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NATIONAL DAM SAFETY PROGRAM. WRIGHTS MILL DAM (NJ 00432), DELAW--ETC(U)
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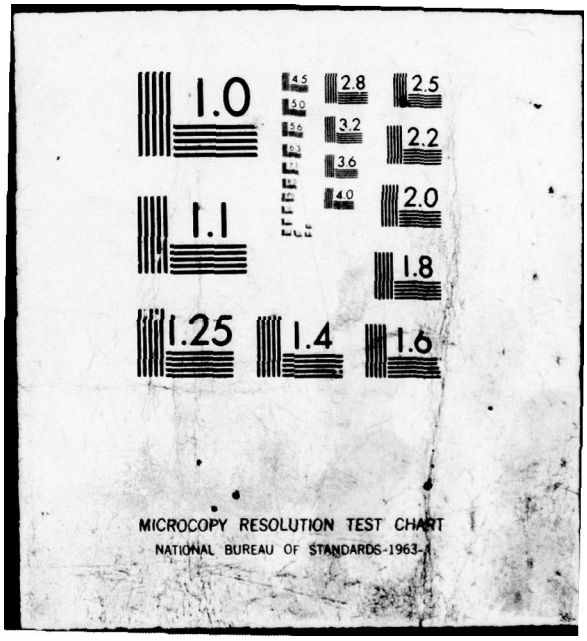
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DELAWARE RIVER BASIN
RACCOON CREEK, GLOUCESTER COUNTY
NEW JERSEY

LEVEL II

WRIGHTS MILL DAM
NJ 00432

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NJ00432	2. GOVT ACCESSION NO.
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16. Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Spillways
Riprap
Embankments
National Dam Inspection Act. Report
Wrights Mill Dam, N.J.

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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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

19 NOV 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Wrights Mill Dam in Gloucester County, New Jersey 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, Wrights Mill Dam, a high hazard potential structure, is judged to be in good overall condition. The dam's spillway is considered inadequate since 25 percent of the Spillway Design Flood--SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood). The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the determination that dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to determine the source of seepage and location of the 24-inch outlets. Any remedial measures found necessary should be initiated within calendar year 1980.

c. The following remedial actions should be completed within one year from the date of approval of this report:

(1) The embankment areas at the ends of the downstream bridge wingwalls and the upstream steel sheeting should be regraded and stabilized with slope protection.

(2) Remove the dead trees on the downstream embankment to lessen the piping potential.

(3) Place riprap in the downstream channel immediately below the outlet.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, 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 James J. Florio of the First District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five 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.

NAPEN-D
Honorable Brendan T. Byrne

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

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

WRIGHTS MILL DAM (NJ00432)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 9 May 1979 by Louis Berger & Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Wrights Mill Dam, a high hazard potential structure, is judged to be in good overall condition. The dam's spillway is considered inadequate since 25 percent of the Spillway Design Flood--SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood). The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the determination that dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to determine the source of seepage and location of the 24-inch outlets. Any remedial measures found necessary should be initiated within calendar year 1980.

c. The following remedial actions should be completed within one year from the date of approval of this report:

(1) The embankment areas at the ends of the downstream bridge wingwalls and the upstream steel sheeting should be regraded and stabilized with slope protection.

(2) Remove the dead trees on the downstream embankment to lessen the piping potential.

(3) Place riprap in the downstream channel immediately below the outlet.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 14 Nov 1979

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Wrights Mill Dam Fed ID# NJ 00432
and NJ ID# 31.22

State Located New Jersey
County Located Gloucester
Coordinates Lat. 3941.1 - Long. 7510.6
Stream Cartwheel Br. of Raccoon Creek
Date of Inspection 9 May 1979

[Cont'd from P. 1]

ASSESSMENT OF GENERAL CONDITIONS

Wrights Mill Dam is assessed to be in a good overall condition and no physically detrimental conditions were observed but further hydraulic studies are recommended in the future to ascertain more accurately the capacity of the spillway. Overtopping of the dam could lead to a downstream embankment washout. Remedial actions recommended to be undertaken in the near future include 1) remove the dead trees and root systems on the downstream embankment slopes, 2) place riprap in the downstream channel and 3) place slope protection at the ends of the steel sheeting and downstream culvert wingwalls.

The capacity of the spillway will accommodate only 24% of the one-half PMF design flood.

F. Keith Jolls P.E.
Project Manager

OVERVIEW OF WRIGHTS MILL DAM

MAY, 1979

TABLE OF CONTENTS

FIGURES

APPENDIX

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 Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. 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 aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: WRIGHTS MILL DAM FED ID# NJ 00432
NJ ID# 31-22

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Engineer District, Philadelphia, to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Wrights Mill Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The dam is a 55 year-old earth embankment approximately 120 feet in length with a bridged spillway. An asphalt pavement (Elmer-Barnsboro Rd.) 30 feet in width runs along the crest. The spillway is a three sided concrete drop inlet with removable 3'-6" wide timber stoplogs on the front face. Steel sheet piling extends along the shoulder line on the upstream face of the dam on each side of the drop inlet. The maximum height of the dam is 13 feet at the culvert outlet.

[Cont'd on p. X (four pages back)]

b. Location

Wrights Mill Dam is located on the Cartwheel Branch of Raccoon Creek in Elk Township, Gloucester County, New Jersey. The dam lies approximately ½ mile east of the lake community at Gilman Lake and just south of the intersection of Ewan-Aura and Elmer-Barnsboro Roads.

c. Size Classification

The maximum height of the dam is thirteen feet and the maximum storage is 107 acre-feet. Therefore, the dam is placed in the small size category as defined by the Recommended Guidelines for Safety Inspection of Dams (storage impoundment less than 1,000 acre-feet).

d. Hazard Classification

Based on Corps of Engineers criteria and the fact that in the event of a failure, excessive damage could occur to downstream properties together with a significant potential for loss of more than a few lives, the dam is classified as a high hazard. Immediately downstream there are numerous homes which lie along the shores of Lake Gilman and are at a considerably lower elevation than the study dam.

e. Ownership

The spillway portion is reputedly owned by Mr. Raymond Wright, RD #1, Box 284A, Monroeville, but the culvert structure and embankment are within the Right-of-Way of the Gloucester County Road Department. The culvert has the County Designation No. 7-H-5. The exact position of the R.O.W. boundary could not be located in the field. In view of the fact that most of the dam lies within County property, the overall ownership and responsibility thereof appears to be that of Gloucester County but there may be joint ownership.

f. Purpose of Dam

The dam impounds a farm pool which is occasionally used for recreational purposes.

g. Design and Construction History

No information was available pertaining to the history of the dam. Division of Water Resources reference data indicated that in 1925 a permit was filed with that Division and the nameplate on the County culvert indicates it was built in 1926. The Wright family paid for the construction of the inlet structure but the exact date of installation is unknown. The abandoned sawmill immediately below the dam has existed since the 1880's and in the past, was fed from the reservoir by two 24" lines. It is thought that some of earlier dam existed here prior to 1925.

h. Normal Operating Procedures

For operating procedures, see Section 4. The roadway and culvert are operated as a part of the County Road network.

