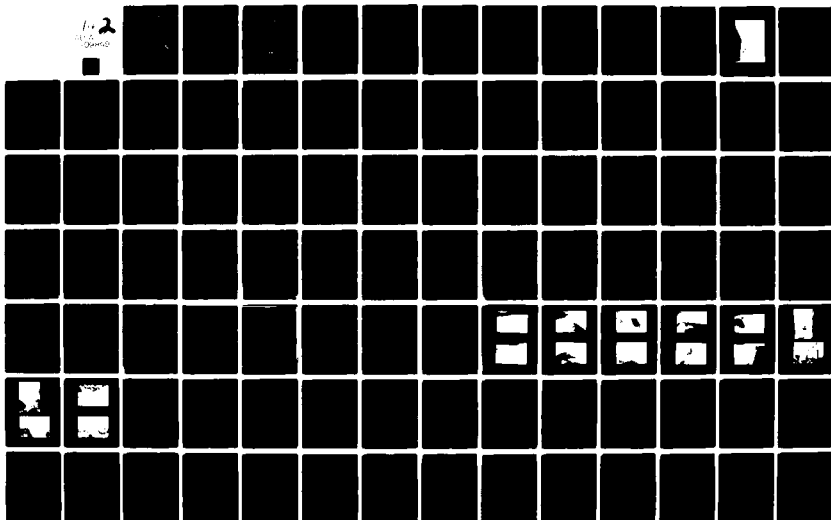


AD-A109 899

TIPPETTS-ABBETT-MCCARTHY-STRATTON NEW YORK
NATIONAL DAM SAFETY PROGRAM. RIO DAM (INVENTORY NUMBER NY 497).--ETC(U)
SEP 81 E O'BRIEN
DACW51-81-C-0008
NL

UNCLASSIFIED

1-2
1-2
1-2



A
989

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)

Phase I Inspection Report

Rio Dam

Delaware River Basin, Orange County, NY
Inventory 4975. TYPE OF REPORT & PERIOD COVERED
Phase I Inspection Report
National Dam Safety Program

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)

EUGENE O'Brien

8. CONTRACT OR GRANT NUMBER(s)

DACW51-81-C-0008

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Tippett's-Abbett-McCarthy-Stratton

The TAMS Building

655 Third Avenue New York, New York 10017

10. PROGRAM ELEMENT, PROJECT, TASK
AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS

Department of the Army

26 Federal Plaza New York District, CofE

New York, New York 10287

12. REPORT DATE

14 September 1981

13. NUMBER OF PAGES

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

Department of the Army

26 Federal Plaza New York District, CofE

New York, NY 10287

15. SECURITY CLASS. (of this report)

UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING
SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution unlimited.

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

18. SUPPLEMENTARY NOTES

"Original contains color
plates; All DTIC reproduct-
ions will be in black and
white"

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

Dam Safety

National Dam Safety Program

Visual Inspection

Hydrology, Structural Stability

Rio Dam

Orange County

Delaware River Basin

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

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Examination of available documents and a visual inspection of the dam and the appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property.

AD A109899

DTIC
ELE
JAN 22 1982
H

Using Corps of Engineers' Screening Criteria, it has been determined that the dam would be overtopped for all storms exceeding approximately 57.7 percent of Probable Maximum Flood (PMF). The spillway is, therefore, adjudged as "inadequate".

Structural stability analyses performed, based on available information and visual inspection indicate that the spillway section is inadequate with respect to overturning and sliding stability, when subjected to $\frac{1}{2}$ PMF or PMF loading conditions. The basis for this determination of inadequacy are criteria established by the Corps of Engineers (Ref. 1).

In addition, the nature and sources of seepage waters present at the downstream toe of the dam need to be further investigated.

DELAWARE RIVER BASIN

RIO DAM

**ORANGE COUNTY, NEW YORK
INVENTORY NO. N.Y. 497**

**PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM**



**APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED**

NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1981

01 15 82 068

⁴ **DELAWARE RIVER BASIN**

² **RIO DAM**

ORANGE COUNTY, NEW YORK

³ **INVENTORY NO. N.Y. 497**

**PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM**



NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1981

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

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

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. 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 SAFETY PROGRAM
RIO DAM
I.D. NO. N.Y. 497
D.E.C. NO. 149B - 86
DELAWARE RIVER BASIN
ORANGE AND SULLIVAN COUNTIES, NEW YORK

CONTENTS

	Page No.
- ASSESSMENT	-
- OVERVIEW PHOTOGRAPH	-
1 PROJECT INFORMATION	1
1.1 GENERAL	1
a. Authority	1
b. Purpose of Inspection	1
1.2 DESCRIPTION OF THE PROJECT	1
a. Description of Dam and Appurtenant Structures	1
b. Location	2
c. Size Classification	2
d. Hazard Classification	2
e. Ownership	2
f. Purpose	2
g. Design and Construction	2
h. Normal Operating Procedures	3
1.3 PERTINENT DATA	3
a. Drainage Area	3
b. Discharge at Damsite	3
c. Elevation	3
d. Reservoir	3
e. Storage	3
f. Dam	3
g. Spillway	3
h. Reservoir Drain	3
i. Penstock System	3
2 ENGINEERING DATA	5
2.1 GEOLOGY	5

Accession For	
NTIS GPA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and or Special
A	23



	<u>Page No.</u>
2.2 SUBSURFACE INVESTIGATIONS	5
2.3 DAM AND APPURTENANT STRUCTURES	5
2.4 CONSTRUCTION RECORDS	5
2.5 OPERATING RECORDS	5
2.6 EVALUATION OF DATA	6
3 VISUAL INSPECTION	7
3.1 FINDINGS	7
a. General	7
b. Embankment	7
c. Spillway	7
d. Seepage	7
e. Appurtenant Structures	7
f. Downstream Channel	8
g. Abutments	8
h. Reservoir Area	8
3.2 EVALUATION OF OBSERVATIONS	8
4 OPERATIONAL & MAINTENANCE PROCEDURES	9
4.1 PROCEDURES	9
4.2 MAINTENANCE OF THE DAM	9
4.3 WARNING SYSTEM IN EFFECT	9
4.4 EVALUATION	9
5 HYDRAULIC/HYDROLOGIC	10
5.1 DRAINAGE AREA CHARACTERISTICS	10
5.2 ANALYSIS CRITERIA	10
5.3 SPILLWAY CAPACITY	10
5.4 RESERVOIR CAPACITY	10
5.5 FLOODS OF RECORD	11
5.6 OVERTOPPING POTENTIAL	11
5.7 EVALUATION	11

	<u>Page No.</u>
6 STRUCTURAL STABILITY	12
6.1 EVALUATION OF STRUCTURAL STABILITY	12
a. Visual Observations	12
b. Design and Construction Data	12
c. Operating Records	12
d. Post-Construction Changes	12
e. Seismicity	12
6.2 STRUCTURAL STABILITY ANALYSIS	12
7 ASSESSMENT/RECOMMENDATIONS	14
7.1 ASSESSMENT	14
a. Safety	14
b. Adequacy of Information	14
c. Need for Additional Investigations	14
d. Urgency	15
7.2 RECOMMENDED MEASURES	15

APPENDICES

- A. DRAWINGS
- B. PHOTOGRAPHS
- C. VISUAL OBSERVATION
- D. HYDROLOGIC DATA & COMPUTATIONS
- E. STRUCTURAL STABILITY ANALYSIS
- F. REFERENCES
- G. OTHER DATA

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NAME OF DAM: Rio Dam (I.D. No. N.Y. 497)
STATE LOCATED: New York
COUNTY LOCATED: Orange and Sullivan
STREAM: Mongaup River
BASIN: Delaware River
DATE OF INSPECTION: 8 July 1981

ASSESSMENT

Examination of available documents and a visual inspection of the dam and the appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property.

Using Corps of Engineers' Screening Criteria, it has been determined that the dam would be overtopped for all storms exceeding approximately 57.7 percent of Probable Maximum Flood (PMF). The spillway is, therefore, adjudged as "inadequate".

Structural stability analyses performed, based on available information and visual inspection indicate that the spillway section is inadequate with respect to overturning and sliding stability, when subjected to $\frac{1}{2}$ PMF or PMF loading conditions. The basis for this determination of inadequacy are criteria established by the Corps of Engineers (Ref. 1).

In addition, the nature and sources of seepage waters present at the downstream toe of the dam need to be further investigated.

It is, therefore, recommended that within 3 months of notification to the owner, investigation and analysis of embankment stability with respect to seepage should be performed. The results of this investigation and analysis will determine the appropriate remedial measures which will be required. In the interim, continued use of the present Emergency Action Plan and Periodic Inspection Practice will be sufficient to monitor the facility during periods of heavy rainfall.

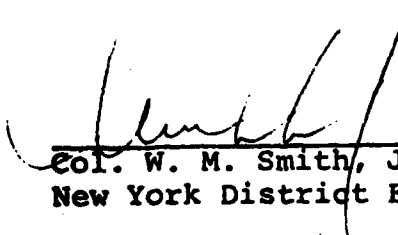
In addition, the dam has a number of problem areas which require further attention. The following remedial measures must be completed within one year:

- Repair distressed areas of wood stave penstock to facilitate its future use as an emergency reservoir drain system.
- Remove small bushes, brush and trees growing on both downstream and upstream embankment slopes.
- Monitoring of seepage using the existing weir systems should be continued.



Eugene O'Brien, P.E.
New York No. 29823

Approved By:



Col. W. M. Smith, Jr.
New York District Engineer

Date:

14 Sep 81



1. OVERVIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
RIO DAM
I.D. NO. N.Y. 497
D.E.C. NO. 149B - 86
DELAWARE RIVER BASIN
ORANGE AND SULLIVAN COUNTIES, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers Contract No. DACW 51-81-C-0008, Modification P00001 in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, dated 8 August 1972.

b. Purpose of Inspection

This inspection was conducted to evaluate the existing condition of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property and to recommend remedial measures where required.

1.2 DESCRIPTION OF THE PROJECT

a. Description of Dam and Appurtenant Structures

The Rio Dam is an earthfill embankment with a concrete overflow section located about mid-length along the 1,487 foot long structure. The maximum height of the dam at the overflow section is 101 feet. The embankment portion of the structure is a zoned fill. The central core is composed of sandy clay and has a top width of about 10 feet, side slopes of 2 Vertical to 1 Horizontal (2V:1H) and extends into an impervious foundation stratum. The outer shell of the embankment is constructed of sand, gravel and boulder fill using slope ratios of 1V:3H on the upstream and 1V:2H on the downstream. Crest of the dam is 20 feet wide and serves as a public roadway. Random stone riprap covers the entire upstream slope of the dam whereas only portions of the downstream slope within the lateral extent of the spillway abutment walls are similarly protected.

An intake having an invert at El 769.5 is located at the right spillway abutment to supply flow through an 11.0 foot diameter wood stave penstock to a small hydroelectric generating station located about 1.5 miles downstream of the dam. It is

reported that some segments of the penstock are damaged and therefore it has not been in use for the past 2 years.

The centrally located spillway section of the dam is a concrete gravity structure 264 feet in length, having a maximum height of 101 feet. Overflow is concrete through eight 30 foot wide bays separated by 3 feet wide piers which support a roadway bridge deck. Flow is controlled using flashboards; to a maximum design height of 5 feet. The flashboard system is designed to release when lake levels reach 2 feet above the top of flashboards. The dam has no reservoir drain. If repaired, the penstock could be used to partially drain the reservoir.

b. Location

The Rio Dam is located on the Mongaup River, a tributary of the Delaware River, about 1.5 miles northwest of the town of Rio and about 13 miles south-southwest of the City of Monticello, on the border of Sullivan and Orange Counties, New York.

c. Size Classification

The dam is 101 feet high and has a reservoir storage capacity of 19,978 acre-feet and, therefore, is classified as a large dam.

d. Hazard Classification

The dam is in the "high" hazard potential category due to location of a hydroelectric generating station and the village of Mongaup, 1.5 miles and 4 miles downstream, respectively.

e. Ownership

The dam is owned and operated by Orange and Rockland Utilities Inc., One Blue Hill Plaza, Pearl River, N.Y. 10965, Tel Nos. (914) 627-2420 or (914) 352-6000. Prime contacts are Mr. Frank E. Fischer; Vice President and Mr. Donald Lavers, Supervisor-in-charge of Engineering.

f. Purpose

The dam provides storage for hydroelectric power development. Presently and over the past two years, power has not been generated at the facility. Recreation is permitted on the lake except at the southern end where the dam is located.

g. Design and Construction

The dam was designed by Charles H. Tenney & Co., 200 Devonshire Road, Boston, Massachusetts in 1925. The dam

was constructed between 1926 and 1927 by Fred T. Ley, Inc., General Contractor, Boston, Massachusetts. Resurfacing of both the spillway chute and roadway have been performed in recent years by the owner.

h. Normal Operating Procedures

Discharge through the spillway is presently controlled with two flash boards to El 811.2 present in the 5 western most spillway bays whereas single boards to El 810.67 are present in the remaining 3 eastern bays. Since the power unit associated with Rio Dam is presently not on line, the flow from the reservoir is regulated over the spillway by using the flashboards as a function of discharge from Swinging Bridge Dam and Toronto Dam, located upstream in order to maintain a relatively constant lake level for recreational purposes.

1.3 PERTINENT DATA

a. Drainage Area 202 square miles

b. Discharge at Damsite cfs

Uncontrolled Spillway at
Maximum Pool (El. 825.00) 62,090 cfs

c. Elevation, USGS Datum MSL

Maximum Pool, Top of Dam	825.00 feet
Maximum Design Pool	822.00 feet
Spillway: Crest	810.00 feet
Top of	
Flashboard (designed)	815.00 feet
Invert Penstock Inlet	769.50 feet

d. Reservoir

Length of Maximum Pool	3,910 feet
Surface Area @ Maximum Pool	542 acres

e. Storage

Normal Pool	13,110 acre-feet
Maximum Pool	19,978 acre-feet

f. Dam

Type	Earthfill w/concrete spillway section
Height	101 feet
Length	1,487 feet
Upstream Slope	1V:3H
Downstream Slope	1V:2H
Crest Elevation	825.00 feet
Crest Width,	20 feet
Cut Off Type	Penetrating clay core in earthfill section; shallow concrete wall in spillway section
Grout Curtain	None

g. Spillway

Type	Controlled "ogee" concrete gravity structure
Crest Elevation	810.00 feet
Width: Total:	264 feet (total)
Effective:	240 feet (hydraulic)
Flow Regulation	Flashboards (5 feet maximum)

h. Reservoir Drain

Type	None
------	------

i. Penstock System

Intake invert elevation	769.5 feet
Pipe Construction	Steel/Wood Stave
Pipe Diameter	11.0 feet

SECTION 2 - ENGINEERING DATA

2.1 GEOLOGY

The Rio Dam is located in the "Appalachian Uplands" Physiographic province of New York State. This province (northern extreme of the Appalachian Plateau) was formed by dissection of the uplifted but flat lying sandstones and shales of the middle and upper Deconian Catskill Delta. Relief is high to moderate. Maximum dissection occurs in the Catskill Mountain area, where only the mountain peaks approximately the original plateau surface. Drainage is generally south or southwest toward the Delaware River system. Bedrock which out crops at the river bed near the toe of the spillway is a fine grained sandstone dipping about 5-10 degrees to the north. Strike is to the west and estimated to be 5-10 degrees.

2.2 SUBSURFACE INVESTIGATIONS

A subsurface investigation was conducted. The results of the investigation are presented in conjunction with the available design drawings in Appendix A - Drawing KK-3-52. In general, the investigation indicated that the soils at the site are alluvial in the lower river area, whereas the near surface soils in the upland portions of the valley are primarily of glacial origin being composed of clay, sand and gravel with occasional zones of boulders. Underlying bedrock consists of interlayered sandstone and shales.

2.3 DAM AND APPURTENANT STRUCTURES

The dam was designed by Charles H. Tenney & Co., 200 Devonshire Road, Boston, Massachusetts. All drawings available for review have been reproduced and are presented as one-half size reductions in Appendix A.

2.4 CONSTRUCTION RECORDS

No information regarding the construction of the dam is available, other than the date of construction, which is from 1926 to 1927, and the name of the contractor, Fred T. Let, Inc., Gunnite resurfacing of the spillway chute and apron and reconstruction of the roadway were performed during the 1970's by the owner.

2.5 OPERATING RECORDS

All information concerning operation and maintenance of the dam is on file at the Orange and Rockland Operations and Generating Center in Spring Valley, New York.

2.6 EVALUATION OF DATA

Some of the data presented in this report has been made available by representatives of Orange and Rockland Utilities Inc. All information gathered appears to be adequate and reliable for Phase I Inspection purposes.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The visual inspection of the Rio Dam was made on July 8, 1981. The weather was clear with temperatures ranging in the mid to high 90's. The reservoir level at the time of inspection was about El 811.20.

b. Embankment

The earth embankment shows no signs of noticeable distress. Both vertical and horizontal alignments of the structure show no signs of noticeable movement. Occasional small bushes, trees, and brush have become established on both upstream and downstream slopes. Minor longitudinal hairline cracks were observed in the asphalt roadway pavement surface.

c. Spillway

The spillway chute and apron appears generally in good structural condition. Minor longitudinal cracks exhibited along the chute appear to be associated with construction joints from the gunnite resurfacing. Minor spalling of the structure near downstream training walls was observed.

d. Seepage

Minor seepage was observed around the steel pipe at the head waters of the penstock as it exits the right spillway abutment. Seepage associated with a natural spring is flowing from the downstream left abutment and is collected into a small drainage ditch immediately downstream of the embankment toe. A wet marshy area at the toe of the dam was observed, approximately 20 feet northeast, at the end of the left spillway abutment. Source of surface water in the area appears to be seepage from the embankment toe. Seepage was also observed entering the spillway apron at the downstream left abutment (see photograph No. 15). Source of these waters may be a combination of bedrock groundwater, surface water runoff, and embankment seepage. Seepage waters observed in the vicinity of the toe of the dam were visibly free of suspended solids. Two weirs are located on the drainage ditches downstream of the embankment toe to facilitate measurement of collected seepage and surface water runoff. Approximate locations of these weirs are shown on the sketch which is included in Appendix C.

e. Appurtenant Structures

Gatehouse is in good condition. Penstock control valves are reported in good working order but were not operated during site inspection. Penstock is damaged and needs repair before it can be used in conjunction with power generation or partial drainage of the reservoir. Penstock gate valve has minor leak.

f. Downstream Channel

The spillway discharges directly into the natural rock channel of the Mongaup River. In the area immediately downstream of the dam (See Photograph 7) the channel is generally clear and unobstructed with the exception of a few fallen trees.

g. Abutments

The dam abutment areas are in good condition showing no signs of instability. Seepage waters are flowing from the bedrock, forming the left abutment immediately downstream of the dam.

h. Reservoir Area

No slides or general instability were observed along the reservoir shoreline in the general vicinity of the dam. No significant sedimentation was observed along the dam.

3.2 EVALUATION OF OBSERVATIONS

Although deficiencies were observed, there is no indication that the dam is in imminent danger. Some of the deficiencies noted previously are minor and should be corrected in conjunction with routine, whereas other conditions described, may present potential for further deterioration and consequently need for further investigation and correction.

The following is a summary of the problem areas encountered and recommended corrective measures requiring immediate attention:

- 1) Investigation nature and source of seepage waters present along the toe of the dam.
- 2) Repair distressed areas of wood stave penstock to facilitate its future use as an emergency reservoir drain system.
- 3) Remove small bushes, brush and trees growing on both upstream and downstream embankment slopes.

SECTION 4 - OPERATIONAL & MAINTENANCE PROCEDURES

4.1 PROCEDURES

The Rio Dam was previously used as a power generating dam for Orange and Rockland Utilities Inc. For the past two years the penstock has been closed as a result of a rupture in the wood stave section and no power generated. Previous operations included the operation of a single 11 foot diameter wood stave penstock to carry water from the reservoir to a power house located some 7,000 feet downstream. Flow is controlled by a sliding gate valve operated from the gatehouse atop the dam.

Spillway discharges as well as lake level is controlled using a system of flashboards located on the crest of the eight bay spillway

4.2 MAINTENANCE OF THE DAM

The dam is maintained by the owner, Orange and Rockland Utilities Inc. Maintenance is performed on an as-needed basis as determined by frequent inspections. Maintenance of the dam appears to be adequate with the exceptions as noted in "SECTION 4 - EVALUATION".

4.3 WARNING SYSTEM IN EFFECT

It is reported that an Emergency Action Plan (EAP) has been developed by the owner to monitor the three hydroelectric facilities located on the Mongaup River including the Rio Dam. Within this EAP a procedure for continual monitoring and reporting of flood level conditions is stated with procedures for notification of various public authorities in the event an emergency situation develops.

4.4 EVALUATION

Both the maintenance and operation procedures are inadequate in following areas:

- 1) Vegetation on both upstream and downstream embankment slopes.
- 2) Penstock is inoperable.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA CHARACTERISTICS

Rio Dam is located on the Mongaup River about 5 miles north of its junction with the West Branch Delaware River at Mongaup, Sullivan County, New York (HUC#02040104). The drainage area contributing to the reservoir is 202 square miles. The basin is approximately 25 miles along the north-south axis, with a maximum width of about 11 miles. The basin contains many lakes and reservoirs in addition to Rio Reservoir, and rises from a normal lake elevation of 810 MSL (invert of spillway) to over 2,200 ft in the north. Ground cover ranges from urban areas to national forest and includes farm lands, and wet lands.

5.2 ANALYSIS CRITERIA

The unit hydrographs and modeling parameters for the watershed, divided into 3 sub-areas were obtained from the "Upper Delaware River Basin Flood Routing Model"(Ref.2), prepared in 1976 by Water Resources Engineers Inc. (WRE), for the New York District of the U.S. Army Corps of Engineers. This model computed the Standard Project Flood for the entire watershed. The Rio Dam drainage area consists of sub-basins 49, 50 and 51 of the Delaware River basin model.

The Probable Maximum Precipitation for the Rio Dam watershed is 21-inches(Ref.3). The Probable Maximum Flood hydrograph was computed using the HEC-1DB computer package(Ref.4). It was necessary to extend the storage discharge rating of Swinging Bridge Dam to meet the PMF flows.

A total PMF inflow based on the combined output of Swinging Bridge Dam, Toronto Dam and the runoff contribution of the Rio Dam watershed was calculated to be 107,744 cfs was used for analysis.

5.3 SPILLWAY CAPACITY

The computed discharge capacities of the spillway at low chord of the roadway bridge, El 823.9 and at the top of dam, El 825 are 51,242 cfs and 62,090 cfs, respectively.

5.4 RESERVOIR CAPACITY

The reservoir capacity at the spillway crest, El 810, is given as 13,110 acre-feet (Ref.2). The computed surcharge storage of 6,868 acre-feet is equivalent to about 0.6-inches of runoff over the entire watershed.

5.5 FLOODS OF RECORD

Maximum flood was reported to be in August 1955. Records reservoir levels during this flood are the files of the owner.

5.6 OVERTOPPING POTENTIAL

The potential of the dam being overtopped was investigated on the basis of the spillway discharge capacity and the available surcharge storage to meet the combined PMF inflows.

Two cases were evaluated using the HEC-1DB analysis; Case A) flood build-up with no flashboards in place at the beginning of the PMF; and Case B) flood stage build-up with flashboards in place to El 815 at the beginning of the routing with safety release as water builds up to El 817.

During the flood series analyses the penstock gate was assumed to be closed and flashboards at the Toronto Reservoir were assumed absent. The results of the two Multi-Ratio Case analyses are as follows:

Case A No Flashboards at Rio Dam

<u>Ratio of PMF</u>	<u>Peak Outflow (cfs)</u>	<u>Overtopping (ft)</u>
1.0	107,523	4.69
0.75	79,675	2.28
0.50	51,090	0.00
0.25	24,389	0.00

Case B Flashboards to El 815 At Beginning of Flood

<u>Ratio of PMF</u>	<u>Peak Outflow (cfs)</u>	<u>Overtopping (ft)</u>
1.0	107,525	4.69
0.75	79,676	2.28
0.50	51,089	0.00
0.25	24,386	0.00

The maximum spillway discharge capacity (water surface at El 825) of 62,090 cfs is 57.7% of the peak PMF outflow.

5.7 EVALUATION

The spillway is unable to pass the PMF without the dam being overtopped, and is assessed as being "inadequate".

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations do not indicate conditions which would adversely affect the structural stability of the dam. The observed seepage at the embankment is not considered detrimental to the stability or safety of the dam at the present time.

b. Design and Construction Data

Design drawings prepared by Charles H. Tenney and Co. Engineers, Boston, Mass. were provided by the owner and provided the basis for stability evaluations. Data regarding the construction history of the structures was not available.

c. Operating Records

No major operational problems which would affect the stability of the dam were reported.

d. Post-Construction Changes

A complete resurfacing of the spillway chute and apron was performed in 1971 as a result of significant spalling. Reconstruction of the roadway spanning the crest was performed in 1979.

e. Seismicity

According to the guidelines and criteria set forth by the Corps of Engineers (Ref. 1) the dam is located in a Zone 1 seismic area.

6.2 STRUCTURAL STABILITY ANALYSIS

Structural stability of the concrete overflow section was evaluated. The method of analysis and stability criteria, were in accordance with EM 1110-2-2200 published by the Corps of Engineers, U.S. Army. Assumptions and calculations for the analyses are included in the Appendix D, and summarized as follows:

<u>Case</u>	<u>Loading Condition</u>	<u>Location of Resultant</u>	<u>Sliding F.S.</u>
I.	Normal loading condition, reservoir level at spillway crest, no ice load	within middle one third	3.19
II.	Normal loading condition, reservoir level at spillway crest, with ice load	within middle one third	3.13
III.	Unusual loading: flood level equal to $\frac{1}{4}$ PMF at maximum overflow section	7.53 ft outside middle one third	2.60
IV.	Extreme loading: flood level equal to PMF at the maximum overflow section	14.16 ft outside middle one third	2.02

The results of the stability analysis indicate that stability of the maximum overflow section of the dam against overturning is inadequate for both $\frac{1}{4}$ PMF and PMF loading conditions. In both cases the resultant forces are located outside the middle one third of the base width and factors of safety against sliding are less than 3.0. These conditions are not consistent with the minimum criteria set forth by the Corps of Engineers(Ref.1) and, therefore, the dam is considered inadequate for $\frac{1}{4}$ PMF and PMF conditions.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

Examination of the available documents and a visual inspection of the dam and the appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

Using the Corps of Engineers' Screening Criteria (Ref. 1) for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 57.7 percent of the Probable Maximum Flood (PMF). The spillway is, therefore, adjudged as "inadequate".

Structural stability of the dam based on available information and visual inspection is inadequate under Corps of Engineers Criteria for both $\frac{1}{2}$ PMF and PMF loading conditions. Resultant forces for these two conditions fall outside the middle one third of the base width with factors of safety against sliding being less than 3.0.

b. Adequacy of Information

The information and data available were adequate for performance of this investigation.

c. Need for Additional Investigation

Investigation to determine source of surface waters at the toe of the dam (left side of spillway) and their potential indication of embankment seepage should be undertaken to provide data for more detailed seepage analyses.

d. Urgency

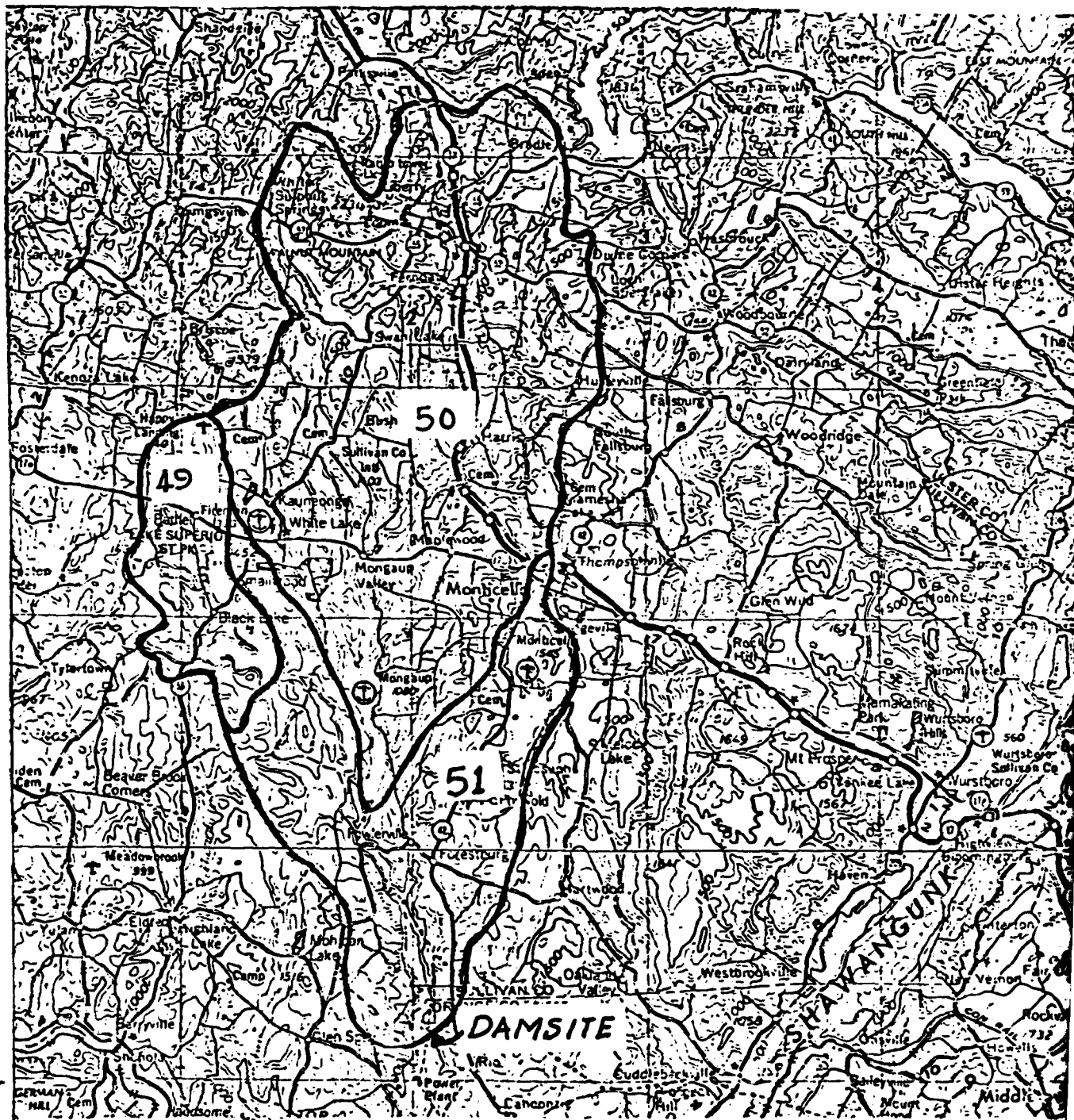
The additional investigation recommended should be initiated within 3 months from the date of notification. Within 18 months of notification, remedial measure as a result of these investigations must be initiated, with completion of these measures during the following year.

7.2 RECOMMENDED MEASURES

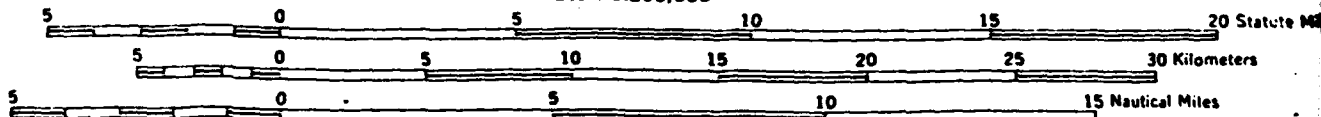
1. The results of the aforementioned analyses will determine in the appropriate remedial measures required.
2. Repair distressed areas of wood stave penstock to facilitate its further use as an emergency reservoir drain system.
3. Remove small bushes, brushes and trees growing on both upstream and downstream embankment slopes.
4. Monitoring of seepage using the existing weir systems should be continued.

DRAWINGS

DWG. NO. KK-3-50:	Stress Sheet Spillway, Section of Dam
DWG. NO. KK-3-51A:	General Plan
DWG. NO. KK-3-52:	Borings
DWG. NO. KK-3-53:	General Plan of Dam
DWG. NO. KK-3-54:	General Plan, Abutment Walls of Dam
DWG. NO. KK-3-55:	General Plan, Spillway Section of Dam
DWG. NO. KK-3-56:	Sections Abutment Walls of Dam
DWG. NO. KK-3-57:	Details of Bridge over Dam
DWG. NO. KK-3-58:	Intake, General Plan



Scale 1:250,000



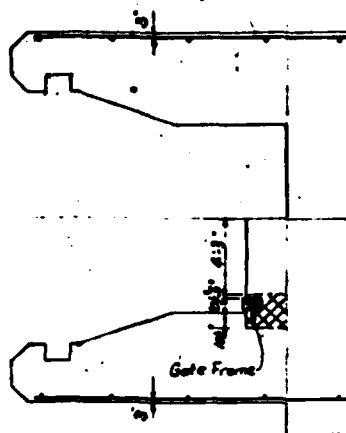
CONTOUR INTERVAL 100 FEET

TRANSVERSE MERCATOR PROJECTION

BLACK NUMBERED LINES INDICATE THE 10,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 18

1965 MAGNETIC DECLINATION FROM TRUE NORTH VARIES FROM 9° (180 MILS) WESTERLY FOR THE CENTER OF THE WEST EDGE TO 11° (200 MILS) WESTERLY FOR THE CENTER OF THE EAST EDGE

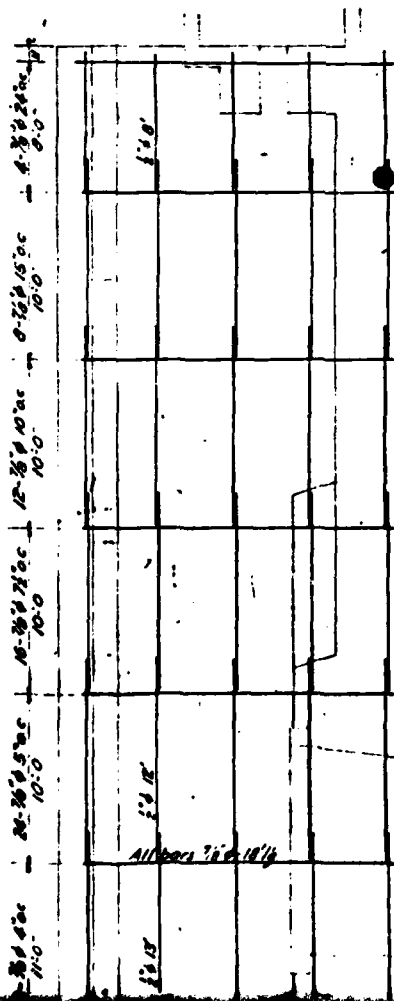
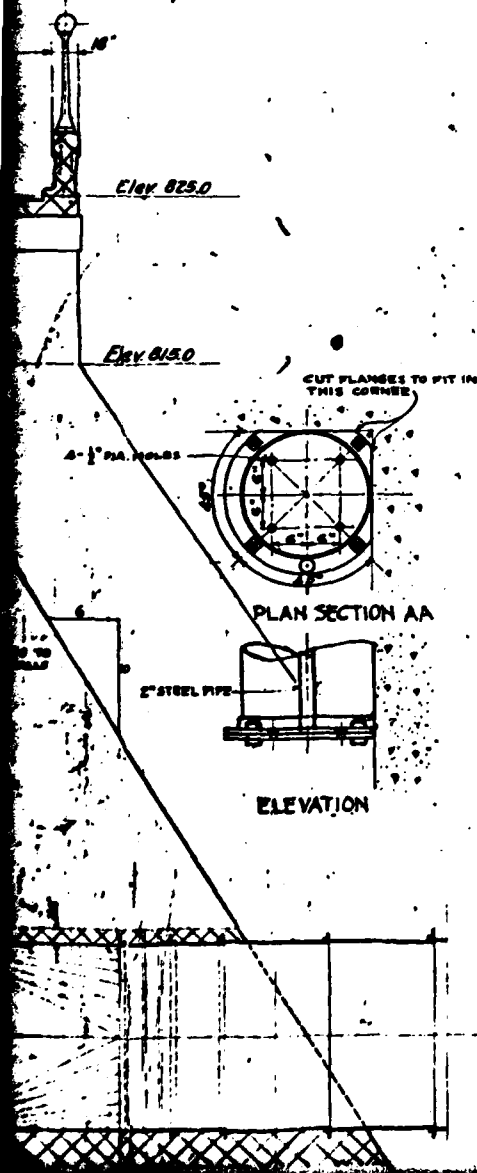
FOR SALE BY U S GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092



SECTIONS SHOWING REINFORCEMENT

SCHEDULE

NUMBER	SIZE	LENGTH
134	7/8" ϕ	10'
22	7/8" ϕ	20'
16	7/8" ϕ	13'
40	1/2" ϕ	12'
10	1/2" ϕ	8'

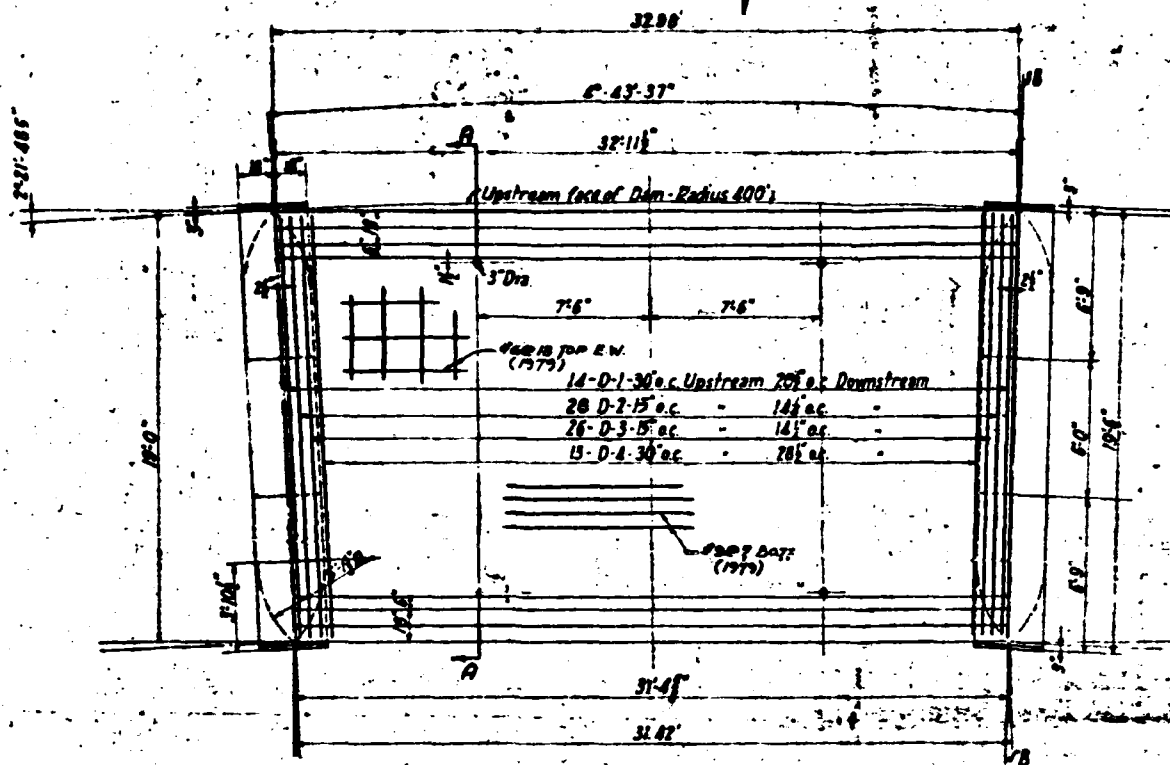


124 P.C.

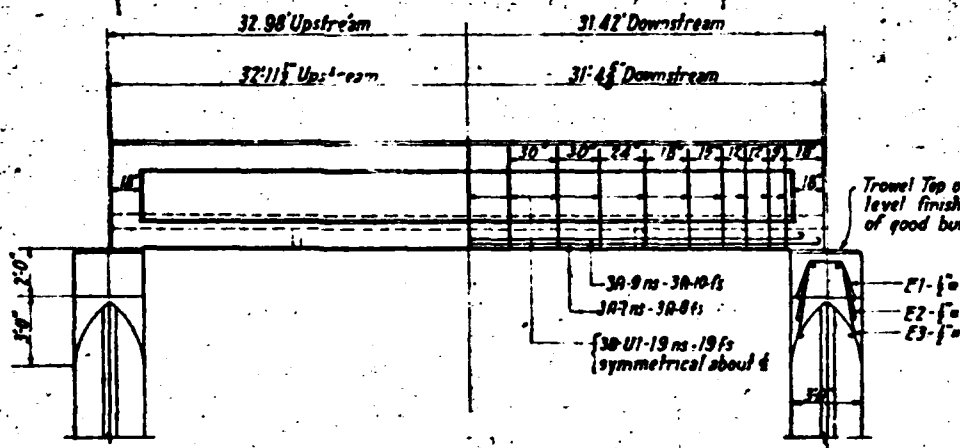
APPROVED:

CHAS. T. MAIN, CONSULTING ENGR.,
200 DEVONSHIRE ST.,
BOSTON, MASS.

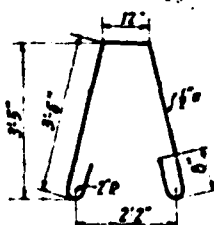
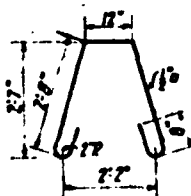
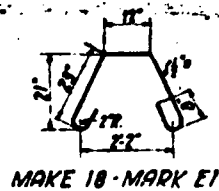
Chas. T. Main



PLAN
Scale $\frac{1}{4}$ " = 1'-0"
8 Spans like this. See Drwg KK-3-55

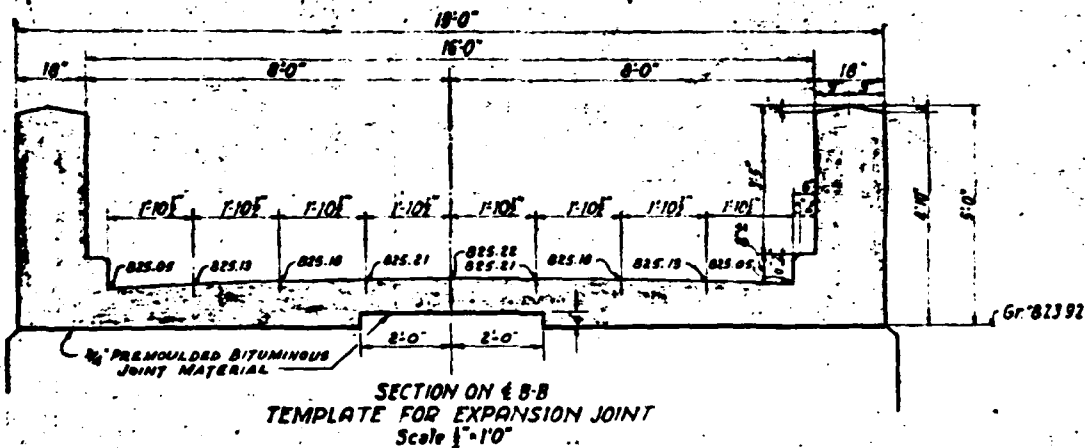
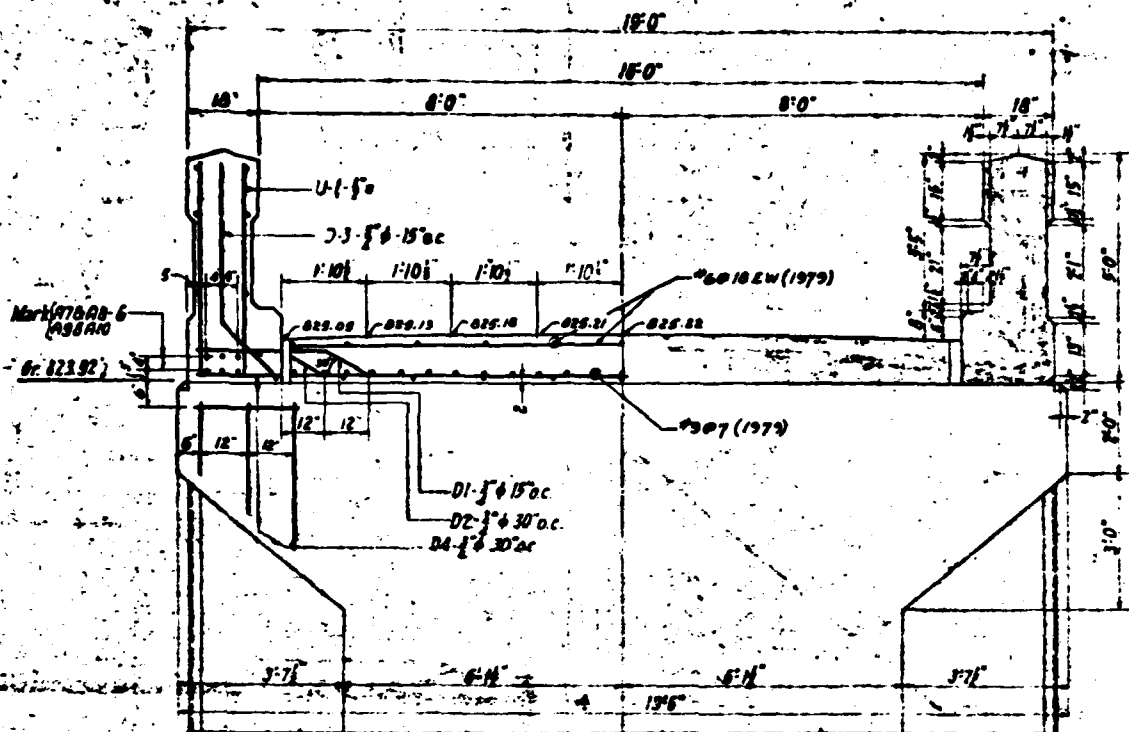


ELEVATION
Scale $\frac{1}{4}$ " = 1'-0"



SCHEDULE OF SPACERS

Dia.	LENGTH	QUANTITY
1"	2'-9"	36
1"	3'-0"	56
1"	3'-6"	56
1"	3'-0"	8
1"	3'-3"	16
1"	3'-6"	16
1"	3'-9"	16
1"	3'-0"	16
1"	3'-3"	16

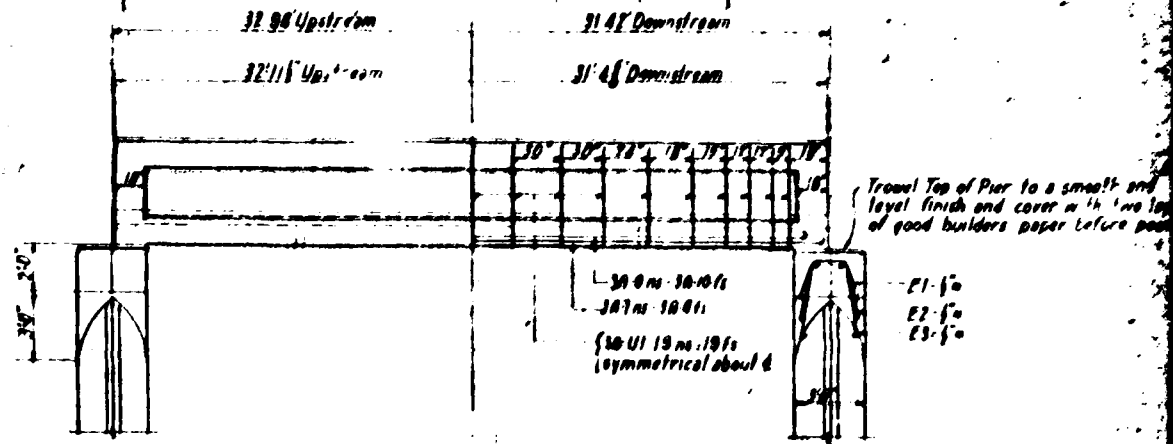
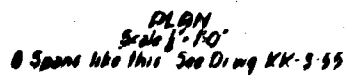


NOTE
Bridge floor and railings to be 1-2 4 concrete (2000#)
Bridge piers to be 1-2 5 concrete
See KK-3-118 for LIGHTING CONDUITS IN BRIDGE.

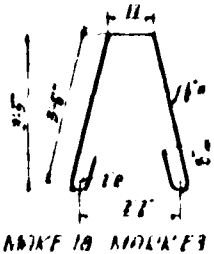
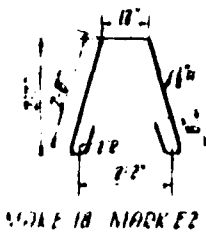
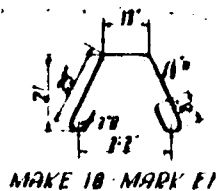
SCHEDULE OF BENT BARS

Bar	Dia	Length	Qty.	DETAIL
A1	1 1/2"	34'-6"	24	31'-8" 18" 15"
A8	1 1/2"	36'-0"	24	12'-6" 18" 15"
A9	1 1/2"	37'-6"	24	21'-0" 18" 15"
A10	1 1/2"	33'-0"	24	18'-8" 18" 15"
D1	5/8"	18'-11"	112	17'-0" 15" 15"
D2	5/8"	18'-11"	208	21'-0" 13'-0" 15" 15"

APPROVED
CHAS T MAIN CONSULTING ENGINEER
200 DEVONSHIRE STREET
BOSTON, MASS.

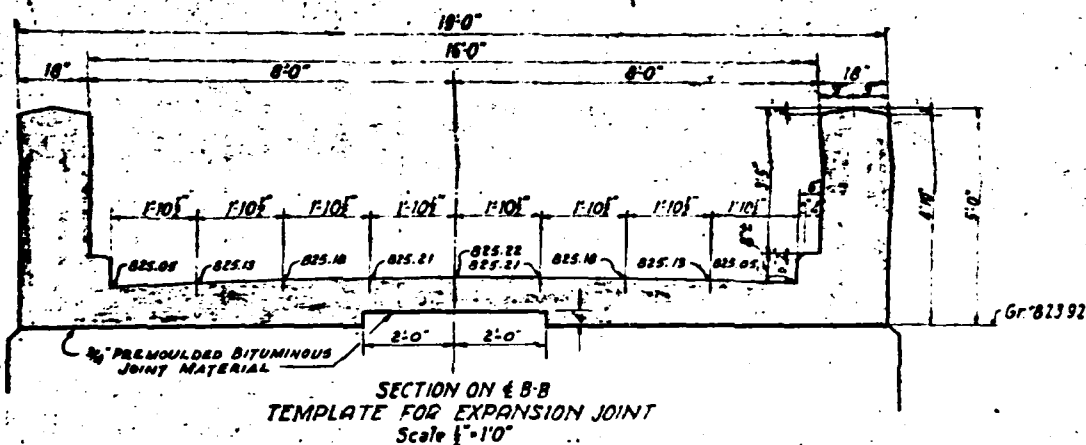
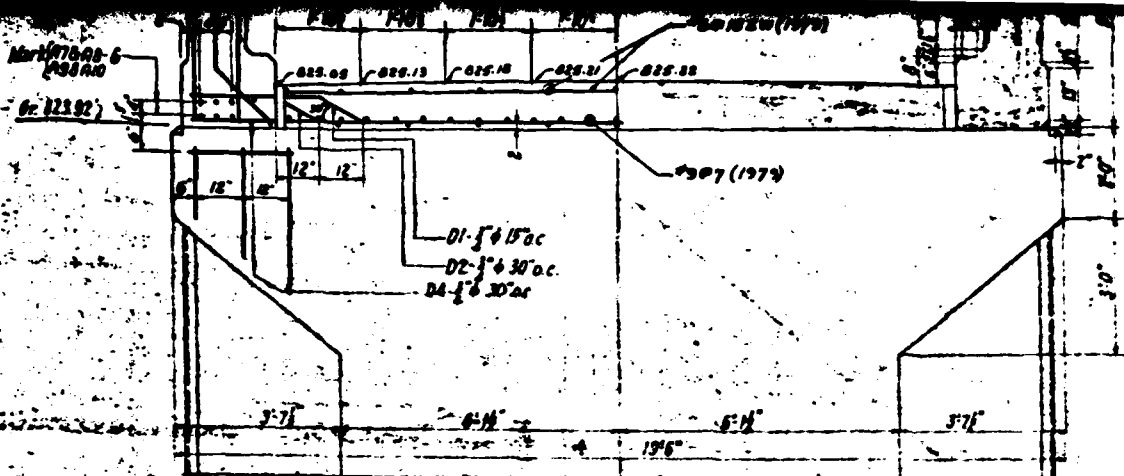


ELEVATION
Scale $\frac{1}{4}" = 1'-0"$



SCHEDULE OF SPACERS		
DIA	LENGTH	QUANTITY
1"	7'9"	36
1"	9'0"	56
1"	3'6"	56
1"	3'0"	8
1"	3'3"	16
1"	3'6"	16
1"	3'9"	16
1"	3'0"	16
1"	3'3"	16

Model
A1
A8
A8
A10
D1
D2
D3
U1
D4
M



NOTE
Bridge floor and railings to be 1:2.4 concrete (2500)
Bridge piers to be 1:2.5 concrete
See KK-3-118 for LIGHTING CONDUITS IN BRIDGE.

SCHEDULE OF BENT BARS			
NO.	SIZE	LENGTH	QTY.
A7	1/2"	34'-6"	24
A8	1/2"	35'-0"	24
A9	1/2"	31'-6"	24
A10	1/2"	33'-0"	24
D1	5/8"	18'-10"	112
D2	1"	18'-10"	208
D3	5/8"	25'-2"	208
U1	1"	10'-0"	304
D4	5/8"	18'-6"	104

NOTED: BARS ADDED IN 1973 - SEE SECTIONS AND PLAN

APPROVED:
CHAS T MAIN, CONSULTING ENGINEER
200 DEVONSHIRE STREET
BOSTON, MASS.
BY *Chas T Main*

CATSKILL POWER CORP MIDDLETOWN, NY		FILE #
REVISIONS	RIO DEVELOPMENT DETAILS OF BRIDGE OVER DAM	DATE OVER 0 3 2 1 TIME
	DESIGNED BY CHARLES H. TENNEY & CO. ENGINEERS 100 WEST 42ND ST. NEW YORK, N.Y.	NO. 100-100
	DATE	DEC 1950
	NO. 100-100	KK 3 57

0° 0' at upstream edge of dam

EAST ABUTMENT

PLAN OF DAM

SECTION THRU APRON

400 ft Radius

Elev. 910.0

REFERENCE DRAWINGS

NUMBER	TITLE
AK 3-51	GENERAL PLAN OF DEVELOPMENT
-52	BORINGS
-53	GENERAL PLAN OF DAM
-54	GENERAL PLAN ABUTMENT WALLS OF
-56	DETAIL SECTIONS
-57	DETAIL OF BRIDGE OVER DAM.
AK 3-58	INTAKE GENERAL PLAN

Cut off to extend to sound impervious
rock if possible, with as little
shooting as practicable. Depth of
cut off to be determined in the
field by engineer.

