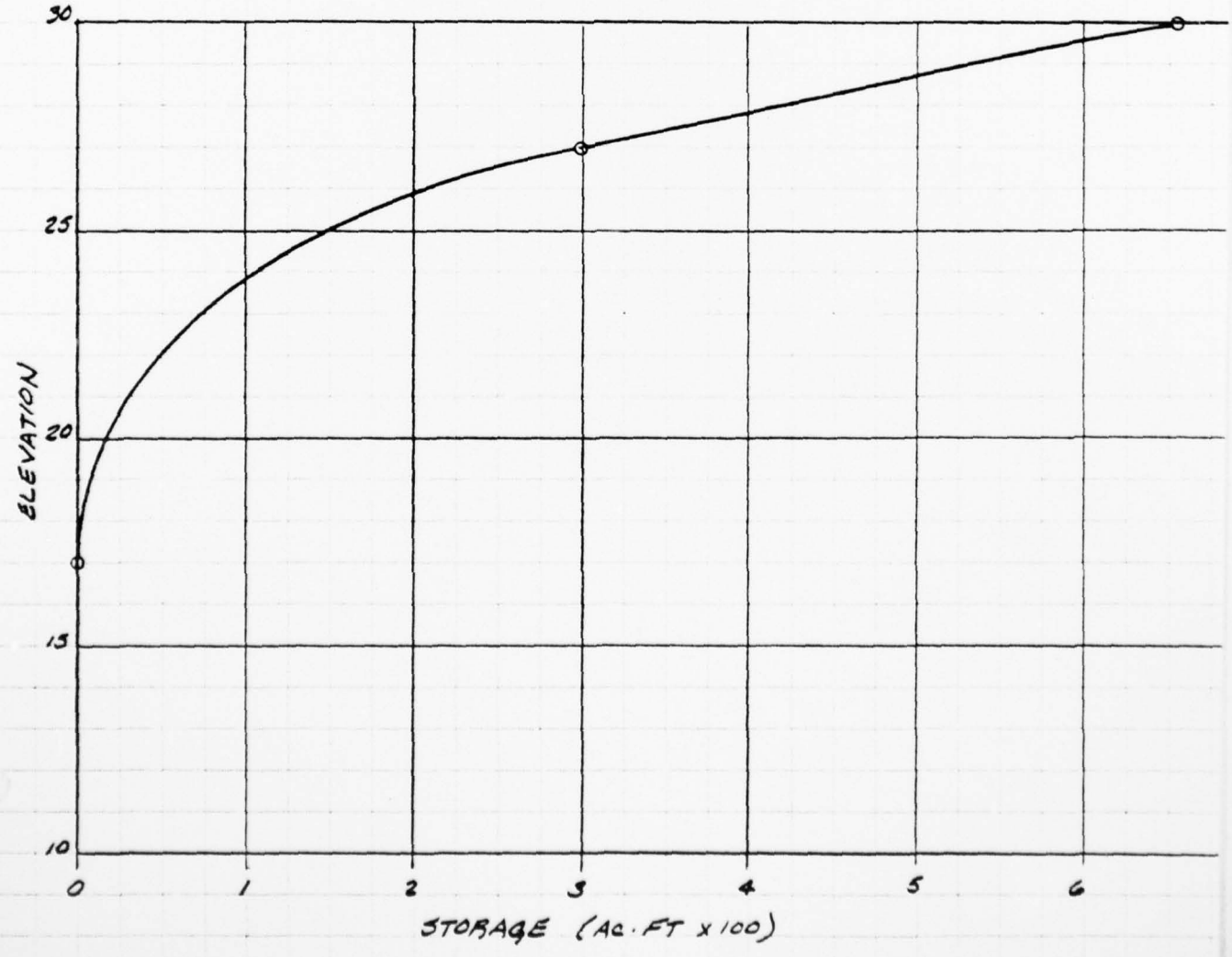
JOB 2089 HEARNS POND DAM
SHEET NO _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____

ELEV	AREA (FT^2)	AVG AREA (FT^2)	DEPTH	VOLUME (FT^3)	Σ VOLUME (FT^3)	Σ VOLUME (FT
17	0				0	0
		1,300,000	10	13,000,000		
27	2,600,000				13,000,000	298.4
		5,140,000	3	15,420,000		
30	7,680,000				28,420,000	652.4

STAGED STORAGE CURVE

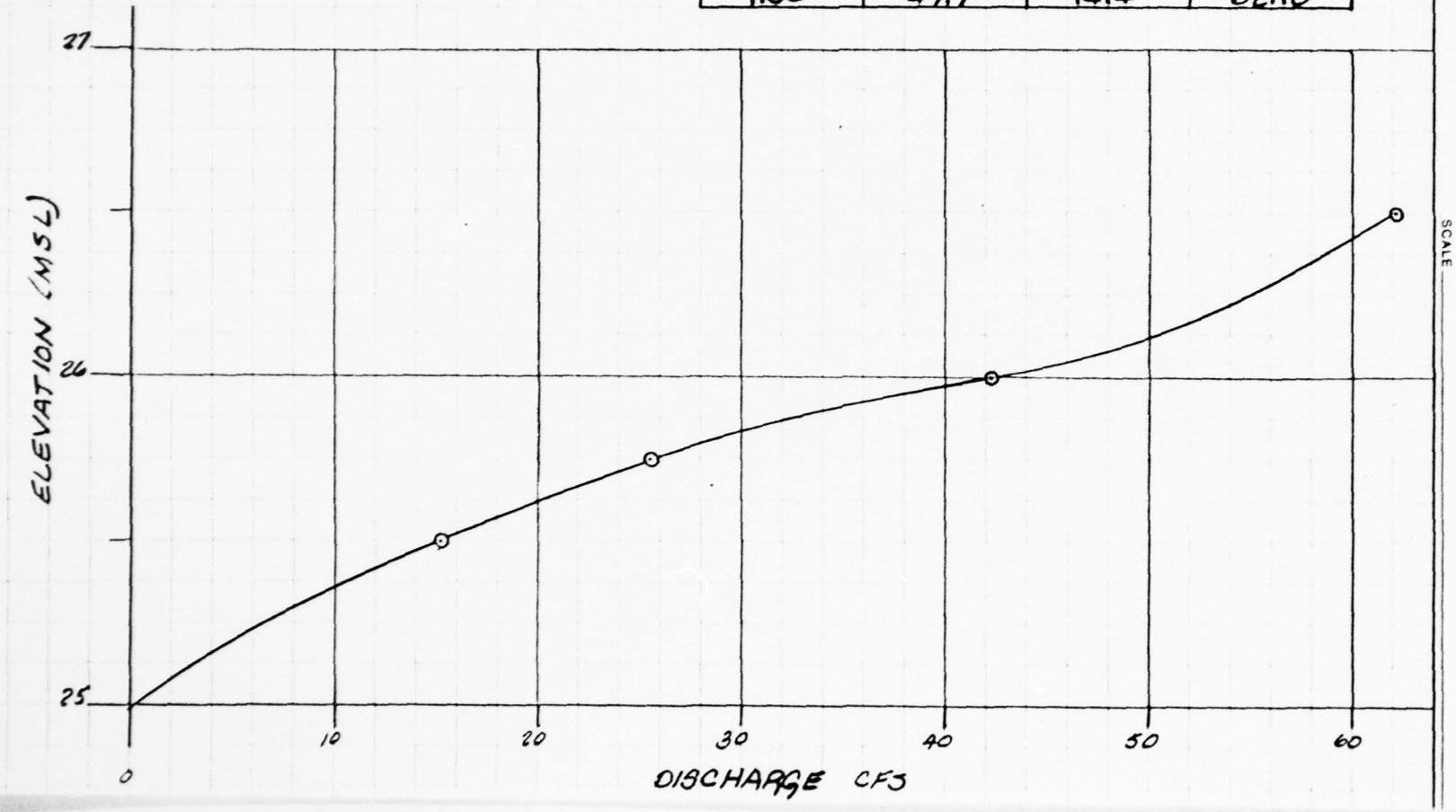


STAGED DISCHARGE - BOARDS IN - HEARNS POND

Q_1 = FLOW AT MAIN STRUCTURE

Q_2 = FLOW AT MILL RACE

H	Q_1	Q_2	Q TOTAL
.50	11.66	3.52	15.18
.75	19.61	5.92	25.52
1.00	31.8	10.5	42.30
1.50	47.7	14.4	62.10



Lippincott Engineering Associates
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JOB 2089 HEARNS POND DAM

SHEET NO _____ OF _____

CALCULATED BY _____ DATE 2/79

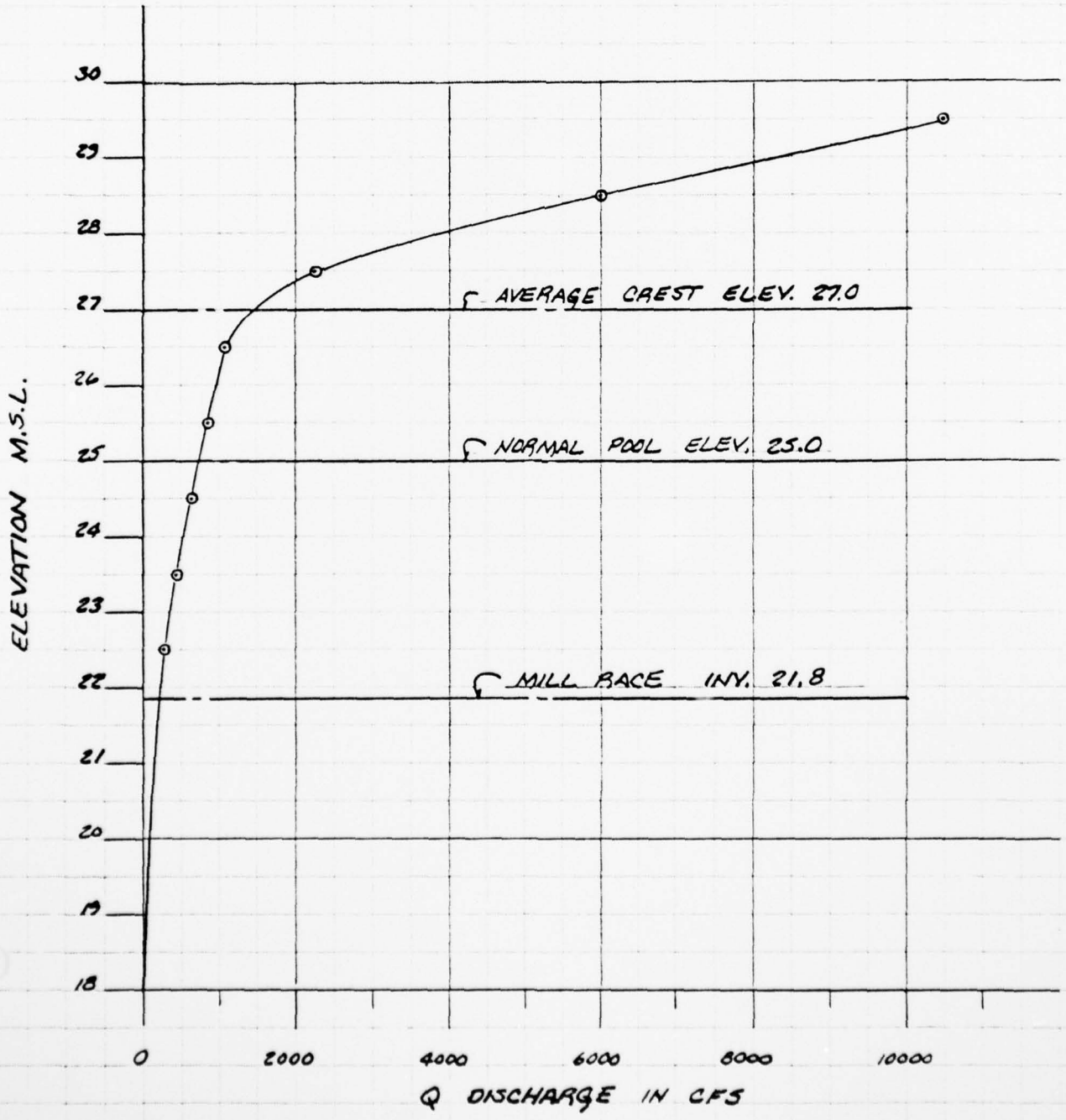
CHECKED BY _____ DATE _____

SCALE _____

Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
Area Code (609) 461-1239

JOB 2089 HEARNS POND DAM
SHEET NO _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____