1.3 PERTINENT DATA

a. Drainage Area: 1.7 square miles

b. Discharge of Damsite

Maximum spillway capacity (at top of dam) - 900 cfs

c. Elevation (ft. above M.S.L.)

Top of Dam (max. pool) - 100.0
Recreation Pool (spillway crest) - 95.0
Streambed at Centerline of Dam - 87.0±

d. Reservoir

Length of Maximum Pool - 1,500 feet
Length of Recreation Pool - 1,000 feet

e. Storage (acre-feet)

Top of Dam (maximum pool) - 107
Recreation Pool - 70

f. Reservoir Surface (acres)

Top of Dam (maximum pool) - 7.8
Recreation Pool - 7.0

g. Dam

Type - road embankment with three sided drop inlet spillway affixed to an arch culvert.
Length - 120 feet
Height - 13 feet
Top Width - 40+ feet
Side Slopes - 2H:1V
Zoning and Core - Unknown

h. Diversion and Regulating Tunnel

Type - None

i. Spillway

Type - three-sided drop inlet - narrow crest with removable stoplogs at front face
Length (effective) - 26 feet
Gates - removable stop logs (3'-6" x 8'-0" deep)
U/S Channel - main reservoir
D/S Channel - well defined steep sided narrow channel

j. Regulating Outlets

None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design information was located for review. The culvert was designed by Mr. William C. Cattell, the County Engineer in 1925 and appears to be of a type prevalent during that decade as numerous similar structures of this era are located in Gloucester County.

2.2 CONSTRUCTION

The culvert and roadway embankment was built by Samuel Campbell, General Contractor.

2.3 OPERATION

See Section 4.

2.4 EVALUATION

a. Availability

In view of the size and structural condition, it is felt that sufficient engineering data was obtained to adequately assess the overall condition of the dam.

b. Adequacy

Based on the experience of the inspection team with similar structures built in the same decade, the spillway arch culvert was carefully and conservatively designed. The engineering data is therefore believed to be adequate for the subject inspection albeit no engineering drawings were located.

SECTION 3 - VISUAL INSPECTIONS

3.1 a. General

The visual inspection was conducted on May 9, 1979. The reservoir water level at the time of the inspection was about 3 inches above the top of the intake stoplogs and was flowing freely. At that time, one of the planks had been removed.

b. Dam

The embankment portions of the dam were found to be well compacted and in moderately good condition. The lake water level appears to be quite constant during most periods (excepting for very heavy inflows) as the banks are well stabilized and show little evidence of sloughing at the waterline along the upstream face. The 2H to 1V sideslopes are grassed over and have several good-sized (up to 15 inch diameter) trees growing along the slopes. There is some evidence of concentrated pavement run-off in certain locations. The effective length of embankment extends practically to the road intersection just north of the dam. It was noted that further north along the Elmer-Barnsboro Road, the pavement is 2 to 3 feet lower than the top of dam and there is a 36" buried conduit which runs under the Ewan-Aura Road (just east of the intersection). The conduit appears to be plugged up but connects via a roadside ditch to Raccoon Creek about 500 feet to the north. This transverse interconnection appears to have negligible hydraulic effect on the dam.

Each side of the spillway, interlocking vertical steel sheeting is driven along the easterly fascia line of the culvert and extends approximately 25 feet on the left and 50 feet on the right. There is a minor amount of erosion at the ends of the sheeting and also at the ends of the downstream wingwalls on the far side of the crest.

Heavy seepage was observed downstream from the abandoned sawmill which is about 30 feet below the right embankment. The source could not be

determined but this might be leakage through the two 24" pipes which are not abandoned but extend into the sawmill from the vicinity of the dam.

Except for a short zone immediately adjacent to each side of the spillway, the average height of embankment is less than 10 feet and in view of the large height-to-width ratio, is believed to be structurally stable.

c. Appurtenant Structures

The reinforced concrete arch culvert is in excellent structural condition in view of its age. The wingwalls and parapets display only minor cracking and spalled areas but the structurally important zones are in an integral condition. The semi-circular culvert opening has a 6 foot intrados radius and a clear span of 12 feet. The headroom above a reinforced concrete paved invert is about 10 feet. This invert slab, which forms the culvert floor, is about 3 feet above the streambed immediately downstream. The drop in the outfall appears to be the result of long-term erosion and scour but presently is in no danger of undercutting the culvert foundation.

The spillway inlet is a 3-sided 7' x 12' reinforced concrete frame affixed to the culvert wingwalls. It is of a design seen frequently in Gloucester County on construction built in the 1920's and 30's and functions very well for the purpose intended. Timber stoplogs 3'-6" wide are set in vertical slots formed in the concrete on the upstream face and the inlet frame is overtopped with a concrete deck slab 2 feet above the top of the spillway. From the size of lake and drainage area, it is doubtful that this was actually designed as an anti-vortex device but probably served merely as a maintenance platform for removing and replacing the flashboards. The concrete is in a good condition with only minor cracking and weathering. The flashboards are fairly new and in a solid condition.

d. Reservoir Area

The reservoir has a well-defined shoreline that extends about ¼ mile upstream to its headwaters and is bounded by woods and cultivated fields. The natural banks are between 5 and 8 feet above normal pool. There is a considerable amount of fallen timber around the reservoir perimeter. The lake was drained two years ago when the stoplogs were replaced.

e. Downstream Channel

Cartwheel Branch discharges into Gilman Lake 500 feet downstream from the dam in the same lagoon where Raccoon Creek enters Gilman Lake. The natural channel is narrow but well-defined and has rather steep wooded slopes. Although there are only two dwellings along the short channel section, Gilman Lake has extensive development all around its perimeter.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Procedures were not physically observed by the inspection team as there is little day-to-day operation.

4.2 MAINTENANCE OF DAM

The dam embankment and culvert are maintained by Gloucester County in a workmanlike fashion as part of their continual highway program.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facility is the set of stoplogs which are periodically adjusted by Mr. Wright.

4.4 DESCRIPTION OF WARNING SYSTEM IN EFFECT

None exists except for monitoring by County and local Municipal personnel during heavy storms.