SECTION B-B

55.2
NEXT ABUTMENT

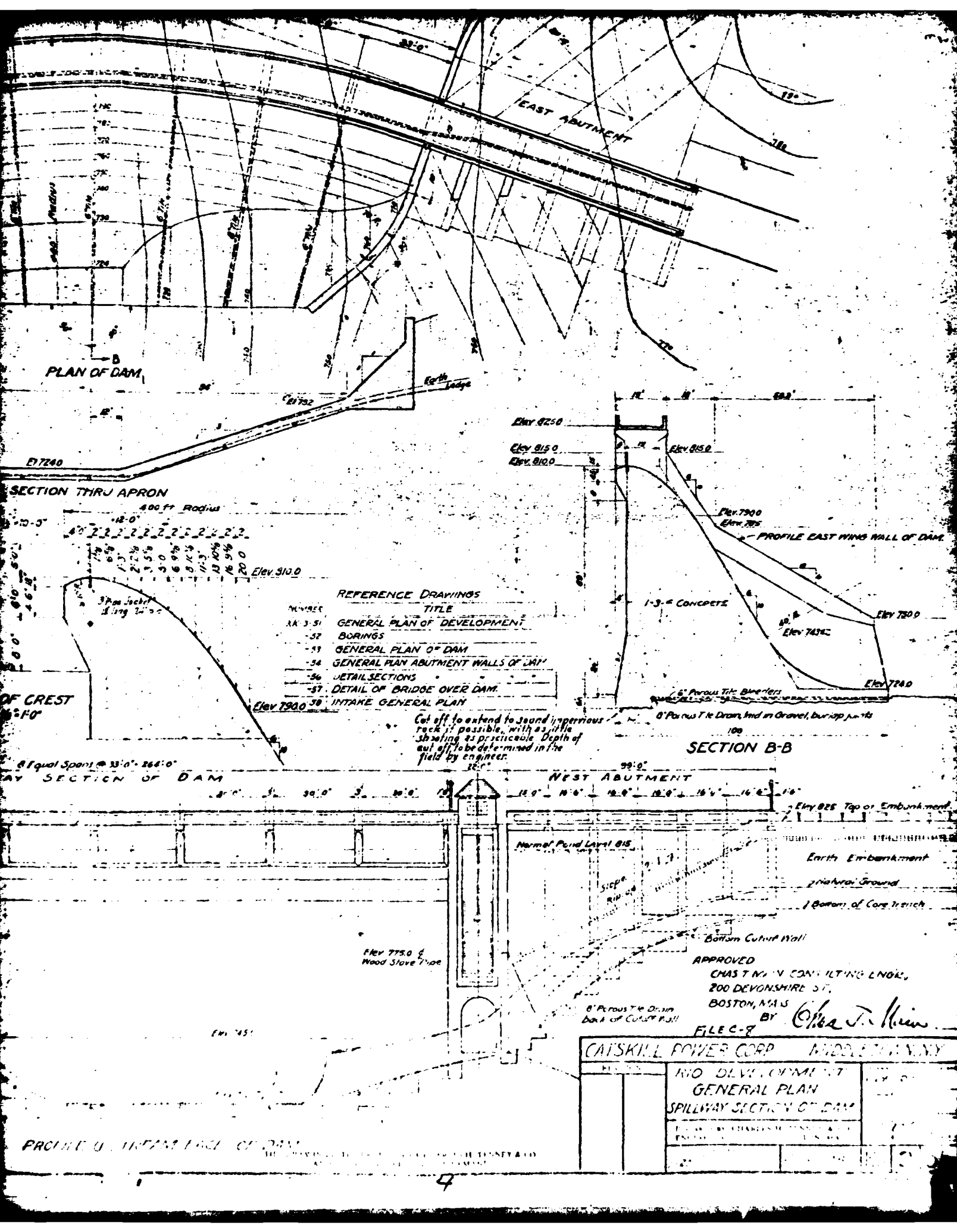
Normal Pond Level 815

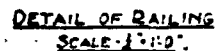
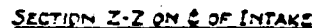
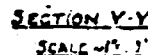
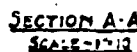
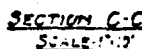
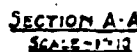
Earth Embankment

2nd Natural Ground

Bottom of Core Trench

APPROVED
CHRISTIAN V. CONSULTING & NO. 1
200 DEVONSHIRE ST.





SCHEDULE OF FINANCES - 1947

NOTES

CHAS. T. MAIN, CONSULTING ENGINEER
2200 DEXTER AVE. ST. LOUIS, MO.

Face of Dam
Sta. 2+30

PLAN
SCALE - 1" = 20'

ELEVATION

Normal Surface
at Face of Dam

Approximate Ledge

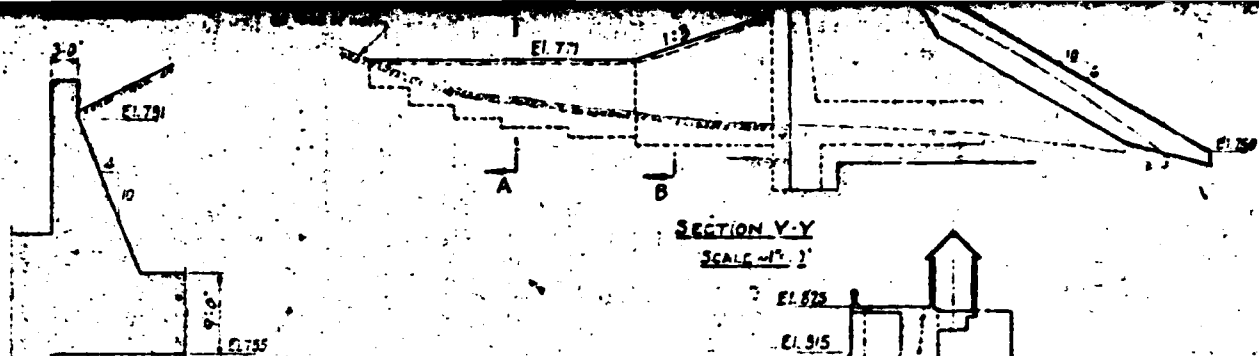
EAST ABUTMENT

WEST ABUTMENT

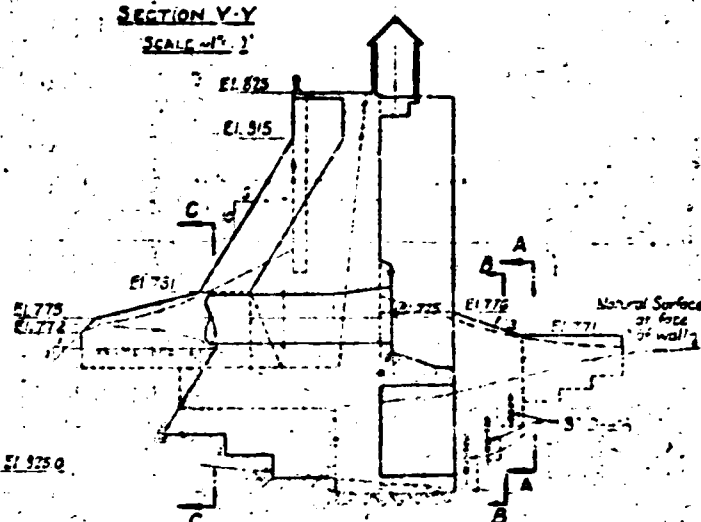
SECTION X-X

Reference same as for East

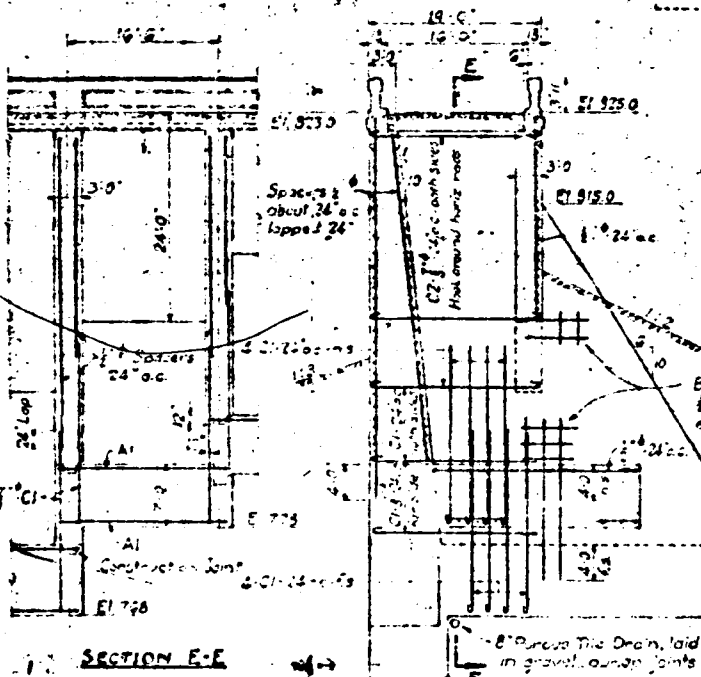
SECTION D-D



SECTION C-C
SCALE 1/4"

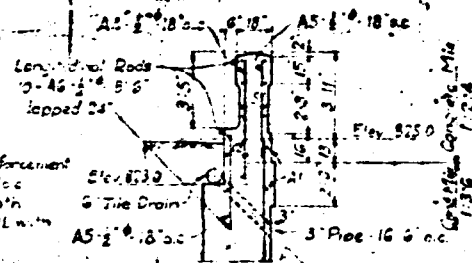


SECTION Z-Z ON E OF INTAKE
SCALE 1/4"



SECTION E-E
SCALE 1/4"

TYPICAL SECTION D-D THROUGH WALL
SCALE 1/4"



DETAIL OF RAILING
SCALE 1/4"

REFERENCE DRAWINGS
KK-3-55: GENERAL PLAN-SPILLWAY SECTION OF DAM
KK-3-56: SECTIONS-ABUTMENT WALLS OF DAM
KK-3-58: INTAKE-GENERAL PLAN

NOTES

Concrete Mix = 1:2:4 except for railing: 1:2 1/2:4 Mix for railing.
Minimum distance from face of steel to face of concrete 3"
15.25 inches max. depth of concrete for steel.
Reinforcing bars 1/2" diameter 24" o.c.
Vertical pipe and extend 4' to bottom sub as shown
All construction joints to be keyed, and sealed with a putty
with 1/2" mortar in joints 12 inches before concrete is placed

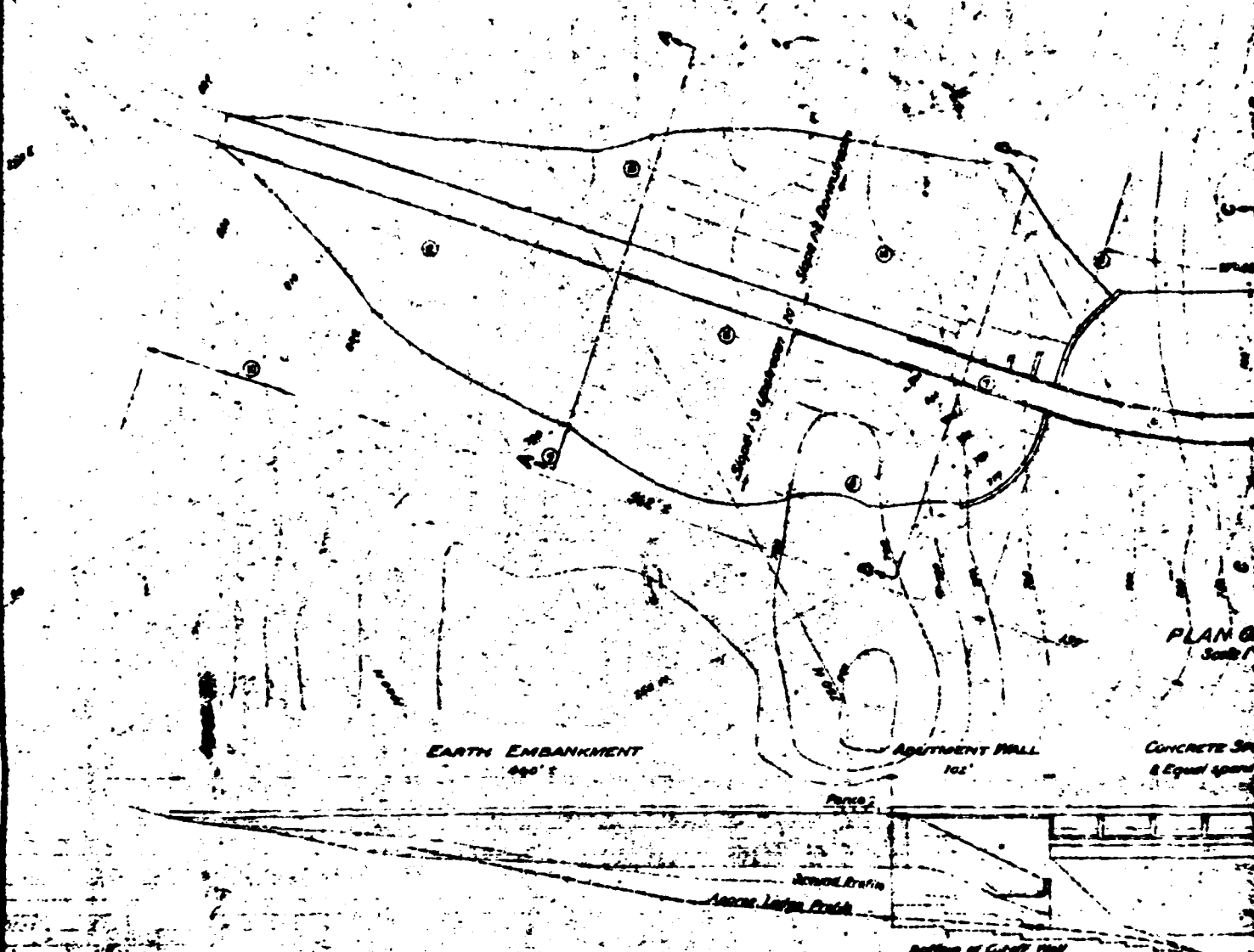
SCHEDULE OF REINFORCEMENT				
DIAGRAM	MARK	NO.	SIZE	LENGTH
	A1	1	1/2"	1.5'
	A2	1	1/2"	1.5'
	A3	1	1/2"	1.5'
	A4	1	1/2"	1.5'
	A5	1	1/2"	1.5'
	B1	1	1/2"	1.5'
	B2	1	1/2"	1.5'
	B3	1	1/2"	1.5'
	B4	1	1/2"	1.5'
	B5	1	1/2"	1.5'
	C1	1	1/2"	1.5'
	C2	1	1/2"	1.5'
	C3	1	1/2"	1.5'
	C4	1	1/2"	1.5'
	C5	1	1/2"	1.5'

See Det. KK-3-56
See Det. KK-3-56
See Det. KK-3-56

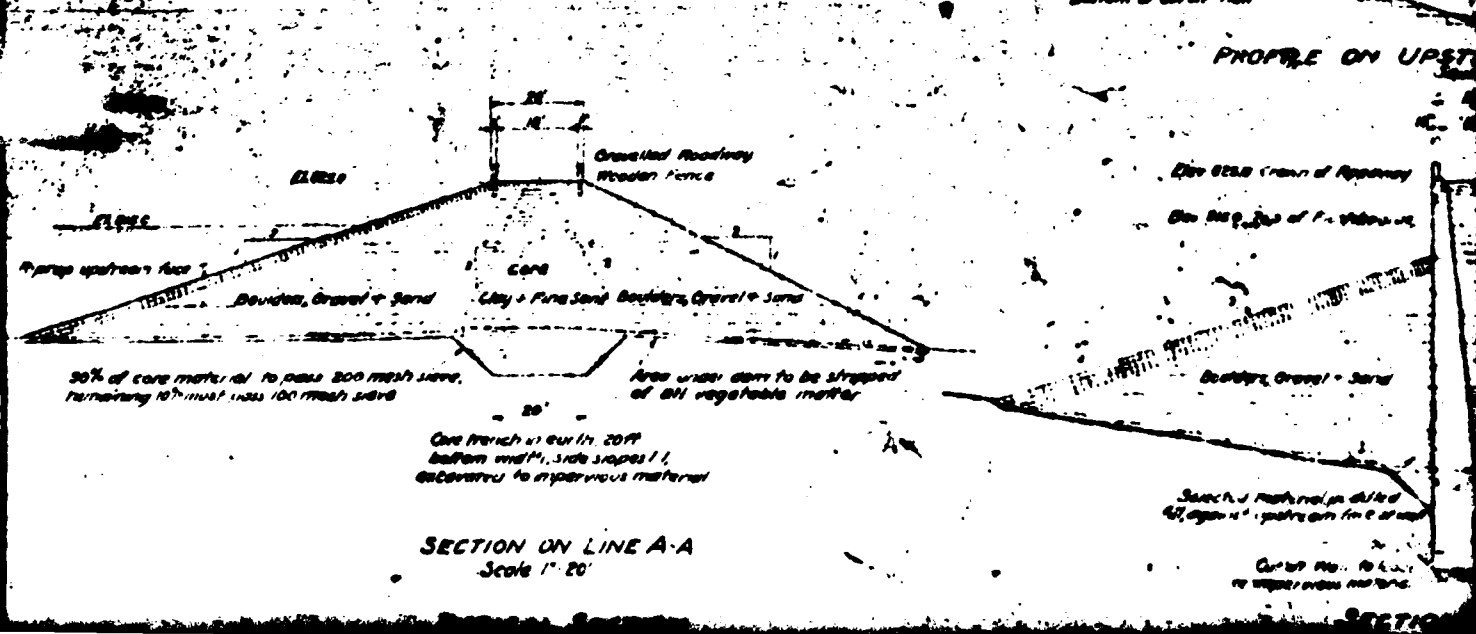
APPROVED:
CHAS. T. MAIN, CONSULTING ENGINEER
500 DEATHWASH ST.
BOSTON, MASS.

BY: *Chas. T. Main*
FILE C-2

CATSKILL POWER CO. NEW HAVEN, CT.	
PROJECT NO.	DATE
DESIGNED BY	CHECKED BY
DRAWN BY	APPROVED BY



PLAN ON South



PROFILE ON UPST

SECTION ON LINE A-A
Scale 1" = 20"

SECTION

RIVER

PLAN OF DAM

Scale 1" = 50'

MONGAUP

① indicates Test Boring
Center of Coordinates
is point 61000 of Original Survey.

CONCRETE SPILLWAY DAM
& Equal spans 150' - 200'

INTAKE ABUTMENT WALL
15' - 20'

EARTH EMBANKMENT
200'

SECTION ON UPSTREAM FACE OF DAM

Scale 1" = 50'

15' - 20'

Max. Flood E1000
Road Right-of-Way E1000

Gravelly Roadway

Ramp both upstream & downstream faces, minimum thickness 20"

Boundaries, Gravel 15' - 20'

15'-6" CONCRETE

Area under dam to be stripped
of all logs, trees, etc.

SECTION ON LINE B-B

PLAN OF DAM Scale 1" = 50'

MONGAUP

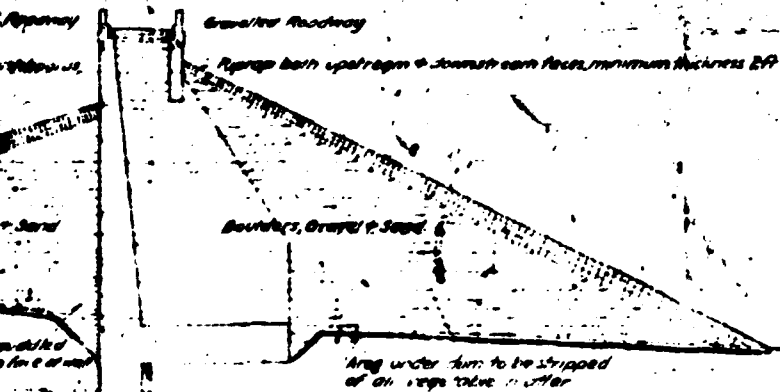
① indicates Test Boring
Center of coordinates
is point 61000 of Original Survey

CONCRETE SPILLWAY DAM
8 Equal spans 1 - 22' - 00"

INTAKE ABUTMENT WALL
12' - 00"

EARTH EMBANKMENT
200'

ON UPSTREAM FACE OF DAM Scale 1" = 50'



SECTION ON LINE B-B Scale 1" = 20'

SECTION ABUTMENT WALL

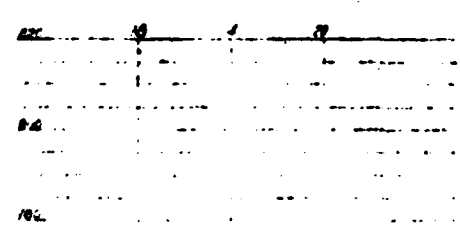
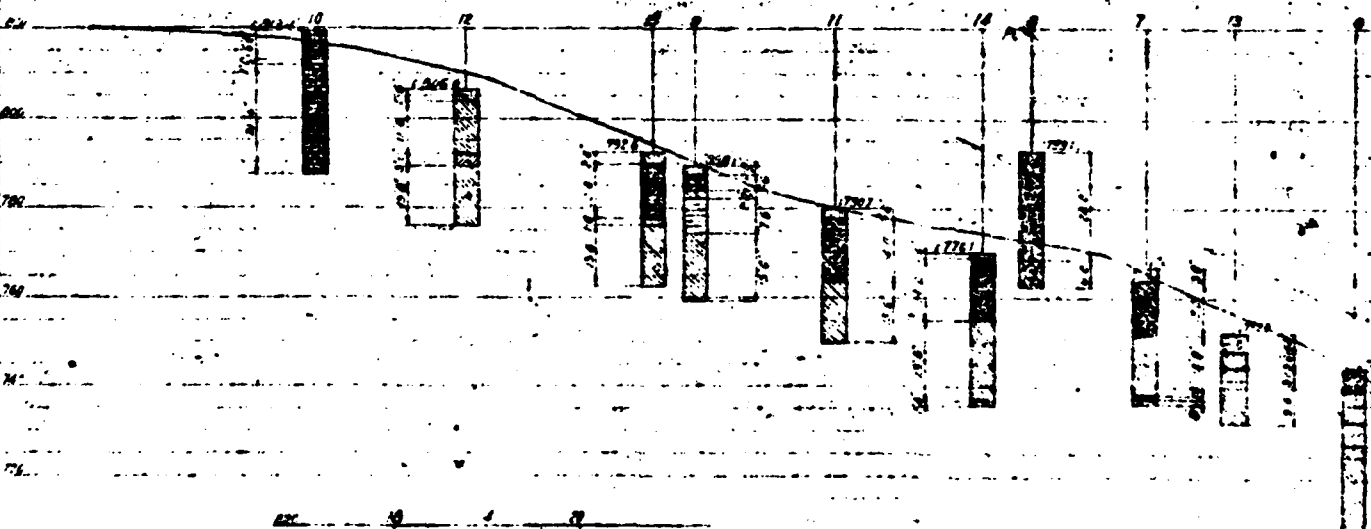
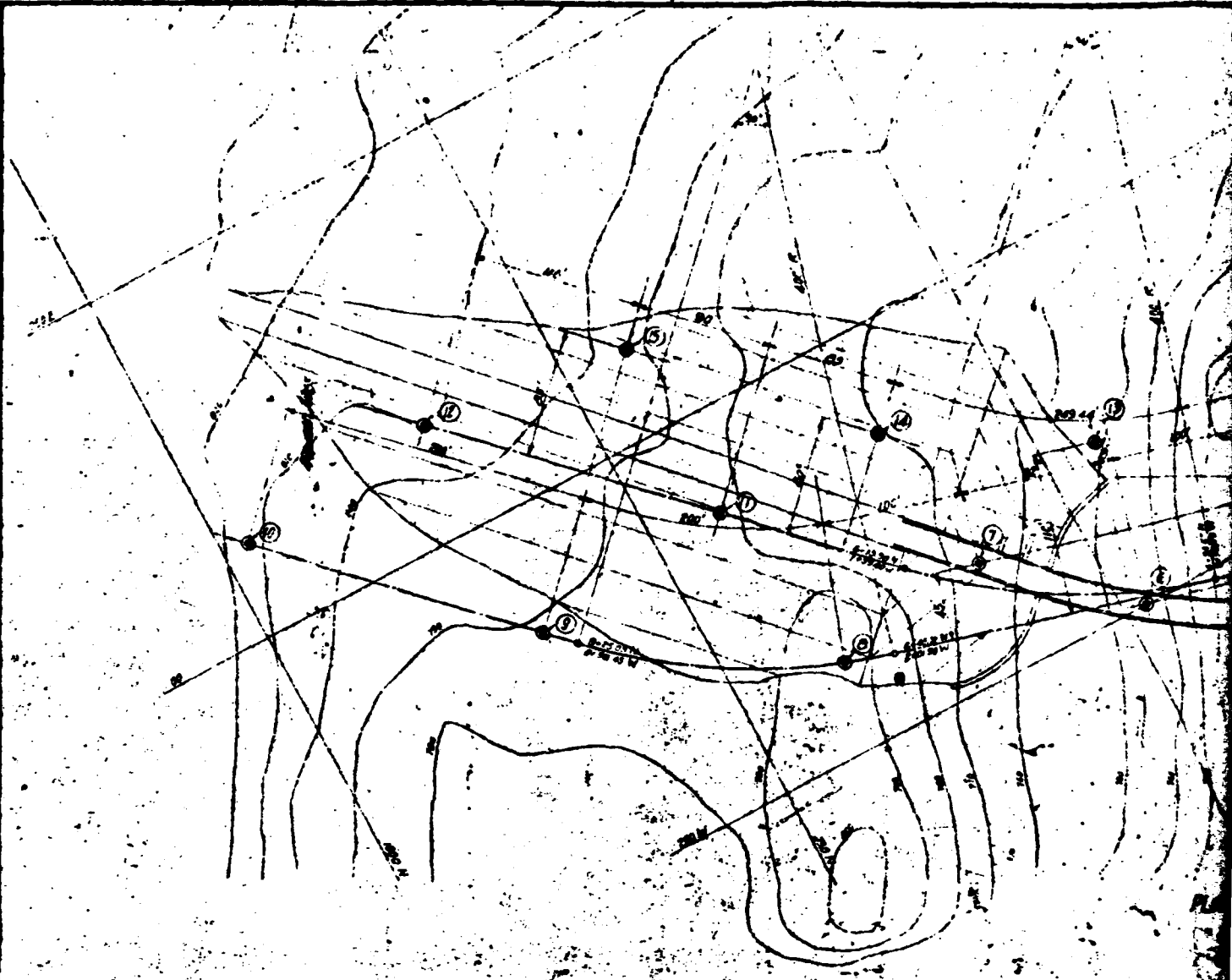
SECTION ON LINE C-C CONCRETE SPILLWAY Scale 1" = 20'

100'

APPROVED:
CHAS T MAIN, CONSULTING ENGR,
100 DEVONSHIRE ST.,
DORCH, MASS

Chas T Main

CATSKILL POWER CORP	
REV.	RIO DEVELOPMENT
	GENERAL PLAN OF DAM
PREPARED BY: CHARLES H. MAIN & ASSOCIATES	
DATE: 1934	

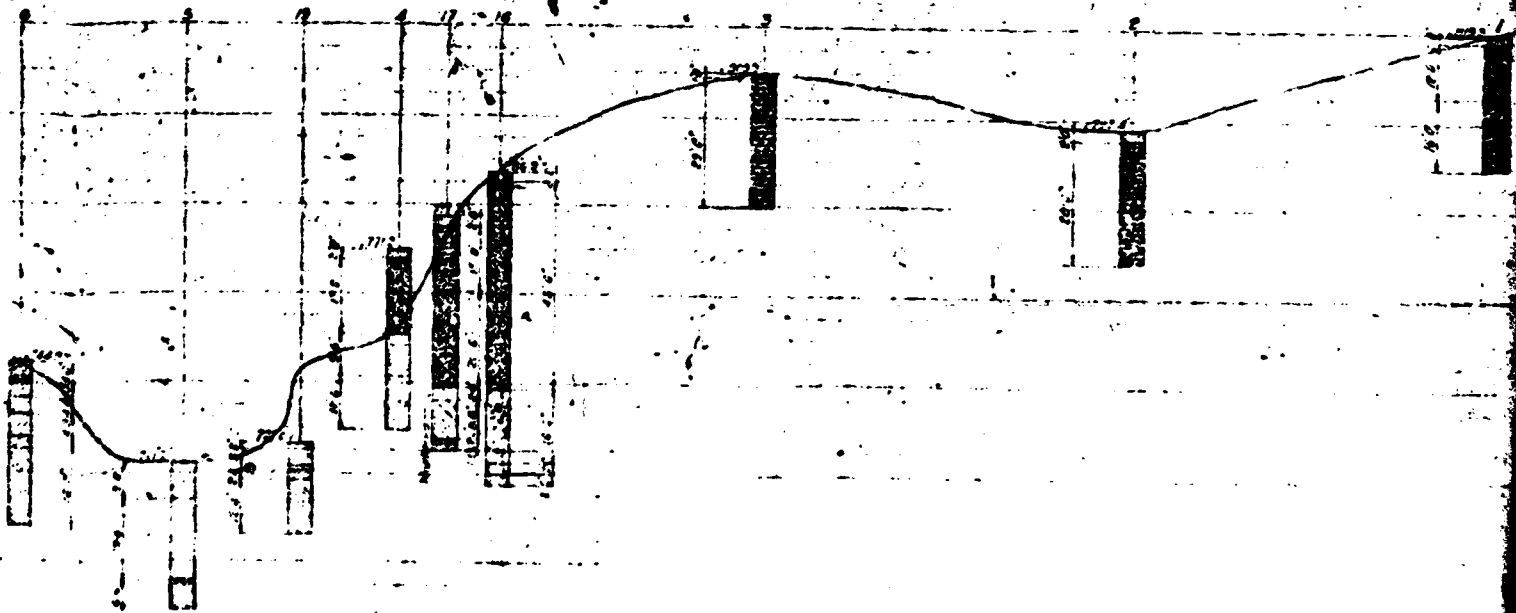


KEY

RIVER

MONGAUP

PLAN OF BORINGS
Scale 1" = 50'

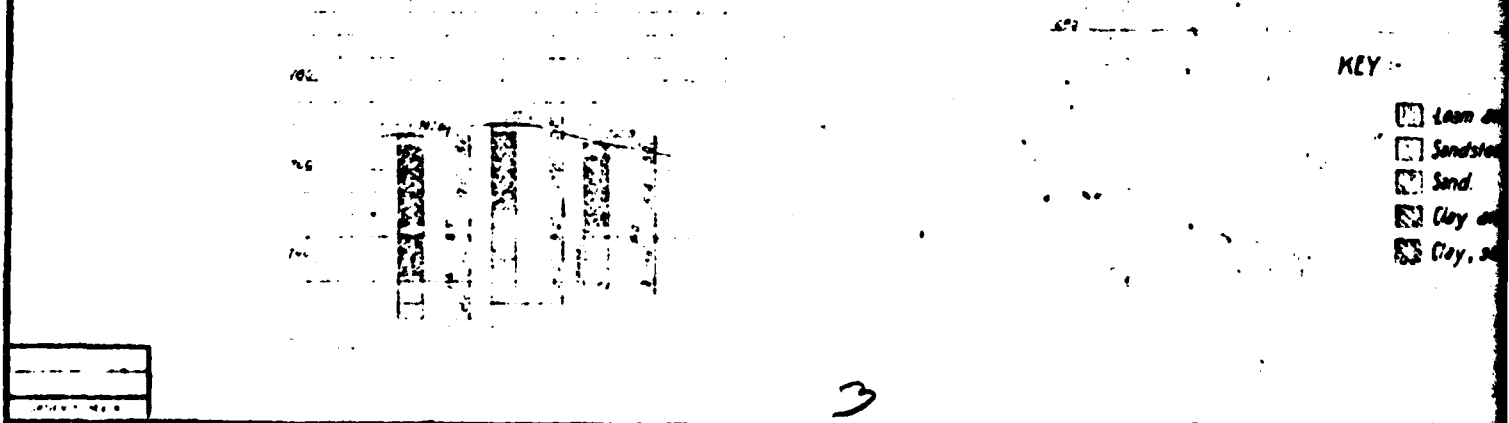
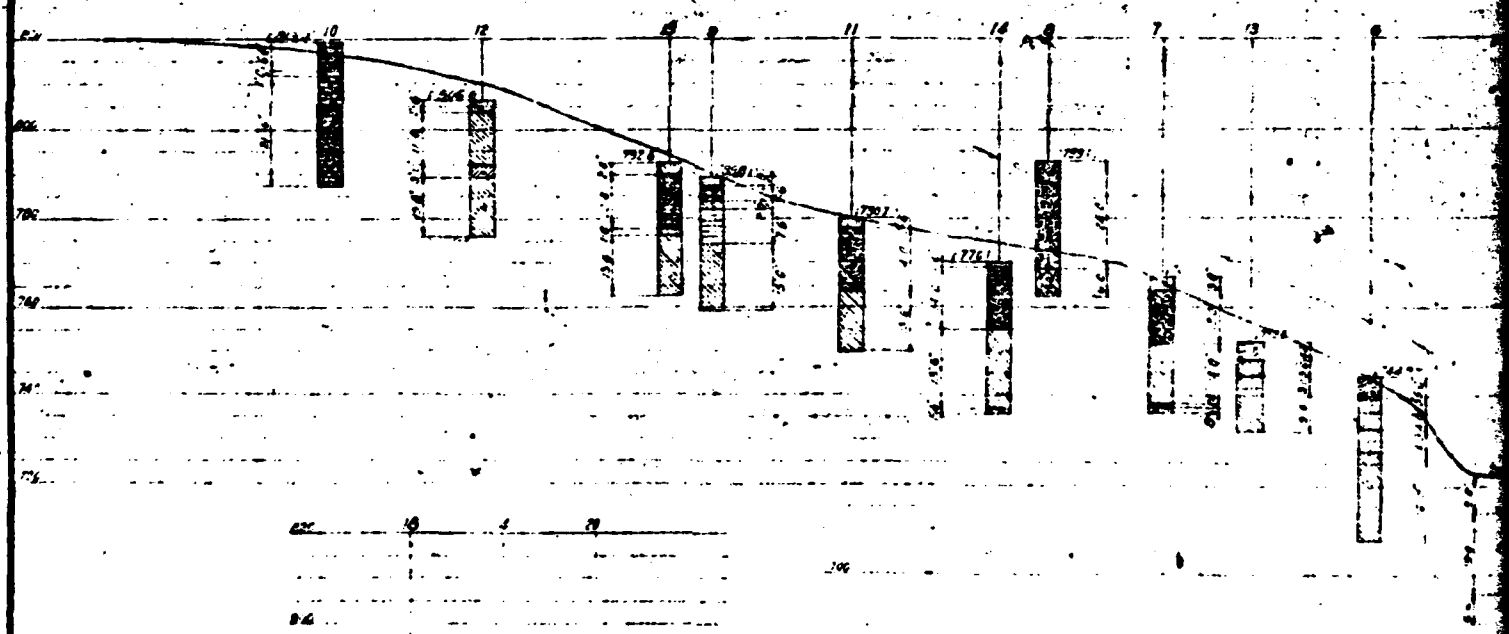
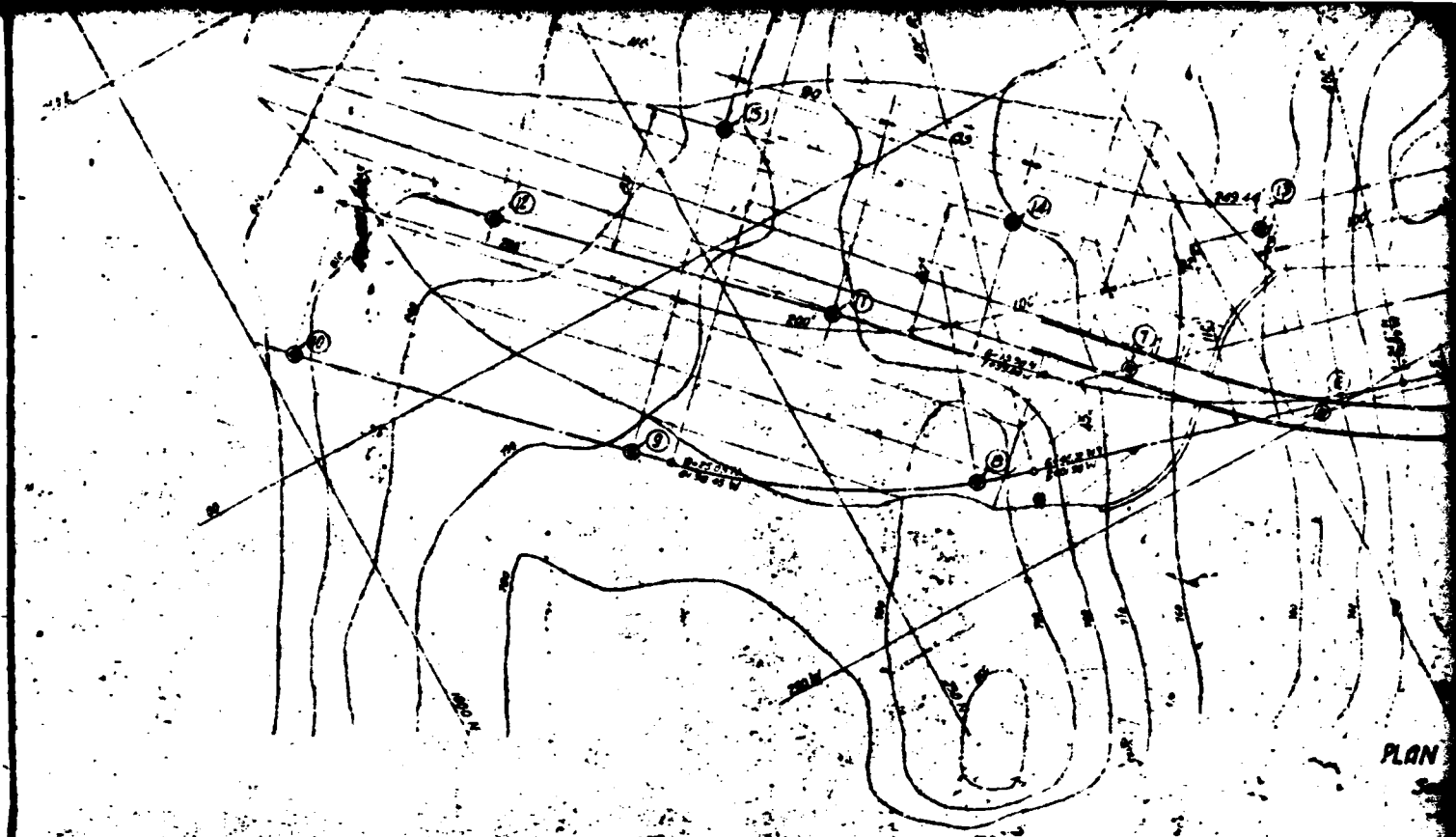


KEY

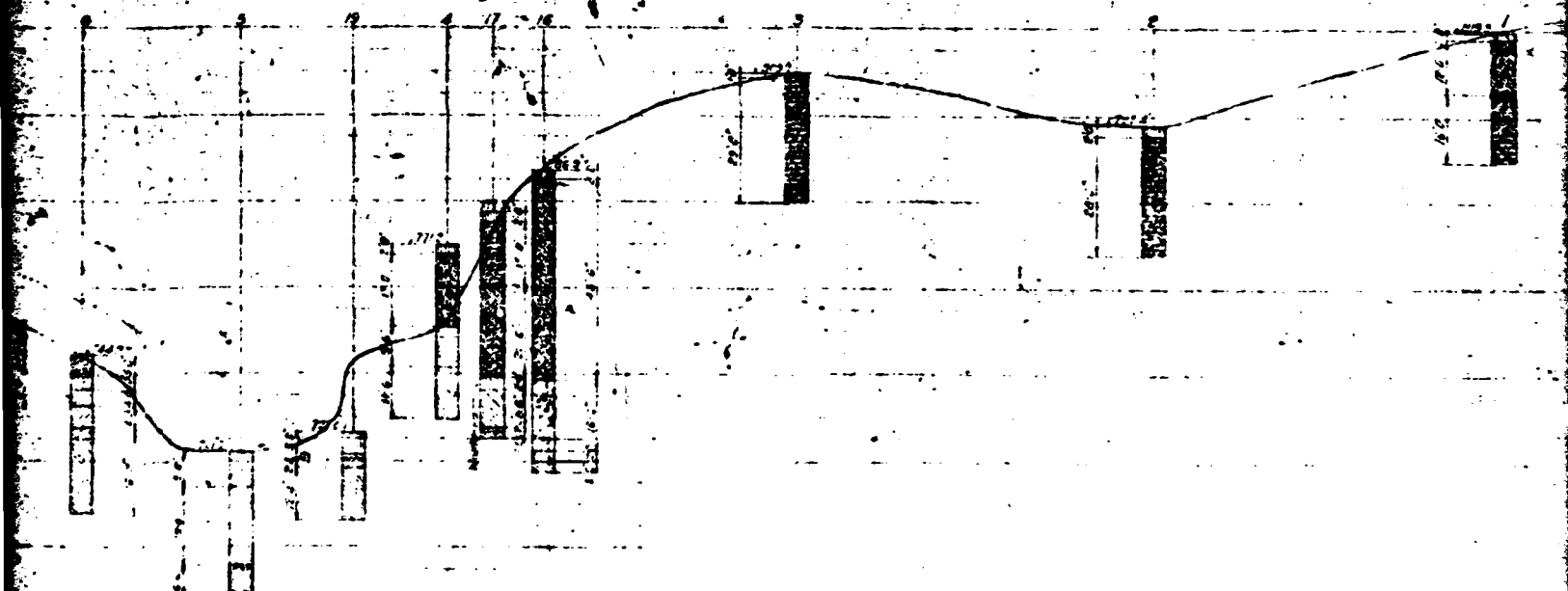
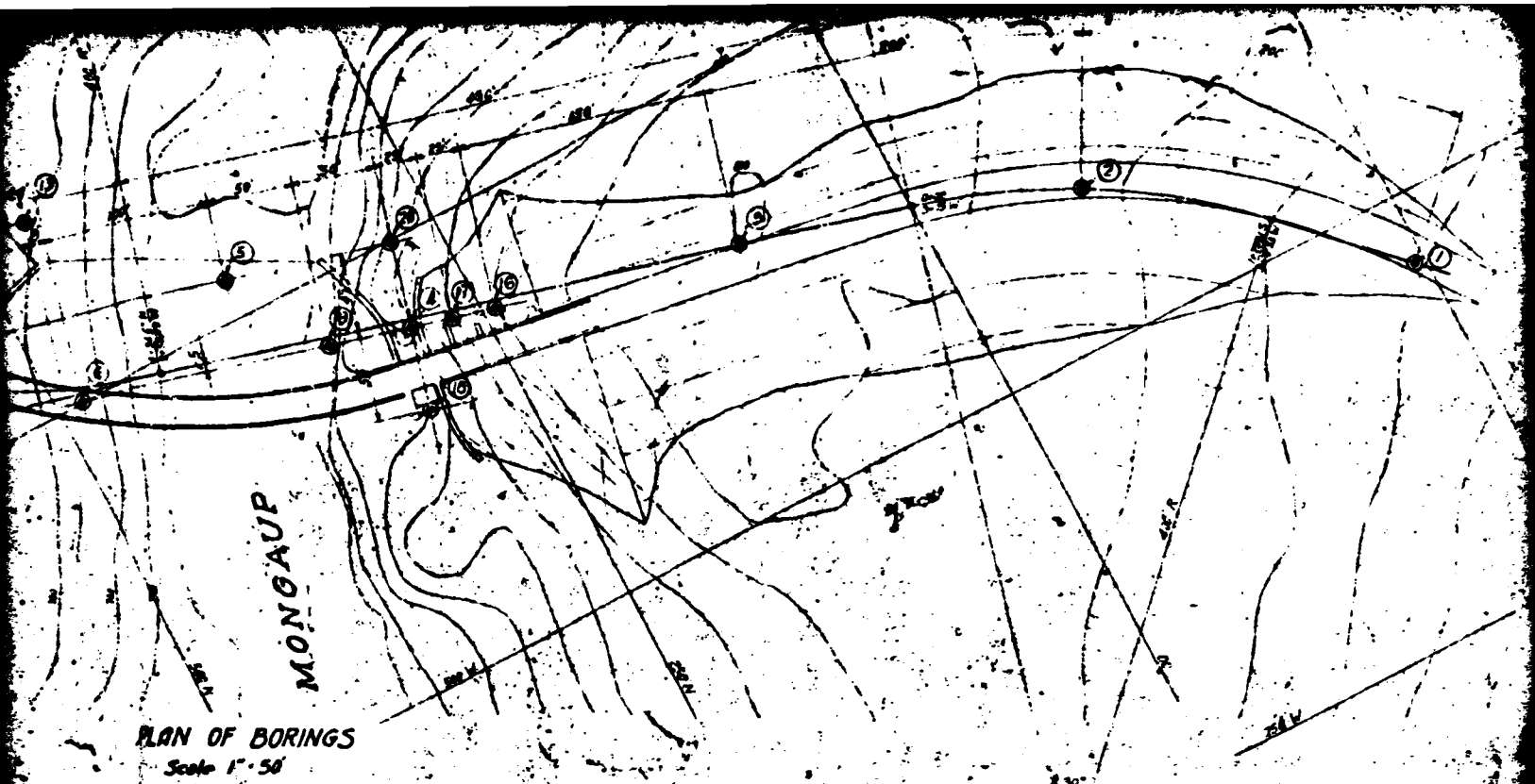
■ Mud and silt

■ Sand and gravel

APPROVED
CHAS T MAIN, CONSULTING ENGR
200 DEVONSHIRE ST
BOSTON, MASS



- KEY
- loam
 - sandstone
 - sand
 - clay
 - clay, sand



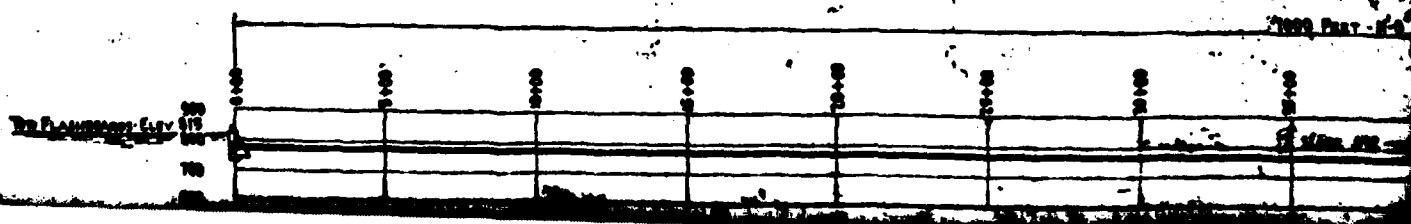
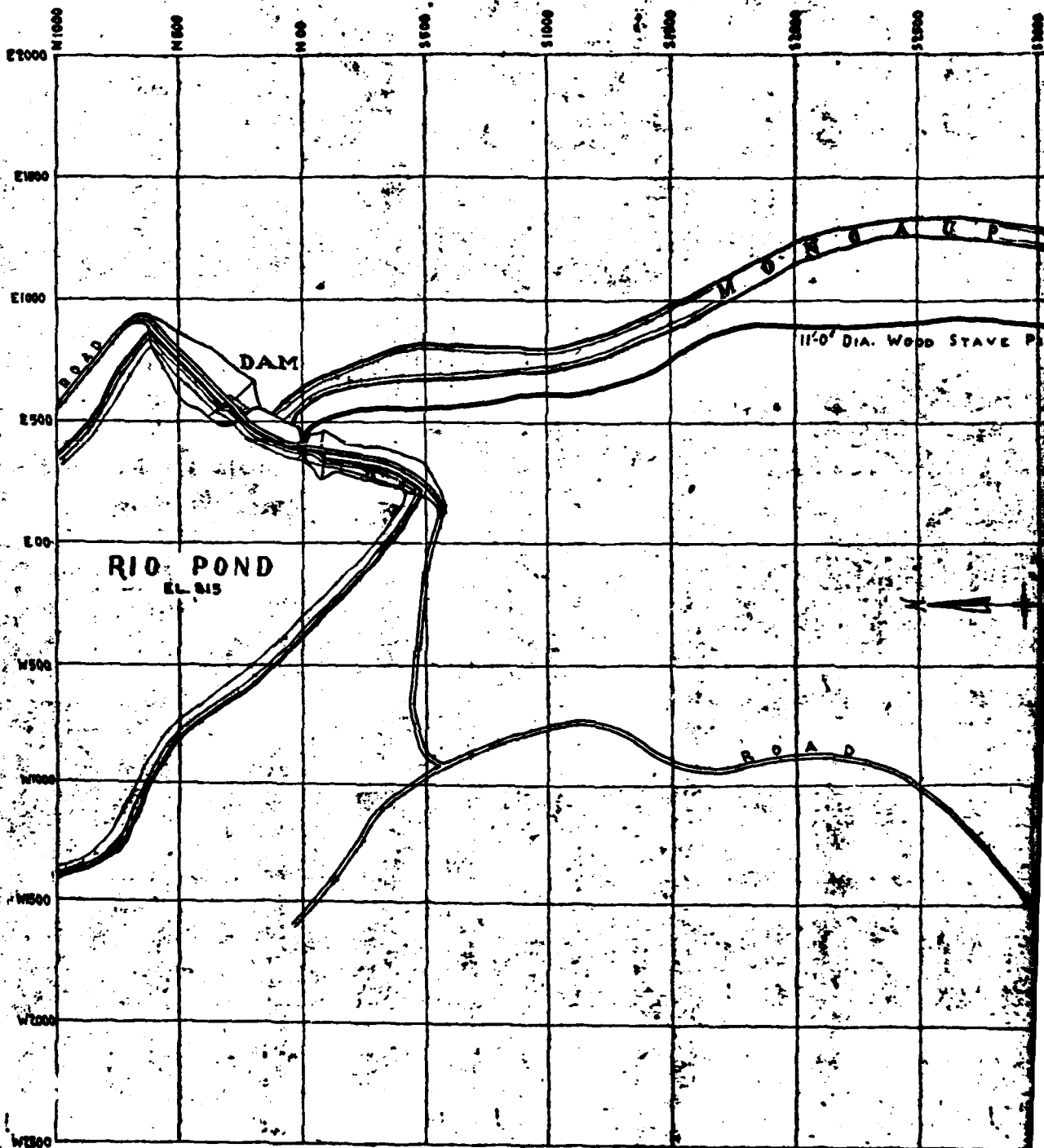
KEY:

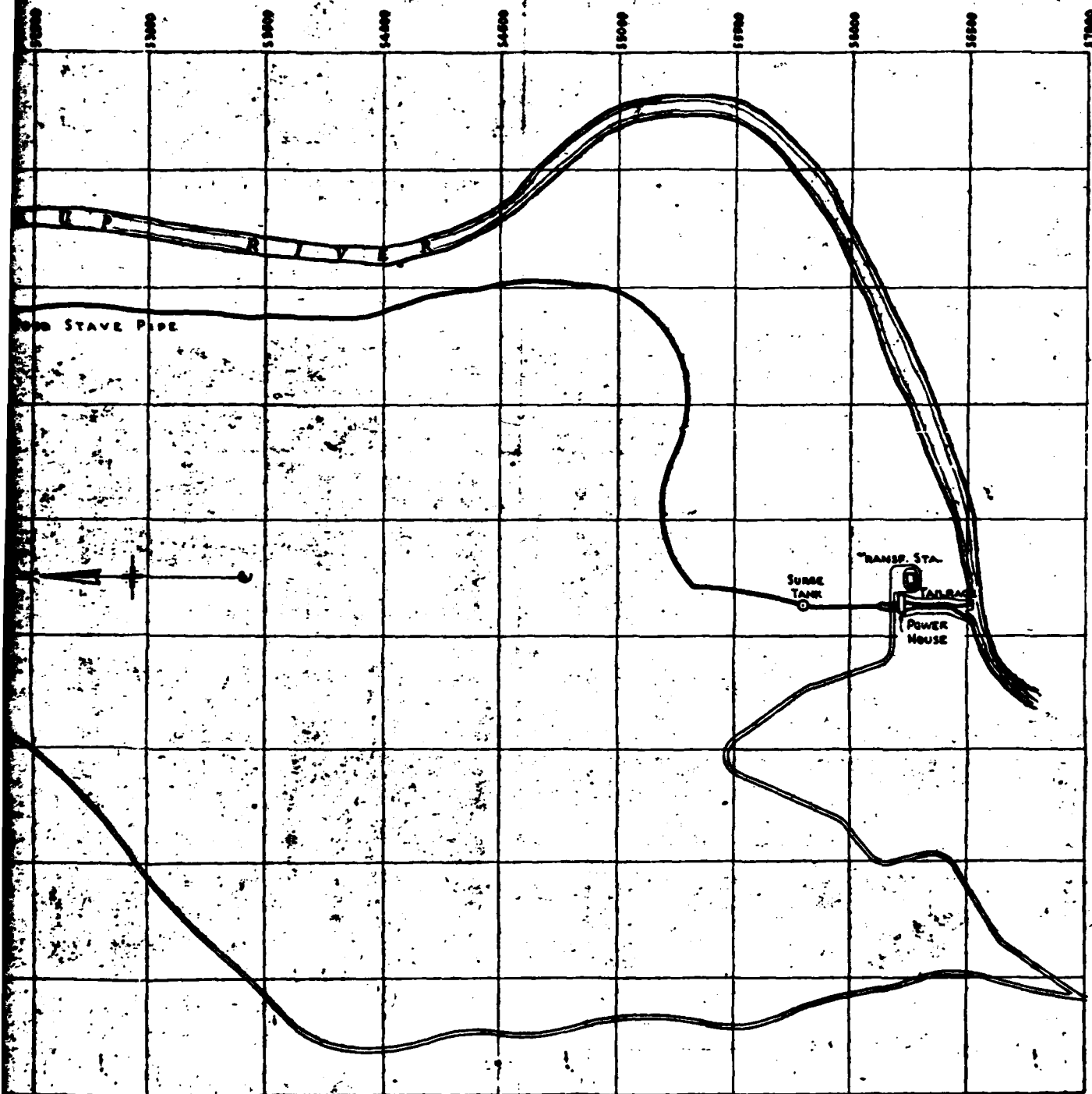
- | | |
|---|---|
|  Loam and topsoil. |  Sand and gravel |
|  Sandstone |  Shale |
|  Sand. |  Boulders |
|  Clay and sand. |  Sand, gravel and boulders |
|  Clay, sand and gravel |  Clay |

APPROVED
CHAS T MAIN, CONSULTING ENGR
200 DEVONSHIRE ST
BOSTON, MASS
BY *Chas T. Main*

CATSKILL POWER CORP MIDDLETOWN, N.Y.	
REVENUES	RIO DEVELOPMENT BORINGS
Prepared by: CHARLES H. TENNEY & CO. ENGINEERS	BOSTON, MASS.
DATE: Nov. 1, 1924	NO. 3 52