TOTAL DISCHARGE - HEARNS POND COMBINED
ALL BOARDS OUT



Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
Area Code (609) 461-1239

JOB 2089 WILLIAMS POND DAM
SHEET NO _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____

WILLIAMS POND

$$T.P. = C_t (L \times L_{CA})^{0.3}$$

$$= 3.0 (5.73 \times 2.70)^{0.3}$$

$$= 6.8 \text{ HRS}$$

FROM DELAWARE STATE HIGHWAY DEPT.
PLANS FOR CONTRACT Nº 1312 10/28/78

A) DROP BOARD DAM

B) NORMAL POOL ELEV. 7.5

C) HIGH TIDE ELEV. 2.76

D) LOW TIDE ELEV. -0.76

E) BOTTOM BOARD ELEV. -2.00

Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
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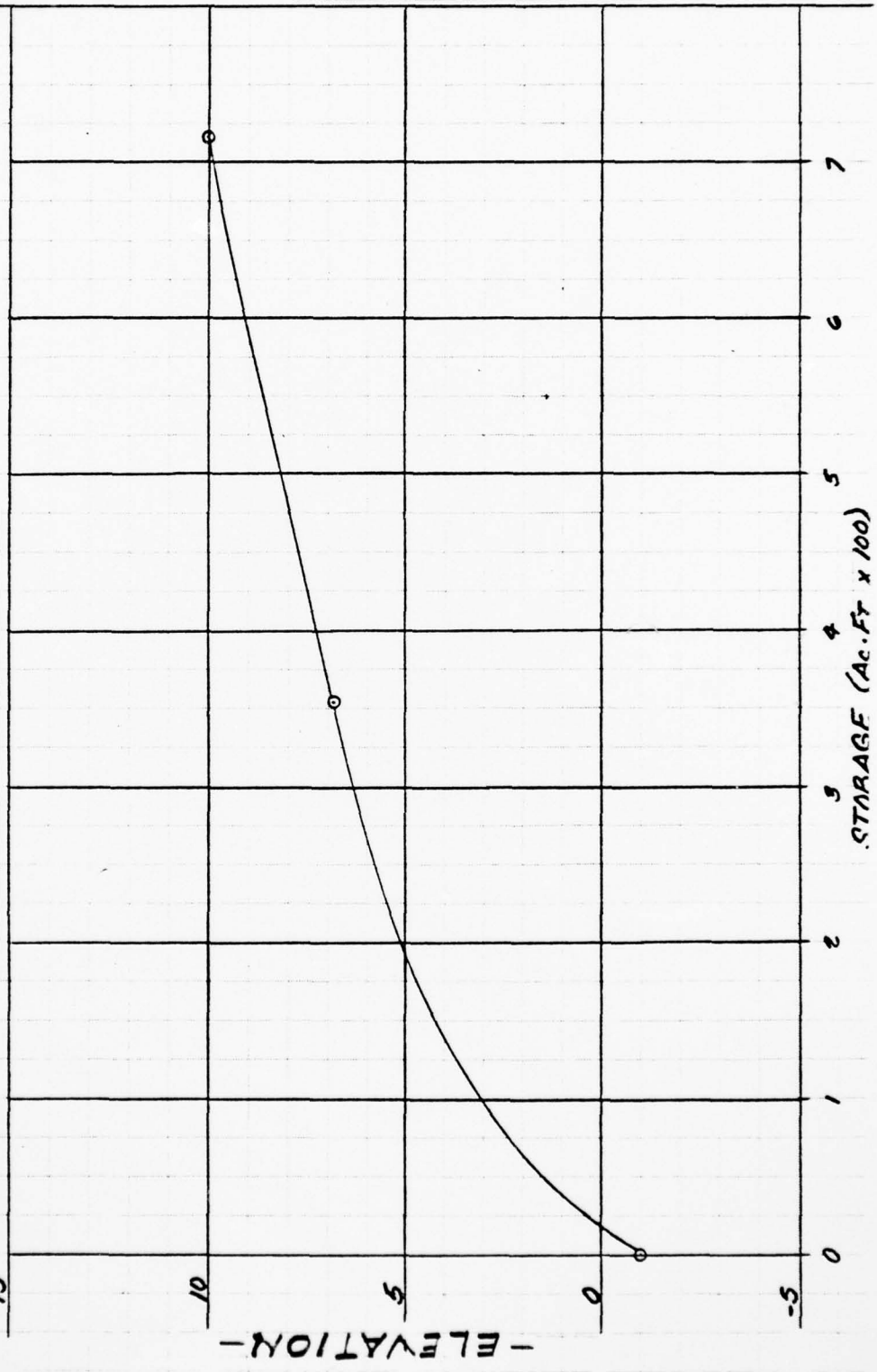
JOB 2089 WILLIAMS POND DAM
SHEET NO _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____

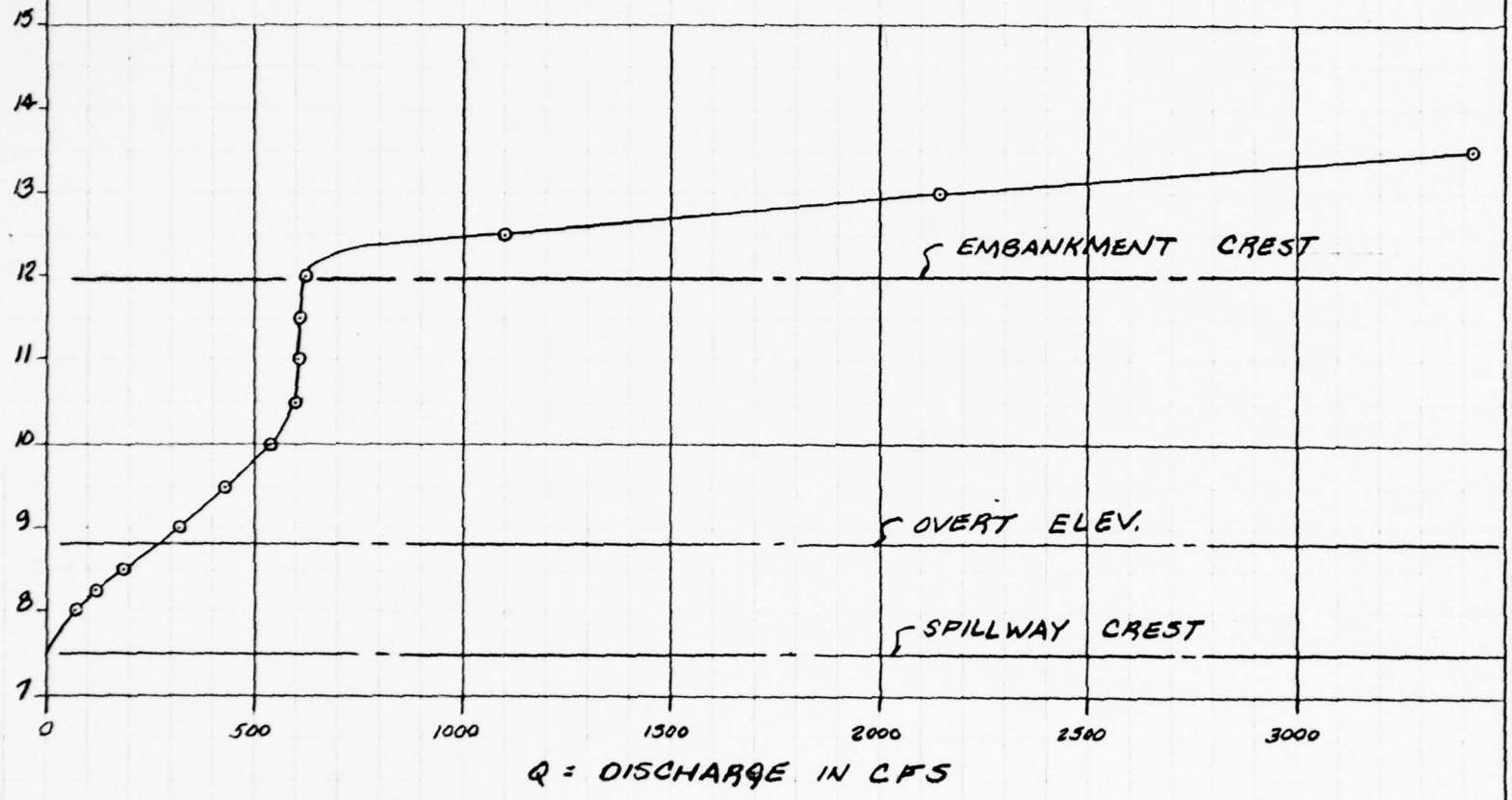
ELEV.	AREA (FT²)	AVG. AREA (FT²)	DEPTH	VOLUME (FT³)	Σ VOLUME (FT³)	Σ VOLUME (AC-FT)
-1	0				0	0
		1,980,000	7.8'	15,444,000		
6.8	3,960,000				15,444,000	354.5
		4,910,000	3.2'	15,712,000		
10	5,860,000				31,156,000	715.2

STAGED STORAGE CURVE



STAGED DISCHARGE - WILLIAMS POND DAM - BOARDS IN

ELEV.	HEAD	Q	ELEV.	HEAD	Q	ELEV.	HEAD	Q
7.5	0	0	9.5	2.0	432	12.0	4.5	618
8.0	0.5	66	10.0	2.5	534	12.5	5.0	1096
8.25	0.75	120	10.5	3.0	600	13.0	5.5	2144
8.5	1.0	185	11.0	3.5	606	13.5	6.0	3417
9.0	1.5	318	11.5	4.0	612			