4.5 EVALUATION

The present operational procedures and safeguards are deemed to be only marginally adequate in view of the hazard classification of the dam. Mr. Wright maintains and monitors the stoplogs regularly as part of his agricultural operations on the adjacent property. However, he informed the inspection team that during a flood in September 1940, the Lake Gilman Dam collapsed in spite of his family's efforts to subvert the flooding conditions.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

In accordance with the criteria in the Recommended Guidelines for Safety Inspection of Dams, it has been determined that the Wrights Mill Dam is small in size but is placed in the high hazard category. Accordingly the spillway design flood (SDF) was determined by the inspection team to be one-half the probable maximum flood (PMF). The inflow hydrograph was calculated using precipitation data from Hydrometeorological Report #33. In accordance with Corps of Engineers directives, the inflow hydrograph and flood routing were performed utilizing the HEC-1 computer program. The peak inflow to the reservoir for the ½ PMF was 3,822 cfs and when routed through the reservoir, reduced insignificantly to 3,788 cfs. The spillway capacity before overtopping occurs is 900 cfs and can accommodate only 24% of the design flood and is "inadequate" (see Section 7).

b. Experience Data

There were no records available concerning Wrights Mill Dam. However, local residents informed the inspection team that the dam has been overtopped several times in the past.

c. Visual Observations

The spillway and inlet operate satisfactorily and there is little evidence of excess outlet velocities although the downstream channel is scoured out approximately three feet below the paved invert of the culvert. Although the inlet is presently clear of debris, there is a considerable amount of fallen timber around the reservoir which would collect at the inlet should abnormally high water occur.

d. Overtopping Potential

Reviewing the results of the hydraulic analysis, the dam would be overtopped by approximately 4.5

feet at the peak of the design storm. Such a degree of overtopping would flood northward over the Elmer-Barnsboro Road and possibly discharge into Raccoon Creek.

e. Drawdown

It would take approximately 17 hours to dewater Wrights Mill Pond by removing the stoplogs to the bottom of the spillway (El. 87.0).

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Based on the existing conditions, the dam is deemed to be in moderately good condition except for the continual maintenance problem of roadway drainage at the ends of the bridge wingwalls and steel sheet piling. Although no safety hazard to crossing traffic is foreseen, a collapse of the culvert due to vehicular overloads could block the discharge channel and create a hydraulic stoppage. However, in view of its structural condition, this is very unlikely if legal load limits are observed. The roadway embankment is very wide in relation to its height and as a water impounding structure, has an adequate factor of safety. The depth and limits of the sheet piling are unknown but certainly contribute to the overall strength of the structure. Although some evidence of seepage was observed immediately northwest of the dam, it could not be ascertained whether this was due to percolation or leakage from the two abandoned 24" sluiceways under the old sawmill. However, in the opinion of the inspection team, this discharge is viewed as not serious insofar as the dam's overall safety is concerened.

b. Design and Construction Data

Although no hydraulic or structural computations were located, the inspection indicates that the concrete intake and arch culvert were conservatively designed and in spite of their age, are believed to be in a safe condition. It could not be determined when and for what reason the County installed the steel sheet piling along the front face of the dam. In regard to foundation conditions, from the lack of any visible settlement or major structural cracking of the culvert and based upon the experience of the inspection team, it is in all probability founded on timber piling with in-situ timber T. & G. cofferdam sheeting around the pilecap perimeter. The site is underlaid with recent alluvium

deposits of silt and sand with some clay and significant amounts of organic material near the surface. Overall drainage conditions are poor. The underlying formation is a combination of Bridgeton, Cohansey, Kirkwood and Pennsauken sands and the depth to bedrock is over 50 feet.

c. Operating Records

No records are available but the dam appears to function satisfactorily. There are no known instances where overtopping caused any appreciable damage. A part of the timber flashboards were replaced about 2 years ago but no records have been kept of such maintenance work.

d. Post Construction Changes

The only post-construction change in evidence is the steel sheet piling that has been installed along the upstream shoulderline.

e. Seismic Stability

The dam is located in Seismic Zone 1 and due to its embankment width and spillway geometry, has negligible vulnerability regarding earthquake design loadings. Experience indicates dams in Zone 1 will have adequate stability under dynamic loadings if stable under static loading conditions.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS
PROPOSED REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, Wrights Mill Dam is classified as being in a sound and satisfactory structural condition although the spillway is incapable of passing the design flood. The dam embankment was built of unknown composition but due to its broad width, steel sheet piling along the upstream face, timber cofferdam under the spillway and lack of any serious evidence of seepage, is felt to be of a sufficient impervious condition to withstand normal hydraulic heads. The present spillway capacity is inadequate and does not meet the requirements of the Recommended Guidelines for Safety Inspection of Dams, being able to accommodate only 24% of the design flood as calculated by Corps of Engineers criteria. The SDF is calculated to overtop the dam by 4.5 feet at the low points along the roadway. Such a substantial overtopping would seriously endanger 3 or more dwellings immediately downstream of the dam and the shoreline residences of the Lake Gilman farther downstream. However, the spillway is not classified as "seriously inadequate," UNSAFE, NON-EMERGENCY as failure from overtopping would not significantly increase the hazard to human life downstream. In the event of the PMF storm the downstream residences would already be partially inundated by backwater from the downstream dam and the additional discharge from this rather small lake would contribute rather insignificantly to the hazard condition.

b. Adequacy of Information

The information gathered for the Phase I inspection is deemed to be adequate regarding the structural stability of the dam. However, no recent surveys or inspections have reportedly been made.

c. Urgency

It is recommended that the remedial measures enumerated below be performed in the near future.

d. Necessity for Further Study

Due to the high hazard classification of the dam and the fact that the spillway is inadequate, further engineering hydraulic studies are recommended. Additionally, the location of the 24" lines into the mill should be determined and their leakage evaluated.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Alternatives

On the basis of the inspection, physical improvements to the present spillway are not warranted until further studies are completed. The downstream face of the embankment at the extreme low point in the roadway profile could be further protected with slope paving and in effect, act as an auxiliary spillway should overtopping occur. Additionally, the embankment areas at the ends of all the downstream bridge wingwalls and the steel sheeting on the upstream face should be regraded and stabilized with slope protection. Other recommended remedial measures included:

1) removal of the dead trees and root systems on the downstream embankment;

2) place riprap in the downstream channel immediately below the outlet.

b. O&M Maintenance and Procedures

No additional procedures at the dam other than those presently in effect appear to be warranted.