THIS DRAWING IS THE PROPERTY OF CHARLES H. TENNEY & CO.
AND IS SUBJECT TO RETURN ON DEMAND

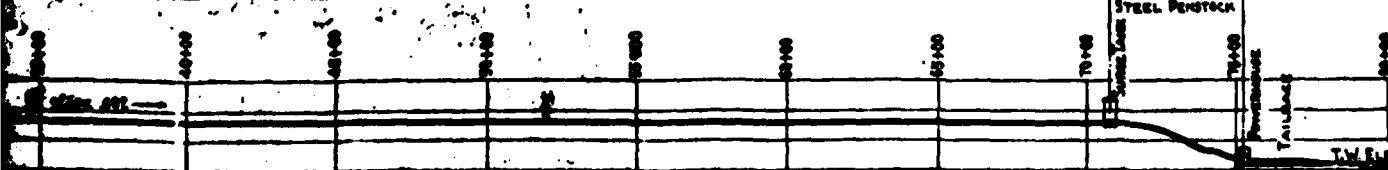




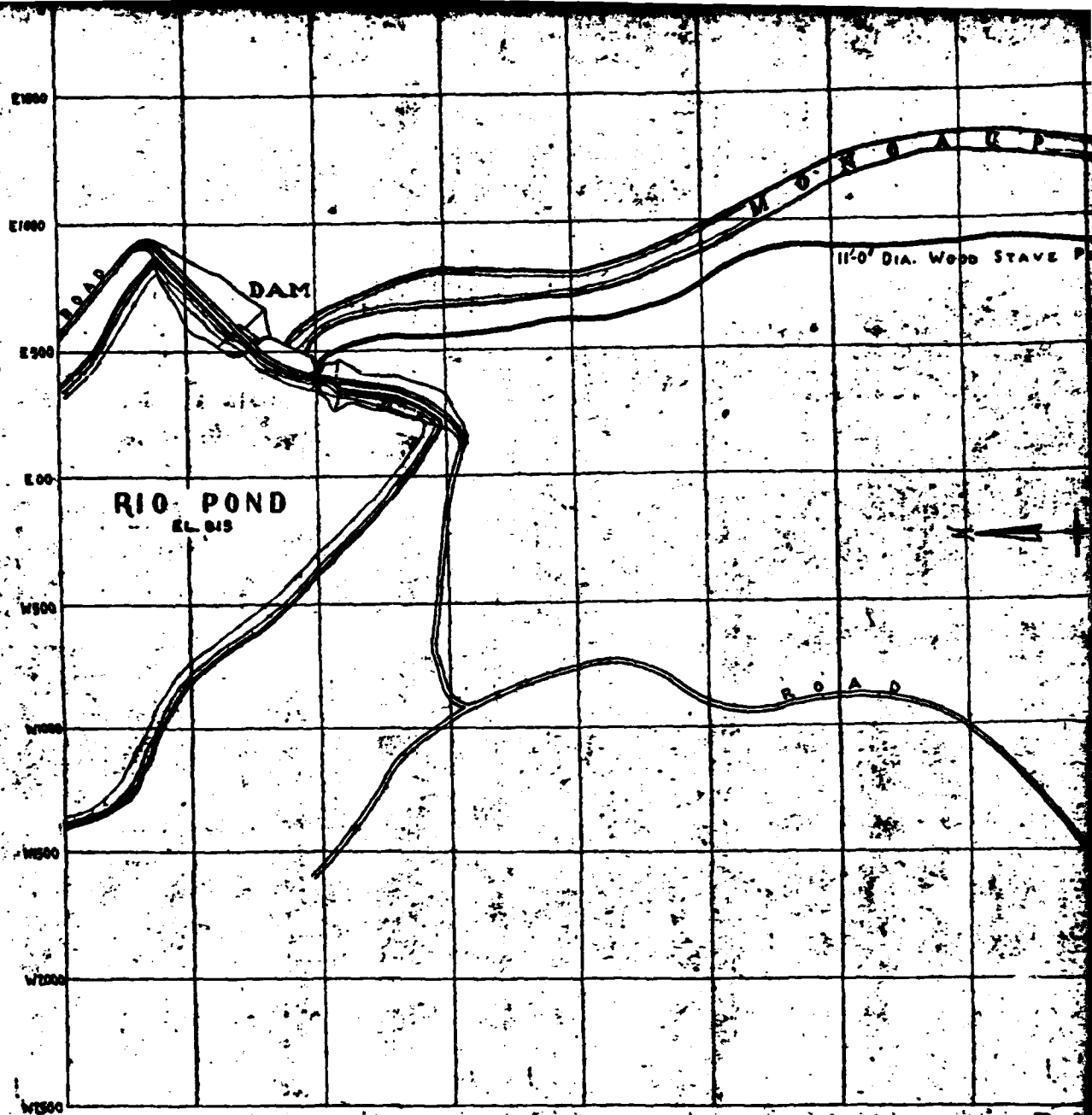
PLAN

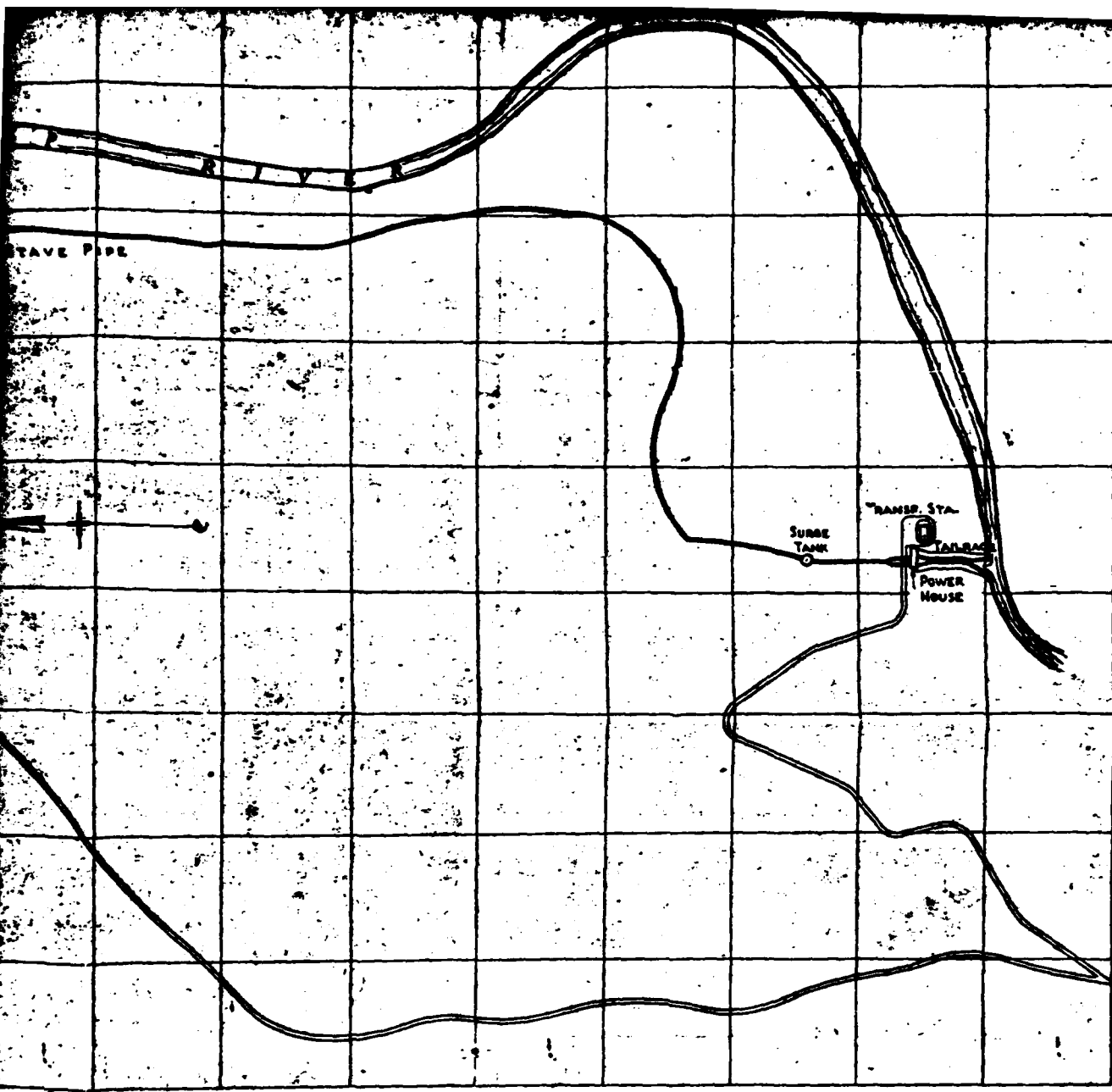
0 100 FEET

WOOD STAVE PIPE - 12" DIA.



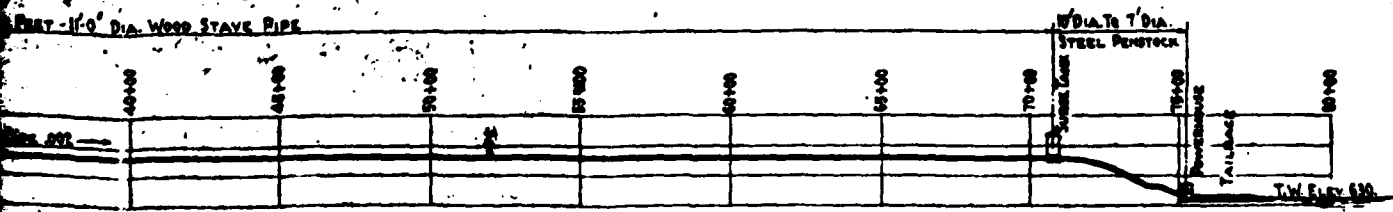
T.W. ELEV. 620





PLAN

0 50 100 FEET

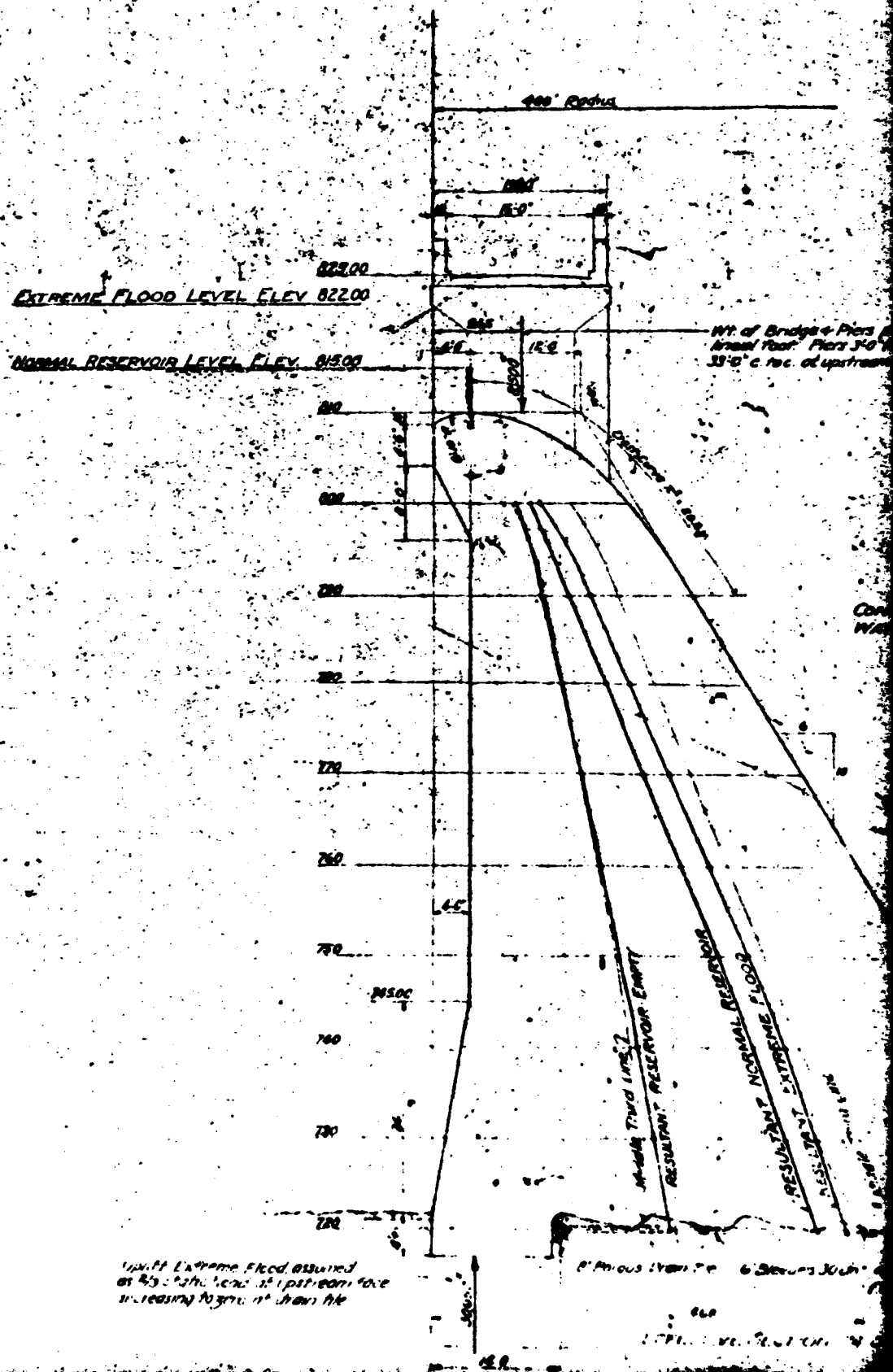


ON CENTERLINE OF PIPE

APPROVED:
CHAS. T. MAIN, INC. CONSULTING ENGRS
801 DEVONSHIRE ST.
BOSTON, MASS.
BY *Charles T. Main*

THIS DRAWING IS THE PROPERTY OF CHARLES T. MAIN & CO.
AND IS SUBJECT TO RETURN ON DEMAND

ROCKLAND LIGHT & POWER CO. — NYACK, N.Y.			
REVISIONS		RIO DEVELOPMENT GENERAL PLAN	
PREPARED BY CHARLES T. MAIN & CO. ENGINEERS		APPROVED BY <i>W. F. Hall</i> JAN 16, 1909	
SCALE 1" = 300'		KK 3 51-A	



CONCRETE 1:3:6, 145° PER CU. FT.
WATER 62.4° PER CU. FT.

AD. Radius

Elev 7640

30th - 40th of November
1940 - 1941 - 1942 - 1943

APPROVED
CHAS F. MAIN, CONSULTING ENG.
200 DEVERINGHUE ST.
BOSTON 19, MASS.

5v

EXTREME FLOOD LEVEL ELEV 822.00

NORMAL RESERVOIR LEVEL ELEV 815.00

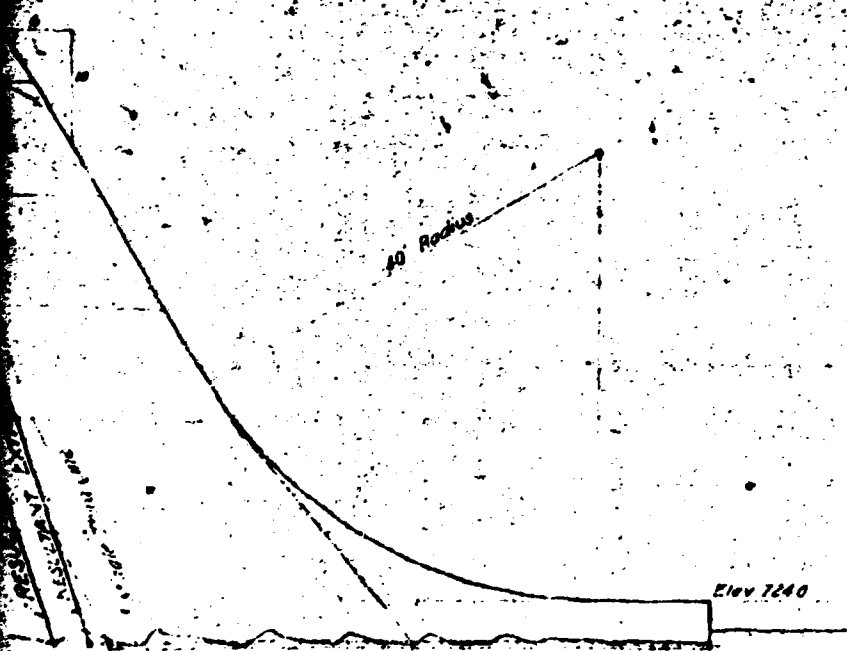
WT. of Bridge Piers
Abutment Piers 3'-0"
33'-0" c. rec. of upstream

100 ft. Extreme Flood, assumed
at 45' c. rec. of upstream force
increasing to 100' from the

8' Piers (Vari. 7' 6" Structure 30' c. rec. of upstream)

4 Piers per
Piers 3'-0" thick
at upstream face.

CONCRETE 1:3:6, 145° PER CU. FT.
WATER 62.4° PER CU. FT.



Shows Joint Position of Resultant
Extreme Flood Loading up to

APPROVED
CHAS. T. MAIN, CONSULTING ENGR.
200 DEVENISH ST.
BOSTON, MASS.

BY *Chas. T. Main*

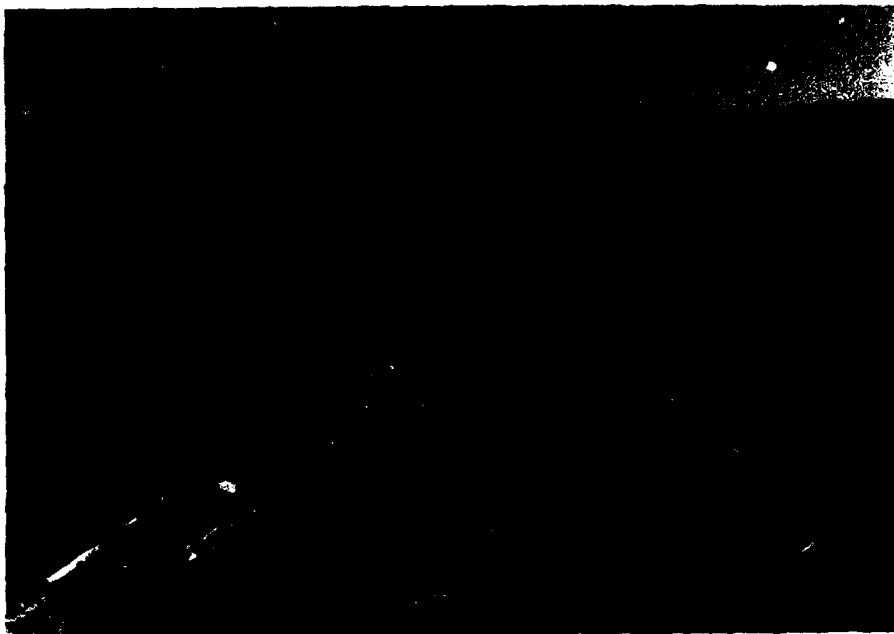
CATSKILL POWER CORP. MIDDLETON, MASS.	
REVISIONS	RIO DEVELOPMENT STRESS SHEET SPILLWAY SECTION OF DAM
1	AS NOTED
2	AS NOTED
3	AS NOTED
4	AS NOTED
5	AS NOTED
6	AS NOTED
7	AS NOTED
8	AS NOTED
9	AS NOTED
10	AS NOTED
11	AS NOTED
12	AS NOTED
13	AS NOTED
14	AS NOTED
15	AS NOTED
16	AS NOTED
17	AS NOTED
18	AS NOTED
19	AS NOTED
20	AS NOTED
21	AS NOTED
22	AS NOTED
23	AS NOTED
24	AS NOTED
25	AS NOTED
26	AS NOTED
27	AS NOTED
28	AS NOTED
29	AS NOTED
30	AS NOTED
31	AS NOTED
32	AS NOTED
33	AS NOTED
34	AS NOTED
35	AS NOTED
36	AS NOTED
37	AS NOTED
38	AS NOTED
39	AS NOTED
40	AS NOTED
41	AS NOTED
42	AS NOTED
43	AS NOTED
44	AS NOTED
45	AS NOTED
46	AS NOTED
47	AS NOTED
48	AS NOTED
49	AS NOTED
50	AS NOTED

THIS DRAWING IS THE PROPERTY OF THE CATSKILL POWER CORP. AND IS NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF THE CATSKILL POWER CORP.

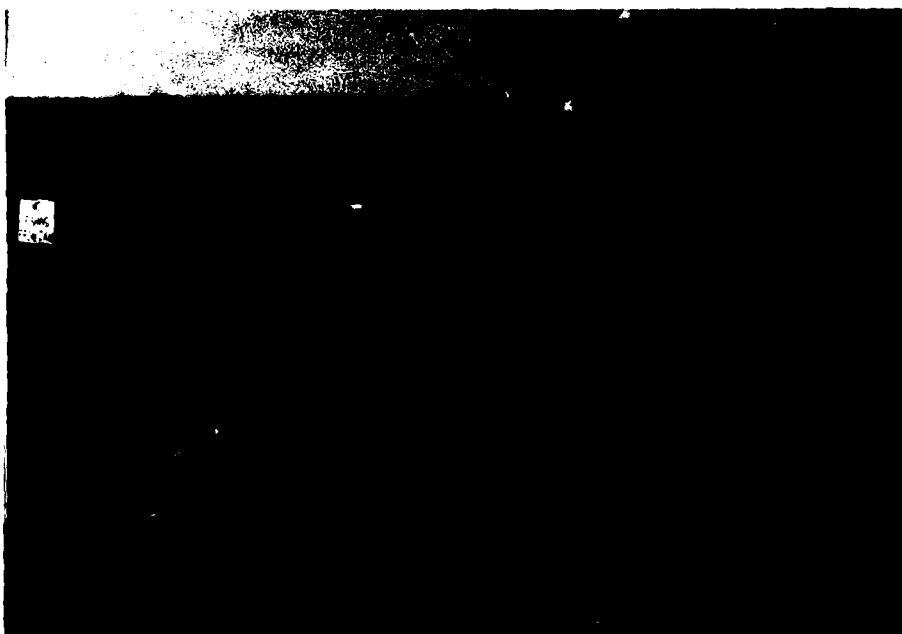
3150

PHOTOGRAPHS

APPENDIX B



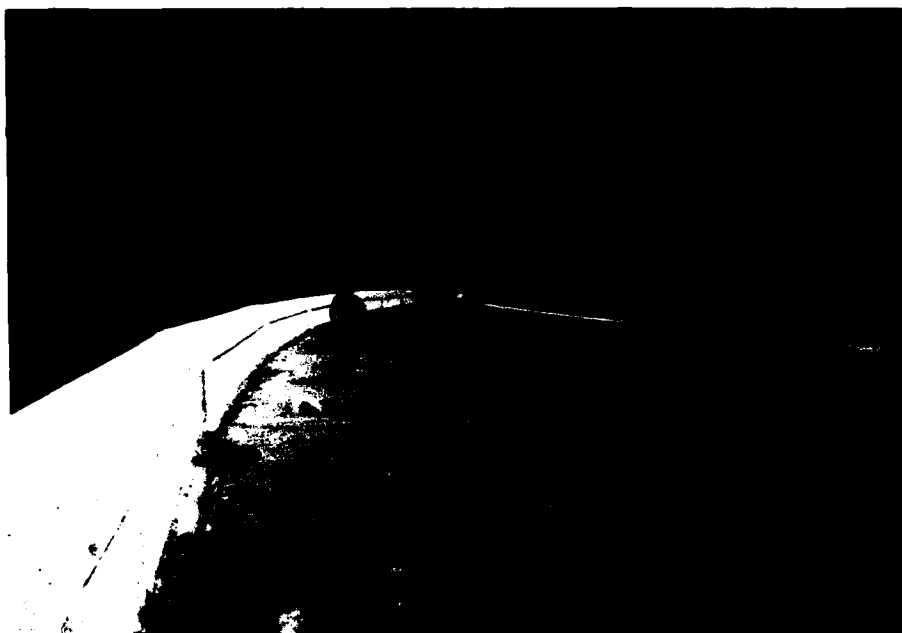
2. VIEW OF UPSTREAM SLOPE FROM RIGHT ABUTMENT



3. VIEW OF UPSTREAM SLOPE FROM LEFT ABUTMENT



4. VIEW OF DAM CREST FROM CENTER LOOKING
TOWARDS RIGHT ABUTMENT



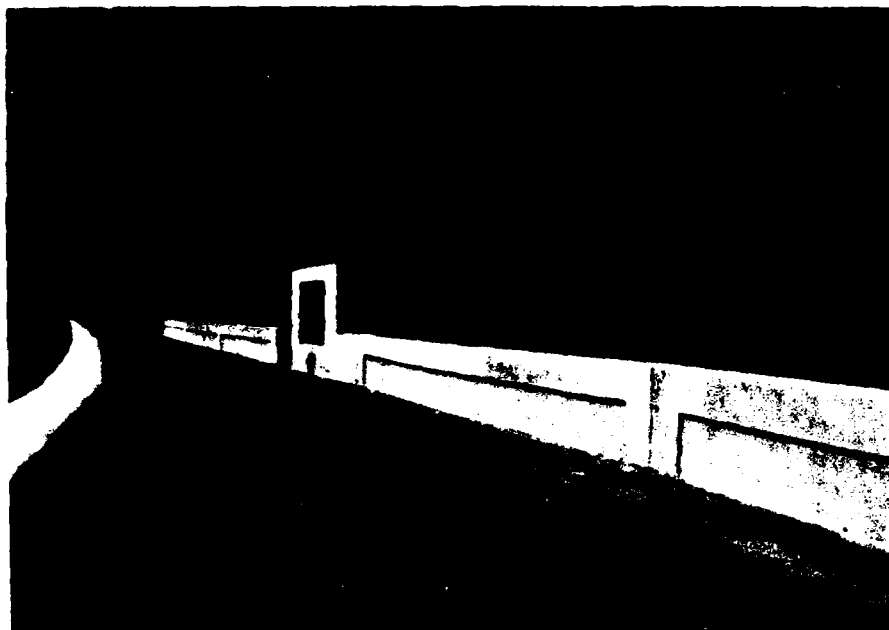
5. VIEW OF DAM CREST FROM CENTER LOOKING
TOWARDS LEFT ABUTMENT



6. VIEW OF SPILLWAY FROM DOWNSTREAM RIGHT
ABUTMENT (NOTE CHANGE IN PENSTOCK FROM
STEEL PIPE TO WOOD STAVE SECTION)



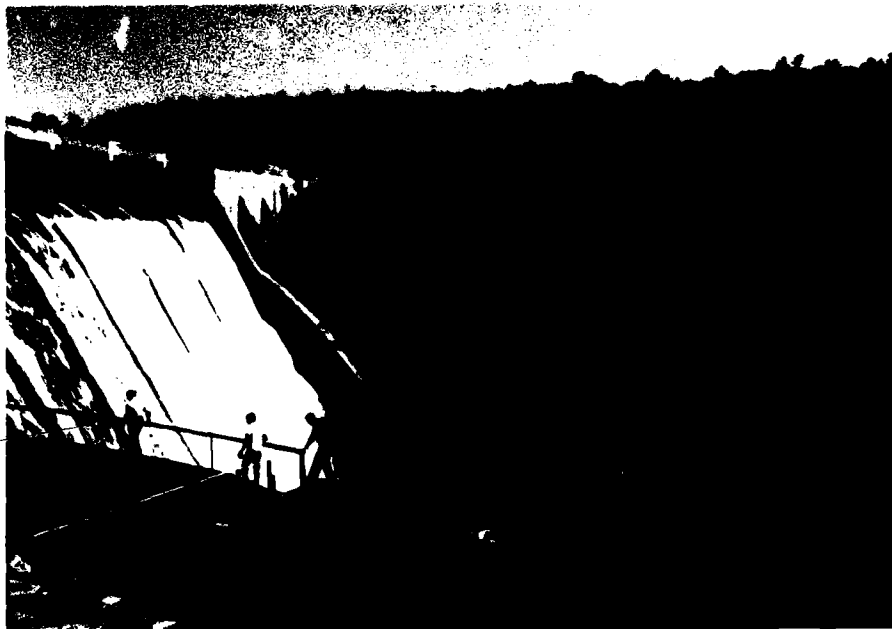
7. VIEW OF RIVER CHANNEL IMMEDIATELY DOWNSTREAM
OF SPILLWAY



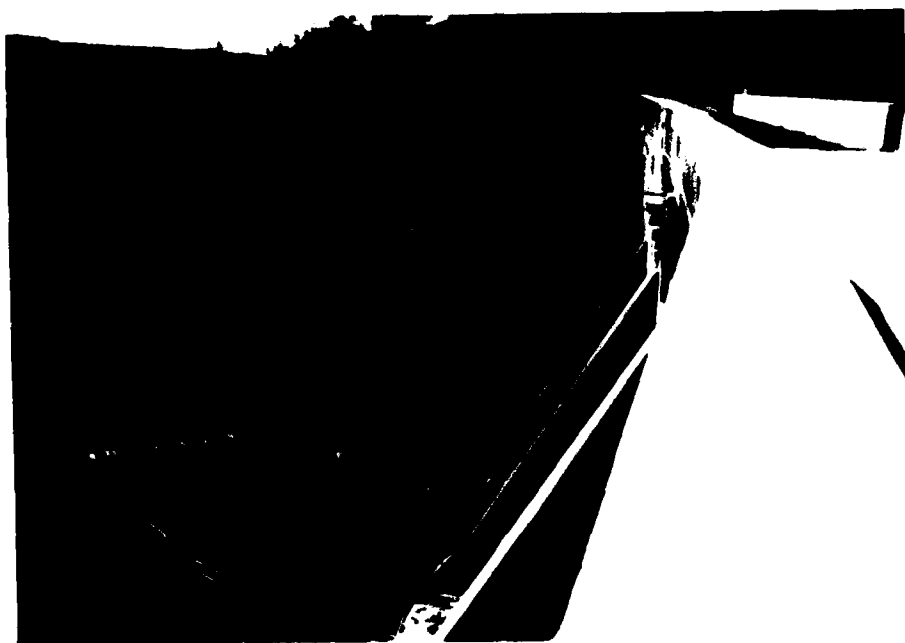
8. GATEHOUSE LOCATED NEAR RIGHT SPILLWAY
ABUTMENT



9. SLIDING GATE VALVE CONTROLS LOCATED IN
GATEHOUSE



10. VIEW OF DOWNSTREAM LEFT ABUTMENT



11. VIEW OF DOWNSTREAM RIGHT ABUTMENT



12. PENSTOCK DRAIN VALVE
LOCATED IMMEDIATELY
UPSTREAM OF STEEL/WOOD
STAVE PIPE TRANSITION



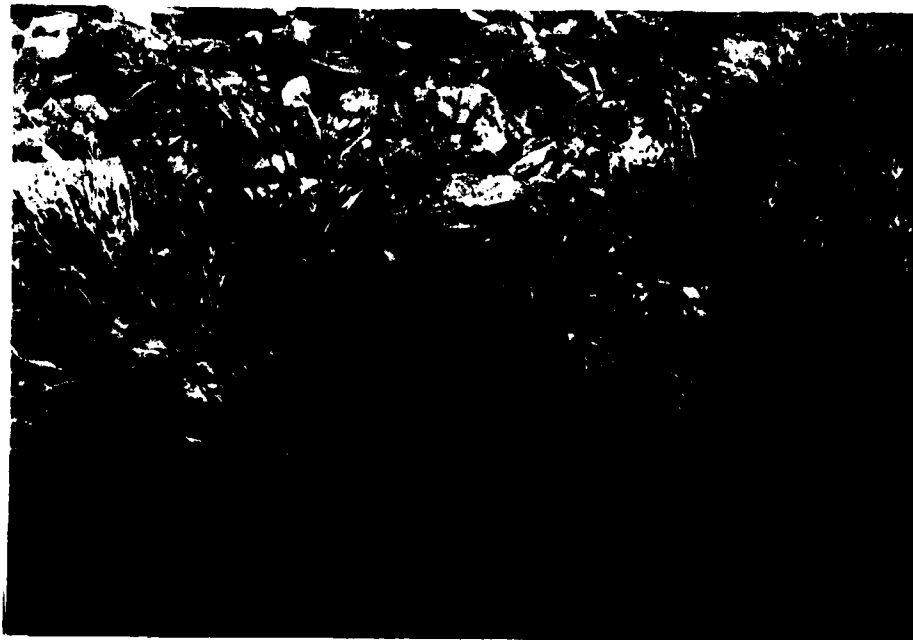
13. WEIR LOCATED ON DRAINAGE DITCH IMMEDIATELY
DOWNSTREAM OF DAM TOE ON LEFT ABUTMENT-USED
TO MONITOR FLOW FROM SPRING



14. DOWNSTREAM JUNCTION
OF STEEL PENSTOCK AND
SPILLWAY ABUTMENT WALL
(NOTE SEEPAGE AROUND
PIPE)



15. DOWNSTREAM TOE OF SPILLWAY CHUTE AT LEFT
ABUTMENT (NOTE SEEPAGE ENTERING FROM BE-
HIND WING WALL)

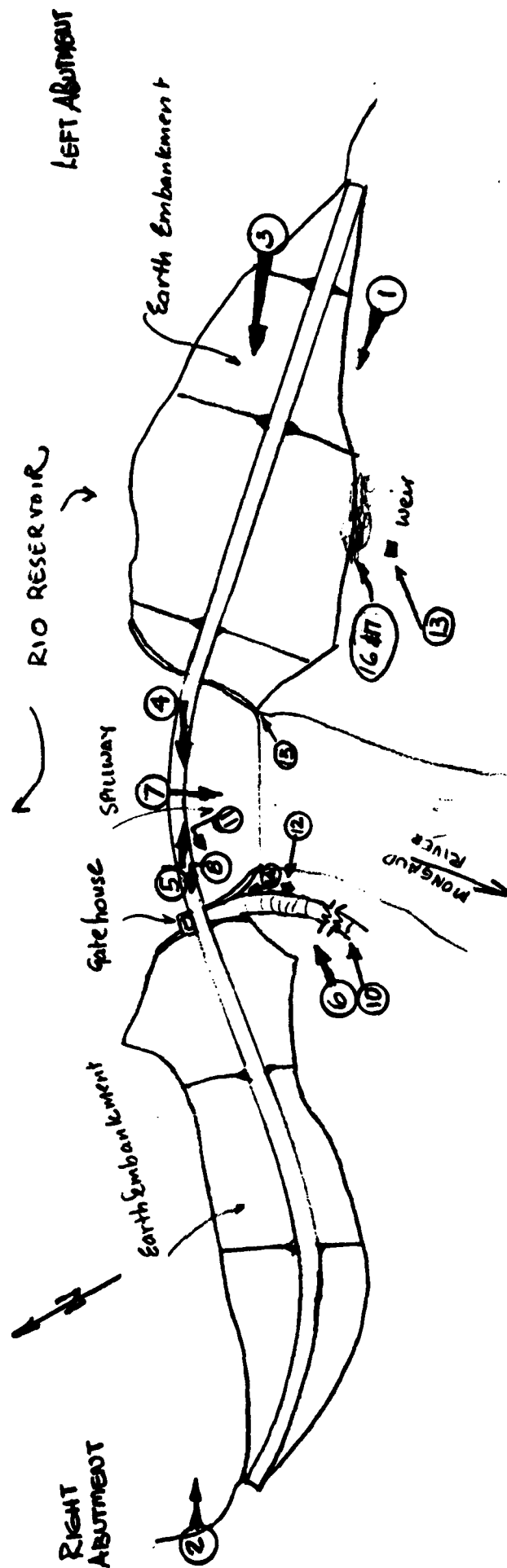


16. TOE OF DAM NEAR TERMINATION OF SPILLWAY
LEFT ABUTMENT CUT OFF WALL (NOTE SURFACE
WATER)



17. CLOSE-UP OF DAM TOE AS SHOWN IN PHOTOGRAPH 16
(NOTE WATER EMANATING FROM RIPRAP AT TOE)

Photograph 9 taken inside the gate house



Note
Locations of Photographs are approximate.

Scale
NTS

RIO DAM PHOTOGRAPHS LOCATION PLAN.

VISUAL OBSERVATION

APPENDIX C

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam RIO DAM
Fed. I.D. # NY 00497 DEC Dam No. 149B-86
River Basin DELAWARE RIVER BASIN
Location: Town UPPER MONGAUP County ORANGE AND SULLIVAN
Stream Name MONGAUP RIVER
Tributary of DELAWARE RIVER
Latitude (N) 41°-28.8' Longitude (W) 74° 45 4'
Type of Dam EARTH WITH CONC. SPILLWAY
Hazard Category HIGH (1)
Date(s) of Inspection 8 JULY 1981
Weather Conditions Sunny - 85°-95° F.
Reservoir Level at Time of Inspection E1. 811.20

b. Inspection Personnel HARVEY S. FELDMAN; JYOTINDRA PATEL;
AND JOHN WALLACE

c. Persons Contacted (Including Address & Phone No.) MR. DONALD LAVERS, SUPERVISOR
& INCHARGE OF ENGINEERING; & MR ROY WANVIG, SENIOR CIVIL ENGINEER

ADDRESS: ORANGE AND ROCKLAND UTILITIES INC.
ONE BLUE HILL PLAZA
PEARL RIVER, NEW YORK 10965

TELEPHONE: (914) 352-6000
914-627-2648 (Direct dial Number of Mr. WANVIG.)

d. History:

Date Constructed 1926-1927 Date(s) Reconstructed 1979 (Roadway spanning
the spillway reconstructed)

Designer { CHARLES H. TENNEY & CO, ENGINEERS BOSTON, MASS
CHAS. T. MAIN, Inc. Boston, Massachusetts.

Constructed By FRED T LEY & CO. Springfield, Massachusetts.

Present Owner ORANGE AND ROCKLAND UTILITIES INC.

2) Embankment

LEFT AND RIGHT EMBANKMENTS including
Spillway abutment walls.

a. Characteristics

- (1) Embankment Material Embankment portions consists of gravel & sand
and at abutment walls is riprap.
- (2) Cutoff Type Embankment - Core consisting clay and fine sand.
Abutment wall - Concrete wall
- (3) Impervious Core Only in the embankment portion
- (4) Internal Drainage System 8" porous tile drain, laid in gravel
immediately downstream of cut off along entire base of spillway over abutments ^{NO 1/2}
- (5) Miscellaneous 8" tile drain connected to intermediately spaced
6" tile blade lines existing near downstream toe of spillway

b. Crest - serves as a roadway. — Spillway - concrete pavement
abutments & embankment - Asphalt.

- (1) Vertical Alignment generally good
- (2) Horizontal Alignment curved and alignment generally
good
- (3) Surface Cracks asphalt portion of pavement (embankments)
minor cracks - hairline size
- (4) Miscellaneous the concrete pavement spanning the spillway
repaired recently - repaired section appears to be good.

c. Upstream Slope

- (1) Slope (Estimate) (V:H) 1(V) : 3(H) - embankments & abutment wall ^{section.}
- (2) Undesirable Growth or Debris, Animal Burrows minor vegetation;
Debris & animal burrows - none observed
- (3) Sloughing, Subsidence or Depressions none observed

(4) Slope Protection rip rap appears to be in good condition (above reservoir level)

(5) Surface Cracks or Movement at Toe None observed above level. Toe of U/S face submerged. Therefore condition could not be ascertained

d. Downstream Slope

(1) Slope (Estimate - V:H) 1(V) : 2(H) - abutment walls & embankment

(2) Undesirable Growth or Debris, Animal Burrows Overgrown with grass, shrubs, and small trees.

(3) Sloughing, Subsidence or Depressions None observed

(4) Surface Cracks or Movement at Toe no cracks visible. It appears to be no movement at Toe

(5) Seepage At three locations; two locations on the left embankment; and third at contact between spillway training wall and ^{left} abutment wall fill (downstream side.) See ATTACHED sketch sheet 2A

(6) External Drainage System (Ditches, Trenches; Blanket) Along the toe of the left embankment, flow from the seepages at the left embankment is collected in the ditch which runs along the toe of the dam. There are no other drainage system (external)

(7) Condition Around Outlet Structure There is no outlet structure.

(8) Seepage Beyond Toe Flow from a natural spring is collected in a ditch which joins the ditch at left embankment

e. Abutments - Embankment Contact

The flow from natural spring is measured by the weir and the combined flow is measured by another weir located at the bank of the downstream channel (see sketch on sheet 2A)

Both embankments - one contact is natural ground and the other is with spillway abutment wall

(1) Erosion at Contact None observed

(2) Seepage Along Contact At Contact between spillway and left abutment wall fill (downstream side) - seepage occurring at downstream end of the downstream training wall. (see also 2.d.5)

3) Drainage System

- a. Description of System ^{**} In the abutment walls of the spillway section, 8" porous tile drain, placed in gravel. The drains along the downstream face of the cut off wall. and form the drainage system of the spillway which consist of the longitudinal and transverse tile drains.
- b. Condition of System Could not be observed because tile drains are subsurface.
- c. Discharge from Drainage System could not be observed at the spillway because spillway was flowing.

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.)

2 Weirs located in the ditches which collect flow from the seepage occurring at the downstream face of the dam (imminity of toe) and from the natural spring located at left abutment. In addition to weirs there is pipe which also measures flow which is due to seepage from the exposed rock at left bank of the downstream channel. (See attached sketch sheet 3A)

^{**} Description of System - continued. The transverse drains run at the bottom of the spillway weir and existing at the downstream of the spillway apron into natural channel.

5) Reservoir

- a. Slopes Variable slopes in vicinity of the dam are in generally stable condition.
- b. Sedimentation Lake water is clear in the vicinity of dam and there appears to be no sedimentation problems
- c. Unusual Conditions Which Affect Dam none observed.

6) Area Downstream of Dam

- a. Downstream Hazard (No. of Homes, Highways, etc.) _____
- b. Seepage, Unusual Growth No seepage observed except in the vicinity of the spillway - from exposed rock
- c. Evidence of Movement Beyond Toe of Dam none
- d. Condition of Downstream Channel good except minor floating debris

7) Spillway(s) (Including Discharge Conveyance Channel)

- The concrete spillway is located at about center of the dam. The spillway consists of 3 (eight) overflow sections each about 33 feet span. Total length 264 ft. spanning the spillway
- a. General is a concrete roadway which is supported by the 7 piers equally spaced along the spillway cut; the discharges over the spillway are controlled by flashboards which drop out of position after lake reaches a certain stage. The spillway is founded on bedrock and the downstream channel is bedrock formed. The surface of the spillway is grouted.
- b. Condition of Service Spillway The concrete spillway appears to be in good condition except minor spalling of the concrete especially at downstream training walls. At the nonoverflow section of downstream face (above penstock intake) few inches of concrete surface is removed. It is reported that this section will be reinforced by the scaffold used during the repairwork of roadway still in place at this section. (see structural comments)

c. Condition of Auxiliary Spillway There is no auxiliary spillway

d. Condition of Discharge Conveyance Channel good except
minor floating debris. The exposed slopes which
are rock formed are stable

8) Reservoir Drain/Outlet There is no Reservoir Drain. *
power house pipe system
Type: Pipe X Conduit _____ Other _____
Material: Concrete _____ Metal steel & Other WOOD STAVE PIPE
Size: 11.0' WOOD / 10'-7" steel Length 7075 WOOD STAVE / 450' steel penstock
Invert Elevations: Entrance 769.5 Exit 630 ±
Physical Condition (Describe): _____ Unobservable ✓
Material: _____
Joints: _____ Alignment _____
Structural Integrity: _____
Hydraulic Capability: _____
Means of Control: Gate X Valve _____ Uncontrolled _____
Operation: Operable Reportedly Inoperable _____ Other _____
Present Condition (Describe): WAS NOT OPERATED AT TIME OF
SITE VISIT NOR WITHIN PAST 2 YRS. Reportedly in good condition
There is a power plant intake located at the right abutment of
the spillway having an invert EI 769.5 that may be used in an emergency
as a partial reservoir drain

9) Structural Concrete Spillway and Spillway Abutment walls.

- a. Concrete Surfaces Since the discharges were flowing over the spillway, the condition of concrete surface of the spillway could not be ascertained. The condition of the concrete surface at the abutment walls are good.
- b. Structural Cracking Several horizontal cracks at downstream face of the spillway. Cracks appears to be at the grout surface joints.
- c. Movement - Horizontal & Vertical Alignment (Settlement) None observed.
- d. Junctions with Abutments or Embankments The spillway and the abutment walls are tied well with the both embankments. There is seepage occurring at the left spillway/abutment contact as described below.
- e. Drains - Foundation, Joint, Face According to drawings longitudinal and transverse tile drains at the bottom of the spillway section; and longitudinal drain at abutment walls. None could be located (see Drainage System Item # 3)
- f. Water Passages, Conduits, Sluices CONSTRUCTION DRAWING shows the presence of a bypass tunnel located at the base of the dam w/ flow controlled by a temporary sluice. Filling slates are also shown. This tunnel has apparently been filled at the conclusion of dam construction.
- g. Seepage or Leakage Minor amounts of seepage were observed from the toe of the spillway on the left abutment. Seepage waters were observed exiting from joints in the foundation rock immediately downstream of the left abutment spillway retaining wall. Minor seepage was observed when the power plant pipeline exited the downstream face of the spillway right abutment.

- h. Joints - Construction, etc. Appear in good condition
- i. Foundation The concrete spillway section is founded on competent sandstone and shale bedrock
- j. Abutments Appear in good condition
- k. Control Gates were not operated at time of inspection but were reported operable by owner representative
- l. Approach & Outlet Channels good condition
- m. Energy Dissipators (Plunge Pool, etc.) -NONE-
- n. Intake Structures -NOT OBSERVED-
- o. Stability Appears in stable condition
- p. Miscellaneous

10) Appurtenant Structures (Powerhouse, Lock, Gatehouse, Other)

a. Description and Condition _____

Powerhouse which is located
several miles d/s. The penstock from the
dam connects the powerhouse. It is reported
that the several segments of penstock
are damaged. The gatehouse appears
to be in good condition.

TAMS

Job No. 1579-19

Sheet 10 of

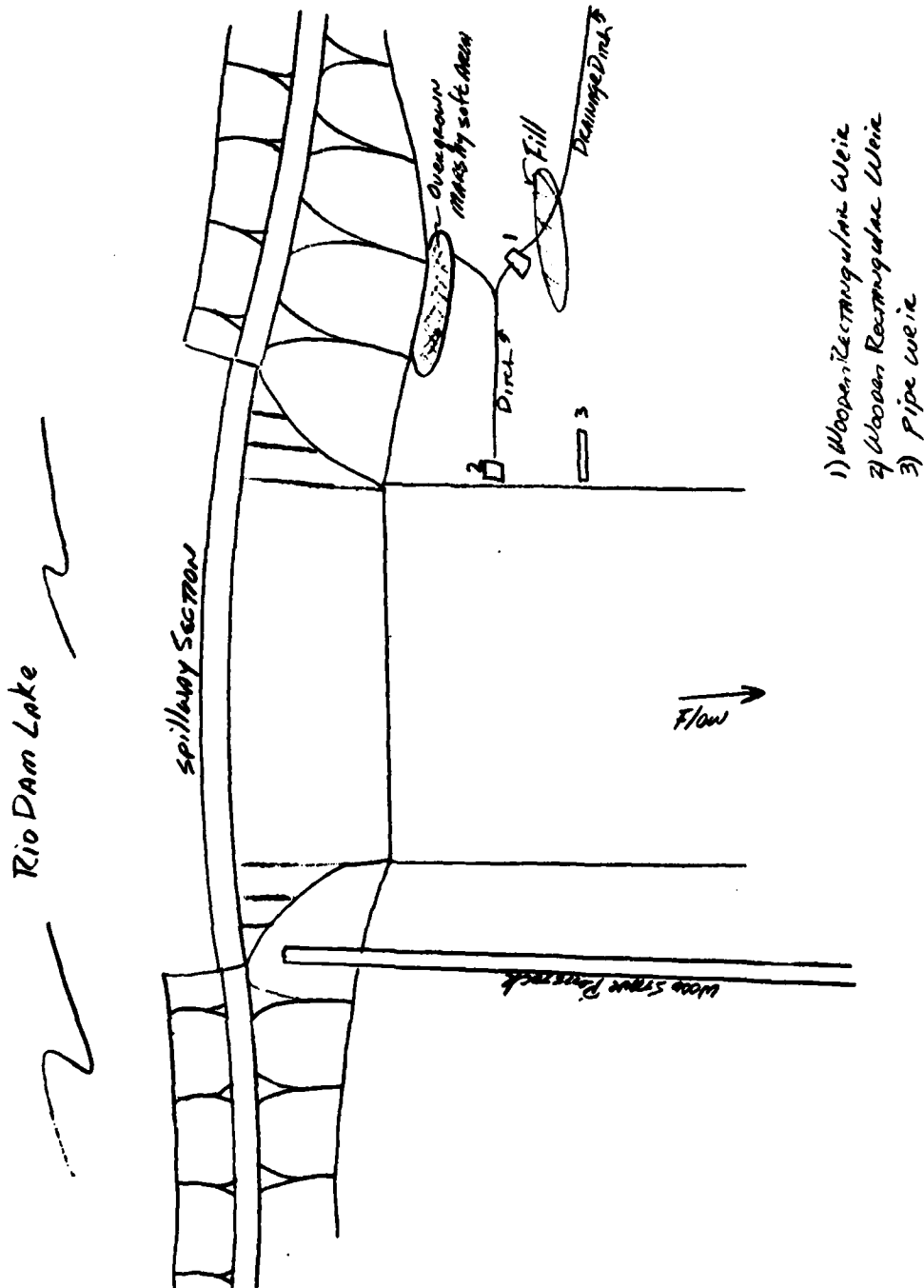
Project NYS Dam Inspection

Date 7-29-81

Subject Rio Dam NY 00497

By IFW

Site Plan View Showing Areas of Interest From Site Visit Ch'k. by _____



HYDROLOGIC DATA & COMPUTATIONS

APPENDIX D

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

1

AREA-CAPACITY DATA:

	<u>Elevation</u> (ft.)	<u>Surface Area</u> (acres)	<u>Storage Capacity</u> (acre-ft.)
1) Top of Dam	<u>825.0</u>	<u>540</u>	<u>19978</u>
2) Design High Water (Max. Design Pool) (shown on the drawings)	<u>822.0</u>	<u>508</u>	<u>18398</u>
3) Auxiliary Spillway Crest	<u>None</u>	<u>—</u>	<u>—</u>
4) Pool Level with Flashboards	<u>815.0</u>	<u>428</u>	<u>15105</u>
5) Service Spillway Crest	<u>810.0</u>	<u>370</u>	<u>13110</u>

DISCHARGES

	<u>Volume</u> (cfs)
1) Average Daily	<u>UNKNOWN</u>
2) Spillway @ Maximum High Water	<u>62090</u>
3) Spillway @ Design High Water	<u>41500</u>
4) Spillway @ Auxiliary Spillway Crest Elevation	<u>—</u>
5) Low Level Outlet	<u>UNKNOWN</u>
6) Total (of all facilities) @ Maximum High Water	<u>62090 +</u>
7) Maximum Known Flood	<u>—</u>
8) At Time of Inspection	<u>UNKNOWN</u>

EMBANKMENT
CREST:

ELEVATION: 825.0'

Type: Earth fill

Width: 20.0' Length: 1487' including spillway

Spillover Controlled Concrete Spill over section

Location Spill over section located in center of Dam

SPILLWAY:

SERVICE

AUXILIARY

810.0

Elevation

NONE

Over flow section

Type

264 ft

Width

Type of Control

Uncontrolled

Controlled:

Flash boards

Type

(Flashboards; gate)

5

Number

12" / 30ft

Size/Length

Invert Material

Anticipated Length
of operating service

150't

Chute Length

Height Between Spillway Crest
& Approach Channel Invert
(Weir Flow)

HYDROMETEROLOGICAL GAGES:

Type : _____

Location: _____

Records:

Date - _____

Max. Reading - _____

FLOOD WATER CONTROL SYSTEM:

Warning System: OBSERVATION AND REPORTING in the form of
an Emergency Action Plan

Method of Controlled Releases (mechanisms):

NONE CURRENTLY ACTIVE - INOPERATIVE
PISTON could be used if REPAIRED

DRAINAGE AREA:

202 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: forest land, urban, suburban & ruralTerrain - Relief: gently to steeply slopingSurface - Soil: RESIDUAL & glacialRunoff Potential (existing or planned extensive alterations to existing
(surface or subsurface conditions)UNKNOWN

Potential Sedimentation problem areas (natural or man-made; present or future)

UNKNOWNPotential Backwater problem areas for levels at maximum storage capacity
including surcharge storage:NONEDikes - Floodwalls (overflow & non-overflow) - Low reaches along the
Reservoir perimeter:Location: UNKNOWN

Elevation: _____

Reservoir:

Length @ Maximum Pool 0.74 (Miles)Length of Shoreline (@ Spillway Crest) 8.05 (Miles)

TAMS

Job No. 1579-19

Project RIO DAM PHASE 1 SAFETY INSPECTION

Subject HYDROLOGIC / HYDRAULIC COMPUTATIONS

Sheet 1 of 9

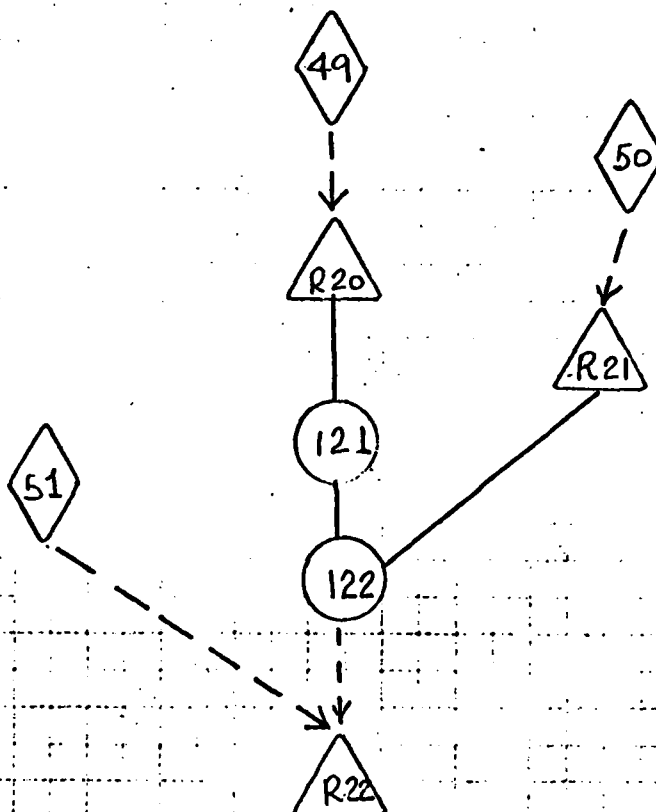
Date JULY 23, 1988

By D. L. C

Ch'k. by _____

FROM: UPPER DELAWARE RIVER BASIN
HYDROLOGIC FLOOD ROUTING MODEL.