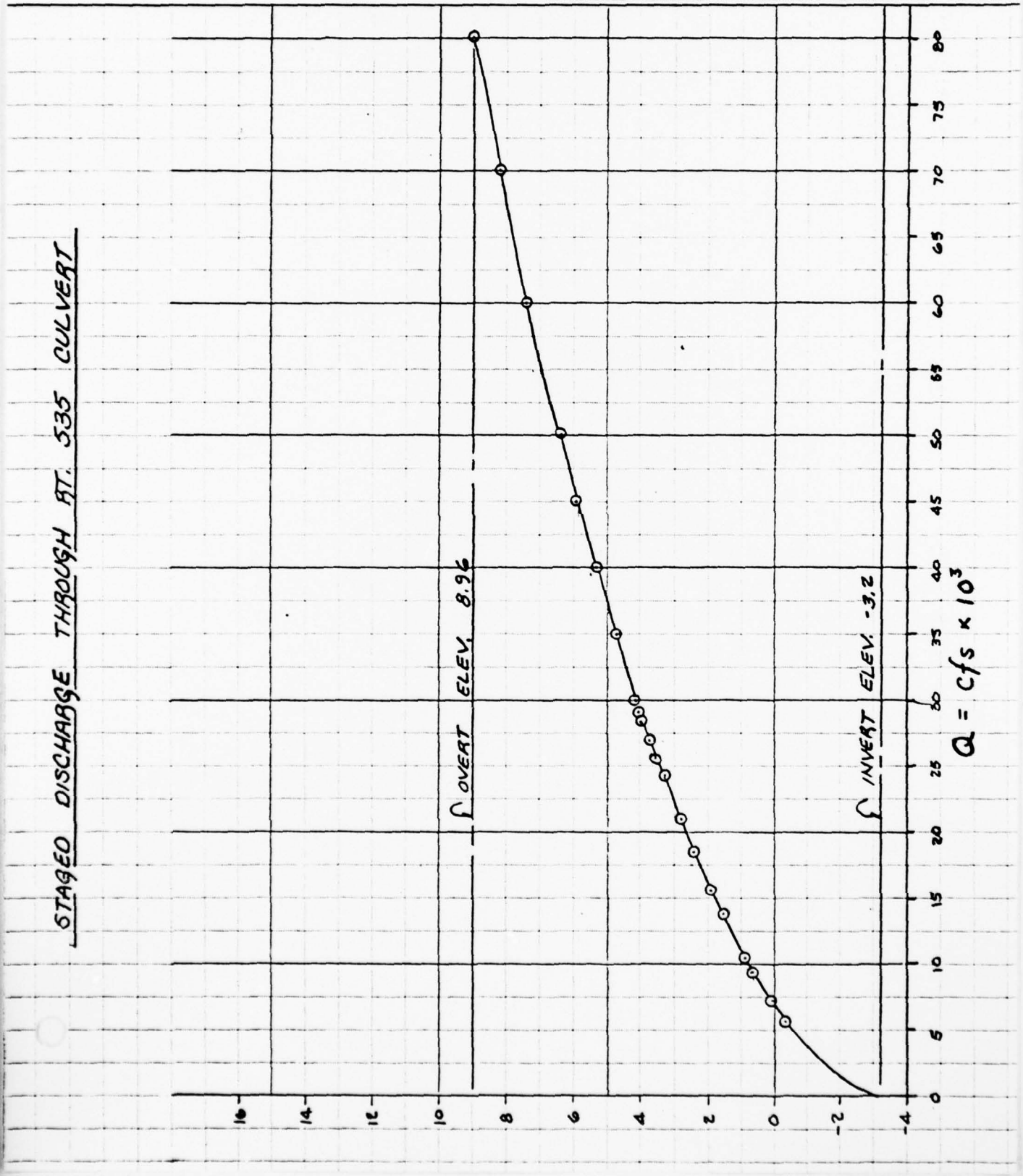


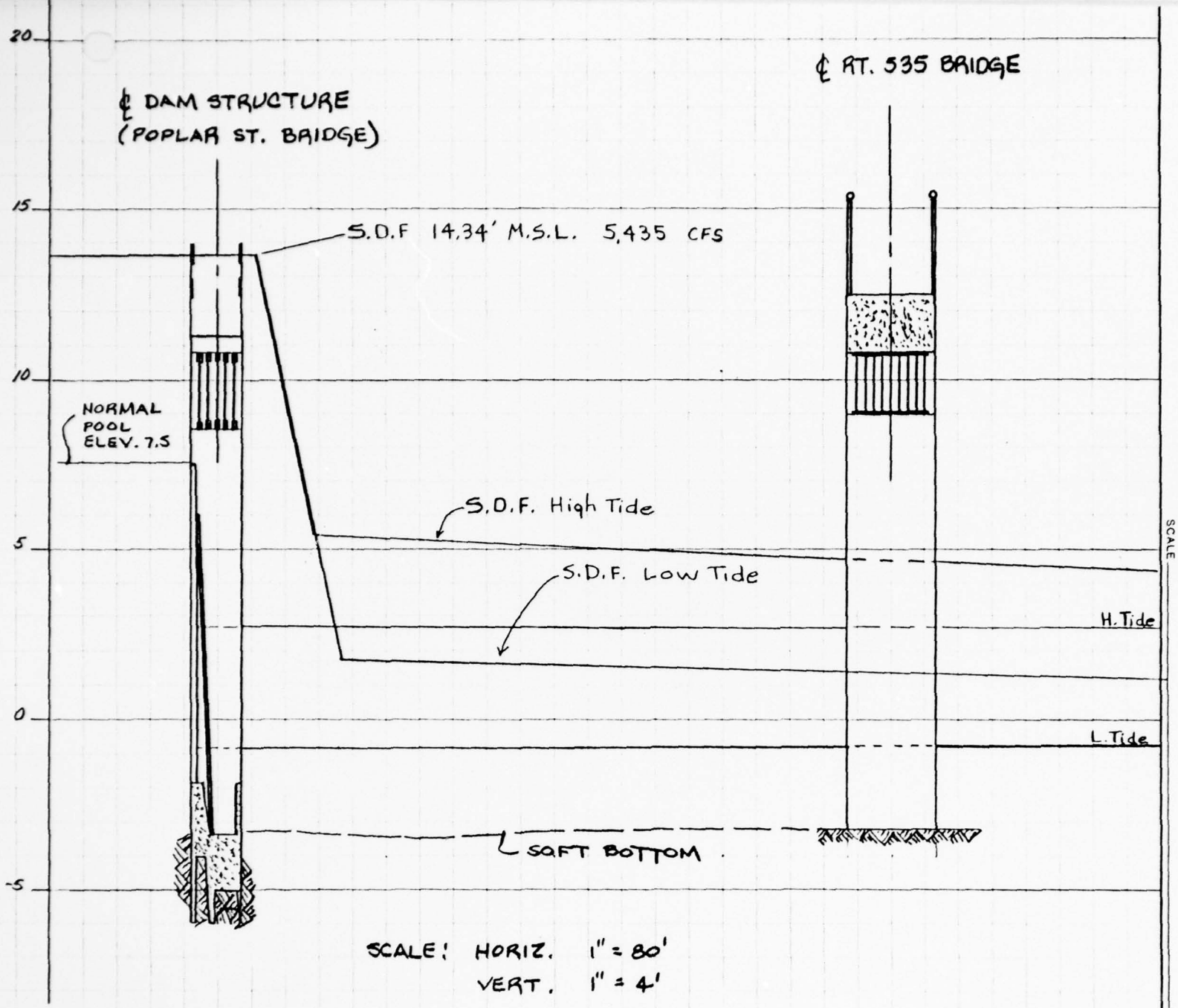
Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
Area Code (609) 461-1239

JOB 2002 WILLIAMS POND DAM
SHEET NO ____ OF ____
CALCULATED BY ____ DATE 2/23
CHECKED BY ____ DATE ____
SCALE ____

Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
Area Code (609) 461-1239

JOB 2089 WILLIAMS POND DAM
SHEET NO _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____





Lippincott Engineering Associates
501 Burlington Avenue
DELANCO, NEW JERSEY 08075
Area Code (609) 461-1239

JOB 2089 WILLIAMS POND DAM
SHEET NO _____ OF _____
CALCULATED BY _____ DATE 2/79
CHECKED BY _____ DATE _____
SCALE _____

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  21 JUN 78
**********
     1          AI      WILLIAMS POND DAM
     2          A2      PHASE I DAM INSPECTION -- STATE OF DELAWARE
     3          A3      PATRICK A. KENNEDY, THOMAS TYLER MOORE ASSOCIATES
     4          B    120         0        30         0         0         0         0         0         0         0
     5          B1     5
     6          J      1         1         1
     7          J1   1.0
     8          K      0         1                             0         0         1         0
     9          K1       INFLOW HYDROGRAPH TO HEARNS POND
    10          M      0         1     13.40                   0         0                             1
    11          O     48       7.9
    12          O1 .0055    .0055    .0055    .0055    .0065    .0065    .0065    .0065    .008     .008
    13          O1  .008     .008      .01      .01      .01      .01    .0135    .0135    .018     .018
    14          O1  .023     .031     .048      .38     .072     .037     .027     .021    .015     .015
    15          O1  .015     .015     .009     .009     .009     .009     .009     .009    .009     .009
    16          O1  .006     .006     .006     .006     .006     .006     .006     .006
    17          I                                                                  1.0      .05
    18          W    6.5      .50
    19          X    0.0      0.0      1.0
    20          K      1         2                             0         0         1         0
    21          K1       ROUTE FLOWS THROUGH HEARNS POND
    22          Y                                    1         1
    23          Y1     1
    24          Y4  22.5      23.5     24.5     25.5     26.5     27.5     28.5     -22.5    -1
    25          Y5     0       435      633      850     1077     2244     6006
    26          SS     0       298      652     1360
    27          SE    17        27       30       36
    28          SS  25.0
    29          SD  27.0
    30          K      1         3                             0         0         1         0
    31          K1       CHANNEL ROUTING -- HEARNS POND TO WILLIAMS POND
    32          Y                                    1         1
    33          Y1     1                                                                   0
    34          Y6   .15       .08      .15      7.0     19.5     7140    .0015
    35          Y7     0      19.5      110     14.5      219      9.5      250      7.0      281      9.5
    36          Y7   390      14.5      500     19.5      520     19.5
    37          K      0         4                             0         0         1         0
    38          K1       INFLOW HYDROGRAPH TO WILLIAMS POND
    39          M      0         1     9.83                    0         0                             1
    40          O     48       7.9
    41          O1 .0055    .0055    .0055    .0055    .0065    .0065    .0065    .0065    .008     .008
    42          O1  .008     .008      .01      .01      .01      .01    .0135    .0135    .018     .018
    43          O1  .023     .031     .048      .38     .072     .037     .027     .021    .015     .015
    44          O1  .015     .015     .009     .009     .009     .009     .009     .009    .009     .009
    45          O1  .006     .006     .006     .006     .006     .006     .006     .006
    46          I                                                                  1.0      .05
    47          W    6.8      .50
    48          X    0.0      0.0      1.0
    49          K      2         5                             0         0         1         0
    50          K1       COMBINE HYDROGRAPHS FOR HEARNS POND AND WILLIAMS POND
```

```
K     1     6                                   0       0       1       0
K1        ROUTE COMBINED FLOWS THROUGH WILLIAMS POND
Y                                       1       1
Y1    1                                                      -7.5      -1
Y4  8.0     9.0     10.0    11.0    12.0    12.5    13.0    13.5
Y5   66     312      540     720     840    1431    3360    3780
$5    0     355      715    1469
$E  0.0     5.8     10.0    13.5
$$  7.5
$D 12.0
K    99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	2
ROUTE HYDROGRAPH TO	3
RUNOFF HYDROGRAPH AT	4
COMBINE 2 HYDROGRAPHS AT	5
ROUTE HYDROGRAPH TO	6

END OF NETWORK

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 21 JUN 79
****

RUN DATE= 79/02/21.
TIME= 15.46.21.