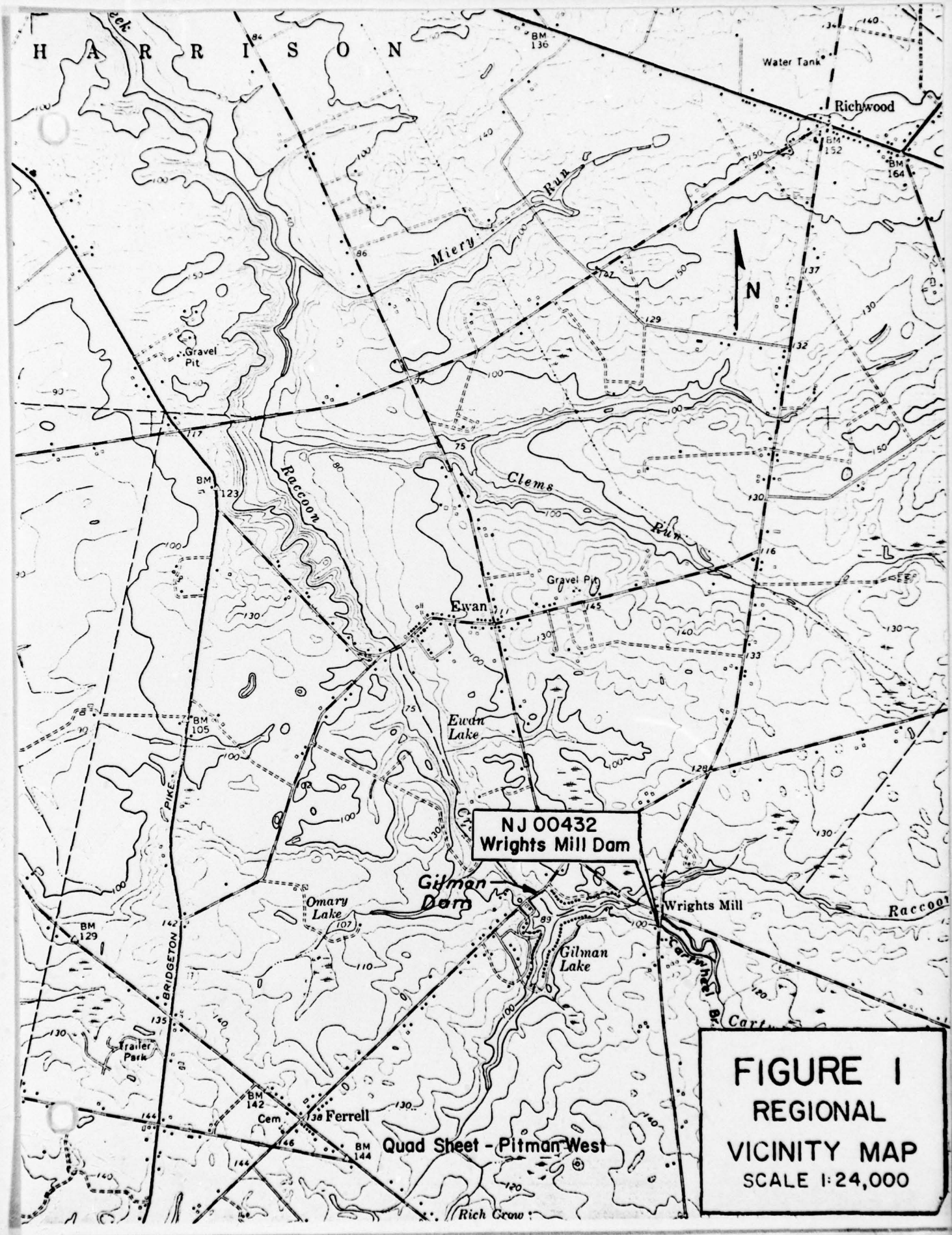
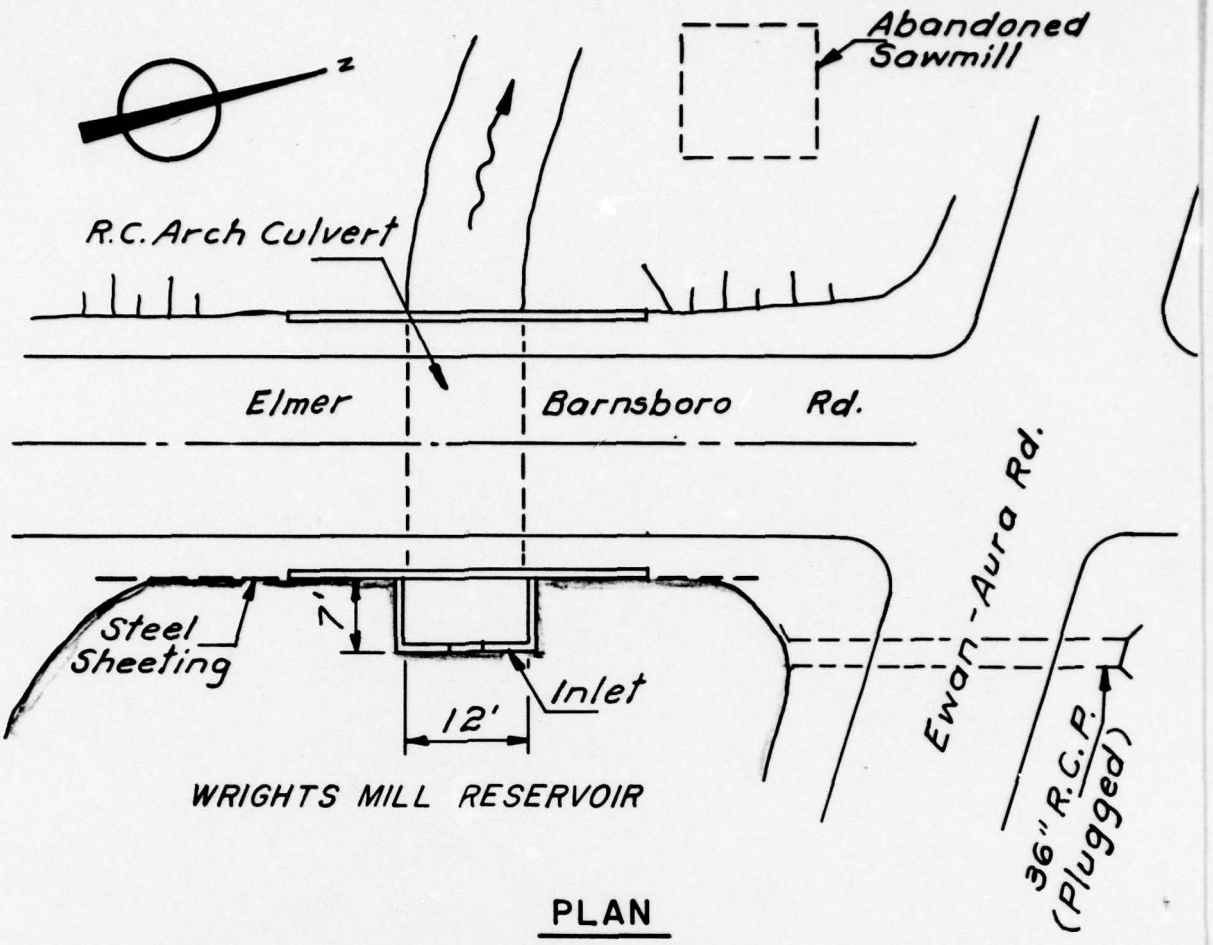
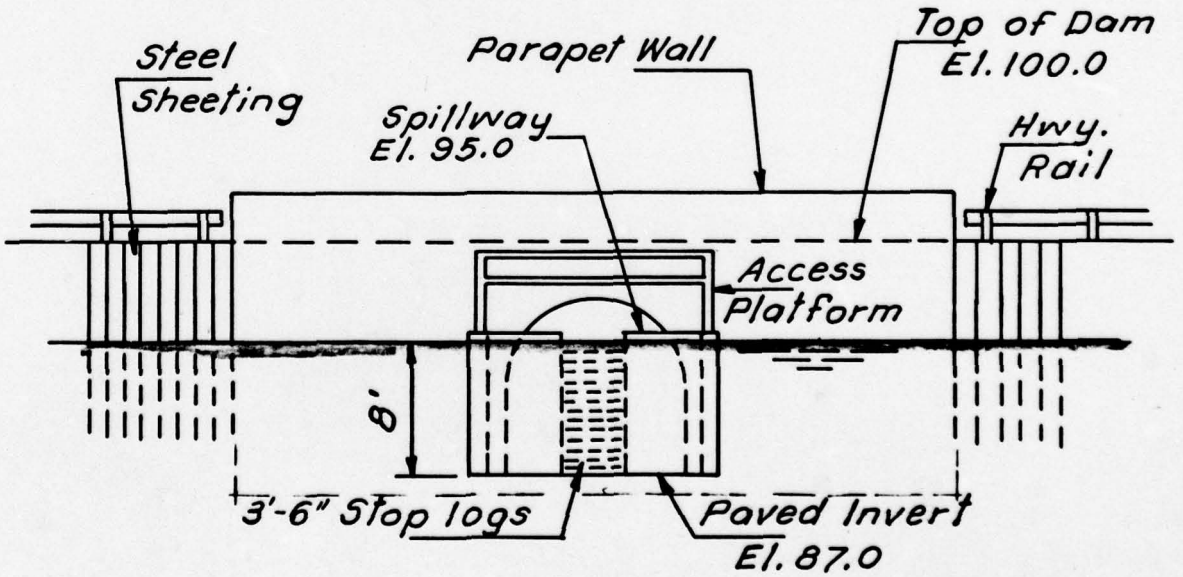