(REF 2)



MONGOUF RIVER BASIN TO RIO RESERVOIR
AND DAM.

R 20 TORONTO RESERVOIR

R 21 SWINGING BRIDGE RESERVOIR

R 22 RIO RESERVOIR

TAMS

Job No. 1579-19
 Project RIO DAM
 Subject HYDROLOGIC/HYDRAULIC COMPUTATIONS

Sheet 2 of 9
 Date AUG 21, 1981
 By D.L.C.
 Ch'k. by _____

BASIN AREA 202 SQ MILES (REF 2)

- ① TORONTO RESERVOIR SUBAREA 23.2 SQ MILES
- ② SWINGING BRIDGE RES SUBAREA 118.0 SQ MI
- ③ RIO RESERVOIR SUBAREA 60.8 SQ MI

FROM HMR 33 ZONE 1

ALL SEASON 200 SQ MI 24 HR PMP = 21.0"

DURATION (HRS)	① %	② DEPTH	③
6	102	82	88
12	114	96	104
24	124	107	114
48	134	112	120

TOP OF DAM PARAPET 829.0'

TOP OF ROAD OVER SPILLWAY 825.0'

LOWCOURT " " " 823.9'

TAMS

Job No. 1579-19 Sheet 3 of 9
 Project Rio DAM Date JULY 23, 81
 Subject HYDROLOGIC & HYDRAULIC COMPUTATIONS By DLC
 Ch'k. by _____

SUBBASIN CHARACTERISTICS and UNIT HYDROGRAPHS

Subbasin	49	50	51
Drainage Area (sq mi)	23.2	118.0	60.8
Length (mi)	9.9	14.4	6.3
Slope (ft/ft)	0.0057	0.0066	0.0150

Hours	Discharge (cfs)		
0	0	0	0
3	499	2,537	2,876
6	1,347	5,327	3,660
9	848	4,440	2,222
12	647	3,425	1,438
15	499	2,664	1,046
18	349	1,903	719
21	224	1,395	458
24	155	1,015	261
27	120	761	157
30	100	533	118
33	75	381	65
36	50	304	52
39	40	254	0
42	35	203	
45	0	127	
48		101	
51		0	
54			

TAMS

Job No. 1579-19
 Project RIO DAM
 Subject HYDROLOGIC / HYDRAULIC COMPUTATIONS

Sheet 4 of 9
 Date JULY 23, 81
 By DLC
 Ch'k. by _____

MODELING PARAMETERS

			<u>1950</u>			<u>1955</u> X		
SUBBASIN	QRCSN ¹ Ratio	RTIOR ²	INITIAL BASE FLOW (cfs/sq mi)	LOSSES INITIAL (in.)	CONSTANT (in./hr)	INITIAL BASE FLOW (cfs/sq mi)	LOSSES INITIAL (in.)	CONSTANT (in./hr)
49	0.55	4.30	0.80	2.00	0.17	0.80	2.00	0.30
50	0.46	3.70	0.80	2.10	0.14	0.80	2.00	0.13
51	0.49	4.00	0.80	2.10	0.14	0.80	2.00	0.25

RESERVOIR DISCHARGE RATINGS

SWINGING BRIDGE

Spillway Crest
 Elevation = 1,065 ft
 Storage at Spillway
 Crest Elevation = 28,060 acre ft

<u>Storage (acre ft)</u>	<u>Discharge (cfs)</u>
7,820	457
28,060	1,076
28,980	1,576
29,900	2,176
30,820	2,876
31,740	3,876
32,890	4,876
33,580	6,576
34,500	8,776
35,420	24,776

TORONTO

Spillway Crest
 Elevation = 1,215 ft
 Storage at Spillway
 Crest Elevation = 21,850 acre ft

<u>Storage (acre ft)</u>	<u>Discharge (cfs)</u>
21,850	0
23,230	420
23,920	800
24,610	1,230
25,300	1,780
25,990	2,350
26,680	2,950
27,370	3,600
28,060	4,300
28,750	5,000

TAMS

Job No. 1579-19
 Project RIO DAM
 Subject HYDROLOGIC/HYDRAULIC COMPUTATIONS.

Sheet 5 of 9
 Date July 23, 5
 By D.L.C.
 Ch'k. by _____

SPILLWAY Consists of 8 bays 30.0' wide

Assume $H_D = (\text{DESIGN HEAD}) = 12.0'$

EL.	H_c	H_c/H_D	C	Q_1	Q_8	
810	0					
815	5			0	0	TOP OF FLASHBOARDS
817	(2)		3.3	280	2240	Just prior to tripping of flashboards
818	8	0.67	3.8	2579.5	20636	
820	10	0.83	3.91	3709.4	29675.2	
822	12	1.00	4.02	5013.2	40105.6	
823.9	13.9	1.16	4.12	6405.3	51242.4	LOW COR'D ROADWAY
825				7761.4	62090	
829				9505.7	76045.5	Pressure flow $Q = 0.82 \sqrt{g H_c}$

AREA UNDER RD - 1 SPAN = $30 \times 13.9 = 417$ sqft

$$H_c = 829 - 817 = 12.0'$$

$$Q = (0.82 \sqrt{64.4}) (\sqrt{12}) (417)$$

$$= (2744.055) \sqrt{H} = 9505.7$$

It is assumed flash boards are in place - Q at EL 817 is over flash boards (which act as sharp crested weir) - flash boards are tripped as reservoir surface rises above EL 817 (20 feet above top of flashboards).

TAMS

Job No. 1579-19

Project RIO DAM

Subject HYDROLOGIC/HYDRAULIC COMPUTATIONS

Sheet 6 of 9

Date July 24, 81

By D L C

Ch'k. by _____

Flow over bridge parapet $L = 465'$

EL.	H	C	Q	USE C = 2.6 (Pressure flow) $Q_{8.}$	Q_{TOTAL}
829	0		0		
830	1.	2.6	1209	79150	80359
832	3	2.6	6282	85022	91304

Pressure flow under rd. $Q = CA \sqrt{2g} \sqrt{H} = (2744.055) \sqrt{H}$

Area of 1 span = 417 sqft

AT 830 $H = 830 - 817 = 13.0'$ $C = 0.52$

$$Q = (2744.055) \sqrt{13} = 9893.8 \text{ cfs}$$

AT 832 $H = 15.$

$$Q = (2744.055) \sqrt{15} = 10,627.7 \text{ cfs}$$

SPILLWAY RATINGS TABLE

EL	Q
810	0
815	0
817	2240
818	20636
823.9	51242
825.	62090
829	76045
830	80359
832	91304

LOWCORN

TOP OF DAM.

TOP OF Parapet

} Flow over 465' parapet
+ pressure flow

TAMS

Job No. 1579.19

Project RIO DAM

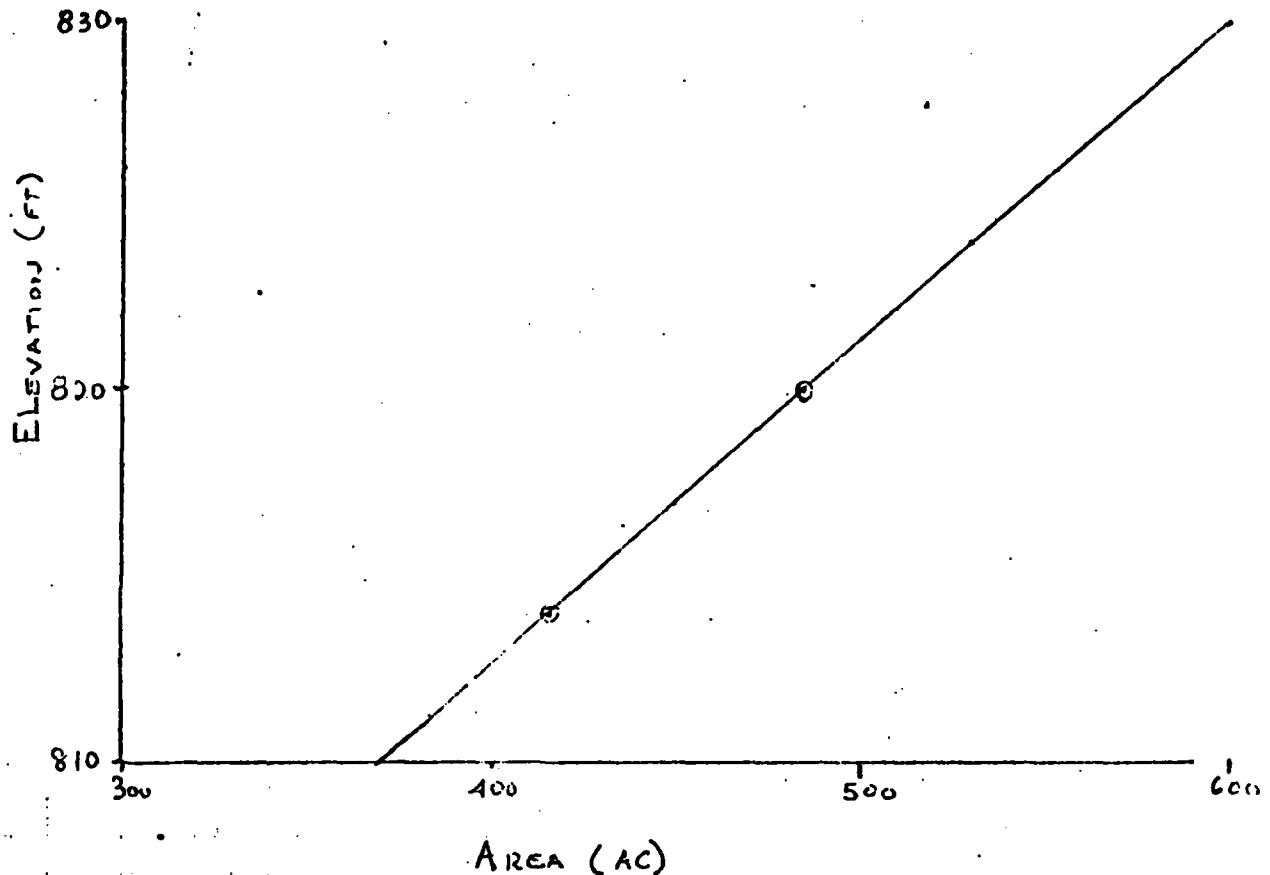
Subject HYDROLOGIC/HYDRAULIC COMPUTATIONS.

Sheet 7 of 9

Date JULY 24, 1981

By D L C

Ch'k. by _____



EL	ΔH	AREA	MEAN AREA	INC. VOL	STORAGE
810		370			13110
	5		399	1995	
815		428			15105
	2		439	878	
817		450			15988
	3		467.15	1401.5	
820		484.3			17384.5
	4		507.15	2028.6	
824		530			19413.1
	6		565	3890	
830		600			22803.1

Area extrapolated as shown above - increase assumed linear

TAMS

Job No.

Project

Subject

Rio DAM.

HYDROLOGIC / HYDRAULIC COMPUTATIONS

EXTRAPOLATION STORAGE / DISCHARGE SWINGING BRIDGE

Sheet

8 of 9

Date

JULY 28, 1961

By

D.L.C.

Ch'k. by

DISCHARGE. USING MANNING FORMULA for OPEN CHANNEL

WIDTH = 325

Slope = 0.01 ft/ft

at EL 1072.5 H = 7.5. use $n = 0.035$

$A = 2437.5$ $P = 340$ $R = 7.17$ $R^{2/3} = 3.72$

$$Q = \left(\frac{1.49}{0.035} \right) (2437.5) (\sqrt{0.01}) (3.72)$$

$$= 38,600 \text{ cfs}$$

at EL 1080 top of dam

Use $n = 0.035$

$A = 4875$ $P = 355$ $R = 13.73$ $R^{2/3} = 5.73$

$$Q = \left(\frac{1.49}{0.035} \right) (5.73) (4875) (\sqrt{0.01}) =$$

$$= 118,900 \text{ cfs}$$

From Phase I Report

EL

STORAGE

1065

27000

1070

32000

1073

38500

assuming

linear increase in storage.

1072.5

37420

1080.

53670

TAMS

Job No. 1579-19

Sheet 9 of 9

Project RIO RESERVOIR (MONGAUP RIVER)

Date 7/81

Subject _____

By JMD

Ch'k. by _____

FETCH: 0.74 mi. (1.95")

PERIMETER (@ EL. 814): 21.25" = 8.05 mi.

LAKE AREA:	2.15	} HIGHLAND	2.40	} POND	
(@ EL. 814)	2.11		2.42		} EDDY
	2.14		2.42		
	2.12				

area = 2.13 in²

area = 2.4133 in²

195.6 acres + 221.6 acres = 417.2 acres
= 0.65 sq. mi.

CONTOUR (@ EL. 820):	2.53	} HIGHLAND	2.80	} POND	
	2.47		2.78		} EDDY
	2.45		2.78		
	2.50				

area = 2.4875 in²

area = 2.7867 in²

228.4 acres + 255.9 acres = 484.3 acres
= 0.76 sq. mi.

DRAINAGE AREA: 202 SQ MI (REF 2)

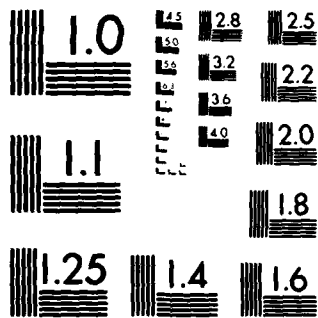
TIPPETTS-ABBETT-MCCARTHY-STRATTON NEW YORK F/6 13/13
NATIONAL DAM SAFETY PROGRAM, RIO DAM (INVENTORY NUMBER NY 497).--ETC(U)
SEP 81 E O'BRIEN DACW51-81-C-0008

NL

2.4 2

END
DATE
FILMED
2-82
DTIC

2-92



MICROCOPY RESOLUTION TEST CHART

CASE A

NO FLASHBOARDS AT
BEGINNING OF FLOOD
ROUTING (Sheets 1 of 28
thru 28 of 28)

Job No. _____

Project

Sheet _____ of _____

Sut

Date _____

CASE A.
no flash boards on spillway crest.

 FROM: WASHINGTON FACTORY (NEC-1)
 DOW SAFETY VERSION JULY 1978
 LAST MODIFICATION 11 APR 80

[illegible]

Sheet 1 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

sheet 2 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	121
RUNOFF HYDROGRAPH AT	2
ROUTE HYDROGRAPH TO	122
COMBINE 2 HYDROGRAPHS AT	3
RUNOFF HYDROGRAPH AT	4
COMBINE 2 HYDROGRAPHS AT	5
ROUTE HYDROGRAPH TO	6
ROUTE HYDROGRAPH TO	7
END OF NETWORK	

Sheet 3 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

P. _____

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80

934 DATE= 8/12/24
TIME= 12:50:57

P10 DAM PHASE 1 SAFETY INVESTIGATION
HEC 1 DB PRE ANALYSIS
JULY 1981

JOB SPECIFICATION
NO HMR MPIN TDAY IMR IMIN METRC IPLT IPRT NSTAN
50 3 0 0 0 0 0 0 0 0
JOPER MWT LROPT TRACE
5 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED
MPLAN= 1 MRTIO= 4 LATIO= 1
RTIO= 1.00 .75 .50 .25

SUR-AREA RUNOFF COMPUTATION

49 TORONTO SUB-AREA RUNOFF

ISTAQ	1COMP	IECON	ISTAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

INTVC	IJNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	23.20	0.00	202.00	0.00	0.000	0	1	0

PRECIP DATA
SPEE PHS RA R12 R24 R48 R72 R96
0.30 21.00 102.00 112.00 124.00 134.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS .293

LROPT	STKR	DLTRP	RTIOL	ERAIN	STRES	RTIOK	STRTL	CNSTL	ALSHR	RTIMP
U	0.00	0.00	1.00	0.00	0.00	1.00	2.00	.30	0.00	0.00

49% 1347. 648. 647. 499. 349. 224. 155. 120. 100.
75% 50. 40. 35. 0.
UNIT GRAPH TOTALS 4988. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA
START= -.80 QPCSN= -.55 RTIOR= 4.30

END-OF-PERIOD FLOW

MR.PN	PERIOD	RAIN	EXCS	LOSS	COMP	MR.MN	PERIOD	RAIN	EXCS	LOSS	COMP
MR.6A						MR.0A					

Sheet 4 of 28

TAMS

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

By _____

1.00	3.00	1	0.03	0.00	0.03	16.	1.04	6.00	26	0.00	0.00	2030.
1.01	4.00	2	0.03	0.00	0.03	16.	1.04	6.00	27	0.00	0.00	2533.
1.01	5.00	3	0.09	0.00	0.09	12.	1.04	12.00	28	0.00	0.00	2159.
1.01	12.53	4	0.06	0.00	0.09	10.	1.04	15.00	29	0.00	0.00	1992.
1.01	15.00	5	0.50	0.00	0.50	9.	1.04	38.00	30	0.00	0.00	1635.
1.01	15.00	6	1.02	0.00	1.02	8.	1.04	21.00	31	0.00	0.00	1433.
1.01	21.00	7	0.04	0.00	0.04	7.	1.05	6.00	32	0.00	0.00	1221.
1.02	6.00	8	0.04	0.00	0.04	6.	1.05	3.00	33	0.00	0.00	1056.
1.02	6.00	9	0.37	0.00	0.37	5.	1.05	6.00	34	0.00	0.00	912.
1.02	6.00	10	0.37	0.00	0.37	4.	1.05	9.00	35	0.00	0.00	788.
1.02	6.00	11	1.11	0.00	1.11	3.	1.05	12.00	36	0.00	0.00	611.
1.02	12.00	12	1.11	0.00	1.11	2.	1.05	12.00	37	0.00	0.00	559.
1.02	15.00	13	6.24	0.00	6.24	1.	1.05	18.00	38	0.00	0.00	509.
1.02	18.00	14	12.67	0.00	12.67	0.	1.05	21.00	39	0.00	0.00	440.
1.04	21.00	15	0.54	0.00	0.54	20621.	1.06	3.00	40	0.00	0.00	360.
1.03	3.00	16	0.00	0.00	0.00	13613.	1.06	6.00	41	0.00	0.00	320.
1.03	3.00	17	0.00	0.00	0.00	10890.	1.06	6.00	42	0.00	0.00	264.
1.03	6.00	18	0.00	0.00	0.00	9412.	1.06	6.00	43	0.00	0.00	255.
1.03	6.00	19	0.00	0.00	0.00	8135.	1.06	12.00	44	0.00	0.00	212.
1.03	12.00	20	0.00	0.00	0.00	7031.	1.06	15.00	45	0.00	0.00	183.
1.03	15.00	21	0.00	0.00	0.00	6076.	1.06	18.00	46	0.00	0.00	158.
1.03	16.00	22	0.00	0.00	0.00	5252.	1.06	21.00	47	0.00	0.00	137.
1.03	21.00	23	0.00	0.00	0.00	4539.	1.07	3.00	48	0.00	0.00	118.
1.04	6.00	24	0.00	0.00	0.00	3923.	1.07	3.00	49	0.00	0.00	102.
1.04	6.00	25	0.00	0.00	0.00	3391.	1.07	6.00	50	0.00	0.00	98.
SUM 24.34.17.33 7.31 191017.												
SUM (631.33 445.33 186.33 3733.93)												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												
PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME												
CFS 20621. 17059. 16961. 5271.												
CMS 584. 310. 149. 3709.												
INCHES 6.84 12.58 25.36 26.24												
MM 173.74 446.53 645.19 666.91												
AC-FT 8459. 21741. 31365. 32471.												
THOUS CU F 10436. 26817. 38658. 60052.												
HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1												

TAMS

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

By _____

4557 3939 3404 2942 2543 1892 1642 1419 1226
1046 792 684 591 511 442 382 330 285
246 159 138 119 103 89 77 66

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
CFS 15466 12794 8221 3953 98225
CMS 438 362 233 172 2781
INCHES 5.13 13.18 19.02 19.69
MM 130.30 334.89 483.14 500.14
AC-FT 6344 16306 23523 24353
THOUS CU M 7826 20113 29016 30039

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

5. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 852. 853. 854. 855. 856. 857. 858. 859. 860. 861. 862. 863. 864. 865. 866. 867. 868. 869. 870. 871. 872. 873. 874. 875. 876. 877. 878. 879. 880. 881. 882. 883. 884. 885. 886. 887. 888. 889. 890. 891. 892. 893. 894. 895. 896. 897. 898. 899. 900. 901. 902. 903. 904. 905. 906. 907. 908. 909. 910. 911. 912. 913. 914. 915. 916. 917. 918. 919. 920. 921. 922. 923. 924. 925. 926. 927. 928. 929. 930. 931. 932. 933. 934. 935. 936. 937. 938. 939. 940. 941. 942. 943. 944. 945. 946. 947. 948. 949. 950. 951. 952. 953. 954. 955. 956. 957. 958. 959. 960. 961. 962. 963. 964. 965. 966. 967. 968. 969. 970. 971. 972. 973. 974. 975. 976. 977. 978. 979. 980. 981. 982. 983. 984. 985. 986. 987. 988. 989. 990. 991. 992. 993. 994. 995. 996. 997. 998. 999. 1000. 1001. 1002. 1003. 1004. 1005. 1006. 1007. 1008. 1009. 1010. 1011. 1012. 1013. 1014. 1015. 1016. 1017. 1018. 1019. 1020. 1021. 1022. 1023. 1024. 1025. 1026. 1027. 1028. 1029. 1030. 1031. 1032. 1033. 1034. 1035. 1036. 1037. 1038. 1039. 1040. 1041. 1042. 1043. 1044. 1045. 1046. 1047. 1048. 1049. 1050. 1051. 1052. 1053. 1054. 1055. 1056. 1057. 1058. 1059. 1060. 1061. 1062. 1063. 1064. 1065. 1066. 1067. 1068. 1069. 1070. 1071. 1072. 1073. 1074. 1075. 1076. 1077. 1078. 1079. 1080. 1081. 1082. 1083. 1084. 1085. 1086. 1087. 1088. 1089. 1090. 1091. 1092. 1093. 1094. 1095. 1096. 1097. 1098. 1099. 1100. 1101. 1102. 1103. 1104. 1105. 1106. 1107. 1108. 1109. 1110. 1111. 1112. 1113. 1114. 1115. 1116. 1117. 1118. 1119. 1120. 1121. 1122. 1123. 1124. 1125. 1126. 1127. 1128. 1129. 1130. 1131. 1132. 1133. 1134. 1135. 1136. 1137. 1138. 1139. 1140. 1141. 1142. 1143. 1144. 1145. 1146. 1147. 1148. 1149. 1150. 1151. 1152. 1153. 1154. 1155. 1156. 1157. 1158. 1159. 1160. 1161. 1162. 1163. 1164. 1165. 1166. 1167. 1168. 1169. 1170. 1171. 1172. 1173. 1174. 1175. 1176. 1177. 1178. 1179. 1180. 1181. 1182. 1183. 1184. 1185. 1186. 1187. 1188. 1189. 1190. 1191. 1192. 1193. 1194. 1195. 1196. 1197. 1198. 1199. 1200. 1201. 1202. 1203. 1204. 1205. 1206. 1207. 1208. 1209. 1210. 1211. 1212. 1213. 1214. 1215. 1216. 1217. 1218. 1219. 1220. 1221. 1222. 1223. 1224. 1225. 1226. 1227. 1228. 1229. 1230. 1231. 1232. 1233. 1234. 1235. 1236. 1237. 1238. 1239. 1240. 1241. 1242. 1243. 1244. 1245. 1246. 1247. 1248. 1249. 1250. 1251. 1252. 1253. 1254. 1255. 1256. 1257. 1258. 1259. 1260. 1261. 1262. 1263. 1264. 1265. 1266. 1267. 1268. 1269. 1270. 1271. 1272. 1273. 1274. 1275. 1276. 1277. 1278. 1279. 1280. 1281. 1282. 1283. 1284. 1285. 1286. 1287. 1288. 1289. 1290. 1291. 1292. 1293. 1294. 1295. 1296. 1297. 1298. 1299. 1300. 1301. 1302. 1303. 1304. 1305. 1306. 1307. 1308. 1309. 1310. 1311. 1312. 1313. 1314. 1315. 1316. 1317. 1318. 1319. 1320. 1321. 1322. 1323. 1324. 1325. 1326. 1327. 1328. 1329. 1330. 1331. 1332. 1333. 1334. 1335. 1336. 1337. 1338. 1339. 1340. 1341. 1342. 1343. 1344. 1345. 1346. 1347. 1348. 1349. 1350. 1351. 1352. 1353. 1354. 1355. 1356. 1357. 1358. 1359. 1360. 1361. 1362. 1363. 1364. 1365. 1366. 1367. 1368. 1369. 1370. 1371. 1372. 1373. 1374. 1375. 1376. 1377. 1378. 1379. 1380. 1381. 1382. 1383. 1384. 1385. 1386. 1387. 1388. 1389. 1390. 1391. 1392. 1393. 1394. 1395. 1396. 1397. 1398. 1399. 1400. 1401. 1402. 1403. 1404. 1405. 1406. 1407. 1408. 1409. 1410. 1411. 1412. 1413. 1414. 1415. 1416. 1417. 1418. 1419. 1420. 1421. 1422. 1423. 1424. 1425. 1426. 1427. 1428. 1429. 1430. 1431. 1432. 1433. 1434. 1435. 1436. 1437. 1438. 1439. 1440. 1441. 1442. 1443. 1444. 1445. 1446. 1447. 1448. 1449. 1450. 1451. 1452. 1453. 1454. 1455. 1456. 1457. 1458. 1459. 1460. 1461. 1462. 1463. 1464. 1465. 1466. 1467. 1468. 1469. 1470. 1471. 1472. 1473. 1474. 1475. 1476. 1477. 1478. 1479. 1480. 1481. 1482. 1483. 1484. 1485. 1486. 1487. 1488. 1489. 1490. 1491. 1492. 1493. 1494. 1495. 1496. 1497. 1498. 1499. 1500. 1501. 1502. 1503. 1504. 1505. 1506. 1507. 1508. 1509. 1510. 1511. 1512. 1513. 1514. 1515. 1516. 1517. 1518. 1519. 1520. 1521. 1522. 1523. 1524. 1525. 1526. 1527. 1528. 1529. 1530. 1531. 1532. 1533. 1534. 1535. 1536. 1537. 1538. 1539. 1540. 1541. 1542. 1543. 1544. 1545. 1546. 1547. 1548. 1549. 1550. 1551. 1552. 1553. 1554. 1555. 1556. 1557. 1558. 1559. 1560. 1561. 1562. 1563. 1564. 1565. 1566. 1567. 1568. 1569. 1570. 1571. 1572. 1573. 1574. 1575. 1576. 1577. 1578. 1579. 1580. 1581. 1582. 1583. 1584. 1585. 1586. 1587. 1588. 1589. 1590. 1591. 1592. 1593. 1594. 1595. 1596. 1597. 1598. 1599. 1600. 1601. 1602. 1603. 1604. 1605. 1606. 1607. 1608. 1609. 1610. 1611. 1612. 1613. 1614. 1615. 1616. 1617. 1618. 1619. 1620. 1621. 1622. 1623. 1624. 1625. 1626. 1627. 1628. 1629. 1630. 1631. 1632. 1633. 1634. 1635. 1636. 1637. 1638. 1639. 1640. 1641. 1642. 1643. 1644. 1645. 1646. 1647. 1648. 1649. 1650. 1651. 1652. 1653. 1654. 1655. 1656. 1657. 1658. 1659. 1660. 1661. 1662. 1663. 1664. 1665. 1666. 1667. 1668. 1669. 1670. 1671. 1672. 1673. 1674. 1675. 1676. 1677. 1678. 1679. 1680. 1681. 1682. 1683. 1684. 1685. 1686. 1687. 1688. 1689. 1690. 1691. 1692. 1693. 1694. 1695. 1696. 1697. 1698. 1699. 1700. 1701. 1702. 1703. 1704. 1705. 1706. 1707. 1708. 1709. 1710. 1711. 1712. 1713. 1714. 1715. 1716. 1717. 1718. 1719. 1720. 1721. 1722. 1723. 1724. 1725. 1726. 1727. 1728. 1729. 1730. 1731. 1732. 1733. 1734. 1735. 1736. 1737. 1738. 1739. 1740. 1741. 1742. 1743. 1744. 1745. 1746. 1747. 1748. 1749. 1750. 1751. 1752. 1753. 1754. 1755. 1756. 1757. 1758. 1759. 1760. 1761. 1762. 1763. 1764. 1765. 1766. 1767. 1768. 1769. 1770. 1771. 1772. 1773. 1774. 1775. 1776. 1777. 1778. 1779. 1780. 1781. 1782. 1783. 1784. 1785. 1786. 1787. 1788. 1789. 1790. 1791. 1792. 1793. 1794. 1795. 1796. 1797. 1798. 1799. 1800. 1801. 1802. 1803. 1804. 1805. 1806. 1807. 1808. 1809. 1810. 1811. 1812. 1813. 1814. 1815. 1816. 1817. 1818. 1819. 1820. 1821. 1822. 1823. 1824. 1825. 1826. 1827. 1828. 1829. 1830. 1831. 1832. 1833. 1834. 1835. 1836. 1837. 1838. 1839. 1840. 1841. 1842. 1843. 1844. 1845. 1846. 1847. 1848. 1849. 1850. 1851. 1852. 1853. 1854. 1855. 1856. 1857. 1858. 1859. 1860. 1861. 1862. 1863. 1864. 1865. 1866. 1867. 1868. 1869. 1870. 1871. 1872. 1873. 1874. 1875. 1876. 1877. 1878. 1879. 1880. 1881. 1882. 1883. 1884. 1885. 1886. 1887. 1888. 1889. 1890. 1891. 1892. 1893. 1894. 1895. 1896. 1897. 1898. 1899. 1900. 1901. 1902. 1903. 1904. 1905. 1906. 1907. 1908. 1909. 1910. 1911. 1912. 1913. 1914. 1915. 1916. 1917. 1918. 1919. 1920. 1921. 1922. 1923. 1924. 1925. 1926. 1927. 1928. 1929. 1930. 1931. 1932. 1933. 1934. 1935. 1936. 1937. 1938. 1939. 1940. 1941. 1942. 1943. 1944. 1945. 1946. 1947. 1948. 1949. 1950. 1951. 1952. 1953. 1954. 1955. 1956. 1957. 1958. 1959. 1960. 1961. 1962. 1963. 1964. 1965. 1966. 1967. 1968. 1969. 1970. 1971. 1972. 1973. 1974. 1975. 1976. 1977. 1978. 1979. 1980. 1981. 1982. 1983. 1984. 1985. 1986. 1987. 1988. 1989. 1990. 1991. 1992. 1993. 1994. 1995. 1996. 1997. 1998. 1999. 2000. 2001. 2002. 2003. 2004. 2005. 2006. 2007. 2008. 2009. 2010. 2011. 2012. 2013. 2014. 2015. 2016. 2017. 2018. 2019. 2020. 2021. 2022. 2023. 2024. 2025. 2026. 2027. 2028. 2029. 2030. 2031. 2032. 2033. 2034. 2035. 2036. 2037. 2038. 2039. 2040. 2041. 2042. 2043. 2044. 2045. 2046. 2047. 2048. 2049. 2050. 2051. 2052. 2053. 2054. 2055. 2056. 2057. 2058. 2059. 2060. 2061. 2062. 2063. 2064. 2065. 2066. 2067. 2068. 2069. 2070. 2071. 2072. 2073. 2074. 2075. 2076. 2077. 2078. 2079. 2080. 2081. 2082. 2083. 2084. 2085. 2086. 2087. 2088. 2089. 2090. 2091. 2092. 2093. 2094. 2095. 2096. 2097. 2098. 2099. 2100. 2101. 2102. 2103. 2104. 2105. 2106. 2107. 2108. 2109. 2110. 2111. 2112. 2113. 2114. 2115. 2116. 2117. 2118. 2119. 2120. 2121. 2122. 2123. 2124. 2125. 2126. 2127. 2128

Job No. _____

Project

Subject

Sheet _____ of _____

Date _____

By _____

| | 0.0 | 0.00 | 0.00 | 0.00 | 1 | 1 | 0 | 0 | 0 |
|---------|----------|----------|----------|----------|----------|------|---|-----|--------|
| | MSIP | MSIP | MSIP | MSIP | LAG | ANSK | X | YSK | ISPRAT |
| 2156.00 | 23920.00 | 25300.00 | 27370.00 | 28750.00 | 32000.00 | | | | |
| 0.00 | 1760.00 | 3600.00 | 5000.00 | 10000.00 | | | | | |

STATION 121, PLAN 1, RTIO 1

NOTES

[illegible]

STOR

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | 2101 | 2102 | 2103 | 2104 | 2105 | 2106 | 2107 | 2108 | 2109 | 2110 | 2111 | 2112 | 2113 | 2114 | 2115 | 2116 | 2117 | 2118 | 2119 | 2120 | 2121 | 2122 | 2123 | 2124 | 2125 | 2126 | 2127 | 2128 | 2129 | 2130 | 2131 | 2132 | 2133 | 2134 | 2135 | 2136 | 2137 | 2138 | 2139 | 2140 | 2141 | 2142 | 2143 | 2144 | 2145 | 2146 | 2147 | 2148 | 2149 | 2150 | 2151 | 2152 | 2153 | 2154 | 2155 | 2156 | 2157 | 2158 | 2159 | 2160 | 2161 | 2162 | 2163 | 2164 | 2165 | 2166 | 2167 | 2168 | 2169 | 2170 | 2171 | 2172 | 2173 | 2174 | 2175 | 2176 | 2177 | 2178 | 2179 | 2180 | 2181 | 2182 | 2183 | 2184 | 2185 | 2186 | 2187 | 2188 | 2189 | 2190 | 2191 | 2192 | 2193 | 2194 | 2195 | 2196 | 2197 | 2198 | 2199 | 2200 | 2201 | 2202 | 2203 | 2204 | 2205 | 2206 | 2207 | 2208 | 2209 | 2210 | 2211 | 2212 | 2213 | 2214 | 2215 | 2216 | 2217 | 2218 | 2219 | 2220 | 2221 | 2222 | 2223 | 2224 | 2225 | 2226 | 2227 | 2228 | 2229 | 2230 | 2231 | 2232 | 2233 | 2234 | 2235 | 2236 | 2237 | 2238 | 2239 | 2240 | 2241 | 2242 | 2243 | 2244 | 2245 | 2246 | 2247 | 2248 | 2249 | 2250 | 2251 | 2252 | 2253 | 2254 | 2255 | 2256 | 2257 | 2258 | 2259 | 2260 | 2261 | 2262 | 2263 | 2264 | 2265 | 2266 | 2267 | 2268 | 2269 | 2270 | 2271 | 2272 | 2273 | 2274 | 2275 | 2276 | 2277 | 2278 | 2279 | 2280 | 2281 | 2282 | 2283 | 2284 | 2285 | 2286 | 2287 | 2288 | 2289 | 2290 | 2291 | 2292 | 2293 | 2294 | 2295 | 2296 | 2297 | 2298 | 2299 | 2300 | 2301 | 2302 | 2303 | 2304 | 2305 | 2306 | 2307 | 2308 | 2309 | 2310 | 2311 | 2312 | 2313 | 2314 | 2315 | 2316 | 2317 | 2318 | 2319 | 2320 | 2321 | 2322 | 2323 | 2324 | 2325 | 2326 | 2327 | 2328 | 2329 | 2330 | 2331 | 2332 | 2333 | 2334 | 2335 | 2336 | 2337 | 2338 | 2339 | 2340 | 2341 | 2342 | 2343 | 2344 | 2345 | 2346 | 2347 | 2348 | 2349 | 2350 | 2351 | 2352 | 2353 | 2354 | 2355 | 2356 | 2357 | 2358 | 2359 | 2360 | 2361 | 2362 | 2363 | 2364 | 2365 | 2366 | 2367 | 2368 | 2369 | 2370 | 2371 | 2372 | 2373 | 2374 | 2375 | 2376 | 2377 | 2378 | 2379 | 2380 | 2381 | 2382 | 2383 | 2384 | 2385 | 2386 | 2387 | 2388 | 2389 | 2390 | 2391 | 2392 | 2393 | 2394 | 2395 | 2396 | 2397 | 2398 | 2399 | 2400 | 2401 | 2402 | 2403 | 2404 | 2405 | 2406 | 2407 | 2408 | 2409 | 2410 | 2411 | 2412 | 2413 | 2414 | 2415 | 2416 | 2417 | 2418 | 2419 | 2420 | 2421 | 2422 | 2423 | 2424 | 2425 | 2426 | 2427 | 2 |
|--|------|---|
|--|------|---|

Page

[illegible]

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|-----------|-------|--------|---------|---------|--------------|
| CF3 | 9550 | 9405 | 5152 | 4938 | 126854 |
| CM5 | 270 | 266 | 132 | 137 | 3572 |
| INCHES | 3.77 | 3.77 | 13.13 | 23.28 | 25.29 |
| MM | 95.79 | 95.79 | 333.44 | 591.31 | 642.41 |
| AC-FT | 4664 | 16235 | 26780 | 26780 | 31278 |
| HOUS CU M | 5733 | 20025 | 35512 | 35512 | 34581 |

MAXIMUM STORAGE = 31700.

STATION 121, PLAN 1, BY 10 2

OUTLINE

| DUTY-FLOW | | | | | | | | | |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |
| 1. | 14. | 696. | 2730. | 4875. | 6202. | 6654. | 6331. | 6328. | 6328. |
| 2. | 24. | 5354. | 4492. | 4101. | 3714. | 3373. | 3058. | 2758. | 2476. |
| 3. | 4. | 1973. | 1754. | 1593. | 1438. | 1295. | 1162. | 1041. | 829. |
| 4. | 716. | 639. | 539. | 499. | 463. | 430. | 395. | 358. | 325. |

5708

| Year | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | | |
|------|---|
| 1953 | 2157 | 2158 | 2159 | 2160 | 2161 | 2162 | 2163 | 2164 | 2165 | 2166 | 2167 | 2168 | 2169 | 2170 | 2171 | 2172 | 2173 | 2174 | 2175 | 2176 | 2177 | 2178 | 2179 | 2180 | 2181 | 2182 | 2183 | 2184 | 2185 | 2186 | 2187 | 2188 | 2189 | 2190 | 2191 | 2192 | 2193 | 2194 | 2195 | 2196 | 2197 | 2198 | 2199 | 2200 | 2201 | 2202 | 2203 | 2204 | 2205 | 2206 | 2207 | 2208 | 2209 | 2210 | 2211 | 2212 | 2213 | 2214 | 2215 | 2216 | 2217 | 2218 | 2219 | 2220 | 2221 | 2222 | 2223 | 2224 | 2225 | 2226 | 2227 | 2228 | 2229 | 2230 | 2231 | 2232 | 2233 | 2234 | 2235 | 2236 | 2237 | 2238 | 2239 | 2240 | 2241 | 2242 | 2243 | 2244 | 2245 | 2246 | 2247 | 2248 | 2249 | 2250 | 2251 | 2252 | 2253 | 2254 | 2255 | 2256 | 2257 | 2258 | 2259 | 2260 | 2261 | 2262 | 2263 | 2264 | 2265 | 2266 | 2267 | 2268 | 2269 | 2270 | 2271 | 2272 | 2273 | 2274 | 2275 | 2276 | 2277 | 2278 | 2279 | 2280 | 2281 | 2282 | 2283 | 2284 | 2285 | 2286 | 2287 | 2288 | 2289 | 2290 | 2291 | 2292 | 2293 | 2294 | 2295 | 2296 | 2297 | 2298 | 2299 | 2300 | 2301 | 2302 | 2303 | 2304 | 2305 | 2306 | 2307 | 2308 | 2309 | 2310 | 2311 | 2312 | 2313 | 2314 | 2315 | 2316 | 2317 | 2318 | 2319 | 2320 | 2321 | 2322 | 2323 | 2324 | 2325 | 2326 | 2327 | 2328 | 2329 | 2330 | 2331 | 2332 | 2333 | 2334 | 2335 | 2336 | 2337 | 2338 | 2339 | 2340 | 2341 | 2342 | 2343 | 2344 | 2345 | 2346 | 2347 | 2348 | 2349 | 2350 | 2351 | 2352 | 2353 | 2354 | 2355 | 2356 | 2357 | 2358 | 2359 | 2360 | 2361 | 2362 | 2363 | 2364 | 2365 | 2366 | 2367 | 2368 | 2369 | 2370 | 2371 | 2372 | 2373 | 2374 | 2375 | 2376 | 2377 | 2378 | 2379 | 2380 | 2381 | 2382 | 2383 | 2384 | 2385 | 2386 | 2387 | 2388 | 2389 | 2390 | 2391 | 2392 | 2393 | 2394 | 2395 | 2396 | 2397 | 2398 | 2399 | 2400 | 2401 | 2402 | 2403 | 2404 | 2405 | 2406 | 2407 | 2408 | 2409 | 2410 | 2411 | 2412 | 2413 | 2 |

Sheet 7 of 28

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

By _____

| | U.N | . | 0.0 | 0.0 | U.0 | STAGE | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|-----|---|-----|-----|-----|-------|--------|---------|---------|--------------|
| CFS | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 6561. | 3825. | 3575. | 9412. |
| CMS | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 168. | 165. | 101. | 2665. |
| INCHES | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 2.63 | 9.34 | 17.20 | 18.87 |
| MM | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 66.82 | 237.30 | 436.91 | 479.24 |
| AC-FT | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 3253. | 15534. | 21272. | 23333. |
| THOUS CU M | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 4013. | 14251. | 26239. | 28781. |

MAXIMUM STORAGE = 29825.

STATION 121, PLAN 1, RIJO 3-

[illegible]

STAGE

| | CFS | PFAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|-----|-------|--------|---------|---------|--------------|
| 0.0 | 0.0 | 3947. | 3907. | 3601. | 2320. | 62233. |
| 0.0 | 0.0 | 112. | 111. | 102. | 66. | 1762. |
| INCHES | | | 1.57 | 5.76 | 11.16 | 12.48 |
| MM | | | 39.79 | 146.71 | 283.57 | 316.90 |
| AC-FT | | | 1937. | 7143. | 13407. | 15430. |
| THOUS CU M | | | 2390. | 8811. | 17030. | 19032. |

MAXIMUM STORAGE = 27712.

STATION 121, PLAN 1, RTIO 4

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

| U. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|----|----|----|----|
| 3. | 49. | 232. | 599. | 1041. | 1368. | 1557. | 1660. | 1698. | | | | | |
| 1499. | 1576. | 1692. | 1399. | 1300. | 1200. | 1102. | 1006. | 915. | | | | | |
| 228. | 770. | 682. | 639. | 597. | 557. | 519. | 482. | 448. | | | | | |
| 415. | 344. | 328. | 302. | 278. | 256. | 236. | 217. | 199. | | | | | |

| 21851. | 21852. | 21853. | 21853. | 21853. | 21853. | 21853. | 21853. | 21853. |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 21857. | 21871. | 22450. | 23401. | 24720. | 24986. | 25131. | 25155. | |
| 25179. | 25109. | 24895. | 24763. | 24625. | 24684. | 24345. | 24210. | 24081. |
| 23400. | 23643. | 23615. | 23504. | 23396. | 23292. | 23193. | 23098. | 23008. |
| 22923. | 22843. | 22698. | 22632. | 22570. | 22513. | 22460. | 22411. | 22365. |

| U. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|---------|---------|--------------|
| 1498. | 1686. | 1588. | 1104. | 30667. |
| 48. | 48. | 45. | 31. | 868. |
| INCHES | 17.17 | 2.55 | 5.31 | 6.15 |
| MM | 436. | 64.67 | 134.98 | 156.16 |
| AC-FT | 836. | 3149. | 6572. | 7603. |
| THOUS CU M | 1031. | 3884. | 8107. | 9379. |

MAXIMUM STORAGE = 25185.

SUB-AREA RUNOFF COMPUTATION

50 SWINGING BRIDGE SUB-AREA RUNOFF

| ISTAQ | ICOMP | IECON | ITAPE | JPLY | JPRY | IMARE | ISTAGE | TAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

HYDROGRAPH DATA

| INTEC | JUNE | TAREA | SNAP | TESBA | TESPC | RATIO | ISNMW | ISARE | LOCAL |
|-------|------|--------|------|--------|-------|-------|-------|-------|-------|
| 1 | -1 | 118.00 | 0.00 | 202.00 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA

| SPE | PVS | R6 | R12 | R24 | R48 | R72 | R96 |
|------|-------|-------|-------|--------|--------|------|------|
| 0.00 | 21.00 | 82.00 | 96.00 | 107.00 | 112.00 | 0.00 | 0.00 |

BASE COMPUTED BY THE PROGRAM IS .863

LOSS DATA

| LANDPI | STPKR | DLTKR | RTLOL | ERAIN | SINKS | RTLOK | SIRYL | CNSTL | ALSEX | RTIMP |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 2.00 | .13 | 0.00 | 0.00 |

GIVEN UNIT GRAPH. NUMBER= 17

| 2557. | 5327. | 4440. | 3425. | 2664. | 1903. | 1395. | 1015. | 761. | 533. |
|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| 341. | 304. | 254. | 203. | 127. | 101. | 0. | 0. | 0. | 0. |

Sheet 9 of 28

TAMS

Job No. _____

Project _____

Subiant _____

Sheet _____ of _____

Date _____

By _____

UNIT GRAPH TOTALS 25370, CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

RTIO = 3.70

STRATQ = -1.80

ORCSN = -46

| MO-CA | HR-MN | PERIOD | RAIN | EXCS | LOSS | CORE Q | MO-DA | HR-MN | PERIOD | RAIN | EXCS | LOSS | COMP 2 |
|-------|-------|--------|-------|------|------|--------|-------|-------|--------|----------|----------|----------|------------|
| 1-01 | 3-00 | 1 | .02 | 0.00 | .02 | 83. | 1-04 | 6-00 | 26 | 0.00 | 0.00 | 0.00 | 13081. |
| 1-01 | 6-00 | 2 | .02 | 0.00 | .02 | 73. | 1-04 | 9-00 | 27 | 0.00 | 0.00 | 0.00 | 11477. |
| 1-01 | 9-00 | 3 | .06 | 0.00 | .06 | 64. | 1-04 | 12-00 | 28 | 0.00 | 0.00 | 0.00 | 10069. |
| 1-01 | 12-00 | 4 | .06 | 0.00 | .06 | 56. | 1-04 | 15-00 | 29 | 0.00 | 0.00 | 0.00 | 8834. |
| 1-01 | 15-00 | 5 | .23 | 0.00 | .23 | 49. | 1-04 | 18-00 | 30 | 0.00 | 0.00 | 0.00 | 7731. |
| 1-01 | 18-00 | 6 | .48 | 0.00 | .48 | 43. | 1-04 | 21-00 | 31 | 0.00 | 0.00 | 0.00 | 6900. |
| 1-01 | 21-00 | 7 | .03 | 0.00 | .03 | 38. | 1-05 | 0-00 | 32 | 0.00 | 0.00 | 0.00 | 5966. |
| 1-02 | 0-00 | 8 | .03 | 0.00 | .03 | 33. | 1-05 | 3-00 | 33 | 0.00 | 0.00 | 0.00 | 5233. |
| 1-02 | 3-00 | 9 | .41 | 0.00 | .41 | 29. | 1-05 | 6-00 | 34 | 0.00 | 0.00 | 0.00 | 4593. |
| 1-02 | 6-00 | 10 | .41 | 0.00 | .41 | 26. | 1-05 | 9-00 | 35 | 0.00 | 0.00 | 0.00 | 4030. |
| 1-02 | 9-00 | 11 | 1.30 | .73 | .57 | 1867. | 1-05 | 12-00 | 36 | 0.00 | 0.00 | 0.00 | 3535. |
| 1-02 | 12-00 | 12 | 1.30 | .91 | .39 | 6195. | 1-05 | 15-00 | 37 | 0.00 | 0.00 | 0.00 | 3102. |
| 1-02 | 15-00 | 13 | 5.02 | 4.63 | .39 | 19813. | 1-05 | 18-00 | 38 | 0.00 | 0.00 | 0.00 | 2721. |
| 1-02 | 18-00 | 14 | 10.18 | 9.72 | .39 | 56016. | 1-05 | 21-00 | 39 | 0.00 | 0.00 | 0.00 | 2382. |
| 1-04 | 21-00 | 15 | .61 | .22 | .39 | 76320. | 1-06 | 0-00 | 40 | 0.00 | 0.00 | 0.00 | 2095. |
| 1-03 | 0-00 | 16 | .61 | .22 | .39 | 64875. | 1-06 | 3-00 | 41 | 0.00 | 0.00 | 0.00 | 1838. |
| 1-03 | 3-00 | 17 | 0.00 | 0.00 | 0.00 | 50776. | 1-06 | 6-00 | 42 | 0.00 | 0.00 | 0.00 | 1613. |
| 1-03 | 6-00 | 18 | 0.00 | 0.00 | 0.00 | 38645. | 1-06 | 9-00 | 43 | 0.00 | 0.00 | 0.00 | 1415. |
| 1-03 | 9-00 | 19 | 0.00 | 0.00 | 0.00 | 32687. | 1-06 | 12-00 | 44 | 0.00 | 0.00 | 0.00 | 1241. |
| 1-03 | 12-00 | 20 | 0.00 | 0.00 | 0.00 | 28679. | 1-06 | 15-00 | 45 | 0.00 | 0.00 | 0.00 | 1059. |
| 1-03 | 15-00 | 21 | 0.00 | 0.00 | 0.00 | 25162. | 1-06 | 18-00 | 46 | 0.00 | 0.00 | 0.00 | 956. |
| 1-03 | 18-00 | 22 | 0.00 | 0.00 | 0.00 | 22076. | 1-06 | 21-00 | 47 | 0.00 | 0.00 | 0.00 | 838. |
| 1-03 | 21-00 | 23 | 0.00 | 0.00 | 0.00 | 19369. | 1-07 | 0-00 | 48 | 0.00 | 0.00 | 0.00 | 736. |
| 1-04 | 0-00 | 24 | 0.00 | 0.00 | 0.00 | 16993. | 1-07 | 3-00 | 49 | 0.00 | 0.00 | 0.00 | 643. |
| 1-04 | 3-00 | 25 | 0.00 | 0.00 | 0.00 | 14909. | 1-07 | 6-00 | 50 | 0.00 | 0.00 | 0.00 | 566. |
| SUM | | | | | | | | | | 2076 | 16.50 | 4.26 | 579490. |
| | | | | | | | | | | (527.) | (419.) | (108.) | (16409.33) |

| THOUS CU M | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|---------|---------|---------|--------------|
| CFS | 78320. | 69383. | 46501. | 22970. | 579166. |
| CMS | 2218. | 1965. | 1318. | 650. | 16403. |
| INCHES | 5.47 | 5.47 | 14.68 | 21.73 | 22.83 |
| MM | 138.93 | 372.93 | 551.92 | 579.85 | 579.85 |
| AC-FT | 34405. | 92352. | 136678. | 143594. | 143594. |
| | 42438. | 115914. | 168590. | 177121. | |

HYDROGRAPH AT STA 2 FOR PLAN 1- RTIO 1

| RTIO | 64. | 56. | 49. | 43. | 38. | 33. | 29. | 26. |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 25370. | 6195. | 56016. | 78320. | 64875. | 50776. | 38645. | 32657. | 28679. |
| 25152. | 22076. | 16993. | 14909. | 11081. | 11472. | 10069. | 8834. | 7731. |
| 6400. | 2466. | 5235. | 4030. | 3535. | 3102. | 2721. | 2388. | 2095. |
| 1438. | 1615. | 1415. | 1089. | 956. | 838. | 736. | 643. | 566. |

| THOUS CU M | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|--------|---------|---------|--------------|
| CFS | 78320. | 69383. | 46501. | 22970. | 579166. |
| CMS | 2218. | 1965. | 1318. | 650. | 16403. |
| INCHES | 5.47 | 5.47 | 14.68 | 21.73 | 22.83 |
| MM | 138.93 | 372.93 | 551.92 | 579.85 | 579.85 |
| AC-FT | 34405. | 92352. | 136678. | 143594. | 143594. |

Sheet 10 of 28

TAMS

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

By _____

TACUS CU M 42438. 113914. 168590. 177121.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 2

| | 45. | 42. | 37. | 32. | 28. | 25. | 22. | 19. |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|
| 62. | 1406. | 1420. | 1427. | 1434. | 1440. | 1446. | 1451. | 1456. |
| 56. | 1457. | 1462. | 1467. | 1472. | 1477. | 1482. | 1487. | 1492. |
| 51. | 1497. | 1502. | 1507. | 1512. | 1517. | 1522. | 1527. | 1532. |
| 46. | 1537. | 1542. | 1547. | 1552. | 1557. | 1562. | 1567. | 1572. |
| 41. | 1572. | 1577. | 1582. | 1587. | 1592. | 1597. | 1602. | 1607. |
| 36. | 1607. | 1612. | 1617. | 1622. | 1627. | 1632. | 1637. | 1642. |
| 31. | 1647. | 1652. | 1657. | 1662. | 1667. | 1672. | 1677. | 1682. |
| 26. | 1687. | 1692. | 1697. | 1702. | 1707. | 1712. | 1717. | 1722. |
| 21. | 1727. | 1732. | 1737. | 1742. | 1747. | 1752. | 1757. | 1762. |
| 16. | 1767. | 1772. | 1777. | 1782. | 1787. | 1792. | 1797. | 1802. |
| 11. | 1807. | 1812. | 1817. | 1822. | 1827. | 1832. | 1837. | 1842. |
| 6. | 1847. | 1852. | 1857. | 1862. | 1867. | 1872. | 1877. | 1882. |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

| | | | | | | | | |
|------------|--------|--------|--------|--------|--------|-------|-------|-------|
| CFS | 58740. | 52037. | 34921. | 17227. | 12300. | 8133. | 5033. | 3133. |
| CMS | 1663. | 1474. | 989. | 488. | 320. | 213. | 137. | 85. |
| INCHES | 4.10 | 3.60 | 2.39 | 1.18 | 0.78 | 0.51 | 0.32 | 0.20 |
| MM | 104.20 | 91.44 | 60.47 | 30.03 | 19.81 | 12.95 | 8.13 | 5.08 |
| AC-FT | 25804. | 22604. | 15004. | 7230. | 4730. | 3130. | 1970. | 1250. |
| THOUS CU M | 31828. | 26436. | 17643. | 8243. | 5330. | 3530. | 2230. | 1430. |

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 3

| | 32. | 28. | 25. | 22. | 19. | 17. | 15. | 13. |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|
| 41. | 1251. | 1256. | 1261. | 1266. | 1271. | 1276. | 1281. | 1286. |
| 36. | 1286. | 1291. | 1296. | 1301. | 1306. | 1311. | 1316. | 1321. |
| 31. | 1326. | 1331. | 1336. | 1341. | 1346. | 1351. | 1356. | 1361. |
| 26. | 1366. | 1371. | 1376. | 1381. | 1386. | 1391. | 1396. | 1401. |
| 21. | 1406. | 1411. | 1416. | 1421. | 1426. | 1431. | 1436. | 1441. |
| 16. | 1446. | 1451. | 1456. | 1461. | 1466. | 1471. | 1476. | 1481. |
| 11. | 1486. | 1491. | 1496. | 1501. | 1506. | 1511. | 1516. | 1521. |
| 6. | 1526. | 1531. | 1536. | 1541. | 1546. | 1551. | 1556. | 1561. |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

| | | | | | | | | |
|------------|--------|--------|--------|--------|-------|-------|-------|-------|
| CFS | 39160. | 34692. | 23280. | 11485. | 7200. | 4730. | 3130. | 1970. |
| CMS | 1109. | 982. | 659. | 325. | 200. | 137. | 85. | 53. |
| INCHES | 2.73 | 2.41 | 1.60 | 0.80 | 0.51 | 0.32 | 0.20 | 0.13 |
| MM | 69.47 | 61.46 | 40.76 | 20.32 | 12.95 | 8.13 | 5.08 | 3.28 |
| AC-FT | 17202. | 15176. | 9839. | 4939. | 3139. | 1979. | 1259. | 789. |
| THOUS CU M | 21219. | 18557. | 11485. | 5839. | 3639. | 2239. | 1439. | 939. |

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 4

| | 16. | 14. | 12. | 9. | 8. | 7. | 6. |
|-------|--------|--------|--------|--------|--------|-------|-------|
| 21. | 1549. | 14004. | 19580. | 16219. | 12694. | 9661. | 8172. |
| 16. | 1549. | 4953. | 14004. | 3270. | 2869. | 2517. | 2209. |
| 11. | 6270. | 5319. | 4248. | 3270. | 2869. | 2517. | 2209. |
| 6. | 17250. | 1492. | 1309. | 1148. | 884. | 775. | 680. |
| 1. | 17250. | 4013. | 354. | 310. | 272. | 239. | 210. |
| 0. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -5. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -10. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -15. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -20. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -25. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -30. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -35. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -40. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -45. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -50. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -55. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -60. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -65. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -70. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -75. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -80. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -85. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -90. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -95. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -100. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -105. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -110. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -115. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -120. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -125. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -130. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -135. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -140. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -145. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -150. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -155. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -160. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -165. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -170. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -175. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -180. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -185. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -190. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -195. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -200. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -205. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -210. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -215. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -220. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -225. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -230. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -235. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -240. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -245. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -250. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -255. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -260. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -265. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -270. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -275. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -280. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -285. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -290. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -295. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -300. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -305. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -310. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -315. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -320. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -325. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -330. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -335. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -340. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -345. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -350. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -355. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -360. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -365. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -370. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -375. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -380. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -385. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -390. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -395. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -400. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -405. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -410. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -415. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -420. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -425. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -430. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -435. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -440. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -445. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -450. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -455. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -460. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -465. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -470. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -475. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -480. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -485. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -490. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -495. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |
| -500. | 459. | 4013. | 354. | 310. | 272. | 239. | 210. |

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Sub _____ **D** _____

HAZARD ROUTE THROUGH SWINGING BRIDGE RESERVOIR

| ISTAQ | ICOMP | JECON | ITAPE | JPLI | JPRI | INAME | ISYAGE | INVT |
|---------|--------|-------|-------|-------|-------|-------|--------|------|
| 122 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| LOSLOSS | CLOSS | AVG | IRIS | ISAME | IOPI | ICMP | LISTR | |
| 0.0 | 0.000 | 0.00 | 1 | 1 | 0 | 0 | 0 | |
| MSIPS | MSIPBL | LAG | ARSK | X | ISS | STORA | ISPRAT | |
| 1 | 0 | 0.000 | 0.000 | 0.000 | 0.000 | 28060 | 0 | |

| | | | | | | | |
|-------|-------|-----|-------|-------|-------|--------|--------|
| NSIPS | NSIDL | LAG | AMSK | X | ISS | STORA | ISPRAT |
| 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | 28060. | 0 |

| | | | | |
|----------|---------|----------|----------|----------|
| STICKAGE | 7820.00 | 27200.00 | 37420.00 | 53670.00 |
|----------|---------|----------|----------|----------|

| | | | |
|--------|---------|----------|-----------|
| 657.00 | 1076.00 | 38600.00 | 118900.00 |
|--------|---------|----------|-----------|

STATION 122, PLAN 1, RYIO 1

[illegible]

STAGE

[illegible]

MAXIMUM STORAGE = 43261.