WILLIAMS POND DAM
PHASE I DAM INSPECTION -- STATE OF DELAWARE
PATRICK A. KENNEDY, THOMAS TYLER MOORE ASSOCIATES

48 1/2 Hour

JOB SPECIFICATION

NO	NMIN	MIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
120	0	30	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

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

RTIOS= 1.00

****

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO HEARNS POND

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
0	1	13.40	0.00	13.40	0.00	0.000	0	1	0

PRECIP DATA

NP	STORM	DAJ	DAK
48	7.90	0.00	0.00

PRECIP PATTERN

.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.02	.02
.02	.03	.05	.16	.07	.04	.03	.02	.02	.02
.02	.02	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01		

LOSS DATA

LROPT	STRTL	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= 6.50 CP= .50 NTA= 0

RECESSION DATA
STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=13.09 AND R=17.54 INTERVALS

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 6.52 HOURS, CP= .50 VOL= .99

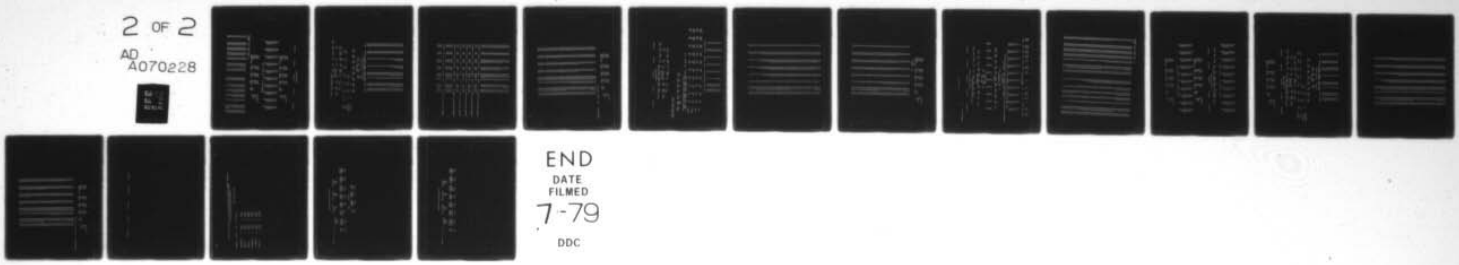
13.	50.	104.	167.	238.	314.	395.	474.	543.	600.
644.	673.	687.	679.	649.	613.	579.	547.	516.	488.
461.	435.	411.	388.	367.	348.	327.	309.	292.	276.
260.	246.	232.	220.	207.	196.	185.	175.	165.	156.
147.	139.	131.	124.	117.	111.	105.	99.	93.	88.
83.	79.	74.	70.	66.	63.	59.	56.	53.	50.
47.	44.	42.	40.	37.	35.	33.	32.	30.	28.
27.	25.	24.	22.	21.	20.	19.	18.	17.	16.
15.	14.	13.	13.	12.	11.	11.	10.	10.	9.
9.	8.	8.	7.	7.	6.	6.	6.	5.	5.

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.30	1	.04	0.00	.04	0.	1.02	6.30	61	0.00	0.00	0.00	1233.
1.01	1.00	2	.04	0.00	.04	0.	1.02	7.00	62	0.00	0.00	0.00	1164.
1.01	1.30	3	.04	0.00	.04	0.	1.02	7.30	63	0.00	0.00	0.00	1100.
1.01	2.00	4	.04	0.00	.04	0.	1.02	8.00	64	0.00	0.00	0.00	1039.
1.01	2.30	5	.05	0.00	.05	0.	1.02	8.30	65	0.00	0.00	0.00	981.
1.01	3.00	6	.05	0.00	.05	0.	1.02	9.00	66	0.00	0.00	0.00	927.
1.01	3.30	7	.05	0.00	.05	0.	1.02	9.30	67	0.00	0.00	0.00	875.
1.01	4.00	8	.05	0.00	.05	0.	1.02	10.00	68	0.00	0.00	0.00	827.
1.01	4.30	9	.06	0.00	.06	0.	1.02	10.30	69	0.00	0.00	0.00	781.
1.01	5.00	10	.06	0.00	.06	0.	1.02	11.00	70	0.00	0.00	0.00	738.
1.01	5.30	11	.06	0.00	.06	0.	1.02	11.30	71	0.00	0.00	0.00	697.
1.01	6.00	12	.06	0.00	.06	0.	1.02	12.00	72	0.00	0.00	0.00	658.
1.01	6.30	13	.08	0.00	.08	0.	1.02	12.30	73	0.00	0.00	0.00	622.
1.01	7.00	14	.08	0.00	.08	0.	1.02	13.00	74	0.00	0.00	0.00	587.
1.01	7.30	15	.08	0.00	.08	0.	1.02	13.30	75	0.00	0.00	0.00	555.
1.01	8.00	16	.08	0.00	.08	0.	1.02	14.00	76	0.00	0.00	0.00	524.
1.01	8.30	17	.11	.04	.06	1.	1.02	14.30	77	0.00	0.00	0.00	495.
1.01	9.00	18	.11	.08	.03	3.	1.02	15.00	78	0.00	0.00	0.00	467.
1.01	9.30	19	.13	.10	.03	10.	1.02	15.30	79	0.00	0.00	0.00	442.
1.01	10.00	20	.14	.12	.03	22.	1.02	16.00	80	0.00	0.00	0.00	417.
1.01	10.30	21	.15	.16	.03	42.	1.02	16.30	81	0.00	0.00	0.00	394.
1.01	11.00	22	.24	.22	.03	73.	1.02	17.00	82	0.00	0.00	0.00	372.
1.01	11.30	23	.38	.35	.03	118.	1.02	17.30	83	0.00	0.00	0.00	351.
1.01	12.00	24	3.00	2.98	.03	219.	1.02	18.00	84	0.00	0.00	0.00	332.
1.01	12.30	25	.57	.54	.02	407.	1.02	18.30	85	0.00	0.00	0.00	314.
1.01	13.00	26	.29	.27	.03	665.	1.02	19.00	86	0.00	0.00	0.00	296.
1.01	13.30	27	.21	.19	.03	972.	1.02	19.30	87	0.00	0.00	0.00	280.
1.01	14.00	28	.17	.14	.03	1316.	1.02	20.00	88	0.00	0.00	0.00	264.
1.01	14.30	29	.12	.09	.03	1687.	1.02	20.30	89	0.00	0.00	0.00	250.
1.01	15.00	30	.12	.09	.03	2072.	1.02	21.00	90	0.00	0.00	0.00	236.
1.01	15.30	31	.12	.09	.03	2451.	1.02	21.30	91	0.00	0.00	0.00	223.
1.01	16.00	32	.12	.09	.03	2793.	1.02	22.00	92	0.00	0.00	0.00	210.
1.01	16.30	33	.07	.05	.03	3084.	1.02	22.30	93	0.00	0.00	0.00	199.
1.01	17.00	34	.07	.05	.03	3317.	1.02	23.00	94	0.00	0.00	0.00	188.
1.01	17.30	35	.07	.05	.03	3487.	1.02	23.30	95	0.00	0.00	0.00	177.
1.01	18.00	36	.07	.05	.03	3588.	1.03	0.00	96	0.00	0.00	0.00	167.
1.01	18.30	37	.07	.05	.03	3599.	1.03	.30	97	0.00	0.00	0.00	158.
1.01	19.00	38	.07	.05	.03	3527.	1.03	1.00	98	0.00	0.00	0.00	149.
1.01	19.30	39	.07	.05	.03	3416.	1.03	1.30	99	0.00	0.00	0.00	141.
1.01	20.00	40	.07	.05	.03	3297.	1.03	2.00	100	0.00	0.00	0.00	133.
1.01	20.30	41	.05	.02	.03	3176.	1.03	2.30	101	0.00	0.00	0.00	126.
1.01	21.00	42	.05	.02	.03	3054.	1.03	3.00	102	0.00	0.00	0.00	119.
1.01	21.30	43	.05	.02	.03	2933.	1.03	3.30	103	0.00	0.00	0.00	112.
1.01	22.00	44	.05	.02	.03	2815.	1.03	4.00	104	0.00	0.00	0.00	106.