FIGURE 1
REGIONAL VICINITY MAP
SCALE 1:24,000



PLAN



INLET ELEVATION

FIGURE 2

Check List
Visual Inspection
Phase 1

Name Dam Wrights Mill Dam County Gloucester State New Jersey Coordinators NJDEP

Date(s) Inspection 9 May 1979 Weather Clear Temperature 82 °F

Pool Elevation at Time of Inspection 95.2± M.S.L. Tailwater at Time of Inspection 87± M.S.L.

Inspection Personnel:

K. Jolls

L. Baines

K. Greenfield

K. Jolls Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed in 2 lane asphalt road on dam crest	Effective length goes from street intersection at west end to approximately east edge of lake (in front of house)
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Satisfactory	Roadway elevation = top of dam
RIPRAP FAILURES	No riprap	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
Excessive Shrub Growth, trees etc.	Several large trees on both slopes. (diameter from 2" to 15".	Remove dead trees and roots.
FUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Satisfactory. No defined abutment areas.	
ANY NOTICEABLE SEEPAGE	None except from 2-24 "Ø lines into old sawmill area (inlet locations unknown).	Old sawmill located to the right of spillway just below crest.
STAFF GAGE AND RECORDER	None	
DRAINS	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Good Condition	Depth from spillway crest to downstream channel = 8 feet
APPROACH CHANNEL	Main Lake reservoir	
DISCHARGE CHANNEL	Clear of debris	
BRIDGE AND PIERS	Satisfactory condition	County Bridge #7-H- 5 William C. Cattell C.E. Built 1926. Mr. Wright stated his grandfather paid to have the spillway built.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Approximately 2H:IV - surrounding land 5'-8' above lake level.	
SEDIMENTATION	Heavy sedimentation. Some debris on west shoreline.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Well defined but narrow channel	
SLOPES	Steep; wooded	
APPROXIMATE NO. OF HOMES AND POPULATION	Only 1 or 2 (approx. at high water)	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	None Available
REGIONAL VICINITY MAP	Available (U.S.G.S. Quad)
CONSTRUCTION HISTORY	Not Available
TYPICAL SECTIONS OF DAM	Not available
HYDROLOGIC/HYDRAULIC DATA	Not available
OUTLETS - PLAN	Not available
- DETAILS	Not available
-CONSTRAINTS	Not available
-DISCHARGE RATINGS	Not available
RAINFALL/RESERVOIR RECORDS	None

ITEM	REMARKS
SPILLWAY PLAN	Not available
SECTIONS	Not available
DETAILS	Not available
OPERATING EQUIPMENT PLANS & DETAILS	Not available

ITEM	REMARKS
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS	Not available
HYDROLOGY & HYDRAULICS	Not available
DAM STABILITY	Not available
SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS	Not available
BORING RECORDS	Not available
LABORATORY	Not available
FIELD	Not available
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	Unknown

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

May, 1979

View of Spillway

April, 1979

View of Spillway Outlet

May, 1979

View of Crest Looking Southwest

May, 1979

View of Downstream Channel

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.7 sq. mi

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 95 MSL (70 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 100 MSL (107 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: unknown

ELEVATION TOP DAM: 100 MSL

CREST: Asphalt-paved country road

a. Elevation 100 MSL
b. Type Road embankment with three-sided drop inlet (see below).
c. Width 40+ feet
d. Length 120 feet
e. Location Spillover 30 feet from right abutment
f. Number and Type of Gates None

OUTLET WORKS: Spillway.

a. Type Three-sided drop inlet
b. Location 30 feet from right abutment
c. Entrance inverts 95 MSL
d. Exit inverts 87 MSL
e. Emergency draindown facilities Removeable stoplogs

HYDROMETEOROLOGICAL GAGES: None
a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 900 cfs

BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A1 OF

CHKD. BY DATE WRIGHTS MILL RAM PROJECT C234

SUBJECT

Time of concentration:

length along water course to drainage divide = 1.55 miles
= 8184 feet

$\Delta H \approx 50'$ Slope $= \frac{50 \times 100}{8184} = 0.6\%$

Assume a velocity of 2 feet s^{-1}

gives $t_c = \frac{8184}{2 \times 3600} = 1.14$ hours

By California Culverts Method:

gives $t_c = \left(\frac{11.9 \times 1.55^3}{50}\right)^{0.385} = 0.95$ hours

By Kirpichs formula:

gives $t_c = \frac{0.00013 \times 8184^{0.77}}{0.0061^{0.385}} = 0.95$ hours

Use $t_c = 0.95$ hours

$t_p = \frac{0.25}{2} + 0.6 \times 0.95 = 0.70$ hours

$Q_p = \frac{484 \times 1.7}{0.7} = 1175$ cfs

BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A2 OF
CHKD. BY DATE WRIGHTS MILL DAM PROJECT C234
SUBJECT

Unitgraph :

Time (hours)	T/Tp	Dimensionless Ordinate	Q (cfs) = Qp x Do
0.25	0.36	0.22	259
0.50	0.71	0.78	917
0.75	1.07	0.99	1164
1.00	1.43	0.72	846
1.25	1.79	0.42	494
1.50	2.14	0.26	306
1.75	2.50	0.15	176
2.00	2.86	0.09	106
2.25	3.21	0.055	65
2.50	3.57	0.033	39
2.75	3.93	0.02	24