EVATION 122, PLAN 1, RTO 2.

| | 1071. | 1063. | 1054. | 1039. | 1031. | 1023. | 1015. | 1007. |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1224. | 1071. | 1063. | 1054. | 1039. | 1031. | 1023. | 1015. | 1007. |
| 1205. | 1224. | 1205. | 1186. | 1167. | 1148. | 1129. | 1110. | 1091. |
| 1186. | 1205. | 1186. | 1167. | 1148. | 1129. | 1110. | 1091. | 1072. |
| 1167. | 1186. | 1167. | 1148. | 1129. | 1110. | 1091. | 1072. | 1053. |
| 1148. | 1167. | 1148. | 1129. | 1110. | 1091. | 1072. | 1053. | 1034. |
| 1129. | 1148. | 1129. | 1110. | 1091. | 1072. | 1053. | 1034. | 1015. |
| 1110. | 1129. | 1110. | 1091. | 1072. | 1053. | 1034. | 1015. | 996. |
| 1091. | 1110. | 1091. | 1072. | 1053. | 1034. | 1015. | 996. | 977. |
| 1072. | 1091. | 1072. | 1053. | 1034. | 1015. | 996. | 977. | 958. |
| 1053. | 1072. | 1053. | 1034. | 1015. | 996. | 977. | 958. | 939. |
| 1034. | 1053. | 1034. | 1015. | 996. | 977. | 958. | 939. | 920. |
| 1015. | 1034. | 1015. | 996. | 977. | 958. | 939. | 920. | 901. |
| 996. | 1015. | 996. | 977. | 958. | 939. | 920. | 901. | 882. |
| 977. | 996. | 977. | 958. | 939. | 920. | 901. | 882. | 863. |
| 958. | 977. | 958. | 939. | 920. | 901. | 882. | 863. | 844. |
| 939. | 958. | 939. | 920. | 901. | 882. | 863. | 844. | 825. |
| 920. | 939. | 920. | 901. | 882. | 863. | 844. | 825. | 806. |
| 901. | 920. | 901. | 882. | 863. | 844. | 825. | 806. | 787. |
| 882. | 901. | 882. | 863. | 844. | 825. | 806. | 787. | 768. |
| 863. | 882. | 863. | 844. | 825. | 806. | 787. | 768. | 749. |
| 844. | 863. | 844. | 825. | 806. | 787. | 768. | 749. | 730. |
| 825. | 844. | 825. | 806. | 787. | 768. | 749. | 730. | 711. |
| 806. | 825. | 806. | 787. | 768. | 749. | 730. | 711. | 692. |
| 787. | 806. | 787. | 768. | 749. | 730. | 711. | 692. | 673. |
| 768. | 787. | 768. | 749. | 730. | 711. | 692. | 673. | 654. |
| 749. | 768. | 749. | 730. | 711. | 692. | 673. | 654. | 635. |
| 730. | 749. | 730. | 711. | 692. | 673. | 654. | 635. | 616. |
| 711. | 730. | 711. | 692. | 673. | 654. | 635. | 616. | 597. |
| 692. | 711. | 692. | 673. | 654. | 635. | 616. | 597. | 578. |
| 673. | 692. | 673. | 654. | 635. | 616. | 597. | 578. | 559. |
| 654. | 673. | 654. | 635. | 616. | 597. | 578. | 559. | 540. |
| 635. | 654. | 635. | 616. | 597. | 578. | 559. | 540. | 521. |
| 616. | 635. | 616. | 597. | 578. | 559. | 540. | 521. | 502. |
| 597. | 616. | 597. | 578. | 559. | 540. | 521. | 502. | 483. |
| 578. | 597. | 578. | 559. | 540. | 521. | 502. | 483. | 464. |
| 559. | 578. | 559. | 540. | 521. | 502. | 483. | 464. | 445. |
| 540. | 559. | 540. | 521. | 502. | 483. | 464. | 445. | 426. |
| 521. | 540. | 521. | 502. | 483. | 464. | 445. | 426. | 407. |
| 502. | 521. | 502. | 483. | 464. | 445. | 426. | 407. | 388. |
| 483. | 502. | 483. | 464. | 445. | 426. | 407. | 388. | 369. |
| 464. | 483. | 464. | 445. | 426. | 407. | 388. | 369. | 350. |
| 445. | 464. | 445. | 426. | 407. | 388. | 369. | 350. | 331. |
| 426. | 445. | 426. | 407. | 388. | 369. | 350. | 331. | 312. |
| 407. | 426. | 407. | 388. | 369. | 350. | 331. | 312. | 293. |
| 388. | 407. | 388. | 369. | 350. | 331. | 312. | 293. | 274. |
| 369. | 388. | 369. | 350. | 331. | 312. | 293. | 274. | 255. |
| 350. | 369. | 350. | 331. | 312. | 293. | 274. | 255. | 236. |
| 331. | 350. | 331. | 312. | 293. | 274. | 255. | 236. | 217. |
| 312. | 331. | 312. | 293. | 274. | 255. | 236. | 217. | 198. |
| 293. | 312. | 293. | 274. | 255. | 236. | 217. | 198. | 179. |
| 274. | 293. | 274. | 255. | 236. | 217. | 198. | 179. | 160. |
| 255. | 274. | 255. | 236. | 217. | 198. | 179. | 160. | 141. |
| 236. | 255. | 236. | 217. | 198. | 179. | 160. | 141. | 122. |
| 217. | 236. | 217. | 198. | 179. | 160. | 141. | 122. | 103. |
| 198. | 217. | 198. | 179. | 160. | 141. | 122. | 103. | 84. |
| 179. | 198. | 179. | 160. | 141. | 122. | 103. | 84. | 65. |
| 160. | 179. | 160. | 141. | 122. | 103. | 84. | 65. | 46. |
| 141. | 160. | 141. | 122. | 103. | 84. | 65. | 46. | 27. |
| 122. | 141. | 122. | 103. | 84. | 65. | 46. | 27. | 8. |
| 103. | 122. | 103. | 84. | 65. | 46. | 27. | 8. | |
| 84. | 103. | 84. | 65. | 46. | 27. | 8. | | |
| 65. | 84. | 65. | 46. | 27. | 8. | | | |
| 46. | 65. | 46. | 27. | 8. | | | | |
| 27. | 46. | 27. | 8. | | | | | |
| 8. | 27. | 8. | | | | | | |
| | 8. | | | | | | | |

Sheet 12 of 28

Rv

Sheet 13 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

D. _____

MAXIMUM STORAGE = 35548.

STATION 122, PLAN 1, RTIO 4

OUTFLOW

| | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1592. | 1070. | 1062. | 1054. | 1045. | 1037. | 1029. | 1021. | 1013. | 1005. |
| 592. | 999. | 1017. | 1025. | 1033. | 1041. | 1049. | 1057. | 1065. | 1073. |
| 7447. | 4442. | 5688. | 4066. | 4354. | 3719. | 3350. | 2939. | 2579. | 2262. |
| 1953. | 1742. | 1529. | 1341. | 1176. | 1075. | 1074. | 1071. | 1067. | 1063. |
| 1055. | 1034. | 1049. | 1043. | 1037. | 1031. | 1024. | 1018. | 1011. | 1006. |

STOR

| | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2742. | 27016. | 26756. | 26498. | 26241. | 25985. | 25732. | 25480. | 25230. | 24981. |
| 26751. | 26493. | 26235. | 25977. | 25719. | 25461. | 25203. | 24945. | 24687. | 24429. |
| 26133. | 25875. | 25617. | 25359. | 25101. | 24843. | 24585. | 24327. | 24069. | 23811. |
| 27442. | 27281. | 27120. | 26959. | 26798. | 26637. | 26476. | 26315. | 26154. | 25993. |
| 26553. | 26392. | 26231. | 26070. | 25909. | 25748. | 25587. | 25426. | 25265. | 25104. |

STAGE

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

6-HOUR

24-HOUR

72-HOUR

TOTAL VOLUME

| | | | | | |
|------------|--------|--------|--------|--------|---------|
| PEAK | 15367. | 14373. | 10534. | 5341. | 154394. |
| CFS | 435. | 407. | 298. | 151. | 4372. |
| INCHES | 1.13 | 3.32 | 5.05 | 6.09 | |
| AC-FT | 28.76 | 84.37 | 128.34 | 154.58 | |
| THOUS CU F | 7127. | 20691. | 31781. | 38279. | |
| | 8791. | 25773. | 39202. | 47217. | |

MAXIMUM STORAGE = 31092.

COMBINE HYDROGRAPHS

100 COMBINE HYDROGRAPHS 121 & 122

ISTAG ICOMP IECOM ITAPE JPLT JPRT INARE ISTAGE IAUO

| | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| 1432. | 1073. | 1067. | 1059. | 1052. | 1044. | 1037. | 1029. | 1021. | 1013. |
| 1017. | 1000. | 983. | 966. | 949. | 932. | 915. | 898. | 881. | 864. |
| 37492. | 29141. | 26621. | 24101. | 21581. | 19061. | 16541. | 14021. | 11501. | 8981. |
| 10731. | 9401. | 8031. | 6661. | 5291. | 3921. | 2551. | 1181. | 0. | 0. |
| 3072. | 2711. | 2417. | 2166. | 1941. | 1739. | 1555. | 1374. | 1193. | 1012. |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

Sheet 14 of 28

Job No. _____

Project _____

Summary

Sheet _____ of _____

Date _____

Bv _____

Sheet 15 of 28

| | | | | | |
|------------|--------|--------|---------|---------|---------|
| CIS | 75299. | 69610. | 52360. | 27426. | 707218. |
| CMS | 2132. | 1971. | 1483. | 777. | 20026. |
| INCMS | | 4.59 | 13.60 | 21.68 | 23.30 |
| MM | | 116.68 | 350.47 | 550.72 | 591.72 |
| AC-FT | | 34317. | 103535. | 185194. | 175343. |
| THOUS CU M | | 42577. | 128104. | 201297. | 216283. |

[illegible]

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|--------|---------|---------|--------------|
| CFS | 54,236 | 30539 | 37736 | 20437 | 531612 |
| CFS | 1534 | 1431 | 1097 | 579 | 15054 |
| INCHES | | 3.33 | 10.21 | 16.16 | 17.51 |
| MM | | 84.57 | 259.41 | 410.38 | 444.79 |
| AC-FT | | 25061 | 76871 | 121607 | 131803 |
| THOUS CU Y | | 30912 | 94819 | 150000 | 162578 |

[illegible]

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|--------|--------|--------|---------|---------|--------------|
| CFS | 34,562 | 32,631 | 25,204 | 13,423 | 357,088 |
| CMS | 924 | 714 | 380 | 1012 | 10,112 |
| INCHES | 979 | 2.15 | 6.64 | 10.61 | 11.76 |
| PM | | 54.52 | 128.70 | 269.53 | 291.72 |
| AC-F | 16176 | 49991 | 79870 | 88391 | 88334 |
| CU M | 19932 | 6163 | 94318 | | 109203 |

| | SUP OF 2 HYDROGRAPHS AT | | | | 3 | PLAN 1 | RTIO 4 | |
|-------|-------------------------|-------|-------|-------|-------|--------|--------|-------|
| 1596. | 1071. | 1063. | 1055. | 1047. | 1038. | 1030. | 1022. | 1014. |
| 1592. | 1067. | 1065. | 1051. | 1043. | 1035. | 1027. | 1019. | 1011. |
| 1585. | 1060. | 1058. | 1044. | 1036. | 1028. | 1020. | 1012. | 1004. |
| 1578. | 1053. | 1051. | 1037. | 1029. | 1021. | 1013. | 1005. | 997. |
| 1571. | 1046. | 1044. | 1030. | 1022. | 1014. | 1006. | 998. | 990. |
| 1564. | 1039. | 1037. | 1023. | 1015. | 1007. | 999. | 991. | 983. |
| 1557. | 1032. | 1030. | 1016. | 1008. | 1000. | 992. | 984. | 976. |
| 1550. | 1025. | 1023. | 1009. | 1001. | 993. | 985. | 977. | 969. |
| 1543. | 1018. | 1016. | 1002. | 994. | 986. | 978. | 970. | 962. |
| 1536. | 1011. | 1009. | 995. | 987. | 979. | 971. | 963. | 955. |
| 1529. | 1004. | 1002. | 988. | 980. | 972. | 964. | 956. | 948. |
| 1522. | 997. | 995. | 981. | 973. | 965. | 957. | 949. | 941. |
| 1515. | 990. | 988. | 974. | 966. | 958. | 950. | 942. | 934. |
| 1508. | 983. | 981. | 967. | 959. | 951. | 943. | 935. | 927. |
| 1501. | 976. | 974. | 960. | 952. | 944. | 936. | 928. | 920. |
| 1494. | 969. | 967. | 953. | 945. | 937. | 929. | 921. | 913. |
| 1487. | 962. | 960. | 946. | 938. | 930. | 922. | 914. | 906. |
| 1480. | 955. | 953. | 939. | 931. | 923. | 915. | 907. | 899. |
| 1473. | 948. | 946. | 932. | 924. | 916. | 908. | 900. | 892. |
| 1466. | 941. | 939. | 925. | 917. | 909. | 901. | 893. | 885. |
| 1459. | 934. | 932. | 918. | 910. | 902. | 894. | 886. | 878. |
| 1452. | 927. | 925. | 911. | 903. | 895. | 887. | 879. | 871. |
| 1445. | 920. | 918. | 904. | 896. | 888. | 880. | 872. | 864. |
| 1438. | 913. | 911. | 897. | 889. | 881. | 873. | 865. | 857. |
| 1431. | 906. | 904. | 890. | 882. | 874. | 866. | 858. | 850. |
| 1424. | 899. | 897. | 883. | 875. | 867. | 859. | 851. | 843. |
| 1417. | 892. | 890. | 876. | 868. | 860. | 852. | 844. | 836. |
| 1410. | 885. | 883. | 869. | 861. | 853. | 845. | 837. | 829. |
| 1403. | 878. | 876. | 862. | 854. | 846. | 838. | 830. | 822. |
| 1396. | 871. | 869. | 855. | 847. | 839. | 831. | 823. | 815. |
| 1389. | 864. | 862. | 848. | 840. | 832. | 824. | 816. | 808. |
| 1382. | 857. | 855. | 841. | 833. | 825. | 817. | 809. | 801. |
| 1375. | 850. | 848. | 834. | 826. | 818. | 810. | 802. | 794. |
| 1368. | 843. | 841. | 827. | 819. | 811. | 803. | 795. | 787. |
| 1361. | 836. | 834. | 820. | 812. | 804. | 796. | 788. | 780. |
| 1354. | 829. | 827. | 813. | 805. | 797. | 789. | 781. | 773. |
| 1347. | 822. | 820. | 806. | 798. | 790. | 782. | 774. | 766. |
| 1340. | 815. | 813. | 799. | 791. | 783. | 775. | 767. | 759. |
| 1333. | 808. | 806. | 792. | 784. | 776. | 768. | 760. | 752. |
| 1326. | 801. | 799. | 785. | 777. | 769. | 761. | 753. | 745. |
| 1319. | 794. | 792. | 778. | 770. | 762. | 754. | 746. | 738. |
| 1312. | 787. | 785. | 771. | 763. | 755. | 747. | 739. | 731. |
| 1305. | 780. | 778. | 764. | 756. | 748. | 740. | 732. | 724. |
| 1298. | 773. | 771. | 757. | 749. | 741. | 733. | 725. | 717. |
| 1291. | 766. | 764. | 750. | 7 | | | | |

TAMS

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

By _____

SUB-AREA RUNOFF COMPUTATION

51 RIO RESERVOIR SUBAREA INFLOW

| ISTAQ | ICOMP | IECON | ITAPE | JPLY | JPRY | ISAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 4 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

HYDROGRAPH DATA

| INPUG | IUMG | TAREA | SNAP | IRSDA | IRSPC | RATIO | ISN9N | ISAME | LOCAL |
|-------|------|-------|------|--------|-------|-------|-------|-------|-------|
| 1 | -1 | 60.80 | 0.00 | 202.00 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA

| SPFT | PHS | R6 | R12 | R24 | R48 | R72 | R96 |
|------|-------|-------|--------|--------|--------|------|------|
| 0.00 | 21.00 | 88.00 | 104.00 | 114.00 | 120.00 | 0.00 | 0.00 |

IRSDC COMPUTED BY THE PROGRAM IS 4.23

LOSS DATA

| LRPOT | STKR | DLIR | RILOL | ERAIN | SIRKS | RIJOK | SIRIL | CNSIL | ALSNX | RIIMP |
|-------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 2.00 | .25 | 0.00 | 0.00 |

2276. 3660. 2222. 1438. 1046. 719. 458. 261. 157. 118.
65. 52. GIVEN UNIT GRAPH: MUMGO= 13

UNIT GRAPH TOTALS 13072. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRIR= -.80 RECSN= .49 RTIOR= 4.00

| MO. DA | | MR. PN | | PERIOD | | RAIN | | EXCS | | LOSS | | END-OF-PERIOD FLOW | | COMP | | NO. DA | | MR. MN | | PERIOD | | RAIN | | EXCS | | LOSS | | COMP | | CORP | |
|--------|-------|--------|-----|--------|-----|--------|------|-------|----|------|------|--------------------|------|-------|----|--------|------|--------|------|--------|------|------|------|------|------|------|------|------|------|------|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
| 1.01 | 3.00 | 1 | .02 | 9.00 | .02 | 42. | 1.04 | 6.00 | 26 | 0.00 | 0.00 | 1. | 1.04 | 9.00 | 27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.01 | 5.00 | 2 | .02 | 3.00 | .02 | 37. | 1.04 | 12.00 | 28 | 0.00 | 0.00 | 1. | 1.04 | 12.00 | 28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.01 | 9.00 | 3 | .02 | 0.00 | .02 | 28. | 1.04 | 15.00 | 29 | 0.00 | 0.00 | 1. | 1.04 | 15.00 | 29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.01 | 14.00 | 4 | .02 | 0.00 | .02 | 24. | 1.04 | 18.00 | 30 | 0.00 | 0.00 | 1. | 1.04 | 18.00 | 30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.01 | 18.00 | 5 | .02 | 0.00 | .02 | 21. | 1.04 | 21.00 | 31 | 0.00 | 0.00 | 1. | 1.04 | 21.00 | 31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.01 | 21.00 | 6 | .03 | 0.00 | .03 | 18. | 1.05 | 0.00 | 32 | 0.00 | 0.00 | 1. | 1.05 | 0.00 | 32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.02 | 5.00 | 7 | .03 | 0.00 | .03 | 16. | 1.05 | 6.00 | 33 | 0.00 | 0.00 | 1. | 1.05 | 6.00 | 33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.02 | 9.00 | 8 | .03 | 0.00 | .03 | 14. | 1.05 | 9.00 | 34 | 0.00 | 0.00 | 1. | 1.05 | 9.00 | 34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.02 | 14.00 | 9 | .03 | 0.00 | .03 | 12. | 1.05 | 12.00 | 35 | 0.00 | 0.00 | 1. | 1.05 | 12.00 | 35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.02 | 18.00 | 10 | .03 | 0.00 | .03 | 1099. | 1.05 | 15.00 | 36 | 0.00 | 0.00 | 1. | 1.05 | 15.00 | 36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.02 | 21.00 | 11 | .03 | 0.00 | .03 | 4535. | 1.05 | 18.00 | 37 | 0.00 | 0.00 | 1. | 1.05 | 18.00 | 37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.02 | 25.00 | 12 | .03 | 0.00 | .03 | 17479. | 1.05 | 21.00 | 38 | 0.00 | 0.00 | 1. | 1.05 | 21.00 | 38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.02 | 29.00 | 13 | .03 | 0.00 | .03 | 46203. | 1.06 | 0.00 | 40 | 0.00 | 0.00 | 1. | 1.06 | 0.00 | 40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.02 | 33.00 | 14 | .03 | 0.00 | .03 | 30522. | 1.06 | 3.00 | 41 | 0.00 | 0.00 | 1. | 1.06 | 3.00 | 41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.03 | 3.00 | 15 | .06 | 0.00 | .06 | 20374. | 1.06 | 6.00 | 42 | 0.00 | 0.00 | 1. | 1.06 | 6.00 | 42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.03 | 7.00 | 16 | .06 | 0.00 | .06 | 14484. | 1.06 | 9.00 | 43 | 0.00 | 0.00 | 1. | 1.06 | 9.00 | 43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.03 | 11.00 | 17 | .06 | 0.00 | .06 | 9738. | 1.06 | 12.00 | 44 | 0.00 | 0.00 | 1. | 1.06 | 12.00 | 44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.03 | 15.00 | 18 | .06 | 0.00 | .06 | 6066. | 1.06 | 15.00 | 45 | 0.00 | 0.00 | 1. | 1.06 | 15.00 | 45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.03 | 19.00 | 19 | .06 | 0.00 | .06 | 3516. | 1.06 | 18.00 | 46 | 0.00 | 0.00 | 1. | 1.06 | 18.00 | 46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1.03 | 23.00 | 20 | .06 | 0.00 | .06 | 2229. | 1.06 | 21.00 | 47 | 0.00 | 0.00 | 1. | 1.06 | 21.00 | 47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |

Sheet 16 of 28

TAMS

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

By _____

1.03 21.00 23 0.00 0.00 0.00 1542. 1.07 0.00 48 0.00 0.00 0.00 0.00
 1.04 0.00 24 3.00 0.00 904. 1.07 3.00 49 0.00 0.00 0.00 0.00
 1.04 3.00 25 0.00 0.00 531. 1.07 6.00 50 0.00 0.00 0.00 0.00
 SUM 22.24 16.20 6.04 212125.
 (565.) (412.) (153.) (6006.71)

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
 CFS 49293. 44479. 24493. 8836. 212107.
 CMS 1396. 1260. 694. 250. 6006.
 INCHES 6.81 16.99 16.22 16.23
 MP 172.85 320.73 412.05 412.14
 AC-FT 22056. 48581. 52576. 52588.
 THOUS CU M 27205. 59923. 64532. 64532.

HYDROGRAPH AT STA 4 FOR PLAN 1, RTIO 1

32. 37. 26. 24. 21. 16. 14. 12. 10. 9.
 1909. 4533. 17479. 48809. 49293. 30522. 20316. 14488. 9738. 6006.
 1542. 904. 531. 1. 1. 1. 1. 1. 1. 1.
 1. 1. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
 CFS 49293. 44479. 24493. 8836. 212107.
 CMS 1396. 1260. 694. 250. 6006.
 INCHES 6.81 16.99 16.22 16.23
 MP 172.85 320.73 412.05 412.14
 AC-FT 22056. 48581. 52576. 52588.
 THOUS CU M 27205. 59923. 64532. 64532.

HYDROGRAPH AT STA 4 FOR PLAN 1, RTIO 2

32. 37. 26. 24. 21. 16. 14. 12. 10. 9.
 1432. 3400. 13109. 34607. 36970. 22891. 15236. 10866. 7303. 4350.
 2837. 1674. 678. 398. 1. 1. 1. 1. 1. 1.
 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
 CFS 36970. 33359. 18370. 6627. 15080.
 CMS 1047. 945. 520. 188. 4505.
 INCHES 5.10 11.24 12.17 12.17
 MP 129.64 285.55 309.03 309.11
 AC-FT 18562. 36436. 39432. 39441.
 THOUS CU M 20404. 44943. 48619. 48650.

HYDROGRAPH AT STA 4 FOR PLAN 1, RTIO 3

32. 37. 26. 24. 21. 16. 14. 12. 10. 9.
 955. 2246. 8739. 24406. 15261. 10157. 7244. 4869. 3033. 6.
 1752. 1114. 453. 263. 1. 1. 1. 1. 1. 1.
 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
 CFS 24406. 22240. 12246. 4418. 106053.
 CMS 6627. 5200. 2500. 883. 21210.
 INCHES 12.17 12.17 12.17 12.17
 MP 309.11 309.11 309.11 309.11
 AC-FT 39441. 39441. 39441. 39441.
 THOUS CU M 48650. 48650. 48650. 48650.

Sheet 17 of 28

Job No. _____

Project _____

Schicht

Sheet _____ of _____

Date _____

Rv

Sheet 18 of 28

| | CMs | 698. | 630. | 347. | 125. | 3003. |
|-----------|--------|--------|--------|------|------|--------|
| INCHES | 5.40 | 7.49 | 8.11 | | | |
| MM | 86.43 | 190.37 | 206.02 | | | |
| AC-FT | 11024. | 24290. | 26788. | | | |
| POUS CU M | 13603. | 29968. | 32426. | | | |
| | | | | | | 32433. |

HYDROGRAPH AT STA 4 FOR PLAN 1, RTIO 4[illegible]

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL | VOLUME |
|------------|-------|--------|---------|---------|-------|--------|
| CFS | 12325 | 11120 | 6125 | 2209 | | 53027 |
| CMS | 349 | 315 | 175 | 63 | | 1502 |
| INCHES | | 1.70 | 5.75 | 4.06 | | 4.06 |
| MM | | 43.21 | 95.18 | 103.01 | | 103.04 |
| AC-FT | | 5514 | 12144 | 13144 | | 13147 |
| THOUS CU M | | 6801 | 14981 | 16213 | | 16217 |

COMBINE HYDROGRAPHS

100 COMBINE HYDROGRAPH AT 6 WITH RIO INFLOW

| ISTAG | ICOMP | IECON | ITYPE | JPLT | JPR1 | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 5 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

[illegible]

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|-------------|--------|--------|---------|---------|--------------|
| CFS | 107745 | 10273 | 73656 | 33926 | 919325 |
| CWS | 3031 | 2892 | 2086 | 1016 | 26032 |
| INCHES | | 4.71 | 13.57 | 19.89 | 21.17 |
| MM | | 119.63 | 344.61 | 505.11 | 537.67 |
| AC-FT | | 5071 | 14709 | 214730 | 227932 |
| INCHES CU M | | 6255 | 18020 | 26425 | 281150 |

| | SUM OF 2 HYDROGRAPHS AT | | | 5 PLAN 1 | RTIO 2 |
|--------|-------------------------|--------|--------|----------|--------|
| 1657. | 1150. | 1079. | 1068. | 1058. | 1048. |
| 2446. | 15398. | 55291. | 79150. | 77780. | 66404. |
| 26055. | 24456. | 20068. | 17560. | 15172. | 13625. |
| 2195. | 3362. | 5615. | 4907. | 4391. | 1170. |

Sheet _____ of _____
Date _____
By _____

Sheet 19 of 28

Job No. _____

Project

Syhiart

Sheet _____ of _____

Date _____

By _____

| | 0.00 | 0.00 | 0.00 | 1 | 1 | 1 | 0 | 0 | 0 |
|-------|--------|--------|---------|----------|----------|----------|----------|----------|----------|
| STAFF | 210.00 | 815.00 | 817.00 | 818.00 | 823.90 | 825.00 | 829.00 | 830.00 | 842.80 |
| FLOW | 0.00 | 0.00 | 2240.00 | 20636.00 | 51245.00 | 62090.00 | 76045.00 | 80359.00 | 91304.20 |

CAPACITY: 15110. 15105. 15943. 17385. 19413. 22803.

ELEVATIONS= 817. 815. 817. 820. 824. 830.

| CREL | SMTD | CSW | EXPV | ELEV | COOL | CAREA | EMPL |
|------|------|-----|------|------|------|-------|------|
| 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| DAM DATA | | | |
|----------|------|------|--------|
| TOPFL | COOD | FXPD | DAMWID |
| P25.0 | 2.8 | 1.5 | 1000. |

STATION 6, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

| | 6. | 3. | 0. | OUTFLOW | 0. | 614. | 819. | 920. |
|--|-------|--------|--------|---------|--------|--------|--------|--------|
| | 1440. | 20706. | 53116. | 105273. | 0. | 211. | 614. | 920. |
| | 4416. | 32470. | 28049. | 24272. | 21035. | 93716. | 62370. | 50369. |
| | 1745. | 9642. | 7470. | 6543. | 5408. | 17436. | 13745. | 12423. |
| | 3117. | 2445. | 2226. | 2143. | 1997. | 5126. | 4003. | 3330. |
| | | | | | | 1853. | 1747. | 1613. |

| STORAGE | | | | | | | | | |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 13527. | 13473. | 14147. | 14412. | 14686. | 14951. | 15188. | 15346. | 15426. | 15468. |
| 15003. | 16131. | 16457. | 19465. | 22335. | 22630. | 21984. | 21068. | 20016. | 19248. |
| 12664. | 16115. | 17528. | 17115. | 16778. | 16486. | 16369. | 16333. | 16275. | 16242. |
| 16230. | 16171. | 16161. | 16116. | 16092. | 16074. | 16056. | 16041. | 16028. | 16016. |
| 13005. | 15596. | 15688. | 15977. | 15945. | 15887. | 15831. | 15790. | 15760. | 15737. |

| STAGE | |
|-------|-------|
| 219.0 | 219.5 |
| 216.2 | 217.1 |
| 222.5 | 221.2 |
| 217.2 | 217.4 |
| 217.0 | 217.0 |
| 212.6 | 213.3 |
| 211.0 | 209.5 |
| 220.3 | 218.7 |
| 217.3 | 217.2 |
| 217.0 | 216.9 |
| 216.2 | 215.2 |
| 215.0 | 214.6 |
| 214.0 | 213.9 |
| 213.0 | 212.6 |
| 212.0 | 211.8 |
| 211.0 | 211.2 |
| 210.0 | 210.6 |
| 209.0 | 209.1 |
| 208.0 | 208.5 |
| 207.0 | 207.7 |
| 206.0 | 206.9 |
| 205.0 | 206.1 |
| 204.0 | 205.3 |
| 203.0 | 204.6 |
| 202.0 | 203.9 |
| 201.0 | 203.2 |
| 200.0 | 202.5 |
| 199.0 | 201.8 |
| 198.0 | 201.1 |
| 197.0 | 200.4 |
| 196.0 | 199.7 |
| 195.0 | 199.0 |
| 194.0 | 198.3 |
| 193.0 | 197.6 |
| 192.0 | 196.9 |
| 191.0 | 196.2 |
| 190.0 | 195.5 |
| 189.0 | 194.8 |
| 188.0 | 194.1 |
| 187.0 | 193.4 |
| 186.0 | 192.7 |
| 185.0 | 192.0 |
| 184.0 | 191.3 |
| 183.0 | 190.6 |
| 182.0 | 189.9 |
| 181.0 | 189.2 |
| 180.0 | 188.5 |
| 179.0 | 187.8 |
| 178.0 | 187.1 |
| 177.0 | 186.4 |
| 176.0 | 185.7 |
| 175.0 | 185.0 |
| 174.0 | 184.3 |
| 173.0 | 183.6 |
| 172.0 | 182.9 |
| 171.0 | 182.2 |
| 170.0 | 181.5 |
| 169.0 | 180.8 |
| 168.0 | 180.1 |
| 167.0 | 179.4 |
| 166.0 | 178.7 |
| 165.0 | 178.0 |
| 164.0 | 177.3 |
| 163.0 | 176.6 |
| 162.0 | 175.9 |
| 161.0 | 175.2 |
| 160.0 | 174.5 |
| 159.0 | 173.8 |
| 158.0 | 173.1 |
| 157.0 | 172.4 |
| 156.0 | 171.7 |
| 155.0 | 171.0 |
| 154.0 | 170.3 |
| 153.0 | 169.6 |
| 152.0 | 168.9 |
| 151.0 | 168.2 |
| 150.0 | 167.5 |
| 149.0 | 166.8 |
| 148.0 | 166.1 |
| 147.0 | 165.4 |
| 146.0 | 164.7 |
| 145.0 | 164.0 |
| 144.0 | 163.3 |
| 143.0 | 162.6 |
| 142.0 | 161.9 |
| 141.0 | 161.2 |
| 140.0 | 160.5 |
| 139.0 | 159.8 |
| 138.0 | 159.1 |
| 137.0 | 158.4 |
| 136.0 | 157.7 |
| 135.0 | 157.0 |
| 134.0 | 156.3 |
| 133.0 | 155.6 |
| 132.0 | 154.9 |
| 131.0 | 154.2 |
| 130.0 | 153.5 |
| 129.0 | 152.8 |
| 128.0 | 152.1 |
| 127.0 | 151.4 |
| 126.0 | 150.7 |
| 125.0 | 150.0 |
| 124.0 | 149.3 |
| 123.0 | 148.6 |
| 122.0 | 147.9 |
| 121.0 | 147.2 |
| 120.0 | 146.5 |
| 119.0 | 145.8 |
| 118.0 | 145.1 |
| 117.0 | 144.4 |
| 116.0 | 143.7 |
| 115.0 | 143.0 |
| 114.0 | 142.3 |
| 113.0 | 141.6 |
| 112.0 | 140.9 |
| 111.0 | 140.2 |
| 110.0 | 139.5 |
| 109.0 | 138.8 |
| 108.0 | 138.1 |
| 107.0 | 137.4 |
| 106.0 | 136.7 |
| 105.0 | 136.0 |
| 104.0 | 135.3 |
| 103.0 | 134.6 |
| 102.0 | 133.9 |
| 101.0 | 133.2 |
| 100.0 | 132.5 |
| 99.0 | 131.8 |
| 98.0 | 131.1 |
| 97.0 | 130.4 |
| 96.0 | 129.7 |
| 95.0 | 129.0 |
| 94.0 | 128.3 |
| 93.0 | 127.6 |
| 92.0 | 126.9 |
| 91.0 | 126.2 |
| 90.0 | 125.5 |
| 89.0 | 124.8 |
| 88.0 | 124.1 |
| 87.0 | 123.4 |
| 86.0 | |

PLEASE OUTFLOW IS 107523. AT TIME 40. (H) HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|---------|---------|---------|---------|--------------|
| CFS | 107523. | 107384. | 73023. | 35976. | 910409. |
| CMS | 2927. | 2064. | 1019. | 1019. | 25780. |
| INCHES | 3045. | 4.76 | 13.45 | 19.88 | 20.96 |
| MP | | 120.93 | 341.66 | 505.01 | 532.45 |
| AC-FT | | 51265. | 144840. | 214087. | 225721. |
| INCHS CU M | | 63234. | 172657. | 264073. | 278423. |

Sheet 20 of 28

STATION
6, PLAN 1, RATIO 2

Job No. _____

Project

Subject

Sheet _____ of _____

Date _____

Bv _____

END-OF-PERIOD HYDROGRAPH ORDINATES

| U. | J. | .D. | U. | OUTFLOW | 0. | 172. | 591. | 804. | 910. |
|---------|--------|--------|--------|---------|--------|--------|--------|--------|--------|
| 1505. | 2561. | 14669. | 40361. | 73029. | 79675. | 69619. | 58111. | 46986. | 39782. |
| 33029. | 26005. | 24222. | 21129. | 17498. | 15618. | 13427. | 12138. | 10557. | 9432. |
| 2244. | 7316. | 4431. | 5693. | 5026. | 4450. | 3927. | 3470. | 3059. | 2499. |
| 2455. | 2215. | 2123. | 1771. | 1532. | 1736. | 1666. | 1609. | 1581. | 1517. |
| STORAGE | | | | | | | | | |
| 1505. | 14334. | 14334. | 14403. | 14669. | 14933. | 15172. | 15337. | 15420. | 15462. |
| 33029. | 12201. | 12201. | 12501. | 12662. | 12666. | 12632. | 12750. | 12826. | 12826. |
| 77552. | 17114. | 16773. | 16594. | 16371. | 16323. | 16267. | 16236. | 16194. | 16166. |
| 16116. | 16069. | 16069. | 16071. | 16054. | 16039. | 16026. | 16014. | 16004. | 15995. |
| 15567. | 15936. | 15936. | 15677. | 15823. | 15786. | 15756. | 15736. | 15717. | 15700. |
| STAGE | | | | | | | | | |
| 811.0 | 811.9 | 812.6 | 813.2 | 813.9 | 814.6 | 815.2 | 815.5 | 815.7 | 815.8 |
| 812.2 | 817.0 | 817.7 | 818.1 | 818.6 | 819.2 | 819.6 | 820.4 | 821.1 | 821.7 |
| 820.4 | 816.4 | 818.7 | 818.1 | 817.8 | 817.7 | 817.6 | 817.5 | 817.5 | 817.4 |
| 817.3 | 817.5 | 817.2 | 817.2 | 817.2 | 817.1 | 817.1 | 817.1 | 817.0 | 817.0 |
| 817.0 | 817.0 | 816.9 | 816.8 | 816.6 | 816.6 | 816.3 | 816.4 | 816.4 | 816.4 |

PEAK CUTFION IS 79675. AT TIME 6P.00 HOURS

STATION 6, PLAN 1, RATIO 3

[illegible]

Sheet 21 of 28

Sheet _____ of _____

Date _____

Rv _____

PEAK OUTPUT IS 31097. AT TIME 42.00 HOURS

| | PEAK | 4-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|-------|--------|---------|---------|--------------|
| CFS | 51000 | 46357 | 35558 | 17650 | 454503. |
| CMS | 1247. | 1369. | 1001. | 500. | 12770. |
| INCHES | | 2.23 | 9.55 | 9.55 | 10.47 |
| MM | | 56.56 | 166.37 | 247.75 | 265.82 |
| AC-FT | 23979 | 70528 | 105027 | 112687 | 112687 |
| THOUS CU Y | 29577 | 86993 | 129543 | 138998 | 138998 |

STATION 6, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

[illegible]

PEAK OUTFLOW IS 24399. AT TIME 48.60 HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|--------|--------|--------|---------|---------|--------------|
| CFS | 24359. | 23257. | 16902. | 8531. | 229882. |
| CMS | 659. | 659. | 479. | 242. | 6504. |
| INCHES | 601. | 3.11 | 4.71 | 2.50 | 5.20 |
| INCHES | 27.20 | 79.08 | 119.25 | 13.33 | 5.20 |
| AC-FT | 11532. | 33525. | 50761. | 56466. | 70242. |
| AC-FT | 14225. | 41333. | 52615. | 70242. | 70242. |

Sheet 22 of 28

HYDROGRAPH ROUTING

2 CHANNEL ROUTE AT STATION 10+00

| | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------|--------|---------|---------|--------------|
| PFAK | | | | |

By _____

[illegible]

Sheet 24 of 28

By

Sheet 25. of 28

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|-------------|---------|---------|---------|---------|--------------|
| CFS | 24,557. | 23,257. | 16,904. | 8,531. | 22,9669. |
| CMS | 690. | 659. | 470. | 242. | 6503. |
| INCHES | | 1.07 | 3.11 | 6.71 | 5.29 |
| PM | | 27.20 | 79.09 | 119.75 | 136.32 |
| AL-F | | 11,522. | 3,5530. | 5,0766. | 5,0943. |
| THOUS. CU M | | 12,225. | 4,338. | 4,2437. | 7,0238. |

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

Sheet 26 of 28

MAXIMUM STORAGE = 23.

MAXIMUM STAGE IS 716.0

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

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 RATIO 2 RATIO 3 RATIO 4
1.00 .75 .50 .25

HYDROGRAPH AT 1 23.20 1 20621. 15466. 10310. 5155.
(60.09) (583.92) (437.94) (291.96) (145.98) (

ROUTED TO 121 23.20 1 9539. 6654. 3947. 1898.
(60.09) (270.11) (188.43) (111.77) (48.09) (

HYDROGRAPH AT 2 116.00 1 78320. 58740. 39160. 19580.
(305.62) (2217.79) (1663.34) (1108.89) (554.45) (

ROUTED TO 122 112.00 1 67464. 50014. 31728. 15367.
(305.62) (1910.37) (1416.24) (898.44) (435.13) (

2 COMBINED 3 141.20 1 75299. 54889. 34562. 16407.
(365.71) (2132.24) (1554.27) (978.68) (464.67) (

HYDROGRAPH AT 4 60.80 1 49293. 36970. 24646. 12373.
(157.47) (1395.82) (1046.96) (697.91) (348.95) (

2 COMBINED 5 262.00 1 107744. 78180. 51079. 24037.
(523.18) (3050.97) (2213.80) (1446.40) (681.22) (

ROUTED TO 6 202.00 1 107523. 79675. 51090. 24389.
(523.18) (3044.71) (2256.14) (1446.70) (690.63) (

ROUTED TO 7 202.00 1 107637. 79749. 51090. 24357.
(523.18) (3047.51) (2258.24) (1446.71) (689.72) (

Sheet 27 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

SUMMARY OF DAM SAFETY ANALYSIS

INITIAL VALUE SPILLWAY CREST TOP OF DAM
 ELEVATION 810.00 810.00 825.00
 STORAGE 13110. 13110. 19975.
 OUTFLOW 0. 0. 62090.

| RATIO OF
PNE | 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 | 824.68 | 4.69 | 22630. | 107523. | 15.00 | 48.00 | 0.00 |
| .75 | 827.28 | 2.28 | 21266. | 79675. | 9.00 | 48.00 | 0.30 |
| .50 | 823.77 | 0.00 | 19347. | 51090. | 0.00 | 45.00 | 0.30 |
| .25 | 818.72 | 0.00 | 16722. | 24389. | 0.00 | 48.00 | 0.00 |

PLAN 1 STATION 7

| RATIO | MAXIMUM
FLOW, CFS | MAXIMUM
STAGE, FT | TIME
HOURS |
|-------|----------------------|----------------------|---------------|
| 1.00 | 107657. | 727.5 | 48.00 |
| .75 | 79749. | 724.7 | 48.00 |
| .50 | 51090. | 721.0 | 48.00 |
| .25 | 24357. | 716.0 | 48.00 |

Sheet 28 of 28

CASE B

FLASHBOARD AT EL. 815 AT
BEGINNING OF FLOOD ROUTING
(Sheets 1 of 28 thru 28 of 28)

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Sut _____

CASE B FLASHBOARDS IN PLACE TO EL. 815 AT START OF FLOOD ROUTING.

.....
FLOOD HYDROGRAPH PACKAGE (OHC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80
.....

| RIO DAM PHASE 1 SAFETY INVESTIGATION | | | | | | | | | |
|--------------------------------------|----|-------|-----------------------------|-------|-------|-------|------|------|-----|
| REC. 1 DR. PHF ANALYSIS | | | | | | | | | |
| JULY 1981 | | | | | | | | | |
| | | | | | | | | | |
| 1 | A1 | | | | | | | | |
| 2 | A2 | | | | | | | | |
| 3 | A3 | | | | | | | | |
| 4 | B | 50 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | B1 | 5 | | | | | | | |
| 6 | J | 1 | 4 | 1 | | | | | |
| 7 | J1 | 1 | 0.75 | 0.5 | 0.25 | | | | |
| 8 | F | 1 | | | | | | | |
| 9 | | | | | | | | | |
| 10 | A1 | 49 | TORONTO SUB-AREA RUNOFF | | | | | | |
| 11 | A | 1 | -1 | 23.2 | 202 | | | | |
| 12 | P | | 21 | 102 | 114 | 134 | | | |
| 13 | F | | | | | | | | |
| 14 | U | 15 | | | | | | | |
| 15 | U1 | 459 | 1347 | 848 | 667 | 499 | 349 | 224 | 355 |
| 16 | U1 | 75 | 50 | 40 | 35 | | | | |
| 17 | X | -2 | -55 | 4.3 | | | | | |
| 18 | A | 1 | 121 | | | | | | |
| 19 | K1 | | | | | | | | |
| 20 | Y | | | | | | | | |
| 21 | V1 | 1 | | | | | | | |
| 22 | V2 | 21950 | 25300 | 27370 | 28750 | 32000 | | | |
| 23 | K | 0 | 1740 | 3600 | 5000 | 10000 | | | |
| 24 | K1 | 2 | | | | | | | |
| 25 | M | 1 | | | | | | | |
| 26 | P | 1 | 118 | 96 | 202 | | | | |
| 27 | T | 21 | 22 | 96 | 102 | 112 | | | |
| 28 | U | 17 | | | | | | | |
| 29 | U1 | 2537 | 4440 | 3425 | 2664 | 1903 | 1395 | 1015 | 741 |
| 30 | U1 | 341 | 304 | 203 | 127 | 101 | | | |
| 31 | X | -6 | -46 | 3.7 | | | | | |
| 32 | C | 1 | 122 | | | | | | |
| 33 | K1 | | | | | | | | |
| 34 | Y | | | | | | | | |
| 35 | | | | | | | | | |
| 36 | V1 | 1 | | | | | | | |
| 37 | V2 | 7420 | 37420 | 53670 | | | | | |
| 38 | V3 | 437 | 1076 | 3600 | 11800 | | | | |
| 39 | K | 2 | | | | | | | |
| 40 | K1 | | | | | | | | |
| 41 | K | 0 | | | | | | | |
| 42 | A1 | 51 | RIO RESERVOIR SUBAREA INLEW | | | | | | |
| 43 | P | 1 | -1 | 60.8 | 202 | | | | |
| 44 | P | | 21 | 88 | 104 | 114 | 120 | | |
| 45 | J | | | | | | | | |
| 46 | U | 13 | | | | | | | |
| 47 | J1 | 2676 | 3640 | 2222 | 1638 | 1046 | 719 | 458 | 261 |
| 48 | U1 | 65 | 52 | | | | | | |
| 49 | X | -5 | -49 | 4 | | | | | |
| 50 | K1 | 2 | | | | | | | |
| 51 | K1 | | | | | | | | |

Sheet 1 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Sut-

Sheet 2 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Sub _____

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

| | |
|--------------------------|-----|
| RUNOFF HYDROGRAPH AT | 1 |
| ROUTE HYDROGRAPH TO | 121 |
| RUNOFF HYDROGRAPH AT | 2 |
| ROUTE HYDROGRAPH TO | 122 |
| COMBINE 2 HYDROGRAPHS AT | 3 |
| RUNOFF HYDROGRAPH AT | 4 |
| ROUTE HYDROGRAPH TO | 5 |
| COMBINE 2 HYDROGRAPHS AT | 6 |
| ROUTE HYDROGRAPH TO | 7 |
| END OF NETWORK | |

Sheet 3 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Sub-_____

D. _____

 FILE HYDROGRAPH PACKAGE (HLC-1)
 GAP SAFETY VERSION JULY 1978
 LAST MODIFICATION 01 APR 80

END DATE: 8/10/20.
 TIME: 12:51:22.

RIO DAN PHASE 1 SAFETY INVESTIGATION HEC 1 PM PRE ANALYSIS JULY 1981

JOB SPECIFICATION

| NO | NHR | NMIN | ISAY | THR | IMIN | MTRC | IPLT | IPRT | MSTAN |
|----|-----|------|------|-----|------|------|------|------|-------|
| 50 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

MULTI-PLAN ANALYSES TO BE PERFORMED

RTIOS= 1.00 .75 .50 .25
 NPLAN= 1 MTRIO= 4 LRTIO= 1

SUB-AREA RUNOFF COMPUTATION

49 TORONTO SUB-AREA RUNOFF

| ISTAG | ICOMP | IECON | ITYPE | JPLY | JPRY | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| INTOG | IUNG | TAREA | SNAP | TRSDA | TRSPC | RATIO | ISNOW | ISAME | LOCAL |
|-------|------|-------|------|--------|-------|-------|-------|-------|-------|
| 1 | -1 | 23.20 | 0.00 | 202.00 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA
 SPFE PHS R6 R12 R24 R48 R72 R96
 0.00 21.00 102.00 114.00 126.00 134.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS .483

LOSS DATA

| LROPT | STERR | DLTAR | RTIOL | ERAIN | STOKS | RTIOK | STATL | CHSTL | ALSHR | RTIMP |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| U | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 2.00 | .30 | 0.00 | 0.00 |

499. 1347. 648. 647. 499. 349. 224. 155. 120. 100.
 75. 40. 35. 0.