AD-A070 228 NEW JERSEY STATE DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/2
NATIONAL DAM SAFETY PROGRAM. WILLIAMS POND DAM (DE00064), NANTI--ETC(U)
APR 79 I W LIPPINCOTT DACW61-78-C-0124

UNCLASSIFIED NL

2 OF 2
AD A070228



END
DATE FILMED
7-79
DDC

1.01	22.30	45	.03	.02	.03	2699.	1.03	4.30	105	0.00	0.00	0.00	100.
1.01	23.00	46	.03	.02	.03	2585.	1.03	5.00	106	0.00	0.00	0.00	95.
1.01	23.30	47	.03	.02	.03	2476.	1.03	5.30	107	0.00	0.00	0.00	89.
1.02	0.00	48	.03	.02	.03	2370.	1.03	6.00	108	0.00	0.00	0.00	84.
1.02	.30	49	0.00	0.00	0.00	2267.	1.03	6.30	109	0.00	0.00	0.00	80.
1.02	1.00	50	0.00	0.00	0.00	2167.	1.03	7.00	110	0.00	0.00	0.00	75.
1.02	1.30	51	0.00	0.00	0.00	2070.	1.03	7.30	111	0.00	0.00	0.00	71.
1.02	2.00	52	0.00	0.00	0.00	1975.	1.03	8.00	112	0.00	0.00	0.00	67.
1.02	2.30	53	0.00	0.00	0.00	1882.	1.03	8.30	113	0.00	0.00	0.00	63.
1.02	3.00	54	0.00	0.00	0.00	1791.	1.03	9.00	114	0.00	0.00	0.00	60.
1.02	3.30	55	0.00	0.00	0.00	1704.	1.03	9.30	115	0.00	0.00	0.00	57.
1.02	4.00	56	0.00	0.00	0.00	1618.	1.03	10.00	116	0.00	0.00	0.00	54.
1.02	4.30	57	0.00	0.00	0.00	1536.	1.03	10.30	117	0.00	0.00	0.00	50.
1.02	5.00	58	0.00	0.00	0.00	1456.	1.03	11.00	118	0.00	0.00	0.00	47.
1.02	5.30	59	0.00	0.00	0.00	1378.	1.03	11.30	119	0.00	0.00	0.00	44.
1.02	6.00	60	0.00	0.00	0.00	1304.	1.03	12.00	120	0.00	0.00	0.00	41.
									SUM	7.90	6.11	1.79	104925.
										(201.)(	155.)(	45.)(	2971.15)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3599.	3274.	1961.	874.	104906.
CMS	102.	93.	56.	25.	2971.
INCHES		2.27	5.45	6.07	6.07
MM		57.72	138.31	154.15	154.15
AC-FT		1623.	3890.	4335.	4335.
THOUS CU M		2002.	4798.	5347.	5347.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	3.	10.	22.
42.	73.	118.	219.	407.	665.	972.	1316.	1687.	2072.
2451.	2793.	3084.	3317.	3487.	3588.	3599.	3527.	3416.	3297.
3176.	3054.	2933.	2815.	2699.	2585.	2476.	2370.	2267.	2167.
2070.	1975.	1882.	1791.	1704.	1618.	1536.	1456.	1378.	1304.
1233.	1164.	1100.	1039.	981.	927.	875.	827.	781.	738.
697.	658.	622.	587.	555.	524.	495.	467.	442.	417.
394.	372.	351.	332.	314.	296.	280.	264.	250.	236.
223.	210.	199.	188.	177.	167.	158.	149.	141.	133.
126.	119.	112.	106.	100.	95.	89.	84.	80.	75.
71.	67.	63.	60.	57.	54.	50.	47.	44.	41.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3599.	3274.	1961.	874.	104906.
CMS	102.	93.	56.	25.	2971.
INCHES		2.27	5.45	6.07	6.07
MM		57.72	138.31	154.15	154.15
AC-FT		1623.	3890.	4335.	4335.
THOUS CU M		2002.	4798.	5347.	5347.

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HYDROGRAPH ROUTING

ROUTE FLOWS THROUGH BEARNS POND

ISTAO	ICOMP	ICON	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	-23.	-1

STAGE	22.5	23.5	24.5	25.5	26.5	27.5	28.5
FLOW	0.	433.	633.	850.	1077.	2244.	6006.
CAPACITY=	0.	298.	652.	1360.			
ELEVATION=	17.	27.	30.	30.			

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
27.0	0.0	0.0	0.

STATION 2, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

MO.DA	HR.MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	.30	1	.50	0.	0.	164.	22.5
1.01	1.00	2	1.00	0.	0.	164.	22.5
1.01	1.30	3	1.50	0.	0.	164.	22.5
1.01	2.00	4	2.00	0.	0.	164.	22.5
1.01	2.30	5	2.50	0.	0.	164.	22.5
1.01	3.00	6	3.00	0.	0.	164.	22.5
1.01	3.30	7	3.50	0.	0.	164.	22.5
1.01	4.00	8	4.00	0.	0.	164.	22.5
1.01	4.30	9	4.50	0.	0.	164.	22.5
1.01	5.00	10	5.00	0.	0.	164.	22.5
1.01	5.30	11	5.50	0.	0.	164.	22.5
1.01	6.00	12	6.00	0.	0.	164.	22.5
1.01	6.30	13	6.50	0.	0.	164.	22.5
1.01	7.00	14	7.00	0.	0.	164.	22.5
1.01	7.30	15	7.50	0.	0.	164.	22.5
1.01	8.00	16	8.00	0.	0.	164.	22.5
1.01	8.30	17	8.50	1.	0.	164.	22.5
1.01	9.00	18	9.00	3.	1.	164.	22.5
1.01	9.30	19	9.50	10.	4.	164.	22.5
1.01	10.00	20	10.00	22.	9.	165.	22.5
1.01	10.30	21	10.50	42.	20.	165.	22.5
1.01	11.00	22	11.00	73.	37.	166.	22.6
1.01	11.30	23	11.50	118.	64.	168.	22.6
1.01	12.00	24	12.00	219.	112.	172.	22.8
1.01	12.30	25	12.50	407.	205.	178.	23.0
1.01	13.00	26	13.00	665.	358.	188.	23.3
1.01	13.30	27	13.50	972.	506.	204.	23.9
1.01	14.00	28	14.00	1316.	662.	228.	24.6
1.01	14.30	29	14.50	1687.	883.	258.	25.6
1.01	15.00	30	15.00	2072.	1331.	290.	26.7

1.01	15.30	31	15.50	2451.	1851.	317.	27.2
1.01	16.00	32	16.00	2743.	2113.	344.	27.4
1.01	16.30	33	16.50	3004.	3540.	357.	27.5
1.01	17.00	34	17.00	3317.	3543.	357.	27.5

ITERATIVE SOLUTION DID NOT CONVERGE 35 1 0.000 2.765E+01 1.470E+03 2.756E+01 7.584E+02

1.01	17.30	35	17.50	3407.	3687.	364.	27.6
1.01	18.00	36	18.00	3508.	3597.	360.	27.5
1.01	18.30	37	18.50	3599.	3595.	360.	27.5
1.01	19.00	38	19.00	3527.	3578.	359.	27.5
1.01	19.30	39	19.50	3416.	3578.	359.	27.5
1.01	20.00	40	20.00	3297.	3549.	357.	27.5

ITERATIVE SOLUTION DID NOT CONVERGE 41 1 0.000 2.752E+01 7.987E+02 2.743E+01 -1.202E+03

1.01	20.30	41	20.50	3176.	2158.	348.	27.4
1.01	21.00	42	21.00	3054.	3575.	359.	27.5

ITERATIVE SOLUTION DID NOT CONVERGE 43 1 0.000 2.749E+01 -1.352E+02 2.754E+01 1.344E+03

1.01	21.30	43	21.50	2933.	3630.	361.	27.5
1.01	22.00	44	22.00	2815.	2225.	355.	27.5

ITERATIVE SOLUTION DID NOT CONVERGE 45 1 0.000 2.746E+01 -1.243E+03 2.752E+01 4.768E+02

1.01	22.30	45	22.50	2699.	3581.	359.	27.5
1.01	23.00	46	23.00	2585.	2168.	349.	27.4

ITERATIVE SOLUTION DID NOT CONVERGE 47 1 0.000 2.738E+01 -1.135E+03 2.744E+01 -6.808E+02

1.01	23.30	47	23.50	2476.	2175.	350.	27.4
1.02	0.00	48	24.00	2370.	2240.	357.	27.5

ITERATIVE SOLUTION DID NOT CONVERGE 49 1 0.000 2.749E+01 -2.148E+02 2.752E+01 1.322E+03

1.02	.30	49	24.50	2267.	3589.	359.	27.5
1.02	1.00	50	25.00	2167.	2025.	335.	27.3
1.02	1.30	51	25.50	2070.	2057.	338.	27.3
1.02	2.00	52	26.00	1975.	2046.	337.	27.3
1.02	2.30	53	26.50	1882.	2006.	333.	27.3
1.02	3.00	54	27.00	1791.	1948.	327.	27.2
1.02	3.30	55	27.50	1704.	1880.	320.	27.2
1.02	4.00	56	28.00	1618.	1806.	313.	27.1
1.02	4.30	57	28.50	1536.	1728.	305.	27.1
1.02	5.00	58	29.00	1456.	1631.	297.	27.0
1.02	5.30	59	29.50	1378.	1440.	292.	26.8
1.02	6.00	60	30.00	1304.	1352.	290.	26.7
1.02	6.30	61	30.50	1233.	1277.	288.	26.7
1.02	7.00	62	31.00	1164.	1207.	286.	26.6
1.02	7.30	63	31.50	1100.	1140.	285.	26.6
1.02	8.00	64	32.00	1039.	1077.	283.	26.5
1.02	8.30	65	32.50	981.	1059.	281.	26.4
1.02	9.00	66	33.00	927.	1030.	277.	26.3
1.02	9.30	67	33.50	875.	995.	272.	26.1
1.02	10.00	68	34.00	827.	950.	267.	26.0
1.02	10.30	69	34.50	781.	913.	262.	25.8
1.02	11.00	70	35.00	738.	872.	256.	25.6
1.02	11.30	71	35.50	697.	831.	251.	25.4
1.02	12.00	72	36.00	658.	791.	245.	25.2

1.02	12.30	73	36.50	622.	751.	240.	25.0
1.02	13.00	74	37.00	587.	713.	234.	24.9
1.02	13.30	75	37.50	555.	678.	229.	24.7
1.02	14.00	76	38.00	524.	640.	224.	24.5
1.02	14.30	77	38.50	495.	608.	220.	24.4
1.02	15.00	78	39.00	467.	577.	215.	24.2
1.02	15.30	79	39.50	442.	548.	211.	24.1
1.02	16.00	80	40.00	417.	519.	206.	23.9
1.02	16.30	81	40.50	394.	492.	202.	23.8
1.02	17.00	82	41.00	372.	465.	198.	23.7
1.02	17.30	83	41.50	351.	440.	195.	23.5
1.02	18.00	84	42.00	332.	400.	191.	23.4
1.02	18.30	85	42.50	314.	364.	189.	23.3
1.02	19.00	86	43.00	296.	337.	187.	23.3
1.02	19.30	87	43.50	280.	314.	185.	23.2
1.02	20.00	88	44.00	264.	295.	184.	23.2
1.02	20.30	89	44.50	250.	277.	183.	23.1
1.02	21.00	90	45.00	236.	261.	182.	23.1
1.02	21.30	91	45.50	223.	247.	181.	23.1
1.02	22.00	92	46.00	210.	233.	180.	23.0
1.02	22.30	93	46.50	199.	220.	179.	23.0
1.02	23.00	94	47.00	188.	207.	178.	23.0
1.02	23.30	95	47.50	177.	196.	177.	23.0
1.03	0.00	96	48.00	167.	185.	177.	22.9
1.03	.30	97	48.50	158.	175.	176.	22.9
1.03	1.00	98	49.00	149.	165.	175.	22.9
1.03	1.30	99	49.50	141.	156.	175.	22.9
1.03	2.00	100	50.00	133.	147.	174.	22.8
1.03	2.30	101	50.50	126.	139.	173.	22.8
1.03	3.00	102	51.00	119.	131.	173.	22.8
1.03	3.30	103	51.50	112.	124.	172.	22.8
1.03	4.00	104	52.00	106.	117.	172.	22.8
1.03	4.30	105	52.50	100.	111.	171.	22.8
1.03	5.00	106	53.00	95.	105.	171.	22.7
1.03	5.30	107	53.50	89.	99.	171.	22.7
1.03	6.00	108	54.00	84.	93.	170.	22.7
1.03	6.30	109	54.50	80.	88.	170.	22.7
1.03	7.00	110	55.00	75.	83.	170.	22.7
1.03	7.30	111	55.50	71.	79.	169.	22.7
1.03	8.00	112	56.00	67.	74.	169.	22.7
1.03	8.30	113	56.50	63.	70.	169.	22.7
1.03	9.00	114	57.00	60.	66.	168.	22.7
1.03	9.30	115	57.50	57.	63.	168.	22.6
1.03	10.00	116	58.00	54.	59.	168.	22.6
1.03	10.30	117	58.50	50.	56.	168.	22.6
1.03	11.00	118	59.00	47.	53.	167.	22.6
1.03	11.30	119	59.50	44.	49.	167.	22.6
1.03	12.00	120	60.00	41.	46.	167.	22.6

PEAK OUTFLOW IS 3687. AT TIME 17.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3687.	3350.	1980.	888.	106528.
CMS	104.	95.	56.	25.	3017.
INCHES		2.33	5.50	6.16	6.16
MM		59.18	139.66	156.53	156.53
AC-FT		1664.	3928.	4402.	4402.
THOUS CU M		2053.	4845.	5430.	5430.