Precipitation :

Probable Maximum Precipitation for 200 square miles - 24 hours (in inches) = 23.8"

Maximum 6 hour percentage = 113%

Maximum 12 hour percentage = 123%

Maximum 24 hour percentage = 132%

BY. D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A3 OF

CHKD. BY. DATE WRIGHTS MILL DAM PROJECT C234

SUBJECT Spillway discharge capacity

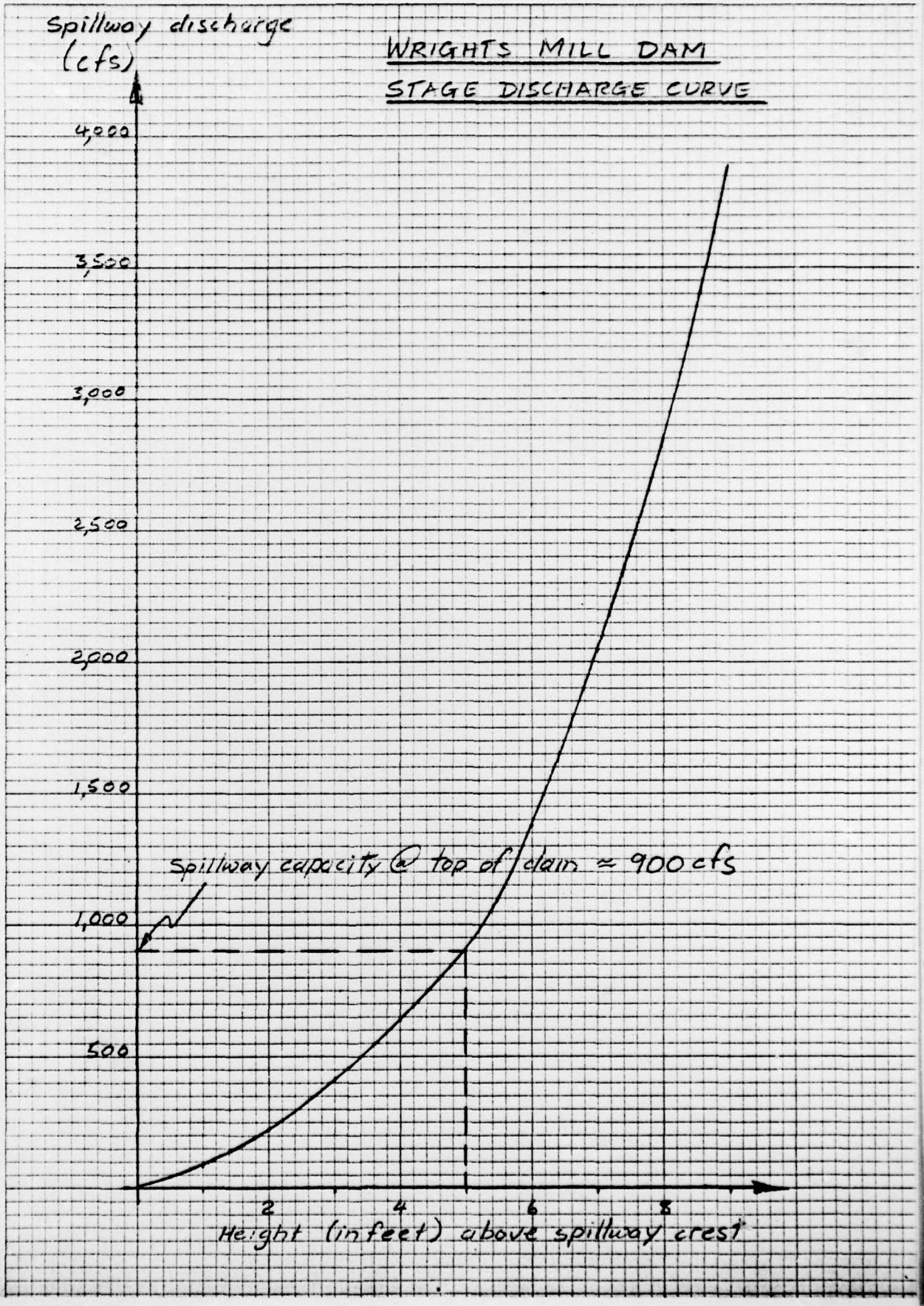
Spillway discharge:

flow over crest l = 26'			flow over dam L = 70' Effective			flow over bridge parapet L = 50'		
H	C	Q	H	C	Q	H	C	Q
0	3.1	0						
1	3.1	81						
2	3.1	228						
3	3.1	419						
4	3.1	645						
5	3.1	901	0	2.8	0			
6	3.1	1185	1	2.8	196			
7	3.1	1493	2	2.8	554			
8	3.1	1824	3	2.8	1018.			
9	3.1	2176	4	2.8	1568	1	28	140

ΣQ (cfs)

H above spillway crest	Q
0	0
1	81
2	228
3	419
4	645
5	901
6	1381
7	2047
8	2842
9	3884

NOTE:
Bridge parapet is approximately 3 feet higher than road and is about 50 feet in length. Total length of dam = 120 feet.



BY D.J.M. DATE 6-79
CHKD. BY ____ DATE ____
SUBJECT ____

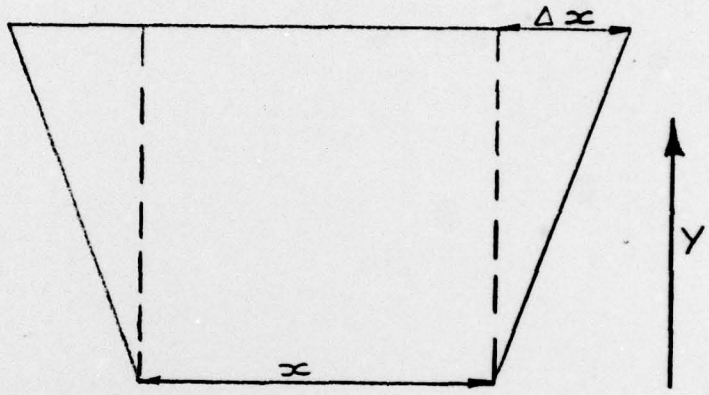
LOUIS BERGER & ASSOCIATES INC.