UNIT GRAPH TOTALS 4988. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA
 STRIO= -.80 ORCSN= -.55 RTIOK= 4.30

END-OF-PERIOD FLOW

| NO.0A | MP.0A | PERIOD | RAIN | EXCS | LOSS | COMP | NO.0A | MP.0A | PERIOD | RAIN | EXCS | LOSS | COMP |
|-------|-------|--------|------|------|------|------|-------|-------|--------|------|------|------|------|
| U | | | | | | | | | | | | | |

Sheet 4 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subsiant _____

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | SUM | 24.84 | 12.53 | 7.31 | 131017 |
|------|-------|-------|-------|-------|------|--------|
| 1.01 | 3.00 | 0.00 | 2330. | 0.00 | 0.00 | 0.00 | 2330. |
| 1.02 | 6.00 | 0.00 | 2533. | 0.00 | 0.00 | 0.00 | 2533. |
| 1.03 | 9.00 | 0.00 | 2189. | 0.00 | 0.00 | 0.00 | 2189. |
| 1.04 | 12.00 | 0.00 | 1892. | 0.00 | 0.00 | 0.00 | 1892. |
| 1.05 | 15.00 | 0.00 | 1635. | 0.00 | 0.00 | 0.00 | 1635. |
| 1.06 | 18.00 | 0.00 | 1413. | 0.00 | 0.00 | 0.00 | 1413. |
| 1.07 | 21.00 | 0.00 | 1221. | 0.00 | 0.00 | 0.00 | 1221. |
| 1.08 | 24.00 | 0.00 | 1056. | 0.00 | 0.00 | 0.00 | 1056. |
| 1.09 | 27.00 | 0.00 | 912. | 0.00 | 0.00 | 0.00 | 912. |
| 1.10 | 30.00 | 788. | 0.00 | 0.00 | 0.00 | 788. |
| 1.11 | 33.00 | 0.00 | 681. | 0.00 | 0.00 | 0.00 | 681. |
| 1.12 | 36.00 | 0.00 | 589. | 0.00 | 0.00 | 0.00 | 589. |
| 1.13 | 39.00 | 0.00 | 509. | 0.00 | 0.00 | 0.00 | 509. |
| 1.14 | 42.00 | 0.00 | 440. | 0.00 | 0.00 | 0.00 | 440. |
| 1.15 | 45.00 | 0.00 | 389. | 0.00 | 0.00 | 0.00 | 389. |
| 1.16 | 48.00 | 0.00 | 329. | 0.00 | 0.00 | 0.00 | 329. |
| 1.17 | 51.00 | 0.00 | 254. | 0.00 | 0.00 | 0.00 | 254. |
| 1.18 | 54.00 | 0.00 | 212. | 0.00 | 0.00 | 0.00 | 212. |
| 1.19 | 57.00 | 0.00 | 183. | 0.00 | 0.00 | 0.00 | 183. |
| 1.20 | 60.00 | 158. | 0.00 | 0.00 | 0.00 | 158. |
| 1.21 | 63.00 | 0.00 | 137. | 0.00 | 0.00 | 0.00 | 137. |
| 1.22 | 66.00 | 0.00 | 118. | 0.00 | 0.00 | 0.00 | 118. |
| 1.23 | 69.00 | 0.00 | 102. | 0.00 | 0.00 | 0.00 | 102. |
| 1.24 | 72.00 | 0.00 | 88. | 0.00 | 0.00 | 0.00 | 88. |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

| | | | | |
|--------|--------|--------|--------|---------|
| 20621. | 17059. | 10961. | 5271. | 130966. |
| 524. | 483. | 310. | 149. | 3709. |
| 6.84 | 17.58 | 25.36 | 26.26 | |
| 173.74 | 446.53 | 644.19 | 666.91 | |
| 8459. | 21741. | 31365. | 32471. | |
| 10436. | 26817. | 38088. | 40052. | |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO.1

| | 12. | 10. | 9. | 7. | 6. | 5. | 4. |
|-------|-------|--------|--------|--------|--------|-------|-------|
| 14. | 2152. | 13282. | 20621. | 13613. | 10820. | 9412. | 7031. |
| 119. | 4539. | 3923. | 3391. | 2930. | 2533. | 2189. | 1835. |
| 6076. | 1056. | 912. | 788. | 681. | 589. | 509. | 440. |
| 1433. | 245. | 212. | 183. | 158. | 137. | 118. | 88. |
| 329. | | | | | | | |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

| | | | | |
|--------|--------|--------|--------|---------|
| 20621. | 17059. | 10961. | 5271. | 130966. |
| 584. | 483. | 310. | 149. | 3709. |
| 6.84 | 17.58 | 25.36 | 26.26 | |
| 173.74 | 446.53 | 644.19 | 666.91 | |
| 8459. | 21741. | 31365. | 32471. | |
| 10436. | 26817. | 38088. | 40052. | |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO.2

| | 12. | 10. | 9. | 7. | 6. | 5. | 4. |
|------|-------|--------|--------|--------|-------|-------|-------|
| 12. | 2349. | 10036. | 15466. | 10210. | 8168. | 7059. | 5273. |
| 296. | | | | | | | |
| 10. | | | | | | | |
| 2. | | | | | | | |

Sheet 5 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Sul _____

4557. 5939. 3404. 2942. 2563. 2198. 1899. 1642. 1412. 1226.
1260. 916. 684. 591. 511. 442. 382. 330. 300. 285.
246. 213. 159. 138. 119. 103. 89. 77. 64. 48.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
CFS 15466. 12794. 8221. 3933. 98223.
CMS 438. 362. 233. 112. 2781.
INCHES 5.13 13.18 19.02 19.69
MM 130.30 334.89 493.14 500.18
AC-FT 6344. 16306. 23523. 24353.
THOUS CU M 7826. 20113. 29016. 30039.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

7. 6. 5. 4. 3. 2. 1.
55. 197. 1568. 6691. 10310. 4807. 5445. 4706. 4067. 3515.
3036. 2026. 1961. 1695. 1465. 1266. 1094. 946. 818.
727. 611. 456. 394. 341. 294. 255. 220. 190.
164. 142. 106. 92. 79. 68. 59. 51. 44.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
CFS 10310. 8530. 5480. 2635. 65483.
CMS 292. 242. 155. 75. 1854.
INCHES 3.42 8.79 12.68 13.43
MM 86.87 223.26 322.09 333.45
AC-FT 4230. 10870. 15682. 16236.
THOUS CU M 5217. 13408. 19344. 20026.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

4. 3. 2. 1. 1.
27. 99. 383. 3345. 2155. 3403. 2723. 2353. 2034. 1758.
1519. 1213. 981. 848. 753. 633. 547. 473. 409.
553. 305. 228. 197. 170. 147. 127. 110. 95.
62. 71. 53. 46. 40. 34. 30. 26. 22.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
CFS 5155. 4265. 2740. 1318. 32742.
CMS 140. 121. 78. 37. 927.
INCHES 1.71 4.39 6.34 6.56
MM 43.63 111.63 161.05 166.23
AC-FT 2115. 5435. 7841. 8118.
THOUS CU M 2609. 6704. 9672. 10013.

HYDROGRAPH ROUTING

R23 ROUTE THROUGH TORONTO RESERVOIR

| ISTAG | ICOMP | IECON | ITAPE | JPLT | JPRY | INAME | ISTAGE | IAUTO |
|--------------|-------|-------|-------|------|------|-------|--------|-------|
| 121 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| ROUTING DATA | | | | | | | | |

QLOSS CLOSS AVG 18ES 18AME 10PT 1PMP LSTR

Sheet _____ of _____

Project _____

Date _____

Sub

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|-------|--------|---------|---------|--------------|
| CIS | 6654. | 6561. | 5825. | 3375. | 94112. |
| C4S | 186. | 166. | 165. | 101. | 2665. |
| INCHES | 2.63 | 9.34 | 17.20 | 18.87 | |
| PP | 66.82 | 237.30 | 436.91 | 479.24 | |
| AC-FT | 3253. | 11554. | 21272. | 23333. | |
| THOUS CU M | 4013. | 14251. | 26239. | 28781. | |

MAXIMUM STORAGE = 29825.

STATION 121, PLAN 1, RY10 3.

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. | 28. | 29. | 30. | 31. | 32. | 33. | 34. | 35. | 36. | 37. | 38. | 39. | 40. | 41. | 42. | 43. | 44. | 45. | 46. | 47. | 48. | 49. | 50. | 51. | 52. | 53. | 54. | 55. | 56. | 57. | 58. | 59. | 60. | 61. | 62. | 63. | 64. | 65. | 66. | 67. | 68. | 69. | 70. | 71. | 72. | 73. | 74. | 75. | 76. | 77. | 78. | 79. | 80. | 81. | 82. | 83. | 84. | 85. | 86. | 87. | 88. | 89. | 90. | 91. | 92. | 93. | 94. | 95. | 96. | 97. | 98. | 99. | 100. |
|---------|----|----|----|----|----|----|----|----|----|------|
| OUTFLOW | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. | 28. | 29. | 30. | 31. | 32. | 33. | 34. | 35. | 36. | 37. | 38. | 39. | 40. | 41. | 42. | 43. | 44. | 45. | 46. | 47. | 48. | 49. | 50. | 51. | 52. | 53. | 54. | 55. | 56. | 57. | 58. | 59. | 60. | 61. | 62. | 63. | 64. | 65. | 66. | 67. | 68. | 69. | 70. | 71. | 72. | 73. | 74. | 75. | 76. | 77. | 78. | 79. | 80. | 81. | 82. | 83. | 84. | 85. | 86. | 87. | 88. | 89. | 90. | 91. | 92. | 93. | 94. | 95. | 96. | 97. | 98. | 99. | 100. |

OR

| STOR | | |
|--------|--------|--------|
| 21453. | 21455. | 21856. |
| 21454. | 21456. | 21857. |
| 21455. | 21457. | 21858. |
| 21456. | 21458. | 21859. |
| 21457. | 21459. | 21860. |
| 21458. | 21460. | 21861. |
| 21459. | 21461. | 21862. |
| 21460. | 21462. | 21863. |
| 21461. | 21463. | 21864. |
| 21462. | 21464. | 21865. |
| 21463. | 21465. | 21866. |
| 21464. | 21466. | 21867. |
| 21465. | 21467. | 21868. |
| 21466. | 21468. | 21869. |
| 21467. | 21469. | 21870. |
| 21468. | 21470. | 21871. |
| 21469. | 21471. | 21872. |
| 21470. | 21472. | 21873. |
| 21471. | 21473. | 21874. |
| 21472. | 21474. | 21875. |
| 21473. | 21475. | 21876. |
| 21474. | 21476. | 21877. |
| 21475. | 21477. | 21878. |
| 21476. | 21478. | 21879. |
| 21477. | 21479. | 21880. |
| 21478. | 21480. | 21881. |
| 21479. | 21481. | 21882. |
| 21480. | 21482. | 21883. |
| 21481. | 21483. | 21884. |
| 21482. | 21484. | 21885. |
| 21483. | 21485. | 21886. |
| 21484. | 21486. | 21887. |
| 21485. | 21487. | 21888. |
| 21486. | 21488. | 21889. |
| 21487. | 21489. | 21890. |
| 21488. | 21490. | 21891. |
| 21489. | 21491. | 21892. |
| 21490. | 21492. | 21893. |
| 21491. | 21493. | 21894. |
| 21492. | 21494. | 21895. |
| 21493. | 21495. | 21896. |
| 21494. | 21496. | 21897. |
| 21495. | 21497. | 21898. |
| 21496. | 21498. | 21899. |
| 21497. | 21499. | 21900. |
| 21498. | 21500. | 21901. |
| 21499. | 21501. | 21902. |
| 21500. | 21502. | 21903. |
| 21501. | 21503. | 21904. |
| 21502. | 21504. | 21905. |
| 21503. | 21505. | 21906. |
| 21504. | 21506. | 21907. |
| 21505. | 21507. | 21908. |
| 21506. | 21508. | 21909. |
| 21507. | 21509. | 21910. |
| 21508. | 21510. | 21911. |
| 21509. | 21511. | 21912. |
| 21510. | 21512. | 21913. |
| 21511. | 21513. | 21914. |
| 21512. | 21514. | 21915. |
| 21513. | 21515. | 21916. |
| 21514. | 21516. | 21917. |
| 21515. | 21517. | 21918. |
| 21516. | 21518. | 21919. |
| 21517. | 21519. | 21920. |
| 21518. | 21520. | 21921. |
| 21519. | 21521. | 21922. |
| 21520. | 21522. | 21923. |
| 21521. | 21523. | 21924. |
| 21522. | 21524. | 21925. |
| 21523. | 21525. | 21926. |
| 21524. | 21526. | 21927. |
| 21525. | 21527. | 21928. |
| 21526. | 21528. | 21929. |
| 21527. | 21529. | 21930. |
| 21528. | 21530. | 21931. |
| 21529. | 21531. | 21932. |
| 21530. | 21532. | 21933. |
| 21531. | 21533. | 21934. |
| 21532. | 21534. | 21935. |
| 21533. | 21535. | 21936. |
| 21534. | 21536. | 21937. |
| 21535. | 21537. | 21938. |
| 21536. | 21538. | 21939. |
| 21537. | 21539. | 21940. |
| 21538. | 21540. | 21941. |
| 21539. | 21541. | 21942. |
| 21540. | 21542. | 21943. |
| 21541. | 21543. | 21944. |
| 21542. | 21544. | 21945. |
| 21543. | 21545. | 21946. |
| 21544. | 21546. | 21947. |
| 21545. | 21547. | 21948. |
| 21546. | 21548. | 21949. |
| 21547. | 21549. | 21950. |
| 21548. | 21550. | 21951. |
| 21549. | 21551. | 21952. |
| 21550. | 21552. | 21953. |
| 21551. | 21553. | 21954. |
| 21552. | 21554. | 21955. |
| 21553. | 21555. | 21956. |
| 21554. | 2 | |

| | STAGE | | | | | |
|-----|-------|-----|-----|-----|-----|-----|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

MAXIMUM STORAGE = 27712.

STATION 121, PLAN 1, RTIO 4

NOTING

Sheet 8 of 28

Date _____

903.

826 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

UNIT GRAPHS TOTALS 25370. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA
* START= -.80 GRCN= -.46 RTIO= 3.70

| NO. | HR. | PERIOD | RAIN | EXCS | LOSS | END-OF-PERIOD FLOW | NO. | HR. | PERIOD | RAIN | EXCS | LOSS | COMP |
|------|-------|--------|-------|------|------|--------------------|------|-------|--------|--------------------------------------|-------|------|---------|
| 1.01 | 3.00 | 1 | .02 | 0.00 | .02 | 83. | 1.04 | 6.00 | 26 | 0.00 | 0.00 | 0.00 | 13081. |
| 1.01 | 6.00 | 2 | .02 | 0.00 | .02 | 73. | 1.04 | 9.00 | 27 | 0.00 | 0.00 | 0.00 | 11477. |
| 1.01 | 9.00 | 3 | .06 | 3.00 | .06 | 64. | 1.04 | 12.00 | 28 | 0.00 | 0.00 | 0.00 | 10069. |
| 1.01 | 12.00 | 4 | .16 | 0.00 | .06 | 56. | 1.04 | 15.00 | 29 | 0.30 | 0.00 | 0.00 | 8834. |
| 1.01 | 15.00 | 5 | .23 | 0.00 | .23 | 43. | 1.04 | 18.00 | 30 | 0.00 | 0.00 | 0.00 | 7751. |
| 1.01 | 18.00 | 6 | .42 | 0.00 | .42 | 38. | 1.04 | 21.00 | 31 | 0.00 | 0.00 | 0.00 | 6400. |
| 1.01 | 21.00 | 7 | .03 | 3.00 | .03 | 33. | 1.05 | 24.00 | 32 | 0.00 | 0.00 | 0.00 | 5966. |
| 1.02 | 3.00 | 8 | .03 | 3.00 | .03 | 29. | 1.05 | 27.00 | 33 | 0.00 | 0.00 | 0.00 | 5235. |
| 1.02 | 6.00 | 9 | .41 | 0.00 | .41 | 26. | 1.05 | 30.00 | 34 | 0.00 | 0.00 | 0.00 | 4593. |
| 1.02 | 9.00 | 10 | .41 | 0.00 | .41 | 26. | 1.05 | 33.00 | 35 | 0.00 | 0.00 | 0.00 | 4030. |
| 1.02 | 12.00 | 11 | 1.20 | .73 | .57 | 1867. | 1.05 | 36.00 | 36 | 0.00 | 0.00 | 0.00 | 3535. |
| 1.02 | 15.00 | 12 | 1.30 | .91 | .39 | 6193. | 1.05 | 39.00 | 37 | 0.00 | 0.00 | 0.00 | 3102. |
| 1.02 | 18.00 | 13 | 5.02 | 4.63 | .39 | 19813. | 1.05 | 42.00 | 38 | 0.00 | 0.00 | 0.00 | 2721. |
| 1.02 | 21.00 | 14 | 10.16 | 9.79 | .39 | 56016. | 1.05 | 45.00 | 39 | 0.00 | 0.00 | 0.00 | 2385. |
| 1.02 | 24.00 | 15 | .61 | .22 | .39 | 78320. | 1.06 | 48.00 | 40 | 0.00 | 0.00 | 0.00 | 2095. |
| 1.03 | 3.00 | 16 | .41 | .22 | .39 | 64875. | 1.06 | 51.00 | 41 | 0.00 | 0.00 | 0.00 | 1839. |
| 1.03 | 6.00 | 17 | 0.00 | 0.00 | 0.00 | 50776. | 1.06 | 54.00 | 42 | 0.00 | 0.00 | 0.00 | 1513. |
| 1.03 | 9.00 | 18 | 0.00 | 0.00 | 0.00 | 32645. | 1.06 | 57.00 | 43 | 0.00 | 0.00 | 0.00 | 1415. |
| 1.03 | 12.00 | 19 | 0.00 | 0.00 | 0.00 | 32647. | 1.06 | 60.00 | 44 | 0.00 | 0.00 | 0.00 | 1241. |
| 1.03 | 15.00 | 20 | 0.00 | 0.00 | 0.00 | 24679. | 1.06 | 63.00 | 45 | 0.00 | 0.00 | 0.00 | 1089. |
| 1.03 | 18.00 | 21 | 0.00 | 0.00 | 0.00 | 25162. | 1.06 | 66.00 | 46 | 0.00 | 0.00 | 0.00 | 956. |
| 1.03 | 21.00 | 22 | 0.00 | 0.00 | 0.00 | 22076. | 1.06 | 69.00 | 47 | 0.00 | 0.00 | 0.00 | 838. |
| 1.03 | 24.00 | 23 | 0.00 | 0.00 | 0.00 | 19369. | 1.06 | 72.00 | 48 | 0.00 | 0.00 | 0.00 | 736. |
| 1.04 | 3.00 | 24 | 0.00 | 0.00 | 0.00 | 16993. | 1.07 | 75.00 | 49 | 0.00 | 0.00 | 0.00 | 645. |
| 1.04 | 6.00 | 25 | 0.00 | 0.00 | 0.00 | 14909. | 1.07 | 78.00 | 50 | 0.00 | 0.00 | 0.00 | 566. |
| SUM | | | | | | | | | | 20.76 | 16.50 | 4.26 | 579690. |
| | | | | | | | | | | (527.3 (419.3 (108.3 (16409.33) | | | |

| NO. | HR. | PERIOD | RAIN | EXCS | LOSS | END-OF-PERIOD FLOW | NO. | HR. | PERIOD | RAIN | EXCS | LOSS | COMP |
|------|-------|--------|-------|------|------|--------------------|------|-------|--------|------|------|------|--------|
| 1.01 | 3.00 | 1 | .02 | 0.00 | .02 | 83. | 1.04 | 6.00 | 26 | 0.00 | 0.00 | 0.00 | 13081. |
| 1.01 | 6.00 | 2 | .02 | 0.00 | .02 | 73. | 1.04 | 9.00 | 27 | 0.00 | 0.00 | 0.00 | 11477. |
| 1.01 | 9.00 | 3 | .06 | 3.00 | .06 | 64. | 1.04 | 12.00 | 28 | 0.00 | 0.00 | 0.00 | 10069. |
| 1.01 | 12.00 | 4 | .16 | 0.00 | .06 | 56. | 1.04 | 15.00 | 29 | 0.30 | 0.00 | 0.00 | 8834. |
| 1.01 | 15.00 | 5 | .23 | 0.00 | .23 | 43. | 1.04 | 18.00 | 30 | 0.00 | 0.00 | 0.00 | 7751. |
| 1.01 | 18.00 | 6 | .42 | 0.00 | .42 | 38. | 1.04 | 21.00 | 31 | 0.00 | 0.00 | 0.00 | 6400. |
| 1.01 | 21.00 | 7 | .03 | 3.00 | .03 | 33. | 1.05 | 24.00 | 32 | 0.00 | 0.00 | 0.00 | 5966. |
| 1.02 | 3.00 | 8 | .03 | 3.00 | .03 | 29. | 1.05 | 27.00 | 33 | 0.00 | 0.00 | 0.00 | 5235. |
| 1.02 | 6.00 | 9 | .41 | 0.00 | .41 | 26. | 1.05 | 30.00 | 34 | 0.00 | 0.00 | 0.00 | 4593. |
| 1.02 | 9.00 | 10 | .41 | 0.00 | .41 | 26. | 1.05 | 33.00 | 35 | 0.00 | 0.00 | 0.00 | 4030. |
| 1.02 | 12.00 | 11 | 1.20 | .73 | .57 | 1867. | 1.05 | 36.00 | 36 | 0.00 | 0.00 | 0.00 | 3535. |
| 1.02 | 15.00 | 12 | 1.30 | .91 | .39 | 6193. | 1.05 | 39.00 | 37 | 0.00 | 0.00 | 0.00 | 3102. |
| 1.02 | 18.00 | 13 | 5.02 | 4.63 | .39 | 19813. | 1.05 | 42.00 | 38 | 0.00 | 0.00 | 0.00 | 2721. |
| 1.02 | 21.00 | 14 | 10.16 | 9.79 | .39 | 56016. | 1.05 | 45.00 | 39 | 0.00 | 0.00 | 0.00 | 2385. |
| 1.02 | 24.00 | 15 | .61 | .22 | .39 | 78320. | 1.06 | 48.00 | 40 | 0.00 | 0.00 | 0.00 | 2095. |
| 1.03 | 3.00 | 16 | .41 | .22 | .39 | 64875. | 1.06 | 51.00 | 41 | 0.00 | 0.00 | 0.00 | 1839. |
| 1.03 | 6.00 | 17 | 0.00 | 0.00 | 0.00 | 50776. | 1.06 | 54.00 | 42 | 0.00 | 0.00 | 0.00 | 1513. |
| 1.03 | 9.00 | 18 | 0.00 | 0.00 | 0.00 | 32645. | 1.06 | 57.00 | 43 | 0.00 | 0.00 | 0.00 | 1415. |
| 1.03 | 12.00 | 19 | 0.00 | 0.00 | 0.00 | 32647. | 1.06 | 60.00 | 44 | 0.00 | 0.00 | 0.00 | 1241. |
| 1.03 | 15.00 | 20 | 0.00 | 0.00 | 0.00 | 24679. | 1.06 | 63.00 | 45 | 0.00 | 0.00 | 0.00 | 1089. |
| 1.03 | 18.00 | 21 | 0.00 | 0.00 | 0.00 | 25162. | 1.06 | 66.00 | 46 | 0.00 | 0.00 | 0.00 | 956. |
| 1.03 | 21.00 | 22 | 0.00 | 0.00 | 0.00 | 22076. | 1.06 | 69.00 | 47 | 0.00 | 0.00 | 0.00 | 838. |
| 1.03 | 24.00 | 23 | 0.00 | 0.00 | 0.00 | 19369. | 1.06 | 72.00 | 48 | 0.00 | 0.00 | 0.00 | 736. |
| 1.04 | 3.00 | 24 | 0.00 | 0.00 | 0.00 | 16993. | 1.07 | 75.00 | 49 | 0.00 | 0.00 | 0.00 | 645. |
| 1.04 | 6.00 | 25 | 0.00 | 0.00 | 0.00 | 14909. | 1.07 | 78.00 | 50 | 0.00 | 0.00 | 0.00 | 566. |

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 1

| NO. | HR. | PERIOD | RAIN | EXCS | LOSS | END-OF-PERIOD FLOW | NO. | HR. | PERIOD | RAIN | EXCS | LOSS | COMP |
|------|-------|--------|-------|------|------|--------------------|------|-------|--------|------|------|------|--------|
| 1.01 | 3.00 | 1 | .02 | 0.00 | .02 | 83. | 1.04 | 6.00 | 26 | 0.00 | 0.00 | 0.00 | 13081. |
| 1.01 | 6.00 | 2 | .02 | 0.00 | .02 | 73. | 1.04 | 9.00 | 27 | 0.00 | 0.00 | 0.00 | 11477. |
| 1.01 | 9.00 | 3 | .06 | 3.00 | .06 | 64. | 1.04 | 12.00 | 28 | 0.00 | 0.00 | 0.00 | 10069. |
| 1.01 | 12.00 | 4 | .16 | 0.00 | .06 | 56. | 1.04 | 15.00 | 29 | 0.30 | 0.00 | 0.00 | 8834. |
| 1.01 | 15.00 | 5 | .23 | 0.00 | .23 | 43. | 1.04 | 18.00 | 30 | 0.00 | 0.00 | 0.00 | 7751. |
| 1.01 | 18.00 | 6 | .42 | 0.00 | .42 | 38. | 1.04 | 21.00 | 31 | 0.00 | 0.00 | 0.00 | 6400. |
| 1.01 | 21.00 | 7 | .03 | 3.00 | .03 | 33. | 1.05 | 24.00 | 32 | 0.00 | 0.00 | 0.00 | 5966. |
| 1.02 | 3.00 | 8 | .03 | 3.00 | .03 | 29. | 1.05 | 27.00 | 33 | 0.00 | 0.00 | 0.00 | 5235. |
| 1.02 | 6.00 | 9 | .41 | 0.00 | .41 | 26. | 1.05 | 30.00 | 34 | 0.00 | 0.00 | 0.00 | 4593. |
| 1.02 | 9.00 | 10 | .41 | 0.00 | .41 | 26. | 1.05 | 33.00 | 35 | 0.00 | 0.00 | 0.00 | 4030. |
| 1.02 | 12.00 | 11 | 1.20 | .73 | .57 | 1867. | 1.05 | 36.00 | 36 | 0.00 | 0.00 | 0.00 | 3535. |
| 1.02 | 15.00 | 12 | 1.30 | .91 | .39 | 6193. | 1.05 | 39.00 | 37 | 0.00 | 0.00 | 0.00 | 3102. |
| 1.02 | 18.00 | 13 | 5.02 | 4.63 | .39 | 19813. | 1.05 | 42.00 | 38 | 0.00 | 0.00 | 0.00 | 2721. |
| 1.02 | 21.00 | 14 | 10.16 | 9.79 | .39 | 56016. | 1.05 | 45.00 | 39 | 0.00 | 0.00 | 0.00 | 2385. |
| 1.02 | 24.00 | 15 | .61 | .22 | .39 | 78320. | 1.06 | 48.00 | 40 | 0.00 | 0.00 | 0.00 | 2095. |
| 1.03 | 3.00 | 16 | .41 | .22 | .39 | 64875. | 1.06 | 51.00 | 41 | 0.00 | 0.00 | 0.00 | 1839. |
| 1.03 | 6.00 | 17 | 0.00 | 0.00 | 0.00 | 50776. | 1.06 | 54.00 | 42 | 0.00 | 0.00 | 0.00 | 1513. |
| 1.03 | 9.00 | 18 | 0.00 | 0.00 | 0.00 | 32645. | 1.06 | 57.00 | 43 | 0.00 | 0.00 | 0.00 | 1415. |
| 1.03 | 12.00 | 19 | 0.00 | 0.00 | 0.00 | 32647. | 1.06 | 60.00 | 44 | 0.00 | 0.00 | 0.00 | 1241. |
| 1.03 | 15.00 | 20 | 0.00 | 0.00 | 0.00 | 24679. | 1.06 | 63.00 | 45 | 0.00 | 0.00 | 0.00 | 1089. |
| 1.03 | 18.00 | 21 | 0.00 | 0.00 | 0.00 | 25162. | 1.06 | 66.00 | 46 | 0.00 | 0.00 | 0.00 | 956. |
| 1.03 | 21.00 | 22 | 0.00 | 0.00 | 0.00 | 22076. | 1.06 | 69.00 | 47 | 0.00 | 0.00 | 0.00 | 838. |
| 1.03 | 24.00 | 23 | 0.00 | 0.00 | 0.00 | 19369. | 1.06 | 72.00 | 48 | 0.00 | 0.00 | 0.00 | 736. |
| 1.04 | 3.00 | 24 | 0.00 | 0.00 | 0.00 | 16993. | 1.07 | 75.00 | 49 | 0.00 | 0.00 | 0.00 | 645. |
| 1.04 | 6.00 | 25 | 0.00 | 0.00 | 0.00 | 14909. | 1.07 | 78.00 | 50 | 0.00 | 0.00 | 0.00 | 566. |

Sheet 10 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Sub _____

THOUS CU M 42438. 113914. 168590. 177121.

| HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 2 | | | | | | | | | |
|--|--------|--------|---------|---------|---------|-----|-----|-----|-----|
| | 42. | 48. | 54. | 60. | 66. | 72. | 78. | 84. | 90. |
| CFS | 58740. | 52037. | 34921. | 17227. | 436373. | | | | |
| CMS | 1663. | 1474. | 989. | 484. | 12300. | | | | |
| INCHES | 4.10 | 11.01 | 16.30 | 17.12 | | | | | |
| MM | 104.20 | 279.69 | 413.94 | 434.89 | | | | | |
| AC-FT | 25804. | 69264. | 102509. | 107696. | | | | | |
| CU M | 31828. | 85436. | 126443. | 132841. | | | | | |
| THOUS CU M | | | | | | | | | |

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

921 ROUTE THROUGH SWINGING BRIDGE RESERVOIR

ISTAG ICOMP IECON ITAPE JPLT JPRT JNAME JSTAGE JAUO
122 1 0 0 0 0 0 1 0 0

ROUTING DATA

LOSS LOSS AVG IRES ISAME IOST IPMP LSTR
0.0 0.00 0.00 1 1 0 0 0

MSIPS MSIDL LAG AMSKK X ISK STORA ISPRAT
1 0 0 0.000 0.000 28060. 0

STORAGE 7x20.00 27200.00 37470.00 53670.00

OUTFLOW 457.00 1076.00 38600.00 118900.00

STATION 122, PLAN 1, RTIO 1

| OUTFLOW | |
|---------|--------|
| 1637. | 1071. |
| 1637. | 1031. |
| 29448. | 25201. |
| 7640. | 6960. |
| 2146. | 1883. |

| STOR | |
|--------|--------|
| 27522. | 27036. |
| 25706. | 25706. |
| 26727. | 35934. |
| 27047. | 28806. |
| 27491. | 27420. |

| STAGF | |
|-------|-----|
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |

| PEAK | | 6-HOUR | | 24-HOUR | | 72-HOUR | | TOTAL VOLUME | |
|------------|--------|---------|---------|---------|---------|---------|--|--------------|--|
| CFS | 67464. | 62365. | 44745. | 22619. | 581064. | | | | |
| CMS | 1910. | 1766. | 1267. | 641. | 16454. | | | | |
| INCHES | 4.52 | 4.52 | 14.11 | 21.40 | 22.90 | | | | |
| MM | 124.68 | 358.39 | 543.50 | 581.75 | 144065. | | | | |
| AC-FT | 30925. | 86751. | 134594. | 144065. | 177702. | | | | |
| T+OUS CU Y | 36165. | 109473. | 166019. | | | | | | |

MAXIMUM STORAGE = 43261.

STATION 122, PLAN 1, RTIO 2

| OUTFLOW | |
|---------|--------|
| 1624. | 1079. |
| 1624. | 1020. |
| 27272. | 16428. |
| 29552. | 5225. |
| 1605. | 1412. |

Sheet 12 of 28

sheet 13 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Sub _____

MAXIMUM STORAGE = 35548.

STATION 122, PLAN 1, RTIO 4

OUTFLOW

| | | | | | | | | | |
|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|
| 1596. | 1070. | 1062. | 1054. | 1045. | 1037. | 1029. | 1021. | 1013. | 1005. |
| 596. | 596. | 1097. | 1082. | 11135. | 15367. | 14797. | 12533. | 10271. | 8644. |
| 7457. | 6452. | 5668. | 4966. | 4354. | 3819. | 3350. | 2939. | 2579. | 2262. |
| 1955. | 1762. | 1528. | 1361. | 1176. | 1075. | 1074. | 1071. | 1067. | 1063. |
| 1056. | 1056. | 1049. | 1043. | 1037. | 1031. | 1024. | 1018. | 1011. | 1004. |

STORM

| | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 27542. | 27014. | 26756. | 26498. | 26241. | 25985. | 25732. | 25480. | 25230. | 24981. |
| 24751. | 24791. | 25349. | 27365. | 29940. | 31092. | 30937. | 30320. | 29704. | 29261. |
| 24235. | 24272. | 24252. | 24252. | 28033. | 27947. | 27819. | 27707. | 27609. | 27523. |
| 27446. | 27381. | 27323. | 27272. | 27227. | 27183. | 27122. | 27037. | 26930. | 26805. |
| 25535. | 26509. | 26542. | 26163. | 25979. | 25786. | 25587. | 25382. | 25174. | 24961. |

STAGE

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

| | | | | | |
|------------|--------|--------|--------|--------|--------|
| CFS | 15567. | 14373. | 10536. | 5341. | 15394. |
| CFS | 435. | 407. | 298. | 151. | 4372. |
| INCHES | 1.13 | 1.13 | 0.82 | 0.41 | 1.13 |
| MM | 28.78 | 28.78 | 20.83 | 10.41 | 28.78 |
| AC-FT | 7127. | 20894. | 31781. | 38279. | 47217. |
| IMOUS CU M | 8791. | 25773. | 39202. | 47217. | 47217. |

MAXIMUM STORAGE = 31092.

COMBINE HYDROGRAPHS

100 COMBINE HYDROGRAPHS 121 & 122

| 1STAQ | 1COMP | 1ECON | 1TAPE | 1JPLT | 1JPRY | 1NAME | 1STAGE | 1AUTO |
|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| 3 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 4

| | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1636. | 1073. | 1067. | 1059. | 1052. | 1044. | 1037. | 1029. | 1021. | 1013. |
| 1017. | 1043. | 5200. | 26621. | 58451. | 75299. | 69391. | 57956. | 48023. | 42418. |
| 27452. | 23423. | 26141. | 25629. | 22512. | 19511. | 17612. | 15555. | 13744. | 12151. |
| 10723. | 9468. | 846. | 7350. | 6472. | 5728. | 5066. | 4477. | 3953. | 3480. |
| 3072. | 2715. | 2417. | 2186. | 1941. | 1739. | 1655. | 1611. | 1569. | 1528. |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

Sheet 14 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

CFS 75299. 69610. 52360. 27426. 70721R.
CMS 2132. 1071. 1483. 777. 20026.
INCHES 4.59 13.80 21.68 23.30
MM 116.48 350.47 550.72 591.72
AC-FT 34517. 103855. 163194. 175343.
THOUS CU M 42577. 128104. 201297. 216283.

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 2
1025. 1073. 1065. 1058. 1050. 1042. 1035. 1027. 1019. 1011.
1.07. 1.24. 1.45. 1.68. 1.92. 2.16. 2.41. 2.66. 2.91. 3.16.
2.76. 2.91. 3.06. 3.21. 3.36. 3.51. 3.66. 3.81. 3.96. 4.11.
4.26. 4.41. 4.56. 4.71. 4.86. 5.01. 5.16. 5.31. 5.46. 5.61.
5.76. 5.91. 6.06. 6.21. 6.36. 6.51. 6.66. 6.81. 6.96. 7.11.
7.26. 7.41. 7.56. 7.71. 7.86. 8.01. 8.16. 8.31. 8.46. 8.61.
8.76. 8.91. 9.06. 9.21. 9.36. 9.51. 9.66. 9.81. 9.96. 10.11.
10.26. 10.41. 10.56. 10.71. 10.86. 11.01. 11.16. 11.31. 11.46. 11.61.
11.76. 11.91. 12.06. 12.21. 12.36. 12.51. 12.66. 12.81. 12.96. 13.11.
13.26. 13.41. 13.56. 13.71. 13.86. 14.01. 14.16. 14.31. 14.46. 14.61.
14.76. 14.91. 15.06. 15.21. 15.36. 15.51. 15.66. 15.81. 15.96. 16.11.
16.26. 16.41. 16.56. 16.71. 16.86. 17.01. 17.16. 17.31. 17.46. 17.61.
17.76. 17.91. 18.06. 18.21. 18.36. 18.51. 18.66. 18.81. 18.96. 19.11.
19.26. 19.41. 19.56. 19.71. 19.86. 20.01. 20.16. 20.31. 20.46. 20.61.
20.76. 20.91. 21.06. 21.21. 21.36. 21.51. 21.66. 21.81. 21.96. 22.11.
22.26. 22.41. 22.56. 22.71. 22.86. 23.01. 23.16. 23.31. 23.46. 23.61.
23.76. 23.91. 24.06. 24.21. 24.36. 24.51. 24.66. 24.81. 24.96. 25.11.
25.26. 25.41. 25.56. 25.71. 25.86. 26.01. 26.16. 26.31. 26.46. 26.61.
26.76. 26.91. 27.06. 27.21. 27.36. 27.51. 27.66. 27.81. 27.96. 28.11.
28.26. 28.41. 28.56. 28.71. 28.86. 29.01. 29.16. 29.31. 29.46. 29.61.
29.76. 29.91. 30.06. 30.21. 30.36. 30.51. 30.66. 30.81. 30.96. 31.11.
31.26. 31.41. 31.56. 31.71. 31.86. 32.01. 32.16. 32.31. 32.46. 32.61.
32.76. 32.91. 33.06. 33.21. 33.36. 33.51. 33.66. 33.81. 33.96. 34.11.
34.26. 34.41. 34.56. 34.71. 34.86. 35.01. 35.16. 35.31. 35.46. 35.61.
35.76. 35.91. 36.06. 36.21. 36.36. 36.51. 36.66. 36.81. 36.96. 37.11.
37.26. 37.41. 37.56. 37.71. 37.86. 38.01. 38.16. 38.31. 38.46. 38.61.
38.76. 38.91. 39.06. 39.21. 39.36. 39.51. 39.66. 39.81. 39.96. 40.11.
40.26. 40.41. 40.56. 40.71. 40.86. 41.01. 41.16. 41.31. 41.46. 41.61.
41.76. 41.91. 42.06. 42.21. 42.36. 42.51. 42.66. 42.81. 42.96. 43.11.
43.26. 43.41. 43.56. 43.71. 43.86. 44.01. 44.16. 44.31. 44.46. 44.61.
44.76. 44.91. 45.06. 45.21. 45.36. 45.51. 45.66. 45.81. 45.96. 46.11.
46.26. 46.41. 46.56. 46.71. 46.86. 47.01. 47.16. 47.31. 47.46. 47.61.
47.76. 47.91. 48.06. 48.21. 48.36. 48.51. 48.66. 48.81. 48.96. 49.11.
49.26. 49.41. 49.56. 49.71. 49.86. 50.01. 50.16. 50.31. 50.46. 50.61.
50.76. 50.91. 51.06. 51.21. 51.36. 51.51. 51.66. 51.81. 51.96. 52.11.
52.26. 52.41. 52.56. 52.71. 52.86. 53.01. 53.16. 53.31. 53.46. 53.61.
53.76. 53.91. 54.06. 54.21. 54.36. 54.51. 54.66. 54.81. 54.96. 55.11.
55.26. 55.41. 55.56. 55.71. 55.86. 56.01. 56.16. 56.31. 56.46. 56.61.
56.76. 56.91. 57.06. 57.21. 57.36. 57.51. 57.66. 57.81. 57.96. 58.11.
58.26. 58.41. 58.56. 58.71. 58.86. 59.01. 59.16. 59.31. 59.46. 59.61.
59.76. 59.91. 60.06. 60.21. 60.36. 60.51. 60.66. 60.81. 60.96. 61.11.
61.26. 61.41. 61.56. 61.71. 61.86. 62.01. 62.16. 62.31. 62.46. 62.61.
62.76. 62.91. 63.06. 63.21. 63.36. 63.51. 63.66. 63.81. 63.96. 64.11.
64.26. 64.41. 64.56. 64.71. 64.86. 65.01. 65.16. 65.31. 65.46. 65.61.
65.76. 65.91. 66.06. 66.21. 66.36. 66.51. 66.66. 66.81. 66.96. 67.11.
67.26. 67.41. 67.56. 67.71. 67.86. 68.01. 68.16. 68.31. 68.46. 68.61.
68.76. 68.91. 69.06. 69.21. 69.36. 69.51. 69.66. 69.81. 69.96. 70.11.
70.26. 70.41. 70.56. 70.71. 70.86. 71.01. 71.16. 71.31. 71.46. 71.61.
71.76. 71.91. 72.06. 72.21. 72.36. 72.51. 72.66. 72.81. 72.96. 73.11.
73.26. 73.41. 73.56. 73.71. 73.86. 74.01. 74.16. 74.31. 74.46. 74.61.
74.76. 74.91. 75.06. 75.21. 75.36. 75.51. 75.66. 75.81. 75.96. 76.11.
76.26. 76.41. 76.56. 76.71. 76.86. 77.01. 77.16. 77.31. 77.46. 77.61.
77.76. 77.91. 78.06. 78.21. 78.36. 78.51. 78.66. 78.81. 78.96. 79.11.
79.26. 79.41. 79.56. 79.71. 79.86. 80.01. 80.16. 80.31. 80.46. 80.61.
80.76. 80.91. 81.06. 81.21. 81.36. 81.51. 81.66. 81.81. 81.96. 82.11.
82.26. 82.41. 82.56. 82.71. 82.86. 83.01. 83.16. 83.31. 83.46. 83.61.
83.76. 83.91. 84.06. 84.21. 84.36. 84.51. 84.66. 84.81. 84.96. 85.11.
85.26. 85.41. 85.56. 85.71. 85.86. 86.01. 86.16. 86.31. 86.46. 86.61.
86.76. 86.91. 87.06. 87.21. 87.36. 87.51. 87.66. 87.81. 87.96. 88.11.
88.26. 88.41. 88.56. 88.71. 88.86. 89.01. 89.16. 89.31. 89.46. 89.61.
89.76. 89.91. 90.06. 90.21. 90.36. 90.51. 90.66. 90.81. 90.96. 91.11.
91.26. 91.41. 91.56. 91.71. 91.86. 92.01. 92.16. 92.31. 92.46. 92.61.
92.76. 92.91. 93.06. 93.21. 93.36. 93.51. 93.66. 93.81. 93.96. 94.11.
94.26. 94.41. 94.56. 94.71. 94.86. 95.01. 95.16. 95.31. 95.46. 95.61.
95.76. 95.91. 96.06. 96.21. 96.36. 96.51. 96.66. 96.81. 96.96. 97.11.
97.26. 97.41. 97.56. 97.71. 97.86. 98.01. 98.16. 98.31. 98.46. 98.61.
98.76. 98.91. 99.06. 99.21. 99.36. 99.51. 99.66. 99.81. 99.96. 100.11.
100.26. 100.41. 100.56. 100.71. 100.86. 101.01. 101.16. 101.31. 101.46. 101.61.
101.76. 101.91. 102.06. 102.21. 102.36. 102.51. 102.66. 102.81. 102.96. 103.11.
103.26. 103.41. 103.56. 103.71. 103.86. 104.01. 104.16. 104.31. 104.46. 104.61.
104.76. 104.91. 105.06. 105.21. 105.36. 105.51. 105.66. 105.81. 105.96. 106.11.
106.26. 106.41. 106.56. 106.71. 106.86. 107.01. 107.16. 107.31. 107.46. 107.61.
107.76. 107.91. 108.06. 108.21. 108.36. 108.51. 108.66. 108.81. 108.96. 109.11.
109.26. 109.41. 109.56. 109.71. 109.86. 110.01. 110.16. 110.31. 110.46. 110.61.
110.76. 110.91. 111.06. 111.21. 111.36. 111.51. 111.66. 111.81. 111.96. 112.11.
112.26. 112.41. 112.56. 112.71. 112.86. 113.01. 113.16. 113.31. 113.46. 113.61.
113.76. 113.91. 114.06. 114.21. 114.36. 114.51. 114.66. 114.81. 114.96. 115.11.
115.26. 115.41. 115.56. 115.71. 115.86. 116.01. 116.16. 116.31. 116.46. 116.61.
116.76. 116.91. 117.06. 117.21. 117.36. 117.51. 117.66. 117.81. 117.96. 118.11.
118.26. 118.41. 118.56. 118.71. 118.86. 119.01. 119.16. 119.31. 119.46. 119.61.
119.76. 119.91. 120.06. 120.21. 120.36. 120.51. 120.66. 120.81. 120.96. 121.11.
121.26. 121.41. 121.56. 121.71. 121.86. 122.01. 122.16. 122.31. 122.46. 122.61.
122.76. 122.91. 123.06. 123.21. 123.36. 123.51. 123.66. 123.81. 123.96. 124.11.
124.26. 124.41. 124.56. 124.71. 124.86. 125.01. 125.16. 125.31. 125.46. 125.61.
125.76. 125.91. 126.06. 126.21. 126.36. 126.51. 126.66. 126.81. 126.96. 127.11.
127.26. 127.41. 127.56. 127.71. 127.86. 128.01. 128.16. 128.31. 128.46. 128.61.
128.76. 128.91. 129.06. 129.21. 129.36. 129.51. 129.66. 129.81. 129.96. 130.11.
130.26. 130.41. 130.56. 130.71. 130.86. 131.01. 131.16. 131.31. 131.46. 131.61.
131.76. 131.91. 132.06. 132.21. 132.36. 132.51. 132.66. 132.81. 132.96. 133.11.
133.26. 133.41. 133.56. 133.71. 133.86. 134.01. 134.16. 134.31. 134.46. 134.61.
134.76. 134.91. 135.06. 135.21. 135.36. 135.51. 135.66. 135.81. 135.96. 136.11.
136.26. 136.41. 136.56. 136.71. 136.86. 137.01. 137.16. 137.31. 137.46. 137.61.
137.76. 137.91. 138.06. 138.21. 138.36. 138.51. 138.66. 138.81. 138.96. 139.11.
139.26. 139.41. 139.56. 139.71. 139.86. 140.01. 140.16. 140.31. 140.46. 140.61.
140.76. 140.91. 141.06. 141.21. 141.36. 141.51. 141.66. 141.81. 141.96. 142.11.
142.26. 142.41. 142.56. 142.71. 142.86. 143.01. 143.16. 143.31. 143.46. 143.61.
143.76. 143.91. 144.06. 144.21. 144.36. 144.51. 144.66. 144.81. 144.96. 145.11.
145.26. 145.41. 145.56. 145.71. 145.86. 146.01. 146.16. 146.31. 146.46. 146.61.
146.76. 146.91. 147.06. 147.21. 147.36. 147.51. 147.66. 147.81. 147.96. 148.11.
148.26. 148.41. 148.56. 148.71. 148.86. 149.01. 149.16. 149.31. 149.46. 149.61.
149.76. 149.91. 150.06. 150.21. 150.36. 150.51. 150.66. 150.81. 150.96. 151.11.
151.26. 151.41. 151.56. 151.71. 151.86. 152.01. 152.16. 152.31. 152.46. 152.61.
152.76. 152.91. 153.06. 153.21. 153.36. 153.51. 153.66. 153.81. 153.96. 154.11.
154.26. 154.41. 154.56. 154.71. 154.86. 155.01. 155.16. 155.31. 155.46. 155.61.
155.76. 155.91. 156.06. 156.21. 156.36. 156.51. 156.66. 156.81. 156.96. 157.11.
157.26. 157.41. 157.56. 157.71. 157.86. 158.01. 158.16. 158.31. 158.46. 158.61.
158.76. 158.91. 159.06. 159.21. 159.36. 159.51. 159.66. 159.81. 159.96. 160.11.
160.26. 160.41. 160.56. 160.71. 160.86. 161.01. 161.16. 161.31. 161.46. 161.61.
161.76. 161.91. 162.06. 162.21. 162.36. 162.51. 162.66. 162.81. 162.96. 163.11.
163.26. 163.41. 163.56. 163.71. 163.86. 164.01. 164.16. 164.31. 164.46. 164.61.
164.76. 164.91. 165.06. 165.21. 165.36. 165.51. 165.66. 165.81. 165.96. 166.11.
166.26. 166.41. 166.56. 166.71. 166.86. 167.01. 167.16. 167.31. 167.46. 167.61.
167.76. 167.91. 168.06. 168.21. 168.36. 168.51. 168.66. 168.81. 168.96. 169.11.
169.26. 169.41. 169.56. 169.71. 169.86. 170.01. 170.16. 170.31. 170.46. 170.61.
170.76. 170.91. 171.06. 171.21. 171.36. 171.51. 171.66. 171.81. 171.96. 172.11.
172.26. 172.41. 172.56. 172.71. 172.86. 173.01. 173.16. 173.31. 173.46. 173.61.
173.76. 173.91. 174.06. 174.21. 174.36. 174.51. 174.66. 174.81. 174.96. 175.11.
175.26. 175.41. 175.56. 175.71. 175.86. 176.01. 176.16. 176.31. 176.46. 176.61.
176.76. 176.91. 177.06. 177.21. 177.36. 177.51. 177.66. 177.81. 177.96. 178.11.
178.26. 178.41. 178.56. 178.71. 178.86. 179.01. 179.16. 179.31. 179.46. 179.61.
179.76. 179.91. 180.06. 180.21. 180.36. 180.51. 180.66. 180.81. 180.96. 181.11.
181.26. 181.41. 181.56. 181.71. 181.86. 182.01. 182.16. 182.31. 182.46. 182.61.
182.76. 182.91. 183.06. 183.21. 183.36. 183.51. 183.66. 183.81. 183.96. 184.11.
184.26. 184.41. 184.56. 184.71. 184.86. 185.01. 185.16. 185.31. 185.46. 185.61.
185.76. 185.91. 186.06. 186.21. 186.36. 186.51. 186.66. 186.81. 186.96. 187.11.
187.26. 187.41. 187.56. 187.71. 187.86. 188.01. 188.16. 188.31. 188.46. 188.61.
188.76. 188.91. 189.06. 189.21. 189.36. 189.51. 189.66. 189.81. 189.96. 190.11.
190.26. 190.41. 190.56. 190.71. 190.86. 191.01. 191.16. 191.31. 191.46. 191.61.
191.76. 191.91. 192.06. 192.21. 192.36. 192.51. 192.66. 192.81. 192.96. 193.11.
193.26. 193.41. 193.56. 193.71. 193.86. 194.01. 194.16. 194.31. 194.46. 194.61.
194.76. 194.91. 195.06. 195.21. 195.36. 195.51. 195.66. 195.81. 195.96. 196.11.
196.26. 196.41. 196.56. 196.71. 196.86. 197.01. 197.16. 197.31. 197.46. 197.61.
197.76. 197.91. 198.06. 198.21. 198.36. 198.51. 198.66. 198.81. 198.96. 199.11.
199.26. 199.41. 199.56. 199.71. 199.86. 200.01. 200.16. 200.31. 200.46. 200.61.
200.76. 200.91. 201.06. 201.21. 201.36. 201.51. 201.66. 201.81. 201.96. 202.11.
202.26. 202.41. 202.56. 202.71. 202.86. 203.01. 203.16. 203.31. 203.46. 203.61.
203.76. 203.91. 204.06. 204.21. 204.36. 204.51. 204.66. 204.81. 204.96. 205.11.
205.26. 205.41. 205.56. 205.71. 205.86. 206.01. 206.16. 206.31. 206.46. 206.61.
206.76. 206.91. 207.06. 207.21. 207.36. 207.51. 207.66. 207.81. 207.96. 208.11.
208.26. 208.41. 208.56. 208.71. 208.86. 209.01. 209.16. 209.31. 209.46. 209.61.
209.76. 209.91. 210.06. 210.21. 210.36. 210.51. 210.66. 210.81. 210.96. 211.11.
211.26. 211.41. 211.56. 211.71. 211.86. 212.01. 212.16. 212.31. 212.46. 212.61.
212.76. 212.91. 213.06. 213.21. 213.36. 213.51. 213.66. 213.81. 213.96. 214.11.
214.26. 214.41. 214.56. 214.71. 214.86. 215.01. 215.16. 215.31. 215.46. 215.61.
215.76. 215.91. 216.06. 216.21. 216.36. 216.51. 216.66. 216.81. 216.96. 217.11.
217.26. 217.41. 217.56. 217.71. 217.86. 218.01. 218.16. 218.31. 218.46. 218.61.
218.76. 218.91. 219.06. 219.21. 219.36. 219.51. 219.66. 219.81. 219.96. 220.11.
220.26. 220.41. 220.56. 220.71. 220.86. 221.01. 221.16. 221.31. 221.46. 221.61.
221.76. 221.91. 222.06. 222.21. 222.36. 222.51. 222.66. 222.81. 222.96. 223.11.
223.26. 223.41. 223.56. 223.71. 223.86. 224.01. 224.16. 224.31. 224.46. 224.61.
224.76. 224.91. 225.06. 225.21. 225.36. 225.51. 225.66. 225.81. 225.96. 226.11.
226.26. 226.41. 226.56. 226.71. 226.86. 227.01. 227.16. 227.31. 227.46. 227.61.
227.76. 227.91. 228.06. 228.21. 228.36. 228.51. 228.66. 228.81. 228.96. 229.11.
229.26. 229.41. 229.56. 229.71. 229.86. 230.01. 230.16. 230.31. 230.46. 230.61.
230.76. 230.91. 231.06. 231.21. 231.36. 231.51. 231.66. 231.81. 231.96. 232.11.

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

Rv _____

SUB-AREA RUNOFF COMPUTATION

51 RIO RESERVOIR SUBAREA INFLOW

ISTAG ICOMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUO

HYDROGRAPH DATA
JWEG IUNG TAREA SNAP TRSBA TRSPC RATIO ISNOW ISAME LOCAL

PRECIP DATA
SPFF PMS R6 R12 R24 R48 R72 R96
0.00 21.00 86.00 104.00 114.00 120.00 0.00 0.00

LOSS DATA

LACPT SIAKR PLINR RTIOL ERAIN STRKS RTION STAZL ENSTL ALSEN RIJMP
0 0.00 0.00 1.00 0.00 0.00 0.00 1.00 2.00 .25 0.00 0.00

2.76. 3660. 2222. 1438. 1046. 719. 458. 261. 157. 110.
65. 52. 0. 0.