HYDROGRAPH ROUTING

CHANNEL ROUTING -- MEARNS POND TO WILLIAMS POND

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
3	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	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.1500	.0800	.1500	7.0	19.5	7140.	.00150
	$N/\sqrt{s}$					

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00	19.50	110.00	14.50	219.00	9.50	250.00	7.00	281.00	9.50
390.00	14.50	500.00	19.50	520.00	19.50				

STORAGE	0.	1.	4.	8.	14.	23.	35.	50.	68.	89.
	114.	141.	172.	205.	242.	282.	325.	371.	420.	472.
OUTFLOW	0.	2.	12.	34.	74.	137.	227.	348.	505.	703.
	944.	1233.	1613.	2073.	2590.	3166.	3803.	4502.	5266.	6094.
STAGE	7.0	7.7	8.3	9.0	9.6	10.3	10.9	11.6	12.3	12.9
	13.6	14.2	14.9	15.6	16.2	16.9	17.5	18.2	18.8	19.5
FLOW	0.	2.	12.	34.	74.	137.	227.	348.	505.	703.
	944.	1233.	1613.	2073.	2590.	3166.	3803.	4502.	5266.	6094.

HO.DA	HR.MN	PERIOD	EOP STOR	AVG IN	EOP OUT	STAGE	AVG PUMP
1.01	.30	1	0.	0.	0.	7.0	0.
1.01	1.00	2	0.	0.	0.	7.0	0.
1.01	1.30	3	0.	0.	0.	7.0	0.
1.01	2.00	4	0.	0.	0.	7.0	0.
1.01	2.30	5	0.	0.	0.	7.0	0.
1.01	3.00	6	0.	0.	0.	7.0	0.
1.01	3.30	7	0.	0.	0.	7.0	0.
1.01	4.00	8	0.	0.	0.	7.0	0.
1.01	4.30	9	0.	0.	0.	7.0	0.
1.01	5.00	10	0.	0.	0.	7.0	0.
1.01	5.30	11	0.	0.	0.	7.0	0.
1.01	6.00	12	0.	0.	0.	7.0	0.

1.01	6.30	11	0.	0.	0.	7.0	0.
1.01	7.00	14	0.	0.	0.	7.0	0.
1.01	7.30	15	0.	0.	0.	7.0	0.
1.01	8.00	16	0.	0.	0.	7.0	0.
1.01	8.30	17	0.	0.	0.	7.0	0.
1.01	9.00	18	0.	1.	0.	7.0	0.
1.01	9.30	19	0.	2.	0.	7.1	0.
1.01	10.00	20	0.	6.	1.	7.3	0.
1.01	10.30	21	1.	15.	2.	7.7	0.
1.01	11.00	22	2.	29.	6.	7.9	0.
1.01	11.30	23	4.	51.	12.	8.3	0.
1.01	12.00	24	8.	88.	27.	8.8	0.
1.01	12.30	25	11.	159.	56.	9.3	0.
1.01	13.00	26	19.	282.	112.	10.0	0.
1.01	13.30	27	31.	432.	197.	10.7	0.
1.01	14.00	28	45.	584.	300.	11.4	0.
1.01	14.30	29	61.	773.	445.	12.0	0.
1.01	15.00	30	84.	1107.	655.	12.8	0.
1.01	15.30	31	116.	1591.	972.	13.6	0.
1.01	16.00	32	150.	1982.	1348.	14.4	0.
1.01	16.30	33	198.	2830.	1981.	15.4	0.
1.01	17.00	34	249.	3545.	2686.	16.3	0.
1.01	17.30	35	278.	3815.	3113.	16.8	0.
1.01	18.00	36	295.	3842.	3360.	17.1	0.
1.01	18.30	37	302.	3596.	3470.	17.2	0.
1.01	19.00	38	306.	3585.	3524.	17.2	0.
1.01	19.30	39	308.	3576.	3548.	17.3	0.
1.01	20.00	40	308.	3563.	3555.	17.3	0.
1.01	20.30	41	286.	2654.	3226.	16.9	0.
1.01	21.00	42	274.	2867.	3060.	16.7	0.
1.01	21.30	43	292.	3602.	3312.	17.0	0.
1.01	22.00	44	279.	2927.	3132.	16.8	0.
1.01	22.30	45	272.	2903.	3027.	16.7	0.
1.01	23.00	46	267.	2874.	2957.	16.6	0.
1.01	23.30	47	242.	2172.	2596.	16.2	0.
1.02	0.00	48	230.	2208.	2421.	16.0	0.
1.02	.30	49	246.	2914.	2644.	16.3	0.
1.02	1.00	50	251.	2807.	2719.	16.4	0.
1.02	1.30	51	229.	2041.	2411.	16.0	0.
1.02	2.00	52	218.	2051.	2249.	15.8	0.
1.02	2.30	53	211.	2026.	2148.	15.6	0.
1.02	3.00	54	205.	1977.	2071.	15.6	0.
1.02	3.30	55	200.	1914.	2002.	15.5	0.
1.02	4.00	56	195.	1843.	1932.	15.4	0.
1.02	4.30	57	190.	1767.	1859.	15.2	0.
1.02	5.00	58	184.	1680.	1780.	15.1	0.
1.02	5.30	59	176.	1535.	1672.	15.0	0.
1.02	6.00	60	167.	1396.	1555.	14.8	0.
1.02	6.30	61	159.	1314.	1456.	14.6	0.
1.02	7.00	62	152.	1242.	1369.	14.5	0.
1.02	7.30	63	145.	1173.	1289.	14.3	0.
1.02	8.00	64	140.	1108.	1217.	14.2	0.
1.02	8.30	65	134.	1068.	1164.	14.1	0.
1.02	9.00	66	130.	1045.	1121.	14.0	0.
1.02	9.30	67	127.	1013.	1082.	13.9	0.
1.02	10.00	68	123.	976.	1044.	13.8	0.
1.02	10.30	69	119.	935.	1005.	13.7	0.
1.02	11.00	70	116.	894.	965.	13.6	0.
1.02	11.30	71	112.	852.	926.	13.5	0.
1.02	12.00	72	108.	811.	887.	13.4	0.

1.02	12.30	73	104.	771.	847.	13.3	0.
1.02	13.00	74	100.	732.	808.	13.2	0.
1.02	13.30	75	96.	694.	769.	13.1	0.
1.02	14.00	76	92.	658.	731.	13.0	0.
1.02	14.30	77	88.	624.	695.	12.9	0.
1.02	15.00	78	85.	593.	662.	12.8	0.
1.02	15.30	79	81.	563.	630.	12.7	0.
1.02	16.00	80	78.	533.	599.	12.6	0.
1.02	16.30	81	75.	505.	569.	12.5	0.
1.02	17.00	82	72.	479.	540.	12.4	0.
1.02	17.30	83	69.	453.	512.	12.3	0.
1.02	18.00	84	66.	428.	483.	12.2	0.
1.02	18.30	85	62.	382.	453.	12.0	0.
1.02	19.00	86	58.	350.	422.	11.9	0.
1.02	19.30	87	55.	325.	392.	11.8	0.
1.02	20.00	88	52.	304.	366.	11.7	0.
1.02	20.30	89	49.	286.	342.	11.6	0.
1.02	21.00	90	47.	269.	321.	11.5	0.
1.02	21.30	91	44.	254.	302.	11.4	0.
1.02	22.00	92	42.	240.	284.	11.3	0.
1.02	22.30	93	40.	228.	268.	11.2	0.
1.02	23.00	94	38.	214.	252.	11.1	0.
1.02	23.30	95	36.	202.	238.	11.0	0.
1.03	0.00	96	35.	190.	224.	10.9	0.
1.03	.30	97	33.	180.	212.	10.8	0.
1.03	1.00	98	31.	170.	201.	10.8	0.
1.03	1.30	99	30.	160.	190.	10.7	0.
1.03	2.00	100	29.	152.	180.	10.6	0.
1.03	2.30	101	27.	143.	170.	10.5	0.
1.03	3.00	102	26.	135.	161.	10.5	0.
1.03	3.30	103	25.	128.	152.	10.4	0.
1.03	4.00	104	24.	121.	143.	10.3	0.
1.03	4.30	105	23.	114.	136.	10.3	0.
1.03	5.00	106	22.	108.	128.	10.2	0.
1.03	5.30	107	21.	102.	122.	10.1	0.
1.03	6.00	108	20.	96.	115.	10.1	0.
1.03	6.30	109	19.	91.	109.	10.0	0.
1.03	7.00	110	18.	86.	104.	9.9	0.
1.03	7.30	111	17.	81.	97.	9.9	0.
1.03	8.00	112	17.	76.	92.	9.8	0.
1.03	8.30	113	16.	72.	87.	9.8	0.
1.03	9.00	114	15.	68.	82.	9.7	0.
1.03	9.30	115	15.	64.	78.	9.7	0.
1.03	10.00	116	14.	61.	73.	9.6	0.
1.03	10.30	117	13.	57.	70.	9.6	0.
1.03	11.00	118	13.	54.	66.	9.5	0.
1.03	11.30	119	12.	51.	62.	9.4	0.
1.03	12.00	120	12.	48.	59.	9.4	0.
				SUM	106274.		
				(	3009.35)		

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3555.	3202.	1906.	845.	106245.
CMS	101.	92.	54.	25.	3009.
INCHES		2.20	5.46	6.15	6.15
MM		57.53	138.66	156.12	156.12
AC-FT		1618.	3859.	4390.	4390.
THOUS CU M		1995.	4810.	5415.	5415.