WRIGHTS MILL DAM

SHEET NO. A5 OF
PROJECT C 234

SURCHARGE STORAGE :

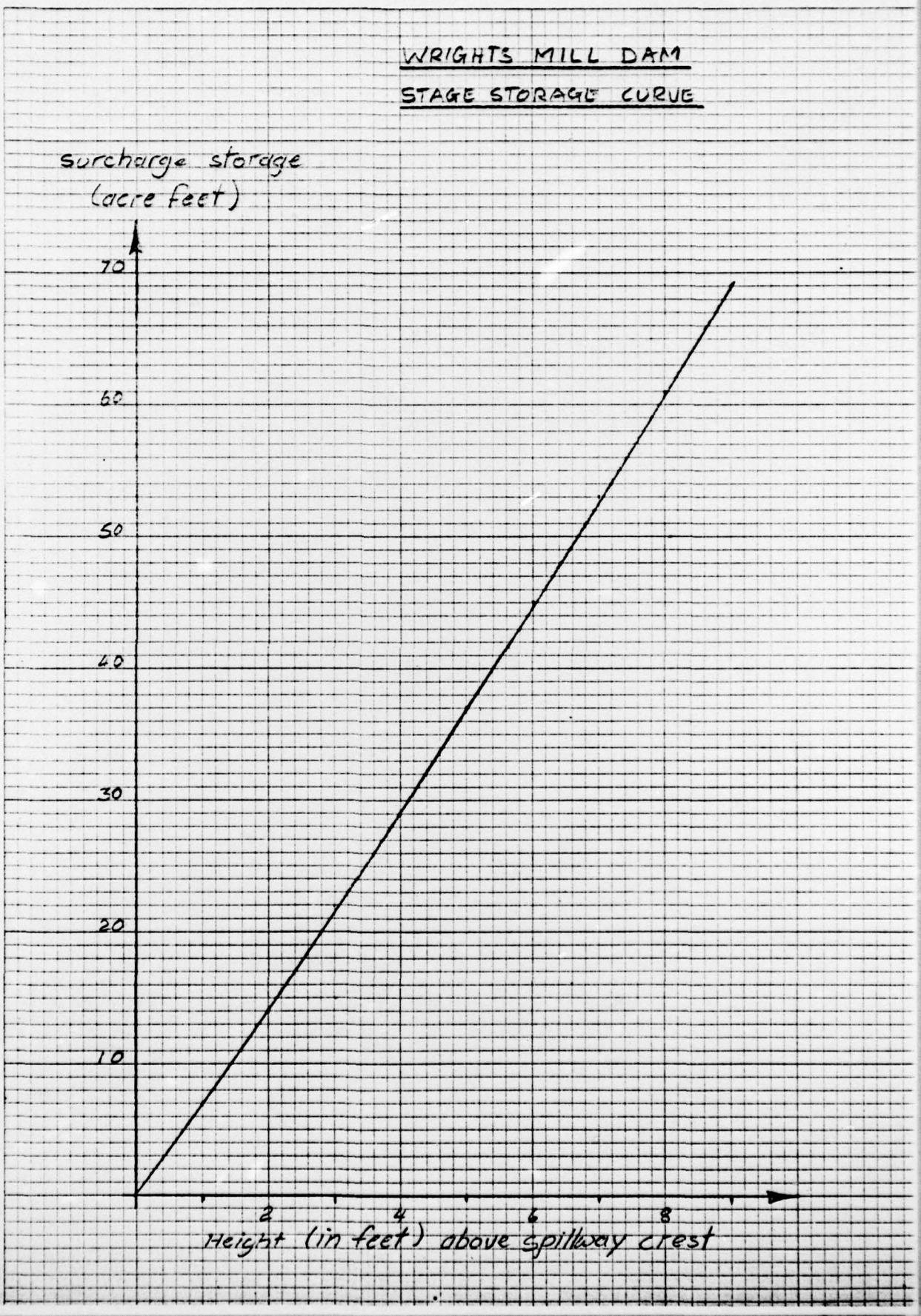
Area of lake @ normal pool = 7 acres
Area of lake @ top of dam = 7.8 acres
Area of 100' contour = 7.8 acres



Increment in volume $\Delta V = (x + \Delta x) Y$

Height in feet above spillway crest.	Surcharge storage (acre feet)
0	
1	7
2	14
3	22
4	29
5	37
6	45
7	53
8	61
9	69

Storage given to nearest acre foot.



GENERAL SUMMARY OF APPENDIX :

length of dam = 120 feet
effective length of spillway = 26'

Spillway capacity @ top of dam = 900 cfs

Surcharge storage @ top of dam = 37 acre feet
storage @ normal pool = 70 acre feet

∴ Total storage @ top of dam = 107 acre feet

Area of lake @ normal pool = 7 acres
Area of lake @ top of dam = 7.8 acres

Drainage area = 1.7 square miles.

BY D.J.M. DATE 7-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A8 OF
CHKD. BY DATE WRIGHTS MILL DAM PROJECT C234
SUBJECT

Available head = 8'±

Storage @ normal pool = 70 acre feet

Assume drawdown in two stages with no inflow and no tailwater condition
Discharge from $Q = 3.1 \times 3.5 \times H^{3/2}$

Stage i)

$H = 6'$

$Q \approx 160$ cfs

$\therefore$ time $\approx \dfrac{70 \times 43560}{2 \times 160 \times 3600}$

$= 2.65$ hours

Stage ii)

$H = 2'$

$Q \approx 31$ cfs

$\therefore$ time $\approx \dfrac{70 \times 43560}{2 \times 31 \times 3600}$

$= 13.66$ hours

Σ time $= 13.66 + 2.65$

$= 16.3$ Say 17 hours

WRIGHTS MILL&GILMAN LAKE DAMS (WRIGHTS MILL UPSTREAM FROM GILMAN)
BY D.J.M.
JUNE 29 1979

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	15	0	0	0	0	0	0	0

JOPER	NWT
3	0

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SUB-AREA RUNOFF COMPUTATION

INFLOW TO RESERVOIR

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	1.70	0.0	1.70	0.80	0.500	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	23.80	113.00	123.00	132.00	0.0	0.0	0.0

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

GIVEN UNIT GRAPH. NUHGQ= 11

259.	917.	1164.	846.	494.	306.	176.	106.	65.	39.
24.									

UNIT GRAPH TOTALS 4396. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.03	0.00	0.
2	0.03	0.00	0.
3	0.03	0.00	0.
4	0.03	0.00	0.
5	0.03	0.00	0.
6	0.03	0.00	0.
7	0.03	0.00	0.
8	0.03	0.00	0.
9	0.03	0.00	0.
10	0.03	0.00	0.
11	0.03	0.00	0.
12	0.03	0.00	0.
13	0.03	0.00	0.

LOUIS BERGER & ASSOCIATES INC.