UNIT GRAPH TOTALS 13072. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

START= -.20 RECSM= .49 RTIOR= 4.00

| MO-DA | HR-MN | PERIOD | RAIN | EXCS | LOSS | COMP Q | END-OF-PERIOD FLOW | MO-DA | HR-MN | PERIOD | RAIN | EXCS | LOSS | COMP Q |
|-------|-------|--------|-------|-------|------|--------|--------------------|-------|-------|--------|------|------|------|--------|
| 1-01 | 7-00 | 1 | .02 | 0.00 | .02 | .42 | 1.04 | 6-00 | 26 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-01 | 8-00 | 2 | .02 | 0.00 | .02 | .37 | 1.04 | 7-00 | 27 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-01 | 9-00 | 3 | .08 | 0.00 | .04 | .37 | 1.04 | 8-00 | 28 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-01 | 10-00 | 4 | .08 | 0.00 | .08 | .28 | 1.04 | 9-00 | 29 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-01 | 11-00 | 5 | .24 | 0.00 | .24 | .24 | 1.04 | 10-00 | 30 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-01 | 12-00 | 6 | .54 | 0.00 | .54 | .21 | 1.04 | 11-00 | 31 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-01 | 1-00 | 7 | .03 | 0.00 | .03 | .18 | 1.05 | 12-00 | 32 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 2-00 | 8 | .03 | 0.00 | .03 | .16 | 1.05 | 1-00 | 33 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 3-00 | 9 | .37 | 0.00 | .37 | .14 | 1.05 | 2-00 | 34 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 4-00 | 10 | .37 | 0.00 | .37 | .12 | 1.05 | 3-00 | 35 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 5-00 | 11 | 1.42 | .66 | .82 | .1909 | 1.05 | 4-00 | 36 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 6-00 | 12 | 1.42 | .73 | .75 | .4533 | 1.05 | 5-00 | 37 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 7-00 | 13 | 5.38 | 4.63 | .75 | .17479 | 1.05 | 6-00 | 38 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 8-00 | 14 | 10.93 | 10.18 | .75 | .48209 | 1.05 | 7-00 | 39 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 9-00 | 15 | .56 | 0.00 | .56 | .49293 | 1.06 | 8-00 | 40 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-02 | 10-00 | 16 | .56 | 0.00 | .56 | .30522 | 1.06 | 9-00 | 41 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-03 | 1-00 | 17 | 0.00 | 0.00 | 0.00 | .20314 | 1.06 | 10-00 | 42 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-03 | 2-00 | 18 | 0.00 | 0.00 | 0.00 | .14488 | 1.06 | 11-00 | 43 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-03 | 3-00 | 19 | 0.00 | 0.00 | 0.00 | .9738 | 1.06 | 12-00 | 44 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-03 | 4-00 | 20 | 0.00 | 0.00 | 0.00 | .6066 | 1.06 | 1-00 | 45 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-03 | 5-00 | 21 | 0.00 | 0.00 | 0.00 | .3516 | 1.06 | 2-00 | 46 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |
| 1-03 | 6-00 | 22 | 0.00 | 0.00 | 0.00 | .2224 | 1.06 | 3-00 | 47 | 0.00 | 0.00 | 0.00 | 0.00 | 1. |

Sheet No. of 28

TAMS

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

By _____

1.03 21.00 23 0.00 0.00 0.00 1542. 1.07 0.00 48 0.00 0.00 0.00 0.
 1.04 0.00 24 0.00 0.00 904. 1.07 3.00 49 0.00 0.00 0.00 0.
 1.04 3.00 25 0.00 0.00 551. 1.07 6.00 50 0.00 0.00 0.00 0.
 SUM 22.24 16.20 6.04 212125.
 (565.) (412.) (153.) (6006.71)

| PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|---------|---------|--------------|
| 49293. | 44479. | 24493. | 8336. | 212107. |
| CFS | 1396. | 694. | 250. | 6006. |
| INCHES | 6.41 | 14.99 | 16.22 | 16.23 |
| MM | 172.85 | 380.73 | 412.05 | 412.14 |
| AC-FT | 22056. | 48581. | 52576. | 52588. |
| THOUS CU M | 27203. | 59923. | 64852. | 64867. |

HYDROGRAPH AT STA 4 FOR PLAN 1, RTIO 1

| 32. | 28. | 24. | 20. | 16. | 12. |
|-------|--------|--------|--------|--------|--------|
| 1909. | 17479. | 49293. | 30522. | 20314. | 14488. |
| 3516. | 1542. | 904. | 531. | 1. | 1. |
| 1. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. |

| PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|---------|---------|--------------|
| 49293. | 44479. | 24493. | 8336. | 212107. |
| CFS | 1396. | 694. | 250. | 6006. |
| INCHES | 6.41 | 14.99 | 16.22 | 16.23 |
| MM | 172.85 | 380.73 | 412.05 | 412.14 |
| AC-FT | 22056. | 48581. | 52576. | 52588. |
| THOUS CU M | 27203. | 59923. | 64852. | 64867. |

HYDROGRAPH AT STA 4 FOR PLAN 1, RTIO 2

| 32. | 28. | 24. | 20. | 16. | 12. |
|-------|-------|--------|--------|--------|--------|
| 1432. | 3403. | 13109. | 36270. | 22891. | 15236. |
| 2637. | 1472. | 1157. | 678. | 398. | 1. |
| 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. |

| PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|---------|---------|--------------|
| 36970. | 33359. | 18370. | 6027. | 159080. |
| CFS | 1047. | 945. | 520. | 188. |
| INCHES | 5.10 | 11.24 | 12.17 | 12.17 |
| MM | 129.44 | 285.55 | 309.03 | 309.11 |
| AC-FT | 16542. | 36436. | 39432. | 39441. |
| THOUS CU M | 20406. | 44943. | 48659. | 48650. |

HYDROGRAPH AT STA 5 FOR PLAN 1, RTIO 3

| 32. | 28. | 24. | 20. | 16. | 12. |
|-------|-------|--------|--------|--------|--------|
| 1432. | 3403. | 13109. | 36270. | 22891. | 15236. |
| 2637. | 1472. | 1157. | 678. | 398. | 1. |
| 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. |

| PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|---------|---------|--------------|
| 24646. | 22240. | 17246. | 4418. | 106053. |
| CFS | 1047. | 945. | 520. | 188. |
| INCHES | 5.10 | 11.24 | 12.17 | 12.17 |
| MM | 129.44 | 285.55 | 309.03 | 309.11 |
| AC-FT | 16542. | 36436. | 39432. | 39441. |
| THOUS CU M | 20406. | 44943. | 48659. | 48650. |

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

Bv _____

Sheet 18 of 28

| | | | | | |
|------------|--------|--------|--------|------|--------|
| CM'S | 698. | 630. | 347. | 125. | 3003. |
| INCHES | 3.40 | 7.99 | 8.11 | | |
| MM. | 86.43 | 190.37 | 206.02 | | 206.07 |
| AC-FT | 11028. | 24290. | 26288. | | 26294. |
| THOUS CU M | 13603. | 29968. | 32426. | | 32433. |

HYDROGRAPH AT STA 4 FOR PLAN 1, RYD 6

| | 9. | 8. | 7. | 6. | 5. | 4. | 3. |
|-----|-------|-------|--------|--------|-------|-------|-------|
| 11. | 1133. | 4370. | 12202. | 12323. | 7030. | 3622. | 2436. |
| 77. | 557. | 396. | 226. | 133. | 0. | 0. | 0. |
| 79. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 80. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|-------------|-------|--------|---------|---------|--------------|
| CFS | 12325 | 11120 | 6125 | 2209 | 53027 |
| CMS | 349 | 315 | 175 | 63 | 1502 |
| INCHES | | 1.50 | 3.75 | 4.06 | |
| MM | | 43.21 | 95.18 | 103.01 | 103.04 |
| AC-FT | | 5514 | 12145 | 13144 | 13147 |
| THOUS. CU M | | 6801 | 14981 | 16213 | 16217 |

COMBINE HYDROGRAPHS

ME HYDROGRAPH AT 6 WITH RIO INFLOW

SUM OF 2 HYDROGRAPHS AT 5 PLAN 1 RTIO 1

[illegible]

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|---------|--------|---------|---------|--------------|
| C/S | 10774.6 | 1027.5 | 7365.6 | 3598.6 | 91935.5 |
| C/S | 3051 | 299.6 | 208.6 | 1019 | 26032 |
| INCHES | | 4.71 | 13.57 | 19.89 | 21.17 |
| MM | | 119.63 | 344.61 | 505.11 | 537.67 |
| AC-F | 5071.6 | 146091 | 214130 | 227932 | 227932 |
| THOUS CU M | 62555 | 180201 | 264125 | 281150 | 281150 |

SUM OF 2 HYDROGRAPHS AT 5 PLAN 1 RTIO 2

[illegible]

TAMS

Job No. _____

Project _____

Subiant _____

Sheet _____ of _____

Date _____

Rv _____

2375. 2128. 1408. 1710. 1654. 1611. 1568. 1528. 1489. 1451.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
78180. 54581. 26824. 690892.
CFS 75036. 2125. 1546. 19358.
2125. 1546. 19358.
INCHES 3.46 10.05 14.82 15.90
MM 87.77 255.37 376.52 403.95
AC-FT 37208. 108260. 159617. 171246.
THOUS CU W 45895. 133537. 198884. 211229.

SUM OF 2 HYDROGRAPHS AT 5 PLAN 1 RTIO 3

1633. 1693. 1070. 1060. 1031. 1024. 1033. 1024. 1015.
1962. 3292. 55351. 51076. 49823. 43603. 36270. 29409. 24523.
20626. 17647. 13454. 11826. 10242. 9061. 8007. 7068. 6246.
5236. 4902. 4338. 3835. 3388. 2992. 2356. 2111. 1894.
1701. 1657. 1613. 1571. 1530. 1491. 1453. 1418. 1384. 1351.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
51079. 48382. 35016. 17678. 403141.
CFS 1446. 1376. 1009. 501. 13175.
MM 2.24 6.56 9.77 10.66
INCHES 56.83 166.64 248.13 270.87
AC-FT 24090. 70643. 105190. 114824.
THOUS CU W 29715. 87337. 129750. 141639.

SUM OF 2 HYDROGRAPHS AT 5 PLAN 1 RTIO 4

1639. 1680. 1071. 1053. 1044. 1035. 1026. 1018. 1010.
1479. 2143. 1616. 24057. 21246. 17712. 14365. 11859.
10014. 6664. 6684. 5895. 5120. 4551. 4041. 3585. 3177.
2431. 2512. 2023. 1815. 1673. 1631. 1590. 1550. 1511.
1416. 1403. 1371. 1339. 1309. 1281. 1254. 1228. 1204.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
24057. 25344. 16869. 8366. 236087.
CFS 681. 661. 478. 243. 6742.
INCHES 1.08 3.11 4.73 5.48
MM 27.31 79.02 120.24 139.25
AC-FT 11516. 33499. 50972. 59030.
THOUS CU W 14278. 41321. 62872. 72812.

HYDROGRAPH ROUTING

10. RID DAM ROUTING

| GLSS | CLOSS | AVG | IRCS | ISARE | IOPT | IPMP | LSR |
|-------|-------|-------|-------|-------|------|-------|-------|
| ISTAQ | ICOMP | IFCON | ITAPE | JPLT | JPRY | INAME | IAUTO |
| 6 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |

Sheet 19 of 28

| | 0.1 | 0.000 | 0.00 | 1 | 1 | 0 | 0 | 0 | 0 |
|-------|--------|--------|---------|----------|----------|----------|----------|----------|----------|
| | WSPS | WSTDL | LAG | AFSKK | X | TSK | STORA | ISPRAT | |
| STAGE | 210.00 | 815.00 | 817.00 | 818.00 | 823.90 | 825.00 | 829.00 | 830.00 | 832.00 |
| FLOW | 0.00 | 0.00 | 2240.00 | 20636.00 | 51242.00 | 62090.00 | 76045.00 | 80359.00 | 91304.30 |

| CAPACITY= | 13119. | 15105. | 15983. | 17385. | 19413. | 22803. |
|-----------|--------|--------|--------|--------|--------|--------|
| | | | | | | |

813. 815. 817. 820. 824. 830.

| CAPL | SPUD | COOW | EXPW | ELEV | COOL | CARFA | EXPL |
|-------|------|------|------|------|------|-------|------|
| 910.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| DAM DATA | | | |
|----------|------|------|--------|
| TOPEL | COOD | EXPD | DAMVID |
| 825.0 | 2.8 | 1.5 | 1000. |

STATION 6, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

| INLET | | OUTFLOW | |
|-------|--------|---------|---------|
| 526. | 1000. | 1095. | 1080. |
| 3471. | 4550. | 53145. | 107525. |
| 4114. | 37455. | 28049. | 21035. |
| 7775. | 5642. | 7470. | 5808. |
| 5117. | 2444. | 2226. | 1997. |
| | | 2543. | 1853. |
| | | 6543. | 4537. |
| | | 1747. | 1672. |
| | | 1061. | 1051. |
| | | 93215. | 43370. |
| | | 17436. | 13745. |
| | | 16022. | 13745. |
| | | 5126. | 4003. |
| | | 1747. | 1672. |
| | | 1853. | 1613. |
| | | 4003. | 3536. |
| | | 13745. | 12425. |
| | | 43370. | 50069. |
| | | 1051. | 1041. |

| STORAGE | |
|---------|--------|
| 15332. | 15332. |
| 15334. | 15334. |
| 15335. | 15335. |
| 15336. | 15336. |
| 15337. | 15337. |
| 15338. | 15338. |
| 15339. | 15339. |
| 15340. | 15340. |
| 15341. | 15341. |
| 15342. | 15342. |
| 15343. | 15343. |
| 15344. | 15344. |
| 15345. | 15345. |
| 15346. | 15346. |
| 15347. | 15347. |
| 15348. | 15348. |
| 15349. | 15349. |
| 15350. | 15350. |
| 15351. | 15351. |
| 15352. | 15352. |
| 15353. | 15353. |
| 15354. | 15354. |
| 15355. | 15355. |
| 15356. | 15356. |
| 15357. | 15357. |
| 15358. | 15358. |
| 15359. | 15359. |
| 15360. | 15360. |
| 15361. | 15361. |
| 15362. | 15362. |
| 15363. | 15363. |
| 15364. | 15364. |
| 15365. | 15365. |
| 15366. | 15366. |
| 15367. | 15367. |
| 15368. | 15368. |
| 15369. | 15369. |
| 15370. | 15370. |
| 15371. | 15371. |
| 15372. | 15372. |
| 15373. | 15373. |
| 15374. | 15374. |
| 15375. | 15375. |
| 15376. | 15376. |
| 15377. | 15377. |
| 15378. | 15378. |
| 15379. | 15379. |
| 15380. | 15380. |
| 15381. | 15381. |
| 15382. | 15382. |
| 15383. | 15383. |
| 15384. | 15384. |
| 15385. | 15385. |
| 15386. | 15386. |
| 15387. | 15387. |
| 15388. | 15388. |
| 15389. | 15389. |
| 15390. | 15390. |
| 15391. | 15391. |
| 15392. | 15392. |
| 15393. | 15393. |
| 15394. | 15394. |
| 15395. | 15395. |
| 15396. | 15396. |
| 15397. | 15397. |
| 15398. | 15398. |
| 15399. | 15399. |
| 15400. | 15400. |

[illegible]

PEAK OUTFLOW IS 167525, AT TIME 4P.00 HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|---------|---------|---------|---------|--------------|
| CF3 | 107225. | 103383. | 73024. | 35979. | 918052. |
| CM5 | 1045. | 2927. | 206P. | 1019. | 25996. |
| INCHES | | 4.76 | 13.45 | 19.88 | 21.14 |
| "M | | 120.93 | 341.66 | 505.02 | 536.92 |
| AC-FT | | 51264. | 144640. | 214090. | 227816. |
| THOUS CU M | | 63234. | 177658. | 264076. | 280760. |

TAMS

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

END-OF-PERIOD HYDROGRAPH ORDINATES

| TIME | OUTFLOW | | STORAGE | | STAGE | |
|---------|---------|---------|---------|---------|---------|---------|
| | 796.0 | 1076.0 | 1085.0 | 1079.0 | 1072.0 | 1063.0 |
| 796.0 | 1076.0 | 1085.0 | 1079.0 | 1072.0 | 1063.0 | 1054.0 |
| 1370.0 | 2678.0 | 14692.0 | 40415.0 | 73024.0 | 79676.0 | 69619.0 |
| 3304.0 | 25005.0 | 24222.0 | 21120.0 | 17498.0 | 15618.0 | 13427.0 |
| 6244.0 | 7394.0 | 6411.0 | 5493.0 | 450.0 | 1927.0 | 3470.0 |
| 2400.0 | 2213.0 | 2120.0 | 1971.0 | 1832.0 | 1736.0 | 1666.0 |
| 15417.0 | 15527.0 | 15533.0 | 15528.0 | 15525.0 | 15522.0 | 15518.0 |
| 15642.0 | 15694.0 | 16304.0 | 20662.0 | 21266.0 | 20632.0 | 19750.0 |
| 17552.0 | 17114.0 | 16723.0 | 16494.0 | 16371.0 | 16233.0 | 16234.0 |
| 16139.0 | 16112.0 | 16099.0 | 16071.0 | 16054.0 | 16039.0 | 16014.0 |
| 15957.0 | 15973.0 | 15935.0 | 15877.0 | 15823.0 | 15786.0 | 15758.0 |
| 815.7 | 816.0 | 816.0 | 816.0 | 816.0 | 815.9 | 815.9 |
| 816.2 | 817.0 | 817.7 | 821.8 | 826.6 | 827.3 | 824.6 |
| 819.4 | 819.4 | 819.7 | 818.1 | 817.8 | 817.7 | 817.5 |
| 817.3 | 817.3 | 817.2 | 817.2 | 817.2 | 817.1 | 817.1 |
| 817.0 | 817.0 | 816.9 | 816.8 | 816.6 | 816.5 | 816.4 |

PEAK OUTFLOW IS 79676. AT TIME 48.00 HOURS

| TIME | PEAK | | 6-HOUR | | 24-HOUR | | 72-HOUR | | TOTAL VOLUME | |
|------------|---------|---------|---------|---------|---------|----------|---------|---------|--------------|---------|
| | CFS | 79676.0 | 75499.0 | 54305.0 | 26817.0 | 689552.0 | 19526.0 | 15526.0 | 15526.0 | 15526.0 |
| CMS | 2256.0 | 2136.0 | 1538.0 | 1037.0 | 759.0 | 19526.0 | 15526.0 | 15526.0 | 15526.0 | 15526.0 |
| INCHES | 3.48 | 3.48 | 3.48 | 3.48 | 3.48 | 3.48 | 3.48 | 3.48 | 3.48 | 3.48 |
| MM | 88.31 | 88.31 | 88.31 | 88.31 | 88.31 | 88.31 | 88.31 | 88.31 | 88.31 | 88.31 |
| AC-FT | 37437.0 | 37437.0 | 37437.0 | 37437.0 | 37437.0 | 37437.0 | 37437.0 | 37437.0 | 37437.0 | 37437.0 |
| THOUS CU M | 46178.0 | 46178.0 | 46178.0 | 46178.0 | 46178.0 | 46178.0 | 46178.0 | 46178.0 | 46178.0 | 46178.0 |

STATION 6. PLAN 1. RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

| TIME | OUTFLOW | | STORAGE | | STAGE | |
|---------|---------|---------|---------|---------|---------|---------|
| | 795.0 | 1062.0 | 1073.0 | 1074.0 | 1070.0 | 1063.0 |
| 795.0 | 1062.0 | 1073.0 | 1074.0 | 1070.0 | 1063.0 | 1055.0 |
| 1250.0 | 1911.0 | 8171.0 | 28339.0 | 45056.0 | 51082.0 | 46196.0 |
| 21736.0 | 17729.0 | 15772.0 | 13612.0 | 12027.0 | 10379.0 | 9171.0 |
| 5653.0 | 4966.0 | 4392.0 | 3885.0 | 3432.0 | 3031.0 | 2674.0 |
| 1590.0 | 1525.0 | 1455.0 | 1405.0 | 1310.0 | 1162.0 | 1019.0 |
| 15613.0 | 15521.0 | 15526.0 | 15526.0 | 15526.0 | 15522.0 | 15518.0 |
| 15595.0 | 15654.0 | 16151.0 | 17144.0 | 18758.0 | 19347.0 | 18869.0 |
| 16551.0 | 16376.0 | 16327.0 | 16272.0 | 16232.0 | 16190.0 | 16185.0 |
| 16084.0 | 16052.0 | 16038.0 | 16025.0 | 16013.0 | 16003.0 | 16003.0 |
| 15873.0 | 15823.0 | 15784.0 | 15758.0 | 15736.0 | 15717.0 | 15694.0 |
| 815.7 | 815.9 | 816.0 | 816.0 | 816.0 | 815.9 | 815.9 |
| 816.1 | 816.7 | 817.4 | 819.5 | 822.7 | 823.9 | 821.6 |
| 818.2 | 817.4 | 817.7 | 817.6 | 817.5 | 817.4 | 817.4 |
| 817.2 | 817.1 | 817.1 | 817.1 | 817.1 | 817.0 | 817.0 |
| 816.7 | 816.6 | 816.5 | 816.5 | 816.4 | 816.4 | 816.3 |

Sheet 21 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

PEAK OUTFLOW IS 51039. AT TIME 49.00 HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|-------------|--------|--------|---------|---------|--------------|
| CFS | 51039. | 48358. | 35557. | 17653. | 462160. |
| INCHES | 1487. | 1369. | 1007. | 500. | 13087. |
| | | 2.23 | 6.55 | 9.76 | 10.64 |
| MM | | 56.56 | 166.36 | 247.78 | 270.29 |
| AC-FT | | 23979. | 70526. | 105041. | 114585. |
| THOUS CU YD | | 29578. | 86992. | 129566. | 141339. |

STATION 6, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

| | OUTFLOW | | | | |
|--------|---------|--------|--------|--------|--------|
| 775. | 1064. | 1060. | 1055. | 1047. | 1039. |
| 1127. | 13940. | 21906. | 24386. | 22364. | 18322. |
| 10119. | 6795. | 5948. | 5209. | 4589. | 4103. |
| 2446. | 2184. | 2057. | 1906. | 1784. | 1701. |
| 1541. | 1462. | 1392. | 1359. | 1328. | 1271. |
| | | | | | 1245. |
| | STORAGE | | | | |
| 15679. | 15521. | 15522. | 15518. | 15515. | 15512. |
| 15346. | 16073. | 16281. | 16788. | 16806. | 16392. |
| 16153. | 16172. | 16099. | 16077. | 16043. | 16030. |
| 15996. | 15991. | 15964. | 15911. | 15652. | 15604. |
| 15709. | 15693. | 15664. | 15651. | 15639. | 15626. |
| | | | | | 15603. |
| | | | | | 15593. |

STAGE

| | 815.9 | 815.9 | 815.9 | 815.9 | 815.9 |
|-------|-------|-------|-------|-------|-------|
| 815.7 | 815.9 | 815.9 | 815.9 | 815.9 | 815.9 |
| 816.0 | 817.1 | 817.6 | 818.7 | 818.3 | 817.9 |
| 817.4 | 817.3 | 817.2 | 817.2 | 817.1 | 817.1 |
| 817.0 | 817.0 | 816.9 | 816.8 | 816.7 | 816.5 |
| 816.4 | 816.3 | 816.3 | 816.2 | 816.2 | 816.2 |
| | | | | | 816.1 |
| | | | | | 816.1 |

PEAK OUTFLOW IS 24346. AT TIME 45.00 HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|-------------|--------|--------|---------|---------|--------------|
| CFS | 24346. | 23261. | 16902. | 8534. | 237342. |
| INCHES | 691. | 659. | 479. | 242. | 6721. |
| MM | | 1.07 | 3.11 | 4.72 | 5.46 |
| AC-FT | | 27.21 | 79.08 | 119.78 | 136.81 |
| THOUS CU YD | | 11534. | 33526. | 50779. | 58845. |
| | | 14227. | 41352. | 62535. | 72586. |

Sheet 22 of 28

HYDROGRAPH ROUTING

7 CHANNEL ROUTE AT STATION 10+00

TAMS

Job No. _____
 Project _____
 Subject _____

Sheet _____ of _____
 Date _____
 By _____

| NORMAL DEPTH CHANNEL ROUTING | | | | | | | | | | | | | | |
|--|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--|--|--|--|--|
| ISTAQ | ICOMP | IFCON | ITAPP | JPLY | JPRT | INAME | ISTAGE | TAUTO | | | | | | |
| 7 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | |
| ROUTING DATA | | | | | | | | | | | | | | |
| QLOSS | AVG | IRFS | ISAME | IOPT | IPRP | | | | | | | | | |
| 0.0 | 0.00 | 1 | 1 | 0 | 0 | | | | | | | | | |
| ASTPS | NSTDL | LAG | AMSKK | X | ISK | STORA | JSPRAT | | | | | | | |
| 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0. | | | | | | | |
| SEL | | | | | | | | | | | | | | |
| 0.0350 | 0.0350 | 0.0350 | 0.0350 | 0.0350 | 0.0350 | | | | | | | | | |
| CROSS SECTION COORDINATES--STA/ELEV, STA/ELEV--ETC | | | | | | | | | | | | | | |
| 0.00 | 740.00 | 40.00 | 720.00 | 712.00 | 80.00 | 705.00 | 160.00 | 705.00 | | | | | | |
| 170.00 | 715.00 | 220.00 | 720.00 | 710.00 | 740.00 | | | | | | | | | |
| STORAGE | | | | | | | | | | | | | | |
| 0.00 | 3.45 | 7.05 | 10.79 | 14.67 | 18.70 | 22.99 | 28.13 | 34.74 | 42.52 | | | | | |
| 50.02 | 59.03 | 68.94 | 78.76 | 89.08 | 99.91 | 111.25 | 123.09 | 135.64 | 148.30 | | | | | |
| OUTFLOW | | | | | | | | | | | | | | |
| 0.00 | 1240.15 | 3921.41 | 7687.38 | 12398.78 | 17976.94 | 24592.28 | 32659.61 | 42374.20 | 54742.10 | | | | | |
| 60.32 | 55 | 103232.27 | 123378.72 | 145375.66 | 169868.18 | 196304.15 | 224933.00 | 255805.15 | 286971.53 | | | | | |
| STAGE | | | | | | | | | | | | | | |
| 705.00 | 706.84 | 710.64 | 710.53 | 712.37 | 714.21 | 716.05 | 717.89 | 719.74 | 721.58 | | | | | |
| 723.42 | 725.26 | 727.11 | 728.95 | 730.79 | 732.63 | 734.47 | 736.32 | 738.16 | 740.00 | | | | | |
| FLOW | | | | | | | | | | | | | | |
| 0.00 | 1240.15 | 3921.41 | 7687.38 | 12398.78 | 17976.94 | 24592.28 | 32659.61 | 42374.20 | 54742.10 | | | | | |
| 60.32 | 55 | 103232.27 | 123378.72 | 145375.66 | 169868.18 | 196304.15 | 224933.00 | 255805.15 | 286971.53 | | | | | |
| STATION 7. PLAN 1, RTIO 1 | | | | | | | | | | | | | | |
| OUTFLOW | | | | | | | | | | | | | | |
| 1524. | 326. | 1623. | 395. | 1764. | 428. | 1699. | 455. | 1635. | 478. | | | | | |
| 2427. | 3695. | 21098. | 52534. | 105642. | 17146. | 93649. | 75967. | 62788. | 49715. | | | | | |
| 44697. | 37113. | 32435. | 27711. | 24626. | 20701. | 17785. | 15685. | 14091. | 12088. | | | | | |
| 11136. | 7213. | 6723. | 7149. | 6866. | 5496. | 5439. | 4234. | 4305. | 3244. | | | | | |
| 3408. | 2470. | 2721. | 1957. | 2407. | 1740. | 2106. | 1501. | 1914. | 1376. | | | | | |
| STOR | | | | | | | | | | | | | | |
| 4. | 1. | 4. | 1. | 4. | 1. | 4. | 1. | 4. | 1. | | | | | |
| 5. | 2. | 21. | 41. | 70. | 71. | 64. | 55. | 47. | 39. | | | | | |
| 36. | 31. | 25. | 25. | 23. | 20. | 19. | 17. | 16. | 14. | | | | | |
| 14. | 12. | 10. | 10. | 9. | 9. | 7. | 7. | 7. | 6. | | | | | |
| 6. | 5. | 5. | 4. | 5. | 4. | 5. | 4. | 4. | 4. | | | | | |
| STAGE | | | | | | | | | | | | | | |
| 707.1 | 705.5 | 707.2 | 705.6 | 707.2 | 705.6 | 707.2 | 705.7 | 707.1 | 705.7 | | | | | |
| 707.4 | 715.5 | 715.1 | 717.2 | 727.3 | 727.5 | 726.1 | 724.2 | 722.6 | 723.8 | | | | | |
| 720.0 | 715.7 | 717.9 | 716.8 | 716.1 | 715.0 | 714.1 | 713.5 | 712.9 | 712.2 | | | | | |
| 711.9 | 711.2 | 710.9 | 710.3 | 710.1 | 709.5 | 709.4 | 708.8 | 708.9 | 708.2 | | | | | |
| 707.5 | 707.7 | 707.9 | 707.3 | 707.6 | 707.2 | 707.4 | 707.0 | 707.3 | 706.9 | | | | | |
| PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME | | | | | | | | | | | | | | |

Sheet 23 of 28

Sheet 23 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

CFS 107146. 103396. 73029. 35979. 918053.
CMS 3034. 2928. 2084. 1019. 25996.
INCHES 4.76 13.45 19.88 21.14
MM 120.94 341.69 505.01 536.92
AC-FT 51271. 144850. 214088. 227616.
THOUS CU M 63241. 178670. 264074. 280761.

MAXIMUM STORAGE = 71.

MAXIMUM STAGE IS 727.5

STATION 7, PLAN 1, RTIO 2

| STAGE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | | |
|--------|--------|------|
| 1561. | 1595. | 1629. | 1663. | 1697. | 1731. | 1765. | 1799. | 1833. | 1867. | 1901. | 1935. | 1969. | 2003. | 2037. | 2071. | 2105. | 2139. | 2173. | 2207. | 2241. | 2275. | 2309. | 2343. | 2377. | 2411. | 2445. | 2479. | 2513. | 2547. | 2581. | 2615. | 2649. | 2683. | 2717. | 2751. | 2785. | 2819. | 2853. | 2887. | 2921. | 2955. | 2989. | 3023. | 3057. | 3091. | 3125. | 3159. | 3193. | 3227. | 3261. | 3295. | 3329. | 3363. | 3397. | 3431. | 3465. | 3499. | 3533. | 3567. | 3601. | 3635. | 3669. | 3703. | 3737. | 3771. | 3805. | 3839. | 3873. | 3907. | 3941. | 3975. | 4009. | 4043. | 4077. | 4111. | 4145. | 4179. | 4213. | 4247. | 4281. | 4315. | 4349. | 4383. | 4417. | 4451. | 4485. | 4519. | 4553. | 4587. | 4621. | 4655. | 4689. | 4723. | 4757. | 4791. | 4825. | 4859. | 4893. | 4927. | 4961. | 4995. | 5029. | 5063. | 5097. | 5131. | 5165. | 5199. | 5233. | 5267. | 5301. | 5335. | 5369. | 5403. | 5437. | 5471. | 5505. | 5539. | 5573. | 5607. | 5641. | 5675. | 5709. | 5743. | 5777. | 5811. | 5845. | 5879. | 5913. | 5947. | 5981. | 6015. | 6049. | 6083. | 6117. | 6151. | 6185. | 6219. | 6253. | 6287. | 6321. | 6355. | 6389. | 6423. | 6457. | 6491. | 6525. | 6559. | 6593. | 6627. | 6661. | 6695. | 6729. | 6763. | 6797. | 6831. | 6865. | 6899. | 6933. | 6967. | 7001. | 7035. | 7069. | 7103. | 7137. | 7171. | 7205. | 7239. | 7273. | 7307. | 7341. | 7375. | 7409. | 7443. | 7477. | 7511. | 7545. | 7579. | 7613. | 7647. | 7681. | 7715. | 7749. | 7783. | 7817. | 7851. | 7885. | 7919. | 7953. | 7987. | 8021. | 8055. | 8089. | 8123. | 8157. | 8191. | 8225. | 8259. | 8293. | 8327. | 8361. | 8395. | 8429. | 8463. | 8497. | 8531. | 8565. | 8599. | 8633. | 8667. | 8701. | 8735. | 8769. | 8803. | 8837. | 8871. | 8905. | 8939. | 8973. | 9007. | 9041. | 9075. | 9109. | 9143. | 9177. | 9211. | 9245. | 9279. | 9313. | 9347. | 9381. | 9415. | 9449. | 9483. | 9517. | 9551. | 9585. | 9619. | 9653. | 9687. | 9721. | 9755. | 9789. | 9823. | 9857. | 9891. | 9925. | 9959. | 9993. | 10027. | 10061. | 10095. | 10129. | 10163. | 10197. | 10231. | 10265. | 10299. | 10333. | 10367. | 10401. | 10435. | 10469. | 10503. | 10537. | 10571. | 10605. | 10639. | 10673. | 10707. | 10741. | 10775. | 10809. | 10843. | 10877. | 10911. | 10945. | 10979. | 11013. | 11047. | 11081. | 11115. | 11149. | 11183. | 11217. | 11251. | 11285. | 11319. | 11353. | 11387. | 11421. | 11455. | 11489. | 11523. | 11557. | 11591. | 11625. | 11659. | 11693. | 11727. | 11761. | 11795. | 11829. | 11863. | 11897. | 11931. | 11965. | 12000. | 12034. | 12068. | 12102. | 12136. | 12170. | 12204. | 12238. | 12272. | 12306. | 12340. | 12374. | 12408. | 12442. | 12476. | 12510. | 12544. | 12578. | 12612. | 12646. | 12680. | 12714. | 12748. | 12782. | 12816. | 12850. | 12884. | 12918. | 12952. | 12986. | 13020. | 13054. | 13088. | 13122. | 13156. | 13190. | 13224. | 13258. | 13292. | 13326. | 13360. | 13394. | 13428. | 13462. | 13496. | 13530. | 13564. | 13598. | 13632. | 13666. | 13700. | 13734. | 13768. | 13802. | 13836. | 13870. | 13904. | 13938. | 13972. | 14006. | 14040. | 14074. | 14108. | 14142. | 14176. | 14210. | 14244. | 14278. | 14312. | 14346. | 14380. | 14414. | 14448. | 14482. | 14516. | 14550. | 14584. | 14618. | 14652. | 14686. | 14720. | 14754. | 14788. | 14822. | 14856. | 14890. | 14924. | 14958. | 14992. | 15026. | 15060. | 15094. | 15128. | 15162. | 15196. | 15230. | 15264. | 15298. | 15332. | 15366. | 15400. | 15434. | 15468. | 15502. | 15536. | 15570. | 15604. | 15638. | 15672. | 15706. | 15740. | 15774. | 15808. | 15842. | 15876. | 15910. | 15944. | 15978. | 16012. | 16046. | 16080. | 16114. | 16148. | 16182. | 16216. | 16250. | 16284. | 16318. | 16352. | 16386. | 16420. | 16454. | 16488. | 16522. | 16556. | 16590. | 16624. | 16658. | 16692. | 16726. | 16760. | 16794. | 16828. | 16862. | 16896. | 16930. | 16964. | 17000. | 17034. | 17068. | 17102. | 17136. | 17170. | 17204. | 17238. | 17272. | 17306. | 17340. | 17374. | 17408. | 17442. | 17476. | 17510. | 17544. | 17578. | 17612. | 17646. | 17680. | 17714. | 17748. | 17782. | 17816. | 17850. | 17884. | 17918. | 17952. | 17986. | 18020. | 18054. | 18088. | 18122. | 18156. | 18190. | 18224. | 18258. | 18292. | 18326. | 18360. | 18394. | 18428. | 18462. | 18496. | 18530. | 18564. | 18598. | 18632. | 18666. | 18700. | 18734. | 18768. | 18802. | 18836. | 18870. | 18904. | 18938. | 18972. | 19006. | 19040. | 19074. | 19108. | 19142. | 19176. | 19210. | 19244. | 19278. | 19312. | 19346. | 19380. | 19414. | 19448. | 19482. | 19516. | 19550. | 19584. | 19618. | 19652. | 19686. | 19720. | 19754. | 19788. | 19822. | 19856. | 19890. | 19924. | 19958. | 19992. | 20026. | 20060. | 20094. | 20128. | 20162. | 20196. | 20230. | 20264. | 20298. | 20332. | 20366. | 20400. | 20434. | 20468. | 20502. | 20536. | 20570. | 20604. | 20638. | 20672. | 20706. | 20740. | 20774. | 20808. | 20842. | 20876. | 20910. | 20944. | 20978. | 21012. | 21046. | 21080. | 21114. | 21148. | 21182. | 21216. | 21250. | 21284. | 21318. | 21352. | 21386. | 21420. | 21454. | 21488. | 21522. | 21556. | 21590. | 21624. | 21658. | 21692. | 21726. | 21760. | 21794. | 21828. | 21862. | 21896. | 21930. | 21964. | 22000. | 22034. | 22068. | 22102. | 22136. | 22170. | 22204. | 22238. | 22272. | 22306. | 22340. | 22374. | 22408. | 22442. | 22476. | 22510. | 22544. | 22578. | 22612. | 22646. | 22680. | 22714. | 22748. | 22782. | 22816. | 22850. | 22884. | 22918. | 22952. | 22986. | 23020. | 23054. | 23088. | 23122. | 23156. | 23190. | 23224. | 23258. | 23292. | 23326. | 23360. | 23394. | 23428. | 23462. | 23496. | 23530. | 23564. | 23598. | 23632. | 23666. | 23700. | 23734. | 23768. | 23802. | 23836. | 23870. | 23904. | 23938. | 23972. | 24006. | 24040. | 24074. | 24108. | 24142. | 24176. | 24210. | 24244. | 24278. | 24312. | 24346. | 24380. | 24414. | 24448. | 24482. | 24516. | 24550. | 24584. | 24618. | 24652. | 24686. | 24720. | 24754. | 24788. | 24822. | 24856. | 24890. | 24924. | 24958. | 24992. | 25026. | 25060. | 25094. | 25128. | 25162. | 25196. | 25230. | 25264. | 25298. | 25332. | 25366. | 25400. | 25434. | 25468. | 25502. | 25536. | 25570. | 25604. | 25638. | 25672. | 25706. | 25740. | 25774. | 25808. | 25842. | 25876. | 25910. | 25944. | 25978. | 26012. | 26046. | 26080. | 26114. | 26148. | 26182. | 26216. | 26250. | 26284. | 26318. | 26352. | 26386. | 26420. | 26454. | 26488. | 26522. | 26556. | 26590. | 26624. | 26658. | 26692. | 26726. | 26760. | 26794. | 26828. | 26862. | 26896. | 26930. | 26964. | 27000. | 27034. | 27068. | 27102. | 27136. | 27170. | 27204. | 27238. | 27272. | 27306. | 27340. | 27374. | 27408. | 27442. | 27476. | 27510. | 27544. | 27578. | 27612. | 27646. | 27680. | 27714. | 27748. | 27782. | 27816. | 27850. | 27884. | 27918. | 27952. | 27986. | 28020. | 28054. | 28088. | 28122. | 28156. | 28190. | 28224. | 28258. | 28292. | 28326. | 28360. | 28394. | 28428. | 28462. | 28496. | 28530. | 28564. | 28598. | 28632. | 28666. | 28700. | 28734. | 28768. | 28802. | 28836. | 28870. | 28904. | 28938. | 28972. | 29006. | 29040. | 29074. | 29108. | 29142. | 29176. | 29210. | 29244. | 29278. | 29312. | 29346. | 29380. | 29414. | 29448. | 29482. | 29516. | 29550. | 29584. | 29618. | 29652. | 29686. | 29720. | 29754. | 29788. | 29822. | 29856. | 29890. | 29924. | 29958. | 29992. | 30026. | 30060. | 30094. | 30128. | 30162. | 30196. | 30230. | 30264. | 30298. | 30332. | 30366. | 30400. | 30434. | 30468. | 30502. | 30536. | 30570. | 30604. | 30638. | 30672. | 30706. | 30740. | 30774. | 30808. | 30842. | 30876. | 30910. | 30944. | 30978. | 31012. | 31046. | 31080. | 31114. | 31148. | 31182. | 31216. | 31250. | 31284. | 31318. | 31352. | 31386. | 31420. | 31454. | 31488. | 31522. | 31556. | 31590. | 31624. | 31658. | 31692. | 31726. | 31760. | 31794. | 31828. | 31862. | 31896. | 31930. | 31964. | 32000. | 32034. | 32068. | 32102. | 32136. | 32170. | 32204. | 32238. | 32272. | 32306. | 32340. | 32374. | 32408. | 32442. | 32476. | 32510. | 32544. | 32578. | 32612. | 32646. | 32680. | 32714. | 32748. | 32782. | 32816. | 32850. | 32884. | 32918. | 32952. | 32986. | 33020. | 33054. | 33088. | 33122. | 33156. | 33190. | 33224. | 33258. | 33292. | 33326. | 33360. | 33394. | 33428. | 33462. | 33496. | 33530. | 33564. | 33598. | 33632. | 33666. | 33700. | 33734. | 33768. | 33802. | 33836. | 33870. | 33904. | 33938. | 33972. | 34006. | 34040. | 34074. | 34108. | 34142. | 34176. | 34210. | 34244. | 34278. | 34312. | 34346. | 34380. | 34414. | 34448. | 34482. | 34516. | 34550. | 34584. | 34618. | 34652. | 34686. | 34720. | 34754. | 34788. | 34822. | 34856. | 34890. | 34924. | 34958. | 34992. | 35026. | 35060. | 35094. | 35128. | 35162. | 35196. | 35230. | 35264. | 35298. | 35332. | 35366. | 35400. | 35434. | 35468. | 35502. | 35536. | 35570. | 35604. | 35638. | 35672. | 35706. | 35740. | 35774. | 35808. | 35842. | 35876. | 35910. | 35944. | 35978. | 36012. | 3604 |

TAMS

Job No. _____

Project _____

Subsient _____

Sheet _____ of _____

Date _____

By _____

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 4. | 1. | 4. | 1. | 4. | 1. | 4. | 1. | 4. | 1. |
| 4. | 4. | 12. | 25. | 37. | 40. | 37. | 32. | 28. | 24. |
| 21. | 16. | 17. | 15. | 15. | 13. | 12. | 11. | 11. | 9. |
| 5. | 8. | 5. | 6. | 7. | 5. | 6. | 5. | 5. | 4. |
| 5. | 4. | 5. | 4. | 4. | 3. | 4. | 3. | 4. | 3. |

| | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 707.0 | 705.5 | 707.2 | 705.6 | 707.2 | 705.6 | 707.1 | 705.7 | 707.1 | 705.7 |
| 707.2 | 704.9 | 711.2 | 716.8 | 720.2 | 721.0 | 720.4 | 719.0 | 717.9 | 716.3 |
| 715.4 | 714.0 | 713.6 | 712.6 | 712.4 | 711.4 | 711.3 | 710.5 | 710.5 | 709.7 |
| 709.7 | 709.0 | 709.1 | 708.4 | 708.6 | 707.8 | 708.1 | 707.4 | 707.2 | 707.2 |
| 707.6 | 707.0 | 707.4 | 706.9 | 707.3 | 706.9 | 707.2 | 706.8 | 707.2 | 706.7 |

| | | | | |
|---------------|--------|---------|---------|--------------|
| PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
| CFS | 50404. | 35560. | 17652. | 462162. |
| CMS | 1433. | 1369. | 1007. | 13087. |
| INCHES | 2.23 | 6.55 | 9.75 | 10.64 |
| MP | 56.56 | 166.36 | 247.76 | 270.30 |
| AC-FT | 25976. | 70532. | 105339. | 114586. |
| THOUS. CU. Y. | 29577. | 87000. | 129566. | 141339. |

MAXIMUM STORAGE = 40.

WASTEWATER STAGE IS 721.0

STATION 7. PLAN 1, 2, 3, 4

| | | | | | | | | | |
|--------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| 1514. | 329. | 1754. | 395. | 1705. | 433. | 1646. | 463. | 1587. | 498. |
| 1643. | 557. | 3270. | 13444. | 22303. | 23892. | 22864. | 17848. | 15022. | 11705. |
| 15227. | 8376. | 1173. | 6345. | 6398. | 4772. | 5024. | 3680. | 4042. | 2815. |
| 7245. | 2152. | 2663. | 1208. | 2423. | 1547. | 2337. | 1356. | 1975. | 1256. |
| 1264. | 1185. | 1770. | 1126. | 1684. | 1075. | 1605. | 1031. | 1531. | 993. |

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 4. | 1. | 4. | 1. | 4. | 1. | 4. | 1. | 4. | 1. |
| 4. | 3. | 7. | 15. | 22. | 23. | 22. | 19. | 17. | 14. |
| 13. | 11. | 11. | 7. | 10. | 8. | 7. | 7. | 7. | 6. |
| 6. | 5. | 5. | 4. | 5. | 4. | 5. | 4. | 4. | 3. |
| 4. | 3. | 4. | 3. | 4. | 3. | 4. | 3. | 4. | 3. |

| | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 707.0 | 705.5 | 707.2 | 705.6 | 707.2 | 705.6 | 707.1 | 705.7 | 707.1 | 705.7 |
| 707.2 | 704.9 | 711.2 | 716.8 | 720.2 | 721.0 | 720.4 | 719.0 | 717.9 | 716.3 |
| 715.4 | 714.0 | 713.6 | 712.6 | 712.4 | 711.4 | 711.3 | 710.5 | 710.5 | 709.7 |
| 709.7 | 709.0 | 709.1 | 708.4 | 708.6 | 707.8 | 708.1 | 707.4 | 707.2 | 707.2 |
| 707.6 | 707.0 | 707.4 | 706.9 | 707.3 | 706.9 | 707.2 | 706.8 | 707.2 | 706.7 |

| | | | | |
|---------------|--------|---------|---------|--------------|
| PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
| CFS | 25722. | 22260. | 16904. | 237347. |
| CMS | 677. | 659. | 479. | 6721. |
| INCHES | 1.07 | 3.11 | 4.72 | 5.47 |
| MP | 27.21 | 79.09 | 119.78 | 138.81 |
| AC-FT | 11534. | 35528. | 50778. | 58846. |
| THOUS. CU. Y. | 14227. | 41557. | 59533. | 72586. |

Sheet 25 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Subject _____

By _____

MAXIMUM STORAGE # 23

MAXIMUM STAGE IS 715.9

Sheet 26 of 28

TAMS

Job No. _____

Project _____

Subject _____

Sheet _____ of _____

Date _____

Bv _____

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

RATIOS APPLIED TO FLOWS

STATION PLAN RATIO 1 RATIO 2 RATIO 3 RATIO 4
1.00 .75 .50 .25

HYDROGRAPH AT 1 23.20 1 20621 15466 10310 5155
(60.09) (565.92) (437.96) (291.96) (165.98) (

ROUTED TO 121 23.20 1 9539 6656 3947 1698
(60.09) (270.11) (188.83) (111.77) (48.09) (

HYDROGRAPH AT 2 115.00 1 76320 56740 39160 19580
(305.62) (2217.73) (1663.36) (1108.89) (554.45) (

ROUTED TO 122 115.00 1 67464 50016 31728 15367
(305.62) (1910.37) (1416.26) (898.44) (435.13) (

2 COMBINED 3 141.20 1 75299 54889 34562 16407
(365.71) (2132.26) (1556.27) (978.88) (464.60) (

HYDROGRAPH AT 4 60.20 1 49293 36970 24646 12323
(157.47) (1395.62) (1046.86) (697.91) (348.95) (

2 COMBINED 5 202.00 1 107745 78180 51079 24037
(523.18) (3050.97) (2213.80) (1446.40) (681.22) (

ROUTED TO 6 202.00 1 107525 79676 51089 24386
(523.18) (3044.76) (2256.18) (1446.69) (690.54) (

ROUTED TO 7 202.00 1 107146 79248 50604 23892
(523.18) (3036.03) (2244.06) (1432.94) (676.56) (

Sheet 27 of 28

TAMS

Job No. _____

Sheet _____ of _____

Project _____

Date _____

Station _____

Rv _____

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

ELEVATION
STORAGE
OUTFLOW

INITIAL VALUE
815.00
15105.
0.

SPILLWAY CREST
810.00
13110.
0.

TOP OF DAM
825.00
19978.
62093.

RATIO
7
P-F

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
.75
.50
.25

829.69
827.28
823.97
818.72

4.69
2.28
0.00
0.00

22631.
21266.
19347.
16788.

107525.
79676.
51089.
24386.

15.00
9.00
0.00
0.00

48.00
48.00
48.00
48.00

0.30
0.00
0.00
0.00

PLAN 1 STATION 7

RATIO

MAXIMUM
FLOW, CFS

MAXIMUM
STAGE, FT

TIME
HOURS

1.00
.75
.50
.25

107146.
70246.
50604.
23892.

727.5
724.6
721.0
715.9

48.00
48.00
48.00
48.00

Sheet 28 of 28

STRUCTURAL STABILITY ANALYSIS

APPENDIX E

TAMS

Job No. 1579-19

Sheet 1 of 19

Project NYS Dam Inspection

Date 7-30-81

Subject RIO DAM Stability Analysis

By Jew

Ch'k. by _____

Assumptions:

- 1) Unit Wt. of Concrete is 145 pcf
- 2) Ice load of 5000 lb./ft² acts at normal Pool Level crest of Dam (COE Criteria) Ice is 1 ft thick
- 3) Dam is founded on Rock - $\phi = 45^\circ$ $C = 4500$ pcf
- 4) Dam Site is in Seismic Zone I-
- 5) Normal operating level of Lake is 810.5'
- 6) No back fill and minimal filtration on upstream side of Dam
- 7) In assumed failure mode Dam forms a crack at Point A assuming a new point of base rotation see sheet 3 of 11.
- 8) Reduced hydrostatic uplift associated with presence of a crack is calculated as per COE criteria. EM 1110-2-2200
- 9) Simplified Geometry as shown on sheet 3 of 19.
- 10) Roadway Piers + Roadway apply a Resultant Point Load of 8.5 kips/ft acting at a point 16.5' downstream of the upstream spillway face

Additional Data:

- 1) Based on Backwater Flood Routing analysis the following maximum downstream and embankment conditions have been calculated

| Case | Maximum El. | Falure El. |
|---------|-------------|------------|
| 1/2 PMF | 823.87 | 740.0 |
| PMF | 829.69 | 746.5 |

TAMS

Job No. 1579-19

Sheet 2 of 19

Project NYS Dam Inspection

Date 7-30-81

Subject Rio Dam - Stability Analyses

By JL

Ch'k. by _____

Cases Evaluated

Case I Normal Loading; Lake Load at EL. 810.5 - No Ice Load

Case II Case I Condition with the addition of assumed ice loading - 1 ft. thickness

Case III Unusual Loading; Lake Load at $\frac{1}{2}$ PMF Stage

Case IV Extreme Loading; Lake Load at 1 PMF Stage

Stability Criteria

- Overturning - Resultant force shall be contained within the middle $\frac{1}{3}$ of the base width for Cases I, II,
- Sliding - Factor of Safety against sliding failure shall be 3.0 or greater for Cases I-III

Sign Convention

Force $\downarrow$ $\uparrow$ $\rightarrow$ $\leftarrow$
Moment $\curvearrowright$ $\curvearrowleft$

TAMS

Job No. 1579-14

Sheet 3 of 19

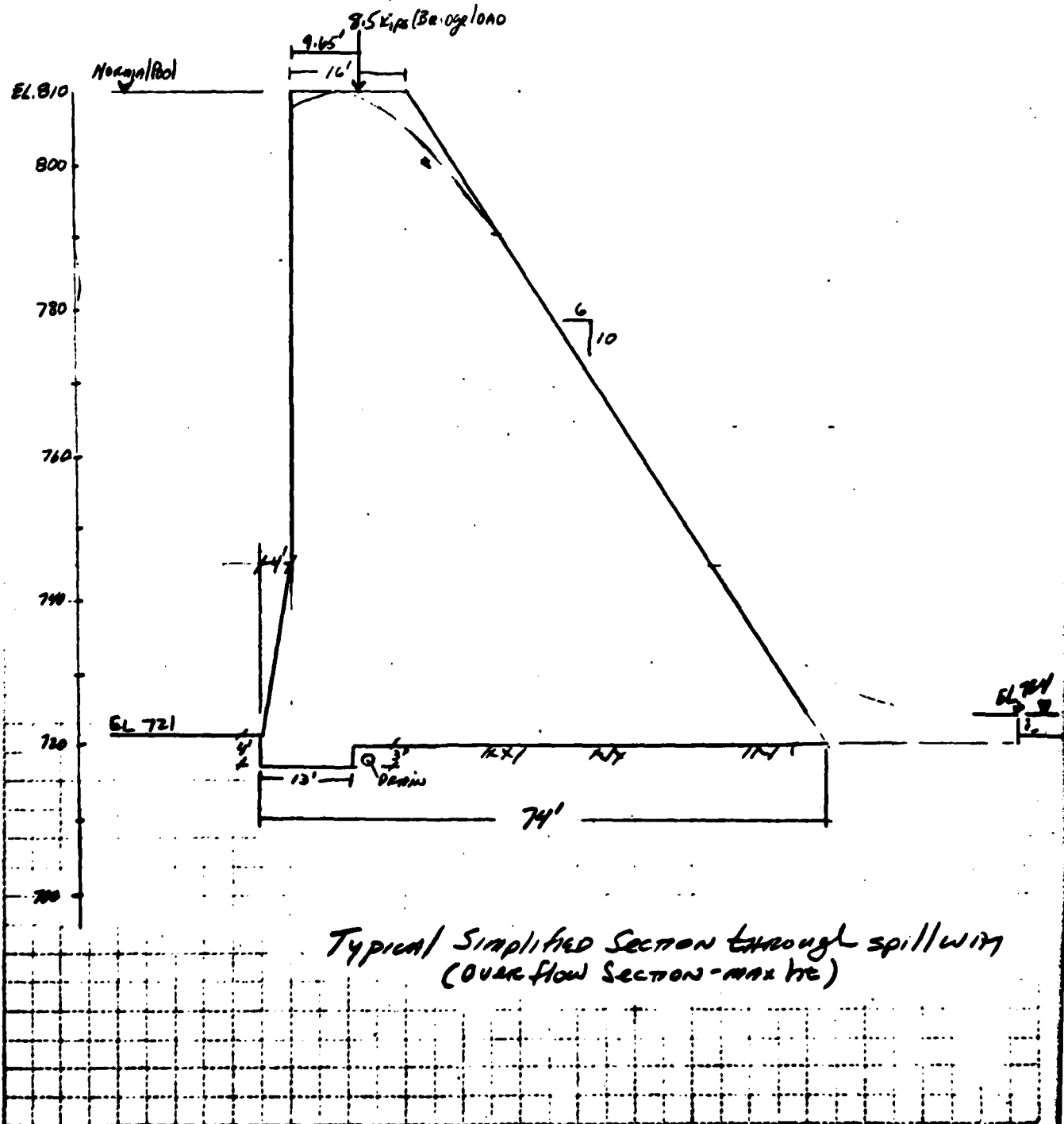
Project NYS Dam Inspection

Date 7-31-81

Subject RIO DAM O&R Utilities

By JW

Ch'k. by _____



TAMS

Job No. 1579-19

Sheet 4 of 19

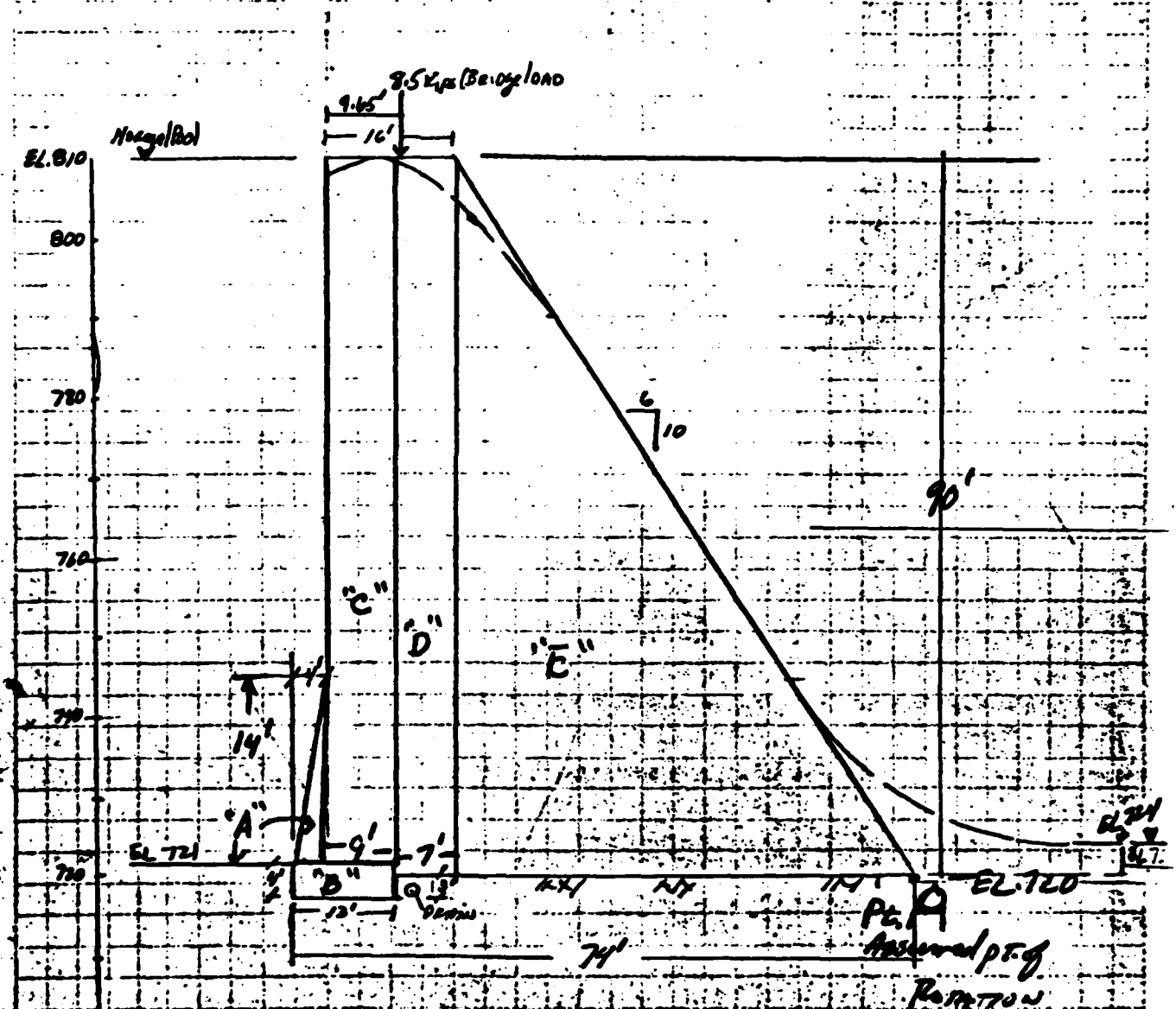
Project NYS Dam Inspection

Date 7-31-81

Subject RTD DAM O&R Utilities

By JW

Ch'k. by _____



Segments of Dam used to
Calculate Mass and Specific Gravity

TAMS

Job No. 1579-19

Sheet 5 of 19

Project NYS Dam Inspection

Date 7-31-81

Subject Rid Dam - Stability Analysis

By JW

Ch'k. by _____

Calculation of Mass - concrete @ 145 pcf
(per unit width basis)

Section "A"

$$14 \times 4 \times \frac{1}{2} \times 145 = 4.06 \text{ kips}$$

$$M_{Ax} = 74 - \frac{1}{3} \times 4 = 71.33'$$

Section "B"

$$4 \times 13 \times 145 = 7.54 \text{ kips}$$

$$M_{Ax} = 74 - \frac{1}{2} = 67.50'$$

Section "C"

$$9 \times 89 \times 145 = 116.15 \text{ kips}$$

$$M_{Ax} = 74 - 4 - \frac{1}{2} = 65.5'$$

Section "D"

$$7 \times 90 \times 145 = 91.35 \text{ kips}$$

$$M_{Ax} = 74 - 13 - \frac{1}{2} = 57.5'$$

Section "E"

$$\frac{1}{2} \times 90 \times (74 - 20) \times 145 = 352.35 \text{ kips}$$

$$M_{Ax} = \frac{1}{2}(74 - 20) = 36'$$

Resultant Reaction from Bridge Deck + Pier as per Devg. KK 3-50

$$R = 8.5 \text{ kips} \quad M_{Ax} = 74 - 4 - 9.65 = 60.35'$$

$$\Sigma F_y = \underline{579.95 \text{ kips}}$$

$$\Sigma M_A = 4.06 \times 71.33 + 7.54 \times 67.5 + 116.15 \times 65.5 + 91.35 \times 57.5 + 352.35 \times 36 + 8.5 \times 60.35 = \underline{26,857 \text{ kft}}$$

$$\times \text{LOCATION OF RESULTANT} \quad \frac{26,857}{579.95} = 46.31'$$

Total Length of Spillway including Abutment walls is ~ 487'
for a maximum 90' section $\frac{487}{90} > 4 \therefore$ neglect end clear.