MAXIMUM STORAGE = 305.

MAXIMUM STAGE IS 17.3

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SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO WILLIAMS POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
4	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	9.83	0.00	9.83	0.00	0.000	0	1	0

PRECIP DATA

NP	STORM	DAJ	DAK
48	7.90	0.00	0.00

PRECIP PATTERN

.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.02	.02
.02	.03	.05	.38	.07	.04	.03	.02	.02	.02
.02	.02	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01		

LOSS DATA

LKOPT	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= 6.80 CP= .50 NTA= 0

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=14.36 AND R=18.50 INTERVALS

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 6.79 HOURS, CP= .50 VOL= .99

9.	33.	67.	108.	154.	204.	257.	310.	360.	401.
434.	459.	474.	479.	468.	445.	422.	400.	379.	359.
340.	322.	305.	289.	274.	259.	246.	233.	221.	209.
198.	188.	178.	168.	159.	151.	143.	136.	128.	122.
115.	109.	103.	98.	93.	88.	83.	79.	75.	71.
67.	64.	60.	57.	54.	51.	49.	46.	44.	41.
39.	37.	35.	33.	32.	30.	28.	27.	25.	24.
23.	22.	20.	19.	18.	17.	16.	16.	15.	14.
13.	13.	12.	11.	11.	10.	10.	9.	9.	8.
8.	7.	7.	7.	6.	6.	6.	5.	5.	5.

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
1.01	.30	1	.04	0.00	.04	0.	1.02	6.30	61	0.00	0.00	0.00	946.
1.01	1.00	2	.04	0.00	.04	0.	1.02	7.00	62	0.00	0.00	0.00	897.
1.01	1.30	3	.04	0.00	.04	0.	1.02	7.30	63	0.00	0.00	0.00	850.

1.01	2.00	4	.04	0.00	.04	0.	1.02	8.00	64	0.00	0.00	0.00	805.
1.01	2.30	5	.05	0.00	.05	0.	1.02	8.30	65	0.00	0.00	0.00	762.
1.01	3.00	6	.05	0.00	.05	0.	1.02	9.00	66	0.00	0.00	0.00	722.
1.01	3.30	7	.05	0.00	.05	0.	1.02	9.30	67	0.00	0.00	0.00	684.
1.01	4.00	8	.05	0.00	.05	0.	1.02	10.00	68	0.00	0.00	0.00	648.
1.01	4.30	9	.05	0.00	.05	0.	1.02	10.30	69	0.00	0.00	0.00	614.
1.01	5.00	10	.06	0.00	.06	0.	1.02	11.00	70	0.00	0.00	0.00	582.
1.01	5.30	11	.06	0.00	.06	0.	1.02	11.30	71	0.00	0.00	0.00	551.
1.01	6.00	12	.06	0.00	.06	0.	1.02	12.00	72	0.00	0.00	0.00	522.
1.01	6.30	13	.05	0.00	.05	0.	1.02	12.30	73	0.00	0.00	0.00	495.
1.01	7.00	14	.05	0.00	.05	0.	1.02	13.00	74	0.00	0.00	0.00	469.
1.01	7.30	15	.05	0.00	.05	0.	1.02	13.30	75	0.00	0.00	0.00	444.
1.01	8.00	16	.05	0.00	.05	0.	1.02	14.00	76	0.00	0.00	0.00	421.
1.01	8.30	17	.11	.04	.06	0.	1.02	14.30	77	0.00	0.00	0.00	399.
1.01	9.00	18	.11	.08	.03	2.	1.02	15.00	78	0.00	0.00	0.00	378.
1.01	9.30	19	.13	.10	.03	6.	1.02	15.30	79	0.00	0.00	0.00	358.
1.01	10.00	20	.14	.12	.03	14.	1.02	16.00	80	0.00	0.00	0.00	339.
1.01	10.30	21	.18	.16	.03	27.	1.02	16.30	81	0.00	0.00	0.00	321.
1.01	11.00	22	.24	.22	.03	47.	1.02	17.00	82	0.00	0.00	0.00	304.
1.01	11.30	23	.38	.35	.03	77.	1.02	17.30	83	0.00	0.00	0.00	288.
1.01	12.00	24	3.00	2.98	.03	142.	1.02	18.00	84	0.00	0.00	0.00	273.
1.01	12.30	25	.57	.54	.02	204.	1.02	18.30	85	0.00	0.00	0.00	259.
1.01	13.00	26	.29	.27	.03	432.	1.02	19.00	86	0.00	0.00	0.00	245.
1.01	13.30	27	.21	.19	.03	633.	1.02	19.30	87	0.00	0.00	0.00	232.
1.01	14.00	28	.17	.14	.03	859.	1.02	20.00	88	0.00	0.00	0.00	220.
1.01	14.30	29	.12	.09	.03	1103.	1.02	20.30	89	0.00	0.00	0.00	208.
1.01	15.00	30	.12	.09	.03	1359.	1.02	21.00	90	0.00	0.00	0.00	197.
1.01	15.30	31	.12	.09	.03	1617.	1.02	21.30	91	0.00	0.00	0.00	187.
1.01	16.00	32	.12	.09	.03	1859.	1.02	22.00	92	0.00	0.00	0.00	177.
1.01	16.30	33	.07	.05	.03	2069.	1.02	22.30	93	0.00	0.00	0.00	168.
1.01	17.00	34	.07	.05	.03	2245.	1.02	23.00	94	0.00	0.00	0.00	159.
1.01	17.30	35	.07	.05	.03	2382.	1.02	23.30	95	0.00	0.00	0.00	151.
1.01	18.00	36	.07	.05	.03	2478.	1.03	0.00	96	0.00	0.00	0.00	143.
1.01	18.30	37	.07	.05	.03	2526.	1.03	.30	97	0.00	0.00	0.00	135.
1.01	19.00	38	.07	.05	.03	2514.	1.03	1.00	98	0.00	0.00	0.00	128.
1.01	19.30	39	.07	.05	.03	2454.	1.03	1.30	99	0.00	0.00	0.00	121.
1.01	20.00	40	.07	.05	.03	2378.	1.03	2.00	100	0.00	0.00	0.00	115.
1.01	20.30	41	.03	.02	.03	2294.	1.03	2.30	101	0.00	0.00	0.00	109.
1.01	21.00	42	.03	.02	.03	2217.	1.03	3.00	102	0.00	0.00	0.00	103.
1.01	21.30	43	.03	.02	.03	2136.	1.03	3.30	103	0.00	0.00	0.00	98.
1.01	22.00	44	.03	.02	.03	2056.	1.03	4.00	104	0.00	0.00	0.00	93.
1.01	22.30	45	.03	.02	.01	1977.	1.03	4.30	105	0.00	0.00	0.00	88.
1.01	23.00	46	.05	.02	.03	1899.	1.03	5.00	106	0.00	0.00	0.00	83.
1.01	23.30	47	.03	.02	.03	1823.	1.03	5.30	107	0.00	0.00	0.00	79.
1.02	0.00	48	.03	.02	.03	1749.	1.03	6.00	108	0.00	0.00	0.00	75.
1.02	.30	49	0.00	0.00	0.00	1678.	1.03	6.30	109	0.00	0.00	0.00	71.
1.02	1.00	50	0.00	0.00	0.00	1608.	1.03	7.00	110	0.00	0.00	0.00	67.
1.02	1.30	51	0.00	0.00	0.00	1540.	1.03	7.30	111	0.00	0.00	0.00	63.
1.02	2.00	52	0.00	0.00	0.00	1474.	1.03	8.00	112	0.00	0.00	0.00	60.
1.02	2.30	53	0.00	0.00	0.00	1408.	1.03	8.30	113	0.00	0.00	0.00	57.
1.02	3.00	54	0.00	0.00	0.00	1345.	1.03	9.00	114	0.00	0.00	0.00	54.
1.02	3.30	55	0.00	0.00	0.00	1282.	1.03	9.30	115	0.00	0.00	0.00	51.
1.02	4.00	56	0.00	0.00	0.00	1222.	1.03	10.00	116	0.00	0.00	0.00	48.
1.02	4.30	57	0.00	0.00	0.00	1163.	1.03	10.30	117	0.00	0.00	0.00	46.
1.02	5.00	58	0.00	0.00	0.00	1105.	1.03	11.00	118	0.00	0.00	0.00	43.
1.02	5.30	59	0.00	0.00	0.00	1051.	1.03	11.30	119	0.00	0.00	0.00	40.
1.02	6.00	60	0.00	0.00	0.00	994.	1.03	12.00	120	0.00	0.00	0.00	38.
									SUM	7.90	6.11	1.79	76800.
										(201.)(	155.)(	45.)(	2174.73)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2526.	2309.	1417.	640.	76783.
CMS	72.	65.	40.	18.	2174.
INCHES		2.18	5.37	6.06	6.06
MM		55.50	136.28	153.80	153.80
AC-FT		1145.	2811.	3173.	3173.
THOUS CU M		1412.	3468.	3914.	3914.

HYDROGRAPH AT STA 4 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	2.	6.	14.
27.	47.	77.	142.	264.	432.	633.	859.	1103.	1359.
1617.	1859.	2069.	2245.	2382.	2478.	2526.	2514.	2454.	2378.
2298.	2217.	2136.	2056.	1977.	1899.	1823.	1749.	1678.	1608.
1540.	1474.	1408.	1345.	1282.	1222.	1163.	1106.	1051.	998.
946.	897.	850.	805.	762.	722.	684.	648.	614.	582.
551.	522.	495.	469.	444.	421.	399.	378.	358.	339.
321.	304.	288.	273.	259.	245.	232.	220.	208.	197.
187.	177.	168.	159.	151.	143.	135.	128.	121.	115.
109.	103.	98.	93.	88.	83.	79.	75.	71.	67.
63.	60.	57.	54.	51.	48.	46.	43.	40.	38.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2526.	2309.	1417.	640.	76783.
CMS	72.	65.	40.	18.	2174.
INCHES		2.18	5.37	6.06	6.06
MM		55.50	136.28	153.80	153.80
AC-FT		1145.	2811.	3173.	3173.
THOUS CU M		1412.	3468.	3914.	3914.