14	0.03	0.00	0.
15	0.03	0.00	0.
16	0.03	0.00	0.
17	0.03	0.00	0.
18	0.03	0.00	0.
19	0.03	0.00	3.
20	0.03	0.00	6.
21	0.03	0.00	10.
22	0.03	0.00	12.
23	0.03	0.00	14.
24	0.03	0.00	14.
25	0.08	0.05	28.
26	0.08	0.05	75.
27	0.08	0.05	134.
28	0.08	0.05	177.
29	0.08	0.05	202.
30	0.08	0.05	218.
31	0.08	0.05	227.
32	0.08	0.05	232.
33	0.08	0.05	236.
34	0.08	0.05	238.
35	0.08	0.05	239.
36	0.08	0.05	239.
37	0.08	0.05	239.
38	0.08	0.05	239.
39	0.08	0.05	239.
40	0.08	0.05	239.
41	0.08	0.05	239.
42	0.08	0.05	239.
43	0.08	0.05	239.
44	0.08	0.05	239.
45	0.08	0.05	239.
46	0.08	0.05	239.
47	0.08	0.05	239.
48	0.08	0.05	239.
49	0.54	0.51	358.
50	0.54	0.51	778.
51	0.54	0.51	1312.
52	0.54	0.51	1700.
53	0.65	0.62	1954.
54	0.65	0.62	2193.
55	0.65	0.62	2399.
56	0.65	0.62	2539.
57	0.81	0.78	2663.
58	0.81	0.78	2862.
59	0.81	0.78	3080.
60	0.81	0.78	3228.
61	2.04	2.02	3635.
62	2.04	2.02	4823.
63	2.04	2.02	6294.
64	2.04	2.02	7358.
65	0.75	0.73	7645.
66	0.75	0.73	6846.
67	0.75	0.73	5565.
68	0.75	0.73	4604.
69	0.59	0.57	4005.
70	0.59	0.57	3510.
71	0.59	0.57	3125.
72	0.59	0.57	2852.
73	0.04	0.02	2546.
74	0.04	0.02	1943.

75	0.04	0.02	1245.
76	0.04	0.02	763.
77	0.04	0.02	482.
78	0.04	0.02	307.
79	0.04	0.02	207.
80	0.04	0.02	149.
81	0.04	0.02	113.
82	0.04	0.02	92.
83	0.04	0.02	78.
84	0.04	0.02	78.
85	0.04	0.02	78.
86	0.04	0.02	78.
87	0.04	0.02	78.
88	0.04	0.02	78.
89	0.04	0.02	78.
90	0.04	0.02	78.
91	0.04	0.02	78.
92	0.04	0.02	78.
93	0.04	0.02	78.
94	0.04	0.02	78.
95	0.04	0.02	78.
96	0.04	0.02	78.
97	0.0	0.0	74.
98	0.0	0.0	57.
99	0.0	0.0	37.
100	0.0	0.0	22.
SUM	25.12	22.60	99629.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7645.	3695.	1038.	996.	99630.
INCHES		20.22	22.72	22.72	22.72
AC-FT		1833.	2060.	2060.	2060.

RUNOFF MULTIPLIED BY 0.50

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	1.	3.
5.	6.	7.	7.	14.	38.	67.	89.	101.	109.
113.	116.	118.	119.	119.	119.	119.	119.	119.	119.
119.	119.	119.	119.	119.	119.	119.	119.	179.	389.
656.	850.	977.	1097.	1200.	1269.	1332.	1431.	1540.	1614.
1817.	2411.	3147.	3679.	3822.	3423.	2783.	2302.	2002.	1755.
1562.	1426.	1273.	971.	622.	382.	241.	154.	103.	74.
57.	46.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	37.	29.	18.	11.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3822.	1847.	519.	498.	49815.
INCHES		10.11	11.36	11.36	11.36
AC-FT		917.	1030.	1030.	1030.

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HYDROGRAPH ROUTING

ROUTING THROUGH RESERVOIR

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
11	1	0	0	0	0	1

ROUTING DATA

BY O.J.M. DATE ________ **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A12 OF ____

CHKD. BY ______ DATE ________ WRIGHTS MILL DAM PROJECT C-234

SUBJECT ________

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	0.

STORAGE=	0.	7.	14.	22.	29.	37.	45.	53.	61.	69.
OUTFLOW=	0.	81.	228.	419.	645.	901.	1381.	2047.	2842.	3884.

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	0.	0.
2	0.	0.	0.
3	0.	0.	0.
4	0.	0.	0.
5	0.	0.	0.
6	0.	0.	0.
7	0.	0.	0.
8	0.	0.	0.
9	0.	0.	0.
10	0.	0.	0.
11	0.	0.	0.
12	0.	0.	0.
13	0.	0.	0.
14	0.	0.	0.
15	0.	0.	0.
16	0.	0.	0.
17	0.	0.	0.
18	0.	0.	0.
19	0.	1.	0.
20	0.	2.	1.
21	0.	4.	1.
22	0.	6.	2.
23	0.	6.	3.
24	0.	7.	4.
25	0.	11.	5.
26	1.	26.	10.
27	2.	52.	19.
28	3.	78.	31.
29	4.	95.	45.
30	5.	105.	58.
31	6.	111.	69.
32	7.	115.	79.
33	7.	117.	91.
34	8.	118.	101.
35	8.	119.	107.
36	8.	119.	112.
37	9.	119.	114.
38	9.	119.	116.
39	9.	119.	117.
40	9.	119.	118.
41	9.	119.	119.
42	9.	119.	119.
43	9.	119.	119.
44	9.	119.	119.
45	9.	119.	119.
46	9.	119.	119.
47	9.	119.	119.
48	9.	119.	119.
49	9.	149.	130.
50	12.	284.	185.
51	18.	522.	314.

BY D.J.M. DATE _____ **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A13 OF

CHKD. BY _____ DATE _____ WRIGHTS MILL DAM PROJECT C-234

SUBJECT _____

52	25.	753.	506.
53	31.	913.	709.
54	36.	1037.	872.
55	40.	1148.	1068.
56	42.	1234.	1195.
57	43.	1301.	1276.
58	45.	1381.	1357.
59	46.	1486.	1471.
60	47.	1577.	1569.
61	49.	1716.	1705.
62	53.	2114.	2087.
63	60.	2779.	2788.
64	66.	3413.	3498.
65	68.	3751.	3788.
66	67.	3623.	3598.
67	62.	3103.	3030.
68	58.	2542.	2514.
69	54.	2152.	2148.
70	51.	1879.	1890.
71	49.	1659.	1676.
72	47.	1494.	1508.
73	45.	1349.	1365.
74	42.	1122.	1179.
75	37.	797.	892.
76	31.	502.	698.
77	25.	311.	505.
78	20.	197.	365.
79	16.	129.	272.
80	13.	89.	202.
81	10.	65.	153.
82	9.	51.	117.
83	7.	43.	90.
84	7.	39.	76.
85	6.	39.	68.
86	5.	39.	62.
87	5.	39.	57.
88	5.	39.	53.
89	4.	39.	50.
90	4.	39.	48.
91	4.	39.	46.
92	4.	39.	45.
93	4.	39.	43.
94	4.	39.	43.
95	4.	39.	42.
96	4.	39.	41.
97	4.	38.	41.
98	3.	33.	39.
99	3.	24.	36.
100	3.	15.	31.
SUM			49695.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3788.	1028.	518.	497.	49695.
INCHES		10.00	11.33	11.33	11.33
AC-FT		907.	1027.	1027.	1027.

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