TAMS

Job No. 1579-19

Sheet 6 of 10

Project 1145 Dam Inspection

Date 7-31-81

Subject Rio Dam - Stealing Piles

By zw

Ch'k. by

Calculate Case I Hydrostatic Forces
Static Pool at 810.5'

headwater

Top of Spillway EL. 810.0

$$.5 \times 62.4 = 31.2 \text{ psf}$$

At head of Dam

$$(810.5 - 717) 62.4 = 5834.4 \text{ psf}$$

$$\text{Total force on upstream side } \frac{31.2 + 5834.4}{2} \times \frac{93}{1000} = 272.75 \text{ Kips}$$

Calculate Moment

$$\frac{272750}{2} - 31.2 \bar{x} - \frac{1}{2} 62.4 \bar{x}^2 = 0$$

$$x^2 + x - 4371 = 0$$

$$x = 65.6 \quad M_{A_y} = 24.4$$

$$\Sigma F_x = -272.75 \text{ Kips}$$

$$\Sigma M_A = -6655.1 \text{ Kft}$$

Tailwater

$$F_x = \frac{1}{2} 4 \times 62.4 = 499.2 \text{ lb} \quad M_{A_x} = \frac{4}{3} = 1.33'$$

$$F_y = \frac{1}{2} 62.4 \times 249.5 = 299.4 \text{ lb} \quad M_A = \frac{2.4}{3} = 0.8'$$

Uplift assuming 50% Drain Efficiency Re drain see sheet 7
As shown on sheet 7

$$F_A = \frac{5834.4 + 2551}{2} \times 13 = 54.5 \text{ kips}$$

$$\text{Find } \bar{x} = \frac{13}{3} \left(\frac{2(2551) + 5834.4}{2551 + 5834.4} \right) = 5.65$$

$$M_A - 74 \bar{x} = 68.35'$$

TAMS

Job No. 1579-19

Project NYS Dam Inspection

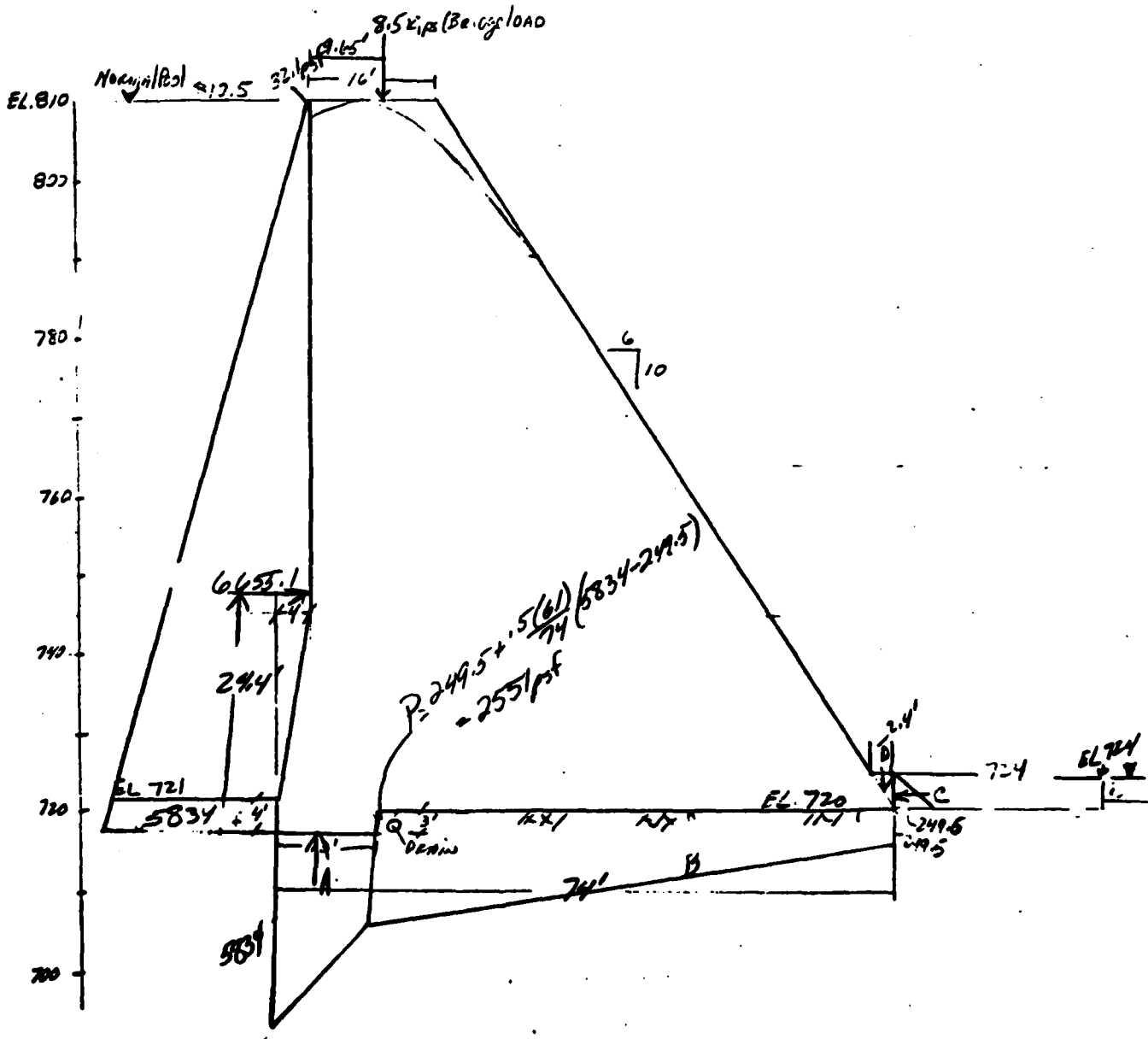
Subject RTD DALL OLR Utilities

Sheet 7 of 19

Date 7-31-81

By jw

Ch'k. by _____



TAMS

Job No. 154-19

Sheet 8 of 19

Project NYS Dam Inspection

Date 7-21-81

Subject Rio Dam - Stabilizing Analysis

By JW

Ch'k. by

Case 4 uplift cont.

$$F_0 = \frac{2551 + 249.5}{2} \cdot (74 - 13) = -85.41 \text{ Kips}$$

$$\bar{x} = \frac{61}{5} \left(\frac{2 \times 249.5 + 2551}{249.5 + 2551} \right) = 22.1'$$

$$\bar{x} = 22.1 \quad MA = 74 - 13 - 22.1 = 38.8'$$

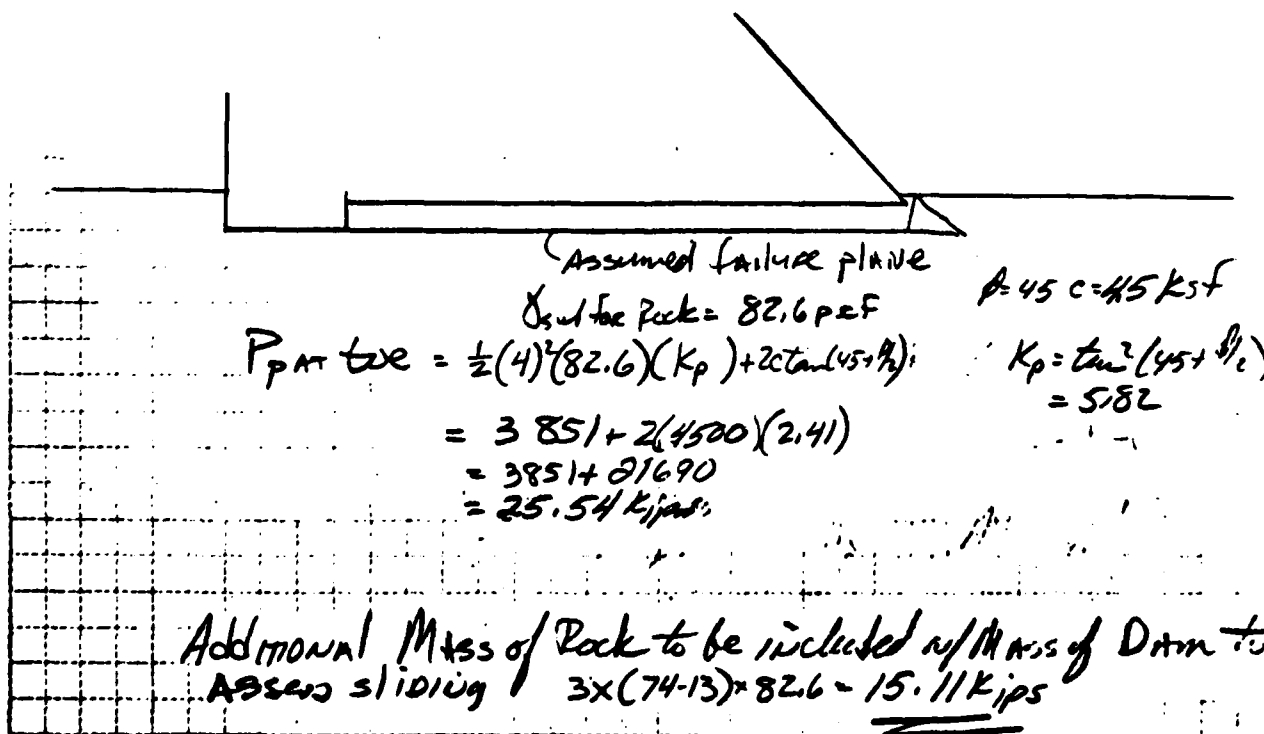
$$\Sigma F_v = -139.61 \quad \Sigma M_A = -13693.1$$

$$\Sigma F_H = -272.2 \text{ Kips}$$

For Sliding Failure Assume rock mass fails along

plane parallel to base at base of Key (EI 717)

w/ Passive Resistance from embedment at toe
being based on $\phi = 45^\circ$ $c = 1 \text{ Ksf}$



TAMS

Job No. 1579-19

Project NVS DAM INSPECTION

Subject RIO DAM - STABILIZING ANALYSIS

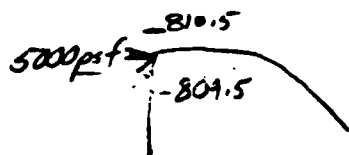
Sheet 9 of 19

Date 7-31-81

By JEL

Ch'k. by _____

CASE II ICE LOADING



Ice 1-foot thick exerting a force based on 5000 p.s.f.

$$F_x = 5.0 \text{ Kips}$$

$$M_A = 5.0 \times 90 = 450 \text{ Kft}$$

$$M_{A\bar{A}} = 810 - 720 = 90$$

CASE III $\frac{1}{2}$ PMF

Heads water @ 823.87

see sheet 10 for Pressure Distribution

H₂O Pressure at top of Spillway, El 810

$$(823.87 - 810) 62.4 = 0.865 \text{ Ksf}$$

Pressure at heel of Dam El 717

$$(823.87 - 717) 62.4 = 6.668 \text{ Ksf}$$

Total Pressure on Upstream Face of Dam

$$\frac{0.865 + 6.668}{2} \times 93 = \underline{\underline{310.13 \text{ Kips}}}$$

find $\bar{x}$:

$$\bar{x} = \frac{93}{3} \left(\frac{2(0.865) + 6.668}{0.865 + 6.668} \right) = 34.56$$

$$M_A = 34.56 - 3 = \underline{\underline{31.56}}$$

TAMS

Job No. 157A-79

Sheet 10 of 19

Project NYS Dam Inspection

Date 7-31-81

Subject Rio Dam - Stability Analysis

By JW

Ch'k. by _____

Case III Cont.

INITIAL READING 1000 JS. 0175

$$724 - 17.5 = 706.5$$

TAILWATER CONDITIONS

Flood level @ EL 740.0

to account for hydrodynamic forces use 60% of F_v F_H calculated based on static water conditions.

$$P_u = (740 - 720) 62.4 = 1248 \text{ psf}$$

$$F_u = \frac{1}{2} 1248.0 \times 20 = 12,480 \text{ lbs} \quad \therefore 6 = 7.49 \text{ ft}$$

$$M_u = 20/3 = 6.67$$

$$P_v = 1248 \text{ psf}$$

$$F_v = \frac{1}{2} (1248 \times 12.36) = 7,713 \text{ kips} \quad M_v = \frac{12.36}{3} = 4.12'$$

$$\times 1.60$$

$$+ 4.63 \text{ kips}$$

Uplift Assuming $\gamma = 1$ at 50% efficiency

$$H_{at \text{ drain}} = H_1 + \frac{K_x}{L} (H_2 - H_1)$$

$$= 1248 + \frac{50 \times 61}{74} (6668 - 1248)$$

$$= 3482 \text{ psf}$$

Pt 1: at heel (ref. shot 11)

$$F_1 = \frac{6668 + 3482}{2} \times 13 = 65,975 \text{ kips}$$

$$\text{find } \bar{x} : \bar{x} = \frac{13}{3} \left(\frac{3482 \times 12 + 6668}{3482 + 6668} \right) = 5.82'$$

$$M_u = 74 - 5.82 = 68.2'$$

Pt 2 downstream of Drain

$$F_2 = \frac{1248 + 3482}{2} \times 61 = 144,266 \text{ kips}$$

$$\text{find } \bar{x} : \bar{x} = \frac{61}{3} \left(\frac{2 \times 1248 + 3482}{1248 + 3482} \right) = 25.7$$

$$M_u = 74 - 13 - \bar{x} = 35.2'$$

TAMS

Job No. 1319-19

Project NYS Dam Inspection

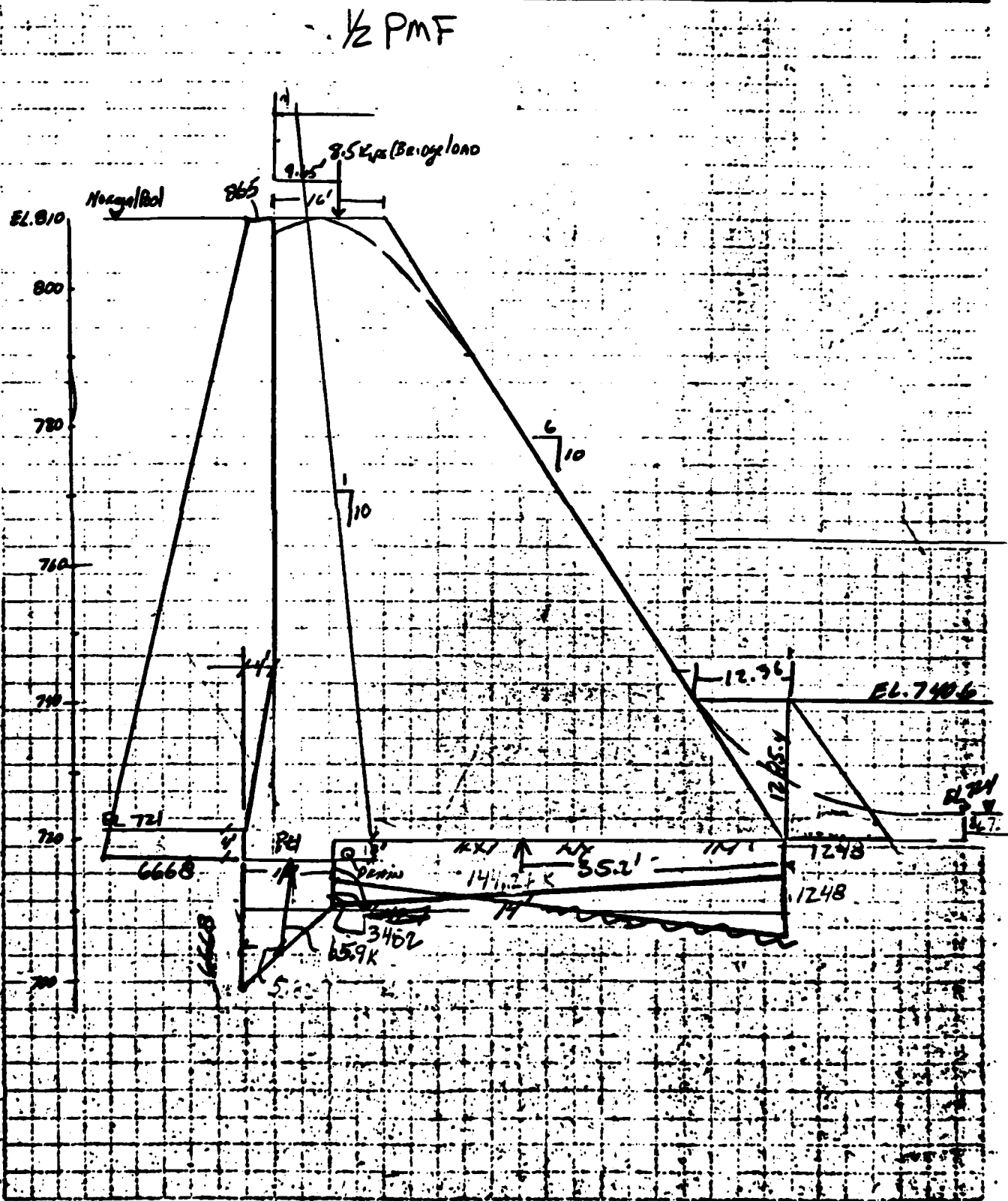
Subject: RIS Dam O&R Utilities

Sheet 11 of 14

Date 7-31-51

By

Ch'k. by



TAMS

Job No. 1579-19

Sheet 12 of 19

Project NYS Dam Inspection

Date 7-31-81

Subject Rio Dam - Consulting Analysis

By JOE

Ch'k. by _____

CASE III Hydrostatic Pressure Summary

$$\Sigma F_H = -302.64 \text{ kips}$$

$$\Sigma F_V = -205.6 \text{ kips}$$

$$\Sigma M_A = 19,296 \text{ kft}$$

CASE II Hydrostatic Pressure Calc. DIFF Condition
Use 60% of Tailwater Pressure to account for hydrodynamic effect
Free surface @ EL. 829.69
Tailwater @ EL. 727.5

See Sheet 13 for Pressure Distribution

Pressure at top of Spillway EL 810

$$P = (829.69 - 810) 62.4 = 1228.6 \text{ psf}$$

Pressure at Base of heel EL 717

$$P = (829.69 - 717) 62.4 = 7031.86 \text{ psf}$$

F_H on upstream face

$$\frac{1228.6 + 7031.8}{2} \times 93 = \underline{\underline{384.11}} \text{ kips}$$

relative to 41810 $\bar{x}$: $\frac{93}{13} \left(\frac{2 \times \frac{1228.6 + 7031.8}{2}}{1228.6 + 7031.8} \right) = 35.6'$

$$M_A = \bar{x} - 3 = 35.6 - 3 = \underline{\underline{32.6'}}$$

TAMS

Job No. 1579-19

Project NYS Data Inspection

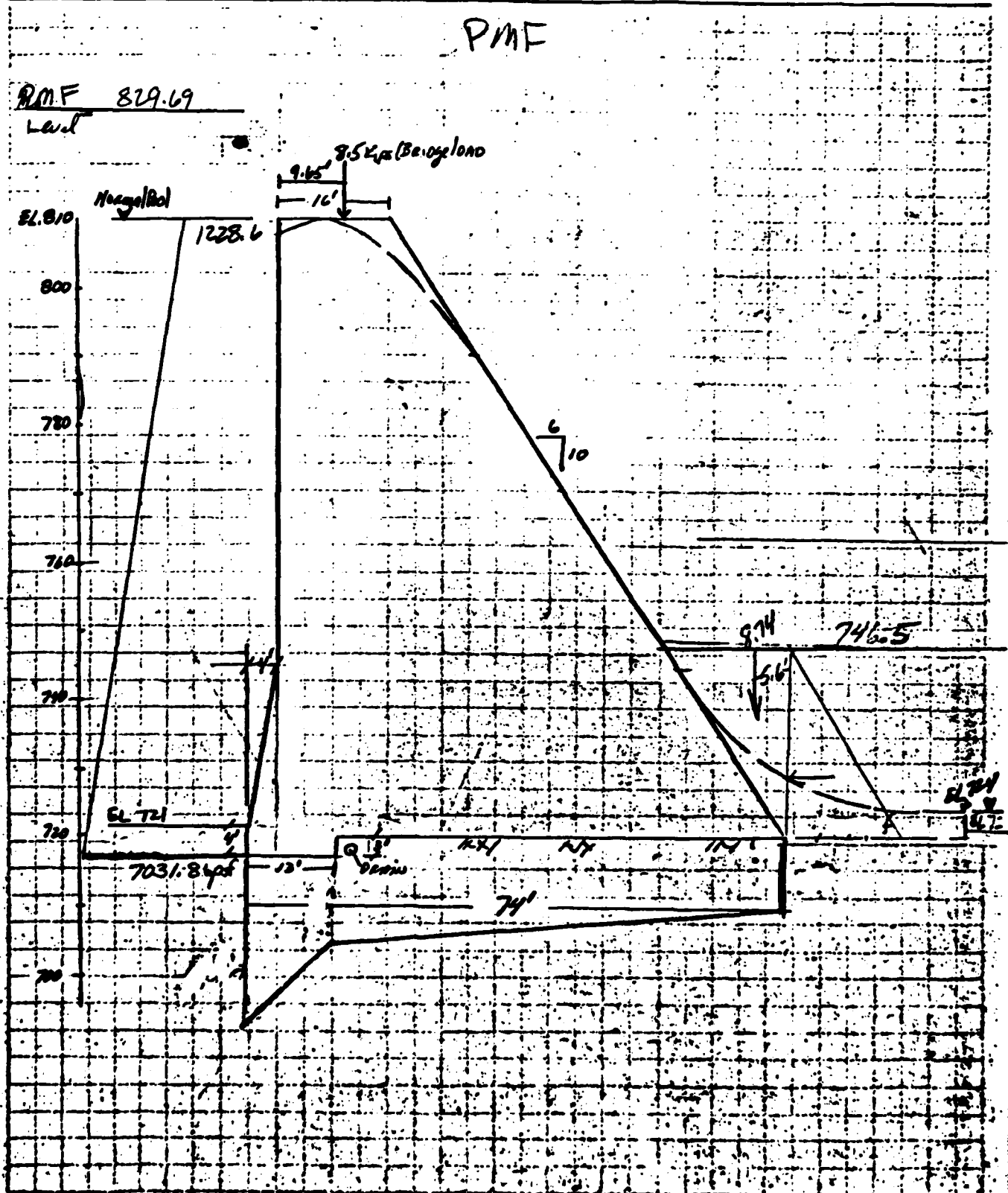
Subject: RIS DAM Q/R Volumes

Sheet 13 of 19

Date 7-31-81

By

Ch'k. by _____



TAMS

Job No. 1579-19
 Project NYS Dam Inspection
 Subject Rio Dam - Stability Analyses

Sheet 11 of 19
 Date 8-4-87
 By jal
 Ch'k. by _____

Case III Cont.
 Tailwater Pressure Conditions

Par Base

$$746.5 - 720 = 26.5$$

$$62.8 \times 26.5 = 1653.6 \text{ psf}$$

$$F_y = 16.7 \times 1653.6 \times \frac{1}{2} = 13,80 \text{ K} \times .6 = \underline{\underline{8.28 \text{ Kips}}}$$

$$M_A = \frac{16.7}{3} = \underline{\underline{5.6'}}$$

$$F_H = \frac{1}{2} \times 1653.6 \times 27.9 = 23.07 \text{ K} \times .6 = \underline{\underline{13.84 \text{ Kips}}}$$

$$M_A = \frac{27.9}{3} = \underline{\underline{9.3'}}$$

Base Hydrostatic Forces

Using assumed 50% drain efficiency, the pressure at the drain is

$$P = P_1 + \frac{K \times}{2} (P_2 - P_1)$$

$$= 1653.6 + \frac{50(61)}{74} (7031.8 - 1653.6)$$

$$= 3870 \text{ psf}$$

F at Heel

$$F = \frac{7031.8 + 3870}{2} \times 13 = \underline{\underline{-70.86 \text{ Kips}}}$$

$$\bar{x} = \frac{13}{3} \left(\frac{2 \times 3870 + 7031.8}{3870 + 7031.8} \right) = 5.87$$

$$M_A = 74 - 5.87 = \underline{\underline{68.1'}}$$

Remaining Uplift F

$$F_u = \frac{3870 + 1653.6}{2} \times 61 = \underline{\underline{168.47 \text{ Kips}}}$$

$$\bar{x} = \frac{61}{3} \left(\frac{2 \times 1653 + 3870}{1653 + 3870} \right) = 26.4'$$

$$M_A = 74 - 13 - 26.4 = \underline{\underline{34.6'}}$$

$$\Sigma F_H = 370.3 \text{ K}$$

$$\Sigma F_v = 23,105 \text{ K}$$

$$\Sigma M_A = -23,192 \text{ K-ft}$$

FAMS

Job No. 1579-19

Sheet 15 of 19

Project 145 DAM INSPECTION

Date 8-4-81

Subject RIO DAM

By JW

Ch'k. by

CASE I ANALYSIS

| | $\Sigma F_v (kips)$ | $\Sigma F_H (kips)$ | $\Sigma M_A (k-ft)$ |
|---------------------|---------------------|---------------------|---------------------|
| DEAD LOAD | 579.15 | | 26,857 |
| PASSIVE RESISTANCE | | 25.54 kips | |
| HYDROSTATIC LOADING | -139.61 | -272.2 | -13693 |
| NET Σ | 440.34 | -246.6 | 13164 |

$$\bar{e} = \frac{74}{2} - \frac{13164}{440.34} = 7.1$$

$$15 \frac{74}{6} - 7.1 \geq 0 \quad (5.23) \quad \text{yes}$$

Result is acceptable
No. 100 kips of force

Check Bearing Press

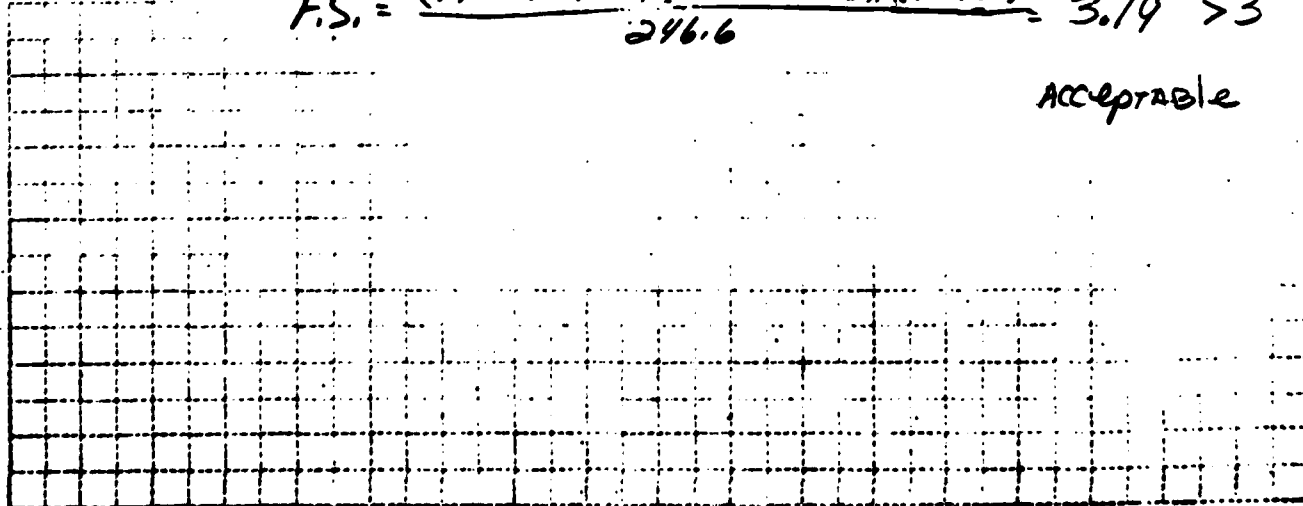
$$P = \frac{440.34}{74} \left(1 \pm \frac{6(7.1)}{74} \right) \frac{1000}{1.74} = 41.32 \pm 23.79 \Rightarrow \begin{matrix} 65.11 \text{ psi} \\ 17.53 \text{ psi} \end{matrix}$$

OK

F.S. AGAINST SLIDING

$$F.S. = \frac{(440.34 + 15.11)(\tan 45) + 74(4.5 \text{ k-ft})}{246.6} = 3.19 > 3$$

Acceptable



TAMS

Job No. 1579-19

Sheet 16 of 19

Project NYS Dam Inspection

Date 8-4-81

Subject Rio Dam - Stability Analysis

By JW

Ch'k. by _____

CASE II Analysis ICE Loading

| | <u>SF_u(Kips)</u> | <u>SF_u(Kips)</u> | <u>Σ M_A (K-ft)</u> |
|---------------------|-----------------------------|-----------------------------|-------------------------------|
| DEAD LOAD | 579.95 | — | 26857 |
| PASSIVE RESISTANCE | — | 25.54 | — |
| HYDROSTATIC LOADING | -139.61 | -272.2 | -13093 |
| <u>Ice Load</u> | <u>—</u> | <u>-5.0</u> | <u>-450.0</u> |
| <u>NET Σ</u> | <u>440.34</u> | <u>-251.6</u> | <u>12714</u> |

$$\bar{e} = \frac{74}{2} - \frac{12714}{440.34} = 8.12'$$

IS $\frac{74}{6} - 8.12 = 0 (+4.21)$ yes 2.5' from toe
WITHIN middle 1/3 of base

Check Foundation Pressures

$$P = \frac{440.34}{74} \left(1 \pm \frac{6 \times 8.12}{74} \right) \frac{1000}{144} = 41.32 \pm 27.2 \text{ psi}$$

Acceptable for
Rock Foundation $\begin{cases} 9867 \text{ psf} = 68.52 \text{ psi} \\ 2033 \text{ psf} = 14.12 \text{ psi} \end{cases}$
OK

F.S. Against Sliding

$$\frac{(440.34 + 15111) \tan 45^\circ + 74(4.5)}{251.6} = 3.1373 \text{ OK}$$

TAMS

Job No. 1579-19

Sheet 17 of 19

Project NYS Dam Inspection

Date 8-4-81

Subject 1210 Dam - Stability Analysis

By jan

Ch'k. by _____

Case III $\frac{1}{2}$ PMF

| | $\Sigma F_u(kips)$ | $\Sigma F_v(kips)$ | $\Sigma M_A(k \cdot ft)$ |
|---------------------|--------------------------------|---------------------------------|-------------------------------|
| Demo Load | <u>579.95</u> | | <u>26,857</u> |
| Passive Resistance | | <u>25.54</u> | |
| Hydrostatic Loading | <u>-205.6</u>
<u>374.35</u> | <u>-302.64</u>
<u>-277.1</u> | <u>-19,296</u>
<u>7561</u> |

find eccentricity $\bar{e}$

$$\bar{e} = \frac{74}{2} - \frac{7561}{374.35} = 20.19'$$

is resultant within central $\frac{1}{3}$ of base

only if $\frac{76}{6} - |20.19'| \geq 0$ (-7.53) NO
resultant located c. 175% middle $\frac{1}{3}$

Check Foundation Pressures

$$P = \frac{374.35}{74} \left(1 \pm \frac{6(20.19')}{74} \right) \times \frac{1200}{144} \text{ psi} = 35.13 \pm 57.51$$

yields the range 92.64 psi
to -22.38 psi
acceptable for
sound rock foundation

F.S. AGAINST SLIDING

$$F.S. = \frac{(374.35 + 15.11) \tan 95^\circ + 74(4.5 \text{ ksf})}{277.1} = 2.60 < 3$$

DOES NOT
meet CRITERIA

TAMS

Job No. 1579-19

Sheet 18 of 19

Project NYS Dam Inspector

Date 8-4-87

Subject Rio Dam - Stability Analysis

By JW

Ch'k. by _____

CASE II PMF CONDITION

| | $\Sigma F_V (kips)$ | $\Sigma F_H (kips)$ | $\Sigma M_A (k-ft)$ |
|--------------------|---------------------|---------------------|---------------------|
| DAM LOAD | 579.95 | — | 26,857 |
| PASSIVE RESISTANCE | — | 25.54 | — |
| HYDROSTATIC LOADS | -231.05 | -370.3 | -23,192 |
| | 348.9 | -344.76 | 3665 |

FIND ECCENTRICITY $\bar{e}$

$$\bar{e} = \frac{74}{2} - \frac{3665}{348.9} = 26.49'$$

IS RESULTANT WITHIN MIDDLE 1/3

only if $\frac{74}{6} - 26.49 \geq 0$ (-14.16) NO RESULTANT
NOT WITHIN MIDDLE 1/3

CHECK BEARING PRESSURE

$$P = \frac{348.9}{74} \left(1 \pm \frac{6(26.49)}{74} \right) \frac{1000}{144} \text{ psi} = 32.74 \pm 70.32 \text{ psi}$$

$$= 103.07 \text{ to } -37.58 \text{ psi}$$

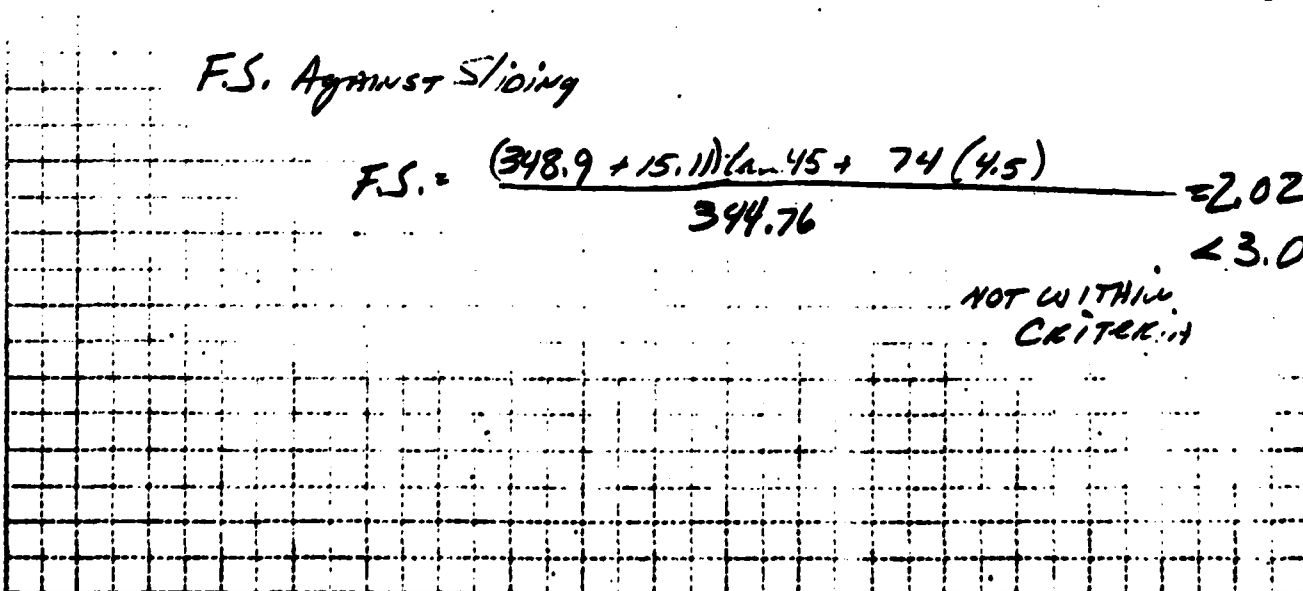
↓
ACCEPTABLE RANGE

F.S. AGAINST SLIDING

$$F.S. = \frac{(348.9 + 15.11) \tan 45 + 74(4.5)}{344.76} = 2.02$$

$$< 3.0$$

NOT WITHIN
CRITERIA



TAMS

Job No. 1579-19
 Project NYS Dam Inspection
 Subject Red Dam - Stability Analysis

Sheet 19 of 19
 Date 8-11-71
 By J.C.
 Ch'k. by _____

SUMMARY

| <u>CASE</u> | <u>F.S. AGAINST SLIDING</u> | <u>LOCATION OF RESULTANT FORCE</u> | <u>FOUNDATION PRESSURE</u> |
|-------------|-----------------------------|------------------------------------|-----------------------------|
| <u>I</u> | <u>3.19</u> | <u>WITHIN MIDDLE 1/3</u> | <u>65.11 / 17.53, psi</u> |
| <u>II</u> | <u>3.13</u> | <u>WITHIN MIDDLE 1/3</u> | <u>68.52 / 14.12, psi</u> |
| <u>III</u> | <u>2.60</u> | <u>7.53 ft OUTSIDE MIDDLE 1/3</u> | <u>92.64 / -22.14, psi</u> |
| <u>IV</u> | <u>2.02</u> | <u>14.16 ft OUTSIDE MIDDLE 1/3</u> | <u>103.07 / -37.58, psi</u> |

REFERENCES

APPENDIX F

REFERENCES

1. "Recommended Guidelines for Safety Inspection of Dams", Department of the Army, Office of the Chief of Engineers, Appendix D.
2. "Upper Delaware River Basin, Hydrologic Flood Routing Model", Department of the Army, Corps of Engineers, New York District, October 1976.
3. "Seasonal Variation of the Probable Maximum Precipitation, East of the 105th Meridian for Areas from 10 to 1,000 Square Miles, and Durations of 6, 12, 24 and 40 Hours", Hydrometeorological Report No. 33. Weather Bureau, U.S. Department of Commerce, April 1956.
4. "Flood Hydrograph Package (HEC-1) Users Manual for Dam Safety Investigations", U.S. Army Corps of Engineers, Hydrologic Engineering Center, September 1979.

OTHER DATA

APPENDIX G

State Engineer and Surveyor

ALBANY

NY 497

Received Dec 22 - 1925 Dam No. 86 Del Watershed
 Disposition Approved Jan 3 - 1926 Serial No. 566
 Foundation inspected _____
 Structure inspected _____

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the State Engineer, Albany, N. Y., in compliance with the provisions of Chapter LXV of the Consolidated Laws and Chapter 647, Laws of 1911, Section 22 as amended, for the approval of specifications and detailed drawings, marked KK-3-50-52-53-54-55-56 and 58

herewith submitted for the { construction } of a dam located as stated below. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about November 1st, 1927
 (Date)

1. The dam will be on Mongaup River flowing into Delaware River in the town of Deer Park and Lumberland, County of Orange and Sullivan and 3 miles from its confluence with the Delaware River
 (Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. The name and address of the owner is Catskill Power Corp., Middletown, N. Y.

3. The dam will be used for hydro-electric power

4. Will any part of the dam be built upon or its pond flood any State lands? no

5. The watershed at the proposed dam draining into the pond to be formed thereby is 195 square miles.

6. The proposed dam will have a pond area at the spillcrest elevation of 410 acres and will impound 580,000,000 cubic feet of water.

7. The lowest part of the natural shore of the pond is 500 feet vertically above the spillcrest, and everywhere else the shore will be at least 500 feet above the spillcrest.

8. The maximum known flow of the stream at the dam site was _____ cubic feet per second on no records
 (Date)

9. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam. no

10. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) sandstone

11. The material of the right bank, in the direction with the current, is ledge; at the spillcrest elevation this material has a top slope of _____ inches vertical to a foot horizontal on the center line of the dam, a vertical thickness at this elevation of _____ feet, and the top surface extends for a vertical height of _____ feet above the spillcrest.

12. The material of the left bank is ledge; has a top slope of _____ inches to a foot horizontal, a thickness of _____ feet, and a height of _____ feet.

13. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. no loss of water in any bore hole

14. If the bed is in layers, are the layers horizontal or inclined? horizontal If inclined what is the direction of the horizontal outcropping relative to the axis of the main dam and the inclination and direction of the layers in a plane perpendicular to the horizontal outcropping

15. What is the thickness of the layers? 4 ft. to 8 ft.

16. Are there any porous seams or fissures? No

17. WASTES. The spillway of the above proposed dam will be 240 feet long in the clear; the waters will be held at the right end by a concrete abutment the top of which will be 15 feet above the spillcrest, and have a top width of 19 feet; and at the left end by a concrete abutment the top of which will be 15 feet above the spillcrest, and have a top width of 19 feet.

18. There will be also for flood discharge a pipe _____ inches inside diameter and the bottom will be _____ feet below the spillcrest, a sluice or gate _____ feet wide in the clear by _____ feet high, and the bottom will be _____ feet below the spillcrest.

19. APRON. Below the proposed dam there will be an apron built of concrete, 160 feet long across the stream, 32 feet wide and 4 feet thick. The downstream side of the apron will have a thickness of _____ feet for a width of _____ feet.

20. PLANS. Each application for a permit of a dam over 12 feet in height must be accompanied by a location map and complete working drawings in triplicate of the proposed structure, one set of which will be returned if they are approved. Each drawing should have a title giving the parts shown, the name of the town and county in which the dam site is located, and the name of the owner and of the engineer.

The location map (U. S. Geological Quadrangle or other map) should show the exact location of the proposed dam; of buildings below the dam which might be damaged by any failure of the dam; of roads adjacent to or crossing the stream below the dam, giving the lowest elevation of the roadway above the stream bed and giving the shape,

the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground below the dam.

The complete working drawings should give all the dimensions necessary for the calculations of the stability of the structure, and all the information asked for below under "Sketches." There may be attached to the application any written reports, calculations, investigations or opinions that may aid in showing the data and method used by the designer. State the assumed ice and uplift pressures and the conditions on which based.

21. SKETCHES. For small and unimportant structures, if plans have not been made, on the back of this application make a sketch to scale for each different cross-section at the highest point; giving the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spill at 18 inches below the crest), the elevation of the top in reference to the spillcrest, the length of the section, and the material of which the section is to be constructed; on the spillway section show a cross section of the apron, giving its width, thickness and material; and show the abutment or wash wall at the end of the spillway, giving its heights and thickness. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; the abutments by their top width and top lengths from the upstream face of the spillcrest; and outline the apron. Also sketch an elevation of each end of the dam with a cross section of the banks, giving the depth and width excavated into the banks.

22. ELEVATIONS. Also give the elevations, if possible from the Mean Sea Level, of at least two permanent Bench Marks; of the spillcrest for any existing dam on the proposed dam site, at the middle and at the ends of the spill; of the spillcrest for the above proposed dam; and of the spillcrest of any adjacent dams.

23. SAMPLES. When so instructed, send samples of the materials to be used in the construction of the proposed dam, using shipping tags which will be furnished. For sand, one-half a cubic foot is desired (exclusive of any stone over $\frac{1}{4}$ inch in size mixed therewith); for cement, three pints; and for the natural bed, twenty cubic inches if of ledge and one-half a cubic foot if of soil.

24. INSPECTION. State how inspection is to be provided for during construction by competent
resident engineer

25. WATER SUPPLY. Are the waters impounded by the above dam to be used for a public water supply? no
Has an application under the provisions of Article IX of the Conservation Law for such use been made to the Water Control Commission, Albany, N. Y.?

Name and address of Designing Engineer

Chas. T. Main
200 Devonshire St., Boston, Mass.

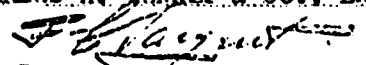
Engineers License Number 6146

The above information is correct to the best of my knowledge and belief.

200 Devonshire St., Boston, Mass.
(Address of signer)

December 21, 1925
(Date)

CATSKILL POWER CORPORATION
CHARLES H. TENNEY & CO., Engineers


Vice President in Charge of Engineering
(A person signing for owner should indicate his title or authority)

DAM INSPECTION REPORT
(By Visual Inspection)

R10 Reservoir

| Dam Number | River Basin | Town | County | Hazard Class* | Date & Inspector |
|------------|-------------|-------------------------|--------------------|---------------|------------------|
| 86 | Delaware | Lumberton
Dover Park | Sullivan
Orange | C | 10/17/74
JVE |

Type of Construction

- ☒ Earth w/concrete spillway
- ☐ Earth w/drop inlet pipe
- ☐ Earth w/stone or riprap spillway
- ☐ Concrete
- ☐ Stone
- ☐ Timber

Use

- ☐ Water Supply
- ☒ Power
- ☐ Recreation
- ☐ Fish and Wildlife
- ☐ Farm Pond
- ☐ No Apparent Use-Abandoned

Estimated Impoundment Size

- ☐ 1-5 acres
- ☐ 5-10 acres
- ☒ Over 10 acres

Estimated Height of Dam above Streambed

- ☐ Under 10 feet
- ☐ 10-25 feet
- ☒ Over 25 feet

Condition of Spillway

- ☒ Service satisfactory
- ☐ In need of repair or maintenance
- ☒ Auxiliary satisfactory
- ☐ In need of repair or maintenance

Explain: Concrete starting to show age - Some work done on abutment walls to preserve concrete

Condition of Non-Overflow Section

- ☒ Satisfactory
- ☐ In need of repair or maintenance

Explain: _____

Condition of Mechanical Equipment

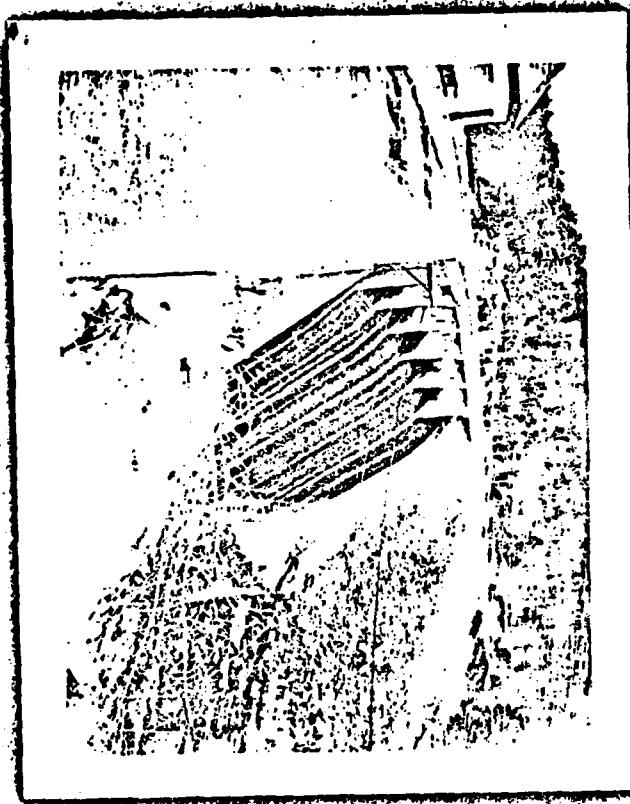
- ☒ Satisfactory
- ☐ In need of repair or maintenance

Explain: _____

Evaluation (From Visual Inspection)

- ☒ No defects observed beyond normal maintenance
- ☐ Repairs required beyond normal maintenance

*Explain Hazard Class, if Necessary Very high with large impoundment



ORANGE AND ROCKLAND UTILITIES, INC.

one blue hill plaza, pearl river, new york, 10965 914-352-6000

writer's direct dial number 914-627-2648

RECEIVED

JUL 20 1981

July 16, 1981

SOILS SECTION

Mr. Jyotindra Patel
Tippetts-Abbett-McCarthy-Stratton
The TAMS Building
655 Third Avenue
New York, New York 10017

Re: National Dam Inspection Program
Rio Dam, N.Y. 497

Dear Mr. Patel:

Enclosed herewith is a tabulation of the weir monitoring program for Rio Dam which has been in effect since November 1979.

The existing weirs have been in place for at least 25 years. However, as a result of our engineering offices being relocated several times over the past years, these records are either misplaced or lost.

We have a copy of an insurance report (also enclosed) made in 1964 indicating a leakage at the dam of 193 gallons per minute. This report also includes a good deal of background information about the design and construction of the dam which should be helpful in the compilation of your report.

If there is any other information you need, please contact us and we will be glad to assist you in this matter.

Very truly yours,

R.O. Wanvig
R. O. Wanvig
Senior Civil Engineer

ROW/cb
Encs.

RIO DAM - WEIR MONITORING

| Date | 11/30/79 | 1/2/80 | 4/22/80 | 8/1/80 | 10/14/81 | 5/1/81 |
|---------------------|----------|-----------------------------|---------|--------|----------|--------|
| Rio.-Elev. | 811.8 | 811.2 | 811.8 | 811.5 | 811.0 | 812.2 |
| <u>Weir No.</u> | | | | | | |
| | | <u>FLOW - Gal. per Min.</u> | | | | |
| 1. 18" Box (stream) | 137.0 | 104.0 | 202.0 | 29.6 | 3.0 | 104.0 |
| 2. 48" Box | 314.0 | 314.0 | 425.5 | 192.0 | 240.0 | 453.0 |
| 3. 4" Pipe (Stream) | 3.0 | 2.5 | 0 | 2.1 | 3.0 | 1.0 |
| Net Leakage | | | | | | |
| 2 - (1+3) | 174.0 | 207.5 | 223.5 | 160.3 | 234.0 | 348.0 |

NOTE: Previous records of seepage have been lost or are unavailable. A copy of an insurance report (enclosed herewith) made June 1964 reveals that seepage was 193 gpm with Rio Reservoir at elevation 812.0'. This figure basically agrees with the current net leakage figures shown above.

The reading on 5/1/81 was taken after a very heavy rain fall and the lake elevation well above normal.

ROW/dd

July 13, 1981

6/4/64

ORANGE AND ROCKLAND UTILITIES, INC.

The Dam or Structure - Rio Dam - Deerpark and Lumberland, New York

1. By whom designed - Chas. T. Main, Inc., Boston, Massachusetts.
2. By whom constructed - Fred T. Ley & Co., Springfield, Massachusetts.
3. Year constructed - 1926-1927.
4. Type
Concrete
5. Size
 - a. Length - Spillway 264 feet; total including abutments and earth embankments 1500 feet.
 - b. Height - 90 feet to spillway crest (maximum).
 - c. Width at base - At spillway 100 feet.
 - d. Width at top - About 10 feet - Ogee section.
6. Anchorage
 - a. How are wings of dam secured? The concrete abutment walls are built into rock ledge. The earth embankments flanking the two abutment walls are founded on earth and tie into the earth hillside.
 - b. Foundation under dam: Spillway section is founded on rock.
7. Water Impounded
 - a. Area of pond surface is 460 acres with water at top of 5-ft. flashboards (Elevation 815).
 - b. Average depth - 33 feet.
 - c. Depth at spillway - 5 feet with water at top of 5-ft. flashboards.
 - d. Depth at dam - 90 feet maximum
 - e. Water Supply
 1. River.
 - *f. Length of time to refill - 45 days in average water year.
 - ** 1. Approximate area of water used - 2200 acre feet.
 - g. What is water used for? Hydroelectric power.
8. Control
 - a. Gates - None except head gates to power penstock.
 1. Size - 9.5 ft. x 12.5 ft.
 2. Number - One.
 3. Location with respect to bottom of dam: Centerline of gate 49.5 feet above.
 - b. Diversion tunnels - None as such, but there is one 11-ft. diameter wood penstock supplying water to the Rio Power Plant.
 - c. Spillway
 1. Size - 240 feet long at crest of concrete dam.
 2. Elevation with top of dam: At top.

NOTES:

*Assumes no water released during refill period -- only Rio drainage area used to determine runoff (15 square miles).

Condition

1. Maintenance, Inspection and Operation -- Inspected weekly and maintained as necessary.
2. Erosion or deterioration of dam structure -- Dam structure in good condition.
3. Seepage: With water at elevation ~~812~~ ⁸¹² ~~193 gpm~~ ^{193 gpm} ~~around the eastern earth embankment~~
4. Property around lake is mostly undeveloped forest land. Employees' recreation area and some private hunting and fishing clubs.
 - a. Lowering of water affects use of lake for recreation to some extent.

Public Exposure at Dam Site

1. Road across dam? Yes - public.
2. Is public allowed access to dam? See 1 next above.
3. Is supervision maintained full time? No.

Conditions Downstream from Dam

1. River bed drops about 95 feet in the 8,000 feet between the dam and the point where water re-enters the river after going through the Rio powerhouse.
2. Width of valley below dam is approximately 1800 feet at elevation of top of dam.
3. Spillway discharges into this valley.
4. Number of bridges that might be affected by flood conditions should dam rupture:

Assuming that this question refers only to public bridges over the Mongaup River, there is one bridge over the river on Highway 97 near the confluence of the Mongaup and Delaware Rivers.

a. Give size and stability of structure: Not known.

5. Buildings and structures that would be affected by dam failure (power plants, piers, etc.):

The power plant of Orange and Rockland which might be affected is the Rio Plant.

6. Dams, weirs and flood gates in streambed which might be affected by dam failure:

If this question refers to the Mongaup River, there are no other dams which would be affected by the failure of the Rio Dam.