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COMBINE HYDROGRAPHS

COMBINE HYDROGRAPHS FOR HEARNS POND AND WILLIAMS POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
5	2	0	0	0	0	1	0	0

SUM OF 2 HYDROGRAPHS AT 5 PLAN 1 RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	2.	7.	15.
29.	53.	89.	169.	321.	545.	830.	1165.	1548.	2014.
2589.	3206.	4058.	4931.	5495.	5838.	5996.	6038.	6002.	5933.
5525.	5277.	5448.	5188.	5003.	4855.	4419.	4170.	4322.	4327.
3951.	3723.	3557.	3418.	3285.	3154.	3022.	2886.	2723.	2552.
2403.	2265.	2138.	2022.	1926.	1844.	1767.	1693.	1619.	1547.
1477.	1409.	1342.	1277.	1214.	1152.	1094.	1040.	988.	938.
890.	844.	800.	757.	711.	667.	629.	585.	550.	519.
489.	461.	435.	411.	388.	367.	348.	329.	312.	295.
279.	264.	250.	238.	223.	212.	200.	190.	180.	170.
161.	152.	144.	136.	129.	122.	115.	109.	103.	97.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6038.	3553.	3106.	1525.	183027.
CMS	171.	101.	88.	43.	5183.
INCHES		2.22	5.39	6.11	6.11
MM		56.48	136.93	155.14	155.14
AC-FT		2754.	6675.	7563.	7563.
THOUS CU M		3396.	8234.	9329.	9329.

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HYDROGRAPH ROUTING

ROUTE COMBINED FLOWS THROUGH WILLIAMS POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	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	-a.	-1

STAGE	8.0	9.0	10.0	11.0	12.0	12.5	13.0	13.5
FLOW	66.	312.	540.	720.	840.	1431.	3360.	3780.
CAPACITY=	0.	355.	715.	1469.				
ELEVATION=	0.	7.	10.	14.				

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
12.0	0.0	0.0	0.

STATION 6, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

MO.DA	HR.MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	.30	1	.50	0.	66.	431.	7.5
1.01	1.00	2	1.00	0.	66.	428.	7.5
1.01	1.30	3	1.50	0.	66.	426.	7.4
1.01	2.00	4	2.00	0.	66.	423.	7.4
1.01	2.30	5	2.50	0.	66.	420.	7.4
1.01	3.00	6	3.00	0.	66.	417.	7.4
1.01	3.30	7	3.50	0.	66.	415.	7.3
1.01	4.00	8	4.00	0.	66.	412.	7.3
1.01	4.30	9	4.50	0.	66.	409.	7.3
1.01	5.00	10	5.00	0.	66.	406.	7.3
1.01	5.30	11	5.50	0.	66.	404.	7.2
1.01	6.00	12	6.00	0.	66.	401.	7.2
1.01	6.30	13	6.50	0.	66.	398.	7.2
1.01	7.00	14	7.00	0.	66.	396.	7.2

1.01	7.30	15	7.50	0.	66.	393.	7.1
1.01	8.00	16	8.00	0.	66.	390.	7.1
1.01	8.30	17	8.50	0.	66.	387.	7.1
1.01	9.00	18	9.00	2.	66.	385.	7.1
1.01	9.30	19	9.50	7.	66.	382.	7.0
1.01	10.00	20	10.00	15.	66.	380.	7.0
1.01	10.30	21	10.50	29.	66.	378.	7.0
1.01	11.00	22	11.00	53.	66.	377.	7.0
1.01	11.30	23	11.50	89.	66.	377.	7.0
1.01	12.00	24	12.00	169.	66.	380.	7.0
1.01	12.30	25	12.50	321.	66.	387.	7.1
1.01	13.00	26	13.00	545.	66.	402.	7.2
1.01	13.30	27	13.50	830.	66.	428.	7.4
1.01	14.00	28	14.00	1165.	66.	467.	7.8
1.01	14.30	29	14.50	1548.	129.	519.	8.3
1.01	15.00	30	15.00	2014.	271.	584.	8.8
1.01	15.30	31	15.50	2589.	437.	664.	9.6
1.01	16.00	32	16.00	3206.	580.	763.	10.2
1.01	16.30	33	16.50	4050.	664.	887.	10.8
1.01	17.00	34	17.00	4931.	782.	1042.	11.5
1.01	17.30	35	17.50	5495.	1226.	1216.	12.3
1.01	18.00	36	18.00	5838.	2845.	1366.	13.0
1.01	18.30	37	18.50	5996.	3817.	1473.	13.5
1.01	19.00	38	19.00	6038.	4513.	1550.	13.9
1.01	19.30	39	19.50	6002.	4990.	1602.	14.1
1.01	20.00	40	20.00	5933.	5299.	1636.	14.3
1.01	20.30	41	20.50	5525.	5435.	1651.	14.3
1.01	21.00	42	21.00	5277.	5424.	1650.	14.3
1.01	21.30	43	21.50	5448.	5405.	1648.	14.3
1.01	22.00	44	22.00	5188.	5377.	1645.	14.3
1.01	22.30	45	22.50	5003.	5288.	1635.	14.3
1.01	23.00	46	23.00	4855.	5175.	1622.	14.2
1.01	23.30	47	23.50	4419.	5005.	1604.	14.1
1.02	0.00	48	24.00	4170.	4780.	1579.	14.0
1.02	.30	49	24.50	4322.	4611.	1560.	13.9
1.02	1.00	50	25.00	4327.	4520.	1550.	13.9
1.02	1.30	51	25.50	3951.	4400.	1537.	13.8
1.02	2.00	52	26.00	3723.	4222.	1518.	13.7
1.02	2.30	53	26.50	3557.	4037.	1497.	13.6
1.02	3.00	54	27.00	3416.	3863.	1478.	13.5
1.02	3.30	55	27.50	3285.	3701.	1460.	13.5
1.02	4.00	56	28.00	3154.	3548.	1444.	13.4
1.02	4.30	57	28.50	3022.	3403.	1428.	13.3
1.02	5.00	58	29.00	2886.	3261.	1412.	13.2
1.02	5.30	59	29.50	2723.	3116.	1396.	13.2
1.02	6.00	60	30.00	2552.	2965.	1379.	13.1
1.02	6.30	61	30.50	2403.	2811.	1362.	13.0
1.02	7.00	62	31.00	2265.	2970.	1339.	12.9
1.02	7.30	63	31.50	2138.	2555.	1316.	12.8
1.02	8.00	64	32.00	2022.	2299.	1302.	12.7
1.02	8.30	65	32.50	1926.	2123.	1292.	12.7
1.02	9.00	66	33.00	1844.	1995.	1285.	12.6
1.02	9.30	67	33.50	1767.	1894.	1279.	12.6
1.02	10.00	68	34.00	1693.	1807.	1275.	12.6
1.02	10.30	69	34.50	1619.	1727.	1270.	12.6
1.02	11.00	70	35.00	1547.	1651.	1266.	12.6
1.02	11.30	71	35.50	1477.	1577.	1262.	12.5
1.02	12.00	72	36.00	1409.	1506.	1258.	12.5
1.02	12.30	73	36.50	1342.	1435.	1254.	12.5
1.02	13.00	74	37.00	1277.	1367.	1249.	12.5

1.02	13.30	75	37.50	1214.	1374.	1243.	12.5
1.02	14.00	76	38.00	1152.	1336.	1236.	12.4
1.02	14.30	77	38.50	1094.	1293.	1228.	12.4
1.02	15.00	78	39.00	1040.	1247.	1220.	12.3
1.02	15.30	79	39.50	988.	1200.	1211.	12.3
1.02	16.00	80	40.00	938.	1152.	1203.	12.3
1.02	16.30	81	40.50	890.	1104.	1194.	12.2
1.02	17.00	82	41.00	844.	1056.	1185.	12.2
1.02	17.30	83	41.50	800.	1008.	1177.	12.1
1.02	18.00	84	42.00	757.	962.	1168.	12.1
1.02	18.30	85	42.50	711.	916.	1160.	12.1
1.02	19.00	86	43.00	667.	870.	1151.	12.0
1.02	19.30	87	43.50	624.	838.	1143.	12.0
1.02	20.00	88	44.00	585.	833.	1133.	11.9
1.02	20.30	89	44.50	550.	827.	1122.	11.9
1.02	21.00	90	45.00	519.	820.	1110.	11.8
1.02	21.30	91	45.50	489.	813.	1098.	11.8
1.02	22.00	92	46.00	461.	805.	1084.	11.7
1.02	22.30	93	46.50	435.	797.	1069.	11.6
1.02	23.00	94	47.00	411.	789.	1054.	11.6
1.02	23.30	95	47.50	388.	780.	1038.	11.5
1.03	0.00	96	48.00	367.	771.	1022.	11.4
1.03	.30	97	48.50	346.	761.	1005.	11.3
1.03	1.00	98	49.00	329.	752.	988.	11.3
1.03	1.30	99	49.50	312.	742.	970.	11.2
1.03	2.00	100	50.00	295.	732.	952.	11.1
1.03	2.30	101	50.50	279.	722.	934.	11.0
1.03	3.00	102	51.00	264.	708.	915.	10.9
1.03	3.30	103	51.50	250.	692.	897.	10.8
1.03	4.00	104	52.00	236.	677.	879.	10.8
1.03	4.30	105	52.50	223.	662.	861.	10.7
1.03	5.00	106	53.00	212.	647.	843.	10.6
1.03	5.30	107	53.50	200.	632.	825.	10.5
1.03	6.00	108	54.00	190.	617.	807.	10.4
1.03	6.30	109	54.50	180.	602.	790.	10.3
1.03	7.00	110	55.00	170.	588.	772.	10.3
1.03	7.30	111	55.50	161.	573.	755.	10.2
1.03	8.00	112	56.00	152.	559.	738.	10.1
1.03	8.30	113	56.50	144.	545.	721.	10.0
1.03	9.00	114	57.00	136.	520.	705.	9.9
1.03	9.30	115	57.50	129.	489.	690.	9.8
1.03	10.00	116	58.00	122.	460.	675.	9.6
1.03	10.30	117	58.50	115.	432.	662.	9.5
1.03	11.00	118	59.00	109.	406.	649.	9.4
1.03	11.30	119	59.50	103.	382.	637.	9.3
1.03	12.00	120	60.00	97.	360.	626.	9.2

PEAK OUTFLOW IS 5435. AT TIME 20.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5435.	5109.	3076.	1486.	178349.
CMS	154.	145.	87.	42.	5050.
INCHES		2.05	4.93	5.95	5.95
MM		51.96	125.14	151.17	151.17
AC-FT		2533.	6101.	7370.	7370.
THOUS CU M		3125.	7525.	9091.	9091.

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	RATIO 1 1.00
HYDROGRAPH AT	1	13.40	1	3599.
		(34.71)		(101.91)
ROUTED TO	2	13.40	1	3687.
		(34.71)		(104.39)
ROUTED TO	3	13.40	1	3555.
		(34.71)		(100.67)
HYDROGRAPH AT	4	9.83	1	2526.
		(25.46)		(71.53)
2 COMBINED	5	23.23	1	6038.
		(60.17)		(170.97)
ROUTED TO	6	23.23	1	5435.
		(60.17)		(153.91)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	22.50	25.00	27.00
STORAGE	164.	238.	298.
OUTFLOW	0.	742.	1661.

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	27.56	.56	364.	3667.	13.50	17.50	0.00

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	3555.	17.3	20.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	7.50	7.50	12.00
STORAGE	434.	434.	1146.
OUTFLOW	66.	66.	840.

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	14.34	2.34	1651.	5435.	26.00	20.50	0.00